



SAR EVALUATION REPORT

Applicant Name:

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

Date of Testing:

02/04/13 - 03/05/13

Test Site/Location:

PCTEST Lab, Columbia, MD, USA

Document Serial No.:

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FCC ID:

A3LSGHM919

APPLICANT:

SAMSUNG ELECTRONICS, CO. LTD.

DUT Type:

Portable Handset

Application Type:

Certification

FCC Rule Part(s):

CFR §2.1093

Model(s):

SGH-M919

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)
PCE	GSM/GPRS/EDGE 850	824.20 - 848.80 MHz	32.78	0.24	0.45	0.58
PCE	UMTS 850	826.40 - 846.60 MHz	22.58	0.18	0.32	0.32
PCE	UMTS 1750	1712.4 - 1752.5 MHz	22.66	0.70	0.79	0.93
PCE	GSM/GPRS/EDGE 1900	1850.20 - 1909.80 MHz	30.12	0.34	0.39	0.76
PCE	UMTS 1900	1852.4 - 1907.6 MHz	22.37	0.54	0.63	0.63
PCE	LTE Band 17	706.5 - 713.5 MHz	23.19	0.12	0.24	0.24
PCE	LTE Band 5 (Cell)	826.5 - 846.5 MHz	23.23	0.19	0.31	0.31
PCE	LTE Band 4 (AWS)	1712.5 - 1752.5 MHz	22.97	0.48	0.66	0.78
PCE	LTE Band 2 (PCS)	1852.5 - 1907.5 MHz	23.14	0.67	0.65	1.01
DTS	2.4 GHz WLAN	2412 - 2462 MHz	16.94	0.23	0.17	0.17
DTS	5.8 GHz WLAN	5745 - 5825 MHz	12.51	0.20	0.24	
UNII	5.2 GHz WLAN	5180 - 5240 MHz	12.57	0.24	0.39	
UNII	5.3 GHz WLAN	5260 - 5320 MHz	13.08	0.33	0.52	
UNII	5.5 GHz WLAN	5500 - 5700 MHz	13.18	0.31	0.48	
DSS/DTS	Bluetooth	2402 - 2480 MHz	9.51	N/A		
Simultaneous SAR per KDB 690783 D01v01r02:				1.03	1.31	1.04

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: 0Y1303040444-R3.A3L) 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) 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
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.5 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 17	Data	706.5 - 713.5 MHz
LTE Band 5 (Cell)	Data	826.5 - 846.5 MHz
LTE Band 4 (AWS)	Data	1712.5 - 1752.5 MHz
LTE Band 2 (PCS)	Data	1852.5 - 1907.5 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
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		Voice (dBm)	Burst Average GMSK (dBm)				Burst Average 8-PSK (dBm)			
		1 TX Slot	1 TX Slots	2 TX Slots	3 TX Slots	4 TX Slots	1 TX Slots	2 TX Slots	3 TX Slots	4 TX Slots
GSM/GPRS/EDGE 850	Maximum	33.0	33.0	31.5	30.5	29.0	27.5	26.5	26.5	26.5
	Nominal	32.5	32.5	31.0	30.0	28.5	27.0	26.0	26.0	26.0
GSM/GPRS/EDGE 1900	Maximum	30.5	30.5	28.5	27.5	26.5	26.5	26.0	26.0	25.5
	Nominal	30.0	30.0	28.0	27.0	26.0	26.0	25.5	25.5	25.0

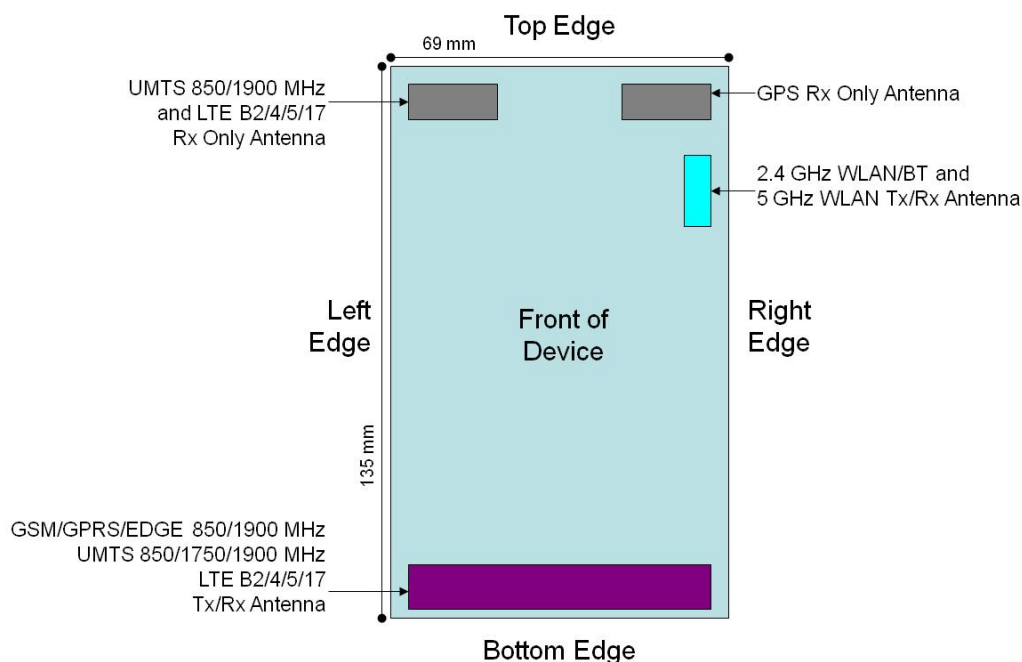
Mode / Band		Modulated Average (dBm)		
		3GPP RMC	3GPP HSDPA/DC-HSDPA	3GPP HSUPA
UMTS Band 5 (850 MHz)	Maximum	23.0	22.0	21.5
	Nominal	22.5	21.5	21.0
UMTS Band 4 (1750 MHz)	Maximum	23.0	22.0	22.0
	Nominal	22.5	21.5	21.5
UMTS Band 2 (1900 MHz)	Maximum	22.5	22.0	21.5
	Nominal	22.0	21.5	21.0

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Mode / Band		Modulated Average (dBm)
LTE Band 17	Maximum	23.5
	Nominal	23.0
LTE Band 5 (Cell)	Maximum	23.5
	Nominal	23.0
LTE Band 4 (AWS)	Maximum	23.0
	Nominal	22.5
LTE Band 2 (PCS)	Maximum	23.5
	Nominal	23.0

Mode / Band		Modulated Average (dBm)
IEEE 802.11b (2.4 GHz)	Maximum	17.0
	Nominal	16.5
IEEE 802.11g (2.4 GHz)	Maximum	15.0
	Nominal	14.5
IEEE 802.11n (2.4 GHz)	Maximum	14.0
	Nominal	13.5
IEEE 802.11a (5 GHz)	Maximum	13.5
	Nominal	13.0
IEEE 802.11n 20 MHz BW (5 GHz)	Maximum	13.5
	Nominal	13.0
IEEE 802.11n 40 MHz BW (5 GHz)	Maximum	13.5
	Nominal	13.0
IEEE 802.11ac (5 GHz)	Maximum	13.0
	Nominal	12.5
Bluetooth	Maximum	10.0
	Nominal	9.5

1.3 DUT Antenna Locations



Note: Specific antenna dimensions and separation distances are shown in the antenna distance document.

Figure 1-1
DUT Antenna Locations

Table 1-1
Mobile Hotspot Sides for SAR Testing

Mobile Hotspot Sides for SAR Testing						
Mode	Back	Front	Top	Bottom	Right	Left
GPRS 850	Yes	Yes	No	Yes	Yes	Yes
UMTS 850	Yes	Yes	No	Yes	Yes	Yes
UMTS 1750	Yes	Yes	No	Yes	Yes	Yes
GPRS 1900	Yes	Yes	No	Yes	Yes	Yes
UMTS 1900	Yes	Yes	No	Yes	Yes	Yes
LTE Band 17	Yes	Yes	No	Yes	Yes	Yes
LTE Band 5 (Cell)	Yes	Yes	No	Yes	Yes	Yes
LTE Band 4 (AWS)	Yes	Yes	No	Yes	Yes	Yes
LTE Band 2 (PCS)	Yes	Yes	No	Yes	Yes	Yes
2.4 GHz WLAN	Yes	Yes	Yes	No	Yes	No

Note: Particular DUT edges were not required to be evaluated for Wireless Router SAR if the edges were greater than 2.5 cm from the transmitting antenna according to FCC KDB Publication 941225 D06v01 guidance, page 2. The antenna document shows the distances between the transmit antennas and the edges of the device. When the wireless router mode is enabled, all 5 GHz bands are disabled.

1.4 Near Field Communications (NFC) Antenna

This DUT has NFC operations. The NFC antenna is integrated into the standard battery. The SAR tests were performed with the standard battery. Battery model: B600BU

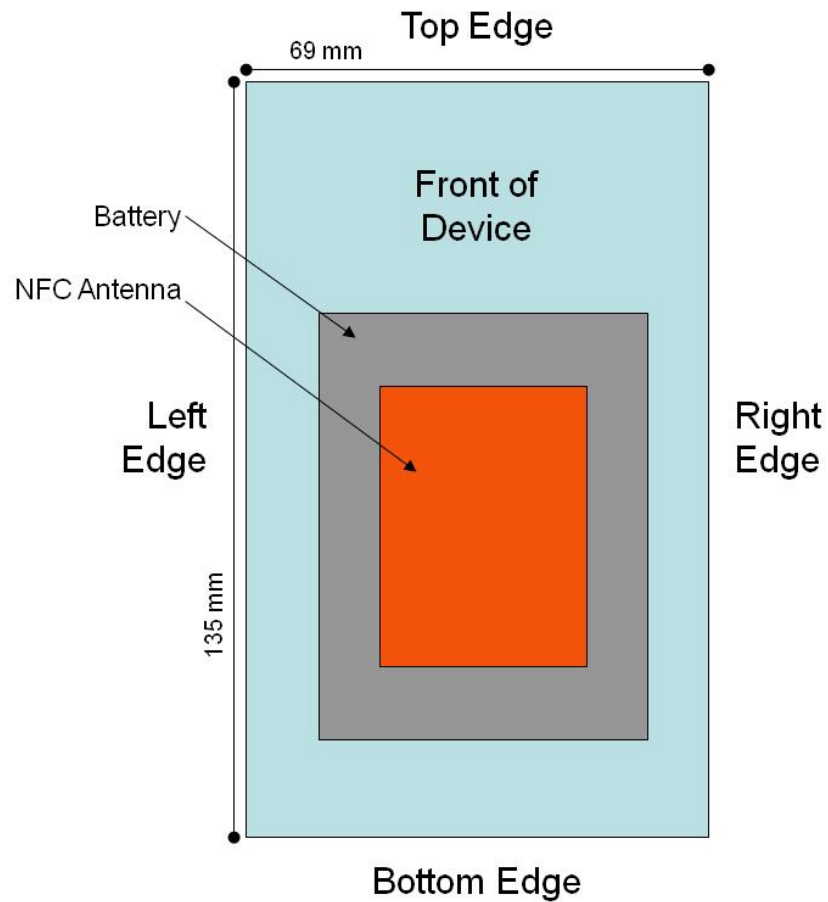


Figure 1-2
NFC Antenna Locations

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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 Configurations	Head	Body-Worn Accessory	Hot Spot	Note	Scenario Possible?
		IEEE 1528, Supp C	Supp C	FCC KDB 941225 D06		
1	GSM 850/1900 MHz Voice + WiFi 2.4GHz	Yes	Yes	N/A	2.4GHz Client only	Yes
2	850/1700/1900 WCDMA Voice + WiFi 2.4GHz	Yes	Yes	N/A	2.4GHz Client only	Yes
3	850/1900 MHz GPRS/EDGE Data + WiFi 2.4 GHz	N/A	N/A	Yes	2G Hotspot	Yes
4	850/1700/1900 MHz WCDMA/HSPA Data + WiFi 2.4 GHz	Yes*	Yes*	Yes	3G Hotspot	Yes
5	700/850/1750/1900 MHz Band LTE Data + WiFi 2.4 GHz	Yes*	Yes*	Yes	4G Hotspot	Yes
6	GSM 850/1900 MHz Voice + WiFi 5GHz	Yes	Yes	N/A	5GHz Client only	Yes
7	850/1700/1900 MHz WCDMA Voice + WiFi 5 GHz	Yes	Yes	N/A	5GHz Client only	Yes
8	GSM 850/1900 MHz Voice + Bluetooth	N/A	Yes	N/A		Yes
9	850/1700/1900 WCDMA Voice + Bluetooth	N/A	Yes	N/A		Yes
10	700/850/1750/1900 MHz Band LTE Data + Bluetooth	N/A	Yes*	N/A		Yes
11	850/1900 MHz GPRS/EDGE Data + WiFi 5GHz	N/A	N/A	N/A	Not Supported by S/W	No
12	850/1700/1900 MHz WCDMA/HSPA Data + WiFi 5GHz	N/A	N/A	N/A	Not Supported by S/W	No
13	700/850/1750/1900 MHz Band LTE Data + WiFi 5GHz	N/A	N/A	N/A	Not Supported by S/W	No
14	850/1900 MHz GPRS/EDGE Data + WiFi Direct	N/A	N/A	N/A	WiFi Direct only	Yes
15	850/1700/1900 MHz WCDMA/HSPA Data + WiFi Direct	N/A	N/A	N/A	WiFi Direct only	Yes
16	700/850/1750/1900 MHz Band LTE Data + WiFi Direct	N/A	N/A	N/A	WiFi Direct only	Yes
17	All Voice + LTE	N/A	N/A	N/A	Not Supported by H/W	No
18	All Voice + WiFi + LTE	N/A	N/A	N/A	Not Supported by H/W	No

Notes:

1. GSM/WCDMA/LTE use one modem and transceiver IC. The signals can not be transmitted simultaneously.
2. 2G/3G/4G + 5GHz WiFi Hotspot is block by S/W. This cannot be changed by ant S/W modification by any party after it is manufactured.
3. We do not expect the 2G/3G/4G + WiFi Direct scenario operation to be used in the above exposure conditions in typical usage. Hence it is denoted as N/A.

(*) denotes VOIP applications that can be practically utilized by the end-user in these scenarios (i.e. Google Talk)

Note: When the user utilizes multiple services in UMTS 3G mode it uses multi-Radio Access Bearer or multi-RAB. The power control is based on a physical control channel (Dedicated Physical Control Channel [DPCCH]) and power control will be adjusted to meet the needs of both services. Therefore, the UMTS+WLAN scenario also represents the UMTS Voice/DATA + WLAN Hotspot scenario.

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1.6 Wireless Charging Cover

This DUT may be used with a standard battery cover or with an optional wireless charging battery cover. Per FCC KDB Publication 648474 D04, SAR was measured using the standard battery cover and then repeated with the wireless charging battery cover for the highest reported SAR for each wireless technology, frequency band, operating mode, and exposure condition. No other additional test with wireless charging cover was required since all reported SAR were less than 1.2 W/kg.

1.7 SAR Test Exclusions Applied

(A) WIFI/BT

Wireless Router operations are allowed for 2.4 GHz but not allowed by the chipset firmware for 5 GHz WIFI bands, therefore 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 D01 v05, the SAR exclusion threshold for distances <50mm is defined by the following equation:

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

Based on the maximum conducted power of Bluetooth (rounded to the nearest mW) and the antenna to user separation distance, Bluetooth SAR was not required; $[(10/10) * \sqrt{2.441}] = 1.6 < 3.0$.

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) 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

Per October 2012 TCB workshop notes, 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.

(B) Licensed Transmitter(s)

GSM/GPRS/EDGE DTM is not supported for US bands. Therefore, the GSM Voice modes in this report do not transmit simultaneously with GPRS/EDGE Data.

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.

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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

- FCC OET Bulletin 65 Supplement C [June 2001]
- 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 D04v01 (Wireless Charging Covers)

1.10 Device Serial Numbers

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

	Head Serial Number	Body-Worn Serial Number	Hotspot Serial Number
GSM/GPRS/EDGE 850	20FCB	20FCA	20FCA
UMTS 850	20FCA	20FCA	20FCA
UMTS 1750	20FCA	20FCE	20FCE
GSM/GPRS/EDGE 1900	20FCA	20FCA	20FCA
UMTS 1900	20FCA	20FCA	20FCA
LTE Band 17	20FB4	20FB4	20FB4
LTE Band 5 (Cell)	20FCA	20FCA	20FCA
LTE Band 4 (AWS)	20FB4	20FB4	20FB4
LTE Band 2 (PCS)	20FCA	20FCA	20FCA
2.4 GHz WLAN	22	22	22
5 GHz WLAN	#002	#002	-

2

LTE INFORMATION

LTE Information			
FCC ID	A3LSGHM919		
Form Factor	Portable Handset		
Frequency Range of each LTE transmission band	LTE Band 17 (706.5 - 713.5 MHz)		
	LTE Band 4 (AWS) (1712.5 - 1752.5 MHz)		
	LTE Band 5 (Cell) (826.5 - 846.5 MHz)		
	LTE Band 2 (PCS) (1852.5 - 1907.5 MHz)		
Channel Bandwidths	LTE Band 17: 5 MHz, 10 MHz		
	LTE Band 4 (AWS): 5 MHz, 10 MHz, 15 MHz, 20 MHz		
	LTE Band 5 (Cell): 5 MHz, 10 MHz		
	LTE Band 2 (PCS): 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 5 (Cell): 5 MHz	826.5 (20425)	836.5 (20525)	846.5 (20625)
LTE Band 5 (Cell): 10 MHz	829 (20450)	836.5 (20525)	844 (20600)
LTE Band 4 (AWS): 5 MHz	1712.5 (19975)	1732.5 (20175)	1752.5 (20375)
LTE Band 4 (AWS): 10 MHz	1715 (20000)	1732.5 (20175)	1750 (20350)
LTE Band 4 (AWS): 15 MHz	1717.5 (20025)	1732.5 (20175)	1747.5 (20325)
LTE Band 4 (AWS): 20 MHz	1720 (20050)	1732.5 (20175)	1745 (20300)
LTE Band 2 (PCS): 5 MHz	1852.5 (18625)	1880 (18900)	1907.5 (19175)
LTE Band 2 (PCS): 10 MHz	1855 (18650)	1880 (18900)	1905 (19150)
UE Category	3		
Modulations Supported in UL	QPSK, 16QAM		
LTE Transmitter and Antenna Implementation	This device uses 1 Tx/Rx antenna for GSM/GPRS/EDGE/UMTS/LTE and one Rx only antenna for UMTS/LTE.		
Description of LTE Tx and Ant. Implementation	GSM/GPRS/EDGE/LTE share a transmission path		
Hotspot with LTE+WIFI	YES		
Hotspot with LTE+WIFI active with Voice sessions?	NO		
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		
Conducted power Table provided for 1RB (low, mid and high offset), 50% RB (low, mid, and high offset), and 100% RB	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 [24]. 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:

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).
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). 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. The data was extrapolated to the surface of the outer-shell of the phantom. The combined distance extrapolated was the combined distance from the center of the dipoles 2.7mm away from the tip of the probe housing plus the 1.2 mm distance between the surface and the lowest measuring point. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).
 - b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the "Not a knot" condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.
 - c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete to calculate the SAR drift. If the drift deviated by more than 5%, the SAR test and drift measurements were repeated.

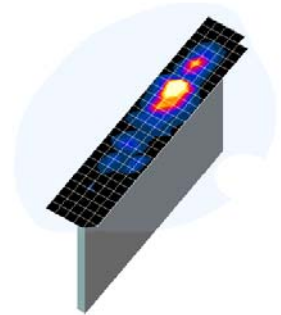


Figure 4-1
Sample SAR Area Scan

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

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

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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) is perpendicular to the reference plane and passing through the RE (or LE) is called the Reference Pivoting Line (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].

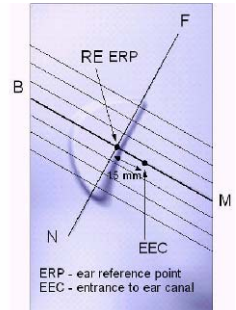


Figure 5-1
Close-Up Side view
of ERP

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 “test device reference point” located along the “vertical centerline” on the front of the device aligned to the “ear reference point” (See Figure 5-3). The “test device reference point” 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

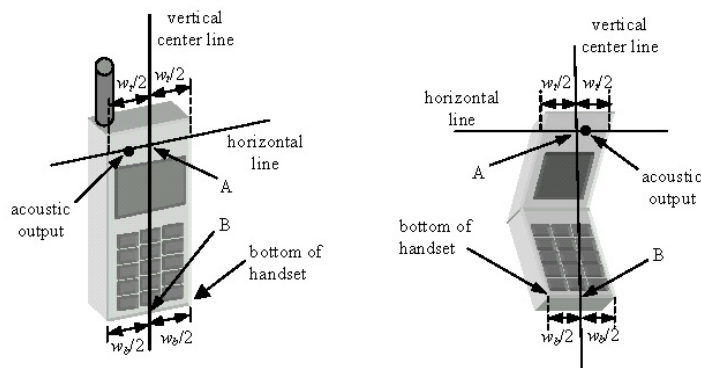


Figure 5-3
Handset Vertical Center & Horizontal Line Reference Points

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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.

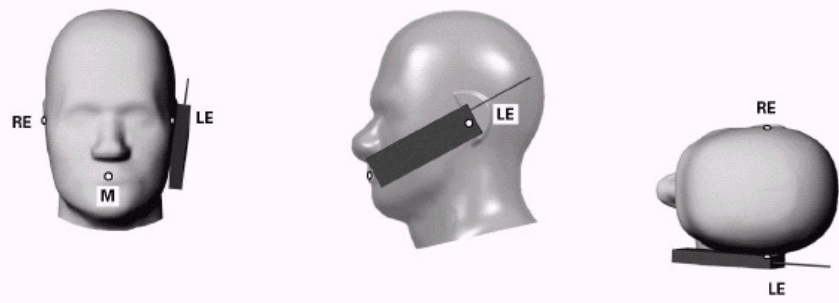


Figure 6-1 Front, Side and Top View of Cheek Position

2. The handset was translated towards the phantom along the line passing through RE & LE until the handset touches the ear.
3. While maintaining the handset in this plane, the handset was rotated around the LE-RE line until the vertical centerline was in the plane normal to MB-NF including the line MB (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. The tilted position was obtained when any part of the phone was in contact of the ear as well as a second part of the phone was in contact with the head (see Figure 6-2).

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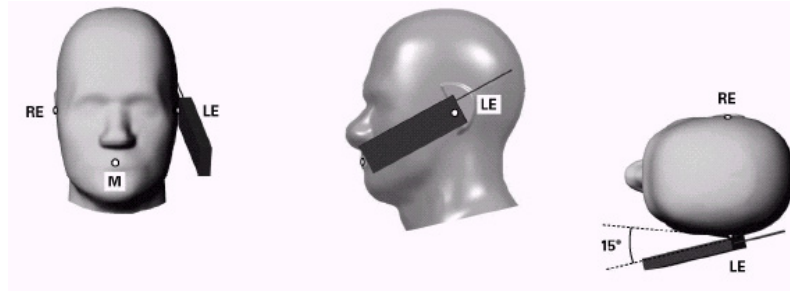


Figure 6-2 Front, Side and Top View of Ear/15° Tilt Position

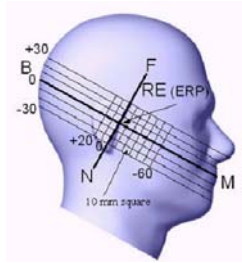


Figure 6-3
Side view w/ relevant markings

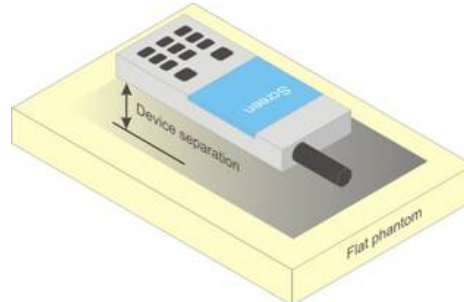


Figure 6-4
Sample Body-Worn Diagram

6.4 SAR Evaluations near the Mouth/Jaw Regions of the SAM Phantom

Antennas located near the bottom of a phone may require SAR measurements around the mouth and jaw regions of the SAM head phantom. This typically applies to clam-shell style phones that are generally longer in the unfolded normal use positions or to certain older style long rectangular phones.

Under these circumstances, the following procedures apply, adopted from the FCC guidance on SAR handsets document FCC KDB Publication 648474 D04_v01. The SAR required in these regions of SAM should be measured using a flat phantom. The phone should be positioned with a separation distance of 4 mm between the ear reference point (ERP) and the outer surface of the flat phantom shell. While maintaining this distance at the ERP location, the low (bottom) edge of the phone should be lowered from the phantom to establish the same separation distance between the peak SAR location identified by the truncated partial SAR distribution measured with the SAM phantom. The distance from the peak SAR location to the phone is determined by the straight line passing perpendicularly through the phantom surface. When it is not feasible to maintain 4 mm separation at the ERP while also establishing the required separation at the peak SAR location, the top edge of the phone will be allowed to touch the phantom with a separation < 4 mm at the ERP. The phone should not be tilted to the left or right while placed in this inclined position to the flat phantom.

The latest IEEE 1528 committee developments propose the usage of a tilted phantom when the antenna of the phone is mounted at the bottom or in all cases the peak absorption is in the chin region. Both SAM heads of the TwinSAM-Chin20 are rotated 20 degrees around the NF line. Each head can be removed individually from the table for emptying and cleaning.

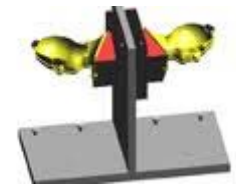


Figure 6-5 Twin SAM
Chin20

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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 6-4). Per FCC KDB Publication 648474 D04_v01, 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 D01_v05 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 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.

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 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)
SPATIAL PEAK SAR Brain	1.6	8.0
SPATIAL AVERAGE SAR Whole Body	0.08	0.4
SPATIAL PEAK SAR Hands, Feet, Ankles, Wrists	4.0	20

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

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Power measurements 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 UMTS

8.3.1 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.

8.3.2 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". SAR in AMR configurations is not required when the maximum average output of each RF channel for 12.2 kbps AMR is less than 0.25 dB higher than that measured in 12.2 kbps RMC. Otherwise, SAR is measured on the maximum output channel in 12.2 AMR with a 3.4 kbps SRB (signaling radio bearer) using the exposure configuration that resulted in the highest SAR for that RF channel in the 12.2 kbps RMC mode.

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8.3.3 Body SAR Measurements

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

8.3.4 SAR Measurements for Handsets with Rel 5 HSDPA

Body SAR for HSDPA is not required for handsets with HSDPA capabilities when the maximum average output power of each RF channel with HSDPA active is less than 0.25 dB higher than that measured without HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2 kbps RMC is $\leq 75\%$ of the SAR limit. Otherwise, SAR is measured for HSDPA, using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, using the highest body SAR configuration measured in 12.2 kbps RMC without HSDPA, on the maximum output channel with the body exposure configuration that resulted in the highest SAR in 12.2 kbps RMC mode for that RF channel.

The H-set used in FRC for HSDPA should be configured according to the UE category of a test device. The number of HS-DSCH/HSPDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the applicable H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the FRC for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 2 ms to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors of $\beta_c=9$ and $\beta_d=15$, and power offset parameters of $\Delta_{ACK} = \Delta_{NACK} = 5$ and $\Delta_{CQI}=2$ is used. The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the FRC.

8.3.5 SAR Measurements for Handsets with Rel 6 HSUPA

Body SAR for HSUPA is not required when the maximum average output of each RF channel with HSUPA/HSDPA active is less than 0.25 dB higher than as measured without HSUPA/HSDPA using 12.2 kbps RMC and maximum SAR for 12.2 kbps RMC is $\leq 75\%$ of the SAR limit. Otherwise SAR is measured on the maximum output channel for the body exposure configuration produced highest SAR in 12.2 kbps RMC for that RF channel, using the additional procedures under "Release 6 HSPA data devices"

Head SAR for VOIP operations under HSPA is not required when maximum average output of each RF channel with HSPA is less than 0.25 dB higher than as measured using 12.2 kbps RMC. Otherwise SAR is measured using same HSPA configuration as used for body SAR.

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	$\beta_{1s}^{(1)}$	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	$\beta_{ed1}: 47/15$ $\beta_{ed2}: 47/15$	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 $\Delta_{CQI} = 8 \Leftrightarrow A_{1s} = \beta_{1s}/\beta_c = 30/15 \Leftrightarrow \beta_{1s} = 30/15 * \beta_c$.													
Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{1s}/\beta_c = 24/15$. 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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8.4 SAR Measurement Conditions for LTE

LTE modes were tested according to FCC KDB 941225 D05v02 publication. Please see notes after the tabulated SAR data for required test configurations. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The R&S CMW500 was used for LTE output power measurements and SAR testing. Closed loop power control was used so the UE transmits with maximum output power during SAR testing.

8.4.1 Spectrum Plots for RB Configurations

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

8.4.2 MPR

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

8.4.3 A-MPR

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

8.4.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05v02r01:

- a. Per Section 5.2.1, SAR is required for QPSK 1 RB Allocation for the largest bandwidth
 - i. The required channel and offset combination with the highest maximum output power is required for SAR.
 - 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.

8.5 SAR Testing with 802.11 Transmitters

Normal network operating configurations are not suitable for measuring the SAR of 802.11 a/b/g/n/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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8.5.1 General Device Setup

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters. The test frequencies should correspond to actual channel frequencies defined for domestic use. SAR for devices with switched diversity should be measured with only one antenna transmitting at a time during each SAR measurement, according to a fixed modulation and data rate. The same data pattern should be used for all measurements.

8.5.2 Frequency Channel Configurations [27]

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/ac modes and higher data rates for 802.11a/n/ac were evaluated only if the respective mode was 0.25 dB or higher than the 802.11a mode.

If the maximum extrapolated peak SAR of the zoom scan for the highest output channel was less than 1.6 W/kg or 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 GSM Conducted Powers

		Maximum Burst-Averaged Output Power								
		Voice	GPRS/EDGE Data (GMSK)				EDGE Data (8-PSK)			
Band	Channel	GSM [dBm] CS (1 Slot)	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	32.79	32.84	31.41	30.09	28.63	26.51	26.41	26.33	26.17
	190	32.78	32.82	31.00	29.79	28.61	26.44	26.34	26.23	26.13
	251	32.78	32.78	31.42	30.12	28.51	26.56	26.46	26.35	26.14
GSM 1900	512	29.93	29.69	28.15	27.03	25.82	25.26	25.08	25.05	24.90
	661	30.12	29.87	28.28	27.21	25.87	25.44	25.33	25.31	25.13
	810	30.33	29.91	28.49	27.26	26.17	25.71	25.62	25.56	25.40
		Calculated Maximum Frame-Averaged Output Power								
		Voice	GPRS/EDGE Data (GMSK)				EDGE Data (8-PSK)			
Band	Channel	GSM [dBm] CS (1 Slot)	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	23.76	23.81	25.39	25.83	25.62	17.48	20.39	22.07	23.16
	190	23.75	23.79	24.98	25.53	25.60	17.41	20.32	21.97	23.12
	251	23.75	23.75	25.40	25.86	25.50	17.53	20.44	22.09	23.13
GSM 1900	512	20.90	20.66	22.13	22.77	22.81	16.23	19.06	20.79	21.89
	661	21.09	20.84	22.26	22.95	22.86	16.41	19.31	21.05	22.12
	810	21.30	20.88	22.47	23.00	23.16	16.68	19.60	21.30	22.39

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 bolded GPRS modes were selected for SAR testing according to the highest frame-averaged output power table according to KDB 941225 D03v01.
- 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.
- This device does not support evolved EDGE (eEDGE)

GSM Class: B
GPRS Multislot class: 12 (Max 4 Tx uplink slots)
EDGE Multislot class: 12 (Max 4 Tx uplink slots)
DTM Multislot Class: N/A



Figure 9-1
Power Measurement Setup

FCC ID: A3LSGHM919	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1303040444-R3.A3L	Test Dates: 02/04/13 - 03/05/13	DUT Type: Portable Handset		Page 22 of 54

9.2 UMTS Conducted Powers

3GPP Release Version	Mode	3GPP 34.121 Subtest	Cellular Band [dBm]			AWS Band [dBm]			PCS Band [dBm]			3GPP MPR [dB]
			4132	4183	4233	1312	1412	1862	9262	9400	9538	
99	WCDMA	12.2 kbps RMC	22.62	22.58	22.75	22.62	22.66	22.61	22.33	22.37	22.42	-
99		12.2 kbps AMR	22.61	22.54	22.80	22.70	22.65	22.61	22.35	22.42	22.32	-
6	HSDPA	Subtest 1	21.59	21.56	21.82	21.78	21.73	21.72	21.52	21.55	21.49	0
6		Subtest 2	21.72	21.60	21.88	21.85	21.78	21.69	21.67	21.77	21.48	0
6		Subtest 3	21.39	21.16	21.39	21.14	21.36	21.15	21.38	21.43	21.30	0.5
6		Subtest 4	21.11	20.96	21.36	21.25	21.21	21.16	20.94	21.01	21.38	0.5
6	HSUPA	Subtest 1	21.10	21.31	21.13	21.90	21.57	21.53	21.28	21.31	21.02	0
6		Subtest 2	20.67	20.54	20.46	20.80	20.90	20.80	20.65	20.78	20.65	2
6		Subtest 3	20.50	20.01	20.34	20.60	20.35	20.33	20.53	20.49	20.17	1
6		Subtest 4	21.20	21.02	21.19	21.36	21.14	21.11	21.11	21.19	21.10	2
6		Subtest 5	20.81	20.75	20.88	21.15	21.33	21.50	21.47	21.36	21.40	0
8	DC-HSDPA	Subtest 1	21.48	21.58	21.24	21.73	21.97	21.90	21.29	21.73	21.51	0
8		Subtest 2	21.49	21.53	21.27	21.98	21.99	21.81	21.67	22.00	21.79	0
8		Subtest 3	20.93	21.22	20.85	21.39	21.58	21.36	20.75	21.32	21.51	0.5
8		Subtest 4	20.82	21.16	20.77	21.21	21.58	21.39	20.71	21.21	21.17	0.5

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.

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.

DC-HSDPA considerations

- 3GPP Specification 34.121-1 Release 8 Ver 8.10.0 was used for DC-HSDPA guidance
- H-Set 12 (QPSK) was confirmed to be used during DC-HSDPA measurements
- Measured maximum output powers for DC-HSDPA were not greater than 1/4 dB higher than the WCDMA 12.2 kbps RMC maximum output, as a result, SAR is not required for DC-HSDPA
- The DUT supports UE category 24 for HSDPA

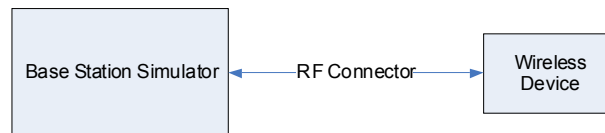


Figure 9-2
Power Measurement Setup

FCC ID: A3LSGHM919	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1303040444-R3.A3L	Test Dates: 02/04/13 - 03/05/13	DUT Type: Portable Handset		Page 23 of 54

9.3 LTE Conducted Powers

9.3.1 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	22.93	0	0
	710.0	23790	10	QPSK	1	25	23.02	0	0
	710.0	23790	10	QPSK	1	49	23.19	0	0
	710.0	23790	10	QPSK	25	0	21.97	1	0-1
	710.0	23790	10	QPSK	25	12	21.98	1	0-1
	710.0	23790	10	QPSK	25	25	22.05	1	0-1
	710.0	23790	10	QPSK	50	0	21.93	1	0-1
	710.0	23790	10	16QAM	1	0	21.86	1	0-1
	710.0	23790	10	16QAM	1	25	21.91	1	0-1
	710.0	23790	10	16QAM	1	49	22.00	1	0-1
	710.0	23790	10	16QAM	25	0	21.01	2	0-2
	710.0	23790	10	16QAM	25	12	21.05	2	0-2
	710.0	23790	10	16QAM	25	25	21.12	2	0-2
	710.0	23790	10	16QAM	50	0	21.01	2	0-2

Note: LTE Band 17 at 10 MHz Bandwidth does not support three non-overlapping channels. Per KDB 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the mid 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	23.12	0	0
	710.0	23790	5	QPSK	1	12	22.97	0	0
	710.0	23790	5	QPSK	1	24	23.08	0	0
	710.0	23790	5	QPSK	12	0	22.07	1	0-1
	710.0	23790	5	QPSK	12	6	22.03	1	0-1
	710.0	23790	5	QPSK	12	13	22.15	1	0-1
	710.0	23790	5	QPSK	25	0	21.98	1	0-1
	710.0	23790	5	16-QAM	1	0	22.18	1	0-1
	710.0	23790	5	16-QAM	1	12	22.15	1	0-1
	710.0	23790	5	16-QAM	1	24	22.19	1	0-1
	710.0	23790	5	16-QAM	12	0	21.05	2	0-2
	710.0	23790	5	16-QAM	12	6	21.08	2	0-2
	710.0	23790	5	16-QAM	12	13	21.08	2	0-2
	710.0	23790	5	16-QAM	25	0	21.01	2	0-2

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

9.3.2 LTE Band 5 (Cell)

Table 9-3
LTE Band 5 (Cell) 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	836.5	20525	10	QPSK	1	0	23.14	0	0
	836.5	20525	10	QPSK	1	25	23.23	0	0
	836.5	20525	10	QPSK	1	49	23.18	0	0
	836.5	20525	10	QPSK	25	0	22.16	1	0-1
	836.5	20525	10	QPSK	25	12	22.17	1	0-1
	836.5	20525	10	QPSK	25	25	22.08	1	0-1
	836.5	20525	10	QPSK	50	0	22.00	1	0-1
	836.5	20525	10	16QAM	1	0	22.04	1	0-1
	836.5	20525	10	16QAM	1	25	22.12	1	0-1
	836.5	20525	10	16QAM	1	49	22.04	1	0-1
	836.5	20525	10	16QAM	25	0	21.08	2	0-2
	836.5	20525	10	16QAM	25	12	21.09	2	0-2
	836.5	20525	10	16QAM	25	25	21.00	2	0-2
	836.5	20525	10	16QAM	50	0	20.99	2	0-2

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

Table 9-4

LTE Band 5 (Cell) 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	826.5	20425	5	QPSK	1	0	23.19	0	0
	826.5	20425	5	QPSK	1	12	23.20	0	0
	826.5	20425	5	QPSK	1	24	23.21	0	0
	826.5	20425	5	QPSK	12	0	22.17	1	0-1
	826.5	20425	5	QPSK	12	6	22.15	1	0-1
	826.5	20425	5	QPSK	12	13	22.26	1	0-1
	826.5	20425	5	QPSK	25	0	22.15	1	0-1
	826.5	20425	5	16-QAM	1	0	22.09	1	0-1
	826.5	20425	5	16-QAM	1	12	22.08	1	0-1
	826.5	20425	5	16-QAM	1	24	22.11	1	0-1
	826.5	20425	5	16-QAM	12	0	21.20	2	0-2
	826.5	20425	5	16-QAM	12	6	21.25	2	0-2
	826.5	20425	5	16-QAM	12	13	21.28	2	0-2
	826.5	20425	5	16-QAM	25	0	21.24	2	0-2
	836.5	20525	5	QPSK	1	0	23.05	0	0
	836.5	20525	5	QPSK	1	12	23.24	0	0
Mid	836.5	20525	5	QPSK	1	24	23.17	0	0
	836.5	20525	5	QPSK	12	0	22.22	1	0-1
	836.5	20525	5	QPSK	12	6	22.20	1	0-1
	836.5	20525	5	QPSK	12	13	22.32	1	0-1
	836.5	20525	5	QPSK	25	0	22.15	1	0-1
	836.5	20525	5	16-QAM	1	0	21.85	1	0-1
	836.5	20525	5	16-QAM	1	12	22.06	1	0-1
	836.5	20525	5	16-QAM	1	24	22.06	1	0-1
	836.5	20525	5	16-QAM	12	0	21.24	2	0-2
	836.5	20525	5	16-QAM	12	6	21.18	2	0-2
	836.5	20525	5	16-QAM	12	13	21.22	2	0-2
	836.5	20525	5	16-QAM	25	0	21.23	2	0-2
	846.5	20625	5	QPSK	1	0	23.24	0	0
	846.5	20625	5	QPSK	1	12	23.29	0	0
	846.5	20625	5	QPSK	1	24	23.23	0	0
	846.5	20625	5	QPSK	12	0	22.32	1	0-1
High	846.5	20625	5	QPSK	12	6	22.34	1	0-1
	846.5	20625	5	QPSK	12	13	22.33	1	0-1
	846.5	20625	5	QPSK	25	0	22.25	1	0-1
	846.5	20625	5	16-QAM	1	0	22.14	1	0-1
	846.5	20625	5	16-QAM	1	12	22.18	1	0-1
	846.5	20625	5	16-QAM	1	24	22.13	1	0-1
	846.5	20625	5	16-QAM	12	0	21.37	2	0-2
	846.5	20625	5	16-QAM	12	6	21.32	2	0-2
	846.5	20625	5	16-QAM	12	13	21.37	2	0-2
	846.5	20625	5	16-QAM	25	0	21.26	2	0-2

9.3.1

LTE Band 4 (AWS)

Table 9-5

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Mid	1732.5	20175	20	QPSK	1	0	22.63	0	0
	1732.5	20175	20	QPSK	1	50	22.93	0	0
	1732.5	20175	20	QPSK	1	99	22.97	0	0
	1732.5	20175	20	QPSK	50	0	21.57	1	0-1
	1732.5	20175	20	QPSK	50	25	21.72	1	0-1
	1732.5	20175	20	QPSK	50	50	21.76	1	0-1
	1732.5	20175	20	QPSK	100	0	21.69	1	0-1
	1732.5	20175	20	16QAM	1	0	21.58	1	0-1
	1732.5	20175	20	16QAM	1	50	21.85	1	0-1
	1732.5	20175	20	16QAM	1	99	21.93	1	0-1
	1732.5	20175	20	16QAM	50	0	20.49	2	0-2
	1732.5	20175	20	16QAM	50	25	20.64	2	0-2
	1732.5	20175	20	16QAM	50	50	20.79	2	0-2
	1732.5	20175	20	16QAM	100	0	20.66	2	0-2

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

Table 9-6
LTE Band 4 (AWS) Conducted Powers - 15 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Low	1717.5	20025	15	QPSK	1	0	22.36	0	0
	1717.5	20025	15	QPSK	1	36	22.74	0	0
	1717.5	20025	15	QPSK	1	74	22.88	0	0
	1717.5	20025	15	QPSK	36	0	21.58	1	0-1
	1717.5	20025	15	QPSK	36	18	21.54	1	0-1
	1717.5	20025	15	QPSK	36	37	21.76	1	0-1
	1717.5	20025	15	QPSK	75	0	21.58	1	0-1
	1717.5	20025	15	16QAM	1	0	21.67	1	0-1
	1717.5	20025	15	16QAM	1	36	21.98	1	0-1
	1717.5	20025	15	16QAM	1	74	21.94	1	0-1
	1717.5	20025	15	16QAM	36	0	20.63	2	0-2
	1717.5	20025	15	16QAM	36	18	20.64	2	0-2
	1717.5	20025	15	16QAM	36	37	20.85	2	0-2
	1717.5	20025	15	16QAM	75	0	20.63	2	0-2
Mid	1732.5	20175	15	QPSK	1	0	22.68	0	0
	1732.5	20175	15	QPSK	1	36	22.90	0	0
	1732.5	20175	15	QPSK	1	74	22.92	0	0
	1732.5	20175	15	QPSK	36	0	21.74	1	0-1
	1732.5	20175	15	QPSK	36	18	21.75	1	0-1
	1732.5	20175	15	QPSK	36	37	21.75	1	0-1
	1732.5	20175	15	QPSK	75	0	21.67	1	0-1
	1732.5	20175	15	16QAM	1	0	21.62	1	0-1
	1732.5	20175	15	16QAM	1	36	21.82	1	0-1
	1732.5	20175	15	16QAM	1	74	21.92	1	0-1
	1732.5	20175	15	16QAM	36	0	20.59	2	0-2
	1732.5	20175	15	16QAM	36	18	20.72	2	0-2
	1732.5	20175	15	16QAM	36	37	20.72	2	0-2
	1732.5	20175	15	16QAM	75	0	20.61	2	0-2
High	1747.5	20325	15	QPSK	1	0	22.78	0	0
	1747.5	20325	15	QPSK	1	36	22.66	0	0
	1747.5	20325	15	QPSK	1	74	22.88	0	0
	1747.5	20325	15	QPSK	36	0	21.50	1	0-1
	1747.5	20325	15	QPSK	36	18	21.53	1	0-1
	1747.5	20325	15	QPSK	36	37	21.60	1	0-1
	1747.5	20325	15	QPSK	75	0	21.53	1	0-1
	1747.5	20325	15	16QAM	1	0	21.69	1	0-1
	1747.5	20325	15	16QAM	1	36	21.67	1	0-1
	1747.5	20325	15	16QAM	1	74	21.75	1	0-1
	1747.5	20325	15	16QAM	36	0	20.46	2	0-2
	1747.5	20325	15	16QAM	36	18	20.39	2	0-2
	1747.5	20325	15	16QAM	36	37	20.58	2	0-2
	1747.5	20325	15	16QAM	75	0	20.56	2	0-2

Table 9-7
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	22.56	0	0
	1715	20000	10	QPSK	1	25	22.82	0	0
	1715	20000	10	QPSK	1	49	22.88	0	0
	1715	20000	10	QPSK	25	0	21.54	1	0-1
	1715	20000	10	QPSK	25	12	21.67	1	0-1
	1715	20000	10	QPSK	25	25	21.78	1	0-1
	1715	20000	10	QPSK	50	0	21.66	1	0-1
	1715	20000	10	16QAM	1	0	21.52	1	0-1
	1715	20000	10	16QAM	1	25	21.77	1	0-1
	1715	20000	10	16QAM	1	49	21.79	1	0-1
	1715	20000	10	16QAM	25	0	20.63	2	0-2
	1715	20000	10	16QAM	25	12	20.72	2	0-2
	1715	20000	10	16QAM	25	25	20.68	2	0-2
	1715	20000	10	16QAM	50	0	20.57	2	0-2
Mid	1732.5	20175	10	QPSK	1	0	22.97	0	0
	1732.5	20175	10	QPSK	1	25	22.80	0	0
	1732.5	20175	10	QPSK	1	49	22.79	0	0
	1732.5	20175	10	QPSK	25	0	21.74	1	0-1
	1732.5	20175	10	QPSK	25	12	21.68	1	0-1
	1732.5	20175	10	QPSK	25	25	21.68	1	0-1
	1732.5	20175	10	QPSK	50	0	21.61	1	0-1
	1732.5	20175	10	16QAM	1	0	21.93	1	0-1
	1732.5	20175	10	16QAM	1	25	21.82	1	0-1
	1732.5	20175	10	16QAM	1	49	21.70	1	0-1
	1732.5	20175	10	16QAM	25	0	20.82	2	0-2
	1732.5	20175	10	16QAM	25	12	20.70	2	0-2
	1732.5	20175	10	16QAM	25	25	20.75	2	0-2
	1732.5	20175	10	16QAM	50	0	20.51	2	0-2
High	1750	20350	10	QPSK	1	0	22.65	0	0
	1750	20350	10	QPSK	1	25	22.71	0	0
	1750	20350	10	QPSK	1	49	22.80	0	0
	1750	20350	10	QPSK	25	0	21.50	1	0-1
	1750	20350	10	QPSK	25	12	21.68	1	0-1
	1750	20350	10	QPSK	25	25	21.65	1	0-1
	1750	20350	10	QPSK	50	0	21.59	1	0-1
	1750	20350	10	16QAM	1	0	21.61	1	0-1
	1750	20350	10	16QAM	1	25	21.65	1	0-1
	1750	20350	10	16QAM	1	49	21.69	1	0-1
	1750	20350	10	16QAM	25	0	20.57	2	0-2
	1750	20350	10	16QAM	25	12	20.69	2	0-2
	1750	20350	10	16QAM	25	25	20.66	2	0-2
	1750	20350	10	16QAM	50	0	20.54	2	0-2

Table 9-8
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	22.51	0	0
	1712.5	19975	5	QPSK	1	12	22.62	0	0
	1712.5	19975	5	QPSK	1	24	22.77	0	0
	1712.5	19975	5	QPSK	12	0	21.60	1	0-1
	1712.5	19975	5	QPSK	12	6	21.60	1	0-1
	1712.5	19975	5	QPSK	12	13	21.76	1	0-1
	1712.5	19975	5	QPSK	25	0	21.54	1	0-1
	1712.5	19975	5	16-QAM	1	0	21.31	1	0-1
	1712.5	19975	5	16-QAM	1	12	21.50	1	0-1
	1712.5	19975	5	16-QAM	1	24	21.57	1	0-1
	1712.5	19975	5	16-QAM	12	0	20.70	2	0-2
	1712.5	19975	5	16-QAM	12	6	20.69	2	0-2
	1712.5	19975	5	16-QAM	12	13	20.85	2	0-2
	1712.5	19975	5	16-QAM	25	0	20.65	2	0-2
	1732.5	20175	5	QPSK	1	0	22.88	0	0
	1732.5	20175	5	QPSK	1	12	22.90	0	0
Mid	1732.5	20175	5	QPSK	1	24	22.77	0	0
	1732.5	20175	5	QPSK	12	0	21.78	1	0-1
	1732.5	20175	5	QPSK	12	6	21.75	1	0-1
	1732.5	20175	5	QPSK	12	13	21.82	1	0-1
	1732.5	20175	5	QPSK	25	0	21.64	1	0-1
	1732.5	20175	5	16-QAM	1	0	21.97	1	0-1
	1732.5	20175	5	16-QAM	1	12	21.99	1	0-1
	1732.5	20175	5	16-QAM	1	24	21.90	1	0-1
	1732.5	20175	5	16-QAM	12	0	20.80	2	0-2
	1732.5	20175	5	16-QAM	12	6	20.78	2	0-2
	1732.5	20175	5	16-QAM	12	13	20.79	2	0-2
	1732.5	20175	5	16-QAM	25	0	20.60	2	0-2
	1752.5	20375	5	QPSK	1	0	22.82	0	0
	1752.5	20375	5	QPSK	1	12	22.94	0	0
	1752.5	20375	5	QPSK	1	24	22.85	0	0
	1752.5	20375	5	QPSK	12	0	21.75	1	0-1
High	1752.5	20375	5	QPSK	12	6	21.81	1	0-1
	1752.5	20375	5	QPSK	12	13	21.82	1	0-1
	1752.5	20375	5	QPSK	25	0	21.70	1	0-1
	1752.5	20375	5	16-QAM	1	0	21.86	1	0-1
	1752.5	20375	5	16-QAM	1	12	21.99	1	0-1
	1752.5	20375	5	16-QAM	1	24	21.91	1	0-1
	1752.5	20375	5	16-QAM	12	0	20.77	2	0-2
	1752.5	20375	5	16-QAM	12	6	20.73	2	0-2
	1752.5	20375	5	16-QAM	12	13	20.80	2	0-2
	1752.5	20375	5	16-QAM	25	0	20.64	2	0-2

9.3.2 LTE Band 2 (PCS)

Table 9-9
LTE Band 2 (PCS) 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	1855	18650	10	QPSK	1	0	22.94	0	0
	1855	18650	10	QPSK	1	25	23.00	0	0
	1855	18650	10	QPSK	1	49	22.98	0	0
	1855	18650	10	QPSK	25	0	21.96	1	0-1
	1855	18650	10	QPSK	25	12	21.97	1	0-1
	1855	18650	10	QPSK	25	25	21.92	1	0-1
	1855	18650	10	QPSK	50	0	21.80	1	0-1
	1855	18650	10	16QAM	1	0	22.04	1	0-1
	1855	18650	10	16QAM	1	25	22.07	1	0-1
	1855	18650	10	16QAM	1	49	22.12	1	0-1
	1855	18650	10	16QAM	25	0	21.04	2	0-2
	1855	18650	10	16QAM	25	12	21.02	2	0-2
	1855	18650	10	16QAM	25	25	21.03	2	0-2
	1855	18650	10	16QAM	50	0	20.87	2	0-2
	1880.0	18900	10	QPSK	1	0	23.06	0	0
	1880.0	18900	10	QPSK	1	25	23.11	0	0
Mid	1880.0	18900	10	QPSK	1	49	23.14	0	0
	1880.0	18900	10	QPSK	25	0	22.04	1	0-1
	1880.0	18900	10	QPSK	25	12	22.05	1	0-1
	1880.0	18900	10	QPSK	25	25	22.06	1	0-1
	1880.0	18900	10	QPSK	50	0	22.04	1	0-1
	1880.0	18900	10	16QAM	1	0	22.15	1	0-1
	1880.0	18900	10	16QAM	1	25	22.23	1	0-1
	1880.0	18900	10	16QAM	1	49	22.22	1	0-1
	1880.0	18900	10	16QAM	25	0	21.08	2	0-2
	1880.0	18900	10	16QAM	25	12	21.11	2	0-2
	1880.0	18900	10	16QAM	25	25	21.15	2	0-2
	1880.0	18900	10	16QAM	50	0	21.01	2	0-2
	1905	19150	10	QPSK	1	0	22.90	0	0
	1905	19150	10	QPSK	1	25	22.98	0	0
	1905	19150	10	QPSK	1	49	23.01	0	0
High	1905	19150	10	QPSK	25	0	21.91	1	0-1
	1905	19150	10	QPSK	25	12	21.89	1	0-1
	1905	19150	10	QPSK	25	25	21.93	1	0-1
	1905	19150	10	QPSK	50	0	21.76	1	0-1
	1905	19150	10	16QAM	1	0	22.01	1	0-1
	1905	19150	10	16QAM	1	25	22.03	1	0-1
	1905	19150	10	16QAM	1	49	22.04	1	0-1
	1905	19150	10	16QAM	25	0	21.03	2	0-2
	1905	19150	10	16QAM	25	12	20.96	2	0-2
	1905	19150	10	16QAM	25	25	21.03	2	0-2
	1905	19150	10	16QAM	50	0	21.01	2	0-2

Table 9-10
LTE Band 2 (PCS) 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	1852.5	18625	5	QPSK	1	0	23.02	0	0
	1852.5	18625	5	QPSK	1	12	23.06	0	0
	1852.5	18625	5	QPSK	1	24	23.06	0	0
	1852.5	18625	5	QPSK	12	0	22.10	1	0-1
	1852.5	18625	5	QPSK	12	6	22.08	1	0-1
	1852.5	18625	5	QPSK	12	13	22.07	1	0-1
	1852.5	18625	5	QPSK	25	0	21.98	1	0-1
	1852.5	18625	5	16-QAM	1	0	21.80	1	0-1
	1852.5	18625	5	16-QAM	1	12	21.96	1	0-1
	1852.5	18625	5	16-QAM	1	24	21.94	1	0-1
	1852.5	18625	5	16-QAM	12	0	21.13	2	0-2
	1852.5	18625	5	16-QAM	12	6	21.08	2	0-2
	1852.5	18625	5	16-QAM	12	13	21.04	2	0-2
	1852.5	18625	5	16-QAM	25	0	21.02	2	0-2
Mid	1880.0	18900	5	QPSK	1	0	23.14	0	0
	1880.0	18900	5	QPSK	1	12	23.13	0	0
	1880.0	18900	5	QPSK	1	24	23.20	0	0
	1880.0	18900	5	QPSK	12	0	22.17	1	0-1
	1880.0	18900	5	QPSK	12	6	22.14	1	0-1
	1880.0	18900	5	QPSK	12	13	22.20	1	0-1
	1880.0	18900	5	QPSK	25	0	22.05	1	0-1
	1880.0	18900	5	16-QAM	1	0	22.00	1	0-1
	1880.0	18900	5	16-QAM	1	12	22.04	1	0-1
	1880.0	18900	5	16-QAM	1	24	22.06	1	0-1
	1880.0	18900	5	16-QAM	12	0	21.18	2	0-2
	1880.0	18900	5	16-QAM	12	6	21.17	2	0-2
	1880.0	18900	5	16-QAM	12	13	21.18	2	0-2
	1880.0	18900	5	16-QAM	25	0	21.15	2	0-2
High	1907.5	19175	5	QPSK	1	0	23.02	0	0
	1907.5	19175	5	QPSK	1	12	23.07	0	0
	1907.5	19175	5	QPSK	1	24	22.95	0	0
	1907.5	19175	5	QPSK	12	0	22.15	1	0-1
	1907.5	19175	5	QPSK	12	6	22.08	1	0-1
	1907.5	19175	5	QPSK	12	13	22.07	1	0-1
	1907.5	19175	5	QPSK	25	0	22.04	1	0-1
	1907.5	19175	5	16-QAM	1	0	21.85	1	0-1
	1907.5	19175	5	16-QAM	1	12	21.95	1	0-1
	1907.5	19175	5	16-QAM	1	24	21.86	1	0-1
	1907.5	19175	5	16-QAM	12	0	21.14	2	0-2
	1907.5	19175	5	16-QAM	12	6	21.14	2	0-2
	1907.5	19175	5	16-QAM	12	13	21.10	2	0-2
	1907.5	19175	5	16-QAM	25	0	21.07	2	0-2

9.4 WLAN Conducted Powers

Table 9-11
IEEE 802.11b Average RF Power

Mode	Freq [MHz]	Channel	802.11b (2.4 GHz) Conducted Power [dBm]			
			Data Rate [Mbps]			
			1	2	5.5	11
802.11b	2412	1	16.46	16.89	16.97	16.92
802.11b	2437	6	16.94	16.27	16.33	16.38
802.11b	2462	11	16.18	16.70	16.78	16.78

Table 9-12
IEEE 802.11g Average RF Power

Mode	Freq [MHz]	Channel	802.11g (2.4 GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
802.11g	2412	1	14.25	14.30	14.33	14.31	14.31	14.23	14.42	14.20
802.11g	2437	6	14.75	14.67	14.57	14.78	14.70	14.63	14.85	14.61
802.11g	2462	11	14.00	13.98	14.12	14.20	14.12	13.97	14.28	13.94

Table 9-13
IEEE 802.11n Average RF Power

Mode	Freq [MHz]	Channel	802.11n (2.4 GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			6.5	13	20	26	39	52	58	65
802.11n	2412	1	13.18	13.29	13.20	13.10	13.28	13.33	13.28	13.37
802.11n	2437	6	13.48	13.49	13.75	13.62	13.59	13.70	13.72	13.59
802.11n	2462	11	12.99	13.11	13.12	13.06	13.13	13.15	13.18	13.15

Table 9-14
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*	12.57	12.47	12.51	12.47	12.45	12.46	12.58	12.34
802.11a	5200	40	12.40	12.36	12.40	12.32	12.39	12.38	12.51	12.34
802.11a	5220	44	12.33	12.26	12.29	12.29	12.22	12.26	12.42	12.21
802.11a	5240	48*	12.20	12.18	12.22	12.19	12.08	12.12	12.19	12.03
802.11a	5260	52*	13.08	13.15	13.18	13.20	13.18	13.10	13.29	13.06
802.11a	5280	56	13.06	13.09	13.14	13.11	13.08	13.07	13.08	12.87
802.11a	5300	60	12.93	12.99	13.05	13.00	12.98	13.03	13.02	12.79
802.11a	5320	64*	12.90	12.92	13.00	13.04	12.81	12.88	12.96	12.74
802.11a	5500	100	13.18	13.21	13.16	13.16	13.15	13.18	13.22	13.03
802.11a	5520	104*	13.08	13.14	13.13	13.06	13.09	13.04	13.14	12.88
802.11a	5540	108	13.08	13.01	13.06	13.05	13.08	13.11	13.07	12.88
802.11a	5560	112	12.94	13.07	13.00	13.15	12.92	12.98	13.00	12.84
802.11a	5580	116*	12.87	13.09	12.95	13.09	12.85	13.15	13.04	12.71
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	12.70	12.81	12.67	12.71	12.72	12.81	12.69	12.44
802.11a	5680	136*	12.56	12.49	12.58	12.55	12.57	12.71	12.66	12.42
802.11a	5700	140	12.50	12.55	12.47	12.51	12.59	12.61	12.53	12.25
802.11a	5745	149*	12.51	12.53	12.40	12.59	12.50	12.51	12.59	12.44
802.11a	5765	153	12.46	12.54	12.50	12.55	12.52	12.47	12.55	12.38
802.11a	5785	157*	12.32	12.40	12.46	12.37	12.38	12.31	12.55	12.30
802.11a	5805	161*	12.32	12.34	12.38	12.37	12.36	12.39	12.43	12.15
802.11a	5825	165	12.26	12.18	12.26	12.22	12.26	12.16	12.37	12.08

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.

Table 9-15
IEEE 802.11n Average RF Power – 20 MHz Bandwidth

Mode	Freq	Channel	20MHz BW 802.11n (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		6.5	13	20	26	39	52	58	65
802.11n	5180	36	12.19	12.22	12.27	12.17	12.16	12.43	12.30	12.40
802.11n	5200	40	12.27	12.21	12.37	12.21	12.33	12.27	12.26	12.13
802.11n	5220	44	12.24	12.28	12.29	12.29	12.35	12.31	12.34	12.33
802.11n	5240	48	12.36	12.25	12.29	12.17	12.26	12.35	12.40	12.32
802.11n	5260	52	12.31	12.48	12.42	12.58	12.40	12.48	12.33	12.32
802.11n	5280	56	12.27	12.31	12.32	12.31	12.33	12.35	12.34	12.27
802.11n	5300	60	12.30	12.34	12.23	12.32	12.41	12.37	12.31	12.22
802.11n	5320	64	12.18	12.18	12.16	12.30	12.27	12.22	12.45	12.42
802.11n	5500	100	12.23	12.43	12.30	12.55	12.44	12.34	12.57	12.51
802.11n	5520	104	12.38	12.32	12.35	12.33	12.42	12.30	12.42	12.27
802.11n	5540	108	12.28	12.27	12.22	12.24	12.30	12.29	12.33	12.28
802.11n	5560	112	12.36	12.35	12.26	12.30	12.34	12.36	12.35	12.31
802.11n	5580	116	12.38	12.42	12.33	12.43	12.39	12.38	12.42	12.55
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
802.11n	5660	132	12.13	12.15	12.21	12.19	12.15	12.24	12.23	12.08
802.11n	5680	136	12.04	12.11	12.07	12.20	12.22	12.19	12.11	12.19
802.11n	5700	140	12.20	12.15	12.02	12.04	12.12	12.08	12.13	12.09
802.11n	5745	149	12.31	12.40	12.32	12.35	12.44	12.33	12.43	12.37
802.11n	5765	153	12.24	12.20	12.14	12.21	12.28	12.30	12.36	12.37
802.11n	5785	157	12.16	12.22	12.24	12.25	12.21	12.26	12.31	12.31
802.11n	5805	161	12.13	12.25	12.34	12.28	12.27	12.15	12.25	12.22
802.11n	5825	165	11.89	11.96	11.72	12.06	11.59	12.01	11.80	11.85

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.

Table 9-16
IEEE 802.11n Average RF Power – 40 MHz Bandwidth

Mode	Freq	Channel	40MHz BW 802.11n (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		13.5/15	27/30	40.5/45	54/60	81/90	108/120	121.5/135	135/150
802.11n	5190	38	12.64	12.55	12.57	12.59	12.55	12.46	12.57	12.63
802.11n	5230	46	12.57	12.63	12.54	12.61	12.48	12.55	12.55	12.49
802.11n	5270	54	13.03	12.90	12.96	12.95	12.94	13.01	13.04	12.97
802.11n	5310	62	12.83	12.95	12.92	12.87	12.84	12.91	12.92	12.88
802.11n	5510	102	12.67	12.60	12.43	12.42	12.46	12.55	12.50	12.48
802.11n	5550	110	12.66	12.61	12.57	12.65	12.40	12.56	12.39	12.62
802.11n	5590	118	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5630	126	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5670	134	12.24	12.25	12.23	12.30	12.27	12.15	12.29	12.14
802.11n	5755	151	12.18	12.16	12.04	11.90	11.80	11.67	11.62	11.44
802.11n	5795	159	12.24	12.07	12.02	12.12	12.22	12.20	12.28	12.48

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.

Table 9-17
IEEE 802.11ac Average RF Power – 80 MHz Bandwidth

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Mode	Freq [MHz]	Channel	80MHz BW 802.11ac (5GHz) Conducted Power [dBm]									
			Data Rate [Mbps]									
			29.3/32.5	58.5/65	87.8/97.5	117/130	175.5/195	234/260	263.3/292.5	292.5/325	351/390	390/433.3
			MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
802.11ac	5210	42	12.78	12.81	12.73	12.63	12.72	12.59	12.72	12.70	12.57	12.59
802.11ac	5290	58	12.12	12.22	12.22	12.28	12.33	12.29	12.26	12.29	12.27	12.33
802.11ac	5530	106	12.22	12.31	12.36	12.21	12.14	12.28	12.27	12.19	12.14	12.17
802.11ac	5775	155	12.33	12.37	12.48	12.55	12.43	12.30	12.29	12.31	12.33	12.23

Justification for reduced test configurations for WIFI channels per KDB Publication 248227 D01v01r02 and October 2012 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 and 802.11ac) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11a mode.
- When the maximum extrapolated peak SAR of the zoom scan for the maximum output channel is <1.6 W/kg and the reported 1g averaged SAR is <0.8 W/kg, SAR testing on other channels is not required. Otherwise, the other default (or corresponding required) test channels were additionally tested using the lowest data rate.
- The data rate and channel for the bolded powers above were tested for SAR.



Figure 9-3
Power Measurement Setup

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10 SYSTEM VERIFICATION

10.1 Tissue Verification

Table 10-1
Measured Tissue Properties

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (°C)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ϵ	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ϵ	% dev σ	% dev ϵ
02/12/2013	750H	23.2	710	0.867	41.150	0.887	42.113	-2.25%	-2.29%
			740	0.895	40.756	0.889	41.953	0.67%	-2.85%
			755	0.908	40.528	0.891	41.876	1.91%	-3.22%
02/08/2013	835H	22.4	820	0.913	40.650	0.90	41.57	1.67%	-2.22%
			835	0.928	40.460	0.90	41.50	3.11%	-2.51%
			850	0.944	40.280	0.92	41.50	3.06%	-2.94%
02/11/2013	835H	23.5	820	0.895	41.051	0.90	41.57	-0.33%	-1.25%
			835	0.912	40.942	0.90	41.50	1.33%	-1.34%
			850	0.928	40.670	0.92	41.50	1.31%	-2.00%
02/08/2013	1750H	19.9	1710	1.326	40.050	1.35	40.14	-1.63%	-0.21%
			1750	1.368	39.830	1.37	40.10	-0.15%	-0.67%
			1790	1.409	39.690	1.39	40.02	1.08%	-0.82%
03/03/2013	1750H	23.3	1710	1.383	40.490	1.35	40.14	2.60%	0.88%
			1750	1.396	40.363	1.37	40.10	1.90%	0.66%
			1790	1.424	40.128	1.39	40.02	2.15%	0.27%
02/11/2013	1900H	22.7	1850	1.404	39.310	1.40	40.00	0.29%	-1.72%
			1880	1.424	39.210	1.40	40.00	1.71%	-1.98%
			1910	1.463	39.100	1.40	40.00	4.50%	-2.25%
02/12/2013	1900H	21.0	1850	1.343	38.350	1.40	40.00	-4.07%	-4.13%
			1880	1.362	38.200	1.40	40.00	-2.71%	-4.50%
			1910	1.392	38.040	1.40	40.00	-0.57%	-4.90%
03/04/2013	1900H	22.7	1850	1.364	38.860	1.40	40.00	-2.57%	-2.85%
			1880	1.393	38.741	1.40	40.00	-0.50%	-3.15%
			1910	1.419	38.556	1.40	40.00	1.36%	-3.61%
02/25/2013	2450H	24.4	2401	1.820	40.760	1.76	39.30	3.53%	3.72%
			2450	1.876	40.580	1.80	39.20	4.22%	3.52%
			2499	1.935	40.340	1.85	39.14	4.48%	3.08%
2/4/2013	5200H-5800H	23.7	5180	4.615	37.100	4.639	36.020	-0.52%	3.00%
			5200	4.602	37.460	4.660	36.000	-1.24%	4.06%
			5260	4.638	36.900	4.720	35.940	-1.74%	2.67%
			5300	4.794	36.730	4.760	35.900	0.71%	2.31%
			5500	4.910	36.620	4.965	35.650	-1.11%	2.72%
			5745	5.380	36.210	5.215	35.355	3.16%	2.42%
			5800	5.381	35.410	5.270	35.300	2.11%	0.31%
			5800	5.381	35.410	5.270	35.300	2.11%	0.31%
02/12/2013	750B	22.7	710	0.942	53.564	0.96	55.69	-1.88%	-3.81%
			740	0.970	53.239	0.96	55.57	0.73%	-4.19%
			755	0.982	53.107	0.96	55.51	1.87%	-4.33%
2/7/2013	835B	21.5	820	0.981	53.540	0.969	55.258	1.24%	-3.11%
			835	0.998	53.480	0.970	55.200	2.89%	-3.12%
			850	1.013	53.340	0.988	55.154	2.53%	-3.29%
2/13/2013	835B	24.3	820	0.984	53.933	0.969	55.258	1.55%	-2.40%
			835	0.998	53.789	0.970	55.200	2.89%	-2.56%
			850	1.016	53.567	0.988	55.154	2.83%	-2.88%
2/10/2013	1750B	24.0	1710	1.421	52.490	1.460	53.540	-2.67%	-1.96%
			1750	1.461	52.300	1.490	53.430	-1.95%	-2.11%
			1790	1.499	52.190	1.510	53.330	-0.73%	-2.14%
3/4/2013	1750B	21.2	1710	1.464	51.240	1.460	53.540	0.27%	-4.30%
			1750	1.510	51.120	1.490	53.430	1.34%	-4.32%
			1790	1.556	50.962	1.510	53.330	3.05%	-4.44%
2/7/2013	1900B	21.8	1850	1.500	52.990	1.520	53.300	-1.32%	-0.58%
			1880	1.532	52.880	1.520	53.300	0.79%	-0.79%
			1910	1.572	52.800	1.520	53.300	3.42%	-0.94%
3/3/2013	1900B	23.1	1850	1.500	51.481	1.520	53.300	-1.32%	-3.41%
			1880	1.536	51.368	1.520	53.300	1.05%	-3.62%
			1910	1.568	51.282	1.520	53.300	3.16%	-3.79%
3/5/2013	1900B	21.3	1850	1.521	52.520	1.520	53.300	0.07%	-1.46%
			1880	1.552	52.420	1.520	53.300	2.11%	-1.65%
			1910	1.585	52.270	1.520	53.300	4.28%	-1.93%
2/28/2013	2450B	21.6	2401	1.858	50.995	1.903	52.765	-2.36%	-3.35%
			2450	1.916	50.813	1.950	52.700	-1.74%	-3.58%
			2499	1.986	50.638	2.019	52.638	-1.63%	-3.80%
2/6/2013	5200B-5800B	23.9	5180	5.097	47.580	5.276	49.041	-3.39%	-2.98%
			5200	5.106	47.540	5.299	49.014	-3.64%	-3.01%
			5260	5.217	47.380	5.369	48.906	-2.83%	-3.12%
			5300	5.258	47.310	5.416	48.851	-2.92%	-3.15%
			5500	5.551	46.840	5.650	48.580	-1.75%	-3.58%
			5560	5.631	46.720	5.720	48.499	-1.56%	-3.67%
			5600	5.679	46.570	5.766	48.444	-1.51%	-3.87%
			5660	5.773	46.490	5.837	48.363	-1.10%	-3.87%
			5745	5.887	46.270	5.936	48.248	-0.83%	-4.10%
			5800	5.993	46.180	6.000	48.200	-0.12%	-4.19%
			5800	5.993	46.180	6.000	48.200	-0.12%	-4.19%
			5800	5.993	46.180	6.000	48.200	-0.12%	-4.19%

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 IEEE 1528 6.6.1.2). The tissue parameters listed in the SAR test plots may slightly differ from the table above due to significant digit rounding in the software.

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10.2 Test System Verification

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

Table 10-2
System Verification Results

System Verification TARGET & MEASURED											
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 (%)
750	HEAD	02/12/2013	21.9	22.0	0.170	1003	3022	1.430	8.460	8.412	-0.57%
835	HEAD	02/08/2013	24.4	23.3	0.100	40026	3022	0.970	9.390	9.700	3.30%
835	HEAD	02/11/2013	24.4	23.4	0.100	40119	3022	0.993	9.420	9.930	5.41%
1750	HEAD	02/08/2013	23.4	21.4	0.100	1051	3288	3.440	36.600	34.400	-6.01%
1750	HEAD	03/03/2013	24.3	21.6	0.100	1008	3589	3.700	36.400	37.000	1.65%
1900	HEAD	02/11/2013	22.8	21.3	0.100	50149	3213	4.150	39.300	41.500	5.60%
1900	HEAD	02/12/2013	23.0	21.1	0.100	50149	3263	3.870	39.300	38.700	-1.53%
1900	HEAD	03/04/2013	24.3	22.5	0.100	50148	3263	3.940	39.700	39.400	-0.76%
2450	HEAD	02/25/2013	24.4	24.2	0.100	719	3022	5.330	52.700	53.300	1.14%
5200	HEAD	02/04/2013	23.4	22.6	0.040	1007	3589	3.070	79.800	76.750	-3.82%
5300	HEAD	02/04/2013	23.4	22.6	0.040	1007	3589	3.120	83.100	78.000	-6.14%
5500	HEAD	02/04/2013	23.6	22.8	0.040	1007	3589	3.380	84.900	84.500	-0.47%
5800	HEAD	02/04/2013	23.7	22.9	0.100	1007	3589	7.650	79.800	76.500	-4.14%
750	BODY	02/12/2013	23.9	23.3	0.100	1003	3287	0.887	8.830	8.870	0.45%
835	BODY	02/07/2013	23.0	22.4	0.100	40133	3213	0.939	9.600	9.390	-2.19%
835	BODY	02/13/2013	24.7	24.2	0.100	40133	3213	0.957	9.600	9.570	-0.31%
1750	BODY	02/10/2013	23.3	22.3	0.100	1051	3288	4.040	37.600	40.400	7.45%
1750	BODY	03/04/2013	24.5	22.2	0.100	1051	3288	3.480	37.600	34.800	-7.45%
1900	BODY	02/07/2013	23.4	22.1	0.100	50149	3263	4.020	39.300	40.200	2.29%
1900	BODY	03/03/2013	24.3	22.9	0.100	50148	3263	4.140	40.800	41.400	1.47%
1900	BODY	03/05/2013	24.6	21.2	0.100	50148	3920	4.160	40.800	41.600	1.96%
2450	BODY	02/28/2013	23.9	23.4	0.100	882	3263	4.950	49.900	49.500	-0.80%
5200	BODY	02/06/2013	24.1	23.2	0.100	1007	3589	6.830	73.300	68.300	-6.82%
5300	BODY	02/06/2013	24.2	23.0	0.100	1007	3589	7.080	75.600	70.800	-6.35%
5500	BODY	02/06/2013	24.1	23.2	0.100	1007	3589	7.580	78.500	75.800	-3.44%
5600	BODY	02/06/2013	24.4	23.3	0.100	1007	3589	7.840	80.000	78.400	-2.00%
5800	BODY	02/06/2013	24.2	23.0	0.100	1007	3589	7.000	74.300	70.000	-5.79%

Note:

- For 5 GHz WLAN testing, when the extrapolated peak SAR of the zoom scan for the maximum output channels is < 1.6 W/kg and the reported 1g averaged SAR is < 0.8 W/kg, SAR testing on other default channels is not required. Testing on other default channels for head configuration was not required, therefore a 5600 MHz Head System Verification Test was not required. However, testing on other default channels for body configuration was required, and the 5600 MHz Body System Verification Test was required.
- Per FCC KDB 865664 D02, a System Verification Plot for the 835 Body System Verification Test on 2/13/2013 was not included because it was not the largest deviation from the SAR dipole target for a common dipole, SAR probe calibration point, and SAR system combination.

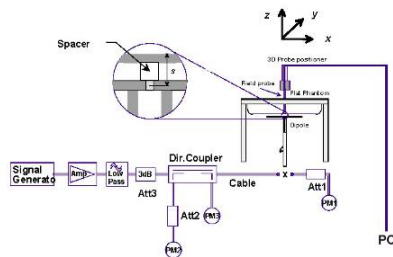


Figure 10-1
System Verification Setup Diagram



Figure 10-2
System Verification Setup Photo

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11 SAR DATA SUMMARY

11.1 Standalone Head SAR Data

Table 11-1
GSM 850 Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Cover Type	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	190	GSM 850	GSM	33.0	32.78	0.05	Right	Cheek	Standard	20FCB	1:8.3	0.216	1.052	0.227	
836.60	190	GSM 850	GSM	33.0	32.78	0.15	Right	Tilt	Standard	20FCB	1:8.3	0.115	1.052	0.121	
836.60	190	GSM 850	GSM	33.0	32.78	-0.03	Left	Cheek	Standard	20FCB	1:8.3	0.224	1.052	0.236	A1
836.60	190	GSM 850	GSM	33.0	32.78	0.13	Left	Cheek	Wireless Charging	20FCB	1:8.3	0.169	1.052	0.178	
836.60	190	GSM 850	GSM	33.0	32.78	-0.03	Left	Tilt	Standard	20FCB	1:8.3	0.127	1.052	0.134	
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
UMTS 850 Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Cover Type	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	23.0	22.58	0.05	Right	Cheek	Standard	20FCA	1:1	0.163	1.102	0.180	
836.60	4183	UMTS 850	RMC	23.0	22.58	0.00	Right	Tilt	Standard	20FCA	1:1	0.110	1.102	0.121	
836.60	4183	UMTS 850	RMC	23.0	22.58	0.04	Left	Cheek	Standard	20FCA	1:1	0.164	1.102	0.181	A2
836.60	4183	UMTS 850	RMC	23.0	22.58	-0.04	Left	Cheek	Wireless Charging	20FCA	1:1	0.147	1.102	0.162	
836.60	4183	UMTS 850	RMC	23.0	22.58	0.01	Left	Tilt	Standard	20FCA	1:1	0.105	1.102	0.116	
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 1750 Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Cover Type	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
1730.40	1412	UMTS 1750	RMC	23.0	22.66	-0.10	Right	Cheek	Standard	20FCA	1:1	0.315	1.081	0.341	
1730.40	1412	UMTS 1750	RMC	23.0	22.66	0.02	Right	Tilt	Standard	20FCA	1:1	0.261	1.081	0.282	
1730.40	1412	UMTS 1750	RMC	23.0	22.66	-0.15	Left	Cheek	Standard	20FCA	1:1	0.580	1.081	0.627	
1730.40	1412	UMTS 1750	RMC	23.0	22.66	-0.11	Left	Cheek	Wireless Charging	20FCA	1:1	0.648	1.081	0.700	A3
1730.40	1412	UMTS 1750	RMC	23.0	22.66	0.09	Left	Tilt	Standard	20FCA	1:1	0.238	1.081	0.257	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Head 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-4
GSM 1900 Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Cover Type	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
1880.00	661	GSM 1900	GSM	30.5	30.12	0.08	Right	Cheek	Standard	20FCA	1:8.3	0.169	1.091	0.184	
1880.00	661	GSM 1900	GSM	30.5	30.12	0.12	Right	Tilt	Standard	20FCA	1:8.3	0.139	1.091	0.152	
1880.00	661	GSM 1900	GSM	30.5	30.12	0.02	Left	Cheek	Standard	20FCA	1:8.3	0.310	1.091	0.338	
1880.00	661	GSM 1900	GSM	30.5	30.12	0.05	Left	Cheek	Wireless Charging	20FCA	1:8.3	0.311	1.091	0.339	A4
1880.00	661	GSM 1900	GSM	30.5	30.12	0.03	Left	Tilt	Standard	20FCA	1:8.3	0.101	1.091	0.110	
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
UMTS 1900 Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Cover Type	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	22.5	22.37	0.01	Right	Cheek	Standard	20FCA	1:1	0.262	1.030	0.270	
1880.00	9400	UMTS 1900	RMC	22.5	22.37	0.00	Right	Tilt	Standard	20FCA	1:1	0.182	1.030	0.187	
1880.00	9400	UMTS 1900	RMC	22.5	22.37	0.00	Left	Cheek	Standard	20FCA	1:1	0.523	1.030	0.539	A5
1880.00	9400	UMTS 1900	RMC	22.5	22.37	-0.04	Left	Cheek	Wireless Charging	20FCA	1:1	0.519	1.030	0.535	
1880.00	9400	UMTS 1900	RMC	22.5	22.37	-0.02	Left	Tilt	Standard	20FCA	1:1	0.150	1.030	0.155	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Head							
Spatial Peak								1.6 W/kg (mW/g)							
Uncontrolled Exposure/General Population								averaged over 1 gram							

Table 11-6
LTE Band 17 Head SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover Type	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	Standard	23.5	23.19	0.07	0	Right	Cheek	QPSK	1	49	20FB4	1:1	0.096	1.074	0.103	
710.00	23790	Mid	LTE Band 17	10	Standard	22.5	22.05	0.04	1	Right	Cheek	QPSK	25	25	20FB4	1:1	0.089	1.109	0.099	
710.00	23790	Mid	LTE Band 17	10	Standard	23.5	23.19	0.07	0	Right	Tilt	QPSK	1	49	20FB4	1:1	0.060	1.074	0.064	
710.00	23790	Mid	LTE Band 17	10	Standard	22.5	22.05	0.05	1	Right	Tilt	QPSK	25	25	20FB4	1:1	0.056	1.109	0.062	
710.00	23790	Mid	LTE Band 17	10	Standard	23.5	23.19	-0.06	0	Left	Cheek	QPSK	1	49	20FB4	1:1	0.110	1.074	0.118	A6
710.00	23790	Mid	LTE Band 17	10	Wireless Charging	23.5	23.19	0.09	0	Left	Cheek	QPSK	1	49	20FB4	1:1	0.069	1.074	0.074	
710.00	23790	Mid	LTE Band 17	10	Standard	22.5	22.05	-0.02	1	Left	Cheek	QPSK	25	25	20FB4	1:1	0.102	1.109	0.113	
710.00	23790	Mid	LTE Band 17	10	Standard	23.5	23.19	0.02	0	Left	Tilt	QPSK	1	49	20FB4	1:1	0.060	1.074	0.065	
710.00	23790	Mid	LTE Band 17	10	Standard	22.5	22.05	0.08	1	Left	Tilt	QPSK	25	25	20FB4	1:1	0.057	1.109	0.063	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT										Head										
Spatial Peak										1.6 W/kg (mW/g)										
Uncontrolled Exposure/General Population										averaged over 1 gram										

Table 11-7
LTE Band 5 (Cell) Head SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover Type	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #	
MHz	Ch.															(W/kg)		(W/kg)		
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	23.5	23.23	0.02	0	Right	Cheek	QPSK	1	25	20FCA	1:1	0.179	1.064	0.190	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	22.5	22.17	0.06	1	Right	Cheek	QPSK	25	12	20FCA	1:1	0.139	1.079	0.150	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	23.5	23.23	-0.01	0	Right	Tilt	QPSK	1	25	20FCA	1:1	0.123	1.064	0.131	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	22.5	22.17	-0.08	1	Right	Tilt	QPSK	25	12	20FCA	1:1	0.093	1.079	0.100	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	23.5	23.23	-0.05	0	Left	Cheek	QPSK	1	25	20FCA	1:1	0.182	1.064	0.194	A7
836.50	20525	Mid	LTE Band 5 (Cell)	10	Wireless Charging	23.5	23.23	-0.03	0	Left	Cheek	QPSK	1	25	20FCA	1:1	0.155	1.064	0.165	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	22.5	22.17	0.03	1	Left	Cheek	QPSK	25	12	20FCA	1:1	0.133	1.079	0.144	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	23.5	23.23	0.04	0	Left	Tilt	QPSK	1	25	20FCA	1:1	0.112	1.064	0.119	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	22.5	22.17	0.07	1	Left	Tilt	QPSK	25	12	20FCA	1:1	0.088	1.079	0.094	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT										Head										
Spatial Peak										1.6 W/kg (mW/g)										
Uncontrolled Exposure/General Population										averaged over 1 gram										

Table 11-8
LTE Band 4 (AWS) Head SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover Type	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #	
MHz	Ch.															(W/kg)		(W/kg)		
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.0	22.97	0.16	0	Right	Cheek	QPSK	1	99	20FB4	1:1	0.243	1.007	0.245	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	22.0	21.76	0.03	1	Right	Cheek	QPSK	50	50	20FB4	1:1	0.169	1.057	0.179	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.0	22.97	0.07	0	Right	Tilt	QPSK	1	99	20FB4	1:1	0.227	1.007	0.229	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	22.0	21.76	0.04	1	Right	Tilt	QPSK	50	50	20FB4	1:1	0.162	1.057	0.171	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.0	22.97	0.03	0	Left	Cheek	QPSK	1	99	20FB4	1:1	0.477	1.007	0.480	A8
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Wireless Charging	23.0	22.97	0.04	1	Left	Cheek	QPSK	1	99	20FB4	1:1	0.467	1.007	0.470	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	22.0	21.76	-0.01	1	Left	Cheek	QPSK	50	50	20FB4	1:1	0.344	1.057	0.364	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.0	22.97	-0.03	0	Left	Tilt	QPSK	1	99	20FB4	1:1	0.190	1.007	0.191	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	22.0	21.76	0.02	1	Left	Tilt	QPSK	50	50	20FB4	1:1	0.137	1.057	0.145	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT										Head										
Spatial Peak										1.6 W/kg (mW/g)										
Uncontrolled Exposure/General Population										averaged over 1 gram										

Table 11-9
LTE Band 2 (PCS) Head SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover Type	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)		
1880.00	18900	Mid	LTE Band 2 (PCS)	10	Standard	23.5	23.14	-0.04	0	Right	Cheek	QPSK	1	49	20FCA	1:1	0.343	1.086	0.372	
1880.00	18900	Mid	LTE Band 2 (PCS)	10	Standard	22.5	22.06	0.04	1	Right	Cheek	QPSK	25	25	20FCA	1:1	0.259	1.107	0.287	
1880.00	18900	Mid	LTE Band 2 (PCS)	10	Standard	23.5	23.14	0.07	0	Right	Tilt	QPSK	1	49	20FCA	1:1	0.254	1.086	0.276	
1880.00	18900	Mid	LTE Band 2 (PCS)	10	Standard	22.5	22.06	-0.02	1	Right	Tilt	QPSK	25	25	20FCA	1:1	0.187	1.107	0.207	
1880.00	18900	Mid	LTE Band 2 (PCS)	10	Standard	23.5	23.14	-0.06	0	Left	Cheek	QPSK	1	49	20FCA	1:1	0.620	1.086	0.673	A9
1880.00	18900	Mid	LTE Band 2 (PCS)	10	Wireless Charging	23.5	23.14	0.05	0	Left	Cheek	QPSK	1	49	20FCA	1:1	0.553	1.086	0.601	
1880.00	18900	Mid	LTE Band 2 (PCS)	10	Standard	22.5	22.06	0.07	1	Left	Cheek	QPSK	25	25	20FCA	1:1	0.478	1.107	0.529	
1880.00	18900	Mid	LTE Band 2 (PCS)	10	Standard	23.5	23.14	0.11	0	Left	Tilt	QPSK	1	49	20FCA	1:1	0.178	1.086	0.193	
1880.00	18900	Mid	LTE Band 2 (PCS)	10	Standard	22.5	22.06	0.10	1	Left	Tilt	QPSK	25	25	20FCA	1:1	0.140	1.107	0.155	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT										Head										
Spatial Peak										1.6 W/kg (mW/g)										
Uncontrolled Exposure/General Population										averaged over 1 gram										

Table 11-10
DTS Head SAR

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Cover Type	Device Serial Number	Data Rate (Mbps)	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
2437	6	IEEE 802.11b	DSSS	17.0	16.94	0.06	Right	Cheek	Standard	22	1	1:1	0.068	1.014	0.069	
2437	6	IEEE 802.11b	DSSS	17.0	16.94	0.12	Right	Tilt	Standard	22	1	1:1	0.058	1.014	0.059	
2437	6	IEEE 802.11b	DSSS	17.0	16.94	-0.02	Left	Cheek	Standard	22	1	1:1	0.205	1.014	0.208	
2437	6	IEEE 802.11b	DSSS	17.0	16.94	-0.06	Left	Cheek	Wireless Charging	22	1	1:1	0.228	1.014	0.231	A10
2437	6	IEEE 802.11b	DSSS	17.0	16.94	0.03	Left	Tilt	Standard	22	1	1:1	0.081	1.014	0.082	
5745	149	IEEE 802.11a	OFDM	13.5	12.51	0.03	Right	Cheek	Standard	#002	6	1:1	0.024	1.256	0.030	
5745	149	IEEE 802.11a	OFDM	13.5	12.51	0.03	Right	Tilt	Standard	#002	6	1:1	0.019	1.256	0.024	
5745	149	IEEE 802.11a	OFDM	13.5	12.51	-0.17	Left	Cheek	Standard	#002	6	1:1	0.155	1.256	0.195	A12
5745	149	IEEE 802.11a	OFDM	13.5	12.51	0.04	Left	Tilt	Standard	#002	6	1:1	0.033	1.256	0.041	
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	Cover Type	Device Serial Number	Data Rate (Mbps)	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
5180	36	IEEE 802.11a	OFDM	13.5	12.57	-0.08	Right	Cheek	Standard	#002	6	1:1	0.021	1.239	0.025	
5180	36	IEEE 802.11a	OFDM	13.5	12.57	0.07	Right	Tilt	Standard	#002	6	1:1	0.012	1.239	0.014	
5180	36	IEEE 802.11a	OFDM	13.5	12.57	0.03	Left	Cheek	Standard	#002	6	1:1	0.197	1.239	0.244	
5180	36	IEEE 802.11a	OFDM	13.5	12.57	0.11	Left	Tilt	Standard	#002	6	1:1	0.045	1.239	0.056	
5260	52	IEEE 802.11a	OFDM	13.5	13.08	0.06	Right	Cheek	Standard	#002	6	1:1	0.039	1.102	0.043	
5260	52	IEEE 802.11a	OFDM	13.5	13.08	0.04	Right	Tilt	Standard	#002	6	1:1	0.019	1.102	0.021	
5260	52	IEEE 802.11a	OFDM	13.5	13.08	0.14	Left	Cheek	Standard	#002	6	1:1	0.300	1.102	0.331	A11
5260	52	IEEE 802.11a	OFDM	13.5	13.08	0.08	Left	Cheek	Wireless Charging	#002	6	1:1	0.083	1.102	0.091	
5260	52	IEEE 802.11a	OFDM	13.5	13.08	0.11	Left	Tilt	Standard	#002	6	1:1	0.068	1.102	0.075	
5500	100	IEEE 802.11a	OFDM	13.5	13.18	0.12	Right	Cheek	Standard	#002	6	1:1	0.036	1.076	0.039	
5500	100	IEEE 802.11a	OFDM	13.5	13.18	0.16	Right	Tilt	Standard	#002	6	1:1	0.019	1.076	0.021	
5500	100	IEEE 802.11a	OFDM	13.5	13.18	-0.13	Left	Cheek	Standard	#002	6	1:1	0.289	1.076	0.311	
5500	100	IEEE 802.11a	OFDM	13.5	13.18	0.04	Left	Tilt	Standard	#002	6	1:1	0.064	1.076	0.069	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Head 1.6 W/kg (mW/g) averaged over 1 gram						

11.2 Standalone Body-Worn SAR Data

Table 11-12
GSM/UMTS/ Body-Worn SAR Data

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Cover 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	GSM 850	GSM	33.0	32.78	0.02	10 mm	Standard	20FCA	1	1:8.3	back	0.429	1.052	0.451	A13
836.60	190	GSM 850	GSM	33.0	32.78	0.00	10 mm	Wireless Charging	20FCA	1	1:8.3	back	0.230	1.052	0.242	
836.60	4183	UMTS 850	RMC	23.0	22.58	0.01	10 mm	Standard	20FCA	N/A	1:1	back	0.288	1.102	0.317	A15
836.60	4183	UMTS 850	RMC	23.0	22.58	0.03	10 mm	Wireless Charging	20FCA	N/A	1:1	back	0.206	1.102	0.227	
1730.40	1412	UMTS 1750	RMC	23.0	22.66	0.01	10 mm	Standard	20FCE	N/A	1:1	back	0.729	1.081	0.788	A16
1730.40	1412	UMTS 1750	RMC	23.0	22.66	0.08	10 mm	Wireless Charging	20FCE	N/A	1:1	back	0.565	1.081	0.611	
1880.00	661	GSM 1900	GSM	30.5	30.12	0.03	10 mm	Standard	20FCA	1	1:8.3	back	0.360	1.091	0.393	A18
1880.00	661	GSM 1900	GSM	30.5	30.12	0.00	10 mm	Wireless Charging	20FCA	1	1:8.3	back	0.288	1.091	0.314	
1880.00	9400	UMTS 1900	RMC	22.5	22.37	0.03	10 mm	Standard	20FCA	N/A	1:1	back	0.607	1.030	0.625	A20
1880.00	9400	UMTS 1900	RMC	22.5	22.37	-0.05	10 mm	Wireless Charging	20FCA	N/A	1:1	back	0.459	1.030	0.473	
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
LTE Body-Worn SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover Type	Maxim um 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) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #	
MHz	Ch.																			
710.00	23790	Mid	LTE Band 17	10	Standard	23.5	23.19	-0.03	0	20FB4	QPSK	1	49	10 mm	back	1:1	0.219	1.074	0.235	A21
710.00	23790	Mid	LTE Band 17	10	Wireless Charging	23.5	23.19	-0.03	0	20FB4	QPSK	1	49	10 mm	back	1:1	0.156	1.074	0.168	
710.00	23790	Mid	LTE Band 17	10	Standard	22.5	22.05	0.02	1	20FB4	QPSK	25	25	10 mm	back	1:1	0.201	1.109	0.223	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	23.5	23.23	0.06	0	20FCA	QPSK	1	25	10 mm	back	1:1	0.294	1.064	0.313	A22
836.50	20525	Mid	LTE Band 5 (Cell)	10	Wireless Charging	23.5	23.23	-0.03	0	20FCA	QPSK	1	25	10 mm	back	1:1	0.223	1.064	0.237	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	22.5	22.17	0.01	1	20FCA	QPSK	25	12	10 mm	back	1:1	0.224	1.079	0.242	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.0	22.97	-0.03	0	20FB4	QPSK	1	99	10 mm	back	1:1	0.653	1.007	0.658	A23
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Wireless Charging	23.0	22.97	-0.02	0	20FB4	QPSK	1	99	10 mm	back	1:1	0.494	1.007	0.497	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	22.0	21.76	0.07	1	20FB4	QPSK	50	50	10 mm	back	1:1	0.475	1.057	0.502	
1880.00	18900	Mid	LTE Band 2 (PCS)	10	Standard	23.5	23.14	0.02	0	20FCA	QPSK	1	49	10 mm	back	1:1	0.602	1.086	0.654	A25
1880.00	18900	Mid	LTE Band 2 (PCS)	10	Wireless Charging	23.5	23.14	0.00	0	20FCA	QPSK	1	49	10 mm	back	1:1	0.587	1.086	0.637	
1880.00	18900	Mid	LTE Band 2 (PCS)	10	Standard	22.5	22.06	0.04	1	20FCA	QPSK	25	25	10 mm	back	1:1	0.475	1.107	0.526	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Body 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-14
DTS Body-Worn SAR

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Cover Type	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
2437	6	IEEE 802.11b	DSSS	17.0	16.94	-0.02	10 mm	Standard	22	1	back	1:1	0.163	1.014	0.165	
2437	6	IEEE 802.11b	DSSS	17.0	16.94	-0.04	10 mm	Wireless Charging	22	1	back	1:1	0.167	1.014	0.169	A27
5745	149	IEEE 802.11a	OFDM	13.5	12.51	-0.04	10 mm	Standard	#002	6	back	1:1	0.192	1.256	0.241	A29
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 11-15
NII Body-Worn SAR

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Cover Type	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
5180	36	IEEE 802.11a	OFDM	13.5	12.57	0.20	10 mm	Standard	#002	6	back	1:1	0.304	1.239	0.390	
5260	52	IEEE 802.11a	OFDM	13.5	13.08	-0.07	10 mm	Standard	#002	6	back	1:1	0.445	1.102	0.490	
5300	60	IEEE 802.11a	OFDM	13.5	12.93	-0.07	10 mm	Standard	#002	6	back	1:1	0.459	1.140	0.523	A28
5300	60	IEEE 802.11a	OFDM	13.5	12.93	0.12	10 mm	Wireless Charging	#002	6	back	1:1	0.106	1.140	0.121	
5500	100	IEEE 802.11a	OFDM	13.5	13.18	-0.06	10 mm	Standard	#002	6	back	1:1	0.442	1.076	0.476	
5560	112	IEEE 802.11a	OFDM	13.5	12.94	-0.07	10 mm	Standard	#002	6	back	1:1	0.397	1.138	0.452	
5660	132	IEEE 802.11a	OFDM	13.5	12.70	-0.07	10 mm	Standard	#002	6	back	1:1	0.270	1.202	0.325	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram									

11.3 Standalone Wireless Router SAR Data

Table 11-16
GPRS/UMTS/ Hotspot SAR Data

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Cover Type	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	GSM 850	GPRS	30.5	29.79	-0.03	10 mm	Standard	20FCA	3	1:2.76	back	0.490	1.178	0.577	A14
836.60	190	GSM 850	GPRS	30.5	29.79	-0.04	10 mm	Wireless Charging	20FCA	3	1:2.76	back	0.401	1.178	0.472	
836.60	190	GSM 850	GPRS	30.5	29.79	-0.03	10 mm	Standard	20FCA	3	1:2.76	front	0.452	1.178	0.532	
836.60	190	GSM 850	GPRS	30.5	29.79	-0.03	10 mm	Standard	20FCA	3	1:2.76	bottom	0.118	1.178	0.139	
836.60	190	GSM 850	GPRS	30.5	29.79	0.15	10 mm	Standard	20FCA	3	1:2.76	right	0.471	1.178	0.555	
836.60	190	GSM 850	GPRS	30.5	29.79	0.05	10 mm	Standard	20FCA	3	1:2.76	left	0.476	1.178	0.561	
836.60	4183	UMTS 850	RMC	23.0	22.58	0.01	10 mm	Standard	20FCA	N/A	1:1	back	0.288	1.102	0.317	A15
836.60	4183	UMTS 850	RMC	23.0	22.58	0.03	10 mm	Wireless Charging	20FCA	N/A	1:1	back	0.206	1.102	0.227	
836.60	4183	UMTS 850	RMC	23.0	22.58	0.01	10 mm	Standard	20FCA	N/A	1:1	front	0.257	1.102	0.283	
836.60	4183	UMTS 850	RMC	23.0	22.58	0.05	10 mm	Standard	20FCA	N/A	1:1	bottom	0.073	1.102	0.080	
836.60	4183	UMTS 850	RMC	23.0	22.58	0.07	10 mm	Standard	20FCA	N/A	1:1	right	0.242	1.102	0.267	
836.60	4183	UMTS 850	RMC	23.0	22.58	-0.07	10 mm	Standard	20FCA	N/A	1:1	left	0.234	1.102	0.258	
1730.40	1412	UMTS 1750	RMC	23.0	22.66	0.01	10 mm	Standard	20FCE	N/A	1:1	back	0.729	1.081	0.788	
1712.40	1312	UMTS 1750	RMC	23.0	22.62	0.03	10 mm	Standard	20FCE	N/A	1:1	front	0.779	1.091	0.850	
1730.40	1412	UMTS 1750	RMC	23.0	22.66	0.01	10 mm	Standard	20FCE	N/A	1:1	front	0.812	1.081	0.878	
1752.50	1862	UMTS 1750	RMC	23.0	22.61	0.08	10 mm	Standard	20FCE	N/A	1:1	front	0.848	1.094	0.928	A17
1752.50	1862	UMTS 1750	RMC	23.0	22.61	0.01	10 mm	Wireless Charging	20FCE	N/A	1:1	front	0.782	1.094	0.856	
1730.40	1412	UMTS 1750	RMC	23.0	22.66	0.01	10 mm	Standard	20FCE	N/A	1:1	bottom	0.483	1.081	0.522	
1730.40	1412	UMTS 1750	RMC	23.0	22.66	0.02	10 mm	Standard	20FCE	N/A	1:1	right	0.065	1.081	0.070	
1730.40	1412	UMTS 1750	RMC	23.0	22.66	-0.06	10 mm	Standard	20FCE	N/A	1:1	left	0.287	1.081	0.310	
1752.50	1862	UMTS 1750	RMC	23.0	22.61	0.02	10 mm	Standard	20FCE	N/A	1:1	front	0.784	1.094	0.858	
1880.00	661	GSM 1900	GPRS	26.5	25.87	0.08	10 mm	Standard	20FCA	4	1:2.076	back	0.497	1.156	0.575	
1880.00	661	GSM 1900	GPRS	26.5	25.87	0.14	10 mm	Standard	20FCA	4	1:2.076	front	0.655	1.156	0.757	A19
1880.00	661	GSM 1900	GPRS	26.5	25.87	0.00	10 mm	Wireless Charging	20FCA	4	1:2.076	front	0.652	1.156	0.754	
1880.00	661	GSM 1900	GPRS	26.5	25.87	-0.05	10 mm	Standard	20FCA	4	1:2.076	bottom	0.457	1.156	0.528	
1880.00	661	GSM 1900	GPRS	26.5	25.87	0.08	10 mm	Standard	20FCA	4	1:2.076	right	0.046	1.156	0.053	
1880.00	661	GSM 1900	GPRS	26.5	25.87	0.15	10 mm	Standard	20FCA	4	1:2.076	left	0.231	1.156	0.267	
1880.00	9400	UMTS 1900	RMC	22.5	22.37	0.03	10 mm	Standard	20FCA	N/A	1:1	back	0.607	1.030	0.625	A20
1880.00	9400	UMTS 1900	RMC	22.5	22.37	-0.05	10 mm	Wireless Charging	20FCA	N/A	1:1	back	0.459	1.030	0.473	
1880.00	9400	UMTS 1900	RMC	22.5	22.37	0.03	10 mm	Standard	20FCA	N/A	1:1	front	0.607	1.030	0.625	
1880.00	9400	UMTS 1900	RMC	22.5	22.37	0.00	10 mm	Standard	20FCA	N/A	1:1	bottom	0.451	1.030	0.465	
1880.00	9400	UMTS 1900	RMC	22.5	22.37	0.01	10 mm	Standard	20FCA	N/A	1:1	right	0.055	1.030	0.057	
1880.00	9400	UMTS 1900	RMC	22.5	22.37	-0.01	10 mm	Standard	20FCA	N/A	1:1	left	0.285	1.030	0.294	
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
LTE Band 17 Hotspot SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Cover 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.	High															(W/kg)		(W/kg)	
710.00	23790	Mid	LTE Band 17	10	Standard	23.5	23.19	-0.03	0	20FB4	QPSK	1	49	10 mm	back	1:1	0.219	1.074	0.235	A21
710.00	23790	Mid	LTE Band 17	10	Wireless Charging	23.5	23.19	-0.03	0	20FB4	QPSK	1	49	10 mm	back	1:1	0.156	1.074	0.168	
710.00	23790	Mid	LTE Band 17	10	Standard	22.5	22.05	0.02	1	20FB4	QPSK	25	25	10 mm	back	1:1	0.201	1.109	0.223	
710.00	23790	Mid	LTE Band 17	10	Standard	23.5	23.19	0.02	0	20FB4	QPSK	1	49	10 mm	front	1:1	0.166	1.074	0.178	
710.00	23790	Mid	LTE Band 17	10	Standard	22.5	22.05	0.11	1	20FB4	QPSK	25	25	10 mm	front	1:1	0.152	1.109	0.169	
710.00	23790	Mid	LTE Band 17	10	Standard	23.5	23.19	-0.16	0	20FB4	QPSK	1	49	10 mm	bottom	1:1	0.052	1.074	0.056	
710.00	23790	Mid	LTE Band 17	10	Standard	22.5	22.05	0.03	1	20FB4	QPSK	25	25	10 mm	bottom	1:1	0.045	1.109	0.049	
710.00	23790	Mid	LTE Band 17	10	Standard	23.5	23.19	-0.05	0	20FB4	QPSK	1	49	10 mm	right	1:1	0.087	1.074	0.094	
710.00	23790	Mid	LTE Band 17	10	Standard	22.5	22.05	-0.07	1	20FB4	QPSK	25	25	10 mm	right	1:1	0.082	1.109	0.091	
710.00	23790	Mid	LTE Band 17	10	Standard	23.5	23.19	0.06	0	20FB4	QPSK	1	49	10 mm	left	1:1	0.120	1.074	0.129	
710.00	23790	Mid	LTE Band 17	10	Standard	22.5	22.05	0.00	1	20FB4	QPSK	25	25	10 mm	left	1:1	0.116	1.109	0.129	
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 11-18
LTE Band 5 (Cell) Hotspot SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover 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)			
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	23.5	23.23	0.06	0	20FCA	QPSK	1	25	10 mm	back	1:1	0.234	1.064	0.313	A22
836.50	20525	Mid	LTE Band 5 (Cell)	10	Wireless Charging	23.5	23.23	-0.03	0	20FCA	QPSK	1	25	10 mm	back	1:1	0.223	1.064	0.237	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	22.5	22.17	0.01	1	20FCA	QPSK	25	12	10 mm	back	1:1	0.224	1.079	0.242	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	23.5	23.23	0.02	0	20FCA	QPSK	1	25	10 mm	front	1:1	0.195	1.064	0.207	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	22.5	22.17	-0.01	1	20FCA	QPSK	25	12	10 mm	front	1:1	0.256	1.079	0.276	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	23.5	23.23	-0.17	0	20FCA	QPSK	1	25	10 mm	bottom	1:1	0.081	1.064	0.086	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	22.5	22.17	0.00	1	20FCA	QPSK	25	12	10 mm	bottom	1:1	0.059	1.079	0.064	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	23.5	23.23	-0.18	0	20FCA	QPSK	1	25	10 mm	right	1:1	0.262	1.064	0.279	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	22.5	22.17	-0.04	1	20FCA	QPSK	25	12	10 mm	right	1:1	0.200	1.079	0.216	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	23.5	23.23	0.00	0	20FCA	QPSK	1	25	10 mm	left	1:1	0.255	1.064	0.271	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	22.5	22.17	0.03	1	20FCA	QPSK	25	12	10 mm	left	1:1	0.194	1.079	0.209	
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 11-19
LTE Band 4 (AWS) Hotspot SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover 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	Plot #	
MHz	Ch.															(W/kg)		(W/kg)		
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.0	22.97	-0.03	0	20FB4	QPSK	1	99	10 mm	back	1:1	0.653	1.007	0.658	A24
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	22.0	21.76	0.07	1	20FB4	QPSK	50	50	10 mm	back	1:1	0.475	1.057	0.502	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.0	22.97	0.01	0	20FB4	QPSK	1	99	10 mm	front	1:1	0.744	1.007	0.749	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Wireless Charging	23.0	22.97	-0.02	1	20FB4	QPSK	50	25	10 mm	front	1:1	0.771	1.007	0.776	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	22.0	21.76	-0.02	1	20FB4	QPSK	50	50	10 mm	front	1:1	0.530	1.057	0.560	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.0	22.97	-0.09	0	20FB4	QPSK	1	99	10 mm	bottom	1:1	0.456	1.007	0.459	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	22.0	21.76	0.04	1	20FB4	QPSK	50	50	10 mm	bottom	1:1	0.331	1.057	0.350	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.0	22.97	-0.11	0	20FB4	QPSK	1	99	10 mm	right	1:1	0.068	1.007	0.069	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	22.0	21.76	0.05	1	20FB4	QPSK	50	50	10 mm	right	1:1	0.043	1.057	0.045	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.0	22.97	-0.03	0	20FB4	QPSK	1	99	10 mm	left	1:1	0.278	1.007	0.280	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	22.0	21.76	0.01	1	20FB4	QPSK	50	50	10 mm	left	1:1	0.192	1.057	0.203	
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 11-20
LTE Band 2 (PCS) Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Cover 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)	Scaled SAR (1g)	Plot #	
MHz	Ch.															(W/kg)	(W/kg)		
1880.00	18900	Mid	LTE Band 2 (PCS)	10	Standard	23.5	23.14	0.02	0	20FCA	QPSK	1	49	10 mm	back	1:1	0.602	1.086	0.654
1880.00	18900	Mid	LTE Band 2 (PCS)	10	Standard	22.5	22.06	0.04	1	20FCA	QPSK	25	25	10 mm	back	1:1	0.475	1.107	0.526
1855.00	18650	Low	LTE Band 2 (PCS)	10	Standard	23.5	23.00	-0.02	0	20FCA	QPSK	1	25	10 mm	front	1:1	0.900	1.122	1.010
1855.00	18650	Low	LTE Band 2 (PCS)	10	Wireless Charging	23.5	23.00	0.03	0	20FCA	QPSK	1	25	10 mm	front	1:1	0.759	1.122	0.852
1880.00	18900	Mid	LTE Band 2 (PCS)	10	Standard	23.5	23.14	-0.09	0	20FCA	QPSK	1	49	10 mm	front	1:1	0.819	1.086	0.889
1905.00	19150	High	LTE Band 2 (PCS)	10	Standard	23.5	23.01	-0.06	0	20FCA	QPSK	1	49	10 mm	front	1:1	0.807	1.119	0.903
1880.00	18900	Mid	LTE Band 2 (PCS)	10	Standard	22.5	22.06	0.08	1	20FCA	QPSK	25	25	10 mm	front	1:1	0.623	1.107	0.690
1880.00	18900	Mid	LTE Band 2 (PCS)	10	Standard	22.5	22.04	0.00	1	20FCA	QPSK	50	0	10 mm	front	1:1	0.670	1.112	0.745
1880.00	18900	Mid	LTE Band 2 (PCS)	10	Standard	23.5	23.14	-0.04	0	20FCA	QPSK	1	49	10 mm	bottom	1:1	0.528	1.086	0.573
1880.00	18900	Mid	LTE Band 2 (PCS)	10	Standard	22.5	22.06	0.14	1	20FCA	QPSK	25	25	10 mm	bottom	1:1	0.413	1.107	0.457
1880.00	18900	Mid	LTE Band 2 (PCS)	10	Standard	23.5	23.14	-0.05	0	20FCA	QPSK	1	49	10 mm	right	1:1	0.073	1.086	0.079
1880.00	18900	Mid	LTE Band 2 (PCS)	10	Standard	22.5	22.06	-0.07	1	20FCA	QPSK	25	25	10 mm	right	1:1	0.049	1.107	0.054
1880.00	18900	Mid	LTE Band 2 (PCS)	10	Standard	23.5	23.14	0.05	0	20FCA	QPSK	1	49	10 mm	left	1:1	0.343	1.086	0.372
1880.00	18900	Mid	LTE Band 2 (PCS)	10	Standard	22.5	22.06	0.02	1	20FCA	QPSK	25	25	10 mm	left	1:1	0.262	1.107	0.290
1855.00	18650	Low	LTE Band 2 (PCS)	10	Standard	0.0	23.00	-0.08	0	20FCA	QPSK	1	25	10 mm	front	1:1	0.898	0.905	1.008
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 11-21
WLAN Hotspot SAR

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Cover Type	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
2437	6	IEEE 802.11b	DSSS	17.0	16.94	-0.02	10 mm	Standard	22	1	back	1:1	0.163	1.014	0.165	
2437	6	IEEE 802.11b	DSSS	17.0	16.94	-0.04	10 mm	Wireless Charging	22	1	back	1:1	0.167	1.014	0.169	A27
2437	6	IEEE 802.11b	DSSS	17.0	16.94	0.07	10 mm	Standard	22	1	front	1:1	0.034	1.014	0.034	
2437	6	IEEE 802.11b	DSSS	17.0	16.94	0.02	10 mm	Standard	22	1	top	1:1	0.023	1.014	0.023	
2437	6	IEEE 802.11b	DSSS	17.0	16.94	0.10	10 mm	Standard	22	1	right	1:1	0.061	1.014	0.062	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram									

11.4 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2003, FCC/OET Bulletin 65, Supplement C [June 2001] and FCC KDB Publication 447498 D01v05.
2. Batteries are fully charged at the beginning of the SAR measurements. A standard battery including NFC antenna was used for all SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v05.
6. Device was tested using a fixed spacing for body-worn accessory testing. A separation distance of 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.
7. 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.
8. Per FCC KDB 865664 D01 v01, variability SAR tests were performed when the measured SAR results for a frequency band were greater than 0.8 W/kg. Repeated SAR measurements are highlighted in the tables above for clarity. Please see Section 13 for variability analysis.
9. During SAR Testing for the Wireless Router conditions per FCC KDB Publication 941225 D06v01, the actual Portable Hotspot operation (with actual simultaneous transmission of a transmitter with WIFI) was not activated (See Section 6.6 for more details).
10. This DUT may be used with a standard battery cover or with an optional wireless charging battery cover. Per FCC KDB Publication 648474 D04, SAR was measured using the standard battery cover and then repeated with the wireless charging battery cover for the highest reported SAR for each wireless technology, frequency band, operating mode, and exposure condition. No other additional testing with the wireless charging battery cover was required since all reported SAR were under 1.2 W/kg.

GSM Test Notes:

1. Body-Worn accessory testing is typically associated with voice operations. Therefore, GSM voice was evaluated for body-worn SAR.
2. Justification for reduced test configurations per KDB Publication 941225 D03v01: The source-based time-averaged output power was evaluated for all multi-slot operations. The multi-slot configuration with the highest frame averaged output power was evaluated for SAR.
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). Therefore, no additionally testing was required at other channels. Additionally, 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 must be used. Because the maximum output power variation was $< \frac{1}{2}$ dB across the required test channels, only middle channel was required to be tested by default.

UMTS Notes:

1. UMTS mode in Body 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.

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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 must be 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. Implementation of the general test procedures can be found in Section 8.4.4.
2. MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.
3. A-MPR was disabled for all SAR tests by setting NS=01 on the base station simulator.

WLAN Notes:

1. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 D01v01r02 and October 2012 FCC/TCB Meeting Notes for 2.4 GHz WIFI: Highest average RF output power channel for the lowest data rate was selected for SAR evaluation in 802.11b. Other IEEE 802.11 modes (including 802.11g/n) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11b mode.
2. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 D01v01r02 and October 2012 FCC/TCB Meeting Notes for 5 GHz WIFI: Highest average RF output power channel for the lowest data rate was selected for SAR evaluation in 802.11a. Other IEEE 802.11 modes (including 802.11 ac and 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. 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 default channels was required.

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12 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

12.1 Introduction

The following procedures adopted from FCC KDB Publication 447498 D01v05 are applicable to handsets with built-in unlicensed transmitters such as 802.11a/b/g/n/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 D01v05 IV.C.1.iii, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the simultaneous transmitting antennas in a specific physical test configuration is ≤ 1.6 W/kg. When standalone SAR is not required to be measured, per FCC KDB 447498 D01v05 4.3.2 2), the following equation must be used to estimate the standalone 1g SAR for simultaneous transmission assessment involving that transmitter.

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

Table 12-1
Estimated SAR

Mode	Frequency	Maximum Allowed Power	Separation Distance (Body)	Estimated SAR (Body)
	[MHz]	[dBm]	[mm]	[W/kg]
Bluetooth	2441	10.00	10	0.208

Note: Held-to ear configurations are not applicable to Bluetooth operations and therefore were not considered for simultaneous transmission.

12.3 Head SAR Simultaneous Transmission Analysis

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

Simult Tx	Configuration	GSM 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.227	0.069	0.296	Head SAR	Right Cheek	0.180	0.069	0.249
	Right Tilt	0.121	0.059	0.180		Right Tilt	0.121	0.059	0.180
	Left Cheek	0.236	0.231	0.467		Left Cheek	0.181	0.231	0.412
	Left Tilt	0.134	0.082	0.216		Left Tilt	0.116	0.082	0.198
Simult Tx	Configuration	UMTS 1750 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GSM 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.341	0.069	0.410	Head SAR	Right Cheek	0.184	0.069	0.253
	Right Tilt	0.282	0.059	0.341		Right Tilt	0.152	0.059	0.211
	Left Cheek	0.700	0.231	0.931		Left Cheek	0.339	0.231	0.570
	Left Tilt	0.257	0.082	0.339		Left Tilt	0.110	0.082	0.192
Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.270	0.069	0.339	Head SAR	Right Cheek	0.103	0.069	0.172
	Right Tilt	0.187	0.059	0.246		Right Tilt	0.064	0.059	0.123
	Left Cheek	0.539	0.231	0.770		Left Cheek	0.118	0.231	0.349
	Left Tilt	0.155	0.082	0.237		Left Tilt	0.065	0.082	0.147
Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	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	0.190	0.069	0.259	Head SAR	Right Cheek	0.245	0.069	0.314
	Right Tilt	0.131	0.059	0.190		Right Tilt	0.229	0.059	0.288
	Left Cheek	0.194	0.231	0.425		Left Cheek	0.480	0.231	0.711
	Left Tilt	0.119	0.082	0.201		Left Tilt	0.191	0.082	0.273
Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)					
Head SAR	Right Cheek	0.372	0.069	0.441					
	Right Tilt	0.276	0.059	0.335					
	Left Cheek	0.673	0.231	0.904					
	Left Tilt	0.193	0.082	0.275					

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

Simult Tx	Configuration	GSM 850 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.227	0.043	0.270	Head SAR	Right Cheek	0.180	0.043	0.223
	Right Tilt	0.121	0.024	0.145		Right Tilt	0.121	0.024	0.145
	Left Cheek	0.236	0.331	0.567		Left Cheek	0.181	0.331	0.512
	Left Tilt	0.134	0.075	0.209		Left Tilt	0.116	0.075	0.191
Simult Tx	Configuration	UMTS 1750 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GSM 1900 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.341	0.043	0.384	Head SAR	Right Cheek	0.184	0.043	0.227
	Right Tilt	0.282	0.024	0.306		Right Tilt	0.152	0.024	0.176
	Left Cheek	0.700	0.331	1.031		Left Cheek	0.339	0.331	0.670
	Left Tilt	0.257	0.075	0.332		Left Tilt	0.110	0.075	0.185

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.270	0.043	0.313
	Right Tilt	0.187	0.024	0.211
	Left Cheek	0.539	0.331	0.870
	Left Tilt	0.155	0.075	0.230

12.4 Body-Worn Simultaneous Transmission Analysis

Table 12-4
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body-Worn at 10 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	0.451	0.169	0.620
Back Side	UMTS 850	0.317	0.169	0.486
Back Side	UMTS 1750	0.788	0.169	0.957
Back Side	GSM 1900	0.393	0.169	0.562
Back Side	UMTS 1900	0.625	0.169	0.794
Back Side	LTE Band 17	0.235	0.169	0.404
Back Side	LTE Band 5 (Cell)	0.313	0.169	0.482
Back Side	LTE Band 4 (AWS)	0.658	0.169	0.827
Back Side	LTE Band 2 (PCS)	0.654	0.169	0.823

Table 12-5
Simultaneous Transmission Scenario with 5 GHz WLAN (Body-Worn at 10 mm)

Configuration	Mode	2G/3G SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	0.451	0.523	0.974
Back Side	UMTS 850	0.317	0.523	0.840
Back Side	UMTS 1750	0.788	0.523	1.311
Back Side	GSM 1900	0.393	0.523	0.916
Back Side	UMTS 1900	0.625	0.523	1.148

Table 12-6

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Simultaneous Transmission Scenario with Bluetooth (Body-Worn at 10 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	0.451	0.208	0.659
Back Side	UMTS 850	0.317	0.208	0.525
Back Side	UMTS 1750	0.788	0.208	0.996
Back Side	GSM 1900	0.393	0.208	0.601
Back Side	UMTS 1900	0.625	0.208	0.833
Back Side	LTE Band 17	0.235	0.208	0.443
Back Side	LTE Band 5 (Cell)	0.313	0.208	0.521
Back Side	LTE Band 4 (AWS)	0.658	0.208	0.866
Back Side	LTE Band 2 (PCS)	0.654	0.208	0.862

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.

12.5 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 WLAN (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	UMTS 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.577	0.169	0.746	Body SAR	Back	0.317	0.169	0.486
	Front	0.532	0.034	0.566		Front	0.283	0.034	0.317
	Top	-	0.023	0.023		Top	-	0.023	0.023
	Bottom	0.139	-	0.139		Bottom	0.080	-	0.080
	Right	0.555	0.062	0.617		Right	0.267	0.062	0.329
	Left	0.561	-	0.561		Left	0.258	-	0.258
Simult Tx	Configuration	UMTS 1750 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	0.788	0.169	0.957	Body SAR	Back	0.575	0.169	0.744
	Front	0.928	0.034	0.962		Front	0.757	0.034	0.791
	Top	-	0.023	0.023		Top	-	0.023	0.023
	Bottom	0.522	-	0.522		Bottom	0.528	-	0.528
	Right	0.070	0.062	0.132		Right	0.053	0.062	0.115
	Left	0.310	-	0.310		Left	0.267	-	0.267
Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.625	0.169	0.794	Body SAR	Back	0.235	0.169	0.404
	Front	0.625	0.034	0.659		Front	0.178	0.034	0.212
	Top	-	0.023	0.023		Top	-	0.023	0.023
	Bottom	0.465	-	0.465		Bottom	0.056	-	0.056
	Right	0.057	0.062	0.119		Right	0.094	0.062	0.156
	Left	0.294	-	0.294		Left	0.129	-	0.129

Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.313	0.169	0.482	Body SAR	Back	0.658	0.169	0.827
	Front	0.276	0.034	0.310		Front	0.776	0.034	0.810
	Top	-	0.023	0.023		Top	-	0.023	0.023
	Bottom	0.086	-	0.086		Bottom	0.459	-	0.459
	Right	0.279	0.062	0.341		Right	0.069	0.062	0.131
	Left	0.271	-	0.271		Left	0.280	-	0.280

Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.654	0.169	0.823
	Front	1.010	0.034	1.044
	Top	-	0.023	0.023
	Bottom	0.573	-	0.573
	Right	0.079	0.062	0.141
	Left	0.372	-	0.372

12.6 Simultaneous Transmission Conclusion

The above numerical summed SAR results for all the worst-case simultaneous transmission conditions were below the SAR limit. Therefore, the above analysis is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit and therefore no measured volumetric simultaneous SAR summation is required per FCC KDB Publication 447498 D01v05.

13 SAR MEASUREMENT VARIABILITY

13.1 Measurement Variability

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

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

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

Table 13-1
Body SAR Measurement Variability Results

BODY VARIABILITY RESULTS													
Band	FREQUENCY		Mode	Service	Side	Spacing	Measured SAR (1g)	1st Repeated SAR (1g)	Ratio	2nd Repeated SAR (1g)	Ratio	3rd Repeated SAR (1g)	Ratio
	MHz	Ch.					(W/kg)	(W/kg)		(W/kg)		(W/kg)	
1750	1752.50	1862	UMTS 1750	RMC	front	10 mm	0.848	0.784	1.08	N/A	N/A	N/A	N/A
1900	1855.00	18650	LTE Band 2 (PCS)	QPSK, 1 RB, 25 RB Offset	front	10 mm	0.900	0.898	1.00	N/A	N/A	N/A	N/A
ANSI / IEEE C95.1 1992 - SAFETY LIMIT						Body							
Spatial Peak						1.6 W/kg (mW/g)							
Uncontrolled Exposure/General Population						averaged over 1 gram							

13.2 Measurement Uncertainty

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

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14 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	85047A	S-Parameter Test Set	N/A	N/A	N/A	2904A00579
Agilent	85070E	Dielectric Probe Kit	3/8/2012	Annual	3/8/2013	MY44300633
Agilent	8594A	(9kHz-2.9GHz) Spectrum Analyzer	N/A	N/A	N/A	3051A00187
Agilent	8648D	(9kHz-4GHz) Signal Generator	10/10/2012	Annual	10/10/2013	3613A00315
Agilent	8648D	Signal Generator	4/3/2012	Annual	4/3/2013	3629U00687
Agilent	8753E	(30kHz-6GHz) Network Analyzer	4/4/2012	Annual	4/4/2013	JP38020182
Agilent	8753E	(30kHz-6GHz) Network Analyzer	4/3/2012	Annual	4/3/2013	US37903050
Agilent	E8257D	(250kHz-20GHz) Signal Generator	4/5/2012	Annual	4/5/2013	MY45470194
Amplifier Research	551G4	5W, 800MHz-4.2GHz	CBT	N/A	CBT	21910
Anritsu	MA24106A	USB Power Sensor	8/22/2012	Annual	8/22/2013	1231538
Anritsu	MA24106A	USB Power Sensor	8/22/2012	Annual	8/22/2013	1231535
Anritsu	MA2411B	Power Sensor	3/5/2012	Annual	3/5/2013	846215
Anritsu	MA2411B	Pulse Power Sensor	12/4/2012	Annual	12/4/2013	1207364
Anritsu	MA2411B	Pulse Power Sensor	12/5/2012	Annual	12/5/2013	1126066
Anritsu	MA2481A	Power Sensor	4/5/2012	Annual	4/5/2013	5605
Anritsu	ML2496A	Power Meter	11/28/2012	Annual	11/28/2013	1138001
Anritsu	MT8820C	Radio Communication Tester	11/6/2012	Annual	11/6/2013	6209091190
COMTech	AR85729-5	Solid State Amplifier	CBT	N/A	CBT	M155A00-009
COMTECH	AR85729-5/5759B	Solid State Amplifier	CBT	N/A	CBT	M3W1A00-1002
Control Company	4353	Long Stem Thermometer	9/25/2012	Biennial	9/25/2014	122541143
Control Company	36934-158	Wall-Mounted Thermometer	1/4/2012	Biennial	1/4/2014	122014497
Gigatronics	80701A	(0.05-18GHz) Power Sensor	10/10/2012	Annual	10/10/2013	1833460
Gigatronics	8651A	Universal Power Meter	10/10/2012	Annual	10/10/2013	8650319
Intelligent Weigh	PD-3000	Electronic Balance	3/27/2012	Annual	3/27/2013	11081534
Intelligent Weighing	PD-3000	Electronic Balance	6/29/2012	Annual	6/29/2013	120405017
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
MiniCircuits	SLP-2400+	Low Pass Filter	CBT	N/A	CBT	R8979500903
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-1200+	Low Pass Filter DC to 1000 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Narda	4014C-6	4 - 8 GHz SMA 6 dB Directional Coupler	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Narda	BW-53W2	Attenuator (3dB)	CBT	N/A	CBT	120
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Rohde & Schwarz	CMU200	Base Station Simulator	5/22/2012	Annual	5/22/2013	109892
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	10/7/2011	Biennial	10/7/2013	103962
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	D1750V2	1750 MHz SAR Dipole	4/24/2012	Annual	4/24/2013	1051
SPEAG	D1765V2	1765 MHz SAR Dipole	5/18/2012	Annual	5/18/2013	1008
SPEAG	D1900V2	1900 MHz SAR Dipole	2/22/2012	Annual	2/22/2013	5d149
SPEAG	D1900V2	1900 MHz SAR Dipole	2/6/2013	Annual	2/6/2014	5d148
SPEAG	D2450V2	2450 MHz SAR Dipole	8/23/2012	Annual	8/23/2013	719
SPEAG	D2450V2	2450 MHz SAR Dipole	2/11/2013	Annual	2/11/2014	882
SPEAG	D5GHZV2	5 GHz SAR Dipole	10/30/2012	Annual	10/30/2013	1007
SPEAG	D750V3	750 MHz Dipole	2/5/2013	Annual	2/5/2014	1003
SPEAG	D835V2	835 MHz SAR Dipole	8/23/2012	Annual	8/23/2013	4d026
SPEAG	D835V2	835 MHz SAR Dipole	4/20/2012	Annual	4/20/2013	4d119
SPEAG	D835V2	835 MHz SAR Dipole	2/17/2012	Annual	2/17/2013	4d133
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/19/2012	Annual	4/19/2013	665
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/17/2013	Annual	1/17/2014	1272
SPEAG	DAE4	Dasy Data Acquisition Electronics	9/19/2012	Annual	9/19/2013	1323
SPEAG	DAE4	Dasy Data Acquisition Electronics	11/13/2012	Annual	11/13/2013	1333
SPEAG	DAE4	Dasy Data Acquisition Electronics	8/24/2012	Annual	8/24/2013	1322
SPEAG	DAE4	Dasy Data Acquisition Electronics	5/7/2012	Annual	5/7/2013	1334
SPEAG	DAK-3.5	Dielectric Assessment Kit	6/19/2012	Annual	6/19/2013	1070
SPEAG	DAK-3.5	Dielectric Assessment Kit	12/11/2012	Annual	12/11/2013	1091
SPEAG	ES3DV2	SAR Probe	8/28/2012	Annual	8/28/2013	3022
SPEAG	ES3DV3	SAR Probe	4/24/2012	Annual	4/24/2013	3213
SPEAG	ES3DV3	SAR Probe	5/18/2012	Annual	5/18/2013	3263
SPEAG	ES3DV3	SAR Probe	9/20/2012	Annual	9/20/2013	3288
SPEAG	ES3DV3	SAR Probe	11/15/2012	Annual	11/15/2013	3287
SPEAG	EX3DV4	SAR Probe	1/17/2013	Annual	1/17/2014	3589
VWR	23226-658	Long Stem Thermometer	3/30/2012	Biennial	3/30/2014	122179874
VWR	36934-158	Wall-Mounted Thermometer	9/30/2011	Biennial	9/30/2013	111859323
VWR	62344-925	Mini-Thermometer	10/24/2011	Biennial	10/24/2013	111886430

Note:

1. CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, amplifier, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path. The power meter offset was then adjusted to compensate for the measurement system losses. This level offset is stored within the power meter before measurements are made. This calibration verification procedure applies to the system verification and output power measurements. The calibrated reading is then taken directly from the power meter after compensation of the losses for all final power measurements.
2. All equipment were used during their valid calibration periods.
3. Agilent 850471A S-Parameter Test Set is used as a connector dock in series with a calibrated network analyzer. All measurements are made by the calibrated network analyzer; therefore no calibration is needed for this Test Set.
4. Agilent 8594A (9 kHz-2.9 GHz) Spectrum Analyzer was used only to verify device transmission for WIFI signal, therefore calibration of this device was not required.

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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

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

16 CONCLUSION

16.1 Measurement Conclusion

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

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

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APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: 20FCB

Communication System: GSM850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.93 \text{ S/m}$; $\epsilon_r = 40.441$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 02-08-2013; Ambient Temp: 24.4°C; Tissue Temp: 23.3°C

Probe: ES3DV2 - SN3022; ConvF(6.03, 6.03, 6.03); Calibrated: 8/28/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/24/2012

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

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.8 (7028)

Mode: GSM 850, Left Head, Cheek, Mid.ch, Standard Cover

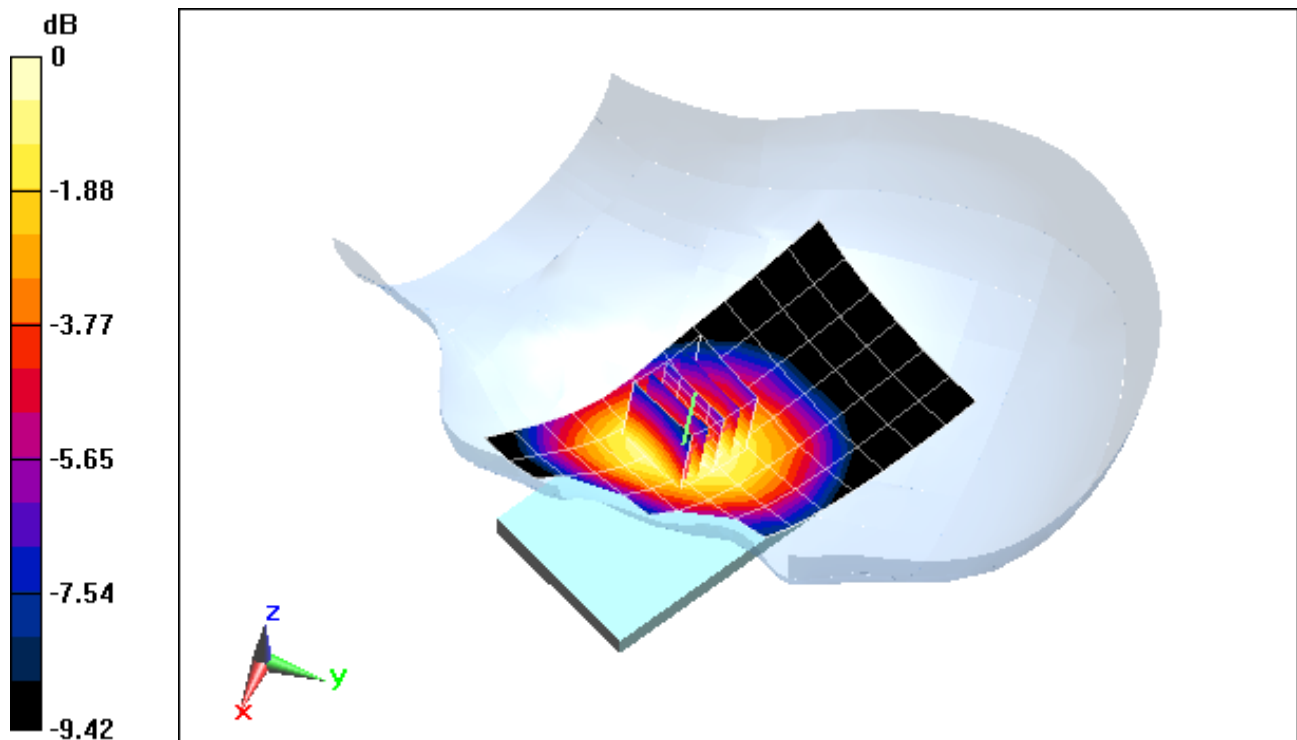
Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 16.026 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.282 W/kg

SAR(1 g) = 0.224 W/kg; SAR(10 g) = 0.168 W/kg



0 dB = 0.232 W/kg = -6.35 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: 20FCA

Communication System: UMTS850; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.914 \text{ S/m}$; $\epsilon_r = 40.913$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 02-11-2013; Ambient Temp: 24.4°C; Tissue Temp: 23.4°C

Probe: ES3DV2 - SN3022; ConvF(6.03, 6.03, 6.03); Calibrated: 8/28/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/24/2012

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.8 (7028)

Mode: UMTS 850, Left Head, Cheek, Mid.ch, Standard Cover

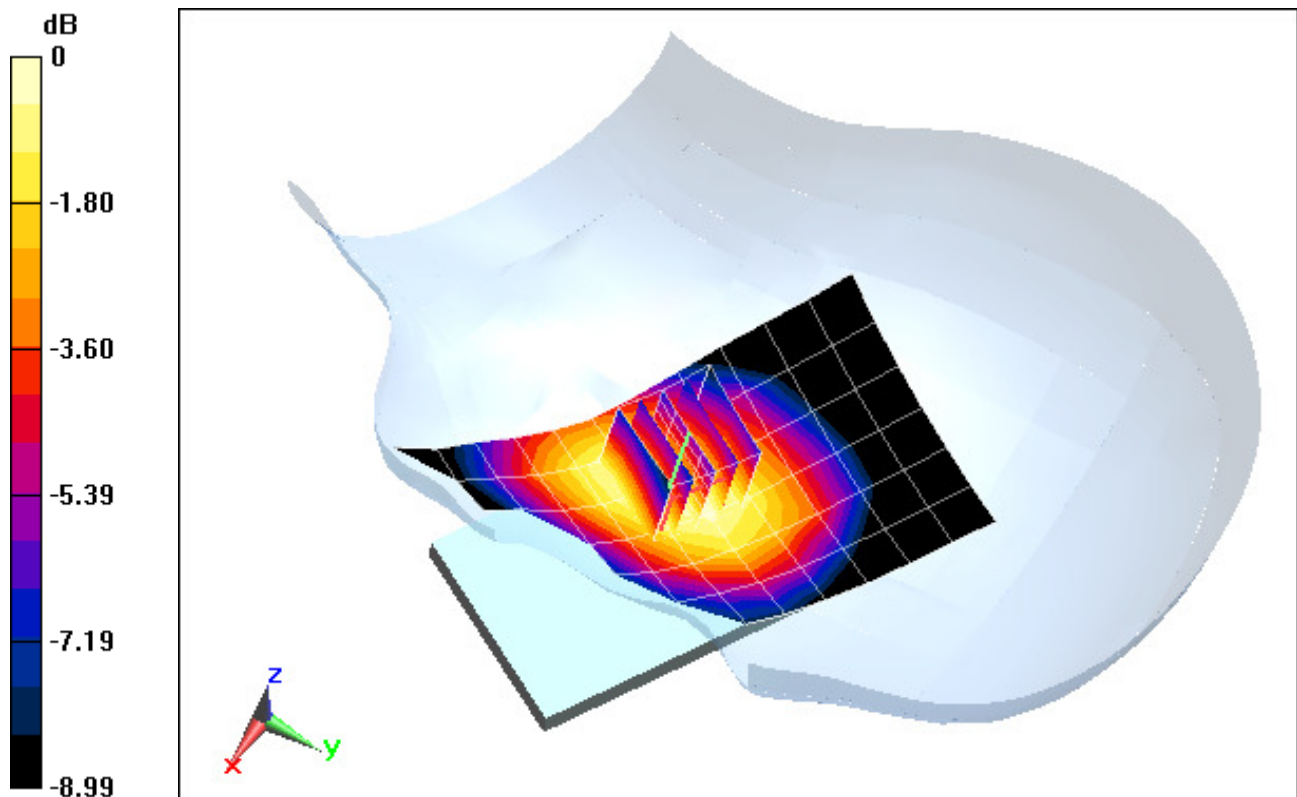
Area Scan (7x12x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 13.528 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.200 W/kg

SAR(1 g) = 0.164 W/kg; SAR(10 g) = 0.126 W/kg



0 dB = 0.170 W/kg = -7.70 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: 20FCA

Communication System: UMTS 1750; Frequency: 1730.4 MHz; Duty Cycle: 1:1

Medium: 1750 MHz Medium parameters used (interpolated):

$f = 1730.4 \text{ MHz}$; $\sigma = 1.39 \text{ S/m}$; $\epsilon_r = 40.425$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 03-03-2013; Ambient Temp: 24.3°C; Tissue Temp: 21.6°C

Probe: EX3DV4 - SN3589; ConvF(7.34, 7.34, 7.34); Calibrated: 1/17/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/17/2013

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

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.8 (7028)

Mode: UMTS 1750, Left Head, Cheek, Mid.ch, Wireless Charging Cover

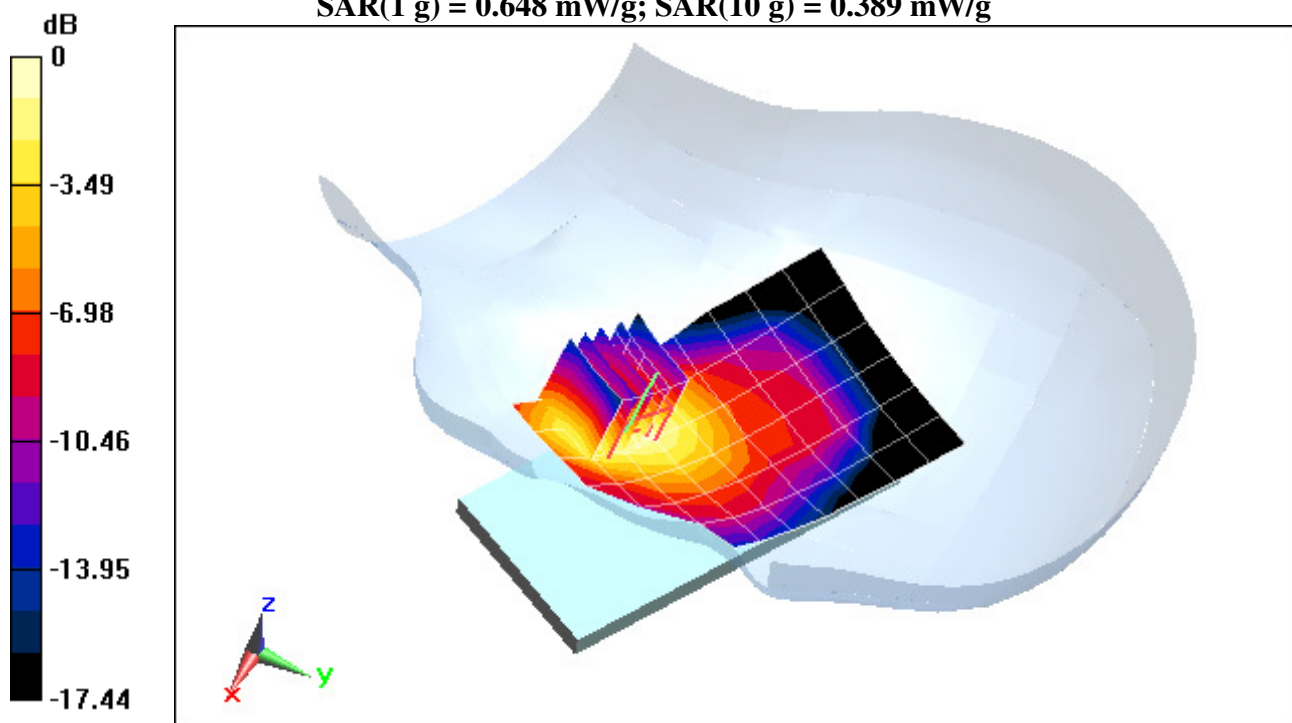
Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 20.920 V/m; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 1.002 mW/g

SAR(1 g) = 0.648 mW/g; SAR(10 g) = 0.389 mW/g



0 dB = 0.700 mW/g = -3.10 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: 20FCA

Communication System: GSM; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium: 1900 Head Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.393 \text{ S/m}$; $\epsilon_r = 38.741$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 03-04-2013; Ambient Temp: 24.3°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3263; ConvF(5.09, 5.09, 5.09); Calibrated: 5/18/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 5/7/2012

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

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

Mode: GSM 1900, Left Head, Cheek, Mid.ch, Wireless Charging Cover

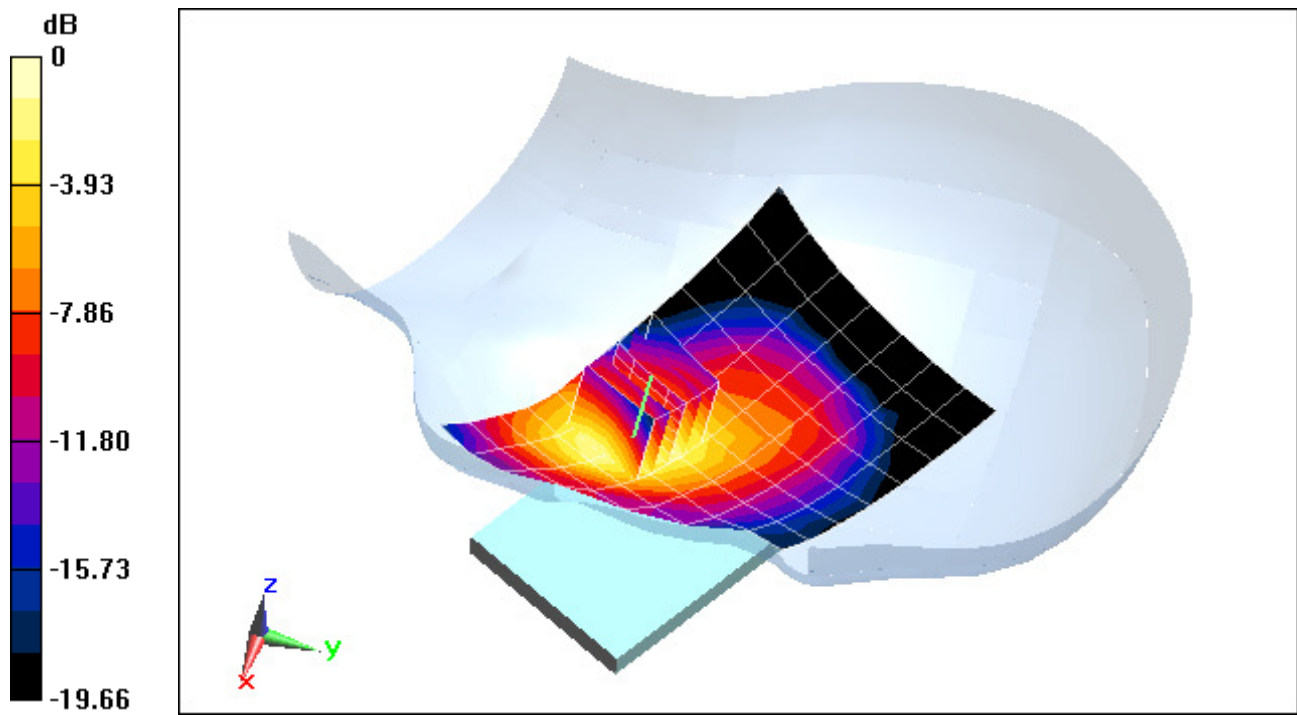
Area Scan (8x14x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 15.546 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.482 mW/g

SAR(1 g) = 0.311 mW/g



0 dB = 0.340 mW/g = -9.37 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: 20FCA

Communication System: UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Head Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.424 \text{ S/m}$; $\epsilon_r = 39.21$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 02-11-2013; Ambient Temp: 22.8°C; Tissue Temp: 21.3°C

Probe: ES3DV3 - SN3213; ConvF(5.02, 5.02, 5.02); Calibrated: 4/24/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/19/2012

Phantom: SAM Right; Type: QD000P40CD; Serial: 1686

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

Mode: UMTS 1900, Left Head, Cheek, Mid.ch, Standard Cover

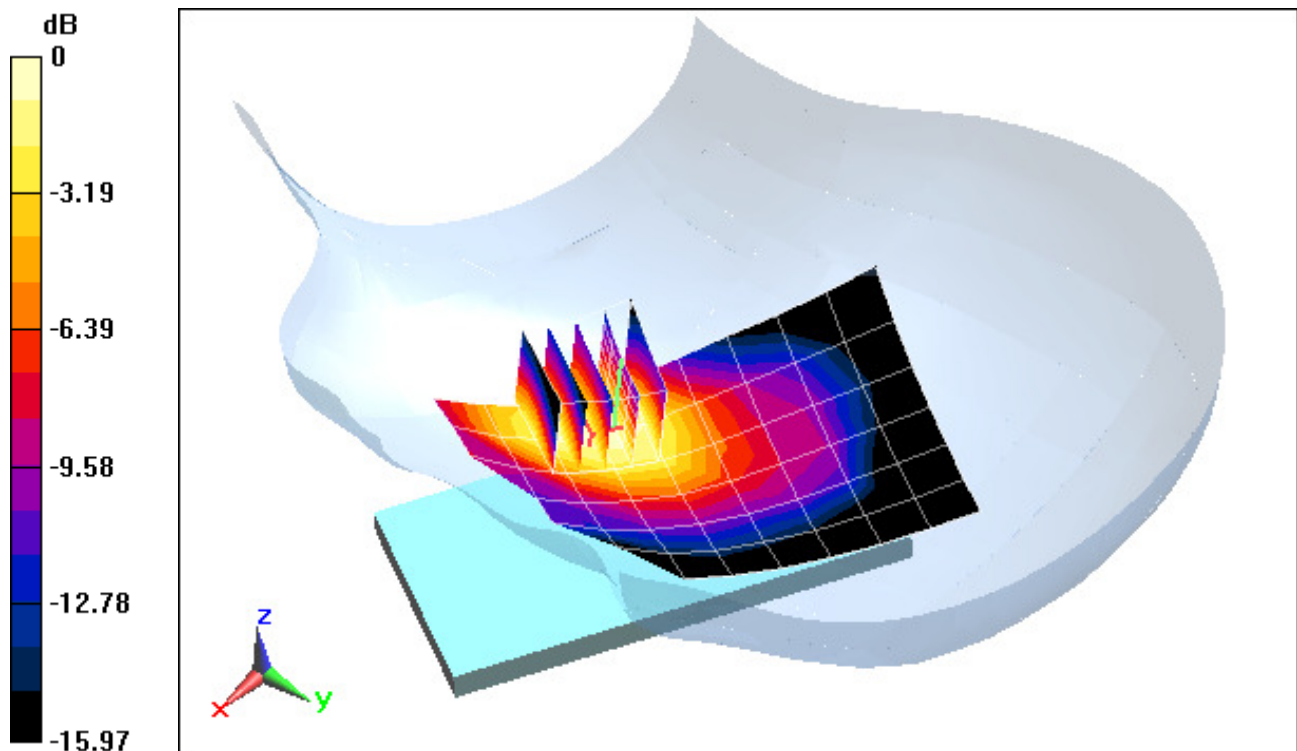
Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 19.990 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.813 W/kg

SAR(1 g) = 0.523 W/kg



0 dB = 0.554 W/kg = -2.56 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: 20FB4

Communication System: LTE BAND 17; Frequency: 710 MHz; Duty Cycle: 1:1

Medium: 750 Head Medium parameters used:

$$f = 710 \text{ MHz}; \sigma = 0.867 \text{ S/m}; \epsilon_r = 41.15; \rho = 1000 \text{ kg/m}^3$$

Phantom section: Left Section

Test Date: 02-12-2013; Ambient Temp: 21.9°C; Tissue Temp: 22.0°C

Probe: ES3DV2 - SN3022; ConvF(6.3, 6.3, 6.3); Calibrated: 8/28/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/24/2012

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

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.8 (7028)

Mode: LTE Band 17, Left Head, Cheek, Mid.ch

10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset, Standard Cover

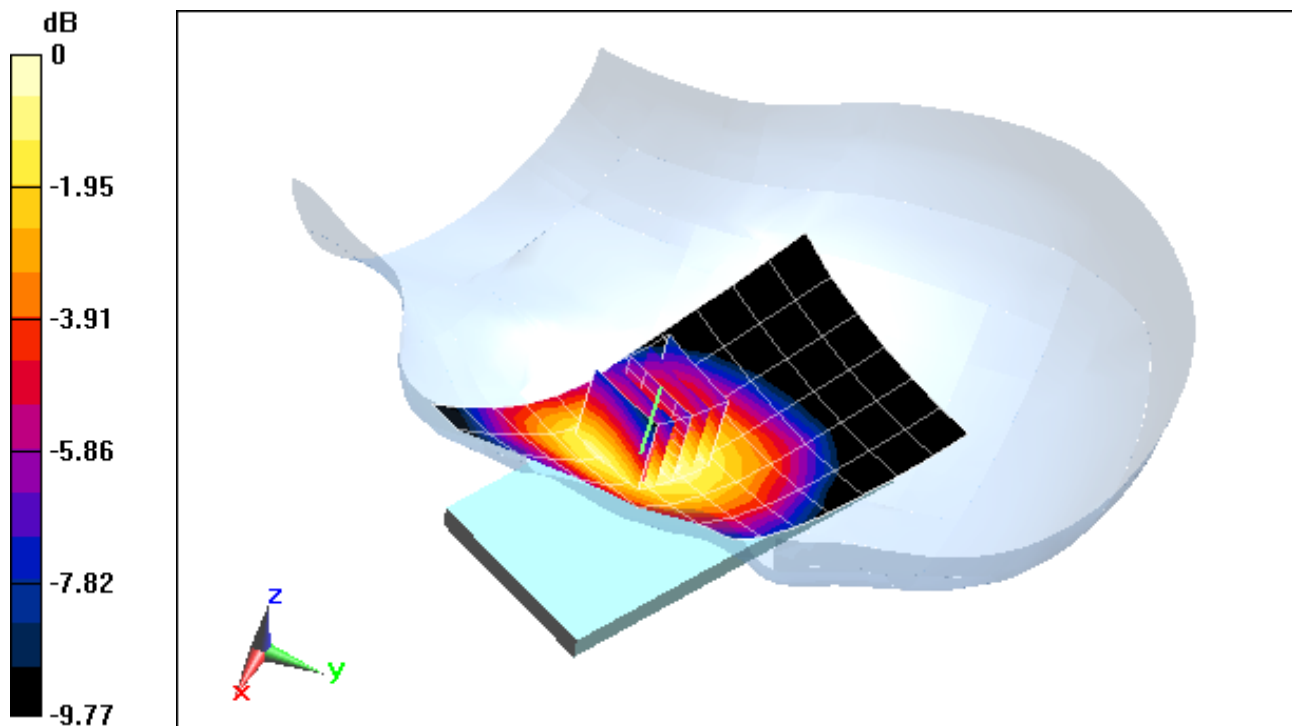
Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 11.945 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 0.134 W/kg

SAR(1 g) = 0.110 W/kg; SAR(10 g) = 0.084 W/kg



0 dB = 0.116 W/kg = -9.36 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: 20FCA

Communication System: LTE BAND 5; Frequency: 836.5 MHz; Duty Cycle: 1:1

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.5 \text{ MHz}$; $\sigma = 0.914 \text{ S/m}$; $\epsilon_r = 40.915$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 02-11-2013; Ambient Temp: 24.4°C; Tissue Temp: 23.4°C

Probe: ES3DV2 - SN3022; ConvF(6.03, 6.03, 6.03); Calibrated: 8/28/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/24/2012

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.8 (7028)

Mode: LTE Band 5 (Cell), Left Head, Cheek, Mid.ch

10 MHz Bandwidth, QPSK, 1 RB, 25 RB Offset, Standard Cover

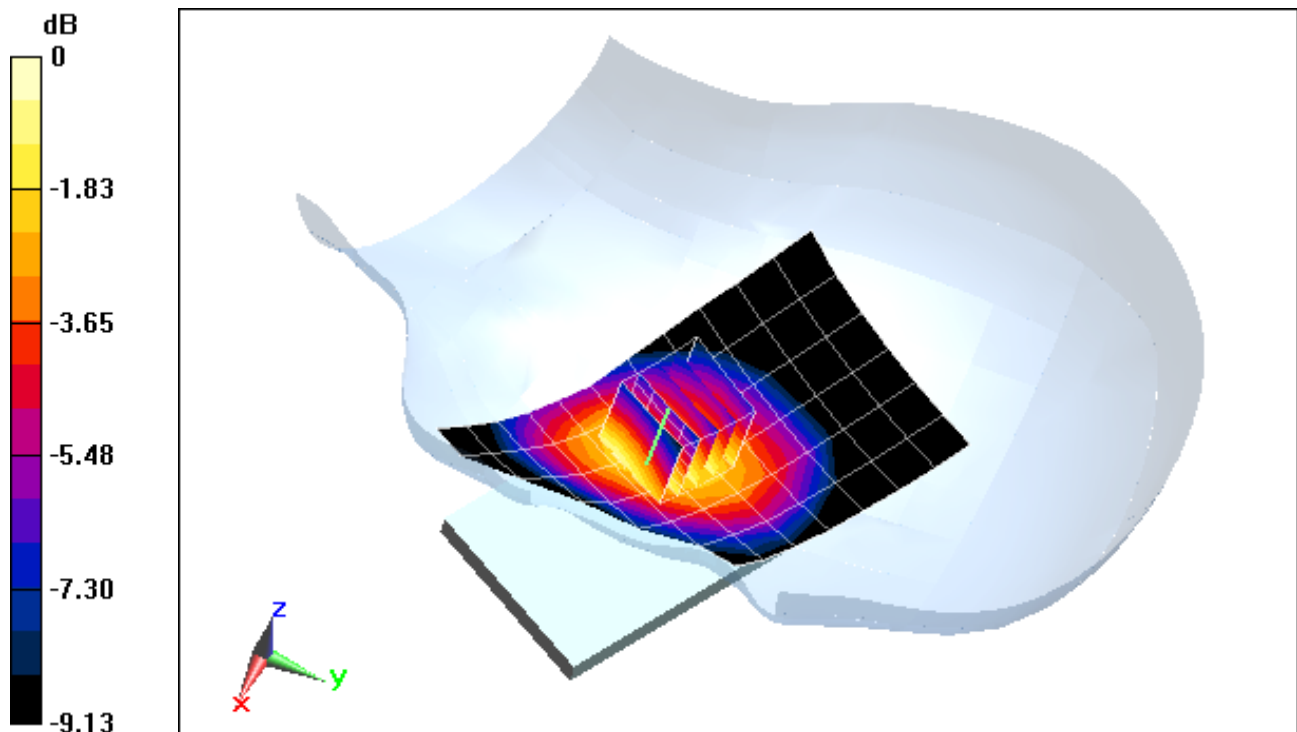
Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 15.397 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 0.228 W/kg

SAR(1 g) = 0.182 W/kg; SAR(10 g) = 0.136 W/kg



0 dB = 0.187 W/kg = -7.28 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: 20FB4

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

Medium: 1750 Head Medium parameters used (interpolated):

$f = 1732.5 \text{ MHz}$; $\sigma = 1.35 \text{ S/m}$; $\epsilon_r = 39.926$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 02-08-2013; Ambient Temp: 23.4°C; Tissue Temp: 21.4°C

Probe: ES3DV3 - SN3288; ConvF(5.51, 5.51, 5.51); Calibrated: 9/20/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/19/2012

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

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

Mode: LTE Band 4 (AWS), Left Head, Cheek, Mid.ch

QPSK, 20 MHz Bandwidth, 1 RB, 99 RB Offset, Standard Cover

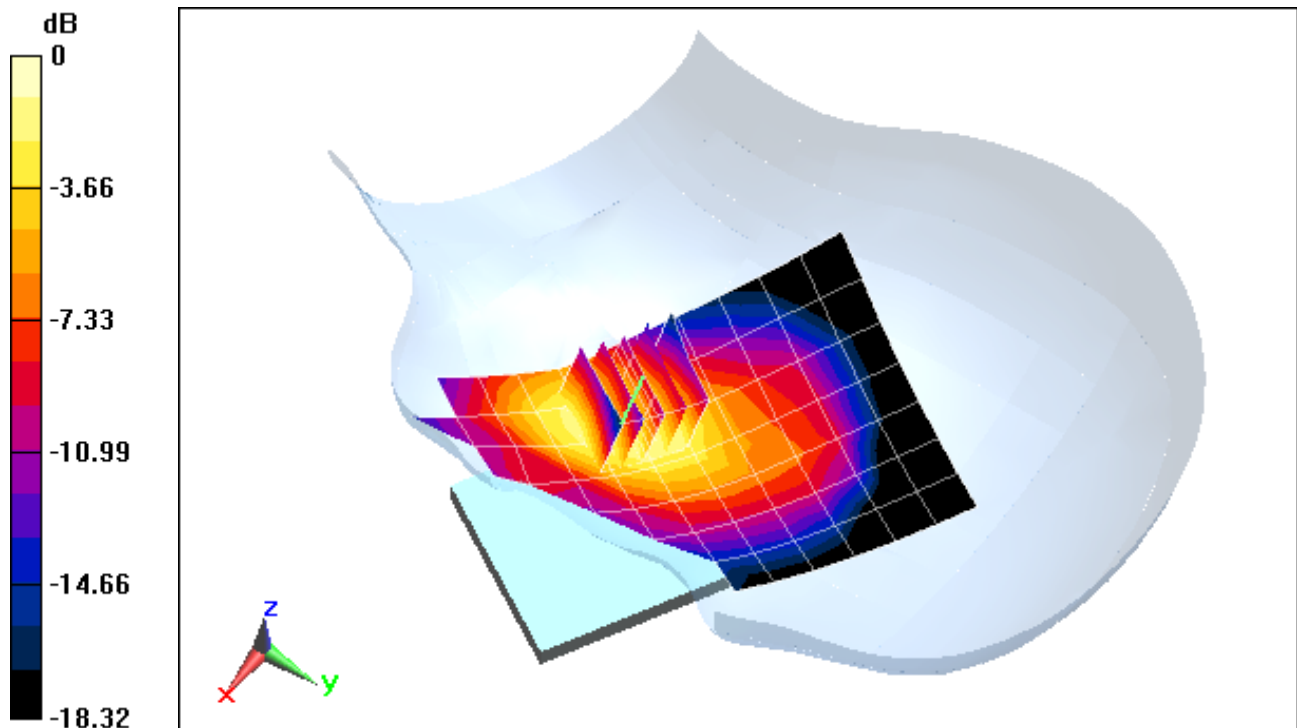
Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 20.815 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.697 W/kg

SAR(1 g) = 0.477 W/kg



0 dB = 0.521 W/kg = -2.83 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: 20FCA

Communication System: LTE Band 2; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Head Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.362 \text{ S/m}$; $\epsilon_r = 38.20$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 02-12-2013; Ambient Temp: 23.0°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3263; ConvF(5.09, 5.09, 5.09); Calibrated: 5/18/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 5/7/2012

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

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

Mode: LTE Band 2 (PCS), Left Head, Cheek, Mid.ch

QPSK, 10 MHz Bandwidth, 1 RB, 49 RB Offset, Standard Cover

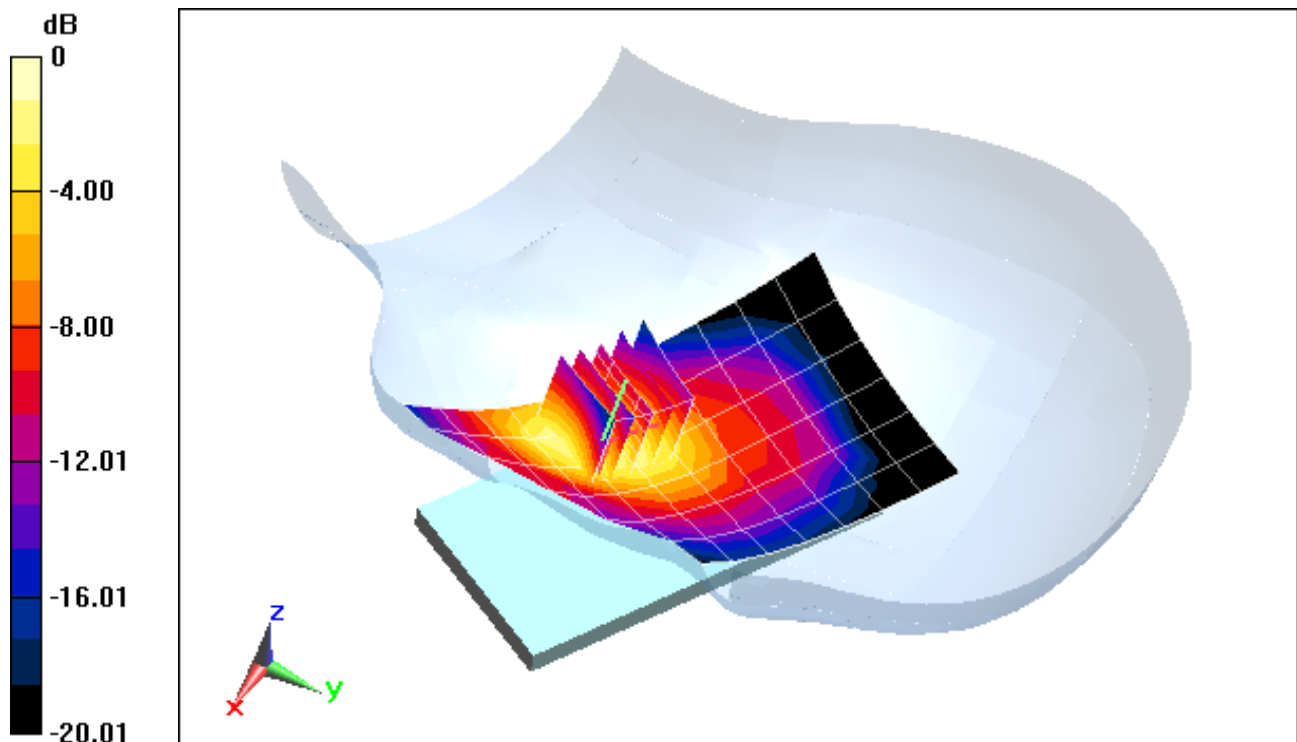
Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 24.257 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 0.964 W/kg

SAR(1 g) = 0.620 W/kg; SAR(10 g) = 0.376 W/kg



0 dB = 0.678 W/kg = -1.69 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: 22

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

Medium: 2450 Head Medium parameters used (interpolated):

$f = 2437 \text{ MHz}$; $\sigma = 1.861 \text{ S/m}$; $\epsilon_r = 40.628$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section; Space: 1.0 cm

Test Date: 02-25-2013; Ambient Temp: 24.4°C; Tissue Temp: 24.2°C

Probe: ES3DV2 - SN3022; ConvF(4.23, 4.23, 4.23); Calibrated: 8/28/2012;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/24/2012

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

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.8 (7028)

Mode: IEEE 802.11b, Left Head, Cheek, Ch 06, 1 Mbps, Wireless Charging Cover

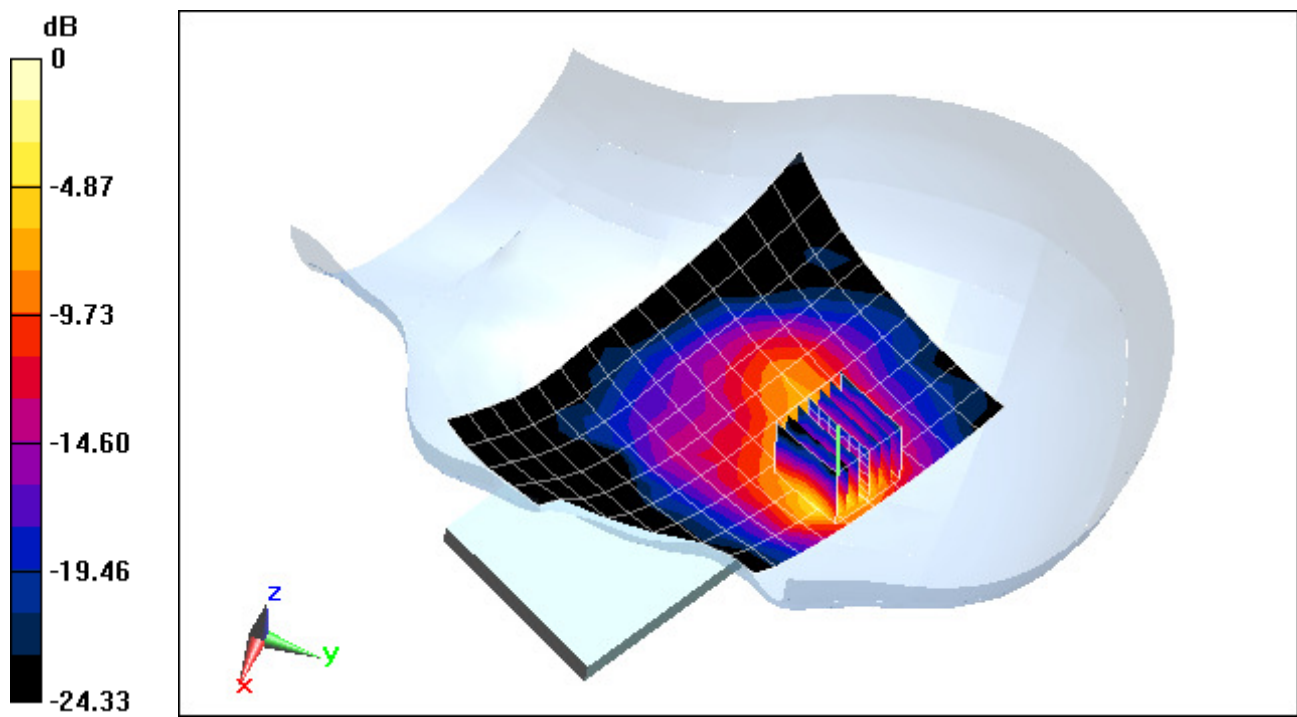
Area Scan (10x15x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 11.388 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 0.562 mW/g

SAR(1 g) = 0.228 mW/g; SAR(10 g) = 0.098 mW/g



0 dB = 0.321 mW/g = -9.87 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: #002

Communication System: IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5260 MHz; Duty Cycle: 1:1

Medium: 5 GHz Head Medium parameters used:

$$f = 5260 \text{ MHz}; \sigma = 4.638 \text{ S/m}; \epsilon_r = 36.9; \rho = 1000 \text{ kg/m}^3$$

Phantom section: Left Section

Test Date: 02-04-2013; Ambient Temp: 23.4°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN3589; ConvF(4.27, 4.27, 4.27); Calibrated: 1/17/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/17/2013

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.8 (7028)

Mode: IEEE 802.11a, 5.3 GHz Left Head, Cheek, Ch 52, 6 Mbps, Standard Cover

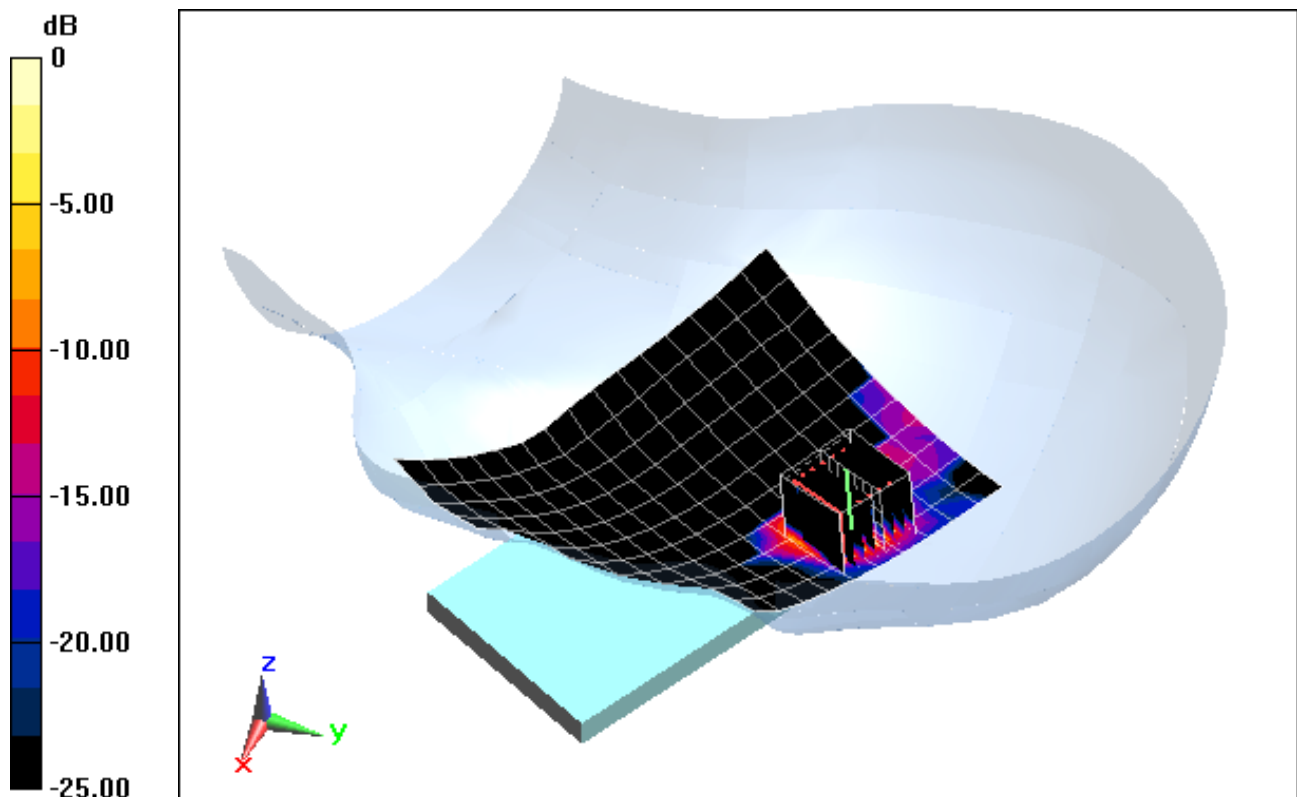
Area Scan (12x16x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 9.056 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 1.37 W/kg

SAR(1 g) = 0.300 W/kg; SAR(10 g) = 0.074 W/kg



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: #002

Communication System: IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5745 MHz; Duty Cycle: 1:1

Medium: 5 GHz Head Medium parameters used:

$f = 5745 \text{ MHz}$; $\sigma = 5.38 \text{ S/m}$; $\epsilon_r = 36.21$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 02-04-2013; Ambient Temp: 23.7°C; Tissue Temp: 22.9°C

Probe: EX3DV4 - SN3589; ConvF(3.85, 3.85, 3.85); Calibrated: 1/17/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/17/2013

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.8 (7028)

Mode: IEEE 802.11a, 5.8 GHz Left Head, Cheek, Ch 149, 6 Mbps, Standard Cover

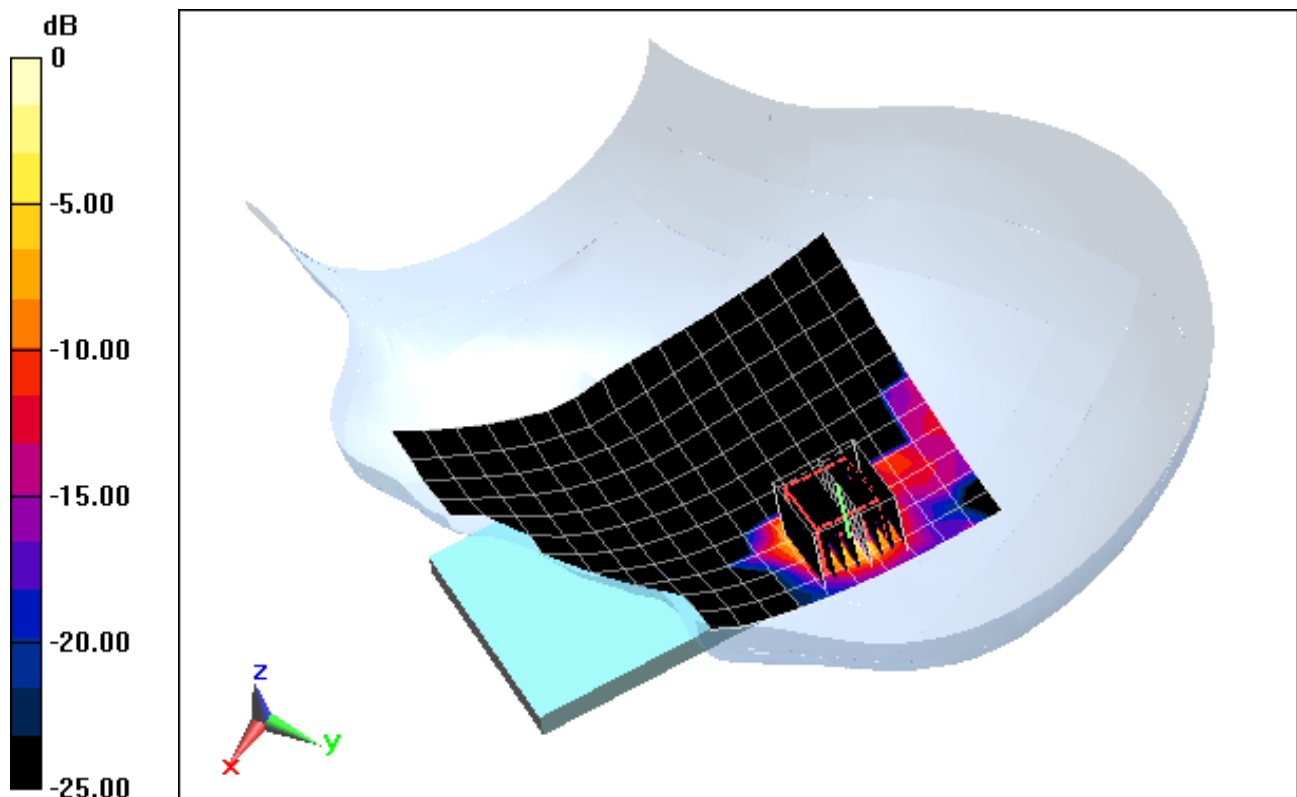
Area Scan (12x16x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 6.209 V/m; Power Drift = -0.17 dB

Peak SAR (extrapolated) = 0.942 W/kg

SAR(1 g) = 0.155 W/kg; SAR(10 g) = 0.037 W/kg



0 dB = 0.541 W/kg = -2.67 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: 20FCA

Communication System: GSM; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 1 \text{ S/m}$; $\epsilon_r = 53.465$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-07-2013; Ambient Temp: 23.0°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3213; ConvF(6.07, 6.07, 6.07); Calibrated: 4/24/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/19/2012

Phantom: ELI v5.0 Door; Type: QDOVA002BB; Serial: TP-1158

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

Mode: GSM 850, Body SAR, Back side, Mid.ch, Standard Cover

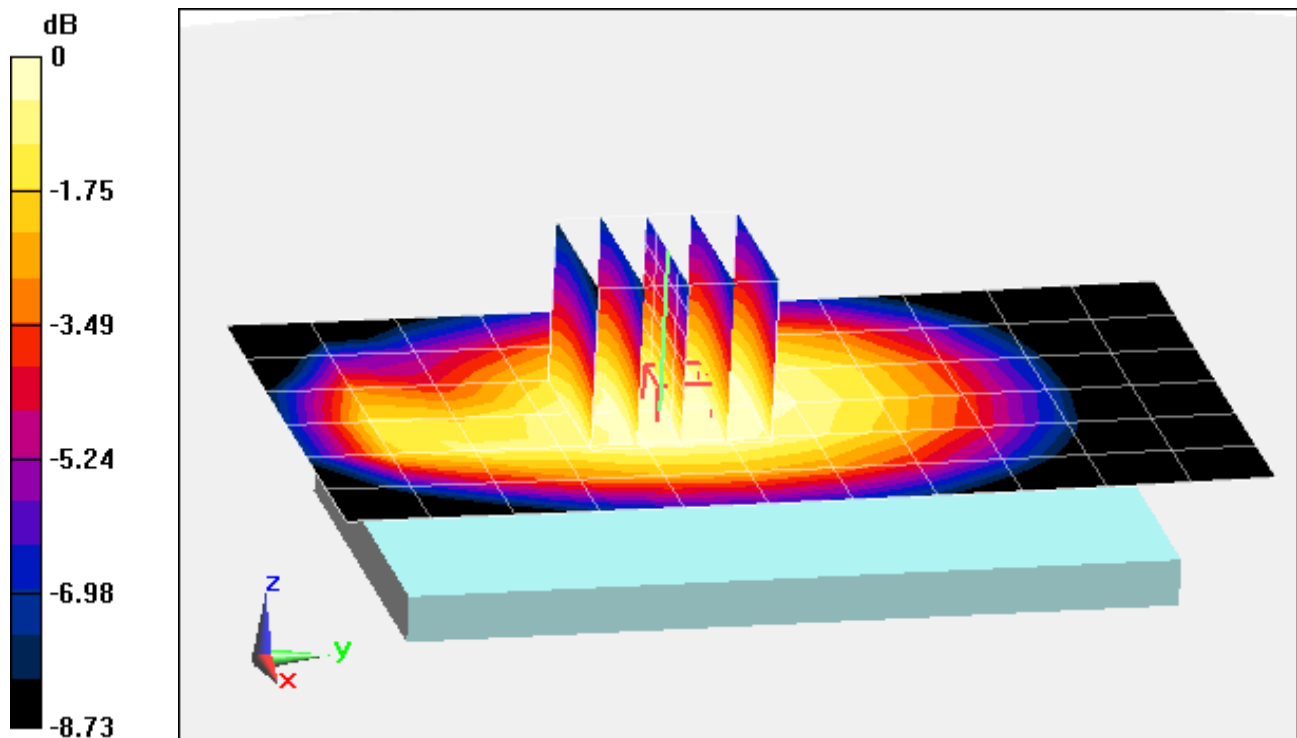
Area Scan (7x12x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 21.579 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.526 W/kg

SAR(1 g) = 0.429 W/kg



0 dB = 0.447 W/kg = -3.50 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: 20FCA

Communication System: GSM GPRS; 3 Tx slots; Frequency: 836.6 MHz; Duty Cycle: 1:2.76

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 1 \text{ S/m}$; $\epsilon_r = 53.465$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-07-2013; Ambient Temp: 23.0°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3213; ConvF(6.07, 6.07, 6.07); Calibrated: 4/24/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/19/2012

Phantom: ELI v5.0 Door; Type: QDOVA002BB; Serial: TP-1158

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

Mode: GPRS 850, Body SAR, Back side, Mid.ch, 3 Tx Slots, Standard Cover

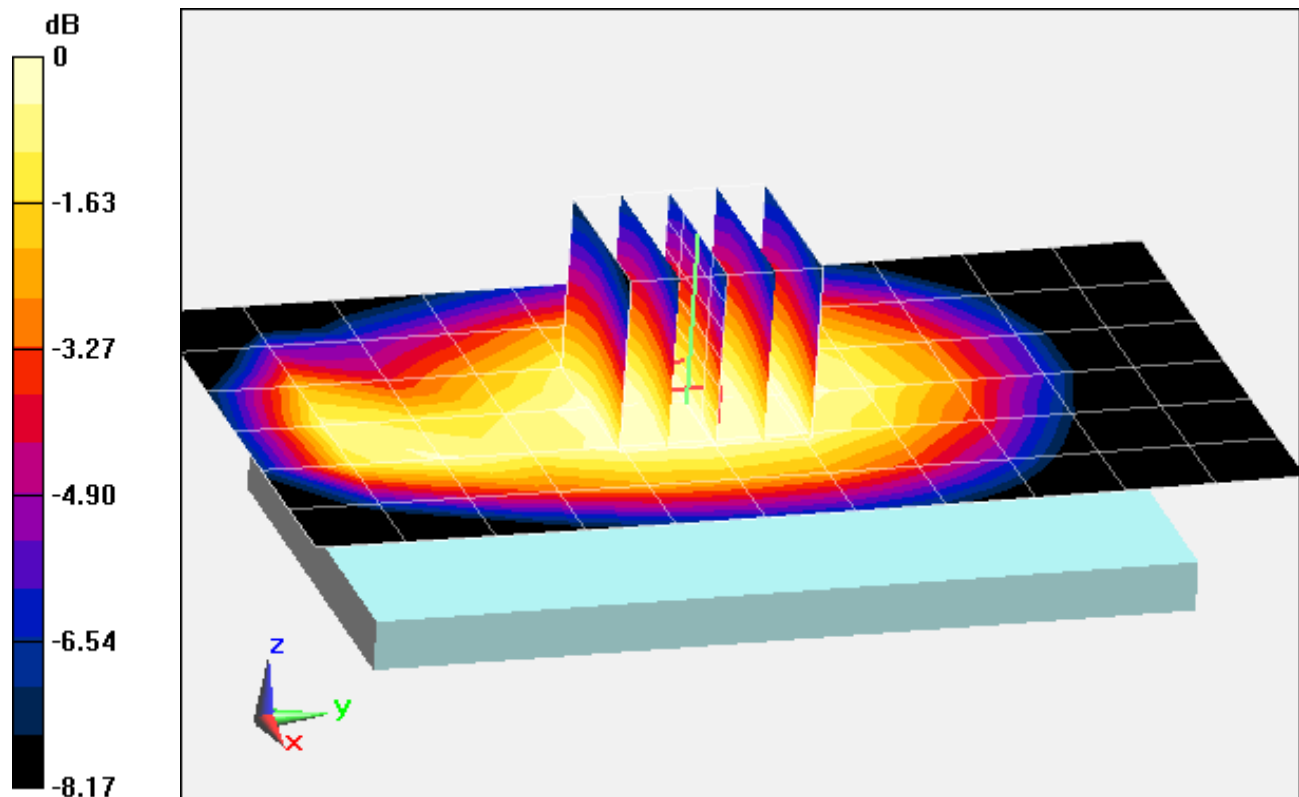
Area Scan (7x12x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 22.990 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.601 W/kg

SAR(1 g) = 0.490 W/kg



0 dB = 0.511 W/kg = -2.92 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: 20FCA

Communication System: UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 1 \text{ S/m}$; $\epsilon_r = 53.465$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-07-2013; Ambient Temp: 23.0°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3213; ConvF(6.07, 6.07, 6.07); Calibrated: 4/24/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/19/2012

Phantom: ELI v5.0 Door; Type: QDOVA002BB; Serial: TP-1158

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

Mode: UMTS 850, Body SAR, Back side, Mid.ch, Standard Cover

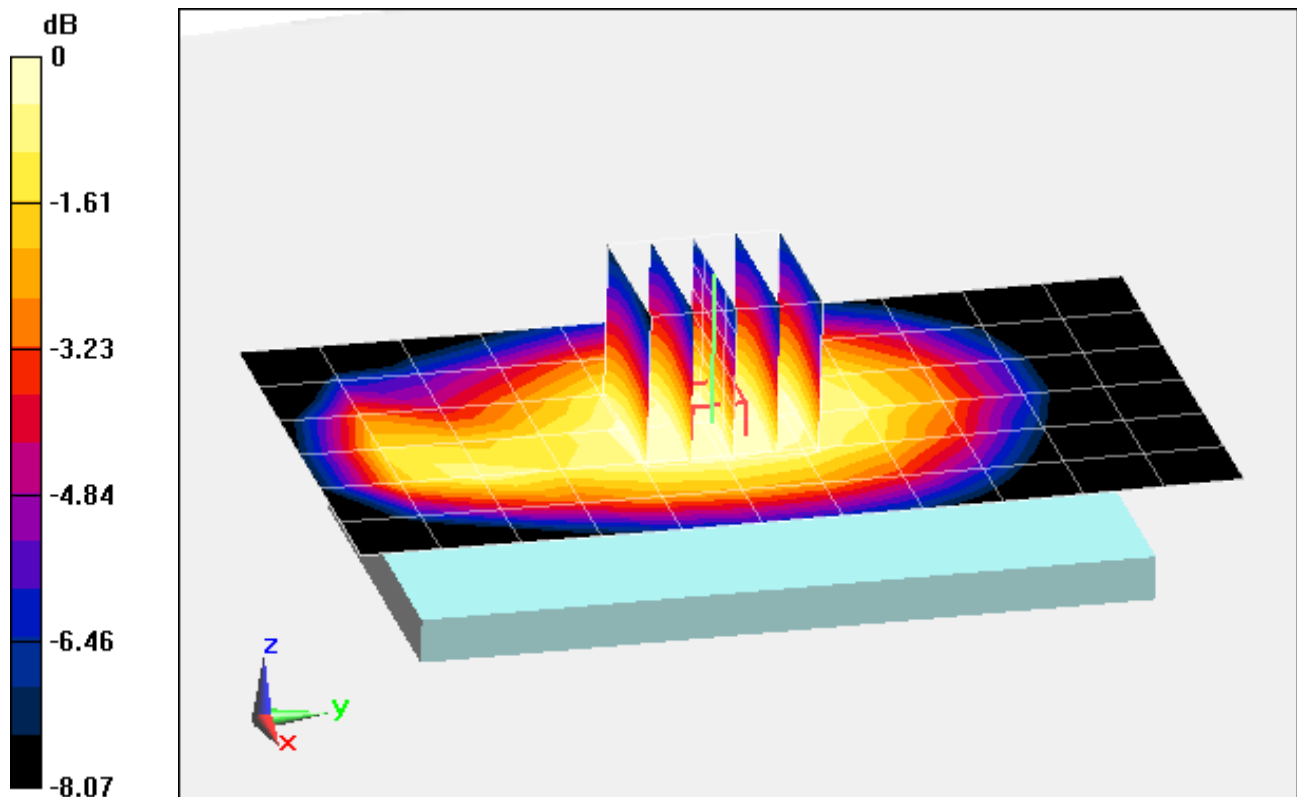
Area Scan (7x12x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 17.659 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.351 W/kg

SAR(1 g) = 0.288 W/kg



0 dB = 0.301 W/kg = -5.21 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: 20FCE

Communication System: UMTS; Frequency: 1730.4 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used (interpolated):

$f = 1730.4 \text{ MHz}$; $\sigma = 1.441 \text{ S/m}$; $\epsilon_r = 52.393$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-10-2013; Ambient Temp: 23.3°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3288; ConvF(5.18, 5.18, 5.18); Calibrated: 9/20/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/19/2012

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

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

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

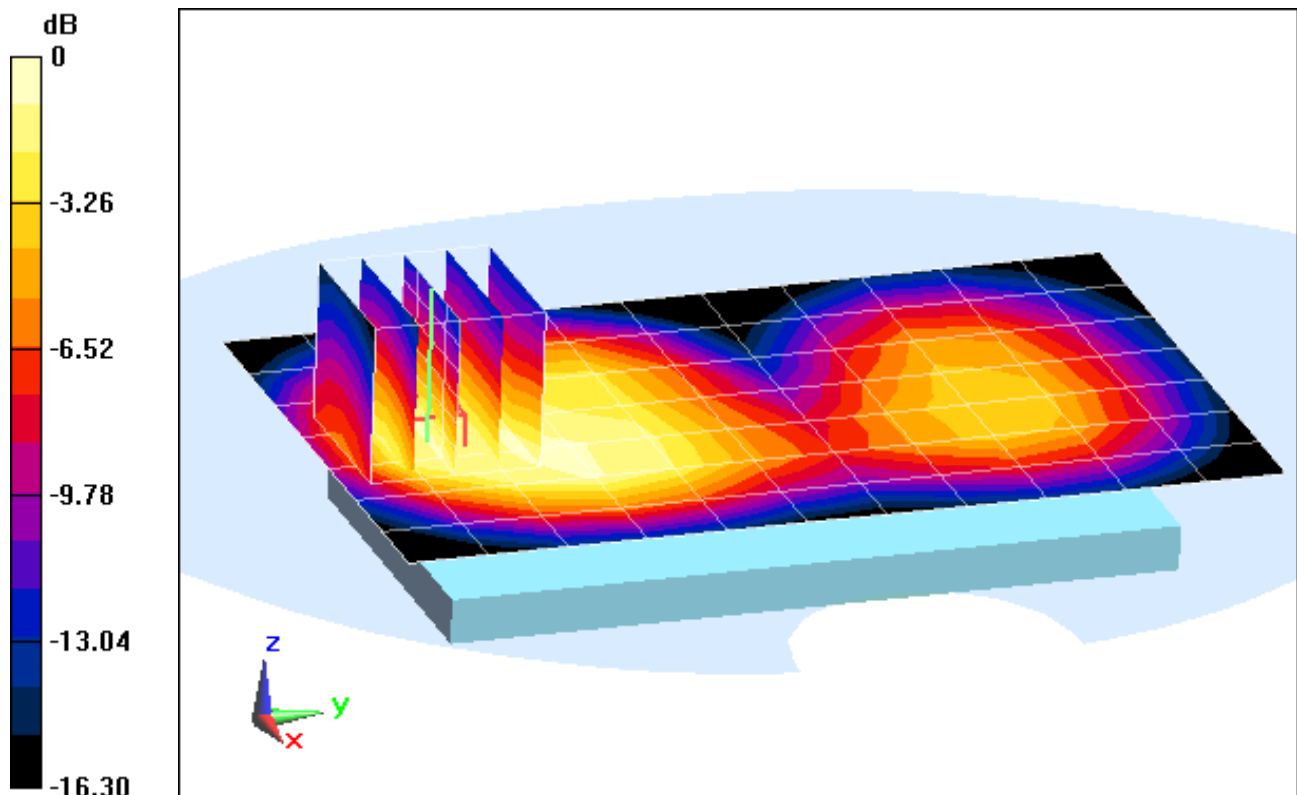
Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 20.754 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 1.24 W/kg

SAR(1 g) = 0.729 W/kg



0 dB = 0.814 W/kg = -0.89 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: 20FCE

Communication System: UMTS; Frequency: 1752.5 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used (interpolated):

$f = 1752.5 \text{ MHz}$; $\sigma = 1.463 \text{ S/m}$; $\epsilon_r = 52.293$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-10-2013; Ambient Temp: 23.3°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3288; ConvF(5.18, 5.18, 5.18); Calibrated: 9/20/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/19/2012

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

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

Mode: UMTS 1750, Body SAR, Front side, High.ch, Standard Cover

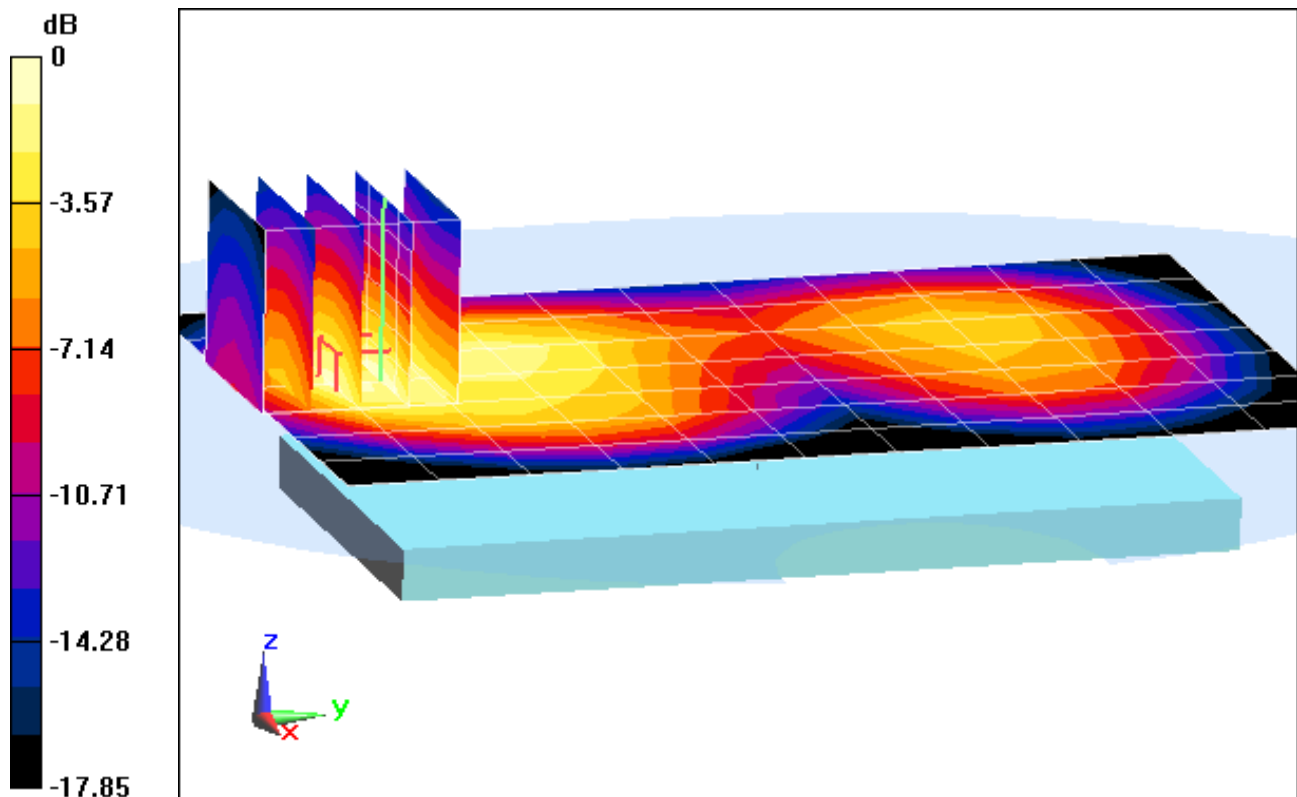
Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 24.181 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 1.51 W/kg

SAR(1 g) = 0.848 W/kg



0 dB = 0.911 W/kg = -0.40 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: 20FCA

Communication System: GSM; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.536 \text{ S/m}$; $\epsilon_r = 51.368$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-03-2013; Ambient Temp: 24.3°C; Tissue Temp: 22.9°C

Probe: ES3DV3 - SN3263; ConvF(4.76, 4.76, 4.76); Calibrated: 5/18/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 5/7/2012

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

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

Mode: GSM 1900, Body SAR, Back side, Mid.ch, Standard Cover

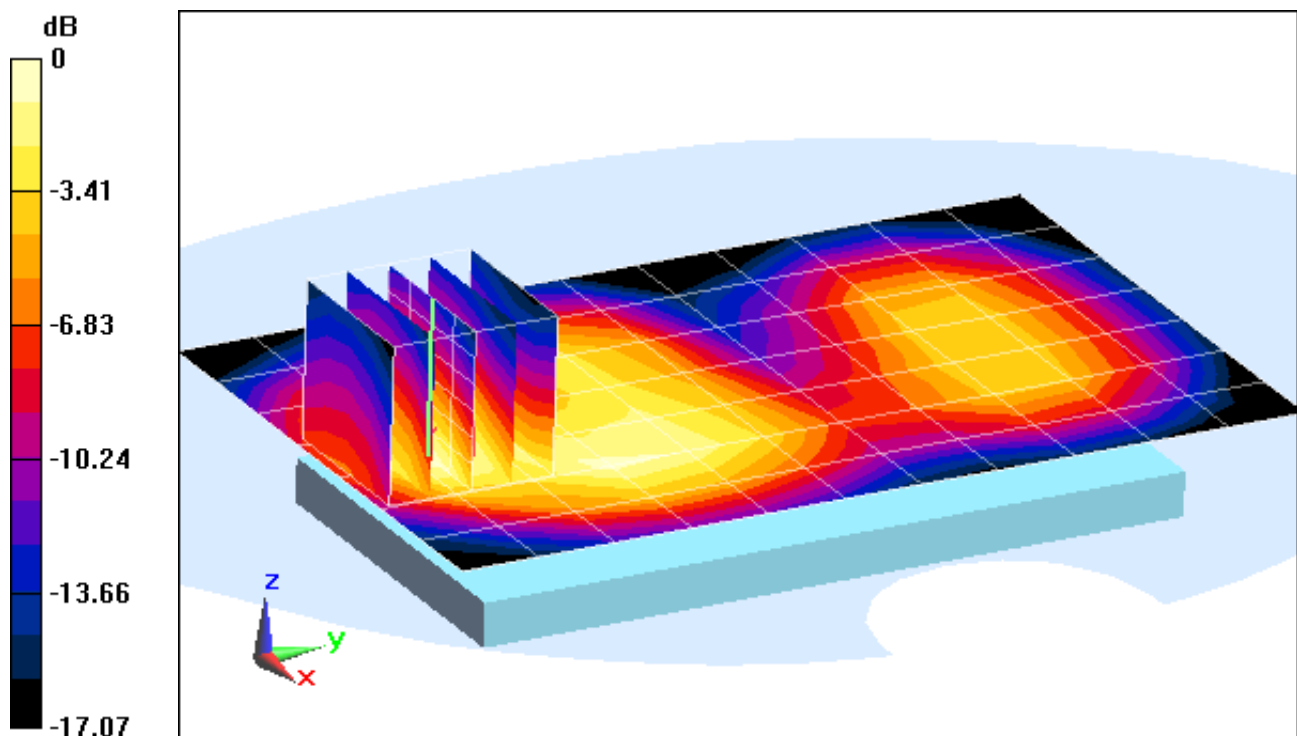
Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 15.074 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.623 mW/g

SAR(1 g) = 0.360 mW/g



0 dB = 0.388 mW/g = -8.22 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: 20FCA

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

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.536 \text{ S/m}$; $\epsilon_r = 51.368$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-03-2013; Ambient Temp: 24.3°C; Tissue Temp: 22.9°C

Probe: ES3DV3 - SN3263; ConvF(4.76, 4.76, 4.76); Calibrated: 5/18/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 5/7/2012

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

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

Mode: GPRS 1900, Body SAR, Front side, Mid.ch, 4 Tx Slots, Standard Cover

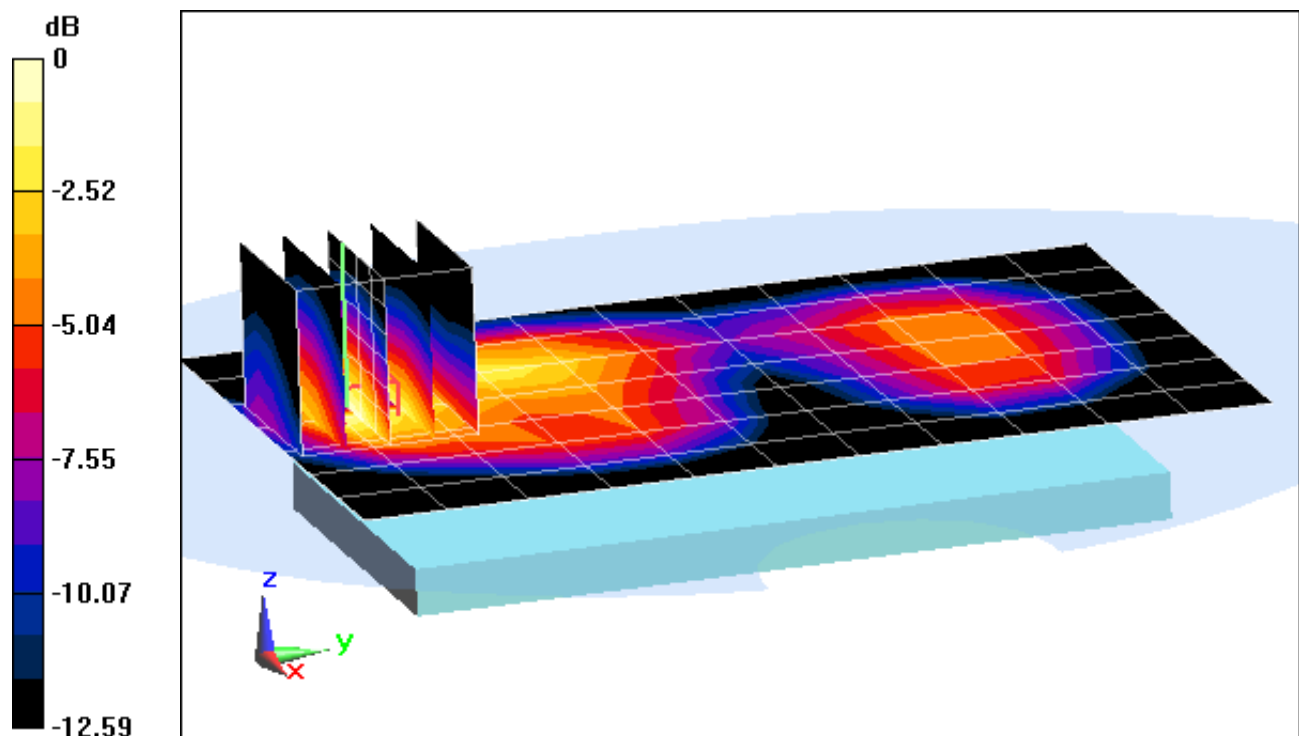
Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 20.671 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 1.191 mW/g

SAR(1 g) = 0.655 mW/g



0 dB = 0.751 mW/g = -2.49 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: 20FCA

Communication System: UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.532 \text{ S/m}$; $\epsilon_r = 52.88$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-07-2013; Ambient Temp: 23.4°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3263; ConvF(4.76, 4.76, 4.76); Calibrated: 5/18/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 5/7/2012

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

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

Mode: UMTS 1900, Body SAR, Back side, Mid.ch, Standard Cover

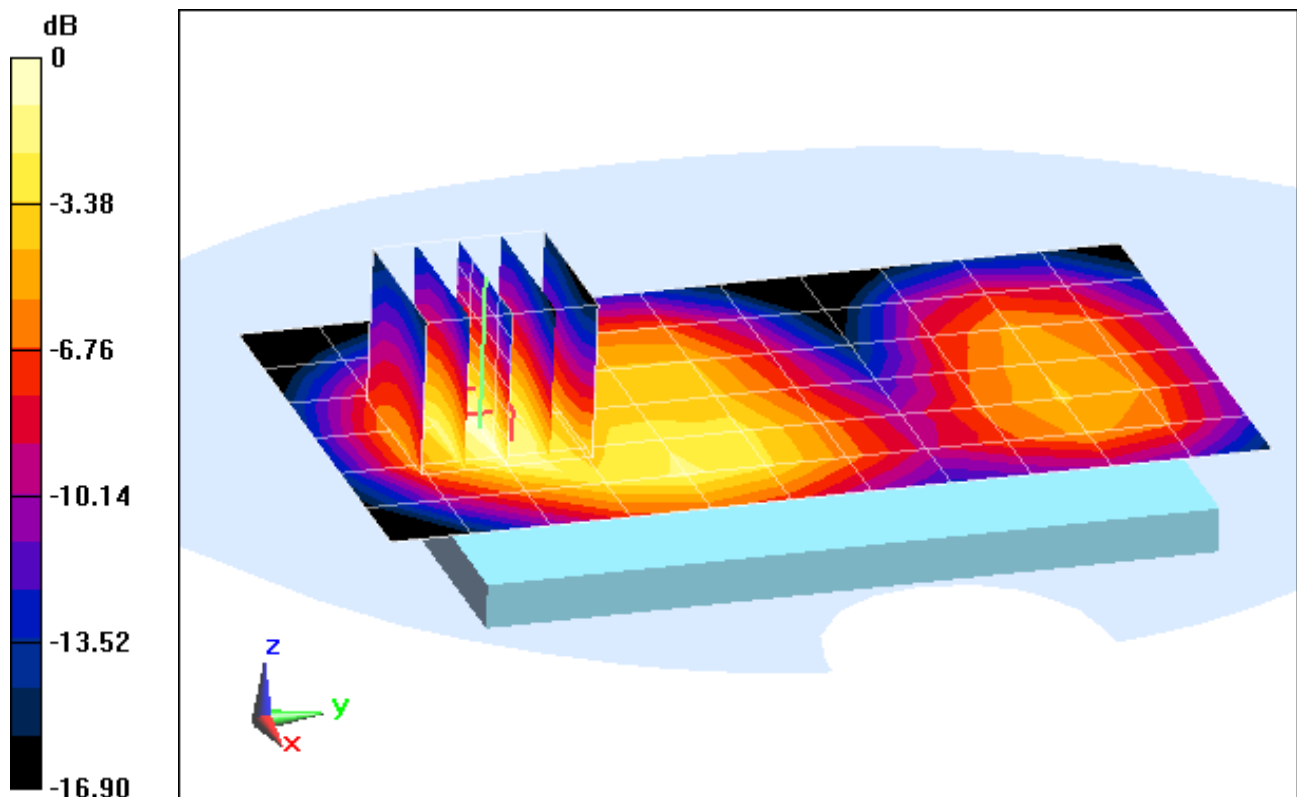
Area Scan (7x12x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 20.993 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 1.06 W/kg

SAR(1 g) = 0.607 W/kg



0 dB = 0.678 W/kg = -1.69 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: 20FB4

Communication System: LTE BAND 17; Frequency: 710 MHz; Duty Cycle: 1:1

Medium: 750 Body Medium parameters used:

$f = 710 \text{ MHz}$; $\sigma = 0.942 \text{ S/m}$; $\epsilon_r = 53.564$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-12-2013; Ambient Temp: 23.9°C; Tissue Temp: 23.3°C

Probe: ES3DV3 - SN3287; ConvF(6.14, 6.14, 6.14); Calibrated: 11/15/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 11/13/2012

Phantom: SAM with CRP; Type: SAM 4.0; Serial: TP1375

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.8 (7028)

Mode: LTE Band 17, Body SAR, Back side, Mid.ch

10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset, Standard Cover

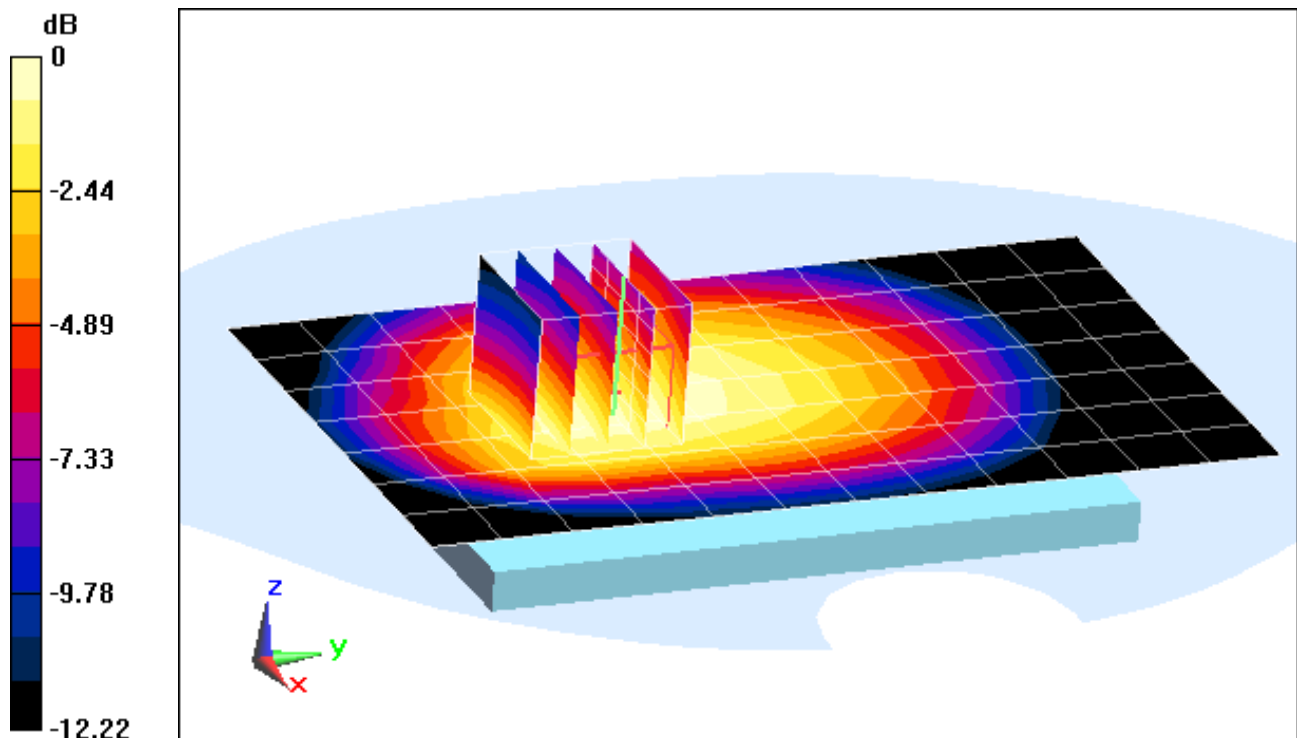
Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 15.729 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.294 W/kg

SAR(1 g) = 0.219 W/kg; SAR(10 g) = 0.161 W/kg



0 dB = 0.230 W/kg = -6.38 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: 20FCA

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

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.5 \text{ MHz}$; $\sigma = 1 \text{ S/m}$; $\epsilon_r = 53.767$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-13-2013; Ambient Temp: 24.7°C; Tissue Temp: 24.2°C

Probe: ES3DV3 - SN3213; ConvF(6.07, 6.07, 6.07); Calibrated: 4/24/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/19/2012

Phantom: ELI v5.0 Door; Type: QDOVA002BB; Serial: TP-1158

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

Mode: LTE Band 5 (Cell.), Body SAR, Back side, Mid.ch

10 MHz Bandwidth, QPSK, 1 RB, 25 RB Offset, Standard Cover

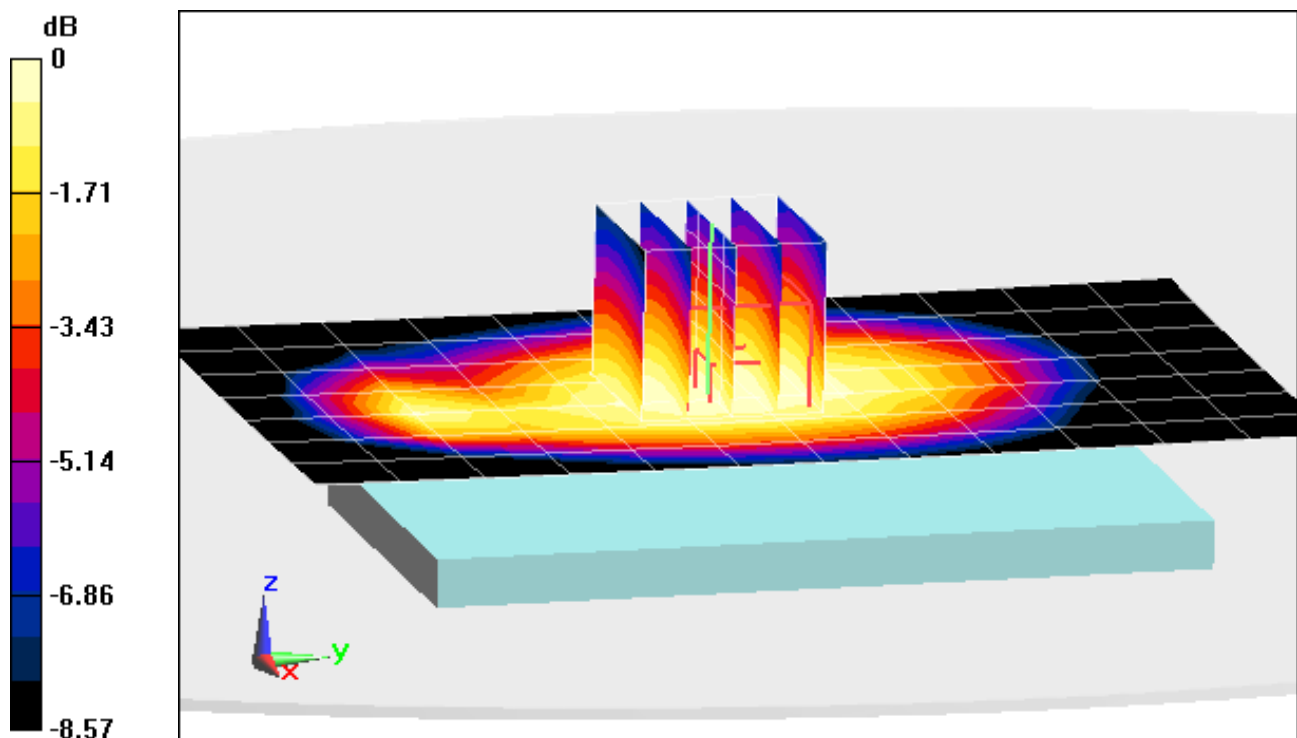
Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 17.729 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 0.358 W/kg

SAR(1 g) = 0.294 W/kg; SAR(10 g) = 0.227 W/kg



0 dB = 0.307 W/kg = -5.13 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: 20FB4

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

Medium: 1750 Body Medium parameters used (interpolated):

$f = 1732.5 \text{ MHz}$; $\sigma = 1.444 \text{ S/m}$; $\epsilon_r = 52.383$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-10-2013; Ambient Temp: 23.3°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3288; ConvF(5.18, 5.18, 5.18); Calibrated: 9/20/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/19/2012

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

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

Mode: LTE Band 4 (AWS), Body SAR, Back side, Mid.ch

20 MHz Bandwidth, QPSK, 1 RB, 99 RB Offset, Standard Cover

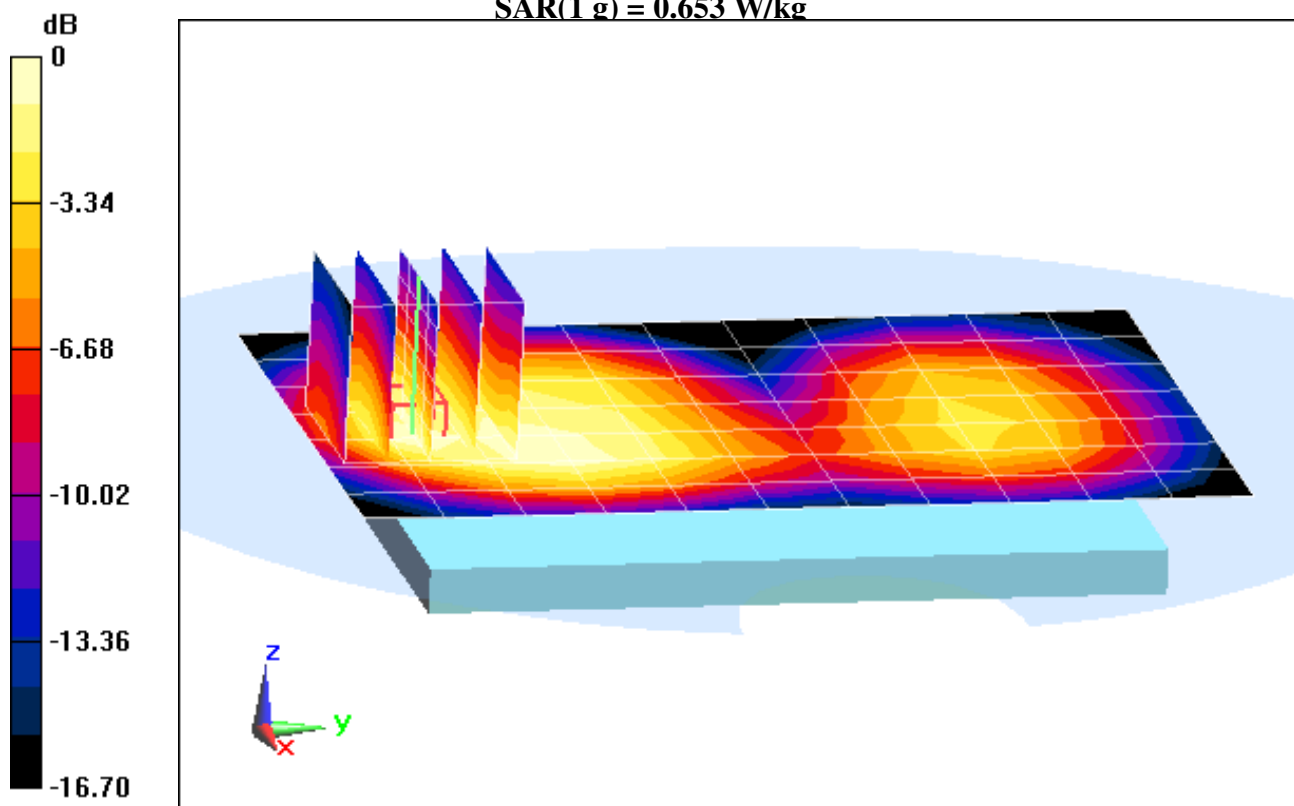
Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 22.851 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 1.11 W/kg

SAR(1 g) = 0.653 W/kg



0 dB = 0.715 W/kg = -1.46 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: 20FB4

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

Medium: 1750 Body Medium parameters used (interpolated):

$f = 1732.5 \text{ MHz}$; $\sigma = 1.49 \text{ S/m}$; $\epsilon_r = 51.172$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-04-2013; Ambient Temp: 23.9°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3288; ConvF(5.18, 5.18, 5.18); Calibrated: 9/20/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/19/2012

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

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

Mode: LTE Band 4 (AWS), Body SAR, Front side, Mid.ch

20 MHz Bandwidth, QPSK, 1 RB, 99 RB Offset, Wireless Charging Cover

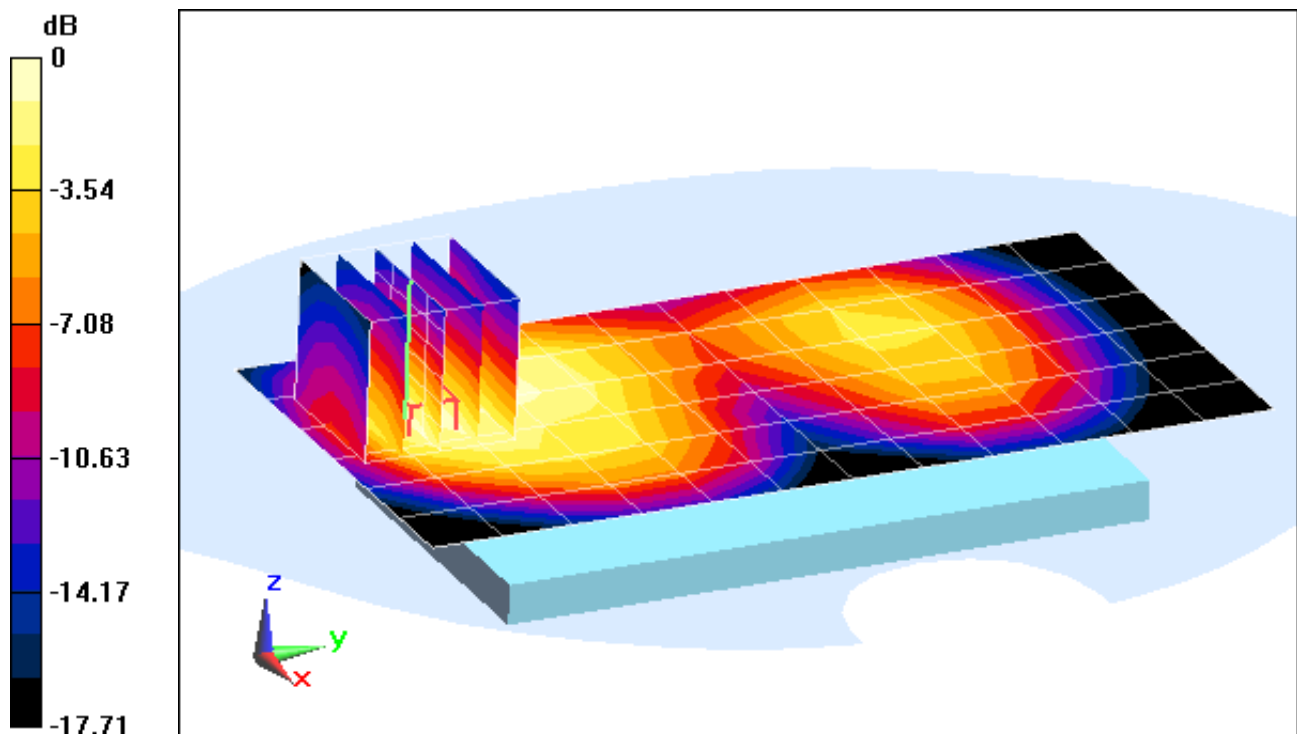
Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 24.339 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 1.354 mW/g

SAR(1 g) = 0.771 mW/g



0 dB = 0.842 mW/g = -1.49 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: 20FCA

Communication System: LTE Band 2; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.536 \text{ S/m}$; $\epsilon_r = 51.368$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-03-2013; Ambient Temp: 24.3°C; Tissue Temp: 22.9°C

Probe: ES3DV3 - SN3263; ConvF(4.76, 4.76, 4.76); Calibrated: 5/18/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 5/7/2012

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

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

Mode: LTE Band 2 (PCS), Body SAR, Back side, Mid.ch

10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset, Standard Cover

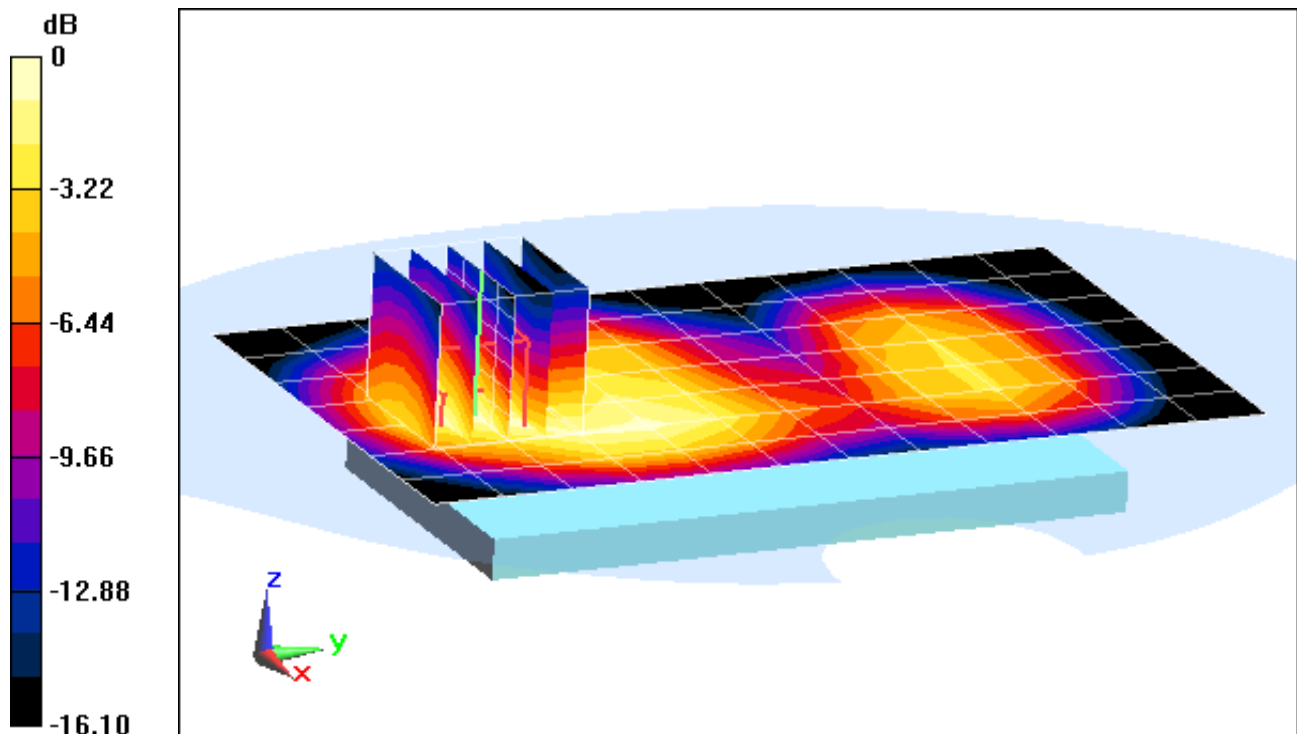
Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 20.618 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 1.050 mW/g

SAR(1 g) = 0.602 mW/g; SAR(10 g) = 0.325 mW/g



0 dB = 0.631 mW/g = -4.00 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: 20FCA

Communication System: LTE Band 2 (PCS); Frequency: 1855 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1855 \text{ MHz}$; $\sigma = 1.506 \text{ S/m}$; $\epsilon_r = 51.462$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-03-2013; Ambient Temp: 24.3°C; Tissue Temp: 22.9°C

Probe: ES3DV3 - SN3263; ConvF(4.76, 4.76, 4.76); Calibrated: 5/18/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 5/7/2012

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

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

Mode: LTE Band 2 (PCS), Body SAR, Front side, Low.ch

10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset, Standard Cover

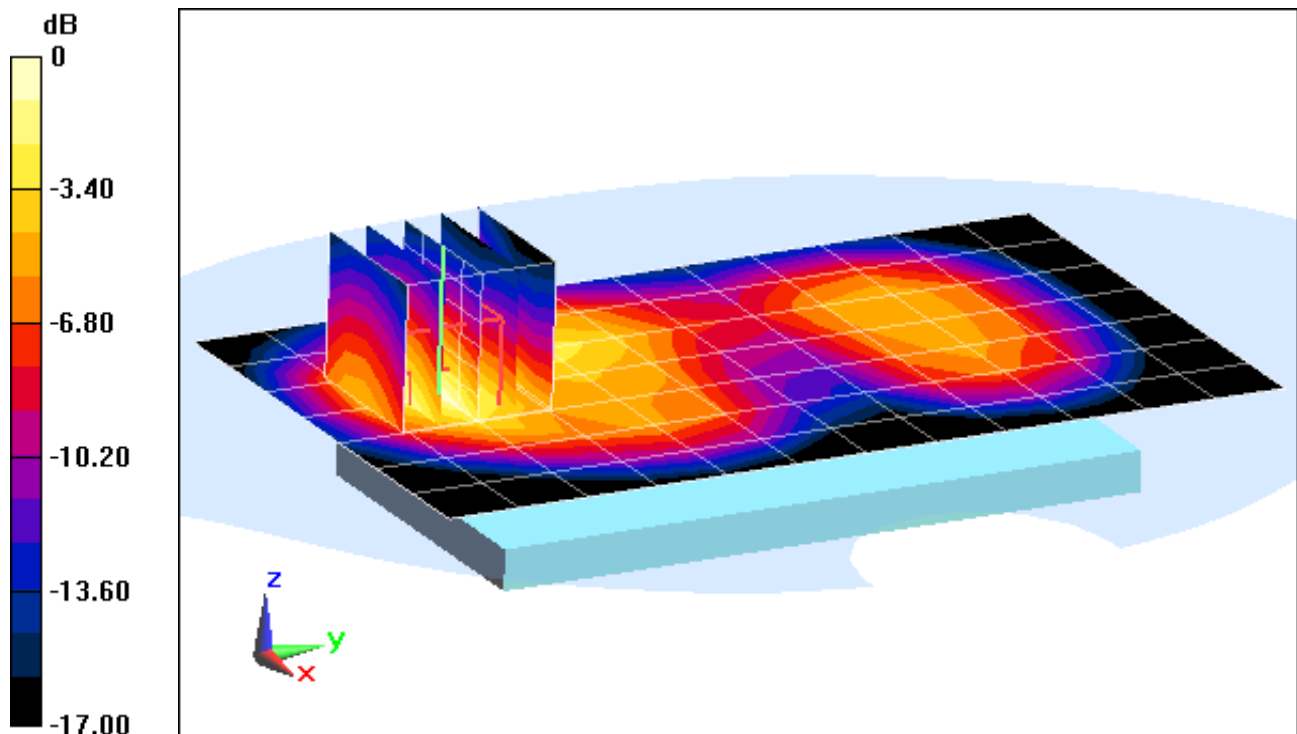
Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 26.040 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 1.661 mW/g

SAR(1 g) = 0.900 mW/g; SAR(10 g) = 0.452 mW/g



0 dB = 0.980 mW/g = -0.18 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: 22

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

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2437 \text{ MHz}$; $\sigma = 1.901 \text{ S/m}$; $\epsilon_r = 50.861$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-28-2013; Ambient Temp: 23.9°C; Tissue Temp: 23.4°C

Probe: ES3DV3 - SN3263; ConvF(4.35, 4.35, 4.35); Calibrated: 5/18/2012;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 5/7/2012

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

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

Mode: IEEE 802.11b, Body SAR, Ch 06, 1 Mbps, Back Side, Wireless Charging Cover

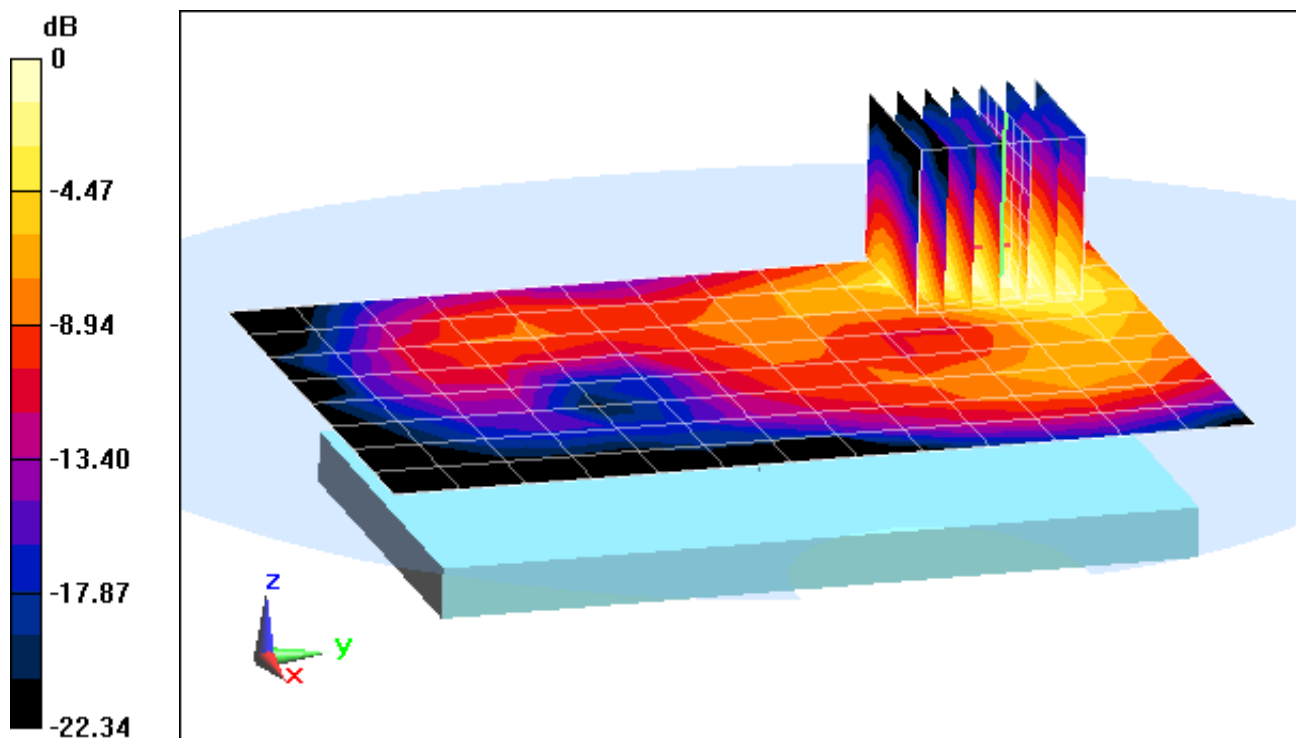
Area Scan (8x14x1): Measurement grid: dx=12mm, dy=12mm

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

Reference Value = 9.527 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 0.343 mW/g

SAR(1 g) = 0.167 mW/g



0 dB = 0.190 mW/g = -14.43 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: #002

Communication System: IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5300 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5300 \text{ MHz}$; $\sigma = 5.258 \text{ S/m}$; $\epsilon_r = 47.31$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-06-2013; Ambient Temp: 24.2°C; Tissue Temp: 23.0°C

Probe: EX3DV4 - SN3589; ConvF(3.81, 3.81, 3.81); Calibrated: 1/17/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/17/2013

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

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.8 (7028)

Mode: IEEE 802.11a, 5.3 GHz, Body SAR, Ch 60, 6 Mbps, Back Side, Standard Cover

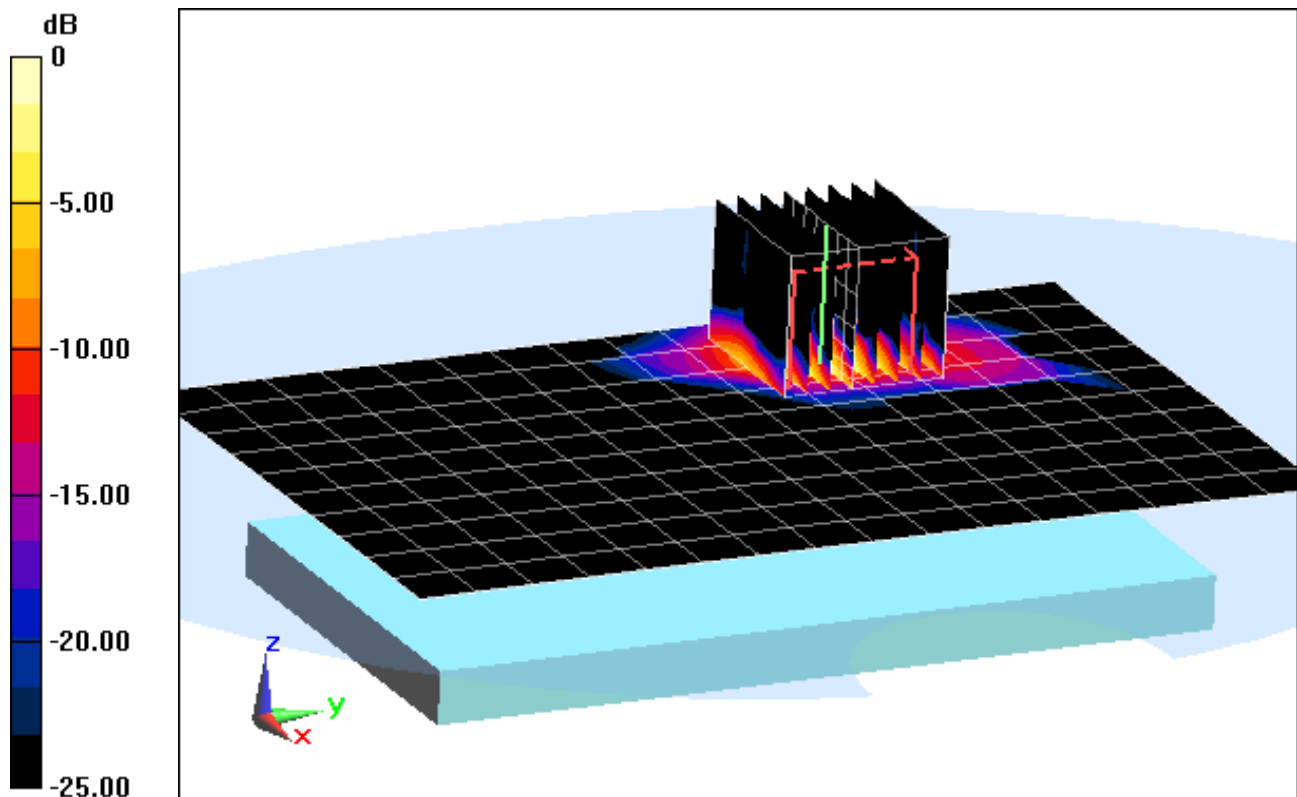
Area Scan (11x17x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 10.033 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 2.20 W/kg

SAR(1 g) = 0.459 W/kg; SAR(10 g) = 0.135 W/kg



0 dB = 1.17 W/kg = 0.68 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSGHM919; Type: Portable Handset; Serial: #002

Communication System: IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5745 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5745 \text{ MHz}$; $\sigma = 5.887 \text{ S/m}$; $\epsilon_r = 46.27$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-06-2013; Ambient Temp: 24.2°C; Tissue Temp: 23.0°C

Probe: EX3DV4 - SN3589; ConvF(3.66, 3.66, 3.66); Calibrated: 1/17/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/17/2013

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

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.8 (7028)

Mode: IEEE 802.11a, 5.8 GHz, Body SAR, Ch 149, 6 Mbps, Back Side, Standard Cover

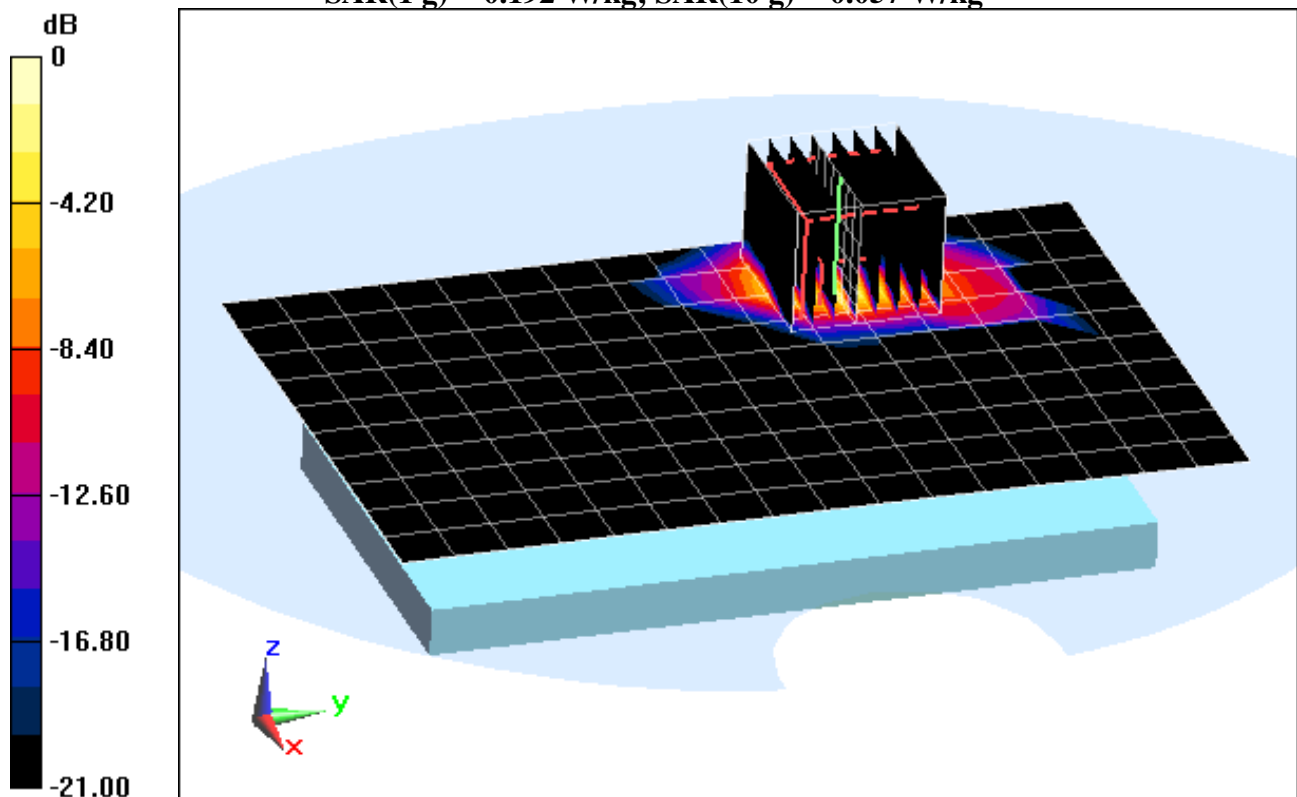
Area Scan (11x17x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 6.289 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 0.884 W/kg

SAR(1 g) = 0.192 W/kg; SAR(10 g) = 0.057 W/kg



0 dB = 0.545 W/kg = -2.64 dBW/kg

APPENDIX B: SYSTEM VERIFICATION

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: CW; Frequency: 750 MHz; Duty Cycle: 1:1

Medium: 750 Head Medium parameters used (interpolated):

$f = 750 \text{ MHz}$; $\sigma = 0.904 \text{ S/m}$; $\epsilon_r = 40.604$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 02-12-2013; Ambient Temp: 21.9°C; Tissue Temp: 22.0°C

Probe: ES3DV2 - SN3022; ConvF(6.3, 6.3, 6.3); Calibrated: 8/28/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/24/2012

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

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.8 (7028)

750MHz System Verification

Area Scan (7x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

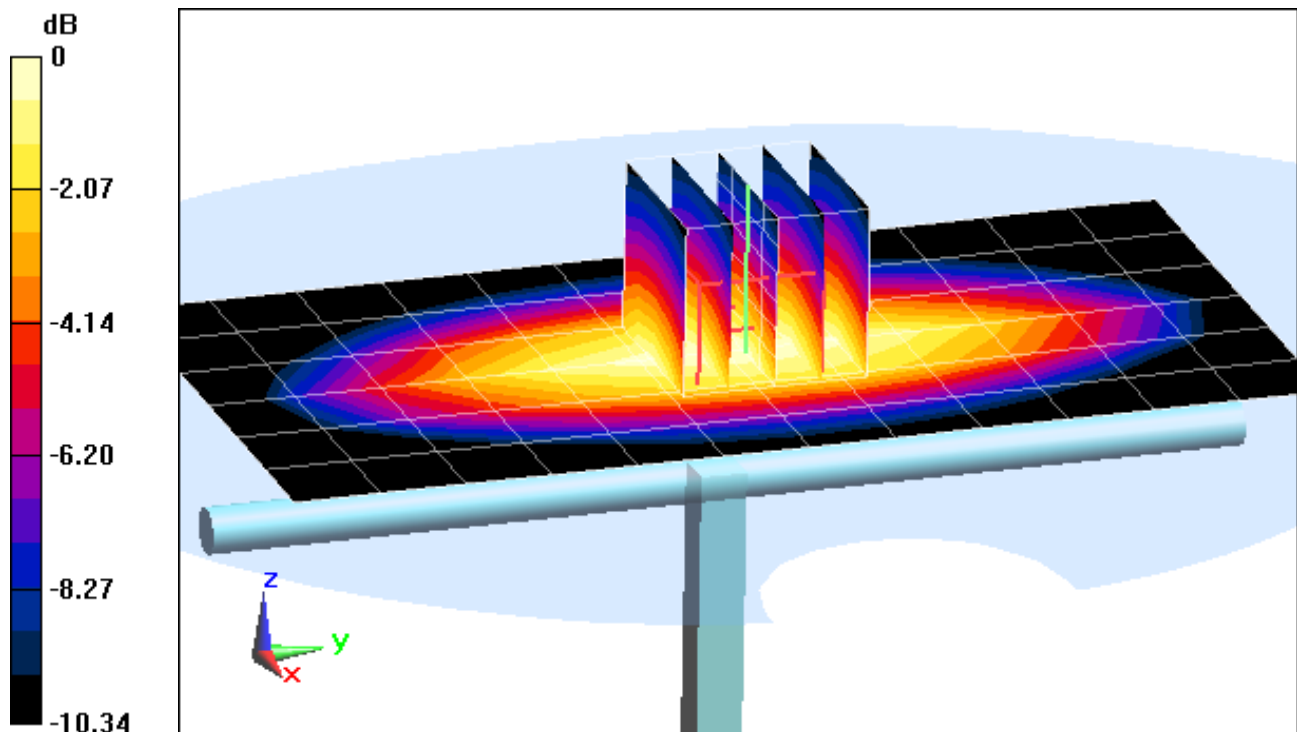
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 22.3 dBm (170 mW)

Peak SAR (extrapolated) = 2.10 W/kg

SAR(1 g) = 1.43 W/kg; SAR(10 g) = 0.941 W/kg

Deviation = -0.57%



0 dB = 1.54 W/kg = 1.88 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 835MHz; Type: D835V2; Serial: 4d026

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: 835 Head Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 0.928 \text{ S/m}$; $\epsilon_r = 40.46$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 02-08-2013; Ambient Temp: 24.4°C; Tissue Temp: 23.3°C

Probe: ES3DV2 - SN3022; ConvF(6.03, 6.03, 6.03); Calibrated: 8/28/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/24/2012

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

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.8 (7028)

835MHz System Verification

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

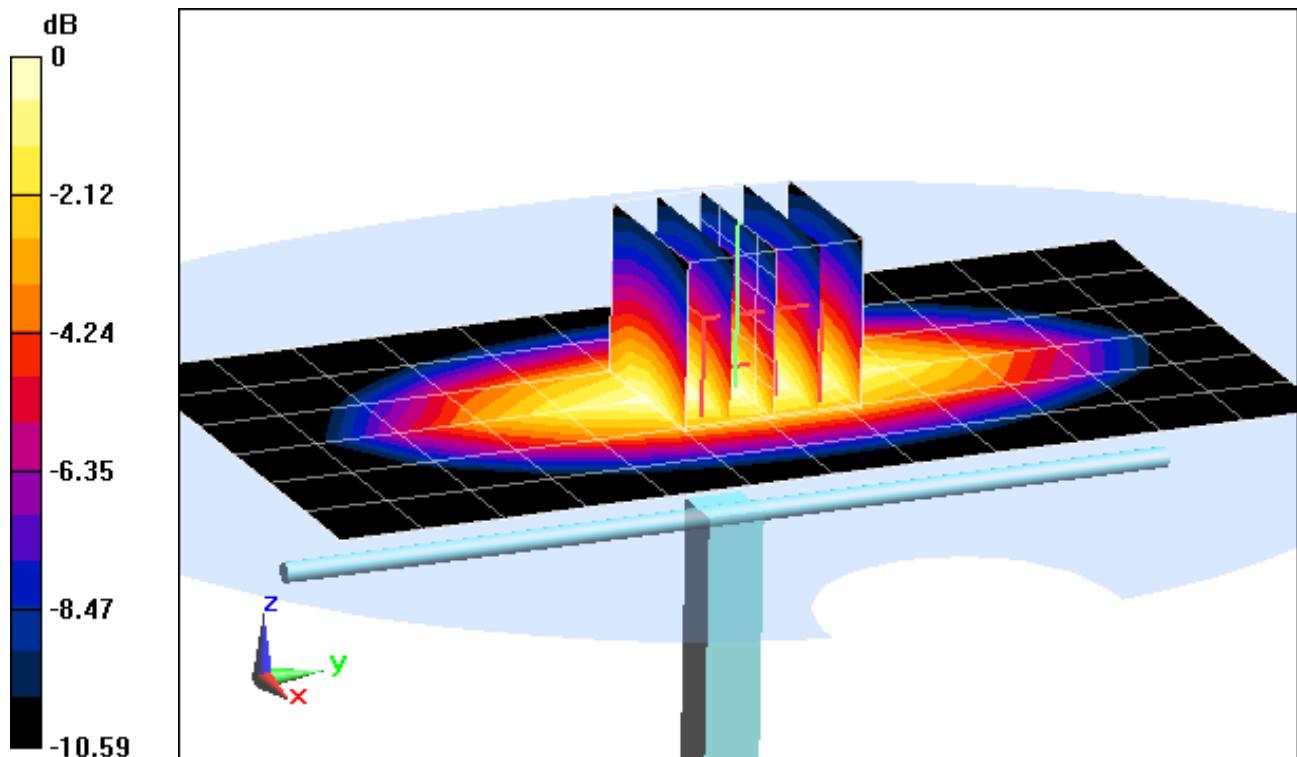
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 1.43 W/kg

SAR(1 g) = 0.970 W/kg; SAR(10 g) = 0.633 W/kg

Deviation = 3.30%



0 dB = 1.05 W/kg = 0.21 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: 835 Head Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 0.912 \text{ S/m}$; $\epsilon_r = 40.942$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 02-11-2013; Ambient Temp: 24.4°C; Tissue Temp: 23.4°C

Probe: ES3DV2 - SN3022; ConvF(6.03, 6.03, 6.03); Calibrated: 8/28/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/24/2012

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.8 (7028)

835MHz System Verification

Area Scan (7x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

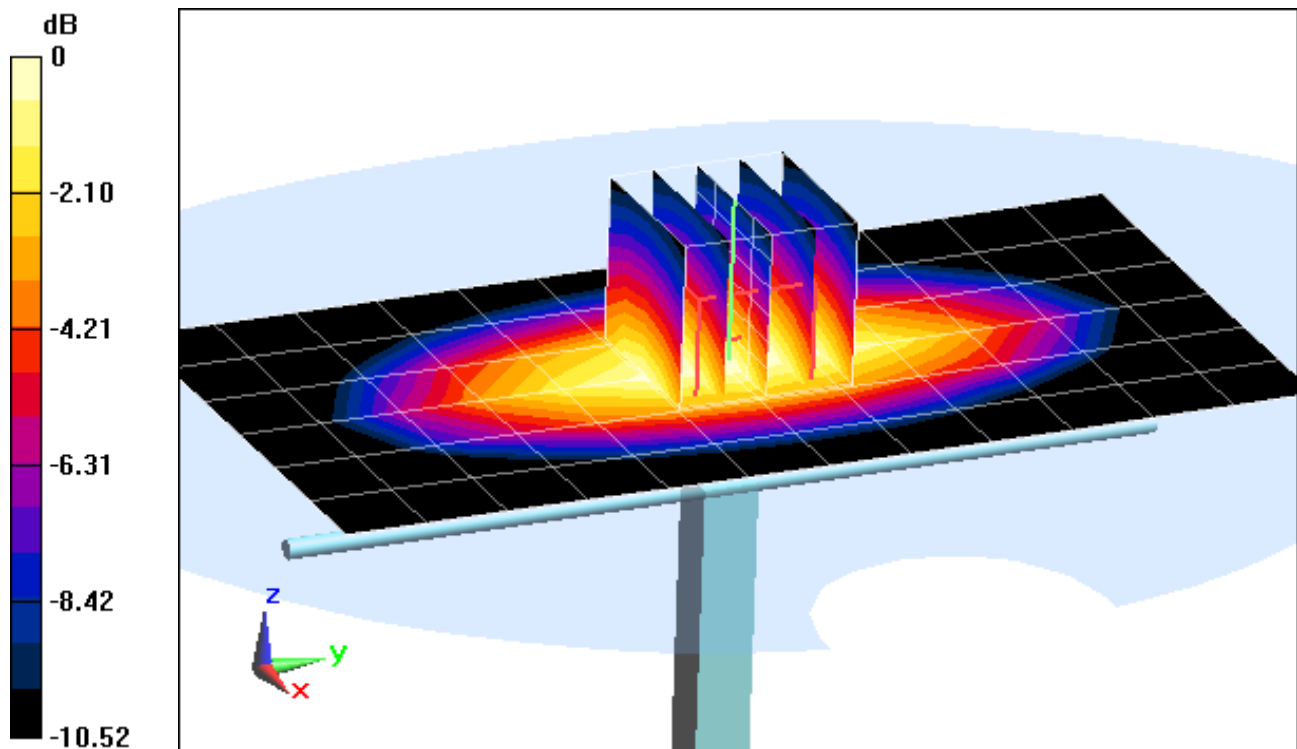
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 1.46 W/kg

SAR(1 g) = 0.993 W/kg; SAR(10 g) = 0.651 W/kg

Deviation = 5.41%



0 dB = 1.08 W/kg = 0.33 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium: 1750 Head Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.368 \text{ S/m}$; $\epsilon_r = 39.83$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 02-08-2013; Ambient Temp: 23.4°C; Tissue Temp: 21.4°C

Probe: ES3DV3 - SN3288; ConvF(5.51, 5.51, 5.51); Calibrated: 9/20/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/19/2012

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

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

1750 MHz System Verification

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

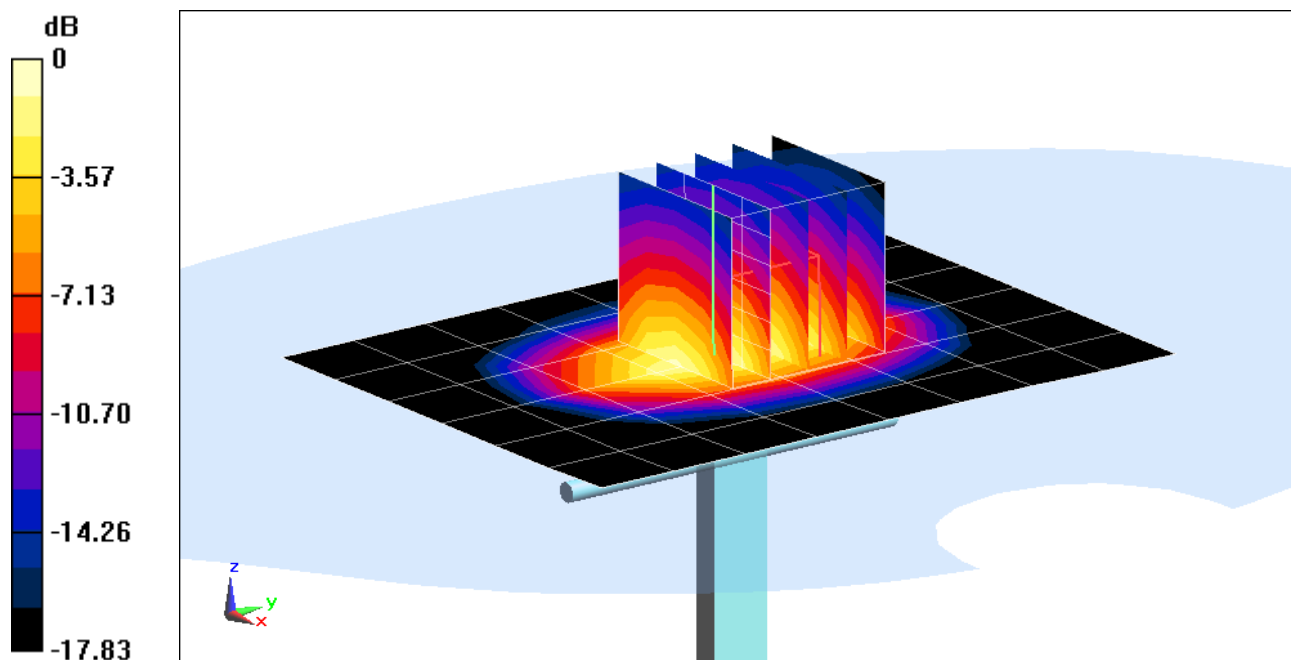
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power: 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 6.24 W/kg

SAR(1 g) = 3.44 W/kg; SAR(10 g) = 1.82 W/kg

Deviation: -6.01%



0 dB = 3.79 W/kg = 5.79 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1008

Communication System: CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium: 1750 Head Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.396 \text{ S/m}$; $\epsilon_r = 40.363$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 03-03-2013; Ambient Temp: 24.3°C; Tissue Temp: 21.6°C

Probe: EX3DV4 - SN3589; ConvF(7.34, 7.34, 7.34); Calibrated: 1/17/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/17/2013

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

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.8 (7028)

1750 MHz System Verification

Area Scan (6x6x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

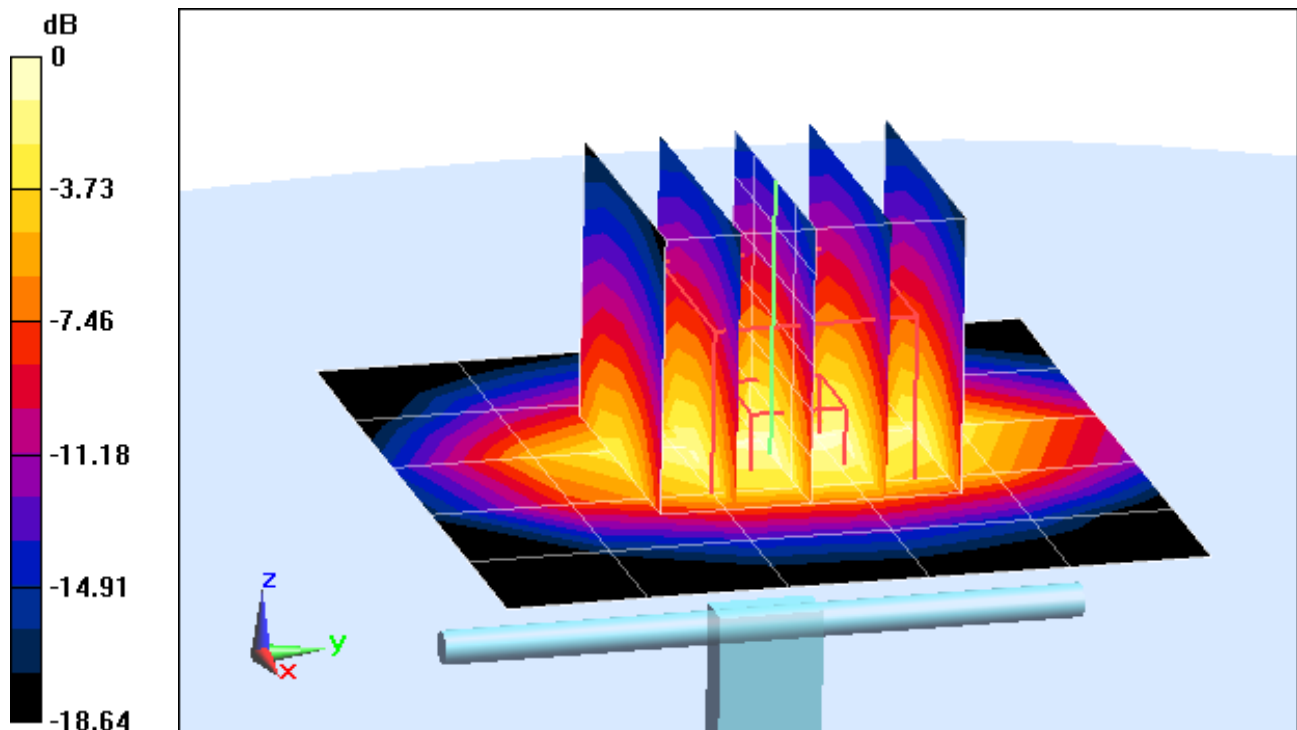
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 6.94 mW/g

SAR(1 g) = 3.7 mW/g; SAR(10 g) = 1.9 mW/g

Deviation = 1.65%



0 dB = 4.40 mW/g = 12.87 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: 1900 Head Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.45 \text{ S/m}$; $\epsilon_r = 39.137$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-11-2013; Ambient Temp: 22.8°C; Tissue Temp: 21.3°C

Probe: ES3DV3 - SN3213; ConvF(5.02, 5.02, 5.02); Calibrated: 4/24/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/19/2012

Phantom: SAM Right; Type: QD000P40CD; Serial: 1686

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

1900 MHz System Verification

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

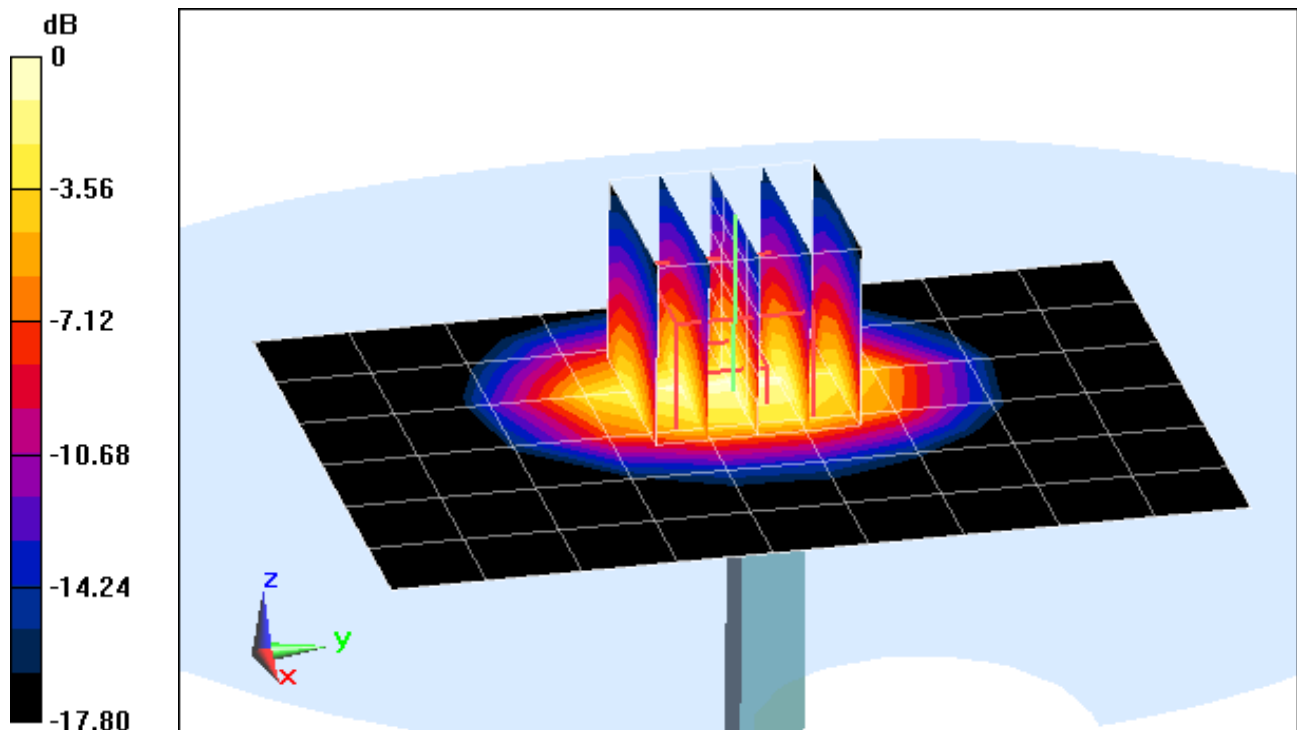
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 7.69 W/kg

SAR(1 g) = 4.15 W/kg; SAR(10 g) = 2.14 W/kg

Deviation = 5.60%



0 dB = 4.67 W/kg = 6.69 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: 1900 Head Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.382 \text{ S/m}$; $\epsilon_r = 38.095$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-12-2013; Ambient Temp: 23.0°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3263; ConvF(5.09, 5.09, 5.09); Calibrated: 5/18/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 5/7/2012

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

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

1900 MHz System Verification

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

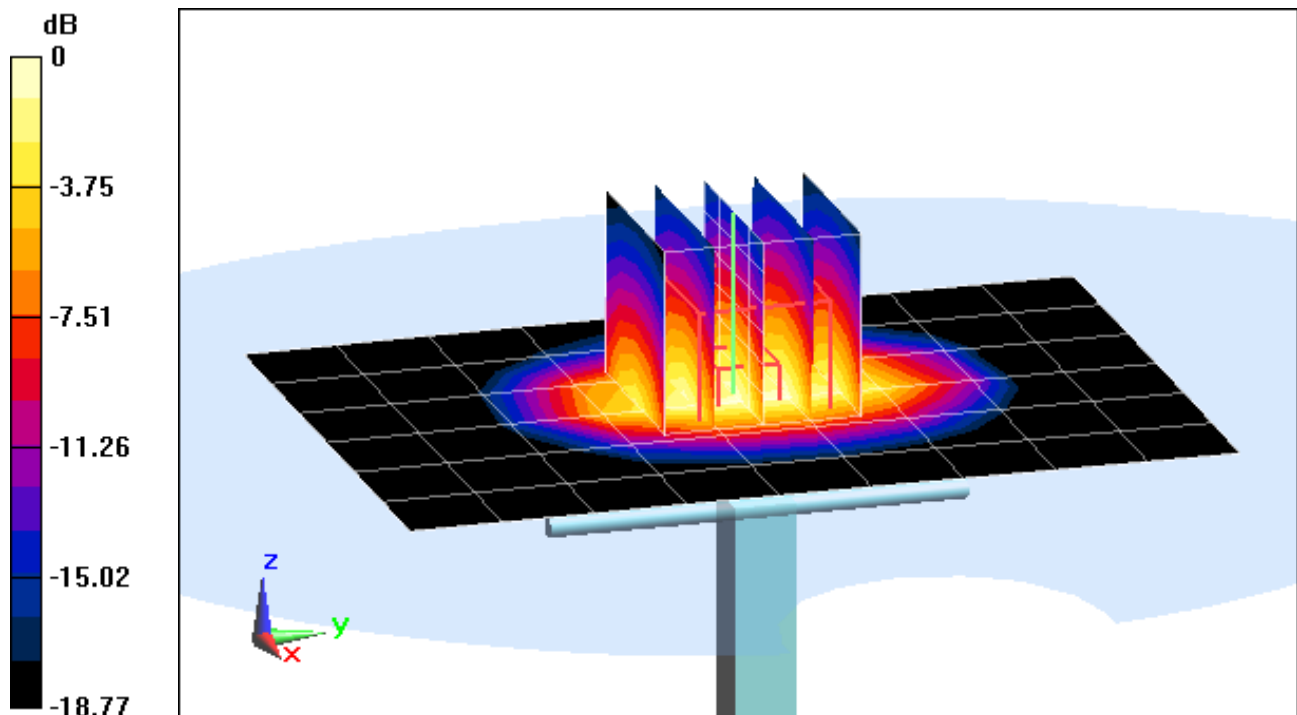
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 7.42 W/kg

SAR(1 g) = 3.87 W/kg; SAR(10 g) = 1.98 W/kg

Deviation = -1.53%



0 dB = 4.34 W/kg = 6.37 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: 1900 Head Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.41 \text{ S/m}$; $\epsilon_r = 38.618$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-04-2013; Ambient Temp: 24.3°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3263; ConvF(5.09, 5.09, 5.09); Calibrated: 5/18/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 5/7/2012

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

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

1900 MHz System Verification

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

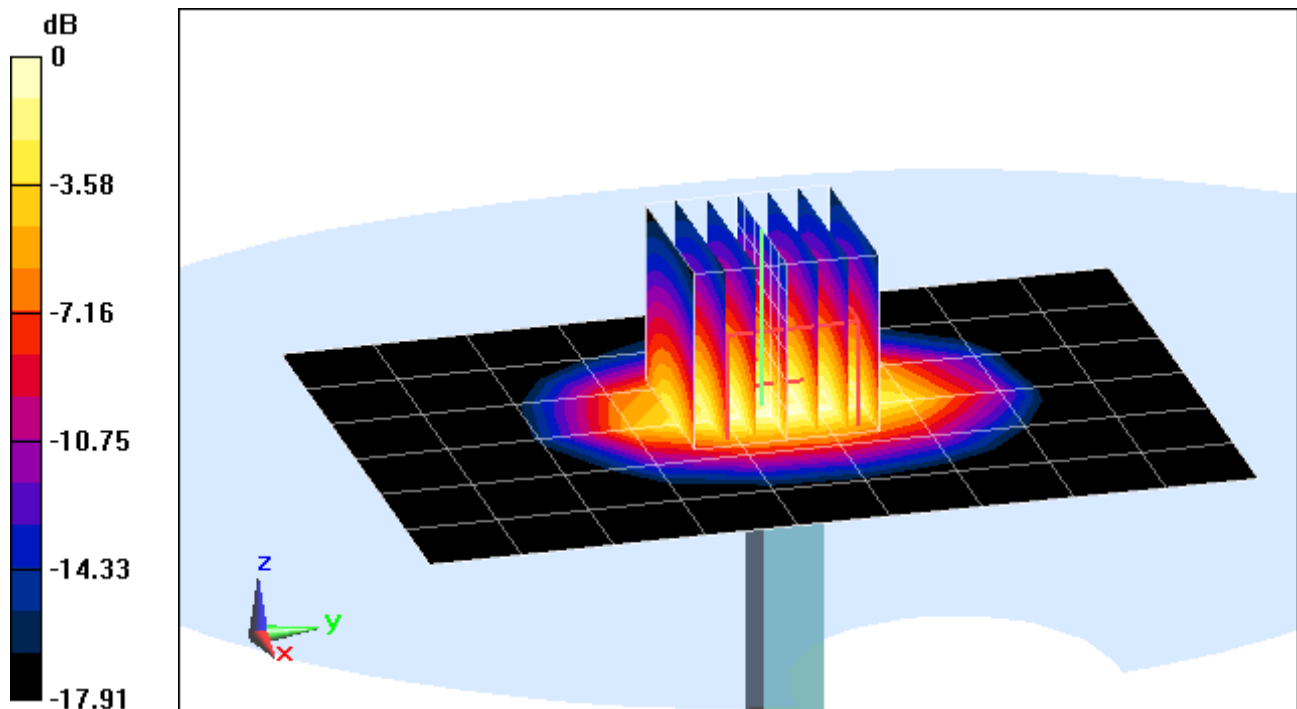
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 7.387 mW/g

SAR(1 g) = 3.94 mW/g; SAR(10 g) = 2.04 mW/g

Deviation = -0.76%



0 dB = 4.40 mW/g = 12.87 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: 2450 Head Medium parameters used:

$f = 2450 \text{ MHz}$; $\sigma = 1.876 \text{ S/m}$; $\epsilon_r = 40.58$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-25-2013; Ambient Temp: 24.4°C; Tissue Temp: 24.2°C

Probe: ES3DV2 - SN3022; ConvF(4.23, 4.23, 4.23); Calibrated: 8/28/2012;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/24/2012

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

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.8 (7028)

2450MHz System Verification

Area Scan (6x8x1): Measurement grid: dx=12mm, dy=12mm

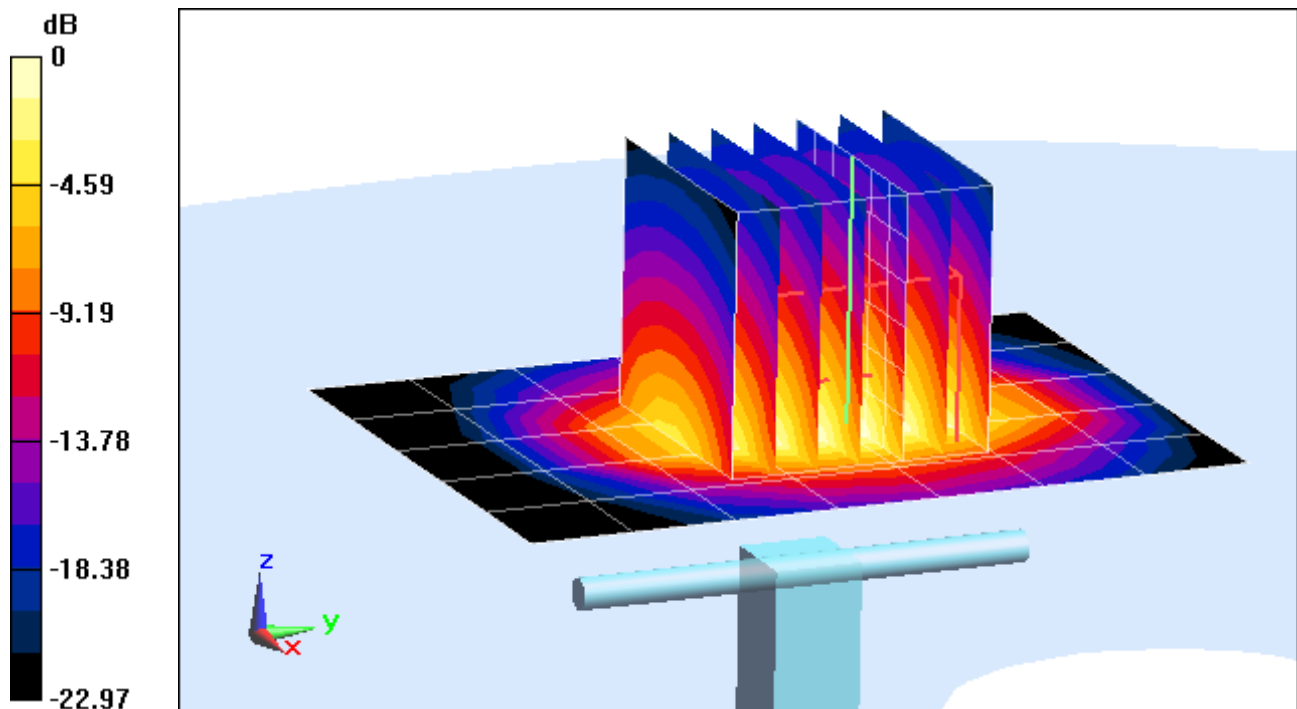
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 11.474 mW/g

SAR(1 g) = 5.33 mW/g; SAR(10 g) = 2.49 mW/g

Deviation = 1.14%



0 dB = 6.90 mW/g = 16.78 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: CW; Frequency: 5200 MHz; Duty Cycle: 1:1

Medium: 5 GHz Head Medium parameters used:

$f = 5200 \text{ MHz}$; $\sigma = 4.602 \text{ S/m}$; $\epsilon_r = 37.46$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-04-2013; Ambient Temp: 23.4°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN3589; ConvF(4.48, 4.48, 4.48); Calibrated: 1/17/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/17/2013

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.8 (7028)

5200MHz System Verification

Area Scan (7x9x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

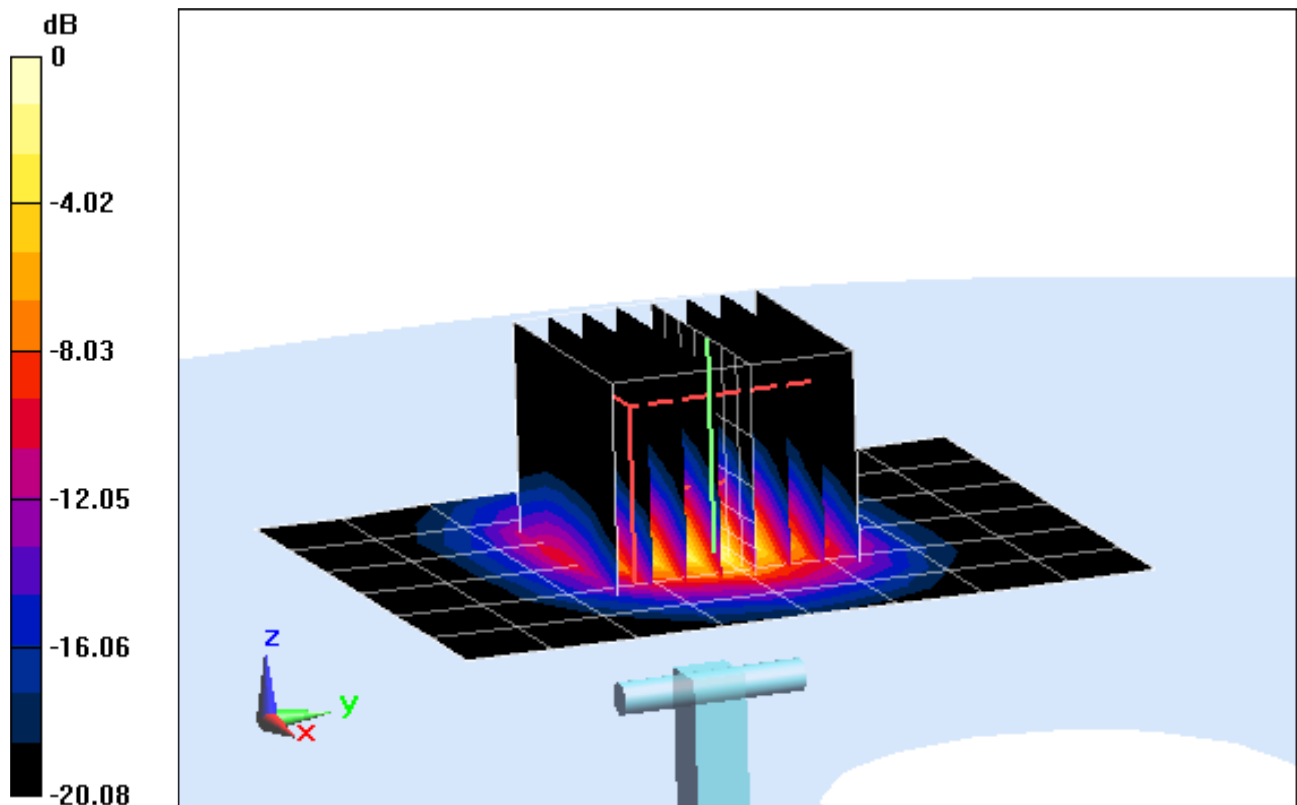
Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$, Graded Ratio=1.4

Input Power = 16 dBm (40 mW)

Peak SAR (extrapolated) = 13.4 W/kg

SAR(1 g) = 3.07 W/kg; SAR(10 g) = 0.889 W/kg

Deviation = -3.82%



0 dB = 6.94 W/kg = 8.41 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: CW; Frequency: 5300 MHz; Duty Cycle: 1:1

Medium: 5 GHz Head Medium parameters used:

$f = 5300 \text{ MHz}$; $\sigma = 4.794 \text{ S/m}$; $\epsilon_r = 36.73$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-04-2013; Ambient Temp: 23.4°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN3589; ConvF(4.27, 4.27, 4.27); Calibrated: 1/17/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/17/2013

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.8 (7028)

5300MHz System Verification

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

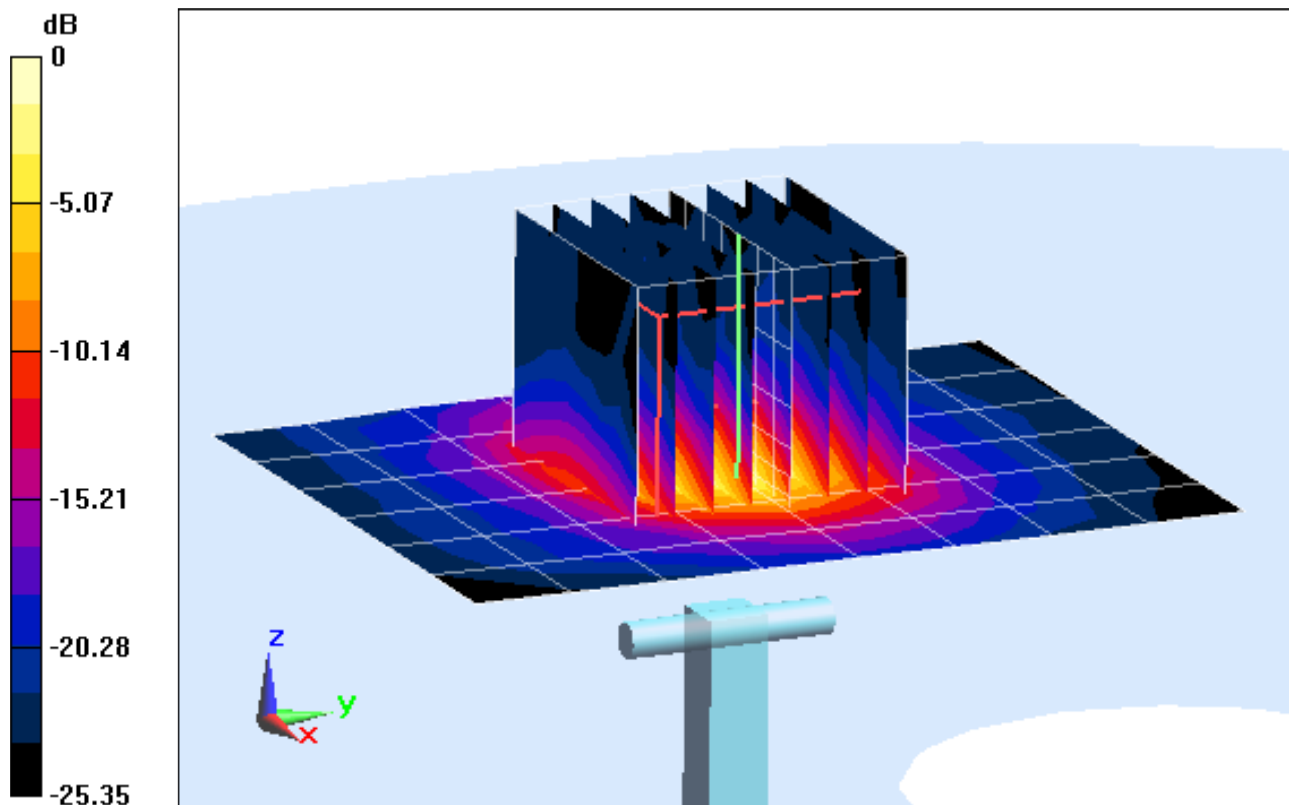
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm, Graded Ratio=1.4

Input Power = 16 dBm (40 mW)

Peak SAR (extrapolated) = 14.6 W/kg

SAR(1 g) = 3.12 W/kg; SAR(10 g) = 0.892 W/kg

Deviation = -6.14%



0 dB = 7.71 W/kg = 8.87 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5500 MHz; Type: D5GHzV2; Serial: 1007

Communication System: CW; Frequency: 5500 MHz; Duty Cycle: 1:1

Medium: 5 GHz Head Medium parameters used:

$f = 5500 \text{ MHz}$; $\sigma = 4.91 \text{ S/m}$; $\epsilon_r = 36.62$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-04-2013; Ambient Temp: 23.6°C; Tissue Temp: 22.8°C

Probe: EX3DV4 - SN3589; ConvF(4.14, 4.14, 4.14); Calibrated: 1/17/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/17/2013

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.8 (7028)

5500MHz System Verification

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

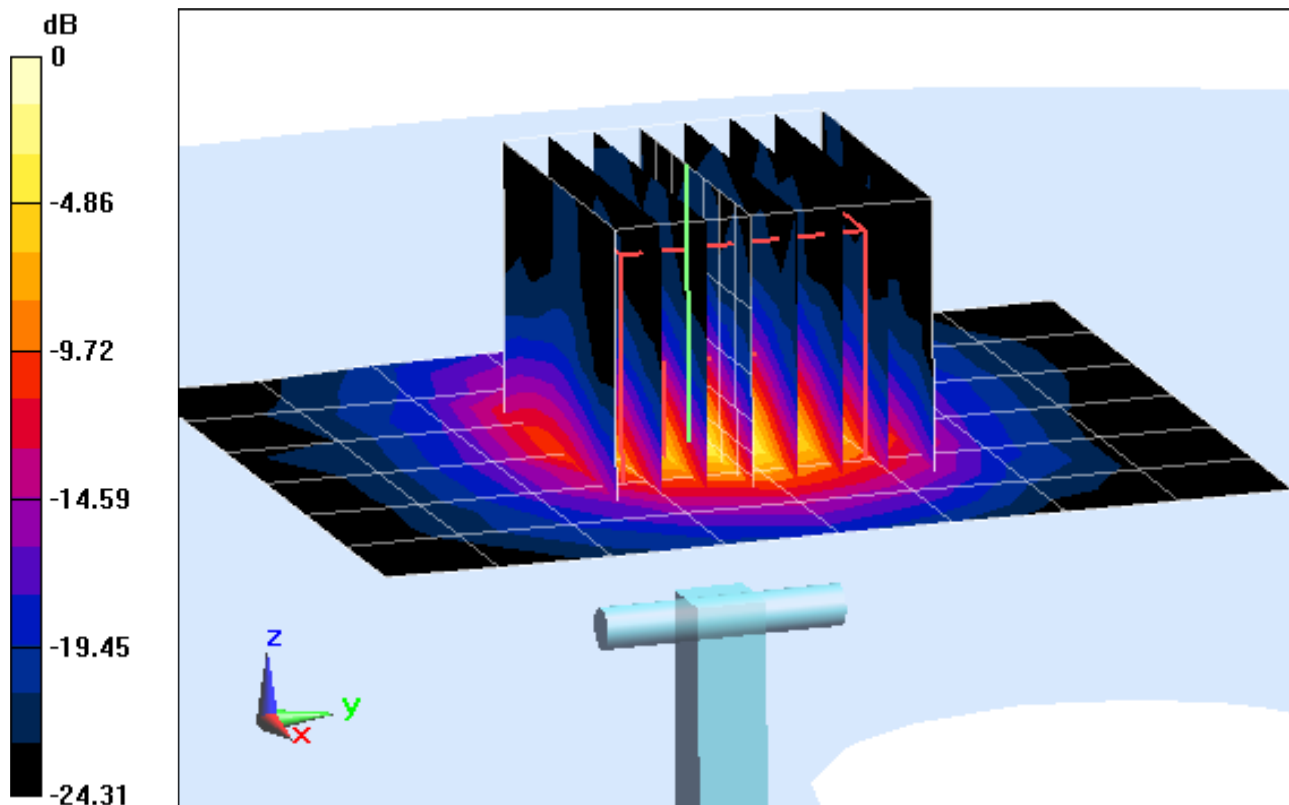
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm, Graded Ratio=1.4

Input Power = 16 dBm (40 mW)

Peak SAR (extrapolated) = 15.1 W/kg

SAR(1 g) = 3.38 W/kg; SAR(10 g) = 0.969 W/kg

Deviation = -0.47%



0 dB = 8.84 W/kg = 9.46 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: CW; Frequency: 5800 MHz; Duty Cycle: 1:1

Medium: 5 GHz Head Medium parameters used:

$f = 5800 \text{ MHz}$; $\sigma = 5.381 \text{ S/m}$; $\epsilon_r = 35.41$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-04-2013; Ambient Temp: 23.7°C; Tissue Temp: 22.9°C

Probe: EX3DV4 - SN3589; ConvF(3.85, 3.85, 3.85); Calibrated: 1/17/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/17/2013

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.8 (7028)

5800MHz System Verification

Area Scan (7x9x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

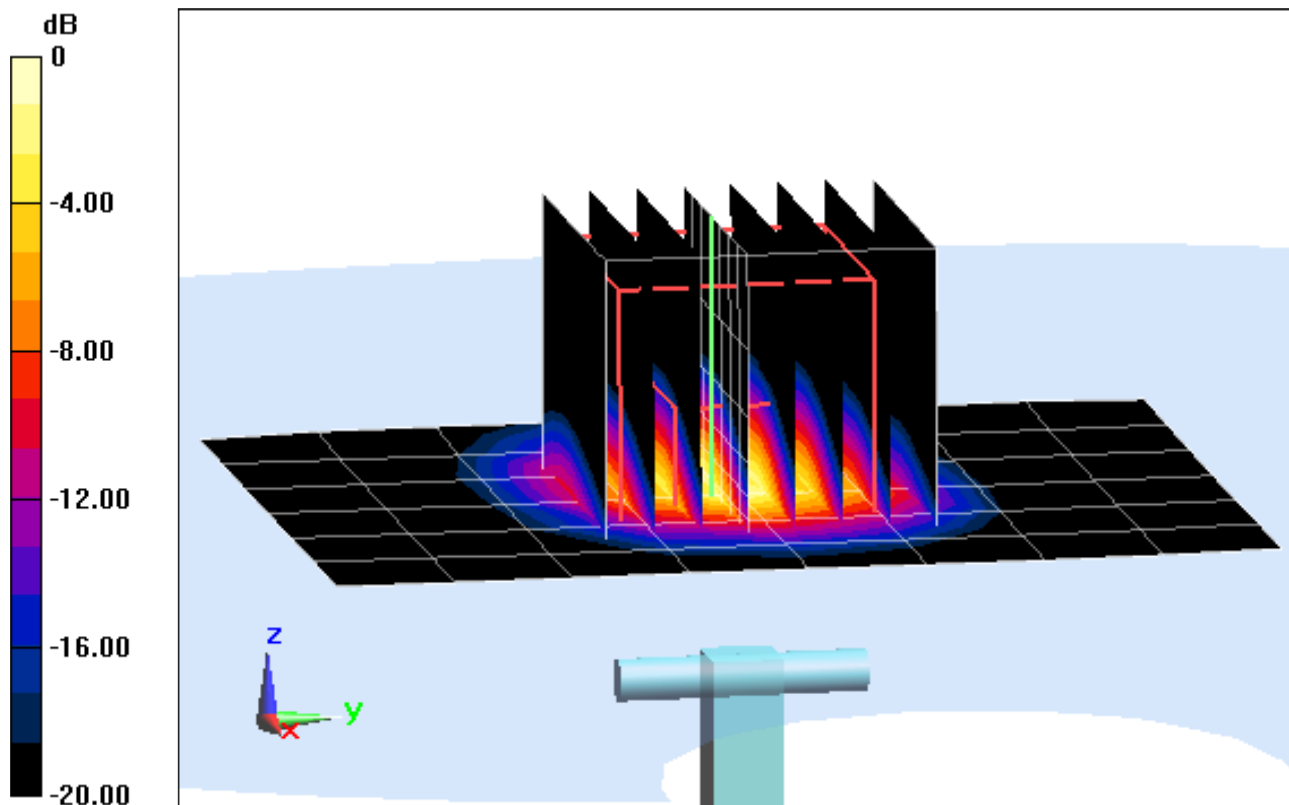
Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$, Graded Ratio=1.4

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 38.3 W/kg

SAR(1 g) = 7.65 W/kg; SAR(10 g) = 2.14 W/kg

Deviation = -4.14%



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

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: CW; Frequency: 750 MHz; Duty Cycle: 1:1

Medium: 750 Body Medium parameters used (interpolated):

$f = 750 \text{ MHz}$; $\sigma = 0.978 \text{ S/m}$; $\epsilon_r = 53.151$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 02-12-2013; Ambient Temp: 23.9°C; Tissue Temp: 23.3°C

Probe: ES3DV3 - SN3287; ConvF(6.14, 6.14, 6.14); Calibrated: 11/15/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 11/13/2012

Phantom: SAM with CRP; Type: SAM 4.0; Serial: TP1375

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.8 (7028)

750MHz System Verification

Area Scan (7x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

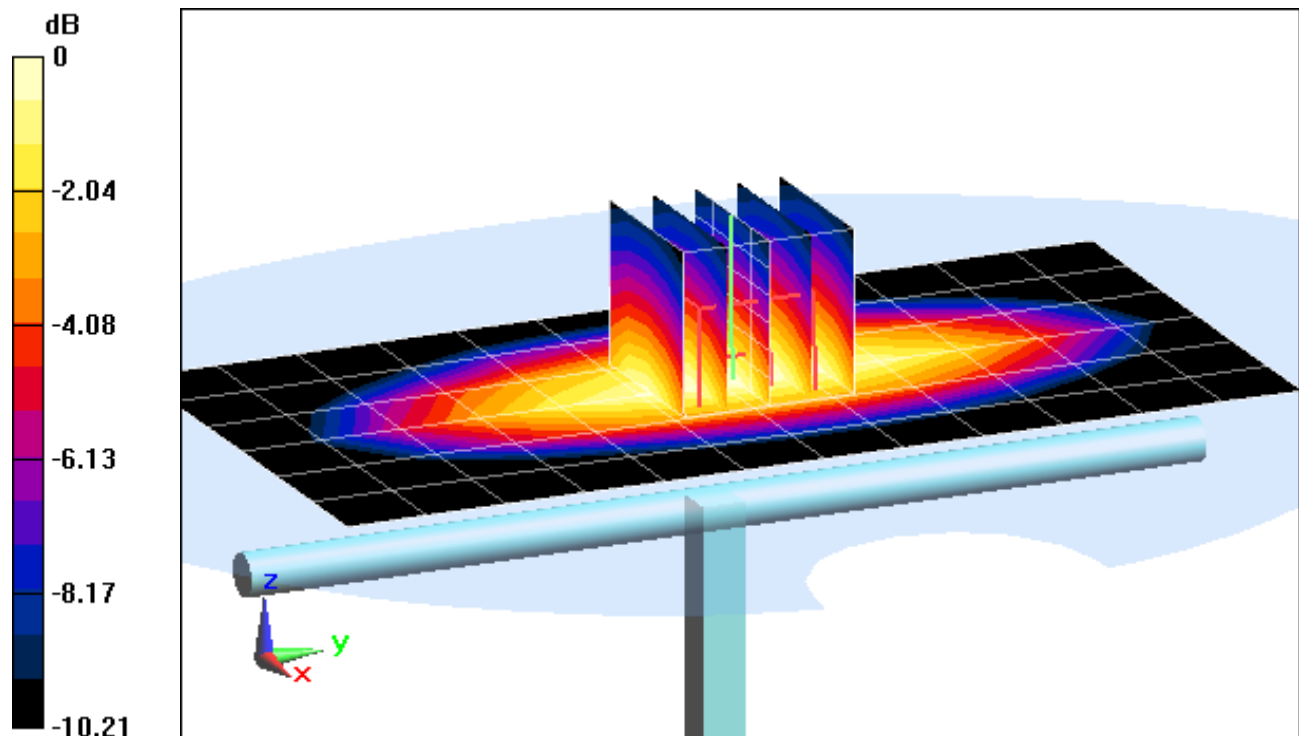
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 1.27 W/kg

SAR(1 g) = 0.887 W/kg; SAR(10 g) = 0.590 W/kg

Deviation = 0.45%



0 dB = 0.961 W/kg = -0.17 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 0.998 \text{ S/m}$; $\epsilon_r = 53.48$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 02-07-2013; Ambient Temp: 23.0°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3213; ConvF(6.07, 6.07, 6.07); Calibrated: 4/24/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/19/2012

Phantom: ELI v5.0 Door; Type: QDOVA002BB; Serial: TP-1158

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

835 MHz System Verification

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

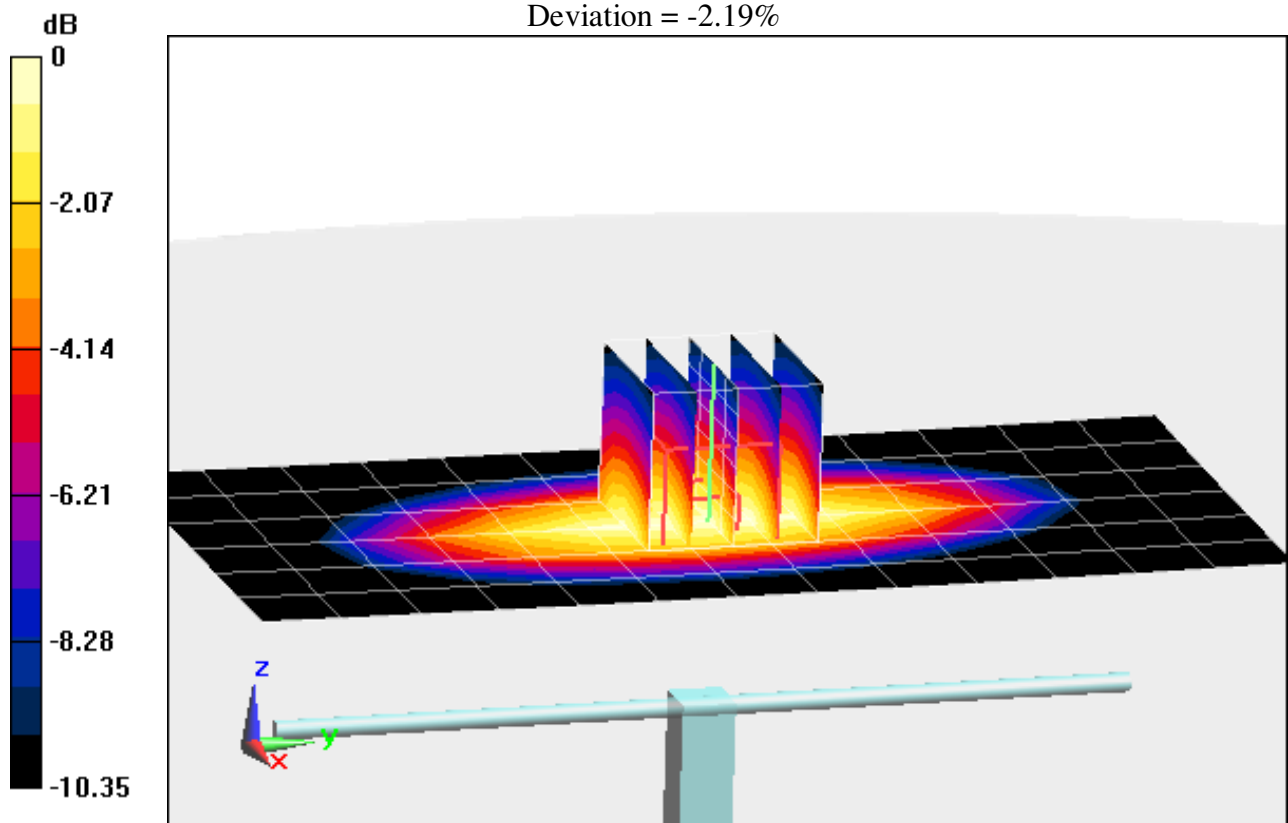
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 1.36 W/kg

SAR(1 g) = 0.939 W/kg; SAR(10 g) = 0.619 W/kg

Deviation = -2.19%



0 dB = 1.01 W/kg = 0.04 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.461 \text{ S/m}$; $\epsilon_r = 52.3$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-10-2013; Ambient Temp: 23.3°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3288; ConvF(5.18, 5.18, 5.18); Calibrated: 9/20/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/19/2012

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

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

1750 MHz System Verification

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

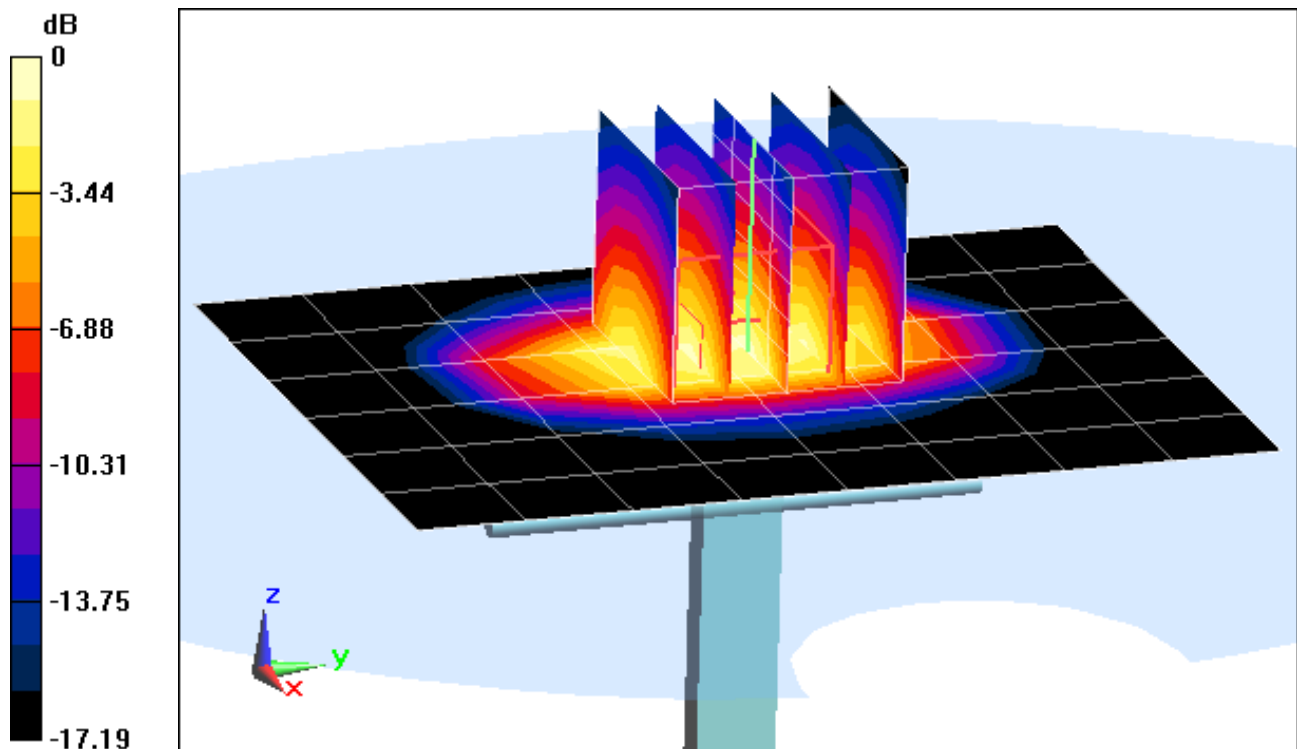
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 7.23 W/kg

SAR(1 g) = 4.04 W/kg; SAR(10 g) = 2.13 W/kg

Deviation = 7.45%



0 dB = 4.52 W/kg = 6.55 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: 1900 Body; Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.559 \text{ S/m}$; $\epsilon_r = 52.827$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-07-2013; Ambient Temp: 23.4°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3263; ConvF(4.76, 4.76, 4.76); Calibrated: 5/18/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 5/7/2012

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

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

1900 MHz System Verification

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

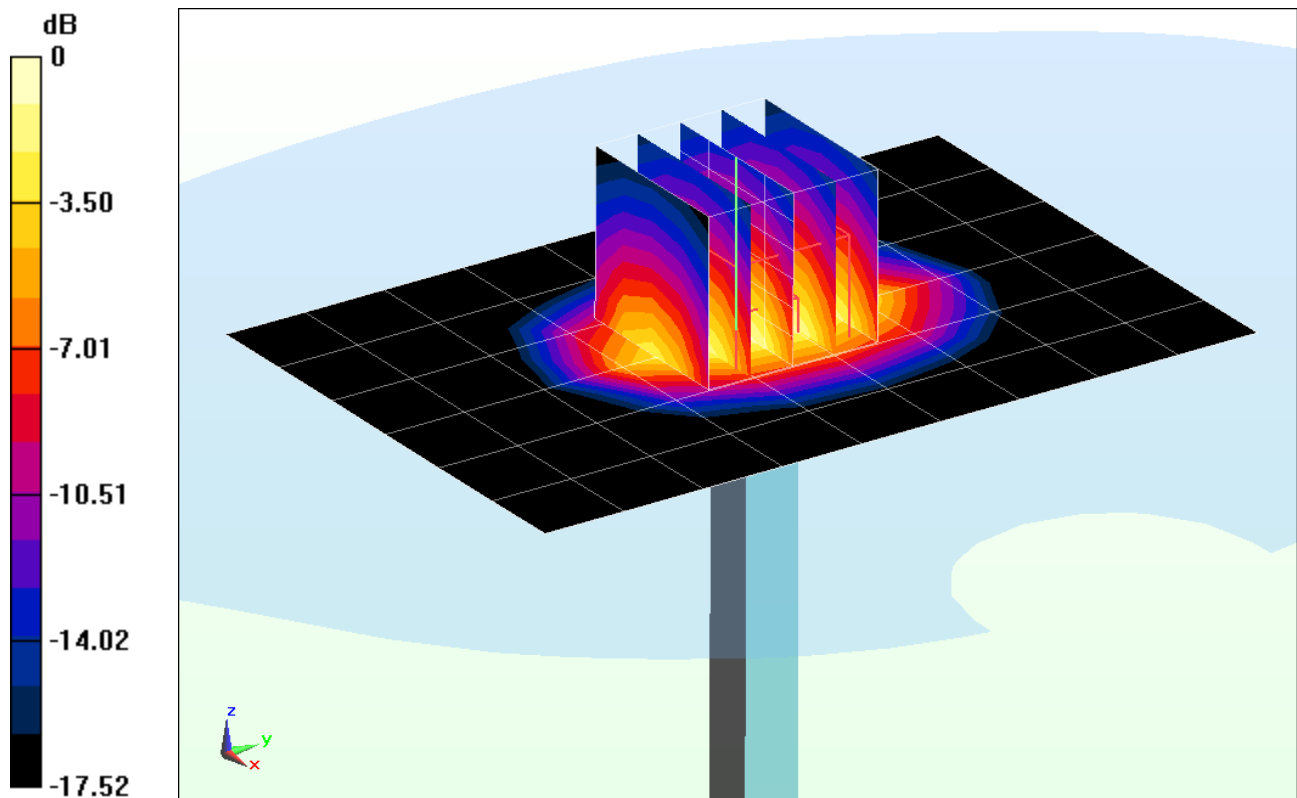
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 7.30 W/kg

SAR(1 g) = 4.02 W/kg; SAR(10 g) = 2.1 W/kg

Deviation = 2.29%



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

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.557 \text{ S/m}$; $\epsilon_r = 51.311$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-03-2013; Ambient Temp: 24.3°C; Tissue Temp: 22.9°C

Probe: ES3DV3 - SN3263; ConvF(4.76, 4.76, 4.76); Calibrated: 5/18/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 5/7/2012

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

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

1900 MHz System Verification

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

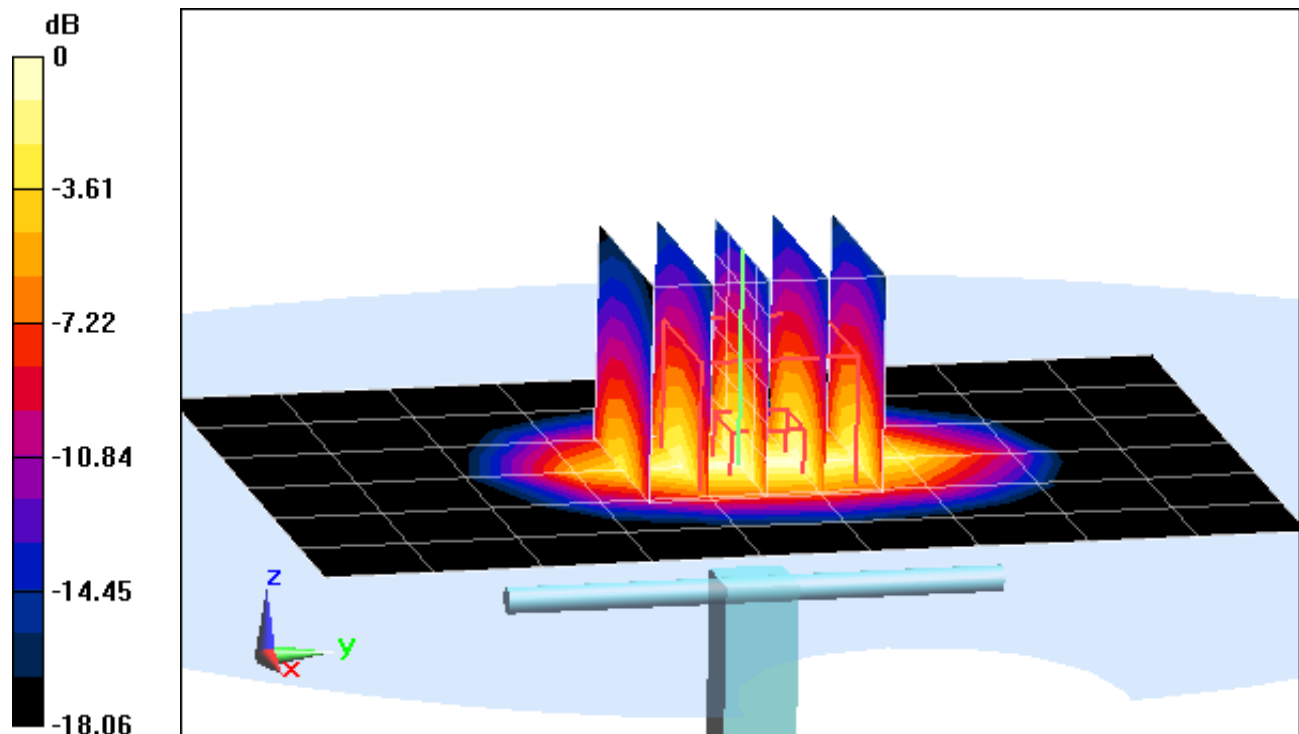
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 7.598 mW/g

SAR(1 g) = 4.14 mW/g; SAR(10 g) = 2.15 mW/g

Deviation = 1.47%



0 dB = 4.61 mW/g = 13.27 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: 1900 Body; Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.574 \text{ S/m}$; $\epsilon_r = 52.321$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-05-2013; Ambient Temp: 24.6°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN3920; ConvF(7.38, 7.38, 7.38); Calibrated: 2/27/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 2/6/2013

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

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

1900 MHz System Verification

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

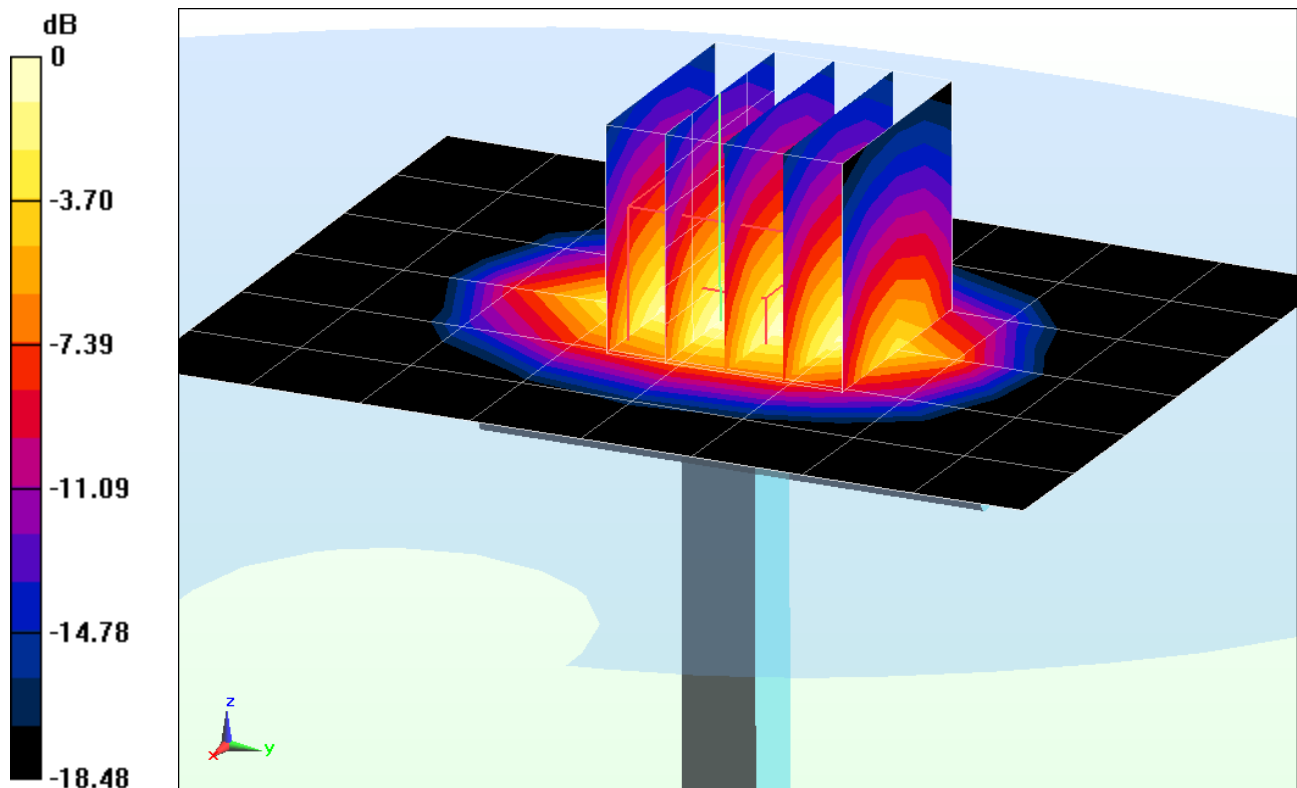
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 7.66 W/kg

SAR(1 g) = 4.16 W/kg; SAR(10 g) = 2.15 W/kg

Deviation = 1.96%



0 dB = 4.59 W/kg = 6.62 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 882

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: 2450 Body Medium parameters used:

$f = 2450 \text{ MHz}$; $\sigma = 1.916 \text{ S/m}$; $\epsilon_r = 50.813$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-28-2013; Ambient Temp: 23.9°C; Tissue Temp: 23.4°C

Probe: ES3DV3 - SN3263; ConvF(4.35, 4.35, 4.35); Calibrated: 5/18/2012;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 5/7/2012

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

Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

2450 MHz System Verification

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

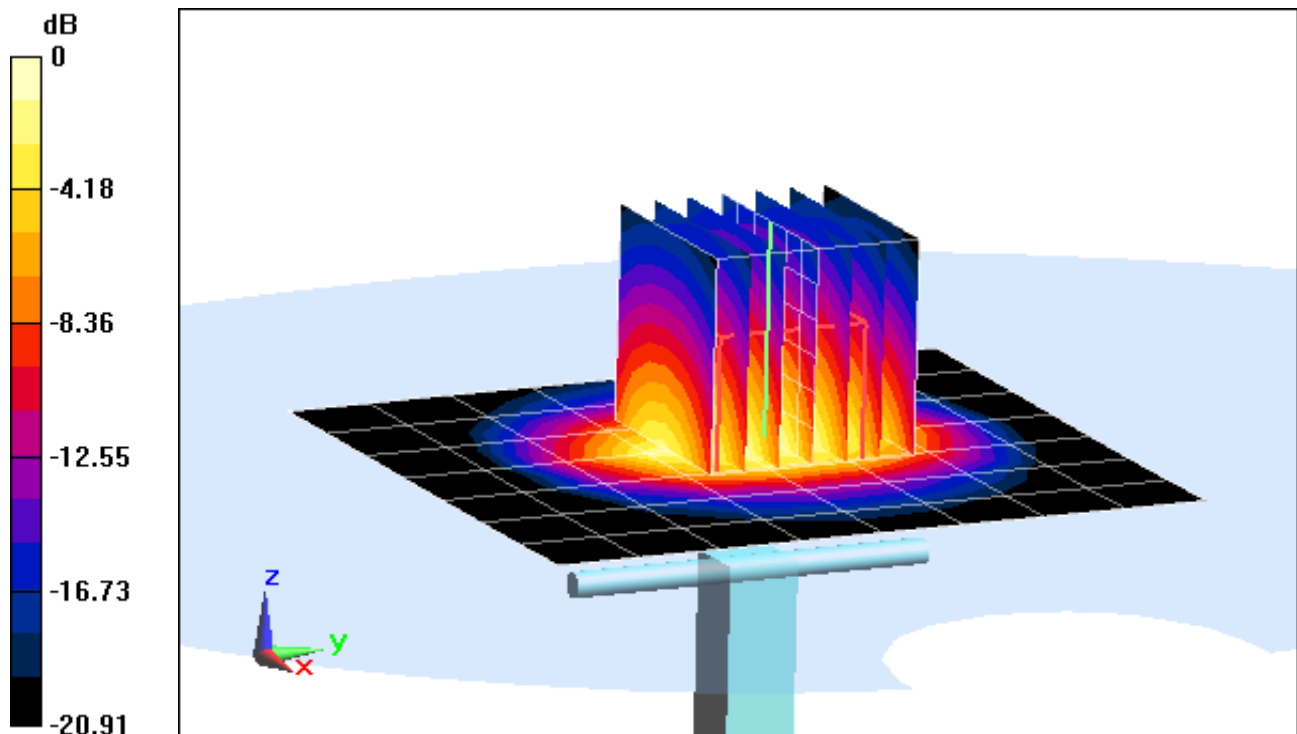
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 10.285 mW/g

SAR(1 g) = 4.95 mW/g; SAR(10 g) = 2.31 mW/g

Deviation = -0.80%



0 dB = 5.66 mW/g = 15.06 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: CW; Frequency: 5200 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5200 \text{ MHz}$; $\sigma = 5.106 \text{ S/m}$; $\epsilon_r = 47.54$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-06-2013; Ambient Temp: 24.1°C; Tissue Temp: 23.2°C

Probe: EX3DV4 - SN3589; ConvF(3.99, 3.99, 3.99); Calibrated: 1/17/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/17/2013

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

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.8 (7028)

5200MHz System Verification

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

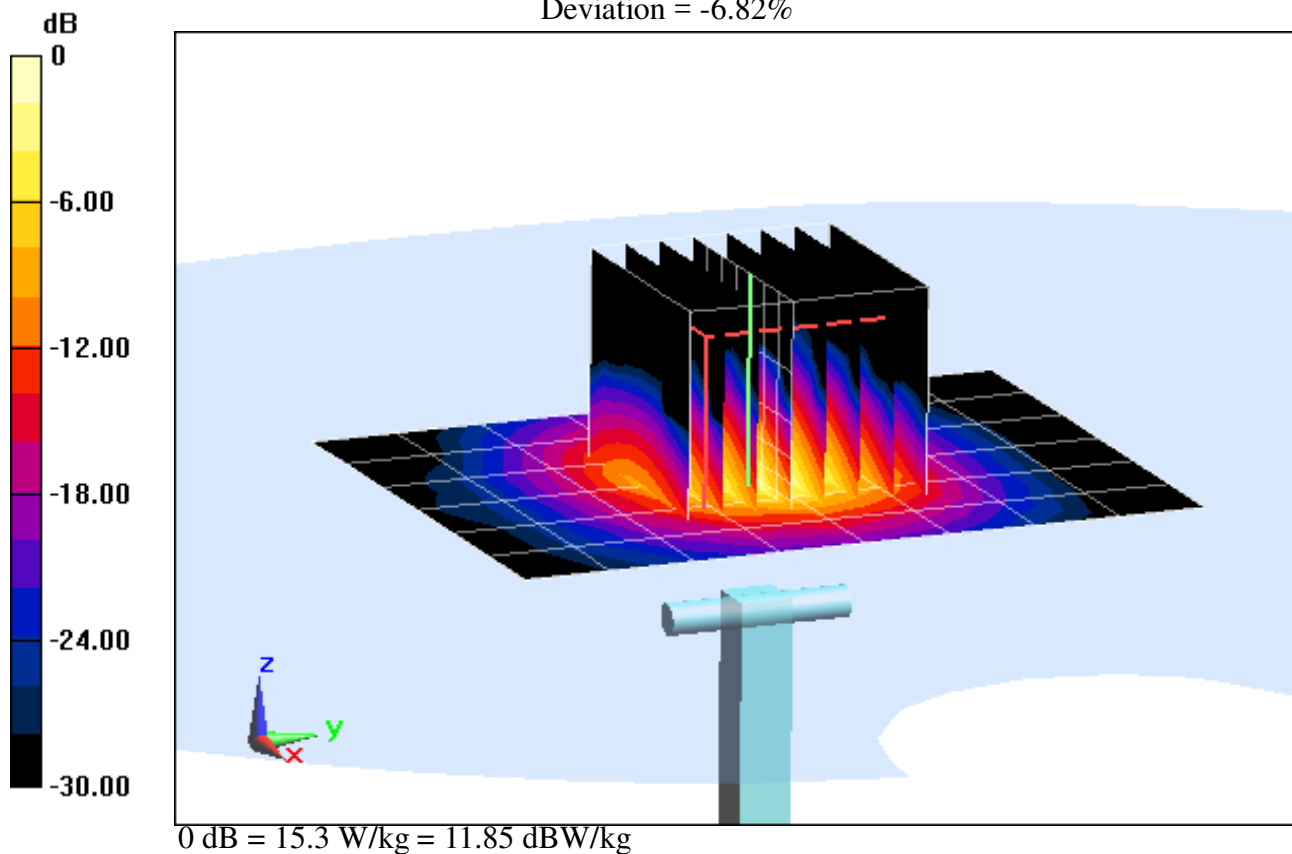
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm, Graded Ratio=1.4

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 31.2 W/kg

SAR(1 g) = 6.83 W/kg; SAR(10 g) = 1.94 W/kg

Deviation = -6.82%



PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: CW; Frequency: 5300 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5300 \text{ MHz}$; $\sigma = 5.258 \text{ S/m}$; $\epsilon_r = 47.31$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-06-2013; Ambient Temp: 24.2°C; Tissue Temp: 23.0°C

Probe: EX3DV4 - SN3589; ConvF(3.81, 3.81, 3.81); Calibrated: 1/17/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/17/2013

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

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.8 (7028)

5300MHz System Verification

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

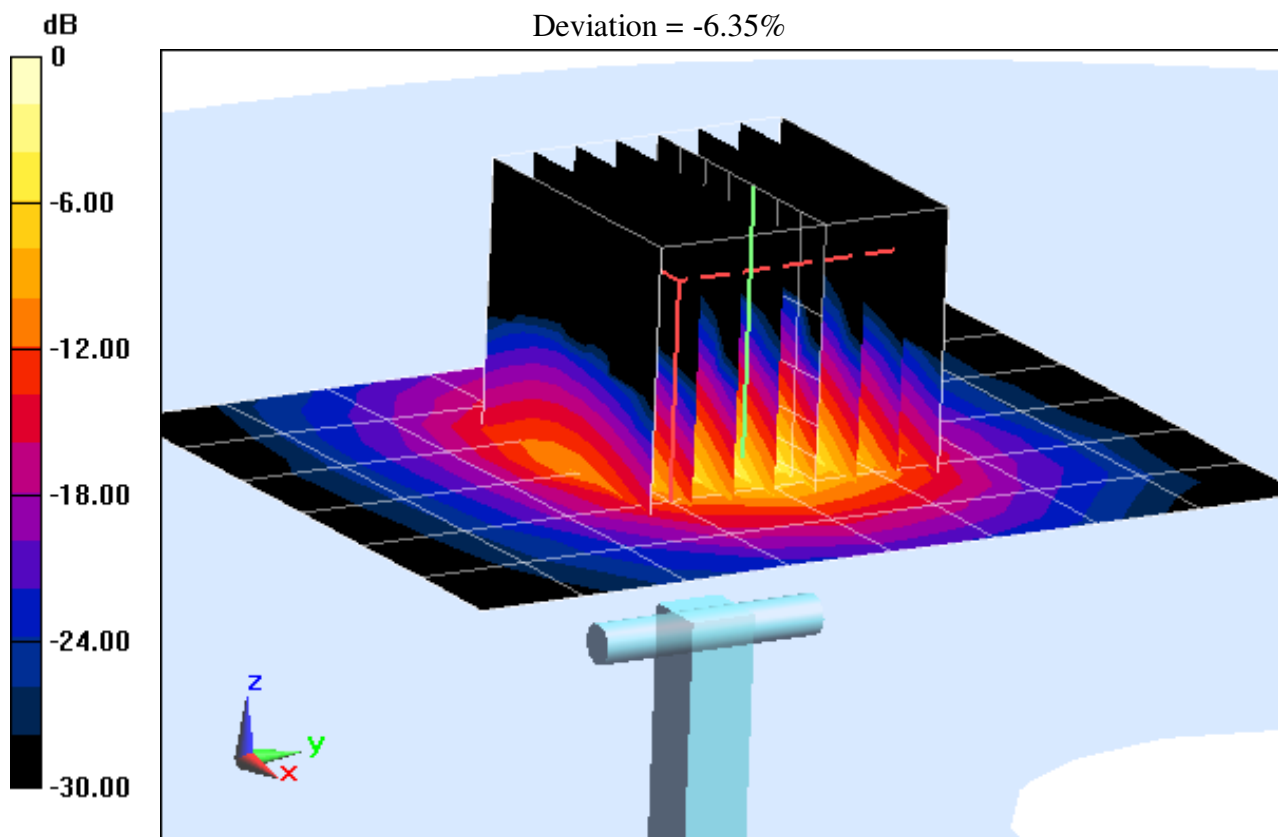
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm, Graded Ratio=1.4

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 35.8 W/kg

SAR(1 g) = 7.08 W/kg; SAR(10 g) = 1.98 W/kg

Deviation = -6.35%



0 dB = 17.2 W/kg = 12.36 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5500 MHz; Type: D5GHzV2; Serial: 1007

Communication System: CW; Frequency: 5500 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5500 \text{ MHz}$; $\sigma = 5.551 \text{ S/m}$; $\epsilon_r = 46.84$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-06-2013; Ambient Temp: 24.1°C; Tissue Temp: 23.2°C

Probe: EX3DV4 - SN3589; ConvF(3.52, 3.52, 3.52); Calibrated: 1/17/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/17/2013

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

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.8 (7028)

5500MHz System Verification

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

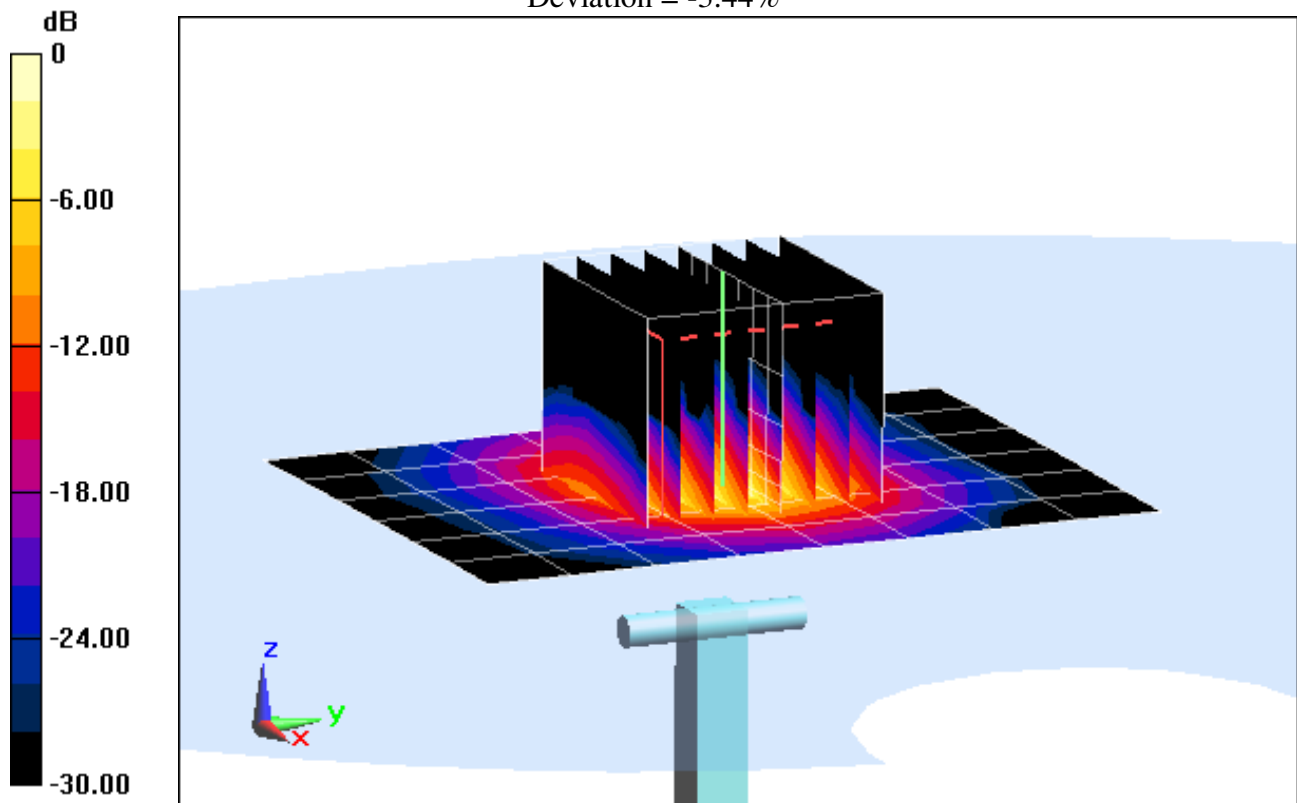
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm, Graded Ratio=1.4

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 33.2 W/kg

SAR(1 g) = 7.58 W/kg; SAR(10 g) = 2.14 W/kg

Deviation = -3.44%



0 dB = 18.5 W/kg = 12.67 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 500 MHz; Type: D5GHzV2; Serial: 1007

Communication System: CW; Frequency: 5600 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5600 \text{ MHz}$; $\sigma = 5.679 \text{ S/m}$; $\epsilon_r = 46.57$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-06-2013; Ambient Temp: 24.4°C; Tissue Temp: 23.3°C

Probe: EX3DV4 - SN3589; ConvF(3.32, 3.32, 3.32); Calibrated: 1/17/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/17/2013

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

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.8 (7028)

5600MHz System Verification

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

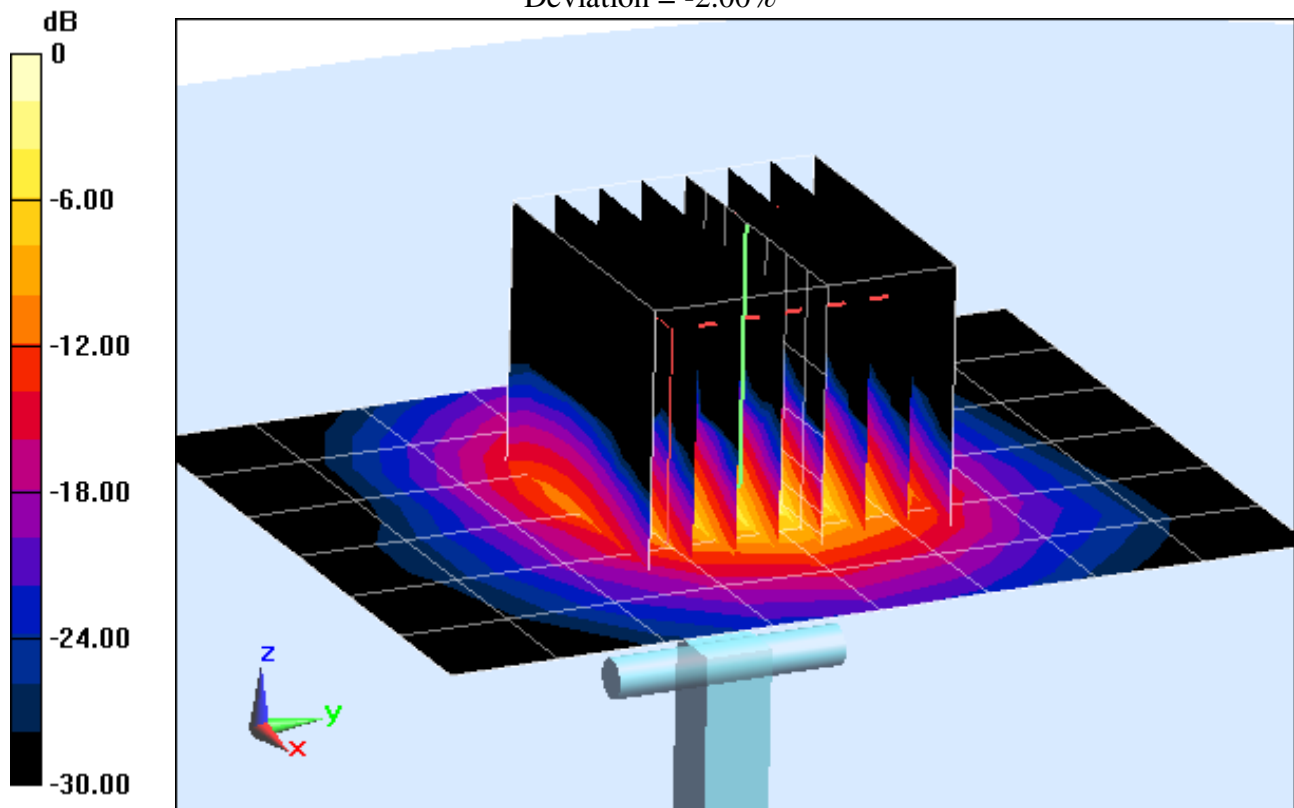
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm, Graded Ratio=1.4

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 32.3 W/kg

SAR(1 g) = 7.84 W/kg; SAR(10 g) = 2.17 W/kg

Deviation = -2.00%



0 dB = 19.7 W/kg = 12.94 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: CW; Frequency: 5800 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5800 \text{ MHz}$; $\sigma = 5.993 \text{ S/m}$; $\epsilon_r = 46.18$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-06-2013; Ambient Temp: 24.2°C; Tissue Temp: 23.0°C

Probe: EX3DV4 - SN3589; ConvF(3.66, 3.66, 3.66); Calibrated: 1/17/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/17/2013

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

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.8 (7028)

5800MHz System Verification

Area Scan (7x9x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

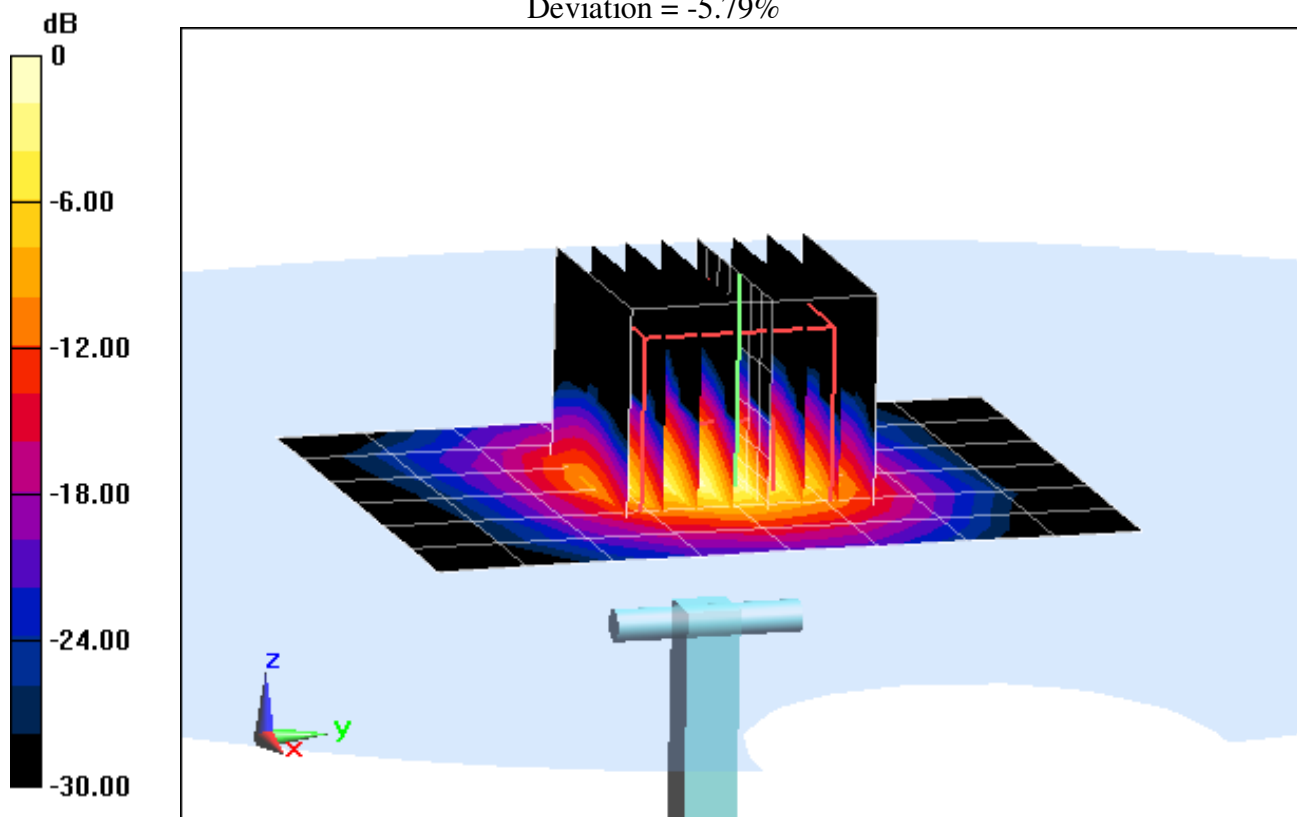
Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$, Graded Ratio=1.4

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 40.4 W/kg

SAR(1 g) = 7 W/kg; SAR(10 g) = 1.93 W/kg

Deviation = -5.79%



0 dB = 16.9 W/kg = 12.28 dBW/kg

APPENDIX C: PROBE CALIBRATION



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

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

Client **PC Test**

Certificate No: **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

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:

- 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:

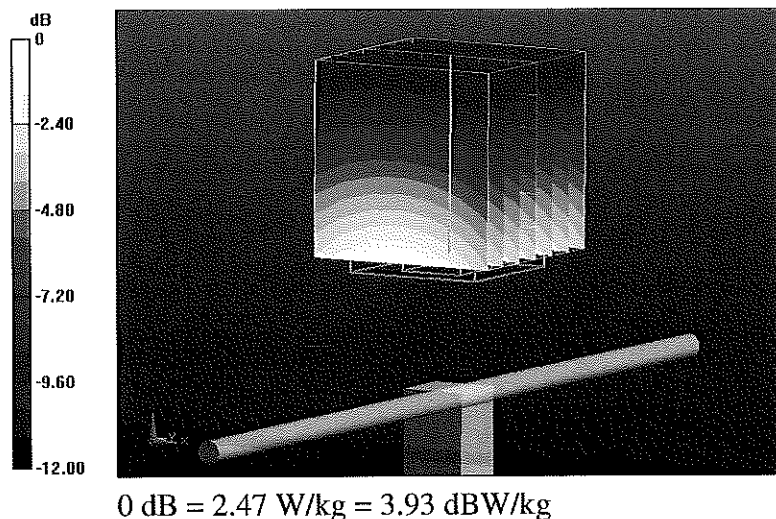
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

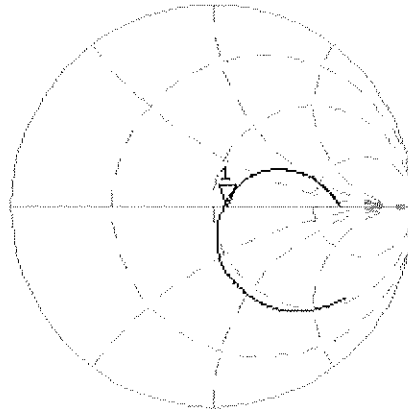
Maximum value of SAR (measured) = 2.47 W/kg



Impedance Measurement Plot for Head TSL

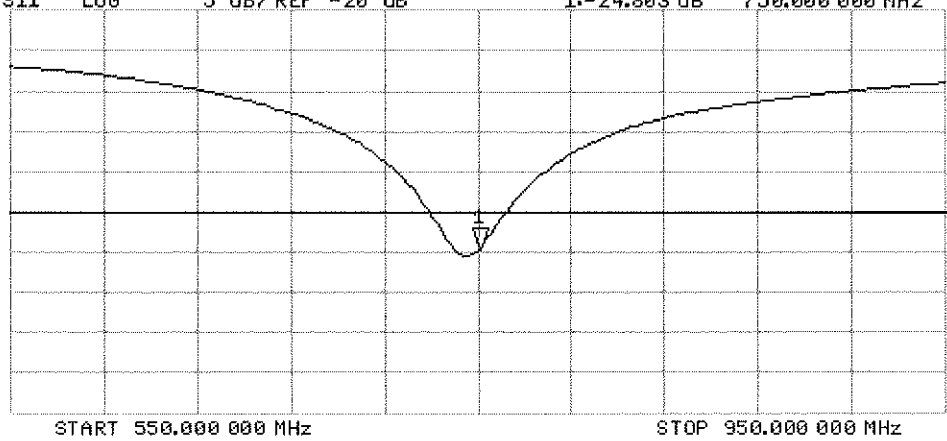
7 Jan 2013 12:55:14
 CH1 S11 1 U FS 1: 56.100 Ω -179.69 m Ω 1.1810 nF 750.000 000 MHz

*
 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:

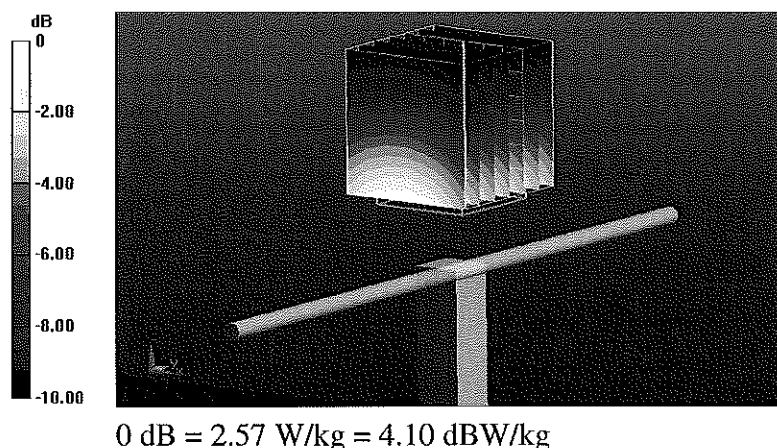
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

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 $\angle$ -3.4629 $\angle$ 61.280 pF 750.000 000 MHz

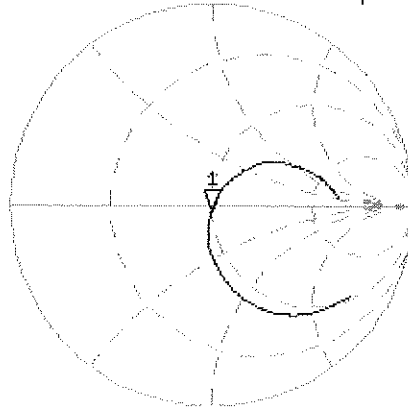
*

De1

Ca

Avg
16

H1d

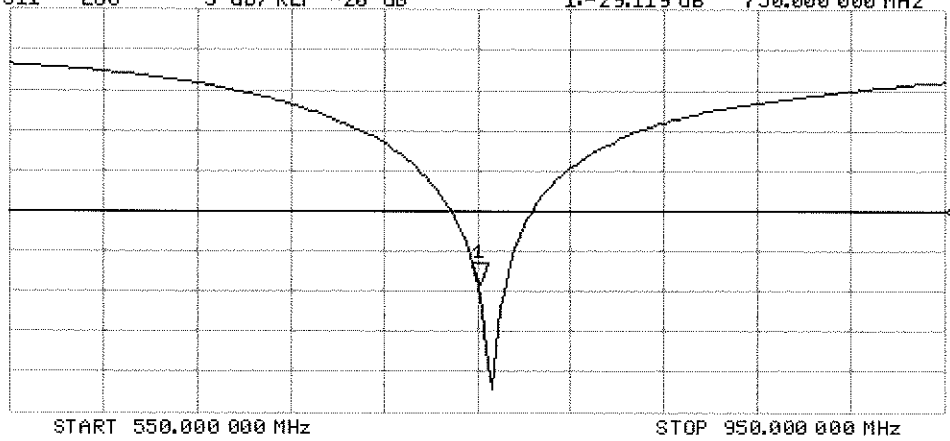


CH2 S11 LOG 5 dB/REF -20 dB 1:-29.119 dB 750.000 000 MHz

Ca

Avg
16

H1d





Accredited by the Swiss Accreditation Service (SAS)
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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D835V2-4d119_Apr12**

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 4d119**

Calibration procedure(s) **QA CAL-05.v8**
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: **April 20, 2012**

✓ KOK
5/4/12

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	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.2 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12
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-11)	In house check: Oct-12

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 20, 2012

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Accredited by the Swiss Accreditation Service (SAS)

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "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	V52.8.1
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

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

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.36 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	9.42 mW /g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.55 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	6.19 mW /g $\pm$ 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	54.5 $\pm$ 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 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	9.56 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.62 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	6.31 mW / g $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.3 Ω - 2.2 j Ω
Return Loss	- 32.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.8 Ω - 4.3 j Ω
Return Loss	- 25.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.386 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: 20.04.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.9 \text{ mho/m}$; $\epsilon_r = 41.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.07, 6.07, 6.07); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

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

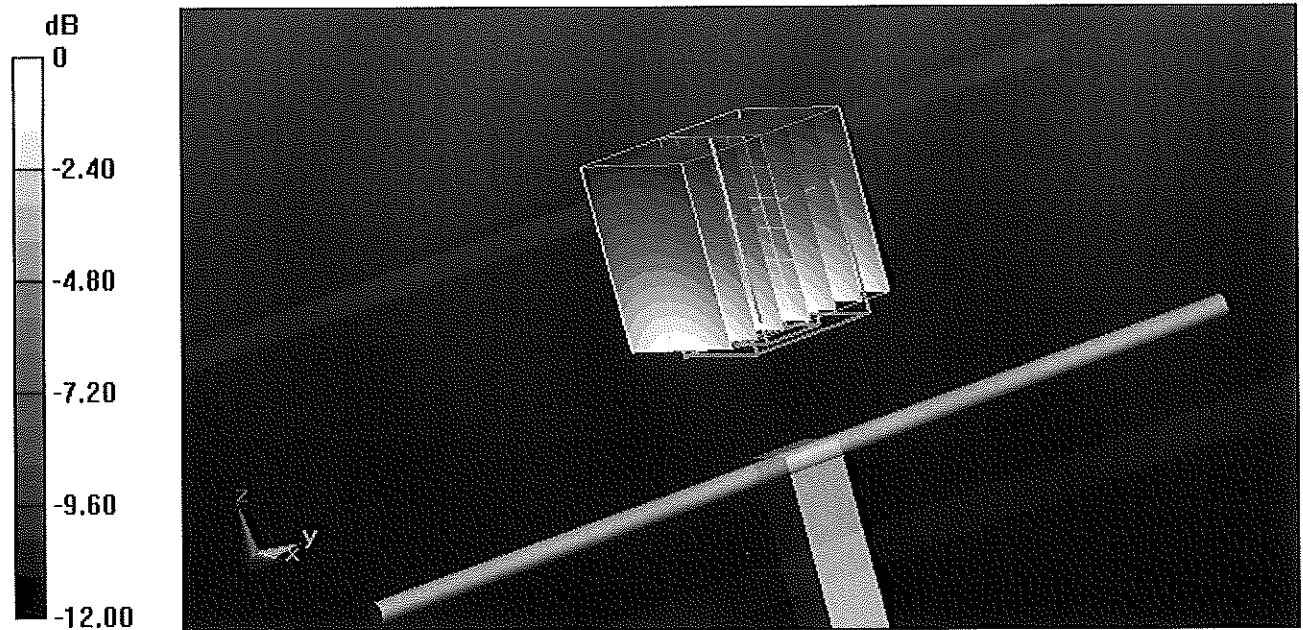
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 57.041 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 3.480 mW/g

SAR(1 g) = 2.36 mW/g; SAR(10 g) = 1.55 mW/g

Maximum value of SAR (measured) = 2.75 mW/g



0 dB = 2.75 mW/g = 8.79 dB mW/g

Impedance Measurement Plot for Head TSL

20 Apr 2012 09:34:14
 [CH1] S11 1 U FS 1: 51.279 Ω -2.1582 Ω 88.316 pF 835.000 000 MHz

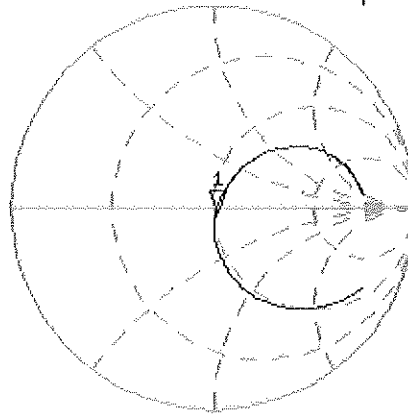
*

De1

Cor

Avg
16

H1d

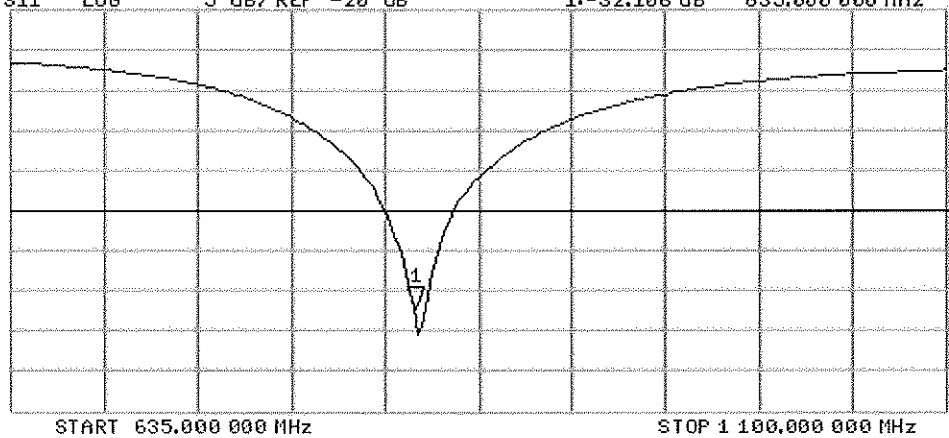


CH2 S11 LOG 5 dB/REF -20 dB 1:-32.106 dB 835.000 000 MHz

Cor

Avg
16

H1d



DASY5 Validation Report for Body TSL

Date: 19.04.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 1.01 \text{ mho/m}$; $\epsilon_r = 54.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.02, 6.02, 6.02); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

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

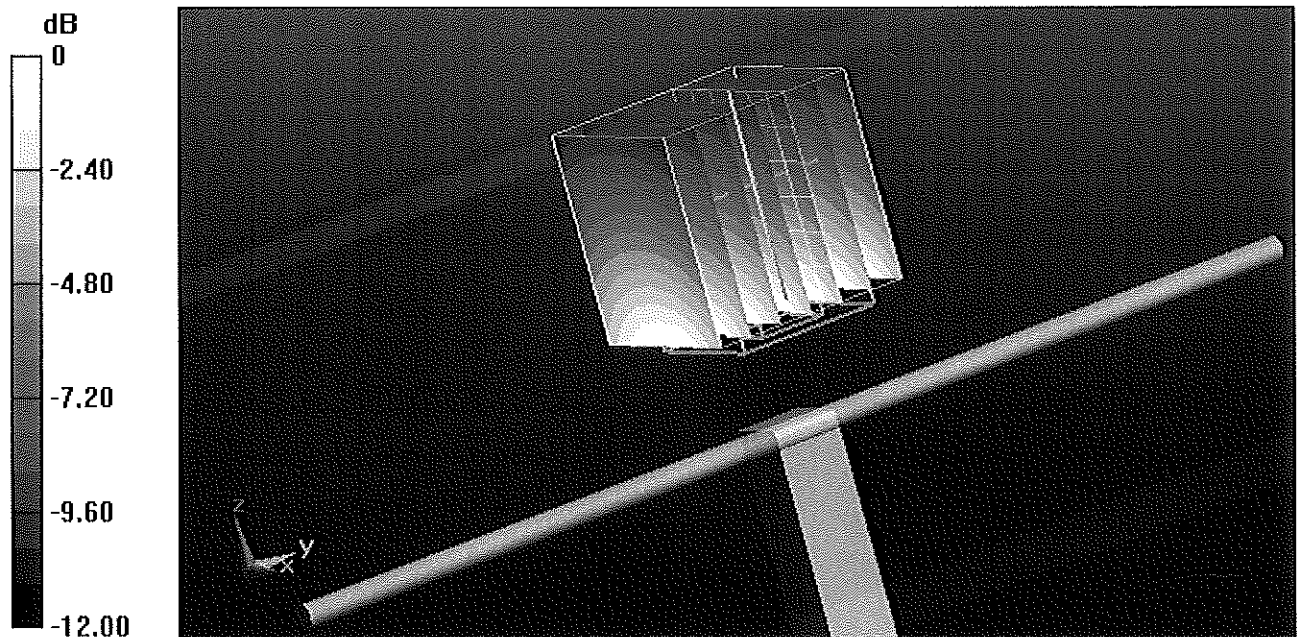
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 55.253 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 3.571 mW/g

SAR(1 g) = 2.47 mW/g; SAR(10 g) = 1.62 mW/g

Maximum value of SAR (measured) = 2.87 mW/g

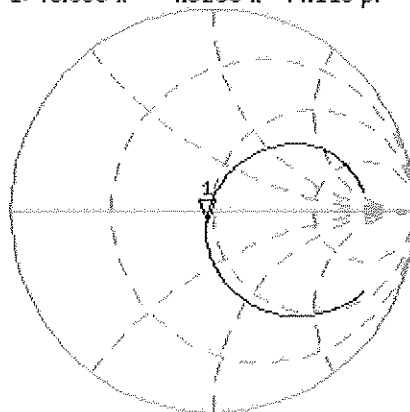


0 dB = 2.87 mW/g = 9.16 dB mW/g

Impedance Measurement Plot for Body TSL

19 Apr 2012 10:20:53
 [CH1] S11 1 U FS 1: 46.836 Ω -4.3203 Ω 44.118 pF 835.000 000 MHz

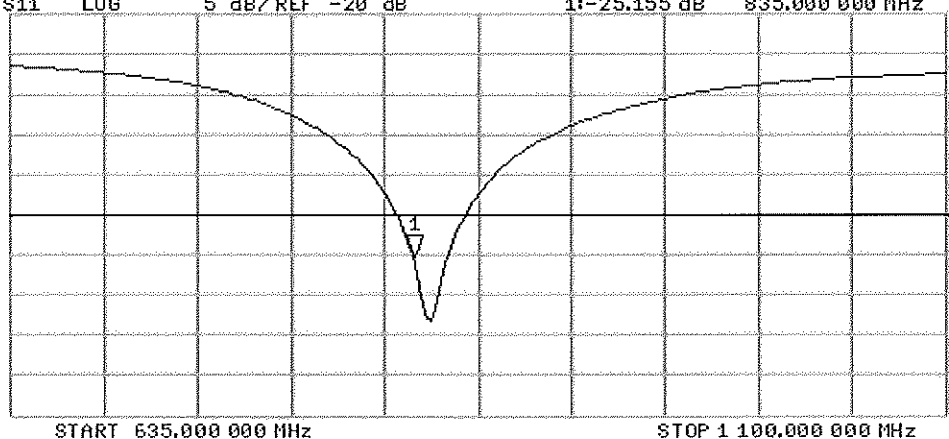
*
 Del
 Cor



Avg
 16
 H1 d

CH2 S11 LOG 5 dB/REF -20 dB 1:-25.155 dB 835.000 000 MHz

Cor
 Avg
 16
 H1 d





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Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D835V2-4d133_Feb12/2**

CALIBRATION CERTIFICATE (Replacement of No:D835V2-4d133_Feb12)

Object **D835V2 - SN: 4d133**

Calibration procedure(s) **QA CAL-05.v8**
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: **February 17, 2012**

KOK
4/23/12

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	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5086 (20g)	29-Mar-11 (No. 217-01368)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12
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-11)	In house check: Oct-12

Calibrated by:	Name Israe El-Naouq	Function Laboratory Technician	Signature <i>Israe El-Naouq</i>
Approved by:	Katja Pokovic	Technical Manager	<i>Katja Pokovic</i>

Issued: April 16, 2012

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "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.

Measurement Conditions

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

DASY Version	DASY5	V52.8.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	41.8 $\pm$ 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	2.34 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	9.45 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.53 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	6.17 mW / g $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	55.7 $\pm$ 6 %	1.01 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.47 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	9.60 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.62 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	6.33 mW / g $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.5 Ω - 2.9 j Ω
Return Loss	- 28.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.3 Ω - 5.1 j Ω
Return Loss	- 24.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.396 ns
----------------------------------	----------

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

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	July 22, 2011

DASY5 Validation Report for Head TSL

Date: 03.02.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.89 \text{ mho/m}$; $\epsilon_r = 41.8$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.07, 6.07, 6.07); Calibrated: 30.12.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

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

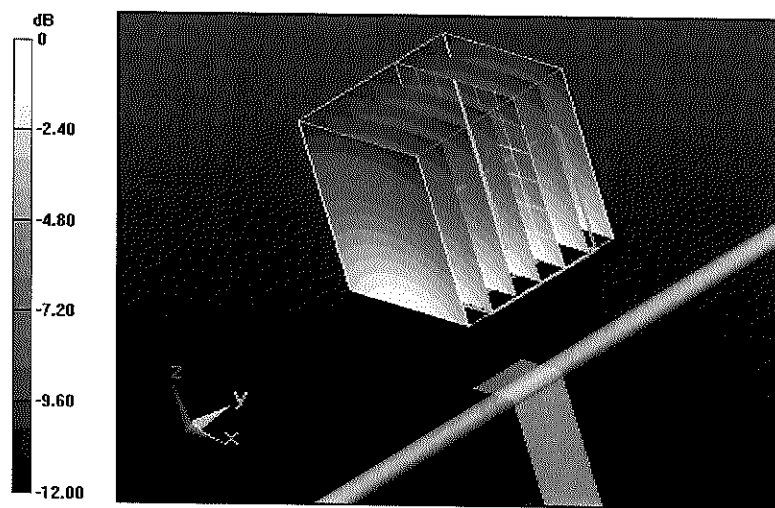
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.046 V/m; Power Drift = -0.0089 dB

Peak SAR (extrapolated) = 3.4450

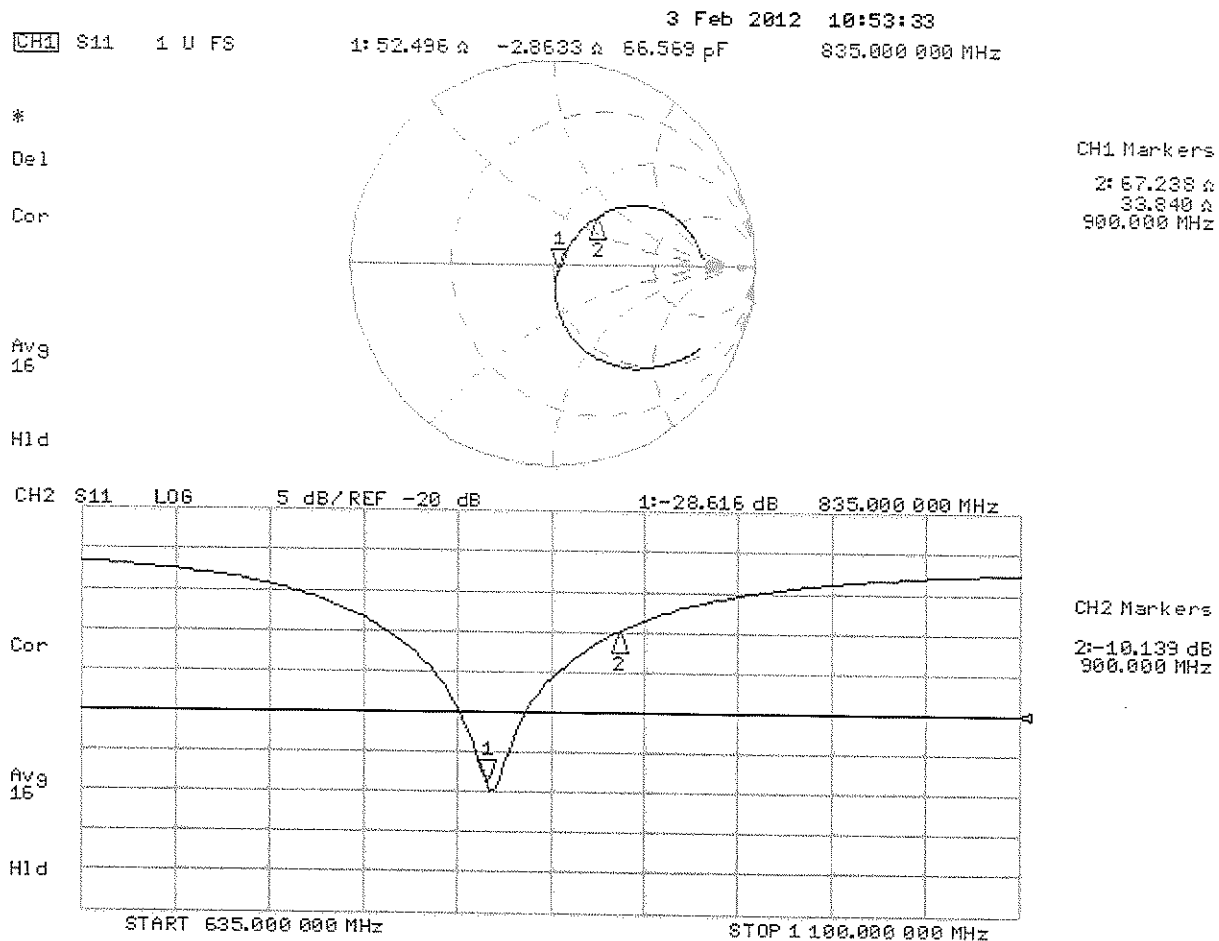
SAR(1 g) = 2.34 mW/g; SAR(10 g) = 1.53 mW/g

Maximum value of SAR (measured) = 2.713 mW/g



0 dB = 2.710mW/g = 8.66 dB mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 17.02.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 1.01 \text{ mho/m}$; $\epsilon_r = 55.7$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.02, 6.02, 6.02); Calibrated: 30.12.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

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

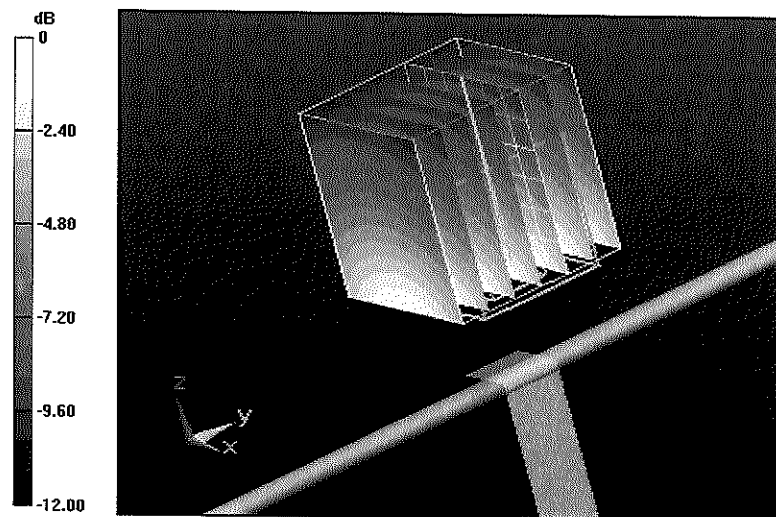
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 55.163 V/m; Power Drift = 0.0044 dB

Peak SAR (extrapolated) = 3.5620

SAR(1 g) = 2.47 mW/g; SAR(10 g) = 1.62 mW/g

Maximum value of SAR (measured) = 2.866 mW/g

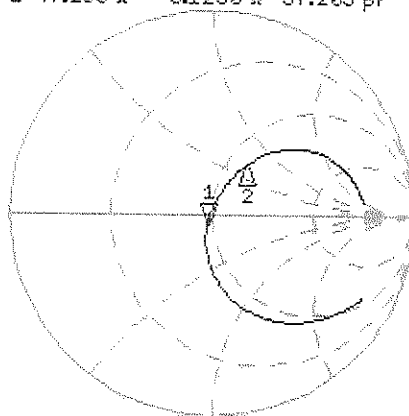


0 dB = 2.870mW/g = 9.16 dB mW/g

Impedance Measurement Plot for Body TSL

17 Feb 2012 10:44:46
 CH1 S11 1 U FS 1: 47.285 Ω -5.1230 Ω 37.265 pF 835.000 000 MHz

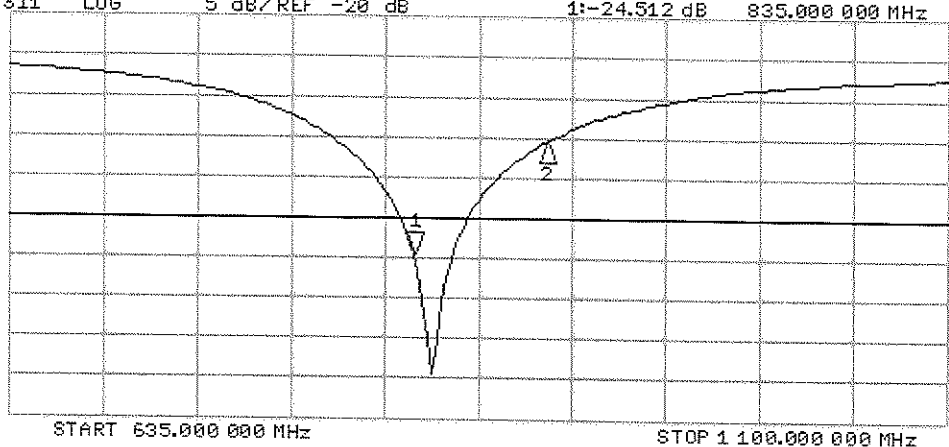
*
 Del
 Cor
 Avg
 16
 H1d



CH1 Markers
 2: 60.352 Ω
 32.086 Ω
 900.000 MHz

CH2 S11 LOG 5 dB/REF -20 dB 1: -24.512 dB 835.000 000 MHz

Cor
 Avg
 16
 H1d



CH2 Markers
 2: -10.651 dB
 900.000 MHz



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Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D835V2-4d026_Aug12**

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 4d026**

Calibration procedure(s) **QA CAL-05.v8**
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: **August 23, 2012**

*1/OK
9/12/12*

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	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.2 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
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-11)	In house check: Oct-12

Calibrated by: **Israe El-Naouq** **Function**
Laboratory Technician

Signature

Israe El-Naouq
[Signature]

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

Issued: August 23, 2012

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Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	41.3 $\pm$ 6 %	0.90 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.35 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	9.39 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.53 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	6.12 mW / g $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	53.2 $\pm$ 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	2.47 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	9.58 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.62 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	6.33 mW / g $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.7 Ω - 3.4 j Ω
Return Loss	- 26.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.6 Ω - 4.8 j Ω
Return Loss	- 26.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.389 ns
----------------------------------	----------

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

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	December 17, 2004

DASY5 Validation Report for Head TSL

Date: 23.08.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d026

Communication System: CW; Frequency: 835 MHz

Medium parameters used: $f = 835$ MHz; $\sigma = 0.9$ mho/m; $\epsilon_r = 41.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.07, 6.07, 6.07); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.2(969); SEMCAD X 14.6.6(6824)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm 2/Zoom Scan (7x7x7)/Cube 0:

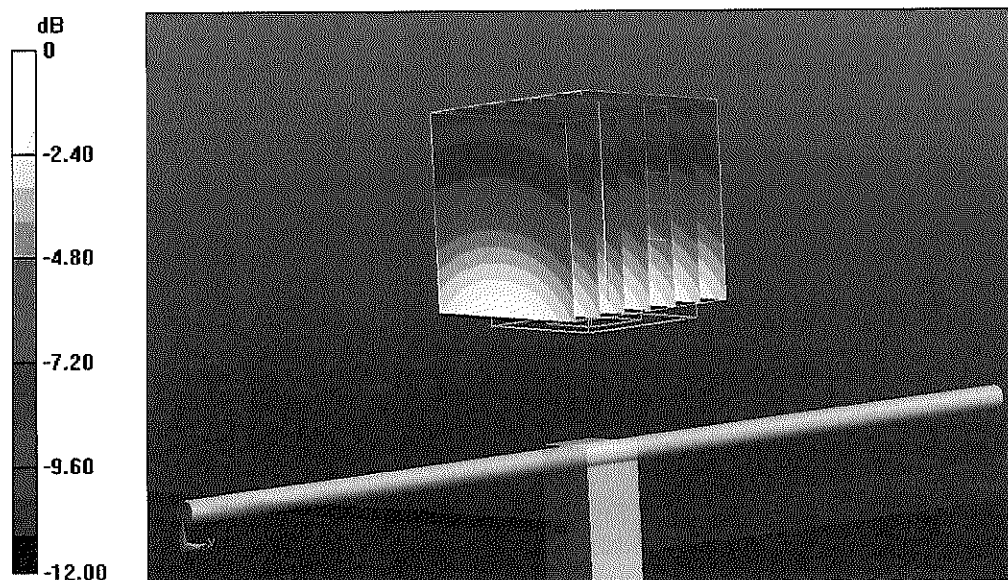
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 56.824 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 3.482 mW/g

SAR(1 g) = 2.35 mW/g; SAR(10 g) = 1.53 mW/g

Maximum value of SAR (measured) = 2.72 W/kg

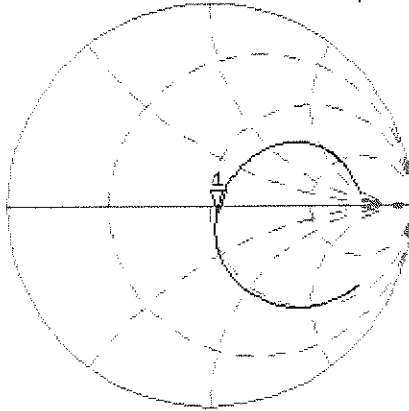


0 dB = 2.72 W/kg = 8.69 dB W/kg

Impedance Measurement Plot for Head TSL

23 Aug 2012 12:19:04
 CH1 S11 1 U FS 1: 53.662 $\angle$ -3.3516 $\angle$ 56.870 pF 835.000 000 MHz

*
 Del
 Cor



Avg
 15

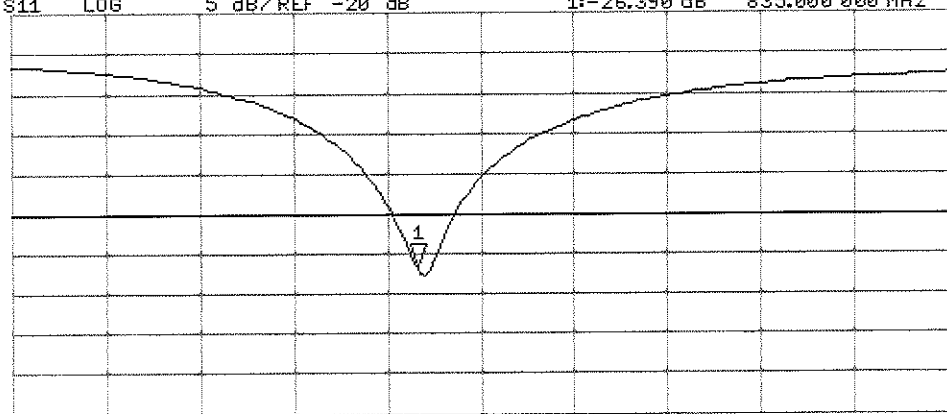
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-26.390 dB 835.000 000 MHz

Cor

Avg
 16

H1d



START 635.000 000 MHz

STOP 1 100.000 000 MHz

DASY5 Validation Report for Body TSL

Date: 23.08.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d026

Communication System: CW; Frequency: 835 MHz

Medium parameters used: $f = 835$ MHz; $\sigma = 1$ mho/m; $\epsilon_r = 53.2$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.02, 6.02, 6.02); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.2(969); SEMCAD X 14.6.6(6824)

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

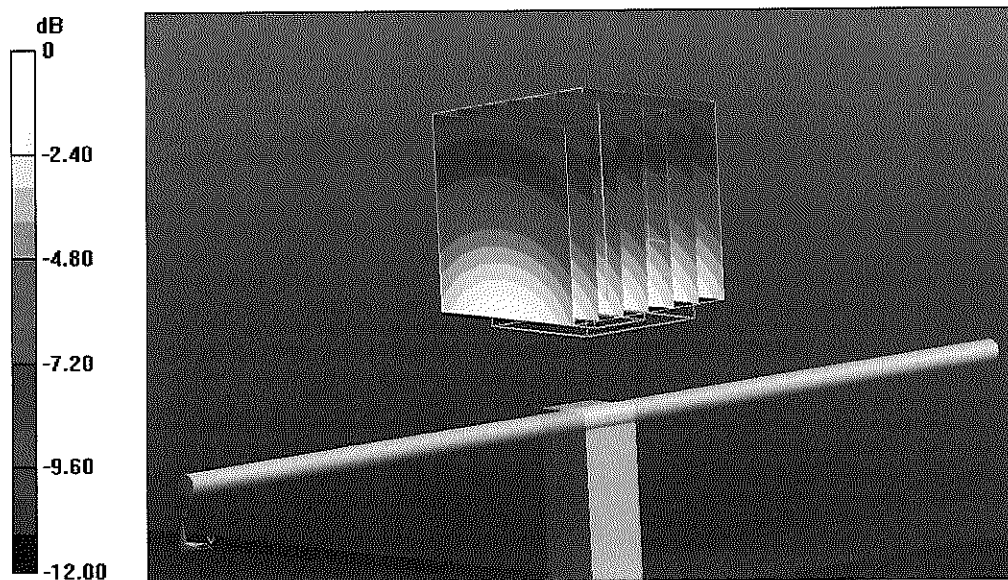
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.339 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 3.592 mW/g

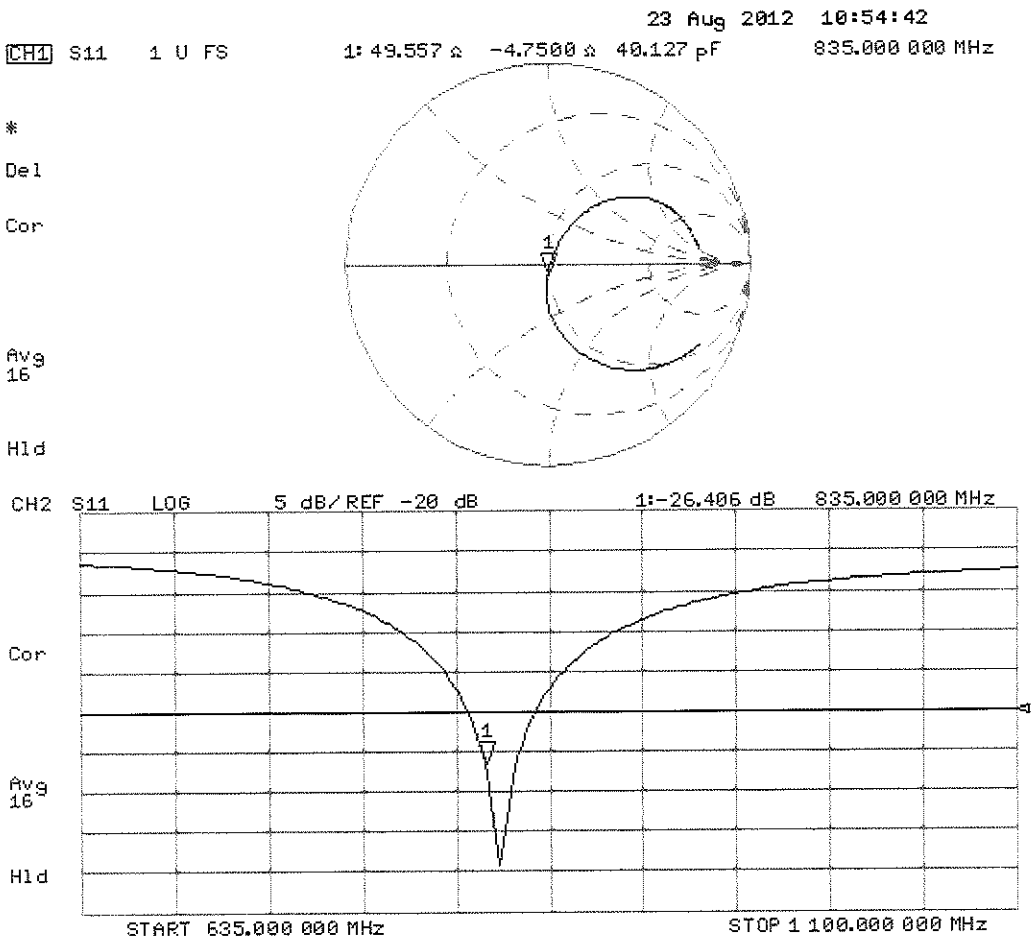
SAR(1 g) = 2.47 mW/g; SAR(10 g) = 1.62 mW/g

Maximum value of SAR (measured) = 2.87 W/kg



0 dB = 2.87 W/kg = 9.16 dB W/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: **D1750V2-1051_Apr12**

CALIBRATION CERTIFICATE

Object **D1750V2 - SN: 1051**

Calibration procedure(s) **QA CAL-05.v8**
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: **April 24, 2012**

*✓KOK
5/4/12*

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	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.2 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12
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-11)	In house check: Oct-12

Calibrated by: **Dimce Iliev** **Laboratory Technician** *D. Iliev*

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

Issued: April 24, 2012

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



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "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	V52.8.1
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	40.6 $\pm$ 6 %	1.35 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.03 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	36.6 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.83 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	19.5 mW / g $\pm$ 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	52.9 $\pm$ 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 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.33 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	37.6 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.03 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	20.2 mW / g $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.7 Ω - 0.2 j Ω
Return Loss	- 42.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.0 Ω + 0.0 j Ω
Return Loss	- 27.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.222 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	February 19, 2010

DASY5 Validation Report for Head TSL

Date: 24.04.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 1750 MHz

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.35$ mho/m; $\epsilon_r = 40.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.22, 5.22, 5.22); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

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

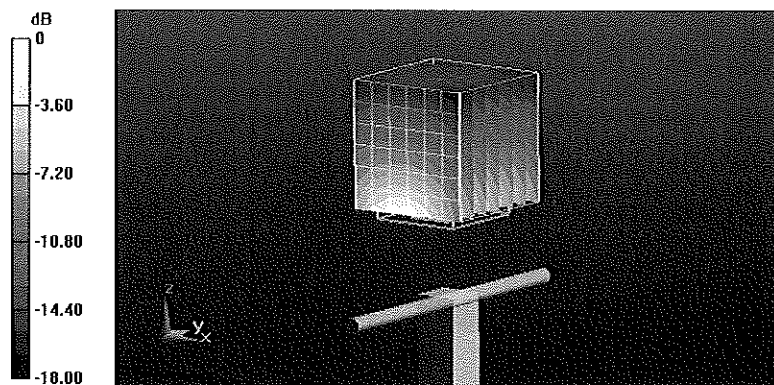
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.857 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 16.022 mW/g

SAR(1 g) = 9.03 mW/g; SAR(10 g) = 4.83 mW/g

Maximum value of SAR (measured) = 11.2 mW/g

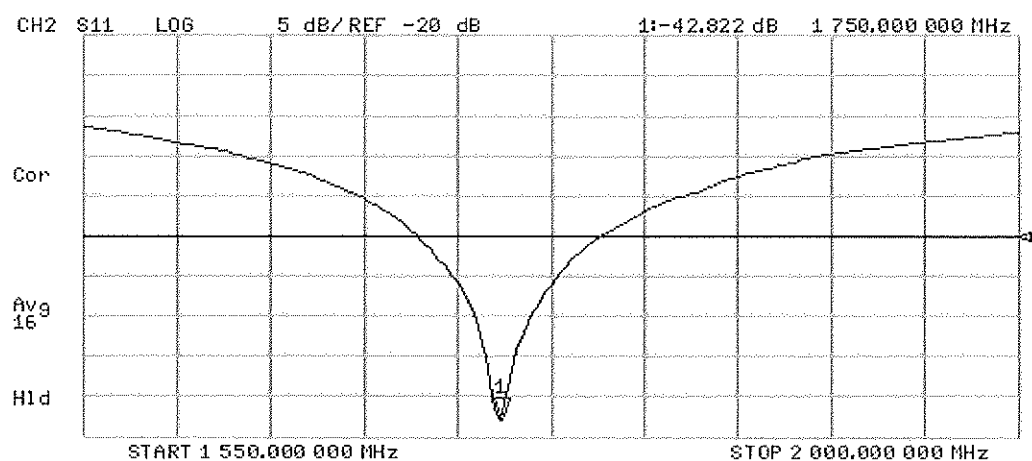
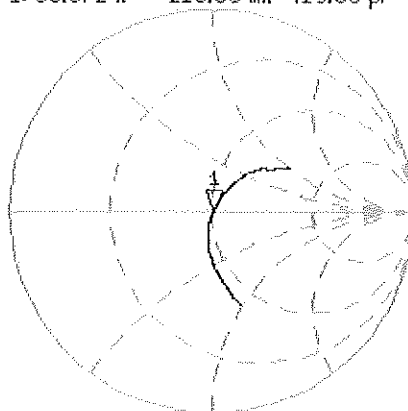


0 dB = 11.2 mW/g = 20.98 dB mW/g

Impedance Measurement Plot for Head TSL

24 Apr 2012 09:49:22
 [CH1] S11 1 U FS 1: 50.672 Ω -216.80 m Ω 419.50 pF 1 750.000 000 MHz

*
 Del
 Cor
 Avg
 16
 H1d



DASY5 Validation Report for Body TSL

Date: 24.04.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 1750 MHz

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.47$ mho/m; $\epsilon_r = 52.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.85, 4.85, 4.85); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

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

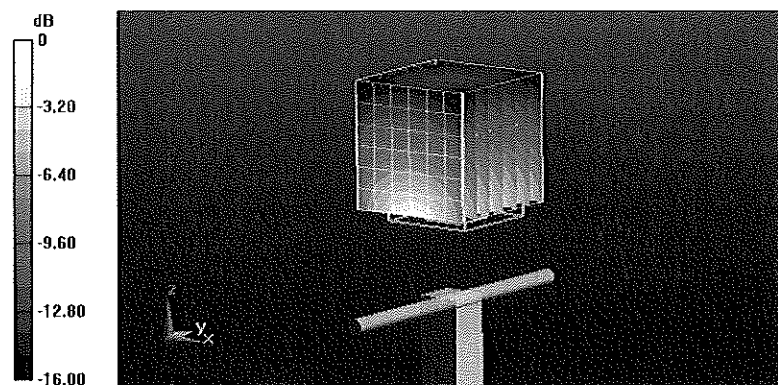
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.394 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 15.953 mW/g

SAR(1 g) = 9.33 mW/g; SAR(10 g) = 5.03 mW/g

Maximum value of SAR (measured) = 11.7 mW/g

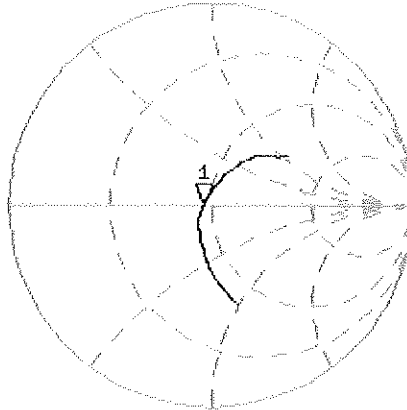


0 dB = 11.7 mW/g = 21.36 dB mW/g

Impedance Measurement Plot for Body TSL

24 Apr 2012 09:48:35
[CH1] S11 1 U FS 1: 45.977 Ω 0.0020 Ω 177.41 fH 1 750.000 000 MHz

*
De1
Cor

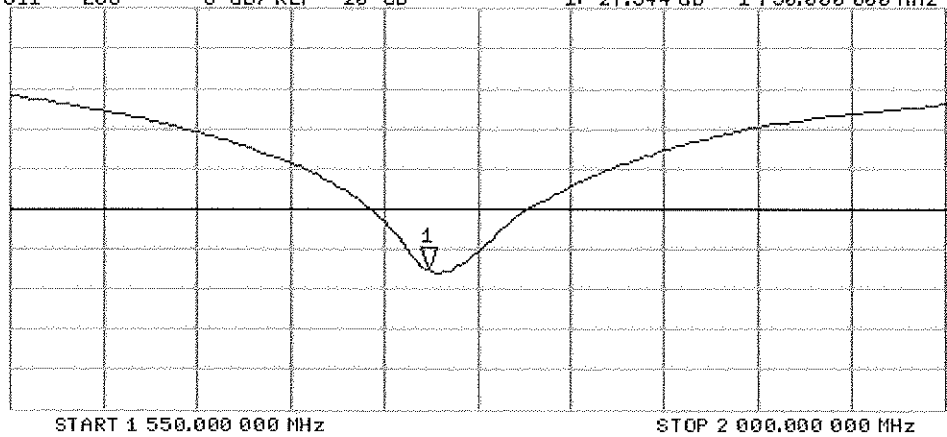


Av9
16
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-27.544 dB 1 750.000 000 MHz

Cor

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: **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
2/24/13

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

Calibrated by: **Leif Klysner** Name: **Leif Klysner** Function: **Laboratory Technician** Signature: *[Signature]*

Approved by: **Katja Pokovic** Name: **Katja Pokovic** Function: **Technical Manager** Signature: *[Signature]*

Issued: February 6, 2013

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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	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 cm³ (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 cm³ (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 cm³ (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 cm³ (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
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 11, 2011

DASY5 Validation Report for Head TSL

Date: 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:

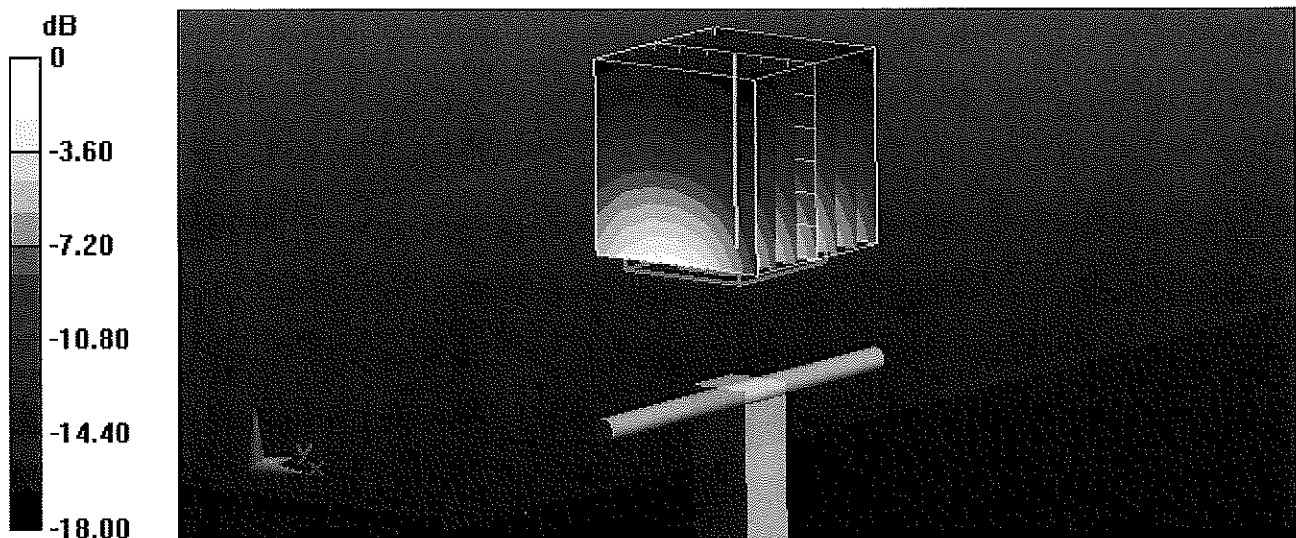
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

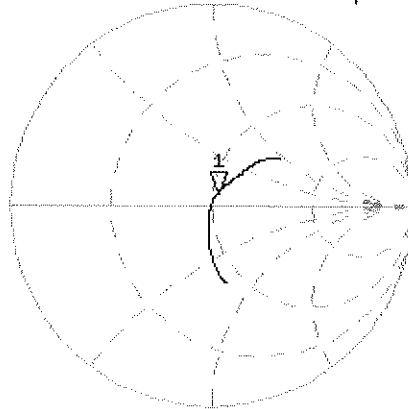


0 dB = 12.1 W/kg = 10.83 dBW/kg

Impedance Measurement Plot for Head TSL

6 Feb 2013 09:25:10
 CH1 S11 1 U FS 1: 52.125 Ω 5.8711 Ω 491.80 μ H 1 900.000 000 MHz

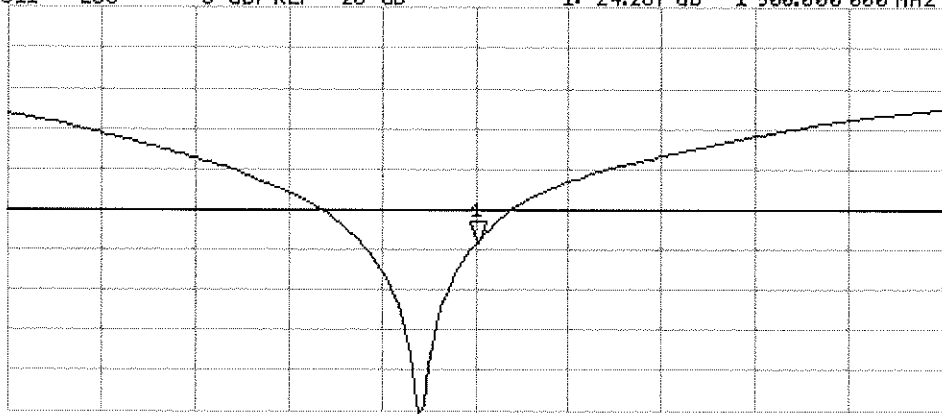
*
 Del
 CA



Avg
 16
 H1d

CH2 S11 LOG 5 dB/REF -20 dB 1: -24.287 dB 1 900.000 000 MHz

CA



Avg
 16
 H1d

START 1 700.000 000 MHz

STOP 2 100.000 000 MHz

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:

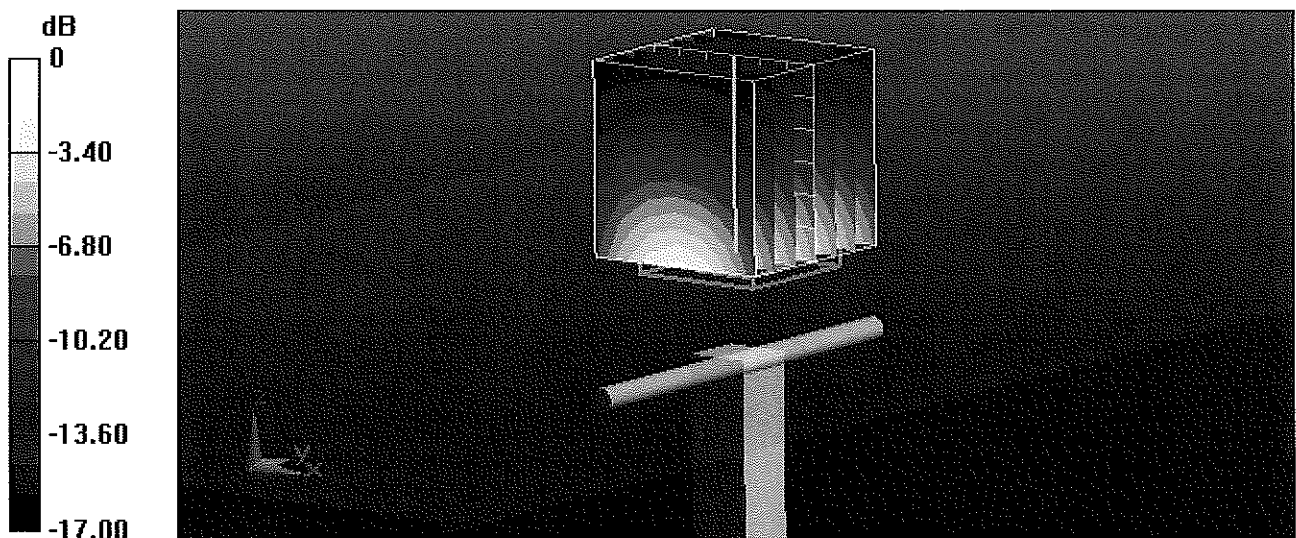
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

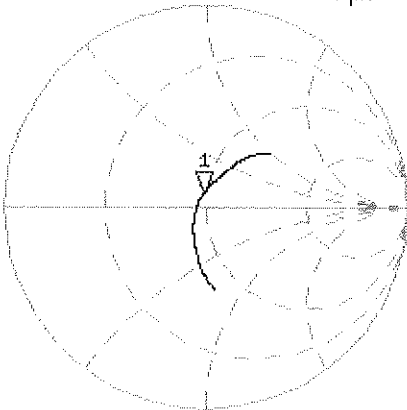


0 dB = 13.1 W/kg = 11.17 dBW/kg

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

