



SAR EVALUATION REPORT

Applicant Name:

Samsung Electronics, Co. Ltd.
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Gyeonggi-do 443-742, Korea

Date of Testing:

05/11/15 - 05/26/15

Test Site/Location:

PCTEST Lab, Columbia, MD, USA

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FCC ID:

A3LSMG530P

APPLICANT:

SAMSUNG ELECTRONICS, CO. LTD.

DUT Type:

Portable Handset

Application Type:

Certification

FCC Rule Part(s):

CFR §2.1093

Model(s):

SM-G530P

Equipment Class	Band & Mode	Tx Frequency	SAR		
			1 gm Head (W/kg)	1 gm Body-Worn (W/kg)	1 gm Hotspot (W/kg)
PCE	CDMA/EVDO BC0 (\$22H)	824.70 - 848.31 MHz	0.91	1.10	1.03
PCE	CDMA/EVDO BC10 (\$90S)	817.90 - 823.10 MHz	0.79	1.10	0.95
PCE	PCS CDMA/EVDO	1851.25 - 1908.75 MHz	0.96	0.89	0.76
PCE	LTE Band 12	699.7 - 715.3 MHz	0.32	0.45	0.59
PCE	LTE Band 26	814.7 - 848.3 MHz	0.39	0.70	0.79
PCE	LTE Band 4 (AWS)	1710.7 - 1754.3 MHz	0.46	0.33	0.44
PCE	LTE Band 25 (PCS)	1850.7 - 1914.3 MHz	0.41	0.54	0.53
PCE	LTE Band 41	2498.5 - 2687.5 MHz	0.38	0.26	0.59
DTS	2.4 GHz WLAN	2412 - 2462 MHz	0.35	0.18	0.41
DSS/DTS	Bluetooth	2402 - 2480 MHz	N/A		
Simultaneous SAR per KDB 690783 D01v01r03:			1.05	1.38	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 1.8 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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1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
CDMA/EVDO BC0 (§22H)	Voice/Data	824.70 - 848.31 MHz
CDMA/EVDO BC10 (§90S)	Voice/Data	817.90 - 823.10 MHz
PCS CDMA/EVDO	Voice/Data	1851.25 - 1908.75 MHz
LTE Band 12	Data	699.7 - 715.3 MHz
LTE Band 26	Data	814.7 - 848.3 MHz
LTE Band 5	Data	824.7 - 848.3 MHz
LTE Band 4 (AWS)	Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Data	1850.7 - 1914.3 MHz
LTE Band 2	Data	1950.7 - 1909.3 MHz
LTE Band 41	Data	2498.5 - 2687.5 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
ANT+	Data	2402 - 2480 MHz

1.2 Power Reduction for SAR

The device utilizes power reduction under portable hotspot for SAR compliance. There is power reduction for CDMA/EVDO 850/1900, and LTE Band 4/2/25. There is no power reduction for LTE Bands 12/5/26/41, and WLAN modes. The reduced powers were confirmed via conducted power measurements at the RF port (See Section 9). A detailed description of the hotspot power reduction is included in the technical descriptions in the FCC Filing.

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 D01v05.

Hotspot Mode Inactive

Mode / Band		Modulated Average (dBm)
CDMA/EVDO BC0 (§22H)	Maximum	25.5
	Nominal	25.0
CDMA/EVDO BC10 (§90S)	Maximum	25.5
	Nominal	25.0
PCS CDMA/EVDO	Maximum	25.5
	Nominal	25.0

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Hotspot Mode Inactive

Mode / Band		Modulated Average (dBm)
LTE Band 12	Maximum	23.5
	Nominal	23.0
LTE Band 26	Maximum	23.5
	Nominal	23.0
LTE Band 5	Maximum	23.5
	Nominal	23.0
LTE Band 4 (AWS)	Maximum	23.5
	Nominal	23.0
LTE Band 2	Maximum	23.5
	Nominal	23.0
LTE Band 25 (PCS)	Maximum	23.5
	Nominal	23.0
LTE Band 41	Maximum	24.5
	Nominal	24.0

Mode / Band		Modulated Average (dBm)
IEEE 802.11b (2.4 GHz)	Maximum	17.5
	Nominal	17.0
IEEE 802.11g (2.4 GHz)	Maximum	14.5
	Nominal	14.0
IEEE 802.11n (2.4 GHz)	Maximum	14.0
	Nominal	13.5
Bluetooth	Maximum	13.0
	Nominal	12.5
Bluetooth LE	Maximum	3.5
	Nominal	3.0

Hotspot Mode Active

Mode / Band		Modulated Average (dBm)
CDMA/EVDO BC0 (§22H)	Maximum	23.5
	Nominal	23.0
CDMA/EVDO BC10 (§90S)	Maximum	23.5
	Nominal	23.0
PCS CDMA/EVDO	Maximum	22.5
	Nominal	22.0

Hotspot Mode Active

Mode / Band		Modulated Average (dBm)
LTE Band 4 (AWS)	Maximum	20.5
	Nominal	20.0
LTE Band 2	Maximum	20.5
	Nominal	20.0
LTE Band 25 (PCS)	Maximum	20.5
	Nominal	20.0

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1.4 DUT Antenna Locations

A diagram showing the location 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. The overall dimensions of this device are > 9 x 5 cm. The overall diagonal dimension of the device is <160 mm and the diagonal display is <150 mm.

Table 1-1
Mobile Hotspot Sides for SAR Testing

Mode	Back	Front	Top	Bottom	Right	Left
EVDO BC0 (\$22H)	Yes	Yes	No	Yes	Yes	Yes
EVDO BC10 (\$90S)	Yes	Yes	No	Yes	Yes	Yes
PCS EVDO	Yes	Yes	No	Yes	Yes	Yes
LTE Band 12	Yes	Yes	No	Yes	Yes	Yes
LTE Band 26	Yes	Yes	No	Yes	Yes	Yes
LTE Band 4 (AWS)	Yes	Yes	No	Yes	Yes	Yes
LTE Band 25 (PCS)	Yes	Yes	No	Yes	Yes	Yes
LTE Band 41	Yes	Yes	No	Yes	Yes	Yes
2.4 GHz WLAN	Yes	Yes	Yes	No	No	Yes

Note: Particular DUT edges were not required to be evaluated for Wireless Router SAR if the edges were greater than 2.5 cm from the transmitting antenna according to FCC KDB Publication 941225 D06v02 guidance, page 2. The distances between the transmit antennas and the edges of the device are included in the filing.

1.5 Near Field Communications (NFC) Antenna

This DUT has NFC Operations. The NFC antenna is integrated into the specialized battery. Therefore, all SAR tests were performed with the specialized battery (model: EB-BG530BBU). A diagram showing the location of the NFC antenna can be found in Appendix F.

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1.6 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.

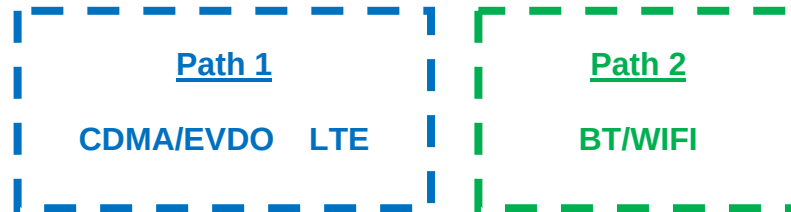


Figure 1-1
Simultaneous Transmission Paths

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	Head	Body-Worn Accessory	Wireless Router	Notes
1	1x CDMA voice + 2.4 GHz Wi-Fi	Yes	Yes	N/A	
2	1x CDMA voice + 2.4 GHz Bluetooth	N/A	Yes	N/A	
3	LTE + 2.4 GHz Wi-Fi	Yes*	Yes*	Yes	*Pre-installed VOIP applications are considered.
4	LTE + 2.4 GHz Bluetooth	N/A	Yes*	N/A	*Pre-installed VOIP applications are considered.
5	CDMA/EVDO data + 2.4 GHz Wi-Fi	Yes*	Yes*	Yes	*Pre-installed VOIP applications are considered.
6	CDMA/EVDO data + 2.4 GHz Bluetooth	N/A	Yes*	N/A	*Pre-installed VOIP applications are considered.
7	1x CDMA voice + CDMA/EVDO data	N/A	N/A	N/A	Not supported by HW
8	CDMA/EVDO data + LTE	N/A	N/A	N/A	Not supported by HW
9	1x CDMA voice + LTE	N/A	N/A	N/A	Not supported by HW
10	1x CDMA voice + LTE + 2.4 GHz Wi-Fi	N/A	N/A	N/A	Not supported by HW

- 2.4 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.
- Per the manufacturer, WIFI Direct is not expected to be used in conjunction with a held-to-ear or body-worn accessory voice call. Therefore, there are no simultaneous transmission scenarios involving WIFI direct beyond that listed in the above table.
- This device does not support VoLTE.
- This device supports VoWIFI.

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1.7 Miscellaneous SAR Test Considerations

(A) WIFI/BT

Per FCC KDB 447498 D01v05, 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 (rounded to the nearest mW) and the antenna to user separation distance, body-worn Bluetooth SAR was not required; $[(20/15) * \sqrt{2.480}] = 2.1 < 3.0$. Per KDB Publication 447498 D01v05, the maximum power of the channel was rounded to the nearest mW before calculation.

(B) Licensed Transmitter(s)

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 D05v02r03.

CDMA 1X Advanced technology was not required for SAR since the maximum output powers for 1x Advanced was not more than 0.25 dB higher than the maximum measured powers for 1x and the measured SAR in any 1x mode exposure conditions was not greater than 1.2 W/kg per FCC KDB Publication 941225 D01v03.

This Device additionally supports LTE B2. LTE Band 2 and LTE Band 25 share the same transmission path. LTE Band 2 was not evaluated for SAR since the supported frequency range falls within the LTE Band 25 supported frequency range and the Band 2 target power was equal to the Band 25 target power.

This Device additionally supports LTE B5. LTE Band 5 and LTE Band 26 share the same transmission path. LTE Band 5 was not evaluated for SAR since the supported frequency range falls within the LTE Band 26 supported frequency range and the Band 5 target power was equal to the Band 26 target power.

1.8 Guidance Applied

- IEEE 1528-2003
- FCC KDB Publication 941225 D01v03, D05v02r03, D06v02 (3G/4G and Hotspot)
- FCC KDB Publication 248227 D01v02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D01v05r02 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r03, D02v01r01 (SAR Measurements up to 6 GHz)

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1.9 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.

	Head Serial Number	Reduced Head Serial Number	Body-Worn Serial Number	Hotspot Serial Number
CDMA/EVDO BC0 (\$22H)	85234	85223	85234	85223
CDMA/EVDO BC10 (\$90S)	85234	85223	85234	85223
PCS CDMA/EVDO	85234	85155	85320	85155
LTE Band 12	85168	-	85168	85168
LTE Band 26	85227	-	85168	85168
LTE Band 4 (AWS)	85227	85240	85168	85240
LTE Band 25 (PCS)	85168	85320	85168	85320
LTE Band 41	85244	-	85244	85244
2.4 GHz WLAN	85226	-	85244	85244

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LTE INFORMATION

LTE Information					
FCC ID	A3LSMG530P				
Form Factor	Portable Handset				
Frequency Range of each LTE transmission band	LTE Band 12 (699.7 - 715.3 MHz)				
	LTE Band 26 (814.7 - 848.3 MHz)				
	LTE Band 5 (824.7 - 848.3 MHz)				
	LTE Band 4 (AWS) (1710.7 - 1754.3 MHz)				
	LTE Band 2 (1850.7 - 1909.3 MHz)				
	LTE Band 25 (PCS) (1850.7 - 1914.3 MHz)				
	LTE Band 41 (2498.5 - 2687.5 MHz)				
Channel Bandwidths	LTE Band 12: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz				
	LTE Band 26: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz				
	LTE Band 5: 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: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 25 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 41: 5 MHz, 10 MHz, 15 MHz, 20 MHz				
Channel Numbers and Frequencies (MHz)	Low	Low-Mid	Mid	High-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 26: 1.4 MHz	814.7 (26697)	831.5 (26865)	848.3 (27033)		
LTE Band 26: 3 MHz	815.5 (26705)	831.5 (26865)	847.5 (27025)		
LTE Band 26: 5 MHz	816.5 (26715)	831.5 (26865)	846.5 (27015)		
LTE Band 26: 10 MHz	819 (26740)	831.5 (26865)	844 (26990)		
LTE Band 26: 15 MHz	831.5 (26865)	836.5 (26915)	841.5 (26965)		
LTE Band 5: 1.4 MHz	824.7 (20407)	836.5 (20525)	848.3 (20643)		
LTE Band 5: 3 MHz	825.5 (20415)	836.5 (20525)	847.5 (20635)		
LTE Band 5: 5 MHz	826.5 (20425)	836.5 (20525)	846.5 (20625)		
LTE Band 5: 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: 1.4 MHz	1850.7 (18607)	1880 (18900)	1909.3 (19193)		
LTE Band 2: 3 MHz	1851.5 (18615)	1880 (18900)	1908.5 (19185)		
LTE Band 2: 5 MHz	1852.5 (18625)	1880 (18900)	1907.5 (19175)		
LTE Band 2: 10 MHz	1855 (18650)	1880 (18900)	1905 (19150)		
LTE Band 2: 15 MHz	1857.5 (18675)	1880 (18900)	1902.5 (19125)		
LTE Band 2: 20 MHz	1860 (18700)	1880 (18900)	1900 (19100)		
LTE Band 25 (PCS): 1.4 MHz	1850.7 (26047)	1882.5 (26365)	1914.3 (26683)		
LTE Band 25 (PCS): 3 MHz	1851.5 (26055)	1882.5 (26365)	1913.5 (26675)		
LTE Band 25 (PCS): 5 MHz	1852.5 (26065)	1882.5 (26365)	1912.5 (26665)		
LTE Band 25 (PCS): 10 MHz	1855 (26090)	1882.5 (26365)	1910 (26640)		
LTE Band 25 (PCS): 15 MHz	1857.5 (26115)	1882.5 (26365)	1907.5 (26615)		
LTE Band 25 (PCS): 20 MHz	1860 (26140)	1882.5 (26365)	1905 (26590)		
LTE Band 41: 5 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 41: 10 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 41: 15 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 41: 20 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
UE Category	4				
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 Release 10 Additional Information	This device does not support full LTE Release 10 features such as: Carrier Aggregation, Relay, HetNet, Enhanced MIMO, eICl, WIFI Offloading, MDH, eMBMA, Cross-Carrier Scheduling, Enhanced SC-FDMA.				

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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 (ρ). 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:

- σ = conductivity of the tissue-simulating material (S/m)
- ρ = mass density of the tissue-simulating material (kg/m³)
- 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 D01v01 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 D01v01 (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 D01v01 (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.

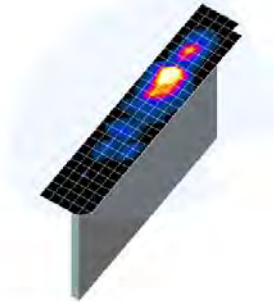


Figure 4-1
Sample SAR Area Scan

Table 4-1
Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v01*

Frequency	Maximum Area Scan Resolution (mm) ($\Delta x_{\text{area}}, \Delta y_{\text{area}}$)	Maximum Zoom Scan Resolution (mm) ($\Delta x_{\text{zoom}}, \Delta y_{\text{zoom}}$)	Maximum Zoom Scan Spatial Resolution (mm)			Minimum Zoom Scan Volume (mm) (x,y,z)
			Uniform Grid	Graded Grid		
			$\Delta z_{\text{zoom}}(n)$	$\Delta z_{\text{zoom}}(1)^*$	$\Delta z_{\text{zoom}}(n>1)^*$	
≤ 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

DEFINITION OF REFERENCE POINTS

5.1 EAR REFERENCE POINT

Figure 5-2 shows the front, back and side views of the SAM Twin Phantom. The point “M” is the reference point for the center of the mouth, “LE” is the left ear reference point (ERP), and “RE” is the right ERP. The ERP is 15mm posterior to the entrance to the ear canal (EEC) along the B-M line (Back-Mouth), as shown in Figure 5-1. The plane passing through the two ear canals and M is defined as the Reference Plane. The line N-F (Neck-Front), also called the Reference Pivoting Line, is not perpendicular to the reference plane (see Figure 5-1). Line B-M is perpendicular to the N-F line. Both N-F and B-M lines are marked on the external phantom shell to facilitate handset positioning [5].

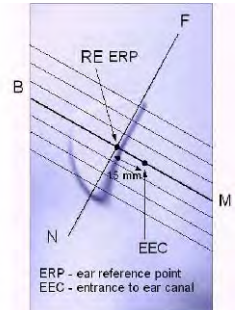


Figure 5-1
Close-Up Side view
of ERP

5.2 HANDSET REFERENCE POINTS

Two imaginary lines on the handset were established: the vertical centerline and the horizontal line. The test device was placed in a normal operating position with the acoustic output located along the “vertical centerline” on the front of the device aligned to the “ear reference point” (See Figure 5-3). The acoustic output was then located at the same level as the center of the ear reference point. The test device was positioned so that the “vertical centerline” was bisecting the front surface of the handset at its top and bottom edges, positioning the “ear reference point” on the outer surface of the both the left and right head phantoms on the ear reference point.



Figure 5-2
Front, back and side view of SAM Twin Phantom

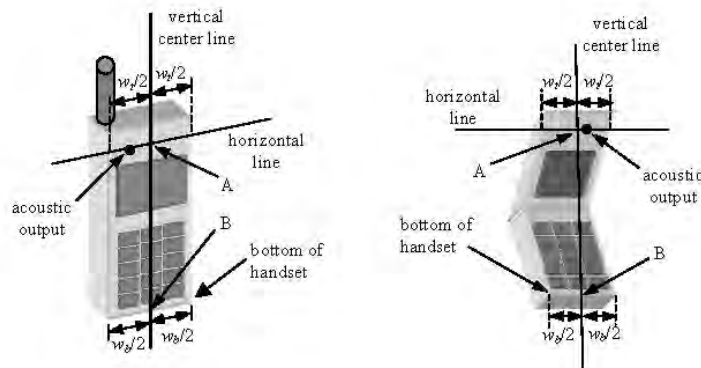


Figure 5-3
Handset Vertical Center & Horizontal Line Reference Points

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TEST CONFIGURATION POSITIONS FOR HANDSETS

6.1 Device Holder

The device holder is made out of low-loss POM material having the following dielectric parameters: relative permittivity $\epsilon = 3$ and loss tangent $\delta = 0.02$.

6.2 Positioning for Cheek

1. The test device was positioned with the device close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 6-1), such that the plane defined by the vertical center line and the horizontal line of the phone is approximately parallel to the sagittal plane of the phantom.

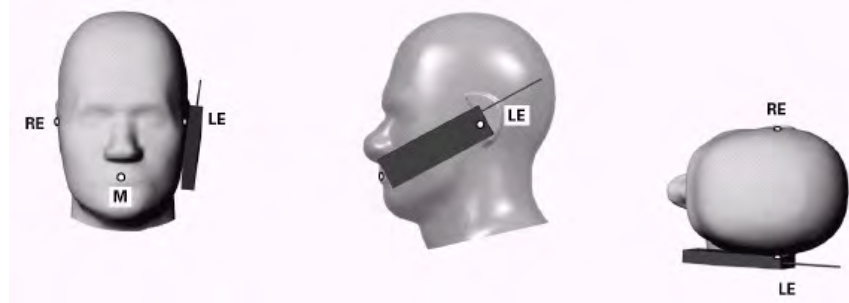


Figure 6-1 Front, Side and Top View of Cheek Position

2. The handset was translated towards the phantom along the line passing through RE & LE until the handset touches the pinna.
3. While maintaining the handset in this plane, the handset was rotated around the LE-RE line until the vertical centerline was in the reference plane.
4. The phone was then rotated around the vertical centerline until the phone (horizontal line) was symmetrical with respect to the line NF.
5. While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE, and maintaining the device contact with the ear, the device was rotated about the NF line until any point on the handset made contact with a phantom point below the ear (cheek) (See Figure 6-2).

6.3 Positioning for Ear / 15° Tilt

With the test device aligned in the “Cheek Position”:

1. While maintaining the orientation of the phone, the phone was retracted parallel to the reference plane far enough to enable a rotation of the phone by 15 degrees.
2. The phone was then rotated around the horizontal line by 15 degrees.
3. While maintaining the orientation of the phone, the phone was moved parallel to the reference plane until any part of the handset touched the head. (In this position, point A was located on the line RE-LE). The tilted position is obtained when the contact is on the pinna. If the contact was at any location other than the pinna, the angle of the phone would then be reduced. In this situation, the tilted position was obtained when any part of the phone was in contact of the ear as well as a second part of the phone was in contact with the head (see Figure 6-2).

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Figure 6-2 Front, Side and Top View of Ear/15° Tilt Position

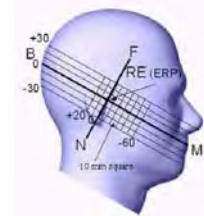


Figure 6-3 Side view w/ relevant markings

6.4 Body-Worn Accessory Configurations

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 6-4). Per FCC KDB Publication 648474 D04v01, Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB Publication 447498 D01v05 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is $> 1.2 \text{ W/kg}$, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

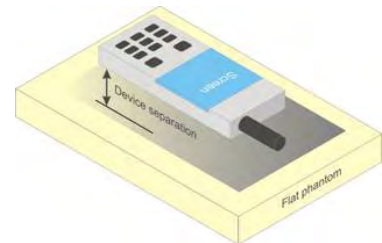


Figure 6-4 Sample Body-Worn Diagram

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are tested with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

Body-worn accessories may not always be supplied or available as options for some devices intended to be authorized for body-worn use. In this case, a test configuration with a separation distance between the back of the device and the flat phantom is used. Test position spacing was documented. Transmitters that are designed to operate in front of a person's face, as in push-to-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom in head fluid. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessories, including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.

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6.5 Extremity Exposure Configurations

Devices that are designed or intended for use on extremities or mainly operated in extremity only exposure conditions; i.e., hands, wrists, feet and ankles, may require extremity SAR evaluation. When the device also operates in close proximity to the user's body, SAR compliance for the body is also required. The 1-g body and 10-g extremity SAR Exclusion Thresholds found in KDB Publication 44798 D01v05 should be applied to determine SAR test requirements.

Per KDB Publication 447498 D01v05, Cell phones (handsets) are not normally designed to be used on extremities or operated in extremity only exposure conditions. The maximum output power levels of handsets generally do not require extremity SAR testing to show compliance. Therefore, extremity SAR was not evaluated for this device.

6.6 Wireless Router Configurations

Some battery-operated handsets have the capability to transmit and receive user data through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06v02 where SAR test considerations for handsets ($L \times W \geq 9 \text{ cm} \times 5 \text{ cm}$) are based on a composite test separation distance of 10 mm from the front, back and edges of the device containing transmitting antennas within 2.5 cm of their edges, determined from general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions due to the limitations of the SAR assessment probes. Therefore, SAR must be evaluated for each frequency transmission and mode separately and spatially summed with the WIFI transmitter according to FCC KDB Publication 447498 D01v05 publication procedures. The "Portable Hotspot" feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

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7 RF EXPOSURE LIMITS

7.1 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.

7.2 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 7-1
SAR Human Exposure Specified in ANSI/IEEE C95.1-1992 and Health Canada Safety Code 6

HUMAN EXPOSURE LIMITS		
	UNCONTROLLED ENVIRONMENT <i>General Population</i> (W/kg) or (mW/g)	CONTROLLED ENVIRONMENT <i>Occupational</i> (W/kg) or (mW/g)
Peak Spatial Average SAR Head	1.6	8.0
Whole Body SAR	0.08	0.4
Peak Spatial Average SAR 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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Power measurements for licensed transmitters are performed using a base station simulator under digital average power.

8.1 Measured and Reported SAR

Per FCC KDB Publication 447498 D01v05, 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 D01v01r02.

8.2 3G SAR Test Reduction Procedure

In FCC KDB Publication 941225 D01v03, 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 ≤ 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 ≤ 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.

8.3 Procedures Used to Establish RF Signal for SAR

The following procedures are according to FCC KDB Publication 941225 D01v03 "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.

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8.4 SAR Measurement Conditions for CDMA2000

The following procedures were performed according to FCC KDB Publication 941225 D01v03 “3G SAR Measurement Procedures.”

8.4.1 Output Power Verification

See 3GPP2 C.S0011/TIA-98-E as recommended by FCC KDB Publication 941225 D01v03 “3G SAR Measurement Procedures.” Maximum output power is verified on the High, Middle and Low channels according to procedures in section 4.4.5.2 of 3GPP2 C.S0011/TIA-98-E. SO55 tests were measured with power control bits in the “All Up” condition.

1. If the mobile station (MS) supports Reverse TCH RC 1 and Forward TCH RC 1, set up a call using Fundamental Channel Test Mode 1 (RC=1/1) with 9600 bps data rate only.
2. Under RC1, C.S0011 Table 4.4.5.2-1, Table 8-1 parameters were applied.
3. If the MS supports the RC 3 Reverse FCH, RC3 Reverse SCH₀ and demodulation of RC 3,4, or 5, set up a call using Supplemental Channel Test Mode 3 (RC 3/3) with 9600 bps Fundamental Channel and 9600 bps SCH₀ data rate.
4. Under RC3, C.S0011 Table 4.4.5.2-2, Table 8-2 was applied.

Table 8-1
Parameters for Max. Power for RC1

Parameter	Units	Value
I_{or}	dBm/1.23 MHz	-104
$\frac{Pilot E_c}{I_{or}}$	dB	-7
$\frac{Traffic E_c}{I_{or}}$	dB	-7.4

Table 8-2
Parameters for Max. Power for RC3

Parameter	Units	Value
I_{or}	dBm/1.23 MHz	-86
$\frac{Pilot E_c}{I_{or}}$	dB	-7
$\frac{Traffic E_c}{I_{or}}$	dB	-7.4

5. FCHs were configured at full rate for maximum SAR with “All Up” power control bits.

8.4.2 Head SAR Measurements

SAR for next to the ear head exposure is measured in RC3 with the handset configured to transmit at fullrate in SO55. The 3G SAR test reduction procedure is applied to RC1 with RC3 as the primary mode; otherwise, SAR is required for the channel with maximum measured output in RC1 using the head exposure configuration that results in the highest reported SAR in RC3.

Head SAR is additionally evaluated using EVDO Rev. A to support compliance for VoIP operations. See Section 8.4.5 for EVDO Rev. A configuration parameters.

8.4.3 Body-worn SAR Measurements

SAR for body-worn exposure configurations is measured in RC3 with the DUT configured to transmit at full rate on FCH with all other code channels disabled using TDSO / SO32. The 3G SAR test reduction procedure is applied to the multiple code channel configuration (FCH+SCH_n), with FCH only as the primary mode. Otherwise, SAR is required for multiple code channel configuration (FCH + SCH_n), with FCH at full rate and SCH₀ enabled at 9600 bps, using the highest reported SAR configuration for FCH only. When multiple code channels are enabled, the transmitter output can shift by more than 0.5 dB and may lead to higher SAR drifts and SCH dropouts.

The 3G SAR test reduction procedure is applied to body-worn accessory SAR in RC1 with RC3 as the primary mode. Otherwise, SAR is required for RC1, with SO55 and full rate, using the highest reported SAR configuration for body-worn accessory exposure in RC3.

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8.4.4 Body-worn SAR Measurements for EVDO Devices

For handsets with Ev-Do capabilities, the 3G SAR test reduction procedure is applied to Ev-Do Rev. 0 with 1x RTT RC3 as the primary mode to determine body-worn accessory test requirements. Otherwise, body-worn accessory SAR is required for Rev. 0, at 153.6 kbps, using the highest reported SAR configuration for body-worn accessory exposure in RC3.

The 3G SAR test reduction procedure is applied to Rev. A, with Rev. 0 as the primary mode to determine body-worn accessory SAR test requirements. When SAR is not required for Rev. 0, the 3G SAR test reduction is applied with 1x RTT RC3 as the primary mode.

When SAR is required for EVDO Rev. A, SAR is measured with a Reverse Data Channel payload size of 4096 bits and a Termination Target of 16 slots defined for Subtype 2 Physical Layer configurations, using the highest reported SAR configuration for body-worn accessory exposure in Rev. 0 or 1x RTT RC3, as appropriate.

8.4.5 Body SAR Measurements for EVDO Hotspot

Hotspot Body SAR is measured using Subtype 0/1 Physical Layer configurations for Rev. 0. The 3G SAR test reduction procedure is applied to Rev. A, Subtype 2 Physical layer configuration, with Rev. 0 as the primary mode; otherwise, SAR is measured for Rev. A using the highest reported SAR configuration for body-worn accessory exposure in Rev. 0. The AT is tested with a Reverse Data Channel rate of 153.6 kbps in Subtype 0/1 Physical Layer configurations; and a Reverse Data Channel payload size of 4096 bits and Termination Target of 16 slots in Subtype 2 Physical Layer configurations.

For Ev-Do data devices that also support 1x RTT voice and/or data operations, the 3G SAR test reduction procedure is applied to 1x RTT RC3 and RC1 with Ev-Do Rev. 0 and Rev. A as the respective primary modes. Otherwise, the 'Body-Worn Accessory SAR' procedures in the '3GPP2 CDMA 2000 1x Handsets' section are applied.

8.4.6 CDMA2000 1x Advanced

This device additionally supports 1x Advanced. Conducted powers are measured using SO75 with RC8 on the uplink and RC11 on the downlink per FCC KDB Publication 941225 D01v03. Smart blanking is disabled for all measurements. The EUT is configured with forward power control Mode 000 and reverse power control at 400 bps. Conducted powers are measured on an Agilent 8960 Series 10 Wireless Communications Test Set, Model E5515C using the CDMA2000 1x Advanced application, Option E1962B-410.

The 3G SAR test reduction procedure is applied to the 1x-Advanced transmission mode with 1x RTT RC3 as the primary mode. When SAR measurement is required, the 1x-Advanced power measurement configurations are used. The 1x Advanced SAR procedures are applied separately to head, body-worn accessory and other exposure conditions.

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8.5 SAR Measurement Conditions for LTE

LTE modes are tested according to FCC KDB 941225 D05v02r03 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).

8.5.1 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.

8.5.2 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.

8.5.3 A-MPR

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

8.5.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05v02r03:

- 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 ≤ 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.

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8.5.5 TDD

LTE TDD testing is performed using guidance from FCC KDB 941225 D05v02r03 and the SAR test guidance provided in April 2013 TCB workshop notes. TDD is tested at the highest duty factor using UL-DL configuration 0 with special subframe configuration 6 and applying the FDD LTE procedures in KDB 941225 D05v02r03. SAR testing is performed using the extended cyclic prefix listed in 3GPP TS 36.211 Section 4.

8.6 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 D01v02 for more details.

8.6.1 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 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. Initial Test Position Procedure

For exposure conditions with multiple test positions, such as handset operating next to the ear, devices with hotspot mode or UMPC mini-tablet, procedures for initial test position can be applied. Using the transmission mode determined by the DSSS procedure or initial test configuration, area scans are measured for all positions in an exposure condition. The test position with the highest extrapolated (peak) SAR is used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg, no additional testing for the remaining test positions is required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.

8.6.2 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 ≤ 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.

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9.1 CDMA Conducted Powers

Table 9-1
Maximum Average RF Output Powers

Band	Channel	Rule Part	Frequency	SO55 [dBm]	SO55 [dBm]	SO75 [dBm]	TDSO SO32 [dBm]	TDSO SO32 [dBm]	1x EvDO Rev. 0 [dBm]	1x EvDO Rev. A [dBm]
	F-RC		MHz	RC1	RC3	RC11	FCH+SCH	FCH	(RTAP)	(RETAP)
Cellular	564	90S	820.1	24.38	24.46	24.44	24.64	24.81	24.45	24.40
Cellular	1013	22H	824.7	24.35	24.38	24.36	24.50	24.67	24.46	24.42
	384	22H	836.52	24.38	24.50	24.60	24.68	25.09	24.53	24.51
	777	22H	848.31	24.29	24.34	24.32	24.62	24.98	24.41	24.33
PCS	25	24E	1851.25	24.22	24.27	24.35	24.46	24.47	24.46	24.45
	600	24E	1880	24.15	24.17	24.27	24.42	24.44	24.43	24.42
	1175	24E	1908.75	24.31	24.52	24.38	24.61	24.62	24.61	24.55

Note: RC1 is only applicable for IS-95 compatibility. For FCC Rule Part 90S, Per FCC KDB Publication 447498 D01v05 4.1.6, only one channel is required since the device operates within the transmission range of 817.90 – 823.10 MHz.

Table 9-2
Hotspot Reduced Average RF Output Powers – Hotspot Mode On

Band	Channel	Rule Part	Frequency	TDSO SO32 [dBm]	TDSO SO32 [dBm]	1x EvDO Rev. 0 [dBm]	1x EvDO Rev. A [dBm]
	F-RC		MHz	FCH+SCH	FCH	(RTAP)	(RETAP)
Cellular	564	90S	820.1	22.12	22.09	22.14	22.13
Cellular	1013	22H	824.7	22.17	22.21	22.16	22.09
	384	22H	836.52	22.33	22.32	22.22	22.21
	777	22H	848.31	22.19	22.12	22.08	22.07
PCS	25	24E	1851.25	21.50	21.49	21.50	21.49
	600	24E	1880	21.44	21.44	21.40	21.36
	1175	24E	1908.75	21.29	21.35	21.31	21.30

Note: RC1 is only applicable for IS-95 compatibility. For FCC Rule Part 90S, Per FCC KDB Publication 447498 D01v05 4.1.6, only one channel is required since the device operates within the transmission range of 817.90 – 823.10 MHz.



Figure 9-1
Power Measurement Setup

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9.2 LTE Conducted Powers

9.2.1

LTE Band 12

Table 9-3
LTE Band 12 Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Mid	707.5	23095	10	QPSK	1	0	23.17	0	0
	707.5	23095	10	QPSK	1	25	23.29	0	0
	707.5	23095	10	QPSK	1	49	22.87	0	0
	707.5	23095	10	QPSK	25	0	21.90	0-1	1
	707.5	23095	10	QPSK	25	12	21.89	0-1	1
	707.5	23095	10	QPSK	25	25	21.83	0-1	1
	707.5	23095	10	QPSK	50	0	21.88	0-1	1
	707.5	23095	10	16QAM	1	0	21.80	0-1	1
	707.5	23095	10	16QAM	1	25	22.02	0-1	1
	707.5	23095	10	16QAM	1	49	21.63	0-1	1
	707.5	23095	10	16QAM	25	0	20.70	0-2	2
	707.5	23095	10	16QAM	25	12	20.71	0-2	2
	707.5	23095	10	16QAM	25	25	20.54	0-2	2
	707.5	23095	10	16QAM	50	0	20.80	0-2	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.

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Table 9-4
LTE Band 12 Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	701.5	23035	5	QPSK	1	0	23.07	0	0
	701.5	23035	5	QPSK	1	12	23.17	0	0
	701.5	23035	5	QPSK	1	24	23.33	0	0
	701.5	23035	5	QPSK	12	0	22.09	0-1	1
	701.5	23035	5	QPSK	12	6	22.08	0-1	1
	701.5	23035	5	QPSK	12	13	22.18	0-1	1
	701.5	23035	5	QPSK	25	0	22.17	0-1	1
	701.5	23035	5	16-QAM	1	0	21.67	0-1	1
	701.5	23035	5	16-QAM	1	12	21.53	0-1	1
	701.5	23035	5	16-QAM	1	24	21.61	0-1	1
	701.5	23035	5	16-QAM	12	0	20.95	0-2	2
	701.5	23035	5	16-QAM	12	6	20.91	0-2	2
Mid	701.5	23035	5	16-QAM	12	13	21.00	0-2	2
	701.5	23035	5	16-QAM	25	0	21.21	0-2	2
	707.5	23095	5	QPSK	1	0	23.08	0	0
	707.5	23095	5	QPSK	1	12	23.16	0	0
	707.5	23095	5	QPSK	1	24	22.79	0	0
	707.5	23095	5	QPSK	12	0	22.14	0-1	1
	707.5	23095	5	QPSK	12	6	22.21	0-1	1
	707.5	23095	5	QPSK	12	13	22.18	0-1	1
	707.5	23095	5	QPSK	25	0	22.16	0-1	1
	707.5	23095	5	16-QAM	1	0	21.73	0-1	1
	707.5	23095	5	16-QAM	1	12	22.01	0-1	1
	707.5	23095	5	16-QAM	1	24	21.54	0-1	1
High	707.5	23095	5	16-QAM	12	0	20.92	0-2	2
	707.5	23095	5	16-QAM	12	6	20.98	0-2	2
	707.5	23095	5	16-QAM	12	13	20.98	0-2	2
	707.5	23095	5	16-QAM	25	0	20.94	0-2	2
	713.5	23155	5	QPSK	1	0	22.85	0	0
	713.5	23155	5	QPSK	1	12	23.22	0	0
	713.5	23155	5	QPSK	1	24	23.00	0	0
	713.5	23155	5	QPSK	12	0	21.94	0-1	1
	713.5	23155	5	QPSK	12	6	21.76	0-1	1
	713.5	23155	5	QPSK	12	13	21.85	0-1	1
	713.5	23155	5	QPSK	25	0	21.94	0-1	1
	713.5	23155	5	16-QAM	1	0	21.61	0-1	1
	713.5	23155	5	16-QAM	1	12	21.57	0-1	1
	713.5	23155	5	16-QAM	1	24	21.58	0-1	1
	713.5	23155	5	16-QAM	12	0	20.68	0-2	2
	713.5	23155	5	16-QAM	12	6	20.65	0-2	2
	713.5	23155	5	16-QAM	12	13	20.79	0-2	2
	713.5	23155	5	16-QAM	25	0	20.73	0-2	2

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Table 9-5
LTE Band 12 Conducted Powers - 3 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	700.5	23025	3	QPSK	1	0	23.24	0	0
	700.5	23025	3	QPSK	1	7	23.31	0	0
	700.5	23025	3	QPSK	1	14	23.20	0	0
	700.5	23025	3	QPSK	8	0	22.05	0-1	1
	700.5	23025	3	QPSK	8	4	22.09	0-1	1
	700.5	23025	3	QPSK	8	7	22.05	0-1	1
	700.5	23025	3	QPSK	15	0	22.07	0-1	1
	700.5	23025	3	16-QAM	1	0	21.58	0-1	1
	700.5	23025	3	16-QAM	1	7	21.75	0-1	1
	700.5	23025	3	16-QAM	1	14	21.60	0-1	1
	700.5	23025	3	16-QAM	8	0	20.73	0-2	2
	700.5	23025	3	16-QAM	8	4	20.89	0-2	2
	700.5	23025	3	16-QAM	8	7	20.94	0-2	2
Mid	700.5	23025	3	16-QAM	15	0	21.11	0-2	2
	707.5	23095	3	QPSK	1	0	23.28	0	0
	707.5	23095	3	QPSK	1	7	23.29	0	0
	707.5	23095	3	QPSK	1	14	23.16	0	0
	707.5	23095	3	QPSK	8	0	22.08	0-1	1
	707.5	23095	3	QPSK	8	4	22.20	0-1	1
	707.5	23095	3	QPSK	8	7	22.11	0-1	1
	707.5	23095	3	QPSK	15	0	22.20	0-1	1
	707.5	23095	3	16-QAM	1	0	21.51	0-1	1
	707.5	23095	3	16-QAM	1	7	21.53	0-1	1
	707.5	23095	3	16-QAM	1	14	21.51	0-1	1
	707.5	23095	3	16-QAM	8	0	21.03	0-2	2
	707.5	23095	3	16-QAM	8	4	21.25	0-2	2
High	707.5	23095	3	16-QAM	8	7	21.00	0-2	2
	707.5	23095	3	16-QAM	15	0	21.05	0-2	2
	714.5	23165	3	QPSK	1	0	23.15	0	0
	714.5	23165	3	QPSK	1	7	23.16	0	0
	714.5	23165	3	QPSK	1	14	23.13	0	0
	714.5	23165	3	QPSK	8	0	22.01	0-1	1
	714.5	23165	3	QPSK	8	4	21.90	0-1	1
	714.5	23165	3	QPSK	8	7	21.92	0-1	1
	714.5	23165	3	QPSK	15	0	21.87	0-1	1
	714.5	23165	3	16-QAM	1	0	21.64	0-1	1
	714.5	23165	3	16-QAM	1	7	21.80	0-1	1
	714.5	23165	3	16-QAM	1	14	21.61	0-1	1
	714.5	23165	3	16-QAM	8	0	20.57	0-2	2
	714.5	23165	3	16-QAM	8	4	20.54	0-2	2
	714.5	23165	3	16-QAM	8	7	20.50	0-2	2
	714.5	23165	3	16-QAM	15	0	20.60	0-2	2

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Table 9-6
LTE Band 12 Conducted Powers - 1.4 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	699.7	23017	1.4	QPSK	1	0	23.10	0	0
	699.7	23017	1.4	QPSK	1	2	23.20	0	0
	699.7	23017	1.4	QPSK	1	5	23.09	0	0
	699.7	23017	1.4	QPSK	3	0	23.06	0	0
	699.7	23017	1.4	QPSK	3	2	23.03	0	0
	699.7	23017	1.4	QPSK	3	3	23.10	0	0
	699.7	23017	1.4	QPSK	6	0	22.16	0-1	1
	699.7	23017	1.4	16-QAM	1	0	21.64	0-1	1
	699.7	23017	1.4	16-QAM	1	2	21.78	0-1	1
	699.7	23017	1.4	16-QAM	1	5	21.73	0-1	1
	699.7	23017	1.4	16-QAM	3	0	21.71	0-1	1
	699.7	23017	1.4	16-QAM	3	2	21.64	0-1	1
	699.7	23017	1.4	16-QAM	3	3	21.52	0-1	1
Mid	699.7	23017	1.4	16-QAM	6	0	21.14	0-2	2
	707.5	23095	1.4	QPSK	1	0	23.49	0	0
	707.5	23095	1.4	QPSK	1	2	23.43	0	0
	707.5	23095	1.4	QPSK	1	5	23.48	0	0
	707.5	23095	1.4	QPSK	3	0	22.95	0	0
	707.5	23095	1.4	QPSK	3	2	23.28	0	0
	707.5	23095	1.4	QPSK	3	3	23.07	0	0
	707.5	23095	1.4	QPSK	6	0	22.04	0-1	1
	707.5	23095	1.4	16-QAM	1	0	21.59	0-1	1
	707.5	23095	1.4	16-QAM	1	2	21.76	0-1	1
	707.5	23095	1.4	16-QAM	1	5	21.68	0-1	1
	707.5	23095	1.4	16-QAM	3	0	21.56	0-1	1
	707.5	23095	1.4	16-QAM	3	2	21.54	0-1	1
High	707.5	23095	1.4	16-QAM	3	3	21.52	0-1	1
	707.5	23095	1.4	16-QAM	6	0	21.19	0-2	2
	715.3	23173	1.4	QPSK	1	0	22.87	0	0
	715.3	23173	1.4	QPSK	1	2	23.35	0	0
	715.3	23173	1.4	QPSK	1	5	23.00	0	0
	715.3	23173	1.4	QPSK	3	0	22.95	0	0
	715.3	23173	1.4	QPSK	3	2	23.09	0	0
	715.3	23173	1.4	QPSK	3	3	23.00	0	0
	715.3	23173	1.4	QPSK	6	0	21.95	0-1	1
	715.3	23173	1.4	16-QAM	1	0	21.50	0-1	1
	715.3	23173	1.4	16-QAM	1	2	21.50	0-1	1
	715.3	23173	1.4	16-QAM	1	5	21.55	0-1	1
	715.3	23173	1.4	16-QAM	3	0	21.54	0-1	1
	715.3	23173	1.4	16-QAM	3	2	21.51	0-1	1
	715.3	23173	1.4	16-QAM	3	3	21.56	0-1	1
	715.3	23173	1.4	16-QAM	6	0	20.87	0-2	2

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9.2.2

LTE Band 26

Table 9-7
LTE Band 26 Conducted Powers - 15 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Mid	836.5	26915	15	QPSK	1	0	23.35	0	0
	836.5	26915	15	QPSK	1	36	23.48	0	0
	836.5	26915	15	QPSK	1	74	23.32	0	0
	836.5	26915	15	QPSK	36	0	22.39	0-1	1
	836.5	26915	15	QPSK	36	18	22.30	0-1	1
	836.5	26915	15	QPSK	36	37	22.27	0-1	1
	836.5	26915	15	QPSK	75	0	22.36	0-1	1
	836.5	26915	15	16QAM	1	0	22.38	0-1	1
	836.5	26915	15	16QAM	1	36	22.23	0-1	1
	836.5	26915	15	16QAM	1	74	22.24	0-1	1
	836.5	26915	15	16QAM	36	0	21.48	0-2	2
	836.5	26915	15	16QAM	36	18	21.24	0-2	2
	836.5	26915	15	16QAM	36	37	21.28	0-2	2
	836.5	26915	15	16QAM	75	0	21.42	0-2	2

Note: LTE Band 26 at 15 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 9-8
LTE Band 26 Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	819	26740	10	QPSK	1	0	23.44	0	0
	819	26740	10	QPSK	1	25	23.49	0	0
	819	26740	10	QPSK	1	49	23.50	0	0
	819	26740	10	QPSK	25	0	22.43	0-1	1
	819	26740	10	QPSK	25	12	22.29	0-1	1
	819	26740	10	QPSK	25	25	22.36	0-1	1
	819	26740	10	QPSK	50	0	22.45	0-1	1
	819	26740	10	16QAM	1	0	22.45	0-1	1
	819	26740	10	16QAM	1	25	22.48	0-1	1
	819	26740	10	16QAM	1	49	22.48	0-1	1
	819	26740	10	16QAM	25	0	21.45	0-2	2
	819	26740	10	16QAM	25	12	21.20	0-2	2
Mid	819	26740	10	16QAM	25	25	21.23	0-2	2
	819	26740	10	16QAM	50	0	21.45	0-2	2
	831.5	26865	10	QPSK	1	0	23.47	0	0
	831.5	26865	10	QPSK	1	25	23.36	0	0
	831.5	26865	10	QPSK	1	49	23.40	0	0
	831.5	26865	10	QPSK	25	0	22.50	0-1	1
	831.5	26865	10	QPSK	25	12	22.44	0-1	1
	831.5	26865	10	QPSK	25	25	22.35	0-1	1
	831.5	26865	10	QPSK	50	0	22.44	0-1	1
	831.5	26865	10	16QAM	1	0	22.46	0-1	1
	831.5	26865	10	16QAM	1	25	22.45	0-1	1
	831.5	26865	10	16QAM	1	49	22.46	0-1	1
High	831.5	26865	10	16QAM	25	0	21.48	0-2	2
	831.5	26865	10	16QAM	25	12	21.34	0-2	2
	831.5	26865	10	16QAM	25	25	21.25	0-2	2
	831.5	26865	10	16QAM	50	0	21.37	0-2	2
	844	26990	10	QPSK	1	0	23.36	0	0
	844	26990	10	QPSK	1	25	23.43	0	0
	844	26990	10	QPSK	1	49	23.48	0	0
	844	26990	10	QPSK	25	0	22.32	0-1	1
	844	26990	10	QPSK	25	12	22.24	0-1	1
	844	26990	10	QPSK	25	25	22.25	0-1	1
	844	26990	10	QPSK	50	0	22.32	0-1	1
	844	26990	10	16QAM	1	0	22.47	0-1	1
	844	26990	10	16QAM	1	25	21.86	0-1	1
	844	26990	10	16QAM	1	49	21.80	0-1	1
	844	26990	10	16QAM	25	0	21.27	0-2	2
	844	26990	10	16QAM	25	12	21.29	0-2	2
	844	26990	10	16QAM	25	25	21.22	0-2	2
	844	26990	10	16QAM	50	0	21.23	0-2	2

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Table 9-9
LTE Band 26 Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	816.5	26715	5	QPSK	1	0	23.49	0	0
	816.5	26715	5	QPSK	1	12	23.42	0	0
	816.5	26715	5	QPSK	1	24	23.34	0	0
	816.5	26715	5	QPSK	12	0	22.33	0-1	1
	816.5	26715	5	QPSK	12	6	22.30	0-1	1
	816.5	26715	5	QPSK	12	13	22.28	0-1	1
	816.5	26715	5	QPSK	25	0	22.36	0-1	1
	816.5	26715	5	16-QAM	1	0	22.36	0-1	1
	816.5	26715	5	16-QAM	1	12	22.28	0-1	1
	816.5	26715	5	16-QAM	1	24	22.05	0-1	1
	816.5	26715	5	16-QAM	12	0	21.30	0-2	2
	816.5	26715	5	16-QAM	12	6	21.29	0-2	2
Mid	831.5	26865	5	QPSK	12	13	21.15	0-2	2
	831.5	26715	5	16-QAM	25	0	21.34	0-2	2
	831.5	26865	5	QPSK	1	0	23.20	0	0
	831.5	26865	5	QPSK	1	12	23.33	0	0
	831.5	26865	5	QPSK	1	24	23.11	0	0
	831.5	26865	5	QPSK	12	0	22.38	0-1	1
	831.5	26865	5	QPSK	12	6	22.42	0-1	1
	831.5	26865	5	QPSK	12	13	22.38	0-1	1
	831.5	26865	5	QPSK	25	0	22.47	0-1	1
	831.5	26865	5	16-QAM	1	0	22.40	0-1	1
	831.5	26865	5	16-QAM	1	12	22.41	0-1	1
	831.5	26865	5	16-QAM	1	24	22.29	0-1	1
High	846.5	27015	5	16-QAM	12	0	21.38	0-2	2
	846.5	26865	5	16-QAM	12	6	21.39	0-2	2
	846.5	26865	5	16-QAM	12	13	21.43	0-2	2
	846.5	26865	5	16-QAM	25	0	21.28	0-2	2
	846.5	27015	5	QPSK	1	0	23.31	0	0
	846.5	27015	5	QPSK	1	12	23.38	0	0
	846.5	27015	5	QPSK	1	24	23.22	0	0
	846.5	27015	5	QPSK	12	0	22.23	0-1	1
	846.5	27015	5	QPSK	12	6	22.15	0-1	1
	846.5	27015	5	QPSK	12	13	22.24	0-1	1
	846.5	27015	5	QPSK	25	0	22.24	0-1	1
	846.5	27015	5	16-QAM	1	0	22.28	0-1	1

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Table 9-10
LTE Band 26 Conducted Powers - 3 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	815.5	26705	3	QPSK	1	0	23.33	0	0
	815.5	26705	3	QPSK	1	7	23.45	0	0
	815.5	26705	3	QPSK	1	14	23.25	0	0
	815.5	26705	3	QPSK	8	0	22.50	0-1	1
	815.5	26705	3	QPSK	8	4	22.32	0-1	1
	815.5	26705	3	QPSK	8	7	22.28	0-1	1
	815.5	26705	3	QPSK	15	0	22.35	0-1	1
	815.5	26705	3	16-QAM	1	0	22.31	0-1	1
	815.5	26705	3	16-QAM	1	7	22.39	0-1	1
	815.5	26705	3	16-QAM	1	14	21.98	0-1	1
	815.5	26705	3	16-QAM	8	0	21.34	0-2	2
	815.5	26705	3	16-QAM	8	4	21.13	0-2	2
Mid	831.5	26865	3	QPSK	8	7	21.05	0-2	2
	831.5	26705	3	16-QAM	15	0	21.20	0-2	2
	831.5	26865	3	QPSK	1	0	23.47	0	0
	831.5	26865	3	QPSK	1	7	23.49	0	0
	831.5	26865	3	QPSK	1	14	23.46	0	0
	831.5	26865	3	QPSK	8	0	22.35	0-1	1
	831.5	26865	3	QPSK	8	4	22.44	0-1	1
	831.5	26865	3	QPSK	8	7	22.27	0-1	1
	831.5	26865	3	QPSK	15	0	22.38	0-1	1
	831.5	26865	3	16-QAM	1	0	22.41	0-1	1
	831.5	26865	3	16-QAM	1	7	22.46	0-1	1
	831.5	26865	3	16-QAM	1	14	22.48	0-1	1
High	847.5	27025	3	16-QAM	8	0	21.36	0-2	2
	847.5	27025	3	16-QAM	8	4	21.38	0-2	2
	847.5	27025	3	16-QAM	8	7	21.49	0-2	2
	847.5	26865	3	16-QAM	15	0	21.50	0-2	2
	847.5	27025	3	QPSK	1	0	23.23	0	0
	847.5	27025	3	QPSK	1	7	23.31	0	0
	847.5	27025	3	QPSK	1	14	23.34	0	0
	847.5	27025	3	QPSK	8	0	22.23	0-1	1
	847.5	27025	3	QPSK	8	4	22.13	0-1	1
	847.5	27025	3	QPSK	8	7	22.23	0-1	1
	847.5	27025	3	QPSK	15	0	22.19	0-1	1
	847.5	27025	3	16-QAM	1	0	22.07	0-1	1
	847.5	27025	3	16-QAM	1	7	22.03	0-1	1
	847.5	27025	3	16-QAM	1	14	21.96	0-1	1
	847.5	27025	3	16-QAM	8	0	21.18	0-2	2
	847.5	27025	3	16-QAM	8	4	21.20	0-2	2
	847.5	27025	3	16-QAM	8	7	21.26	0-2	2
	847.5	27025	3	16-QAM	15	0	21.16	0-2	2

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Table 9-11
LTE Band 26 Conducted Powers - 1.4 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	814.7	26697	1.4	QPSK	1	0	23.49	0	0
	814.7	26697	1.4	QPSK	1	2	23.46	0	0
	814.7	26697	1.4	QPSK	1	5	23.22	0	0
	814.7	26697	1.4	QPSK	3	0	23.33	0	0
	814.7	26697	1.4	QPSK	3	2	23.30	0	0
	814.7	26697	1.4	QPSK	3	3	23.40	0	0
	814.7	26697	1.4	QPSK	6	0	22.41	0-1	1
	814.7	26697	1.4	16-QAM	1	0	22.35	0-1	1
	814.7	26697	1.4	16-QAM	1	2	22.44	0-1	1
	814.7	26697	1.4	16-QAM	1	5	22.48	0-1	1
	814.7	26697	1.4	16-QAM	3	0	22.49	0-1	1
	814.7	26697	1.4	16-QAM	3	2	22.42	0-1	1
Mid	831.5	26697	1.4	16-QAM	3	3	22.44	0-1	1
	814.7	26697	1.4	16-QAM	6	0	21.40	0-2	2
	831.5	26865	1.4	QPSK	1	0	23.46	0	0
	831.5	26865	1.4	QPSK	1	2	23.50	0	0
	831.5	26865	1.4	QPSK	1	5	23.47	0	0
	831.5	26865	1.4	QPSK	3	0	23.48	0	0
	831.5	26865	1.4	QPSK	3	2	23.43	0	0
	831.5	26865	1.4	QPSK	3	3	23.26	0	0
	831.5	26865	1.4	QPSK	6	0	22.42	0-1	1
	831.5	26865	1.4	16-QAM	1	0	22.50	0-1	1
	831.5	26865	1.4	16-QAM	1	2	22.47	0-1	1
	831.5	26865	1.4	16-QAM	1	5	22.48	0-1	1
High	831.5	26865	1.4	16-QAM	3	0	22.42	0-1	1
	831.5	26865	1.4	16-QAM	3	2	22.38	0-1	1
	831.5	26865	1.4	16-QAM	3	3	22.34	0-1	1
	831.5	26865	1.4	16-QAM	6	0	21.46	0-2	2
	848.3	27033	1.4	QPSK	1	0	23.12	0	0
	848.3	27033	1.4	QPSK	1	2	23.42	0	0
	848.3	27033	1.4	QPSK	1	5	23.50	0	0
	848.3	27033	1.4	QPSK	3	0	23.14	0	0
	848.3	27033	1.4	QPSK	3	2	23.25	0	0
	848.3	27033	1.4	QPSK	3	3	23.27	0	0
	848.3	27033	1.4	QPSK	6	0	22.22	0-1	1
	848.3	27033	1.4	16-QAM	1	0	21.86	0-1	1
	848.3	27033	1.4	16-QAM	1	2	22.22	0-1	1
	848.3	27033	1.4	16-QAM	1	5	21.87	0-1	1
	848.3	27033	1.4	16-QAM	3	0	21.83	0-1	1
	848.3	27033	1.4	16-QAM	3	2	21.82	0-1	1
	848.3	27033	1.4	16-QAM	3	3	22.34	0-1	1
	848.3	27033	1.4	16-QAM	6	0	21.26	0-2	2

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LTE Band 4 (AWS)

Table 9-12
LTE Band 4 (AWS) Conducted Powers - 20 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Mid	1732.5	20175	20	QPSK	1	0	23.48	0	0
	1732.5	20175	20	QPSK	1	50	23.50	0	0
	1732.5	20175	20	QPSK	1	99	23.39	0	0
	1732.5	20175	20	QPSK	50	0	22.29	0-1	1
	1732.5	20175	20	QPSK	50	25	22.18	0-1	1
	1732.5	20175	20	QPSK	50	50	22.15	0-1	1
	1732.5	20175	20	QPSK	100	0	22.20	0-1	1
	1732.5	20175	20	16QAM	1	0	21.59	0-1	1
	1732.5	20175	20	16QAM	1	50	21.61	0-1	1
	1732.5	20175	20	16QAM	1	99	21.50	0-1	1
	1732.5	20175	20	16QAM	50	0	21.10	0-2	2
	1732.5	20175	20	16QAM	50	25	21.06	0-2	2
	1732.5	20175	20	16QAM	50	50	21.04	0-2	2
	1732.5	20175	20	16QAM	100	0	21.09	0-2	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.

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Table 9-13
LTE Band 4 (AWS) Conducted Powers - 15 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1717.5	20025	15	QPSK	1	0	23.44	0	0
	1717.5	20025	15	QPSK	1	36	23.40	0	0
	1717.5	20025	15	QPSK	1	74	23.50	0	0
	1717.5	20025	15	QPSK	36	0	22.24	0-1	1
	1717.5	20025	15	QPSK	36	18	21.98	0-1	1
	1717.5	20025	15	QPSK	36	37	22.13	0-1	1
	1717.5	20025	15	QPSK	75	0	22.12	0-1	1
	1717.5	20025	15	16QAM	1	0	21.69	0-1	1
	1717.5	20025	15	16QAM	1	36	21.60	0-1	1
	1717.5	20025	15	16QAM	1	74	21.62	0-1	1
	1717.5	20025	15	16QAM	36	0	21.21	0-2	2
	1717.5	20025	15	16QAM	36	18	21.07	0-2	2
	1717.5	20025	15	16QAM	36	37	21.12	0-2	2
Mid	1732.5	20175	15	QPSK	1	0	23.50	0	0
	1732.5	20175	15	QPSK	1	36	23.44	0	0
	1732.5	20175	15	QPSK	1	74	23.46	0	0
	1732.5	20175	15	QPSK	36	0	22.25	0-1	1
	1732.5	20175	15	QPSK	36	18	22.14	0-1	1
	1732.5	20175	15	QPSK	36	37	22.18	0-1	1
	1732.5	20175	15	QPSK	75	0	22.18	0-1	1
	1732.5	20175	15	16QAM	1	0	21.73	0-1	1
	1732.5	20175	15	16QAM	1	36	21.50	0-1	1
	1732.5	20175	15	16QAM	1	74	21.64	0-1	1
	1732.5	20175	15	16QAM	36	0	21.13	0-2	2
	1732.5	20175	15	16QAM	36	18	21.13	0-2	2
	1732.5	20175	15	16QAM	36	37	21.14	0-2	2
	1732.5	20175	15	16QAM	75	0	21.35	0-2	2
High	1747.5	20325	15	QPSK	1	0	23.39	0	0
	1747.5	20325	15	QPSK	1	36	23.38	0	0
	1747.5	20325	15	QPSK	1	74	23.50	0	0
	1747.5	20325	15	QPSK	36	0	22.24	0-1	1
	1747.5	20325	15	QPSK	36	18	22.23	0-1	1
	1747.5	20325	15	QPSK	36	37	22.23	0-1	1
	1747.5	20325	15	QPSK	75	0	22.22	0-1	1
	1747.5	20325	15	16QAM	1	0	21.72	0-1	1
	1747.5	20325	15	16QAM	1	36	21.60	0-1	1
	1747.5	20325	15	16QAM	1	74	21.70	0-1	1
	1747.5	20325	15	16QAM	36	0	21.23	0-2	2
	1747.5	20325	15	16QAM	36	18	21.18	0-2	2
	1747.5	20325	15	16QAM	36	37	21.32	0-2	2
	1747.5	20325	15	16QAM	75	0	21.25	0-2	2

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Table 9-14
LTE Band 4 (AWS) Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1715	20000	10	QPSK	1	0	23.47	0	0
	1715	20000	10	QPSK	1	25	23.46	0	0
	1715	20000	10	QPSK	1	49	23.44	0	0
	1715	20000	10	QPSK	25	0	22.24	0-1	1
	1715	20000	10	QPSK	25	12	22.23	0-1	1
	1715	20000	10	QPSK	25	25	22.22	0-1	1
	1715	20000	10	QPSK	50	0	22.23	0-1	1
	1715	20000	10	16QAM	1	0	21.52	0-1	1
	1715	20000	10	16QAM	1	25	21.57	0-1	1
	1715	20000	10	16QAM	1	49	21.53	0-1	1
	1715	20000	10	16QAM	25	0	21.06	0-2	2
	1715	20000	10	16QAM	25	12	21.22	0-2	2
	1715	20000	10	16QAM	25	25	21.08	0-2	2
	1715	20000	10	16QAM	50	0	21.09	0-2	2
Mid	1732.5	20175	10	QPSK	1	0	23.40	0	0
	1732.5	20175	10	QPSK	1	25	23.50	0	0
	1732.5	20175	10	QPSK	1	49	23.27	0	0
	1732.5	20175	10	QPSK	25	0	22.28	0-1	1
	1732.5	20175	10	QPSK	25	12	22.20	0-1	1
	1732.5	20175	10	QPSK	25	25	22.24	0-1	1
	1732.5	20175	10	QPSK	50	0	22.27	0-1	1
	1732.5	20175	10	16QAM	1	0	21.66	0-1	1
	1732.5	20175	10	16QAM	1	25	21.58	0-1	1
	1732.5	20175	10	16QAM	1	49	21.53	0-1	1
	1732.5	20175	10	16QAM	25	0	21.14	0-2	2
	1732.5	20175	10	16QAM	25	12	21.15	0-2	2
	1732.5	20175	10	16QAM	25	25	21.16	0-2	2
	1732.5	20175	10	16QAM	50	0	21.16	0-2	2
High	1750	20350	10	QPSK	1	0	23.36	0	0
	1750	20350	10	QPSK	1	25	23.19	0	0
	1750	20350	10	QPSK	1	49	23.38	0	0
	1750	20350	10	QPSK	25	0	22.23	0-1	1
	1750	20350	10	QPSK	25	12	22.16	0-1	1
	1750	20350	10	QPSK	25	25	22.15	0-1	1
	1750	20350	10	QPSK	50	0	22.21	0-1	1
	1750	20350	10	16QAM	1	0	21.54	0-1	1
	1750	20350	10	16QAM	1	25	21.53	0-1	1
	1750	20350	10	16QAM	1	49	21.51	0-1	1
	1750	20350	10	16QAM	25	0	21.06	0-2	2
	1750	20350	10	16QAM	25	12	21.12	0-2	2
	1750	20350	10	16QAM	25	25	21.11	0-2	2
	1750	20350	10	16QAM	50	0	21.11	0-2	2

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Table 9-15
LTE Band 4 (AWS) Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1712.5	19975	5	QPSK	1	0	23.19	0	0
	1712.5	19975	5	QPSK	1	12	23.22	0	0
	1712.5	19975	5	QPSK	1	24	23.36	0	0
	1712.5	19975	5	QPSK	12	0	22.13	0-1	1
	1712.5	19975	5	QPSK	12	6	22.18	0-1	1
	1712.5	19975	5	QPSK	12	13	22.15	0-1	1
	1712.5	19975	5	QPSK	25	0	22.15	0-1	1
	1712.5	19975	5	16-QAM	1	0	21.56	0-1	1
	1712.5	19975	5	16-QAM	1	12	21.59	0-1	1
	1712.5	19975	5	16-QAM	1	24	21.50	0-1	1
	1712.5	19975	5	16-QAM	12	0	20.99	0-2	2
	1712.5	19975	5	16-QAM	12	6	21.09	0-2	2
Mid	1712.5	19975	5	16-QAM	12	13	21.04	0-2	2
	1712.5	19975	5	16-QAM	25	0	21.12	0-2	2
	1732.5	20175	5	QPSK	1	0	23.28	0	0
	1732.5	20175	5	QPSK	1	12	23.43	0	0
	1732.5	20175	5	QPSK	1	24	23.19	0	0
	1732.5	20175	5	QPSK	12	0	22.15	0-1	1
	1732.5	20175	5	QPSK	12	6	22.14	0-1	1
	1732.5	20175	5	QPSK	12	13	22.11	0-1	1
	1732.5	20175	5	QPSK	25	0	22.14	0-1	1
	1732.5	20175	5	16-QAM	1	0	21.60	0-1	1
	1732.5	20175	5	16-QAM	1	12	21.53	0-1	1
	1732.5	20175	5	16-QAM	1	24	21.50	0-1	1
High	1732.5	20175	5	16-QAM	12	0	20.95	0-2	2
	1732.5	20175	5	16-QAM	12	6	21.11	0-2	2
	1732.5	20175	5	16-QAM	12	13	20.97	0-2	2
	1732.5	20175	5	16-QAM	25	0	21.08	0-2	2
	1752.5	20375	5	QPSK	1	0	23.41	0	0
	1752.5	20375	5	QPSK	1	12	23.41	0	0
	1752.5	20375	5	QPSK	1	24	23.46	0	0
	1752.5	20375	5	QPSK	12	0	22.24	0-1	1
	1752.5	20375	5	QPSK	12	6	22.28	0-1	1
	1752.5	20375	5	QPSK	12	13	22.26	0-1	1
	1752.5	20375	5	QPSK	25	0	22.29	0-1	1
	1752.5	20375	5	16-QAM	1	0	21.53	0-1	1
	1752.5	20375	5	16-QAM	1	12	21.58	0-1	1
	1752.5	20375	5	16-QAM	1	24	21.50	0-1	1
	1752.5	20375	5	16-QAM	12	0	21.23	0-2	2
	1752.5	20375	5	16-QAM	12	6	21.07	0-2	2
	1752.5	20375	5	16-QAM	12	13	21.07	0-2	2
	1752.5	20375	5	16-QAM	25	0	21.34	0-2	2

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Table 9-16
LTE Band 4 (AWS) Conducted Powers - 3 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1711.5	19965	3	QPSK	1	0	23.40	0	0
	1711.5	19965	3	QPSK	1	7	23.18	0	0
	1711.5	19965	3	QPSK	1	14	23.13	0	0
	1711.5	19965	3	QPSK	8	0	22.10	0-1	1
	1711.5	19965	3	QPSK	8	4	22.08	0-1	1
	1711.5	19965	3	QPSK	8	7	22.11	0-1	1
	1711.5	19965	3	QPSK	15	0	22.05	0-1	1
	1711.5	19965	3	16-QAM	1	0	22.15	0-1	1
	1711.5	19965	3	16-QAM	1	7	22.09	0-1	1
	1711.5	19965	3	16-QAM	1	14	22.14	0-1	1
	1711.5	19965	3	16-QAM	8	0	21.33	0-2	2
	1711.5	19965	3	16-QAM	8	4	21.00	0-2	2
Mid	1711.5	19965	3	16-QAM	8	7	21.18	0-2	2
	1711.5	19965	3	16-QAM	15	0	21.16	0-2	2
	1732.5	20175	3	QPSK	1	0	23.16	0	0
	1732.5	20175	3	QPSK	1	7	23.10	0	0
	1732.5	20175	3	QPSK	1	14	23.00	0	0
	1732.5	20175	3	QPSK	8	0	22.09	0-1	1
	1732.5	20175	3	QPSK	8	4	22.18	0-1	1
	1732.5	20175	3	QPSK	8	7	22.14	0-1	1
	1732.5	20175	3	QPSK	15	0	22.15	0-1	1
	1732.5	20175	3	16-QAM	1	0	22.14	0-1	1
	1732.5	20175	3	16-QAM	1	7	22.14	0-1	1
	1732.5	20175	3	16-QAM	1	14	22.15	0-1	1
High	1732.5	20175	3	16-QAM	8	0	21.36	0-2	2
	1732.5	20175	3	16-QAM	8	4	21.12	0-2	2
	1732.5	20175	3	16-QAM	8	7	21.17	0-2	2
	1732.5	20175	3	16-QAM	15	0	21.06	0-2	2
	1753.5	20385	3	QPSK	1	0	23.20	0	0
	1753.5	20385	3	QPSK	1	7	23.24	0	0
	1753.5	20385	3	QPSK	1	14	23.27	0	0
	1753.5	20385	3	QPSK	8	0	22.28	0-1	1
	1753.5	20385	3	QPSK	8	4	22.08	0-1	1
	1753.5	20385	3	QPSK	8	7	22.28	0-1	1
	1753.5	20385	3	QPSK	15	0	22.27	0-1	1
	1753.5	20385	3	16-QAM	1	0	21.90	0-1	1
	1753.5	20385	3	16-QAM	1	7	21.84	0-1	1
	1753.5	20385	3	16-QAM	1	14	22.21	0-1	1
	1753.5	20385	3	16-QAM	8	0	21.13	0-2	2
	1753.5	20385	3	16-QAM	8	4	21.24	0-2	2
	1753.5	20385	3	16-QAM	8	7	21.22	0-2	2
	1753.5	20385	3	16-QAM	15	0	21.21	0-2	2

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Table 9-17
LTE Band 4 (AWS) Conducted Powers - 1.4 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1710.7	19957	1.4	QPSK	1	0	23.49	0	0
	1710.7	19957	1.4	QPSK	1	2	23.02	0	0
	1710.7	19957	1.4	QPSK	1	5	23.08	0	0
	1710.7	19957	1.4	QPSK	3	0	23.12	0	0
	1710.7	19957	1.4	QPSK	3	2	23.28	0	0
	1710.7	19957	1.4	QPSK	3	3	23.22	0	0
	1710.7	19957	1.4	QPSK	6	0	22.24	0-1	1
	1710.7	19957	1.4	16-QAM	1	0	21.70	0-1	1
	1710.7	19957	1.4	16-QAM	1	2	21.57	0-1	1
	1710.7	19957	1.4	16-QAM	1	5	21.58	0-1	1
	1710.7	19957	1.4	16-QAM	3	0	21.53	0-1	1
	1710.7	19957	1.4	16-QAM	3	2	21.54	0-1	1
	1710.7	19957	1.4	16-QAM	3	3	21.53	0-1	1
Mid	1710.7	19957	1.4	16-QAM	6	0	21.36	0-2	2
	1732.5	20175	1.4	QPSK	1	0	23.11	0	0
	1732.5	20175	1.4	QPSK	1	2	23.29	0	0
	1732.5	20175	1.4	QPSK	1	5	23.27	0	0
	1732.5	20175	1.4	QPSK	3	0	23.32	0	0
	1732.5	20175	1.4	QPSK	3	2	23.18	0	0
	1732.5	20175	1.4	QPSK	3	3	23.15	0	0
	1732.5	20175	1.4	QPSK	6	0	22.17	0-1	1
	1732.5	20175	1.4	16-QAM	1	0	21.54	0-1	1
	1732.5	20175	1.4	16-QAM	1	2	21.53	0-1	1
	1732.5	20175	1.4	16-QAM	1	5	21.56	0-1	1
	1732.5	20175	1.4	16-QAM	3	0	21.51	0-1	1
	1732.5	20175	1.4	16-QAM	3	2	21.58	0-1	1
	1732.5	20175	1.4	16-QAM	3	3	21.59	0-1	1
High	1732.5	20175	1.4	16-QAM	6	0	21.33	0-2	2
	1754.3	20393	1.4	QPSK	1	0	23.40	0	0
	1754.3	20393	1.4	QPSK	1	2	23.50	0	0
	1754.3	20393	1.4	QPSK	1	5	23.45	0	0
	1754.3	20393	1.4	QPSK	3	0	23.33	0	0
	1754.3	20393	1.4	QPSK	3	2	23.19	0	0
	1754.3	20393	1.4	QPSK	3	3	23.35	0	0
	1754.3	20393	1.4	QPSK	6	0	22.26	0-1	1
	1754.3	20393	1.4	16-QAM	1	0	21.54	0-1	1
	1754.3	20393	1.4	16-QAM	1	2	21.57	0-1	1
	1754.3	20393	1.4	16-QAM	1	5	21.60	0-1	1
	1754.3	20393	1.4	16-QAM	3	0	21.56	0-1	1
	1754.3	20393	1.4	16-QAM	3	2	21.58	0-1	1
	1754.3	20393	1.4	16-QAM	3	3	21.65	0-1	1
	1754.3	20393	1.4	16-QAM	6	0	21.04	0-2	2

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9.2.4

LTE Band 4 (AWS) – Hotspot Mode On

Table 9-18
LTE Band 4 (AWS) Conducted Powers - 20 MHz Bandwidth – Hotspot Mode On

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Mid	1732.5	20175	20	QPSK	1	0	20.32	0	0
	1732.5	20175	20	QPSK	1	50	20.23	0	0
	1732.5	20175	20	QPSK	1	99	20.01	0	0
	1732.5	20175	20	QPSK	50	0	20.15	0-1	0
	1732.5	20175	20	QPSK	50	25	20.13	0-1	0
	1732.5	20175	20	QPSK	50	50	20.06	0-1	0
	1732.5	20175	20	QPSK	100	0	20.14	0-1	0
	1732.5	20175	20	16QAM	1	0	20.04	0-1	0
	1732.5	20175	20	16QAM	1	50	20.03	0-1	0
	1732.5	20175	20	16QAM	1	99	20.00	0-1	0
	1732.5	20175	20	16QAM	50	0	20.10	0-2	0
	1732.5	20175	20	16QAM	50	25	20.07	0-2	0
	1732.5	20175	20	16QAM	50	50	20.10	0-2	0
	1732.5	20175	20	16QAM	100	0	20.13	0-2	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.

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Table 9-19

LTE Band 4 (AWS) Conducted Powers - 15 MHz Bandwidth – Hotspot Mode On

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1717.5	20025	15	QPSK	1	0	20.21	0	0
	1717.5	20025	15	QPSK	1	36	20.01	0	0
	1717.5	20025	15	QPSK	1	74	19.84	0	0
	1717.5	20025	15	QPSK	36	0	20.03	0-1	0
	1717.5	20025	15	QPSK	36	18	19.91	0-1	0
	1717.5	20025	15	QPSK	36	37	19.95	0-1	0
	1717.5	20025	15	QPSK	75	0	19.90	0-1	0
	1717.5	20025	15	16QAM	1	0	19.97	0-1	0
	1717.5	20025	15	16QAM	1	36	19.92	0-1	0
	1717.5	20025	15	16QAM	1	74	19.93	0-1	0
	1717.5	20025	15	16QAM	36	0	20.02	0-2	0
	1717.5	20025	15	16QAM	36	18	19.99	0-2	0
	1717.5	20025	15	16QAM	36	37	20.00	0-2	0
Mid	1732.5	20175	15	QPSK	1	0	20.15	0	0
	1732.5	20175	15	QPSK	1	36	19.94	0	0
	1732.5	20175	15	QPSK	1	74	19.99	0	0
	1732.5	20175	15	QPSK	36	0	20.09	0-1	0
	1732.5	20175	15	QPSK	36	18	20.01	0-1	0
	1732.5	20175	15	QPSK	36	37	20.00	0-1	0
	1732.5	20175	15	QPSK	75	0	20.04	0-1	0
	1732.5	20175	15	16QAM	1	0	20.14	0-1	0
	1732.5	20175	15	16QAM	1	36	19.87	0-1	0
	1732.5	20175	15	16QAM	1	74	19.93	0-1	0
	1732.5	20175	15	16QAM	36	0	20.21	0-2	0
	1732.5	20175	15	16QAM	36	18	20.23	0-2	0
	1732.5	20175	15	16QAM	36	37	20.11	0-2	0
	1732.5	20175	15	16QAM	75	0	20.05	0-2	0
High	1747.5	20325	15	QPSK	1	0	20.03	0	0
	1747.5	20325	15	QPSK	1	36	19.84	0	0
	1747.5	20325	15	QPSK	1	74	19.87	0	0
	1747.5	20325	15	QPSK	36	0	20.05	0-1	0
	1747.5	20325	15	QPSK	36	18	20.04	0-1	0
	1747.5	20325	15	QPSK	36	37	20.00	0-1	0
	1747.5	20325	15	QPSK	75	0	19.90	0-1	0
	1747.5	20325	15	16QAM	1	0	20.18	0-1	0
	1747.5	20325	15	16QAM	1	36	20.01	0-1	0
	1747.5	20325	15	16QAM	1	74	20.04	0-1	0
	1747.5	20325	15	16QAM	36	0	19.83	0-2	0
	1747.5	20325	15	16QAM	36	18	19.93	0-2	0
	1747.5	20325	15	16QAM	36	37	19.94	0-2	0
	1747.5	20325	15	16QAM	75	0	19.96	0-2	0

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Table 9-20

LTE Band 4 (AWS) Conducted Powers - 10 MHz Bandwidth – Hotspot Mode On

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1715	20000	10	QPSK	1	0	20.07	0	0
	1715	20000	10	QPSK	1	25	19.95	0	0
	1715	20000	10	QPSK	1	49	19.98	0	0
	1715	20000	10	QPSK	25	0	19.92	0-1	0
	1715	20000	10	QPSK	25	12	19.87	0-1	0
	1715	20000	10	QPSK	25	25	19.88	0-1	0
	1715	20000	10	QPSK	50	0	19.93	0-1	0
	1715	20000	10	16QAM	1	0	19.98	0-1	0
	1715	20000	10	16QAM	1	25	19.91	0-1	0
	1715	20000	10	16QAM	1	49	19.97	0-1	0
	1715	20000	10	16QAM	25	0	19.95	0-2	0
	1715	20000	10	16QAM	25	12	19.93	0-2	0
	1715	20000	10	16QAM	25	25	19.97	0-2	0
Mid	1732.5	20175	10	QPSK	1	0	20.09	0	0
	1732.5	20175	10	QPSK	1	25	20.02	0	0
	1732.5	20175	10	QPSK	1	49	20.03	0	0
	1732.5	20175	10	QPSK	25	0	20.06	0-1	0
	1732.5	20175	10	QPSK	25	12	19.95	0-1	0
	1732.5	20175	10	QPSK	25	25	19.99	0-1	0
	1732.5	20175	10	QPSK	50	0	20.01	0-1	0
	1732.5	20175	10	16QAM	1	0	20.00	0-1	0
	1732.5	20175	10	16QAM	1	25	20.06	0-1	0
	1732.5	20175	10	16QAM	1	49	20.08	0-1	0
	1732.5	20175	10	16QAM	25	0	20.04	0-2	0
	1732.5	20175	10	16QAM	25	12	20.06	0-2	0
	1732.5	20175	10	16QAM	25	25	20.04	0-2	0
	1732.5	20175	10	16QAM	50	0	20.12	0-2	0
High	1750	20350	10	QPSK	1	0	20.07	0	0
	1750	20350	10	QPSK	1	25	20.10	0	0
	1750	20350	10	QPSK	1	49	19.79	0	0
	1750	20350	10	QPSK	25	0	20.06	0-1	0
	1750	20350	10	QPSK	25	12	19.99	0-1	0
	1750	20350	10	QPSK	25	25	19.84	0-1	0
	1750	20350	10	QPSK	50	0	19.95	0-1	0
	1750	20350	10	16QAM	1	0	20.07	0-1	0
	1750	20350	10	16QAM	1	25	20.02	0-1	0
	1750	20350	10	16QAM	1	49	19.96	0-1	0
	1750	20350	10	16QAM	25	0	20.25	0-2	0
	1750	20350	10	16QAM	25	12	19.97	0-2	0
	1750	20350	10	16QAM	25	25	20.02	0-2	0
	1750	20350	10	16QAM	50	0	19.95	0-2	0

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Table 9-21

LTE Band 4 (AWS) Conducted Powers - 5 MHz Bandwidth – Hotspot Mode On

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1712.5	19975	5	QPSK	1	0	19.65	0	0
	1712.5	19975	5	QPSK	1	12	19.99	0	0
	1712.5	19975	5	QPSK	1	24	19.65	0	0
	1712.5	19975	5	QPSK	12	0	19.88	0-1	0
	1712.5	19975	5	QPSK	12	6	19.95	0-1	0
	1712.5	19975	5	QPSK	12	13	20.00	0-1	0
	1712.5	19975	5	QPSK	25	0	19.93	0-1	0
	1712.5	19975	5	16-QAM	1	0	19.87	0-1	0
	1712.5	19975	5	16-QAM	1	12	19.81	0-1	0
	1712.5	19975	5	16-QAM	1	24	19.71	0-1	0
	1712.5	19975	5	16-QAM	12	0	20.07	0-2	0
	1712.5	19975	5	16-QAM	12	6	20.06	0-2	0
	1712.5	19975	5	16-QAM	12	13	20.21	0-2	0
Mid	1732.5	20175	5	QPSK	1	0	20.00	0	0
	1732.5	20175	5	QPSK	1	12	20.03	0	0
	1732.5	20175	5	QPSK	1	24	20.03	0	0
	1732.5	20175	5	QPSK	12	0	20.10	0-1	0
	1732.5	20175	5	QPSK	12	6	19.99	0-1	0
	1732.5	20175	5	QPSK	12	13	19.97	0-1	0
	1732.5	20175	5	QPSK	25	0	20.08	0-1	0
	1732.5	20175	5	16-QAM	1	0	19.95	0-1	0
	1732.5	20175	5	16-QAM	1	12	19.92	0-1	0
	1732.5	20175	5	16-QAM	1	24	19.93	0-1	0
	1732.5	20175	5	16-QAM	12	0	20.10	0-2	0
	1732.5	20175	5	16-QAM	12	6	19.91	0-2	0
	1732.5	20175	5	16-QAM	12	13	20.03	0-2	0
	1732.5	20175	5	16-QAM	25	0	20.04	0-2	0
High	1752.5	20375	5	QPSK	1	0	20.02	0	0
	1752.5	20375	5	QPSK	1	12	19.86	0	0
	1752.5	20375	5	QPSK	1	24	19.90	0	0
	1752.5	20375	5	QPSK	12	0	19.88	0-1	0
	1752.5	20375	5	QPSK	12	6	19.92	0-1	0
	1752.5	20375	5	QPSK	12	13	19.91	0-1	0
	1752.5	20375	5	QPSK	25	0	19.88	0-1	0
	1752.5	20375	5	16-QAM	1	0	19.93	0-1	0
	1752.5	20375	5	16-QAM	1	12	19.91	0-1	0
	1752.5	20375	5	16-QAM	1	24	19.83	0-1	0
	1752.5	20375	5	16-QAM	12	0	19.76	0-2	0
	1752.5	20375	5	16-QAM	12	6	19.66	0-2	0
	1752.5	20375	5	16-QAM	12	13	19.74	0-2	0
	1752.5	20375	5	16-QAM	25	0	19.87	0-2	0

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Table 9-22
LTE Band 4 (AWS) Conducted Powers - 3 MHz Bandwidth – Hotspot Mode On

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1711.5	19965	3	QPSK	1	0	20.01	0	0
	1711.5	19965	3	QPSK	1	7	20.15	0	0
	1711.5	19965	3	QPSK	1	14	20.03	0	0
	1711.5	19965	3	QPSK	8	0	19.91	0-1	0
	1711.5	19965	3	QPSK	8	4	19.91	0-1	0
	1711.5	19965	3	QPSK	8	7	20.05	0-1	0
	1711.5	19965	3	QPSK	15	0	19.93	0-1	0
	1711.5	19965	3	16-QAM	1	0	20.01	0-1	0
	1711.5	19965	3	16-QAM	1	7	20.09	0-1	0
	1711.5	19965	3	16-QAM	1	14	20.06	0-1	0
	1711.5	19965	3	16-QAM	8	0	19.83	0-2	0
	1711.5	19965	3	16-QAM	8	4	19.80	0-2	0
	1711.5	19965	3	16-QAM	8	7	19.98	0-2	0
Mid	1732.5	20175	3	QPSK	1	0	19.91	0	0
	1732.5	20175	3	QPSK	1	7	19.99	0	0
	1732.5	20175	3	QPSK	1	14	20.06	0	0
	1732.5	20175	3	QPSK	8	0	20.10	0-1	0
	1732.5	20175	3	QPSK	8	4	19.98	0-1	0
	1732.5	20175	3	QPSK	8	7	19.88	0-1	0
	1732.5	20175	3	QPSK	15	0	19.97	0-1	0
	1732.5	20175	3	16-QAM	1	0	20.17	0-1	0
	1732.5	20175	3	16-QAM	1	7	20.06	0-1	0
	1732.5	20175	3	16-QAM	1	14	20.05	0-1	0
	1732.5	20175	3	16-QAM	8	0	19.96	0-2	0
	1732.5	20175	3	16-QAM	8	4	19.92	0-2	0
	1732.5	20175	3	16-QAM	8	7	19.90	0-2	0
	1732.5	20175	3	16-QAM	15	0	19.91	0-2	0
High	1753.5	20385	3	QPSK	1	0	19.94	0	0
	1753.5	20385	3	QPSK	1	7	19.95	0	0
	1753.5	20385	3	QPSK	1	14	19.96	0	0
	1753.5	20385	3	QPSK	8	0	19.86	0-1	0
	1753.5	20385	3	QPSK	8	4	19.81	0-1	0
	1753.5	20385	3	QPSK	8	7	19.92	0-1	0
	1753.5	20385	3	QPSK	15	0	20.00	0-1	0
	1753.5	20385	3	16-QAM	1	0	19.99	0-1	0
	1753.5	20385	3	16-QAM	1	7	20.01	0-1	0
	1753.5	20385	3	16-QAM	1	14	20.04	0-1	0
	1753.5	20385	3	16-QAM	8	0	19.94	0-2	0
	1753.5	20385	3	16-QAM	8	4	19.95	0-2	0
	1753.5	20385	3	16-QAM	8	7	19.88	0-2	0
	1753.5	20385	3	16-QAM	15	0	20.09	0-2	0

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Table 9-23
LTE Band 4 (AWS) Conducted Powers - 1.4 MHz Bandwidth – Hotspot Mode On

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1710.7	19957	1.4	QPSK	1	0	19.98	0	0
	1710.7	19957	1.4	QPSK	1	2	19.71	0	0
	1710.7	19957	1.4	QPSK	1	5	19.66	0	0
	1710.7	19957	1.4	QPSK	3	0	19.97	0	0
	1710.7	19957	1.4	QPSK	3	2	19.88	0	0
	1710.7	19957	1.4	QPSK	3	3	19.96	0	0
	1710.7	19957	1.4	QPSK	6	0	19.95	0-1	0
	1710.7	19957	1.4	16-QAM	1	0	19.90	0-1	0
	1710.7	19957	1.4	16-QAM	1	2	19.96	0-1	0
	1710.7	19957	1.4	16-QAM	1	5	19.91	0-1	0
	1710.7	19957	1.4	16-QAM	3	0	19.81	0-1	0
	1710.7	19957	1.4	16-QAM	3	2	19.88	0-1	0
	1710.7	19957	1.4	16-QAM	3	3	19.93	0-1	0
Mid	1710.7	19957	1.4	16-QAM	6	0	19.90	0-2	0
	1732.5	20175	1.4	QPSK	1	0	19.91	0	0
	1732.5	20175	1.4	QPSK	1	2	20.03	0	0
	1732.5	20175	1.4	QPSK	1	5	20.03	0	0
	1732.5	20175	1.4	QPSK	3	0	20.24	0	0
	1732.5	20175	1.4	QPSK	3	2	20.17	0	0
	1732.5	20175	1.4	QPSK	3	3	20.06	0	0
	1732.5	20175	1.4	QPSK	6	0	20.04	0-1	0
	1732.5	20175	1.4	16-QAM	1	0	19.93	0-1	0
	1732.5	20175	1.4	16-QAM	1	2	19.94	0-1	0
	1732.5	20175	1.4	16-QAM	1	5	19.96	0-1	0
	1732.5	20175	1.4	16-QAM	3	0	20.02	0-1	0
	1732.5	20175	1.4	16-QAM	3	2	19.93	0-1	0
	1732.5	20175	1.4	16-QAM	3	3	19.90	0-1	0
High	1732.5	20175	1.4	16-QAM	6	0	19.69	0-2	0
	1754.3	20393	1.4	QPSK	1	0	19.95	0	0
	1754.3	20393	1.4	QPSK	1	2	20.14	0	0
	1754.3	20393	1.4	QPSK	1	5	19.91	0	0
	1754.3	20393	1.4	QPSK	3	0	19.87	0	0
	1754.3	20393	1.4	QPSK	3	2	19.95	0	0
	1754.3	20393	1.4	QPSK	3	3	20.12	0	0
	1754.3	20393	1.4	QPSK	6	0	19.95	0-1	0
	1754.3	20393	1.4	16-QAM	1	0	19.94	0-1	0
	1754.3	20393	1.4	16-QAM	1	2	20.03	0-1	0
	1754.3	20393	1.4	16-QAM	1	5	20.05	0-1	0
	1754.3	20393	1.4	16-QAM	3	0	19.79	0-1	0
	1754.3	20393	1.4	16-QAM	3	2	19.81	0-1	0
	1754.3	20393	1.4	16-QAM	3	3	19.96	0-1	0
	1754.3	20393	1.4	16-QAM	6	0	19.93	0-2	0

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LTE Band 25 (PCS)

Table 9-24
LTE Band 25 (PCS) Conducted Powers - 20 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1860	26140	20	QPSK	1	0	22.92	0	0
	1860	26140	20	QPSK	1	50	22.76	0	0
	1860	26140	20	QPSK	1	99	22.81	0	0
	1860	26140	20	QPSK	50	0	22.18	0-1	1
	1860	26140	20	QPSK	50	25	22.02	0-1	1
	1860	26140	20	QPSK	50	50	21.93	0-1	1
	1860	26140	20	QPSK	100	0	22.02	0-1	1
	1860	26140	20	16QAM	1	0	22.50	0-1	1
	1860	26140	20	16QAM	1	50	22.37	0-1	1
	1860	26140	20	16QAM	1	99	22.40	0-1	1
	1860	26140	20	16QAM	50	0	21.02	0-2	2
	1860	26140	20	16QAM	50	25	20.86	0-2	2
Mid	1860	26140	20	16QAM	50	50	20.88	0-2	2
	1860	26140	20	16QAM	100	0	20.93	0-2	2
	1882.5	26365	20	QPSK	1	0	23.19	0	0
	1882.5	26365	20	QPSK	1	50	23.43	0	0
	1882.5	26365	20	QPSK	1	99	23.29	0	0
	1882.5	26365	20	QPSK	50	0	22.08	0-1	1
	1882.5	26365	20	QPSK	50	25	21.99	0-1	1
	1882.5	26365	20	QPSK	50	50	21.91	0-1	1
	1882.5	26365	20	QPSK	100	0	21.98	0-1	1
	1882.5	26365	20	16QAM	1	0	22.02	0-1	1
	1882.5	26365	20	16QAM	1	50	22.16	0-1	1
	1882.5	26365	20	16QAM	1	99	22.08	0-1	1
High	1882.5	26365	20	16QAM	50	0	21.05	0-2	2
	1882.5	26365	20	16QAM	50	25	20.95	0-2	2
	1882.5	26365	20	16QAM	50	50	20.85	0-2	2
	1882.5	26365	20	16QAM	100	0	20.92	0-2	2
	1905	26590	20	QPSK	1	0	23.30	0	0
	1905	26590	20	QPSK	1	50	23.42	0	0
	1905	26590	20	QPSK	1	99	22.52	0	0
	1905	26590	20	QPSK	50	0	22.14	0-1	1
	1905	26590	20	QPSK	50	25	22.06	0-1	1
	1905	26590	20	QPSK	50	50	22.03	0-1	1
	1905	26590	20	QPSK	100	0	22.03	0-1	1
	1905	26590	20	16QAM	1	0	22.42	0-1	1
	1905	26590	20	16QAM	1	50	22.10	0-1	1
	1905	26590	20	16QAM	1	99	21.69	0-1	1
	1905	26590	20	16QAM	50	0	21.02	0-2	2
	1905	26590	20	16QAM	50	25	20.93	0-2	2
	1905	26590	20	16QAM	50	50	20.97	0-2	2
	1905	26590	20	16QAM	100	0	20.98	0-2	2

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Table 9-25
LTE Band 25 (PCS) Conducted Powers - 15 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1857.5	26115	15	QPSK	1	0	23.07	0	0
	1857.5	26115	15	QPSK	1	36	22.96	0	0
	1857.5	26115	15	QPSK	1	74	22.96	0	0
	1857.5	26115	15	QPSK	36	0	22.16	0-1	1
	1857.5	26115	15	QPSK	36	18	22.02	0-1	1
	1857.5	26115	15	QPSK	36	37	21.98	0-1	1
	1857.5	26115	15	QPSK	75	0	21.99	0-1	1
	1857.5	26115	15	16QAM	1	0	22.45	0-1	1
	1857.5	26115	15	16QAM	1	36	22.28	0-1	1
	1857.5	26115	15	16QAM	1	74	22.45	0-1	1
	1857.5	26115	15	16QAM	36	0	21.11	0-2	2
	1857.5	26115	15	16QAM	36	18	21.10	0-2	2
	1857.5	26115	15	16QAM	36	37	21.07	0-2	2
	1857.5	26115	15	16QAM	75	0	21.07	0-2	2
Mid	1882.5	26365	15	QPSK	1	0	23.09	0	0
	1882.5	26365	15	QPSK	1	36	23.21	0	0
	1882.5	26365	15	QPSK	1	74	23.38	0	0
	1882.5	26365	15	QPSK	36	0	22.10	0-1	1
	1882.5	26365	15	QPSK	36	18	22.12	0-1	1
	1882.5	26365	15	QPSK	36	37	22.10	0-1	1
	1882.5	26365	15	QPSK	75	0	22.10	0-1	1
	1882.5	26365	15	16QAM	1	0	22.19	0-1	1
	1882.5	26365	15	16QAM	1	36	22.10	0-1	1
	1882.5	26365	15	16QAM	1	74	22.16	0-1	1
	1882.5	26365	15	16QAM	36	0	20.89	0-2	2
	1882.5	26365	15	16QAM	36	18	20.88	0-2	2
	1882.5	26365	15	16QAM	36	37	20.87	0-2	2
	1882.5	26365	15	16QAM	75	0	20.97	0-2	2
High	1907.5	26615	15	QPSK	1	0	23.46	0	0
	1907.5	26615	15	QPSK	1	36	23.36	0	0
	1907.5	26615	15	QPSK	1	74	23.23	0	0
	1907.5	26615	15	QPSK	36	0	22.39	0-1	1
	1907.5	26615	15	QPSK	36	18	22.25	0-1	1
	1907.5	26615	15	QPSK	36	37	22.19	0-1	1
	1907.5	26615	15	QPSK	75	0	22.17	0-1	1
	1907.5	26615	15	16QAM	1	0	22.50	0-1	1
	1907.5	26615	15	16QAM	1	36	22.38	0-1	1
	1907.5	26615	15	16QAM	1	74	22.29	0-1	1
	1907.5	26615	15	16QAM	36	0	21.48	0-2	2
	1907.5	26615	15	16QAM	36	18	21.22	0-2	2
	1907.5	26615	15	16QAM	36	37	21.17	0-2	2
	1907.5	26615	15	16QAM	75	0	21.09	0-2	2

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Table 9-26
LTE Band 25 (PCS) Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1855	26090	10	QPSK	1	0	23.25	0	0
	1855	26090	10	QPSK	1	25	23.06	0	0
	1855	26090	10	QPSK	1	49	23.15	0	0
	1855	26090	10	QPSK	25	0	22.29	0-1	1
	1855	26090	10	QPSK	25	12	22.10	0-1	1
	1855	26090	10	QPSK	25	25	22.04	0-1	1
	1855	26090	10	QPSK	50	0	22.05	0-1	1
	1855	26090	10	16QAM	1	0	22.39	0-1	1
	1855	26090	10	16QAM	1	25	22.23	0-1	1
	1855	26090	10	16QAM	1	49	22.34	0-1	1
	1855	26090	10	16QAM	25	0	21.09	0-2	2
	1855	26090	10	16QAM	25	12	21.04	0-2	2
	1855	26090	10	16QAM	25	25	21.07	0-2	2
	1855	26090	10	16QAM	50	0	21.01	0-2	2
Mid	1882.5	26365	10	QPSK	1	0	23.29	0	0
	1882.5	26365	10	QPSK	1	25	23.21	0	0
	1882.5	26365	10	QPSK	1	49	23.25	0	0
	1882.5	26365	10	QPSK	25	0	22.27	0-1	1
	1882.5	26365	10	QPSK	25	12	22.04	0-1	1
	1882.5	26365	10	QPSK	25	25	22.18	0-1	1
	1882.5	26365	10	QPSK	50	0	22.07	0-1	1
	1882.5	26365	10	16QAM	1	0	22.29	0-1	1
	1882.5	26365	10	16QAM	1	25	22.38	0-1	1
	1882.5	26365	10	16QAM	1	49	22.22	0-1	1
	1882.5	26365	10	16QAM	25	0	21.02	0-2	2
	1882.5	26365	10	16QAM	25	12	20.99	0-2	2
	1882.5	26365	10	16QAM	25	25	20.95	0-2	2
	1882.5	26365	10	16QAM	50	0	21.08	0-2	2
High	1910	26640	10	QPSK	1	0	23.30	0	0
	1910	26640	10	QPSK	1	25	23.30	0	0
	1910	26640	10	QPSK	1	49	23.25	0	0
	1910	26640	10	QPSK	25	0	22.31	0-1	1
	1910	26640	10	QPSK	25	12	22.23	0-1	1
	1910	26640	10	QPSK	25	25	22.24	0-1	1
	1910	26640	10	QPSK	50	0	22.21	0-1	1
	1910	26640	10	16QAM	1	0	22.38	0-1	1
	1910	26640	10	16QAM	1	25	22.07	0-1	1
	1910	26640	10	16QAM	1	49	22.28	0-1	1
	1910	26640	10	16QAM	25	0	21.18	0-2	2
	1910	26640	10	16QAM	25	12	21.25	0-2	2
	1910	26640	10	16QAM	25	25	21.25	0-2	2
	1910	26640	10	16QAM	50	0	21.26	0-2	2

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Table 9-27
LTE Band 25 (PCS) Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1852.5	26065	5	QPSK	1	0	22.81	0	0
	1852.5	26065	5	QPSK	1	12	22.89	0	0
	1852.5	26065	5	QPSK	1	24	22.93	0	0
	1852.5	26065	5	QPSK	12	0	22.03	0-1	1
	1852.5	26065	5	QPSK	12	6	22.00	0-1	1
	1852.5	26065	5	QPSK	12	13	22.10	0-1	1
	1852.5	26065	5	QPSK	25	0	22.08	0-1	1
	1852.5	26065	5	16-QAM	1	0	21.97	0-1	1
	1852.5	26065	5	16-QAM	1	12	22.26	0-1	1
	1852.5	26065	5	16-QAM	1	24	22.07	0-1	1
	1852.5	26065	5	16-QAM	12	0	20.84	0-2	2
	1852.5	26065	5	16-QAM	12	6	20.92	0-2	2
	1852.5	26065	5	16-QAM	12	13	21.11	0-2	2
Mid	1852.5	26065	5	16-QAM	25	0	21.00	0-2	2
	1882.5	26365	5	QPSK	1	0	23.19	0	0
	1882.5	26365	5	QPSK	1	12	23.38	0	0
	1882.5	26365	5	QPSK	1	24	23.43	0	0
	1882.5	26365	5	QPSK	12	0	22.06	0-1	1
	1882.5	26365	5	QPSK	12	6	22.12	0-1	1
	1882.5	26365	5	QPSK	12	13	22.20	0-1	1
	1882.5	26365	5	QPSK	25	0	22.11	0-1	1
	1882.5	26365	5	16-QAM	1	0	21.93	0-1	1
	1882.5	26365	5	16-QAM	1	12	22.04	0-1	1
	1882.5	26365	5	16-QAM	1	24	22.05	0-1	1
	1882.5	26365	5	16-QAM	12	0	20.99	0-2	2
	1882.5	26365	5	16-QAM	12	6	20.98	0-2	2
	1882.5	26365	5	16-QAM	12	13	21.03	0-2	2
High	1882.5	26365	5	16-QAM	25	0	21.14	0-2	2
	1912.5	26665	5	QPSK	1	0	23.28	0	0
	1912.5	26665	5	QPSK	1	12	23.50	0	0
	1912.5	26665	5	QPSK	1	24	23.20	0	0
	1912.5	26665	5	QPSK	12	0	22.20	0-1	1
	1912.5	26665	5	QPSK	12	6	22.13	0-1	1
	1912.5	26665	5	QPSK	12	13	22.20	0-1	1
	1912.5	26665	5	QPSK	25	0	22.20	0-1	1
	1912.5	26665	5	16-QAM	1	0	22.34	0-1	1
	1912.5	26665	5	16-QAM	1	12	22.41	0-1	1
	1912.5	26665	5	16-QAM	1	24	22.32	0-1	1
	1912.5	26665	5	16-QAM	12	0	21.07	0-2	2
	1912.5	26665	5	16-QAM	12	6	21.27	0-2	2
	1912.5	26665	5	16-QAM	12	13	21.06	0-2	2
	1912.5	26665	5	16-QAM	25	0	21.09	0-2	2

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Table 9-28
LTE Band 25 (PCS) Conducted Powers - 3 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1851.5	26055	3	QPSK	1	0	23.30	0	0
	1851.5	26055	3	QPSK	1	7	23.26	0	0
	1851.5	26055	3	QPSK	1	14	23.19	0	0
	1851.5	26055	3	QPSK	8	0	22.09	0-1	1
	1851.5	26055	3	QPSK	8	4	22.11	0-1	1
	1851.5	26055	3	QPSK	8	7	22.00	0-1	1
	1851.5	26055	3	QPSK	15	0	22.02	0-1	1
	1851.5	26055	3	16-QAM	1	0	22.32	0-1	1
	1851.5	26055	3	16-QAM	1	7	22.44	0-1	1
	1851.5	26055	3	16-QAM	1	14	22.27	0-1	1
	1851.5	26055	3	16-QAM	8	0	21.00	0-2	2
	1851.5	26055	3	16-QAM	8	4	21.02	0-2	2
	1851.5	26055	3	16-QAM	8	7	21.00	0-2	2
Mid	1851.5	26055	3	16-QAM	15	0	21.10	0-2	2
	1882.5	26365	3	QPSK	1	0	23.17	0	0
	1882.5	26365	3	QPSK	1	7	23.28	0	0
	1882.5	26365	3	QPSK	1	14	23.50	0	0
	1882.5	26365	3	QPSK	8	0	22.12	0-1	1
	1882.5	26365	3	QPSK	8	4	22.12	0-1	1
	1882.5	26365	3	QPSK	8	7	22.20	0-1	1
	1882.5	26365	3	QPSK	15	0	22.15	0-1	1
	1882.5	26365	3	16-QAM	1	0	22.16	0-1	1
	1882.5	26365	3	16-QAM	1	7	22.50	0-1	1
	1882.5	26365	3	16-QAM	1	14	22.26	0-1	1
	1882.5	26365	3	16-QAM	8	0	20.81	0-2	2
	1882.5	26365	3	16-QAM	8	4	20.62	0-2	2
High	1882.5	26365	3	16-QAM	8	7	20.97	0-2	2
	1882.5	26365	3	16-QAM	15	0	21.17	0-2	2
	1913.5	26675	3	QPSK	1	0	23.22	0	0
	1913.5	26675	3	QPSK	1	7	23.36	0	0
	1913.5	26675	3	QPSK	1	14	23.09	0	0
	1913.5	26675	3	QPSK	8	0	22.24	0-1	1
	1913.5	26675	3	QPSK	8	4	22.16	0-1	1
	1913.5	26675	3	QPSK	8	7	22.14	0-1	1
	1913.5	26675	3	QPSK	15	0	22.19	0-1	1
	1913.5	26675	3	16-QAM	1	0	22.12	0-1	1
	1913.5	26675	3	16-QAM	1	7	21.94	0-1	1
	1913.5	26675	3	16-QAM	1	14	21.86	0-1	1
	1913.5	26675	3	16-QAM	8	0	21.22	0-2	2
	1913.5	26675	3	16-QAM	8	4	21.15	0-2	2
	1913.5	26675	3	16-QAM	8	7	21.22	0-2	2
	1913.5	26675	3	16-QAM	15	0	20.91	0-2	2

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Table 9-29
LTE Band 25 (PCS) Conducted Powers - 1.4 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1850.7	26047	1.4	QPSK	1	0	23.03	0	0
	1850.7	26047	1.4	QPSK	1	2	23.38	0	0
	1850.7	26047	1.4	QPSK	1	5	23.16	0	0
	1850.7	26047	1.4	QPSK	3	0	23.06	0	0
	1850.7	26047	1.4	QPSK	3	2	23.01	0	0
	1850.7	26047	1.4	QPSK	3	3	22.97	0	0
	1850.7	26047	1.4	QPSK	6	0	22.26	0-1	1
	1850.7	26047	1.4	16-QAM	1	0	21.70	0-1	1
	1850.7	26047	1.4	16-QAM	1	2	21.71	0-1	1
	1850.7	26047	1.4	16-QAM	1	5	21.79	0-1	1
	1850.7	26047	1.4	16-QAM	3	0	21.58	0-1	1
	1850.7	26047	1.4	16-QAM	3	2	21.71	0-1	1
	1850.7	26047	1.4	16-QAM	3	3	21.80	0-1	1
Mid	1850.7	26047	1.4	16-QAM	6	0	21.07	0-2	2
	1882.5	26365	1.4	QPSK	1	0	22.95	0	0
	1882.5	26365	1.4	QPSK	1	2	23.08	0	0
	1882.5	26365	1.4	QPSK	1	5	23.02	0	0
	1882.5	26365	1.4	QPSK	3	0	22.90	0	0
	1882.5	26365	1.4	QPSK	3	2	23.05	0	0
	1882.5	26365	1.4	QPSK	3	3	23.21	0	0
	1882.5	26365	1.4	QPSK	6	0	22.12	0-1	1
	1882.5	26365	1.4	16-QAM	1	0	22.24	0-1	1
	1882.5	26365	1.4	16-QAM	1	2	22.45	0-1	1
	1882.5	26365	1.4	16-QAM	1	5	22.46	0-1	1
	1882.5	26365	1.4	16-QAM	3	0	22.15	0-1	1
	1882.5	26365	1.4	16-QAM	3	2	22.09	0-1	1
	1882.5	26365	1.4	16-QAM	3	3	22.14	0-1	1
High	1882.5	26365	1.4	16-QAM	6	0	21.13	0-2	2
	1914.3	26683	1.4	QPSK	1	0	23.43	0	0
	1914.3	26683	1.4	QPSK	1	2	23.45	0	0
	1914.3	26683	1.4	QPSK	1	5	23.25	0	0
	1914.3	26683	1.4	QPSK	3	0	23.10	0	0
	1914.3	26683	1.4	QPSK	3	2	23.18	0	0
	1914.3	26683	1.4	QPSK	3	3	23.06	0	0
	1914.3	26683	1.4	QPSK	6	0	22.14	0-1	1
	1914.3	26683	1.4	16-QAM	1	0	22.21	0-1	1
	1914.3	26683	1.4	16-QAM	1	2	22.17	0-1	1
	1914.3	26683	1.4	16-QAM	1	5	22.04	0-1	1
	1914.3	26683	1.4	16-QAM	3	0	22.19	0-1	1
	1914.3	26683	1.4	16-QAM	3	2	22.20	0-1	1
	1914.3	26683	1.4	16-QAM	3	3	22.12	0-1	1
	1914.3	26683	1.4	16-QAM	6	0	21.30	0-2	2

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LTE Band 25 (PCS) – Hotspot Mode On

Table 9-30
LTE Band 25 (PCS) Conducted Powers - 20 MHz Bandwidth – Hotspot Mode On

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1860	26140	20	QPSK	1	0	20.32	0	0
	1860	26140	20	QPSK	1	50	20.41	0	0
	1860	26140	20	QPSK	1	99	20.36	0	0
	1860	26140	20	QPSK	50	0	20.43	0-1	0
	1860	26140	20	QPSK	50	25	20.45	0-1	0
	1860	26140	20	QPSK	50	50	20.22	0-1	0
	1860	26140	20	QPSK	100	0	20.40	0-1	0
	1860	26140	20	16QAM	1	0	20.31	0-1	0
	1860	26140	20	16QAM	1	50	20.29	0-1	0
	1860	26140	20	16QAM	1	99	20.10	0-1	0
	1860	26140	20	16QAM	50	0	20.44	0-2	0
	1860	26140	20	16QAM	50	25	20.36	0-2	0
Mid	1860	26140	20	16QAM	50	50	20.21	0-2	0
	1860	26140	20	16QAM	100	0	20.38	0-2	0
	1882.5	26365	20	QPSK	1	0	20.38	0	0
	1882.5	26365	20	QPSK	1	50	20.49	0	0
	1882.5	26365	20	QPSK	1	99	20.46	0	0
	1882.5	26365	20	QPSK	50	0	20.45	0	0
	1882.5	26365	20	QPSK	50	25	20.35	0-1	0
	1882.5	26365	20	QPSK	50	50	20.39	0-1	0
	1882.5	26365	20	QPSK	100	0	20.40	0-1	0
	1882.5	26365	20	16QAM	1	0	20.31	0-1	0
	1882.5	26365	20	16QAM	1	50	20.41	0-1	0
	1882.5	26365	20	16QAM	1	99	20.11	0-1	0
High	1882.5	26365	20	16QAM	50	0	20.42	0-2	0
	1882.5	26365	20	16QAM	50	25	20.38	0-2	0
	1882.5	26365	20	16QAM	50	50	20.27	0-2	0
	1882.5	26365	20	16QAM	100	0	20.32	0-2	0
	1905	26590	20	QPSK	1	0	20.50	0	0
	1905	26590	20	QPSK	1	50	20.49	0	0
	1905	26590	20	QPSK	1	99	20.40	0	0
	1905	26590	20	QPSK	50	0	20.46	0-1	0
	1905	26590	20	QPSK	50	25	20.29	0-1	0
	1905	26590	20	QPSK	50	50	20.21	0-1	0
	1905	26590	20	QPSK	100	0	20.32	0-1	0
	1905	26590	20	16QAM	1	0	20.43	0-1	0
	1905	26590	20	16QAM	1	50	20.29	0-1	0
	1905	26590	20	16QAM	1	99	20.06	0-1	0
	1905	26590	20	16QAM	50	0	20.42	0-2	0
	1905	26590	20	16QAM	50	25	20.31	0-2	0
	1905	26590	20	16QAM	50	50	20.31	0-2	0
	1905	26590	20	16QAM	100	0	20.32	0-2	0

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Table 9-31
LTE Band 25 (PCS) Conducted Powers - 15 MHz Bandwidth – Hotspot Mode On

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1857.5	26115	15	QPSK	1	0	20.25	0	0
	1857.5	26115	15	QPSK	1	36	20.39	0	0
	1857.5	26115	15	QPSK	1	74	20.33	0	0
	1857.5	26115	15	QPSK	36	0	20.36	0-1	0
	1857.5	26115	15	QPSK	36	18	20.38	0-1	0
	1857.5	26115	15	QPSK	36	37	20.15	0-1	0
	1857.5	26115	15	QPSK	75	0	20.33	0-1	0
	1857.5	26115	15	16QAM	1	0	20.24	0-1	0
	1857.5	26115	15	16QAM	1	36	20.22	0-1	0
	1857.5	26115	15	16QAM	1	74	20.03	0-1	0
	1857.5	26115	15	16QAM	36	0	20.37	0-2	0
	1857.5	26115	15	16QAM	36	18	20.29	0-2	0
	1857.5	26115	15	16QAM	36	37	20.22	0-2	0
	1857.5	26115	15	16QAM	75	0	20.31	0-2	0
Mid	1882.5	26365	15	QPSK	1	0	20.31	0	0
	1882.5	26365	15	QPSK	1	36	20.42	0	0
	1882.5	26365	15	QPSK	1	74	20.39	0	0
	1882.5	26365	15	QPSK	36	0	20.38	0-1	0
	1882.5	26365	15	QPSK	36	18	20.28	0-1	0
	1882.5	26365	15	QPSK	36	37	20.32	0-1	0
	1882.5	26365	15	QPSK	75	0	20.33	0-1	0
	1882.5	26365	15	16QAM	1	0	20.24	0-1	0
	1882.5	26365	15	16QAM	1	36	20.34	0-1	0
	1882.5	26365	15	16QAM	1	74	20.04	0-1	0
	1882.5	26365	15	16QAM	36	0	20.35	0-2	0
	1882.5	26365	15	16QAM	36	18	20.31	0-2	0
	1882.5	26365	15	16QAM	36	37	20.20	0-2	0
	1882.5	26365	15	16QAM	75	0	20.25	0-2	0
High	1907.5	26615	15	QPSK	1	0	20.43	0	0
	1907.5	26615	15	QPSK	1	36	20.42	0	0
	1907.5	26615	15	QPSK	1	74	20.33	0	0
	1907.5	26615	15	QPSK	36	0	20.39	0-1	0
	1907.5	26615	15	QPSK	36	18	20.22	0-1	0
	1907.5	26615	15	QPSK	36	37	20.14	0-1	0
	1907.5	26615	15	QPSK	75	0	20.25	0-1	0
	1907.5	26615	15	16QAM	1	0	20.36	0-1	0
	1907.5	26615	15	16QAM	1	36	20.22	0-1	0
	1907.5	26615	15	16QAM	1	74	20.15	0-1	0
	1907.5	26615	15	16QAM	36	0	20.35	0-2	0
	1907.5	26615	15	16QAM	36	18	20.24	0-2	0
	1907.5	26615	15	16QAM	36	37	20.20	0-2	0
	1907.5	26615	15	16QAM	75	0	20.25	0-2	0

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Table 9-32
LTE Band 25 (PCS) Conducted Powers - 10 MHz Bandwidth – Hotspot Mode On

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1855	26090	10	QPSK	1	0	20.30	0	0
	1855	26090	10	QPSK	1	25	20.39	0	0
	1855	26090	10	QPSK	1	49	20.34	0	0
	1855	26090	10	QPSK	25	0	20.49	0-1	0
	1855	26090	10	QPSK	25	12	20.43	0-1	0
	1855	26090	10	QPSK	25	25	20.22	0-1	0
	1855	26090	10	QPSK	50	0	20.38	0-1	0
	1855	26090	10	16QAM	1	0	20.29	0-1	0
	1855	26090	10	16QAM	1	25	20.30	0-1	0
	1855	26090	10	16QAM	1	49	20.08	0-1	0
	1855	26090	10	16QAM	25	0	20.42	0-2	0
	1855	26090	10	16QAM	25	12	20.34	0-2	0
	1855	26090	10	16QAM	25	25	20.20	0-2	0
	1855	26090	10	16QAM	50	0	20.36	0-2	0
Mid	1882.5	26365	10	QPSK	1	0	20.36	0	0
	1882.5	26365	10	QPSK	1	25	20.47	0	0
	1882.5	26365	10	QPSK	1	49	20.44	0	0
	1882.5	26365	10	QPSK	25	0	20.43	0-1	0
	1882.5	26365	10	QPSK	25	12	20.31	0-1	0
	1882.5	26365	10	QPSK	25	25	20.37	0-1	0
	1882.5	26365	10	QPSK	50	0	20.38	0-1	0
	1882.5	26365	10	16QAM	1	0	20.29	0-1	0
	1882.5	26365	10	16QAM	1	25	20.32	0-1	0
	1882.5	26365	10	16QAM	1	49	20.09	0-1	0
	1882.5	26365	10	16QAM	25	0	20.40	0-2	0
	1882.5	26365	10	16QAM	25	12	20.36	0-2	0
	1882.5	26365	10	16QAM	25	25	20.25	0-2	0
	1882.5	26365	10	16QAM	50	0	20.30	0-2	0
High	1910	26640	10	QPSK	1	0	20.48	0	0
	1910	26640	10	QPSK	1	25	20.45	0	0
	1910	26640	10	QPSK	1	49	20.38	0	0
	1910	26640	10	QPSK	25	0	20.44	0-1	0
	1910	26640	10	QPSK	25	12	20.27	0-1	0
	1910	26640	10	QPSK	25	25	20.19	0-1	0
	1910	26640	10	QPSK	50	0	20.30	0-1	0
	1910	26640	10	16QAM	1	0	20.41	0-1	0
	1910	26640	10	16QAM	1	25	20.27	0-1	0
	1910	26640	10	16QAM	1	49	20.11	0-1	0
	1910	26640	10	16QAM	25	0	20.40	0-2	0
	1910	26640	10	16QAM	25	12	20.29	0-2	0
	1910	26640	10	16QAM	25	25	20.21	0-2	0
	1910	26640	10	16QAM	50	0	20.31	0-2	0

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Table 9-33
LTE Band 25 (PCS) Conducted Powers - 5 MHz Bandwidth – Hotspot Mode On

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1852.5	26065	5	QPSK	1	0	20.27	0	0
	1852.5	26065	5	QPSK	1	12	20.36	0	0
	1852.5	26065	5	QPSK	1	24	20.31	0	0
	1852.5	26065	5	QPSK	12	0	20.38	0-1	0
	1852.5	26065	5	QPSK	12	6	20.40	0-1	0
	1852.5	26065	5	QPSK	12	13	20.17	0-1	0
	1852.5	26065	5	QPSK	25	0	20.35	0-1	0
	1852.5	26065	5	16-QAM	1	0	20.26	0-1	0
	1852.5	26065	5	16-QAM	1	12	20.24	0-1	0
	1852.5	26065	5	16-QAM	1	24	20.05	0-1	0
	1852.5	26065	5	16-QAM	12	0	20.39	0-2	0
	1852.5	26065	5	16-QAM	12	6	20.31	0-2	0
	1852.5	26065	5	16-QAM	12	13	20.16	0-2	0
Mid	1852.5	26065	5	16-QAM	25	0	20.33	0-2	0
	1882.5	26365	5	QPSK	1	0	20.33	0	0
	1882.5	26365	5	QPSK	1	12	20.44	0	0
	1882.5	26365	5	QPSK	1	24	20.41	0	0
	1882.5	26365	5	QPSK	12	0	20.40	0-1	0
	1882.5	26365	5	QPSK	12	6	20.30	0-1	0
	1882.5	26365	5	QPSK	12	13	20.34	0-1	0
	1882.5	26365	5	QPSK	25	0	20.35	0-1	0
	1882.5	26365	5	16-QAM	1	0	20.26	0-1	0
	1882.5	26365	5	16-QAM	1	12	20.36	0-1	0
	1882.5	26365	5	16-QAM	1	24	20.06	0-1	0
	1882.5	26365	5	16-QAM	12	0	20.37	0-2	0
	1882.5	26365	5	16-QAM	12	6	20.33	0-2	0
	1882.5	26365	5	16-QAM	12	13	20.22	0-2	0
High	1882.5	26365	5	16-QAM	25	0	20.27	0-2	0
	1912.5	26665	5	QPSK	1	0	20.45	0	0
	1912.5	26665	5	QPSK	1	12	20.44	0	0
	1912.5	26665	5	QPSK	1	24	20.35	0	0
	1912.5	26665	5	QPSK	12	0	20.41	0-1	0
	1912.5	26665	5	QPSK	12	6	20.24	0-1	0
	1912.5	26665	5	QPSK	12	13	20.16	0-1	0
	1912.5	26665	5	QPSK	25	0	20.27	0-1	0
	1912.5	26665	5	16-QAM	1	0	20.38	0-1	0
	1912.5	26665	5	16-QAM	1	12	20.24	0-1	0
	1912.5	26665	5	16-QAM	1	24	20.01	0-1	0
	1912.5	26665	5	16-QAM	12	0	20.37	0-2	0
	1912.5	26665	5	16-QAM	12	6	20.26	0-2	0
	1912.5	26665	5	16-QAM	12	13	20.26	0-2	0
	1912.5	26665	5	16-QAM	25	0	20.27	0-2	0

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Table 9-34

LTE Band 25 (PCS) Conducted Powers - 3 MHz Bandwidth – Hotspot Mode On

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1851.5	26055	3	QPSK	1	0	20.24	0	0
	1851.5	26055	3	QPSK	1	7	20.30	0	0
	1851.5	26055	3	QPSK	1	14	20.28	0	0
	1851.5	26055	3	QPSK	8	0	20.35	0-1	0
	1851.5	26055	3	QPSK	8	4	20.37	0-1	0
	1851.5	26055	3	QPSK	8	7	20.14	0-1	0
	1851.5	26055	3	QPSK	15	0	20.32	0-1	0
	1851.5	26055	3	16-QAM	1	0	20.25	0-1	0
	1851.5	26055	3	16-QAM	1	7	20.22	0-1	0
	1851.5	26055	3	16-QAM	1	14	20.13	0-1	0
	1851.5	26055	3	16-QAM	8	0	20.36	0-2	0
	1851.5	26055	3	16-QAM	8	4	20.28	0-2	0
	1851.5	26055	3	16-QAM	8	7	20.13	0-2	0
Mid	1851.5	26055	3	16-QAM	15	0	20.24	0-2	0
	1882.5	26365	3	QPSK	1	0	20.21	0	0
	1882.5	26365	3	QPSK	1	7	20.41	0	0
	1882.5	26365	3	QPSK	1	14	20.38	0	0
	1882.5	26365	3	QPSK	8	0	20.37	0-1	0
	1882.5	26365	3	QPSK	8	4	20.22	0-1	0
	1882.5	26365	3	QPSK	8	7	20.31	0-1	0
	1882.5	26365	3	QPSK	15	0	20.32	0-1	0
	1882.5	26365	3	16-QAM	1	0	20.25	0-1	0
	1882.5	26365	3	16-QAM	1	7	20.31	0-1	0
	1882.5	26365	3	16-QAM	1	14	20.11	0-1	0
	1882.5	26365	3	16-QAM	8	0	20.34	0-2	0
	1882.5	26365	3	16-QAM	8	4	20.28	0-2	0
High	1882.5	26365	3	16-QAM	8	7	20.18	0-2	0
	1882.5	26365	3	16-QAM	15	0	20.24	0-2	0
	1913.5	26675	3	QPSK	1	0	20.42	0	0
	1913.5	26675	3	QPSK	1	7	20.41	0	0
	1913.5	26675	3	QPSK	1	14	20.32	0	0
	1913.5	26675	3	QPSK	8	0	20.38	0-1	0
	1913.5	26675	3	QPSK	8	4	20.21	0-1	0
	1913.5	26675	3	QPSK	8	7	20.13	0-1	0
	1913.5	26675	3	QPSK	15	0	20.24	0-1	0
	1913.5	26675	3	16-QAM	1	0	20.35	0-1	0
	1913.5	26675	3	16-QAM	1	7	20.18	0-1	0
	1913.5	26675	3	16-QAM	1	14	20.20	0-1	0
	1913.5	26675	3	16-QAM	8	0	20.34	0-2	0
	1913.5	26675	3	16-QAM	8	4	20.20	0-2	0
	1913.5	26675	3	16-QAM	8	7	20.25	0-2	0
	1913.5	26675	3	16-QAM	15	0	20.11	0-2	0

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Table 9-35
LTE Band 25 (PCS) Conducted Powers - 1.4 MHz Bandwidth – Hotspot Mode On

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1850.7	26047	1.4	QPSK	1	0	20.30	0	0
	1850.7	26047	1.4	QPSK	1	2	20.31	0	0
	1850.7	26047	1.4	QPSK	1	5	20.34	0	0
	1850.7	26047	1.4	QPSK	3	0	20.41	0	0
	1850.7	26047	1.4	QPSK	3	2	20.43	0	0
	1850.7	26047	1.4	QPSK	3	3	20.22	0	0
	1850.7	26047	1.4	QPSK	6	0	20.38	0-1	0
	1850.7	26047	1.4	16-QAM	1	0	20.29	0-1	0
	1850.7	26047	1.4	16-QAM	1	2	20.30	0-1	0
	1850.7	26047	1.4	16-QAM	1	5	20.08	0-1	0
	1850.7	26047	1.4	16-QAM	3	0	20.42	0-1	0
	1850.7	26047	1.4	16-QAM	3	2	20.33	0-1	0
	1850.7	26047	1.4	16-QAM	3	3	20.22	0-1	0
	1850.7	26047	1.4	16-QAM	6	0	20.30	0-2	0
Mid	1882.5	26365	1.4	QPSK	1	0	20.36	0	0
	1882.5	26365	1.4	QPSK	1	2	20.40	0	0
	1882.5	26365	1.4	QPSK	1	5	20.44	0	0
	1882.5	26365	1.4	QPSK	3	0	20.43	0	0
	1882.5	26365	1.4	QPSK	3	2	20.33	0	0
	1882.5	26365	1.4	QPSK	3	3	20.37	0	0
	1882.5	26365	1.4	QPSK	6	0	20.38	0-1	0
	1882.5	26365	1.4	16-QAM	1	0	20.29	0-1	0
	1882.5	26365	1.4	16-QAM	1	2	20.39	0-1	0
	1882.5	26365	1.4	16-QAM	1	5	20.19	0-1	0
	1882.5	26365	1.4	16-QAM	3	0	20.39	0-1	0
	1882.5	26365	1.4	16-QAM	3	2	20.36	0-1	0
	1882.5	26365	1.4	16-QAM	3	3	20.25	0-1	0
	1882.5	26365	1.4	16-QAM	6	0	20.29	0-2	0
High	1914.3	26683	1.4	QPSK	1	0	20.45	0	0
	1914.3	26683	1.4	QPSK	1	2	20.47	0	0
	1914.3	26683	1.4	QPSK	1	5	20.38	0	0
	1914.3	26683	1.4	QPSK	3	0	20.40	0	0
	1914.3	26683	1.4	QPSK	3	2	20.27	0	0
	1914.3	26683	1.4	QPSK	3	3	20.10	0	0
	1914.3	26683	1.4	QPSK	6	0	20.30	0-1	0
	1914.3	26683	1.4	16-QAM	1	0	20.41	0-1	0
	1914.3	26683	1.4	16-QAM	1	2	20.25	0-1	0
	1914.3	26683	1.4	16-QAM	1	5	20.14	0-1	0
	1914.3	26683	1.4	16-QAM	3	0	20.40	0-1	0
	1914.3	26683	1.4	16-QAM	3	2	20.29	0-1	0
	1914.3	26683	1.4	16-QAM	3	3	20.33	0-1	0
	1914.3	26683	1.4	16-QAM	6	0	20.31	0-2	0

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LTE Band 41

Table 9-36
LTE Band 41 Conducted Powers - 20 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	2506.0	39750	20	QPSK	1	0	24.12	0	0
	2506.0	39750	20	QPSK	1	50	24.05	0	0
	2506.0	39750	20	QPSK	1	99	23.86	0	0
	2506.0	39750	20	QPSK	50	0	23.31	0-1	1
	2506.0	39750	20	QPSK	50	25	23.19	0-1	1
	2506.0	39750	20	QPSK	50	50	23.12	0-1	1
	2506.0	39750	20	QPSK	100	0	23.08	0-1	1
	2506.0	39750	20	16QAM	1	0	23.35	0-1	1
	2506.0	39750	20	16QAM	1	50	23.05	0-1	1
	2506.0	39750	20	16QAM	1	99	23.12	0-1	1
	2506.0	39750	20	16QAM	50	0	22.36	0-2	2
	2506.0	39750	20	16QAM	50	25	22.34	0-2	2
	2506.0	39750	20	16QAM	50	50	22.29	0-2	2
	2506.0	39750	20	16QAM	100	0	22.20	0-2	2
	2549.5	40185	20	QPSK	1	0	24.18	0	0
	2549.5	40185	20	QPSK	1	50	24.10	0	0
Low Mid	2549.5	40185	20	QPSK	1	99	23.79	0	0
	2549.5	40185	20	QPSK	50	0	23.30	0-1	1
	2549.5	40185	20	QPSK	50	25	23.29	0-1	1
	2549.5	40185	20	QPSK	50	50	23.28	0-1	1
	2549.5	40185	20	QPSK	100	0	23.17	0-1	1
	2549.5	40185	20	16-QAM	1	0	23.09	0-1	1
	2549.5	40185	20	16-QAM	1	50	22.95	0-1	1
	2549.5	40185	20	16-QAM	1	99	22.94	0-1	1
	2549.5	40185	20	16-QAM	50	0	22.36	0-2	2
	2549.5	40185	20	16-QAM	50	25	22.31	0-2	2
	2549.5	40185	20	16-QAM	50	50	22.33	0-2	2
	2549.5	40185	20	16-QAM	100	0	22.10	0-2	2
Mid	2593.0	40620	20	QPSK	1	0	24.06	0	0
	2593.0	40620	20	QPSK	1	50	24.03	0	0
	2593.0	40620	20	QPSK	1	99	24.01	0	0
	2593.0	40620	20	QPSK	50	0	23.34	0-1	1
	2593.0	40620	20	QPSK	50	25	23.38	0-1	1
	2593.0	40620	20	QPSK	50	50	23.24	0-1	1
	2593.0	40620	20	QPSK	100	0	23.32	0-1	1
	2593.0	40620	20	16-QAM	1	0	23.08	0-1	1
	2593.0	40620	20	16-QAM	1	50	23.14	0-1	1
	2593.0	40620	20	16-QAM	1	99	23.09	0-1	1
	2593.0	40620	20	16-QAM	50	0	22.46	0-2	2
	2593.0	40620	20	16-QAM	50	25	22.45	0-2	2
	2593.0	40620	20	16-QAM	50	50	22.37	0-2	2
	2593.0	40620	20	16-QAM	100	0	22.07	0-2	2
Mid High	2636.5	41055	20	QPSK	1	0	24.19	0	0
	2636.5	41055	20	QPSK	1	50	23.95	0	0
	2636.5	41055	20	QPSK	1	99	23.99	0	0
	2636.5	41055	20	QPSK	50	0	23.39	0-1	1
	2636.5	41055	20	QPSK	50	25	23.28	0-1	1
	2636.5	41055	20	QPSK	50	50	23.01	0-1	1
	2636.5	41055	20	QPSK	100	0	23.34	0-1	1
	2636.5	41055	20	16-QAM	1	0	23.04	0-1	1
	2636.5	41055	20	16-QAM	1	50	22.85	0-1	1
	2636.5	41055	20	16-QAM	1	99	22.94	0-1	1
	2636.5	41055	20	16-QAM	50	0	22.48	0-2	2
	2636.5	41055	20	16-QAM	50	25	22.46	0-2	2
	2636.5	41055	20	16-QAM	50	50	22.34	0-2	2
	2636.5	41055	20	16-QAM	100	0	22.27	0-2	2
High	2680.0	41490	20	QPSK	1	0	24.11	0	0
	2680.0	41490	20	QPSK	1	50	24.10	0	0
	2680.0	41490	20	QPSK	1	99	23.79	0	0
	2680.0	41490	20	QPSK	50	0	23.32	0-1	1
	2680.0	41490	20	QPSK	50	25	23.21	0-1	1
	2680.0	41490	20	QPSK	50	50	23.16	0-1	1
	2680.0	41490	20	QPSK	100	0	23.27	0-1	1
	2680.0	41490	20	16-QAM	1	0	23.36	0-1	1
	2680.0	41490	20	16-QAM	1	50	23.43	0-1	1
	2680.0	41490	20	16-QAM	1	99	23.50	0-1	1
	2680.0	41490	20	16-QAM	50	0	22.43	0-2	2
	2680.0	41490	20	16-QAM	50	25	22.47	0-2	2
	2680.0	41490	20	16-QAM	50	50	22.31	0-2	2
	2680.0	41490	20	16-QAM	100	0	22.37	0-2	2

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Table 9-37
LTE Band 41 Conducted Powers - 15 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	2506.0	39750	15	QPSK	1	0	24.50	0	0
	2506.0	39750	15	QPSK	1	36	24.40	0	0
	2506.0	39750	15	QPSK	1	74	24.44	0	0
	2506.0	39750	15	QPSK	36	0	23.42	0-1	1
	2506.0	39750	15	QPSK	36	18	23.46	0-1	1
	2506.0	39750	15	QPSK	36	37	23.27	0-1	1
	2506.0	39750	15	QPSK	75	0	23.28	0-1	1
	2506.0	39750	15	16QAM	1	0	23.38	0-1	1
	2506.0	39750	15	16QAM	1	36	23.36	0-1	1
	2506.0	39750	15	16QAM	1	74	23.31	0-1	1
	2506.0	39750	15	16QAM	36	0	22.49	0-2	2
	2506.0	39750	15	16QAM	36	18	22.41	0-2	2
	2506.0	39750	15	16QAM	36	37	22.39	0-2	2
	2506.0	39750	15	16QAM	75	0	22.26	0-2	2
Low Mid	2549.5	40185	15	QPSK	1	0	24.50	0	0
	2549.5	40185	15	QPSK	1	36	24.25	0	0
	2549.5	40185	15	QPSK	1	74	24.24	0	0
	2549.5	40185	15	QPSK	36	0	23.50	0-1	1
	2549.5	40185	15	QPSK	36	18	23.45	0-1	1
	2549.5	40185	15	QPSK	36	37	23.41	0-1	1
	2549.5	40185	15	QPSK	75	0	23.45	0-1	1
	2549.5	40185	15	16-QAM	1	0	23.25	0-1	1
	2549.5	40185	15	16-QAM	1	36	23.08	0-1	1
	2549.5	40185	15	16-QAM	1	74	23.07	0-1	1
	2549.5	40185	15	16-QAM	36	0	22.50	0-2	2
	2549.5	40185	15	16-QAM	36	18	22.48	0-2	2
	2549.5	40185	15	16-QAM	36	37	22.44	0-2	2
	2549.5	40185	15	16-QAM	75	0	22.49	0-2	2
Mid	2593.0	40620	15	QPSK	1	0	24.49	0	0
	2593.0	40620	15	QPSK	1	36	24.27	0	0
	2593.0	40620	15	QPSK	1	74	24.20	0	0
	2593.0	40620	15	QPSK	36	0	23.45	0-1	1
	2593.0	40620	15	QPSK	36	18	23.35	0-1	1
	2593.0	40620	15	QPSK	36	37	23.29	0-1	1
	2593.0	40620	15	QPSK	75	0	23.32	0-1	1
	2593.0	40620	15	16-QAM	1	0	23.40	0-1	1
	2593.0	40620	15	16-QAM	1	36	22.87	0-1	1
	2593.0	40620	15	16-QAM	1	74	22.86	0-1	1
	2593.0	40620	15	16-QAM	36	0	22.50	0-2	2
	2593.0	40620	15	16-QAM	36	18	22.44	0-2	2
	2593.0	40620	15	16-QAM	36	37	22.48	0-2	2
	2593.0	40620	15	16-QAM	75	0	22.41	0-2	2
Mid High	2636.5	41055	15	QPSK	1	0	24.44	0	0
	2636.5	41055	15	QPSK	1	36	24.33	0	0
	2636.5	41055	15	QPSK	1	74	24.35	0	0
	2636.5	41055	15	QPSK	36	0	23.50	0-1	1
	2636.5	41055	15	QPSK	36	18	23.44	0-1	1
	2636.5	41055	15	QPSK	36	37	23.47	0-1	1
	2636.5	41055	15	QPSK	75	0	23.49	0-1	1
	2636.5	41055	15	16-QAM	1	0	23.27	0-1	1
	2636.5	41055	15	16-QAM	1	36	23.35	0-1	1
	2636.5	41055	15	16-QAM	1	74	23.39	0-1	1
	2636.5	41055	15	16-QAM	36	0	22.49	0-2	2
	2636.5	41055	15	16-QAM	36	18	22.44	0-2	2
	2636.5	41055	15	16-QAM	36	37	22.38	0-2	2
	2636.5	41055	15	16-QAM	75	0	22.31	0-2	2
High	2680.0	41490	15	QPSK	1	0	24.38	0	0
	2680.0	41490	15	QPSK	1	36	24.42	0	0
	2680.0	41490	15	QPSK	1	74	24.45	0	0
	2680.0	41490	15	QPSK	36	0	23.47	0-1	1
	2680.0	41490	15	QPSK	36	18	23.42	0-1	1
	2680.0	41490	15	QPSK	36	37	23.41	0-1	1
	2680.0	41490	15	QPSK	75	0	23.44	0-1	1
	2680.0	41490	15	16-QAM	1	0	23.09	0-1	1
	2680.0	41490	15	16-QAM	1	36	23.25	0-1	1
	2680.0	41490	15	16-QAM	1	74	23.28	0-1	1
	2680.0	41490	15	16-QAM	36	0	22.43	0-2	2
	2680.0	41490	15	16-QAM	36	18	22.45	0-2	2
	2680.0	41490	15	16-QAM	36	37	22.49	0-2	2
	2680.0	41490	15	16-QAM	75	0	22.47	0-2	2

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Table 9-38
LTE Band 41 Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	2506.0	39750	10	QPSK	1	0	24.50	0	0
	2506.0	39750	10	QPSK	1	25	24.40	0	0
	2506.0	39750	10	QPSK	1	49	24.41	0	0
	2506.0	39750	10	QPSK	25	0	23.40	0-1	1
	2506.0	39750	10	QPSK	25	12	23.38	0-1	1
	2506.0	39750	10	QPSK	25	25	23.25	0-1	1
	2506.0	39750	10	QPSK	50	0	23.29	0-1	1
	2506.0	39750	10	16QAM	1	0	22.92	0-1	1
	2506.0	39750	10	16QAM	1	25	23.12	0-1	1
	2506.0	39750	10	16QAM	1	49	23.06	0-1	1
	2506.0	39750	10	16QAM	25	0	22.41	0-2	2
	2506.0	39750	10	16QAM	25	12	22.33	0-2	2
	2506.0	39750	10	16QAM	25	25	22.27	0-2	2
	2506.0	39750	10	16QAM	50	0	22.38	0-2	2
	2549.5	40185	10	QPSK	1	0	24.45	0	0
	2549.5	40185	10	QPSK	1	25	24.22	0	0
Low Mid	2549.5	40185	10	QPSK	1	49	24.26	0	0
	2549.5	40185	10	QPSK	25	0	23.43	0-1	1
	2549.5	40185	10	QPSK	25	12	23.32	0-1	1
	2549.5	40185	10	QPSK	25	25	23.31	0-1	1
	2549.5	40185	10	QPSK	50	0	23.37	0-1	1
	2549.5	40185	10	16-QAM	1	0	23.11	0-1	1
	2549.5	40185	10	16-QAM	1	25	22.89	0-1	1
	2549.5	40185	10	16-QAM	1	49	22.91	0-1	1
	2549.5	40185	10	16-QAM	25	0	22.50	0-2	2
	2549.5	40185	10	16-QAM	25	12	22.46	0-2	2
	2549.5	40185	10	16-QAM	25	25	22.47	0-2	2
	2549.5	40185	10	16-QAM	50	0	22.44	0-2	2
	2593.0	40620	10	QPSK	1	0	24.32	0	0
	2593.0	40620	10	QPSK	1	25	24.07	0	0
	2593.0	40620	10	QPSK	1	49	24.16	0	0
	2593.0	40620	10	QPSK	25	0	23.42	0-1	1
Mid	2593.0	40620	10	QPSK	25	12	23.32	0-1	1
	2593.0	40620	10	QPSK	25	25	23.31	0-1	1
	2593.0	40620	10	QPSK	50	0	23.35	0-1	1
	2593.0	40620	10	16-QAM	1	0	23.11	0-1	1
	2593.0	40620	10	16-QAM	1	25	22.91	0-1	1
	2593.0	40620	10	16-QAM	1	49	22.92	0-1	1
	2593.0	40620	10	16-QAM	25	0	22.47	0-2	2
	2593.0	40620	10	16-QAM	25	12	22.48	0-2	2
	2593.0	40620	10	16-QAM	25	25	22.47	0-2	2
	2593.0	40620	10	16-QAM	50	0	22.50	0-2	2
	2636.5	41055	10	QPSK	1	0	24.45	0	0
	2636.5	41055	10	QPSK	1	25	24.31	0	0
	2636.5	41055	10	QPSK	1	49	24.40	0	0
	2636.5	41055	10	QPSK	25	0	23.43	0-1	1
	2636.5	41055	10	QPSK	25	12	23.34	0-1	1
	2636.5	41055	10	QPSK	25	25	23.46	0-1	1
	2636.5	41055	10	QPSK	50	0	23.50	0-1	1
Mid High	2636.5	41055	10	16-QAM	1	0	23.02	0-1	1
	2636.5	41055	10	16-QAM	1	25	23.11	0-1	1
	2636.5	41055	10	16-QAM	1	49	23.14	0-1	1
	2636.5	41055	10	16-QAM	25	0	22.15	0-2	2
	2636.5	41055	10	16-QAM	25	12	22.16	0-2	2
	2636.5	41055	10	16-QAM	25	25	22.20	0-2	2
	2636.5	41055	10	16-QAM	50	0	22.34	0-2	2
	2680.0	41490	10	QPSK	1	0	24.38	0	0
	2680.0	41490	10	QPSK	1	25	24.28	0	0
	2680.0	41490	10	QPSK	1	49	24.42	0	0
	2680.0	41490	10	QPSK	25	0	23.29	0-1	1
	2680.0	41490	10	QPSK	25	12	23.26	0-1	1
	2680.0	41490	10	QPSK	25	25	23.24	0-1	1
	2680.0	41490	10	QPSK	50	0	23.23	0-1	1
	2680.0	41490	10	16-QAM	1	0	23.11	0-1	1
High	2680.0	41490	10	16-QAM	1	25	22.84	0-1	1
	2680.0	41490	10	16-QAM	1	49	22.97	0-1	1
	2680.0	41490	10	16-QAM	25	0	22.42	0-2	2
	2680.0	41490	10	16-QAM	25	12	22.39	0-2	2
	2680.0	41490	10	16-QAM	25	25	22.37	0-2	2
	2680.0	41490	10	16-QAM	50	0	22.50	0-2	2

Table 9-39
LTE Band 41 Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	2506.0	39750	5	QPSK	1	0	24.46	0	0
	2506.0	39750	5	QPSK	1	12	24.43	0	0
	2506.0	39750	5	QPSK	1	24	24.50	0	0
	2506.0	39750	5	QPSK	12	0	23.26	0-1	1
	2506.0	39750	5	QPSK	12	6	23.25	0-1	1
	2506.0	39750	5	QPSK	12	13	23.28	0-1	1
	2506.0	39750	5	QPSK	25	0	23.26	0-1	1
	2506.0	39750	5	16-QAM	1	0	23.31	0-1	1
	2506.0	39750	5	16-QAM	1	12	23.46	0-1	1
	2506.0	39750	5	16-QAM	1	24	23.23	0-1	1
	2506.0	39750	5	16-QAM	12	0	22.21	0-2	2
	2506.0	39750	5	16-QAM	12	6	22.23	0-2	2
	2506.0	39750	5	16-QAM	12	13	22.16	0-2	2
	2506.0	39750	5	16-QAM	25	0	22.33	0-2	2
	2549.5	40185	5	QPSK	1	0	24.30	0	0
	2549.5	40185	5	QPSK	1	12	24.40	0	0
Low Mid	2549.5	40185	5	QPSK	1	24	24.43	0	0
	2549.5	40185	5	QPSK	12	0	23.44	0-1	1
	2549.5	40185	5	QPSK	12	6	23.33	0-1	1
	2549.5	40185	5	QPSK	12	13	23.29	0-1	1
	2549.5	40185	5	QPSK	25	0	23.32	0-1	1
	2549.5	40185	5	16-QAM	1	0	23.43	0-1	1
	2549.5	40185	5	16-QAM	1	12	23.49	0-1	1
	2549.5	40185	5	16-QAM	1	24	23.49	0-1	1
	2549.5	40185	5	16-QAM	12	0	22.27	0-2	2
	2549.5	40185	5	16-QAM	12	6	22.18	0-2	2
	2549.5	40185	5	16-QAM	12	13	22.22	0-2	2
	2549.5	40185	5	16-QAM	25	0	22.31	0-2	2
	2593.0	40620	5	QPSK	1	0	24.35	0	0
	2593.0	40620	5	QPSK	1	12	24.28	0	0
	2593.0	40620	5	QPSK	1	24	24.42	0	0
Mid	2593.0	40620	5	QPSK	12	0	23.38	0-1	1
	2593.0	40620	5	QPSK	12	6	23.29	0-1	1
	2593.0	40620	5	QPSK	12	13	23.34	0-1	1
	2593.0	40620	5	QPSK	25	0	23.37	0-1	1
	2593.0	40620	5	16-QAM	1	0	23.42	0-1	1
	2593.0	40620	5	16-QAM	1	12	23.50	0-1	1
	2593.0	40620	5	16-QAM	1	24	23.42	0-1	1
	2593.0	40620	5	16-QAM	12	0	22.43	0-2	2
	2593.0	40620	5	16-QAM	12	6	22.24	0-2	2
	2593.0	40620	5	16-QAM	12	13	22.20	0-2	2
	2593.0	40620	5	16-QAM	25	0	22.35	0-2	2
	2636.5	41055	5	QPSK	1	0	24.48	0	0
	2636.5	41055	5	QPSK	1	12	24.44	0	0
	2636.5	41055	5	QPSK	1	24	24.50	0	0
	2636.5	41055	5	QPSK	12	0	23.39	0-1	1
Mid High	2636.5	41055	5	QPSK	12	6	23.26	0-1	1
	2636.5	41055	5	QPSK	12	13	23.36	0-1	1
	2636.5	41055	5	QPSK	25	0	23.32	0-1	1
	2636.5	41055	5	16-QAM	1	0	23.27	0-1	1
	2636.5	41055	5	16-QAM	1	12	23.47	0-1	1
	2636.5	41055	5	16-QAM	1	24	23.28	0-1	1
	2636.5	41055	5	16-QAM	12	0	22.42	0-2	2
	2636.5	41055	5	16-QAM	12	6	22.38	0-2	2
	2636.5	41055	5	16-QAM	12	13	22.41	0-2	2
	2636.5	41055	5	16-QAM	25	0	22.32	0-2	2
	2680.0	41490	5	QPSK	1	0	24.29	0	0
	2680.0	41490	5	QPSK	1	12	24.31	0	0
	2680.0	41490	5	QPSK	1	24	24.26	0	0
	2680.0	41490	5	QPSK	12	0	23.32	0-1	1
	2680.0	41490	5	QPSK	12	6	23.25	0-1	1
	2680.0	41490	5	QPSK	12	13	23.31	0-1	1
High	2680.0	41490	5	QPSK	25	0	23.23	0-1	1
	2680.0	41490	5	16-QAM	1	0	23.28	0-1	1
	2680.0	41490	5	16-QAM	1	12	23.50	0-1	1
	2680.0	41490	5	16-QAM	1	24	23.49	0-1	1
	2680.0	41490	5	16-QAM	12	0	22.46	0-2	2
	2680.0	41490	5	16-QAM	12	6	22.48	0-2	2
	2680.0	41490	5	16-QAM	12	13	22.44	0-2	2
	2680.0	41490	5	16-QAM	25	0	22.49	0-2	2

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9.3 WLAN Conducted Powers

Table 9-40
IEEE 802.11b/g/n Average RF Power

Freq [MHz]	Channel	2.4GHz Conducted Power [dBm]		
		IEEE Transmission Mode		
		802.11b	802.11g	802.11n
2412	1	17.32	14.42	13.37
2437	6	17.48	14.23	13.40
2462	11	17.35	14.46	13.28

Justification for test configurations for WLAN per KDB Publication 248227 D01v02:

- 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.

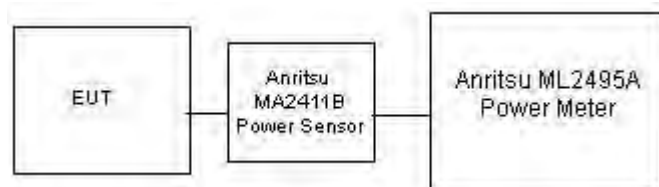


Figure 9-2
Power Measurement Setup for Bandwidths < 50 MHz

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10 SYSTEM VERIFICATION

10.1 Tissue Verification

Table 10-1
Measured Tissue Properties

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (C°)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ϵ	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ϵ	%dev σ	%dev ϵ
05/13/2015	750H	22.1	695	0.863	42.030	0.889	42.227	-2.92%	-0.47%
			710	0.878	41.840	0.890	42.149	-1.35%	-0.73%
			740	0.905	41.427	0.893	41.994	1.34%	-1.35%
			755	0.919	41.254	0.894	41.916	2.80%	-1.58%
05/11/2015	835H	22.5	820	0.905	42.074	0.899	41.578	0.67%	1.19%
			835	0.919	41.888	0.900	41.500	2.11%	0.93%
			850	0.933	41.700	0.916	41.500	1.86%	0.48%
05/13/2015	1750H	22.1	1710	1.346	38.810	1.348	40.142	-0.15%	-3.32%
			1750	1.386	38.607	1.371	40.079	1.09%	-3.67%
			1790	1.429	38.419	1.394	40.016	2.51%	-3.99%
05/11/2015	1900H	22.3	1850	1.376	39.432	1.400	40.000	-1.71%	-1.42%
			1880	1.402	39.286	1.400	40.000	0.14%	-1.79%
			1910	1.435	39.173	1.400	40.000	2.50%	-2.07%
05/12/2015	2450H	23.7	2401	1.816	38.382	1.756	39.287	3.42%	-2.30%
			2450	1.871	38.161	1.800	39.200	3.94%	-2.65%
			2499	1.931	37.967	1.853	39.138	4.21%	-2.99%
05/12/2015	2600H	23.7	2600	2.050	37.538	1.964	39.009	4.38%	-3.77%
			2650	2.108	37.330	2.018	38.945	4.46%	-4.15%
			2700	2.169	37.084	2.073	38.882	4.63%	-4.62%
05/11/2015	750B	22.2	695	0.955	56.077	0.959	55.745	-0.42%	0.60%
			710	0.956	55.898	0.960	55.687	-0.42%	0.38%
			740	0.995	55.701	0.963	55.570	3.32%	0.24%
			755	0.999	55.441	0.964	55.512	3.63%	-0.13%
05/11/2015	835B	22.5	820	0.996	54.094	0.969	55.258	2.79%	-2.11%
			835	1.009	53.954	0.970	55.200	4.02%	-2.26%
			850	1.023	53.797	0.988	55.154	3.54%	-2.46%
05/20/2015	835B	22.5	820	0.985	53.905	0.969	55.258	1.65%	-2.45%
			835	1.000	53.751	0.970	55.200	3.09%	-2.63%
			850	1.012	53.616	0.988	55.154	2.43%	-2.79%
05/26/2015	835B	21.5	820	1.001	54.114	0.969	55.258	3.30%	-2.07%
			835	1.018	53.930	0.970	55.200	4.95%	-2.30%
			850	1.027	53.721	0.988	55.154	3.95%	-2.60%
05/12/2015	1750B	22.3	1710	1.491	52.590	1.463	53.537	1.91%	-1.77%
			1750	1.534	52.455	1.488	53.432	3.09%	-1.83%
			1790	1.579	52.289	1.514	53.326	4.29%	-1.94%
05/12/2015	1900B	22.1	1850	1.482	51.904	1.520	53.300	-2.50%	-2.62%
			1880	1.516	51.783	1.520	53.300	-0.26%	-2.85%
			1910	1.553	51.684	1.520	53.300	2.17%	-3.03%
05/14/2015	1900B	23.4	1850	1.451	51.359	1.520	53.300	-4.54%	-3.64%
			1880	1.484	51.274	1.520	53.300	-2.37%	-3.80%
			1910	1.520	51.208	1.520	53.300	0.00%	-3.92%
05/14/2015	2450B	22.6	2401	1.901	51.476	1.903	52.765	-0.11%	-2.44%
			2450	1.971	51.281	1.950	52.700	1.08%	-2.69%
			2499	2.036	51.097	2.019	52.638	0.84%	-2.93%
05/14/2015	2600B	22.6	2600	2.175	50.696	2.163	52.509	0.55%	-3.45%
			2650	2.244	50.490	2.234	52.445	0.45%	-3.73%
			2700	2.314	50.290	2.305	52.382	0.39%	-3.99%

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 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.

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10.2 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 10-2
System Verification Results

System Verification 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 _{1g} (W/kg)	1 W Target SAR _{1g} (W/kg)	1 W Normalized SAR _{1g} (W/kg)	Deviation _{1g} (%)
J	750	HEAD	05/13/2015	22.9	22.1	0.100	1003	3022	0.783	8.090	7.830	-3.21%
K	835	HEAD	05/11/2015	24.1	22.5	0.100	4d133	3288	0.990	9.200	9.900	7.61%
C	1750	HEAD	05/13/2015	24.0	22.1	0.100	1051	3333	3.850	36.200	38.500	6.35%
G	1900	HEAD	05/11/2015	23.0	22.3	0.100	5d149	3318	3.820	40.200	38.200	-4.98%
E	2450	HEAD	05/12/2015	23.2	23.7	0.100	719	3332	5.340	52.100	53.400	2.50%
E	2600	HEAD	05/12/2015	23.2	23.7	0.100	1071	3332	5.850	57.500	58.500	1.74%
J	750	BODY	05/11/2015	23.1	22.2	0.100	1054	3022	0.870	8.530	8.700	1.99%
D	835	BODY	05/11/2015	24.0	22.5	0.100	4d133	3209	1.000	9.350	10.000	6.95%
D	835	BODY	05/20/2015	22.6	22.5	0.100	4d132	3209	0.997	9.140	9.970	9.08%
G	835	BODY	05/26/2015	22.1	21.5	0.100	4d133	3318	0.878	9.350	8.780	-6.10%
B	1750	BODY	05/12/2015	22.5	22.3	0.100	1051	3334	3.950	37.100	39.500	6.47%
H	1900	BODY	05/12/2015	22.8	22.1	0.100	5d141	3258	4.190	40.000	41.900	4.75%
H	1900	BODY	05/14/2015	23.2	23.4	0.100	5d141	3258	3.710	40.000	37.100	-7.25%
E	2450	BODY	05/14/2015	22.9	22.6	0.100	719	3332	5.000	51.800	50.000	-3.47%
E	2600	BODY	05/14/2015	22.9	22.6	0.100	1071	3332	5.660	56.900	56.600	-0.53%

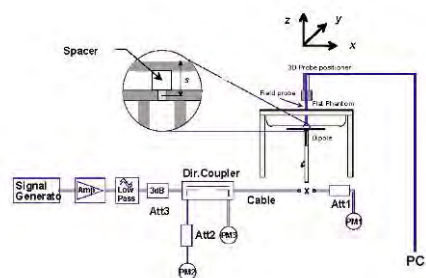


Figure 10-1
System Verification Setup Diagram



Figure 10-2
System Verification Setup Photo

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11 SAR DATA SUMMARY

11.1 Standalone Head SAR Data

Table 11-1
CDMA BC0 (\$22H) Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
836.52	384	CDMA BC0 (S22H)	RC3 / SO55	25.5	24.50	-0.02	Right	Cheek	85234	1:1	0.556	1.259	0.700	
836.52	384	CDMA BC0 (S22H)	RC3 / SO55	25.5	24.50	0.04	Right	Tilt	85234	1:1	0.267	1.259	0.336	
824.70	1013	CDMA BC0 (S22H)	RC3 / SO55	25.5	24.38	0.05	Left	Cheek	85234	1:1	0.576	1.294	0.745	
836.52	384	CDMA BC0 (S22H)	RC3 / SO55	25.5	24.50	0.00	Left	Cheek	85234	1:1	0.685	1.259	0.862	
848.31	777	CDMA BC0 (S22H)	RC3 / SO55	25.5	24.34	0.00	Left	Cheek	85234	1:1	0.699	1.306	0.913	A1
836.52	384	CDMA BC0 (S22H)	RC3 / SO55	25.5	24.50	0.04	Left	Tilt	85234	1:1	0.307	1.259	0.387	
836.52	384	CDMA BC0 (S22H)	EVDO Rev. A	23.5	22.21	0.00	Right	Cheek	85223	1:1	0.341	1.346	0.459	
836.52	384	CDMA BC0 (S22H)	EVDO Rev. A	23.5	22.21	-0.13	Right	Tilt	85223	1:1	0.193	1.346	0.260	
836.52	384	CDMA BC0 (S22H)	EVDO Rev. A	23.5	22.21	-0.06	Left	Cheek	85223	1:1	0.341	1.346	0.459	
836.52	384	CDMA BC0 (S22H)	EVDO Rev. A	23.5	22.21	0.16	Left	Tilt	85223	1:1	0.197	1.346	0.265	
836.52	384	CDMA BC0 (S22H)	EVDO Rev. A	25.5	24.51	0.07	Right	Cheek	85234	1:1	0.607	1.256	0.762	
836.52	384	CDMA BC0 (S22H)	EVDO Rev. A	25.5	24.51	0.12	Right	Tilt	85234	1:1	0.350	1.256	0.440	
824.70	1013	CDMA BC0 (S22H)	EVDO Rev. A	25.5	24.42	0.01	Left	Cheek	85234	1:1	0.634	1.282	0.813	
836.52	384	CDMA BC0 (S22H)	EVDO Rev. A	25.5	24.51	-0.06	Left	Cheek	85234	1:1	0.665	1.256	0.835	
848.31	777	CDMA BC0 (S22H)	EVDO Rev. A	25.5	24.33	0.07	Left	Cheek	85234	1:1	0.660	1.309	0.864	
836.52	384	CDMA BC0 (S22H)	EVDO Rev. A	25.5	24.51	-0.04	Left	Tilt	85234	1:1	0.389	1.256	0.489	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Head 1.6 W/kg (mW/g) averaged over 1 gram						

Table 11-2
CDMA BC10 (\$90S) Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
820.10	564	CDMA BC10 (S90S)	RC3 / SO55	25.5	24.46	0.01	Right	Cheek	85234	1:1	0.524	1.271	0.666	
820.10	564	CDMA BC10 (S90S)	RC3 / SO55	25.5	24.46	0.09	Right	Tilt	85234	1:1	0.310	1.271	0.394	
820.10	564	CDMA BC10 (S90S)	RC3 / SO55	25.5	24.46	-0.01	Left	Cheek	85234	1:1	0.542	1.271	0.689	
820.10	564	CDMA BC10 (S90S)	RC3 / SO55	25.5	24.46	0.05	Left	Tilt	85234	1:1	0.306	1.271	0.389	
820.10	564	CDMA BC10 (S90S)	EVDO Rev. A	23.5	22.13	0.10	Right	Cheek	85223	1:1	0.341	1.371	0.468	
820.10	564	CDMA BC10 (S90S)	EVDO Rev. A	23.5	22.13	0.01	Right	Tilt	85223	1:1	0.243	1.371	0.333	
820.10	564	CDMA BC10 (S90S)	EVDO Rev. A	23.5	22.13	-0.08	Left	Cheek	85223	1:1	0.338	1.371	0.463	
820.10	564	CDMA BC10 (S90S)	EVDO Rev. A	23.5	22.13	0.04	Left	Tilt	85223	1:1	0.207	1.371	0.284	
820.10	564	CDMA BC10 (S90S)	EVDO Rev. A	25.5	24.40	-0.10	Right	Cheek	85234	1:1	0.593	1.288	0.764	
820.10	564	CDMA BC10 (S90S)	EVDO Rev. A	25.5	24.40	0.13	Right	Tilt	85234	1:1	0.380	1.288	0.489	
820.10	564	CDMA BC10 (S90S)	EVDO Rev. A	25.5	24.40	0.01	Left	Cheek	85234	1:1	0.614	1.288	0.791	A2
820.10	564	CDMA BC10 (S90S)	EVDO Rev. A	25.5	24.40	-0.08	Left	Tilt	85234	1:1	0.356	1.288	0.459	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Head 1.6 W/kg (mW/g) averaged over 1 gram						

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Table 11-3
PCS CDMA Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1880.00	600	PCS CDMA	RC3 / SO55	25.5	24.17	0.04	Right	Cheek	85234	1:1	0.324	1.358	0.440	
1880.00	600	PCS CDMA	RC3 / SO55	25.5	24.17	0.09	Right	Tilt	85234	1:1	0.179	1.358	0.243	
1880.00	600	PCS CDMA	RC3 / SO55	25.5	24.17	0.00	Left	Cheek	85234	1:1	0.467	1.358	0.634	
1880.00	600	PCS CDMA	RC3 / SO55	25.5	24.17	-0.05	Left	Tilt	85234	1:1	0.105	1.358	0.143	
1880.00	600	PCS CDMA	EVDO Rev. A	22.5	21.36	0.17	Right	Cheek	85155	1:1	0.160	1.300	0.208	
1880.00	600	PCS CDMA	EVDO Rev. A	22.5	21.36	0.15	Right	Tilt	85155	1:1	0.071	1.300	0.092	
1880.00	600	PCS CDMA	EVDO Rev. A	22.5	21.36	-0.01	Left	Cheek	85155	1:1	0.271	1.300	0.352	
1880.00	600	PCS CDMA	EVDO Rev. A	22.5	21.36	0.07	Left	Tilt	85155	1:1	0.054	1.300	0.070	
1880.00	600	PCS CDMA	EVDO Rev. A	25.5	24.42	0.20	Right	Cheek	85234	1:1	0.315	1.282	0.404	
1880.00	600	PCS CDMA	EVDO Rev. A	25.5	24.42	0.15	Right	Tilt	85234	1:1	0.185	1.282	0.237	
1851.25	25	PCS CDMA	EVDO Rev. A	25.5	24.45	0.05	Left	Cheek	85234	1:1	0.754	1.274	0.961	A3
1880.00	600	PCS CDMA	EVDO Rev. A	25.5	24.42	0.02	Left	Cheek	85234	1:1	0.735	1.282	0.942	
1908.75	1175	PCS CDMA	EVDO Rev. A	25.5	24.55	-0.20	Left	Cheek	85234	1:1	0.672	1.245	0.837	
1880.00	600	PCS CDMA	EVDO Rev. A	25.5	24.42	-0.09	Left	Tilt	85234	1:1	0.126	1.282	0.162	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Head 1.6 W/kg (mW/g) averaged over 1 gram						

Table 11-4
LTE Band 12 Head SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.															(W/kg)	(W/kg)		
707.50	23095	Mid	LTE Band 12	10	23.5	23.29	0.06	0	Right	Cheek	QPSK	1	25	85168	1:1	0.277	1.050	0.291	
707.50	23095	Mid	LTE Band 12	10	22.5	21.90	-0.04	1	Right	Cheek	QPSK	25	0	85168	1:1	0.205	1.148	0.235	
707.50	23095	Mid	LTE Band 12	10	23.5	23.29	-0.17	0	Right	Tilt	QPSK	1	25	85168	1:1	0.152	1.050	0.160	
707.50	23095	Mid	LTE Band 12	10	22.5	21.90	0.05	1	Right	Tilt	QPSK	25	0	85168	1:1	0.130	1.148	0.149	
707.50	23095	Mid	LTE Band 12	10	23.5	23.29	-0.19	0	Left	Cheek	QPSK	1	25	85168	1:1	0.304	1.050	0.319	A4
707.50	23095	Mid	LTE Band 12	10	22.5	21.90	0.00	1	Left	Cheek	QPSK	25	0	85168	1:1	0.226	1.148	0.259	
707.50	23095	Mid	LTE Band 12	10	23.5	23.29	0.05	0	Left	Tilt	QPSK	1	25	85168	1:1	0.168	1.050	0.176	
707.50	23095	Mid	LTE Band 12	10	22.5	21.90	0.14	1	Left	Tilt	QPSK	25	0	85168	1:1	0.127	1.148	0.146	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

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Table 11-5
LTE Band 26 Head SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.	(W/kg)														(W/kg)			
836.50	26915	Mid	LTE Band 26	15	23.5	23.48	0.21	0	Right	Cheek	QPSK	1	36	85227	1:1	0.328	1.005	0.330	
836.50	26915	Mid	LTE Band 26	15	22.5	22.39	0.10	1	Right	Cheek	QPSK	36	0	85227	1:1	0.269	1.026	0.276	
836.50	26915	Mid	LTE Band 26	15	23.5	23.48	0.07	0	Right	Tilt	QPSK	1	36	85227	1:1	0.201	1.005	0.202	
836.50	26915	Mid	LTE Band 26	15	22.5	22.39	0.12	1	Right	Tilt	QPSK	36	0	85227	1:1	0.158	1.026	0.162	
836.50	26915	Mid	LTE Band 26	15	23.5	23.48	-0.10	0	Left	Cheek	QPSK	1	36	85227	1:1	0.386	1.005	0.388	A5
836.50	26915	Mid	LTE Band 26	15	22.5	22.39	0.04	1	Left	Cheek	QPSK	36	0	85227	1:1	0.297	1.026	0.305	
836.50	26915	Mid	LTE Band 26	15	23.5	23.48	-0.13	0	Left	Tilt	QPSK	1	36	85227	1:1	0.240	1.005	0.241	
836.50	26915	Mid	LTE Band 26	15	22.5	22.39	0.13	1	Left	Tilt	QPSK	36	0	85227	1:1	0.187	1.026	0.192	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Head 1.6 W/kg (mW/g) averaged over 1 gram									

Table 11-6
LTE Band 4 (AWS) Head SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.5	23.50	0.05	0	Right	Cheek	QPSK	1	50	85227	1:1	0.278	1.000	0.278	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	22.29	0.00	1	Right	Cheek	QPSK	50	0	85227	1:1	0.239	1.050	0.251	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.5	23.50	-0.02	0	Right	Tilt	QPSK	1	50	85227	1:1	0.217	1.000	0.217	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	22.29	0.09	1	Right	Tilt	QPSK	50	0	85227	1:1	0.189	1.050	0.198	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.5	23.50	-0.01	0	Left	Cheek	QPSK	1	50	85227	1:1	0.458	1.000	0.458	A6
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	22.29	-0.08	1	Left	Cheek	QPSK	50	0	85227	1:1	0.386	1.050	0.405	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.5	23.50	0.06	0	Left	Tilt	QPSK	1	50	85227	1:1	0.203	1.000	0.203	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	22.29	-0.08	1	Left	Tilt	QPSK	50	0	85227	1:1	0.166	1.050	0.174	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.5	20.32	0.00	0	Right	Cheek	QPSK	1	0	85240	1:1	0.148	1.042	0.154	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.5	20.15	-0.05	0	Right	Cheek	QPSK	50	0	85240	1:1	0.137	1.084	0.149	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.5	20.32	-0.03	0	Right	Tilt	QPSK	1	0	85240	1:1	0.130	1.042	0.135	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.5	20.15	0.04	0	Right	Tilt	QPSK	50	0	85240	1:1	0.122	1.084	0.132	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.5	20.32	-0.01	0	Left	Cheek	QPSK	1	0	85240	1:1	0.279	1.042	0.291	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.5	20.15	-0.07	0	Left	Cheek	QPSK	50	0	85240	1:1	0.261	1.084	0.283	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.5	20.32	0.08	0	Left	Tilt	QPSK	1	0	85240	1:1	0.108	1.042	0.113	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.5	20.15	0.01	0	Left	Tilt	QPSK	50	0	85240	1:1	0.112	1.084	0.121	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

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Table 11-7
LTE Band 25 (PCS) Head SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR(1g)	Scaling Factor	Scaled SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.5	23.43	0.13	0	Right	Cheek	QPSK	1	50	85168	1:1	0.219	1.016	0.223	
1860.00	26140	Low	LTE Band 25 (PCS)	20	22.5	22.18	0.06	1	Right	Cheek	QPSK	50	0	85168	1:1	0.171	1.076	0.184	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.5	23.43	0.01	0	Right	Tilt	QPSK	1	50	85168	1:1	0.106	1.016	0.108	
1860.00	26140	Low	LTE Band 25 (PCS)	20	22.5	22.18	-0.02	1	Right	Tilt	QPSK	50	0	85168	1:1	0.079	1.076	0.085	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.5	23.43	-0.06	0	Left	Cheek	QPSK	1	50	85168	1:1	0.404	1.016	0.410	A7
1860.00	26140	Low	LTE Band 25 (PCS)	20	22.5	22.18	-0.01	1	Left	Cheek	QPSK	50	0	85168	1:1	0.309	1.076	0.332	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.5	23.43	0.07	0	Left	Tilt	QPSK	1	50	85168	1:1	0.121	1.016	0.123	
1860.00	26140	Low	LTE Band 25 (PCS)	20	22.5	22.18	0.19	1	Left	Tilt	QPSK	50	0	85168	1:1	0.066	1.076	0.071	
1905.00	26590	High	LTE Band 25 (PCS)	20	20.5	20.50	-0.11	0	Right	Cheek	QPSK	1	0	85320	1:1	0.165	1.000	0.165	
1905.00	26590	High	LTE Band 25 (PCS)	20	20.5	20.46	-0.07	0	Right	Cheek	QPSK	50	0	85320	1:1	0.136	1.009	0.137	
1905.00	26590	High	LTE Band 25 (PCS)	20	20.5	20.50	-0.14	0	Right	Tilt	QPSK	1	0	85320	1:1	0.073	1.000	0.073	
1905.00	26590	High	LTE Band 25 (PCS)	20	20.5	20.46	-0.12	0	Right	Tilt	QPSK	50	0	85320	1:1	0.067	1.009	0.068	
1905.00	26590	High	LTE Band 25 (PCS)	20	20.5	20.50	0.03	0	Left	Cheek	QPSK	1	0	85320	1:1	0.258	1.000	0.258	
1905.00	26590	High	LTE Band 25 (PCS)	20	20.5	20.46	-0.01	0	Left	Cheek	QPSK	50	0	85320	1:1	0.212	1.009	0.214	
1905.00	26590	High	LTE Band 25 (PCS)	20	20.5	20.50	0.09	0	Left	Tilt	QPSK	1	0	85320	1:1	0.066	1.000	0.066	
1905.00	26590	High	LTE Band 25 (PCS)	20	20.5	20.46	-0.11	0	Left	Tilt	QPSK	50	0	85320	1:1	0.060	1.009	0.061	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-8
LTE Band 41 Head SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
																(W/kg)		(W/kg)	
2636.50	41055	Mid-High	LTE Band 41	20	24.5	24.19	-0.14	0	Right	Cheek	QPSK	1	0	85244	1:1.58	0.352	1.074	0.378	A8
2636.50	41055	Mid-High	LTE Band 41	20	23.5	23.39	-0.11	1	Right	Cheek	QPSK	50	0	85244	1:1.58	0.313	1.026	0.321	
2636.50	41055	Mid-High	LTE Band 41	20	24.5	24.19	-0.06	0	Right	Tilt	QPSK	1	0	85244	1:1.58	0.117	1.074	0.126	
2636.50	41055	Mid-High	LTE Band 41	20	23.5	23.39	-0.05	1	Right	Tilt	QPSK	50	0	85244	1:1.58	0.101	1.026	0.104	
2636.50	41055	Mid-High	LTE Band 41	20	24.5	24.19	0.18	0	Left	Cheek	QPSK	1	0	85244	1:1.58	0.162	1.074	0.174	
2636.50	41055	Mid-High	LTE Band 41	20	23.5	23.39	0.09	1	Left	Cheek	QPSK	50	0	85244	1:1.58	0.129	1.026	0.132	
2636.50	41055	Mid-High	LTE Band 41	20	24.5	24.19	0.04	0	Left	Tilt	QPSK	1	0	85244	1:1.58	0.162	1.074	0.174	
2636.50	41055	Mid-High	LTE Band 41	20	23.5	23.39	0.12	1	Left	Tilt	QPSK	50	0	85244	1:1.58	0.138	1.026	0.142	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT										Head									
Spatial Peak										1.6 W/kg (mW/g)									
Uncontrolled Exposure/General Population										averaged over 1 gram									

Table 11-9
DTS Head SAR

MEASUREMENT RESULTS																		
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Data Rate (Mbps)	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Scaled SAR (1g)	Plot #
MHz	Ch.												W/kg	(W/kg)			(W/kg)	
2437	6	802.11b	DSSS	22	17.5	17.48	-0.02	Right	Cheek	85226	1	99.7	0.419	0.347	1.005	1.003	0.350	A9
2437	6	802.11b	DSSS	22	17.5	17.48	-	Right	Tilt	85226	1	99.7	0.197	-	1.005	1.003	-	
2437	6	802.11b	DSSS	22	17.5	17.48	0.02	Left	Cheek	85226	1	99.7	0.135	0.109	1.005	1.003	0.110	
2437	6	802.11b	DSSS	22	17.5	17.48	-	Left	Tilt	85226	1	99.7	0.117	-	1.005	1.003	-	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram									

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11.2 Standalone Body-Worn SAR Data

Table 11-10
CDMA Body-Worn 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	Scaled SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
824.70	1013	CDMA BC0 (\$22H)	TDSO / SO32	25.5	24.67	-0.01	15 mm	85234	1:1	back	0.844	1.211	1.022	
836.52	384	CDMA BC0 (\$22H)	TDSO / SO32	25.5	25.09	0.04	15 mm	85234	1:1	back	0.995	1.099	1.094	
848.31	777	CDMA BC0 (\$22H)	TDSO / SO32	25.5	24.98	0.00	15 mm	85234	1:1	back	0.968	1.127	1.091	
836.52	384	CDMA BC0 (\$22H)	TDSO / SO32	25.5	25.09	-0.03	15 mm	85234	1:1	back	1.000	1.099	1.099	A10
820.10	564	CDMA BC10 (\$90S)	TDSO / SO32	25.5	24.81	0.01	15 mm	85234	1:1	back	0.934	1.172	1.095	A12
1851.25	25	PCS CDMA	TDSO / SO32	25.5	24.47	0.06	15 mm	85320	1:1	back	0.634	1.268	0.804	
1880.00	600	PCS CDMA	TDSO / SO32	25.5	24.44	-0.08	15 mm	85320	1:1	back	0.696	1.276	0.888	
1908.75	1175	PCS CDMA	TDSO / SO32	25.5	24.62	-0.06	15 mm	85320	1:1	back	0.717	1.225	0.878	A14
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram							

Blue entry represents variability measurement.

Table 11-11
LTE Body-Worn 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	Scaled SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
707.50	23095	Mid	LTE Band 12	10	23.5	23.29	0.18	0	85168	QPSK	1	25	15 mm	back	1:1	0.430	1.050	0.452	A16
707.50	23095	Mid	LTE Band 12	10	22.5	21.90	-0.03	1	85168	QPSK	25	0	15 mm	back	1:1	0.307	1.148	0.352	
836.50	26915	Mid	LTE Band 26	15	23.5	23.48	-0.03	0	85168	QPSK	1	36	15 mm	back	1:1	0.699	1.005	0.702	A18
836.50	26915	Mid	LTE Band 26	15	22.5	22.39	0.08	1	85168	QPSK	36	0	15 mm	back	1:1	0.506	1.026	0.519	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.5	23.50	-0.01	0	85168	QPSK	1	50	15 mm	back	1:1	0.334	1.000	0.334	A20
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	22.29	0.02	1	85168	QPSK	50	0	15 mm	back	1:1	0.272	1.050	0.286	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.5	23.43	0.07	0	85168	QPSK	1	50	15 mm	back	1:1	0.529	1.016	0.537	A22
1860.00	26140	Low	LTE Band 25 (PCS)	20	22.5	22.18	-0.02	1	85168	QPSK	50	0	15 mm	back	1:1	0.398	1.076	0.428	
2636.50	41055	Mid-High	LTE Band 41	20	24.5	24.19	-0.16	0	85244	QPSK	1	0	15 mm	back	1:1.58	0.246	1.074	0.264	A24
2636.50	41055	Mid-High	LTE Band 41	20	23.5	23.39	0.07	1	85244	QPSK	50	0	15 mm	back	1:1.58	0.208	1.026	0.213	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT										Body									
Spatial Peak										1.6 W/kg (mW/g)									
Uncontrolled Exposure/General Population										averaged over 1 gram									

Table 11-12
DTS Body-Worn 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 (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Scaled SAR (1g)	Plot #
MHz	Ch.												W/kg	(W/kg)			(W/kg)	
2437	6	802.11b	DSSS	22	17.5	17.48	0.05	15 mm	85244	1	back	99.7	0.208	0.177	1.005	1.003	0.179	A26
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Body 1.6 W/kg (mW/g) averaged over 1 gram									

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11.3 Standalone Wireless Router SAR Data

Table 11-13
CDMA Hotspot 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	Scaled SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
824.70	1013	CDMA BC0 (\$22H)	EVDO Rev. 0	23.5	22.16	0.00	10 mm	85233	1:1	back	0.711	1.361	0.968	
836.52	384	CDMA BC0 (\$22H)	EVDO Rev. 0	23.5	22.22	0.07	10 mm	85233	1:1	back	0.763	1.343	1.025	A11
848.31	777	CDMA BC0 (\$22H)	EVDO Rev. 0	23.5	22.08	0.08	10 mm	85233	1:1	back	0.721	1.387	1.000	
836.52	384	CDMA BC0 (\$22H)	EVDO Rev. 0	23.5	22.22	0.04	10 mm	85233	1:1	front	0.516	1.343	0.693	
836.52	384	CDMA BC0 (\$22H)	EVDO Rev. 0	23.5	22.22	0.01	10 mm	85233	1:1	bottom	0.077	1.343	0.103	
836.52	384	CDMA BC0 (\$22H)	EVDO Rev. 0	23.5	22.22	0.00	10 mm	85233	1:1	right	0.271	1.343	0.364	
836.52	384	CDMA BC0 (\$22H)	EVDO Rev. 0	23.5	22.22	0.03	10 mm	85233	1:1	left	0.354	1.343	0.475	
820.10	564	CDMA BC10 (\$90S)	EVDO Rev. 0	23.5	22.14	0.03	10 mm	85233	1:1	back	0.691	1.368	0.945	A13
820.10	564	CDMA BC10 (\$90S)	EVDO Rev. 0	23.5	22.14	0.06	10 mm	85233	1:1	front	0.464	1.368	0.635	
820.10	564	CDMA BC10 (\$90S)	EVDO Rev. 0	23.5	22.14	-0.03	10 mm	85233	1:1	bottom	0.070	1.368	0.096	
820.10	564	CDMA BC10 (\$90S)	EVDO Rev. 0	23.5	22.14	0.00	10 mm	85233	1:1	right	0.265	1.368	0.363	
820.10	564	CDMA BC10 (\$90S)	EVDO Rev. 0	23.5	22.14	0.07	10 mm	85233	1:1	left	0.345	1.368	0.472	
1880.00	600	PCS CDMA	EVDO Rev. 0	22.5	21.40	0.01	10 mm	85155	1:1	back	0.586	1.288	0.755	A15
1880.00	600	PCS CDMA	EVDO Rev. 0	22.5	21.40	-0.05	10 mm	85155	1:1	front	0.538	1.288	0.693	
1880.00	600	PCS CDMA	EVDO Rev. 0	22.5	21.40	-0.05	10 mm	85155	1:1	bottom	0.548	1.288	0.706	
1880.00	600	PCS CDMA	EVDO Rev. 0	22.5	21.40	0.14	10 mm	85155	1:1	right	0.049	1.288	0.063	
1880.00	600	PCS CDMA	EVDO Rev. 0	22.5	21.40	0.00	10 mm	85155	1:1	left	0.218	1.288	0.281	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-14
LTE Band 12 Hotspot 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	Scaled SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
707.50	23095	Mid	LTE Band 12	10	23.5	23.29	0.05	0	85168	QPSK	1	25	10 mm	back	1:1	0.561	1.050	0.589	A17
707.50	23095	Mid	LTE Band 12	10	22.5	21.90	-0.01	1	85168	QPSK	25	0	10 mm	back	1:1	0.407	1.148	0.467	
707.50	23095	Mid	LTE Band 12	10	23.5	23.29	0.10	0	85168	QPSK	1	25	10 mm	front	1:1	0.409	1.050	0.429	
707.50	23095	Mid	LTE Band 12	10	22.5	21.90	-0.01	1	85168	QPSK	25	0	10 mm	front	1:1	0.291	1.148	0.334	
707.50	23095	Mid	LTE Band 12	10	23.5	23.29	0.03	0	85168	QPSK	1	25	10 mm	bottom	1:1	0.049	1.050	0.051	
707.50	23095	Mid	LTE Band 12	10	22.5	21.90	-0.10	1	85168	QPSK	25	0	10 mm	bottom	1:1	0.035	1.148	0.040	
707.50	23095	Mid	LTE Band 12	10	23.5	23.29	0.08	0	85168	QPSK	1	25	10 mm	right	1:1	0.273	1.050	0.287	
707.50	23095	Mid	LTE Band 12	10	22.5	21.90	-0.02	1	85168	QPSK	25	0	10 mm	right	1:1	0.199	1.148	0.228	
707.50	23095	Mid	LTE Band 12	10	23.5	23.29	0.16	0	85168	QPSK	1	25	10 mm	left	1:1	0.368	1.050	0.386	
707.50	23095	Mid	LTE Band 12	10	22.5	21.90	-0.03	1	85168	QPSK	25	0	10 mm	left	1:1	0.263	1.148	0.302	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram											

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Table 11-15
LTE Band 26 Hotspot 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	Scaled SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
836.50	26915	Mid	LTE Band 26	15	23.5	23.48	-0.03	0	85168	QPSK	1	36	10 mm	back	1:1	0.789	1.005	0.793	A19
836.50	26915	Mid	LTE Band 26	15	22.5	22.39	-0.08	1	85168	QPSK	36	0	10 mm	back	1:1	0.564	1.026	0.579	
836.50	26915	Mid	LTE Band 26	15	23.5	23.48	0.01	0	85168	QPSK	1	36	10 mm	front	1:1	0.578	1.005	0.581	
836.50	26915	Mid	LTE Band 26	15	22.5	22.39	-0.06	1	85168	QPSK	36	0	10 mm	front	1:1	0.413	1.026	0.424	
836.50	26915	Mid	LTE Band 26	15	23.5	23.48	0.04	0	85168	QPSK	1	36	10 mm	bottom	1:1	0.079	1.005	0.079	
836.50	26915	Mid	LTE Band 26	15	22.5	22.39	-0.03	1	85168	QPSK	36	0	10 mm	bottom	1:1	0.056	1.026	0.057	
836.50	26915	Mid	LTE Band 26	15	23.5	23.48	0.02	0	85168	QPSK	1	36	10 mm	right	1:1	0.441	1.005	0.443	
836.50	26915	Mid	LTE Band 26	15	22.5	22.39	-0.06	1	85168	QPSK	36	0	10 mm	right	1:1	0.345	1.026	0.354	
836.50	26915	Mid	LTE Band 26	15	23.5	23.48	0.14	0	85168	QPSK	1	36	10 mm	left	1:1	0.630	1.005	0.633	
836.50	26915	Mid	LTE Band 26	15	22.5	22.39	0.03	1	85168	QPSK	36	0	10 mm	left	1:1	0.483	1.026	0.496	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Body											
Spatial Peak								1.6 W/kg (mW/g)											
Uncontrolled Exposure/General Population								averaged over 1 gram											

Table 11-16
LTE Band 4 (AWS) Hotspot 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	Scaled SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.5	20.32	-0.01	0	85240	QPSK	1	0	10 mm	back	1:1	0.384	1.042	0.400	A21
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.5	20.15	0.03	0	85240	QPSK	50	0	10 mm	back	1:1	0.359	1.084	0.389	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.5	20.32	-0.01	0	85240	QPSK	1	0	10 mm	front	1:1	0.418	1.042	0.436	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.5	20.15	0.00	0	85240	QPSK	50	0	10 mm	front	1:1	0.404	1.084	0.438	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.5	20.32	-0.01	0	85240	QPSK	1	0	10 mm	bottom	1:1	0.193	1.042	0.201	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.5	20.15	-0.01	0	85240	QPSK	50	0	10 mm	bottom	1:1	0.181	1.084	0.196	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.5	20.32	0.08	0	85240	QPSK	1	0	10 mm	right	1:1	0.037	1.042	0.039	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.5	20.15	-0.02	0	85240	QPSK	50	0	10 mm	right	1:1	0.034	1.084	0.037	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.5	20.32	0.20	0	85240	QPSK	1	0	10 mm	left	1:1	0.280	1.042	0.292	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.5	20.15	0.02	0	85240	QPSK	50	0	10 mm	left	1:1	0.274	1.084	0.297	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak								Body 1.6 W/kg (mW/g) averaged over 1 gram											
Uncontrolled Exposure/General Population																			

Table 11-17
LTE Band 25 (PCS) Hotspot 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	Scaled SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
1905.00	26590	High	LTE Band 25 (PCS)	20	20.5	20.50	0.03	0	85320	QPSK	1	0	10 mm	back	1:1	0.511	1.000	0.511	A23
1905.00	26590	High	LTE Band 25 (PCS)	20	20.5	20.46	-0.01	0	85320	QPSK	50	0	10 mm	back	1:1	0.489	1.009	0.493	
1905.00	26590	High	LTE Band 25 (PCS)	20	20.5	20.50	-0.08	0	85320	QPSK	1	0	10 mm	front	1:1	0.527	1.000	0.527	
1905.00	26590	High	LTE Band 25 (PCS)	20	20.5	20.46	0.04	0	85320	QPSK	50	0	10 mm	front	1:1	0.490	1.009	0.494	
1905.00	26590	High	LTE Band 25 (PCS)	20	20.5	20.50	-0.16	0	85320	QPSK	1	0	10 mm	bottom	1:1	0.434	1.000	0.434	
1905.00	26590	High	LTE Band 25 (PCS)	20	20.5	20.46	-0.02	0	85320	QPSK	50	0	10 mm	bottom	1:1	0.421	1.009	0.425	
1905.00	26590	High	LTE Band 25 (PCS)	20	20.5	20.50	0.19	0	85320	QPSK	1	0	10 mm	right	1:1	0.047	1.000	0.047	
1905.00	26590	High	LTE Band 25 (PCS)	20	20.5	20.46	0.10	0	85320	QPSK	50	0	10 mm	right	1:1	0.043	1.009	0.043	
1905.00	26590	High	LTE Band 25 (PCS)	20	20.5	20.50	-0.20	0	85320	QPSK	1	0	10 mm	left	1:1	0.220	1.000	0.220	
1905.00	26590	High	LTE Band 25 (PCS)	20	20.5	20.46	0.04	0	85320	QPSK	50	0	10 mm	left	1:1	0.204	1.009	0.206	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak								Body 1.6 W/kg (mW/g)											
Uncontrolled Exposure/General Population								averaged over 1 gram											

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Table 11-18
LTE Band 41 Hotspot 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	Scaled SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
2636.50	41055	Mid-High	LTE Band 41	20	24.5	24.19	0.16	0	85244	QPSK	1	0	10 mm	back	1:1.58	0.548	1.074	0.589	A25
2636.50	41055	Mid-High	LTE Band 41	20	23.5	23.39	0.19	1	85244	QPSK	50	0	10 mm	back	1:1.58	0.421	1.026	0.432	
2636.50	41055	Mid-High	LTE Band 41	20	24.5	24.19	0.01	0	85244	QPSK	1	0	10 mm	front	1:1.58	0.548	1.074	0.589	
2636.50	41055	Mid-High	LTE Band 41	20	23.5	23.39	0.06	1	85244	QPSK	50	0	10 mm	front	1:1.58	0.464	1.026	0.476	
2636.50	41055	Mid-High	LTE Band 41	20	24.5	24.19	-0.03	0	85244	QPSK	1	0	10 mm	bottom	1:1.58	0.391	1.074	0.420	
2636.50	41055	Mid-High	LTE Band 41	20	23.5	23.39	0.02	1	85244	QPSK	50	0	10 mm	bottom	1:1.58	0.340	1.026	0.349	
2636.50	41055	Mid-High	LTE Band 41	20	24.5	24.19	0.08	0	85244	QPSK	1	0	10 mm	right	1:1.58	0.360	1.074	0.387	
2636.50	41055	Mid-High	LTE Band 41	20	23.5	23.39	0.00	1	85244	QPSK	50	0	10 mm	right	1:1.58	0.298	1.026	0.306	
2636.50	41055	Mid-High	LTE Band 41	20	24.5	24.19	0.18	0	85244	QPSK	1	0	10 mm	left	1:1.58	0.040	1.074	0.043	
2636.50	41055	Mid-High	LTE Band 41	20	23.5	23.39	-0.02	1	85244	QPSK	50	0	10 mm	left	1:1.58	0.031	1.026	0.032	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Body											
Spatial Peak								1.6 W/kg (mW/g)											
Uncontrolled Exposure/General Population								averaged over 1 gram											

Table 11-19
WLAN Hotspot 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 (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Scaled SAR (1g)	Plot #
MHz	Ch.												W/kg	(W/kg)			(W/kg)	
2437	6	802.11b	DSSS	22	17.5	17.48	0.03	10 mm	85244	1	back	99.7	0.400	0.407	1.005	1.003	0.410	A27
2437	6	802.11b	DSSS	22	17.5	17.48	-	10 mm	85244	1	front	99.7	0.141	-	1.005	1.003	-	
2437	6	802.11b	DSSS	22	17.5	17.48	-	10 mm	85244	1	top	99.7	0.077	-	1.005	1.003	-	
2437	6	802.11b	DSSS	22	17.5	17.48	0.01	10 mm	85244	1	left	99.7	0.365	0.264	1.005	1.003	0.266	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Body 1.6 W/kg (mW/g) averaged over 1 gram										
Spatial Peak																		
Uncontrolled Exposure/General Population																		

11.4 SAR Test Notes

General Notes:

- The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2003, and FCC KDB Publication 447498 D01v05.
- 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 D01v05.
- Device was tested using a fixed spacing for body-worn accessory testing. A separation distance of 15 mm was considered because the manufacturer has determined that there will be body-worn accessories available in the marketplace for users to support this separation distance.
- Per FCC KDB Publication 648474 D04v01, body-worn SAR was evaluated without a headset connected to the device. Since the standalone reported body-worn SAR was ≤ 1.2 W/kg, no additional body-worn SAR evaluations using a headset cable were required.
- Per FCC KDB 865664 D01 v01, variability SAR tests were performed when the measured SAR results for a frequency band were greater than 0.8 W/kg. Repeated SAR measurements are highlighted in the tables above for clarity. Please see Section 13 for variability analysis.
- During SAR Testing for the Wireless Router conditions per FCC KDB Publication 941225 D06v02, the actual Portable Hotspot operation (with actual simultaneous transmission of a transmitter with WIFI) was not activated (See Section 6.6 for more details).
- This device utilizes power reduction for CDMA/EVDO BC0/1/10 and LTE Band 2, 4 and 25, under portable Hotspot for SAR compliance. Therefore, these wireless router configurations were tested at reduced output power levels.

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CDMA Notes:

1. Head SAR for CDMA2000 mode was tested under RC3/SO55 per FCC KDB Publication 941225 D01v03.
2. Body-Worn SAR was tested with 1x RTT with TDSO / SO32 FCH Only. EVDO and TDSO / SO32 FCH+SCH SAR body-worn tests were not required per the 3G SAR Test Reduction procedures in FCC KDB Publication 941225 D01v03.
3. CDMA Wireless Router SAR is measured using Subtype 0/1 Physical Layer configurations for Rev. 0 according to KDB 941225 D01v03 procedures for data devices. Wireless Router SAR was not required for EVDO Rev.A or 1x RTT per the 3G SAR Test Reduction procedures in FCC KDB Publication 941225 D01v03.
4. Head SAR was additionally evaluated using EVDO Rev. A to determine compliance for VoIP operations.
5. Per FCC KDB Publication 447498 D01v05, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 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 D05v02r03. The general test procedures used for testing can be found in Section 8.5.4.
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 FCC KDB Publication 447498 D01v05r01, when the reported (scaled) for LTE Band 41 SAR measured at the highest output power channel in a given a test configuration was > 0.6 W/kg, testing at the other channels was required for such test configurations.
5. TDD LTE was tested per FCC KDB 941225 D05v02r03 and using the guidance provided in April 2013 TCB workshop notes. Testing was performed using UL-DL configuration 0 with 6 UL subframes and 2 S subframes using extended cyclic prefix only and special subframe configuration 6. SAR tests were performed at maximum output power and worst-case transmission duty factor in extended cyclic prefix. Per 3GPP 36.211 Section 4, the duty factor for special subframe configuration 6 using extended cyclic prefix is 0.633.

WLAN Notes:

1. For held-to-ear and hotspot operations, the initial test position procedures were applied. The test position with the highest extrapolated peak SAR will be used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg, no additional testing for the remaining test positions was required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.
2. Justification for test configurations for WLAN per KDB Publication 248227 D01v02 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 8.6.2 for more information.
3. When the maximum reported 1g averaged SAR is ≤ 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 ≤ 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. WIFI transmission was verified using an uncalibrated spectrum analyzer.

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12 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

12.1 Introduction

The following procedures adopted from FCC KDB Publication 447498 D01v05r02 are applicable to devices with built-in unlicensed transmitters such as 802.11 and Bluetooth devices which may simultaneously transmit with the licensed transmitter.

12.2 Simultaneous Transmission Procedures

This device contains transmitters that may operate simultaneously. Therefore simultaneous transmission analysis is required. Per FCC KDB 447498 D01v05 IV.C.1.iii 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 physical test configuration is ≤ 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.

When standalone SAR is not required to be measured, per FCC KDB 447498 D01v05 4.3.2 2), the following equation must be used to estimate the standalone 1g SAR for simultaneous transmission assessment involving that transmitter.

$$\text{Estimated SAR} = \frac{\sqrt{f(\text{GHz})}}{7.5} * \frac{(\text{Max Power of channel, mW})}{\text{Min. Separation Distance, mm}}$$

Table 12-1
Estimated SAR

Mode	Frequency	Maximum Allowed Power	Separation Distance (Body)	Estimated SAR (Body)
	[MHz]	[dBm]	[mm]	[W/kg]
Bluetooth	2480	13.00	15	0.280

Note: Held-to ear configurations are not applicable to Bluetooth operations and therefore were not considered for simultaneous transmission. Per KDB Publication 447498 D01v05, the maximum power of the channel was rounded to the nearest mW before calculation.

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12.3 Head SAR Simultaneous Transmission Analysis

Table 12-2
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Held to Ear)

Simult Tx	Configuration	CDMA BC0 (\$22H) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	EVDO BC0 (\$22H) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.700	0.350	1.050	Head SAR	Right Cheek	0.459	0.350	0.809
	Right Tilt	0.336	0.350*	0.686		Right Tilt	0.260	0.350*	0.610
	Left Cheek	0.913	0.110	1.023		Left Cheek	0.459	0.110	0.569
	Left Tilt	0.387	0.350*	0.737		Left Tilt	0.265	0.350*	0.615
Simult Tx	Configuration	CDMA BC10 (\$90S) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	EVDO BC10 (\$90S) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.666	0.350	1.016	Head SAR	Right Cheek	0.468	0.350	0.818
	Right Tilt	0.394	0.350*	0.744		Right Tilt	0.333	0.350*	0.683
	Left Cheek	0.689	0.110	0.799		Left Cheek	0.463	0.110	0.573
	Left Tilt	0.389	0.350*	0.739		Left Tilt	0.284	0.350*	0.634
Simult Tx	Configuration	PCS CDMA SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	PCS EVDO SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.440	0.350	0.790	Head SAR	Right Cheek	0.208	0.350	0.558
	Right Tilt	0.243	0.350*	0.593		Right Tilt	0.092	0.350*	0.442
	Left Cheek	0.634	0.110	0.744		Left Cheek	0.352	0.110	0.462
	Left Tilt	0.143	0.350*	0.493		Left Tilt	0.070	0.350*	0.420
Simult Tx	Configuration	LTE Band 12 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 26 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.291	0.350	0.641	Head SAR	Right Cheek	0.330	0.350	0.680
	Right Tilt	0.160	0.350*	0.510		Right Tilt	0.202	0.350*	0.552
	Left Cheek	0.319	0.110	0.429		Left Cheek	0.388	0.110	0.498
	Left Tilt	0.176	0.350*	0.526		Left Tilt	0.241	0.350*	0.591
Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 25 (PCS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.154	0.350	0.504	Head SAR	Right Cheek	0.165	0.350	0.515
	Right Tilt	0.135	0.350*	0.485		Right Tilt	0.073	0.350*	0.423
	Left Cheek	0.291	0.110	0.401		Left Cheek	0.258	0.110	0.368
	Left Tilt	0.121	0.350*	0.471		Left Tilt	0.066	0.350*	0.416
Simult Tx	Configuration	LTE Band 41 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)					
Head SAR	Right Cheek	0.378	0.350	0.728					
	Right Tilt	0.126	0.350*	0.476					
	Left Cheek	0.174	0.110	0.284					
	Left Tilt	0.174	0.350*	0.524					

(*) Note: When positions were not required for SAR evaluation per the Initial Test Position procedures in FCC KDB Publication 248227 D01v02, the most conservative value for the mode and exposure condition was used to determine simultaneous SAR test exclusion.

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12.4 Body-Worn Simultaneous Transmission Analysis

Table 12-3
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body-Worn at 1.5 cm)

Exposure Condition	Mode	CDMA/LTE SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body-Worn	CDMA BC0 (\$22H)	1.099	0.179	1.278
	CDMA BC10 (\$90S)	1.095	0.179	1.274
	PCS CDMA	0.888	0.179	1.067
	LTE Band 12	0.452	0.179	0.631
	LTE Band 26	0.702	0.179	0.881
	LTE Band 4 (AWS)	< 0.334	0.179	< 0.513
	LTE Band 25 (PCS)	< 0.537	0.179	< 0.716
	LTE Band 41	0.264	0.179	0.443

Note: For SAR summation for body-worn back side at 15mm with 2.4 GHz WLAN, LTE Band 4 and Band 25 values at maximum output power level were used since the SAR values at maximum power level were more conservative than SAR values at reduced power level. "<" denotes that the LTE Band 4/25 SAR values at maximum output power level were used for summation purposes.

Table 12-4
Simultaneous Transmission Scenario with Bluetooth (Body-Worn at 1.5 cm)

Exposure Condition	Mode	CDMA/LTE SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body-Worn	CDMA BC0 (\$22H)	1.099	0.280	1.379
	CDMA BC10 (\$90S)	1.095	0.280	1.375
	PCS CDMA	0.888	0.280	1.168
	LTE Band 12	0.452	0.280	0.732
	LTE Band 26	0.702	0.280	0.982
	LTE Band 4 (AWS)	0.334	0.280	0.614
	LTE Band 25 (PCS)	0.537	0.280	0.817
	LTE Band 41	0.264	0.280	0.544

Note: Bluetooth SAR was not required to be measured per FCC KDB 447498. Estimated SAR results were used in the above table to determine simultaneous transmission SAR test exclusion.

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12.5 Hotspot SAR Simultaneous Transmission Analysis

Per FCC KDB Publication 941225 D06v02, the devices edges with antennas more than 2.5 cm from edge are not required to be evaluated for SAR (“-”).

Table 12-5
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Hotspot at 1.0 cm)

Exposure Condition	Mode	CDMA/LTE SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Hotspot SAR	EVDO BC0 (\$22H)	1.025	0.410	1.435
	EVDO BC10 (\$90S)	0.945	0.410	1.355
	PCS EVDO	0.755	0.410	1.165
	LTE Band 12	0.589	0.410	0.999
	LTE Band 26	0.793	0.410	1.203
	LTE Band 4 (AWS)	0.438	0.410	0.848
	LTE Band 25 (PCS)	0.527	0.410	0.937
	LTE Band 41	0.589	0.410	0.999

12.6 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 D01v05 and IEEE 1528-2013 Section 6.3.4.1.2.

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13 SAR MEASUREMENT VARIABILITY

13.1 Measurement Variability

Per FCC KDB Publication 865664 D01v01, SAR measurement variability was assessed for each frequency band, which was determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media were required for SAR measurements in a frequency band, the variability measurement procedures were applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. These additional measurements were repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device was returned to ambient conditions (normal room temperature) with the battery fully charged before it was re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR Measurement Variability was assessed using the following procedures for each frequency band:

- 1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.
- 2) A second repeated measurement was performed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
- 3) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20 .
- 4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg

Table 13-1
Body SAR Measurement Variability Results

BODY VARIABILITY RESULTS													
Band	FREQUENCY		Mode	Service	Side	Spacing	Measured SAR (1g)	1st Repeated SAR (1g)	Ratio	2nd Repeated SAR (1g)	Ratio	3rd Repeated SAR (1g)	Ratio
	MHz	Ch.					(W/kg)	(W/kg)		(W/kg)		(W/kg)	
835	836.52	384	CDMA BC0 (\$22H)	TDSO / SO32	back	15 mm	0.995	1.000	1.01	N/A	N/A	N/A	N/A
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population						Body 1.6 W/kg (mW/g) averaged over 1 gram							

13.2 Measurement Uncertainty

The measured SAR was < 1.5 W/kg for all frequency bands. Therefore, per KDB Publication 865664 D01v01, the extended measurement uncertainty analysis per IEEE 1528-2003 was not required.

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14 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	E8257D	(250kHz-20GHz) Signal Generator	3/15/2015	Annual	3/15/2016	MY45470194
Agilent	8753E	(30kHz-6GHz) Network Analyzer	12/30/2014	Annual	12/30/2015	JP38020182
Agilent	8594A	(9kHz-2.9GHz) Spectrum Analyzer	N/A	N/A	N/A	3051A00187
Agilent	8648D	(9kHz-4GHz) Signal Generator	3/15/2015	Annual	3/15/2016	3629U00687
Agilent	E4438C	ESG Vector Signal Generator	3/15/2015	Annual	3/15/2016	MY45091346
Agilent	N5182A	MXG Vector Signal Generator	10/27/2014	Annual	10/27/2015	MY47420603
Agilent	8753ES	Network Analyzer	3/20/2015	Annual	3/20/2016	MY40001472
Agilent	8753ES	S-Parameter Network Analyzer	1/20/2015	Annual	1/20/2016	US39170122
Agilent	E5515C	Wireless Communications Test Set	8/9/2014	Annual	8/9/2015	GB43304278
Agilent	E5515C	Wireless Communications Test Set	11/5/2013	Biennial	11/5/2015	GB46310798
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433971
Anritsu	ML2495A	Power Meter	10/31/2013	Annual	10/31/2015	941001
Anritsu	ML2495A	Power Meter	10/31/2013	Annual	10/31/2015	1039008
Anritsu	MA2411B	Pulse Power Sensor	11/13/2014	Annual	11/13/2015	1339018
Anritsu	MA2411B	Pulse Power Sensor	11/17/2014	Annual	11/17/2015	1207364
Anritsu	MT8820C	Radio Communication Analyzer	8/28/2014	Annual	8/28/2015	6201240328
Anritsu	MT8820C	Radio Communication Analyzer	9/19/2014	Annual	9/19/2015	6201144418
Anritsu	MA24106A	USB Power Sensor	3/11/2015	Annual	3/11/2016	1344554
Anritsu	MA24106A	USB Power Sensor	3/11/2015	Annual	3/11/2016	1344557
COMTECH	AR85729-5/5759B	Solid State Amplifier	CBT	N/A	CBT	M3W1A00-1002
Control Company	4353	Long Stem Thermometer	3/5/2015	Biennial	3/5/2017	150149565
Fisher Scientific	15-077-960	Digital Thermometer	12/4/2013	Biennial	12/4/2015	130764551
Gigatronix	80701A	(0.05-18GHz) Power Sensor	10/30/2014	Annual	10/30/2015	1833460
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
MiniCircuits	SLP-2400+	Low Pass Filter	CBT	N/A	CBT	R8979500903
Mini-Circuits	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
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
Mitutoyo	CD-6°CSX	Digital Caliper	5/8/2014	Biennial	5/8/2016	13264162
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Narda	BW-S3W2	Attenuator (3dB)	CBT	N/A	CBT	120
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Rohde & Schwarz	CMU200	Base Station Simulator	6/6/2014	Annual	6/6/2015	109892
Rohde & Schwarz	CMW500	Radio Communication tester	5/5/2015	Annual	5/5/2016	140144
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	3/18/2014	Biennial	3/18/2016	N/A
SPEAG	D750V3	750 MHz Dipole	1/16/2015	Annual	1/16/2016	1003
SPEAG	D750V3	750 MHz Dipole	3/11/2015	Annual	3/11/2016	1054
SPEAG	D835V2	835 MHz SAR Dipole	7/24/2014	Annual	7/24/2015	4d133
SPEAG	D835V2	835 MHz SAR Dipole	1/16/2015	Annual	1/16/2016	4d132
SPEAG	D1750V2	1750 MHz SAR Dipole	4/15/2015	Annual	4/15/2016	1051
SPEAG	D1900V2	1900 MHz SAR Dipole	7/23/2014	Annual	7/23/2015	5d149
SPEAG	D1900V2	1900 MHz SAR Dipole	4/14/2015	Annual	4/14/2016	5d141
SPEAG	D2450V2	2450 MHz SAR Dipole	8/11/2014	Annual	8/11/2015	719
SPEAG	D2600V2	2600 MHz SAR Dipole	10/20/2014	Annual	10/20/2015	1071
SPEAG	ES3DV2	SAR Probe	8/19/2014	Annual	8/19/2015	3022
SPEAG	ES3DV3	SAR Probe	9/18/2014	Annual	9/18/2015	3332
SPEAG	ES3DV3	SAR Probe	9/24/2014	Annual	9/24/2015	3288
SPEAG	ES3DV3	SAR Probe	10/24/2014	Annual	10/24/2015	3333
SPEAG	ES3DV3	SAR Probe	12/16/2014	Annual	12/16/2015	3334
SPEAG	ES3DV3	SAR Probe	1/23/2015	Annual	1/23/2016	3318
SPEAG	ES3DV3	SAR Probe	2/27/2015	Annual	2/27/2016	3258
SPEAG	ES3DV3	SAR Probe	3/19/2015	Annual	3/19/2016	3209
SPEAG	DAE4	Dasy Data Acquisition Electronics	8/12/2014	Annual	8/12/2015	1322
SPEAG	DAE4	Dasy Data Acquisition Electronics	9/17/2014	Annual	9/17/2015	1323
SPEAG	DAE4	Dasy Data Acquisition Electronics	9/18/2014	Annual	9/18/2015	1364
SPEAG	DAE4	Dasy Data Acquisition Electronics	10/23/2014	Annual	10/23/2015	1408
SPEAG	DAE4	Dasy Data Acquisition Electronics	12/12/2014	Annual	12/12/2015	1415
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/14/2015	Annual	1/14/2016	1272
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/18/2015	Annual	2/18/2016	665
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/13/2015	Annual	3/13/2016	1334
SPEAG	DAK-3.5	Dielectric Assessment Kit	10/21/2014	Annual	10/21/2015	1091
SPEAG	DAKS-3.5	Portable Dielectric Assessment Kit	7/15/2014	Annual	7/15/2015	1039
VWR	36934-158	Wall-Mounted Thermometer	8/8/2013	Biennial	8/8/2015	130477877

Note: 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.

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15 MEASUREMENT UNCERTAINTIES

Applicable for frequencies less than 3000 MHz.

a	b	c	d	e= f(d,k)	f	g	h = c x f/e	i = c x g/e	k
Uncertainty Component	IEEE 1528 Sec.	Tol. (± %)	Prob. Dist.	Div.	c _i 1gm	c _i 10 gms	1gm u _i (± %)	10gms u _i (± %)	v _i
Measurement System									
Probe Calibration	E.2.1	6.0	N	1	1.0	1.0	6.0	6.0	∞
Axial Isotropy	E.2.2	0.25	N	1	0.7	0.7	0.2	0.2	∞
Hemishperical Isotropy	E.2.2	1.3	N	1	1.0	1.0	1.3	1.3	∞
Boundary Effect	E.2.3	0.4	N	1	1.0	1.0	0.4	0.4	∞
Linearity	E.2.4	0.3	N	1	1.0	1.0	0.3	0.3	∞
System Detection Limits	E.2.5	5.1	N	1	1.0	1.0	5.1	5.1	∞
Readout Electronics	E.2.6	1.0	N	1	1.0	1.0	1.0	1.0	∞
Response Time	E.2.7	0.8	R	1.73	1.0	1.0	0.5	0.5	∞
Integration Time	E.2.8	2.6	R	1.73	1.0	1.0	1.5	1.5	∞
RF Ambient Conditions	E.6.1	3.0	R	1.73	1.0	1.0	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1.0	1.0	0.2	0.2	∞
Probe Positioning w/ respect to Phantom	E.6.3	2.9	R	1.73	1.0	1.0	1.7	1.7	∞
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E.5	1.0	R	1.73	1.0	1.0	0.6	0.6	∞
Test Sample Related									
Test Sample Positioning	E.4.2	6.0	N	1	1.0	1.0	6.0	6.0	287
Device Holder Uncertainty	E.4.1	3.32	R	1.73	1.0	1.0	1.9	1.9	∞
Output Power Variation - SAR drift measurement	6.6.2	5.0	R	1.73	1.0	1.0	2.9	2.9	∞
Phantom & Tissue Parameters									
Phantom Uncertainty (Shape & Thickness tolerances)	E.3.1	4.0	R	1.73	1.0	1.0	2.3	2.3	∞
Liquid Conductivity - deviation from target values	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity - measurement uncertainty	E.3.3	3.8	N	1	0.64	0.43	2.4	1.6	6
Liquid Permittivity - deviation from target values	E.3.2	5.0	R	1.73	0.60	0.49	1.7	1.4	∞
Liquid Permittivity - measurement uncertainty	E.3.3	4.5	N	1	0.60	0.49	2.7	2.2	6
Combined Standard Uncertainty (k=1)							RSS	12.1	11.7
Expanded Uncertainty							k=2	24.2	23.5
(95% CONFIDENCE LEVEL)									

The above measurement uncertainties are according to IEEE Std. 1528-2003

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16 CONCLUSION

16.1 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]

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17 REFERENCES

- [1] Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation, Aug. 1996.
- [2] ANSI/IEEE C95.1-2005, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3kHz to 300GHz, New York: IEEE, 2006.
- [3] ANSI/IEEE C95.1-1992, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3kHz to 300GHz, New York: IEEE, Sept. 1992.
- [4] ANSI/IEEE C95.3-2002, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave, New York: IEEE, December 2002.
- [5] IEEE Standards Coordinating Committee 39 –Standards Coordinating Committee 34 – IEEE Std. 1528-2003, Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head Due to Wireless Communications Devices: Measurement Techniques.
- [6] NCRP, National Council on Radiation Protection and Measurements, Biological Effects and Exposure Criteria for RadioFrequency Electromagnetic Fields, NCRP Report No. 86, 1986. Reprinted Feb. 1995.
- [7] T. Schmid, O. Egger, N. Kuster, Automated E-field scanning system for dosimetric assessments, IEEE Transaction on Microwave Theory and Techniques, vol. 44, Jan. 1996, pp. 105-113.
- [8] K. Pokovic, T. Schmid, N. Kuster, Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies, ICECOM97, Oct. 1997, pp.1-124.
- [9] K. Pokovic, T. Schmid, and N. Kuster, E-field Probe with improved isotropy in brain simulating liquids, Proceedings of the ELMAR, Zadar, Croatia, June 23-25, 1996, pp. 172-175.
- [10] Schmid & Partner Engineering AG, Application Note: Data Storage and Evaluation, June 1998, p2.
- [11] V. Hombach, K. Meier, M. Burkhardt, E. Kuhn, N. Kuster, The Dependence of EM Energy Absorption upon Human Modeling at 900 MHz, IEEE Transaction on Microwave Theory and Techniques, vol. 44 no. 10, Oct. 1996, pp. 1865-1873.
- [12] N. Kuster and Q. Balzano, Energy absorption mechanism by biological bodies in the near field of dipole antennas above 300MHz, IEEE Transaction on Vehicular Technology, vol. 41, no. 1, Feb. 1992, pp. 17-23.
- [13] G. Hartsgrrove, A. Kraszewski, A. Surowiec, Simulated Biological Materials for Electromagnetic Radiation Absorption Studies, University of Ottawa, Bioelectromagnetics, Canada: 1987, pp. 29-36.
- [14] Q. Balzano, O. Garay, T. Manning Jr., Electromagnetic Energy Exposure of Simulated Users of Portable Cellular Telephones, IEEE Transactions on Vehicular Technology, vol. 44, no.3, Aug. 1995.
- [15] W. Gander, Computermathematick, Birkhaeuser, Basel, 1992.
- [16] W.H. Press, S.A. Teukolsky, W.T. Vetterling, and B.P. Flannery, Numerical Recipes in C, The Art of Scientific Computing, Second edition, Cambridge University Press, 1992.
- [17] N. Kuster, R. Kastle, T. Schmid, Dosimetric evaluation of mobile communications equipment with known precision, IEEE Transaction on Communications, vol. E80-B, no. 5, May 1997, pp. 645-652.

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- [18] CENELEC CLC/SC111B, European Prestandard (prENV 50166-2), Human Exposure to Electromagnetic Fields High-frequency: 10kHz-300GHz, Jan. 1995.
- [19] Prof. Dr. Niels Kuster, ETH, Eidgenössische Technische Hochschule Zürich, Dosimetric Evaluation of the Cellular Phone.
- [20] IEC 62209-1, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 1: Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz), Feb. 2005.
- [21] Industry Canada RSS-102 Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) Issue 4, March 2010.
- [22] Health Canada Safety Code 6 Limits of Human Exposure to Radio Frequency Electromagnetic Fields in the Frequency Range from 3 kHz – 300 GHz, 2009
- [23] FCC SAR Test Procedures for 2G-3G Devices, Mobile Hotspot and UMPC Devices KDB Publications 941225, D01-D06
- [24] SAR Measurement Guidance for IEEE 802.11 Transmitters, KDB Publication 248227 D01v02
- [25] FCC SAR Considerations for Handsets with Multiple Transmitters and Antennas, KDB Publications 648474 D03-D04
- [26] FCC SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers, FCC KDB Publication 616217 D04
- [27] FCC SAR Measurement and Reporting Requirements for 100MHz – 6 GHz, KDB Publications 865664 D01-D02
- [28] FCC General RF Exposure Guidance and SAR Procedures for Dongles, KDB Publication 447498, D01-D02
- [29] Anexo à Resolução No. 533, de 10 de Setembro de 2009.
- [30] IEC 62209-2, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 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), Mar. 2010.

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APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG530P; Type: Portable Handset; Serial: 85234

Communication System: UID 0, Cellular CDMA; Frequency: 848.31 MHz; Duty Cycle: 1:1

Medium: 835 Head Medium parameters used (interpolated):

$f = 848.31 \text{ MHz}$; $\sigma = 0.931 \text{ S/m}$; $\epsilon_r = 41.721$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 05-11-2015; Ambient Temp: 24.1°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3288; ConvF(6.51, 6.51, 6.51); Calibrated: 9/24/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1364; Calibrated: 9/18/2014

Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1797

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

Mode: Cell. CDMA BC0, Left Head, Cheek, High.ch

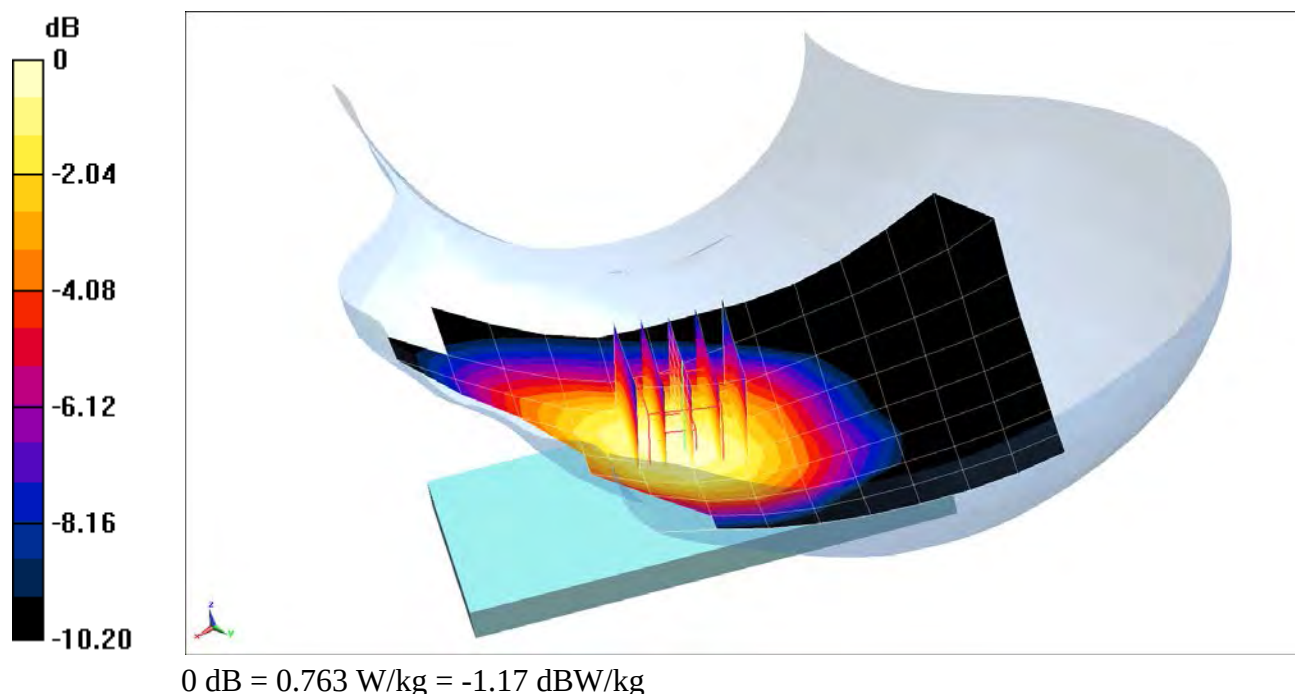
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Zoom Scan (6x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 28.21 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.883 W/kg

SAR (1 g) = 0.699 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG530P; Type: Portable Handset; Serial: 85234

Communication System: UID 0, Cellular CDMA; Frequency: 820.1 MHz; Duty Cycle: 1:1

Medium: 835 Head Medium parameters used (interpolated):

$f = 820.1 \text{ MHz}$; $\sigma = 0.905 \text{ S/m}$; $\epsilon_r = 42.073$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 05-11-2015; Ambient Temp: 24.1°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3288; ConvF(6.51, 6.51, 6.51); Calibrated: 9/24/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1364; Calibrated: 9/18/2014

Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1797

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

Mode: Cell. BC10, EVDO Rev. A, Left Head, Cheek, Mid.ch

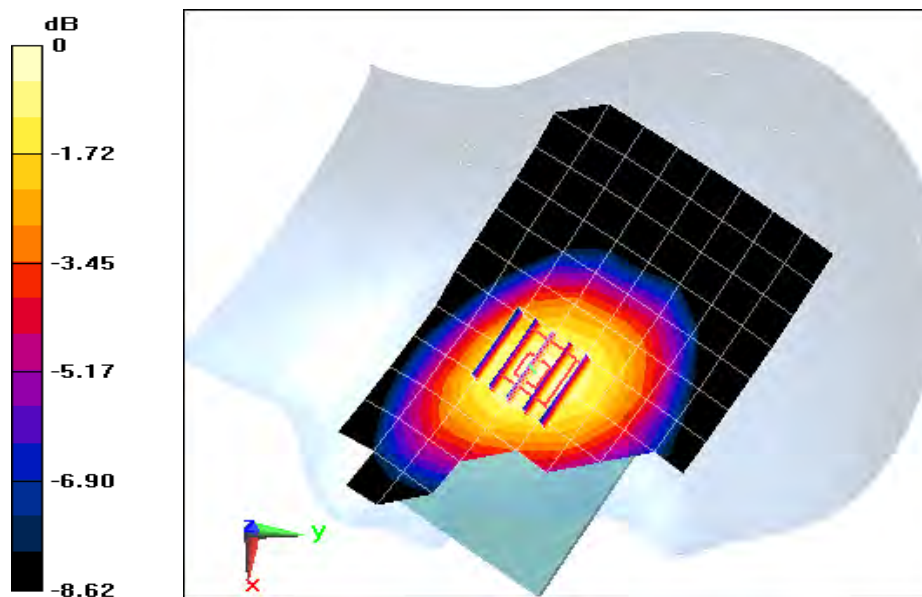
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 26.87 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.766 W/kg

SAR(1 g) = 0.614 W/kg



0 dB = 0.674 W/kg = -1.71 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG530P; Type: Portable Handset; Serial: 85234

Communication System: UID 0, PCS CDMA; Frequency: 1851.25 MHz; Duty Cycle: 1:1

Medium: 1900 Head Medium parameters used (interpolated):

$f = 1851.25 \text{ MHz}$; $\sigma = 1.377 \text{ S/m}$; $\epsilon_r = 39.426$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 05-11-2015; Ambient Temp: 23.0°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3318; ConvF(5.05, 5.05, 5.05); Calibrated: 1/23/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/14/2015

Phantom: SAM Front; Type: SAM; Serial: 1686

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

Mode: PCS EVDO Rev. A, Left Head, Cheek, Low.ch

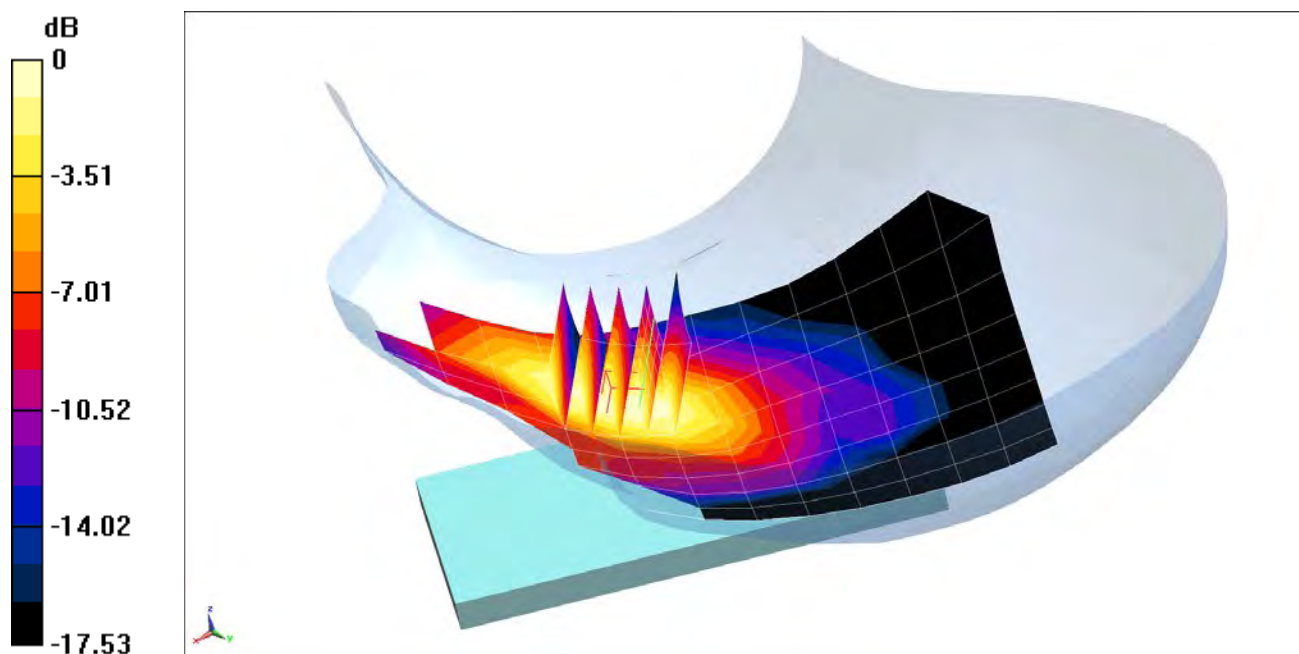
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 23.52 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 1.20 W/kg

SAR (1 g) = 0.754 W/kg



0 dB = 0.870 W/kg = -0.60 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG530P; Type: Portable Handset; Serial: 85168

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

Medium: 750 Head Medium parameters used (interpolated):

$f = 707.5 \text{ MHz}$; $\sigma = 0.875 \text{ S/m}$; $\epsilon_r = 41.872$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 05-13-2015; Ambient Temp: 22.9°C; Tissue Temp: 22.1°C

Probe: ES3DV2 - SN3022; ConvF(6.39, 6.39, 6.39); Calibrated: 8/19/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/12/2014

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 12, Left Head, Cheek, Mid.ch
10 MHz Bandwidth, QPSK, 1 RB, 25 RB Offset

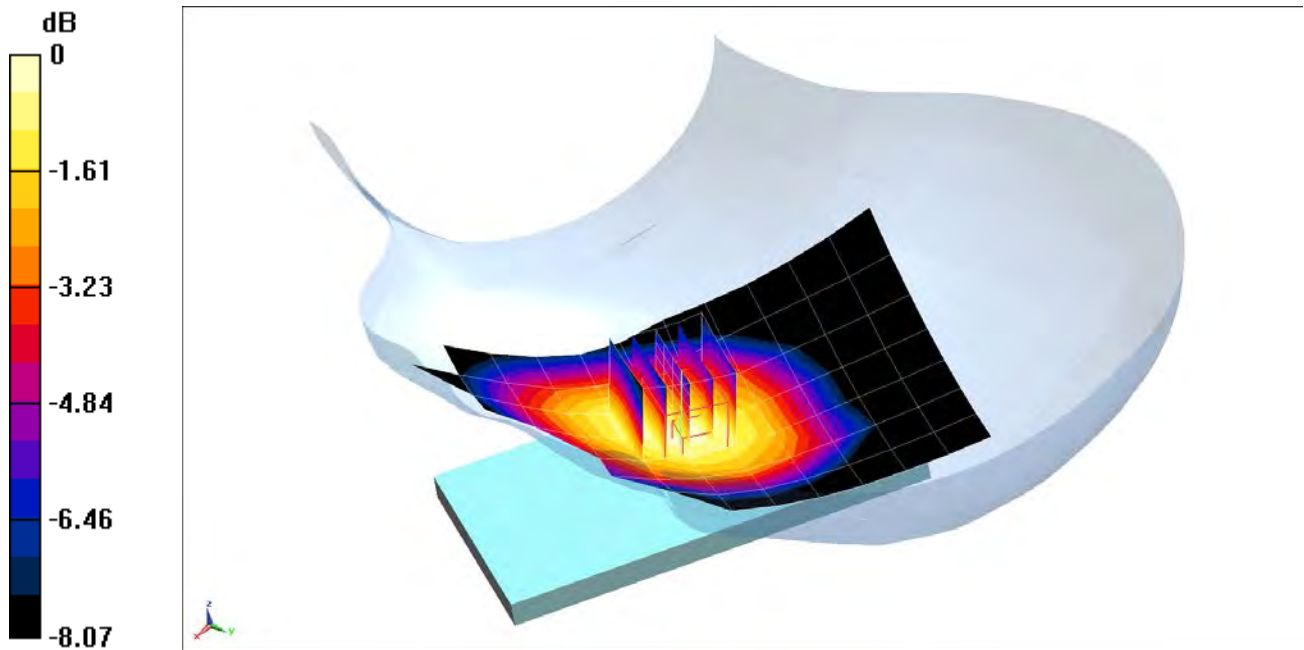
Area Scan (8x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 20.74 V/m; Power Drift = -0.19 dB

Peak SAR (extrapolated) = 0.374 W/kg

SAR (1 g) = 0.304 W/kg



0 dB = 0.333 W/kg = -4.78 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG530P; Type: Portable Handset; Serial: 85227

Communication System: UID 0, LTE Band 26; Frequency: 836.5 MHz; Duty Cycle: 1:1

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.5$ MHz; $\sigma = 0.92$ S/m; $\epsilon_r = 41.869$; $\rho = 1000$ kg/m³

Phantom section: Left Section

Test Date: 05-11-2015; Ambient Temp: 24.1°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3288; ConvF(6.51, 6.51, 6.51); Calibrated: 9/24/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1364; Calibrated: 9/18/2014

Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1797

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

Mode: LTE Band 26, Left Head, Cheek, Mid.ch
15 MHz Bandwidth, QPSK, 1 RB, 36 RB Offset

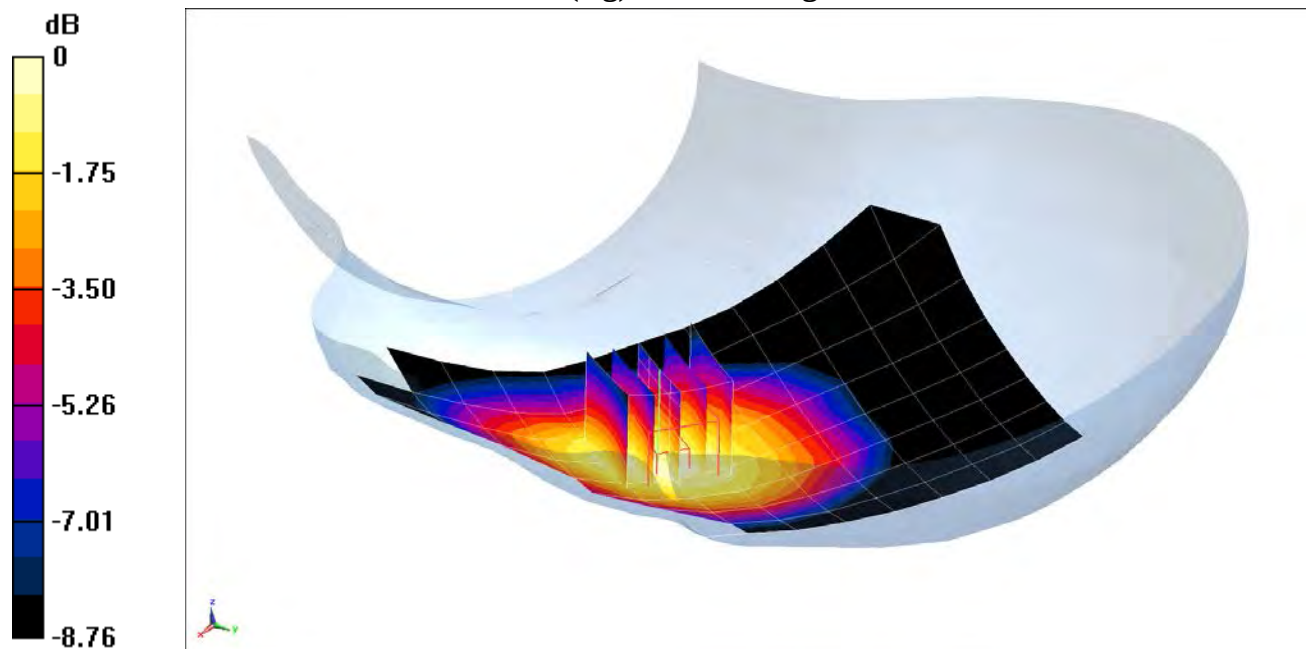
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 22.08 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 0.482 W/kg

SAR (1 g) = 0.386 W/kg



0 dB = 0.424 W/kg = -3.73 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG530P; Type: Portable Handset; Serial: 85227

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

Medium: 1750 Head Medium parameters used (interpolated):

$f = 1732.5 \text{ MHz}$; $\sigma = 1.368 \text{ S/m}$; $\epsilon_r = 38.696$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 05-13-2015; Ambient Temp: 24.0°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3333; ConvF(5.26, 5.26, 5.26); Calibrated: 10/24/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1408; Calibrated: 10/23/2014

Phantom: Main TWIN SAM; Type: QD000P40CC; Serial: TP-1406

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

Mode: LTE Band 4 (AWS), Left Head, Cheek, Mid.ch
20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset

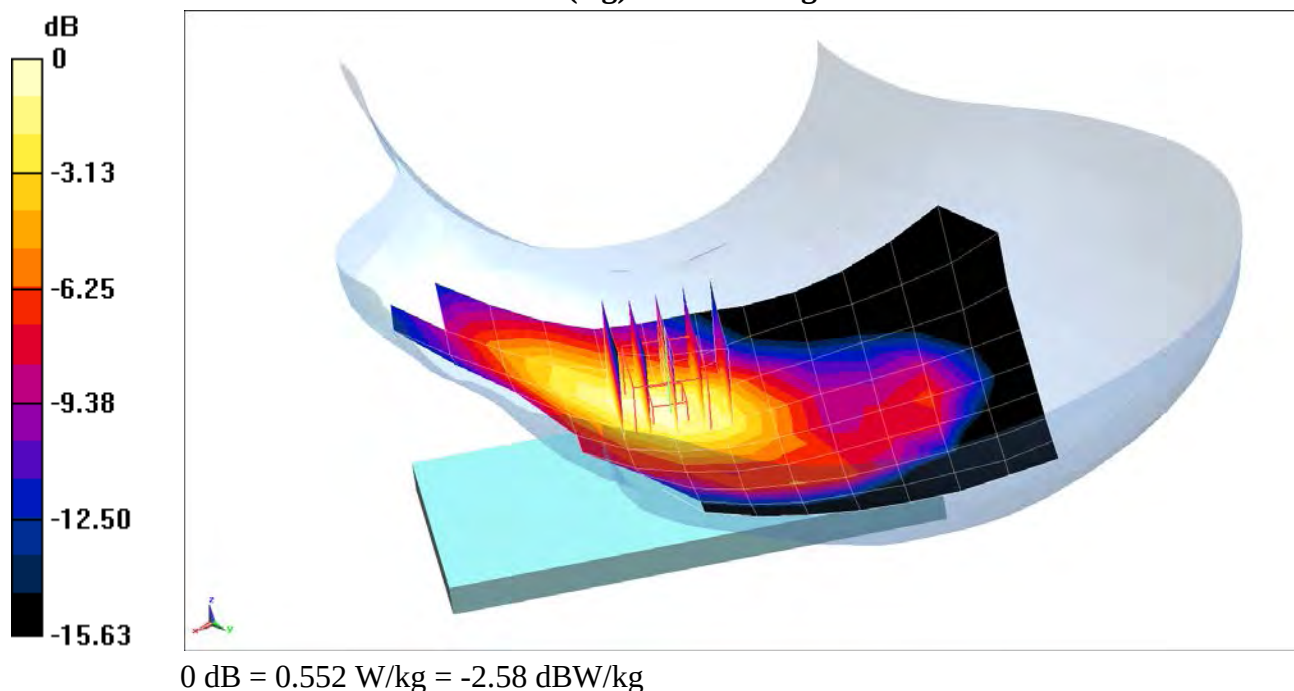
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 20.47 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.703 W/kg

SAR (1 g) = 0.458 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG530P; Type: Portable Handset; Serial: 85168

Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1882.5 MHz; Duty Cycle: 1:1

Medium: 1900 Head Medium parameters used (interpolated):

$f = 1882.5 \text{ MHz}$; $\sigma = 1.405 \text{ S/m}$; $\epsilon_r = 39.277$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 05-11-2015; Ambient Temp: 23.0°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3318; ConvF(5.05, 5.05, 5.05); Calibrated: 1/23/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/14/2015

Phantom: SAM Front; Type: SAM; Serial: 1686

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

Mode: LTE Band 25 (PCS), Left Head, Cheek, Mid.ch
20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset

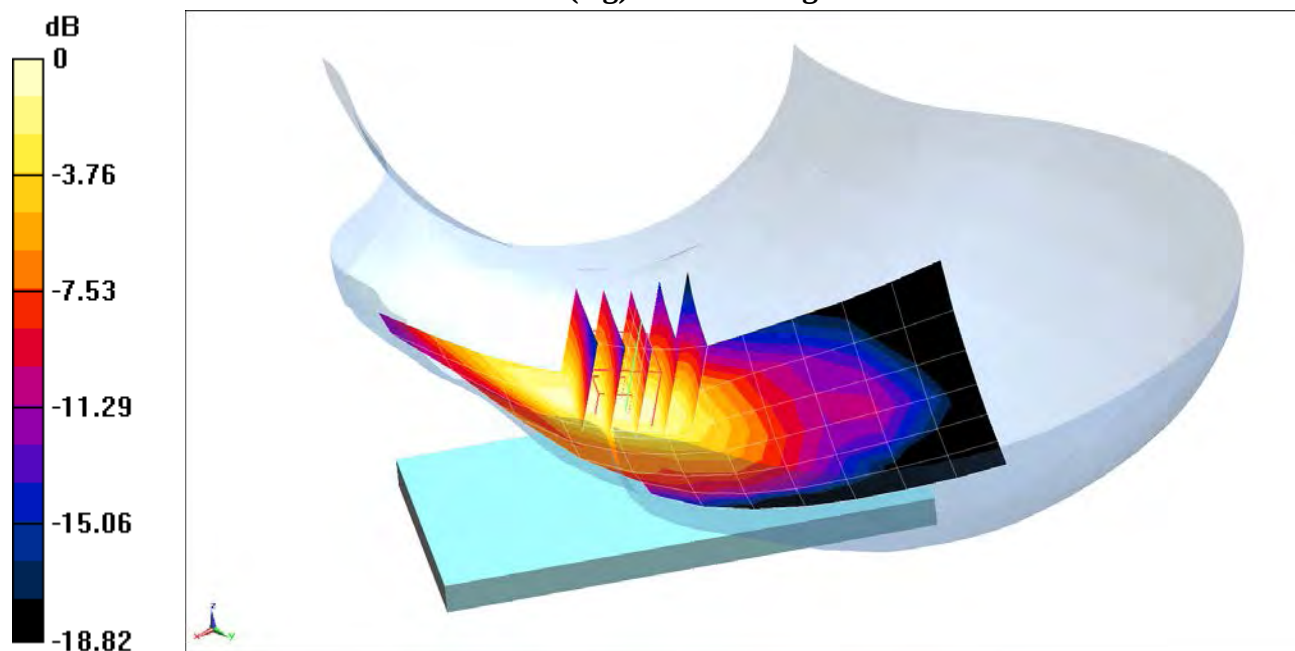
Area Scan (7x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 19.23 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 0.624 W/kg

SAR (1 g) = 0.404 W/kg



0 dB = 0.472 W/kg = -3.26 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG530P; Type: Portable Handset; Serial: 85244

Communication System: UID 0, LTE Band 41; Frequency: 2636.5 MHz; Duty Cycle: 1:1.58

Medium: 2600 Head Medium parameters used (interpolated):

$f = 2636.5$ MHz; $\sigma = 2.092$ S/m; $\epsilon_r = 37.386$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Test Date: 05-12-2015; Ambient Temp: 23.2°C; Tissue Temp: 23.7°C

Probe: ES3DV3 - SN3332; ConvF(4.35, 4.35, 4.35); Calibrated: 9/18/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/17/2014

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 41, Right Head, Cheek, Mid-High.ch

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

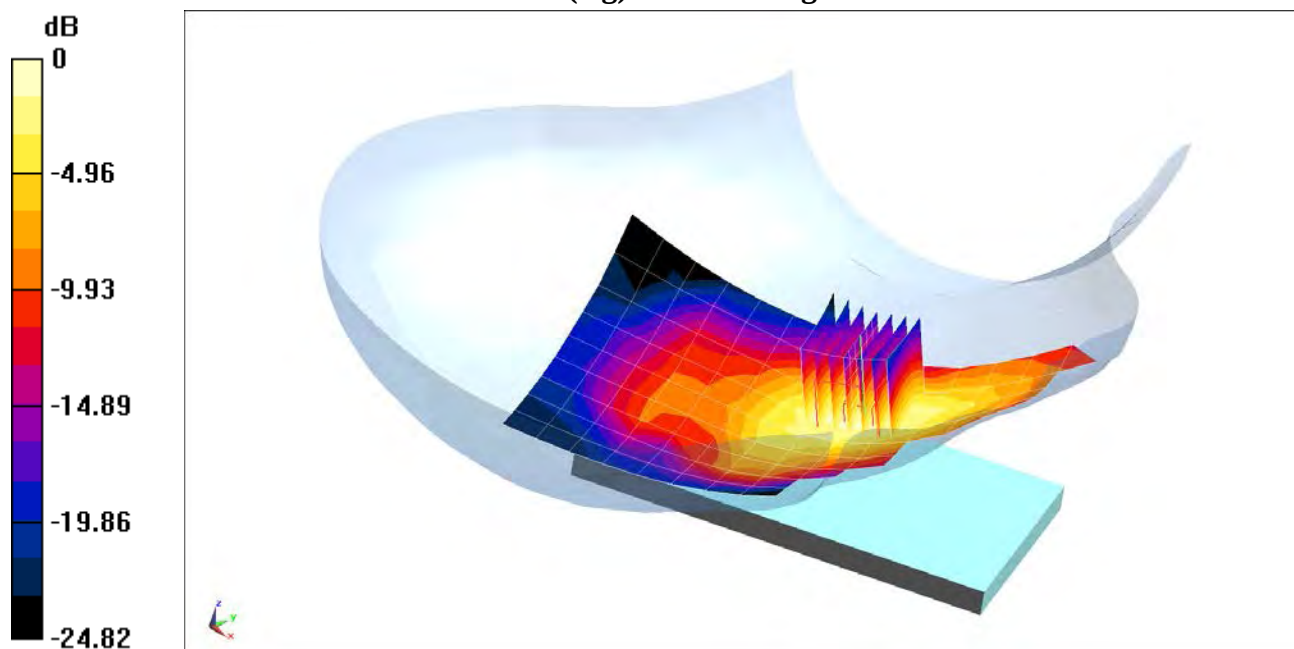
Area Scan (10x17x1): Measurement grid: dx=12mm, dy=12mm

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

Reference Value = 14.53 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 0.675 W/kg

SAR (1 g) = 0.352 W/kg



0 dB = 0.448 W/kg = -3.49 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG530P; Type: Portable Handset; Serial: 85226

Communication System: UID 0, IEEE 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium: 2450 Head Medium parameters used (interpolated):

$f = 2437 \text{ MHz}$; $\sigma = 1.856 \text{ S/m}$; $\epsilon_r = 38.22$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 05-12-2015; Ambient Temp: 23.2°C; Tissue Temp: 23.7°C

Probe: ES3DV3 - SN3332; ConvF(4.49, 4.49, 4.49); Calibrated: 9/18/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/17/2014

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

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

Mode: IEEE 802.11b, Right Head, Cheek, Ch 6, 1 Mbps, 22 MHz Bandwidth

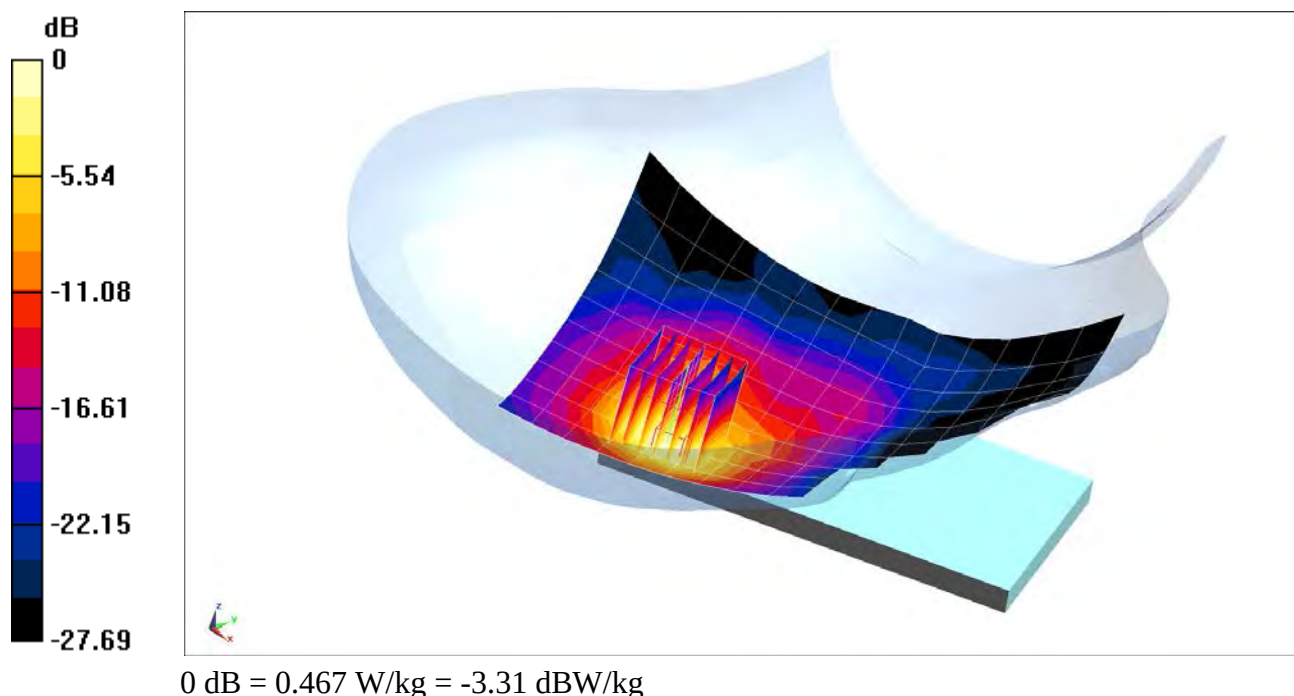
Area Scan (11x18x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 14.91 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.829 W/kg

SAR (1 g) = 0.347 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG530P; Type: Portable Handset; Serial: 85234

Communication System: UID 0, CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.52 \text{ MHz}$; $\sigma = 1.019 \text{ S/m}$; $\epsilon_r = 53.909$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 05-26-2015; Ambient Temp: 22.1°C; Tissue Temp: 21.5°C

Probe: ES3DV3 - SN3318; ConvF(6.23, 6.23, 6.23); Calibrated: 1/23/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/14/2015

Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2027

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

Mode: Cell. CDMA BC0, Body SAR, Back side, Mid.ch

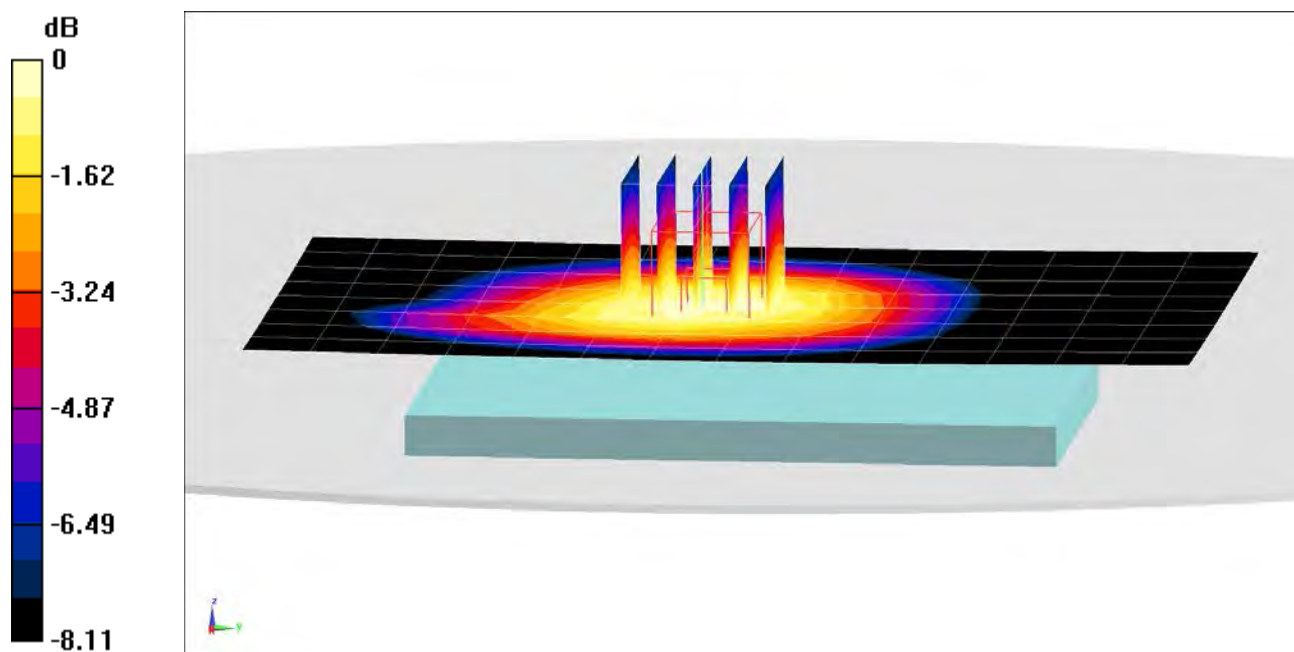
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 29.05 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 1.27 W/kg

SAR (1 g) = 1 W/kg



0 dB = 1.10 W/kg = 0.41 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG530P; Type: Portable Handset; Serial: 85233

Communication System: UID 0, CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.52 \text{ MHz}$; $\sigma = 1.001 \text{ S/m}$; $\epsilon_r = 53.737$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 05-20-2015; Ambient Temp: 22.6°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3209; ConvF(6.07, 6.07, 6.07); Calibrated: 3/19/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/13/2015

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: Cell. BC0, EVDO Rev. 0, Body SAR, Back side, Mid.ch

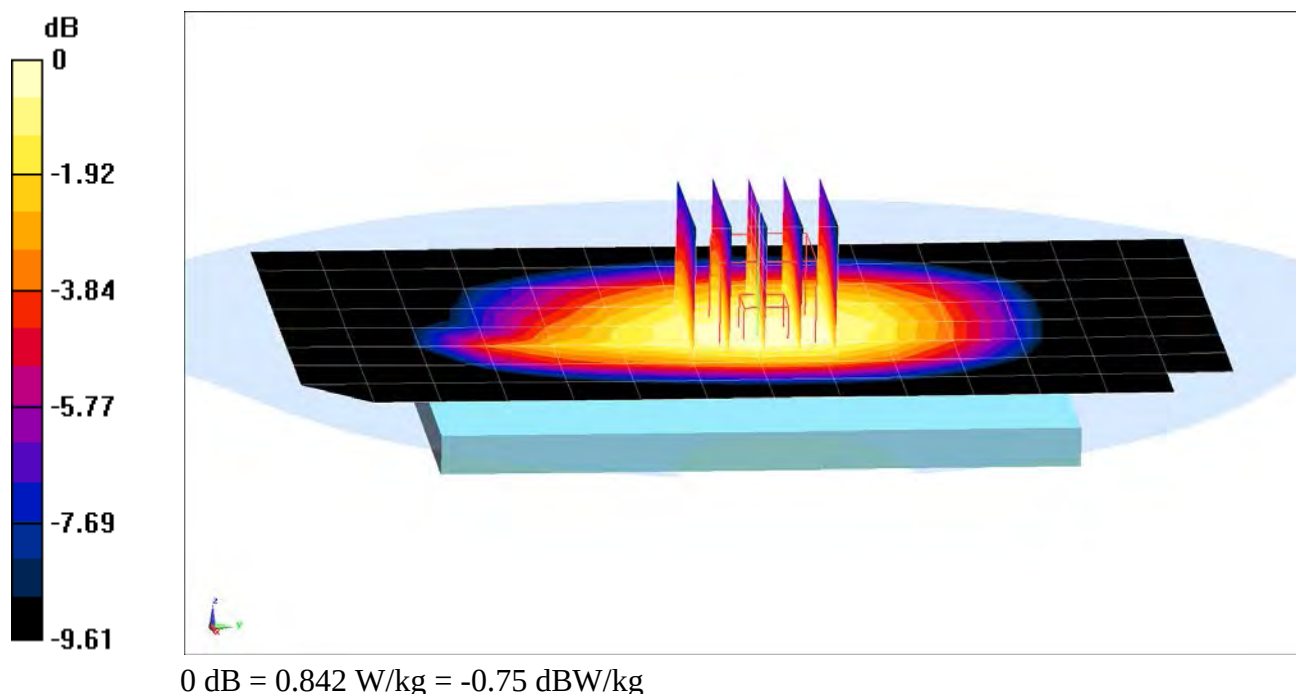
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Zoom Scan (6x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 27.81 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.991 W/kg

SAR (1 g) = 0.763 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG530P; Type: Portable Handset; Serial: 85234

Communication System: UID 0, CDMA; Frequency: 820.1 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 820.1 \text{ MHz}$; $\sigma = 0.996 \text{ S/m}$; $\epsilon_r = 54.093$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 05-11-2015; Ambient Temp: 24.0°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3209; ConvF(6.07, 6.07, 6.07); Calibrated: 3/19/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/13/2015

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: Cell. CDMA BC10, Body SAR, Back side, Mid.ch

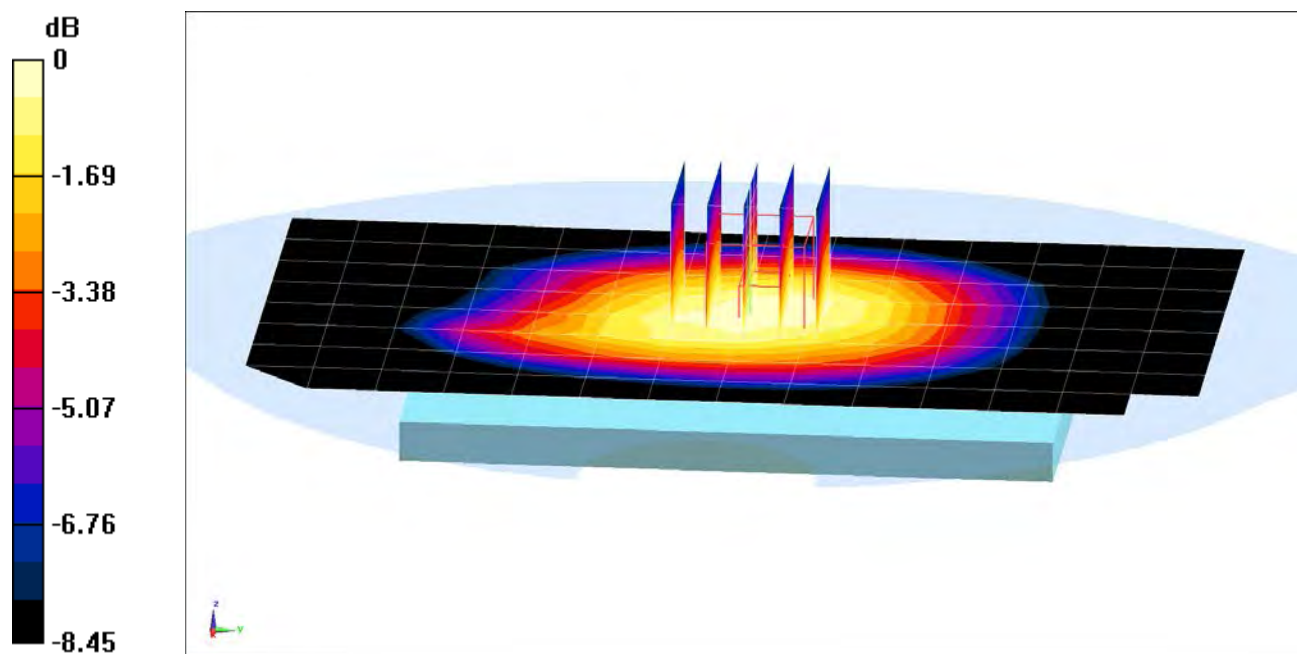
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 31.64 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 1.19 W/kg

SAR (1 g) = 0.934 W/kg



0 dB = 1.03 W/kg = 0.13 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG530P; Type: Portable Handset; Serial: 85233

Communication System: UID 0, CDMA; Frequency: 820.1 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 820.1 \text{ MHz}$; $\sigma = 0.985 \text{ S/m}$; $\epsilon_r = 53.904$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 05-20-2015; Ambient Temp: 22.6°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3209; ConvF(6.07, 6.07, 6.07); Calibrated: 3/19/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/13/2015

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: Cell. BC10, EVDO Rev. 0, Body SAR, Back side, Mid.ch

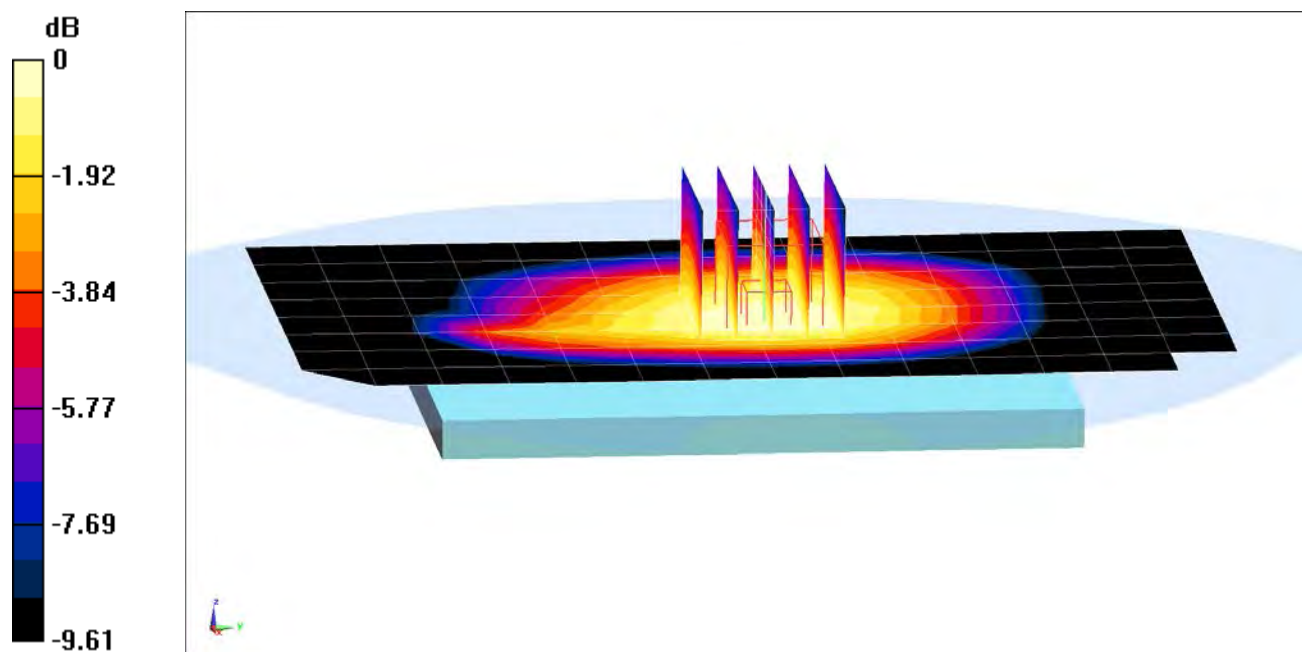
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Zoom Scan (6x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 26.92 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.885 W/kg

SAR (1 g) = 0.691 W/kg



0 dB = 0.761 W/kg = -1.19 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG530P; Type: Portable Handset; Serial: 85320

Communication System: UID 0, CDMA; Frequency: 1908.75 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1908.75 \text{ MHz}$; $\sigma = 1.518 \text{ S/m}$; $\epsilon_r = 51.211$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 05-14-2015; Ambient Temp: 23.2°C; Tissue Temp: 23.4°C

Probe: ES3DV3 - SN3258; ConvF(4.64, 4.64, 4.64); Calibrated: 2/27/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

Phantom: SAM with CRP v5.0; Type: QD000P40CD; Serial: TP:1759

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

Mode: PCS CDMA, Body SAR, Back side, High.ch

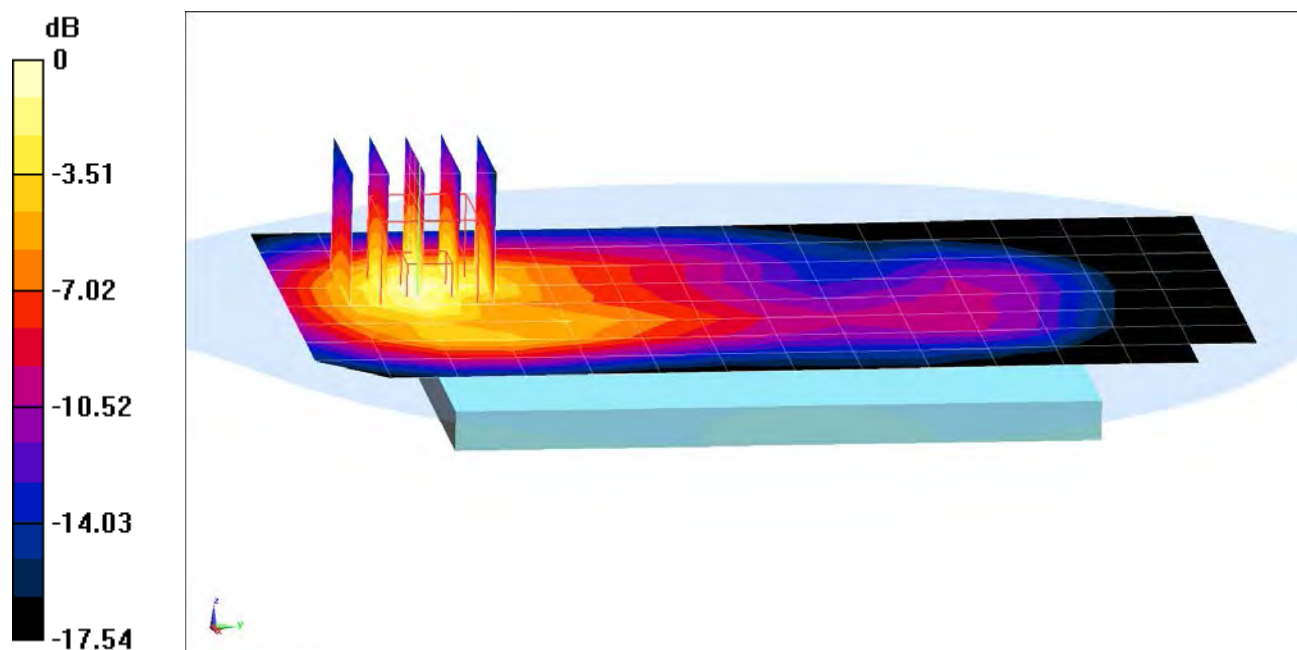
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 22.84 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 1.15 W/kg

SAR (1 g) = 0.717 W/kg



0 dB = 0.829 W/kg = -0.81 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG530P; Type: Portable Handset; Serial: 85155

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

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.484 \text{ S/m}$; $\epsilon_r = 51.274$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 05-14-2015; Ambient Temp: 23.2°C; Tissue Temp: 23.4°C

Probe: ES3DV3 - SN3258; ConvF(4.64, 4.64, 4.64); Calibrated: 2/27/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

Phantom: SAM with CRP v5.0; Type: QD000P40CD; Serial: TP:1759

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

Mode: PCS EVDO Rev. 0, Body SAR, Back side, Mid.ch

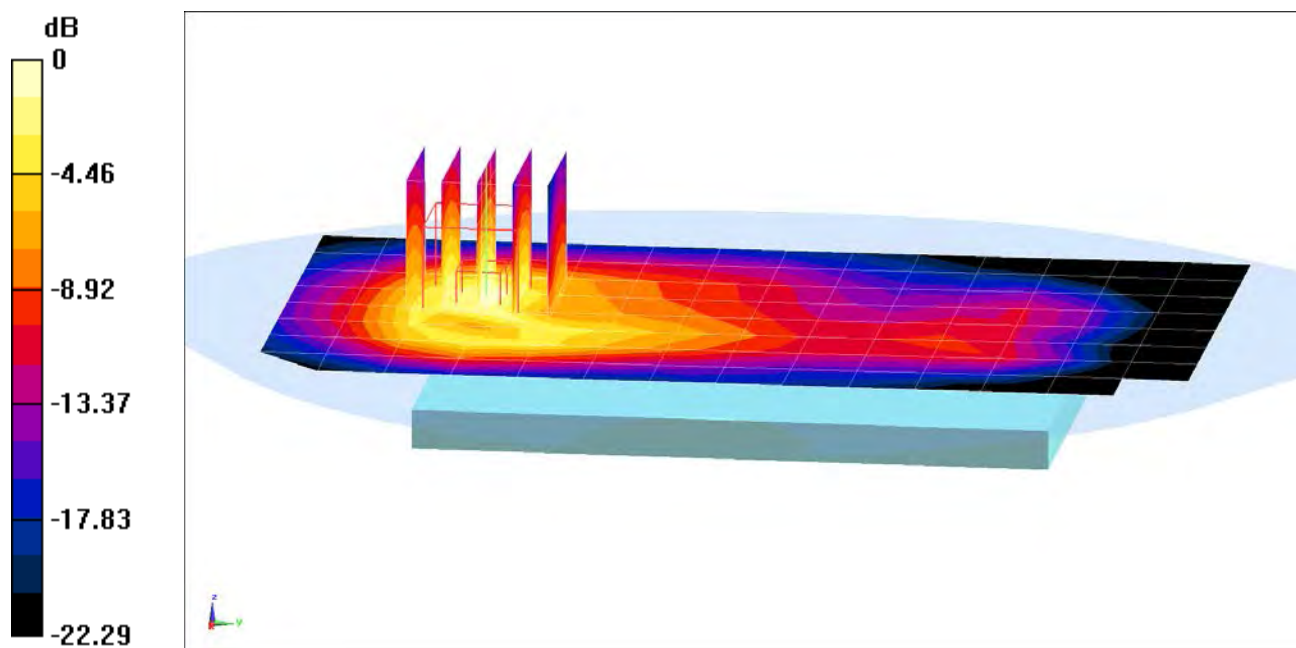
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 20.66 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.984 W/kg

SAR (1 g) = 0.586 W/kg



0 dB = 0.719 W/kg = -1.43 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG530P; Type: Portable Handset; Serial: 85168

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

Medium: 750 Body Medium parameters used (interpolated):

$f = 707.5$ MHz; $\sigma = 0.956$ S/m; $\epsilon_r = 55.928$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 05-11-2015; Ambient Temp: 23.1°C; Tissue Temp: 22.2°C

Probe: ES3DV2 - SN3022; ConvF(6.02, 6.02, 6.02); Calibrated: 8/19/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/12/2014

Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226

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

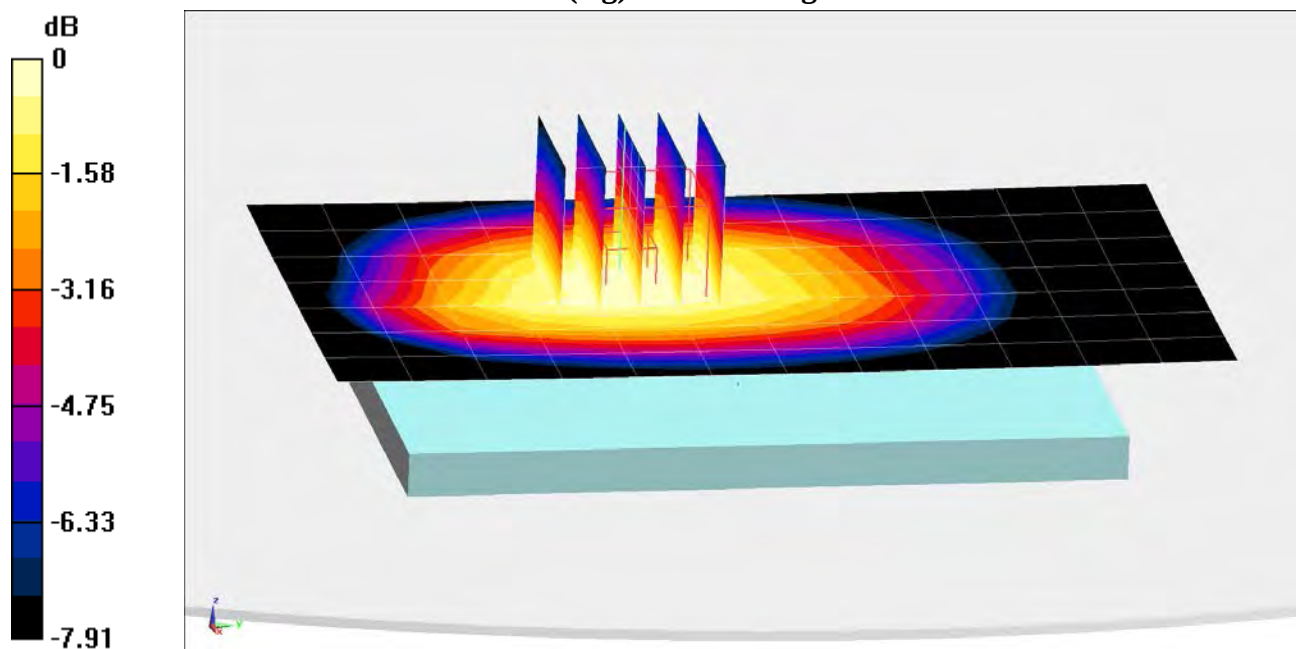
Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 21.43 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 0.532 W/kg

SAR (1 g) = 0.430 W/kg



0 dB = 0.471 W/kg = -3.27 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG530P; Type: Portable Handset; Serial: 85168

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

Medium: 750 Body Medium parameters used (interpolated):

$f = 707.5 \text{ MHz}$; $\sigma = 0.956 \text{ S/m}$; $\epsilon_r = 55.928$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 05-11-2015; Ambient Temp: 23.1°C; Tissue Temp: 22.2°C

Probe: ES3DV2 - SN3022; ConvF(6.02, 6.02, 6.02); Calibrated: 8/19/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/12/2014

Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226

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

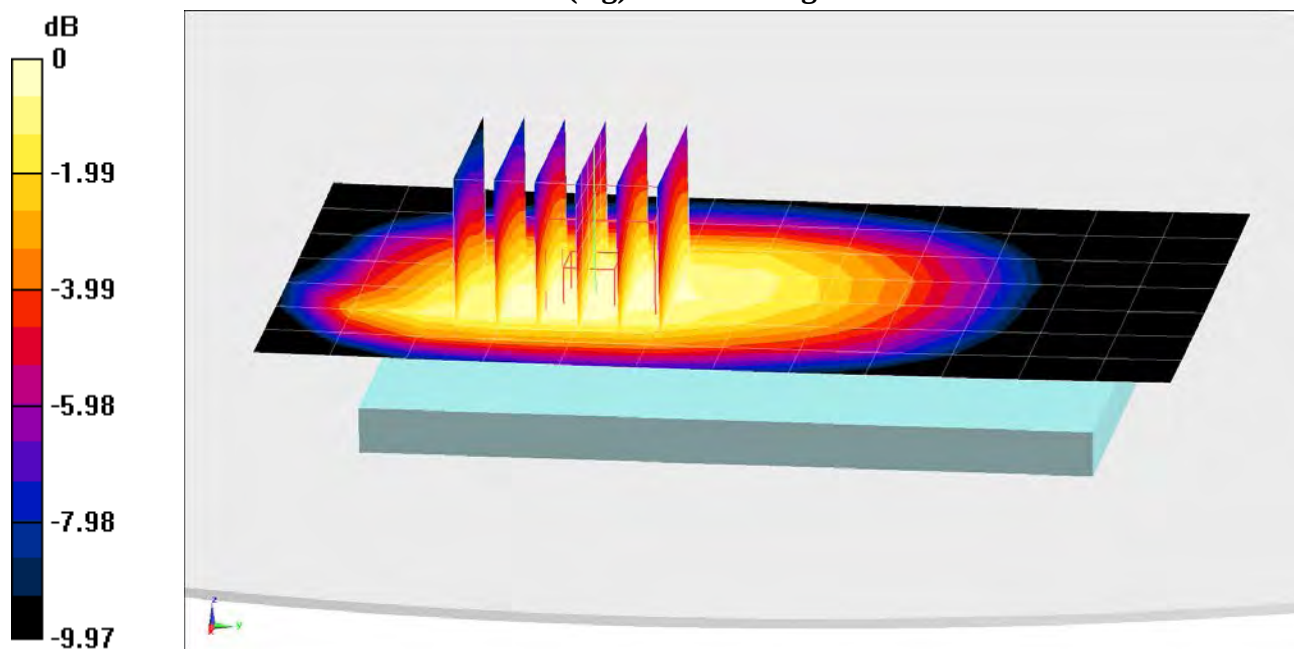
Area Scan (8x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Zoom Scan (6x6x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 24.91 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.717 W/kg

SAR (1 g) = 0.561 W/kg



0 dB = 0.621 W/kg = -2.07 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG530P; Type: Portable Handset; Serial: 85168

Communication System: UID 0, LTE Band 26; Frequency: 836.5 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.5 \text{ MHz}$; $\sigma = 1.01 \text{ S/m}$; $\epsilon_r = 53.938$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 05-11-2015; Ambient Temp: 24.0°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3209; ConvF(6.07, 6.07, 6.07); Calibrated: 3/19/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/13/2015

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: LTE Band 26, Body SAR, Back side, Mid.ch
15 MHz Bandwidth, QPSK, 1 RB, 36 RB Offset

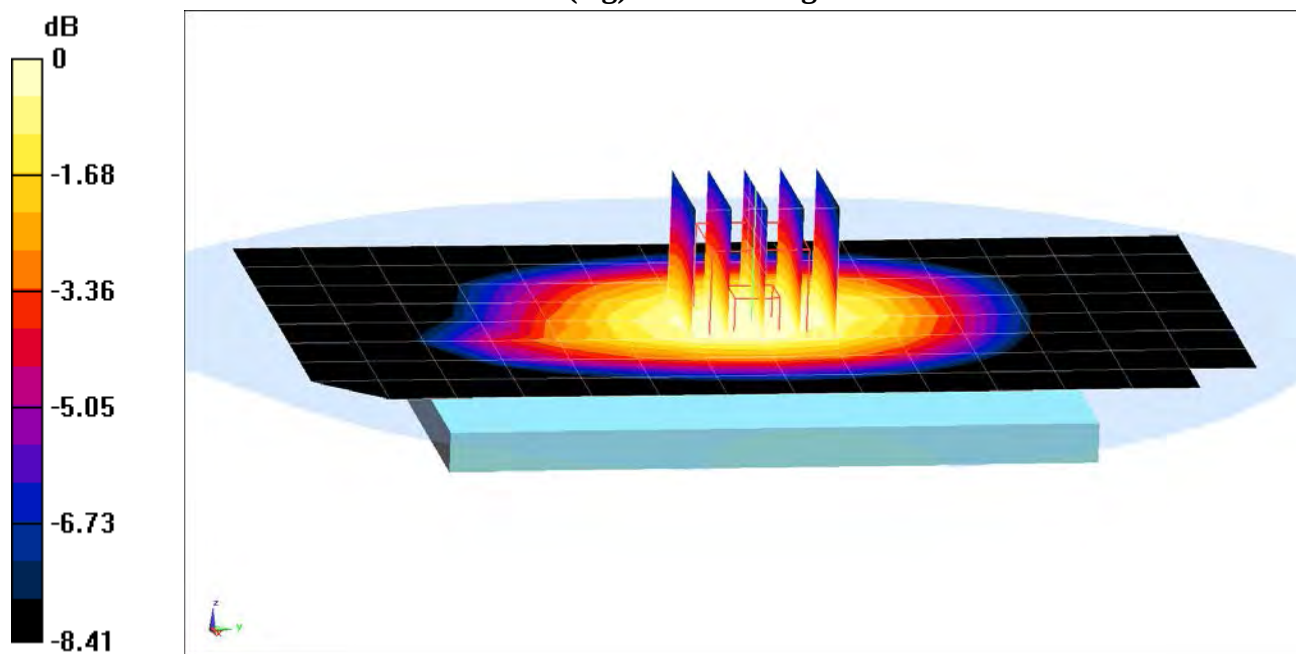
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 27.25 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.898 W/kg

SAR (1 g) = 0.699 W/kg



0 dB = 0.767 W/kg = -1.15 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG530P; Type: Portable Handset; Serial: 85168

Communication System: UID 0, LTE Band 26; Frequency: 836.5 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.5 \text{ MHz}$; $\sigma = 1.01 \text{ S/m}$; $\epsilon_r = 53.938$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 05-11-2015; Ambient Temp: 24.0°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3209; ConvF(6.07, 6.07, 6.07); Calibrated: 3/19/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/13/2015

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: LTE Band 26, Body SAR, Back side, Mid.ch
15 MHz Bandwidth, QPSK, 1 RB, 36 RB Offset

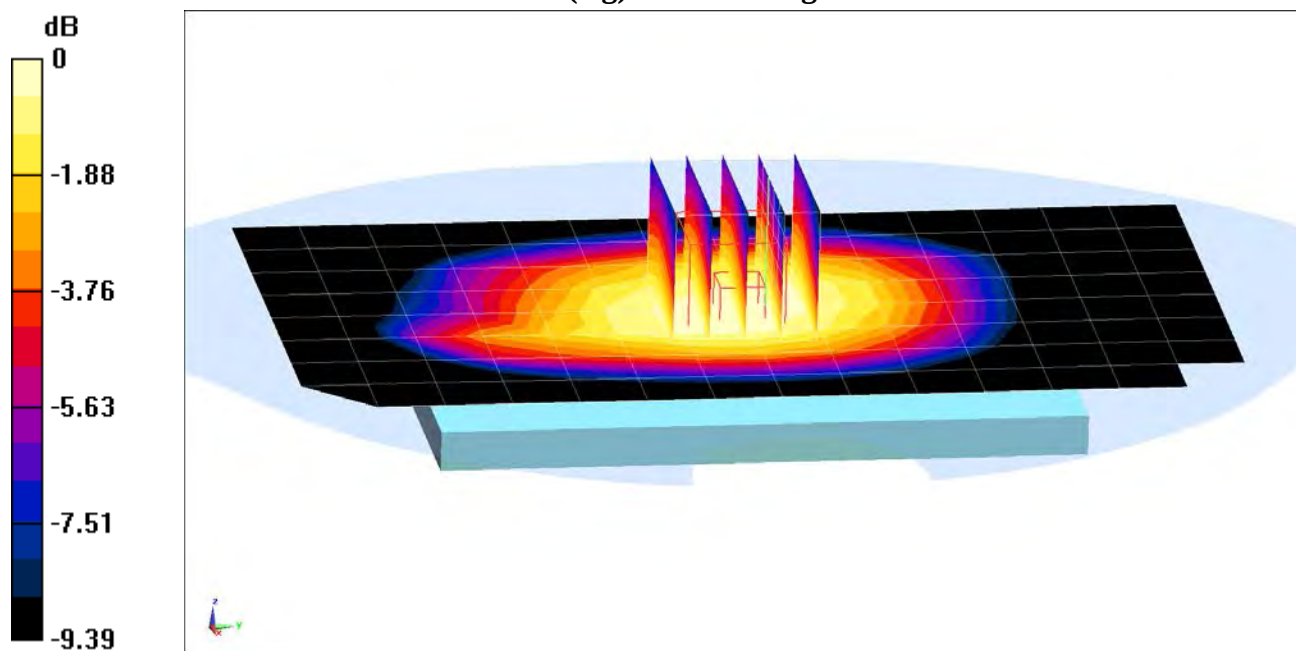
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Zoom Scan (6x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 29.13 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.994 W/kg

SAR (1 g) = 0.789 W/kg



0 dB = 0.859 W/kg = -0.66 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG530P; Type: Portable Handset; Serial: 85168

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

Medium: 1750 Body Medium parameters used (interpolated):

$f = 1732.5 \text{ MHz}$; $\sigma = 1.515 \text{ S/m}$; $\epsilon_r = 52.514$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 05-12-2015; Ambient Temp: 22.5°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3334; ConvF(4.94, 4.94, 4.94); Calibrated: 12/16/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1415; Calibrated: 12/12/2014

Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1158

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

Mode: LTE Band 4 (AWS), Body SAR, Back side, Mid.ch
20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset

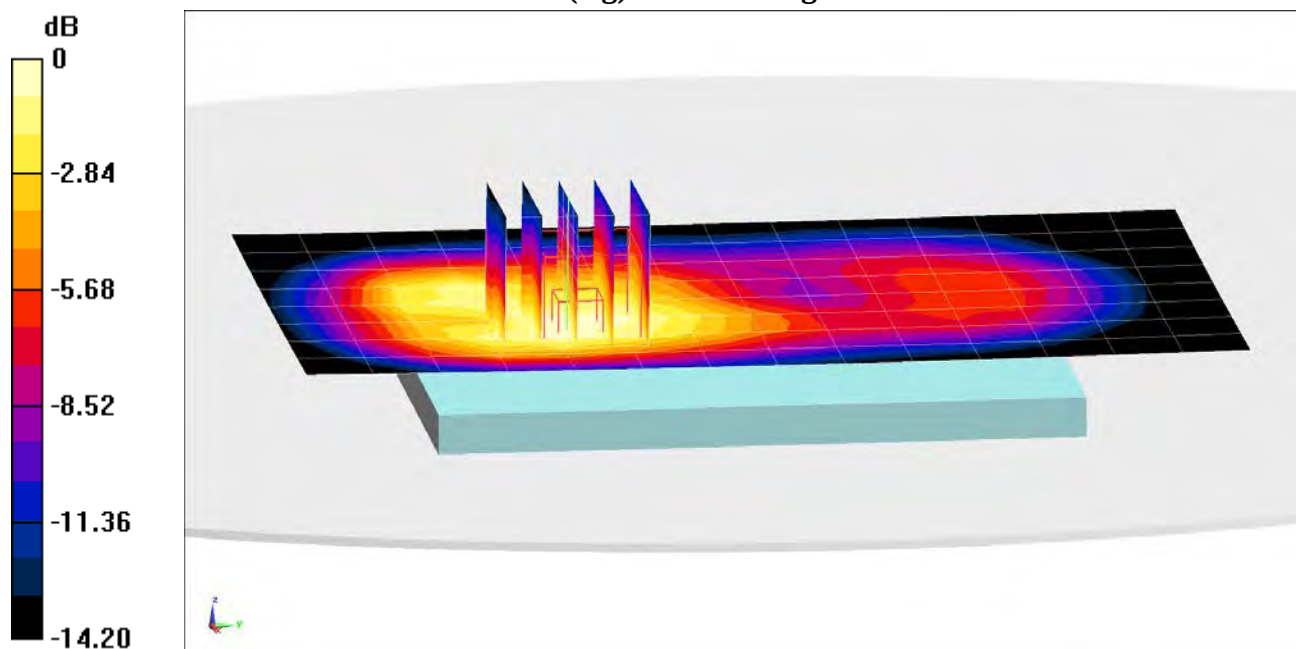
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 15.65 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.513 W/kg

SAR (1 g) = 0.334 W/kg



0 dB = 0.387 W/kg = -4.12 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG530P; Type: Portable Handset; Serial: 85240

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

Medium: 1750 Body Medium parameters used (interpolated):

$f = 1732.5 \text{ MHz}$; $\sigma = 1.515 \text{ S/m}$; $\epsilon_r = 52.514$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 05-12-2015; Ambient Temp: 22.5°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3334; ConvF(4.94, 4.94, 4.94); Calibrated: 12/16/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1415; Calibrated: 12/12/2014

Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1158

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

Mode: LTE Band 4 (AWS), Body SAR, Front side, Mid.ch
20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

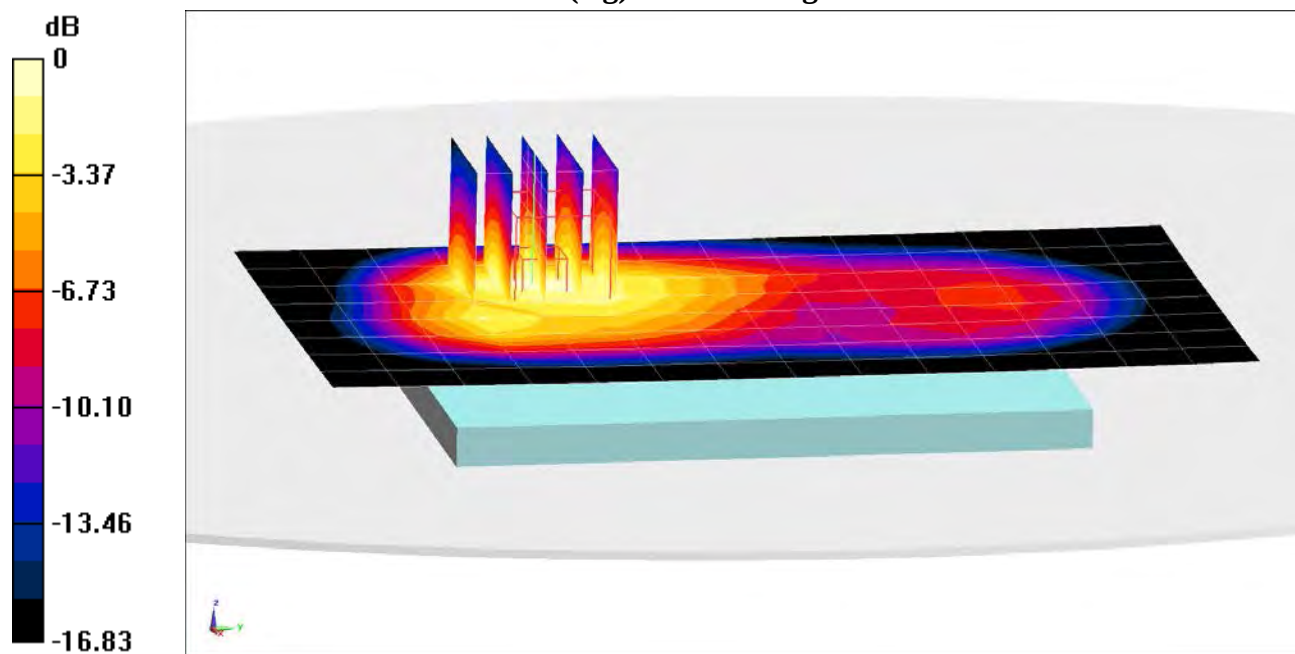
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 17.35 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.684 W/kg

SAR (1 g) = 0.418 W/kg



0 dB = 0.506 W/kg = -2.96 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG530P; Type: Portable Handset; Serial: 85168

Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1882.5 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1882.5 \text{ MHz}$; $\sigma = 1.519 \text{ S/m}$; $\epsilon_r = 51.775$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 05-12-2015; Ambient Temp: 22.8°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3258; ConvF(4.64, 4.64, 4.64); Calibrated: 2/27/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

Phantom: SAM with CRP v5.0; Type: QD000P40CD; Serial: TP:1759

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

Mode: LTE Band 25 (PCS), Body SAR, Back side, Mid.ch
20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset

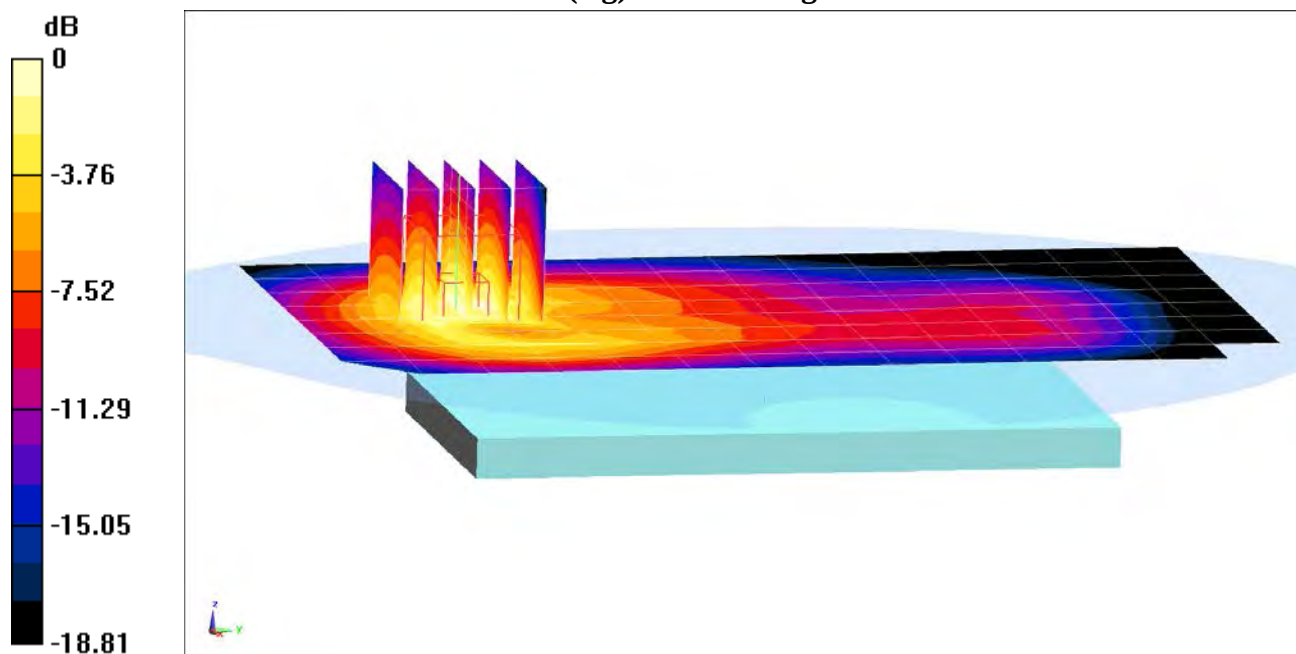
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 18.11 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.827 W/kg

SAR (1 g) = 0.529 W/kg



0 dB = 0.633 W/kg = -1.99 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG530P; Type: Portable Handset; Serial: 85320

Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1905 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1905 \text{ MHz}$; $\sigma = 1.547 \text{ S/m}$; $\epsilon_r = 51.7$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 05-12-2015; Ambient Temp: 22.8°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3258; ConvF(4.64, 4.64, 4.64); Calibrated: 2/27/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

Phantom: SAM with CRP v5.0; Type: QD000P40CD; Serial: TP:1759

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

Mode: LTE Band 25 (PCS), Body SAR, Front side, High.ch
20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

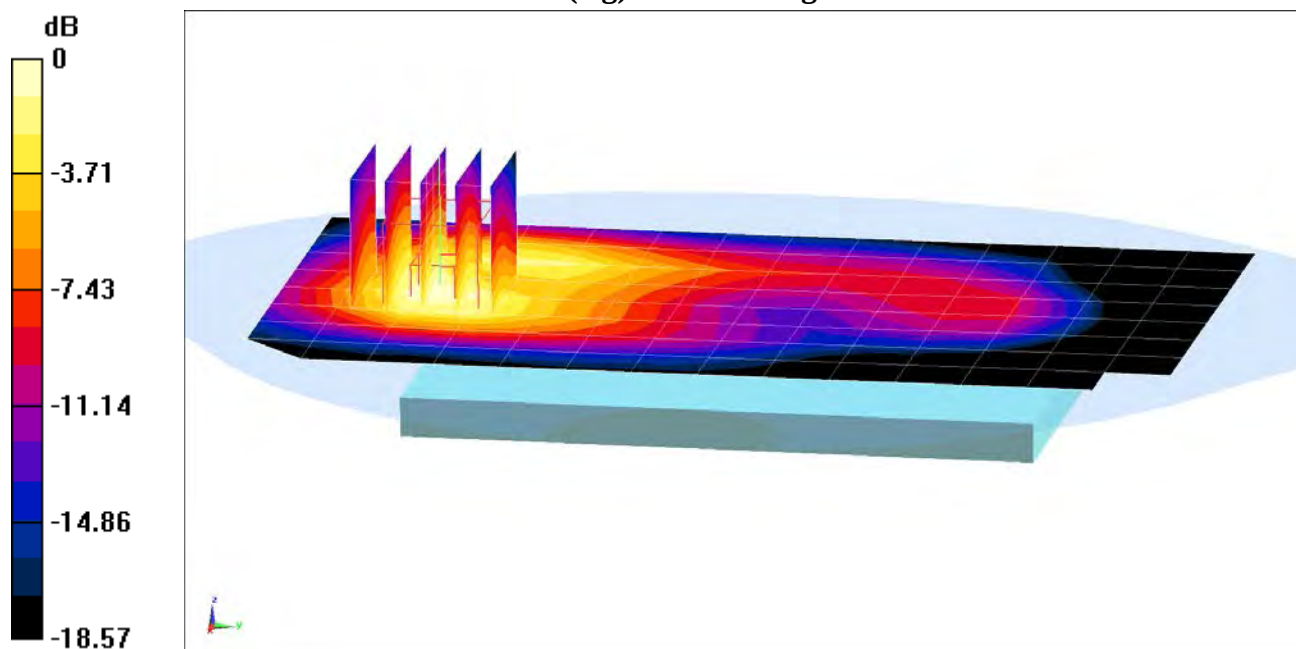
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 18.53 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 0.852 W/kg

SAR (1 g) = 0.527 W/kg



0 dB = 0.634 W/kg = -1.98 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG530P; Type: Portable Handset; Serial: 85244

Communication System: UID 0, LTE Band 41; Frequency: 2636.5 MHz; Duty Cycle: 1:1.58

Medium: 2600 Body Medium parameters used (interpolated):

$f = 2636.5$ MHz; $\sigma = 2.225$ S/m; $\epsilon_r = 50.546$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 05-14-2015; Ambient Temp: 22.9°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3332; ConvF(4.11, 4.11, 4.11); Calibrated: 9/18/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/17/2014

Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648

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

Mode: LTE Band 41, Body SAR, Back side, Mid-High.ch
20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

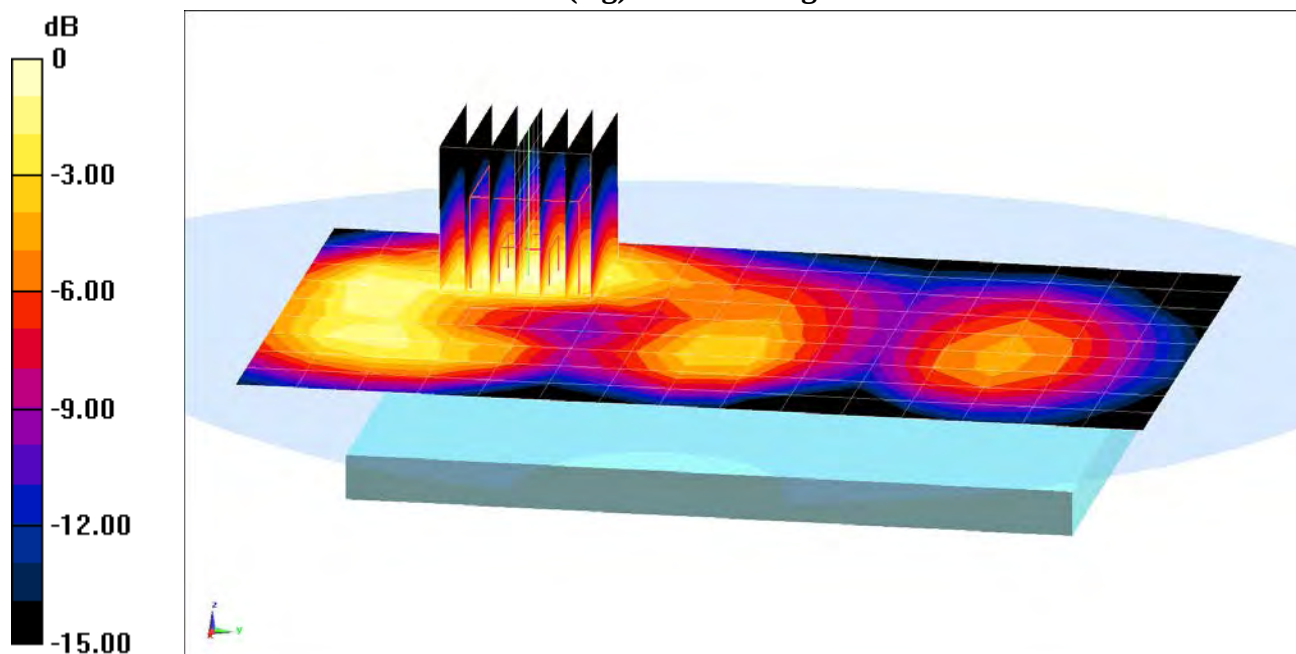
Area Scan (10x16x1): Measurement grid: dx=12mm, dy=12mm

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

Reference Value = 11.37 V/m; Power Drift = -0.16 dB

Peak SAR (extrapolated) = 0.507 W/kg

SAR (1 g) = 0.246 W/kg



0 dB = 0.312 W/kg = -5.06 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG530P; Type: Portable Handset; Serial: 85244

Communication System: UID 0, LTE Band 41; Frequency: 2636.5 MHz; Duty Cycle: 1:1.58

Medium: 2600 Body Medium parameters used (interpolated):

$f = 2636.5 \text{ MHz}$; $\sigma = 2.225 \text{ S/m}$; $\epsilon_r = 50.546$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 05-14-2015; Ambient Temp: 22.9°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3332; ConvF(4.11, 4.11, 4.11); Calibrated: 9/18/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/17/2014

Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648

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

Mode: LTE Band 41, Body SAR, Back side, Mid-High.ch
20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

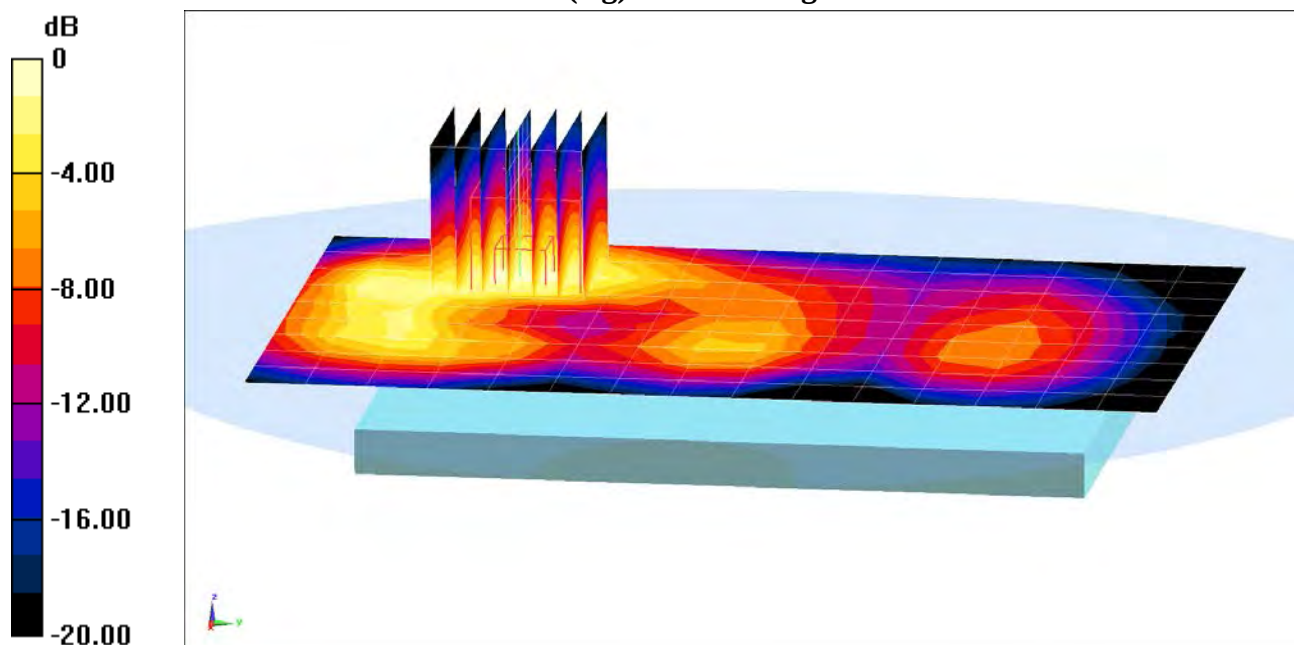
Area Scan (10x16x1): Measurement grid: dx=12mm, dy=12mm

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

Reference Value = 16.36 V/m; Power Drift = 0.16 dB

Peak SAR (extrapolated) = 1.13 W/kg

SAR (1 g) = 0.548 W/kg



0 dB = 0.705 W/kg = -1.52 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG530P; Type: Portable Handset; Serial: 85244

Communication System: UID 0, IEEE 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2437 \text{ MHz}$; $\sigma = 1.952 \text{ S/m}$; $\epsilon_r = 51.333$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 05-14-2015; Ambient Temp: 22.9°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3332; ConvF(4.31, 4.31, 4.31); Calibrated: 9/18/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/17/2014

Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648

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

Mode: IEEE 802.11b, Body SAR, Ch 6, 1 Mbps, Back Side, 22 MHz Bandwidth

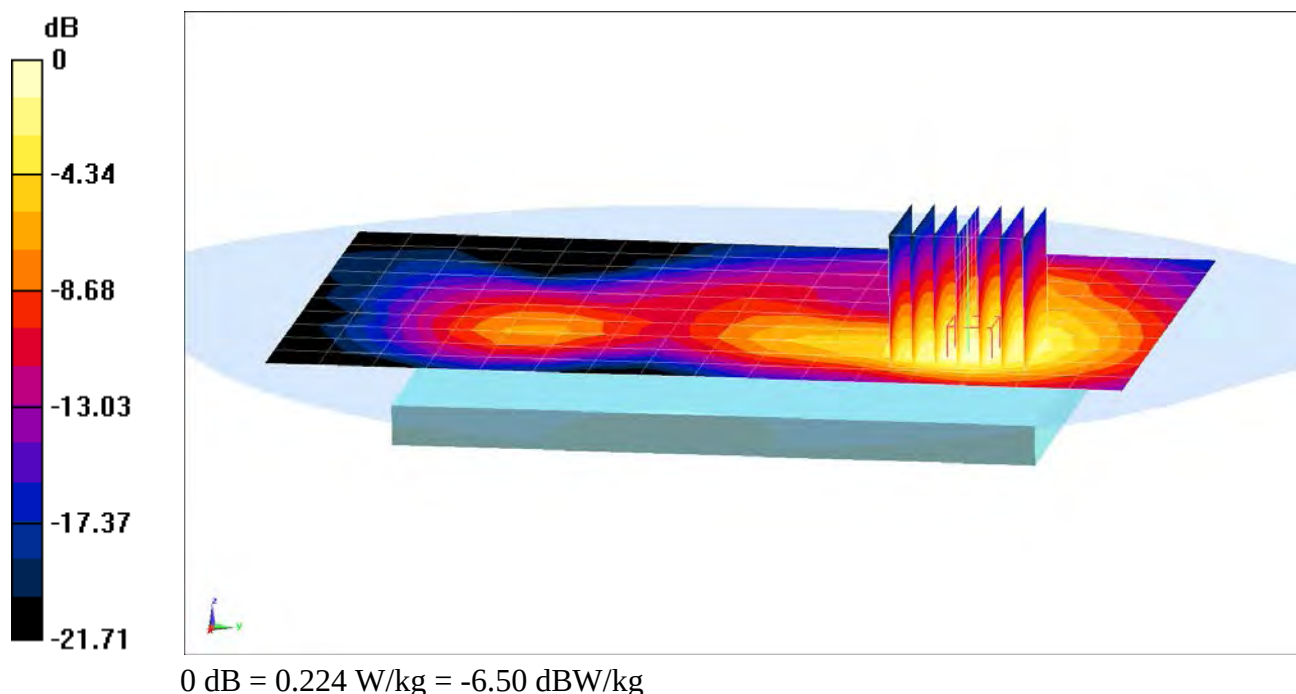
Area Scan (11x17x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 9.733 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.336 W/kg

SAR (1 g) = 0.177 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG530P; Type: Portable Handset; Serial: 85244

Communication System: UID 0, IEEE 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2437 \text{ MHz}$; $\sigma = 1.952 \text{ S/m}$; $\epsilon_r = 51.333$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 05-14-2013; Ambient Temp: 22.9°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3332; ConvF(4.31, 4.31, 4.31); Calibrated: 9/18/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/17/2014

Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648

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

Mode: IEEE 802.11b, Body SAR, Ch 6, 1 Mbps, Back Side, 22 MHz Bandwidth

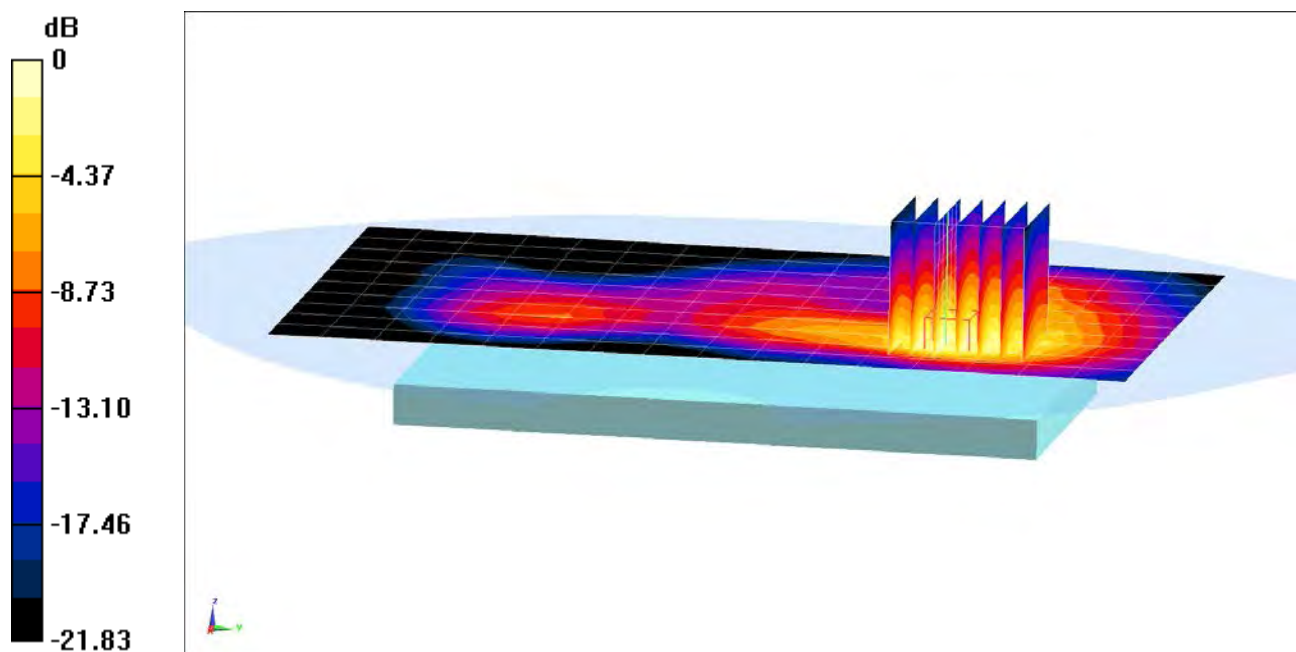
Area Scan (11x17x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 12.93 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.833 W/kg

SAR (1 g) = 0.407 W/kg



0 dB = 0.522 W/kg = -2.82 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 Head Medium parameters used (interpolated):

$f = 750 \text{ MHz}$; $\sigma = 0.914 \text{ S/m}$; $\epsilon_r = 41.312$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 05-13-2015; Ambient Temp: 22.9°C; Tissue Temp: 22.1°C

Probe: ES3DV2 - SN3022; ConvF(6.39, 6.39, 6.39); Calibrated: 8/19/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/12/2014

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)

750 MHz System Verification

Area Scan (7x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

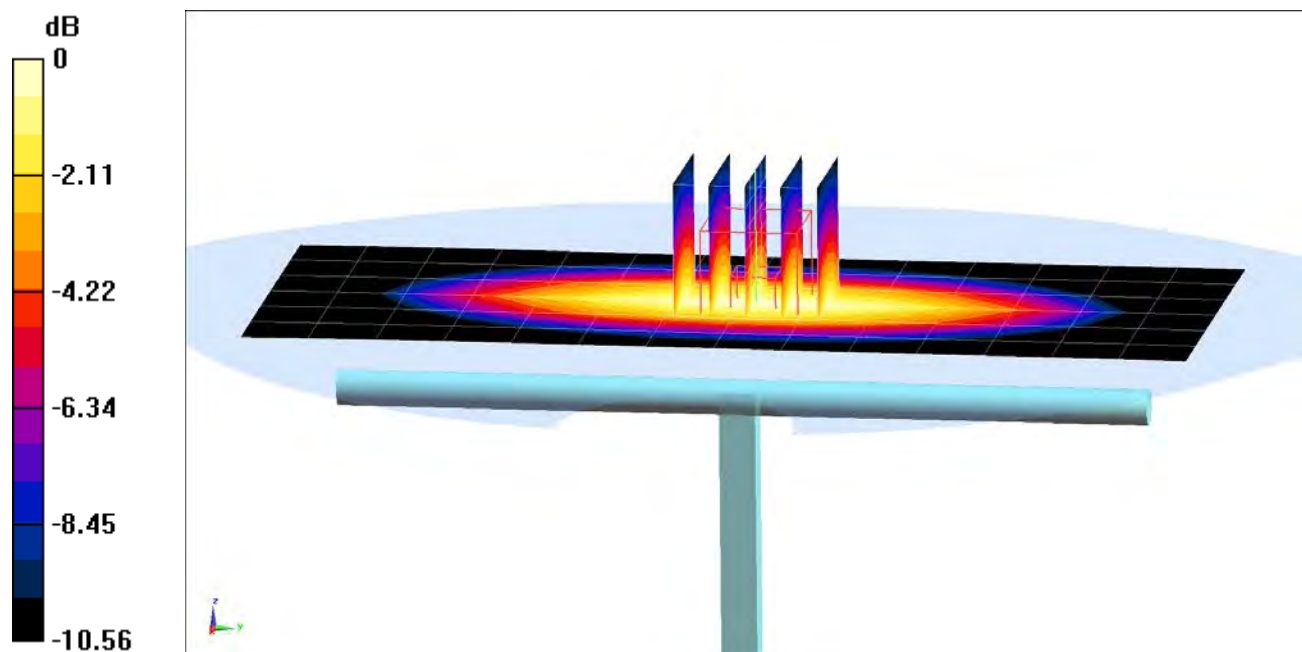
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 1.16 W/kg

SAR (1 g) = 0.783 W/kg

Deviation = -3.21%



0 dB = 0.916 W/kg = -0.38 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 Head Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 0.919 \text{ S/m}$; $\epsilon_r = 41.888$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 05-11-2015; Ambient Temp: 24.1°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3288; ConvF(6.51, 6.51, 6.51); Calibrated: 9/24/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1364; Calibrated: 9/18/2014

Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1797

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

835 MHz System Verification

Area Scan (7x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

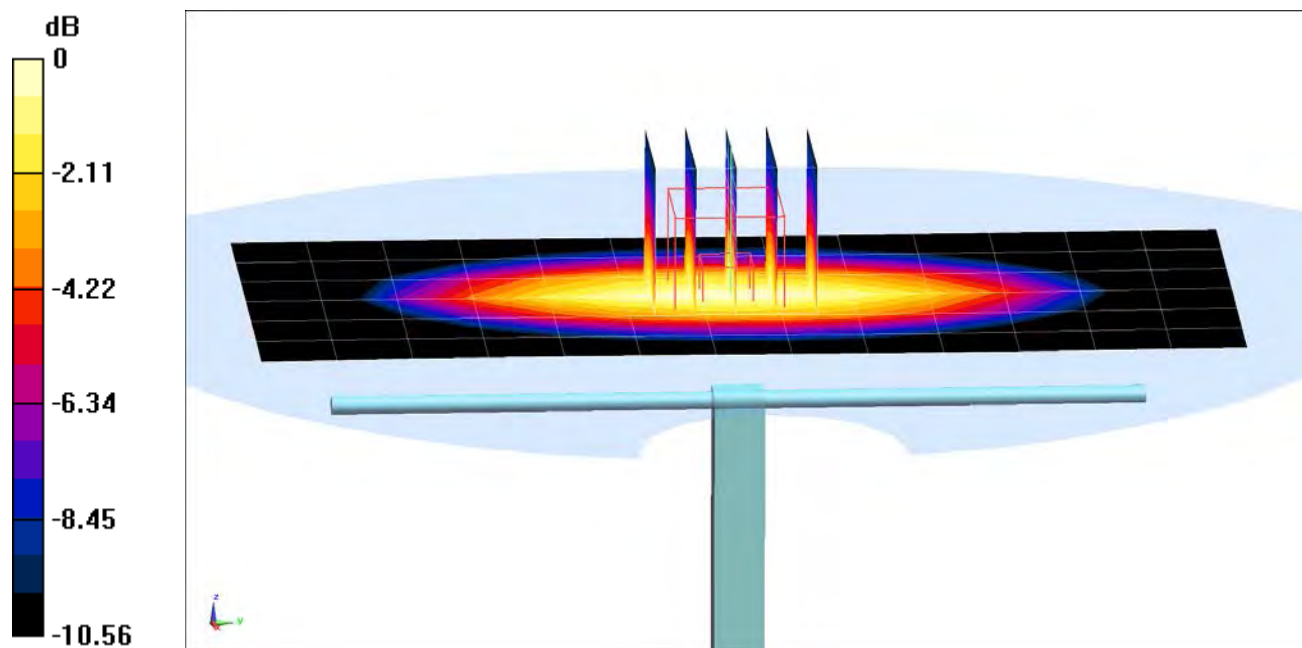
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 1.48 W/kg

SAR (1 g) = 0.990 W/kg

Deviation = 7.61%



0 dB = 1.16 W/kg = 0.64 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 Head Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.386 \text{ S/m}$; $\epsilon_r = 38.607$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 05-13-2015; Ambient Temp: 24.0°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3333; ConvF(5.26, 5.26, 5.26); Calibrated: 10/24/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1408; Calibrated: 10/23/2014

Phantom: Main TWIN SAM; Type: QD000P40CC; Serial: TP-1406

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

1750 MHz System Verification

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

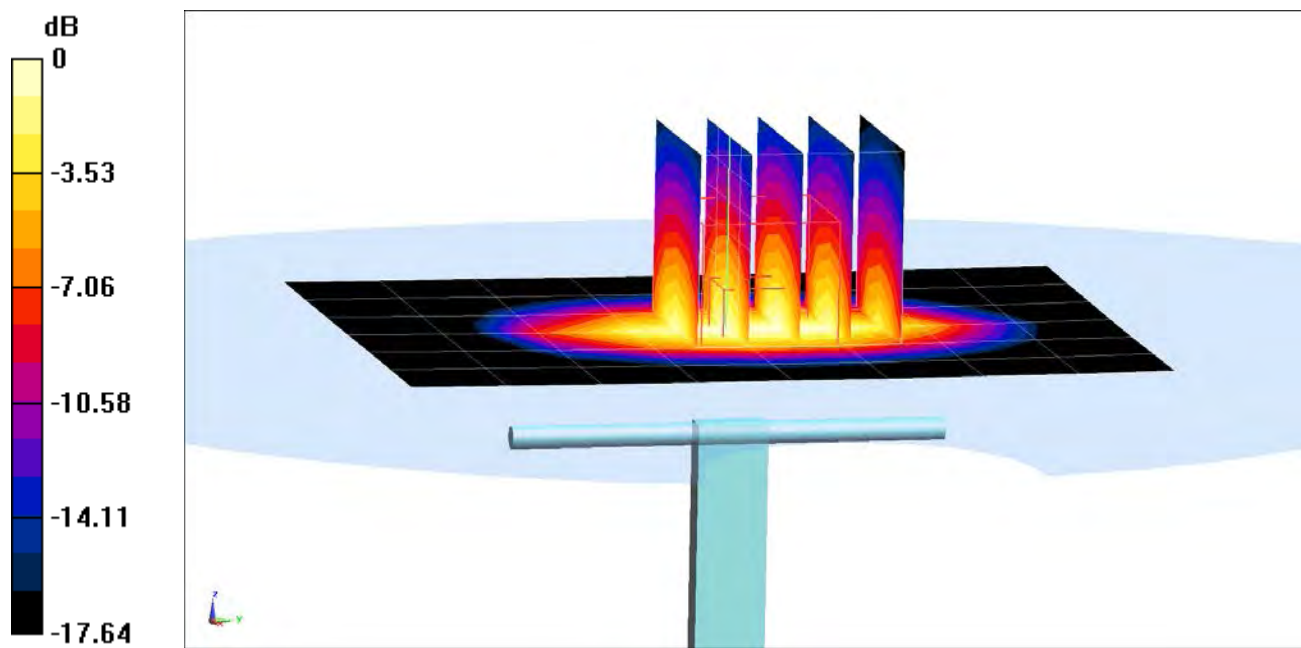
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 6.87 W/kg

SAR (1 g) = 3.85 W/kg

Deviation = 6.35%



0 dB = 4.79 W/kg = 6.80 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 Head Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.424 \text{ S/m}$; $\epsilon_r = 39.211$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 05-11-2015; Ambient Temp: 23.0°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3318; ConvF(5.05, 5.05, 5.05); Calibrated: 1/23/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/14/2015

Phantom: SAM Front; Type: SAM; Serial: 1686

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

1900 MHz System Verification

Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

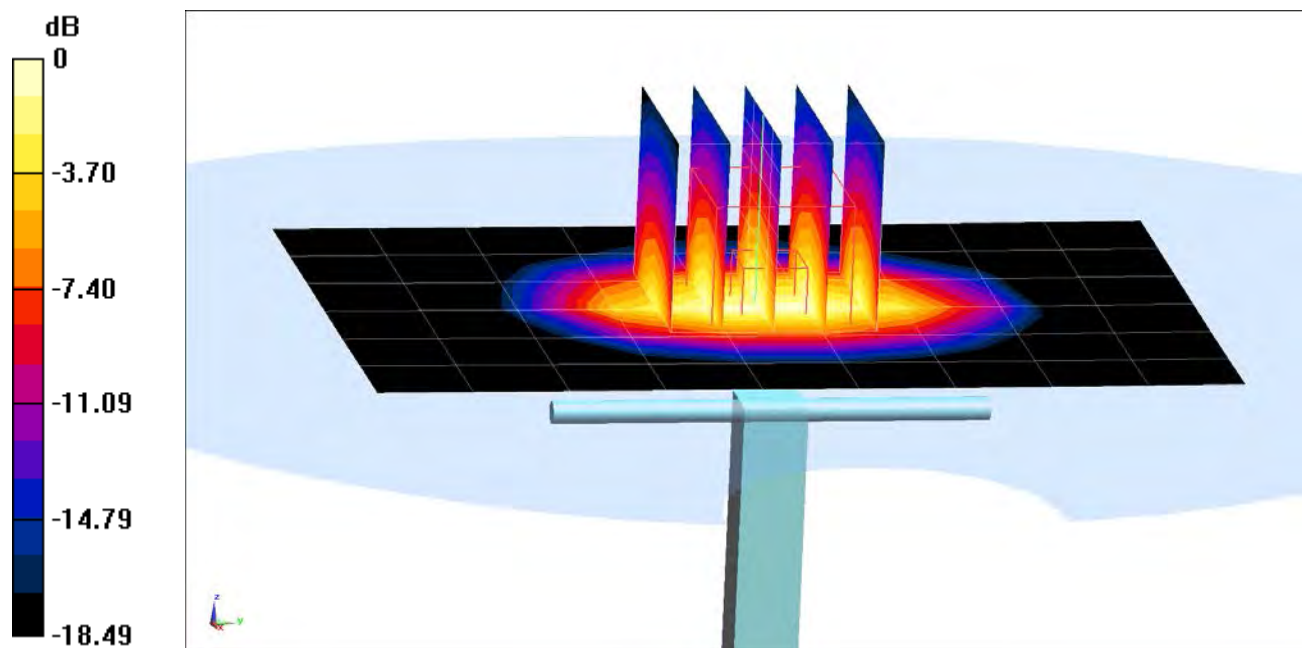
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 7.08 W/kg

SAR (1 g) = 3.82 W/kg

Deviation = -4.98%



0 dB = 4.86 W/kg = 6.87 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 Head Medium parameters used:

$f = 2450 \text{ MHz}$; $\sigma = 1.871 \text{ S/m}$; $\epsilon_r = 38.161$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 05-12-2015; Ambient Temp: 23.2°C; Tissue Temp: 23.7°C

Probe: ES3DV3 - SN3332; ConvF(4.49, 4.49, 4.49); Calibrated: 9/18/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/17/2014

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

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

2450 MHz System Verification

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

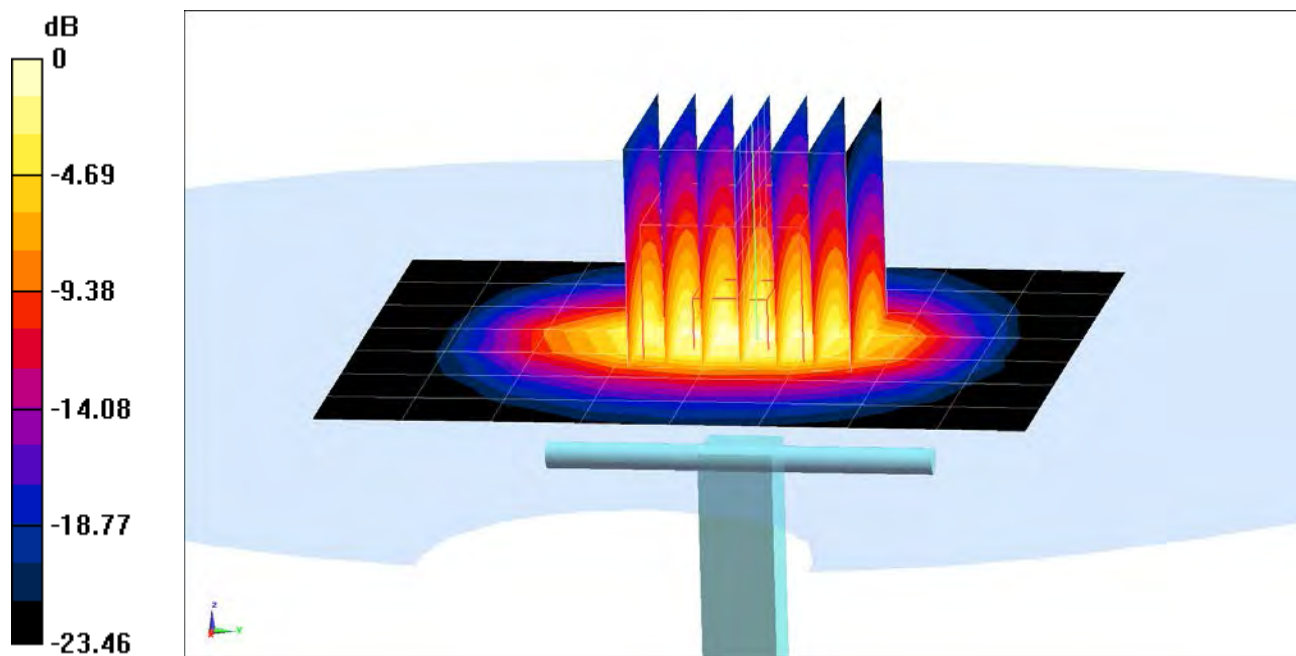
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 11.2 W/kg

SAR (1 g) = 5.34 W/kg

Deviation = 2.50%



0 dB = 6.98 W/kg = 8.44 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: 1071

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

Medium: 2600 Head Medium parameters used:

$f = 2600 \text{ MHz}$; $\sigma = 2.05 \text{ S/m}$; $\epsilon_r = 37.538$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 05-12-2015; Ambient Temp: 23.2°C; Tissue Temp: 23.7°C

Probe: ES3DV3 - SN3332; ConvF(4.35, 4.35, 4.35); Calibrated: 9/18/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/17/2014

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

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

2600 MHz System Verification

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

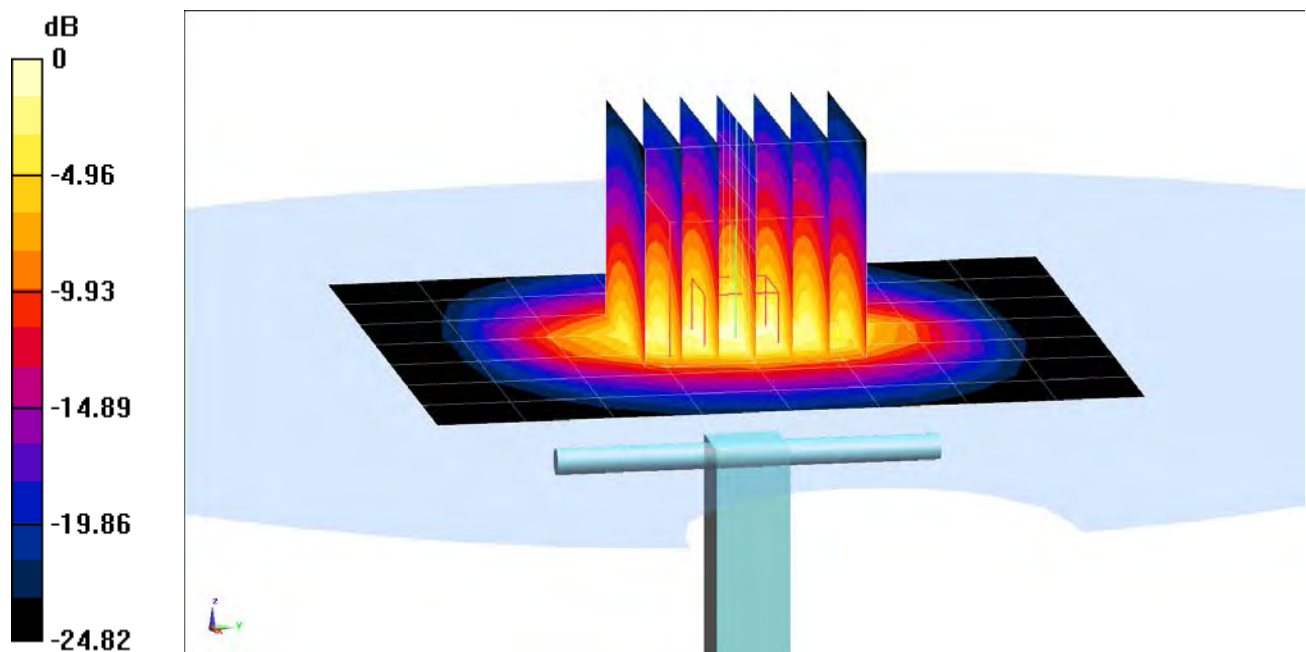
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 12.9 W/kg

SAR (1 g) = 5.85 W/kg

Deviation = 1.74%



0 dB = 7.85 W/kg = 8.95 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 750 MHz; Type: D750V3; Serial: 1054

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

Medium: 750 Body Medium parameters used (interpolated):

$f = 750 \text{ MHz}$; $\sigma = 0.998 \text{ S/m}$; $\epsilon_r = 55.528$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 05-11-2015; Ambient Temp: 23.1°C; Tissue Temp: 22.2°C

Probe: ES3DV2 - SN3022; ConvF(6.02, 6.02, 6.02); Calibrated: 8/19/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/12/2014

Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226

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

750 MHz System Verification

Area Scan (7x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

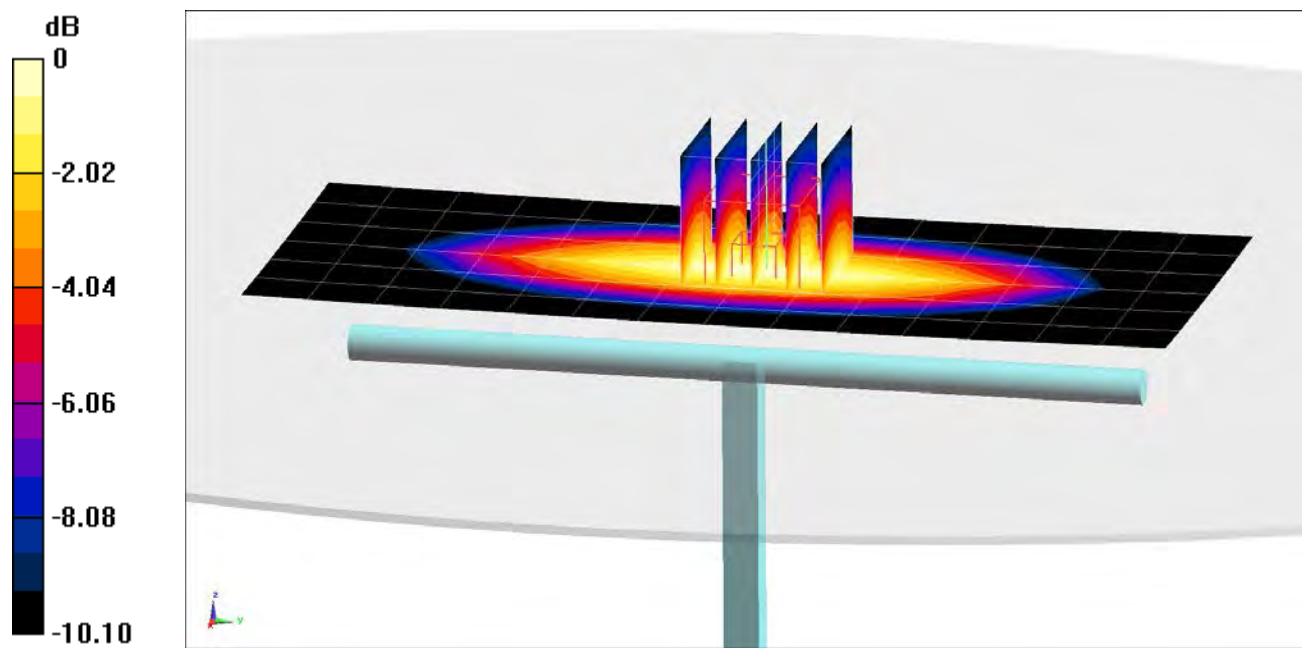
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 1.27 W/kg

SAR (1 g) = 0.870 W/kg

Deviation = 1.99%



0 dB = 1.01 W/kg = 0.04 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:

$f = 835 \text{ MHz}$; $\sigma = 1.009 \text{ S/m}$; $\epsilon_r = 53.954$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 05-11-2015; Ambient Temp: 24.0°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3209; ConvF(6.07, 6.07, 6.07); Calibrated: 3/19/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/13/2015

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

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

835 MHz System Verification

Area Scan (7x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

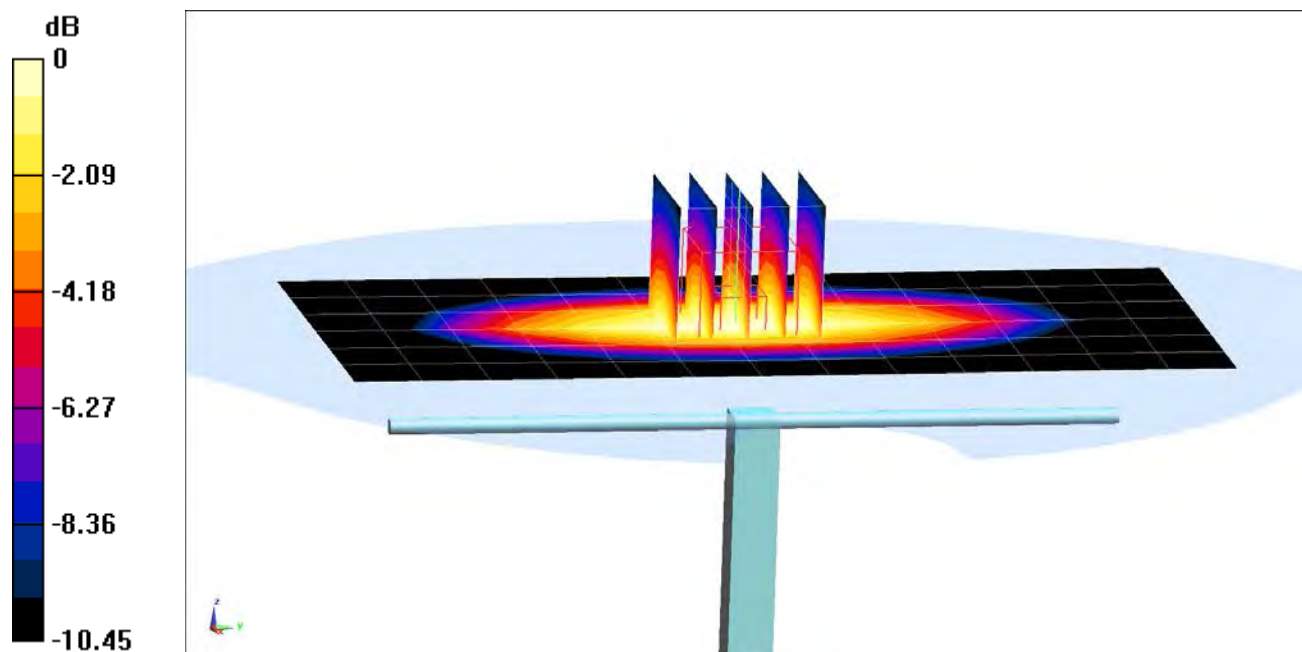
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 1.47 W/kg

SAR (1 g) = 1.000 W/kg

Deviation = 6.95%



0 dB = 1.16 W/kg = 0.64 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d132

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

Medium: 835 Body Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 1 \text{ S/m}$; $\epsilon_r = 53.751$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 05-20-2015; Ambient Temp: 22.6°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3209; ConvF(6.07, 6.07, 6.07); Calibrated: 3/19/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/13/2015

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

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

835 MHz System Verification

Area Scan (7x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

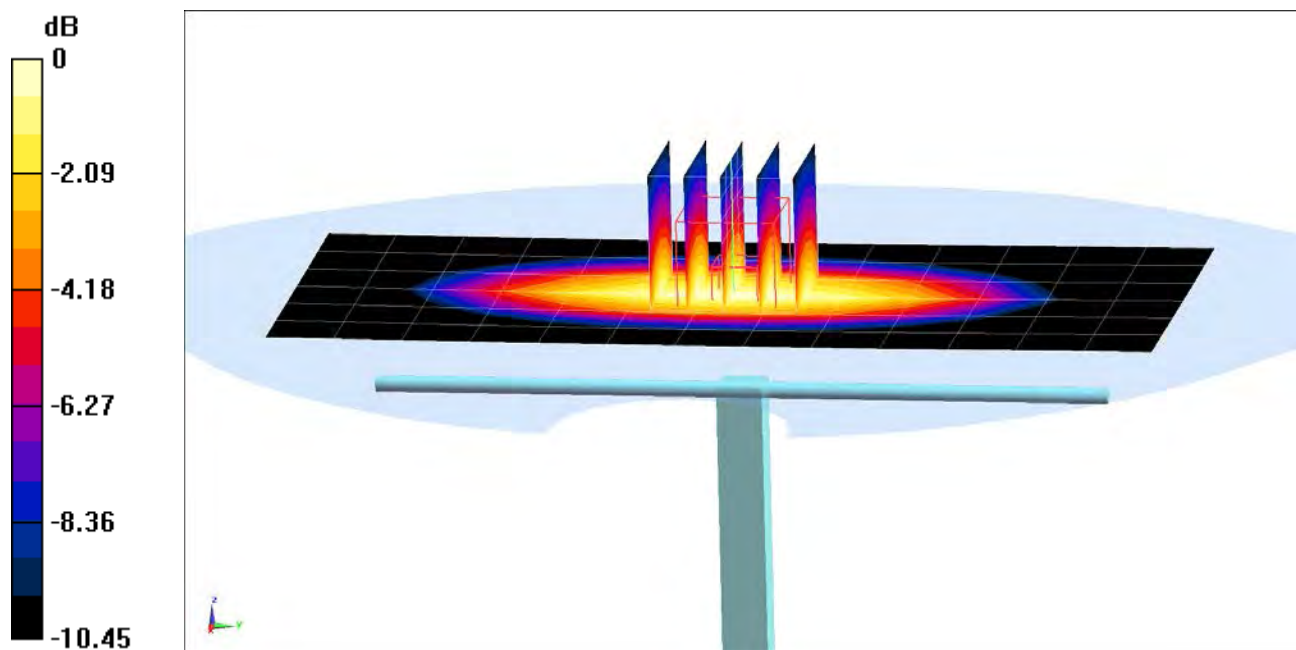
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 1.47 W/kg

SAR (1 g) = 0.997 W/kg

Deviation = 9.08%



0 dB = 1.17 W/kg = 0.68 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:

$f = 835 \text{ MHz}$; $\sigma = 1.018 \text{ S/m}$; $\epsilon_r = 53.93$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 05-26-2015; Ambient Temp: 22.1°C; Tissue Temp: 21.5°C

Probe: ES3DV3 - SN3318; ConvF(6.23, 6.23, 6.23); Calibrated: 1/23/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/14/2015

Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2027

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

835 MHz System Verification

Area Scan (7x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

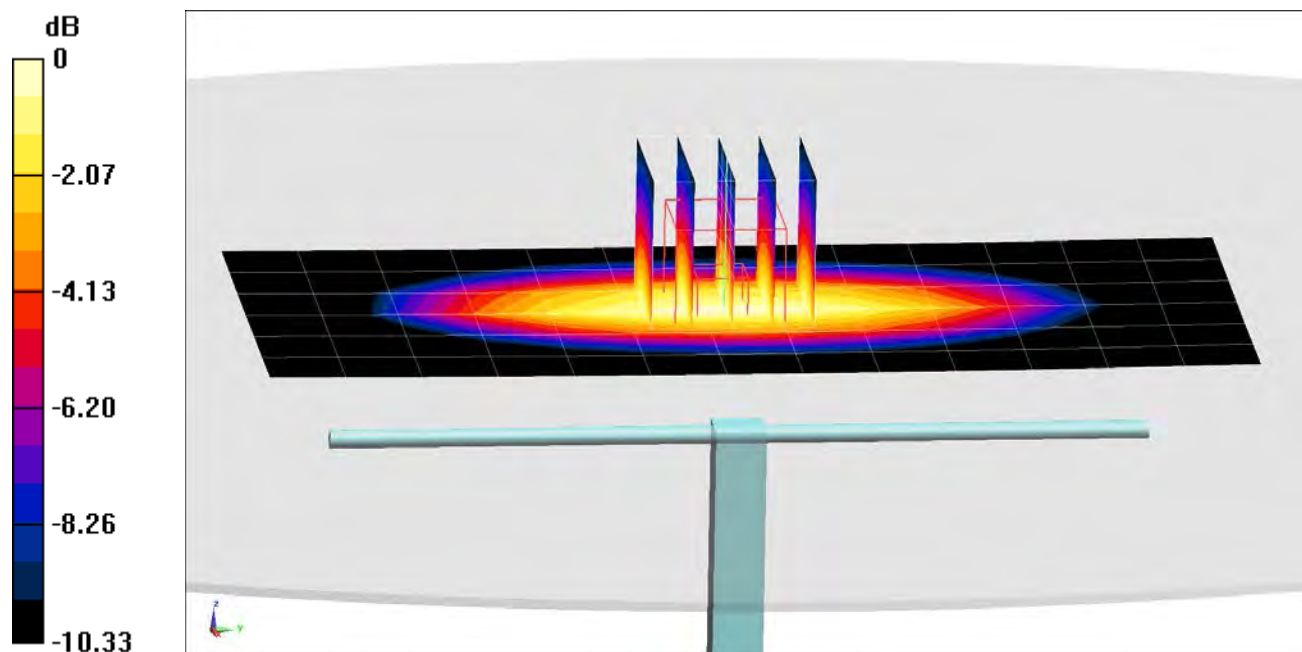
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 1.28 W/kg

SAR (1 g) = 0.878 W/kg

Deviation = -6.10%



0 dB = 1.03 W/kg = 0.13 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:

$f = 1750 \text{ MHz}$; $\sigma = 1.534 \text{ S/m}$; $\epsilon_r = 52.455$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 05-12-2015; Ambient Temp: 22.5°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3334; ConvF(4.94, 4.94, 4.94); Calibrated: 12/16/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1415; Calibrated: 12/12/2014

Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1158

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

1750 MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm

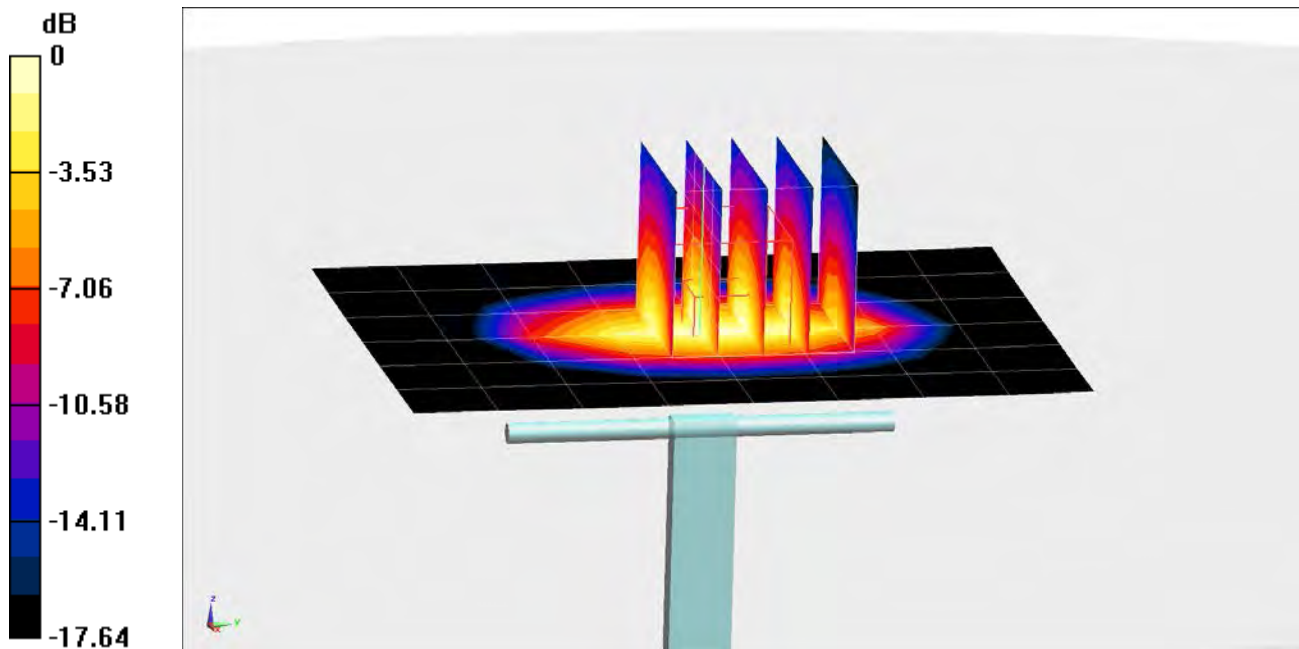
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 7.03 W/kg

SAR (1 g) = 3.95 W/kg

Deviation = 6.47%



0 dB = 4.75 W/kg = 6.77 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d141

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

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.508 \text{ S/m}$; $\epsilon_r = 51.23$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 05-14-2015; Ambient Temp: 23.2°C; Tissue Temp: 23.4°C

Probe: ES3DV3 - SN3258; ConvF(4.64, 4.64, 4.64); Calibrated: 2/27/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

Phantom: SAM with CRP v5.0; Type: QD000P40CD; Serial: TP:1759

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

1900 MHz System Verification

Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

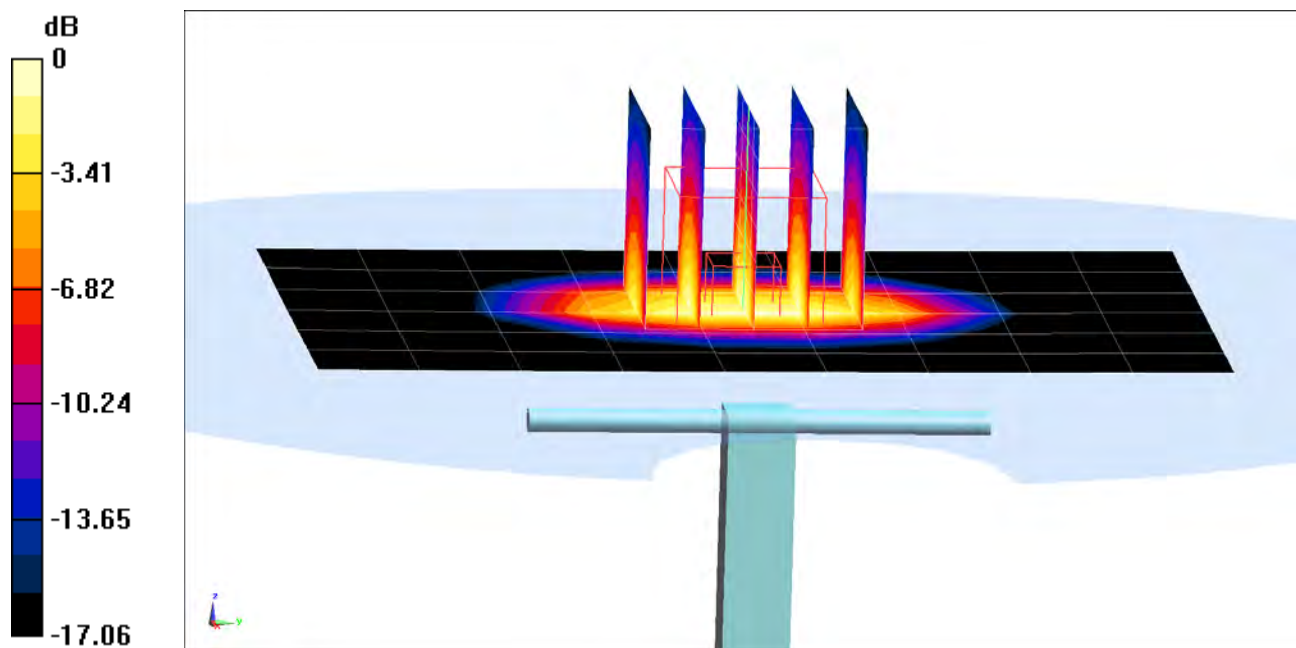
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 6.49 W/kg

SAR (1 g) = 3.71 W/kg

Deviation = -7.25%



0 dB = 4.67 W/kg = 6.69 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:

$f = 2450 \text{ MHz}$; $\sigma = 1.971 \text{ S/m}$; $\epsilon_r = 51.281$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 05-14-2015; Ambient Temp: 22.9°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3332; ConvF(4.31, 4.31, 4.31); Calibrated: 9/18/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/17/2014

Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648

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

2450 MHz System Verification

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

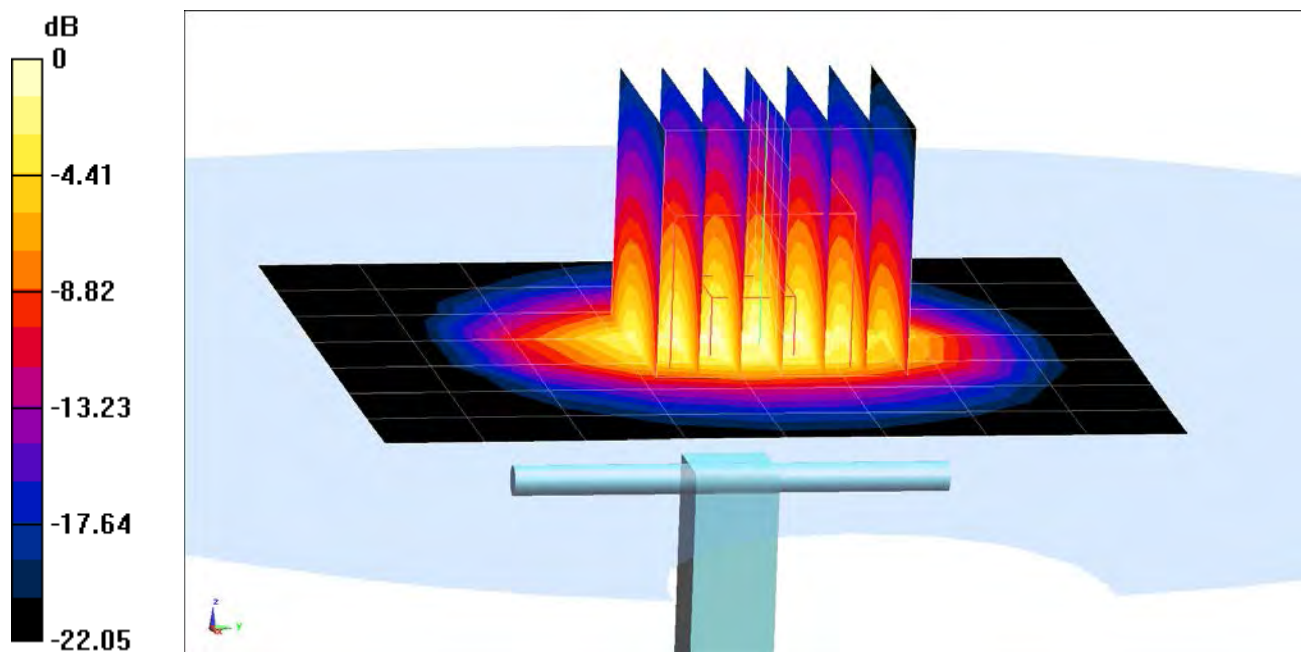
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 10.4 W/kg

SAR (1 g) = 5 W/kg

Deviation = -3.47%



0 dB = 6.55 W/kg = 8.16 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: 1071

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

Medium: 2600 Body Medium parameters used:

$f = 2600 \text{ MHz}$; $\sigma = 2.175 \text{ S/m}$; $\epsilon_r = 50.696$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 05-14-2015; Ambient Temp: 22.9°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3332; ConvF(4.11, 4.11, 4.11); Calibrated: 9/18/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/17/2014

Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648

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

2600 MHz System Verification

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

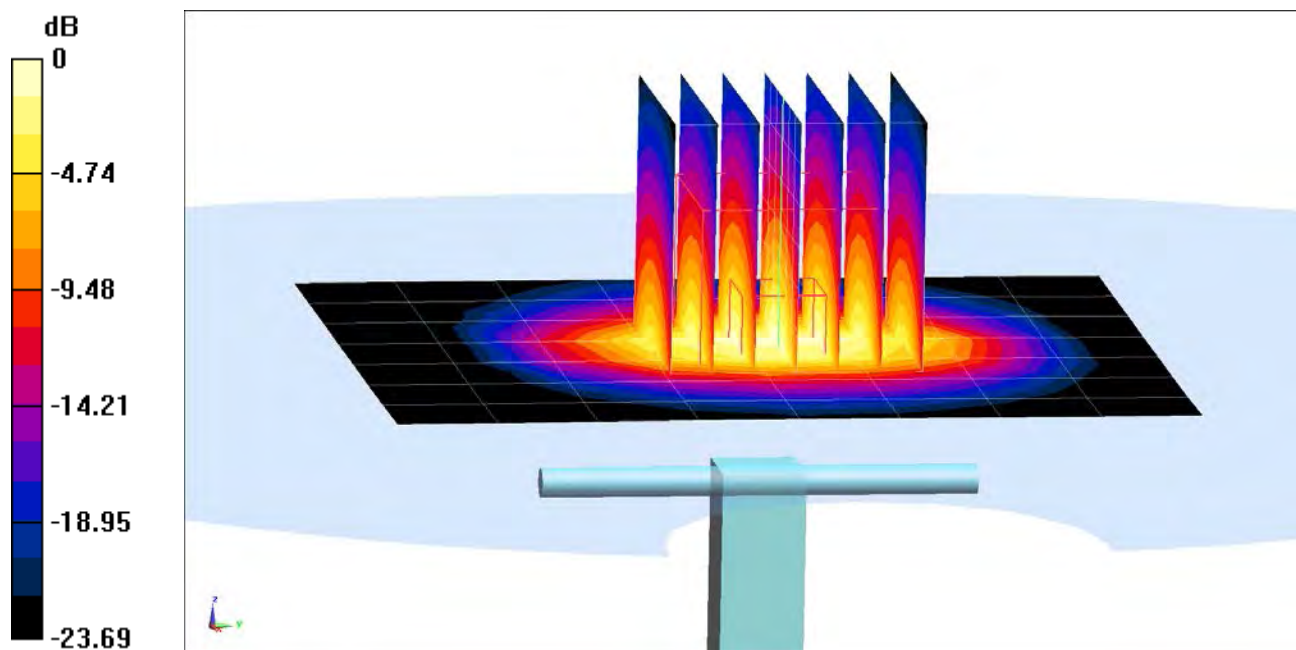
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 13.1 W/kg

SAR (1 g) = 5.66 W/kg

Deviation = -0.53%



0 dB = 7.53 W/kg = 8.77 dBW/kg

APPENDIX C: PROBE CALIBRATION



Accreditation No.: **SCS 0108**

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

Certificate No: **D750V3-1003_Jan15**

Client **PC Test**

CALIBRATION CERTIFICATE

Object **D750V3 - SN: 1003**

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

CC
2/3/15

Calibration date: **January 16, 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 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-14 (No. ES3-3205_Dec14)	Dec-15
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

Calibrated by: **Name** Michael Weber **Function** Laboratory Technician

Signature

Approved by: **Katja Pokovic** **Technical Manager**

Issued: January 19, 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
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

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
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:* SAR measured at the stated antenna input power.
- SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	41.7 $\pm$ 6 %	0.91 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.06 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.09 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.32 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	56.0 $\pm$ 6 %	0.99 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.16 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	8.46 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.42 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	5.58 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.7 Ω - 1.4 j Ω
Return Loss	- 28.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.3 Ω - 3.8 j Ω
Return Loss	- 27.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.043 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	January 21, 2009

DASY5 Validation Report for Head TSL

Date: 16.01.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1003

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.91 \text{ S/m}$; $\epsilon_r = 41.7$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.44, 6.44, 6.44); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

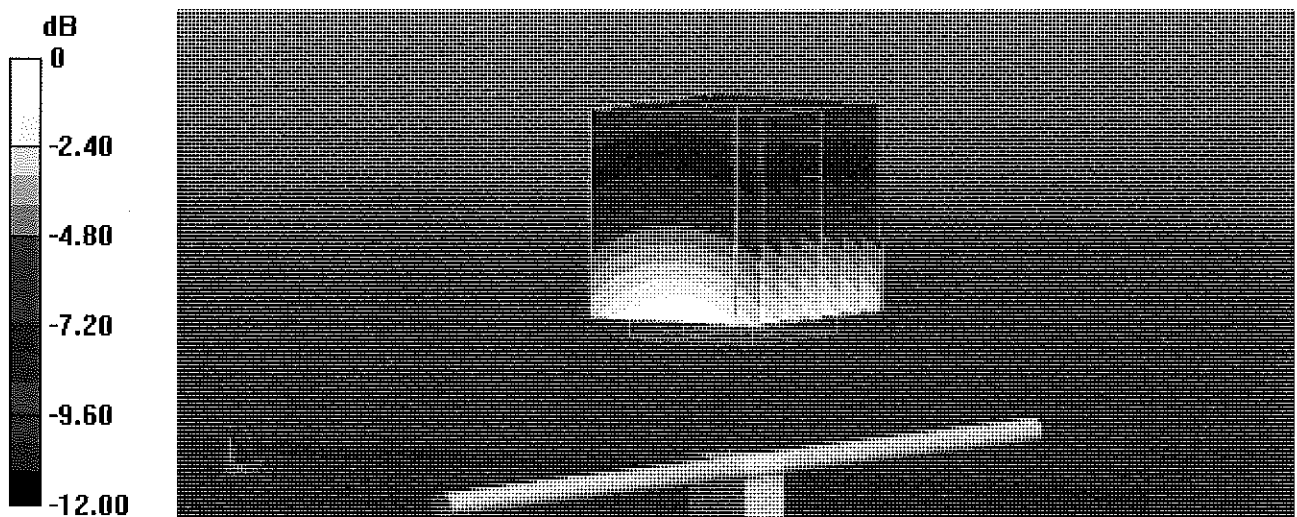
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 53.08 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 3.05 W/kg

SAR(1 g) = 2.06 W/kg; SAR(10 g) = 1.35 W/kg

Maximum value of SAR (measured) = 2.41 W/kg

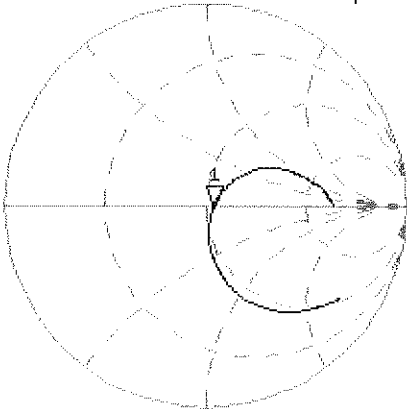


0 dB = 2.41 W/kg = 3.82 dBW/kg

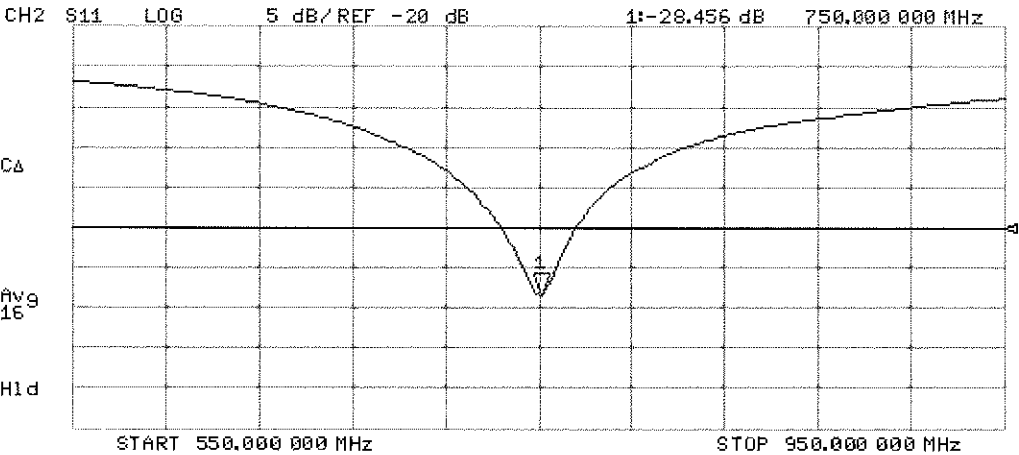
Impedance Measurement Plot for Head TSL

16 Jan 2015 16:07:22
[CH1] S11 1 U FS 1: 53.666 Ω -1.3730 Δ 154.55 pF 750.000 000 MHz

*
Del
CA



Avg
16
H1d



DASY5 Validation Report for Body TSL

Date: 16.01.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1003

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.99 \text{ S/m}$; $\epsilon_r = 56$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.21, 6.21, 6.21); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

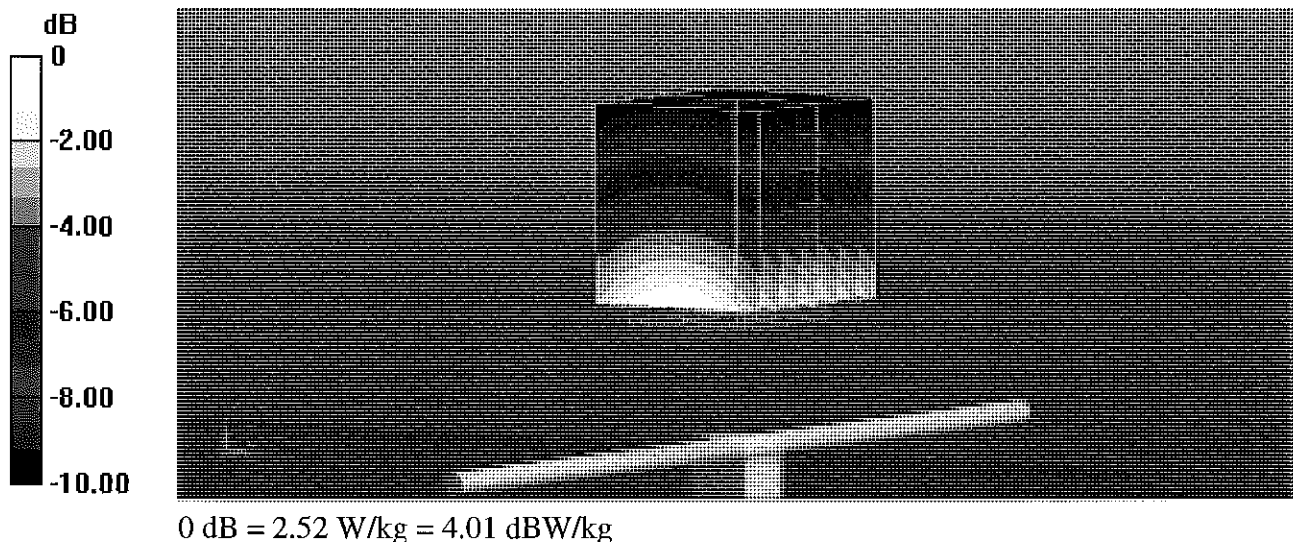
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 52.21 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 3.16 W/kg

SAR(1 g) = 2.16 W/kg; SAR(10 g) = 1.42 W/kg

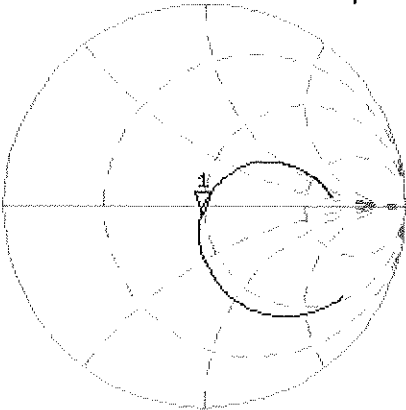
Maximum value of SAR (measured) = 2.52 W/kg



Impedance Measurement Plot for Body TSL

16 Jan 2015 13:37:35
[CH1] S11 1 U FS 1: 48.268 Ω -3.7676 Ω 56.324 pF 750.000 000 MHz

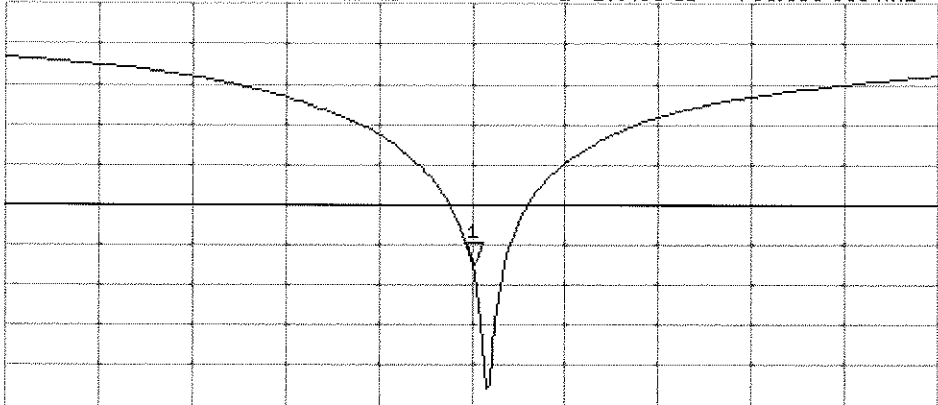
*
De1
CA



Avg
16
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-27.498 dB 750.000 000 MHz

CA
Avg
16
H1d



START 550.000 000 MHz STOP 950.000 000 MHz



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Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D835V2-4d133_Jul14**

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 4d133**

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

CC
W/CM

Calibration date: **July 24, 2014**

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 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	30-Apr-14 (No. DAE4-601_Apr14)	Apr-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8763E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

Calibrated by: **Name** **Function** **Signature**
Jeton Kastrali **Laboratory Technician**

Approved by: **Katja Pokovic** **Technical Manager**

Issued: July 24, 2014

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



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

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
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

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%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	41.1 $\pm$ 6 %	0.94 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.20 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.53 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.96 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	53.8 $\pm$ 6 %	1.02 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.44 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	9.35 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.59 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	6.15 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.6 Ω - 1.0 j Ω
Return Loss	- 34.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.8 Ω - 3.3 j Ω
Return Loss	- 27.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.395 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	July 22, 2011

DASY5 Validation Report for Head TSL

Date: 24.07.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d133

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.94 \text{ S/m}$; $\epsilon_r = 41.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.22, 6.22, 6.22); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Head Tissue/Pin=250 mW, $d=15\text{mm}$ /Zoom Scan (7x7x7)/Cube 0:

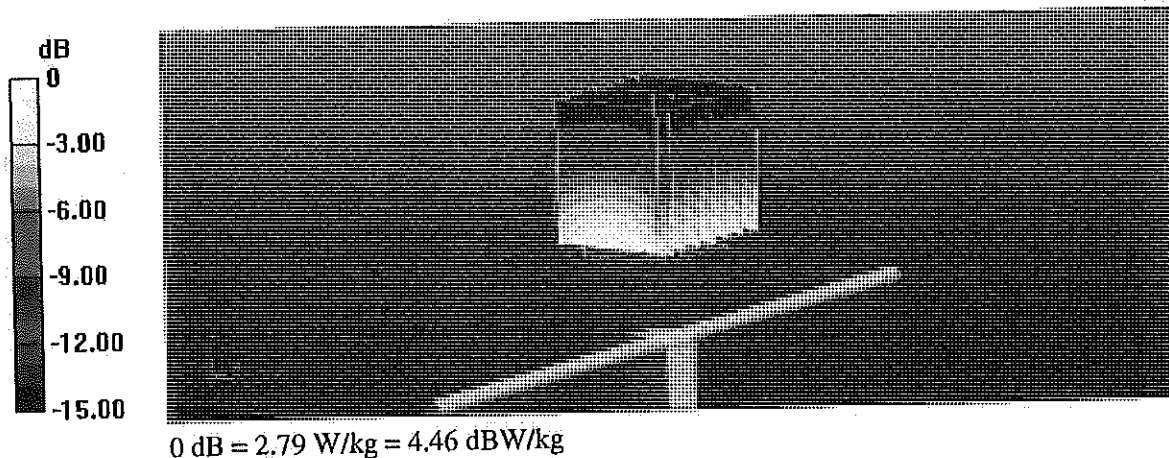
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 56.07 V/m; Power Drift = 0.03 dB

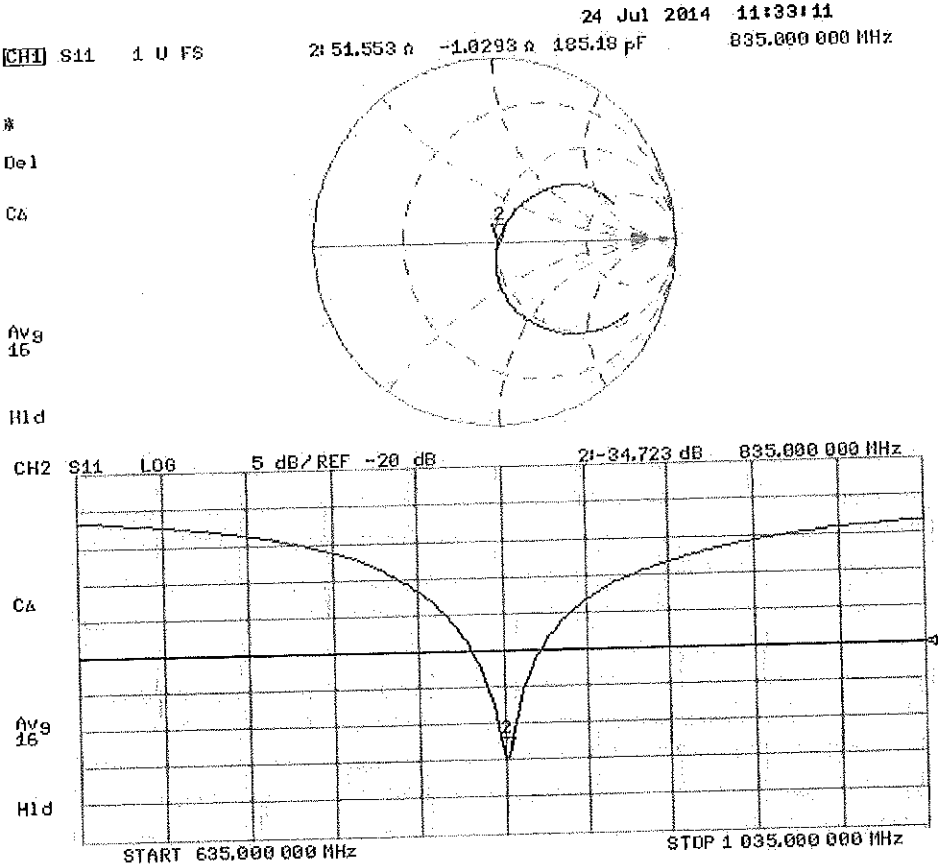
Peak SAR (extrapolated) = 3.58 W/kg

SAR(1 g) = 2.38 W/kg; SAR(10 g) = 1.53 W/kg

Maximum value of SAR (measured) = 2.79 W/kg



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 17.07.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d133

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835$ MHz; $\sigma = 1.02$ S/m; $\epsilon_r = 53.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.09, 6.09, 6.09); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

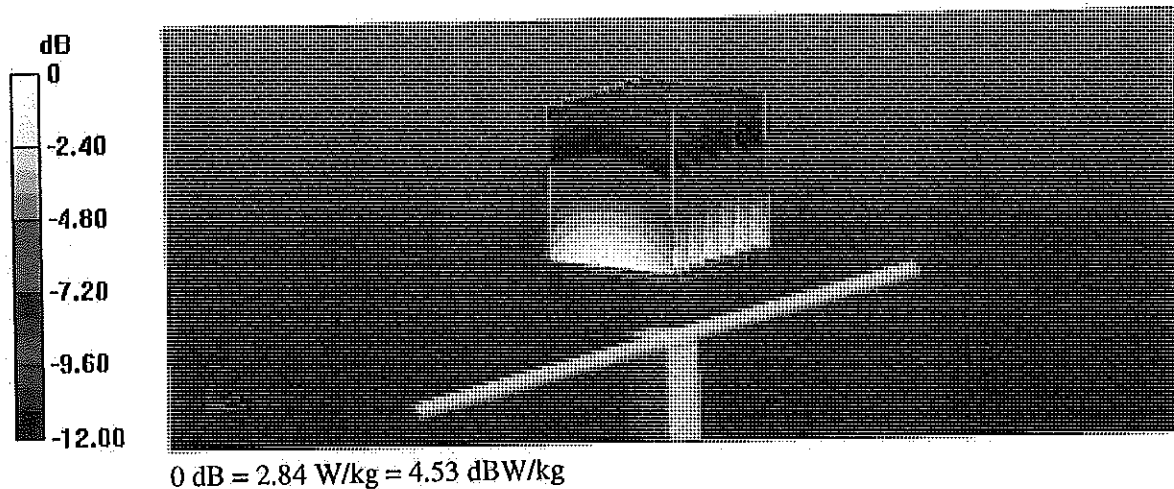
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54.61 V/m; Power Drift = -0.01 dB

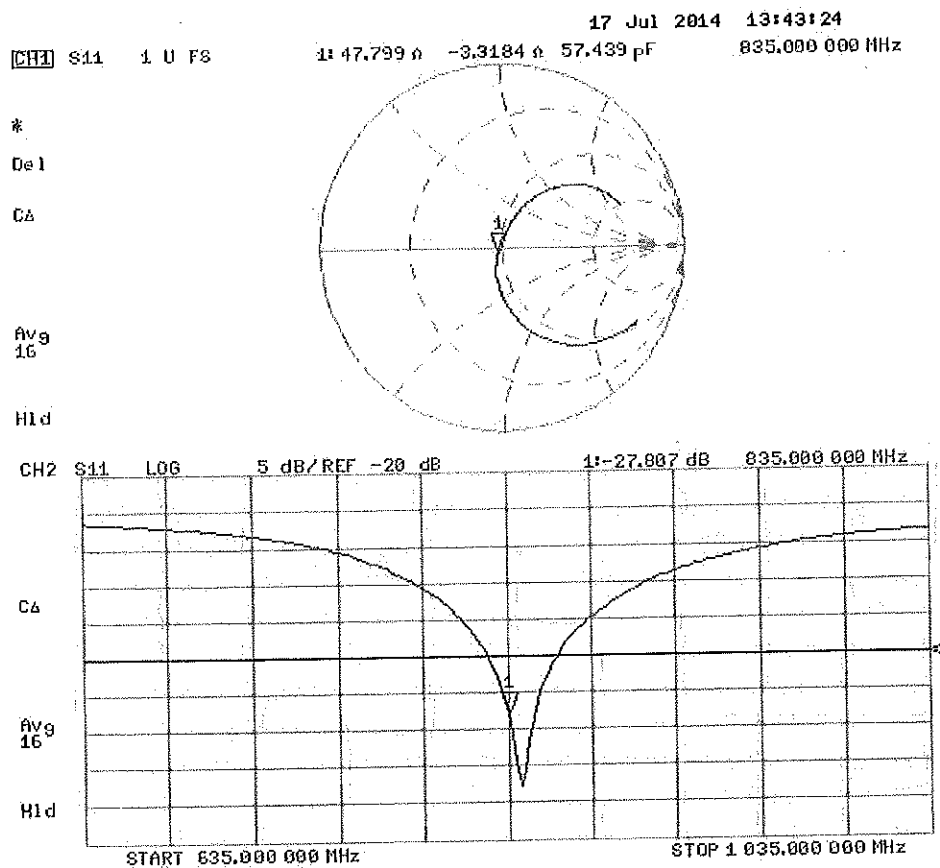
Peak SAR (extrapolated) = 3.59 W/kg

SAR(1 g) = 2.44 W/kg; SAR(10 g) = 1.59 W/kg

Maximum value of SAR (measured) = 2.84 W/kg



Impedance Measurement Plot for Body TSL





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: **D1750V2-1051_Apr15**

CALIBRATION CERTIFICATE

Object **D1750V2 - SN:1051**

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

PM ✓
 4/29/15

Calibration date: **April 15, 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 EPM-442A	GB37480704	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	01-Apr-15 (No. 217-02131)	Mar-16
Type-N mismatch combination	SN: 5047.2 / 06327	01-Apr-15 (No. 217-02134)	Mar-16
Reference Probe ES3DV3	SN: 3205	30-Dec-14 (No. ES3-3205_Dec14)	Dec-15
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

Calibrated by: **Jeton Kastrati** **Laboratory Technician**

Signature

Approved by: **Katja Pokovic** **Technical Manager**

Issued: April 15, 2015

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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**

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

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
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:* SAR measured at the stated antenna input power.
- SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	38.9 $\pm$ 6 %	1.35 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.04 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	36.2 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.80 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	19.2 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	51.5 $\pm$ 6 %	1.48 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.32 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	37.1 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.01 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.0 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.3 Ω - 0.2 j Ω
Return Loss	- 37.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.9 Ω + 0.3 j Ω
Return Loss	- 29.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.221 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	February 19, 2010

DASY5 Validation Report for Head TSL

Date: 15.04.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1051

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.35$ S/m; $\epsilon_r = 38.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.2, 5.2, 5.2); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

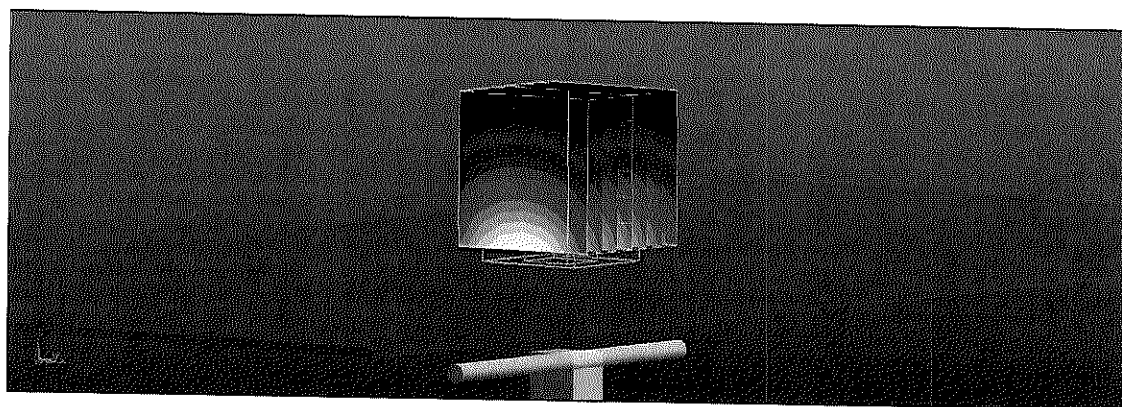
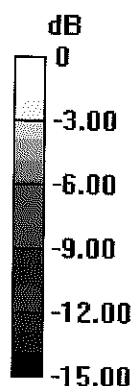
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.99 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 16.3 W/kg

SAR(1 g) = 9.04 W/kg; SAR(10 g) = 4.8 W/kg

Maximum value of SAR (measured) = 11.5 W/kg

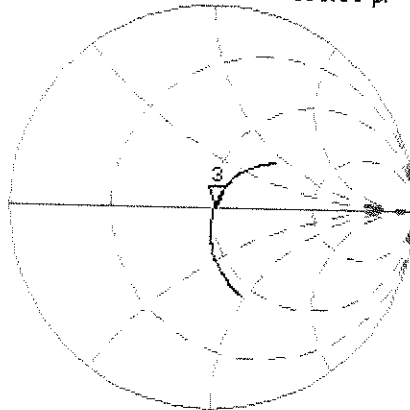


0 dB = 11.5 W/kg = 10.61 dBW/kg

Impedance Measurement Plot for Head TSL

CH1 S11 1 U FS 15 Apr 2015 12:25:31
 3: 51.330 Ω -248.05 m Ω 365.65 pF 1 750.000 000 MHz

*
 Del
 C Δ



Avg
 15

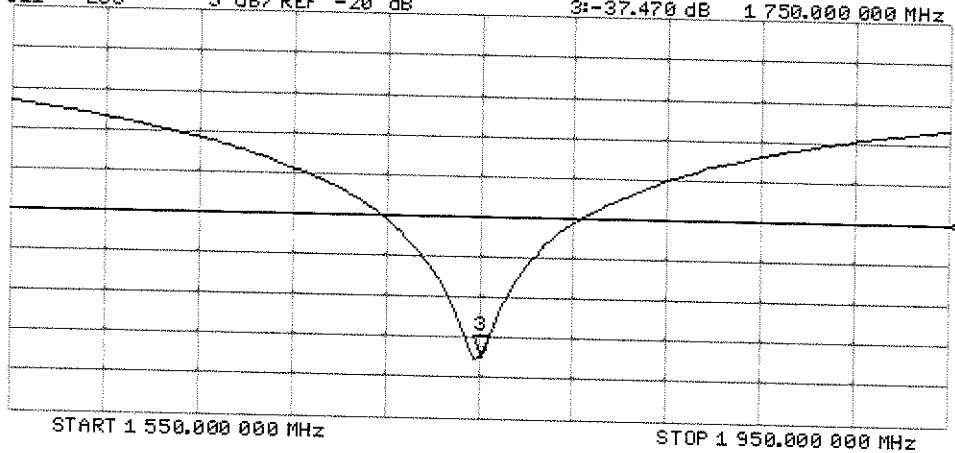
H1d

CH2 S11 LOG 5 dB/REF -20 dB 3:-37.470 dB 1 750.000 000 MHz

C Δ

Avg
 15

H1d



DASY5 Validation Report for Body TSL

Date: 15.04.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1051

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.48$ S/m; $\epsilon_r = 51.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.88, 4.88, 4.88); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

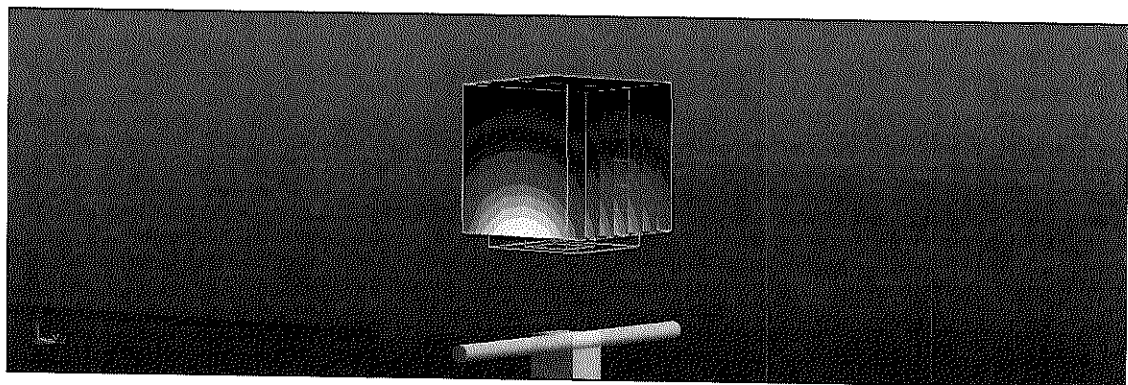
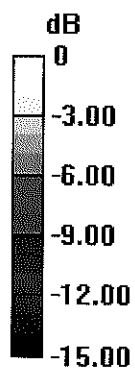
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 92.87 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 16.0 W/kg

SAR(1 g) = 9.32 W/kg; SAR(10 g) = 5.01 W/kg

Maximum value of SAR (measured) = 11.7 W/kg

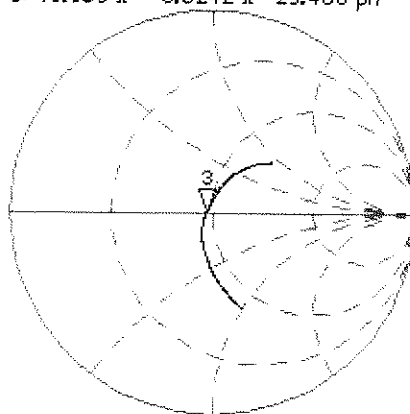


0 dB = 11.7 W/kg = 10.68 dBW/kg

Impedance Measurement Plot for Body TSL

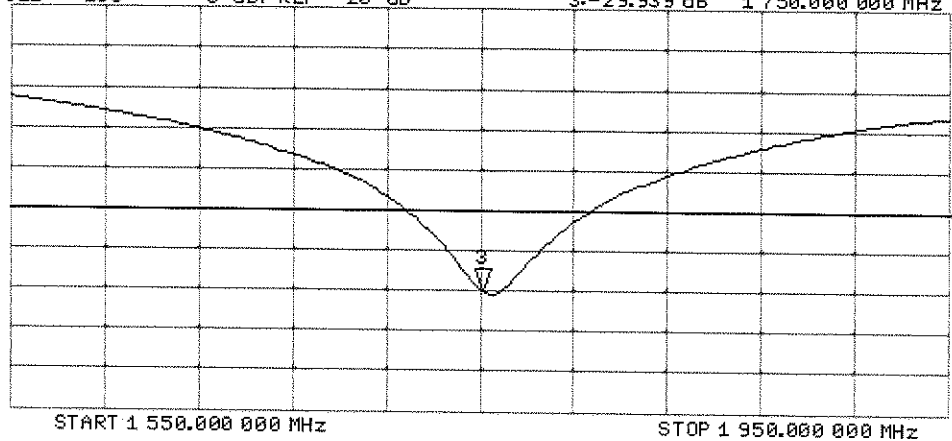
15 Apr 2015 12:23:57
 [CH1] S11 1 U FS 3: 46.930 Ω 0.3242 Ω 29.486 pH 1 750.000 000 MHz

*
 Del
 Ca
 Avg
 16
 H1 d



CH2 S11 LOG 5 dB/REF -20 dB 3:-29.939 dB 1 750.000 000 MHz

Ca
 Avg
 16
 H1 d





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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D1900V2-5d149_Jul14**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d149**

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

CC
 11/5/14

Calibration date: **July 23, 2014**

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 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	30-Apr-14 (No. DAE4-601_Apr14)	Apr-15
Secondary Standards	ID #	Check Date (In house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (In house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (In house check Oct-13)	In house check: Oct-14

Calibrated by:	Name Jeton Kastrati	Function Laboratory Technician	Signature
Approved by:	Katja Pokovic	Technical Manager	

Issued: July 23, 2014

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



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

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
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

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
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:* SAR measured at the stated antenna input power.
- SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	39.5 $\pm$ 6 %	1.38 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.0 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	40.2 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.24 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	21.0 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	52.5 $\pm$ 6 %	1.51 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.1 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	40.4 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.33 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.3 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$52.6 \Omega + 5.5 j\Omega$
Return Loss	- 24.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$48.8 \Omega + 6.1 j\Omega$
Return Loss	- 24.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.197 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 11, 2011

DASY5 Validation Report for Head TSL

Date: 23.07.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d149

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900 \text{ MHz}$; $\sigma = 1.38 \text{ S/m}$; $\epsilon_r = 39.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.06, 5.06, 5.06); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 100I
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Head Tissue/Pin=250 mW, $d=10\text{mm}$ /Zoom Scan (7x7x7)/Cube 0:

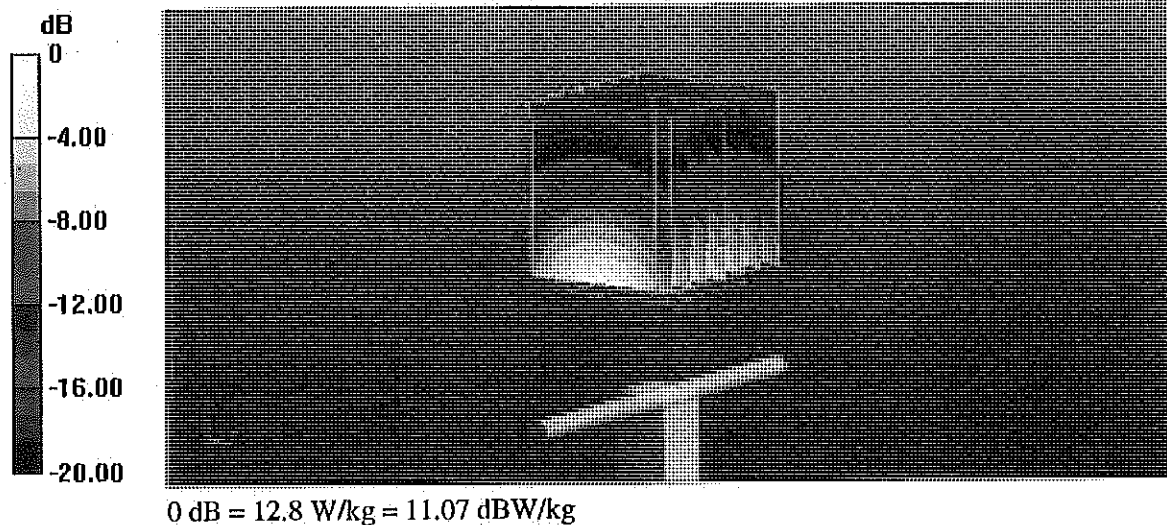
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 98.92 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 18.4 W/kg

SAR(1 g) = 10 W/kg; SAR(10 g) = 5.24 W/kg

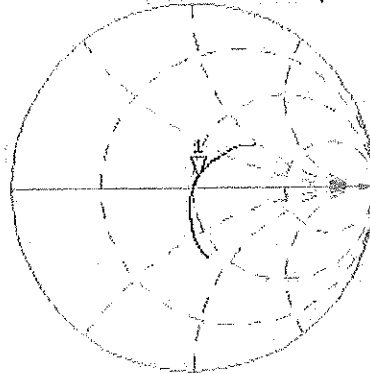
Maximum value of SAR (measured) = 12.8 W/kg



Impedance Measurement Plot for Head TSL

23 Jul 2014 10:46:05
 [CH1] S11 1 U FS 1: 52.600 Ω 5.4570 Ω 457.11 pH 1 900.000 000 MHz

*
 Del
 Cor



Avg
 16

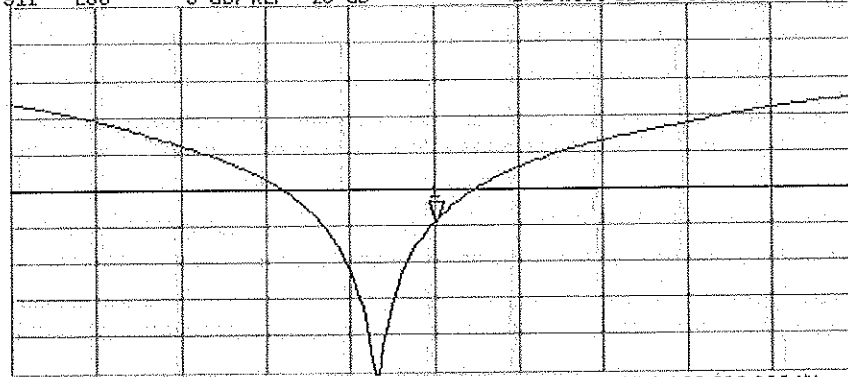
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1: -24.600 dB 1 900.000 000 MHz

Cor

Avg
 16

H1d



START 1 700.000 000 MHz

STOP 2 100.000 000 MHz

DASY5 Validation Report for Body TSL

Date: 23.07.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d149

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.51$ S/m; $\epsilon_r = 52.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.76, 4.76, 4.76); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

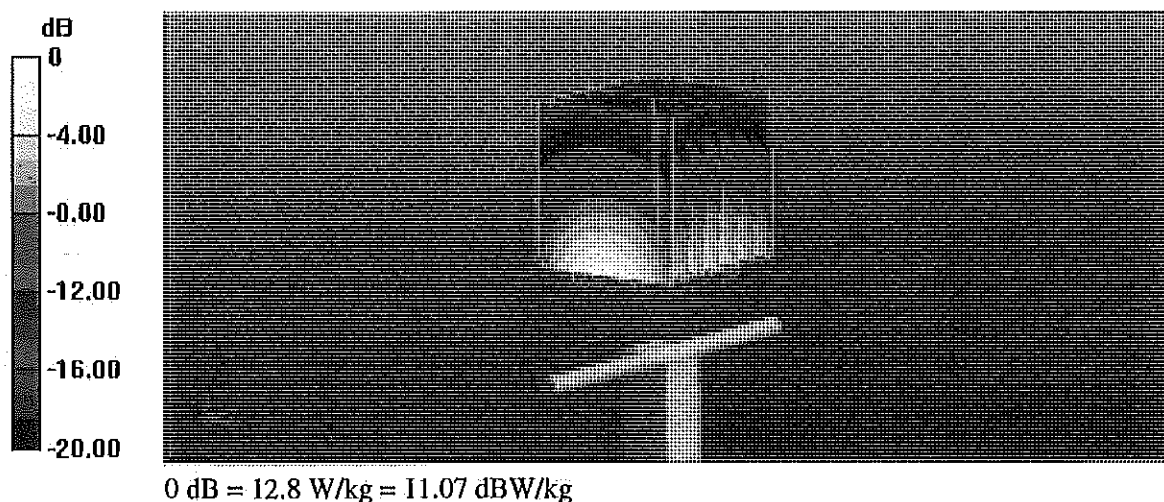
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.83 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 17.6 W/kg

SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.33 W/kg

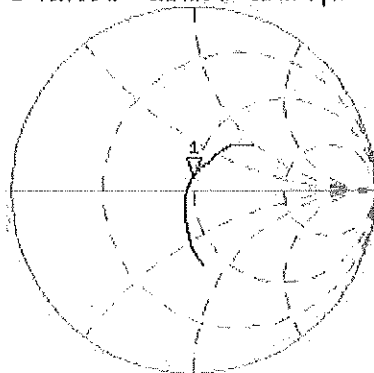
Maximum value of SAR (measured) = 12.8 W/kg



Impedance Measurement Plot for Body TSL

23 Jul 2014 10:45:45
 CH1 S11 1 U FS 1: 48.789 Ω 6.1426 Ω 514.54 μH 1 900.000 000 MHz

*
 Del
 Cor



Avg
 16

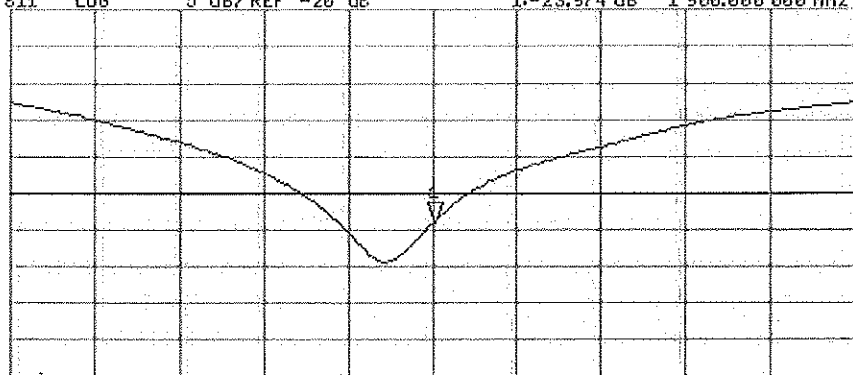
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1: -23.974 dB 1 900.000 000 MHz

Cor

Avg
 16

H1d



START 1 700.000 000 MHz

STOP 2 100.000 000 MHz



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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D2450V2-719_Aug14**

CALIBRATION CERTIFICATE

Object **D2450V2 - SN: 719**

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: **August 11, 2014**

✓ KOK
9/8/14

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 EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	30-Apr-14 (No. DAE4-601_Apr14)	Apr-15
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

Calibrated by: **Michael Weber** Function: **Laboratory Technician**

Signature

M. Weber

Approved by: **Katja Pokovic** Technical Manager

Katja Pokovic

Issued: August 12, 2014

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



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

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
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

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
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:* SAR measured at the stated antenna input power.
- SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	38.0 $\pm$ 6 %	1.82 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.2 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	52.1 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.09 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.2 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	50.5 $\pm$ 6 %	2.02 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.3 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	51.8 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.10 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	24.0 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$54.9 \Omega + 3.0 j\Omega$
Return Loss	- 25.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$50.9 \Omega + 5.8 j\Omega$
Return Loss	- 24.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.149 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	September 10, 2002

DASY5 Validation Report for Head TSL

Date: 11.08.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 719

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.82$ S/m; $\epsilon_r = 38$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

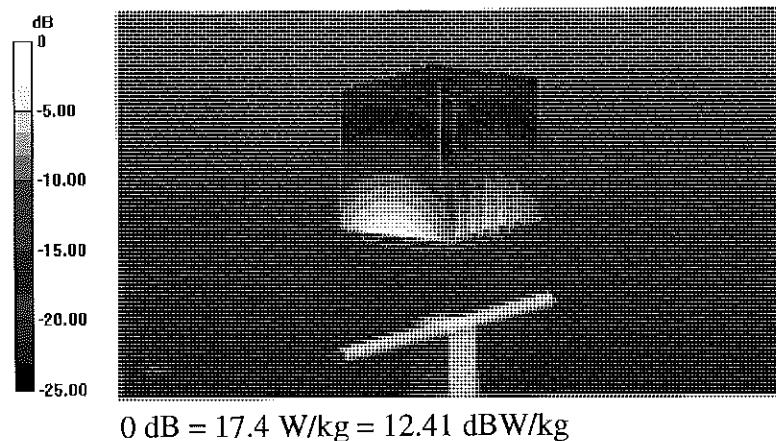
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 101.6 V/m; Power Drift = 0.03 dB

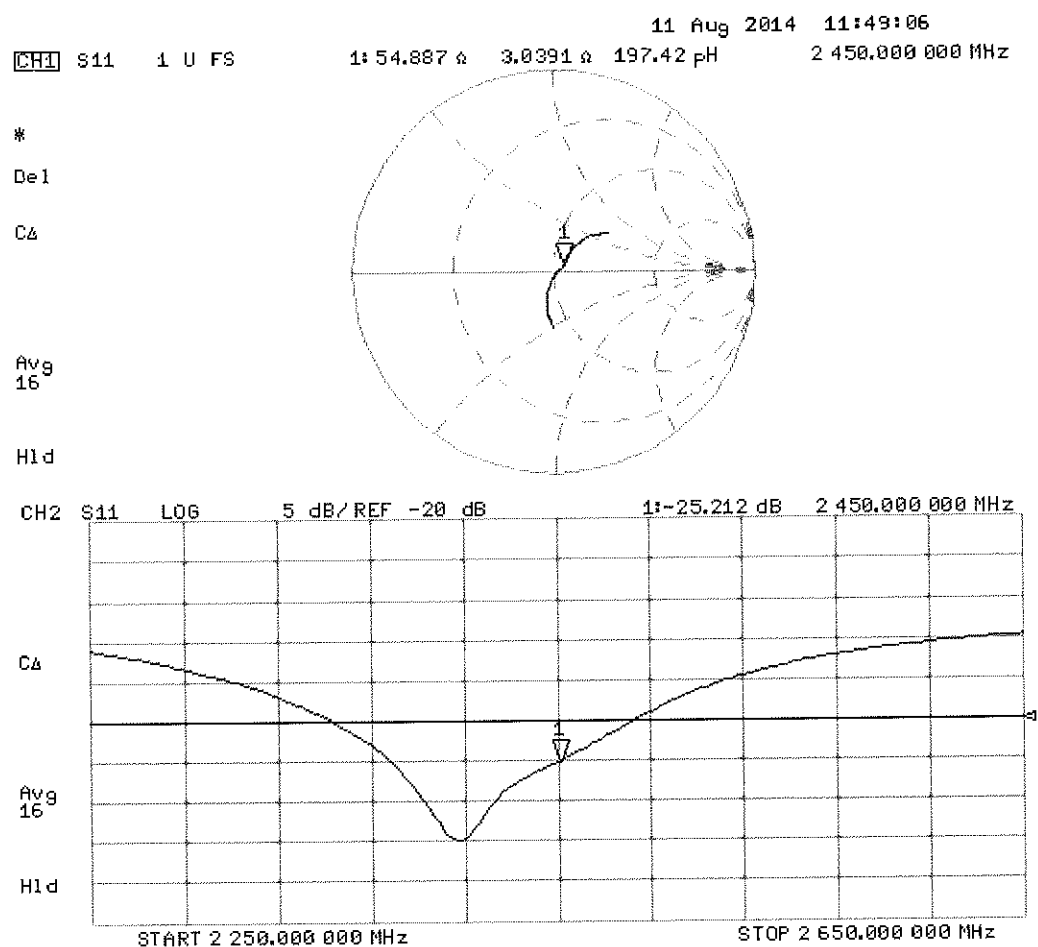
Peak SAR (extrapolated) = 27.5 W/kg

SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.09 W/kg

Maximum value of SAR (measured) = 17.4 W/kg



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 11.08.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 719

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 2.02$ S/m; $\epsilon_r = 50.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.35, 4.35, 4.35); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

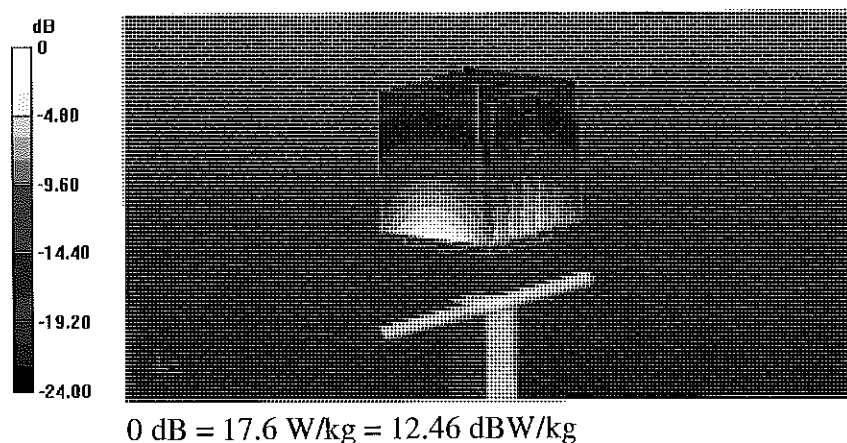
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.08 V/m; Power Drift = -0.01 dB

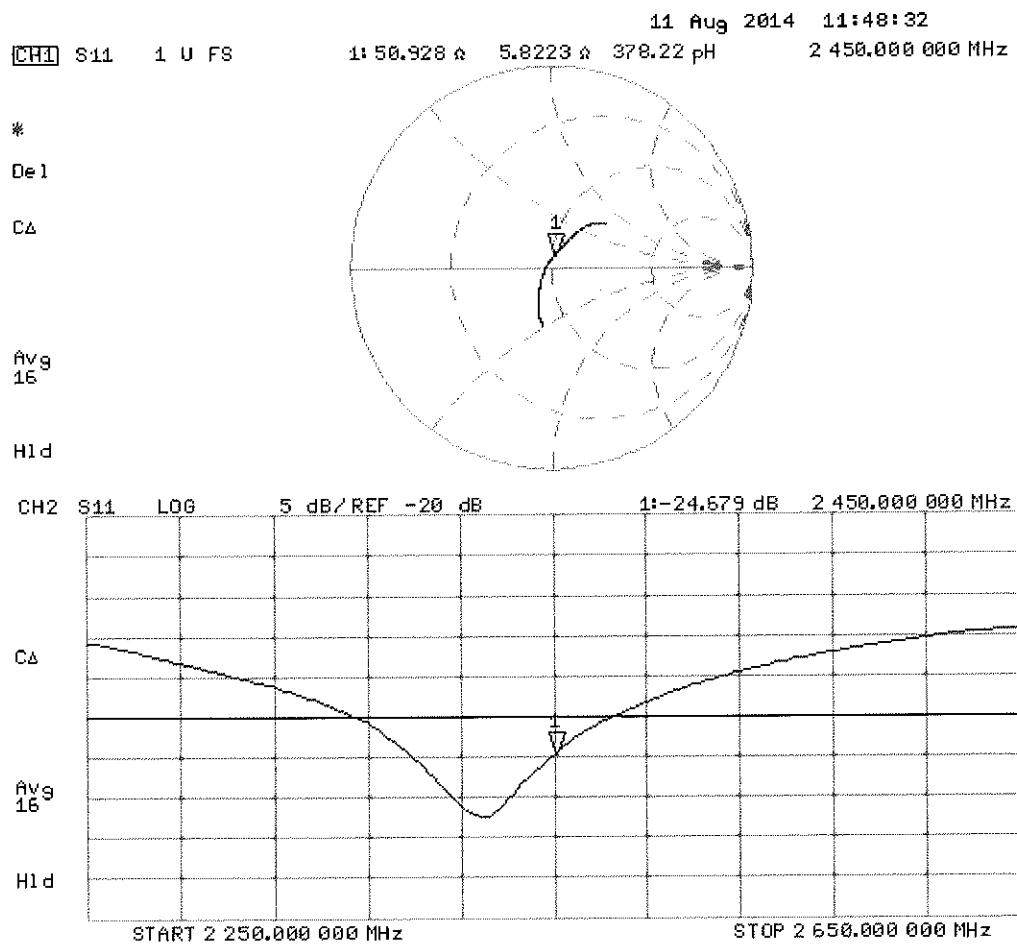
Peak SAR (extrapolated) = 27.9 W/kg

SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.1 W/kg

Maximum value of SAR (measured) = 17.6 W/kg



Impedance Measurement Plot for Body TSL





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Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D2600V2-1071_Oct14**

CALIBRATION CERTIFICATE

Object **D2600V2 - SN: 1071**

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

CC
 WMP

Calibration date: **October 20, 2014**

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 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15
Secondary Standards	ID #	Check Date (In house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

Calibrated by: **Michael Weber** Name: **Michael Weber** Function: **Laboratory Technician**

Signature

[Signature]

Approved by: **Katja Pokovic** Name: **Katja Pokovic** Technical Manager

[Signature]

Issued: October 20, 2014

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

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
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:* SAR measured at the stated antenna input power.
- SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2600 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	37.8 $\pm$ 6 %	2.03 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	14.7 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	57.5 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW Input power	6.57 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	25.9 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.5	2.16 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	50.8 $\pm$ 6 %	2.22 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW Input power	14.5 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	56.9 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW Input power	6.43 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	25.4 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.7 Ω - 5.2 j Ω
Return Loss	- 25.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.9 Ω - 4.2 j Ω
Return Loss	- 24.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.153 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	July 17, 2013

DASY5 Validation Report for Head TSL

Date: 20.10.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1071

Communication System: UID 0 - CW; Frequency: 2600 MHz

Medium parameters used: $f = 2600$ MHz; $\sigma = 2.03$ S/m; $\epsilon_r = 37.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.46, 4.46, 4.46); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

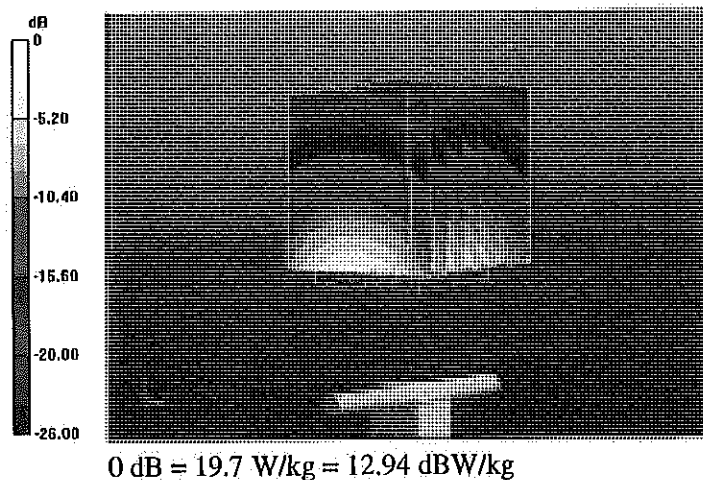
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 103.3 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 31.0 W/kg

SAR(1 g) = 14.7 W/kg; SAR(10 g) = 6.57 W/kg

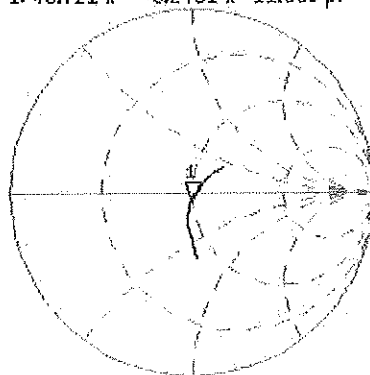
Maximum value of SAR (measured) = 19.7 W/kg



Impedance Measurement Plot for Head TSL

20 Oct 2014 11:58:04
 CH1 S11 1 U.FS 1: 48.721 Ω -5.2461 Ω 11.668 pF 2 600.000 000 MHz

*
 Del
 CA



AVG
 16

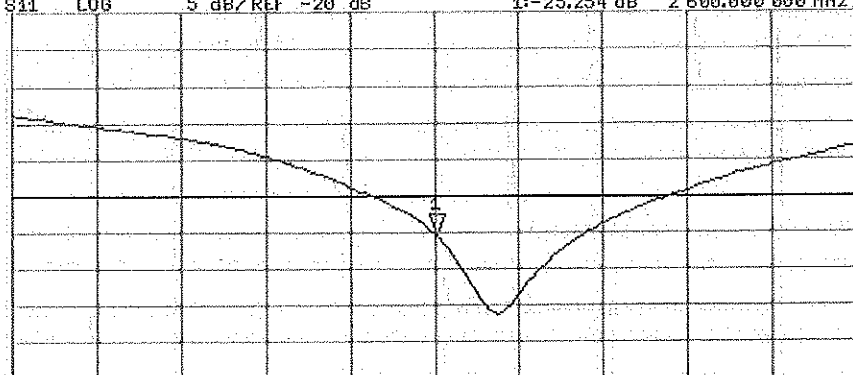
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1: -25.254 dB 2 600.000 000 MHz

CA

AVG
 16

H1d



START 2 400.000 000 MHz

STOP 2 800.000 000 MHz

DASY5 Validation Report for Body TSL

Date: 20.10.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1071

Communication System: UID 0 - CW; Frequency: 2600 MHz

Medium parameters used: $f = 2600$ MHz; $\sigma = 2.22$ S/m; $\epsilon_r = 50.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.24, 4.24, 4.24); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

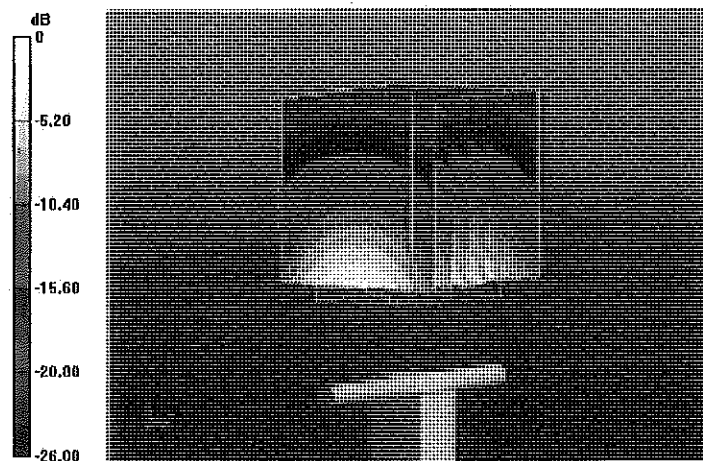
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.02 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 31.0 W/kg

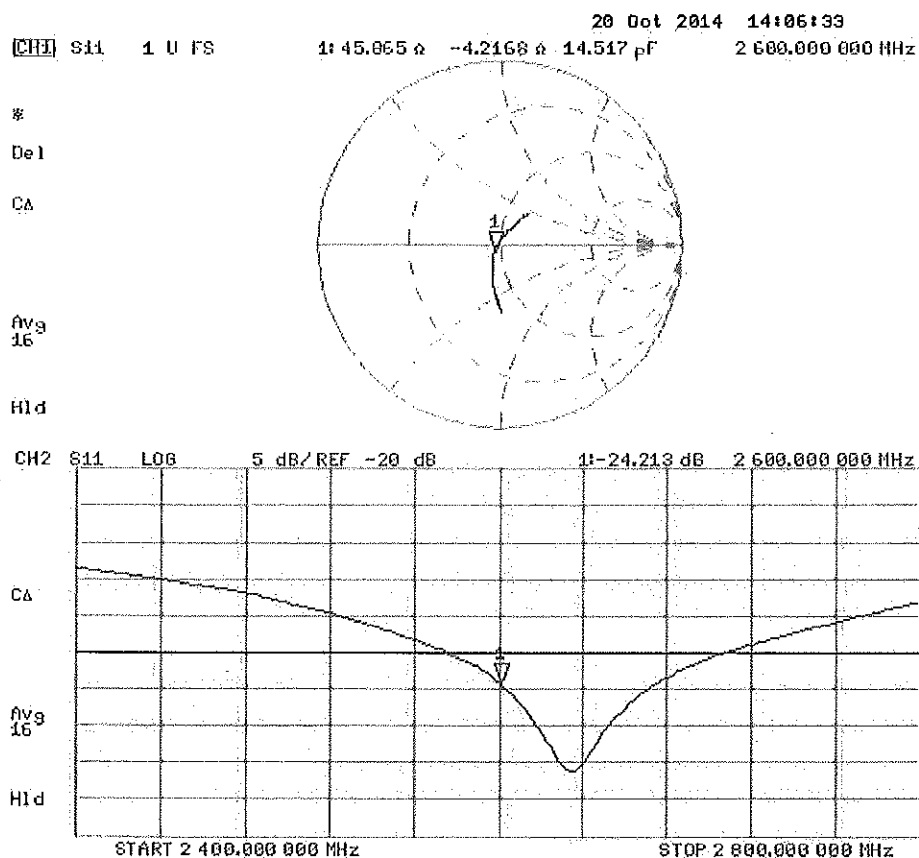
SAR(1 g) = 14.5 W/kg; SAR(10 g) = 6.43 W/kg

Maximum value of SAR (measured) = 19.3 W/kg



0 dB = 19.3 W/kg = 12.86 dBW/kg

Impedance Measurement Plot for Body TSL





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Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D750V3-1054_Mar15**

CALIBRATION CERTIFICATE

Object **D750V3 - SN:1054**

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

CC v
 3/26/15

Calibration date: **March 11, 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 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-14 (No. ES3-3205_Dec14)	Dec-15
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

Calibrated by: **Michael Weber** **Laboratory Technician**

Signature

M. Weber

Approved by: **Katja Pokovic** **Technical Manager**

Katja Pokovic

Issued: March 11, 2015

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



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

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

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
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:* SAR measured at the stated antenna input power.
- SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	40.8 $\pm$ 6 %	0.90 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.10 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.28 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.42 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	54.7 $\pm$ 6 %	0.99 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.19 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	8.53 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.45 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	5.68 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.8 Ω - 0.6 j Ω
Return Loss	- 26.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.8 Ω - 2.6 j Ω
Return Loss	- 30.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.033 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	November 08, 2011

DASY5 Validation Report for Head TSL

Date: 11.03.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1054

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used: $f = 750$ MHz; $\sigma = 0.9$ S/m; $\epsilon_r = 40.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.44, 6.44, 6.44); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

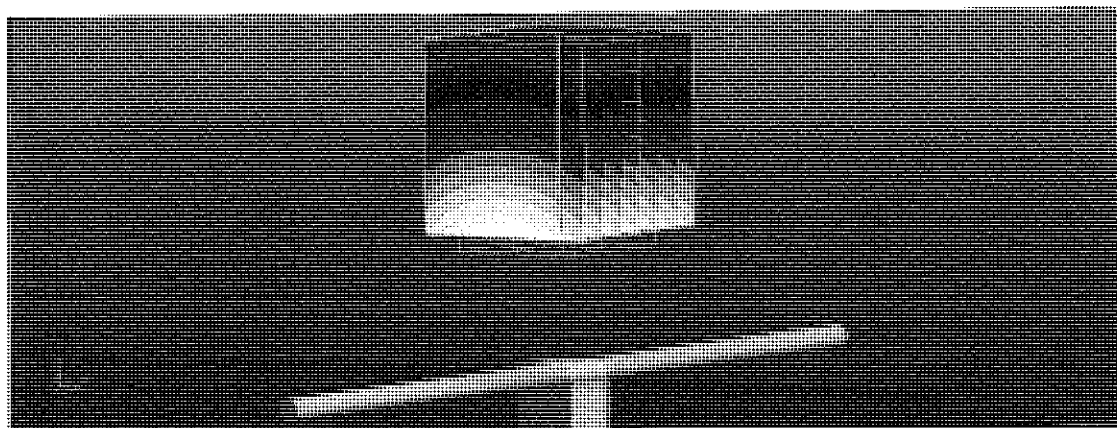
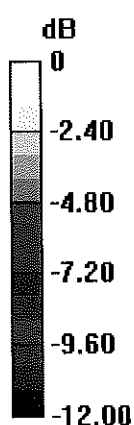
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54.06 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.16 W/kg

SAR(1 g) = 2.1 W/kg; SAR(10 g) = 1.37 W/kg

Maximum value of SAR (measured) = 2.46 W/kg



0 dB = 2.46 W/kg = 3.91 dBW/kg

Impedance Measurement Plot for Head TSL

11 Mar 2015 12:42:05
 CH1 S11 1 U FS 1: 54.844 Ω -552.73 m Ω 383.92 pF 750.000 000 MHz

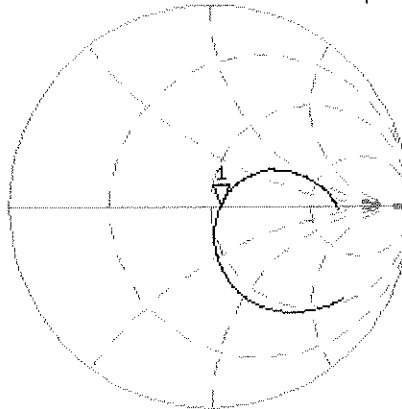
*

Del

CA

Avg
16

H1d



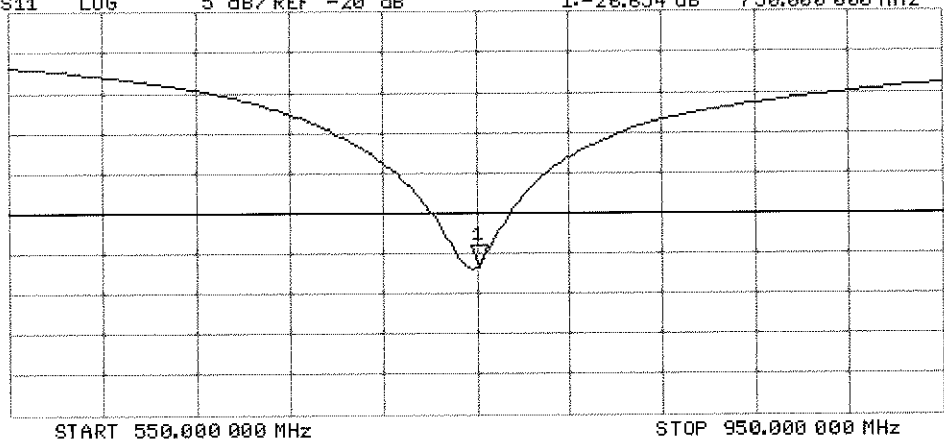
CH2 S11 LOG 5 dB/REF -20 dB 1:-26.654 dB 750.000 000 MHz

Del

CA

Avg
16

H1d



DASY5 Validation Report for Body TSL

Date: 11.03.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1054

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.99 \text{ S/m}$; $\epsilon_r = 54.7$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.21, 6.21, 6.21); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

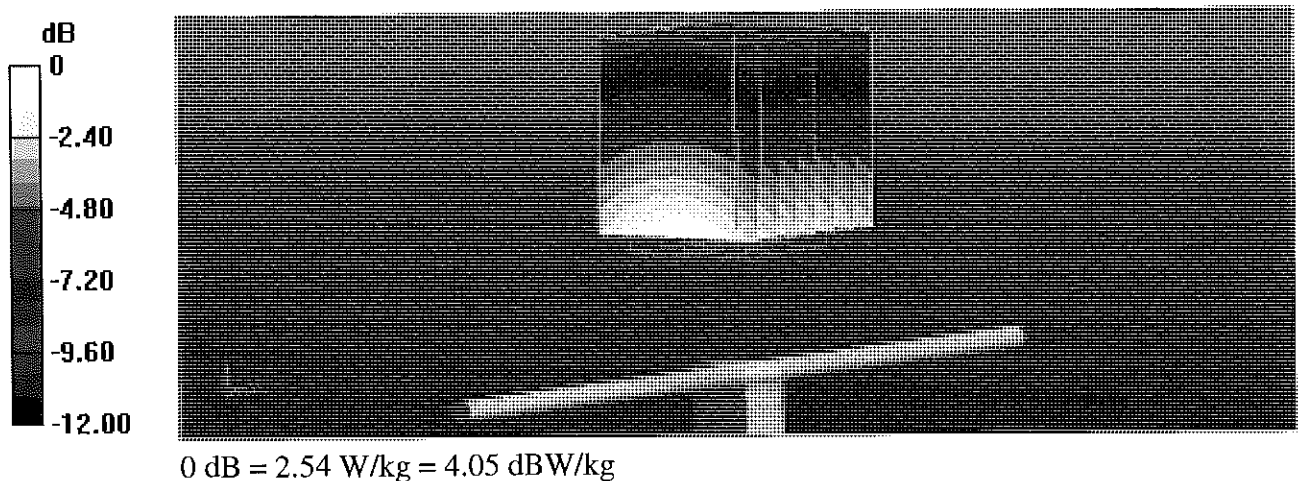
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 52.35 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 3.20 W/kg

SAR(1 g) = 2.19 W/kg; SAR(10 g) = 1.45 W/kg

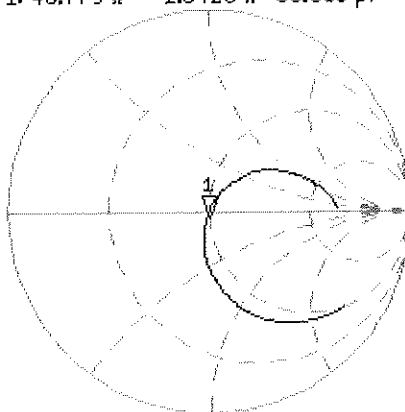
Maximum value of SAR (measured) = 2.54 W/kg



Impedance Measurement Plot for Body TSL

11 Mar 2015 11:49:08
 CH1 S11 1 U FS 1: 48.779 Ω -2.6426 Ω 80.303 pF 750.000 000 MHz

*
 Del
 CA



Avg
 16

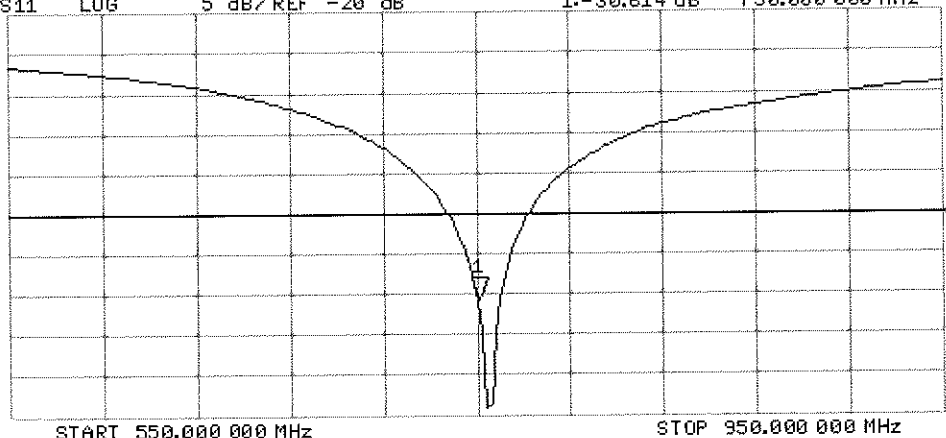
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-30.614 dB 750.000 000 MHz

Del
 CA

Avg
 16

H1d





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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D835V2-4d132_Jan15**

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 4d132**

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

CC
 2/3/15

Calibration date: **January 16, 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 EPM-442A	GB37480704	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-14 (No. ES3-3205_Dec14)	Dec-15
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

Calibrated by: **Michael Weber** Function: **Laboratory Technician**

Signature

Approved by: **Katja Pokovic** Technical Manager

Issued: January 19, 2015

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Accreditation No.: **SCS 0108**

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Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

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
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

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%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	41.5 $\pm$ 6 %	0.93 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.25 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.54 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.04 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	55.8 $\pm$ 6 %	1.01 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.35 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	9.14 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.53 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	5.98 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.8 Ω - 2.3 j Ω
Return Loss	- 30.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.5 Ω - 4.3 j Ω
Return Loss	- 25.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.385 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	July 22, 2011

DASY5 Validation Report for Head TSL

Date: 16.01.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d132

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.93 \text{ S/m}$; $\epsilon_r = 41.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.2, 6.2, 6.2); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

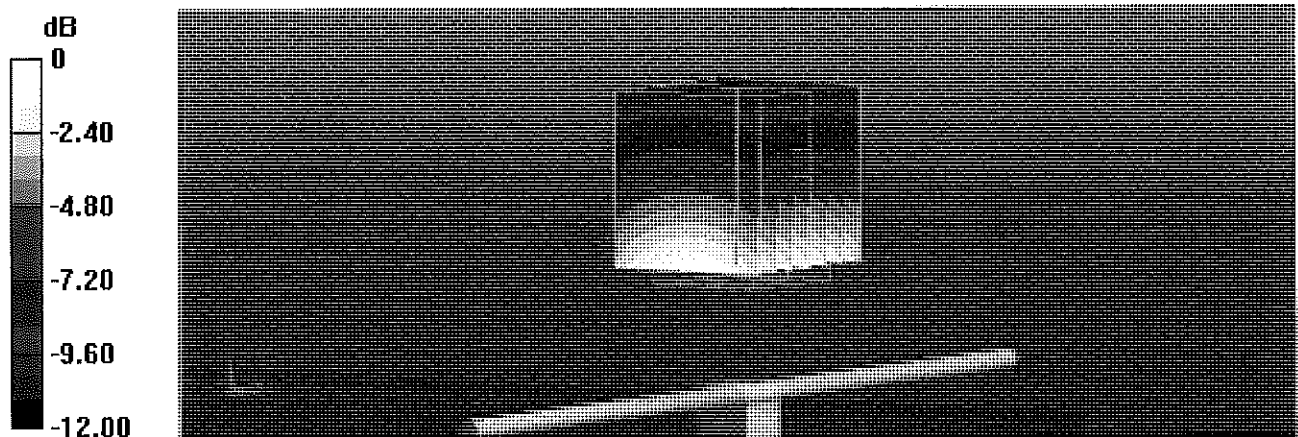
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 56.27 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 3.51 W/kg

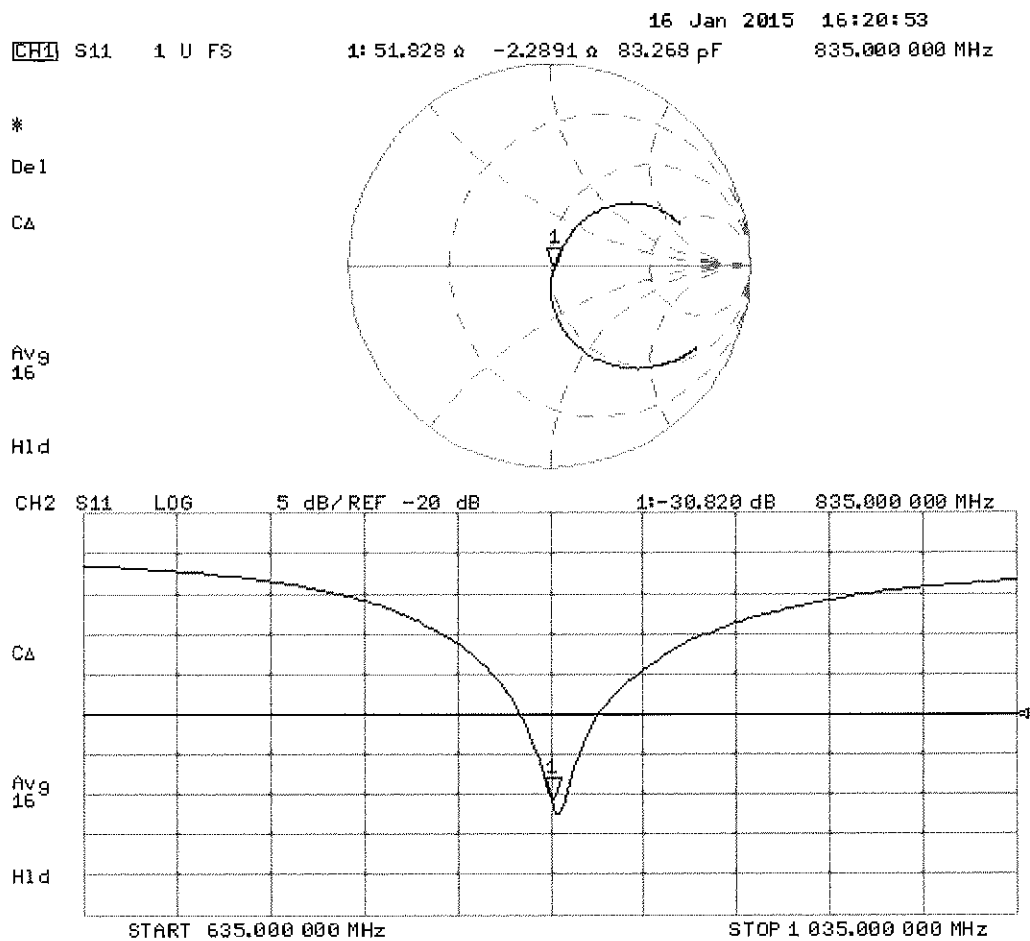
SAR(1 g) = 2.37 W/kg; SAR(10 g) = 1.54 W/kg

Maximum value of SAR (measured) = 2.77 W/kg



0 dB = 2.77 W/kg = 4.42 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 16.01.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d132

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 1.01 \text{ S/m}$; $\epsilon_r = 55.8$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.17, 6.17, 6.17); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

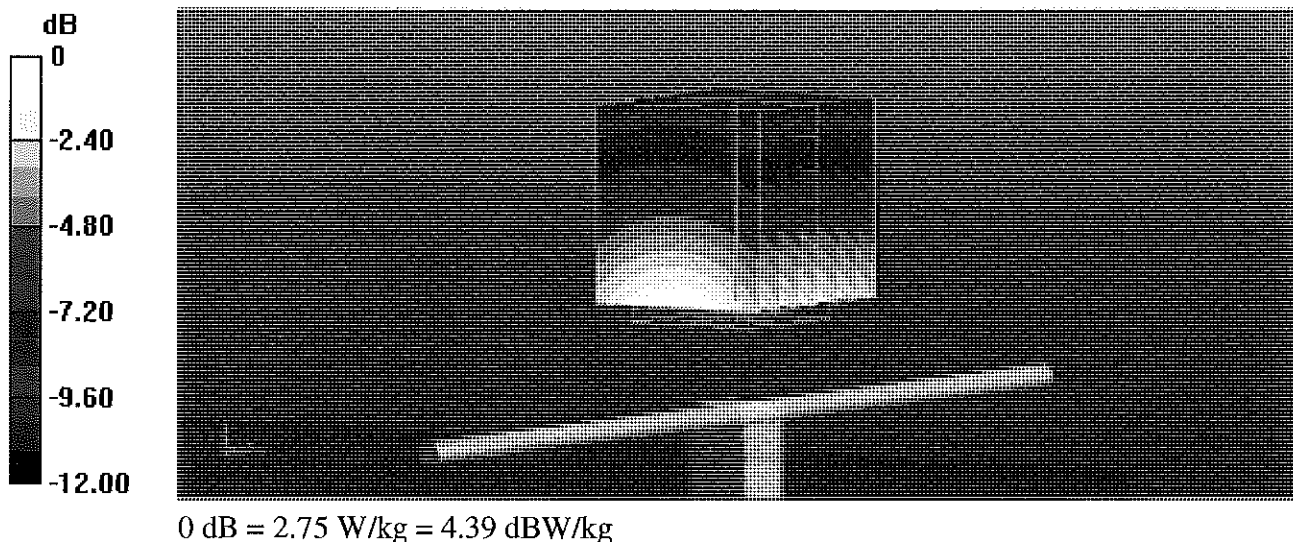
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 54.27 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 3.47 W/kg

SAR(1 g) = 2.35 W/kg; SAR(10 g) = 1.53 W/kg

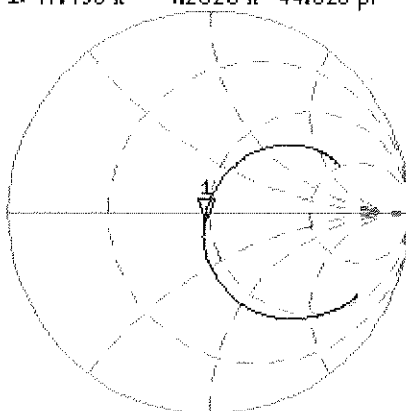
Maximum value of SAR (measured) = 2.75 W/kg



Impedance Measurement Plot for Body TSL

16 Jan 2015 13:51:19
 CH1 S11 1 U FS 1: 47.498 Ω -4.2520 Ω 44.828 pF 835.000 000 MHz

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 CA



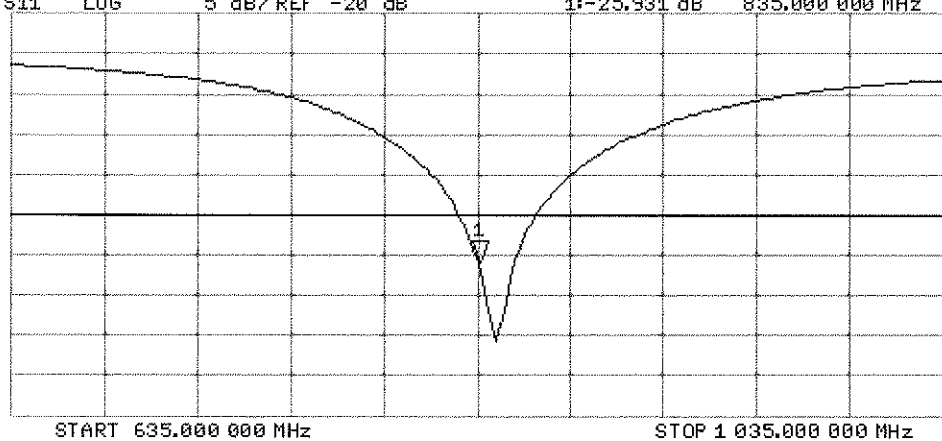
Avg
 16
 H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-25.931 dB 835.000 000 MHz

CA

Avg
 16

H1d





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Accreditation No.: **SCS 0108**

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Client **PC Test**

Certificate No: **D1900V2-5d141_Apr15**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN:5d141**

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: **April 14, 2015**

PN ✓
 4/29/15

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 EPM-442A	GB37480704	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	01-Apr-15 (No. 217-02131)	Mar-16
Type-N mismatch combination	SN: 5047.2 / 06327	01-Apr-15 (No. 217-02134)	Mar-16
Reference Probe ES3DV3	SN: 3205	30-Dec-14 (No. ES3-3205_Dec14)	Dec-15
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

Calibrated by: Name **Claudio Leubler** Function **Laboratory Technician**

Signature

Approved by: **Katja Pokovic** Technical Manager

Issued: April 14, 2015

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Accreditation No.: **SCS 0108**

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

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
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

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%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	38.6 $\pm$ 6 %	1.37 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.93 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	39.9 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.20 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	20.9 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	52.8 $\pm$ 6 %	1.50 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.94 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	40.0 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.29 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.2 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$53.0 \Omega + 4.6 j\Omega$
Return Loss	- 25.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$48.2 \Omega + 5.6 j\Omega$
Return Loss	- 24.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.198 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 11, 2011

DASY5 Validation Report for Head TSL

Date: 14.04.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d141

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.37$ S/m; $\epsilon_r = 38.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5, 5, 5); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

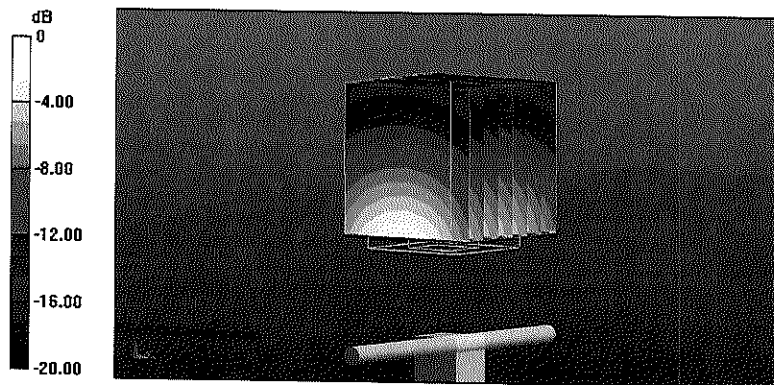
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 98.18 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 18.2 W/kg

SAR(1 g) = 9.93 W/kg; SAR(10 g) = 5.2 W/kg

Maximum value of SAR (measured) = 12.5 W/kg

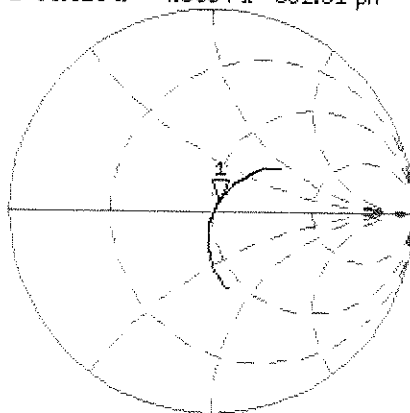


0 dB = 12.5 W/kg = 10.97 dBW/kg

Impedance Measurement Plot for Head TSL

14 Apr 2015 13:39:53
 [CH1] S11 1 U FS 1: 53.010 Ω 4.5664 Ω 382.51 pF 1 900.000 000 MHz

*
 De1
 CA



Avg
 16

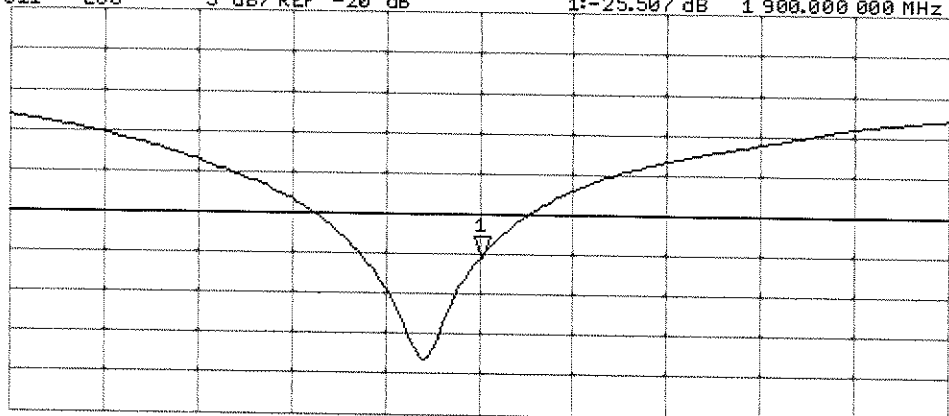
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-25.507 dB 1 900.000 000 MHz

CA

Avg
 16

H1d



START 1 700.000 000 MHz

STOP 2 100.000 000 MHz

DASY5 Validation Report for Body TSL

Date: 14.04.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d141

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.5$ S/m; $\epsilon_r = 52.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.65, 4.65, 4.65); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

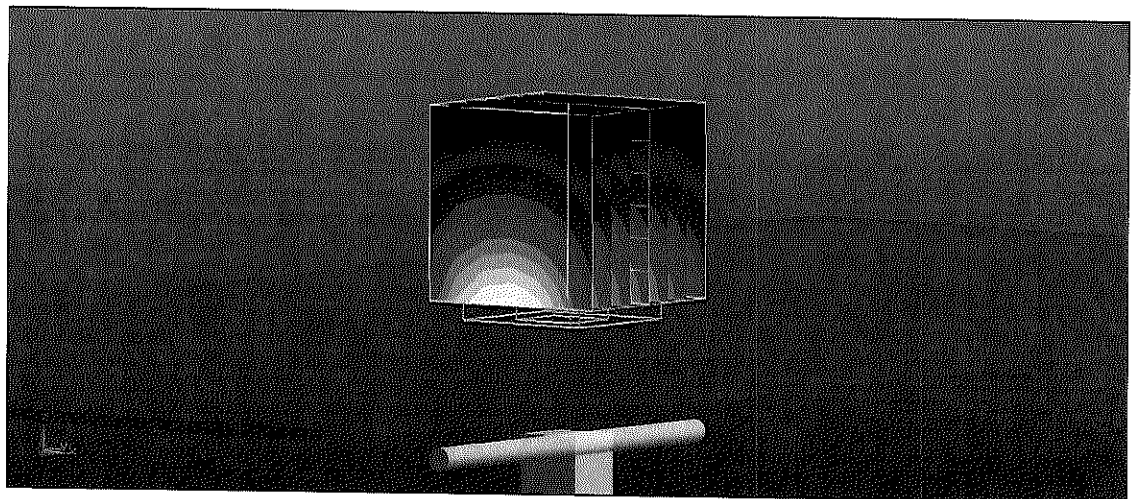
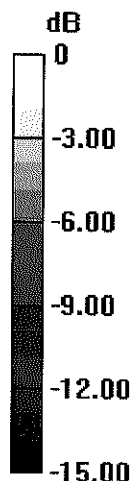
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.73 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 16.9 W/kg

SAR(1 g) = 9.94 W/kg; SAR(10 g) = 5.29 W/kg

Maximum value of SAR (measured) = 12.5 W/kg

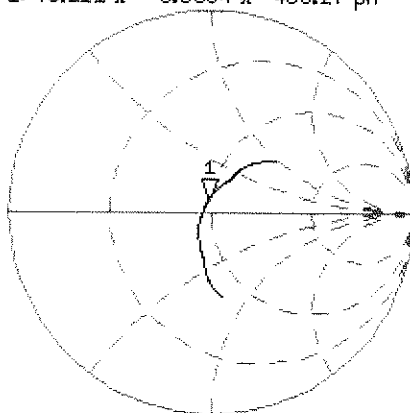


0 dB = 12.5 W/kg = 10.97 dBW/kg

Impedance Measurement Plot for Body TSL

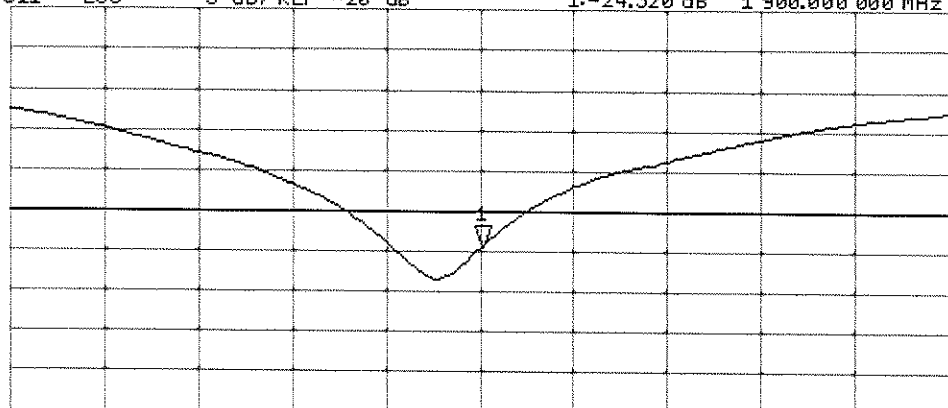
14 Apr 2015 13:39:04
 CH1 S11 1 U FS 1: 48.211 Ω 5.5664 Ω 466.27 pH 1 900.000 000 MHz

*
 Del
 CA
 Avg
 16
 H1d



CH2 S11 LOG 5 dB/REF -20 dB 1:-24,520 dB 1 900.000 000 MHz

CA
 Avg
 16
 H1d



START 1 700.000 000 MHz

STOP 2 100.000 000 MHz

**Calibration Laboratory of
Schmid & Partner
Engineering AG**
Zeughausstrasse 43, 8004 Zurich, Switzerland



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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Swiss Calibration Service

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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 108**

Client **PC Test**

Certificate No: **ES3-3022_Aug14/2**

CALIBRATION CERTIFICATE (Replacement of No: ES3-3022_Aug14)

Object **ES3DV2 - SN:3022**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-12.v9, QA CAL-23.v5, QA CAL-25.v6**
Calibration procedure for dosimetric E-field probes

CC
D/M/Y

Calibration date: **August 19, 2014**

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	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-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 660	13-Dec-13 (No. DAE4-660_Dec13)	Dec-14
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-13)	In house check: Oct-14

Calibrated by:	Name Jeton Kastrati	Function Laboratory Technician	Signature 
Approved by:	Name Katja Pokovic	Technical Manager	
Issued: November 3, 2014 This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			



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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 108**

Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), 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_{x,y,z}:** Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E^2 -field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z} = NORM_{x,y,z} * 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_{x,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_{x,y,z}; B_{x,y,z}; C_{x,y,z}; D_{x,y,z}; VR_{x,y,z}:** 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_{x,y,z} * 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 ± 50 MHz to ± 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_x (no uncertainty required).

Probe ES3DV2

SN:3022

Manufactured: April 15, 2003
Calibrated: August 19, 2014

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 ($\mu V/(V/m)^2$) ^A	1.00	1.04	0.96	$\pm 10.1 \%$
DCP (mV) ^B	103.0	96.3	101.6	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu V}$	C	D dB	VR mV	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	181.8	$\pm 2.7 \%$
		Y	0.0	0.0	1.0		183.0	
		Z	0.0	0.0	1.0		192.3	
10010- CAA	SAR Validation (Square, 100ms, 10ms)	X	2.51	63.1	12.7	10.00	42.6	$\pm 1.9 \%$
		Y	2.62	63.1	12.9		42.7	
		Z	3.12	65.7	13.6		40.4	
10011- CAB	UMTS-FDD (WCDMA)	X	3.33	67.8	19.2	2.91	145.9	$\pm 0.9 \%$
		Y	3.13	64.9	16.9		147.4	
		Z	3.20	66.4	18.2		139.6	
10012- CAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	3.05	70.1	19.8	1.87	147.2	$\pm 0.9 \%$
		Y	2.62	65.1	16.2		147.4	
		Z	2.85	68.2	18.4		141.7	
10013- CAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	11.10	70.9	23.6	9.46	143.9	$\pm 3.0 \%$
		Y	11.04	70.2	22.9		144.2	
		Z	10.77	70.2	23.1		134.7	
10021- DAB	GSM-FDD (TDMA, GMSK)	X	19.66	99.7	28.6	9.39	126.0	$\pm 1.9 \%$
		Y	11.04	89.6	25.5		138.9	
		Z	10.45	88.8	24.9		137.5	
10023- DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	20.19	99.6	28.5	9.57	142.0	$\pm 2.5 \%$
		Y	10.53	88.4	25.0		145.5	
		Z	15.52	96.5	27.8		147.6	
10024- DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	31.93	99.6	25.2	6.56	149.5	$\pm 1.9 \%$
		Y	12.70	87.9	22.2		148.0	
		Z	27.00	99.8	25.7		135.3	
10027- DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	38.32	99.8	23.8	4.80	148.1	$\pm 2.2 \%$
		Y	9.80	83.2	19.3		138.8	
		Z	31.96	99.9	24.2		128.9	
10028- DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	40.03	99.5	22.8	3.55	130.5	$\pm 2.2 \%$
		Y	40.27	99.6	23.0		148.1	
		Z	43.09	99.7	22.5		140.1	
10032- CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	38.93	99.4	20.4	1.16	146.7	$\pm 1.9 \%$
		Y	32.83	92.5	17.9		139.2	
		Z	31.94	99.5	20.8		133.1	
10039- CAB	CDMA2000 (1xRTT, RC1)	X	4.66	66.8	19.3	4.57	144.5	$\pm 1.2 \%$
		Y	4.56	65.3	17.9		137.2	
		Z	4.52	66.1	18.7		131.7	

10081-CAB	CDMA2000 (1xRTT, RC3)	X	3.82	66.0	18.7	3.97	140.3	±0.9 %
		Y	3.77	64.5	17.3		133.6	
		Z	3.79	65.7	18.4		128.2	
10098-CAB	UMTS-FDD (HSUPA, Subtest 2)	X	4.40	66.2	18.5	3.98	130.9	±1.2 %
		Y	4.39	65.0	17.4		131.1	
		Z	4.47	66.3	18.4		140.0	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.30	67.3	19.8	5.67	137.4	±1.7 %
		Y	6.25	66.3	18.9		135.9	
		Z	6.36	67.4	19.7		147.5	
10108-CAB	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.14	66.8	19.6	5.80	134.6	±1.7 %
		Y	6.17	66.1	18.9		133.9	
		Z	6.24	67.0	19.7		144.5	
10110-CAB	LTE-FDD (SC-FDMA, 100% RB, 6 MHz, QPSK)	X	5.82	66.3	19.4	5.75	131.2	±1.7 %
		Y	5.82	65.4	18.6		130.3	
		Z	5.91	66.5	19.4		140.4	
10114-CAA	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	X	10.00	68.5	21.2	8.10	124.3	±2.5 %
		Y	9.89	67.9	20.6		124.0	
		Z	10.05	68.6	21.2		133.2	
10117-CAA	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.01	68.6	21.2	8.07	125.8	±2.5 %
		Y	9.91	67.9	20.7		125.8	
		Z	10.09	68.8	21.3		134.7	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	9.69	75.5	26.4	9.28	144.7	±3.3 %
		Y	9.09	72.7	24.6		143.2	
		Z	8.54	72.0	24.5		124.8	
10154-CAB	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	5.82	66.2	19.4	5.75	131.3	±1.9 %
		Y	6.06	66.3	19.1		149.2	
		Z	5.91	66.5	19.4		140.7	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.27	66.9	19.7	5.82	136.5	±1.4 %
		Y	6.19	65.8	18.7		128.4	
		Z	6.33	67.0	19.6		145.4	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	4.81	66.4	19.7	5.73	134.8	±1.7 %
		Y	4.92	66.1	19.1		149.9	
		Z	4.78	66.4	19.6		141.2	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	7.83	76.6	27.2	9.21	131.4	±3.5 %
		Y	7.54	74.5	25.8		147.8	
		Z	7.71	76.7	27.4		145.3	
10175-CAB	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	4.90	66.9	20.0	5.72	147.6	±1.4 %
		Y	4.90	66.0	19.1		148.0	
		Z	4.78	66.4	19.6		141.6	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	4.90	66.9	20.0	5.72	148.1	±1.4 %
		Y	4.89	65.9	19.0		146.9	
		Z	4.80	66.5	19.7		142.1	
10193-CAA	IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	X	9.80	68.7	21.4	8.09	135.1	±2.7 %
		Y	9.78	68.2	20.9		135.5	
		Z	9.70	68.5	21.2		130.2	

10196-CAA	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.79	68.7	21.4	8.10	136.4	±2.7 %
		Y	9.81	68.3	20.9		138.0	
		Z	9.72	68.6	21.3		132.8	
10219-CAA	IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)	X	9.68	68.6	21.3	8.03	136.0	±2.7 %
		Y	9.74	68.3	21.0		137.4	
		Z	9.62	68.5	21.2		132.6	
10222-CAA	IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)	X	10.20	69.1	21.5	8.06	143.4	±2.5 %
		Y	9.91	60.0	20.7		125.8	
		Z	10.27	69.4	21.6		148.4	
10225-CAB	UMTS-FDD (HSPA+)	X	6.87	66.9	19.6	5.97	139.5	±1.9 %
		Y	7.04	66.9	19.3		149.3	
		Z	6.89	67.0	19.5		143.5	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	7.66	75.9	26.9	9.21	126.1	±3.0 %
		Y	7.17	73.1	25.1		132.1	
		Z	7.18	74.6	26.3		128.0	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	8.58	73.1	25.3	9.24	127.6	±3.3 %
		Y	8.22	71.0	23.7		126.9	
		Z	8.83	74.3	26.0		149.8	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	9.69	75.5	26.5	9.30	143.8	±3.3 %
		Y	8.88	72.0	24.2		135.2	
		Z	8.83	72.9	25.1		131.3	
10274-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)	X	5.87	67.0	19.2	4.87	141.2	±1.4 %
		Y	5.77	65.8	18.1		136.0	
		Z	5.71	66.3	18.6		132.7	
10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.44	67.2	19.2	3.96	147.3	±0.9 %
		Y	4.29	65.3	17.6		139.2	
		Z	4.31	66.3	18.5		139.6	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.60	67.1	19.1	3.46	137.8	±0.7 %
		Y	3.44	64.8	17.2		129.6	
		Z	3.48	66.2	18.4		130.5	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.50	66.9	18.9	3.39	139.5	±0.7 %
		Y	3.38	64.8	17.2		132.0	
		Z	3.48	66.5	18.5		133.1	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.12	66.7	19.6	5.81	133.3	±1.9 %
		Y	6.35	66.7	19.3		149.3	
		Z	6.17	66.8	19.5		132.7	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.72	67.4	20.0	6.06	138.7	±1.7 %
		Y	6.63	66.3	19.1		131.4	
		Z	6.72	67.3	19.9		138.7	
10315-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)	X	2.90	69.9	19.8	1.71	146.4	±0.5 %
		Y	2.54	65.2	16.5		139.3	
		Z	2.75	68.1	18.5		146.4	
10316-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 96pc duty cycle)	X	10.12	69.3	21.9	8.36	142.9	±3.0 %
		Y	10.01	68.5	21.3		135.2	
		Z	10.11	69.3	21.9		141.7	

10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.59	68.2	19.0	3.76	126.7	±0.7 %
		Y	4.59	67.2	18.0		142.4	
		Z	4.64	68.5	19.0		143.0	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.64	68.8	19.3	3.77	147.1	±0.9 %
		Y	4.47	67.1	17.9		139.6	
		Z	4.54	68.4	18.9		147.2	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	2.66	69.0	19.4	1.54	145.8	±0.5 %
		Y	2.40	64.8	16.2		140.0	
		Z	2.62	67.8	18.4		147.2	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	9.97	69.1	21.7	8.23	142.0	±3.0 %
		Y	10.08	68.9	21.4		145.8	
		Z	10.01	69.2	21.8		143.3	

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%.

[^] The uncertainties of NormX,Y,Z do not affect the E^2 -field uncertainty inside TSL (see Pages 8 and 9).

[^] Numerical linearization parameter: uncertainty not required.

[^] 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) ^c	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^g	Depth ^g (mm)	Unct. (k=2)
750	41.9	0.89	6.39	6.39	6.39	0.20	2.24	± 12.0 %
835	41.5	0.90	6.18	6.18	6.18	0.23	1.98	± 12.0 %
1750	40.1	1.37	5.04	5.04	5.04	0.51	1.35	± 12.0 %
1900	40.0	1.40	4.85	4.85	4.85	0.38	1.66	± 12.0 %
2450	39.2	1.80	4.31	4.31	4.31	0.66	1.28	± 12.0 %
2600	39.0	1.96	4.13	4.13	4.13	0.76	1.28	± 12.0 %

^c 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.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) 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 (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^g 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) ^c	Relative Permittivity ^f	Conductivity (S/m) ^f	ConvF X	ConvF Y	ConvF Z	Alpha ^g	Depth ^g (mm)	Unct. (k=2)
450	56.7	0.94	6.78	6.78	6.78	0.12	1.30	± 13.3 %
600	56.1	0.95	6.72	6.72	6.72	0.05	1.20	± 13.3 %
750	55.5	0.96	6.02	6.02	6.02	0.23	2.05	± 12.0 %
835	55.2	0.97	5.98	5.98	5.98	0.29	1.85	± 12.0 %
1750	53.4	1.49	4.70	4.70	4.70	0.66	1.25	± 12.0 %
1900	53.3	1.52	4.49	4.49	4.49	0.33	2.02	± 12.0 %
2450	52.7	1.95	4.05	4.05	4.05	0.80	1.01	± 12.0 %
2600	52.5	2.16	3.94	3.94	3.94	0.68	1.03	± 12.0 %

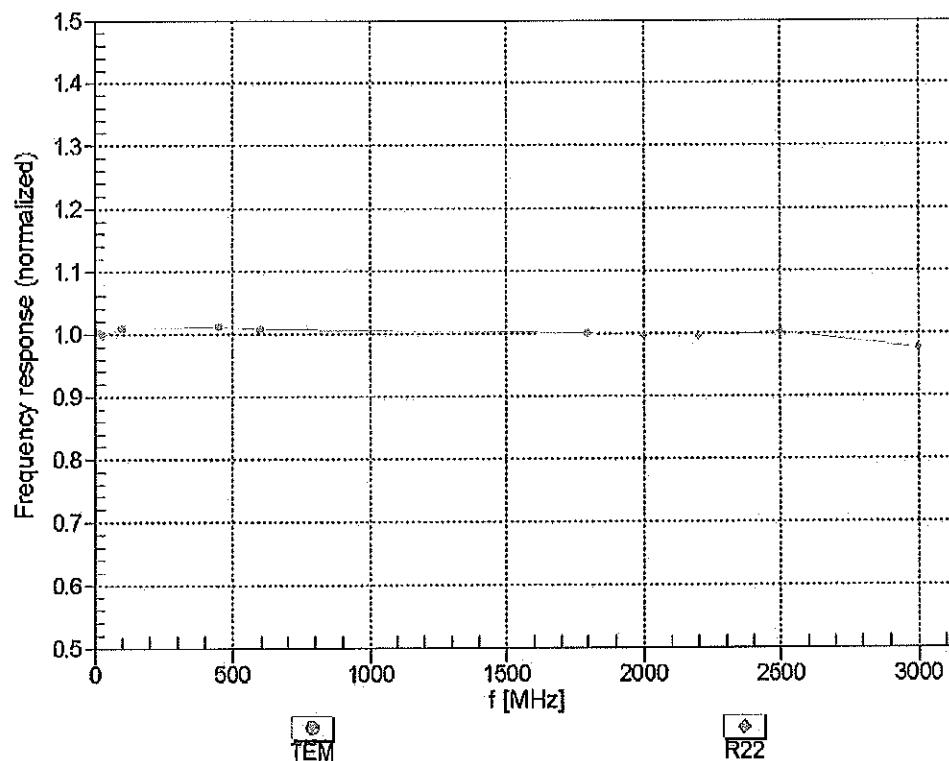
^c Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 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.

^f At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) 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 (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^g 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

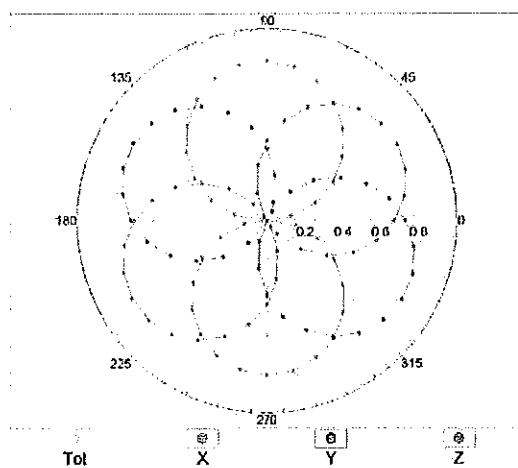
(TEM-Cell:ifi110 EXX, Waveguide: R22)



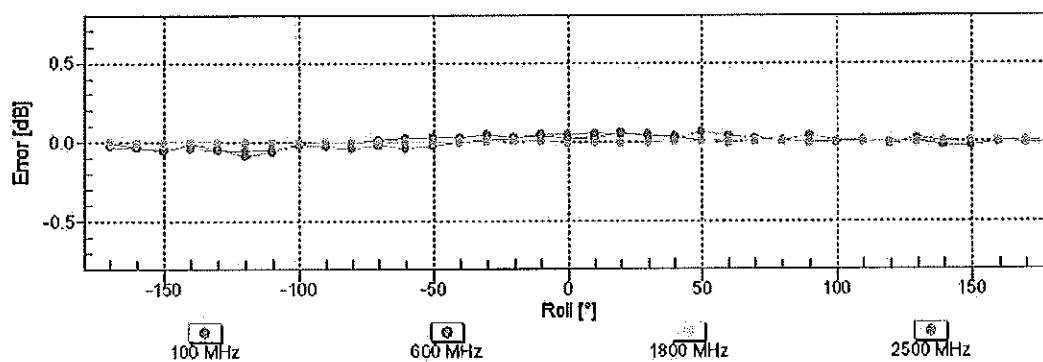
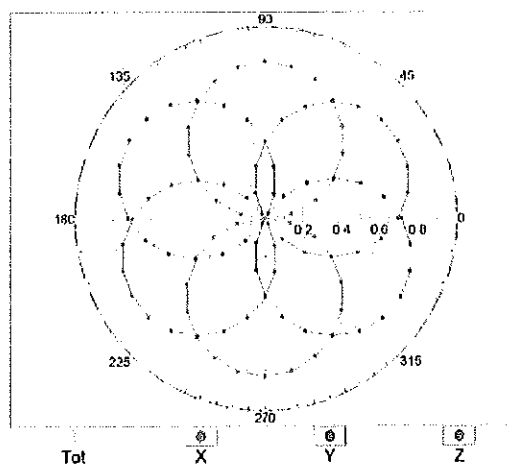
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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

f=600 MHz,TEM

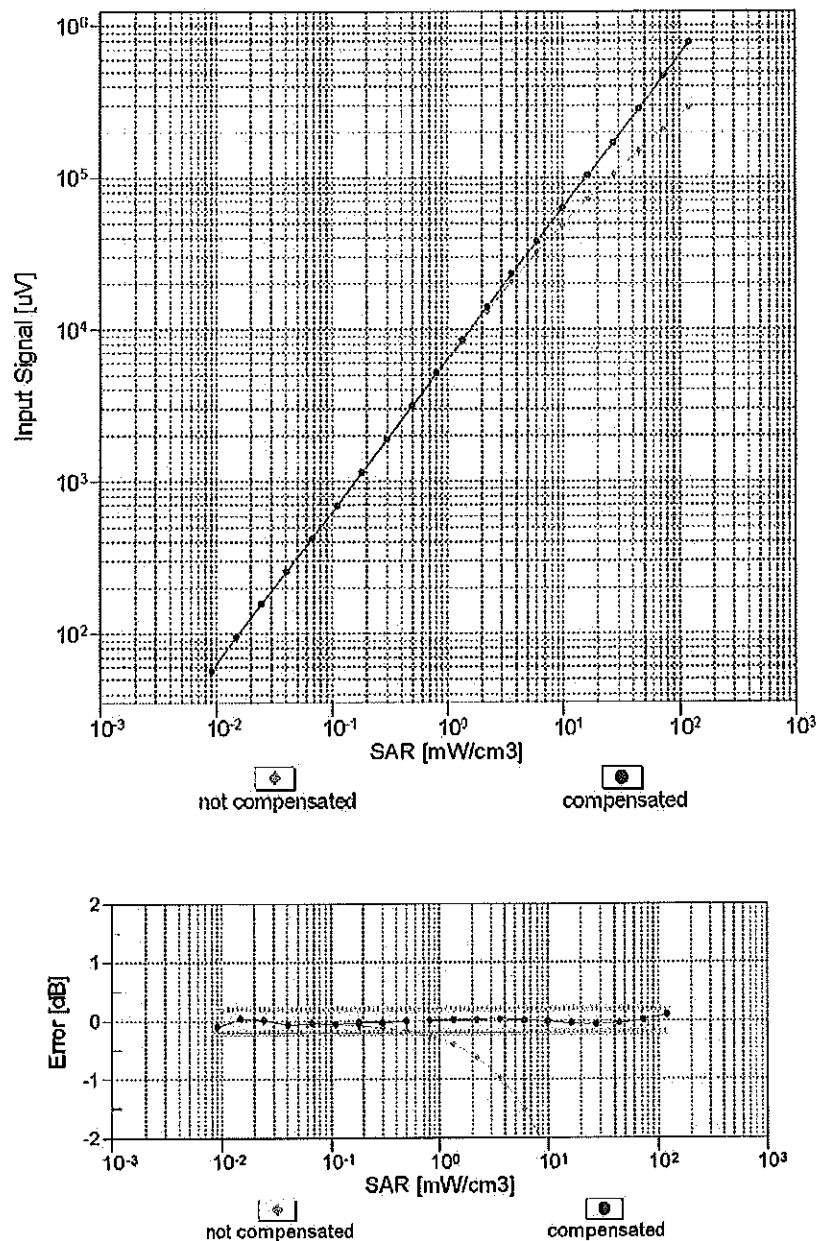


f=1800 MHz,R22



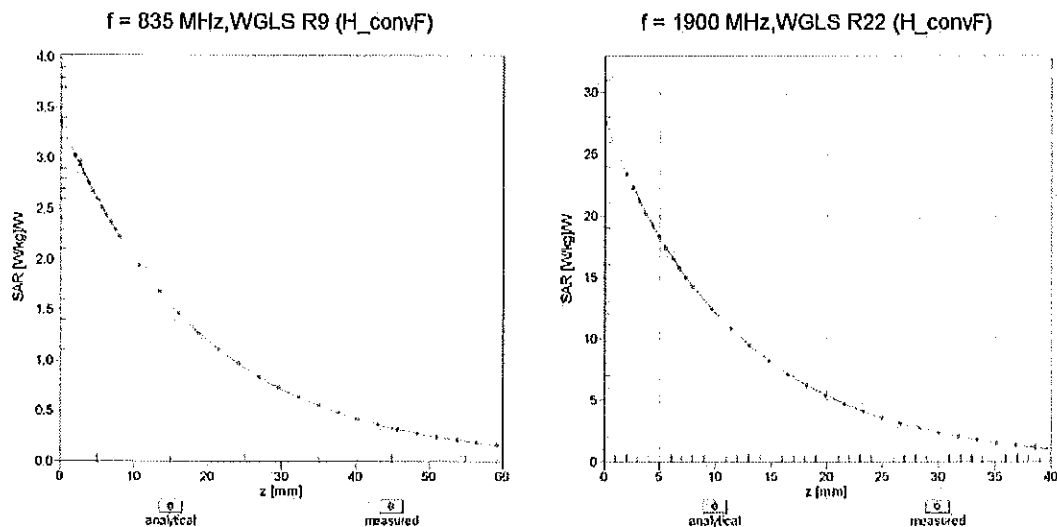
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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



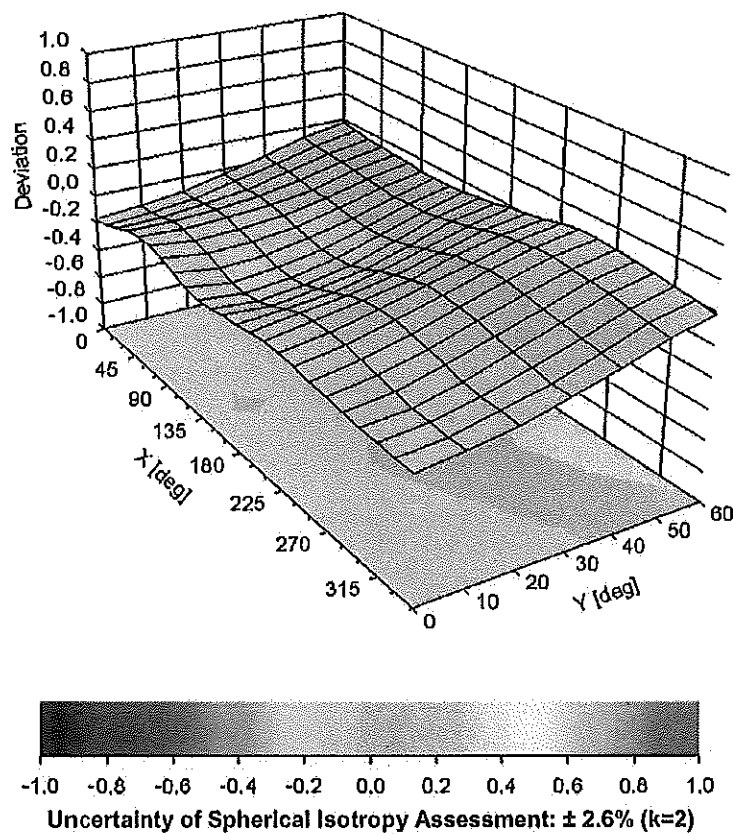
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, θ), $f = 900 \text{ MHz}$



DASY/EASY - Parameters of Probe: ES3DV2 - SN:3022**Other Probe Parameters**

Sensor Arrangement	Triangular
Connector Angle (°)	-80.3
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



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 108**

Client **PC Test**

Certificate No: **ES3-3288_Sep14/2**

CALIBRATION CERTIFICATE (Replacement of No:ES3-3288_Sep14)

Object **ES3DV3 - SN:3288**

Calibration procedure(s)

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

CC
10/12/14

Calibration date:

September 24, 2014

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	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-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 660	13-Dec-13 (No. DAE4-660_Dec13)	Dec-14
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-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Leif Klysner	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	
Issued: November 3, 2014			
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			



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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 108**

Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization ϕ	ϕ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), 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_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z}** = NORM_{x,y,z} * 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_{x,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_{x,y,z}; B_{x,y,z}; C_{x,y,z}; D_{x,y,z}; VR_{x,y,z}**: 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_{x,y,z} * 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 ± 50 MHz to ± 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_x (no uncertainty required).

Probe ES3DV3

SN:3288

Manufactured:	July 6, 2010
Repaired:	September 18, 2014
Calibrated:	September 24, 2014

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3288

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$) ^A	1.05	1.16	0.92	$\pm 10.1 \%$
DCP (mV) ^B	105.1	104.6	106.7	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu V}$	C	D dB	VR mV	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	195.8	$\pm 3.5 \%$
		Y	0.0	0.0	1.0		175.9	
		Z	0.0	0.0	1.0		177.1	
10010- CAA	SAR Validation (Square, 100ms, 10ms)	X	2.71	61.9	11.4	10.00	40.3	$\pm 2.2 \%$
		Y	2.37	60.2	11.2		42.6	
		Z	1.54	56.6	8.9		41.2	
10011- CAB	UMTS-FDD (WCDMA)	X	3.29	67.1	18.4	2.91	133.8	$\pm 0.5 \%$
		Y	3.43	67.9	18.9		139.5	
		Z	3.45	68.1	18.9		141.3	
10012- CAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	2.99	68.9	18.6	1.87	135.1	$\pm 0.7 \%$
		Y	3.59	72.4	20.4		140.7	
		Z	3.54	72.4	20.3		143.0	
10013- CAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	11.15	70.8	23.3	9.46	132.3	$\pm 3.5 \%$
		Y	11.29	70.8	23.2		141.1	
		Z	11.07	70.7	23.2		139.2	
10021- DAB	GSM-FDD (TDMA, GMSK)	X	14.71	90.5	24.5	9.39	149.0	$\pm 1.9 \%$
		Y	16.40	92.8	26.0		131.3	
		Z	11.34	87.2	23.6		126.1	
10023- DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	15.91	92.2	25.3	9.57	138.9	$\pm 2.5 \%$
		Y	21.25	96.9	27.2		142.0	
		Z	11.68	87.2	23.5		145.9	
10024- DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	38.62	99.8	24.7	6.56	123.8	$\pm 2.2 \%$
		Y	36.71	99.7	25.2		128.1	
		Z	36.56	99.4	24.5		129.5	
10027- DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	56.60	99.6	22.6	4.80	138.8	$\pm 1.9 \%$
		Y	46.94	99.9	23.7		149.9	
		Z	51.17	99.8	22.9		144.9	
10028- DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	70.88	100.0	21.6	3.55	147.5	$\pm 1.9 \%$
		Y	52.58	99.8	22.6		129.4	
		Z	76.98	99.8	21.2		128.7	
10032- CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	98.89	99.5	18.9	1.16	135.8	$\pm 1.4 \%$
		Y	78.39	99.6	19.5		141.7	
		Z	95.21	95.5	17.1		143.4	
10039- CAB	CDMA2000 (1xRTT, RC1)	X	4.72	66.7	18.9	4.57	133.7	$\pm 0.9 \%$
		Y	4.85	67.1	19.1		137.7	
		Z	4.81	67.4	19.2		141.9	

10081-CAB	CDMA2000 (1xRTT, RC3)	X	3.91	66.3	18.6	3.97	129.5	±0.7 %
		Y	4.00	66.6	18.7		133.7	
		Z	3.99	66.8	18.8		137.5	
10098-CAB	UMTS-FDD (HSUPA, Subtest 2)	X	4.63	66.9	18.7	3.98	141.4	±0.7 %
		Y	4.78	67.5	19.0		147.7	
		Z	4.57	66.8	18.6		127.8	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.59	68.2	20.1	5.67	149.2	±1.4 %
		Y	6.36	67.3	19.6		130.7	
		Z	6.36	67.5	19.6		133.6	
10108-CAB	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.44	67.8	20.0	5.80	146.6	±1.4 %
		Y	6.23	66.8	19.4		128.8	
		Z	6.24	67.1	19.6		131.4	
10110-CAB	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X	6.08	67.1	19.6	5.75	143.2	±1.4 %
		Y	6.20	67.4	19.8		148.0	
		Z	5.92	66.6	19.3		128.5	
10114-CAA	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	X	10.32	69.3	21.5	8.10	137.0	±2.2 %
		Y	10.31	69.1	21.4		143.5	
		Z	10.37	69.5	21.6		146.1	
10117-CAA	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.35	69.4	21.6	8.07	138.3	±2.2 %
		Y	10.36	69.3	21.4		146.4	
		Z	10.42	69.6	21.6		149.0	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	9.95	75.7	26.2	9.28	134.9	±3.3 %
		Y	10.37	76.0	26.1		146.6	
		Z	9.77	75.4	26.0		142.5	
10154-CAB	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	6.12	67.2	19.7	5.75	144.9	±1.4 %
		Y	6.21	67.4	19.8		148.8	
		Z	5.91	66.5	19.3		128.7	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.28	66.7	19.4	5.82	125.5	±1.2 %
		Y	6.37	66.8	19.4		129.7	
		Z	6.36	67.1	19.6		132.9	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	5.08	67.6	20.2	5.73	147.0	±1.2 %
		Y	4.95	66.6	19.6		128.6	
		Z	4.91	66.9	19.8		131.2	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	8.18	77.2	27.2	9.21	123.4	±2.7 %
		Y	8.37	76.6	26.6		129.5	
		Z	7.97	76.7	26.9		128.7	
10175-CAB	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	5.05	67.4	20.1	5.72	146.2	±1.4 %
		Y	5.10	67.3	20.0		142.8	
		Z	4.87	66.7	19.6		129.6	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	5.04	67.4	20.0	5.72	145.5	±1.2 %
		Y	5.12	67.4	20.0		143.4	
		Z	4.87	66.7	19.6		129.9	
10193-CAA	IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	X	9.92	68.9	21.4	8.09	131.0	±2.2 %
		Y	9.84	68.5	21.1		130.0	
		Z	9.94	69.0	21.4		138.6	

10196-CAA	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.90	68.9	21.4	8.10	130.8	±2.2 %
		Y	9.81	68.4	21.0		131.4	
		Z	9.95	69.1	21.5		140.5	
10219-CAA	IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)	X	9.81	68.8	21.3	8.03	130.0	±2.2 %
		Y	9.89	68.9	21.3		138.1	
		Z	9.89	69.1	21.5		140.5	
10222-CAA	IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)	X	10.25	69.2	21.4	8.06	137.1	±2.2 %
		Y	10.30	69.2	21.4		144.4	
		Z	10.38	69.6	21.6		148.4	
10225-CAB	UMTS-FDD (HSPA+)	X	6.90	66.8	19.3	5.97	132.8	±1.4 %
		Y	7.09	67.3	19.6		142.0	
		Z	7.04	67.4	19.6		143.5	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	9.61	81.9	29.6	9.21	149.3	±2.7 %
		Y	8.66	77.6	27.1		133.7	
		Z	8.20	77.5	27.3		132.2	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	9.16	74.5	25.8	9.24	126.3	±3.0 %
		Y	9.62	75.0	25.8		137.4	
		Z	9.16	74.8	25.9		135.2	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	9.97	75.7	26.3	9.30	133.7	±3.3 %
		Y	10.38	75.9	26.1		146.1	
		Z	9.91	75.7	26.3		143.8	
10274-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)	X	5.86	66.6	18.7	4.87	129.9	±0.9 %
		Y	6.01	67.1	19.0		135.7	
		Z	5.95	67.1	19.0		139.4	
10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.40	66.7	18.6	3.96	136.4	±0.7 %
		Y	4.55	67.3	19.0		138.3	
		Z	4.56	67.6	19.1		144.3	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.64	66.9	18.7	3.46	127.4	±0.5 %
		Y	3.77	67.6	19.1		130.2	
		Z	3.72	67.5	19.0		134.4	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.58	67.0	18.7	3.39	128.4	±0.5 %
		Y	3.73	67.7	19.1		132.7	
		Z	3.69	67.8	19.1		136.1	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.43	67.7	19.9	5.81	145.5	±1.4 %
		Y	6.49	67.7	19.9		149.5	
		Z	6.23	67.0	19.6		129.5	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.74	67.3	19.8	6.06	126.7	±1.4 %
		Y	6.83	67.5	19.8		132.9	
		Z	6.81	67.6	19.9		135.8	
10315-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)	X	3.00	69.9	19.4	1.71	133.9	±0.5 %
		Y	3.30	71.5	20.1		141.0	
		Z	3.22	71.4	20.0		142.9	
10316-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 96pc duty cycle)	X	10.17	69.2	21.8	8.36	130.5	±2.5 %
		Y	10.20	69.1	21.6		138.4	
		Z	10.20	69.4	21.8		140.7	

10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.75	68.3	18.8	3.76	138.5	±0.7 %
		Y	5.00	69.1	19.2		146.7	
		Z	4.92	69.2	19.1		148.5	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.73	68.6	18.9	3.77	136.3	±0.7 %
		Y	4.97	69.4	19.4		143.7	
		Z	4.91	69.6	19.3		146.0	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	2.65	68.1	18.5	1.54	135.2	±0.5 %
		Y	3.05	70.8	19.9		140.7	
		Z	2.87	69.8	19.3		144.8	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	10.00	69.0	21.5	8.23	130.8	±2.2 %
		Y	10.06	68.9	21.4		138.6	
		Z	10.08	69.3	21.7		141.6	

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%.

^A The uncertainties of NormX,Y,Z do not affect the E^2 -field uncertainty inside TSL (see Pages 8 and 9).

^B Numerical linearization parameter: uncertainty not required.

^E 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:3288

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unct. (k=2)
750	41.9	0.89	6.81	6.81	6.81	0.37	1.70	± 12.0 %
835	41.5	0.90	6.51	6.51	6.51	0.45	1.52	± 12.0 %
1750	40.1	1.37	5.38	5.38	5.38	0.44	1.58	± 12.0 %
1900	40.0	1.40	5.17	5.17	5.17	0.80	1.18	± 12.0 %
2450	39.2	1.80	4.56	4.56	4.56	0.80	1.21	± 12.0 %
2600	39.0	1.96	4.44	4.44	4.44	0.80	1.22	± 12.0 %

^C 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.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) 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 (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^G 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:3288

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unct. (k=2)
750	55.5	0.96	6.38	6.38	6.38	0.31	1.89	± 12.0 %
835	55.2	0.97	6.32	6.32	6.32	0.55	1.39	± 12.0 %
1750	53.4	1.49	5.03	5.03	5.03	0.57	1.44	± 12.0 %
1900	53.3	1.52	4.82	4.82	4.82	0.51	1.54	± 12.0 %
2450	52.7	1.95	4.36	4.36	4.36	0.71	1.07	± 12.0 %
2600	52.5	2.16	4.22	4.22	4.22	0.80	1.07	± 12.0 %

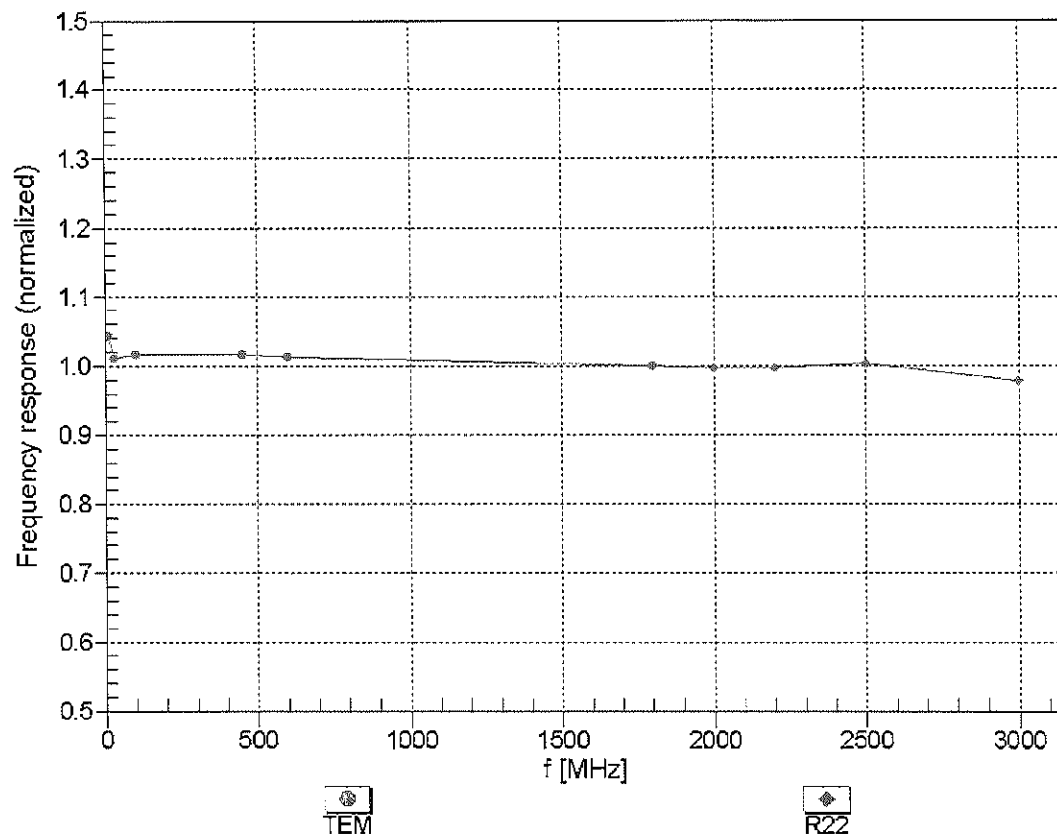
^C Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 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.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) 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 (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^G 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

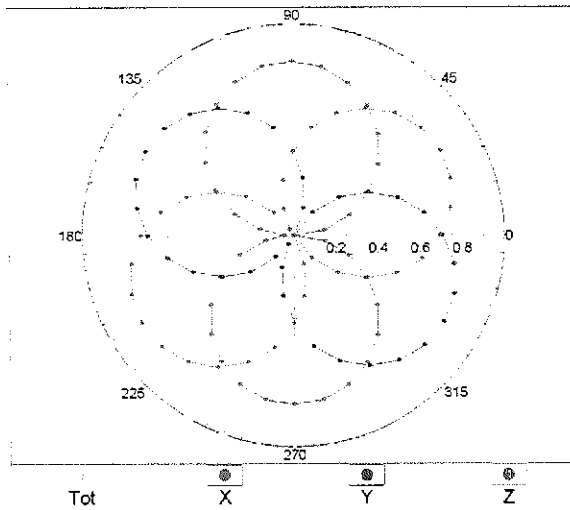
(TEM-Cell:ifi110 EXX, Waveguide: R22)



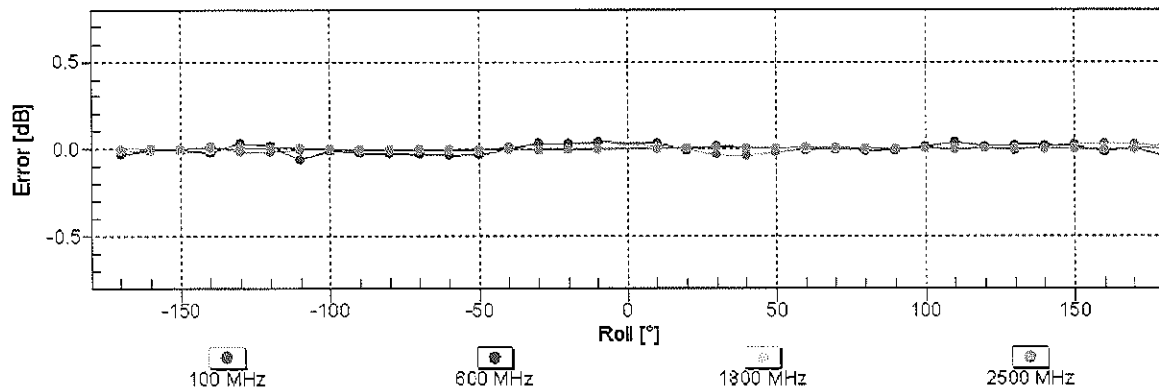
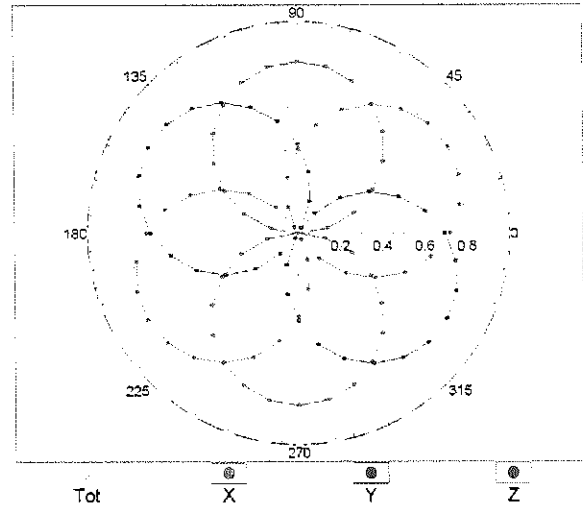
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

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

f=600 MHz,TEM

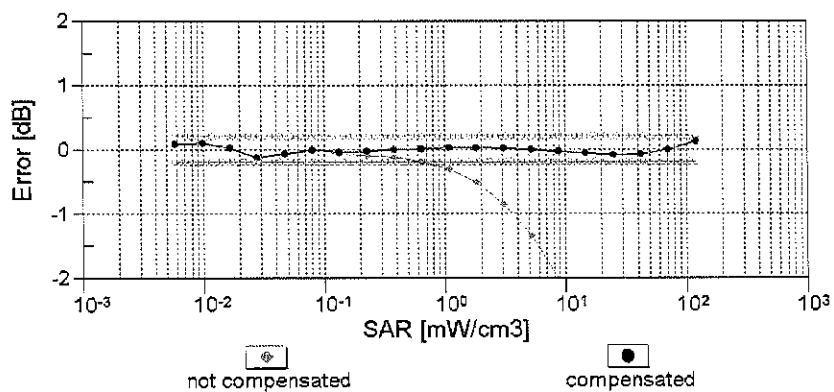
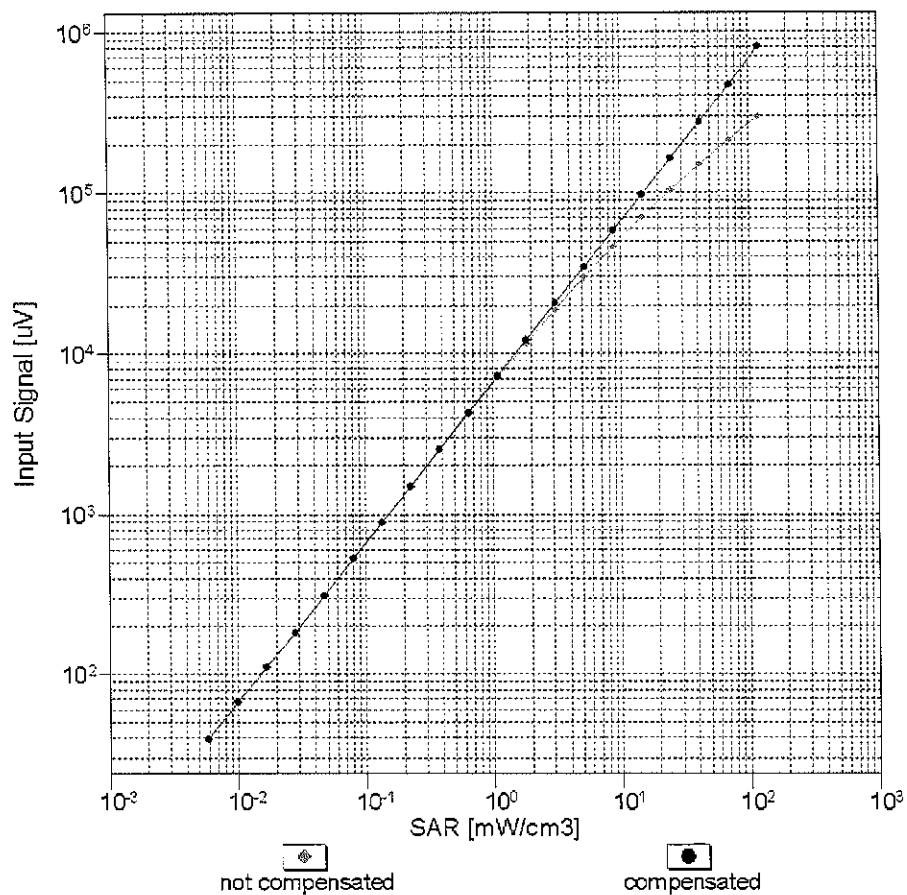


f=1800 MHz,R22



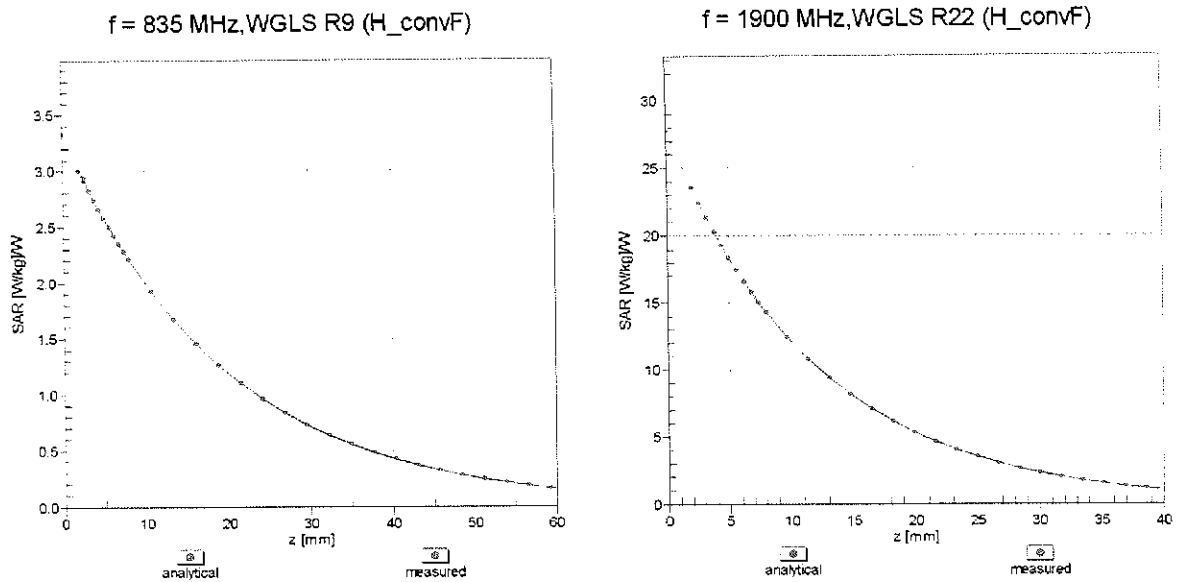
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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



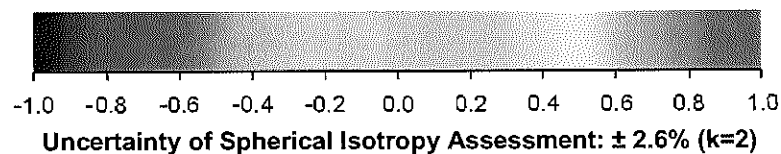
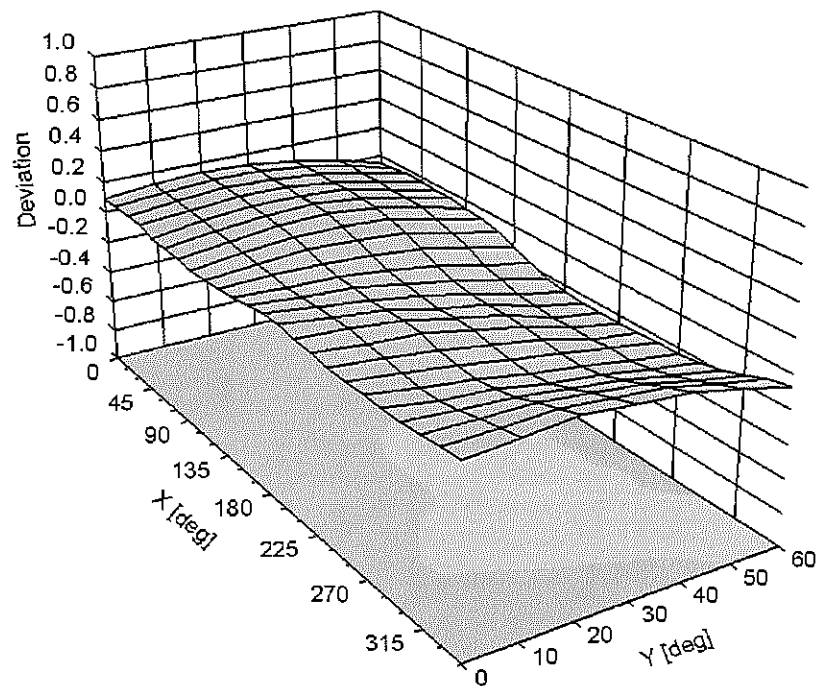
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, θ), $f = 900 \text{ MHz}$



DASY/EASY - Parameters of Probe: ES3DV3 - SN:3288

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-110
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

Calibration Laboratory of
Schmid & Partner
Engineering AG
 Zeughausstrasse 43, 8004 Zurich, Switzerland



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
 Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **ES3-3333_Oct14**

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

CC
10/31/14

Calibration date: **October 24, 2014**

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 ± 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-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 660	13-Dec-13 (No. DAE4-660_Dec13)	Dec-14
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 Leif Klysner	Function Laboratory Technician	Signature
Approved by:	Name Kalja Pokovic	Function Technical Manager	Signature
			Issued: October 24, 2014

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 108**

Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization ϕ	ϕ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), 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_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z}** = NORM_{x,y,z} * 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_{x,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_{x,y,z}; B_{x,y,z}; C_{x,y,z}; D_{x,y,z}; VR_{x,y,z}**: 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_{x,y,z} * 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 ± 50 MHz to ± 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_x (no uncertainty required).

Probe ES3DV3

SN:3333

Manufactured: January 24, 2012
Calibrated: October 24, 2014

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 ($\mu V/(V/m)^2$) ^A	1.08	0.90	0.88	± 10.1 %
DCP (mV) ^B	102.7	107.7	106.3	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu V}$	C	D dB	VR mV	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	190.7	±2.5 %
		Y	0.0	0.0	1.0		183.3	
		Z	0.0	0.0	1.0		197.9	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	3.17	61.7	12.2	10.00	42.4	±1.9 %
		Y	3.16	63.7	12.4		38.0	
		Z	1.84	59.2	10.5		39.9	
10011-CAB	UMTS-FDD (WCDMA)	X	3.22	65.9	17.6	2.91	128.5	±0.5 %
		Y	3.60	69.3	19.8		146.7	
		Z	3.51	68.1	18.8		133.7	
10012-CAA	IEEE 802.11b WIFI 2.4 GHz (DSSS, 1 Mbps)	X	3.14	68.6	18.2	1.87	132.6	±0.7 %
		Y	3.64	73.3	21.1		127.5	
		Z	3.50	71.4	19.6		136.4	
10013-CAA	IEEE 802.11g WIFI 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	11.56	70.8	23.0	9.46	135.8	±3.5 %
		Y	10.93	70.2	23.0		122.3	
		Z	10.93	70.0	22.6		132.8	
10021-DAB	GSM-FDD (TDMA, GMSK)	X	24.80	96.9	27.6	9.39	147.6	±1.9 %
		Y	19.44	94.3	26.1		148.6	
		Z	9.58	82.7	21.9		138.2	
10023-DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	20.09	93.0	26.4	9.57	141.7	±2.7 %
		Y	24.86	99.0	27.9		143.5	
		Z	11.74	86.4	23.4		134.4	
10024-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	23.76	91.2	23.1	6.56	147.8	±2.5 %
		Y	37.10	99.8	25.3		149.9	
		Z	16.01	88.1	21.6		128.0	
10027-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	36.24	94.5	22.6	4.80	128.6	±2.5 %
		Y	47.57	99.9	23.7		133.5	
		Z	44.37	99.7	23.6		140.1	
10028-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	65.86	99.7	22.7	3.55	133.1	±2.7 %
		Y	55.92	100.0	22.6		142.0	
		Z	59.41	100.0	22.2		125.1	
10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	85.87	100.0	20.1	1.16	138.3	±2.2 %
		Y	14.41	99.2	23.3		130.5	
		Z	85.82	99.8	19.3		135.9	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.49	67.4	19.4	5.67	144.6	±1.7 %
		Y	6.49	68.0	20.1		139.9	
		Z	6.54	67.9	19.7		147.3	

10103-CAB	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	10.81	74.7	24.9	9.29	122.0	±3.0 %
		Y	10.50	75.9	26.1		131.6	
		Z	9.76	73.5	24.5		138.6	
10108-CAB	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.43	67.2	19.4	5.80	143.3	±1.7 %
		Y	6.37	67.7	20.0		138.0	
		Z	6.43	67.5	19.7		146.7	
10117-CAA	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.19	68.6	20.9	8.07	136.2	±2.5 %
		Y	10.15	68.9	21.4		128.3	
		Z	10.12	68.7	21.0		137.9	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	11.48	77.0	26.1	9.28	147.5	±3.3 %
		Y	9.81	74.9	25.8		125.7	
		Z	9.22	72.8	24.3		133.2	
10154-CAB	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	6.10	66.5	19.1	5.75	140.0	±1.7 %
		Y	6.04	67.1	19.8		134.8	
		Z	6.12	67.1	19.5		143.2	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.57	67.2	19.4	5.82	146.3	±1.7 %
		Y	6.47	67.6	20.0		139.6	
		Z	6.56	67.6	19.7		148.5	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	5.16	66.7	19.4	5.73	145.8	±1.4 %
		Y	5.02	67.5	20.2		137.5	
		Z	5.07	67.2	19.7		147.1	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	10.07	79.2	27.3	9.21	136.5	±3.0 %
		Y	9.70	81.5	29.3		142.5	
		Z	7.63	74.3	25.3		125.0	
10175-CAB	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	5.13	66.6	19.3	5.72	145.9	±1.4 %
		Y	5.01	67.4	20.1		137.5	
		Z	5.04	67.1	19.7		146.3	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	5.14	66.6	19.3	5.72	145.7	±1.4 %
		Y	5.03	67.5	20.3		137.4	
		Z	5.06	67.2	19.7		146.6	
10196-CAA	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.88	68.3	20.8	8.10	130.9	±2.5 %
		Y	10.13	69.6	21.8		149.0	
		Z	9.77	68.4	20.9		131.6	
10225-CAB	UMTS-FDD (HSPA+)	X	6.98	66.5	19.0	5.97	132.9	±1.7 %
		Y	7.14	67.8	20.0		149.7	
		Z	7.02	67.2	19.4		134.3	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	10.13	79.4	27.4	9.21	137.5	±3.0 %
		Y	9.73	81.6	29.3		143.3	
		Z	7.59	74.1	25.1		125.6	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	10.80	76.4	25.9	9.24	140.0	±3.3 %
		Y	10.19	77.2	27.1		147.2	
		Z	8.55	71.8	23.9		124.9	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	11.59	77.3	26.3	9.30	148.4	±3.5 %
		Y	9.87	75.1	25.9		126.0	
		Z	9.21	72.7	24.2		133.6	

10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.40	66.1	18.1	3.96	134.1	±0.7 %
		Y	4.48	67.4	19.2		129.7	
		Z	4.54	67.2	18.7		137.4	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.59	65.7	17.7	3.46	127.5	±0.7 %
		Y	3.85	68.4	19.7		143.4	
		Z	3.78	67.6	18.8		129.7	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.56	65.9	17.8	3.39	127.9	±0.7 %
		Y	3.81	68.6	19.8		144.2	
		Z	3.71	67.5	18.8		130.7	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.44	67.1	19.4	5.81	143.0	±1.7 %
		Y	6.37	67.6	20.0		137.9	
		Z	6.43	67.5	19.7		146.5	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	7.02	67.8	19.8	6.06	148.7	±1.9 %
		Y	6.96	68.2	20.4		143.6	
		Z	6.72	67.1	19.5		126.9	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.73	67.0	17.9	3.76	140.2	±0.7 %
		Y	4.96	69.4	19.5		130.7	
		Z	5.05	69.3	19.1		140.9	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.70	67.2	18.1	3.77	138.1	±0.7 %
		Y	4.85	69.5	19.6		129.6	
		Z	5.14	70.1	19.5		139.3	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	2.47	66.1	17.1	1.54	133.2	±0.7 %
		Y	3.15	72.2	20.9		127.9	
		Z	3.32	72.0	20.1		137.2	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	9.99	68.4	21.0	8.23	131.6	±2.5 %
		Y	9.84	68.6	21.4		123.3	
		Z	9.89	68.6	21.1		133.4	

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%.

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

^B Numerical linearization parameter: uncertainty not required.

^E 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) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unct. (k=2)
750	41.9	0.89	6.55	6.55	6.55	0.34	1.74	± 12.0 %
835	41.5	0.90	6.33	6.33	6.33	0.44	1.48	± 12.0 %
1750	40.1	1.37	5.26	5.26	5.26	0.73	1.21	± 12.0 %
1900	40.0	1.40	5.11	5.11	5.11	0.66	1.32	± 12.0 %
2450	39.2	1.80	4.53	4.53	4.53	0.62	1.40	± 12.0 %
2600	39.0	1.96	4.40	4.40	4.40	0.68	1.38	± 12.0 %

^C 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.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) 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 (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^G 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

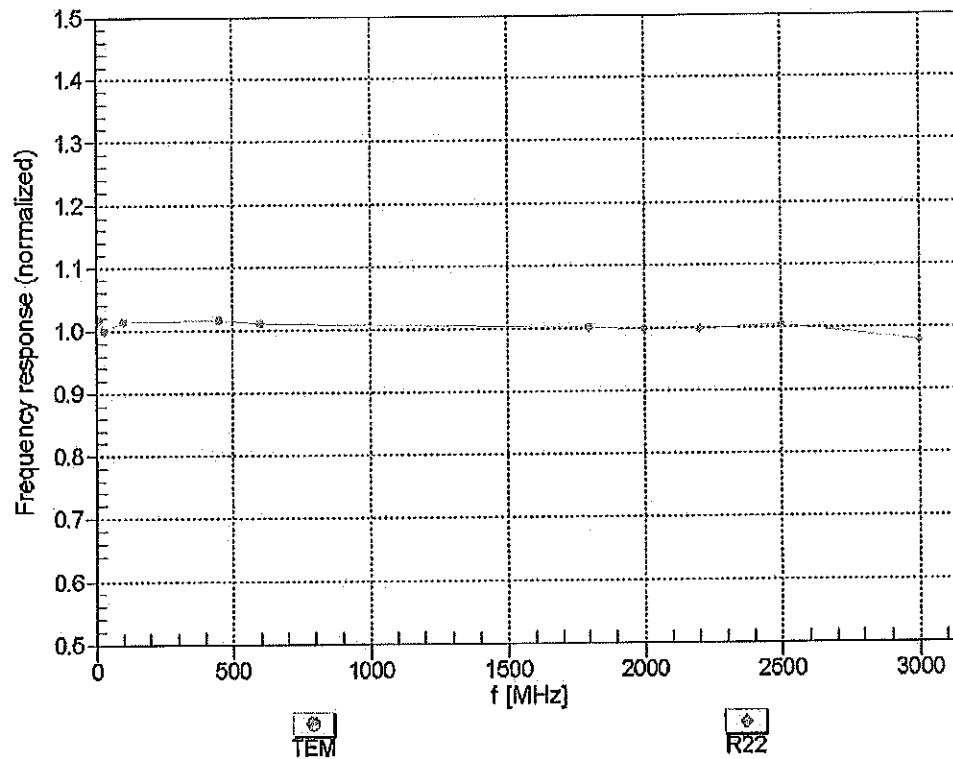
f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth (mm)	Uct. (k=2)
750	55.5	0.96	6.14	6.14	6.14	0.35	1.76	± 12.0 %
835	55.2	0.97	6.12	6.12	6.12	0.57	1.37	± 12.0 %
1750	53.4	1.49	4.89	4.89	4.89	0.80	1.24	± 12.0 %
1900	53.3	1.52	4.67	4.67	4.67	0.75	1.29	± 12.0 %
2450	52.7	1.95	4.26	4.26	4.26	0.80	1.01	± 12.0 %
2600	52.5	2.16	4.13	4.13	4.13	0.80	0.99	± 12.0 %

^C 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.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) 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 (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^G 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.

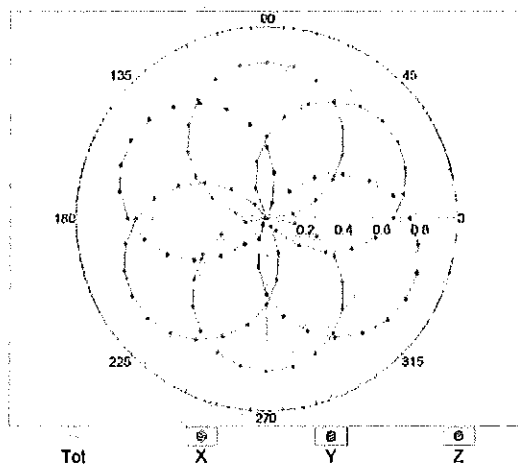
Frequency Response of E-Field (TEM-Cell: Ifi110 EXX, Waveguide: R22)



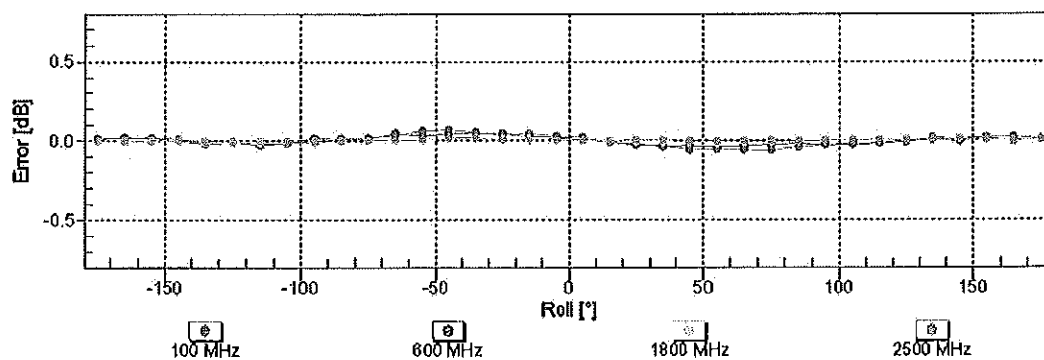
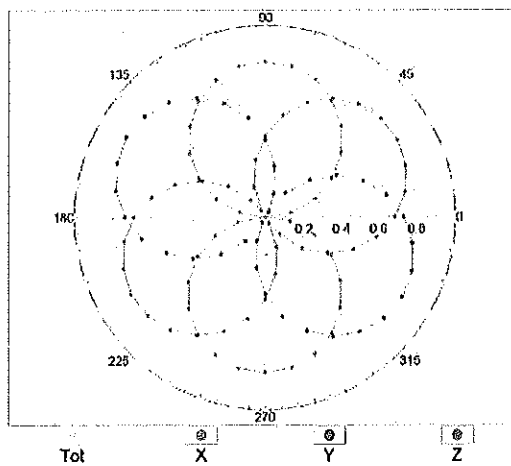
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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

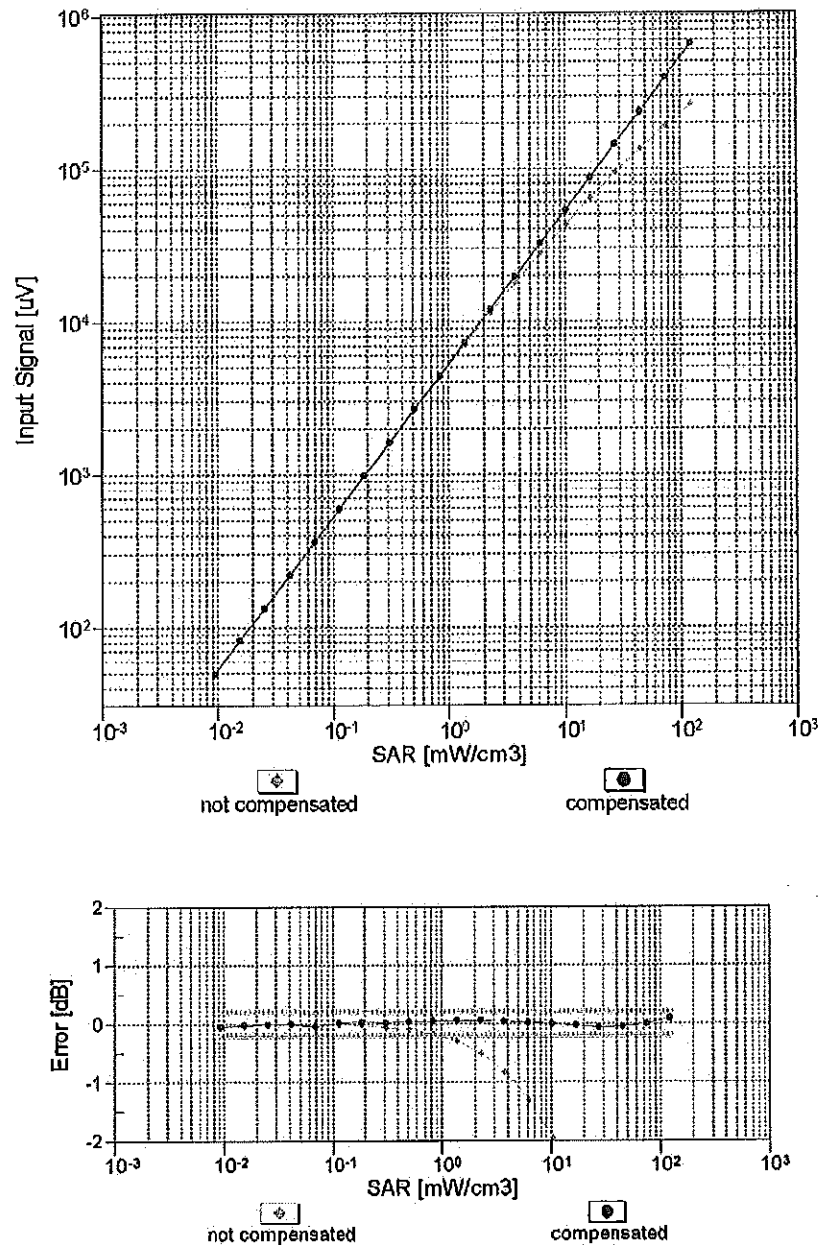
f=600 MHz,TEM



f=1800 MHz,R22

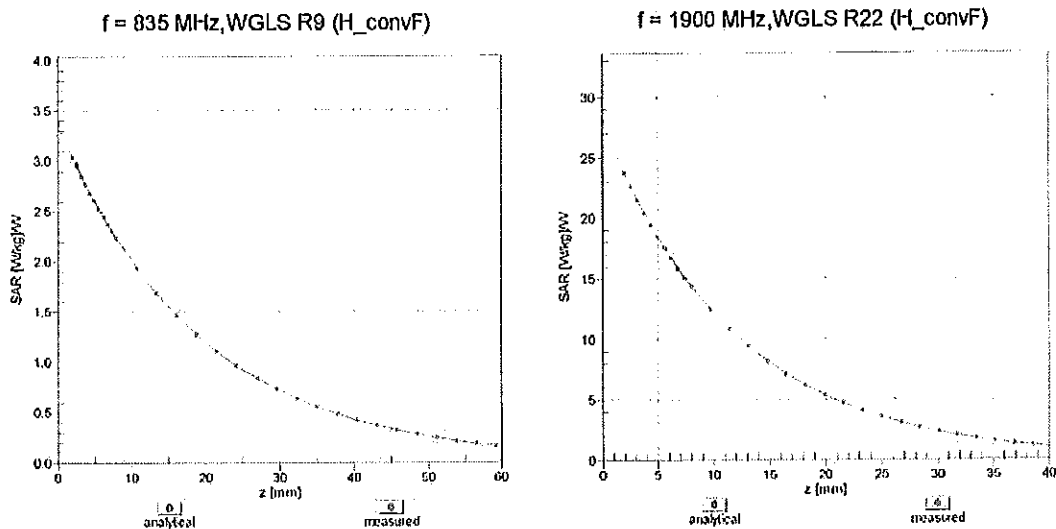
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ (k=2)

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



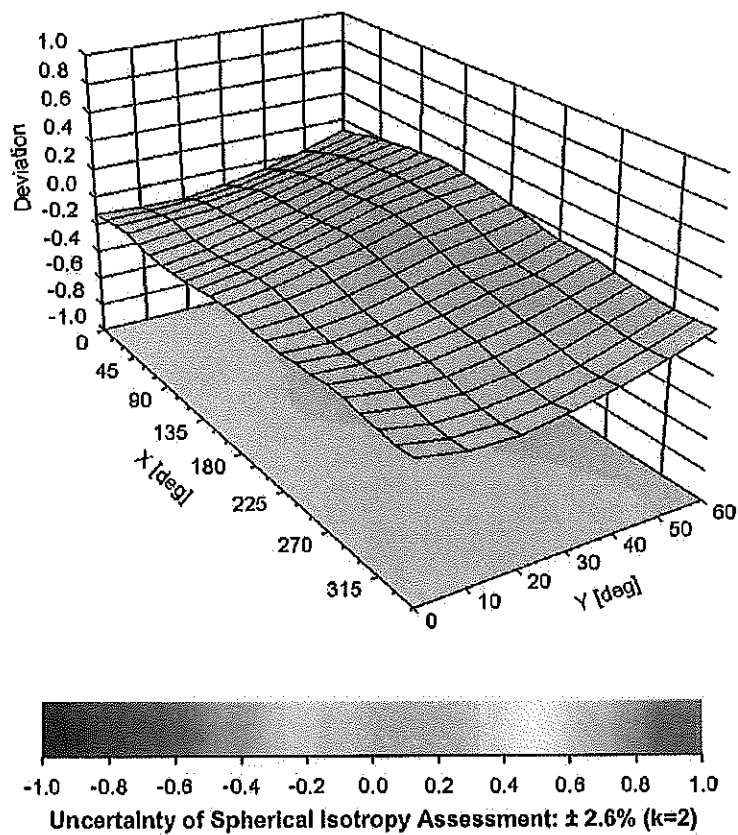
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, θ), $f = 900 \text{ MHz}$



DASY/EASY - Parameters of Probe: ES3DV3 - SN:3333**Other Probe Parameters**

Sensor Arrangement	Triangular
Connector Angle (°)	-34.9
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

**Calibration Laboratory of
Schmid & Partner
Engineering AG**
Zeughausstrasse 43, 8004 Zurich, Switzerland



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

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 108**

Client **PC Test**

Certificate No: **ES3-3332_Sep14/2**

CALIBRATION CERTIFICATE (Replacement of No: ES3-3332_Sep14)

Object **ES3DV3 - SN:3332**

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

CC
12/14/14

Calibration date: **September 18, 2014**

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	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-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 660	13-Dec-13 (No. DAE4-660_Dec13)	Dec-14
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-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	
Issued: November 3, 2014			
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 108**

Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), 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_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z}** = NORM_{x,y,z} * 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_{x,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_{x,y,z}; B_{x,y,z}; C_{x,y,z}; D_{x,y,z}; VR_{x,y,z}**: 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_{x,y,z} * 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 ± 50 MHz to ± 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_x (no uncertainty required).

Probe ES3DV3

SN:3332

Manufactured: January 24, 2012
Calibrated: September 18, 2014

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3332

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.94	1.15	0.98	$\pm 10.1 \%$
DCP (mV) ^B	105.8	103.8	112.4	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Unc ^C (k=2)
0	CW	X	0.0	0.0	1.0	0.00	178.7	$\pm 3.0 \%$
		Y	0.0	0.0	1.0		199.5	
		Z	0.0	0.0	1.0		186.5	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	55.60	92.4	20.6	10.00	35.7	$\pm 1.7 \%$
		Y	2.80	61.2	11.6		42.9	
		Z	10.49	80.1	18.0		36.1	
10011-CAB	UMTS-FDD (WCDMA)	X	3.47	67.9	18.8	2.91	141.3	$\pm 0.7 \%$
		Y	3.29	67.0	18.4		138.2	
		Z	3.78	70.4	20.1		147.9	
10012-CAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	3.53	72.0	20.1	1.87	141.7	$\pm 0.7 \%$
		Y	3.03	69.1	18.8		141.1	
		Z	4.06	75.5	21.6		148.2	
10013-CAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	10.87	69.8	22.6	9.46	137.3	$\pm 3.5 \%$
		Y	11.63	71.7	23.9		141.9	
		Z	10.51	69.6	22.5		139.2	
10021-DAB	GSM-FDD (TDMA, GMSK)	X	6.92	78.4	20.1	9.39	137.0	$\pm 2.5 \%$
		Y	26.20	99.6	27.8		141.5	
		Z	5.13	78.3	21.1		144.7	
10023-DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	9.10	83.6	22.5	9.57	144.0	$\pm 2.5 \%$
		Y	26.31	100.0	28.1		136.7	
		Z	6.15	81.6	22.5		139.9	
10024-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	10.54	84.1	20.4	6.56	141.8	$\pm 2.5 \%$
		Y	40.55	99.6	24.9		142.2	
		Z	6.45	81.5	20.2		145.7	
10027-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	28.34	94.6	21.9	4.80	131.4	$\pm 2.5 \%$
		Y	52.22	99.6	23.3		126.8	
		Z	28.33	99.5	23.9		140.7	
10028-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	52.17	100.0	22.2	3.55	147.0	$\pm 1.7 \%$
		Y	57.29	99.6	22.4		133.0	
		Z	25.84	99.5	23.3		126.2	
10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	59.05	100.0	19.9	1.16	135.5	$\pm 1.9 \%$
		Y	100.00	99.7	19.2		143.5	
		Z	34.97	100.0	20.4		143.1	

10039-CAB	CDMA2000 (1xRTT, RC1)	X	4.78	66.9	18.9	4.57	134.6	±0.9 %
		Y	4.85	67.1	19.1		141.0	
		Z	4.76	67.8	19.4		140.7	
10081-CAB	CDMA2000 (1xRTT, RC3)	X	3.98	66.4	18.6	3.97	130.4	±0.7 %
		Y	3.98	66.5	18.7		136.2	
		Z	4.04	67.7	19.2		137.4	
10098-CAB	UMTS-FDD (HSUPA, Subtest 2)	X	4.75	67.3	18.8	3.98	144.4	±0.7 %
		Y	4.55	66.5	18.5		126.5	
		Z	4.72	67.9	19.0		128.1	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.26	66.9	19.2	5.67	124.5	±1.2 %
		Y	6.38	67.4	19.7		131.7	
		Z	6.36	67.7	19.7		132.3	
10108-CAB	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.44	67.5	19.7	5.80	147.4	±1.4 %
		Y	6.31	67.2	19.7		130.2	
		Z	6.17	67.2	19.6		130.1	
10110-CAB	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X	6.08	66.9	19.5	5.75	142.7	±1.4 %
		Y	5.97	66.6	19.4		127.3	
		Z	5.84	66.7	19.3		126.2	
10114-CAA	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	X	10.13	68.7	21.0	8.10	136.9	±2.5 %
		Y	10.57	69.9	21.9		146.3	
		Z	10.06	69.0	21.1		143.6	
10117-CAA	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.12	68.6	21.0	8.07	138.2	±2.5 %
		Y	10.60	69.9	21.9		148.0	
		Z	10.07	69.0	21.1		146.6	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	8.76	71.7	23.8	9.28	130.7	±3.0 %
		Y	10.03	75.2	25.9		121.5	
		Z	8.15	70.7	23.5		134.1	
10164-CAB	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	6.10	67.0	19.5	5.75	144.4	±1.4 %
		Y	5.98	66.6	19.4		127.8	
		Z	5.84	66.6	19.3		127.2	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.56	67.5	19.7	5.82	149.5	±1.7 %
		Y	6.41	67.1	19.6		132.5	
		Z	6.17	66.8	19.4		130.4	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	5.01	67.0	19.7	5.73	147.8	±1.2 %
		Y	5.01	66.9	19.8		132.1	
		Z	4.75	66.9	19.7		130.3	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	7.65	75.0	25.8	9.21	144.9	±2.7 %
		Y	10.17	82.4	29.7		136.4	
		Z	6.53	72.3	24.6		145.6	
10175-CAB	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	4.98	66.9	19.6	5.72	141.0	±1.2 %
		Y	4.98	66.7	19.7		130.5	
		Z	4.71	66.7	19.5		128.1	

10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	4.95	66.7	19.5	5.72	139.8	±1.2 %
		Y	4.97	66.7	19.7		129.5	
		Z	4.72	66.8	19.6		128.0	
10193-CAA	IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	X	9.75	68.2	20.9	8.09	131.8	±2.5 %
		Y	10.16	69.4	21.7		139.2	
		Z	9.62	68.6	21.0		137.3	
10196-CAA	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.77	68.3	20.9	8.10	133.6	±2.5 %
		Y	10.17	69.4	21.8		140.1	
		Z	9.61	68.5	21.0		140.1	
10219-CAA	IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)	X	9.69	68.3	20.9	8.03	133.6	±2.5 %
		Y	10.05	69.3	21.7		139.2	
		Z	9.58	68.7	21.1		139.4	
10222-CAA	IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)	X	10.13	68.7	21.0	8.06	140.7	±2.5 %
		Y	10.61	69.8	21.8		145.1	
		Z	10.11	69.1	21.2		148.4	
10225-CAB	UMTS-FDD (HSPA+)	X	7.03	67.2	19.4	5.97	138.0	±1.4 %
		Y	7.07	67.2	19.6		140.2	
		Z	6.97	67.8	19.7		144.6	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	7.11	72.9	24.7	9.21	124.6	±2.7 %
		Y	10.04	82.0	29.5		135.7	
		Z	6.29	71.2	24.0		126.2	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	8.61	72.5	24.3	9.24	145.2	±3.3 %
		Y	10.53	77.8	27.4		136.7	
		Z	7.56	70.0	23.1		126.7	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	8.74	71.6	23.8	9.30	128.7	±3.3 %
		Y	11.51	79.1	28.0		147.2	
		Z	8.07	70.4	23.2		134.1	
10274-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)	X	5.90	66.7	18.7	4.87	128.0	±0.9 %
		Y	5.93	66.8	18.9		134.5	
		Z	5.92	67.6	19.1		138.2	
10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.53	67.1	18.8	3.96	133.8	±0.7 %
		Y	4.48	67.0	18.8		139.6	
		Z	4.62	68.3	19.3		145.0	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.82	67.8	19.0	3.46	147.6	±0.7 %
		Y	3.66	67.0	18.8		131.7	
		Z	3.97	69.6	20.0		135.9	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.70	67.5	18.8	3.39	128.1	±0.7 %
		Y	3.60	66.9	18.7		132.5	
		Z	3.80	68.9	19.5		139.8	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.47	67.6	19.8	5.81	149.7	±1.7 %
		Y	6.24	66.9	19.5		126.3	
		Z	6.20	67.3	19.6		130.9	

10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.72	67.1	19.5	6.06	128.8	±1.4 %
		Y	6.85	67.7	20.0		132.4	
		Z	6.75	67.7	19.8		136.6	
10315-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)	X	3.27	71.1	19.8	1.71	140.1	±0.7 %
		Y	2.95	69.4	19.1		139.8	
		Z	3.75	74.4	21.2		146.9	
10316-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 96pc duty cycle)	X	10.04	68.7	21.3	8.36	136.3	±2.5 %
		Y	10.42	69.8	22.1		138.1	
		Z	9.84	68.9	21.3		139.7	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	5.01	69.3	19.2	3.76	144.3	±0.7 %
		Y	4.79	68.1	18.7		146.3	
		Z	5.40	72.5	20.8		146.7	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.97	69.5	19.3	3.77	141.3	±0.7 %
		Y	4.72	68.2	18.8		143.1	
		Z	5.12	71.8	20.5		144.4	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	3.05	70.5	19.5	1.54	139.7	±0.7 %
		Y	2.71	68.7	18.9		140.2	
		Z	4.22	77.3	22.5		145.9	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	9.92	68.6	21.1	8.23	136.3	±2.5 %
		Y	10.20	69.4	21.8		138.3	
		Z	9.76	68.8	21.3		138.9	

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%.

^A The uncertainties of NormX,Y,Z do not affect the E^2 -field uncertainty inside TSL (see Pages 8 and 9).

^B Numerical linearization parameter: uncertainty not required.

^E 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:3332

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unct. (k=2)
750	41.9	0.89	6.56	6.56	6.56	0.50	1.43	± 12.0 %
835	41.5	0.90	6.31	6.31	6.31	0.61	1.31	± 12.0 %
1750	40.1	1.37	5.17	5.17	5.17	0.62	1.33	± 12.0 %
1900	40.0	1.40	5.04	5.04	5.04	0.80	1.17	± 12.0 %
2450	39.2	1.80	4.49	4.49	4.49	0.77	1.24	± 12.0 %
2600	39.0	1.96	4.35	4.35	4.35	0.73	1.38	± 12.0 %

^C 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.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) 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 (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^G 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:3332

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unct. (k=2)
750	55.5	0.96	6.24	6.24	6.24	0.50	1.50	± 12.0 %
835	55.2	0.97	6.21	6.21	6.21	0.45	1.59	± 12.0 %
1750	53.4	1.49	4.88	4.88	4.88	0.39	1.78	± 12.0 %
1900	53.3	1.52	4.64	4.64	4.64	0.61	1.47	± 12.0 %
2450	52.7	1.95	4.31	4.31	4.31	0.80	1.18	± 12.0 %
2600	52.5	2.16	4.11	4.11	4.11	0.68	0.99	± 12.0 %

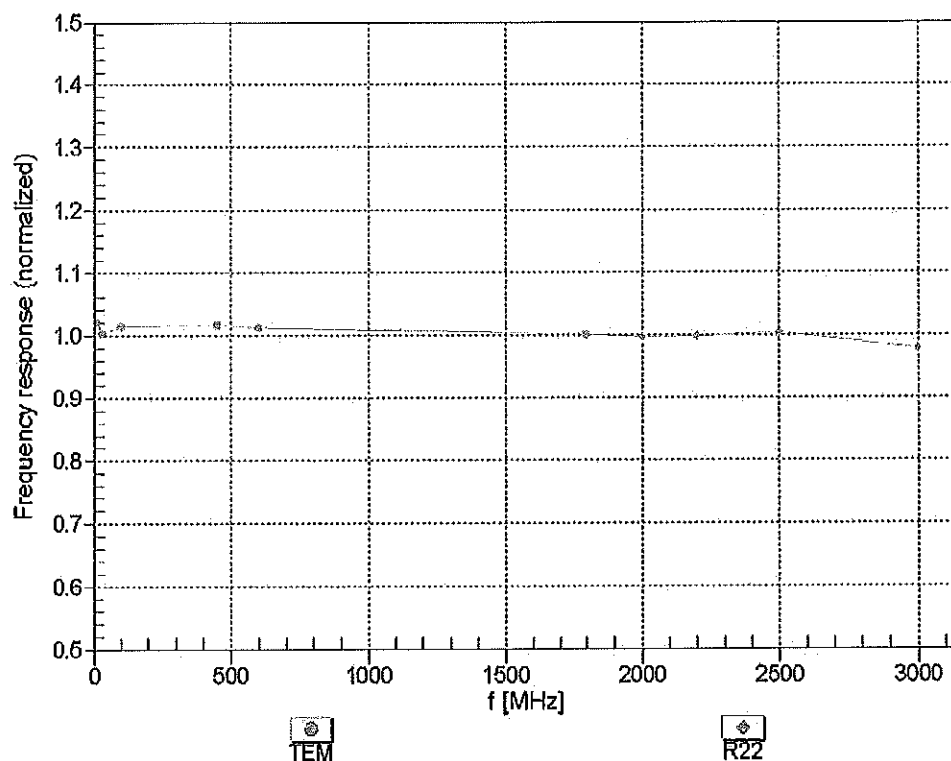
^C Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 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.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) 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 (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^G 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)

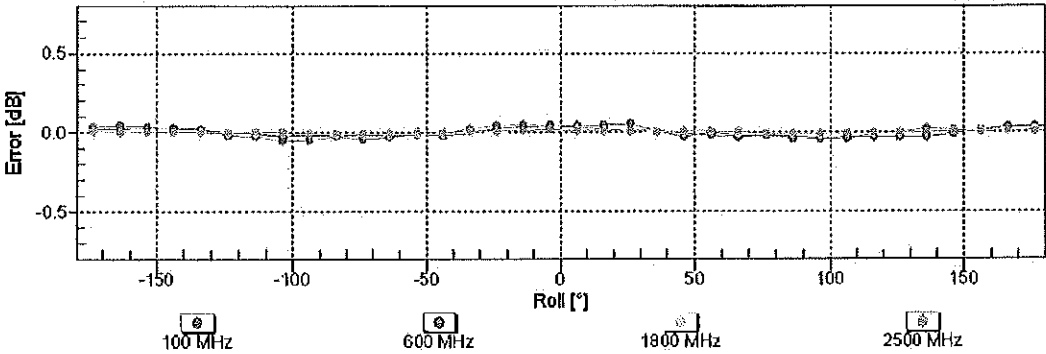
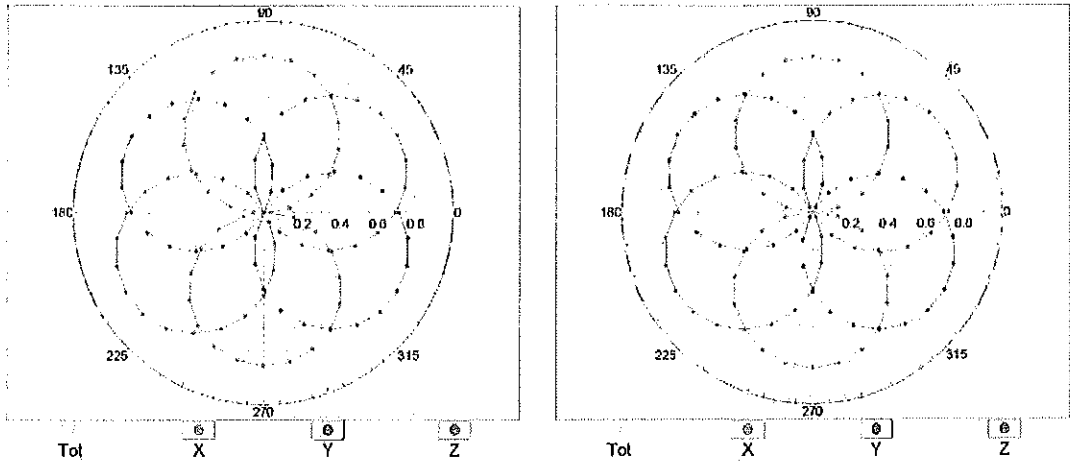


Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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

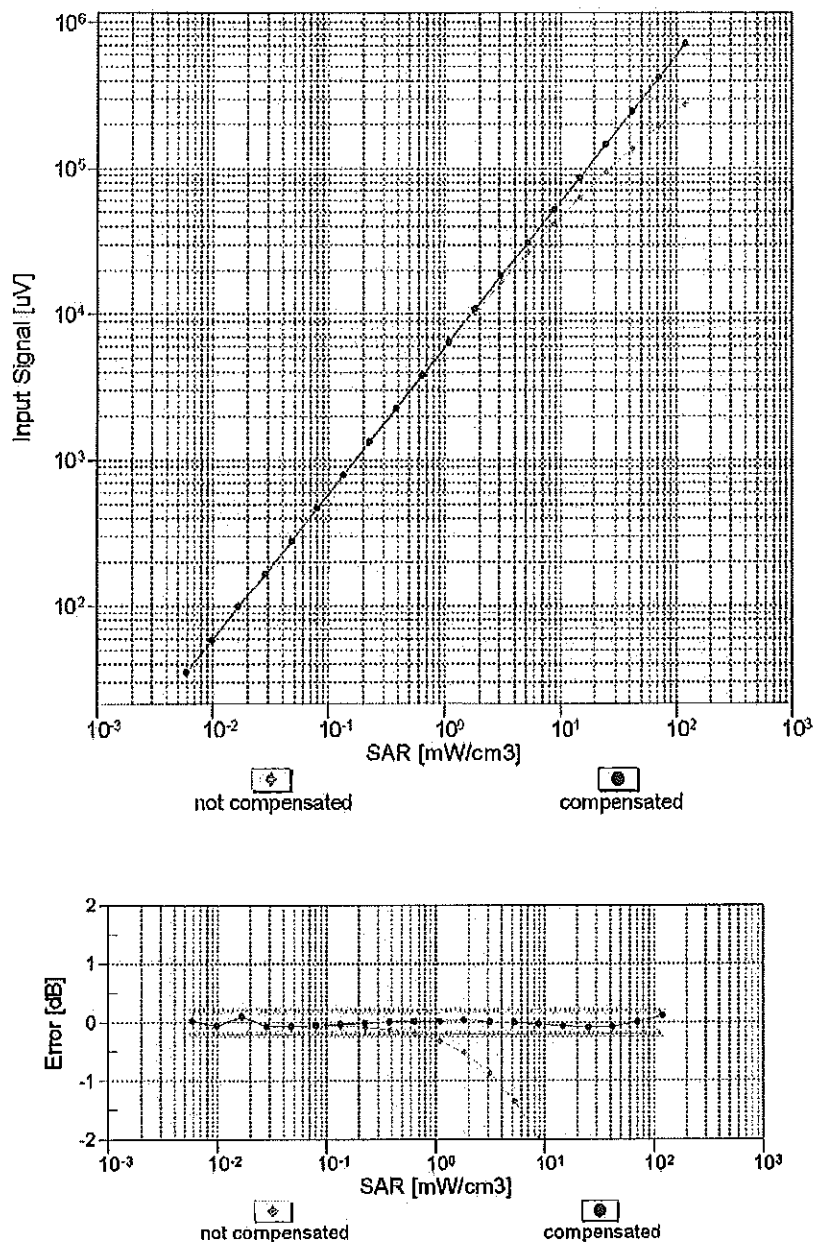
f=600 MHz,TEM

f=1800 MHz,R22



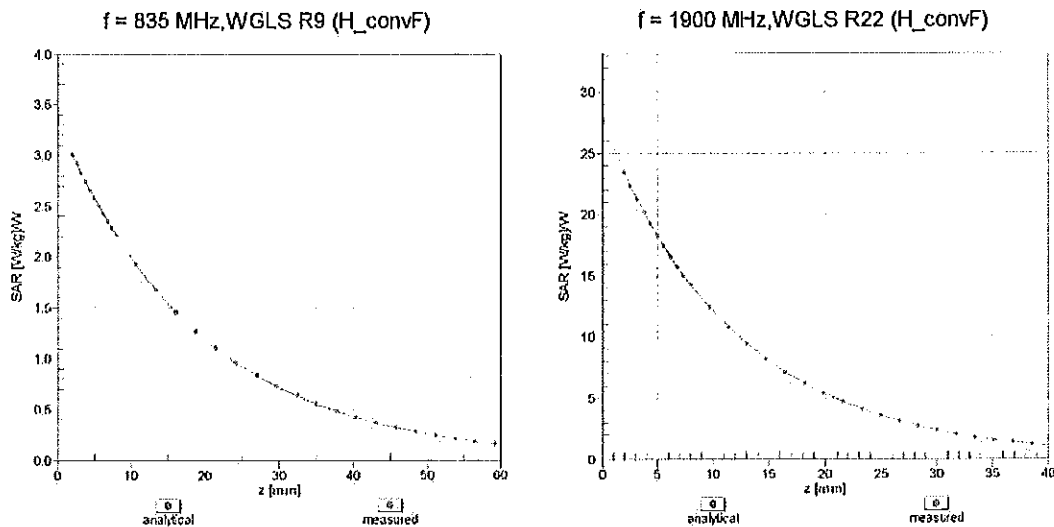
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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



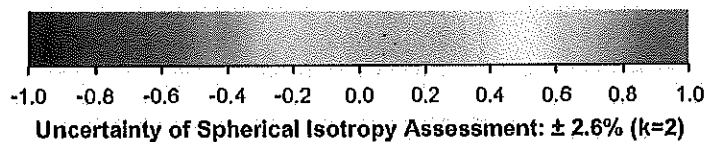
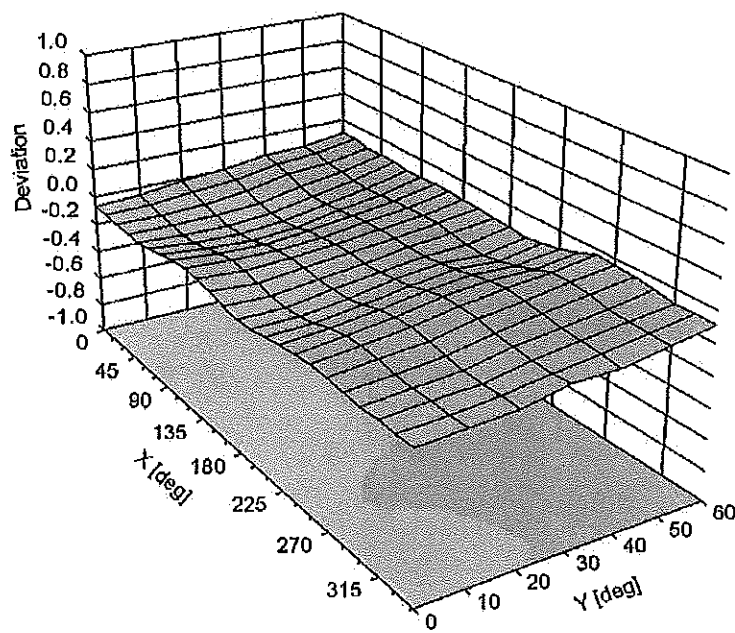
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, θ), $f = 900 \text{ MHz}$



DASY/EASY - Parameters of Probe: ES3DV3 - SN:3332**Other Probe Parameters**

Sensor Arrangement	Triangular
Connector Angle (°)	-3.7
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 ± 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 Israe Elnaouq	Function Laboratory Technician	Signature
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 19, 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 _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), 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_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E^2 -field uncertainty inside TSL (see below *ConvF*).
- NORM(f)_{x,y,z}** = NORM_{x,y,z} * 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_{x,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_{x,y,z}; B_{x,y,z}; C_{x,y,z}; D_{x,y,z}; VR_{x,y,z}**: 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_{x,y,z} * 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 ± 50 MHz to ± 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_x (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 ($\mu V/(V/m)^2$) ^A	1.35	1.33	1.14	± 10.1 %
DCP (mV) ^B	102.0	100.9	103.3	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu V}$	C	D dB	VR mV	Unc ^E (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- 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- 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- 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- 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- 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- 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- 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- 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- 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- 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- 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%.

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

^B Numerical linearization parameter: uncertainty not required.

^E 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) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (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 %

^C 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.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) 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 (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^G 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) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (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 %

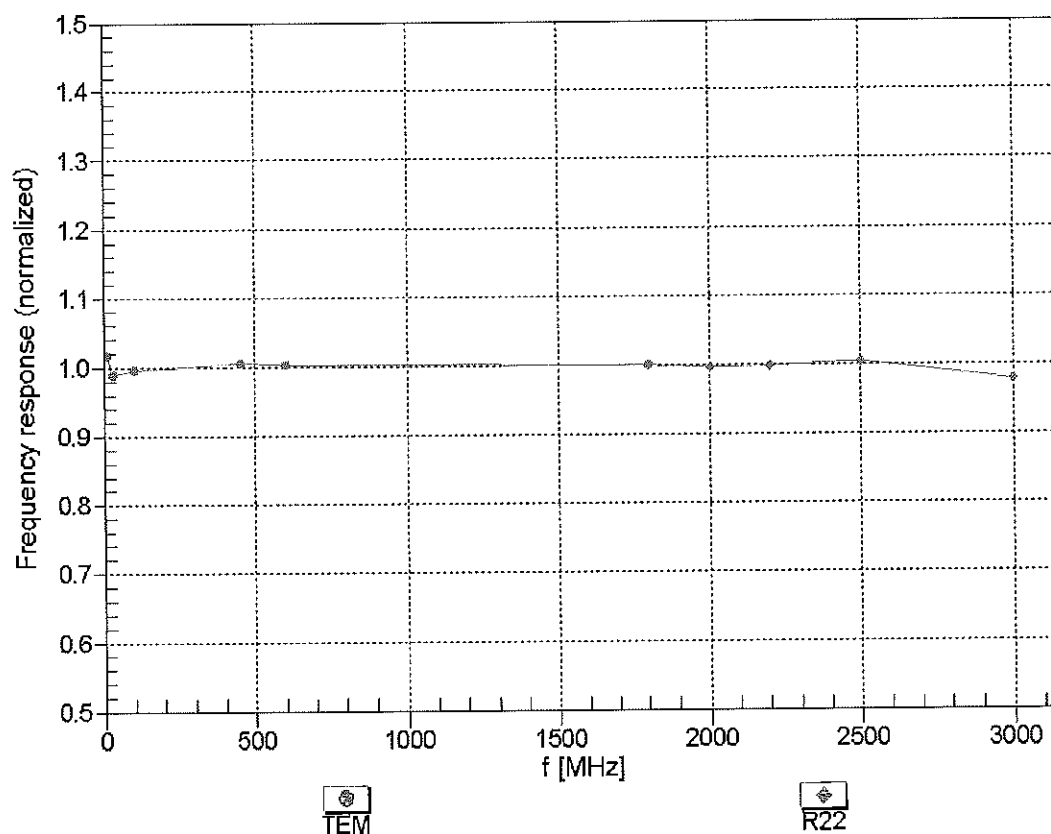
^C Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 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.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) 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 (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^G 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

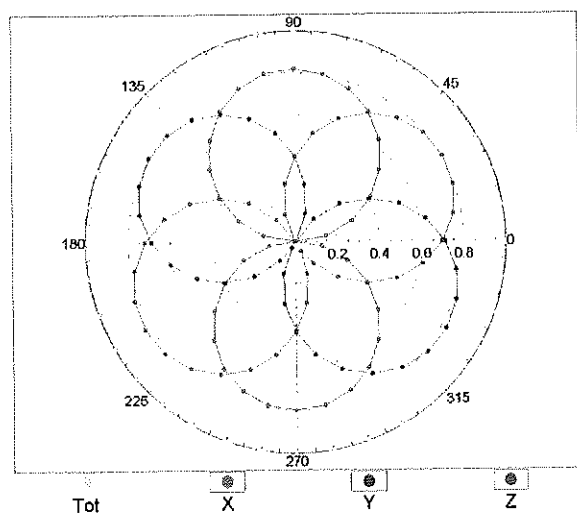
(TEM-Cell:ifi110 EXX, Waveguide: R22)



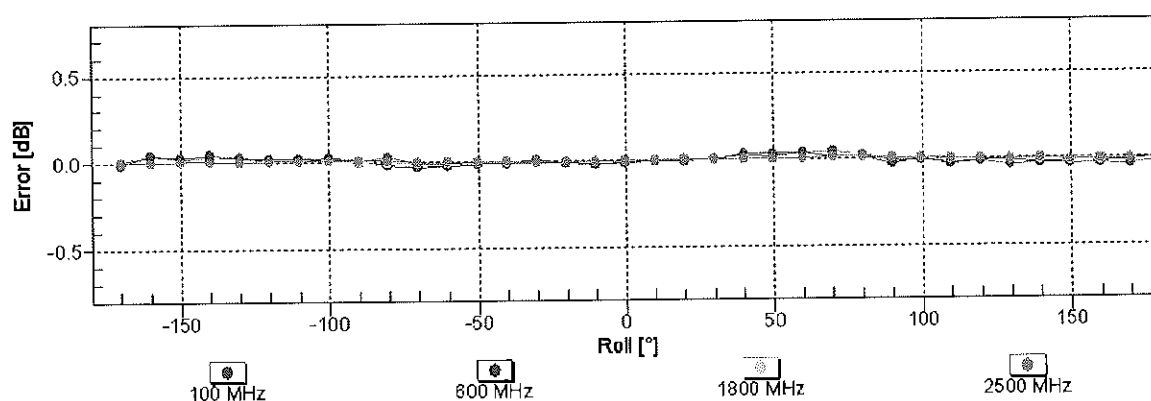
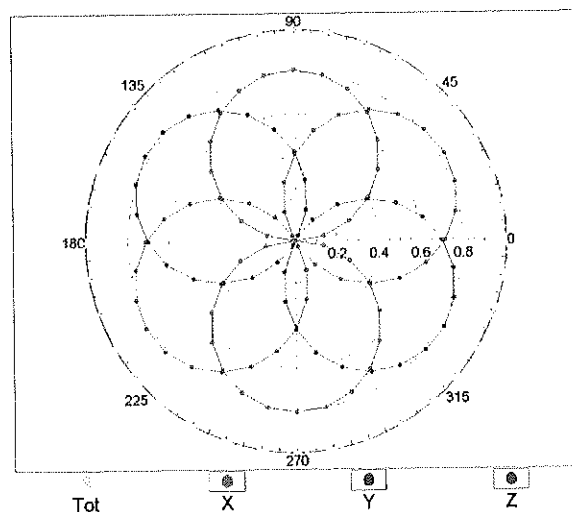
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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

f=600 MHz,TEM

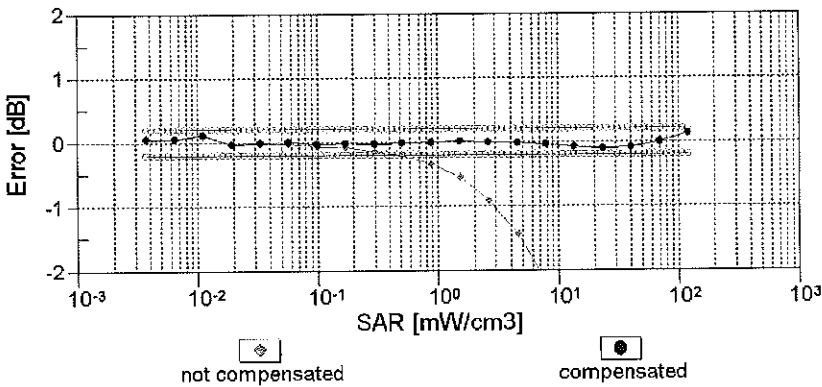
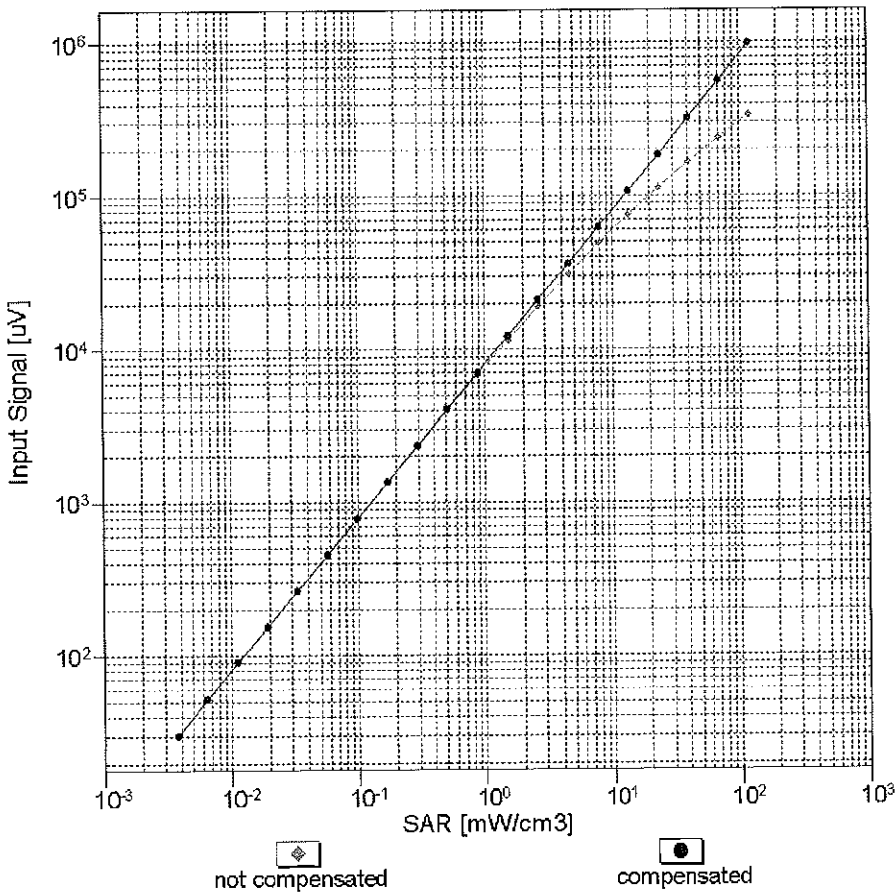


f=1800 MHz,R22



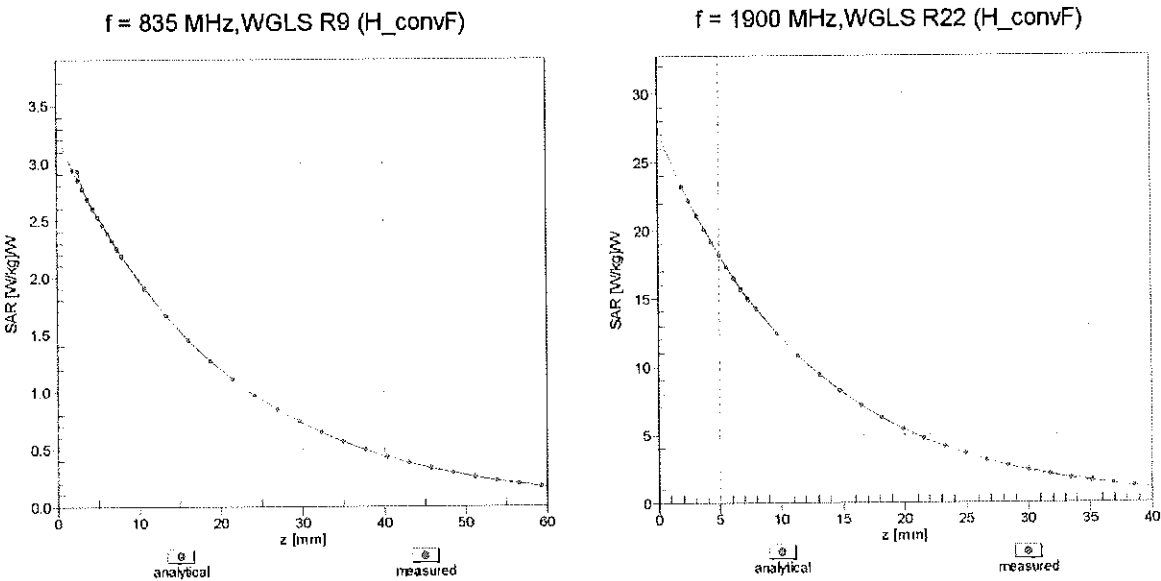
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range f(SAR_{head})
(TEM cell , f_{eval}= 1900 MHz)

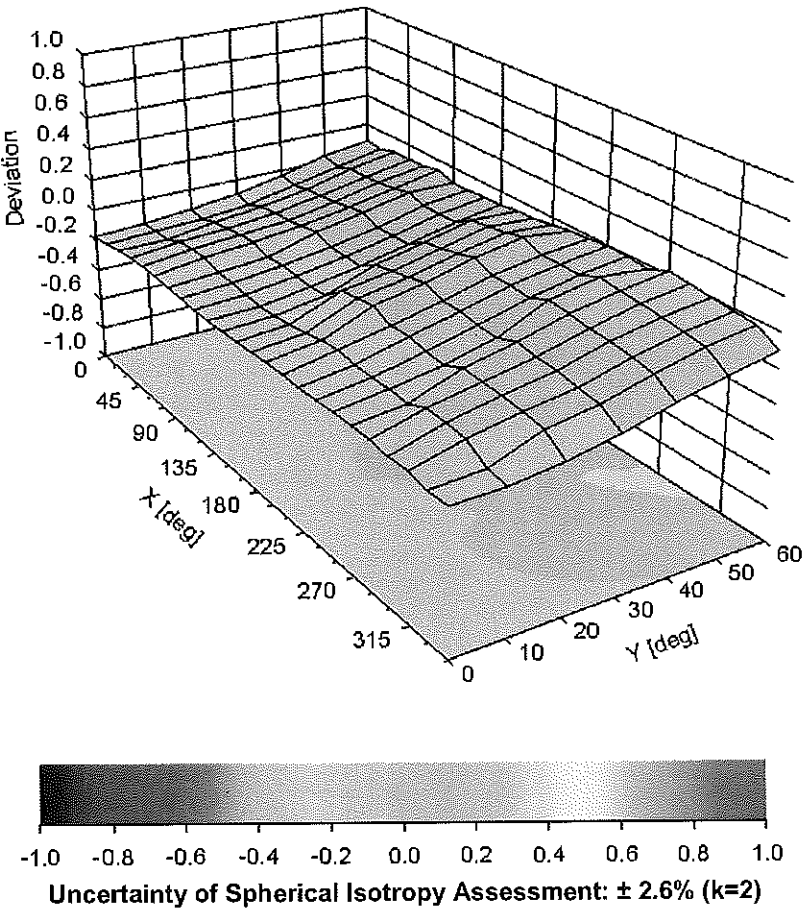


Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in Liquid Error (ϕ , θ), 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

Calibration Laboratory of
Schmid & Partner
Engineering AG
 Zeughausstrasse 43, 8004 Zurich, Switzerland



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
 Swiss Calibration Service

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 108**

Client **PC Test**

Certificate No: **ES3-3334_Dec14**

CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3334**

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

CC
 12/31/14

Calibration date: **December 16, 2014**

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	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-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 789	30-Apr-14 (No. DAE4-789_Apr14)	Apr-15
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 Lelf Klysner	Function Laboratory Technician	Signature
Approved by:	Katja Pokovic	Technical Manager	
			Issued: December 16, 2014

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



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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 108**

Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization ϕ	ϕ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), 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_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z}** = NORM_{x,y,z} * 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_{x,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_{x,y,z}; B_{x,y,z}; C_{x,y,z}; D_{x,y,z}; VR_{x,y,z}**: 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_{x,y,z} * 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 ± 50 MHz to ± 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_x (no uncertainty required).

Probe ES3DV3

SN:3334

Manufactured:	January 24, 2012
Repaired:	December 9, 2014
Calibrated:	December 16, 2014

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3334

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	1.04	1.05	1.01	$\pm 10.1 \%$
DCP (mV) ^B	106.5	105.0	105.6	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	188.0	$\pm 3.0 \%$
		Y	0.0	0.0	1.0		183.2	
		Z	0.0	0.0	1.0		181.8	
10010- CAA	SAR Validation (Square, 100ms, 10ms)	X	4.61	67.2	13.7	10.00	38.4	$\pm 1.4 \%$
		Y	20.36	82.7	18.7		38.0	
		Z	17.55	80.3	17.6		37.0	
10011- CAB	UMTS-FDD (WCDMA)	X	3.56	68.4	19.1	2.91	148.4	$\pm 0.7 \%$
		Y	3.44	68.1	19.2		146.9	
		Z	3.52	68.3	19.1		144.7	
10012- CAB	IEEE 802.11b WIFI 2.4 GHz (DSSS, 1 Mbps)	X	3.54	71.9	20.0	1.87	148.0	$\pm 0.7 \%$
		Y	3.51	72.2	20.5		148.9	
		Z	3.80	73.3	20.6		144.6	
10013- CAB	IEEE 802.11g WIFI 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	11.39	71.1	23.3	9.46	149.8	$\pm 3.8 \%$
		Y	11.54	71.8	24.0		149.5	
		Z	11.11	70.5	23.0		141.6	
10021- DAB	GSM-FDD (TDMA, GMSK)	X	15.29	91.3	25.0	9.39	131.9	$\pm 1.7 \%$
		Y	24.16	100.0	28.4		142.8	
		Z	13.05	89.2	24.5		126.5	
10023- DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	16.07	91.7	25.1	9.57	144.0	$\pm 2.2 \%$
		Y	19.00	95.3	26.8		136.4	
		Z	13.93	89.8	24.6		141.0	
10024- DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	19.98	91.0	22.4	6.56	134.2	$\pm 1.9 \%$
		Y	34.78	99.7	25.5		145.0	
		Z	29.89	96.8	24.1		129.8	
10027- DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	56.30	99.7	22.8	4.80	125.2	$\pm 1.9 \%$
		Y	41.16	99.6	23.9		131.2	
		Z	50.78	99.8	23.1		147.6	
10028- DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	49.35	99.7	22.5	3.55	133.2	$\pm 2.2 \%$
		Y	46.49	99.6	22.9		139.2	
		Z	58.21	99.7	22.0		129.4	
10032- CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	56.54	100.0	20.2	1.16	128.0	$\pm 1.7 \%$
		Y	20.03	99.3	22.4		130.3	
		Z	84.01	100.0	19.4		141.0	
10100- CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.44	67.6	19.6	5.67	138.5	$\pm 1.4 \%$
		Y	6.50	67.9	20.0		142.1	
		Z	6.31	67.2	19.4		129.4	

10103-CAB	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	9.77	73.6	24.6	9.29	129.6	±3.3 %
		Y	10.52	76.0	26.3		132.1	
		Z	10.21	75.0	25.4		147.7	
10108-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.36	67.2	19.6	5.80	136.8	±1.4 %
		Y	6.31	67.3	19.8		137.2	
		Z	6.20	66.7	19.3		128.8	
10117-CAB	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	9.96	68.3	20.8	8.07	126.5	±2.5 %
		Y	10.12	68.8	21.3		126.6	
		Z	10.22	69.0	21.2		143.7	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	9.29	73.0	24.4	9.28	125.3	±3.3 %
		Y	9.65	74.5	25.6		124.4	
		Z	9.65	74.3	25.2		141.1	
10154-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	6.03	66.7	19.3	5.75	132.7	±1.4 %
		Y	5.97	66.7	19.5		132.7	
		Z	6.17	67.3	19.7		148.3	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.47	67.2	19.5	5.82	138.1	±1.4 %
		Y	6.44	67.3	19.8		138.2	
		Z	6.27	66.6	19.2		126.8	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	5.03	66.9	19.6	5.73	137.2	±1.2 %
		Y	4.97	67.0	19.9		135.7	
		Z	4.91	66.5	19.5		127.1	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	8.53	77.4	26.9	9.21	142.4	±2.7 %
		Y	9.59	81.3	29.3		142.3	
		Z	7.78	75.0	25.7		126.7	
10175-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	5.02	67.0	19.7	5.72	131.8	±1.2 %
		Y	4.98	67.0	19.9		136.1	
		Z	4.95	66.8	19.6		128.1	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	4.99	66.8	19.6	5.72	131.2	±1.2 %
		Y	4.99	67.1	20.0		136.2	
		Z	4.92	66.6	19.5		127.9	
10196-CAB	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.98	68.8	21.2	8.10	141.7	±2.5 %
		Y	10.14	69.5	21.8		147.2	
		Z	9.85	68.6	21.1		137.5	
10225-CAB	UMTS-FDD (HSPA+)	X	7.17	67.5	19.6	5.97	146.0	±1.4 %
		Y	7.13	67.7	19.9		149.9	
		Z	7.12	67.5	19.6		142.9	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	8.29	76.6	26.5	9.21	136.1	±2.7 %
		Y	9.60	81.4	29.3		142.3	
		Z	7.98	75.8	26.1		132.9	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	9.27	74.1	25.1	9.24	139.1	±3.3 %
		Y	10.25	77.5	27.4		146.3	
		Z	9.07	73.7	25.0		135.8	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	9.95	74.9	25.4	9.30	147.0	±3.3 %
		Y	9.80	75.0	25.9		125.9	
		Z	9.74	74.6	25.4		143.8	

10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.63	67.6	19.0	3.96	147.5	±0.7 %
		Y	4.41	66.9	18.9		129.5	
		Z	4.61	67.6	19.1		148.1	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.83	67.7	19.0	3.46	133.7	±0.7 %
		Y	3.71	67.4	19.0		139.0	
		Z	3.86	68.1	19.2		133.7	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.85	68.2	19.2	3.39	136.7	±0.5 %
		Y	3.67	67.5	19.1		141.3	
		Z	3.75	67.8	19.0		136.2	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.31	67.1	19.5	5.81	130.6	±1.4 %
		Y	6.32	67.3	19.8		135.1	
		Z	6.24	66.9	19.4		129.2	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.85	67.5	19.8	6.06	135.1	±1.4 %
		Y	6.90	67.9	20.2		141.5	
		Z	6.82	67.5	19.8		135.1	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	5.04	69.1	19.1	3.76	126.0	±0.5 %
		Y	4.90	69.0	19.3		129.6	
		Z	5.11	69.7	19.4		125.8	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	5.05	69.6	19.4	3.77	147.1	±0.7 %
		Y	4.84	69.2	19.5		127.8	
		Z	5.15	70.1	19.6		143.3	
10415-AAA	IEEE 802.11b WIFI 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	3.13	71.2	19.9	1.54	144.5	±0.5 %
		Y	2.93	70.4	19.9		149.8	
		Z	3.18	71.6	20.1		141.4	
10416-AAA	IEEE 802.11g WIFI 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	10.11	69.0	21.4	8.23	144.3	±2.5 %
		Y	10.21	69.6	21.9		148.3	
		Z	9.99	68.9	21.3		141.1	

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%.

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

^B Numerical linearization parameter: uncertainty not required.

^E 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:3334

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^c	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unct. (k=2)
750	41.9	0.89	6.51	6.51	6.51	0.80	1.17	± 12.0 %
835	41.5	0.90	6.25	6.25	6.25	0.38	1.58	± 12.0 %
1750	40.1	1.37	5.21	5.21	5.21	0.43	1.63	± 12.0 %
1900	40.0	1.40	5.03	5.03	5.03	0.53	1.45	± 12.0 %
2450	39.2	1.80	4.51	4.51	4.51	0.80	1.26	± 12.0 %
2600	39.0	1.96	4.31	4.31	4.31	0.79	1.27	± 12.0 %

^c 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.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) 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 (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^G 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:3334

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) ^c	Relative Permittivity ^f	Conductivity (S/m) ^f	ConvF X	ConvF Y	ConvF Z	Alpha ^g	Depth ^d (mm)	Unct. (k=2)
750	55.5	0.96	6.09	6.09	6.09	0.49	1.47	± 12.0 %
835	55.2	0.97	6.14	6.14	6.14	0.69	1.27	± 12.0 %
1750	53.4	1.49	4.94	4.94	4.94	0.80	1.24	± 12.0 %
1900	53.3	1.52	4.73	4.73	4.73	0.62	1.44	± 12.0 %
2450	52.7	1.95	4.28	4.28	4.28	0.80	1.13	± 12.0 %
2600	52.5	2.16	4.16	4.16	4.16	0.75	1.25	± 12.0 %

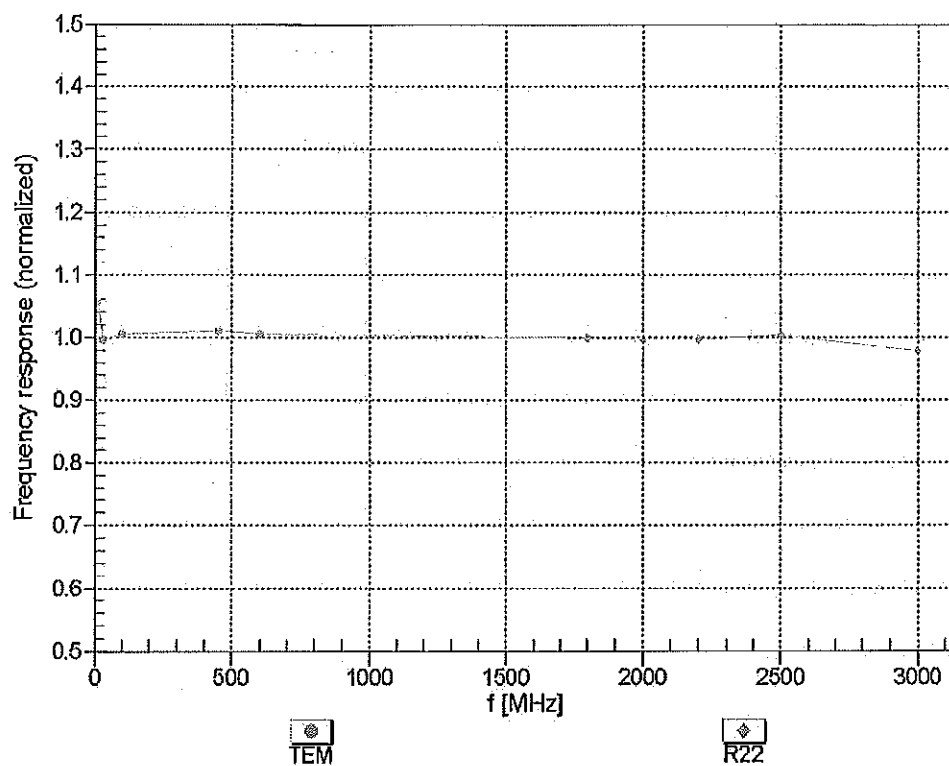
^c Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 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.

^f At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) 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 (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^g 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)

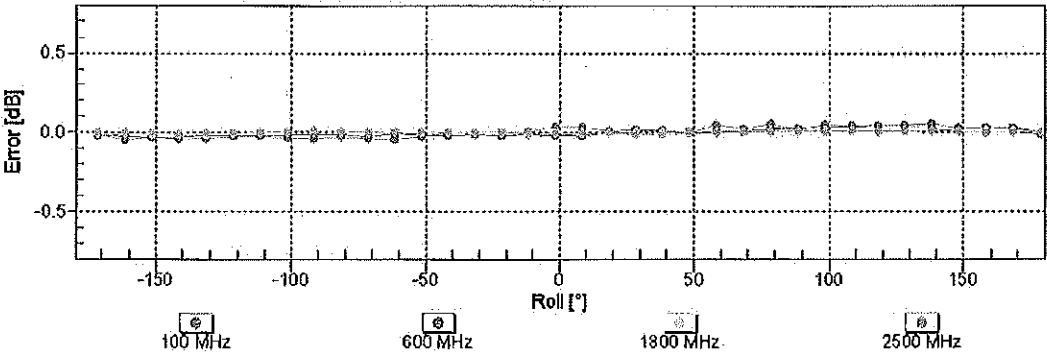
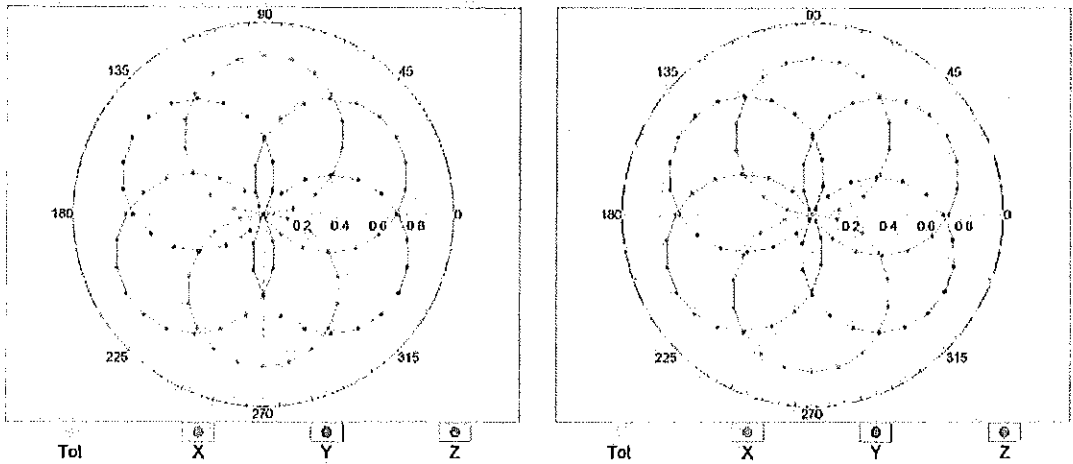


Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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

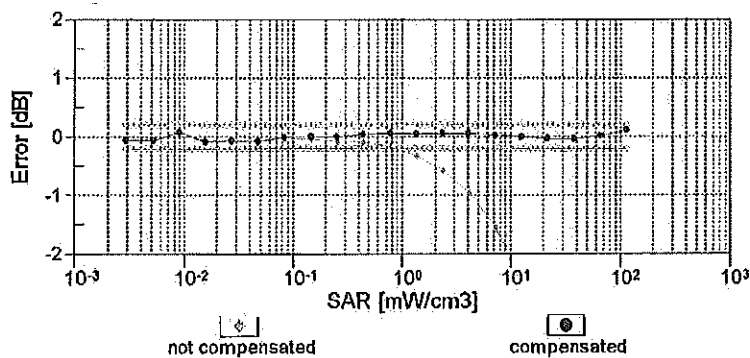
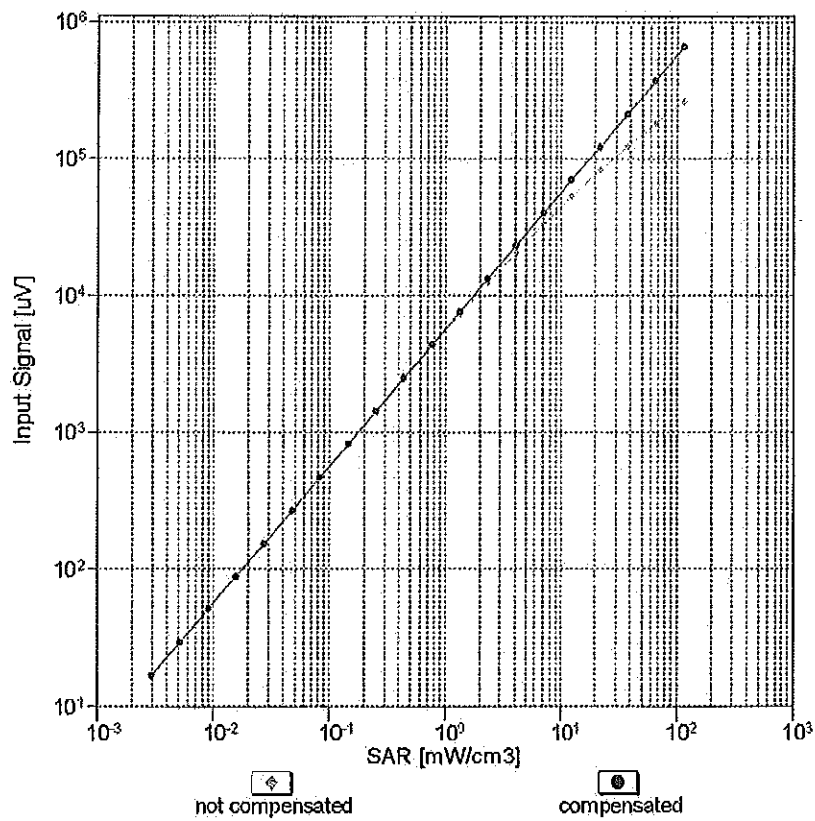
f=600 MHz,TEM

f=1800 MHz,R22



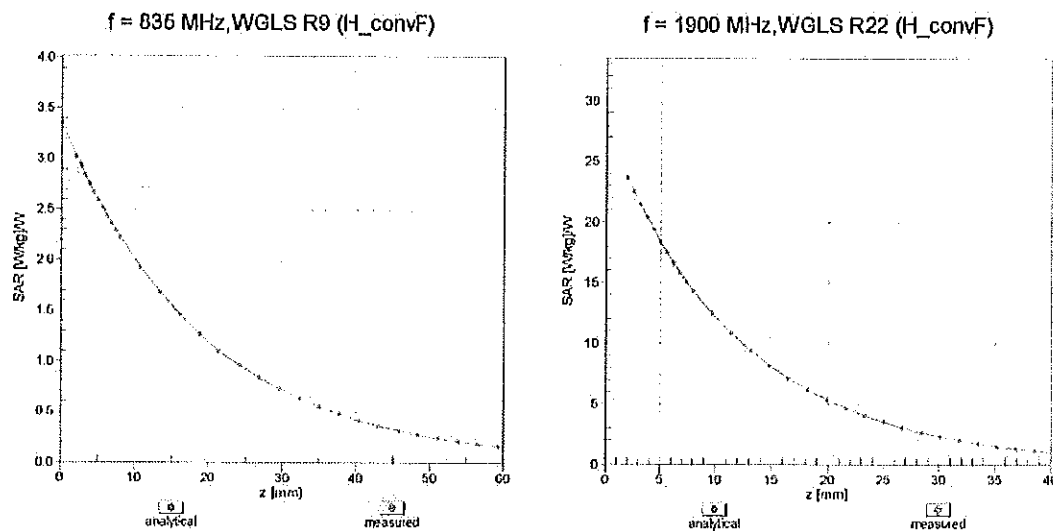
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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



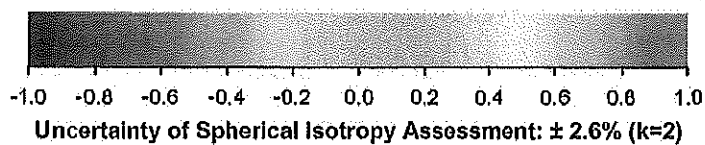
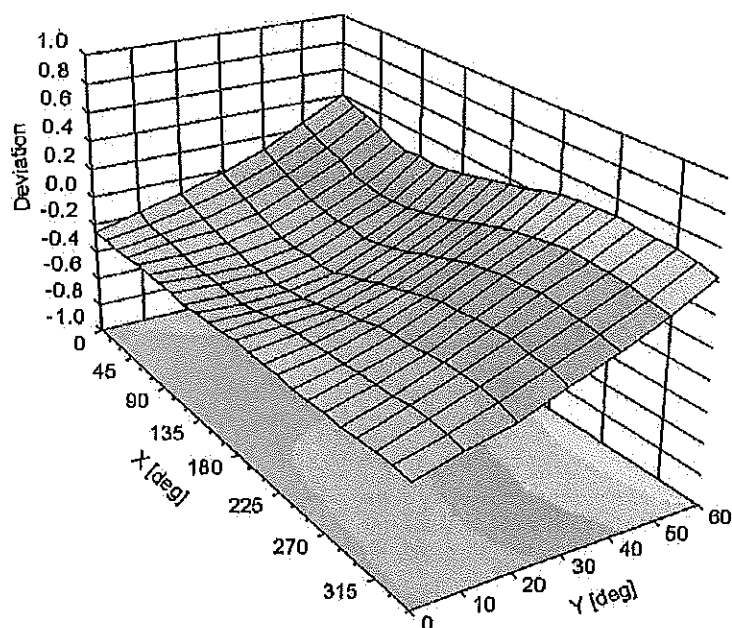
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ , θ), $f = 900 \text{ MHz}$



DASY/EASY - Parameters of Probe: ES3DV3 - SN:3334**Other Probe Parameters**

Sensor Arrangement	Triangular
Connector Angle (°)	18.5
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)
 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: **ES3-3258_Feb15**

CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3258**

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

PN ✓
 3/6/15

Calibration date: **February 27, 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 ± 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 Claudio Leubler	Function Laboratory Technician	Signature
Approved by:	Name Katja Pokovic	Function Technical Manager	Signature
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			Issued: February 27, 2015



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

The Swiss Accreditation Service is one of the signatories to the EA
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Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization ϕ	ϕ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), 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_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z}** = NORM_{x,y,z} * 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_{x,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_{x,y,z}; B_{x,y,z}; C_{x,y,z}; D_{x,y,z}; VR_{x,y,z}; 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_{x,y,z} * 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 ± 50 MHz to ± 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_x (no uncertainty required).

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3258

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	1.29	1.17	1.01	$\pm 10.1 \%$
DCP (mV) ^B	101.9	104.5	92.0	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	186.8	$\pm 3.0 \%$
		Y	0.0	0.0	1.0		179.5	
		Z	0.0	0.0	1.0		198.4	
10010- CAA	SAR Validation (Square, 100ms, 10ms)	X	4.70	64.5	13.6	10.00	43.6	$\pm 2.2 \%$
		Y	1.69	57.9	9.8		40.8	
		Z	1.36	61.6	10.5		58.3	
10011- CAB	UMTS-FDD (WCDMA)	X	3.23	66.3	18.0	2.91	131.8	$\pm 1.2 \%$
		Y	3.40	67.3	18.3		140.6	
		Z	3.40	67.4	19.0		139.4	
10012- CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	2.96	67.7	17.9	1.87	134.2	$\pm 0.7 \%$
		Y	3.06	69.0	18.5		141.2	
		Z	2.58	67.5	18.9		138.1	
10013- CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	12.10	72.1	24.0	9.46	139.7	$\pm 3.3 \%$
		Y	11.17	70.7	23.2		138.6	
		Z	11.13	70.3	23.5		139.1	
10021- DAB	GSM-FDD (TDMA, GMSK)	X	29.84	99.9	28.9	9.39	130.2	$\pm 1.9 \%$
		Y	10.50	86.9	23.8		142.5	
		Z	2.45	67.0	12.9		144.1	
10023- DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	28.34	99.7	29.1	9.57	119.3	$\pm 3.3 \%$
		Y	10.00	85.7	23.2		131.8	
		Z	3.08	71.4	16.0		138.3	
10024- DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	44.08	99.6	25.8	6.56	118.9	$\pm 2.5 \%$
		Y	11.63	85.2	20.7		147.3	
		Z	25.69	99.7	23.4		141.6	
10027- DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	57.19	100.0	24.3	4.80	127.3	$\pm 1.7 \%$
		Y	46.70	99.7	23.1		141.3	
		Z	11.63	87.8	18.3		135.6	
10028- DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	63.03	99.9	23.1	3.55	132.4	$\pm 1.7 \%$
		Y	43.32	97.5	21.5		149.6	
		Z	0.59	59.3	4.9		148.4	
10032- CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	79.78	100.0	20.4	1.16	137.7	$\pm 1.9 \%$
		Y	95.25	97.5	18.1		139.0	
		Z	0.21	58.7	2.5		149.8	
10100- CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.64	68.2	20.0	5.67	146.3	$\pm 1.4 \%$
		Y	6.22	66.7	19.1		127.5	
		Z	6.65	67.9	20.3		129.0	

10103-CAB	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	12.42	78.6	27.2	9.29	126.0	±3.0 %
		Y	9.78	74.1	25.0		141.1	
		Z	8.68	72.3	24.8		127.4	
10108-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.57	67.9	20.0	5.80	144.7	±1.4 %
		Y	6.19	66.6	19.2		126.9	
		Z	6.50	67.4	20.1		128.3	
10117-CAB	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.56	69.6	21.7	8.07	136.4	±2.5 %
		Y	10.21	69.0	21.2		142.8	
		Z	10.95	70.3	22.4		149.6	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	11.31	76.6	26.2	9.28	124.3	±3.0 %
		Y	9.26	73.5	24.9		136.5	
		Z	8.51	72.6	25.3		147.8	
10154-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	6.23	67.2	19.7	5.75	144.5	±1.4 %
		Y	6.12	67.0	19.5		146.5	
		Z	6.17	66.8	19.7		126.0	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.65	67.6	19.8	5.82	149.6	±1.4 %
		Y	6.28	66.5	19.1		128.2	
		Z	6.49	66.9	19.7		130.6	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	5.25	67.1	19.8	5.73	149.2	±2.7 %
		Y	4.91	66.4	19.3		127.6	
		Z	5.18	67.5	20.3		129.2	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	13.26	87.2	31.5	9.21	141.5	±3.5 %
		Y	8.12	76.7	26.7		148.3	
		Z	6.24	71.2	25.1		133.0	
10175-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	5.24	67.1	19.8	5.72	144.4	±1.4 %
		Y	5.07	67.2	19.7		148.4	
		Z	5.39	68.3	20.9		149.2	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	5.23	67.0	19.7	5.72	147.7	±1.4 %
		Y	5.08	67.2	19.7		147.7	
		Z	5.32	68.0	20.7		149.9	
10196-CAB	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	10.20	69.2	21.6	8.10	132.2	±2.5 %
		Y	9.77	68.4	21.0		132.4	
		Z	10.50	69.7	22.2		142.9	
10225-CAB	UMTS-FDD (HSPA+)	X	7.05	66.7	19.3	5.97	134.8	±1.7 %
		Y	6.99	67.1	19.3		137.4	
		Z	7.25	67.1	19.9		143.2	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	12.72	85.8	30.7	9.21	144.2	±3.0 %
		Y	7.30	73.7	25.2		124.4	
		Z	6.37	71.8	25.5		135.4	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	12.64	81.1	28.7	9.24	142.0	±3.3 %
		Y	8.41	72.0	24.2		125.6	
		Z	7.90	71.5	24.9		139.7	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	11.35	76.9	26.5	9.30	118.8	±2.7 %
		Y	9.17	73.2	24.7		135.1	
		Z	8.55	72.7	25.4		146.4	

10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.42	66.3	18.4	3.96	134.0	±1.2 %
		Y	4.49	66.9	18.6		140.3	
		Z	4.67	67.6	19.5		142.8	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.71	66.6	18.4	3.46	147.8	±0.9 %
		Y	3.74	67.2	18.6		130.4	
		Z	3.70	66.6	18.9		131.8	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.68	66.8	18.5	3.39	147.7	±0.7 %
		Y	3.60	66.7	18.3		132.8	
		Z	3.66	66.5	18.7		133.8	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.55	67.8	20.0	5.81	143.8	±1.7 %
		Y	6.39	67.3	19.6		147.3	
		Z	6.60	67.6	20.3		129.4	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	7.16	68.5	20.4	6.06	149.6	±1.4 %
		Y	6.69	67.0	19.4		129.6	
		Z	7.28	68.5	20.8		136.6	
10400-AAB	IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)	X	10.51	69.6	22.0	8.37	132.9	±2.7 %
		Y	10.08	68.8	21.3		135.5	
		Z	10.91	70.2	22.7		147.0	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.65	66.6	18.0	3.76	140.7	±2.2 %
		Y	4.93	68.8	18.8		143.5	
		Z	4.99	68.3	19.2		148.7	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.53	66.5	17.8	3.77	138.3	±0.7 %
		Y	4.85	68.9	18.8		140.2	
		Z	4.58	66.5	18.2		145.3	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	2.43	66.1	17.4	1.54	133.0	±1.9 %
		Y	2.72	68.0	18.0		138.1	
		Z	2.54	67.6	18.8		139.4	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	10.18	69.0	21.5	8.23	132.1	±2.5 %
		Y	9.90	68.6	21.2		134.4	
		Z	10.65	69.8	22.4		144.7	

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%.

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

^B Numerical linearization parameter: uncertainty not required.

^E 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:3258

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unct. (k=2)
750	41.9	0.89	6.45	6.45	6.45	0.48	1.43	± 12.0 %
835	41.5	0.90	6.21	6.21	6.21	0.40	1.59	± 12.0 %
1750	40.1	1.37	5.27	5.27	5.27	0.66	1.25	± 12.0 %
1900	40.0	1.40	5.15	5.15	5.15	0.75	1.20	± 12.0 %
2300	39.5	1.67	5.06	5.06	5.06	0.73	1.31	± 12.0 %
2450	39.2	1.80	4.61	4.61	4.61	0.69	1.36	± 12.0 %
2600	39.0	1.96	4.38	4.38	4.38	0.80	1.26	± 12.0 %

^C 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.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) 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 (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^G 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:3258

Calibration Parameter Determined in Body Tissue Simulating Media

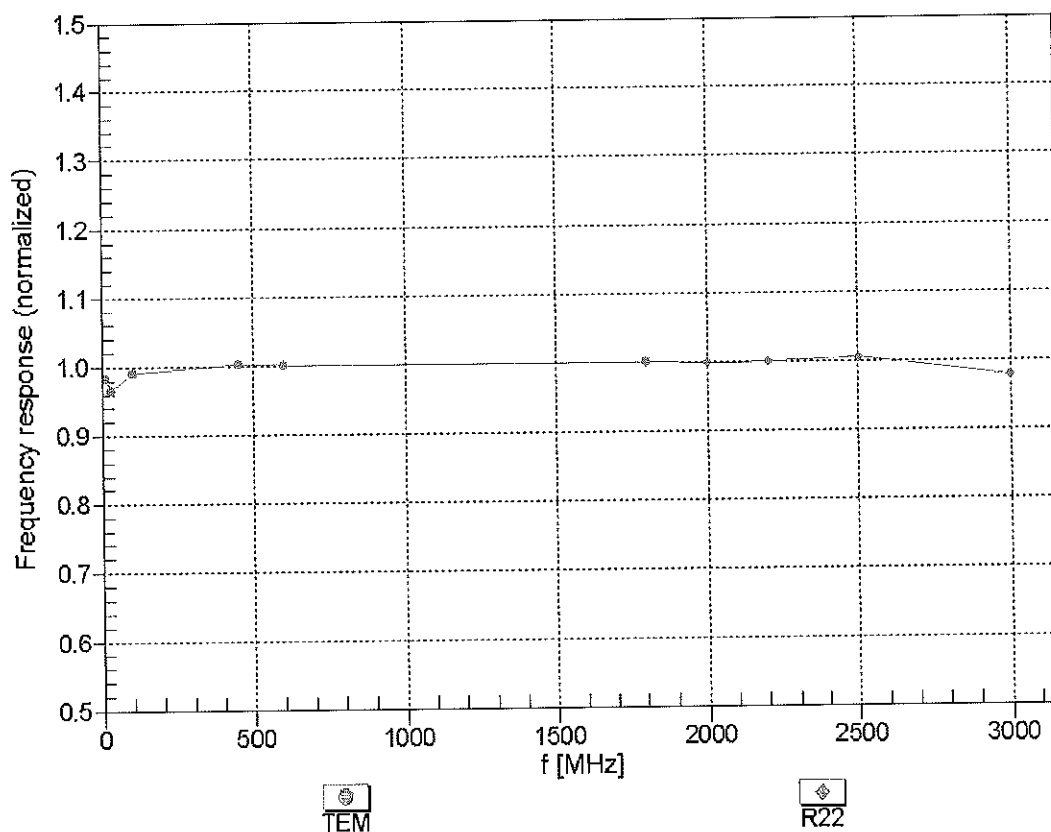
f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unct. (k=2)
750	55.5	0.96	6.13	6.13	6.13	0.47	1.51	± 12.0 %
835	55.2	0.97	6.16	6.16	6.16	0.63	1.25	± 12.0 %
1750	53.4	1.49	4.88	4.88	4.88	0.75	1.39	± 12.0 %
1900	53.3	1.52	4.64	4.64	4.64	0.71	1.34	± 12.0 %
2300	52.9	1.81	4.77	4.77	4.77	0.80	1.18	± 12.0 %
2450	52.7	1.95	4.17	4.17	4.17	0.80	1.09	± 12.0 %
2600	52.5	2.16	3.95	3.95	3.95	0.80	1.09	± 12.0 %

^C 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.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) 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 (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^G 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.

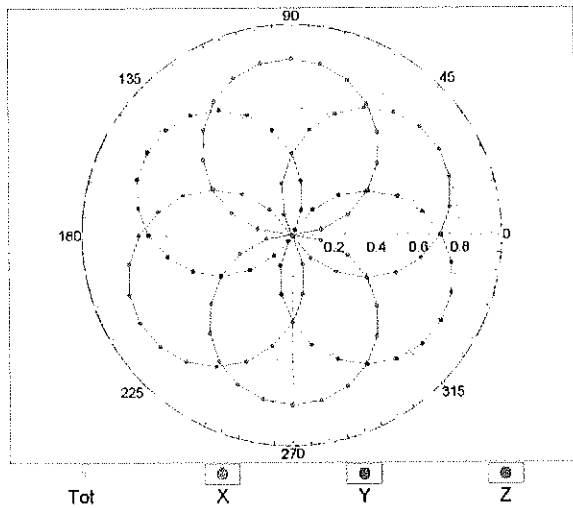
Frequency Response of E-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)



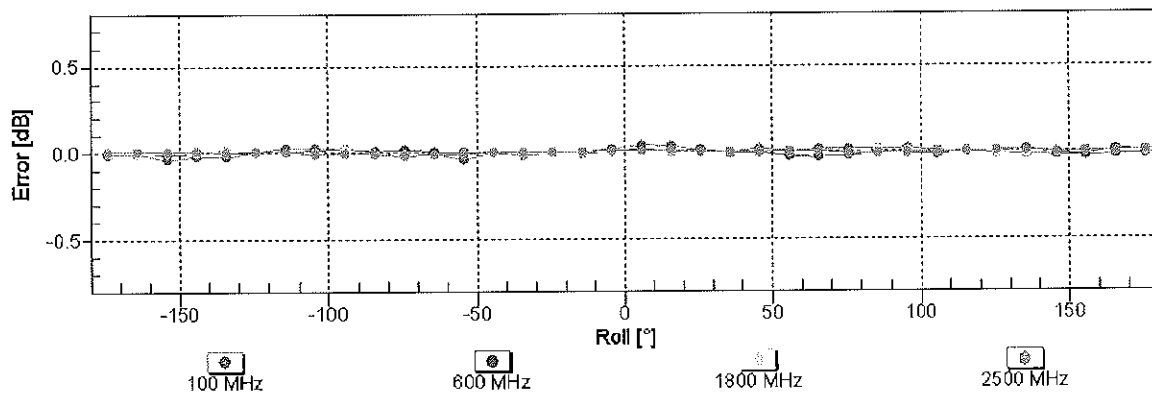
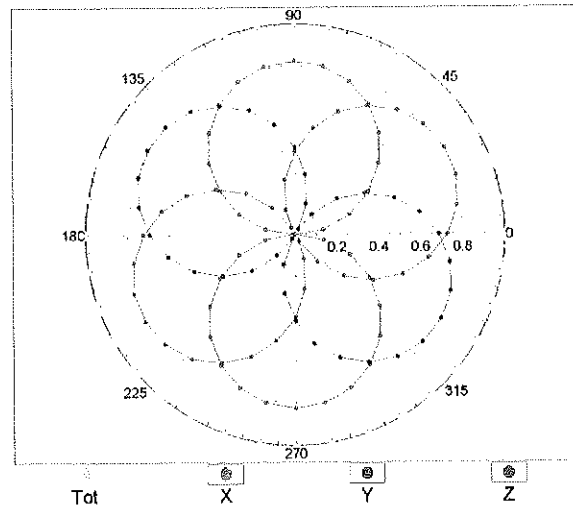
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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

f=600 MHz,TEM

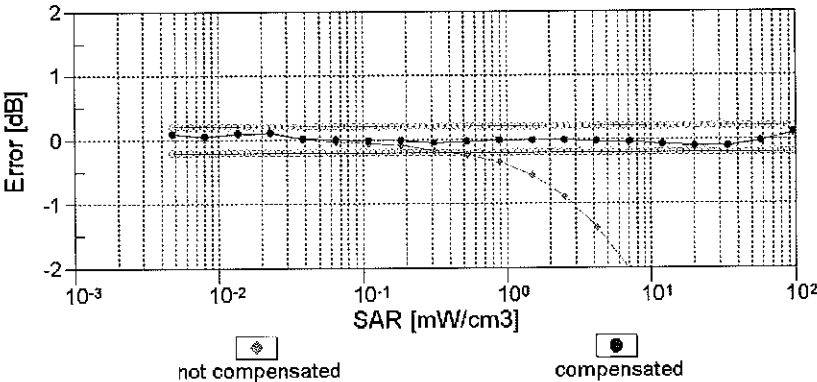
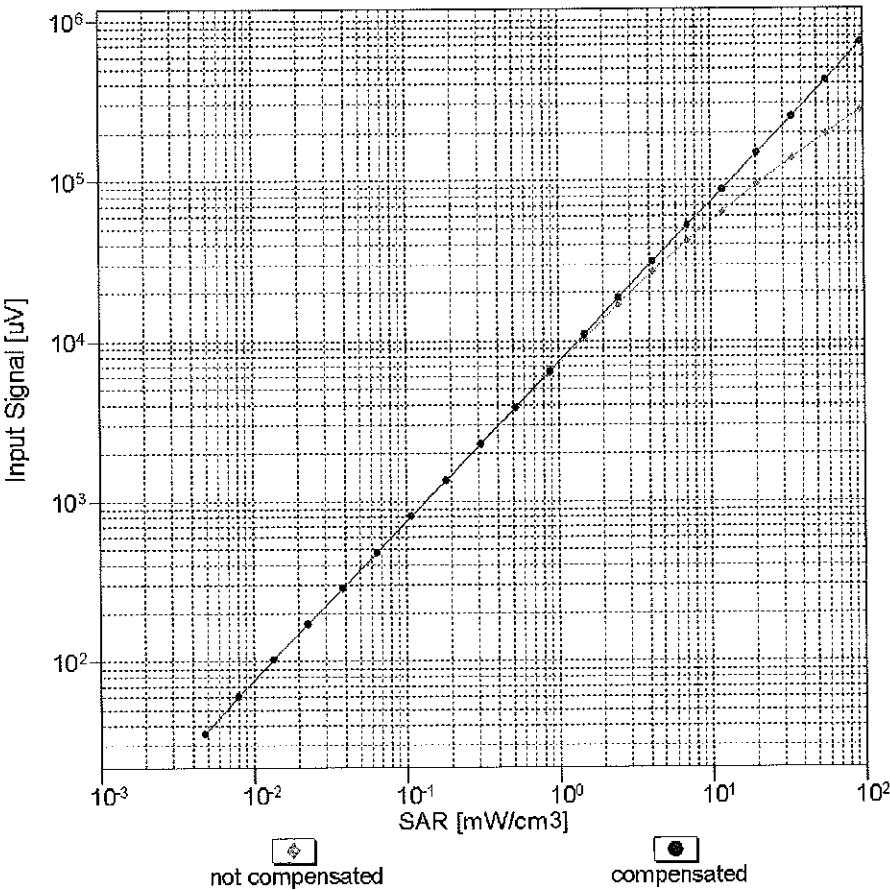


f=1800 MHz,R22



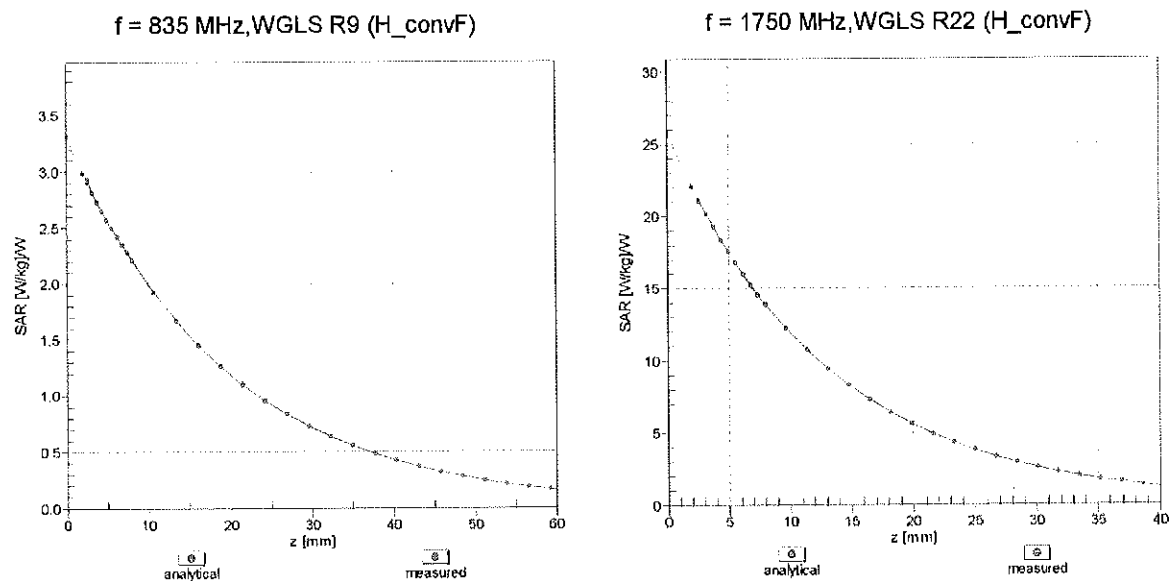
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ (k=2)

Dynamic Range f(SAR_{head})
(TEM cell , f_{eval}= 1900 MHz)



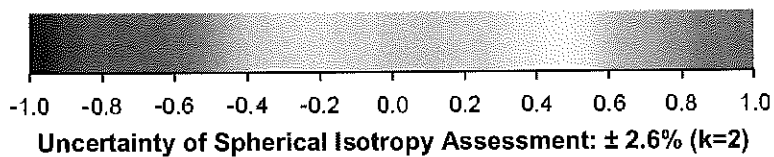
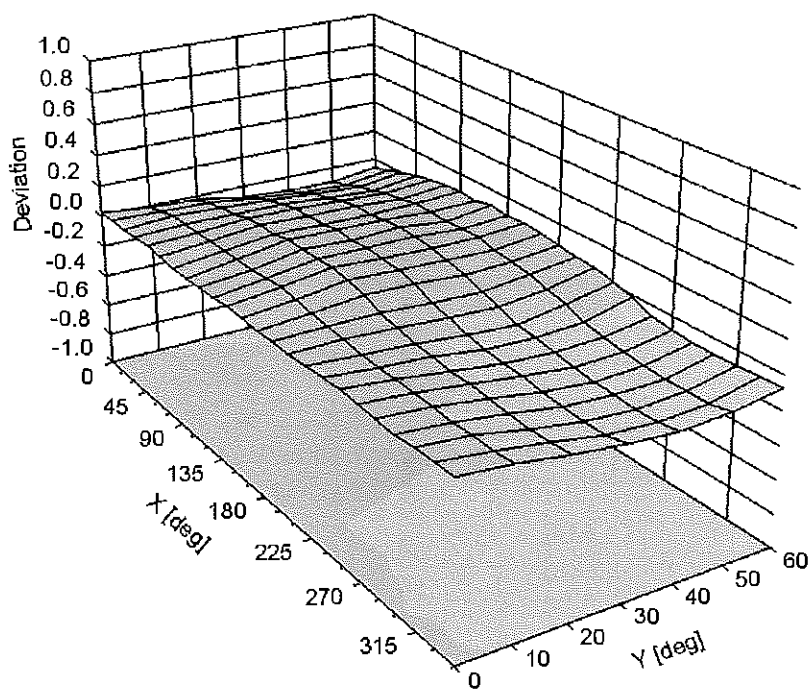
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, θ), $f = 900 \text{ MHz}$



DASY/EASY - Parameters of Probe: ES3DV3 - SN:3258

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-114.2
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)
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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **ES3-3318_Jan15**

CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3318**

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

CC
 1/30/15

Calibration date: **January 23, 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	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 Israe Elnaouq	Function Laboratory Technician	Signature
Approved by:	Katja Pokovic	Technical Manager	

Issued: January 26, 2015

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



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

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 Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization ϕ	ϕ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), 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_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z}** = NORM_{x,y,z} * 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_{x,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_{x,y,z}; B_{x,y,z}; C_{x,y,z}; D_{x,y,z}; VR_{x,y,z}**: 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_{x,y,z} * 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 ± 50 MHz to ± 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_x (no uncertainty required).

Probe ES3DV3

SN:3318

Manufactured: January 10, 2012
Calibrated: January 23, 2015

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3318

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	1.15	0.92	1.28	$\pm 10.1 \%$
DCP (mV) ^B	106.4	109.2	103.4	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	200.6	$\pm 3.5 \%$
		Y	0.0	0.0	1.0		185.3	
		Z	0.0	0.0	1.0		207.7	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	3.26	66.4	14.0	10.00	41.4	$\pm 1.2 \%$
		Y	1.76	59.6	9.8		36.1	
		Z	1.82	57.7	9.6		43.6	
10011-CAB	UMTS-FDD (WCDMA)	X	3.48	68.9	19.9	2.91	120.2	$\pm 0.5 \%$
		Y	3.76	70.1	19.9		146.0	
		Z	3.11	66.0	17.9		124.4	
10012-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	3.71	74.2	21.7	1.87	121.7	$\pm 0.7 \%$
		Y	3.65	73.3	20.7		147.5	
		Z	2.77	67.4	17.8		126.6	
10013-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	10.68	69.5	22.7	9.46	114.7	$\pm 2.5 \%$
		Y	10.82	70.4	23.0		139.8	
		Z	11.22	71.1	23.7		122.2	
10021-DAB	GSM-FDD (TDMA, GMSK)	X	16.13	95.0	26.6	9.39	122.7	$\pm 2.2 \%$
		Y	4.61	73.1	17.2		130.8	
		Z	15.10	92.0	25.4		135.9	
10023-DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	17.03	96.8	27.5	9.57	113.0	$\pm 1.9 \%$
		Y	4.15	71.7	16.8		119.9	
		Z	21.50	98.0	27.5		130.9	
10024-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	35.51	99.5	24.5	6.56	147.6	$\pm 2.7 \%$
		Y	6.12	77.2	17.1		118.1	
		Z	38.50	99.7	24.7		114.0	
10027-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	45.57	99.9	23.2	4.80	113.3	$\pm 1.7 \%$
		Y	2.73	68.4	12.6		133.3	
		Z	54.59	99.9	22.9		131.0	
10028-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	53.68	99.5	21.9	3.55	123.0	$\pm 3.0 \%$
		Y	60.05	99.8	21.1		144.9	
		Z	66.60	99.6	21.6		140.7	
10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	20.92	99.4	21.8	1.16	136.6	$\pm 2.2 \%$
		Y	95.40	88.3	13.8		117.6	
		Z	100.00	99.5	18.7		110.1	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.50	68.1	20.2	5.67	130.5	$\pm 1.2 \%$
		Y	6.11	66.7	19.2		107.2	
		Z	6.55	68.2	20.1		142.7	

10103-CAB	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	9.76	74.8	25.9	9.29	116.0	±2.5 %
		Y	8.85	72.2	24.1		134.9	
		Z	10.83	77.4	27.2		131.5	
10108-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.36	67.7	20.1	5.80	128.7	±1.2 %
		Y	5.92	66.1	19.0		106.6	
		Z	6.42	67.7	20.0		140.4	
10117-CAB	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.20	69.1	21.6	8.07	118.1	±2.5 %
		Y	10.27	69.3	21.4		143.9	
		Z	10.43	69.7	21.8		131.0	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	9.09	73.7	25.5	9.28	112.0	±2.7 %
		Y	8.35	71.5	23.9		131.1	
		Z	9.58	74.4	25.6		126.8	
10154-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	6.01	67.0	19.8	5.75	126.4	±1.2 %
		Y	6.17	67.7	19.9		148.9	
		Z	6.07	67.1	19.7		137.2	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.41	67.4	19.9	5.82	130.9	±0.9 %
		Y	6.06	66.2	19.0		109.1	
		Z	6.54	67.7	20.0		142.6	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	4.79	66.5	19.8	5.73	109.4	±0.9 %
		Y	4.82	67.1	19.8		128.8	
		Z	4.85	66.4	19.5		119.0	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	8.44	79.3	28.7	9.21	125.1	±2.5 %
		Y	7.15	75.0	26.0		144.0	
		Z	10.13	83.8	30.8		141.9	
10175-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	5.13	68.2	20.8	5.72	146.5	±0.9 %
		Y	4.77	66.8	19.6		125.2	
		Z	4.81	66.2	19.4		118.5	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	5.11	68.1	20.7	5.72	146.4	±0.9 %
		Y	4.79	67.0	19.7		126.0	
		Z	4.88	66.6	19.7		118.9	
10196-CAB	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.63	68.3	21.2	8.10	108.2	±2.5 %
		Y	9.84	68.9	21.3		135.5	
		Z	9.99	69.2	21.7		124.0	
10225-CAB	UMTS-FDD (HSPA+)	X	6.99	67.3	19.7	5.97	134.8	±0.9 %
		Y	6.73	66.8	19.2		115.9	
		Z	6.71	66.2	19.0		106.3	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	7.79	76.4	27.0	9.21	126.4	±2.5 %
		Y	7.19	75.1	26.1		144.7	
		Z	10.12	83.9	30.9		142.0	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	8.19	71.9	24.7	9.24	103.3	±2.2 %
		Y	7.76	70.8	23.6		122.0	
		Z	9.31	75.2	26.4		119.1	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	8.90	73.0	25.1	9.30	108.7	±2.2 %
		Y	8.38	71.6	24.0		129.7	
		Z	10.15	76.5	26.9		126.1	

10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.42	67.2	19.2	3.96	119.1	±0.7 %
		Y	4.71	68.5	19.5		143.8	
		Z	4.39	66.7	18.6		131.7	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.65	67.5	19.3	3.46	111.3	±0.5 %
		Y	3.89	69.0	19.6		130.9	
		Z	3.49	66.1	18.2		122.4	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.60	67.6	19.3	3.39	114.4	±0.5 %
		Y	3.85	69.1	19.7		133.4	
		Z	3.45	66.2	18.2		123.7	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.36	67.6	20.1	5.81	128.7	±1.2 %
		Y	5.95	66.1	19.0		106.5	
		Z	6.39	67.6	19.9		140.7	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.98	68.4	20.6	6.06	134.9	±1.2 %
		Y	6.52	66.7	19.3		111.3	
		Z	7.06	68.6	20.5		146.2	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.97	69.7	19.7	3.76	122.2	±0.5 %
		Y	5.31	71.6	20.2		143.6	
		Z	4.54	67.3	18.2		133.0	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.77	69.4	19.6	3.77	120.8	±0.5 %
		Y	5.40	72.4	20.6		141.3	
		Z	4.71	68.5	18.9		131.5	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	3.07	71.7	20.7	1.54	120.5	±0.7 %
		Y	3.52	73.8	21.0		142.0	
		Z	2.38	66.1	17.4		129.6	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	9.73	68.3	21.2	8.23	114.7	±2.5 %
		Y	9.99	69.2	21.5		138.0	
		Z	10.10	69.4	21.9		125.3	

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%.

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

^B Numerical linearization parameter: uncertainty not required.

^E 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:3318

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unct. (k=2)
750	41.9	0.89	6.58	6.58	6.58	0.36	1.73	± 12.0 %
835	41.5	0.90	6.39	6.39	6.39	0.80	1.14	± 12.0 %
1750	40.1	1.37	5.27	5.27	5.27	0.76	1.19	± 12.0 %
1900	40.0	1.40	5.05	5.05	5.05	0.44	1.55	± 12.0 %
2300	39.5	1.67	4.78	4.78	4.78	0.80	1.23	± 12.0 %
2450	39.2	1.80	4.50	4.50	4.50	0.55	1.49	± 12.0 %
2600	39.0	1.96	4.34	4.34	4.34	0.76	1.32	± 12.0 %

^C 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.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) 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 (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^G 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:3318

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unct. (k=2)
750	55.5	0.96	6.22	6.22	6.22	0.67	1.28	± 12.0 %
835	55.2	0.97	6.23	6.23	6.23	0.80	1.19	± 12.0 %
1750	53.4	1.49	4.95	4.95	4.95	0.40	1.77	± 12.0 %
1900	53.3	1.52	4.76	4.76	4.76	0.60	1.48	± 12.0 %
2300	52.9	1.81	4.52	4.52	4.52	0.80	1.19	± 12.0 %
2450	52.7	1.95	4.37	4.37	4.37	0.72	1.23	± 12.0 %
2600	52.5	2.16	4.17	4.17	4.17	0.80	1.00	± 12.0 %

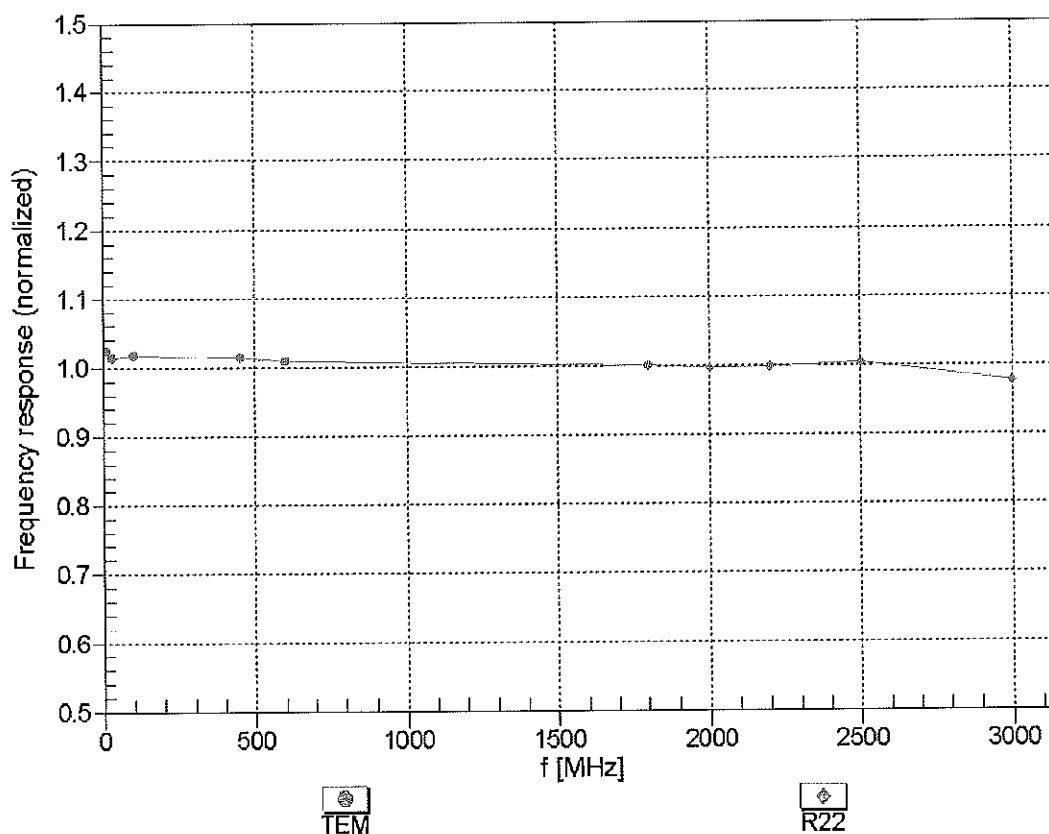
^C Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 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.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to $\pm 10\%$ if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to $\pm 5\%$. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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

Frequency Response of E-Field

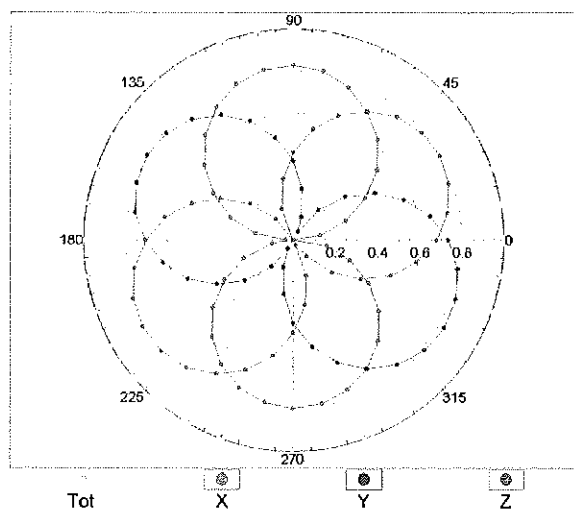
(TEM-Cell:ifi110 EXX, Waveguide: R22)



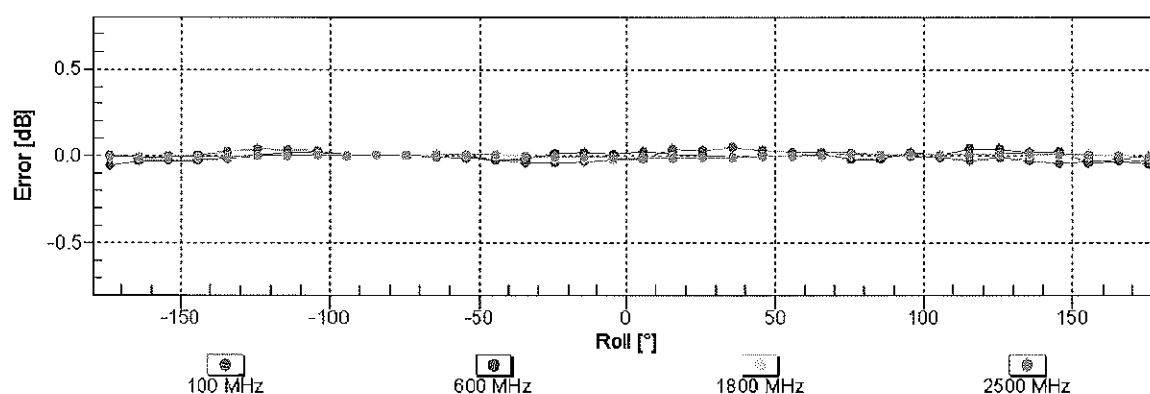
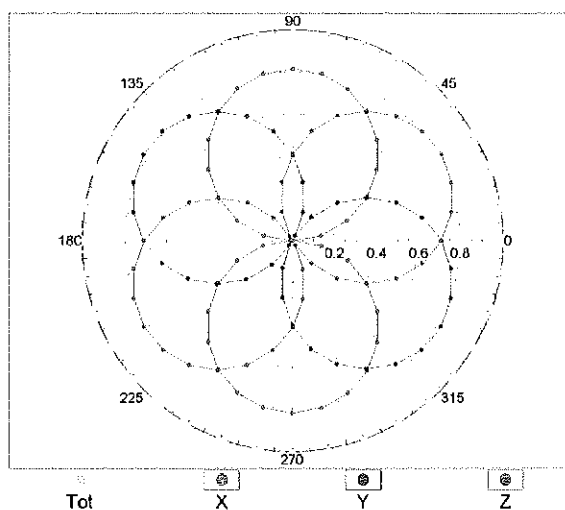
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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

f=600 MHz,TEM



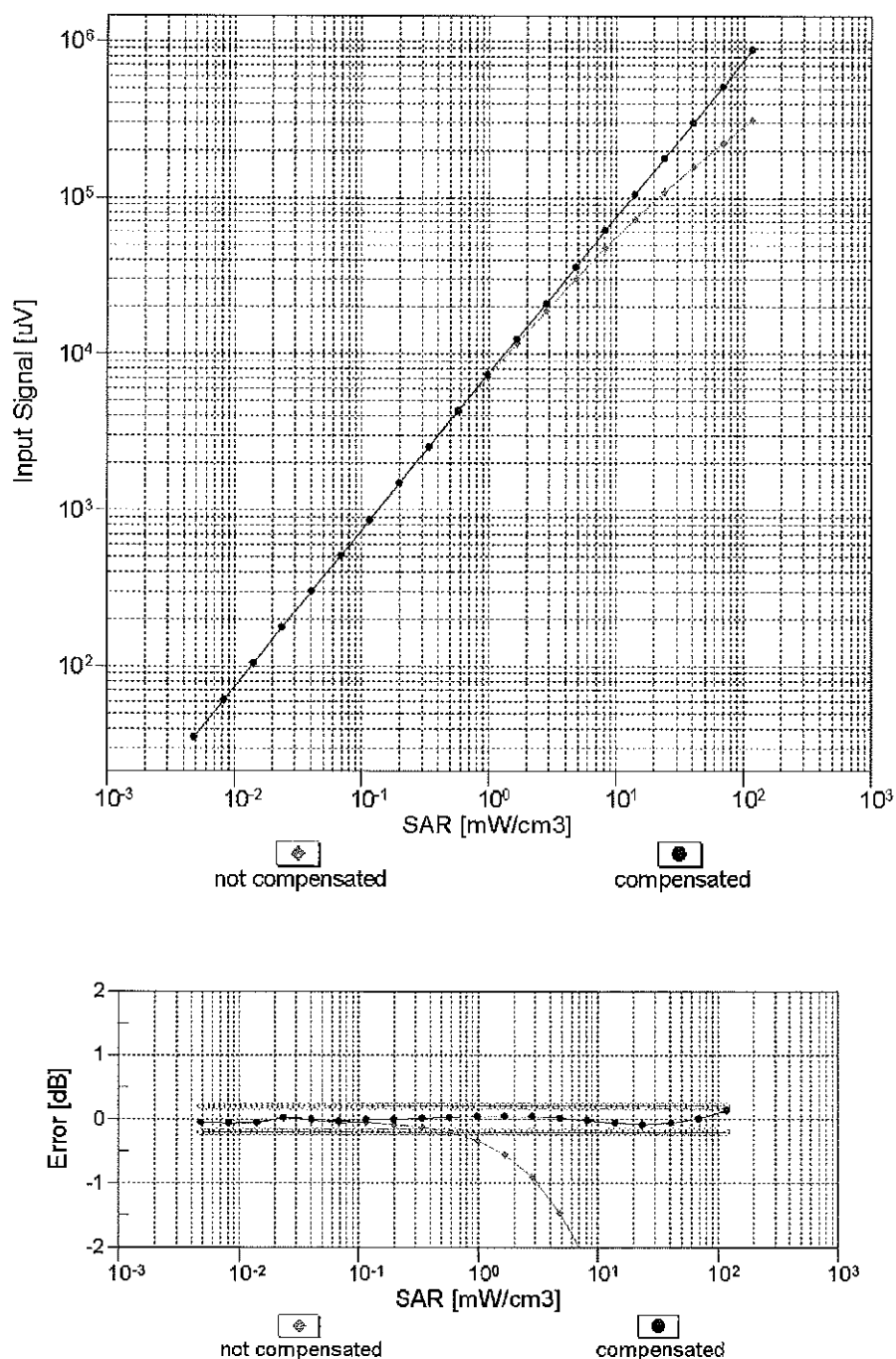
f=1800 MHz,R22



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

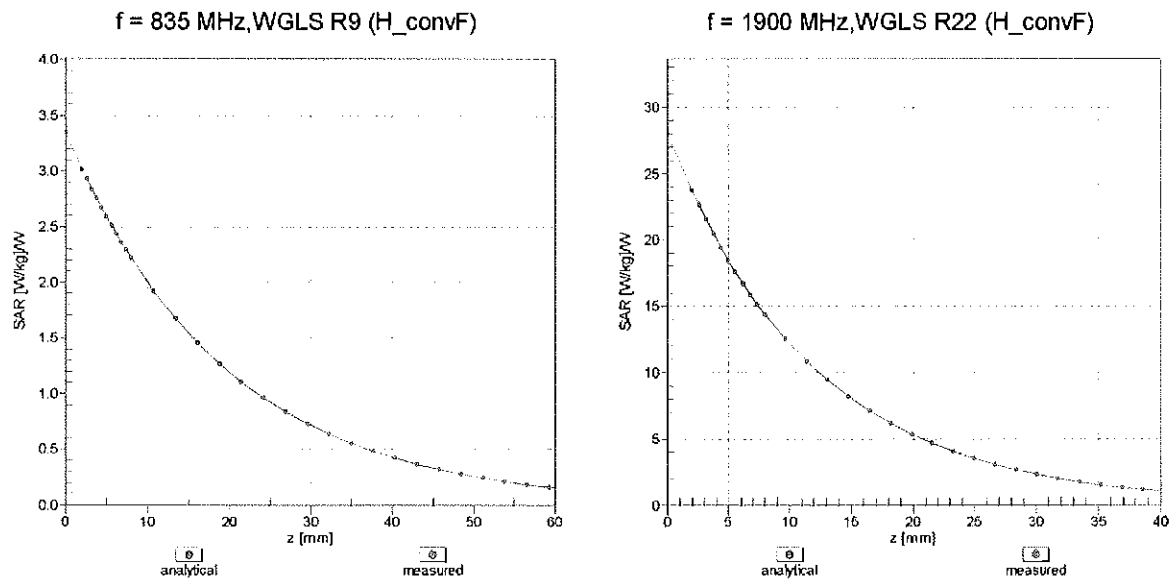
Dynamic Range f(SAR_{head})

(TEM cell , f_{eval}= 1900 MHz)



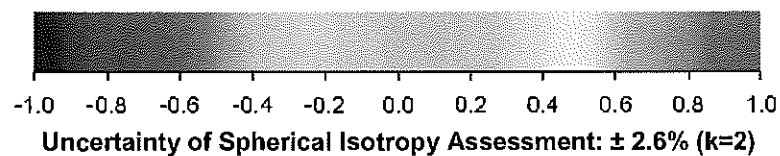
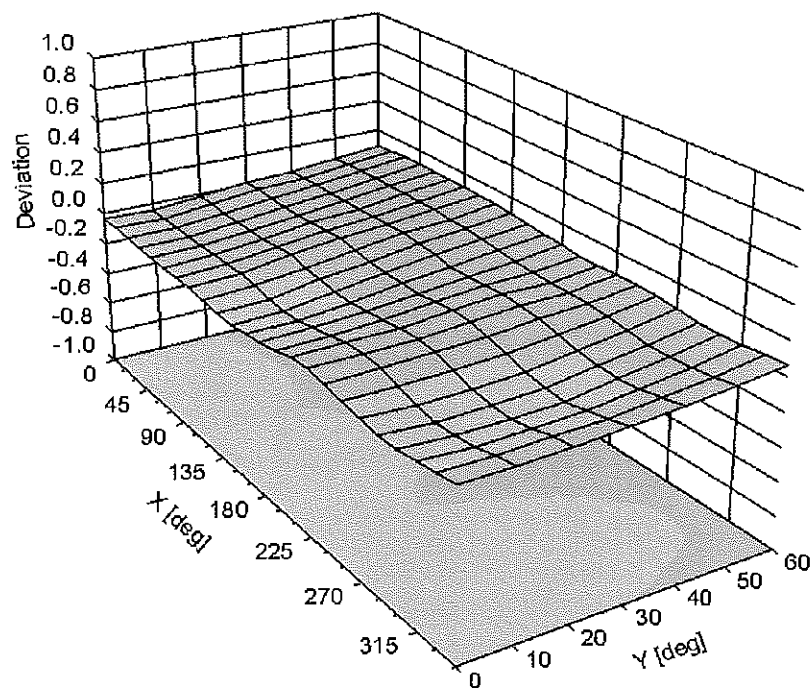
Uncertainty of Linearity Assessment: $\pm 0.6\%$ (k=2)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, θ), $f = 900 \text{ MHz}$



Uncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ ($k=2$)

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3318

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-104.4
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

APPENDIX D: SAR TISSUE SPECIFICATIONS

Measurement Procedure for Tissue verification:

- 1) The network analyzer and probe system was configured and calibrated.
- 2) The probe was immersed in the tissue. The tissue was placed in a nonmetallic container. Trapped air bubbles beneath the flange were minimized by placing the probe at a slight angle.
- 3) The complex admittance with respect to the probe aperture was measured
- 4) The complex relative permittivity ϵ can be calculated from the below equation (Pournaropoulos and Misra):

$$Y = \frac{j2\omega\epsilon_r\epsilon_0}{[\ln(b/a)]^2} \int_a^b \int_a^b \int_0^\pi \cos\phi' \frac{\exp[-j\omega r(\mu_0\epsilon_r'\epsilon_0)^{1/2}]}{r} d\phi' d\rho' d\rho$$

where Y is the admittance of the probe in contact with the sample, the primed and unprimed coordinates refer to source and observation points, respectively, $r^2 = \rho^2 + \rho'^2 - 2\rho\rho'\cos\phi'$, ω is the angular frequency, and $j = \sqrt{-1}$.

Table D-I
Composition of the Tissue Equivalent Matter

Frequency (MHz)	750	750	835	835	1750	1750	1900	1900	2450 - 2600	2450 - 2600
Tissue	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Ingredients (% by weight)										
Bactericide			0.1	0.1						
DGBE					47	31	44.92	29.44		26.7
HEC	See page 2-3	See page 2	1	1					See page 4	
NaCl			1.45	0.94	0.4	0.2	0.18	0.39		0.1
Sucrose			57	44.9						
Water			40.45	53.06	52.6	68.8	54.9	70.17		73.2

FCC ID: A3LSMG530P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Test Dates: 05/11/15 - 05/26/15	DUT Type: Portable Handset			APPENDIX D: Page 1 of 4

2 Composition / Information on ingredients

The Item is composed of the following ingredients:

H ₂ O	Water, 35 – 58%
Sucrose	Sugar, white, refined, 40 – 60%
NaCl	Sodium Chloride, 0 – 6%
Hydroxyethyl-cellulose	Medium Viscosity (CAS# 9004-62-0), <0.3%
Preventol-D7	Preservative: aqueous preparation, (CAS# 55965-84-9), containing 5-chloro-2-methyl-3(2H)-isothiazolone and 2-methyl-3(2H)-isothiazolone, 0.1 – 0.7%
Relevant for safety; Refer to the respective Safety Data Sheet*.	

Figure D-1

Composition of 750 MHz Head and Body Tissue Equivalent Matter

Note: 750MHz liquid recipes are proprietary SPEAG. Since the composition is approximate to the actual liquids utilized, the manufacturer tissue-equivalent liquid data sheets are provided below.

Measurement Certificate / Material Test

Item Name	Body Tissue Simulating Liquid (MSL750V2)
Product No.	SL AAM 075 AA (Charge: 130828-1)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

Setup Validation

Validation results were within $\pm 2.5\%$ towards the target values of Methanol.

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

Test Condition

Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	28-Aug-13
Operator	IEN

Additional Information

TSL Density	1.212 g/cm ³
TSL Heat-capacity	3.006 kJ/(kg·K)

f [MHz]	Measured			Target		Diff. to Target [%]	
	HP-e'	HP-e''	sigma	eps	sigma	Δ-eps	Δ-sigma
600	57.4	24.76	0.83	56.1	0.95	2.3	-13.2
625	57.1	24.42	0.85	56.0	0.95	2.0	-11.0
650	56.8	24.09	0.87	55.9	0.96	1.6	-8.9
675	56.6	23.80	0.89	55.8	0.96	1.3	-6.7
700	56.3	23.52	0.92	55.7	0.96	1.0	-4.5
725	56.1	23.27	0.94	55.6	0.96	0.8	-2.4
750	55.8	23.03	0.96	55.5	0.96	0.5	-0.3
775	55.6	22.87	0.99	55.4	0.97	0.2	2.1
800	55.3	22.71	1.01	55.3	0.97	-0.1	4.5
825	55.1	22.54	1.03	55.2	0.98	-0.3	5.8
850	54.9	22.45	1.05	55.2	0.98	-0.5	6.4
875	54.8	22.37	1.06	55.2	0.99	-0.6	7.0
900	54.6	22.25	1.08	55.1	1.02	-0.9	8.2
925	54.4	22.13	1.11	55.0	1.05	-1.1	5.5
950	54.2	22.02	1.13	55.0	1.06	-1.5	6.6
975	53.9	21.91	1.16	54.9	1.08	-1.8	7.7
1000	53.7	21.84	1.18	54.9	1.09	-2.2	9.0
1000	53.5	21.77	1.21	54.8	1.10	-2.5	10.3

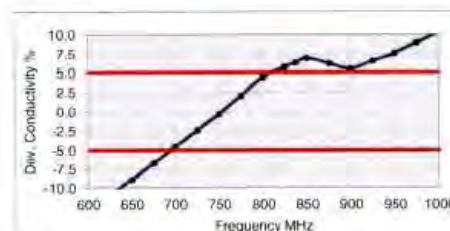
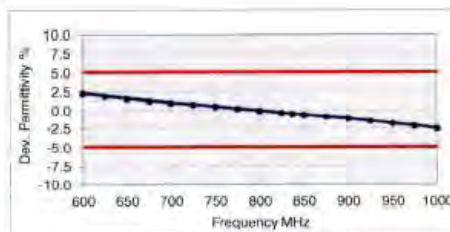


Figure D-2
750MHz Body Tissue Equivalent Matter

FCC ID: A3LSMG530P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Test Dates: 05/11/15 - 05/26/15	DUT Type: Portable Handset			APPENDIX D: Page 2 of 4

Measurement Certificate / Material Test

Item Name **Head Tissue Simulating Liquid (HSL750V2)**
 Product No. SL AAH 075 AA (Charge: 130826-2)
 Manufacturer SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

Setup Validation

Validation results were within $\pm 2.5\%$ towards the target values of Methanol.

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

Test Condition

Ambient Environment temperatur (22 ± 3)°C and humidity < 70%.
 TSL Temperature 22°C
 Test Date 28-Aug-13
 Operator IEN

Additional Information

TSL Density 1.284 g/cm³
 TSL Heat-capacity 2.701 kJ/(kg*K)

f [MHz]	Measured			Target		Diff.to Target (%)	
	HP-e'	HP-e''	sigma	eps	sigma	Δ -eps	Δ -sigma
600	44.4	23.32	0.78	42.7	0.88	3.9	-11.7
625	44.0	23.05	0.80	42.6	0.88	3.4	-9.3
650	43.6	22.78	0.82	42.5	0.89	2.8	-7.0
675	43.3	22.54	0.85	42.3	0.89	2.2	-4.7
700	42.9	22.30	0.87	42.2	0.89	1.6	-2.4
725	42.6	22.10	0.89	42.1	0.89	1.2	0.0
750	42.3	21.90	0.91	41.9	0.89	0.8	2.3
775	41.9	21.74	0.94	41.8	0.90	0.2	4.6
800	41.6	21.57	0.96	41.7	0.90	-0.3	7.0
825	41.3	21.42	0.98	41.6	0.91	-0.8	8.4
838	41.1	21.35	0.99	41.5	0.91	-1.0	9.1
850	41.0	21.27	1.01	41.5	0.92	-1.3	9.8
875	40.7	21.14	1.03	41.5	0.94	-2.0	9.1
900	40.4	21.00	1.05	41.5	0.97	-2.6	8.4
925	40.1	20.89	1.07	41.5	0.98	-3.2	9.4
950	39.9	20.78	1.10	41.4	0.99	-3.8	10.4
975	39.6	20.69	1.12	41.4	1.00	-4.4	11.7
1000	39.3	20.60	1.15	41.3	1.01	-4.9	12.9

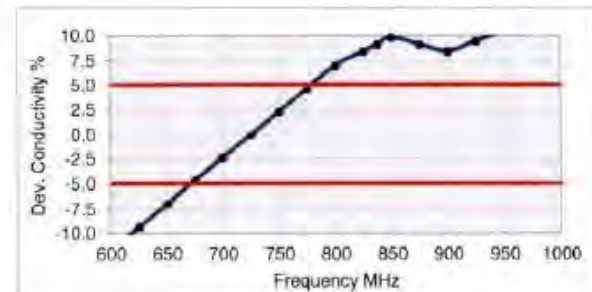
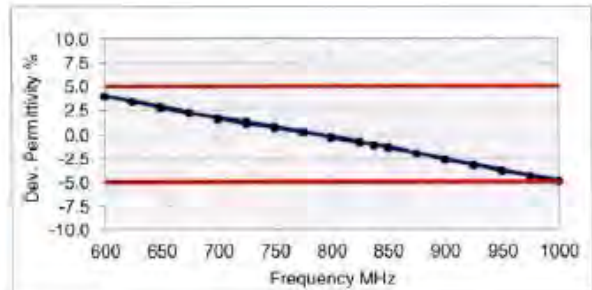


Figure D-3
750MHz Head Tissue Equivalent Matter

FCC ID: A3LSMG530P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Test Dates: 05/11/15 - 05/26/15	DUT Type: Portable Handset			APPENDIX D: Page 3 of 4

2 Composition / Information on ingredients

The Item is composed of the following ingredients:

H ₂ O	Water, 52 – 75%
C ₈ H ₁₈ O ₃	Diethylene glycol monobutyl ether (DGBE), 25 – 48% (CAS-No. 112-34-5, EC-No. 203-961-6, EC-index-No. 603-096-00-8) Relevant for safety; Refer to the respective Safety Data Sheet*.
NaCl	Sodium Chloride, <1.0%

Figure D-4

Composition of 2.4 – 2.6 GHz Head Tissue Equivalent Matter

Note: 2.4 – 2.6 GHz head liquid recipes are proprietary SPEAG. Since the composition is approximate to the actual liquids utilized, the manufacturer tissue-equivalent liquid data sheets are provided below.

Measurement Certificate / Material Test

Item Name	Head Tissue Simulating Liquid (HSL2450V2)
Product No.	SL AAH 245 BA (Charge: 130926-1)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

Setup Validation

Validation results were within $\pm 2.5\%$ towards the target values of Methanol.

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

Test Condition

Ambient	Environment temperatur ($22 \pm 3^\circ\text{C}$ and humidity < 70%.
TSL Temperature	23°C
Test Date	2-Oct-13
Operator	CL

Additional Information

TSL Density	0.988 g/cm ³
TSL Heat-capacity	3.680 kJ/(kg*K)

f (MHz)	HP-e'	HP-e''	sigma	eps	sigma	Δ-eps	Δ-sigma
1900	40.3	11.88	1.26	40.0	1.40	0.9	-10.3
1925	40.3	11.98	1.28	40.0	1.40	0.6	-8.3
1950	40.2	12.08	1.31	40.0	1.40	0.4	-6.4
1975	40.1	12.15	1.34	40.0	1.40	0.2	-4.6
2000	40.0	12.23	1.36	40.0	1.40	-0.1	-2.8
2025	39.9	12.34	1.39	40.0	1.42	-0.2	-2.3
2050	39.8	12.45	1.42	39.9	1.44	-0.3	-1.7
2075	39.7	12.54	1.45	39.9	1.47	-0.4	-1.3
2100	39.6	12.64	1.48	39.8	1.49	-0.5	-0.8
2125	39.5	12.69	1.50	39.8	1.51	-0.7	-0.7
2150	39.4	12.75	1.52	39.7	1.53	-0.8	-0.6
2175	39.3	12.84	1.55	39.7	1.56	-1.0	0.1
2200	39.2	12.94	1.58	39.6	1.58	-1.2	0.4
2225	39.1	13.00	1.61	39.6	1.60	-1.3	0.6
2250	39.0	13.07	1.64	39.6	1.62	-1.4	0.8
2275	38.9	13.15	1.66	39.5	1.64	-1.5	1.2
2300	38.8	13.22	1.69	39.5	1.67	-1.7	1.5
2325	38.7	13.32	1.72	39.4	1.69	-1.9	2.0
2350	38.6	13.42	1.75	39.4	1.71	-2.0	2.5
2375	38.5	13.49	1.78	39.3	1.73	-2.1	2.8
2400	38.4	13.56	1.81	39.3	1.76	-2.3	3.1
2425	38.3	13.63	1.84	39.2	1.78	-2.5	3.5
2450	38.2	13.71	1.87	39.2	1.80	-2.6	3.8
2475	38.1	13.79	1.90	39.2	1.83	-2.8	3.9
2500	38.0	13.87	1.93	39.1	1.85	-3.0	4.0
2525	37.9	13.96	1.96	39.1	1.88	-3.1	4.2
2550	37.8	14.05	1.99	39.1	1.91	-3.3	4.4
2575	37.7	14.11	2.02	39.0	1.94	-3.5	4.4
2600	37.5	14.17	2.05	39.0	1.96	-3.8	4.4
2625	37.4	14.23	2.08	39.0	1.99	-4.0	4.4
2650	37.3	14.30	2.11	38.9	2.02	-4.2	4.5
2675	37.2	14.37	2.14	38.9	2.05	-4.4	4.6
2700	37.1	14.45	2.17	38.9	2.07	-4.6	4.7

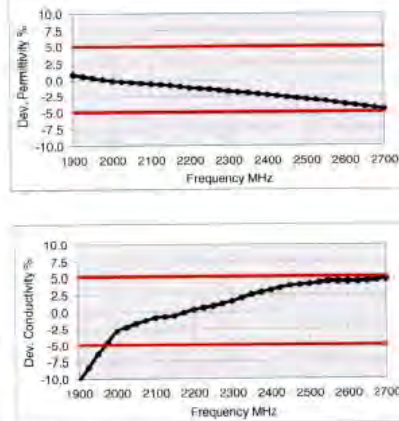


Figure D-5

2.4 – 2.6 GHz Head Tissue Equivalent Matter

FCC ID: A3LSMG530P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Test Dates: 05/11/15 - 05/26/15	DUT Type: Portable Handset			APPENDIX D: Page 4 of 4

APPENDIX E: SAR SYSTEM VALIDATION

Per FCC KDB 865664 D02v01, SAR system validation status should be documented to confirm measurement accuracy. The SAR systems (including SAR probes, system components and software versions) used for this device were validated against its performance specifications prior to the SAR measurements. Reference dipoles were used with the required tissue- equivalent media for system validation, according to the procedures outlined in FCC KDB 865664 D01 v01 and IEEE 1528-2013. Since SAR probe calibrations are frequency dependent, each probe calibration point was validated at a frequency within the valid frequency range of the probe calibration point, using the system that normally operates with the probe for routine SAR measurements and according to the required tissue-equivalent media.

A tabulated summary of the system validation status including the validation date(s), measurement frequencies, SAR probes and tissue dielectric parameters has been included.

Table E-I
SAR System Validation Summary

SAR SYSTEM #	FREQ. [MHz]	DATE	PROBE SN	PROBE TYPE	PROBE CAL. POINT		COND.	PERM.	CW VALIDATION			MOD. VALIDATION		
							(σ)	(τ)	SENSITIVITY	PROBE LINEARITY	PROBE ISOTROPY	MOD. TYPE	DUTY FACTOR	PAR
J	750	9/26/2014	3022	ES3DV2	750	Head	0.916	40.240	PASS	PASS	PASS	N/A	N/A	N/A
K	835	10/13/2014	3288	ES3DV3	835	Head	0.926	41.940	PASS	PASS	PASS	GMSK	PASS	N/A
C	1750	11/12/2014	3333	ES3DV3	1750	Head	1.332	39.430	PASS	PASS	PASS	N/A	N/A	N/A
G	1900	4/8/2015	3318	ES3DV3	1900	Head	1.447	40.150	PASS	PASS	PASS	GMSK	PASS	N/A
E	2450	11/5/2014	3332	ES3DV3	2450	Head	1.868	39.670	PASS	PASS	PASS	OFDM/TDD	PASS	PASS
E	2600	11/5/2014	3332	ES3DV3	2600	Head	2.042	39.070	PASS	PASS	PASS	TDD	PASS	N/A
J	750	9/29/2014	3022	ES3DV2	750	Body	0.955	53.590	PASS	PASS	PASS	N/A	N/A	N/A
D	835	4/8/2015	3209	ES3DV3	835	Body	1.007	54.130	PASS	PASS	PASS	GMSK	PASS	N/A
G	835	5/26/2015	3318	ES3DV3	835	Body	1.018	53.930	PASS	PASS	PASS	GMSK	PASS	N/A
B	1750	1/4/2015	3334	ES3DV3	1750	Body	1.527	51.870	PASS	PASS	PASS	N/A	N/A	N/A
H	1900	5/8/2015	3258	ES3DV3	1900	Body	1.555	51.820	PASS	PASS	PASS	GMSK	PASS	N/A
E	2450	11/3/2014	3332	ES3DV3	2450	Body	1.996	52.210	PASS	PASS	PASS	OFDM/TDD	PASS	PASS
E	2600	11/3/2014	3332	ES3DV3	2600	Body	2.210	51.630	PASS	PASS	PASS	TDD	PASS	N/A

NOTE: While the probes have been calibrated for both CW and modulated signals, all measurements were performed using communication systems calibrated for CW signals only. Modulations in the table above represent test configurations for which the measurement system has been validated per FCC KDB Publication 865664 D01v01 for scenarios when CW probe calibrations are used with other signal types. SAR systems were validated for modulated signals with a periodic duty cycle, such as GMSK, or with a high peak to average ratio (>5 dB), such as OFDM according to KDB 865664.

FCC ID: A3LSMG530P	 SAR EVALUATION REPORT 	Reviewed by: Quality Manager
Test Dates: 05/11/15 - 05/26/15	DUT Type: Portable Handset	APPENDIX E: Page 1 of 1