



SAR EVALUATION REPORT

Applicant Name:

Samsung Electronics, Co. Ltd.
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Yeongtong-gu, Suwon-si
Gyeonggi-do 443-742, Korea

Date of Testing:

03/17/14 - 03/24/14

Test Site/Location:

PCTEST Lab, Columbia, MD, USA

Document Serial No.:

0Y1403170565-R1.A3L

FCC ID:

A3LSPHL710T

APPLICANT:

SAMSUNG ELECTRONICS, CO. LTD.

DUT Type:

Portable Handset

Application Type:

Certification

FCC Rule Part(s):

CFR §2.1093

Model(s):

SPH-L710T

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 BC10 (\$90S)	817.90 - 823.10 MHz	0.56	0.62	1.00
PCE	CDMA/EVDO BC0 (\$22H)	824.70 - 848.31 MHz	0.61	0.60	0.49
PCE	PCS CDMA/EVDO	1851.25 - 1908.75 MHz	0.49	0.55	0.72
PCE	LTE Band 26	814.7 - 848.3 MHz	0.37	0.68	0.44
PCE	LTE Band 25 (PCS)	1851.5 - 1913.5 MHz	0.62	0.69	1.00
PCE	LTE Band 41	2501 - 2685 MHz	0.87	0.39	0.95
DTS	2.4 GHz WLAN	2412 - 2462 MHz	0.15	0.17	0.39
DTS	5.8 GHz WLAN	5745 - 5825 MHz	< 0.1	0.12	
NII	5.2 GHz WLAN	5180 - 5240 MHz	< 0.1	0.32	
NII	5.3 GHz WLAN	5260 - 5320 MHz	< 0.1	0.41	
NII	5.5 GHz WLAN	5500 - 5700 MHz	< 0.1	0.17	
DSS/DTS	Bluetooth	2402 - 2480 MHz		N/A	
Simultaneous SAR per KDB 690783 D01v01r02:				1.39	

Note: This revised Test Report (S/N: 0Y1403170565-R1.A3L) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

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 BC10 (§90S)	Voice/Data	817.90 - 823.10 MHz
CDMA/EVDO BC0 (§22H)	Voice/Data	824.70 - 848.31 MHz
PCS CDMA/EVDO	Voice/Data	1851.25 - 1908.75 MHz
LTE Band 26	Data	814.7 - 848.3 MHz
LTE Band 25 (PCS)	Data	1851.5 - 1913.5 MHz
LTE Band 41	Data	2501 - 2685 MHz
2.4 GHz WLAN	Data	2412 - 2462 MHz
5.8 GHz WLAN	Data	5745 - 5825 MHz
5.2 GHz WLAN	Data	5180 - 5240 MHz
5.3 GHz WLAN	Data	5260 - 5320 MHz
5.5 GHz WLAN	Data	5500 - 5700 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz

1.2 Power Reduction for SAR

This device utilizes power reduction under some portable hotspot conditions for SAR compliance. The following modes utilize hotspot power reduction: CDMA/EVDO BC0, PCS CDMA/EVDO, LTE Band 26, and LTE Band 25. There is no hotspot power reduction for CDMA/EVDO BC10 or LTE Band 41. A summary of hotspot power reduction data is included in Appendix G.

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.

1.3.1 Maximum Power

Mode / Band		Modulated Average (dBm)
CDMA/EVDO BC10 (§90S)	Maximum	25.0
	Nominal	24.5
CDMA/EVDO BC0 (§22H)	Maximum	25.0
	Nominal	24.5
PCS CDMA/EVDO	Maximum	25.0
	Nominal	24.5

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Mode / Band		Modulated Average (dBm)
LTE Band 26	Maximum	24.5
	Nominal	24.0
LTE Band 25 (PCS)	Maximum	24.5
	Nominal	24.0
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	13.5
	Nominal	13.0
IEEE 802.11a (5 GHz)	Maximum	14.5
	Nominal	14.0
IEEE 802.11n (5 GHz) 20 MHz Bandwidth	Maximum	13.5
	Nominal	13.0
IEEE 802.11n (5 GHz) 40 MHz Bandwidth	Maximum	12.5
	Nominal	12.0
Bluetooth	Maximum	11.0
	Nominal	10.5
Bluetooth LE	Maximum	8.0
	Nominal	7.5

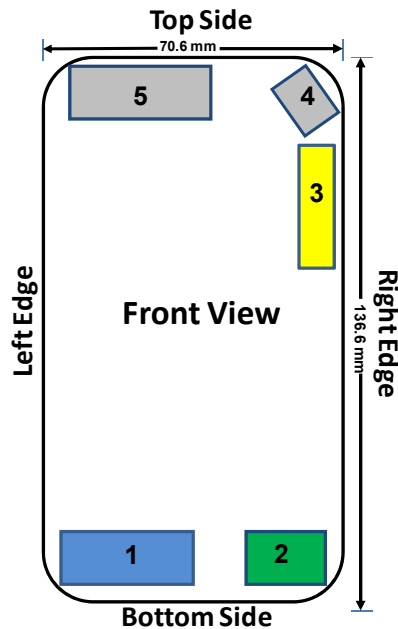
1.3.2 Reduced Power with Hotspot Activated

Mode / Band		Modulated Average (dBm)
CDMA/EVDO BC0 (§22H)	Maximum	23.0
	Nominal	22.5
PCS CDMA/EVDO	Maximum	23.0
	Nominal	22.5

Mode / Band		Modulated Average (dBm)
LTE Band 26	Maximum	22.5
	Nominal	22.0
LTE Band 25 (PCS)	Maximum	22.5
	Nominal	22.0

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1.4 DUT Antenna Locations



1. Main Antenna #1 (Tx/Rx)
 - CDMA/EVDO BC0/1/10
 - LTE Band 25/26
2. Main Antenna #2 (Tx/Rx)
 - LTE Band 41
3. Bluetooth and WIFI Antenna (Tx/Rx)
 - 2.4 GHz Bluetooth
 - 2.4 GHz WIFI
 - 5 GHz WIFI
4. GPS Antenna (Rx Only)
5. Sub Antenna (Rx Only)
 - CDMA/EVDO BC0/1/10
 - LTE Band 25/26/41

Note: Exact antenna dimensions and separation distances are shown in the Technical Descriptions in the FCC Filing.

Figure 1-1
DUT Antenna Locations

Table 1-1
Mobile Hotspot Sides for SAR Testing

Mobile Hotspot Sides for SAR Testing						
Mode	Back	Front	Top	Bottom	Right	Left
EVDO BC10 (\$90S)	Yes	Yes	No	Yes	No	Yes
EVDO BC0 (\$22H)	Yes	Yes	No	Yes	No	Yes
PCS EVDO	Yes	Yes	No	Yes	No	Yes
LTE Band 26	Yes	Yes	No	Yes	No	Yes
LTE Band 25 (PCS)	Yes	Yes	No	Yes	No	Yes
LTE Band 41	Yes	Yes	No	Yes	Yes	No
2.4 GHz WLAN	Yes	Yes	Yes	No	Yes	No

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 D06v01 guidance, page 2. When the wireless router mode is enabled, all 5 GHz bands are disabled. Therefore 5 GHz WIFI is not considered in this section.

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1.5 Near Field Communications (NFC) Antenna

This DUT has NFC operations. The NFC antenna is integrated into the specialized battery. The SAR tests were performed with the specialized battery (model: **EB-L1G6LLA**).

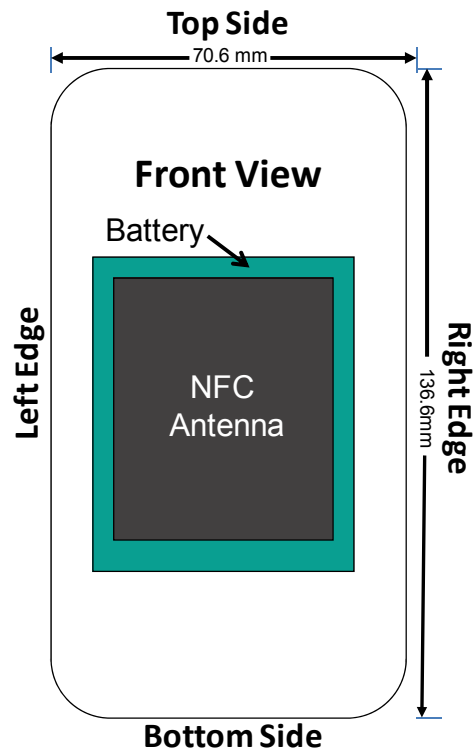


Figure 1-2
NFC Antenna Locations

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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 1-3 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.

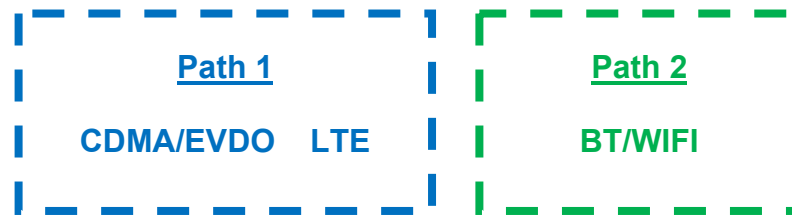


Figure 1-3
Simultaneous Transmission Paths

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 + 5 GHz WI-FI	Yes	Yes	N/A	
3	1x CDMA voice + 2.4 GHz Bluetooth	N/A	Yes	N/A	
4	LTE + 2.4 GHz WI-FI	Yes*	Yes*	Yes	*-Pre-installed VOIP applications are considered.
5	LTE + 2.4 GHz Bluetooth	N/A	Yes*	N/A	*-Pre-installed VOIP applications are considered.
6	CDMA/EVDO data + 2.4 GHz WI-FI	Yes*	Yes*	Yes	*-Pre-installed VOIP applications are considered.
7	CDMA/EVDO data + 2.4 GHz Bluetooth	N/A	Yes*	N/A	*-Pre-installed VOIP applications are considered.
8	1x CDMA voice + CDMA/EVDO data	N/A	N/A	N/A	Not supported by HW
9	CDMA/EVDO data + LTE	N/A	N/A	N/A	Not supported by HW
10	1x CDMA voice + LTE	N/A	N/A	N/A	Not supported by HW
11	1x CDMA voice + LTE + 2.4 GHz WI-FI	N/A	N/A	N/A	Not supported by HW
12	1x CDMA voice + LTE + 5 GHz WI-FI	N/A	N/A	N/A	Not supported by HW
13	CDMA/EVDO data + 5 GHz WI-FI	N/A	N/A	N/A	Not supported by SW
14	LTE + 5 GHz WI-FI	N/A	N/A	N/A	Not supported by SW

Note:

1. 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.
2. 2.4 GHz WLAN, 2.4 GHz Bluetooth, and 5 GHz WLAN share the same antenna path and cannot transmit simultaneously.
3. CDMA, EVDO, and LTE share the same antenna path and cannot transmit simultaneously.
4. When the wireless router mode is enabled, all 5 GHz bands are disabled. Therefore 5 GHz WIFI Wireless Router is not considered in Table 1-2.

1.7 SAR Test Exclusions Applied

(A) WIFI/BT

Since Wireless Router operations are not allowed by the chipset firmware using 5 GHz WIFI, only 2.4 GHz WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v01.

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Per FCC KDB 447498 D01v05, the 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, Bluetooth SAR was not required; $[(13/15) * \sqrt{2.441}] = 1.4 < 3.0$. Per KDB Publication 447498 D01v05, the maximum power of the channel was rounded to the nearest mW before calculation.

This device supports 20 MHz and 40 MHz Bandwidths for IEEE 802.11n for 5 GHz WIFI only. IEEE 802.11n was not evaluated for SAR since the average output power of 20 MHz and 40 MHz bandwidths was not more than 0.25 dB higher than the average output power of IEEE 802.11a.

(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 D05v02.

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.

1.8 Guidance Applied

- IEEE 1528-2003
- FCC KDB Publication 941225: D01v02 (3G), D02v02r02 (1x Advanced), D05v02r03 (LTE), D06v01r01 (Hotspot)
- FCC KDB Publication 248227 D01v01r02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D01v05r02 (General SAR Guidance)
- FCC KDB Publication 865664: D01v01r03 (SAR Measurements up to 6 GHz), D02v01r01 (SAR Reporting)
- April 2013 TCB Workshop Notes (LTE TDD)

1.9 Device Serial Numbers

Several samples were used with identical hardware 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.

	Maximum Power Head Serial Number	Reduced Power Head Serial Number	Body-Worn Serial Number	Hotspot Serial Number
CDMA/EVDO BC10 (\$90S)	1703-9	-	1703-9	1703-9
CDMA/EVDO BC0 (\$22H)	1703-9	1703-14	1703-9	1703-14
PCS CDMA/EVDO	1703-10	1703-6	1703-10	1703-6
LTE Band 26	1703-8	1703-12	1703-8	1703-12
LTE Band 25 (PCS)	1703-32	1703-31	1703-32	1703-31
LTE Band 41	1703-13	-	1703-13	1703-13
2.4 GHz WLAN	1703-7	-	1703-7	1703-7
5 GHz WLAN	1703-7	-	1703-7	-

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LTE INFORMATION

LTE Information					
FCC ID	A3LSPHL710T				
Form Factor	Portable Handset				
Frequency Range of each LTE transmission band	LTE Band 26 (814.7 - 848.3 MHz)				
	LTE Band 25 (PCS) (1851.5 - 1913.5 MHz)				
	LTE Band 41 (2501 - 2685 MHz)				
Channel Bandwidths	LTE Band 26: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz				
	LTE Band 25 (PCS): 3 MHz, 5 MHz, 10 MHz				
	LTE Band 41: 10 MHz, 15 MHz, 20 MHz				
Channel Numbers and Frequencies (MHz)	Low	Low-Mid	Mid	Mid-High	High
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 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 41: 10 MHz	2501 (39700)	2547 (40160)	2593 (40620)	2639 (41080)	2685 (41540)
LTE Band 41: 15 MHz	2503.5 (39725)	2548.3 (41073)	2593 (40620)	2637.8 (41068)	2682.5 (41515)
LTE Band 41: 20 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
UE Category	3				
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				

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3 INTRODUCTION

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

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

3.1 SAR Definition

Specific Absorption Rate is defined as the time derivative (rate) of the incremental energy (dU) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density (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.

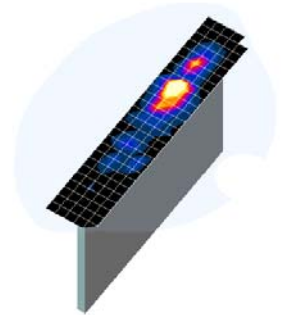


Figure 4-1
Sample SAR Area
Scan

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

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

*Also compliant to IEEE 1528-2013 Table 6

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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].

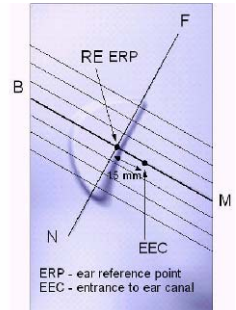


Figure 5-1
Close-Up Side view
of ERP

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

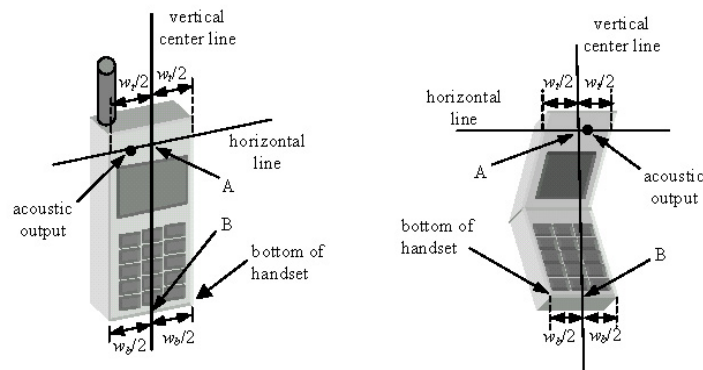


Figure 5-3
Handset Vertical Center & Horizontal Line Reference Points

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6 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.

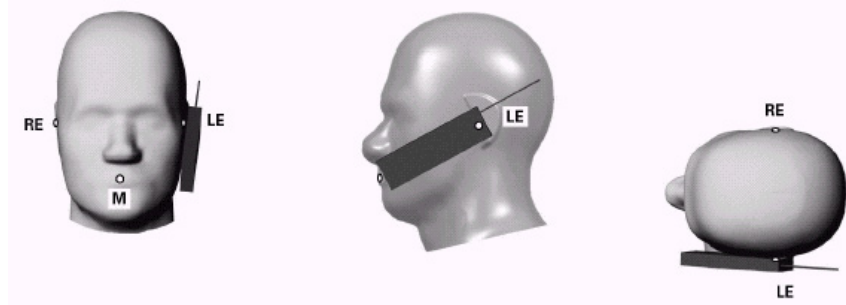


Figure 6-1 Front, Side and Top View of Cheek Position

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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6.5 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 6-5). 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.

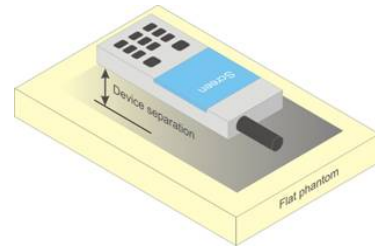


Figure 6-5
Sample Body-Worn Diagram

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.

6.6 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 44798 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.

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6.7 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 D06 v01 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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8 FCC MEASUREMENT PROCEDURES

Power measurements were 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 Procedures Used to Establish RF Signal for SAR

The following procedures are according to FCC KDB Publication 941225 D01 "SAR Measurement Procedures for 3G Devices" v02, October 2007.

The device was 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 were 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 was 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 deviated by more than 5%, the SAR test and drift measurements were repeated.

8.3 SAR Measurement Conditions for CDMA2000

The following procedures were performed according to FCC KDB Publication 941225 D01 "SAR Measurement Procedures for 3G Devices" v02, October 2007.

8.3.1 Output Power Verification

See 3GPP2 C.S0011/TIA-98-E as recommended by "SAR Measurement Procedures for 3G Devices" v02, October 2007. 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.

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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.

8.3.2 CDMA2000 1x Advanced

This device additionally supports 1x Advanced. Conducted powers were measured using SO75 with RC8 on the uplink and RC11 on the downlink per KDB Publication 941225 D02v02. Smart blanking was disabled for all measurements. The EUT was configured with forward power control Mode 000 and reverse power control at 400 bps. Conducted powers were measured on an Agilent 8960 Series 10 Wireless Communications Test Set, Model E5515C using the CDMA2000 1x Advanced application, Option E1962B-410.

Based on the maximum output power measured for 1x Advanced, SAR is required for 1x advanced when if the maximum output for 1x Advanced is more than 0.25 dB higher than the maximum measured for 1x. Also, if the measured SAR in any 1x mode exposure conditions (head, body etc.) is larger than 1.2 W/kg, the highest of those configurations above 1.2 W/kg for each exposure condition in 1x Advanced has to be repeated. All measured SAR in 1x mode higher than 1.5 W/kg must be repeated for 1x Advanced.

8.3.3 Head SAR Measurements

SAR for head exposure configurations is measured in RC3 with the DUT configured to transmit at full rate using Loopback Service Option SO55. SAR for RC1 is not required when the maximum average output of each channel is less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel in RC1 using the exposure configuration that results in the highest SAR for that channel in RC3.

Head SAR was additionally evaluated using EVDO Rev. A to support compliance for VoIP operations. See Section 8.3.5 for EVDO Rev. A configuration parameters.

8.3.4 Body SAR Measurements

SAR for body 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. SAR for multiple code channels (FCH + SCH_n) is not required when the maximum average output of each RF channel is less than ¼ dB higher than that measured with FCH only. Otherwise, SAR is measured on the maximum output channel (FCH + SCH_n) with FCH at full rate and SCH₀ enabled at 9600 bps using the exposure configuration that results in the highest SAR for that channel with FCH only. When multiple code channels are enabled, the DUT output may shift by more than 0.5 dB and lead to higher SAR drifts and SCH dropouts. Body SAR was measured using TDSO / SO32 with power control bits in the “All Up”

Body SAR in RC1 is not required when the maximum average output of each channel is less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel in RC1; with Loopback Service Option SO55, at full rate, using the body exposure configuration that results in the highest SAR for that channel in RC3.

8.3.5 Handsets with EVDO

For handsets with Ev-Do capabilities, when the maximum average output of each channel in Rev. 0 is less than ¼ dB higher than that measured in RC3 (1x RTT), body SAR for EV-DO is not

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required. Otherwise, SAR for Rev. 0 is measured on the maximum output channel at 153.6 kbps using the body exposure configuration that results in the highest SAR for that channel in RC3. SAR for Rev. A is not required when the maximum average output of each channel is less than that measured in Rev. 0 or less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel for Rev. A using a Reverse Data Channel payload size of 4096 bits and a Termination Target of 16 slots defined for Subtype 2 Physical Layer configurations. A Forward Traffic Channel data rate corresponding to the 2-slot version of 307.2 kbps with the ACK Channel transmitting in all slots would be configured in the downlink for both Rev. 0 and Rev. A.

8.3.6 Body SAR Measurements for EVDO Hotspot

Hotspot Body SAR is measured using Subtype 0/1 Physical Layer configurations for Rev. 0 per KDB Publication 941225 D01 procedures for “1x Ev-Do data Devices”. SAR for Subtype 2 Physical layer configurations is not required for Rev. A when the maximum average output of each RF channels is less than that measured in Subtype 0/1 Physical layer configurations. Otherwise, SAR is measured on the maximum output channel for Rev. A using the exposure configuration that results in the highest SAR for the RF channels 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.

SAR is not required for 1x RTT for Ev-Do devices that also support 1x RTT voice and/or data operations, when the maximum average output of each channel is less than 1/4 dB higher than that measured in Subtype 0/1 Physical Layer configurations for Rev. 0. Otherwise, CDMA “Body-SAR Measurement” procedures for “CDMA 2000 1x Handsets” were applied.

8.4 SAR Measurement Conditions for LTE

LTE modes were tested according to FCC KDB 941225 D05v02 publication. Please see notes after the tabulated SAR data for required test configurations. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The R&S CMW500 was 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).

8.4.1 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.

8.4.2 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.

8.4.3 A-MPR

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

8.4.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05v02r01:

- 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.

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- 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.

8.4.5 TDD

LTE TDD testing procedures were performed using guidance from FCC KDB 941225 D05v02r03 and the SAR test guidance provided in April 2013 TCB workshop notes. TDD was 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. SAR testing was performed using the extended cyclic prefix listed in 3GPP TS 36.211 Section 4.

8.5 SAR Testing with 802.11 Transmitters

Normal network operating configurations are not suitable for measuring the SAR of 802.11 a/b/g/n transmitters. 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 D01v01r02 for more details.

8.5.1 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. The test frequencies should correspond to actual channel frequencies defined for domestic use. SAR for devices with switched diversity should be measured with only one antenna transmitting at a time during each SAR measurement, according to a fixed modulation and data rate. The same data pattern should be used for all measurements.

8.5.2 Frequency Channel Configurations [24]

For 2.4 GHz, the highest average RF output power channel between the low, mid and high channel at the lowest data rate was selected for SAR evaluation in 802.11b mode. 802.11g/n modes and higher data rates for 802.11b were additionally evaluated for SAR if the output power of the respective mode was 0.25 dB or higher than the powers of the SAR configurations tested in the 802.11b mode.

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For 5 GHz, the highest average RF output power channel across the default test channels at the lowest data rate was selected for SAR evaluation in 802.11a. When the adjacent channels are higher in power than the default channels, these “required channels” were considered instead of the default channels for SAR testing. 802.11n modes and higher data rates for 802.11a/n were evaluated only if the respective mode was higher than 0.25 dB or more than the 802.11a mode.

If the maximum extrapolated peak SAR of the zoom scan for the highest output channel was less than 1.6 W/kg and if the 1g averaged SAR was less than 0.8 W/kg, SAR testing was not required for the other test channels in the band.

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9.1 CDMA Conducted Powers

Table 9-1
Maximum CDMA Conducted Powers with Hotspot Inactive

Band	Channel	Rule Part	Frequency [MHz]	SO55 [dBm]	SO55 [dBm]	SO75 [dBm]	TDSO SO32 [dBm]	TDSO SO32 [dBm]	1x EvDO Rev. 0 [dBm]	1x EvDO Rev. A [dBm]
F-RC				RC1	RC3	RC11	FCH+SCH	FCH	(RTAP)	(RETAP)
Cellular	564	90S	820.1	24.85	24.83	24.80	24.87	24.88	24.86	24.82
Cellular	1013	22H	824.7	24.82	24.90	24.79	24.85	24.87	24.88	24.87
	384	22H	836.52	24.79	24.86	24.78	24.82	24.84	24.86	24.82
	777	22H	848.31	24.86	24.89	24.81	24.87	24.89	24.91	24.85
PCS	25	24E	1851.25	24.78	24.73	24.52	24.76	24.76	24.58	24.56
	600	24E	1880	24.63	24.65	24.62	24.69	24.72	24.68	24.65
	1175	24E	1908.75	24.79	24.83	24.77	24.81	24.83	24.79	24.77

Note:

1. RC1 is only applicable for IS-95 compatibility.
2. 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.

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Table 9-2
Reduced CDMA Conducted Powers Representing Hotspot Active

Band	Channel	Rule Part	Frequency [MHz]	SO55 [dBm]	SO55 [dBm]	SO75 [dBm]	TDSO SO32 [dBm]	TDSO SO32 [dBm]	1x EvDO Rev. 0 [dBm]	1x EvDO Rev. A [dBm]
F-RC				RC1	RC3	RC11	FCH+SCH	FCH	(RTAP)	(RETAP)
Cellular	1013	22H	824.7	22.91	22.96	22.91	22.90	22.95	22.86	22.82
	384	22H	836.52	22.89	22.95	22.98	22.93	22.94	22.94	22.88
	777	22H	848.31	22.96	22.99	23.00	22.97	22.99	22.99	22.96
PCS	25	24E	1851.25	22.61	22.64	22.66	22.70	22.68	22.69	22.67
	600	24E	1880	22.52	22.58	22.62	22.60	22.65	22.66	22.60
	1175	24E	1908.75	22.58	22.80	22.61	22.81	22.84	22.65	22.64

Note:

1. RC1 is only applicable for IS-95 compatibility.
2. Separate test samples were tuned to fixed reduced power levels to represent the Hotspot Active scenario for SAR testing purposes only.

Per KDB Publication 941225 D01v02:

1. Head SAR was tested with SO55 RC3. SO55 RC1 was not required since the average output power was not more than 0.25 dB than the SO55 RC3 powers.
2. Body-Worn SAR was tested with 1x RTT with TDSO / SO32 FCH Only. Ev-Do and TDSO / SO32 FCH+SCH SAR tests were not required since the average output power was not more than 0.25 dB higher than the TDSO / SO32 FCH only powers.
3. Hotspot SAR is measured using Subtype 0/1 Physical Layer configurations for Rev. 0. If the average output power of Subtype 2 for Rev. A is less than the Rev. 0 power levels, then Rev. A SAR is not required. Otherwise, SAR is measured on the maximum output channel for Rev. A using the exposure configuration that results in the highest SAR for that RF channel in Rev. 0. SAR is not required for 1x RTT for Ev-Do hotspot devices when the maximum average output of each channel is less than 1/4 dB higher than that measured in Subtype 0/1 Physical Layer configurations for Rev. 0

Per FCC KDB 941225 D02v02:

1. 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. See Section 8.3.2 for 1x Advanced test set up.



Figure 9-1
Power Measurement Setup

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9.2 LTE Maximum Conducted Powers

9.2.1 LTE Band 26

Table 9-3
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	24.03	0
	819	26740	10	QPSK	1	25	24.09	0
	819	26740	10	QPSK	1	49	23.96	0
	819	26740	10	QPSK	25	0	23.09	0-1
	819	26740	10	QPSK	25	12	23.15	0-1
	819	26740	10	QPSK	25	25	23.03	0-1
	819	26740	10	QPSK	50	0	22.93	0-1
	819	26740	10	16QAM	1	0	22.74	0-1
	819	26740	10	16QAM	1	25	22.78	0-1
	819	26740	10	16QAM	1	49	22.65	0-1
	819	26740	10	16QAM	25	0	22.20	0-2
	819	26740	10	16QAM	25	12	22.26	0-2
	819	26740	10	16QAM	25	25	22.07	0-2
	819	26740	10	16QAM	50	0	21.98	0-2
	831.5	26865	10	QPSK	1	0	24.14	0
	831.5	26865	10	QPSK	1	25	24.04	0
	831.5	26865	10	QPSK	1	49	24.12	0
Mid	831.5	26865	10	QPSK	25	0	23.28	0-1
	831.5	26865	10	QPSK	25	12	23.13	0-1
	831.5	26865	10	QPSK	25	25	23.11	0-1
	831.5	26865	10	QPSK	50	0	23.10	0-1
	831.5	26865	10	16QAM	1	0	22.62	0-1
	831.5	26865	10	16QAM	1	25	22.50	0-1
	831.5	26865	10	16QAM	1	49	22.59	0-1
	831.5	26865	10	16QAM	25	0	22.30	0-2
	831.5	26865	10	16QAM	25	12	22.29	0-2
	831.5	26865	10	16QAM	25	25	22.28	0-2
	831.5	26865	10	16QAM	50	0	22.21	0-2
	844	26990	10	QPSK	1	0	24.19	0
	844	26990	10	QPSK	1	25	24.30	0
	844	26990	10	QPSK	1	49	24.20	0
	844	26990	10	QPSK	25	0	23.18	0-1
	844	26990	10	QPSK	25	12	23.25	0-1
	844	26990	10	QPSK	25	25	23.29	0-1
	844	26990	10	QPSK	50	0	23.19	0-1
	844	26990	10	16QAM	1	0	23.28	0-1
	844	26990	10	16QAM	1	25	23.30	0-1
	844	26990	10	16QAM	1	49	23.29	0-1
	844	26990	10	16QAM	25	0	22.19	0-2
	844	26990	10	16QAM	25	12	22.30	0-2
	844	26990	10	16QAM	25	25	22.30	0-2
High	844	26990	10	16QAM	50	0	22.24	0-2

Table 9-4
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	24.25	0
	816.5	26715	5	QPSK	1	12	24.20	0
	816.5	26715	5	QPSK	1	24	24.30	0
	816.5	26715	5	QPSK	12	0	23.11	0-1
	816.5	26715	5	QPSK	12	6	23.10	0-1
	816.5	26715	5	QPSK	12	13	23.21	0-1
	816.5	26715	5	QPSK	25	0	23.07	0-1
	816.5	26715	5	16-QAM	1	0	23.32	0-1
	816.5	26715	5	16-QAM	1	12	23.22	0-1
	816.5	26715	5	16-QAM	1	24	23.24	0-1
	816.5	26715	5	16-QAM	12	0	22.17	0-2
	816.5	26715	5	16-QAM	12	6	22.18	0-2
	816.5	26715	5	16-QAM	12	13	22.28	0-2
	816.5	26715	5	16-QAM	25	0	22.05	0-2
	831.5	26865	5	QPSK	1	0	23.94	0
	831.5	26865	5	QPSK	1	12	23.83	0
	831.5	26865	5	QPSK	1	24	23.84	0
	831.5	26865	5	QPSK	12	0	22.91	0-1
Mid	831.5	26865	5	QPSK	12	6	22.85	0-1
	831.5	26865	5	QPSK	12	13	22.98	0-1
	831.5	26865	5	QPSK	25	0	22.82	0-1
	831.5	26865	5	16-QAM	1	0	22.51	0-1
	831.5	26865	5	16-QAM	1	12	22.54	0-1
	831.5	26865	5	16-QAM	1	24	22.58	0-1
	831.5	26865	5	16-QAM	12	0	21.94	0-2
	831.5	26865	5	16-QAM	12	6	21.92	0-2
	831.5	26865	5	16-QAM	12	13	21.85	0-2
	831.5	26865	5	16-QAM	25	0	21.97	0-2
	846.5	27015	5	QPSK	1	0	24.10	0
	846.5	27015	5	QPSK	1	12	24.19	0
	846.5	27015	5	QPSK	1	24	23.78	0
	846.5	27015	5	QPSK	12	0	23.28	0-1
	846.5	27015	5	QPSK	12	6	23.19	0-1
	846.5	27015	5	QPSK	12	13	23.15	0-1
	846.5	27015	5	QPSK	25	0	23.10	0-1
	846.5	27015	5	16-QAM	1	0	23.30	0-1
	846.5	27015	5	16-QAM	1	12	23.45	0-1
	846.5	27015	5	16-QAM	1	24	23.09	0-1
	846.5	27015	5	16-QAM	12	0	22.50	0-2
	846.5	27015	5	16-QAM	12	6	22.48	0-2
	846.5	27015	5	16-QAM	12	13	22.34	0-2
	846.5	27015	5	16-QAM	25	0	22.49	0-2

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Table 9-5
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	24.11	0	0
	815.5	26705	3	QPSK	1	7	24.02	0	0
	815.5	26705	3	QPSK	1	14	24.07	0	0
	815.5	26705	3	QPSK	8	0	23.17	0-1	1
	815.5	26705	3	QPSK	8	4	23.18	0-1	1
	815.5	26705	3	QPSK	8	7	23.14	0-1	1
	815.5	26705	3	QPSK	15	0	23.16	0-1	1
	815.5	26705	3	16-QAM	1	0	22.55	0-1	1
	815.5	26705	3	16-QAM	1	7	22.50	0-1	1
	815.5	26705	3	16-QAM	1	14	22.50	0-1	1
	815.5	26705	3	16-QAM	8	0	22.15	0-2	2
	815.5	26705	3	16-QAM	8	4	22.11	0-2	2
	815.5	26705	3	16-QAM	8	7	22.08	0-2	2
	815.5	26705	3	16-QAM	15	0	22.13	0-2	2
	831.5	26865	3	QPSK	1	0	24.20	0	0
Mid	831.5	26865	3	QPSK	1	7	24.05	0	0
	831.5	26865	3	QPSK	1	14	24.15	0	0
	831.5	26865	3	QPSK	8	0	23.25	0-1	1
	831.5	26865	3	QPSK	8	4	23.19	0-1	1
	831.5	26865	3	QPSK	8	7	23.24	0-1	1
	831.5	26865	3	QPSK	15	0	23.23	0-1	1
	831.5	26865	3	16-QAM	1	0	22.89	0-1	1
	831.5	26865	3	16-QAM	1	7	22.78	0-1	1
	831.5	26865	3	16-QAM	1	14	22.84	0-1	1
	831.5	26865	3	16-QAM	8	0	22.33	0-2	2
	831.5	26865	3	16-QAM	8	4	22.27	0-2	2
	831.5	26865	3	16-QAM	8	7	22.33	0-2	2
	831.5	26865	3	16-QAM	15	0	22.31	0-2	2
	847.5	27025	3	QPSK	1	0	24.47	0	0
	847.5	27025	3	QPSK	1	7	24.31	0	0
High	847.5	27025	3	QPSK	1	14	24.14	0	0
	847.5	27025	3	QPSK	8	0	23.41	0-1	1
	847.5	27025	3	QPSK	8	4	23.32	0-1	1
	847.5	27025	3	QPSK	8	7	23.23	0-1	1
	847.5	27025	3	QPSK	15	0	23.25	0-1	1
	847.5	27025	3	16-QAM	1	0	23.50	0-1	1
	847.5	27025	3	16-QAM	1	7	23.43	0-1	1
	847.5	27025	3	16-QAM	1	14	23.26	0-1	1
	847.5	27025	3	16-QAM	8	0	22.44	0-2	2
	847.5	27025	3	16-QAM	8	4	22.34	0-2	2
	847.5	27025	3	16-QAM	8	7	22.26	0-2	2
	847.5	27025	3	16-QAM	15	0	22.38	0-2	2

Table 9-6
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	23.88	0	0
	814.7	26697	1.4	QPSK	1	2	24.14	0	0
	814.7	26697	1.4	QPSK	1	5	24.20	0	0
	814.7	26697	1.4	QPSK	3	0	24.16	0	0
	814.7	26697	1.4	QPSK	3	2	24.13	0	0
	814.7	26697	1.4	QPSK	3	3	24.14	0	0
	814.7	26697	1.4	QPSK	6	0	23.16	0-1	1
	814.7	26697	1.4	16-QAM	1	0	22.95	0-1	1
	814.7	26697	1.4	16-QAM	1	2	23.37	0-1	1
	814.7	26697	1.4	16-QAM	1	5	23.31	0-1	1
	814.7	26697	1.4	16-QAM	3	0	23.20	0-1	1
	814.7	26697	1.4	16-QAM	3	2	23.11	0-1	1
	814.7	26697	1.4	16-QAM	3	3	23.21	0-1	1
	814.7	26697	1.4	16-QAM	6	0	22.04	0-2	2
Mid	831.5	26865	1.4	QPSK	1	0	24.12	0	0
	831.5	26865	1.4	QPSK	1	2	24.08	0	0
	831.5	26865	1.4	QPSK	1	5	24.16	0	0
	831.5	26865	1.4	QPSK	3	0	24.21	0	0
	831.5	26865	1.4	QPSK	3	2	24.17	0	0
	831.5	26865	1.4	QPSK	3	3	24.16	0	0
	831.5	26865	1.4	QPSK	6	0	23.16	0-1	1
	831.5	26865	1.4	16-QAM	1	0	22.54	0-1	1
	831.5	26865	1.4	16-QAM	1	2	22.50	0-1	1
	831.5	26865	1.4	16-QAM	1	5	22.59	0-1	1
	831.5	26865	1.4	16-QAM	3	0	23.30	0-1	1
	831.5	26865	1.4	16-QAM	3	2	23.27	0-1	1
	831.5	26865	1.4	16-QAM	3	3	23.24	0-1	1
	831.5	26865	1.4	16-QAM	6	0	22.39	0-2	2
High	848.3	27033	1.4	QPSK	1	0	24.38	0	0
	848.3	27033	1.4	QPSK	1	2	24.26	0	0
	848.3	27033	1.4	QPSK	1	5	24.21	0	0
	848.3	27033	1.4	QPSK	3	0	24.29	0	0
	848.3	27033	1.4	QPSK	3	2	24.18	0	0
	848.3	27033	1.4	QPSK	3	3	24.12	0	0
	848.3	27033	1.4	QPSK	6	0	23.28	0-1	1
	848.3	27033	1.4	16-QAM	1	0	22.84	0-1	1
	848.3	27033	1.4	16-QAM	1	2	22.77	0-1	1
	848.3	27033	1.4	16-QAM	1	5	22.69	0-1	1
	848.3	27033	1.4	16-QAM	3	0	23.38	0-1	1
	848.3	27033	1.4	16-QAM	3	2	23.27	0-1	1
	848.3	27033	1.4	16-QAM	3	3	23.29	0-1	1
	848.3	27033	1.4	16-QAM	6	0	22.37	0-2	2

9.2.2

LTE Band 25 (PCS)

Table 9-7

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	24.26	0
	1855	26090	10	QPSK	1	25	24.21	0
	1855	26090	10	QPSK	1	49	24.20	0
	1855	26090	10	QPSK	25	0	23.31	0-1
	1855	26090	10	QPSK	25	12	23.32	0-1
	1855	26090	10	QPSK	25	25	23.20	0-1
	1855	26090	10	QPSK	50	0	23.18	0-1
	1855	26090	10	16QAM	1	0	23.07	0-1
	1855	26090	10	16QAM	1	25	23.05	0-1
	1855	26090	10	16QAM	1	49	23.02	0-1
	1855	26090	10	16QAM	25	0	22.28	0-2
	1855	26090	10	16QAM	25	12	22.32	0-2
	1855	26090	10	16QAM	25	25	22.31	0-2
	1855	26090	10	16QAM	50	0	22.19	0-2
	1855	26090	10	16QAM	50	0	22.19	0-2
Mid	1882.5	26365	10	QPSK	1	0	24.03	0
	1882.5	26365	10	QPSK	1	25	24.14	0
	1882.5	26365	10	QPSK	1	49	24.12	0
	1882.5	26365	10	QPSK	25	0	23.30	0-1
	1882.5	26365	10	QPSK	25	12	23.29	0-1
	1882.5	26365	10	QPSK	25	25	23.38	0-1
	1882.5	26365	10	QPSK	50	0	23.22	0-1
	1882.5	26365	10	16QAM	1	0	23.45	0-1
	1882.5	26365	10	16QAM	1	25	23.49	0-1
	1882.5	26365	10	16QAM	1	49	23.50	0-1
	1882.5	26365	10	16QAM	25	0	22.31	0-2
	1882.5	26365	10	16QAM	25	12	22.32	0-2
	1882.5	26365	10	16QAM	25	25	22.38	0-2
	1882.5	26365	10	16QAM	50	0	22.32	0-2
	1882.5	26365	10	16QAM	50	0	22.32	0-2
High	1910	26640	10	QPSK	1	0	24.21	0
	1910	26640	10	QPSK	1	25	24.10	0
	1910	26640	10	QPSK	1	49	23.94	0
	1910	26640	10	QPSK	25	0	23.33	0-1
	1910	26640	10	QPSK	25	12	23.25	0-1
	1910	26640	10	QPSK	25	25	23.19	0-1
	1910	26640	10	QPSK	50	0	23.26	0-1
	1910	26640	10	16QAM	1	0	23.02	0-1
	1910	26640	10	16QAM	1	25	22.95	0-1
	1910	26640	10	16QAM	1	49	22.81	0-1
	1910	26640	10	16QAM	25	0	22.35	0-2
	1910	26640	10	16QAM	25	12	22.30	0-2
	1910	26640	10	16QAM	25	25	22.19	0-2
	1910	26640	10	16QAM	50	0	22.24	0-2
	1910	26640	10	16QAM	50	0	22.24	0-2

Table 9-8

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	24.27	0
	1852.5	26065	5	QPSK	1	12	24.18	0
	1852.5	26065	5	QPSK	1	24	24.26	0
	1852.5	26065	5	QPSK	12	0	23.17	0-1
	1852.5	26065	5	QPSK	12	6	23.23	0-1
	1852.5	26065	5	QPSK	12	13	23.30	0-1
	1852.5	26065	5	QPSK	25	0	23.27	0-1
	1852.5	26065	5	16-QAM	1	0	23.15	0-1
	1852.5	26065	5	16-QAM	1	12	23.17	0-1
	1852.5	26065	5	16-QAM	1	24	23.21	0-1
	1852.5	26065	5	16-QAM	12	0	22.26	0-2
	1852.5	26065	5	16-QAM	12	6	22.30	0-2
	1852.5	26065	5	16-QAM	12	13	22.29	0-2
	1852.5	26065	5	16-QAM	25	0	22.21	0-2
	1852.5	26065	5	16-QAM	25	0	22.21	0-2
Mid	1882.5	26365	5	QPSK	1	0	24.11	0
	1882.5	26365	5	QPSK	1	12	24.16	0
	1882.5	26365	5	QPSK	1	24	24.24	0
	1882.5	26365	5	QPSK	12	0	23.32	0-1
	1882.5	26365	5	QPSK	12	6	23.38	0-1
	1882.5	26365	5	QPSK	12	13	23.27	0-1
	1882.5	26365	5	QPSK	25	0	23.38	0-1
	1882.5	26365	5	16-QAM	1	0	22.98	0-1
	1882.5	26365	5	16-QAM	1	12	22.99	0-1
	1882.5	26365	5	16-QAM	1	24	23.02	0-1
	1882.5	26365	5	16-QAM	12	0	22.49	0-2
	1882.5	26365	5	16-QAM	12	6	22.43	0-2
	1882.5	26365	5	16-QAM	12	13	22.42	0-2
	1882.5	26365	5	16-QAM	25	0	22.36	0-2
	1882.5	26365	5	16-QAM	25	0	22.36	0-2
High	1912.5	26665	5	QPSK	1	0	24.24	0
	1912.5	26665	5	QPSK	1	12	24.19	0
	1912.5	26665	5	QPSK	1	24	24.15	0
	1912.5	26665	5	QPSK	12	0	23.18	0-1
	1912.5	26665	5	QPSK	12	6	23.27	0-1
	1912.5	26665	5	QPSK	12	13	23.27	0-1
	1912.5	26665	5	QPSK	25	0	23.20	0-1
	1912.5	26665	5	16-QAM	1	0	23.27	0-1
	1912.5	26665	5	16-QAM	1	12	22.95	0-1
	1912.5	26665	5	16-QAM	1	24	23.02	0-1
	1912.5	26665	5	16-QAM	12	0	22.35	0-2
	1912.5	26665	5	16-QAM	12	6	22.34	0-2
	1912.5	26665	5	16-QAM	12	13	22.28	0-2
	1912.5	26665	5	16-QAM	25	0	22.11	0-2
	1912.5	26665	5	16-QAM	25	0	22.11	0-2

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Table 9-9
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	24.05	0	0
	1851.5	26055	3	QPSK	1	7	24.19	0	0
	1851.5	26055	3	QPSK	1	14	24.16	0	0
	1851.5	26055	3	QPSK	8	0	23.12	0-1	1
	1851.5	26055	3	QPSK	8	4	23.13	0-1	1
	1851.5	26055	3	QPSK	8	7	23.12	0-1	1
	1851.5	26055	3	QPSK	15	0	23.09	0-1	1
	1851.5	26055	3	16-QAM	1	0	23.08	0-1	1
	1851.5	26055	3	16-QAM	1	7	23.05	0-1	1
	1851.5	26055	3	16-QAM	1	14	23.16	0-1	1
	1851.5	26055	3	16-QAM	8	0	22.18	0-2	2
	1851.5	26055	3	16-QAM	8	4	22.14	0-2	2
	1851.5	26055	3	16-QAM	8	7	22.15	0-2	2
	1851.5	26055	3	16-QAM	15	0	22.12	0-2	2
Mid	1882.5	26365	3	QPSK	1	0	24.23	0	0
	1882.5	26365	3	QPSK	1	7	24.25	0	0
	1882.5	26365	3	QPSK	1	14	24.26	0	0
	1882.5	26365	3	QPSK	8	0	23.29	0-1	1
	1882.5	26365	3	QPSK	8	4	23.28	0-1	1
	1882.5	26365	3	QPSK	8	7	23.28	0-1	1
	1882.5	26365	3	QPSK	15	0	23.31	0-1	1
	1882.5	26365	3	16-QAM	1	0	23.11	0-1	1
	1882.5	26365	3	16-QAM	1	7	23.49	0-1	1
	1882.5	26365	3	16-QAM	1	14	23.44	0-1	1
	1882.5	26365	3	16-QAM	8	0	22.19	0-2	2
	1882.5	26365	3	16-QAM	8	4	22.20	0-2	2
	1882.5	26365	3	16-QAM	8	7	22.25	0-2	2
	1882.5	26365	3	16-QAM	15	0	22.32	0-2	2
High	1913.5	26675	3	QPSK	1	0	24.05	0	0
	1913.5	26675	3	QPSK	1	7	23.96	0	0
	1913.5	26675	3	QPSK	1	14	23.97	0	0
	1913.5	26675	3	QPSK	8	0	23.23	0-1	1
	1913.5	26675	3	QPSK	8	4	23.16	0-1	1
	1913.5	26675	3	QPSK	8	7	23.18	0-1	1
	1913.5	26675	3	QPSK	15	0	23.23	0-1	1
	1913.5	26675	3	16-QAM	1	0	22.92	0-1	1
	1913.5	26675	3	16-QAM	1	7	22.84	0-1	1
	1913.5	26675	3	16-QAM	1	14	22.84	0-1	1
	1913.5	26675	3	16-QAM	8	0	22.12	0-2	2
	1913.5	26675	3	16-QAM	8	4	22.03	0-2	2
	1913.5	26675	3	16-QAM	8	7	22.21	0-2	2
	1913.5	26675	3	16-QAM	15	0	22.28	0-2	2

9.2.3

LTE Band 41

Table 9-10
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	39750	20	QPSK	1	0	24.14	0	0
	2506	39750	20	QPSK	1	50	24.16	0	0
	2506	39750	20	QPSK	1	99	24.11	0	0
	2506	39750	20	QPSK	50	0	23.09	0-1	1
	2506	39750	20	QPSK	50	25	23.12	0-1	1
	2506	39750	20	QPSK	50	50	23.11	0-1	1
	2506	39750	20	QPSK	100	0	23.06	0-1	1
	2506	39750	20	16QAM	1	0	23.27	0-1	1
	2506	39750	20	16QAM	1	50	23.34	0-1	1
	2506	39750	20	16QAM	1	99	23.28	0-1	1
	2506	39750	20	16QAM	50	0	22.12	0-2	2
	2506	39750	20	16QAM	50	25	22.06	0-2	2
	2506	39750	20	16QAM	50	50	22.07	0-2	2
	2506	39750	20	16QAM	100	0	22.19	0-2	2
Low Mid	2549.5	40185	20	QPSK	1	0	24.24	0	0
	2549.5	40185	20	QPSK	1	50	24.39	0	0
	2549.5	40185	20	QPSK	1	99	24.33	0	0
	2549.5	40185	20	QPSK	50	0	23.18	0-1	1
	2549.5	40185	20	QPSK	50	25	23.22	0-1	1
	2549.5	40185	20	QPSK	50	50	23.28	0-1	1
	2549.5	40185	20	QPSK	100	0	23.22	0-1	1
	2549.5	40185	20	16-QAM	1	0	23.32	0-1	1
	2549.5	40185	20	16-QAM	1	50	23.50	0-1	1
	2549.5	40185	20	16-QAM	1	99	23.43	0-1	1
	2549.5	40185	20	16-QAM	50	0	22.22	0-2	2
	2549.5	40185	20	16-QAM	50	25	22.26	0-2	2
	2549.5	40185	20	16-QAM	50	50	22.33	0-2	2
	2549.5	40185	20	16-QAM	100	0	22.36	0-2	2
Mid	2593	40620	20	QPSK	1	0	24.49	0	0
	2593	40620	20	QPSK	1	50	24.50	0	0
	2593	40620	20	QPSK	1	99	24.49	0	0
	2593	40620	20	QPSK	50	0	23.25	0-1	1
	2593	40620	20	QPSK	50	25	23.29	0-1	1
	2593	40620	20	QPSK	50	50	23.26	0-1	1
	2593	40620	20	QPSK	100	0	23.21	0-1	1
	2593	40620	20	16-QAM	1	0	23.48	0-1	1
	2593	40620	20	16-QAM	1	50	23.50	0-1	1
	2593	40620	20	16-QAM	1	99	23.39	0-1	1
	2593	40620	20	16-QAM	50	0	22.28	0-2	2
	2593	40620	20	16-QAM	50	25	22.32	0-2	2
	2593	40620	20	16-QAM	50	50	22.31	0-2	2
	2593	40620	20	16-QAM	100	0	22.35	0-2	2
Mid High	2636.5	41055	20	QPSK	1	0	24.46	0	0
	2636.5	41055	20	QPSK	1	50	24.42	0	0
	2636.5	41055	20	QPSK	1	99	24.42	0	0
	2636.5	41055	20	QPSK	50	0	23.33	0-1	1
	2636.5	41055	20	QPSK	50	25	23.25	0-1	1
	2636.5	41055	20	QPSK	50	50	23.28	0-1	1
	2636.5	41055	20	QPSK	100	0	23.26	0-1	1
	2636.5	41055	20	16-QAM	1	0	23.44	0-1	1
	2636.5	41055	20	16-QAM	1	50	23.43	0-1	1
	2636.5	41055	20	16-QAM	1	99	23.39	0-1	1
	2636.5	41055	20	16-QAM	50	0	22.40	0-2	2
	2636.5	41055	20	16-QAM	50	25	22.33	0-2	2
	2636.5	41055	20	16-QAM	50	50	22.37	0-2	2
	2636.5	41055	20	16-QAM	100	0	22.32	0-2	2
High	2680	41490	20	QPSK	1	0	24.46	0	0
	2680	41490	20	QPSK	1	50	24.40	0	0
	2680	41490	20	QPSK	1	99	24.45	0	0
	2680	41490	20	QPSK	50	0	23.36	0-1	1
	2680	41490	20	QPSK	50	25	23.22	0-1	1
	2680	41490	20	QPSK	50	50	23.21	0-1	1
	2680	41490	20	QPSK	100	0	23.21	0-1	1
	2680	41490	20	16-QAM	1	0	23.44	0-1	1
	2680	41490	20	16-QAM	1	50	23.40	0-1	1
	2680	41490	20	16-QAM	1	99	23.30	0-1	1
	2680	41490	20	16-QAM	50	0	22.34	0-2	2
	2680	41490	20	16-QAM	50	25	22.30	0-2	2
	2680	41490	20	16-QAM	50	50	22.30	0-2	2
	2680	41490	20	16-QAM	100	0	22.27	0-2	2

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Table 9-11
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	2503.5	39725	15	QPSK	1	0	24.19	0	0
	2503.5	39725	15	QPSK	1	36	24.29	0	0
	2503.5	39725	15	QPSK	1	74	24.24	0	0
	2503.5	39725	15	QPSK	36	0	23.09	0-1	1
	2503.5	39725	15	QPSK	36	18	23.20	0-1	1
	2503.5	39725	15	QPSK	36	37	23.12	0-1	1
	2503.5	39725	15	QPSK	75	0	23.04	0-1	1
	2503.5	39725	15	16QAM	1	0	23.32	0-1	1
	2503.5	39725	15	16QAM	1	36	23.41	0-1	1
	2503.5	39725	15	16QAM	1	74	23.37	0-1	1
	2503.5	39725	15	16QAM	36	0	22.24	0-2	2
	2503.5	39725	15	16QAM	36	18	22.17	0-2	2
Low Mid	2503.5	39725	15	16QAM	36	37	22.12	0-2	2
	2503.5	39725	15	16QAM	75	0	22.20	0-2	2
	2548.25	40173	15	QPSK	1	0	24.32	0	0
	2548.25	40173	15	QPSK	1	36	24.49	0	0
	2548.25	40173	15	QPSK	1	74	24.48	0	0
	2548.25	40173	15	QPSK	36	0	23.31	0-1	1
	2548.25	40173	15	QPSK	36	18	23.38	0-1	1
	2548.25	40173	15	QPSK	36	37	23.40	0-1	1
	2548.25	40173	15	QPSK	75	0	23.28	0-1	1
	2548.25	40173	15	16-QAM	1	0	23.39	0-1	1
	2548.25	40173	15	16-QAM	1	36	23.45	0-1	1
	2548.25	40173	15	16-QAM	1	74	23.44	0-1	1
Mid	2548.25	40173	15	16-QAM	36	0	22.33	0-2	2
	2548.25	40173	15	16-QAM	36	18	22.35	0-2	2
	2548.25	40173	15	16-QAM	36	37	22.37	0-2	2
	2548.25	40173	15	16-QAM	75	0	22.29	0-2	2
	2593	40620	15	QPSK	1	0	24.25	0	0
	2593	40620	15	QPSK	1	36	24.44	0	0
	2593	40620	15	QPSK	1	74	24.37	0	0
	2593	40620	15	QPSK	36	0	23.28	0-1	1
	2593	40620	15	QPSK	36	18	23.25	0-1	1
	2593	40620	15	QPSK	36	37	23.26	0-1	1
	2593	40620	15	QPSK	75	0	23.25	0-1	1
	2593	40620	15	16-QAM	1	0	23.37	0-1	1
Mid High	2593	40620	15	16-QAM	1	36	23.45	0-1	1
	2593	40620	15	16-QAM	1	74	23.41	0-1	1
	2593	40620	15	16-QAM	36	0	22.29	0-2	2
	2593	40620	15	16-QAM	36	18	22.25	0-2	2
	2593	40620	15	16-QAM	36	37	22.26	0-2	2
	2593	40620	15	16-QAM	75	0	22.18	0-2	2
	2637.75	41068	15	QPSK	1	0	24.46	0	0
	2637.75	41068	15	QPSK	1	36	24.39	0	0
	2637.75	41068	15	QPSK	1	74	24.41	0	0
	2637.75	41068	15	QPSK	36	0	23.33	0-1	1
	2637.75	41068	15	QPSK	36	18	23.30	0-1	1
	2637.75	41068	15	QPSK	36	37	23.26	0-1	1
High	2637.75	41068	15	QPSK	75	0	23.28	0-1	1
	2637.75	41068	15	16-QAM	1	0	23.45	0-1	1
	2637.75	41068	15	16-QAM	1	36	23.49	0-1	1
	2637.75	41068	15	16-QAM	1	74	23.42	0-1	1
	2637.75	41068	15	16-QAM	36	0	22.30	0-2	2
	2637.75	41068	15	16-QAM	36	18	22.38	0-2	2
	2637.75	41068	15	16-QAM	36	37	22.25	0-2	2
	2637.75	41068	15	16-QAM	75	0	22.31	0-2	2
	2682.5	41515	15	QPSK	1	0	24.36	0	0
	2682.5	41515	15	QPSK	1	36	24.30	0	0
	2682.5	41515	15	QPSK	1	74	24.38	0	0
	2682.5	41515	15	QPSK	36	0	23.28	0-1	1
	2682.5	41515	15	QPSK	36	18	23.34	0-1	1
	2682.5	41515	15	QPSK	36	37	23.29	0-1	1
	2682.5	41515	15	QPSK	75	0	23.24	0-1	1
	2682.5	41515	15	16-QAM	1	0	23.46	0-1	1
	2682.5	41515	15	16-QAM	1	36	23.49	0-1	1
	2682.5	41515	15	16-QAM	1	74	23.43	0-1	1
	2682.5	41515	15	16-QAM	36	0	22.29	0-2	2
	2682.5	41515	15	16-QAM	36	18	22.27	0-2	2
	2682.5	41515	15	16-QAM	36	37	22.24	0-2	2
	2682.5	41515	15	16-QAM	75	0	22.19	0-2	2

Table 9-12
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	2501	39700	10	QPSK	1	0	24.10	0	0
	2501	39700	10	QPSK	1	25	24.45	0	0
	2501	39700	10	QPSK	1	49	24.33	0	0
	2501	39700	10	QPSK	25	0	23.29	0-1	1
	2501	39700	10	QPSK	25	12	23.31	0-1	1
	2501	39700	10	QPSK	25	25	23.24	0-1	1
	2501	39700	10	QPSK	50	0	23.18	0-1	1
	2501	39700	10	16QAM	1	0	23.38	0-1	1
	2501	39700	10	16QAM	1	25	23.41	0-1	1
	2501	39700	10	16QAM	1	49	23.38	0-1	1
	2501	39700	10	16QAM	25	0	22.35	0-2	2
	2501	39700	10	16QAM	25	12	22.21	0-2	2
	2501	39700	10	16QAM	25	25	22.14	0-2	2
	2501	39700	10	16QAM	50	0	22.20	0-2	2
Low Mid	2547	40160	10	QPSK	1	0	24.40	0	0
	2547	40160	10	QPSK	1	25	24.49	0	0
	2547	40160	10	QPSK	1	49	24.35	0	0
	2547	40160	10	QPSK	25	0	23.38	0-1	1
	2547	40160	10	QPSK	25	12	23.44	0-1	1
	2547	40160	10	QPSK	25	25	23.32	0-1	1
	2547	40160	10	QPSK	50	0	23.32	0-1	1
	2547	40160	10	16-QAM	1	0	23.35	0-1	1
	2547	40160	10	16-QAM	1	25	23.47	0-1	1
	2547	40160	10	16-QAM	1	49	23.47	0-1	1
	2547	40160	10	16-QAM	25	0	22.36	0-2	2
	2547	40160	10	16-QAM	25	12	22.44	0-2	2
	2547	40160	10	16-QAM	25	25	22.33	0-2	2
	2547	40160	10	16-QAM	50	0	22.44	0-2	2
Mid	2593	40620	10	QPSK	1	0	24.32	0	0
	2593	40620	10	QPSK	1	25	24.41	0	0
	2593	40620	10	QPSK	1	49	24.40	0	0
	2593	40620	10	QPSK	25	0	23.40	0-1	1
	2593	40620	10	QPSK	25	12	23.37	0-1	1
	2593	40620	10	QPSK	25	25	23.36	0-1	1
	2593	40620	10	QPSK	50	0	23.27	0-1	1
	2593	40620	10	16-QAM	1	0	23.41	0-1	1
	2593	40620	10	16-QAM	1	25	23.49	0-1	1
	2593	40620	10	16-QAM	1	49	23.49	0-1	1
	2593	40620	10	16-QAM	25	0	22.33	0-2	2
	2593	40620	10	16-QAM	25	12	22.34	0-2	2
	2593	40620	10	16-QAM	25	25	22.29	0-2	2
	2593	40620	10	16-QAM	50	0	22.31	0-2	2
Mid High	2639	41080	10	QPSK	1	0	24.44	0	0
	2639	41080	10	QPSK	1	25	24.39	0	0
	2639	41080	10	QPSK	1	49	24.43	0	0
	2639	41080	10	QPSK	25	0	23.40	0-1	1
	2639	41080	10	QPSK	25	12	23.45	0-1	1
	2639	41080	10	QPSK	25	25	23.31	0-1	1
	2639	41080	10	QPSK	50	0	23.25	0-1	1
	2639	41080	10	16-QAM	1	0	23.34	0-1	1
	2639	41080	10	16-QAM	1	25	23.30	0-1	1
	2639	41080	10	16-QAM	1	49	23.43	0-1	1
	2639	41080	10	16-QAM	25	0	22.33	0-2	2
	2639	41080	10	16-QAM	25	12	22.39	0-2	2
	2639	41080	10	16-QAM	25	25	22.36	0-2	2
	2639	41080	10	16-QAM	50	0	22.40	0-2	2
High	2685	41540	10	QPSK	1	0	24.33	0	0
	2685	41540	10	QPSK	1	25	24.32	0	0
	2685	41540	10	QPSK	1	49	24.40	0	0
	2685	41540	10	QPSK	25	0	23.41	0-1	1
	2685	41540	10	QPSK	25	12	23.37	0-1	1
	2685	41540	10	QPSK	25	25	23.31	0-1	1
	2685	41540	10	QPSK	50	0	23.26	0-1	1
	2685	41540	10	16-QAM	1	0	23.31	0-1	1
	2685	41540	10	16-QAM	1	25	23.49	0-1	1
	2685	41540	10	16-QAM	1	49	23.43	0-1	1
	2685	41540	10	16-QAM	25	0	22.36	0-2	2
	2685	41540	10	16-QAM	25	12	22.33	0-2	2
	2685	41540	10	16-QAM	25	25	22.28	0-2	2
	2685	41540	10	16-QAM	50	0	22.31	0-2	2

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9.3 LTE Reduced Conducted Powers Representing Hotspot Active

Note: Separate test samples were tuned to fixed reduced power levels to represent the Hotspot Active scenario for SAR testing purposes only.

9.3.1 LTE Band 26

Table 9-13

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	21.90	0	0
	819	26740	10	QPSK	1	25	22.05	0	0
	819	26740	10	QPSK	1	49	22.01	0	0
	819	26740	10	QPSK	25	0	21.90	0-1	0
	819	26740	10	QPSK	25	12	22.01	0-1	0
	819	26740	10	QPSK	25	25	21.98	0-1	0
	819	26740	10	QPSK	50	0	21.86	0-1	0
	819	26740	10	16QAM	1	0	21.58	0-1	0
	819	26740	10	16QAM	1	25	21.74	0-1	0
	819	26740	10	16QAM	1	49	21.56	0-1	0
	819	26740	10	16QAM	25	0	22.01	0-2	0
	819	26740	10	16QAM	25	12	22.02	0-2	0
	819	26740	10	16QAM	25	25	22.04	0-2	0
	819	26740	10	16QAM	50	0	21.89	0-2	0
	831.5	26865	10	QPSK	1	0	22.07	0	0
	831.5	26865	10	QPSK	1	25	22.13	0	0
Mid	831.5	26865	10	QPSK	1	49	22.11	0	0
	831.5	26865	10	QPSK	25	0	22.16	0-1	0
	831.5	26865	10	QPSK	25	12	22.13	0-1	0
	831.5	26865	10	QPSK	25	25	22.21	0-1	0
	831.5	26865	10	QPSK	50	0	22.04	0-1	0
	831.5	26865	10	16QAM	1	0	21.79	0-1	0
	831.5	26865	10	16QAM	1	25	21.81	0-1	0
	831.5	26865	10	16QAM	1	49	21.80	0-1	0
	831.5	26865	10	16QAM	25	0	22.21	0-2	0
	831.5	26865	10	16QAM	25	12	22.21	0-2	0
	831.5	26865	10	16QAM	25	25	22.27	0-2	0
	831.5	26865	10	16QAM	50	0	22.06	0-2	0
	844	26990	10	QPSK	1	0	22.00	0	0
	844	26990	10	QPSK	1	25	22.25	0	0
	844	26990	10	QPSK	1	49	21.97	0	0
	844	26990	10	QPSK	25	0	21.89	0-1	0
High	844	26990	10	QPSK	25	12	22.11	0-1	0
	844	26990	10	QPSK	25	25	22.14	0-1	0
	844	26990	10	QPSK	50	0	21.96	0-1	0
	844	26990	10	16QAM	1	0	22.14	0-1	0
	844	26990	10	16QAM	1	25	22.33	0-1	0
	844	26990	10	16QAM	1	49	22.12	0-1	0
	844	26990	10	16QAM	25	0	21.88	0-2	0
	844	26990	10	16QAM	25	12	22.15	0-2	0
	844	26990	10	16QAM	25	25	22.26	0-2	0
	844	26990	10	16QAM	50	0	21.85	0-2	0

Table 9-14

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	22.14	0	0
	816.5	26715	5	QPSK	1	12	22.18	0	0
	816.5	26715	5	QPSK	1	24	22.22	0	0
	816.5	26715	5	QPSK	12	0	22.07	0-1	0
	816.5	26715	5	QPSK	12	6	22.08	0-1	0
	816.5	26715	5	QPSK	12	13	22.08	0-1	0
	816.5	26715	5	QPSK	25	0	22.03	0-1	0
	816.5	26715	5	16-QAM	1	0	22.06	0-1	0
	816.5	26715	5	16-QAM	1	12	22.09	0-1	0
	816.5	26715	5	16-QAM	1	24	22.17	0-1	0
	816.5	26715	5	16-QAM	12	0	22.09	0-2	0
	816.5	26715	5	16-QAM	12	6	22.10	0-2	0
	816.5	26715	5	16-QAM	12	13	22.05	0-2	0
	816.5	26715	5	16-QAM	25	0	22.06	0-2	0
	831.5	26865	5	QPSK	1	0	22.36	0	0
	831.5	26865	5	QPSK	1	12	22.33	0	0
Mid	831.5	26865	5	QPSK	1	24	22.41	0	0
	831.5	26865	5	QPSK	12	0	22.15	0-1	0
	831.5	26865	5	QPSK	12	6	22.14	0-1	0
	831.5	26865	5	QPSK	12	13	22.29	0-1	0
	831.5	26865	5	QPSK	25	0	22.14	0-1	0
	831.5	26865	5	16-QAM	1	0	22.30	0-1	0
	831.5	26865	5	16-QAM	1	12	22.35	0-1	0
	831.5	26865	5	16-QAM	1	24	22.41	0-1	0
	831.5	26865	5	16-QAM	12	0	22.17	0-2	0
	831.5	26865	5	16-QAM	12	6	22.15	0-2	0
	831.5	26865	5	16-QAM	12	13	22.30	0-2	0
	831.5	26865	5	16-QAM	25	0	22.12	0-2	0
	846.5	27015	5	QPSK	1	0	22.11	0	0
	846.5	27015	5	QPSK	1	12	22.13	0	0
	846.5	27015	5	QPSK	1	24	21.86	0	0
	846.5	27015	5	QPSK	12	0	22.38	0-1	0
High	846.5	27015	5	QPSK	12	6	22.29	0-1	0
	846.5	27015	5	QPSK	12	13	22.13	0-1	0
	846.5	27015	5	QPSK	25	0	22.15	0-1	0
	846.5	27015	5	16-QAM	1	0	21.50	0-1	0
	846.5	27015	5	16-QAM	1	12	21.53	0-1	0
	846.5	27015	5	16-QAM	1	24	21.73	0-1	0
	846.5	27015	5	16-QAM	12	0	22.39	0-2	0
	846.5	27015	5	16-QAM	12	6	22.37	0-2	0
	846.5	27015	5	16-QAM	12	13	22.01	0-2	0
	846.5	27015	5	16-QAM	25	0	22.16	0-2	0

Table 9-15
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	21.96	0	0
	815.5	26705	3	QPSK	1	7	21.98	0	0
	815.5	26705	3	QPSK	1	14	21.96	0	0
	815.5	26705	3	QPSK	8	0	22.01	0-1	0
	815.5	26705	3	QPSK	8	4	22.00	0-1	0
	815.5	26705	3	QPSK	8	7	22.08	0-1	0
	815.5	26705	3	QPSK	15	0	22.05	0-1	0
	815.5	26705	3	16-QAM	1	0	21.51	0-1	0
	815.5	26705	3	16-QAM	1	7	21.54	0-1	0
	815.5	26705	3	16-QAM	1	14	21.50	0-1	0
	815.5	26705	3	16-QAM	8	0	21.97	0-2	0
	815.5	26705	3	16-QAM	8	4	21.94	0-2	0
	815.5	26705	3	16-QAM	8	7	21.96	0-2	0
	815.5	26705	3	16-QAM	15	0	22.03	0-2	0
	831.5	26865	3	QPSK	1	0	22.07	0	0
Mid	831.5	26865	3	QPSK	1	7	22.11	0	0
	831.5	26865	3	QPSK	1	14	22.20	0	0
	831.5	26865	3	QPSK	8	0	22.15	0-1	0
	831.5	26865	3	QPSK	8	4	22.19	0-1	0
	831.5	26865	3	QPSK	8	7	22.25	0-1	0
	831.5	26865	3	QPSK	15	0	22.08	0-1	0
	831.5	26865	3	16-QAM	1	0	21.81	0-1	0
	831.5	26865	3	16-QAM	1	7	21.76	0-1	0
	831.5	26865	3	16-QAM	1	14	21.91	0-1	0
	831.5	26865	3	16-QAM	8	0	22.13	0-2	0
	831.5	26865	3	16-QAM	8	4	22.22	0-2	0
	831.5	26865	3	16-QAM	8	7	22.23	0-2	0
	831.5	26865	3	16-QAM	15	0	22.14	0-2	0
	847.5	27025	3	QPSK	1	0	22.32	0	0
	847.5	27025	3	QPSK	1	7	22.11	0	0
High	847.5	27025	3	QPSK	1	14	21.92	0	0
	847.5	27025	3	QPSK	8	0	22.23	0-1	0
	847.5	27025	3	QPSK	8	4	22.11	0-1	0
	847.5	27025	3	QPSK	8	7	22.04	0-1	0
	847.5	27025	3	QPSK	15	0	22.07	0-1	0
	847.5	27025	3	16-QAM	1	0	22.36	0-1	0
	847.5	27025	3	16-QAM	1	7	22.25	0-1	0
	847.5	27025	3	16-QAM	1	14	22.07	0-1	0
	847.5	27025	3	16-QAM	8	0	22.16	0-2	0
	847.5	27025	3	16-QAM	8	4	22.13	0-2	0
	847.5	27025	3	16-QAM	8	7	22.02	0-2	0
	847.5	27025	3	16-QAM	15	0	22.09	0-2	0

Table 9-16
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	21.95	0	0
	814.7	26697	1.4	QPSK	1	2	21.90	0	0
	814.7	26697	1.4	QPSK	1	5	21.95	0	0
	814.7	26697	1.4	QPSK	3	0	22.03	0	0
	814.7	26697	1.4	QPSK	3	2	22.07	0	0
	814.7	26697	1.4	QPSK	3	3	22.03	0	0
	814.7	26697	1.4	QPSK	6	0	22.01	0-1	0
	814.7	26697	1.4	16-QAM	1	0	21.56	0-1	0
	814.7	26697	1.4	16-QAM	1	2	21.51	0-1	0
	814.7	26697	1.4	16-QAM	1	5	21.54	0-1	0
	814.7	26697	1.4	16-QAM	3	0	22.16	0-1	0
	814.7	26697	1.4	16-QAM	3	2	22.14	0-1	0
	814.7	26697	1.4	16-QAM	3	3	22.12	0-1	0
	814.7	26697	1.4	16-QAM	6	0	22.16	0-2	0
Mid	831.5	26865	1.4	QPSK	1	0	22.17	0	0
	831.5	26865	1.4	QPSK	1	2	22.21	0	0
	831.5	26865	1.4	QPSK	1	5	22.26	0	0
	831.5	26865	1.4	QPSK	3	0	22.12	0	0
	831.5	26865	1.4	QPSK	3	2	22.19	0	0
	831.5	26865	1.4	QPSK	3	3	22.24	0	0
	831.5	26865	1.4	QPSK	6	0	22.27	0-1	0
	831.5	26865	1.4	16-QAM	1	0	21.65	0-1	0
	831.5	26865	1.4	16-QAM	1	2	21.74	0-1	0
	831.5	26865	1.4	16-QAM	1	5	21.79	0-1	0
	831.5	26865	1.4	16-QAM	3	0	22.17	0-1	0
	831.5	26865	1.4	16-QAM	3	2	22.30	0-1	0
	831.5	26865	1.4	16-QAM	3	3	22.32	0-1	0
	831.5	26865	1.4	16-QAM	6	0	22.29	0-2	0
High	848.3	27033	1.4	QPSK	1	0	22.16	0	0
	848.3	27033	1.4	QPSK	1	2	22.01	0	0
	848.3	27033	1.4	QPSK	1	5	21.90	0	0
	848.3	27033	1.4	QPSK	3	0	22.06	0	0
	848.3	27033	1.4	QPSK	3	2	22.02	0	0
	848.3	27033	1.4	QPSK	3	3	21.95	0	0
	848.3	27033	1.4	QPSK	6	0	22.03	0-1	0
	848.3	27033	1.4	16-QAM	1	0	22.21	0-1	0
	848.3	27033	1.4	16-QAM	1	2	22.18	0-1	0
	848.3	27033	1.4	16-QAM	1	5	22.01	0-1	0
	848.3	27033	1.4	16-QAM	3	0	22.09	0-1	0
	848.3	27033	1.4	16-QAM	3	2	22.02	0-1	0
	848.3	27033	1.4	16-QAM	3	3	22.00	0-1	0
	848.3	27033	1.4	16-QAM	6	0	21.86	0-2	0

9.3.2

LTE Band 25 (PCS)

Table 9-17

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	22.00	0	0
	1855	26090	10	QPSK	1	25	22.10	0	0
	1855	26090	10	QPSK	1	49	22.30	0	0
	1855	26090	10	QPSK	25	0	22.12	0-1	0
	1855	26090	10	QPSK	25	12	22.06	0-1	0
	1855	26090	10	QPSK	25	25	22.15	0-1	0
	1855	26090	10	QPSK	50	0	22.10	0-1	0
	1855	26090	10	16QAM	1	0	21.84	0-1	0
	1855	26090	10	16QAM	1	25	21.93	0-1	0
	1855	26090	10	16QAM	1	49	22.02	0-1	0
	1855	26090	10	16QAM	25	0	22.09	0-2	0
	1855	26090	10	16QAM	25	12	22.12	0-2	0
	1855	26090	10	16QAM	25	25	22.09	0-2	0
	1855	26090	10	16QAM	50	0	22.07	0-2	0
	1855	26090	10	16QAM	50	0	22.07	0-2	0
Mid	1882.5	26365	10	QPSK	1	0	21.95	0	0
	1882.5	26365	10	QPSK	1	25	22.00	0	0
	1882.5	26365	10	QPSK	1	49	21.95	0	0
	1882.5	26365	10	QPSK	25	0	22.09	0-1	0
	1882.5	26365	10	QPSK	25	12	22.09	0-1	0
	1882.5	26365	10	QPSK	25	25	22.12	0-1	0
	1882.5	26365	10	QPSK	50	0	21.99	0-1	0
	1882.5	26365	10	16QAM	1	0	22.31	0-1	0
	1882.5	26365	10	16QAM	1	25	22.28	0-1	0
	1882.5	26365	10	16QAM	1	49	22.27	0-1	0
	1882.5	26365	10	16QAM	25	0	22.13	0-2	0
	1882.5	26365	10	16QAM	25	12	22.10	0-2	0
	1882.5	26365	10	16QAM	25	25	22.05	0-2	0
	1882.5	26365	10	16QAM	50	0	21.95	0-2	0
	1882.5	26365	10	16QAM	50	0	21.95	0-2	0
High	1910	26640	10	QPSK	1	0	22.06	0	0
	1910	26640	10	QPSK	1	25	21.99	0	0
	1910	26640	10	QPSK	1	49	21.96	0	0
	1910	26640	10	QPSK	25	0	22.24	0-1	0
	1910	26640	10	QPSK	25	12	22.10	0-1	0
	1910	26640	10	QPSK	25	25	22.02	0-1	0
	1910	26640	10	QPSK	50	0	22.06	0-1	0
	1910	26640	10	16QAM	1	0	21.86	0-1	0
	1910	26640	10	16QAM	1	25	21.87	0-1	0
	1910	26640	10	16QAM	1	49	21.78	0-1	0
	1910	26640	10	16QAM	25	0	22.23	0-2	0
	1910	26640	10	16QAM	25	12	22.11	0-2	0
	1910	26640	10	16QAM	25	25	21.96	0-2	0
	1910	26640	10	16QAM	50	0	22.02	0-2	0
	1910	26640	10	16QAM	50	0	22.02	0-2	0

Table 9-18

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	22.06	0	0
	1852.5	26065	5	QPSK	1	12	22.05	0	0
	1852.5	26065	5	QPSK	1	24	22.13	0	0
	1852.5	26065	5	QPSK	12	0	22.02	0-1	0
	1852.5	26065	5	QPSK	12	6	22.09	0-1	0
	1852.5	26065	5	QPSK	12	13	22.07	0-1	0
	1852.5	26065	5	QPSK	25	0	22.04	0-1	0
	1852.5	26065	5	16-QAM	1	0	21.88	0-1	0
	1852.5	26065	5	16-QAM	1	12	21.90	0-1	0
	1852.5	26065	5	16-QAM	1	24	22.00	0-1	0
	1852.5	26065	5	16-QAM	12	0	22.11	0-2	0
	1852.5	26065	5	16-QAM	12	6	22.17	0-2	0
	1852.5	26065	5	16-QAM	12	13	22.09	0-2	0
	1852.5	26065	5	16-QAM	25	0	21.99	0-2	0
	1852.5	26065	5	16-QAM	25	0	21.99	0-2	0
Mid	1882.5	26365	5	QPSK	1	0	22.12	0	0
	1882.5	26365	5	QPSK	1	12	21.96	0	0
	1882.5	26365	5	QPSK	1	24	22.03	0	0
	1882.5	26365	5	QPSK	12	0	22.13	0-1	0
	1882.5	26365	5	QPSK	12	6	22.25	0-1	0
	1882.5	26365	5	QPSK	12	13	22.15	0-1	0
	1882.5	26365	5	QPSK	25	0	21.96	0-1	0
	1882.5	26365	5	16-QAM	1	0	21.79	0-1	0
	1882.5	26365	5	16-QAM	1	12	21.78	0-1	0
	1882.5	26365	5	16-QAM	1	24	21.77	0-1	0
	1882.5	26365	5	16-QAM	12	0	22.19	0-2	0
	1882.5	26365	5	16-QAM	12	6	22.22	0-2	0
	1882.5	26365	5	16-QAM	12	13	22.15	0-2	0
	1882.5	26365	5	16-QAM	25	0	21.96	0-2	0
	1882.5	26365	5	16-QAM	25	0	21.96	0-2	0
High	1912.5	26665	5	QPSK	1	0	22.15	0	0
	1912.5	26665	5	QPSK	1	12	22.10	0	0
	1912.5	26665	5	QPSK	1	24	22.26	0	0
	1912.5	26665	5	QPSK	12	0	21.92	0-1	0
	1912.5	26665	5	QPSK	12	6	22.11	0-1	0
	1912.5	26665	5	QPSK	12	13	22.04	0-1	0
	1912.5	26665	5	QPSK	25	0	22.05	0-1	0
	1912.5	26665	5	16-QAM	1	0	22.07	0-1	0
	1912.5	26665	5	16-QAM	1	12	21.79	0-1	0
	1912.5	26665	5	16-QAM	1	24	21.76	0-1	0
	1912.5	26665	5	16-QAM	12	0	22.20	0-2	0
	1912.5	26665	5	16-QAM	12	6	22.23	0-2	0
	1912.5	26665	5	16-QAM	12	13	22.18	0-2	0
	1912.5	26665	5	16-QAM	25	0	21.92	0-2	0
	1912.5	26665	5	16-QAM	25	0	21.92	0-2	0

FCC ID: A3LSPHL710T		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: OY1403170565-R1.A3L	Test Dates: 03/17/14 - 03/24/14	DUT Type: Portable Handset		Page 34 of 60

Table 9-19

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	21.95	0	0
	1851.5	26055	3	QPSK	1	7	22.01	0	0
	1851.5	26055	3	QPSK	1	14	22.09	0	0
	1851.5	26055	3	QPSK	8	0	22.04	0-1	0
	1851.5	26055	3	QPSK	8	4	22.08	0-1	0
	1851.5	26055	3	QPSK	8	7	22.10	0-1	0
	1851.5	26055	3	QPSK	15	0	21.99	0-1	0
	1851.5	26055	3	16-QAM	1	0	21.73	0-1	0
	1851.5	26055	3	16-QAM	1	7	21.77	0-1	0
	1851.5	26055	3	16-QAM	1	14	21.78	0-1	0
	1851.5	26055	3	16-QAM	8	0	21.76	0-2	0
	1851.5	26055	3	16-QAM	8	4	21.77	0-2	0
	1851.5	26055	3	16-QAM	8	7	21.79	0-2	0
	1851.5	26055	3	16-QAM	15	0	21.98	0-2	0
Mid	1882.5	26365	3	QPSK	1	0	22.07	0	0
	1882.5	26365	3	QPSK	1	7	22.03	0	0
	1882.5	26365	3	QPSK	1	14	22.03	0	0
	1882.5	26365	3	QPSK	8	0	22.20	0-1	0
	1882.5	26365	3	QPSK	8	4	22.17	0-1	0
	1882.5	26365	3	QPSK	8	7	22.14	0-1	0
	1882.5	26365	3	QPSK	15	0	22.09	0-1	0
	1882.5	26365	3	16-QAM	1	0	22.30	0-1	0
	1882.5	26365	3	16-QAM	1	7	22.32	0-1	0
	1882.5	26365	3	16-QAM	1	14	22.34	0-1	0
	1882.5	26365	3	16-QAM	8	0	22.01	0-2	0
	1882.5	26365	3	16-QAM	8	4	21.95	0-2	0
	1882.5	26365	3	16-QAM	8	7	22.02	0-2	0
	1882.5	26365	3	16-QAM	15	0	22.14	0-2	0
High	1913.5	26675	3	QPSK	1	0	21.86	0	0
	1913.5	26675	3	QPSK	1	7	21.88	0	0
	1913.5	26675	3	QPSK	1	14	22.05	0	0
	1913.5	26675	3	QPSK	8	0	21.95	0-1	0
	1913.5	26675	3	QPSK	8	4	22.01	0-1	0
	1913.5	26675	3	QPSK	8	7	22.10	0-1	0
	1913.5	26675	3	QPSK	15	0	21.95	0-1	0
	1913.5	26675	3	16-QAM	1	0	21.70	0-1	0
	1913.5	26675	3	16-QAM	1	7	21.68	0-1	0
	1913.5	26675	3	16-QAM	1	14	21.78	0-1	0
	1913.5	26675	3	16-QAM	8	0	22.02	0-2	0
	1913.5	26675	3	16-QAM	8	4	22.07	0-2	0
	1913.5	26675	3	16-QAM	8	7	22.10	0-2	0
	1913.5	26675	3	16-QAM	15	0	21.97	0-2	0

9.4 WLAN Conducted Powers

Table 9-20
IEEE 802.11b Average RF Power

Mode	Freq	Channel	802.11b (2.4 GHz) Conducted Power [dBm]			
			Data Rate [Mbps]			
	[MHz]		1	2	5.5	11
802.11b	2412	1*	17.45	17.42	17.32	17.44
802.11b	2437	6*	16.61	16.62	16.33	16.37
802.11b	2462	11*	16.54	16.69	16.57	16.55

Table 9-21
IEEE 802.11g Average RF Power

Mode	Freq	Channel	802.11g (2.4 GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		6	9	12	18	24	36	48	54
802.11g	2412	1	13.85	13.81	13.63	13.45	13.64	13.79	13.71	13.89
802.11g	2437	6	13.96	13.83	13.54	13.55	13.67	13.93	13.77	13.80
802.11g	2462	11	13.73	13.67	13.50	13.66	13.80	13.84	13.56	13.51

Table 9-22
IEEE 802.11n Average RF Power

Mode	Freq	Channel	802.11n (2.4 GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		6.5	13	20	26	39	52	58	65
802.11n	2412	1	12.65	12.78	12.74	12.91	12.95	12.81	12.92	12.89
802.11n	2437	6	12.98	13.20	13.04	13.15	13.10	13.04	13.16	13.24
802.11n	2462	11	12.94	13.07	12.92	13.11	13.10	13.05	13.08	13.17

Table 9-23
IEEE 802.11a Average RF Power

Mode	Freq	Channel	802.11a (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		6	9	12	18	24	36	48	54
802.11a	5180	36*	14.38	14.46	14.42	14.39	14.47	14.46	14.40	14.49
802.11a	5200	40	14.42	14.44	14.49	14.48	14.47	14.48	14.42	14.47
802.11a	5220	44	14.35	14.43	14.40	14.35	14.47	14.44	14.38	14.49
802.11a	5240	48*	14.40	14.46	14.43	14.34	14.49	14.49	14.40	14.42
802.11a	5260	52*	14.42	14.45	14.32	14.47	14.43	14.45	14.49	14.42
802.11a	5280	56	14.46	14.49	14.43	14.48	14.44	14.48	14.41	14.39
802.11a	5300	60	14.45	14.45	14.31	14.45	14.43	14.44	14.40	14.42
802.11a	5320	64*	14.47	14.49	14.30	14.43	14.43	14.48	14.41	14.48
802.11a	5500	100	13.88	13.91	13.94	13.95	13.94	14.02	13.99	13.98
802.11a	5520	104*	14.00	13.99	14.06	14.01	14.02	14.15	14.10	14.15
802.11a	5540	108	14.00	14.07	14.03	14.07	14.07	14.14	14.18	14.13
802.11a	5560	112	14.01	13.99	14.04	14.14	14.14	14.19	14.10	14.18
802.11a	5580	116*	13.96	13.98	13.99	14.04	14.07	14.15	14.00	14.04
802.11a	5600	120	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5620	124	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5640	128	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5660	132	13.96	13.98	13.98	14.12	14.02	14.07	14.13	14.06
802.11a	5680	136*	13.91	13.89	13.91	13.90	13.97	14.10	14.09	14.00
802.11a	5700	140	13.81	13.92	13.85	13.93	13.82	14.00	13.98	13.83
802.11a	5745	149*	13.91	13.85	13.82	13.80	13.83	13.91	13.98	13.94
802.11a	5765	153	13.93	13.82	13.82	13.79	13.92	13.93	13.97	13.92
802.11a	5785	157*	13.81	13.74	13.67	13.63	13.78	13.75	13.82	13.85
802.11a	5805	161	13.77	13.65	13.67	13.71	13.66	13.78	13.82	13.71
802.11a	5825	165*	13.78	13.68	13.70	13.64	13.71	13.79	13.85	13.83

Per FCC KDB Publication 443999 and RSS-210 A9.2(3), transmission on channels which overlap the 5600-5650 MHz is prohibited as a client. This device does not transmit any beacons or initiate any transmissions in 5.3 and 5.5 GHz Band.

(*) – indicates default channels per KDB Publication 248227 D01v01r02. When the adjacent channels are higher in power then the default channels, these “required channels” are considered for SAR testing instead of the default channels.

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Table 9-24
IEEE 802.11n Average RF Power – 20 MHz Bandwidth

Mode	Freq [MHz]	Channel	20MHz BW 802.11n (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			6.5	13	19.5	26	39	52	58.5	65
802.11n	5180	36	13.42	13.34	13.43	13.49	13.32	13.44	13.39	13.46
802.11n	5200	40	13.37	13.23	13.36	13.43	13.18	13.39	13.39	13.48
802.11n	5220	44	13.34	13.28	13.38	13.38	13.26	13.36	13.33	13.38
802.11n	5240	48	13.41	13.37	13.36	13.49	13.23	13.36	13.42	13.49
802.11n	5260	52	13.44	13.33	13.46	13.45	13.49	13.44	13.41	13.43
802.11n	5280	56	13.44	13.33	13.49	13.38	13.48	13.42	13.45	13.49
802.11n	5300	60	13.48	13.32	13.46	13.41	13.44	13.39	13.43	13.47
802.11n	5320	64	13.48	13.34	13.46	13.45	13.47	13.48	13.45	13.46
802.11n	5500	100	12.82	12.92	12.94	12.94	12.98	12.99	12.92	13.01
802.11n	5520	104	12.89	13.03	13.01	13.02	13.00	13.14	13.01	13.08
802.11n	5540	108	12.96	13.11	13.13	13.12	13.10	13.12	13.02	13.10
802.11n	5560	112	12.89	12.93	13.04	13.04	12.99	13.07	12.95	13.09
802.11n	5580	116	12.92	13.00	13.02	13.05	13.08	13.19	13.03	13.10
802.11n	5600	120	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5620	124	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5640	128	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5660	132	12.84	13.00	12.92	12.99	13.02	12.99	13.02	13.05
802.11n	5680	136	12.76	12.88	12.96	12.91	12.92	12.91	12.78	12.99
802.11n	5700	140	12.78	12.90	12.83	12.95	12.87	12.96	12.85	12.94
802.11n	5745	149	12.70	12.84	12.72	12.78	12.81	12.88	12.86	12.87
802.11n	5765	153	12.80	12.94	12.74	12.83	12.85	13.03	12.96	12.93
802.11n	5785	157	12.78	12.92	12.75	12.89	12.88	12.99	12.94	12.97
802.11n	5805	161	12.73	12.89	12.76	12.89	12.90	12.89	12.87	12.82
802.11n	5825	165	12.72	12.84	12.74	12.78	12.89	12.90	12.93	12.92

Table 9-25
IEEE 802.11n Average RF Power – 40 MHz Bandwidth

Mode	Freq [MHz]	Channel	40MHz BW 802.11n (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			13.5	27	40.5	54	81	108	121.5	135
802.11n	5190	38	11.80	11.76	11.74	11.78	11.79	11.72	11.83	11.72
802.11n	5230	46	11.69	11.68	11.59	11.66	11.69	11.63	11.69	11.64
802.11n	5270	54	11.72	11.75	11.65	11.78	11.83	11.84	11.87	11.75
802.11n	5310	62	11.64	11.64	11.57	11.65	11.75	11.75	11.75	11.76
802.11n	5510	102	12.00	12.00	11.99	12.09	12.17	12.09	12.10	12.13
802.11n	5550	110	12.12	12.19	12.07	12.24	12.26	12.23	12.13	12.19
802.11n	5590	118	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5630	126	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5670	134	12.07	12.03	12.07	12.10	12.26	12.16	12.17	12.28
802.11n	5755	151	11.92	11.95	11.95	12.03	11.95	12.00	12.08	11.92
802.11n	5795	159	12.03	12.06	12.02	12.17	12.05	12.08	12.29	12.04

Justification for reduced test configurations for WIFI channels per KDB Publication 248227 D01v01r02 and October 2012/April 2013 FCC/TCB Meeting Notes:

- For 2.4 GHz, highest average RF output power channel for the lowest data rate for IEEE 802.11b were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11g/n) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11b mode.
- For 5 GHz, highest average RF output power channel for the lowest data rate for IEEE 802.11a were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11n 20 MHz and 40 MHz) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11a mode.
- When the maximum extrapolated peak SAR of the zoom scan for the maximum output channel is <1.6 W/kg and the reported 1g averaged SAR is <0.8 W/kg, SAR testing on other channels is not required. Otherwise, the other default (or corresponding required) test channels were additionally tested using the lowest data rate.
- The bolded data rate and channel above were tested for SAR.

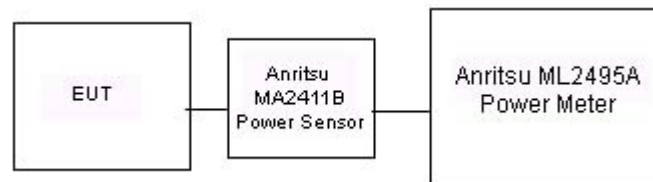


Figure 9-2
Power Measurement Setup

FCC ID: A3LSPHL710T	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT		Reviewed by: Quality Manager
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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
03/17/2014	835H	22.0	820	0.887	40.142	0.899	41.578	-1.33%	-3.45%
			835	0.902	39.953	0.900	41.500	0.22%	-3.73%
			850	0.916	39.720	0.916	41.500	0.00%	-4.29%
03/18/2014	1900H	22.8	1850	1.366	39.585	1.400	40.000	-2.43%	-1.04%
			1880	1.394	39.469	1.400	40.000	-0.43%	-1.33%
			1910	1.426	39.332	1.400	40.000	1.86%	-1.67%
03/20/2014	2450H-2600H	23.6	2401	1.722	38.781	1.756	39.287	-1.94%	-1.29%
			2450	1.776	38.606	1.800	39.200	-1.33%	-1.52%
			2499	1.825	38.462	1.853	39.138	-1.51%	-1.73%
			2500	1.827	38.434	1.855	39.136	-1.51%	-1.79%
			2550	1.884	38.247	1.909	39.073	-1.31%	-2.11%
			2600	1.939	38.088	1.964	39.009	-1.27%	-2.36%
			2650	1.991	37.866	2.018	38.945	-1.34%	-2.77%
03/19/2014	5200H-5800H	22.6	2700	2.051	37.701	2.073	38.882	-1.06%	-3.04%
			5200	4.467	35.968	4.655	35.986	-4.04%	-0.05%
			5300	4.561	35.862	4.758	35.871	-4.14%	-0.03%
			5320	4.594	35.847	4.778	35.849	-3.85%	-0.01%
			5560	4.833	35.532	5.024	35.574	-3.80%	-0.12%
			5600	4.878	35.458	5.065	35.529	-3.69%	-0.20%
			5765	5.051	35.330	5.234	35.340	-3.50%	-0.03%
03/17/2014	835B	22.1	5800	5.073	35.250	5.270	35.300	-3.74%	-0.14%
			820	0.989	53.772	0.969	55.258	2.06%	-2.69%
			835	1.003	53.629	0.970	55.200	3.40%	-2.85%
03/19/2014	1900B	23.3	850	1.017	53.449	0.988	55.154	2.94%	-3.09%
			1850	1.505	51.683	1.520	53.300	0.99%	-3.03%
			1880	1.540	51.580	1.520	53.300	1.32%	-3.23%
03/19/2014	2450B-2600B	23.8	1910	1.576	51.455	1.520	53.300	3.68%	-3.46%
			2401	1.913	52.261	1.903	52.765	0.53%	-0.96%
			2450	1.979	52.093	1.950	52.700	1.49%	-1.15%
			2499	2.043	51.914	2.019	52.638	1.19%	-1.38%
			2500	2.041	51.898	2.021	52.636	0.99%	-1.40%
			2550	2.110	51.712	2.092	52.573	0.86%	-1.64%
			2600	2.179	51.544	2.163	52.509	0.74%	-1.84%
03/24/2014	2450B-2600B	23.6	2650	2.243	51.308	2.234	52.445	0.40%	-2.17%
			2700	2.315	51.148	2.305	52.382	0.43%	-2.36%
			2401	1.960	52.548	1.903	52.765	3.00%	-0.41%
			2450	2.027	52.361	1.950	52.700	3.95%	-0.64%
			2499	2.094	52.214	2.019	52.638	3.71%	-0.81%
			2500	2.097	52.190	2.021	52.636	3.76%	-0.85%
			2550	2.168	51.999	2.092	52.573	3.63%	-1.09%
03/18/2014	5200B-5800B	22.9	2600	2.237	51.843	2.163	52.509	3.42%	-1.27%
			2650	2.309	51.603	2.234	52.445	3.36%	-1.61%
			2700	2.382	51.430	2.305	52.382	3.34%	-1.82%
			5200	5.162	47.513	5.299	49.014	-2.59%	-3.06%
			5300	5.289	47.204	5.416	48.879	-2.34%	-3.43%
			5320	5.319	47.142	5.439	48.851	-2.21%	-3.50%
			5560	5.663	46.525	5.720	48.526	-1.00%	-4.12%
			5600	5.712	46.518	5.766	48.471	-0.94%	-4.03%
			5765	5.942	46.499	5.959	48.248	-0.29%	-3.63%
			5800	5.985	46.544	6.000	48.200	-0.25%	-3.44%

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 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} (%)
K	835	HEAD	03/17/2014	24.2	22.1	0.100	4d119	3333	0.954	9.680	9.540	-1.45%
G	1900	HEAD	03/18/2014	24.0	23.4	0.100	5d149	3258	3.950	40.400	39.500	-2.23%
G	2450	HEAD	03/20/2014	24.2	23.3	0.100	719	3258	5.370	53.200	53.700	0.94%
G	2600	HEAD	03/20/2014	24.0	23.2	0.100	1004	3258	5.800	58.200	58.000	-0.34%
E	5200	HEAD	03/19/2014	24.5	22.8	0.010	1057	3914	0.728	78.000	72.800	-6.67%
E	5300	HEAD	03/19/2014	24.4	22.8	0.010	1057	3914	0.792	83.000	79.200	-4.58%
E	5600	HEAD	03/19/2014	24.5	22.7	0.010	1057	3914	0.819	83.500	81.900	-1.92%
E	5800	HEAD	03/19/2014	24.5	22.6	0.010	1057	3914	0.761	79.300	76.100	-4.04%
J	835	BODY	03/17/2014	23.2	21.2	0.100	4d119	3332	0.957	9.540	9.570	0.31%
D	1900	BODY	03/19/2014	24.4	23.3	0.100	5d149	3022	4.170	40.500	41.700	2.96%
H	2450	BODY	03/19/2014	23.4	23.4	0.100	719	3589	5.010	51.700	50.100	-3.09%
H	2450	BODY	03/24/2014	23.6	23.3	0.040	719	3589	2.040	51.700	51.000	-1.35%
H	2600	BODY	03/19/2014	23.4	23.4	0.100	1004	3589	5.430	57.500	54.300	-5.57%
H	2600	BODY	03/24/2014	23.7	23.3	0.040	1004	3589	2.220	57.500	55.500	-3.48%
A	5200	BODY	03/18/2014	22.5	21.2	0.100	1007	3920	7.320	72.600	73.200	0.83%
A	5300	BODY	03/18/2014	22.5	21.2	0.100	1007	3920	7.570	74.700	75.700	1.34%
A	5600	BODY	03/18/2014	22.5	21.2	0.100	1007	3920	7.610	77.300	76.100	-1.55%
A	5800	BODY	03/18/2014	22.5	21.2	0.100	1007	3920	7.220	72.900	72.200	-0.96%

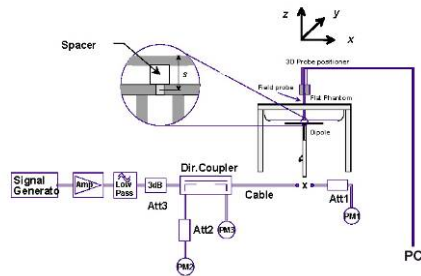


Figure 10-1
System Verification Setup Diagram



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 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 (§90S)	RC3 / SO55	25.0	24.83	-0.03	Right	Cheek	1703-9	1:1	0.435	1.040	0.452	
820.10	564	CDMA BC10 (§90S)	RC3 / SO55	25.0	24.83	-0.17	Right	Tilt	1703-9	1:1	0.301	1.040	0.313	
820.10	564	CDMA BC10 (§90S)	RC3 / SO55	25.0	24.83	-0.03	Left	Cheek	1703-9	1:1	0.501	1.040	0.521	
820.10	564	CDMA BC10 (§90S)	RC3 / SO55	25.0	24.83	-0.10	Left	Tilt	1703-9	1:1	0.313	1.040	0.326	
820.10	564	CDMA BC10 (§90S)	EVDO Rev. A	25.0	24.82	-0.03	Right	Cheek	1703-9	1:1	0.457	1.042	0.476	
820.10	564	CDMA BC10 (§90S)	EVDO Rev. A	25.0	24.82	-0.03	Right	Tilt	1703-9	1:1	0.277	1.042	0.289	
820.10	564	CDMA BC10 (§90S)	EVDO Rev. A	25.0	24.82	-0.20	Left	Cheek	1703-9	1:1	0.534	1.042	0.556	A1
820.10	564	CDMA BC10 (§90S)	EVDO Rev. A	25.0	24.82	-0.11	Left	Tilt	1703-9	1:1	0.247	1.042	0.257	
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 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 (§22H)	RC3 / SO55	25.0	24.86	0.16	Right	Cheek	1703-9	1:1	0.415	1.033	0.429	
836.52	384	CDMA BC0 (§22H)	RC3 / SO55	25.0	24.86	0.18	Right	Tilt	1703-9	1:1	0.275	1.033	0.284	
836.52	384	CDMA BC0 (§22H)	RC3 / SO55	25.0	24.86	0.07	Left	Cheek	1703-9	1:1	0.528	1.033	0.545	
836.52	384	CDMA BC0 (§22H)	RC3 / SO55	25.0	24.86	-0.06	Left	Tilt	1703-9	1:1	0.312	1.033	0.322	
836.52	384	CDMA BC0 (§22H)	EVDO Rev. A	23.0	22.88	0.01	Right	Cheek	1703-14	1:1	0.269	1.028	0.277	
836.52	384	CDMA BC0 (§22H)	EVDO Rev. A	23.0	22.88	0.01	Right	Tilt	1703-14	1:1	0.144	1.028	0.148	
836.52	384	CDMA BC0 (§22H)	EVDO Rev. A	23.0	22.88	-0.05	Left	Cheek	1703-14	1:1	0.353	1.028	0.363	
836.52	384	CDMA BC0 (§22H)	EVDO Rev. A	23.0	22.88	-0.06	Left	Tilt	1703-14	1:1	0.184	1.028	0.189	
836.52	384	CDMA BC0 (§22H)	EVDO Rev. A	25.0	24.82	-0.18	Right	Cheek	1703-9	1:1	0.463	1.042	0.482	
836.52	384	CDMA BC0 (§22H)	EVDO Rev. A	25.0	24.82	-0.06	Right	Tilt	1703-9	1:1	0.221	1.042	0.230	
836.52	384	CDMA BC0 (§22H)	EVDO Rev. A	25.0	24.82	-0.03	Left	Cheek	1703-9	1:1	0.589	1.042	0.614	A2
836.52	384	CDMA BC0 (§22H)	EVDO Rev. A	25.0	24.82	0.21	Left	Tilt	1703-9	1:1	0.308	1.042	0.321	
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	25.0	24.65	-0.15	Right	Cheek	1703-10	1:1	0.451	1.084	0.489	A3
1880.00	600	PCS CDMA	RC3 / SO55	25.0	24.65	-0.16	Right	Tilt	1703-10	1:1	0.107	1.084	0.116	
1880.00	600	PCS CDMA	RC3 / SO55	25.0	24.65	0.13	Left	Cheek	1703-10	1:1	0.414	1.084	0.449	
1880.00	600	PCS CDMA	RC3 / SO55	25.0	24.65	0.04	Left	Tilt	1703-10	1:1	0.103	1.084	0.112	
1880.00	600	PCS CDMA	EVDO Rev. A	23.0	22.60	0.04	Right	Cheek	1703-6	1:1	0.222	1.096	0.243	
1880.00	600	PCS CDMA	EVDO Rev. A	23.0	22.60	0.03	Right	Tilt	1703-6	1:1	0.076	1.096	0.083	
1880.00	600	PCS CDMA	EVDO Rev. A	23.0	22.60	0.07	Left	Cheek	1703-6	1:1	0.229	1.096	0.251	
1880.00	600	PCS CDMA	EVDO Rev. A	23.0	22.60	0.14	Left	Tilt	1703-6	1:1	0.080	1.096	0.088	
1880.00	600	PCS CDMA	EVDO Rev. A	25.0	24.65	-0.03	Right	Cheek	1703-10	1:1	0.404	1.084	0.438	
1880.00	600	PCS CDMA	EVDO Rev. A	25.0	24.65	0.12	Right	Tilt	1703-10	1:1	0.103	1.084	0.112	
1880.00	600	PCS CDMA	EVDO Rev. A	25.0	24.65	0.15	Left	Cheek	1703-10	1:1	0.366	1.084	0.397	
1880.00	600	PCS CDMA	EVDO Rev. A	25.0	24.65	0.14	Left	Tilt	1703-10	1:1	0.110	1.084	0.119	
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 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)		
844.00	26990	High	LTE Band 26	10	24.5	24.30	0.04	0	Right	Cheek	QPSK	1	25	1703-8	1:1	0.348	1.047	0.364	
844.00	26990	High	LTE Band 26	10	23.5	23.29	0.04	1	Right	Cheek	QPSK	25	25	1703-8	1:1	0.293	1.050	0.308	
844.00	26990	High	LTE Band 26	10	24.5	24.30	-0.15	0	Right	Tilt	QPSK	1	25	1703-8	1:1	0.197	1.047	0.206	
844.00	26990	High	LTE Band 26	10	23.5	23.29	0.10	1	Right	Tilt	QPSK	25	25	1703-8	1:1	0.166	1.050	0.174	
844.00	26990	High	LTE Band 26	10	24.5	24.30	-0.02	0	Left	Cheek	QPSK	1	25	1703-8	1:1	0.357	1.047	0.374	A4
844.00	26990	High	LTE Band 26	10	23.5	23.29	0.06	1	Left	Cheek	QPSK	25	25	1703-8	1:1	0.350	1.050	0.368	
844.00	26990	High	LTE Band 26	10	24.5	24.30	-0.01	0	Left	Tilt	QPSK	1	25	1703-8	1:1	0.202	1.047	0.211	
844.00	26990	High	LTE Band 26	10	23.5	23.29	0.07	1	Left	Tilt	QPSK	25	25	1703-8	1:1	0.196	1.050	0.206	
844.00	26990	High	LTE Band 26	10	22.5	22.25	-0.01	0	Right	Cheek	QPSK	1	25	1703-12	1:1	0.185	1.059	0.196	
831.50	26865	Mid	LTE Band 26	10	22.5	22.21	-0.06	0	Right	Cheek	QPSK	25	25	1703-12	1:1	0.236	1.069	0.252	
844.00	26990	High	LTE Band 26	10	22.5	22.25	-0.04	0	Right	Tilt	QPSK	1	25	1703-12	1:1	0.135	1.059	0.143	
831.50	26865	Mid	LTE Band 26	10	22.5	22.21	-0.02	0	Right	Tilt	QPSK	25	25	1703-12	1:1	0.133	1.069	0.142	
844.00	26990	High	LTE Band 26	10	22.5	22.25	0.07	0	Left	Cheek	QPSK	1	25	1703-12	1:1	0.243	1.059	0.257	
831.50	26865	Mid	LTE Band 26	10	22.5	22.21	-0.08	0	Left	Cheek	QPSK	25	25	1703-12	1:1	0.284	1.069	0.304	
844.00	26990	High	LTE Band 26	10	22.5	22.25	0.06	0	Left	Tilt	QPSK	1	25	1703-12	1:1	0.127	1.059	0.134	
831.50	26865	Mid	LTE Band 26	10	22.5	22.21	-0.05	0	Left	Tilt	QPSK	25	25	1703-12	1:1	0.150	1.069	0.160	
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 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)		
1855.00	26090	Low	LTE Band 25 (PCS)	10	24.5	24.26	0.03	0	Right	Cheek	QPSK	1	0	1703-32	1:1	0.583	1.057	0.616	A5
1882.50	26365	Mid	LTE Band 25 (PCS)	10	23.5	23.38	0.00	1	Right	Cheek	QPSK	25	25	1703-32	1:1	0.435	1.028	0.447	
1855.00	26090	Low	LTE Band 25 (PCS)	10	24.5	24.26	0.04	0	Right	Tilt	QPSK	1	0	1703-32	1:1	0.162	1.057	0.171	
1882.50	26365	Mid	LTE Band 25 (PCS)	10	23.5	23.38	0.03	1	Right	Tilt	QPSK	25	25	1703-32	1:1	0.101	1.028	0.104	
1855.00	26090	Low	LTE Band 25 (PCS)	10	24.5	24.26	0.06	0	Left	Cheek	QPSK	1	0	1703-32	1:1	0.548	1.057	0.579	
1882.50	26365	Mid	LTE Band 25 (PCS)	10	23.5	23.38	0.01	1	Left	Cheek	QPSK	25	25	1703-32	1:1	0.392	1.028	0.403	
1855.00	26090	Low	LTE Band 25 (PCS)	10	24.5	24.26	-0.03	0	Left	Tilt	QPSK	1	0	1703-32	1:1	0.116	1.057	0.123	
1882.50	26365	Mid	LTE Band 25 (PCS)	10	23.5	23.38	0.02	1	Left	Tilt	QPSK	25	25	1703-32	1:1	0.100	1.028	0.103	
1855.00	26090	Low	LTE Band 25 (PCS)	10	22.5	22.30	-0.03	0	Right	Cheek	QPSK	1	49	1703-31	1:1	0.322	1.047	0.337	
1910.00	26640	High	LTE Band 25 (PCS)	10	22.5	22.24	0.03	0	Right	Cheek	QPSK	25	0	1703-31	1:1	0.308	1.062	0.327	
1855.00	26090	Low	LTE Band 25 (PCS)	10	22.5	22.30	0.00	0	Right	Tilt	QPSK	1	49	1703-31	1:1	0.092	1.047	0.096	
1910.00	26640	High	LTE Band 25 (PCS)	10	22.5	22.24	0.04	0	Right	Tilt	QPSK	25	0	1703-31	1:1	0.095	1.062	0.101	
1855.00	26090	Low	LTE Band 25 (PCS)	10	22.5	22.30	0.11	0	Left	Cheek	QPSK	1	49	1703-31	1:1	0.239	1.047	0.250	
1910.00	26640	High	LTE Band 25 (PCS)	10	22.5	22.24	-0.09	0	Left	Cheek	QPSK	25	0	1703-31	1:1	0.245	1.062	0.260	
1855.00	26090	Low	LTE Band 25 (PCS)	10	22.5	22.30	0.12	0	Left	Tilt	QPSK	1	49	1703-31	1:1	0.057	1.047	0.060	
1910.00	26640	High	LTE Band 25 (PCS)	10	22.5	22.24	0.02	0	Left	Tilt	QPSK	25	0	1703-31	1:1	0.071	1.062	0.075	
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 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 #	
MHz	Ch.														(W/kg)		(W/kg)		
2506.00	39750	Low	LTE Band 41	20	24.5	24.16	-0.02	0	Right	Cheek	QPSK	1	50	1703-13	1:1.58	0.752	1.081	0.813	
2549.50	40185	Low-Mid	LTE Band 41	20	24.5	24.39	0.02	0	Right	Cheek	QPSK	1	50	1703-13	1:1.58	0.845	1.026	0.867	
2593.00	40620	Mid	LTE Band 41	20	24.5	24.50	0.05	0	Right	Cheek	QPSK	1	50	1703-13	1:1.58	0.865	1.000	0.865	
2636.50	41055	Mid-High	LTE Band 41	20	24.5	24.46	0.10	0	Right	Cheek	QPSK	1	0	1703-13	1:1.58	0.865	1.009	0.873	A6
2680.00	41490	High	LTE Band 41	20	24.5	24.46	-0.02	0	Right	Cheek	QPSK	1	0	1703-13	1:1.58	0.829	1.009	0.836	
2506.00	39750	Low	LTE Band 41	20	23.5	23.12	0.03	1	Right	Cheek	QPSK	50	25	1703-13	1:1.58	0.627	1.091	0.684	
2549.50	40185	Low-Mid	LTE Band 41	20	23.5	23.28	0.00	1	Right	Cheek	QPSK	50	50	1703-13	1:1.58	0.659	1.052	0.693	
2593.00	40620	Mid	LTE Band 41	20	23.5	23.29	-0.03	1	Right	Cheek	QPSK	50	25	1703-13	1:1.58	0.690	1.050	0.725	
2636.50	41055	Mid-High	LTE Band 41	20	23.5	23.33	0.08	1	Right	Cheek	QPSK	50	0	1703-13	1:1.58	0.727	1.040	0.756	
2680.00	41490	High	LTE Band 41	20	23.5	23.36	-0.16	1	Right	Cheek	QPSK	50	0	1703-13	1:1.58	0.702	1.033	0.725	
2636.50	41055	Mid-High	LTE Band 41	20	23.5	23.26	0.02	1	Right	Cheek	QPSK	100	0	1703-13	1:1.58	0.709	1.057	0.749	
2593.00	40620	Mid	LTE Band 41	20	24.5	24.50	0.01	0	Right	Tilt	QPSK	1	50	1703-13	1:1.58	0.214	1.000	0.214	
2680.00	41490	High	LTE Band 41	20	23.5	23.36	0.02	1	Right	Tilt	QPSK	50	0	1703-13	1:1.58	0.200	1.033	0.207	
2593.00	40620	Mid	LTE Band 41	20	24.5	24.50	-0.07	0	Left	Cheek	QPSK	1	50	1703-13	1:1.58	0.379	1.000	0.379	
2680.00	41490	High	LTE Band 41	20	23.5	23.36	0.11	1	Left	Cheek	QPSK	50	0	1703-13	1:1.58	0.337	1.033	0.348	
2593.00	40620	Mid	LTE Band 41	20	24.5	24.50	-0.08	0	Left	Tilt	QPSK	1	50	1703-13	1:1.58	0.325	1.000	0.325	
2680.00	41490	High	LTE Band 41	20	23.5	23.36	0.12	1	Left	Tilt	QPSK	50	0	1703-13	1:1.58	0.289	1.033	0.299	
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
DTS Head SAR**

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Data Rate (Mbps)	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
2412	1	IEEE 802.11b	DSSS	17.5	17.45	0.02	Right	Cheek	1703-7	1	1:1	0.086	1.012	0.087	
2412	1	IEEE 802.11b	DSSS	17.5	17.45	0.05	Right	Tilt	1703-7	1	1:1	0.072	1.012	0.073	
2412	1	IEEE 802.11b	DSSS	17.5	17.45	0.12	Left	Cheek	1703-7	1	1:1	0.148	1.012	0.150	A7
2412	1	IEEE 802.11b	DSSS	17.5	17.45	0.05	Left	Tilt	1703-7	1	1:1	0.086	1.012	0.087	
5765	153	IEEE 802.11a	OFDM	14.5	13.93	0.00	Right	Cheek	1703-7	6	1:1	0.000	1.140	0.000	
5765	153	IEEE 802.11a	OFDM	14.5	13.93	0.00	Right	Tilt	1703-7	6	1:1	0.000	1.140	0.000	
5765	153	IEEE 802.11a	OFDM	14.5	13.93	0.03	Left	Cheek	1703-7	6	1:1	0.011	1.140	0.013	A8
5765	153	IEEE 802.11a	OFDM	14.5	13.93	0.04	Left	Tilt	1703-7	6	1:1	0.011	1.140	0.013	
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
NII Head SAR**

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Data Rate (Mbps)	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
5200	40	IEEE 802.11a	OFDM	14.5	14.42	0.04	Right	Cheek	1703-7	6	1:1	0.007	1.019	0.007	
5200	40	IEEE 802.11a	OFDM	14.5	14.42	0.07	Right	Tilt	1703-7	6	1:1	0.008	1.019	0.008	
5200	40	IEEE 802.11a	OFDM	14.5	14.42	0.16	Left	Cheek	1703-7	6	1:1	0.031	1.019	0.032	
5200	40	IEEE 802.11a	OFDM	14.5	14.42	0.12	Left	Tilt	1703-7	6	1:1	0.030	1.019	0.031	
5320	64	IEEE 802.11a	OFDM	14.5	14.47	0.04	Right	Cheek	1703-7	6	1:1	0.015	1.007	0.015	
5320	64	IEEE 802.11a	OFDM	14.5	14.47	0.03	Right	Tilt	1703-7	6	1:1	0.015	1.007	0.015	
5320	64	IEEE 802.11a	OFDM	14.5	14.47	-0.04	Left	Cheek	1703-7	6	1:1	0.051	1.007	0.051	A9
5320	64	IEEE 802.11a	OFDM	14.5	14.47	0.03	Left	Tilt	1703-7	6	1:1	0.043	1.007	0.043	
5560	112	IEEE 802.11a	OFDM	14.5	14.01	0.08	Right	Cheek	1703-7	6	1:1	0.007	1.119	0.008	
5560	112	IEEE 802.11a	OFDM	14.5	14.01	0.05	Right	Tilt	1703-7	6	1:1	0.000	1.119	0.000	
5560	112	IEEE 802.11a	OFDM	14.5	14.01	0.05	Left	Cheek	1703-7	6	1:1	0.016	1.119	0.018	
5560	112	IEEE 802.11a	OFDM	14.5	14.01	0.11	Left	Tilt	1703-7	6	1:1	0.025	1.119	0.028	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram								

11.2 Standalone Body-Worn SAR Data

**Table 11-9
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)	
820.10	564	CDMA BC10 (§90S)	TDSO / SO32	25.0	24.88	-0.03	15 mm	1703-9	1:1	back	0.602	1.028	0.619	A10
836.52	384	CDMA BC0 (§22H)	TDSO / SO32	25.0	24.84	0.02	15 mm	1703-9	1:1	back	0.576	1.038	0.598	A12
1880.00	600	PCS CDMA	TDSO / SO32	25.0	24.72	-0.05	15 mm	1703-10	1:1	back	0.512	1.067	0.546	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							

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Table 11-10
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)		
844.00	26990	High	LTE Band 26	10	24.5	24.30	-0.01	0	1703-8	QPSK	1	25	15 mm	back	1:1	0.645	1.047	0.675	A16
844.00	26990	High	LTE Band 26	10	23.5	23.29	-0.01	1	1703-8	QPSK	25	25	15 mm	back	1:1	0.550	1.050	0.578	
1855.00	26090	Low	LTE Band 25 (PCS)	10	24.5	24.26	-0.02	0	1703-32	QPSK	1	0	15 mm	back	1:1	0.656	1.057	0.693	A18
1882.50	26365	Mid	LTE Band 25 (PCS)	10	23.5	23.38	0.09	1	1703-32	QPSK	25	25	15 mm	back	1:1	0.574	1.028	0.590	
2593.00	40620	Mid	LTE Band 41	20	24.5	24.50	-0.14	0	1703-13	QPSK	1	50	15 mm	back	1:1.58	0.393	1.000	0.393	A20
2680.00	41490	High	LTE Band 41	20	23.5	23.36	-0.02	1	1703-13	QPSK	50	0	15 mm	back	1:1.58	0.318	1.033	0.328	
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 11-11
DTS Body-Worn SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
2412	1	IEEE 802.11b	DSSS	17.5	17.45	-0.05	15 mm	1703-7	1	back	1:1	0.167	1.012	0.169	A22
5765	153	IEEE 802.11a	OFDM	14.5	13.93	0.12	15 mm	1703-7	6	back	1:1	0.103	1.140	0.117	A24
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 11-12
NII Body-Worn SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
5200	40	IEEE 802.11a	OFDM	14.5	14.42	0.09	15 mm	1703-7	6	back	1:1	0.310	1.019	0.316	
5320	64	IEEE 802.11a	OFDM	14.5	14.47	0.02	15 mm	1703-7	6	back	1:1	0.403	1.007	0.406	A25
5560	112	IEEE 802.11a	OFDM	14.5	14.01	0.05	15 mm	1703-7	6	back	1:1	0.149	1.119	0.167	
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)	
820.10	564	CDMA BC10 (\$90S)	EVDO Rev. 0	25.0	24.86	0.09	10 mm	1703-9	1:1	back	0.776	1.033	0.802	
820.10	564	CDMA BC10 (\$90S)	EVDO Rev. 0	25.0	24.86	-0.01	10 mm	1703-9	1:1	front	0.614	1.033	0.634	
820.10	564	CDMA BC10 (\$90S)	EVDO Rev. 0	25.0	24.86	0.02	10 mm	1703-9	1:1	bottom	0.488	1.033	0.504	
820.10	564	CDMA BC10 (\$90S)	EVDO Rev. 0	25.0	24.86	0.08	10 mm	1703-9	1:1	left	0.971	1.033	1.003	A11
820.10	564	CDMA BC10 (\$90S)	EVDO Rev. 0	25.0	24.86	-0.04	10 mm	1703-9	1:1	left	0.948	1.033	0.979	
836.52	384	CDMA BC0 (\$22H)	EVDO Rev. 0	23.0	22.94	-0.03	10 mm	1703-14	1:1	back	0.485	1.014	0.492	A13
836.52	384	CDMA BC0 (\$22H)	EVDO Rev. 0	23.0	22.94	0.03	10 mm	1703-14	1:1	front	0.363	1.014	0.368	
836.52	384	CDMA BC0 (\$22H)	EVDO Rev. 0	23.0	22.94	-0.01	10 mm	1703-14	1:1	bottom	0.309	1.014	0.313	
836.52	384	CDMA BC0 (\$22H)	EVDO Rev. 0	23.0	22.94	0.02	10 mm	1703-14	1:1	left	0.462	1.014	0.468	
1880.00	600	PCS CDMA	EVDO Rev. 0	23.0	22.66	-0.09	10 mm	1703-6	1:1	back	0.670	1.081	0.724	A15
1880.00	600	PCS CDMA	EVDO Rev. 0	23.0	22.66	0.00	10 mm	1703-6	1:1	front	0.415	1.081	0.449	
1880.00	600	PCS CDMA	EVDO Rev. 0	23.0	22.66	-0.06	10 mm	1703-6	1:1	bottom	0.575	1.081	0.622	
1880.00	600	PCS CDMA	EVDO Rev. 0	23.0	22.66	0.03	10 mm	1703-6	1:1	left	0.159	1.081	0.172	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram							

Note: Blue highlighted entry represents repeatability measurement.

Table 11-14
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)		
844.00	26990	High	LTE Band 26	10	22.5	22.25	0.08	0	1703-12	QPSK	1	25	10 mm	back	1:1	0.367	1.059	0.389	
831.50	26865	Mid	LTE Band 26	10	22.5	22.21	0.09	0	1703-12	QPSK	25	25	10 mm	back	1:1	0.400	1.069	0.428	
844.00	26990	High	LTE Band 26	10	22.5	22.25	-0.04	0	1703-12	QPSK	1	25	10 mm	front	1:1	0.310	1.059	0.328	
831.50	26865	Mid	LTE Band 26	10	22.5	22.21	0.06	0	1703-12	QPSK	25	25	10 mm	front	1:1	0.324	1.069	0.346	
844.00	26990	High	LTE Band 26	10	22.5	22.25	0.01	0	1703-12	QPSK	1	25	10 mm	bottom	1:1	0.252	1.059	0.267	
831.50	26865	Mid	LTE Band 26	10	22.5	22.21	0.00	0	1703-12	QPSK	25	25	10 mm	bottom	1:1	0.254	1.069	0.272	
844.00	26990	High	LTE Band 26	10	22.5	22.25	0.03	0	1703-12	QPSK	1	25	10 mm	left	1:1	0.352	1.059	0.373	
831.50	26865	Mid	LTE Band 26	10	22.5	22.21	0.04	0	1703-12	QPSK	25	25	10 mm	left	1:1	0.408	1.069	0.436	
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 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)		
1855.00	26090	Low	LTE Band 25 (PCS)	10	22.5	22.30	-0.02	0	1703-31	QPSK	1	49	10 mm	back	1:1	0.690	1.047	0.722	A19
1855.00	26090	Low	LTE Band 25 (PCS)	10	22.5	22.15	0.06	0	1703-31	QPSK	25	25	10 mm	back	1:1	0.689	1.084	0.747	
1882.50	26365	Mid	LTE Band 25 (PCS)	10	22.5	22.12	0.01	0	1703-31	QPSK	25	25	10 mm	back	1:1	0.821	1.091	0.896	
1910.00	26640	High	LTE Band 25 (PCS)	10	22.5	22.24	-0.02	0	1703-31	QPSK	25	0	10 mm	back	1:1	0.942	1.062	1.000	
1855.00	26090	Low	LTE Band 25 (PCS)	10	22.5	22.10	0.01	0	1703-31	QPSK	50	0	10 mm	back	1:1	0.703	1.096	0.770	
1855.00	26090	Low	LTE Band 25 (PCS)	10	22.5	22.30	-0.07	0	1703-31	QPSK	1	49	10 mm	front	1:1	0.417	1.047	0.437	
1910.00	26640	High	LTE Band 25 (PCS)	10	22.5	22.24	-0.03	0	1703-31	QPSK	25	0	10 mm	front	1:1	0.516	1.062	0.548	
1855.00	26090	Low	LTE Band 25 (PCS)	10	22.5	22.30	-0.01	0	1703-31	QPSK	1	49	10 mm	bottom	1:1	0.611	1.047	0.640	
1910.00	26640	High	LTE Band 25 (PCS)	10	22.5	22.24	-0.04	0	1703-31	QPSK	25	0	10 mm	bottom	1:1	0.750	1.062	0.797	
1855.00	26090	Low	LTE Band 25 (PCS)	10	22.5	22.30	-0.09	0	1703-31	QPSK	1	49	10 mm	left	1:1	0.181	1.047	0.190	
1910.00	26640	High	LTE Band 25 (PCS)	10	22.5	22.24	0.03	0	1703-31	QPSK	25	0	10 mm	left	1:1	0.197	1.062	0.209	
1910.00	26640	High	LTE Band 25 (PCS)	10	22.5	22.24	0.12	0	1703-31	QPSK	25	0	10 mm	back	1:1	0.909	1.062	0.965	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Body											
Spatial Peak								1.6 W/kg (mW/g)											
Uncontrolled Exposure/General Population								averaged over 1 gram											

Note: Blue highlighted entry represents repeatability measurement.

Table 11-16
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)		
2506.00	39750	Low	LTE Band 41	20	24.5	24.16	-0.15	0	1703-13	QPSK	1	50	10 mm	back	1:1.58	0.834	1.081	0.902	
2549.50	40185	Low-Mid	LTE Band 41	20	24.5	24.39	-0.02	0	1703-13	QPSK	1	50	10 mm	back	1:1.58	0.927	1.026	0.951	
2593.00	40620	Mid	LTE Band 41	20	24.5	24.50	-0.09	0	1703-13	QPSK	1	50	10 mm	back	1:1.58	0.773	1.000	0.773	
2636.50	41055	Mid-High	LTE Band 41	20	24.5	24.46	0.00	0	1703-13	QPSK	1	0	10 mm	back	1:1.58	0.936	1.009	0.944	
2680.00	41490	High	LTE Band 41	20	24.5	24.46	-0.03	0	1703-13	QPSK	1	0	10 mm	back	1:1.58	0.787	1.009	0.794	
2506.00	39750	Low	LTE Band 41	20	23.5	23.12	0.03	1	1703-13	QPSK	50	25	10 mm	back	1:1.58	0.710	1.091	0.775	
2549.50	40185	Low-Mid	LTE Band 41	20	23.5	23.28	-0.04	1	1703-13	QPSK	50	50	10 mm	back	1:1.58	0.725	1.052	0.763	
2593.00	40620	Mid	LTE Band 41	20	23.5	23.29	-0.05	1	1703-13	QPSK	50	25	10 mm	back	1:1.58	0.731	1.050	0.768	
2636.50	41055	Mid-High	LTE Band 41	20	23.5	23.33	-0.03	1	1703-13	QPSK	50	0	10 mm	back	1:1.58	0.744	1.040	0.774	
2680.00	41490	High	LTE Band 41	20	23.5	23.36	-0.05	1	1703-13	QPSK	50	0	10 mm	back	1:1.58	0.657	1.033	0.679	
2636.50	41055	Mid-High	LTE Band 41	20	23.5	23.26	-0.09	1	1703-13	QPSK	100	0	10 mm	back	1:1.58	0.758	1.057	0.801	
2593.00	40620	Mid	LTE Band 41	20	24.5	24.50	-0.09	0	1703-13	QPSK	1	50	10 mm	front	1:1.58	0.527	1.000	0.527	
2680.00	41490	High	LTE Band 41	20	23.5	23.36	-0.02	1	1703-13	QPSK	50	0	10 mm	front	1:1.58	0.499	1.033	0.515	
2593.00	40620	Mid	LTE Band 41	20	24.5	24.50	-0.06	0	1703-13	QPSK	1	50	10 mm	bottom	1:1.58	0.340	1.000	0.340	
2680.00	41490	High	LTE Band 41	20	23.5	23.36	-0.16	1	1703-13	QPSK	50	0	10 mm	bottom	1:1.58	0.317	1.033	0.327	
2593.00	40620	Mid	LTE Band 41	20	24.5	24.50	-0.04	0	1703-13	QPSK	1	50	10 mm	right	1:1.58	0.477	1.000	0.477	
2680.00	41490	High	LTE Band 41	20	23.5	23.36	-0.03	1	1703-13	QPSK	50	0	10 mm	right	1:1.58	0.390	1.033	0.403	
2506.00	39750	Low	LTE Band 41	20	24.5	24.16	-0.03	0	1703-13	QPSK	1	50	10 mm	back	1:1.58	0.802	1.081	0.867	
2636.50	41055	Mid-High	LTE Band 41	20	24.5	24.46	-0.01	0	1703-13	QPSK	1	0	10 mm	back	1:1.58	0.930	1.009	0.938	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak								Body 1.6 W/kg (mW/g) averaged over 1 gram											
Uncontrolled Exposure/General Population																			

Note: Blue highlighted entries represent repeatability measurements.

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Table 11-17
WLAN Hotspot SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
2412	1	IEEE 802.11b	DSSS	17.5	17.45	-0.06	10 mm	1703-7	1	back	1:1	0.381	1.012	0.386	A23
2412	1	IEEE 802.11b	DSSS	17.5	17.45	-0.11	10 mm	1703-7	1	front	1:1	0.051	1.012	0.052	
2412	1	IEEE 802.11b	DSSS	17.5	17.45	0.06	10 mm	1703-7	1	top	1:1	0.027	1.012	0.027	
2412	1	IEEE 802.11b	DSSS	17.5	17.45	0.10	10 mm	1703-7	1	right	1:1	0.172	1.012	0.174	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram								

11.4 SAR Test Notes

General Notes:

1. 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.
2. Batteries are fully charged at the beginning of the SAR measurements. A specialized battery with NFC operations was used for all SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. 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.
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v05.
6. 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.
7. Per FCC KDB Publication 648474 D04v01, body-worn SAR was evaluated without a headset connected to the device. Since the standalone reported SAR was ≤ 1.2 W/kg, no additional SAR evaluations using a headset cable were required.
8. 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.
9. During SAR Testing for the Wireless Router conditions per FCC KDB Publication 941225 D06v01, the actual Portable Hotspot operation (with actual simultaneous transmission of a transmitter with WIFI) was not activated (See Section 6.7 for more details).
10. This device utilizes power reduction for BC0 CDMA/EVDO, PCS CDMA/EVDO, LTE Band 26, and LTE Band 25 under portable hotspot conditions for SAR compliance. Therefore, hotspot was tested at reduced powers for these modes.

CDMA Notes:

1. Head SAR for CDMA2000 mode was tested under RC3/SO55 per FCC KDB Publication 941225 D01v02.
2. Body-Worn SAR was tested with 1x RTT with TDSO / SO32 FCH Only. EVDO and TDSO / SO32 FCH+SCH SAR tests were not required since the average output power was not more than 0.25 dB higher than the TDSO / SO32 FCH only powers, per FCC KDB Publication 941225 D01v02.
3. CDMA Wireless Router SAR is measured using Subtype 0/1 Physical Layer configurations for Rev. 0 according to KDB 941225 D01 procedures for data devices. Since the average output power of Subtype 2 for Rev. A is less than the Rev. 0 power levels, EVDO Rev. A SAR is not required. SAR is not required for 1x RTT for Ev-Do hotspot devices when the maximum average output of each channel is less than 1/4 dB higher than that measured in Subtype 0/1 Physical Layer configurations for Rev. 0.

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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.
6. This device applies power reduction for BC0 CDMA/EVDO and PCS CDMA/EVDO modes when Hotspot is ON. Therefore, BC0 CDMA/EVDO and PCS CDMA/EVDO were evaluated at hotspot reduced power levels. There is no power reduction applied to BC10 CDMA/EVDO.

LTE Notes:

1. LTE Considerations: LTE test configurations are determined according to SAR Evaluation Considerations for LTE Devices in FCC KDB Publication 941225 D05v02r01. The general test procedures used for testing can be found in Section 8.4.4.
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.
6. This device applies power reduction for LTE Band 26 and LTE Band 25 when Hotspot is ON. Therefore, LTE Band 25 and LTE Band 26 were evaluated at hotspot reduced power levels. There is no power reduction applied to LTE Band 41.

WLAN Notes:

1. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 D01v01r02 and October 2012 FCC/TCB Meeting Notes for 2.4 GHz WIFI: Highest average RF output power channel for the lowest data rate was selected for SAR evaluation in 802.11b. Other IEEE 802.11 modes (including 802.11g/n) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11b mode.
2. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 D01v01r02 and October 2012 FCC/TCB Meeting Notes for 5 GHz WIFI: Highest average RF output power channel for the lowest data rate was selected for SAR evaluation in 802.11a. Other IEEE 802.11 modes (including 802.11n 20 MHz and 40 MHz bandwidths) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11a mode.
3. When Hotspot is enabled, all 5 GHz bands are disabled. Therefore no 5 GHz WIFI Wireless Router SAR Data was required.
4. WIFI transmission was verified using an uncalibrated spectrum analyzer.
5. Since the maximum extrapolated peak SAR of the zoom scan for the maximum output channel is < 1.6 W/kg and the reported 1g averaged SAR is < 0.8 W/kg, SAR testing on other default channels was not required.

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12 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

12.1 Introduction

The following procedures adopted from FCC KDB Publication 447498 D01v05 are applicable to handsets with built-in unlicensed transmitters such as 802.11a/b/g/n 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. 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	2441	11.00	15	0.181

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.

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 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	0.452	0.087	0.539	Head SAR	Right Cheek	0.476	0.087	0.563
	Right Tilt	0.313	0.073	0.386		Right Tilt	0.289	0.073	0.362
	Left Cheek	0.521	0.150	0.671		Left Cheek	0.556	0.150	0.706
	Left Tilt	0.326	0.087	0.413		Left Tilt	0.257	0.087	0.344

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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	0.429	0.087	0.516	Head SAR	Right Cheek	0.277	0.087	0.364
	Right Tilt	0.284	0.073	0.357		Right Tilt	0.148	0.073	0.221
	Left Cheek	0.545	0.150	0.695		Left Cheek	0.363	0.150	0.513
	Left Tilt	0.322	0.087	0.409		Left Tilt	0.189	0.087	0.276
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	0.489	0.087	0.576	Head SAR	Right Cheek	0.243	0.087	0.330
	Right Tilt	0.116	0.073	0.189		Right Tilt	0.083	0.073	0.156
	Left Cheek	0.449	0.150	0.599		Left Cheek	0.251	0.150	0.401
	Left Tilt	0.112	0.087	0.199		Left Tilt	0.088	0.087	0.175
Simult Tx	Configuration	LTE Band 26 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	0.252	0.087	0.339	Head SAR	Right Cheek	0.337	0.087	0.424
	Right Tilt	0.143	0.073	0.216		Right Tilt	0.101	0.073	0.174
	Left Cheek	0.304	0.150	0.454		Left Cheek	0.260	0.150	0.410
	Left Tilt	0.160	0.087	0.247		Left Tilt	0.075	0.087	0.162
		Simult Tx	Configuration	LTE Band 41 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)			
		Head SAR	Right Cheek	0.873	0.087	0.960			
			Right Tilt	0.214	0.073	0.287			
			Left Cheek	0.379	0.150	0.529			
			Left Tilt	0.325	0.087	0.412			

Table 12-3
Simultaneous Transmission Scenario with 5 GHz WLAN (Held to Ear)

Simult Tx	Configuration	CDMA BC10 (\$90S) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	CDMA BC0 (\$22H) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.452	0.015	0.467	Head SAR	Right Cheek	0.429	0.015	0.444
	Right Tilt	0.313	0.015	0.328		Right Tilt	0.284	0.015	0.299
	Left Cheek	0.521	0.051	0.572		Left Cheek	0.545	0.051	0.596
	Left Tilt	0.326	0.043	0.369		Left Tilt	0.322	0.043	0.365

	Simult Tx	Configuration	PCS CDMA SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
	Head SAR	Right Cheek	0.489	0.015	0.504
		Right Tilt	0.116	0.015	0.131
		Left Cheek	0.449	0.051	0.500
		Left Tilt	0.112	0.043	0.155

12.4 Body-Worn Simultaneous Transmission Analysis

Table 12-4
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body-Worn at 1.5 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Back Side	CDMA BC10 (§90S)	0.619	0.169	0.788
Back Side	CDMA BC0 (§22H)	0.598	0.169	0.767
Back Side	PCS CDMA	0.546	0.169	0.715
Back Side	LTE Band 26	0.675	0.169	0.844
Back Side	LTE Band 25 (PCS)	0.693	0.169	0.862
Back Side	LTE Band 41	0.393	0.169	0.562

Table 12-5
Simultaneous Transmission Scenario with 5 GHz WLAN (Body-Worn at 1.5 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Back Side	CDMA BC10 (§90S)	0.619	0.406	1.025
Back Side	CDMA BC0 (§22H)	0.598	0.406	1.004
Back Side	PCS CDMA	0.546	0.406	0.952

Table 12-6
Simultaneous Transmission Scenario with Bluetooth (Body-Worn at 1.5 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Back Side	CDMA BC10 (§90S)	0.619	0.181	0.800
Back Side	CDMA BC0 (§22H)	0.598	0.181	0.779
Back Side	PCS CDMA	0.546	0.181	0.727
Back Side	LTE Band 26	0.675	0.181	0.856
Back Side	LTE Band 25 (PCS)	0.693	0.181	0.874
Back Side	LTE Band 41	0.393	0.181	0.574

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 D06v01, the devices edges with antennas more than 2.5 cm from edge are not required to be evaluated for SAR (“-”).

Table 12-7
Simultaneous Transmission Scenario (2.4 GHz Hotspot at 1.0 cm)

Simult Tx	Configuration	EVDO BC10 (\$90S) 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)
Body SAR	Back	0.802	0.386	1.188	Body SAR	Back	0.492	0.386	0.878
	Front	0.634	0.052	0.686		Front	0.368	0.052	0.420
	Top	-	0.027	0.027		Top	-	0.027	0.027
	Bottom	0.504	-	0.504		Bottom	0.313	-	0.313
	Right	-	0.174	0.174		Right	-	0.174	0.174
	Left	1.003	-	1.003		Left	0.468	-	0.468
Simult Tx	Configuration	PCS EVDO 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)
Body SAR	Back	0.724	0.386	1.110	Body SAR	Back	0.428	0.386	0.814
	Front	0.449	0.052	0.501		Front	0.346	0.052	0.398
	Top	-	0.027	0.027		Top	-	0.027	0.027
	Bottom	0.622	-	0.622		Bottom	0.272	-	0.272
	Right	-	0.174	0.174		Right	-	0.174	0.174
	Left	0.172	-	0.172		Left	0.436	-	0.436
Simult Tx	Configuration	LTE Band 25 (PCS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 41 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	1.000	0.386	1.386	Body SAR	Back	0.951	0.386	1.337
	Front	0.548	0.052	0.600		Front	0.527	0.052	0.579
	Top	-	0.027	0.027		Top	-	0.027	0.027
	Bottom	0.797	-	0.797		Bottom	0.340	-	0.340
	Right	-	0.174	0.174		Right	0.477	0.174	0.651
	Left	0.209	-	0.209		Left	-	-	0.000

Notes:

1. Since the held-to-ear combinations involving EVDO/LTE data + 2.4 GHz WIFI in Table 12-2 will only occur in hotspot mode, the SAR values at reduced power levels (representing the Hotspot active scenario) were used for summation. Scenarios involving maximum level EVDO/LTE data + 2.4 GHz WIFI are not applicable, and therefore were not evaluated.
2. Since the held-to-ear combinations involving EVDO/LTE data + WIFI are only possible when hotspot mode is active, the SAR summations involving EVDO/LTE data + 5 GHz WIFI were not evaluated in Table 12-3 because 5 GHz hotspot is not supported.

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 ($\sim 10\%$ 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)			
835	820.10	564	CDMA BC10 (§90S)	EVDO Rev. 0	left	10 mm	0.971	0.948	1.02	N/A	N/A	N/A	N/A
1900	1910.00	26640	LTE Band 25 (PCS)	QPSK, 25 RB, 0 RB Offset	back	10 mm	0.942	0.909	1.04	N/A	N/A	N/A	N/A
2450	2506.00	39750	LTE Band 41	QPSK, 1 RB, 50 RB Offset	back	10 mm	0.834	0.802	1.04	N/A	N/A	N/A	N/A
2600	2636.50	41055	LTE Band 41	QPSK, 1 RB, 0 RB Offset	back	10 mm	0.936	0.930	1.01	N/A	N/A	N/A	N/A
ANSI / IEEE C95.1 1992 - SAFETY LIMIT						Body							
Spatial Peak						1.6 W/kg (mW/g)							
Uncontrolled Exposure/General Population						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	8648D	(9kHz-4GHz) Signal Generator	4/17/2013	Annual	4/17/2014	3629U00687
Agilent	N5182A	MXG Vector Signal Generator	10/28/2013	Annual	10/28/2014	US46240505
Agilent	8753ES	S-Parameter Network Analyzer	10/29/2013	Annual	10/29/2014	US39170122
Agilent	8753E	(30kHz-6GHz) Network Analyzer	7/23/2013	Annual	7/23/2014	US37390350
Agilent	8753E	(30kHz-6GHz) Network Analyzer	4/16/2013	Annual	4/16/2014	JP38020182
Agilent	E8257D	(250kHz-20GHz) Signal Generator	4/16/2013	Annual	4/16/2014	MY45470194
Agilent	E5515C	Wireless Communications Test Set	5/9/2013	Biennial	5/9/2015	GB43304447
Agilent	E5515C	Wireless Communications Test Set	10/18/2012	Biennial	10/18/2014	GB43193563
Amplifier Research	551G4	5W, 800MHz-4.2GHz	CBT	N/A	CBT	21910
Anritsu	MA24106A	USB Power Sensor	1/3/2014	Annual	1/3/2015	1349514
Anritsu	MA2481A	Power Sensor	10/30/2013	Annual	10/30/2014	5605
Anritsu	MT8820C	Radio Communication Analyzer	12/12/2013	Annual	12/12/2014	6200901190
Anritsu	MA24106A	USB Power Sensor	1/3/2014	Annual	1/3/2015	1344557
Anritsu	ML2495A	Power Meter	10/31/2013	Annual	10/31/2014	1039008
Anritsu	MA24106A	USB Power Sensor	1/3/2014	Annual	1/3/2015	1349513
Anritsu	MA24106A	USB Power Sensor	1/3/2014	Annual	1/3/2015	1349501
Anritsu	MA24106A	USB Power Sensor	1/3/2014	Annual	1/3/2015	1349503
Anritsu	MT8820C	Radio Communication Analyzer	12/12/2013	Annual	12/12/2014	6201300731
Anritsu	MA2411B	Pulse Power Sensor	12/31/2013	Annual	12/31/2014	1339007
Anritsu	MA2411B	Pulse Power Sensor	12/31/2013	Annual	12/31/2014	1339008
COMTECH	AR85729-5	Solid State Amplifier	CBT	N/A	CBT	M155A00-009
COMTECH	AR85729-5/5759B	Solid State Amplifier	CBT	N/A	CBT	M3W1A00-1002
Control Company	4052	Long Stem Thermometer	9/27/2013	Biennial	9/27/2015	130567447
Control Company	4353	Long Stem Thermometer	9/25/2012	Biennial	9/25/2014	122541139
Control Company	4353	Long Stem Thermometer	9/25/2012	Biennial	9/25/2014	122541143
Fisher Scientific	15-077-960	Thermometer	11/6/2012	Biennial	11/6/2014	122640025
Gigatronics	8651A	Universal Power Meter	10/30/2013	Annual	10/30/2014	8650319
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
MiniCircuits	SLP-2400+	Low Pass Filter	CBT	N/A	CBT	R8979500903
Mini-Circuits	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
Mini-Circuits	NLP-1200+	Low Pass Filter DC to 1000 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Narda	BW-S3W2	Attenuator (3dB)	CBT	N/A	CBT	120
Narda	4014C-6	4 - 8 GHz SMA 6 dB Directional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	10/16/2013	Annual	10/16/2014	100976
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	12/9/2013	Annual	12/9/2014	109366
Seekonk	NC-100	Torque Wrench (8" lb)	3/5/2012	Triennial	3/5/2015	N/A
Seekonk	NC-100	Torque Wrench (8" lb)	11/29/2011	Triennial	11/29/2014	21053
SPEAG	ES3DV3	SAR Probe	11/22/2013	Annual	11/22/2014	3333
SPEAG	ES3DV3	SAR Probe	2/25/2014	Annual	2/25/2015	3258
SPEAG	EX3DV4	SAR Probe	10/23/2013	Annual	10/23/2014	3914
SPEAG	ES3DV3	SAR Probe	11/25/2013	Annual	11/25/2014	3332
SPEAG	ES3DV2	SAR Probe	8/22/2013	Annual	8/22/2014	3022
SPEAG	EX3DV4	SAR Probe	1/29/2014	Annual	1/29/2015	3589
SPEAG	EX3DV4	SAR Probe	12/18/2013	Annual	12/18/2014	3920
SPEAG	DAE4	Dasy Data Acquisition Electronics	11/19/2013	Annual	11/19/2014	1408
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/26/2014	Annual	2/26/2015	665
SPEAG	DAE4	Dasy Data Acquisition Electronics	11/19/2013	Annual	11/19/2014	1333
SPEAG	DAE4	Dasy Data Acquisition Electronics	11/18/2013	Annual	11/18/2014	1407
SPEAG	DAE4	Dasy Data Acquisition Electronics	8/21/2013	Annual	8/21/2014	1322
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/22/2014	Annual	1/22/2015	1272
SPEAG	DAE4	Dasy Data Acquisition Electronics	12/12/2013	Annual	12/12/2014	649
SPEAG	D835V2	835 MHz SAR Dipole	4/25/2013	Annual	4/25/2014	4d119
SPEAG	D1900V2	1900 MHz SAR Dipole	7/22/2013	Annual	7/22/2014	5d149
SPEAG	D2450V2	2450 MHz SAR Dipole	8/23/2013	Annual	8/23/2014	719
SPEAG	D2600V2	2600 MHz SAR Dipole	5/2/2013	Annual	5/2/2014	1004
SPEAG	D5GHzV2	5 GHz SAR Dipole	1/27/2014	Annual	1/27/2015	1057
SPEAG	D5GHzV2	5 GHz SAR Dipole	9/23/2013	Annual	9/23/2014	1007
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/14/2013	Annual	5/14/2014	1070
SPEAG	DAK-3.5	Dielectric Assessment Kit	11/13/2013	Annual	11/13/2014	1091
Tektronix	RSA6114A	Real Time Spectrum Analyzer	4/17/2013	Annual	4/17/2014	8010177
VWR	36934-158	Wall-Mounted Thermometer	8/8/2013	Annual	8/8/2014	130258636
VWR	36934-158	Wall-Mounted Thermometer	8/8/2013	Annual	8/8/2014	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 (95% CONFIDENCE LEVEL)							k=2	24.2	23.5
									299

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

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Applicable for frequencies up to 6 GHz.

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	6.55	N	1	1.0	1.0	6.6	6.6	∞
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	12.4	12.0
Expanded Uncertainty (95% CONFIDENCE LEVEL)							k=2	24.7	24.0

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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APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHL710T; Type: Portable Handset; Serial: 1703-9

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

Medium: 835 Head Medium parameters used (interpolated):

$f = 820.1 \text{ MHz}$; $\sigma = 0.887 \text{ S/m}$; $\epsilon_r = 40.141$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 03-17-2014; Ambient Temp: 24.2°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3333; ConvF(6.3, 6.3, 6.3); Calibrated: 11/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1408; Calibrated: 11/19/2013

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

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

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

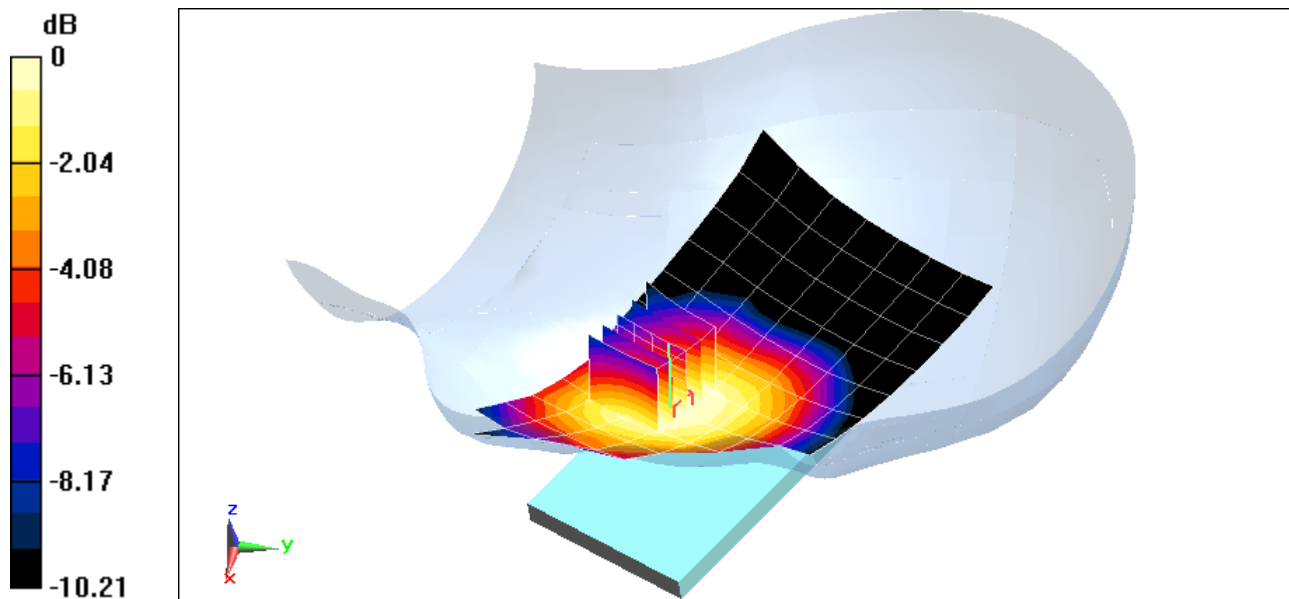
Area Scan (8x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 25.588 V/m; Power Drift = -0.20 dB

Peak SAR (extrapolated) = 0.671 W/kg

SAR(1 g) = 0.534 W/kg



0 dB = 0.562 W/kg = -2.50 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHL710T; Type: Portable Handset; Serial: 1703-9

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

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.52 \text{ MHz}$; $\sigma = 0.903 \text{ S/m}$; $\epsilon_r = 39.929$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 03-17-2014; Ambient Temp: 24.2°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3333; ConvF(6.3, 6.3, 6.3); Calibrated: 11/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1408; Calibrated: 11/19/2013

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

Mode: Cell. BC0 EVDO Rev.A, Left Head, Cheek, Mid.ch

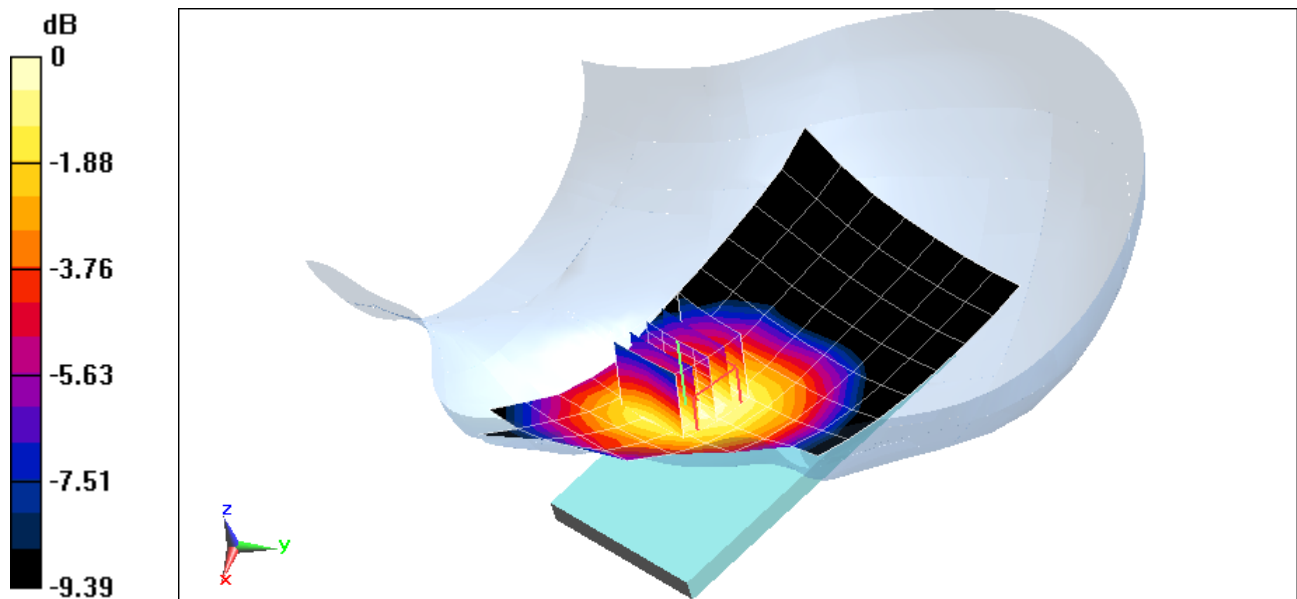
Area Scan (8x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 26.163 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.751 W/kg

SAR(1 g) = 0.589 W/kg



0 dB = 0.626 W/kg = -2.03 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHL710T; Type: Portable Handset; Serial: 1703-10

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

Medium: 1900 Head Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.394 \text{ S/m}$; $\epsilon_r = 39.469$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 03-18-2014; Ambient Temp: 24.0°C; Tissue Temp: 23.4°C

Probe: ES3DV3 - SN3258; ConvF(5.04, 5.04, 5.04); Calibrated: 2/25/2014;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/26/2014

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

Mode: PCS CDMA, Right Head, Cheek, Mid.ch

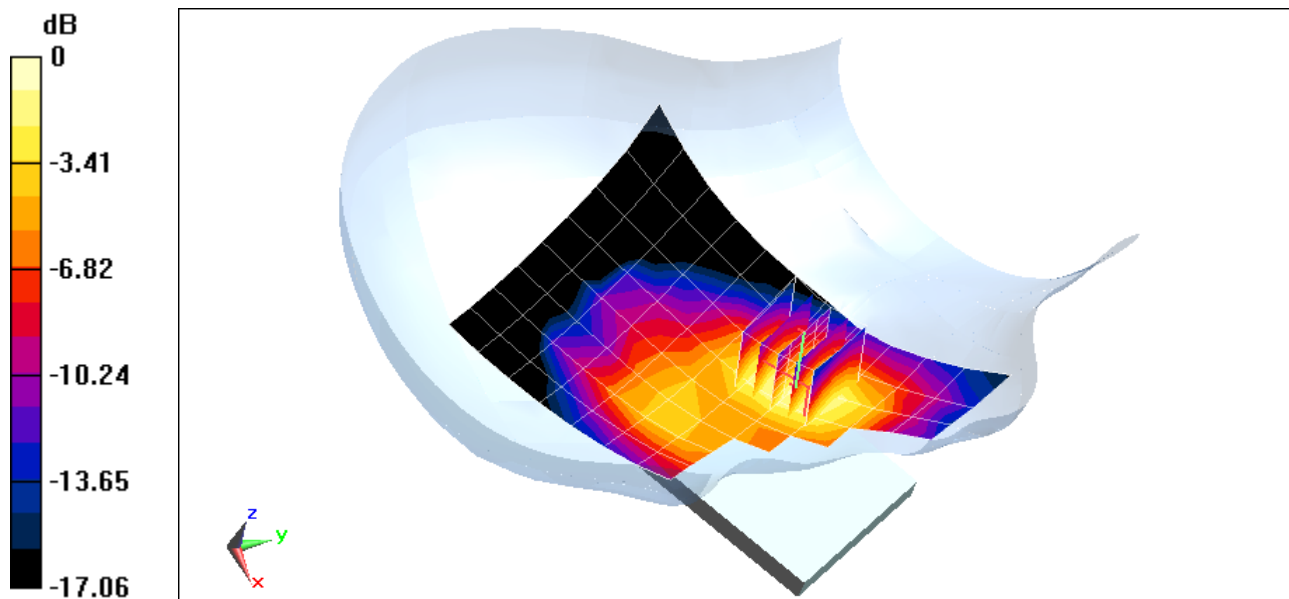
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 18.680 V/m; Power Drift = -0.15 dB

Peak SAR (extrapolated) = 0.709 W/kg

SAR(1 g) = 0.451 W/kg



0 dB = 0.496 W/kg = -3.05 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHL710T; Type: Portable Handset; Serial: 1703-8

Communication System: UID 0, LTE Band 26 (0); Frequency: 844 MHz; Duty Cycle: 1:1

Medium: 835 Head Medium parameters used (interpolated):

$f = 844 \text{ MHz}$; $\sigma = 0.91 \text{ S/m}$; $\epsilon_r = 39.813$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 03-17-2014; Ambient Temp: 24.2°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3333; ConvF(6.3, 6.3, 6.3); Calibrated: 11/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1408; Calibrated: 11/19/2013

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

**Mode: LTE Band 26, Left Head, Cheek, High.ch,
10 MHz Bandwidth, QPSK, 1 RB, 25 RB Offset**

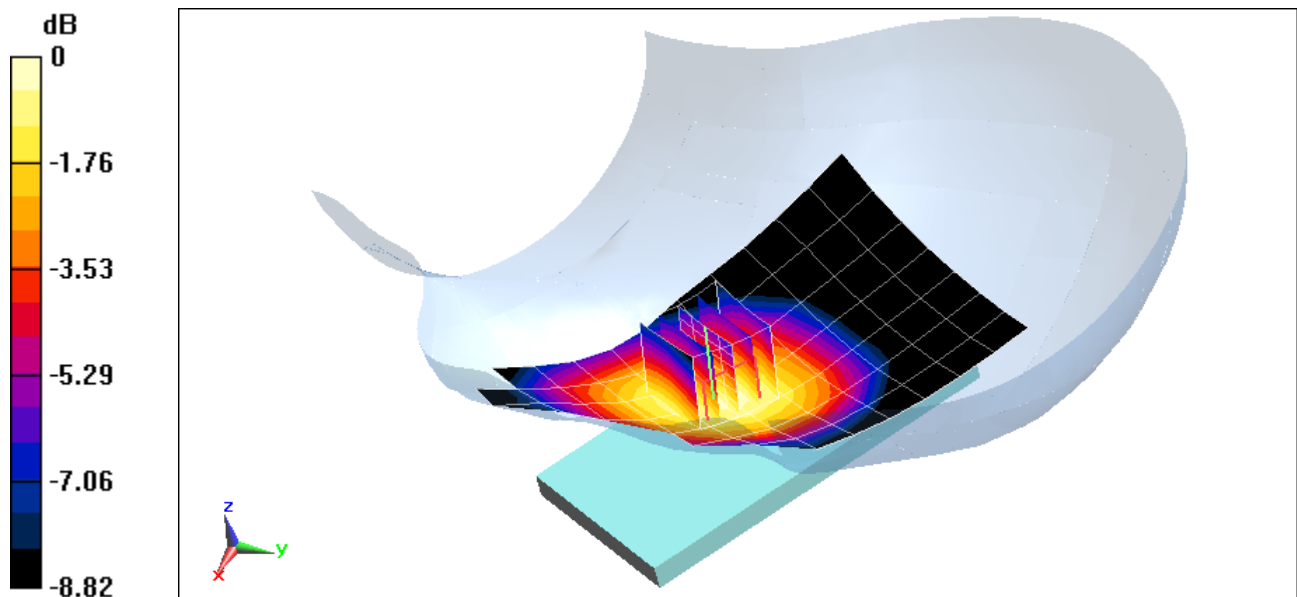
Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 21.461 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.451 W/kg

SAR(1 g) = 0.357 W/kg



0 dB = 0.374 W/kg = -4.27 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHL710T; Type: Portable Handset; Serial: 1703-32

Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1855 MHz; Duty Cycle: 1:1

Medium: 1900 Head Medium parameters used (interpolated):

$f = 1855 \text{ MHz}$; $\sigma = 1.371 \text{ S/m}$; $\epsilon_r = 39.566$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 03-18-2014; Ambient Temp: 24.0°C; Tissue Temp: 23.4°C

Probe: ES3DV3 - SN3258; ConvF(5.04, 5.04, 5.04); Calibrated: 2/25/2014;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/26/2014

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

**Mode: LTE Band 25 (PCS), Right Head, Cheek, Low.ch,
10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset**

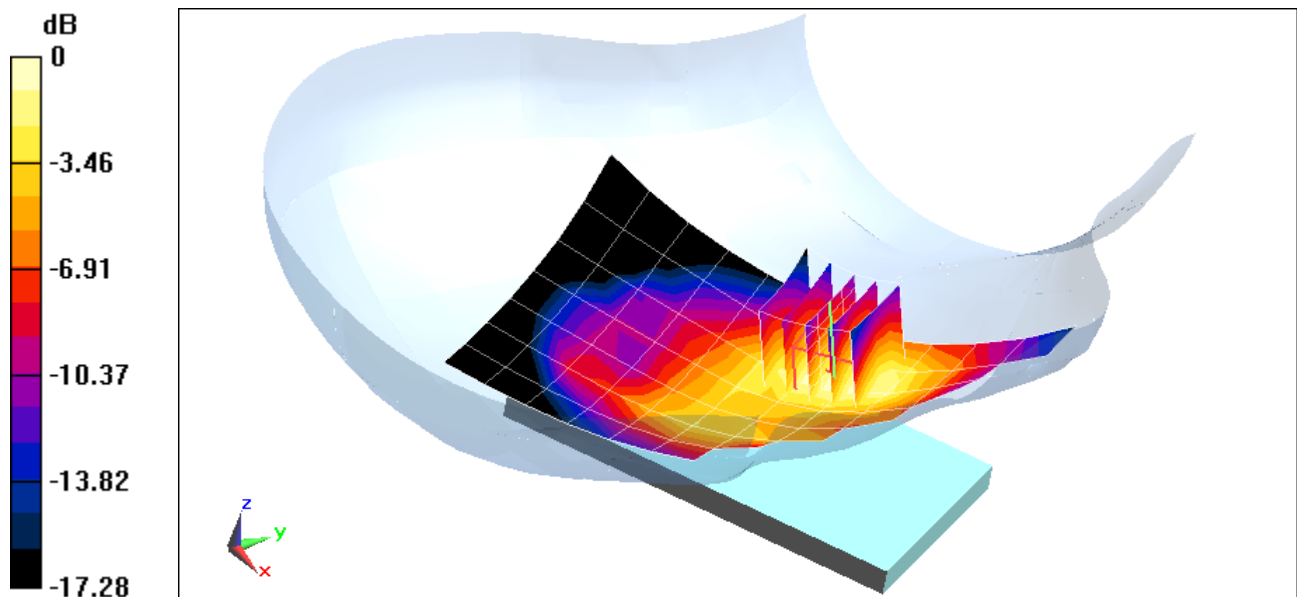
Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 21.340 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.857 W/kg

SAR(1 g) = 0.583 W/kg



0 dB = 0.637 W/kg = -1.96 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHL710T; Type: Portable Handset; Serial: 1703-13

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

Medium: 2450-2600 Head Medium parameters used (interpolated):

$f = 2636.5 \text{ MHz}$; $\sigma = 1.977 \text{ S/m}$; $\epsilon_r = 37.926$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 03-20-2014; Ambient Temp: 24.0°C; Tissue Temp: 23.2°C

Probe: ES3DV3 - SN3258; ConvF(4.34, 4.34, 4.34); Calibrated: 2/25/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/26/2014

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

**Mode: LTE Band 41, Right Head, Cheek, Mid-High.ch,
20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset**

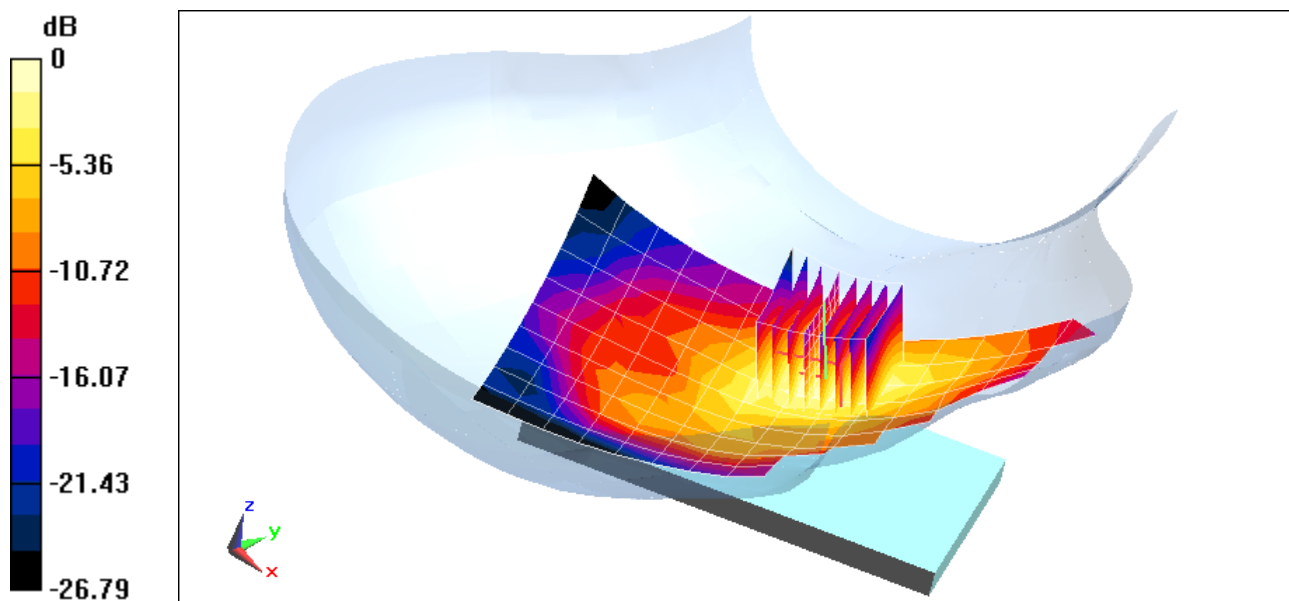
Area Scan (10x15x1): Measurement grid: dx=12mm, dy=12mm

Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 23.127 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 1.56 W/kg

SAR(1 g) = 0.865 W/kg



0 dB = 1.06 W/kg = 0.25 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHL710T; Type: Portable Handset; Serial: 1703-7

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

Medium: 2450-2600 Head Medium parameters used (interpolated):

$f = 2412 \text{ MHz}$; $\sigma = 1.734 \text{ S/m}$; $\epsilon_r = 38.742$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 03-20-2014; Ambient Temp: 24.2°C; Tissue Temp: 23.3°C

Probe: ES3DV3 - SN3258; ConvF(4.52, 4.52, 4.52); Calibrated: 2/25/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/26/2014

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

Mode: IEEE 802.11b, Left Head, Cheek, Ch 01, 1 Mbps

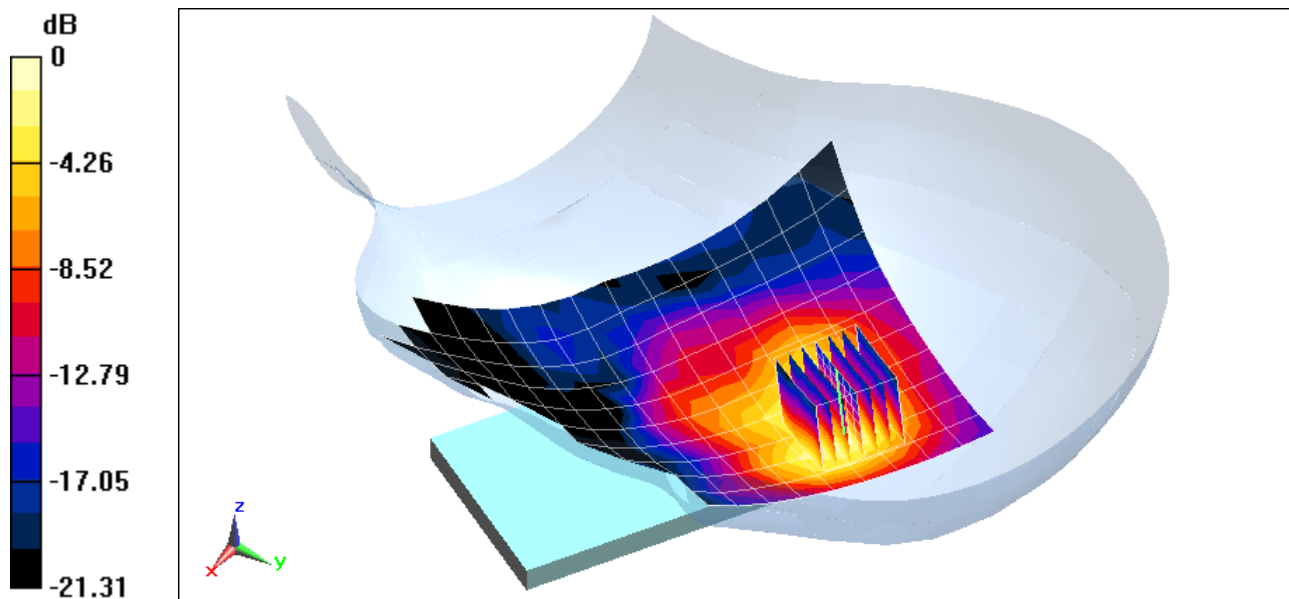
Area Scan (11x18x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 9.485 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 0.308 W/kg

SAR(1 g) = 0.148 W/kg



0 dB = 0.191 W/kg = -7.19 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHL710T; Type: Portable Handset; Serial: 1703-7

Communication System: UID 0, IEEE 802.11a; Frequency: 5765 MHz; Duty Cycle: 1:1

Medium: 5 GHz Head Medium parameters used:

$f = 5765 \text{ MHz}$; $\sigma = 5.051 \text{ S/m}$; $\epsilon_r = 35.33$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 03-19-2014; Ambient Temp: 24.5°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN3914; ConvF(4.52, 4.52, 4.52); Calibrated: 10/23/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 11/19/2013

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

Mode: IEEE 802.11a, 5.8 GHz, Left Head, Cheek, Ch 153, 6 Mbps

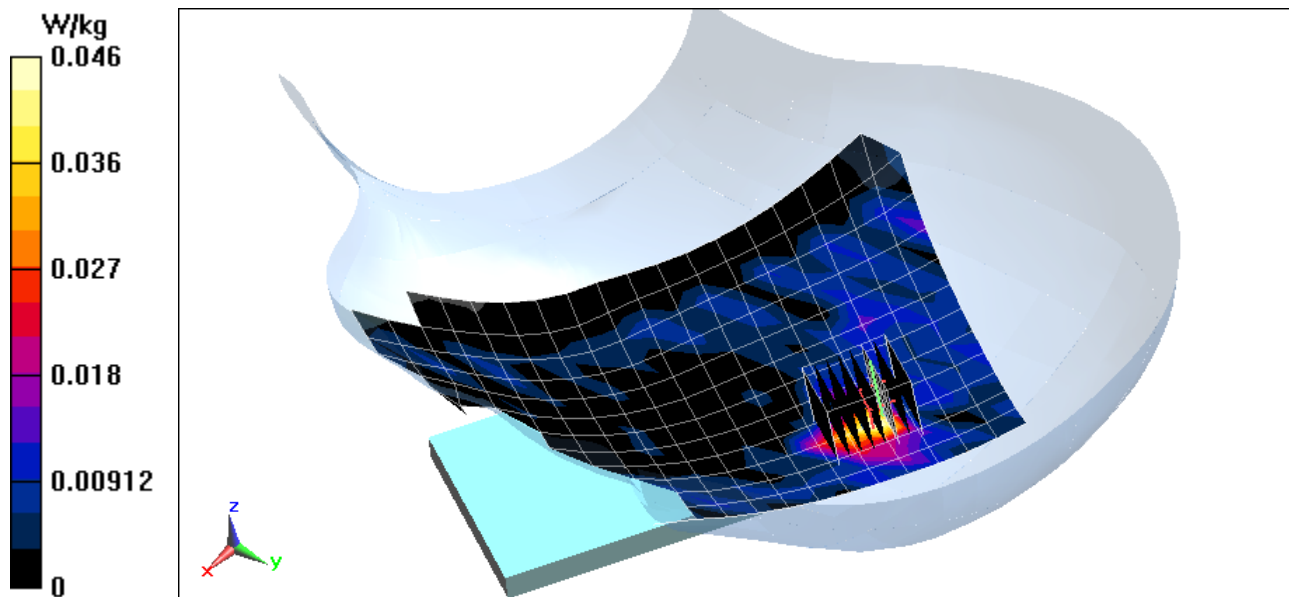
Area Scan (13x22x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 1.245 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.205 W/kg

SAR(1 g) = 0.011 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHL710T; Type: Portable Handset; Serial: 1703-7

Communication System: UID 0, IEEE 802.11a; Frequency: 5320 MHz; Duty Cycle: 1:1

Medium: 5 GHz Head Medium parameters used:

$f = 5320 \text{ MHz}$; $\sigma = 4.594 \text{ S/m}$; $\epsilon_r = 35.847$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 03-19-2014; Ambient Temp: 24.4°C; Tissue Temp: 22.8°C

Probe: EX3DV4 - SN3914; ConvF(4.82, 4.82, 4.82); Calibrated: 10/23/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 11/19/2013

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

Mode: IEEE 802.11a, 5.3 GHz, Left Head, Cheek, Ch 64, 6 Mbps

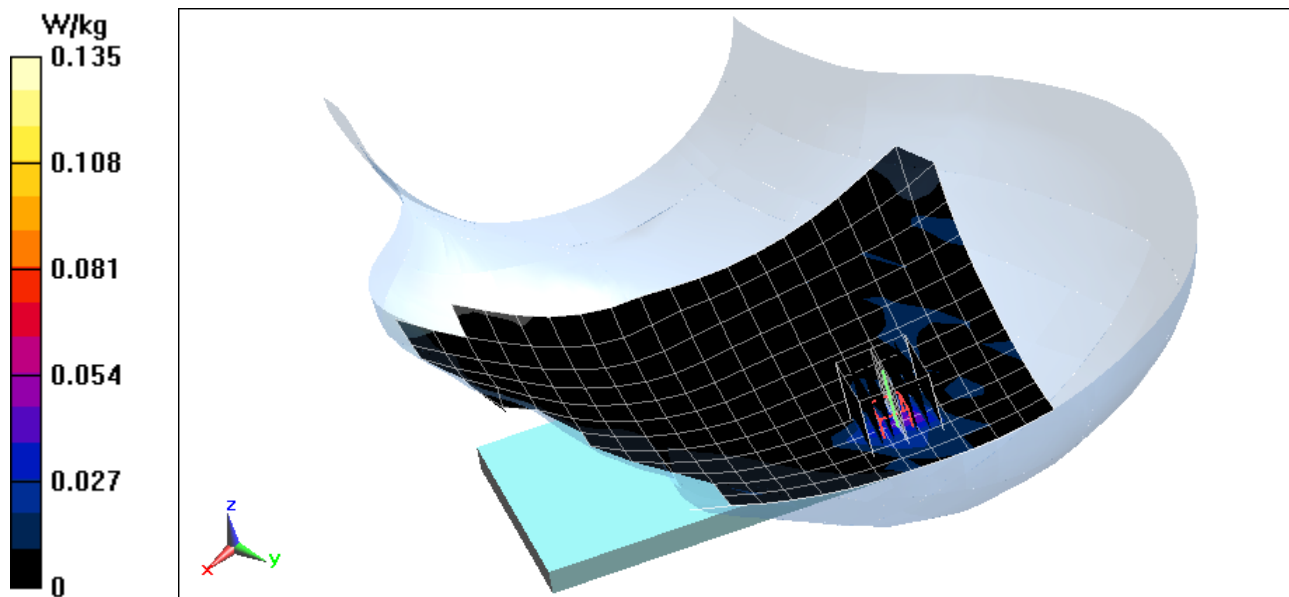
Area Scan (13x22x1): Measurement grid: dx=10mm, dy=10mm

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Reference Value = 3.744 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 0.227 W/kg

SAR(1 g) = 0.051 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHL710T; Type: Portable Handset; Serial: 1703-9

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

Medium: 835 Body Medium parameters used (interpolated):

$f = 820.1 \text{ MHz}$; $\sigma = 0.989 \text{ S/m}$; $\epsilon_r = 53.771$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 03-17-2014; Ambient Temp: 23.2°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3332; ConvF(6.08, 6.08, 6.08); Calibrated: 11/25/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 11/18/2013

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

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

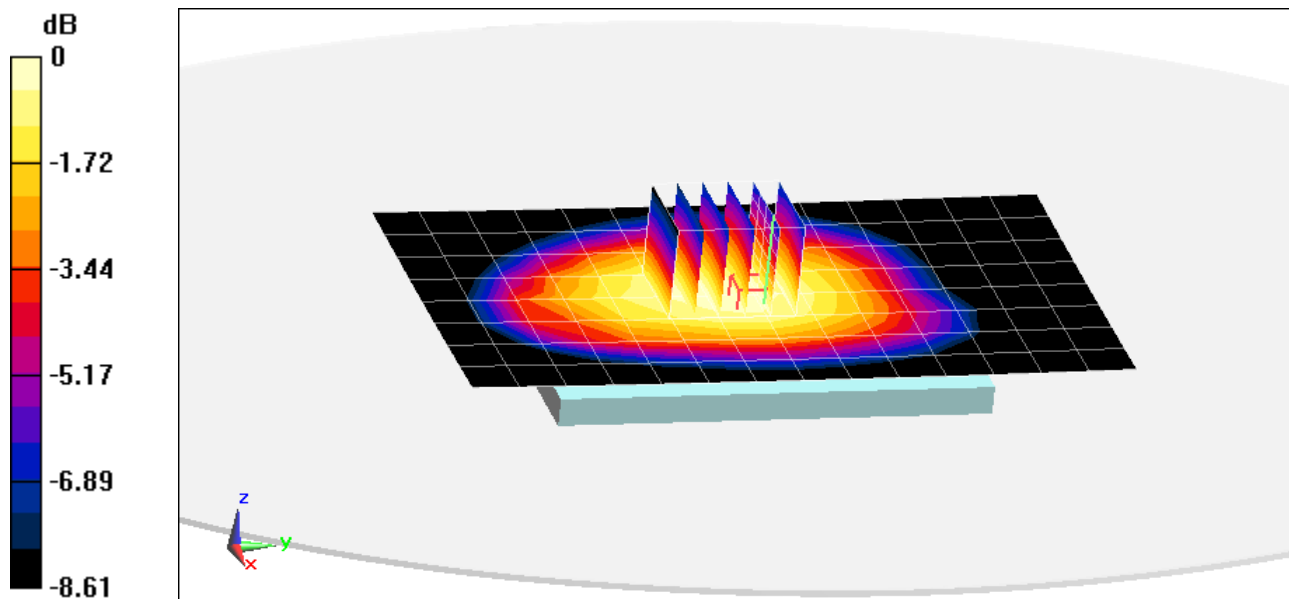
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 25.895 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.749 W/kg

SAR(1 g) = 0.602 W/kg



0 dB = 0.628 W/kg = -2.02 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHL710T; Type: Portable Handset; Serial: 1703-9

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

Medium: 835 Body Medium parameters used (interpolated):

$f = 820.1 \text{ MHz}$; $\sigma = 0.989 \text{ S/m}$; $\epsilon_r = 53.771$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-17-2014; Ambient Temp: 23.2°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3332; ConvF(6.08, 6.08, 6.08); Calibrated: 11/25/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 11/18/2013

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

Mode: Cell. BC10 EVDO Rev.0, Body SAR, Left Edge, Mid.ch

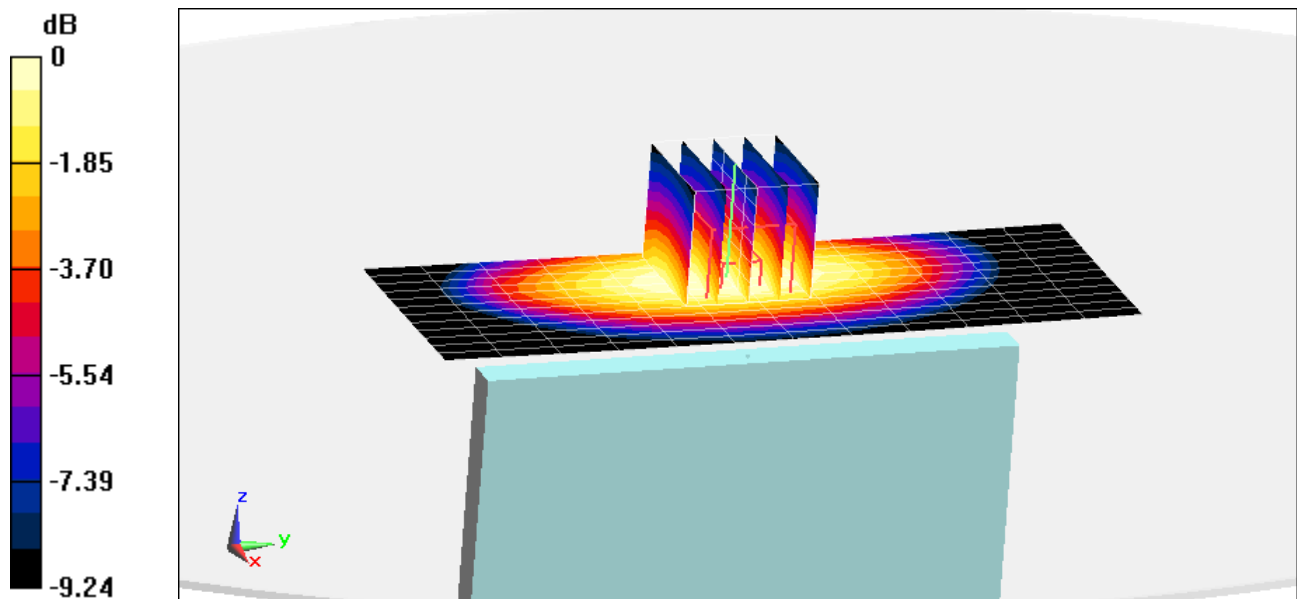
Area Scan (13x13x1): Measurement grid: $dx=5\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 34.206 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 1.33 W/kg

SAR(1 g) = 0.971 W/kg



0 dB = 1.04 W/kg = 0.17 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHL710T; Type: Portable Handset; Serial: 1703-9

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

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.52 \text{ MHz}$; $\sigma = 1.004 \text{ S/m}$; $\epsilon_r = 53.611$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 03-17-2014; Ambient Temp: 23.2°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3332; ConvF(6.08, 6.08, 6.08); Calibrated: 11/25/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 11/18/2013

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

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

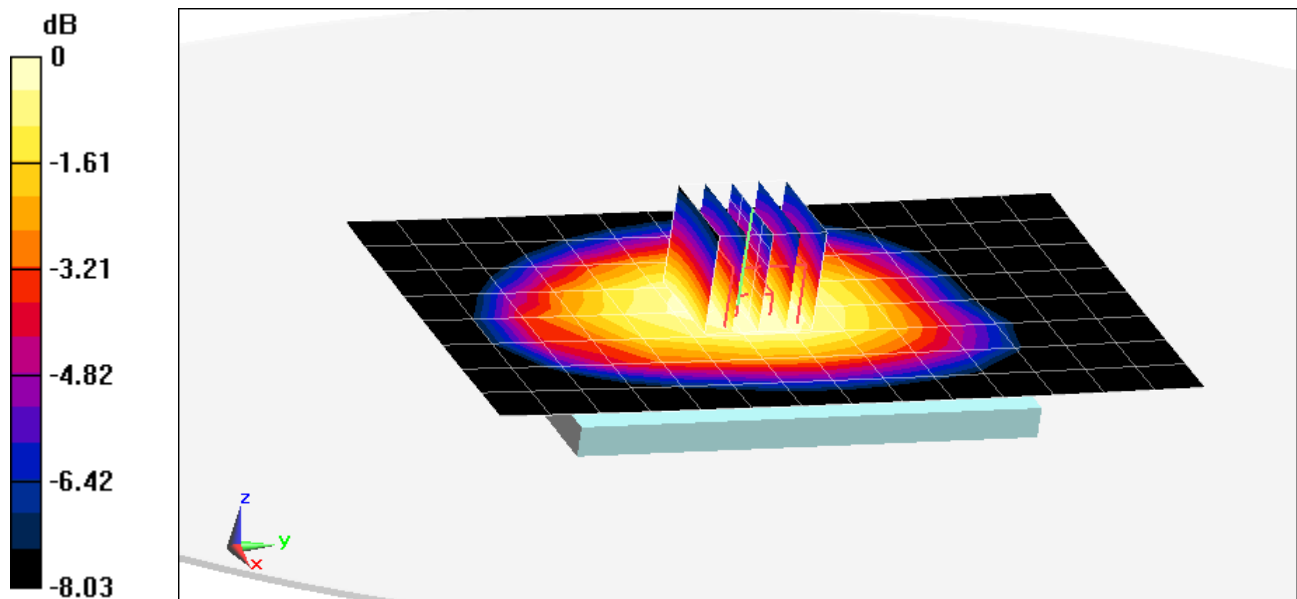
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 24.780 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.708 W/kg

SAR(1 g) = 0.576 W/kg



0 dB = 0.602 W/kg = -2.20 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHL710T; Type: Portable Handset; Serial: 1703-14

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

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.52 \text{ MHz}$; $\sigma = 1.004 \text{ S/m}$; $\epsilon_r = 53.611$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-17-2014; Ambient Temp: 23.2°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3332; ConvF(6.08, 6.08, 6.08); Calibrated: 11/25/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 11/18/2013

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

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

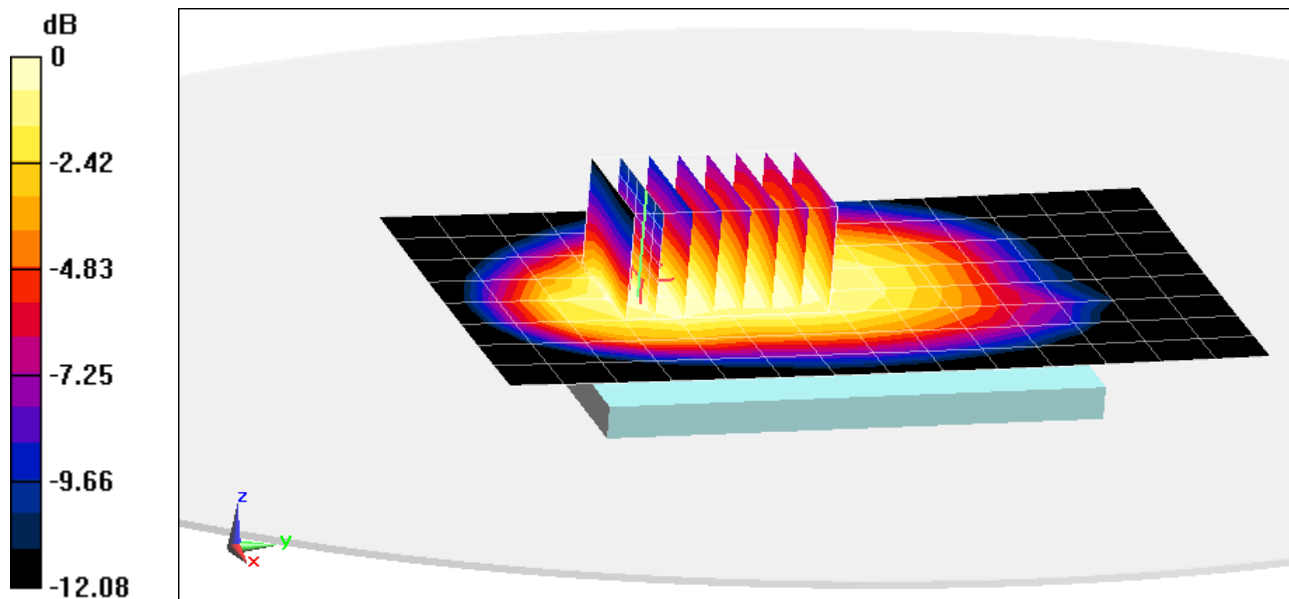
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Zoom Scan (6x8x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 23.140 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.779 W/kg

SAR(1 g) = 0.485 W/kg



0 dB = 0.519 W/kg = -2.85 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHL710T; Type: Portable Handset; Serial: 1703-10

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

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.54 \text{ S/m}$; $\epsilon_r = 51.58$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 03-19-2014; Ambient Temp: 24.4°C; Tissue Temp: 23.3°C

Probe: ES3DV2 - SN3022; ConvF(4.49, 4.49, 4.49); Calibrated: 8/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/21/2013

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

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

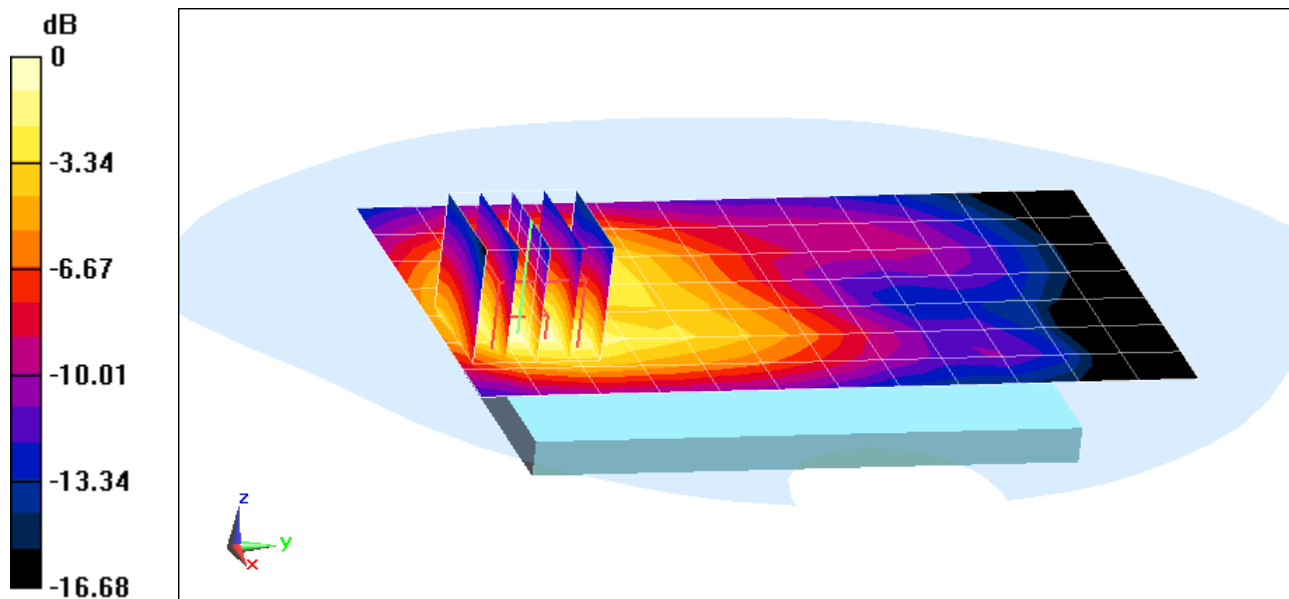
Area Scan (8x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 18.074 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 0.828 W/kg

SAR(1 g) = 0.512 W/kg



0 dB = 0.562 W/kg = -2.50 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHL710T; Type: Portable Handset; Serial: 1703-6

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

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.54 \text{ S/m}$; $\epsilon_r = 51.58$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-19-2014; Ambient Temp: 24.4°C; Tissue Temp: 23.3°C

Probe: ES3DV2 - SN3022; ConvF(4.49, 4.49, 4.49); Calibrated: 8/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/21/2013

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

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

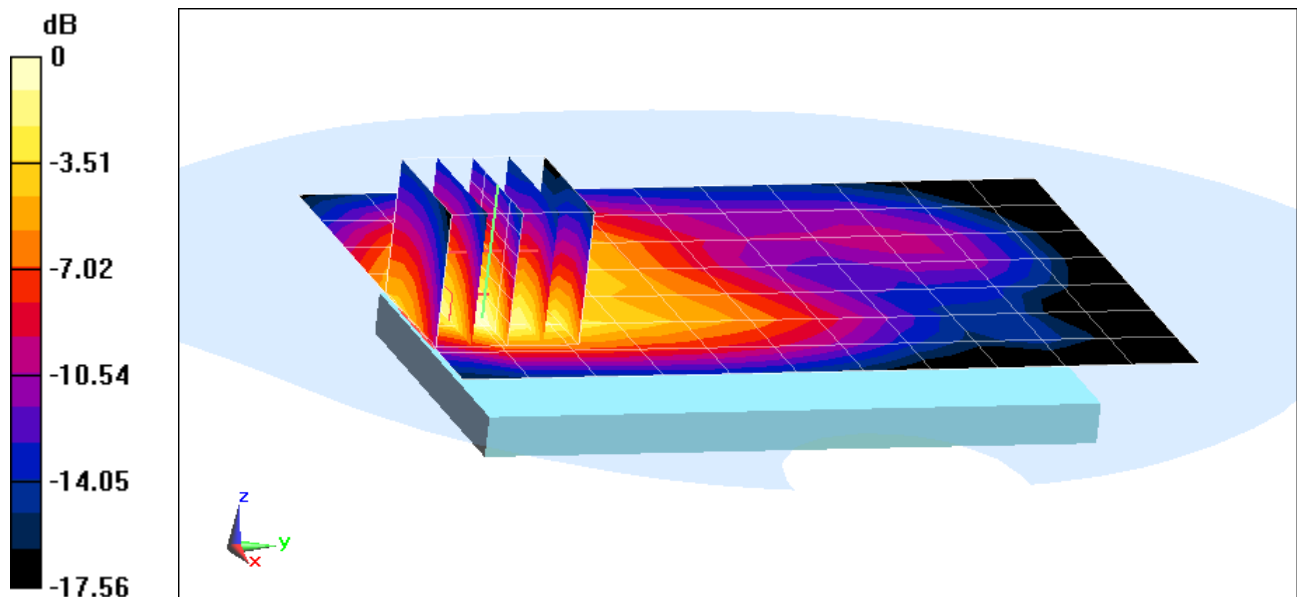
Area Scan (8x12x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 21.626 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 1.15 W/kg

SAR(1 g) = 0.670 W/kg



0 dB = 0.749 W/kg = -1.26 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHL710T; Type: Portable Handset; Serial: 1703-8

Communication System: UID 0, LTE Band 26 (0); Frequency: 844 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 844 \text{ MHz}$; $\sigma = 1.011 \text{ S/m}$; $\epsilon_r = 53.521$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 03-17-2014; Ambient Temp: 23.2°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3332; ConvF(6.08, 6.08, 6.08); Calibrated: 11/25/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 11/18/2013

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

**Mode: LTE Band 26, Body SAR, Back side, High.ch,
10 MHz Bandwidth, QPSK, 1 RB, 25 RB Offset**

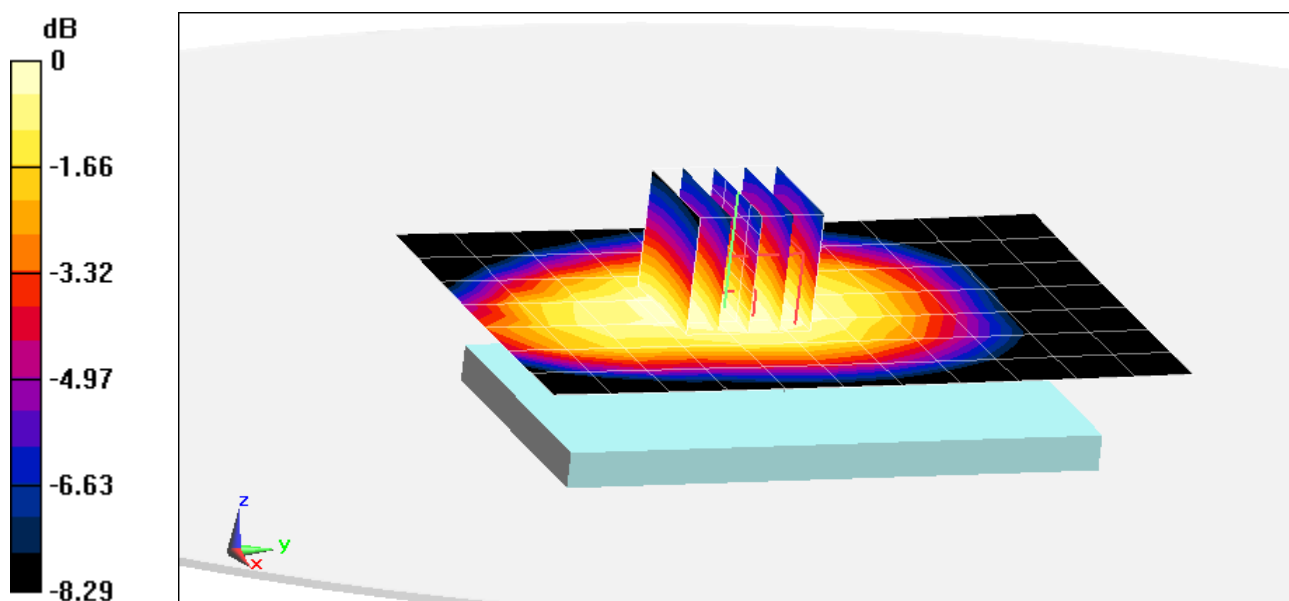
Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 26.312 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.786 W/kg

SAR(1 g) = 0.645 W/kg



0 dB = 0.676 W/kg = -1.70 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHL710T; Type: Portable Handset; Serial: 1703-12

Communication System: UID 0, LTE Band 26; Frequency: 831.5 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 831.5 \text{ MHz}$; $\sigma = 1 \text{ S/m}$; $\epsilon_r = 53.662$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-17-2014; Ambient Temp: 23.2°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3332; ConvF(6.08, 6.08, 6.08); Calibrated: 11/25/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 11/18/2013

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

**Mode: LTE Band 26, Body SAR, Left Edge, Mid.ch,
10 MHz Bandwidth, QPSK, 25 RB, 25 RB Offset**

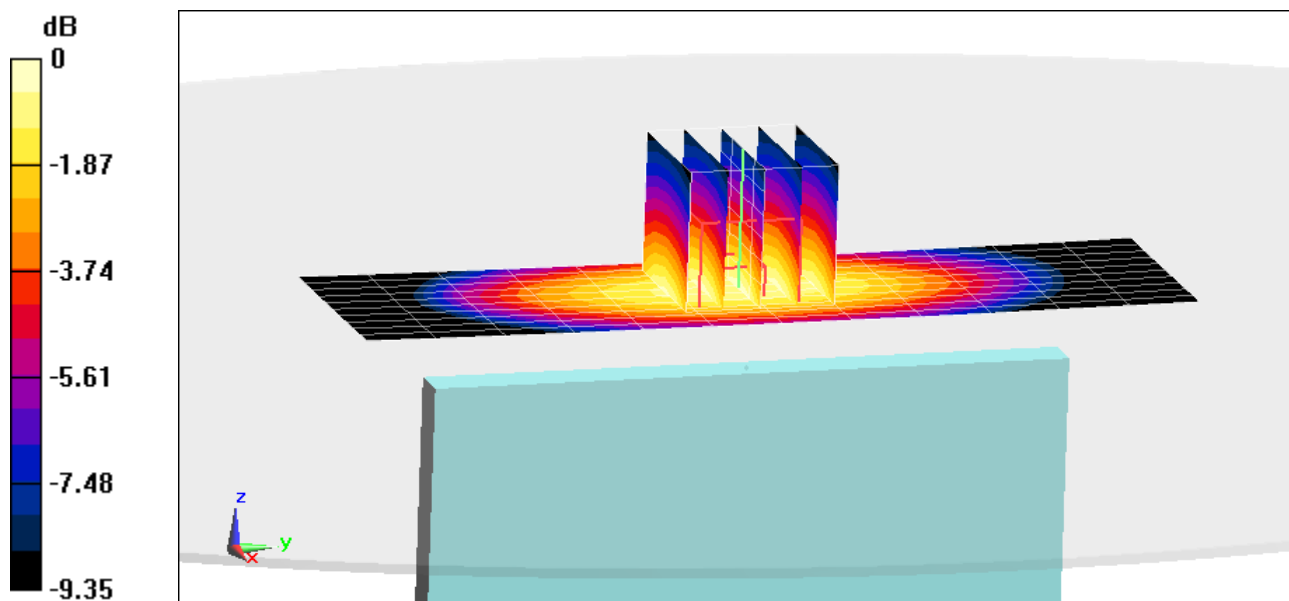
Area Scan (11x13x1): Measurement grid: dx=5mm, dy=15mm

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

Reference Value = 21.124 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.560 W/kg

SAR(1 g) = 0.408 W/kg



0 dB = 0.437 W/kg = -3.60 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHL710T; Type: Portable Handset; Serial: 1703-32

Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1855 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1855 \text{ MHz}$; $\sigma = 1.511 \text{ S/m}$; $\epsilon_r = 51.666$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 03-19-2014; Ambient Temp: 24.4°C; Tissue Temp: 23.3°C

Probe: ES3DV2 - SN3022; ConvF(4.49, 4.49, 4.49); Calibrated: 8/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/21/2013

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

**Mode: LTE Band 25 (PCS), Body SAR, Back side, Low.ch,
10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset**

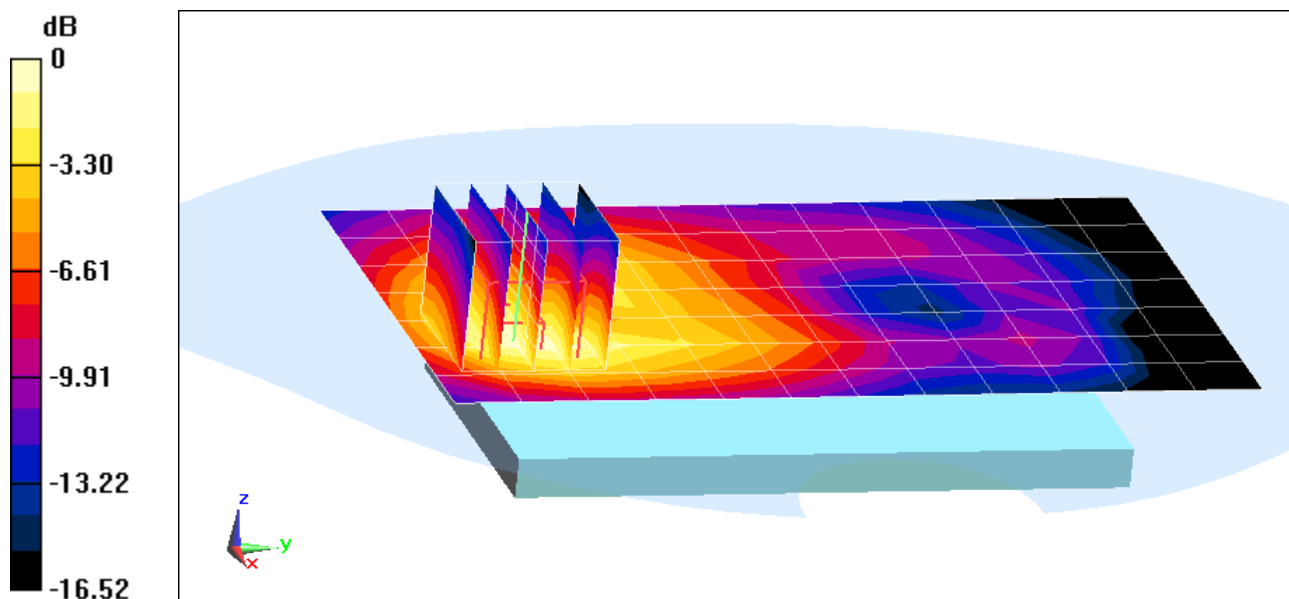
Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 21.418 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 1.07 W/kg

SAR(1 g) = 0.656 W/kg



0 dB = 0.735 W/kg = -1.34 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHL710T; Type: Portable Handset; Serial: 1703-31

Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1910 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used:

$f = 1910 \text{ MHz}$; $\sigma = 1.576 \text{ S/m}$; $\epsilon_r = 51.455$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-19-2014; Ambient Temp: 24.4°C; Tissue Temp: 23.3°C

Probe: ES3DV2 - SN3022; ConvF(4.49, 4.49, 4.49); Calibrated: 8/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/21/2013

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

**Mode: LTE Band 25 (PCS), Body SAR, Back side, High.ch,
10 MHz Bandwidth, QPSK, 25 RB, 0 RB Offset**

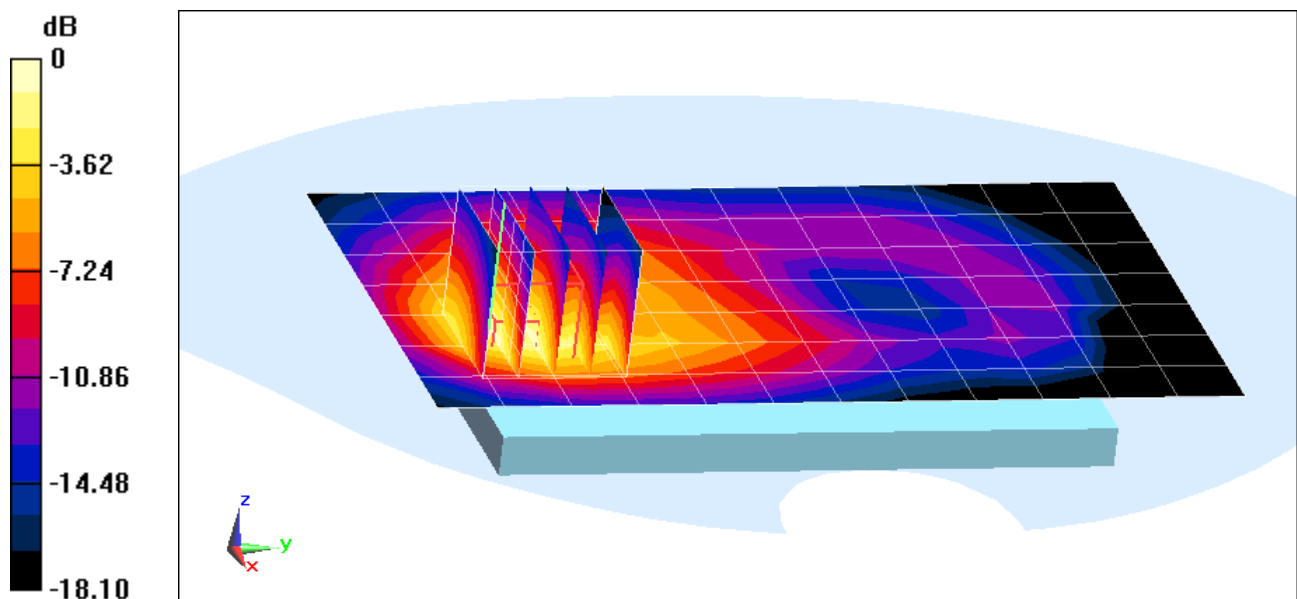
Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 25.622 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 1.65 W/kg

SAR(1 g) = 0.942 W/kg



0 dB = 1.00 W/kg = 0.00 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHL710T; Type: Portable Handset; Serial: 1703-13

Communication System: UID 0, LTE Band 41 (0); Frequency: 2593 MHz; Duty Cycle: 1:1.58

Medium: 2450-2600 Body Medium parameters used (interpolated):

$f = 2593 \text{ MHz}$; $\sigma = 2.227 \text{ S/m}$; $\epsilon_r = 51.865$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 03-24-2014; Ambient Temp: 23.7°C; Tissue Temp: 23.3°C

Probe: EX3DV4 - SN3589; ConvF(6.08, 6.08, 6.08); Calibrated: 1/29/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/22/2014

Phantom: ELI left; Type: QDOVA002AA; Serial: TP:1202

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

**Mode: LTE Band 41, Body SAR, Back side, Mid.ch,
20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset**

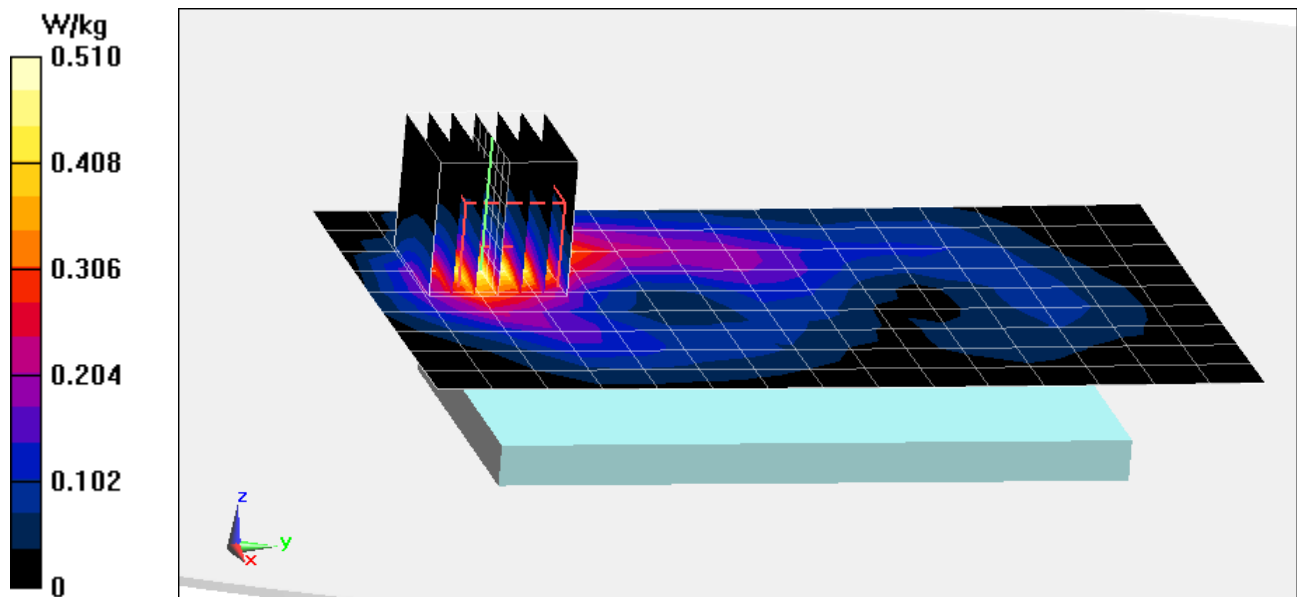
Area Scan (10x16x1): Measurement grid: dx=12mm, dy=12mm

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

Reference Value = 14.135 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 0.841 W/kg

SAR(1 g) = 0.393 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHL710T; Type: Portable Handset; Serial: 1703-13

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

Medium: 2450-2600 Body Medium parameters used (interpolated):

$f = 2636.5$ MHz; $\sigma = 2.226$ S/m; $\epsilon_r = 51.372$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-19-2014; Ambient Temp: 23.4°C; Tissue Temp: 23.4°C

Probe: EX3DV4 - SN3589; ConvF(6.08, 6.08, 6.08); Calibrated: 1/29/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/22/2014

Phantom: ELI left; Type: QDOVA002AA; Serial: TP:1202

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

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

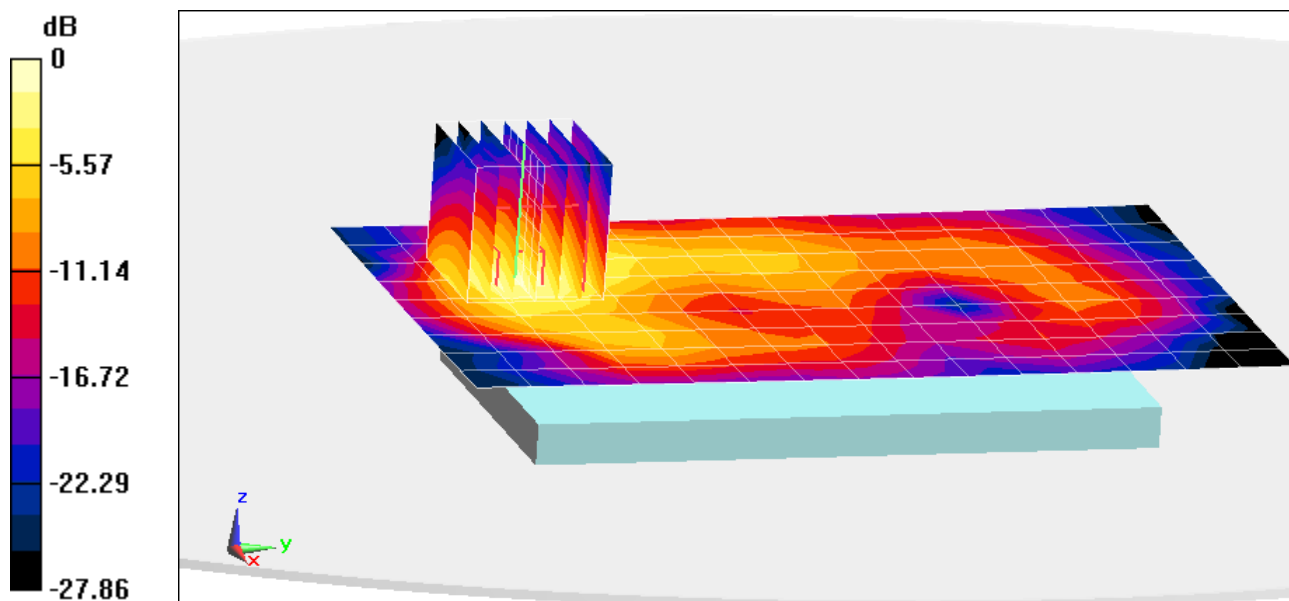
Area Scan (10x16x1): Measurement grid: dx=12mm, dy=12mm

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

Reference Value = 21.523 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 2.16 W/kg

SAR(1 g) = 0.936 W/kg



0 dB = 1.22 W/kg = 0.86 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHL710T; Type: Portable Handset; Serial: 1703-7

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

Medium: 2450-2600 Body Medium parameters used (interpolated):

$f = 2412 \text{ MHz}$; $\sigma = 1.928 \text{ S/m}$; $\epsilon_r = 52.223$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 03-19-2014; Ambient Temp: 23.4°C; Tissue Temp: 23.4°C

Probe: EX3DV4 - SN3589; ConvF(6.26, 6.26, 6.26); Calibrated: 1/29/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/22/2014

Phantom: ELI left; Type: QDOVA002AA; Serial: TP:1202

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

Mode: IEEE 802.11b, Body SAR, Ch 01, 1 Mbps, Back Side

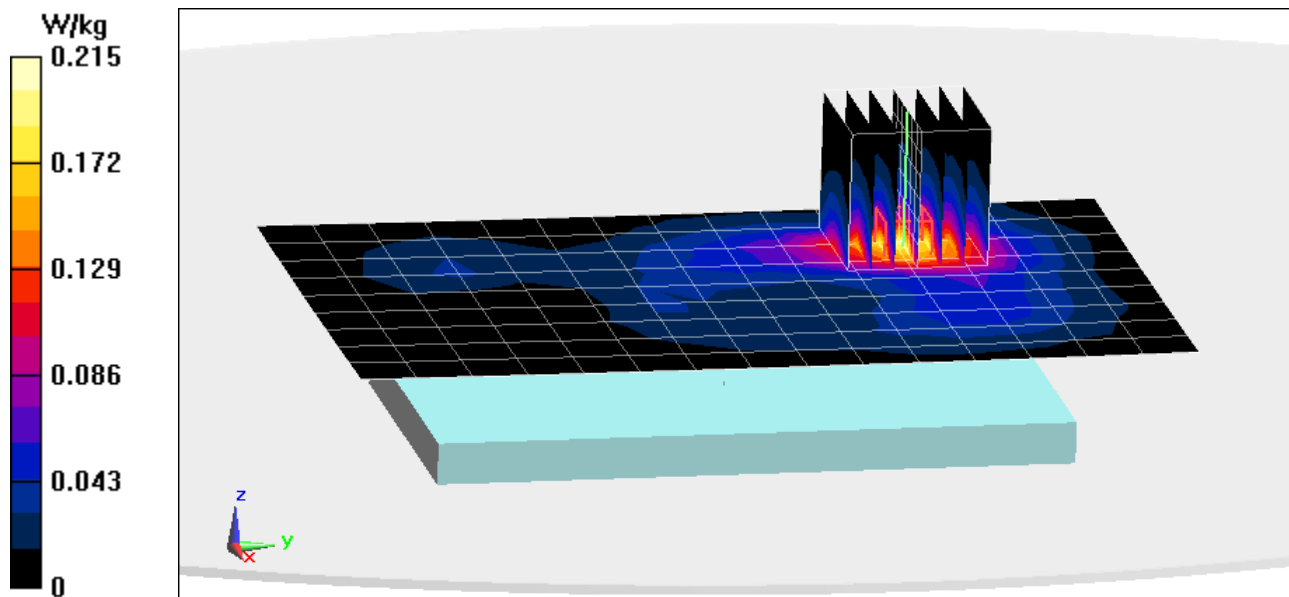
Area Scan (10x16x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 9.461 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 0.321 W/kg

SAR(1 g) = 0.167 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHL710T; Type: Portable Handset; Serial: 1703-7

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

Medium: 2450-2600 Body Medium parameters used (interpolated):

$f = 2412 \text{ MHz}$; $\sigma = 1.928 \text{ S/m}$; $\epsilon_r = 52.223$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-19-2014; Ambient Temp: 23.4°C; Tissue Temp: 23.4°C

Probe: EX3DV4 - SN3589; ConvF(6.26, 6.26, 6.26); Calibrated: 1/29/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/22/2014

Phantom: ELI left; Type: QDOVA002AA; Serial: TP:1202

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

Mode: IEEE 802.11b, Body SAR, Ch 01, 1 Mbps, Back Side

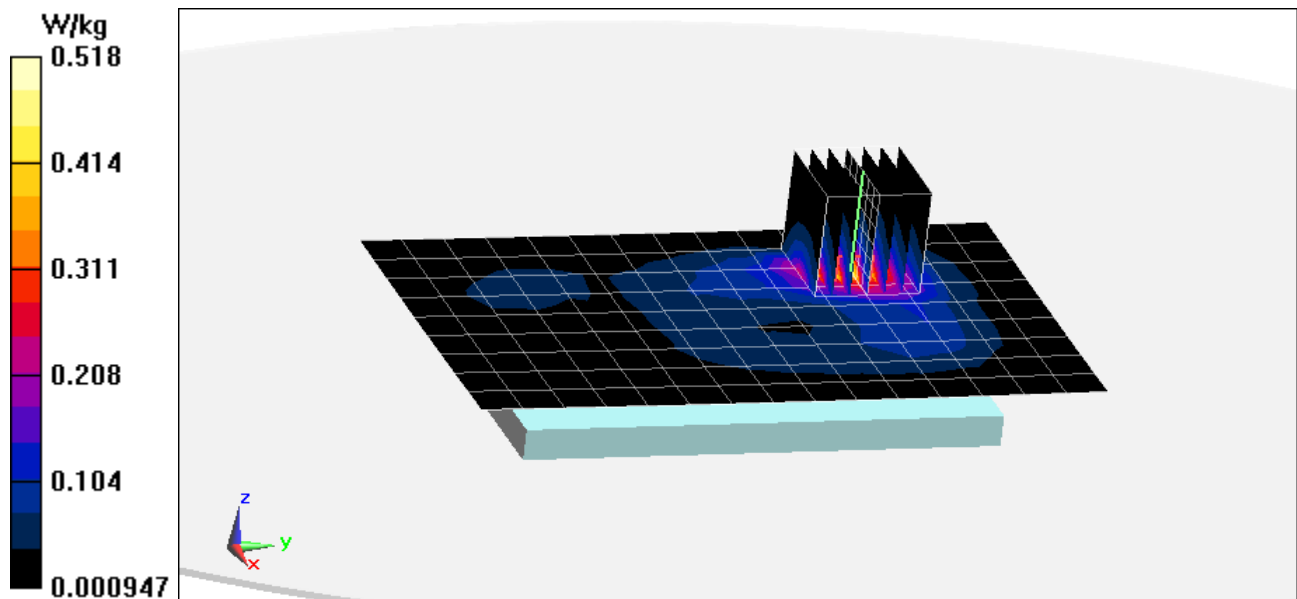
Area Scan (10x16x1): Measurement grid: dx=12mm, dy=12mm

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

Reference Value = 14.206 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 0.805 W/kg

SAR(1 g) = 0.381 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHL710T; Type: Portable Handset; Serial: 1703-7

Communication System: UID 0, IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5765 MHz; Duty Cycle: 1:1

Medium: 5 GHz BodyMedium parameters used:

$f = 5765 \text{ MHz}$; $\sigma = 5.942 \text{ S/m}$; $\epsilon_r = 46.499$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 03-18-2014; Ambient Temp: 22.5°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN3920; ConvF(4, 4, 4); Calibrated: 12/18/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 12/12/2013

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7164)

Mode: IEEE 802.11a, 5.8 GHz, Body SAR, Ch 153, 6 Mbps, Back Side

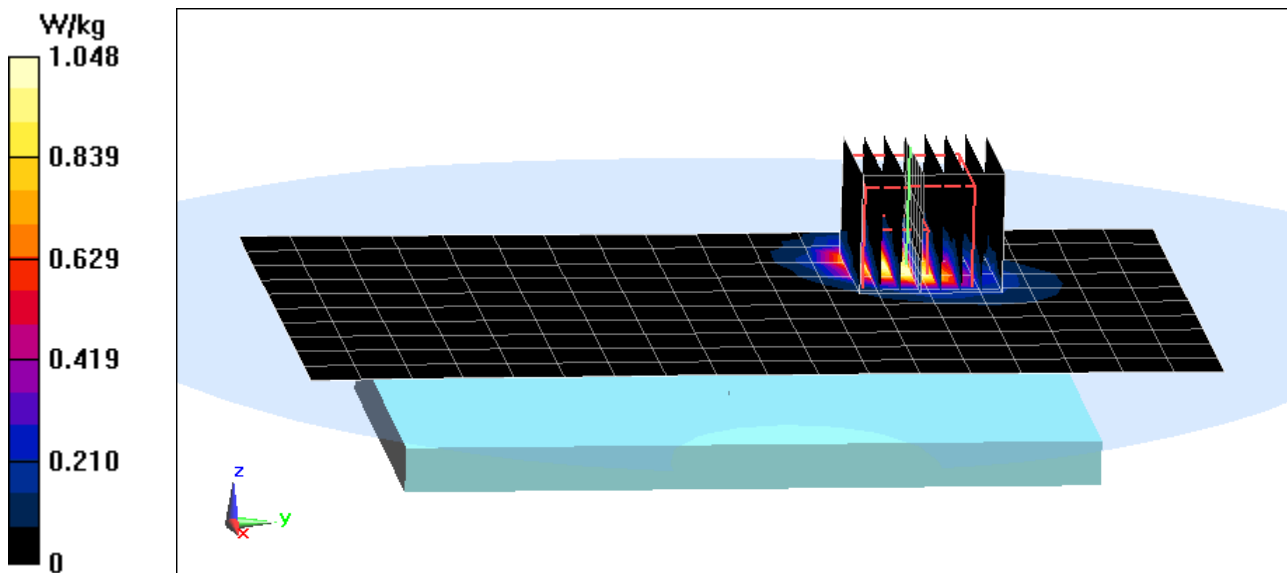
Area Scan (11x19x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 3.733 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 0.482 W/kg

SAR(1 g) = 0.103 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHL710T; Type: Portable Handset; Serial: 1703-7

Communication System: UID 0, IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5320 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5320 \text{ MHz}$; $\sigma = 5.319 \text{ S/m}$; $\epsilon_r = 47.142$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 03-18-2014; Ambient Temp: 22.5°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN3920; ConvF(4.11, 4.11, 4.11); Calibrated: 12/18/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 12/12/2013

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7164)

Mode: IEEE 802.11a, 5.3 GHz, Body SAR, Ch 64, 6 Mbps, Back Side

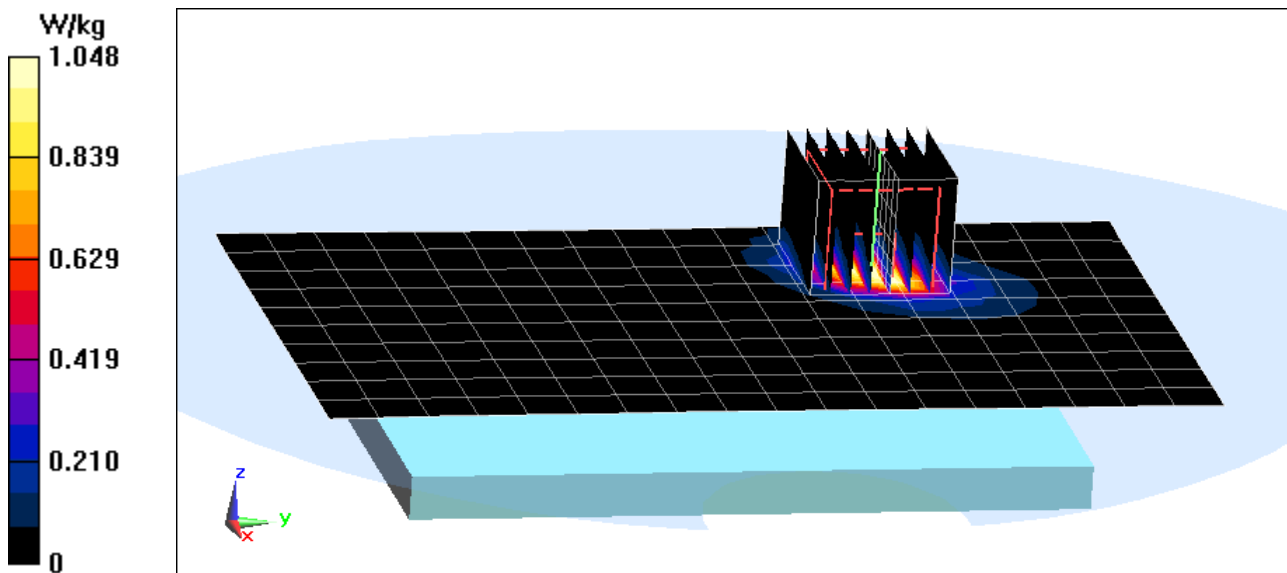
Area Scan (11x19x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 8.119 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 1.52 W/kg

SAR(1 g) = 0.403 W/kg



APPENDIX B: SYSTEM VERIFICATION

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d119

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

Medium: 835 Head Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 0.902 \text{ S/m}$; $\epsilon_r = 39.953$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 03-17-2014; Ambient Temp: 24.2°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3333; ConvF(6.3, 6.3, 6.3); Calibrated: 11/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1408; Calibrated: 11/19/2013

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

835 MHz System Verification

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

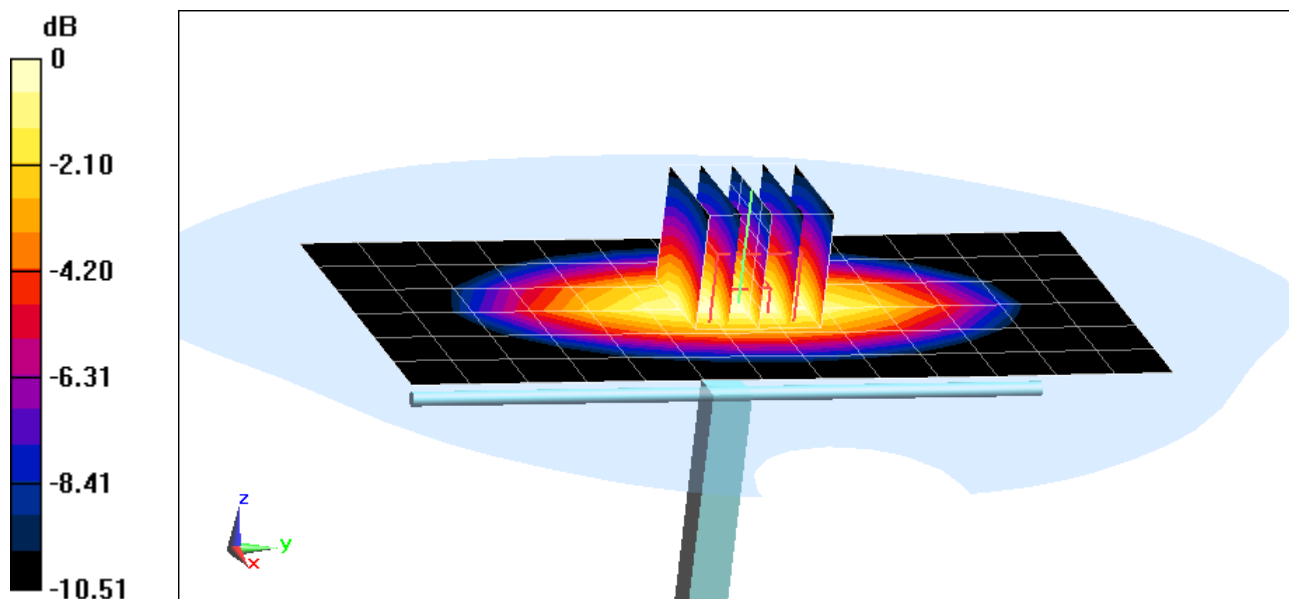
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.41 W/kg

SAR(1 g) = 0.954 W/kg

Deviation = -1.45%



PCTEST ENGINEERING LABORATORY, INC.

DUT: SAR 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):

$f = 1900 \text{ MHz}$; $\sigma = 1.415 \text{ S/m}$; $\epsilon_r = 39.378$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-18-2014; Ambient Temp: 24.0°C; Tissue Temp: 23.4°C

Probe: ES3DV3 - SN3258; ConvF(5.04, 5.04, 5.04); Calibrated: 2/25/2014;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/26/2014

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

1900 MHz System Verification

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

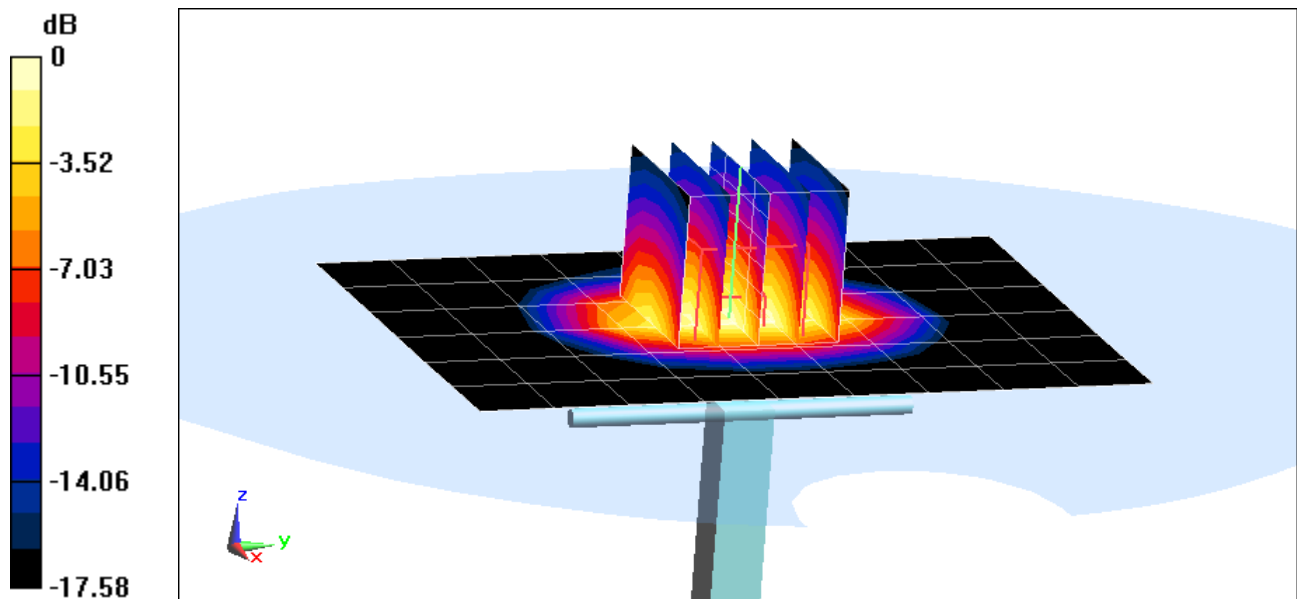
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 7.36 W/kg

SAR(1 g) = 3.95 W/kg

Deviation = -2.23%



0 dB = 4.45 W/kg = 6.48 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: 2450-2600 Head Medium parameters used:

$f = 2450 \text{ MHz}$; $\sigma = 1.776 \text{ S/m}$; $\epsilon_r = 38.606$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-20-2014; Ambient Temp: 24.2°C; Tissue Temp: 23.3°C

Probe: ES3DV3 - SN3258; ConvF(4.52, 4.52, 4.52); Calibrated: 2/25/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/26/2014

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

2450 MHz System Verification

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

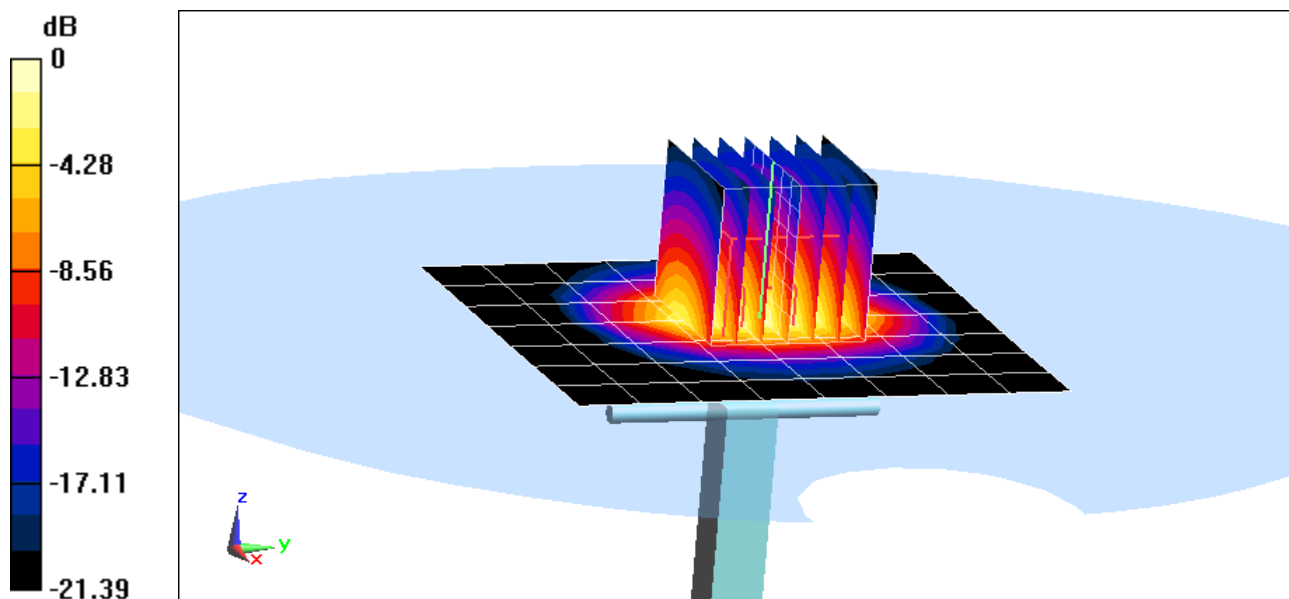
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 11.0 W/kg

SAR(1 g) = 5.37 W/kg

Deviation = 0.94%



0 dB = 7.04 W/kg = 8.48 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 2450-2600 Head Medium parameters used:

$f = 2600 \text{ MHz}$; $\sigma = 1.939 \text{ S/m}$; $\epsilon_r = 38.088$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-20-2014; Ambient Temp: 24.0°C; Tissue Temp: 23.2°C

Probe: ES3DV3 - SN3258; ConvF(4.34, 4.34, 4.34); Calibrated: 2/25/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/26/2014

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

2600 MHz System Verification

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

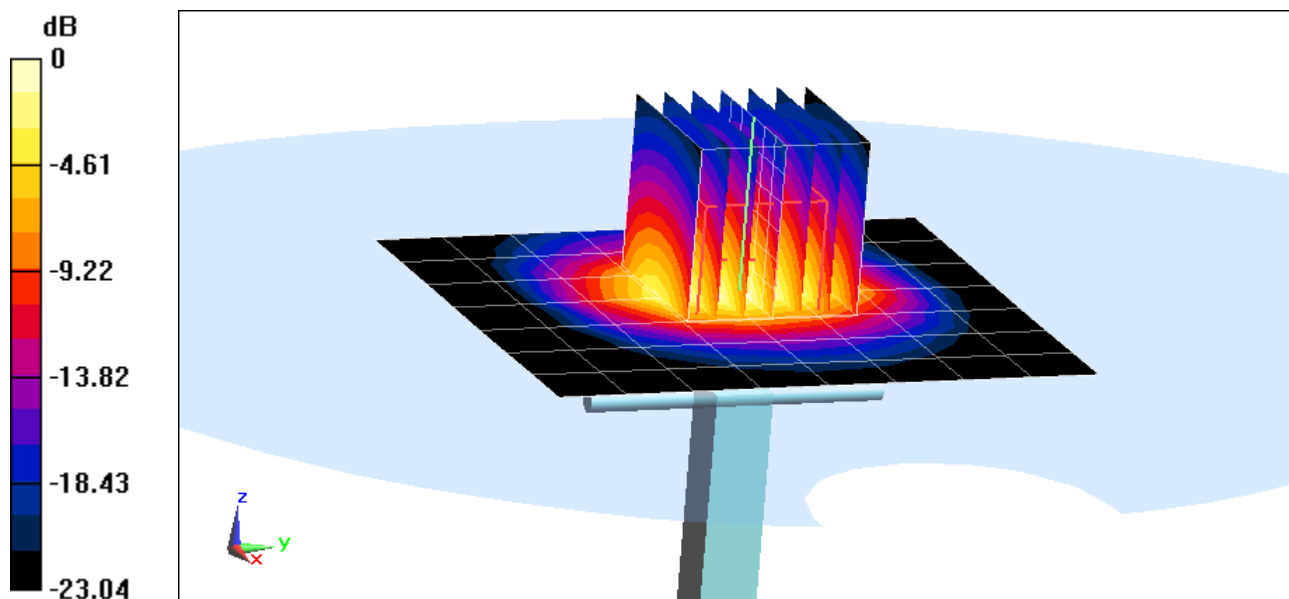
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 12.3 W/kg

SAR(1 g) = 5.8 W/kg

Deviation = -0.34%



0 dB = 7.76 W/kg = 8.90 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5200 MHz; Type: D5GHzV2; Serial: 1057

Communication System: UID 0, CW; Frequency: 5200 MHz; Duty Cycle: 1:1

Medium: 5 GHz Head Medium parameters used:

$f = 5200 \text{ MHz}$; $\sigma = 4.467 \text{ S/m}$; $\epsilon_r = 35.968$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-19-2014; Ambient Temp: 24.5°C; Tissue Temp: 22.8°C

Probe: EX3DV4 - SN3914; ConvF(4.99, 4.99, 4.99); Calibrated: 10/23/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 11/19/2013

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

5200 MHz System Verification

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

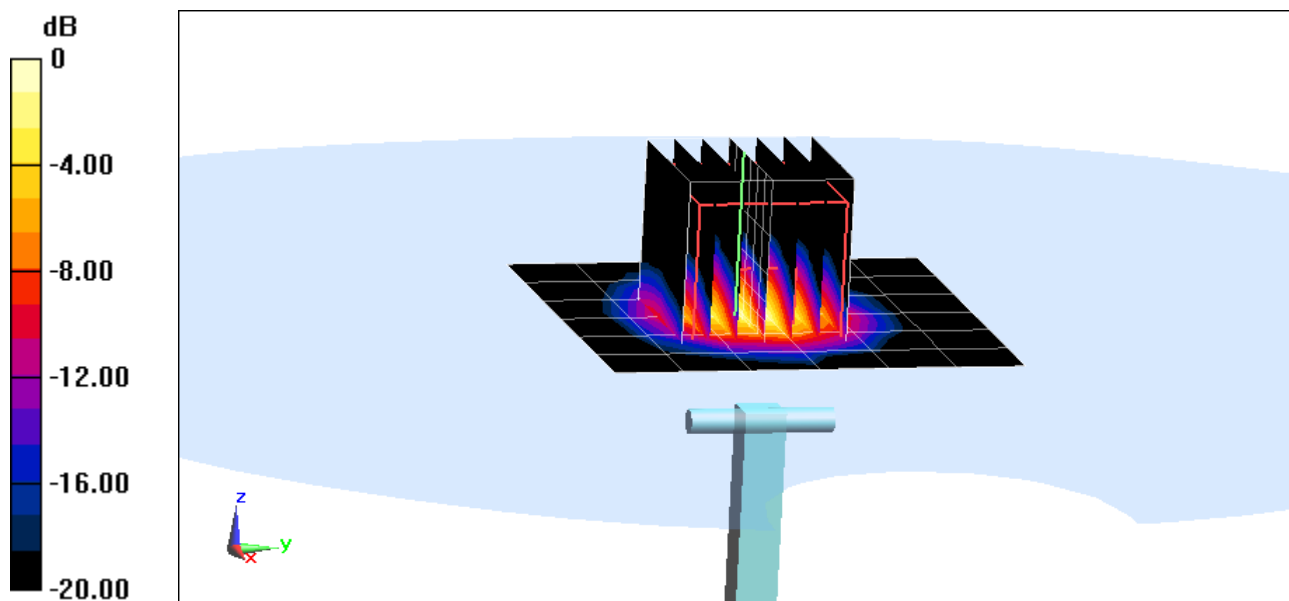
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Input Power = 10.0 dBm (10 mW)

Peak SAR (extrapolated) = 3.15 W/kg

SAR(1 g) = 0.728 W/kg

Deviation = -6.67%



0 dB = 1.74 W/kg = 2.41 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5300 MHz; Type: D5GHzV2; Serial: 1057

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

Medium: 5 GHz Head Medium parameters used:

$f = 5300 \text{ MHz}$; $\sigma = 4.561 \text{ S/m}$; $\epsilon_r = 35.862$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-19-2014; Ambient Temp: 24.4°C; Tissue Temp: 22.8°C

Probe: EX3DV4 - SN3914; ConvF(4.82, 4.82, 4.82); Calibrated: 10/23/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 11/19/2013

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

5300 MHz System Verification

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

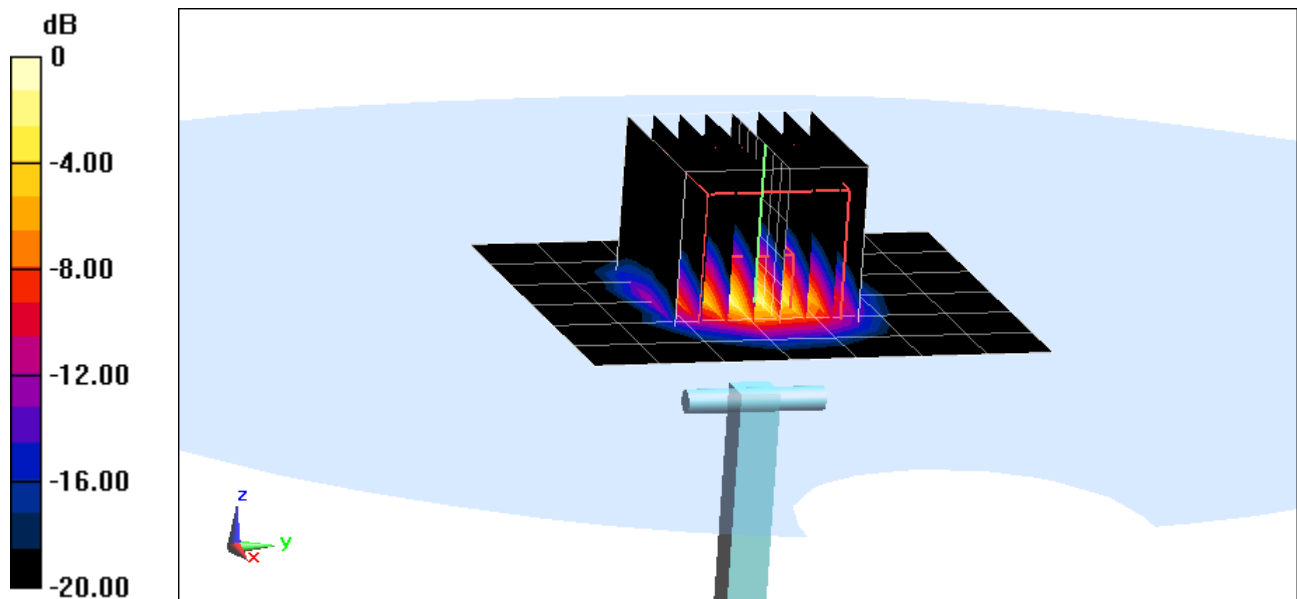
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power = 10.0 dBm (10 mW)

Peak SAR (extrapolated) = 3.53 W/kg

SAR(1 g) = 0.792 W/kg

Deviation = -4.58%



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5600 MHz; Type: D5GHzV2; Serial: 1057

Communication System: UID 0, CW; Frequency: 5600 MHz; Duty Cycle: 1:1

Medium: 5 GHz Head Medium parameters used:

$f = 5600 \text{ MHz}$; $\sigma = 4.878 \text{ S/m}$; $\epsilon_r = 35.458$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-19-2014; Ambient Temp: 24.5°C; Tissue Temp: 22.7°C

Probe: EX3DV4 - SN3914; ConvF(4.37, 4.37, 4.37); Calibrated: 10/23/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 11/19/2013

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

5600 MHz System Verification

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

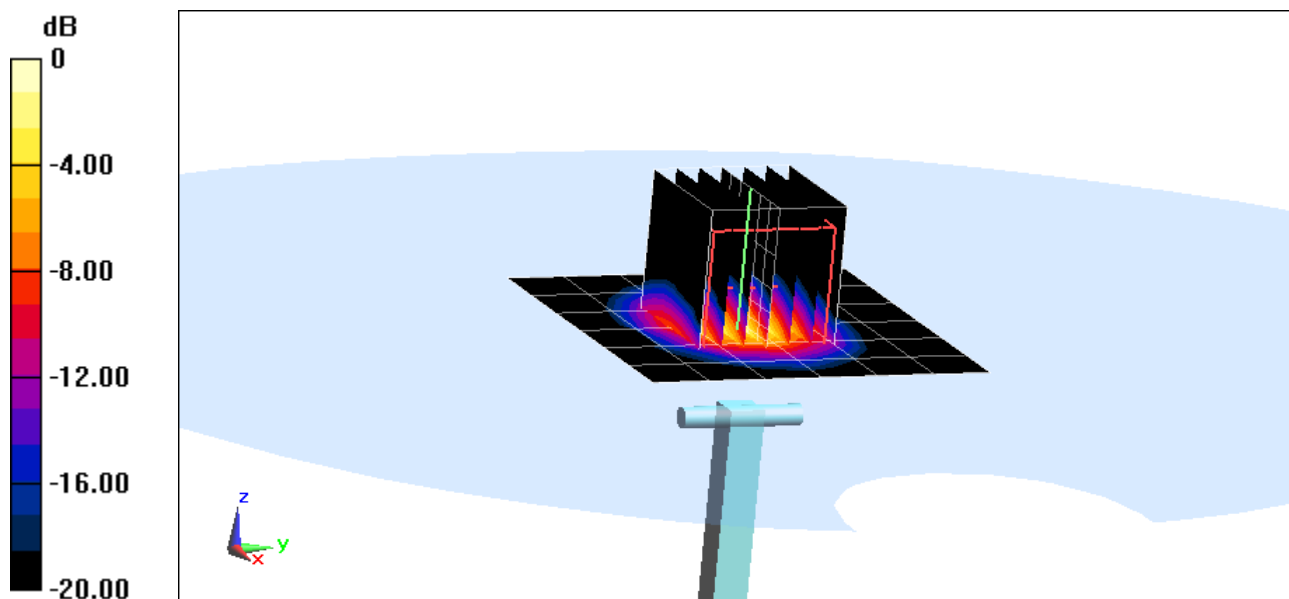
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Input Power = 10.0 dBm (10 mW)

Peak SAR (extrapolated) = 3.79 W/kg

SAR(1 g) = 0.819 W/kg

Deviation = -1.92%



0 dB = 2.16 W/kg = 3.34 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5800 MHz; Type: D5GHzV2; Serial: 1057

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

Medium: 5 GHz Head Medium parameters used:

$f = 5800 \text{ MHz}$; $\sigma = 5.073 \text{ S/m}$; $\epsilon_r = 35.25$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-19-2014; Ambient Temp: 24.5°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN3914; ConvF(4.52, 4.52, 4.52); Calibrated: 10/23/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 11/19/2013

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

5800 MHz System Verification

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

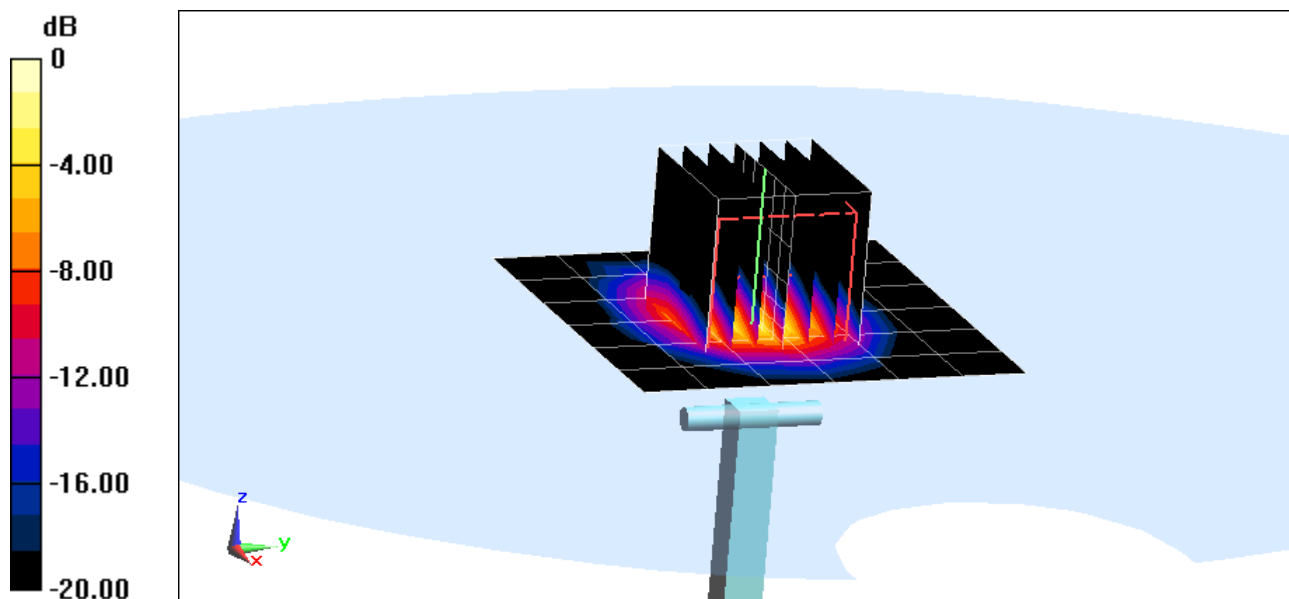
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power = 10.0 dBm (10 mW)

Peak SAR (extrapolated) = 3.73 W/kg

SAR(1 g) = 0.761 W/kg

Deviation = -4.04%



0 dB = 1.93 W/kg = 2.86 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d119

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

Medium: 835 Body Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 1.003 \text{ S/m}$; $\epsilon_r = 53.629$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 03-17-2014; Ambient Temp: 23.2°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3332; ConvF(6.08, 6.08, 6.08); Calibrated: 11/25/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 11/18/2013

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

835 MHz System Verification

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

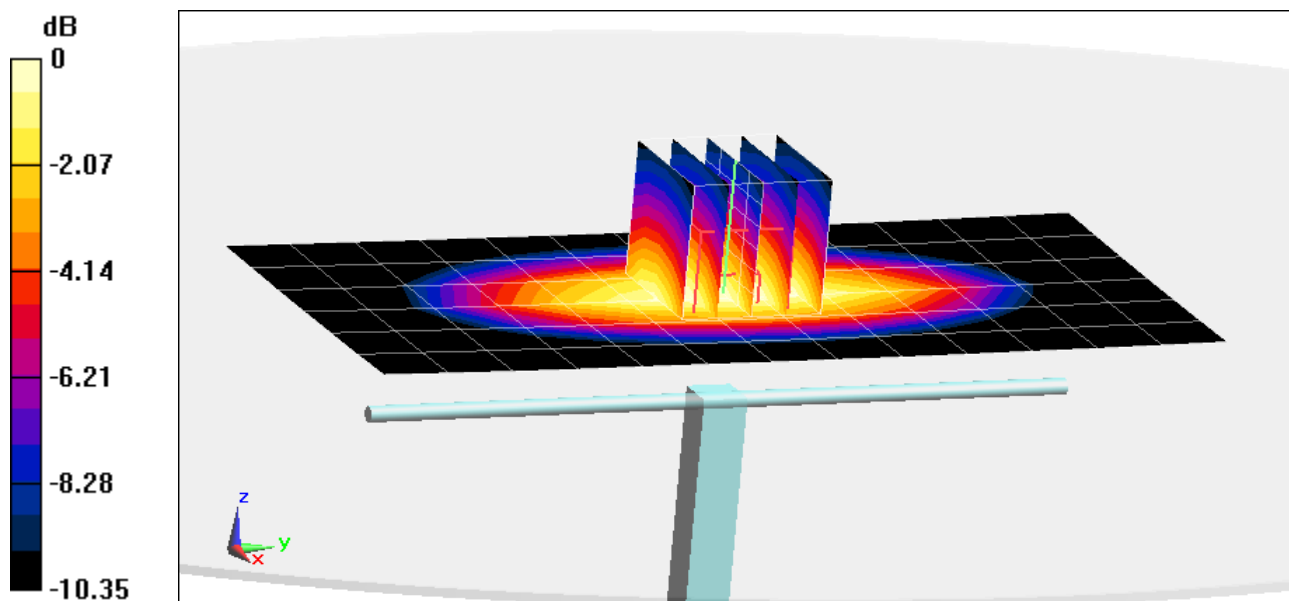
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.39 W/kg

SAR(1 g) = 0.957 W/kg

Deviation = 0.31%



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

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.564 \text{ S/m}$; $\epsilon_r = 51.497$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-19-2014; Ambient Temp: 24.4°C; Tissue Temp: 23.3°C

Probe: ES3DV2 - SN3022; ConvF(4.49, 4.49, 4.49); Calibrated: 8/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/21/2013

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

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

1900 MHz System Verification

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

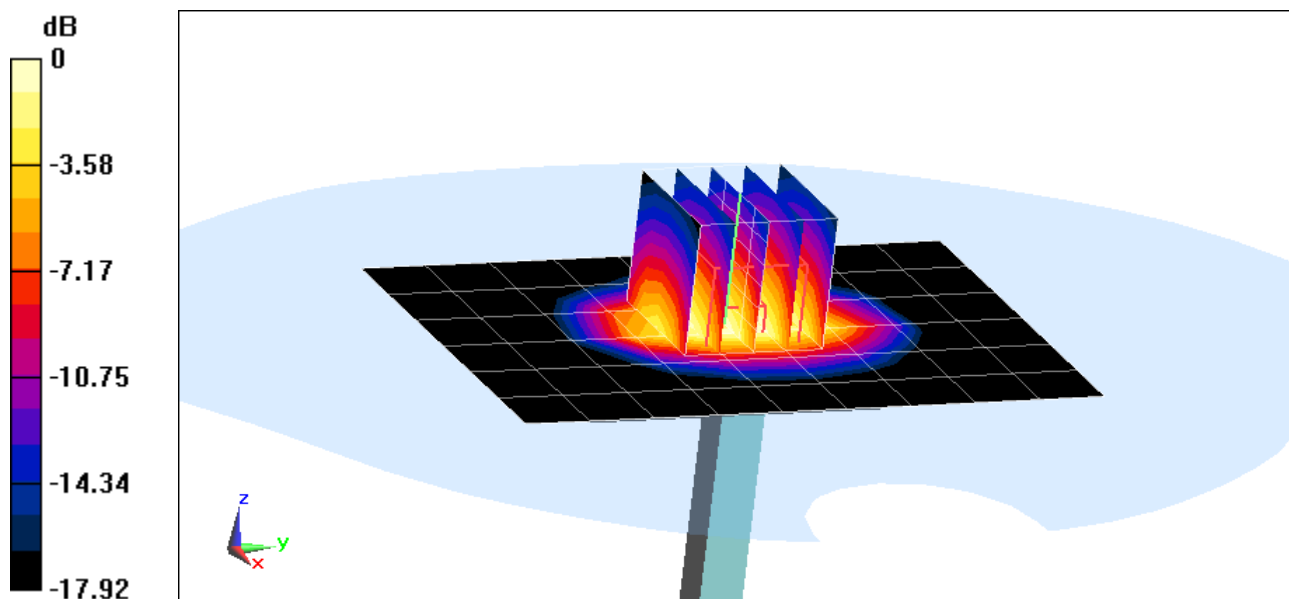
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 7.55 W/kg

SAR(1 g) = 4.17 W/kg

Deviation = 2.96%



0 dB = 4.68 W/kg = 6.70 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: 2450-2600 Body Medium parameters used:

$f = 2450 \text{ MHz}$; $\sigma = 1.979 \text{ S/m}$; $\epsilon_r = 52.093$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-19-2014; Ambient Temp: 23.4°C; Tissue Temp: 23.4°C

Probe: EX3DV4 - SN3589; ConvF(6.26, 6.26, 6.26); Calibrated: 1/29/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/22/2014

Phantom: ELI left; Type: QDOVA002AA; Serial: TP:1202

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

2450 MHz System Verification

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

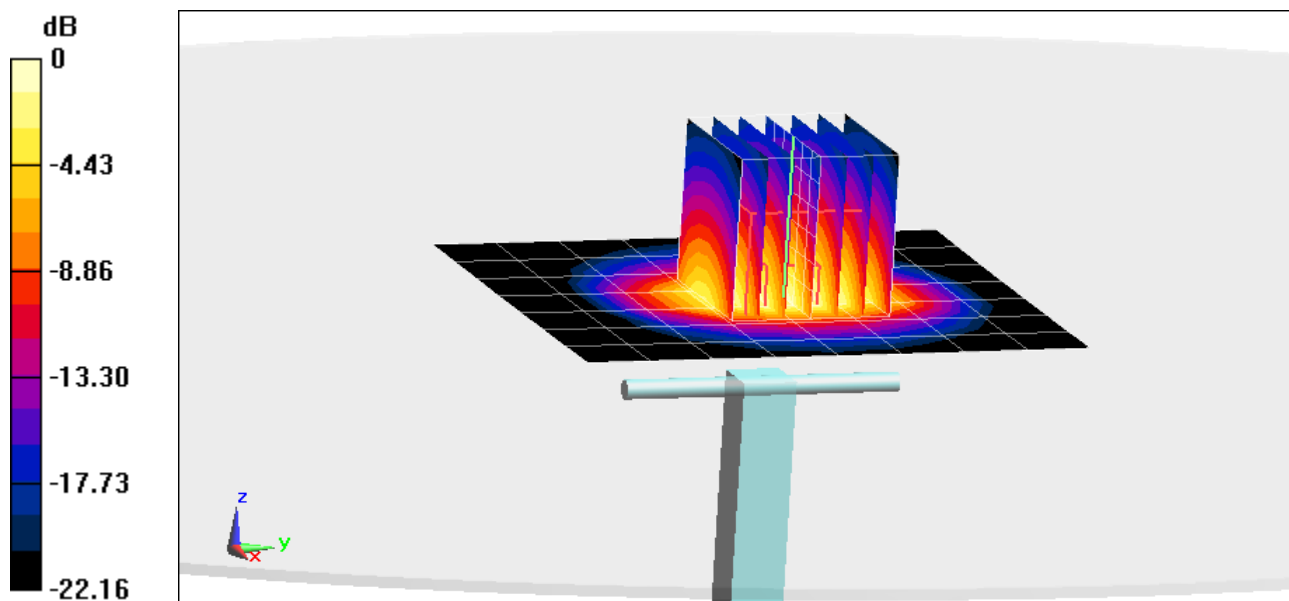
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 10.5 W/kg

SAR(1 g) = 5.01 W/kg

Deviation = -3.09%



0 dB = 6.57 W/kg = 8.18 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 2450-2600 Body Medium parameters used:

$f = 2600 \text{ MHz}$; $\sigma = 2.179 \text{ S/m}$; $\epsilon_r = 51.544$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-19-2014; Ambient Temp: 23.4°C; Tissue Temp: 23.4°C

Probe: EX3DV4 - SN3589; ConvF(6.08, 6.08, 6.08); Calibrated: 1/29/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/22/2014

Phantom: ELI left; Type: QDOVA002AA; Serial: TP:1202

Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

2600 MHz System Verification

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

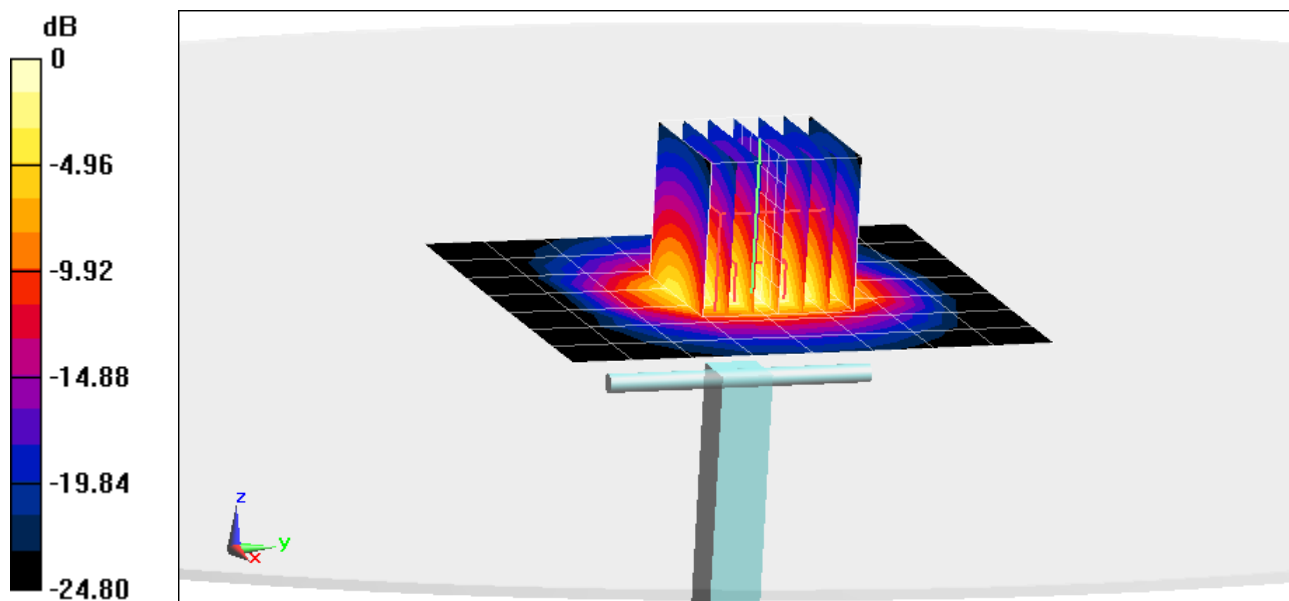
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 12.1 W/kg

SAR(1 g) = 5.43 W/kg

Deviation = -5.57%



0 dB = 7.23 W/kg = 8.59 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5200 MHz; Type: D5GHzV2; Serial: 1007

Communication System: UID 0, CW; Frequency: 5200 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5200 \text{ MHz}$; $\sigma = 5.162 \text{ S/m}$; $\epsilon_r = 47.513$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-18-2014; Ambient Temp: 22.5°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN3920; ConvF(4.23, 4.23, 4.23); Calibrated: 12/18/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 12/12/2013

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7164)

5200MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=10mm, dy=10mm

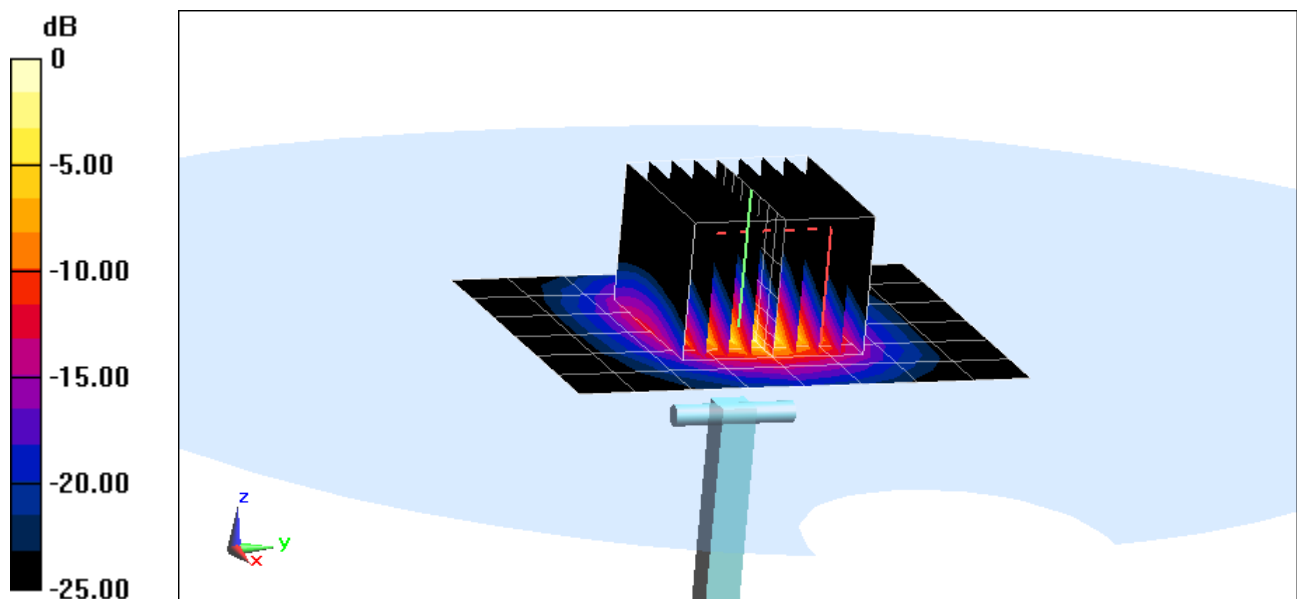
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 29.1 W/kg

SAR(1 g) = 7.32 W/kg

Deviation = 0.83%



0 dB = 18.6 W/kg = 12.70 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5300 MHz; Type: D5GHzV2; Serial: 1007

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

Medium: 5 GHz Body Medium parameters used:

$f = 5300 \text{ MHz}$; $\sigma = 5.289 \text{ S/m}$; $\epsilon_r = 47.204$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-18-2014; Ambient Temp: 22.5°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN3920; ConvF(4.11, 4.11, 4.11); Calibrated: 12/18/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 12/12/2013

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7164)

5300MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=10mm, dy=10mm

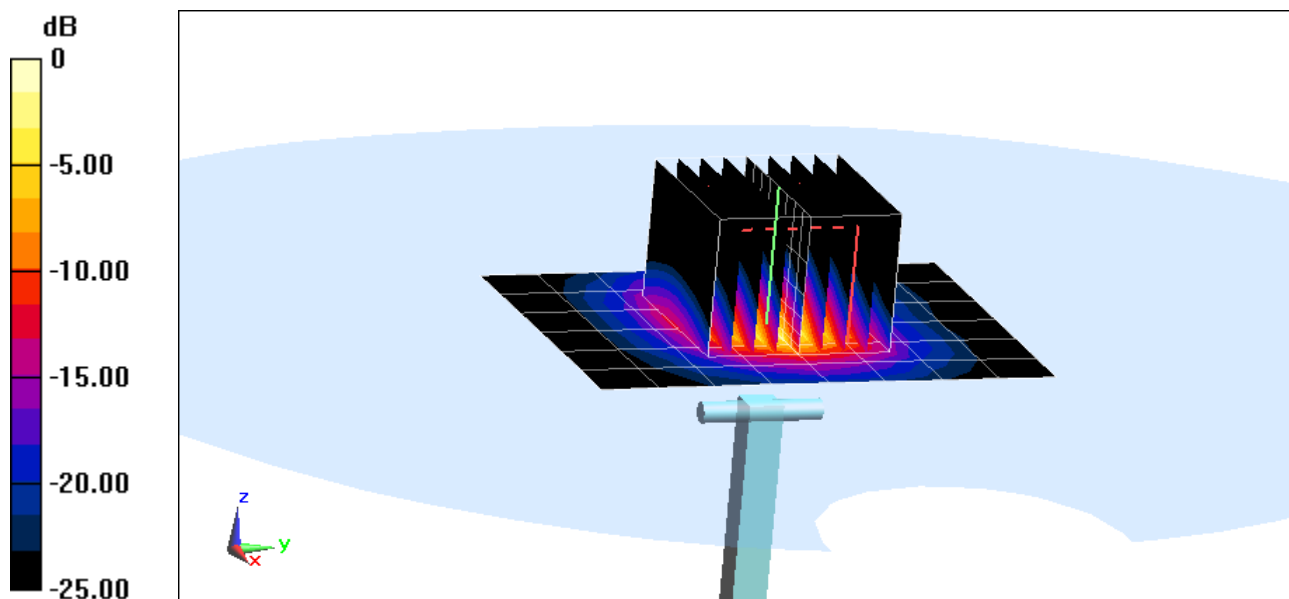
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 31.2 W/kg

SAR(1 g) = 7.57 W/kg

Deviation = 1.34%



0 dB = 19.6 W/kg = 12.92 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5600 MHz; Type: D5GHzV2; Serial: 1007

Communication System: UID 0, CW; Frequency: 5600 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5600 \text{ MHz}$; $\sigma = 5.712 \text{ S/m}$; $\epsilon_r = 46.518$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 03-18-2014; Ambient Temp: 22.5°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN3920; ConvF(3.62, 3.62, 3.62); Calibrated: 12/18/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 12/12/2013

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357

Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.10 (7164)

5600 MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=10mm, dy=10mm

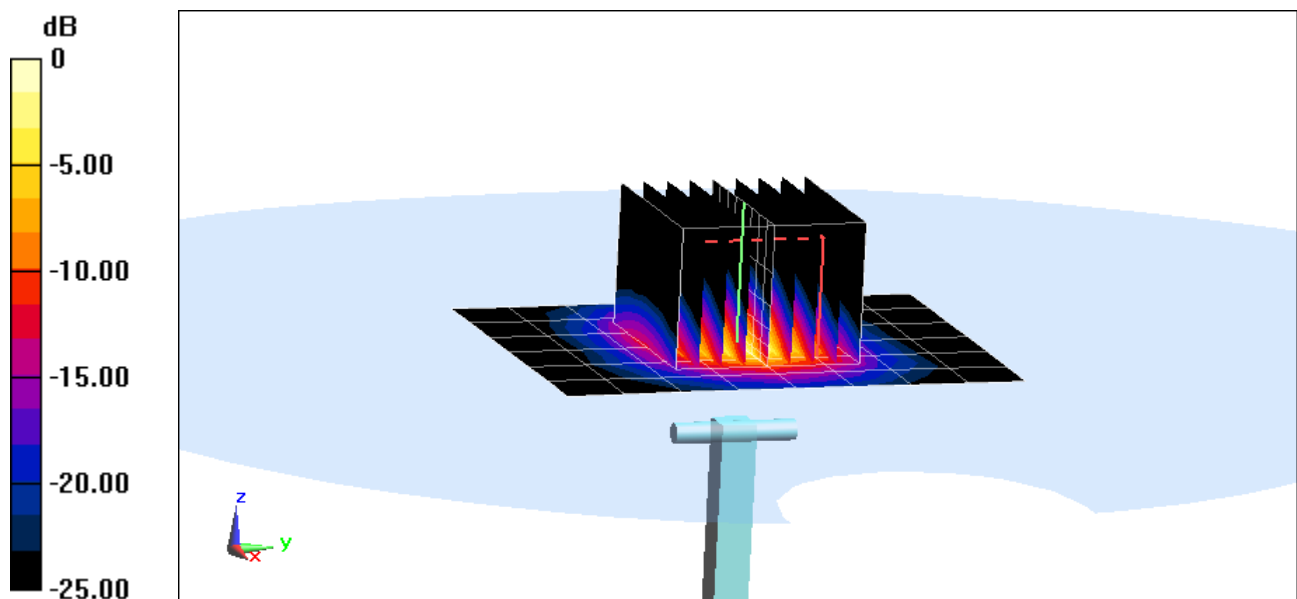
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 33.9 W/kg

SAR(1 g) = 7.61 W/kg

Deviation = -1.55%



0 dB = 20.1 W/kg = 13.03 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5800 MHz; Type: D5GHzV2; Serial: 1007

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

Medium: 5 GHz Body Medium parameters used:

$f = 5800 \text{ MHz}$; $\sigma = 5.985 \text{ S/m}$; $\epsilon_r = 46.544$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-18-2014; Ambient Temp: 22.5°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN3920; ConvF(4, 4, 4); Calibrated: 12/18/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 12/12/2013

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357

Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.10 (7164)

5800MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=10mm, dy=10mm

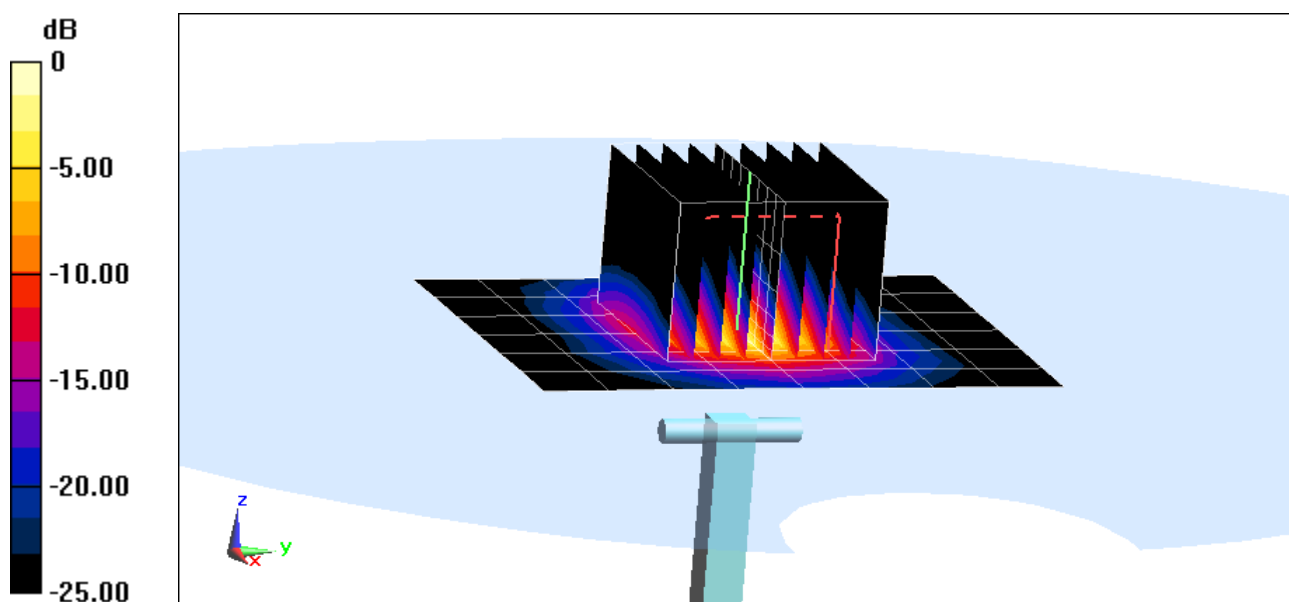
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 32.1 W/kg

SAR(1 g) = 7.22 W/kg

Deviation = -0.96%



0 dB = 19.0 W/kg = 12.79 dBW/kg

APPENDIX C: PROBE CALIBRATION



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

Client **PC Test**

Certificate No: **ES3-3333_Nov13**

CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3333**

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

Calibration date: **November 22, 2013**

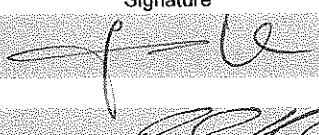
This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

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)

*KOK
11/14*

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
Reference Probe ES3DV2	SN: 3013	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
DAE4	SN: 660	4-Sep-13 (No. DAE4-660_Sep13)	Sep-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-15
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	Function Technical Manager	Signature 

Issued: November 25, 2013

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
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:3333

Manufactured: January 24, 2012
Calibrated: November 22, 2013

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

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	1.08	0.90	0.88	$\pm 10.1 \%$
DCP (mV) ^B	104.9	103.3	101.7	

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	140.9	$\pm 2.2 \%$
		Y	0.0	0.0	1.0		132.0	
		Z	0.0	0.0	1.0		170.3	

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 5 and 6).

^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	6.56	6.56	6.56	0.44	1.54	± 12.0 %
850	41.5	0.92	6.30	6.30	6.30	0.46	1.48	± 12.0 %
1750	40.1	1.37	5.23	5.23	5.23	0.77	1.17	± 12.0 %
1900	40.0	1.40	5.05	5.05	5.05	0.80	1.19	± 12.0 %
2450	39.2	1.80	4.42	4.42	4.42	0.74	1.31	± 12.0 %
2600	39.0	1.96	4.28	4.28	4.28	0.80	1.30	± 12.0 %

^C Frequency validity 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.

^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 ^G (mm)	Unct. (k=2)
750	55.5	0.96	6.11	6.11	6.11	0.33	1.90	± 12.0 %
850	55.2	0.99	6.07	6.07	6.07	0.80	1.19	± 12.0 %
1750	53.4	1.49	4.95	4.95	4.95	0.80	1.26	± 12.0 %
1900	53.3	1.52	4.71	4.71	4.71	0.49	1.54	± 12.0 %
2450	52.7	1.95	4.22	4.22	4.22	0.80	0.95	± 12.0 %
2600	52.5	2.16	4.16	4.16	4.16	0.80	1.07	± 12.0 %

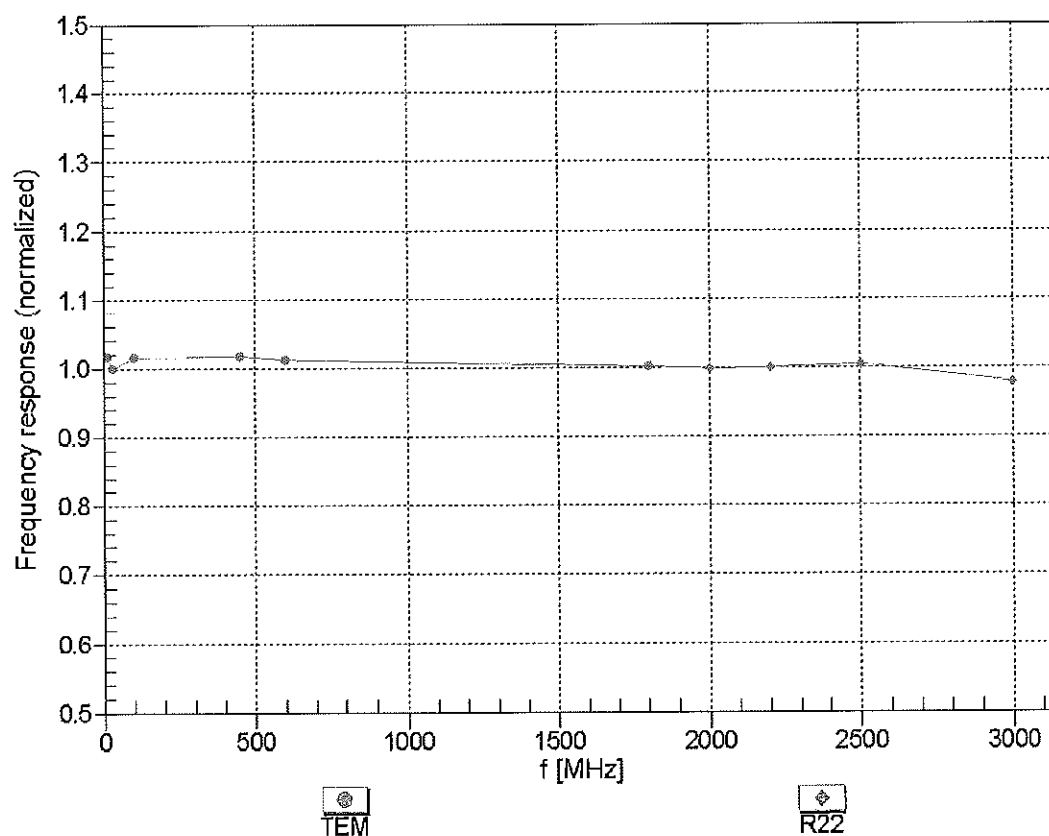
^C Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

^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

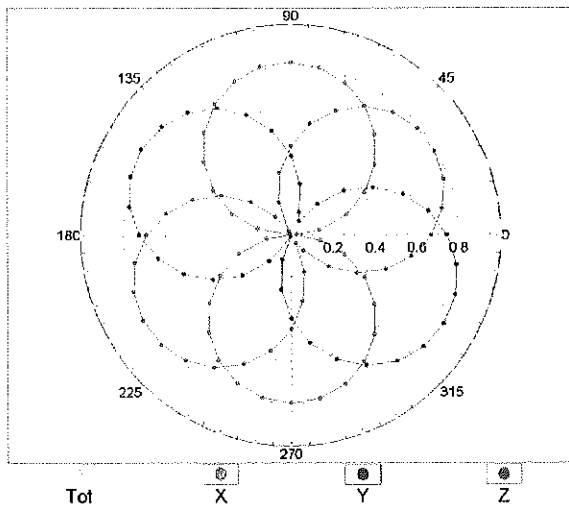
(TEM-Cell:ifi110 EXX, Waveguide: R22)



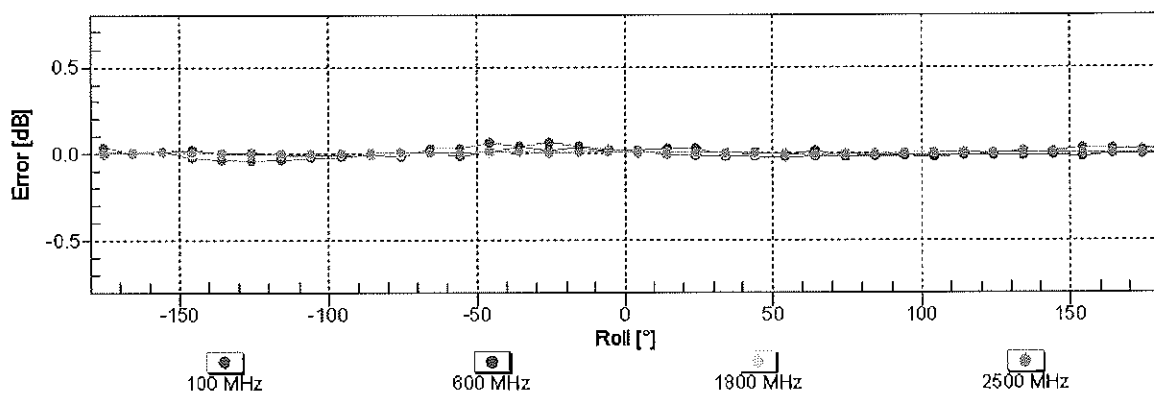
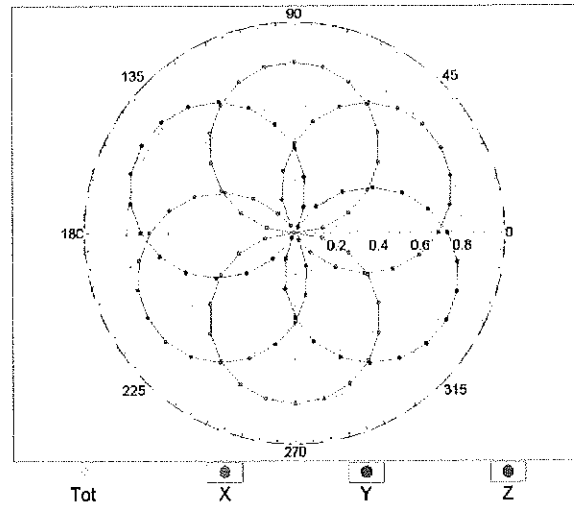
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

Receiving Pattern (ϕ), $\vartheta = 0^\circ$

f=600 MHz,TEM

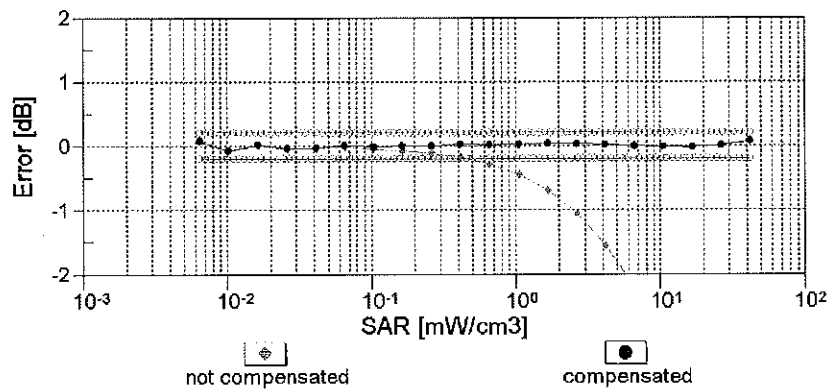
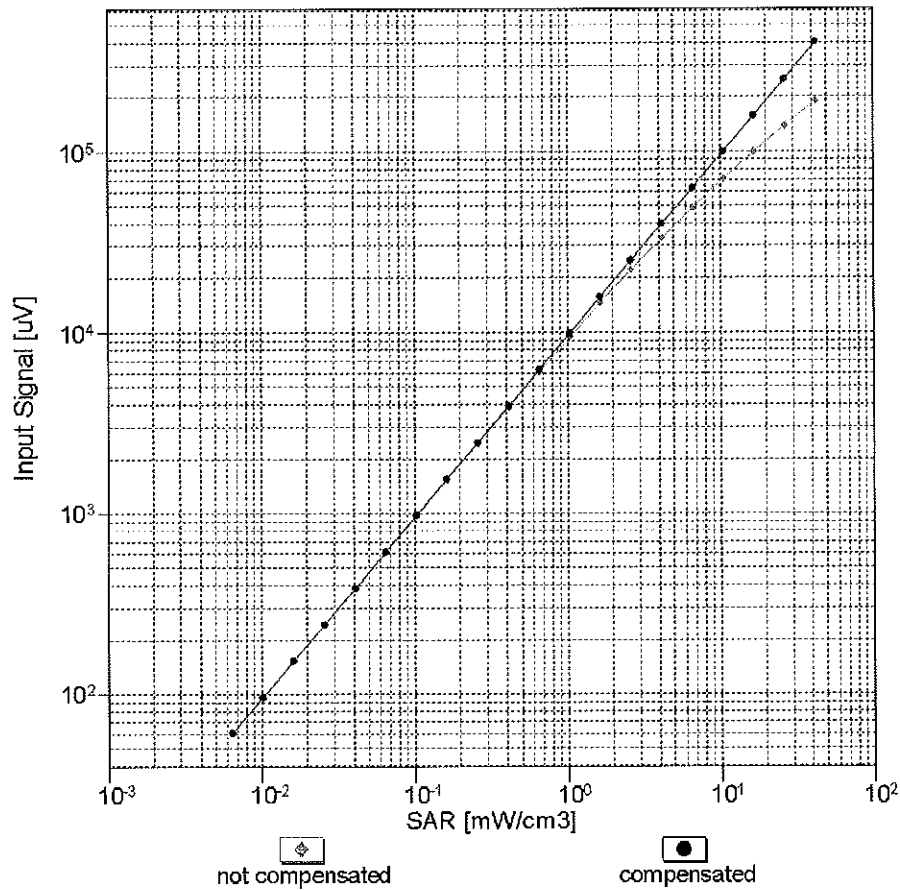


f=1800 MHz,R22



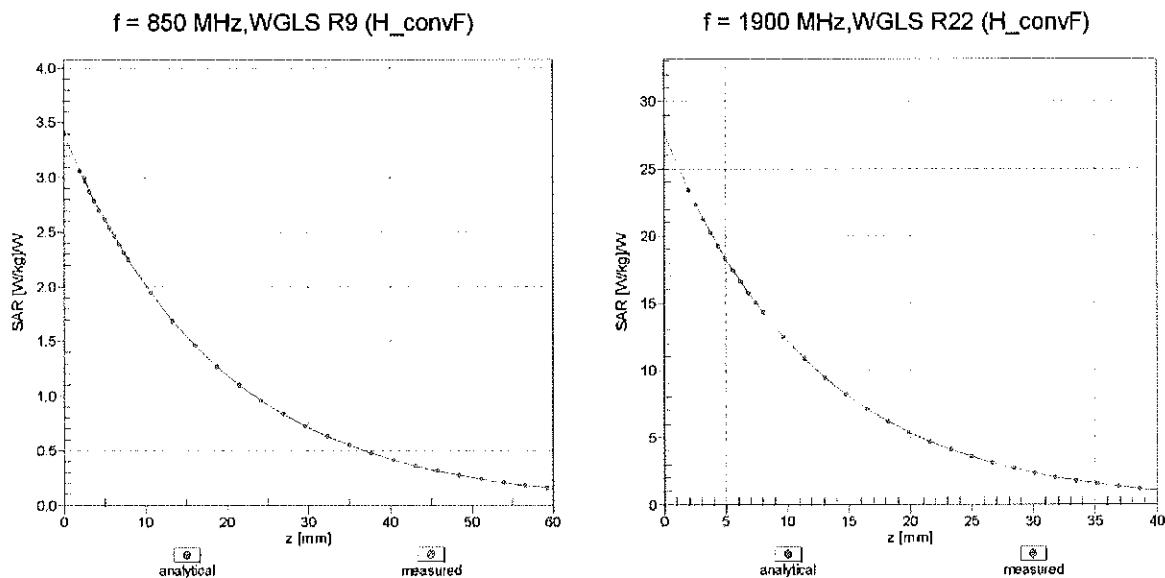
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range f(SAR_{head})
(TEM cell , f = 900 MHz)



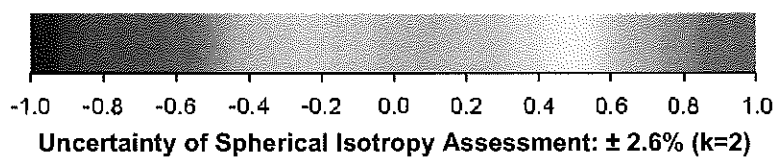
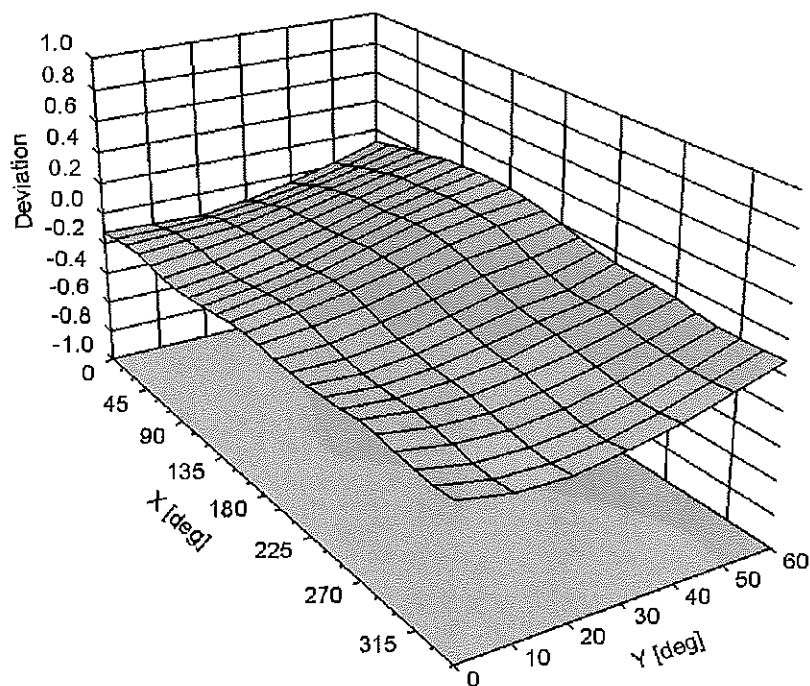
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ , θ), $f = 900 \text{ MHz}$



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

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-35.7
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 108**

Client **PC Test**

Certificate No: **ES3-3258_Feb14**

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

CCV
 3/6/14

Calibration date: **February 25, 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	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
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 Israe El-Naouq	Function Laboratory Technician	Signature
Approved by:	Katja Pokovic	Technical Manager	
			Issued: February 27, 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
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:3258

Manufactured: January 25, 2010
Calibrated: February 25, 2014

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

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	1.19	1.23	$\pm 10.1 \%$
DCP (mV) ^B	104.5	107.0	103.0	

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	222.4	$\pm 3.8 \%$
		Y	0.0	0.0	1.0		202.2	
		Z	0.0	0.0	1.0		207.1	
10010- CAA	SAR Validation (Square, 100ms, 10ms)	X	5.09	65.6	14.1	10.00	44.8	$\pm 1.9 \%$
		Y	1.68	57.4	9.3		40.7	
		Z	4.01	62.4	13.0		51.1	
10011- CAB	UMTS-FDD (WCDMA)	X	3.34	67.5	18.9	2.91	131.2	$\pm 0.5 \%$
		Y	3.43	67.9	18.7		137.1	
		Z	3.42	67.8	19.0		146.0	
10012- CAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	3.40	70.9	19.8	1.87	134.2	$\pm 0.7 \%$
		Y	3.19	70.2	19.2		137.9	
		Z	3.46	70.8	19.6		149.6	
10021- DAB	GSM-FDD (TDMA, GMSK)	X	30.24	99.7	28.7	9.39	131.2	$\pm 1.4 \%$
		Y	12.91	88.5	23.9		147.5	
		Z	30.37	99.5	28.9		128.0	
10023- DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	29.88	100.0	29.0	9.57	123.0	$\pm 1.9 \%$
		Y	16.02	92.5	25.4		140.7	
		Z	30.01	100.0	29.4		125.8	
10024- DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	44.57	99.7	25.9	6.56	119.6	$\pm 1.7 \%$
		Y	28.97	95.3	23.2		127.6	
		Z	43.72	99.8	26.3		120.1	
10027- DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	53.52	99.7	24.4	4.80	129.4	$\pm 2.2 \%$
		Y	54.55	99.9	22.9		143.3	
		Z	51.63	99.7	24.8		127.5	
10028- DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	58.93	99.8	23.4	3.55	133.4	$\pm 2.2 \%$
		Y	77.54	99.7	21.3		125.3	
		Z	56.64	99.8	23.8		130.8	
10032- CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	47.03	99.5	21.3	1.16	136.3	$\pm 1.7 \%$
		Y	95.86	95.2	17.1		138.2	
		Z	39.68	100.0	22.2		132.3	
10039- CAB	CDMA2000 (1xRTT, RC1)	X	4.84	66.8	19.1	4.57	131.3	$\pm 0.9 \%$
		Y	4.75	67.0	18.9		135.2	
		Z	4.86	66.7	19.0		127.2	

10081-CAB	CDMA2000 (1xRTT, RC3)	X	4.06	66.8	19.0	3.97	148.4	±0.7 %
		Y	3.96	66.6	18.6		134.7	
		Z	4.13	66.9	19.1		143.4	
10098-CAB	UMTS-FDD (HSUPA, Subtest 2)	X	4.63	66.8	18.7	3.98	137.3	±0.7 %
		Y	4.75	67.5	18.8		148.4	
		Z	4.65	66.7	18.7		133.2	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.66	68.5	20.3	5.67	144.0	±1.2 %
		Y	6.27	67.1	19.3		130.6	
		Z	6.62	68.2	20.1		140.5	
10108-CAB	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.53	68.0	20.2	5.80	142.6	±1.4 %
		Y	6.17	66.8	19.3		129.2	
		Z	6.52	67.8	20.1		139.0	
10110-CAB	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X	6.19	67.3	19.9	5.75	137.9	±1.4 %
		Y	6.12	67.3	19.6		149.5	
		Z	6.19	67.1	19.8		136.1	
10114-CAA	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	X	10.49	69.5	21.7	8.10	132.4	±2.5 %
		Y	10.23	69.1	21.3		144.3	
		Z	10.45	69.3	21.6		129.5	
10117-CAA	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.46	69.5	21.7	8.07	133.9	±2.5 %
		Y	10.26	69.2	21.3		147.4	
		Z	10.47	69.4	21.7		130.5	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	11.61	77.4	26.8	9.28	118.8	±3.0 %
		Y	9.89	75.2	25.7		144.9	
		Z	12.01	77.8	26.9		119.6	
10154-CAB	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	6.20	67.3	19.9	5.75	139.2	±1.2 %
		Y	5.86	66.2	19.0		128.5	
		Z	6.22	67.3	19.9		136.3	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.63	67.8	20.1	5.82	144.1	±1.4 %
		Y	6.31	66.8	19.3		133.1	
		Z	6.66	67.7	20.0		140.9	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	5.25	67.5	20.2	5.73	143.6	±1.2 %
		Y	4.92	66.7	19.5		131.0	
		Z	5.29	67.4	20.2		140.7	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	13.49	87.5	31.6	9.21	139.0	±2.7 %
		Y	7.83	75.5	26.0		124.9	
		Z	13.47	86.5	31.1		137.8	
10175-CAB	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	5.22	67.4	20.1	5.72	144.3	±1.4 %
		Y	5.08	67.5	19.9		147.9	
		Z	5.26	67.2	20.0		139.6	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	5.24	67.5	20.1	5.72	144.5	±1.2 %
		Y	5.06	67.4	19.8		147.0	
		Z	5.29	67.3	20.1		139.2	

10193-CAA	IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	X	10.12	69.1	21.6	8.09	128.8	±2.2 %
		Y	9.76	68.4	21.0		132.8	
		Z	10.08	68.9	21.5		123.4	
10196-CAA	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	10.15	69.2	21.7	8.10	130.2	±2.2 %
		Y	9.77	68.5	21.0		134.1	
		Z	10.10	69.0	21.5		124.0	
10219-CAA	IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)	X	10.02	69.0	21.5	8.03	128.7	±2.2 %
		Y	9.67	68.5	21.0		133.3	
		Z	10.02	68.9	21.5		123.9	
10222-CAA	IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)	X	10.46	69.6	21.7	8.06	134.0	±2.2 %
		Y	10.09	68.8	21.1		139.7	
		Z	10.40	69.3	21.6		128.7	
10225-CAB	UMTS-FDD (HSPA+)	X	7.09	67.1	19.6	5.97	131.2	±1.4 %
		Y	6.98	67.2	19.4		138.0	
		Z	7.06	66.8	19.4		127.2	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	13.63	87.8	31.7	9.21	141.6	±3.0 %
		Y	7.85	75.5	26.0		126.5	
		Z	13.99	87.7	31.6		141.4	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	12.86	81.4	28.9	9.24	142.1	±3.0 %
		Y	8.91	73.4	24.8		129.9	
		Z	13.15	81.4	28.8		142.0	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	11.63	77.5	26.8	9.30	118.7	±3.0 %
		Y	9.62	74.3	25.2		138.4	
		Z	11.96	77.7	26.9		119.3	
10274-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)	X	6.14	67.4	19.3	4.87	149.9	±0.9 %
		Y	5.90	66.9	18.7		132.8	
		Z	6.20	67.5	19.3		146.6	
10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.45	66.9	18.9	3.96	130.1	±0.7 %
		Y	4.50	67.2	18.8		137.9	
		Z	4.64	67.6	19.3		149.2	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.79	67.5	19.2	3.46	145.3	±0.7 %
		Y	3.74	67.5	18.9		128.2	
		Z	3.78	67.3	19.1		139.1	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.77	67.8	19.3	3.39	147.0	±0.5 %
		Y	3.69	67.7	18.9		130.1	
		Z	3.73	67.3	19.0		141.3	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.52	67.9	20.1	5.81	141.4	±1.4 %
		Y	6.41	67.6	19.7		147.4	
		Z	6.51	67.7	20.1		135.4	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	7.17	68.7	20.7	6.06	147.7	±1.4 %
		Y	6.69	67.2	19.6		128.6	
		Z	7.12	68.4	20.5		142.0	

10315-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)	X	3.04	70.0	19.6	1.71	129.8	±0.5 %
		Y	3.25	71.3	19.7		136.9	
		Z	3.09	69.9	19.5		148.7	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.73	67.3	18.6	3.76	135.7	±0.5 %
		Y	4.93	69.1	19.0		141.5	
		Z	4.73	67.1	18.4		132.7	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.67	67.5	18.6	3.77	134.0	±0.5 %
		Y	4.92	69.4	19.1		139.8	
		Z	4.65	67.1	18.5		130.7	

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 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: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	6.53	6.53	6.53	0.40	1.60	± 12.0 %
835	41.5	0.90	6.27	6.27	6.27	0.80	1.17	± 12.0 %
1750	40.1	1.37	5.19	5.19	5.19	0.80	1.10	± 12.0 %
1900	40.0	1.40	5.04	5.04	5.04	0.68	1.27	± 12.0 %
2450	39.2	1.80	4.52	4.52	4.52	0.78	1.23	± 12.0 %
2600	39.0	1.96	4.34	4.34	4.34	0.76	1.33	± 12.0 %

^C Frequency validity 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.

^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

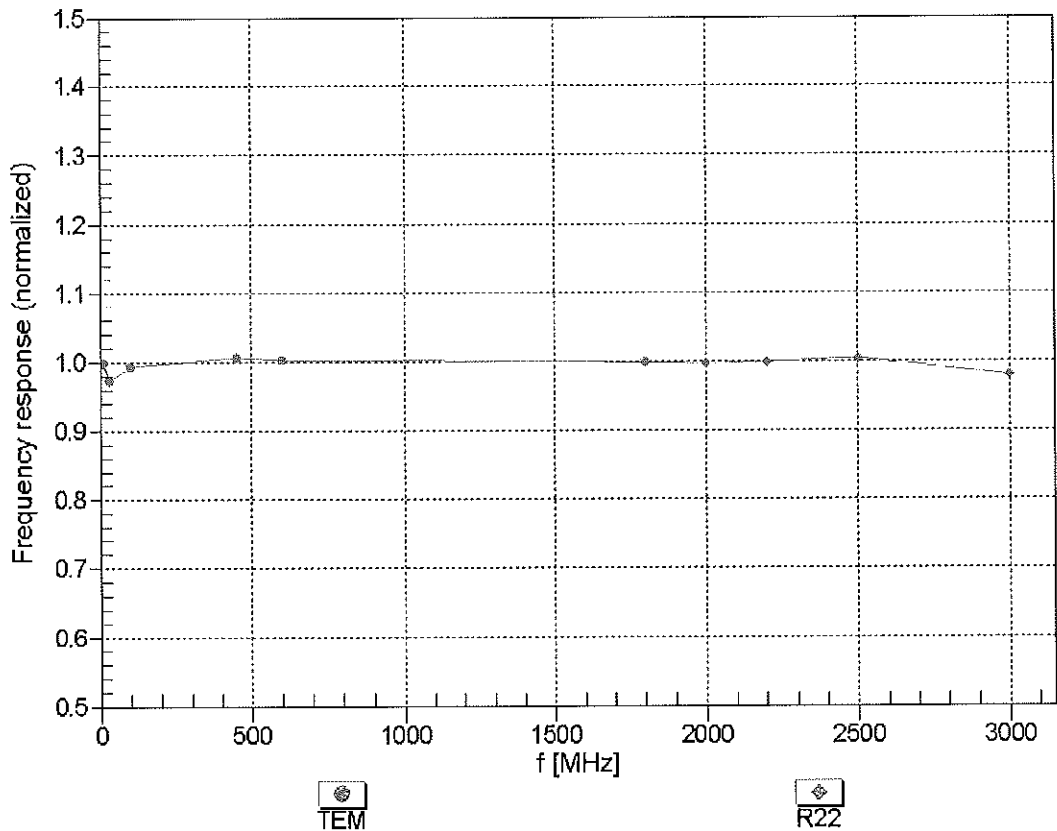
f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unct. (k=2)
750	55.5	0.96	6.15	6.15	6.15	0.61	1.32	± 12.0 %
835	55.2	0.97	6.11	6.11	6.11	0.80	1.15	± 12.0 %
1750	53.4	1.49	4.83	4.83	4.83	0.47	1.74	± 12.0 %
1900	53.3	1.52	4.61	4.61	4.61	0.55	1.59	± 12.0 %
2450	52.7	1.95	4.14	4.14	4.14	0.80	1.11	± 12.0 %
2600	52.5	2.16	3.91	3.91	3.91	0.80	1.00	± 12.0 %

^C Frequency validity 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.

^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.

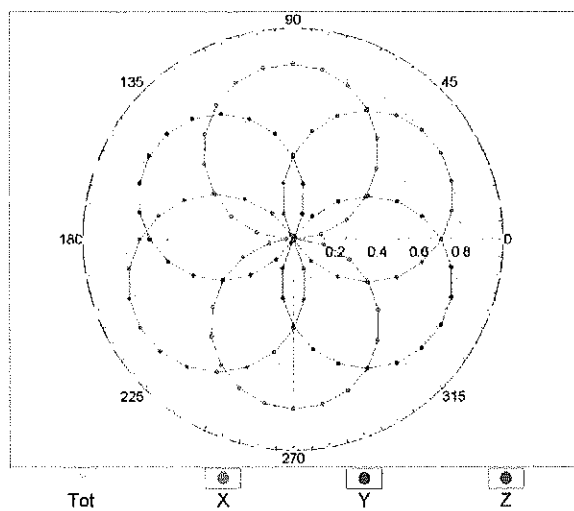
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



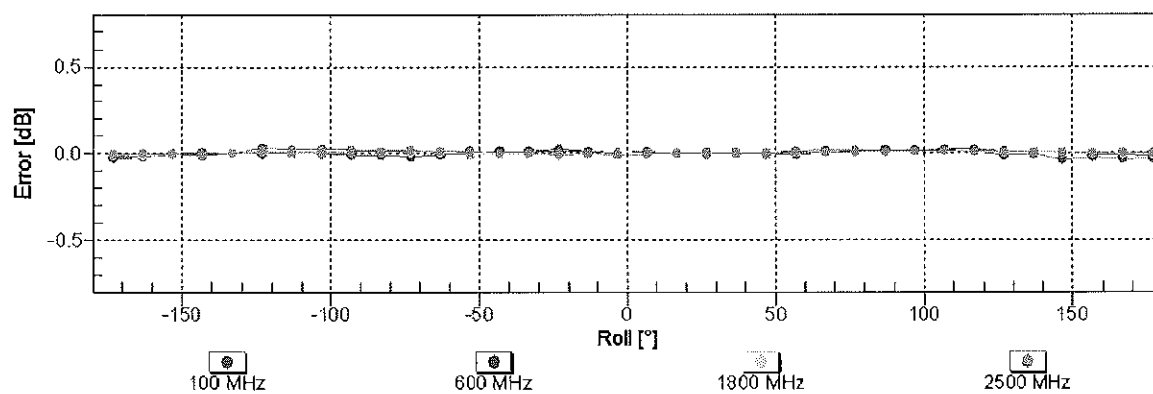
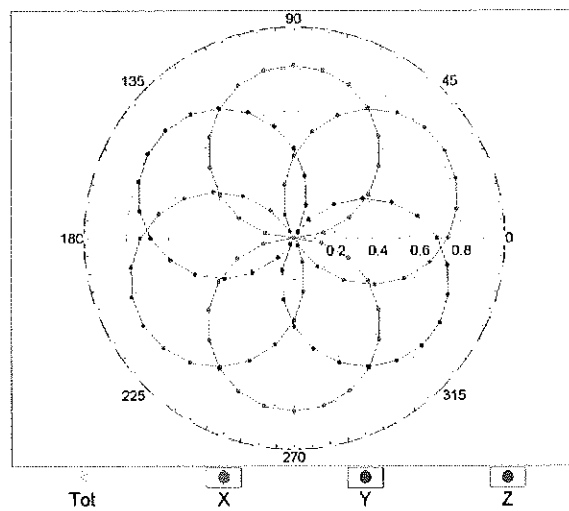
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

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

f=600 MHz,TEM

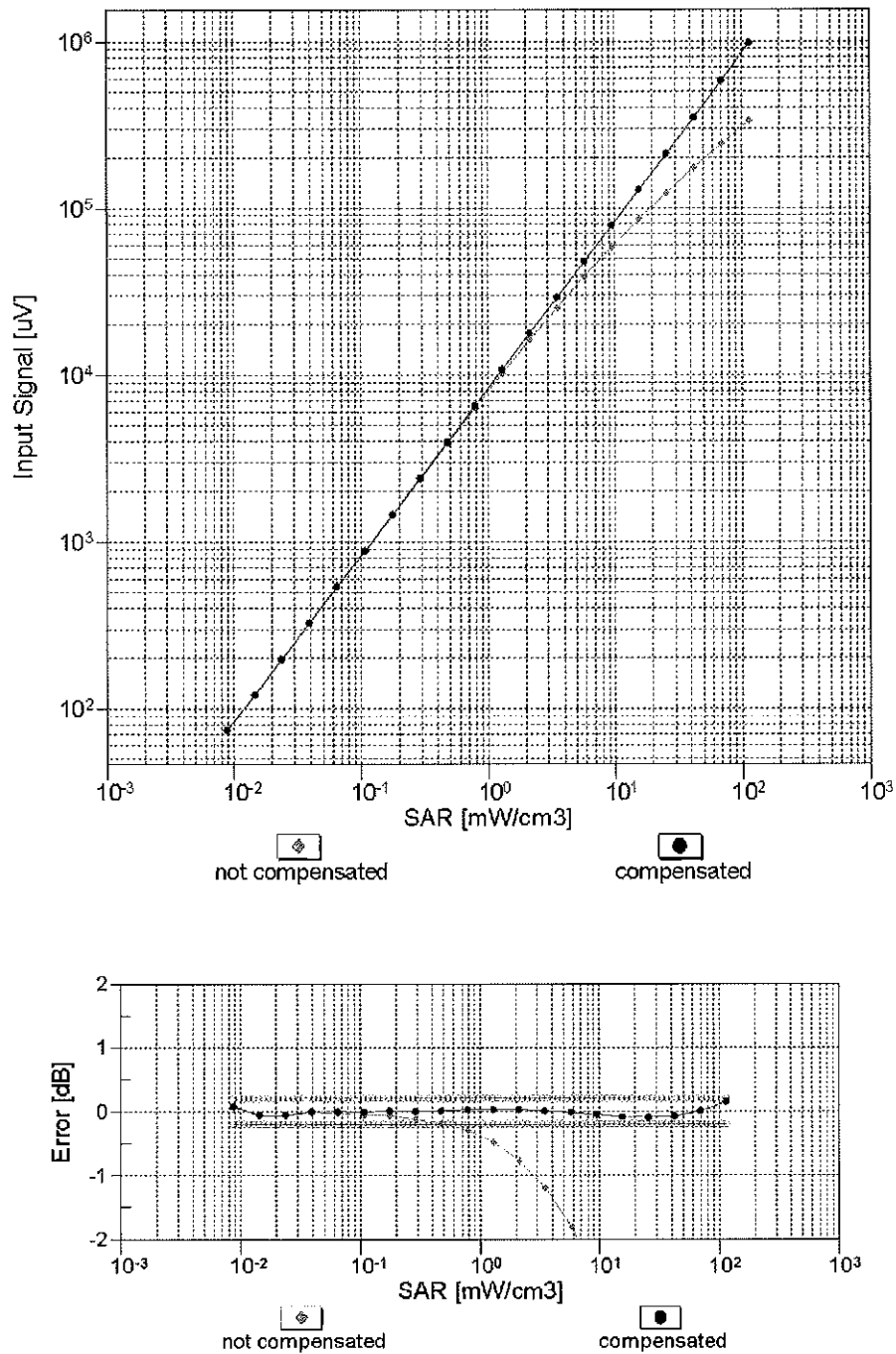


f=1800 MHz,R22



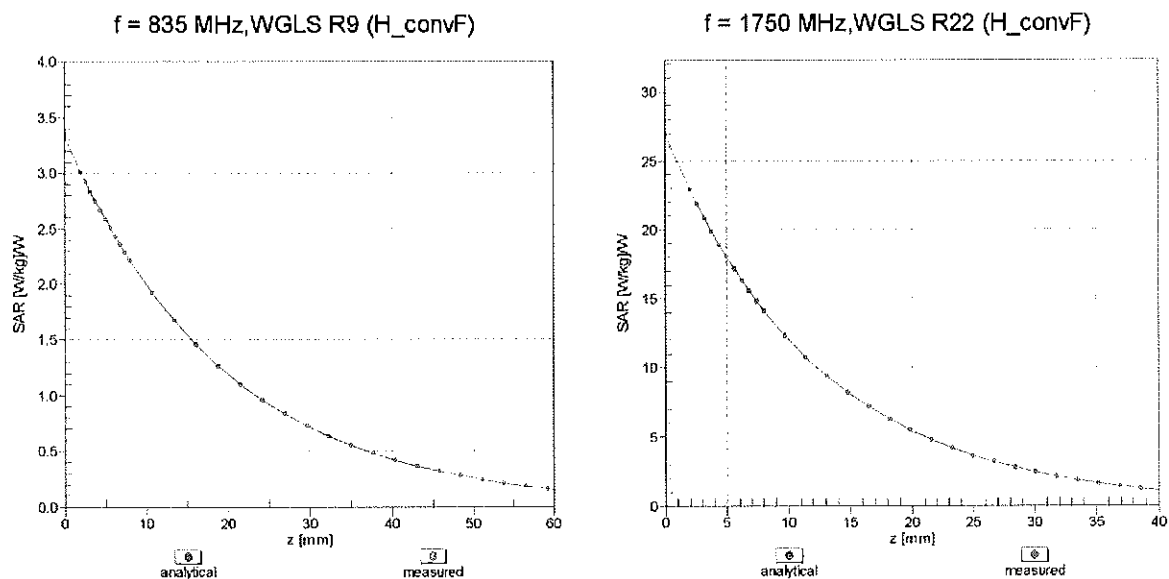
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range f(SAR_{head}) (TEM cell , f_{eval}= 1900 MHz)



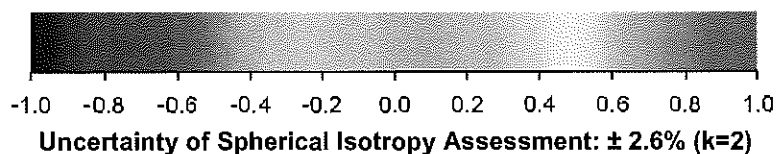
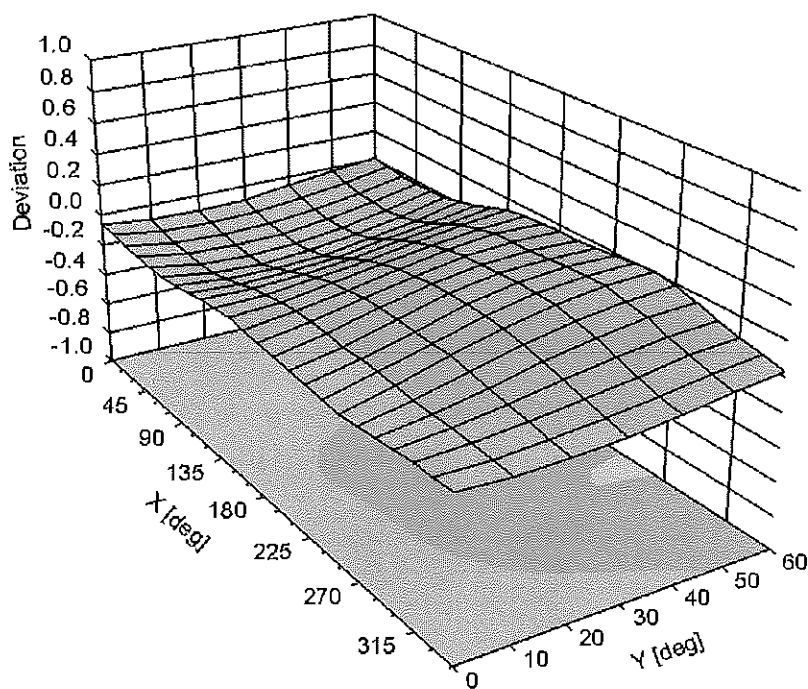
Uncertainty of Linearity Assessment: $\pm 0.6\%$ (k=2)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), $f = 900 \text{ MHz}$



DASY/EASY - Parameters of Probe: ES3DV3 - SN:3258**Other Probe Parameters**

Sensor Arrangement	Triangular
Connector Angle (°)	-123.1
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: **EX3-3914_Oct13**

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3914**

Calibration procedure(s) **QA CAL-01 v3, QA CAL-14 v4, QA CAL-23 v5, QA CAL-25 v6**
 Calibration procedure for dosimetric E-field probes

Calibration date: **October 23, 2013**

VCC
11/20/2013

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	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
Reference Probe ES3DV2	SN: 3013	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
DAE4	SN: 660	4-Sep-13 (No. DAE4-660_Sep13)	Sep-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-15
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	<i>Leif Klysner</i>
Approved by:	Katja Pokovic	Technical Manager	<i>Katja Pokovic</i>
Issued: October 25, 2013			
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			

PCT # 81072



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

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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 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 EX3DV4

SN:3914

Manufactured: December 18, 2012
Calibrated: October 23, 2013

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3914

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.47	0.49	0.51	$\pm 10.1 \%$
DCP (mV) ^B	99.2	98.9	98.2	

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	158.3	$\pm 3.0 \%$
		Y	0.0	0.0	1.0		154.6	
		Z	0.0	0.0	1.0		170.8	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	0.71	53.3	6.1	10.00	48.4	$\pm 2.5 \%$
		Y	2.43	67.0	13.8		39.9	
		Z	4.18	68.7	13.8		45.7	
10011-CAA	UMTS-FDD (WCDMA)	X	3.05	64.4	16.5	2.91	122.4	$\pm 0.5 \%$
		Y	3.31	66.5	18.2		123.5	
		Z	3.34	66.3	17.8		136.6	
10012-CAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	2.49	64.8	16.1	1.87	120.6	$\pm 0.5 \%$
		Y	2.94	68.6	18.7		123.6	
		Z	2.63	65.9	17.0		135.4	
10021-DAA	GSM-FDD (TDMA, GMSK)	X	1.52	61.5	10.9	9.39	83.6	$\pm 1.2 \%$
		Y	2.22	67.4	15.0		116.0	
		Z	2.47	66.8	14.7		95.9	
10023-DAA	GPRS-FDD (TDMA, GMSK, TN 0)	X	1.73	63.3	11.9	9.57	81.5	$\pm 1.7 \%$
		Y	2.11	66.2	14.2		111.8	
		Z	2.76	69.0	16.0		93.6	
10024-DAA	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	1.34	62.1	9.4	6.56	121.0	$\pm 1.2 \%$
		Y	4.24	78.6	17.9		130.0	
		Z	2.91	70.7	14.9		141.4	
10027-DAA	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	1.25	63.5	9.7	4.80	143.5	$\pm 1.4 \%$
		Y	1.59	66.9	12.2		149.7	
		Z	2.98	71.5	14.0		123.3	
10028-DAA	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	0.51	58.3	7.4	3.55	113.4	$\pm 1.2 \%$
		Y	25.43	100.0	22.6		121.3	
		Z	38.67	97.5	20.6		133.3	
10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	0.28	58.6	5.3	1.16	134.7	$\pm 0.9 \%$
		Y	65.75	99.6	18.6		141.3	
		Z	0.20	55.6	4.1		112.1	
10039-CAA	CDMA2000 (1xRTT, RC1)	X	4.33	64.6	17.4	4.57	113.8	$\pm 0.7 \%$
		Y	4.55	66.0	18.6		120.8	
		Z	4.85	66.2	18.4		135.9	
10062-CAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps)	X	9.83	67.6	20.7	8.68	109.0	$\pm 2.5 \%$
		Y	10.06	68.4	21.5		118.2	
		Z	10.66	69.2	21.7		134.0	

10081-CAA	CDMA2000 (1xRTT, RC3)	X	3.59	63.9	16.9	3.97	113.6	±0.7 %
		Y	3.84	65.6	18.2		119.6	
		Z	3.95	65.4	17.8		134.5	
10098-CAA	UMTS-FDD (HSUPA, Subtest 2)	X	4.41	65.2	17.3	3.98	126.0	±0.7 %
		Y	4.73	66.9	18.6		132.5	
		Z	4.51	65.5	17.7		105.6	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.26	66.2	18.6	5.67	130.5	±1.2 %
		Y	6.61	67.7	19.8		139.3	
		Z	6.21	66.0	18.7		107.7	
10108-CAB	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.13	65.8	18.6	5.80	126.3	±1.2 %
		Y	6.40	67.1	19.6		135.6	
		Z	6.10	65.5	18.5		107.4	
10110-CAB	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X	5.78	65.3	18.3	5.75	123.1	±1.2 %
		Y	5.97	66.3	19.2		131.5	
		Z	5.86	65.3	18.4		104.9	
10114-CAA	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	X	9.92	67.7	20.3	8.10	115.7	±2.5 %
		Y	10.25	68.7	21.2		126.8	
		Z	10.71	69.4	21.3		146.0	
10117-CAA	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	9.95	67.8	20.3	8.07	116.6	±2.5 %
		Y	10.26	68.7	21.1		128.3	
		Z	10.70	69.4	21.3		146.9	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	7.19	67.3	21.5	9.28	145.0	±2.2 %
		Y	7.40	68.3	22.4		110.8	
		Z	7.79	68.4	22.0		128.0	
10154-CAB	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	5.79	65.3	18.3	5.75	124.2	±1.2 %
		Y	6.03	66.5	19.4		131.9	
		Z	6.29	66.9	19.3		149.7	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.23	65.9	18.6	5.82	128.3	±1.2 %
		Y	6.51	67.2	19.7		136.9	
		Z	6.24	65.7	18.6		107.3	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	4.83	66.0	18.9	5.73	147.5	±1.2 %
		Y	4.72	65.8	19.2		113.8	
		Z	5.03	66.1	19.1		129.7	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	5.83	69.2	22.8	9.21	149.9	±1.9 %
		Y	5.81	69.4	23.4		120.3	
		Z	6.38	70.0	23.2		137.2	
10175-CAB	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	4.86	66.1	18.9	5.72	149.8	±1.2 %
		Y	4.72	65.8	19.2		113.3	
		Z	5.09	66.4	19.1		126.0	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	4.83	66.0	18.9	5.72	146.3	±1.2 %
		Y	4.69	65.6	19.1		112.2	
		Z	5.02	66.1	19.0		125.1	
10193-CAA	IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	X	9.51	67.4	20.2	8.09	108.6	±2.5 %
		Y	9.72	68.1	20.9		118.2	
		Z	10.30	68.9	21.1		135.0	

10196-CAA	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.52	67.4	20.2	8.10	111.6	±2.5 %
		Y	9.79	68.3	21.1		121.3	
		Z	10.30	68.9	21.2		139.2	
10219-CAA	IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)	X	9.47	67.4	20.2	8.03	111.8	±2.2 %
		Y	9.67	68.3	21.0		120.0	
		Z	10.20	68.9	21.1		138.0	
10222-CAA	IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)	X	9.96	67.9	20.4	8.06	118.4	±2.5 %
		Y	10.25	68.8	21.2		128.2	
		Z	10.65	69.3	21.3		144.5	
10225-CAA	UMTS-FDD (HSPA+)	X	6.96	66.7	18.9	5.97	140.0	±1.4 %
		Y	7.23	67.9	20.0		148.9	
		Z	7.03	66.4	18.9		115.6	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	5.51	67.5	21.8	9.21	114.2	±1.9 %
		Y	5.82	69.4	23.4		123.0	
		Z	6.49	70.6	23.6		140.2	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	6.83	67.1	21.4	9.24	136.6	±1.9 %
		Y	7.30	69.4	23.2		147.3	
		Z	7.36	68.1	22.0		117.5	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	7.26	67.5	21.6	9.30	142.7	±1.9 %
		Y	7.44	68.4	22.4		110.5	
		Z	7.84	68.7	22.2		122.6	
10274-CAA	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)	X	5.86	66.2	18.2	4.87	135.4	±0.9 %
		Y	6.12	67.5	19.2		142.3	
		Z	5.91	65.9	18.2		107.6	
10275-CAA	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.17	64.8	17.3	3.96	115.6	±0.7 %
		Y	4.42	66.4	18.5		124.6	
		Z	4.47	66.0	18.0		132.6	
10291-AAA	CDMA2000, RC3, SO55, Full Rate	X	3.36	64.7	17.1	3.46	109.4	±0.5 %
		Y	3.55	66.2	18.3		118.2	
		Z	3.60	65.6	17.7		120.9	
10292-AAA	CDMA2000, RC3, SO32, Full Rate	X	3.34	64.9	17.2	3.39	110.1	±0.5 %
		Y	3.57	66.7	18.5		121.0	
		Z	3.54	65.6	17.7		123.9	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.14	65.8	18.6	5.81	125.1	±1.2 %
		Y	6.44	67.2	19.7		135.7	
		Z	6.52	67.0	19.3		142.2	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.76	66.6	19.1	6.06	131.8	±1.4 %
		Y	7.03	67.8	20.0		142.5	
		Z	7.15	67.7	19.7		148.6	
10315-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)	X	2.42	64.6	16.1	1.71	116.8	±0.5 %
		Y	3.00	69.3	19.0		126.9	
		Z	2.61	66.3	17.2		128.2	
10317-AAA	IEEE 802.11a WiFi 5 GHz (OFDM, 6 Mbps, 96pc duty cycle)	X	9.71	67.6	20.5	8.36	111.7	±2.5 %
		Y	9.99	68.6	21.4		122.2	
		Z	10.38	68.9	21.3		129.5	

10400-AAA	IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)	X	9.83	67.8	20.6	8.37	112.9	±2.5 %
		Y	10.09	68.7	21.4		123.9	
		Z	10.48	68.9	21.3		130.5	
10402-AAA	IEEE 802.11ac WiFi (80MHz, 64-QAM, 99pc duty cycle)	X	10.61	68.3	20.7	8.53	121.1	±2.5 %
		Y	11.25	70.0	21.9		135.4	
		Z	11.15	69.4	21.4		137.4	
10403-AAA	CDMA2000 (1xEV-DO, Rev. 0)	X	4.51	67.4	17.8	3.76	119.2	±0.5 %
		Y	4.91	69.5	19.3		128.3	
		Z	4.84	67.5	18.1		135.4	
10404-AAA	CDMA2000 (1xEV-DO, Rev. A)	X	4.51	67.7	18.0	3.77	117.4	±0.5 %
		Y	4.92	69.8	19.5		125.4	
		Z	4.71	67.3	18.0		131.9	

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: EX3DV4 - SN:3914

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	9.70	9.70	9.70	0.34	1.01	± 12.0 %
835	41.5	0.90	9.34	9.34	9.34	0.67	0.67	± 12.0 %
1750	40.1	1.37	7.99	7.99	7.99	0.79	0.56	± 12.0 %
1900	40.0	1.40	7.69	7.69	7.69	0.80	0.58	± 12.0 %
2450	39.2	1.80	6.95	6.95	6.95	0.41	0.77	± 12.0 %
2600	39.0	1.96	6.79	6.79	6.79	0.40	0.82	± 12.0 %
5200	36.0	4.66	4.99	4.99	4.99	0.30	1.80	± 13.1 %
5300	35.9	4.76	4.82	4.82	4.82	0.30	1.80	± 13.1 %
5500	35.6	4.96	4.55	4.55	4.55	0.35	1.80	± 13.1 %
5600	35.5	5.07	4.37	4.37	4.37	0.35	1.80	± 13.1 %
5800	35.3	5.27	4.52	4.52	4.52	0.35	1.80	± 13.1 %

^C Frequency validity 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.

^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: EX3DV4 - SN:3914

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	9.39	9.39	9.39	0.63	0.74	± 12.0 %
835	55.2	0.97	9.31	9.31	9.31	0.56	0.76	± 12.0 %
1750	53.4	1.49	7.89	7.89	7.89	0.32	1.03	± 12.0 %
1900	53.3	1.52	7.51	7.51	7.51	0.51	0.76	± 12.0 %
2450	52.7	1.95	7.02	7.02	7.02	0.80	0.50	± 12.0 %
2600	52.5	2.16	6.81	6.81	6.81	0.80	0.50	± 12.0 %
5200	49.0	5.30	4.52	4.52	4.52	0.35	1.90	± 13.1 %
5300	48.9	5.42	4.32	4.32	4.32	0.35	1.90	± 13.1 %
5500	48.6	5.65	4.07	4.07	4.07	0.35	1.90	± 13.1 %
5600	48.5	5.77	3.97	3.97	3.97	0.35	1.90	± 13.1 %
5800	48.2	6.00	4.14	4.14	4.14	0.40	1.90	± 13.1 %

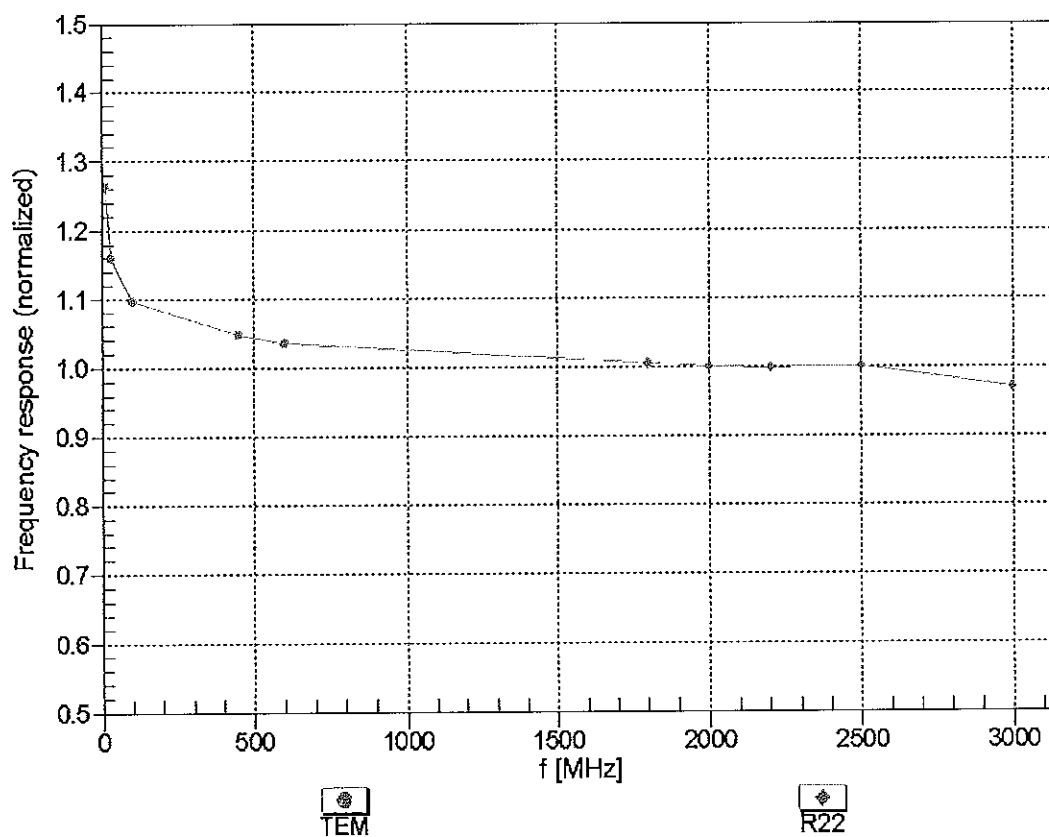
^C Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

^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

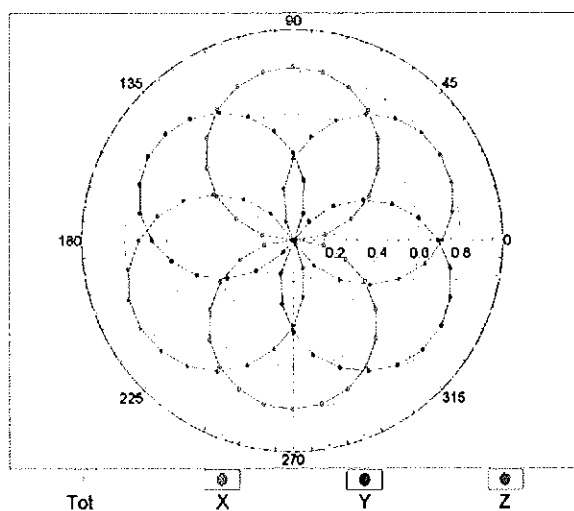
(TEM-Cell: ifi110 EXX, Waveguide: R22)



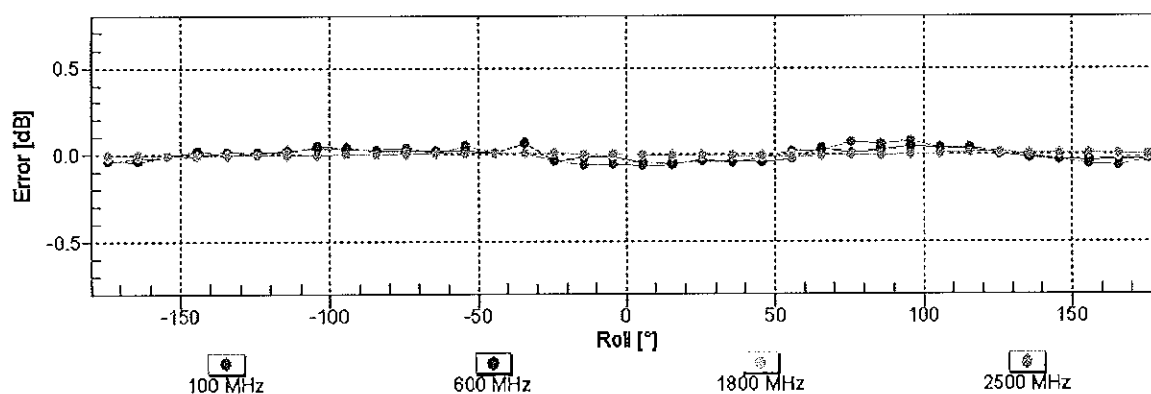
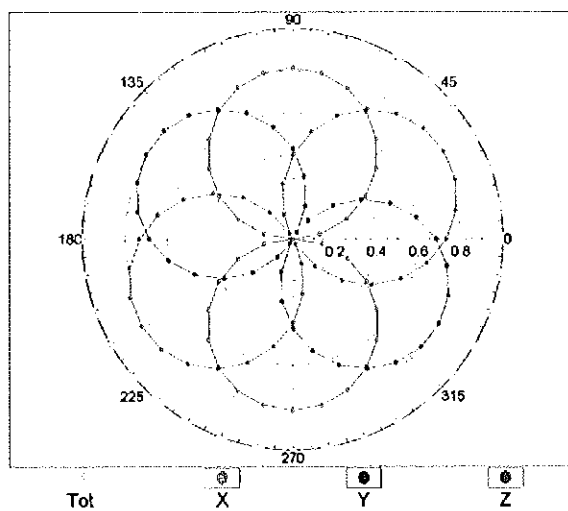
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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

f=600 MHz, TEM

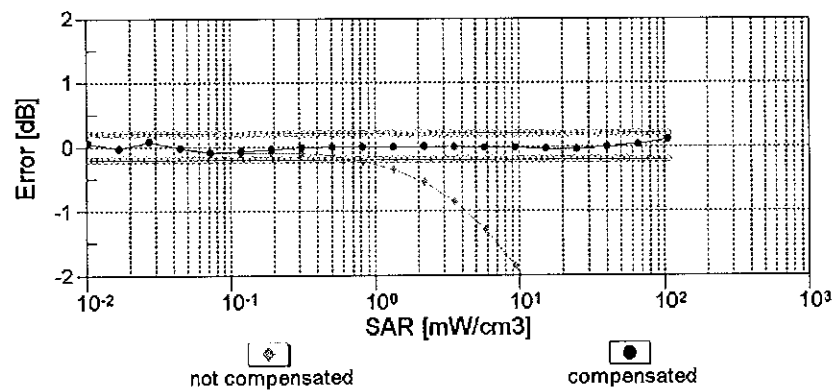
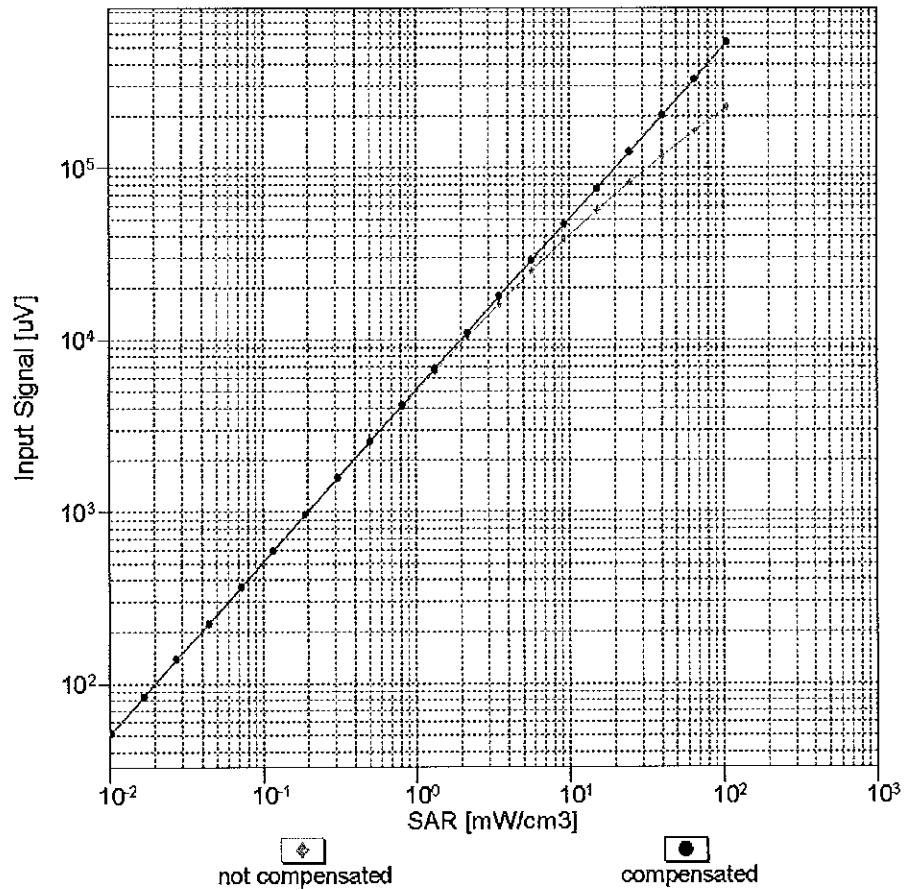


f=1800 MHz, R22



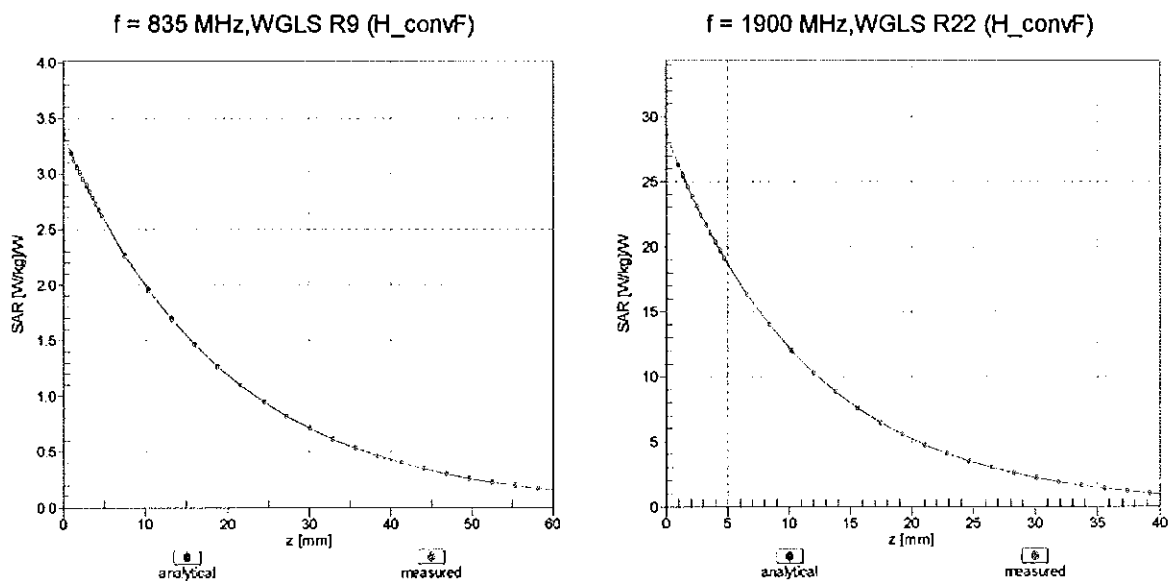
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range $f(\text{SAR}_{\text{head}})$ (TEM cell , $f = 900 \text{ MHz}$)



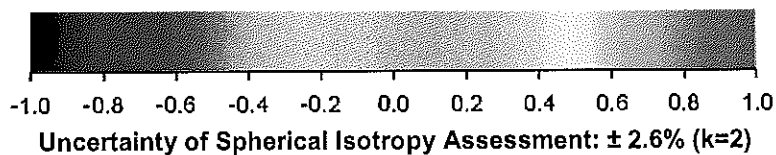
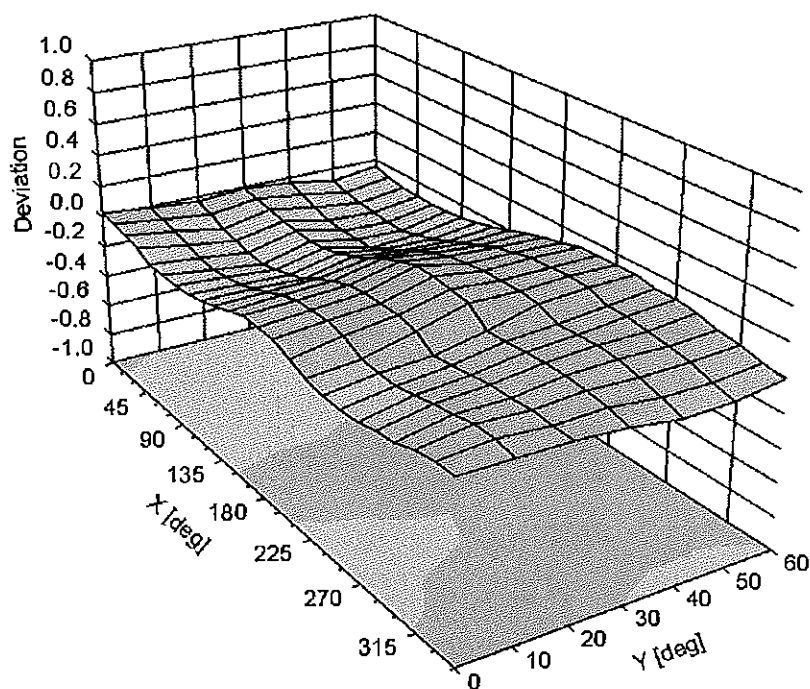
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, θ), $f = 900 \text{ MHz}$



Uncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ ($k=2$)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3914

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-24.3
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm



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Accreditation No.: **SCS 108**

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Client **PC Test**

Certificate No: **ES3-3332_Nov13**

CALIBRATION CERTIFICATE

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

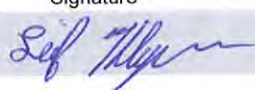
Calibration date: **November 25, 2013**

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	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
Reference Probe ES3DV2	SN: 3013	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
DAE4	SN: 660	4-Sep-13 (No. DAE4-660_Sep13)	Sep-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-15
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

Calibrated by:	Name Leif Klysner	Function Laboratory Technician	Signature 
Approved by:	Katja Pokovic	Technical Manager	

Issued: November 25, 2013

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Accreditation No.: **SCS 108**

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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 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:3332

Manufactured: January 24, 2012
Calibrated: November 25, 2013

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	1.16	0.97	± 10.1 %
DCP (mV) ^B	103.5	101.0	111.0	

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	179.7	±2.5 %
		Y	0.0	0.0	1.0		147.3	
		Z	0.0	0.0	1.0		188.8	

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 E²-field uncertainty inside TSL (see Pages 5 and 6).

^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	6.46	6.46	6.46	0.52	1.42	± 12.0 %
850	41.5	0.92	6.29	6.29	6.29	0.78	1.17	± 12.0 %
1750	40.1	1.37	5.27	5.27	5.27	0.80	1.10	± 12.0 %
1900	40.0	1.40	5.06	5.06	5.06	0.80	1.18	± 12.0 %
2450	39.2	1.80	4.50	4.50	4.50	0.80	1.19	± 12.0 %
2600	39.0	1.96	4.38	4.38	4.38	0.76	1.31	± 12.0 %

^C Frequency validity 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.

^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	6.21	6.21	6.21	0.80	1.19	± 12.0 %
850	55.2	0.99	6.08	6.08	6.08	0.51	1.48	± 12.0 %
1750	53.4	1.49	4.93	4.93	4.93	0.42	1.72	± 12.0 %
1900	53.3	1.52	4.70	4.70	4.70	0.48	1.59	± 12.0 %
2450	52.7	1.95	4.24	4.24	4.24	0.80	1.01	± 12.0 %
2600	52.5	2.16	4.07	4.07	4.07	0.80	0.50	± 12.0 %

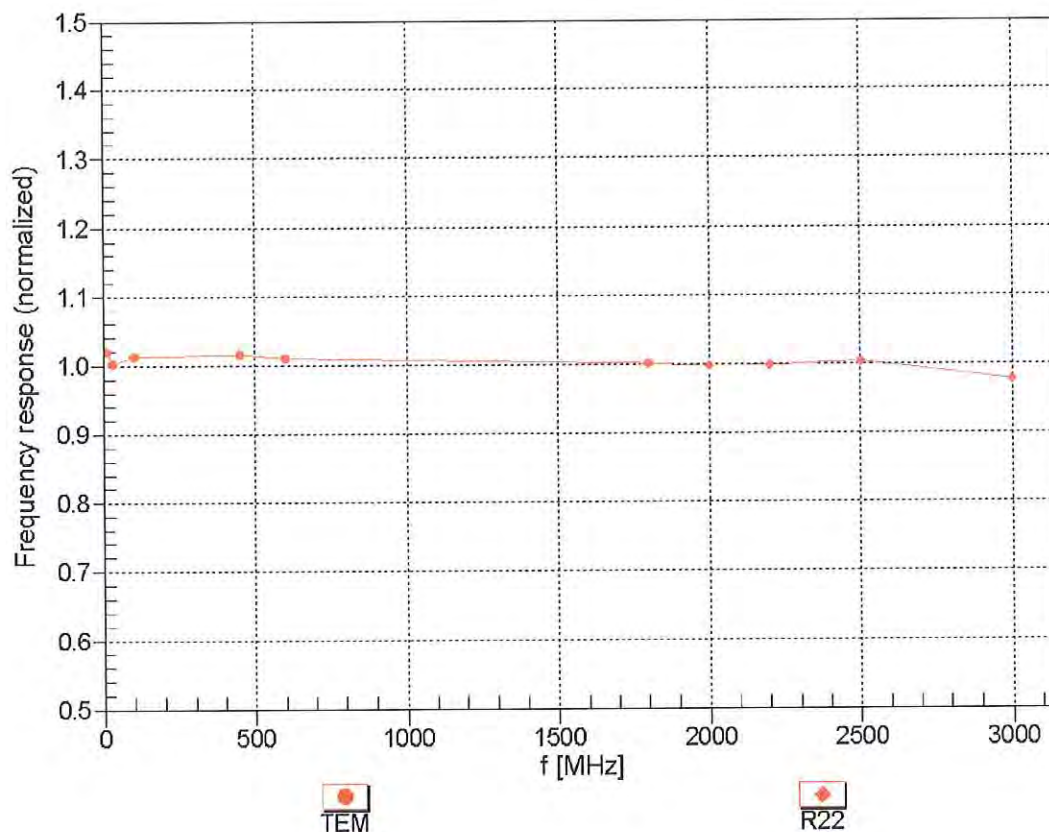
^C Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

^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

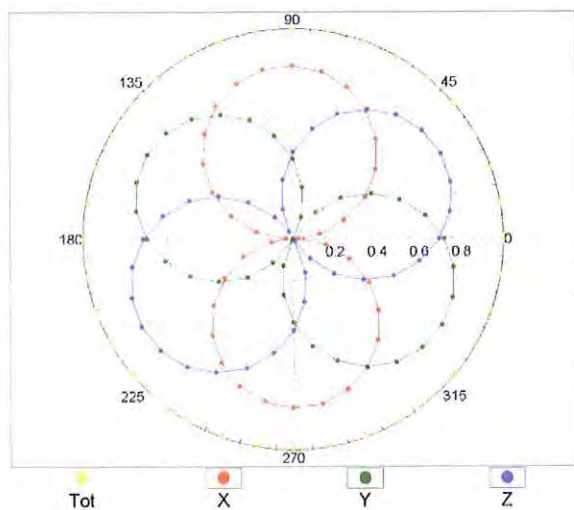
(TEM-Cell:ifi110 EXX, Waveguide: R22)



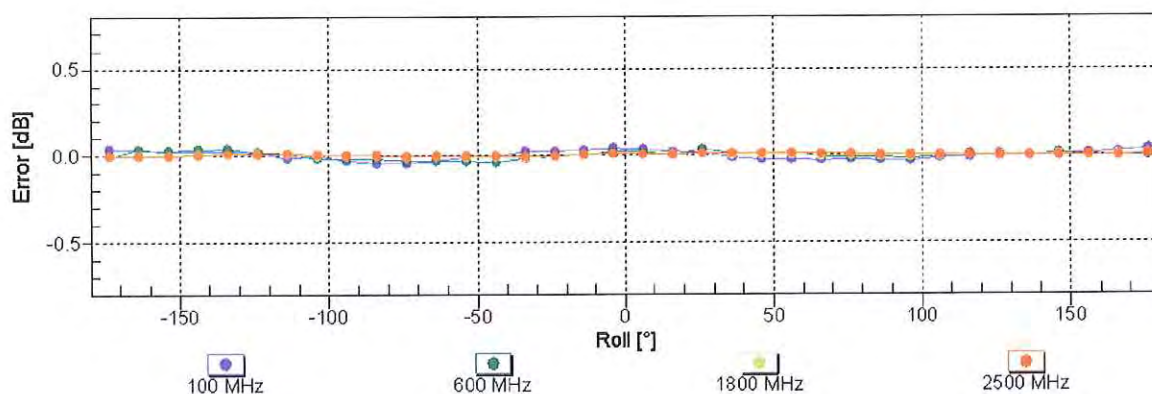
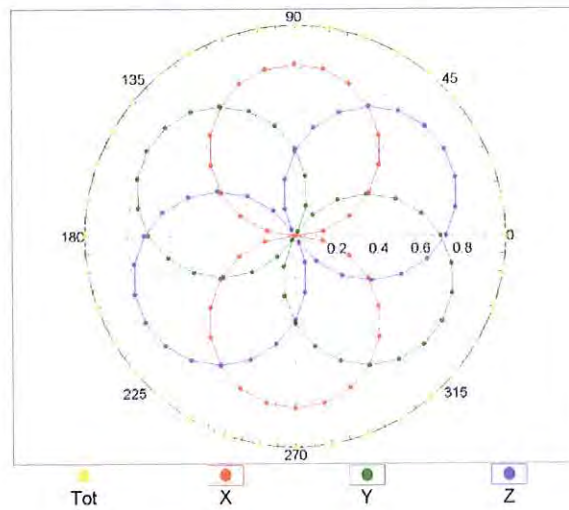
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

Receiving Pattern (ϕ), $\vartheta = 0^\circ$

f=600 MHz,TEM

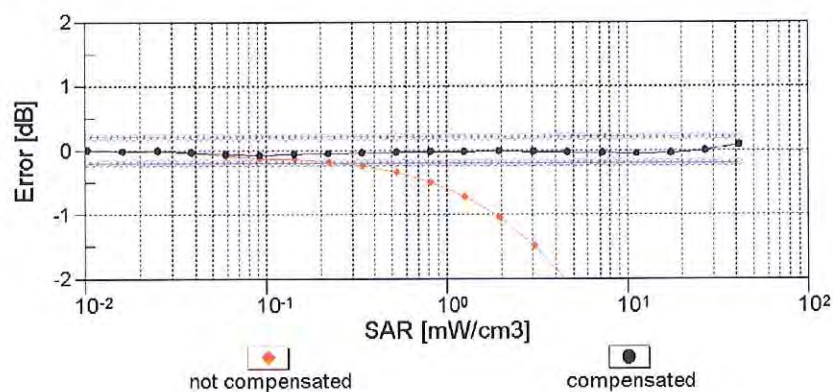
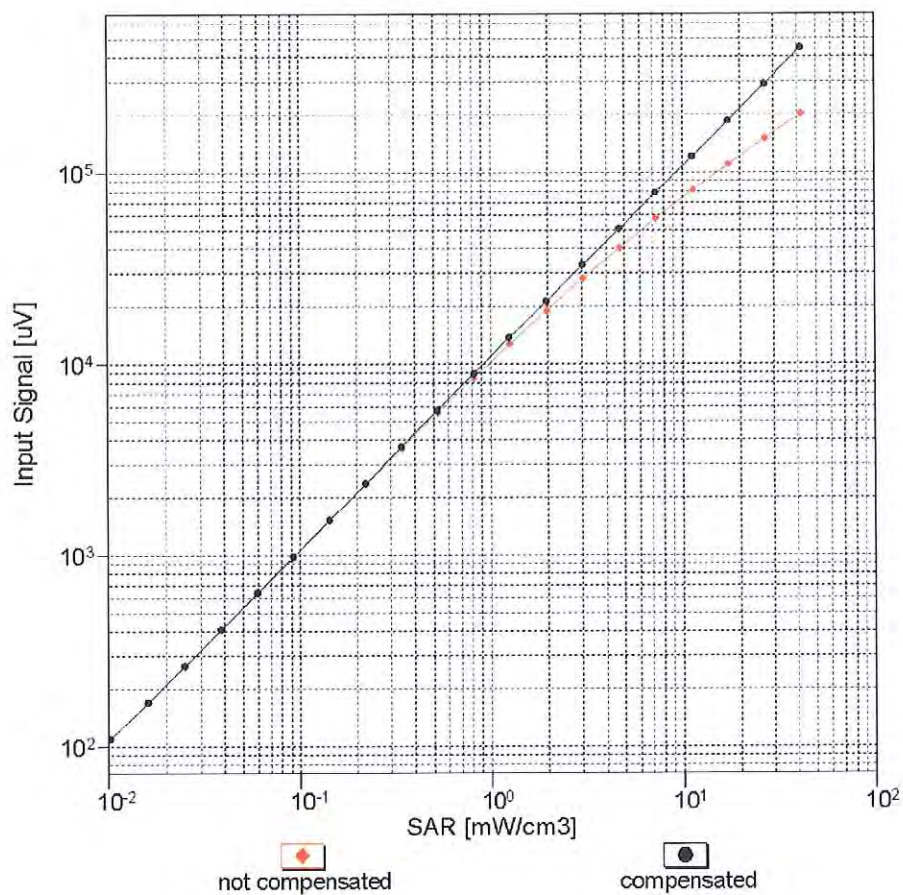


f=1800 MHz,R22



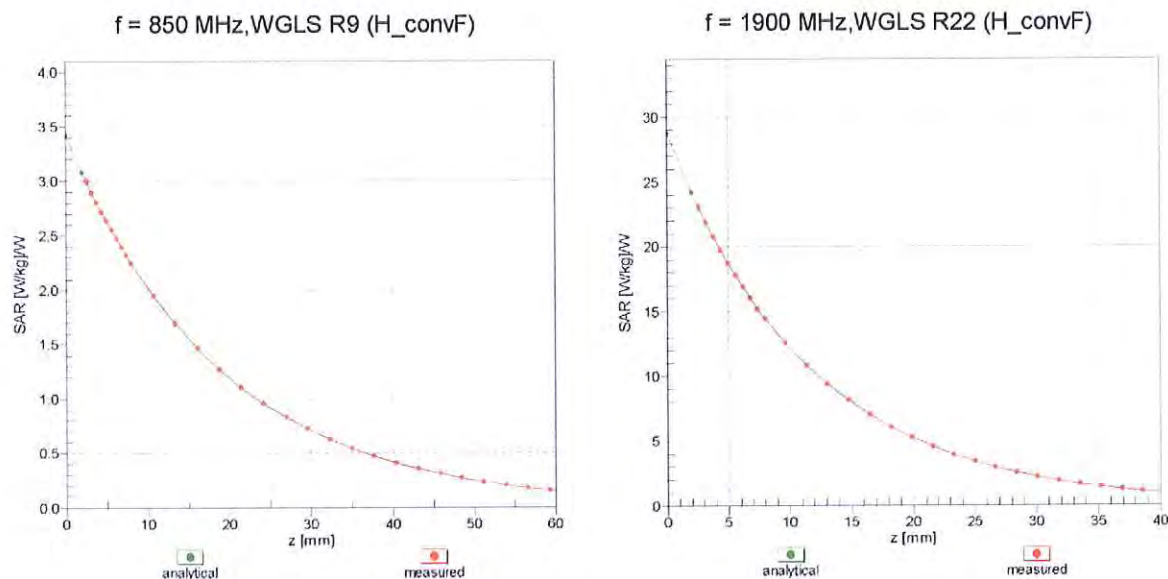
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range $f(\text{SAR}_{\text{head}})$ (TEM cell , $f = 900 \text{ MHz}$)



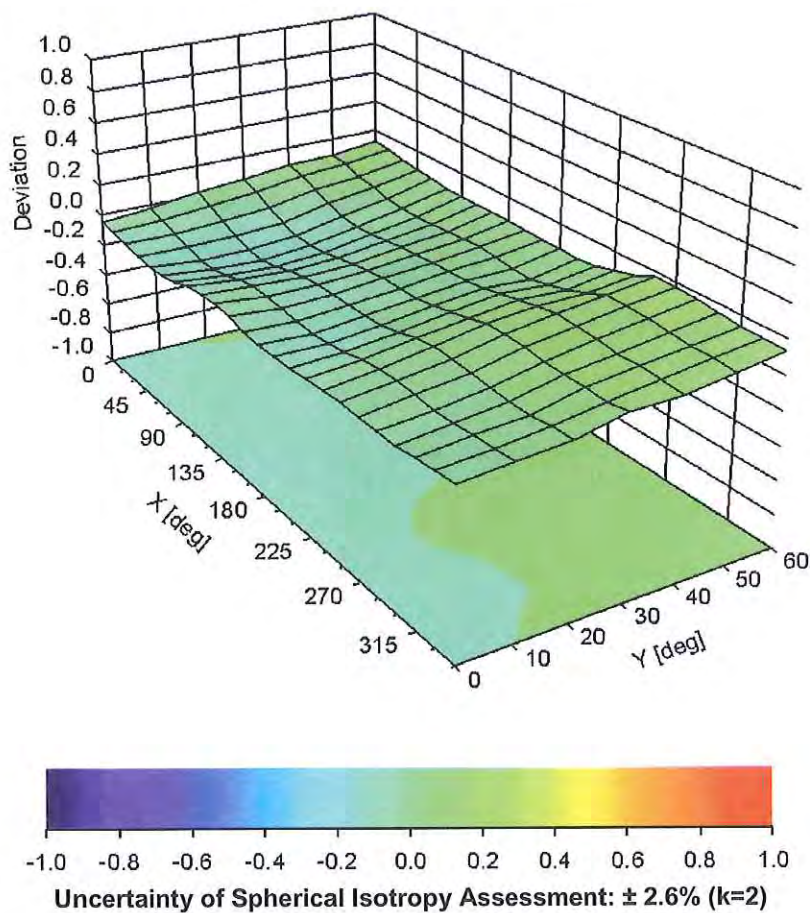
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

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 (°)	-3.9
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



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Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **ES3-3022_Aug13**

CALIBRATION CERTIFICATE

Object **ES3DV2 - SN:3022**

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

Calibration date: **August 22, 2013**

UTC
9/13/13

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	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
Reference Probe ES3DV2	SN: 3013	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
DAE4	SN: 660	31-Jan-13 (No. DAE4-660_Jan13)	Jan-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-15
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	
Issued: August 23, 2013			
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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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- 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.

Probe ES3DV2

SN:3022

Manufactured: April 15, 2003
Calibrated: August 22, 2013

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

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	1.00	1.04	0.99	± 10.1 %
DCP (mV) ^B	100.7	97.4	99.7	

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	178.6	±3.0 %
		Y	0.0	0.0	1.0		141.9	
		Z	0.0	0.0	1.0		134.7	

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 E²-field uncertainty inside TSL (see Pages 5 and 6).

^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: 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	Depth (mm)	Unct. (k=2)
750	41.9	0.89	6.21	6.21	6.21	0.19	2.37	± 12.0 %
835	41.5	0.90	6.09	6.09	6.09	0.30	1.70	± 12.0 %
1750	40.1	1.37	5.19	5.19	5.19	0.65	1.23	± 12.0 %
1900	40.0	1.40	5.03	5.03	5.03	0.51	1.43	± 12.0 %
2450	39.2	1.80	4.36	4.36	4.36	0.51	1.51	± 12.0 %
2600	39.0	1.96	4.16	4.16	4.16	0.74	1.29	± 12.0 %

^C Frequency validity 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.

^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.

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

Calibration Parameter Determined in Body Tissue Simulating Media

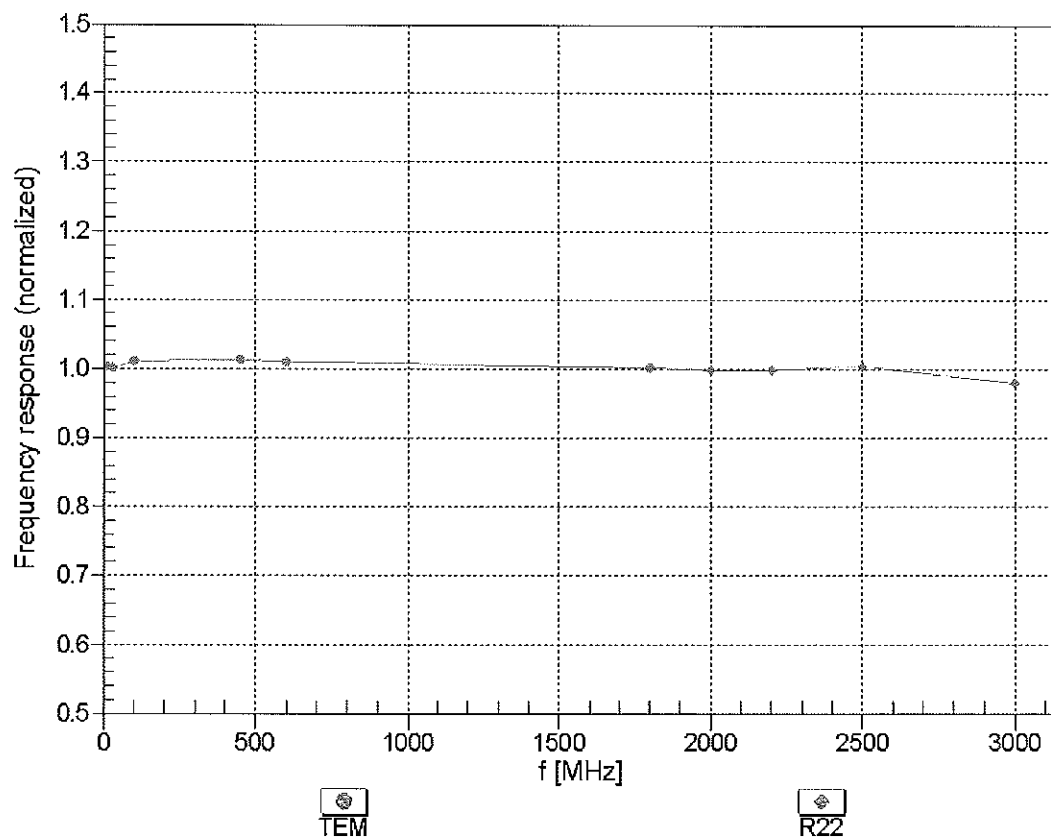
f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	5.92	5.92	5.92	0.24	1.99	± 12.0 %
835	55.2	0.97	5.91	5.91	5.91	0.29	1.85	± 12.0 %
1750	53.4	1.49	4.75	4.75	4.75	0.52	1.52	± 12.0 %
1900	53.3	1.52	4.49	4.49	4.49	0.49	1.56	± 12.0 %
2450	52.7	1.95	4.01	4.01	4.01	0.70	1.02	± 12.0 %
2600	52.5	2.16	3.85	3.85	3.85	0.58	0.90	± 12.0 %

^C Frequency validity 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.

^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.

Frequency Response of E-Field

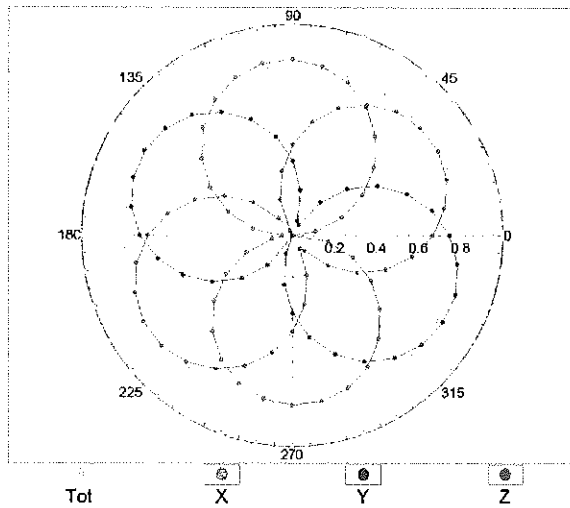
(TEM-Cell:ifi110 EXX, Waveguide: R22)



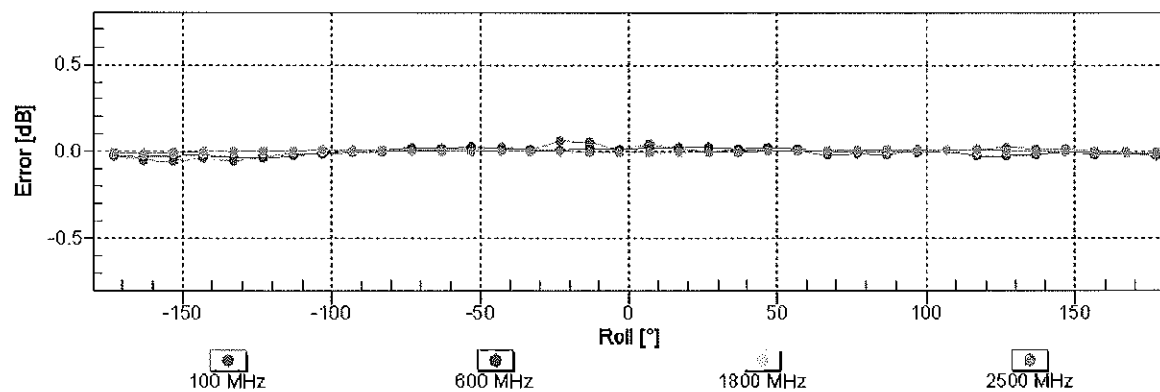
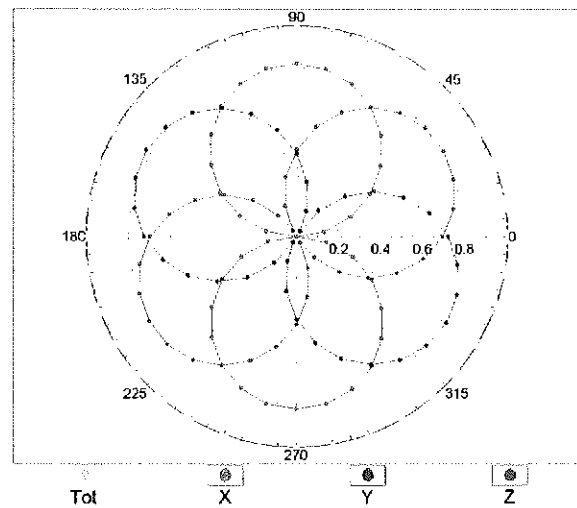
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

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

f=600 MHz,TEM

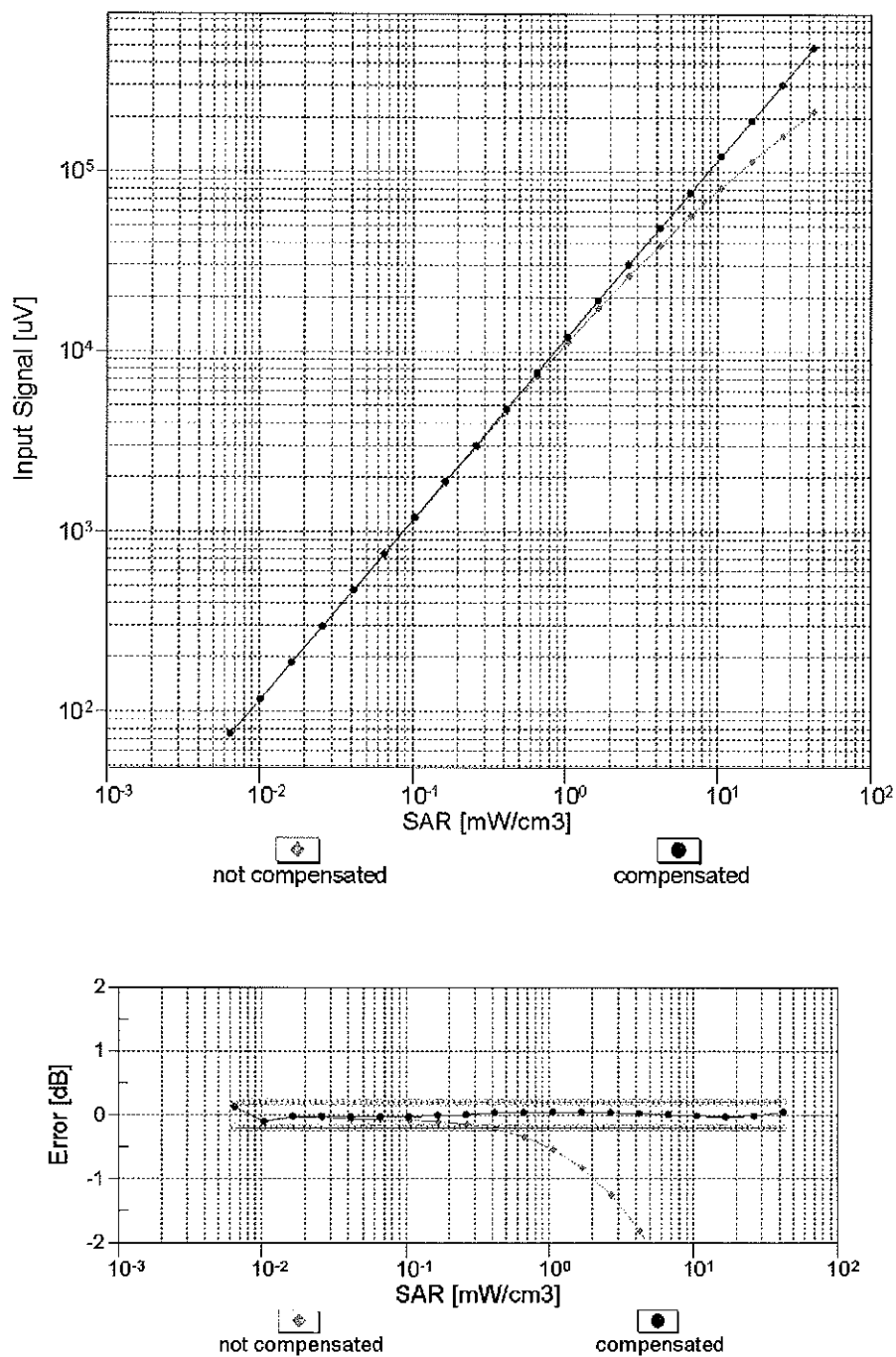


f=1800 MHz,R22



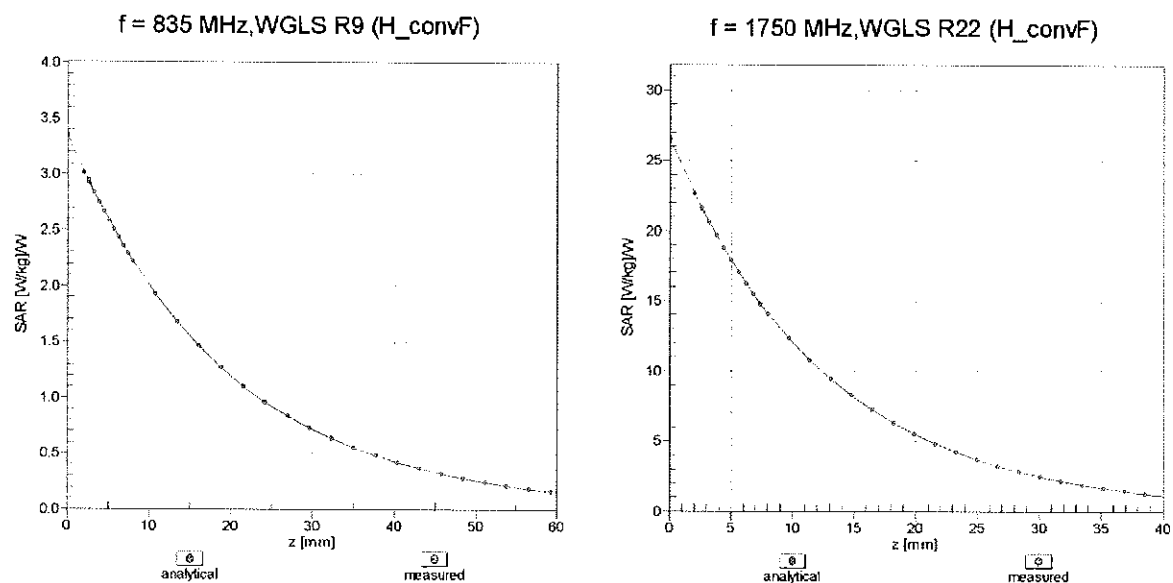
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range f(SAR_{head}) (TEM cell , f = 900 MHz)



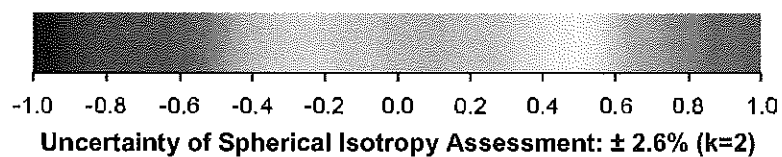
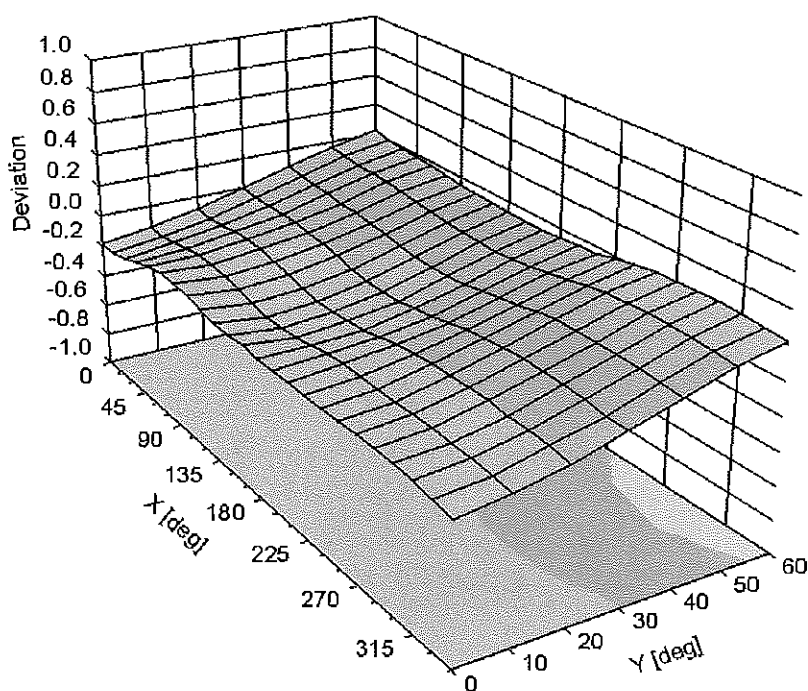
Uncertainty of Linearity Assessment: $\pm 0.6\%$ (k=2)

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 (°)	-83.1
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm



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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **EX3-3589_Jan14**

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3589**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6**
Calibration procedure for dosimetric E-field probes

Calibration date: **January 29, 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	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
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	Function	Signature
	Claudio Leubler	Laboratory Technician	
Approved by:	Name	Function	Signature
	Katja Pokovic	Technical Manager	

Issued: January 30, 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**

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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 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 EX3DV4

SN:3589

Manufactured: March 30, 2006
Calibrated: January 29, 2014

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3589

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$) ^A	0.46	0.40	0.40	± 10.1 %
DCP (mV) ^B	101.2	100.8	98.0	

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	150.4	±3.8 %
		Y	0.0	0.0	1.0		142.3	
		Z	0.0	0.0	1.0		171.7	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	6.00	69.5	14.2	10.00	42.1	±0.9 %
		Y	7.03	71.8	15.0		40.3	
		Z	3.33	64.6	12.1		44.6	
10011-CAA	UMTS-FDD (WCDMA)	X	3.26	66.2	17.8	2.91	117.6	±0.9 %
		Y	3.38	66.8	18.2		113.0	
		Z	2.79	62.4	14.7		133.2	
10012-CAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	2.77	66.8	17.4	1.87	117.4	±0.7 %
		Y	3.22	69.6	18.8		113.5	
		Z	2.22	62.0	13.8		135.2	
10021-DAA	GSM-FDD (TDMA, GMSK)	X	3.61	69.7	16.6	9.39	91.2	±1.7 %
		Y	5.48	77.1	19.6		125.1	
		Z	2.18	62.5	12.6		75.3	
10023-DAA	GPRS-FDD (TDMA, GMSK, TN 0)	X	3.01	66.4	14.9	9.57	86.1	±2.7 %
		Y	7.02	82.0	22.0		120.5	
		Z	2.13	62.9	12.7		71.4	
10024-DAA	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	18.01	91.8	22.6	6.56	132.3	±1.7 %
		Y	8.55	83.0	19.9		134.3	
		Z	4.04	72.4	15.7		139.6	
10027-DAA	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	4.70	74.7	15.9	4.80	107.5	±1.7 %
		Y	4.94	76.1	16.4		107.8	
		Z	2.97	68.7	12.8		127.1	
10028-DAA	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	67.89	99.9	21.4	3.55	114.7	±2.7 %
		Y	48.02	99.7	21.9		116.6	
		Z	1.36	61.4	7.8		134.4	
10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	97.41	97.0	17.7	1.16	129.2	±3.0 %
		Y	71.47	99.8	19.3		130.9	
		Z	0.29	53.5	0.9		109.2	
10039-CAA	CDMA2000 (1xRTT, RC1)	X	4.62	65.4	18.0	4.57	113.0	±1.7 %
		Y	4.74	66.1	18.4		111.5	
		Z	4.22	63.3	15.9		133.6	
10062-CAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps)	X	10.10	67.8	20.8	8.68	108.0	±2.7 %
		Y	10.07	68.1	21.1		108.1	
		Z	10.03	67.6	20.2		130.3	

10098-CAA	UMTS-FDD (HSUPA, Subtest 2)	X	4.53	65.7	17.8	3.98	122.5	±0.9 %
		Y	4.72	66.6	18.4		123.1	
		Z	4.38	64.5	16.7		147.3	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.32	66.5	18.8	5.67	126.9	±1.2 %
		Y	6.50	67.2	19.4		128.9	
		Z	5.80	64.3	17.3		107.2	
10108-CAB	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.22	66.1	18.8	5.80	124.2	±1.7 %
		Y	6.39	66.9	19.4		126.7	
		Z	6.10	65.2	17.7		149.4	
10110-CAB	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X	5.94	65.8	18.7	5.75	121.3	±1.7 %
		Y	6.05	66.3	19.1		123.1	
		Z	5.80	65.0	17.7		144.5	
10114-CAA	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	X	10.01	67.7	20.3	8.10	113.9	±2.5 %
		Y	10.16	68.3	20.8		117.0	
		Z	9.96	67.5	19.8		135.3	
10117-CAA	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.07	67.9	20.4	8.07	115.2	±2.5 %
		Y	10.16	68.2	20.7		118.4	
		Z	10.02	67.7	19.9		138.0	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	7.89	68.4	21.8	9.28	108.1	±1.9 %
		Y	8.15	69.7	22.8		109.4	
		Z	7.38	66.5	20.4		123.2	
10154-CAB	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	5.94	65.7	18.6	5.75	122.1	±1.7 %
		Y	6.03	66.3	19.0		122.5	
		Z	5.79	65.0	17.7		144.0	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.38	66.3	18.9	5.82	126.0	±1.7 %
		Y	6.54	67.0	19.4		128.2	
		Z	6.16	65.3	17.8		146.9	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	5.17	66.5	19.2	5.73	149.7	±1.2 %
		Y	4.95	65.8	19.0		108.3	
		Z	4.64	63.9	17.1		125.3	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	6.79	70.4	23.0	9.21	120.6	±3.0 %
		Y	6.96	72.0	24.2		122.8	
		Z	6.43	69.3	22.0		136.7	
10175-CAB	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	5.15	66.4	19.1	5.72	143.0	±1.4 %
		Y	5.23	67.1	19.6		145.8	
		Z	4.60	63.7	17.0		121.1	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	5.11	66.2	19.0	5.72	141.0	±1.4 %
		Y	5.27	67.3	19.7		144.9	
		Z	4.54	63.4	16.8		119.2	
10193-CAA	IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	X	9.57	67.1	20.1	8.09	102.2	±2.2 %
		Y	9.59	67.4	20.4		105.3	
		Z	9.73	67.6	20.0		129.6	
10196-CAA	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.61	67.3	20.2	8.10	104.6	±2.5 %
		Y	9.63	67.6	20.5		107.8	
		Z	9.63	67.3	19.8		130.9	

10219-CAA	IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)	X	9.61	67.5	20.3	8.03	109.2	±2.7 %
		Y	9.54	67.5	20.4		107.4	
		Z	9.53	67.2	19.7		130.7	
10222-CAA	IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)	X	10.00	67.8	20.4	8.06	114.1	±2.7 %
		Y	10.01	68.0	20.6		112.3	
		Z	9.96	67.6	19.9		137.1	
10225-CAA	UMTS-FDD (HSPA+)	X	7.18	66.9	19.2	5.97	137.5	±1.4 %
		Y	7.25	67.4	19.5		134.4	
		Z	6.48	64.4	17.3		114.6	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	6.93	71.0	23.5	9.21	123.5	±3.0 %
		Y	6.88	71.6	24.0		119.3	
		Z	6.63	70.1	22.4		141.3	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	8.19	70.5	23.1	9.24	142.9	±2.5 %
		Y	8.46	72.0	24.2		143.3	
		Z	7.10	67.0	20.8		119.9	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	7.83	68.1	21.6	9.30	104.2	±2.2 %
		Y	8.07	69.4	22.7		103.0	
		Z	7.49	67.2	20.9		125.2	
10274-CAA	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)	X	5.96	66.2	18.3	4.87	128.1	±1.7 %
		Y	6.12	67.0	18.8		126.0	
		Z	5.31	63.8	16.4		110.2	
10275-CAA	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.30	65.5	17.8	3.96	110.5	±1.2 %
		Y	4.47	66.4	18.4		110.3	
		Z	3.92	63.1	15.6		135.7	
10291-AAA	CDMA2000, RC3, SO55, Full Rate	X	3.59	65.7	17.7	3.46	138.1	±1.2 %
		Y	3.85	67.2	18.6		146.7	
		Z	3.08	61.7	14.7		123.3	
10292-AAA	CDMA2000, RC3, SO32, Full Rate	X	3.59	66.0	17.8	3.39	144.2	±0.9 %
		Y	3.83	67.5	18.7		148.4	
		Z	3.18	63.1	15.7		128.6	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.13	65.8	18.7	5.81	116.5	±1.7 %
		Y	6.30	66.6	19.2		119.4	
		Z	6.20	65.9	18.4		145.6	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.70	66.4	19.0	6.06	122.5	±1.4 %
		Y	6.92	67.3	19.6		124.5	
		Z	6.28	65.0	17.9		103.7	
10315-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)	X	2.66	66.7	17.4	1.71	109.5	±0.7 %
		Y	3.18	70.0	19.2		111.5	
		Z	2.08	61.6	13.4		134.4	
10317-AAA	IEEE 802.11a WiFi 5 GHz (OFDM, 6 Mbps, 96pc duty cycle)	X	9.78	67.4	20.4	8.36	103.5	±2.5 %
		Y	9.81	67.7	20.7		107.1	
		Z	9.86	67.6	20.3		129.5	
10400-AAA	IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)	X	9.86	67.5	20.4	8.37	104.9	±2.7 %
		Y	9.93	67.9	20.8		107.9	
		Z	9.97	67.7	20.2		134.3	

10402-AAA	IEEE 802.11ac WiFi (80MHz, 64-QAM, 99pc duty cycle)	X	10.47	67.9	20.5	8.53	109.9	±3.0 %
		Y	10.86	68.8	21.1		116.0	
		Z	10.68	68.2	20.4		142.5	
10403-AAA	CDMA2000 (1xEV-DO, Rev. 0)	X	4.74	67.0	17.9	3.76	114.9	±0.9 %
		Y	5.02	68.5	18.7		116.6	
		Z	4.23	64.4	15.8		145.1	
10404-AAA	CDMA2000 (1xEV-DO, Rev. A)	X	4.71	67.1	17.9	3.77	112.3	±1.4 %
		Y	4.95	68.5	18.7		115.0	
		Z	4.01	63.4	15.1		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: EX3DV4 - SN:3589

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)	Uct. (k=2)
750	41.9	0.89	8.86	8.86	8.86	0.80	0.62	± 12.0 %
835	41.5	0.90	8.49	8.49	8.49	0.45	0.82	± 12.0 %
1750	40.1	1.37	7.31	7.31	7.31	0.80	0.60	± 12.0 %
1900	40.0	1.40	7.05	7.05	7.05	0.52	0.73	± 12.0 %
2450	39.2	1.80	6.45	6.45	6.45	0.29	1.08	± 12.0 %
2600	39.0	1.96	6.24	6.24	6.24	0.76	0.62	± 12.0 %
5200	36.0	4.66	4.78	4.78	4.78	0.30	1.80	± 13.1 %
5300	35.9	4.76	4.58	4.58	4.58	0.30	1.80	± 13.1 %
5500	35.6	4.96	4.44	4.44	4.44	0.31	1.80	± 13.1 %
5600	35.5	5.07	4.20	4.20	4.20	0.35	1.80	± 13.1 %
5800	35.3	5.27	4.39	4.39	4.39	0.32	1.80	± 13.1 %

^C Frequency validity 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.

^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: EX3DV4 - SN:3589

Calibration Parameter Determined in Body Tissue Simulating Media

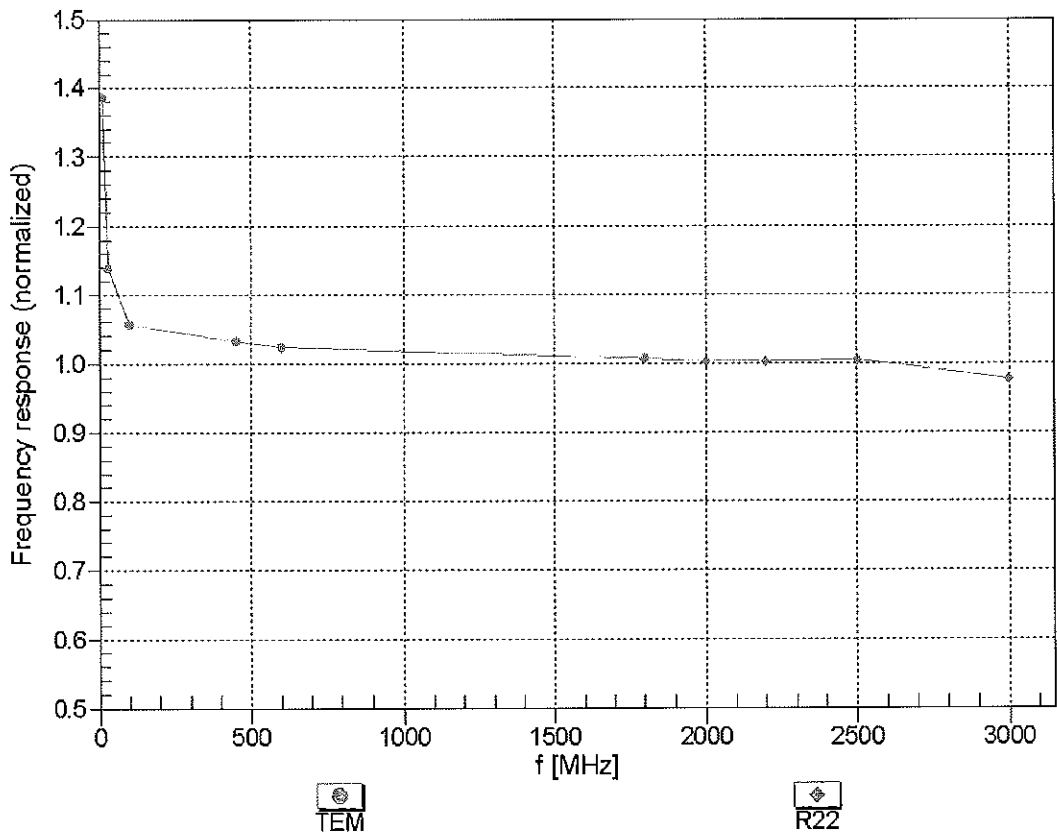
f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unct. (k=2)
750	55.5	0.96	8.34	8.34	8.34	0.66	0.72	± 12.0 %
835	55.2	0.97	8.29	8.29	8.29	0.31	1.11	± 12.0 %
1750	53.4	1.49	6.68	6.68	6.68	0.80	0.61	± 12.0 %
1900	53.3	1.52	6.54	6.54	6.54	0.72	0.64	± 12.0 %
2450	52.7	1.95	6.26	6.26	6.26	0.80	0.57	± 12.0 %
2600	52.5	2.16	6.08	6.08	6.08	0.68	0.50	± 12.0 %
5200	49.0	5.30	4.19	4.19	4.19	0.38	1.90	± 13.1 %
5300	48.9	5.42	3.98	3.98	3.98	0.38	1.90	± 13.1 %
5500	48.6	5.65	3.76	3.76	3.76	0.42	1.90	± 13.1 %
5600	48.5	5.77	3.81	3.81	3.81	0.30	1.90	± 13.1 %
5800	48.2	6.00	3.97	3.97	3.97	0.43	1.90	± 13.1 %

^C Frequency validity 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.

^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.

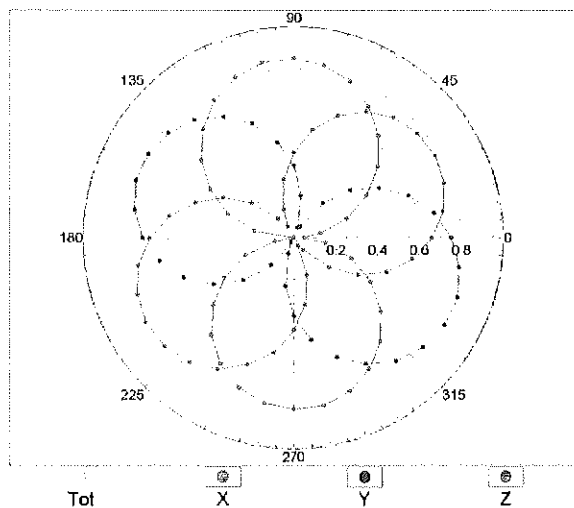
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



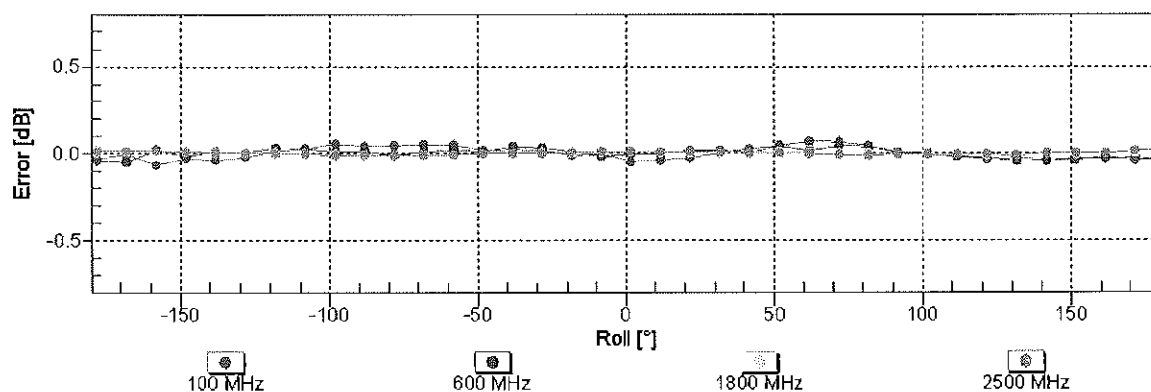
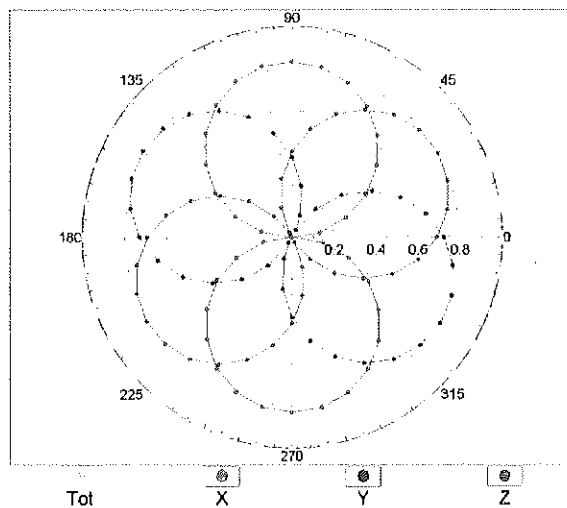
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

Receiving Pattern (ϕ), $\vartheta = 0^\circ$

f=600 MHz,TEM



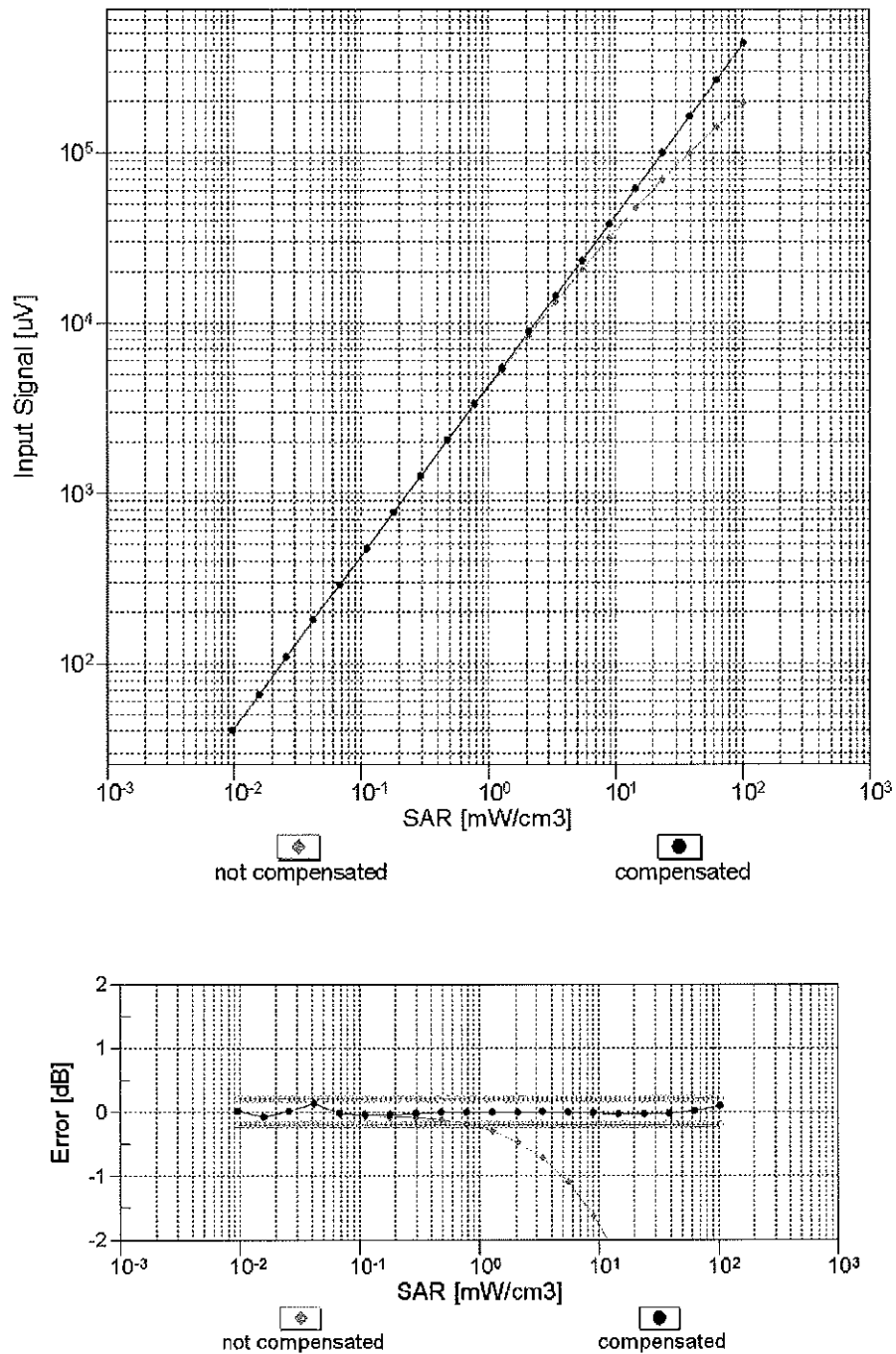
f=1800 MHz,R22



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

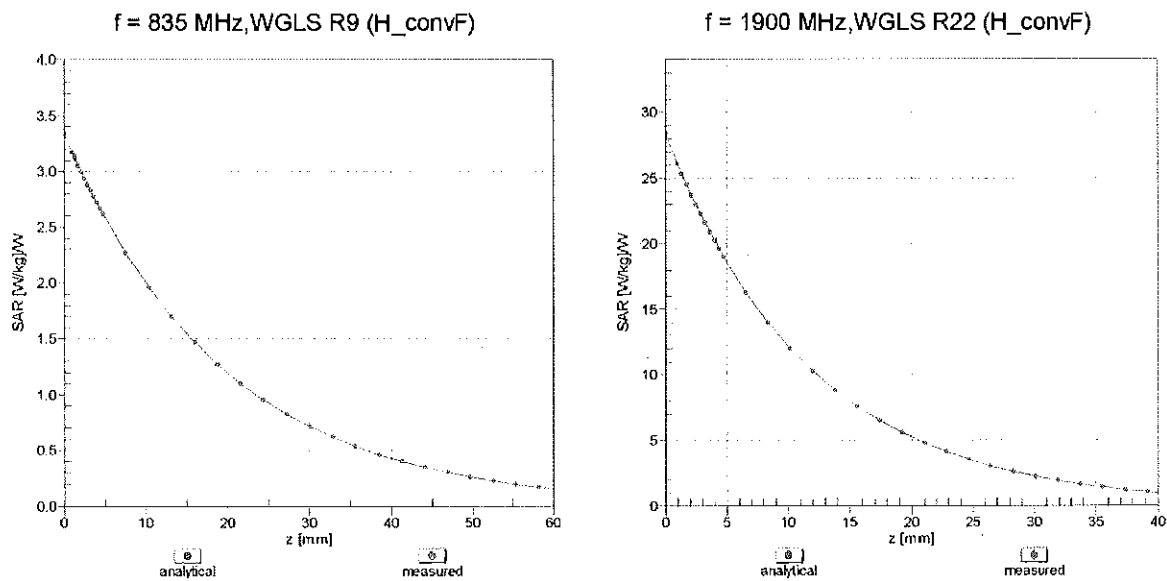
Dynamic Range f(SAR_{head})

(TEM cell , f = 900 MHz)

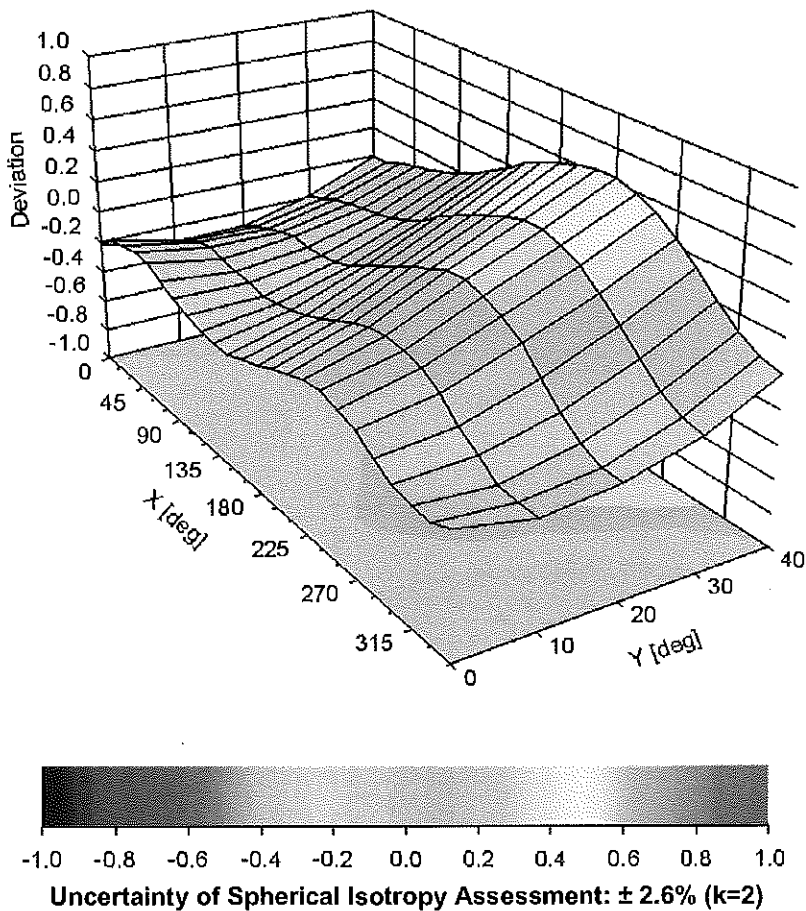


Uncertainty of Linearity Assessment: $\pm 0.6\%$ (k=2)

Conversion Factor Assessment



Deviation from Isotropy in Liquid Error (ϕ, ϑ), f = 900 MHz



DASY/EASY - Parameters of Probe: EX3DV4 - SN:3589

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-38.2
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 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: **EX3-3920_Dec13**

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3920**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6**
Calibration procedure for dosimetric E-field probes

Calibration date: **December 18, 2013**

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	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
Reference Probe ES3DV2	SN: 3013	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
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-15
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: December 19, 2013			
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**

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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 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 EX3DV4

SN:3920

Manufactured: December 18, 2012
Calibrated: December 18, 2013

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3920

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V/m})^2$) ^A	0.34	0.50	0.49	$\pm 10.1 \%$
DCP (mV) ^B	102.9	99.5	98.3	

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	182.5	$\pm 2.7 \%$
		Y	0.0	0.0	1.0		164.9	
		Z	0.0	0.0	1.0		153.0	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	0.76	53.8	6.5	10.00	44.1	$\pm 2.2 \%$
		Y	2.33	62.8	11.4		43.7	
		Z	1.15	55.6	7.5		53.0	
10011-CAA	UMTS-FDD (WCDMA)	X	3.36	66.5	17.5	2.91	142.4	$\pm 0.5 \%$
		Y	3.15	65.0	16.7		131.4	
		Z	3.26	66.0	17.7		121.6	
10012-CAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	2.69	66.4	16.9	1.87	138.1	$\pm 0.5 \%$
		Y	2.56	65.1	16.2		130.7	
		Z	2.72	66.6	17.2		121.4	
10021-DAA	GSM-FDD (TDMA, GMSK)	X	2.06	63.4	11.7	9.39	99.7	$\pm 1.9 \%$
		Y	2.43	66.1	14.1		94.7	
		Z	2.90	69.9	16.1		121.8	
10023-DAA	GPRS-FDD (TDMA, GMSK, TN 0)	X	1.94	62.4	11.3	9.57	95.1	$\pm 1.9 \%$
		Y	2.31	64.8	13.1		90.1	
		Z	2.98	70.4	16.4		117.0	
10024-DAA	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	2.19	67.1	12.2	6.56	140.1	$\pm 1.4 \%$
		Y	2.35	67.0	12.9		134.0	
		Z	3.45	73.5	16.1		131.4	
10027-DAA	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	1.18	61.7	8.5	4.80	121.6	$\pm 1.2 \%$
		Y	1.57	63.4	10.0		116.0	
		Z	1.57	65.5	11.9		109.2	
10028-DAA	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	3.80	74.5	13.3	3.55	130.3	$\pm 0.9 \%$
		Y	1.00	60.5	8.0		123.9	
		Z	1.58	66.1	11.1		119.0	
10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	0.18	55.2	3.4	1.16	111.6	$\pm 0.7 \%$
		Y	0.34	57.4	4.4		143.6	
		Z	0.40	59.2	5.7		136.6	
10039-CAA	CDMA2000 (1xRTT, RC1)	X	4.49	65.9	18.1	4.57	131.8	$\pm 0.9 \%$
		Y	4.57	65.1	17.5		123.0	
		Z	4.66	65.9	18.3		118.6	
10062-CAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps)	X	10.09	68.6	21.3	8.68	126.5	$\pm 2.5 \%$
		Y	10.31	68.5	21.1		121.9	
		Z	10.12	68.3	21.3		115.8	

10098-CAA	UMTS-FDD (HSUPA, Subtest 2)	X	4.64	66.6	18.1	3.98	144.6	±0.7 %
		Y	4.54	65.4	17.4		133.9	
		Z	4.60	66.1	18.0		128.0	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.00	65.5	18.3	5.67	104.2	±1.4 %
		Y	6.44	66.7	18.8		138.2	
		Z	6.54	67.4	19.4		134.7	
10108-CAB	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.37	67.0	19.2	5.80	149.0	±1.4 %
		Y	6.40	66.6	18.9		141.2	
		Z	6.40	66.9	19.4		132.1	
10110-CAB	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X	5.96	66.3	18.9	5.75	142.3	±1.4 %
		Y	6.05	66.1	18.7		136.6	
		Z	6.03	66.3	19.1		128.2	
10114-CAA	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	X	10.28	68.7	20.9	8.10	137.3	±2.5 %
		Y	10.32	68.5	20.7		131.3	
		Z	10.24	68.5	20.9		124.5	
10117-CAA	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.29	68.8	20.9	8.07	138.5	±2.5 %
		Y	10.34	68.6	20.8		131.9	
		Z	10.26	68.5	20.9		125.5	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	7.20	67.5	21.6	9.28	118.6	±2.2 %
		Y	7.59	67.9	21.6		116.7	
		Z	7.78	69.2	22.7		110.7	
10154-CAB	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	5.98	66.4	18.9	5.75	142.7	±1.2 %
		Y	5.97	65.7	18.4		132.7	
		Z	6.06	66.4	19.1		128.6	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.41	66.8	19.1	5.82	147.7	±1.4 %
		Y	6.48	66.5	18.8		137.3	
		Z	6.53	67.0	19.4		134.9	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	4.59	65.5	18.6	5.73	120.3	±1.2 %
		Y	4.76	65.0	18.2		113.9	
		Z	4.82	65.6	18.9		112.0	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	5.77	69.3	22.7	9.21	128.1	±1.9 %
		Y	6.15	69.3	22.6		123.8	
		Z	6.22	70.3	23.6		120.8	
10175-CAB	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	4.62	65.6	18.7	5.72	120.2	±0.9 %
		Y	4.75	65.0	18.2		113.5	
		Z	4.80	65.6	18.8		110.7	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	4.57	65.4	18.6	5.72	118.9	±0.9 %
		Y	4.72	64.8	18.1		113.1	
		Z	4.81	65.6	18.8		110.4	
10193-CAA	IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	X	9.77	68.3	20.8	8.09	128.1	±2.5 %
		Y	9.84	67.9	20.5		117.1	
		Z	9.80	68.1	20.8		116.6	
10196-CAA	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.78	68.4	20.8	8.10	128.4	±2.5 %
		Y	9.86	68.0	20.5		120.3	
		Z	9.82	68.1	20.9		119.1	

10219-CAA	IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)	X	9.70	68.4	20.8	8.03	128.0	±2.5 %
		Y	9.79	68.0	20.5		119.6	
		Z	9.72	68.1	20.8		118.7	
10222-CAA	IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)	X	10.27	68.8	20.9	8.06	137.0	±2.5 %
		Y	10.18	68.3	20.6		125.2	
		Z	10.20	68.5	20.9		124.8	
10225-CAA	UMTS-FDD (HSPA+)	X	6.64	66.1	18.7	5.97	108.8	±1.4 %
		Y	7.23	67.1	19.1		148.9	
		Z	7.31	67.7	19.7		146.5	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	5.82	69.6	23.0	9.21	130.2	±1.9 %
		Y	6.14	69.2	22.6		123.9	
		Z	6.25	70.4	23.7		122.2	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	6.85	67.5	21.7	9.24	112.9	±2.2 %
		Y	7.54	69.0	22.4		149.2	
		Z	7.80	70.6	23.7		147.3	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	7.23	67.6	21.6	9.30	118.3	±2.2 %
		Y	7.55	67.7	21.5		111.5	
		Z	7.79	69.2	22.7		109.6	
10274-CAA	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)	X	5.64	65.9	18.1	4.87	105.5	±1.2 %
		Y	6.04	66.4	18.2		142.6	
		Z	6.09	66.9	18.7		138.4	
10275-CAA	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.42	66.3	18.1	3.96	135.8	±0.7 %
		Y	4.26	65.0	17.3		119.3	
		Z	4.40	65.9	18.0		120.4	
10291-AAA	CDMA2000, RC3, SO55, Full Rate	X	3.62	66.7	18.1	3.46	123.6	±0.7 %
		Y	3.38	64.3	16.7		112.5	
		Z	3.59	66.0	17.9		114.3	
10292-AAA	CDMA2000, RC3, SO32, Full Rate	X	3.46	66.0	17.7	3.39	127.3	±0.5 %
		Y	3.35	64.5	16.8		113.7	
		Z	3.50	65.7	17.7		115.4	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.35	66.9	19.2	5.81	145.7	±1.2 %
		Y	6.26	66.1	18.7		129.2	
		Z	6.42	67.0	19.4		131.3	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.45	65.9	18.7	6.06	103.7	±1.7 %
		Y	6.90	66.9	19.1		137.2	
		Z	7.04	67.7	19.8		137.5	
10315-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)	X	2.85	67.8	17.7	1.71	135.6	±0.5 %
		Y	2.45	64.7	16.0		121.4	
		Z	2.75	67.3	17.6		122.1	
10317-AAA	IEEE 802.11a WiFi 5 GHz (OFDM, 6 Mbps, 96pc duty cycle)	X	9.93	68.5	21.0	8.36	128.1	±2.7 %
		Y	10.02	68.1	20.7		117.9	
		Z	10.01	68.3	21.1		119.4	
10400-AAA	IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)	X	10.09	68.8	21.2	8.37	134.9	±2.5 %
		Y	10.16	68.3	20.8		119.8	
		Z	10.14	68.5	21.2		121.0	

10402-AAA	IEEE 802.11ac WiFi (80MHz, 64-QAM, 99pc duty cycle)	X	11.18	69.8	21.5	8.53	147.1	±2.7 %
		Y	10.79	68.6	20.8		126.5	
		Z	11.17	69.6	21.6		131.4	
10403-AAA	CDMA2000 (1xEV-DO, Rev. 0)	X	4.83	69.6	18.9	3.76	139.6	±0.5 %
		Y	4.70	67.1	17.6		128.1	
		Z	4.90	68.4	18.6		127.8	
10404-AAA	CDMA2000 (1xEV-DO, Rev. A)	X	4.73	69.5	18.9	3.77	134.8	±0.5 %
		Y	4.62	67.1	17.7		124.9	
		Z	4.67	67.7	18.1		125.9	

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: EX3DV4 - SN:3920

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	10.05	10.05	10.05	0.27	1.13	± 12.0 %
835	41.5	0.90	9.69	9.69	9.69	0.50	0.76	± 12.0 %
1750	40.1	1.37	7.91	7.91	7.91	0.72	0.62	± 12.0 %
1900	40.0	1.40	7.70	7.70	7.70	0.77	0.61	± 12.0 %
2450	39.2	1.80	6.98	6.98	6.98	0.37	0.86	± 12.0 %
2600	39.0	1.96	6.74	6.74	6.74	0.34	0.97	± 12.0 %
5200	36.0	4.66	4.87	4.87	4.87	0.40	1.80	± 13.1 %
5300	35.9	4.76	4.66	4.66	4.66	0.40	1.80	± 13.1 %
5500	35.6	4.96	4.54	4.54	4.54	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.37	4.37	4.37	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.11	4.11	4.11	0.50	1.80	± 13.1 %

^C Frequency validity 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.

^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: EX3DV4 - SN:3920

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	9.54	9.54	9.54	0.32	1.07	± 12.0 %
835	55.2	0.97	9.47	9.47	9.47	0.45	0.85	± 12.0 %
1750	53.4	1.49	7.77	7.77	7.77	0.59	0.74	± 12.0 %
1900	53.3	1.52	7.50	7.50	7.50	0.37	0.91	± 12.0 %
2450	52.7	1.95	7.18	7.18	7.18	0.80	0.56	± 12.0 %
2600	52.5	2.16	6.91	6.91	6.91	0.80	0.57	± 12.0 %
5200	49.0	5.30	4.23	4.23	4.23	0.50	1.90	± 13.1 %
5300	48.9	5.42	4.11	4.11	4.11	0.50	1.90	± 13.1 %
5500	48.6	5.65	3.80	3.80	3.80	0.50	1.90	± 13.1 %
5600	48.5	5.77	3.62	3.62	3.62	0.50	1.90	± 13.1 %
5800	48.2	6.00	4.00	4.00	4.00	0.50	1.90	± 13.1 %

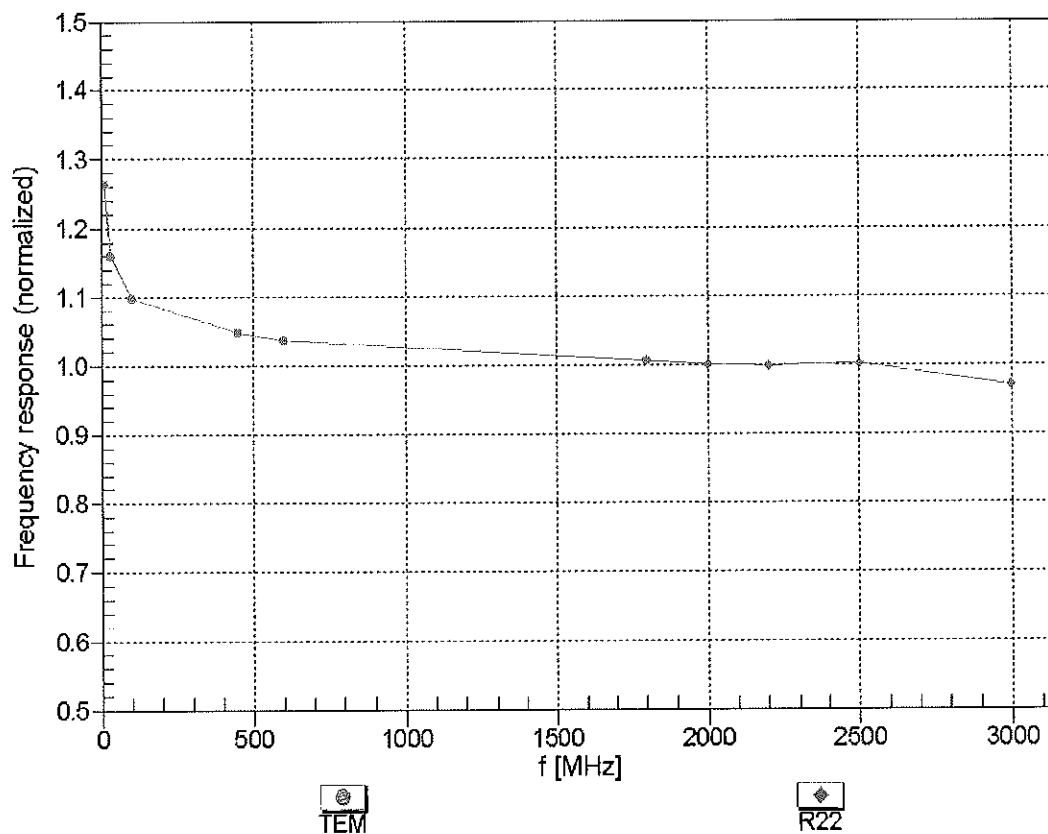
^C Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

^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

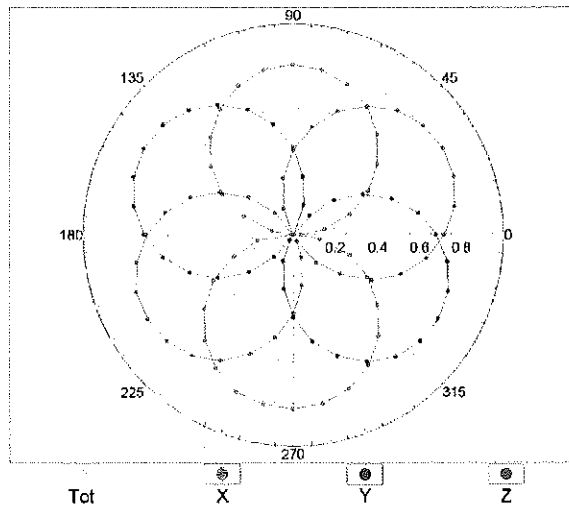
(TEM-Cell:ifi110 EXX, Waveguide: R22)



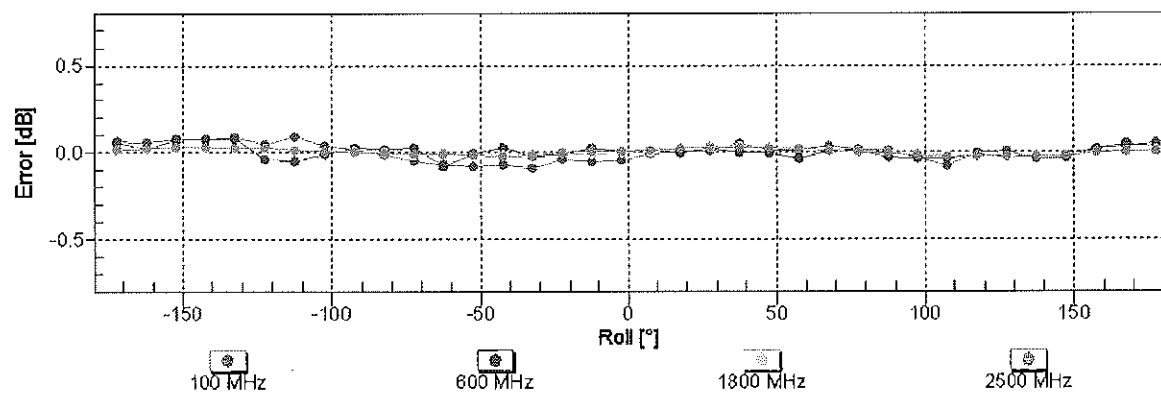
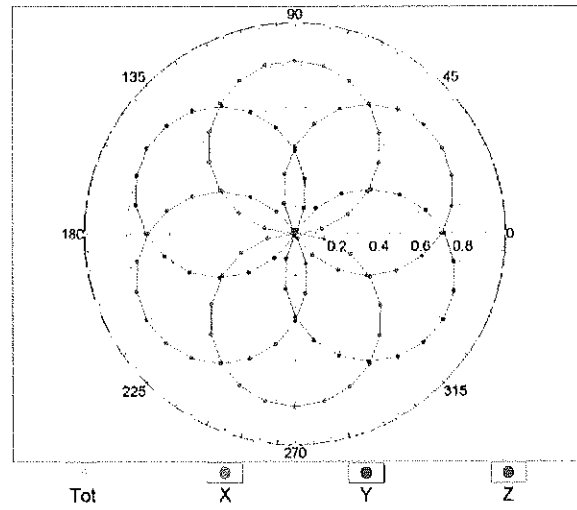
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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

$f=600$ MHz, TEM

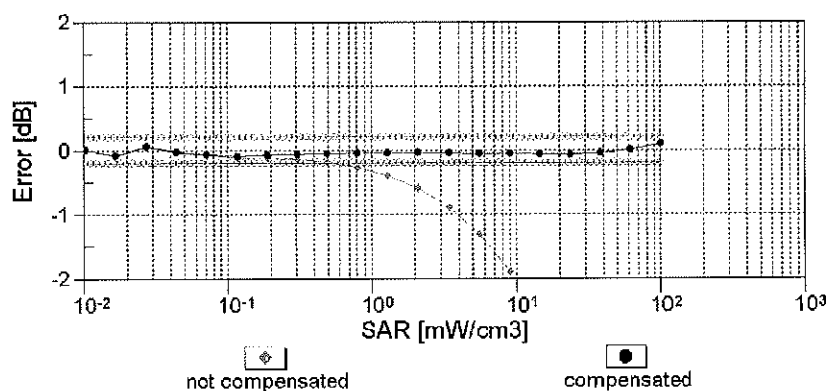
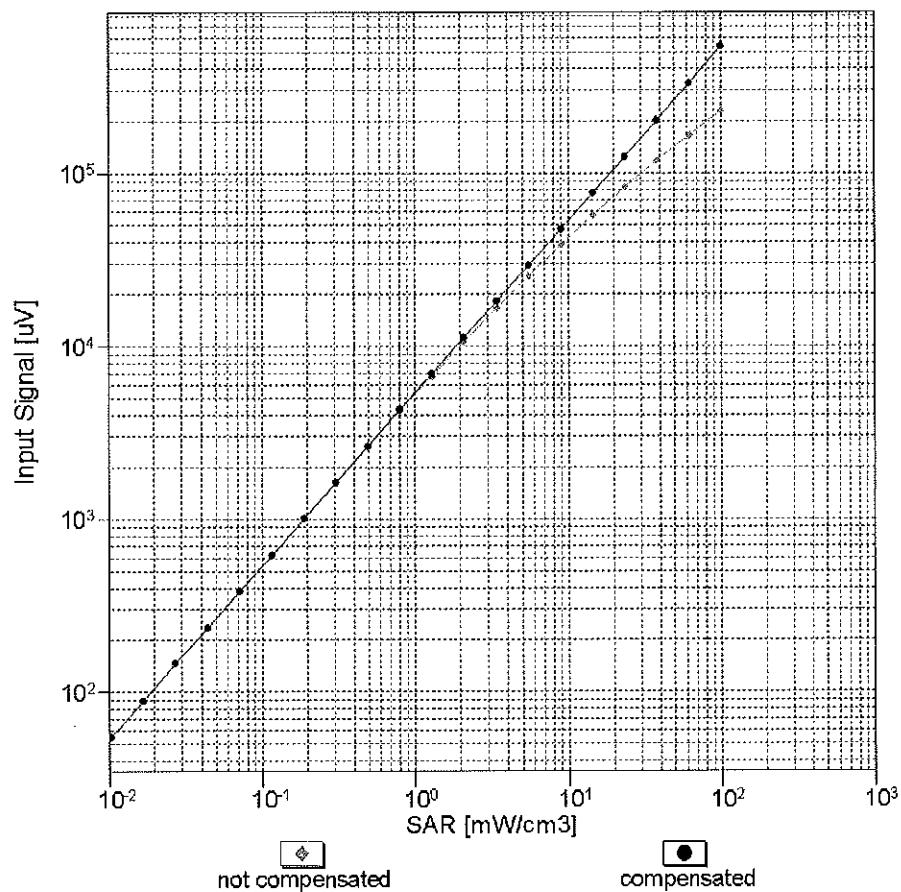


$f=1800$ MHz, R22



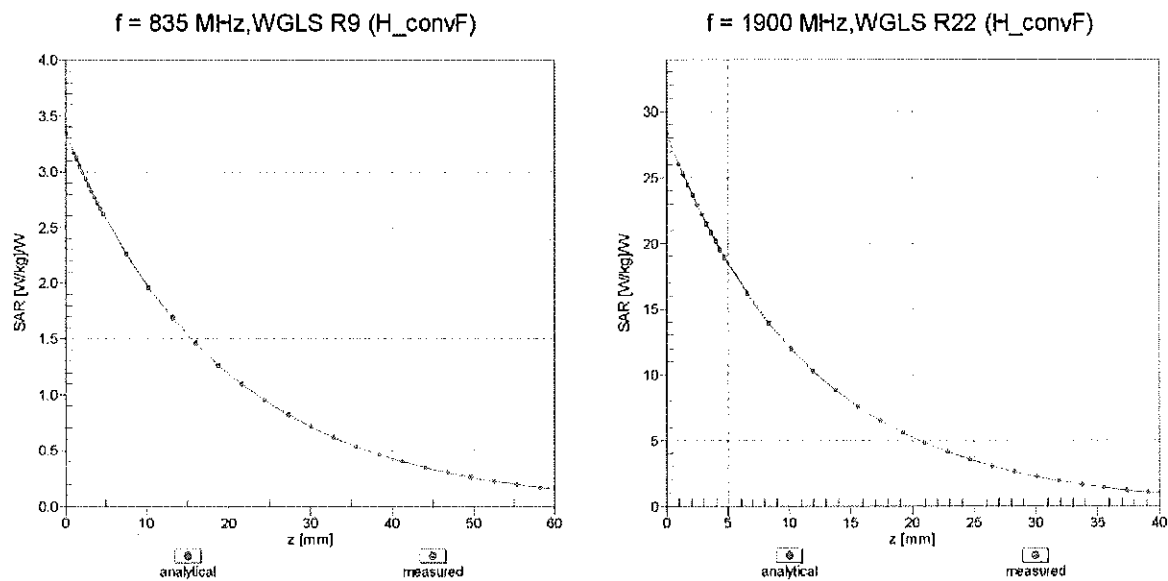
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range $f(\text{SAR}_{\text{head}})$ (TEM cell , $f = 900 \text{ MHz}$)



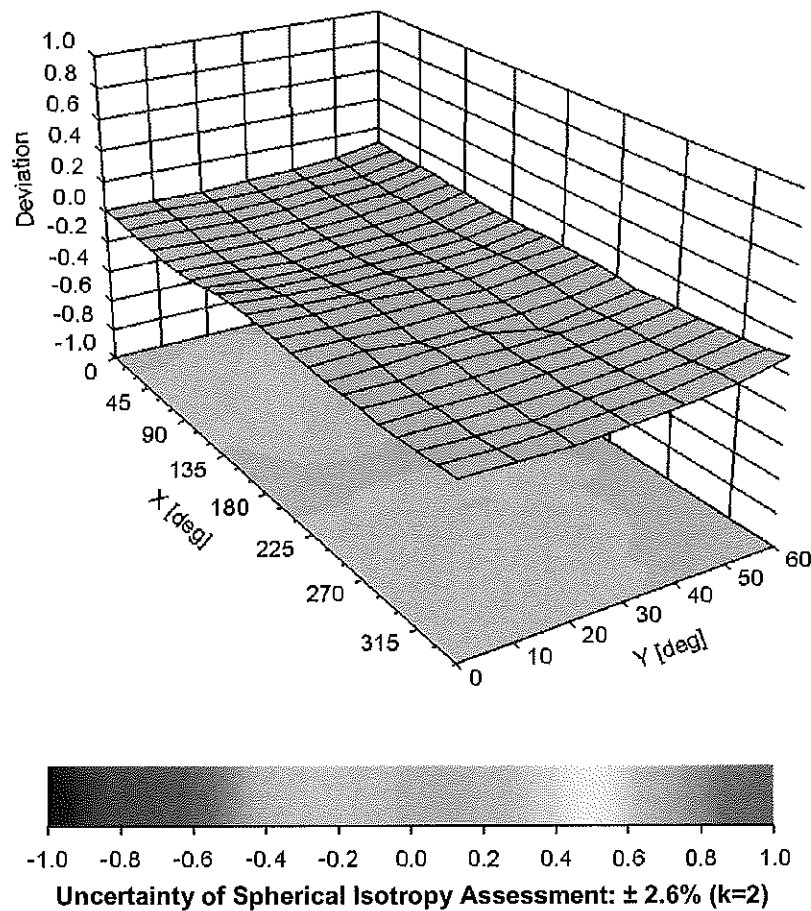
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, θ), f = 900 MHz



DASY/EASY - Parameters of Probe: EX3DV4 - SN:3920

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-22.4
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D835V2-4d119_Apr13**

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 4d119**

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

Calibration date: **April 25, 2013**

✓
KOK
5/8/13

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	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 909	11-Sep-12 (No. DAE4-909_Sep12)	Sep-13
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

Calibrated by: **Claudio Leubler** Function: **Laboratory Technician**

Approved by: **Katja Pokovic** Technical Manager

Signature

[Signature]

[Signature]

Issued: April 26, 2013

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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:

- a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- b) 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
- c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- d) 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	V52.8.6
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	40.8 $\pm$ 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	2.51 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.68 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	1.62 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.30 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	54.0 $\pm$ 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	2.47 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	9.54 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	1.62 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	6.31 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.1 Ω - 4.7 j Ω
Return Loss	- 26.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.8 Ω - 6.3 j Ω
Return Loss	- 22.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.385 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	June 29, 2010

DASY5 Validation Report for Head TSL

Date: 25.04.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d119

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

Medium parameters used: $f = 835$ MHz; $\sigma = 0.94$ S/m; $\epsilon_r = 40.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.05, 6.05, 6.05); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn909; Calibrated: 11.09.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

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

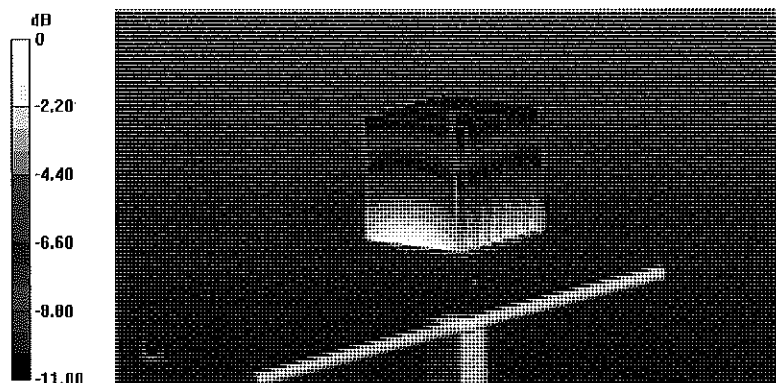
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.387 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 3.86 W/kg

SAR(1 g) = 2.51 W/kg; SAR(10 g) = 1.62 W/kg

Maximum value of SAR (measured) = 2.93 W/kg



0 dB = 2.93 W/kg = 4.67 dBW/kg

Impedance Measurement Plot for Head TSL

25 Apr 2013 09:11:06
 CH1 S11 1 U FS 1: 50.061 Ω -4.6621 Ω 40.884 pF 835.000 000 MHz

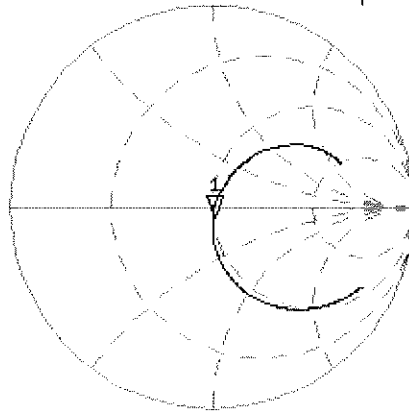
*

Del

CA

Avg
16

H1 d

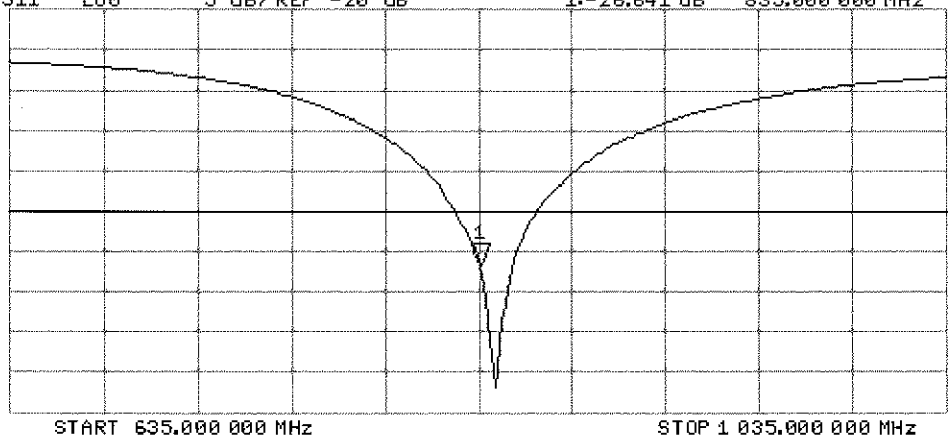


CH2 S11 LOG 5 dB/REF -20 dB 1:-26.641 dB 835.000 000 MHz

CA

Avg
16

H1 d



DASY5 Validation Report for Body TSL

Date: 24.04.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d119

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

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 1.01 \text{ S/m}$; $\epsilon_r = 54$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.04, 6.04, 6.04); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn909; Calibrated: 11.09.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

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

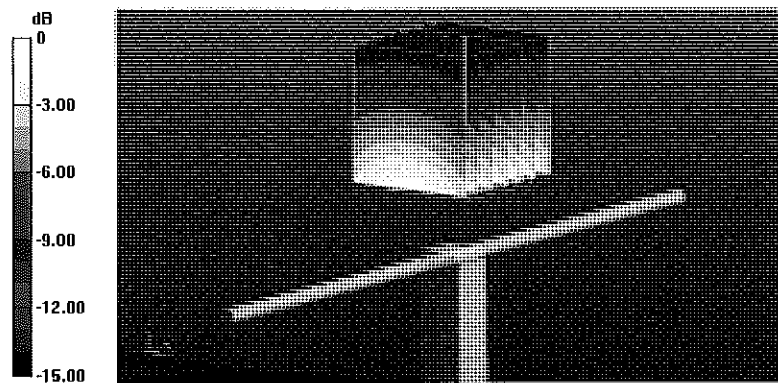
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.178 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 3.68 W/kg

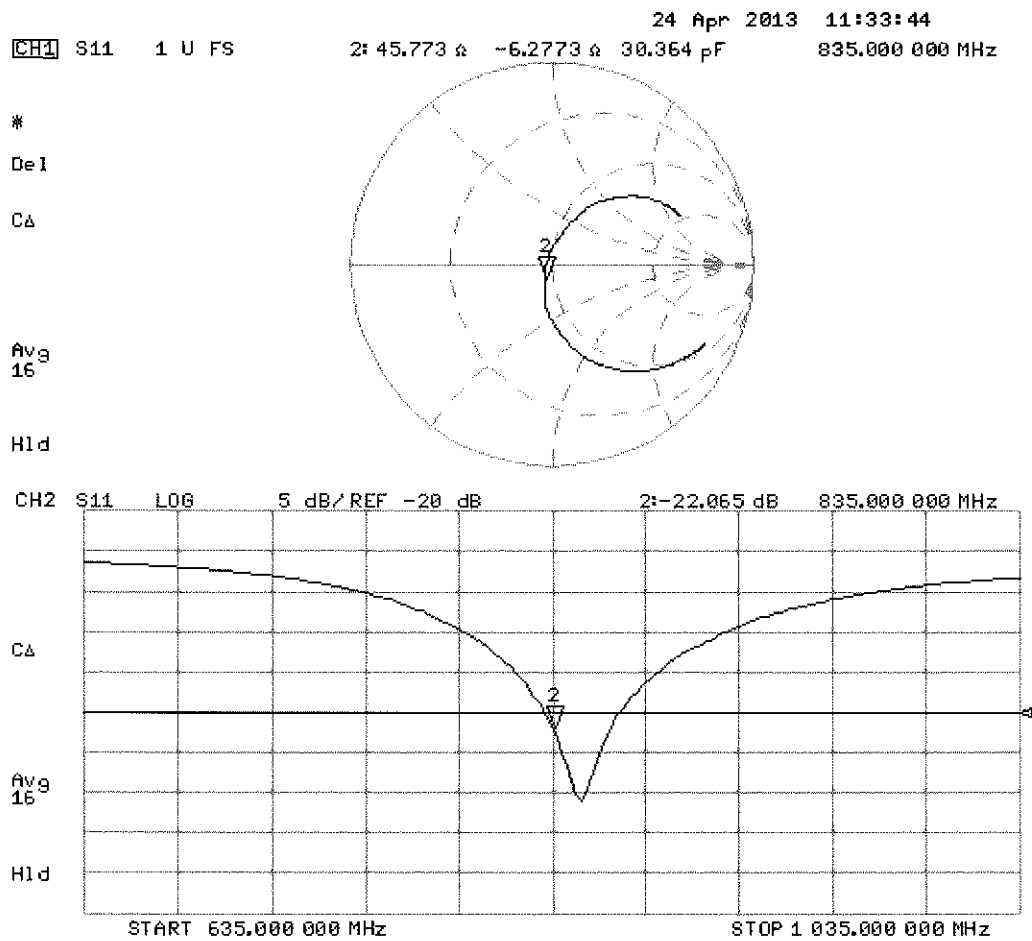
SAR(1 g) = 2.47 W/kg; SAR(10 g) = 1.62 W/kg

Maximum value of SAR (measured) = 2.89 W/kg



0 dB = 2.89 W/kg = 4.61 dBW/kg

Impedance Measurement Plot for Body TSL





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Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D1900V2-5d149_Jul13**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d149**

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

Calibration date: **July 22, 2013**

✓
KOK
8/19/13

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	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

Calibrated by:	Name Jeton Kastrati	Function Laboratory Technician	Signature 
Approved by:	Name Katja Pokovic	Function Technical Manager	Signature 

Issued: July 22, 2013

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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 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- 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
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

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	V52.8.7
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	38.9 $\pm$ 6 %	1.36 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	9.99 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	40.4 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	5.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	21.3 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	53.4 $\pm$ 6 %	1.49 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	10.0 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	40.5 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	5.36 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.6 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$52.9\ \Omega + 6.0\ j\Omega$
Return Loss	- 23.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$48.5\ \Omega + 6.4\ j\Omega$
Return Loss	- 23.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.196 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: 22.07.2013

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: $f = 1900 \text{ MHz}$; $\sigma = 1.36 \text{ S/m}$; $\epsilon_r = 38.9$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.98, 4.98, 4.98); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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

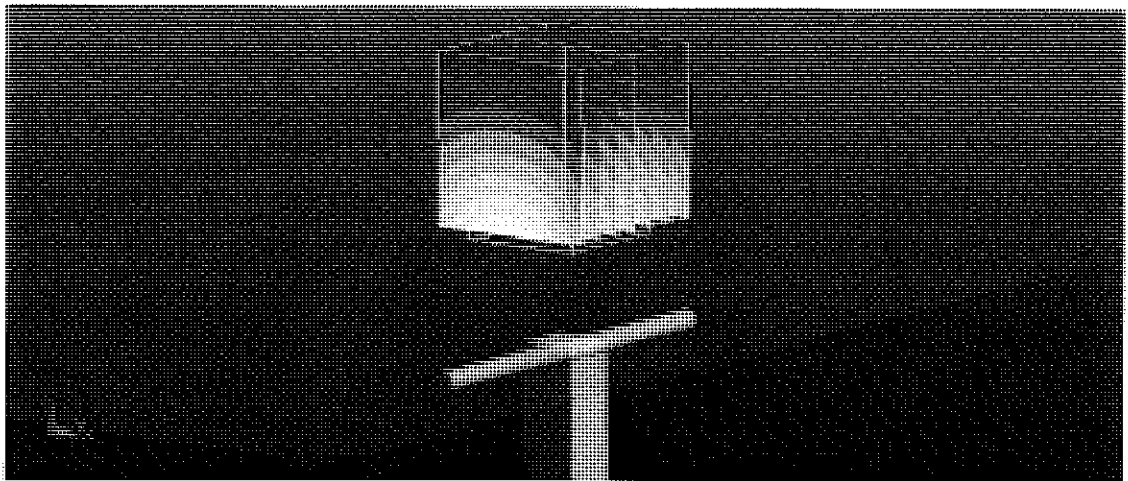
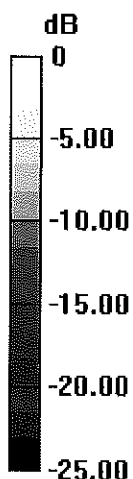
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 96.173 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 18.0 W/kg

SAR(1 g) = 9.99 W/kg; SAR(10 g) = 5.28 W/kg

Maximum value of SAR (measured) = 12.4 W/kg

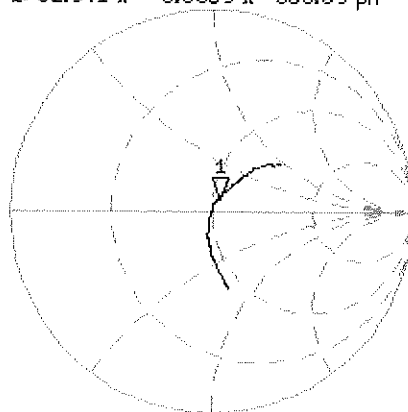


0 dB = 12.4 W/kg = 10.93 dBW/kg

Impedance Measurement Plot for Head TSL

22 Jul 2013 11:59:34
 CH1 S11 1 U FS 1: 52.941 Ω 6.0059 Ω 503.09 μH 1 900.000 000 MHz

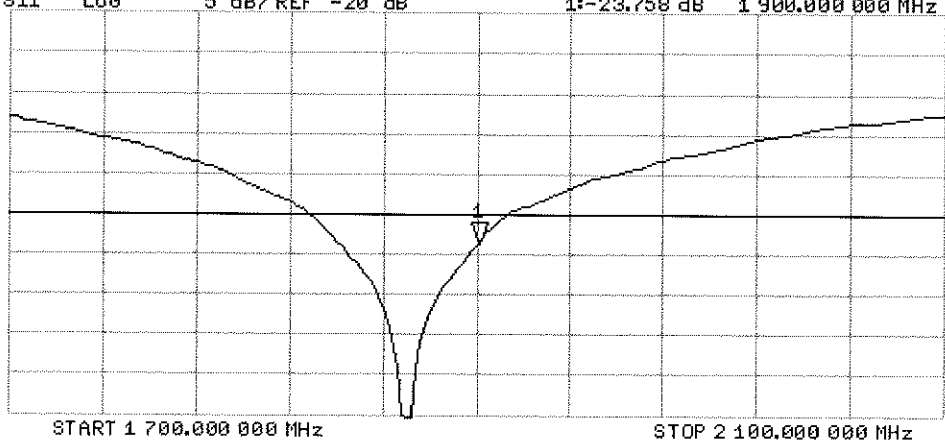
*
 Del
 CA



Avg
 16
 H1d

CH2 S11 L00 5 dB/REF -20 dB 1:-23.758 dB 1 900.000 000 MHz

CA
 Avg
 16
 H1d



DASY5 Validation Report for Body TSL

Date: 22.07.2013

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; $\sigma = 1.49$ S/m; $\epsilon_r = 53.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.6, 4.6, 4.6); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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

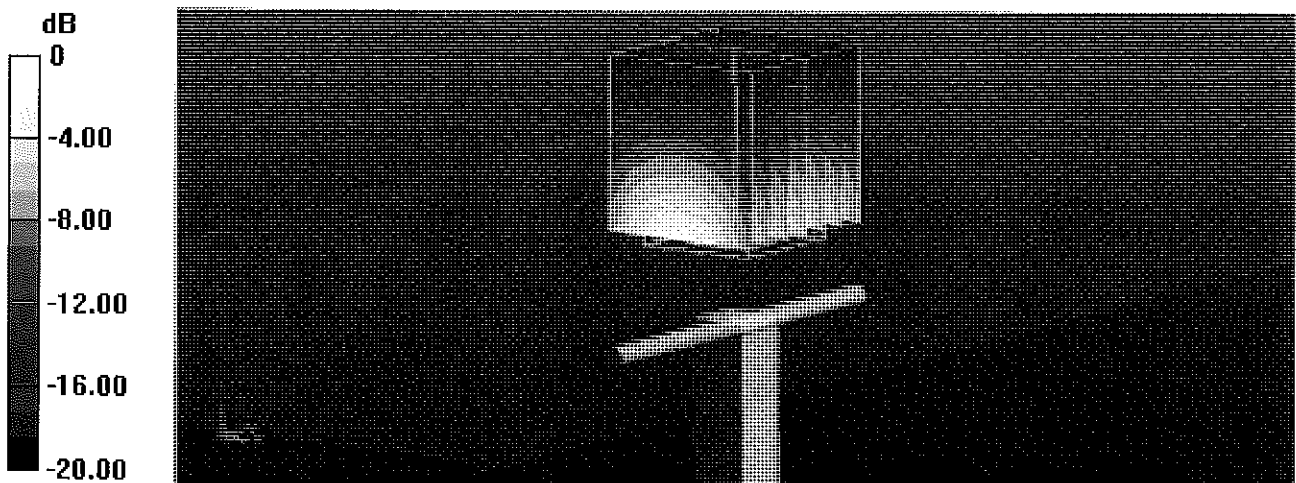
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.173 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 17.0 W/kg

SAR(1 g) = 10 W/kg; SAR(10 g) = 5.36 W/kg

Maximum value of SAR (measured) = 12.6 W/kg



0 dB = 12.6 W/kg = 11.00 dBW/kg

Impedance Measurement Plot for Body TSL

22 Jul 2013 11:32:14
[CH1] S11 1 U FS 1: 48.525 Δ 6.3906 Δ 535.32 pH 1 900.000 000 MHz

*

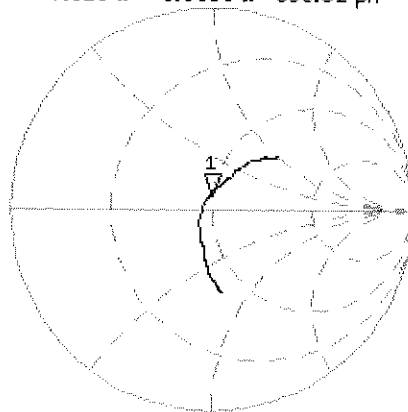
De1

CA

Avg

16

H1d



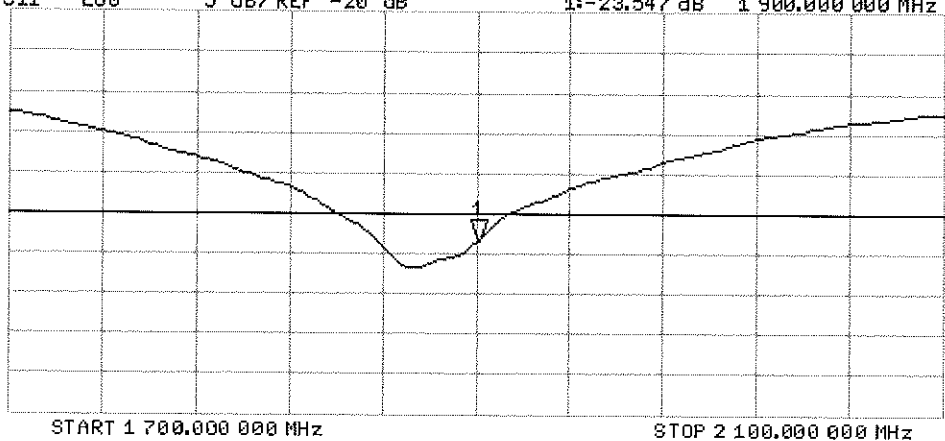
CH2 S11 LOG 5 dB/REF -20 dB 1: -23.547 dB 1 900.000 000 MHz

CA

Avg

16

H1d





Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

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Multilateral Agreement for the recognition of calibration certificates

Client **PC Test**

Certificate No: **D2450V2-719_Aug13**

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 23, 2013**

✓cc
9/13/13

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	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

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

Approved by: **Katja Pokovic** Name: **Katja Pokovic** Function: **Technical Manager** Signature:

Issued: August 23, 2013

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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 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- 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	V52.8.7
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	37.8 $\pm$ 6 %	1.80 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	13.4 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	53.2 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	6.23 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.8 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	50.6 $\pm$ 6 %	2.03 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	13.3 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	51.7 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	6.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	24.1 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$54.6 \Omega + 3.5 j\Omega$
Return Loss	- 25.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$51.1 \Omega + 5.4 j\Omega$
Return Loss	- 25.3 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: 22.08.2013

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; $\sigma = 1.8$ S/m; $\epsilon_r = 37.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.52, 4.52, 4.52); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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

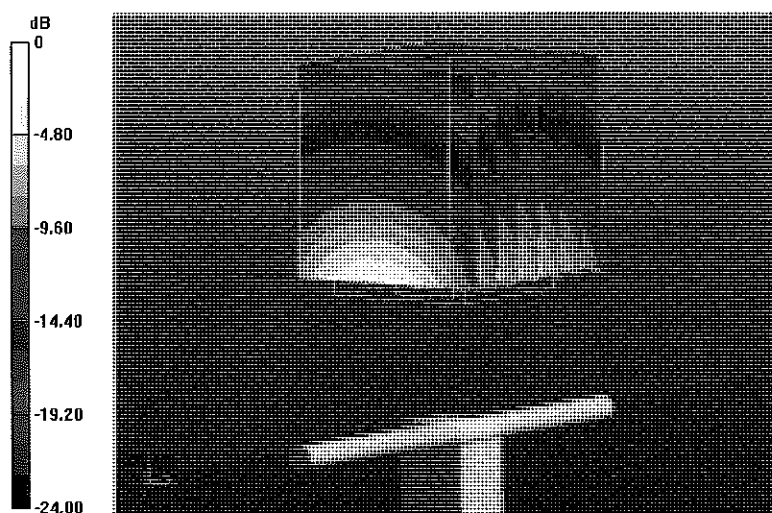
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 100.7 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 27.9 W/kg

SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.23 W/kg

Maximum value of SAR (measured) = 17.0 W/kg

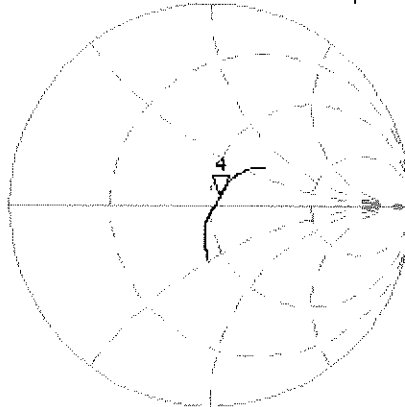


0 dB = 17.0 W/kg = 12.30 dBW/kg

Impedance Measurement Plot for Head TSL

22 Aug 2013 11:00:15
 [CH1] S11 1 U FS 4: 54.639 Ω 3.5215 Ω 228.76 pF 2 450.000 000 MHz

*
 De1
 CA



Avg
 16

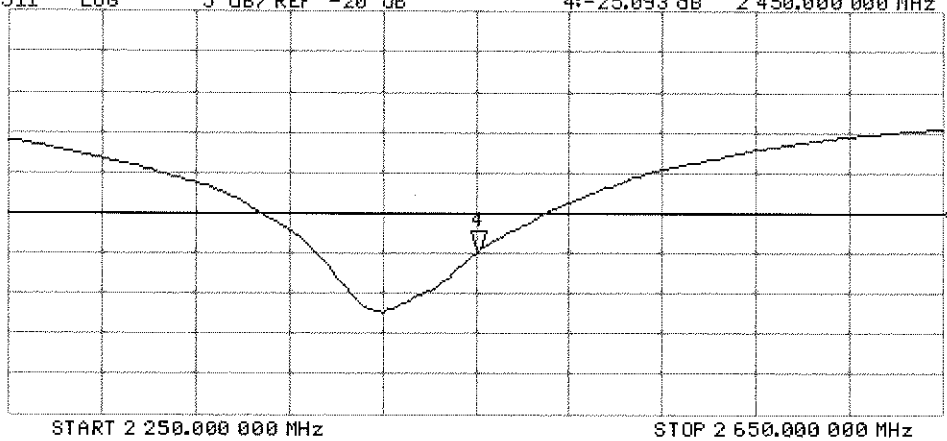
H1d

CH2 S11 LOG 5 dB/REF -20 dB 4: -25.093 dB 2 450.000 000 MHz

CA

Avg
 16

H1d



DASY5 Validation Report for Body TSL

Date: 23.08.2013

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; $\sigma = 2.03$ S/m; $\epsilon_r = 50.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.42, 4.42, 4.42); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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

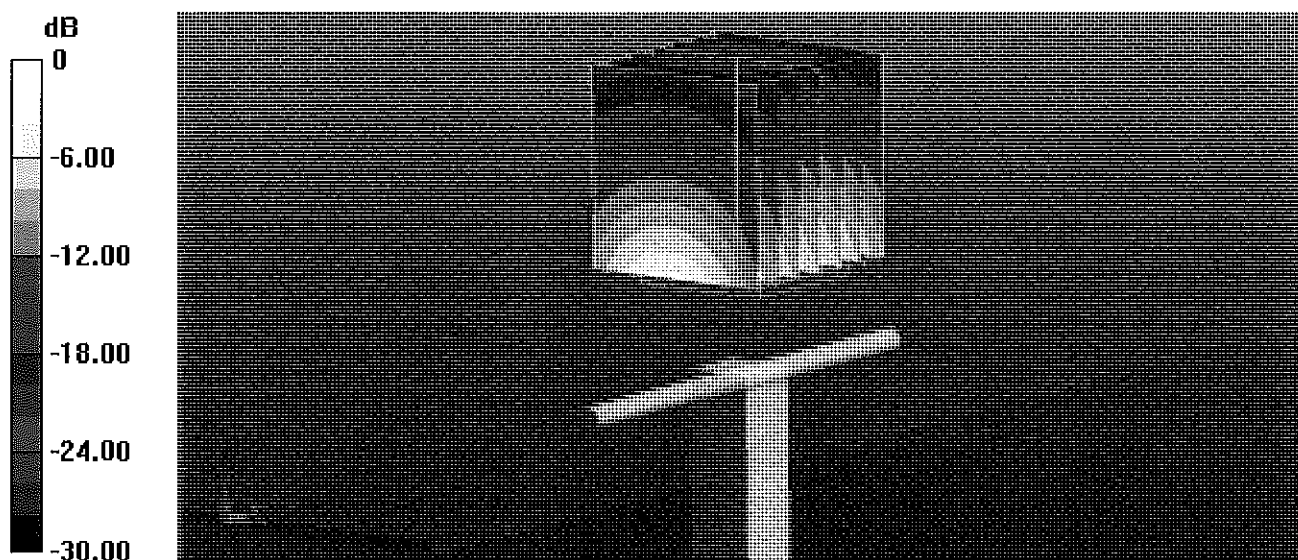
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.688 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 27.9 W/kg

SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.14 W/kg

Maximum value of SAR (measured) = 17.2 W/kg

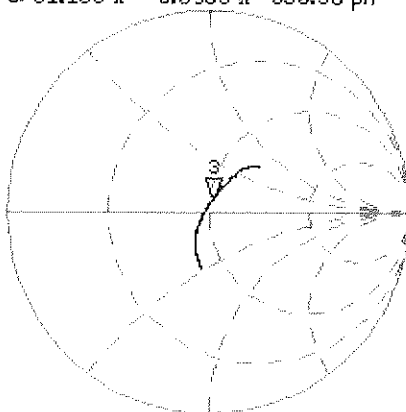


0 dB = 17.2 W/kg = 12.36 dBW/kg

Impedance Measurement Plot for Body TSL

23 Aug 2013 09:00:38
 [CH1] S11 1 U FS 3: 51.135 Ω 5.3965 Ω 350.56 μ H 2 450.000 000 MHz

 Del
 CA



Avg
 16

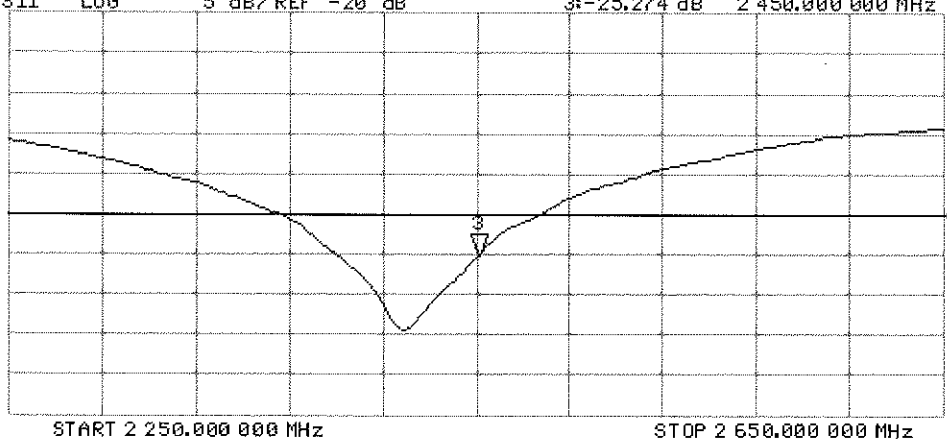
H1d

CH2 S11 LOG 5 dB/REF -20 dB 3:-25.274 dB 2 450.000 000 MHz

CA

Avg
 16

H1d





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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D2600V2-1004_May13**

CALIBRATION CERTIFICATE

Object **D2600V2 - SN: 1004**

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

Calibration date: **May 02, 2013**

✓
100k
5/8/13

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	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14
DAE4	SN: 909	11-Sep-12 (No. DAE4-909_Sep12)	Sep-13
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

Calibrated by: **Claudio Leubler** Name: **Claudio Leubler** Function: **Laboratory Technician**

Signature

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

Issued: May 2, 2013

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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 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- 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
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

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	V52.8.6
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	37.2 $\pm$ 6 %	1.99 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	14.8 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	58.2 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	6.57 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	26.0 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	52.5	2.16 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	50.8 $\pm$ 6 %	2.20 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	14.6 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	57.5 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	25.5 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.0 Ω - 4.3 j Ω
Return Loss	- 27.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.7 Ω - 2.9 j Ω
Return Loss	- 26.8 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	December 23, 2006

DASY5 Validation Report for Head TSL

Date: 02.05.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1004

Communication System: UID 0 - CW; Frequency: 2600 MHz

Medium parameters used: $f = 2600$ MHz; $\sigma = 1.99$ S/m; $\epsilon_r = 37.2$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.45, 4.45, 4.45); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

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

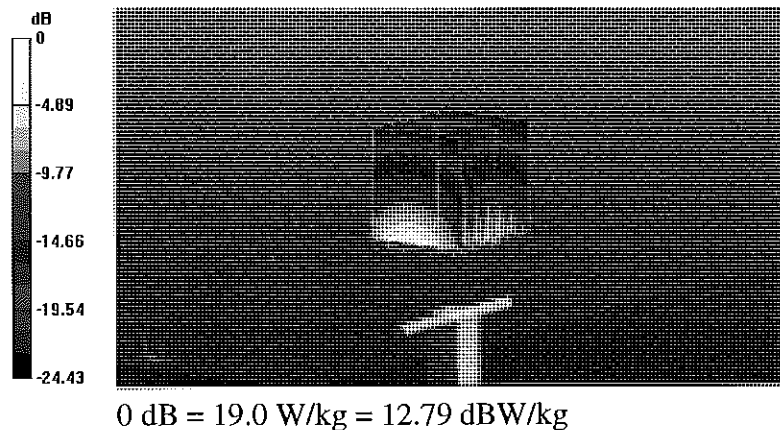
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 101.3 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 31.9 W/kg

SAR(1 g) = 14.8 W/kg; SAR(10 g) = 6.57 W/kg

Maximum value of SAR (measured) = 19.0 W/kg



Impedance Measurement Plot for Head TSL

2 May 2013 10:13:16
 [CH1] S11 1 U FS 1: 49.990 Ω -4.3359 Ω 14.118 pF 2 600.000 000 MHz

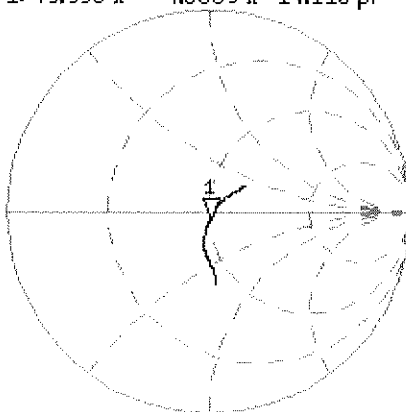
#

De1

CA

Avg
16

H1d

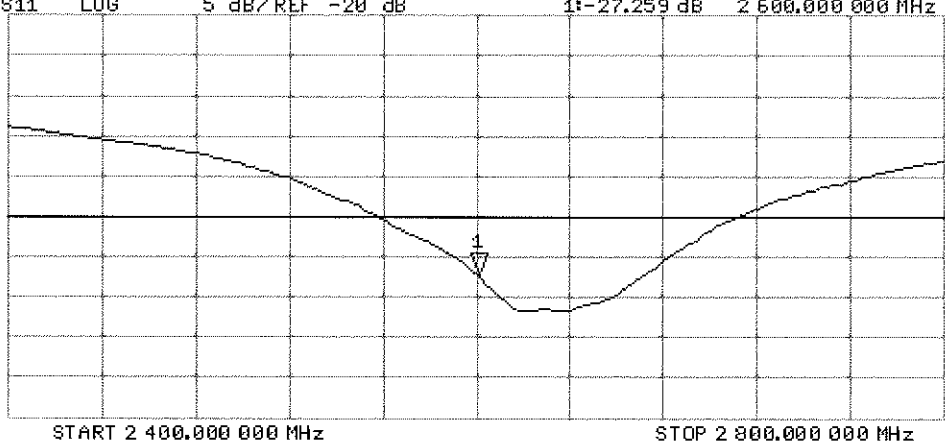


CH2 S11 LOG 5 dB/REF -20 dB 1: -27.259 dB 2 600.000 000 MHz

CA

Avg
16

H1d



DASY5 Validation Report for Body TSL

Date: 25.04.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1004

Communication System: UID 0 - CW; Frequency: 2600 MHz

Medium parameters used: $f = 2600$ MHz; $\sigma = 2.2$ S/m; $\epsilon_r = 50.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.32, 4.32, 4.32); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn909; Calibrated: 11.09.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

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

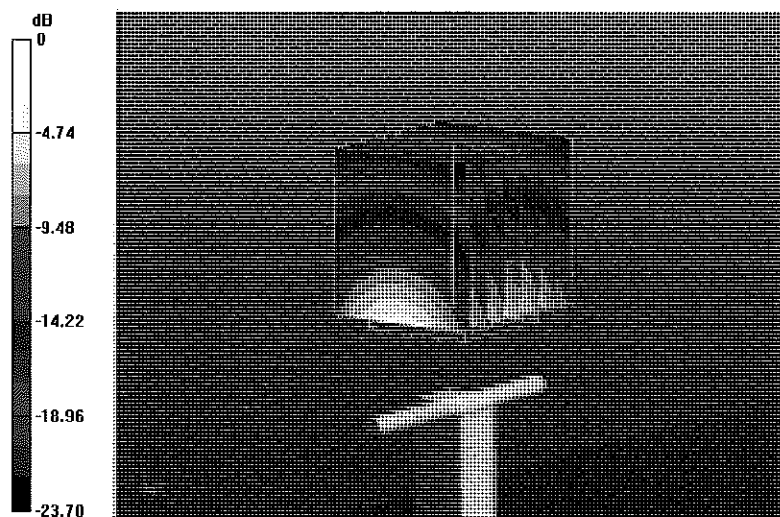
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.605 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 32.0 W/kg

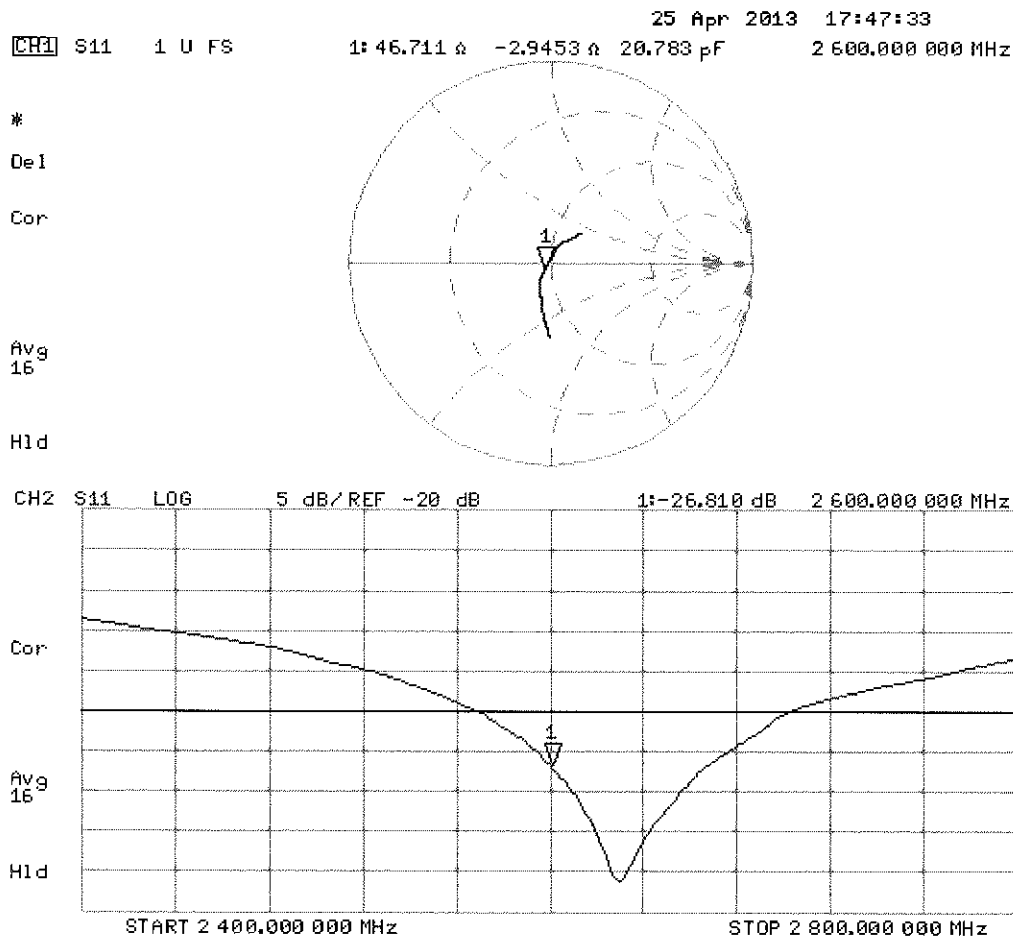
SAR(1 g) = 14.6 W/kg; SAR(10 g) = 6.43 W/kg

Maximum value of SAR (measured) = 19.4 W/kg



0 dB = 19.4 W/kg = 12.88 dBW/kg

Impedance Measurement Plot for Body TSL





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

Client **PC Test**

Certificate No: **D5GHzV2-1057_Jan14**

CALIBRATION CERTIFICATE

Object **D5GHzV2 - SN: 1057**

Calibration procedure(s) **QA CAL-22.v2**
Calibration procedure for dipole validation kits between 3-6 GHz

Calibration date: **January 27, 2014**

CC
2/5/14 ✓

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)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe EX3DV4	SN: 3503	30-Dec-13 (No. EX3-3503_Dec13)	Dec-14
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14
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: **Israe El-Naouq** **Laboratory Technician**

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

Signature

Israe El-Naouq
Katja Pokovic

Issued: January 27, 2014

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



Accredited by the Swiss Accreditation Service (SAS)

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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:

- IEC 62209-2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures"; Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"
- 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

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	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz $\pm$ 1 MHz 5300 MHz $\pm$ 1 MHz 5500 MHz $\pm$ 1 MHz 5600 MHz $\pm$ 1 MHz 5800 MHz $\pm$ 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	35.0 $\pm$ 6 %	4.45 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.85 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	78.0 W/kg $\pm$ 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.25 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.3 W/kg $\pm$ 19.5 % (k=2)

Head TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.9 ± 6 %	4.54 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5300 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.36 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	83.0 W / kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.8 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.6 ± 6 %	4.74 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.50 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	84.3 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.42 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.0 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.5 ± 6 %	4.86 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.42 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	83.5 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.8 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.2 ± 6 %	5.07 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.00 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	79.3 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.6 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.3 ± 6 %	5.44 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.58 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	75.3 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.12 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.0 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.42 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.2 ± 6 %	5.57 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5300 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.79 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	77.4 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.17 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.5 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.6	5.65 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.8 ± 6 %	5.84 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.96 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	79.1 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.22 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	22.0 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.6 ± 6 %	5.98 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.07 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	80.2 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.24 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	22.2 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.3 ± 6 %	6.23 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.48 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	74.3 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.06 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.4 W/kg ± 19.5 % (k=2)

Appendix

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	43.1 Ω - 4.6 j Ω
Return Loss	- 21.0 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	46.5 Ω - 1.3 j Ω
Return Loss	- 28.1 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	46.2 Ω - 2.5 j Ω
Return Loss	- 26.4 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	48.9 Ω - 5.7 j Ω
Return Loss	- 24.6 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	48.7 Ω - 3.1 j Ω
Return Loss	- 29.5 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	49.4 Ω - 7.7 j Ω
Return Loss	- 22.2 dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	49.6 Ω - 3.0 j Ω
Return Loss	- 30.3 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	50.8 Ω - 3.9 j Ω
Return Loss	- 28.0 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	55.4 Ω - 2.5 j Ω
Return Loss	- 25.0 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	52.3 Ω - 0.7 j Ω
Return Loss	- 32.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.186 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 27, 2006

DASY5 Validation Report for Head TSL

Date: 27.01.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1057

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz

Medium parameters used: $f = 5200$ MHz; $\sigma = 4.45$ S/m; $\epsilon_r = 35$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5300$ MHz; $\sigma = 4.54$ S/m; $\epsilon_r = 34.9$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5500$ MHz; $\sigma = 4.74$ S/m; $\epsilon_r = 34.6$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5600$ MHz; $\sigma = 4.86$ S/m; $\epsilon_r = 34.5$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5800$ MHz; $\sigma = 5.07$ S/m; $\epsilon_r = 34.2$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.52, 5.52, 5.52); Calibrated: 30.12.2013, ConvF(5.2, 5.2, 5.2); Calibrated: 30.12.2013, ConvF(5.01, 5.01, 5.01); Calibrated: 30.12.2013, ConvF(4.86, 4.86, 4.86); Calibrated: 30.12.2013, ConvF(4.91, 4.91, 4.91); Calibrated: 30.12.2013;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 63.497 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 28.2 W/kg

SAR(1 g) = 7.85 W/kg; SAR(10 g) = 2.25 W/kg

Maximum value of SAR (measured) = 18.6 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 64.444 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 31.2 W/kg

SAR(1 g) = 8.36 W/kg; SAR(10 g) = 2.4 W/kg

Maximum value of SAR (measured) = 20.1 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 63.807 V/m; Power Drift = 0.07 dB

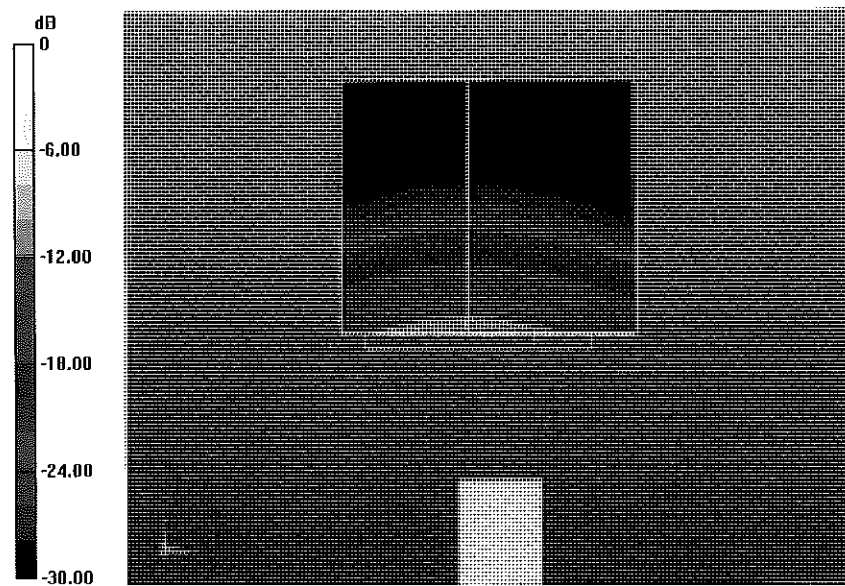
Peak SAR (extrapolated) = 33.0 W/kg

SAR(1 g) = 8.5 W/kg; SAR(10 g) = 2.42 W/kg

Maximum value of SAR (measured) = 20.8 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.194 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 33.2 W/kg
SAR(1 g) = 8.42 W/kg; SAR(10 g) = 2.4 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 60.646 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 32.9 W/kg
SAR(1 g) = 8 W/kg; SAR(10 g) = 2.28 W/kg
Maximum value of SAR (measured) = 19.9 W/kg

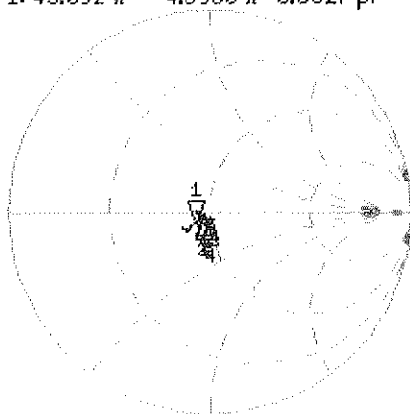


0 dB = 19.9 W/kg = 12.99 dBW/kg

Impedance Measurement Plot for Head TSL

27 Jan 2014 17:12:04
 CH1 S11 1 U FS 1: 43.092 Ω -4.5938 Ω 6.6627 pF 5 200.000 000 MHz

*
 Del
 Cor
 Avg
 16
 H1d

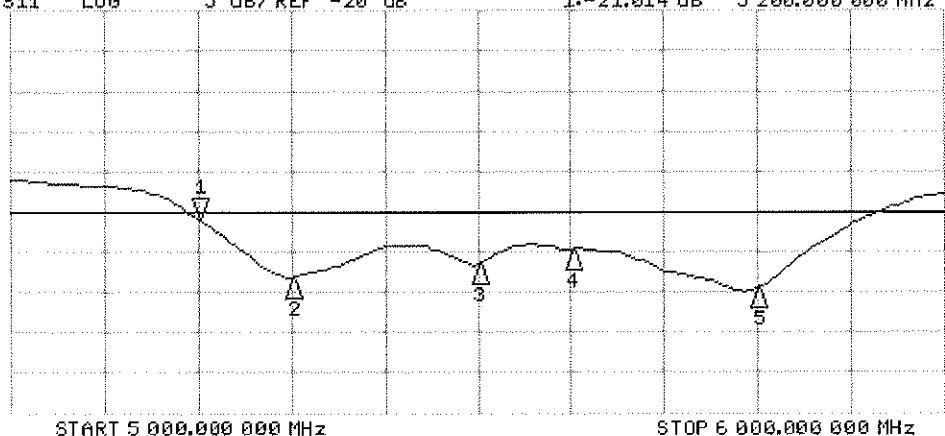


CH1 Markers

2: 46.475 Ω
 -1.3496 Ω
 5.30000 GHz
 3: 46.150 Ω
 -2.5078 Ω
 5.50000 GHz
 4: 48.900 Ω
 -5.6932 Ω
 5.60000 GHz
 5: 48.734 Ω
 -3.0762 Ω
 5.80000 GHz

CH2 S11 LOG 5 dB/REF -20 dB 1: -21.014 dB 5 200.000 000 MHz

Del
 Cor
 Avg
 16
 H1d



CH2 Markers

2: -28.145 dB
 5.30000 GHz
 3: -26.415 dB
 5.50000 GHz
 4: -24.640 dB
 5.60000 GHz
 5: -29.464 dB
 5.80000 GHz

DASY5 Validation Report for Body TSL

Date: 24.01.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1057

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz

Medium parameters used: $f = 5200$ MHz; $\sigma = 5.44$ S/m; $\epsilon_r = 47.3$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5300$ MHz; $\sigma = 5.57$ S/m; $\epsilon_r = 47.2$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5500$ MHz; $\sigma = 5.84$ S/m; $\epsilon_r = 46.8$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5600$ MHz; $\sigma = 5.98$ S/m; $\epsilon_r = 46.6$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5800$ MHz; $\sigma = 6.23$ S/m; $\epsilon_r = 46.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.01, 5.01, 5.01); Calibrated: 30.12.2013, ConvF(4.76, 4.76, 4.76); Calibrated: 30.12.2013, ConvF(4.52, 4.52, 4.52); Calibrated: 30.12.2013, ConvF(4.3, 4.3, 4.3); Calibrated: 30.12.2013, ConvF(4.47, 4.47, 4.47); Calibrated: 30.12.2013;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 58.809 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 30.1 W/kg

SAR(1 g) = 7.58 W/kg; SAR(10 g) = 2.12 W/kg

Maximum value of SAR (measured) = 18.2 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 58.585 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 32.2 W/kg

SAR(1 g) = 7.79 W/kg; SAR(10 g) = 2.17 W/kg

Maximum value of SAR (measured) = 19.1 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 58.364 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 34.4 W/kg

SAR(1 g) = 7.96 W/kg; SAR(10 g) = 2.22 W/kg

Maximum value of SAR (measured) = 19.4 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 57.864 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 35.8 W/kg

SAR(1 g) = 8.07 W/kg; SAR(10 g) = 2.24 W/kg

Maximum value of SAR (measured) = 19.8 W/kg

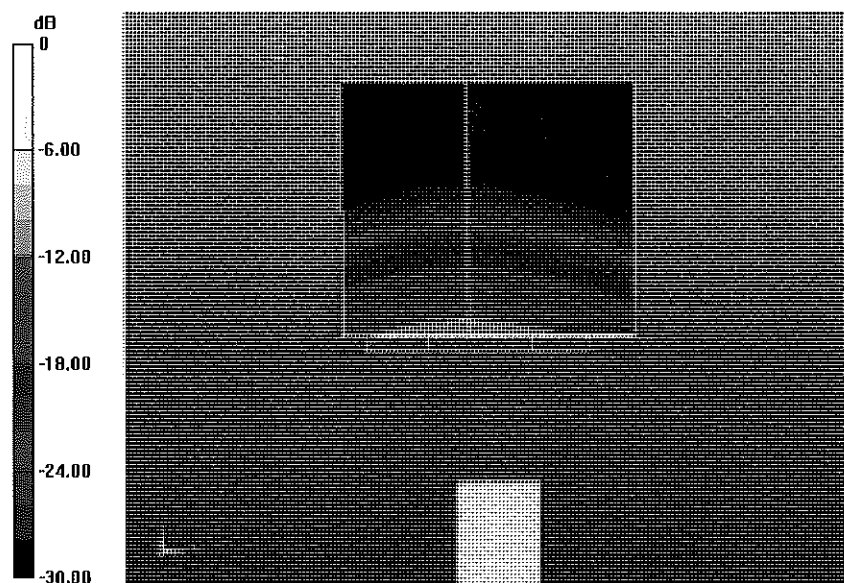
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 54.817 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 35.1 W/kg

SAR(1 g) = 7.48 W/kg; SAR(10 g) = 2.06 W/kg

Maximum value of SAR (measured) = 18.8 W/kg

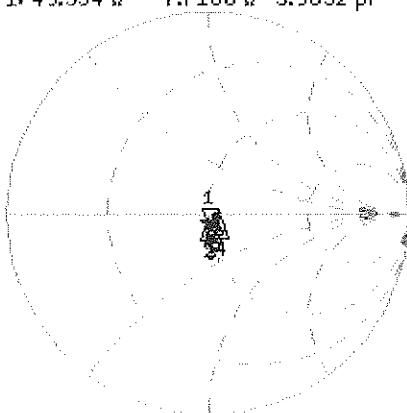


0 dB = 18.8 W/kg = 12.74 dBW/kg

Impedance Measurement Plot for Body TSL

24 Jan 2014 15:50:22
CH1 S11 1 U FS 1: 49.354 Ω -7.7188 Ω 3.9652 pF 5 200.000 000 MHz

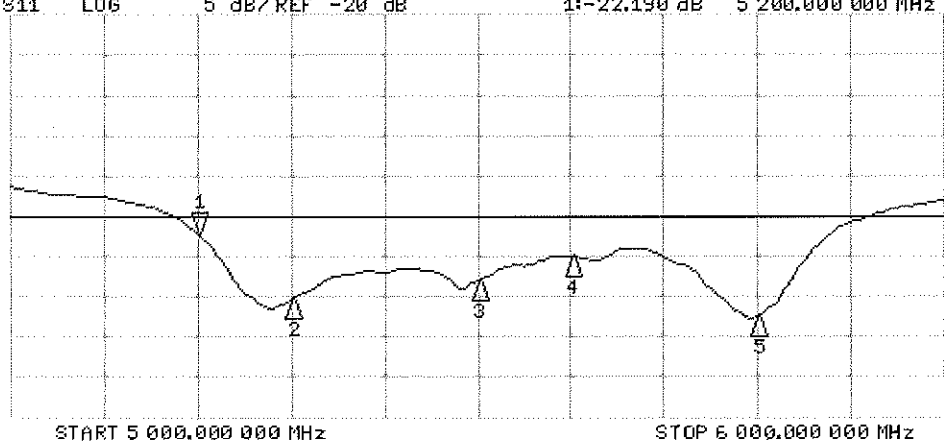
*
 Del
 Cor
 Avg
 16
 H1d



CH1 Markers
 2: 49.559 Ω
 -3.0176 Ω
 5.30000 GHz
 3: 50.793 Ω
 -3.9160 Ω
 5.50000 GHz
 4: 55.393 Ω
 -2.5176 Ω
 5.60000 GHz
 5: 52.320 Ω
 -716.80 m Ω
 5.80000 GHz

CH2 S11 L06 5 dB/REF -20 dB 1:-22.190 dB 5 200.000 000 MHz

Cor
 Avg
 16
 H1d



CH2 Markers
 2:-30.277 dB
 5.30000 GHz
 3:-28.039 dB
 5.50000 GHz
 4:-24.960 dB
 5.60000 GHz
 5:-32.401 dB
 5.80000 GHz



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

Client **PC Test**

Certificate No: **D5GHzV2-1007_Sep13/2**

CALIBRATION CERTIFICATE (Replacement of No: D5GHzV2-1007_Sep13)

Object **D5GHzV2 - SN: 1007**

Calibration procedure(s) **QA CAL-22.v2**
 Calibration procedure for dipole validation kits between 3-6 GHz

CC✓
 10/15/13

Calibration date: **September 23, 2013**

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	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe EX3DV4	SN: 3503	28-Dec-12 (No. EX3-3503_Dec12)	Dec-13
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

Calibrated by: **Leif Klysner** Function: **Laboratory Technician**

Signature

Approved by: **Katja Pokovic** Technical Manager

Issued: October 4, 2013

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

Calibration is Performed According to the Following Standards:

- IEC 62209-2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures"; Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"
- 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

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	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz $\pm$ 1 MHz 5300 MHz $\pm$ 1 MHz 5500 MHz $\pm$ 1 MHz 5600 MHz $\pm$ 1 MHz 5800 MHz $\pm$ 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	35.8 $\pm$ 6 %	4.48 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.77 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	77.5 W/kg $\pm$ 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.23 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.2 W/kg $\pm$ 19.5 % (k=2)

Head TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.6 ± 6 %	4.62 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5300 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.04 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	80.2 W / kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.30 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.9 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.4 ± 6 %	4.76 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.17 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	81.4 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.32 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.1 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.2 ± 6 %	4.86 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.03 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	80.0 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.7 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.0 ± 6 %	5.07 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.78 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	77.5 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.20 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	21.9 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	48.3 ± 6 %	5.36 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.28 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	72.6 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.03 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.2 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.42 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	48.1 ± 6 %	5.56 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5300 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.49 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	74.7 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.09 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.8 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.6	5.65 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.8 ± 6 %	5.75 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.61 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	75.9 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.11 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.0 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.6 ± 6 %	5.88 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.75 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	77.3 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.16 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.5 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.3 ± 6 %	6.17 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.31 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	72.9 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.02 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.1 W/kg ± 19.5 % (k=2)

Appendix

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	52.4 Ω - 11.0 j Ω
Return Loss	- 19.2 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	56.8 Ω - 4.4 j Ω
Return Loss	- 22.3 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	48.8 Ω - 5.4 j Ω
Return Loss	- 25.1 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	57.3 Ω - 8.7 j Ω
Return Loss	- 19.5 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	56.9 Ω + 1.6 j Ω
Return Loss	- 23.5 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	53.1 Ω - 10.3 j Ω
Return Loss	- 19.7 dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	54.3 Ω - 1.5 j Ω
Return Loss	- 27.2 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	49.7 Ω - 3.6 j Ω
Return Loss	- 28.7 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	58.2 Ω - 5.2 j Ω
Return Loss	- 20.9 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	58.7 Ω + 3.9 j Ω
Return Loss	- 21.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.201 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	August 28, 2003

DASY5 Validation Report for Head TSL

Date: 23.09.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1007

Communication System: UID 0 - CW ; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz

Medium parameters used: $f = 5200$ MHz; $\sigma = 4.48$ S/m; $\epsilon_r = 35.8$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5300$ MHz; $\sigma = 4.62$ S/m; $\epsilon_r = 35.6$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5500$ MHz; $\sigma = 4.76$ S/m; $\epsilon_r = 35.4$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5600$ MHz; $\sigma = 4.86$ S/m; $\epsilon_r = 35.2$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5800$ MHz; $\sigma = 5.07$ S/m; $\epsilon_r = 35$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.41, 5.41, 5.41); Calibrated: 28.12.2012, ConvF(5.1, 5.1, 5.1); Calibrated: 28.12.2012, ConvF(4.91, 4.91, 4.91); Calibrated: 28.12.2012, ConvF(4.76, 4.76, 4.76); Calibrated: 28.12.2012, ConvF(4.81, 4.81, 4.81); Calibrated: 28.12.2012;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 63.505 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 28.1 W/kg

SAR(1 g) = 7.77 W/kg; SAR(10 g) = 2.23 W/kg

Maximum value of SAR (measured) = 18.1 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 63.817 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 29.7 W/kg

SAR(1 g) = 8.04 W/kg; SAR(10 g) = 2.3 W/kg

Maximum value of SAR (measured) = 18.7 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 64.029 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 32.0 W/kg

SAR(1 g) = 8.17 W/kg; SAR(10 g) = 2.32 W/kg

Maximum value of SAR (measured) = 19.7 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 63.403 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 31.3 W/kg

SAR(1 g) = 8.03 W/kg; SAR(10 g) = 2.28 W/kg

Maximum value of SAR (measured) = 19.3 W/kg

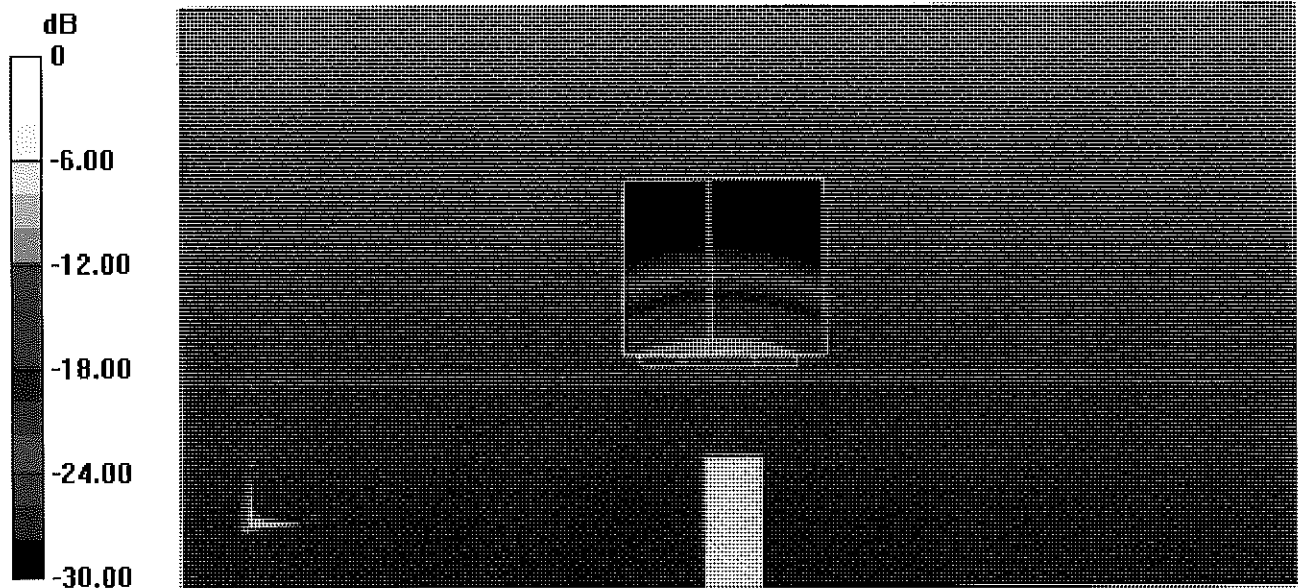
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 60.987 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 31.9 W/kg

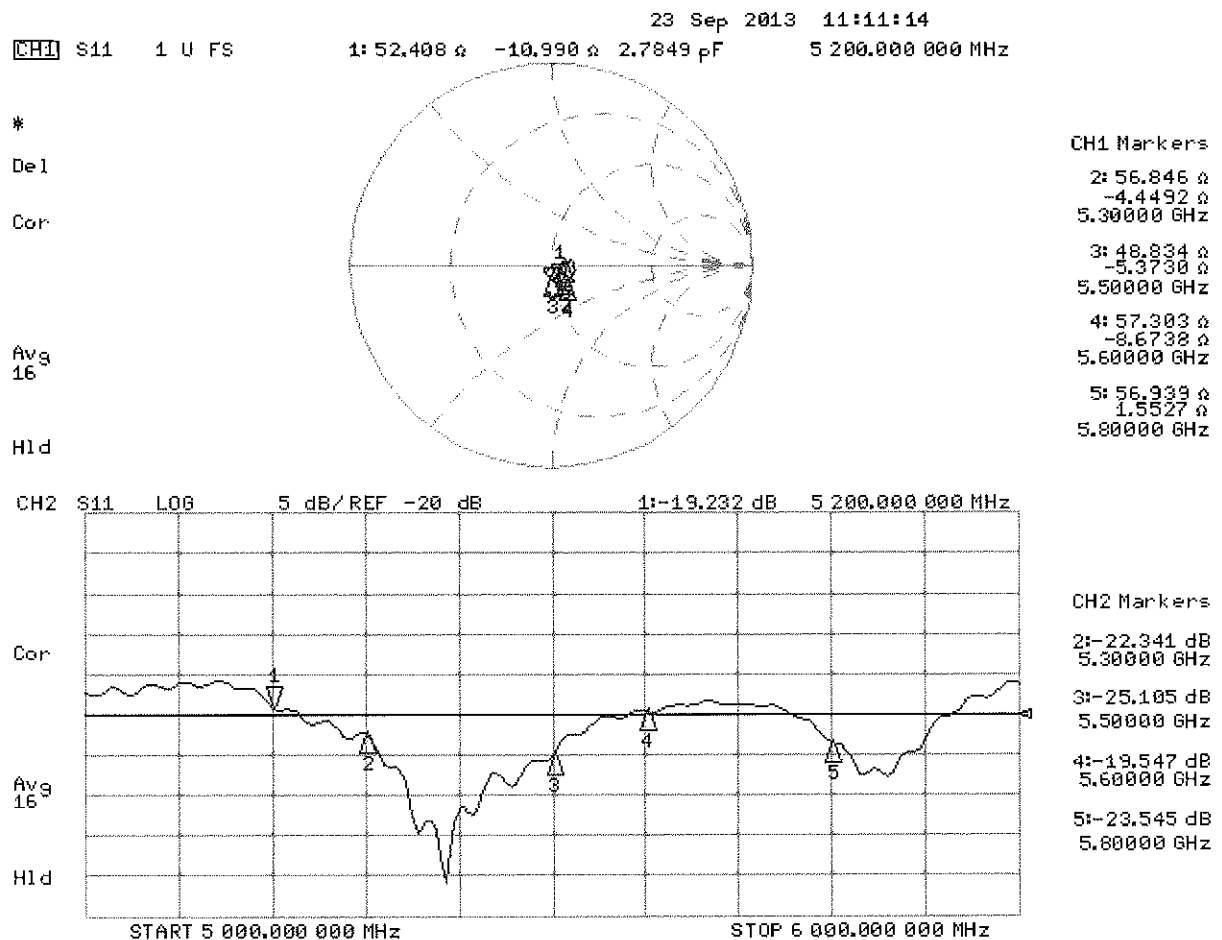
SAR(1 g) = 7.78 W/kg; SAR(10 g) = 2.2 W/kg

Maximum value of SAR (measured) = 19.0 W/kg



0 dB = 19.0 W/kg = 12.79 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 20.09.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1007

Communication System: UID 0 - CW ; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz

Medium parameters used: $f = 5200$ MHz; $\sigma = 5.36$ S/m; $\epsilon_r = 48.3$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5300$ MHz; $\sigma = 5.56$ S/m; $\epsilon_r = 48.1$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5500$ MHz; $\sigma = 5.75$ S/m; $\epsilon_r = 47.8$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5600$ MHz; $\sigma = 5.88$ S/m; $\epsilon_r = 47.6$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5800$ MHz; $\sigma = 6.17$ S/m; $\epsilon_r = 47.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.91, 4.91, 4.91); Calibrated: 28.12.2012, ConvF(4.67, 4.67, 4.67); Calibrated: 28.12.2012, ConvF(4.43, 4.43, 4.43); Calibrated: 28.12.2012, ConvF(4.22, 4.22, 4.22); Calibrated: 28.12.2012, ConvF(4.38, 4.38, 4.38); Calibrated: 28.12.2012;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 58.606 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 28.6 W/kg

SAR(1 g) = 7.28 W/kg; SAR(10 g) = 2.03 W/kg

Maximum value of SAR (measured) = 17.2 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 58.305 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 30.3 W/kg

SAR(1 g) = 7.49 W/kg; SAR(10 g) = 2.09 W/kg

Maximum value of SAR (measured) = 17.8 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 58.471 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 32.4 W/kg

SAR(1 g) = 7.61 W/kg; SAR(10 g) = 2.11 W/kg

Maximum value of SAR (measured) = 18.5 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 58.333 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 33.8 W/kg

SAR(1 g) = 7.75 W/kg; SAR(10 g) = 2.16 W/kg

Maximum value of SAR (measured) = 19.1 W/kg

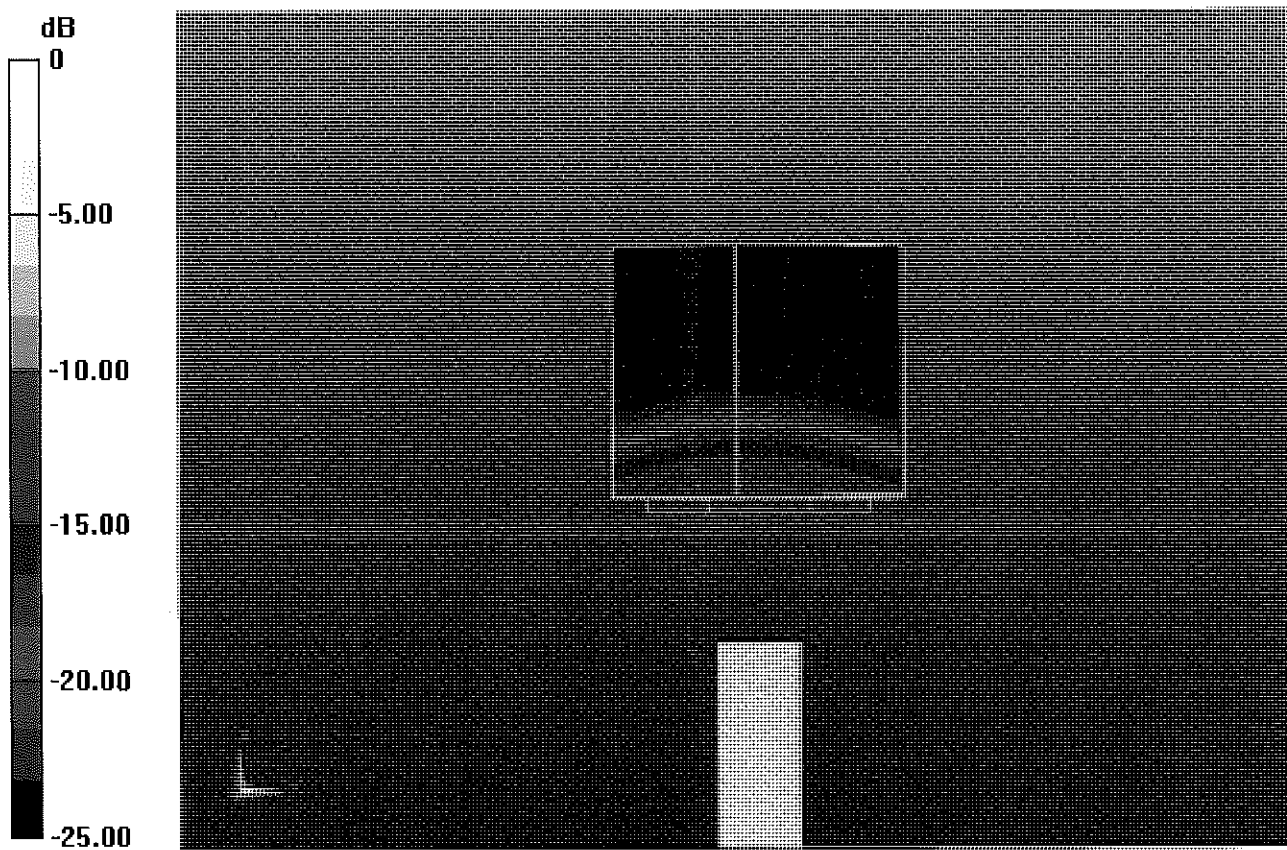
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 55.389 V/m; Power Drift = 0.00 dB

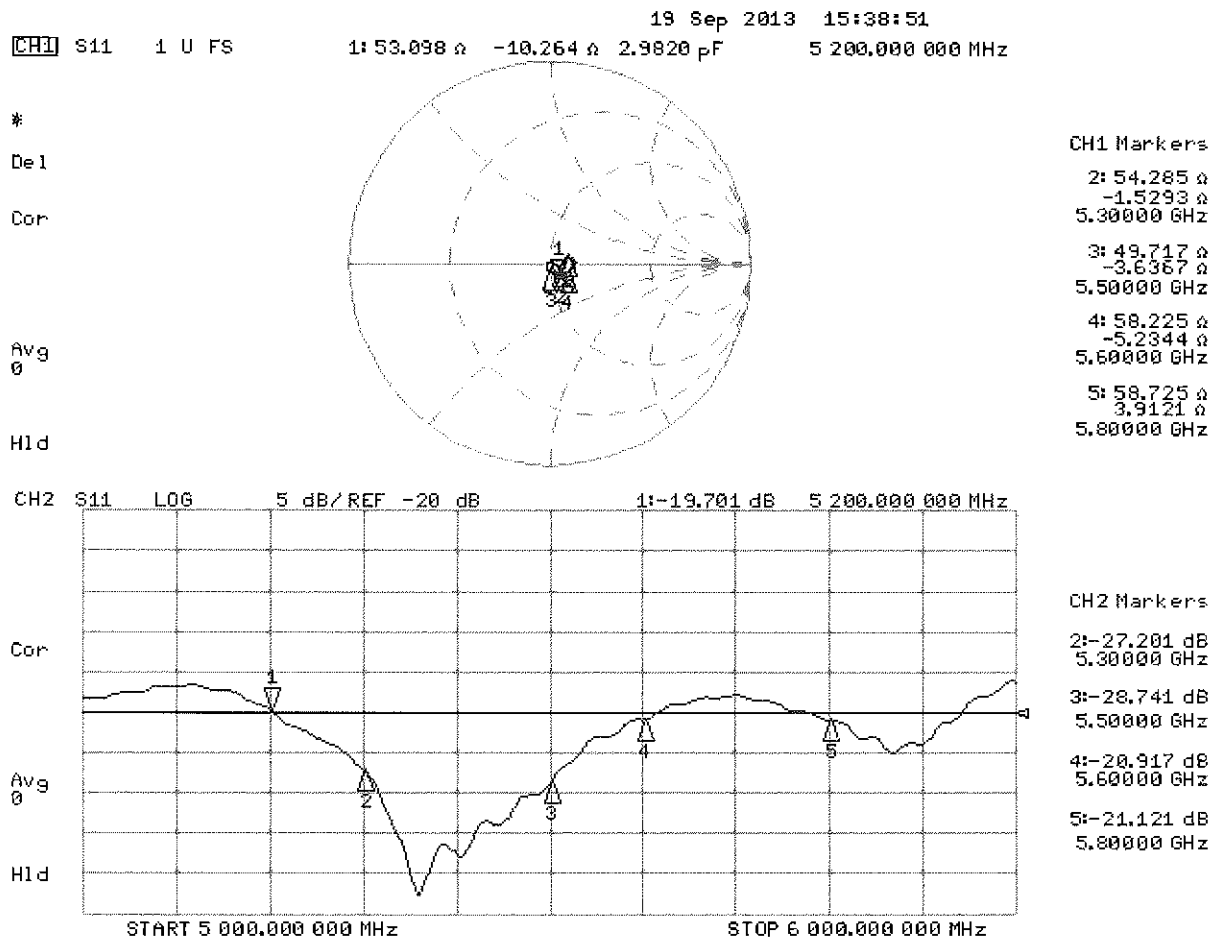
Peak SAR (extrapolated) = 34.1 W/kg

SAR(1 g) = 7.31 W/kg; SAR(10 g) = 2.02 W/kg

Maximum value of SAR (measured) = 18.3 W/kg



Impedance Measurement Plot for Body TSL



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)	(ϵ_r)	SENSI- TIVITY	PROBE LINEARITY	PROBE ISOTROPY	MOD. TYPE	DUTY FACTOR	PAR
K	835	1/16/2014	3333	ES3DV3	835	Head	0.901	40.17	PASS	PASS	PASS	GMSK	PASS	N/A
G	1900	3/7/2014	3258	ES3DV3	1900	Head	1.448	40.49	PASS	PASS	PASS	GMSK	PASS	N/A
G	2450	3/6/2014	3258	ES3DV3	2450	Head	1.736	38.36	PASS	PASS	PASS	OFDM, TDD	PASS	PASS
G	2600	3/6/2014	3258	ES3DV3	2600	Head	1.893	37.87	PASS	PASS	PASS	TDD	PASS	N/A
E	5200	12/3/2013	3914	EX3DV4	5200	Head	4.482	34.70	PASS	PASS	PASS	OFDM	N/A	PASS
E	5300	12/3/2013	3914	EX3DV4	5300	Head	4.604	34.60	PASS	PASS	PASS	OFDM	N/A	PASS
E	5600	12/3/2013	3914	EX3DV4	5600	Head	4.907	34.13	PASS	PASS	PASS	OFDM	N/A	PASS
E	5800	12/3/2013	3914	EX3DV4	5800	Head	5.133	33.89	PASS	PASS	PASS	OFDM	N/A	PASS
J	835	3/6/2014	3332	ES3DV4	835	Body	1.000	53.98	PASS	PASS	PASS	GMSK	PASS	N/A
D	1900	9/10/2013	3022	ES3DV2	1900	Body	1.516	52.49	PASS	PASS	PASS	GMSK	PASS	N/A
H	2450	3/10/2014	3589	EX3DV4	2450	Body	1.998	51.24	PASS	PASS	PASS	OFDM, TDD	PASS	PASS
H	2600	3/11/2014	3589	EX3DV4	2600	Body	2.205	50.65	PASS	PASS	PASS	TDD	PASS	N/A
A	5200	1/13/2014	3920	EX3DV4	5200	Body	5.344	47.27	PASS	PASS	PASS	OFDM	N/A	PASS
A	5300	1/13/2014	3920	EX3DV4	5300	Body	5.500	46.91	PASS	PASS	PASS	OFDM	N/A	PASS
A	5600	1/13/2014	3920	EX3DV4	5600	Body	5.991	46.16	PASS	PASS	PASS	OFDM	N/A	PASS
A	5800	1/23/2014	3920	EX3DV4	5800	Body	6.282	46.05	PASS	PASS	PASS	OFDM	N/A	PASS

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. 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.

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APPENDIX G: HOTSPOT POWER REDUCTION SUMMARY

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A3LSPHL710T Hotspot Power Reduction Data Summary

Per FCC KDB Publication 941225 D05v02r03, since this device uses power reduction for SAR compliance triggered when the hotspot mode of the device is active for some bands/modes, additional analysis has been included to verify the maximum output power levels during states in which the device hotspot is active and not active. Maximum average conducted power measurements were taken at the RF port(s) of the device in the states of Hotspot Tethering 'ON' and Hotspot Tethering 'OFF' for the following modes, to which hotspot power reduction applies: CDMA/EVDO BC0, PCS CDMA/EVDO, LTE Band 26, and LTE Band 25. The resulting CDMA/EVDO/LTE output power data in the tables below was measured and provided by the applicant. The column indicating "Target Tx. Power" is the cell output power level provided to the device controlled using the base station simulator.

Cellular CDMA/EVDO BC0

Hotspot Tethering ON:

Mode	CDMA Target Tx Power [dBm]	CDMA BC0 Conducted Power (dBm)						
		Mid						
		SO55	SO55	SO75	TDSO SO32	TDSO SO32	1x EVDO Rev. 0	1x EVDO Rev. A
	F-RC	RC1	RC3	RC11	FCH+SCH	FCH	(RTAP)	(RETAP)
Hotspot Tethering ON	25	22.56	22.64	22.62	22.71	22.63	22.71	22.65
	24	22.63	22.61	22.59	22.58	22.62	22.61	22.59
	23	22.58	22.62	22.63	22.71	22.64	22.59	22.54
	22	22.09	22.11	22.13	22.16	22.22	22.15	22.12
	21	21.05	21.09	21.04	21.05	21.02	21.07	21.07
	20	20.14	20.09	20.17	20.14	20.11	20.01	20.04
	19	19.15	19.11	19.12	19.09	19.05	19.12	19.07
	18	18.1	18.11	18.16	18.09	18.13	18.25	18.17
	17	17.18	17.13	17.21	17.15	17.08	17.15	17.11
	16	16.11	16.09	16.14	16.21	16.11	16.12	16.08

Hotspot Tethering OFF:

Mode	CDMA Target Tx Power [dBm]	CDMA BC0 Conducted Power (dBm)						
		Mid						
		SO55	SO55	SO75	TDSO SO32	TDSO SO32	1x EVDO Rev. 0	1x EVDO Rev. A
	F-RC	RC1	RC3	RC11	FCH+SCH	FCH	(RTAP)	(RETAP)
Hotspot Tethering OFF	25	24.71	24.69	24.61	24.66	24.68	24.62	24.59
	24	24.65	24.63	24.6	24.67	24.68	24.66	24.62
	23	23.09	23.11	23.05	23.09	23.08	23.04	23.11
	22	22.11	22.04	22.06	22.05	22.09	22.04	22.14
	21	21.15	21.12	21.11	21.09	21.04	21.08	21.07
	20	20.14	20.09	20.17	20.14	20.11	20.01	20.04
	19	19.21	19.15	19.17	19.11	19.09	19.08	19.01
	18	18.08	18.14	18.11	18.05	18.15	18.21	18.09
	17	17.22	17.15	17.11	17.16	17.15	17.04	17.12
	16	16.19	16.11	16.15	16.22	16.09	16.15	16.13

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PCS CDMA/EVDO BC1

Hotspot Tethering ON:

Mode	CDMA Target Tx Power [dBm]	CDMA BC1 Conducted Power (dBm)						
		Mid						
		SO55	SO55	SO75	TDSO SO32	TDSO SO32	1x EVDO Rev. 0	1x EVDO Rev. A
	F-RC	RC1	RC3	RC11	FCH+SCH	FCH	(RTAP)	(RETAP)
Hotspot Tethering ON	25	22.62	22.71	22.55	22.69	22.58	22.54	22.62
	24	22.71	22.58	22.64	22.64	22.66	22.59	22.62
	23	22.65	22.64	22.75	22.77	22.68	22.64	22.71
	22	22.11	22.04	22.06	22.05	22.09	22.04	22.14
	21	21.15	21.12	21.11	21.09	21.04	21.08	21.07
	20	20.14	20.09	20.17	20.14	20.11	20.01	20.04
	19	19.15	19.11	19.12	19.09	19.05	19.12	19.07
	18	18.08	18.14	18.11	18.05	18.15	18.21	18.09
	17	17.11	17.12	17.22	17.14	17.09	17.08	17.11
	16	16.19	16.11	16.15	16.22	16.09	16.15	16.13

Hotspot Tethering OFF:

Mode	CDMA Target Tx Power [dBm]	CDMA BC1 Conducted Power (dBm)						
		Mid						
		SO55	SO55	SO75	TDSO SO32	TDSO SO32	1x EVDO Rev. 0	1x EVDO Rev. A
	F-RC	RC1	RC3	RC11	FCH+SCH	FCH	(RTAP)	(RETAP)
Hotspot Tethering OFF	25	24.65	24.63	24.6	24.67	24.68	24.66	24.62
	24	24.55	24.53	24.56	24.57	24.59	24.46	24.58
	23	23.12	23.09	23.08	23.02	23.07	23.02	23.07
	22	22.11	22.04	22.06	22.05	22.09	22.04	22.14
	21	21.13	21.14	21.09	21.12	21.09	21.05	21.03
	20	20.16	20.19	20.09	20.17	20.13	20.11	20.15
	19	19.15	19.11	19.12	19.09	19.05	19.12	19.07
	18	18.08	18.14	18.11	18.05	18.15	18.21	18.09
	17	17.11	17.12	17.22	17.14	17.09	17.08	17.11
	16	16.19	16.11	16.15	16.22	16.09	16.15	16.13

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LTE Band 26

Hotspot Tethering ON:

Mode	LTE Target Tx Power [dBm]	LTE Band 26 Conducted Power (dBm)													
		Mid													
		QPSK 1 RB, Low Edge	QPSK 1 RB, Mid Edge	QPSK 1 RB, Upper Edge	QPSK 50% RB, Low Edge	QPSK 50% RB, Mid Edge	QPSK 50% RB, Upper Edge	QPSK 100% RB ORB offset	16 QAM 1 RB, Low Edge	16 QAM 1 RB, Mid Edge	16 QAM 1 RB, Upper Edge	16 QAM 50% RB, Low Edge	16 QAM 50% RB, Mid Edge	16 QAM 50% RB, Upper Edge	16 QAM 100% RB ORB offset
Hotspot Tethering ON	24	22.09	22.06	22.08	22.14	22.16	22.09	22.15	22.07	22.09	22.04	22.05	22.02	21.99	22.08
	23	22.15	22.13	22.03	22.01	22.08	22.07	22.04	22.11	22.19	22.14	21.09	21.01	21	21.08
	22	22.09	22.02	22.04	21.05	21.09	21.02	21.08	21.04	21.11	21.13	20.02	19.99	20.07	20.13
	21	21.13	21.02	21.11	20.15	20.09	20.13	20.03	20.09	20.11	20.19	19.06	19.01	19.02	19.15
	20	20.11	20.07	20.17	19.17	19.19	19.13	19.1	19.03	19.08	18.98	18.09	18.05	18.01	18.21
	19	19.1	19.13	19.16	18.11	18.09	18.11	18.05	18.01	18.09	18.12	17.05	17.06	17.02	17.05
	18	18.15	18.09	18.11	17.11	17.13	17.05	17.12	17.15	17.02	17.08	16.11	16.14	16.05	16.08
	17	17.15	17.11	17.13	16.15	16.22	16.14	16.09	16.13	16.17	16.09	15.12	15.11	15.05	15.13
	16	16.21	16.15	16.09	15.11	15.12	15.08	15.13	15.08	15.09	15.01	14.11	14.21	14.14	14.17

Hotspot Tethering OFF:

Mode	LTE Target Tx Power [dBm]	LTE Band 26 Conducted Power (dBm)													
		Mid													
		QPSK 1 RB, Low Edge	QPSK 1 RB, Mid Edge	QPSK 1 RB, Upper Edge	QPSK 50% RB, Low Edge	QPSK 50% RB, Mid Edge	QPSK 50% RB, Upper Edge	QPSK 100% RB ORB offset	16 QAM 1 RB, Low Edge	16 QAM 1 RB, Mid Edge	16 QAM 1 RB, Upper Edge	16 QAM 50% RB, Low Edge	16 QAM 50% RB, Mid Edge	16 QAM 50% RB, Upper Edge	16 QAM 100% RB ORB offset
Hotspot Tethering OFF	24	24.03	24.09	24.14	23.11	23.12	23.07	23.14	23.05	23.01	22.98	22.21	22.14	22.04	22.05
	23	23.11	23.07	23.02	22.05	22.04	22.09	22.11	22.11	22.19	22.04	21.03	21.01	20.98	21.01
	22	22.09	22.02	22.04	21.05	21.09	21.02	21.08	21.04	21.11	21.13	20.02	19.99	20.07	20.13
	21	21.13	21.02	21.11	20.15	20.09	20.13	20.03	20.09	20.11	20.19	19.06	19.01	19.02	19.15
	20	20.11	20.07	20.17	19.17	19.19	19.13	19.1	19.03	19.08	18.98	18.09	18.05	18.01	18.21
	19	19.1	19.13	19.16	18.11	18.09	18.11	18.05	18.01	18.09	18.12	17.05	17.06	17.02	17.05
	18	18.15	18.09	18.11	17.11	17.13	17.05	17.12	17.15	17.02	17.08	16.11	16.14	16.05	16.08
	17	17.15	17.11	17.13	16.15	16.22	16.14	16.09	16.13	16.17	16.09	15.12	15.11	15.05	15.13
	16	16.21	16.15	16.09	15.11	15.12	15.08	15.13	15.08	15.09	15.01	14.11	14.21	14.14	14.17

LTE Band 25

Hotspot Tethering ON:

Mode	LTE Target Tx Power [dBm]	LTE Band 25 Conducted Power (dBm)													
		Mid													
		QPSK 1 RB, Low Edge	QPSK 1 RB, Mid Edge	QPSK 1 RB, Upper Edge	QPSK 50% RB, Low Edge	QPSK 50% RB, Mid Edge	QPSK 50% RB, Upper Edge	QPSK 100% RB ORB offset	16 QAM 1 RB, Low Edge	16 QAM 1 RB, Mid Edge	16 QAM 1 RB, Upper Edge	16 QAM 50% RB, Low Edge	16 QAM 50% RB, Mid Edge	16 QAM 50% RB, Upper Edge	16 QAM 100% RB ORB offset
Hotspot Tethering ON	24	22.09	22.06	22.08	22.14	22.16	22.09	22.15	22.07	22.09	22.04	22.05	22.02	21.99	22.08
	23	22.15	22.13	22.03	22.01	22.08	22.07	22.04	22.11	22.19	22.14	21.09	21.01	21	21.08
	22	22.09	22.02	22.04	21.05	21.09	21.02	21.08	21.04	21.11	21.13	20.02	19.99	20.07	20.13
	21	21.13	21.02	21.11	20.15	20.09	20.13	20.03	20.09	20.11	20.19	19.06	19.01	19.02	19.15
	20	20.11	20.07	20.17	19.17	19.19	19.13	19.1	19.03	19.08	18.98	18.09	18.05	18.01	18.21
	19	19.1	19.13	19.16	18.11	18.09	18.11	18.05	18.01	18.09	18.12	17.05	17.06	17.02	17.05
	18	18.15	18.09	18.11	17.11	17.13	17.05	17.12	17.15	17.02	17.08	16.11	16.14	16.05	16.08
	17	17.15	17.11	17.13	16.15	16.22	16.14	16.09	16.13	16.17	16.09	15.12	15.11	15.05	15.13
	16	16.21	16.15	16.09	15.11	15.12	15.08	15.13	15.08	15.09	15.01	14.11	14.21	14.14	14.17

Hotspot Tethering OFF:

Mode	LTE Target Tx Power [dBm]	LTE Band 25 Conducted Power (dBm)													
		Mid													
		QPSK 1 RB, Low Edge	QPSK 1 RB, Mid Edge	QPSK 1 RB, Upper Edge	QPSK 50% RB, Low Edge	QPSK 50% RB, Mid Edge	QPSK 50% RB, Upper Edge	QPSK 100% RB ORB offset	16 QAM 1 RB, Low Edge	16 QAM 1 RB, Mid Edge	16 QAM 1 RB, Upper Edge	16 QAM 50% RB, Low Edge	16 QAM 50% RB, Mid Edge	16 QAM 50% RB, Upper Edge	16 QAM 100% RB ORB offset
Hotspot Tethering OFF	24	24.15	24.11	24.15	23.12	23.12	23.09	23.05	23.01	23.08	23.12	22.15	22.19	22.12	22.11
	23	23.11	23.07	23.02	22.05	22.04	22.09	22.11	22.11	22.19	22.04	21.03	21.01	20.98	21.01
	22	22.09	22.02	22.04	21.05	21.09	21.02	21.08	21.11	21.19	21.13	20.02	19.99	20.07	20.13
	21	21.13	21.02	21.11	20.15	20.09	20.13	20.03	20.09	20.11	20.19	19.06	19.01	19.02	19.15
	20	20.11	20.07	20.17	19.17	19.19	19.13	19.1	19.03	19.08	18.98	18.09	18.05	18.01	18.21
	19	19.1	19.13	19.16	18.11	18.09	18.11	18.05	18.01	18.09	18.12	17.05	17.06	17.02	17.05
	18	18.15	18.09	18.11	17.11	17.13	17.05	17.12	17.15	17.02	17.08	16.11	16.14	16.05	16.08
	17	17.15	17.11	17.13	16.15	16.22	16.14	16.09	16.13	16.17	16.09	15.12	15.11	15.05	15.13
	16	16.21	16.15	16.09	15.11	15.12	15.08	15.13	15.08	15.09	15.01	14.11	14.21	14.14	14.17

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