



## SAR EVALUATION REPORT

### Applicant Name:

LG Electronics MobileComm U.S.A., Inc.  
1000 Sylvan Avenue  
Englewood Cliffs, NJ 07632  
United States

### Date of Testing:

01/06/16 - 01/16/16

### Test Site/Location:

PCTEST Lab, Columbia, MD, USA

### Document Serial No.:

0Y1601040033.ZNF

### FCC ID:

**ZNFV520**

### APPLICANT:

**LG ELECTRONICS MOBILECOMM U.S.A., INC.**

### DUT Type:

Portable Tablet

### Application Type:

Certification

### FCC Rule Part(s):

CFR §2.1093

### Model(s):

LG-V520, LGV520, V520, LG-V522, LGV522, V522

| Equipment Class                            | Band & Mode       | Tx Frequency        | SAR            |
|--------------------------------------------|-------------------|---------------------|----------------|
|                                            |                   |                     | 1 gm Body W/kg |
| PCB                                        | UMTS 850          | 826.40 - 846.60 MHz | 0.52           |
| PCB                                        | UMTS 1750         | 1712.4 - 1752.6 MHz | 0.43           |
| PCB                                        | UMTS 1900         | 1852.4 - 1907.6 MHz | 0.83           |
| PCB                                        | LTE Band 12       | 699.7 - 715.3 MHz   | 0.57           |
| PCB                                        | LTE Band 17       | 706.5 - 713.5 MHz   | 0.57           |
| PCB                                        | LTE Band 5 (Cell) | 824.7 - 848.3 MHz   | 0.59           |
| PCB                                        | LTE Band 4 (AWS)  | 1710.7 - 1754.3 MHz | 0.69           |
| PCB                                        | LTE Band 2 (PCS)  | 1850.7 - 1909.3 MHz | 0.70           |
| PCB                                        | LTE Band 30       | 2307.5 - 2312.5 MHz | 0.40           |
| PCB                                        | LTE Band 7        | 2502.5 - 2567.5 MHz | 0.61           |
| DTS                                        | 2.4 GHz WLAN      | 2412 - 2462 MHz     | 0.76           |
| NII                                        | U-NII-1           | 5180 - 5240 MHz     | 0.45           |
| NII                                        | U-NII-2A          | 5260 - 5320 MHz     | 0.45           |
| NII                                        | U-NII-2C          | 5500 - 5700 MHz     | 0.47           |
| NII                                        | U-NII-3           | 5745 - 5825 MHz     | 0.89           |
| DSS/DTS                                    | Bluetooth         | 2402 - 2480 MHz     | 0.13           |
| Simultaneous SAR per KDB 690783 D01v01r03: |                   |                     | 1.44           |

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE C95.1-1992 and has been tested in accordance with the measurement procedures specified in Section 1.7 of this report; for North American frequency bands only.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them. Test results reported herein relate only to the item(s) tested.

  
Randy Ortanez  
President



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|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFV520                   |  | SAR EVALUATION REPORT        |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>0Y1601040033.ZNF | Test Dates:<br>01/06/16 - 01/16/16                                                  | DUT Type:<br>Portable Tablet |                                                                                       | Page 1 of 66                    |

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|                                          |                                                                                                                                                                                                        |                                        |
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# 1 DEVICE UNDER TEST

## 1.1 Device Overview

| Band & Mode       | Operating Modes | Tx Frequency        |
|-------------------|-----------------|---------------------|
| UMTS 850          | Data            | 826.40 - 846.60 MHz |
| UMTS 1750         | Data            | 1712.4 - 1752.6 MHz |
| UMTS 1900         | Data            | 1852.4 - 1907.6 MHz |
| LTE Band 12       | Data            | 699.7 - 715.3 MHz   |
| LTE Band 17       | Data            | 706.5 - 713.5 MHz   |
| LTE Band 5 (Cell) | Data            | 824.7 - 848.3 MHz   |
| LTE Band 4 (AWS)  | Data            | 1710.7 - 1754.3 MHz |
| LTE Band 2 (PCS)  | Data            | 1850.7 - 1909.3 MHz |
| LTE Band 30       | Data            | 2307.5 - 2312.5 MHz |
| LTE Band 7        | Data            | 2502.5 - 2567.5 MHz |
| 2.4 GHz WLAN      | Data            | 2412 - 2462 MHz     |
| U-NII-1           | Data            | 5180 - 5240 MHz     |
| U-NII-2A          | Data            | 5260 - 5320 MHz     |
| U-NII-2C          | Data            | 5500 - 5700 MHz     |
| U-NII-3           | Data            | 5745 - 5825 MHz     |
| Bluetooth         | Data            | 2402 - 2480 MHz     |

## 1.2 Power Reduction for SAR

This device uses a power reduction mechanism for SAR compliance. The power reduction mechanism is activated when the device is used in close proximity to the user's body. FCC KDB Publication 616217 D04v01r02 Section 6 was used as a guideline for selecting SAR test distances for this device. Detailed descriptions of the power reduction mechanism are included in the operational description.

The reduced powers for the power reduction mechanisms were confirmed via conducted power measurements at the RF port (See Section 8). Detailed descriptions of the mechanisms are included in the operational description.

## 1.3 Nominal and Maximum Output Power Specifications

This device operates using the following maximum and nominal output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D01v06.

|                                   |                                                                                     |                              |                                                                                       |                                 |
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### 1.3.1 Maximum Power

| Mode / Band            |         | Modulated Average (dBm) |            |            |
|------------------------|---------|-------------------------|------------|------------|
|                        |         | 3GPP WCDMA              | 3GPP HSDPA | 3GPP HSUPA |
| UMTS Band 5 (850 MHz)  | Maximum | 24.7                    | 24.7       | 24.7       |
|                        | Nominal | 24.2                    | 24.2       | 24.2       |
| UMTS Band 4 (1750 MHz) | Maximum | 24.7                    | 24.7       | 24.7       |
|                        | Nominal | 24.2                    | 24.2       | 24.2       |
| UMTS Band 2 (1900 MHz) | Maximum | 24.7                    | 24.7       | 24.7       |
|                        | Nominal | 24.2                    | 24.2       | 24.2       |

| Mode / Band       |         | Modulated Average (dBm) |
|-------------------|---------|-------------------------|
| LTE Band 12       | Maximum | 25.5                    |
|                   | Nominal | 25.0                    |
| LTE Band 17       | Maximum | 25.5                    |
|                   | Nominal | 25.0                    |
| LTE Band 5 (Cell) | Maximum | 25.2                    |
|                   | Nominal | 24.7                    |
| LTE Band 4 (AWS)  | Maximum | 24.7                    |
|                   | Nominal | 24.2                    |
| LTE Band 2 (PCS)  | Maximum | 24.7                    |
|                   | Nominal | 24.2                    |
| LTE Band 30       | Maximum | 23.2                    |
|                   | Nominal | 22.7                    |
| LTE Band 7        | Maximum | 23.7                    |
|                   | Nominal | 23.2                    |

| Mode / Band            |         | Modulated Average (dBm) |
|------------------------|---------|-------------------------|
| IEEE 802.11b (2.4 GHz) | Maximum | 14.5                    |
|                        | Nominal | 13.5                    |
| IEEE 802.11g (2.4 GHz) | Maximum | 13.0                    |
|                        | Nominal | 12.0                    |
| IEEE 802.11n (2.4 GHz) | Maximum | 13.0                    |
|                        | Nominal | 12.0                    |
| Bluetooth              | Maximum | 10.0                    |
|                        | Nominal | 9.0                     |
| Bluetooth LE           | Maximum | 1.0                     |
|                        | Nominal | 0.0                     |

| Mode / Band           |         | Modulated Average (dBm) |                  |                  |
|-----------------------|---------|-------------------------|------------------|------------------|
|                       |         | 20 MHz Bandwidth        | 40 MHz Bandwidth | 80 MHz Bandwidth |
| IEEE 802.11a (5 GHz)  | Maximum | 11.5                    |                  |                  |
|                       | Nominal | 10.5                    |                  |                  |
| IEEE 802.11n (5 GHz)  | Maximum | 11.5                    | 11.5             |                  |
|                       | Nominal | 10.5                    | 10.5             |                  |
| IEEE 802.11ac (5 GHz) | Maximum | 11.5                    | 11.5             | 10.5             |
|                       | Nominal | 10.5                    | 10.5             | 9.5              |

|                                   |                                                                                                                                                                                                        |                              |                                 |
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### 1.3.2 Reduced Power (Body at 0.0 cm)

| Mode / Band            |         | Modulated Average (dBm) |               |               |
|------------------------|---------|-------------------------|---------------|---------------|
|                        |         | 3GPP<br>WCDMA           | 3GPP<br>HSDPA | 3GPP<br>HSUPA |
| UMTS Band 5 (850 MHz)  | Maximum | 20.7                    | 20.7          | 20.7          |
|                        | Nominal | 20.2                    | 20.2          | 20.2          |
| UMTS Band 4 (1750 MHz) | Maximum | 14.7                    | 14.7          | 14.7          |
|                        | Nominal | 14.2                    | 14.2          | 14.2          |
| UMTS Band 2 (1900 MHz) | Maximum | 12.7                    | 12.7          | 12.7          |
|                        | Nominal | 12.2                    | 12.2          | 12.2          |

| Mode / Band       |         | Modulated Average<br>(dBm) |
|-------------------|---------|----------------------------|
| LTE Band 12       | Maximum | 19.5                       |
|                   | Nominal | 19.0                       |
| LTE Band 17       | Maximum | 19.5                       |
|                   | Nominal | 19.0                       |
| LTE Band 5 (Cell) | Maximum | 21.2                       |
|                   | Nominal | 20.7                       |
| LTE Band 4 (AWS)  | Maximum | 14.7                       |
|                   | Nominal | 14.2                       |
| LTE Band 2 (PCS)  | Maximum | 12.7                       |
|                   | Nominal | 12.2                       |
| LTE Band 30       | Maximum | 11.2                       |
|                   | Nominal | 10.7                       |
| LTE Band 7        | Maximum | 11.7                       |
|                   | Nominal | 11.2                       |

## 1.4 DUT Antenna Locations

The overall diagonal dimension of the device is > 200 mm. A diagram showing the locations of the device antennas can be found in Appendix F. Exact antenna dimensions and separation distances are shown in the Technical Descriptions in the FCC filing.

**Table 1-1  
Device Edges/Sides for SAR Testing**

| Mode              | Back | Top | Bottom | Right | Left |
|-------------------|------|-----|--------|-------|------|
| UMTS 850          | Yes  | Yes | No     | No    | Yes  |
| UMTS 1750         | Yes  | Yes | No     | No    | Yes  |
| UMTS 1900         | Yes  | Yes | No     | No    | Yes  |
| LTE Band 12       | Yes  | Yes | No     | Yes   | Yes  |
| LTE Band 5 (Cell) | Yes  | Yes | No     | No    | Yes  |
| LTE Band 4 (AWS)  | Yes  | Yes | No     | No    | Yes  |
| LTE Band 2 (PCS)  | Yes  | Yes | No     | No    | Yes  |
| LTE Band 30       | Yes  | Yes | No     | No    | Yes  |
| LTE Band 7        | Yes  | Yes | No     | No    | Yes  |
| 2.4 GHz WLAN      | Yes  | Yes | No     | Yes   | No   |
| 5 GHz WLAN        | Yes  | Yes | No     | Yes   | No   |
| 2.4 GHz Bluetooth | Yes  | Yes | No     | Yes   | No   |

Note: Per FCC KDB 616217 D04v01, particular DUT edges were not required to be evaluated for SAR based on the SAR exclusion threshold in KDB 447498 D01v06.

|                                   |                                                                                                                                                                                                        |                              |                                 |
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## 1.5 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D05v01, transmitters are considered to be transmitting simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. Possible transmission paths for the DUT are shown in Figure 1-1 and are color-coded to indicate communication modes which share the same path. Modes which share the same transmission path cannot transmit simultaneously with one another.



Figure 1-1  
Simultaneous Transmission Paths

This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB Publication 447498 D01v05 3) procedures.

Table 1-2  
Simultaneous Transmission Scenarios

| No. | Capable Transmit Configuration | Body |
|-----|--------------------------------|------|
| 1   | UMTS + 2.4 GHz WI-FI           | Yes  |
| 2   | UMTS + 5 GHz WI-FI             | Yes  |
| 3   | UMTS + 2.4 GHz Bluetooth       | Yes  |
| 4   | LTE + 2.4 GHz WI-FI            | Yes  |
| 5   | LTE + 5 GHz WI-FI              | Yes  |
| 6   | LTE + 2.4 GHz Bluetooth        | Yes  |

- 2.4 GHz WLAN, 5 GHz WLAN, and 2.4 GHz Bluetooth share the same antenna path and cannot transmit simultaneously.
- All licensed modes share the same antenna path and cannot transmit simultaneously.

## 1.6 Miscellaneous SAR Test Considerations

### (A) WIFI/BT

Since U-NII-1 and U-NII-2A bands have the same maximum output power and the highest reported SAR for U-NII-2A is less than 1.2 W/kg for 1g SAR, SAR is not required for U NII-1 band according to FCC KDB 248227 D01v02r02

Per FCC KDB 447498 D01v06, the 1g SAR exclusion threshold for distances <50mm is defined by the following equation:

$$\frac{\text{Max Power of Channel (mW)}}{\text{Test Separation Dist (mm)}} * \sqrt{\text{Frequency(GHz)}} \leq 3.0$$

Based on the maximum conducted power of Bluetooth LE (rounded to the nearest mW) and the antenna to user separation distance, body-worn Bluetooth LE SAR was not required;  $[(1/5) * \sqrt{2.480}] = 0.3 < 3.0$ . Per KDB Publication 447498 D01v06, the maximum power of the channel was rounded to the nearest mW before calculation.

|                                   |                                                                                     |                              |                                                                                       |                                 |
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This device supports IEEE 802.11ac with the following features:

- a) Up to 80 MHz Bandwidth only
- b) No aggregate channel configurations
- c) 1 Tx antenna output
- d) 256 QAM is supported
- e) Band gap and TDWR channels are not supported

## (B) Licensed Transmitter(s)

This device is only capable of QPSK HSUPA in the uplink. Therefore, no additional SAR tests are required beyond that described for devices with HSUPA in KDB 941225 D01v03r01.

This device additionally supports LTE Band 17. LTE Band 12 and LTE Band 17 share the same transmission path. LTE Band 17 was not evaluated for SAR since the supported frequency range falls within the LTE Band 12 supported frequency range and the Band 17 target power was equal to the Band 12 target power.

LTE SAR for the higher modulations and lower bandwidths were not tested since the maximum average output power of all required channels and configurations was not more than 0.5 dB higher than the highest bandwidth; and the reported LTE SAR for the highest bandwidth was less than 1.45 W/kg for all configurations according to FCC KDB 941225 D05v02r04.

This device supports LTE Carrier Aggregation (CA) in the downlink only. All uplink communications are identical to Release 8 specifications. Per FCC KDB Publication 941225 D05A v01r02, SAR for LTE CA operations was not needed since the maximum average output power in LTE CA mode was not >0.25 dB higher than the maximum output power when downlink carrier aggregation was inactive.

## 1.7 Guidance Applied

- IEEE 1528-2013
- FCC KDB Publication 941225 D01v03r01, D05v02r04, D05Av01r02, D06v02r01 (2G/3G/4G and Hotspot)
- FCC KDB Publication 248227 D01v02r02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D01v06 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r04, D02v01r02 (SAR Measurements up to 6 GHz)
- FCC KDB Publication 616217 D04v01r02 (Tablet SAR Considerations)

## 1.8 Device Serial Numbers

Several samples with identical hardware were used to support SAR testing. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.

|                   | Max Power<br>Body Serial<br>Number | Reduced<br>Power Body<br>Serial Number |
|-------------------|------------------------------------|----------------------------------------|
| UMTS 850          | 04236                              | 04269                                  |
| UMTS 1750         | 04236                              | 04269                                  |
| UMTS 1900         | 04236                              | 04269                                  |
| LTE Band 12       | 04228                              | 04251                                  |
| LTE Band 5 (Cell) | 04244                              | 04251                                  |
| LTE Band 4 (AWS)  | 04228                              | 04251                                  |
| LTE Band 2 (PCS)  | 04228                              | 04251                                  |
| LTE Band 30       | 04228                              | 04251                                  |
| LTE Band 7        | 04244                              | 04285                                  |
| 2.4 GHz WLAN      | 04210                              | N/A                                    |
| 5 GHz WLAN        | 04210                              | N/A                                    |
| 2.4 GHz Bluetooth | 04285                              | N/A                                    |

|                                          |                                                                                                                                                                                                        |                                        |
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|                                          |                                                                                                                                                                                                        | Page 7 of 66                           |

| LTE Information                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                |                |
|-------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|
| FCC ID                                                                                                            | ZNFV520                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                |                |
| Form Factor                                                                                                       | Portable Tablet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                |                |
| Frequency Range of each LTE transmission band                                                                     | LTE Band 12 (699.7 - 715.3 MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                |                |
|                                                                                                                   | LTE Band 17 (706.5 - 713.5 MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                |                |
|                                                                                                                   | LTE Band 5 (Cell) (824.7 - 848.3 MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                |
|                                                                                                                   | LTE Band 4 (AWS) (1710.7 - 1754.3 MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                |                |
|                                                                                                                   | LTE Band 2 (PCS) (1850.7 - 1909.3 MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                |                |
|                                                                                                                   | LTE Band 30 (2307.5 - 2312.5 MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                |                |
| Channel Bandwidths                                                                                                | LTE Band 12: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |                |
|                                                                                                                   | LTE Band 17: 5 MHz, 10 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |                |
|                                                                                                                   | LTE Band 5 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                |                |
|                                                                                                                   | LTE Band 4 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                              |                |                |
|                                                                                                                   | LTE Band 2 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                              |                |                |
|                                                                                                                   | LTE Band 30: 5 MHz, 10 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |                |
| Channel Numbers and Frequencies (MHz)                                                                             | LTE Band 7: 5 MHz, 10 MHz, 15 MHz, 20 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |                |
|                                                                                                                   | Low                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Mid            | High           |
| LTE Band 12: 1.4 MHz                                                                                              | 699.7 (23017)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 707.5 (23095)  | 715.3 (23173)  |
| LTE Band 12: 3 MHz                                                                                                | 700.5 (23025)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 707.5 (23095)  | 714.5 (23165)  |
| LTE Band 12: 5 MHz                                                                                                | 701.5 (23035)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 707.5 (23095)  | 713.5 (23155)  |
| LTE Band 12: 10 MHz                                                                                               | 704 (23060)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 707.5 (23095)  | 711 (23130)    |
| LTE Band 17: 5 MHz                                                                                                | 706.5 (23755)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 710 (23790)    | 713.5 (23825)  |
| LTE Band 17: 10 MHz                                                                                               | 709 (23780)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 710 (23790)    | 711 (23800)    |
| LTE Band 5 (Cell): 1.4 MHz                                                                                        | 824.7 (20407)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 836.5 (20525)  | 848.3 (20643)  |
| LTE Band 5 (Cell): 3 MHz                                                                                          | 825.5 (20415)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 836.5 (20525)  | 847.5 (20635)  |
| LTE Band 5 (Cell): 5 MHz                                                                                          | 826.5 (20425)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 836.5 (20525)  | 846.5 (20625)  |
| LTE Band 5 (Cell): 10 MHz                                                                                         | 829 (20450)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 836.5 (20525)  | 844 (20600)    |
| LTE Band 4 (AWS): 1.4 MHz                                                                                         | 1710.7 (19957)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1732.5 (20175) | 1754.3 (20393) |
| LTE Band 4 (AWS): 3 MHz                                                                                           | 1711.5 (19965)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1732.5 (20175) | 1753.5 (20385) |
| LTE Band 4 (AWS): 5 MHz                                                                                           | 1712.5 (19975)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1732.5 (20175) | 1752.5 (20375) |
| LTE Band 4 (AWS): 10 MHz                                                                                          | 1715 (20000)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1732.5 (20175) | 1750 (20350)   |
| LTE Band 4 (AWS): 15 MHz                                                                                          | 1717.5 (20025)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1732.5 (20175) | 1747.5 (20325) |
| LTE Band 4 (AWS): 20 MHz                                                                                          | 1720 (20050)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1732.5 (20175) | 1745 (20300)   |
| LTE Band 2 (PCS): 1.4 MHz                                                                                         | 1850.7 (18607)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1880 (18900)   | 1909.3 (19193) |
| LTE Band 2 (PCS): 3 MHz                                                                                           | 1851.5 (18615)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1880 (18900)   | 1908.5 (19185) |
| LTE Band 2 (PCS): 5 MHz                                                                                           | 1852.5 (18625)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1880 (18900)   | 1907.5 (19175) |
| LTE Band 2 (PCS): 10 MHz                                                                                          | 1855 (18650)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1880 (18900)   | 1905 (19150)   |
| LTE Band 2 (PCS): 15 MHz                                                                                          | 1857.5 (18675)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1880 (18900)   | 1902.5 (19125) |
| LTE Band 2 (PCS): 20 MHz                                                                                          | 1860 (18700)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1880 (18900)   | 1900 (19100)   |
| LTE Band 30: 5 MHz                                                                                                | 2307.5 (27685)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 2310 (27710)   | 2312.5 (27735) |
| LTE Band 30: 10 MHz                                                                                               | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 2310 (27710)   | N/A            |
| LTE Band 7: 5 MHz                                                                                                 | 2502.5 (20775)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 2535 (21100)   | 2567.5 (21425) |
| LTE Band 7: 10 MHz                                                                                                | 2505 (20800)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 2535 (21100)   | 2565 (21400)   |
| LTE Band 7: 15 MHz                                                                                                | 2507.5 (20825)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 2535 (21100)   | 2562.5 (21375) |
| LTE Band 7: 20 MHz                                                                                                | 2510 (20850)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 2535 (21100)   | 2560 (21350)   |
| UE Category                                                                                                       | 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                |                |
| Modulations Supported in UL                                                                                       | QPSK, 16QAM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |
| LTE MPR Permanently implemented per 3GPP TS 36.101 section 6.2.3~6.2.5? (manufacturer attestation to be provided) | YES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |                |
| A-MPR (Additional MPR) disabled for SAR Testing?                                                                  | YES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |                |
| LTE Carrier Aggregation Possible Combinations                                                                     | The technical description includes all the possible carrier aggregation combinations                                                                                                                                                                                                                                                                                                                                                                                                                         |                |                |
| LTE Release 10 Additional Information                                                                             | This device does not support full CA features on 3GPP Release 10. It supports a maximum of 2 carriers in the downlink. All uplink communications are identical to the Release 8 Specifications. Uplink communications are done on the PCC. Due to carrier capability, only the combinations listed in the documentation are supported. The following LTE Release 10 Features are not supported: Relay, HetNet, Enhanced MIMO, eICl, WIFI Offloading, MDH, eMBMA, Cross-Carrier Scheduling, Enhanced SC-FDMA. |                |                |

|                                   |                                                                                                                                                                                                        |                              |                                 |
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### 3 INTRODUCTION

The FCC and Industry Canada have adopted the guidelines for evaluating the environmental effects of radio frequency (RF) radiation in ET Docket 93-62 on Aug. 6, 1996 and Health Canada Safety Code 6 to protect the public and workers from the potential hazards of RF emissions due to FCC-regulated portable devices. [1]

The safety limits used for the environmental evaluation measurements are based on the criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95.1-1992 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz [3] and Health Canada RF Exposure Guidelines Safety Code 6 [22]. The measurement procedure described in IEEE/ANSI C95.3-2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave [4] is used for guidance in measuring the Specific Absorption Rate (SAR) due to the RF radiation exposure from the Equipment Under Test (EUT). These criteria for SAR evaluation are similar to those recommended by the International Committee for Non-Ionizing Radiation Protection (ICNIRP) in Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields,” Report No. Vol 74. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards.

#### 3.1 SAR Definition

Specific Absorption Rate is defined as the time derivative (rate) of the incremental energy (dU) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density ( $\rho$ ). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body (see Equation 3-1).

**Equation 3-1**  
**SAR Mathematical Equation**

$$SAR = \frac{d}{dt} \left( \frac{dU}{dm} \right) = \frac{d}{dt} \left( \frac{dU}{\rho dv} \right)$$

SAR is expressed in units of Watts per Kilogram (W/kg).

$$SAR = \frac{\sigma \cdot E^2}{\rho}$$

where:

- $\sigma$  = conductivity of the tissue-simulating material (S/m)
- $\rho$  = mass density of the tissue-simulating material (kg/m<sup>3</sup>)
- E = Total RMS electric field strength (V/m)

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relation to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane.[6]

|                                   |                                                                                     |                              |                                                                                       |                                 |
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## 4 DOSIMETRIC ASSESSMENT

### 4.1 Measurement Procedure

The evaluation was performed using the following procedure compliant to FCC KDB Publication 865664 D01v01r04 and IEEE 1528-2013:

1. The SAR distribution at the exposed side of the head or body was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the device-head and body interface and the horizontal grid resolution was determined per FCC KDB Publication 865664 D01v01r04 (See Table 4-1) and IEEE 1528-2013.
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.
3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01r04 (See Table 4-1) and IEEE 1528-2013. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):
  - a. SAR values at the inner surface of the phantom are extrapolated from the measured values along the line away from the surface with spacing no greater than that in Table 4-1. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).
  - b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the "Not a knot" condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.
  - c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete to calculate the SAR drift. If the drift deviated by more than 5%, the SAR test and drift measurements were repeated.

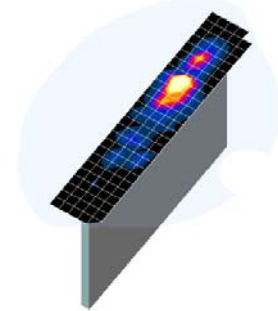


**Figure 4-1**  
**Sample SAR Area**  
**Scan**

**Table 4-1**  
**Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v01r04\***

| Frequency | Maximum Area Scan Resolution (mm)<br>( $\Delta x_{\text{area}}, \Delta y_{\text{area}}$ ) | Maximum Zoom Scan Resolution (mm)<br>( $\Delta x_{\text{zoom}}, \Delta y_{\text{zoom}}$ ) | Maximum Zoom Scan Spatial Resolution (mm)   |                               |                                      | Minimum Zoom Scan Volume (mm)<br>(x,y,z) |
|-----------|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|---------------------------------------------|-------------------------------|--------------------------------------|------------------------------------------|
|           |                                                                                           |                                                                                           | Uniform Grid<br>$\Delta z_{\text{zoom}}(n)$ | Graded Grid                   |                                      |                                          |
|           |                                                                                           |                                                                                           |                                             | $\Delta z_{\text{zoom}}(1)^*$ | $\Delta z_{\text{zoom}}(n>1)^*$      |                                          |
| ≤ 2 GHz   | ≤ 15                                                                                      | ≤ 8                                                                                       | ≤ 5                                         | ≤ 4                           | ≤ 1.5* $\Delta z_{\text{zoom}}(n-1)$ | ≥ 30                                     |
| 2-3 GHz   | ≤ 12                                                                                      | ≤ 5                                                                                       | ≤ 5                                         | ≤ 4                           | ≤ 1.5* $\Delta z_{\text{zoom}}(n-1)$ | ≥ 30                                     |
| 3-4 GHz   | ≤ 12                                                                                      | ≤ 5                                                                                       | ≤ 4                                         | ≤ 3                           | ≤ 1.5* $\Delta z_{\text{zoom}}(n-1)$ | ≥ 28                                     |
| 4-5 GHz   | ≤ 10                                                                                      | ≤ 4                                                                                       | ≤ 3                                         | ≤ 2.5                         | ≤ 1.5* $\Delta z_{\text{zoom}}(n-1)$ | ≥ 25                                     |
| 5-6 GHz   | ≤ 10                                                                                      | ≤ 4                                                                                       | ≤ 2                                         | ≤ 2                           | ≤ 1.5* $\Delta z_{\text{zoom}}(n-1)$ | ≥ 22                                     |

\*Also compliant to IEEE 1528-2013 Table 6

|                                   |                                                                                                                                                                                                        |                              |                                 |
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## 5 SAR TESTING PROCEDURES

### 5.1 SAR Testing for Tablet per KDB Publication 616217 D04v01

This device can be used also in full sized tablet exposure conditions, due to its size. Per FCC KDB 616217, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. The SAR Exclusion Threshold in KDB 447498 D01v05 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

### 5.2 Proximity Sensor Considerations

This device uses a proximity sensor to reduce data powers in tablet-device use conditions.

While the device's antenna is within a certain distance of the user, the sensor activates and reduces the maximum output power allowed. However, the sensor is not active when the device is moved beyond the sensor triggering distance and the maximum output power is no longer limited. Therefore, an additional exposure condition is needed in the vicinity of the triggering distance to ensure SAR is compliant when the device is allowed to operate at a non-reduced output power level.

FCC KDB 616217 D04 Section 6 was used as a guideline for selecting SAR test distances for this device at these additional exposure conditions. Since the sensor activation distance for the back side of the device is 20 mm, a conservative distance of 19 mm was tested for SAR on the back side at maximum power. Since the sensor activation distance for the top edge of the device is 11 mm, a conservative distance of 10 mm was tested for SAR on the top edge at maximum power. Since the sensor activation distance for the left edge of the device is 6 mm, a conservative distance of 5 mm was tested for SAR on the left edge at maximum power. Sensor triggering distance summary data is included in Appendix G. The sensor does not trigger power reduction from the front of the device.

The sensor is designed to support sufficient detection range and sensitivity to cover regions of the sensors in all applicable directions since the sensor entirely covers the antenna.

|                                   |                                                                                                                                                                                                        |                                 |
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|                                   |                                                                                                                                                                                                        | Page 11 of 66                   |

## 6 RF EXPOSURE LIMITS

### 6.1 Uncontrolled Environment

UNCONTROLLED ENVIRONMENTS are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

### 6.2 Controlled Environment

CONTROLLED ENVIRONMENTS are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

**Table 6-1**  
**SAR Human Exposure Specified in ANSI/IEEE C95.1-1992 and Health Canada Safety Code 6**

| HUMAN EXPOSURE LIMITS                                               |                                                                           |                                                                   |
|---------------------------------------------------------------------|---------------------------------------------------------------------------|-------------------------------------------------------------------|
|                                                                     | UNCONTROLLED ENVIRONMENT<br><i>General Population</i><br>(W/kg) or (mW/g) | CONTROLLED ENVIRONMENT<br><i>Occupational</i><br>(W/kg) or (mW/g) |
| <b>Peak Spatial Average SAR</b><br>Head                             | 1.6                                                                       | 8.0                                                               |
| <b>Whole Body SAR</b>                                               | 0.08                                                                      | 0.4                                                               |
| <b>Peak Spatial Average SAR</b><br>Hands, Feet, Ankle, Wrists, etc. | 4.0                                                                       | 20                                                                |

1. The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
2. The Spatial Average value of the SAR averaged over the whole body.
3. The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

|                                   |                                                                                     |                              |                                                                                       |                                 |
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## 7 FCC MEASUREMENT PROCEDURES

Power measurements for licensed transmitters are performed using a base station simulator under digital average power.

### 7.1 Measured and Reported SAR

Per FCC KDB Publication 447498 D01v06, when SAR is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance. For simultaneous transmission, the measured aggregate SAR must be scaled according to the sum of the differences between the maximum tune-up tolerance and actual power used to test each transmitter. When SAR is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as *reported* SAR. The highest *reported* SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r03.

### 7.2 3G SAR Test Reduction Procedure

In FCC KDB Publication 941225 D01v03r01, certain transmission modes within a frequency band and wireless mode evaluated for SAR are defined as primary modes. The equivalent modes considered for SAR test reduction are denoted as secondary modes. When the maximum output power including tune-up tolerance specified for production units in a secondary mode is  $\leq 0.25$  dB higher than the primary mode or when the highest reported SAR of the primary mode, scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode, is  $\leq 1.2$  W/kg, SAR measurements are not required for the secondary mode. These criteria are referred to as the 3G SAR test reduction procedure. When the 3G SAR test reduction procedure is not satisfied, SAR measurements are additionally required for the secondary mode.

### 7.3 Procedures Used to Establish RF Signal for SAR

The following procedures are according to FCC KDB Publication 941225 D01v03r01 “3G SAR Measurement Procedures.”

The device is placed into a simulated call using a base station simulator in a RF shielded chamber. Establishing connections in this manner ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. Devices under test are evaluated prior to testing, with a fully charged battery and were configured to operate at maximum output power. In order to verify that the device is tested throughout the SAR test at maximum output power, the SAR measurement system measures a “point SAR” at an arbitrary reference point at the start and end of the 1 gram SAR evaluation, to assess for any power drifts during the evaluation. If the power drift deviates by more than 5%, the SAR test and drift measurements are repeated.

### 7.4 SAR Measurement Conditions for UMTS

#### 7.4.1 Output Power Verification

Maximum output power is verified on the High, Middle and Low channels according to the general descriptions in section 5.2 of 3GPP TS 34.121, using the appropriate RMC with TPC (transmit power control) set to all “1s” or applying the required inner loop power control procedures to maintain maximum output power while HSUPA is active. Results for all applicable physical channel configurations (DPCCH, DPDCHn and spreading codes, HS-DPCCH etc) are tabulated in this test report. All configurations that are not supported by the DUT or cannot be measured due to technical or equipment limitations are identified.

|                                   |                                                                                     |                              |                                                                                       |                                 |
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## 7.4.2 Body SAR Measurements

SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits all “1s”. The 3G SAR test reduction procedure is applied to other spreading codes and multiple DPDCH<sub>n</sub> configurations supported by the handset with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured using an applicable RMC configuration with the corresponding spreading code or DPDCH<sub>n</sub>, for the highest reported SAR configuration in 12.2 kbps RMC.

## 7.4.3 SAR Measurements with Rel 5 HSDPA

The 3G SAR test reduction procedure is applied to HSDPA body configurations with 12.2 kbps RMC as the primary mode. Otherwise, Body SAR for HSDPA is measured using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, for the highest reported SAR configuration in 12.2 kbps RMC without HSDPA. Handsets with both HSDPA and HSUPA are tested according to Release 6 HSPA test procedures.

## 7.4.4 SAR Measurements with Rel 6 HSUPA

The 3G SAR test reduction procedure is applied to HSPA (HSUPA/HSDPA with RMC) body configurations with 12.2 kbps RMC as the primary mode. Otherwise, Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 and power control algorithm 2, according to the highest reported body SAR configuration in 12.2 kbps RMC without HSPA.

When VOIP applies to head exposure, the 3G SAR test reduction procedure is applied with 12.2 kbps RMC as the primary mode; otherwise, the same HSPA configuration used for body SAR measurements are applied to head exposure testing.

## 7.5 SAR Measurement Conditions for LTE

LTE modes are tested according to FCC KDB 941225 D05v02r04 publication. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The R&S CMW500 or Anritsu MT8820C simulators are used for LTE output power measurements and SAR testing. Closed loop power control was used so the UE transmits with maximum output power during SAR testing. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

### 7.5.1 Spectrum Plots for RB Configurations

A properly configured base station simulator was used for SAR tests and power measurements. Therefore, spectrum plots for RB configurations were not required to be included in this report.

### 7.5.2 MPR

MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.

### 7.5.3 A-MPR

A-MPR (Additional MPR) has been disabled for all SAR tests by setting NS=01 on the base station simulator.

|                                   |                                                                                     |                              |                                                                                       |                                 |
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## 7.5.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05v02r04:

- a. Per Section 5.2.1, SAR is required for QPSK 1 RB Allocation for the largest bandwidth
  - i. The required channel and offset combination with the highest maximum output power is required for SAR.
  - ii. When the reported SAR is  $\leq 0.8$  W/kg, testing of the remaining RB offset configurations and required test channels is not required. Otherwise, SAR is required for the remaining required test channels using the RB offset configuration with highest output power for that channel.
  - iii. When the reported SAR for a required test channel is  $> 1.45$  W/kg, SAR is required for all RB offset configurations for that channel.
- b. Per Section 5.2.2, SAR is required for 50% RB allocation using the largest bandwidth following the same procedures outlined in Section 5.2.1.
- c. Per Section 5.2.3, QPSK SAR is not required for the 100% allocation when the highest maximum output power for the 100% allocation is less than the highest maximum output power of the 1 RB and 50% RB allocations and the reported SAR for the 1 RB and 50% RB allocations is  $< 0.8$  W/kg.
- d. Per Section 5.2.4 and 5.3, SAR tests for higher order modulations and lower bandwidths configurations are not required when the conducted power of the required test configurations determined by Sections 5.2.1 through 5.2.3 is less than or equal to  $\frac{1}{2}$  dB higher than the equivalent configuration using QPSK modulation and when the QPSK SAR for those configurations is  $< 1.45$  W/kg.

## 7.5.5 Downlink Only Carrier Aggregation

Conducted power measurements with LTE Carrier Aggregation (CA) (downlink only) active are made in accordance to KDB Publication 941225 D05Av01r02. The RRC connection is only handled by one cell, the primary component carrier (PCC) for downlink and uplink communications. After making a data connection to the PCC, the UE device adds secondary component carrier(s) (SCC) on the downlink only. All uplink communications and acknowledgements remain identical to specifications when downlink carrier aggregation is inactive on the PCC. For every supported combination of downlink only carrier aggregation, additional conducted output powers are measured with the downlink carrier aggregation active for the configuration with highest measured maximum conducted power with downlink carrier aggregation inactive measured among the channel bandwidth, modulation, and RB combinations in each frequency band. Per FCC KDB Publication 941225 D05Av01r02, no SAR measurements are required for carrier aggregation configurations when the average output power with downlink only carrier aggregation active is not more than 0.25 dB higher than the average output power with downlink only carrier aggregation inactive.

## 7.6 SAR Testing with 802.11 Transmitters

The normal network operating configurations of 802.11 transmitters are not suitable for SAR measurements. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure the results are consistent and reliable. See KDB Publication 248227 D01v02r02 for more details.

### 7.6.1 General Device Setup

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in test mode for SAR measurements must be identical to those

|                                   |                                                                                     |                              |                                                                                       |                                 |
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programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters.

A periodic duty factor is required for current generation SAR systems to measure SAR. When 802.11 frame gaps are accounted for in the transmission, a maximum transmission duty factor of 92 - 96% is typically achievable in most test mode configurations. A minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. The reported SAR is scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

### 7.6.2 U-NII-1 and U-NII-2A

For devices that operate in both U-NII-1 and U-NII-2A bands, when the same maximum output power is specified for both bands, SAR measurement using OFDM SAR test procedures is not required for U-NII-1 unless the highest reported SAR for U-NII-2A is  $> 1.2$  W/kg. When different maximum output powers are specified for the bands, SAR measurement for the U-NII band with the lower maximum output power is not required unless the highest reported SAR for the U-NII band with the higher maximum output power, adjusted by the ratio of lower to higher specified maximum output power for the two bands, is  $> 1.2$  W/kg.

### 7.6.3 U-NII-2C and U-NII-3

The frequency range covered by U-NII-2C and U-NII-3 is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. When Terminal Doppler Weather Radar (TDWR) restriction applies, the channels at 5.60 – 5.65 GHz in U-NII-2C band must be disabled with acceptable mechanisms and documented in the equipment certification. Unless band gap channels are permanently disabled, SAR must be considered for these channels. Each band is tested independently according to the normally required OFDM SAR measurement and probe calibration frequency points requirements.

### 7.6.4 2.4 GHz SAR Test Requirements

SAR is measured for 2.4 GHz 802.11b DSSS using either the fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:

- 1) When the reported SAR of the highest measured maximum output power channel for the exposure configuration is  $\leq 0.8$  W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
- 2) When the reported SAR is  $> 0.8$  W/kg, SAR is required for that position using the next highest measured output power channel. When any reported SAR is  $> 1.2$  W/kg, SAR is required for the third channel; i.e., all channels require testing.

2.4 GHz 802.11 g/n OFDM are additionally evaluated for SAR if the highest reported SAR for 802.11b, adjusted by the ratio of the OFDM to DSSS specified maximum output power, is  $> 1.2$  W/kg. When SAR is required for OFDM modes in 2.4 GHz band, the Initial Test Configuration Procedures should be followed.

### 7.6.5 OFDM Transmission Mode and SAR Test Channel Selection

For the 2.4 GHz and 5 GHz bands, when the same maximum output power was specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration with the largest channel bandwidth, lowest order modulation and lowest data rate. When the maximum output power of a channel is the same for equivalent OFDM configurations; for example, 802.11a, 802.11n and 802.11ac or 802.11g and 802.11n with the same channel bandwidth, modulation and data rate

|                                   |                                                                                                                                                                                                        |                                 |
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| Document S/N:<br>0Y1601040033.ZNF | Test Dates:<br>01/06/16 - 01/16/16                                                                                                                                                                     | DUT Type:<br>Portable Tablet    |
|                                   |                                                                                                                                                                                                        | Page 16 of 66                   |

etc., the lower order 802.11 mode i.e., 802.11a, then 802.11n and 802.11ac or 802.11g then 802.11n, is used for SAR measurement. When the maximum output power are the same for multiple test channels, either according to the default or additional power measurement requirements, SAR is measured using the channel closest to the middle of the frequency band or aggregated band. When there are multiple channels with the same maximum output power, SAR is measured using the higher number channel.

### 7.6.6 Initial Test Configuration Procedure

For OFDM, in both 2.4 and 5 GHz bands, an initial test configuration is determined for each frequency band and aggregated band, according to the transmission mode with the highest maximum output power specified for SAR measurements. When the same maximum output power is specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration(s) with the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order IEEE 802.11 mode. The channel of the transmission mode with the highest average RF output conducted power will be the initial test configuration.

When the reported SAR is  $\leq 0.8$  W/kg, no additional measurements on other test channels are required. Otherwise, SAR is evaluated using the subsequent highest average RF output channel until the reported SAR result is  $\leq 1.2$  W/kg or all channels are measured. When there are multiple untested channels having the same subsequent highest average RF output power, the channel with higher frequency from the lowest 802.11 mode is considered for SAR measurements (See Section 7.6.5).

### 7.6.7 Subsequent Test Configuration Procedures

For OFDM configurations in each frequency band and aggregated band, SAR is evaluated for initial test configuration using the fixed test position or the initial test position procedure. When the highest reported SAR (for the initial test configuration), adjusted by the ratio of the specified maximum output power of the subsequent test configuration to initial test configuration, is  $\leq 1.2$  W/kg, no additional SAR tests for the subsequent test configurations are required.

|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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## 8 RF CONDUCTED POWERS

### 8.1 UMTS Conducted Powers

**Table 8-1**  
**Average RF Output Powers Maximum Power**

| 3GPP Release Version | Mode  | 3GPP 34.121 Subtest | Cellular Band [dBm] |       |       | AWS Band [dBm] |       |       | PCS Band [dBm] |       |       | 3GPP MPR [dB] |
|----------------------|-------|---------------------|---------------------|-------|-------|----------------|-------|-------|----------------|-------|-------|---------------|
|                      |       |                     | 4132                | 4183  | 4233  | 1312           | 1412  | 1513  | 9262           | 9400  | 9538  |               |
| 99                   | WCDMA | 12.2 kbps RMC       | 24.63               | 24.66 | 24.62 | 24.53          | 24.61 | 24.42 | 24.52          | 24.52 | 24.57 | -             |
| 6                    | HSDPA | Subtest 1           | 24.49               | 24.49 | 24.50 | 24.49          | 24.48 | 24.35 | 24.35          | 24.31 | 24.42 | 0             |
| 6                    |       | Subtest 2           | 24.38               | 24.45 | 24.45 | 24.53          | 24.56 | 24.60 | 24.42          | 24.55 | 24.68 | 0             |
| 6                    |       | Subtest 3           | 24.10               | 23.96 | 24.18 | 24.08          | 24.05 | 24.18 | 24.11          | 24.08 | 24.10 | 0.5           |
| 6                    |       | Subtest 4           | 24.09               | 24.11 | 24.12 | 23.91          | 23.95 | 24.00 | 23.81          | 23.85 | 23.79 | 0.5           |
| 6                    | HSUPA | Subtest 1           | 24.46               | 24.12 | 23.72 | 24.50          | 24.24 | 24.02 | 24.10          | 24.15 | 24.13 | 0             |
| 6                    |       | Subtest 2           | 22.34               | 22.26 | 22.31 | 22.43          | 22.50 | 22.25 | 22.61          | 22.61 | 22.63 | 2             |
| 6                    |       | Subtest 3           | 23.49               | 23.60 | 23.47 | 23.42          | 23.50 | 23.30 | 23.43          | 23.35 | 23.38 | 1             |
| 6                    |       | Subtest 4           | 22.29               | 22.18 | 22.21 | 22.28          | 22.30 | 22.20 | 22.42          | 22.34 | 22.45 | 2             |
| 6                    |       | Subtest 5           | 23.75               | 23.75 | 23.92 | 24.42          | 23.80 | 23.80 | 23.95          | 24.16 | 23.97 | 0             |

**Table 8-2**  
**Average RF Output Powers Reduced Power**

| 3GPP Release Version | Mode  | 3GPP 34.121 Subtest | Cellular Band [dBm] |       |       | AWS Band [dBm] |       |       | PCS Band [dBm] |       |       | 3GPP MPR [dB] |
|----------------------|-------|---------------------|---------------------|-------|-------|----------------|-------|-------|----------------|-------|-------|---------------|
|                      |       |                     | 4132                | 4183  | 4233  | 1312           | 1412  | 1513  | 9262           | 9400  | 9538  |               |
| 99                   | WCDMA | 12.2 kbps RMC       | 20.38               | 20.42 | 20.40 | 14.38          | 14.37 | 14.41 | 12.53          | 12.55 | 12.31 | -             |
| 6                    | HSDPA | Subtest 1           | 20.45               | 20.42 | 20.35 | 14.19          | 14.34 | 14.50 | 12.53          | 12.61 | 12.36 | 0             |
| 6                    |       | Subtest 2           | 20.46               | 20.40 | 20.41 | 14.21          | 14.34 | 14.54 | 12.52          | 12.63 | 12.36 | 0             |
| 6                    |       | Subtest 3           | 19.97               | 19.89 | 19.90 | 13.74          | 13.84 | 14.04 | 12.02          | 12.12 | 11.85 | 0.5           |
| 6                    |       | Subtest 4           | 19.93               | 19.87 | 19.93 | 13.74          | 13.87 | 14.00 | 12.01          | 12.06 | 11.86 | 0.5           |
| 6                    | HSUPA | Subtest 1           | 19.95               | 20.01 | 20.30 | 13.79          | 13.96 | 14.02 | 11.83          | 12.03 | 11.77 | 0             |
| 6                    |       | Subtest 2           | 18.34               | 18.28 | 18.39 | 12.22          | 12.33 | 12.51 | 10.51          | 10.59 | 10.35 | 2             |
| 6                    |       | Subtest 3           | 19.40               | 19.12 | 19.42 | 13.19          | 13.28 | 13.49 | 11.49          | 11.54 | 11.39 | 1             |
| 6                    |       | Subtest 4           | 18.42               | 18.28 | 18.27 | 12.25          | 12.37 | 12.54 | 10.50          | 10.56 | 10.39 | 2             |
| 6                    |       | Subtest 5           | 19.80               | 19.82 | 19.83 | 14.15          | 14.10 | 14.47 | 12.40          | 12.53 | 12.25 | 0             |

This device does not support DC-HSDPA.



**Figure 8-1**  
**Power Measurement Setup**

|                                          |                                                                                                                                   |                                     |                                                                                       |                                        |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------|
| FCC ID: ZNFV520                          |  <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | <b>SAR EVALUATION REPORT</b>        |  | <b>Reviewed by:</b><br>Quality Manager |
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## 8.2 LTE Conducted Powers

### 8.2.1 LTE Band 12

**Table 8-3**  
**LTE Band 12 Conducted Powers - 10 MHz Bandwidth**

| LTE Band 12<br>10 MHz Bandwidth |         |           |                          |                              |          |
|---------------------------------|---------|-----------|--------------------------|------------------------------|----------|
| Modulation                      | RB Size | RB Offset | Mid Channel              | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                 |         |           | 23095<br>(707.5 MHz)     |                              |          |
|                                 |         |           | Conducted Power<br>[dBm] |                              |          |
| QPSK                            | 1       | 0         | 24.98                    | 0                            | 0        |
|                                 | 1       | 25        | 25.50                    |                              | 0        |
|                                 | 1       | 49        | 25.23                    |                              | 0        |
|                                 | 25      | 0         | 24.01                    | 0-1                          | 1        |
|                                 | 25      | 12        | 24.08                    |                              | 1        |
|                                 | 25      | 25        | 24.11                    |                              | 1        |
|                                 | 50      | 0         | 24.00                    |                              | 1        |
| 16QAM                           | 1       | 0         | 23.75                    | 0-1                          | 1        |
|                                 | 1       | 25        | 24.00                    |                              | 1        |
|                                 | 1       | 49        | 23.77                    |                              | 1        |
|                                 | 25      | 0         | 23.08                    | 0-2                          | 2        |
|                                 | 25      | 12        | 23.02                    |                              | 2        |
|                                 | 25      | 25        | 22.86                    |                              | 2        |
|                                 | 50      | 0         | 22.79                    |                              | 2        |

Note: LTE Band 12 at 10 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

**Table 8-4**  
**LTE Band 12 Conducted Powers - 5 MHz Bandwidth**

| LTE Band 12<br>5 MHz Bandwidth |         |           |                          |                          |                          |                              |          |
|--------------------------------|---------|-----------|--------------------------|--------------------------|--------------------------|------------------------------|----------|
| Modulation                     | RB Size | RB Offset | Low Channel              | Mid Channel              | High Channel             | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                |         |           | 23035<br>(701.5 MHz)     | 23095<br>(707.5 MHz)     | 23155<br>(713.5 MHz)     |                              |          |
|                                |         |           | Conducted Power<br>[dBm] | Conducted Power<br>[dBm] | Conducted Power<br>[dBm] |                              |          |
| QPSK                           | 1       | 0         | 24.95                    | 24.99                    | 25.20                    | 0                            | 0        |
|                                | 1       | 12        | 25.37                    | 25.37                    | 25.47                    |                              | 0        |
|                                | 1       | 24        | 25.04                    | 25.01                    | 25.27                    |                              | 0        |
|                                | 12      | 0         | 24.03                    | 24.07                    | 24.19                    | 0-1                          | 1        |
|                                | 12      | 6         | 24.09                    | 24.03                    | 24.23                    |                              | 1        |
|                                | 12      | 13        | 23.89                    | 24.04                    | 24.14                    |                              | 1        |
|                                | 25      | 0         | 23.96                    | 24.07                    | 24.19                    |                              | 1        |
| 16QAM                          | 1       | 0         | 23.76                    | 23.46                    | 23.99                    | 0-1                          | 1        |
|                                | 1       | 12        | 23.79                    | 23.87                    | 24.03                    |                              | 1        |
|                                | 1       | 24        | 23.50                    | 23.48                    | 24.03                    |                              | 1        |
|                                | 12      | 0         | 22.89                    | 22.90                    | 22.92                    | 0-2                          | 2        |
|                                | 12      | 6         | 22.94                    | 23.16                    | 23.05                    |                              | 2        |
|                                | 12      | 13        | 22.71                    | 22.87                    | 22.87                    |                              | 2        |
|                                | 25      | 0         | 22.80                    | 23.05                    | 22.66                    |                              | 2        |

|                                   |                                                                                                                                                                                                        |                              |                                 |
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**Table 8-5**  
**LTE Band 12 Conducted Powers - 3 MHz Bandwidth**

| LTE Band 12<br>3 MHz Bandwidth |         |           |                       |                      |                      |                              |          |
|--------------------------------|---------|-----------|-----------------------|----------------------|----------------------|------------------------------|----------|
| Modulation                     | RB Size | RB Offset | Low Channel           | Mid Channel          | High Channel         | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                |         |           | 23025<br>(700.5 MHz)  | 23095<br>(707.5 MHz) | 23165<br>(714.5 MHz) |                              |          |
|                                |         |           | Conducted Power [dBm] |                      |                      |                              |          |
| QPSK                           | 1       | 0         | 25.36                 | 25.34                | 25.29                | 0                            | 0        |
|                                | 1       | 7         | 25.50                 | 25.50                | 25.37                |                              | 0        |
|                                | 1       | 14        | 25.50                 | 25.11                | 25.18                |                              | 0        |
|                                | 8       | 0         | 24.08                 | 24.07                | 24.13                | 0-1                          | 1        |
|                                | 8       | 4         | 24.19                 | 24.05                | 24.20                |                              | 1        |
|                                | 8       | 7         | 23.99                 | 23.94                | 24.13                |                              | 1        |
|                                | 15      | 0         | 24.08                 | 24.06                | 24.12                |                              | 1        |
| 16QAM                          | 1       | 0         | 24.04                 | 24.04                | 23.56                | 0-1                          | 1        |
|                                | 1       | 7         | 24.13                 | 23.91                | 23.43                |                              | 1        |
|                                | 1       | 14        | 23.74                 | 23.60                | 23.64                |                              | 1        |
|                                | 8       | 0         | 22.80                 | 23.06                | 22.92                | 0-2                          | 2        |
|                                | 8       | 4         | 22.90                 | 23.15                | 23.02                |                              | 2        |
|                                | 8       | 7         | 22.71                 | 23.03                | 22.86                |                              | 2        |
|                                | 15      | 0         | 22.86                 | 22.94                | 22.84                |                              | 2        |

**Table 8-6**  
**LTE Band 12 Conducted Powers -1.4 MHz Bandwidth**

| LTE Band 12<br>1.4 MHz Bandwidth |         |           |                       |                      |                      |                              |          |
|----------------------------------|---------|-----------|-----------------------|----------------------|----------------------|------------------------------|----------|
| Modulation                       | RB Size | RB Offset | Low Channel           | Mid Channel          | High Channel         | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                  |         |           | 23017<br>(699.7 MHz)  | 23095<br>(707.5 MHz) | 23173<br>(715.3 MHz) |                              |          |
|                                  |         |           | Conducted Power [dBm] |                      |                      |                              |          |
| QPSK                             | 1       | 0         | 25.23                 | 25.26                | 25.08                | 0                            | 0        |
|                                  | 1       | 2         | 25.22                 | 25.27                | 25.03                |                              | 0        |
|                                  | 1       | 5         | 25.30                 | 25.21                | 25.35                |                              | 0        |
|                                  | 3       | 0         | 25.30                 | 25.26                | 25.22                |                              | 0        |
|                                  | 3       | 2         | 25.29                 | 25.30                | 25.14                |                              | 0        |
|                                  | 3       | 3         | 25.27                 | 25.22                | 25.08                |                              | 0        |
|                                  | 6       | 0         | 24.18                 | 23.99                | 24.19                | 0-1                          | 1        |
| 16QAM                            | 1       | 0         | 23.97                 | 23.73                | 23.84                | 0-1                          | 1        |
|                                  | 1       | 2         | 23.36                 | 23.80                | 23.88                |                              | 1        |
|                                  | 1       | 5         | 23.35                 | 23.66                | 23.95                |                              | 1        |
|                                  | 3       | 0         | 23.41                 | 23.99                | 24.11                |                              | 1        |
|                                  | 3       | 2         | 23.53                 | 24.04                | 23.97                |                              | 1        |
|                                  | 3       | 3         | 23.86                 | 23.98                | 23.69                |                              | 1        |
|                                  | 6       | 0         | 22.83                 | 22.63                | 22.82                | 0-2                          | 2        |

|                                   |                                                                                     |                              |                                                                                       |                                 |
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**Table 8-7**  
**LTE Band 12 Conducted Powers - 10 MHz Bandwidth - Reduced Power**

| LTE Band 12<br>10 MHz Bandwidth |         |           |                          |                              |          |
|---------------------------------|---------|-----------|--------------------------|------------------------------|----------|
| Modulation                      | RB Size | RB Offset | Mid Channel              | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                 |         |           | 23095<br>(707.5 MHz)     |                              |          |
|                                 |         |           | Conducted Power<br>[dBm] |                              |          |
| QPSK                            | 1       | 0         | 18.79                    | 0                            | 0        |
|                                 | 1       | 25        | 19.24                    |                              | 0        |
|                                 | 1       | 49        | 18.90                    |                              | 0        |
|                                 | 25      | 0         | 19.00                    | 0-1                          | 0        |
|                                 | 25      | 12        | 19.07                    |                              | 0        |
|                                 | 25      | 25        | 18.95                    |                              | 0        |
|                                 | 50      | 0         | 18.92                    |                              | 0        |
| 16QAM                           | 1       | 0         | 18.64                    | 0-1                          | 0        |
|                                 | 1       | 25        | 18.79                    |                              | 0        |
|                                 | 1       | 49        | 18.24                    |                              | 0        |
|                                 | 25      | 0         | 18.97                    | 0-2                          | 0        |
|                                 | 25      | 12        | 19.06                    |                              | 0        |
|                                 | 25      | 25        | 18.92                    |                              | 0        |
|                                 | 50      | 0         | 18.98                    |                              | 0        |
|                                 |         |           |                          |                              | 0        |

Note: LTE Band 12 at 10 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

**Table 8-8**  
**LTE Band 12 Conducted Powers - 5 MHz Bandwidth - Reduced Power**

| LTE Band 12<br>5 MHz Bandwidth |         |           |                          |                          |                          |                              |          |
|--------------------------------|---------|-----------|--------------------------|--------------------------|--------------------------|------------------------------|----------|
| Modulation                     | RB Size | RB Offset | Low Channel              | Mid Channel              | High Channel             | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                |         |           | 23035<br>(701.5 MHz)     | 23095<br>(707.5 MHz)     | 23155<br>(713.5 MHz)     |                              |          |
|                                |         |           | Conducted Power<br>[dBm] | Conducted Power<br>[dBm] | Conducted Power<br>[dBm] |                              |          |
| QPSK                           | 1       | 0         | 19.16                    | 18.69                    | 18.91                    | 0                            | 0        |
|                                | 1       | 12        | 19.18                    | 19.50                    | 19.19                    |                              | 0        |
|                                | 1       | 24        | 18.94                    | 18.78                    | 19.15                    |                              | 0        |
|                                | 12      | 0         | 18.97                    | 18.98                    | 18.97                    | 0-1                          | 0        |
|                                | 12      | 6         | 19.07                    | 19.14                    | 19.11                    |                              | 0        |
|                                | 12      | 13        | 18.92                    | 18.98                    | 18.92                    |                              | 0        |
|                                | 25      | 0         | 18.96                    | 19.00                    | 18.96                    |                              | 0        |
| 16QAM                          | 1       | 0         | 18.36                    | 18.91                    | 18.50                    | 0-1                          | 0        |
|                                | 1       | 12        | 18.71                    | 19.35                    | 18.77                    |                              | 0        |
|                                | 1       | 24        | 18.30                    | 18.62                    | 18.33                    |                              | 0        |
|                                | 12      | 0         | 18.79                    | 19.06                    | 18.86                    | 0-2                          | 0        |
|                                | 12      | 6         | 18.79                    | 19.12                    | 19.09                    |                              | 0        |
|                                | 12      | 13        | 18.72                    | 18.96                    | 18.81                    |                              | 0        |
|                                | 25      | 0         | 18.93                    | 18.99                    | 18.86                    |                              | 0        |

|                                          |                                                                                     |                                     |                                                                                       |                                        |
|------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------|
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| <b>Document S/N:</b><br>0Y1601040033.ZNF | <b>Test Dates:</b><br>01/06/16 - 01/16/16                                           | <b>DUT Type:</b><br>Portable Tablet |                                                                                       | Page 21 of 66                          |

**Table 8-9**  
**LTE Band 12 Conducted Powers - 3 MHz Bandwidth - Reduced Power**

| LTE Band 12<br>3 MHz Bandwidth |         |           |                       |                      |                      |                              |          |
|--------------------------------|---------|-----------|-----------------------|----------------------|----------------------|------------------------------|----------|
| Modulation                     | RB Size | RB Offset | Low Channel           | Mid Channel          | High Channel         | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                |         |           | 23025<br>(700.5 MHz)  | 23095<br>(707.5 MHz) | 23165<br>(714.5 MHz) |                              |          |
|                                |         |           | Conducted Power [dBm] |                      |                      |                              |          |
| QPSK                           | 1       | 0         | 19.06                 | 19.01                | 19.01                | 0                            | 0        |
|                                | 1       | 7         | 19.17                 | 19.15                | 19.12                |                              | 0        |
|                                | 1       | 14        | 19.08                 | 18.86                | 18.93                |                              | 0        |
|                                | 8       | 0         | 19.09                 | 19.07                | 18.99                | 0-1                          | 0        |
|                                | 8       | 4         | 19.07                 | 19.07                | 18.96                |                              | 0        |
|                                | 8       | 7         | 18.91                 | 18.98                | 18.90                |                              | 0        |
|                                | 15      | 0         | 19.05                 | 18.96                | 19.01                |                              | 0        |
| 16QAM                          | 1       | 0         | 18.63                 | 18.79                | 18.90                | 0-1                          | 0        |
|                                | 1       | 7         | 18.74                 | 19.14                | 19.00                |                              | 0        |
|                                | 1       | 14        | 18.49                 | 18.64                | 18.71                |                              | 0        |
|                                | 8       | 0         | 19.04                 | 18.91                | 18.77                | 0-2                          | 0        |
|                                | 8       | 4         | 19.31                 | 18.91                | 18.85                |                              | 0        |
|                                | 8       | 7         | 19.00                 | 18.90                | 18.77                |                              | 0        |
|                                | 15      | 0         | 18.92                 | 19.05                | 18.89                |                              | 0        |

**Table 8-10**  
**LTE Band 12 Conducted Powers -1.4 MHz Bandwidth - Reduced Power**

| LTE Band 12<br>1.4 MHz Bandwidth |         |           |                       |                      |                      |                              |          |
|----------------------------------|---------|-----------|-----------------------|----------------------|----------------------|------------------------------|----------|
| Modulation                       | RB Size | RB Offset | Low Channel           | Mid Channel          | High Channel         | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                  |         |           | 23017<br>(699.7 MHz)  | 23095<br>(707.5 MHz) | 23173<br>(715.3 MHz) |                              |          |
|                                  |         |           | Conducted Power [dBm] |                      |                      |                              |          |
| QPSK                             | 1       | 0         | 18.89                 | 18.89                | 19.01                | 0                            | 0        |
|                                  | 1       | 2         | 18.95                 | 19.10                | 18.88                |                              | 0        |
|                                  | 1       | 5         | 18.84                 | 19.03                | 19.01                |                              | 0        |
|                                  | 3       | 0         | 19.00                 | 19.01                | 18.98                |                              | 0        |
|                                  | 3       | 2         | 19.13                 | 19.07                | 19.08                |                              | 0        |
|                                  | 3       | 3         | 19.12                 | 19.02                | 19.07                |                              | 0        |
|                                  | 6       | 0         | 18.93                 | 19.01                | 19.08                | 0-1                          | 0        |
| 16QAM                            | 1       | 0         | 18.79                 | 18.87                | 18.69                | 0-1                          | 0        |
|                                  | 1       | 2         | 18.85                 | 18.94                | 18.64                |                              | 0        |
|                                  | 1       | 5         | 18.77                 | 18.90                | 18.91                |                              | 0        |
|                                  | 3       | 0         | 18.47                 | 18.94                | 18.90                |                              | 0        |
|                                  | 3       | 2         | 18.48                 | 18.99                | 19.11                |                              | 0        |
|                                  | 3       | 3         | 18.58                 | 18.94                | 19.08                |                              | 0        |
|                                  | 6       | 0         | 18.83                 | 18.67                | 19.12                | 0-2                          | 0        |

|                                          |                                                                                     |                                     |                                                                                       |                                        |
|------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------|
| FCC ID: ZNFV520                          |  | <b>SAR EVALUATION REPORT</b>        |  | <b>Reviewed by:</b><br>Quality Manager |
| <b>Document S/N:</b><br>0Y1601040033.ZNF | <b>Test Dates:</b><br>01/06/16 - 01/16/16                                           | <b>DUT Type:</b><br>Portable Tablet | Page 22 of 66                                                                         |                                        |

## 8.2.2

## LTE Band 5 (Cell)

**Table 8-11**  
**LTE Band 5 (Cell) Conducted Powers - 10 MHz Bandwidth**

| LTE Band 5 (Cell)<br>10 MHz Bandwidth |         |           |                          |                              |          |
|---------------------------------------|---------|-----------|--------------------------|------------------------------|----------|
| Modulation                            | RB Size | RB Offset | Mid Channel              | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                       |         |           | 20525<br>(836.5 MHz)     |                              |          |
|                                       |         |           | Conducted Power<br>[dBm] |                              |          |
| QPSK                                  | 1       | 0         | 25.08                    | 0                            | 0        |
|                                       | 1       | 25        | 25.00                    |                              | 0        |
|                                       | 1       | 49        | 25.04                    |                              | 0        |
|                                       | 25      | 0         | 23.82                    | 0-1                          | 1        |
|                                       | 25      | 12        | 23.57                    |                              | 1        |
|                                       | 25      | 25        | 23.57                    |                              | 1        |
|                                       | 50      | 0         | 23.80                    |                              | 1        |
| 16QAM                                 | 1       | 0         | 23.92                    | 0-1                          | 1        |
|                                       | 1       | 25        | 23.53                    |                              | 1        |
|                                       | 1       | 49        | 23.68                    |                              | 1        |
|                                       | 25      | 0         | 22.51                    | 0-2                          | 2        |
|                                       | 25      | 12        | 22.44                    |                              | 2        |
|                                       | 25      | 25        | 22.51                    |                              | 2        |
|                                       | 50      | 0         | 22.64                    |                              | 2        |

Note: LTE Band 5 (Cell) at 10 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

**Table 8-12**  
**LTE Band 5 (Cell) Conducted Powers - 5 MHz Bandwidth**

| LTE Band 5 (Cell)<br>5 MHz Bandwidth |         |           |                       |                      |                      |                              |          |
|--------------------------------------|---------|-----------|-----------------------|----------------------|----------------------|------------------------------|----------|
| Modulation                           | RB Size | RB Offset | Low Channel           | Mid Channel          | High Channel         | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                      |         |           | 20425<br>(826.5 MHz)  | 20525<br>(836.5 MHz) | 20625<br>(846.5 MHz) |                              |          |
|                                      |         |           | Conducted Power [dBm] |                      |                      |                              |          |
| QPSK                                 | 1       | 0         | 24.70                 | 24.88                | 24.66                | 0                            | 0        |
|                                      | 1       | 12        | 25.05                 | 24.76                | 25.18                |                              | 0        |
|                                      | 1       | 24        | 24.97                 | 24.50                | 24.92                |                              | 0        |
|                                      | 12      | 0         | 23.75                 | 23.62                | 23.77                | 0-1                          | 1        |
|                                      | 12      | 6         | 23.87                 | 23.50                | 23.85                |                              | 1        |
|                                      | 12      | 13        | 23.83                 | 23.66                | 23.85                |                              | 1        |
|                                      | 25      | 0         | 23.73                 | 23.66                | 23.88                |                              | 1        |
| 16QAM                                | 1       | 0         | 23.35                 | 23.47                | 23.72                | 0-1                          | 1        |
|                                      | 1       | 12        | 23.74                 | 23.16                | 24.20                |                              | 1        |
|                                      | 1       | 24        | 23.26                 | 22.95                | 23.73                |                              | 1        |
|                                      | 12      | 0         | 22.63                 | 22.22                | 22.83                | 0-2                          | 2        |
|                                      | 12      | 6         | 22.67                 | 22.54                | 22.79                |                              | 2        |
|                                      | 12      | 13        | 22.79                 | 22.52                | 22.67                |                              | 2        |
|                                      | 25      | 0         | 22.93                 | 22.47                | 22.64                |                              | 2        |

|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFV520                   |  |                              |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>0Y1601040033.ZNF | Test Dates:<br>01/06/16 - 01/16/16                                                  | DUT Type:<br>Portable Tablet |                                                                                       | Page 23 of 66                   |

**Table 8-13**  
**LTE Band 5 (Cell) Conducted Powers - 3 MHz Bandwidth**

| LTE Band 5 (Cell)<br>3 MHz Bandwidth |         |           |                       |                      |                      |                              |          |
|--------------------------------------|---------|-----------|-----------------------|----------------------|----------------------|------------------------------|----------|
| Modulation                           | RB Size | RB Offset | Low Channel           | Mid Channel          | High Channel         | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                      |         |           | 20415<br>(825.5 MHz)  | 20525<br>(836.5 MHz) | 20635<br>(847.5 MHz) |                              |          |
|                                      |         |           | Conducted Power [dBm] |                      |                      |                              |          |
| QPSK                                 | 1       | 0         | 24.88                 | 24.82                | 24.98                | 0                            | 0        |
|                                      | 1       | 7         | 25.09                 | 24.98                | 25.14                |                              | 0        |
|                                      | 1       | 14        | 24.96                 | 24.62                | 24.88                |                              | 0        |
|                                      | 8       | 0         | 23.74                 | 23.42                | 23.85                | 0-1                          | 1        |
|                                      | 8       | 4         | 23.82                 | 23.46                | 23.93                |                              | 1        |
|                                      | 8       | 7         | 23.73                 | 23.54                | 23.94                |                              | 1        |
|                                      | 15      | 0         | 23.70                 | 23.49                | 23.92                |                              | 1        |
| 16QAM                                | 1       | 0         | 23.52                 | 23.31                | 23.23                | 0-1                          | 1        |
|                                      | 1       | 7         | 23.74                 | 23.46                | 23.37                |                              | 1        |
|                                      | 1       | 14        | 23.55                 | 23.51                | 23.21                |                              | 1        |
|                                      | 8       | 0         | 22.47                 | 22.58                | 22.66                | 0-2                          | 2        |
|                                      | 8       | 4         | 22.63                 | 22.60                | 22.85                |                              | 2        |
|                                      | 8       | 7         | 22.33                 | 22.59                | 22.86                |                              | 2        |
|                                      | 15      | 0         | 22.51                 | 22.43                | 22.74                |                              | 2        |

**Table 8-14**  
**LTE Band 5 (Cell) Conducted Powers -1.4 MHz Bandwidth**

| LTE Band 5 (Cell) |         |           |                       |                      |                      |                           |          |
|-------------------|---------|-----------|-----------------------|----------------------|----------------------|---------------------------|----------|
| 1.4 MHz Bandwidth |         |           |                       |                      |                      |                           |          |
| Modulation        | RB Size | RB Offset | Low Channel           | Mid Channel          | High Channel         | MPR Allowed per 3GPP [dB] | MPR [dB] |
|                   |         |           | 20407<br>(824.7 MHz)  | 20525<br>(836.5 MHz) | 20643<br>(848.3 MHz) |                           |          |
|                   |         |           | Conducted Power [dBm] |                      |                      |                           |          |
| QPSK              | 1       | 0         | 24.71                 | 24.53                | 24.95                | 0                         | 0        |
|                   | 1       | 2         | 24.96                 | 24.57                | 25.05                |                           | 0        |
|                   | 1       | 5         | 24.63                 | 24.59                | 24.90                |                           | 0        |
|                   | 3       | 0         | 24.79                 | 24.64                | 25.06                |                           | 0        |
|                   | 3       | 2         | 24.87                 | 24.68                | 25.02                |                           | 0        |
|                   | 3       | 3         | 24.84                 | 24.60                | 24.91                |                           | 0        |
|                   | 6       | 0         | 23.67                 | 23.40                | 23.89                | 0-1                       | 1        |
| 16QAM             | 1       | 0         | 23.54                 | 23.27                | 23.55                | 0-1                       | 1        |
|                   | 1       | 2         | 23.16                 | 23.39                | 23.51                |                           | 1        |
|                   | 1       | 5         | 23.20                 | 22.92                | 23.34                |                           | 1        |
|                   | 3       | 0         | 23.08                 | 23.54                | 23.50                |                           | 1        |
|                   | 3       | 2         | 23.07                 | 23.50                | 23.49                |                           | 1        |
|                   | 3       | 3         | 23.04                 | 23.44                | 23.41                |                           | 1        |
|                   | 6       | 0         | 22.37                 | 22.20                | 22.49                | 0-2                       | 2        |

|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFV520                   |  | SAR EVALUATION REPORT        |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>0Y1601040033.ZNF | Test Dates:<br>01/06/16 - 01/16/16                                                  | DUT Type:<br>Portable Tablet |                                                                                       | Page 24 of 66                   |

**Table 8-15**  
**LTE Band 5 (Cell) Conducted Powers - 10 MHz Bandwidth - Reduced Power**

| LTE Band 5 (Cell)<br>10 MHz Bandwidth |         |           |                          |                              |          |
|---------------------------------------|---------|-----------|--------------------------|------------------------------|----------|
| Modulation                            | RB Size | RB Offset | Mid Channel              | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                       |         |           | 20525<br>(836.5 MHz)     |                              |          |
|                                       |         |           | Conducted Power<br>[dBm] |                              |          |
| QPSK                                  | 1       | 0         | 20.78                    | 0                            | 0        |
|                                       | 1       | 25        | 20.94                    |                              | 0        |
|                                       | 1       | 49        | <b>20.94</b>             |                              | 0        |
|                                       | 25      | 0         | <b>20.63</b>             | 0-1                          | 0        |
|                                       | 25      | 12        | 20.60                    |                              | 0        |
|                                       | 25      | 25        | 20.59                    |                              | 0        |
|                                       | 50      | 0         | 20.61                    |                              | 0        |
| 16QAM                                 | 1       | 0         | 20.29                    | 0-1                          | 0        |
|                                       | 1       | 25        | 20.87                    |                              | 0        |
|                                       | 1       | 49        | 20.42                    |                              | 0        |
|                                       | 25      | 0         | 20.51                    | 0-2                          | 0        |
|                                       | 25      | 12        | 20.49                    |                              | 0        |
|                                       | 25      | 25        | 20.47                    |                              | 0        |
|                                       | 50      | 0         | 20.60                    |                              | 0        |

Note: LTE Band 5 (Cell) at 10 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

**Table 8-16**  
**LTE Band 5 (Cell) Conducted Powers - 5 MHz Bandwidth - Reduced Power**

| LTE Band 5 (Cell)<br>5 MHz Bandwidth |         |           |                       |                      |                      |                              |          |
|--------------------------------------|---------|-----------|-----------------------|----------------------|----------------------|------------------------------|----------|
| Modulation                           | RB Size | RB Offset | Low Channel           | Mid Channel          | High Channel         | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                      |         |           | 20425<br>(826.5 MHz)  | 20525<br>(836.5 MHz) | 20625<br>(846.5 MHz) |                              |          |
|                                      |         |           | Conducted Power [dBm] |                      |                      |                              |          |
| QPSK                                 | 1       | 0         | 20.85                 | 20.39                | 20.67                | 0                            | 0        |
|                                      | 1       | 12        | 21.14                 | 20.64                | 21.01                |                              | 0        |
|                                      | 1       | 24        | 20.82                 | 20.29                | 20.74                |                              | 0        |
|                                      | 12      | 0         | 20.78                 | 20.61                | 20.79                | 0-1                          | 0        |
|                                      | 12      | 6         | 20.92                 | 20.50                | 20.87                |                              | 0        |
|                                      | 12      | 13        | 20.80                 | 20.45                | 20.64                |                              | 0        |
|                                      | 25      | 0         | 20.82                 | 20.51                | 20.79                |                              | 0        |
| 16QAM                                | 1       | 0         | 20.40                 | 20.61                | 20.29                | 0-1                          | 0        |
|                                      | 1       | 12        | 20.78                 | 20.90                | 20.70                |                              | 0        |
|                                      | 1       | 24        | 20.24                 | 20.25                | 20.12                |                              | 0        |
|                                      | 12      | 0         | 20.51                 | 20.38                | 20.62                | 0-2                          | 0        |
|                                      | 12      | 6         | 20.73                 | 20.26                | 20.56                |                              | 0        |
|                                      | 12      | 13        | 20.60                 | 20.24                | 20.38                |                              | 0        |
|                                      | 25      | 0         | 20.87                 | 20.38                | 20.52                |                              | 0        |

|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFV520                   |  | SAR EVALUATION REPORT        |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>OY1601040033.ZNF | Test Dates:<br>01/06/16 - 01/16/16                                                  | DUT Type:<br>Portable Tablet |                                                                                       | Page 25 of 66                   |

**Table 8-17**  
**LTE Band 5 (Cell) Conducted Powers - 3 MHz Bandwidth - Reduced Power**

| LTE Band 5 (Cell)<br>3 MHz Bandwidth |         |           |                       |                      |                      |                              |          |
|--------------------------------------|---------|-----------|-----------------------|----------------------|----------------------|------------------------------|----------|
| Modulation                           | RB Size | RB Offset | Low Channel           | Mid Channel          | High Channel         | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                      |         |           | 20415<br>(825.5 MHz)  | 20525<br>(836.5 MHz) | 20635<br>(847.5 MHz) |                              |          |
|                                      |         |           | Conducted Power [dBm] |                      |                      |                              |          |
| QPSK                                 | 1       | 0         | 20.92                 | 20.68                | 20.90                | 0                            | 0        |
|                                      | 1       | 7         | 21.03                 | 20.84                | 21.13                |                              | 0        |
|                                      | 1       | 14        | 20.82                 | 20.70                | 20.76                |                              | 0        |
|                                      | 8       | 0         | 20.81                 | 20.61                | 20.76                | 0-1                          | 0        |
|                                      | 8       | 4         | 20.80                 | 20.51                | 20.72                |                              | 0        |
|                                      | 8       | 7         | 20.76                 | 20.48                | 20.72                |                              | 0        |
|                                      | 15      | 0         | 20.79                 | 20.44                | 20.73                |                              | 0        |
| 16QAM                                | 1       | 0         | 20.76                 | 20.55                | 20.86                | 0-1                          | 0        |
|                                      | 1       | 7         | 20.82                 | 20.60                | 20.88                |                              | 0        |
|                                      | 1       | 14        | 20.36                 | 20.50                | 20.59                |                              | 0        |
|                                      | 8       | 0         | 20.65                 | 20.33                | 20.90                | 0-2                          | 0        |
|                                      | 8       | 4         | 20.85                 | 20.34                | 20.87                |                              | 0        |
|                                      | 8       | 7         | 20.39                 | 20.31                | 20.42                |                              | 0        |
|                                      | 15      | 0         | 20.65                 | 20.32                | 20.46                |                              | 0        |

**Table 8-18**  
**LTE Band 5 (Cell) Conducted Powers - 1.4 MHz Bandwidth - Reduced Power**

| LTE Band 5 (Cell) |         |           |                       |                      |                      |                           |          |
|-------------------|---------|-----------|-----------------------|----------------------|----------------------|---------------------------|----------|
| 1.4 MHz Bandwidth |         |           |                       |                      |                      |                           |          |
| Modulation        | RB Size | RB Offset | Low Channel           | Mid Channel          | High Channel         | MPR Allowed per 3GPP [dB] | MPR [dB] |
|                   |         |           | 20407<br>(824.7 MHz)  | 20525<br>(836.5 MHz) | 20643<br>(848.3 MHz) |                           |          |
|                   |         |           | Conducted Power [dBm] |                      |                      |                           |          |
| QPSK              | 1       | 0         | 20.96                 | 20.79                | 20.87                | 0                         | 0        |
|                   | 1       | 2         | 20.99                 | 20.60                | 20.77                |                           | 0        |
|                   | 1       | 5         | 20.91                 | 20.47                | 20.73                |                           | 0        |
|                   | 3       | 0         | 20.98                 | 20.59                | 20.81                |                           | 0        |
|                   | 3       | 2         | 21.11                 | 20.74                | 20.78                |                           | 0        |
|                   | 3       | 3         | 20.98                 | 20.58                | 20.78                |                           | 0        |
|                   | 6       | 0         | 20.82                 | 20.41                | 20.74                | 0-1                       | 0        |
| 16QAM             | 1       | 0         | 20.73                 | 20.41                | 20.69                | 0-1                       | 0        |
|                   | 1       | 2         | 21.10                 | 20.43                | 20.64                |                           | 0        |
|                   | 1       | 5         | 21.03                 | 20.33                | 20.53                |                           | 0        |
|                   | 3       | 0         | 20.68                 | 20.22                | 20.38                |                           | 0        |
|                   | 3       | 2         | 21.02                 | 20.22                | 20.44                |                           | 0        |
|                   | 3       | 3         | 20.99                 | 20.25                | 20.25                |                           | 0        |
|                   | 6       | 0         | 21.06                 | 20.49                | 20.41                | 0-2                       | 0        |

|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFV520                   |  | <b>SAR EVALUATION REPORT</b> |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>0Y1601040033.ZNF | Test Dates:<br>01/06/16 - 01/16/16                                                  | DUT Type:<br>Portable Tablet |                                                                                       | Page 26 of 66                   |

## 8.2.3

## LTE Band 4 (AWS)

**Table 8-19**  
**LTE Band 4 (AWS) Conducted Powers - 20 MHz Bandwidth**

| LTE Band 4 (AWS)<br>20 MHz Bandwidth |         |           |                          |                              |          |
|--------------------------------------|---------|-----------|--------------------------|------------------------------|----------|
| Modulation                           | RB Size | RB Offset | Mid Channel              | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                      |         |           | 20175<br>(1732.5 MHz)    |                              |          |
|                                      |         |           | Conducted Power<br>[dBm] |                              |          |
| QPSK                                 | 1       | 0         | 24.67                    | 0                            | 0        |
|                                      | 1       | 50        | 24.56                    |                              | 0        |
|                                      | 1       | 99        | <b>24.70</b>             |                              | 0        |
|                                      | 50      | 0         | 23.27                    | 0-1                          | 1        |
|                                      | 50      | 25        | 23.20                    |                              | 1        |
|                                      | 50      | 50        | <b>23.33</b>             |                              | 1        |
|                                      | 100     | 0         | 23.32                    |                              | 1        |
| 16QAM                                | 1       | 0         | 22.93                    | 0-1                          | 1        |
|                                      | 1       | 50        | 22.72                    |                              | 1        |
|                                      | 1       | 99        | 23.22                    |                              | 1        |
|                                      | 50      | 0         | 22.18                    | 0-2                          | 2        |
|                                      | 50      | 25        | 22.05                    |                              | 2        |
|                                      | 50      | 50        | 22.07                    |                              | 2        |
|                                      | 100     | 0         | 22.12                    |                              | 2        |

Note: LTE Band 4 (AWS) at 20 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

**Table 8-20**  
**LTE Band 4 (AWS) Conducted Powers - 15 MHz Bandwidth**

| LTE Band 4 (AWS)<br>15 MHzBandwidth |         |           |                       |                       |                       |                              |          |
|-------------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                          | RB Size | RB Offset | Low Channel           | Mid Channel           | Frequency [MHz]       | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                     |         |           | 20025<br>(1717.5 MHz) | 20175<br>(1732.5 MHz) | 20325<br>(1747.5 MHz) |                              |          |
|                                     |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                                | 1       | 0         | 24.20                 | 24.34                 | 24.61                 | 0                            | 0        |
|                                     | 1       | 36        | 24.29                 | 24.20                 | 24.35                 |                              | 0        |
|                                     | 1       | 74        | 24.30                 | 24.53                 | 24.01                 |                              | 0        |
|                                     | 36      | 0         | 23.11                 | 23.23                 | 23.33                 | 0-1                          | 1        |
|                                     | 36      | 18        | 23.17                 | 23.15                 | 23.20                 |                              | 1        |
|                                     | 36      | 37        | 23.18                 | 23.09                 | 23.09                 |                              | 1        |
|                                     | 75      | 0         | 23.06                 | 23.07                 | 23.22                 |                              | 1        |
| 16QAM                               | 1       | 0         | 22.80                 | 23.11                 | 23.34                 | 0-1                          | 1        |
|                                     | 1       | 36        | 23.06                 | 22.84                 | 23.21                 |                              | 1        |
|                                     | 1       | 74        | 23.10                 | 23.08                 | 23.18                 |                              | 1        |
|                                     | 36      | 0         | 22.01                 | 22.11                 | 22.19                 | 0-2                          | 2        |
|                                     | 36      | 18        | 21.90                 | 22.12                 | 22.15                 |                              | 2        |
|                                     | 36      | 37        | 22.21                 | 21.92                 | 22.01                 |                              | 2        |
|                                     | 75      | 0         | 22.03                 | 22.18                 | 22.13                 |                              | 2        |

|                                   |                                                                                     |                              |                       |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|-----------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFV520                   |  |                              | SAR EVALUATION REPORT |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>0Y1601040033.ZNF | Test Dates:<br>01/06/16 - 01/16/16                                                  | DUT Type:<br>Portable Tablet |                       |                                                                                       | Page 27 of 66                   |

**Table 8-21**  
**LTE Band 4 (AWS) Conducted Powers - 10 MHz Bandwidth**

| LTE Band 4 (AWS)<br>10 MHzBandwidth |         |           |                       |                       |                       |                              |          |
|-------------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                          | RB Size | RB Offset | Low Channel           | Mid Channel           | High Channel          | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                     |         |           | 20000<br>(1715.0 MHz) | 20175<br>(1732.5 MHz) | 20350<br>(1750.0 MHz) |                              |          |
|                                     |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                                | 1       | 0         | 24.59                 | 24.47                 | 24.66                 | 0                            | 0        |
|                                     | 1       | 25        | 24.51                 | 24.54                 | 24.59                 |                              | 0        |
|                                     | 1       | 49        | 24.30                 | 24.42                 | 24.18                 |                              | 0        |
|                                     | 25      | 0         | 23.00                 | 23.16                 | 23.16                 | 0-1                          | 1        |
|                                     | 25      | 12        | 23.15                 | 23.22                 | 23.27                 |                              | 1        |
|                                     | 25      | 25        | 23.06                 | 23.03                 | 23.14                 |                              | 1        |
|                                     | 50      | 0         | 23.05                 | 23.05                 | 23.17                 |                              | 1        |
| 16QAM                               | 1       | 0         | 22.83                 | 22.96                 | 22.79                 | 0-1                          | 1        |
|                                     | 1       | 25        | 23.28                 | 22.78                 | 22.87                 |                              | 1        |
|                                     | 1       | 49        | 22.86                 | 22.74                 | 22.67                 |                              | 1        |
|                                     | 25      | 0         | 21.86                 | 22.15                 | 22.11                 | 0-2                          | 2        |
|                                     | 25      | 12        | 21.78                 | 22.27                 | 22.30                 |                              | 2        |
|                                     | 25      | 25        | 21.85                 | 22.08                 | 22.16                 |                              | 2        |
|                                     | 50      | 0         | 21.94                 | 22.03                 | 22.05                 |                              | 2        |

**Table 8-22**  
**LTE Band 4 (AWS) Conducted Powers - 5 MHz Bandwidth**

| LTE Band 4 (AWS)<br>5 MHzBandwidth |         |           |                       |                       |                       |                              |          |
|------------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                         | RB Size | RB Offset | Low Channel           | Mid Channel           | High Channel          | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                    |         |           | 19975<br>(1712.5 MHz) | 20175<br>(1732.5 MHz) | 20375<br>(1752.5 MHz) |                              |          |
|                                    |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                               | 1       | 0         | 23.99                 | 24.22                 | 24.26                 | 0                            | 0        |
|                                    | 1       | 12        | 24.12                 | 24.60                 | 24.69                 |                              | 0        |
|                                    | 1       | 24        | 24.00                 | 24.22                 | 24.40                 |                              | 0        |
|                                    | 12      | 0         | 22.95                 | 23.22                 | 23.23                 | 0-1                          | 1        |
|                                    | 12      | 6         | 23.04                 | 23.16                 | 23.44                 |                              | 1        |
|                                    | 12      | 13        | 22.86                 | 22.99                 | 23.28                 |                              | 1        |
|                                    | 25      | 0         | 22.81                 | 23.12                 | 23.32                 |                              | 1        |
| 16QAM                              | 1       | 0         | 22.56                 | 22.98                 | 23.08                 | 0-1                          | 1        |
|                                    | 1       | 12        | 22.93                 | 23.17                 | 23.46                 |                              | 1        |
|                                    | 1       | 24        | 22.47                 | 22.77                 | 23.09                 |                              | 1        |
|                                    | 12      | 0         | 21.58                 | 22.14                 | 22.23                 | 0-2                          | 2        |
|                                    | 12      | 6         | 21.70                 | 22.19                 | 22.06                 |                              | 2        |
|                                    | 12      | 13        | 21.80                 | 21.93                 | 21.99                 |                              | 2        |
|                                    | 25      | 0         | 21.93                 | 21.99                 | 22.25                 |                              | 2        |

|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFV520                   |  | <b>SAR EVALUATION REPORT</b> |  | Reviewed by:<br>Quality Manager |
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**Table 8-23**  
**LTE Band 4 (AWS) Conducted Powers - 3 MHz Bandwidth**

| LTE Band 4 (AWS)<br>3 MHzBandwidth |         |           |                       |                       |                       |                              |          |
|------------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                         | RB Size | RB Offset | Frequency [MHz]       | Frequency [MHz]       | Frequency [MHz]       | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                    |         |           | 19965<br>(1711.5 MHz) | 20175<br>(1732.5 MHz) | 20385<br>(1753.5 MHz) |                              |          |
|                                    |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                               | 1       | 0         | 24.13                 | 24.36                 | 24.51                 | 0                            | 0        |
|                                    | 1       | 7         | 24.12                 | 24.42                 | 24.70                 |                              | 0        |
|                                    | 1       | 14        | 24.22                 | 24.34                 | 24.30                 |                              | 0        |
|                                    | 8       | 0         | 22.92                 | 23.23                 | 23.43                 | 0-1                          | 1        |
|                                    | 8       | 4         | 23.02                 | 23.19                 | 23.46                 |                              | 1        |
|                                    | 8       | 7         | 22.98                 | 23.01                 | 23.44                 |                              | 1        |
|                                    | 15      | 0         | 22.97                 | 23.13                 | 23.39                 |                              | 1        |
| 16QAM                              | 1       | 0         | 23.39                 | 23.12                 | 23.20                 | 0-1                          | 1        |
|                                    | 1       | 7         | 23.07                 | 23.20                 | 23.13                 |                              | 1        |
|                                    | 1       | 14        | 22.64                 | 22.96                 | 22.94                 |                              | 1        |
|                                    | 8       | 0         | 21.81                 | 22.14                 | 21.92                 | 0-2                          | 2        |
|                                    | 8       | 4         | 21.75                 | 22.19                 | 21.94                 |                              | 2        |
|                                    | 8       | 7         | 21.72                 | 22.11                 | 21.91                 |                              | 2        |
|                                    | 15      | 0         | 21.72                 | 22.12                 | 22.07                 |                              | 2        |

**Table 8-24**  
**LTE Band 4 (AWS) Conducted Powers - 1.4 MHz Bandwidth**

| LTE Band 4 (AWS)<br>1.4 MHzBandwidth |         |           |                       |                       |                       |                              |          |
|--------------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                           | RB Size | RB Offset | Low Channel           | Mid Channel           | Frequency [MHz]       | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                      |         |           | 19957<br>(1710.7 MHz) | 20175<br>(1732.5 MHz) | 20393<br>(1754.3 MHz) |                              |          |
|                                      |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                                 | 1       | 0         | 24.21                 | 24.12                 | 24.34                 | 0                            | 0        |
|                                      | 1       | 2         | 24.38                 | 24.36                 | 24.40                 |                              | 0        |
|                                      | 1       | 5         | 23.97                 | 24.19                 | 24.39                 |                              | 0        |
|                                      | 3       | 0         | 24.21                 | 24.31                 | 24.43                 |                              | 0        |
|                                      | 3       | 2         | 24.26                 | 24.31                 | 24.48                 |                              | 0        |
|                                      | 3       | 3         | 24.25                 | 24.25                 | 24.43                 | 0                            |          |
|                                      | 6       | 0         | 23.03                 | 23.16                 | 23.16                 | 0-1                          | 1        |
| 16QAM                                | 1       | 0         | 22.83                 | 22.72                 | 22.90                 | 0-1                          | 1        |
|                                      | 1       | 2         | 23.05                 | 22.55                 | 23.00                 |                              | 1        |
|                                      | 1       | 5         | 22.82                 | 22.45                 | 22.96                 |                              | 1        |
|                                      | 3       | 0         | 22.68                 | 22.53                 | 22.81                 |                              | 1        |
|                                      | 3       | 2         | 22.67                 | 22.69                 | 22.89                 |                              | 1        |
|                                      | 3       | 3         | 22.65                 | 22.98                 | 22.87                 | 1                            |          |
|                                      | 6       | 0         | 22.04                 | 21.94                 | 22.19                 | 0-2                          | 2        |

|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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**Table 8-25**  
**LTE Band 4 (AWS) Conducted Powers - 20 MHz Bandwidth - Reduced Power**

| LTE Band 4 (AWS)<br>20 MHz Bandwidth |         |           |                          |                              |          |
|--------------------------------------|---------|-----------|--------------------------|------------------------------|----------|
| Modulation                           | RB Size | RB Offset | Mid Channel              | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                      |         |           | 20175<br>(1732.5 MHz)    |                              |          |
|                                      |         |           | Conducted Power<br>[dBm] |                              |          |
| QPSK                                 | 1       | 0         | 14.25                    | 0                            | 0        |
|                                      | 1       | 50        | 14.66                    |                              | 0        |
|                                      | 1       | 99        | 14.19                    |                              | 0        |
|                                      | 50      | 0         | 14.06                    | 0-1                          | 0        |
|                                      | 50      | 25        | 14.08                    |                              | 0        |
|                                      | 50      | 50        | 14.00                    |                              | 0        |
|                                      | 100     | 0         | 14.00                    |                              | 0        |
| 16QAM                                | 1       | 0         | 13.75                    |                              | 0        |
|                                      | 1       | 50        | 14.42                    |                              | 0        |
|                                      | 1       | 99        | 13.84                    |                              | 0        |
|                                      | 50      | 0         | 14.17                    | 0-2                          | 0        |
|                                      | 50      | 25        | 14.14                    |                              | 0        |
|                                      | 50      | 50        | 13.96                    |                              | 0        |
|                                      | 100     | 0         | 13.90                    |                              | 0        |

Note: LTE Band 4 (AWS) at 20 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

**Table 8-26**  
**LTE Band 4 (AWS) Conducted Powers - 15 MHz Bandwidth - Reduced Power**

| LTE Band 4 (AWS)<br>15 MHzBandwidth |         |           |                       |                       |                       |                              |          |
|-------------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                          | RB Size | RB Offset | Low Channel           | Mid Channel           | Frequency [MHz]       | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                     |         |           | 20025<br>(1717.5 MHz) | 20175<br>(1732.5 MHz) | 20325<br>(1747.5 MHz) |                              |          |
|                                     |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                                | 1       | 0         | 14.47                 | 14.07                 | 14.02                 | 0                            | 0        |
|                                     | 1       | 36        | 14.32                 | 14.17                 | 14.26                 |                              | 0        |
|                                     | 1       | 74        | 14.15                 | 14.13                 | 14.08                 |                              | 0        |
|                                     | 36      | 0         | 14.17                 | 14.06                 | 14.13                 | 0-1                          | 0        |
|                                     | 36      | 18        | 14.13                 | 14.10                 | 14.27                 |                              | 0        |
|                                     | 36      | 37        | 14.14                 | 13.97                 | 14.16                 |                              | 0        |
|                                     | 75      | 0         | 14.04                 | 13.94                 | 14.12                 |                              | 0        |
| 16QAM                               | 1       | 0         | 13.71                 | 13.84                 | 14.33                 | 0-1                          | 0        |
|                                     | 1       | 36        | 14.39                 | 13.92                 | 14.65                 |                              | 0        |
|                                     | 1       | 74        | 13.70                 | 13.51                 | 14.41                 |                              | 0        |
|                                     | 36      | 0         | 13.98                 | 14.05                 | 13.95                 | 0-2                          | 0        |
|                                     | 36      | 18        | 13.88                 | 13.90                 | 14.01                 |                              | 0        |
|                                     | 36      | 37        | 13.80                 | 13.93                 | 13.97                 |                              | 0        |
|                                     | 75      | 0         | 13.97                 | 13.90                 | 13.97                 |                              | 0        |

|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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**Table 8-27**  
**LTE Band 4 (AWS) Conducted Powers - 10 MHz Bandwidth - Reduced Power**

| LTE Band 4 (AWS)<br>10 MHzBandwidth |         |           |                       |                       |                       |                              |          |
|-------------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                          | RB Size | RB Offset | Low Channel           | Mid Channel           | High Channel          | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                     |         |           | 20000<br>(1715.0 MHz) | 20175<br>(1732.5 MHz) | 20350<br>(1750.0 MHz) |                              |          |
|                                     |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                                | 1       | 0         | 14.37                 | 14.05                 | 14.38                 | 0                            | 0        |
|                                     | 1       | 25        | 14.41                 | 14.32                 | 14.43                 |                              | 0        |
|                                     | 1       | 49        | 14.21                 | 14.12                 | 14.33                 |                              | 0        |
|                                     | 25      | 0         | 14.11                 | 14.11                 | 14.33                 | 0-1                          | 0        |
|                                     | 25      | 12        | 14.21                 | 14.04                 | 14.25                 |                              | 0        |
|                                     | 25      | 25        | 14.09                 | 13.95                 | 14.15                 |                              | 0        |
|                                     | 50      | 0         | 14.11                 | 14.01                 | 14.16                 |                              | 0        |
| 16QAM                               | 1       | 0         | 14.02                 | 13.77                 | 13.82                 | 0-1                          | 0        |
|                                     | 1       | 25        | 14.38                 | 13.86                 | 14.13                 |                              | 0        |
|                                     | 1       | 49        | 13.78                 | 13.39                 | 13.73                 |                              | 0        |
|                                     | 25      | 0         | 13.98                 | 13.94                 | 14.17                 | 0-2                          | 0        |
|                                     | 25      | 12        | 14.17                 | 14.00                 | 14.19                 |                              | 0        |
|                                     | 25      | 25        | 14.05                 | 13.83                 | 14.09                 |                              | 0        |
|                                     | 50      | 0         | 14.04                 | 13.87                 | 14.04                 |                              | 0        |

**Table 8-28**  
**LTE Band 4 (AWS) Conducted Powers - 5 MHz Bandwidth - Reduced Power**

| LTE Band 4 (AWS)<br>5 MHzBandwidth |         |           |                       |                       |                       |                              |          |
|------------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                         | RB Size | RB Offset | Low Channel           | Mid Channel           | High Channel          | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                    |         |           | 19975<br>(1712.5 MHz) | 20175<br>(1732.5 MHz) | 20375<br>(1752.5 MHz) |                              |          |
|                                    |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                               | 1       | 0         | 14.47                 | 13.81                 | 14.30                 | 0                            | 0        |
|                                    | 1       | 12        | 13.89                 | 14.16                 | 14.44                 |                              | 0        |
|                                    | 1       | 24        | 14.49                 | 13.83                 | 14.17                 |                              | 0        |
|                                    | 12      | 0         | 14.24                 | 14.08                 | 14.24                 | 0-1                          | 0        |
|                                    | 12      | 6         | 14.24                 | 14.17                 | 14.32                 |                              | 0        |
|                                    | 12      | 13        | 14.12                 | 13.94                 | 14.21                 |                              | 0        |
|                                    | 25      | 0         | 14.19                 | 14.02                 | 14.18                 |                              | 0        |
| 16QAM                              | 1       | 0         | 13.70                 | 13.94                 | 13.74                 | 0-1                          | 0        |
|                                    | 1       | 12        | 13.89                 | 14.42                 | 14.20                 |                              | 0        |
|                                    | 1       | 24        | 13.55                 | 14.15                 | 13.91                 |                              | 0        |
|                                    | 12      | 0         | 13.97                 | 13.96                 | 14.04                 | 0-2                          | 0        |
|                                    | 12      | 6         | 13.98                 | 13.97                 | 14.22                 |                              | 0        |
|                                    | 12      | 13        | 13.85                 | 13.93                 | 14.12                 |                              | 0        |
|                                    | 25      | 0         | 14.06                 | 14.02                 | 14.00                 |                              | 0        |

|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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**Table 8-29**  
**LTE Band 4 (AWS) Conducted Powers - 3 MHz Bandwidth - Reduced Power**

| LTE Band 4 (AWS)<br>3 MHzBandwidth |         |           |                       |                       |                       |                              |          |
|------------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                         | RB Size | RB Offset | Frequency [MHz]       | Frequency [MHz]       | Frequency [MHz]       | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                    |         |           | 19965<br>(1711.5 MHz) | 20175<br>(1732.5 MHz) | 20385<br>(1753.5 MHz) |                              |          |
|                                    |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                               | 1       | 0         | 14.33                 | 13.98                 | 14.32                 | 0                            | 0        |
|                                    | 1       | 7         | 14.31                 | 14.33                 | 14.36                 |                              | 0        |
|                                    | 1       | 14        | 14.43                 | 14.24                 | 14.24                 |                              | 0        |
|                                    | 8       | 0         | 14.23                 | 14.11                 | 14.27                 | 0-1                          | 0        |
|                                    | 8       | 4         | 14.14                 | 14.09                 | 14.37                 |                              | 0        |
|                                    | 8       | 7         | 14.18                 | 13.96                 | 14.34                 |                              | 0        |
|                                    | 15      | 0         | 14.18                 | 14.02                 | 14.32                 |                              | 0        |
| 16QAM                              | 1       | 0         | 13.86                 | 13.74                 | 14.32                 | 0-1                          | 0        |
|                                    | 1       | 7         | 13.94                 | 13.98                 | 14.45                 |                              | 0        |
|                                    | 1       | 14        | 13.91                 | 14.04                 | 14.31                 |                              | 0        |
|                                    | 8       | 0         | 14.19                 | 14.02                 | 14.00                 | 0-2                          | 0        |
|                                    | 8       | 4         | 14.07                 | 14.10                 | 14.27                 |                              | 0        |
|                                    | 8       | 7         | 13.95                 | 14.14                 | 14.15                 |                              | 0        |
|                                    | 15      | 0         | 13.96                 | 14.00                 | 14.13                 |                              | 0        |

**Table 8-30**  
**LTE Band 4 (AWS) Conducted Powers - 1.4 MHz Bandwidth - Reduced Power**

| LTE Band 4 (AWS)<br>1.4 MHzBandwidth |         |           |                       |                       |                       |                              |          |
|--------------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                           | RB Size | RB Offset | Low Channel           | Mid Channel           | Frequency [MHz]       | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                      |         |           | 19957<br>(1710.7 MHz) | 20175<br>(1732.5 MHz) | 20393<br>(1754.3 MHz) |                              |          |
|                                      |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                                 | 1       | 0         | 14.23                 | 14.07                 | 14.32                 | 0                            | 0        |
|                                      | 1       | 2         | 14.19                 | 14.24                 | 14.41                 |                              | 0        |
|                                      | 1       | 5         | 14.13                 | 14.08                 | 14.39                 |                              | 0        |
|                                      | 3       | 0         | 14.18                 | 14.18                 | 14.36                 |                              | 0        |
|                                      | 3       | 2         | 14.25                 | 14.22                 | 14.43                 |                              | 0        |
|                                      | 3       | 3         | 14.22                 | 14.08                 | 14.41                 |                              | 0        |
|                                      | 6       | 0         | 14.19                 | 14.06                 | 14.29                 | 0-1                          | 0        |
| 16QAM                                | 1       | 0         | 14.31                 | 13.92                 | 14.21                 | 0-1                          | 0        |
|                                      | 1       | 2         | 14.28                 | 13.98                 | 14.28                 |                              | 0        |
|                                      | 1       | 5         | 14.24                 | 13.93                 | 14.30                 |                              | 0        |
|                                      | 3       | 0         | 14.08                 | 13.78                 | 14.21                 |                              | 0        |
|                                      | 3       | 2         | 14.22                 | 13.70                 | 14.46                 |                              | 0        |
|                                      | 3       | 3         | 14.29                 | 13.57                 | 14.24                 |                              | 0        |
|                                      | 6       | 0         | 14.26                 | 13.83                 | 14.23                 | 0-2                          | 0        |

|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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## 8.2.4

## LTE Band 2 (PCS)

**Table 8-31**  
**LTE Band 2 (PCS) Conducted Powers - 20 MHz Bandwidth**

| LTE Band 2 (PCS)<br>20 MHz Bandwidth |         |           |                       |                       |                       |                              |          |
|--------------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                           | RB Size | RB Offset | Low Channel           | Mid Channel           | High Channel          | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                      |         |           | 18700<br>(1860.0 MHz) | 18900<br>(1880.0 MHz) | 19100<br>(1900.0 MHz) |                              |          |
|                                      |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                                 | 1       | 0         | 24.24                 | 24.62                 | 24.47                 | 0                            | 0        |
|                                      | 1       | 50        | 24.41                 | 24.61                 | 24.32                 |                              | 0        |
|                                      | 1       | 99        | 24.48                 | 24.49                 | 24.21                 |                              | 0        |
|                                      | 50      | 0         | 23.36                 | 23.40                 | 23.39                 | 0-1                          | 1        |
|                                      | 50      | 25        | 23.10                 | 23.10                 | 23.30                 |                              | 1        |
|                                      | 50      | 50        | 23.10                 | 23.28                 | 23.25                 |                              | 1        |
|                                      | 100     | 0         | 23.22                 | 23.26                 | 23.34                 |                              | 1        |
| 16QAM                                | 1       | 0         | 22.50                 | 23.11                 | 23.07                 | 0-1                          | 1        |
|                                      | 1       | 50        | 22.67                 | 22.90                 | 23.59                 |                              | 1        |
|                                      | 1       | 99        | 22.74                 | 23.03                 | 23.37                 |                              | 1        |
|                                      | 50      | 0         | 22.29                 | 22.46                 | 22.33                 | 0-2                          | 2        |
|                                      | 50      | 25        | 22.00                 | 22.19                 | 22.33                 |                              | 2        |
|                                      | 50      | 50        | 22.09                 | 22.10                 | 22.27                 |                              | 2        |
|                                      | 100     | 0         | 22.25                 | 22.26                 | 22.44                 |                              | 2        |

**Table 8-32**  
**LTE Band 2 (PCS) Conducted Powers - 15 MHz Bandwidth**

| LTE Band 2 (PCS)<br>15 MHz Bandwidth |         |           |                       |                       |                       |                              |          |
|--------------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                           | RB Size | RB Offset | Low Channel           | Mid Channel           | Frequency [MHz]       | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                      |         |           | 18675<br>(1857.5 MHz) | 18900<br>(1880.0 MHz) | 19125<br>(1902.5 MHz) |                              |          |
|                                      |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                                 | 1       | 0         | 24.44                 | 24.33                 | 24.47                 | 0                            | 0        |
|                                      | 1       | 36        | 24.53                 | 24.19                 | 24.44                 |                              | 0        |
|                                      | 1       | 74        | 24.48                 | 24.41                 | 24.20                 |                              | 0        |
|                                      | 36      | 0         | 23.24                 | 23.14                 | 23.39                 | 0-1                          | 1        |
|                                      | 36      | 18        | 23.03                 | 23.06                 | 23.29                 |                              | 1        |
|                                      | 36      | 37        | 23.17                 | 23.12                 | 23.29                 |                              | 1        |
|                                      | 75      | 0         | 23.07                 | 23.15                 | 23.26                 |                              | 1        |
| 16QAM                                | 1       | 0         | 22.64                 | 22.44                 | 23.55                 | 0-1                          | 1        |
|                                      | 1       | 36        | 23.27                 | 23.01                 | 23.43                 |                              | 1        |
|                                      | 1       | 74        | 23.42                 | 22.55                 | 23.51                 |                              | 1        |
|                                      | 36      | 0         | 22.27                 | 22.19                 | 22.21                 | 0-2                          | 2        |
|                                      | 36      | 18        | 22.04                 | 22.14                 | 22.25                 |                              | 2        |
|                                      | 36      | 37        | 21.98                 | 22.14                 | 22.19                 |                              | 2        |
|                                      | 75      | 0         | 22.18                 | 22.18                 | 22.26                 |                              | 2        |

|                                   |                                                                                                                                                                                                        |                              |                                 |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|---------------------------------|
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**Table 8-33**  
**LTE Band 2 (PCS) Conducted Powers - 10 MHz Bandwidth**

| LTE Band 2 (PCS)<br>10 MHz Bandwidth |         |           |                       |                       |                       |                              |          |
|--------------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                           | RB Size | RB Offset | Low Channel           | Frequency [MHz]       | Frequency [MHz]       | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                      |         |           | 18650<br>(1855.0 MHz) | 18900<br>(1880.0 MHz) | 19150<br>(1905.0 MHz) |                              |          |
|                                      |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                                 | 1       | 0         | 24.63                 | 24.45                 | 24.43                 | 0                            | 0        |
|                                      | 1       | 25        | 24.64                 | 24.49                 | 24.59                 |                              | 0        |
|                                      | 1       | 49        | 24.40                 | 24.52                 | 24.44                 |                              | 0        |
|                                      | 25      | 0         | 23.22                 | 23.19                 | 23.36                 | 0-1                          | 1        |
|                                      | 25      | 12        | 23.23                 | 23.08                 | 23.45                 |                              | 1        |
|                                      | 25      | 25        | 23.05                 | 23.00                 | 23.35                 |                              | 1        |
|                                      | 50      | 0         | 23.16                 | 23.00                 | 23.40                 |                              | 1        |
| 16QAM                                | 1       | 0         | 23.43                 | 23.03                 | 23.19                 | 0-1                          | 1        |
|                                      | 1       | 25        | 23.20                 | 22.88                 | 23.24                 |                              | 1        |
|                                      | 1       | 49        | 23.11                 | 23.18                 | 23.36                 |                              | 1        |
|                                      | 25      | 0         | 22.24                 | 22.29                 | 22.70                 | 0-2                          | 2        |
|                                      | 25      | 12        | 22.25                 | 22.14                 | 22.63                 |                              | 2        |
|                                      | 25      | 25        | 21.90                 | 21.98                 | 22.43                 |                              | 2        |
|                                      | 50      | 0         | 22.14                 | 21.90                 | 22.36                 |                              | 2        |

**Table 8-34**  
**LTE Band 2 (PCS) Conducted Powers - 5 MHz Bandwidth**

| LTE Band 2 (PCS)<br>5 MHz Bandwidth |         |           |                       |                       |                       |                              |          |
|-------------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                          | RB Size | RB Offset | Low Channel           | Mid Channel           | Frequency [MHz]       | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                     |         |           | 18625<br>(1852.5 MHz) | 18900<br>(1880.0 MHz) | 19175<br>(1907.5 MHz) |                              |          |
|                                     |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                                | 1       | 0         | 24.20                 | 24.09                 | 24.40                 | 0                            | 0        |
|                                     | 1       | 12        | 24.66                 | 24.40                 | 24.70                 |                              | 0        |
|                                     | 1       | 24        | 24.20                 | 23.96                 | 24.48                 |                              | 0        |
|                                     | 12      | 0         | 23.24                 | 23.13                 | 23.39                 | 0-1                          | 1        |
|                                     | 12      | 6         | 23.32                 | 23.12                 | 23.42                 |                              | 1        |
|                                     | 12      | 13        | 23.06                 | 23.05                 | 23.35                 |                              | 1        |
|                                     | 25      | 0         | 23.16                 | 23.06                 | 23.35                 |                              | 1        |
| 16QAM                               | 1       | 0         | 23.00                 | 22.66                 | 23.33                 | 0-1                          | 1        |
|                                     | 1       | 12        | 23.33                 | 23.04                 | 23.56                 |                              | 1        |
|                                     | 1       | 24        | 22.69                 | 22.66                 | 23.37                 |                              | 1        |
|                                     | 12      | 0         | 22.23                 | 21.88                 | 22.37                 | 0-2                          | 2        |
|                                     | 12      | 6         | 22.31                 | 22.15                 | 22.40                 |                              | 2        |
|                                     | 12      | 13        | 22.14                 | 21.99                 | 22.34                 |                              | 2        |
|                                     | 25      | 0         | 22.25                 | 21.95                 | 22.54                 |                              | 2        |

|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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**Table 8-35**  
**LTE Band 2 (PCS) Conducted Powers - 3 MHz Bandwidth**

| LTE Band 2 (PCS)<br>3 MHz Bandwidth |         |           |                       |                       |                       |                              |          |
|-------------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                          | RB Size | RB Offset | Low Channel           | Mid Channel           | High Channel          | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                     |         |           | 18615<br>(1851.5 MHz) | 18900<br>(1880.0 MHz) | 19185<br>(1908.5 MHz) |                              |          |
|                                     |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                                | 1       | 0         | 24.30                 | 24.39                 | 24.49                 | 0                            | 0        |
|                                     | 1       | 7         | 24.59                 | 24.41                 | 24.57                 |                              | 0        |
|                                     | 1       | 14        | 24.47                 | 24.14                 | 24.55                 |                              | 0        |
|                                     | 8       | 0         | 23.30                 | 23.05                 | 23.42                 | 0-1                          | 1        |
|                                     | 8       | 4         | 23.30                 | 23.02                 | 23.36                 |                              | 1        |
|                                     | 8       | 7         | 23.14                 | 23.06                 | 23.24                 |                              | 1        |
|                                     | 15      | 0         | 23.14                 | 23.06                 | 23.37                 |                              | 1        |
| 16QAM                               | 1       | 0         | 23.26                 | 23.12                 | 23.19                 | 0-1                          | 1        |
|                                     | 1       | 7         | 23.44                 | 23.04                 | 23.54                 |                              | 1        |
|                                     | 1       | 14        | 23.14                 | 22.70                 | 23.33                 |                              | 1        |
|                                     | 8       | 0         | 22.02                 | 22.15                 | 22.46                 | 0-2                          | 2        |
|                                     | 8       | 4         | 22.10                 | 22.22                 | 22.41                 |                              | 2        |
|                                     | 8       | 7         | 22.04                 | 22.15                 | 22.38                 |                              | 2        |
|                                     | 15      | 0         | 22.19                 | 22.16                 | 22.33                 |                              | 2        |

**Table 8-36**  
**LTE Band 2 (PCS) Conducted Powers -1.4 MHz Bandwidth**

| LTE Band 2 (PCS)<br>1.4 MHz Bandwidth |         |           |                       |                       |                       |                              |          |
|---------------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                            | RB Size | RB Offset | Low Channel           | Mid Channel           | High Channel          | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                       |         |           | 18607<br>(1850.7 MHz) | 18900<br>(1880.0 MHz) | 19193<br>(1909.3 MHz) |                              |          |
|                                       |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                                  | 1       | 0         | 24.19                 | 24.14                 | 24.47                 | 0                            | 0        |
|                                       | 1       | 2         | 24.43                 | 24.25                 | 24.47                 |                              | 0        |
|                                       | 1       | 5         | 24.29                 | 24.20                 | 24.60                 |                              | 0        |
|                                       | 3       | 0         | 24.32                 | 24.20                 | 24.70                 |                              | 0        |
|                                       | 3       | 2         | 24.33                 | 24.24                 | 24.42                 |                              | 0        |
|                                       | 3       | 3         | 24.36                 | 24.36                 | 24.65                 |                              | 0        |
|                                       | 6       | 0         | 23.27                 | 23.05                 | 23.34                 | 0-1                          | 1        |
| 16QAM                                 | 1       | 0         | 23.18                 | 22.81                 | 23.00                 | 0-1                          | 1        |
|                                       | 1       | 2         | 22.94                 | 22.91                 | 23.32                 |                              | 1        |
|                                       | 1       | 5         | 22.91                 | 22.81                 | 23.06                 |                              | 1        |
|                                       | 3       | 0         | 22.77                 | 23.08                 | 23.36                 |                              | 1        |
|                                       | 3       | 2         | 22.83                 | 23.14                 | 23.46                 |                              | 1        |
|                                       | 3       | 3         | 22.97                 | 23.10                 | 23.40                 |                              | 1        |
|                                       | 6       | 0         | 22.34                 | 22.09                 | 22.51                 | 0-2                          | 2        |

|                                          |                                                                                     |                                     |                                                                                       |                                        |
|------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------|
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| <b>Document S/N:</b><br>0Y1601040033.ZNF | <b>Test Dates:</b><br>01/06/16 - 01/16/16                                           | <b>DUT Type:</b><br>Portable Tablet |                                                                                       | Page 35 of 66                          |

**Table 8-37**  
**LTE Band 2 (PCS) Conducted Powers - 20 MHz Bandwidth - Reduced Power**

| LTE Band 2 (PCS)<br>20 MHz Bandwidth |         |           |                       |                       |                       |                              |          |
|--------------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                           | RB Size | RB Offset | Low Channel           | Mid Channel           | High Channel          | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                      |         |           | 18700<br>(1860.0 MHz) | 18900<br>(1880.0 MHz) | 19100<br>(1900.0 MHz) |                              |          |
|                                      |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                                 | 1       | 0         | 12.26                 | 11.86                 | 12.33                 | 0                            | 0        |
|                                      | 1       | 50        | 12.69                 | 12.17                 | 12.27                 |                              | 0        |
|                                      | 1       | 99        | 12.30                 | 11.81                 | 12.18                 |                              | 0        |
|                                      | 50      | 0         | 12.33                 | 12.13                 | 12.21                 | 0-1                          | 0        |
|                                      | 50      | 25        | 12.19                 | 12.17                 | 12.12                 |                              | 0        |
|                                      | 50      | 50        | 12.05                 | 12.07                 | 12.01                 |                              | 0        |
|                                      | 100     | 0         | 12.22                 | 12.09                 | 12.19                 |                              | 0        |
| 16QAM                                | 1       | 0         | 11.79                 | 11.78                 | 11.60                 | 0-1                          | 0        |
|                                      | 1       | 50        | 12.49                 | 12.40                 | 12.13                 |                              | 0        |
|                                      | 1       | 99        | 11.73                 | 11.76                 | 11.63                 |                              | 0        |
|                                      | 50      | 0         | 12.31                 | 12.04                 | 12.16                 | 0-2                          | 0        |
|                                      | 50      | 25        | 12.16                 | 12.17                 | 12.09                 |                              | 0        |
|                                      | 50      | 50        | 11.90                 | 11.97                 | 11.86                 |                              | 0        |
|                                      | 100     | 0         | 12.12                 | 12.09                 | 12.15                 |                              | 0        |

**Table 8-38**  
**LTE Band 2 (PCS) Conducted Powers - 15 MHz Bandwidth - Reduced Power**

| LTE Band 2 (PCS)<br>15 MHz Bandwidth |         |           |                       |                       |                       |                              |          |
|--------------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                           | RB Size | RB Offset | Low Channel           | Mid Channel           | Frequency [MHz]       | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                      |         |           | 18675<br>(1857.5 MHz) | 18900<br>(1880.0 MHz) | 19125<br>(1902.5 MHz) |                              |          |
|                                      |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                                 | 1       | 0         | 12.33                 | 12.11                 | 12.18                 | 0                            | 0        |
|                                      | 1       | 36        | 12.56                 | 12.13                 | 12.38                 |                              | 0        |
|                                      | 1       | 74        | 12.19                 | 12.20                 | 12.14                 |                              | 0        |
|                                      | 36      | 0         | 12.26                 | 12.16                 | 11.98                 | 0-1                          | 0        |
|                                      | 36      | 18        | 12.10                 | 12.24                 | 12.24                 |                              | 0        |
|                                      | 36      | 37        | 12.23                 | 12.12                 | 12.08                 |                              | 0        |
|                                      | 75      | 0         | 12.23                 | 12.12                 | 12.11                 |                              | 0        |
| 16QAM                                | 1       | 0         | 12.08                 | 11.86                 | 12.68                 | 0-1                          | 0        |
|                                      | 1       | 36        | 12.10                 | 12.16                 | 12.12                 |                              | 0        |
|                                      | 1       | 74        | 12.05                 | 11.57                 | 11.71                 |                              | 0        |
|                                      | 36      | 0         | 12.09                 | 11.88                 | 11.89                 | 0-2                          | 0        |
|                                      | 36      | 18        | 12.04                 | 12.04                 | 12.16                 |                              | 0        |
|                                      | 36      | 37        | 12.10                 | 11.91                 | 11.89                 |                              | 0        |
|                                      | 75      | 0         | 12.14                 | 12.09                 | 11.96                 |                              | 0        |

|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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**Table 8-39**  
**LTE Band 2 (PCS) Conducted Powers - 10 MHz Bandwidth - Reduced Power**

| LTE Band 2 (PCS)<br>10 MHz Bandwidth |         |           |                       |                       |                       |                              |          |
|--------------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                           | RB Size | RB Offset | Low Channel           | Frequency [MHz]       | Frequency [MHz]       | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                      |         |           | 18650<br>(1855.0 MHz) | 18900<br>(1880.0 MHz) | 19150<br>(1905.0 MHz) |                              |          |
|                                      |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                                 | 1       | 0         | 12.47                 | 12.29                 | 12.14                 | 0                            | 0        |
|                                      | 1       | 25        | 12.59                 | 12.54                 | 12.56                 |                              | 0        |
|                                      | 1       | 49        | 12.36                 | 12.30                 | 12.23                 |                              | 0        |
|                                      | 25      | 0         | 12.24                 | 12.22                 | 12.28                 | 0-1                          | 0        |
|                                      | 25      | 12        | 12.32                 | 12.27                 | 12.30                 |                              | 0        |
|                                      | 25      | 25        | 12.13                 | 12.15                 | 12.14                 |                              | 0        |
|                                      | 50      | 0         | 12.15                 | 12.14                 | 12.21                 |                              | 0        |
| 16QAM                                | 1       | 0         | 12.12                 | 12.02                 | 11.74                 | 0-1                          | 0        |
|                                      | 1       | 25        | 12.67                 | 12.08                 | 12.28                 |                              | 0        |
|                                      | 1       | 49        | 12.02                 | 11.66                 | 11.78                 |                              | 0        |
|                                      | 25      | 0         | 12.11                 | 12.11                 | 12.23                 | 0-2                          | 0        |
|                                      | 25      | 12        | 12.13                 | 12.25                 | 12.15                 |                              | 0        |
|                                      | 25      | 25        | 12.10                 | 12.13                 | 12.08                 |                              | 0        |
|                                      | 50      | 0         | 12.08                 | 12.11                 | 12.10                 |                              | 0        |

**Table 8-40**  
**LTE Band 2 (PCS) Conducted Powers - 5 MHz Bandwidth - Reduced Power**

| LTE Band 2 (PCS)<br>5 MHz Bandwidth |         |           |                       |                       |                       |                              |          |
|-------------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                          | RB Size | RB Offset | Low Channel           | Mid Channel           | Frequency [MHz]       | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                     |         |           | 18625<br>(1852.5 MHz) | 18900<br>(1880.0 MHz) | 19175<br>(1907.5 MHz) |                              |          |
|                                     |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                                | 1       | 0         | 12.29                 | 11.88                 | 12.22                 | 0                            | 0        |
|                                     | 1       | 12        | 12.61                 | 12.39                 | 12.49                 |                              | 0        |
|                                     | 1       | 24        | 12.22                 | 12.02                 | 12.07                 |                              | 0        |
|                                     | 12      | 0         | 12.37                 | 12.22                 | 12.34                 | 0-1                          | 0        |
|                                     | 12      | 6         | 12.35                 | 12.30                 | 12.30                 |                              | 0        |
|                                     | 12      | 13        | 12.19                 | 12.15                 | 12.19                 |                              | 0        |
|                                     | 25      | 0         | 12.22                 | 12.15                 | 12.23                 |                              | 0        |
| 16QAM                               | 1       | 0         | 11.87                 | 12.12                 | 12.04                 | 0-1                          | 0        |
|                                     | 1       | 12        | 12.25                 | 12.45                 | 12.24                 |                              | 0        |
|                                     | 1       | 24        | 11.72                 | 12.07                 | 11.53                 |                              | 0        |
|                                     | 12      | 0         | 11.96                 | 12.12                 | 11.99                 | 0-2                          | 0        |
|                                     | 12      | 6         | 12.12                 | 11.96                 | 12.01                 |                              | 0        |
|                                     | 12      | 13        | 11.95                 | 11.82                 | 11.93                 |                              | 0        |
|                                     | 25      | 0         | 12.18                 | 12.25                 | 12.15                 |                              | 0        |

|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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**Table 8-41**  
**LTE Band 2 (PCS) Conducted Powers - 3 MHz Bandwidth - Reduced Power**

| LTE Band 2 (PCS)<br>3 MHz Bandwidth |         |           |                       |                       |                       |                              |          |
|-------------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                          | RB Size | RB Offset | Low Channel           | Mid Channel           | High Channel          | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                     |         |           | 18615<br>(1851.5 MHz) | 18900<br>(1880.0 MHz) | 19185<br>(1908.5 MHz) |                              |          |
|                                     |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                                | 1       | 0         | 12.38                 | 12.30                 | 12.26                 | 0                            | 0        |
|                                     | 1       | 7         | 12.45                 | 12.53                 | 12.42                 |                              | 0        |
|                                     | 1       | 14        | 12.26                 | 12.33                 | 12.30                 |                              | 0        |
|                                     | 8       | 0         | 12.29                 | 12.23                 | 12.20                 | 0-1                          | 0        |
|                                     | 8       | 4         | 12.28                 | 12.21                 | 12.25                 |                              | 0        |
|                                     | 8       | 7         | 12.21                 | 12.16                 | 12.27                 |                              | 0        |
|                                     | 15      | 0         | 12.22                 | 12.15                 | 12.29                 |                              | 0        |
| 16QAM                               | 1       | 0         | 12.03                 | 12.39                 | 12.09                 | 0-1                          | 0        |
|                                     | 1       | 7         | 12.07                 | 12.43                 | 12.24                 |                              | 0        |
|                                     | 1       | 14        | 12.03                 | 12.00                 | 12.00                 |                              | 0        |
|                                     | 8       | 0         | 12.12                 | 12.25                 | 11.92                 | 0-2                          | 0        |
|                                     | 8       | 4         | 11.98                 | 12.24                 | 11.89                 |                              | 0        |
|                                     | 8       | 7         | 11.93                 | 12.08                 | 11.81                 |                              | 0        |
|                                     | 15      | 0         | 12.11                 | 12.04                 | 11.94                 |                              | 0        |

**Table 8-42**  
**LTE Band 2 (PCS) Conducted Powers -1.4 MHz Bandwidth - Reduced Power**

| LTE Band 2 (PCS)<br>1.4 MHz Bandwidth |         |           |                       |                       |                       |                              |          |
|---------------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                            | RB Size | RB Offset | Low Channel           | Mid Channel           | High Channel          | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                       |         |           | 18607<br>(1850.7 MHz) | 18900<br>(1880.0 MHz) | 19193<br>(1909.3 MHz) |                              |          |
|                                       |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                                  | 1       | 0         | 12.18                 | 12.14                 | 12.23                 | 0                            | 0        |
|                                       | 1       | 2         | 12.41                 | 12.21                 | 12.30                 |                              | 0        |
|                                       | 1       | 5         | 12.33                 | 12.14                 | 12.13                 |                              | 0        |
|                                       | 3       | 0         | 12.38                 | 12.24                 | 12.34                 |                              | 0        |
|                                       | 3       | 2         | 12.44                 | 12.37                 | 12.39                 |                              | 0        |
|                                       | 3       | 3         | 12.40                 | 12.33                 | 12.35                 |                              | 0        |
|                                       | 6       | 0         | 12.28                 | 12.22                 | 12.25                 | 0-1                          | 0        |
| 16QAM                                 | 1       | 0         | 12.33                 | 12.42                 | 12.23                 | 0-1                          | 0        |
|                                       | 1       | 2         | 12.21                 | 12.48                 | 12.18                 |                              | 0        |
|                                       | 1       | 5         | 12.25                 | 12.33                 | 12.33                 |                              | 0        |
|                                       | 3       | 0         | 12.10                 | 12.18                 | 12.39                 |                              | 0        |
|                                       | 3       | 2         | 12.14                 | 11.98                 | 12.44                 |                              | 0        |
|                                       | 3       | 3         | 12.12                 | 12.16                 | 12.38                 |                              | 0        |
|                                       | 6       | 0         | 11.94                 | 11.67                 | 12.20                 | 0-2                          | 0        |

|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFV520                   |  | <b>SAR EVALUATION REPORT</b> |  | Reviewed by:<br>Quality Manager |
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## 8.2.5

## LTE Band 30

**Table 8-43**  
**LTE Band 30 Conducted Powers - 10 MHz Bandwidth**

| LTE Band 30<br>10 MHz Bandwidth |         |           |                          |                              |          |
|---------------------------------|---------|-----------|--------------------------|------------------------------|----------|
| Modulation                      | RB Size | RB Offset | Mid Channel              | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                 |         |           | 27710<br>(2310.0 MHz)    |                              |          |
|                                 |         |           | Conducted Power<br>[dBm] |                              |          |
| QPSK                            | 1       | 0         | 23.15                    | 0                            | 0        |
|                                 |         | 25        | <b>23.19</b>             |                              | 0        |
|                                 |         | 49        | 23.17                    |                              | 0        |
|                                 | 25      | 0         | 21.96                    | 0-1                          | 1        |
|                                 |         | 12        | <b>22.04</b>             |                              | 1        |
|                                 |         | 25        | 21.88                    |                              | 1        |
| 16QAM                           | 1       | 0         | 21.90                    |                              | 1        |
|                                 |         | 25        | 21.90                    |                              | 1        |
|                                 |         | 49        | 21.90                    |                              | 1        |
|                                 | 25      | 0         | 20.91                    | 0-2                          | 2        |
|                                 |         | 12        | 20.78                    |                              | 2        |
|                                 |         | 25        | 20.73                    |                              | 2        |
|                                 | 50      | 0         | 20.88                    |                              | 2        |
|                                 |         | 25        | 20.88                    |                              | 2        |
|                                 |         | 49        | 20.88                    |                              | 2        |

**Table 8-44**  
**LTE Band 30 Conducted Powers - 5 MHz Bandwidth**

| LTE Band 30<br>5 MHz Bandwidth |         |           |                          |                              |          |
|--------------------------------|---------|-----------|--------------------------|------------------------------|----------|
| Modulation                     | RB Size | RB Offset | Mid Channel              | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                |         |           | 27710<br>(2310.0 MHz)    |                              |          |
|                                |         |           | Conducted Power<br>[dBm] |                              |          |
| QPSK                           | 1       | 0         | 22.85                    | 0                            | 0        |
|                                |         | 12        | 23.15                    |                              | 0        |
|                                |         | 24        | 22.88                    |                              | 0        |
|                                | 12      | 0         | 22.05                    | 0-1                          | 1        |
|                                |         | 6         | 21.95                    |                              | 1        |
|                                |         | 13        | 21.94                    |                              | 1        |
| 16QAM                          | 25      | 0         | 21.97                    |                              | 1        |
|                                |         | 12        | 21.97                    |                              | 1        |
|                                |         | 24        | 21.74                    |                              | 1        |
|                                | 1       | 0         | 21.75                    | 0-2                          | 2        |
|                                |         | 12        | 22.19                    |                              | 2        |
|                                |         | 24        | 21.74                    |                              | 2        |
|                                | 12      | 0         | 20.74                    |                              | 2        |
|                                |         | 6         | 20.82                    |                              | 2        |
|                                |         | 13        | 20.63                    |                              | 2        |
|                                | 25      | 0         | 20.78                    |                              | 2        |

Note: LTE Band 30 at 5 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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**Table 8-45**  
**LTE Band 30 Conducted Powers - 10 MHz Bandwidth - Reduced Power**

| LTE Band 30<br>10 MHz Bandwidth |         |           |                          |                              |          |
|---------------------------------|---------|-----------|--------------------------|------------------------------|----------|
| Modulation                      | RB Size | RB Offset | Mid Channel              | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                 |         |           | 27710<br>(2310.0 MHz)    |                              |          |
|                                 |         |           | Conducted Power<br>[dBm] |                              |          |
| QPSK                            | 1       | 0         | 10.98                    | 0                            | 0        |
|                                 |         | 25        | 10.94                    |                              | 0        |
|                                 |         | 49        | 10.75                    |                              | 0        |
|                                 | 25      | 0         | 10.80                    | 0-1                          | 0        |
|                                 |         | 12        | 10.80                    |                              | 0        |
|                                 |         | 25        | 10.61                    |                              | 0        |
|                                 | 50      | 0         | 10.71                    |                              | 0        |
|                                 |         |           |                          |                              | 0        |
| 16QAM                           | 1       | 0         | 10.44                    | 0-2                          | 0        |
|                                 |         | 25        | 10.87                    |                              | 0        |
|                                 |         | 49        | 10.30                    |                              | 0        |
|                                 | 25      | 0         | 10.53                    |                              | 0        |
|                                 |         | 12        | 10.73                    |                              | 0        |
|                                 |         | 25        | 10.63                    |                              | 0        |
|                                 | 50      | 0         | 10.61                    |                              | 0        |
|                                 |         |           |                          |                              | 0        |

**Table 8-46**  
**LTE Band 30 Conducted Powers - 5 MHz Bandwidth - Reduced Power**

| LTE Band 30<br>5 MHz Bandwidth |         |           |                          |                              |          |
|--------------------------------|---------|-----------|--------------------------|------------------------------|----------|
| Modulation                     | RB Size | RB Offset | Mid Channel              | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                |         |           | 27710<br>(2310.0 MHz)    |                              |          |
|                                |         |           | Conducted Power<br>[dBm] |                              |          |
| QPSK                           | 1       | 0         | 10.29                    | 0                            | 0        |
|                                |         | 12        | 10.65                    |                              | 0        |
|                                |         | 24        | 10.09                    |                              | 0        |
|                                | 12      | 0         | 10.71                    | 0-1                          | 0        |
|                                |         | 6         | 10.91                    |                              | 0        |
|                                |         | 13        | 10.70                    |                              | 0        |
|                                | 25      | 0         | 10.72                    |                              | 0        |
|                                |         |           |                          |                              | 0        |
| 16QAM                          | 1       | 0         | 10.58                    | 0-2                          | 0        |
|                                |         | 12        | 11.06                    |                              | 0        |
|                                |         | 24        | 10.59                    |                              | 0        |
|                                | 12      | 0         | 10.76                    |                              | 0        |
|                                |         | 6         | 10.87                    |                              | 0        |
|                                |         | 13        | 10.66                    |                              | 0        |
|                                | 25      | 0         | 10.70                    |                              | 0        |
|                                |         |           |                          |                              | 0        |

Note: LTE Band 30 at 5 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

|                                          |                                                                                     |                                     |                                                                                       |                                        |
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| <b>Document S/N:</b><br>0Y1601040033.ZNF | <b>Test Dates:</b><br>01/06/16 - 01/16/16                                           | <b>DUT Type:</b><br>Portable Tablet |                                                                                       | Page 40 of 66                          |

## 8.2.6

## LTE Band 7

**Table 8-47**  
**LTE Band 7 Conducted Powers - 20 MHz Bandwidth**

| LTE Band 7<br>20 MHz Bandwidth |         |           |                       |                       |                       |                              |          |
|--------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                     | RB Size | RB Offset | Low Channel           | Mid Channel           | High Channel          | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                |         |           | 20850<br>(2510.0 MHz) | 21100<br>(2535.0 MHz) | 21350<br>(2560.0 MHz) |                              |          |
|                                |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                           | 1       | 0         | 23.13                 | 23.35                 | 23.43                 | 0                            | 0        |
|                                |         | 50        | 23.55                 | 23.46                 | 23.42                 |                              | 0        |
|                                |         | 99        | 23.48                 | 23.48                 | 23.35                 |                              | 0        |
|                                | 50      | 0         | 22.40                 | 22.30                 | 22.51                 | 0-1                          | 1        |
|                                |         | 25        | 22.55                 | 22.35                 | 22.39                 |                              | 1        |
|                                |         | 50        | 22.37                 | 22.30                 | 22.27                 |                              | 1        |
|                                | 100     | 0         | 22.48                 | 22.35                 | 22.33                 |                              | 1        |
|                                |         |           |                       |                       |                       |                              |          |
| 16QAM                          | 1       | 0         | 21.77                 | 22.17                 | 22.04                 | 0-1                          | 1        |
|                                |         | 50        | 21.85                 | 21.93                 | 22.23                 |                              | 1        |
|                                |         | 99        | 21.82                 | 22.24                 | 21.74                 |                              | 1        |
|                                | 50      | 0         | 21.42                 | 21.26                 | 21.36                 | 0-2                          | 2        |
|                                |         | 25        | 21.56                 | 21.34                 | 21.27                 |                              | 2        |
|                                |         | 50        | 21.33                 | 21.32                 | 21.10                 |                              | 2        |
|                                | 100     | 0         | 21.33                 | 21.29                 | 21.24                 |                              | 2        |
|                                |         |           |                       |                       |                       |                              |          |
|                                |         |           |                       |                       |                       |                              |          |

**Table 8-48**  
**LTE Band 7 Conducted Powers - 15 MHz Bandwidth**

| LTE Band 7<br>15 MHz Bandwidth |         |           |                       |                       |                       |                              |          |   |
|--------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|---|
| Modulation                     | RB Size | RB Offset | Low Channel           | Mid Channel           | High Channel          | MPR Allowed per<br>3GPP [dB] | MPR [dB] |   |
|                                |         |           | 20825<br>(2507.5 MHz) | 21100<br>(2535.0 MHz) | 21375<br>(2562.5 MHz) |                              |          |   |
|                                |         |           | Conducted Power [dBm] |                       |                       |                              |          |   |
| QPSK                           | 1       | 0         | 23.47                 | 23.56                 | 23.26                 | 0                            | 0        |   |
|                                |         | 36        | 23.49                 | 23.48                 | 23.35                 |                              | 0        |   |
|                                |         | 74        | 23.51                 | 23.47                 | 22.97                 |                              | 0        |   |
|                                | 36      | 0         | 22.21                 | 22.32                 | 22.31                 | 0-1                          | 1        |   |
|                                |         | 18        | 22.48                 | 22.33                 | 22.41                 |                              | 1        |   |
|                                |         | 37        | 22.45                 | 22.19                 | 22.30                 |                              | 1        |   |
|                                | 75      | 0         | 22.37                 | 22.21                 | 22.36                 | 1                            |          |   |
|                                | 16QAM   | 1         | 0                     | 22.42                 | 21.62                 | 22.14                        | 0-1      | 1 |
|                                |         |           | 36                    | 22.41                 | 22.04                 | 22.30                        |          | 1 |
| 74                             |         |           | 22.61                 | 21.77                 | 22.02                 | 1                            |          |   |
| 36                             |         | 0         | 21.12                 | 21.25                 | 21.20                 | 0-2                          | 2        |   |
|                                |         | 18        | 21.41                 | 21.39                 | 21.22                 |                              | 2        |   |
|                                |         | 37        | 21.33                 | 21.23                 | 21.07                 |                              | 2        |   |
| 75                             |         | 0         | 21.28                 | 21.23                 | 21.13                 | 2                            |          |   |

|                                   |                                                                                     |                              |  |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|--|---------------------------------------------------------------------------------------|---------------------------------|
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**Table 8-49**  
**LTE Band 7 Conducted Powers - 10 MHz Bandwidth**

| LTE Band 7<br>10 MHz Bandwidth |         |           |                       |                       |                       |                              |          |
|--------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                     | RB Size | RB Offset | Low Channel           | Mid Channel           | High Channel          | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                |         |           | 20800<br>(2505.0 MHz) | 21100<br>(2535.0 MHz) | 21400<br>(2565.0 MHz) |                              |          |
|                                |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                           | 1       | 0         | 23.53                 | 23.41                 | 23.41                 | 0                            | 0        |
|                                | 1       | 25        | 23.70                 | 23.59                 | 23.47                 |                              | 0        |
|                                | 1       | 49        | 23.61                 | 23.39                 | 23.29                 |                              | 0        |
|                                | 25      | 0         | 22.33                 | 22.36                 | 22.42                 | 0-1                          | 1        |
|                                | 25      | 12        | 22.25                 | 22.41                 | 22.33                 |                              | 1        |
|                                | 25      | 25        | 22.25                 | 22.25                 | 22.26                 |                              | 1        |
|                                | 50      | 0         | 22.32                 | 22.22                 | 22.31                 |                              | 1        |
| 16QAM                          | 1       | 0         | 22.08                 | 21.84                 | 21.83                 | 0-1                          | 1        |
|                                | 1       | 25        | 22.34                 | 21.87                 | 21.89                 |                              | 1        |
|                                | 1       | 49        | 22.50                 | 21.63                 | 21.65                 |                              | 1        |
|                                | 25      | 0         | 21.14                 | 21.31                 | 21.34                 | 0-2                          | 2        |
|                                | 25      | 12        | 21.25                 | 21.37                 | 21.38                 |                              | 2        |
|                                | 25      | 25        | 21.18                 | 21.23                 | 21.41                 |                              | 2        |
|                                | 50      | 0         | 21.19                 | 21.24                 | 21.26                 |                              | 2        |

**Table 8-50**  
**LTE Band 7 Conducted Powers - 5 MHz Bandwidth**

| LTE Band 7<br>5 MHz Bandwidth |         |           |                       |                       |                       |                              |          |
|-------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                    | RB Size | RB Offset | Low Channel           | Mid Channel           | High Channel          | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                               |         |           | 20775<br>(2502.5 MHz) | 21100<br>(2535.0 MHz) | 21425<br>(2567.5 MHz) |                              |          |
|                               |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                          | 1       | 0         | 23.25                 | 23.14                 | 23.10                 | 0                            | 0        |
|                               | 1       | 12        | 23.47                 | 23.64                 | 23.58                 |                              | 0        |
|                               | 1       | 24        | 22.98                 | 23.21                 | 23.25                 |                              | 0        |
|                               | 12      | 0         | 22.27                 | 22.33                 | 22.31                 | 0-1                          | 1        |
|                               | 12      | 6         | 22.36                 | 22.30                 | 22.33                 |                              | 1        |
|                               | 12      | 13        | 22.18                 | 22.23                 | 22.17                 |                              | 1        |
|                               | 25      | 0         | 22.20                 | 22.25                 | 22.16                 |                              | 1        |
| 16QAM                         | 1       | 0         | 22.02                 | 22.41                 | 21.98                 | 0-1                          | 1        |
|                               | 1       | 12        | 22.11                 | 22.62                 | 22.41                 |                              | 1        |
|                               | 1       | 24        | 21.63                 | 21.99                 | 21.92                 |                              | 1        |
|                               | 12      | 0         | 21.11                 | 21.12                 | 21.20                 | 0-2                          | 2        |
|                               | 12      | 6         | 21.01                 | 21.18                 | 21.24                 |                              | 2        |
|                               | 12      | 13        | 21.12                 | 21.01                 | 21.11                 |                              | 2        |
|                               | 25      | 0         | 21.16                 | 21.24                 | 21.20                 |                              | 2        |

|                                          |                                                                                     |                                     |                                                                                       |                                        |
|------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------|
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**Table 8-51**  
**LTE Band 7 Conducted Powers - 20 MHz Bandwidth - Reduced Power**

| LTE Band 7<br>20 MHz Bandwidth |         |           |                       |                       |                       |                              |          |   |
|--------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|---|
| Modulation                     | RB Size | RB Offset | Low Channel           | Mid Channel           | High Channel          | MPR Allowed per<br>3GPP [dB] | MPR [dB] |   |
|                                |         |           | 20850<br>(2510.0 MHz) | 21100<br>(2535.0 MHz) | 21350<br>(2560.0 MHz) |                              |          |   |
|                                |         |           | Conducted Power [dBm] |                       |                       |                              |          |   |
| QPSK                           | 1       | 0         | 10.78                 | 11.23                 | 11.15                 | 0                            | 0        |   |
|                                |         | 50        | 10.99                 | 11.52                 | 11.32                 |                              | 0        |   |
|                                |         | 99        | 10.56                 | 11.17                 | 10.83                 |                              | 0        |   |
|                                | 50      | 0         | 11.11                 | 11.33                 | 11.26                 | 0-1                          | 0        |   |
|                                |         | 25        | 11.16                 | 11.16                 | 11.25                 |                              | 0        |   |
|                                |         | 50        | 11.02                 | 11.08                 | 11.15                 |                              | 0        |   |
|                                | 100     | 0         | 11.00                 | 11.07                 | 11.20                 |                              | 0        |   |
|                                | 16QAM   | 1         | 0                     | 10.65                 | 10.55                 | 10.79                        | 0-1      | 0 |
|                                |         |           | 50                    | 11.29                 | 10.98                 | 10.93                        |          | 0 |
| 99                             |         |           | 10.44                 | 10.53                 | 10.74                 | 0                            |          |   |
| 50                             |         | 0         | 11.06                 | 10.80                 | 11.04                 | 0-2                          | 0        |   |
|                                |         | 25        | 11.12                 | 10.97                 | 11.02                 |                              | 0        |   |
|                                |         | 50        | 10.97                 | 10.81                 | 11.03                 |                              | 0        |   |
| 100                            |         | 0         | 10.98                 | 10.98                 | 11.10                 |                              | 0        |   |

**Table 8-52**  
**LTE Band 7 Conducted Powers - 15 MHz Bandwidth - Reduced Power**

| LTE Band 7<br>15 MHz Bandwidth |         |           |                       |                       |                       |                              |          |
|--------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                     | RB Size | RB Offset | Low Channel           | Mid Channel           | High Channel          | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                |         |           | 20825<br>(2507.5 MHz) | 21100<br>(2535.0 MHz) | 21375<br>(2562.5 MHz) |                              |          |
|                                |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                           | 1       | 0         | 11.46                 | 11.33                 | 11.17                 | 0                            | 0        |
|                                |         | 36        | 11.51                 | 11.31                 | 11.20                 |                              | 0        |
|                                |         | 74        | 11.44                 | 11.16                 | 11.13                 |                              | 0        |
|                                | 36      | 0         | 11.13                 | 11.03                 | 11.21                 | 0-1                          | 0        |
|                                |         | 18        | 11.19                 | 11.15                 | 11.27                 |                              | 0        |
|                                |         | 37        | 11.08                 | 11.09                 | 11.15                 |                              | 0        |
|                                | 75      | 0         | 11.07                 | 11.04                 | 11.21                 |                              | 0        |
|                                | 16QAM   | 1         | 0                     | 10.79                 | 10.73                 | 11.46                        | 0-1      |
| 36                             |         |           | 11.60                 | 10.97                 | 11.46                 | 0                            |          |
| 74                             |         |           | 10.97                 | 10.51                 | 11.34                 | 0                            |          |
| 36                             |         | 0         | 11.03                 | 11.00                 | 11.07                 | 0-2                          | 0        |
|                                |         | 18        | 11.11                 | 11.05                 | 11.23                 |                              | 0        |
|                                |         | 37        | 10.92                 | 10.95                 | 11.14                 |                              | 0        |
| 75                             |         | 0         | 10.92                 | 10.89                 | 10.99                 |                              | 0        |

|                                          |                                                                                     |                                     |                                                                                       |                                        |
|------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------|
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**Table 8-53**  
**LTE Band 7 Conducted Powers - 10 MHz Bandwidth - Reduced Power**

| LTE Band 7<br>10 MHz Bandwidth |         |           |                       |                       |                       |                              |          |
|--------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                     | RB Size | RB Offset | Low Channel           | Mid Channel           | High Channel          | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                |         |           | 20800<br>(2505.0 MHz) | 21100<br>(2535.0 MHz) | 21400<br>(2565.0 MHz) |                              |          |
|                                |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                           | 1       | 0         | 11.34                 | 11.34                 | 11.25                 | 0                            | 0        |
|                                | 1       | 25        | 11.39                 | 11.55                 | 11.43                 |                              | 0        |
|                                | 1       | 49        | 11.27                 | 11.38                 | 11.20                 |                              | 0        |
|                                | 25      | 0         | 11.15                 | 11.19                 | 11.22                 | 0-1                          | 0        |
|                                | 25      | 12        | 11.22                 | 11.12                 | 11.27                 |                              | 0        |
|                                | 25      | 25        | 11.02                 | 11.05                 | 11.12                 |                              | 0        |
|                                | 50      | 0         | 11.09                 | 11.05                 | 11.17                 |                              | 0        |
| 16QAM                          | 1       | 0         | 10.97                 | 10.88                 | 10.90                 | 0-1                          | 0        |
|                                | 1       | 25        | 11.46                 | 11.06                 | 11.07                 |                              | 0        |
|                                | 1       | 49        | 10.90                 | 10.63                 | 10.57                 |                              | 0        |
|                                | 25      | 0         | 11.11                 | 11.21                 | 11.22                 | 0-2                          | 0        |
|                                | 25      | 12        | 11.19                 | 11.29                 | 11.39                 |                              | 0        |
|                                | 25      | 25        | 10.88                 | 11.00                 | 11.23                 |                              | 0        |
|                                | 50      | 0         | 11.02                 | 10.99                 | 11.12                 |                              | 0        |

**Table 8-54**  
**LTE Band 7 Conducted Powers - 5 MHz Bandwidth - Reduced Power**

| LTE Band 7<br>5 MHz Bandwidth |         |           |                       |                       |                       |                              |          |
|-------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                    | RB Size | RB Offset | Low Channel           | Mid Channel           | High Channel          | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                               |         |           | 20775<br>(2502.5 MHz) | 21100<br>(2535.0 MHz) | 21425<br>(2567.5 MHz) |                              |          |
|                               |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                          | 1       | 0         | 11.09                 | 10.92                 | 11.21                 | 0                            | 0        |
|                               | 1       | 12        | 11.45                 | 11.14                 | 11.61                 |                              | 0        |
|                               | 1       | 24        | 11.08                 | 10.67                 | 11.13                 |                              | 0        |
|                               | 12      | 0         | 11.17                 | 11.06                 | 11.26                 | 0-1                          | 0        |
|                               | 12      | 6         | 11.24                 | 11.23                 | 11.25                 |                              | 0        |
|                               | 12      | 13        | 11.13                 | 11.03                 | 11.14                 |                              | 0        |
|                               | 25      | 0         | 11.06                 | 11.06                 | 11.16                 |                              | 0        |
| 16QAM                         | 1       | 0         | 10.83                 | 10.99                 | 10.79                 | 0-1                          | 0        |
|                               | 1       | 12        | 11.27                 | 11.48                 | 11.17                 |                              | 0        |
|                               | 1       | 24        | 10.69                 | 10.99                 | 10.62                 |                              | 0        |
|                               | 12      | 0         | 10.87                 | 11.04                 | 11.00                 | 0-2                          | 0        |
|                               | 12      | 6         | 11.07                 | 11.11                 | 11.01                 |                              | 0        |
|                               | 12      | 13        | 10.84                 | 10.91                 | 11.11                 |                              | 0        |
|                               | 25      | 0         | 11.12                 | 11.05                 | 11.15                 |                              | 0        |

|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFV520                   |  | <b>SAR EVALUATION REPORT</b> |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>0Y1601040033.ZNF | Test Dates:<br>01/06/16 - 01/16/16                                                  | DUT Type:<br>Portable Tablet |                                                                                       | Page 44 of 66                   |

## 8.2.7 LTE Carrier Aggregation Conducted Powers

**Table 8-55**  
**Maximum LTE Carrier Aggregation Conducted Powers**

| PCC      |                     |                  |                          |            |                  |                  |                          | SCC      |                     |                  | Power                    |                           |                           |
|----------|---------------------|------------------|--------------------------|------------|------------------|------------------|--------------------------|----------|---------------------|------------------|--------------------------|---------------------------|---------------------------|
| PCC Band | PCC Bandwidth [MHz] | PCC (UL) Channel | PCC (UL) Frequency [MHz] | PCC UL# RB | PCC UL RB Offset | PCC (DL) Channel | PCC (DL) Frequency [MHz] | SCC Band | SCC Bandwidth [MHz] | SCC (DL) Channel | SCC (DL) Frequency [MHz] | LTE Rel 10 Tx.Power (dBm) | LTE Rel. 8 Tx.Power (dBm) |
| LTE B2   | 5                   | 19175            | 1907.5                   | 1          | 12               | 1175             | 1987.5                   | LTE B12  | 10                  | 5095             | 737.5                    | 24.53                     | 24.70                     |
| LTE B4   | 20                  | 20175            | 1732.5                   | 1          | 99               | 2175             | 2132.5                   | LTE B12  | 10                  | 5095             | 737.5                    | 24.66                     | 24.70                     |
| LTE B2   | 5                   | 19175            | 1907.5                   | 1          | 12               | 1175             | 1987.5                   | LTE B29  | 10                  | 9715             | 722.5                    | 24.67                     | 24.70                     |
| LTE B4   | 20                  | 20175            | 1732.5                   | 1          | 99               | 2175             | 2132.5                   | LTE B29  | 10                  | 9715             | 722.5                    | 24.59                     | 24.70                     |
| LTE B2   | 5                   | 19175            | 1907.5                   | 1          | 12               | 1175             | 1987.5                   | LTE B5   | 10                  | 2525             | 881.5                    | 24.70                     | 24.70                     |
| LTE B4   | 20                  | 20175            | 1732.5                   | 1          | 99               | 2175             | 2132.5                   | LTE B5   | 10                  | 2525             | 881.5                    | 24.70                     | 24.70                     |

**Table 8-56**  
**Reduced LTE Carrier Aggregation Conducted Powers**

| PCC      |                     |                  |                          |            |                  |                  |                          | SCC      |                     |                  | Power                    |                           |                           |
|----------|---------------------|------------------|--------------------------|------------|------------------|------------------|--------------------------|----------|---------------------|------------------|--------------------------|---------------------------|---------------------------|
| PCC Band | PCC Bandwidth [MHz] | PCC (UL) Channel | PCC (UL) Frequency [MHz] | PCC UL# RB | PCC UL RB Offset | PCC (DL) Channel | PCC (DL) Frequency [MHz] | SCC Band | SCC Bandwidth [MHz] | SCC (DL) Channel | SCC (DL) Frequency [MHz] | LTE Rel 10 Tx.Power (dBm) | LTE Rel. 8 Tx.Power (dBm) |
| LTE B2   | 20                  | 18700            | 1860                     | 1          | 50               | 600              | 1930                     | LTE B12  | 10                  | 5095             | 737.5                    | 12.51                     | 12.69                     |
| LTE B4   | 20                  | 20175            | 1732.5                   | 1          | 50               | 2175             | 2132.5                   | LTE B12  | 10                  | 5095             | 737.5                    | 14.68                     | 14.66                     |
| LTE B2   | 20                  | 18700            | 1860                     | 1          | 50               | 600              | 1930                     | LTE B29  | 10                  | 9715             | 722.5                    | 12.70                     | 12.69                     |
| LTE B4   | 20                  | 20175            | 1732.5                   | 1          | 50               | 2175             | 2132.5                   | LTE B29  | 10                  | 9715             | 722.5                    | 14.61                     | 14.66                     |
| LTE B2   | 20                  | 18700            | 1860                     | 1          | 50               | 600              | 1930                     | LTE B5   | 10                  | 2525             | 881.5                    | 12.66                     | 12.69                     |
| LTE B4   | 20                  | 20175            | 1732.5                   | 1          | 50               | 2175             | 2132.5                   | LTE B5   | 10                  | 2525             | 881.5                    | 14.58                     | 14.66                     |

### Notes:

1. The device only supports downlink Carrier Aggregation. Uplink Carrier Aggregation is not supported. For every supported combination of downlink carrier aggregation, power measurements were performed with the downlink carrier aggregation active for the configuration with highest measured maximum conducted power with downlink carrier aggregation inactive measured among the channel bandwidth, modulation, and RB combinations in each frequency band.
2. All control and acknowledge data is sent on uplink channels that operate identical to specifications when downlink carrier aggregation is inactive.
3. Since the supported frequency span for LTE B17 falls completely within the supported frequency span for LTE B12, both LTE bands have the same target power, and both LTE bands share the same transmission path, LTE CA SAR combinations were only assessed for LTE Band 12.

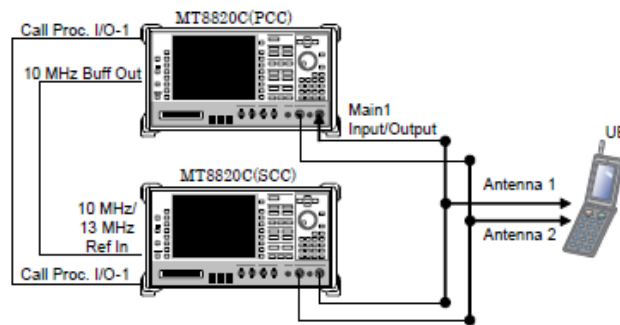


**Figure 8-2**  
**Power Measurement Setup**

|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFV520                   |  | SAR EVALUATION REPORT        |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>OY1601040033.ZNF | Test Dates:<br>01/06/16 - 01/16/16                                                  | DUT Type:<br>Portable Tablet |                                                                                       | Page 45 of 66                   |

### 8.3 WLAN Conducted Powers

**Table 8-57**  
**2.4 GHz Average RF Output Power**

| Freq [MHz] | Channel | 2.4GHz Conducted Power [dBm] |         |         |
|------------|---------|------------------------------|---------|---------|
|            |         | IEEE Transmission Mode       |         |         |
|            |         | 802.11b                      | 802.11g | 802.11n |
| 2412       | 1       | <b>14.45</b>                 | 12.74   | 12.84   |
| 2437       | 6       | 14.05                        | 12.16   | 12.40   |
| 2462       | 11      | 14.44                        | 12.31   | 12.46   |

**Table 8-58**  
**5 GHz Average RF Output Power**

| Freq [MHz] | Channel | 5GHz (40MHz) Conducted Power [dBm] |          |
|------------|---------|------------------------------------|----------|
|            |         | IEEE Transmission Mode             |          |
|            |         | 802.11n                            | 802.11ac |
| 5190       | 38      | 10.59                              | 10.85    |
| 5230       | 46      | 10.79                              | 10.95    |
| 5270       | 54      | 10.92                              | 11.07    |
| 5310       | 62      | <b>10.95</b>                       | 11.25    |
| 5510       | 102     | 10.64                              | 10.84    |
| 5550       | 110     | <b>10.67</b>                       | 10.83    |
| 5670       | 134     | 10.59                              | 10.50    |
| 5755       | 151     | <b>10.55</b>                       | 10.60    |
| 5795       | 159     | 10.21                              | 10.15    |

Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02:

- Power measurements were performed for the transmission mode configuration with the highest maximum output power specified for production units.
- For transmission modes with the same maximum output power specification, powers were measured for the largest channel bandwidth, lowest order modulation and lowest data rate.
- For transmission modes with identical maximum specified output power, channel bandwidth, modulation and data rates, power measurements were required for all identical configurations.
- For each transmission mode configuration, powers were measured for the highest and lowest channels; and at the mid-band channel(s) when there were at least 3 channels supported. For configurations with multiple mid-band channels, due to an even number of channels, both channels were measured.
- The bolded data rate and channel above were tested for SAR.

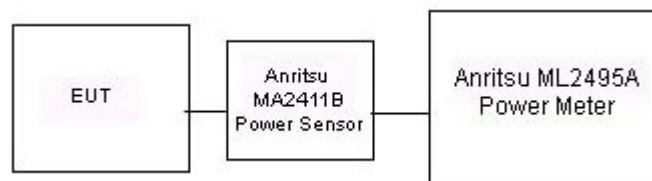


**Figure 8-3**  
**Power Measurement Setup for Bandwidths < 50 MHz**

|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFV520                   |  | SAR EVALUATION REPORT        |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>0Y1601040033.ZNF | Test Dates:<br>01/06/16 - 01/16/16                                                  | DUT Type:<br>Portable Tablet |                                                                                       | Page 46 of 66                   |

## 8.4 Bluetooth Conducted Powers

**Table 8-59**  
**Bluetooth RF Conducted Powers**

| Frequency<br>[MHz] | Data<br>Rate<br>[Mbps] | Channel<br>No. | Avg Conducted<br>Power |       |
|--------------------|------------------------|----------------|------------------------|-------|
|                    |                        |                | [dBm]                  | [mW]  |
| 2402               | 1.0                    | 0              | 6.71                   | 4.691 |
| 2441               | 1.0                    | 39             | <b>9.61</b>            | 9.149 |
| 2480               | 1.0                    | 78             | 7.46                   | 5.577 |
| 2402               | 2.0                    | 0              | 4.61                   | 2.892 |
| 2441               | 2.0                    | 39             | 7.39                   | 5.481 |
| 2480               | 2.0                    | 78             | 5.33                   | 3.415 |
| 2402               | 3.0                    | 0              | 4.67                   | 2.930 |
| 2441               | 3.0                    | 39             | 7.45                   | 5.555 |
| 2480               | 3.0                    | 78             | 5.41                   | 3.479 |

Note: The bolded data rate and channel above was tested for SAR.

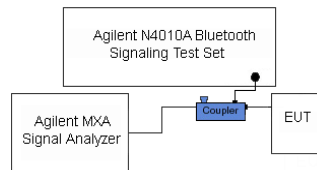


**Figure 8-4**  
**Power Measurement Setup**

|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFV520                   |  | SAR EVALUATION REPORT        |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>0Y1601040033.ZNF | Test Dates:<br>01/06/16 - 01/16/16                                                  | DUT Type:<br>Portable Tablet |                                                                                       | Page 47 of 66                   |

## 9 SYSTEM VERIFICATION

### 9.1 Tissue Verification

**Table 9-1**  
**Measured Tissue Properties**

| Calibrated for Tests Performed on: | Tissue Type | Tissue Temp During Calibration (C°) | Measured Frequency (MHz) | Measured Conductivity, $\sigma$ (S/m) | Measured Dielectric Constant, $\epsilon$ | TARGET Conductivity, $\sigma$ (S/m) | TARGET Dielectric Constant, $\epsilon$ | % dev $\sigma$ | % dev $\epsilon$ |
|------------------------------------|-------------|-------------------------------------|--------------------------|---------------------------------------|------------------------------------------|-------------------------------------|----------------------------------------|----------------|------------------|
| 1/6/2016                           | 750B        | 22.5                                | 700                      | 0.913                                 | 54.853                                   | 0.959                               | 55.726                                 | -4.80%         | -1.57%           |
|                                    |             |                                     | 710                      | 0.923                                 | 54.768                                   | 0.960                               | 55.687                                 | -3.85%         | -1.65%           |
|                                    |             |                                     | 720                      | 0.933                                 | 54.682                                   | 0.961                               | 55.648                                 | -2.91%         | -1.74%           |
|                                    |             |                                     | 725                      | 0.937                                 | 54.647                                   | 0.961                               | 55.629                                 | -2.50%         | -1.77%           |
|                                    |             |                                     | 740                      | 0.951                                 | 54.517                                   | 0.963                               | 55.570                                 | -1.25%         | -1.89%           |
|                                    |             |                                     | 755                      | 0.967                                 | 54.335                                   | 0.964                               | 55.512                                 | 0.31%          | -2.12%           |
| 1/7/2016                           | 835B        | 22.4                                | 820                      | 0.983                                 | 53.328                                   | 0.969                               | 55.258                                 | 1.44%          | -3.49%           |
|                                    |             |                                     | 835                      | 0.997                                 | 53.205                                   | 0.970                               | 55.200                                 | 2.78%          | -3.61%           |
|                                    |             |                                     | 850                      | 1.013                                 | 53.034                                   | 0.988                               | 55.154                                 | 2.53%          | -3.84%           |
| 1/9/2016                           | 835B        | 23.2                                | 820                      | 0.991                                 | 53.831                                   | 0.969                               | 55.258                                 | 2.27%          | -2.58%           |
|                                    |             |                                     | 835                      | 1.005                                 | 53.715                                   | 0.970                               | 55.200                                 | 3.61%          | -2.69%           |
|                                    |             |                                     | 850                      | 1.020                                 | 53.590                                   | 0.988                               | 55.154                                 | 3.24%          | -2.84%           |
| 1/11/2016                          | 1750B       | 22.7                                | 1710                     | 1.441                                 | 51.236                                   | 1.463                               | 53.537                                 | -1.50%         | -4.30%           |
|                                    |             |                                     | 1750                     | 1.486                                 | 51.093                                   | 1.488                               | 53.432                                 | -0.13%         | -4.38%           |
|                                    |             |                                     | 1790                     | 1.529                                 | 50.949                                   | 1.514                               | 53.326                                 | 0.99%          | -4.46%           |
| 1/9/2016                           | 1900B       | 22.6                                | 1850                     | 1.520                                 | 53.825                                   | 1.520                               | 53.300                                 | 0.00%          | 0.98%            |
|                                    |             |                                     | 1880                     | 1.550                                 | 53.707                                   | 1.520                               | 53.300                                 | 1.97%          | 0.76%            |
|                                    |             |                                     | 1910                     | 1.588                                 | 53.605                                   | 1.520                               | 53.300                                 | 4.47%          | 0.57%            |
| 1/14/2016                          | 2450B       | 22.6                                | 2400                     | 1.944                                 | 51.799                                   | 1.902                               | 52.767                                 | 2.21%          | -1.83%           |
|                                    |             |                                     | 2450                     | 2.014                                 | 51.593                                   | 1.950                               | 52.700                                 | 3.28%          | -2.10%           |
|                                    |             |                                     | 2500                     | 2.085                                 | 51.426                                   | 2.021                               | 52.636                                 | 3.17%          | -2.30%           |
| 1/16/2016                          | 2300B-2600B | 22.2                                | 2300                     | 1.753                                 | 51.964                                   | 1.809                               | 52.900                                 | -3.10%         | -1.77%           |
|                                    |             |                                     | 2310                     | 1.767                                 | 51.934                                   | 1.816                               | 52.887                                 | -2.70%         | -1.80%           |
|                                    |             |                                     | 2320                     | 1.780                                 | 51.882                                   | 1.826                               | 52.873                                 | -2.52%         | -1.87%           |
|                                    |             |                                     | 2400                     | 1.879                                 | 51.591                                   | 1.902                               | 52.767                                 | -1.21%         | -2.23%           |
|                                    |             |                                     | 2450                     | 1.944                                 | 51.411                                   | 1.950                               | 52.700                                 | -0.31%         | -2.45%           |
|                                    |             |                                     | 2500                     | 2.006                                 | 51.212                                   | 2.021                               | 52.636                                 | -0.74%         | -2.71%           |
|                                    |             |                                     | 2550                     | 2.082                                 | 51.063                                   | 2.092                               | 52.573                                 | -0.48%         | -2.87%           |
|                                    |             |                                     | 2600                     | 2.150                                 | 50.867                                   | 2.163                               | 52.509                                 | -0.60%         | -3.13%           |
| 01/12/2016                         | 5200B-5800B | 23.8                                | 5300                     | 5.455                                 | 48.493                                   | 5.416                               | 48.879                                 | 0.72%          | -0.79%           |
|                                    |             |                                     | 5320                     | 5.458                                 | 48.504                                   | 5.439                               | 48.851                                 | 0.35%          | -0.71%           |
|                                    |             |                                     | 5500                     | 5.711                                 | 48.227                                   | 5.650                               | 48.607                                 | 1.08%          | -0.78%           |
|                                    |             |                                     | 5540                     | 5.763                                 | 48.153                                   | 5.696                               | 48.553                                 | 1.18%          | -0.82%           |
|                                    |             |                                     | 5560                     | 5.798                                 | 48.078                                   | 5.720                               | 48.526                                 | 1.36%          | -0.92%           |
|                                    |             |                                     | 5745                     | 6.039                                 | 47.844                                   | 5.936                               | 48.275                                 | 1.74%          | -0.89%           |
|                                    |             |                                     | 5765                     | 6.039                                 | 47.881                                   | 5.959                               | 48.248                                 | 1.34%          | -0.76%           |
|                                    |             |                                     | 5785                     | 6.089                                 | 47.786                                   | 5.982                               | 48.220                                 | 1.79%          | -0.90%           |
|                                    |             |                                     | 5800                     | 6.135                                 | 47.714                                   | 6.000                               | 48.200                                 | 2.25%          | -1.01%           |

The above measured tissue parameters were used in the DASY software. The DASY software was used to perform interpolation to determine the dielectric parameters at the SAR test device frequencies (per KDB Publication 865664 D01v01r04 and IEEE 1528-2013 6.6.1.2). The tissue parameters listed in the SAR test plots may slightly differ from the table above due to significant digit rounding in the software.

|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFV520                   |  | SAR EVALUATION REPORT        |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>0Y1601040033.ZNF | Test Dates:<br>01/06/16 - 01/16/16                                                  | DUT Type:<br>Portable Tablet |                                                                                       | Page 48 of 66                   |

## 9.2 Test System Verification

Prior to SAR assessment, the system is verified to  $\pm 10\%$  of the SAR measurement on the reference dipole at the time of calibration by the calibration facility. Full system validation status and result summary can be found in Appendix E.

**Table 9-2**  
**System Verification Results**

| System Verification<br>TARGET & MEASURED |                        |             |            |                |                  |                 |           |          |                                   |                                     |                                         |                             |
|------------------------------------------|------------------------|-------------|------------|----------------|------------------|-----------------|-----------|----------|-----------------------------------|-------------------------------------|-----------------------------------------|-----------------------------|
| SAR System #                             | Tissue Frequency (MHz) | Tissue Type | Date:      | Amb. Temp (°C) | Liquid Temp (°C) | Input Power (W) | Dipole SN | Probe SN | Measured SAR <sub>1g</sub> (W/kg) | 1 W Target SAR <sub>1g</sub> (W/kg) | 1 W Normalized SAR <sub>1g</sub> (W/kg) | Deviation <sub>1g</sub> (%) |
| K                                        | 750                    | BODY        | 01/06/2016 | 23.5           | 22.5             | 0.200           | 1003      | 3022     | 1.770                             | 8.460                               | 8.850                                   | 4.61%                       |
| H                                        | 835                    | BODY        | 01/07/2016 | 24.4           | 22.4             | 0.200           | 4d133     | 3263     | 1.970                             | 9.250                               | 9.850                                   | 6.49%                       |
| H                                        | 835                    | BODY        | 01/09/2016 | 24.5           | 23.2             | 0.200           | 4d133     | 3263     | 2.010                             | 9.250                               | 10.050                                  | 8.65%                       |
| E                                        | 1750                   | BODY        | 01/11/2016 | 23.2           | 22.7             | 0.100           | 1051      | 3351     | 3.790                             | 37.100                              | 37.900                                  | 2.16%                       |
| I                                        | 1900                   | BODY        | 01/09/2016 | 23.1           | 22.6             | 0.100           | 5d149     | 3333     | 3.930                             | 40.400                              | 39.300                                  | -2.72%                      |
| J                                        | 2300                   | BODY        | 01/16/2016 | 20.6           | 22.2             | 0.100           | 1064      | 3319     | 4.600                             | 45.500                              | 46.000                                  | 1.10%                       |
| D                                        | 2450                   | BODY        | 01/14/2016 | 24.2           | 22.6             | 0.100           | 719       | 3209     | 5.370                             | 51.900                              | 53.700                                  | 3.47%                       |
| J                                        | 2450                   | BODY        | 01/16/2016 | 20.6           | 22.2             | 0.100           | 719       | 3319     | 5.150                             | 51.900                              | 51.500                                  | -0.77%                      |
| J                                        | 2600                   | BODY        | 01/16/2016 | 20.6           | 22.2             | 0.100           | 1004      | 3319     | 6.000                             | 56.200                              | 60.000                                  | 6.76%                       |
| D                                        | 5300                   | BODY        | 01/12/2016 | 23.8           | 23.6             | 0.050           | 1120      | 7357     | 3.770                             | 75.200                              | 75.400                                  | 0.27%                       |
| D                                        | 5500                   | BODY        | 01/12/2016 | 23.8           | 23.6             | 0.050           | 1120      | 7357     | 3.820                             | 79.500                              | 76.400                                  | -3.90%                      |
| D                                        | 5800                   | BODY        | 01/12/2016 | 23.8           | 23.6             | 0.050           | 1120      | 7357     | 3.720                             | 76.300                              | 74.400                                  | -2.49%                      |

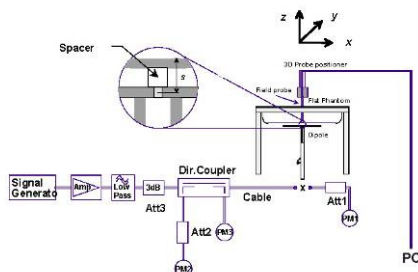


**Figure 9-1**  
**System Verification Setup Diagram**



**Figure 9-2**  
**System Verification Setup Photo**

|                                   |                                                                                                                                                                                                        |                              |                                 |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|---------------------------------|
| FCC ID: ZNFV520                   |  <b>SAR EVALUATION REPORT</b>  |                              | Reviewed by:<br>Quality Manager |
| Document S/N:<br>0Y1601040033.ZNF | Test Dates:<br>01/06/16 - 01/16/16                                                                                                                                                                     | DUT Type:<br>Portable Tablet | Page 49 of 66                   |

# 10 SAR DATA SUMMARY

## 10.1 Standalone Body SAR Data

Table 10-1  
UMTS Body SAR Data

| MEASUREMENT RESULTS                      |      |           |         |                             |                       |                  |                      |                      |            |      |          |                |                   |        |
|------------------------------------------|------|-----------|---------|-----------------------------|-----------------------|------------------|----------------------|----------------------|------------|------|----------|----------------|-------------------|--------|
| FREQUENCY                                |      | Mode      | Service | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Power Drift [dB] | Spacing              | Device Serial Number | Duty Cycle | Side | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |
| MHz                                      | Ch.  |           |         |                             |                       |                  |                      |                      |            |      | (W/kg)   |                | (W/kg)            |        |
| 836.60                                   | 4183 | UMTS 850  | RMC     | 24.7                        | 24.66                 | -0.03            | 19 mm                | 04236                | 1:1        | back | 0.356    | 1.009          | 0.359             | A1     |
| 836.60                                   | 4183 | UMTS 850  | RMC     | 24.7                        | 24.66                 | 0.00             | 10 mm                | 04236                | 1:1        | top  | 0.517    | 1.009          | 0.522             |        |
| 836.60                                   | 4183 | UMTS 850  | RMC     | 24.7                        | 24.66                 | -0.01            | 5 mm                 | 04236                | 1:1        | left | 0.411    | 1.009          | 0.415             |        |
| 836.60                                   | 4183 | UMTS 850  | RMC     | 20.7                        | 20.42                 | -0.18            | 0 mm                 | 04269                | 1:1        | back | 0.313    | 1.067          | 0.334             |        |
| 836.60                                   | 4183 | UMTS 850  | RMC     | 20.7                        | 20.42                 | -0.03            | 0 mm                 | 04269                | 1:1        | top  | 0.385    | 1.067          | 0.411             |        |
| 836.60                                   | 4183 | UMTS 850  | RMC     | 20.7                        | 20.42                 | -0.02            | 0 mm                 | 04269                | 1:1        | left | 0.458    | 1.067          | 0.489             |        |
| 1732.40                                  | 1412 | UMTS 1750 | RMC     | 24.7                        | 24.61                 | 0.02             | 19 mm                | 04236                | 1:1        | back | 0.130    | 1.021          | 0.133             | A2     |
| 1732.40                                  | 1412 | UMTS 1750 | RMC     | 24.7                        | 24.61                 | 0.01             | 10 mm                | 04236                | 1:1        | top  | 0.247    | 1.021          | 0.252             |        |
| 1732.40                                  | 1412 | UMTS 1750 | RMC     | 24.7                        | 24.61                 | 0.02             | 5 mm                 | 04236                | 1:1        | left | 0.093    | 1.021          | 0.095             |        |
| 1732.40                                  | 1412 | UMTS 1750 | RMC     | 14.7                        | 14.37                 | -0.15            | 0 mm                 | 04269                | 1:1        | back | 0.394    | 1.079          | 0.425             |        |
| 1732.40                                  | 1412 | UMTS 1750 | RMC     | 14.7                        | 14.37                 | -0.01            | 0 mm                 | 04269                | 1:1        | top  | 0.312    | 1.079          | 0.337             |        |
| 1732.40                                  | 1412 | UMTS 1750 | RMC     | 14.7                        | 14.37                 | 0.05             | 0 mm                 | 04269                | 1:1        | left | 0.067    | 1.079          | 0.072             |        |
| 1880.00                                  | 9400 | UMTS 1900 | RMC     | 24.7                        | 24.52                 | -0.01            | 19 mm                | 04236                | 1:1        | back | 0.210    | 1.042          | 0.219             | A3     |
| 1852.40                                  | 9262 | UMTS 1900 | RMC     | 24.7                        | 24.52                 | 0.03             | 10 mm                | 04236                | 1:1        | top  | 0.773    | 1.042          | 0.805             |        |
| 1880.00                                  | 9400 | UMTS 1900 | RMC     | 24.7                        | 24.52                 | -0.03            | 10 mm                | 04236                | 1:1        | top  | 0.798    | 1.042          | 0.832             |        |
| 1907.60                                  | 9538 | UMTS 1900 | RMC     | 24.7                        | 24.57                 | -0.02            | 10 mm                | 04236                | 1:1        | top  | 0.412    | 1.030          | 0.424             |        |
| 1880.00                                  | 9400 | UMTS 1900 | RMC     | 24.7                        | 24.52                 | -0.09            | 5 mm                 | 04236                | 1:1        | left | 0.418    | 1.042          | 0.436             |        |
| 1880.00                                  | 9400 | UMTS 1900 | RMC     | 12.7                        | 12.55                 | 0.03             | 0 mm                 | 04269                | 1:1        | back | 0.473    | 1.035          | 0.490             |        |
| 1880.00                                  | 9400 | UMTS 1900 | RMC     | 12.7                        | 12.55                 | 0.07             | 0 mm                 | 04269                | 1:1        | top  | 0.223    | 1.035          | 0.231             |        |
| 1880.00                                  | 9400 | UMTS 1900 | RMC     | 12.7                        | 12.55                 | 0.00             | 0 mm                 | 04269                | 1:1        | left | 0.059    | 1.035          | 0.061             |        |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT    |      |           |         |                             |                       |                  |                      |                      |            |      |          |                |                   |        |
| Spatial Peak                             |      |           |         |                             |                       |                  | Body                 |                      |            |      |          |                |                   |        |
| Uncontrolled Exposure/General Population |      |           |         |                             |                       |                  | 1.6 W/kg (mW/g)      |                      |            |      |          |                |                   |        |
|                                          |      |           |         |                             |                       |                  | averaged over 1 gram |                      |            |      |          |                |                   |        |

|                                   |                                                                                                                                                                                                        |                              |                                 |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|---------------------------------|
| FCC ID: ZNFV520                   |  <b>SAR EVALUATION REPORT</b>  |                              | Reviewed by:<br>Quality Manager |
| Document S/N:<br>0Y1601040033.ZNF | Test Dates:<br>01/06/16 - 01/16/16                                                                                                                                                                     | DUT Type:<br>Portable Tablet | Page 50 of 66                   |

**Table 10-2**  
**LTE Band 12 Body SAR**

| MEASUREMENT RESULTS                                                                               |       |      |                 |                             |                       |                  |          |                                                 |            |         |           |         |       |            |          |                |                   |        |
|---------------------------------------------------------------------------------------------------|-------|------|-----------------|-----------------------------|-----------------------|------------------|----------|-------------------------------------------------|------------|---------|-----------|---------|-------|------------|----------|----------------|-------------------|--------|
| FREQUENCY                                                                                         |       | Mode | Bandwidth [MHz] | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Power Drift [dB] | MPR [dB] | Device Serial Number                            | Modulation | RB Size | RB Offset | Spacing | Side  | Duty Cycle | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |
| MHz                                                                                               | Ch.   |      |                 |                             |                       |                  |          |                                                 |            |         |           |         |       |            | (W/kg)   |                | (W/kg)            |        |
| 707.50                                                                                            | 23095 | Mid  | LTE Band 12     | 10                          | 25.5                  | 25.50            | -0.01    | 0                                               | 04228      | QPSK    | 1         | 25      | 19 mm | back       | 1:1      | 1.000          | 0.216             |        |
| 707.50                                                                                            | 23095 | Mid  | LTE Band 12     | 10                          | 24.5                  | 24.11            | 0.08     | 1                                               | 04228      | QPSK    | 25        | 25      | 19 mm | back       | 1:1      | 1.093          | 0.183             |        |
| 707.50                                                                                            | 23095 | Mid  | LTE Band 12     | 10                          | 25.5                  | 25.50            | 0.04     | 0                                               | 04228      | QPSK    | 1         | 25      | 10 mm | top        | 1:1      | 1.000          | 0.335             |        |
| 707.50                                                                                            | 23095 | Mid  | LTE Band 12     | 10                          | 24.5                  | 24.11            | -0.04    | 1                                               | 04228      | QPSK    | 25        | 25      | 10 mm | top        | 1:1      | 1.093          | 0.295             |        |
| 707.50                                                                                            | 23095 | Mid  | LTE Band 12     | 10                          | 25.5                  | 25.50            | -0.07    | 0                                               | 04228      | QPSK    | 1         | 25      | 0 mm  | right      | 1:1      | 1.000          | 0.073             |        |
| 707.50                                                                                            | 23095 | Mid  | LTE Band 12     | 10                          | 24.5                  | 24.11            | -0.06    | 1                                               | 04228      | QPSK    | 25        | 25      | 0 mm  | right      | 1:1      | 1.093          | 0.083             |        |
| 707.50                                                                                            | 23095 | Mid  | LTE Band 12     | 10                          | 25.5                  | 25.50            | 0.05     | 0                                               | 04228      | QPSK    | 1         | 25      | 5 mm  | left       | 1:1      | 1.000          | 0.405             |        |
| 707.50                                                                                            | 23095 | Mid  | LTE Band 12     | 10                          | 24.5                  | 24.11            | 0.00     | 1                                               | 04228      | QPSK    | 25        | 25      | 5 mm  | left       | 1:1      | 1.093          | 0.353             |        |
| 707.50                                                                                            | 23095 | Mid  | LTE Band 12     | 10                          | 19.5                  | 19.24            | 0.05     | 0                                               | 04251      | QPSK    | 1         | 25      | 0 mm  | back       | 1:1      | 1.063          | 0.559             | A4     |
| 707.50                                                                                            | 23095 | Mid  | LTE Band 12     | 10                          | 19.5                  | 19.07            | -0.02    | 0                                               | 04251      | QPSK    | 25        | 12      | 0 mm  | back       | 1:1      | 1.103          | 0.566             |        |
| 707.50                                                                                            | 23095 | Mid  | LTE Band 12     | 10                          | 19.5                  | 19.24            | -0.12    | 0                                               | 04251      | QPSK    | 1         | 25      | 0 mm  | top        | 1:1      | 1.063          | 0.434             |        |
| 707.50                                                                                            | 23095 | Mid  | LTE Band 12     | 10                          | 19.5                  | 19.07            | -0.12    | 0                                               | 04251      | QPSK    | 25        | 12      | 0 mm  | top        | 1:1      | 1.103          | 0.467             |        |
| 707.50                                                                                            | 23095 | Mid  | LTE Band 12     | 10                          | 19.5                  | 19.24            | 0.12     | 0                                               | 04251      | QPSK    | 1         | 25      | 0 mm  | left       | 1:1      | 1.063          | 0.339             |        |
| 707.50                                                                                            | 23095 | Mid  | LTE Band 12     | 10                          | 19.5                  | 19.07            | 0.14     | 0                                               | 04251      | QPSK    | 25        | 12      | 0 mm  | left       | 1:1      | 1.103          | 0.349             |        |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population |       |      |                 |                             |                       |                  |          | Body<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |            |         |           |         |       |            |          |                |                   |        |

**Table 10-3**  
**LTE Band 5 (Cell) Body SAR**

| MEASUREMENT RESULTS                                                                               |       |      |                   |                             |                       |                  |          |                                                 |            |         |           |         |       |            |          |                |                   |        |
|---------------------------------------------------------------------------------------------------|-------|------|-------------------|-----------------------------|-----------------------|------------------|----------|-------------------------------------------------|------------|---------|-----------|---------|-------|------------|----------|----------------|-------------------|--------|
| FREQUENCY                                                                                         |       | Mode | Bandwidth [MHz]   | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Power Drift [dB] | MPR [dB] | Device Serial Number                            | Modulation | RB Size | RB Offset | Spacing | Side  | Duty Cycle | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |
| MHz                                                                                               | Ch.   |      |                   |                             |                       |                  |          |                                                 |            |         |           |         |       |            | (W/kg)   |                | (W/kg)            |        |
| 836.50                                                                                            | 20525 | Mid  | LTE Band 5 (Cell) | 10                          | 25.2                  | 25.08            | -0.02    | 0                                               | 04244      | QPSK    | 1         | 0       | 19 mm | back       | 1:1      | 1.028          | 0.394             |        |
| 836.50                                                                                            | 20525 | Mid  | LTE Band 5 (Cell) | 10                          | 24.2                  | 23.82            | 0.08     | 1                                               | 04244      | QPSK    | 25        | 0       | 19 mm | back       | 1:1      | 1.091          | 0.365             |        |
| 836.50                                                                                            | 20525 | Mid  | LTE Band 5 (Cell) | 10                          | 25.2                  | 25.08            | 0.07     | 0                                               | 04244      | QPSK    | 1         | 0       | 10 mm | top        | 1:1      | 1.028          | 0.498             |        |
| 836.50                                                                                            | 20525 | Mid  | LTE Band 5 (Cell) | 10                          | 24.2                  | 23.82            | -0.07    | 1                                               | 04244      | QPSK    | 25        | 0       | 10 mm | top        | 1:1      | 1.091          | 0.451             |        |
| 836.50                                                                                            | 20525 | Mid  | LTE Band 5 (Cell) | 10                          | 25.2                  | 25.08            | 0.08     | 0                                               | 04244      | QPSK    | 1         | 0       | 5 mm  | left       | 1:1      | 1.028          | 0.449             |        |
| 836.50                                                                                            | 20525 | Mid  | LTE Band 5 (Cell) | 10                          | 24.2                  | 23.82            | 0.06     | 1                                               | 04244      | QPSK    | 25        | 0       | 5 mm  | left       | 1:1      | 1.091          | 0.359             |        |
| 836.50                                                                                            | 20525 | Mid  | LTE Band 5 (Cell) | 10                          | 21.2                  | 20.94            | 0.20     | 0                                               | 04251      | QPSK    | 1         | 49      | 0 mm  | back       | 1:1      | 1.061          | 0.353             |        |
| 836.50                                                                                            | 20525 | Mid  | LTE Band 5 (Cell) | 10                          | 21.2                  | 20.63            | 0.19     | 0                                               | 04251      | QPSK    | 25        | 0       | 0 mm  | back       | 1:1      | 1.140          | 0.394             |        |
| 836.50                                                                                            | 20525 | Mid  | LTE Band 5 (Cell) | 10                          | 21.2                  | 20.94            | 0.19     | 0                                               | 04251      | QPSK    | 1         | 49      | 0 mm  | top        | 1:1      | 1.061          | 0.427             |        |
| 836.50                                                                                            | 20525 | Mid  | LTE Band 5 (Cell) | 10                          | 21.2                  | 20.63            | 0.10     | 0                                               | 04251      | QPSK    | 25        | 0       | 0 mm  | top        | 1:1      | 1.140          | 0.480             |        |
| 836.50                                                                                            | 20525 | Mid  | LTE Band 5 (Cell) | 10                          | 21.2                  | 20.94            | -0.08    | 0                                               | 04251      | QPSK    | 1         | 49      | 0 mm  | left       | 1:1      | 1.061          | 0.540             |        |
| 836.50                                                                                            | 20525 | Mid  | LTE Band 5 (Cell) | 10                          | 21.2                  | 20.63            | 0.01     | 0                                               | 04251      | QPSK    | 25        | 0       | 0 mm  | left       | 1:1      | 1.140          | 0.588             | A5     |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population |       |      |                   |                             |                       |                  |          | Body<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |            |         |           |         |       |            |          |                |                   |        |

|                                          |                                                                                                                                   |                                     |                                                                                                 |                                        |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------------------------------------------------------------------|----------------------------------------|
| FCC ID: ZNFV520                          |  <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | <b>SAR EVALUATION REPORT</b>        |  <b>LG</b> | <b>Reviewed by:</b><br>Quality Manager |
| <b>Document S/N:</b><br>0Y1601040033.ZNF | <b>Test Dates:</b><br>01/06/16 - 01/16/16                                                                                         | <b>DUT Type:</b><br>Portable Tablet |                                                                                                 | Page 51 of 66                          |

**Table 10-4**  
**LTE Band 4 (AWS) Body SAR**

| MEASUREMENT RESULTS                                                                               |       |      |                  |                             |                       |                  |          |                                                 |            |         |           |         |       |            |          |                |                   |        |
|---------------------------------------------------------------------------------------------------|-------|------|------------------|-----------------------------|-----------------------|------------------|----------|-------------------------------------------------|------------|---------|-----------|---------|-------|------------|----------|----------------|-------------------|--------|
| FREQUENCY                                                                                         |       | Mode | Bandwidth [MHz]  | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Power Drift [dB] | MPR [dB] | Device Serial Number                            | Modulation | RB Size | RB Offset | Spacing | Side  | Duty Cycle | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |
| MHz                                                                                               | Ch.   |      |                  |                             |                       |                  |          |                                                 |            |         |           |         |       |            | (W/kg)   |                | (W/kg)            |        |
| 1732.50                                                                                           | 20175 | Mid  | LTE Band 4 (AWS) | 20                          | 24.7                  | 24.70            | 0.09     | 0                                               | 04228      | QPSK    | 1         | 99      | 19 mm | back       | 1:1      | 1.000          | 0.287             |        |
| 1732.50                                                                                           | 20175 | Mid  | LTE Band 4 (AWS) | 20                          | 23.7                  | 23.33            | 0.11     | 1                                               | 04228      | QPSK    | 50        | 50      | 19 mm | back       | 1:1      | 1.089          | 0.243             |        |
| 1732.50                                                                                           | 20175 | Mid  | LTE Band 4 (AWS) | 20                          | 24.7                  | 24.70            | 0.02     | 0                                               | 04228      | QPSK    | 1         | 99      | 10 mm | top        | 1:1      | 1.000          | 0.689             | A6     |
| 1732.50                                                                                           | 20175 | Mid  | LTE Band 4 (AWS) | 20                          | 23.7                  | 23.33            | -0.04    | 1                                               | 04228      | QPSK    | 50        | 50      | 10 mm | top        | 1:1      | 1.089          | 0.584             |        |
| 1732.50                                                                                           | 20175 | Mid  | LTE Band 4 (AWS) | 20                          | 24.7                  | 24.70            | -0.03    | 0                                               | 04228      | QPSK    | 1         | 99      | 5 mm  | left       | 1:1      | 1.000          | 0.413             |        |
| 1732.50                                                                                           | 20175 | Mid  | LTE Band 4 (AWS) | 20                          | 23.7                  | 23.33            | -0.07    | 1                                               | 04228      | QPSK    | 50        | 50      | 5 mm  | left       | 1:1      | 1.089          | 0.394             |        |
| 1732.50                                                                                           | 20175 | Mid  | LTE Band 4 (AWS) | 20                          | 14.7                  | 14.66            | -0.02    | 0                                               | 04251      | QPSK    | 1         | 50      | 0 mm  | back       | 1:1      | 1.009          | 0.484             |        |
| 1732.50                                                                                           | 20175 | Mid  | LTE Band 4 (AWS) | 20                          | 14.7                  | 14.08            | -0.20    | 0                                               | 04251      | QPSK    | 50        | 25      | 0 mm  | back       | 1:1      | 1.152          | 0.546             |        |
| 1732.50                                                                                           | 20175 | Mid  | LTE Band 4 (AWS) | 20                          | 14.7                  | 14.66            | 0.05     | 0                                               | 04251      | QPSK    | 1         | 50      | 0 mm  | top        | 1:1      | 1.009          | 0.444             |        |
| 1732.50                                                                                           | 20175 | Mid  | LTE Band 4 (AWS) | 20                          | 14.7                  | 14.08            | 0.06     | 0                                               | 04251      | QPSK    | 50        | 25      | 0 mm  | top        | 1:1      | 1.152          | 0.478             |        |
| 1732.50                                                                                           | 20175 | Mid  | LTE Band 4 (AWS) | 20                          | 14.7                  | 14.66            | 0.03     | 0                                               | 04251      | QPSK    | 1         | 50      | 0 mm  | left       | 1:1      | 1.009          | 0.113             |        |
| 1732.50                                                                                           | 20175 | Mid  | LTE Band 4 (AWS) | 20                          | 14.7                  | 14.08            | 0.16     | 0                                               | 04251      | QPSK    | 50        | 25      | 0 mm  | left       | 1:1      | 1.152          | 0.114             |        |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population |       |      |                  |                             |                       |                  |          | Body<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |            |         |           |         |       |            |          |                |                   |        |

**Table 10-5**  
**LTE Band 2 (PCS) Body SAR**

| MEASUREMENT RESULTS                                                                               |       |      |                  |                             |                       |                  |          |                                                 |            |         |           |         |       |            |          |                |                   |        |
|---------------------------------------------------------------------------------------------------|-------|------|------------------|-----------------------------|-----------------------|------------------|----------|-------------------------------------------------|------------|---------|-----------|---------|-------|------------|----------|----------------|-------------------|--------|
| FREQUENCY                                                                                         |       | Mode | Bandwidth [MHz]  | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Power Drift [dB] | MPR [dB] | Device Serial Number                            | Modulation | RB Size | RB Offset | Spacing | Side  | Duty Cycle | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |
| MHz                                                                                               | Ch.   |      |                  |                             |                       |                  |          |                                                 |            |         |           |         |       |            | (W/kg)   |                | (W/kg)            |        |
| 1880.00                                                                                           | 18900 | Mid  | LTE Band 2 (PCS) | 20                          | 24.7                  | 24.62            | 0.10     | 0                                               | 04228      | QPSK    | 1         | 0       | 19 mm | back       | 1:1      | 1.020          | 0.254             |        |
| 1880.00                                                                                           | 18900 | Mid  | LTE Band 2 (PCS) | 20                          | 23.7                  | 23.40            | 0.05     | 1                                               | 04228      | QPSK    | 50        | 0       | 19 mm | back       | 1:1      | 1.072          | 0.244             |        |
| 1880.00                                                                                           | 18900 | Mid  | LTE Band 2 (PCS) | 20                          | 24.7                  | 24.62            | -0.06    | 0                                               | 04228      | QPSK    | 1         | 0       | 10 mm | top        | 1:1      | 1.020          | 0.689             | A7     |
| 1880.00                                                                                           | 18900 | Mid  | LTE Band 2 (PCS) | 20                          | 23.7                  | 23.40            | -0.02    | 1                                               | 04228      | QPSK    | 50        | 0       | 10 mm | top        | 1:1      | 1.072          | 0.696             |        |
| 1880.00                                                                                           | 18900 | Mid  | LTE Band 2 (PCS) | 20                          | 24.7                  | 24.62            | -0.03    | 0                                               | 04228      | QPSK    | 1         | 0       | 5 mm  | left       | 1:1      | 1.020          | 0.348             |        |
| 1880.00                                                                                           | 18900 | Mid  | LTE Band 2 (PCS) | 20                          | 23.7                  | 23.40            | -0.08    | 1                                               | 04228      | QPSK    | 50        | 0       | 5 mm  | left       | 1:1      | 1.072          | 0.339             |        |
| 1860.00                                                                                           | 18700 | Low  | LTE Band 2 (PCS) | 20                          | 12.7                  | 12.69            | 0.06     | 0                                               | 04251      | QPSK    | 1         | 50      | 0 mm  | back       | 1:1      | 1.002          | 0.523             |        |
| 1860.00                                                                                           | 18700 | Low  | LTE Band 2 (PCS) | 20                          | 12.7                  | 12.33            | 0.04     | 0                                               | 04251      | QPSK    | 50        | 0       | 0 mm  | back       | 1:1      | 1.089          | 0.592             |        |
| 1860.00                                                                                           | 18700 | Low  | LTE Band 2 (PCS) | 20                          | 12.7                  | 12.69            | -0.05    | 0                                               | 04251      | QPSK    | 1         | 50      | 0 mm  | top        | 1:1      | 1.002          | 0.275             |        |
| 1860.00                                                                                           | 18700 | Low  | LTE Band 2 (PCS) | 20                          | 12.7                  | 12.33            | -0.19    | 0                                               | 04251      | QPSK    | 50        | 0       | 0 mm  | top        | 1:1      | 1.089          | 0.317             |        |
| 1860.00                                                                                           | 18700 | Low  | LTE Band 2 (PCS) | 20                          | 12.7                  | 12.69            | -0.03    | 0                                               | 04251      | QPSK    | 1         | 50      | 0 mm  | left       | 1:1      | 1.002          | 0.083             |        |
| 1860.00                                                                                           | 18700 | Low  | LTE Band 2 (PCS) | 20                          | 12.7                  | 12.33            | -0.04    | 0                                               | 04251      | QPSK    | 50        | 0       | 0 mm  | left       | 1:1      | 1.089          | 0.091             |        |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population |       |      |                  |                             |                       |                  |          | Body<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |            |         |           |         |       |            |          |                |                   |        |

|                                   |                                                                                     |                              |                                                                                       |                                        |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|----------------------------------------|
| FCC ID: ZNFV520                   |  | <b>SAR EVALUATION REPORT</b> |  | <b>Reviewed by:</b><br>Quality Manager |
| Document S/N:<br>0Y1601040033.ZNF | Test Dates:<br>01/06/16 - 01/16/16                                                  | DUT Type:<br>Portable Tablet |                                                                                       | Page 52 of 66                          |

**Table 10-6**  
**LTE Band 30 Body SAR**

| MEASUREMENT RESULTS                                                                               |       |      |                 |                             |                       |                  |          |                                                 |            |         |           |         |       |            |          |                |                   |        |
|---------------------------------------------------------------------------------------------------|-------|------|-----------------|-----------------------------|-----------------------|------------------|----------|-------------------------------------------------|------------|---------|-----------|---------|-------|------------|----------|----------------|-------------------|--------|
| FREQUENCY                                                                                         |       | Mode | Bandwidth [MHz] | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Power Drift [dB] | MPR [dB] | Device Serial Number                            | Modulation | RB Size | RB Offset | Spacing | Side  | Duty Cycle | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |
| MHz                                                                                               | Ch.   |      |                 |                             |                       |                  |          |                                                 |            |         |           |         |       |            | (W/kg)   |                | (W/kg)            |        |
| 2310.00                                                                                           | 27710 | Mid  | LTE Band 30     | 10                          | 23.2                  | 23.19            | 0.00     | 0                                               | 04228      | QPSK    | 1         | 25      | 19 mm | back       | 1:1      | 1.002          | 0.149             |        |
| 2310.00                                                                                           | 27710 | Mid  | LTE Band 30     | 10                          | 22.2                  | 22.04            | 0.02     | 1                                               | 04228      | QPSK    | 25        | 12      | 19 mm | back       | 1:1      | 1.038          | 0.120             |        |
| 2310.00                                                                                           | 27710 | Mid  | LTE Band 30     | 10                          | 23.2                  | 23.19            | 0.01     | 0                                               | 04228      | QPSK    | 1         | 25      | 10 mm | top        | 1:1      | 1.002          | 0.139             |        |
| 2310.00                                                                                           | 27710 | Mid  | LTE Band 30     | 10                          | 22.2                  | 22.04            | 0.07     | 1                                               | 04228      | QPSK    | 25        | 12      | 10 mm | top        | 1:1      | 1.038          | 0.109             |        |
| 2310.00                                                                                           | 27710 | Mid  | LTE Band 30     | 10                          | 23.2                  | 23.19            | 0.07     | 0                                               | 04228      | QPSK    | 1         | 25      | 5 mm  | left       | 1:1      | 1.002          | 0.339             |        |
| 2310.00                                                                                           | 27710 | Mid  | LTE Band 30     | 10                          | 22.2                  | 22.04            | -0.02    | 1                                               | 04228      | QPSK    | 25        | 12      | 5 mm  | left       | 1:1      | 1.038          | 0.271             |        |
| 2310.00                                                                                           | 27710 | Mid  | LTE Band 30     | 10                          | 11.2                  | 10.98            | -0.08    | 0                                               | 04251      | QPSK    | 1         | 0       | 0 mm  | back       | 1:1      | 1.052          | 0.381             | A8     |
| 2310.00                                                                                           | 27710 | Mid  | LTE Band 30     | 10                          | 11.2                  | 10.80            | 0.11     | 0                                               | 04251      | QPSK    | 25        | 12      | 0 mm  | back       | 1:1      | 1.096          | 0.396             |        |
| 2310.00                                                                                           | 27710 | Mid  | LTE Band 30     | 10                          | 11.2                  | 10.98            | 0.11     | 0                                               | 04251      | QPSK    | 1         | 0       | 0 mm  | top        | 1:1      | 1.052          | 0.055             |        |
| 2310.00                                                                                           | 27710 | Mid  | LTE Band 30     | 10                          | 11.2                  | 10.80            | 0.18     | 0                                               | 04251      | QPSK    | 25        | 12      | 0 mm  | top        | 1:1      | 1.096          | 0.055             |        |
| 2310.00                                                                                           | 27710 | Mid  | LTE Band 30     | 10                          | 11.2                  | 10.98            | 0.19     | 0                                               | 04251      | QPSK    | 1         | 0       | 0 mm  | left       | 1:1      | 1.052          | 0.069             |        |
| 2310.00                                                                                           | 27710 | Mid  | LTE Band 30     | 10                          | 11.2                  | 10.80            | 0.02     | 0                                               | 04251      | QPSK    | 25        | 12      | 0 mm  | left       | 1:1      | 1.096          | 0.070             |        |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population |       |      |                 |                             |                       |                  |          | Body<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |            |         |           |         |       |            |          |                |                   |        |

**Table 10-7**  
**LTE Band 7 Body SAR**

| MEASUREMENT RESULTS                                                                               |       |      |                 |                             |                       |                  |          |                                                 |            |         |           |         |       |            |          |                |                   |        |
|---------------------------------------------------------------------------------------------------|-------|------|-----------------|-----------------------------|-----------------------|------------------|----------|-------------------------------------------------|------------|---------|-----------|---------|-------|------------|----------|----------------|-------------------|--------|
| FREQUENCY                                                                                         |       | Mode | Bandwidth [MHz] | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Power Drift [dB] | MPR [dB] | Device Serial Number                            | Modulation | RB Size | RB Offset | Spacing | Side  | Duty Cycle | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |
| MHz                                                                                               | Ch.   |      |                 |                             |                       |                  |          |                                                 |            |         |           |         |       |            | (W/kg)   |                | (W/kg)            |        |
| 2510.00                                                                                           | 20850 | Low  | LTE Band 7      | 20                          | 23.7                  | 23.55            | -0.10    | 0                                               | 04244      | QPSK    | 1         | 50      | 19 mm | back       | 1:1      | 1.034          | 0.420             |        |
| 2510.00                                                                                           | 20850 | Low  | LTE Band 7      | 20                          | 22.7                  | 22.55            | 0.04     | 1                                               | 04244      | QPSK    | 50        | 25      | 19 mm | back       | 1:1      | 1.036          | 0.338             |        |
| 2510.00                                                                                           | 20850 | Low  | LTE Band 7      | 20                          | 23.7                  | 23.55            | 0.08     | 0                                               | 04244      | QPSK    | 1         | 50      | 10 mm | top        | 1:1      | 1.034          | 0.240             |        |
| 2510.00                                                                                           | 20850 | Low  | LTE Band 7      | 20                          | 22.7                  | 22.55            | -0.01    | 1                                               | 04244      | QPSK    | 50        | 25      | 10 mm | top        | 1:1      | 1.036          | 0.192             |        |
| 2510.00                                                                                           | 20850 | Low  | LTE Band 7      | 20                          | 23.7                  | 23.55            | -0.04    | 0                                               | 04244      | QPSK    | 1         | 50      | 5 mm  | left       | 1:1      | 1.034          | 0.494             |        |
| 2510.00                                                                                           | 20850 | Low  | LTE Band 7      | 20                          | 22.7                  | 22.55            | 0.00     | 1                                               | 04244      | QPSK    | 50        | 25      | 5 mm  | left       | 1:1      | 1.036          | 0.378             |        |
| 2535.00                                                                                           | 21100 | Mid  | LTE Band 7      | 20                          | 11.7                  | 11.52            | 0.09     | 0                                               | 04285      | QPSK    | 1         | 50      | 0 mm  | back       | 1:1      | 1.043          | 0.588             | A9     |
| 2535.00                                                                                           | 21100 | Mid  | LTE Band 7      | 20                          | 11.7                  | 11.33            | -0.03    | 0                                               | 04285      | QPSK    | 50        | 0       | 0 mm  | back       | 1:1      | 1.089          | 0.613             |        |
| 2535.00                                                                                           | 21100 | Mid  | LTE Band 7      | 20                          | 11.7                  | 11.52            | 0.14     | 0                                               | 04285      | QPSK    | 1         | 50      | 0 mm  | top        | 1:1      | 1.043          | 0.145             |        |
| 2535.00                                                                                           | 21100 | Mid  | LTE Band 7      | 20                          | 11.7                  | 11.33            | 0.08     | 0                                               | 04285      | QPSK    | 50        | 0       | 0 mm  | top        | 1:1      | 1.089          | 0.152             |        |
| 2535.00                                                                                           | 21100 | Mid  | LTE Band 7      | 20                          | 11.7                  | 11.52            | -0.06    | 0                                               | 04285      | QPSK    | 1         | 50      | 0 mm  | left       | 1:1      | 1.043          | 0.053             |        |
| 2535.00                                                                                           | 21100 | Mid  | LTE Band 7      | 20                          | 11.7                  | 11.33            | 0.01     | 0                                               | 04285      | QPSK    | 50        | 0       | 0 mm  | left       | 1:1      | 1.089          | 0.061             |        |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population |       |      |                 |                             |                       |                  |          | Body<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |            |         |           |         |       |            |          |                |                   |        |

**Table 10-8**  
**Bluetooth Body SAR**

| MEASUREMENT RESULTS                                                                               |     |           |         |                             |                       |                  |                                                 |                      |                  |       |            |          |                |                   |        |
|---------------------------------------------------------------------------------------------------|-----|-----------|---------|-----------------------------|-----------------------|------------------|-------------------------------------------------|----------------------|------------------|-------|------------|----------|----------------|-------------------|--------|
| FREQUENCY                                                                                         |     | Mode      | Service | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Power Drift [dB] | Spacing                                         | Device Serial Number | Data Rate (Mbps) | Side  | Duty Cycle | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |
| MHz                                                                                               | Ch. |           |         |                             |                       |                  |                                                 |                      |                  |       |            | (W/kg)   |                | (W/kg)            |        |
| 2441                                                                                              | 39  | Bluetooth | FHSS    | 10.0                        | 9.61                  | 0.02             | 0 mm                                            | 04285                | 1                | back  | 1:1        | 0.115    | 1.094          | 0.126             | A12    |
| 2441                                                                                              | 39  | Bluetooth | FHSS    | 10.0                        | 9.61                  | 0.20             | 0 mm                                            | 04285                | 1                | top   | 1:1        | 0.085    | 1.094          | 0.093             |        |
| 2441                                                                                              | 39  | Bluetooth | FHSS    | 10.0                        | 9.61                  | -0.01            | 0 mm                                            | 04285                | 1                | right | 1:1        | 0.041    | 1.094          | 0.045             |        |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population |     |           |         |                             |                       |                  | Body<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |                      |                  |       |            |          |                |                   |        |

|                                   |                                                                                     |                              |  |  |  |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|--|--|--|---------------------------------------------------------------------------------------|---------------------------------|
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| Document S/N:<br>0Y1601040033.ZNF | Test Dates:<br>01/06/16 - 01/16/16                                                  | DUT Type:<br>Portable Tablet |  |  |  | Page 53 of 66                                                                         |                                 |

**Table 10-9**  
**WLAN Body SAR**

| MEASUREMENT RESULTS                      |     |         |         |                 |                             |                       |                  |                      |                      |                  |       |                |          |                        |                             |                   |        |
|------------------------------------------|-----|---------|---------|-----------------|-----------------------------|-----------------------|------------------|----------------------|----------------------|------------------|-------|----------------|----------|------------------------|-----------------------------|-------------------|--------|
| FREQUENCY                                |     | Mode    | Service | Bandwidth [MHz] | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Power Drift [dB] | Spacing              | Device Serial Number | Data Rate (Mbps) | Side  | Duty Cycle (%) | SAR (1g) | Scaling Factor (Power) | Scaling Factor (Duty Cycle) | Reported SAR (1g) | Plot # |
| MHz                                      | Ch. |         |         |                 |                             |                       |                  |                      |                      |                  |       |                | (W/kg)   |                        |                             | (W/kg)            |        |
| 2412                                     | 1   | 802.11b | DSSS    | 22              | 14.5                        | 14.45                 | 0.03             | 0 mm                 | 04210                | 1                | back  | 99.4           | 0.669    | 1.012                  | 1.006                       | 0.681             |        |
| 2412                                     | 1   | 802.11b | DSSS    | 22              | 14.5                        | 14.45                 | 0.19             | 0 mm                 | 04210                | 1                | top   | 99.4           | 0.746    | 1.012                  | 1.006                       | 0.760             | A10    |
| 2412                                     | 1   | 802.11b | DSSS    | 22              | 14.5                        | 14.45                 | 0.11             | 0 mm                 | 04210                | 1                | right | 99.4           | 0.323    | 1.012                  | 1.006                       | 0.329             |        |
| 2412                                     | 1   | 802.11b | DSSS    | 22              | 14.5                        | 14.45                 | 0.16             | 19 mm                | 04210                | 1                | back  | 99.4           | 0.035    | 1.012                  | 1.006                       | 0.035             |        |
| 2412                                     | 1   | 802.11b | DSSS    | 22              | 14.5                        | 14.45                 | 0.02             | 10 mm                | 04210                | 1                | top   | 99.4           | 0.071    | 1.012                  | 1.006                       | 0.072             |        |
| 5310                                     | 62  | 802.11n | OFDM    | 40              | 11.5                        | 10.95                 | 0.11             | 0 mm                 | 04210                | 13.5             | back  | 90.7           | 0.147    | 1.135                  | 1.102                       | 0.184             |        |
| 5310                                     | 62  | 802.11n | OFDM    | 40              | 11.5                        | 10.95                 | -0.13            | 0 mm                 | 04210                | 13.5             | top   | 90.7           | 0.358    | 1.135                  | 1.102                       | 0.447             |        |
| 5310                                     | 62  | 802.11n | OFDM    | 40              | 11.5                        | 10.95                 | 0.04             | 0 mm                 | 04210                | 13.5             | right | 90.7           | 0.069    | 1.135                  | 1.102                       | 0.086             |        |
| 5310                                     | 62  | 802.11n | OFDM    | 40              | 11.5                        | 10.95                 | 0.03             | 19 mm                | 04210                | 13.5             | back  | 90.7           | 0.020    | 1.135                  | 1.102                       | 0.025             |        |
| 5310                                     | 62  | 802.11n | OFDM    | 40              | 11.5                        | 10.95                 | 0.02             | 10 mm                | 04210                | 13.5             | top   | 90.7           | 0.064    | 1.135                  | 1.102                       | 0.080             |        |
| 5550                                     | 110 | 802.11n | OFDM    | 40              | 11.5                        | 10.67                 | -0.04            | 0 mm                 | 04210                | 13.5             | back  | 90.7           | 0.184    | 1.211                  | 1.102                       | 0.246             |        |
| 5550                                     | 110 | 802.11n | OFDM    | 40              | 11.5                        | 10.67                 | 0.00             | 0 mm                 | 04210                | 13.5             | top   | 90.7           | 0.351    | 1.211                  | 1.102                       | 0.468             |        |
| 5550                                     | 110 | 802.11n | OFDM    | 40              | 11.5                        | 10.67                 | 0.03             | 0 mm                 | 04210                | 13.5             | right | 90.7           | 0.119    | 1.211                  | 1.102                       | 0.159             |        |
| 5550                                     | 110 | 802.11n | OFDM    | 40              | 11.5                        | 10.67                 | 0.10             | 19 mm                | 04210                | 13.5             | back  | 90.7           | 0.020    | 1.211                  | 1.102                       | 0.026             |        |
| 5550                                     | 110 | 802.11n | OFDM    | 40              | 11.5                        | 10.67                 | 0.03             | 10 mm                | 04210                | 13.5             | top   | 90.7           | 0.099    | 1.211                  | 1.102                       | 0.132             |        |
| 5755                                     | 151 | 802.11n | OFDM    | 40              | 11.5                        | 10.55                 | -0.08            | 0 mm                 | 04210                | 13.5             | back  | 90.7           | 0.224    | 1.245                  | 1.102                       | 0.307             |        |
| 5755                                     | 151 | 802.11n | OFDM    | 40              | 11.5                        | 10.55                 | 0.01             | 0 mm                 | 04210                | 13.5             | top   | 90.7           | 0.648    | 1.245                  | 1.102                       | 0.889             | A11    |
| 5795                                     | 159 | 802.11n | OFDM    | 40              | 11.5                        | 10.21                 | 0.04             | 0 mm                 | 04210                | 13.5             | top   | 90.7           | 0.521    | 1.346                  | 1.102                       | 0.773             |        |
| 5755                                     | 151 | 802.11n | OFDM    | 40              | 11.5                        | 10.55                 | 0.03             | 0 mm                 | 04210                | 13.5             | right | 90.7           | 0.131    | 1.245                  | 1.102                       | 0.180             |        |
| 5755                                     | 151 | 802.11n | OFDM    | 40              | 11.5                        | 10.55                 | 0.08             | 19 mm                | 04210                | 13.5             | back  | 90.7           | 0.028    | 1.245                  | 1.102                       | 0.039             |        |
| 5755                                     | 151 | 802.11n | OFDM    | 40              | 11.5                        | 10.55                 | 0.08             | 10 mm                | 04210                | 13.5             | top   | 90.7           | 0.088    | 1.245                  | 1.102                       | 0.121             |        |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT    |     |         |         |                 |                             |                       |                  | Body                 |                      |                  |       |                |          |                        |                             |                   |        |
| Spatial Peak                             |     |         |         |                 |                             |                       |                  | 1.6 W/kg (mW/g)      |                      |                  |       |                |          |                        |                             |                   |        |
| Uncontrolled Exposure/General Population |     |         |         |                 |                             |                       |                  | averaged over 1 gram |                      |                  |       |                |          |                        |                             |                   |        |

## 10.2 SAR Test Notes

### General Notes:

- The test data reported are the worst-case SAR values according to test procedures specified in FCC KDB Publication 616217 D04v01r02 and FCC KDB Publication 447498 D01v06.
- Batteries are fully charged at the beginning of the SAR measurements.
- Liquid tissue depth was at least 15.0 cm for all frequencies.
- The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
- SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v06.
- Per FCC KDB Publication 865664 D01v01r04, variability SAR tests were not required since measured SAR results for all frequency bands were less than 0.8 W/kg. Please see Section 12 for more information.
- FCC KDB Publication 616217 D04v01r02 Section 4.3, SAR tests are required for the back surface and edges of the tablet with the tablet touching the phantom. The SAR Exclusion Threshold in FCC KDB 447498 D01v06 was applied to determine SAR test exclusion for adjacent edge configurations.

### UMTS Notes:

- UMTS mode was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01v03r01. HSPA SAR was not required per the 3G Test Reduction Procedure in KDB Publication 941225 D01v03r01.

|                                   |                                                                                     |                              |                                                                                       |                                 |
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2. Per FCC KDB Publication 447498 D01v06, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is  $\leq 0.8$  W/kg then testing at the other channels is not required for such test configuration(s). When the maximum output power variation across the required test channels is  $> \frac{1}{2}$  dB, instead of the middle channel, the highest output power channel was used.

#### LTE Notes:

1. LTE Considerations: LTE test configurations are determined according to SAR Evaluation Considerations for LTE Devices in FCC KDB Publication 941225 D05v02r04. The general test procedures used for testing can be found in Section 7.5.4.
2. MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.
3. A-MPR was disabled for all SAR tests by setting NS=01 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).
4. Per KDB Publication 941225 D05Av01r02, SAR for LTE CA operations was not needed since the maximum average output power in LTE CA mode was not  $>0.25$  dB higher than the maximum output power when downlink carrier aggregation was inactive.

#### WLAN Notes:

1. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 2.4 GHz WIFI operations, the highest measured maximum output power channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4 GHz 802.11g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR. See Section 7.6.4 for more information.
2. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 5 GHz WIFI operations, the initial test configuration was selected according to the transmission mode with the highest maximum allowed powers. Other transmission modes were not investigated since the highest reported SAR for initial test configuration adjusted by the ratio of maximum output powers is less than 1.2 W/kg. See Section 7.6.5 for more information.
3. When the maximum reported 1g averaged SAR is  $\leq 0.8$  W/kg, SAR testing on additional channels was not required. Otherwise, SAR for the next highest output power channel was required until the reported SAR result was  $\leq 1.20$  W/kg or all test channels were measured.
4. The device was configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools. The reported SAR was scaled to the 100% transmission duty factor to determine compliance. Procedures used to measure the duty factor are identical to that in the associated EMC test reports.
5. Per manufacture request, WLAN SAR was additionally tested at maximum power at 19mm for back side, and 10mm for top edge.

|                                   |                                                                                                                                                                                                        |                              |                                 |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|---------------------------------|
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# 11 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

## 11.1 Introduction

The following procedures adopted from FCC KDB Publication 447498 D01v06 are applicable to devices with built-in unlicensed transmitters such as 802.11 and Bluetooth devices which may simultaneously transmit with the licensed transmitter.

## 11.2 Simultaneous Transmission Procedures

This device contains transmitters that may operate simultaneously. Therefore simultaneous transmission analysis is required. Per FCC KDB Publication 447498 D01v06 4.3.2 and IEEE 1528-2013 Section 6.3.4.1.2, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the simultaneous transmitting antennas in a specific a physical test configuration is  $\leq 1.6$  W/kg. The different test positions in an exposure condition may be considered collectively to determine SAR test exclusion according to the sum of 1-g or 10-g SAR.

## 11.3 Body Simultaneous Transmission Analysis

**Table 11-1**  
**Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body at 0.0 cm)**

| Exposure Condition | Mode              | 3G/4G SAR (W/kg) | 2.4 GHz WLAN SAR (W/kg) | $\Sigma$ SAR (W/kg) |
|--------------------|-------------------|------------------|-------------------------|---------------------|
| Body SAR           | UMTS 850          | 0.489            | 0.760                   | 1.249               |
|                    | UMTS 1750         | 0.425            | 0.760                   | 1.185               |
|                    | UMTS 1900         | 0.490            | 0.760                   | 1.250               |
|                    | LTE Band 12       | 0.566            | 0.760                   | 1.326               |
|                    | LTE Band 5 (Cell) | 0.588            | 0.760                   | 1.348               |
|                    | LTE Band 4 (AWS)  | 0.546            | 0.760                   | 1.306               |
|                    | LTE Band 2 (PCS)  | 0.592            | 0.760                   | 1.352               |
|                    | LTE Band 30       | 0.396            | 0.760                   | 1.156               |
|                    | LTE Band 7        | 0.613            | 0.760                   | <b>1.373</b>        |

**Table 11-2**  
**Simultaneous Transmission Scenario with 5 GHz WLAN (Body at 0.0 cm)**

| Exposure Condition | Mode              | 3G/4G SAR (W/kg) | 5 GHz WLAN SAR (W/kg) | $\Sigma$ SAR (W/kg) |
|--------------------|-------------------|------------------|-----------------------|---------------------|
| Body               | UMTS 850          | 0.489            | 0.889                 | 1.378               |
|                    | UMTS 1750         | 0.425            | 0.889                 | 1.314               |
|                    | UMTS 1900         | 0.490            | 0.889                 | 1.379               |
|                    | LTE Band 12       | 0.566            | 0.889                 | See Table 11-3      |
|                    | LTE Band 5 (Cell) | 0.588            | 0.889                 | See Table 11-3      |
|                    | LTE Band 4 (AWS)  | 0.546            | 0.889                 | <b>1.435</b>        |
|                    | LTE Band 2 (PCS)  | 0.592            | 0.889                 | See Table 11-3      |
|                    | LTE Band 30       | 0.396            | 0.889                 | 1.285               |
|                    | LTE Band 7        | 0.613            | 0.889                 | See Table 11-3      |

|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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**Table 11-3**  
**Simultaneous Transmission Scenario with 5 GHz WLAN (Body at 0.0 cm)**

| Simult Tx | Configuration | LTE Band 12 SAR (W/kg)      | 5 GHz WLAN SAR (W/kg) | Σ SAR (W/kg) | Simult Tx | Configuration | LTE Band 5 (Cell) SAR (W/kg) | 5 GHz WLAN SAR (W/kg) | Σ SAR (W/kg) |
|-----------|---------------|-----------------------------|-----------------------|--------------|-----------|---------------|------------------------------|-----------------------|--------------|
| Body SAR  | Back          | 0.566                       | 0.307                 | 0.873        | Body SAR  | Back          | 0.394                        | 0.307                 | 0.701        |
|           | Top           | 0.467                       | 0.889                 | <b>1.356</b> |           | Top           | 0.480                        | 0.889                 | <b>1.369</b> |
|           | Bottom        | 0.400                       | 0.400                 | 0.800        |           | Bottom        | 0.400                        | 0.400                 | 0.800        |
|           | Right         | 0.083                       | 0.180                 | 0.263        |           | Right         | 0.400                        | 0.180                 | 0.580        |
|           | Left          | 0.349                       | 0.400                 | 0.749        |           | Left          | 0.588                        | 0.400                 | 0.988        |
| Simult Tx | Configuration | LTE Band 2 (PCS) SAR (W/kg) | 5 GHz WLAN SAR (W/kg) | Σ SAR (W/kg) | Simult Tx | Configuration | LTE Band 7 SAR (W/kg)        | 5 GHz WLAN SAR (W/kg) | Σ SAR (W/kg) |
| Body SAR  | Back          | 0.592                       | 0.307                 | 0.899        | Body SAR  | Back          | 0.613                        | 0.307                 | 0.920        |
|           | Top           | 0.317                       | 0.889                 | <b>1.206</b> |           | Top           | 0.152                        | 0.889                 | <b>1.041</b> |
|           | Bottom        | 0.400                       | 0.400                 | 0.800        |           | Bottom        | 0.400                        | 0.400                 | 0.800        |
|           | Right         | 0.400                       | 0.180                 | 0.580        |           | Right         | 0.400                        | 0.180                 | 0.580        |
|           | Left          | 0.091                       | 0.400                 | 0.491        |           | Left          | 0.061                        | 0.400                 | 0.461        |

Note: When the test separation distance was > 50 mm, an estimated SAR of 0.4 W/kg was used to determine simultaneous transmission SAR exclusion, for configuration excluded per FCC KDB 447498 D01v06. Therefore, an estimated SAR of 0.4 W/kg for LTE B12, B5, B2, B7 and 5 GHz WLAN was used to evaluate the simultaneous sums.

**Table 11-4**  
**Simultaneous Transmission Scenario with Bluetooth (Body at 0.0 cm)**

| Exposure Condition | Mode              | 3G/4G SAR (W/kg) | Bluetooth SAR (W/kg) | Σ SAR (W/kg) |
|--------------------|-------------------|------------------|----------------------|--------------|
| Body SAR           | UMTS 850          | 0.489            | 0.126                | 0.615        |
|                    | UMTS 1750         | 0.425            | 0.126                | 0.551        |
|                    | UMTS 1900         | 0.490            | 0.126                | 0.616        |
|                    | LTE Band 12       | 0.566            | 0.126                | 0.692        |
|                    | LTE Band 5 (Cell) | 0.588            | 0.126                | 0.714        |
|                    | LTE Band 4 (AWS)  | 0.546            | 0.126                | 0.672        |
|                    | LTE Band 2 (PCS)  | 0.592            | 0.126                | 0.718        |
|                    | LTE Band 30       | 0.396            | 0.126                | 0.522        |
|                    | LTE Band 7        | 0.613            | 0.126                | <b>0.739</b> |

**Table 11-5**  
**Simultaneous Transmission Scenario with 2.4 GHz WLAN (Back Side at 1.9 cm)**

| Configuration | Mode              | 3G/4G SAR (W/kg) | 2.4 GHz WLAN SAR (W/kg) | Σ SAR (W/kg) |
|---------------|-------------------|------------------|-------------------------|--------------|
| Back Side     | UMTS 850          | 0.359            | 0.035                   | 0.394        |
| Back Side     | UMTS 1750         | 0.133            | 0.035                   | 0.168        |
| Back Side     | UMTS 1900         | 0.219            | 0.035                   | 0.254        |
| Back Side     | LTE Band 12       | 0.216            | 0.035                   | 0.251        |
| Back Side     | LTE Band 5 (Cell) | 0.394            | 0.035                   | 0.429        |
| Back Side     | LTE Band 4 (AWS)  | 0.287            | 0.035                   | 0.322        |
| Back Side     | LTE Band 2 (PCS)  | 0.254            | 0.035                   | 0.289        |
| Back Side     | LTE Band 30       | 0.149            | 0.035                   | 0.184        |
| Back Side     | LTE Band 7        | 0.420            | 0.035                   | <b>0.455</b> |

|                                   |                                                                                                                                                                                                        |                                 |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFV520                   |  <b>SAR EVALUATION REPORT</b>  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>0Y1601040033.ZNF | Test Dates:<br>01/06/16 - 01/16/16                                                                                                                                                                     | DUT Type:<br>Portable Tablet    |
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**Table 11-6**  
**Simultaneous Transmission Scenario with 5 GHz WLAN (Back Side at 1.9 cm)**

| Configuration | Mode              | 3G/4G SAR<br>(W/kg) | 5 GHz<br>WLAN<br>SAR<br>(W/kg) | Σ SAR<br>(W/kg) |
|---------------|-------------------|---------------------|--------------------------------|-----------------|
| Back Side     | UMTS 850          | 0.359               | 0.039                          | 0.398           |
| Back Side     | UMTS 1750         | 0.133               | 0.039                          | 0.172           |
| Back Side     | UMTS 1900         | 0.219               | 0.039                          | 0.258           |
| Back Side     | LTE Band 12       | 0.216               | 0.039                          | 0.255           |
| Back Side     | LTE Band 5 (Cell) | 0.394               | 0.039                          | 0.433           |
| Back Side     | LTE Band 4 (AWS)  | 0.287               | 0.039                          | 0.326           |
| Back Side     | LTE Band 2 (PCS)  | 0.254               | 0.039                          | 0.293           |
| Back Side     | LTE Band 30       | 0.149               | 0.039                          | 0.188           |
| Back Side     | LTE Band 7        | 0.420               | 0.039                          | <b>0.459</b>    |

**Table 11-7**  
**Simultaneous Transmission Scenario with 2.4 GHz Bluetooth (Back Side at 1.9 cm)**

| Configuration | Mode              | 3G/4G SAR<br>(W/kg) | Bluetooth<br>SAR<br>(W/kg) | Σ SAR<br>(W/kg) |
|---------------|-------------------|---------------------|----------------------------|-----------------|
| Back Side     | UMTS 850          | 0.359               | 0.126                      | 0.485           |
| Back Side     | UMTS 1750         | 0.133               | 0.126                      | 0.259           |
| Back Side     | UMTS 1900         | 0.219               | 0.126                      | 0.345           |
| Back Side     | LTE Band 12       | 0.216               | 0.126                      | 0.342           |
| Back Side     | LTE Band 5 (Cell) | 0.394               | 0.126                      | 0.520           |
| Back Side     | LTE Band 4 (AWS)  | 0.287               | 0.126                      | 0.413           |
| Back Side     | LTE Band 2 (PCS)  | 0.254               | 0.126                      | 0.380           |
| Back Side     | LTE Band 30       | 0.149               | 0.126                      | 0.275           |
| Back Side     | LTE Band 7        | 0.420               | 0.126                      | <b>0.546</b>    |

For SAR summation the Bluetooth SAR value for 0 mm was used since the 0 mm test distance for Bluetooth SAR is more conservative.

**Table 11-8**  
**Simultaneous Transmission Scenario with 2.4 GHz WLAN (Top Edge at 1.0 cm)**

| Configuration | Mode              | 3G/4G SAR<br>(W/kg) | 2.4 GHz<br>WLAN<br>SAR<br>(W/kg) | Σ SAR<br>(W/kg) |
|---------------|-------------------|---------------------|----------------------------------|-----------------|
| Top Edge      | UMTS 850          | 0.522               | 0.072                            | 0.594           |
| Top Edge      | UMTS 1750         | 0.252               | 0.072                            | 0.324           |
| Top Edge      | UMTS 1900         | 0.832               | 0.072                            | <b>0.904</b>    |
| Top Edge      | LTE Band 12       | 0.335               | 0.072                            | 0.407           |
| Top Edge      | LTE Band 5 (Cell) | 0.498               | 0.072                            | 0.570           |
| Top Edge      | LTE Band 4 (AWS)  | 0.689               | 0.072                            | 0.761           |
| Top Edge      | LTE Band 2 (PCS)  | 0.696               | 0.072                            | 0.768           |
| Top Edge      | LTE Band 30       | 0.139               | 0.072                            | 0.211           |
| Top Edge      | LTE Band 7        | 0.240               | 0.072                            | 0.312           |

|                                          |                                                                                                                                   |                                     |                                                                                                 |                                        |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------------------------------------------------------------------|----------------------------------------|
| FCC ID: ZNFV520                          |  <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | <b>SAR EVALUATION REPORT</b>        |  <b>LG</b> | <b>Reviewed by:</b><br>Quality Manager |
| <b>Document S/N:</b><br>0Y1601040033.ZNF | <b>Test Dates:</b><br>01/06/16 - 01/16/16                                                                                         | <b>DUT Type:</b><br>Portable Tablet | Page 58 of 66                                                                                   |                                        |

**Table 11-9**  
**Simultaneous Transmission Scenario with 5 GHz WLAN (Top Edge at 1.0 cm)**

| Configuration | Mode              | 3G/4G SAR<br>(W/kg) | 5 GHz<br>WLAN<br>SAR<br>(W/kg) | Σ SAR<br>(W/kg) |
|---------------|-------------------|---------------------|--------------------------------|-----------------|
| Top Edge      | UMTS 850          | 0.522               | 0.132                          | 0.654           |
| Top Edge      | UMTS 1750         | 0.252               | 0.132                          | 0.384           |
| Top Edge      | UMTS 1900         | 0.832               | 0.132                          | <b>0.964</b>    |
| Top Edge      | LTE Band 12       | 0.335               | 0.132                          | 0.467           |
| Top Edge      | LTE Band 5 (Cell) | 0.498               | 0.132                          | 0.630           |
| Top Edge      | LTE Band 4 (AWS)  | 0.689               | 0.132                          | 0.821           |
| Top Edge      | LTE Band 2 (PCS)  | 0.696               | 0.132                          | 0.828           |
| Top Edge      | LTE Band 30       | 0.139               | 0.132                          | 0.271           |
| Top Edge      | LTE Band 7        | 0.240               | 0.132                          | 0.372           |

**Table 11-10**  
**Simultaneous Transmission Scenario with 2.4 GHz Bluetooth (Top Edge at 1.0 cm)**

| Configuration | Mode              | 3G/4G SAR<br>(W/kg) | Bluetooth<br>SAR<br>(W/kg) | Σ SAR<br>(W/kg) |
|---------------|-------------------|---------------------|----------------------------|-----------------|
| Top Edge      | UMTS 850          | 0.522               | 0.093                      | 0.615           |
| Top Edge      | UMTS 1750         | 0.252               | 0.093                      | 0.345           |
| Top Edge      | UMTS 1900         | 0.832               | 0.093                      | <b>0.925</b>    |
| Top Edge      | LTE Band 12       | 0.335               | 0.093                      | 0.428           |
| Top Edge      | LTE Band 5 (Cell) | 0.498               | 0.093                      | 0.591           |
| Top Edge      | LTE Band 4 (AWS)  | 0.689               | 0.093                      | 0.782           |
| Top Edge      | LTE Band 2 (PCS)  | 0.696               | 0.093                      | 0.789           |
| Top Edge      | LTE Band 30       | 0.139               | 0.093                      | 0.232           |
| Top Edge      | LTE Band 7        | 0.240               | 0.093                      | 0.333           |

For SAR summation the Bluetooth SAR value for 0 mm was used since the 0 mm test distance for Bluetooth SAR is more conservative.

**Table 11-11**  
**Simultaneous Transmission Scenario with 2.4 GHz WLAN (Left Edge at 0.5 cm)**

| Configuration | Mode              | 3G/4G SAR<br>(W/kg) | 2.4 GHz<br>WLAN<br>SAR<br>(W/kg) | Σ SAR<br>(W/kg) |
|---------------|-------------------|---------------------|----------------------------------|-----------------|
| Left Edge     | UMTS 850          | 0.415               | 0.400                            | 0.815           |
| Left Edge     | UMTS 1750         | 0.095               | 0.400                            | 0.495           |
| Left Edge     | UMTS 1900         | 0.436               | 0.400                            | 0.836           |
| Left Edge     | LTE Band 12       | 0.405               | 0.400                            | 0.805           |
| Left Edge     | LTE Band 5 (Cell) | 0.449               | 0.400                            | 0.849           |
| Left Edge     | LTE Band 4 (AWS)  | 0.413               | 0.400                            | 0.813           |
| Left Edge     | LTE Band 2 (PCS)  | 0.348               | 0.400                            | 0.748           |
| Left Edge     | LTE Band 30       | 0.339               | 0.400                            | 0.739           |
| Left Edge     | LTE Band 7        | 0.494               | 0.400                            | <b>0.894</b>    |

Note: When the test separation distance was > 50 mm, an estimated SAR of 0.4 W/kg was used to determine simultaneous transmission SAR exclusion, for configuration excluded per FCC KDB 447498 D01v06. Therefore, an estimated SAR of 0.4 W/kg for 2.4 GHz WLAN was used to evaluate the simultaneous sums.

|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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**Table 11-12**  
**Simultaneous Transmission Scenario with 5 GHz WLAN (Left Edge at 0.5 cm)**

| Configuration | Mode              | 3G/4G SAR<br>(W/kg) | 5 GHz<br>WLAN<br>SAR<br>(W/kg) | $\Sigma$ SAR<br>(W/kg) |
|---------------|-------------------|---------------------|--------------------------------|------------------------|
| Left Edge     | UMTS 850          | 0.415               | 0.400                          | 0.815                  |
| Left Edge     | UMTS 1750         | 0.095               | 0.400                          | 0.495                  |
| Left Edge     | UMTS 1900         | 0.436               | 0.400                          | 0.836                  |
| Left Edge     | LTE Band 12       | 0.405               | 0.400                          | 0.805                  |
| Left Edge     | LTE Band 5 (Cell) | 0.449               | 0.400                          | 0.849                  |
| Left Edge     | LTE Band 4 (AWS)  | 0.413               | 0.400                          | 0.813                  |
| Left Edge     | LTE Band 2 (PCS)  | 0.348               | 0.400                          | 0.748                  |
| Left Edge     | LTE Band 30       | 0.339               | 0.400                          | 0.739                  |
| Left Edge     | LTE Band 7        | 0.494               | 0.400                          | <b>0.894</b>           |

Note: When the test separation distance was > 50 mm, an estimated SAR of 0.4 W/kg was used to determine simultaneous transmission SAR exclusion, for configuration excluded per FCC KDB 447498 D01v06. Therefore, an estimated SAR of 0.4 W/kg for 5 GHz WLAN was used to evaluate the simultaneous sums.

**Table 11-13**  
**Simultaneous Transmission Scenario with 2.4 GHz Bluetooth (Left Edge at 0.5 cm)**

| Configuration | Mode              | 3G/4G SAR<br>(W/kg) | Bluetooth<br>SAR<br>(W/kg) | $\Sigma$ SAR<br>(W/kg) |
|---------------|-------------------|---------------------|----------------------------|------------------------|
| Left Edge     | UMTS 850          | 0.415               | 0.400                      | 0.815                  |
| Left Edge     | UMTS 1750         | 0.095               | 0.400                      | 0.495                  |
| Left Edge     | UMTS 1900         | 0.436               | 0.400                      | 0.836                  |
| Left Edge     | LTE Band 12       | 0.405               | 0.400                      | 0.805                  |
| Left Edge     | LTE Band 5 (Cell) | 0.449               | 0.400                      | 0.849                  |
| Left Edge     | LTE Band 4 (AWS)  | 0.413               | 0.400                      | 0.813                  |
| Left Edge     | LTE Band 2 (PCS)  | 0.348               | 0.400                      | 0.748                  |
| Left Edge     | LTE Band 30       | 0.339               | 0.400                      | 0.739                  |
| Left Edge     | LTE Band 7        | 0.494               | 0.400                      | <b>0.894</b>           |

Note: When the test separation distance was > 50 mm, an estimated SAR of 0.4 W/kg was used to determine simultaneous transmission SAR exclusion, for configuration excluded per FCC KDB 447498 D01v06. Therefore, an estimated SAR of 0.4 W/kg for 2.4 GHz Bluetooth was used to evaluate the simultaneous sums.

## 11.4 Simultaneous Transmission Conclusion

The above numerical summed SAR results for all the worst-case simultaneous transmission conditions were below the SAR limit. Therefore, the above analysis is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit and therefore no measured volumetric simultaneous SAR summation is required per FCC KDB Publication 447498 D01v06 and IEEE 1528-2013 Section 6.3.4.1.2.

|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFV520                   |  | <b>SAR EVALUATION REPORT</b> |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>0Y1601040033.ZNF | Test Dates:<br>01/06/16 - 01/16/16                                                  | DUT Type:<br>Portable Tablet |                                                                                       | Page 60 of 66                   |

## 12 SAR MEASUREMENT VARIABILITY

### 12.1 Measurement Variability

Per FCC KDB Publication 865664 D01v01, SAR measurement variability was not assessed for each frequency band since all measured SAR values were less than 0.80 W/kg.

### 12.2 Measurement Uncertainty

The measured SAR was <1.5 W/kg for all frequency bands. Therefore, per KDB Publication 865664 D01v01r04, the extended measurement uncertainty analysis per IEEE 1528-2013 was not required.

|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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# 13 EQUIPMENT LIST

| Manufacturer       | Model           | Description                                   | Cal Date   | Cal Interval | Cal Due    | Serial Number |
|--------------------|-----------------|-----------------------------------------------|------------|--------------|------------|---------------|
| SPEAG              | D750V3          | 750 MHz SAR Dipole                            | 1/16/2015  | Annual       | 1/16/2016  | 1003          |
| SPEAG              | D835V2          | 835 MHz SAR Dipole                            | 7/23/2015  | Annual       | 7/23/2016  | 4d133         |
| SPEAG              | D1750V2         | 1750 MHz SAR Dipole                           | 4/15/2015  | Annual       | 4/15/2016  | 1051          |
| SPEAG              | D1900V2         | 1900 MHz SAR Dipole                           | 7/14/2015  | Annual       | 7/14/2016  | 5d149         |
| SPEAG              | D2300V2         | 2300 MHz SAR Dipole                           | 12/8/2015  | Annual       | 12/8/2016  | 1064          |
| SPEAG              | D2450V2         | 2450 MHz SAR Dipole                           | 8/20/2015  | Annual       | 8/20/2016  | 719           |
| SPEAG              | D2600V2         | 2600 MHz SAR Dipole                           | 4/14/2015  | Annual       | 4/14/2016  | 1004          |
| SPEAG              | D5GHzV2         | 5 GHz SAR Dipole                              | 2/17/2015  | Annual       | 2/17/2016  | 1120          |
| SPEAG              | DAE4            | Dasy Data Acquisition Electronics             | 2/18/2015  | Annual       | 2/18/2016  | 665           |
| SPEAG              | DAE4            | Dasy Data Acquisition Electronics             | 6/17/2015  | Annual       | 6/17/2016  | 859           |
| SPEAG              | DAE4            | Dasy Data Acquisition Electronics             | 8/24/2015  | Annual       | 8/24/2016  | 1322          |
| SPEAG              | DAE4            | Dasy Data Acquisition Electronics             | 10/27/2015 | Annual       | 10/27/2016 | 1333          |
| SPEAG              | DAE4            | Dasy Data Acquisition Electronics             | 3/13/2015  | Annual       | 3/13/2016  | 1368          |
| SPEAG              | DAE4            | Dasy Data Acquisition Electronics             | 4/20/2015  | Annual       | 4/20/2016  | 1407          |
| SPEAG              | ES3DV2          | SAR Probe                                     | 8/26/2015  | Annual       | 8/26/2016  | 3022          |
| SPEAG              | ES3DV3          | SAR Probe                                     | 3/19/2015  | Annual       | 3/19/2016  | 3209          |
| SPEAG              | ES3DV3          | SAR Probe                                     | 5/20/2015  | Annual       | 5/20/2016  | 3263          |
| SPEAG              | ES3DV3          | SAR Probe                                     | 3/19/2015  | Annual       | 3/19/2016  | 3319          |
| SPEAG              | ES3DV3          | SAR Probe                                     | 10/29/2015 | Annual       | 10/29/2016 | 3333          |
| SPEAG              | ES3DV3          | SAR Probe                                     | 6/22/2015  | Annual       | 6/22/2016  | 3351          |
| SPEAG              | EX3DV4          | SAR Probe                                     | 4/23/2015  | Annual       | 4/23/2016  | 7357          |
| SPEAG              | DAK-3.5         | Dielectric Assessment Kit                     | 10/20/2015 | Annual       | 10/20/2016 | 1091          |
| Seekonk            | NC-100          | Torque Wrench                                 | 3/18/2014  | Biennial     | 3/18/2016  | N/A           |
| Seekonk            | NC-100          | Torque Wrench                                 | 3/18/2014  | Biennial     | 3/18/2016  | N/A           |
| Rohde & Schwarz    | CMU200          | Base Station Simulator                        | 12/2/2015  | Annual       | 12/2/2016  | 833855/0010   |
| Rohde & Schwarz    | CMW500          | Radio Communication Tester                    | 4/8/2015   | Annual       | 4/8/2016   | 140148        |
| Pasternack         | PE2208-6        | Bidirectional Coupler                         | CBT        | N/A          | CBT        | N/A           |
| Pasternack         | PE2209-10       | Bidirectional Coupler                         | CBT        | N/A          | CBT        | N/A           |
| Narda              | 4014C-6         | 4 - 8 GHz SMA 6 dB Directional Coupler        | CBT        | N/A          | CBT        | N/A           |
| Narda              | BW-S3W2         | Attenuator (3dB)                              | CBT        | N/A          | CBT        | 120           |
| Narda              | 4772-3          | Attenuator (3dB)                              | CBT        | N/A          | CBT        | 9406          |
| Mitutoyo           | CD-6"CSX        | Digital Caliper                               | 5/8/2014   | Biennial     | 5/8/2016   | 13264162      |
| Mini-Circuits      | BW-N20W5+       | DC to 18 GHz Precision Fixed 20 dB Attenuator | CBT        | N/A          | CBT        | N/A           |
| Mini-Circuits      | NLP-1200+       | Low Pass Filter DC to 1000 MHz                | CBT        | N/A          | CBT        | N/A           |
| Mini-Circuits      | NLP-2950+       | Low Pass Filter DC to 2700 MHz                | CBT        | N/A          | CBT        | N/A           |
| Mini-Circuits      | BW-N20W5        | Power Attenuator                              | CBT        | N/A          | CBT        | 1226          |
| MiniCircuits       | VLF-6000+       | Low Pass Filter                               | CBT        | N/A          | CBT        | N/A           |
| MiniCircuits       | SLP-2400+       | Low Pass Filter                               | CBT        | N/A          | CBT        | R8979500903   |
| MCL                | BW-N6W5+        | 6dB Attenuator                                | CBT        | N/A          | CBT        | 1139          |
| Keysight           | 772D            | Dual Directional Coupler                      | CBT        | N/A          | CBT        | MY52180215    |
| Control Company    | 4040            | Digital Thermometer                           | 3/18/2015  | Biennial     | 3/18/2017  | 150195001     |
| Control Company    | 4040            | Digital Thermometer                           | 3/15/2015  | Biennial     | 3/15/2017  | 150195005     |
| Control Company    | 4353            | Long Stem Thermometer                         | 1/22/2015  | Biennial     | 1/22/2017  | 150053029     |
| Control Company    | 4353            | Long Stem Thermometer                         | 1/22/2015  | Biennial     | 1/22/2017  | 150053036     |
| COMTECH            | AR85729-5       | Solid State Amplifier                         | CBT        | N/A          | CBT        | M155A00-009   |
| COMTECH            | AR85729-5/5759B | Solid State Amplifier                         | CBT        | N/A          | CBT        | M3W1A00-1002  |
| Anritsu            | ML2438A         | Power Meter                                   | 3/13/2015  | Annual       | 3/13/2016  | 1070030       |
| Anritsu            | ML2496A         | Power Meter                                   | 3/13/2015  | Annual       | 3/13/2016  | 1351001       |
| Anritsu            | ML2495A         | Power Meter                                   | 10/16/2015 | Biennial     | 10/16/2015 | 1328004       |
| Anritsu            | MA2481A         | Power Sensor                                  | 3/10/2015  | Annual       | 3/10/2016  | 2400          |
| Anritsu            | MA2411B         | Pulse Power Sensor                            | 3/13/2015  | Annual       | 3/13/2016  | 1207470       |
| Anritsu            | MT8820C         | Radio Communication Analyzer                  | 7/24/2015  | Annual       | 7/24/2016  | 6200901190    |
| Anritsu            | MT8820C         | Radio Communication Analyzer                  | 12/4/2015  | Annual       | 12/4/2016  | 6201300731    |
| Anritsu            | MA24106A        | USB Power Sensor                              | 3/11/2015  | Annual       | 3/11/2016  | 1349509       |
| Anritsu            | MA24106A        | USB Power Sensor                              | 3/11/2015  | Annual       | 3/11/2016  | 1349514       |
| Amplifier Research | 1551G6          | Amplifier                                     | CBT        | N/A          | CBT        | 433971        |
| Amplifier Research | 1551G6          | Amplifier                                     | CBT        | N/A          | CBT        | 433972        |
| Agilent            | E8257D          | (250kHz-20GHz) Signal Generator               | 3/15/2015  | Annual       | 3/15/2016  | MY45470194    |
| Agilent            | 8594A           | (9kHz-2.9GHz) Spectrum Analyzer               | CBT        | N/A          | CBT        | 3051A00187    |
| Agilent            | 8648D           | (9kHz-4GHz) Signal Generator                  | 3/15/2015  | Annual       | 3/15/2016  | 3629U00687    |
| Agilent            | E4438C          | ESG Vector Signal Generator                   | 4/1/2014   | Biennial     | 4/1/2016   | MY47270002    |
| Agilent            | E4432B          | ESG-D Series Signal Generator                 | 3/16/2015  | Annual       | 3/16/2016  | US40053896    |
| Agilent            | N9020A          | MXA Signal Analyzer                           | 11/5/2015  | Annual       | 11/5/2016  | US46470561    |
| Agilent            | N5182A          | MXG Vector Signal Generator                   | 3/16/2015  | Annual       | 3/16/2016  | MY47420651    |
| Agilent            | 8753ES          | Network Analyzer                              | 3/20/2015  | Annual       | 3/20/2016  | MY40001472    |
| Agilent            | E5515C          | Wireless Communications Test Set              | 6/18/2015  | Biennial     | 6/18/2017  | GB41450275    |
| Agilent            | N4010A          | Wireless Connectivity Test Set                | N/A        | N/A          | N/A        | GB46170464    |

## Notes:

1. CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, amplifier, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path. The power meter offset was then adjusted to compensate for the measurement system losses. This level offset is stored within the power meter before measurements are made. This calibration verification procedure applies to the system verification and output power measurements. The calibrated reading is then taken directly from the power meter after compensation of the losses for all final power measurements.
2. Each equipment item was used solely within its respective calibration period.

|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFV520                   |  | SAR EVALUATION REPORT        |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>OY1601040033.ZNF | Test Dates:<br>01/06/16 - 01/16/16                                                  | DUT Type:<br>Portable Tablet |                                                                                       | Page 62 of 66                   |

# 14 MEASUREMENT UNCERTAINTIES

| a                                                                             | c             | d              | e=<br>f(d,k) | f                     | g                        | h =<br>c x f/e                 | i =<br>c x g/e                   | k              |
|-------------------------------------------------------------------------------|---------------|----------------|--------------|-----------------------|--------------------------|--------------------------------|----------------------------------|----------------|
| Uncertainty Component                                                         | Tol.<br>(± %) | Prob.<br>Dist. | Div.         | c <sub>i</sub><br>1gm | c <sub>i</sub><br>10 gms | 1gm<br>u <sub>i</sub><br>(± %) | 10gms<br>u <sub>i</sub><br>(± %) | v <sub>i</sub> |
| <b>Measurement System</b>                                                     |               |                |              |                       |                          |                                |                                  |                |
| Probe Calibration                                                             | 6.55          | N              | 1            | 1.0                   | 1.0                      | 6.6                            | 6.6                              | ∞              |
| Axial Isotropy                                                                | 0.25          | N              | 1            | 0.7                   | 0.7                      | 0.2                            | 0.2                              | ∞              |
| Hemishperical Isotropy                                                        | 1.3           | N              | 1            | 0.7                   | 0.7                      | 0.9                            | 0.9                              | ∞              |
| Boundary Effect                                                               | 2.0           | R              | 1.73         | 1.0                   | 1.0                      | 1.2                            | 1.2                              | ∞              |
| Linearity                                                                     | 0.3           | N              | 1            | 1.0                   | 1.0                      | 0.3                            | 0.3                              | ∞              |
| System Detection Limits                                                       | 0.25          | R              | 1.73         | 1.0                   | 1.0                      | 0.1                            | 0.1                              | ∞              |
| Readout Electronics                                                           | 0.3           | N              | 1            | 1.0                   | 1.0                      | 0.3                            | 0.3                              | ∞              |
| Response Time                                                                 | 0.8           | R              | 1.73         | 1.0                   | 1.0                      | 0.5                            | 0.5                              | ∞              |
| Integration Time                                                              | 2.6           | R              | 1.73         | 1.0                   | 1.0                      | 1.5                            | 1.5                              | ∞              |
| RF Ambient Conditions - Noise                                                 | 3.0           | R              | 1.73         | 1.0                   | 1.0                      | 1.7                            | 1.7                              | ∞              |
| RF Ambient Conditions - Reflections                                           | 3.0           | R              | 1.73         | 1.0                   | 1.0                      | 1.7                            | 1.7                              | ∞              |
| Probe Positioner Mechanical Tolerance                                         | 0.4           | R              | 1.73         | 1.0                   | 1.0                      | 0.2                            | 0.2                              | ∞              |
| Probe Positioning w/ respect to Phantom                                       | 6.7           | R              | 1.73         | 1.0                   | 1.0                      | 3.9                            | 3.9                              | ∞              |
| Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation | 4.0           | R              | 1.73         | 1.0                   | 1.0                      | 2.3                            | 2.3                              | ∞              |
| <b>Test Sample Related</b>                                                    |               |                |              |                       |                          |                                |                                  |                |
| Test Sample Positioning                                                       | 2.7           | N              | 1            | 1.0                   | 1.0                      | 2.7                            | 2.7                              | 35             |
| Device Holder Uncertainty                                                     | 1.67          | N              | 1            | 1.0                   | 1.0                      | 1.7                            | 1.7                              | 5              |
| Output Power Variation - SAR drift measurement                                | 5.0           | R              | 1.73         | 1.0                   | 1.0                      | 2.9                            | 2.9                              | ∞              |
| SAR Scaling                                                                   | 0.0           | R              | 1.73         | 1.0                   | 1.0                      | 0.0                            | 0.0                              | ∞              |
| <b>Phantom &amp; Tissue Parameters</b>                                        |               |                |              |                       |                          |                                |                                  |                |
| Phantom Uncertainty (Shape & Thickness tolerances)                            | 7.6           | R              | 1.73         | 1.0                   | 1.0                      | 4.4                            | 4.4                              | ∞              |
| Liquid Conductivity - measurement uncertainty                                 | 4.2           | N              | 1            | 0.78                  | 0.71                     | 3.3                            | 3.0                              | 10             |
| Liquid Permittivity - measurement uncertainty                                 | 4.1           | N              | 1            | 0.23                  | 0.26                     | 1.0                            | 1.1                              | 10             |
| Liquid Conductivity - Temperature Uncertainty                                 | 3.4           | R              | 1.73         | 0.78                  | 0.71                     | 1.5                            | 1.4                              | ∞              |
| Liquid Permittivity - Temperature Uncertainty                                 | 0.6           | R              | 1.73         | 0.23                  | 0.26                     | 0.1                            | 0.1                              | ∞              |
| Liquid Conductivity - deviation from target values                            | 5.0           | R              | 1.73         | 0.64                  | 0.43                     | 1.8                            | 1.2                              | ∞              |
| Liquid Permittivity - deviation from target values                            | 5.0           | R              | 1.73         | 0.60                  | 0.49                     | 1.7                            | 1.4                              | ∞              |
| <b>Combined Standard Uncertainty (k=1)</b>                                    | RSS           |                |              |                       |                          | 11.5                           | 11.3                             | 60             |
| <b>Expanded Uncertainty</b><br>(95% CONFIDENCE LEVEL)                         | k=2           |                |              |                       |                          | 23.0                           | 22.6                             |                |

|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFV520                   |  | SAR EVALUATION REPORT        |  | Reviewed by:<br>Quality Manager |
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## 15 CONCLUSION

### 15.1 Measurement Conclusion

The SAR evaluation indicates that the EUT complies with the RF radiation exposure limits of the FCC and Industry Canada, with respect to all parameters subject to this test. These measurements were taken to simulate the RF effects of RF exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The results and statements relate only to the item(s) tested.

Please note that the absorption and distribution of electromagnetic energy in the body are very complex phenomena that depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because various factors may interact with one another to vary the specific biological outcome of an exposure to electromagnetic fields, any protection guide should consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables. [3]

|                                   |                                                                                     |                              |                                                                                       |                                 |
|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFV520                   |  | SAR EVALUATION REPORT        |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>0Y1601040033.ZNF | Test Dates:<br>01/06/16 - 01/16/16                                                  | DUT Type:<br>Portable Tablet |                                                                                       | Page 64 of 66                   |

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|                                   |                                                                                                                                                                                                        |                              |                                 |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|---------------------------------|
| FCC ID: ZNFV520                   |  <b>SAR EVALUATION REPORT</b>  |                              | Reviewed by:<br>Quality Manager |
| Document S/N:<br>0Y1601040033.ZNF | Test Dates:<br>01/06/16 - 01/16/16                                                                                                                                                                     | DUT Type:<br>Portable Tablet | Page 65 of 66                   |

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|                                          |                                                                                                                                                                                                        |                                     |                                        |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|----------------------------------------|
| <b>FCC ID:</b> ZNFV520                   |  <b>SAR EVALUATION REPORT</b>  |                                     | <b>Reviewed by:</b><br>Quality Manager |
| <b>Document S/N:</b><br>0Y1601040033.ZNF | <b>Test Dates:</b><br>01/06/16 - 01/16/16                                                                                                                                                              | <b>DUT Type:</b><br>Portable Tablet | Page 66 of 66                          |

## APPENDIX A: SAR TEST DATA

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFV520; Type: Portable Tablet; Serial: 04236**

Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$ ;  $\sigma = 0.999 \text{ S/m}$ ;  $\epsilon_r = 53.187$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-07-2016; Ambient Temp: 24.4°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3263; ConvF(6.08, 6.08, 6.08); Calibrated: 5/20/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn859; Calibrated: 6/17/2015

Phantom: SAM with CRP (Left); Type: SAM; Serial: 1715

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Mode: UMTS 850, Body SAR, Top Edge, Mid.ch**

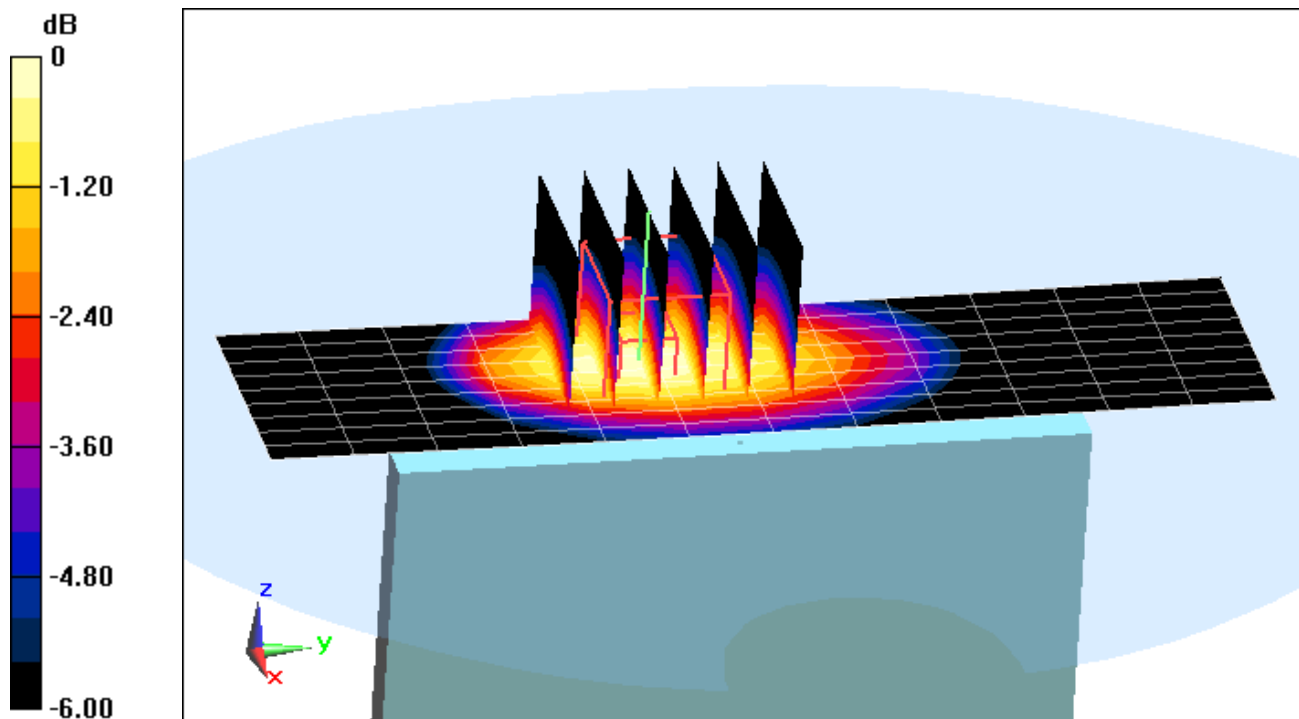
**Area Scan (10x13x1):** Measurement grid:  $dx=5\text{mm}$ ,  $dy=15\text{mm}$

**Zoom Scan (5x6x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 23.61 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.690 W/kg

**SAR(1 g) = 0.517 W/kg**



0 dB = 0.586 W/kg = -2.32 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFV520; Type: Portable Tablet; Serial: 04269**

Communication System: UID 0, UMTS; Frequency: 1732.4 MHz; Duty Cycle: 1:1  
Medium: 1750 Body Medium parameters used (interpolated):  
 $f = 1732.4 \text{ MHz}$ ;  $\sigma = 1.466 \text{ S/m}$ ;  $\epsilon_r = 51.156$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 01-11-2016; Ambient Temp: 23.2°C; Tissue Temp: 22.7°C

Probe: ES3DV3 - SN3351; ConvF(4.88, 4.88, 4.88); Calibrated: 6/22/2015;  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE4 Sn1322; Calibrated: 8/24/2015  
Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647  
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Mode: UMTS 1750, Body SAR, Back side, Mid.ch**

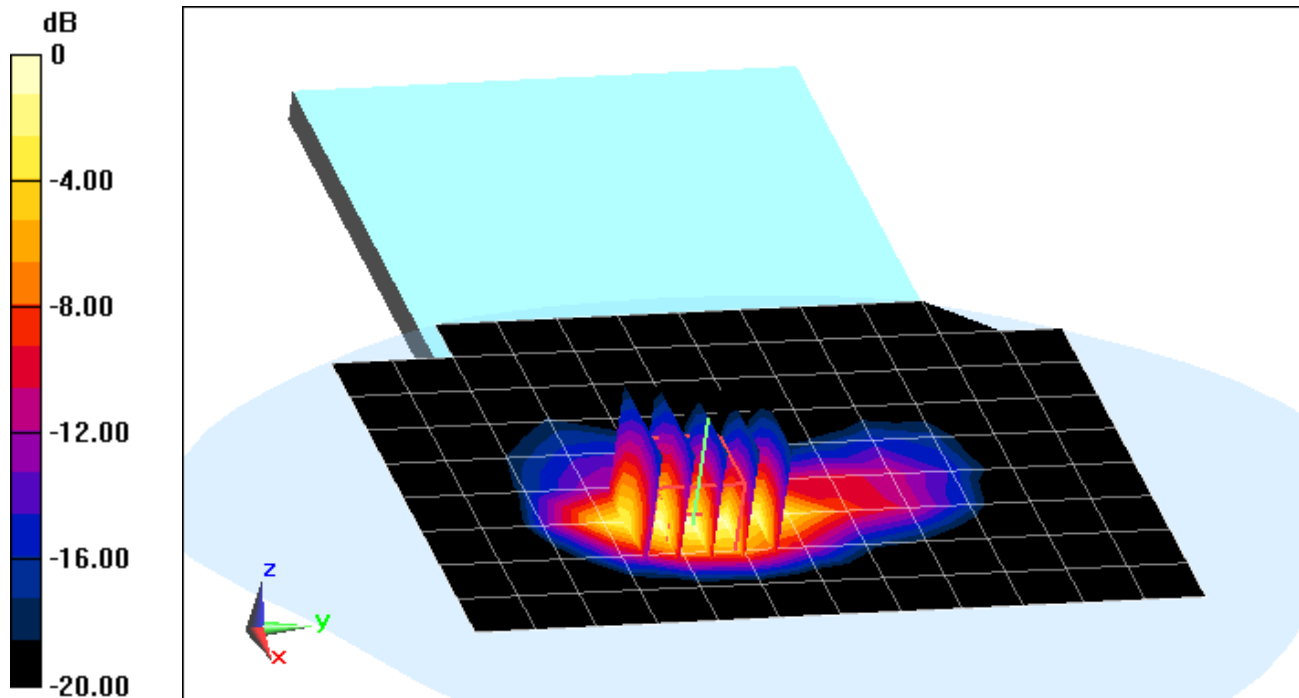
**Area Scan (13x13x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 18.13 V/m; Power Drift = -0.15 dB

Peak SAR (extrapolated) = 0.860 W/kg

**SAR(1 g) = 0.394 W/kg**



0 dB = 0.557 W/kg = -2.54 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFV520; Type: Portable Tablet; Serial: 04236**

Communication System: UID 0, UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used:

$f = 1880$  MHz;  $\sigma = 1.55$  S/m;  $\epsilon_r = 53.707$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-09-2016; Ambient Temp: 23.1°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3333; ConvF(4.7, 4.7, 4.7); Calibrated: 10/29/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/27/2015

Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Mode: UMTS 1900, Body SAR, Top Edge, Mid.ch**

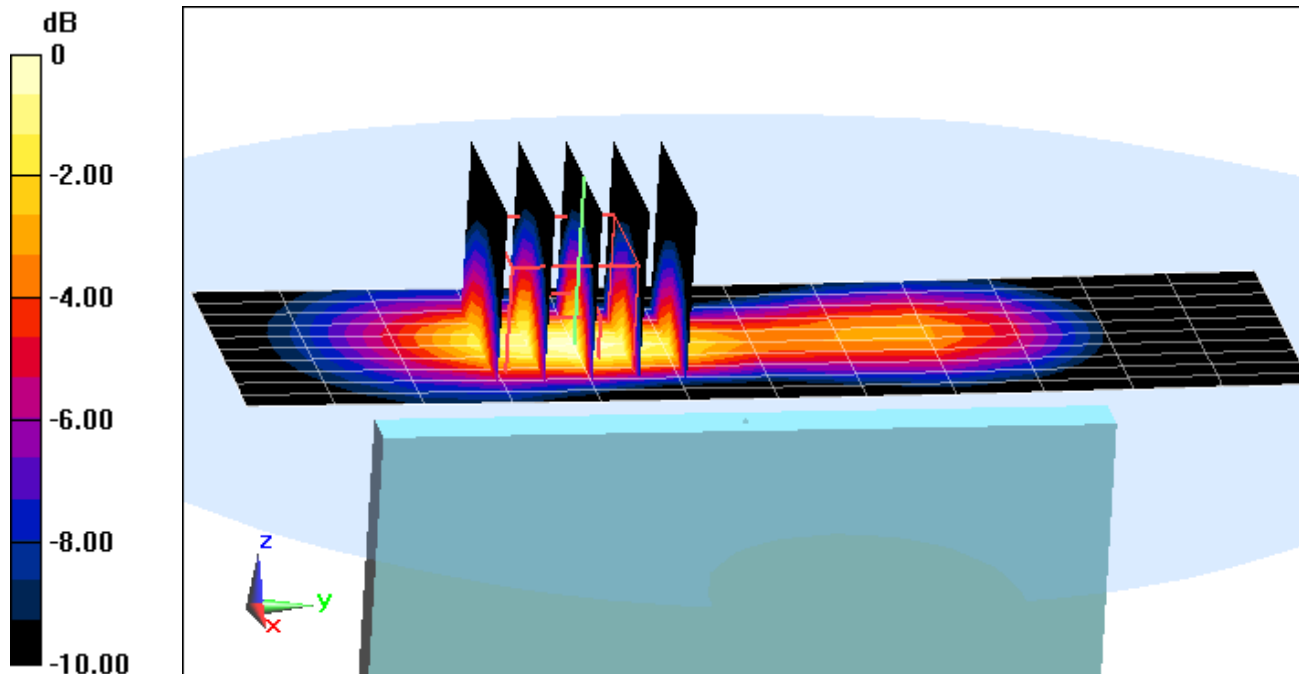
**Area Scan (11x13x1):** Measurement grid: dx=5mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 24.60 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 1.32 W/kg

**SAR(1 g) = 0.798 W/kg**



0 dB = 0.989 W/kg = -0.05 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFV520; Type: Portable Tablet; Serial: 04251**

Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1

Medium: 750 Body Medium parameters used (interpolated):

$f = 707.5 \text{ MHz}$ ;  $\sigma = 0.92 \text{ S/m}$ ;  $\epsilon_r = 54.789$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 01-06-2016; Ambient Temp: 23.5°C; Tissue Temp: 22.5°C

Probe: ES3DV2 - SN3022; ConvF(6.16, 6.16, 6.16); Calibrated: 8/26/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/18/2015

Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1229

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 12, Body SAR, Back side, Mid.ch**

**10 MHz Bandwidth, QPSK, 1 RB, 25 RB Offset**

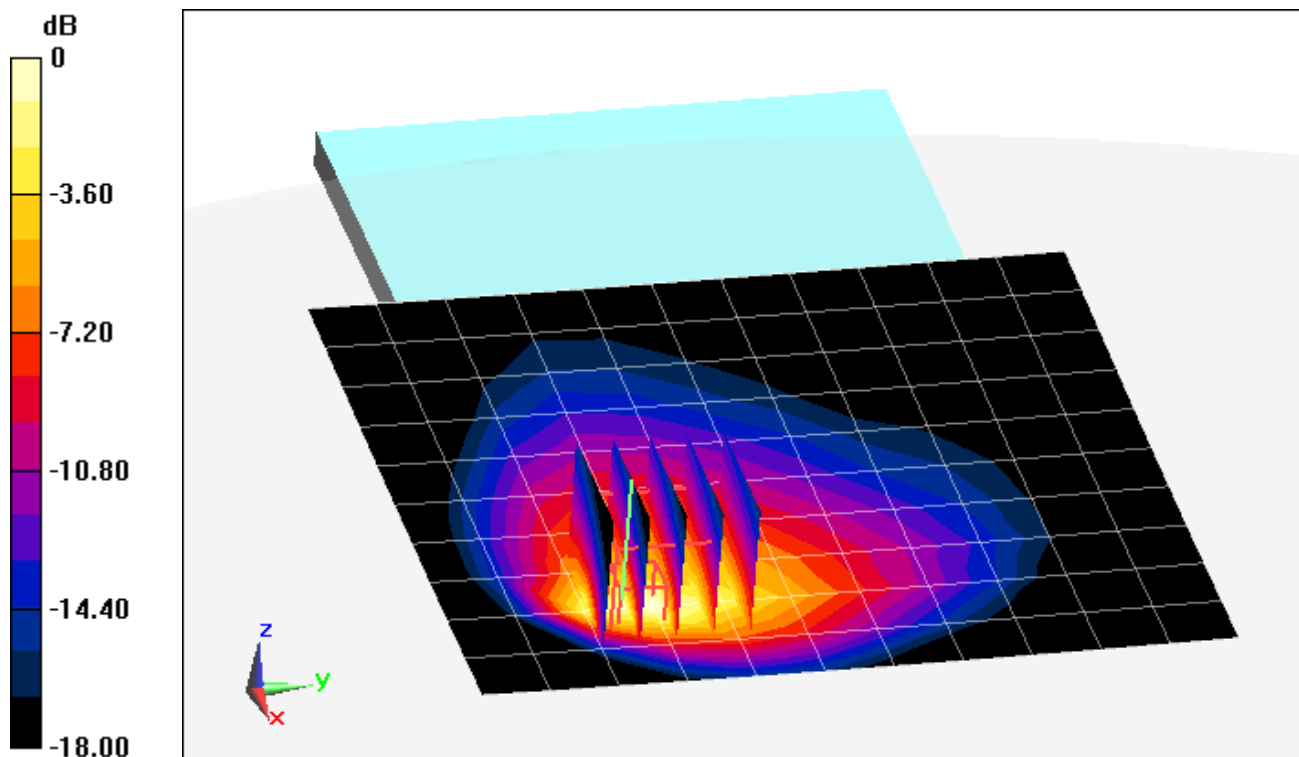
**Area Scan (11x12x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 24.64 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 1.57 W/kg

**SAR(1 g) = 0.526 W/kg**



0 dB = 0.702 W/kg = -1.54 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFV520; Type: Portable Tablet; Serial: 04251**

Communication System: UID 0, LTE Band 5; Frequency: 836.5 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.5 \text{ MHz}$ ;  $\sigma = 1.007 \text{ S/m}$ ;  $\epsilon_r = 53.703$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 01-09-2016; Ambient Temp: 24.5°C; Tissue Temp: 23.2°C

Probe: ES3DV3 - SN3263; ConvF(6.08, 6.08, 6.08); Calibrated: 5/20/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn859; Calibrated: 6/17/2015

Phantom: SAM with CRP (Left); Type: SAM; Serial: 1715

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 5 (Cell.), Body SAR, Left Edge, Mid.ch**

**10 MHz Bandwidth, QPSK, 25 RB, 0 RB Offset**

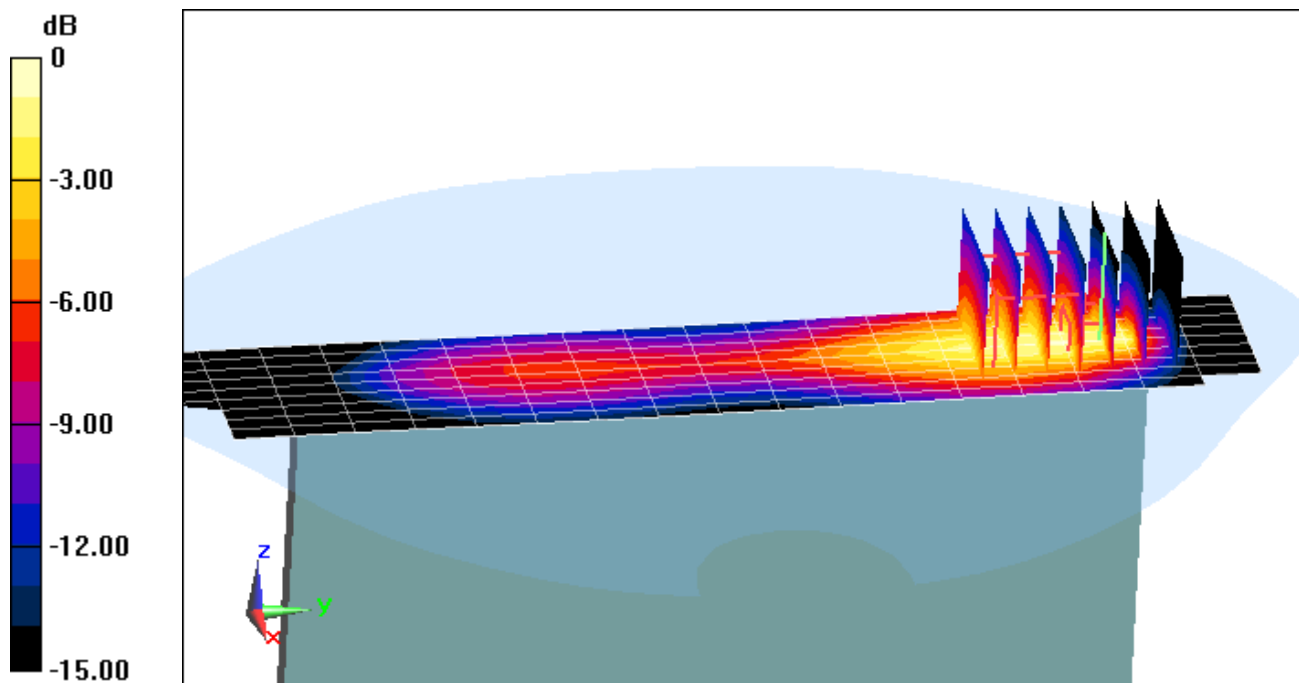
**Area Scan (10x19x1):** Measurement grid: dx=5mm, dy=15mm

**Zoom Scan (5x7x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 23.64 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 1.31 W/kg

**SAR(1 g) = 0.516 W/kg**



0 dB = 0.732 W/kg = -1.35 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFV520; Type: Portable Tablet; Serial: 04228**

Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used (interpolated):

$f = 1732.5$  MHz;  $\sigma = 1.466$  S/m;  $\epsilon_r = 51.156$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-11-2016; Ambient Temp: 23.2°C; Tissue Temp: 22.7°C

Probe: ES3DV3 - SN3351; ConvF(4.88, 4.88, 4.88); Calibrated: 6/22/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/24/2015

Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 4 (AWS), Body SAR, Top Edge, Mid.ch**  
**20 MHz Bandwidth, QPSK, 1 RB, 99 RB Offset**

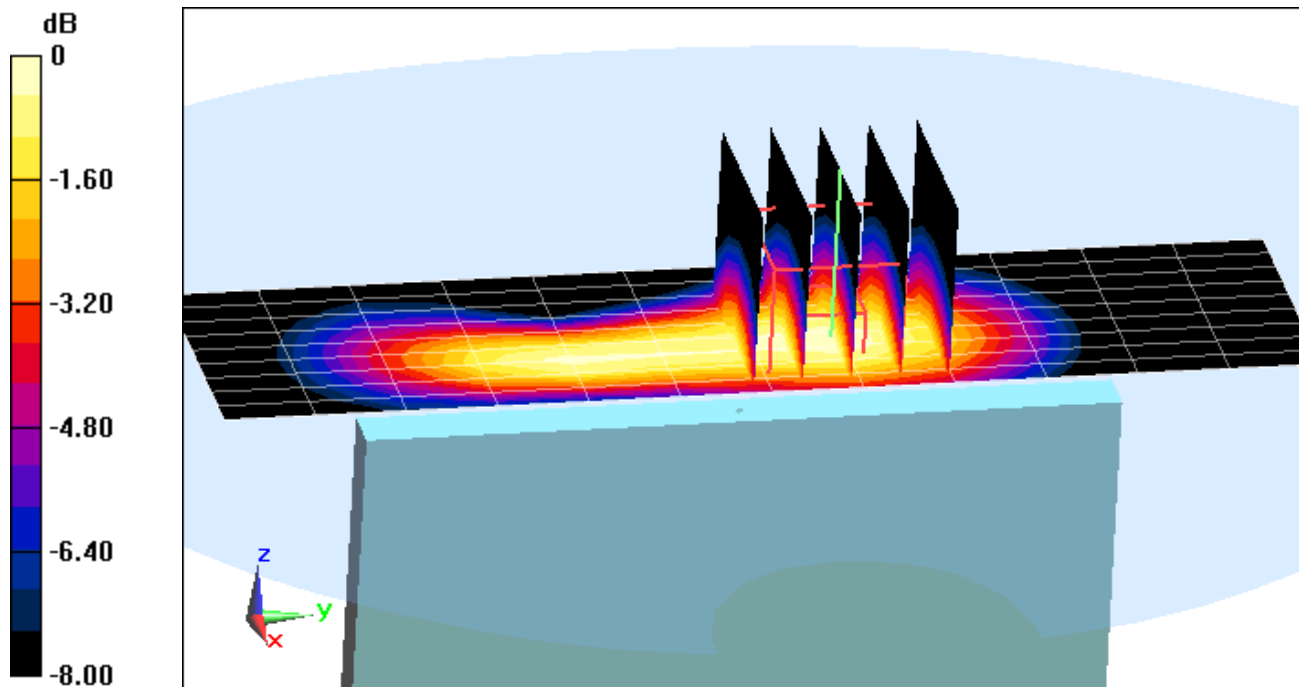
**Area Scan (10x13x1):** Measurement grid: dx=5mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 22.71 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 1.07 W/kg

**SAR(1 g) = 0.689 W/kg**



0 dB = 0.820 W/kg = -0.86 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFV520; Type: Portable Tablet; Serial: 04228**

Communication System: UID 0, LTE Band 2 (PCS); Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$ ;  $\sigma = 1.55 \text{ S/m}$ ;  $\epsilon_r = 53.707$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-09-2016; Ambient Temp: 23.1°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3333; ConvF(4.7, 4.7, 4.7); Calibrated: 10/29/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/27/2015

Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 2 (PCS), Body SAR, Top Edge, Mid.ch**

**20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset**

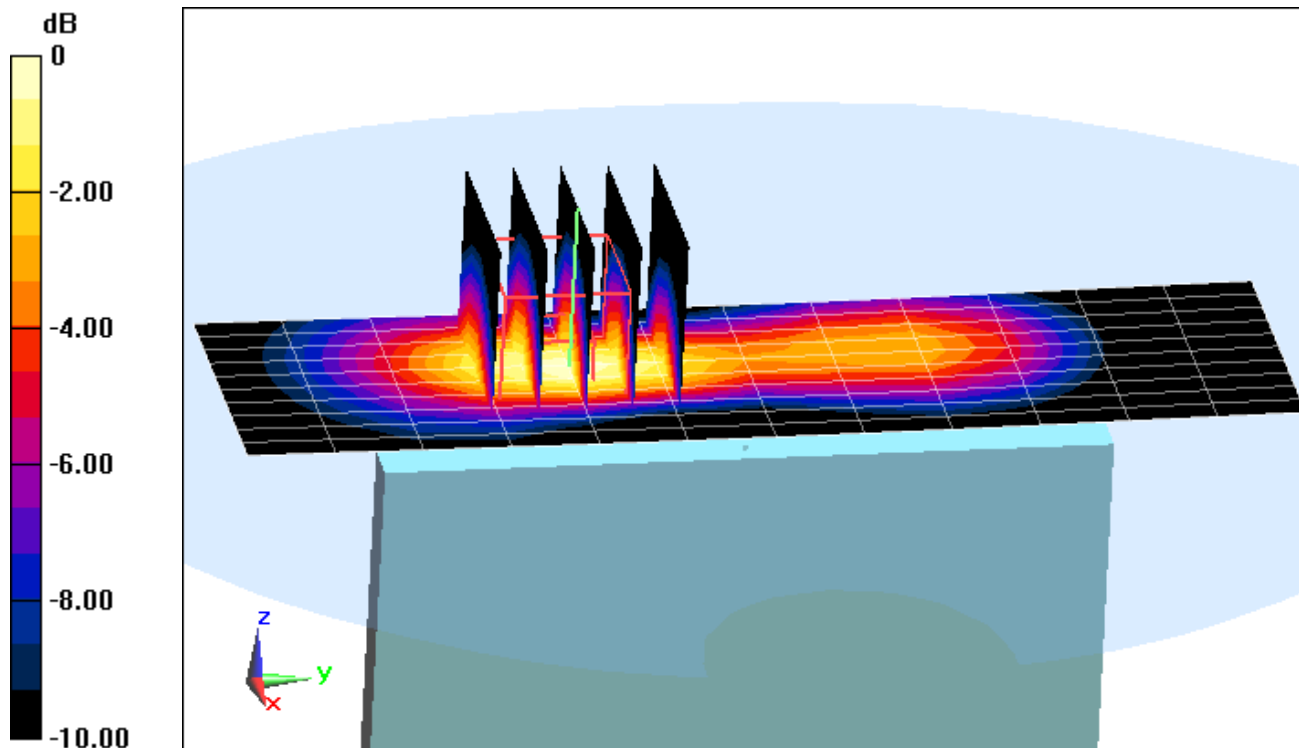
**Area Scan (11x13x1):** Measurement grid:  $dx=5\text{mm}$ ,  $dy=15\text{mm}$

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 22.51 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 1.11 W/kg

**SAR(1 g) = 0.675 W/kg**



0 dB = 0.834 W/kg = -0.79 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFV520; Type: Portable Tablet; Serial: 04251**

Communication System: UID 0, LTE Band 30; Frequency: 2310 MHz; Duty Cycle: 1:1

Medium: 2300 Body Medium parameters used:

$f = 2310$  MHz;  $\sigma = 1.767$  S/m;  $\epsilon_r = 51.934$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 01-16-2016; Ambient Temp: 20.6°C; Tissue Temp: 22.2°C

Probe: ES3DV3 - SN3319; ConvF(4.24, 4.24, 4.24); Calibrated: 3/19/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 3/13/2015

Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 30, Body SAR, Back side, Mid.ch**

**10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset**

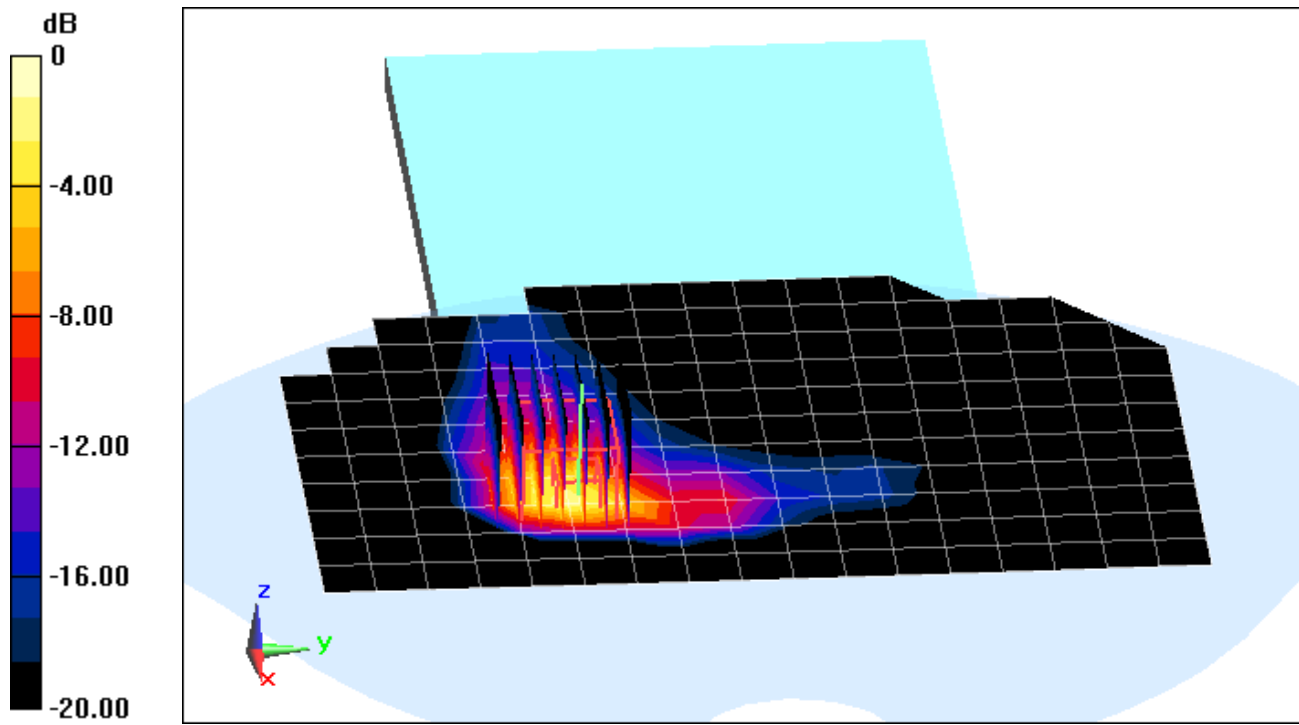
**Area Scan (13x18x1):** Measurement grid: dx=12mm, dy=12mm

**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 14.83 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 0.910 W/kg

**SAR(1 g) = 0.362 W/kg**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFV520; Type: Portable Tablet; Serial: 04285**

Communication System: UID 0, LTE Band 7; Frequency: 2535 MHz; Duty Cycle: 1:1

Medium: 2600 Body Medium parameters used (interpolated):

$f = 2535 \text{ MHz}$ ;  $\sigma = 2.059 \text{ S/m}$ ;  $\epsilon_r = 51.108$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 01-16-2016; Ambient Temp: 20.6°C; Tissue Temp: 22.2°C

Probe: ES3DV3 - SN3319; ConvF(3.9, 3.9, 3.9); Calibrated: 3/19/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 3/13/2015

Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 7, Body SAR, Back side, Mid.ch**

**20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset**

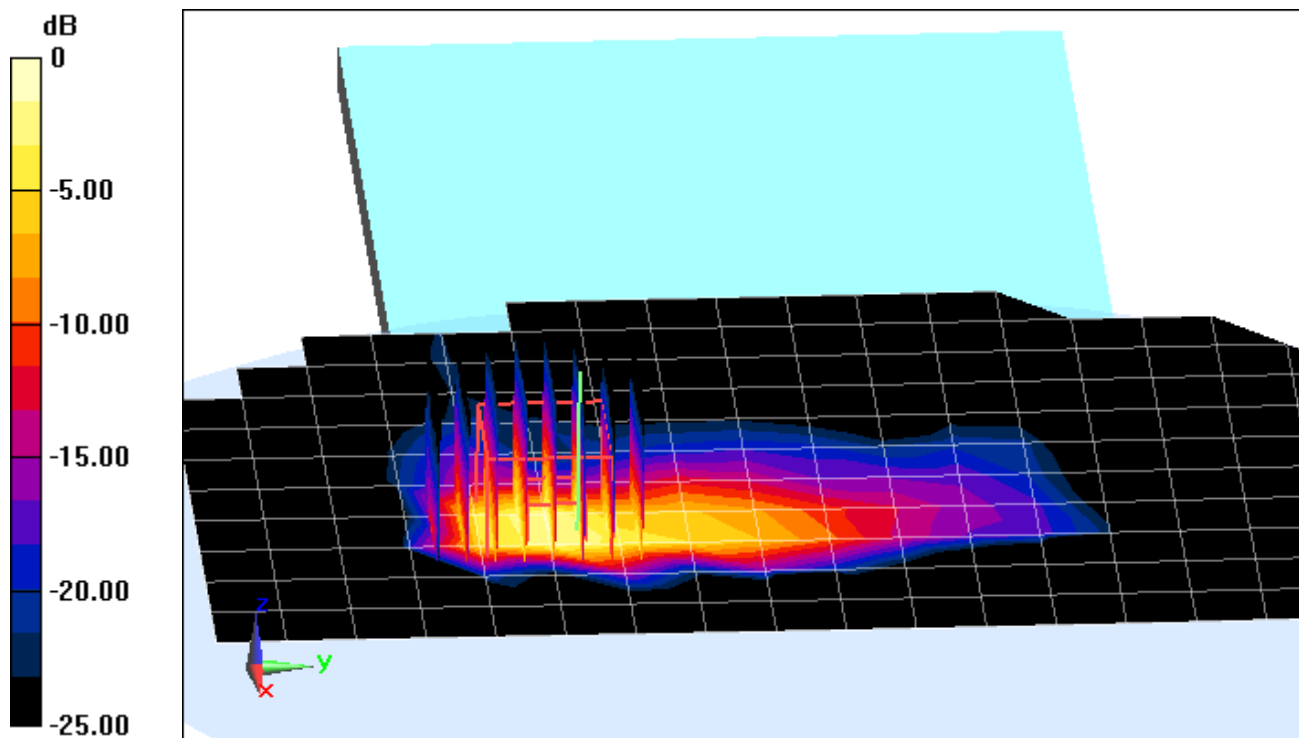
**Area Scan (13x18x1):** Measurement grid:  $dx=12\text{mm}$ ,  $dy=12\text{mm}$

**Zoom Scan (7x8x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 15.84 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 1.78 W/kg

**SAR(1 g) = 0.564 W/kg**



0 dB = 0.837 W/kg = -0.77 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFV520; Type: Portable Tablet; Serial: 04210**

Communication System: UID 0, IEEE 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2412 \text{ MHz}$ ;  $\sigma = 1.961 \text{ S/m}$ ;  $\epsilon_r = 51.75$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 01-14-2016; Ambient Temp: 24.2°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3209; ConvF(4.12, 4.12, 4.12); Calibrated: 3/19/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/20/2015

Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Mode: IEEE 802.11b, 22 MHz Bandwidth, Body SAR, Ch 01, 1 Mbps, Top Edge**

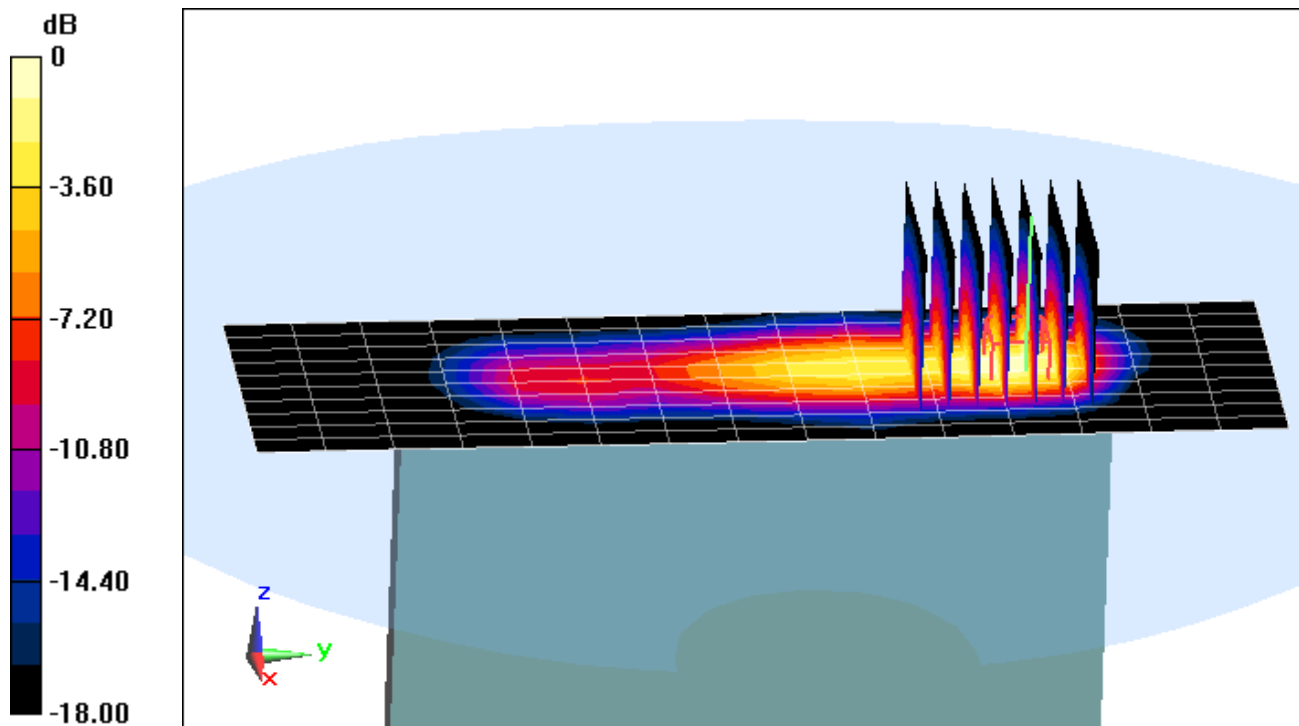
**Area Scan (11x16x1):** Measurement grid: dx=5mm, dy=12mm

**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 20.22 V/m; Power Drift = 0.19 dB

Peak SAR (extrapolated) = 1.89 W/kg

**SAR(1 g) = 0.746 W/kg**



0 dB = 0.995 W/kg = -0.02 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFV520; Type: Portable Tablet; Serial: 04210**

Communication System: UID 0, IEEE 802.11n; Frequency: 5755 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used (interpolated):

$f = 5755 \text{ MHz}$ ;  $\sigma = 6.039 \text{ S/m}$ ;  $\epsilon_r = 47.862$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 01-12-2016; Ambient Temp: 23.8°C; Tissue Temp: 23.6°C

Probe: EX3DV4 - SN7357; ConvF(3.82, 3.82, 3.82); Calibrated: 4/23/2015;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/20/2015

Phantom: SAM v5.0 Left; Type: QD000P40CD; Serial: TP: 1687

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: IEEE 802.11n, U-NII-3, 40 MHz Bandwidth, Body SAR, Ch 151, 6 Mbps, Top Edge**

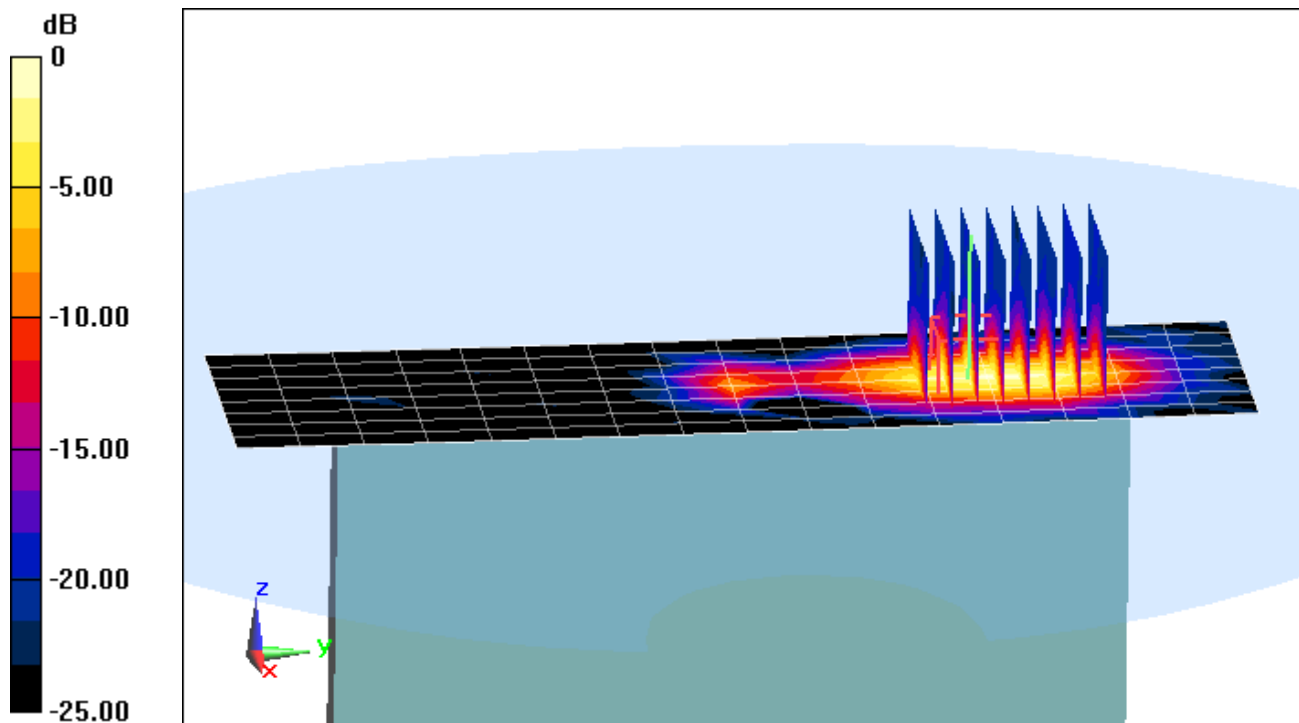
**Area Scan (9x17x1):** Measurement grid: dx=5mm, dy=10mm

**Zoom Scan (7x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Reference Value = 10.89 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 3.43 W/kg

**SAR(1 g) = 0.648 W/kg**



0 dB = 2.00 W/kg = 3.01 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFV520; Type: Portable Tablet; Serial: 04285**

Communication System: UID 0, Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2441 \text{ MHz}$ ;  $\sigma = 1.932 \text{ S/m}$ ;  $\epsilon_r = 51.443$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 01-16-2016; Ambient Temp: 20.6°C; Tissue Temp: 22.2°C

Probe: ES3DV3 - SN3319; ConvF(4.11, 4.11, 4.11); Calibrated: 3/19/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 3/13/2015

Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Mode: Bluetooth, Body SAR, Ch 39, 1 Mbps, Back Side**

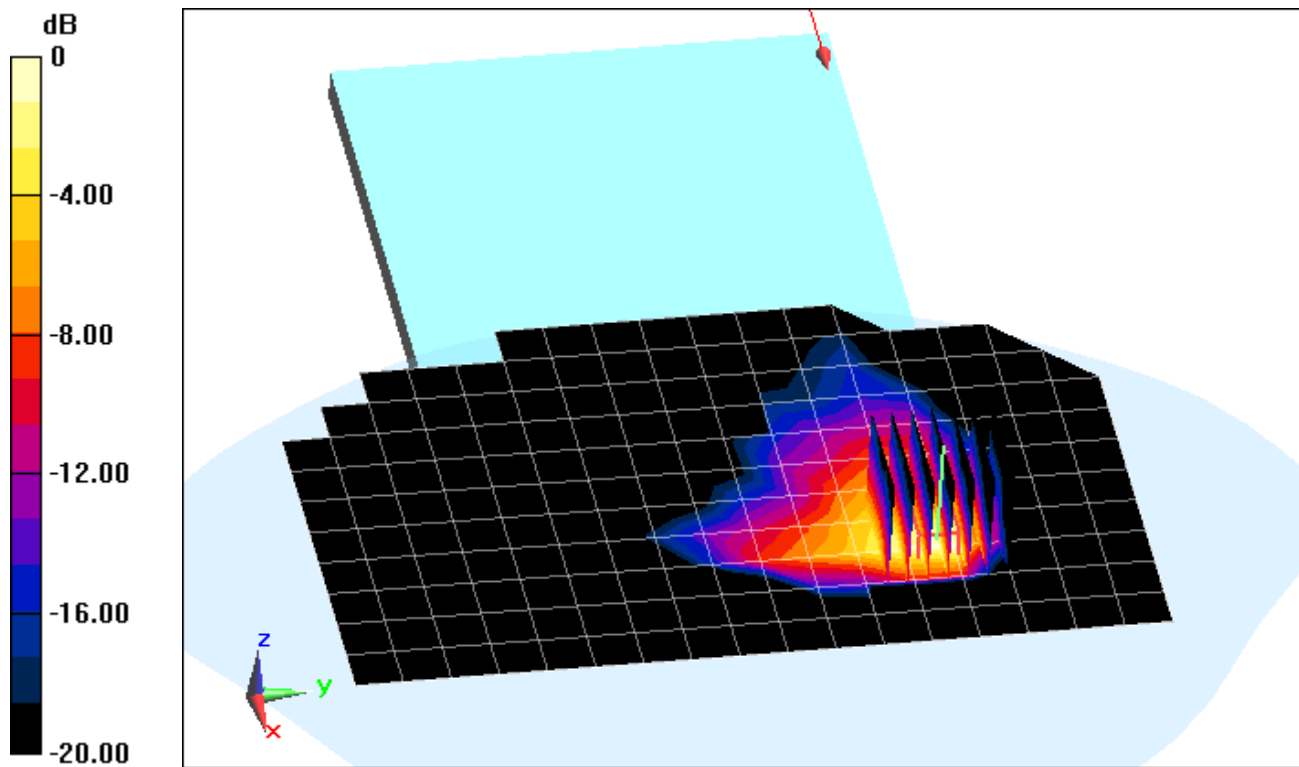
**Area Scan (13x18x1):** Measurement grid:  $dx=12\text{mm}$ ,  $dy=12\text{mm}$

**Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 7.856 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.350 W/kg

**SAR(1 g) = 0.115 W/kg**



0 dB = 0.156 W/kg = -8.07 dBW/kg

## APPENDIX B: SYSTEM VERIFICATION

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 750 MHz; Type: D750V3; Serial: 1003**

Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1

Medium: 750 Body Medium parameters used (interpolated):

$f = 750 \text{ MHz}$ ;  $\sigma = 0.962 \text{ S/m}$ ;  $\epsilon_r = 54.396$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 01-06-2016; Ambient Temp: 23.5°C; Tissue Temp: 22.5°C

Probe: ES3DV2 - SN3022; ConvF(6.16, 6.16, 6.16); Calibrated: 8/26/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/18/2015

Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1229

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

## 750 MHz System Verification at 23.0 dBm (200 mW)

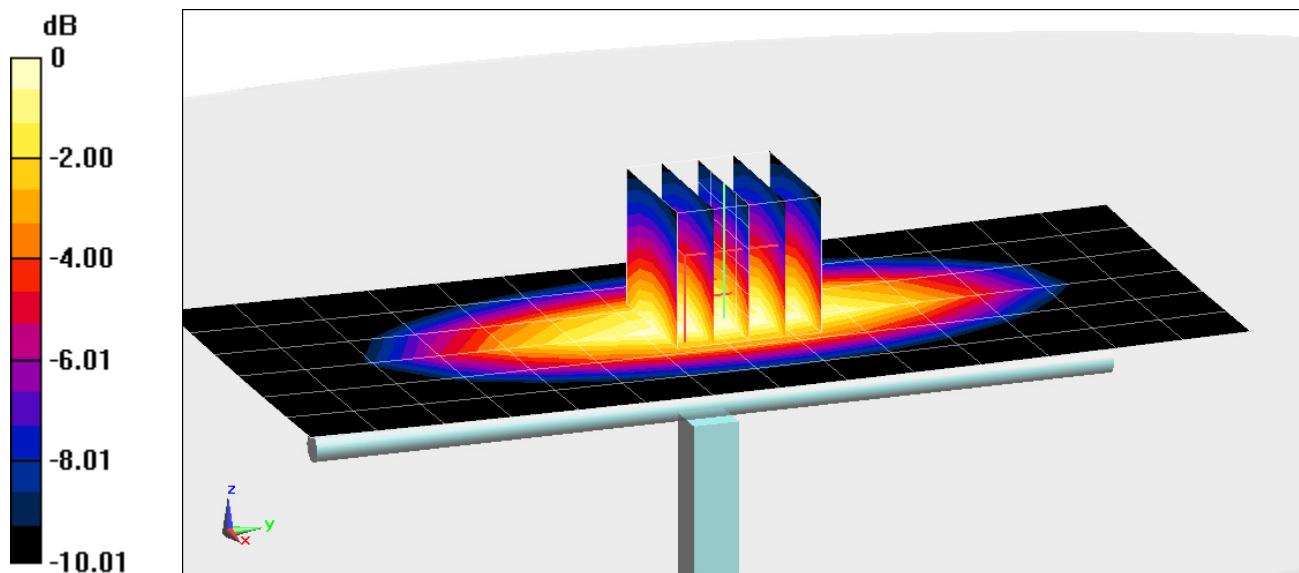
**Area Scan (7x15x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 2.57 W/kg

**SAR(1 g) = 1.77 W/kg**

Deviation(1 g) = 4.61%



0 dB = 2.05 W/kg = 3.12 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d133**

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used:

$f = 835 \text{ MHz}$ ;  $\sigma = 1.005 \text{ S/m}$ ;  $\epsilon_r = 53.715$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 01-09-2016; Ambient Temp: 24.5°C; Tissue Temp: 23.2°C

Probe: ES3DV3 - SN3263; ConvF(6.08, 6.08, 6.08); Calibrated: 5/20/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn859; Calibrated: 6/17/2015

Phantom: SAM with CRP (Left); Type: SAM; Serial: 1715

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

## 835 MHz System Verification at 23.0 dBm (200 mW)

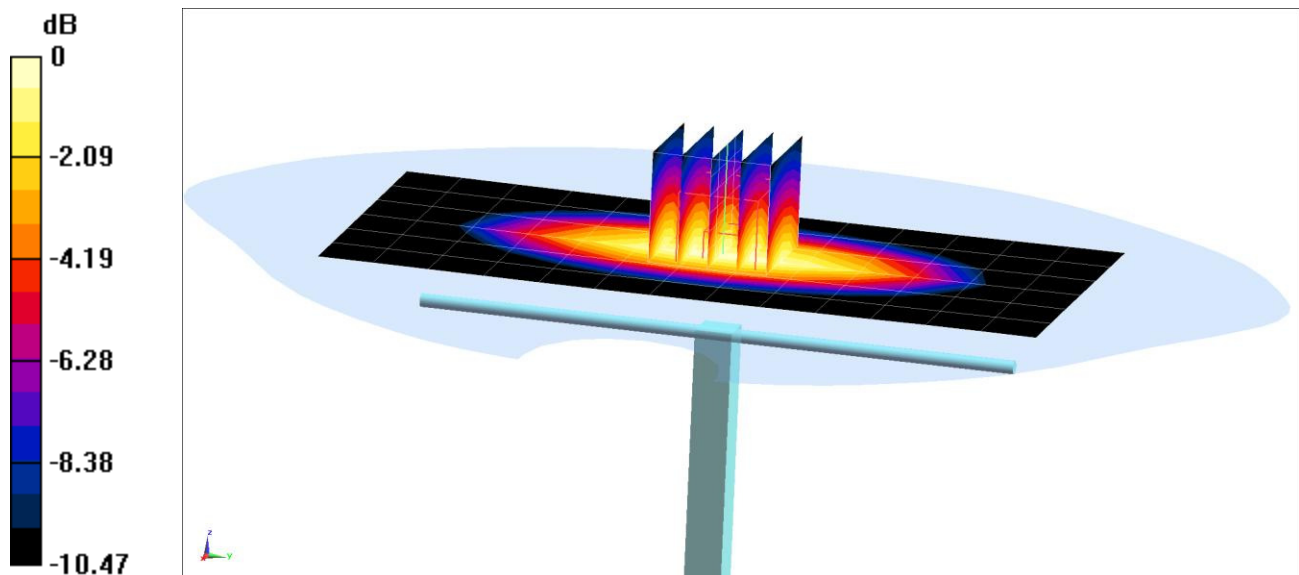
**Area Scan (7x14x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 2.92 W/kg

**SAR(1 g) = 2.01 W/kg**

Deviation(1 g) = 8.65%



0 dB = 2.31 W/kg = 3.64 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1051**

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used:

$f = 1750 \text{ MHz}$ ;  $\sigma = 1.486 \text{ S/m}$ ;  $\epsilon_r = 51.093$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-11-2016; Ambient Temp: 23.2°C; Tissue Temp: 22.7°C

Probe: ES3DV3 - SN3351; ConvF(4.88, 4.88, 4.88); Calibrated: 6/22/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/24/2015

Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

## 1750 MHz System Verification at 20.0 dBm (100 mW)

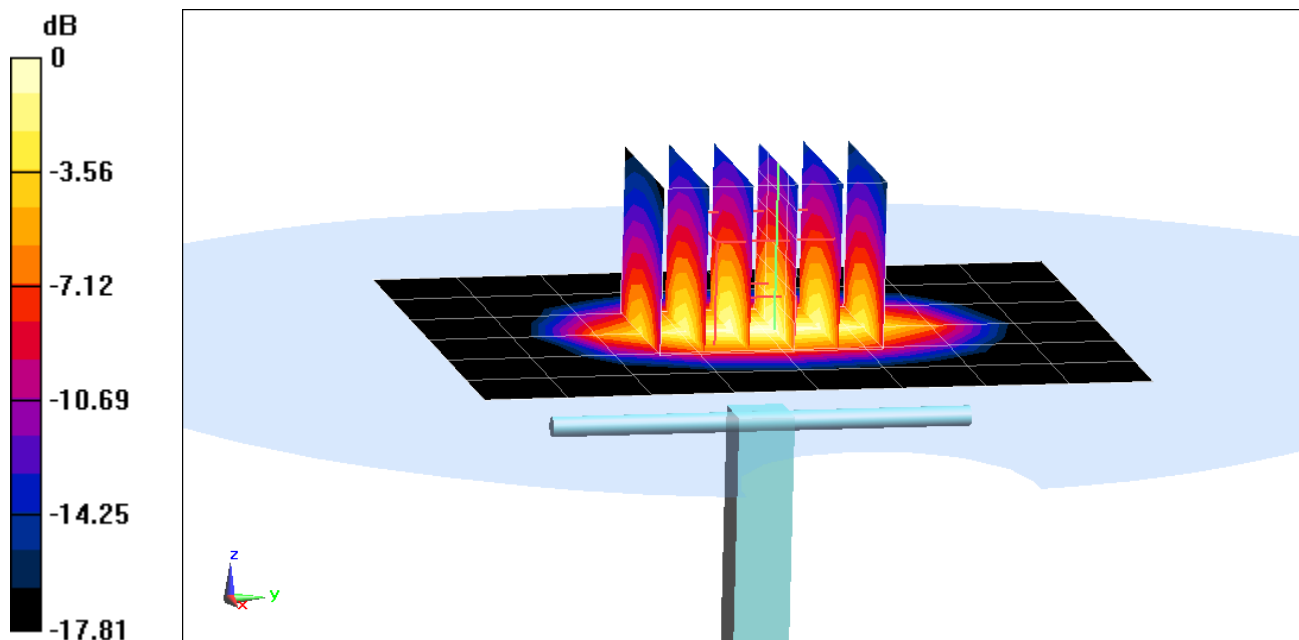
**Area Scan (7x9x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

**Zoom Scan (5x6x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Peak SAR (extrapolated) = 6.54 W/kg

**SAR(1 g) = 3.79 W/kg**

Deviation (1 g) = 2.16%



0 dB = 4.73 W/kg = 6.75 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d149**

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$ ;  $\sigma = 1.575 \text{ S/m}$ ;  $\epsilon_r = 53.639$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-09-2016; Ambient Temp: 23.1°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3333; ConvF(4.7, 4.7, 4.7); Calibrated: 10/29/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/27/2015

Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

## **1900 MHz System Verification at 20.0 dBm (100 mW)**

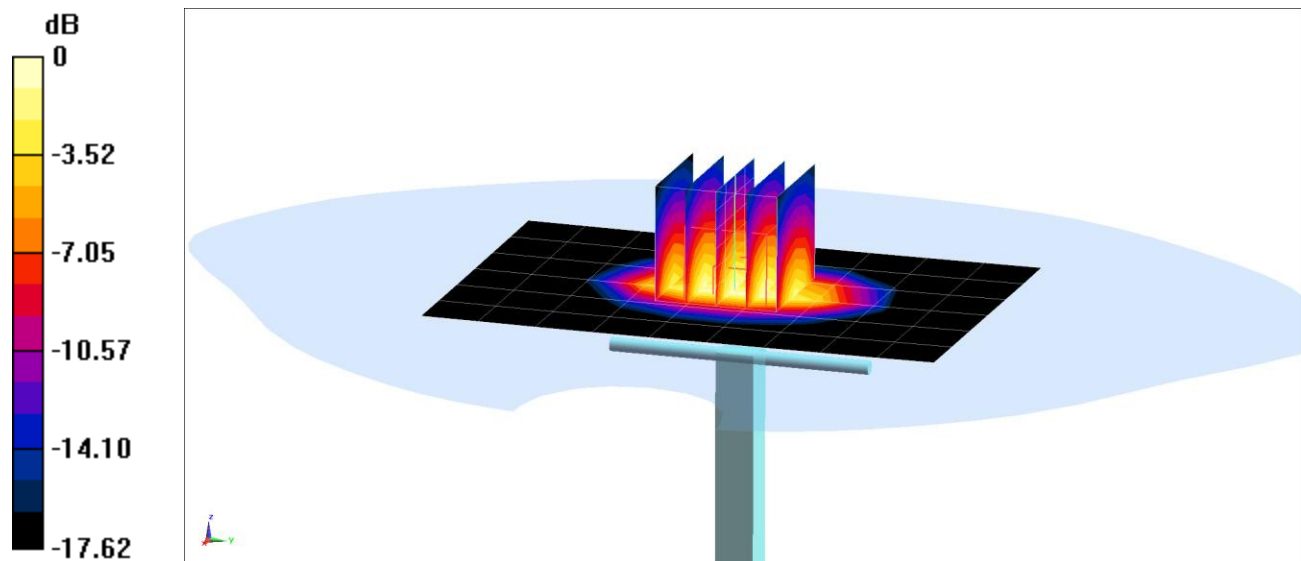
**Area Scan (7x10x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 6.97 W/kg

**SAR(1 g) = 3.93 W/kg**

Deviation(1 g) = -2.72%;



0 dB = 4.97 W/kg = 6.96 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 2300 MHz; Type: D2300V2; Serial: 1064**

Communication System: UID 0, CW; Frequency: 2300 MHz; Duty Cycle: 1:1

Medium: 2300 Body Medium parameters used:

$f = 2300$  MHz;  $\sigma = 1.753$  S/m;  $\epsilon_r = 51.964$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-16-2016; Ambient Temp: 20.6°C; Tissue Temp: 22.2°C

Probe: ES3DV3 - SN3319; ConvF(4.24, 4.24, 4.24); Calibrated: 3/19/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 3/13/2015

Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

## **2300 MHz System Verification at 20.0 dBm (100 mW)**

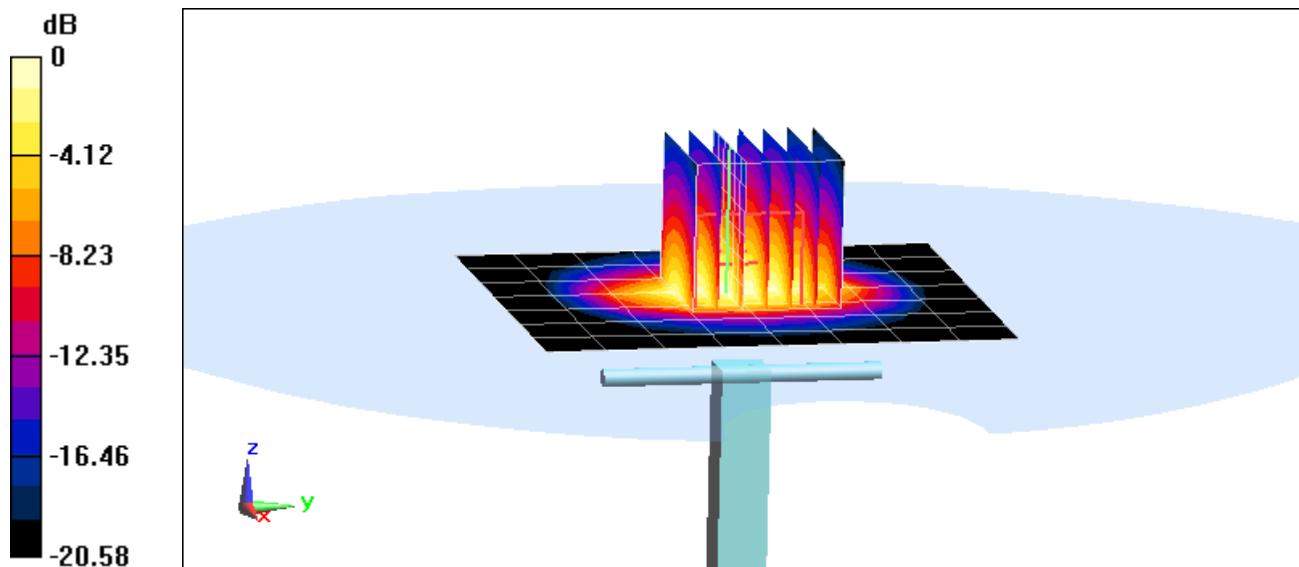
**Area Scan (8x9x1):** Measurement grid: dx=12mm, dy=12mm

**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Peak SAR (extrapolated) = 8.99 W/kg

**SAR(1 g) = 4.6 W/kg**

Deviation(1 g) = 1.10%



0 dB = 5.93 W/kg = 7.73 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 719**

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: 2450 Body Medium parameters used:

$f = 2450 \text{ MHz}$ ;  $\sigma = 2.014 \text{ S/m}$ ;  $\epsilon_r = 51.593$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-14-2016; Ambient Temp: 24.2°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3209; ConvF(4.12, 4.12, 4.12); Calibrated: 3/19/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/20/2015

Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

## 2450 MHz System Verification at 20.0 dBm (100 mW)

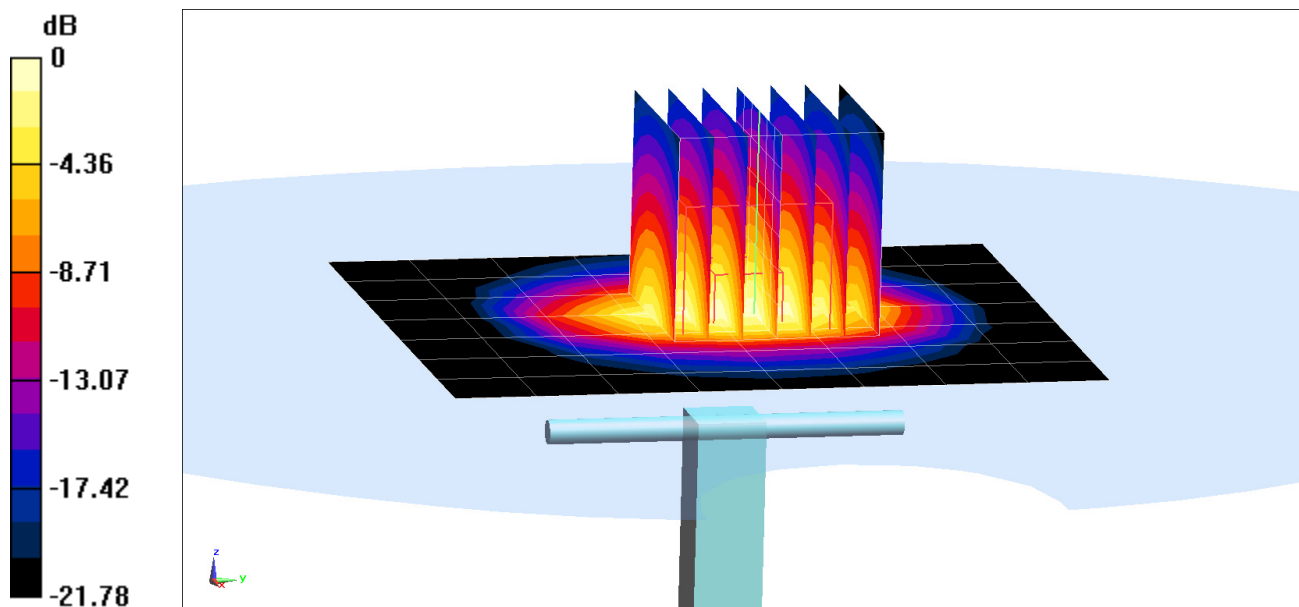
**Area Scan (8x9x1):** Measurement grid:  $dx=12\text{mm}$ ,  $dy=12\text{mm}$

**Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Peak SAR (extrapolated) = 11.1 W/kg

**SAR(1 g) = 5.37 W/kg**

Deviation = 3.47 %



0 dB = 7.03 W/kg = 8.47 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 719**

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: 2450 Body Medium parameters used:

$f = 2450 \text{ MHz}$ ;  $\sigma = 1.944 \text{ S/m}$ ;  $\epsilon_r = 51.411$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-16-2016; Ambient Temp: 20.6°C; Tissue Temp: 22.2°C

Probe: ES3DV3 - SN3319; ConvF(4.11, 4.11, 4.11); Calibrated: 3/19/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 3/13/2015

Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

## **2450 MHz System Verification at 20.0 dBm (100 mW)**

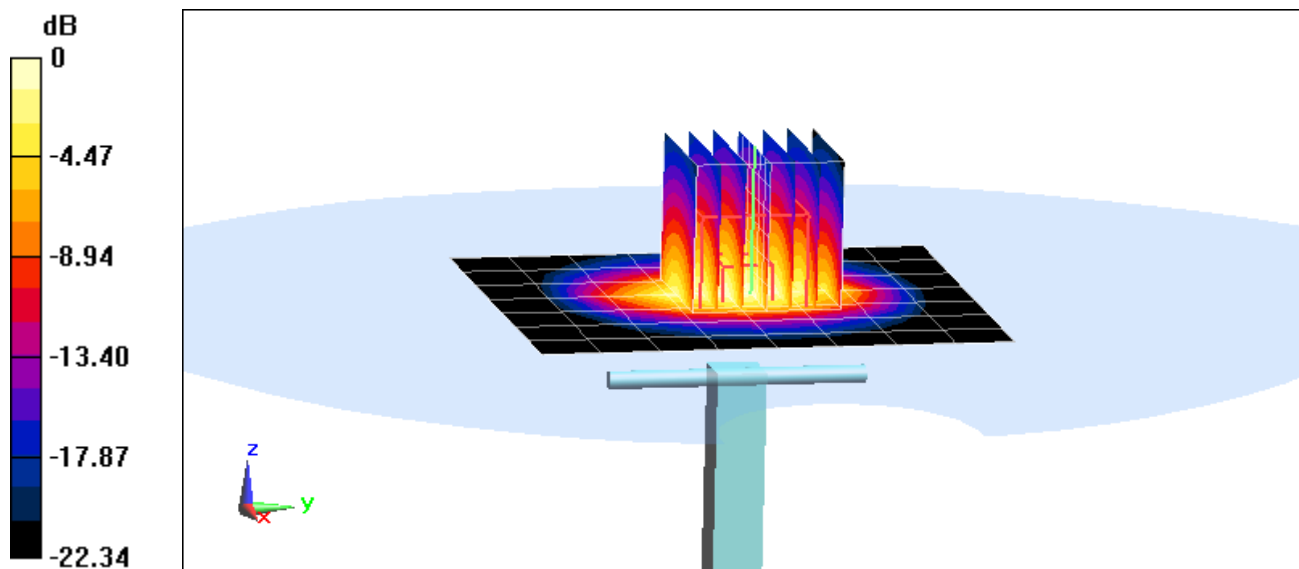
**Area Scan (8x9x1):** Measurement grid: dx=12mm, dy=12mm

**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Peak SAR (extrapolated) = 10.9 W/kg

**SAR(1 g) = 5.15 W/kg**

Deviation(1 g) = -0.77%



0 dB = 6.76 W/kg = 8.30 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 2600 MHz; Type: D2600V2; Serial: 1004**

Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium: 2600 Body Medium parameters used:

$f = 2600 \text{ MHz}$ ;  $\sigma = 2.15 \text{ S/m}$ ;  $\epsilon_r = 50.867$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-16-2016; Ambient Temp: 20.6°C; Tissue Temp: 22.2°C

Probe: ES3DV3 - SN3319; ConvF(3.9, 3.9, 3.9); Calibrated: 3/19/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 3/13/2015

Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

## 2600 MHz System Verification at 20.0 dBm (100 mW)

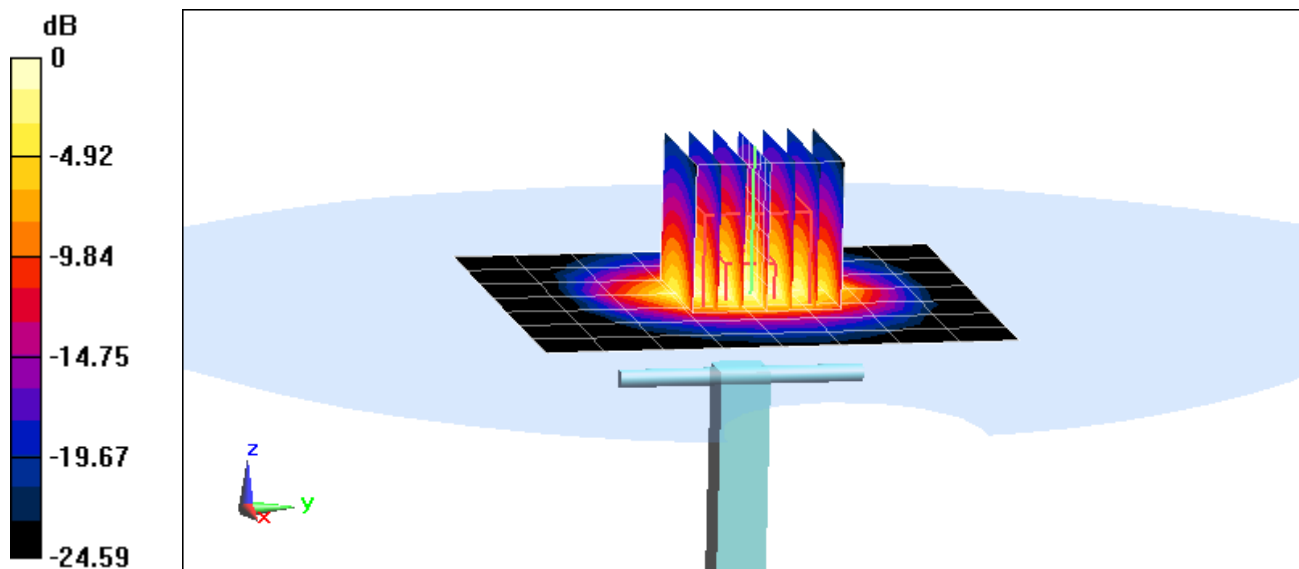
**Area Scan (8x9x1):** Measurement grid: dx=12mm, dy=12mm

**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Peak SAR (extrapolated) = 13.5 W/kg

**SAR(1 g) = 6 W/kg**

Deviation(1 g) = 6.76%



0 dB = 7.97 W/kg = 9.01 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1120**

Communication System: UID 0, CW; Frequency: 5300 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body; Medium parameters used:

$f = 5300 \text{ MHz}$ ;  $\sigma = 5.455 \text{ S/m}$ ;  $\epsilon_r = 48.493$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-12-2016; Ambient Temp: 23.8°C; Tissue Temp: 23.6°C

Probe: EX3DV4 - SN7357; ConvF(4.11, 4.11, 4.11); Calibrated: 4/23/2015;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/20/2015

Phantom: SAM v5.0 Left; Type: QD000P40CD; Serial: TP: 1687

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

## **5300 MHz System Verification at 17.0 dBm (50 mW)**

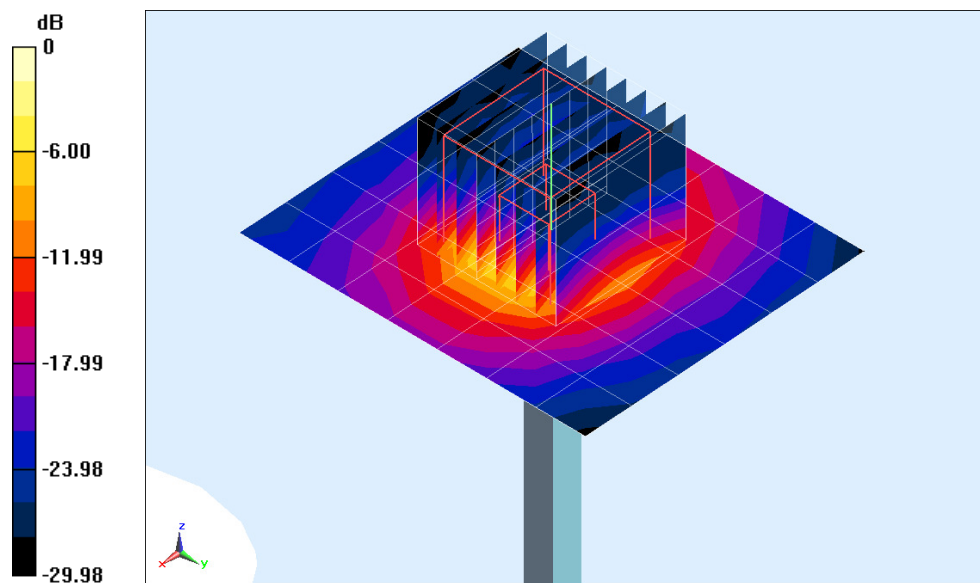
**Area Scan (7x8x1):** Measurement grid: dx=10mm, dy=10mm

**Zoom Scan (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Peak SAR (extrapolated) = 14.9 W/kg

**SAR(1 g) = 3.77 W/kg**

Deviation = 0.27%



0 dB = 8.94 W/kg = 9.51 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1120**

Communication System: UID 0, CW; Frequency: 5500 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body; Medium parameters used:

$f = 5500 \text{ MHz}$ ;  $\sigma = 5.711 \text{ S/m}$ ;  $\epsilon_r = 48.227$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-12-2016; Ambient Temp: 23.8°C; Tissue Temp: 23.6°C

Probe: EX3DV4 - SN7357; ConvF(3.83, 3.83, 3.83); Calibrated: 4/23/2015;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/20/2015

Phantom: SAM v5.0 Left; Type: QD000P40CD; Serial: TP: 1687

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

## **5500 MHz System Verification at 17.0 dBm (50 mW)**

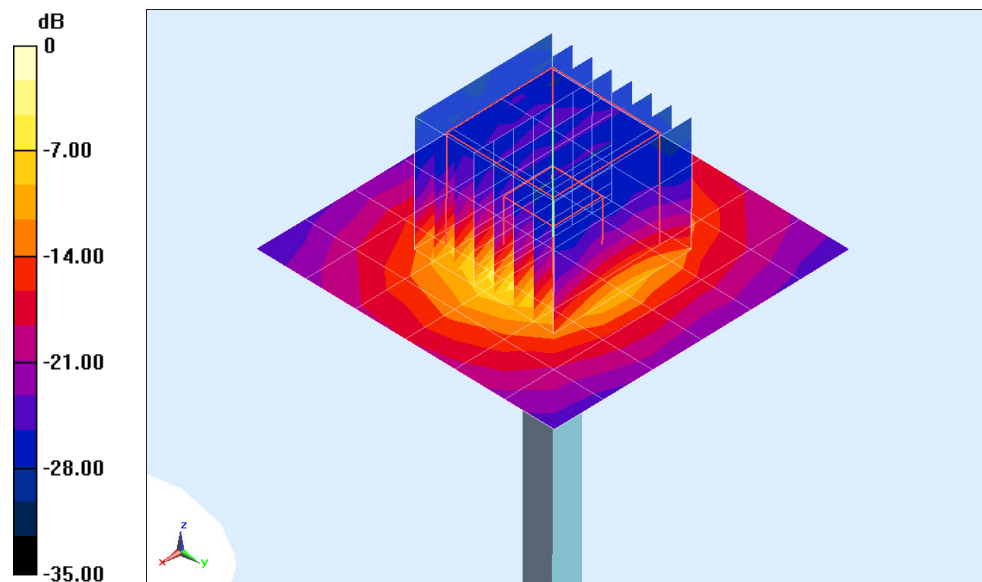
**Area Scan (7x7x1):** Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$

**Zoom Scan (8x8x7)/Cube 0:** Measurement grid:  $dx=4\text{mm}$ ,  $dy=4\text{mm}$ ,  $dz=1.4\text{mm}$ ; Graded Ratio: 1.4

Peak SAR (extrapolated) = 15.9 W/kg

**SAR(1 g) = 3.82 W/kg**

Deviation = -3.90%



0 dB = 9.39 W/kg = 9.73 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1120**

Communication System: UID 0, CW; Frequency: 5800 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body; Medium parameters used:

$f = 5800 \text{ MHz}$ ;  $\sigma = 6.135 \text{ S/m}$ ;  $\epsilon_r = 47.714$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-12-2016; Ambient Temp: 23.8°C; Tissue Temp: 23.6°C

Probe: EX3DV4 - SN7357; ConvF(3.82, 3.82, 3.82); Calibrated: 4/23/2015;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/20/2015

Phantom: SAM v5.0 Left; Type: QD000P40CD; Serial: TP: 1687

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

## **5800 MHz System Verification at 17.0 dBm (50 mW)**

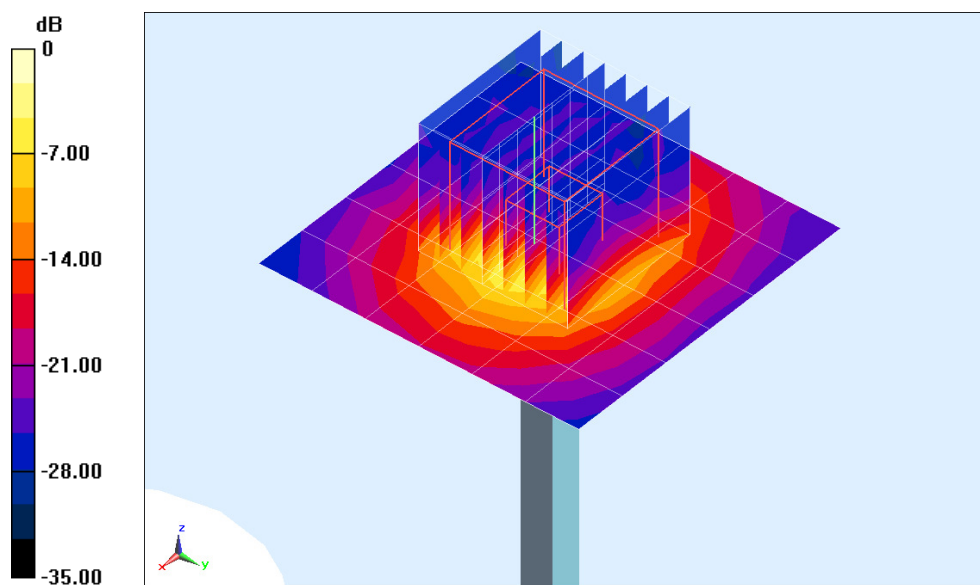
**Area Scan (7x7x1):** Measurement grid: dx=10mm, dy=10mm

**Zoom Scan (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Peak SAR (extrapolated) = 16.0 W/kg

**SAR(1 g) = 3.72 W/kg**

Deviation = -2.49%



0 dB = 9.02 W/kg = 9.55 dBW/kg

## APPENDIX C: PROBE CALIBRATION



Accredited by the Swiss Accreditation Service (SAS)  
 The Swiss Accreditation Service is one of the signatories to the EA  
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **ES3-3022\_Aug15**

## CALIBRATION CERTIFICATE

Object **ES3DV2 - SN:3022**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6**  
**Calibration procedure for dosimetric E-field probes**

Calibration date: **August 26, 2015**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

*BN ✓*  
*9/3/2015*

| Primary Standards          | ID              | Cal Date (Certificate No.)        | Scheduled Calibration  |
|----------------------------|-----------------|-----------------------------------|------------------------|
| Power meter E4419B         | GB41293874      | 01-Apr-15 (No. 217-02128)         | Mar-16                 |
| Power sensor E4412A        | MY41498087      | 01-Apr-15 (No. 217-02128)         | Mar-16                 |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 01-Apr-15 (No. 217-02129)         | Mar-16                 |
| Reference 20 dB Attenuator | SN: S5277 (20x) | 01-Apr-15 (No. 217-02132)         | Mar-16                 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 01-Apr-15 (No. 217-02133)         | Mar-16                 |
| Reference Probe ES3DV2     | SN: 3013        | 30-Dec-14 (No. ES3-3013_Dec14)    | Dec-15                 |
| DAE4                       | SN: 660         | 14-Jan-15 (No. DAE4-660_Jan15)    | Jan-16                 |
| Secondary Standards        | ID              | Check Date (in house)             | Scheduled Check        |
| RF generator HP 8648C      | US3642U01700    | 4-Aug-99 (in house check Apr-13)  | In house check: Apr-16 |
| Network Analyzer HP 8753E  | US37390585      | 18-Oct-01 (in house check Oct-14) | In house check: Oct-15 |

|                |                              |                                          |                              |
|----------------|------------------------------|------------------------------------------|------------------------------|
| Calibrated by: | Name<br><b>Michael Weber</b> | Function<br><b>Laboratory Technician</b> | Signature<br><i>M. Weber</i> |
| Approved by:   | <b>Katja Pokovic</b>         | <b>Technical Manager</b>                 | <i>[Signature]</i>           |

Issued: August 27, 2015

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA  
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

## Glossary:

|                          |                                                                                                                                                         |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| TSL                      | tissue simulating liquid                                                                                                                                |
| NORM <sub>x,y,z</sub>    | sensitivity in free space                                                                                                                               |
| ConvF                    | sensitivity in TSL / NORM <sub>x,y,z</sub>                                                                                                              |
| DCP                      | diode compression point                                                                                                                                 |
| CF                       | crest factor (1/duty_cycle) of the RF signal                                                                                                            |
| A, B, C, D               | modulation dependent linearization parameters                                                                                                           |
| Polarization $\phi$      | $\phi$ rotation around probe axis                                                                                                                       |
| Polarization $\vartheta$ | $\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center),<br>i.e., $\vartheta = 0$ is normal to probe axis |
| Connector Angle          | information used in DASY system to align probe sensor X to the robot coordinate system                                                                  |

## Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

## Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not affect the E<sup>2</sup>-field uncertainty inside TSL (see below ConvF).
- NORM(f)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* frequency\_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP<sub>x,y,z</sub>**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; D<sub>x,y,z</sub>; VR<sub>x,y,z</sub>**: A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM<sub>x,y,z</sub> \* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from  $\pm 50$  MHz to  $\pm 100$  MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM<sub>x</sub> (no uncertainty required).

# Probe ES3DV2

## SN:3022

Manufactured: April 15, 2003  
Calibrated: August 26, 2015

Calibrated for DASY/EASY Systems  
(Note: non-compatible with DASY2 system!)

# DASY/EASY - Parameters of Probe: ES3DV2 - SN:3022

## Basic Calibration Parameters

|                                                           | Sensor X | Sensor Y | Sensor Z | Unc (k=2)     |
|-----------------------------------------------------------|----------|----------|----------|---------------|
| Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup> | 1.00     | 1.03     | 0.95     | $\pm 10.1 \%$ |
| DCP (mV) <sup>B</sup>                                     | 99.9     | 99.7     | 100.9    |               |

## Modulation Calibration Parameters

| UID       | Communication System Name                     |   | A<br>dB | B<br>dB $\sqrt{\mu\text{V}}$ | C    | D<br>dB | VR<br>mV | Unc <sup>E</sup><br>(k=2) |
|-----------|-----------------------------------------------|---|---------|------------------------------|------|---------|----------|---------------------------|
| 0         | CW                                            | X | 0.0     | 0.0                          | 1.0  | 0.00    | 179.6    | $\pm 3.3 \%$              |
|           |                                               | Y | 0.0     | 0.0                          | 1.0  |         | 183.9    |                           |
|           |                                               | Z | 0.0     | 0.0                          | 1.0  |         | 179.0    |                           |
| 10010-CAA | SAR Validation (Square, 100ms, 10ms)          | X | 3.60    | 65.9                         | 14.2 | 10.00   | 43.5     | $\pm 2.2 \%$              |
|           |                                               | Y | 2.84    | 63.5                         | 13.0 |         | 43.3     |                           |
|           |                                               | Z | 2.76    | 63.7                         | 12.7 |         | 41.7     |                           |
| 10011-CAB | UMTS-FDD (WCDMA)                              | X | 3.32    | 67.0                         | 18.7 | 2.91    | 144.4    | $\pm 0.7 \%$              |
|           |                                               | Y | 3.24    | 66.3                         | 18.0 |         | 147.3    |                           |
|           |                                               | Z | 3.19    | 66.3                         | 18.0 |         | 143.5    |                           |
| 10012-CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)      | X | 3.15    | 69.9                         | 19.5 | 1.87    | 146.1    | $\pm 0.7 \%$              |
|           |                                               | Y | 2.88    | 67.7                         | 18.0 |         | 147.9    |                           |
|           |                                               | Z | 2.78    | 67.4                         | 17.8 |         | 145.6    |                           |
| 10013-CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps) | X | 11.40   | 71.3                         | 23.8 | 9.46    | 144.9    | $\pm 3.3 \%$              |
|           |                                               | Y | 11.15   | 70.5                         | 23.1 |         | 146.9    |                           |
|           |                                               | Z | 10.95   | 70.5                         | 23.3 |         | 140.3    |                           |
| 10021-DAB | GSM-FDD (TDMA, GMSK)                          | X | 20.66   | 99.8                         | 29.2 | 9.39    | 132.6    | $\pm 2.2 \%$              |
|           |                                               | Y | 14.36   | 93.3                         | 26.6 |         | 145.3    |                           |
|           |                                               | Z | 17.17   | 97.2                         | 27.8 |         | 145.4    |                           |
| 10023-DAB | GPRS-FDD (TDMA, GMSK, TN 0)                   | X | 17.22   | 96.5                         | 28.2 | 9.57    | 125.4    | $\pm 1.9 \%$              |
|           |                                               | Y | 11.06   | 88.6                         | 25.0 |         | 136.0    |                           |
|           |                                               | Z | 8.71    | 84.6                         | 23.4 |         | 130.7    |                           |
| 10024-DAB | GPRS-FDD (TDMA, GMSK, TN 0-1)                 | X | 31.05   | 99.5                         | 25.9 | 6.56    | 135.2    | $\pm 2.2 \%$              |
|           |                                               | Y | 25.28   | 97.4                         | 25.0 |         | 132.5    |                           |
|           |                                               | Z | 21.58   | 95.7                         | 24.5 |         | 144.4    |                           |
| 10027-DAB | GPRS-FDD (TDMA, GMSK, TN 0-1-2)               | X | 42.88   | 99.9                         | 24.0 | 4.80    | 129.5    | $\pm 1.9 \%$              |
|           |                                               | Y | 40.80   | 99.6                         | 23.7 |         | 124.9    |                           |
|           |                                               | Z | 38.42   | 99.7                         | 23.7 |         | 137.8    |                           |
| 10028-DAB | GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)             | X | 44.48   | 100.0                        | 23.2 | 3.55    | 138.2    | $\pm 1.9 \%$              |
|           |                                               | Y | 44.03   | 99.7                         | 22.8 |         | 133.0    |                           |
|           |                                               | Z | 41.36   | 99.8                         | 22.8 |         | 147.5    |                           |
| 10032-CAA | IEEE 802.15.1 Bluetooth (GFSK, DH5)           | X | 16.08   | 99.5                         | 23.3 | 1.16    | 127.5    | $\pm 1.4 \%$              |
|           |                                               | Y | 79.69   | 99.6                         | 19.3 |         | 146.2    |                           |
|           |                                               | Z | 45.81   | 99.9                         | 20.4 |         | 138.2    |                           |
| 10100-CAB | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)      | X | 6.43    | 67.4                         | 19.8 | 5.67    | 138.7    | $\pm 1.4 \%$              |
|           |                                               | Y | 6.27    | 66.8                         | 19.2 |         | 134.9    |                           |
|           |                                               | Z | 6.16    | 66.6                         | 19.2 |         | 127.6    |                           |

|           |                                          |   |       |      |      |      |       |        |
|-----------|------------------------------------------|---|-------|------|------|------|-------|--------|
| 10103-CAB | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK) | X | 10.13 | 75.0 | 25.9 | 9.29 | 129.4 | ±3.3 % |
|           |                                          | Y | 9.46  | 73.0 | 24.5 |      | 131.8 |        |
|           |                                          | Z | 9.52  | 74.0 | 25.4 |      | 137.0 |        |
| 10108-CAC | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK) | X | 6.27  | 66.9 | 19.7 | 5.80 | 137.0 | ±1.7 % |
|           |                                          | Y | 6.24  | 66.7 | 19.3 |      | 140.0 |        |
|           |                                          | Z | 6.06  | 66.3 | 19.2 |      | 127.1 |        |
| 10117-CAB | IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK) | X | 10.16 | 68.7 | 21.3 | 8.07 | 127.7 | ±2.2 % |
|           |                                          | Y | 9.99  | 68.2 | 20.9 |      | 131.5 |        |
|           |                                          | Z | 10.22 | 69.1 | 21.4 |      | 141.6 |        |
| 10151-CAB | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)  | X | 9.34  | 73.4 | 25.2 | 9.28 | 125.0 | ±3.3 % |
|           |                                          | Y | 8.92  | 72.2 | 24.3 |      | 127.2 |        |
|           |                                          | Z | 8.95  | 73.1 | 25.1 |      | 131.9 |        |
| 10154-CAC | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)  | X | 5.95  | 66.4 | 19.4 | 5.75 | 134.4 | ±1.4 % |
|           |                                          | Y | 5.92  | 66.2 | 19.1 |      | 137.0 |        |
|           |                                          | Z | 5.98  | 66.7 | 19.5 |      | 146.8 |        |
| 10160-CAB | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)  | X | 6.39  | 66.9 | 19.6 | 5.82 | 139.9 | ±1.7 % |
|           |                                          | Y | 6.35  | 66.7 | 19.3 |      | 141.9 |        |
|           |                                          | Z | 6.15  | 66.2 | 19.2 |      | 128.4 |        |
| 10169-CAB | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)    | X | 4.96  | 66.6 | 19.8 | 5.73 | 137.3 | ±1.4 % |
|           |                                          | Y | 4.85  | 66.1 | 19.3 |      | 139.8 |        |
|           |                                          | Z | 4.85  | 66.6 | 19.7 |      | 146.7 |        |
| 10172-CAB | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)    | X | 8.75  | 78.7 | 28.3 | 9.21 | 138.9 | ±3.0 % |
|           |                                          | Y | 7.69  | 75.1 | 26.1 |      | 140.1 |        |
|           |                                          | Z | 7.80  | 76.6 | 27.2 |      | 144.0 |        |
| 10175-CAC | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)    | X | 4.88  | 66.2 | 19.6 | 5.72 | 132.0 | ±1.4 % |
|           |                                          | Y | 4.77  | 65.8 | 19.1 |      | 132.6 |        |
|           |                                          | Z | 4.83  | 66.5 | 19.6 |      | 146.0 |        |
| 10181-CAB | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)    | X | 4.91  | 66.3 | 19.7 | 5.72 | 131.7 | ±1.4 % |
|           |                                          | Y | 4.82  | 66.0 | 19.2 |      | 138.4 |        |
|           |                                          | Z | 4.86  | 66.7 | 19.7 |      | 145.7 |        |
| 10196-CAB | IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)  | X | 10.04 | 69.1 | 21.7 | 8.10 | 140.9 | ±2.2 % |
|           |                                          | Y | 9.62  | 67.9 | 20.8 |      | 125.2 |        |
|           |                                          | Z | 9.74  | 68.6 | 21.3 |      | 133.3 |        |
| 10225-CAB | UMTS-FDD (HSPA+)                         | X | 7.01  | 67.1 | 19.6 | 5.97 | 143.7 | ±1.4 % |
|           |                                          | Y | 6.78  | 66.2 | 19.0 |      | 129.3 |        |
|           |                                          | Z | 6.80  | 66.7 | 19.3 |      | 136.5 |        |
| 10237-CAB | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)    | X | 8.55  | 78.0 | 27.9 | 9.21 | 134.6 | ±3.0 % |
|           |                                          | Y | 7.79  | 75.6 | 26.3 |      | 141.6 |        |
|           |                                          | Z | 7.89  | 76.9 | 27.4 |      | 145.2 |        |
| 10252-CAB | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)  | X | 9.30  | 74.8 | 26.1 | 9.24 | 134.8 | ±3.3 % |
|           |                                          | Y | 8.65  | 72.5 | 24.5 |      | 136.4 |        |
|           |                                          | Z | 8.33  | 72.3 | 24.8 |      | 126.6 |        |
| 10267-CAB | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK) | X | 10.20 | 76.2 | 26.8 | 9.30 | 144.8 | ±3.3 % |
|           |                                          | Y | 9.41  | 73.7 | 25.1 |      | 145.9 |        |
|           |                                          | Z | 9.18  | 73.9 | 25.6 |      | 138.6 |        |

|           |                                                               |   |       |      |      |      |       |        |
|-----------|---------------------------------------------------------------|---|-------|------|------|------|-------|--------|
| 10275-CAB | UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)                      | X | 4.45  | 66.7 | 18.9 | 3.96 | 147.0 | ±0.9 % |
|           |                                                               | Y | 4.21  | 65.5 | 17.9 |      | 126.5 |        |
|           |                                                               | Z | 4.36  | 66.5 | 18.5 |      | 148.0 |        |
| 10291-AAB | CDMA2000, RC3, SO55, Full Rate                                | X | 3.57  | 66.3 | 18.5 | 3.46 | 134.3 | ±0.7 % |
|           |                                                               | Y | 3.48  | 65.6 | 17.8 |      | 136.8 |        |
|           |                                                               | Z | 3.51  | 66.2 | 18.3 |      | 136.4 |        |
| 10292-AAB | CDMA2000, RC3, SO32, Full Rate                                | X | 3.53  | 66.4 | 18.6 | 3.39 | 135.8 | ±0.7 % |
|           |                                                               | Y | 3.45  | 65.8 | 17.9 |      | 140.4 |        |
|           |                                                               | Z | 3.50  | 66.5 | 18.5 |      | 137.0 |        |
| 10297-AAA | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)                       | X | 6.18  | 66.5 | 19.5 | 5.81 | 129.4 | ±1.4 % |
|           |                                                               | Y | 6.15  | 66.3 | 19.1 |      | 133.6 |        |
|           |                                                               | Z | 6.13  | 66.5 | 19.3 |      | 131.2 |        |
| 10311-AAA | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)                      | X | 6.77  | 67.2 | 19.9 | 6.06 | 134.8 | ±1.7 % |
|           |                                                               | Y | 6.81  | 67.3 | 19.7 |      | 144.8 |        |
|           |                                                               | Z | 6.68  | 67.1 | 19.7 |      | 136.7 |        |
| 10400-AAC | IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)           | X | 10.30 | 69.4 | 22.0 | 8.37 | 142.0 | ±2.5 % |
|           |                                                               | Y | 9.90  | 68.2 | 21.1 |      | 126.8 |        |
|           |                                                               | Z | 10.15 | 69.3 | 21.9 |      | 142.6 |        |
| 10403-AAB | CDMA2000 (1xEV-DO, Rev. 0)                                    | X | 4.72  | 68.1 | 18.9 | 3.76 | 147.8 | ±0.7 % |
|           |                                                               | Y | 4.56  | 67.5 | 18.2 |      | 133.6 |        |
|           |                                                               | Z | 4.61  | 68.2 | 18.7 |      | 147.4 |        |
| 10404-AAB | CDMA2000 (1xEV-DO, Rev. A)                                    | X | 4.57  | 67.8 | 18.8 | 3.77 | 144.3 | ±0.7 % |
|           |                                                               | Y | 4.43  | 67.3 | 18.1 |      | 131.3 |        |
|           |                                                               | Z | 4.57  | 68.3 | 18.8 |      | 145.0 |        |
| 10415-AAA | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)     | X | 2.64  | 67.9 | 18.7 | 1.54 | 142.1 | ±0.5 % |
|           |                                                               | Y | 2.36  | 65.4 | 16.8 |      | 130.3 |        |
|           |                                                               | Z | 2.50  | 66.7 | 17.7 |      | 145.0 |        |
| 10416-AAA | IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle) | X | 10.04 | 69.0 | 21.7 | 8.23 | 138.8 | ±2.2 % |
|           |                                                               | Y | 9.71  | 68.0 | 20.9 |      | 125.6 |        |
|           |                                                               | Z | 9.94  | 69.0 | 21.6 |      | 140.4 |        |

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

<sup>A</sup> The uncertainties of Norm X,Y,Z do not affect the  $E^2$ -field uncertainty inside TSL (see Pages 7 and 8).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: ES3DV2 - SN:3022

### Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unc (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-----------|
| 750                  | 41.9                               | 0.89                            | 6.33    | 6.33    | 6.33    | 0.46               | 1.43                    | ± 12.0 %  |
| 835                  | 41.5                               | 0.90                            | 6.11    | 6.11    | 6.11    | 0.24               | 2.08                    | ± 12.0 %  |
| 1750                 | 40.1                               | 1.37                            | 5.08    | 5.08    | 5.08    | 0.45               | 1.47                    | ± 12.0 %  |
| 1900                 | 40.0                               | 1.40                            | 4.93    | 4.93    | 4.93    | 0.59               | 1.25                    | ± 12.0 %  |
| 2300                 | 39.5                               | 1.67                            | 4.63    | 4.63    | 4.63    | 0.55               | 1.39                    | ± 12.0 %  |
| 2450                 | 39.2                               | 1.80                            | 4.30    | 4.30    | 4.30    | 0.51               | 1.47                    | ± 12.0 %  |
| 2600                 | 39.0                               | 1.96                            | 4.12    | 4.12    | 4.12    | 0.57               | 1.46                    | ± 12.0 %  |

<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## DASY/EASY - Parameters of Probe: ES3DV2 - SN:3022

### Calibration Parameter Determined in Body Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unc (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-----------|
| 750                  | 55.5                               | 0.96                            | 6.16    | 6.16    | 6.16    | 0.50               | 1.34                    | ± 12.0 %  |
| 835                  | 55.2                               | 0.97                            | 6.13    | 6.13    | 6.13    | 0.25               | 2.16                    | ± 12.0 %  |
| 1750                 | 53.4                               | 1.49                            | 4.79    | 4.79    | 4.79    | 0.61               | 1.33                    | ± 12.0 %  |
| 1900                 | 53.3                               | 1.52                            | 4.56    | 4.56    | 4.56    | 0.31               | 2.02                    | ± 12.0 %  |
| 2300                 | 52.9                               | 1.81                            | 4.32    | 4.32    | 4.32    | 0.79               | 1.19                    | ± 12.0 %  |
| 2450                 | 52.7                               | 1.95                            | 4.08    | 4.08    | 4.08    | 0.80               | 1.12                    | ± 12.0 %  |
| 2600                 | 52.5                               | 2.16                            | 3.96    | 3.96    | 3.96    | 0.80               | 1.10                    | ± 12.0 %  |

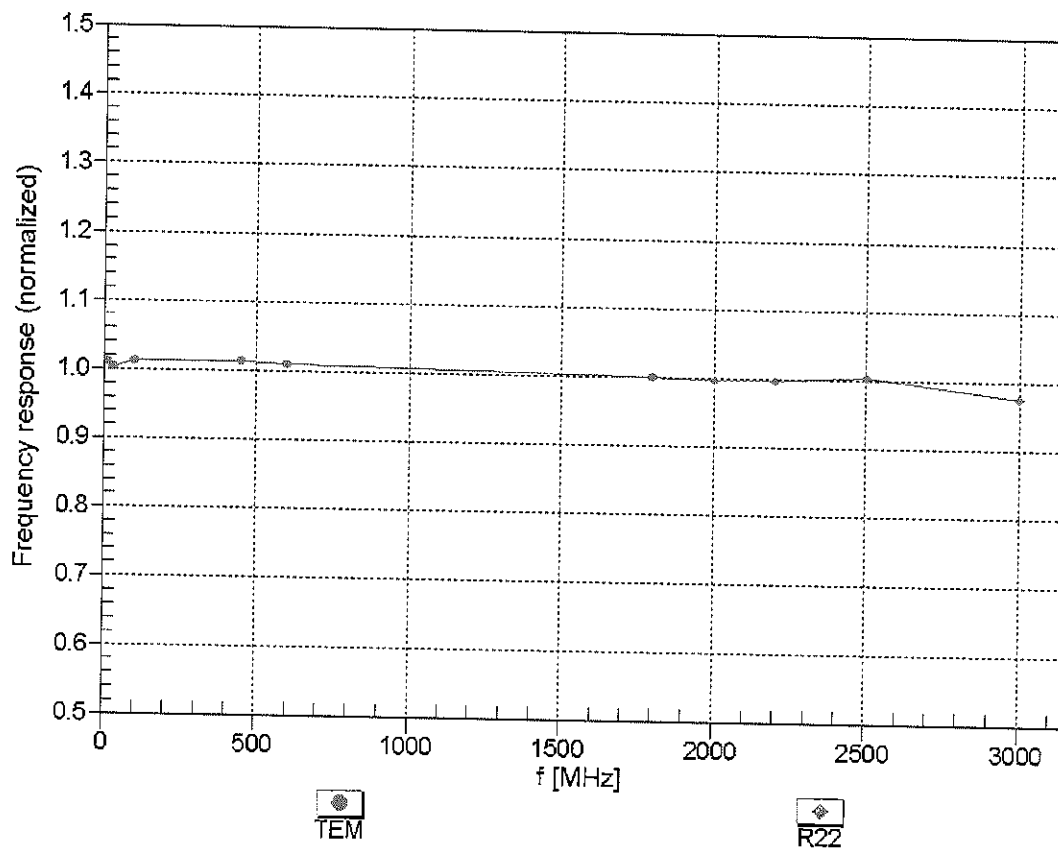
<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## Frequency Response of E-Field

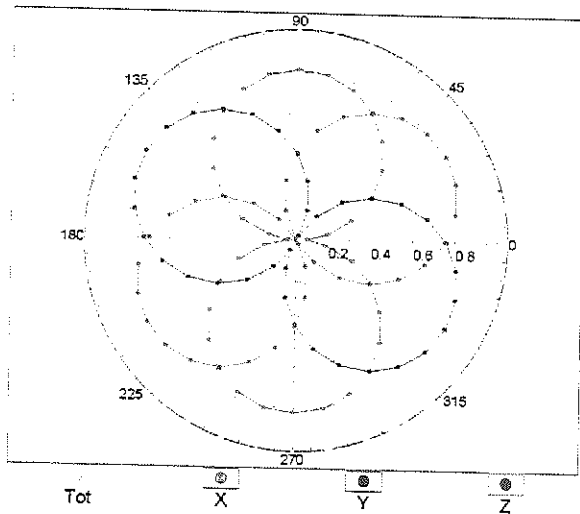
(TEM-Cell: ifi110 EXX, Waveguide: R22)



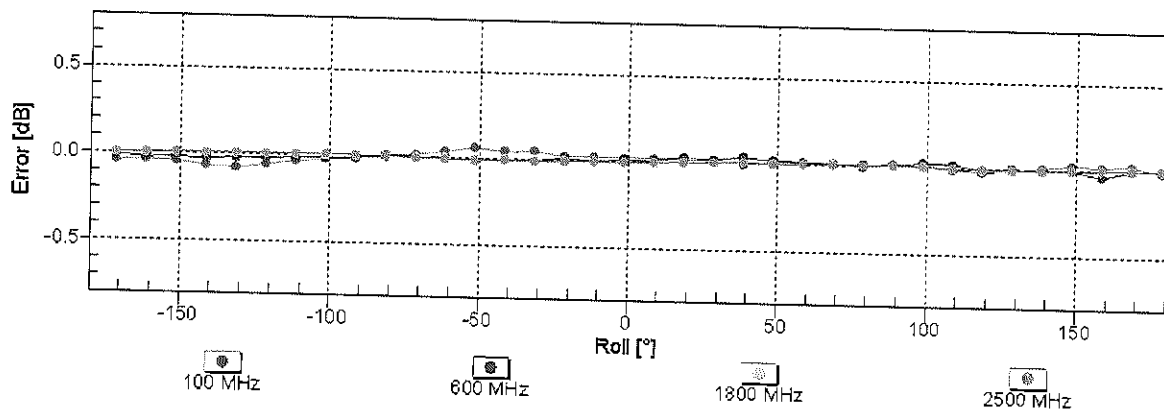
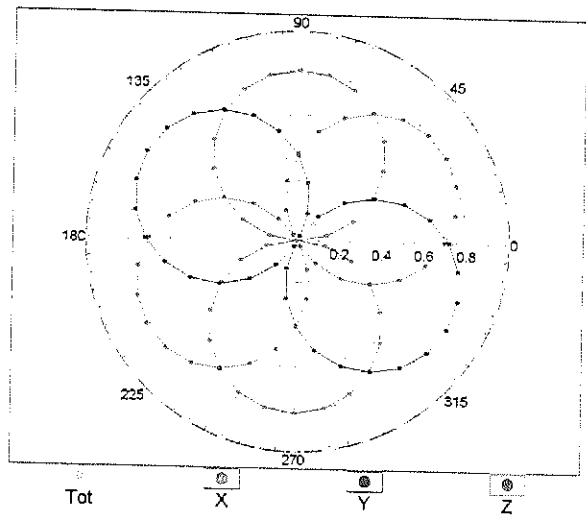
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

## Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$

f=600 MHz, TEM

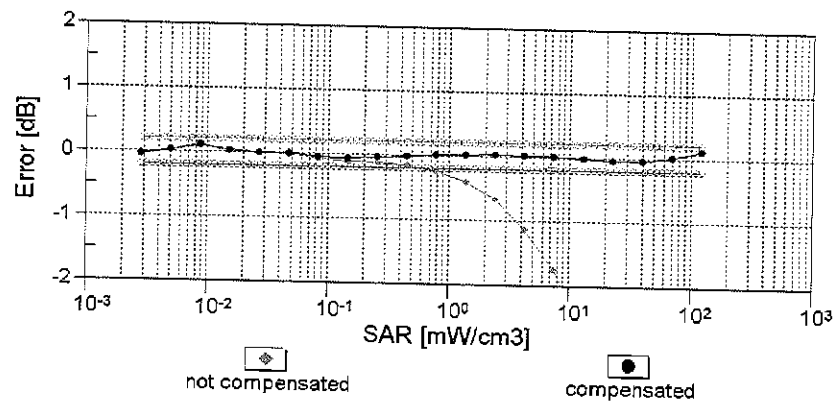
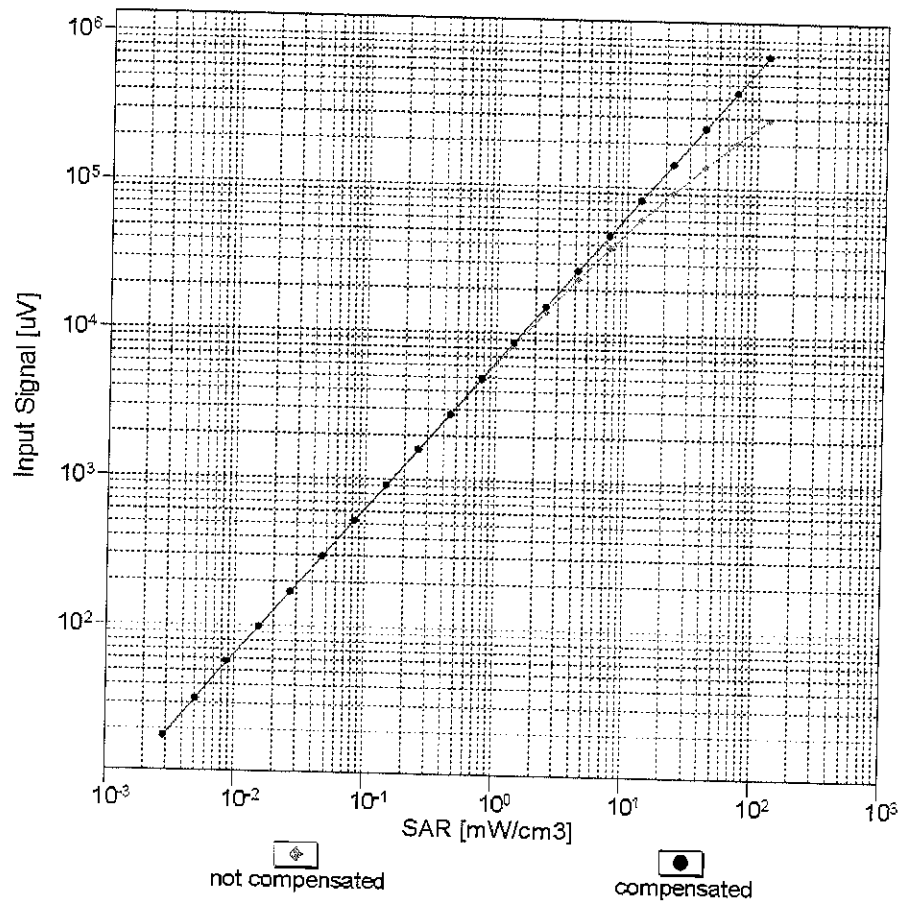


f=1800 MHz, R22



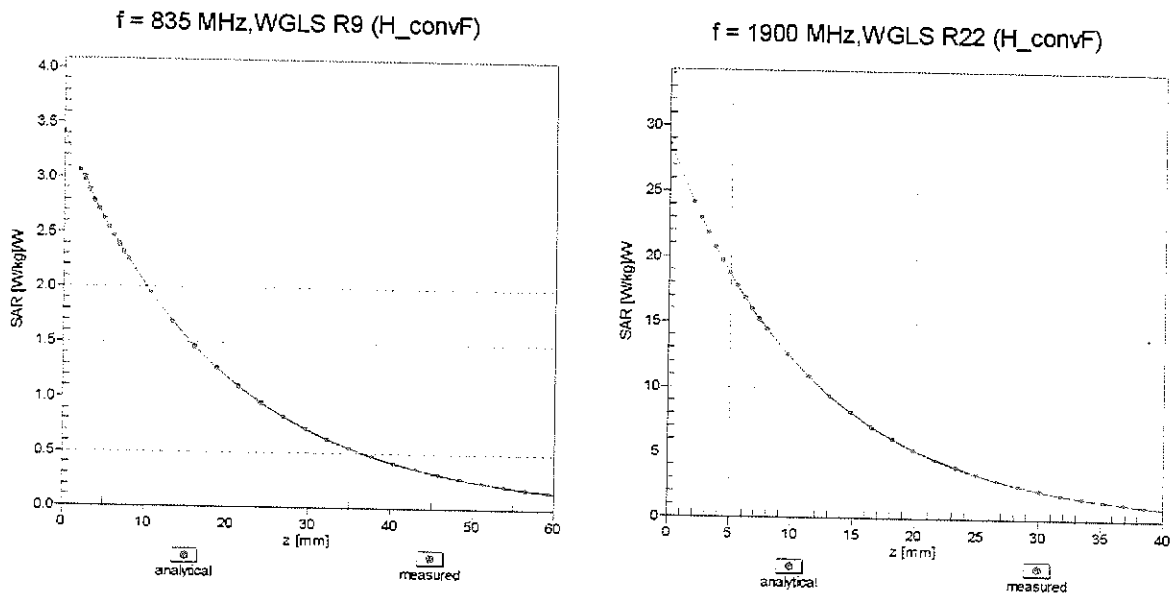
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

# Dynamic Range $f(\text{SAR}_{\text{head}})$ (TEM cell , $f_{\text{eval}} = 1900 \text{ MHz}$ )



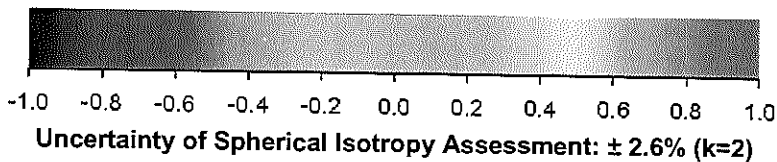
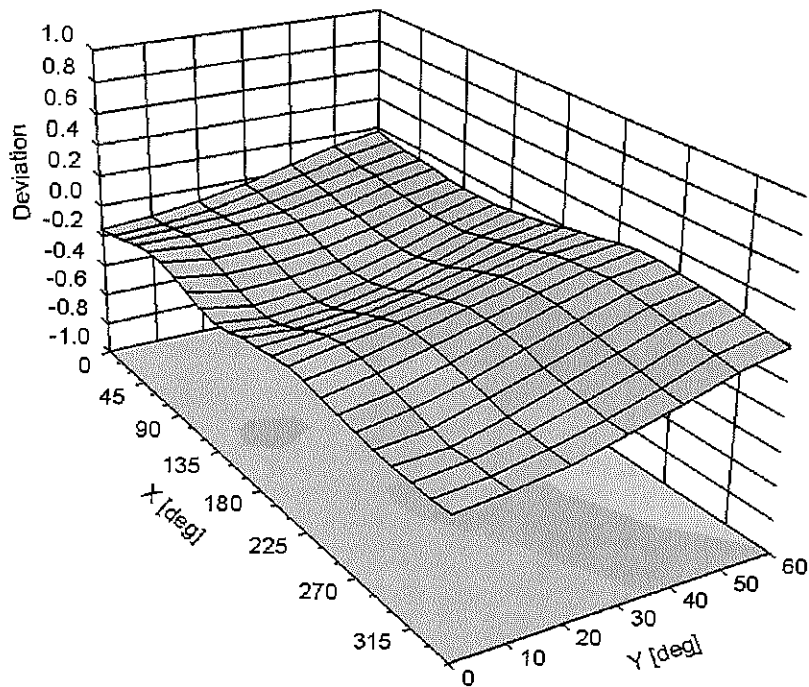
Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

# Conversion Factor Assessment



## Deviation from Isotropy in Liquid

Error ( $\phi, \vartheta$ ), f = 900 MHz



## DASY/EASY - Parameters of Probe: ES3DV2 - SN:3022

### Other Probe Parameters

|                                               |            |
|-----------------------------------------------|------------|
| Sensor Arrangement                            | Triangular |
| Connector Angle (°)                           | 98.5       |
| Mechanical Surface Detection Mode             | enabled    |
| Optical Surface Detection Mode                | disabled   |
| Probe Overall Length                          | 337 mm     |
| Probe Body Diameter                           | 10 mm      |
| Tip Length                                    | 10 mm      |
| Tip Diameter                                  | 4 mm       |
| Probe Tip to Sensor X Calibration Point       | 2 mm       |
| Probe Tip to Sensor Y Calibration Point       | 2 mm       |
| Probe Tip to Sensor Z Calibration Point       | 2 mm       |
| Recommended Measurement Distance from Surface | 3 mm       |



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The Swiss Accreditation Service is one of the signatories to the EA  
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **ES3-3263\_May15**

## CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3263**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6**  
**Calibration procedure for dosimetric E-field probes**

Calibration date: **May 20, 2015**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID              | Cal Date (Certificate No.)        | Scheduled Calibration  |
|----------------------------|-----------------|-----------------------------------|------------------------|
| Power meter E4419B         | GB41293874      | 01-Apr-15 (No. 217-02128)         | Mar-16                 |
| Power sensor E4412A        | MY41498087      | 01-Apr-15 (No. 217-02128)         | Mar-16                 |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 01-Apr-15 (No. 217-02129)         | Mar-16                 |
| Reference 20 dB Attenuator | SN: S5277 (20x) | 01-Apr-15 (No. 217-02132)         | Mar-16                 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 01-Apr-15 (No. 217-02133)         | Mar-16                 |
| Reference Probe ES3DV2     | SN: 3013        | 30-Dec-14 (No. ES3-3013_Dec14)    | Dec-15                 |
| DAE4                       | SN: 660         | 14-Jan-15 (No. DAE4-660_Jan15)    | Jan-16                 |
| Secondary Standards        | ID              | Check Date (in house)             | Scheduled Check        |
| RF generator HP 8648C      | US3642U01700    | 4-Aug-99 (in house check Apr-13)  | In house check: Apr-16 |
| Network Analyzer HP 8753E  | US37390585      | 18-Oct-01 (in house check Oct-14) | In house check: Oct-15 |

|                |                              |                                          |               |
|----------------|------------------------------|------------------------------------------|---------------|
| Calibrated by: | Name<br><b>Leif Klysner</b>  | Function<br><b>Laboratory Technician</b> | Signature<br> |
| Approved by:   | Name<br><b>Katja Pokovic</b> | Function<br><b>Technical Manager</b>     | Signature<br> |

Issued: May 19, 2015

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

*BN ✓*  
*5/28/15*



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Accreditation No.: **SCS 0108**

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## Glossary:

|                          |                                                                                                                                                         |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| TSL                      | tissue simulating liquid                                                                                                                                |
| NORM <sub>x,y,z</sub>    | sensitivity in free space                                                                                                                               |
| ConvF                    | sensitivity in TSL / NORM <sub>x,y,z</sub>                                                                                                              |
| DCP                      | diode compression point                                                                                                                                 |
| CF                       | crest factor (1/duty_cycle) of the RF signal                                                                                                            |
| A, B, C, D               | modulation dependent linearization parameters                                                                                                           |
| Polarization $\phi$      | $\phi$ rotation around probe axis                                                                                                                       |
| Polarization $\vartheta$ | $\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center),<br>i.e., $\vartheta = 0$ is normal to probe axis |
| Connector Angle          | information used in DASY system to align probe sensor X to the robot coordinate system                                                                  |

## Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

## Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not affect the  $E^2$ -field uncertainty inside TSL (see below *ConvF*).
- NORM(f)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* frequency\_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- DCP<sub>x,y,z</sub>**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; D<sub>x,y,z</sub>; VR<sub>x,y,z</sub>**: A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM<sub>x,y,z</sub> \* ConvF whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from  $\pm 50$  MHz to  $\pm 100$  MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM<sub>x</sub> (no uncertainty required).

# Probe ES3DV3

## SN:3263

Manufactured: January 25, 2010  
Calibrated: May 20, 2015

Calibrated for DASY/EASY Systems  
(Note: non-compatible with DASY2 system!)

# DASY/EASY - Parameters of Probe: ES3DV3 - SN:3263

## Basic Calibration Parameters

|                                                           | Sensor X | Sensor Y | Sensor Z | Unc (k=2)     |
|-----------------------------------------------------------|----------|----------|----------|---------------|
| Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup> | 1.21     | 1.25     | 1.13     | $\pm 10.1 \%$ |
| DCP (mV) <sup>B</sup>                                     | 106.1    | 103.6    | 108.3    |               |

## Modulation Calibration Parameters

| UID       | Communication System Name                     |   | A<br>dB | B<br>dB $\sqrt{\mu\text{V}}$ | C    | D<br>dB | VR<br>mV | Unc <sup>E</sup><br>(k=2) |
|-----------|-----------------------------------------------|---|---------|------------------------------|------|---------|----------|---------------------------|
| 0         | CW                                            | X | 0.0     | 0.0                          | 1.0  | 0.00    | 205.3    | $\pm 3.3 \%$              |
|           |                                               | Y | 0.0     | 0.0                          | 1.0  |         | 207.3    |                           |
|           |                                               | Z | 0.0     | 0.0                          | 1.0  |         | 199.5    |                           |
| 10010-CAA | SAR Validation (Square, 100ms, 10ms)          | X | 1.83    | 58.4                         | 9.4  | 10.00   | 41.2     | $\pm 1.4 \%$              |
|           |                                               | Y | 3.88    | 63.3                         | 12.9 |         | 47.5     |                           |
|           |                                               | Z | 1.42    | 56.8                         | 8.7  |         | 39.5     |                           |
| 10011-CAB | UMTS-FDD (WCDMA)                              | X | 3.27    | 67.4                         | 18.6 | 2.91    | 140.1    | $\pm 0.7 \%$              |
|           |                                               | Y | 3.39    | 67.5                         | 18.7 |         | 142.7    |                           |
|           |                                               | Z | 3.32    | 67.6                         | 18.6 |         | 136.9    |                           |
| 10012-CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)      | X | 2.85    | 68.8                         | 18.8 | 1.87    | 142.2    | $\pm 0.7 \%$              |
|           |                                               | Y | 3.38    | 70.7                         | 19.5 |         | 144.8    |                           |
|           |                                               | Z | 3.07    | 70.0                         | 19.1 |         | 138.1    |                           |
| 10013-CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps) | X | 10.99   | 70.8                         | 23.4 | 9.46    | 135.9    | $\pm 2.5 \%$              |
|           |                                               | Y | 11.36   | 70.3                         | 22.8 |         | 124.7    |                           |
|           |                                               | Z | 10.57   | 70.0                         | 22.9 |         | 129.4    |                           |
| 10021-DAB | GSM-FDD (TDMA, GMSK)                          | X | 9.38    | 84.7                         | 22.1 | 9.39    | 139.8    | $\pm 1.9 \%$              |
|           |                                               | Y | 27.79   | 100.0                        | 28.7 |         | 129.4    |                           |
|           |                                               | Z | 9.29    | 86.8                         | 23.8 |         | 134.5    |                           |
| 10023-DAB | GPRS-FDD (TDMA, GMSK, TN 0)                   | X | 9.63    | 84.9                         | 22.1 | 9.57    | 134.1    | $\pm 2.5 \%$              |
|           |                                               | Y | 25.29   | 98.2                         | 28.2 |         | 124.0    |                           |
|           |                                               | Z | 9.65    | 87.7                         | 24.3 |         | 128.2    |                           |
| 10024-DAB | GPRS-FDD (TDMA, GMSK, TN 0-1)                 | X | 16.20   | 88.9                         | 21.0 | 6.56    | 145.2    | $\pm 1.4 \%$              |
|           |                                               | Y | 41.82   | 99.7                         | 25.6 |         | 128.5    |                           |
|           |                                               | Z | 24.57   | 96.8                         | 24.1 |         | 142.0    |                           |
| 10027-DAB | GPRS-FDD (TDMA, GMSK, TN 0-1-2)               | X | 55.77   | 99.6                         | 22.1 | 4.80    | 138.5    | $\pm 2.2 \%$              |
|           |                                               | Y | 53.39   | 99.7                         | 23.9 |         | 140.5    |                           |
|           |                                               | Z | 40.28   | 99.6                         | 23.2 |         | 134.3    |                           |
| 10028-DAB | GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)             | X | 81.43   | 99.8                         | 20.7 | 3.55    | 148.6    | $\pm 1.7 \%$              |
|           |                                               | Y | 60.49   | 99.7                         | 22.9 |         | 146.0    |                           |
|           |                                               | Z | 62.69   | 99.6                         | 21.2 |         | 145.0    |                           |
| 10032-CAA | IEEE 802.15.1 Bluetooth (GFSK, DH5)           | X | 96.06   | 93.7                         | 16.0 | 1.16    | 140.3    | $\pm 1.9 \%$              |
|           |                                               | Y | 77.08   | 99.9                         | 20.1 |         | 149.0    |                           |
|           |                                               | Z | 99.64   | 99.9                         | 18.6 |         | 138.0    |                           |
| 10100-CAB | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)      | X | 6.24    | 67.2                         | 19.6 | 5.67    | 131.7    | $\pm 1.4 \%$              |
|           |                                               | Y | 6.39    | 67.3                         | 19.5 |         | 133.8    |                           |
|           |                                               | Z | 6.19    | 67.2                         | 19.6 |         | 126.8    |                           |

|           |                                          |   |       |      |      |      |       |        |
|-----------|------------------------------------------|---|-------|------|------|------|-------|--------|
| 10103-CAB | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK) | X | 10.13 | 76.3 | 26.6 | 9.29 | 142.6 | ±2.7 % |
|           |                                          | Y | 12.07 | 77.9 | 26.6 |      | 138.9 |        |
|           |                                          | Z | 9.41  | 74.3 | 25.6 |      | 134.1 |        |
| 10108-CAC | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK) | X | 6.13  | 66.9 | 19.5 | 5.80 | 129.6 | ±1.4 % |
|           |                                          | Y | 6.35  | 67.1 | 19.5 |      | 133.7 |        |
|           |                                          | Z | 6.39  | 68.0 | 20.1 |      | 150.0 |        |
| 10117-CAB | IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK) | X | 10.34 | 69.6 | 21.7 | 8.07 | 147.0 | ±1.9 % |
|           |                                          | Y | 10.05 | 68.3 | 20.9 |      | 123.4 |        |
|           |                                          | Z | 10.08 | 69.1 | 21.3 |      | 138.2 |        |
| 10151-CAB | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)  | X | 9.44  | 75.3 | 26.3 | 9.28 | 137.0 | ±3.5 % |
|           |                                          | Y | 11.36 | 76.9 | 26.3 |      | 134.5 |        |
|           |                                          | Z | 8.85  | 73.5 | 25.3 |      | 130.3 |        |
| 10154-CAC | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)  | X | 5.79  | 66.2 | 19.2 | 5.75 | 126.9 | ±1.2 % |
|           |                                          | Y | 6.05  | 66.5 | 19.3 |      | 130.9 |        |
|           |                                          | Z | 5.92  | 66.9 | 19.5 |      | 145.5 |        |
| 10160-CAB | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)  | X | 6.25  | 66.9 | 19.5 | 5.82 | 131.8 | ±1.4 % |
|           |                                          | Y | 6.47  | 67.0 | 19.5 |      | 135.4 |        |
|           |                                          | Z | 6.09  | 66.5 | 19.3 |      | 127.5 |        |
| 10169-CAB | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)    | X | 4.78  | 66.7 | 19.7 | 5.73 | 130.0 | ±1.2 % |
|           |                                          | Y | 5.14  | 66.7 | 19.5 |      | 135.0 |        |
|           |                                          | Z | 4.83  | 67.1 | 19.9 |      | 147.9 |        |
| 10172-CAB | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)    | X | 8.63  | 80.4 | 29.1 | 9.21 | 147.7 | ±2.7 % |
|           |                                          | Y | 9.72  | 78.5 | 27.2 |      | 123.9 |        |
|           |                                          | Z | 7.63  | 76.7 | 27.2 |      | 142.5 |        |
| 10175-CAC | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)    | X | 4.75  | 66.6 | 19.6 | 5.72 | 128.2 | ±1.2 % |
|           |                                          | Y | 5.12  | 66.6 | 19.5 |      | 134.3 |        |
|           |                                          | Z | 4.87  | 67.1 | 19.9 |      | 148.0 |        |
| 10181-CAB | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)    | X | 4.76  | 66.6 | 19.6 | 5.72 | 127.9 | ±1.2 % |
|           |                                          | Y | 5.12  | 66.6 | 19.5 |      | 134.5 |        |
|           |                                          | Z | 4.87  | 67.3 | 20.0 |      | 147.0 |        |
| 10196-CAB | IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)  | X | 9.87  | 69.1 | 21.6 | 8.10 | 135.8 | ±2.2 % |
|           |                                          | Y | 10.19 | 69.1 | 21.4 |      | 145.3 |        |
|           |                                          | Z | 9.65  | 68.8 | 21.3 |      | 130.5 |        |
| 10225-CAB | UMTS-FDD (HSPA+)                         | X | 6.90  | 67.2 | 19.5 | 5.97 | 139.2 | ±1.7 % |
|           |                                          | Y | 7.22  | 67.3 | 19.6 |      | 148.0 |        |
|           |                                          | Z | 6.75  | 67.0 | 19.4 |      | 134.1 |        |
| 10237-CAB | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)    | X | 8.68  | 80.6 | 29.2 | 9.21 | 148.0 | ±3.0 % |
|           |                                          | Y | 9.82  | 78.8 | 27.3 |      | 125.0 |        |
|           |                                          | Z | 7.85  | 77.6 | 27.7 |      | 143.5 |        |
| 10252-CAB | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)  | X | 8.56  | 73.7 | 25.6 | 9.24 | 126.6 | ±3.5 % |
|           |                                          | Y | 10.58 | 76.0 | 25.9 |      | 126.3 |        |
|           |                                          | Z | 8.84  | 74.8 | 26.1 |      | 146.7 |        |
| 10267-CAB | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK) | X | 9.24  | 74.6 | 25.9 | 9.30 | 133.6 | ±3.3 % |
|           |                                          | Y | 11.38 | 76.9 | 26.2 |      | 134.3 |        |
|           |                                          | Z | 8.79  | 73.2 | 25.1 |      | 128.6 |        |

|           |                                                               |   |       |      |      |      |       |        |
|-----------|---------------------------------------------------------------|---|-------|------|------|------|-------|--------|
| 10275-CAB | UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)                      | X | 4.39  | 67.0 | 18.9 | 3.96 | 143.8 | ±0.9 % |
|           |                                                               | Y | 4.55  | 67.1 | 18.8 |      | 147.3 |        |
|           |                                                               | Z | 4.42  | 67.4 | 19.0 |      | 139.9 |        |
| 10291-AAB | CDMA2000, RC3, SO55, Full Rate                                | X | 3.59  | 67.2 | 18.9 | 3.46 | 132.2 | ±0.5 % |
|           |                                                               | Y | 3.68  | 66.7 | 18.5 |      | 136.0 |        |
|           |                                                               | Z | 3.57  | 67.1 | 18.6 |      | 128.5 |        |
| 10292-AAB | CDMA2000, RC3, SO32, Full Rate                                | X | 3.50  | 67.0 | 18.7 | 3.39 | 134.0 | ±0.7 % |
|           |                                                               | Y | 3.62  | 66.6 | 18.4 |      | 138.6 |        |
|           |                                                               | Z | 3.50  | 67.2 | 18.7 |      | 129.8 |        |
| 10297-AAA | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)                       | X | 6.11  | 66.8 | 19.4 | 5.81 | 127.7 | ±1.4 % |
|           |                                                               | Y | 6.33  | 67.0 | 19.5 |      | 132.1 |        |
|           |                                                               | Z | 6.28  | 67.6 | 19.9 |      | 146.6 |        |
| 10311-AAA | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)                      | X | 6.71  | 67.5 | 19.9 | 6.06 | 134.2 | ±1.7 % |
|           |                                                               | Y | 6.93  | 67.7 | 19.9 |      | 138.0 |        |
|           |                                                               | Z | 6.57  | 67.2 | 19.6 |      | 128.0 |        |
| 10400-AAC | IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)           | X | 10.17 | 69.5 | 21.9 | 8.37 | 138.5 | ±2.5 % |
|           |                                                               | Y | 10.55 | 69.5 | 21.8 |      | 148.0 |        |
|           |                                                               | Z | 9.92  | 69.0 | 21.6 |      | 132.5 |        |
| 10403-AAB | CDMA2000 (1xEV-DO, Rev. 0)                                    | X | 4.79  | 69.2 | 19.1 | 3.76 | 144.1 | ±0.7 % |
|           |                                                               | Y | 4.71  | 67.0 | 18.2 |      | 129.2 |        |
|           |                                                               | Z | 4.72  | 69.3 | 19.2 |      | 139.3 |        |
| 10404-AAB | CDMA2000 (1xEV-DO, Rev. A)                                    | X | 4.69  | 69.2 | 19.2 | 3.77 | 142.1 | ±0.7 % |
|           |                                                               | Y | 4.71  | 67.5 | 18.5 |      | 126.7 |        |
|           |                                                               | Z | 4.51  | 68.6 | 18.8 |      | 137.3 |        |
| 10415-AAA | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)     | X | 2.55  | 68.0 | 18.5 | 1.54 | 141.7 | ±0.7 % |
|           |                                                               | Y | 2.67  | 68.4 | 18.6 |      | 144.0 |        |
|           |                                                               | Z | 2.98  | 70.8 | 19.5 |      | 138.0 |        |
| 10416-AAA | IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle) | X | 10.01 | 69.3 | 21.8 | 8.23 | 137.3 | ±2.5 % |
|           |                                                               | Y | 10.31 | 69.3 | 21.6 |      | 146.0 |        |
|           |                                                               | Z | 9.69  | 68.8 | 21.4 |      | 129.9 |        |

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the  $E^2$ -field uncertainty inside TSL (see Pages 7 and 8).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3263

### Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unct. (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-------------|
| 750                  | 41.9                               | 0.89                            | 6.27    | 6.27    | 6.27    | 0.29               | 1.87                    | ± 12.0 %    |
| 835                  | 41.5                               | 0.90                            | 6.18    | 6.18    | 6.18    | 0.49               | 1.42                    | ± 12.0 %    |
| 1750                 | 40.1                               | 1.37                            | 5.27    | 5.27    | 5.27    | 0.49               | 1.46                    | ± 12.0 %    |
| 1900                 | 40.0                               | 1.40                            | 4.96    | 4.96    | 4.96    | 0.66               | 1.28                    | ± 12.0 %    |
| 2300                 | 39.5                               | 1.67                            | 4.63    | 4.63    | 4.63    | 0.58               | 1.41                    | ± 12.0 %    |
| 2450                 | 39.2                               | 1.80                            | 4.40    | 4.40    | 4.40    | 0.71               | 1.34                    | ± 12.0 %    |
| 2600                 | 39.0                               | 1.96                            | 4.25    | 4.25    | 4.25    | 0.80               | 1.25                    | ± 12.0 %    |

<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3263

### Calibration Parameter Determined in Body Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unct. (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-------------|
| 750                  | 55.5                               | 0.96                            | 6.07    | 6.07    | 6.07    | 0.53               | 1.42                    | ± 12.0 %    |
| 835                  | 55.2                               | 0.97                            | 6.08    | 6.08    | 6.08    | 0.57               | 1.36                    | ± 12.0 %    |
| 1750                 | 53.4                               | 1.49                            | 4.88    | 4.88    | 4.88    | 0.54               | 1.50                    | ± 12.0 %    |
| 1900                 | 53.3                               | 1.52                            | 4.66    | 4.66    | 4.66    | 0.56               | 1.51                    | ± 12.0 %    |
| 2300                 | 52.9                               | 1.81                            | 4.42    | 4.42    | 4.42    | 0.69               | 1.33                    | ± 12.0 %    |
| 2450                 | 52.7                               | 1.95                            | 4.28    | 4.28    | 4.28    | 0.80               | 1.08                    | ± 12.0 %    |
| 2600                 | 52.5                               | 2.16                            | 4.11    | 4.11    | 4.11    | 0.80               | 1.09                    | ± 12.0 %    |

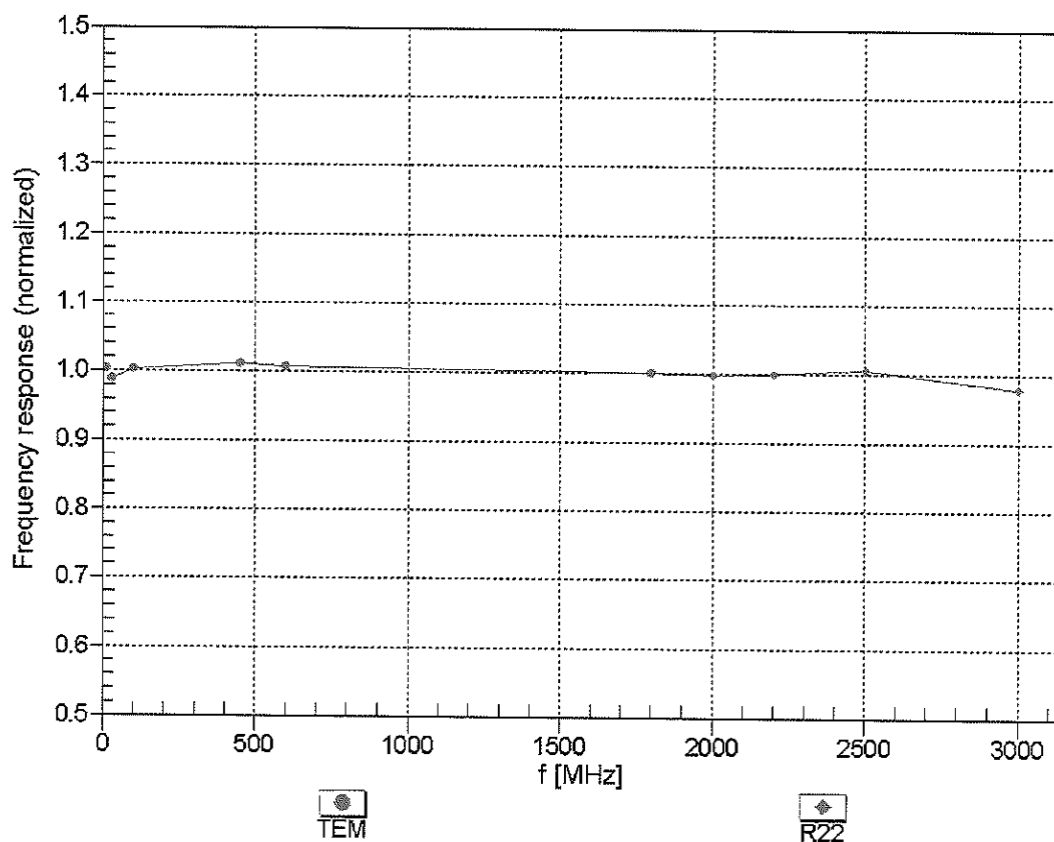
<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## Frequency Response of E-Field

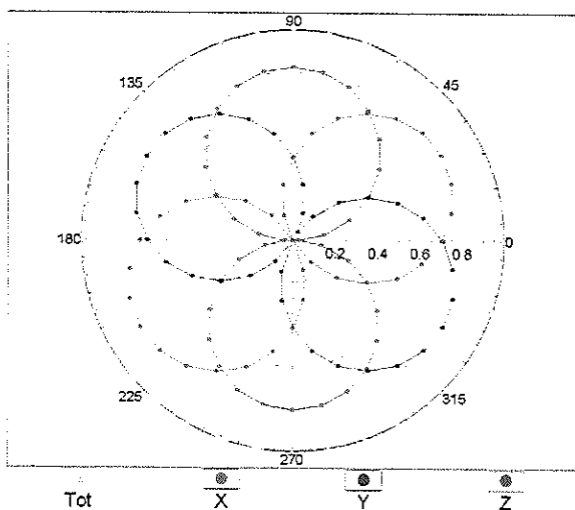
(TEM-Cell:ifi110 EXX, Waveguide: R22)



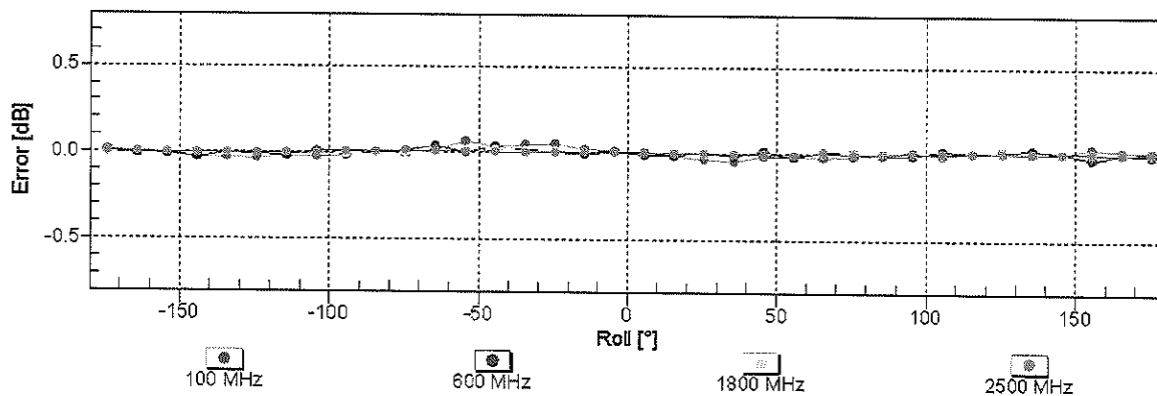
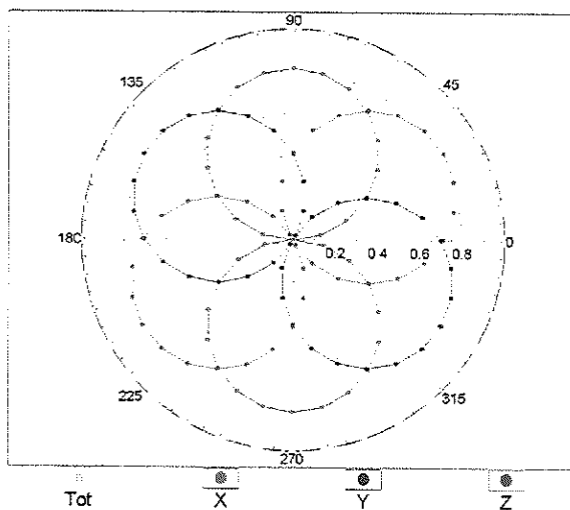
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

## Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$

f=600 MHz,TEM

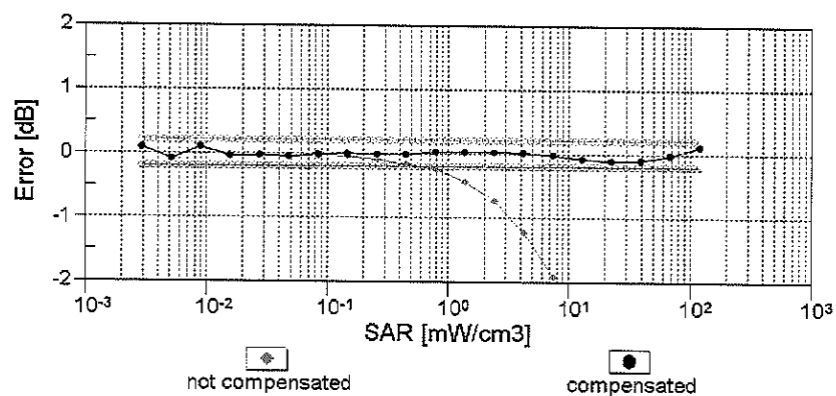
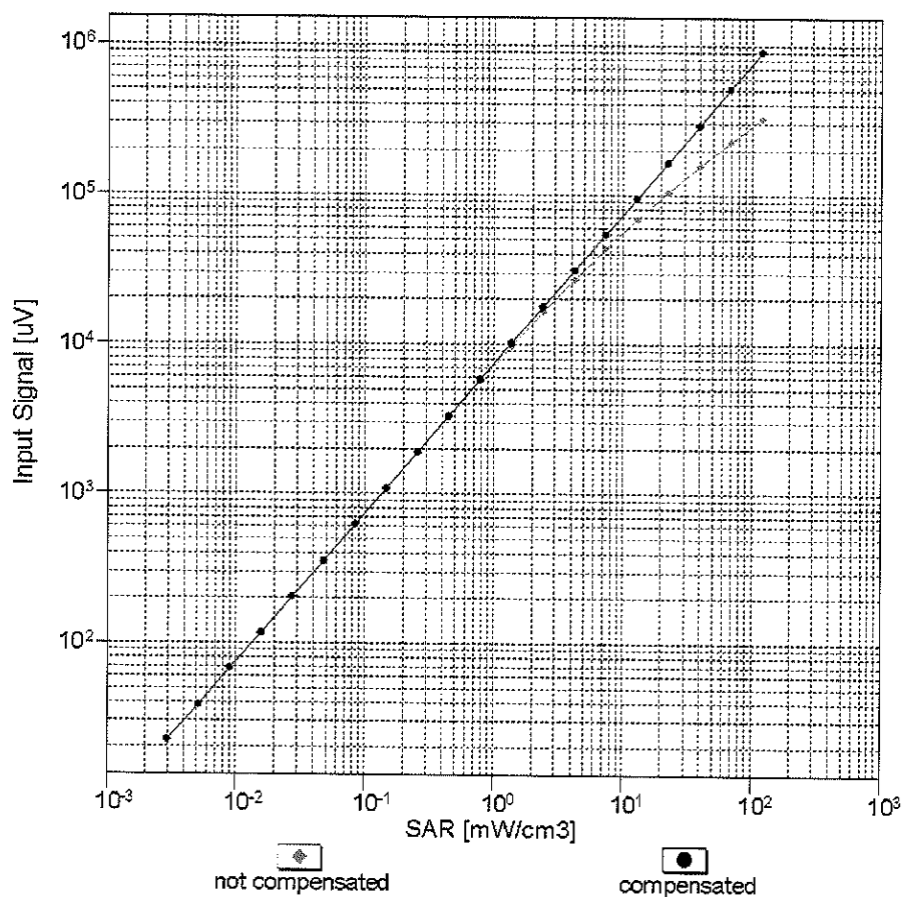


f=1800 MHz,R22



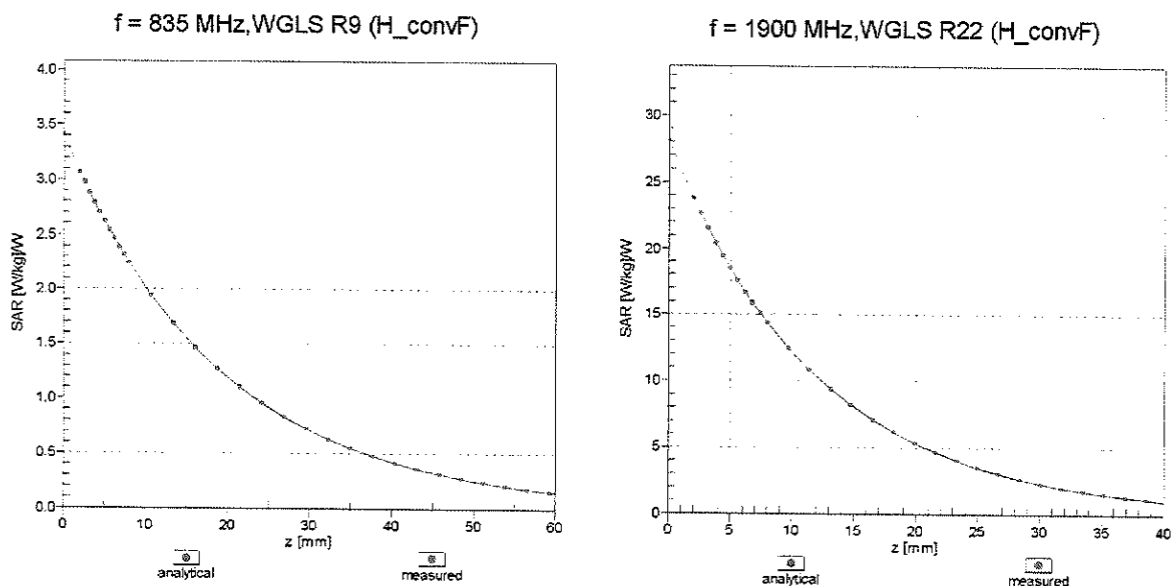
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

# Dynamic Range $f(\text{SAR}_{\text{head}})$ (TEM cell, $f_{\text{eval}} = 1900 \text{ MHz}$ )



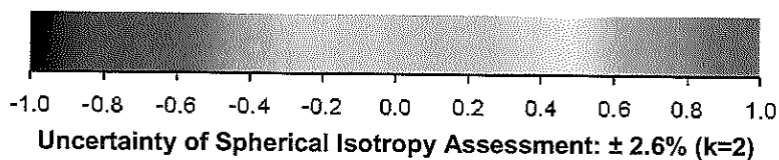
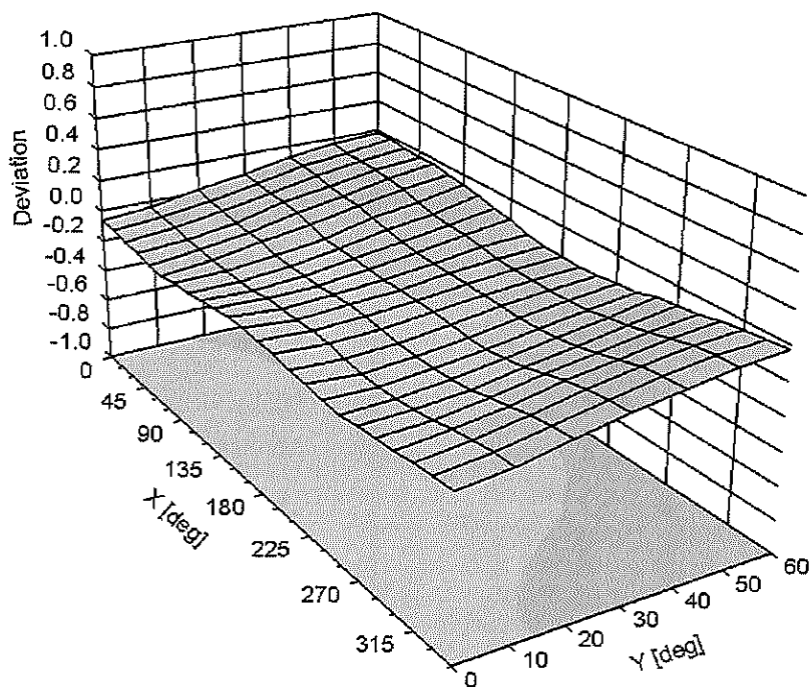
Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

## Conversion Factor Assessment



## Deviation from Isotropy in Liquid

Error ( $\phi, \theta$ ),  $f = 900 \text{ MHz}$



## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3263

### Other Probe Parameters

|                                               |            |
|-----------------------------------------------|------------|
| Sensor Arrangement                            | Triangular |
| Connector Angle (°)                           | 65.6       |
| Mechanical Surface Detection Mode             | enabled    |
| Optical Surface Detection Mode                | disabled   |
| Probe Overall Length                          | 337 mm     |
| Probe Body Diameter                           | 10 mm      |
| Tip Length                                    | 10 mm      |
| Tip Diameter                                  | 4 mm       |
| Probe Tip to Sensor X Calibration Point       | 2 mm       |
| Probe Tip to Sensor Y Calibration Point       | 2 mm       |
| Probe Tip to Sensor Z Calibration Point       | 2 mm       |
| Recommended Measurement Distance from Surface | 3 mm       |



Accredited by the Swiss Accreditation Service (SAS)  
The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **ES3-3351\_Jun15**

## CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3351**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6**  
**Calibration procedure for dosimetric E-field probes**

Calibration date: **June 22, 2015**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature  $(22 \pm 3)^\circ\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID              | Cal Date (Certificate No.)        | Scheduled Calibration  |
|----------------------------|-----------------|-----------------------------------|------------------------|
| Power meter E4419B         | GB41293874      | 01-Apr-15 (No. 217-02128)         | Mar-16                 |
| Power sensor E4412A        | MY41498087      | 01-Apr-15 (No. 217-02128)         | Mar-16                 |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 01-Apr-15 (No. 217-02129)         | Mar-16                 |
| Reference 20 dB Attenuator | SN: S5277 (20x) | 01-Apr-15 (No. 217-02132)         | Mar-16                 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 01-Apr-15 (No. 217-02133)         | Mar-16                 |
| Reference Probe ES3DV2     | SN: 3013        | 30-Dec-14 (No. ES3-3013_Dec14)    | Dec-15                 |
| DAE4                       | SN: 660         | 14-Jan-15 (No. DAE4-660_Jan15)    | Jan-16                 |
| Secondary Standards        | ID              | Check Date (in house)             | Scheduled Check        |
| RF generator HP 8648C      | US3642U01700    | 4-Aug-99 (in house check Apr-13)  | In house check: Apr-16 |
| Network Analyzer HP 8753E  | US37390585      | 18-Oct-01 (in house check Oct-14) | In house check: Oct-15 |

|                                                                                                                 |                             |                                          |                       |
|-----------------------------------------------------------------------------------------------------------------|-----------------------------|------------------------------------------|-----------------------|
| Calibrated by:                                                                                                  | Name<br><b>Leif Klysner</b> | Function<br><b>Laboratory Technician</b> | Signature<br>         |
| Approved by:                                                                                                    | <b>Katja Pokovic</b>        | <b>Technical Manager</b>                 |                       |
|                                                                                                                 |                             |                                          | Issued: June 22, 2015 |
| This calibration certificate shall not be reproduced except in full without written approval of the laboratory. |                             |                                          |                       |



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Accreditation No.: **SCS 0108**

The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

## Glossary:

|                          |                                                                                                                                                         |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| TSL                      | tissue simulating liquid                                                                                                                                |
| NORM <sub>x,y,z</sub>    | sensitivity in free space                                                                                                                               |
| ConvF                    | sensitivity in TSL / NORM <sub>x,y,z</sub>                                                                                                              |
| DCP                      | diode compression point                                                                                                                                 |
| CF                       | crest factor (1/duty_cycle) of the RF signal                                                                                                            |
| A, B, C, D               | modulation dependent linearization parameters                                                                                                           |
| Polarization $\phi$      | $\phi$ rotation around probe axis                                                                                                                       |
| Polarization $\vartheta$ | $\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center),<br>i.e., $\vartheta = 0$ is normal to probe axis |
| Connector Angle          | information used in DASY system to align probe sensor X to the robot coordinate system                                                                  |

## Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

## Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not affect the E<sup>2</sup>-field uncertainty inside TSL (see below *ConvF*).
- NORM(f)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* frequency\_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- DCP<sub>x,y,z</sub>**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; D<sub>x,y,z</sub>; VR<sub>x,y,z</sub>**: A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM<sub>x,y,z</sub> \* ConvF whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from  $\pm 50$  MHz to  $\pm 100$  MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM<sub>x</sub> (no uncertainty required).

# Probe ES3DV3

## SN:3351

Manufactured: May 22, 2012  
Calibrated: June 22, 2015

Calibrated for DASY/EASY Systems  
(Note: non-compatible with DASY2 system!)

# DASY/EASY - Parameters of Probe: ES3DV3 - SN:3351

## Basic Calibration Parameters

|                                       | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|---------------------------------------|----------|----------|----------|-----------|
| Norm ( $\mu V/(V/m)^2$ ) <sup>A</sup> | 0.99     | 1.17     | 1.19     | ± 10.1 %  |
| DCP (mV) <sup>B</sup>                 | 113.6    | 105.2    | 104.5    |           |

## Modulation Calibration Parameters

| UID       | Communication System Name                     |   | A<br>dB | B<br>dB $\sqrt{\mu V}$ | C    | D<br>dB | VR<br>mV | Unc <sup>E</sup><br>(k=2) |
|-----------|-----------------------------------------------|---|---------|------------------------|------|---------|----------|---------------------------|
| 0         | CW                                            | X | 0.0     | 0.0                    | 1.0  | 0.00    | 188.8    | ±3.8 %                    |
|           |                                               | Y | 0.0     | 0.0                    | 1.0  |         | 196.2    |                           |
|           |                                               | Z | 0.0     | 0.0                    | 1.0  |         | 151.3    |                           |
| 10010-CAA | SAR Validation (Square, 100ms, 10ms)          | X | 2.73    | 65.7                   | 12.7 | 10.00   | 35.9     | ±1.2 %                    |
|           |                                               | Y | 1.18    | 58.1                   | 9.8  |         | 37.4     |                           |
|           |                                               | Z | 2.44    | 61.9                   | 12.5 |         | 42.0     |                           |
| 10011-CAB | UMTS-FDD (WCDMA)                              | X | 3.43    | 68.2                   | 18.9 | 2.91    | 148.5    | ±0.5 %                    |
|           |                                               | Y | 3.14    | 66.5                   | 18.1 |         | 114.3    |                           |
|           |                                               | Z | 3.26    | 66.5                   | 18.1 |         | 119.3    |                           |
| 10012-CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)      | X | 3.13    | 70.5                   | 19.4 | 1.87    | 149.0    | ±0.5 %                    |
|           |                                               | Y | 2.46    | 65.9                   | 17.0 |         | 115.2    |                           |
|           |                                               | Z | 3.02    | 68.7                   | 18.5 |         | 120.9    |                           |
| 10013-CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps) | X | 10.59   | 69.9                   | 22.6 | 9.46    | 139.1    | ±2.5 %                    |
|           |                                               | Y | 10.11   | 68.9                   | 22.4 |         | 103.4    |                           |
|           |                                               | Z | 10.74   | 69.4                   | 22.4 |         | 114.3    |                           |
| 10021-DAB | GSM-FDD (TDMA, GMSK)                          | X | 4.33    | 75.1                   | 18.5 | 9.39    | 125.5    | ±1.4 %                    |
|           |                                               | Y | 5.13    | 77.6                   | 20.0 |         | 144.5    |                           |
|           |                                               | Z | 17.70   | 96.1                   | 27.5 |         | 123.5    |                           |
| 10023-DAB | GPRS-FDD (TDMA, GMSK, TN 0)                   | X | 4.56    | 75.8                   | 18.9 | 9.57    | 147.7    | ±2.2 %                    |
|           |                                               | Y | 5.75    | 78.8                   | 20.2 |         | 140.4    |                           |
|           |                                               | Z | 18.60   | 97.9                   | 28.5 |         | 117.3    |                           |
| 10024-DAB | GPRS-FDD (TDMA, GMSK, TN 0-1)                 | X | 3.42    | 71.8                   | 15.3 | 6.56    | 119.6    | ±1.4 %                    |
|           |                                               | Y | 14.95   | 90.8                   | 22.0 |         | 132.7    |                           |
|           |                                               | Z | 29.34   | 98.9                   | 25.6 |         | 106.6    |                           |
| 10027-DAB | GPRS-FDD (TDMA, GMSK, TN 0-1-2)               | X | 28.96   | 99.9                   | 23.5 | 4.80    | 135.7    | ±1.9 %                    |
|           |                                               | Y | 55.26   | 99.9                   | 21.9 |         | 107.5    |                           |
|           |                                               | Z | 35.15   | 99.9                   | 24.6 |         | 120.0    |                           |
| 10028-DAB | GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)             | X | 36.32   | 96.2                   | 20.3 | 3.55    | 147.5    | ±1.9 %                    |
|           |                                               | Y | 73.22   | 99.9                   | 20.7 |         | 117.0    |                           |
|           |                                               | Z | 52.78   | 99.6                   | 22.4 |         | 128.3    |                           |
| 10032-CAA | IEEE 802.15.1 Bluetooth (GFSK, DH5)           | X | 31.23   | 99.5                   | 20.1 | 1.16    | 122.8    | ±1.4 %                    |
|           |                                               | Y | 0.74    | 62.4                   | 7.0  |         | 135.2    |                           |
|           |                                               | Z | 56.68   | 99.6                   | 20.2 |         | 141.5    |                           |
| 10100-CAB | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)      | X | 6.01    | 66.4                   | 18.9 | 5.67    | 112.7    | ±1.2 %                    |
|           |                                               | Y | 6.14    | 66.9                   | 19.3 |         | 124.6    |                           |
|           |                                               | Z | 6.37    | 67.2                   | 19.4 |         | 129.3    |                           |

|           |                                          |   |       |      |      |      |       |        |
|-----------|------------------------------------------|---|-------|------|------|------|-------|--------|
| 10103-CAB | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK) | X | 8.50  | 71.4 | 23.6 | 9.29 | 137.9 | ±2.7 % |
|           |                                          | Y | 8.12  | 70.6 | 23.6 |      | 105.2 |        |
|           |                                          | Z | 9.68  | 73.4 | 24.7 |      | 118.6 |        |
| 10108-CAC | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK) | X | 5.88  | 66.0 | 18.8 | 5.80 | 111.2 | ±1.2 % |
|           |                                          | Y | 5.99  | 66.5 | 19.2 |      | 122.8 |        |
|           |                                          | Z | 6.28  | 66.9 | 19.4 |      | 128.7 |        |
| 10117-CAB | IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK) | X | 10.19 | 69.3 | 21.2 | 8.07 | 149.1 | ±2.2 % |
|           |                                          | Y | 9.73  | 68.2 | 20.9 |      | 111.5 |        |
|           |                                          | Z | 9.97  | 68.3 | 20.8 |      | 117.7 |        |
| 10151-CAB | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)  | X | 8.07  | 71.0 | 23.5 | 9.28 | 132.7 | ±2.5 % |
|           |                                          | Y | 8.82  | 74.2 | 25.9 |      | 147.0 |        |
|           |                                          | Z | 9.11  | 72.5 | 24.4 |      | 115.3 |        |
| 10154-CAC | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)  | X | 5.55  | 65.4 | 18.6 | 5.75 | 107.9 | ±0.9 % |
|           |                                          | Y | 5.67  | 66.0 | 19.0 |      | 120.3 |        |
|           |                                          | Z | 5.96  | 66.3 | 19.1 |      | 126.2 |        |
| 10160-CAB | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)  | X | 5.96  | 65.9 | 18.7 | 5.82 | 111.9 | ±1.2 % |
|           |                                          | Y | 6.12  | 66.6 | 19.3 |      | 125.0 |        |
|           |                                          | Z | 6.38  | 66.8 | 19.3 |      | 131.2 |        |
| 10169-CAB | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)    | X | 4.68  | 66.6 | 19.4 | 5.73 | 130.7 | ±0.9 % |
|           |                                          | Y | 4.81  | 67.2 | 20.0 |      | 144.7 |        |
|           |                                          | Z | 4.74  | 65.5 | 18.9 |      | 109.9 |        |
| 10172-CAB | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)    | X | 6.59  | 73.2 | 25.1 | 9.21 | 143.9 | ±2.5 % |
|           |                                          | Y | 6.42  | 72.7 | 25.3 |      | 113.3 |        |
|           |                                          | Z | 7.92  | 75.5 | 26.2 |      | 127.2 |        |
| 10175-CAC | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)    | X | 4.68  | 66.5 | 19.4 | 5.72 | 128.6 | ±0.9 % |
|           |                                          | Y | 4.80  | 67.2 | 20.0 |      | 144.2 |        |
|           |                                          | Z | 4.73  | 65.5 | 18.9 |      | 109.1 |        |
| 10181-CAB | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)    | X | 4.71  | 66.7 | 19.5 | 5.72 | 128.9 | ±1.2 % |
|           |                                          | Y | 4.78  | 67.1 | 19.9 |      | 143.9 |        |
|           |                                          | Z | 5.12  | 67.3 | 19.9 |      | 149.9 |        |
| 10196-CAB | IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)  | X | 9.72  | 68.8 | 21.1 | 8.10 | 138.3 | ±1.9 % |
|           |                                          | Y | 9.32  | 67.9 | 20.9 |      | 105.9 |        |
|           |                                          | Z | 9.58  | 67.8 | 20.6 |      | 111.2 |        |
| 10225-CAB | UMTS-FDD (HSPA+)                         | X | 6.60  | 66.5 | 18.9 | 5.97 | 117.6 | ±1.2 % |
|           |                                          | Y | 6.69  | 66.9 | 19.3 |      | 132.0 |        |
|           |                                          | Z | 7.08  | 67.2 | 19.5 |      | 139.9 |        |
| 10237-CAB | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)    | X | 6.57  | 73.1 | 25.0 | 9.21 | 144.5 | ±2.2 % |
|           |                                          | Y | 6.59  | 73.6 | 25.8 |      | 114.3 |        |
|           |                                          | Z | 8.03  | 76.0 | 26.4 |      | 127.7 |        |
| 10252-CAB | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)  | X | 7.44  | 70.0 | 23.2 | 9.24 | 122.9 | ±2.5 % |
|           |                                          | Y | 8.16  | 73.3 | 25.5 |      | 138.8 |        |
|           |                                          | Z | 8.43  | 71.6 | 24.1 |      | 108.3 |        |
| 10267-CAB | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK) | X | 8.01  | 70.7 | 23.4 | 9.30 | 130.5 | ±2.7 % |
|           |                                          | Y | 8.86  | 74.4 | 26.1 |      | 146.7 |        |
|           |                                          | Z | 9.12  | 72.6 | 24.5 |      | 114.0 |        |

|           |                                                               |   |       |      |      |      |       |        |
|-----------|---------------------------------------------------------------|---|-------|------|------|------|-------|--------|
| 10275-CAB | UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)                      | X | 4.49  | 67.5 | 18.8 | 3.96 | 146.9 | ±0.7 % |
|           |                                                               | Y | 4.13  | 65.9 | 18.1 |      | 117.5 |        |
|           |                                                               | Z | 4.36  | 66.2 | 18.2 |      | 121.1 |        |
| 10291-AAB | CDMA2000, RC3, SO55, Full Rate                                | X | 3.66  | 67.7 | 18.9 | 3.46 | 133.9 | ±0.5 % |
|           |                                                               | Y | 3.37  | 66.1 | 18.1 |      | 109.3 |        |
|           |                                                               | Z | 3.54  | 66.0 | 18.0 |      | 112.1 |        |
| 10292-AAB | CDMA2000, RC3, SO32, Full Rate                                | X | 3.55  | 67.5 | 18.7 | 3.39 | 136.7 | ±0.7 % |
|           |                                                               | Y | 3.35  | 66.4 | 18.2 |      | 110.1 |        |
|           |                                                               | Z | 3.44  | 65.7 | 17.9 |      | 112.9 |        |
| 10297-AAA | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)                       | X | 5.86  | 65.9 | 18.8 | 5.81 | 109.3 | ±1.2 % |
|           |                                                               | Y | 6.00  | 66.5 | 19.3 |      | 122.6 |        |
|           |                                                               | Z | 6.23  | 66.7 | 19.3 |      | 126.8 |        |
| 10311-AAA | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)                      | X | 6.42  | 66.5 | 19.1 | 6.06 | 114.1 | ±1.2 % |
|           |                                                               | Y | 6.60  | 67.2 | 19.7 |      | 127.9 |        |
|           |                                                               | Z | 6.85  | 67.4 | 19.7 |      | 132.6 |        |
| 10400-AAC | IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)           | X | 10.03 | 69.2 | 21.5 | 8.37 | 141.2 | ±1.9 % |
|           |                                                               | Y | 9.51  | 68.0 | 21.1 |      | 106.9 |        |
|           |                                                               | Z | 9.90  | 68.2 | 21.1 |      | 114.0 |        |
| 10403-AAB | CDMA2000 (1xEV-DO, Rev. 0)                                    | X | 5.00  | 70.6 | 19.6 | 3.76 | 146.5 | ±0.5 % |
|           |                                                               | Y | 4.32  | 67.9 | 18.3 |      | 115.0 |        |
|           |                                                               | Z | 4.63  | 67.5 | 18.3 |      | 121.9 |        |
| 10404-AAB | CDMA2000 (1xEV-DO, Rev. A)                                    | X | 4.99  | 71.0 | 19.8 | 3.77 | 143.8 | ±0.5 % |
|           |                                                               | Y | 4.37  | 68.5 | 18.7 |      | 113.5 |        |
|           |                                                               | Z | 4.56  | 67.5 | 18.2 |      | 120.2 |        |
| 10415-AAA | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)     | X | 3.07  | 71.2 | 19.9 | 1.54 | 145.7 | ±0.5 % |
|           |                                                               | Y | 2.43  | 66.6 | 17.4 |      | 116.6 |        |
|           |                                                               | Z | 2.59  | 67.1 | 17.8 |      | 124.3 |        |
| 10416-AAA | IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle) | X | 9.84  | 69.0 | 21.3 | 8.23 | 139.6 | ±1.9 % |
|           |                                                               | Y | 9.37  | 67.9 | 21.0 |      | 106.5 |        |
|           |                                                               | Z | 9.84  | 68.4 | 21.1 |      | 117.4 |        |

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the  $E^2$ -field uncertainty inside TSL (see Pages 7 and 8).

<sup>B</sup> Numerical linearization parameter; uncertainty not required.

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3351

### Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unct. (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-------------|
| 750                  | 41.9                               | 0.89                            | 6.43    | 6.43    | 6.43    | 0.31               | 1.96                    | ± 12.0 %    |
| 835                  | 41.5                               | 0.90                            | 6.17    | 6.17    | 6.17    | 0.21               | 2.59                    | ± 12.0 %    |
| 1750                 | 40.1                               | 1.37                            | 5.24    | 5.24    | 5.24    | 0.55               | 1.35                    | ± 12.0 %    |
| 1900                 | 40.0                               | 1.40                            | 5.07    | 5.07    | 5.07    | 0.54               | 1.42                    | ± 12.0 %    |
| 2300                 | 39.5                               | 1.67                            | 4.74    | 4.74    | 4.74    | 0.69               | 1.31                    | ± 12.0 %    |
| 2450                 | 39.2                               | 1.80                            | 4.46    | 4.46    | 4.46    | 0.80               | 1.26                    | ± 12.0 %    |
| 2600                 | 39.0                               | 1.96                            | 4.35    | 4.35    | 4.35    | 0.80               | 1.26                    | ± 12.0 %    |

<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3351

### Calibration Parameter Determined in Body Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Uct. (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|------------|
| 750                  | 55.5                               | 0.96                            | 6.21    | 6.21    | 6.21    | 0.29               | 1.98                    | ± 12.0 %   |
| 835                  | 55.2                               | 0.97                            | 6.11    | 6.11    | 6.11    | 0.77               | 1.20                    | ± 12.0 %   |
| 1750                 | 53.4                               | 1.49                            | 4.88    | 4.88    | 4.88    | 0.68               | 1.30                    | ± 12.0 %   |
| 1900                 | 53.3                               | 1.52                            | 4.68    | 4.68    | 4.68    | 0.61               | 1.46                    | ± 12.0 %   |
| 2300                 | 52.9                               | 1.81                            | 4.47    | 4.47    | 4.47    | 0.80               | 1.16                    | ± 12.0 %   |
| 2450                 | 52.7                               | 1.95                            | 4.30    | 4.30    | 4.30    | 0.80               | 1.16                    | ± 12.0 %   |
| 2600                 | 52.5                               | 2.16                            | 4.16    | 4.16    | 4.16    | 0.80               | 1.20                    | ± 12.0 %   |

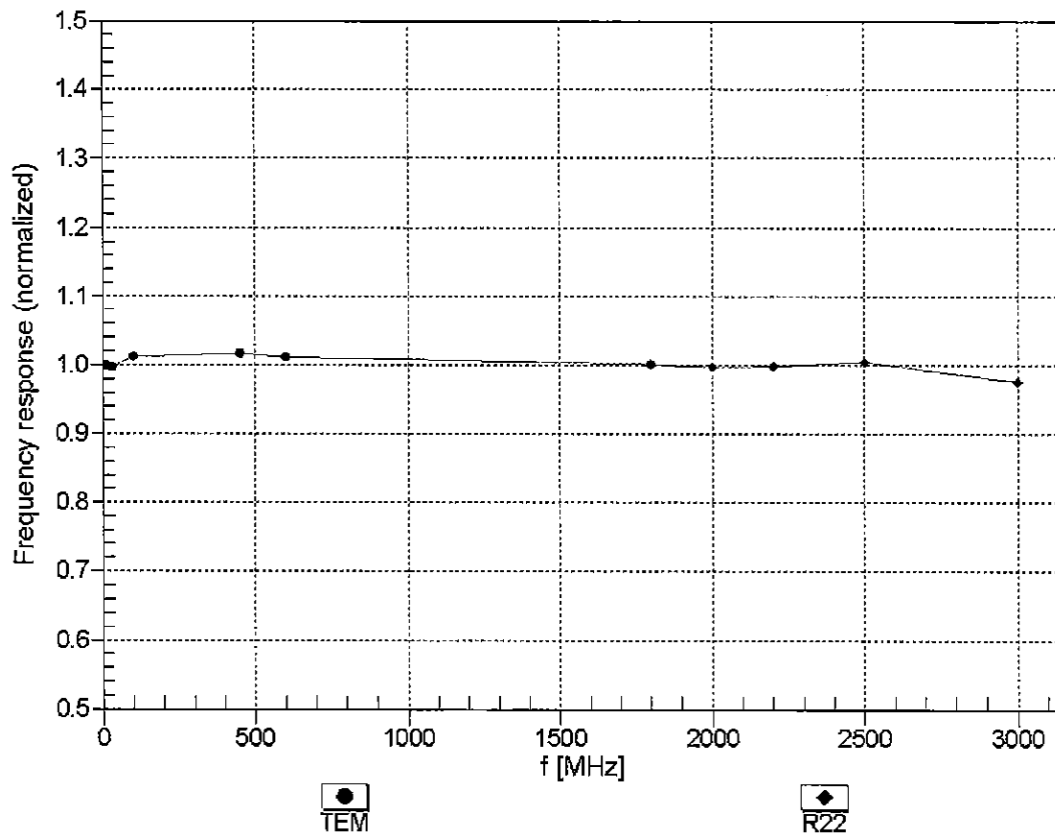
<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## Frequency Response of E-Field

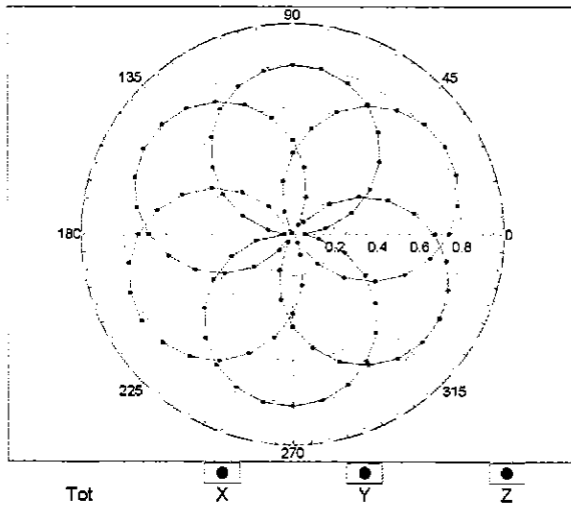
(TEM-Cell:ifi110 EXX, Waveguide: R22)



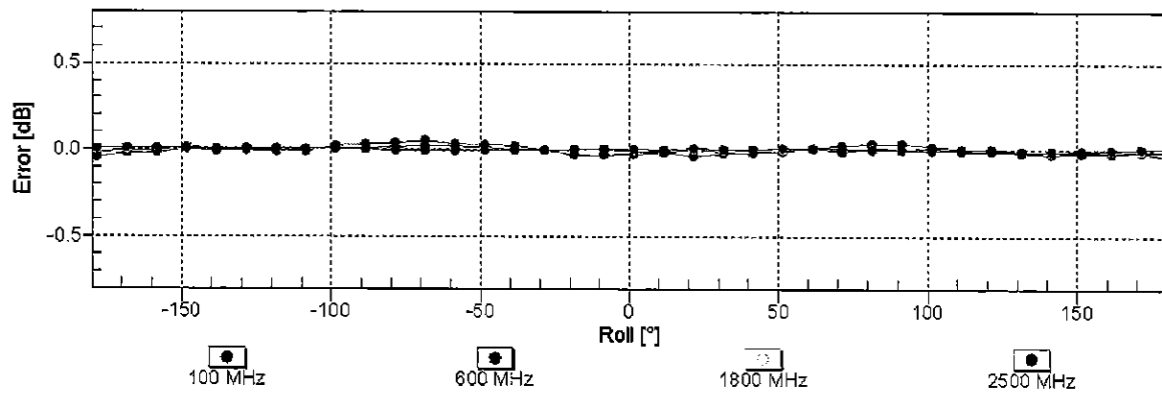
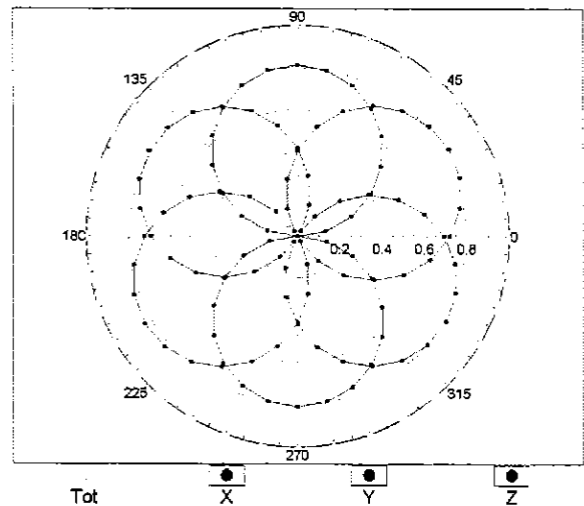
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

## Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$

f=600 MHz,TEM

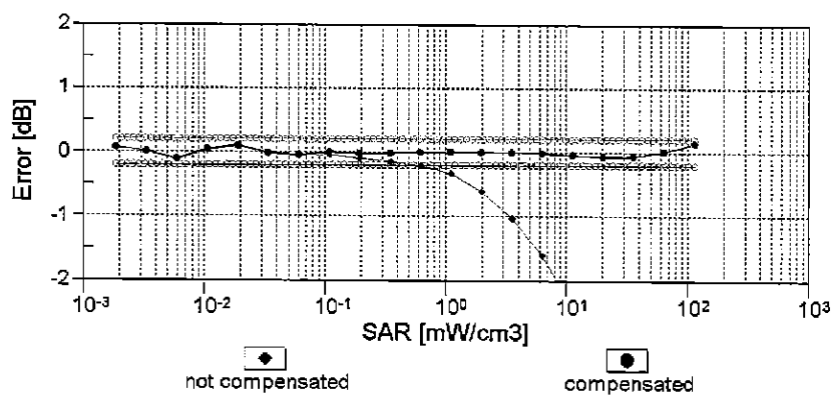
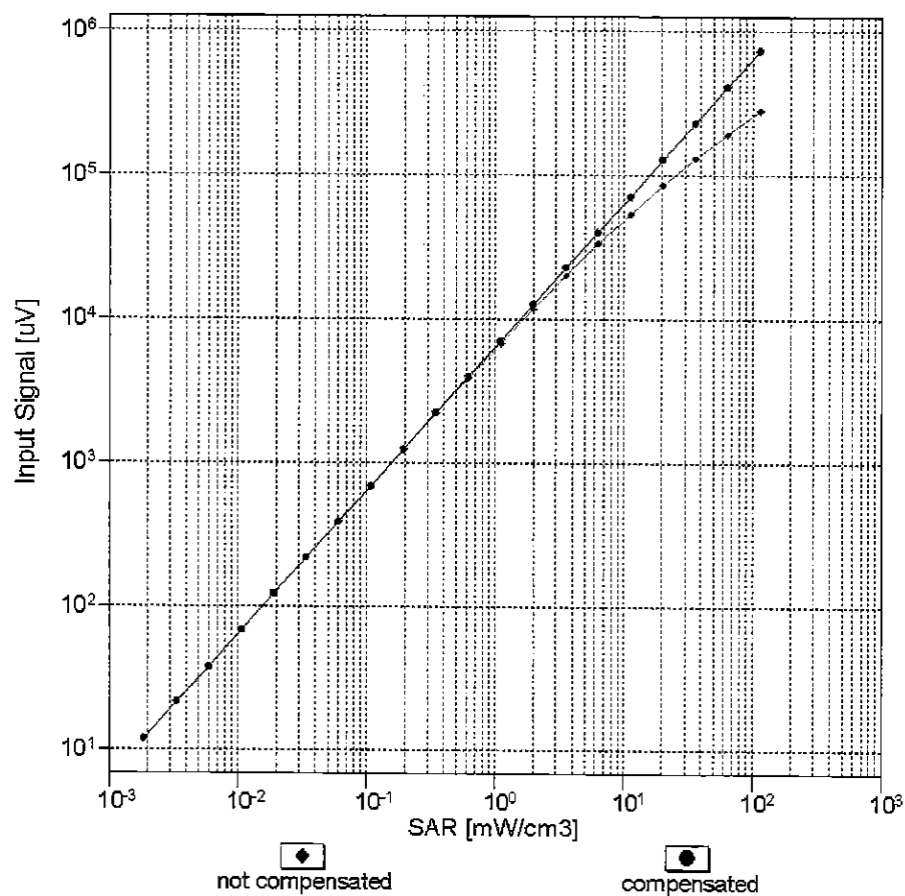


f=1800 MHz,R22



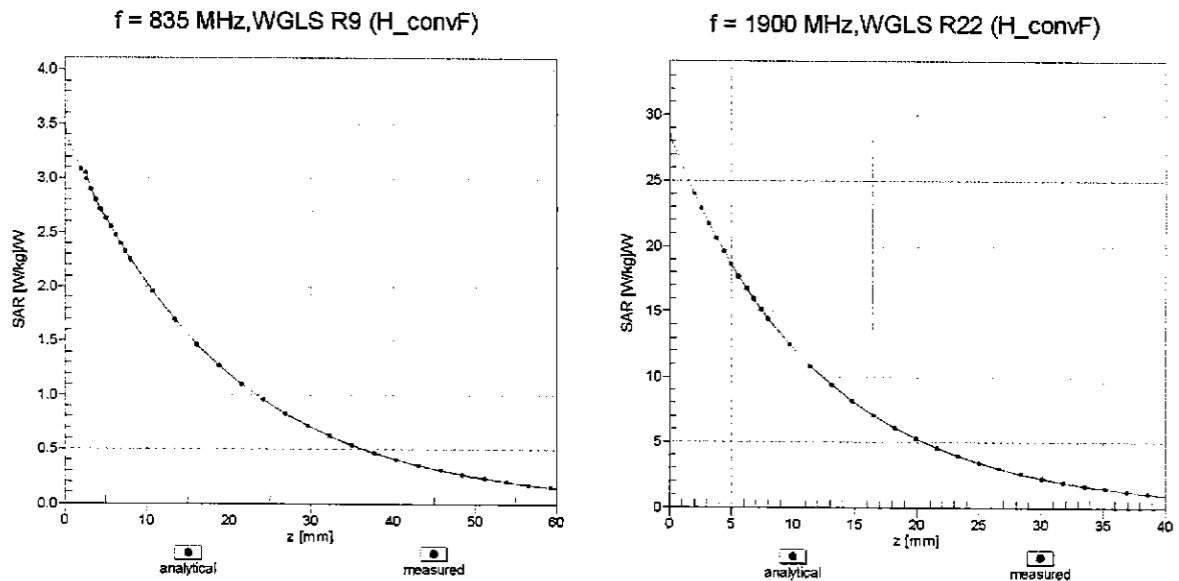
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

# Dynamic Range $f(\text{SAR}_{\text{head}})$ (TEM cell , $f_{\text{eval}} = 1900 \text{ MHz}$ )



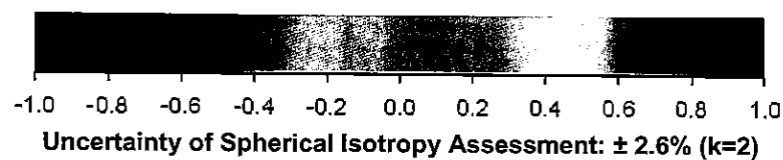
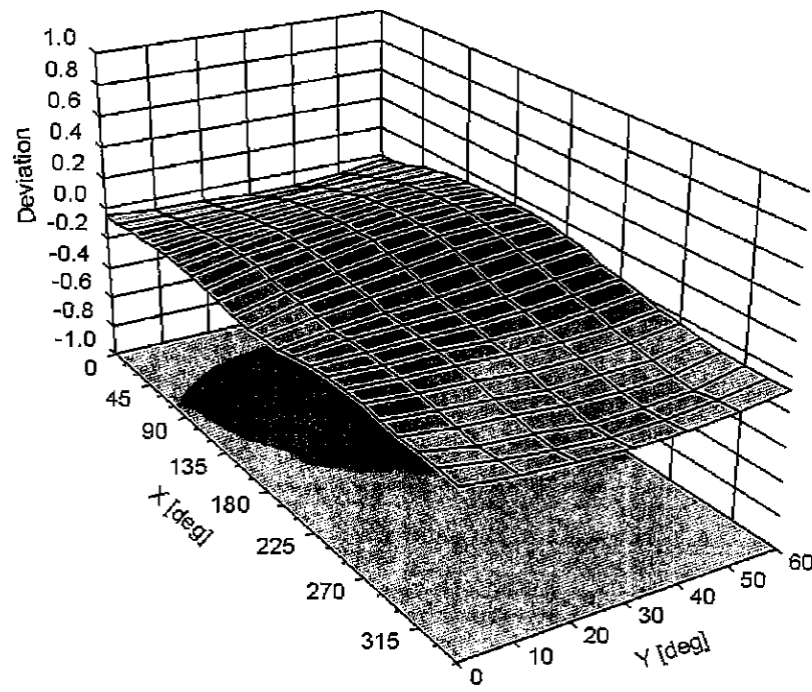
Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

## Conversion Factor Assessment



## Deviation from Isotropy in Liquid

Error ( $\phi, \theta$ ),  $f = 900 \text{ MHz}$



## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3351

### Other Probe Parameters

|                                               |            |
|-----------------------------------------------|------------|
| Sensor Arrangement                            | Triangular |
| Connector Angle (°)                           | 21.5       |
| Mechanical Surface Detection Mode             | enabled    |
| Optical Surface Detection Mode                | disabled   |
| Probe Overall Length                          | 337 mm     |
| Probe Body Diameter                           | 10 mm      |
| Tip Length                                    | 10 mm      |
| Tip Diameter                                  | 4 mm       |
| Probe Tip to Sensor X Calibration Point       | 2 mm       |
| Probe Tip to Sensor Y Calibration Point       | 2 mm       |
| Probe Tip to Sensor Z Calibration Point       | 2 mm       |
| Recommended Measurement Distance from Surface | 3 mm       |



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Client **PC Test**

Certificate No: **ES3-3333\_Oct15**

## CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3333**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6**  
**Calibration procedure for dosimetric E-field probes**

*DN ✓  
14/03/15*

Calibration date: **October 29, 2015**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature  $(22 \pm 3)^\circ\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID              | Cal Date (Certificate No.)        | Scheduled Calibration  |
|----------------------------|-----------------|-----------------------------------|------------------------|
| Power meter E4419B         | GB41293874      | 01-Apr-15 (No. 217-02128)         | Mar-16                 |
| Power sensor E4412A        | MY41498087      | 01-Apr-15 (No. 217-02128)         | Mar-16                 |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 01-Apr-15 (No. 217-02129)         | Mar-16                 |
| Reference 20 dB Attenuator | SN: S5277 (20x) | 01-Apr-15 (No. 217-02132)         | Mar-16                 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 01-Apr-15 (No. 217-02133)         | Mar-16                 |
| Reference Probe ES3DV2     | SN: 3013        | 30-Dec-14 (No. ES3-3013_Dec14)    | Dec-15                 |
| DAE4                       | SN: 660         | 14-Jan-15 (No. DAE4-660_Jan15)    | Jan-16                 |
| Secondary Standards        | ID              | Check Date (in house)             | Scheduled Check        |
| RF generator HP 8648C      | US3642U01700    | 4-Aug-99 (In house check Apr-13)  | In house check: Apr-16 |
| Network Analyzer HP 8753E  | US37390585      | 18-Oct-01 (in house check Oct-15) | In house check: Oct-16 |

|                                                                                                                 |                              |                                          |               |
|-----------------------------------------------------------------------------------------------------------------|------------------------------|------------------------------------------|---------------|
| Calibrated by:                                                                                                  | Name<br><b>Lutz Klysner</b>  | Function<br><b>Laboratory Technician</b> | Signature<br> |
| Approved by:                                                                                                    | Name<br><b>Katja Pokovic</b> | Technical Manager                        |               |
| This calibration certificate shall not be reproduced except in full without written approval of the laboratory. |                              |                                          |               |

Issued: October 29, 2015



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## Glossary:

|                       |                                                                                                                                                   |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| TSL                   | tissue simulating liquid                                                                                                                          |
| NORM <sub>x,y,z</sub> | sensitivity in free space                                                                                                                         |
| ConvF                 | sensitivity in TSL / NORM <sub>x,y,z</sub>                                                                                                        |
| DCP                   | diode compression point                                                                                                                           |
| CF                    | crest factor (1/duty_cycle) of the RF signal                                                                                                      |
| A, B, C, D            | modulation dependent linearization parameters                                                                                                     |
| Polarization $\phi$   | $\phi$ rotation around probe axis                                                                                                                 |
| Polarization $\theta$ | $\theta$ rotation around an axis that is in the plane normal to probe axis (at measurement center),<br>i.e., $\theta = 0$ is normal to probe axis |
| Connector Angle       | information used in DASY system to align probe sensor X to the robot coordinate system                                                            |

## Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865604, "SAR Measurement Requirements for 100 MHz to 6 GHz"

## Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\theta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not affect the E<sup>2</sup>-field uncertainty inside TSL (see below ConvF).
- NORM(f)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* frequency\_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCPx,y,z**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; D<sub>x,y,z</sub>; VR<sub>x,y,z</sub>**: A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM<sub>x,y,z</sub> \* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from  $\pm 50$  MHz to  $\pm 100$  MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM<sub>x</sub> (no uncertainty required).

# Probe ES3DV3

## SN:3333

Manufactured: January 24, 2012  
Calibrated: October 29, 2015

Calibrated for DASY/EASY Systems  
(Note: non-compatible with DASY2 system!)

# DASY/EASY - Parameters of Probe: ES3DV3 - SN:3333

## Basic Calibration Parameters

|                                                           | Sensor X | Sensor Y | Sensor Z | Unc (k=2)     |
|-----------------------------------------------------------|----------|----------|----------|---------------|
| Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup> | 1.07     | 0.90     | 0.88     | $\pm 10.1 \%$ |
| DCP (mV) <sup>B</sup>                                     | 106.8    | 108.5    | 106.8    |               |

## Modulation Calibration Parameters

| UID           | Communication System Name                     |   | A<br>dB | B<br>dB $\sqrt{\mu\text{V}}$ | C    | D<br>dB | VR<br>mV | Unc <sup>E</sup><br>(k=2) |
|---------------|-----------------------------------------------|---|---------|------------------------------|------|---------|----------|---------------------------|
| 0             | CW                                            | X | 0.0     | 0.0                          | 1.0  | 0.00    | 201.0    | $\pm 3.5 \%$              |
|               |                                               | Y | 0.0     | 0.0                          | 1.0  |         | 187.1    |                           |
|               |                                               | Z | 0.0     | 0.0                          | 1.0  |         | 184.8    |                           |
| 10010-<br>CAA | SAR Validation (Square, 100ms, 10ms)          | X | 2.43    | 80.7                         | 11.4 | 10.00   | 41.6     | $\pm 2.2 \%$              |
|               |                                               | Y | 4.35    | 67.4                         | 13.2 |         | 35.6     |                           |
|               |                                               | Z | 1.46    | 57.0                         | 8.7  |         | 36.2     |                           |
| 10011-<br>CAB | UMTS-FDD (WCDMA)                              | X | 3.35    | 67.9                         | 19.1 | 2.91    | 138.2    | $\pm 0.5 \%$              |
|               |                                               | Y | 3.48    | 68.8                         | 19.2 |         | 127.5    |                           |
|               |                                               | Z | 3.37    | 67.6                         | 18.6 |         | 149.0    |                           |
| 10012-<br>CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)      | X | 3.80    | 72.8                         | 20.8 | 1.87    | 141.0    | $\pm 0.7 \%$              |
|               |                                               | Y | 3.68    | 73.3                         | 20.8 |         | 128.0    |                           |
|               |                                               | Z | 3.01    | 69.3                         | 18.8 |         | 128.2    |                           |
| 10013-<br>CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps) | X | 11.52   | 71.7                         | 23.9 | 9.46    | 139.3    | $\pm 3.0 \%$              |
|               |                                               | Y | 10.94   | 70.4                         | 22.9 |         | 147.1    |                           |
|               |                                               | Z | 10.95   | 70.8                         | 23.4 |         | 144.5    |                           |
| 10021-<br>DAB | GSM-FDD (TDMA, GMSK)                          | X | 21.45   | 95.2                         | 26.5 | 9.39    | 139.9    | $\pm 2.5 \%$              |
|               |                                               | Y | 9.12    | 82.9                         | 21.9 |         | 142.0    |                           |
|               |                                               | Z | 11.47   | 88.1                         | 23.9 |         | 127.6    |                           |
| 10023-<br>DAB | GPRS-FDD (TDMA, GMSK, TN 0)                   | X | 20.81   | 95.6                         | 27.0 | 9.57    | 135.8    | $\pm 2.2 \%$              |
|               |                                               | Y | 9.78    | 84.4                         | 22.7 |         | 135.3    |                           |
|               |                                               | Z | 9.12    | 83.5                         | 22.1 |         | 144.6    |                           |
| 10024-<br>DAB | GPRS-FDD (TDMA, GMSK, TN 0-1)                 | X | 39.84   | 99.8                         | 25.2 | 6.56    | 140.9    | $\pm 1.9 \%$              |
|               |                                               | Y | 35.07   | 100.0                        | 25.0 |         | 128.4    |                           |
|               |                                               | Z | 35.20   | 99.8                         | 24.7 |         | 131.9    |                           |
| 10027-<br>DAB | GPRS-FDD (TDMA, GMSK, TN 0-1-2)               | X | 47.16   | 99.8                         | 23.9 | 4.80    | 124.9    | $\pm 2.5 \%$              |
|               |                                               | Y | 49.75   | 99.6                         | 22.8 |         | 145.4    |                           |
|               |                                               | Z | 45.37   | 99.9                         | 23.1 |         | 148.5    |                           |
| 10028-<br>DAB | GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)             | X | 56.24   | 99.6                         | 22.6 | 3.55    | 140.4    | $\pm 2.7 \%$              |
|               |                                               | Y | 56.95   | 99.7                         | 21.9 |         | 129.1    |                           |
|               |                                               | Z | 48.45   | 99.6                         | 22.1 |         | 133.2    |                           |
| 10032-<br>CAA | IEEE 802.15.1 Bluetooth (GFSK, DH5)           | X | 18.03   | 98.1                         | 22.8 | 1.16    | 127.5    | $\pm 1.9 \%$              |
|               |                                               | Y | 35.17   | 99.6                         | 20.7 |         | 141.1    |                           |
|               |                                               | Z | 21.08   | 99.9                         | 21.9 |         | 127.5    |                           |
| 10100-<br>CAB | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)      | X | 6.36    | 87.6                         | 19.8 | 5.67    | 137.5    | $\pm 1.2 \%$              |
|               |                                               | Y | 6.29    | 87.4                         | 19.6 |         | 128.9    |                           |
|               |                                               | Z | 6.35    | 87.5                         | 19.7 |         | 139.5    |                           |

|           |                                          |   |       |      |      |      |       |        |
|-----------|------------------------------------------|---|-------|------|------|------|-------|--------|
| 10103-CAB | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK) | X | 10.85 | 76.6 | 28.4 | 9.29 | 130.8 | ±2.7 % |
|           |                                          | Y | 9.58  | 73.7 | 24.8 |      | 143.0 |        |
|           |                                          | Z | 9.94  | 75.6 | 26.2 |      | 149.3 |        |
| 10108-CAC | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK) | X | 8.21  | 67.0 | 19.7 | 5.80 | 128.9 | ±1.2 % |
|           |                                          | Y | 6.16  | 66.9 | 19.5 |      | 129.2 |        |
|           |                                          | Z | 6.22  | 67.2 | 19.7 |      | 138.0 |        |
| 10117-CAB | IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK) | X | 10.05 | 68.7 | 21.2 | 8.07 | 126.1 | ±2.5 % |
|           |                                          | Y | 10.13 | 69.0 | 21.3 |      | 146.1 |        |
|           |                                          | Z | 9.97  | 68.7 | 21.1 |      | 126.2 |        |
| 10151-CAB | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)  | X | 10.11 | 75.5 | 26.0 | 9.28 | 125.8 | ±3.3 % |
|           |                                          | Y | 9.08  | 73.2 | 24.7 |      | 138.2 |        |
|           |                                          | Z | 9.32  | 74.8 | 26.0 |      | 143.1 |        |
| 10154-CAC | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)  | X | 5.97  | 66.8 | 19.6 | 5.75 | 133.4 | ±1.2 % |
|           |                                          | Y | 5.92  | 66.7 | 19.5 |      | 127.0 |        |
|           |                                          | Z | 5.91  | 68.7 | 19.5 |      | 134.2 |        |
| 10160-CAB | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)  | X | 6.40  | 67.3 | 19.9 | 5.82 | 137.8 | ±1.2 % |
|           |                                          | Y | 6.31  | 67.1 | 19.6 |      | 130.7 |        |
|           |                                          | Z | 6.32  | 67.1 | 19.8 |      | 139.8 |        |
| 10169-CAB | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)    | X | 5.05  | 67.3 | 20.1 | 5.73 | 136.8 | ±1.2 % |
|           |                                          | Y | 4.89  | 67.0 | 19.9 |      | 131.1 |        |
|           |                                          | Z | 4.93  | 67.2 | 20.0 |      | 137.4 |        |
| 10172-CAB | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)    | X | 10.74 | 83.9 | 30.3 | 9.21 | 136.8 | ±2.7 % |
|           |                                          | Y | 7.34  | 74.3 | 25.5 |      | 125.9 |        |
|           |                                          | Z | 7.74  | 76.6 | 27.1 |      | 131.2 |        |
| 10175-CAC | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)    | X | 4.97  | 66.9 | 19.9 | 5.72 | 130.8 | ±1.2 % |
|           |                                          | Y | 4.86  | 66.9 | 19.8 |      | 128.5 |        |
|           |                                          | Z | 4.97  | 67.3 | 20.1 |      | 137.0 |        |
| 10181-CAB | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)    | X | 4.99  | 67.0 | 19.9 | 5.72 | 130.1 | ±1.2 % |
|           |                                          | Y | 4.88  | 67.0 | 19.9 |      | 127.6 |        |
|           |                                          | Z | 4.95  | 67.2 | 20.0 |      | 136.2 |        |
| 10196-CAB | IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)  | X | 10.00 | 69.2 | 21.7 | 8.10 | 137.9 | ±2.2 % |
|           |                                          | Y | 9.75  | 68.7 | 21.2 |      | 137.5 |        |
|           |                                          | Z | 9.94  | 69.4 | 21.7 |      | 145.3 |        |
| 10225-CAB | UMTS-FDD (HSPA+)                         | X | 7.08  | 67.5 | 19.8 | 5.97 | 147.1 | ±1.4 % |
|           |                                          | Y | 7.06  | 67.7 | 19.8 |      | 142.3 |        |
|           |                                          | Z | 7.04  | 67.7 | 19.9 |      | 148.8 |        |
| 10237-CAB | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)    | X | 10.66 | 83.5 | 30.1 | 9.21 | 144.0 | ±3.0 % |
|           |                                          | Y | 7.43  | 74.7 | 25.7 |      | 127.6 |        |
|           |                                          | Z | 7.86  | 77.1 | 27.4 |      | 132.3 |        |
| 10252-CAB | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)  | X | 10.81 | 78.7 | 27.9 | 9.24 | 139.7 | ±3.0 % |
|           |                                          | Y | 8.48  | 72.4 | 24.4 |      | 130.1 |        |
|           |                                          | Z | 8.71  | 74.1 | 25.8 |      | 135.2 |        |
| 10267-CAB | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK) | X | 11.73 | 79.9 | 28.3 | 9.30 | 148.6 | ±3.3 % |
|           |                                          | Y | 9.11  | 73.2 | 24.8 |      | 139.0 |        |
|           |                                          | Z | 9.38  | 74.9 | 26.1 |      | 142.7 |        |

|           |                                                               |   |       |      |      |      |       |        |
|-----------|---------------------------------------------------------------|---|-------|------|------|------|-------|--------|
| 10275-CAB | UMTS-FDD (HSUPA, Subtest 5, 3GPP Ref8.4)                      | X | 4.52  | 67.6 | 19.3 | 3.96 | 144.5 | ±0.7 % |
|           |                                                               | Y | 4.67  | 68.3 | 19.6 |      | 146.0 |        |
|           |                                                               | Z | 4.41  | 67.0 | 18.9 |      | 130.0 |        |
| 10291-AAB | CDMA2000, RC3, SO55, Full Rate                                | X | 3.66  | 67.2 | 19.0 | 3.46 | 134.5 | ±0.5 % |
|           |                                                               | Y | 3.91  | 68.9 | 19.9 |      | 133.2 |        |
|           |                                                               | Z | 3.86  | 68.5 | 19.6 |      | 146.9 |        |
| 10292-AAB | CDMA2000, RC3, SO32, Full Rate                                | X | 3.63  | 67.5 | 19.1 | 3.39 | 134.9 | ±0.5 % |
|           |                                                               | Y | 3.93  | 69.3 | 20.0 |      | 136.0 |        |
|           |                                                               | Z | 3.81  | 68.5 | 19.6 |      | 148.6 |        |
| 10297-AAA | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)                       | X | 6.20  | 67.1 | 19.7 | 5.81 | 129.0 | ±1.2 % |
|           |                                                               | Y | 6.20  | 67.0 | 19.6 |      | 128.0 |        |
|           |                                                               | Z | 6.32  | 67.5 | 19.9 |      | 142.7 |        |
| 10311-AAA | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)                      | X | 6.76  | 67.6 | 20.0 | 6.06 | 134.7 | ±1.4 % |
|           |                                                               | Y | 6.75  | 67.5 | 19.9 |      | 133.5 |        |
|           |                                                               | Z | 6.90  | 68.1 | 20.3 |      | 149.2 |        |
| 10400-AAC | IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)           | X | 10.30 | 69.7 | 22.1 | 8.37 | 140.1 | ±2.5 % |
|           |                                                               | Y | 10.05 | 69.0 | 21.5 |      | 141.2 |        |
|           |                                                               | Z | 9.94  | 69.0 | 21.7 |      | 126.3 |        |
| 10403-AAB | CDMA2000 (1xEV-DO, Rev. 0)                                    | X | 4.80  | 68.5 | 19.0 | 3.76 | 129.3 | ±0.5 % |
|           |                                                               | Y | 5.30  | 71.1 | 20.2 |      | 148.4 |        |
|           |                                                               | Z | 5.10  | 70.4 | 19.9 |      | 135.2 |        |
| 10404-AAB | CDMA2000 (1xEV-DO, Rev. A)                                    | X | 4.77  | 68.8 | 19.2 | 3.77 | 127.3 | ±0.7 % |
|           |                                                               | Y | 5.35  | 71.7 | 20.5 |      | 145.4 |        |
|           |                                                               | Z | 5.03  | 70.6 | 20.1 |      | 133.3 |        |
| 10415-AAA | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)     | X | 2.77  | 69.7 | 19.7 | 1.54 | 147.0 | ±0.7 % |
|           |                                                               | Y | 3.73  | 75.4 | 22.2 |      | 143.7 |        |
|           |                                                               | Z | 3.25  | 72.2 | 20.7 |      | 133.9 |        |
| 10416-AAA | IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 8 Mbps, 99pc duty cycle) | X | 10.11 | 69.4 | 21.8 | 8.23 | 144.7 | ±2.5 % |
|           |                                                               | Y | 9.86  | 68.8 | 21.4 |      | 139.3 |        |
|           |                                                               | Z | 9.72  | 68.6 | 21.3 |      | 126.0 |        |

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

<sup>A</sup> The uncertainties of Norm X,Y,Z do not affect the  $E^2$ -field uncertainty inside TSL (see Pages 7 and 8).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3333

### Calibration Parameter Determined In Head Tissue Simulating Media

| f (MHz) <sup>c</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unc (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-----------|
| 750                  | 41.9                               | 0.89                            | 6.46    | 6.46    | 6.46    | 0.75               | 1.22                    | ± 12.0 %  |
| 835                  | 41.5                               | 0.90                            | 6.16    | 6.16    | 6.16    | 0.36               | 1.67                    | ± 12.0 %  |
| 1750                 | 40.1                               | 1.37                            | 5.21    | 5.21    | 5.21    | 0.80               | 1.19                    | ± 12.0 %  |
| 1900                 | 40.0                               | 1.40                            | 5.03    | 5.03    | 5.03    | 0.73               | 1.25                    | ± 12.0 %  |
| 2300                 | 39.5                               | 1.67                            | 4.73    | 4.73    | 4.73    | 0.60               | 1.43                    | ± 12.0 %  |
| 2450                 | 39.2                               | 1.80                            | 4.53    | 4.53    | 4.53    | 0.80               | 1.28                    | ± 12.0 %  |
| 2600                 | 39.0                               | 1.96                            | 4.39    | 4.39    | 4.39    | 0.80               | 1.29                    | ± 12.0 %  |

<sup>c</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3333

### Calibration Parameter Determined in Body Tissue Simulating Media

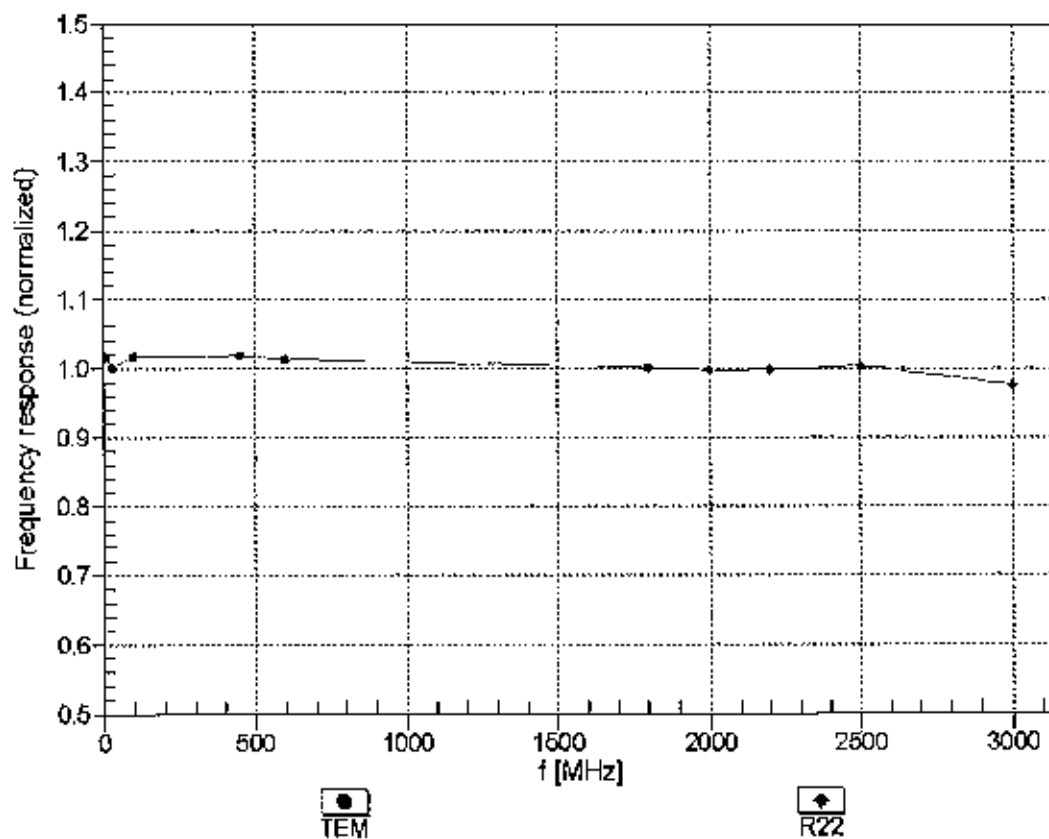
| f (MHz) <sup>c</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>g</sup> | Depth <sup>g</sup> (mm) | Unc (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-----------|
| 750                  | 55.5                               | 0.98                            | 6.31    | 6.31    | 6.31    | 0.70               | 1.26                    | ± 12.0 %  |
| 835                  | 55.2                               | 0.97                            | 6.25    | 6.25    | 6.25    | 0.47               | 1.54                    | ± 12.0 %  |
| 1750                 | 53.4                               | 1.49                            | 4.90    | 4.90    | 4.90    | 0.49               | 1.63                    | ± 12.0 %  |
| 1900                 | 53.3                               | 1.52                            | 4.70    | 4.70    | 4.70    | 0.54               | 1.49                    | ± 12.0 %  |
| 2300                 | 52.9                               | 1.81                            | 4.51    | 4.51    | 4.51    | 0.80               | 1.15                    | ± 12.0 %  |
| 2450                 | 52.7                               | 1.95                            | 4.34    | 4.34    | 4.34    | 0.80               | 1.15                    | ± 12.0 %  |
| 2600                 | 52.5                               | 2.16                            | 4.23    | 4.23    | 4.23    | 0.80               | 1.03                    | ± 12.0 %  |

<sup>c</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 160 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>g</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

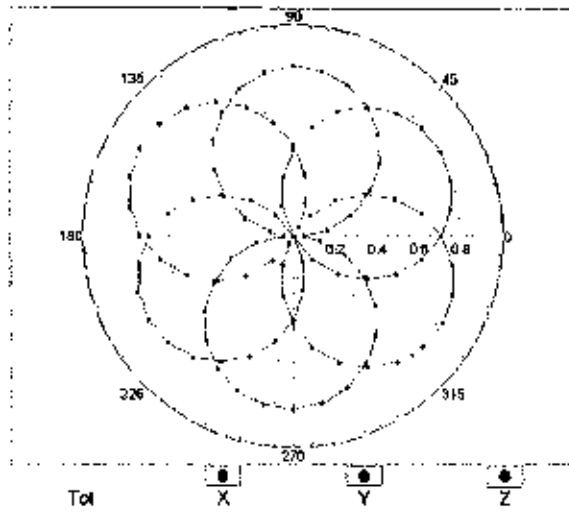
## Frequency Response of E-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)



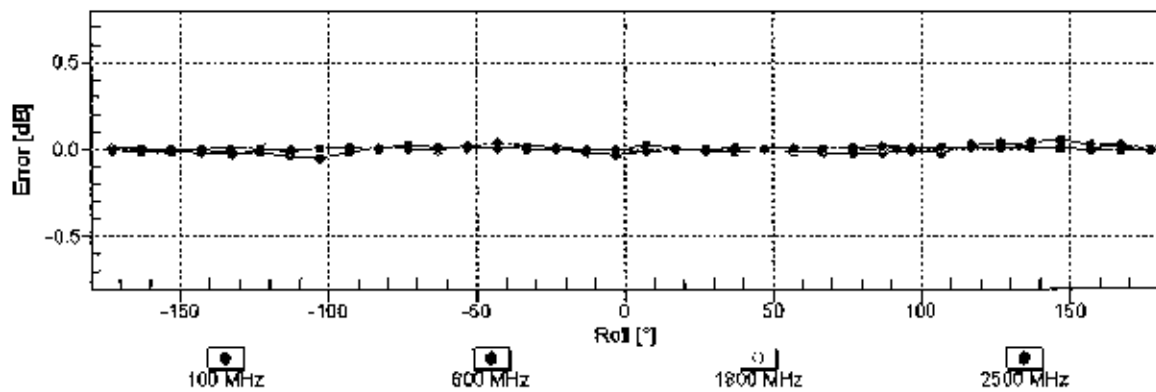
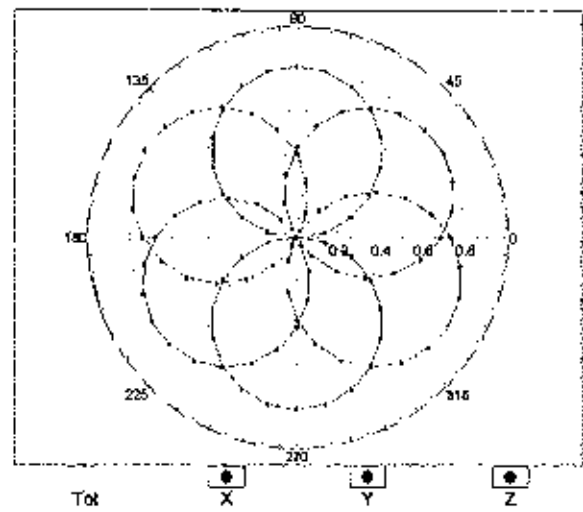
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

## Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$

f=600 MHz,TEM

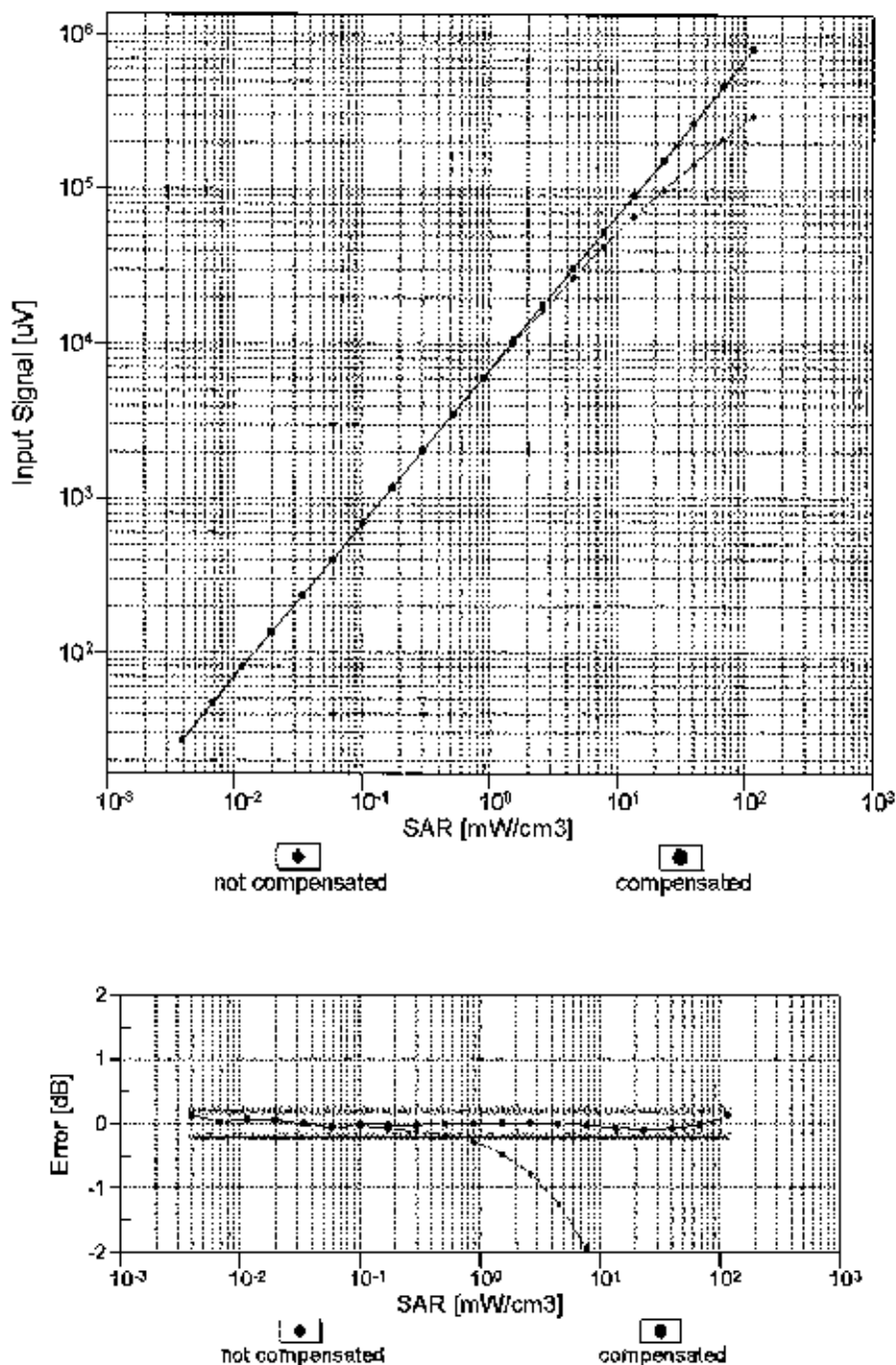


f=1800 MHz,R22



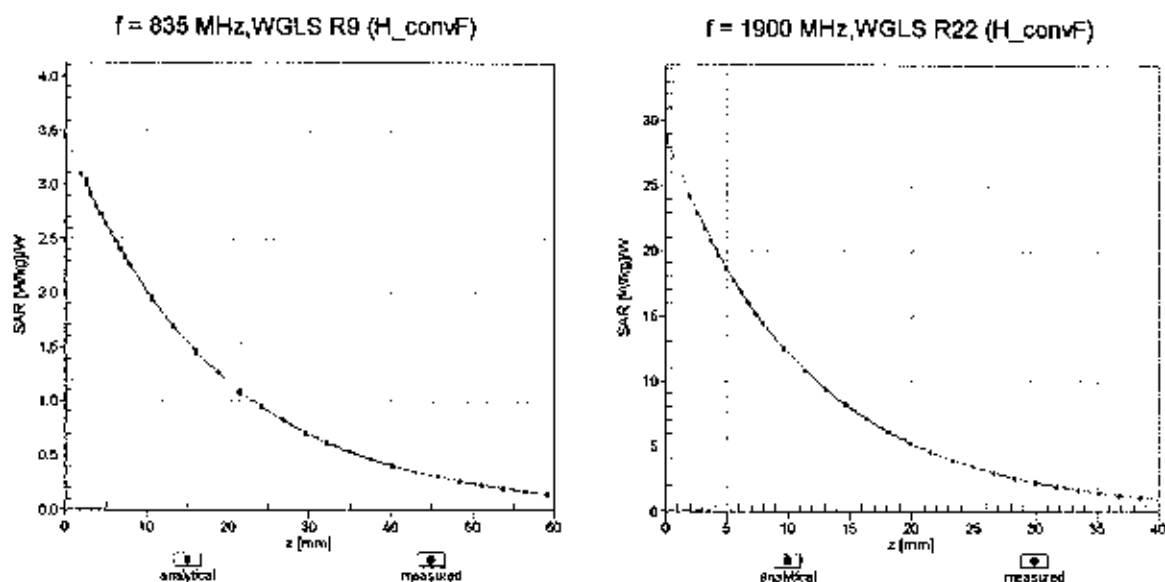
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

# **Dynamic Range $f(\text{SAR}_{\text{head}})$** **(TEM cell, $f_{\text{eval}} = 1900 \text{ MHz}$ )**



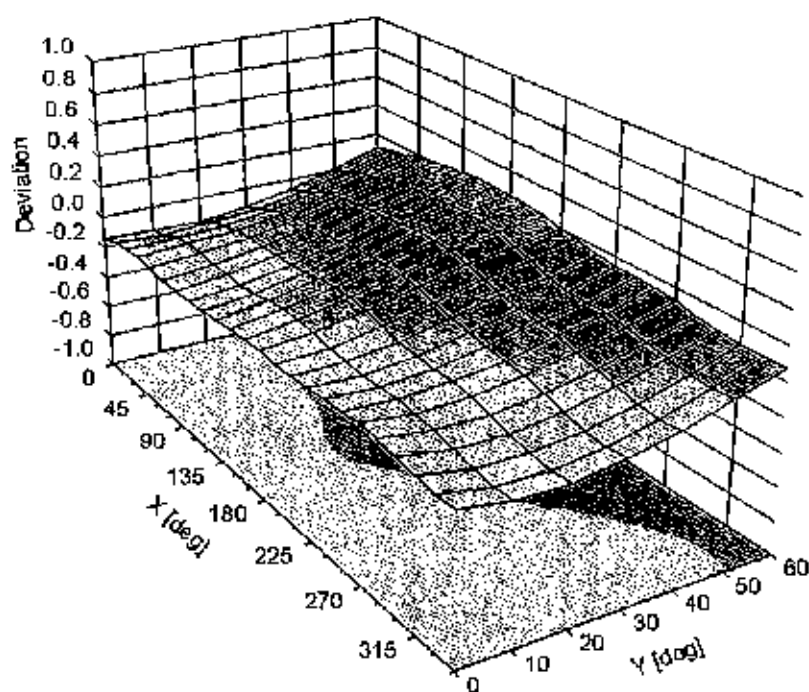
Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

## Conversion Factor Assessment



## Deviation from Isotropy in Liquid

Error ( $\phi, \theta$ ),  $f = 900 \text{ MHz}$



**DASY/EASY - Parameters of Probe: ES3DV3 - SN:3333****Other Probe Parameters**

|                                               |            |
|-----------------------------------------------|------------|
| Sensor Arrangement                            | Triangular |
| Connector Angle (°)                           | -32.8      |
| Mechanical Surface Detection Mode             | enabled    |
| Optical Surface Detection Mode                | disabled   |
| Probe Overall Length                          | 337 mm     |
| Probe Body Diameter                           | 10 mm      |
| Tip Length                                    | 10 mm      |
| Tip Diameter                                  | 4 mm       |
| Probe Tip to Sensor X Calibration Point       | 2 mm       |
| Probe Tip to Sensor Y Calibration Point       | 2 mm       |
| Probe Tip to Sensor Z Calibration Point       | 2 mm       |
| Recommended Measurement Distance from Surface | 3 mm       |



Accredited by the Swiss Accreditation Service (SAS)  
 The Swiss Accreditation Service is one of the signatories to the EA  
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **ES3-3319\_Mar15**

## CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3319**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6**  
**Calibration procedure for dosimetric E-field probes**

Calibration date: **March 19, 2015**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID              | Cal Date (Certificate No.)        | Scheduled Calibration  |
|----------------------------|-----------------|-----------------------------------|------------------------|
| Power meter E4419B         | GB41293874      | 03-Apr-14 (No. 217-01911)         | Apr-15                 |
| Power sensor E4412A        | MY41498087      | 03-Apr-14 (No. 217-01911)         | Apr-15                 |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 03-Apr-14 (No. 217-01915)         | Apr-15                 |
| Reference 20 dB Attenuator | SN: S5277 (20x) | 03-Apr-14 (No. 217-01919)         | Apr-15                 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 03-Apr-14 (No. 217-01920)         | Apr-15                 |
| Reference Probe ES3DV2     | SN: 3013        | 30-Dec-14 (No. ES3-3013_Dec14)    | Dec-15                 |
| DAE4                       | SN: 660         | 14-Jan-15 (No. DAE4-660_Jan15)    | Jan-16                 |
| Secondary Standards        | ID              | Check Date (in house)             | Scheduled Check        |
| RF generator HP 8648C      | US3642U01700    | 4-Aug-99 (in house check Apr-13)  | In house check: Apr-16 |
| Network Analyzer HP 8753E  | US37390585      | 18-Oct-01 (in house check Oct-14) | In house check: Oct-15 |

|                |                              |                                          |               |
|----------------|------------------------------|------------------------------------------|---------------|
| Calibrated by: | Name<br><b>Israe Elnaouq</b> | Function<br><b>Laboratory Technician</b> | Signature<br> |
| Approved by:   | <b>Katja Pokovic</b>         | <b>Technical Manager</b>                 |               |

Issued: March 19, 2015

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### Glossary:

|                          |                                                                                                                                                         |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| TSL                      | tissue simulating liquid                                                                                                                                |
| NORM <sub>x,y,z</sub>    | sensitivity in free space                                                                                                                               |
| ConvF                    | sensitivity in TSL / NORM <sub>x,y,z</sub>                                                                                                              |
| DCP                      | diode compression point                                                                                                                                 |
| CF                       | crest factor (1/duty_cycle) of the RF signal                                                                                                            |
| A, B, C, D               | modulation dependent linearization parameters                                                                                                           |
| Polarization $\varphi$   | $\varphi$ rotation around probe axis                                                                                                                    |
| Polarization $\vartheta$ | $\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center),<br>i.e., $\vartheta = 0$ is normal to probe axis |
| Connector Angle          | information used in DASY system to align probe sensor X to the robot coordinate system                                                                  |

### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

### Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not affect the E<sup>2</sup>-field uncertainty inside TSL (see below ConvF).
- NORM(f)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* frequency\_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP<sub>x,y,z</sub>**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; D<sub>x,y,z</sub>; VR<sub>x,y,z</sub>**: A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM<sub>x,y,z</sub> \* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from  $\pm 50$  MHz to  $\pm 100$  MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM<sub>x</sub> (no uncertainty required).

# Probe ES3DV3

## SN:3319

Manufactured: January 10, 2012  
Calibrated: March 19, 2015

Calibrated for DASY/EASY Systems  
(Note: non-compatible with DASY2 system!)

# DASY/EASY - Parameters of Probe: ES3DV3 - SN:3319

## Basic Calibration Parameters

|                                       | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|---------------------------------------|----------|----------|----------|-----------|
| Norm ( $\mu V/(V/m)^2$ ) <sup>A</sup> | 1.12     | 1.08     | 1.15     | ± 10.1 %  |
| DCP (mV) <sup>B</sup>                 | 104.4    | 106.0    | 104.4    |           |

## Modulation Calibration Parameters

| UID       | Communication System Name                     |   | A<br>dB | B<br>dB $\sqrt{\mu V}$ | C    | D<br>dB | VR<br>mV | Unc <sup>E</sup><br>(k=2) |
|-----------|-----------------------------------------------|---|---------|------------------------|------|---------|----------|---------------------------|
| 0         | CW                                            | X | 0.0     | 0.0                    | 1.0  | 0.00    | 176.1    | ±3.3 %                    |
|           |                                               | Y | 0.0     | 0.0                    | 1.0  |         | 192.7    |                           |
|           |                                               | Z | 0.0     | 0.0                    | 1.0  |         | 174.6    |                           |
| 10010-CAA | SAR Validation (Square, 100ms, 10ms)          | X | 3.26    | 64.8                   | 13.4 | 10.00   | 41.7     | ±1.9 %                    |
|           |                                               | Y | 2.66    | 62.2                   | 11.7 |         | 39.5     |                           |
|           |                                               | Z | 3.51    | 64.8                   | 13.2 |         | 42.1     |                           |
| 10011-CAB | UMTS-FDD (WCDMA)                              | X | 3.47    | 68.1                   | 19.1 | 2.91    | 142.9    | ±0.5 %                    |
|           |                                               | Y | 3.37    | 67.9                   | 19.1 |         | 133.0    |                           |
|           |                                               | Z | 3.57    | 68.7                   | 19.4 |         | 138.6    |                           |
| 10012-CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)      | X | 3.48    | 71.8                   | 20.2 | 1.87    | 143.9    | ±0.7 %                    |
|           |                                               | Y | 3.23    | 70.9                   | 19.9 |         | 134.6    |                           |
|           |                                               | Z | 3.68    | 72.8                   | 20.6 |         | 140.5    |                           |
| 10013-CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps) | X | 11.18   | 70.5                   | 23.1 | 9.46    | 143.4    | ±3.3 %                    |
|           |                                               | Y | 10.98   | 70.5                   | 23.2 |         | 129.9    |                           |
|           |                                               | Z | 11.19   | 70.6                   | 23.1 |         | 138.8    |                           |
| 10021-DAB | GSM-FDD (TDMA, GMSK)                          | X | 15.55   | 92.7                   | 26.1 | 9.39    | 126.5    | ±1.7 %                    |
|           |                                               | Y | 21.21   | 98.0                   | 27.2 |         | 142.0    |                           |
|           |                                               | Z | 19.50   | 96.1                   | 27.0 |         | 125.4    |                           |
| 10023-DAB | GPRS-FDD (TDMA, GMSK, TN 0)                   | X | 23.54   | 100.0                  | 28.4 | 9.57    | 142.6    | ±2.2 %                    |
|           |                                               | Y | 23.24   | 99.9                   | 28.0 |         | 137.4    |                           |
|           |                                               | Z | 23.57   | 99.6                   | 28.2 |         | 139.7    |                           |
| 10024-DAB | GPRS-FDD (TDMA, GMSK, TN 0-1)                 | X | 17.00   | 90.2                   | 22.7 | 6.56    | 128.9    | ±2.2 %                    |
|           |                                               | Y | 35.20   | 99.7                   | 24.9 |         | 148.2    |                           |
|           |                                               | Z | 33.12   | 99.6                   | 25.4 |         | 123.8    |                           |
| 10027-DAB | GPRS-FDD (TDMA, GMSK, TN 0-1-2)               | X | 44.20   | 99.6                   | 23.6 | 4.80    | 146.0    | ±1.9 %                    |
|           |                                               | Y | 49.99   | 99.9                   | 23.0 |         | 136.6    |                           |
|           |                                               | Z | 41.43   | 99.6                   | 23.9 |         | 141.4    |                           |
| 10028-DAB | GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)             | X | 46.56   | 99.7                   | 22.7 | 3.55    | 127.7    | ±2.2 %                    |
|           |                                               | Y | 58.11   | 99.8                   | 21.9 |         | 145.3    |                           |
|           |                                               | Z | 55.65   | 99.6                   | 22.2 |         | 124.3    |                           |
| 10032-CAA | IEEE 802.15.1 Bluetooth (GFSK, DH5)           | X | 34.25   | 99.4                   | 21.1 | 1.16    | 140.3    | ±1.7 %                    |
|           |                                               | Y | 40.72   | 100.0                  | 20.6 |         | 135.7    |                           |
|           |                                               | Z | 45.39   | 100.0                  | 20.8 |         | 136.4    |                           |
| 10100-CAB | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)      | X | 6.30    | 67.1                   | 19.5 | 5.67    | 127.4    | ±1.4 %                    |
|           |                                               | Y | 6.58    | 68.4                   | 20.3 |         | 149.0    |                           |
|           |                                               | Z | 6.55    | 68.0                   | 19.9 |         | 146.3    |                           |

|           |                                          |   |       |      |      |      |       |        |
|-----------|------------------------------------------|---|-------|------|------|------|-------|--------|
| 10103-CAB | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK) | X | 10.47 | 75.6 | 25.8 | 9.29 | 146.6 | ±3.0 % |
|           |                                          | Y | 10.18 | 75.8 | 26.3 |      | 136.2 |        |
|           |                                          | Z | 10.38 | 75.3 | 25.6 |      | 140.8 |        |
| 10108-CAC | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK) | X | 6.18  | 66.6 | 19.4 | 5.80 | 126.9 | ±1.4 % |
|           |                                          | Y | 6.40  | 67.8 | 20.1 |      | 147.0 |        |
|           |                                          | Z | 6.44  | 67.6 | 19.9 |      | 145.7 |        |
| 10117-CAB | IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK) | X | 10.24 | 69.0 | 21.3 | 8.07 | 142.7 | ±2.5 % |
|           |                                          | Y | 10.25 | 69.2 | 21.5 |      | 136.7 |        |
|           |                                          | Z | 10.16 | 68.8 | 21.2 |      | 136.6 |        |
| 10151-CAB | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)  | X | 9.85  | 74.8 | 25.6 | 9.28 | 140.8 | ±3.0 % |
|           |                                          | Y | 9.49  | 74.7 | 25.9 |      | 130.5 |        |
|           |                                          | Z | 9.90  | 74.8 | 25.6 |      | 136.8 |        |
| 10154-CAC | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)  | X | 6.13  | 67.1 | 19.7 | 5.75 | 146.6 | ±1.4 % |
|           |                                          | Y | 6.11  | 67.4 | 19.9 |      | 147.7 |        |
|           |                                          | Z | 6.12  | 67.1 | 19.7 |      | 142.3 |        |
| 10160-CAB | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)  | X | 6.33  | 66.7 | 19.4 | 5.82 | 128.9 | ±1.4 % |
|           |                                          | Y | 6.33  | 67.1 | 19.7 |      | 128.7 |        |
|           |                                          | Z | 6.57  | 67.6 | 19.9 |      | 147.4 |        |
| 10169-CAB | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)    | X | 4.89  | 66.4 | 19.5 | 5.73 | 127.5 | ±1.2 % |
|           |                                          | Y | 4.99  | 67.5 | 20.2 |      | 149.3 |        |
|           |                                          | Z | 5.09  | 67.3 | 20.0 |      | 145.1 |        |
| 10172-CAB | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)    | X | 7.99  | 75.8 | 26.3 | 9.21 | 127.6 | ±2.7 % |
|           |                                          | Y | 9.29  | 81.7 | 29.6 |      | 149.8 |        |
|           |                                          | Z | 8.04  | 75.8 | 26.3 |      | 123.6 |        |
| 10175-CAC | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)    | X | 5.08  | 67.3 | 20.0 | 5.72 | 149.3 | ±1.4 % |
|           |                                          | Y | 5.00  | 67.6 | 20.3 |      | 145.0 |        |
|           |                                          | Z | 5.09  | 67.3 | 20.0 |      | 145.0 |        |
| 10181-CAB | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)    | X | 5.08  | 67.3 | 20.0 | 5.72 | 148.5 | ±1.4 % |
|           |                                          | Y | 5.06  | 67.9 | 20.4 |      | 147.1 |        |
|           |                                          | Z | 5.11  | 67.4 | 20.0 |      | 144.8 |        |
| 10196-CAB | IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)  | X | 9.89  | 68.7 | 21.2 | 8.10 | 134.6 | ±2.2 % |
|           |                                          | Y | 9.84  | 68.9 | 21.4 |      | 130.4 |        |
|           |                                          | Z | 9.82  | 68.5 | 21.1 |      | 130.4 |        |
| 10225-CAB | UMTS-FDD (HSPA+)                         | X | 7.02  | 67.1 | 19.5 | 5.97 | 138.0 | ±1.4 % |
|           |                                          | Y | 6.88  | 67.0 | 19.5 |      | 133.2 |        |
|           |                                          | Z | 7.01  | 67.1 | 19.5 |      | 134.6 |        |
| 10237-CAB | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)    | X | 8.01  | 75.9 | 26.4 | 9.21 | 128.0 | ±2.7 % |
|           |                                          | Y | 9.39  | 82.1 | 29.9 |      | 149.7 |        |
|           |                                          | Z | 8.34  | 76.9 | 26.9 |      | 129.1 |        |
| 10252-CAB | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)  | X | 9.05  | 73.6 | 25.1 | 9.24 | 130.6 | ±3.0 % |
|           |                                          | Y | 8.76  | 73.7 | 25.5 |      | 123.6 |        |
|           |                                          | Z | 9.10  | 73.6 | 25.1 |      | 127.8 |        |
| 10267-CAB | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK) | X | 9.81  | 74.7 | 25.6 | 9.30 | 139.3 | ±3.0 % |
|           |                                          | Y | 9.50  | 74.8 | 25.9 |      | 130.7 |        |
|           |                                          | Z | 9.81  | 74.6 | 25.5 |      | 135.0 |        |

|           |                                                               |   |       |      |      |      |       |        |
|-----------|---------------------------------------------------------------|---|-------|------|------|------|-------|--------|
| 10275-CAB | UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)                      | X | 4.49  | 67.1 | 18.9 | 3.96 | 140.1 | ±0.7 % |
|           |                                                               | Y | 4.46  | 67.2 | 19.0 |      | 137.6 |        |
|           |                                                               | Z | 4.52  | 67.1 | 18.9 |      | 137.1 |        |
| 10291-AAB | CDMA2000, RC3, SO55, Full Rate                                | X | 3.68  | 67.0 | 18.8 | 3.46 | 129.3 | ±0.7 % |
|           |                                                               | Y | 3.64  | 67.3 | 19.0 |      | 130.3 |        |
|           |                                                               | Z | 3.84  | 67.9 | 19.2 |      | 148.6 |        |
| 10292-AAB | CDMA2000, RC3, SO32, Full Rate                                | X | 3.64  | 67.2 | 18.8 | 3.39 | 131.8 | ±0.5 % |
|           |                                                               | Y | 3.60  | 67.4 | 19.1 |      | 128.2 |        |
|           |                                                               | Z | 3.71  | 67.5 | 19.0 |      | 128.0 |        |
| 10297-AAA | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)                       | X | 6.43  | 67.5 | 19.9 | 5.81 | 147.2 | ±1.7 % |
|           |                                                               | Y | 6.39  | 67.7 | 20.0 |      | 145.4 |        |
|           |                                                               | Z | 6.42  | 67.5 | 19.8 |      | 143.2 |        |
| 10311-AAA | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)                      | X | 6.73  | 67.1 | 19.7 | 6.06 | 129.7 | ±1.4 % |
|           |                                                               | Y | 6.75  | 67.5 | 19.9 |      | 130.8 |        |
|           |                                                               | Z | 6.75  | 67.3 | 19.7 |      | 126.2 |        |
| 10400-AAB | IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)           | X | 10.14 | 68.9 | 21.5 | 8.37 | 136.7 | ±2.5 % |
|           |                                                               | Y | 10.23 | 69.5 | 22.0 |      | 136.5 |        |
|           |                                                               | Z | 10.13 | 68.9 | 21.5 |      | 132.8 |        |
| 10403-AAB | CDMA2000 (1xEV-DO, Rev. 0)                                    | X | 4.97  | 69.2 | 19.3 | 3.76 | 143.5 | ±0.5 % |
|           |                                                               | Y | 4.87  | 69.3 | 19.4 |      | 141.0 |        |
|           |                                                               | Z | 5.02  | 69.2 | 19.3 |      | 139.6 |        |
| 10404-AAB | CDMA2000 (1xEV-DO, Rev. A)                                    | X | 4.91  | 69.3 | 19.4 | 3.77 | 139.8 | ±0.7 % |
|           |                                                               | Y | 4.67  | 68.9 | 19.1 |      | 138.9 |        |
|           |                                                               | Z | 4.89  | 69.1 | 19.3 |      | 137.1 |        |
| 10415-AAA | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)     | X | 2.93  | 70.1 | 19.6 | 1.54 | 137.8 | ±0.7 % |
|           |                                                               | Y | 2.84  | 69.8 | 19.6 |      | 138.2 |        |
|           |                                                               | Z | 3.04  | 70.8 | 19.9 |      | 134.2 |        |
| 10416-AAA | IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle) | X | 9.94  | 68.7 | 21.3 | 8.23 | 134.6 | ±2.2 % |
|           |                                                               | Y | 10.00 | 69.1 | 21.7 |      | 134.1 |        |
|           |                                                               | Z | 9.89  | 68.5 | 21.2 |      | 130.1 |        |

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the  $E^2$ -field uncertainty inside TSL (see Pages 7 and 8).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3319

### Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unct. (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-------------|
| 750                  | 41.9                               | 0.89                            | 6.69    | 6.69    | 6.69    | 0.40               | 1.70                    | ± 12.0 %    |
| 835                  | 41.5                               | 0.90                            | 6.41    | 6.41    | 6.41    | 0.43               | 1.62                    | ± 12.0 %    |
| 1750                 | 40.1                               | 1.37                            | 5.29    | 5.29    | 5.29    | 0.80               | 1.16                    | ± 12.0 %    |
| 1900                 | 40.0                               | 1.40                            | 5.10    | 5.10    | 5.10    | 0.80               | 1.24                    | ± 12.0 %    |
| 2300                 | 39.5                               | 1.67                            | 4.77    | 4.77    | 4.77    | 0.64               | 1.38                    | ± 12.0 %    |
| 2450                 | 39.2                               | 1.80                            | 4.55    | 4.55    | 4.55    | 0.80               | 1.29                    | ± 12.0 %    |
| 2600                 | 39.0                               | 1.96                            | 4.39    | 4.39    | 4.39    | 0.80               | 1.31                    | ± 12.0 %    |

<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3319

### Calibration Parameter Determined in Body Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth (mm) <sup>G</sup> | Unct. (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-------------|
| 750                  | 55.5                               | 0.96                            | 6.10    | 6.10    | 6.10    | 0.34               | 1.80                    | ± 12.0 %    |
| 835                  | 55.2                               | 0.97                            | 6.07    | 6.07    | 6.07    | 0.47               | 1.56                    | ± 12.0 %    |
| 1750                 | 53.4                               | 1.49                            | 4.83    | 4.83    | 4.83    | 0.70               | 1.36                    | ± 12.0 %    |
| 1900                 | 53.3                               | 1.52                            | 4.53    | 4.53    | 4.53    | 0.71               | 1.39                    | ± 12.0 %    |
| 2300                 | 52.9                               | 1.81                            | 4.24    | 4.24    | 4.24    | 0.80               | 1.26                    | ± 12.0 %    |
| 2450                 | 52.7                               | 1.95                            | 4.11    | 4.11    | 4.11    | 0.80               | 1.10                    | ± 12.0 %    |
| 2600                 | 52.5                               | 2.16                            | 3.90    | 3.90    | 3.90    | 0.80               | 1.11                    | ± 12.0 %    |

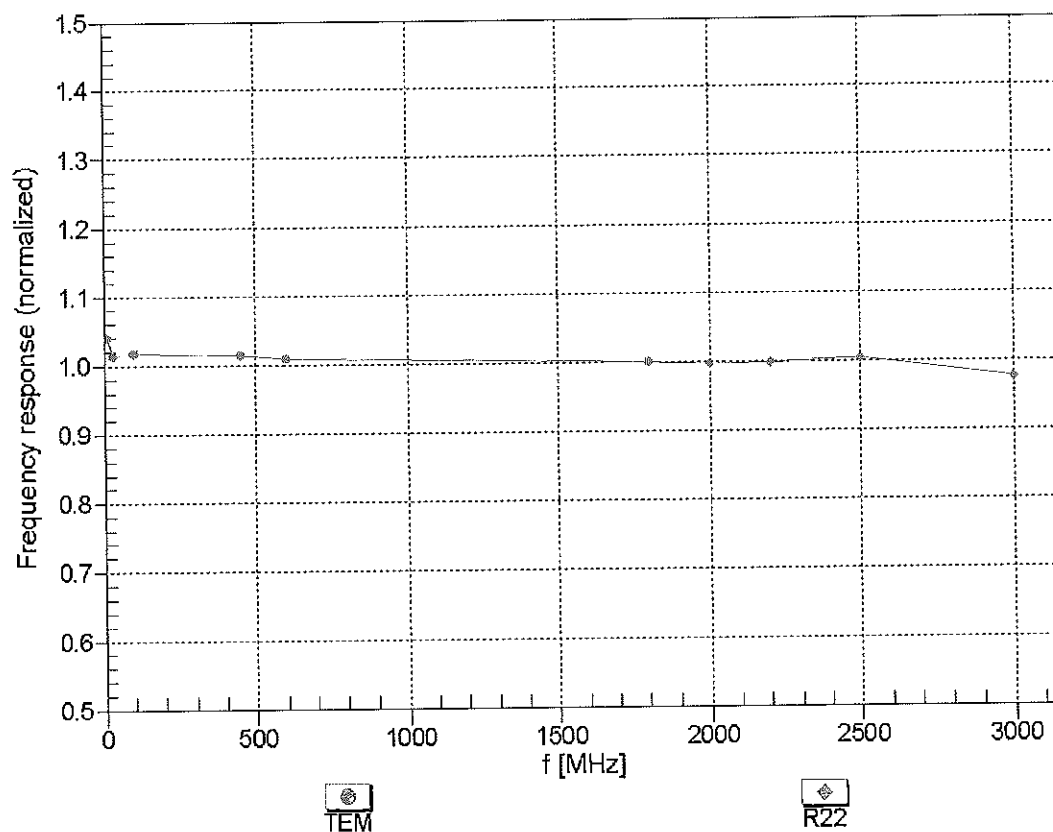
<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## Frequency Response of E-Field

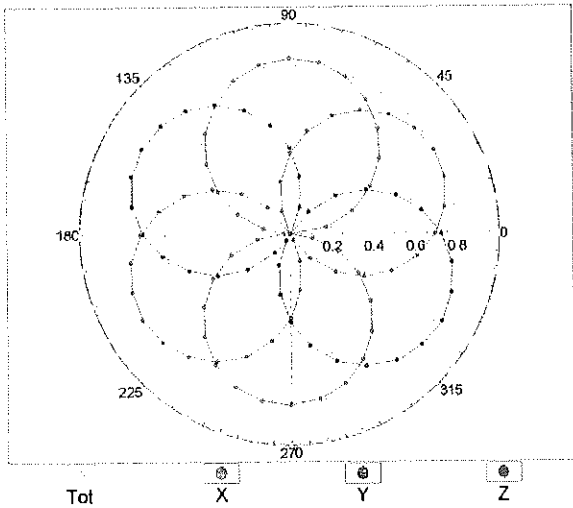
(TEM-Cell:ifi110 EXX, Waveguide: R22)



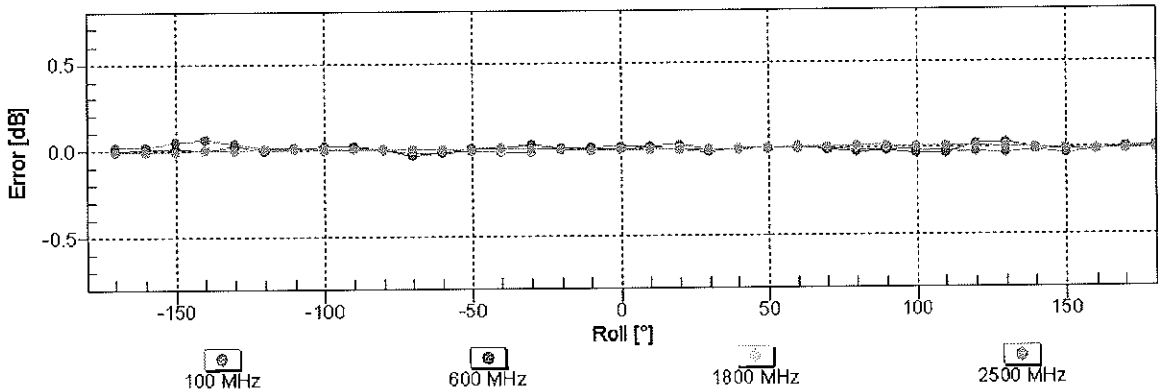
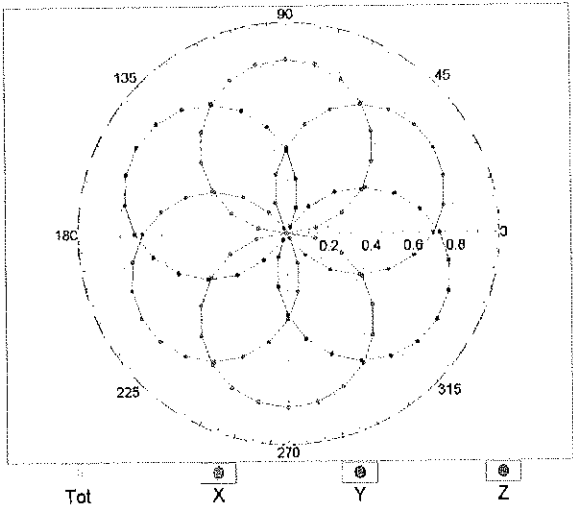
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

Receiving Pattern ( $\phi$ ),  $\theta = 0^\circ$

f=600 MHz,TEM

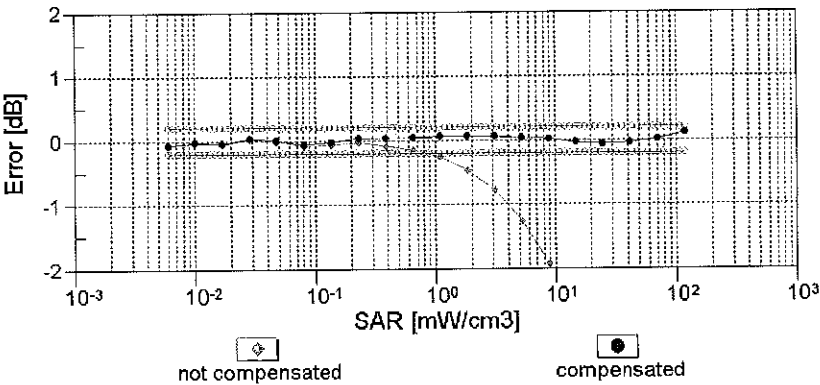
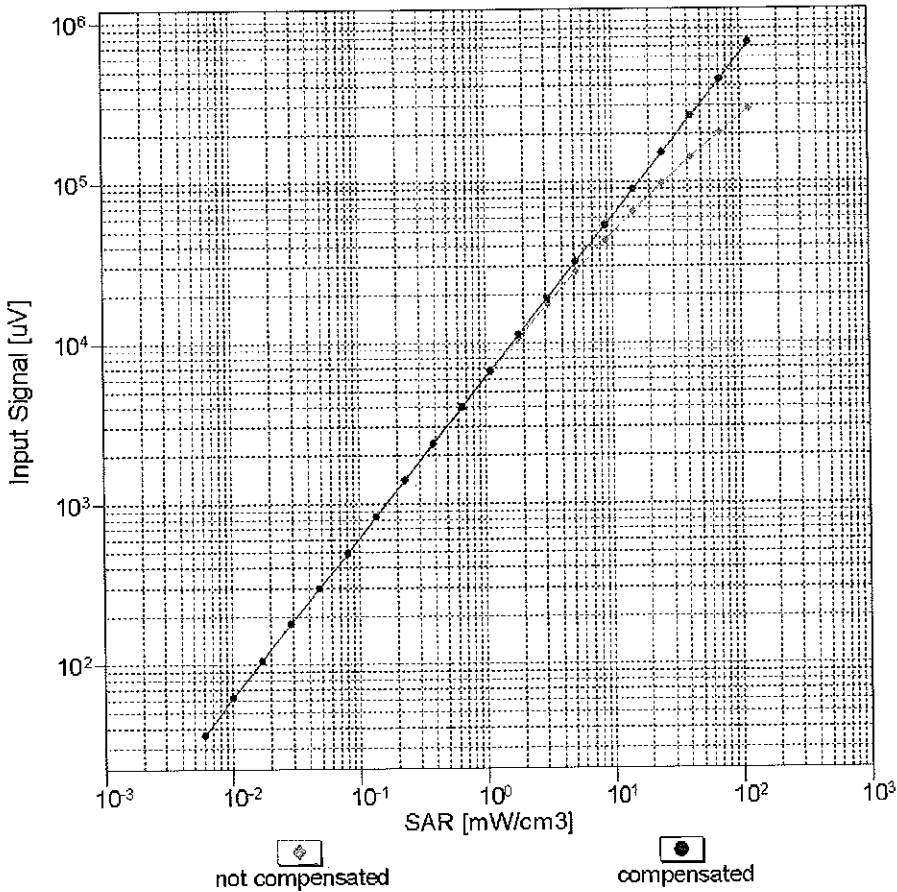


f=1800 MHz,R22



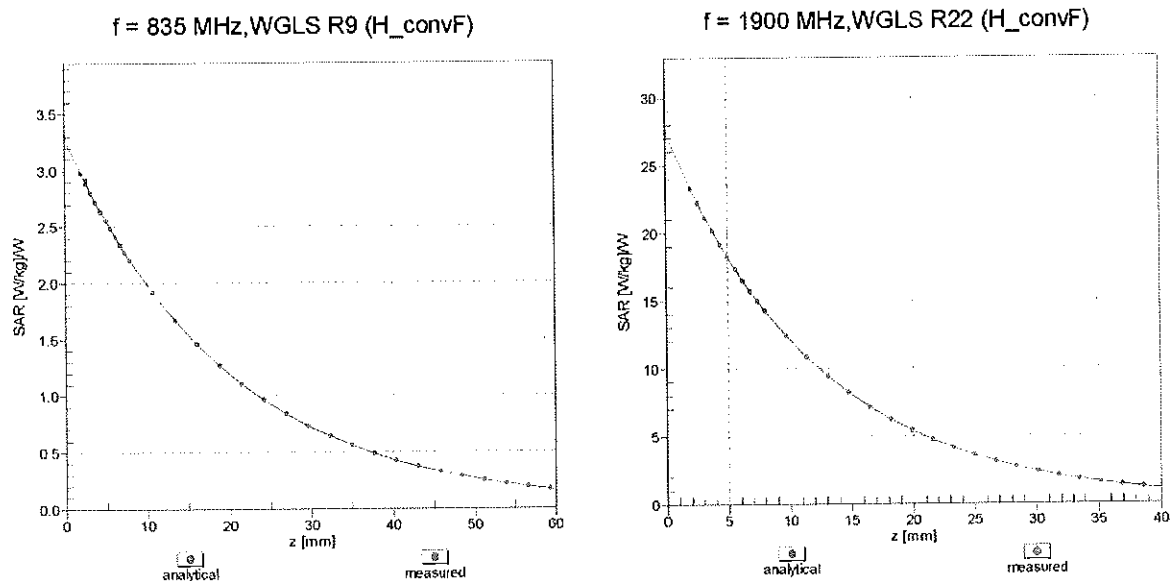
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  (k=2)

**Dynamic Range f(SAR<sub>head</sub>)**  
(TEM cell , f<sub>eval</sub>= 1900 MHz)



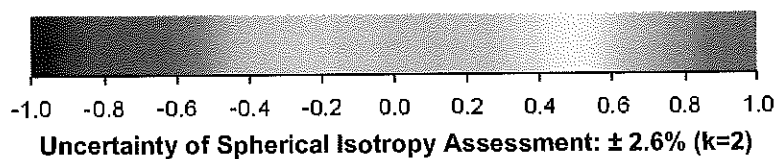
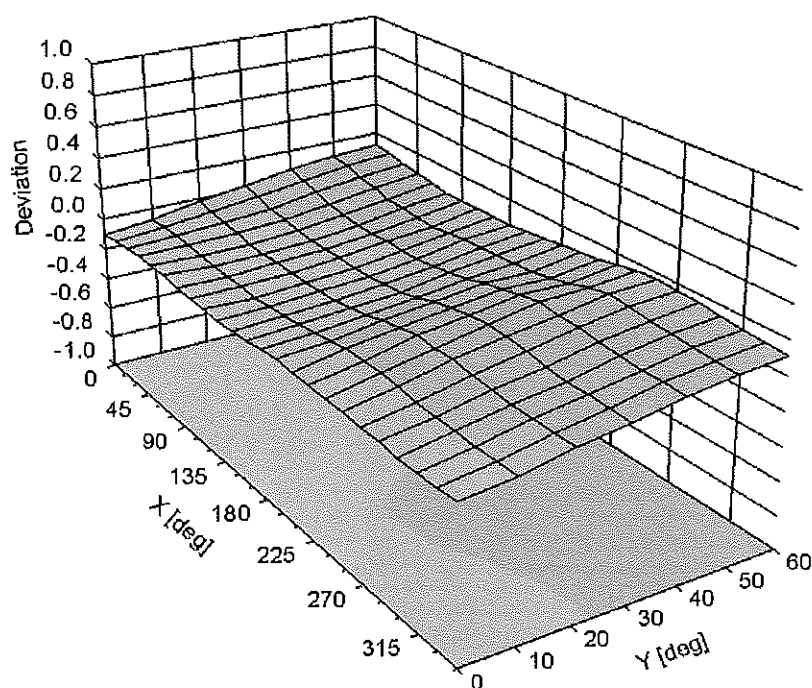
**Uncertainty of Linearity Assessment: ± 0.6% (k=2)**

## Conversion Factor Assessment



## Deviation from Isotropy in Liquid

Error ( $\phi, \theta$ ),  $f = 900 \text{ MHz}$



Uncertainty of Spherical Isotropy Assessment:  $\pm 2.6\%$  ( $k=2$ )

**DASY/EASY - Parameters of Probe: ES3DV3 - SN:3319****Other Probe Parameters**

|                                               |            |
|-----------------------------------------------|------------|
| Sensor Arrangement                            | Triangular |
| Connector Angle (°)                           | -120.2     |
| Mechanical Surface Detection Mode             | enabled    |
| Optical Surface Detection Mode                | disabled   |
| Probe Overall Length                          | 337 mm     |
| Probe Body Diameter                           | 10 mm      |
| Tip Length                                    | 10 mm      |
| Tip Diameter                                  | 4 mm       |
| Probe Tip to Sensor X Calibration Point       | 2 mm       |
| Probe Tip to Sensor Y Calibration Point       | 2 mm       |
| Probe Tip to Sensor Z Calibration Point       | 2 mm       |
| Recommended Measurement Distance from Surface | 3 mm       |



Accredited by the Swiss Accreditation Service (SAS)  
 The Swiss Accreditation Service is one of the signatories to the EA  
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **ES3-3209\_Mar15**

## CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3209**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6**  
**Calibration procedure for dosimetric E-field probes**

Calibration date: **March 19, 2015**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID              | Cal Date (Certificate No.)        | Scheduled Calibration  |
|----------------------------|-----------------|-----------------------------------|------------------------|
| Power meter E4419B         | GB41293874      | 03-Apr-14 (No. 217-01911)         | Apr-15                 |
| Power sensor E4412A        | MY41498087      | 03-Apr-14 (No. 217-01911)         | Apr-15                 |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 03-Apr-14 (No. 217-01915)         | Apr-15                 |
| Reference 20 dB Attenuator | SN: S5277 (20x) | 03-Apr-14 (No. 217-01919)         | Apr-15                 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 03-Apr-14 (No. 217-01920)         | Apr-15                 |
| Reference Probe ES3DV2     | SN: 3013        | 30-Dec-14 (No. ES3-3013_Dec14)    | Dec-15                 |
| DAE4                       | SN: 660         | 14-Jan-15 (No. DAE4-660_Jan15)    | Jan-16                 |
| Secondary Standards        | ID              | Check Date (in house)             | Scheduled Check        |
| RF generator HP 8648C      | US3642U01700    | 4-Aug-99 (in house check Apr-13)  | In house check: Apr-16 |
| Network Analyzer HP 8753E  | US37390585      | 18-Oct-01 (in house check Oct-14) | In house check: Oct-15 |

|                |                              |                                          |               |
|----------------|------------------------------|------------------------------------------|---------------|
| Calibrated by: | Name<br><b>Israe Elnaouq</b> | Function<br><b>Laboratory Technician</b> | Signature<br> |
| Approved by:   | <b>Katja Pokovic</b>         | <b>Technical Manager</b>                 |               |

Issued: March 19, 2015

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



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Accreditation No.: **SCS 0108**

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### Glossary:

|                          |                                                                                                                                                         |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| TSL                      | tissue simulating liquid                                                                                                                                |
| NORM <sub>x,y,z</sub>    | sensitivity in free space                                                                                                                               |
| ConvF                    | sensitivity in TSL / NORM <sub>x,y,z</sub>                                                                                                              |
| DCP                      | diode compression point                                                                                                                                 |
| CF                       | crest factor (1/duty_cycle) of the RF signal                                                                                                            |
| A, B, C, D               | modulation dependent linearization parameters                                                                                                           |
| Polarization $\varphi$   | $\varphi$ rotation around probe axis                                                                                                                    |
| Polarization $\vartheta$ | $\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center),<br>i.e., $\vartheta = 0$ is normal to probe axis |
| Connector Angle          | information used in DASY system to align probe sensor X to the robot coordinate system                                                                  |

### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

### Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not affect the  $E^2$ -field uncertainty inside TSL (see below *ConvF*).
- NORM(f)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* frequency\_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- DCP<sub>x,y,z</sub>**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; D<sub>x,y,z</sub>; VR<sub>x,y,z</sub>**: A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM<sub>x,y,z</sub> \* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from  $\pm 50$  MHz to  $\pm 100$  MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM<sub>x</sub> (no uncertainty required).

# Probe ES3DV3

## SN:3209

Manufactured: October 14, 2008  
Calibrated: March 19, 2015

Calibrated for DASY/EASY Systems  
(Note: non-compatible with DASY2 system!)

# DASY/EASY - Parameters of Probe: ES3DV3 - SN:3209

## Basic Calibration Parameters

|                                       | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|---------------------------------------|----------|----------|----------|-----------|
| Norm ( $\mu V/(V/m)^2$ ) <sup>A</sup> | 1.35     | 1.33     | 1.14     | ± 10.1 %  |
| DCP (mV) <sup>B</sup>                 | 102.0    | 100.9    | 103.3    |           |

## Modulation Calibration Parameters

| UID           | Communication System Name                     |   | A<br>dB | B<br>dB $\sqrt{\mu V}$ | C    | D<br>dB | VR<br>mV | Unc <sup>E</sup><br>(k=2) |
|---------------|-----------------------------------------------|---|---------|------------------------|------|---------|----------|---------------------------|
| 0             | CW                                            | X | 0.0     | 0.0                    | 1.0  | 0.00    | 214.5    | ±3.5 %                    |
|               |                                               | Y | 0.0     | 0.0                    | 1.0  |         | 192.6    |                           |
|               |                                               | Z | 0.0     | 0.0                    | 1.0  |         | 199.1    |                           |
| 10010-<br>CAA | SAR Validation (Square, 100ms, 10ms)          | X | 2.61    | 65.1                   | 12.2 | 10.00   | 42.3     | ±1.7 %                    |
|               |                                               | Y | 1.39    | 57.8                   | 8.9  |         | 42.7     |                           |
|               |                                               | Z | 4.57    | 70.3                   | 14.0 |         | 38.3     |                           |
| 10011-<br>CAB | UMTS-FDD (WCDMA)                              | X | 3.12    | 66.3                   | 18.1 | 2.91    | 130.3    | ±0.7 %                    |
|               |                                               | Y | 3.08    | 65.6                   | 17.5 |         | 132.2    |                           |
|               |                                               | Z | 3.32    | 67.7                   | 19.0 |         | 137.6    |                           |
| 10012-<br>CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)      | X | 2.54    | 66.8                   | 17.8 | 1.87    | 131.1    | ±0.7 %                    |
|               |                                               | Y | 2.67    | 67.1                   | 17.7 |         | 131.6    |                           |
|               |                                               | Z | 2.85    | 69.2                   | 19.1 |         | 138.0    |                           |
| 10013-<br>CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps) | X | 10.78   | 70.5                   | 23.4 | 9.46    | 146.9    | ±2.7 %                    |
|               |                                               | Y | 10.39   | 69.2                   | 22.5 |         | 123.5    |                           |
|               |                                               | Z | 10.50   | 69.9                   | 23.1 |         | 128.4    |                           |
| 10021-<br>DAB | GSM-FDD (TDMA, GMSK)                          | X | 3.65    | 74.2                   | 17.7 | 9.39    | 130.0    | ±1.9 %                    |
|               |                                               | Y | 6.62    | 83.5                   | 22.0 |         | 149.4    |                           |
|               |                                               | Z | 4.25    | 76.8                   | 19.2 |         | 136.2    |                           |
| 10023-<br>DAB | GPRS-FDD (TDMA, GMSK, TN 0)                   | X | 3.95    | 75.3                   | 18.4 | 9.57    | 138.8    | ±2.5 %                    |
|               |                                               | Y | 4.99    | 78.2                   | 19.8 |         | 143.3    |                           |
|               |                                               | Z | 4.11    | 75.8                   | 18.9 |         | 129.3    |                           |
| 10024-<br>DAB | GPRS-FDD (TDMA, GMSK, TN 0-1)                 | X | 6.44    | 80.3                   | 17.7 | 6.56    | 135.0    | ±1.7 %                    |
|               |                                               | Y | 3.76    | 73.7                   | 16.0 |         | 144.2    |                           |
|               |                                               | Z | 11.61   | 88.5                   | 20.7 |         | 148.0    |                           |
| 10027-<br>DAB | GPRS-FDD (TDMA, GMSK, TN 0-1-2)               | X | 43.77   | 99.9                   | 21.8 | 4.80    | 131.8    | ±1.7 %                    |
|               |                                               | Y | 13.95   | 87.5                   | 19.0 |         | 142.7    |                           |
|               |                                               | Z | 39.96   | 99.9                   | 22.1 |         | 145.6    |                           |
| 10028-<br>DAB | GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)             | X | 62.88   | 99.8                   | 20.4 | 3.55    | 144.5    | ±2.2 %                    |
|               |                                               | Y | 2.45    | 70.4                   | 12.9 |         | 130.3    |                           |
|               |                                               | Z | 80.83   | 99.9                   | 19.9 |         | 135.1    |                           |
| 10032-<br>CAA | IEEE 802.15.1 Bluetooth (GFSK, DH5)           | X | 0.32    | 58.4                   | 4.3  | 1.16    | 144.1    | ±1.9 %                    |
|               |                                               | Y | 16.25   | 79.9                   | 12.1 |         | 129.5    |                           |
|               |                                               | Z | 95.90   | 91.1                   | 14.4 |         | 134.6    |                           |
| 10100-<br>CAB | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)      | X | 6.32    | 67.4                   | 19.8 | 5.67    | 138.3    | ±1.4 %                    |
|               |                                               | Y | 6.35    | 67.3                   | 19.5 |         | 144.4    |                           |
|               |                                               | Z | 6.20    | 67.1                   | 19.6 |         | 127.7    |                           |

|           |                                          |   |       |      |      |      |       |        |
|-----------|------------------------------------------|---|-------|------|------|------|-------|--------|
| 10103-CAB | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK) | X | 8.72  | 73.1 | 25.3 | 9.29 | 138.6 | ±2.7 % |
|           |                                          | Y | 8.88  | 72.9 | 24.9 |      | 147.9 |        |
|           |                                          | Z | 8.48  | 72.3 | 24.9 |      | 127.4 |        |
| 10108-CAC | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK) | X | 6.14  | 66.9 | 19.6 | 5.80 | 136.2 | ±1.7 % |
|           |                                          | Y | 6.20  | 66.8 | 19.4 |      | 142.8 |        |
|           |                                          | Z | 6.10  | 66.8 | 19.6 |      | 126.2 |        |
| 10117-CAB | IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK) | X | 10.05 | 68.9 | 21.4 | 8.07 | 126.8 | ±2.2 % |
|           |                                          | Y | 9.98  | 68.5 | 21.1 |      | 132.4 |        |
|           |                                          | Z | 10.23 | 69.4 | 21.7 |      | 140.4 |        |
| 10151-CAB | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)  | X | 8.16  | 72.2 | 25.0 | 9.28 | 133.6 | ±2.7 % |
|           |                                          | Y | 8.33  | 72.0 | 24.5 |      | 142.6 |        |
|           |                                          | Z | 8.40  | 73.1 | 25.6 |      | 147.5 |        |
| 10154-CAC | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)  | X | 5.83  | 66.5 | 19.4 | 5.75 | 133.1 | ±1.4 % |
|           |                                          | Y | 5.89  | 66.3 | 19.2 |      | 139.3 |        |
|           |                                          | Z | 6.00  | 67.2 | 19.9 |      | 146.5 |        |
| 10160-CAB | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)  | X | 6.26  | 66.9 | 19.6 | 5.82 | 138.8 | ±1.7 % |
|           |                                          | Y | 6.34  | 67.0 | 19.5 |      | 145.1 |        |
|           |                                          | Z | 6.22  | 66.9 | 19.7 |      | 128.8 |        |
| 10169-CAB | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)    | X | 4.77  | 66.7 | 19.8 | 5.73 | 135.9 | ±1.4 % |
|           |                                          | Y | 4.89  | 66.6 | 19.5 |      | 141.8 |        |
|           |                                          | Z | 4.85  | 66.8 | 19.9 |      | 128.3 |        |
| 10172-CAB | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)    | X | 6.77  | 75.0 | 26.9 | 9.21 | 144.2 | ±2.5 % |
|           |                                          | Y | 6.56  | 72.6 | 25.2 |      | 131.1 |        |
|           |                                          | Z | 6.68  | 74.0 | 26.4 |      | 137.1 |        |
| 10175-CAC | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)    | X | 4.80  | 66.9 | 19.9 | 5.72 | 135.2 | ±1.4 % |
|           |                                          | Y | 4.87  | 66.5 | 19.5 |      | 140.6 |        |
|           |                                          | Z | 5.03  | 67.7 | 20.4 |      | 149.4 |        |
| 10181-CAB | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)    | X | 4.77  | 66.7 | 19.8 | 5.72 | 134.7 | ±1.2 % |
|           |                                          | Y | 4.88  | 66.5 | 19.5 |      | 140.6 |        |
|           |                                          | Z | 4.84  | 66.8 | 19.9 |      | 127.8 |        |
| 10196-CAB | IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)  | X | 9.97  | 69.5 | 21.9 | 8.10 | 145.2 | ±2.2 % |
|           |                                          | Y | 9.60  | 68.2 | 21.0 |      | 125.1 |        |
|           |                                          | Z | 9.80  | 69.1 | 21.7 |      | 133.9 |        |
| 10225-CAB | UMTS-FDD (HSPA+)                         | X | 6.95  | 67.5 | 19.8 | 5.97 | 147.3 | ±1.4 % |
|           |                                          | Y | 6.73  | 66.4 | 19.1 |      | 128.7 |        |
|           |                                          | Z | 6.89  | 67.4 | 19.8 |      | 137.2 |        |
| 10237-CAB | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)    | X | 6.85  | 75.4 | 27.2 | 9.21 | 146.0 | ±2.5 % |
|           |                                          | Y | 6.54  | 72.5 | 25.1 |      | 131.6 |        |
|           |                                          | Z | 6.76  | 74.4 | 26.6 |      | 138.2 |        |
| 10252-CAB | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)  | X | 7.58  | 71.3 | 24.6 | 9.24 | 126.6 | ±2.5 % |
|           |                                          | Y | 7.73  | 71.1 | 24.2 |      | 133.3 |        |
|           |                                          | Z | 7.82  | 72.4 | 25.3 |      | 139.0 |        |
| 10267-CAB | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK) | X | 8.18  | 72.2 | 25.1 | 9.30 | 133.6 | ±2.7 % |
|           |                                          | Y | 8.35  | 72.0 | 24.6 |      | 141.1 |        |
|           |                                          | Z | 8.42  | 73.2 | 25.6 |      | 147.0 |        |

|           |                                                               |   |       |      |      |      |       |        |
|-----------|---------------------------------------------------------------|---|-------|------|------|------|-------|--------|
| 10275-CAB | UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)                      | X | 4.22  | 66.1 | 18.4 | 3.96 | 128.8 | ±0.9 % |
|           |                                                               | Y | 4.24  | 65.9 | 18.1 |      | 133.8 |        |
|           |                                                               | Z | 4.39  | 67.1 | 19.0 |      | 141.7 |        |
| 10291-AAB | CDMA2000, RC3, SO55, Full Rate                                | X | 3.51  | 66.7 | 18.6 | 3.46 | 140.9 | ±0.7 % |
|           |                                                               | Y | 3.52  | 66.2 | 18.1 |      | 143.4 |        |
|           |                                                               | Z | 3.58  | 67.2 | 19.0 |      | 131.7 |        |
| 10292-AAB | CDMA2000, RC3, SO32, Full Rate                                | X | 3.45  | 66.7 | 18.5 | 3.39 | 142.0 | ±0.7 % |
|           |                                                               | Y | 3.50  | 66.4 | 18.2 |      | 146.9 |        |
|           |                                                               | Z | 3.61  | 67.8 | 19.3 |      | 132.2 |        |
| 10297-AAA | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)                       | X | 6.15  | 66.9 | 19.6 | 5.81 | 136.3 | ±1.4 % |
|           |                                                               | Y | 6.20  | 66.8 | 19.4 |      | 140.3 |        |
|           |                                                               | Z | 6.11  | 66.8 | 19.6 |      | 126.6 |        |
| 10311-AAA | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)                      | X | 6.80  | 67.8 | 20.1 | 6.06 | 143.2 | ±1.7 % |
|           |                                                               | Y | 6.80  | 67.5 | 19.9 |      | 147.4 |        |
|           |                                                               | Z | 6.71  | 67.6 | 20.1 |      | 131.9 |        |
| 10400-AAB | IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)           | X | 10.31 | 70.0 | 22.4 | 8.37 | 147.9 | ±3.0 % |
|           |                                                               | Y | 9.88  | 68.5 | 21.3 |      | 127.2 |        |
|           |                                                               | Z | 10.13 | 69.5 | 22.1 |      | 135.8 |        |
| 10403-AAB | CDMA2000 (1xEV-DO, Rev. 0)                                    | X | 4.60  | 68.6 | 18.9 | 3.76 | 128.2 | ±0.5 % |
|           |                                                               | Y | 4.58  | 67.9 | 18.4 |      | 134.2 |        |
|           |                                                               | Z | 4.86  | 69.6 | 19.5 |      | 142.6 |        |
| 10404-AAB | CDMA2000 (1xEV-DO, Rev. A)                                    | X | 4.57  | 68.9 | 19.1 | 3.77 | 149.7 | ±0.5 % |
|           |                                                               | Y | 4.51  | 68.0 | 18.5 |      | 132.3 |        |
|           |                                                               | Z | 4.78  | 69.6 | 19.5 |      | 140.3 |        |
| 10415-AAA | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)     | X | 2.47  | 67.0 | 17.9 | 1.54 | 128.1 | ±0.7 % |
|           |                                                               | Y | 2.46  | 66.4 | 17.4 |      | 132.5 |        |
|           |                                                               | Z | 2.72  | 69.1 | 19.2 |      | 140.6 |        |
| 10416-AAA | IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle) | X | 10.12 | 69.7 | 22.1 | 8.23 | 146.8 | ±2.7 % |
|           |                                                               | Y | 9.66  | 68.2 | 21.1 |      | 125.0 |        |
|           |                                                               | Z | 9.91  | 69.2 | 21.8 |      | 134.3 |        |

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the  $E^2$ -field uncertainty inside TSL (see Pages 7 and 8).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3209

### Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unct. (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-------------|
| 750                  | 41.9                               | 0.89                            | 6.34    | 6.34    | 6.34    | 0.29               | 2.02                    | ± 12.0 %    |
| 835                  | 41.5                               | 0.90                            | 6.04    | 6.04    | 6.04    | 0.23               | 2.57                    | ± 12.0 %    |
| 1750                 | 40.1                               | 1.37                            | 5.23    | 5.23    | 5.23    | 0.80               | 1.08                    | ± 12.0 %    |
| 1900                 | 40.0                               | 1.40                            | 5.05    | 5.05    | 5.05    | 0.10               | 2.40                    | ± 12.0 %    |
| 2300                 | 39.5                               | 1.67                            | 4.76    | 4.76    | 4.76    | 0.70               | 1.27                    | ± 12.0 %    |
| 2450                 | 39.2                               | 1.80                            | 4.53    | 4.53    | 4.53    | 0.80               | 1.22                    | ± 12.0 %    |
| 2600                 | 39.0                               | 1.96                            | 4.36    | 4.36    | 4.36    | 0.75               | 1.31                    | ± 12.0 %    |

<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3209

### Calibration Parameter Determined in Body Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unct. (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-------------|
| 750                  | 55.5                               | 0.96                            | 6.12    | 6.12    | 6.12    | 0.34               | 1.81                    | ± 12.0 %    |
| 835                  | 55.2                               | 0.97                            | 6.07    | 6.07    | 6.07    | 0.37               | 1.79                    | ± 12.0 %    |
| 1750                 | 53.4                               | 1.49                            | 4.86    | 4.86    | 4.86    | 0.67               | 1.43                    | ± 12.0 %    |
| 1900                 | 53.3                               | 1.52                            | 4.57    | 4.57    | 4.57    | 0.57               | 1.53                    | ± 12.0 %    |
| 2300                 | 52.9                               | 1.81                            | 4.28    | 4.28    | 4.28    | 0.80               | 1.19                    | ± 12.0 %    |
| 2450                 | 52.7                               | 1.95                            | 4.12    | 4.12    | 4.12    | 0.72               | 1.15                    | ± 12.0 %    |
| 2600                 | 52.5                               | 2.16                            | 3.92    | 3.92    | 3.92    | 0.80               | 1.10                    | ± 12.0 %    |

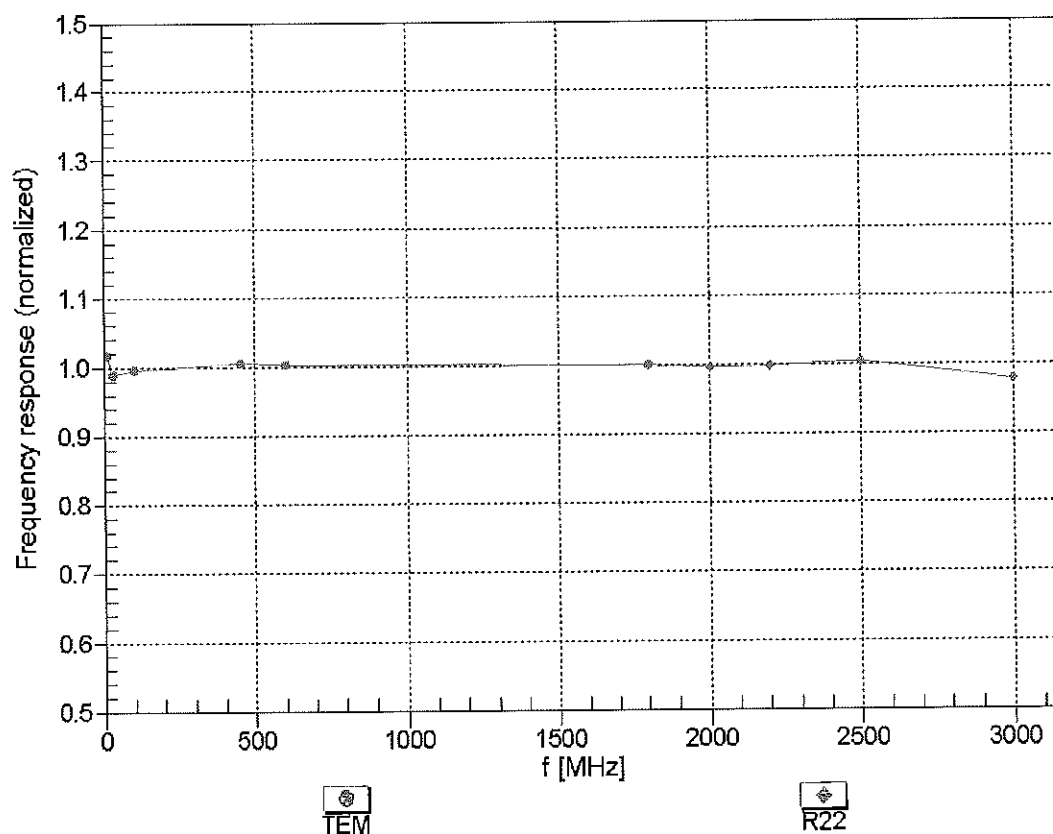
<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## Frequency Response of E-Field

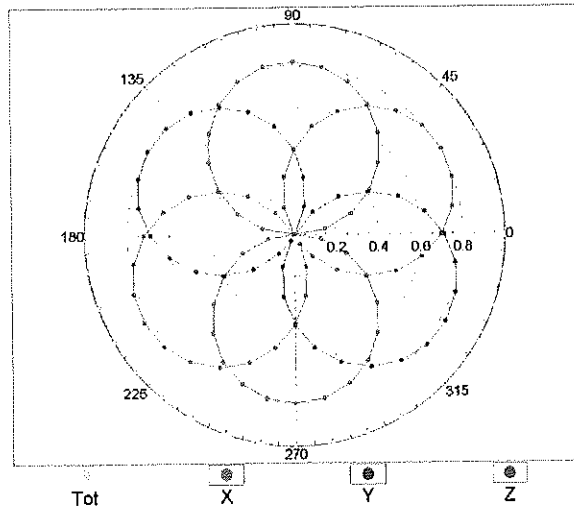
(TEM-Cell:ifi110 EXX, Waveguide: R22)



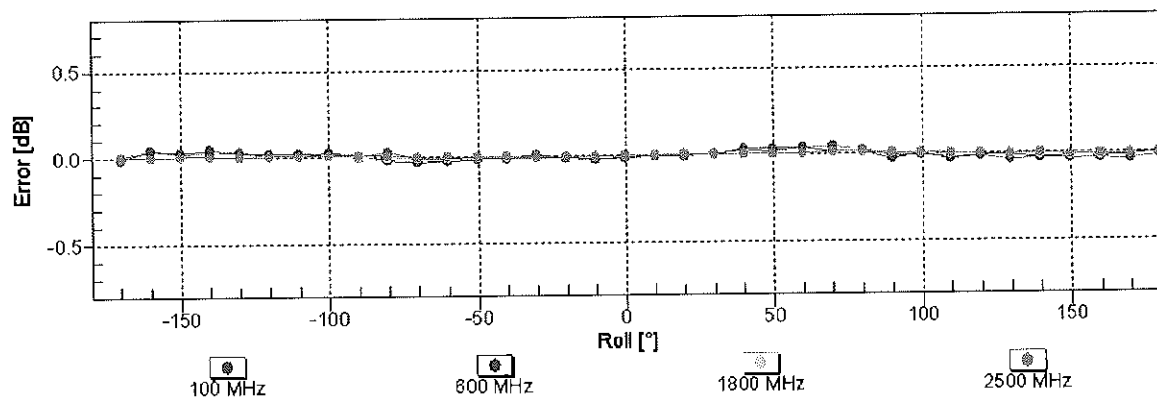
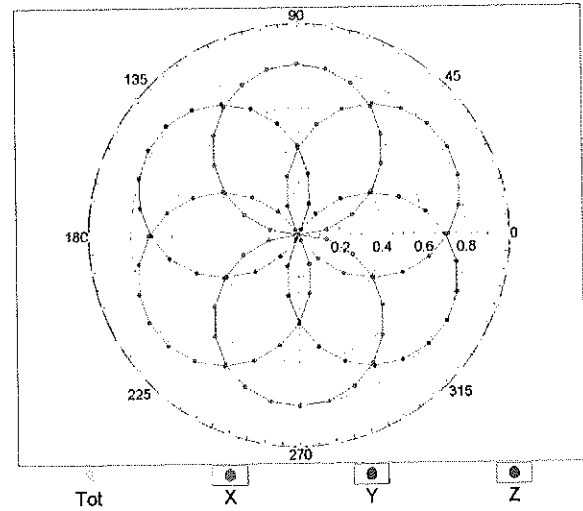
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

## Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$

f=600 MHz,TEM

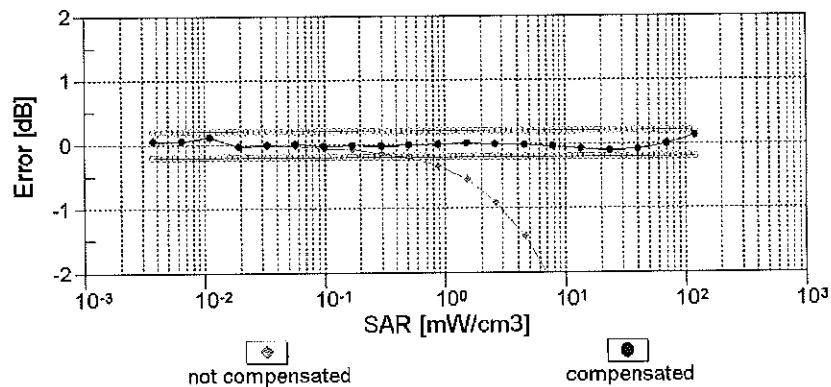
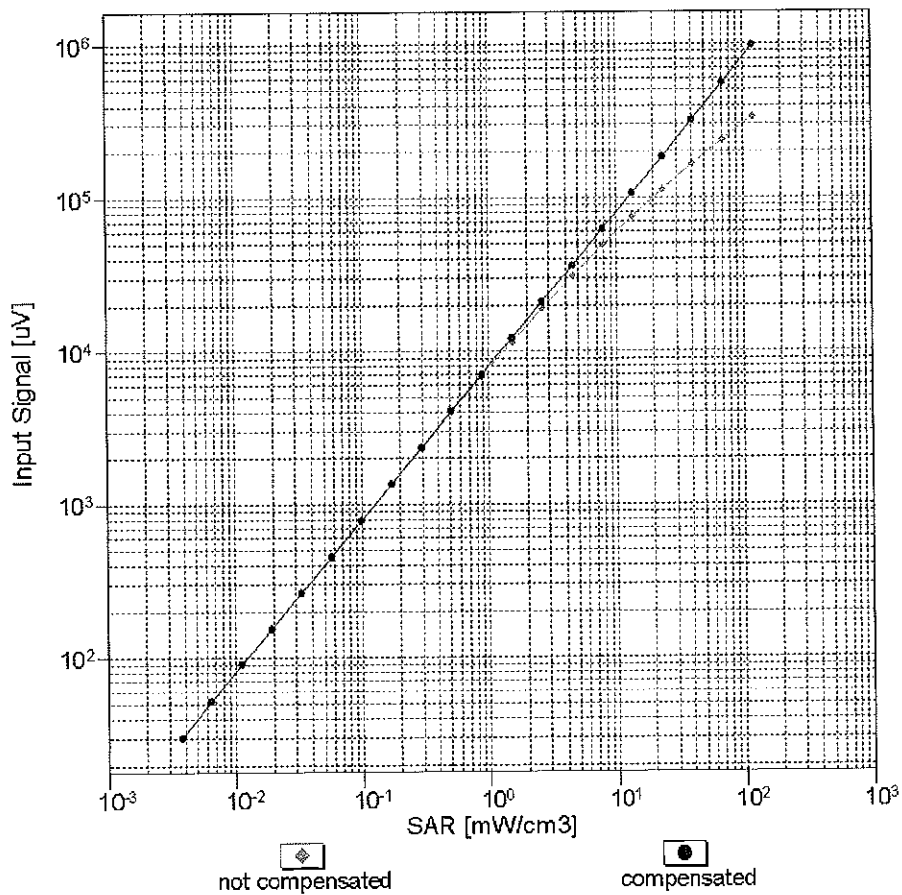


f=1800 MHz,R22



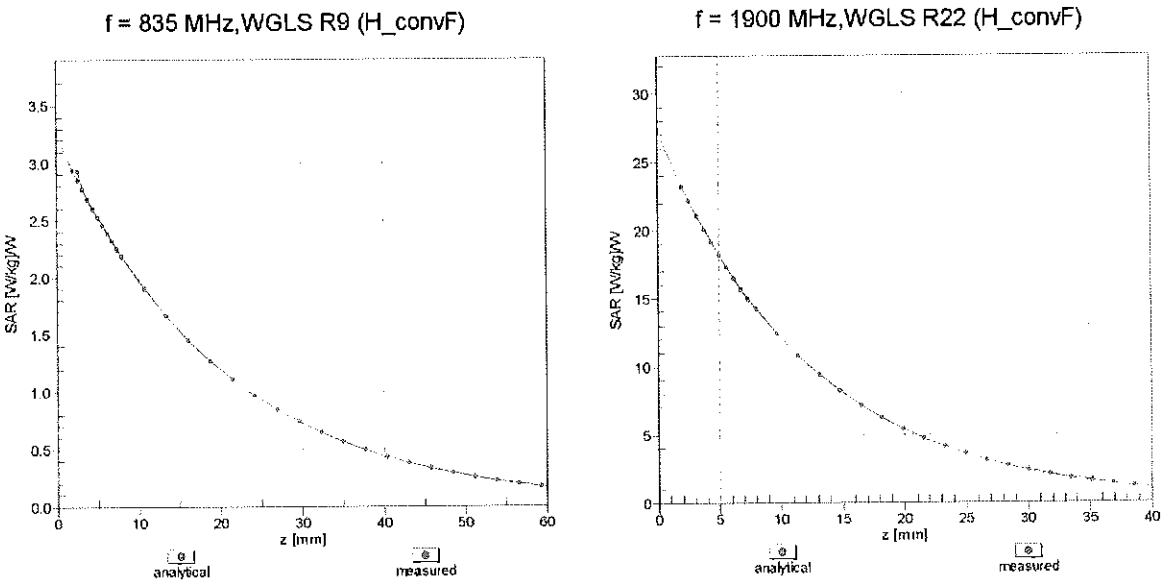
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

**Dynamic Range f(SAR<sub>head</sub>)**  
(TEM cell , f<sub>eval</sub>= 1900 MHz)

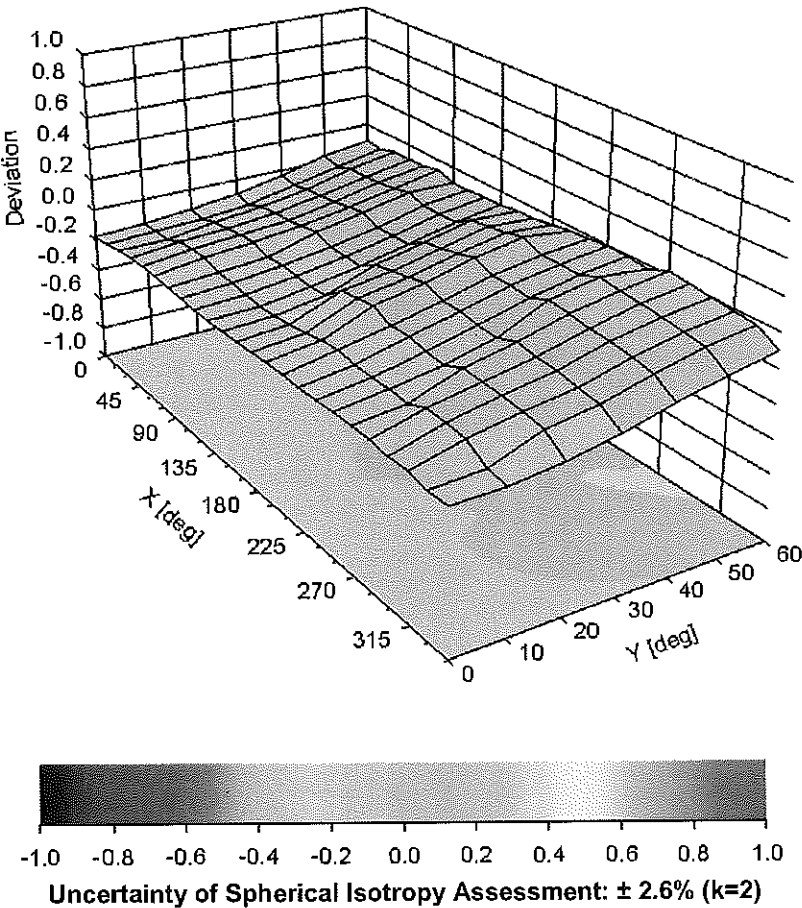


**Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )**

# Conversion Factor Assessment



## Deviation from Isotropy in Liquid Error ( $\phi$ , $\theta$ ), f = 900 MHz



## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3209

### Other Probe Parameters

|                                               |            |
|-----------------------------------------------|------------|
| Sensor Arrangement                            | Triangular |
| Connector Angle (°)                           | -40.3      |
| Mechanical Surface Detection Mode             | enabled    |
| Optical Surface Detection Mode                | disabled   |
| Probe Overall Length                          | 337 mm     |
| Probe Body Diameter                           | 10 mm      |
| Tip Length                                    | 10 mm      |
| Tip Diameter                                  | 4 mm       |
| Probe Tip to Sensor X Calibration Point       | 2 mm       |
| Probe Tip to Sensor Y Calibration Point       | 2 mm       |
| Probe Tip to Sensor Z Calibration Point       | 2 mm       |
| Recommended Measurement Distance from Surface | 3 mm       |