



SAR EVALUATION REPORT

Applicant Name:

Panasonic Corporation of North America
Two Riverfront Plaza, 9th Floor
Newark, NJ 07102
United States

Date of Testing:

12/21/13 - 01/21/14

Test Site/Location:

PCTEST Lab, Columbia, MD, USA

Document Serial No.:

0Y1312092376-R1.ACJ

FCC ID:

ACJEB3910A

APPLICANT:

PANASONIC CORPORATION OF NORTH AMERICA

DUT Type:

Portable Handset

Application Type:

Certification

FCC Rule Part(s):

CFR §2.1093

Model(s):

Toughpad Model FZ-X1

Equipment Class	Band & Mode	Tx Frequency	Measured Conducted Power [dBm]	SAR			
				1 gm Head (W/kg)	1 gm Body-Worn (W/kg)	1 gm Hotspot (W/kg)	10 gm Extremity (W/kg)
PCE	GPRS/EDGE 850	824.20 - 848.80 MHz	27.70	0.37	0.19	0.22	0.16
PCE	GPRS/EDGE 1900	1850.20 - 1909.80 MHz	24.56	0.24	0.39	0.35	0.15
PCE	UMTS 850	826.40 - 846.60 MHz	23.98	0.37	0.29	0.29	0.29
PCE	UMTS 1900	1852.4 - 1907.6 MHz	23.95	0.34	0.24	0.54	0.25
PCE	Cell. CDMA/EVDO	824.70 - 848.31 MHz	24.26	0.44	0.36	0.35	0.36
PCE	PCS CDMA/EVDO	1851.25 - 1908.75 MHz	23.65	0.39	0.20	0.50	0.22
PCE	LTE Band 17	706.5 - 713.5 MHz	22.95	0.27	0.31	0.35	0.26
PCE	LTE Band 13	782 MHz	23.13	0.42	0.32	0.39	0.27
PCE	LTE Band 4 (AWS)	1712.5 - 1752.5 MHz	23.07	0.57	0.39	1.03	0.32
DTS	2.4 GHz WLAN	2412 - 2462 MHz	14.75	< 0.1	0.19	0.19	0.15
DTS	Bluetooth LE	2402 - 2480 MHz	2.55	N/A			
DTS	5.8 GHz WLAN	5745 - 5825 MHz	15.44	< 0.1	0.34		0.48
NII	5.2 GHz WLAN	5180 - 5240 MHz	13.53	0.12	0.50		0.84
NII	5.3 GHz WLAN	5260 - 5320 MHz	15.11	0.14	0.60		0.75
NII	5.5 GHz WLAN	5500 - 5700 MHz	15.45	0.11	0.42		0.58
DSS	Bluetooth	2402 - 2480 MHz	9.31	N/A	<0.1	N/A	N/A
Simultaneous SAR per KDB 690783 D01v01r02:				0.62	0.57	1.07	0.53

Note: Powers in the above table represent output powers for the SAR test configurations and may not represent the highest output powers for all configurations for each mode.

Note: This revised Test Report (S/N: 0Y1312092376-R1.ACJ) supersedes and replaces the previously issued test report on the same subject EUT for the same type of testing as indicated. Please discard or destroy the previously issued test report (S/N: 0Y1312092376-R1.ACJ) 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 1.9 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
GPRS/EDGE 850	Data	824.20 - 848.80 MHz
GPRS/EDGE 1900	Data	1850.20 - 1909.80 MHz
UMTS 850	Data	826.40 - 846.60 MHz
UMTS 1900	Data	1852.4 - 1907.6 MHz
Cell. CDMA/EVDO	Data	824.70 - 848.31 MHz
PCS CDMA/EVDO	Data	1851.25 - 1908.75 MHz
LTE Band 17	Data	706.5 - 713.5 MHz
LTE Band 13	Data	782 MHz
LTE Band 4 (AWS)	Data	1712.5 - 1752.5 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
Bluetooth LE	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz

1.2 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.

Mode / Band		Burst Average GMSK (dBm)				Burst Average 8-PSK (dBm)			
		1 TX Slots	2 TX Slots	3 TX Slots	4 TX Slots	1 TX Slots	2 TX Slots	3 TX Slots	4 TX Slots
GPRS/EDGE 850	Maximum	33.4	30.6	29.0	27.7	27.5	24.8	22.9	21.6
	Nominal	32.5	30.0	28.2	27.0	26.5	24.0	22.2	21.0
GPRS/EDGE 1900	Maximum	31.0	28.5	26.7	25.5	27.0	24.5	22.7	21.5
	Nominal	29.5	27.0	25.2	24.0	25.5	23.0	21.2	20.0

Mode / Band		Modulated Average (dBm)		
		3GPP RMC	3GPP HSDPA	3GPP HSUPA
UMTS Band 5 (850 MHz)	Maximum	24.0	23.0	23.1
	Nominal	23.0	22.5	22.5
UMTS Band 2 (1900 MHz)	Maximum	24.0	23.2	23.2
	Nominal	23.0	22.5	22.5

Mode / Band		Modulated Average (dBm)		
		1x-RTT	EVDO Rev. 0	EVDO Rev. A
Cell. CDMA/EVDO	Maximum	24.8	24.6	24.6
	Nominal	24.0	24.0	24.0
PCS CDMA/EVDO	Maximum	23.9	24.0	23.9
	Nominal	23.5	23.5	23.5

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Mode / Band		Modulated Average (dBm)
LTE Band 17	Maximum	23.3
	Nominal	23.0
LTE Band 13	Maximum	23.5
	Nominal	23.0
LTE Band 4 (AWS)	Maximum	23.9
	Nominal	23.0

Mode / Band		Modulated Average (dBm)				
IEEE 802.11b (2.4 GHz)	Channel	1, 6	11			
	Maximum	15.9	15.8			
	Nominal	14.0	14.0			
IEEE 802.11g (2.4 GHz)	Channel	1	2-10	11		
	Maximum	10.9	13.9	10.8		
	Nominal	9.0	12.0	9.0		
IEEE 802.11n (2.4 GHz)	Channel	1	2-10	11		
	Maximum	10.9	12.9	10.8		
	Nominal	9.0	11.0	9.0		
IEEE 802.11a/n (5 GHz HT20) (5.2 GHz Band)	Channel	36	40-44	48		
	Maximum	13.3	15.6	15.5		
	Nominal	12.0	14.0	14.0		
IEEE 802.11a/n (5 GHz HT20) (5.3 GHz Band)	Channel	52-56	60	64		
	Maximum	17.0	16.8	15.6		
	Nominal	15.5	15.5	14.0		
IEEE 802.11a/n (5 GHz HT20) (5.5 - 5.7 GHz Band)	Channel	100	104-112	116	132-136	140
	Maximum	15.3	17.1	16.6	16.8	15.2
	Nominal	14.0	15.5	15.5	15.5	14.0
IEEE 802.11a/n (5 GHz HT20) (5.8 GHz Band)	Channel	149-153	157-161	165		
	Maximum	16.6	16.8	16.6		
	Nominal	15.5	15.5	15.5		
IEEE 802.11n (5 GHz HT40)	Channel	38-159				
	Maximum	12.2				
	Nominal	11.0				
IEEE 802.11ac (5 GHz HT80) (MCS0 - MCS8)	Channel	42-155				
	Maximum	12.5				
	Nominal	11.0				
IEEE 802.11ac (5 GHz HT80) (MCS9)	Channel	42-155				
	Maximum	11.5				
	Nominal	10.0				
Bluetooth	Channel	Low	Mid	High		
	Maximum	9.5	10.2	8.8		
	Nominal	8.5	8.5	8.5		
Bluetooth LE	Channel	Low	Mid	High		
	Maximum	2.6	3.1	1.8		
	Nominal	1.5	1.5	1.5		

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1.3 DUT Antenna Locations

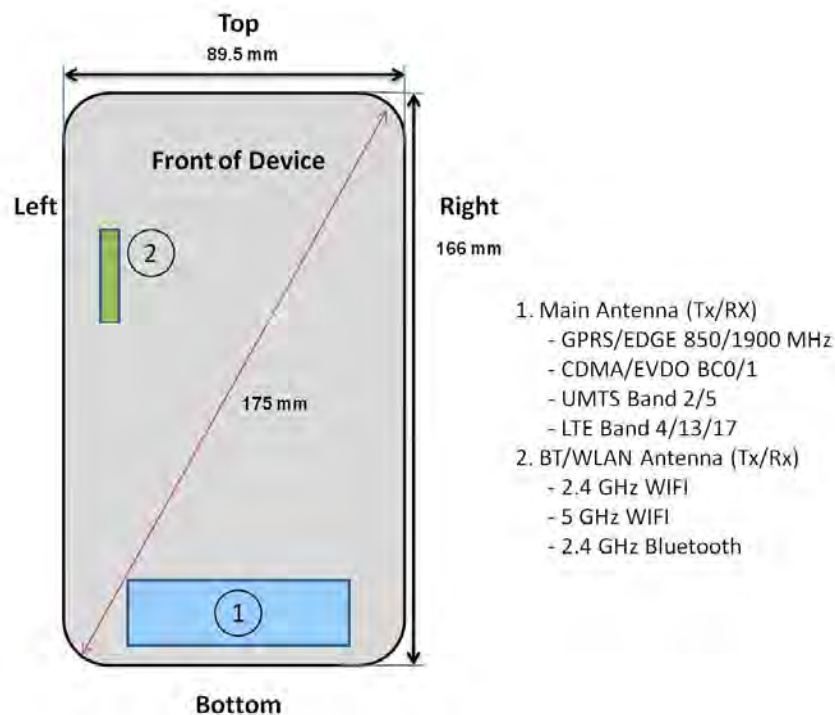


Figure 1-1
DUT Antenna Locations

Note:

1. Exact antenna dimensions and separation distances are shown in the Technical Descriptions in the FCC Filing.
2. Because the diagonal distance of this device is greater than 160 mm but less than 200 mm, it is considered a "phablet."

Table 1-1
Sides for SAR Testing

Mode	Exposure Condition	Back	Front	Top	Bottom	Right	Left
GPRS 850	Hotspot	Yes	Yes	No	Yes	Yes	Yes
GPRS 1900	Hotspot	Yes	Yes	No	Yes	Yes	Yes
UMTS 850	Hotspot	Yes	Yes	No	Yes	Yes	Yes
UMTS 1900	Hotspot	Yes	Yes	No	Yes	Yes	Yes
Cell. EVDO	Hotspot	Yes	Yes	No	Yes	Yes	Yes
PCS EVDO	Hotspot	Yes	Yes	No	Yes	Yes	Yes
LTE Band 17	Hotspot	Yes	Yes	No	Yes	Yes	Yes
LTE Band 13	Hotspot	Yes	Yes	No	Yes	Yes	Yes
LTE Band 4 (AWS)	Hotspot	Yes	Yes	No	Yes	Yes	Yes
2.4 GHz WLAN	Hotspot	Yes	Yes	No	No	No	Yes
5 GHz WLAN	Extremity	Yes	Yes	No	No	No	Yes

Note: Particular DUT edges were not required to be evaluated for Wireless Router and/or Extremity SAR if the edges were greater than 2.5 cm from the transmitting antenna according to FCC KDB Publication 941225 D06v01 guidance, page 2, FCC KDB Publication 648474 D04v01r01, and FCC KDB 447498 D01v05r01. When the wireless router mode is enabled, all 5 GHz bands are disabled.

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1.4 Near Field Communications (NFC) Antenna

This DUT has NFC operations. The NFC antenna is integrated into the device. Therefore, all SAR tests were performed with the NFC antenna already incorporated.

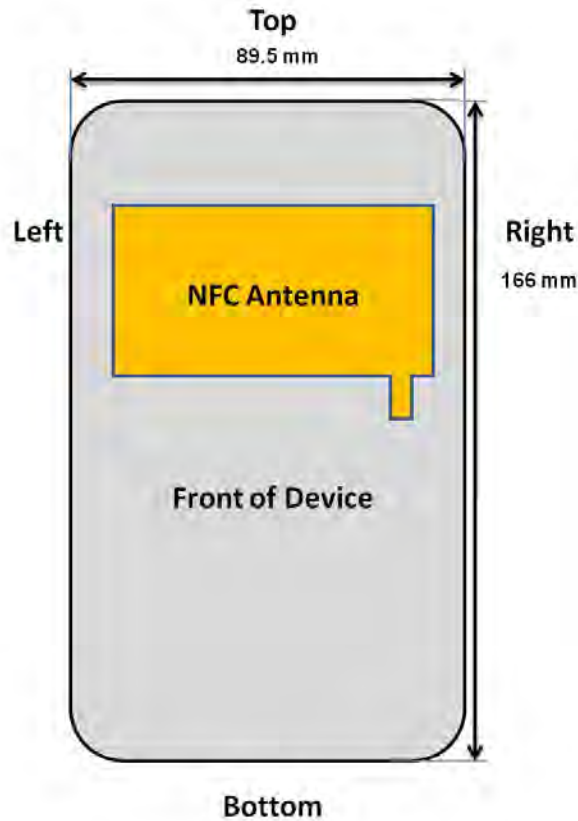


Figure 1-2
NFC Antenna Location

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1.5 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D05v01, transmitters are considered to be transmitting simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. Possible transmission paths for the DUT are shown in Figure 1-3 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	Extremity	Notes
1	UMTS + 2.4 GHz Wi-Fi	Yes	Yes	Yes	Yes	
2	UMTS + 2.4 GHz Bluetooth	N/A	Yes	N/A	Yes	
3	LTE + 2.4 GHz Wi-Fi	Yes	Yes	Yes	Yes	
4	LTE + 2.4 GHz Bluetooth	N/A	Yes	N/A	Yes	
5	CDMA/EVDO data + 2.4 GHz Wi-Fi	Yes	Yes	Yes	Yes	
6	CDMA/EVDO data + 2.4 GHz Bluetooth	N/A	Yes	N/A	Yes	
7	GPRS/EDGE + 2.4 GHz Wi-Fi	Yes	Yes	Yes	Yes	
8	GPRS/EDGE + 2.4 GHz Bluetooth	N/A	Yes	N/A	Yes	
9	CDMA/EVDO data + 5 GHz Wi-Fi	N/A	N/A	N/A	N/A	Not supported by SW
10	LTE + 5 GHz Wi-Fi	N/A	N/A	N/A	N/A	Not supported by SW
11	GPRS/EDGE + 5 GHz Wi-Fi	N/A	N/A	N/A	N/A	Not supported by SW
12	UMTS + 5 GHz Wi-Fi	N/A	N/A	N/A	N/A	Not supported by SW

Notes:

- 2.4 GHz WLAN, 2.4 GHz Bluetooth and 5 GHz share the same antenna path and cannot transmit simultaneously.
- GPRS/EDGE/UMTS/CDMA/EVDO/LTE share the same antenna path and cannot transmit simultaneously.
- WIFI Direct is supported for 2.4 GHz only. Therefore, there are no simultaneous transmission scenarios involving WIFI direct beyond that listed in the above table.

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1.6 Body Holster and Hand Strap Device Accessories

This DUT may also be used with two accessories containing metallic components: a body holster and a hand strap. Per FCC KDB Publication 447498 D01 v05r01, the accessories were tested in conjunction with the host device to demonstrate compliance. The belt holster was evaluated as a body-worn accessory with front and back side evaluated for 1g body-worn SAR with the belt holster for each wireless technology and frequency band at 0mm from the phantom. The hand strap accessory was evaluated for compliance by measuring back side 10g extremity SAR at 0mm for each wireless technology and frequency band. Two diagonal configurations of the metallic components are possible when attaching the hand strap to the device and both were considered in the SAR evaluation. They are referred to as “Hand Strap, Top Right” and “Hand Strap, Top Left.” Please see Figure 1-4 for clarification of the location of the metallic components in these configurations.

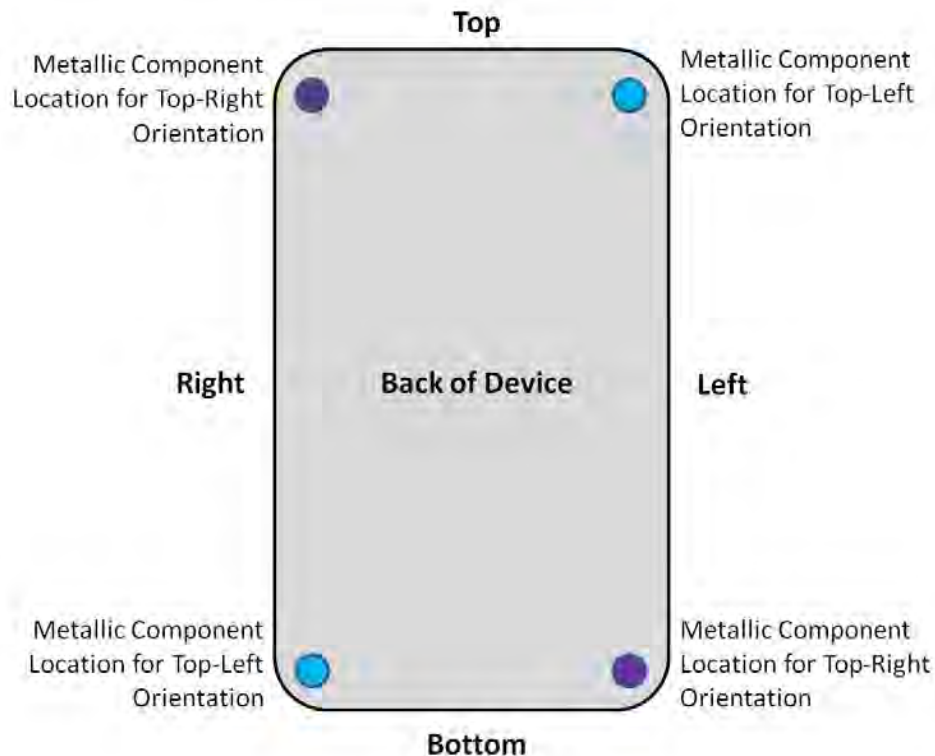


Figure 1-4
Hand Strap Metallic Component Locations

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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.

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 body-worn SAR at 10mm was not required; $[(10/10) * \sqrt{2.441}] = 1.6 < 3.0$. Per KDB Publication 447498 D01v05, the maximum power of the channel was rounded to the nearest mW before calculation.

Based on the maximum conducted power of Bluetooth LE (rounded to the nearest mW) and the antenna to user separation distance, Bluetooth LE body-worn (belt holster) accessory SAR was not required; $[(2/5) * \sqrt{2.440}] = 0.6 < 3.0$. Per KDB Publication 447498 D01v05, the maximum power of the channel was rounded to the nearest mW before calculation.

Per FCC KDB 447498 D01v05r01, the SAR exclusion threshold for 10g Extremity SAR for distances <50mm is defined by the following equation:

$$\frac{\text{Max Power of Channel (mW)}}{\text{Test Separation Dist (mm)}} * \sqrt{\text{Frequency (GHz)}} \leq 7.5$$

Based on the maximum conducted power of Bluetooth (rounded to the nearest mW) and the antenna to user separation distance, Bluetooth extremity SAR was not required; $[(10/5) * \sqrt{2.441}] = 3.1 < 7.5$. Per KDB Publication 447498 D01v05r01, the maximum power of the channel was rounded to the nearest mW before calculation.

Per FCC KDB Publication 648474 D03-D04, this device is considered a "phablet" since its diagonal distance is greater than 160 mm and less than 200 mm. Therefore Extremity SAR tests are required. Because wireless router operations are not supported for 5 GHz WIFI, Extremity SAR was evaluated for 5 GHz WIFI. However, Extremity SAR without accessory was not evaluated for 2.4 GHz WIFI since Hotspot SAR for 2.4 GHz WIFI when scaled up to the maximum output power tolerances is < 1.2 W/kg.

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.

This device supports IEEE 802.11ac with the following features:

- a) Up to 80 MHz Bandwidth only
- b) No aggregate channel configurations
- c) 1 Tx antenna output
- d) 256 QAM is supported
- e) No new 5 GHz channels

Full SAR evaluations for all IEEE 802.11ac configurations were not required since the average output power was not more than 0.25 dB higher than IEEE 802.11a mode. IEEE 802.11ac was evaluated for the highest IEEE 802.11a position in each 5 GHz band and exposure condition.

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(B) Licensed Transmitter(s)

This device is only capable of QPSK HSUPA in the uplink. Therefore, no additional SAR tests are required beyond that described for devices with HSUPA in KDB 941225 D01v02.

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.

Per FCC KDB Publication 648474 D03-D04, this device is considered a "phablet" since its diagonal distance is greater than 160 mm and less than 200 mm. Therefore Extremity SAR tests are required. When hotspot mode applies, 10-g SAR is required only for the surfaces and edges with hotspot mode 1-g SAR scaled up to the maximum output power tolerances > 1.2 W/kg.

This device does not support any network based voice services. Head and Body-worn exposure conditions were evaluated for compliance for VoIP operations.

1.8 Power Reduction for SAR

There is no power reduction used for any band/mode implemented in this device for SAR purposes.

1.9 Guidance Applied

- IEEE 1528-2003
- FCC KDB Publication 941225 D01-D06 (2G/3G/4G and Hotspot)
- FCC KDB Publication 248227 D01v01r02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D01v05 (General SAR Guidance)
- FCC KDB Publication 865664 D01-D02 (SAR Measurements up to 6 GHz)
- FCC KDB Publication 648474 D03-D04 (Phablet Procedures)
- April 2013 TCB Workshop Notes (IEEE 802.11ac)

1.10 Device Serial Numbers

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

	Head Serial Number	Body-Worn Serial Number	Hotspot Serial Number	Extremity Serial Number
GPRS/EDGE 850	SAR#7	SAR#9	SAR#9	SAR#9
GPRS/EDGE 1900	SAR#7	SAR#7	SAR#7	SAR#7
UMTS 850	SAR#7	SAR#7	SAR#7	SAR#7
UMTS 1900	SAR#7	SAR#7	SAR#7	SAR#7
Cell. CDMA/EVDO	SAR#1	SAR#1	SAR#1	SAR#1
PCS CDMA/EVDO	SAR#1	SAR#1	SAR#1	SAR#1
LTE Band 17	SAR#7	SAR#9	SAR#9	SAR#9
LTE Band 13	SAR#9	SAR#9	SAR#9	SAR#9
LTE Band 4 (AWS)	SAR#8	SAR#8	SAR#8	SAR#8
2.4 GHz WLAN	SAR#9	SAR#1	SAR#1	SAR#1
5 GHz WLAN	SAR#2	SAR#2	-	SAR#2
Bluetooth	-	SAR#1	-	-

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2 LTE INFORMATION

LTE Information			
FCC ID	ACJEB3910A		
Form Factor	Portable Handset		
Frequency Range of each LTE transmission band	LTE Band 17 (706.5 - 713.5 MHz)		
	LTE Band 13 (782 MHz)		
	LTE Band 4 (AWS) (1712.5 - 1752.5 MHz)		
Channel Bandwidths	LTE Band 17: 5 MHz, 10 MHz		
	LTE Band 13: 10 MHz		
	LTE Band 4 (AWS): 5 MHz, 10 MHz		
Channel Numbers and Frequencies (MHz)	Low	Mid	High
LTE Band 17: 5 MHz	706.5 (23755)	710 (23790)	713.5 (23825)
LTE Band 17: 10 MHz	709 (23780)	710 (23790)	711 (23800)
LTE Band 13: 10 MHz	782 (23230)	782 (23230)	782 (23230)
LTE Band 4 (AWS): 5 MHz	1712.5 (19975)	1732.5 (20175)	1752.5 (20375)
LTE Band 4 (AWS): 10 MHz	1715 (20000)	1732.5 (20175)	1750 (20350)
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.

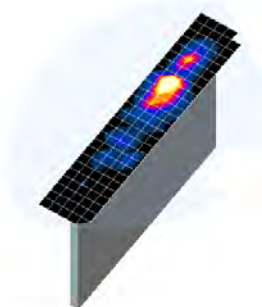


Figure 4-1
Sample SAR Area Scan

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

Frequency	Maximum Area Scan Resolution (mm) (Δx_{area} , Δy_{area})	Maximum Zoom Scan Resolution (mm) ($\Delta x_{zoom(n)}$, $\Delta y_{zoom(n)}$)	Maximum Zoom Scan Spatial Resolution (mm)			Minimum Zoom Scan Volume (mm) (x,y,z)
			Uniform Grid	Graded Grid		
			$\Delta z_{zoom(n)}$	$\Delta z_{zoom(1)}^*$	$\Delta z_{zoom(n>1)}^*$	
≤ 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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5

DEFINITION OF REFERENCE POINTS

5.1 EAR REFERENCE POINT

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

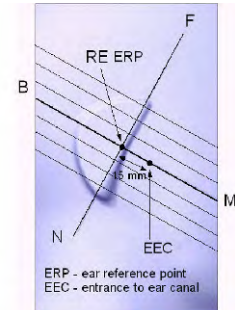


Figure 5-1
Close-Up Side view
of ERP

5.2 HANDSET REFERENCE POINTS

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



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

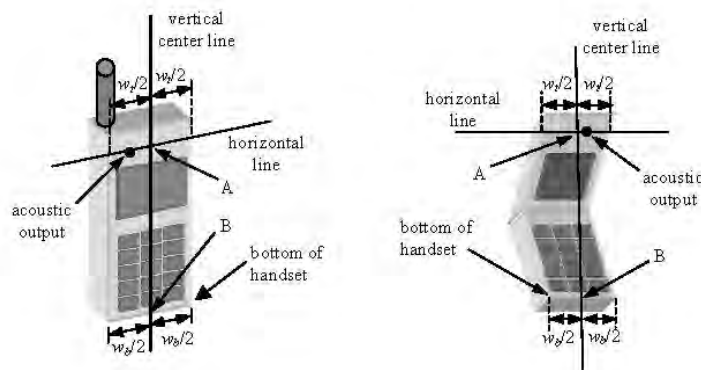


Figure 5-3
Handset Vertical Center & Horizontal Line Reference Points

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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.

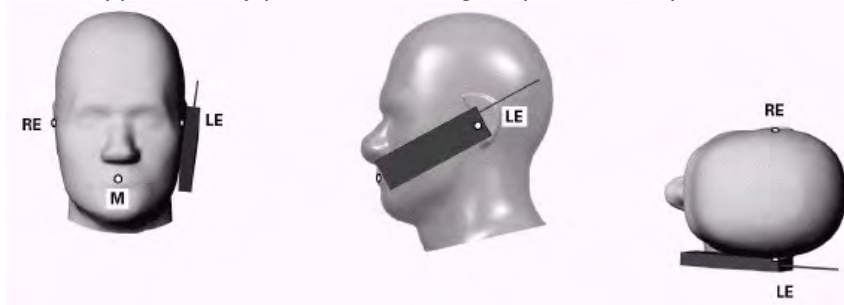


Figure 6-1 Front, Side and Top View of Cheek Position

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.

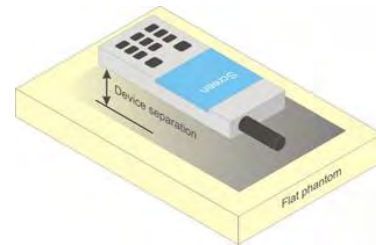


Figure 6-5
Sample Body-Worn Diagram

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.

For smart phones with a display diagonal dimension $> 15.0 \text{ cm}$ or an overall diagonal dimension $> 16.0 \text{ cm}$ that provide similar mobile web access and multimedia support found in mini-tablets or UMPC minitables that support voice calls next to the ear, the phablets procedures outlined in KDB Publication 648474 D04 v01r01DR04 should be applied to evaluate SAR compliance. A device marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance. In addition to the normally required head and body-worn accessory SAR test procedures required for handsets, the UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna $\leq 25 \text{ mm}$ from that surface or edge, in direct contact with the phantom, for 10-g SAR. The UMPC mini-tablet 1-g SAR at 5 mm is not required. When hotspot mode applies, 10-g SAR is required only for the surfaces and edges with hotspot mode 1-g SAR $> 1.2 \text{ W/kg}$. Extremity SAR was additionally evaluated for each band/mode with accessory components that contain metallic components regardless of the reported Hotspot SAR.

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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.

8.3.2 Head SAR Measurements

Head SAR was evaluated using EVDO Rev. A to support compliance for VoIP operations. See Section 8.3.4 for EVDO Rev. A configuration parameters.

8.3.3 Body-worn SAR Measurements

Body SAR was evaluated using EVDO Rev. A to support compliance for VoIP operations. See Section 8.3.4 for EVDO Rev. A configuration parameters.

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8.3.4 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 UMTS

8.4.1 Output Power Verification

Maximum output power is measured on the High, Middle and Low channels for each applicable transmission band according to the general descriptions in section 5.2 of 3GPP TS 34.121, using the appropriate RMC or AMR with TPC (transmit power control) set to all “1s”.

Maximum output power is verified on the High, Middle and Low channels according to the general descriptions in section 5.2 of 3GPP TS 34.121 (release 5), using the appropriate RMC with TPC (transmit power control) set to all “1s” or applying the required inner loop power control procedures to maintain maximum output power while HSUPA is active. Results for all applicable physical channel configurations (DPCCH, DPDCHn and spreading codes, HS-DPCCH etc) are tabulated in this test report. All configurations that are not supported by the DUT or cannot be measured due to technical or equipment limitations are identified.

8.4.2 Head SAR Measurements for Handsets

SAR for head exposure configurations is measured using the 12.2 kbps RMC with TPC bits configured to all “1s”.

8.4.3 Body SAR Measurements

SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits all “1s”.

8.4.4 Procedures Used to Establish RF Signal for SAR HSDPA Data Devices

The following procedures are applicable to HSDPA data devices operating under 3GPP Release 5. Body exposure conditions are typically applicable to these devices, including handsets and data modems operating in various electronic devices. HSDPA operates in conjunction with UMTS and requires an active DPCCH. The default test configuration is to measure SAR in UMTS without HSDPA, with an established radio link between the DUT and a communication test set with 12.2 kbps RMC mode configured in Test Loop Mode 1; and tested with HSDPA with FRC and a 12.2 kbps RMC using the highest SAR configuration in UMTS. SAR is selectively confirmed for other physical channel configurations according to output power, exposure conditions and device operating capabilities. Maximum output power is verified according to 3GPP TS 23.121 (Release 5) and SAR must be measured according to these maximum output conditions.

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Sub-Test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (Note 1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 (Note 4)	15/15 (Note 4)	64	12/15 (Note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5
Note 1: Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$. Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, Δ_{ACK} and $\Delta_{NACK} = 8$ ($A_{hs} = 30/15$) with $\beta_{hs} = 30/15 * \beta_c$, and $\Delta_{CQI} = 7$ ($A_{hs} = 24/15$) with $\beta_{hs} = 24/15 * \beta_c$. Note 3: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.							

Figure 8-1
Table C.10.1.4 of TS 234.121-1

8.4.5 SAR Measurement Conditions for HSPA Data Devices

SAR for body exposure configurations are measured according to the 'Body SAR Measurements' procedures in the 'WCDMA Handsets' section of the KDB 941225 D01 FCC 3G document. In addition, Body SAR is also measured for HSPA when the maximum average output of each RF channel with HSPA active is at least 1/4 dB higher of that measured without HSPA in 12.2 kbps RMC mode or the maximum SAR for 12.2 kbps RMC is above 75% of the SAR limit. Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 with power control algorithm 2, according to the highest body SAR configuration in 12.2 kbps RMC without HSPA. When VOIP is applicable for head exposure, SAR is not required when the maximum output of each RF channel with HSPA is less than 1/4 dB higher than that measured using 12.2 kbps RMC; otherwise, the same HSPA configuration used for body measurements should be used to test for head exposure.

Due to inner loop power control requirements in HSPA, a commercial communication test set should be used for the output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and EDCH configurations for HSPA should be configured according to the β values indicated below as well as other applicable procedures described in the 'WCDMA Handset' and 'Release 5 HSDPA Data Devices' sections of the FCC 3G document.

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	$\beta_{hs}^{(1)}$	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (codes)	CM ⁽²⁾ (dB)	MPR (dB)	AG ⁽⁴⁾ Index	E-TFCI
1	11/15 ⁽³⁾	15/15 ⁽³⁾	64	11/15 ⁽³⁾	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	$\beta_{ed} = 47/15$ $\beta_{ed} = 47/15$	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 ⁽⁴⁾	15/15 ⁽⁴⁾	64	15/15 ⁽⁴⁾	30/15	24/15	134/15	4	1	1.0	0.0	21	81
Note 1: Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$. Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference. Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 10/15$ and $\beta_d = 15/15$. Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 14/15$ and $\beta_d = 15/15$. Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g. Note 6: β_{ed} can not be set directly; it is set by Absolute Grant Value.													

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8.5 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).

8.5.1 Spectrum Plots for RB Configurations

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

8.5.2 MPR

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

8.5.3 A-MPR

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

8.5.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 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.
 - 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.

8.6 SAR Testing with 802.11 Transmitters

Normal network operating configurations are not suitable for measuring the SAR of 802.11 a/b/g/n/ac 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.

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8.6.1 General Device Setup

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters. 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.

8.6.2 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.

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 0.25 dB or higher than the 802.11a mode. 802.11ac SAR was evaluated for highest 802.11a configuration in each 5 GHz band and each exposure condition. 802.11ac modes were additionally evaluated for SAR if the output power for the respective mode was more than 0.25 dB higher than powers of 802.11a modes.

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 RF CONDUCTED POWERS

9.1 CDMA Conducted Powers

Band	Channel	Frequency	TDSO SO32 [dBm]	TDSO SO32 [dBm]	1x EvDO Rev. 0 [dBm]	1x EvDO Rev. A [dBm]
	F-RC	MHz	FCH+SCH	FCH	(RTAP)	(RETAP)
Cellular	1013	824.7	24.31	24.37	24.32	24.29
	384	836.52	24.21	24.22	24.26	24.21
	777	848.31	24.26	24.24	24.19	24.14
PCS	25	1851.25	23.68	23.64	23.61	23.55
	600	1880	23.66	23.67	23.65	23.61
	1175	1908.75	23.80	23.83	23.94	23.84

Per KDB Publication 941225 D01v02:

1. Head SAR was tested with Ev-Do revA.
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

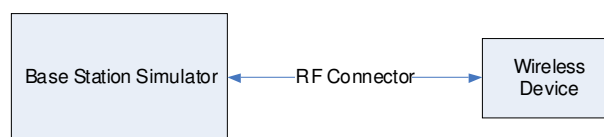


Figure 9-1
Power Measurement Setup

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9.2 GSM Conducted Powers

		Maximum Burst-Averaged Output Power							
		GPRS/EDGE Data (GMSK)				EDGE Data (8-PSK)			
Band	Channel	GPRS [dBm] 1 Tx Slot	GPRS [dBm] 2 Tx Slot	GPRS [dBm] 3 Tx Slot	GPRS [dBm] 4 Tx Slot	EDGE [dBm] 1 Tx Slot	EDGE [dBm] 2 Tx Slot	EDGE [dBm] 3 Tx Slot	EDGE [dBm] 4 Tx Slot
GSM 850	128	32.38	30.25	28.99	27.68	27.03	24.44	22.50	21.23
	190	32.81	30.40	28.91	27.70	27.14	24.50	22.63	21.29
	251	32.78	30.60	28.93	27.69	27.07	24.48	22.60	21.26
GSM 1900	512	30.25	27.71	26.08	24.75	26.05	23.44	22.28	21.18
	661	30.11	27.56	25.97	24.56	26.08	23.37	22.14	20.92
	810	29.97	27.52	25.92	24.63	26.12	23.58	22.06	21.04

		Calculated Maximum Frame-Averaged Output Power							
		GPRS/EDGE Data (GMSK)				EDGE Data (8-PSK)			
Band	Channel	GPRS [dBm] 1 Tx Slot	GPRS [dBm] 2 Tx Slot	GPRS [dBm] 3 Tx Slot	GPRS [dBm] 4 Tx Slot	EDGE [dBm] 1 Tx Slot	EDGE [dBm] 2 Tx Slot	EDGE [dBm] 3 Tx Slot	EDGE [dBm] 4 Tx Slot
GSM 850	128	23.35	24.23	24.73	24.67	18.00	18.42	18.24	18.22
	190	23.78	24.38	24.65	24.69	18.11	18.48	18.37	18.28
	251	23.75	24.58	24.67	24.68	18.04	18.46	18.34	18.25
GSM 1900	512	21.22	21.69	21.82	21.74	17.02	17.42	18.02	18.17
	661	21.08	21.54	21.71	21.55	17.05	17.35	17.88	17.91
	810	20.94	21.50	21.66	21.62	17.09	17.56	17.80	18.03
GSM 850	Frame	23.47	23.98	23.94	23.99	17.47	17.98	18.24	17.99
GSM 1900	Avg.Targets:	20.47	20.98	20.94	20.99	16.47	16.98	16.94	16.99

Note:

- Both burst-averaged and calculated frame-averaged powers are included. Frame-averaged power was calculated from the measured burst-averaged power by converting the slot powers into linear units and calculating the energy over 8 timeslots.
- The source-based frame-averaged output power was evaluated for all GPRS/EDGE slot configurations. The configuration with the highest target frame averaged output power was evaluated. When the maximum frame-averaged powers are equivalent across two or more slots (within 0.25 dB), the configuration with the most number of time slots was tested.
- GPRS/EDGE (GMSK) output powers were measured with coding scheme setting of 1 (CS1) on the base station simulator. CS1 was configured to measure GPRS output power measurements and SAR to ensure GMSK modulation in the signal. Our Investigation has shown that CS1 - CS4 settings do not have any impact on the output levels or modulation in the GPRS modes.
- EDGE (8-PSK) output powers were measured with MCS7 on the base station simulator. MCS7 coding scheme was used to measure the output powers for EDGE since investigation has shown that choosing MCS7 coding scheme will ensure 8-PSK modulation. It has been shown that MCS levels that produce 8PSK modulation do not have an impact on output power.

GSM Class: C

GPRS Multislot class: 12 (Max 4 Tx uplink slots)

EDGE Multislot class: 12 (Max 4 Tx uplink slots)

DTM Multislot Class: N/A

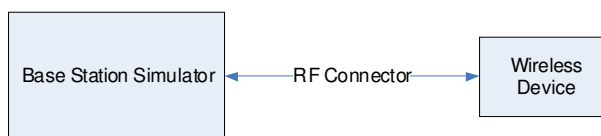


Figure 9-2
Power Measurement Setup

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9.3 UMTS Conducted Powers

3GPP Release Version	Mode	3GPP 34.121 Subtest	Cellular Band [dBm]			PCS Band [dBm]			3GPP MPR [dB]
			4132	4183	4233	9262	9400	9538	
99	WCDMA	12.2 kbps RMC	23.96	23.98	23.98	23.92	23.95	24.00	-
6	HSDPA	Subtest 1	22.98	22.96	22.92	22.94	22.95	22.90	0
6		Subtest 2	22.97	22.94	22.95	22.99	22.96	23.00	0
6		Subtest 3	22.53	22.68	22.61	22.55	22.59	22.52	0.5
6		Subtest 4	22.65	22.70	22.74	22.53	22.61	22.56	0.5
6	HSUPA	Subtest 1	23.00	22.98	23.01	22.65	23.00	22.96	0
6		Subtest 2	21.75	21.79	22.02	21.49	22.00	21.47	2
6		Subtest 3	21.95	22.17	21.78	21.97	21.90	21.85	1
6		Subtest 4	22.62	22.64	22.50	22.19	22.22	22.48	2
6		Subtest 5	22.97	22.83	22.45	23.18	23.15	22.57	0

UMTS SAR was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01v02. HSPA SAR was not required since the average output power of the HSPA subtests was not more than 0.25 dB higher than the RMC level and SAR was less than 1.2 W/kg.

This device does not support DC-HSDPA.

It is expected by the manufacturer that MPR for some HSUPA subtests may be up to 1 dB more than specified by 3GPP, but also as low as 0 dB according to the chipset implementation in this model.

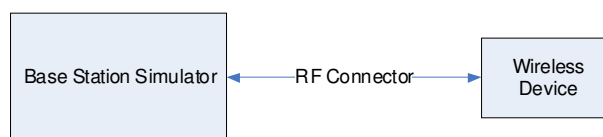


Figure 9-3
Power Measurement Setup

FCC ID: ACJEB3910A	 SAR EVALUATION REPORT 		Reviewed by: Quality Manager
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9.4 LTE Conducted Powers

9.4.1 LTE Band 17

Table 9-1
LTE Band 17 Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Mid	710.0	23790	10	QPSK	1	0	22.79	0	0
	710.0	23790	10	QPSK	1	25	22.95	0	0
	710.0	23790	10	QPSK	1	49	22.91	0	0
	710.0	23790	10	QPSK	25	0	21.72	1	0-1
	710.0	23790	10	QPSK	25	12	21.78	1	0-1
	710.0	23790	10	QPSK	25	25	21.81	1	0-1
	710.0	23790	10	QPSK	50	0	21.58	1	0-1
	710.0	23790	10	16QAM	1	0	21.91	1	0-1
	710.0	23790	10	16QAM	1	25	22.04	1	0-1
	710.0	23790	10	16QAM	1	49	22.03	1	0-1
	710.0	23790	10	16QAM	25	0	20.69	2	0-2
	710.0	23790	10	16QAM	25	12	20.79	2	0-2
	710.0	23790	10	16QAM	25	25	20.83	2	0-2
	710.0	23790	10	16QAM	50	0	20.56	2	0-2

Note: LTE Band 17 at 10 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

Table 9-2
LTE Band 17 Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Mid	710.0	23790	5	QPSK	1	0	23.02	0	0
	710.0	23790	5	QPSK	1	12	23.01	0	0
	710.0	23790	5	QPSK	1	24	22.97	0	0
	710.0	23790	5	QPSK	12	0	21.87	1	0-1
	710.0	23790	5	QPSK	12	6	21.95	1	0-1
	710.0	23790	5	QPSK	12	13	21.90	1	0-1
	710.0	23790	5	QPSK	25	0	21.81	1	0-1
	710.0	23790	5	16-QAM	1	0	22.02	1	0-1
	710.0	23790	5	16-QAM	1	12	22.04	1	0-1
	710.0	23790	5	16-QAM	1	24	21.99	1	0-1
	710.0	23790	5	16-QAM	12	0	20.95	2	0-2
	710.0	23790	5	16-QAM	12	6	21.01	2	0-2
	710.0	23790	5	16-QAM	12	13	21.02	2	0-2
	710.0	23790	5	16-QAM	25	0	20.84	2	0-2

Note: LTE Band 17 at 5 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

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9.4.2

LTE Band 13

Table 9-3
LTE Band 13 Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Mid	782.0	23230	10	QPSK	1	0	23.13	0	0
	782.0	23230	10	QPSK	1	25	22.74	0	0
	782.0	23230	10	QPSK	1	49	22.93	0	0
	782.0	23230	10	QPSK	25	0	21.92	1	0-1
	782.0	23230	10	QPSK	25	12	21.85	1	0-1
	782.0	23230	10	QPSK	25	25	21.76	1	0-1
	782.0	23230	10	QPSK	50	0	21.67	1	0-1
	782.0	23230	10	16QAM	1	0	22.15	1	0-1
	782.0	23230	10	16QAM	1	25	21.98	1	0-1
	782.0	23230	10	16QAM	1	49	22.13	1	0-1
	782.0	23230	10	16QAM	25	0	20.77	2	0-2
	782.0	23230	10	16QAM	25	12	20.64	2	0-2
	782.0	23230	10	16QAM	25	25	20.73	2	0-2
	782.0	23230	10	16QAM	50	0	20.60	2	0-2

Note: LTE Band 13 at 10 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

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9.4.3

LTE Band 4 (AWS)

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Low	1715	20000	10	QPSK	1	0	23.01	0	0
	1715	20000	10	QPSK	1	25	22.98	0	0
	1715	20000	10	QPSK	1	49	22.87	0	0
	1715	20000	10	QPSK	25	0	21.93	1	0-1
	1715	20000	10	QPSK	25	12	21.80	1	0-1
	1715	20000	10	QPSK	25	25	21.79	1	0-1
	1715	20000	10	QPSK	50	0	21.79	1	0-1
	1715	20000	10	16QAM	1	0	22.03	1	0-1
	1715	20000	10	16QAM	1	25	21.91	1	0-1
	1715	20000	10	16QAM	1	49	21.94	1	0-1
	1715	20000	10	16QAM	25	0	20.99	2	0-2
	1715	20000	10	16QAM	25	12	20.90	2	0-2
	1715	20000	10	16QAM	25	25	20.85	2	0-2
	1715	20000	10	16QAM	50	0	20.82	2	0-2
Mid	1732.5	20175	10	QPSK	1	0	23.07	0	0
	1732.5	20175	10	QPSK	1	25	22.99	0	0
	1732.5	20175	10	QPSK	1	49	22.87	0	0
	1732.5	20175	10	QPSK	25	0	21.88	1	0-1
	1732.5	20175	10	QPSK	25	12	21.85	1	0-1
	1732.5	20175	10	QPSK	25	25	21.78	1	0-1
	1732.5	20175	10	QPSK	50	0	21.71	1	0-1
	1732.5	20175	10	16QAM	1	0	22.11	1	0-1
	1732.5	20175	10	16QAM	1	25	22.06	1	0-1
	1732.5	20175	10	16QAM	1	49	21.89	1	0-1
	1732.5	20175	10	16QAM	25	0	20.90	2	0-2
	1732.5	20175	10	16QAM	25	12	20.78	2	0-2
	1732.5	20175	10	16QAM	25	25	20.77	2	0-2
	1732.5	20175	10	16QAM	50	0	20.72	2	0-2
High	1750	20350	10	QPSK	1	0	22.94	0	0
	1750	20350	10	QPSK	1	25	22.84	0	0
	1750	20350	10	QPSK	1	49	23.04	0	0
	1750	20350	10	QPSK	25	0	21.63	1	0-1
	1750	20350	10	QPSK	25	12	21.70	1	0-1
	1750	20350	10	QPSK	25	25	21.67	1	0-1
	1750	20350	10	QPSK	50	0	21.58	1	0-1
	1750	20350	10	16QAM	1	0	21.95	1	0-1
	1750	20350	10	16QAM	1	25	21.90	1	0-1
	1750	20350	10	16QAM	1	49	22.02	1	0-1
	1750	20350	10	16QAM	25	0	20.71	2	0-2
	1750	20350	10	16QAM	25	12	20.75	2	0-2
	1750	20350	10	16QAM	25	25	20.77	2	0-2
	1750	20350	10	16QAM	50	0	20.66	2	0-2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Low	1712.5	19975	5	QPSK	1	0	23.06	0	0
	1712.5	19975	5	QPSK	1	12	23.05	0	0
	1712.5	19975	5	QPSK	1	24	22.95	0	0
	1712.5	19975	5	QPSK	12	0	22.46	1	0-1
	1712.5	19975	5	QPSK	12	6	22.47	1	0-1
	1712.5	19975	5	QPSK	12	13	22.47	1	0-1
	1712.5	19975	5	QPSK	25	0	22.34	1	0-1
	1712.5	19975	5	16-QAM	1	0	22.04	1	0-1
	1712.5	19975	5	16-QAM	1	12	22.08	1	0-1
	1712.5	19975	5	16-QAM	1	24	21.97	1	0-1
	1712.5	19975	5	16-QAM	12	0	21.45	2	0-2
	1712.5	19975	5	16-QAM	12	6	21.49	2	0-2
	1712.5	19975	5	16-QAM	12	13	21.44	2	0-2
Mid	1732.5	20175	5	QPSK	1	0	23.11	0	0
	1732.5	20175	5	QPSK	1	12	23.03	0	0
	1732.5	20175	5	QPSK	1	24	23.05	0	0
	1732.5	20175	5	QPSK	12	0	22.40	1	0-1
	1732.5	20175	5	QPSK	12	6	22.28	1	0-1
	1732.5	20175	5	QPSK	12	13	22.31	1	0-1
	1732.5	20175	5	QPSK	25	0	22.29	1	0-1
	1732.5	20175	5	16-QAM	1	0	22.05	1	0-1
	1732.5	20175	5	16-QAM	1	12	22.10	1	0-1
	1732.5	20175	5	16-QAM	1	24	21.97	1	0-1
	1732.5	20175	5	16-QAM	12	0	21.43	2	0-2
	1732.5	20175	5	16-QAM	12	6	21.47	2	0-2
	1732.5	20175	5	16-QAM	12	13	21.47	2	0-2
High	1752.5	20375	5	QPSK	1	0	23.01	0	0
	1752.5	20375	5	QPSK	1	12	22.94	0	0
	1752.5	20375	5	QPSK	1	24	23.15	0	0
	1752.5	20375	5	QPSK	12	0	22.47	1	0-1
	1752.5	20375	5	QPSK	12	6	22.36	1	0-1
	1752.5	20375	5	QPSK	12	13	22.47	1	0-1
	1752.5	20375	5	QPSK	25	0	22.32	1	0-1
	1752.5	20375	5	16-QAM	1	0	21.99	1	0-1
	1752.5	20375	5	16-QAM	1	12	22.06	1	0-1
	1752.5	20375	5	16-QAM	1	24	22.11	1	0-1
	1752.5	20375	5	16-QAM	12	0	21.50	2	0-2
	1752.5	20375	5	16-QAM	12	6	21.49	2	0-2
	1752.5	20375	5	16-QAM	12	13	21.50	2	0-2
	1752.5	20375	5	16-QAM	25	0	21.36	2	0-2

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9.5 WLAN/Bluetooth Conducted Powers

Table 9-6
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*	14.66	14.63	14.68	14.62
802.11b	2437	6*	14.74	14.72	14.75	14.76
802.11b	2462	11*	14.75	14.79	14.79	14.84

Table 9-7
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	9.33	9.35	9.38	9.31	9.28	9.35	9.36	9.34
802.11g	2417	2	12.65	12.54	12.64	12.68	12.53	12.64	12.58	12.51
802.11g	2437	6	12.54	12.53	12.71	12.57	12.45	12.55	12.55	12.61
802.11g	2457	10	12.60	12.52	12.57	12.59	12.55	12.62	12.60	12.64
802.11g	2462	11	9.34	9.36	9.33	9.39	9.44	9.31	9.29	9.33

Table 9-8
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	9.33	9.36	9.30	9.27	9.36	9.35	9.35	9.33
802.11n	2417	2	11.65	11.62	11.63	11.68	11.64	11.65	11.60	11.67
802.11n	2437	6	11.54	11.67	11.62	11.64	11.68	11.57	11.58	11.59
802.11n	2457	10	11.55	11.62	11.52	11.54	11.52	11.52	11.57	11.52
802.11n	2462	11	9.30	9.32	9.33	9.41	9.31	9.35	9.31	9.34

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Table 9-9
IEEE 802.11a Average RF Power

Mode	Freq [MHz]	Channel	802.11a (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
802.11a	5180	36*	11.51	11.53	11.47	11.52	11.50	11.47	11.46	11.51
802.11a	5200	40	13.44	13.45	13.41	13.39	13.48	13.50	13.49	13.43
802.11a	5220	44	13.41	13.40	13.38	13.45	13.42	13.46	13.40	13.45
802.11a	5240	48*	13.53	13.51	13.48	13.52	13.57	13.48	13.46	13.44
802.11a	5260	52*	15.05	15.01	14.97	15.00	15.06	15.04	15.08	15.03
802.11a	5280	56	15.06	15.00	15.04	15.03	15.06	14.99	15.02	15.01
802.11a	5300	60	15.11	15.10	15.07	15.09	15.14	15.16	15.08	15.04
802.11a	5320	64*	13.75	13.70	13.68	13.70	13.71	13.78	13.69	13.71
802.11a	5500	100	13.87	13.90	13.88	13.85	13.86	13.89	13.94	13.90
802.11a	5520	104*	15.25	15.32	15.30	15.20	15.31	15.22	15.29	15.27
802.11a	5540	108	15.20	15.18	15.26	15.24	15.16	15.24	15.22	15.20
802.11a	5560	112	15.31	15.28	15.29	15.34	15.25	15.28	15.24	15.30
802.11a	5580	116*	15.20	15.31	15.32	15.25	15.22	15.16	15.22	15.15
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	15.31	15.32	15.30	15.34	15.28	15.22	15.25	15.24
802.11a	5680	136*	15.45	15.34	15.36	15.40	15.32	15.41	15.38	15.33
802.11a	5700	140	14.02	14.02	14.05	13.97	14.00	13.99	14.04	14.03
802.11a	5745	149*	15.42	15.40	15.38	15.39	15.40	15.46	15.42	15.44
802.11a	5765	153	15.44	15.41	15.46	15.43	15.44	15.42	15.47	15.40
802.11a	5785	157*	15.36	15.41	15.40	15.36	15.34	15.36	15.24	15.32
802.11a	5805	161	15.33	15.36	15.37	15.32	15.34	15.35	15.36	15.30
802.11a	5825	165*	15.21	15.25	15.28	15.24	15.24	15.20	15.18	15.26

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 than the default channels, these “required channels” are considered for SAR testing instead of the default channels.

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Table 9-10
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	11.55	11.52	11.56	11.50	11.52	11.54	11.48	11.52
802.11n	5200	40	13.61	13.60	13.58	13.63	13.64	13.52	13.57	13.55
802.11n	5220	44	13.44	13.42	13.51	13.40	13.38	13.45	13.37	13.45
802.11n	5240	48	13.61	13.62	13.57	13.60	13.64	13.60	13.55	13.58
802.11n	5260	52	15.20	15.18	15.22	15.17	15.26	15.24	15.20	15.21
802.11n	5280	56	15.14	15.16	15.24	15.17	15.20	15.14	15.13	15.15
802.11n	5300	60	15.09	15.10	15.02	15.14	15.16	15.11	15.07	15.14
802.11n	5320	64	13.77	13.64	13.75	13.79	13.74	13.45	13.42	13.35
802.11n	5500	100	13.77	13.68	13.78	13.72	13.70	13.74	13.75	13.69
802.11n	5520	104	15.22	15.20	15.25	15.24	15.18	15.15	15.16	15.17
802.11n	5540	108	15.26	15.25	15.29	15.24	15.25	15.22	15.28	15.32
802.11n	5560	112	15.20	15.24	15.15	15.28	15.20	15.19	15.18	15.13
802.11n	5580	116	15.19	15.14	15.20	15.14	15.23	15.24	15.19	15.16
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	15.32	15.30	15.24	15.28	15.22	15.29	15.34	15.33
802.11n	5680	136	15.35	15.32	15.38	15.34	15.30	15.24	15.26	15.28
802.11n	5700	140	13.81	13.80	13.79	13.75	13.69	13.84	13.75	13.74
802.11n	5745	149	15.30	15.36	15.34	15.28	15.25	15.34	15.33	15.30
802.11n	5765	153	15.32	15.28	15.30	15.35	15.24	15.25	15.27	15.26
802.11n	5785	157	15.31	15.42	15.27	15.31	15.44	15.38	15.39	15.41
802.11n	5805	161	15.40	15.36	15.42	15.47	15.34	15.36	15.31	15.38
802.11n	5825	165	15.22	15.26	15.31	15.25	15.28	15.37	15.25	15.24

Table 9-11
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	10.15	10.14	10.25	10.14	10.16	10.11	10.08	10.09
802.11n	5230	46	10.23	10.20	10.16	10.17	10.18	10.19	10.22	10.25
802.11n	5270	54	10.34	10.40	10.32	10.35	10.39	10.33	10.32	10.34
802.11n	5310	62	10.52	10.50	10.58	10.61	10.52	10.54	10.55	10.50
802.11n	5510	102	10.55	10.52	10.53	10.57	10.55	10.54	10.52	10.56
802.11n	5550	110	10.54	10.53	10.59	10.50	10.46	10.56	10.61	10.57
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	10.56	10.54	10.57	10.53	10.56	10.52	10.54	10.50
802.11n	5755	151	10.65	10.63	10.64	10.67	10.60	10.62	10.63	10.64
802.11n	5795	159	10.49	10.64	10.66	10.57	10.53	10.52	10.54	10.56

Table 9-12
IEEE 802.11ac Average RF Power – 80 MHz Bandwidth

Mode	Freq [MHz]	Channel	80MHz BW 802.11ac (5GHz) Conducted Power [dBm]									
			Data Rate [Mbps]									
			29.3	58.5	87.8	117	175.5	234	263.3	292.5	351	390
			MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
802.11ac	5210	42	10.60	10.54	10.52	10.57	10.53	10.55	10.59	10.64	10.68	9.94
802.11ac	5290	58	10.86	10.78	10.86	10.89	10.86	10.90	10.84	10.88	10.86	10.02
802.11ac	5530	106	10.88	10.89	10.87	10.85	10.86	10.87	10.85	10.90	10.91	10.16
802.11ac	5775	155	10.91	11.01	10.96	11.02	11.14	11.05	10.92	11.05	10.96	10.18

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Table 9-13
Bluetooth RF Conducted Powers

Mode	Freq [MHz]	Channel	Average Bluetooth Conducted Power [dBm]		
			Data Rate [Mbps]		
			1.0	2.0	3.0
Bluetooth	2402	0	8.92	7.17	7.43
Bluetooth	2441	39	9.31	7.77	7.68
Bluetooth	2480	78	8.25	6.62	6.76

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.
- Full SAR tests for all IEEE 802.11ac configurations were not required because the average output power was not more than 0.25 dB higher than IEEE 802.11a mode. IEEE 802.11ac was evaluated for the highest IEEE 802.11a position in each 5 GHz band and exposure condition.
- 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.

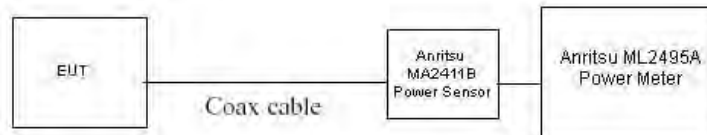


Figure 9-4
Power Measurement Setup for Signal < 50 MHz

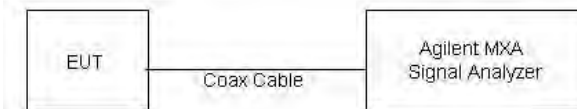


Figure 9-5
Power Measurement Setup for Signal > 50 MHz

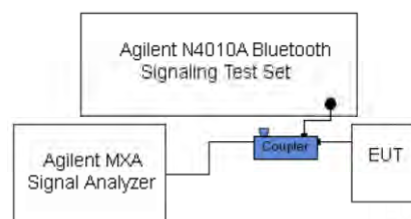


Figure 9-6
Bluetooth Power Measurement Setup

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10 SYSTEM VERIFICATION

10.1 Tissue Verification

Table 10-1
Measured Head 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
12/27/2013	750H	20.8	710	0.871	42.442	0.890	42.149	-2.13%	0.70%
			740	0.903	42.099	0.893	41.994	1.12%	0.25%
			755	0.918	41.905	0.894	41.916	2.68%	-0.03%
12/30/2013	750H	20.2	740	0.897	40.798	0.893	41.994	0.45%	-2.85%
			755	0.912	40.608	0.894	41.916	2.01%	-3.12%
			770	0.925	40.351	0.895	41.838	3.35%	-3.55%
12/23/2013	835H	22.3	785	0.940	40.149	0.896	41.760	4.91%	-3.86%
			820	0.906	41.857	0.899	41.578	0.78%	0.67%
			835	0.921	41.616	0.900	41.500	2.33%	0.28%
12/26/2013	1750H	22.8	850	0.935	41.390	0.916	41.500	2.07%	-0.27%
			1710	1.373	40.613	1.348	40.142	1.85%	1.17%
			1750	1.413	40.355	1.371	40.079	3.06%	0.69%
12/21/2013	1900H	22.7	1790	1.459	40.204	1.394	40.016	4.66%	0.47%
			1850	1.400	40.257	1.400	40.000	0.00%	0.64%
			1880	1.431	40.115	1.400	40.000	2.21%	0.29%
12/27/2013	2450H	22.2	1910	1.463	40.016	1.400	40.000	4.50%	0.04%
			2401	1.767	38.737	1.756	39.287	0.63%	-1.40%
			2450	1.819	38.563	1.800	39.200	1.06%	-1.63%
01/07/2014	5200H-5800H	23.5	2499	1.874	38.391	1.853	39.138	1.13%	-1.91%
			5200	4.570	35.953	4.655	35.986	-1.83%	-0.09%
			5220	4.599	35.917	4.676	35.963	-1.65%	-0.13%
			5240	4.633	35.899	4.696	35.940	-1.34%	-0.11%
			5280	4.666	35.898	4.737	35.894	-1.50%	0.01%
			5300	4.684	35.850	4.758	35.871	-1.56%	-0.06%
			5500	4.893	35.563	4.963	35.643	-1.41%	-0.22%
			5520	4.926	35.553	4.983	35.620	-1.14%	-0.19%
			5540	4.938	35.569	5.004	35.597	-1.32%	-0.08%
			5600	4.995	35.400	5.065	35.529	-1.38%	-0.36%
			5680	5.078	35.328	5.147	35.437	-1.34%	-0.31%
			5765	5.188	35.231	5.234	35.340	-0.88%	-0.31%
			5785	5.202	35.234	5.255	35.317	-1.01%	-0.24%
			5800	5.207	35.157	5.270	35.300	-1.20%	-0.41%

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Table 10-2
Measured Body 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
12/26/2013	750B	21.9	710	0.936	55.296	0.960	55.687	-2.50%	-0.70%
			740	0.964	54.961	0.963	55.570	0.10%	-1.10%
			755	0.979	54.810	0.964	55.512	1.56%	-1.26%
			770	0.993	54.649	0.965	55.453	2.90%	-1.45%
			785	1.007	54.472	0.966	55.395	4.24%	-1.67%
12/26/2013	835B	20.5	820	0.994	54.118	0.969	55.258	2.58%	-2.06%
			835	1.008	53.962	0.970	55.200	3.92%	-2.24%
			850	1.024	53.768	0.988	55.154	3.64%	-2.51%
12/30/2013	835B	21.7	820	0.979	53.202	0.969	55.258	1.03%	-3.72%
			835	0.994	53.033	0.970	55.200	2.47%	-3.93%
			850	1.007	52.900	0.988	55.154	1.92%	-4.09%
12/23/2013	1750B	22.1	1710	1.435	52.238	1.463	53.537	-1.91%	-2.43%
			1750	1.473	52.026	1.488	53.432	-1.01%	-2.63%
			1790	1.525	51.907	1.514	53.326	0.73%	-2.66%
12/30/2013	1750B	20.4	1710	1.462	52.336	1.463	53.537	-0.07%	-2.24%
			1750	1.510	52.164	1.488	53.432	1.48%	-2.37%
			1790	1.556	52.009	1.514	53.326	2.77%	-2.47%
12/23/2013	1900B	22.9	1850	1.509	51.115	1.520	53.300	-0.72%	-4.10%
			1880	1.541	50.984	1.520	53.300	1.38%	-4.35%
			1910	1.574	50.899	1.520	53.300	3.55%	-4.50%
12/26/2013	1900B	22.3	1850	1.504	52.743	1.520	53.300	-1.05%	-1.05%
			1880	1.537	52.614	1.520	53.300	1.12%	-1.29%
			1910	1.569	52.502	1.520	53.300	3.22%	-1.50%
12/30/2013	2450B	21.9	2401	1.956	51.559	1.903	52.765	2.79%	-2.29%
			2450	2.022	51.357	1.950	52.700	3.69%	-2.55%
			2499	2.086	51.178	2.019	52.638	3.32%	-2.77%
01/21/2014	2450B	23.1	2401	1.928	51.513	1.903	52.765	1.31%	-2.37%
			2450	1.989	51.353	1.950	52.700	2.00%	-2.56%
			2499	2.051	51.124	2.019	52.638	1.58%	-2.88%
01/14/2014	5200B-5800B	23.0	5200	5.310	48.450	5.299	49.014	0.21%	-1.15%
			5220	5.340	48.350	5.323	48.987	0.32%	-1.30%
			5240	5.381	48.283	5.346	48.960	0.65%	-1.38%
			5280	5.448	48.278	5.393	48.906	1.02%	-1.28%
			5300	5.450	48.176	5.416	48.879	0.63%	-1.44%
			5500	5.768	47.619	5.650	48.607	2.09%	-2.03%
			5520	5.800	47.655	5.673	48.580	2.24%	-1.90%
			5540	5.833	47.628	5.696	48.553	2.41%	-1.91%
			5600	5.908	47.447	5.766	48.471	2.46%	-2.11%
			5680	6.045	47.284	5.860	48.363	3.16%	-2.23%
			5765	6.173	47.067	5.959	48.248	3.59%	-2.45%
			5785	6.209	47.034	5.982	48.220	3.79%	-2.46%
			5800	6.227	46.992	6.000	48.200	3.78%	-2.51%

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 10-3
1g 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} (%)
C	750	HEAD	12/27/2013	20.7	20.7	0.100	1054	3263	0.830	8.500	8.300	-2.35%
E	750	HEAD	12/30/2013	23.3	21.4	0.100	1003	3914	0.824	8.460	8.240	-2.60%
D	835	HEAD	12/23/2013	21.3	22.3	0.100	4d119	3022	0.954	9.680	9.540	-1.45%
B	1750	HEAD	12/26/2013	23.7	22.8	0.100	1008	3288	3.610	36.800	36.100	-1.90%
G	1900	HEAD	12/21/2013	23.3	22.7	0.100	5d148	3209	4.020	39.700	40.200	1.26%
E	2450	HEAD	12/27/2013	24.5	23.5	0.100	797	3914	5.340	52.500	53.400	1.71%
E	5200	HEAD	01/07/2014	24.1	23.0	0.040	1120	3914	2.850	76.000	71.250	-6.25%
E	5300	HEAD	01/07/2014	24.1	23.1	0.040	1120	3914	3.110	78.700	77.750	-1.21%
E	5500	HEAD	01/07/2014	24.0	23.0	0.040	1120	3914	3.130	80.100	78.250	-2.31%
E	5600	HEAD	01/07/2014	24.1	23.2	0.040	1120	3914	3.290	79.900	82.250	2.94%
E	5800	HEAD	01/07/2014	24.0	23.2	0.040	1120	3914	3.060	74.900	76.500	2.14%
E	750	BODY	12/26/2013	23.9	22.0	0.100	1003	3914	0.882	8.830	8.820	-0.11%
K	835	BODY	12/26/2013	22.3	20.5	0.100	4d119	3333	1.020	9.540	10.200	6.92%
K	835	BODY	12/30/2013	22.3	21.7	0.100	4d119	3333	0.923	9.540	9.230	-3.25%
H	1750	BODY	12/23/2013	22.6	22.1	0.100	1051	3318	3.580	37.800	35.800	-5.29%
H	1750	BODY	12/30/2013	23.0	21.0	0.100	1051	3318	3.720	37.800	37.200	-1.59%
I	1900	BODY	12/23/2013	21.9	22.9	0.100	5d148	3319	4.180	40.800	41.800	2.45%
I	1900	BODY	12/26/2013	22.1	22.1	0.100	5d148	3319	3.930	40.800	39.300	-3.68%
D	2450	BODY	12/30/2013	22.3	22.0	0.100	797	3022	5.150	49.600	51.500	3.83%
D	2450	BODY	01/21/2014	23.9	23.1	0.040	719	3022	2.050	51.700	51.250	-0.87%
E	5200	BODY	01/14/2014	24.4	23.7	0.040	1120	3914	2.980	76.600	74.500	-2.74%
E	5300	BODY	01/14/2014	24.4	23.5	0.040	1120	3914	2.900	76.800	72.500	-5.60%
E	5500	BODY	01/14/2014	24.3	23.5	0.040	1120	3914	3.350	79.800	83.750	4.95%
E	5600	BODY	01/14/2014	24.3	23.7	0.040	1120	3914	3.270	80.700	81.750	1.30%
E	5800	BODY	01/14/2014	24.3	23.6	0.040	1120	3914	2.850	75.500	71.250	-5.63%

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Table 10-4
10g 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 _{10g} (W/kg)	1 W Target SAR _{10g} (W/kg)	1 W Normalized SAR _{10g} (W/kg)	Deviation _{10g} (%)
E	750	BODY	12/26/2013	23.9	22.0	0.100	1003	3914	0.587	5.870	5.870	0.00%
K	835	BODY	12/26/2013	22.3	20.5	0.100	4d119	3333	0.669	6.310	6.690	6.02%
K	835	BODY	12/30/2013	22.3	21.7	0.100	4d119	3333	0.608	6.310	6.080	-3.65%
H	1750	BODY	12/23/2013	22.6	22.1	0.100	1051	3318	1.890	20.400	18.900	-7.35%
I	1900	BODY	12/23/2013	21.9	22.9	0.100	5d148	3319	2.170	21.700	21.700	0.00%
I	1900	BODY	12/26/2013	22.1	22.1	0.100	5d148	3319	2.030	21.700	20.300	-6.45%
D	2450	BODY	12/30/2013	22.3	22.0	0.100	797	3022	2.380	23.200	23.800	2.59%
E	5200	BODY	01/14/2014	24.4	23.7	0.040	1120	3914	0.848	21.500	21.200	-1.40%
E	5300	BODY	01/14/2014	24.4	23.5	0.040	1120	3914	0.808	21.500	20.200	-6.05%
E	5500	BODY	01/14/2014	24.3	23.5	0.040	1120	3914	0.930	22.100	23.250	5.20%
E	5600	BODY	01/14/2014	24.3	23.7	0.040	1120	3914	0.908	22.300	22.700	1.79%
E	5800	BODY	01/14/2014	24.3	23.6	0.040	1120	3914	0.797	20.900	19.925	-4.67%

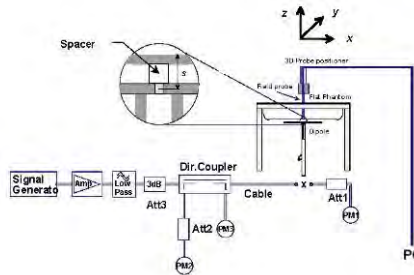


Figure 10-1
System Verification Setup Diagram



Figure 10-2
System Verification Setup Photo

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11 SAR DATA SUMMARY

11.1 Standalone Head SAR Data

Table 11-1
GPRS 850 Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	# of Time Slots	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	190	GPRS 850	GPRS	27.7	27.70	0.19	Right	Cheek	SAR#7	4	1:2.076	0.373	1.000	0.373	A1
836.60	190	GPRS 850	GPRS	27.7	27.70	-0.13	Right	Tilt	SAR#7	4	1:2.076	0.172	1.000	0.172	
836.60	190	GPRS 850	GPRS	27.7	27.70	0.00	Left	Cheek	SAR#7	4	1:2.076	0.258	1.000	0.258	
836.60	190	GPRS 850	GPRS	27.7	27.70	0.03	Left	Tilt	SAR#7	4	1:2.076	0.154	1.000	0.154	
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
GPRS 1900 Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	# of Time Slots	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
1880.00	661	GPRS 1900	GPRS	25.5	24.56	-0.19	Right	Cheek	SAR#7	4	1:2.076	0.192	1.242	0.238	A2
1880.00	661	GPRS 1900	GPRS	25.5	24.56	0.13	Right	Tilt	SAR#7	4	1:2.076	0.072	1.242	0.089	
1880.00	661	GPRS 1900	GPRS	25.5	24.56	0.21	Left	Cheek	SAR#7	4	1:2.076	0.128	1.242	0.159	
1880.00	661	GPRS 1900	GPRS	25.5	24.56	-0.08	Left	Tilt	SAR#7	4	1:2.076	0.070	1.242	0.087	
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 11-3
UMTS 850 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)	
836.60	4183	UMTS 850	RMC	24.0	23.98	0.00	Right	Cheek	SAR#7	1:1	0.365	1.005	0.367	A3
836.60	4183	UMTS 850	RMC	24.0	23.98	0.04	Right	Tilt	SAR#7	1:1	0.209	1.005	0.210	
836.60	4183	UMTS 850	RMC	24.0	23.98	0.12	Left	Cheek	SAR#7	1:1	0.301	1.005	0.303	
836.60	4183	UMTS 850	RMC	24.0	23.98	0.07	Left	Tilt	SAR#7	1:1	0.192	1.005	0.193	
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 11-4
UMTS 1900 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	9400	UMTS 1900	RMC	24.0	23.95	-0.17	Right	Cheek	SAR#7	1:1	0.332	1.012	0.336	A4
1880.00	9400	UMTS 1900	RMC	24.0	23.95	0.01	Right	Tilt	SAR#7	1:1	0.150	1.012	0.152	
1880.00	9400	UMTS 1900	RMC	24.0	23.95	-0.03	Left	Cheek	SAR#7	1:1	0.273	1.012	0.276	
1880.00	9400	UMTS 1900	RMC	24.0	23.95	0.02	Left	Tilt	SAR#7	1:1	0.150	1.012	0.152	
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 11-5
Cell. 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)	
836.52	384	Cell. CDMA	EVDO Rev. A	24.6	24.21	0.01	Right	Cheek	SAR#1	1:1	0.402	1.094	0.440	A5
836.52	384	Cell. CDMA	EVDO Rev. A	24.6	24.21	0.04	Right	Tilt	SAR#1	1:1	0.200	1.094	0.219	
836.52	384	Cell. CDMA	EVDO Rev. A	24.6	24.21	0.17	Left	Cheek	SAR#1	1:1	0.321	1.094	0.351	
836.52	384	Cell. CDMA	EVDO Rev. A	24.6	24.21	0.04	Left	Tilt	SAR#1	1:1	0.186	1.094	0.203	
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
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	EVDO Rev. A	23.9	23.61	0.07	Right	Cheek	SAR#1	1:1	0.363	1.069	0.388	A6
1880.00	600	PCS CDMA	EVDO Rev. A	23.9	23.61	0.00	Right	Tilt	SAR#1	1:1	0.147	1.069	0.157	
1880.00	600	PCS CDMA	EVDO Rev. A	23.9	23.61	0.13	Left	Cheek	SAR#1	1:1	0.284	1.069	0.304	
1880.00	600	PCS CDMA	EVDO Rev. A	23.9	23.61	-0.04	Left	Tilt	SAR#1	1:1	0.152	1.069	0.162	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram							

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Table 11-7
LTE Band 17 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)		
710.00	23790	Mid	LTE Band 17	10	23.3	22.95	-0.10	0	Right	Cheek	QPSK	1	25	SAR#7	1:1	0.251	1.084	0.272	A7
710.00	23790	Mid	LTE Band 17	10	22.3	21.81	0.07	1	Right	Cheek	QPSK	25	25	SAR#7	1:1	0.194	1.119	0.217	
710.00	23790	Mid	LTE Band 17	10	23.3	22.95	0.08	0	Right	Tilt	QPSK	1	25	SAR#7	1:1	0.131	1.084	0.142	
710.00	23790	Mid	LTE Band 17	10	22.3	21.81	0.07	1	Right	Tilt	QPSK	25	25	SAR#7	1:1	0.101	1.119	0.113	
710.00	23790	Mid	LTE Band 17	10	23.3	22.95	-0.02	0	Left	Cheek	QPSK	1	25	SAR#7	1:1	0.245	1.084	0.266	
710.00	23790	Mid	LTE Band 17	10	22.3	21.81	0.02	1	Left	Cheek	QPSK	25	25	SAR#7	1:1	0.187	1.119	0.209	
710.00	23790	Mid	LTE Band 17	10	23.3	22.95	0.01	0	Left	Tilt	QPSK	1	25	SAR#7	1:1	0.136	1.084	0.147	
710.00	23790	Mid	LTE Band 17	10	22.3	21.81	0.03	1	Left	Tilt	QPSK	25	25	SAR#7	1:1	0.101	1.119	0.113	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Head 1.6 W/kg (mW/g) averaged over 1 gram									

Table 11-8
LTE Band 13 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) (W/kg)	Plot #	
MHz	Ch.														(W/kg)				
782.00	23230	Mid	LTE Band 13	10	23.5	23.13	-0.08	0	Right	Cheek	QPSK	1	0	SAR#9	1:1	0.386	1.089	0.420	A8
782.00	23230	Mid	LTE Band 13	10	22.5	21.92	-0.01	1	Right	Cheek	QPSK	25	0	SAR#9	1:1	0.260	1.143	0.297	
782.00	23230	Mid	LTE Band 13	10	23.5	23.13	0.08	0	Right	Tilt	QPSK	1	0	SAR#9	1:1	0.254	1.089	0.277	
782.00	23230	Mid	LTE Band 13	10	22.5	21.92	-0.03	1	Right	Tilt	QPSK	25	0	SAR#9	1:1	0.171	1.143	0.195	
782.00	23230	Mid	LTE Band 13	10	23.5	23.13	0.05	0	Left	Cheek	QPSK	1	0	SAR#9	1:1	0.373	1.089	0.406	
782.00	23230	Mid	LTE Band 13	10	22.5	21.92	0.00	1	Left	Cheek	QPSK	25	0	SAR#9	1:1	0.254	1.143	0.290	
782.00	23230	Mid	LTE Band 13	10	23.5	23.13	-0.07	0	Left	Tilt	QPSK	1	0	SAR#9	1:1	0.292	1.089	0.318	
782.00	23230	Mid	LTE Band 13	10	22.5	21.92	0.07	1	Left	Tilt	QPSK	25	0	SAR#9	1:1	0.186	1.143	0.213	
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 11-9
LTE Band 4 (AWS) Head SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
1732.50	20175	Mid	LTE Band 4 (AWS)	10	23.9	23.07	0.18	0	Right	Cheek	QPSK	1	0	SAR#8	1:1	0.329	1.211	0.398	
1715.00	20000	Low	LTE Band 4 (AWS)	10	22.9	21.93	0.15	1	Right	Cheek	QPSK	25	0	SAR#8	1:1	0.260	1.250	0.325	
1732.50	20175	Mid	LTE Band 4 (AWS)	10	23.9	23.07	-0.05	0	Right	Tilt	QPSK	1	0	SAR#8	1:1	0.210	1.211	0.254	
1715.00	20000	Low	LTE Band 4 (AWS)	10	22.9	21.93	-0.12	1	Right	Tilt	QPSK	25	0	SAR#8	1:1	0.173	1.250	0.216	
1732.50	20175	Mid	LTE Band 4 (AWS)	10	23.9	23.07	0.14	0	Left	Cheek	QPSK	1	0	SAR#8	1:1	0.468	1.211	0.567	A9
1715.00	20000	Low	LTE Band 4 (AWS)	10	22.9	21.93	-0.12	1	Left	Cheek	QPSK	25	0	SAR#8	1:1	0.362	1.250	0.453	
1732.50	20175	Mid	LTE Band 4 (AWS)	10	23.9	23.07	-0.03	0	Left	Tilt	QPSK	1	0	SAR#8	1:1	0.196	1.211	0.237	
1715.00	20000	Low	LTE Band 4 (AWS)	10	22.9	21.93	-0.18	1	Left	Tilt	QPSK	25	0	SAR#8	1:1	0.173	1.250	0.216	
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 11-10
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)	
2462	11	IEEE 802.11b	DSSS	15.8	14.75	-0.19	Right	Cheek	SAR#9	1	1:1	0.001	1.274	0.001	
2462	11	IEEE 802.11b	DSSS	15.8	14.75	-0.20	Right	Tilt	SAR#9	1	1:1	0.001	1.274	0.001	
2462	11	IEEE 802.11b	DSSS	15.8	14.75	0.00	Left	Cheek	SAR#9	1	1:1	0.041	1.274	0.052	A10
2462	11	IEEE 802.11b	DSSS	15.8	14.75	0.06	Left	Tilt	SAR#9	1	1:1	0.031	1.274	0.039	
5765	153	IEEE 802.11a	OFDM	16.6	15.44	0.12	Right	Cheek	SAR#2	6	1:1	0.057	1.306	0.074	A11
5775	155	IEEE 802.11ac	OFDM	12.5	10.91	0.13	Right	Cheek	SAR#2	29.3	1:1	0.019	1.442	0.027	
5765	153	IEEE 802.11a	OFDM	16.6	15.44	0.12	Right	Tilt	SAR#2	6	1:1	0.020	1.306	0.026	
5765	153	IEEE 802.11a	OFDM	16.6	15.44	0.12	Left	Cheek	SAR#2	6	1:1	0.056	1.306	0.073	
5765	153	IEEE 802.11a	OFDM	16.6	15.44	-0.13	Left	Tilt	SAR#2	6	1:1	0.015	1.306	0.020	
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 11-11
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)	
5240	48	IEEE 802.11a	OFDM	15.5	13.53	0.15	Right	Cheek	SAR#2	6	1:1	0.075	1.574	0.118	
5210	42	IEEE 802.11ac	OFDM	12.5	10.60	0.16	Right	Cheek	SAR#2	29.3	1:1	0.026	1.549	0.040	
5240	48	IEEE 802.11a	OFDM	15.5	13.53	0.19	Right	Tilt	SAR#2	6	1:1	0.016	1.574	0.025	
5240	48	IEEE 802.11a	OFDM	15.5	13.53	-0.13	Left	Cheek	SAR#2	6	1:1	0.053	1.574	0.083	
5240	48	IEEE 802.11a	OFDM	15.5	13.53	-0.14	Left	Tilt	SAR#2	6	1:1	0.019	1.574	0.030	
5300	60	IEEE 802.11a	OFDM	16.8	15.11	0.14	Right	Cheek	SAR#2	6	1:1	0.094	1.476	0.139	A12
5290	58	IEEE 802.11ac	OFDM	12.5	10.86	0.13	Right	Cheek	SAR#2	29.3	1:1	0.028	1.459	0.041	
5300	60	IEEE 802.11a	OFDM	16.8	15.11	0.18	Right	Tilt	SAR#2	6	1:1	0.028	1.476	0.041	
5300	60	IEEE 802.11a	OFDM	16.8	15.11	-0.16	Left	Cheek	SAR#2	6	1:1	0.047	1.476	0.069	
5300	60	IEEE 802.11a	OFDM	16.8	15.11	0.13	Left	Tilt	SAR#2	6	1:1	0.016	1.476	0.024	
5680	136	IEEE 802.11a	OFDM	16.8	15.45	-0.14	Right	Cheek	SAR#2	6	1:1	0.078	1.365	0.106	
5530	106	IEEE 802.11ac	OFDM	12.5	10.88	-0.15	Right	Cheek	SAR#2	29.3	1:1	0.022	1.452	0.032	
5680	136	IEEE 802.11a	OFDM	16.8	15.45	-0.14	Right	Tilt	SAR#2	6	1:1	0.020	1.365	0.027	
5680	136	IEEE 802.11a	OFDM	16.8	15.45	0.18	Left	Cheek	SAR#2	6	1:1	0.073	1.365	0.100	
5680	136	IEEE 802.11a	OFDM	16.8	15.45	0.16	Left	Tilt	SAR#2	6	1:1	0.029	1.365	0.040	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Head 1.6 W/kg (mW/g) averaged over 1 gram							

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11.2 Standalone Body-Worn SAR Data

Table 11-12
GPRS/UMTS/CDMA Body-Worn SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	# of Time Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	190	GPRS 850	GPRS	27.7	27.70	0.02	10 mm	SAR#9	4	1:2.076	back	0.194	1.000	0.194	A13
1880.00	661	GPRS 1900	GPRS	25.5	24.56	0.03	10 mm	SAR#7	4	1:2.076	back	0.104	1.242	0.129	
836.60	4183	UMTS 850	RMC	24.0	23.98	0.00	10 mm	SAR#7	N/A	1:1	back	0.286	1.005	0.287	A17
1880.00	9400	UMTS 1900	RMC	24.0	23.95	0.01	10 mm	SAR#7	N/A	1:1	back	0.212	1.012	0.215	
836.52	384	Cell. CDMA	EVDO Rev. A	24.6	24.21	0.01	10 mm	SAR#1	N/A	1:1	back	0.331	1.094	0.362	A20
1880.00	600	PCS CDMA	EVDO Rev. A	23.9	23.61	-0.02	10 mm	SAR#1	N/A	1:1	back	0.161	1.069	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								

Table 11-13
GPRS/UMTS/CDMA Body-Worn Accessory (Body Holster) SAR

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Accessory Type	Device Serial Number	# of Time Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
836.60	190	GPRS 850	GPRS	27.7	27.70	-0.20	0 mm	Body Holster	SAR#9	4	1:2.076	back	0.092	1.000	0.092	
836.60	190	GPRS 850	GPRS	27.7	27.70	-0.12	0 mm	Body Holster	SAR#9	4	1:2.076	front	0.124	1.000	0.124	
1880.00	661	GPRS 1900	GPRS	25.5	24.56	-0.04	0 mm	Body Holster	SAR#7	4	1:2.076	back	0.056	1.242	0.070	
1880.00	661	GPRS 1900	GPRS	25.5	24.56	0.12	0 mm	Body Holster	SAR#7	4	1:2.076	front	0.313	1.242	0.389	A15
836.60	4183	UMTS 850	RMC	24.0	23.98	-0.02	0 mm	Body Holster	SAR#7	N/A	1:1	back	0.135	1.005	0.136	
836.60	4183	UMTS 850	RMC	24.0	23.98	-0.01	0 mm	Body Holster	SAR#7	N/A	1:1	front	0.159	1.005	0.160	
1880.00	9400	UMTS 1900	RMC	24.0	23.95	0.04	0 mm	Body Holster	SAR#7	N/A	1:1	back	0.128	1.012	0.130	
1880.00	9400	UMTS 1900	RMC	24.0	23.95	-0.05	0 mm	Body Holster	SAR#7	N/A	1:1	front	0.233	1.012	0.236	A18
836.52	384	Cell. CDMA	EVDO Rev. A	24.6	24.21	-0.01	0 mm	Body Holster	SAR#1	N/A	1:1	back	0.141	1.094	0.154	
836.52	384	Cell. CDMA	EVDO Rev. A	24.6	24.21	-0.03	0 mm	Body Holster	SAR#1	N/A	1:1	front	0.157	1.094	0.172	
1880.00	600	PCS CDMA	EVDO Rev. A	23.9	23.61	0.00	0 mm	Body Holster	SAR#1	N/A	1:1	back	0.120	1.069	0.128	
1880.00	600	PCS CDMA	EVDO Rev. A	23.9	23.61	-0.01	0 mm	Body Holster	SAR#1	N/A	1:1	front	0.183	1.069	0.196	A22
ANSI / IEEE C95.1 1992 - SAFETY LIMIT																
Spatial Peak							Body									
Uncontrolled Exposure/General Population							1.6 W/kg (mW/g) averaged over 1 gram									

Table 11-14
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)		
710.00	23790	Mid	LTE Band 17	10	23.3	22.95	-0.05	0	SAR#9	QPSK	1	25	10 mm	back	1:1	0.285	1.084	0.309	A24
710.00	23790	Mid	LTE Band 17	10	22.3	21.81	-0.04	1	SAR#9	QPSK	25	25	10 mm	back	1:1	0.186	1.119	0.208	
782.00	23230	Mid	LTE Band 13	10	23.5	23.13	-0.03	0	SAR#9	QPSK	1	0	10 mm	back	1:1	0.289	1.089	0.315	A26
782.00	23230	Mid	LTE Band 13	10	22.5	21.92	-0.05	1	SAR#9	QPSK	25	0	10 mm	back	1:1	0.169	1.143	0.193	
1732.50	20175	Mid	LTE Band 4 (AWS)	10	23.9	23.07	0.11	0	SAR#8	QPSK	1	0	10 mm	back	1:1	0.203	1.211	0.246	
1715.00	20000	Low	LTE Band 4 (AWS)	10	22.9	21.93	-0.03	1	SAR#8	QPSK	25	0	10 mm	back	1:1	0.154	1.250	0.193	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak									Body 1.6 W/kg (mW/g) averaged over 1 gram										
Uncontrolled Exposure/General Population																			

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Table 11-15
LTE Body-Worn Accessory (Body Holster) SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Accessory Type	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)		
710.00	23790	Mid	LTE Band 17	10	Body Holster	23.3	22.95	0.00	0	SAR#9	QPSK	1	25	0 mm	back	1:1	0.170	1.084	0.184	
710.00	23790	Mid	LTE Band 17	10	Body Holster	22.3	21.81	-0.04	1	SAR#9	QPSK	25	25	0 mm	back	1:1	0.113	1.119	0.126	
710.00	23790	Mid	LTE Band 17	10	Body Holster	23.3	22.95	-0.04	0	SAR#9	QPSK	1	25	0 mm	front	1:1	0.237	1.084	0.257	
710.00	23790	Mid	LTE Band 17	10	Body Holster	22.3	21.81	-0.08	1	SAR#9	QPSK	25	25	0 mm	front	1:1	0.161	1.119	0.180	
782.00	23230	Mid	LTE Band 13	10	Body Holster	23.5	23.13	-0.18	0	SAR#9	QPSK	1	0	0 mm	back	1:1	0.096	1.089	0.105	
782.00	23230	Mid	LTE Band 13	10	Body Holster	22.5	21.92	-0.08	1	SAR#9	QPSK	25	0	0 mm	back	1:1	0.060	1.143	0.069	
782.00	23230	Mid	LTE Band 13	10	Body Holster	23.5	23.13	-0.13	0	SAR#9	QPSK	1	0	0 mm	front	1:1	0.141	1.089	0.154	
782.00	23230	Mid	LTE Band 13	10	Body Holster	22.5	21.92	-0.10	1	SAR#9	QPSK	25	0	0 mm	front	1:1	0.089	1.143	0.102	
1732.50	20175	Mid	LTE Band 4 (AWS)	10	Body Holster	23.9	23.07	-0.10	0	SAR#8	QPSK	1	0	0 mm	back	1:1	0.111	1.211	0.134	
1715.00	20000	Low	LTE Band 4 (AWS)	10	Body Holster	22.9	21.93	-0.06	1	SAR#8	QPSK	25	0	0 mm	back	1:1	0.087	1.250	0.109	
1732.50	20175	Mid	LTE Band 4 (AWS)	10	Body Holster	23.9	23.07	-0.01	0	SAR#8	QPSK	1	0	0 mm	front	1:1	0.323	1.211	0.391	A28
1715.00	20000	Low	LTE Band 4 (AWS)	10	Body Holster	22.9	21.93	0.00	1	SAR#8	QPSK	25	0	0 mm	front	1:1	0.268	1.250	0.335	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak										Body 1.6 W/kg (mW/g) averaged over 1 gram										
Uncontrolled Exposure/General Population																				

Table 11-16
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)	
2462	11	IEEE 802.11b	DSSS	15.8	14.75	0.03	10 mm	SAR#1	1	back	1:1	0.146	1.274	0.186	A30
5765	153	IEEE 802.11a	OFDM	16.6	15.44	-0.17	10 mm	SAR#2	6	back	1:1	0.260	1.306	0.340	A31
5775	155	IEEE 802.11ac	OFDM	12.5	10.91	-0.01	10 mm	SAR#2	29.3	back	1:1	0.132	1.442	0.190	
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 11-17
DTS Body-Worn Accessory (Body Holster) SAR

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Accessory Type	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
2462	11	IEEE 802.11b	DSSS	15.8	14.75	0.08	0 mm	Body Holster	SAR#1	1	back	1:1	0.048	1.274	0.061	
2462	11	IEEE 802.11b	DSSS	15.8	14.75	0.14	0 mm	Body Holster	SAR#1	1	front	1:1	0.015	1.274	0.019	
5765	153	IEEE 802.11a	OFDM	16.6	15.44	-0.19	0 mm	Body Holster	SAR#2	6	back	1:1	0.156	1.306	0.204	
5765	153	IEEE 802.11a	OFDM	16.6	15.44	0.11	0 mm	Body Holster	SAR#2	6	front	1:1	0.045	1.306	0.059	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT									Body							
Spatial Peak									1.6 W/kg (mW/g)							
Uncontrolled Exposure/General Population									averaged over 1 gram							

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Table 11-18
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)	
5240	48	IEEE 802.11a	OFDM	15.5	13.53	0.11	10 mm	SAR#2	6	back	1:1	0.318	1.574	0.501	
5210	42	IEEE 802.11ac	OFDM	12.5	10.60	-0.05	10 mm	SAR#2	29.3	back	1:1	0.163	1.549	0.252	
5300	60	IEEE 802.11a	OFDM	16.8	15.11	-0.06	10 mm	SAR#2	6	back	1:1	0.409	1.476	0.604	A32
5290	58	IEEE 802.11ac	OFDM	12.5	10.86	0.01	10 mm	SAR#2	29.3	back	1:1	0.166	1.459	0.242	
5680	136	IEEE 802.11a	OFDM	16.8	15.45	-0.20	10 mm	SAR#2	6	back	1:1	0.307	1.365	0.419	
5530	106	IEEE 802.11ac	OFDM	12.5	10.88	-0.13	10 mm	SAR#2	29.3	back	1:1	0.140	1.452	0.203	
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 11-19
NII Body-Worn Accessory (Body Holster) SAR

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Accessory Type	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
5240	48	IEEE 802.11a	OFDM	15.5	13.53	-0.09	0 mm	Body Holster	SAR#2	6	back	1:1	0.165	1.574	0.260	
5240	48	IEEE 802.11a	OFDM	15.5	13.53	-0.10	0 mm	Body Holster	SAR#2	6	front	1:1	0.044	1.574	0.069	
5300	60	IEEE 802.11a	OFDM	16.8	15.11	-0.13	0 mm	Body Holster	SAR#2	6	back	1:1	0.228	1.476	0.337	
5300	60	IEEE 802.11a	OFDM	16.8	15.11	-0.14	0 mm	Body Holster	SAR#2	6	front	1:1	0.058	1.476	0.086	
5680	136	IEEE 802.11a	OFDM	16.8	15.45	-0.16	0 mm	Body Holster	SAR#2	6	back	1:1	0.179	1.365	0.244	
5680	136	IEEE 802.11a	OFDM	16.8	15.45	0.15	0 mm	Body Holster	SAR#2	6	front	1:1	0.052	1.365	0.071	
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 11-20
Bluetooth Body-Worn Accessory (Body Holster) SAR

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Accessory Type	Device Serial Num ber	Data Rate (Mbps)	Side	Duty Cycle	SAR(1g) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #
MHz	Ch.															
2441	39	Bluetooth	FHSS	10.2	9.31	0.21	0 mm	Body Holster	SAR#1	1	back	1:1	0.009	1.227	0.011	A33
2441	39	Bluetooth	FHSS	10.2	9.31	-0.15	0 mm	Body Holster	SAR#1	1	front	1:1	0.007	1.227	0.009	
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 11-21
GPRS/UMTS/CDMA Hotspot SAR Data

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	# of GPRS Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	190	GPRS 850	GPRS	27.7	27.70	0.02	10 mm	SAR#9	4	1:2.076	back	0.194	1.000	0.194	A14
836.60	190	GPRS 850	GPRS	27.7	27.70	0.02	10 mm	SAR#9	4	1:2.076	front	0.220	1.000	0.220	
836.60	190	GPRS 850	GPRS	27.7	27.70	-0.06	10 mm	SAR#9	4	1:2.076	bottom	0.122	1.000	0.122	
836.60	190	GPRS 850	GPRS	27.7	27.70	0.04	10 mm	SAR#9	4	1:2.076	right	0.188	1.000	0.188	
836.60	190	GPRS 850	GPRS	27.7	27.70	-0.01	10 mm	SAR#9	4	1:2.076	left	0.095	1.000	0.095	
1880.00	661	GPRS 1900	GPRS	25.5	24.56	0.03	10 mm	SAR#7	4	1:2.076	back	0.104	1.242	0.129	A16
1880.00	661	GPRS 1900	GPRS	25.5	24.56	0.00	10 mm	SAR#7	4	1:2.076	front	0.280	1.242	0.348	
1880.00	661	GPRS 1900	GPRS	25.5	24.56	0.01	10 mm	SAR#7	4	1:2.076	bottom	0.184	1.242	0.229	
1880.00	661	GPRS 1900	GPRS	25.5	24.56	0.12	10 mm	SAR#7	4	1:2.076	right	0.080	1.242	0.099	
1880.00	661	GPRS 1900	GPRS	25.5	24.56	0.21	10 mm	SAR#7	4	1:2.076	left	0.062	1.242	0.077	
836.60	4183	UMTS 850	RMC	24.0	23.98	0.00	10 mm	SAR#7	N/A	1:1	back	0.286	1.005	0.287	A17
836.60	4183	UMTS 850	RMC	24.0	23.98	0.04	10 mm	SAR#7	N/A	1:1	front	0.269	1.005	0.270	
836.60	4183	UMTS 850	RMC	24.0	23.98	0.00	10 mm	SAR#7	N/A	1:1	bottom	0.149	1.005	0.150	
836.60	4183	UMTS 850	RMC	24.0	23.98	-0.02	10 mm	SAR#7	N/A	1:1	right	0.283	1.005	0.284	
836.60	4183	UMTS 850	RMC	24.0	23.98	0.05	10 mm	SAR#7	N/A	1:1	left	0.127	1.005	0.128	
1880.00	9400	UMTS 1900	RMC	24.0	23.95	0.01	10 mm	SAR#7	N/A	1:1	back	0.212	1.012	0.215	A19
1880.00	9400	UMTS 1900	RMC	24.0	23.95	-0.04	10 mm	SAR#7	N/A	1:1	front	0.533	1.012	0.539	
1880.00	9400	UMTS 1900	RMC	24.0	23.95	0.02	10 mm	SAR#7	N/A	1:1	bottom	0.349	1.012	0.353	
1880.00	9400	UMTS 1900	RMC	24.0	23.95	-0.02	10 mm	SAR#7	N/A	1:1	right	0.114	1.012	0.115	
1880.00	9400	UMTS 1900	RMC	24.0	23.95	0.04	10 mm	SAR#7	N/A	1:1	left	0.119	1.012	0.120	
836.52	384	Cell. CDMA	EVDO Rev. 0	24.6	24.26	0.01	10 mm	SAR#1	N/A	1:1	back	0.325	1.081	0.351	A21
836.52	384	Cell. CDMA	EVDO Rev. 0	24.6	24.26	0.05	10 mm	SAR#1	N/A	1:1	front	0.284	1.081	0.307	
836.52	384	Cell. CDMA	EVDO Rev. 0	24.6	24.26	0.12	10 mm	SAR#1	N/A	1:1	bottom	0.166	1.081	0.179	
836.52	384	Cell. CDMA	EVDO Rev. 0	24.6	24.26	0.04	10 mm	SAR#1	N/A	1:1	right	0.301	1.081	0.325	
836.52	384	Cell. CDMA	EVDO Rev. 0	24.6	24.26	0.13	10 mm	SAR#1	N/A	1:1	left	0.128	1.081	0.138	
1880.00	600	PCS CDMA	EVDO Rev. 0	24.0	23.65	0.06	10 mm	SAR#1	N/A	1:1	back	0.183	1.084	0.198	A23
1880.00	600	PCS CDMA	EVDO Rev. 0	24.0	23.65	0.05	10 mm	SAR#1	N/A	1:1	front	0.462	1.084	0.501	
1880.00	600	PCS CDMA	EVDO Rev. 0	24.0	23.65	-0.08	10 mm	SAR#1	N/A	1:1	bottom	0.378	1.084	0.410	
1880.00	600	PCS CDMA	EVDO Rev. 0	24.0	23.65	-0.07	10 mm	SAR#1	N/A	1:1	right	0.130	1.084	0.141	
1880.00	600	PCS CDMA	EVDO Rev. 0	24.0	23.65	0.05	10 mm	SAR#1	N/A	1:1	left	0.129	1.084	0.140	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT															
Spatial Peak							Body								
Uncontrolled Exposure/General Population							1.6 W/kg (mW/g) averaged over 1 gram								

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Table 11-22
LTE Band 17 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)		
710.00	23790	Mid	LTE Band 17	10	23.3	22.95	-0.05	0	SAR#9	QPSK	1	25	10 mm	back	1:1	0.285	1.084	0.309	A25
710.00	23790	Mid	LTE Band 17	10	22.3	21.81	-0.04	1	SAR#9	QPSK	25	25	10 mm	back	1:1	0.186	1.119	0.208	
710.00	23790	Mid	LTE Band 17	10	23.3	22.95	0.00	0	SAR#9	QPSK	1	25	10 mm	front	1:1	0.321	1.084	0.348	
710.00	23790	Mid	LTE Band 17	10	22.3	21.81	-0.07	1	SAR#9	QPSK	25	25	10 mm	front	1:1	0.223	1.119	0.250	
710.00	23790	Mid	LTE Band 17	10	23.3	22.95	0.00	0	SAR#9	QPSK	1	25	10 mm	bottom	1:1	0.037	1.084	0.040	
710.00	23790	Mid	LTE Band 17	10	22.3	21.81	-0.04	1	SAR#9	QPSK	25	25	10 mm	bottom	1:1	0.025	1.119	0.028	
710.00	23790	Mid	LTE Band 17	10	23.3	22.95	-0.01	0	SAR#9	QPSK	1	25	10 mm	right	1:1	0.236	1.084	0.256	
710.00	23790	Mid	LTE Band 17	10	22.3	21.81	-0.01	1	SAR#9	QPSK	25	25	10 mm	right	1:1	0.162	1.119	0.181	
710.00	23790	Mid	LTE Band 17	10	23.3	22.95	-0.03	0	SAR#9	QPSK	1	25	10 mm	left	1:1	0.256	1.084	0.278	
710.00	23790	Mid	LTE Band 17	10	22.3	21.81	0.02	1	SAR#9	QPSK	25	25	10 mm	left	1:1	0.172	1.119	0.192	
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 11-23
LTE Band 13 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)		
782.00	23230	Mid	LTE Band 13	10	23.5	23.13	-0.03	0	SAR#9	QPSK	1	0	10 mm	back	1:1	0.289	1.089	0.315	
782.00	23230	Mid	LTE Band 13	10	22.5	21.92	-0.05	1	SAR#9	QPSK	25	0	10 mm	back	1:1	0.169	1.143	0.193	
782.00	23230	Mid	LTE Band 13	10	23.5	23.13	-0.05	0	SAR#9	QPSK	1	0	10 mm	front	1:1	0.355	1.089	0.387	A27
782.00	23230	Mid	LTE Band 13	10	22.5	21.92	0.03	1	SAR#9	QPSK	25	0	10 mm	front	1:1	0.237	1.143	0.271	
782.00	23230	Mid	LTE Band 13	10	23.5	23.13	-0.04	0	SAR#9	QPSK	1	0	10 mm	bottom	1:1	0.116	1.089	0.126	
782.00	23230	Mid	LTE Band 13	10	22.5	21.92	-0.07	1	SAR#9	QPSK	25	0	10 mm	bottom	1:1	0.079	1.143	0.090	
782.00	23230	Mid	LTE Band 13	10	23.5	23.13	-0.01	0	SAR#9	QPSK	1	0	10 mm	right	1:1	0.258	1.089	0.281	
782.00	23230	Mid	LTE Band 13	10	22.5	21.92	0.04	1	SAR#9	QPSK	25	0	10 mm	right	1:1	0.169	1.143	0.193	
782.00	23230	Mid	LTE Band 13	10	23.5	23.13	-0.05	0	SAR#9	QPSK	1	0	10 mm	left	1:1	0.241	1.089	0.262	
782.00	23230	Mid	LTE Band 13	10	22.5	21.92	0.01	1	SAR#9	QPSK	25	0	10 mm	left	1:1	0.156	1.143	0.178	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT									Body										
Spatial Peak									1.6 W/kg (mW/g)										
Uncontrolled Exposure/General Population									averaged over 1 gram										

Table 11-24
LTE Band 4 (AWS) Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
1732.50	20175	Mid	LTE Band 4 (AWS)	10	23.9	23.07	0.11	0	SAR#8	QPSK	1	0	10 mm	back	1:1	0.203	1.211	0.246	A29
1715.00	20000	Low	LTE Band 4 (AWS)	10	22.9	21.93	-0.03	1	SAR#8	QPSK	25	0	10 mm	back	1:1	0.154	1.250	0.193	
1715.00	20000	Low	LTE Band 4 (AWS)	10	23.9	23.01	-0.01	0	SAR#8	QPSK	1	0	10 mm	front	1:1	0.835	1.227	1.025	
1732.50	20175	Mid	LTE Band 4 (AWS)	10	23.9	23.07	-0.05	0	SAR#8	QPSK	1	0	10 mm	front	1:1	0.796	1.211	0.964	
1750.00	20350	High	LTE Band 4 (AWS)	10	23.9	23.04	-0.03	0	SAR#8	QPSK	1	49	10 mm	front	1:1	0.823	1.219	1.003	
1715.00	20000	Low	LTE Band 4 (AWS)	10	22.9	21.93	0.02	1	SAR#8	QPSK	25	0	10 mm	front	1:1	0.646	1.250	0.808	
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.9	21.88	0.01	1	SAR#8	QPSK	25	0	10 mm	front	1:1	0.619	1.265	0.783	
1750.00	20350	High	LTE Band 4 (AWS)	10	22.9	21.70	-0.01	1	SAR#8	QPSK	25	12	10 mm	front	1:1	0.631	1.318	0.832	
1715.00	20000	Low	LTE Band 4 (AWS)	10	22.9	21.79	0.01	1	SAR#8	QPSK	50	0	10 mm	front	1:1	0.617	1.291	0.797	
1732.50	20175	Mid	LTE Band 4 (AWS)	10	23.9	23.07	0.01	0	SAR#8	QPSK	1	0	10 mm	bottom	1:1	0.403	1.211	0.488	
1715.00	20000	Low	LTE Band 4 (AWS)	10	22.9	21.93	0.08	1	SAR#8	QPSK	25	0	10 mm	bottom	1:1	0.309	1.250	0.386	
1732.50	20175	Mid	LTE Band 4 (AWS)	10	23.9	23.07	-0.01	0	SAR#8	QPSK	1	0	10 mm	right	1:1	0.063	1.211	0.076	
1715.00	20000	Low	LTE Band 4 (AWS)	10	22.9	21.93	0.03	1	SAR#8	QPSK	25	0	10 mm	right	1:1	0.050	1.250	0.063	
1732.50	20175	Mid	LTE Band 4 (AWS)	10	23.9	23.07	0.00	0	SAR#8	QPSK	1	0	10 mm	left	1:1	0.407	1.211	0.493	
1715.00	20000	Low	LTE Band 4 (AWS)	10	22.9	21.93	-0.07	1	SAR#8	QPSK	25	0	10 mm	left	1:1	0.307	1.250	0.384	
1715.00	20000	Low	LTE Band 4 (AWS)	10	23.9	23.01	-0.02	0	SAR#8	QPSK	1	0	10 mm	front	1:1	0.757	1.227	0.929	
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 entry indicates repeatability data.

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**Table 11-25
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)	
2462	11	IEEE 802.11b	DSSS	15.8	14.75	0.03	10 mm	SAR#1	1	back	1:1	0.146	1.274	0.186	A30
2462	11	IEEE 802.11b	DSSS	15.8	14.75	0.02	10 mm	SAR#1	1	front	1:1	0.038	1.274	0.048	
2462	11	IEEE 802.11b	DSSS	15.8	14.75	0.06	10 mm	SAR#1	1	left	1:1	0.079	1.274	0.101	
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 Standalone Extremity SAR Data

**Table 11-26
GPRS/UMTS/CDMA Extremity SAR Data**

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Accessory Type	Device Serial Number	# of GPRS Slots	Duty Cycle	Side	SAR (10g)	Scaling Factor	Scaled SAR (10g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
836.60	190	GPRS 850	GPRS	27.7	27.70	0.05	0 mm	Hand Strap, Top Right	SAR#9	4	1:2.076	back	0.156	1.000	0.156	
836.60	190	GPRS 850	GPRS	27.7	27.70	-0.02	0 mm	Hand Strap, Top Left	SAR#9	4	1:2.076	back	0.164	1.000	0.164	A34
1880.00	661	GPRS 1900	GPRS	25.5	24.56	-0.07	0 mm	Hand Strap, Top Right	SAR#7	4	1:2.076	back	0.107	1.242	0.133	
1880.00	661	GPRS 1900	GPRS	25.5	24.56	-0.14	0 mm	Hand Strap, Top Left	SAR#7	4	1:2.076	back	0.123	1.242	0.153	A35
836.60	4183	UMTS 850	RMC	24.0	23.98	0.02	0 mm	Hand Strap, Top Right	SAR#7	N/A	1:1	back	0.274	1.005	0.275	
836.60	4183	UMTS 850	RMC	24.0	23.98	0.01	0 mm	Hand Strap, Top Left	SAR#7	N/A	1:1	back	0.288	1.005	0.289	A36
1880.00	9400	UMTS 1900	RMC	24.0	23.95	-0.04	0 mm	Hand Strap, Top Right	SAR#7	N/A	1:1	back	0.224	1.012	0.227	
1880.00	9400	UMTS 1900	RMC	24.0	23.95	0.01	0 mm	Hand Strap, Top Left	SAR#7	N/A	1:1	back	0.244	1.012	0.247	A37
836.52	384	Cell. CDMA	EVDO Rev. 0	24.6	24.26	-0.02	0 mm	Hand Strap, Top Right	SAR#1	N/A	1:1	back	0.308	1.081	0.333	
836.52	384	Cell. CDMA	EVDO Rev. 0	24.6	24.26	0.02	0 mm	Hand Strap, Top Left	SAR#1	N/A	1:1	back	0.332	1.081	0.359	A38
1880.00	600	PCS CDMA	EVDO Rev. 0	24.0	23.65	0.02	0 mm	Hand Strap, Top Right	SAR#1	N/A	1:1	back	0.175	1.084	0.190	
1880.00	600	PCS CDMA	EVDO Rev. 0	24.0	23.65	0.03	0 mm	Hand Strap, Top Left	SAR#1	N/A	1:1	back	0.199	1.084	0.216	A39
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Extremity 4.0 W/kg (mW/g) averaged over 10 grams								

**Table 11-27
LTE Extremity SAR**

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Accessory Type	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 (10g)	Scaling Factor	Scaled SAR (10g)	Plot #	
MHz	Ch.															(W/kg)		(W/kg)		
710.00	23790	Mid	LTE Band 17	10	Hand Strap, Top Right	23.3	22.95	-0.03	0	SAR#9	QPSK	1	25	0 mm	back	1:1	0.244	1.084	0.264	A40
710.00	23790	Mid	LTE Band 17	10	Hand Strap, Top Right	22.3	21.81	0.10	1	SAR#9	QPSK	25	25	0 mm	back	1:1	0.167	1.119	0.187	
710.00	23790	Mid	LTE Band 17	10	Hand Strap, Top Left	23.3	22.95	0.03	0	SAR#9	QPSK	1	25	0 mm	back	1:1	0.244	1.084	0.264	
710.00	23790	Mid	LTE Band 17	10	Hand Strap, Top Left	22.3	21.81	-0.02	1	SAR#9	QPSK	25	25	0 mm	back	1:1	0.171	1.119	0.191	
782.00	23230	Mid	LTE Band 13	10	Hand Strap, Top Right	23.5	23.13	-0.02	0	SAR#9	QPSK	1	0	0 mm	back	1:1	0.248	1.089	0.270	A41
782.00	23230	Mid	LTE Band 13	10	Hand Strap, Top Right	22.5	21.92	-0.01	1	SAR#9	QPSK	25	0	0 mm	back	1:1	0.161	1.143	0.184	
782.00	23230	Mid	LTE Band 13	10	Hand Strap, Top Left	23.5	23.13	0.06	0	SAR#9	QPSK	1	0	0 mm	back	1:1	0.242	1.089	0.264	
782.00	23230	Mid	LTE Band 13	10	Hand Strap, Top Left	23.5	21.92	-0.01	1	SAR#9	QPSK	25	0	0 mm	back	1:1	0.157	1.439	0.226	
1732.50	20175	Mid	LTE Band 4 (AWS)	10	Hand Strap, Top Right	23.9	23.07	-0.03	0	SAR#8	QPSK	1	0	0 mm	back	1:1	0.260	1.211	0.315	A42
1715.00	20000	Low	LTE Band 4 (AWS)	10	Hand Strap, Top Right	22.9	21.93	0.03	1	SAR#8	QPSK	25	0	0 mm	back	1:1	0.197	1.250	0.246	
1732.50	20175	Mid	LTE Band 4 (AWS)	10	Hand Strap, Top Left	23.9	23.07	-0.01	0	SAR#8	QPSK	1	0	0 mm	back	1:1	0.207	1.211	0.251	
1715.00	20000	Low	LTE Band 4 (AWS)	10	Hand Strap, Top Left	22.9	21.93	-0.02	1	SAR#8	QPSK	25	0	0 mm	back	1:1	0.169	1.250	0.211	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Extremity 4.0 W/kg (mW/g) averaged over 10 grams										

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**Table 11-28
DTS Extremity SAR**

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Accessory Type	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (10g)	Scaling Factor	Scaled SAR (10g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
2462	11	IEEE 802.11b	DSSS	15.8	14.75	0.08	0 mm	Hand Strap, Top Right	SAR#1	1	back	1:1	0.108	1.274	0.138	
2462	11	IEEE 802.11b	DSSS	15.8	14.75	0.06	0 mm	Hand Strap, Top Left	SAR#1	1	back	1:1	0.116	1.274	0.148	A43
5765	153	IEEE 802.11a	OFDM	16.6	15.44	-0.10	0 mm	Hand Strap, Top Right	SAR#2	6	back	1:1	0.215	1.306	0.281	
5765	153	IEEE 802.11a	OFDM	16.6	15.44	0.13	0 mm	Hand Strap, Top Left	SAR#2	6	back	1:1	0.223	1.306	0.291	
5765	153	IEEE 802.11a	OFDM	16.6	15.44	-0.06	0 mm	None	SAR#2	6	back	1:1	0.364	1.306	0.475	A44
5775	155	IEEE 802.11ac	OFDM	12.5	10.91	-0.09	0 mm	None	SAR#2	29.3	back	1:1	0.135	1.442	0.195	
5765	153	IEEE 802.11a	OFDM	16.6	15.44	-0.12	0 mm	None	SAR#2	6	front	1:1	0.028	1.306	0.037	
5765	153	IEEE 802.11a	OFDM	16.6	15.44	-0.12	0 mm	None	SAR#2	6	left	1:1	0.233	1.306	0.304	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Extremity 4.0 W/kg (mW/g) averaged over 10 grams								

**Table 11-29
NII Extremity SAR**

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Accessory Type	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (10g)	Scaling Factor	Scaled SAR (10g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
5240	48	IEEE 802.11a	OFDM	15.5	13.53	-0.03	0 mm	Hand Strap, Top Right	SAR#2	6	back	1:1	0.218	1.574	0.343	
5240	48	IEEE 802.11a	OFDM	15.5	13.53	-0.09	0 mm	Hand Strap, Top Left	SAR#2	6	back	1:1	0.215	1.574	0.338	
5240	48	IEEE 802.11a	OFDM	15.5	13.53	-0.19	0 mm	None	SAR#2	6	back	1:1	0.531	1.574	0.836	A45
5210	42	IEEE 802.11ac	OFDM	12.5	10.60	0.03	0 mm	None	SAR#2	29.3	back	1:1	0.191	1.549	0.296	
5240	48	IEEE 802.11a	OFDM	15.5	13.53	0.08	0 mm	None	SAR#2	6	front	1:1	0.044	1.574	0.069	
5240	48	IEEE 802.11a	OFDM	15.5	13.53	0.19	0 mm	None	SAR#2	6	left	1:1	0.209	1.574	0.329	
5300	60	IEEE 802.11a	OFDM	16.8	15.11	-0.09	0 mm	Hand Strap, Top Right	SAR#2	6	back	1:1	0.298	1.476	0.440	
5300	60	IEEE 802.11a	OFDM	16.8	15.11	0.09	0 mm	Hand Strap, Top Left	SAR#2	6	back	1:1	0.296	1.476	0.437	
5300	60	IEEE 802.11a	OFDM	16.8	15.11	0.02	0 mm	None	SAR#2	6	back	1:1	0.505	1.476	0.745	
5290	58	IEEE 802.11ac	OFDM	12.5	10.86	-0.12	0 mm	None	SAR#2	29.3	back	1:1	0.196	1.459	0.286	
5300	60	IEEE 802.11a	OFDM	16.8	15.11	-0.13	0 mm	None	SAR#2	6	front	1:1	0.043	1.476	0.063	
5300	60	IEEE 802.11a	OFDM	16.8	15.11	-0.02	0 mm	None	SAR#2	6	left	1:1	0.287	1.476	0.424	
5680	136	IEEE 802.11a	OFDM	16.8	15.45	-0.07	0 mm	Hand Strap, Top Right	SAR#2	6	back	1:1	0.242	1.365	0.330	
5680	136	IEEE 802.11a	OFDM	16.8	15.45	-0.04	0 mm	Hand Strap, Top Left	SAR#2	6	back	1:1	0.240	1.365	0.328	
5680	136	IEEE 802.11a	OFDM	16.8	15.45	0.00	0 mm	None	SAR#2	6	back	1:1	0.421	1.365	0.575	
5530	106	IEEE 802.11ac	OFDM	12.5	10.88	-0.20	0 mm	None	SAR#2	29.3	back	1:1	0.157	1.452	0.228	
5680	136	IEEE 802.11a	OFDM	16.8	15.45	-0.12	0 mm	None	SAR#2	6	front	1:1	0.034	1.365	0.046	
5680	136	IEEE 802.11a	OFDM	16.8	15.45	-0.13	0 mm	None	SAR#2	6	left	1:1	0.246	1.365	0.336	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Extremity 4.0 W/kg (mW/g) averaged over 10 grams								

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11.5 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 standard battery 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. This DUT has NFC operations. The NFC antenna SAR tests were performed with the NFC antenna already incorporated.
6. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v05.
7. Device was tested using a fixed spacing for body-worn accessory testing. A separation distance of 10 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. A body-worn distance of 0mm for was used for testing with the belt holder accessory.
8. Per FCC KDB Publication 648474 D04v01, 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.
9. Per FCC KDB 865664 D01 v01, variability SAR tests were performed when the measured 1 gram SAR results for a frequency band were greater than 0.8 W/kg or when the measured 10 gram SAR results for a frequency band were greater than 2.0 W/kg. Repeated SAR measurements are highlighted in the tables above for clarity. Please see Section 13 for variability analysis.
10. 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).
11. Per FCC KDB Publication 648474 D04v01r01, this device is considered a "phablet" since the diagonal distance is greater than 160 mm but less than 200 mm. Therefore, full extremity SAR tests are required when hotspot mode does not apply or if hotspot 1g SAR > 1.2 W/kg. Full extremity SAR was not evaluated for the licensed transmitter or 2.4 GHz WIFI since Hotspot SAR is < 1.2 W/kg.
12. Per FCC KDB Publication 447498 D01 v05r01, the metallic body-worn accessories (body-holster and hand strap) were tested in conjunction with the host device to demonstrate compliance. The belt holster was evaluated as a body-worn accessory with front and back side evaluated for 1g body-worn SAR with the belt holster for each wireless technology and frequency band at 0mm from the phantom. The hand strap accessory was evaluated for compliance by measuring back side 10g extremity SAR at 0mm for each wireless technology and frequency band for both diagonal orientations of the metallic components.

GPRS Test Notes:

1. This device supports GSM VOIP in the head and body-worn configurations; therefore GPRS was evaluated for head and body-worn compliance.
2. Justification for reduced test configurations per KDB Publication 941225 D03v01 and October 2013 TCB Workshop Notes: The source-based frame-averaged output power was evaluated for all GPRS/EDGE slot configurations. The configuration with the highest target frame averaged output power was evaluated. When the maximum frame-averaged powers are equivalent across two or more slots (within 0.25 dB), the configuration with the most number of time slots was tested.

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3. 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.

UMTS Notes:

1. UMTS mode in was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01v02. HSPA SAR was not required since the average output power of the HSPA subtests was not more than 0.25 dB higher than the RMC level and SAR was less than 1.2 W/kg.
2. 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.

CDMA Notes:

1. Head SAR was evaluated using EVDO Rev. A to determine compliance for VoIP operations.
2. Body-Worn SAR was tested with EVDO Rev. A to determine compliance for VoIP operations.
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.
4. Per FCC KDB Publication 447498 D01v05, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s). When the maximum output power variation across the required test channels is $> \frac{1}{2}$ dB, instead of the middle channel, the highest output power channel was used.

LTE Notes:

1. LTE Considerations: LTE test configurations are determined according to SAR Evaluation Considerations for LTE Devices in FCC KDB Publication 941225 D05v02r01. The general test procedures used for testing can be found in Section 8.5.4.
2. MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.
3. A-MPR was disabled for all SAR tests by setting NS=01 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

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WLAN/BT 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.
6. Per April 2013 TCB workshop notes, full SAR testing for 802.11ac was not required since the average output power was not more than 0.25 dB higher than the output power of IEEE 802.11a mode. IEEE 802.11ac was evaluated for the highest IEEE 802.11a position in each 5 GHz band and exposure condition.

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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/ac 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 D01v05r01 IV.C.1.iii, simultaneous transmission SAR test exclusion may be applied when the sum of the 1g SAR for all the simultaneous transmitting antennas in a specific physical test configuration is ≤ 1.6 W/kg and when the sum of the 10g SAR for all simultaneous transmitting antennas in a specific physical test configuration is ≤ 4.0 W/kg. When standalone SAR is not required to be measured, per FCC KDB 447498 D01v05r01 4.3.2 2), the following equations must be used to estimate the standalone 1g and 10g SAR for simultaneous transmission assessment involving that transmitter.

$$\text{Estimated 1g SAR} = \frac{\sqrt{f(\text{GHz})}}{7.5} * \frac{(\text{Max Power of channel, mW})}{\text{Min. Separation Distance, mm}}$$

$$\text{Estimated 10g SAR} = \frac{\sqrt{f(\text{GHz})}}{18.75} * \frac{(\text{Max Power of channel, mW})}{\text{Min. Separation Distance, mm}}$$

**Table 12-1
Estimated SAR**

Mode	Frequency	Maximum Allowed Power	Separation Distance (Body)	Estimated 1g SAR (Body)
	[MHz]	[dBm]	[mm]	[W/kg]
Bluetooth	2441	10.20	10	0.208
Bluetooth LE	2440	3.10	10	0.042

Mode	Frequency	Maximum Allowed Power	Separation Distance (Body)	Estimated 10 SAR (Extremity)
	[MHz]	[dBm]	[mm]	[W/kg]
Bluetooth	2441	10.20	5	0.167

Notes:

1. 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.
2. Per FCC KDB Publication 447498 D01v05r01, when the test separation distance is < 5 mm (touching), a distance of 5 mm is applied to determine estimated SAR.

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12.3 Head SAR Simultaneous Transmission Analysis

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

Simult Tx	Configuration	GPRS 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.373	0.001	0.374	Head SAR	Right Cheek	0.238	0.001	0.239
	Right Tilt	0.172	0.001	0.173		Right Tilt	0.089	0.001	0.090
	Left Cheek	0.258	0.052	0.310		Left Cheek	0.159	0.052	0.211
	Left Tilt	0.154	0.039	0.193		Left Tilt	0.087	0.039	0.126

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.367	0.001	0.368	Head SAR	Right Cheek	0.336	0.001	0.337
	Right Tilt	0.210	0.001	0.211		Right Tilt	0.152	0.001	0.153
	Left Cheek	0.303	0.052	0.355		Left Cheek	0.276	0.052	0.328
	Left Tilt	0.193	0.039	0.232		Left Tilt	0.152	0.039	0.191

Simult Tx	Configuration	Cell. EVDO SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	Cell. EVDO SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.440	0.001	0.441	Head SAR	Right Cheek	0.388	0.001	0.389
	Right Tilt	0.219	0.001	0.220		Right Tilt	0.157	0.001	0.158
	Left Cheek	0.351	0.052	0.403		Left Cheek	0.304	0.052	0.356
	Left Tilt	0.203	0.039	0.242		Left Tilt	0.162	0.039	0.201

Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 13 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.272	0.001	0.273	Head SAR	Right Cheek	0.420	0.001	0.421
	Right Tilt	0.142	0.001	0.143		Right Tilt	0.277	0.001	0.278
	Left Cheek	0.266	0.052	0.318		Left Cheek	0.406	0.052	0.458
	Left Tilt	0.147	0.039	0.186		Left Tilt	0.318	0.039	0.357

Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.398	0.001	0.399
	Right Tilt	0.254	0.001	0.255
	Left Cheek	0.567	0.052	0.619
	Left Tilt	0.237	0.039	0.276

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12.4 Body-Worn Simultaneous Transmission Analysis

Table 12-3
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body-Worn at 1.0 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Back Side	GPRS 850	0.194	0.186	0.380
Back Side	GPRS 1900	0.129	0.186	0.315
Back Side	UMTS 850	0.287	0.186	0.473
Back Side	UMTS 1900	0.215	0.186	0.401
Back Side	Cell. EVDO	0.362	0.186	0.548
Back Side	PCS EVDO	0.172	0.186	0.358
Back Side	LTE Band 17	0.309	0.186	0.495
Back Side	LTE Band 13	0.315	0.186	0.501
Back Side	LTE Band 4 (AWS)	0.246	0.186	0.432

Table 12-4
Simultaneous Transmission Scenario with Bluetooth (Body-Worn at 1.0 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Back Side	GPRS 850	0.194	0.208	0.402
Back Side	GPRS 1900	0.129	0.208	0.337
Back Side	UMTS 850	0.287	0.208	0.495
Back Side	UMTS 1900	0.215	0.208	0.423
Back Side	Cell. EVDO	0.362	0.208	0.570
Back Side	PCS EVDO	0.172	0.208	0.380
Back Side	LTE Band 17	0.309	0.208	0.517
Back Side	LTE Band 13	0.315	0.208	0.523
Back Side	LTE Band 4 (AWS)	0.246	0.208	0.454

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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Table 12-5
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body Holster Accessory at 0.0 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Back Side	GPRS 850	0.092	0.061	0.153
Back Side	GPRS 1900	0.070	0.061	0.131
Back Side	UMTS 850	0.136	0.061	0.197
Back Side	UMTS 1900	0.130	0.061	0.191
Back Side	Cell. EVDO	0.154	0.061	0.215
Back Side	PCS EVDO	0.128	0.061	0.189
Back Side	LTE Band 17	0.184	0.061	0.245
Back Side	LTE Band 13	0.105	0.061	0.166
Back Side	LTE Band 4 (AWS)	0.134	0.061	0.195

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Front Side	GPRS 850	0.124	0.019	0.143
Front Side	GPRS 1900	0.389	0.019	0.408
Front Side	UMTS 850	0.160	0.019	0.179
Front Side	UMTS 1900	0.236	0.019	0.255
Front Side	Cell. EVDO	0.172	0.019	0.191
Front Side	PCS EVDO	0.196	0.019	0.215
Front Side	LTE Band 17	0.257	0.019	0.276
Front Side	LTE Band 13	0.154	0.019	0.173
Front Side	LTE Band 4 (AWS)	0.391	0.019	0.410

Table 12-6
Simultaneous Transmission Scenario with Bluetooth (Body Holster Accessory at 0.0 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Back Side	GPRS 850	0.092	0.042	0.134
Back Side	GPRS 1900	0.070	0.042	0.112
Back Side	UMTS 850	0.136	0.042	0.178
Back Side	UMTS 1900	0.130	0.042	0.172
Back Side	Cell. EVDO	0.154	0.042	0.196
Back Side	PCS EVDO	0.128	0.042	0.170
Back Side	LTE Band 17	0.184	0.042	0.226
Back Side	LTE Band 13	0.105	0.042	0.147
Back Side	LTE Band 4 (AWS)	0.134	0.042	0.176

Configuration	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Front Side	GPRS 850	0.124	0.042	0.166
Front Side	GPRS 1900	0.389	0.042	0.431
Front Side	UMTS 850	0.160	0.042	0.202
Front Side	UMTS 1900	0.236	0.042	0.278
Front Side	Cell. EVDO	0.172	0.042	0.214
Front Side	PCS EVDO	0.196	0.042	0.238
Front Side	LTE Band 17	0.257	0.042	0.299
Front Side	LTE Band 13	0.154	0.042	0.196
Front Side	LTE Band 4 (AWS)	0.391	0.042	0.433

Note: Estimated Bluetooth LE SAR results were used in the above table to determine simultaneous transmission SAR test compliance since these results were higher than measured Bluetooth SAR.

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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	GPRS 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.194	0.186	0.380	Body SAR	Back	0.129	0.186	0.315
	Front	0.220	0.048	0.268		Front	0.348	0.048	0.396
	Top	-	-	0.000		Top	-	-	0.000
	Bottom	0.122	-	0.122		Bottom	0.229	-	0.229
	Right	0.188	-	0.188		Right	0.099	-	0.099
	Left	0.095	0.101	0.196		Left	0.077	0.101	0.178

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.287	0.186	0.473	Body SAR	Back	0.215	0.186	0.401
	Front	0.270	0.048	0.318		Front	0.539	0.048	0.587
	Top	-	-	0.000		Top	-	-	0.000
	Bottom	0.150	-	0.150		Bottom	0.353	-	0.353
	Right	0.284	-	0.284		Right	0.115	-	0.115
	Left	0.128	0.101	0.229		Left	0.120	0.101	0.221

Simult Tx	Configuration	Cell. EVDO 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)
Body SAR	Back	0.351	0.186	0.537	Body SAR	Back	0.198	0.186	0.384
	Front	0.307	0.048	0.355		Front	0.501	0.048	0.549
	Top	-	-	0.000		Top	-	-	0.000
	Bottom	0.179	-	0.179		Bottom	0.410	-	0.410
	Right	0.325	-	0.325		Right	0.141	-	0.141
	Left	0.138	0.101	0.239		Left	0.140	0.101	0.241

Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 13 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.309	0.186	0.495	Body SAR	Back	0.315	0.186	0.501
	Front	0.348	0.048	0.396		Front	0.387	0.048	0.435
	Top	-	-	0.000		Top	-	-	0.000
	Bottom	0.040	-	0.040		Bottom	0.126	-	0.126
	Right	0.256	-	0.256		Right	0.281	-	0.281
	Left	0.278	0.101	0.379		Left	0.262	0.101	0.363

Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.246	0.186	0.432
	Front	1.025	0.048	1.073
	Top	-	-	0.000
	Bottom	0.488	-	0.488
	Right	0.076	-	0.076
	Left	0.493	0.101	0.594

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12.6 Extremity SAR Simultaneous Transmission Analysis

Note: The worst case reported SAR for each hand strap extremity configuration was used for SAR summation, regardless of orientation of metallic components. Therefore, the summations above represent the absolute worst cases for simultaneous transmission.

Table 12-8
Simultaneous Transmission Scenario with 2.4 GHz (Hand Strap Accessory at 0.0 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ10g SAR (W/kg)
Back Side	GPRS 850	0.164	0.148	0.312
Back Side	GPRS 1900	0.153	0.148	0.301
Back Side	UMTS 850	0.289	0.148	0.437
Back Side	UMTS 1900	0.247	0.148	0.395
Back Side	Cell. EVDO	0.359	0.148	0.507
Back Side	PCS EVDO	0.216	0.148	0.364
Back Side	LTE Band 17	0.264	0.148	0.412
Back Side	LTE Band 13	0.270	0.148	0.418
Back Side	LTE Band 4 (AWS)	0.315	0.148	0.463

Table 12-9
Simultaneous Transmission Scenario with Bluetooth (Hand Strap Accessory at 0.0 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ10g SAR (W/kg)
Back Side	GPRS 850	0.164	0.167	0.331
Back Side	GPRS 1900	0.153	0.167	0.320
Back Side	UMTS 850	0.289	0.167	0.456
Back Side	UMTS 1900	0.247	0.167	0.414
Back Side	Cell. EVDO	0.359	0.167	0.526
Back Side	PCS EVDO	0.216	0.167	0.383
Back Side	LTE Band 17	0.264	0.167	0.431
Back Side	LTE Band 13	0.270	0.167	0.437
Back Side	LTE Band 4 (AWS)	0.315	0.167	0.482

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.

12.7 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
- 5) 10g Extremity SAR measurement variability analysis applies a factor of 2.5 to the procedures outlined above.

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)
	MHz	Ch.					(W/kg)	(W/kg)		(W/kg)		(W/kg)
1750	1715.00	20000	LTE Band 4 (AWS)	QPSK, 1 RB, 0 RB Offset	front	10 mm	0.835	0.757	1.10	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 1g SAR was < 1.5 W/kg and measured 10g SAR was < 3.75 W/kg for all frequency bands. Therefore, per KDB Publication 865664 D01v01, the extended measurement uncertainty analysis per IEEE 1528-2003 was not required.

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14 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	E8257D	(250kHz-20GHz) Signal Generator	4/16/2013	Annual	4/16/2014	MY45470194
Agilent	8753E	(30kHz-6GHz) Network Analyzer	4/16/2013	Annual	4/16/2014	JP38020182
Agilent	8594A	(9kHz-2.9GHz) Spectrum Analyzer	N/A	N/A	N/A	3051A00187
Agilent	8648D	(9kHz-4GHz) Signal Generator	4/17/2013	Annual	4/17/2014	3629U00687
Agilent	85070C	Dielectric Probe Kit	2/14/2013	Annual	2/14/2014	MY44300633
Agilent	N9020A	MXA Signal Analyzer	10/29/2013	Annual	10/29/2014	US46470561
Agilent	N4010A	Wireless Connectivity Test Set	N/A	N/A	N/A	GB44450273
Agilent	N5182A	MKG 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	85047A	S-Parameter Test Set	N/A	N/A	N/A	2904A00579
Agilent	E5515C	Wireless Communications Test Set	10/18/2012	Biennial	10/18/2014	GB43193563
Agilent	E5515C	Wireless Communications Test Set	5/9/2013	Biennial	5/9/2015	GB43304447
Amplifier Research	551G4	5W, 800MHz-4.2GHz	CBT	N/A	CBT	21910
Anritsu	ML2495A	Power Meter	10/31/2013	Annual	10/31/2014	1039008
Anritsu	MA2481A	Power Sensor	10/30/2013	Annual	10/30/2014	5605
Anritsu	MA2481A	Power Sensor	2/14/2013	Annual	2/14/2014	5821
Anritsu	MA2411B	Pulse Power Sensor	12/31/2013	Annual	12/31/2014	133908
Anritsu	MA2411B	Pulse Power Sensor	11/14/2013	Annual	11/14/2014	1126066
Anritsu	MT8820C	Radio Communication Analyzer	12/12/2013	Annual	12/12/2014	6200901190
Anritsu	MT8820C	Radio Communication Analyzer	6/28/2013	Annual	6/28/2014	6201240328
Anritsu	MA24106A	USB Power Sensor	1/3/2014	Annual	1/3/2015	1344554
Anritsu	MA24106A	USB Power Sensor	1/3/2014	Annual	1/3/2015	1344557
COMTech	AR85729-5	Solid State Amplifier	CBT	N/A	CBT	MT55A00-009
Control Company	4353	Long Stem Thermometer	9/25/2012	Biennial	9/25/2014	122539615
Fisher Scientific	15-077-960	Thermometer	11/6/2012	Biennial	11/6/2014	122640025
Gigatronics	80701A	(0.05-18GHz) Power Sensor	10/30/2013	Annual	10/30/2014	1833460
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	SLP-2400+	Low Pass Filter	CBT	N/A	CBT	R8979500903
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-1200+	Low Pass Filter DC to 1000 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
Narda	4014C-6	4 - 8 GHz SMA 6 dB Directional Coupler	CBT	N/A	CBT	N/A
Narda	BW-53W2	Attenuator (3dB)	CBT	N/A	CBT	120
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2208-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Rohde & Schwarz	CMU200	Base Station Simulator	9/23/2013	Annual	9/23/2014	109892
Rohde & Schwarz	CMU200	Base Station Simulator	5/3/2013	Annual	5/3/2014	836371/0079
Rohde & Schwarz	NRV	Dual Channel Power Meter	10/12/2012	Biennial	10/12/2014	101695
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	10/16/2013	Annual	10/16/2014	100976
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	2/8/2013	Annual	2/8/2014	101699
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	10/4/2013	Biennial	10/4/2015	103962
Rohde & Schwarz	NRV-232	Peak Power Sensor	10/12/2012	Biennial	10/12/2014	836019/013
Rohde & Schwarz	SME06	Signal Generator	10/30/2013	Annual	10/30/2014	832026
Rohde & Schwarz	NRV5	Single Channel Power Meter	10/31/2013	Annual	10/31/2014	835360/0079
Seekonk	NC-100	Torque Wrench (8" lb)	11/29/2011	Triennial	11/29/2014	21053
Seekonk	NC-100	Torque Wrench (8" lb)	3/5/2012	Triennial	3/5/2015	N/A
SPEAG	D750V3	750 MHz Dipole	1/7/2013	Annual	1/7/2014	1003
SPEAG	D750V3	750 MHz Dipole	3/18/2013	Annual	3/18/2014	1054
SPEAG	D835V2	835 MHz SAR Dipole	4/25/2013	Annual	4/25/2014	401119
SPEAG	D1750V2	1750 MHz SAR Dipole	4/30/2013	Annual	4/30/2014	1051
SPEAG	D1765V2	1765 MHz SAR Dipole	5/14/2013	Annual	5/14/2014	1008
SPEAG	D1900V2	1900 MHz SAR Dipole	2/6/2013	Annual	2/6/2014	50148
SPEAG	D2450V2	2450 MHz SAR Dipole	8/23/2013	Annual	8/23/2014	719
SPEAG	D2450V2	2450 MHz SAR Dipole	1/8/2013	Annual	1/8/2014	797
SPEAG	D5GHZV2	5 GHz SAR Dipole	2/14/2013	Annual	2/14/2014	1120
SPEAG	DAE4	Dasy Data Acquisition Electronics	5/13/2013	Annual	5/13/2014	859
SPEAG	DAE4	Dasy Data Acquisition Electronics	8/21/2013	Annual	8/21/2014	1322
SPEAG	DAE4	Dasy Data Acquisition Electronics	9/17/2013	Annual	9/17/2014	1323
SPEAG	DAE4	Dasy Data Acquisition Electronics	11/19/2013	Annual	11/19/2014	1333
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/8/2013	Annual	3/8/2014	1334
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/22/2013	Annual	4/22/2014	1364
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/22/2013	Annual	4/22/2014	1368
SPEAG	DAE4	Dasy Data Acquisition Electronics	11/19/2013	Annual	11/19/2014	1408
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/14/2013	Annual	5/14/2014	1070
SPEAG	DAK-3.5	Portable Dielectric Assessment Kit	8/18/2013	Annual	8/18/2014	1009
SPEAG	ES3DV2	SAR Probe	8/22/2013	Annual	8/22/2014	3022
SPEAG	ES3DV3	SAR Probe	3/15/2013	Annual	3/15/2014	3209
SPEAG	ES3DV3	SAR Probe	5/16/2013	Annual	5/16/2014	3263
SPEAG	ES3DV3	SAR Probe	9/23/2013	Annual	9/23/2014	3288
SPEAG	ES3DV3	SAR Probe	4/29/2013	Annual	4/29/2014	3318
SPEAG	ES3DV3	SAR Probe	4/29/2013 & 6/28/2013	Annual	4/29/2014	3319
SPEAG	ES3DV3	SAR Probe	11/22/2013	Annual	11/22/2014	3333
SPEAG	EX3DV4	SAR Probe	10/23/2013	Annual	10/23/2014	3914
Tektronix	RSA6114A	Real Time Spectrum Analyzer	4/17/2013	Annual	4/17/2014	8010177
VWR	23226-658	Long Stem Thermometer	3/30/2012	Biennial	3/30/2014	122179874
VWR	36934-158	Wall-Mounted Thermometer	8/8/2013	Annual	8/8/2014	130477877

Note:

- All equipment was used within its calibration period.
- 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

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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Document S/N: 0Y1312092376-R1.ACJ	Test Dates: 12/21/13 - 01/21/14	DUT Type: Portable Handset		Page 65 of 66

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APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#7

Communication System: UID 0, GSM GPRS; 4 Tx slots; Frequency: 836.6 MHz; Duty Cycle: 1:2.076

Medium: 835 Head, Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.922 \text{ S/m}$; $\epsilon_r = 41.592$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 12-23-2013; Ambient Temp: 21.3°C; Tissue Temp: 22.3°C

Probe: ES3DV2 - SN3022; ConvF(6.09, 6.09, 6.09); Calibrated: 8/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

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

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

Mode: GPRS 850, Right Head, Cheek, Mid.ch, 4 Tx slots

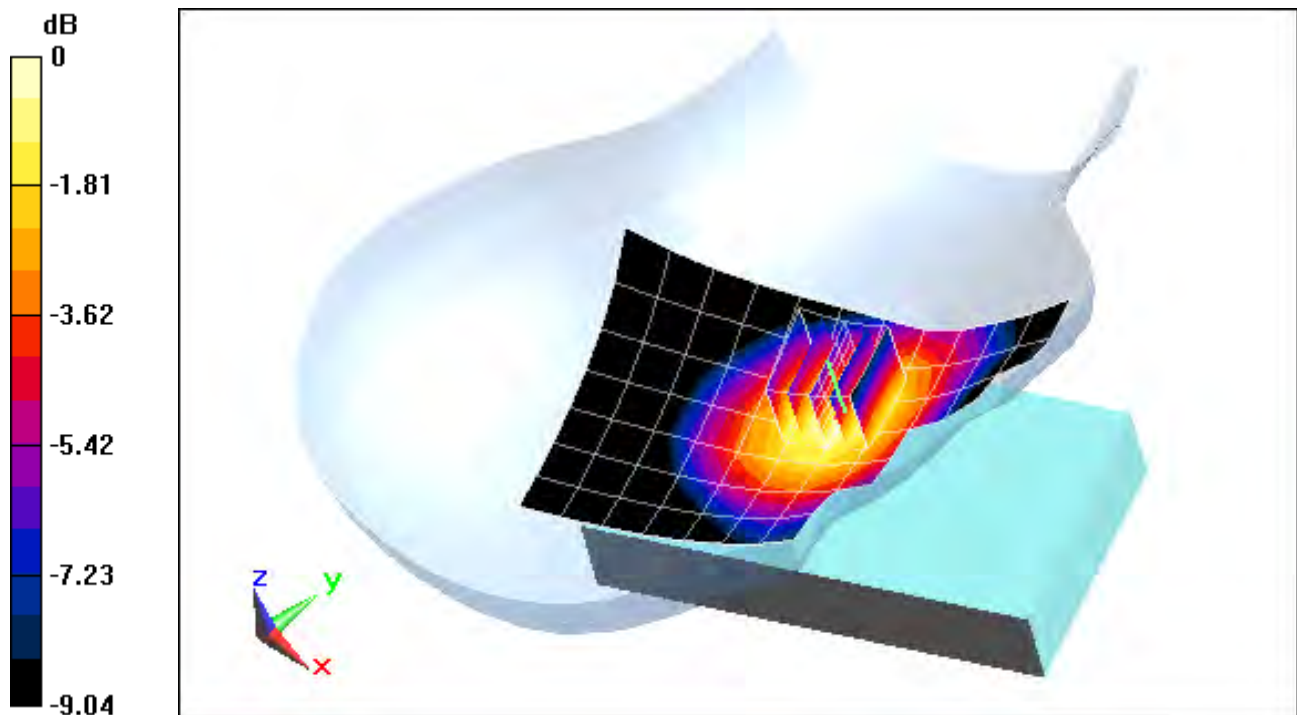
Area Scan (8x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 20.440 V/m; Power Drift = 0.19 dB

Peak SAR (extrapolated) = 0.468 W/kg

SAR(1 g) = 0.373 W/kg



0 dB = 0.398 W/kg = -4.00 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#7

Communication System: UID 0, GSM GPRS; 4 Tx slots; Frequency: 1880 MHz; Duty Cycle: 1:2.076

Medium: 1900 Head, Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.431 \text{ S/m}$; $\epsilon_r = 40.115$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 12-21-2013; Ambient Temp: 23.3°C; Tissue Temp: 22.7°C

Probe: ES3DV3 - SN3209; ConvF(5.21, 5.21, 5.21); Calibrated: 3/15/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/8/2013

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

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

Mode: GPRS 1900, Right Head, Cheek, Mid.ch, 4 Tx Slots

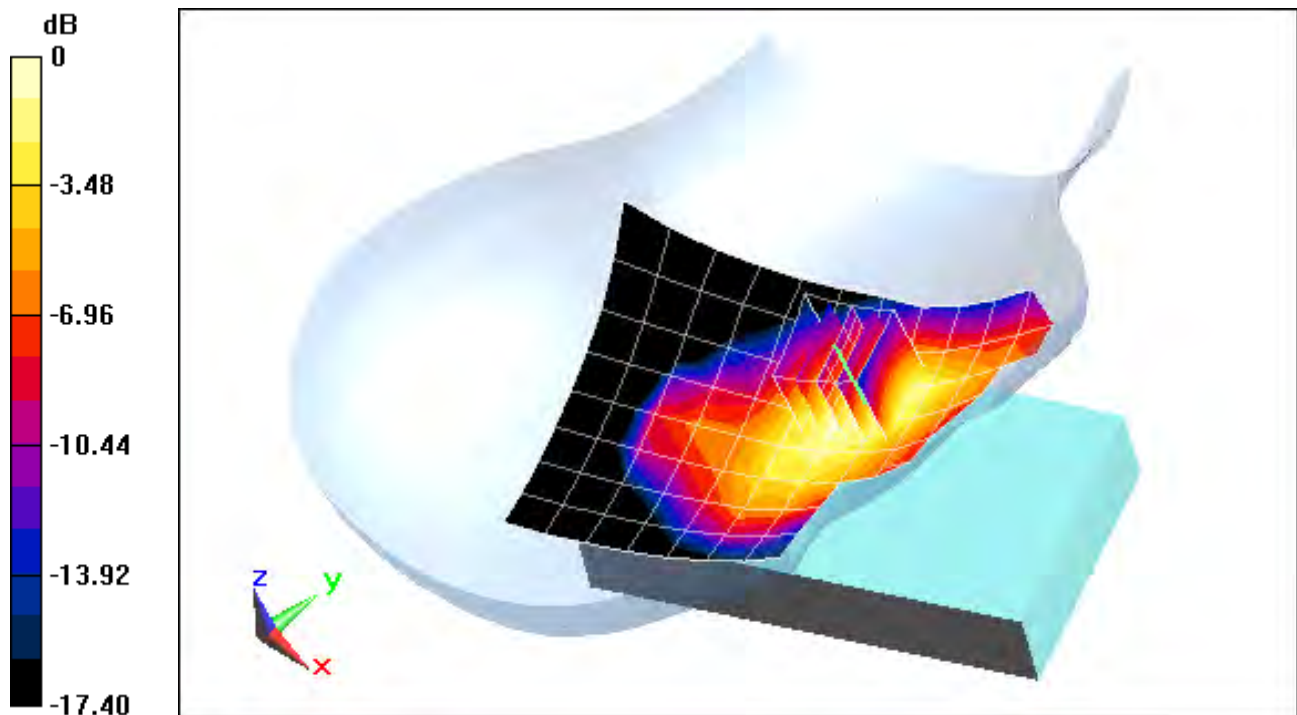
Area Scan (9x14x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 11.732 V/m; Power Drift = -0.19 dB

Peak SAR (extrapolated) = 0.289 W/kg

SAR(1 g) = 0.192 W/kg



0 dB = 0.205 W/kg = -6.88 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#7

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

Medium: 835 Head, Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.922 \text{ S/m}$; $\epsilon_r = 41.592$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 12-23-2013; Ambient Temp: 21.3°C; Tissue Temp: 22.3°C

Probe: ES3DV2 - SN3022; ConvF(6.09, 6.09, 6.09); Calibrated: 8/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

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

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

Mode: UMTS 850, Right Head, Cheek, Mid.ch

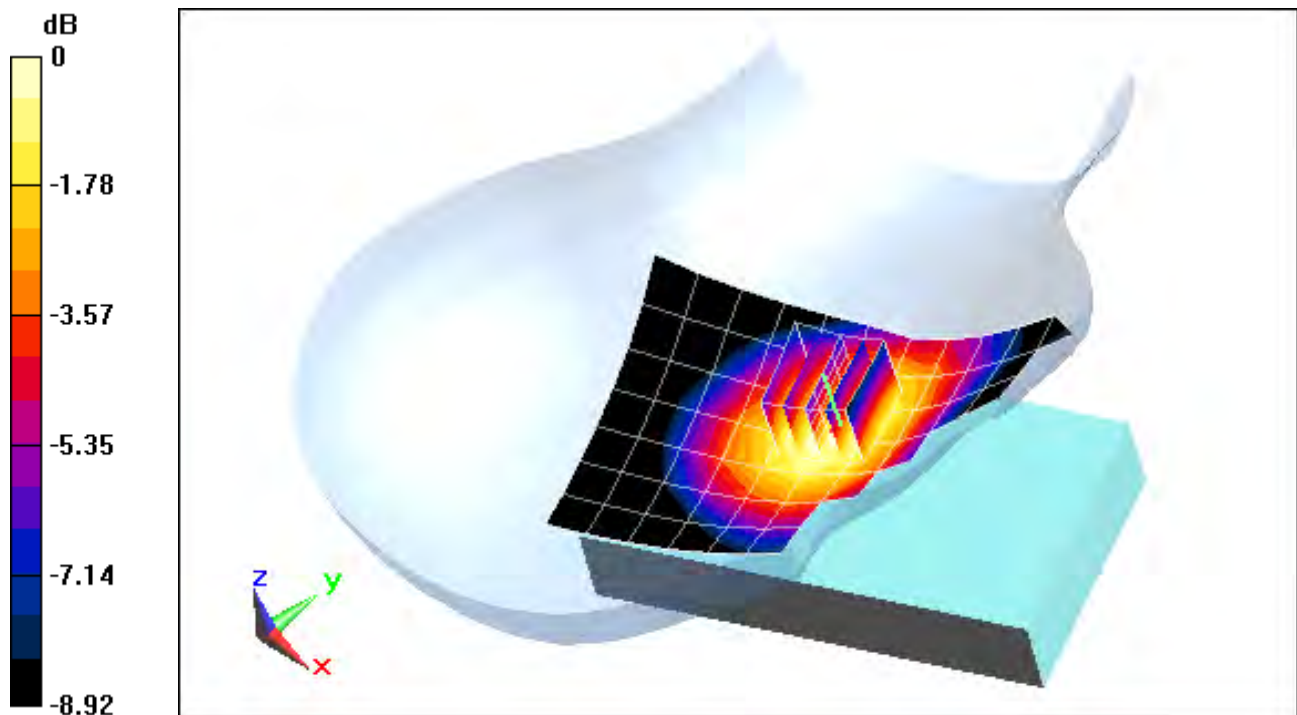
Area Scan (8x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 20.374 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.450 W/kg

SAR(1 g) = 0.365 W/kg



0 dB = 0.385 W/kg = -4.15 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#7

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

Medium: 1900 Head, Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.431 \text{ S/m}$; $\epsilon_r = 40.115$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 12-21-2013; Ambient Temp: 23.3°C; Tissue Temp: 22.7°C

Probe: ES3DV3 - SN3209; ConvF(5.21, 5.21, 5.21); Calibrated: 3/15/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/8/2013

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

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

Mode: UMTS 1900, Right Head, Cheek, Mid.ch

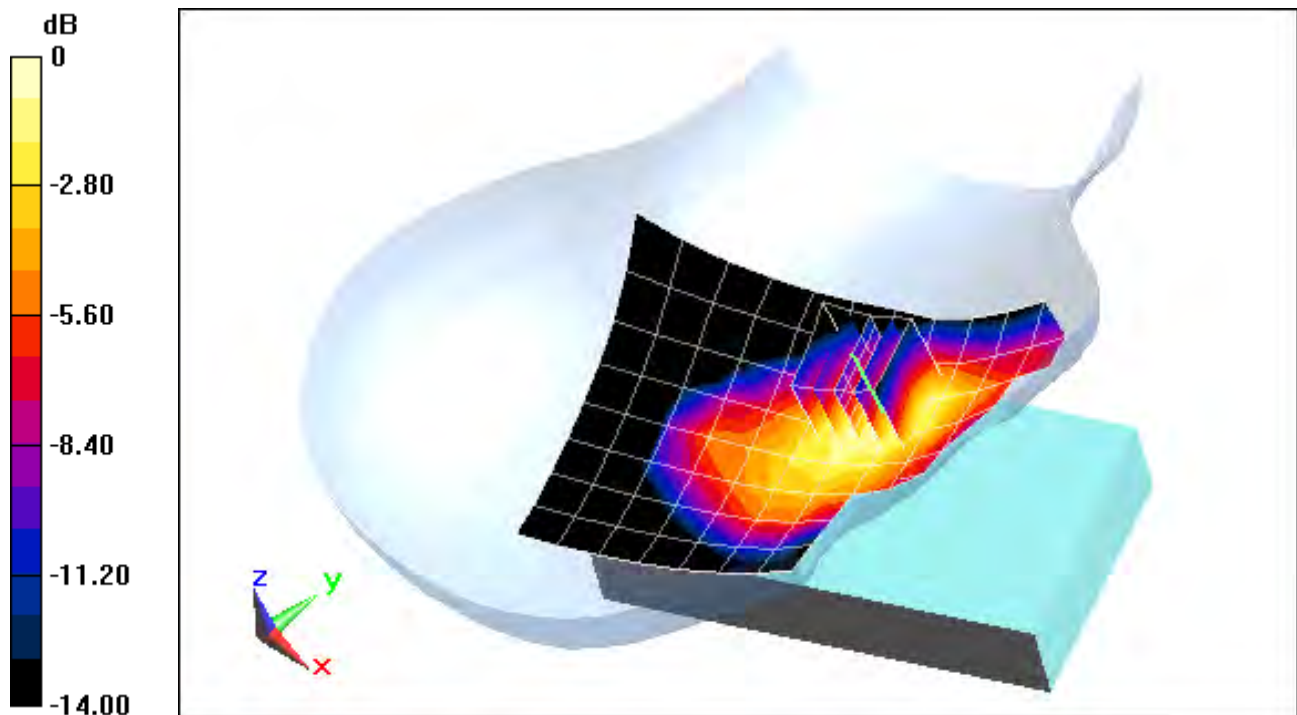
Area Scan (9x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 15.343 V/m; Power Drift = -0.17 dB

Peak SAR (extrapolated) = 0.494 W/kg

SAR(1 g) = 0.332 W/kg



0 dB = 0.353 W/kg = -4.52 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#1

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

Medium: 835 Head, Medium parameters used (interpolated):

$f = 836.52 \text{ MHz}$; $\sigma = 0.922 \text{ S/m}$; $\epsilon_r = 41.593$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 12-23-2013; Ambient Temp: 21.3°C; Tissue Temp: 22.3°C

Probe: ES3DV2 - SN3022; ConvF(6.09, 6.09, 6.09); Calibrated: 8/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

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

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

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

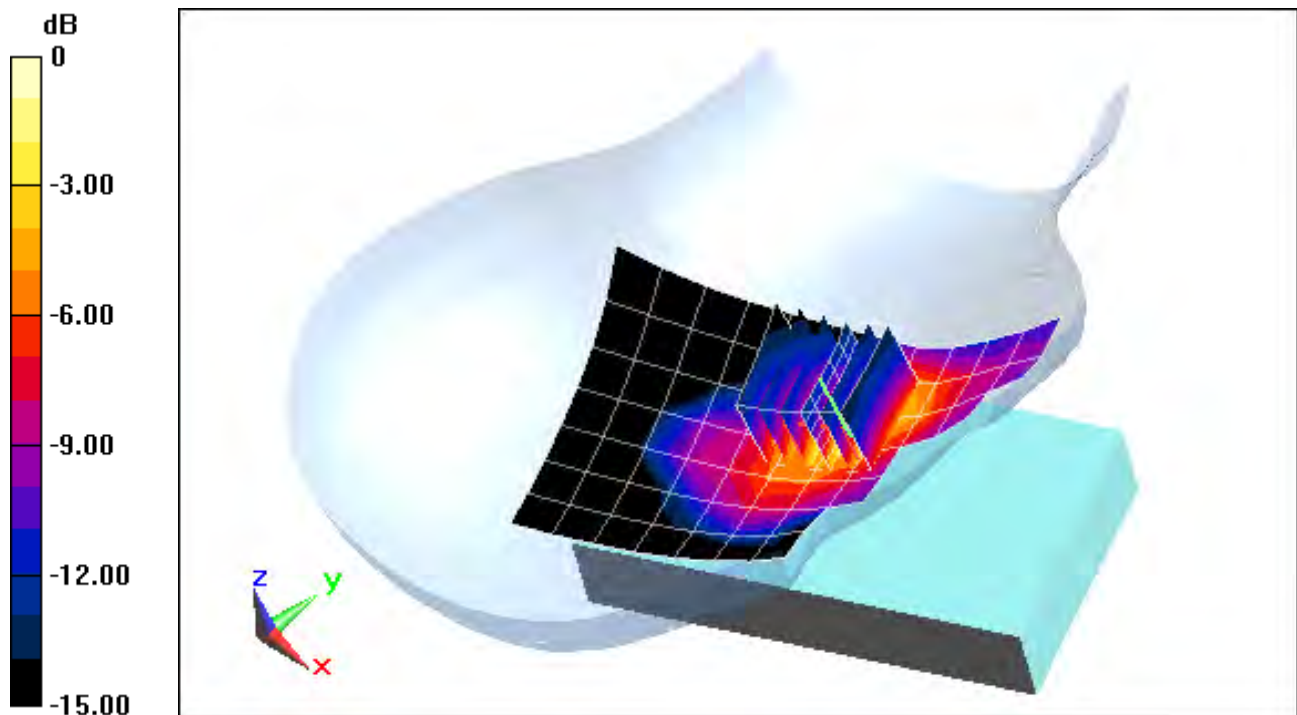
Area Scan (8x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 22.006 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.492 W/kg

SAR(1 g) = 0.402 W/kg



0 dB = 0.418 W/kg = -3.79 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#1

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

Medium: 1900 Head, Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.431 \text{ S/m}$; $\epsilon_r = 40.115$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 12-21-2013; Ambient Temp: 23.3°C; Tissue Temp: 22.7°C

Probe: ES3DV3 - SN3209; ConvF(5.21, 5.21, 5.21); Calibrated: 3/15/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/8/2013

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

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

Mode: PCS EVDO Rev. A, Right Head, Cheek, Mid.ch

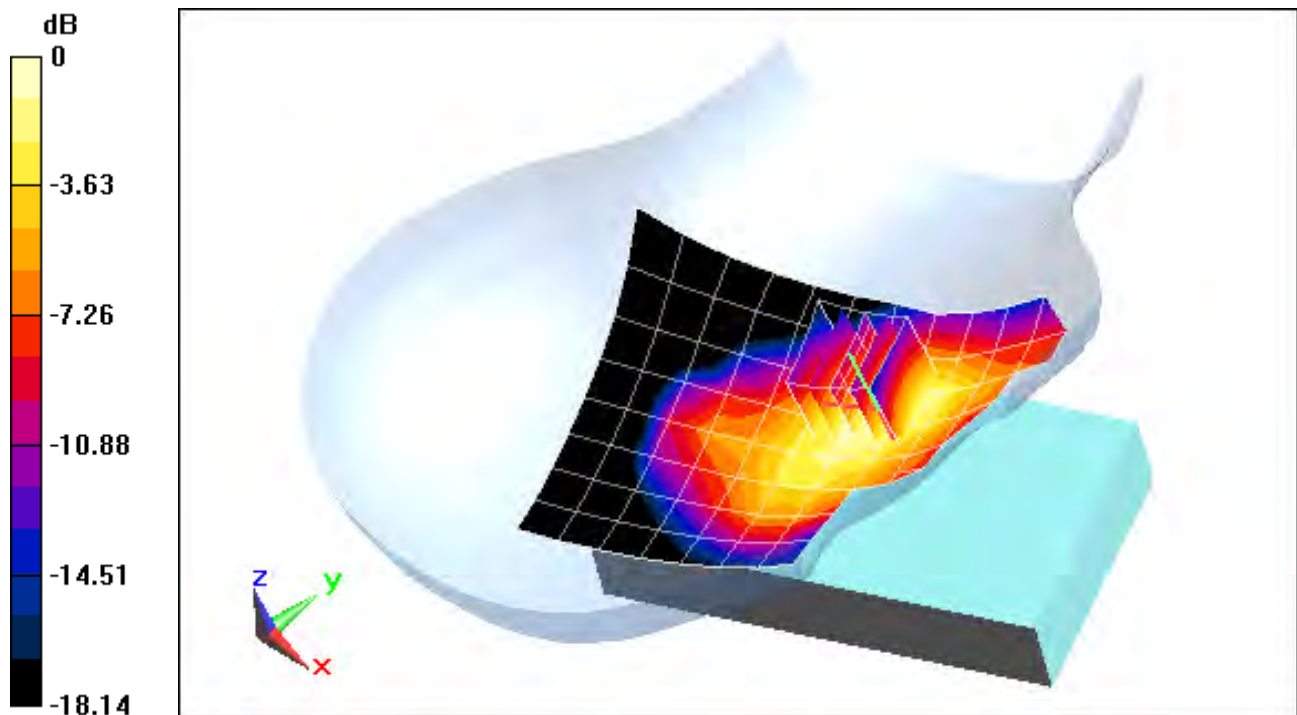
Area Scan (9x14x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 15.757 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.542 W/kg

SAR(1 g) = 0.363 W/kg



0 dB = 0.389 W/kg = -4.10 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#7

Communication System: UID 0, LTE Band 17; Frequency: 710 MHz; Duty Cycle: 1:1

Medium: 750 Head, Medium parameters used:

$f = 710 \text{ MHz}$; $\sigma = 0.871 \text{ S/m}$; $\epsilon_r = 42.442$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 12-27-2013; Ambient Temp: 20.7°C; Tissue Temp: 20.7°C

Probe: ES3DV3 - SN3263; ConvF(6.51, 6.51, 6.51); Calibrated: 5/16/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn859; Calibrated: 5/13/2013

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

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

**Mode: LTE Band 17, Right Head, Cheek, Mid.ch, 10 MHz Bandwidth,
QPSK, 1 RB, 25 RB Offset**

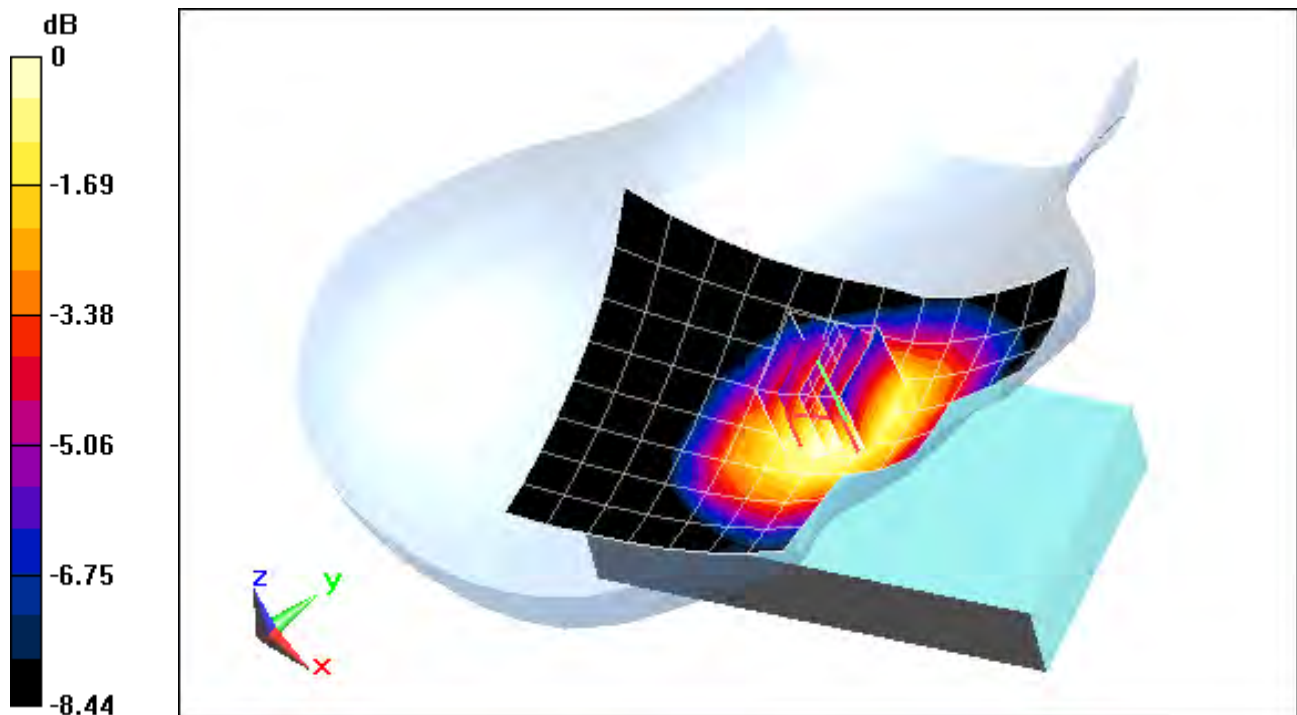
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 17.981 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 0.300 W/kg

SAR(1 g) = 0.251 W/kg



0 dB = 0.262 W/kg = -5.82 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#9

Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1

Medium: 740 Head, Medium parameters used (interpolated):

$f = 782 \text{ MHz}$; $\sigma = 0.937 \text{ S/m}$; $\epsilon_r = 40.189$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 12-30-2013; Ambient Temp: 23.3°C; Tissue Temp: 21.4°C

Probe: EX3DV4 - SN3914; ConvF(9.7, 9.7, 9.7); Calibrated: 10/23/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

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

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

**Mode: LTE Band 13, Right Head, Cheek, Mid.ch, 10 MHz Bandwidth,
QPSK, 1 RB, 0 RB Offset**

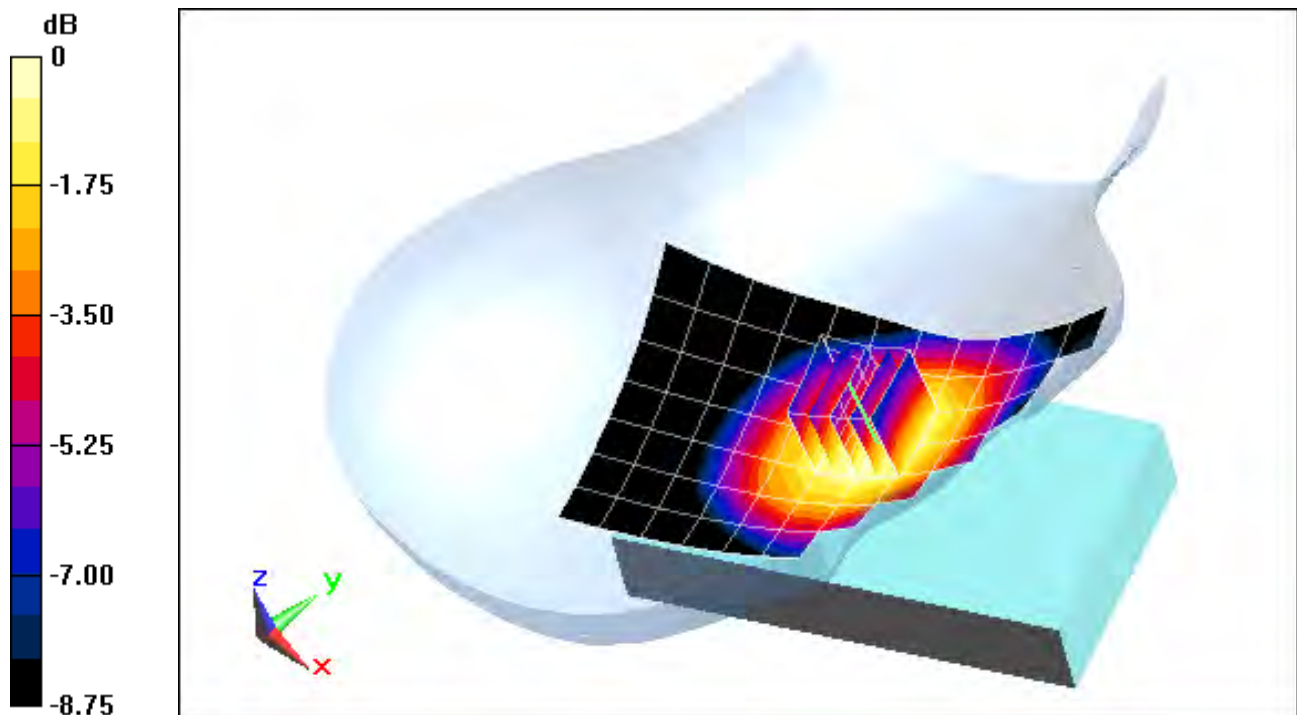
Area Scan (8x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 21.601 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 0.473 W/kg

SAR(1 g) = 0.386 W/kg



0 dB = 0.401 W/kg = -3.97 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#8

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

Medium: 1750 Head, Medium parameters used (interpolated):

$f = 1732.5 \text{ MHz}$; $\sigma = 1.396 \text{ S/m}$; $\epsilon_r = 40.468$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 12-26-2013; Ambient Temp: 23.7°C; Tissue Temp: 22.8°C

Probe: ES3DV3 - SN3288; ConvF(5.67, 5.67, 5.67); Calibrated: 9/23/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/17/2013

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

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

**Mode: LTE Band 4 (AWS), Left Head, Cheek, Mid.ch, 10 MHz Bandwidth,
QPSK, 1 RB, 0 RB Offset**

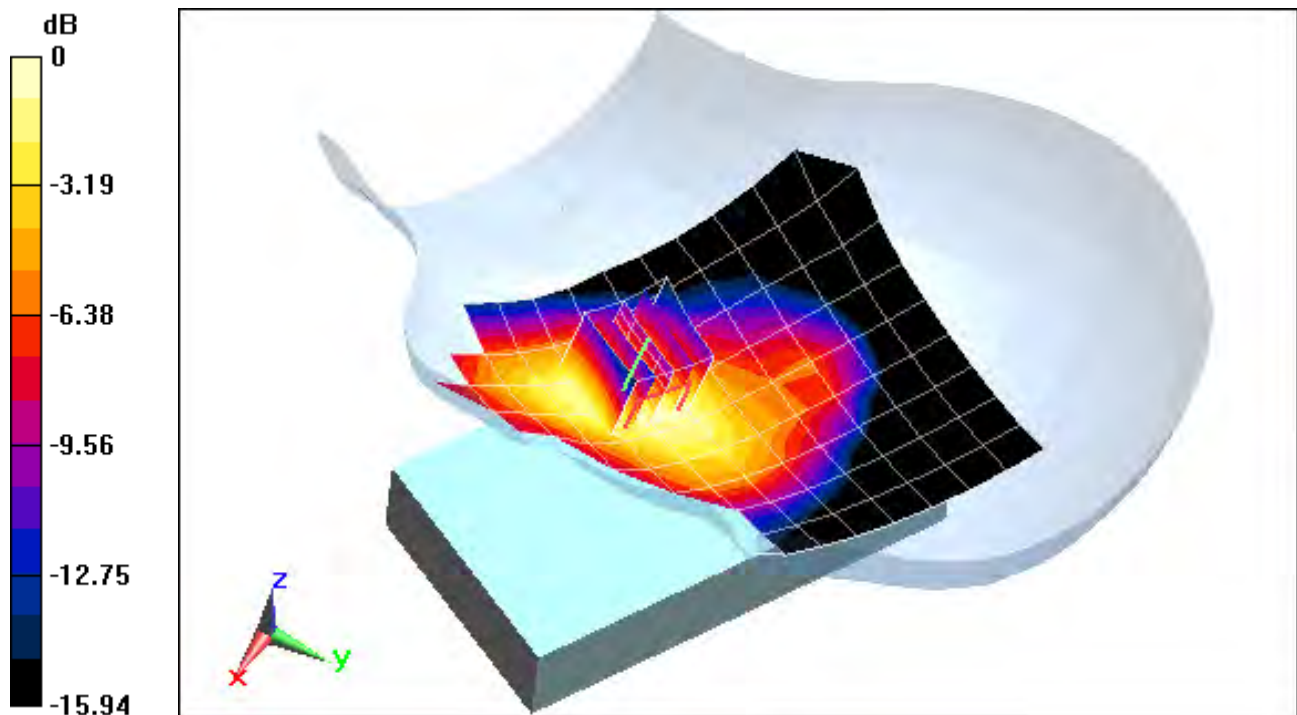
Area Scan (10x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 20.247 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 0.696 W/kg

SAR(1 g) = 0.468 W/kg



0 dB = 0.505 W/kg = -2.97 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#9

Communication System: UID 0, IEEE 802.11b; Frequency: 2462 MHz; Duty Cycle: 1:1

Medium: 2450 Head, Medium parameters used (interpolated):

$f = 2462 \text{ MHz}$; $\sigma = 1.832 \text{ S/m}$; $\epsilon_r = 38.521$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 12-27-2013; Ambient Temp: 24.5°C; Tissue Temp: 23.5°C

Probe: EX3DV4 - SN3914; ConvF(6.95, 6.95, 6.95); Calibrated: 10/23/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

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

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

Mode: IEEE 802.11b, Left Head, Cheek, Ch 11, 1 Mbps

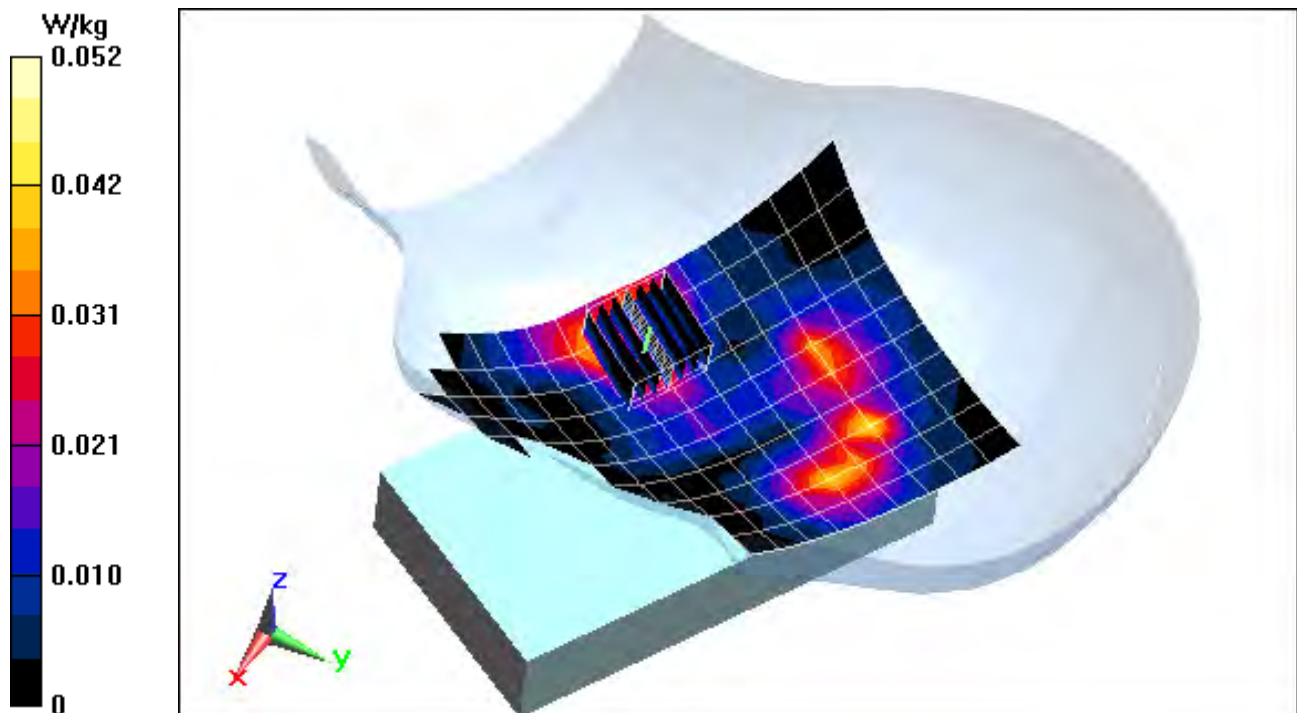
Area Scan (11x18x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 4.849 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.0800 W/kg

SAR(1 g) = 0.041 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#2

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

Medium: 5 GHz Head, Medium parameters used:

$$f = 5765 \text{ MHz}; \sigma = 5.188 \text{ S/m}; \epsilon_r = 35.231; \rho = 1000 \text{ kg/m}^3$$

Phantom section: Right Section

Test Date: 01-07-2014; Ambient Temp: 24.0°C; Tissue Temp: 23.2°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, Right Head, Cheek, Ch 153, 6 Mbps

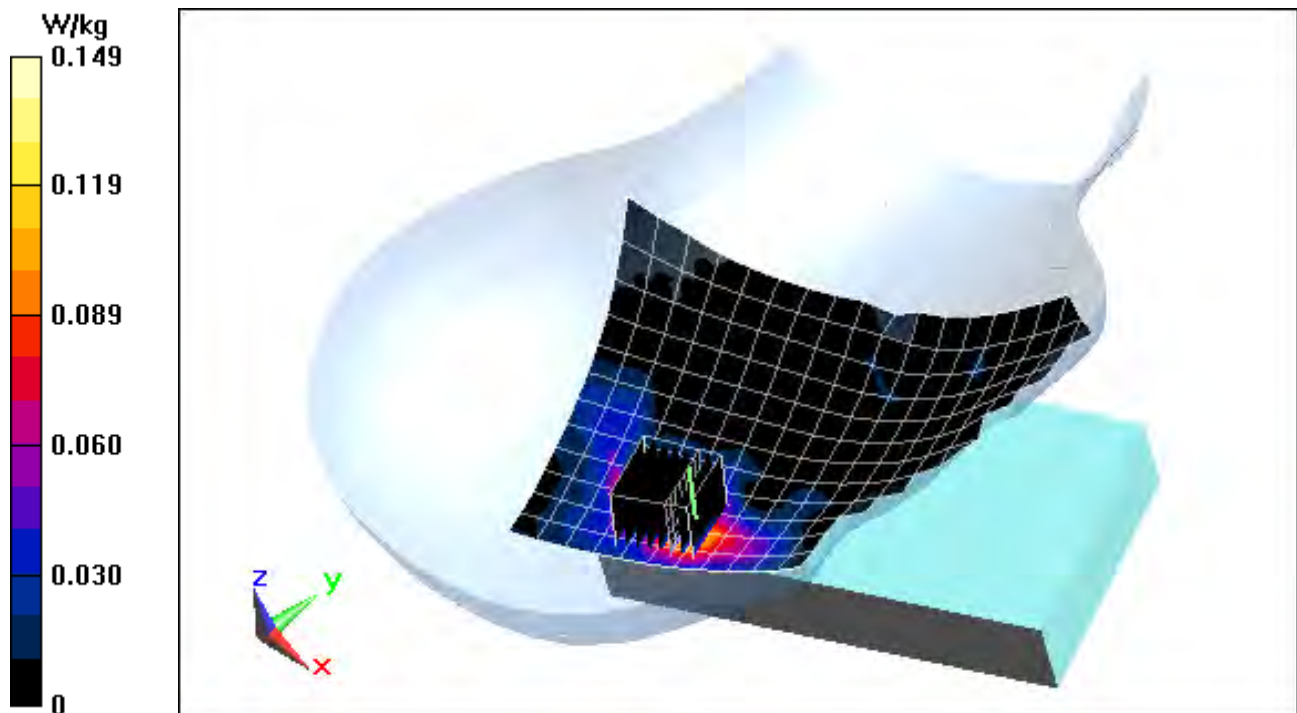
Area Scan (13x22x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 2.862 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 0.243 W/kg

SAR(1 g) = 0.057 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#2

Communication System: UID 0, IEEE 802.11a; Frequency: 5300 MHz; Duty Cycle: 1:1

Medium: 5 GHz Head, Medium parameters used:

$f = 5300 \text{ MHz}$; $\sigma = 4.684 \text{ S/m}$; $\epsilon_r = 35.85$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 01-07-2014; Ambient Temp: 24.1°C; Tissue Temp: 23.1°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, Right Head, Cheek, Ch 60, 6 Mbps

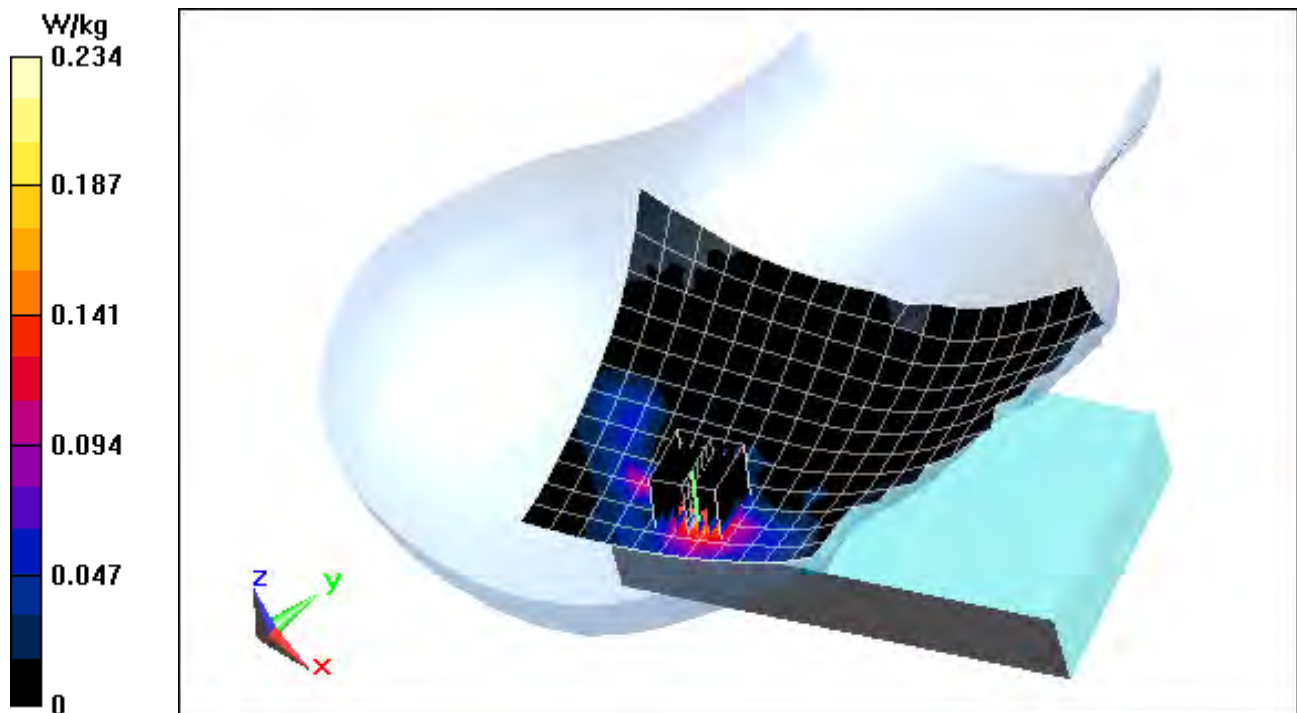
Area Scan (13x22x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

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

Reference Value = 4.395 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 0.356 W/kg

SAR(1 g) = 0.094 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#9

Communication System: UID 0, GSM GPRS; 4 Tx slots; Frequency: 836.6 MHz; Duty Cycle: 1:2.076

Medium: 835 Body, Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 1.01 \text{ S/m}$; $\epsilon_r = 53.941$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-26-2013; Ambient Temp: 22.3°C; Tissue Temp: 20.5°C

Probe: ES3DV3 - SN3333; ConvF(6.07, 6.07, 6.07); Calibrated: 11/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

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

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

**Mode: GPRS 850, Body SAR, Back Side, Mid.ch, 4 Tx Slots,
without Accessory**

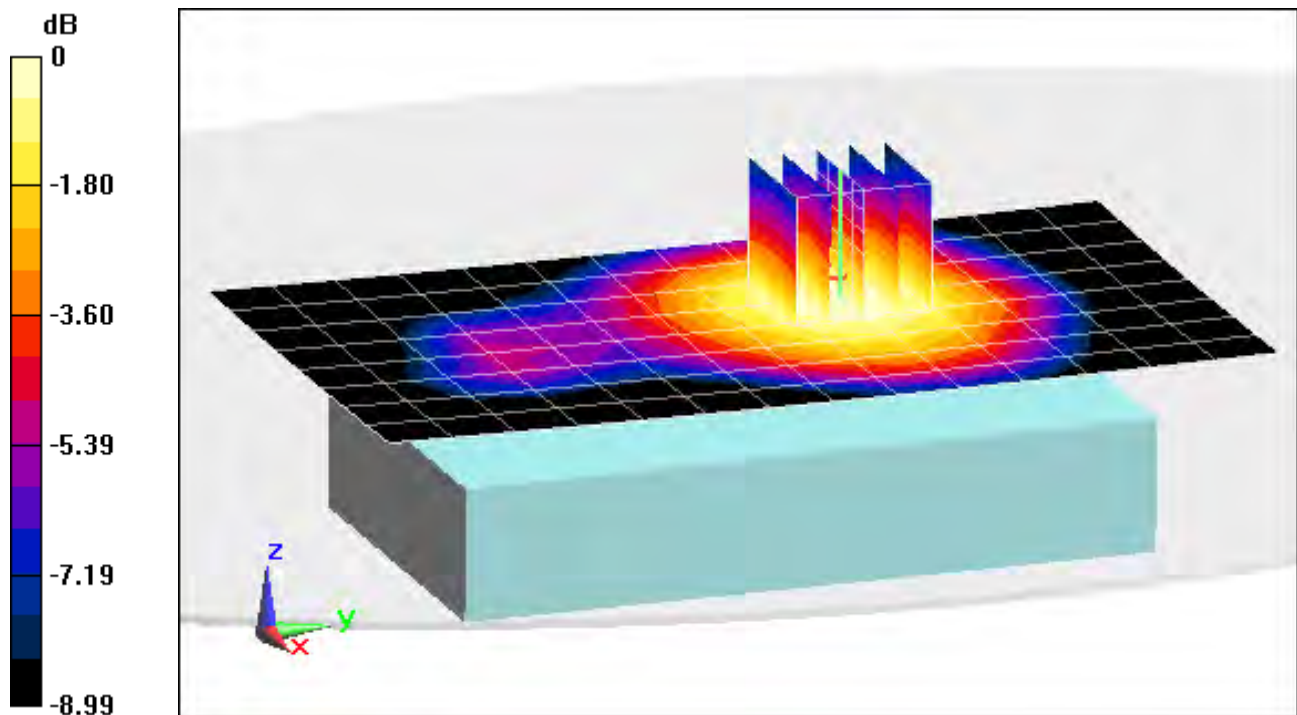
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 14.193 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.246 W/kg

SAR(1 g) = 0.194 W/kg



0 dB = 0.205 W/kg = -6.88 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#9

Communication System: UID 0, GSM GPRS; 4 Tx slots; Frequency: 836.6 MHz; Duty Cycle: 1:2.076

Medium: 835 Body, Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 1.01 \text{ S/m}$; $\epsilon_r = 53.941$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-26-2013; Ambient Temp: 22.3°C; Tissue Temp: 20.5°C

Probe: ES3DV3 - SN3333; ConvF(6.07, 6.07, 6.07); Calibrated: 11/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

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

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

**Mode: GPRS 850, Body SAR, Front Side, Mid.ch, 4 Tx Slots,
without Accessory**

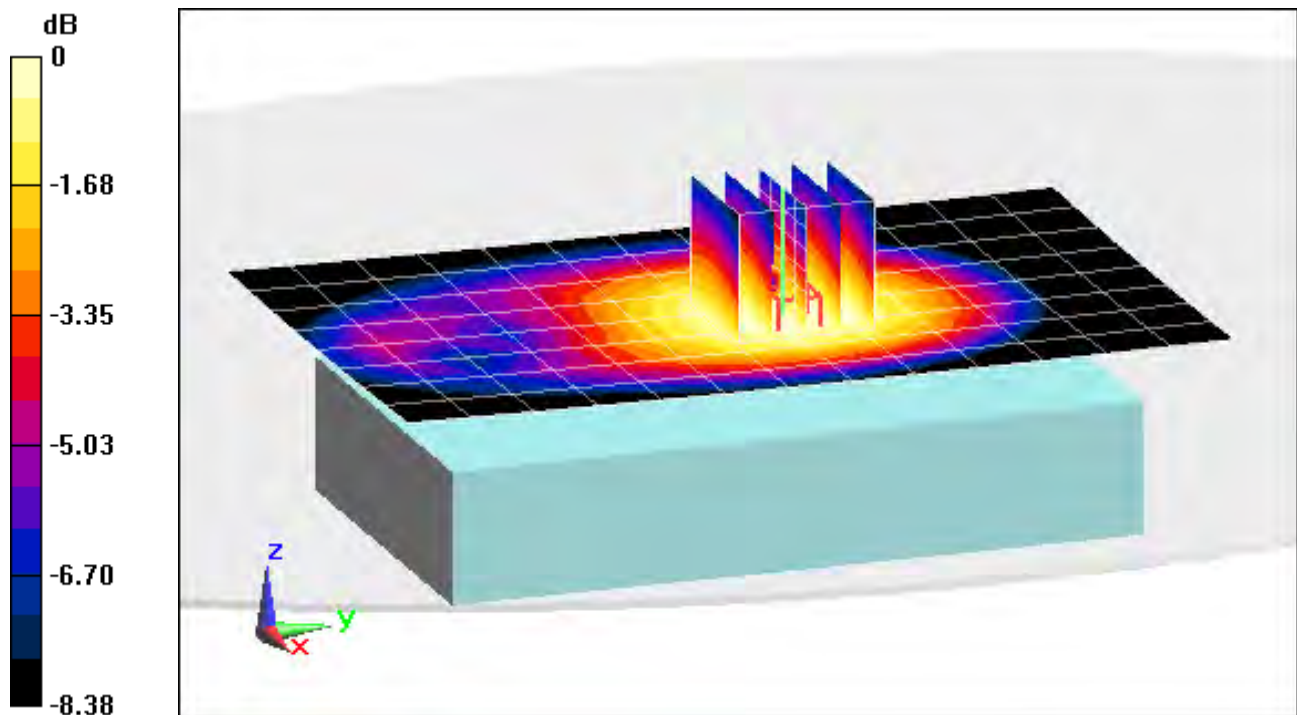
Area Scan (9x14x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 15.089 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.406 W/kg

SAR(1 g) = 0.220 W/kg



0 dB = 0.228 W/kg = -6.42 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#7

Communication System: UID 0, GSM GPRS; 4 Tx slots; Frequency: 1880 MHz; Duty Cycle: 1:2.076

Medium: 1900 Body, Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.541 \text{ S/m}$; $\epsilon_r = 50.984$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 12-23-2013; Ambient Temp: 21.9°C; Tissue Temp: 22.9°C

Probe: ES3DV3 - SN3319; ConvF(4.85, 4.85, 4.85); Calibrated: 4/29/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/22/2013

Phantom: SAM front; Type: QD000P40CD; Serial: TP:1759

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

**Mode: GPRS 1900, Body SAR, Front Side, Mid.ch, 4 Tx Slots,
with Body Holster Accessory**

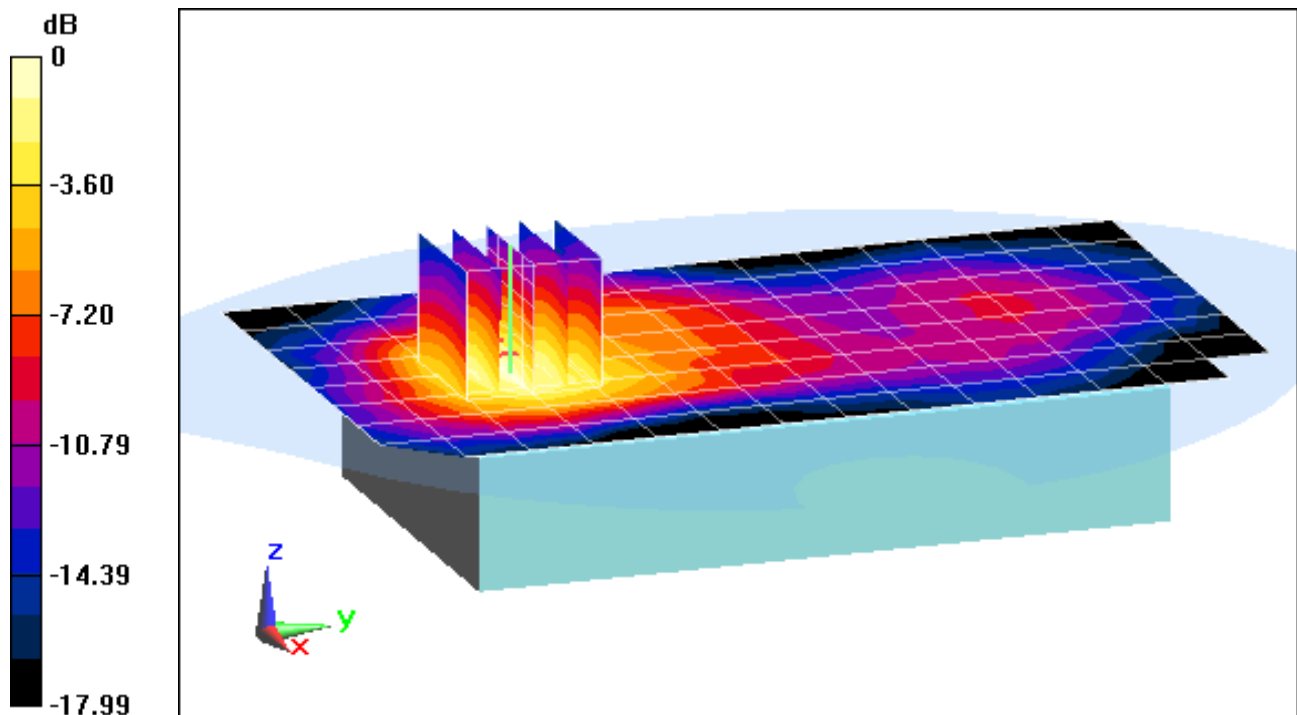
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 14.903 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 0.503 W/kg

SAR(1 g) = 0.313 W/kg



0 dB = 0.343 W/kg = -4.65 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#7

Communication System: UID 0, GSM GPRS; 4 Tx slots; Frequency: 1880 MHz; Duty Cycle: 1:2.076

Medium: 1900 Body, Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.541 \text{ S/m}$; $\epsilon_r = 50.984$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-23-2013; Ambient Temp: 21.9°C; Tissue Temp: 22.9°C

Probe: ES3DV3 - SN3319; ConvF(4.85, 4.85, 4.85); Calibrated: 4/29/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/22/2013

Phantom: SAM front; Type: QD000P40CD; Serial: TP:1759

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

**Mode: GPRS 1900, Body SAR, Front Side, Mid.ch, 4 Tx Slots,
without Accessory**

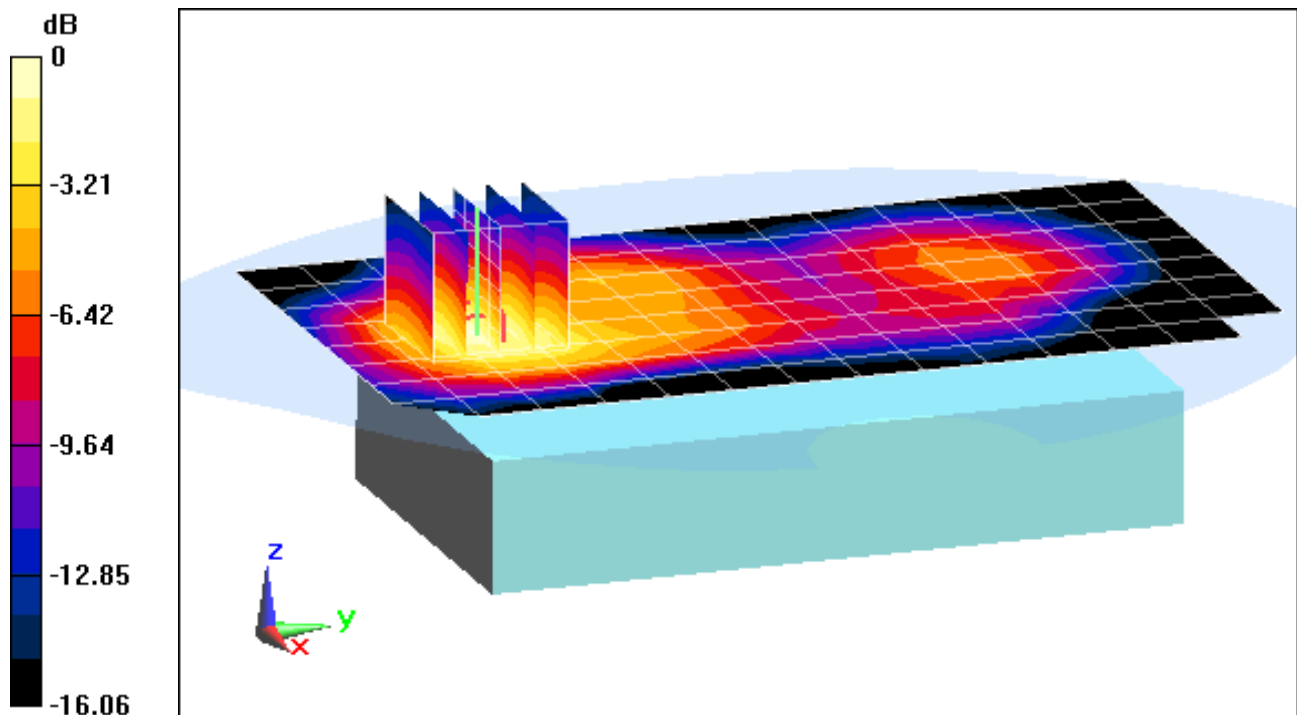
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 13.919 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.455 W/kg

SAR(1 g) = 0.280 W/kg



0 dB = 0.309 W/kg = -5.10 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#7

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

Medium: 835 Body, Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 1.01 \text{ S/m}$; $\epsilon_r = 53.941$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-26-2013; Ambient Temp: 22.3°C; Tissue Temp: 20.5°C

Probe: ES3DV3 - SN3333; ConvF(6.07, 6.07, 6.07); Calibrated: 11/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

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

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

**Mode: UMTS 850, Body SAR, Back Side, Mid.ch,
without Accessory**

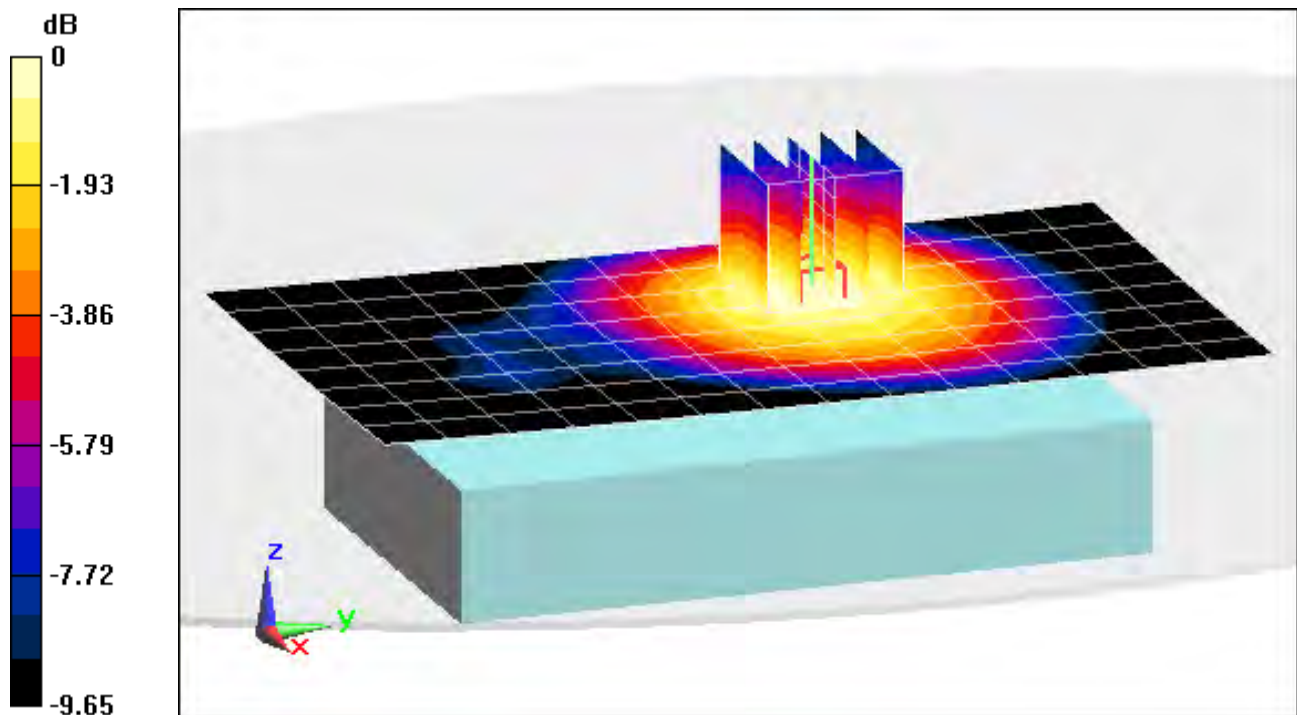
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 17.156 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.374 W/kg

SAR(1 g) = 0.286 W/kg



0 dB = 0.302 W/kg = -5.20 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#7

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

Medium: 1900 Body, Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.541 \text{ S/m}$; $\epsilon_r = 50.984$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 12-23-2013; Ambient Temp: 21.9°C; Tissue Temp: 22.9°C

Probe: ES3DV3 - SN3319; ConvF(4.85, 4.85, 4.85); Calibrated: 4/29/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/22/2013

Phantom: SAM front; Type: QD000P40CD; Serial: TP:1759

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

**Mode: UMTS 1900, Body SAR, Front Side, Mid.ch,
with Body Holster Accessory**

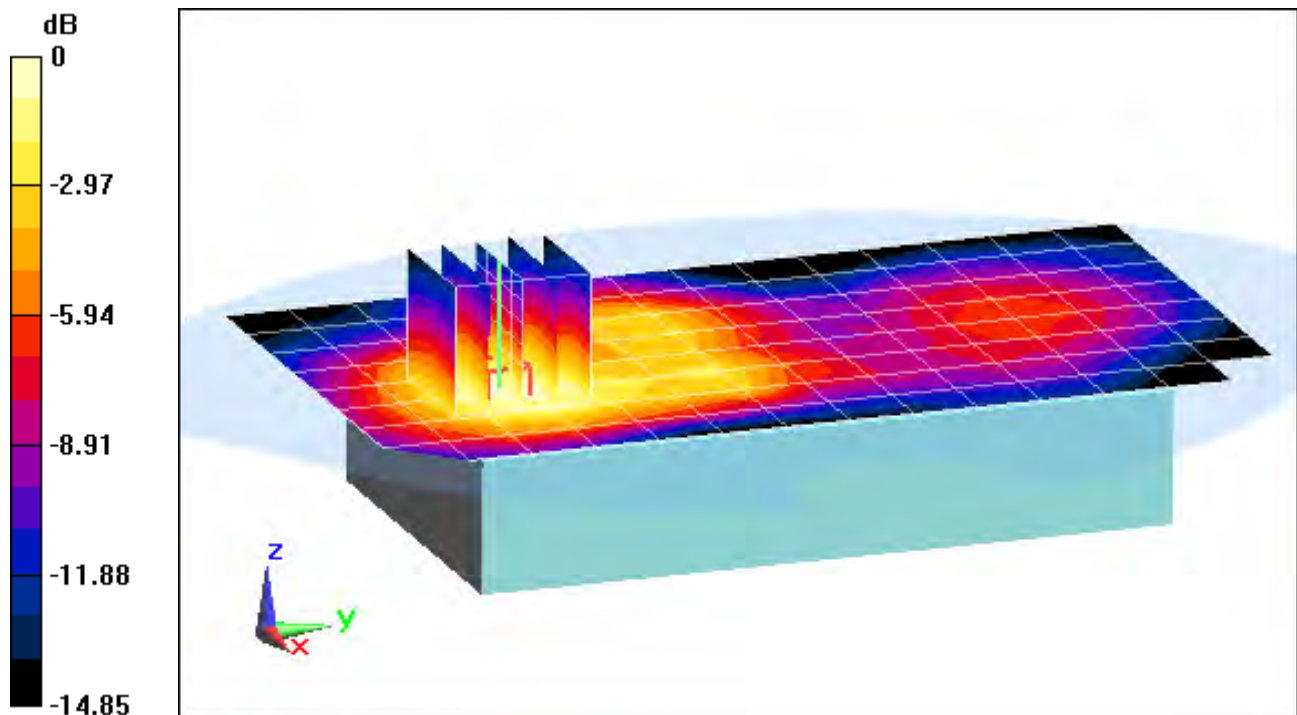
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 12.839 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 0.366 W/kg

SAR(1 g) = 0.233 W/kg



0 dB = 0.254 W/kg = -5.95 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#7

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

Medium: 1900 Body, Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.541 \text{ S/m}$; $\epsilon_r = 50.984$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-23-2013; Ambient Temp: 21.9°C; Tissue Temp: 22.9°C

Probe: ES3DV3 - SN3319; ConvF(4.85, 4.85, 4.85); Calibrated: 4/29/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/22/2013

Phantom: SAM front; Type: QD000P40CD; Serial: TP:1759

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

**Mode: UMTS 1900, Body SAR, Front Side, Mid.ch,
without Accessory**

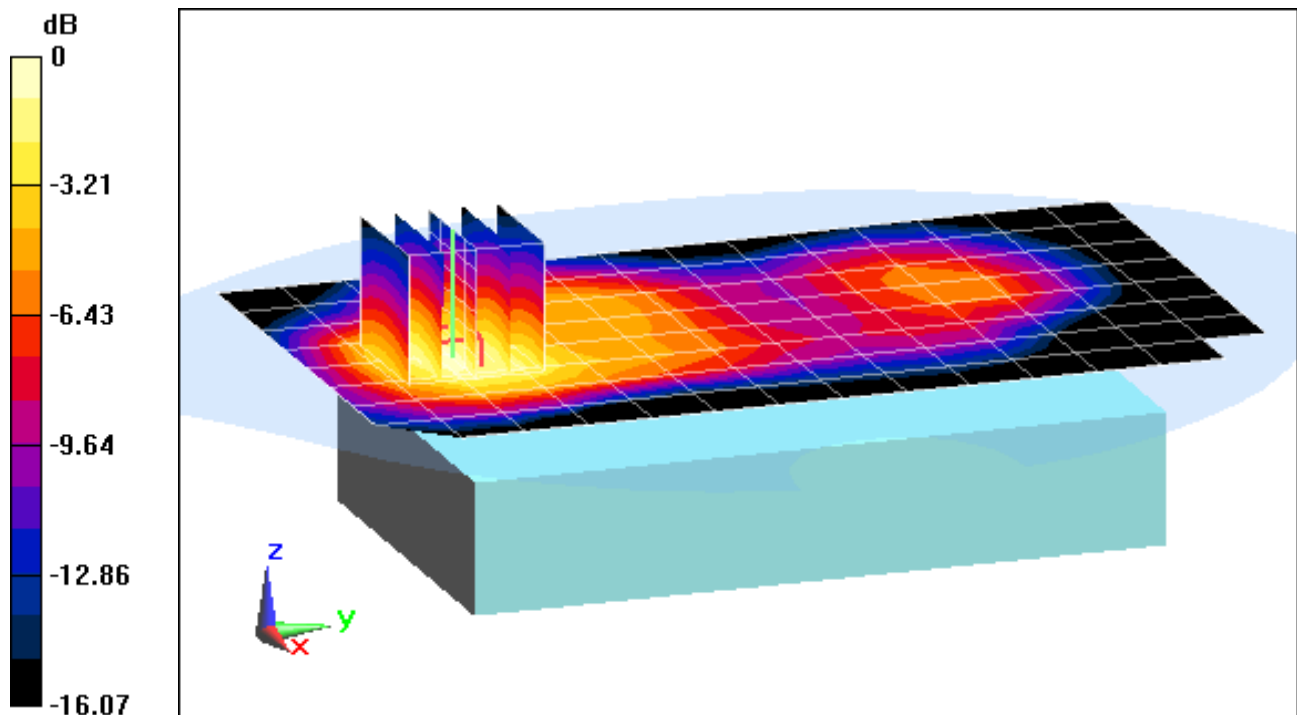
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 19.691 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 0.869 W/kg

SAR(1 g) = 0.533 W/kg



0 dB = 0.587 W/kg = -2.31 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#1

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

Medium: 835 Body, Medium parameters used (interpolated):

$f = 836.52 \text{ MHz}$; $\sigma = 0.995 \text{ S/m}$; $\epsilon_r = 53.02$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-30-2013; Ambient Temp: 22.3°C; Tissue Temp: 21.7°C

Probe: ES3DV3 - SN3333; ConvF(6.07, 6.07, 6.07); Calibrated: 11/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

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

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

**Mode: Cell. CDMA, Body SAR, Back side, Mid.ch,
without Accessory**

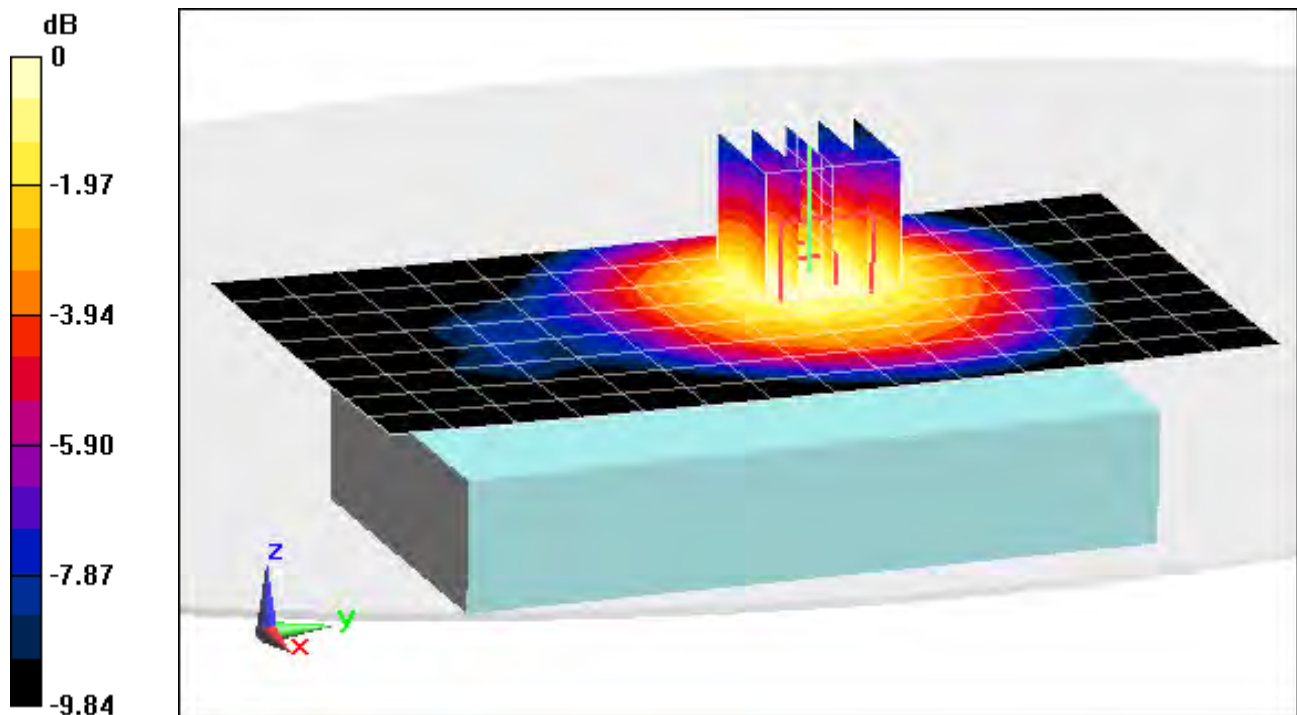
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 18.707 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.441 W/kg

SAR(1 g) = 0.331 W/kg



0 dB = 0.351 W/kg = -4.55 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#1

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

Medium: 835 Body, Medium parameters used (interpolated):

$f = 836.52 \text{ MHz}$; $\sigma = 0.995 \text{ S/m}$; $\epsilon_r = 53.02$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-30-2013; Ambient Temp: 22.3°C; Tissue Temp: 21.7°C

Probe: ES3DV3 - SN3333; ConvF(6.07, 6.07, 6.07); Calibrated: 11/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

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

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

**Mode: Cell. EVDO Rev. 0, Body SAR, Back Side, Mid.ch,
without Accessory**

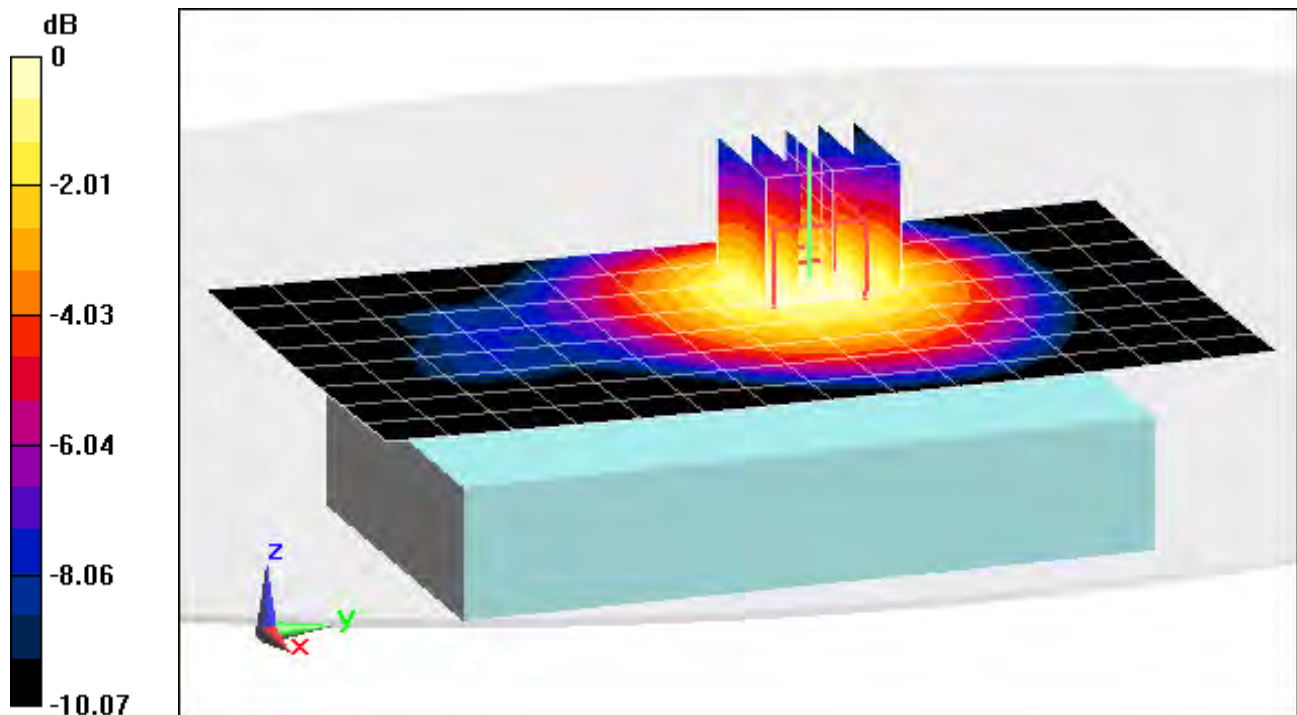
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 18.674 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.432 W/kg

SAR(1 g) = 0.325 W/kg



0 dB = 0.344 W/kg = -4.63 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#1

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

Medium: 1900 Body, Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.537 \text{ S/m}$; $\epsilon_r = 52.614$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 12-26-2013; Ambient Temp: 22.1°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3319; ConvF(4.85, 4.85, 4.85); Calibrated: 4/29/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/22/2013

Phantom: SAM front; Type: QD000P40CD; Serial: TP:1759

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

**Mode: PCS CDMA, Body SAR, Front Side, Mid.ch,
with Body Holster Accessory**

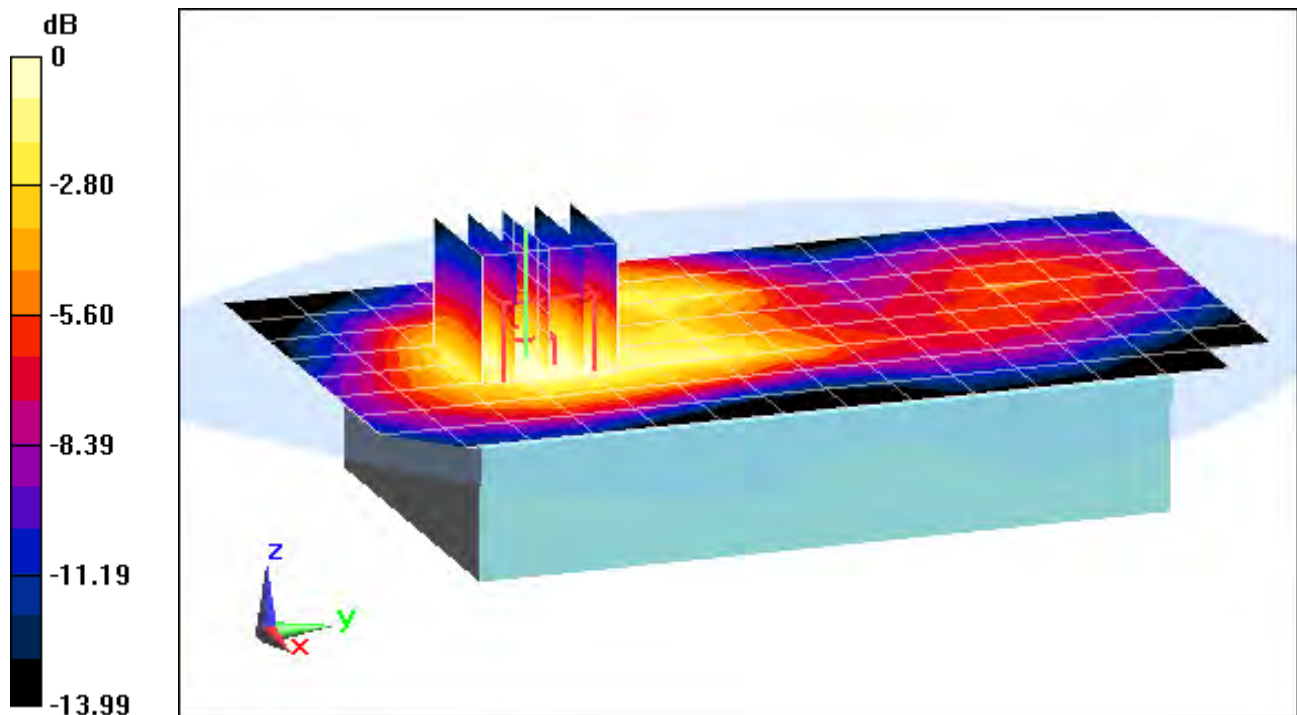
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 11.512 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.281 W/kg

SAR(1 g) = 0.183 W/kg



0 dB = 0.198 W/kg = -7.03 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#1

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

Medium: 1900 Body, Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.537 \text{ S/m}$; $\epsilon_r = 52.614$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-26-2013; Ambient Temp: 22.1°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3319; ConvF(4.85, 4.85, 4.85); Calibrated: 4/29/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/22/2013

Phantom: SAM front; Type: QD000P40CD; Serial: TP:1759

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

**Mode: PCS EVDO Rev. 0, Body SAR, Front Side, Mid.ch,
without Accessory**

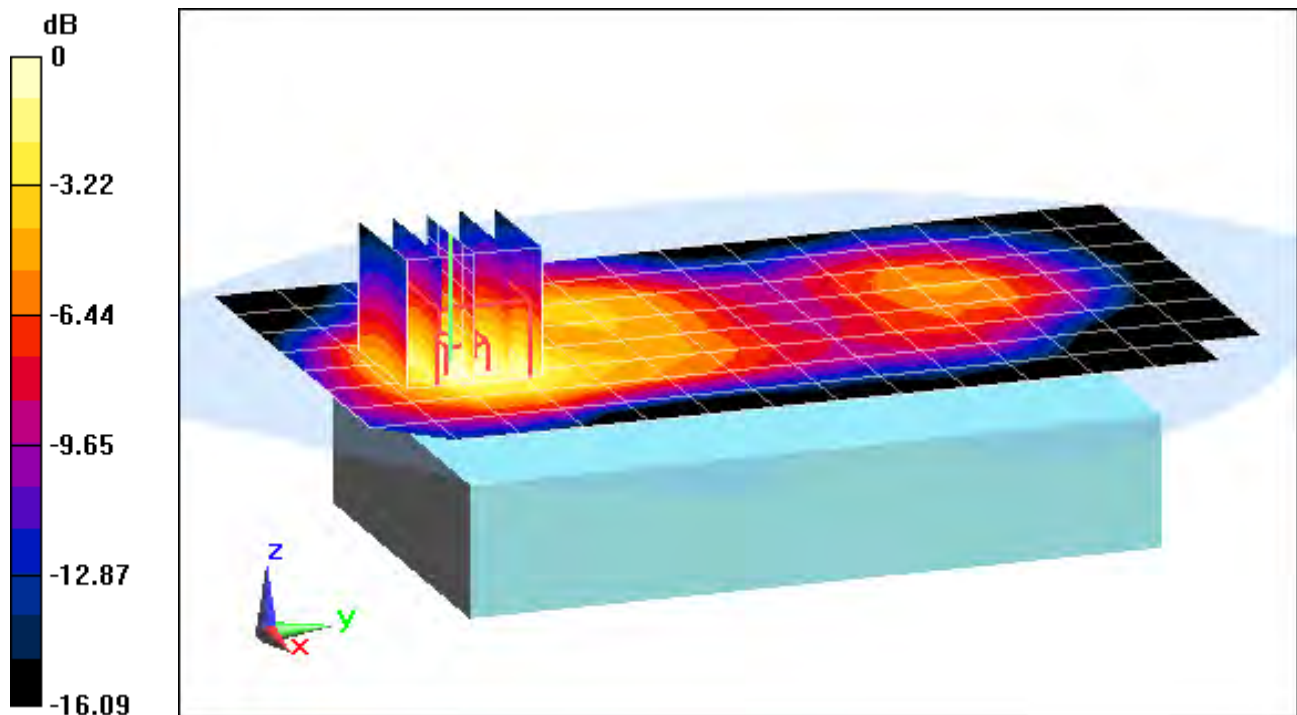
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 17.608 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.730 W/kg

SAR(1 g) = 0.462 W/kg



0 dB = 0.503 W/kg = -2.98 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#9

Communication System: UID 0, LTE Band 17; Frequency: 710 MHz; Duty Cycle: 1:1

Medium: 750 Body, Medium parameters used:

$f = 710 \text{ MHz}$; $\sigma = 0.936 \text{ S/m}$; $\epsilon_r = 55.296$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-26-2013; Ambient Temp: 23.9°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN3914; ConvF(9.39, 9.39, 9.39); Calibrated: 10/23/2013;

Sensor-Surface: 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: LTE Band 17, Body SAR, Back Side, Mid.ch, 10 MHz Bandwidth,
QPSK, 1 RB, 25 RB Offset, without Accessory**

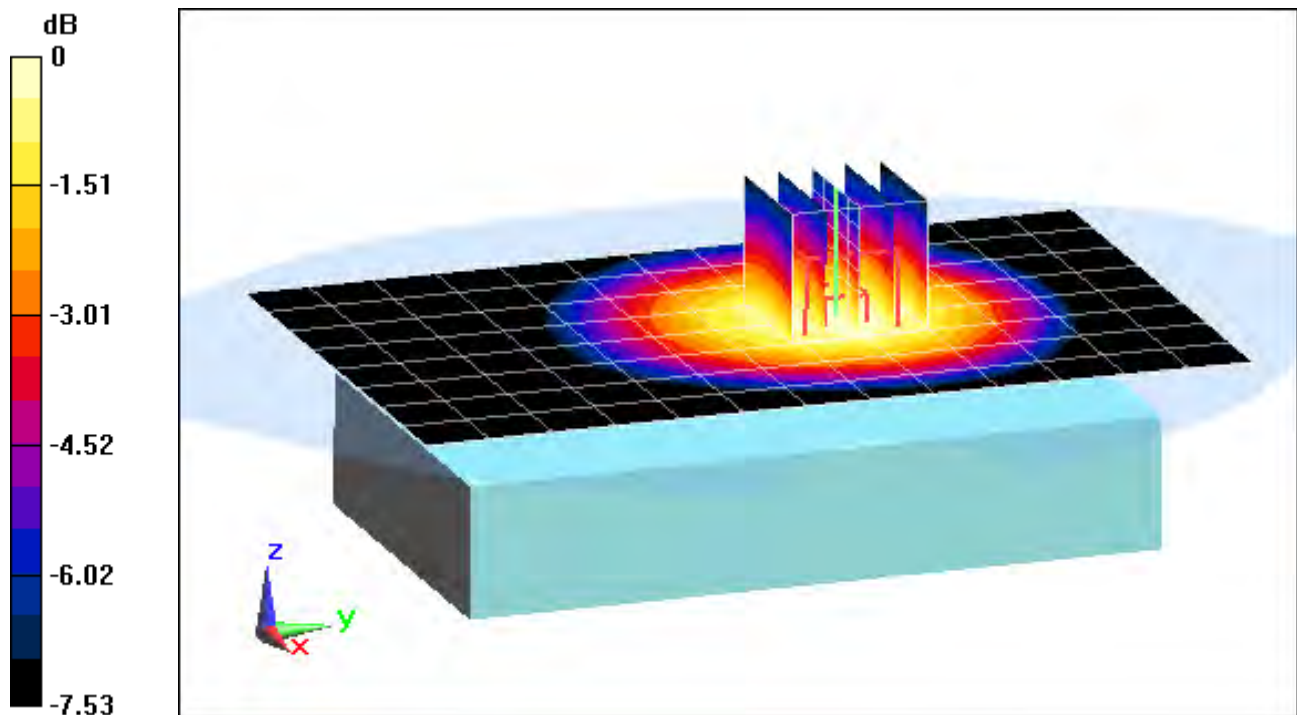
Area Scan (9x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 17.955 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 0.358 W/kg

SAR(1 g) = 0.285 W/kg



0 dB = 0.299 W/kg = -5.24 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#9

Communication System: UID 0, LTE Band 17; Frequency: 710 MHz; Duty Cycle: 1:1

Medium: 750 Body, Medium parameters used:

$f = 710 \text{ MHz}$; $\sigma = 0.936 \text{ S/m}$; $\epsilon_r = 55.296$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-26-2013; Ambient Temp: 23.9°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN3914; ConvF(9.39, 9.39, 9.39); Calibrated: 10/23/2013;

Sensor-Surface: 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: LTE Band 17, Body SAR, Front Side, Mid.ch, 10 MHz Bandwidth,
QPSK, 1 RB, 25 RB Offset, without Accessory**

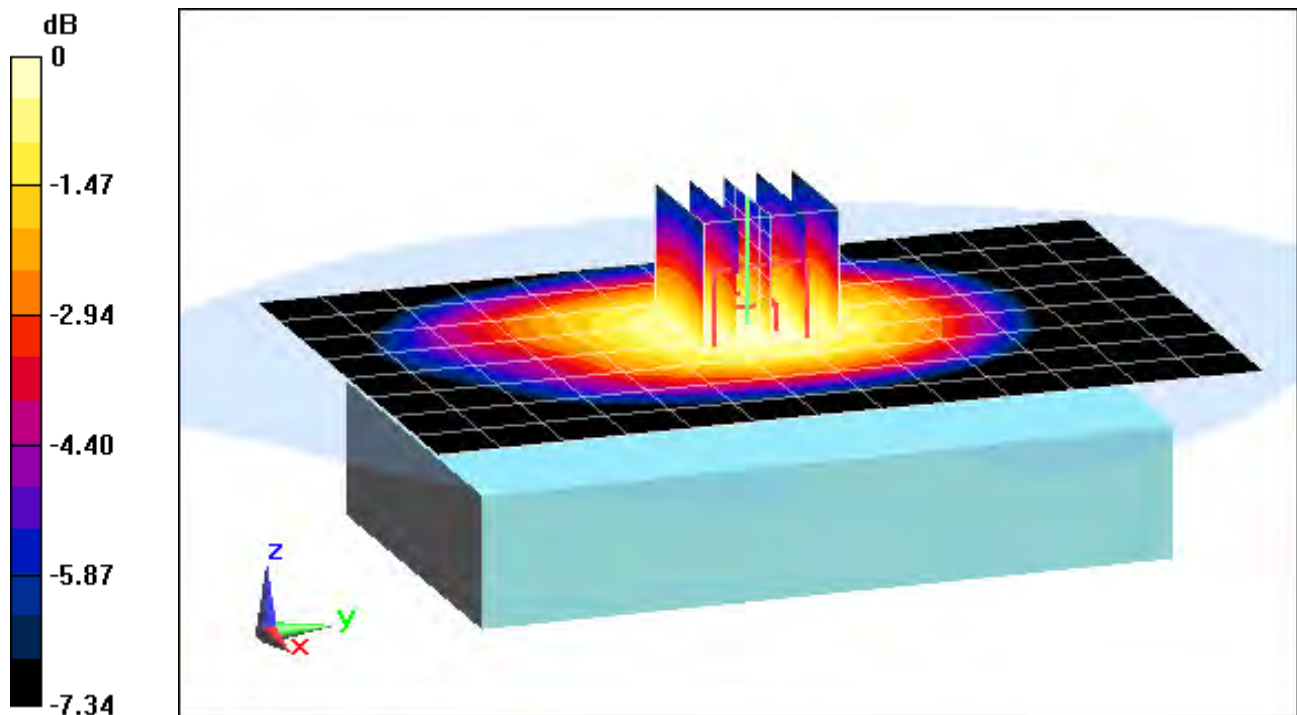
Area Scan (9x14x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 18.663 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.392 W/kg

SAR(1 g) = 0.321 W/kg



0 dB = 0.335 W/kg = -4.75 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#9

Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1

Medium: 750 Body, Medium parameters used (interpolated):

$f = 782 \text{ MHz}$; $\sigma = 1.004 \text{ S/m}$; $\epsilon_r = 54.507$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-26-2013; Ambient Temp: 23.9°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN3914; ConvF(9.39, 9.39, 9.39); Calibrated: 10/23/2013;

Sensor-Surface: 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: LTE Band 13, Body SAR, Back Side, Mid.ch, 10 MHz Bandwidth,
QPSK, 1 RB, 0 RB Offset, without Accessory**

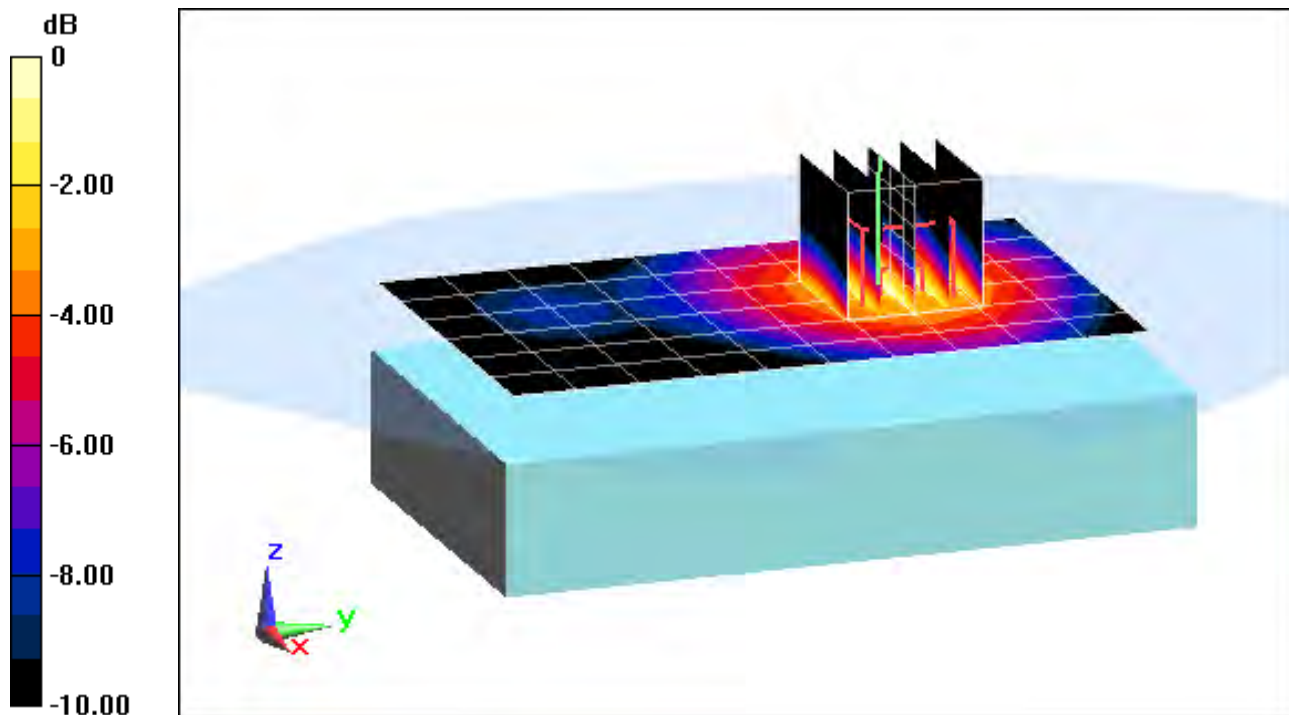
Area Scan (7x11x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 17.338 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.368 W/kg

SAR(1 g) = 0.289 W/kg



0 dB = 0.302 W/kg = -5.20 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#9

Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1

Medium: 750 Body, Medium parameters used (interpolated):

$f = 782 \text{ MHz}$; $\sigma = 1.004 \text{ S/m}$; $\epsilon_r = 54.507$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-26-2013; Ambient Temp: 23.9°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN3914; ConvF(9.39, 9.39, 9.39); Calibrated: 10/23/2013;

Sensor-Surface: 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: LTE Band 13, Body SAR, Front Side, Mid.ch, 10 MHz Bandwidth,
QPSK, 1 RB, 0 RB Offset, without Accessory**

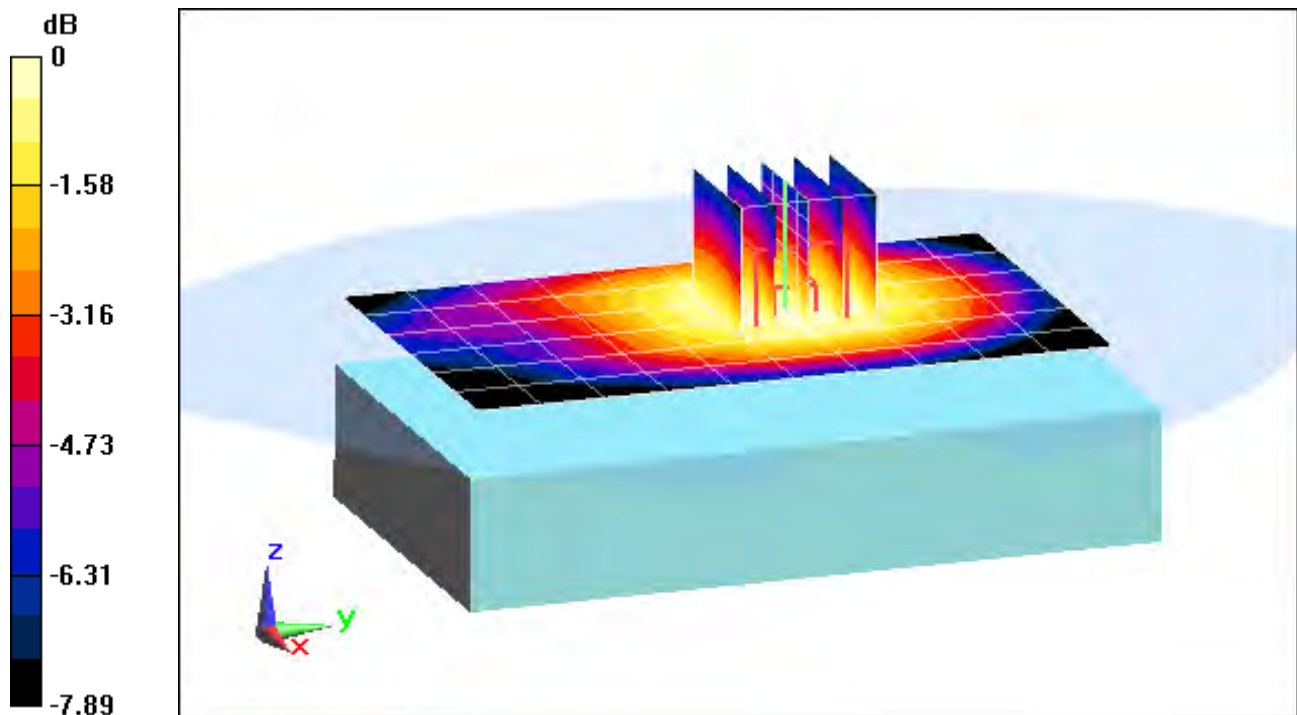
Area Scan (7x11x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 19.210 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 0.444 W/kg

SAR(1 g) = 0.355 W/kg



0 dB = 0.370 W/kg = -4.32 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#8

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

Medium: 1750 Body, Medium parameters used (interpolated):

$f = 1732.5 \text{ MHz}$; $\sigma = 1.456 \text{ S/m}$; $\epsilon_r = 52.119$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 12-23-2013; Ambient Temp: 22.6°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3318; ConvF(5.22, 5.22, 5.22); Calibrated: 6/28/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1364; Calibrated: 4/22/2013

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 4 (AWS), Body SAR, Front Side, Mid.ch, 10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset, with Body Holster Accessory

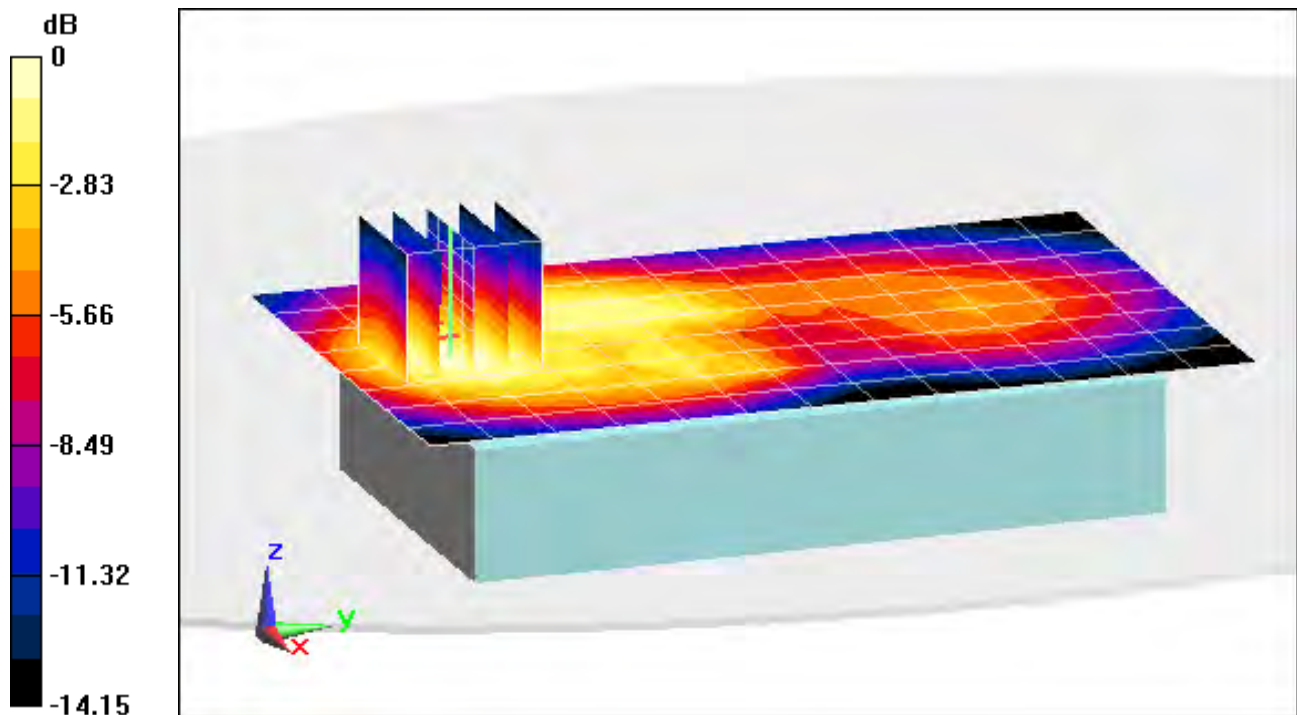
Area Scan (9x14x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 15.631 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.544 W/kg

SAR(1 g) = 0.323 W/kg



0 dB = 0.349 W/kg = -4.57 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#8

Communication System: UID 0, LTE Band 4 (AWS), Frequency: 1715 MHz; Duty Cycle: 1:1

Medium: 1750 Body, Medium parameters used (interpolated):

$f = 1715 \text{ MHz}$; $\sigma = 1.44 \text{ S/m}$; $\epsilon_r = 52.212$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-23-2013; Ambient Temp: 22.6°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3318; ConvF(5.22, 5.22, 5.22); Calibrated: 6/28/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1364; Calibrated: 4/22/2013

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 4 (AWS), Body SAR, Front Side, Low.ch, 10 MHz Bandwidth,
QPSK, 1 RB, 0 RB Offset, without Accessory**

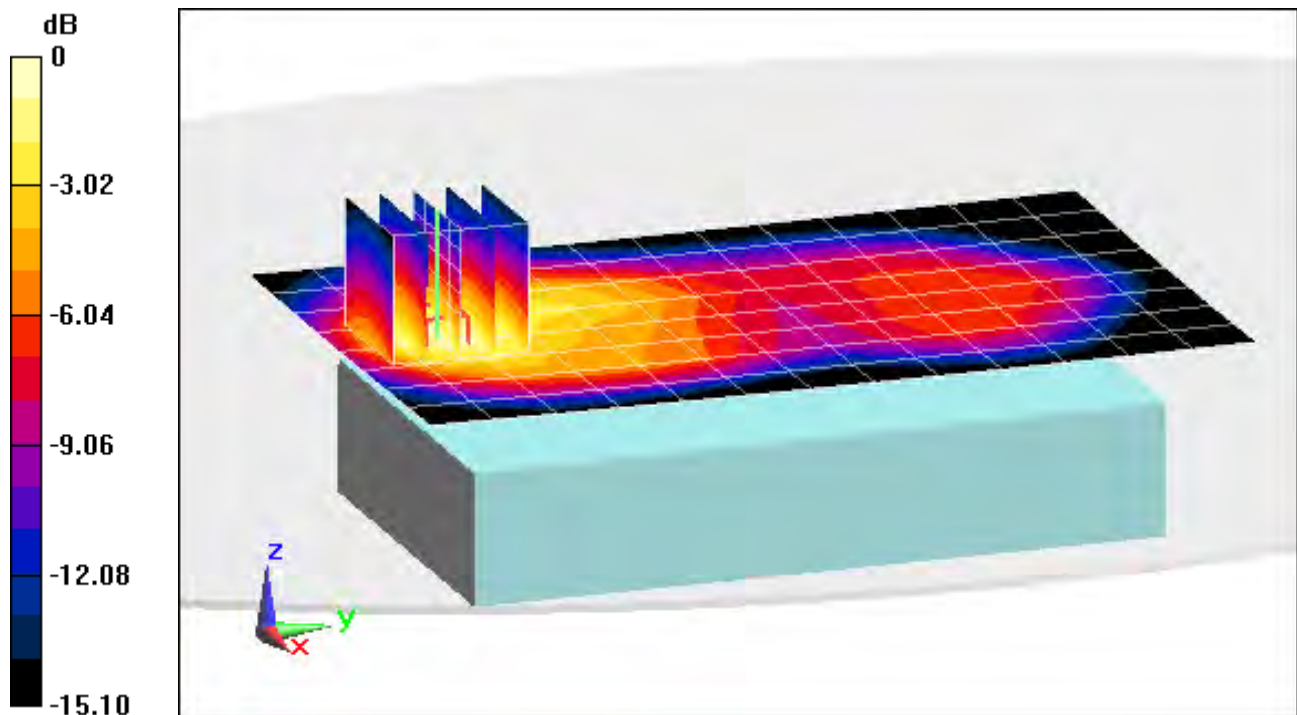
Area Scan (9x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 25.112 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 1.49 W/kg

SAR(1 g) = 0.835 W/kg



0 dB = 0.907 W/kg = -0.42 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#1

Communication System: UID 0, IEEE 802.11b; Frequency: 2462 MHz; Duty Cycle: 1:1

Medium: 2450 Body, Medium parameters used (interpolated):

$f = 2462 \text{ MHz}$; $\sigma = 2.038 \text{ S/m}$; $\epsilon_r = 51.313$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-30-2013; Ambient Temp: 22.3°C; Tissue Temp: 22.0°C

Probe: ES3DV2 - SN3022; ConvF(4.01, 4.01, 4.01); Calibrated: 8/22/2013;

Sensor-Surface: 3mm (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: IEEE 802.11b, Body SAR, Ch 11, 1 Mbps, Back Side,
without Accessory**

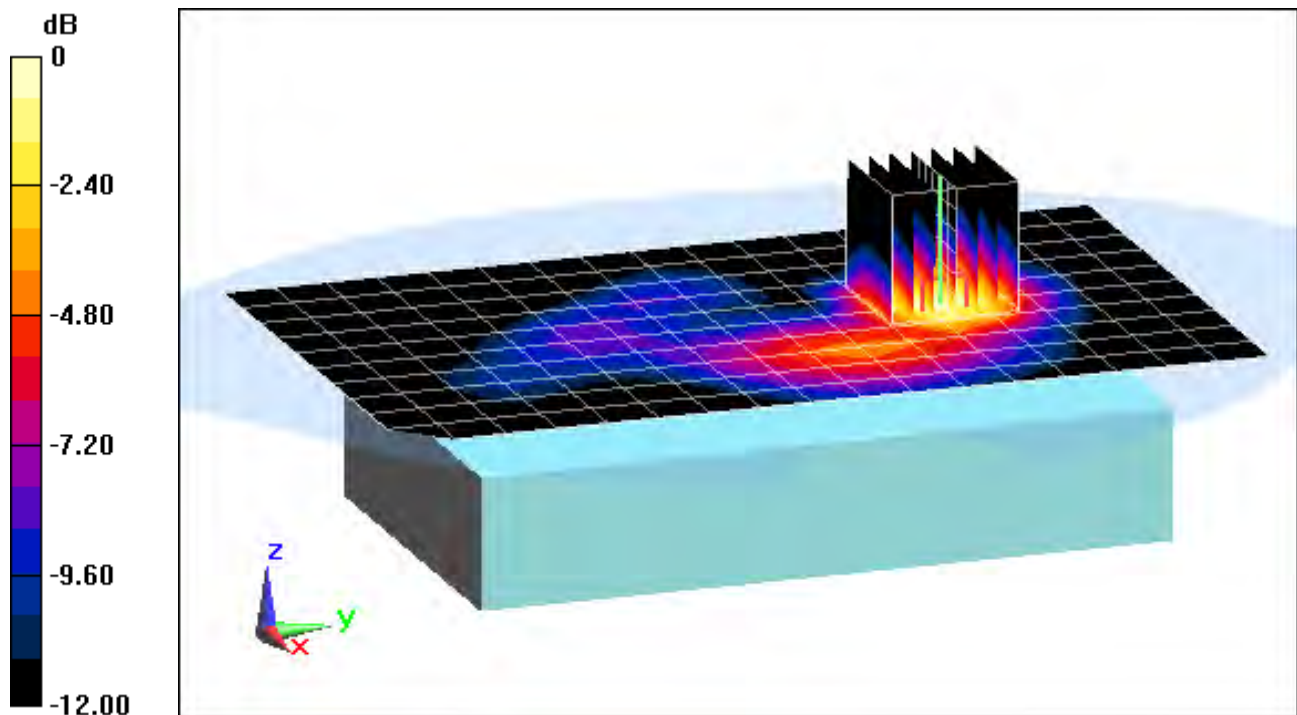
Area Scan (11x18x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 8.753 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.277 W/kg

SAR(1 g) = 0.146 W/kg



0 dB = 0.181 W/kg = -7.42 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#2

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

Medium: 5 GHz Body, Medium parameters used:

$f = 5765 \text{ MHz}$; $\sigma = 6.173 \text{ S/m}$; $\epsilon_r = 47.067$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-14-2014; Ambient Temp: 24.3°C; Tissue Temp: 23.6°C

Probe: EX3DV4 - SN3914; ConvF(4.14, 4.14, 4.14); 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, Body SAR, Ch 153, 6 Mbps, Back Side,
without Accessory**

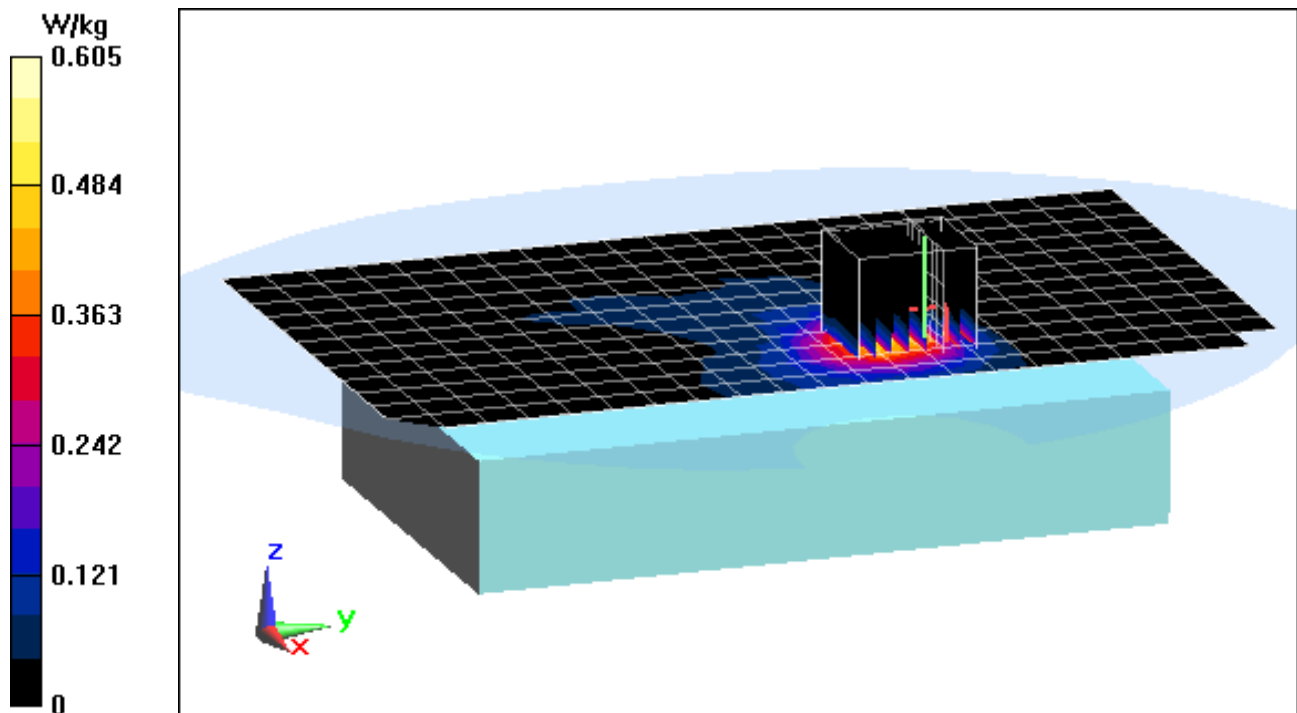
Area Scan (13x22x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 5.179 V/m; Power Drift = -0.17 dB

Peak SAR (extrapolated) = 1.10 W/kg

SAR(1 g) = 0.260 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#2

Communication System: UID 0, IEEE 802.11a; Frequency: 5300 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body, Medium parameters used:

$f = 5300 \text{ MHz}$; $\sigma = 5.45 \text{ S/m}$; $\epsilon_r = 48.176$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-14-2014; Ambient Temp: 24.4°C; Tissue Temp: 23.5°C

Probe: EX3DV4 - SN3914; ConvF(4.32, 4.32, 4.32); 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, Body SAR, Ch 60, 6 Mbps, Back Side,
without Accessory**

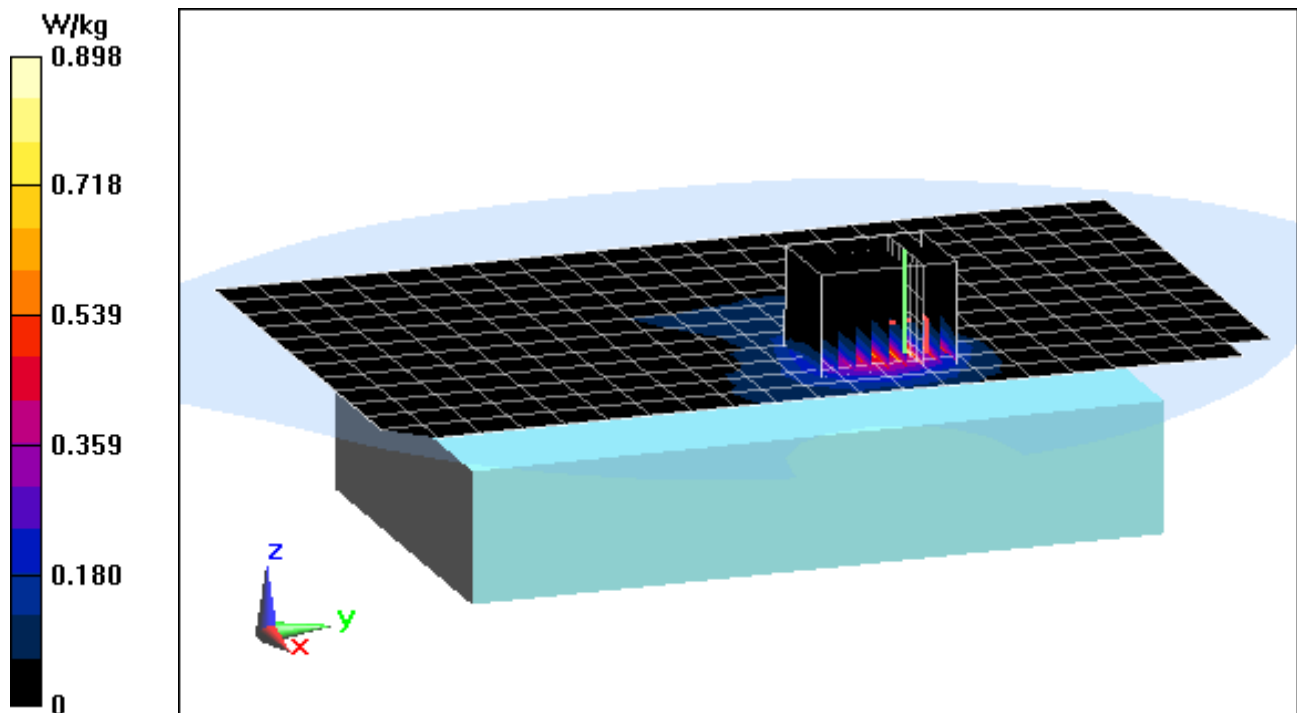
Area Scan (13x22x1): Measurement grid: dx=10mm, dy=10mm

Zoom Scan (7x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Reference Value = 7.679 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 1.55 W/kg

SAR(1 g) = 0.409 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#1

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

Medium: 2450 Body, Medium parameters used (interpolated):

$f = 2441 \text{ MHz}$; $\sigma = 1.978 \text{ S/m}$; $\epsilon_r = 51.382$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 01-21-2014; Ambient Temp: 23.9°C; Tissue Temp: 23.1°C

Probe: ES3DV2 - SN3022; ConvF(4.01, 4.01, 4.01); Calibrated: 8/22/2013;

Sensor-Surface: 3mm (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: Bluetooth, Body SAR, Ch 39, 1 Mbps, Back Side,
with Body Holster Accessory**

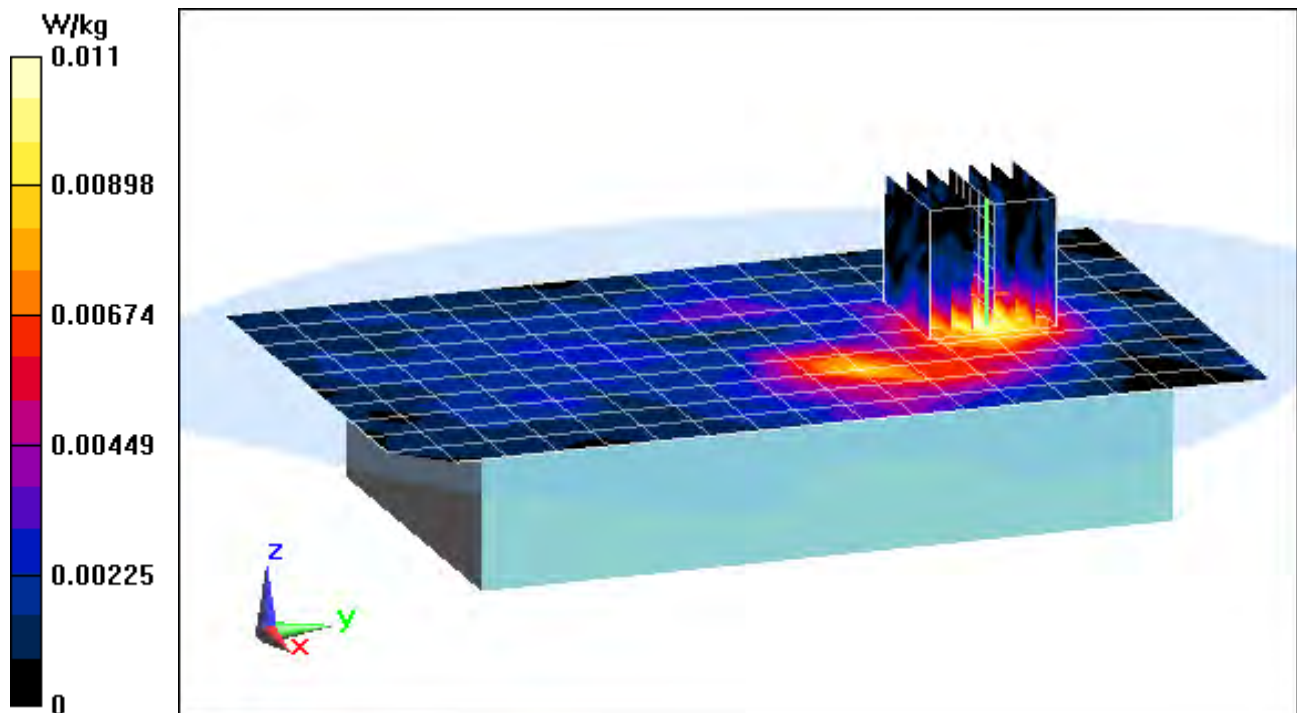
Area Scan (11x18x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 2.213 V/m; Power Drift = 0.21 dB

Peak SAR (extrapolated) = 0.0170 W/kg

SAR(1 g) = 0.00871 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#9

Communication System: UID 0, GSM GPRS; 4 Tx slots; Frequency: 836.6 MHz; Duty Cycle: 1:2.076

Medium: 835 Body, Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 1.01 \text{ S/m}$; $\epsilon_r = 53.941$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 12-26-2013; Ambient Temp: 22.3°C; Tissue Temp: 20.5°C

Probe: ES3DV3 - SN3333; ConvF(6.07, 6.07, 6.07); Calibrated: 11/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

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

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

**Mode: GPRS 850, Extremity SAR, Back Side, Mid.ch, 4 Tx Slots,
with Hand Strap Accessory, Top-Left**

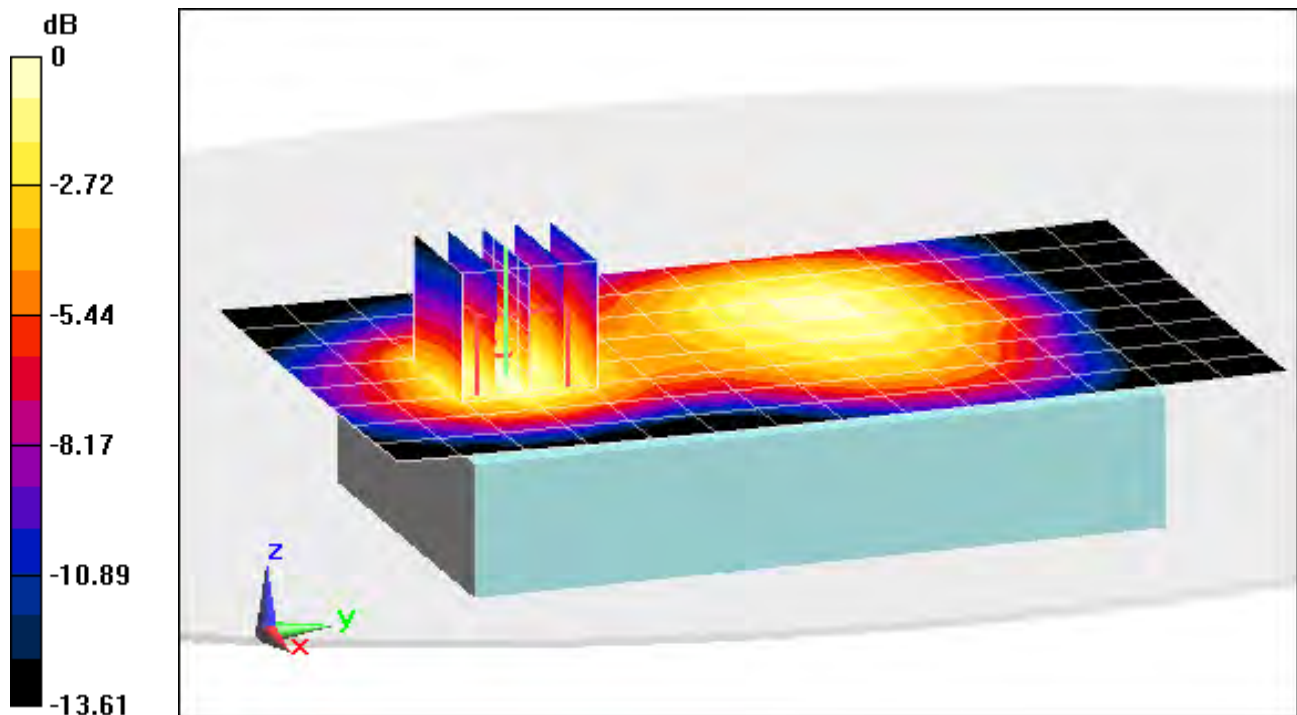
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 15.357 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.399 W/kg

SAR(10 g) = 0.164 W/kg



0 dB = 0.277 W/kg = -5.58 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#7

Communication System: UID 0, GSM GPRS; 4 Tx slots; Frequency: 1880 MHz; Duty Cycle: 1:2.076

Medium: 1900 Body, Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.541 \text{ S/m}$; $\epsilon_r = 50.984$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 12-23-2013; Ambient Temp: 21.9°C; Tissue Temp: 22.9°C

Probe: ES3DV3 - SN3319; ConvF(4.85, 4.85, 4.85); Calibrated: 4/29/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/22/2013

Phantom: SAM front; Type: QD000P40CD; Serial: TP:1759

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

**Mode: GPRS 1900, Extremity SAR, Back Side, Mid.ch, 4 Tx Slots,
with Hand Strap Accessory, Top-Left**

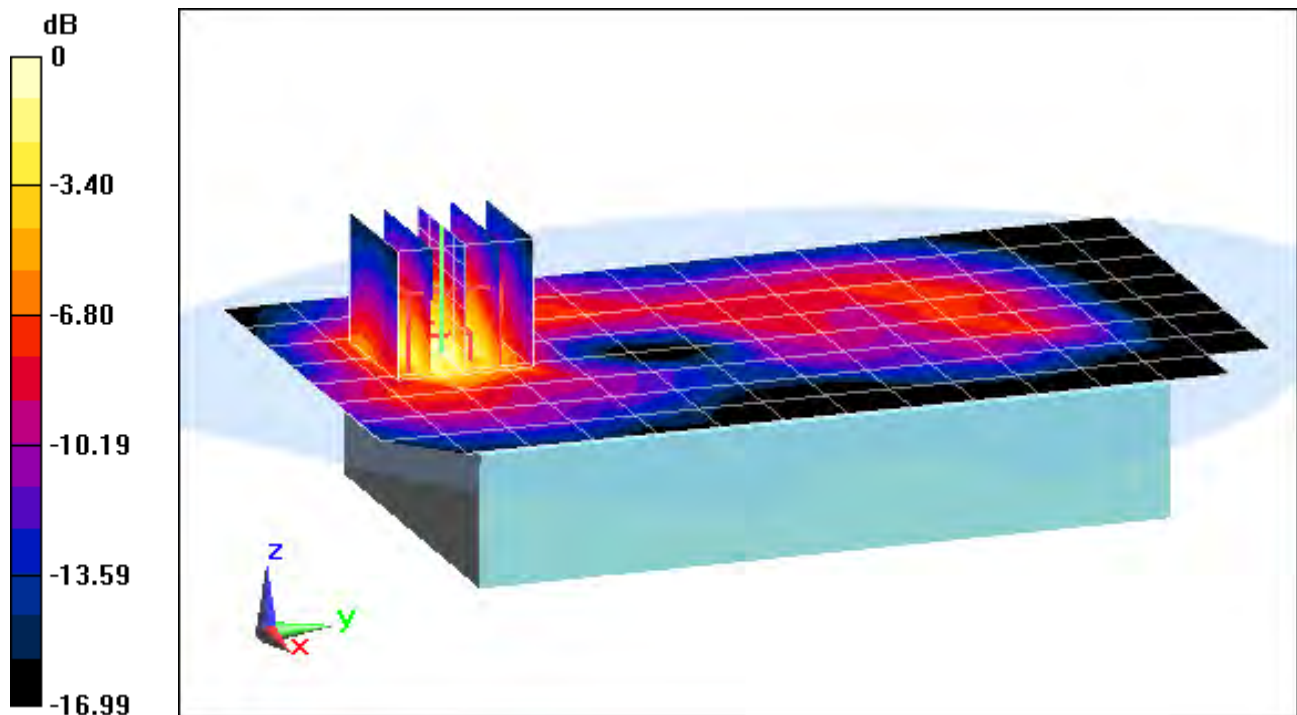
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 12.283 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 0.432 W/kg

SAR(10 g) = 0.123 W/kg



0 dB = 0.263 W/kg = -5.80 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#7

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

Medium: 835 Body, Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 1.01 \text{ S/m}$; $\epsilon_r = 53.941$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 12-26-2013; Ambient Temp: 22.3°C; Tissue Temp: 20.5°C

Probe: ES3DV3 - SN3333; ConvF(6.07, 6.07, 6.07); Calibrated: 11/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

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

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

**Mode: UMTS 850, Extremity SAR, Back Side, Mid.ch,
with Hand Strap Accessory, Top-Left**

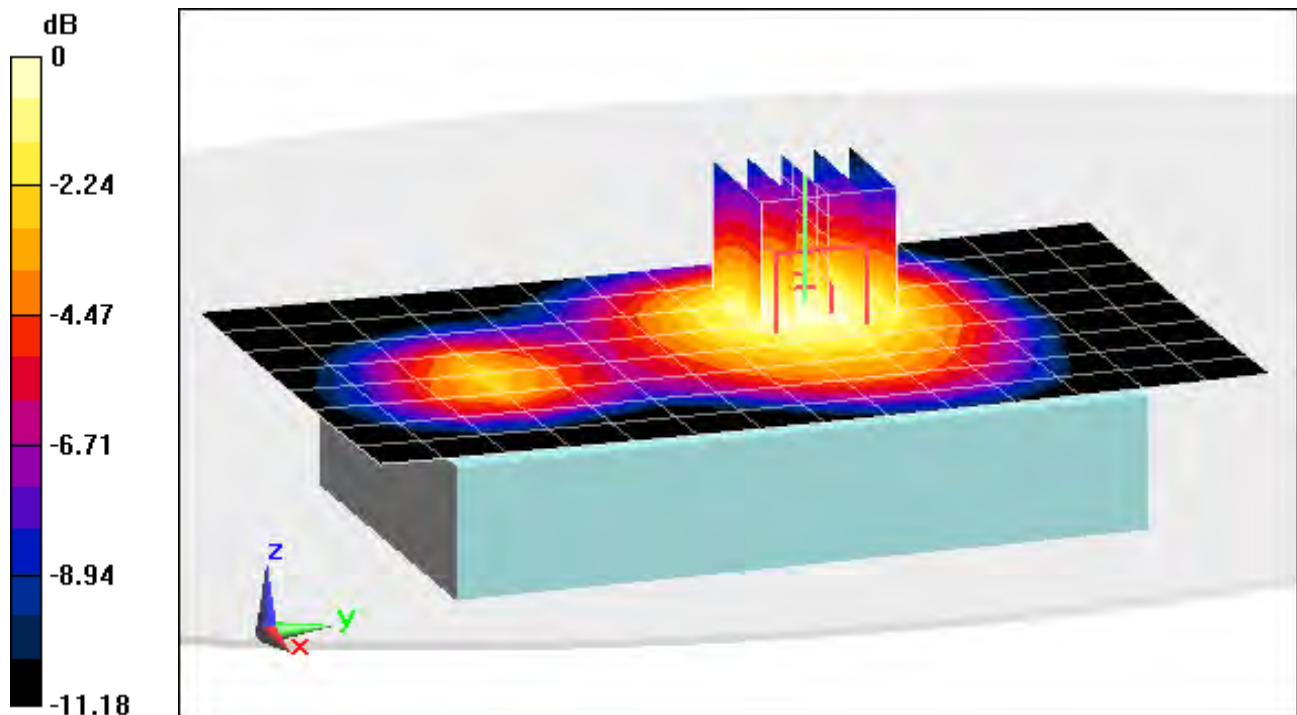
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 20.349 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.560 W/kg

SAR(10 g) = 0.288 W/kg



0 dB = 0.433 W/kg = -3.64 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#7

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

Medium: 1900 Body, Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.541 \text{ S/m}$; $\epsilon_r = 50.984$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 12-23-2013; Ambient Temp: 21.9°C; Tissue Temp: 22.9°C

Probe: ES3DV3 - SN3319; ConvF(4.85, 4.85, 4.85); Calibrated: 4/29/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/22/2013

Phantom: SAM front; Type: QD000P40CD; Serial: TP:1759

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

**Mode: UMTS 1900, Extremity SAR, Back Side, Mid.ch,
with Hand Strap Accessory, Top-Left**

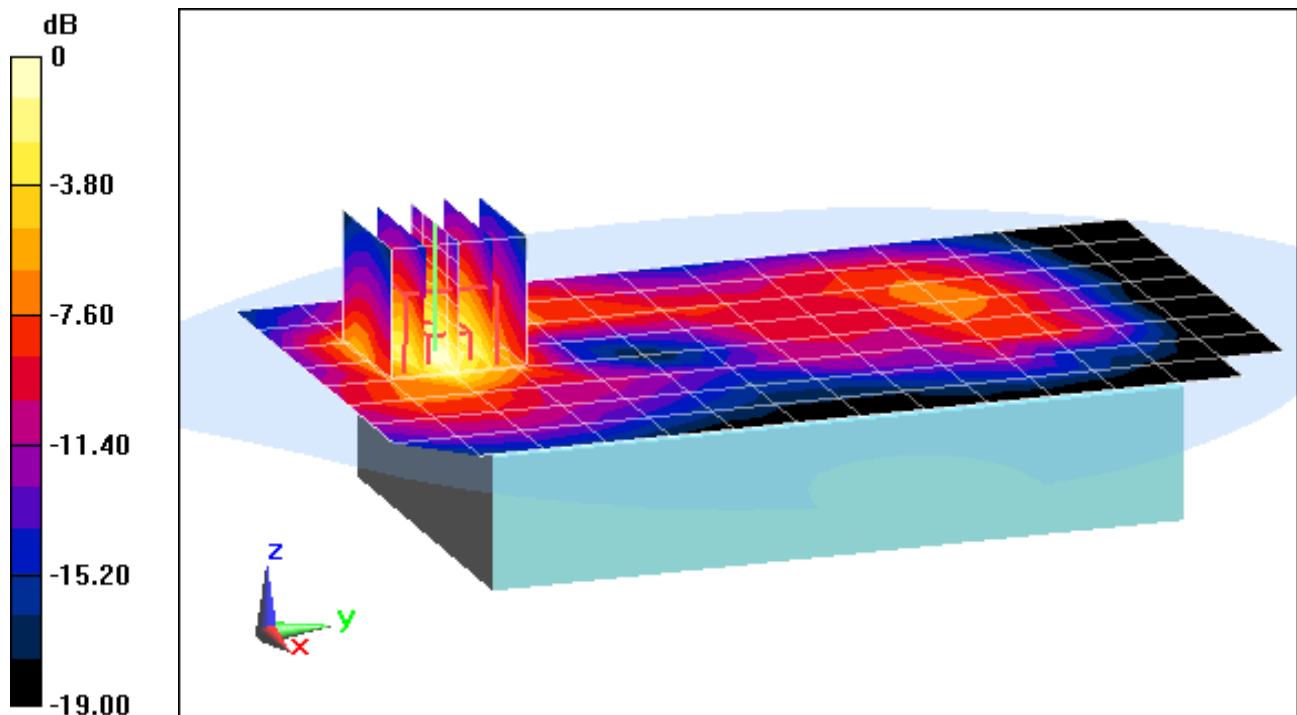
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 18.575 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.817 W/kg

SAR(10 g) = 0.244 W/kg



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#1

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

Medium: 835 Body, Medium parameters used (interpolated):

$f = 836.52 \text{ MHz}$; $\sigma = 0.995 \text{ S/m}$; $\epsilon_r = 53.02$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 12-30-2013; Ambient Temp: 22.3°C; Tissue Temp: 21.7°C

Probe: ES3DV3 - SN3333; ConvF(6.07, 6.07, 6.07); Calibrated: 11/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

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

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

**Mode: Cell. CDMA, Extremity SAR, Back Side, Mid.ch,
with Hand Strap Accessory, Top-Left**

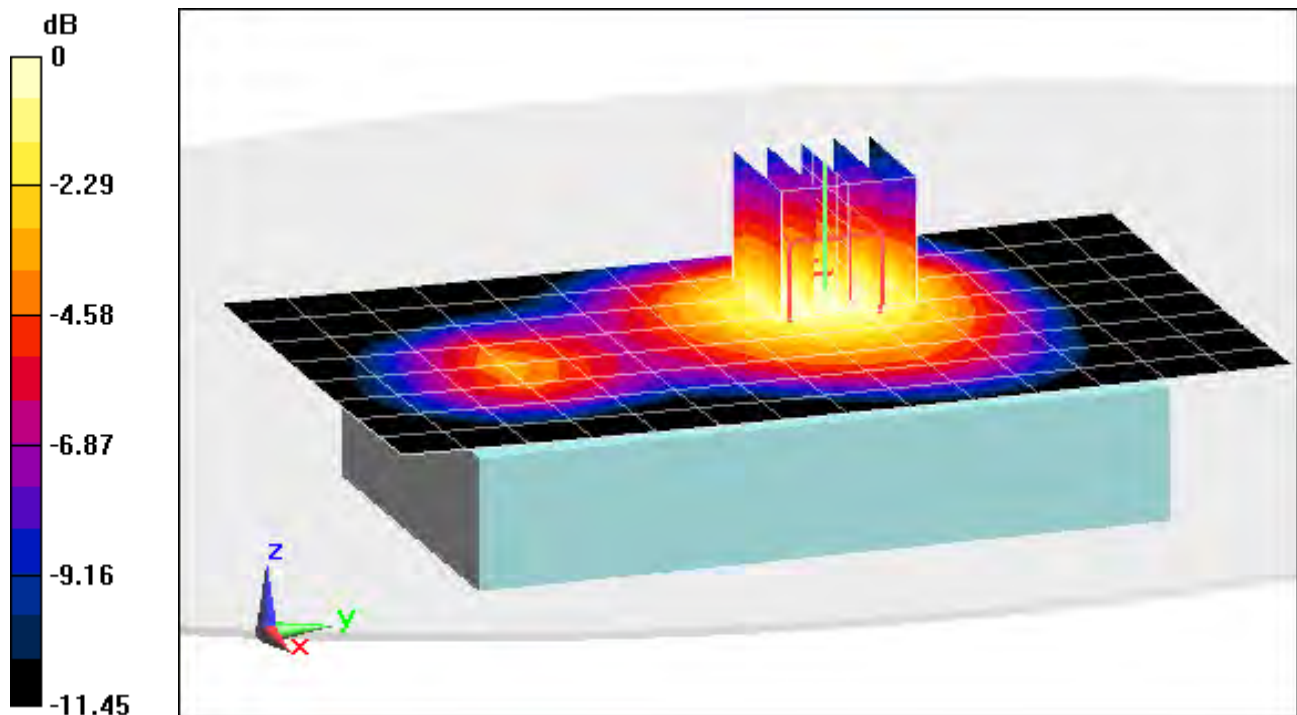
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 22.606 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.670 W/kg

SAR(10 g) = 0.332 W/kg



0 dB = 0.508 W/kg = -2.94 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#1

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

Medium: 1900 Body, Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.537 \text{ S/m}$; $\epsilon_r = 52.614$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 12-26-2013; Ambient Temp: 22.1°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3319; ConvF(4.85, 4.85, 4.85); Calibrated: 4/29/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/22/2013

Phantom: SAM front; Type: QD000P40CD; Serial: TP:1759

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

**Mode: PCS CDMA, Extremity SAR, Back Side, Mid.ch,
with Hand Strap Accessory, Top-Left**

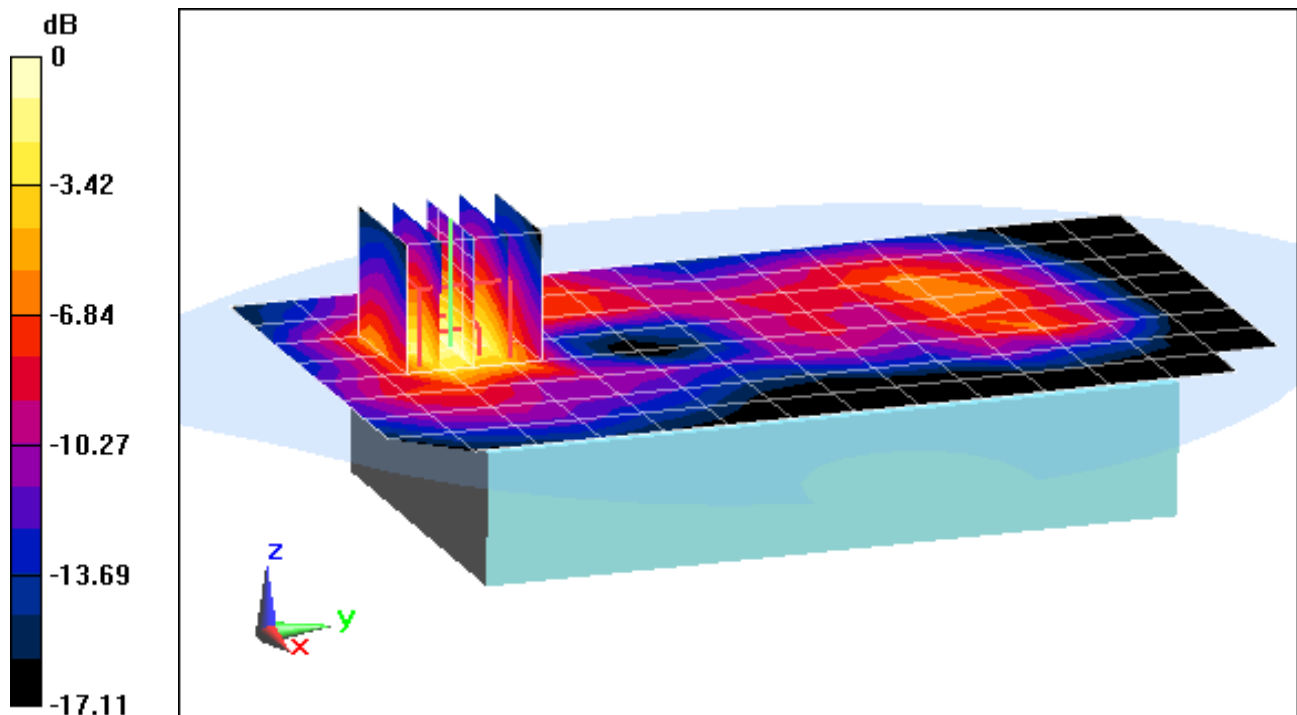
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 15.091 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.645 W/kg

SAR(10 g) = 0.199 W/kg



0 dB = 0.413 W/kg = -3.84 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#9

Communication System: UID 0, LTE Band 17; Frequency: 710 MHz; Duty Cycle: 1:1

Medium: 750 Body, Medium parameters used:

$f = 710 \text{ MHz}$; $\sigma = 0.936 \text{ S/m}$; $\epsilon_r = 55.296$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 12-26-2013; Ambient Temp: 23.9°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN3914; ConvF(9.39, 9.39, 9.39); Calibrated: 10/23/2013;

Sensor-Surface: 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: LTE Band 17, Extremity SAR, Back Side, Mid.ch, 10 MHz Bandwidth,
QPSK, 1 RB, 25 RB Offset, with Hand Strap Accessory, Top-Right**

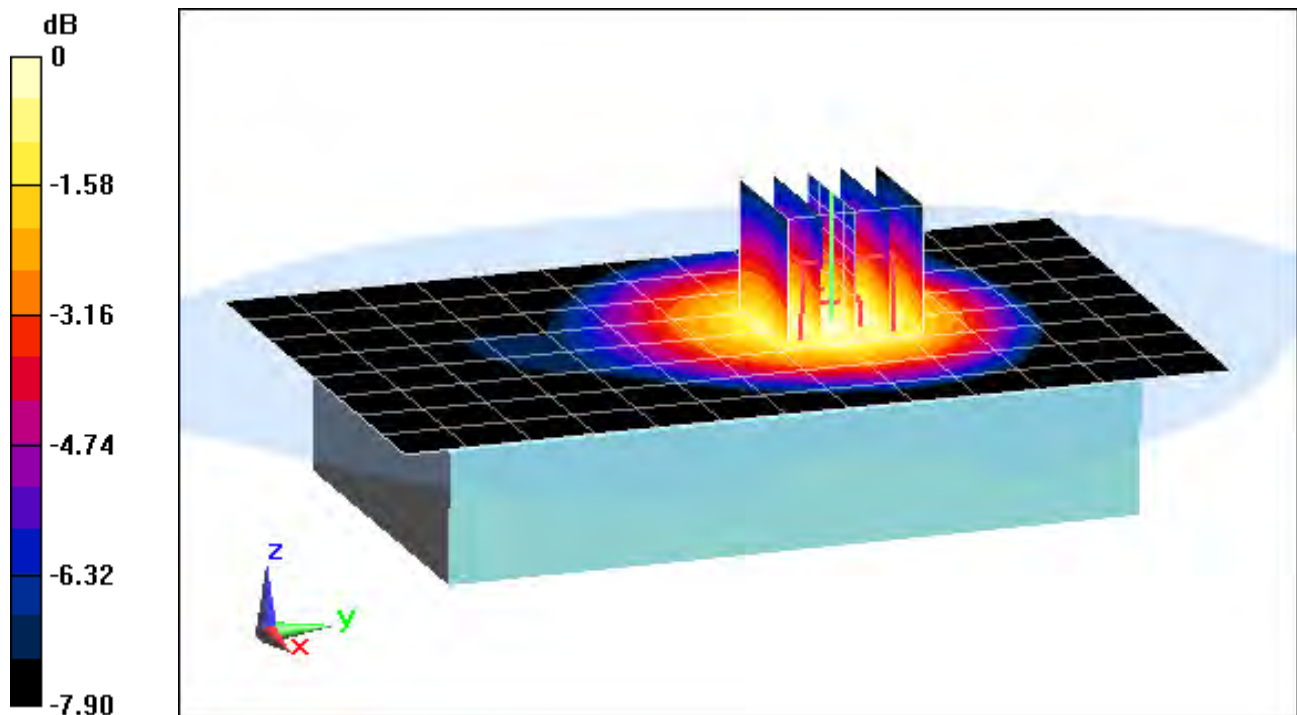
Area Scan (9x14x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 19.019 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.412 W/kg

SAR(10 g) = 0.244 W/kg



0 dB = 0.343 W/kg = -4.65 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#9

Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1

Medium: 750 Body, Medium parameters used (interpolated):

$f = 782 \text{ MHz}$; $\sigma = 1.004 \text{ S/m}$; $\epsilon_r = 54.507$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 12-26-2013; Ambient Temp: 23.9°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN3914; ConvF(9.39, 9.39, 9.39); Calibrated: 10/23/2013;

Sensor-Surface: 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: LTE Band 13, Extremity SAR, Back Side, Mid.ch, 10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset, with Hand Strap Accessory, Top-Right

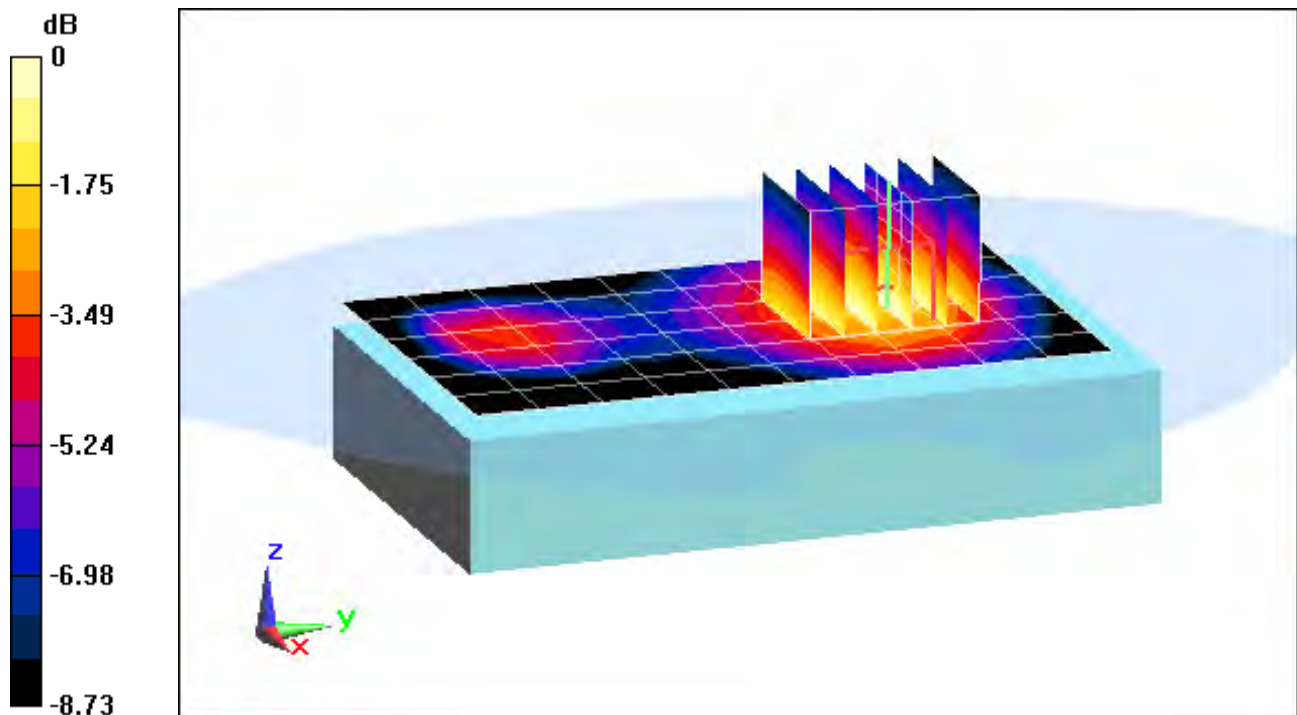
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

Zoom Scan (5x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 18.417 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.417 W/kg

SAR(10 g) = 0.248 W/kg



0 dB = 0.347 W/kg = -4.60 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#8

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

Medium: 1750 Body, Medium parameters used (interpolated):

$f = 1732.5 \text{ MHz}$; $\sigma = 1.456 \text{ S/m}$; $\epsilon_r = 52.119$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 12-23-2013; Ambient Temp: 22.6°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3318; ConvF(5.22, 5.22, 5.22); Calibrated: 6/28/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1364; Calibrated: 4/22/2013

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 4 (AWS), Extremity SAR, Back Side, Mid.ch, 10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset, with Hand Strap Accessory, Top-Right

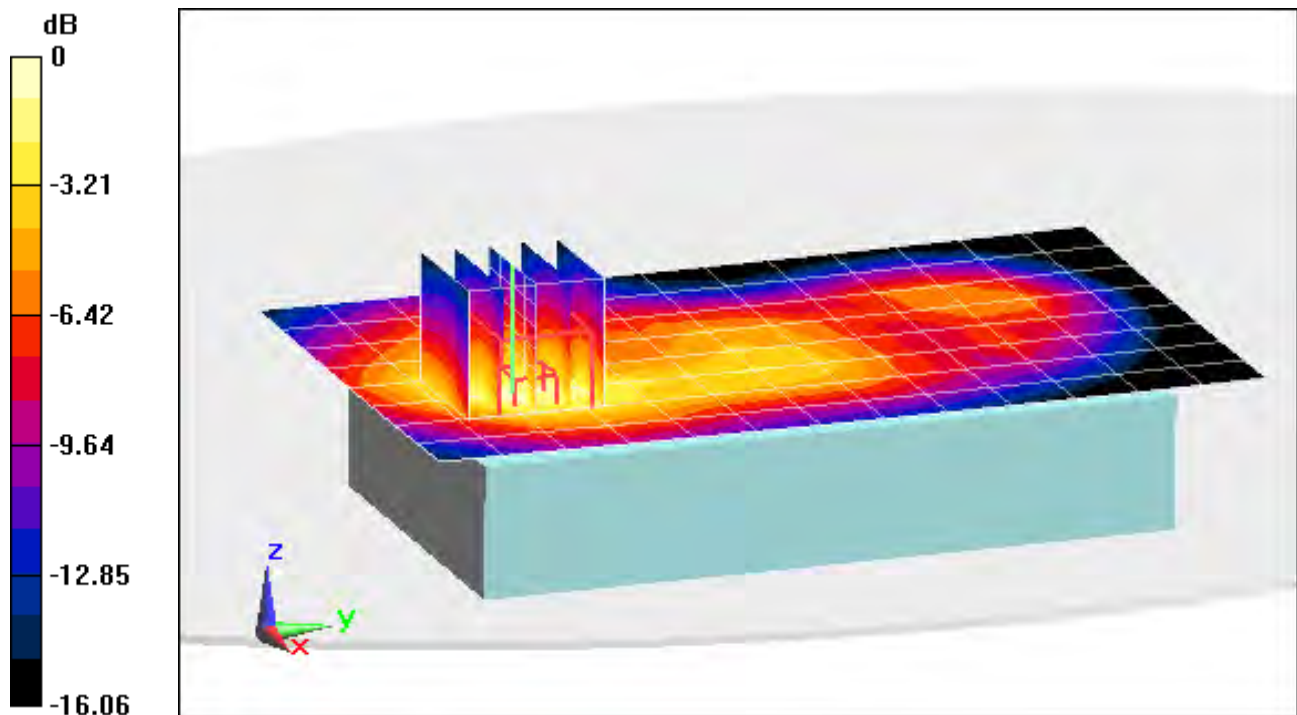
Area Scan (9x14x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 18.978 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.840 W/kg

SAR(10 g) = 0.260 W/kg



0 dB = 0.526 W/kg = -2.79 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#1

Communication System: UID 0, IEEE 802.11b; Frequency: 2462 MHz; Duty Cycle: 1:1

Medium: 2450 Body, Medium parameters used (interpolated):

$f = 2462 \text{ MHz}$; $\sigma = 2.038 \text{ S/m}$; $\epsilon_r = 51.313$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 12-30-2013; Ambient Temp: 22.3°C; Tissue Temp: 22.0°C

Probe: ES3DV2 - SN3022; ConvF(4.01, 4.01, 4.01); Calibrated: 8/22/2013;

Sensor-Surface: 3mm (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: IEEE 802.11b, Extremity SAR, Ch 11, 1 Mbps, Back Side,
with Hand Strap Accessory, Top-Left**

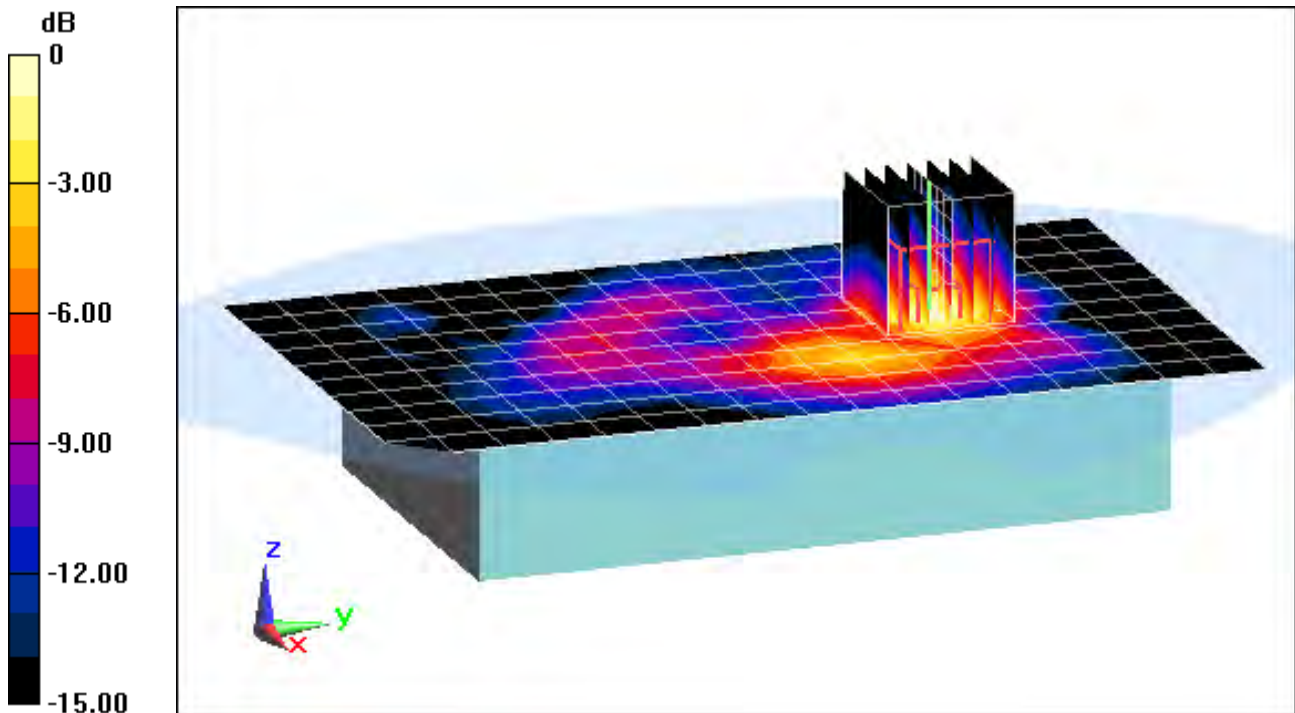
Area Scan (11x18x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 10.958 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 0.441 W/kg

SAR(10 g) = 0.116 W/kg



0 dB = 0.296 W/kg = -5.29 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#2

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

Medium: 5 GHz Body, Medium parameters used:

$f = 5765 \text{ MHz}$; $\sigma = 6.173 \text{ S/m}$; $\epsilon_r = 47.067$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 01-14-2014; Ambient Temp: 24.3°C; Tissue Temp: 23.6°C

Probe: EX3DV4 - SN3914; ConvF(4.14, 4.14, 4.14); 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, Extremity SAR, Ch 153, 6 Mbps, Back Side,
without Accessory**

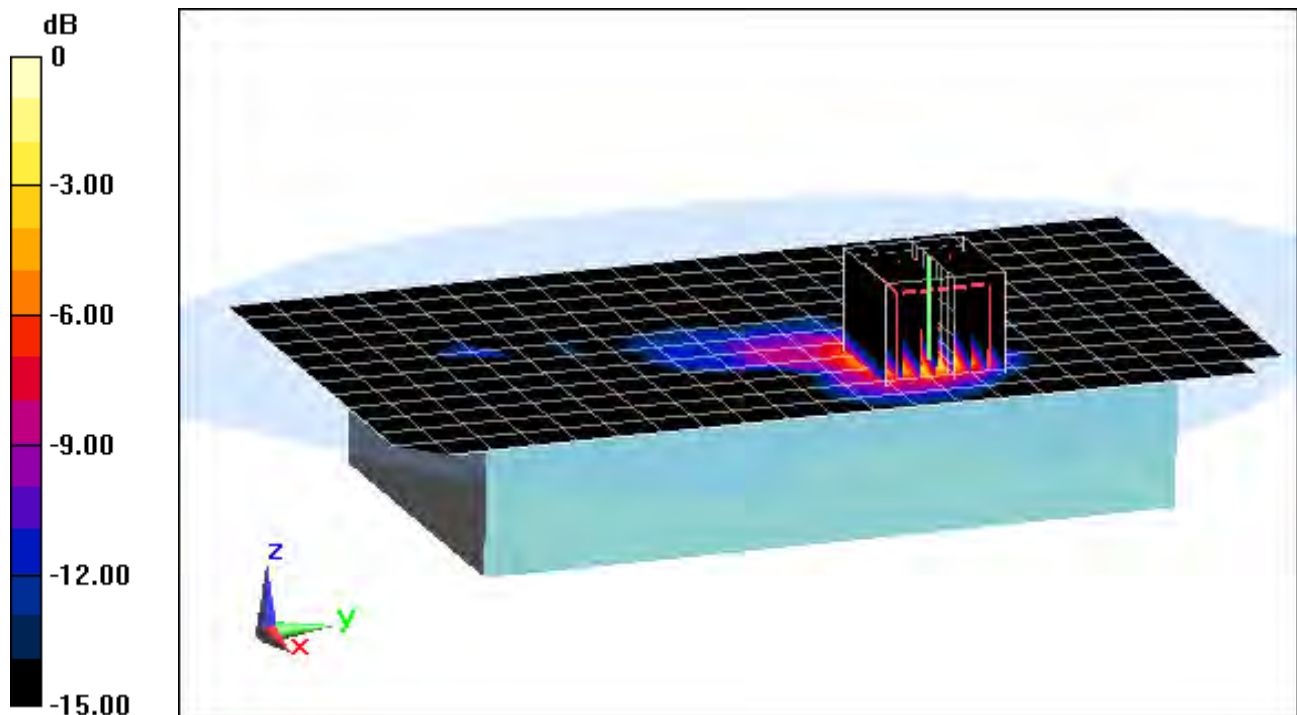
Area Scan (13x22x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 12.096 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 5.59 W/kg

SAR(10 g) = 0.364 W/kg



0 dB = 3.05 W/kg = 4.84 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ACJEB3910A; Type: Portable Handset; Serial: SAR#2

Communication System: UID 0, IEEE 802.11a; Frequency: 5240 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body, Medium parameters used:

$f = 5240 \text{ MHz}$; $\sigma = 5.381 \text{ S/m}$; $\epsilon_r = 48.283$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 01-14-2014; Ambient Temp: 24.4°C; Tissue Temp: 23.7°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, 5.2 GHz, Extremity SAR, Ch 48, 6 Mbps, Back Side,
without Accessory**

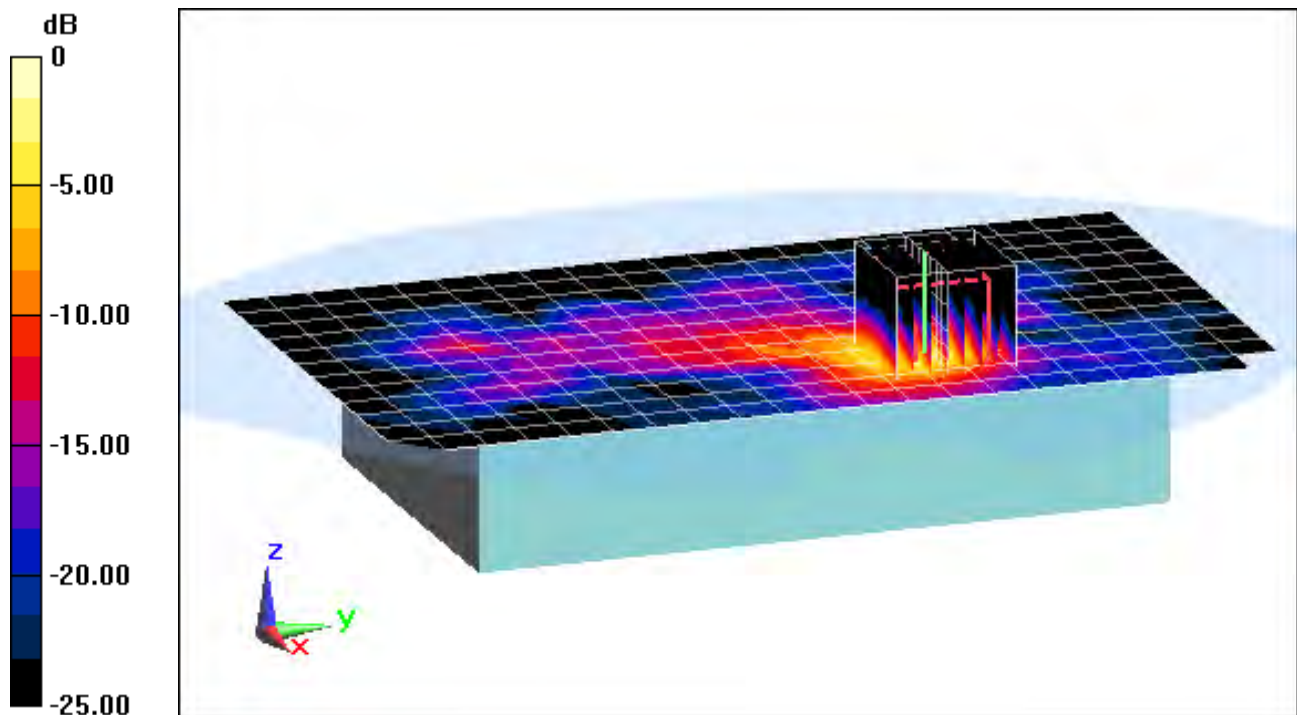
Area Scan (13x22x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 15.760 V/m; Power Drift = -0.19 dB

Peak SAR (extrapolated) = 6.70 W/kg

SAR(10 g) = 0.531 W/kg



0 dB = 3.95 W/kg = 5.97 dBW/kg

APPENDIX B: SYSTEM VERIFICATION

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 750 Head, Medium parameters used (interpolated):

$f = 750 \text{ MHz}$; $\sigma = 0.913 \text{ S/m}$; $\epsilon_r = 41.97$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-27-2013; Ambient Temp: 20.7°C; Tissue Temp: 20.7°C

Probe: ES3DV3 - SN3263; ConvF(6.51, 6.51, 6.51); Calibrated: 5/16/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn859; Calibrated: 5/13/2013

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

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

750 MHz System Verification

Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm

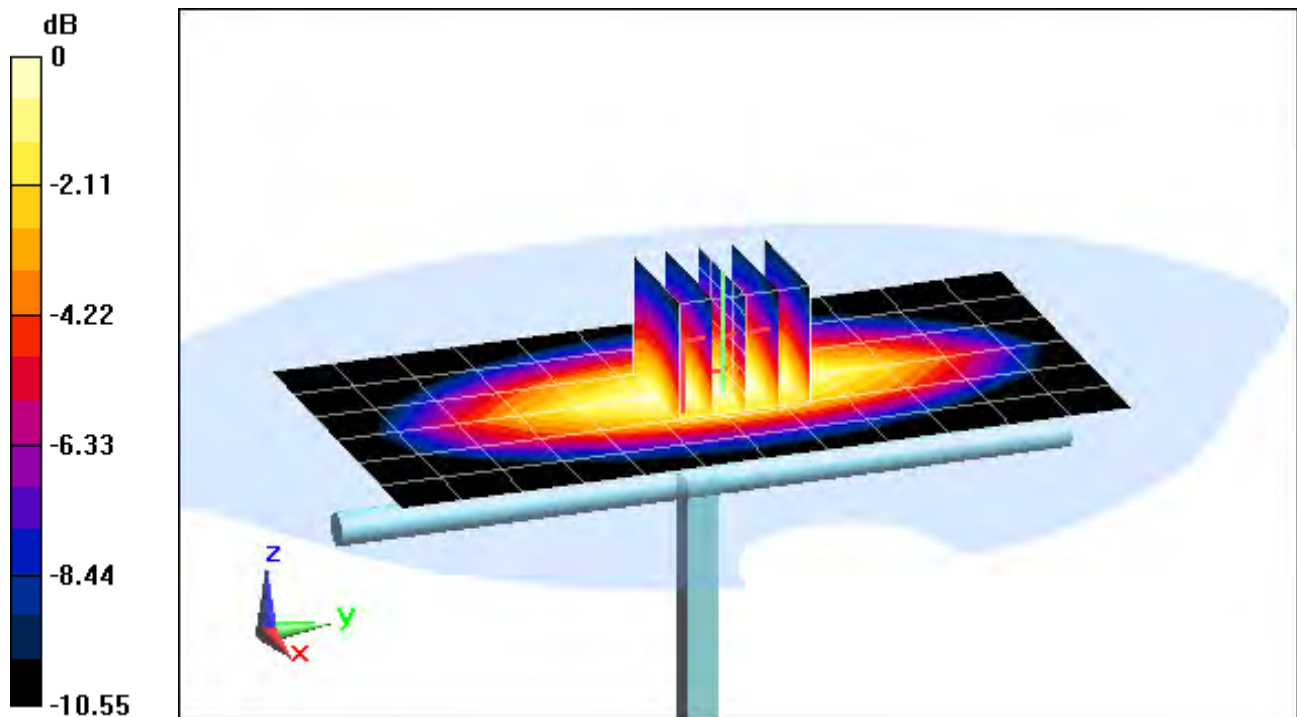
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.23 W/kg

SAR(1 g) = 0.830 W/kg

Deviation (1 g) = -2.35%



0 dB = 0.888 W/kg = -0.52 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 750 Head, Medium parameters used (interpolated):

$f = 750 \text{ MHz}$; $\sigma = 0.907 \text{ S/m}$; $\epsilon_r = 40.671$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-30-2013; Ambient Temp: 23.3°C; Tissue Temp: 21.4°C

Probe: EX3DV4 - SN3914; ConvF(9.7, 9.7, 9.7); Calibrated: 10/23/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

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

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

750 MHz System Verification

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

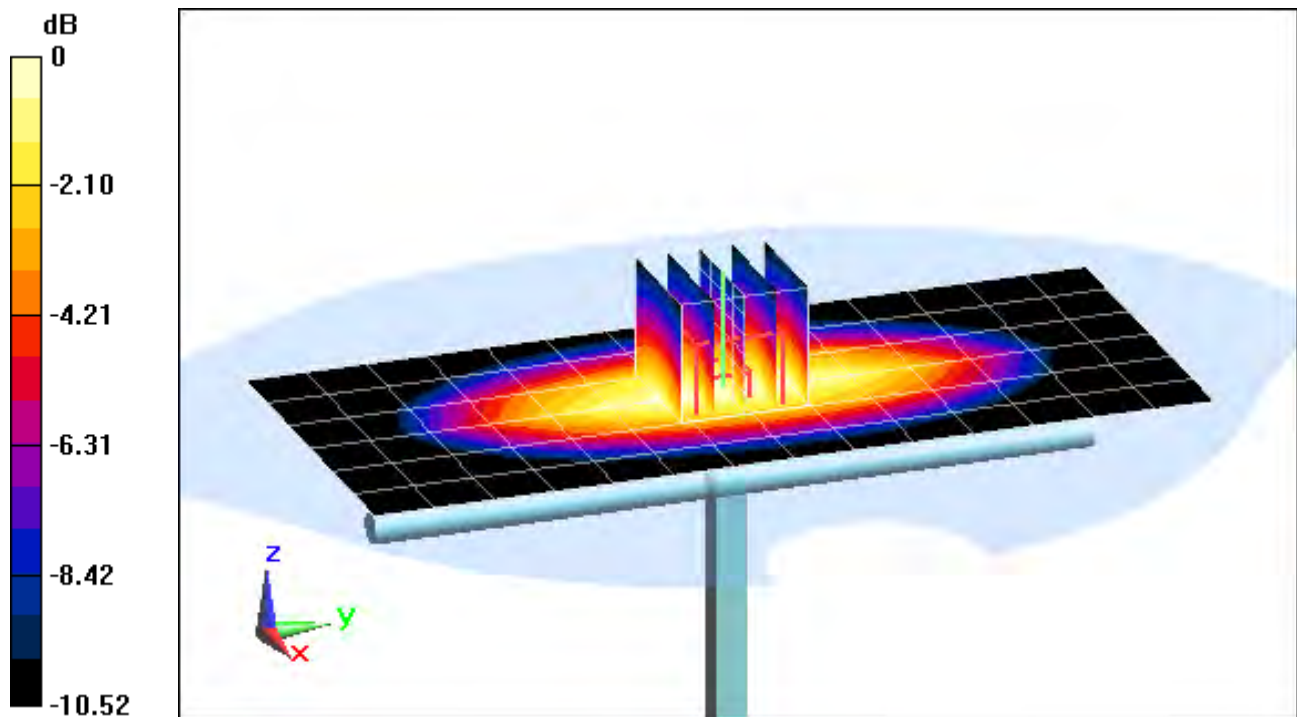
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.23 W/kg

SAR(1 g) = 0.824 W/kg

Deviation (1 g) = -2.60%



0 dB = 0.890 W/kg = -0.51 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 Head, Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 0.921 \text{ S/m}$; $\epsilon_r = 41.616$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-23-2013; Ambient Temp: 21.3°C; Tissue Temp: 22.3°C

Probe: ES3DV2 - SN3022; ConvF(6.09, 6.09, 6.09); Calibrated: 8/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

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

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

835 MHz System Verification

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

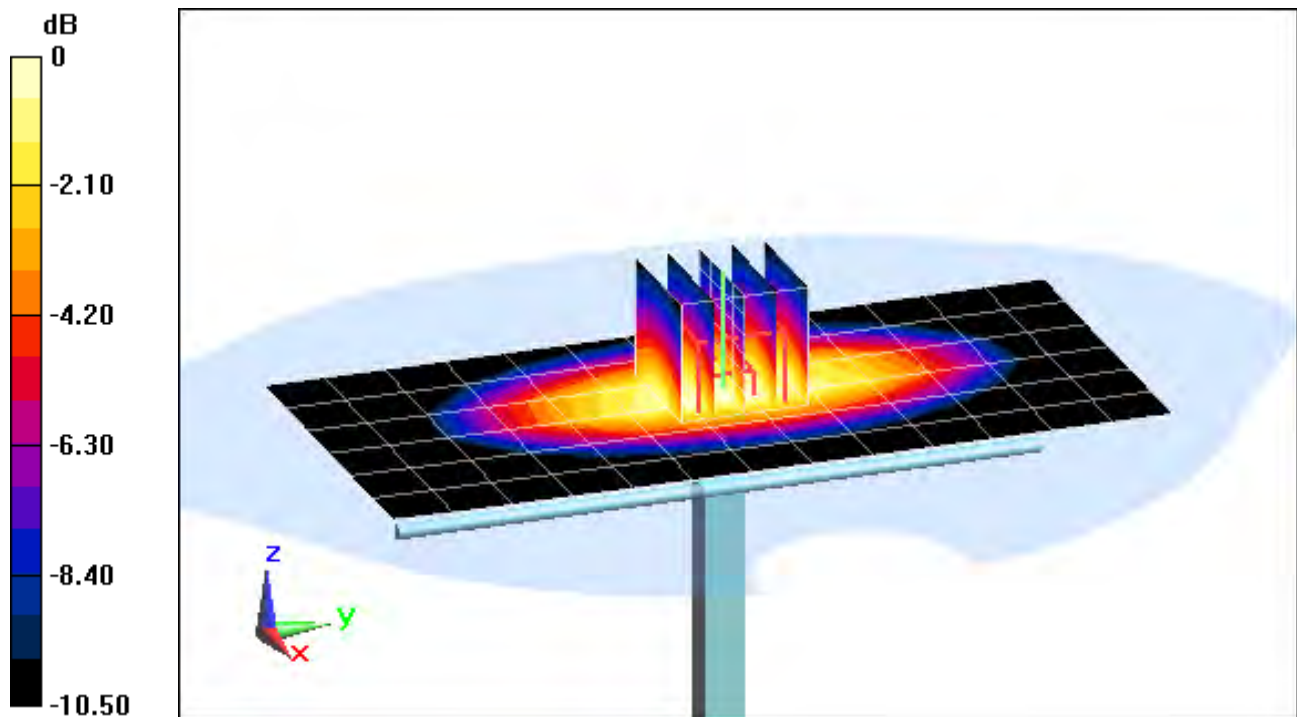
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.39 W/kg

SAR(1 g) = 0.954 W/kg

Deviation (1 g) = -1.45%



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1750 MHz; Type: D1765V2; Serial: 1008

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

Medium: 1750 Head, Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.413 \text{ S/m}$; $\epsilon_r = 40.355$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-26-2013; Ambient Temp: 23.7°C; Tissue Temp: 22.8°C

Probe: ES3DV3 - SN3288; ConvF(5.67, 5.67, 5.67); Calibrated: 9/23/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/17/2013

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

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

1750 MHz System Verification

Area Scan (6x8x1): Measurement grid: dx=15mm, dy=15mm

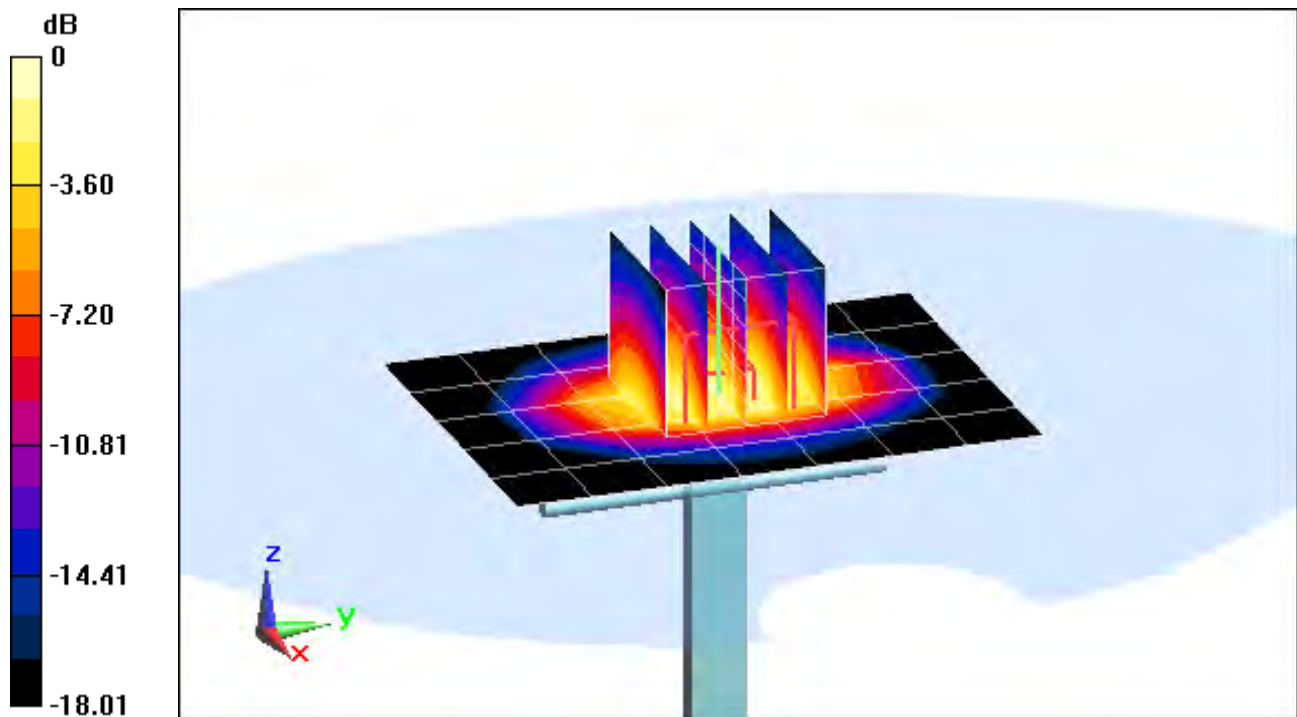
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 6.70 W/kg

SAR(1 g) = 3.61 W/kg

Deviation (1 g) = -1.90%



0 dB = 4.04 W/kg = 6.06 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d148

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

Medium: 1900 Head, Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.452 \text{ S/m}$; $\epsilon_r = 40.049$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-21-2013; Ambient Temp: 23.3°C; Tissue Temp: 22.7°C

Probe: ES3DV3 - SN3209; ConvF(5.21, 5.21, 5.21); Calibrated: 3/15/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/8/2013

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: $dx=15\text{mm}$, $dy=15\text{mm}$

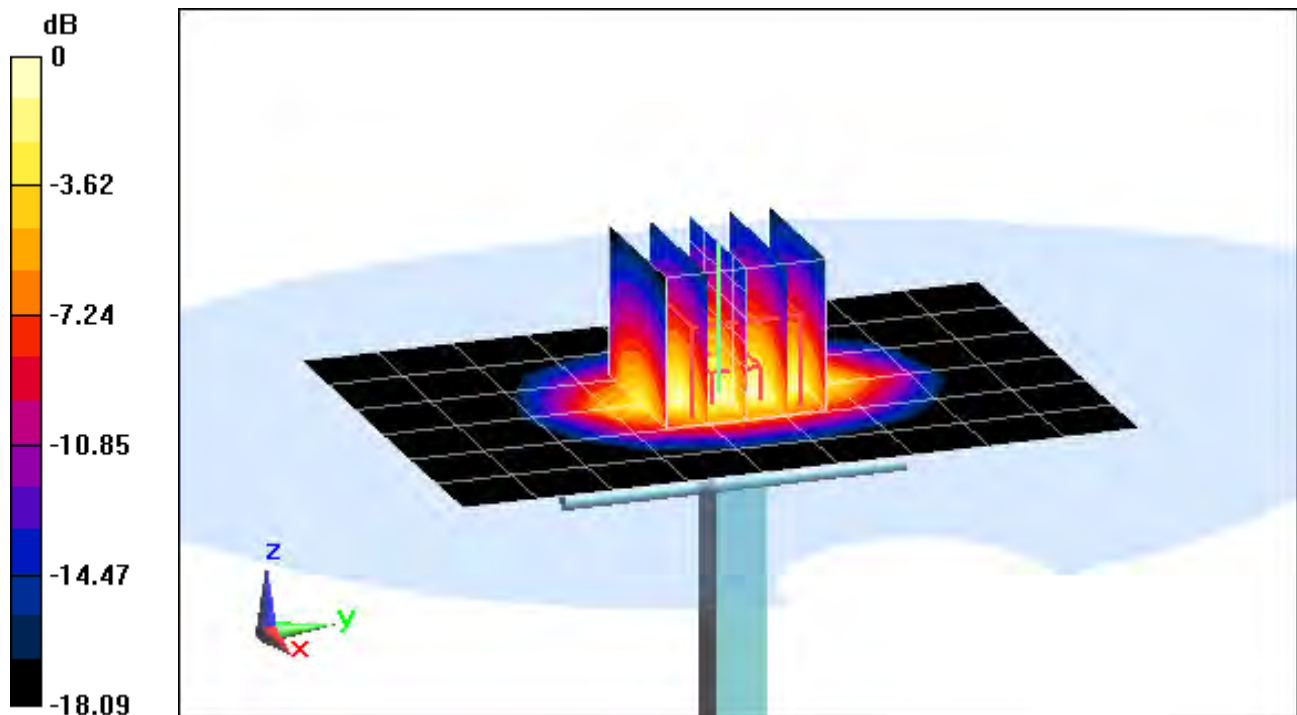
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 7.45 W/kg

SAR(1 g) = 4.02 W/kg

Deviation (1 g) = 1.26%



0 dB = 4.49 W/kg = 6.52 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 797

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

Medium: 2450 Head, Medium parameters used:

$f = 2450 \text{ MHz}$; $\sigma = 1.819 \text{ S/m}$; $\epsilon_r = 38.563$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-27-2013; Ambient Temp: 24.5°C; Tissue Temp: 23.5°C

Probe: EX3DV4 - SN3914; ConvF(6.95, 6.95, 6.95); Calibrated: 10/23/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

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

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

2450 MHz System Verification

Area Scan (9x10x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

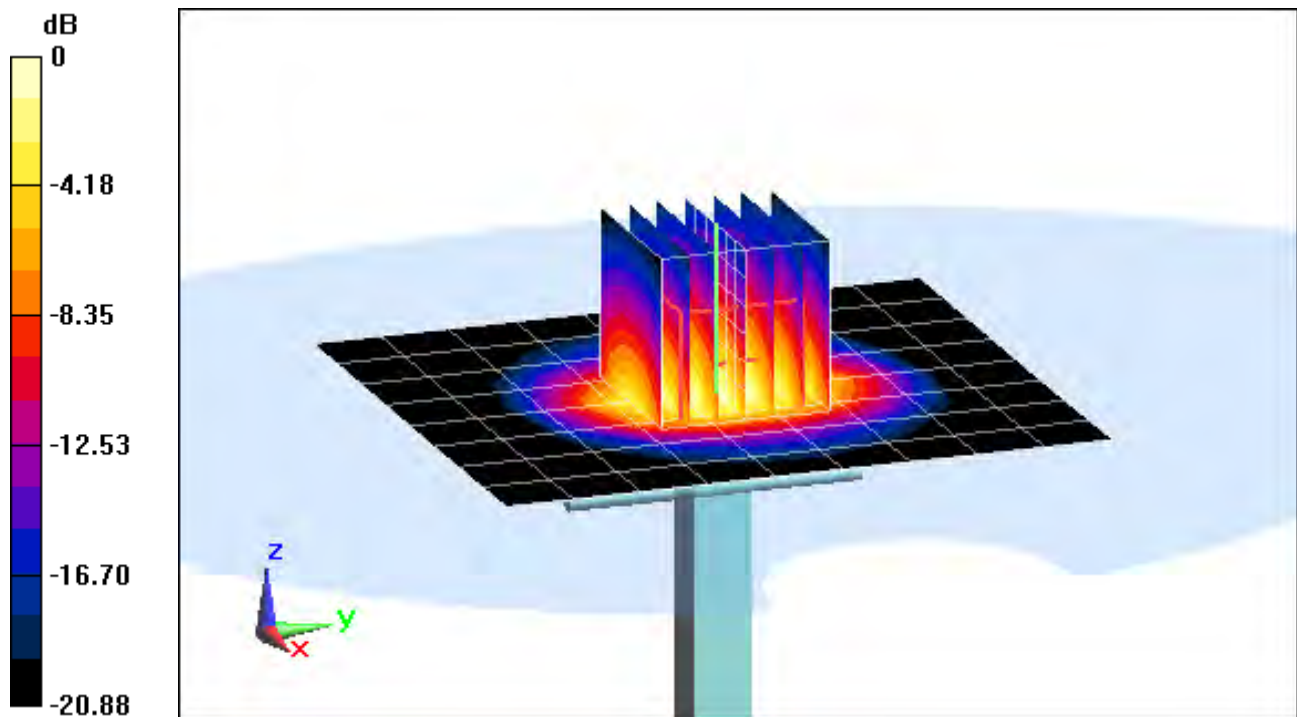
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 10.8 W/kg

SAR(1 g) = 5.34 W/kg

Deviation (1 g) = 1.71%



0 dB = 7.01 W/kg = 8.46 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5200 MHz; Type: D5GHzV2; Serial: 1120

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

Medium: 5 GHz Head, Medium parameters used:

$f = 5200 \text{ MHz}$; $\sigma = 4.57 \text{ S/m}$; $\epsilon_r = 35.953$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-07-2014; Ambient Temp: 24.1°C; Tissue Temp: 23.0°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: $dx=10\text{mm}$, $dy=10\text{mm}$

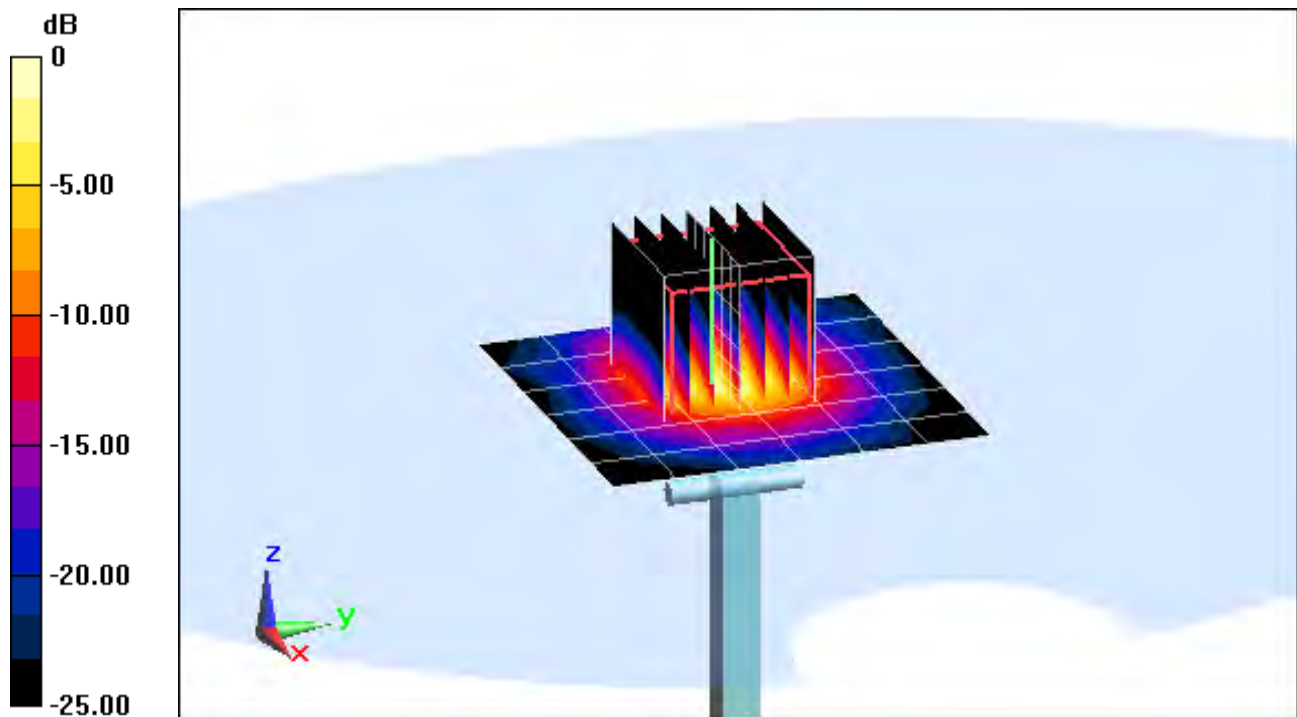
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Input Power = 16.0 dBm (40 mW)

Peak SAR (extrapolated) = 11.7 W/kg

SAR(1 g) = 2.85 W/kg

Deviation (1 g) = -6.25%



0 dB = 6.62 W/kg = 8.21 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5300 MHz; Type: D5GHzV2; Serial: 1120

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

Medium: 5 GHz Head, Medium parameters used:

$f = 5300 \text{ MHz}$; $\sigma = 4.684 \text{ S/m}$; $\epsilon_r = 35.85$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-07-2014; Ambient Temp: 24.1°C; Tissue Temp: 23.1°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: $dx=10\text{mm}$, $dy=10\text{mm}$

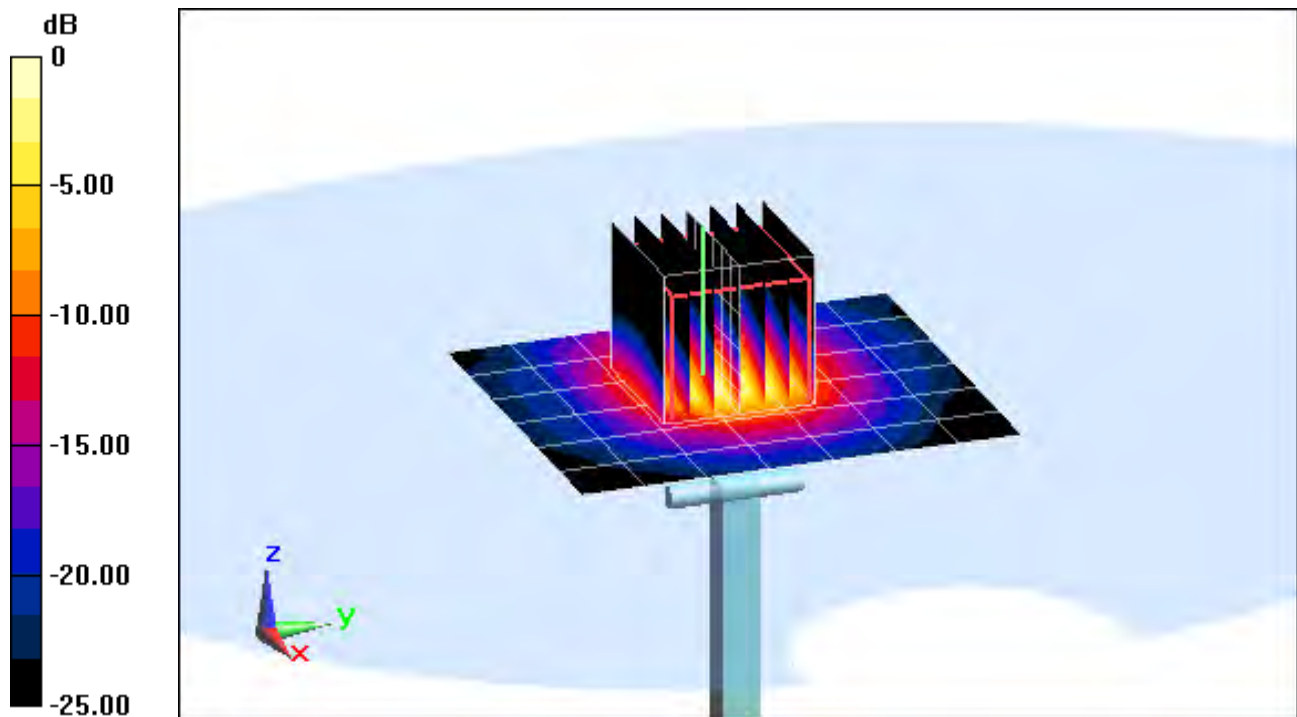
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Input Power = 16.0 dBm (40 mW)

Peak SAR (extrapolated) = 13.2 W/kg

SAR(1 g) = 3.11 W/kg

Deviation (1 g) = -1.21%



0 dB = 6.03 W/kg = 7.80 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5500 MHz; Type: D5GHzV2; Serial: 1120

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

Medium: 5 GHz Head, Medium parameters used:

$f = 5500 \text{ MHz}$; $\sigma = 4.893 \text{ S/m}$; $\epsilon_r = 35.563$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-07-2014; Ambient Temp: 24.0°C; Tissue Temp: 23.0°C

Probe: EX3DV4 - SN3914; ConvF(4.55, 4.55, 4.55); 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)

5500 MHz System Verification

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

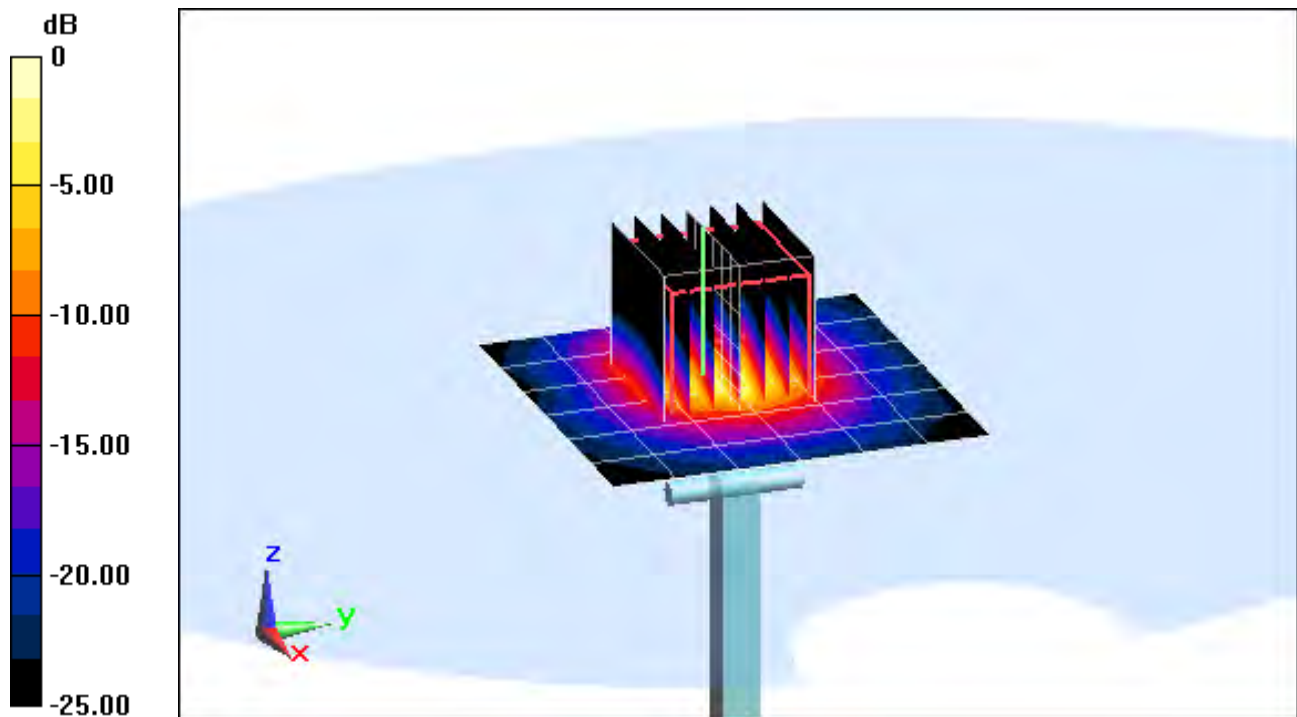
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power = 16.0 dBm (40 mW)

Peak SAR (extrapolated) = 13.6 W/kg

SAR(1 g) = 3.13 W/kg

Deviation (1 g) = -2.31%



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5600 MHz; Type: D5GHzV2; Serial: 1120

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

Medium: 5 GHz Head, Medium parameters used:

$f = 5600 \text{ MHz}$; $\sigma = 4.995 \text{ S/m}$; $\epsilon_r = 35.4$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-07-2014; Ambient Temp: 24.1°C; Tissue Temp: 23.2°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=10mm, dy=10mm

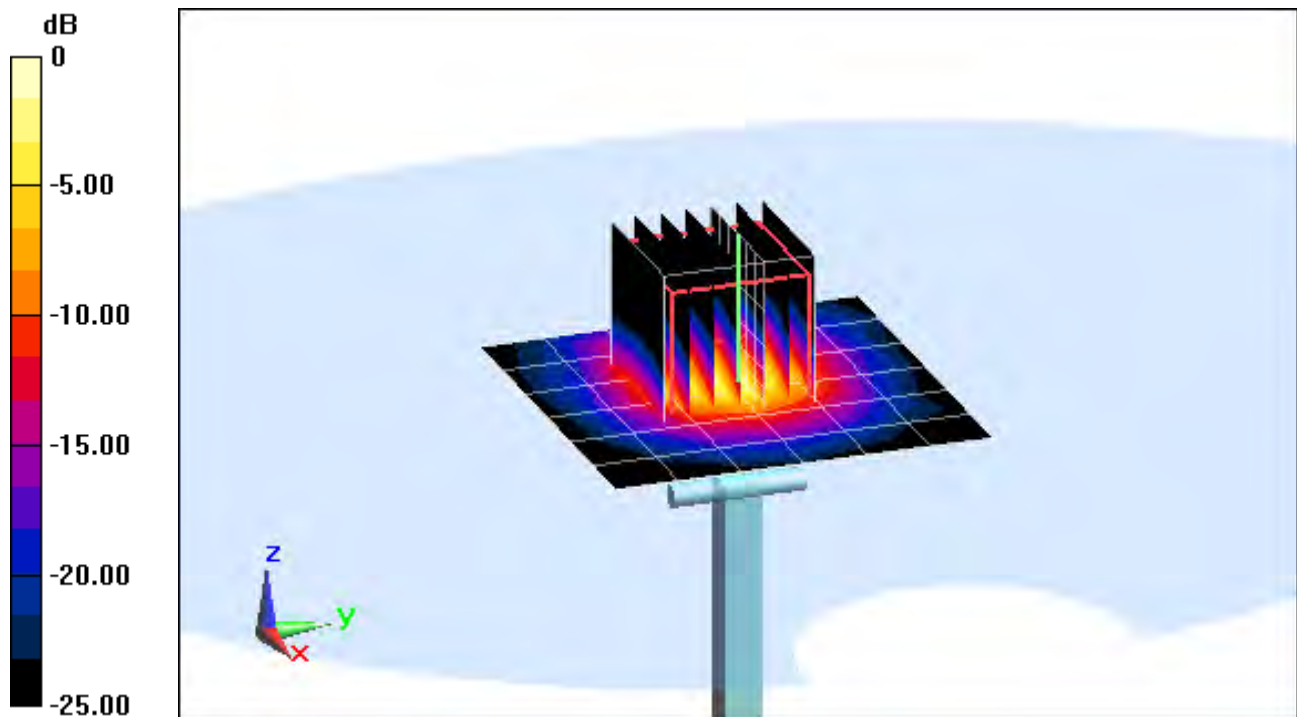
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power = 16.0 dBm (40 mW)

Peak SAR (extrapolated) = 14.6 W/kg

SAR(1 g) = 3.29 W/kg

Deviation (1 g) = 2.94%



0 dB = 7.95 W/kg = 9.00 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5800 MHz; Type: D5GHzV2; Serial: 1120

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

Medium: 5 GHz Head, Medium parameters used:

$f = 5800 \text{ MHz}$; $\sigma = 5.207 \text{ S/m}$; $\epsilon_r = 35.157$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-07-2014; Ambient Temp: 24.0°C; Tissue Temp: 23.2°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

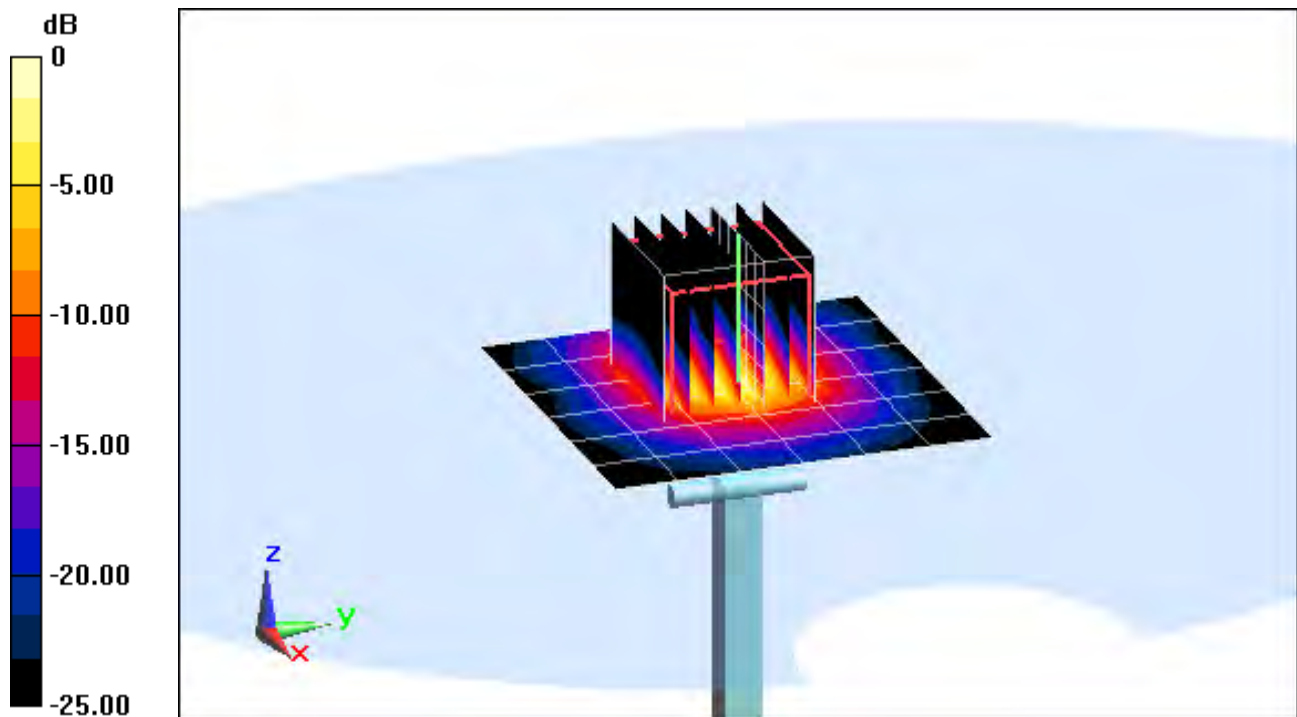
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power = 16.0 dBm (40 mW)

Peak SAR (extrapolated) = 14.3 W/kg

SAR(1 g) = 3.06 W/kg

Deviation (1 g) = 2.14%



0 dB = 7.50 W/kg = 8.75 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 750 Body, Medium parameters used (interpolated):

$f = 750 \text{ MHz}$; $\sigma = 0.974 \text{ S/m}$; $\epsilon_r = 54.86$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-26-2013; Ambient Temp: 23.9°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN3914; ConvF(9.39, 9.39, 9.39); Calibrated: 10/23/2013;

Sensor-Surface: 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)

750 MHz System Verification

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

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

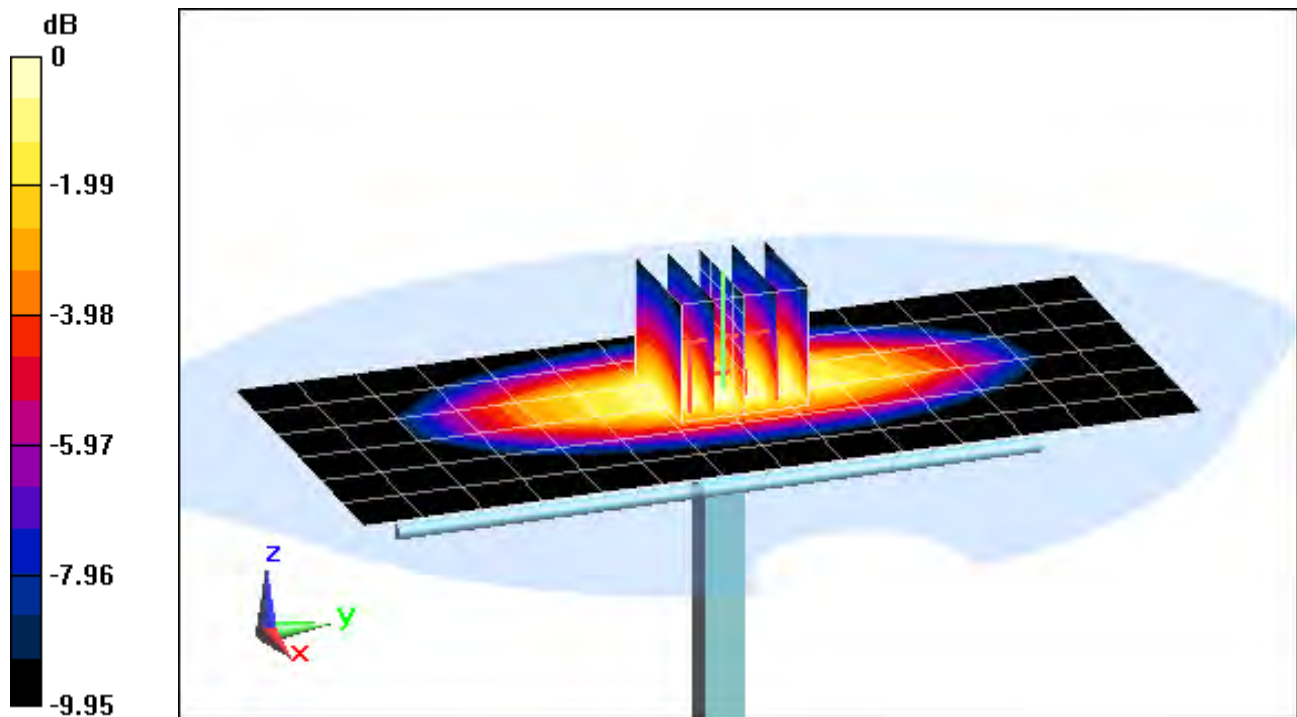
Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.30 W/kg

SAR(1 g) = 0.882 W/kg; SAR(10 g) = 0.587 W/kg

Deviation (1 g) = -0.11%

Deviation (10 g) = 0.00%



0 dB = 0.950 W/kg = -0.22 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:

$f = 835 \text{ MHz}$; $\sigma = 1.008 \text{ S/m}$; $\epsilon_r = 53.962$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-26-2013; Ambient Temp: 22.3°C; Tissue Temp: 20.5°C

Probe: ES3DV3 - SN3333; ConvF(6.07, 6.07, 6.07); Calibrated: 11/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

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

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: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

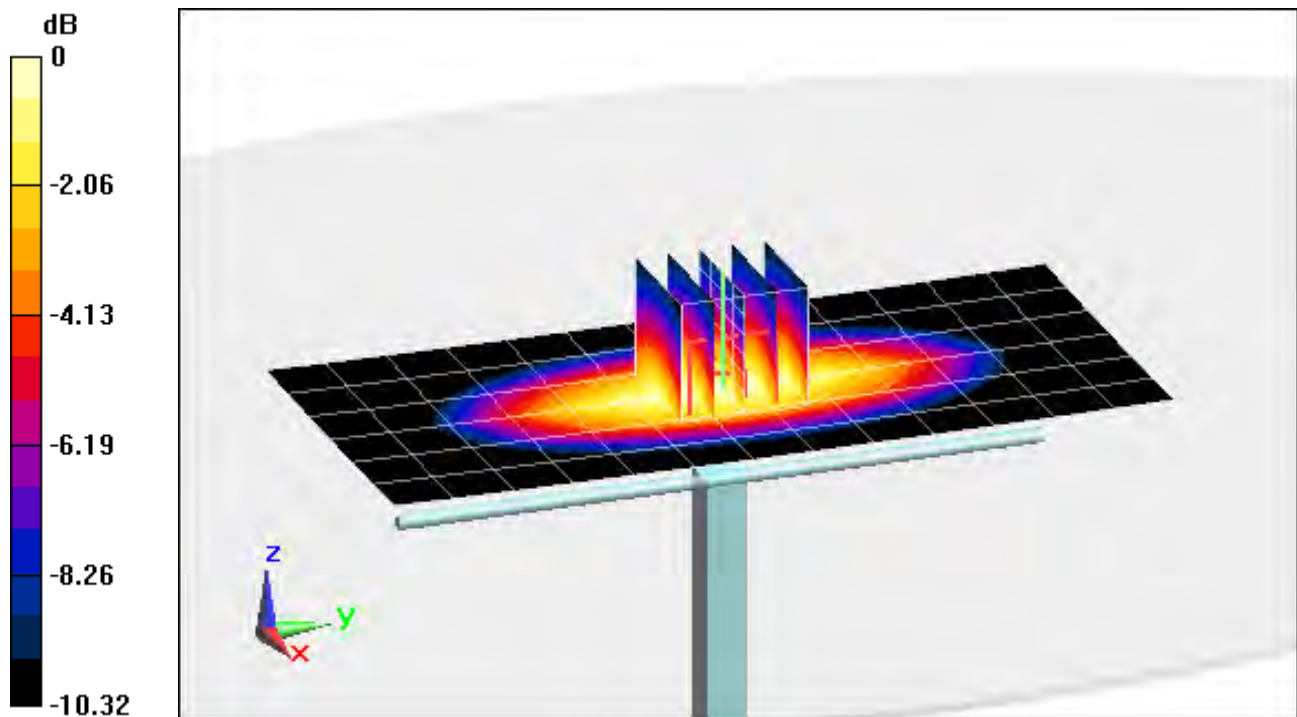
Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.49 W/kg

SAR(1 g) = 1.02 W/kg; SAR(10 g) = 0.669 W/kg

Deviation (1 g) = 6.92%

Deviation (10 g) = 6.02%



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

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 1750 Body, Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.473 \text{ S/m}$; $\epsilon_r = 52.026$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-23-2013; Ambient Temp: 22.6°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3318; ConvF(5.22, 5.22, 5.22); Calibrated: 6/19/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1364; Calibrated: 4/22/2013

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

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

1750 MHz System Verification

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

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

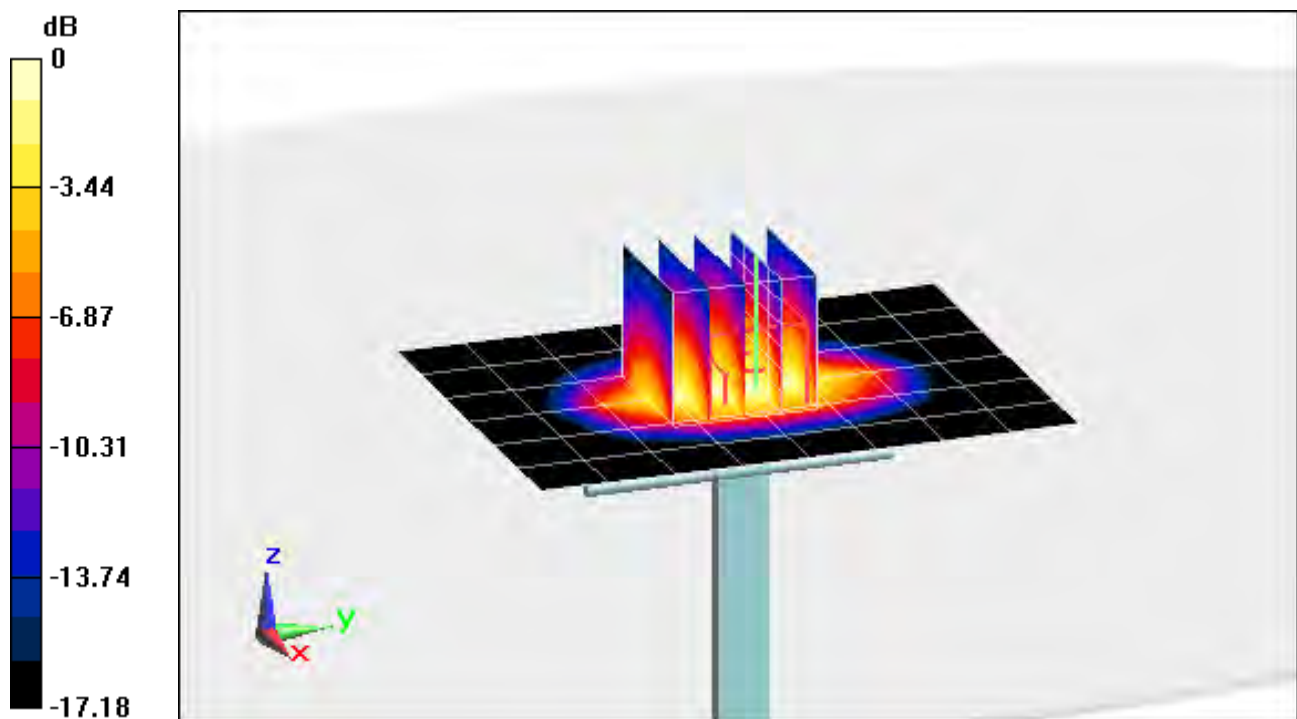
Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 6.80 W/kg

SAR(1 g) = 3.58 W/kg; SAR(10 g) = 1.89 W/kg

Deviation (1 g) = -5.29%

Deviation (10 g) = -7.35%



0 dB = 3.92 W/kg = 5.93 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d148

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

Medium: 1900 Body, Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.558 \text{ S/m}$; $\epsilon_r = 52.539$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-26-2013; Ambient Temp: 22.1°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3319; ConvF(4.85, 4.85, 4.85); Calibrated: 4/29/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/22/2013

Phantom: SAM front; Type: QD000P40CD; Serial: TP:1759

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: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

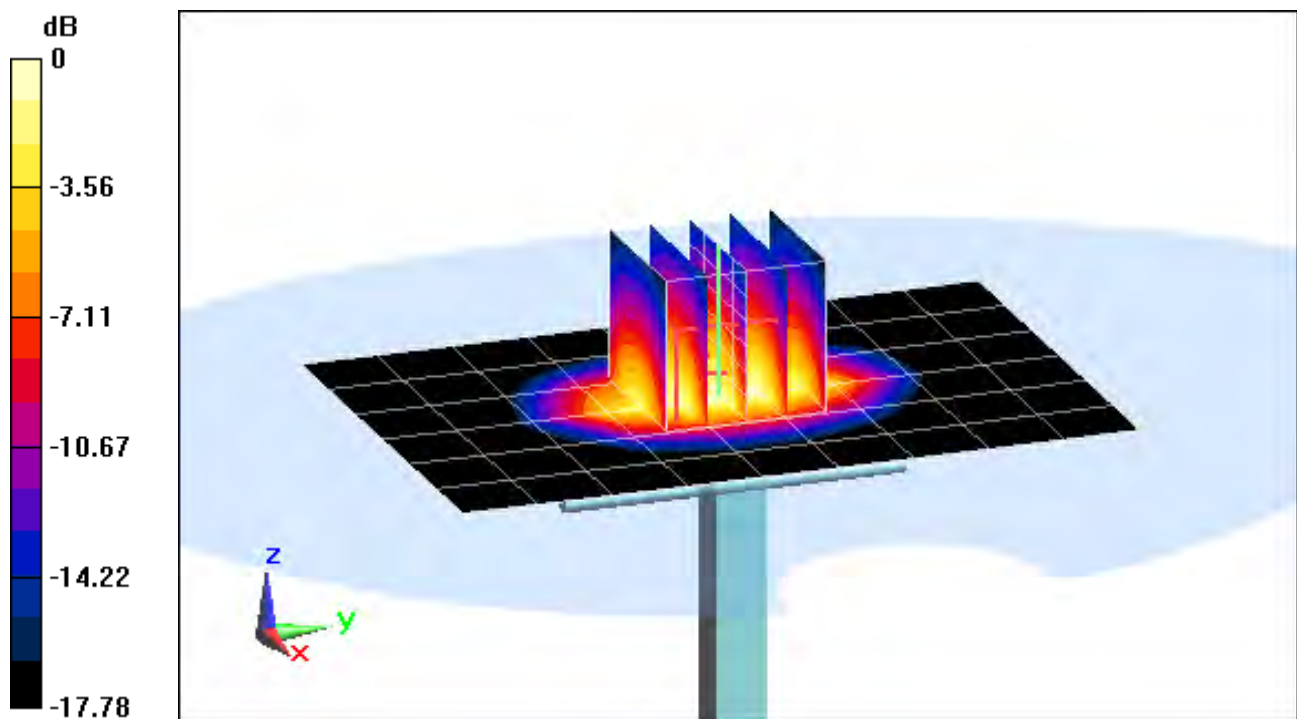
Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 7.12 W/kg

SAR(1 g) = 3.93 W/kg; SAR(10 g) = 2.03 W/kg

Deviation (1 g) = -3.68%

Deviation (10 g) = -6.45%



0 dB = 4.44 W/kg = 6.47 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 797

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

Medium: 2450 Body, Medium parameters used:

$f = 2450 \text{ MHz}$; $\sigma = 2.022 \text{ S/m}$; $\epsilon_r = 51.357$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-30-2013; Ambient Temp: 22.3°C; Tissue Temp: 22.0°C

Probe: ES3DV2 - SN3022; ConvF(4.01, 4.01, 4.01); Calibrated: 8/22/2013;

Sensor-Surface: 3mm (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)

2450 MHz System Verification

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

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

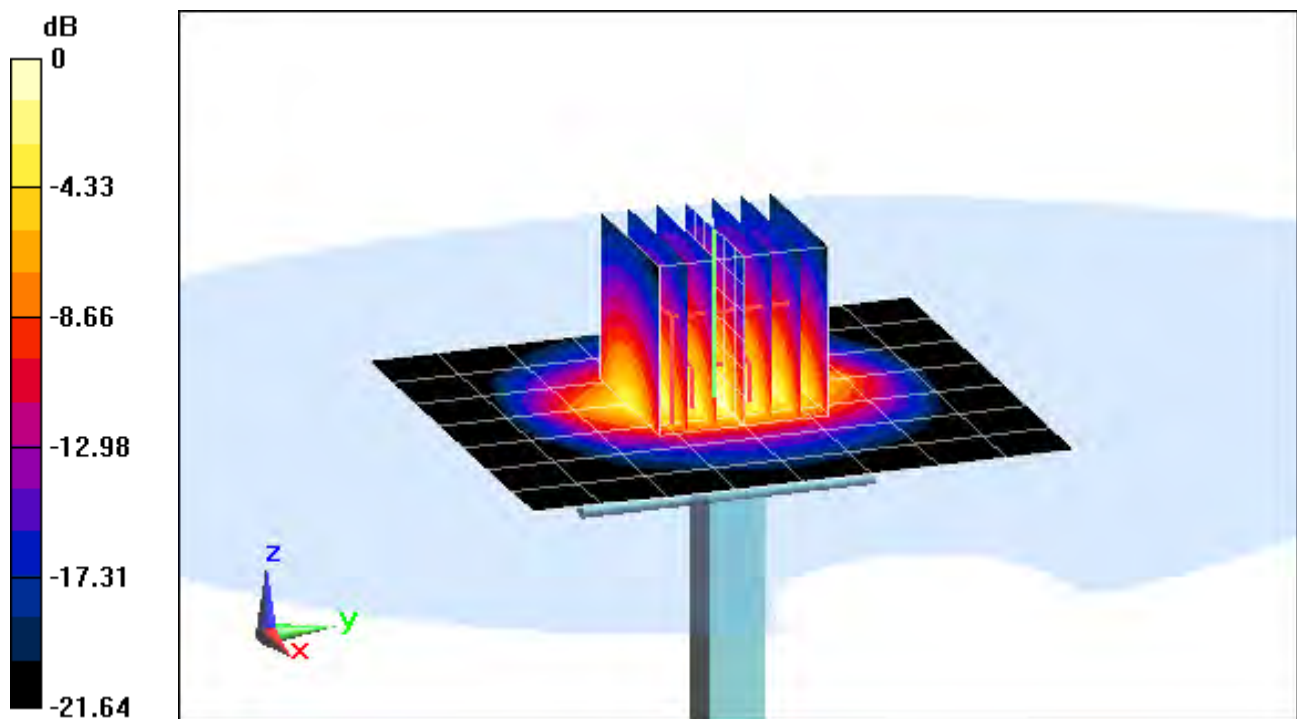
Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 10.9 W/kg

SAR(1 g) = 5.15 W/kg; SAR(10 g) = 2.38 W/kg

Deviation (1 g) = 3.83%

Deviation (10 g) = 2.59%



0 dB = 6.70 W/kg = 8.26 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 2450 Body, Medium parameters used:

$f = 2450 \text{ MHz}$; $\sigma = 1.989 \text{ S/m}$; $\epsilon_r = 51.353$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-21-2014; Ambient Temp: 23.9°C; Tissue Temp: 23.1°C

Probe: ES3DV2 - SN3022; ConvF(4.01, 4.01, 4.01); Calibrated: 8/22/2013;

Sensor-Surface: 3mm (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)

2450 MHz System Verification

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

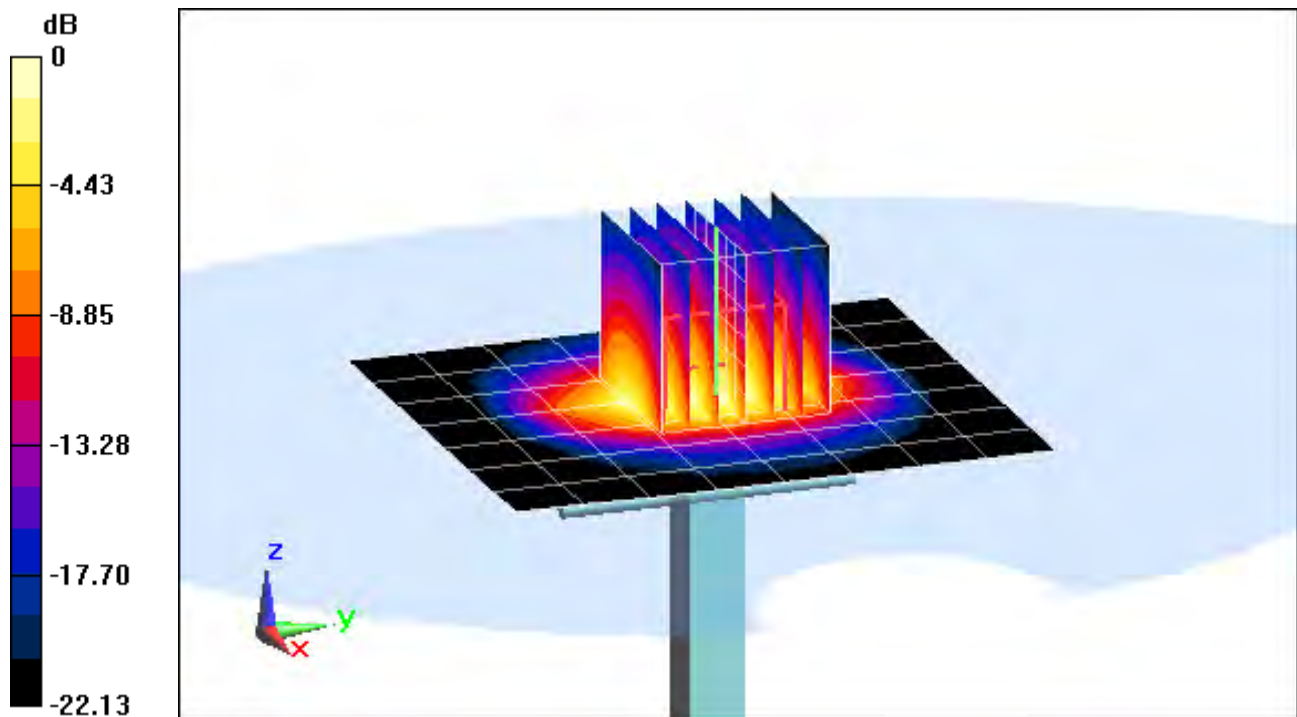
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Input Power = 16.0 dBm (40 mW)

Peak SAR (extrapolated) = 4.34 W/kg

SAR(1 g) = 2.05 W/kg

Deviation (1 g) = -0.87%



0 dB = 2.66 W/kg = 4.25 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5200 MHz; Type: D5GHzV2; Serial: 1120

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

Medium: 5 GHz Body, Medium parameters used:

$f = 5200 \text{ MHz}$; $\sigma = 5.31 \text{ S/m}$; $\epsilon_r = 48.45$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-14-2014; Ambient Temp: 24.4°C; Tissue Temp: 23.7°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)

5200 MHz System Verification

Area Scan (7x8x1): 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

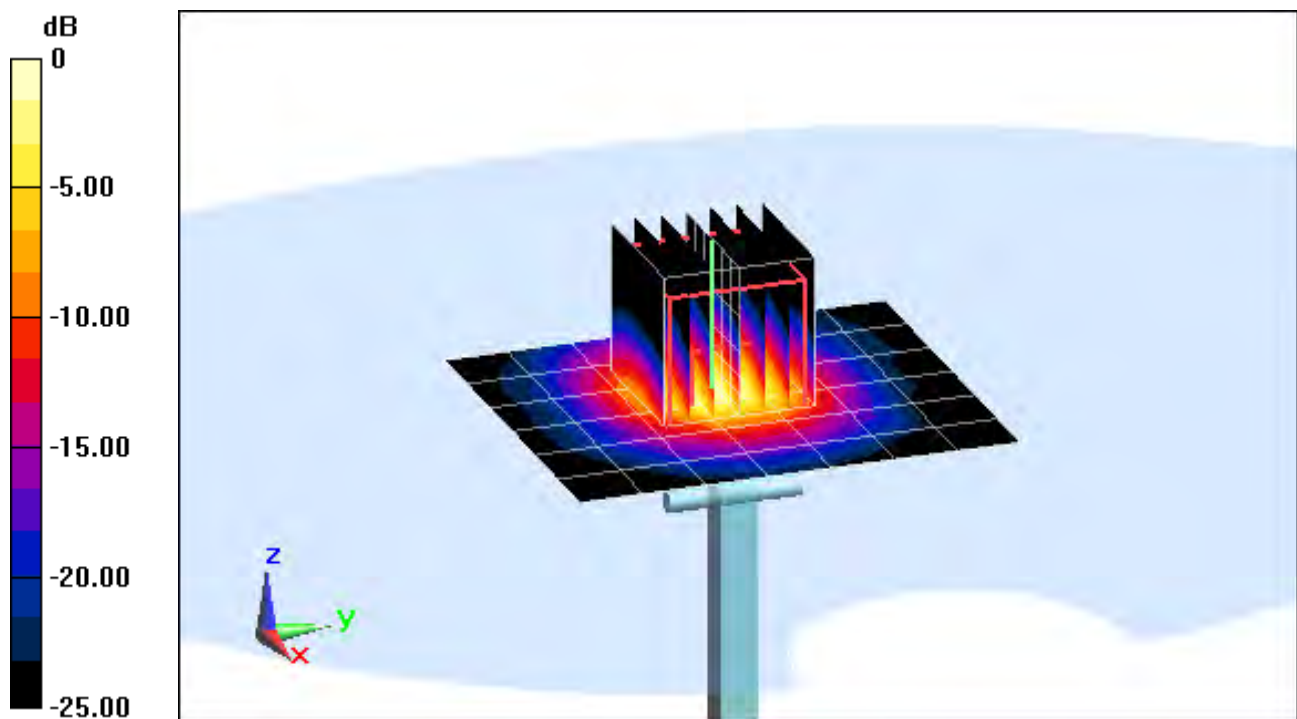
Input Power = 16.0 dBm (40 mW)

Peak SAR (extrapolated) = 12.4 W/kg

SAR(1 g) = 2.98 W/kg; SAR(10 g) = 0.848 W/kg

Deviation (1 g) = -2.74%

Deviation (10 g) = -1.40%



0 dB = 7.52 W/kg = 8.76 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5300 MHz; Type: D5GHzV2; Serial: 1120

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

Medium: 5 GHz Body, Medium parameters used:

$f = 5300 \text{ MHz}$; $\sigma = 5.45 \text{ S/m}$; $\epsilon_r = 48.176$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-14-2014; Ambient Temp: 24.4°C; Tissue Temp: 23.5°C

Probe: EX3DV4 - SN3914; ConvF(4.32, 4.32, 4.32); 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: $dx=10\text{mm}$, $dy=10\text{mm}$

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

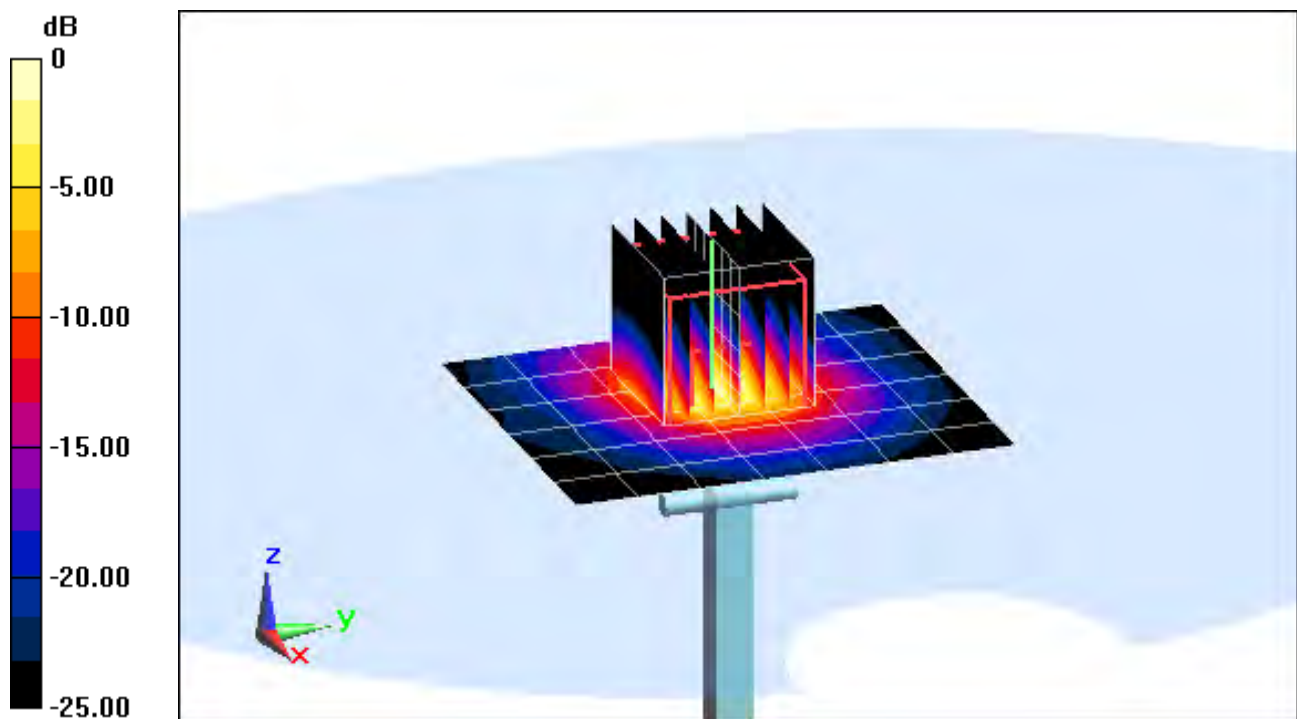
Input Power = 16.0 dBm (40 mW)

Peak SAR (extrapolated) = 12.9 W/kg

SAR(1 g) = 2.90 W/kg; SAR(10 g) = 0.808 W/kg

Deviation (1 g) = -5.60%

Deviation (10 g) = -6.05%



PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5500 MHz; Type: D5GHzV2; Serial: 1120

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

Medium: 5 GHz Body, Medium parameters used:

$f = 5500 \text{ MHz}$; $\sigma = 5.768 \text{ S/m}$; $\epsilon_r = 47.619$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-14-2014; Ambient Temp: 24.3°C; Tissue Temp: 23.5°C

Probe: EX3DV4 - SN3914; ConvF(4.07, 4.07, 4.07); 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)

5500 MHz System Verification

Area Scan (7x8x1): 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

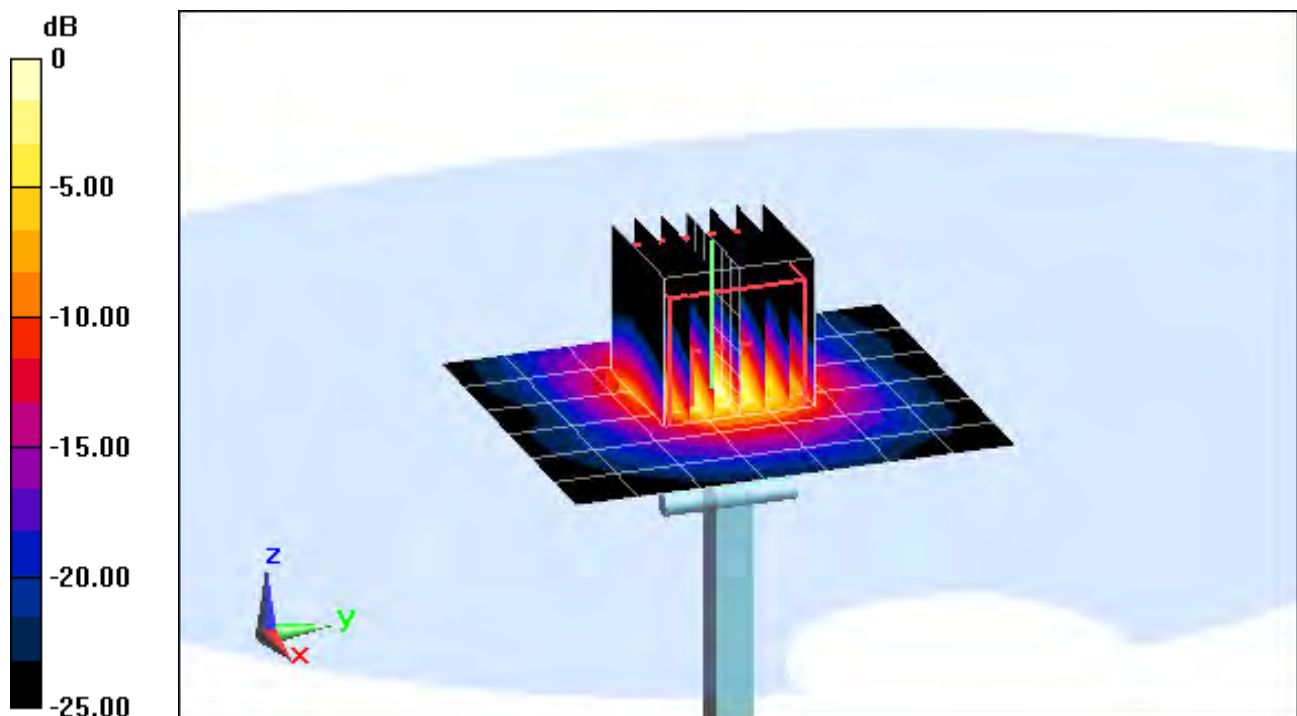
Input Power = 16.0 dBm (40 mW)

Peak SAR (extrapolated) = 15.7 W/kg

SAR(1 g) = 3.35 W/kg; SAR(10 g) = 0.930 W/kg

Deviation (1 g) = 4.95%

Deviation (10 g) = 5.20%



PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5600 MHz; Type: D5GHzV2; Serial: 1120

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

Medium: 5 GHz Body, Medium parameters used:

$f = 5600 \text{ MHz}$; $\sigma = 5.908 \text{ S/m}$; $\epsilon_r = 47.447$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-14-2014; Ambient Temp: 24.3°C; Tissue Temp: 23.7°C

Probe: EX3DV4 - SN3914; ConvF(3.97, 3.97, 3.97); 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 (7x8x1): 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

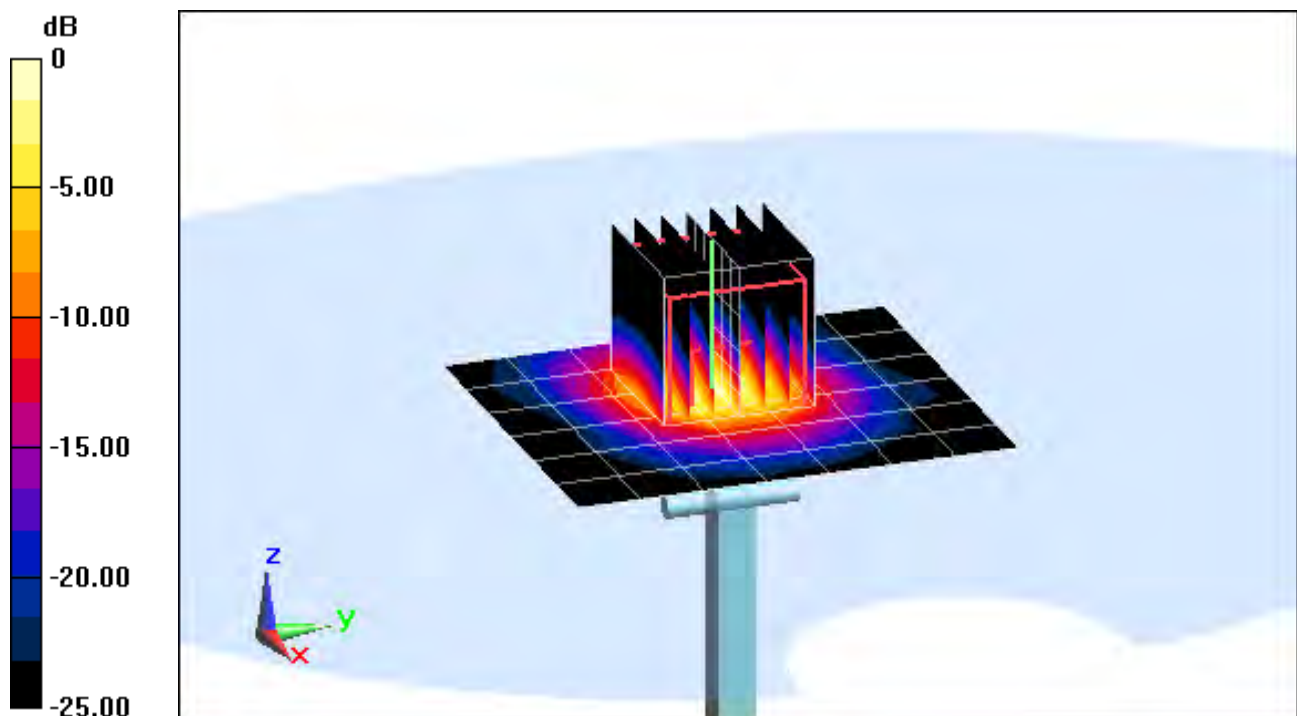
Input Power = 16.0 dBm (40 mW)

Peak SAR (extrapolated) = 15.7 W/kg

SAR(1 g) = 3.27 W/kg; SAR(10 g) = 0.908 W/kg

Deviation (1 g) = 1.30%

Deviation (10 g) = 1.79%



0 dB = 8.68 W/kg = 9.39 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5800 MHz; Type: D5GHzV2; Serial: 1120

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

Medium: 5 GHz Body, Medium parameters used:

$f = 5800 \text{ MHz}$; $\sigma = 6.227 \text{ S/m}$; $\epsilon_r = 46.992$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-14-2014; Ambient Temp: 24.3°C; Tissue Temp: 23.6°C

Probe: EX3DV4 - SN3914; ConvF(4.14, 4.14, 4.14); 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 (7x8x1): 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

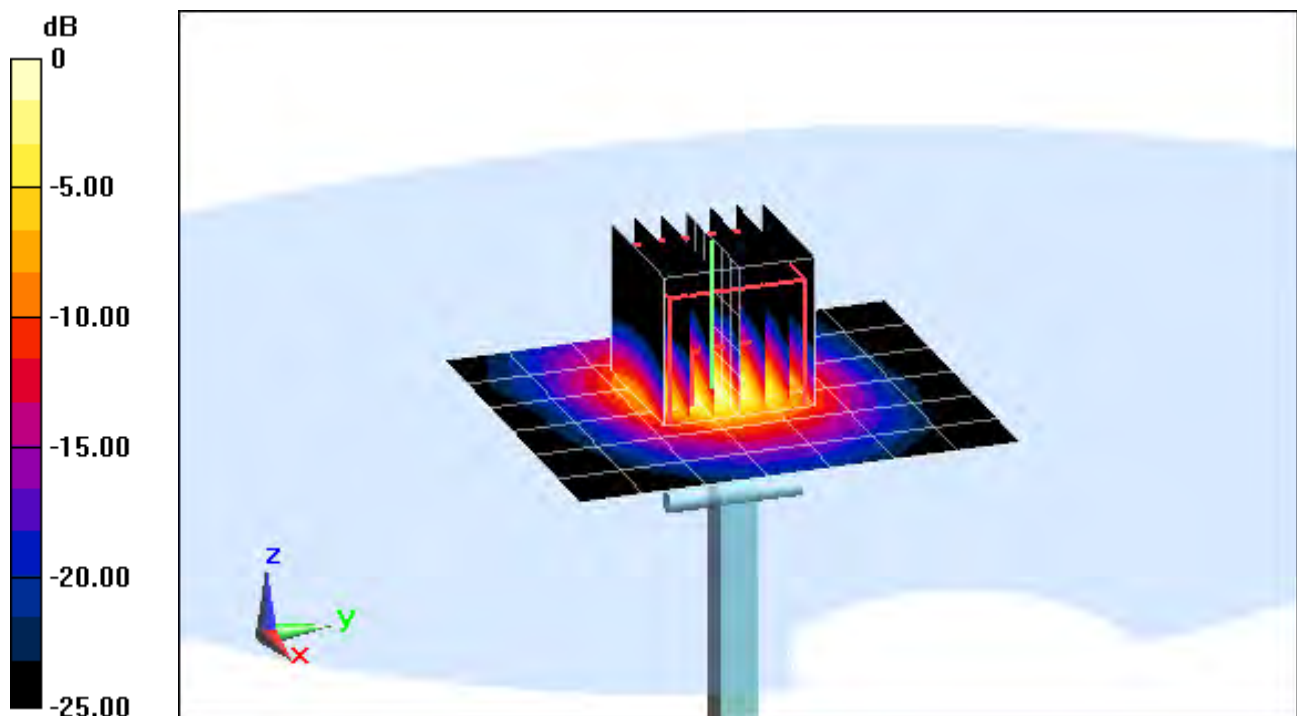
Input Power = 16.0 dBm (40 mW)

Peak SAR (extrapolated) = 13.9 W/kg

SAR(1 g) = 2.85 W/kg; SAR(10 g) = 0.797 W/kg

Deviation (1 g) = -5.63%

Deviation (10 g) = -4.67%



0 dB = 7.62 W/kg = 8.82 dBW/kg

APPENDIX C: PROBE CALIBRATION



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

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D750V3-1054_Mar13**

CALIBRATION CERTIFICATE

Object **D750V3 - SN: 1054**

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

Calibration date: **March 18, 2013**

✓ KOK
3/22/13

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)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.3 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-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

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 18, 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
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	V52.8.5
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	41.1 $\pm$ 6 %	0.92 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.19 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.50 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.42 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.55 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	54.2 $\pm$ 6 %	1.00 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.26 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	8.72 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.48 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	5.75 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.4 Ω - 0.9 j Ω
Return Loss	- 27.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.7 Ω - 2.7 j Ω
Return Loss	- 31.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.034 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	November 08, 2011

DASY5 Validation Report for Head TSL

Date: 18.03.2013

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 750 MHz

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.92 \text{ S/m}$; $\epsilon_r = 41.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.28, 6.28, 6.28); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.5(1059); SEMCAD X 14.6.8(7028)

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

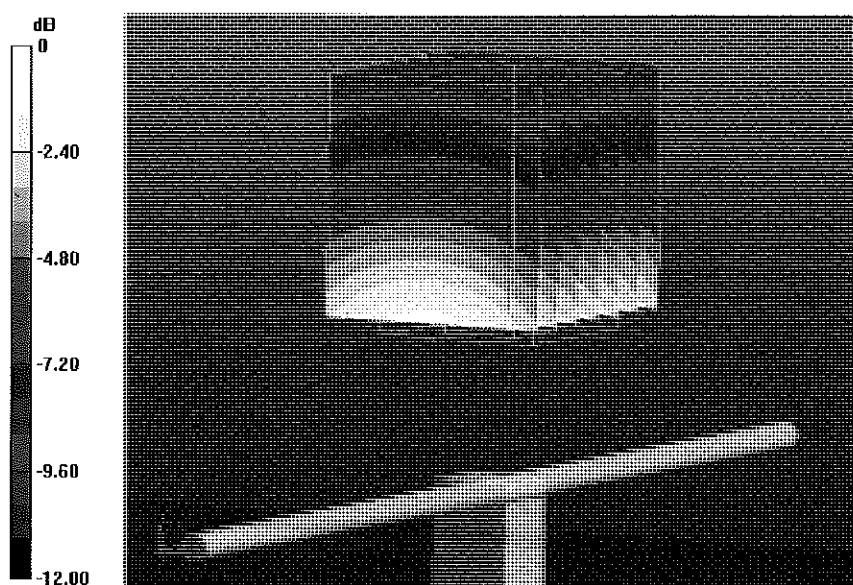
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 52.772 V/m ; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 3.33 W/kg

SAR(1 g) = 2.19 W/kg ; SAR(10 g) = 1.42 W/kg

Maximum value of SAR (measured) = 2.55 W/kg

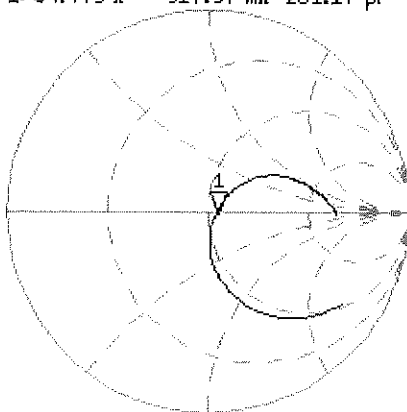


0 dB = 2.55 W/kg = 4.07 dBW/kg

Impedance Measurement Plot for Head TSL

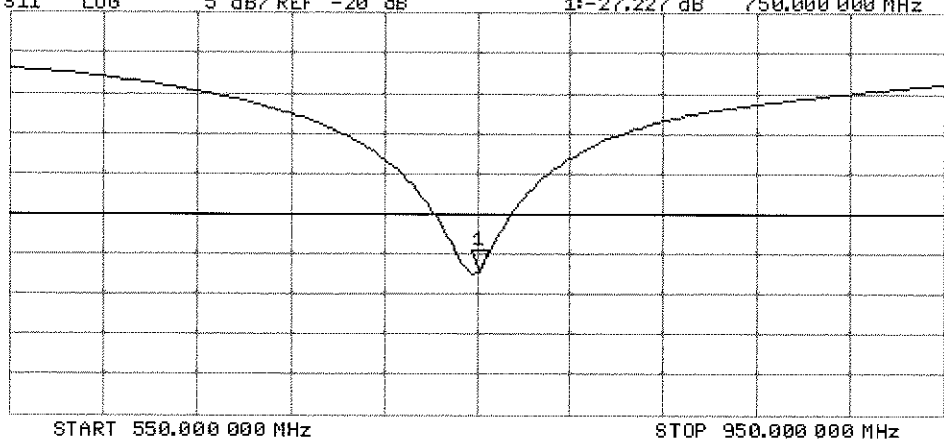
18 Mar 2013 13:14:09
CH1 S11 1 U FS 1: 54.449 Ω -917.97 m Ω 231.17 pF 750.000 000 MHz

*
 Del
 CA
 Avg
 16
 H1 d



CH2 S11 LOG 5 dB/REF -20 dB 1:-27.227 dB 750.000 000 MHz

CA
 Avg
 16
 H1 d



DASY5 Validation Report for Body TSL

Date: 18.03.2013

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 750 MHz

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 1 \text{ S/m}$; $\epsilon_r = 54.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.11, 6.11, 6.11); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.5(1059); SEMCAD X 14.6.8(7028)

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

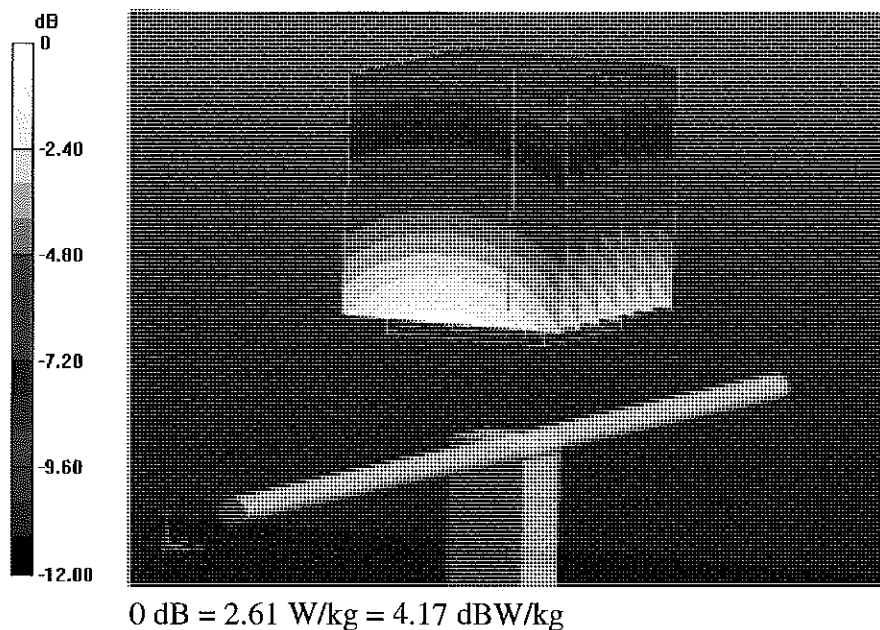
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 52.772 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 3.32 W/kg

SAR(1 g) = 2.26 W/kg; SAR(10 g) = 1.48 W/kg

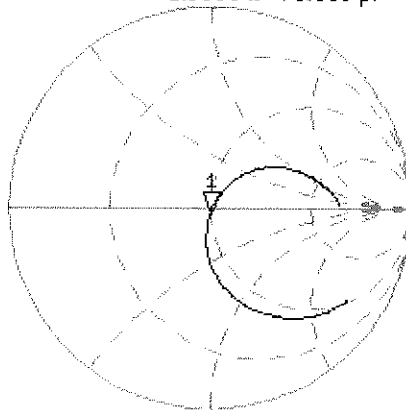
Maximum value of SAR (measured) = 2.61 W/kg



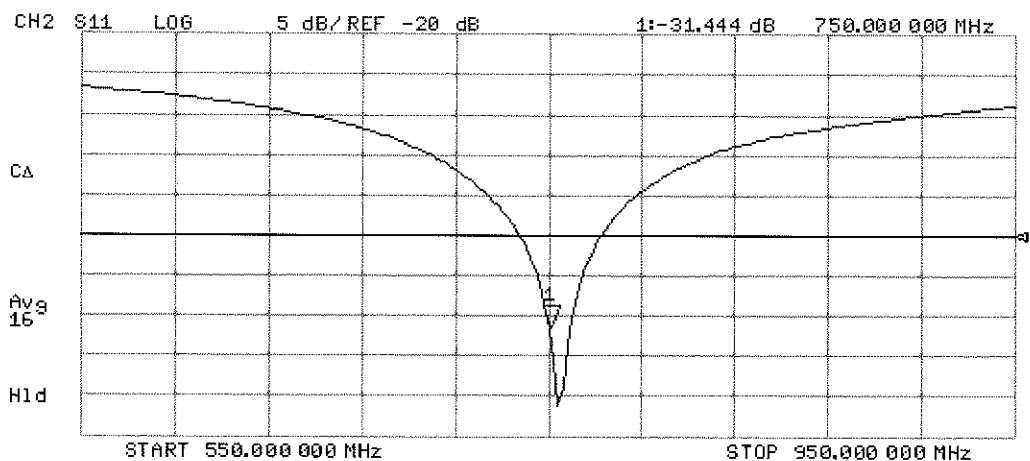
Impedance Measurement Plot for Body TSL

18 Mar 2013 12:24:11
CH1 S11 1 U FS 1: 49.717 $\angle$ -2.6553 $\angle$ 79.890 pF 750.000 000 MHz

*
De1
CA



Av9
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: **D750V3-1003_Jan13**

CALIBRATION CERTIFICATE

Object **D750V3 - SN: 1003**

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

Calibration date: **January 07, 2013**

✓ KOK
1/28/13

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)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.3 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-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

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

Issued: January 8, 2013

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Accreditation No.: **SCS 108**

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

Glossary:

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

Calibration is Performed According to the Following Standards:

- 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	V52.8.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	41.4 $\pm$ 6 %	0.89 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	2.12 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.46 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	1.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.51 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	54.8 $\pm$ 6 %	0.97 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	2.23 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	8.83 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	1.48 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	5.87 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	56.1 Ω - 0.2 j Ω
Return Loss	- 24.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.6 Ω - 3.5 j Ω
Return Loss	- 29.1 dB

General Antenna Parameters and Design

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

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

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	January 21, 2009

DASY5 Validation Report for Head TSL

Date: 07.01.2013

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 750 MHz

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.89 \text{ S/m}$; $\epsilon_r = 41.4$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.28, 6.28, 6.28); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.4(1052); SEMCAD X 14.6.8(7028)

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

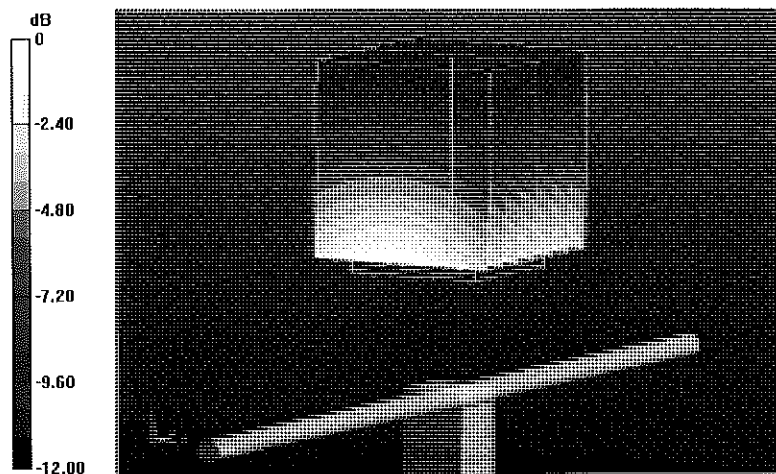
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 53.114 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 3.24 W/kg

SAR(1 g) = 2.12 W/kg; SAR(10 g) = 1.38 W/kg

Maximum value of SAR (measured) = 2.47 W/kg

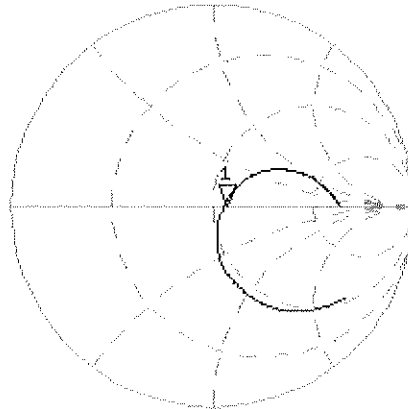


0 dB = 2.47 W/kg = 3.93 dBW/kg

Impedance Measurement Plot for Head TSL

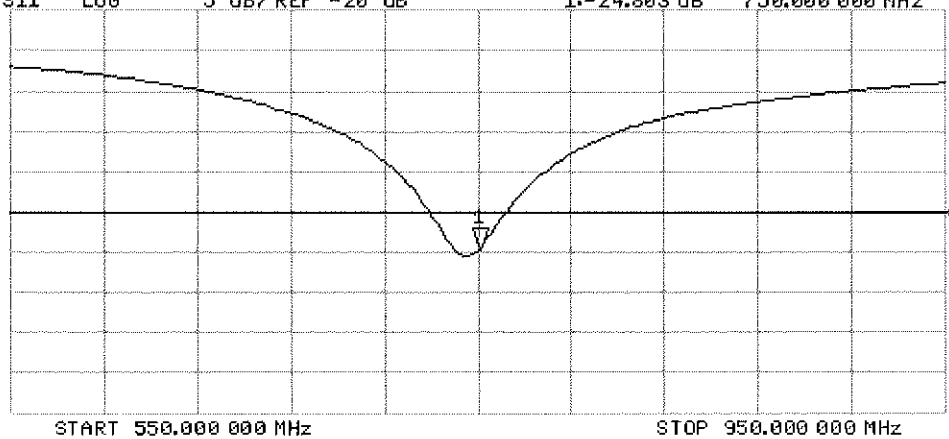
7 Jan 2013 12:55:14
 [CH1] S11 1 U FS 1: 56.100 Ω -179.69 m Ω 1.1810 nF 750.000 000 MHz

*
 De1
 Ca
 Avg
 16
 H1d



CH2 S11 LOG 5 dB/REF -20 dB 1:-24.803 dB 750.000 000 MHz

Ca
 Avg
 16
 H1d



DASY5 Validation Report for Body TSL

Date: 07.01.2013

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 750 MHz

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.97 \text{ S/m}$; $\epsilon_r = 54.8$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.11, 6.11, 6.11); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.4(1052); SEMCAD X 14.6.8(7028)

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

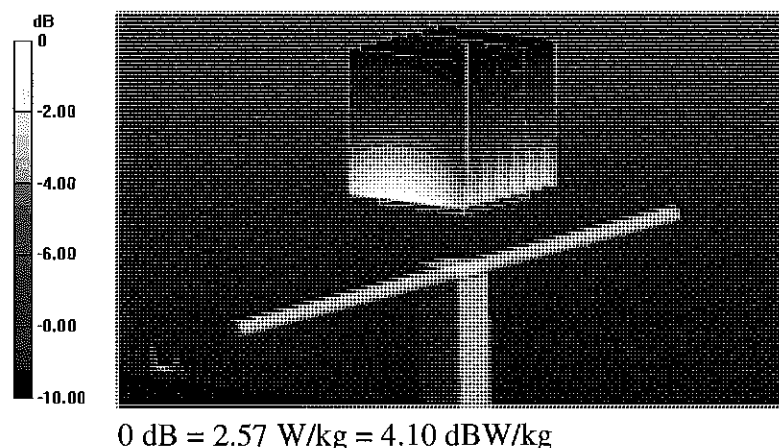
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 53.114 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 3.25 W/kg

SAR(1 g) = 2.23 W/kg; SAR(10 g) = 1.48 W/kg

Maximum value of SAR (measured) = 2.57 W/kg



Impedance Measurement Plot for Body TSL

7 Jan 2013 09:57:48
CH1 S11 1 U FS 1: 49.564 Ω -3.4629 Ω 61.280 pF 750.000 000 MHz

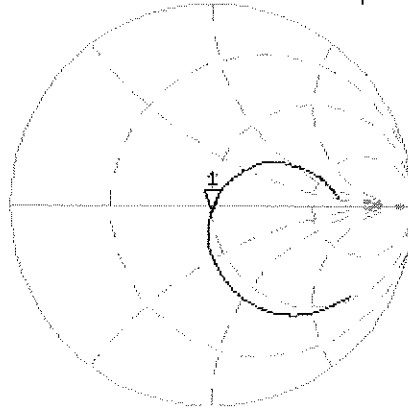
*

Del

CA

Avg
16

H1 d

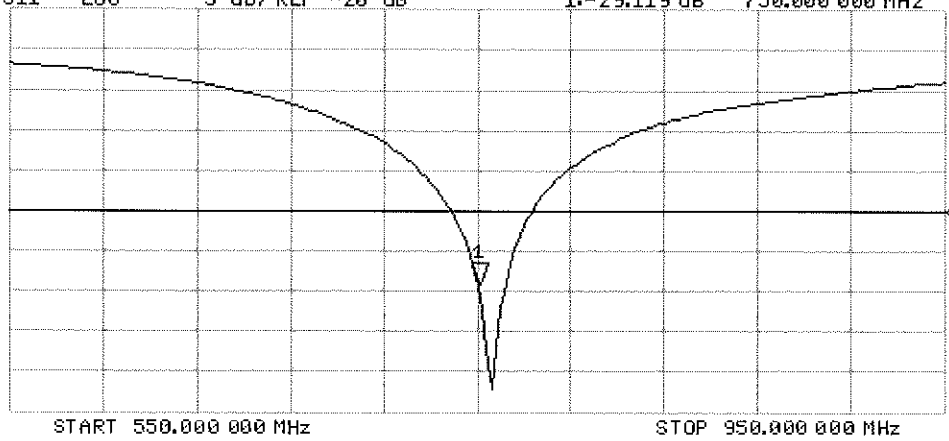


CH2 S11 LOG 5 dB/REF -20 dB 1:-29.119 dB 750.000 000 MHz

CA

Avg
16

H1 d





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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

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 cm³ (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 cm³ (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 cm³ (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 cm³ (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
----------------------------------	----------

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:

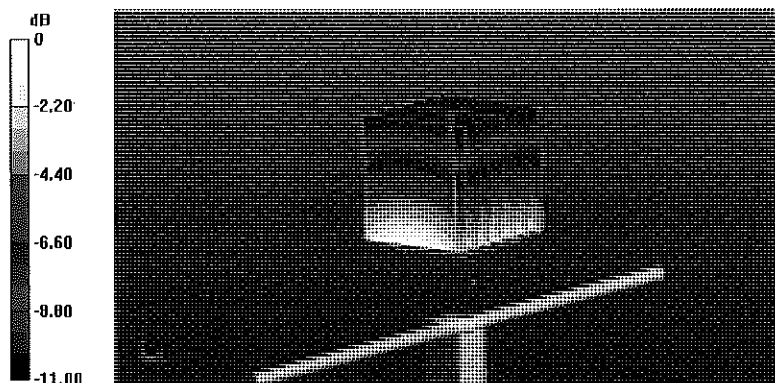
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

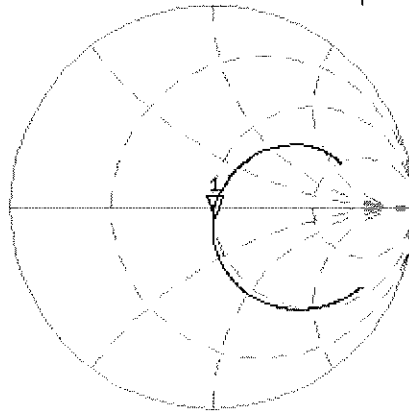
*

Del

CA

Avg
16

H1 d

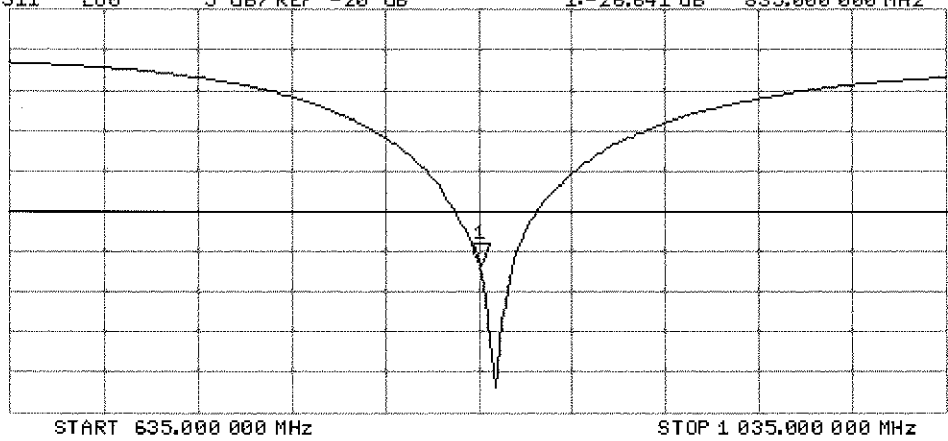


CH2 S11 LOG 5 dB/REF -20 dB 1:-26.641 dB 835.000 000 MHz

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: $f = 835$ MHz; $\sigma = 1.01$ S/m; $\epsilon_r = 54$; $\rho = 1000$ kg/m³

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:

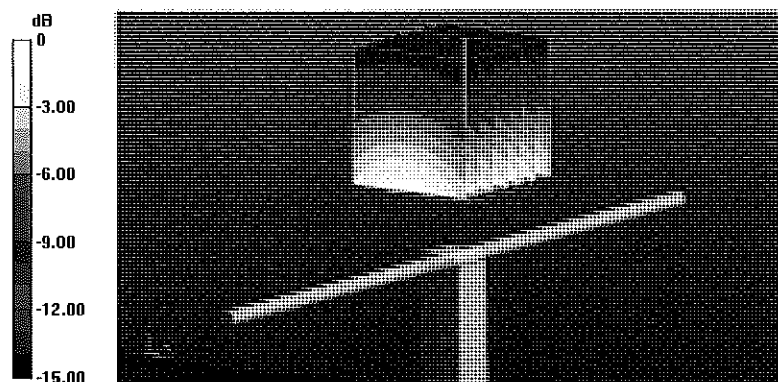
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

Peak SAR (extrapolated) = 3.68 W/kg

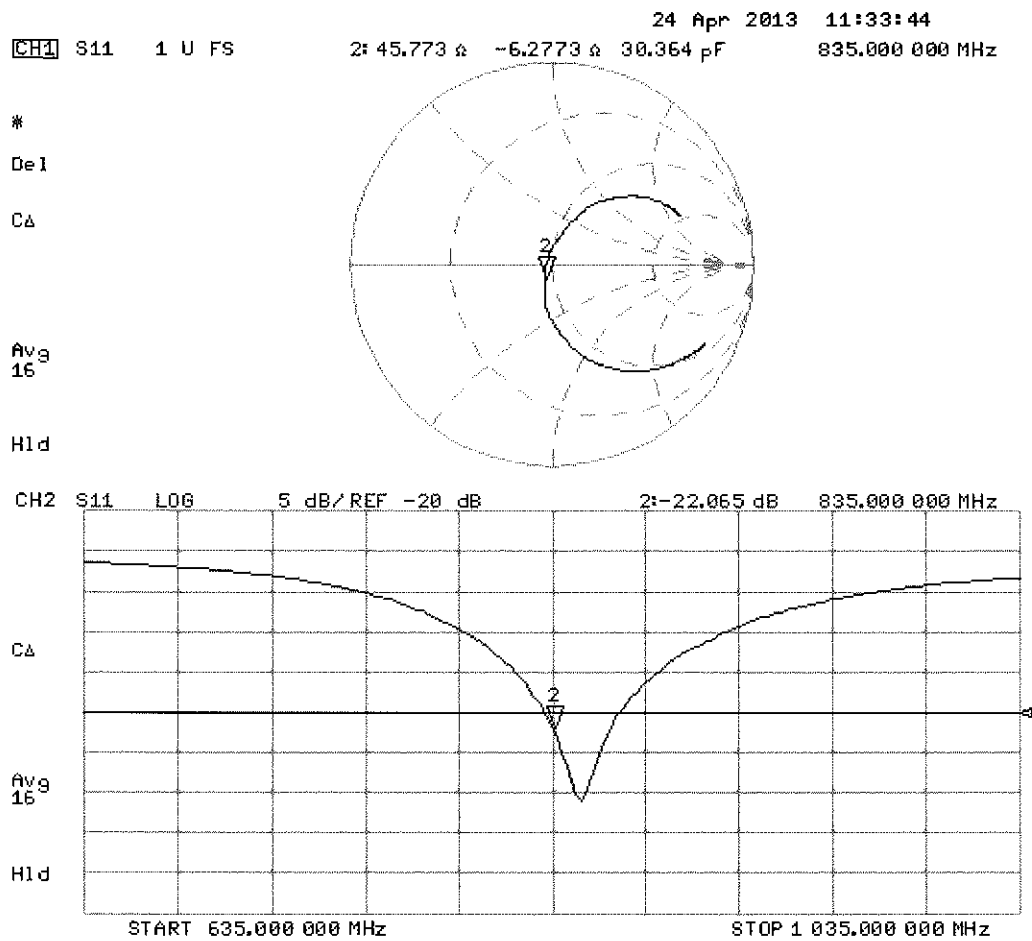
SAR(1 g) = 2.47 W/kg; SAR(10 g) = 1.62 W/kg

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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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D1765V2-1008_May13**

CALIBRATION CERTIFICATE

Object **D1765V2 - SN: 1008**

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

Calibration date: **May 14, 2013**

*✓ 100K
5/23/13*

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
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 Kastrat** Name: **Jeton Kastrat** Function: **Laboratory Technician** Signature: *[Signature]*

Approved by: **Katja Pokovic** Name: **Katja Pokovic** Function: **Technical Manager** Signature: *[Signature]*

Issued: May 15, 2013

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Accreditation No.: **SCS 108**

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

Glossary:

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

Calibration is Performed According to the Following Standards:

- 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	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	39.1 $\pm$ 6 %	1.33 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.09 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	36.8 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.85 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	19.6 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	51.7 $\pm$ 6 %	1.47 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.53 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	38.2 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.10 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.4 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.3 Ω - 6.4 j Ω
Return Loss	- 23.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	43.8 Ω - 6.1 j Ω
Return Loss	- 20.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.211 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	October 06, 2005

DASY5 Validation Report for Head TSL

Date: 14.05.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1765 MHz; Type: D1765V2; Serial: D1765V2 - SN: 1008

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

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.33$ S/m; $\epsilon_r = 39.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.18, 5.18, 5.18); 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:

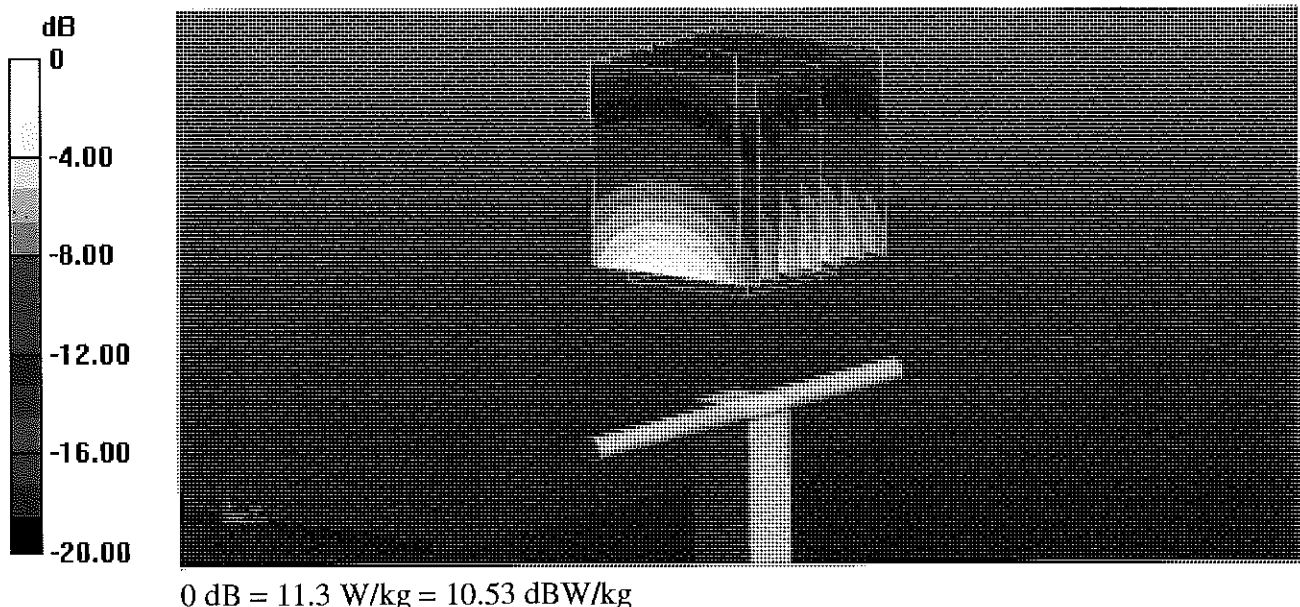
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.430 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 16.3 W/kg

SAR(1 g) = 9.09 W/kg; SAR(10 g) = 4.85 W/kg

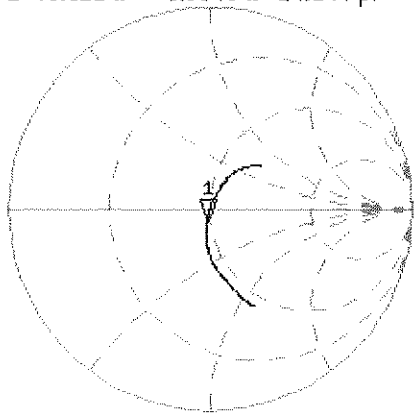
Maximum value of SAR (measured) = 11.3 W/kg



Impedance Measurement Plot for Head TSL

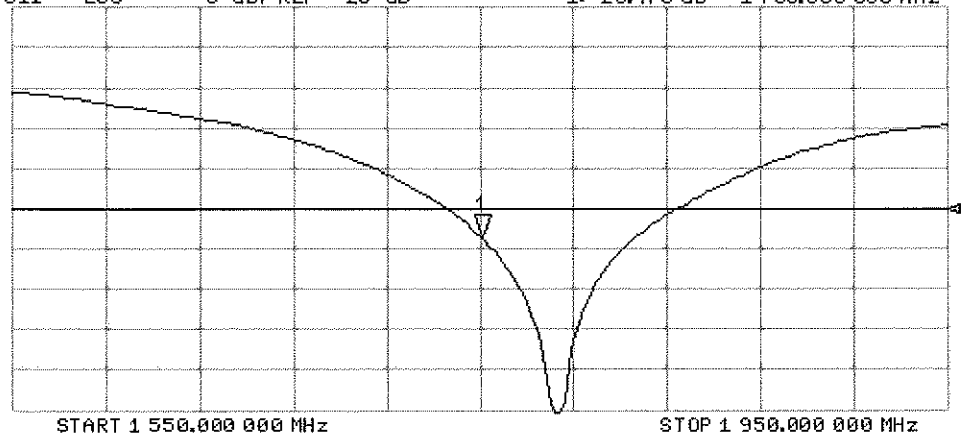
14 May 2013 15:57:39
[CH1] S11 1 U FS 1: 48.322 Ω -6.3848 Ω 14.244 pF 1 750.000 000 MHz

*
De1
CA
Avg
16
H1d



CH2 S11 LOG 5 dB/REF -20 dB 1:-23.476 dB 1 750.000 000 MHz

CA
Avg
16
H1d



DASY5 Validation Report for Body TSL

Date: 13.05.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1765 MHz; Type: D1765V2; Serial: D1765V2 - SN: 1008

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

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.47$ S/m; $\epsilon_r = 51.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.83, 4.83, 4.83); 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 52.8.6(1115); SEMCAD X 14.6.9(7117)

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

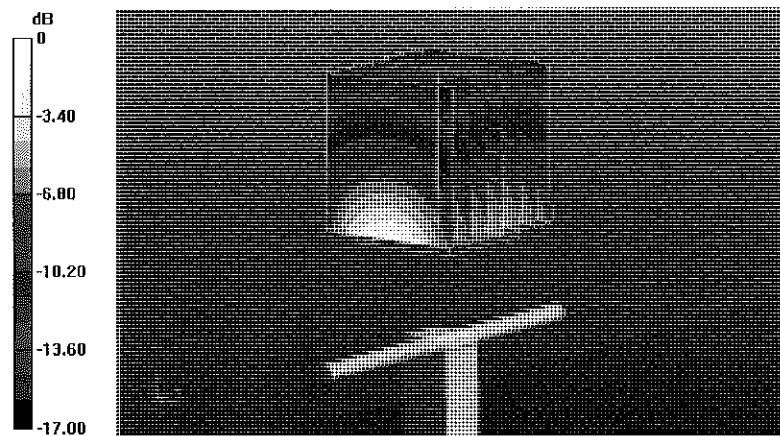
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.430 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 16.4 W/kg

SAR(1 g) = 9.53 W/kg; SAR(10 g) = 5.1 W/kg

Maximum value of SAR (measured) = 12.0 W/kg

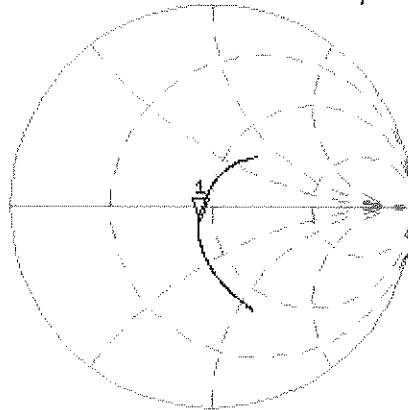


0 dB = 12.0 W/kg = 10.79 dBW/kg

Impedance Measurement Plot for Body TSL

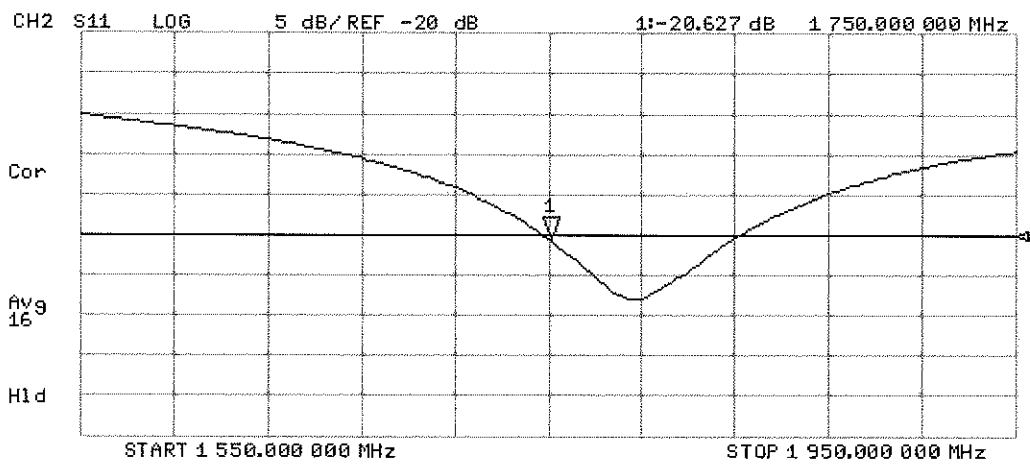
13 May 2013 15:25:53
[CH1] S11 1 U FS 1: 43.775 Ω -6.1426 Ω 14.806 pF 1 750.000 000 MHz

*
De1
Cor



Avg
16

H1d





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Accreditation No.: **SCS 108**

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 Multilateral Agreement for the recognition of calibration certificates

Client **PC Test**

Certificate No: **D1900V2-5d148_Feb13**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d148**

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

Calibration date: **February 06, 2013**

✓
KOK
2/21/13

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)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.3 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-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: **Leif Klysner** Name: **Leif Klysner** Function: **Laboratory Technician**

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

Signature

Issued: February 6, 2013

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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	V52.8.5
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	39.4 $\pm$ 6 %	1.38 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.87 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	39.7 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	5.18 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	20.8 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	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	51.9 $\pm$ 6 %	1.53 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	10.3 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	40.8 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	5.45 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.7 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.1 Ω + 5.9 j Ω
Return Loss	- 24.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.3 Ω + 6.3 j Ω
Return Loss	- 23.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.199 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: 06.02.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d148

Communication System: CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.38$ S/m; $\epsilon_r = 39.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.98, 4.98, 4.98); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.5(1059); SEMCAD X 14.6.8(7028)

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

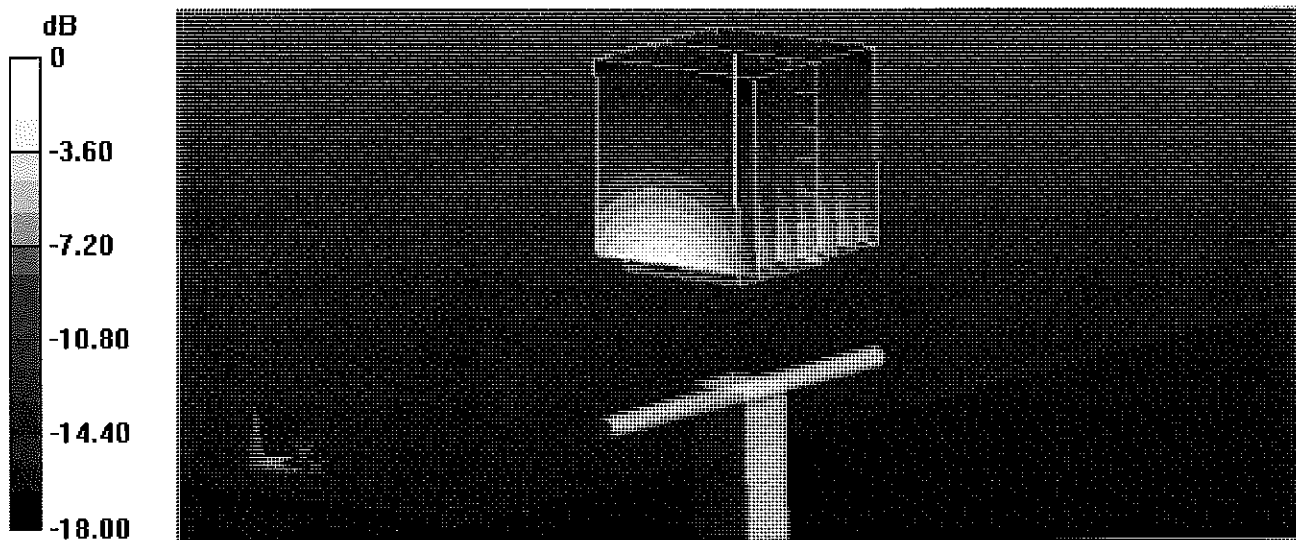
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.534 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 17.8 W/kg

SAR(1 g) = 9.87 W/kg; SAR(10 g) = 5.18 W/kg

Maximum value of SAR (measured) = 12.1 W/kg

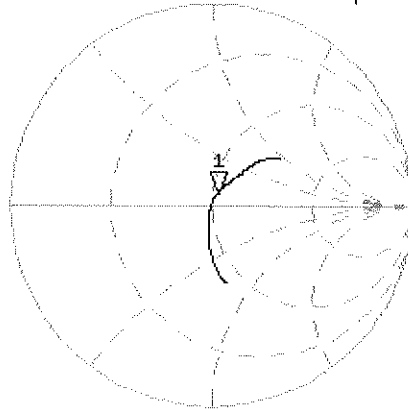


0 dB = 12.1 W/kg = 10.83 dBW/kg

Impedance Measurement Plot for Head TSL

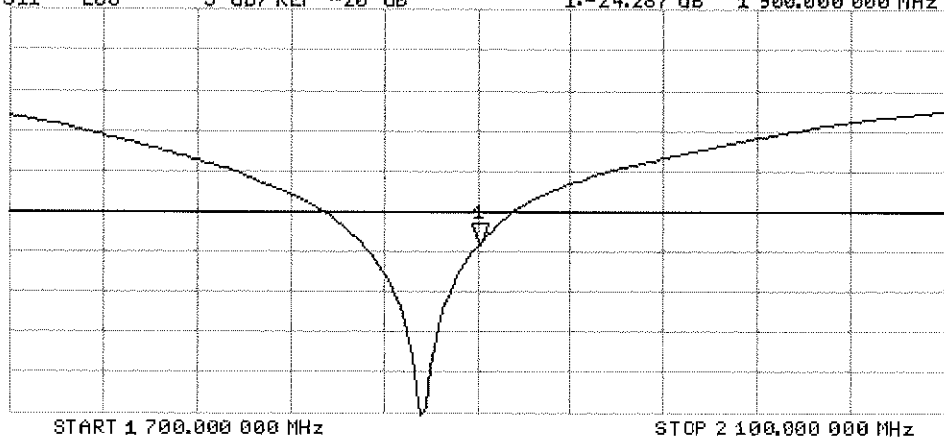
6 Feb 2013 09:25:10
 CH1 S11 1 U FS 1: 52.125 $\angle$ 5.8711 $\angle$ 491.80 μ H 1 900.000 000 MHz

*
 Del
 CA
 Avg
 16
 H1d



CH2 S11 LOG 5 dB/REF -20 dB 1: -24.287 dB 1 900.000 000 MHz

CA
 Avg
 16
 H1d



DASY5 Validation Report for Body TSL

Date: 06.02.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d148

Communication System: CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.53$ S/m; $\epsilon_r = 51.9$; $\rho = 1000$ 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: 27.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.5(1059); SEMCAD X 14.6.8(7028)

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

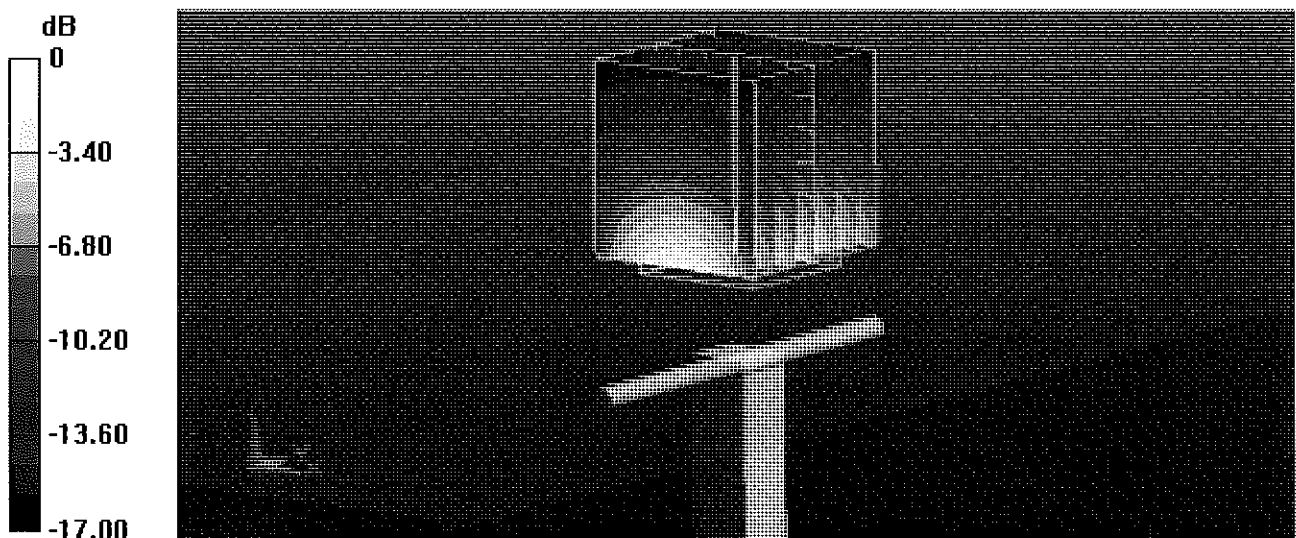
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.534 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 17.9 W/kg

SAR(1 g) = 10.3 W/kg; SAR(10 g) = 5.45 W/kg

Maximum value of SAR (measured) = 13.1 W/kg

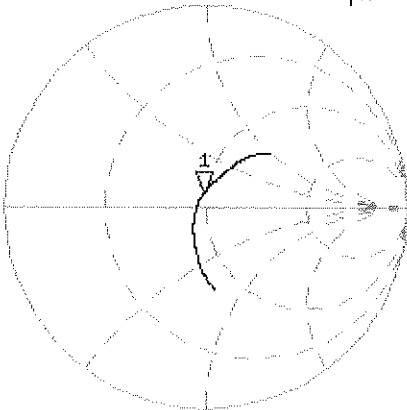


0 dB = 13.1 W/kg = 11.17 dBW/kg

Impedance Measurement Plot for Body TSL

6 Feb 2013 09:24:17
CH1 S11 1 U FS 1: 48.344 Ω 6.2715 Ω 525.34 μ H 1 900.000 000 MHz

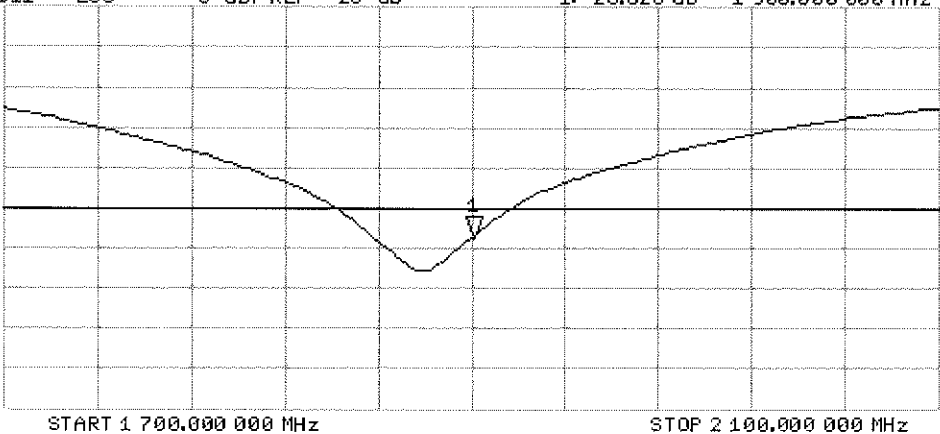
*
De1
CA



Avg
16
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-23.628 dB 1 900.000 000 MHz

CA
Avg
16
H1d





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Client **PC Test**

Certificate No: **D2450V2-797_Jan13**

CALIBRATION CERTIFICATE

Object **D2450V2 - SN: 797**

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

Calibration date: **January 08, 2013**

✓
KOK
1/28/13

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)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.3 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-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: Name **Israe El-Naouq** Function **Laboratory Technician**

Signature

Israe El-Naouq

Approved by: **Katja Pokovic** Technical Manager

Katja Pokovic

Issued: January 8, 2013

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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	V52.8.4
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	37.9 $\pm$ 6 %	1.85 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	52.5 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.20 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.5 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	50.5 $\pm$ 6 %	2.01 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	12.7 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	49.6 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	5.88 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	23.2 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$53.3 \Omega + 3.1 j\Omega$
Return Loss	- 27.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$49.1 \Omega + 4.9 j\Omega$
Return Loss	- 26.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.152 ns
----------------------------------	----------

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

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	January 24, 2006

DASY5 Validation Report for Head TSL

Date: 08.01.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 797

Communication System: CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.85$ S/m; $\epsilon_r = 37.9$; $\rho = 1000$ 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: 27.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.4(1052); SEMCAD X 14.6.8(7028)

Dipole Calibration for Head Tissue/ $P_{in}=250$ mW, $d=10$ mm/Zoom Scan (7x7x7)/Cube 0:

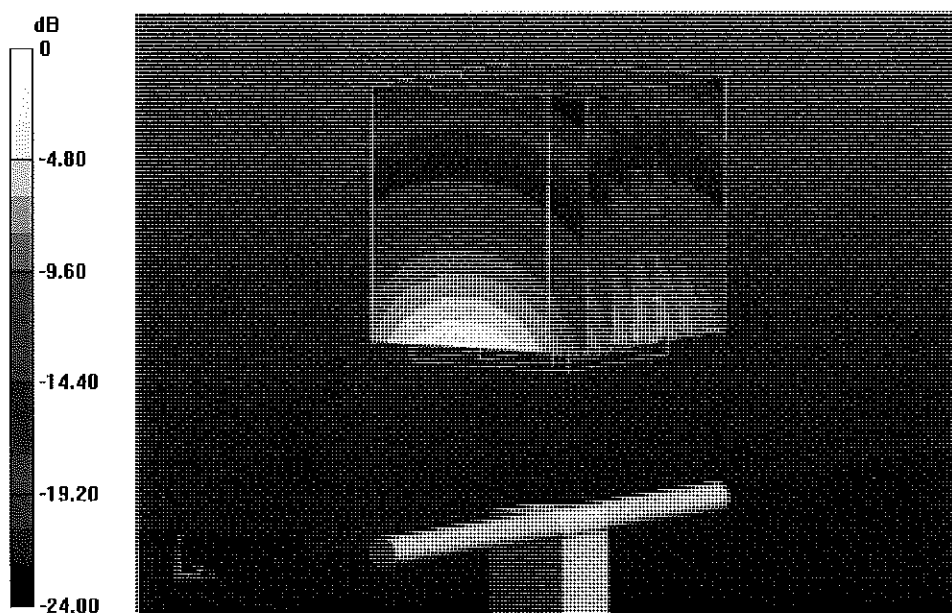
Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 99.154 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 27.8 W/kg

SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.2 W/kg

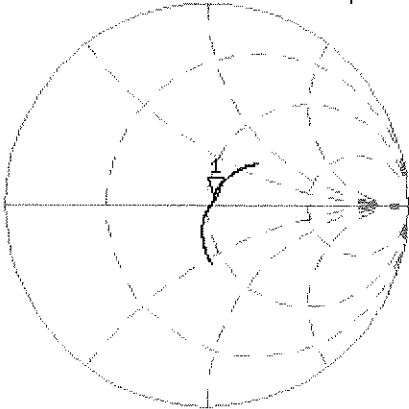
Maximum value of SAR (measured) = 17.0 W/kg



Impedance Measurement Plot for Head TSL

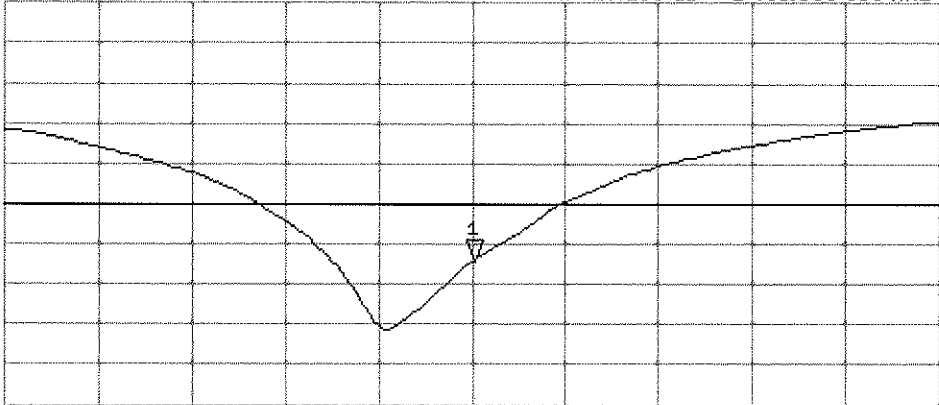
8 Jan 2013 12:37:14
CH1 S11 1 U FS 1: 53.346 $\angle$ 3.0762 $\angle$ 199.83 pH 2 450.000 000 MHz

*
De1
Cor
Avg
16
H1d



CH2 S11 LOG 5 dB/REF -20 dB 1: -27.136 dB 2 450.000 000 MHz

Cor
Avg
16
H1d



START 2 250.000 000 MHz STOP 2 650.000 000 MHz

DASY5 Validation Report for Body TSL

Date: 08.01.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 797

Communication System: CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 2.01$ S/m; $\epsilon_r = 50.5$; $\rho = 1000$ 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: 27.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.4(1052); SEMCAD X 14.6.8(7028)

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

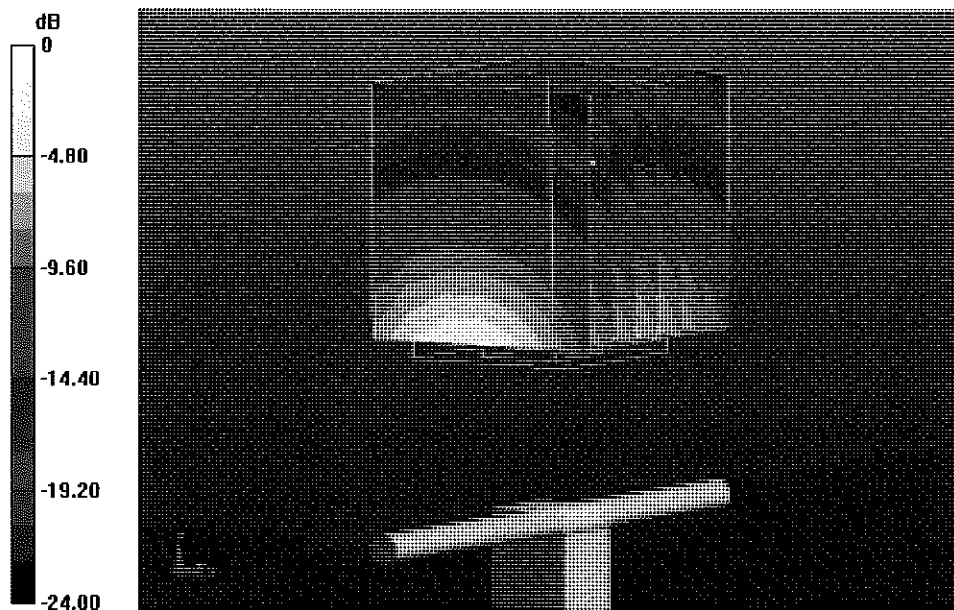
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.935 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 26.7 W/kg

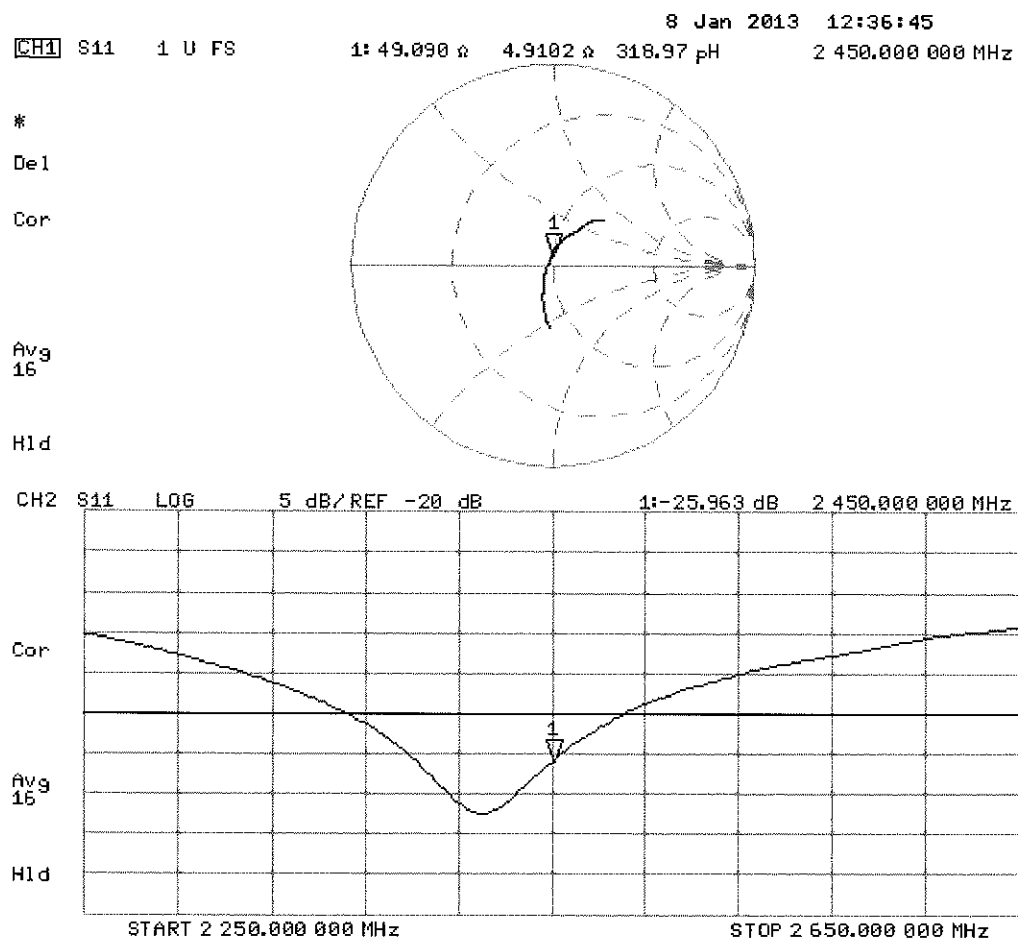
SAR(1 g) = 12.7 W/kg; SAR(10 g) = 5.88 W/kg

Maximum value of SAR (measured) = 16.7 W/kg



0 dB = 16.7 W/kg = 12.23 dBW/kg

Impedance Measurement Plot for Body TSL





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Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D5GHzV2-1120_Feb13**

CALIBRATION CERTIFICATE

Object **D5GHzV2 - SN: 1120**

Calibration procedure(s) **QA CAL-22.v2**
Calibration procedure for dipole validation kits between 3-6 GHz

Calibration date: **February 14, 2013**

✓
Kok
2/2/13

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)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.3 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe EX3DV4	SN: 3503	28-Dec-12 (No. EX3-3503_Dec12)	Dec-13
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-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: **Israe El-Naouq** Function: **Laboratory Technician**

Approved by: **Katja Pokovic** Technical Manager

Signature

Israe El-Naouq
Katja Pokovic

Issued: February 14, 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:

- a) 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
- b) 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:

- c) 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	V52.8.5
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	34.7 $\pm$ 6 %	4.47 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	7.67 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	76.0 W/kg $\pm$ 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.18 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	21.5 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	34.5 ± 6 %	4.57 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	7.94 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	78.7 W / kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.27 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.4 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	34.2 ± 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	8.09 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	80.1 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.29 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.6 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	34.1 ± 6 %	4.83 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	8.08 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	79.9 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	22.5 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	33.9 ± 6 %	5.05 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	7.57 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	74.9 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.13 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	21.0 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	46.9 ± 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	7.73 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	76.6 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.17 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.5 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	46.7 ± 6 %	5.48 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	7.75 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	76.8 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.18 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	46.3 ± 6 %	5.71 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	8.06 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	79.8 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	22.1 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	46.2 ± 6 %	5.83 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	8.15 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	80.7 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.26 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	22.3 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	45.9 ± 6 %	6.12 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	7.62 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	75.5 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (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	20.9 W/kg ± 19.5 % (k=2)

Appendix

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	$53.8 \Omega - 6.3 j\Omega$
Return Loss	- 23.0 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	$50.1 \Omega + 0.5 j\Omega$
Return Loss	- 45.3 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	$51.0 \Omega - 0.9 j\Omega$
Return Loss	- 37.9 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	$55.3 \Omega - 0.9 j\Omega$
Return Loss	- 25.8 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	$53.5 \Omega + 3.3 j\Omega$
Return Loss	- 26.7 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	$53.7 \Omega - 4.8 j\Omega$
Return Loss	- 24.8 dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	$50.2 \Omega + 2.4 j\Omega$
Return Loss	- 32.5 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	$51.6 \Omega - 1.5 j\Omega$
Return Loss	- 33.3 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	$57.4 \Omega + 0.9 j\Omega$
Return Loss	- 23.2 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	$53.5\ \Omega + 3.2\ j\Omega$
Return Loss	- 26.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.206 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	September 08, 2011

DASY5 Validation Report for Head TSL

Date: 08.02.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1120

Communication System: CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz

Medium parameters used: $f = 5200$ MHz; $\sigma = 4.47$ S/m; $\epsilon_r = 34.7$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5300$ MHz; $\sigma = 4.57$ S/m; $\epsilon_r = 34.5$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5500$ MHz; $\sigma = 4.74$ S/m; $\epsilon_r = 34.2$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5600$ MHz; $\sigma = 4.83$ S/m; $\epsilon_r = 34.1$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5800$ MHz; $\sigma = 5.05$ S/m; $\epsilon_r = 33.9$; $\rho = 1000$ 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: 27.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.5(1059); SEMCAD X 14.6.8(7028)

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 = 61.561 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 28.8 W/kg

SAR(1 g) = 7.67 W/kg; SAR(10 g) = 2.18 W/kg

Maximum value of SAR (measured) = 17.7 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 = 62.429 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 30.3 W/kg

SAR(1 g) = 7.94 W/kg; SAR(10 g) = 2.27 W/kg

Maximum value of SAR (measured) = 18.5 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 = 61.998 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 32.7 W/kg

SAR(1 g) = 8.09 W/kg; SAR(10 g) = 2.29 W/kg

Maximum value of SAR (measured) = 19.3 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 = 62.540 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 33.3 W/kg

SAR(1 g) = 8.08 W/kg; SAR(10 g) = 2.28 W/kg

Maximum value of SAR (measured) = 19.5 W/kg

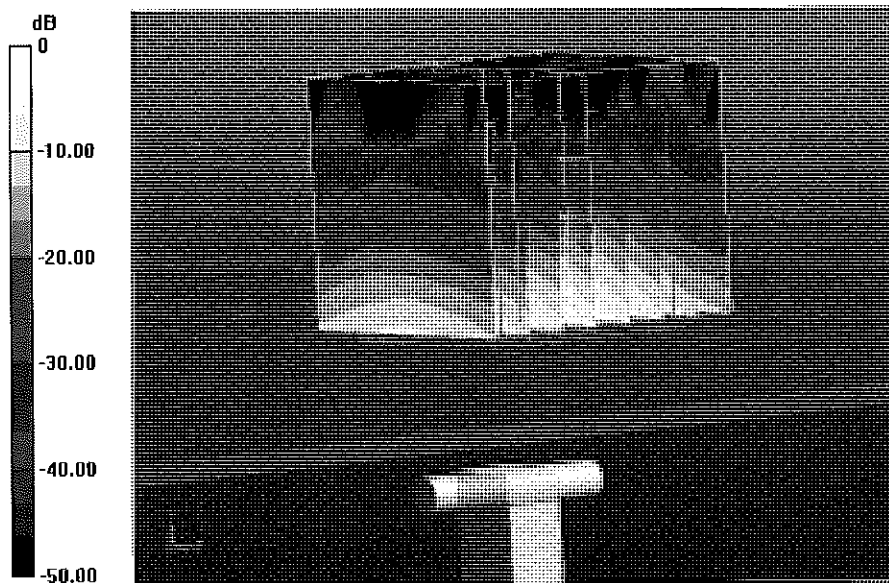
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 58.600 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 32.9 W/kg

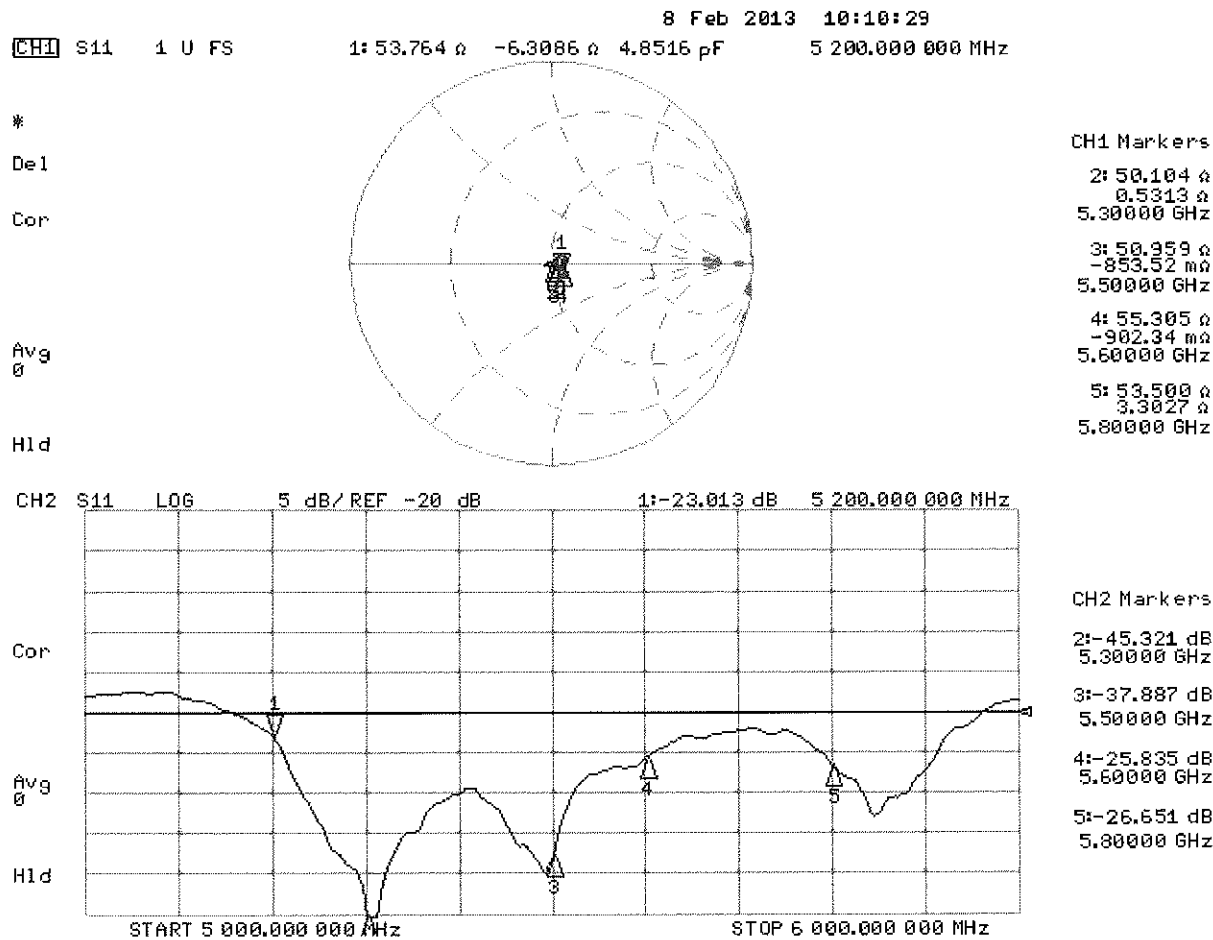
SAR(1 g) = 7.57 W/kg; SAR(10 g) = 2.13 W/kg

Maximum value of SAR (measured) = 18.8 W/kg



0 dB = 18.8 W/kg = 12.74 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 14.02.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1120

Communication System: 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; $\epsilon_r = 46.9$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5300$ MHz; $\sigma = 5.48$ S/m; $\epsilon_r = 46.7$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5500$ MHz; $\sigma = 5.71$ S/m; $\epsilon_r = 46.3$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5600$ MHz; $\sigma = 5.83$ S/m; $\epsilon_r = 46.2$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5800$ MHz; $\sigma = 6.12$ S/m; $\epsilon_r = 45.9$; $\rho = 1000$ 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: 27.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.5(1059); SEMCAD X 14.6.8(7028)

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 = 61.053 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 31.1 W/kg

SAR(1 g) = 7.73 W/kg; SAR(10 g) = 2.17 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 = 60.021 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 32.1 W/kg

SAR(1 g) = 7.75 W/kg; SAR(10 g) = 2.18 W/kg

Maximum value of SAR (measured) = 18.5 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 = 59.894 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 35.3 W/kg

SAR(1 g) = 8.06 W/kg; SAR(10 g) = 2.24 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 = 59.730 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 36.8 W/kg

SAR(1 g) = 8.15 W/kg; SAR(10 g) = 2.26 W/kg

Maximum value of SAR (measured) = 19.9 W/kg

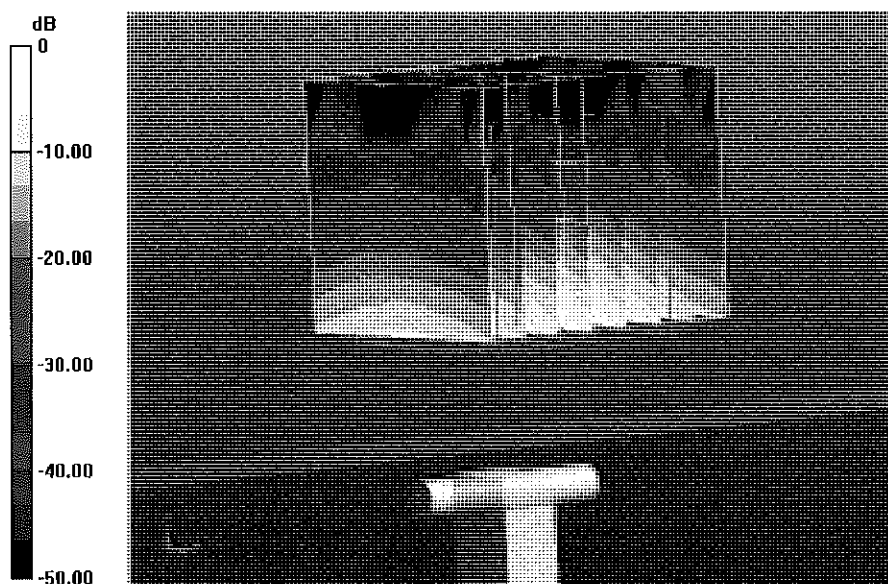
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 56.663 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 36.4 W/kg

SAR(1 g) = 7.62 W/kg; SAR(10 g) = 2.12 W/kg

Maximum value of SAR (measured) = 19.0 W/kg

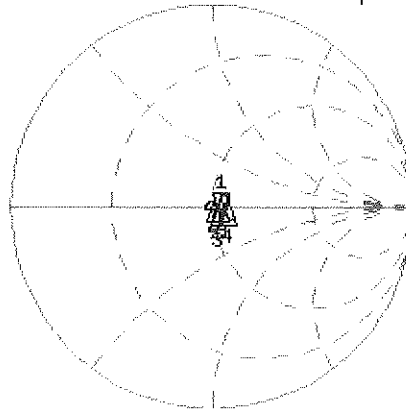


0 dB = 19.0 W/kg = 12.79 dBW/kg

Impedance Measurement Plot for Body TSL

14 Feb 2013 15:47:05
 CH1 S11 1 U FS 1: 53.672 Ω -4.7539 Ω 6.4382 pF 5 200.000 000 MHz

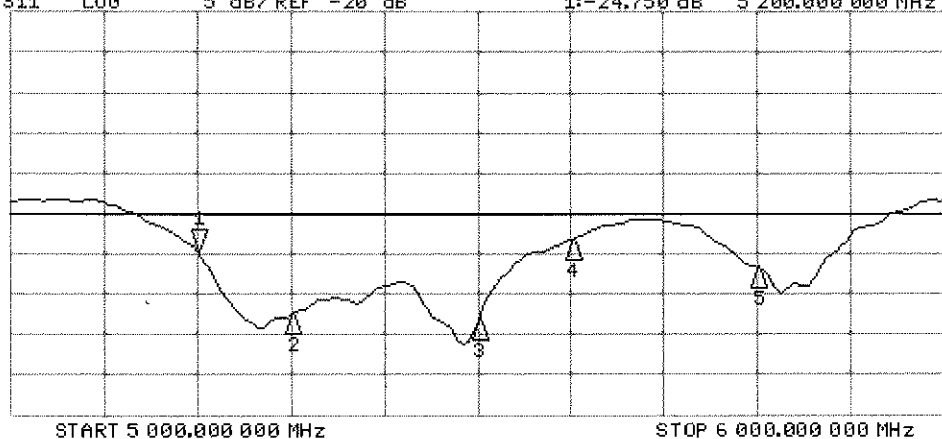
*
 Del
 Cor
 Avg
 16
 H1d



CH1 Markers
 2: 50.250 Ω
 2.3555 Ω
 5.30000 GHz
 3: 51.629 Ω
 -1.4824 Ω
 5.50000 GHz
 4: 57.389 Ω
 0.9180 Ω
 5.60000 GHz
 5: 53.543 Ω
 3.2441 Ω
 5.80000 GHz

CH2 S11 LOG 5 dB/REF -20 dB 1: -24.750 dB 5 200.000 000 MHz

Cor
 Avg
 16
 H1d



CH2 Markers
 2: -32.508 dB
 5.30000 GHz
 3: -33.267 dB
 5.50000 GHz
 4: -23.183 dB
 5.60000 GHz
 5: -26.672 dB
 5.80000 GHz



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: **D1750V2-1051_Apr13**

CALIBRATION CERTIFICATE

Object **D1750V2 - SN: 1051**

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

Calibration date: **April 30, 2013**

✓
 LOK
 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
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: April 30, 2013

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



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Accreditation No.: **SCS 108**

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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	1750 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	39.1 $\pm$ 6 %	1.33 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.01 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	36.5 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.83 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	19.5 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	51.8 $\pm$ 6 %	1.50 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.55 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	37.8 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.13 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.4 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$50.9 \Omega + 0.3 j\Omega$
Return Loss	- 40.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$47.0 \Omega + 0.4 j\Omega$
Return Loss	- 30.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.222 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	February 19, 2010

DASY5 Validation Report for Head TSL

Date: 30.04.2013

Test Laboratory: SPEAG, Zurich, Switzerland

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

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

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.33$ S/m; $\epsilon_r = 39.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.18, 5.18, 5.18); 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 (8x7x7)/Cube 0:

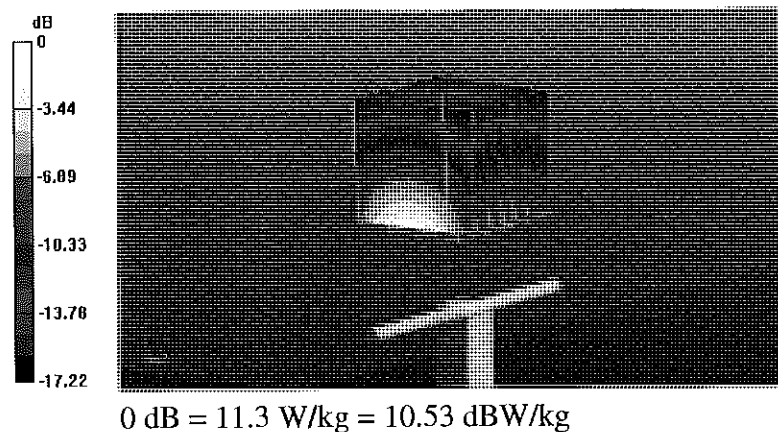
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 90.104 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 16.0 W/kg

SAR(1 g) = 9.01 W/kg; SAR(10 g) = 4.83 W/kg

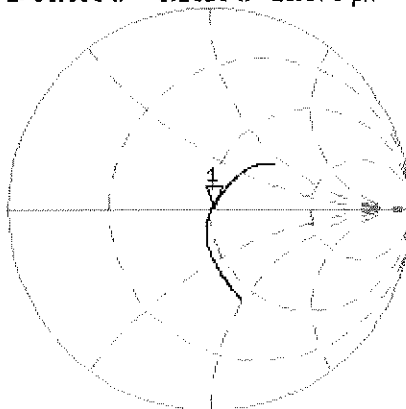
Maximum value of SAR (measured) = 11.3 W/kg



Impedance Measurement Plot for Head TSL

30 Apr 2013 12:59:57
 [CH1] S11 1 U FS 1: 50.889 Ω 0.2813 Ω 25.578 μH 1 750.000 000 MHz

*
 Del
 C Δ



Avg
 4

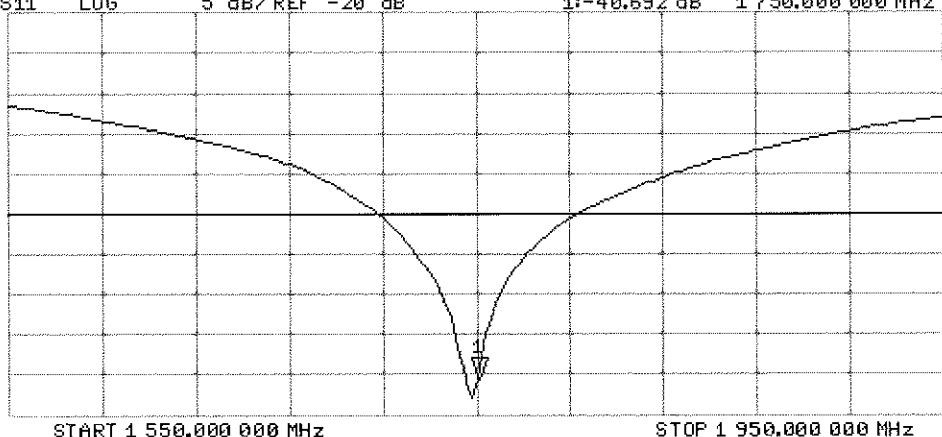
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-40.692 dB 1 750.000 000 MHz

C Δ

Avg
 4

H1d



DASY5 Validation Report for Body TSL

Date: 30.04.2013

Test Laboratory: SPEAG, Zurich, Switzerland

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

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

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.5$ S/m; $\epsilon_r = 51.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.83, 4.83, 4.83); 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 52.8.6(1115); SEMCAD X 14.6.9(7117)

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

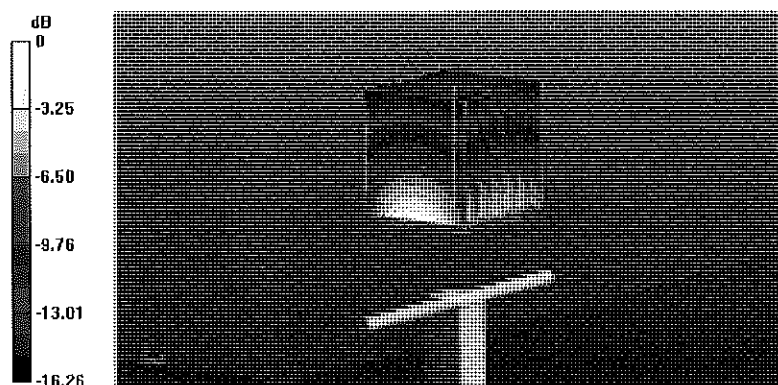
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.473 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 16.4 W/kg

SAR(1 g) = 9.55 W/kg; SAR(10 g) = 5.13 W/kg

Maximum value of SAR (measured) = 12.0 W/kg

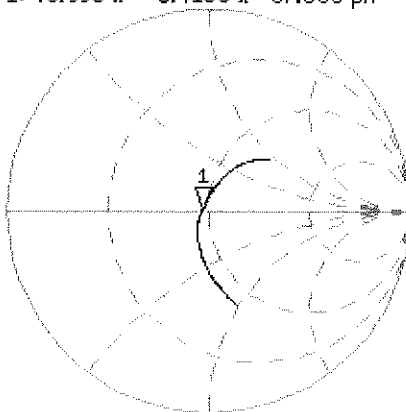


0 dB = 12.0 W/kg = 10.79 dBW/kg

Impedance Measurement Plot for Body TSL

30 Apr 2013 12:59:14
 [CH1] S11 1 U FS 1: 46.998 Ω 0.4160 Ω 37.835 pF 1 750.000 000 MHz

*
 Del
 CA



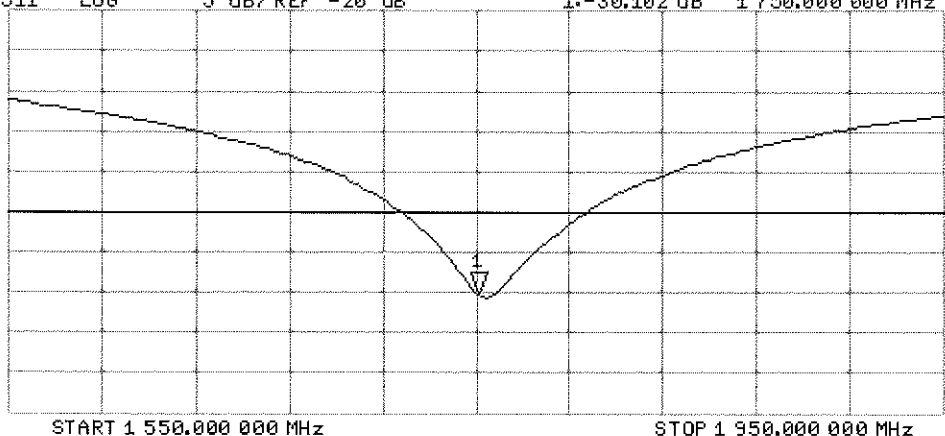
Avg
 16
 H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-30.102 dB 1 750.000 000 MHz

CA

Avg
 16

H1d





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Accreditation No.: **SCS 108**

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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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Accreditation No.: **SCS 108**

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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:

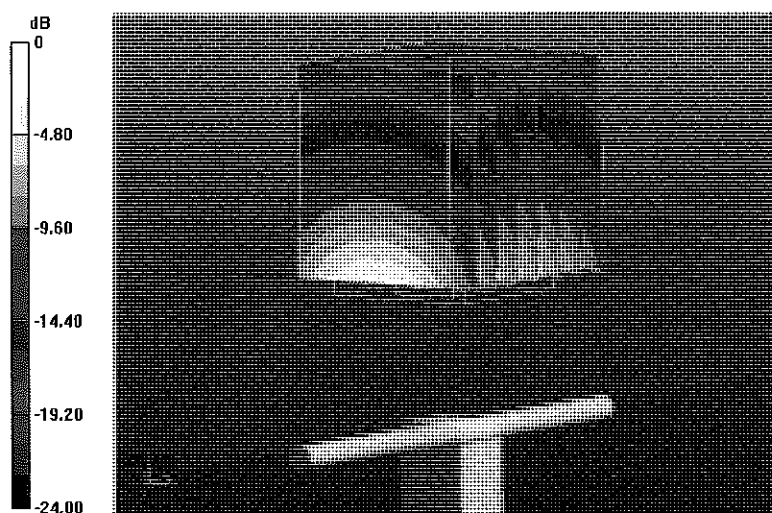
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

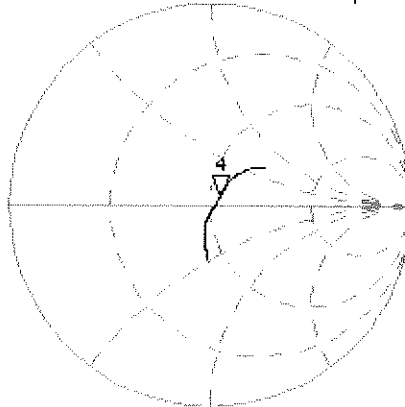


0 dB = 17.0 W/kg = 12.30 dBW/kg

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

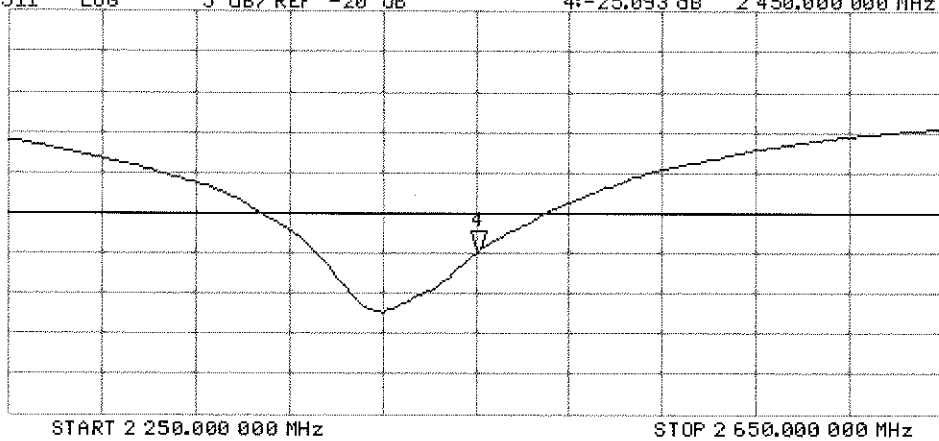
H1d

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:

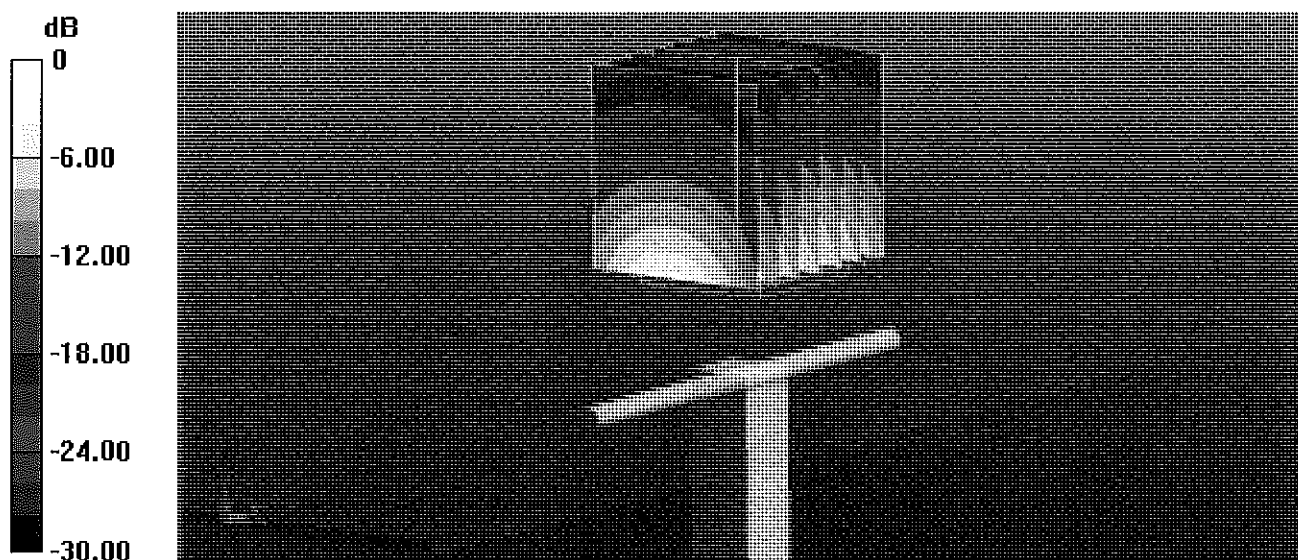
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

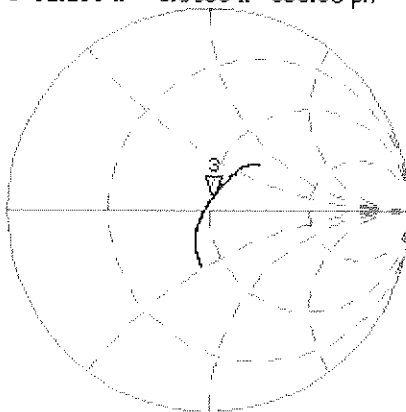


0 dB = 17.2 W/kg = 12.36 dBW/kg

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

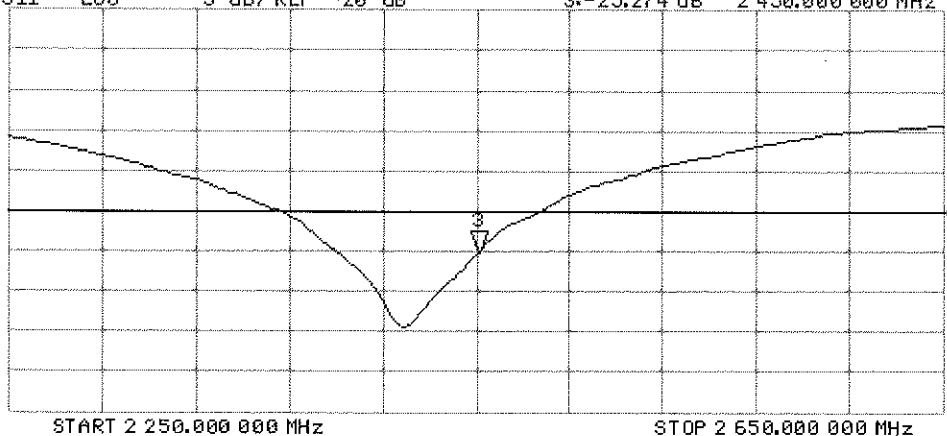
H1d

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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Client **PC Test**

Certificate No: **ES3-3263_May13**

CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3263**

Calibration procedure(s) **QA CAL-01.v8, QA CAL-23.v4, QA CAL-25.v4**
Calibration procedure for dosimetric E-field probes

Calibration date: **May 16, 2013**

*✓ KOK
5/23/13*

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 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:	Leif Klysner	Laboratory Technician	<i>Leif Klysner</i>
Approved by:	Katja Pokovic	Technical Manager	<i>Katja Pokovic</i>
Issued: May 17, 2013			
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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

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 ES3DV3

SN:3263

Manufactured: January 25, 2010
Calibrated: May 16, 2013

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

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	1.21	1.25	1.12	$\pm 10.1 \%$
DCP (mV) ^B	101.2	100.2	103.7	

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	156.5	$\pm 2.5 \%$
		Y	0.0	0.0	1.0		153.2	
		Z	0.0	0.0	1.0		147.2	

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:3263

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	6.51	6.51	6.51	0.21	2.29	± 12.0 %
835	41.5	0.90	6.29	6.29	6.29	0.50	1.38	± 12.0 %
1750	40.1	1.37	5.30	5.30	5.30	0.45	1.54	± 12.0 %
1900	40.0	1.40	5.11	5.11	5.11	0.57	1.38	± 12.0 %
2450	39.2	1.80	4.47	4.47	4.47	0.59	1.49	± 12.0 %
2600	39.0	1.96	4.31	4.31	4.31	0.80	1.28	± 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: ES3DV3 - SN:3263

Calibration Parameter Determined in Body Tissue Simulating Media

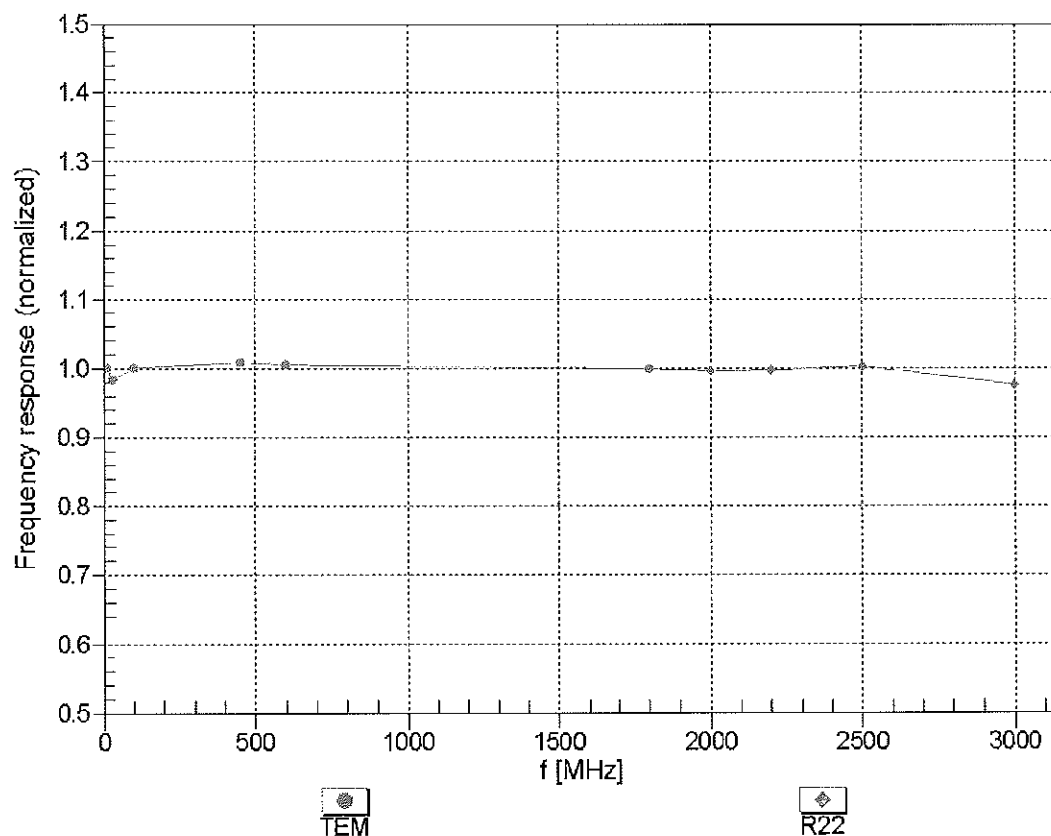
f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	6.37	6.37	6.37	0.34	1.82	± 12.0 %
835	55.2	0.97	6.29	6.29	6.29	0.54	1.39	± 12.0 %
1750	53.4	1.49	5.01	5.01	5.01	0.72	1.27	± 12.0 %
1900	53.3	1.52	4.78	4.78	4.78	0.53	1.56	± 12.0 %
2450	52.7	1.95	4.33	4.33	4.33	0.80	1.14	± 12.0 %
2600	52.5	2.16	4.14	4.14	4.14	0.80	1.02	± 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

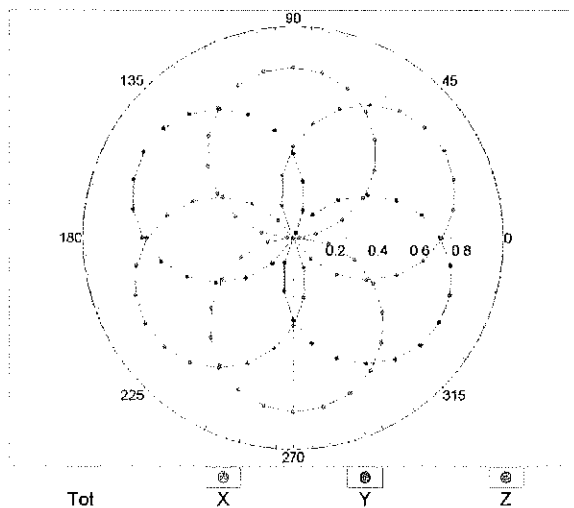
(TEM-Cell:ifi110 EXX, Waveguide: R22)



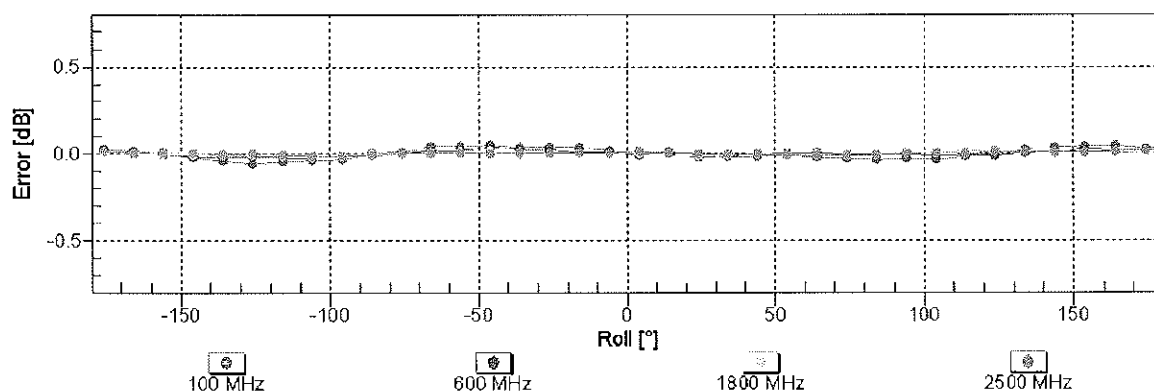
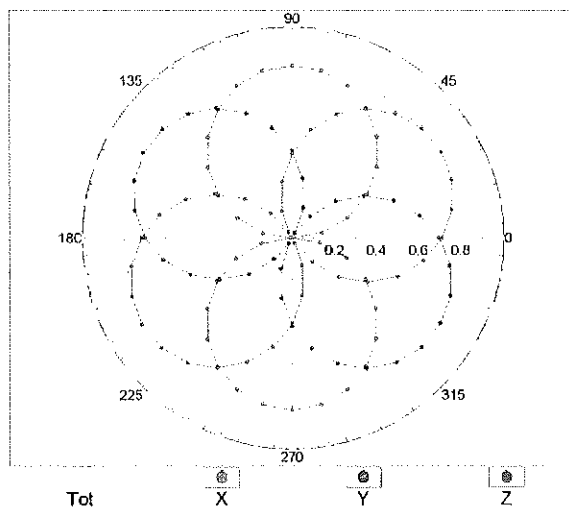
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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

f=600 MHz,TEM

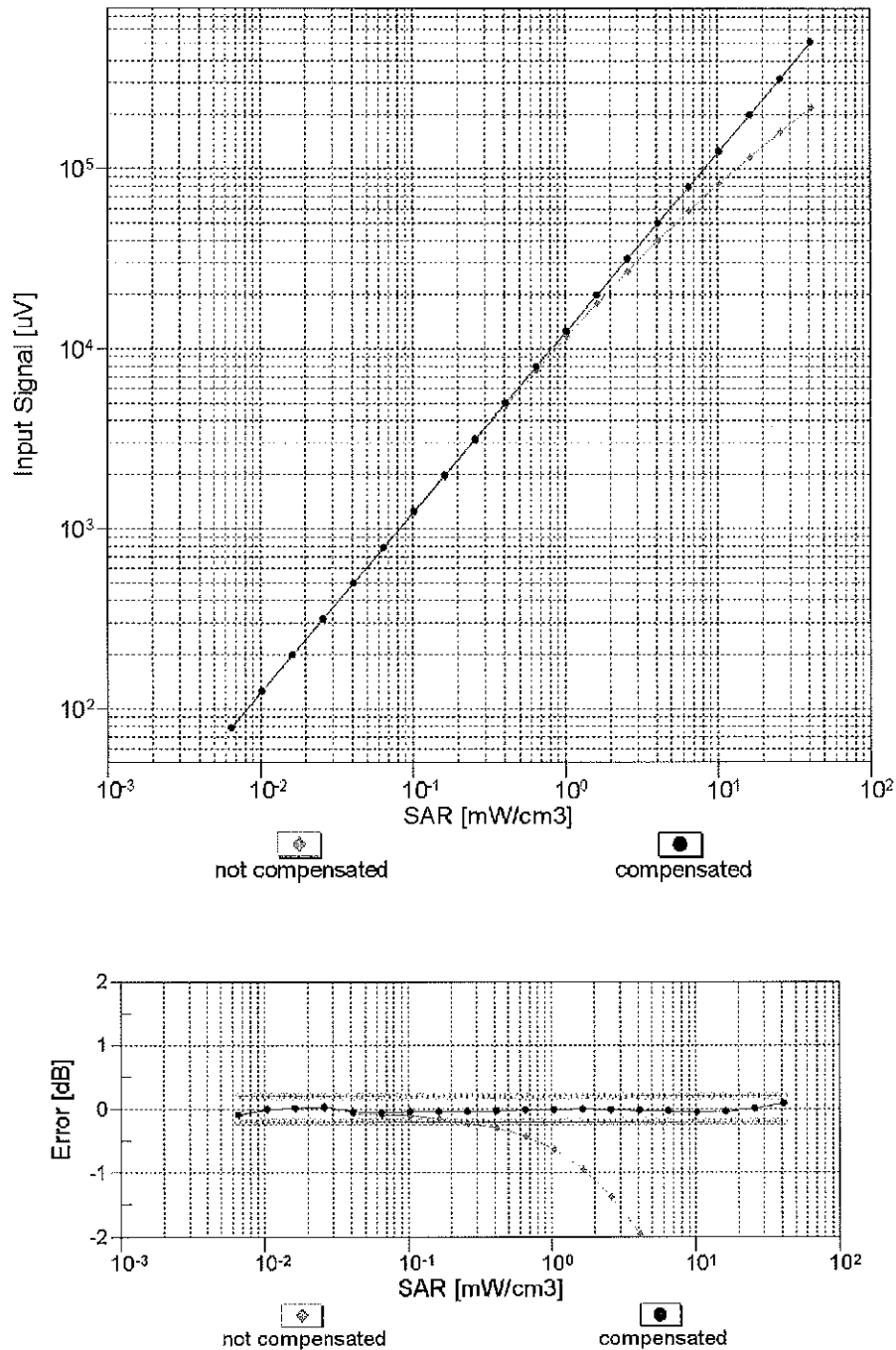


f=1800 MHz,R22



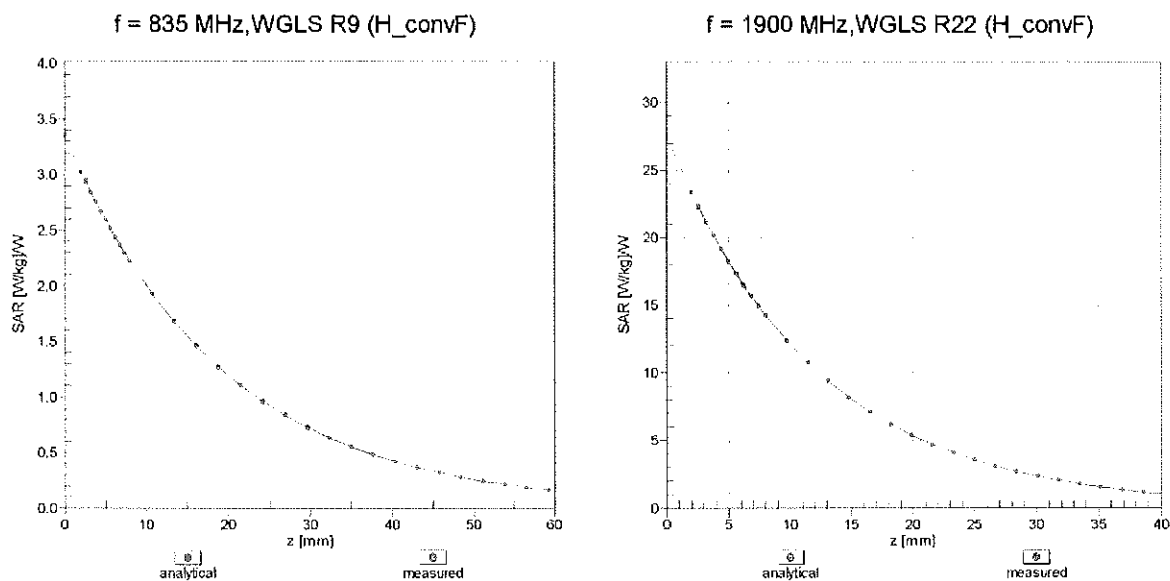
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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



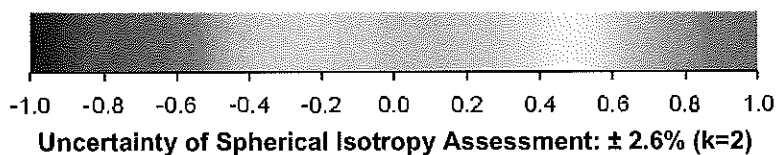
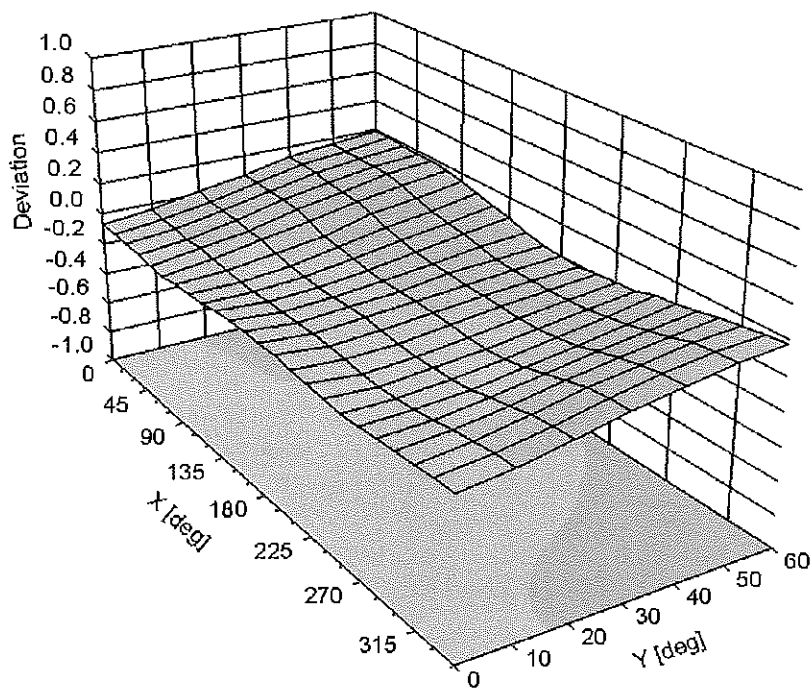
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, θ), $f = 900 \text{ MHz}$



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

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-116
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: **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			
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PCT # 81072



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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., $\theta = 0$ is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\theta = 0$ ($f \leq 900$ 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 %

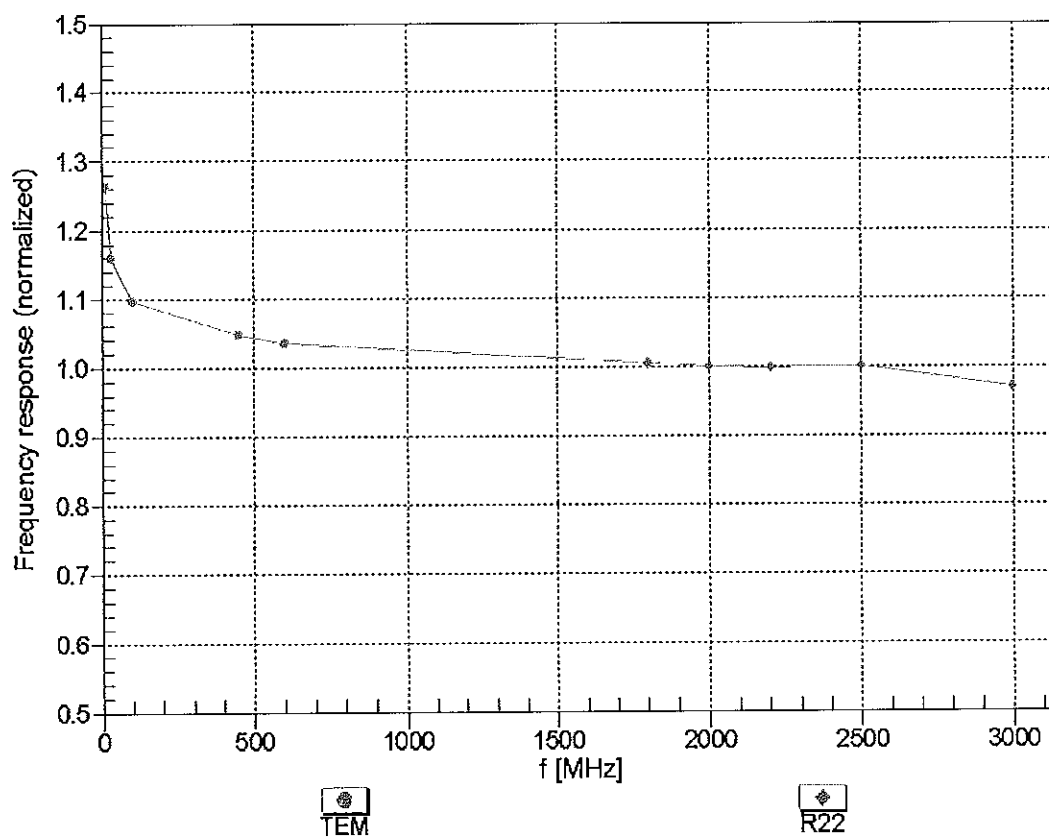
^C Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

^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

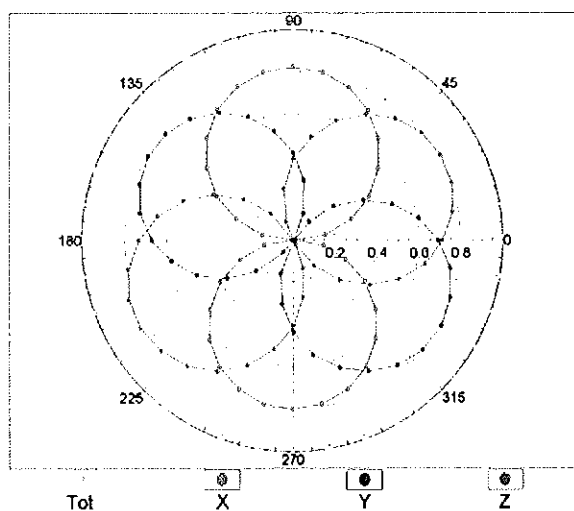
(TEM-Cell: ifi110 EXX, Waveguide: R22)



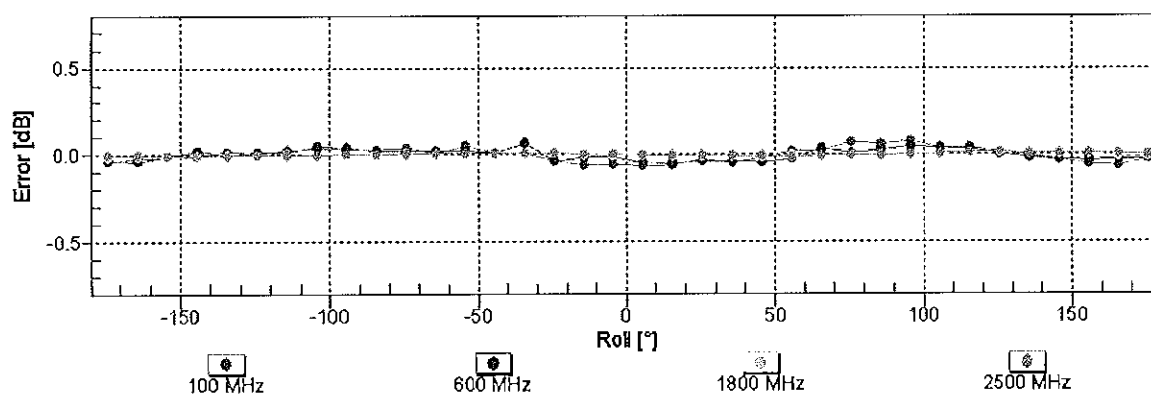
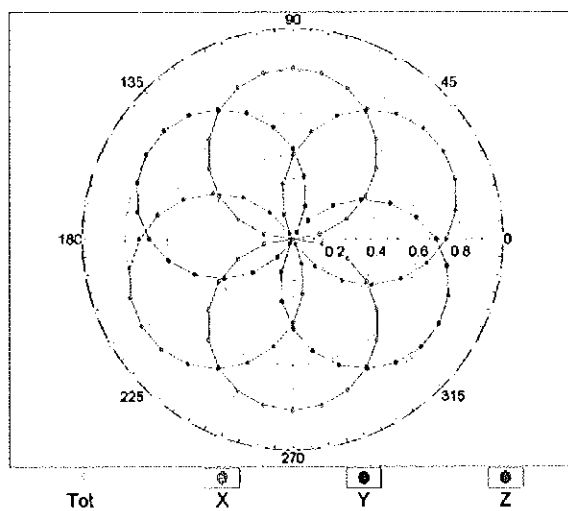
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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

f=600 MHz,TEM

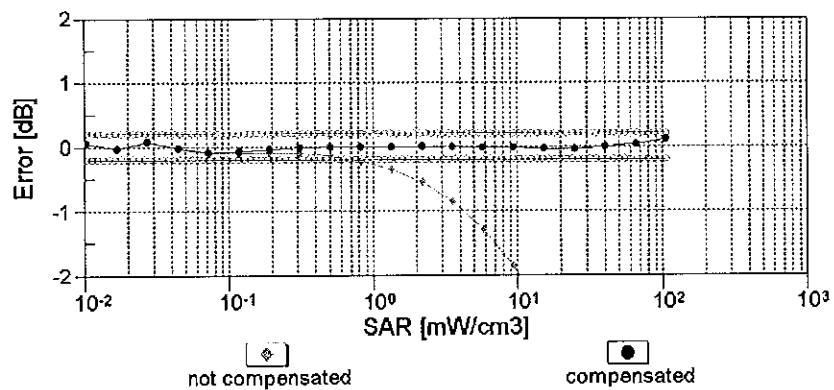
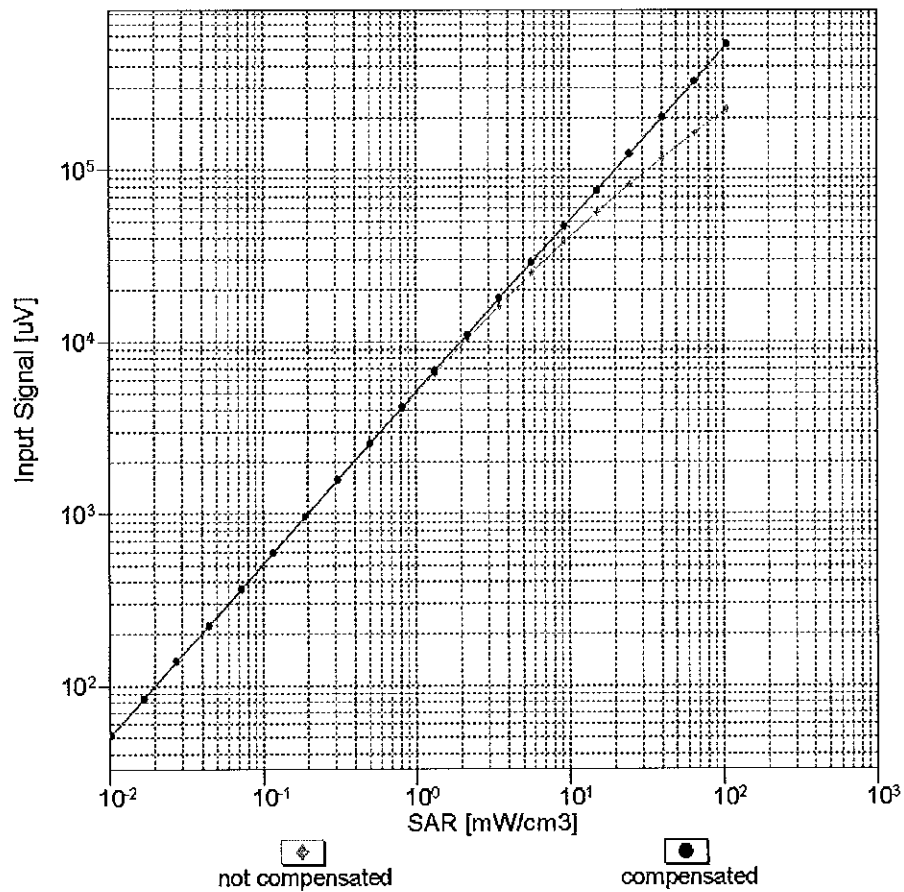


f=1800 MHz,R22



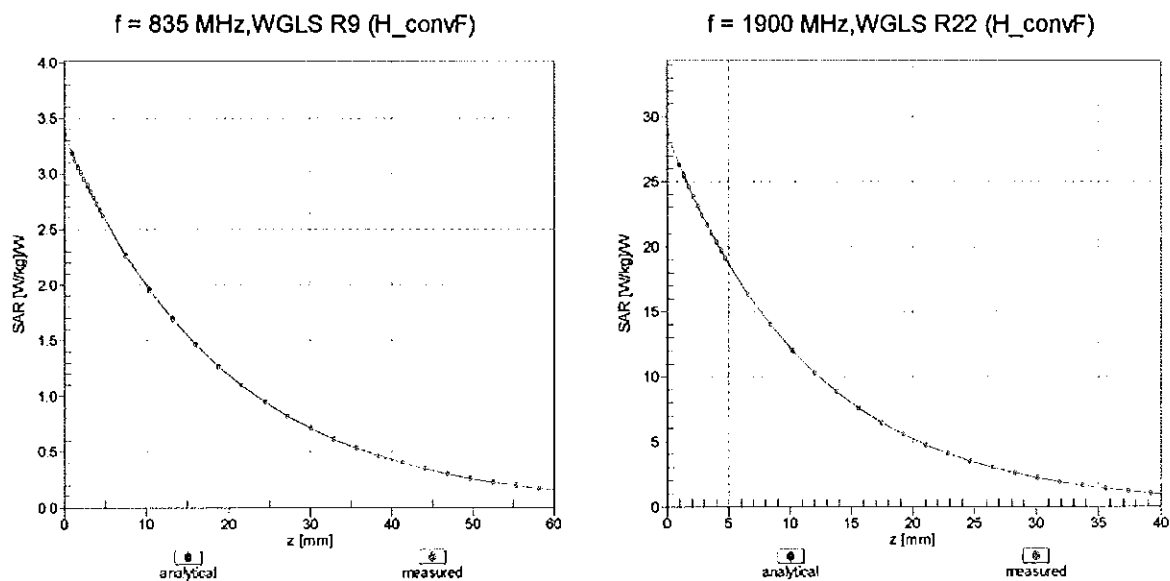
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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



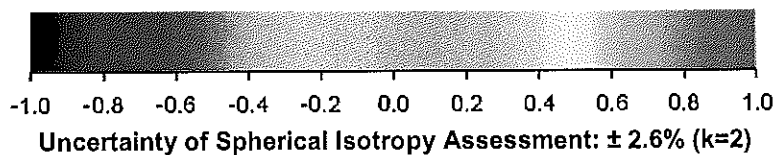
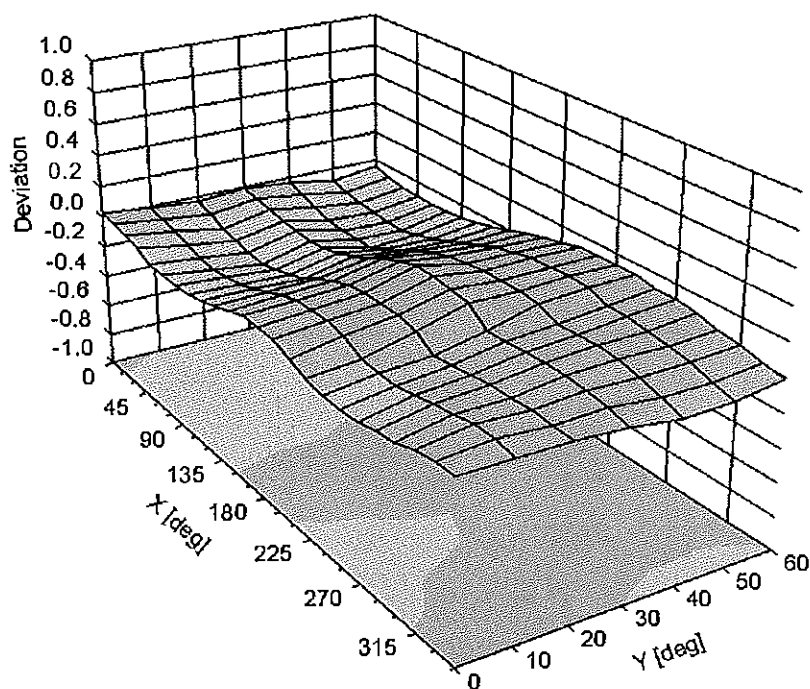
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, θ), $f = 900 \text{ MHz}$



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**

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



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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

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

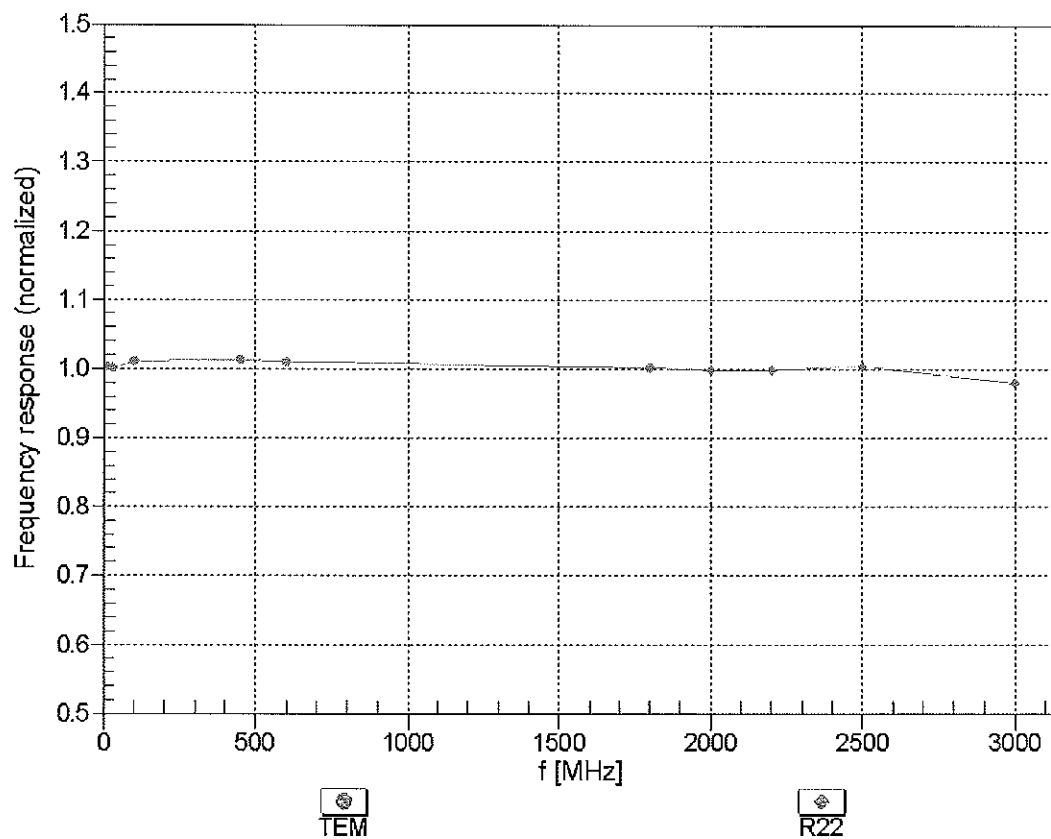
f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	5.92	5.92	5.92	0.24	1.99	± 12.0 %
835	55.2	0.97	5.91	5.91	5.91	0.29	1.85	± 12.0 %
1750	53.4	1.49	4.75	4.75	4.75	0.52	1.52	± 12.0 %
1900	53.3	1.52	4.49	4.49	4.49	0.49	1.56	± 12.0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

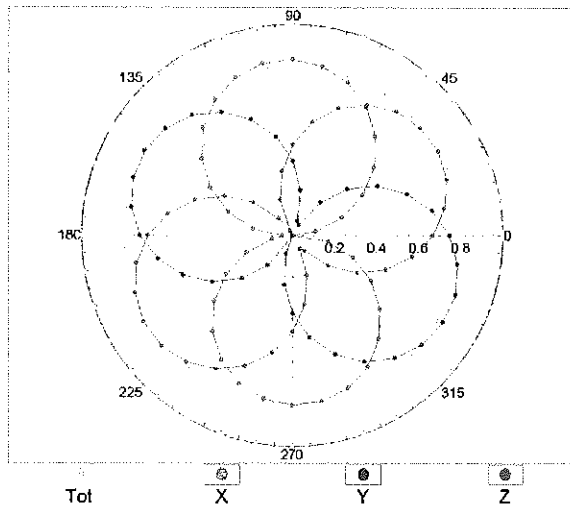
(TEM-Cell:ifi110 EXX, Waveguide: R22)



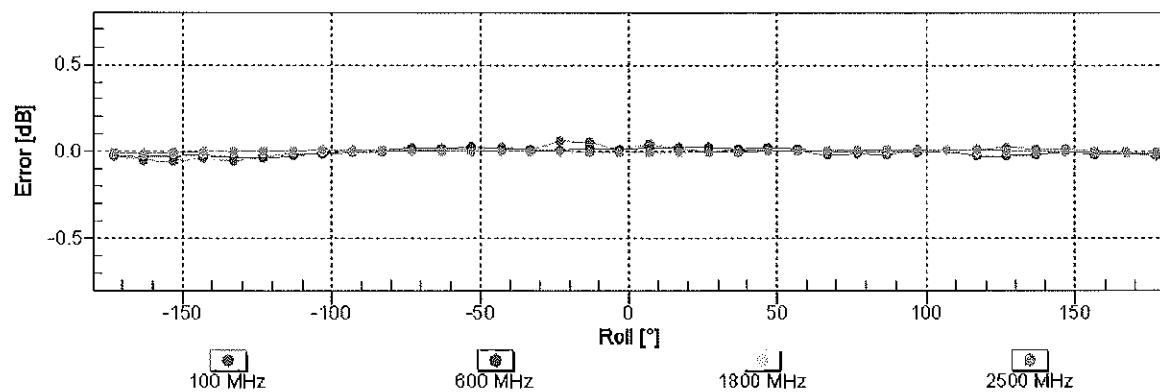
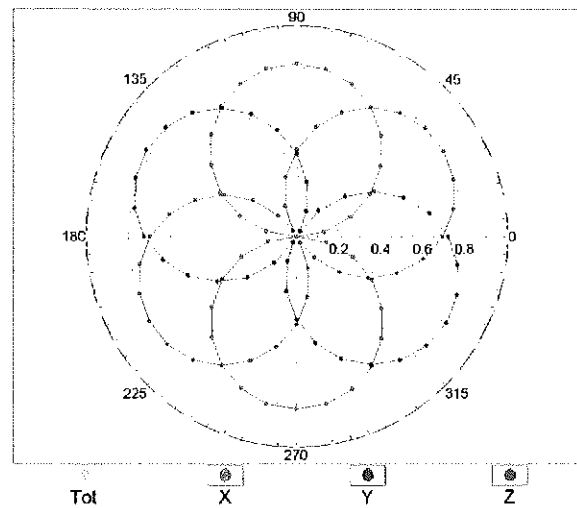
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

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

f=600 MHz,TEM

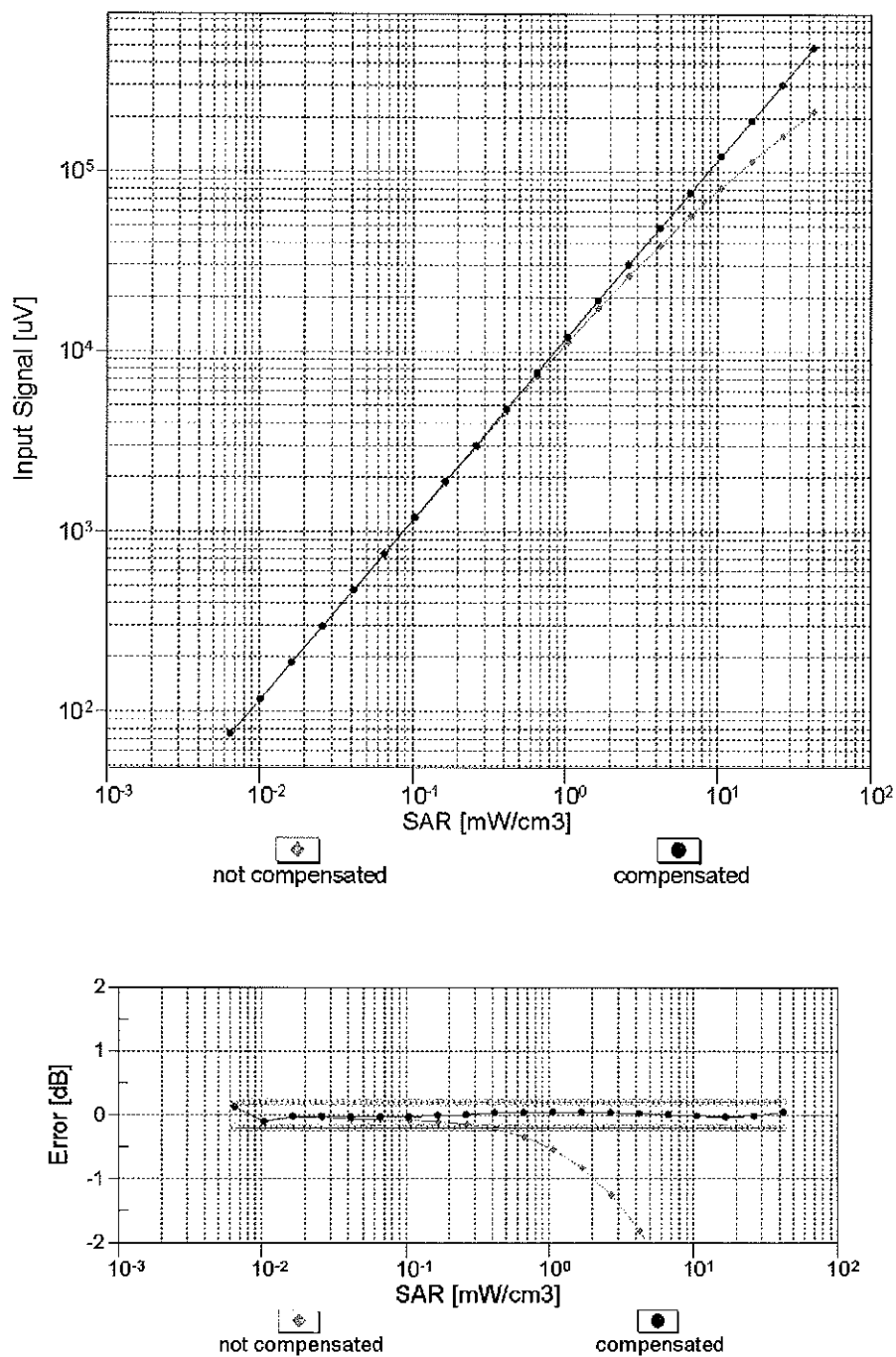


f=1800 MHz,R22



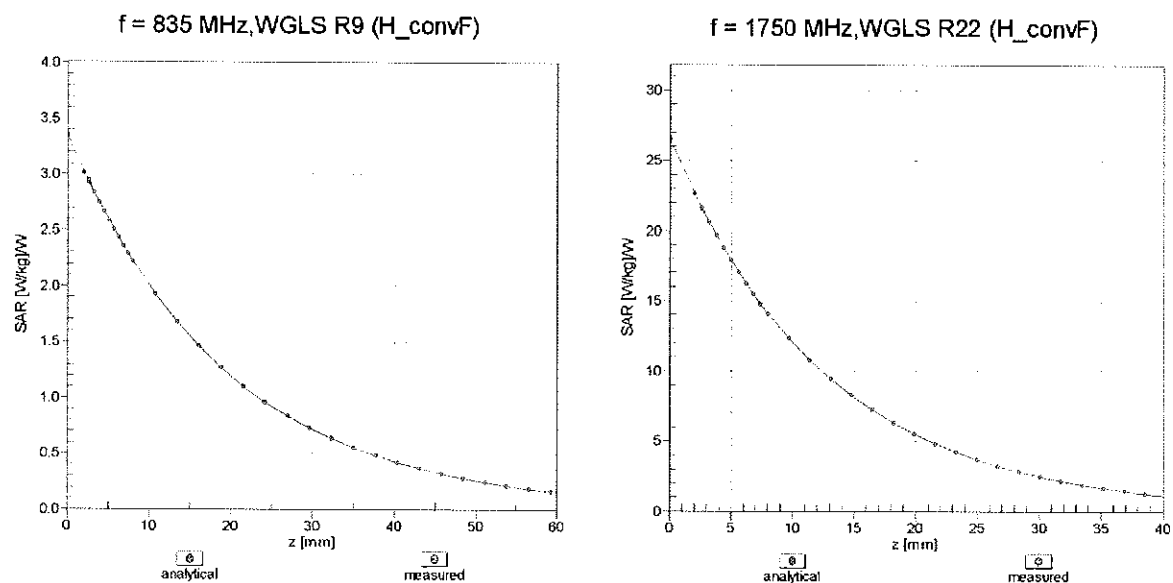
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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



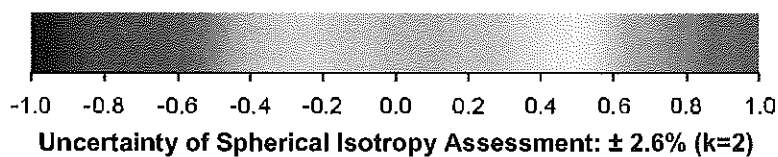
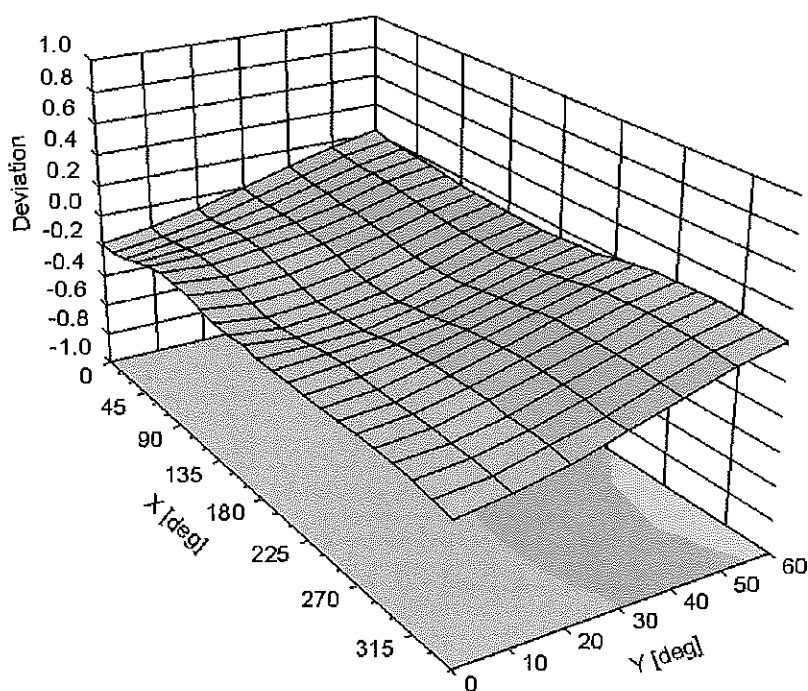
Uncertainty of Linearity Assessment: $\pm 0.6\%$ (k=2)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ , θ), $f = 900 \text{ MHz}$



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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Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **ES3-3288_Sep13/2**

CALIBRATION CERTIFICATE (Replacement of No: ES3-3288_Sep13)

Object	ES3DV3 - SN:3288	CCV 10/4/13
Calibration procedure(s)	QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6 Calibration procedure for dosimetric E-field probes	
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 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)	Apr-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

Calibrated by:	Name Jeton Kastrati	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.			

Probe ES3DV3

SN:3288

Manufactured: July 6, 2010
Calibrated: September 23, 2013

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



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

The Swiss Accreditation Service is one of the signatories to the EA
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Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization ϕ	ϕ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

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.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3288

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.87	0.97	0.75	± 10.1 %
DCP (mV) ^B	103.3	103.2	100.2	

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	171.1	±3.5 %
		Y	0.0	0.0	1.0		135.0	
		Z	0.0	0.0	1.0		154.3	

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 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:3288

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	6.56	6.56	6.56	0.32	1.89	± 12.0 %
835	41.5	0.90	6.37	6.37	6.37	0.34	1.82	± 12.0 %
1750	40.1	1.37	5.67	5.67	5.67	0.56	1.51	± 12.0 %
1900	40.0	1.40	5.47	5.47	5.47	0.80	1.29	± 12.0 %
2450	39.2	1.80	4.63	4.63	4.63	0.80	1.34	± 12.0 %
2600	39.0	1.96	4.55	4.55	4.55	0.80	1.41	± 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: ES3DV3 - SN:3288

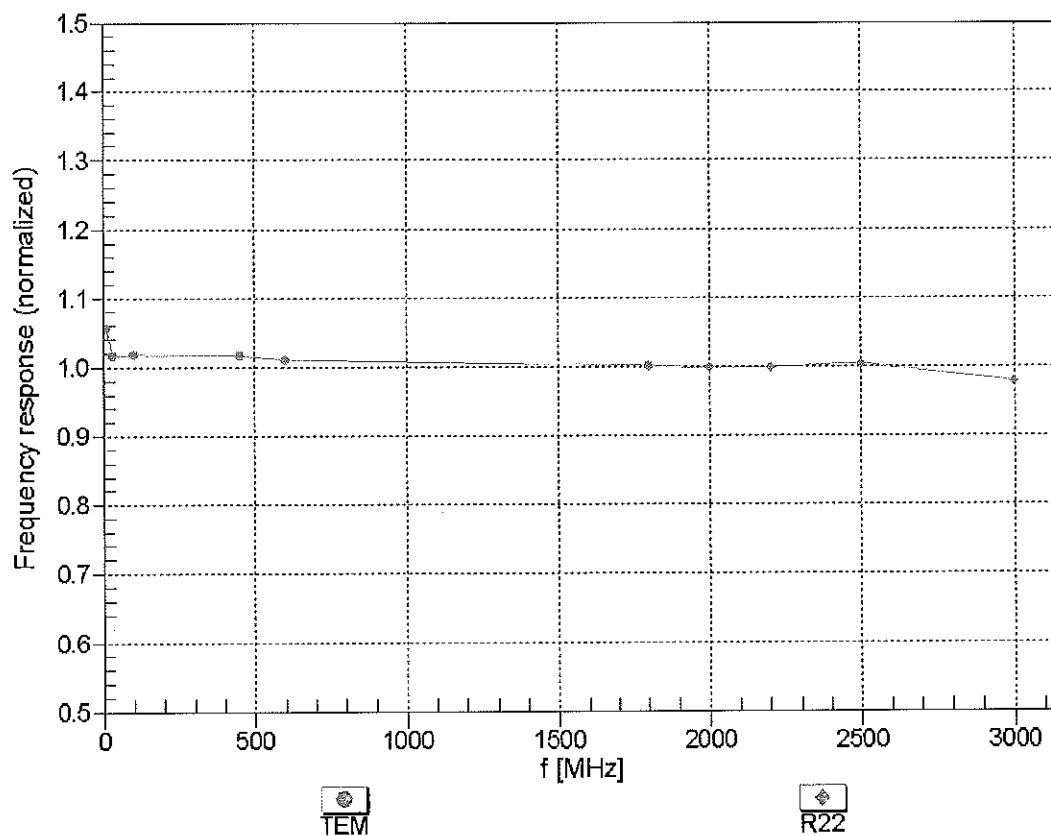
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	6.25	6.25	6.25	0.70	1.27	± 12.0 %
835	55.2	0.97	6.27	6.27	6.27	0.75	1.22	± 12.0 %
1750	53.4	1.49	5.10	5.10	5.10	0.59	1.46	± 12.0 %
1900	53.3	1.52	4.82	4.82	4.82	0.53	1.54	± 12.0 %
2450	52.7	1.95	4.37	4.37	4.37	0.80	1.02	± 12.0 %
2600	52.5	2.16	4.14	4.14	4.14	0.64	0.94	± 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.

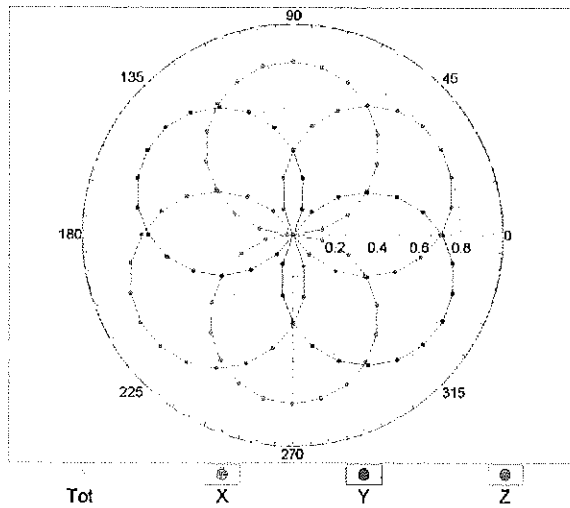
Frequency Response of E-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)



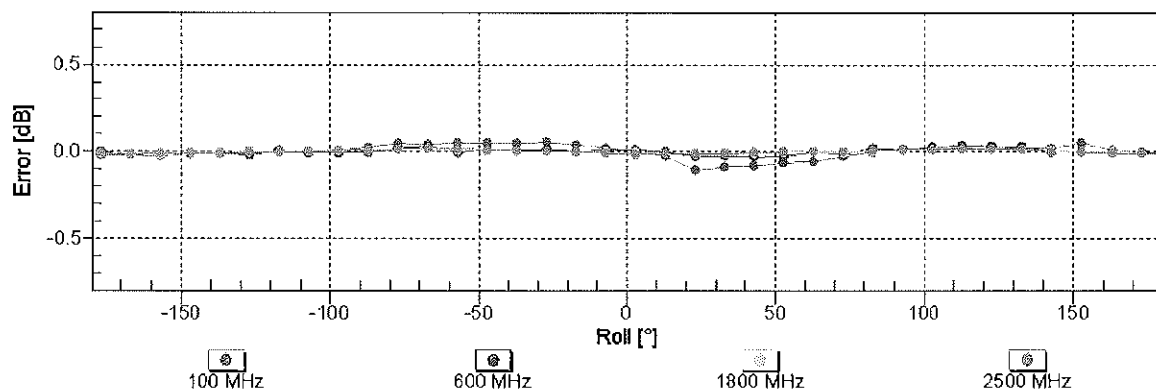
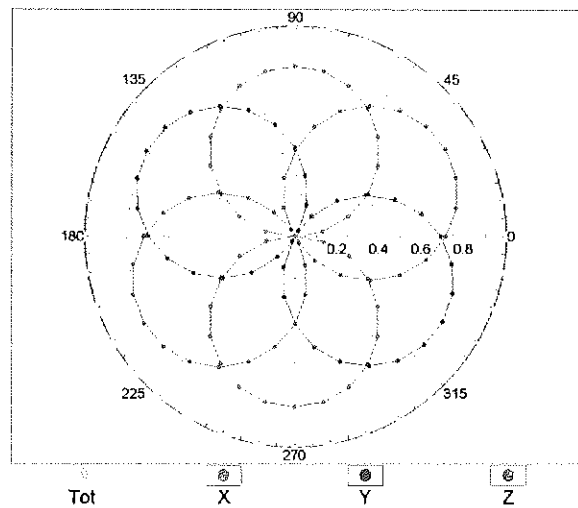
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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

f=600 MHz,TEM

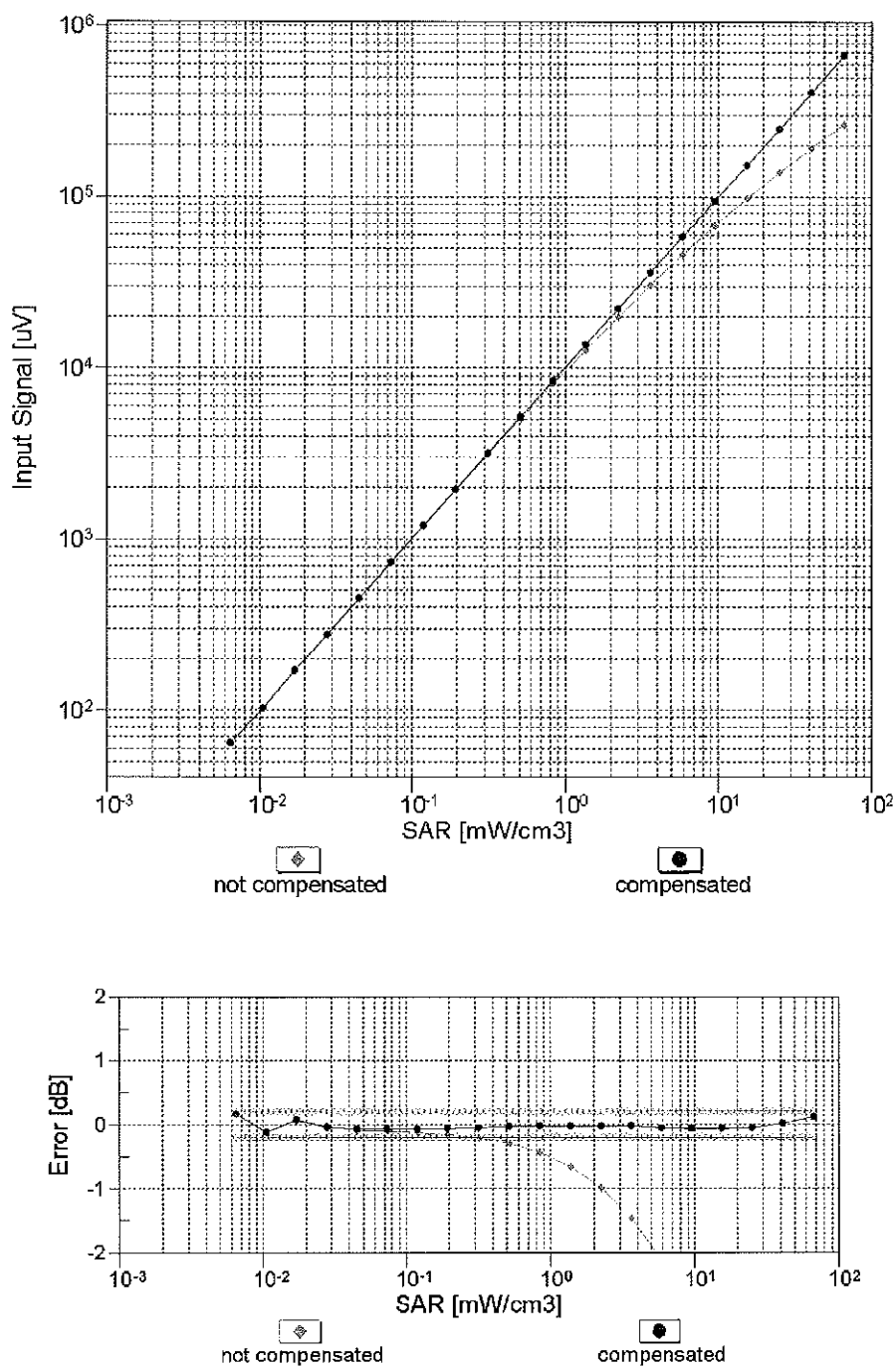


f=1800 MHz,R22



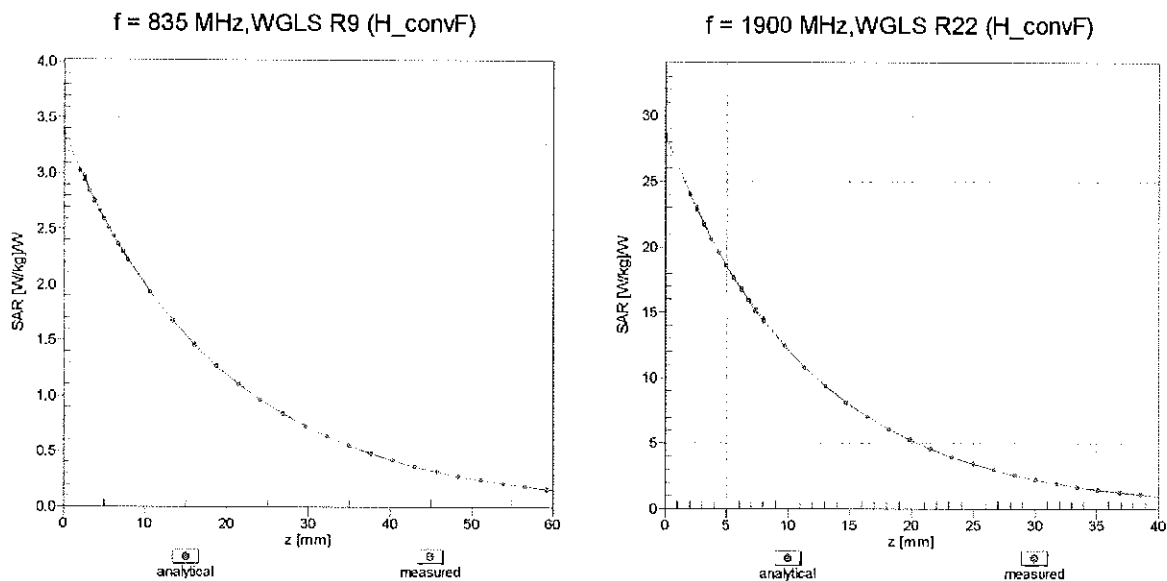
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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



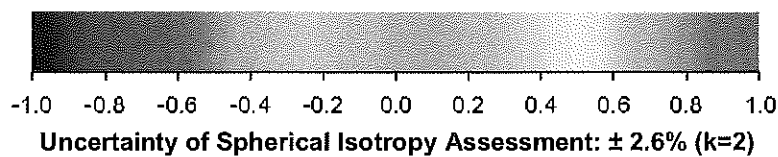
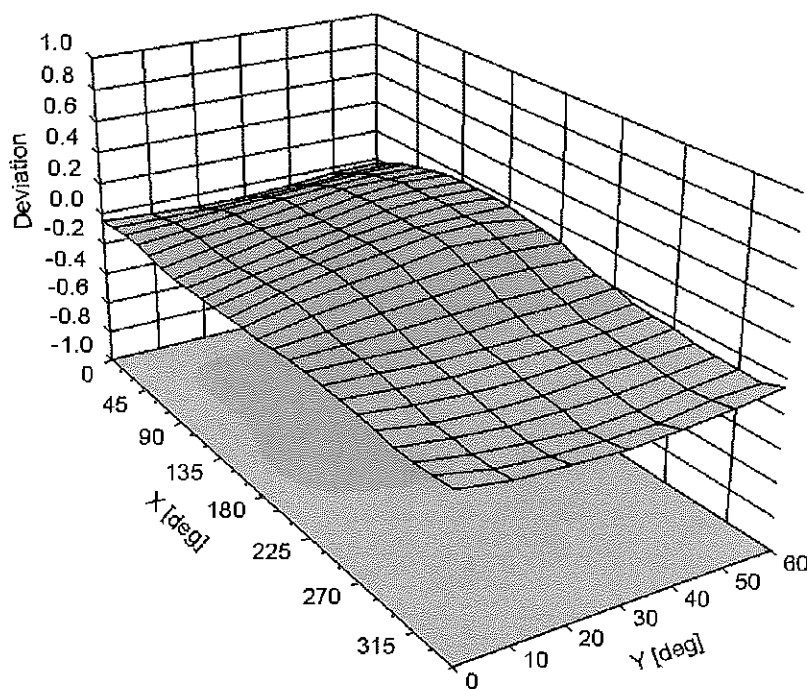
Uncertainty of Linearity Assessment: $\pm 0.6\%$ (k=2)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, θ), $f = 900 \text{ MHz}$



DASY/EASY - Parameters of Probe: ES3DV3 - SN:3288

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-127.1
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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Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **ES3-3209_Mar13**

CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3209**

Calibration procedure(s) **QA CAL-01.v8, QA CAL-23.v4, QA CAL-25.v4**
Calibration procedure for dosimetric E-field probes

Calibration date: **March 15, 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)

✓ KOK
3/24/13

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Reference 30 dB Attenuator	SN: S5129 (30b)	27-Mar-12 (No. 217-01532)	Apr-13
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-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

Calibrated by:	Name Israe El-Naouq	Function Laboratory Technician	Signature
Approved by:	Name Katja Pokovic	Function Technical Manager	Signature
			Issued: March 15, 2013
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			



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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 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.
- DCPx,y,z**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A_{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 ES3DV3

SN:3209

Manufactured: October 14, 2008
Calibrated: March 15, 2013

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3209

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	1.35	1.33	1.14	$\pm 10.1 \%$
DCP (mV) ^B	99.2	97.8	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	163.6	$\pm 3.5 \%$
		Y	0.0	0.0	1.0		170.3	
		Z	0.0	0.0	1.0		158.7	

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 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:3209

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	6.74	6.74	6.74	0.76	1.18	± 12.0 %
835	41.5	0.90	6.46	6.46	6.46	0.31	1.81	± 12.0 %
1750	40.1	1.37	5.39	5.39	5.39	0.80	1.21	± 12.0 %
1900	40.0	1.40	5.21	5.21	5.21	0.78	1.26	± 12.0 %
2450	39.2	1.80	4.57	4.57	4.57	0.65	1.43	± 12.0 %
2600	39.0	1.96	4.43	4.43	4.43	0.75	1.36	± 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: ES3DV3 - SN:3209

Calibration Parameter Determined in Body Tissue Simulating Media

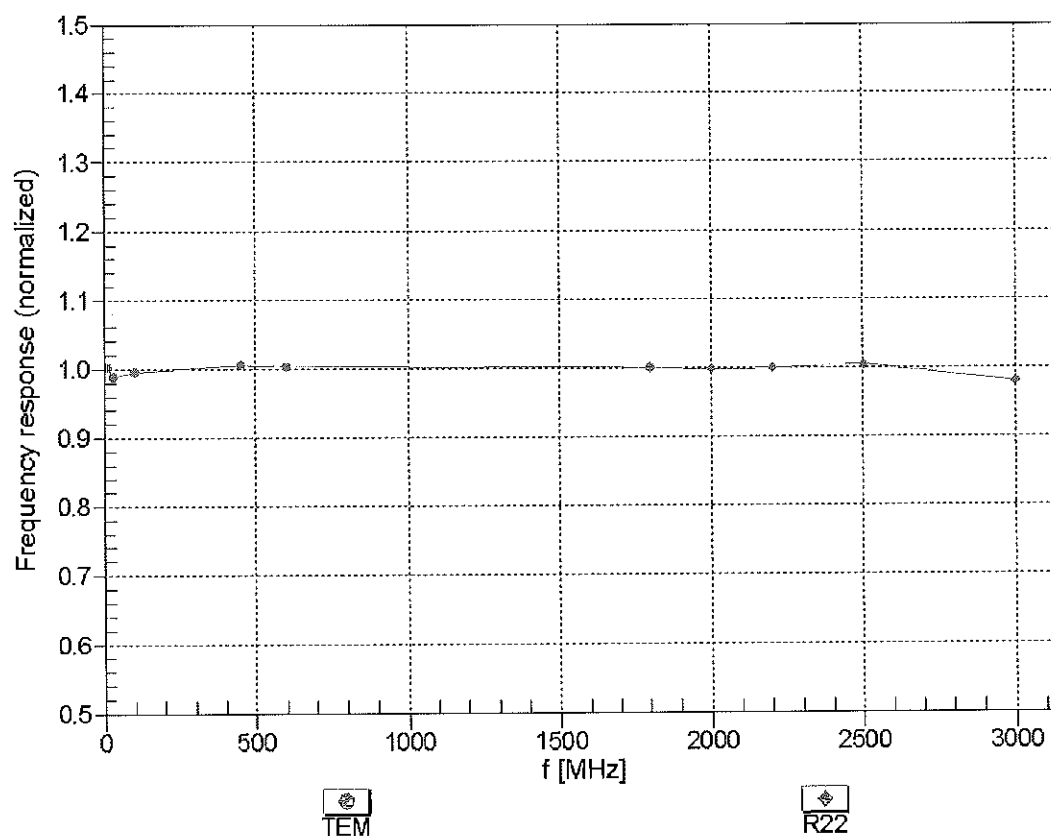
f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	6.38	6.38	6.38	0.80	1.16	± 12.0 %
835	55.2	0.97	6.28	6.28	6.28	0.52	1.45	± 12.0 %
1750	53.4	1.49	5.03	5.03	5.03	0.58	1.45	± 12.0 %
1900	53.3	1.52	4.77	4.77	4.77	0.70	1.36	± 12.0 %
2450	52.7	1.95	4.34	4.34	4.34	0.80	1.15	± 12.0 %
2600	52.5	2.16	4.11	4.11	4.11	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.

Frequency Response of E-Field

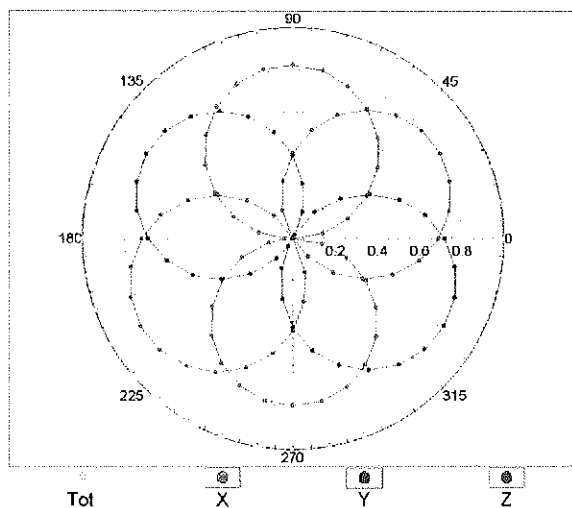
(TEM-Cell:ifi110 EXX, Waveguide: R22)



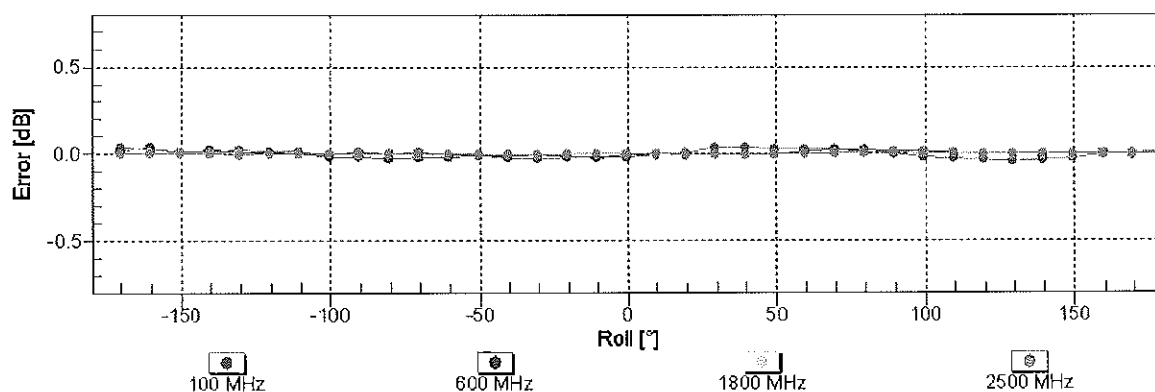
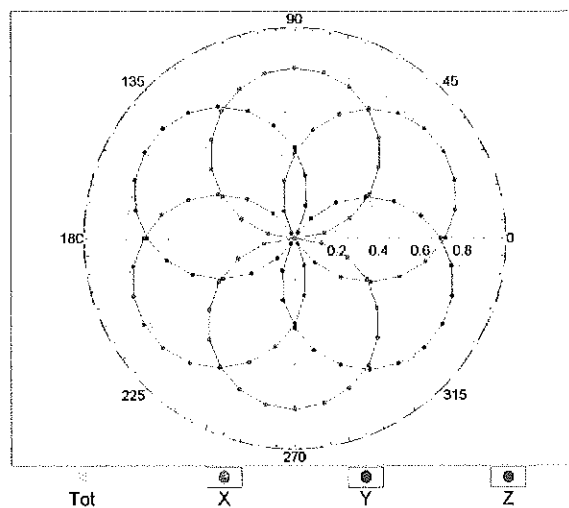
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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

f=600 MHz,TEM

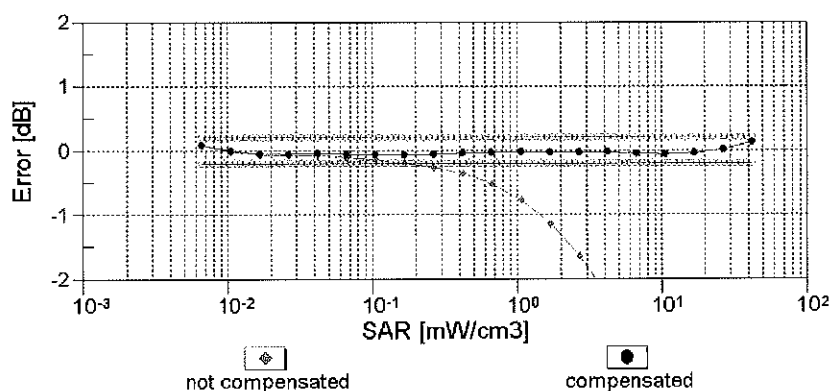
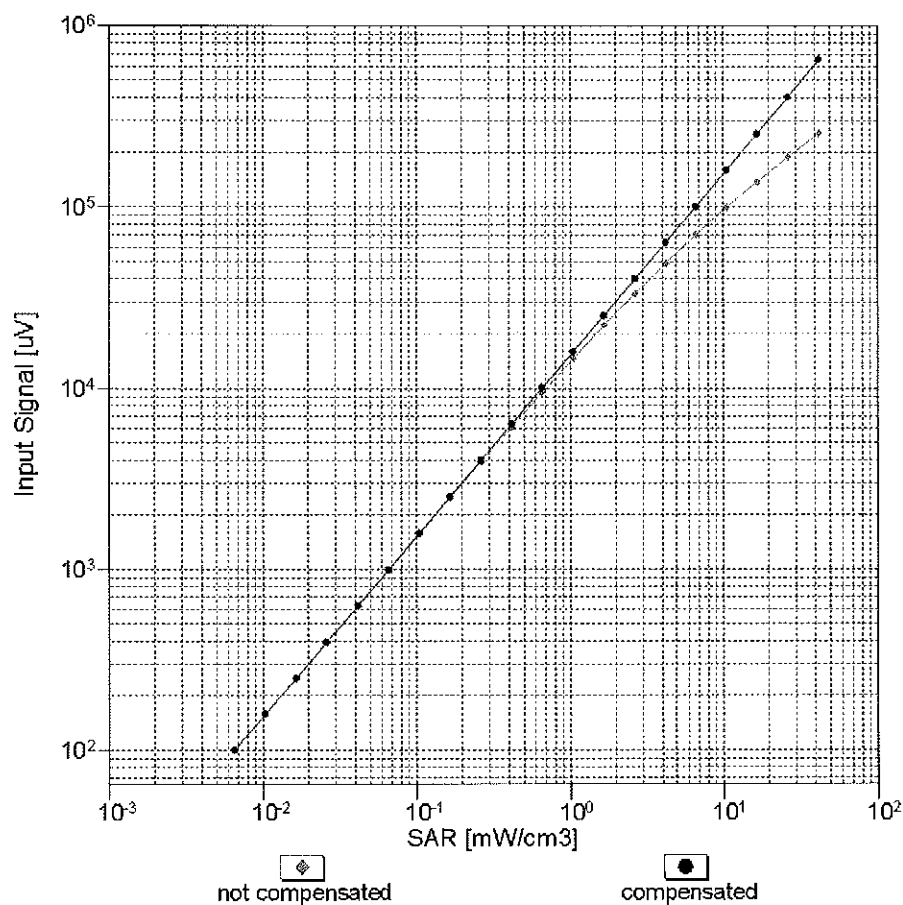


f=1800 MHz,R22



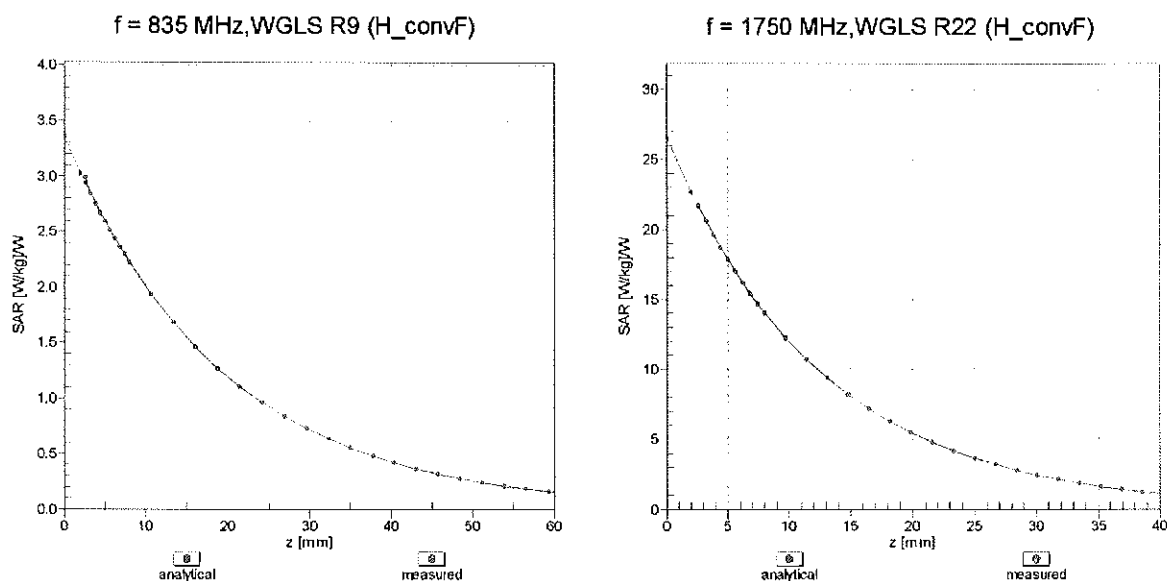
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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



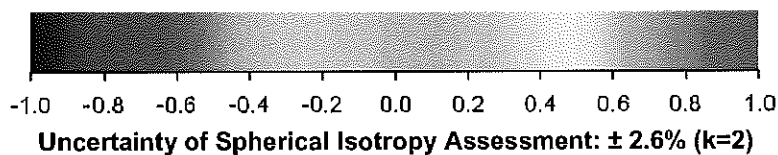
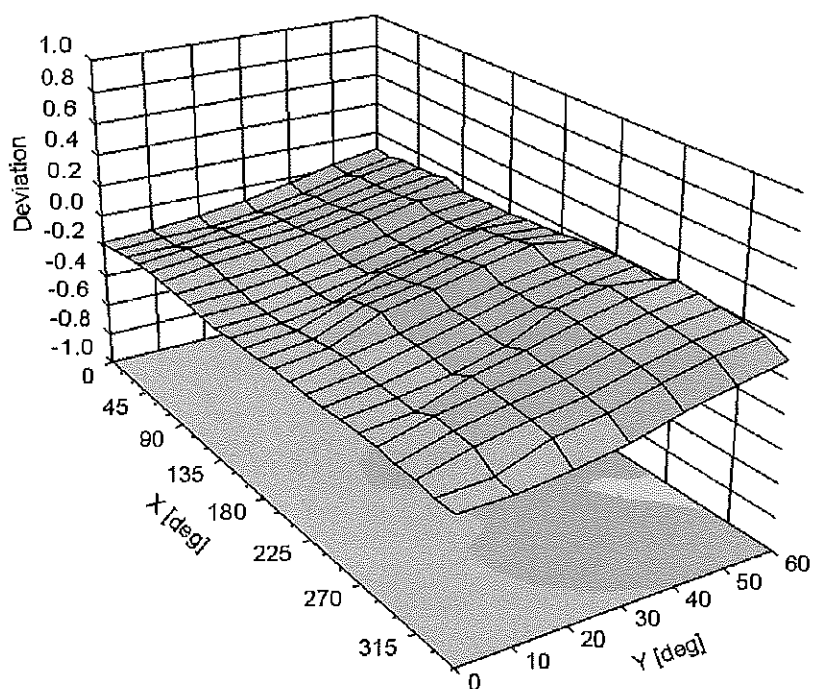
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, θ), $f = 900 \text{ MHz}$



DASY/EASY - Parameters of Probe: ES3DV3 - SN:3209

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-40.6
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm



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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 ± 3)°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

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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 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

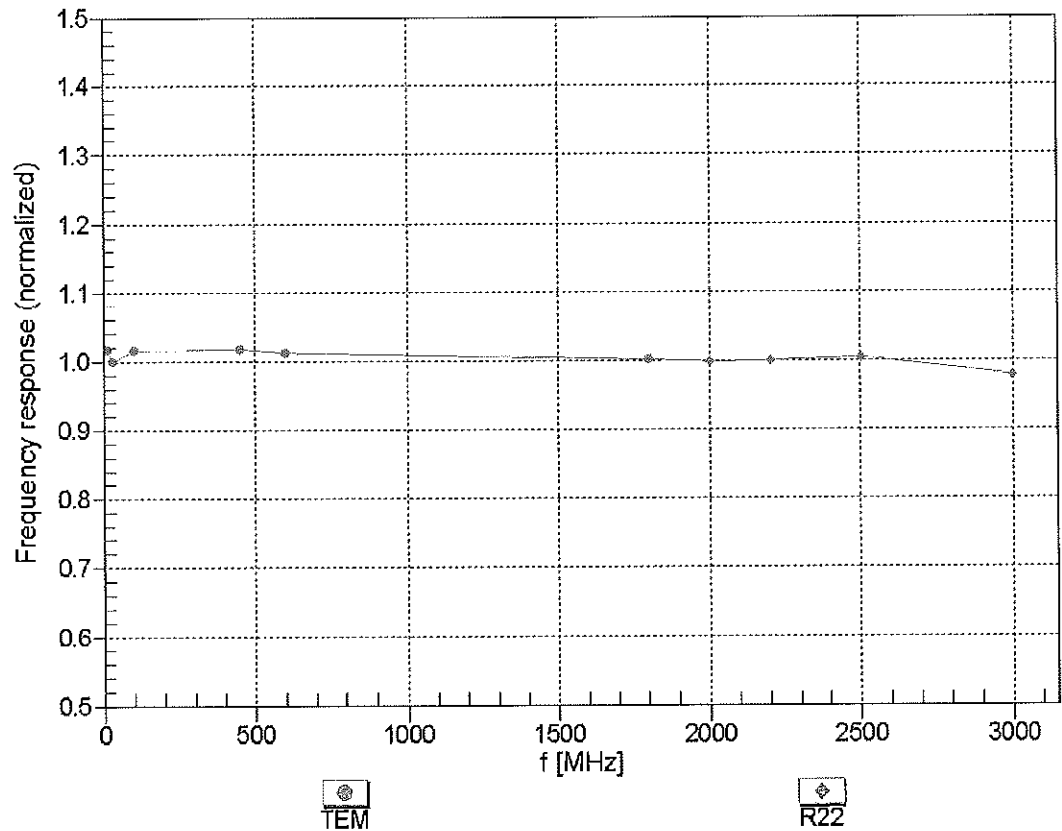
f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unct. (k=2)
750	55.5	0.96	6.11	6.11	6.11	0.33	1.90	± 12.0 %
850	55.2	0.99	6.07	6.07	6.07	0.80	1.19	± 12.0 %
1750	53.4	1.49	4.95	4.95	4.95	0.80	1.26	± 12.0 %
1900	53.3	1.52	4.71	4.71	4.71	0.49	1.54	± 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.

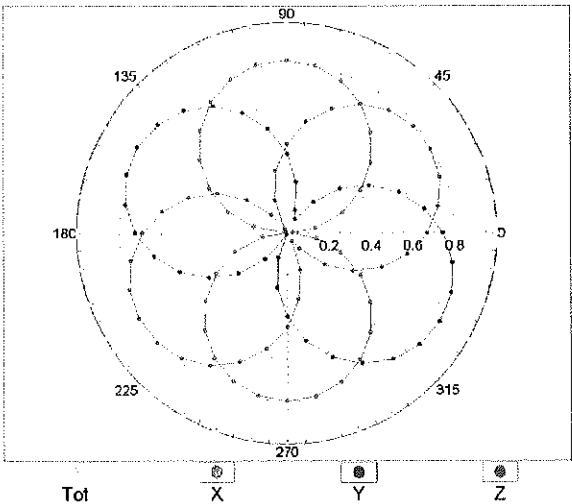
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



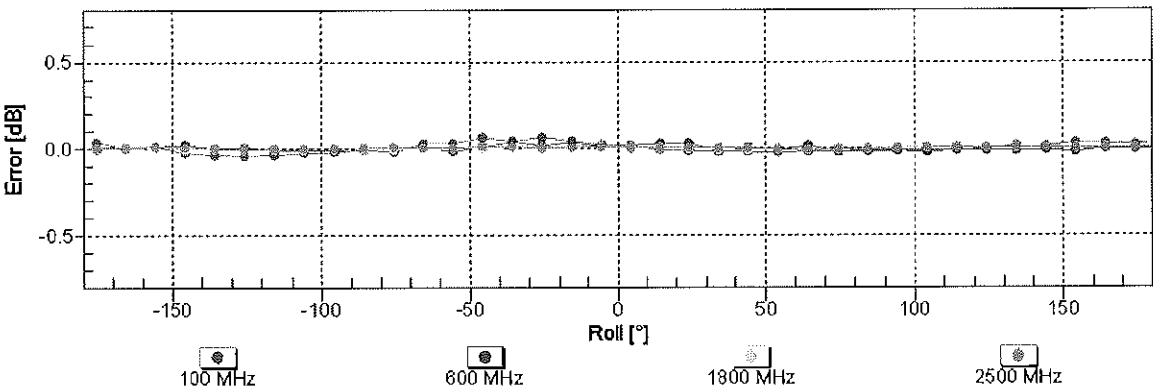
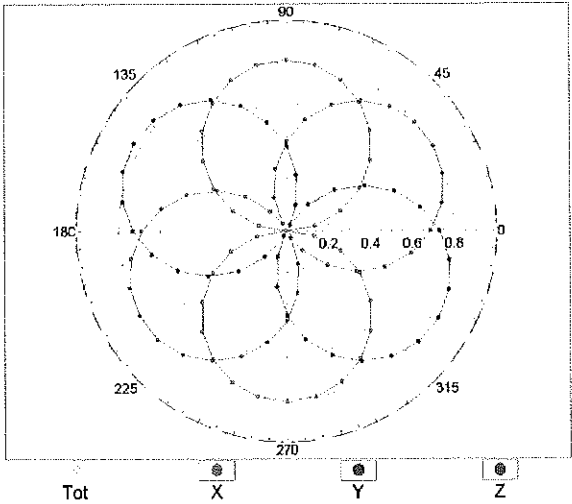
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

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

f=600 MHz,TEM

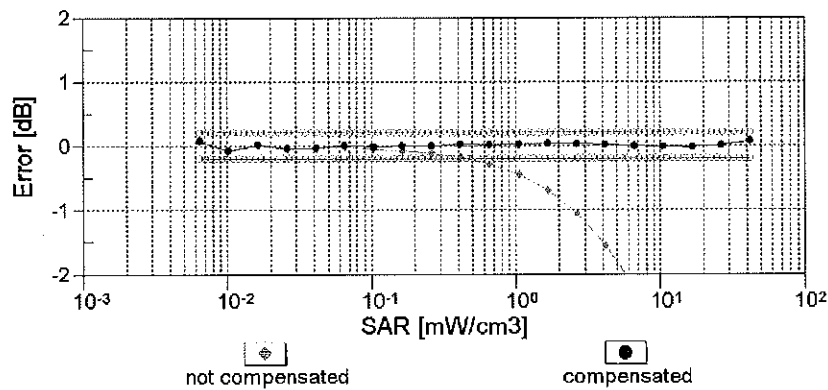
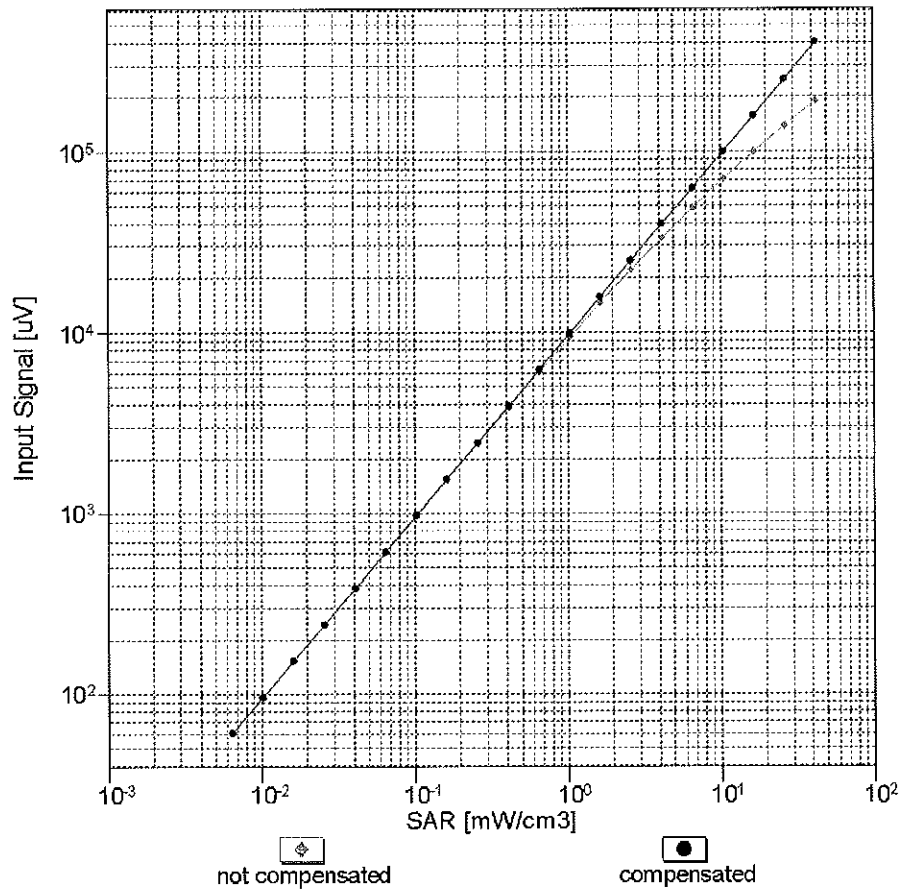


f=1800 MHz,R22



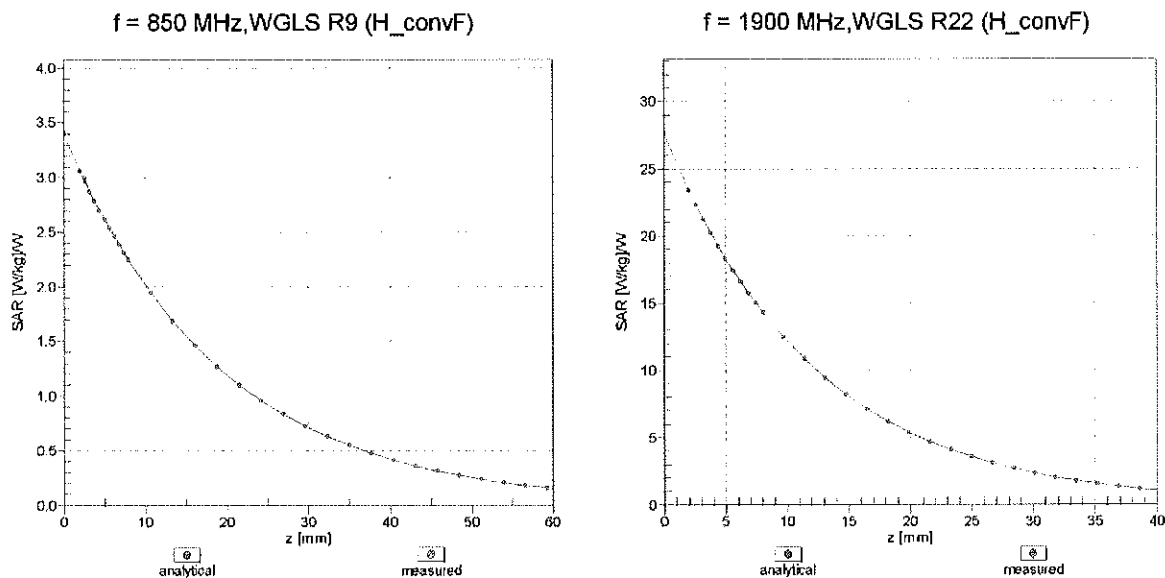
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ (k=2)

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



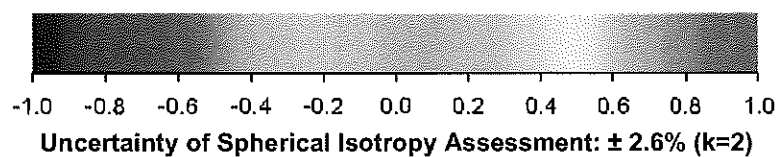
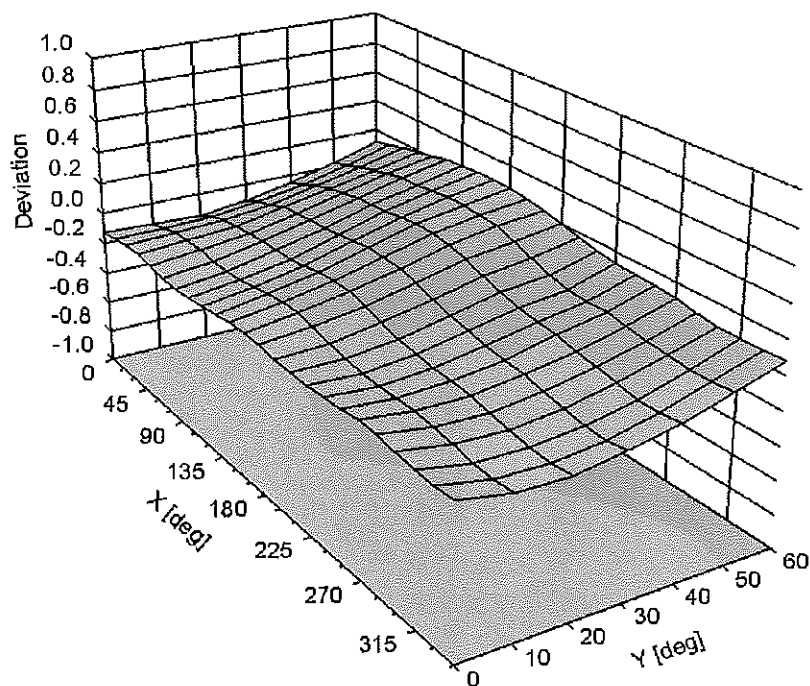
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

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)

Accreditation No.: **SCS 108**

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 Multilateral Agreement for the recognition of calibration certificates

Client **PC Test**

Certificate No: **ES3-3318_Apr13**

CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3318**

Calibration procedure(s) **QA CAL-01.v8, QA CAL-23.v4, QA CAL-25.v4**
Calibration procedure for dosimetric E-field probes

Calibration date: **April 29, 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	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:	Dimce Iliev	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	
			Issued: April 29, 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

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 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.

Probe ES3DV3

SN:3318

Manufactured: January 10, 2012
Calibrated: April 29, 2013

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3318

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	1.15	0.92	1.29	± 10.1 %
DCP (mV) ^B	102.6	105.4	100.8	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB/ μV	C	D dB	VR mV	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	153.6	±3.5 %
		Y	0.0	0.0	1.0		133.8	
		Z	0.0	0.0	1.0		154.8	

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:3318

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	6.59	6.59	6.59	0.25	2.12	± 12.0 %
850	41.5	0.92	6.33	6.33	6.33	0.57	1.25	± 12.0 %
1900	40.0	1.40	5.22	5.22	5.22	0.79	1.25	± 12.0 %
2450	39.2	1.80	4.59	4.59	4.59	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.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3318

Calibration Parameter Determined in Body Tissue Simulating Media

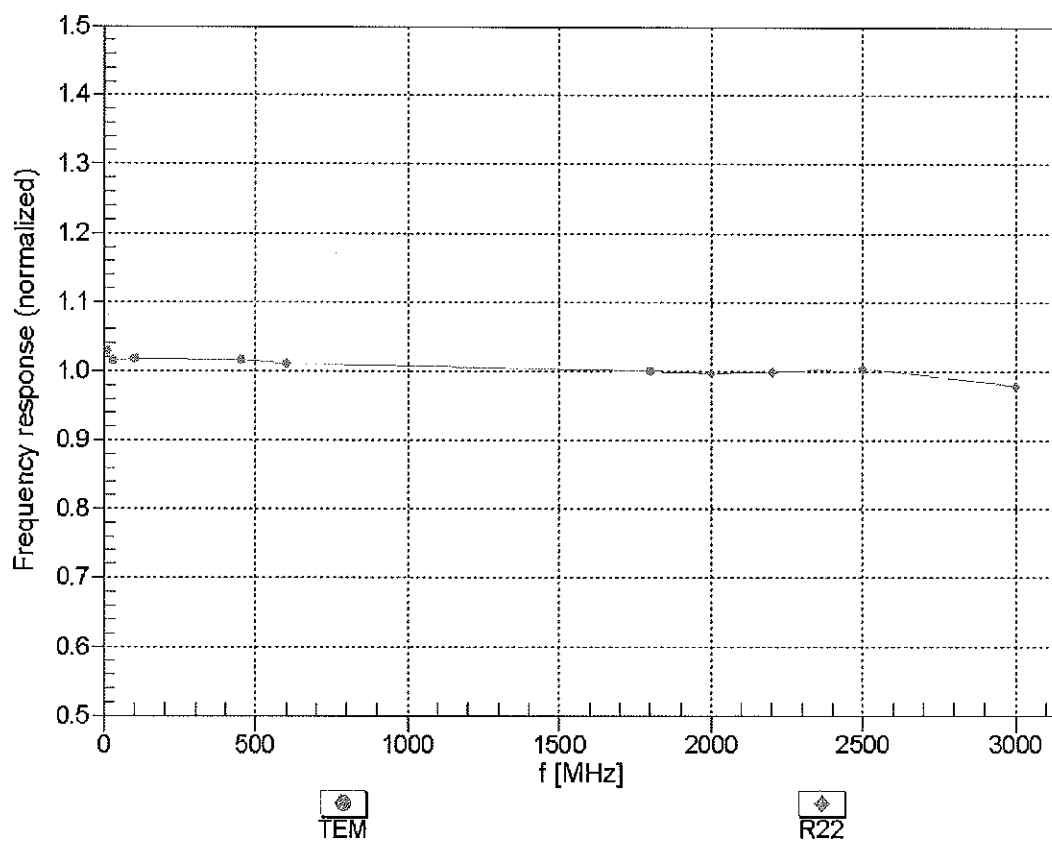
f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	6.35	6.35	6.35	0.53	1.42	± 12.0 %
850	55.2	0.99	6.21	6.21	6.21	0.57	1.38	± 12.0 %
1900	53.3	1.52	4.79	4.79	4.79	0.46	1.77	± 12.0 %
2450	52.7	1.95	4.31	4.31	4.31	0.80	1.09	± 12.0 %

^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

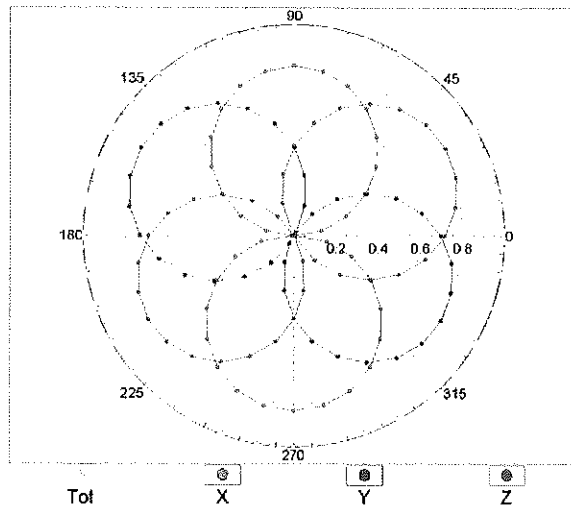
(TEM-Cell:ifi110 EXX, Waveguide: R22)



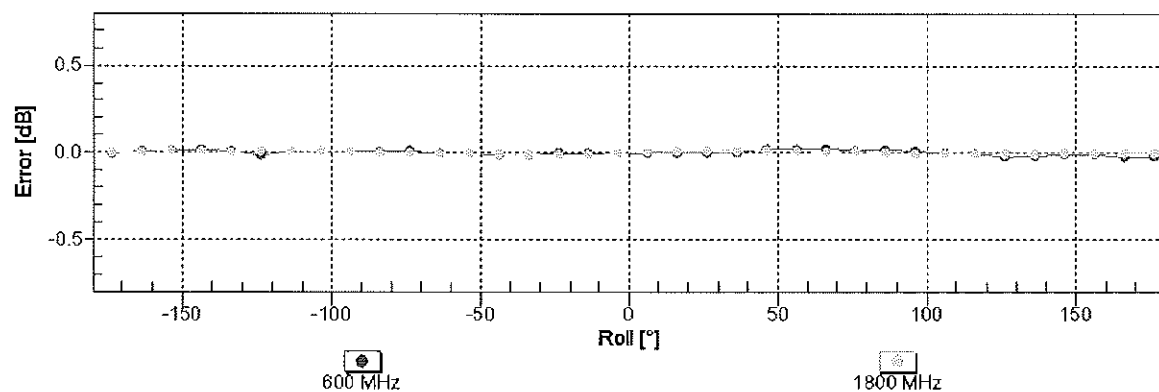
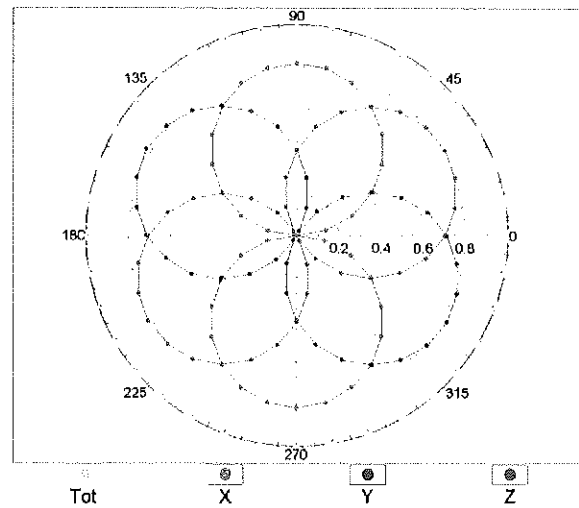
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

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

f=600 MHz,TEM

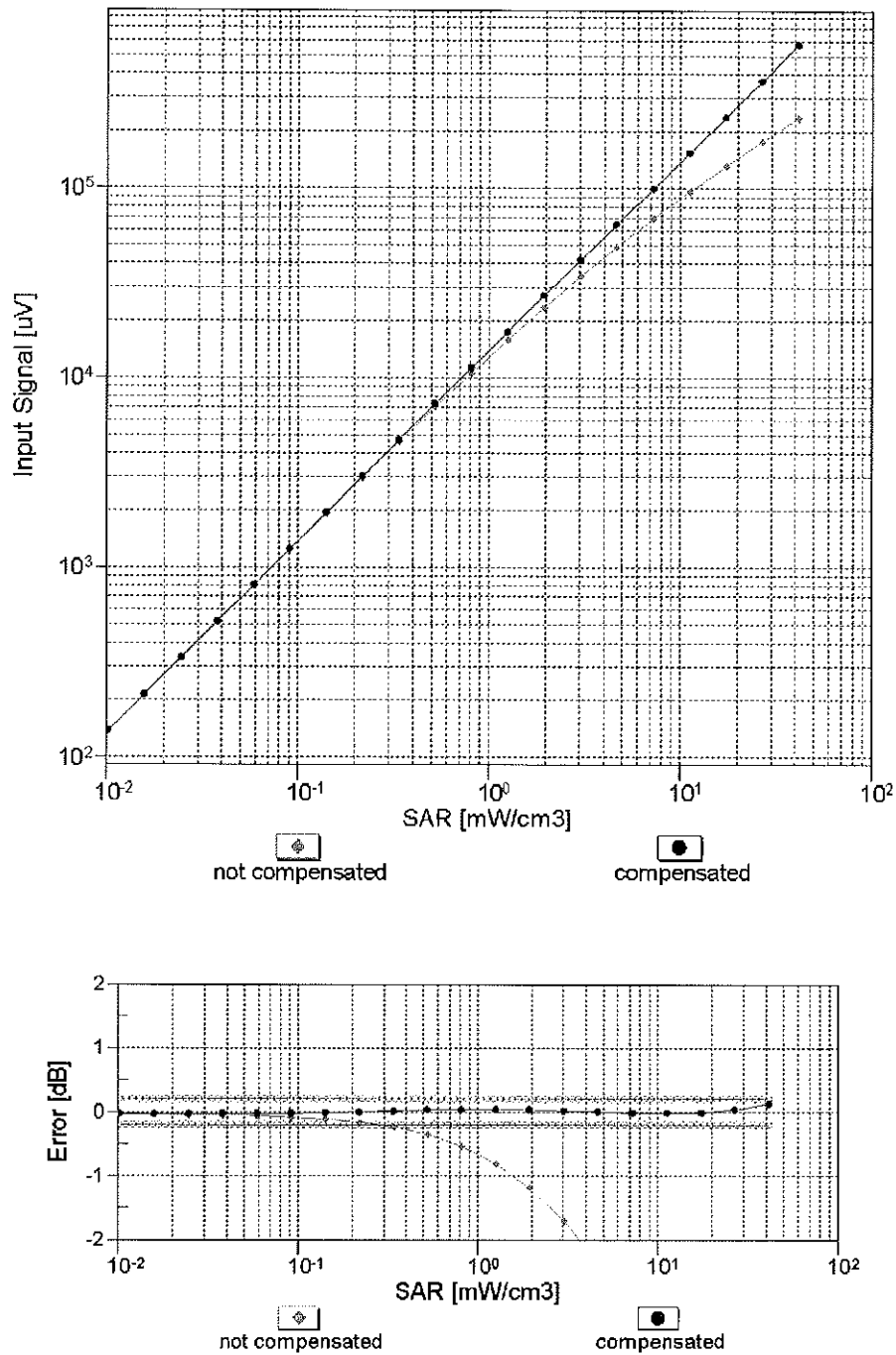


f=1800 MHz,R22



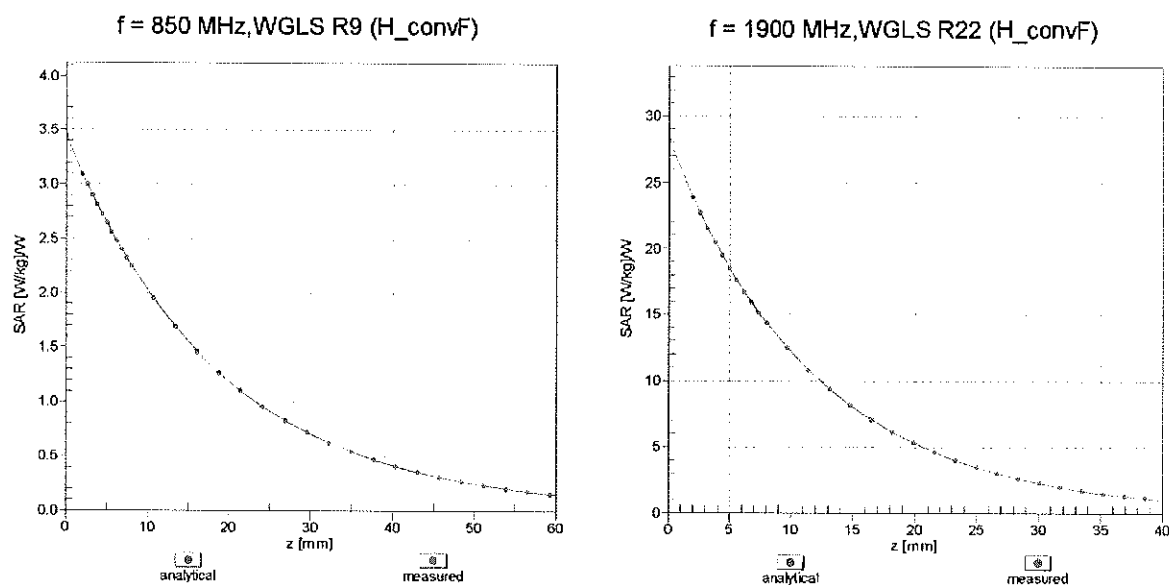
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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



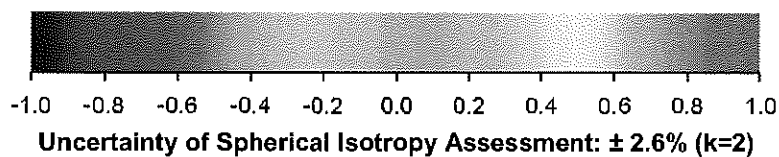
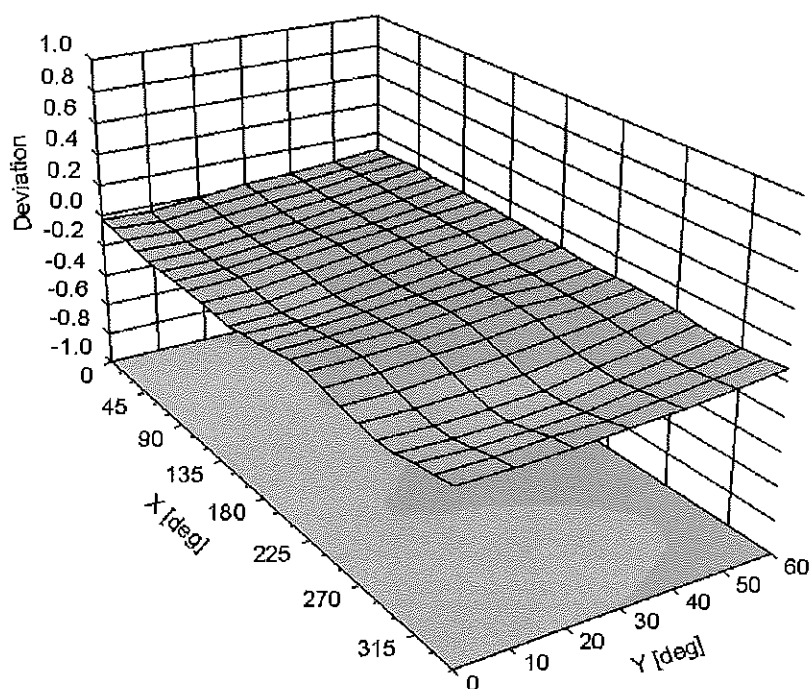
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, θ), $f = 900 \text{ MHz}$



DASY/EASY - Parameters of Probe: ES3DV3 - SN:3318**Other Probe Parameters**

Sensor Arrangement	Triangular
Connector Angle (°)	-103.8
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

Additional Conversion Factors

for Dosimetric E-Field Probe

Type:

ES3DV3

Serial Number:

3318

Place of Assessment:

Zurich

Date of Assessment:

June 19, 2013

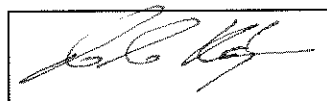
Probe Calibration Date:

April 29, 2013

✓
Kox
6/25/13

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. The evaluation is coupled with measured conversion factors (probe calibration date indicated above). The uncertainty of the numerical assessment is based on the extrapolation from measured value at 835 MHz or at 1900 MHz.

Assessed by:



Dosimetric E-Field Probe ES3DV3 SN:3318

Conversion factor ($\pm$ standard deviation)

1750 $\pm$ 50 MHz *ConvF* 5.59 $\pm$ 7%

$\epsilon_r = 40.1 \pm 5\%$
 $\sigma = 1.37 \pm 5\%$ mho/m
(head tissue)

1750 $\pm$ 50 MHz *ConvF* 5.22 $\pm$ 7%

$\epsilon_r = 53.4 \pm 5\%$
 $\sigma = 1.49 \pm 5\%$ mho/m
(body tissue)

Important Note:

For numerically assessed probe conversion factors, parameters Alpha and Delta in the DASY software must have the following entries: Alpha = 0 and Delta = 1.

Please see also DASY Manual.



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: **ES3-3319_Apr13**

CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3319**

Calibration procedure(s) **QA CAL-01.v8, QA CAL-23.v4, QA CAL-25.v4**
Calibration procedure for dosimetric E-field probes

Calibration date: **April 29, 2013**

VCC
6/14/13

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
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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

Calibrated by:	Name Dimce Iliev	Function Laboratory Technician	Signature
Approved by:	Katja Pokovic	Technical Manager	
Issued: April 29, 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

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 ES3DV3

SN:3319

Manufactured: January 10, 2012
Calibrated: April 29, 2013

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3319

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	1.12	1.20	1.22	± 10.1 %
DCP (mV) ^B	100.7	102.6	102.4	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB/ μV	C	D dB	VR mV	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	152.0	±3.8 %
		Y	0.0	0.0	1.0		159.0	
		Z	0.0	0.0	1.0		149.8	

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 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:3319

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	6.49	6.49	6.49	0.28	1.97	± 12.0 %
850	41.5	0.92	6.23	6.23	6.23	0.42	1.57	± 12.0 %
1900	40.0	1.40	5.22	5.22	5.22	0.80	1.24	± 12.0 %
2450	39.2	1.80	4.57	4.57	4.57	0.80	1.32	± 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: ES3DV3 - SN:3319

Calibration Parameter Determined in Body Tissue Simulating Media

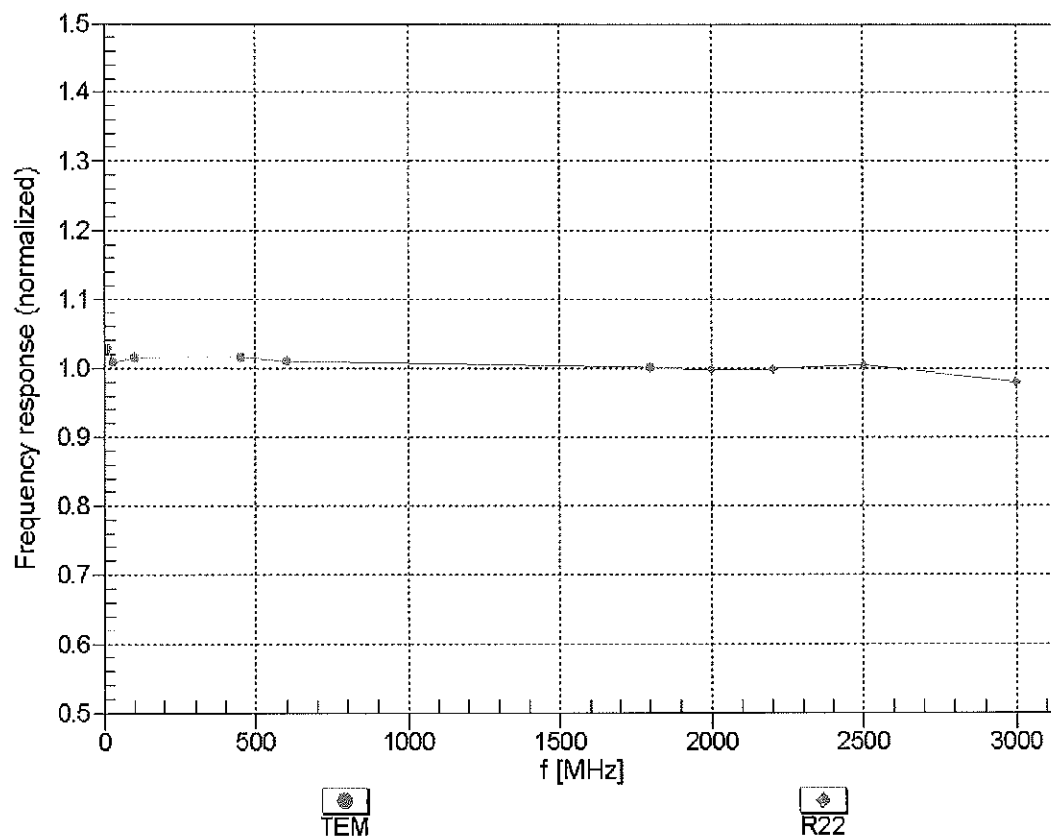
f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	6.30	6.30	6.30	0.45	1.53	± 12.0 %
850	55.2	0.99	6.15	6.15	6.15	0.42	1.65	± 12.0 %
1900	53.3	1.52	4.85	4.85	4.85	0.63	1.49	± 12.0 %
2450	52.7	1.95	4.32	4.32	4.32	0.69	1.20	± 12.0 %

^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

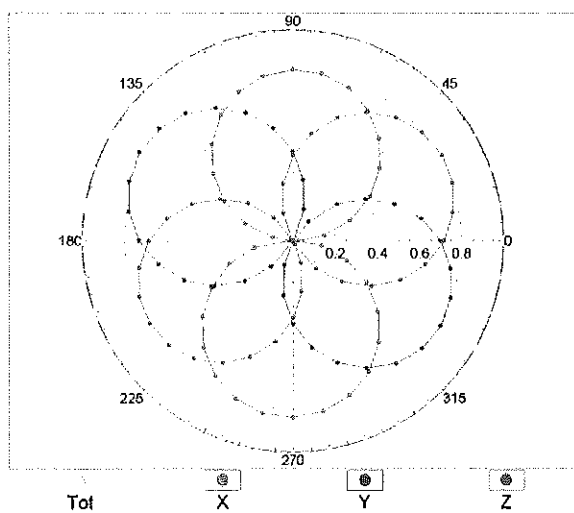
(TEM-Cell:ifi110 EXX, Waveguide: R22)



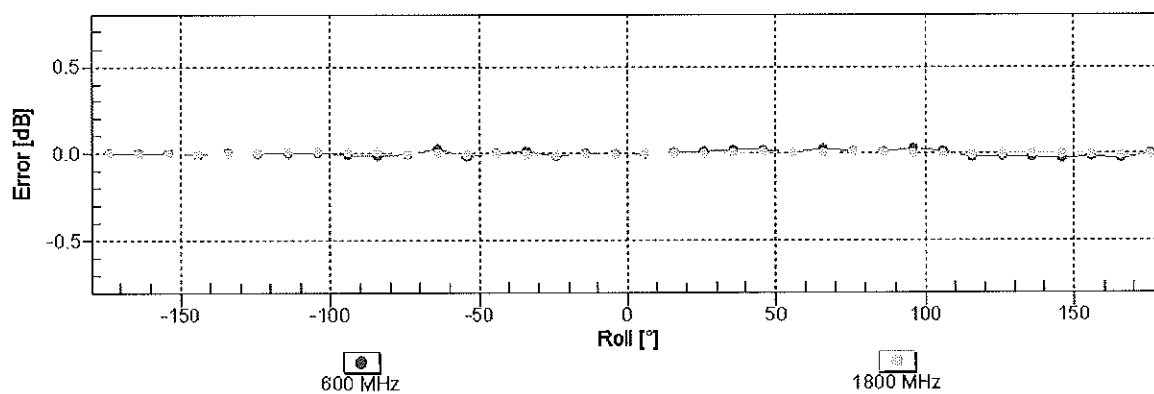
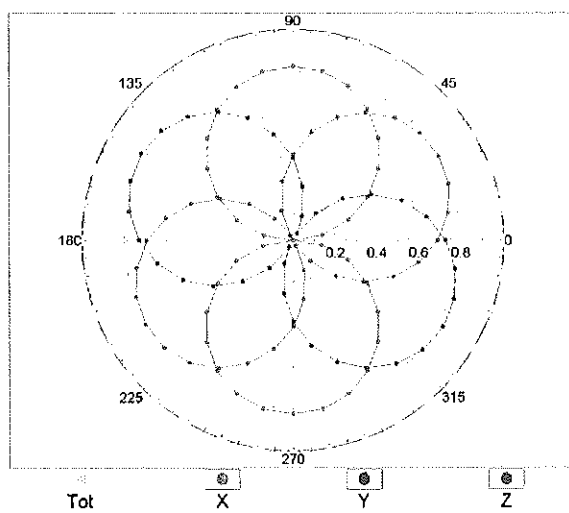
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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

f=600 MHz,TEM

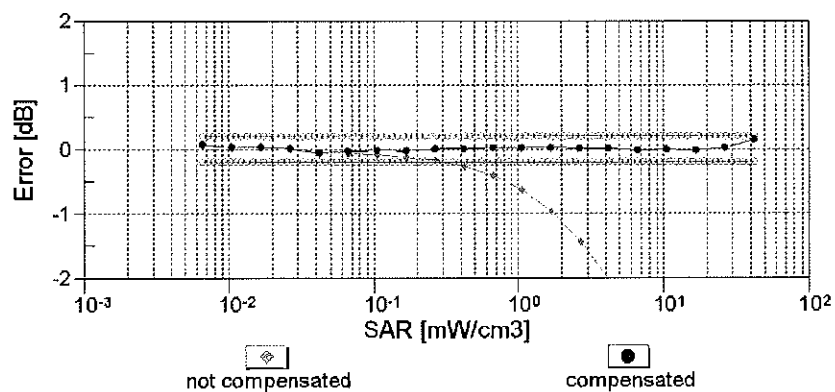
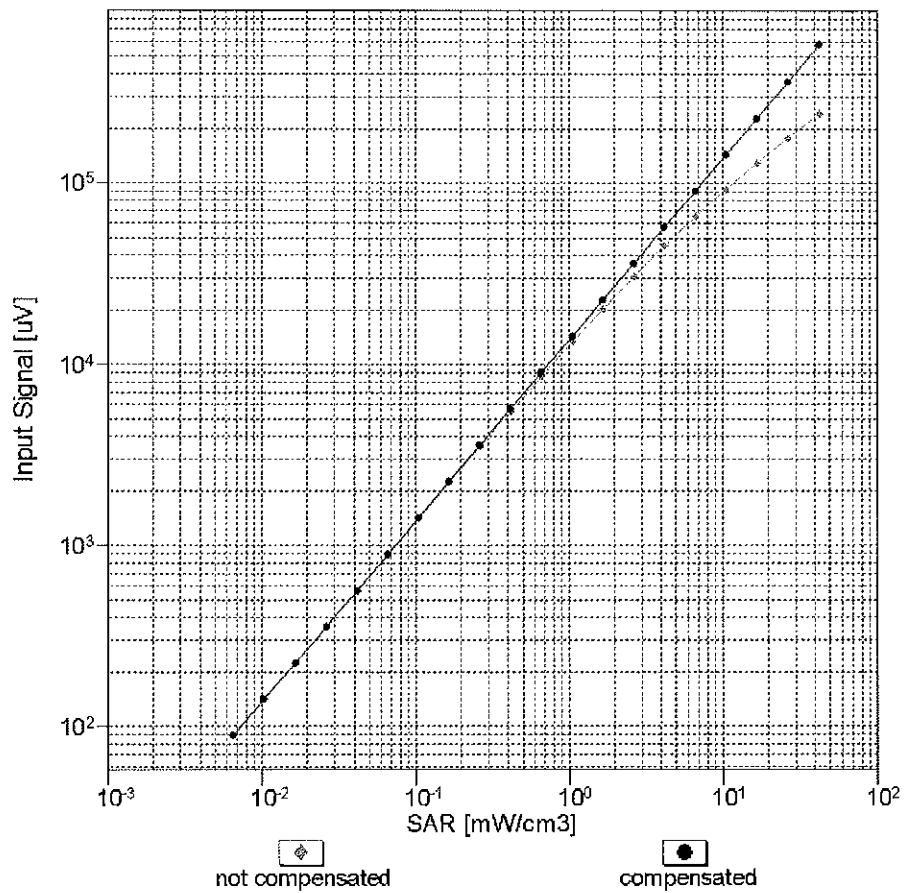


f=1800 MHz,R22



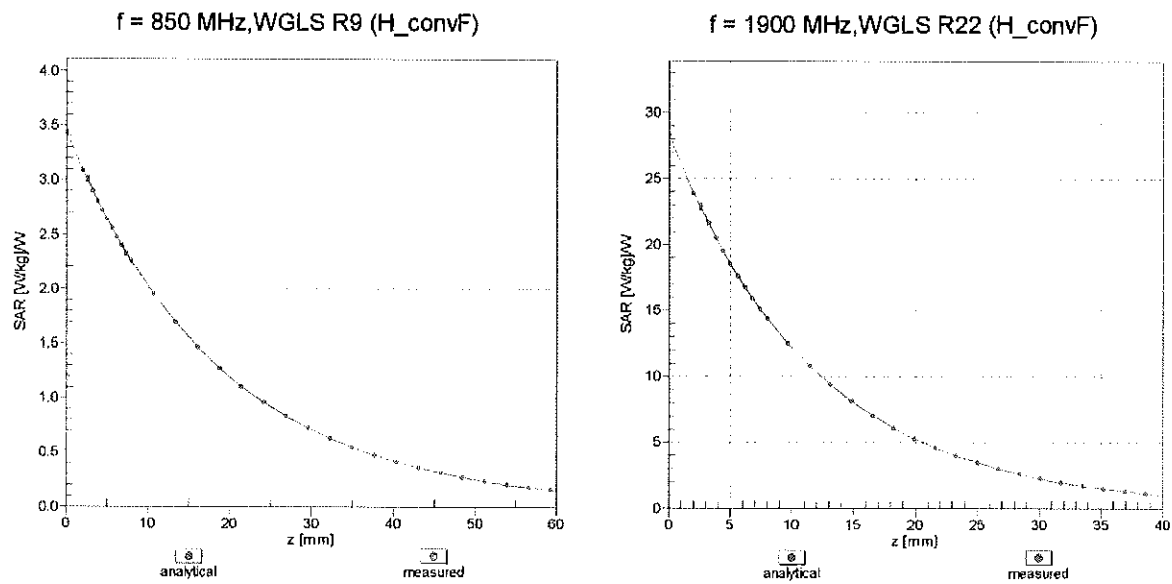
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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



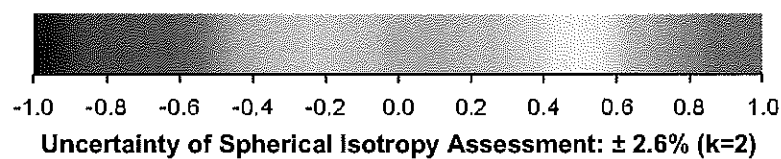
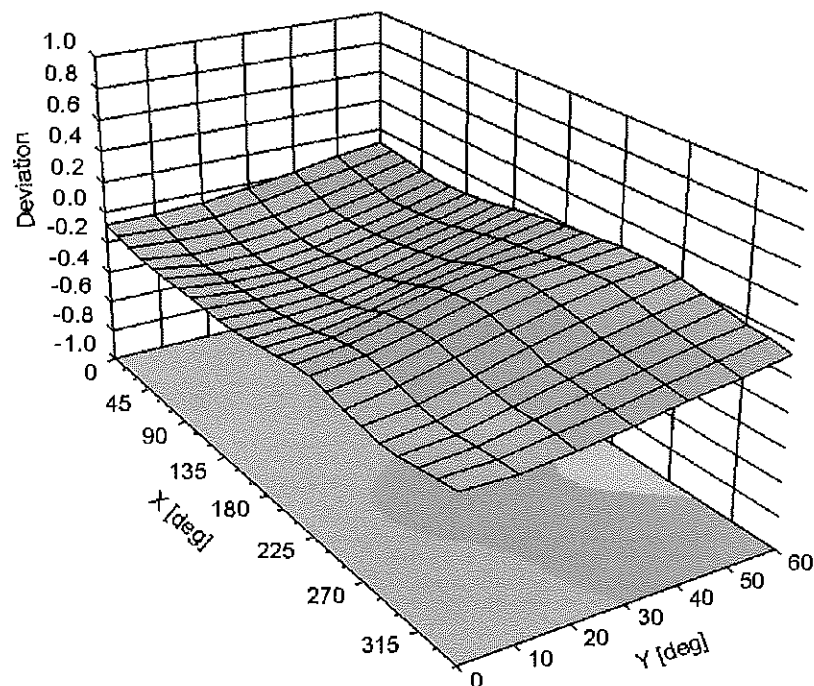
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

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: ES3DV3 - SN:3319

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-104.1
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

Additional Conversion Factors

for Dosimetric E-Field Probe

Type:

ES3DV3

Serial Number:

3319

Place of Assessment:

Zurich

Date of Assessment:

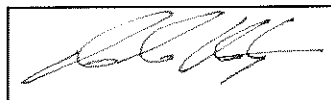
June 19, 2013

Probe Calibration Date:

April 29, 2013

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. The evaluation is coupled with measured conversion factors (probe calibration date indicated above). The uncertainty of the numerical assessment is based on the extrapolation from measured value at 835 MHz or at 1900 MHz.

Assessed by:



✓
KOK
6/25/13

Dosimetric E-Field Probe ES3DV3 SN:3319

Conversion factor ($\pm$ standard deviation)

1750 $\pm$ 50 MHz *ConvF* 5.59 $\pm$ 7 %

$\epsilon_r = 40.1 \pm 5\%$
 $\sigma = 1.37 \pm 5\%$ mho/m
(head tissue)

1750 $\pm$ 50 MHz *ConvF* 5.22 $\pm$ 7 %

$\epsilon_r = 53.4 \pm 5\%$
 $\sigma = 1.49 \pm 5\%$ mho/m
(body tissue)

Important Note:

For numerically assessed probe conversion factors, parameters Alpha and Delta in the DASY software must have the following entries: Alpha = 0 and Delta = 1.

Please see also DASY Manual.

APPENDIX D: SAR TISSUE SPECIFICATIONS

Measurement Procedure for Tissue verification:

- 1) The network analyzer and probe system was configured and calibrated.
- 2) The probe was immersed in the tissue. The tissue was placed in a nonmetallic container. Trapped air bubbles beneath the flange were minimized by placing the probe at a slight angle.
- 3) The complex admittance with respect to the probe aperture was measured
- 4) The complex relative permittivity ϵ can be calculated from the below equation (Pournaropoulos and Misra):

$$Y = \frac{j2\omega\epsilon_r\epsilon_0}{[\ln(b/a)]^2} \int_a^b \int_a^b \int_0^\pi \cos\phi' \frac{\exp[-j\omega r(\mu_0\epsilon_r'\epsilon_0)^{1/2}]}{r} d\phi' d\rho' d\rho$$

where Y is the admittance of the probe in contact with the sample, the primed and unprimed coordinates refer to source and observation points, respectively, $r^2 = \rho^2 + \rho'^2 - 2\rho\rho'\cos\phi'$, ω is the angular frequency, and $j = \sqrt{-1}$.

Table D-I
Composition of the Tissue Equivalent Matter

Frequency (MHz)	750	750	835	835	1750	1750	1900	1900	2450	2450	5200-5800	5200-5800
Tissue	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Ingredients (% by weight)												
Bactericide			0.1	0.1								
DGBE					47	31	44.92	29.44		26.7		
HEC			1	1								
NaCl	See Pages 2-3	See Page 2	1.45	0.94	0.4	0.2	0.18	0.39	See Page 4	0.1	See Page 5	
Sucrose			57	44.9								
Polysorbate (Tween) 80												20
Water			40.45	53.06	52.6	68.8	54.9	70.17		73.2		80

FCC ID: ACJEB3910A		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Test Dates: 12/21/13 - 01/21/14	DUT Type: Portable Handset			APPENDIX D: Page 1 of 5

2 Composition / Information on ingredients

The item is composed of the following ingredients:

H ₂ O	Water, 35 – 58%
Sucrose	Sugar, white, refined, 40 – 60%
NaCl	Sodium Chloride, 0 – 6%
Hydroxyethyl-cellulose	Medium Viscosity (CAS# 9004-62-0), <0.3%
Preventol-D7	Preservative: aqueous preparation, (CAS# 55965-84-9), containing 5-chloro-2-methyl-3(2H)-isothiazolone and 2-methyl-3(2H)-isothiazolone, 0.1 – 0.7%
Relevant for safety; Refer to the respective Safety Data Sheet*.	

Figure D-1
Composition of 750 MHz Head and Body Tissue Equivalent Matter

Note: 750MHz liquid recipes are proprietary SPEAG. Since the composition is approximate to the actual liquids utilized, the manufacturer tissue-equivalent liquid data sheets are provided below.

Measurement Certificate / Material Test

Item Name	Body Tissue Simulating Liquid (MSL750)
Product No.	SL AAM 075 AA (Charge: 111130-3)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe (type DAk).

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

Test Condition

Ambient Condition 22°C ; 30% humidity
TSL Temperature 22°C
Test Date 7-Dec-11

Additional Information

TSL Density 1.212 g/cm³
TSL Heat-capacity 3.006 kJ/(kg*K)

Results

f [MHz]	Measured			Target		Diff. to Target [%]	
	HP-e'	HP-e''	sigma	eps	sigma	Δ-eps	Δ-sigma
600	57.9	26.01	0.83	56.1	0.95	3.1	-12.3
625	57.6	24.66	0.86	56.0	0.95	2.9	-10.1
650	57.4	24.31	0.88	55.9	0.96	2.6	-8.0
675	57.1	24.02	0.90	55.8	0.96	2.3	-5.8
700	56.8	23.74	0.92	55.7	0.96	2.0	-3.7
725	56.6	23.50	0.95	55.6	0.96	1.7	-1.5
750	56.4	23.26	0.97	55.5	0.96	1.5	0.8
775	56.1	23.06	0.99	55.4	0.97	1.2	3.0
800	55.8	22.86	1.02	55.3	0.97	0.9	5.2
825	55.6	22.72	1.04	55.2	0.98	0.6	6.6
850	55.5	22.64	1.05	55.2	0.98	0.5	7.3
875	55.4	22.57	1.07	55.2	0.99	0.4	8.0
900	55.1	22.44	1.09	55.1	1.02	0.1	7.2
925	54.9	22.31	1.12	55.0	1.05	-0.2	6.4
950	54.7	22.20	1.14	55.0	1.06	-0.5	7.5
975	54.5	22.09	1.17	54.9	1.08	-0.9	8.5
1000	54.3	21.99	1.19	54.9	1.09	-1.2	9.7
1000	54.1	21.89	1.22	54.8	1.10	-1.4	10.9

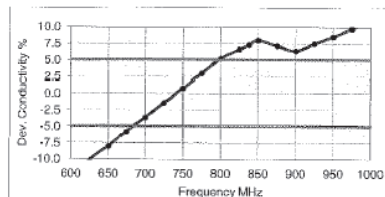
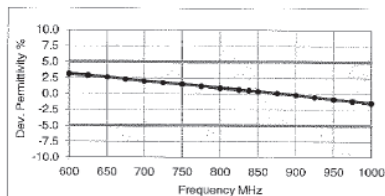


Figure D-2
750MHz Body Tissue Equivalent Matter

FCC ID: ACJEB3910A		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Test Dates: 12/21/13 - 01/21/14	DUT Type: Portable Handset			APPENDIX D: Page 2 of 5

Measurement Certificate / Material Test

Item Name: Head Tissue Simulating Liquid (HSL 750)
 Product No.: SL AAH 075 (Charge: 111208-2)
 Manufacturer: SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe (type DAK).

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

Test Condition

Ambient Condition: 22°C ; 30% humidity
 TSL Temperature: 22°C
 Test Date: 14-Dec-11

Additional Information

TSL Density: 1.284 g/cm³
 TSL Heat-capacity: 2.701 kJ/(kg*K)

Results

f [MHz]	Measured			Target		Diff. to Target (%)	
	HP-e'	HP-e''	sigma	eps	sigma	Δ-eps	Δ-sigma
600	44.5	22.77	0.76	42.7	0.88	4.2	-13.8
625	44.2	22.50	0.78	42.6	0.88	3.7	-11.5
650	43.8	22.24	0.80	42.5	0.89	3.1	-9.2
675	43.4	22.03	0.83	42.3	0.89	2.5	-6.8
700	43.0	21.82	0.85	42.2	0.89	1.9	-4.5
725	42.7	21.64	0.87	42.1	0.89	1.4	-2.1
750	42.3	21.45	0.89	41.9	0.89	1.0	0.2
775	42.0	21.28	0.92	41.8	0.90	0.5	2.4
800	41.7	21.11	0.94	41.7	0.90	0.0	4.7
825	41.4	20.97	0.96	41.6	0.91	-0.5	6.1
850	41.2	20.90	0.97	41.5	0.91	-0.7	6.6
875	41.1	20.83	0.98	41.5	0.92	-1.0	7.5
900	40.8	20.69	1.01	41.5	0.94	-1.7	6.8
925	40.5	20.55	1.03	41.5	0.97	-2.4	6.1
950	40.2	20.45	1.05	41.5	0.98	-3.0	7.1
975	39.9	20.34	1.08	41.4	0.99	-3.6	8.1
1000	39.4	20.14	1.12	41.3	1.01	-4.7	10.4

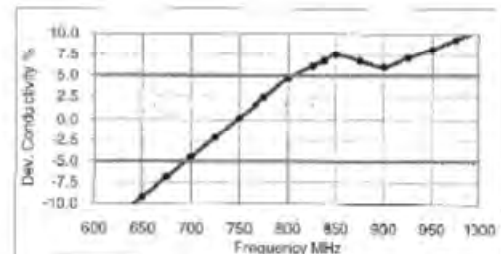
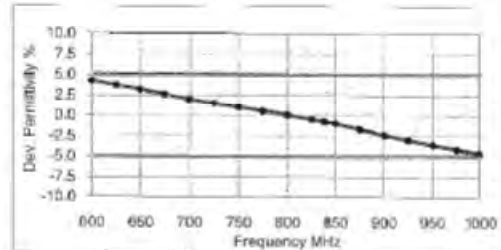


Figure D-3
750MHz Head Tissue Equivalent Matter

FCC ID: ACJEB3910A		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Test Dates: 12/21/13 - 01/21/14	DUT Type: Portable Handset			APPENDIX D: Page 3 of 5

2 Composition / Information on ingredients

The Item is composed of the following ingredients:

H ₂ O	Water, 52 – 75%
C ₈ H ₁₈ O ₃	Diethylene glycol monobutyl ether (DGBE), 25 – 48% (CAS-No. 112-34-5, EC-No. 203-961-6, EC-index-No. 603-096-00-8)
	Relevant for safety; Refer to the respective Safety Data Sheet*.
NaCl	Sodium Chloride, <1.0%

Figure D-4

Composition of 2.4 GHz Head Tissue Equivalent Matter

Note: 2.4 GHz head liquid recipes are proprietary SPEAG. Since the composition is approximate to the actual liquids utilized, the manufacturer tissue-equivalent liquid data sheets are provided below.

Measurement Certificate / Material Test

Item Name	Head Tissue Simulating Liquid (HSL 2450)
Product No.	SL A4H 245 BA (Charge: 120112-4)
Manufacturer	SPEAG
Measurement Method	
TSL dielectric parameters measured using calibrated OCP probe (type DAK).	
Target Parameters	
Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.	
Test Condition	
Ambient Condition 22°C, 30% humidity	
TSL Temperature 23°C	
Test Date 16-Jan-12	
Additional Information	
TSL Density 0.988 g/cm ³	
TSL Heat-capacity 3.680 kJ/(kg*K)	

Results

	Measured			Target		Diff.to Target [%]	
f [MHz]	HP-e ¹	HP-e ²	sigma	eps	sigma	A-eps	A-sigma
1900	40.5	11.99	1.27	40.0	1.40	1.1	-9.5
1925	40.3	12.08	1.29	40.0	1.40	0.9	-7.8
1950	40.2	12.17	1.32	40.0	1.40	0.8	-5.7
1975	40.1	12.26	1.35	40.0	1.40	0.3	-3.8
2000	40.0	12.35	1.37	40.0	1.40	0.0	-1.9
2025	39.9	12.44	1.40	40.0	1.42	-0.1	-1.5
2050	39.8	12.53	1.43	39.9	1.44	-0.3	-1.1
2075	39.7	12.60	1.46	39.9	1.47	-0.4	-0.6
2100	39.6	12.68	1.48	39.8	1.49	-0.5	-0.5
2125	39.5	12.76	1.51	39.8	1.51	-0.7	-0.2
2150	39.4	12.84	1.54	39.7	1.53	-0.8	0.2
2175	39.3	12.93	1.56	39.7	1.56	-1.0	0.6
2200	39.2	13.02	1.59	39.6	1.58	-1.1	1.0
2225	39.1	13.09	1.62	39.6	1.60	-1.3	1.3
2250	39.0	13.17	1.65	39.5	1.62	-1.4	1.6
2275	38.9	13.25	1.68	39.5	1.64	-1.5	2.0
2300	38.8	13.33	1.71	39.5	1.67	-1.7	2.3
2325	38.7	13.40	1.73	39.4	1.69	-1.8	2.7
2350	38.6	13.48	1.76	39.4	1.71	-2.0	3.0
2375	38.5	13.56	1.79	39.3	1.73	-2.1	3.3
2400	38.4	13.63	1.82	39.3	1.76	-2.3	3.7
2425	38.3	13.71	1.85	39.2	1.78	-2.4	4.0
2450	38.2	13.78	1.86	39.2	1.80	-2.6	4.4
2475	38.1	13.85	1.91	39.2	1.83	-2.7	4.8
2500	38.0	13.93	1.94	39.1	1.85	-2.9	4.8
2525	37.9	13.99	1.97	39.1	1.88	-3.1	4.4
2550	37.8	14.06	1.99	39.1	1.91	-3.3	4.4
2575	37.7	14.13	2.02	39.0	1.94	-3.5	4.5
2600	37.6	14.20	2.05	39.0	1.96	-3.7	4.8
2625	37.5	14.26	2.08	39.0	1.99	-3.8	4.6
2650	37.4	14.32	2.11	39.0	2.02	-4.0	4.6
2675	37.3	14.39	2.14	38.9	2.05	-4.3	4.1
2700	37.1	14.46	2.17	38.9	2.07	-4.5	4.8

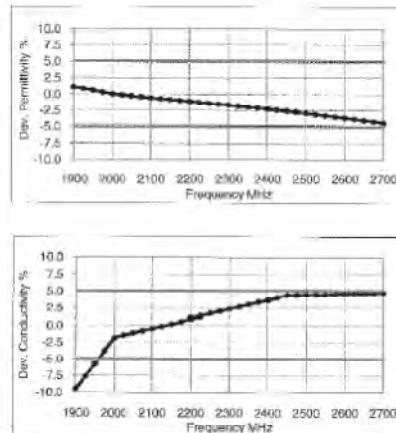


Figure D-5

2.4 GHz Head Tissue Equivalent Matter

FCC ID: ACJEB3910A		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Test Dates: 12/21/13 - 01/21/14	DUT Type: Portable Handset			APPENDIX D: Page 4 of 5

2 Composition / Information on ingredients

The Item is composed of the following ingredients:

Water	50 – 65%
Mineral oil	10 – 30%
Emulsifiers	8 – 25%
Sodium salt	0 – 1.5%

Figure D-6
Composition of 5 GHz Head Tissue Equivalent Matter

Note: 5GHz head liquid recipes are proprietary SPEAG. Since the composition is approximate to the actual liquids utilized, the manufacturer tissue-equivalent liquid data sheets are provided below.

Measurement Certificate / Material Test

Item Name	Head Tissue Simulating Liquid (HBBL3500-5800V5)
Product No.	SL AAH 502 AB (Charge: 120402-2)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe (type DAK).

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

Test Condition

Ambient Condition 22°C ; 30% humidity
TSL Temperature 22°C
Test Date 4-Apr-12

Additional Information

TSL Density 0.985 g/cm³
TSL Heat-capacity 3.383 kJ/(kg*K)

Results

f (MHz)	Measured	Target	Diff. to Target (%)
HP-ε'	σ	ε _{pe} σ	Δ-ε _{pe} Δ-σ
3400	38.7 14.96 2.83	38.0 2.81	1.8 0.7
3500	38.6 14.91 2.90	37.9 2.91	1.7 -0.3
3600	38.5 14.92 2.99	37.8 3.02	1.7 -0.9
3700	38.3 14.92 3.07	37.7 3.12	1.7 -1.5
3800	38.2 14.94 3.16	37.6 3.22	1.7 -1.9
3900	38.1 14.95 3.24	37.5 3.32	1.7 -2.4
4000	38.0 15.00 3.34	37.4 3.43	1.8 -2.5
4100	37.9 15.04 3.43	37.2 3.53	1.8 -2.8
4200	37.8 15.08 3.52	37.1 3.63	1.8 -2.9
4300	37.7 15.14 3.62	37.0 3.73	1.8 -3.0
4400	37.5 15.18 3.71	36.9 3.84	1.7 -3.1
4500	37.4 15.20 3.81	36.8 3.94	1.6 -3.3
4600	37.3 15.29 3.91	36.7 4.04	1.6 -3.2
4700	37.1 15.34 4.01	36.6 4.14	1.5 -3.2
4800	37.0 15.39 4.11	36.4 4.25	1.4 -3.2
4850	36.9 15.43 4.16	36.4 4.30	1.3 -3.1
4900	36.8 15.45 4.21	36.3 4.35	1.3 -3.1
4950	36.7 15.47 4.26	36.3 4.40	1.2 -3.1
5000	36.7 15.50 4.31	36.2 4.45	1.2 -3.1
5050	36.6 15.55 4.37	36.2 4.50	1.1 -3.0
5100	36.5 15.60 4.43	36.1 4.55	1.1 -2.8
5150	36.4 15.62 4.48	36.0 4.60	1.0 -2.8
5200	36.4 15.63 4.53	36.0 4.66	1.0 -2.8
5250	36.3 15.67 4.58	35.9 4.71	1.0 -2.8
5300	36.2 15.70 4.63	35.9 4.76	1.0 -2.7
5350	36.1 15.70 4.67	35.8 4.81	0.9 -2.9
5400	36.1 15.74 4.73	35.8 4.86	0.8 -2.7
5450	36.0 15.75 4.77	35.7 4.91	0.9 -2.8
5500	35.9 15.75 4.82	35.6 4.96	0.8 -2.9
5550	35.9 15.80 4.88	35.6 5.01	0.8 -2.7
5600	35.8 15.82 4.93	35.5 5.07	0.7 -2.7
5650	35.7 15.86 4.96	35.5 5.12	0.7 -2.6
5700	35.7 15.88 5.03	35.4 5.17	0.7 -2.6
5750	35.6 15.90 5.08	35.4 5.22	0.6 -2.6
5800	35.5 15.94 5.14	35.3 5.27	0.5 -2.4
5850	35.4 15.98 5.20	35.3 5.34	0.4 -2.5
5900	35.4 16.02 5.26	35.3 5.40	0.2 -2.6

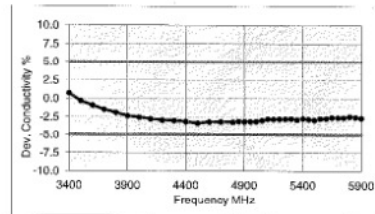
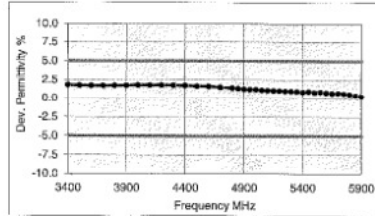


Figure D-7
5GHz Head Tissue Equivalent Matter

FCC ID: ACJEB3910A		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Test Dates: 12/21/13 - 01/21/14	DUT Type: Portable Handset			APPENDIX D: Page 5 of 5

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
C	750	8/16/2013	3263	ES3DV3	750	Head	0.915	42.08	PASS	PASS	PASS	N/A	N/A	N/A
E	750	12/30/2013	3914	EX3DV4	750	Head	0.907	40.67	PASS	PASS	PASS	N/A	N/A	N/A
D	835	10/7/2013	3022	ES3DV2	835	Head	0.910	39.82	PASS	PASS	PASS	GMSK	PASS	N/A
B	1750	11/6/2013	3288	ES3DV3	1750	Head	1.406	40.47	PASS	PASS	PASS	N/A	N/A	N/A
G	1900	12/16/2013	3209	ES3DV3	1900	Head	1.437	38.75	PASS	PASS	PASS	GMSK	PASS	N/A
E	2450	12/23/2013	3914	EX3DV4	2450	Head	1.790	38.86	PASS	PASS	PASS	OFDM	N/A	PASS
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	5500	12/3/2013	3914	EX3DV4	5500	Head	4.821	34.28	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
E	750	12/26/2013	3914	EX3DV4	750	Body	0.974	54.86	PASS	PASS	PASS	N/A	N/A	N/A
K	835	12/19/2013	3333	ES3DV3	835	Body	1.006	53.18	PASS	PASS	PASS	GMSK	PASS	N/A
H	1750	6/21/2013	3318	ES3DV3	1750	Body	1.475	52.93	PASS	PASS	PASS	N/A	N/A	N/A
I	1900	7/1/2013	3319	ES3DV3	1900	Body	1.502	52.10	PASS	PASS	PASS	GMSK	PASS	N/A
D	2450	10/11/2013	3022	ES3DV2	2450	Body	2.008	52.50	PASS	PASS	PASS	OFDM	N/A	PASS
E	5200	12/7/2013	3914	EX3DV4	5200	Body	5.330	48.16	PASS	PASS	PASS	OFDM	N/A	PASS
E	5300	12/7/2013	3914	EX3DV4	5300	Body	5.481	47.91	PASS	PASS	PASS	OFDM	N/A	PASS
E	5500	12/7/2013	3914	EX3DV4	5500	Body	5.807	47.39	PASS	PASS	PASS	OFDM	N/A	PASS
E	5600	12/7/2013	3914	EX3DV4	5600	Body	5.933	47.15	PASS	PASS	PASS	OFDM	N/A	PASS
E	5800	12/7/2013	3914	EX3DV4	5800	Body	6.240	46.70	PASS	PASS	PASS	OFDM	N/A	PASS

Table E-II: Extremity SAR Considerations
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
E	750	12/26/2013	3914	EX3DV4	750	Body	0.974	54.86	PASS	PASS	PASS	N/A	N/A	N/A
K	835	12/19/2013	3333	ES3DV3	835	Body	1.006	53.18	PASS	PASS	PASS	GMSK	PASS	N/A
H	1750	6/21/2013	3318	ES3DV3	1750	Body	1.475	52.93	PASS	PASS	PASS	N/A	N/A	N/A
I	1900	7/1/2013	3319	ES3DV3	1900	Body	1.502	52.10	PASS	PASS	PASS	GMSK	PASS	N/A
D	2450	10/11/2013	3022	ES3DV32	2450	Body	2.008	52.50	PASS	PASS	PASS	OFDM	N/A	PASS
E	5200	12/7/2013	3914	EX3DV4	5200	Body	5.330	48.16	PASS	PASS	PASS	OFDM	N/A	PASS
E	5300	12/7/2013	3914	EX3DV4	5300	Body	5.481	47.91	PASS	PASS	PASS	OFDM	N/A	PASS
E	5500	12/7/2013	3914	EX3DV4	5500	Body	5.807	47.39	PASS	PASS	PASS	OFDM	N/A	PASS
E	5600	12/7/2013	3914	EX3DV4	5600	Body	5.933	47.15	PASS	PASS	PASS	OFDM	N/A	PASS
E	5800	12/7/2013	3914	EX3DV4	5800	Body	6.240	46.70	PASS	PASS	PASS	OFDM	N/A	PASS

NOTE: While the probes have been calibrated for both a CW and modulated signals, all measurements were performed using communication systems calibrated for CW signals only. Modulations in the table above represent test configurations for which the measurement system has been validated per FCC KDB Publication 865664 D01v01 for scenarios when CW probe calibrations are used with other signal types. SAR systems were validated for modulated signals with a periodic duty cycle, such as GMSK, or with a high peak to average ratio (>5 dB), such as OFDM according to KDB 865664.

FCC ID: ACJEB3910A		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Test Dates: 12/21/13 - 01/21/14	DUT Type: Portable Handset	APPENDIX E: Page 1 of 1		