



SAR EVALUATION REPORT

Applicant Name:

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

Date of Testing:

07/28/14 - 08/04/14

Test Site/Location:

PCTEST Lab, Columbia, MD, USA

Document Serial No.:

OY1407281498.A3L

FCC ID:

A3LSMN910KOR

APPLICANT:

SAMSUNG ELECTRONICS, CO. LTD.

DUT Type:

Portable Handset

Application Type:

Certification

FCC Rule Part(s):

CFR §2.1093

Model(s):

SM-N910S, SM-N910K, SM-N910L

Equipment Class	Band & Mode	Tx Frequency	SAR			
			1 gm Head (W/kg)	1 gm Body-Worn (W/kg)	1 gm Hotspot (W/kg)	10 gm Extremity (W/kg)
PCE	UMTS 850	826.40 - 846.60 MHz	0.12	0.51	0.55	
PCE	GSM/GPRS 1900	1850.20 - 1909.80 MHz	< 0.1	0.21	0.47	
PCE	UMTS 1900	1852.4 - 1907.6 MHz	0.20	0.52	1.03	
PCE	LTE Band 17	706.5 - 713.5 MHz	< 0.1	0.12	0.14	
PCE	LTE Band 5 (Cell)	826.5 - 846.5 MHz	0.14	0.60	0.72	
DTS	2.4 GHz WLAN	2412 - 2462 MHz	0.42	< 0.1	< 0.1	
DTS	5.8 GHz WLAN	5745 - 5825 MHz	0.19	0.10	0.10	
NII	5.2 GHz WLAN	5180 - 5240 MHz	< 0.1	< 0.1		0.22
NII	5.3 GHz WLAN	5260 - 5320 MHz	0.10	< 0.1		0.20
NII	5.5 GHz WLAN	5500 - 5700 MHz	0.16	< 0.1		0.18
DSS/DTS	Bluetooth	2402 - 2480 MHz	N/A			
Simultaneous SAR per KDB 690783 D01v01r03:			0.54	0.90	1.03	0.22

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE C95.1-1992 and has been tested in accordance with the measurement procedures specified in Section 1.8 of this report; for North American frequency bands only.

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


Randy Ortanez
President



The SAR Tick is an initiative of the Mobile Manufacturers Forum (MMF). While a product may be considered eligible, use of the SAR Tick logo requires an agreement with the MMF. Further details can be obtained by emailing: sartick@mmfai.info.

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1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
UMTS 850	Voice/Data	826.40 - 846.60 MHz
GSM/GPRS 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 17	Voice/Data	706.5 - 713.5 MHz
LTE Band 5 (Cell)	Voice/Data	826.5 - 846.5 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
ANT+	Data	2402 - 2480 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.

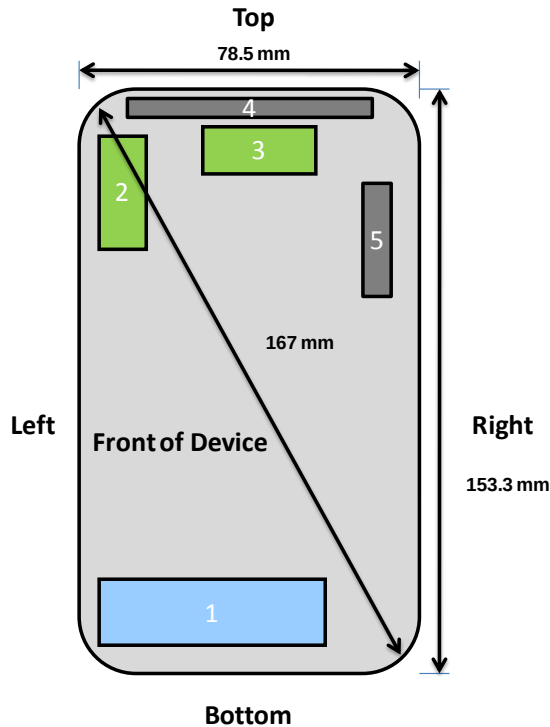
Mode / Band		Voice (dBm)	Burst Average GMSK (dBm)	
		1 TX Slot	1 TX Slots	2 TX Slots
GSM/GPRS 1900	Maximum	30.5	30.5	28.5
	Nominal	30.0	30.0	28.0
Mode / Band		Modulated Average (dBm)		
		3GPP WCDMA Rel 99	3GPP HSDPA Rel 5	3GPP HSUPA Rel 6
UMTS Band 5 (850 MHz)	Maximum	23.5	23.0	22.5
	Nominal	23.0	22.5	22.0
UMTS Band 2 (1900 MHz)	Maximum	23.5	23.0	22.5
	Nominal	23.0	22.5	22.0
Mode / Band		Modulated Average (dBm)		
LTE Band 17	Maximum	23.5		
	Nominal	23.0		
LTE Band 5 (Cell)	Maximum	24.0		
	Nominal	23.5		

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Mode / Band		Modulated Average (dBm)
SISO IEEE 802.11b (2.4 GHz)	Maximum	16.5
	Nominal	16.0
SISO IEEE 802.11g (2.4 GHz)	Maximum	13.5
	Nominal	13.0
SISO IEEE 802.11n (2.4 GHz)	Maximum	11.5
	Nominal	11.0
MIMO IEEE 802.11n (2.4 GHz)	Maximum	14.5
	Nominal	14.0
SISO IEEE 802.11a (5 GHz)	Maximum	12.5
	Nominal	12.0
SISO IEEE 802.11n (5 GHz)	Maximum	12.5
	Nominal	12.0
MIMO IEEE 802.11n (5 GHz)	Maximum	15.5
	Nominal	15.0
SISO IEEE 802.11ac (5 GHz)	Maximum	10.5
	Nominal	10.0
MIMO IEEE 802.11ac (5 GHz)	Maximum	13.5
	Nominal	13.0
Bluetooth	Maximum	11.5
	Nominal	11.0
Bluetooth LE	Maximum	7.0
	Nominal	6.5

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1.3 DUT Antenna Locations



1. Main Antenna
 - 1900 MHz GSM/GPRS (Tx/Rx)
 - 850/1900 MHz UMTS (Tx/Rx)
 - LTE B5/B17 (Tx/Rx)
2. BT/WiFi Antenna 1
 - 2.4/5 GHz WiFi (Tx/Rx)
 - 2.4 GHz BT (Tx/Rx)
 - GPS (Rx Only)
3. WiFi Antenna 2
 - 2.4/5 GHz WiFi (Tx/Rx)
4. Sub Antenna
 - LTE B5/B17 (Rx only)
5. Sub Antenna
 - LTE Non-US Band (Rx only)

Note: Exact antenna dimensions and separation distances are shown in the Technical Descriptions in the FCC Filing. Since the diagonal dimension of this device is > 160 mm and <200 mm, it is considered a “phablet.”

Figure 1-1
DUT Antenna Locations

Table 1-1
Sides for SAR Testing

Sides for SAR Testing							
Mode	Exposure Condition	Back	Front	Top	Bottom	Right	Left
UMTS 850	Hotspot	Yes	Yes	No	Yes	No	Yes
GPRS 1900	Hotspot	Yes	Yes	No	Yes	No	Yes
UMTS 1900	Hotspot	Yes	Yes	No	Yes	No	Yes
LTE Band 17	Hotspot	Yes	Yes	No	Yes	No	Yes
LTE Band 5 (Cell)	Hotspot	Yes	Yes	No	Yes	No	Yes
2.4 GHz WLAN Antenna 1	Hotspot	Yes	Yes	Yes	No	No	Yes
2.4 GHz WLAN Antenna 2	Hotspot	Yes	Yes	Yes	No	No	No
2.4 GHz WLAN MIMO	Hotspot	Yes	Yes	Yes	No	No	Yes
5.8 GHz DTS WLAN Antenna 1	Hotspot	Yes	Yes	Yes	No	No	Yes
5.8 GHz DTS WLAN Antenna 2	Hotspot	Yes	Yes	Yes	No	No	No
5.8 GHz DTS WLAN MIMO	Hotspot	Yes	Yes	Yes	No	No	Yes
5.2-5.7 GHz NII WLAN Antenna 1	Extremity	Yes	Yes	Yes	No	No	Yes
5.2-5.7 GHz NII WLAN Antenna 2	Extremity	Yes	Yes	Yes	No	No	No
5.2-5.7 GHz NII WLAN MIMO	Extremity	Yes	Yes	Yes	No	No	Yes

Note: Particular DUT edges were not required to be evaluated for Wireless Router SAR or Extremity SAR if the edges were greater than 2.5 cm from the transmitting antenna according to FCC KDB Publication 941225 D06v01 guidance, page 2 and FCC KDB 648474 D04v01r01.

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1.4 Near Field Communications (NFC) Antenna

This DUT has NFC operations. The NFC antenna is integrated into the specialized battery. The SAR tests were performed with the specialized battery (model: **EB-BN910BBK**).

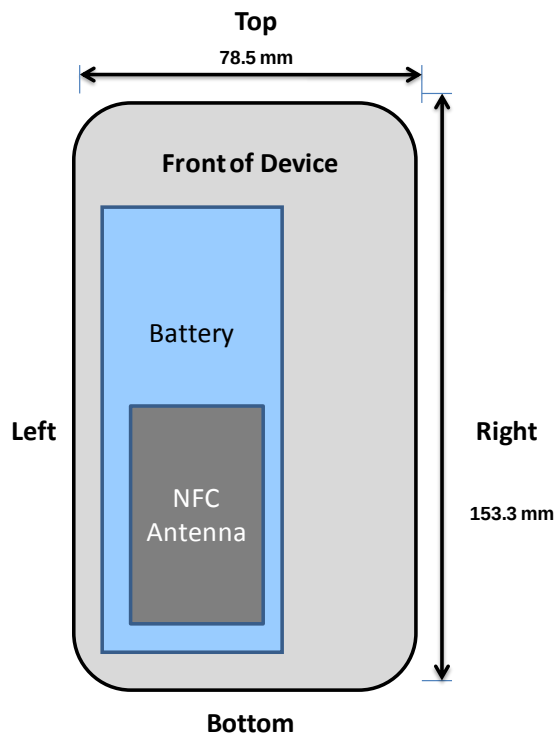


Figure 1-2
NFC Antenna Locations

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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.

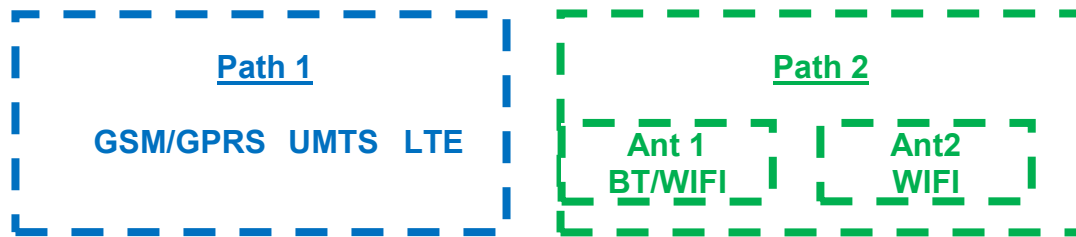


Figure 1-3
Simultaneous Transmission Paths

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 Configuration	Head	Body-Worn Accessory	Wireless Router	Extremity	Notes
1	GSM voice + 2.4 GHz Wi-Fi	Yes	Yes	N/A	Yes	
2	GSM voice + 5 GHz Wi-Fi	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz Bluetooth	N/A	Yes	N/A	Yes	
4	UMTS + 2.4 GHz Wi-Fi	Yes	Yes	Yes	Yes	
5	UMTS + 5 GHz Wi-Fi	Yes	Yes	Yes	Yes	
6	UMTS + 2.4 GHz Bluetooth	N/A	Yes	N/A	Yes	
7	LTE + 2.4 GHz Wi-Fi	Yes	Yes	Yes	Yes	
8	LTE + 5 GHz Wi-Fi	Yes	Yes	Yes	Yes	
9	LTE + 2.4 GHz Bluetooth	N/A	Yes	N/A	Yes	
10	GPRS + 2.4 GHz Wi-Fi	N/A	N/A	Yes	Yes	
11	GPRS + 5 GHz Wi-Fi	N/A	N/A	Yes	Yes	

- 2.4 GHz WLAN, 5 GHz WLAN, and 2.4 GHz Bluetooth share the same antenna path and cannot transmit simultaneously.
- All licensed modes share the same antenna path and cannot transmit simultaneously.
- 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.
- Per the manufacturer, WIFI Direct is not expected to be used in conjunction with a held-to-ear or body-worn accessory voice call. Therefore, there are no simultaneous transmission scenarios involving WIFI direct beyond that listed in the above table.
- 5 GHz Wireless Router is only supported for the 5.8 GHz band by S/W, therefore 5.2-5.7 GHz bands were not evaluated for Wireless Router conditions
- This device supports 2x2 MIMO Tx for WLAN 802.11n/ac. Each WLAN antenna can transmit independently or together when operating with MIMO.

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1.6 SAR Test Exclusions Applied

(A) WIFI/BT

Since Wireless Router operations are not allowed by the chipset firmware using 5 GHz NII WIFI, only 2.4 GHz WIFI and 5.8 GHz DTS WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v01.

Per FCC KDB 447498 D01v05, the 1g SAR exclusion threshold for distances <50mm is defined by the following equation:

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

Based on the maximum conducted power of Bluetooth (rounded to the nearest mW) and the antenna to user separation distance, body-worn Bluetooth SAR was not required; $[(14/10) * \sqrt{2.480}] = 2.2 < 3.0$. Per KDB Publication 447498 D01v05, the maximum power of the channel was rounded to the nearest mW before calculation.

Per FCC KDB 447498 D01v05, the 10g SAR exclusion threshold for distances <50mm is defined by the following equation:

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

Based on the maximum conducted power of Bluetooth (rounded to the nearest mW) and the antenna to user separation distance, extremity Bluetooth SAR was not required; $[(14/5) * \sqrt{2.480}] = 4.4 < 7.5$. Per KDB Publication 447498 D01v05, the maximum power of the channel was rounded to the nearest mW before calculation.

This device supports 20 MHz and 40 MHz Bandwidths for IEEE 802.11n for 5 GHz WIFI only.

This device supports IEEE 802.11ac with the following features:

- a) Up to 80 MHz Bandwidth only
- b) No aggregate channel configurations
- c) 2 Tx antenna output
- d) 256 QAM is supported
- e) No new 5 GHz channels

Per April 2013 TCB Workshop notes, full SAR tests for all SISO IEEE 802.11ac configurations were not required because the average output power was not more than 0.25 dB higher than SISO IEEE 802.11a mode. SISO IEEE 802.11ac was evaluated for the highest SISO IEEE 802.11a position in each 5 GHz band and exposure condition.

Per FCC KDB Publication 648474 D04v01r01, this device is considered a "phablet" since the diagonal dimension is greater than 160mm and less than 200mm. Extremity SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg. Because wireless router operations are not supported for 5.2-5.7 GHz WLAN, extremity SAR tests were performed. Extremity SAR was not evaluated for 2.4 GHz WLAN and 5.8 GHz WLAN operations since wireless router 1g SAR was < 1.2 W/kg.

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(B) Licensed Transmitter(s)

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

Per FCC KDB Publication 648474 D04v01r01, this device is considered a "phablet" since the diagonal dimension is greater than 160mm and less than 200mm. Therefore, extremity SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg. Extremity SAR was not evaluated for licensed technologies since wireless router 1g SAR was < 1.2 W/kg for these modes.

1.7 Power Reduction for SAR

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

1.8 Guidance Applied

- IEEE 1528-2003
- FCC KDB Publication 941225 D01v02, D03v01, D05v02r03, D05Av01, D06v01r01 (2G/3G/4G and Hotspot)
- FCC KDB Publication 248227 D01v01r02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D01v05r02 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r03, D02v01r01 (SAR Measurements up to 6 GHz)
- FCC KDB Publication 648474 D03-D04 (Phablet Procedures)
- April 2013 TCB Workshop Notes (IEEE 802.11ac)
- October 2013 TCB Workshop Notes (GPRS Testing Considerations)

1.9 Device Serial Numbers

Several samples with identical hardware 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	Extremity Serial Number
UMTS 850	F1926	F1926	F1926	-
GSM/GPRS 1900	F1924	F1924	F1924	-
UMTS 1900	F1924	F1924	F1924	-
LTE Band 17	F1924	F1926	F1926	-
LTE Band 5 (Cell)	F1926	F1926	F1926	-
2.4 GHz WLAN	F1926	F1923	F1923	-
5 GHz WLAN	F1923	F1922	F1922	F1922

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2 LTE INFORMATION

LTE Information			
FCC ID	A3LSMN910KOR		
Form Factor	Portable Handset		
Frequency Range of each LTE transmission band	LTE Band 17 (706.5 - 713.5 MHz)		
	LTE Band 5 (Cell) (826.5 - 846.5 MHz)		
Channel Bandwidths	LTE Band 17: 5 MHz, 10 MHz		
	LTE Band 5 (Cell): 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)
UE Category	3		
Modulations Supported in UL	QPSK, 16QAM		
LTE MPR Permanently implemented per 3GPP TS 36.101 section 6.2.3~6.2.5? (manufacturer attestation to be provided)	YES		
A-MPR (Additional MPR) disabled for SAR Testing?	YES		

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3 INTRODUCTION

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

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

3.1 SAR Definition

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

Equation 3-1
SAR Mathematical Equation

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

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

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

where:

- σ = conductivity of the tissue-simulating material (S/m)
- ρ = mass density of the tissue-simulating material (kg/m³)
- E = Total RMS electric field strength (V/m)

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

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4 DOSIMETRIC ASSESSMENT

4.1 Measurement Procedure

The evaluation was performed using the following procedure compliant to FCC KDB Publication 865664 D01v01 and IEEE 1528-2013:

1. The SAR distribution at the exposed side of the head or body was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the device-head and body interface and the horizontal grid resolution was determined per FCC KDB Publication 865664 D01v01 (See Table 4-1) and IEEE 1528-2013.
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.
3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01 (See Table 4-1) and IEEE 1528-2013. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):
 - a. SAR values at the inner surface of the phantom are extrapolated from the measured values along the line away from the surface with spacing no greater than that in Table 4-1. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).
 - b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the "Not a knot" condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.
 - c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete to calculate the SAR drift. If the drift deviated by more than 5%, the SAR test and drift measurements were repeated.

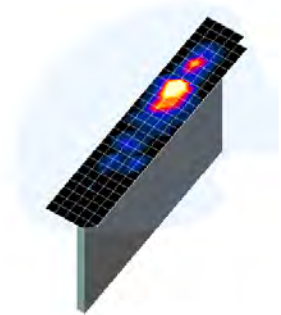


Figure 4-1
Sample SAR Area Scan

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

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

*Also compliant to IEEE 1528-2013 Table 6

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5

DEFINITION OF REFERENCE POINTS

5.1 EAR REFERENCE POINT

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

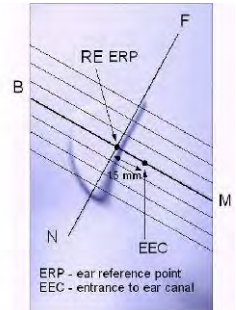


Figure 5-1
Close-Up Side view
of ERP

5.2 HANDSET REFERENCE POINTS

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



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

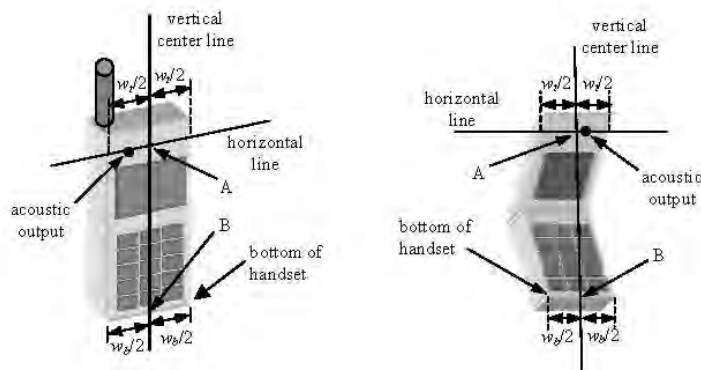


Figure 5-3
Handset Vertical Center & Horizontal Line Reference Points

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6 TEST CONFIGURATION POSITIONS FOR HANDSETS

6.1 Device Holder

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

6.2 Positioning for Cheek

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



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

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

6.3 Positioning for Ear / 15° Tilt

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

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

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

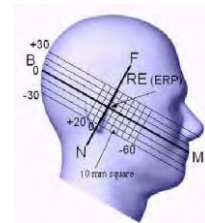


Figure 6-3 Side view w/ relevant markings

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. Per IEEE 1528-2013, a rotated SAM phantom is necessary to allow probe access to such regions. Both SAM heads of the TwinSAM-Chin20 are rotated 20 degrees around the NF line. Each head can be removed from the table for emptying and cleaning.

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.

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 D04v01, Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB Publication 447498 D01v05 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

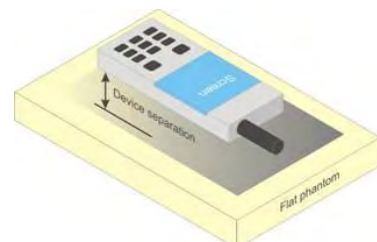


Figure 6-4 Sample Body-Worn Diagram

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic

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components are tested with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

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

6.6 Extremity Exposure Configurations

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

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

6.7 Wireless Router Configurations

Some battery-operated handsets have the capability to transmit and receive user data through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06 v01 where SAR test considerations for handsets ($L \times W \geq 9 \text{ cm} \times 5 \text{ cm}$) are based on a composite test separation distance of 10 mm from the front, back and edges of the device containing transmitting antennas within 2.5 cm of their edges, determined from general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

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

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7 RF EXPOSURE LIMITS

7.1 Uncontrolled Environment

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

7.2 Controlled Environment

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

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

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

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

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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.

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

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

8.3.5 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.

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Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	$\beta_{sc}^{(1)}$	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 $\Delta_{CQI} = 8 \Leftrightarrow A_{10} = \beta_{10}/\beta_c = 30/15 \Leftrightarrow \beta_{10} = 30/15 * \beta_c$.

Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{10}/\beta_c = 24/15$. 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.

8.4 SAR Measurement Conditions for LTE

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

8.4.1 Spectrum Plots for RB Configurations

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

8.4.2 MPR

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

8.4.3 A-MPR

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

8.4.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05v02r01:

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

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- 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 ½ 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.

8.5.1 General Device Setup

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

8.5.2 Frequency Channel Configurations [24]

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

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

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

8.5.3 MIMO SAR considerations

Per KDB 248227, SAR for MIMO was measured with both transmitting simultaneously and was evaluated independently of SISO operation. For 2.4 and 5 GHz MIMO, 20 MHz Bandwidth 802.11n was evaluated. Other IEEE 802.11 modes and bandwidths were not investigated for MIMO operations since the maximum allowed output power (including tolerance) was not higher for these modes.

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9 RF CONDUCTED POWERS

9.1 GSM Conducted Powers

		Maximum Burst-Averaged Output Power		
		Voice	GPRS Data (GMSK)	
Band	Channel	GSM [dBm] CS (1 Slot)	GPRS [dBm] 1 Tx Slot	GPRS [dBm] 2 Tx Slot
GSM 1900	512	29.65	29.63	27.17
	661	29.52	29.56	26.88
	810	29.49	29.49	27.04
		Calculated Maximum Frame-Averaged Output Power		
		Voice	GPRS Data (GMSK)	
Band	Channel	GSM [dBm] CS (1 Slot)	GPRS [dBm] 1 Tx Slot	GPRS [dBm] 2 Tx Slot
GSM 1900	512	20.62	20.60	21.15
	661	20.49	20.53	20.86
	810	20.46	20.46	21.02
GSM 1900	Frame Avg. Targets:	20.97	20.97	21.98

Notes:

- Both burst-averaged and calculated frame-averaged powers are included. Frame-averaged power was calculated from the measured burst-averaged power by converting the slot powers into linear units and calculating the energy over 8 timeslots.
- The source-based frame-averaged output power was evaluated for all GPRS slot configurations. The configuration with the highest target frame averaged output power was evaluated for hotspot SAR. When the maximum frame-averaged powers are equivalent across two or more slots (within 0.25 dB), the configuration with the most number of time slots was tested.
- GPRS (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.

GSM Class: B
GPRS Multislot class: 10 (Max 2 Tx uplink slots)
EDGE Multislot class: N/A
DTM Multislot Class: N/A



Figure 9-1
Power Measurement Setup

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9.2 UMTS Conducted Powers

3GPP Release Version	Mode	3GPP 34.121 Subtest	Cellular Band [dBm]			PCS Band [dBm]			3GPP MPR [dB]
			4132	4183	4233	9262	9400	9538	
99	WCDMA	12.2 kbps RMC	23.00	22.97	22.96	22.83	22.95	23.13	-
99		12.2 kbps AMR	22.89	22.85	22.90	22.77	22.87	23.12	-
6	HSDPA	Subtest 1	22.94	22.95	23.00	22.81	22.93	22.20	0
6		Subtest 2	22.00	22.03	22.17	22.89	22.06	21.72	0
6		Subtest 3	21.12	21.08	21.21	21.14	21.16	21.03	0.5
6		Subtest 4	21.06	21.09	21.09	21.07	21.18	21.12	0.5
6	HSUPA	Subtest 1	21.74	21.92	21.58	21.85	21.71	21.76	0
6		Subtest 2	19.53	20.06	19.62	19.97	20.02	20.11	2
6		Subtest 3	20.17	20.82	20.48	20.96	20.26	20.92	1
6		Subtest 4	19.24	20.07	19.68	20.05	19.38	20.02	2
6		Subtest 5	20.58	20.92	20.52	21.03	20.68	20.93	0

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

This device does not support DC-HSDPA.

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

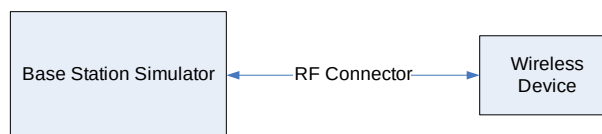


Figure 9-2
Power Measurement Setup

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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]	MPR Allowed per 3GPP [dB]	MPR [dB]
Mid	710.0	23790	10	QPSK	1	0	23.50	0	0
	710.0	23790	10	QPSK	1	25	23.47	0	0
	710.0	23790	10	QPSK	1	49	23.48	0	0
	710.0	23790	10	QPSK	25	0	22.35	0-1	1
	710.0	23790	10	QPSK	25	12	22.32	0-1	1
	710.0	23790	10	QPSK	25	25	22.24	0-1	1
	710.0	23790	10	QPSK	50	0	22.31	0-1	1
	710.0	23790	10	16QAM	1	0	22.50	0-1	1
	710.0	23790	10	16QAM	1	25	22.47	0-1	1
	710.0	23790	10	16QAM	1	49	22.34	0-1	1
	710.0	23790	10	16QAM	25	0	21.24	0-2	2
	710.0	23790	10	16QAM	25	12	21.25	0-2	2
	710.0	23790	10	16QAM	25	25	21.20	0-2	2
	710.0	23790	10	16QAM	50	0	21.16	0-2	2

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

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Mid	710.0	23790	5	QPSK	1	0	23.49	0	0
	710.0	23790	5	QPSK	1	12	23.48	0	0
	710.0	23790	5	QPSK	1	24	23.50	0	0
	710.0	23790	5	QPSK	12	0	22.33	0-1	1
	710.0	23790	5	QPSK	12	6	22.34	0-1	1
	710.0	23790	5	QPSK	12	13	22.32	0-1	1
	710.0	23790	5	QPSK	25	0	22.32	0-1	1
	710.0	23790	5	16-QAM	1	0	22.49	0-1	1
	710.0	23790	5	16-QAM	1	12	22.43	0-1	1
	710.0	23790	5	16-QAM	1	24	22.50	0-1	1
	710.0	23790	5	16-QAM	12	0	21.17	0-2	2
	710.0	23790	5	16-QAM	12	6	21.08	0-2	2
	710.0	23790	5	16-QAM	12	13	21.05	0-2	2
	710.0	23790	5	16-QAM	25	0	21.25	0-2	2

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

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9.3.2

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]	MPR Allowed per 3GPP [dB]	MPR [dB]
Mid	836.5	20525	10	QPSK	1	0	23.78	0	0
	836.5	20525	10	QPSK	1	25	23.70	0	0
	836.5	20525	10	QPSK	1	49	23.64	0	0
	836.5	20525	10	QPSK	25	0	22.33	0-1	1
	836.5	20525	10	QPSK	25	12	22.38	0-1	1
	836.5	20525	10	QPSK	25	25	22.30	0-1	1
	836.5	20525	10	QPSK	50	0	22.23	0-1	1
	836.5	20525	10	16QAM	1	0	22.97	0-1	1
	836.5	20525	10	16QAM	1	25	23.00	0-1	1
	836.5	20525	10	16QAM	1	49	22.97	0-1	1
	836.5	20525	10	16QAM	25	0	21.14	0-2	2
	836.5	20525	10	16QAM	25	12	21.11	0-2	2
	836.5	20525	10	16QAM	25	25	21.09	0-2	2
	836.5	20525	10	16QAM	50	0	21.08	0-2	2

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

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	826.5	20425	5	QPSK	1	0	23.92	0	0
	826.5	20425	5	QPSK	1	12	23.92	0	0
	826.5	20425	5	QPSK	1	24	23.99	0	0
	826.5	20425	5	QPSK	12	0	22.19	0-1	1
	826.5	20425	5	QPSK	12	6	22.23	0-1	1
	826.5	20425	5	QPSK	12	13	22.21	0-1	1
	826.5	20425	5	QPSK	25	0	22.22	0-1	1
	826.5	20425	5	16-QAM	1	0	23.00	0-1	1
	826.5	20425	5	16-QAM	1	12	22.89	0-1	1
	826.5	20425	5	16-QAM	1	24	22.97	0-1	1
	826.5	20425	5	16-QAM	12	0	21.06	0-2	2
	826.5	20425	5	16-QAM	12	6	21.11	0-2	2
	826.5	20425	5	16-QAM	12	13	21.02	0-2	2
	826.5	20425	5	16-QAM	25	0	21.12	0-2	2
	836.5	20525	5	QPSK	1	0	23.64	0	0
	836.5	20525	5	QPSK	1	12	23.97	0	0
	836.5	20525	5	QPSK	1	24	24.00	0	0
Mid	836.5	20525	5	QPSK	12	0	22.29	0-1	1
	836.5	20525	5	QPSK	12	6	22.26	0-1	1
	836.5	20525	5	QPSK	12	13	22.23	0-1	1
	836.5	20525	5	QPSK	25	0	22.24	0-1	1
	836.5	20525	5	16-QAM	1	0	23.00	0-1	1
	836.5	20525	5	16-QAM	1	12	22.97	0-1	1
	836.5	20525	5	16-QAM	1	24	22.96	0-1	1
	836.5	20525	5	16-QAM	12	0	21.10	0-2	2
	836.5	20525	5	16-QAM	12	6	21.03	0-2	2
	836.5	20525	5	16-QAM	12	13	21.00	0-2	2
	836.5	20525	5	16-QAM	25	0	21.24	0-2	2
	846.5	20625	5	QPSK	1	0	23.27	0	0
	846.5	20625	5	QPSK	1	12	23.14	0	0
	846.5	20625	5	QPSK	1	24	23.10	0	0
	846.5	20625	5	QPSK	12	0	22.16	0-1	1
	846.5	20625	5	QPSK	12	6	22.13	0-1	1
	846.5	20625	5	QPSK	12	13	22.13	0-1	1
	846.5	20625	5	QPSK	25	0	22.15	0-1	1
High	846.5	20625	5	16-QAM	1	0	22.64	0-1	1
	846.5	20625	5	16-QAM	1	12	22.31	0-1	1
	846.5	20625	5	16-QAM	1	24	22.36	0-1	1
	846.5	20625	5	16-QAM	12	0	21.07	0-2	2
	846.5	20625	5	16-QAM	12	6	21.05	0-2	2
	846.5	20625	5	16-QAM	12	13	21.04	0-2	2
	846.5	20625	5	16-QAM	25	0	21.00	0-2	2

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9.4 WLAN Conducted Powers

Table 9-5
IEEE 802.11b Average RF Power – Antenna 1

Mode	Freq [MHz]	Channel	802.11b Conducted Power [dBm]			
			Data Rate [Mbps]			
			1	2	5.5	11
802.11b	2412	1*	15.85	16.04	16.01	16.00
802.11b	2437	6*	16.24	15.57	15.52	15.59
802.11b	2462	11*	15.74	16.14	16.17	16.10

Table 9-6
IEEE 802.11b Average RF Power – Antenna 2

Mode	Freq [MHz]	Channel	802.11b Conducted Power [dBm]			
			Data Rate [Mbps]			
			1	2	5.5	11
802.11b	2412	1*	15.64	15.00	15.07	15.02
802.11b	2437	6*	16.28	15.47	15.48	15.57
802.11b	2462	11*	15.48	15.64	15.82	15.76

Table 9-7
IEEE 802.11g Average RF Power – Antenna 1

Mode	Freq [MHz]	Channel	802.11g Conducted Power [dBm]							
			Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
802.11g	2412	1	12.73	12.67	12.77	12.59	12.77	12.58	13.22	12.63
802.11g	2437	6	13.31	13.21	13.33	13.31	13.10	13.02	12.81	12.84
802.11g	2462	11	12.85	12.98	12.86	12.82	13.15	12.95	12.90	12.97

Table 9-8
IEEE 802.11g Average RF Power – Antenna 2

Mode	Freq [MHz]	Channel	802.11g Conducted Power [dBm]							
			Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
802.11g	2412	1	12.92	13.20	13.09	13.05	12.79	13.12	12.83	12.28
802.11g	2437	6	12.62	12.68	12.78	12.75	12.71	12.70	12.86	12.87
802.11g	2462	11	12.81	12.67	12.65	12.61	12.60	12.71	12.67	12.24

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Table 9-9
IEEE 802.11n Average RF Power – Antenna 1

Mode	Freq [MHz]	Channel	802.11n (2.4GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			6.5	13	19.5	26	39	52	58.5	65
802.11n	2412	1	11.36	11.41	11.38	10.68	10.83	10.57	10.77	10.72
802.11n	2437	6	11.05	11.06	11.16	11.22	11.20	11.19	11.27	11.31
802.11n	2462	11	10.70	10.61	10.77	10.81	11.07	10.89	11.10	10.93

Table 9-10
IEEE 802.11n Average RF Power – Antenna 2

Mode	Freq [MHz]	Channel	802.11n (2.4GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			6.5	13	19.5	26	39	52	58.5	65
802.11n	2412	1	10.75	10.64	10.67	10.86	10.88	10.64	10.81	10.99
802.11n	2437	6	11.29	11.23	11.37	11.47	10.67	10.46	10.71	10.62
802.11n	2462	11	10.75	10.50	10.67	10.88	10.92	10.82	11.00	10.95

Table 9-11
IEEE 802.11n Average RF Power – MIMO

802.11n (2.4 GHz) Conducted Power [dBm]			
Mode	Freq [MHz]	Channel	MIMO
			Data Rate [Mbps]
			13
802.11n	2412	1	14.08
802.11n	2437	6	14.18
802.11n	2462	11	13.74

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Table 9-12
IEEE 802.11a Average RF Power – Antenna 1

Mode	Freq [MHz]	Channel	802.11a Conducted Power [dBm]							
			Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
802.11a	5180	36*	12.39	11.63	11.54	11.53	11.73	11.72	11.64	11.36
802.11a	5200	40	12.32	11.56	11.56	11.46	11.66	11.74	11.55	11.36
802.11a	5220	44	12.34	11.60	11.53	11.52	11.68	11.62	11.60	11.28
802.11a	5240	48*	12.28	11.49	11.43	11.37	11.60	11.65	11.48	11.21
802.11a	5260	52*	12.21	11.71	11.51	11.31	11.45	11.51	12.11	11.49
802.11a	5280	56	12.23	11.75	11.46	11.34	11.49	11.54	12.10	11.52
802.11a	5300	60	12.17	11.70	11.43	11.28	11.44	11.47	12.07	11.46
802.11a	5320	64*	12.13	11.68	11.46	11.24	11.28	11.46	12.04	11.34
802.11a	5500	100	11.76	11.65	11.71	11.67	12.05	11.82	12.13	11.80
802.11a	5520	104*	11.83	11.76	11.77	11.74	12.06	11.87	12.12	11.88
802.11a	5540	108	11.86	11.70	11.82	11.77	12.10	11.88	11.91	11.95
802.11a	5560	112	11.96	11.80	11.85	11.87	12.01	11.99	11.90	12.03
802.11a	5580	116*	11.91	11.81	11.87	11.88	12.19	12.00	12.01	11.98
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	11.95	11.81	11.91	11.85	12.17	12.02	12.01	12.07
802.11a	5680	136*	11.94	11.90	11.95	11.86	11.90	12.05	12.01	11.96
802.11a	5700	140	11.85	11.67	11.81	11.71	12.12	11.91	11.90	11.89
802.11a	5745	149*	11.71	11.69	11.50	11.43	11.71	11.69	11.70	11.49
802.11a	5765	153	11.70	11.66	11.55	11.42	11.73	11.67	11.70	11.54
802.11a	5785	157*	11.71	11.70	11.50	11.46	11.73	11.66	11.69	11.52
802.11a	5805	161	11.62	11.51	11.49	11.32	11.67	11.55	11.62	11.48
802.11a	5825	165*	11.72	11.68	11.52	11.46	11.74	11.74	11.70	11.49

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

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

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Table 9-13
IEEE 802.11a Average RF Power – Antenna 2

Mode	Freq [MHz]	Channel	802.11a Conducted Power [dBm]							
			Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
802.11a	5180	36*	12.27	12.18	12.02	11.93	12.04	12.11	12.00	12.11
802.11a	5200	40	12.22	12.11	11.99	11.90	11.93	12.03	11.93	12.07
802.11a	5220	44	12.14	12.00	11.88	11.78	11.94	11.99	11.79	12.03
802.11a	5240	48*	11.98	11.87	11.79	11.64	11.79	11.83	11.68	11.87
802.11a	5260	52*	11.77	11.45	11.65	11.55	11.67	11.71	11.81	11.82
802.11a	5280	56	11.65	11.33	11.51	11.41	11.57	11.62	11.66	11.68
802.11a	5300	60	11.47	11.22	11.33	11.23	11.39	11.47	11.53	11.52
802.11a	5320	64*	11.46	11.16	11.35	11.24	11.35	11.40	11.53	11.49
802.11a	5500	100	12.19	12.01	12.24	12.16	12.14	12.23	12.23	11.76
802.11a	5520	104*	12.21	12.09	12.23	12.18	12.22	12.24	12.22	11.81
802.11a	5540	108	12.16	12.01	12.18	12.16	12.01	12.15	12.23	11.70
802.11a	5560	112	12.14	11.92	12.19	12.15	12.14	12.22	12.25	11.66
802.11a	5580	116*	11.86	11.73	11.93	11.81	11.73	11.89	11.88	11.44
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	11.70	11.53	11.79	11.67	11.60	11.73	11.74	11.27
802.11a	5680	136*	11.69	11.48	11.71	11.68	11.67	11.79	11.73	11.28
802.11a	5700	140	11.92	11.73	11.93	11.85	11.93	11.92	12.00	11.51
802.11a	5745	149*	11.54	11.23	11.29	12.01	11.43	11.44	11.80	11.31
802.11a	5765	153	11.62	11.26	11.39	11.35	11.49	11.55	11.86	11.37
802.11a	5785	157*	11.51	11.22	11.24	11.94	11.42	11.33	11.84	11.36
802.11a	5805	161	11.78	11.46	11.57	11.60	11.62	11.67	11.50	11.55
802.11a	5825	165*	11.55	11.23	11.32	11.60	11.44	11.43	11.88	11.31

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

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

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Table 9-14
IEEE 802.11n Average RF Power – 20 MHz Bandwidth – Antenna 1

Mode	Freq [MHz]	Channel	20MHz BW 802.11n (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			6.5	13	19.5	26	39	52	58.5	65
802.11n	5180	36	12.41	12.41	12.45	11.81	11.86	11.74	11.76	11.61
802.11n	5200	40	12.37	12.39	12.46	11.75	11.86	11.67	11.67	11.64
802.11n	5220	44	12.38	12.40	12.38	11.84	11.78	11.68	11.73	11.55
802.11n	5240	48	12.16	12.23	12.21	11.57	11.58	11.57	11.52	11.35
802.11n	5260	52	12.22	12.15	12.21	11.57	11.82	11.64	11.54	11.77
802.11n	5280	56	12.28	12.18	12.26	11.65	11.85	11.61	11.61	11.87
802.11n	5300	60	12.29	12.27	12.32	11.57	11.90	11.71	11.59	11.77
802.11n	5320	64	12.11	12.00	12.07	11.47	11.69	11.56	11.47	11.71
802.11n	5500	100	11.93	11.65	11.57	11.90	11.98	11.94	11.86	11.78
802.11n	5520	104	11.94	11.68	11.64	11.87	11.97	11.99	11.84	11.80
802.11n	5540	108	11.83	11.49	11.48	11.73	11.90	11.86	11.70	11.68
802.11n	5560	112	11.81	11.55	11.45	11.83	11.89	11.78	11.79	11.57
802.11n	5580	116	11.88	11.58	11.57	11.93	11.89	11.96	11.87	11.72
802.11n	5600	120	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5620	124	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5640	128	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5660	132	11.77	11.53	11.38	11.76	11.83	11.71	11.71	11.67
802.11n	5680	136	11.86	11.62	11.48	11.84	11.90	11.88	11.79	11.72
802.11n	5700	140	11.89	11.62	11.55	11.85	11.92	11.90	11.76	11.73
802.11n	5745	149	11.81	11.66	11.42	11.64	11.71	11.66	11.73	11.61
802.11n	5765	153	11.78	11.59	11.37	11.60	11.68	11.62	11.62	11.58
802.11n	5785	157	11.70	11.58	11.36	11.52	11.66	11.54	11.61	11.51
802.11n	5805	161	11.51	11.38	11.16	11.33	11.46	11.37	11.45	11.31
802.11n	5825	165	11.28	11.20	10.88	11.20	11.26	11.14	11.14	11.07

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Table 9-15
IEEE 802.11n Average RF Power – 20 MHz Bandwidth – Antenna 2

Mode	Freq [MHz]	Channel	20MHz BW 802.11n (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			6.5	13	19.5	26	39	52	58.5	65
802.11n	5180	36	12.27	12.19	12.13	12.35	12.41	12.34	12.42	12.39
802.11n	5200	40	12.28	12.16	12.16	12.29	12.39	12.30	12.47	12.40
802.11n	5220	44	12.25	12.16	12.05	12.36	12.44	12.28	12.42	12.40
802.11n	5240	48	12.29	12.24	12.14	12.41	12.46	12.41	12.43	12.43
802.11n	5260	52	11.90	11.37	11.41	11.77	11.77	11.79	11.57	11.77
802.11n	5280	56	11.78	11.28	11.32	11.72	11.62	11.74	11.49	11.62
802.11n	5300	60	11.67	11.12	11.12	11.51	11.51	11.57	11.38	11.51
802.11n	5320	64	11.87	11.36	11.45	11.68	11.78	11.70	11.62	11.71
802.11n	5500	100	11.72	11.67	11.15	11.49	11.48	11.53	11.55	11.41
802.11n	5520	104	11.75	11.67	11.11	11.46	11.52	11.59	11.64	11.46
802.11n	5540	108	11.63	11.59	11.06	11.37	11.44	11.48	11.49	11.27
802.11n	5560	112	11.31	11.30	10.81	11.06	11.03	11.12	11.20	11.03
802.11n	5580	116	11.49	11.44	10.92	11.27	11.23	11.30	11.27	11.21
802.11n	5600	120	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5620	124	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5640	128	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5660	132	11.46	11.45	10.99	11.23	11.27	11.28	11.32	11.14
802.11n	5680	136	11.49	11.45	10.95	11.24	11.32	11.35	11.30	11.20
802.11n	5700	140	11.36	11.36	10.81	11.14	11.22	11.19	11.21	11.08
802.11n	5745	149	12.01	11.85	11.78	11.99	11.98	11.89	11.94	11.98
802.11n	5765	153	11.98	11.83	11.73	11.95	11.94	11.82	11.95	12.01
802.11n	5785	157	11.89	11.79	11.66	11.81	11.83	11.78	11.81	11.88
802.11n	5805	161	11.99	11.80	11.71	11.95	11.95	11.88	11.95	11.97
802.11n	5825	165	11.67	11.46	11.43	11.64	11.59	11.59	11.51	11.69

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Table 9-16
IEEE 802.11n Average RF Power – 20 MHz Bandwidth – MIMO

20MHz BW 802.11n (5GHz) Conducted Power [dBm]			
Mode	Freq [MHz]	Channel	MIMO
			Data Rate [Mbps]
			13
802.11n	5180	36	15.35
802.11n	5200	40	15.34
802.11n	5220	44	15.33
802.11n	5240	48	15.24
802.11n	5260	52	15.07
802.11n	5280	56	15.05
802.11n	5300	60	15.00
802.11n	5320	64	15.00
802.11n	5500	100	14.84
802.11n	5520	104	14.86
802.11n	5540	108	14.74
802.11n	5560	112	14.58
802.11n	5580	116	14.70
802.11n	5600	120	N/A
802.11n	5620	124	N/A
802.11n	5640	128	N/A
802.11n	5660	132	14.63
802.11n	5680	136	14.69
802.11n	5700	140	14.64
802.11n	5745	149	14.92
802.11n	5765	153	14.89
802.11n	5785	157	14.81
802.11n	5805	161	14.77
802.11n	5825	165	14.49

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Table 9-17
IEEE 802.11ac Average RF Power – 20 MHz Bandwidth – Antenna 1

20MHz BW 802.11ac (5GHz) Conducted Power [dBm]			
Mode	Freq [MHz]	Channel	Data Rate
			6.5 Mbps
802.11ac	5180	36	10.16
802.11ac	5200	40	10.34
802.11ac	5240	48	10.11
802.11ac	5260	52	10.40
802.11ac	5280	56	10.14
802.11ac	5320	64	10.26
802.11ac	5500	100	9.73
802.11ac	5580	116	9.74
802.11ac	5600	120	N/A
802.11ac	5620	124	N/A
802.11ac	5640	128	N/A
802.11ac	5700	140	9.94
802.11ac	5745	149	9.60
802.11ac	5785	157	9.79
802.11ac	5825	165	9.65

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Table 9-18
IEEE 802.11ac Average RF Power – 20 MHz Bandwidth – Antenna 2

20MHz BW 802.11ac (5GHz) Conducted Power [dBm]			
Mode	Freq [MHz]	Channel	Data Rate
			6.5 Mbps
802.11ac	5180	36	9.71
802.11ac	5200	40	9.66
802.11ac	5240	48	9.51
802.11ac	5260	52	10.16
802.11ac	5280	56	10.09
802.11ac	5320	64	10.05
802.11ac	5500	100	9.97
802.11ac	5580	116	9.64
802.11ac	5600	120	N/A
802.11ac	5620	124	N/A
802.11ac	5640	128	N/A
802.11ac	5700	140	9.59
802.11ac	5745	149	10.17
802.11ac	5785	157	10.23
802.11ac	5825	165	10.23

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Table 9-19
IEEE 802.11ac Average RF Power – 20 MHz Bandwidth – MIMO

20MHz BW 802.11ac (5GHz) Conducted Power [dBm]			
Mode	Freq [MHz]	Channel	MIMO
			Data Rate [Mbps]
			13
802.11ac	5180	36	12.95
802.11ac	5200	40	13.02
802.11ac	5240	48	12.83
802.11ac	5260	52	13.29
802.11ac	5280	56	13.13
802.11ac	5320	64	13.17
802.11ac	5500	100	12.86
802.11ac	5580	116	12.70
802.11ac	5600	120	N/A
802.11ac	5620	124	N/A
802.11ac	5640	128	N/A
802.11ac	5700	140	12.78
802.11ac	5745	149	12.90
802.11ac	5785	157	13.03
802.11ac	5825	165	12.93

Table 9-20
IEEE 802.11n Average RF Power – 40 MHz Bandwidth – Antenna 1

Mode	Freq [MHz]	Channel	40MHz BW 802.11n (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			13.5	27	40.5	54	81	108	121.5	135
802.11n	5190	38	11.56	12.01	12.10	11.97	12.09	12.04	12.00	11.99
802.11n	5230	46	11.24	11.64	11.75	11.61	11.74	11.65	11.66	11.62
802.11n	5270	54	12.45	11.75	11.73	11.84	11.96	11.79	11.84	11.95
802.11n	5310	62	12.33	11.65	11.64	11.75	11.86	11.66	11.77	11.79
802.11n	5510	102	12.06	12.00	12.11	12.01	12.04	12.10	12.12	12.15
802.11n	5550	110	11.94	11.86	11.93	11.85	11.94	12.00	12.02	11.97
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	12.03	11.89	12.08	11.94	11.98	12.07	12.16	12.10
802.11n	5755	151	11.94	11.87	11.95	11.91	11.90	11.88	11.85	11.84
802.11n	5795	159	11.76	11.72	11.81	11.73	11.72	11.74	11.70	11.71

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Table 9-21
IEEE 802.11n Average RF Power – 40 MHz Bandwidth – Antenna 2

Mode	Freq [MHz]	Channel	40MHz BW 802.11n (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			13.5	27	40.5	54	81	108	121.5	135
802.11n	5190	38	11.79	11.38	11.25	11.54	11.51	11.85	11.02	10.93
802.11n	5230	46	11.66	11.22	11.14	11.41	11.37	11.63	10.92	10.81
802.11n	5270	54	11.99	11.85	11.99	11.89	11.69	11.31	11.58	11.53
802.11n	5310	62	11.78	11.63	11.76	11.59	11.45	11.05	11.37	11.30
802.11n	5510	102	12.22	12.44	12.31	12.01	12.01	12.13	12.12	12.40
802.11n	5550	110	12.07	12.27	12.11	11.85	11.88	12.02	12.01	12.18
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	11.83	12.07	11.88	11.64	11.62	11.76	11.78	12.08
802.11n	5755	151	11.94	11.89	11.76	11.91	12.02	11.97	12.02	11.89
802.11n	5795	159	12.01	11.94	11.79	12.01	12.00	12.01	12.00	12.00

Table 9-22
IEEE 802.11n Average RF Power – 40 MHz Bandwidth – MIMO

40MHz BW 802.11n (5GHz) Conducted Power [dBm]			
Mode	Freq [MHz]	Channel	MIMO
			Data Rate [Mbps]
			27
802.11n	5190	38	14.69
802.11n	5230	46	14.47
802.11n	5270	54	15.24
802.11n	5310	62	15.07
802.11n	5510	102	15.09
802.11n	5550	110	15.02
802.11n	5590	118	N/A
802.11n	5630	126	N/A
802.11n	5670	134	14.94
802.11n	5755	151	14.95
802.11n	5795	159	14.90

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Table 9-23
IEEE 802.11ac Average RF Power – 40 MHz Bandwidth – Antenna 1

40MHz BW 802.11ac (5GHz) Conducted Power [dBm]			
Mode	Freq [MHz]	Channel	Data Rate
			13.5 Mbps
802.11ac	5190	38	10.24
802.11ac	5230	46	10.18
802.11ac	5270	54	10.41
802.11ac	5310	62	10.32
802.11ac	5510	102	9.96
802.11ac	5550	110	9.92
802.11n	5590	118	N/A
802.11n	5630	126	N/A
802.11ac	5670	134	9.99
802.11ac	5755	151	9.86
802.11ac	5795	159	9.81

Table 9-24
IEEE 802.11ac Average RF Power – 40 MHz Bandwidth – Antenna 2

40MHz BW 802.11ac (5GHz) Conducted Power [dBm]			
Mode	Freq [MHz]	Channel	Data Rate
			13.5 Mbps
802.11ac	5190	38	9.83
802.11ac	5230	46	9.68
802.11ac	5270	54	10.41
802.11ac	5310	62	10.34
802.11ac	5510	102	10.09
802.11ac	5550	110	10.05
802.11n	5590	118	N/A
802.11n	5630	126	N/A
802.11ac	5670	134	9.73
802.11ac	5755	151	10.42
802.11ac	5795	159	10.36

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

40MHz BW 802.11ac (5GHz) Conducted Power [dBm]			
Mode	Freq [MHz]	Channel	MIMO
			Data Rate [Mbps]
			27
802.11ac	5190	38	13.05
802.11ac	5230	46	12.95
802.11ac	5270	54	13.42
802.11ac	5310	62	13.34
802.11ac	5510	102	13.04
802.11ac	5550	110	13.00
802.11n	5590	118	N/A
802.11n	5630	126	N/A
802.11ac	5670	134	12.87
802.11ac	5755	151	13.16
802.11ac	5795	159	13.10

Table 9-26
IEEE 802.11ac Average RF Power – 80 MHz Bandwidth – Antenna 1

Mode	Freq [MHz]	Channel	80MHz BW 802.11ac (5GHz) Conducted Power [dBm]									
			Data Rate [Mbps]									
			29.3	58.5	87.8	117	175.5	234	263.3	292.5	351	390
802.11ac	5210	42	10.06	10.12	10.13	9.56	9.98	10.12	10.15	9.98	9.88	9.87
802.11ac	5290	58	10.16	10.01	9.99	10.02	9.98	10.00	10.01	10.05	10.11	10.15
802.11ac	5530	106	9.71	9.75	9.67	9.65	9.55	9.67	9.68	9.69	9.70	9.68
802.11ac	5775	155	10.36	10.26	10.15	10.37	9.56	9.53	9.58	9.71	9.77	9.58

Table 9-27
IEEE 802.11ac Average RF Power – 80 MHz Bandwidth – Antenna 2

Mode	Freq [MHz]	Channel	80MHz BW 802.11ac (5GHz) Conducted Power [dBm]									
			Data Rate [Mbps]									
			29.3	58.5	87.8	117	175.5	234	263.3	292.5	351	390
802.11ac	5210	42	9.50	9.61	9.53	9.70	9.69	9.70	9.71	9.69	9.40	9.39
802.11ac	5290	58	9.99	10.08	10.16	9.28	9.41	9.22	9.12	9.11	9.14	9.25
802.11ac	5530	106	9.81	9.98	9.87	9.85	10.01	10.02	10.01	9.79	9.81	9.84
802.11ac	5775	155	10.14	9.55	9.65	9.85	9.62	9.68	9.66	9.55	9.77	9.71

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Table 9-28
IEEE 802.11ac Average RF Power – 80 MHz Bandwidth – MIMO

80MHz BW 802.11ac (5GHz) Conducted Power [dBm]			
Mode	Freq [MHz]	Channel	MIMO
			Data Rate [Mbps]
			58.5
802.11ac	5210	42	12.80
802.11ac	5290	58	13.09
802.11ac	5530	106	12.77
802.11ac	5775	155	12.84

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

- For 2.4 GHz SISO operations, highest average RF output power channel for the lowest data rate for IEEE 802.11b were selected for SAR evaluation. Other IEEE 802.11 SISO modes (including 802.11g/n) were not required 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 SISO operations, highest average RF output power channel for the lowest data rate for IEEE 802.11a were selected for SAR evaluation. Other IEEE 802.11 SISO modes (including 802.11n 20 MHz and 40 MHz) were not required since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11a mode.
- Full SAR tests for all SISO IEEE 802.11ac configurations were not required because the average output power was not more than 0.25 dB higher than IEEE 802.11a mode. IEEE 802.11ac in SISO mode was evaluated for the highest IEEE 802.11a position in each 5 GHz band and exposure condition.
- For MIMO 2.4 GHz and 5 GHz operations, the highest average RF output power channel for the lowest data rate for IEEE 802.11n (20 MHz bandwidth) was selected for SAR evaluation. Other IEEE 802.11 modes and bandwidths were not investigated for MIMO operations since the maximum allowed output power (including tolerance) was not higher for these modes.
- The individual spectra for each 2x2 MIMO WIFI Antenna were summed mathematically in linear power units for the MIMO output power measurements.
- When the maximum extrapolated peak SAR of the zoom scan for the maximum output channel is <1.6 W/kg and the reported 1g averaged SAR is <0.8 W/kg, SAR testing on other channels is not required. Otherwise, the other default (or corresponding required) test channels were additionally tested using the lowest data rate.
- The bolded data rate and channel above were tested for SAR.

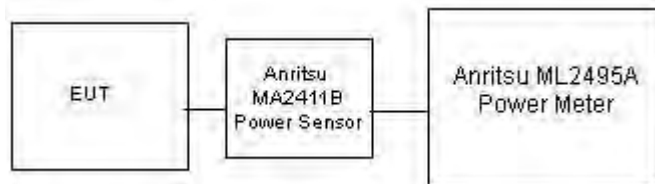


Figure 9-3
Power Measurement Setup for Bandwidths < 50 MHz

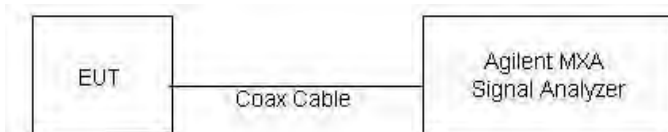


Figure 9-4
Power Measurement Setup for Bandwidths > 50 MHz

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10 SYSTEM VERIFICATION

10.1 Tissue Verification

Table 10-1
Measured Tissue Properties - Head

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
07/31/2014	750H	23.3	710	0.883	42.522	0.890	42.149	-0.79%	0.88%
			725	0.897	42.352	0.891	42.071	0.67%	0.67%
			740	0.912	42.137	0.893	41.994	2.13%	0.34%
			755	0.924	41.933	0.894	41.916	3.36%	0.04%
07/28/2014	835H	21.9	820	0.914	42.686	0.899	41.578	1.67%	2.66%
			835	0.928	42.507	0.900	41.500	3.11%	2.43%
			850	0.943	42.303	0.916	41.500	2.95%	1.93%
07/29/2014	1900H	22.9	1850	1.348	39.198	1.400	40.000	-3.71%	-2.01%
			1880	1.376	39.077	1.400	40.000	-1.71%	-2.31%
			1910	1.407	38.963	1.400	40.000	0.50%	-2.59%
08/04/2014	2450H	23.7	2401	1.692	41.107	1.756	39.287	-3.64%	4.63%
			2450	1.743	40.910	1.800	39.200	-3.17%	4.36%
			2499	1.798	40.760	1.853	39.138	-2.97%	4.14%
07/31/2014	5200H-5800H	22.9	5180	4.549	37.186	4.635	36.009	-1.86%	3.27%
			5200	4.565	37.099	4.655	35.986	-1.93%	3.09%
			5220	4.594	37.073	4.676	35.963	-1.75%	3.09%
			5260	4.648	37.059	4.717	35.917	-1.46%	3.18%
			5280	4.659	37.043	4.737	35.894	-1.65%	3.20%
			5300	4.664	36.989	4.758	35.871	-1.98%	3.12%
			5500	4.880	36.728	4.963	35.643	-1.67%	3.04%
			5520	4.905	36.700	4.983	35.620	-1.57%	3.03%
			5540	4.920	36.682	5.004	35.597	-1.68%	3.05%
			5560	4.935	36.660	5.024	35.574	-1.77%	3.05%
			5600	4.986	36.583	5.065	35.529	-1.56%	2.97%
			5745	5.155	36.409	5.214	35.363	-1.13%	2.96%
			5765	5.177	36.421	5.234	35.340	-1.09%	3.06%
			5785	5.175	36.416	5.255	35.317	-1.52%	3.11%
			5800	5.188	36.346	5.270	35.300	-1.56%	2.96%
			5805	5.194	36.336	5.275	35.294	-1.54%	2.95%
			5825	5.218	36.281	5.296	35.271	-1.47%	2.86%

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Table 10-2
Measured Tissue Properties - Body

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
07/30/2014	750B	23.6	710	0.928	53.864	0.960	55.687	-3.33%	-3.27%
			725	0.941	53.674	0.961	55.629	-2.08%	-3.51%
			740	0.954	53.537	0.963	55.570	-0.93%	-3.66%
			755	0.969	53.396	0.964	55.512	0.52%	-3.81%
07/28/2014	835B	23.0	820	0.985	54.321	0.969	55.258	1.65%	-1.70%
			835	1.000	54.176	0.970	55.200	3.09%	-1.86%
			850	1.014	54.021	0.988	55.154	2.63%	-2.05%
			1850	1.462	54.088	1.520	53.300	-3.82%	1.48%
07/28/2014	1900B	22.4	1880	1.497	53.978	1.520	53.300	-1.51%	1.27%
			1910	1.533	53.882	1.520	53.300	0.86%	1.09%
			1850	1.467	53.578	1.520	53.300	-3.49%	0.52%
			1880	1.501	53.483	1.520	53.300	-1.25%	0.34%
07/31/2014	1900B	22.9	1910	1.538	53.387	1.520	53.300	1.18%	0.16%
			2401	1.865	54.036	1.903	52.765	-2.00%	2.41%
			2450	1.940	53.858	1.950	52.700	-0.51%	2.20%
			2499	1.996	53.672	2.019	52.638	-1.14%	1.96%
07/31/2014	5200B-5800B	22.6	5180	5.237	48.042	5.276	49.041	-0.74%	-2.04%
			5200	5.260	47.955	5.299	49.014	-0.74%	-2.16%
			5220	5.288	47.896	5.323	48.987	-0.66%	-2.23%
			5260	5.381	47.828	5.369	48.933	0.22%	-2.26%
			5280	5.405	47.791	5.393	48.906	0.22%	-2.28%
			5300	5.412	47.761	5.416	48.879	-0.07%	-2.29%
			5500	5.727	47.243	5.650	48.607	1.36%	-2.81%
			5520	5.772	47.190	5.673	48.580	1.75%	-2.86%
			5540	5.783	47.160	5.696	48.553	1.53%	-2.87%
			5560	5.795	47.133	5.720	48.526	1.31%	-2.87%
			5600	5.860	47.011	5.766	48.471	1.63%	-3.01%
			5745	6.100	46.684	5.936	48.275	2.76%	-3.30%
			5765	6.128	46.670	5.959	48.248	2.84%	-3.27%
			5785	6.150	46.633	5.982	48.220	2.81%	-3.29%
			5800	6.162	46.575	6.000	48.200	2.70%	-3.37%
			5805	6.178	46.581	6.006	48.193	2.86%	-3.34%
08/04/2014	5200B-5800B	23.3	5825	6.202	46.516	6.029	48.166	2.87%	-3.43%
			5180	5.150	48.048	5.276	49.041	-2.39%	-2.02%
			5200	5.175	47.948	5.299	49.014	-2.34%	-2.17%
			5220	5.224	47.894	5.323	48.987	-1.86%	-2.23%
			5260	5.291	47.813	5.369	48.933	-1.45%	-2.29%
			5280	5.302	47.831	5.393	48.906	-1.69%	-2.20%
			5300	5.317	47.776	5.416	48.879	-1.83%	-2.26%
			5500	5.624	47.265	5.650	48.607	-0.46%	-2.76%
			5520	5.664	47.212	5.673	48.580	-0.16%	-2.82%
			5540	5.680	47.187	5.696	48.553	-0.28%	-2.81%
			5560	5.702	47.133	5.720	48.526	-0.31%	-2.87%
			5600	5.772	47.041	5.766	48.471	0.10%	-2.95%

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

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10.2 Test System Verification

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

Table 10-3
System Verification Results – 1g SAR

System Verification TARGET & MEASURED												
SAR System #	Tissue Frequency (MHz)	Tissue Type	Date:	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Dipole SN	Probe SN	Measured SAR _{1g} (W/kg)	1 W Target SAR _{1g} (W/kg)	1 W Normalized SAR _{1g} (W/kg)	Deviation _{1g} (%)
K	750	HEAD	07/31/2014	24.5	22.3	0.100	1003	3287	0.837	8.370	8.370	0.00%
H	835	HEAD	07/28/2014	23.0	21.9	0.100	4d119	3319	0.966	9.220	9.660	4.77%
I	1900	HEAD	07/29/2014	23.4	22.9	0.100	5d141	3209	4.030	40.100	40.300	0.50%
H	2450	HEAD	08/04/2014	23.6	23.7	0.100	797	3319	5.160	51.800	51.600	-0.39%
E	5200	HEAD	07/31/2014	24.5	22.9	0.100	1057	3914	7.480	78.000	74.800	-4.10%
E	5300	HEAD	07/31/2014	24.9	22.9	0.100	1057	3914	8.090	83.000	80.900	-2.53%
E	5500	HEAD	07/31/2014	24.8	23.0	0.100	1057	3914	8.320	84.300	83.200	-1.30%
E	5600	HEAD	07/31/2014	24.8	23.0	0.100	1057	3914	7.950	83.500	79.500	-4.79%
E	5800	HEAD	07/31/2014	24.7	23.0	0.100	1057	3914	7.670	79.300	76.700	-3.28%
K	750	BODY	07/30/2014	24.1	23.6	0.100	1003	3287	0.887	8.770	8.870	1.14%
D	835	BODY	07/28/2014	24.4	23.0	0.100	4d119	3022	1.000	9.340	10.000	7.07%
K	1900	BODY	07/28/2014	24.3	23.2	0.100	5d141	3287	4.160	40.600	41.600	2.46%
K	1900	BODY	07/31/2014	24.5	23.2	0.100	5d141	3287	4.160	40.600	41.600	2.46%
H	2450	BODY	07/31/2014	24.3	22.8	0.100	797	3319	4.800	49.400	48.000	-2.83%
I	5200	BODY	07/31/2014	24.1	22.6	0.100	1057	3589	7.770	75.300	77.700	3.19%
I	5300	BODY	07/31/2014	24.0	22.6	0.100	1057	3589	8.130	77.400	81.300	5.04%
I	5500	BODY	07/31/2014	24.0	22.7	0.100	1057	3589	8.070	79.100	80.700	2.02%
I	5600	BODY	07/31/2014	24.0	22.8	0.100	1057	3589	7.900	80.200	79.000	-1.50%
I	5800	BODY	07/31/2014	24.1	22.7	0.100	1057	3589	7.010	74.300	70.100	-5.65%

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Table 10-4
System Verification Results – 10g SAR

System Verification TARGET & MEASURED												
SAR System #	Tissue Frequency (MHz)	Tissue Type	Date:	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Dipole SN	Probe SN	Measured SAR _{10g} (W/kg)	1 W Target SAR _{10g} (W/kg)	1 W Normalized SAR _{10g} (W/kg)	Deviation _{10g} (%)
I	5200	BODY	08/04/2014	23.9	23.3	0.100	1057	3589	2.150	21.000	21.500	2.38%
I	5300	BODY	08/04/2014	24.0	23.3	0.100	1057	3589	2.290	21.500	22.900	6.51%
I	5500	BODY	08/04/2014	24.0	23.3	0.100	1057	3589	2.320	22.000	23.200	5.45%
I	5600	BODY	08/04/2014	24.0	23.3	0.100	1057	3589	2.140	22.200	21.400	-3.60%
I	5800	BODY	08/04/2014	24.0	23.3	0.100	1057	3589	2.200	20.400	22.000	7.84%

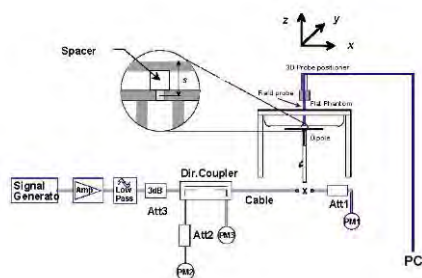


Figure 10-1
System Verification Setup Diagram



Figure 10-2
System Verification Setup Photo

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11 SAR DATA SUMMARY

11.1 Standalone Head SAR Data

Table 11-1
UMTS 850 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Num ber	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
836.60	4183	UMTS 850	RMC	23.5	22.97	0.02	Right	Cheek	F1926	1:1	0.052	1.130	0.059	
836.60	4183	UMTS 850	RMC	23.5	22.97	0.04	Right	Tilt	F1926	1:1	0.035	1.130	0.040	
836.60	4183	UMTS 850	RMC	23.5	22.97	0.02	Left	Cheek	F1926	1:1	0.104	1.130	0.118	A1
836.60	4183	UMTS 850	RMC	23.5	22.97	0.03	Left	Tilt	F1926	1:1	0.039	1.130	0.044	
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
GSM 1900 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1880.00	661	GSM 1900	GSM	30.5	29.52	0.06	Right	Cheek	F1924	1:8:3	0.034	1.253	0.043	
1880.00	661	GSM 1900	GSM	30.5	29.52	-0.02	Right	Tilt	F1924	1:8:3	0.031	1.253	0.039	
1880.00	661	GSM 1900	GSM	30.5	29.52	0.07	Left	Cheek	F1924	1:8:3	0.065	1.253	0.081	A2
1880.00	661	GSM 1900	GSM	30.5	29.52	-0.15	Left	Tilt	F1924	1:8:3	0.009	1.253	0.011	
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 1900 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1880.00	9400	UMTS 1900	RMC	23.5	22.95	0.03	Right	Cheek	F1924	1:1	0.105	1.135	0.119	
1880.00	9400	UMTS 1900	RMC	23.5	22.95	-0.07	Right	Tilt	F1924	1:1	0.078	1.135	0.089	
1880.00	9400	UMTS 1900	RMC	23.5	22.95	-0.02	Left	Cheek	F1924	1:1	0.172	1.135	0.195	A3
1880.00	9400	UMTS 1900	RMC	23.5	22.95	0.03	Left	Tilt	F1924	1:1	0.030	1.135	0.034	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Head 1.6 W/kg (mW/g) averaged over 1 gram						

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Table 11-4
LTE Band 17 Head SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
710.00	23790	Mid	LTE Band 17	10	23.5	23.50	0.05	0	Right	Cheek	QPSK	1	0	F1924	1:1	0.015	1.000	0.015	
710.00	23790	Mid	LTE Band 17	10	22.5	22.35	0.03	1	Right	Cheek	QPSK	25	0	F1924	1:1	0.010	1.035	0.010	
710.00	23790	Mid	LTE Band 17	10	23.5	23.50	0.07	0	Right	Tilt	QPSK	1	0	F1924	1:1	0.008	1.000	0.008	
710.00	23790	Mid	LTE Band 17	10	22.5	22.35	0.11	1	Right	Tilt	QPSK	25	0	F1924	1:1	0.005	1.035	0.005	
710.00	23790	Mid	LTE Band 17	10	23.5	23.50	0.00	0	Left	Cheek	QPSK	1	0	F1924	1:1	0.030	1.000	0.030	A4
710.00	23790	Mid	LTE Band 17	10	22.5	22.35	0.04	1	Left	Cheek	QPSK	25	0	F1924	1:1	0.022	1.035	0.023	
710.00	23790	Mid	LTE Band 17	10	23.5	23.50	0.07	0	Left	Tilt	QPSK	1	0	F1924	1:1	0.009	1.000	0.009	
710.00	23790	Mid	LTE Band 17	10	22.5	22.35	0.03	1	Left	Tilt	QPSK	25	0	F1924	1:1	0.006	1.035	0.006	
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
LTE Band 5 (Cell) Head SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #	
MHz	Ch.														[W/kg]		[W/kg]		
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	23.78	0.03	0	Right	Cheek	QPSK	1	0	F1926	1:1	0.065	1.052	0.068	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	22.38	0.05	1	Right	Cheek	QPSK	25	12	F1926	1:1	0.042	1.153	0.048	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	23.78	0.04	0	Right	Tilt	QPSK	1	0	F1926	1:1	0.039	1.052	0.041	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	22.38	0.08	1	Right	Tilt	QPSK	25	12	F1926	1:1	0.027	1.153	0.031	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	23.78	0.14	0	Left	Cheek	QPSK	1	0	F1926	1:1	0.131	1.052	0.138	A5
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	22.38	0.07	1	Left	Cheek	QPSK	25	12	F1926	1:1	0.087	1.153	0.100	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	23.78	0.15	0	Left	Tilt	QPSK	1	0	F1926	1:1	0.048	1.052	0.050	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	22.38	0.02	1	Left	Tilt	QPSK	25	12	F1926	1:1	0.033	1.153	0.038	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

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**Table 11-6
DTS Head SAR**

MEASUREMENT RESULTS																	
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Antenna Config.	Bandwidth (MHz)	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	16.5	16.24	0.20	Right	Cheek	1	20	F1926	1	1:1	0.140	1.062	0.149	
2412	1	IEEE 802.11n	OFDM	11.5	11.36	0.06	Right	Cheek	1	20	F1926	6.5	1:1	0.033	1.033	0.034	
2437	6	IEEE 802.11b	DSSS	16.5	16.24	0.00	Right	Tilt	1	20	F1926	1	1:1	0.086	1.062	0.091	
2437	6	IEEE 802.11b	DSSS	16.5	16.24	0.03	Left	Cheek	1	20	F1926	1	1:1	0.045	1.062	0.048	
2437	6	IEEE 802.11b	DSSS	16.5	16.24	0.08	Left	Tilt	1	20	F1926	1	1:1	0.030	1.062	0.032	
2437	6	IEEE 802.11b	DSSS	16.5	16.28	0.02	Right	Cheek	2	20	F1926	1	1:1	0.398	1.052	0.419	A6
2437	6	IEEE 802.11n	OFDM	11.5	11.29	0.13	Right	Cheek	2	20	F1926	6.5	1:1	0.065	1.050	0.068	
2437	6	IEEE 802.11b	DSSS	16.5	16.28	0.05	Right	Tilt	2	20	F1926	1	1:1	0.284	1.052	0.299	
2437	6	IEEE 802.11b	DSSS	16.5	16.28	0.20	Left	Cheek	2	20	F1926	1	1:1	0.107	1.052	0.113	
2437	6	IEEE 802.11b	DSSS	16.5	16.28	0.02	Left	Tilt	2	20	F1926	1	1:1	0.114	1.052	0.120	
2437	6	IEEE 802.11n	OFDM	14.5	14.18	0.05	Right	Cheek	MIMO	20	F1926	13	1:1	0.105	1.076	0.113	
2437	6	IEEE 802.11n	OFDM	14.5	14.18	0.05	Right	Tilt	MIMO	20	F1926	13	1:1	0.074	1.076	0.080	
2437	6	IEEE 802.11n	OFDM	14.5	14.18	0.05	Left	Cheek	MIMO	20	F1926	13	1:1	0.039	1.076	0.042	
2437	6	IEEE 802.11n	OFDM	14.5	14.18	0.05	Left	Tilt	MIMO	20	F1926	13	1:1	0.028	1.076	0.030	
5825	165	IEEE 802.11a	OFDM	12.5	11.72	0.05	Right	Cheek	1	20	F1923	6	1:1	0.157	1.197	0.188	A7
5775	155	IEEE 802.11ac	OFDM	10.5	10.36	0.14	Right	Cheek	1	80	F1923	29.3	1:1	0.097	1.033	0.100	
5755	151	IEEE 802.11n	OFDM	12.5	11.94	0.04	Right	Cheek	1	40	F1923	13.5	1:1	0.156	1.138	0.178	
5825	165	IEEE 802.11a	OFDM	12.5	11.72	-0.18	Right	Tilt	1	20	F1923	6	1:1	0.096	1.197	0.115	
5825	165	IEEE 802.11a	OFDM	12.5	11.72	0.07	Left	Cheek	1	20	F1923	6	1:1	0.041	1.197	0.049	
5825	165	IEEE 802.11a	OFDM	12.5	11.72	-0.16	Left	Tilt	1	20	F1923	6	1:1	0.038	1.197	0.045	
5805	161	IEEE 802.11a	OFDM	12.5	11.78	0.00	Right	Cheek	2	20	F1923	6	1:1	0.000	1.180	0.000	
5805	161	IEEE 802.11a	OFDM	12.5	11.78	0.00	Right	Tilt	2	20	F1923	6	1:1	0.000	1.180	0.000	
5775	155	IEEE 802.11ac	OFDM	10.5	10.14	0.00	Right	Tilt	2	80	F1923	29.3	1:1	0.000	1.086	0.000	
5795	159	IEEE 802.11n	OFDM	12.5	12.01	0.00	Right	Tilt	2	40	F1923	13.5	1:1	0.000	1.119	0.000	
5805	161	IEEE 802.11a	OFDM	12.5	11.78	0.00	Left	Cheek	2	20	F1923	6	1:1	0.000	1.180	0.000	
5805	161	IEEE 802.11a	OFDM	12.5	11.78	0.00	Left	Tilt	2	20	F1923	6	1:1	0.000	1.180	0.000	
5745	149	IEEE 802.11n	OFDM	15.5	14.92	-0.03	Right	Cheek	MIMO	20	F1923	13	1:1	0.033	1.143	0.038	
5745	149	IEEE 802.11n	OFDM	15.5	14.92	0.10	Right	Tilt	MIMO	20	F1923	13	1:1	0.015	1.143	0.017	
5745	149	IEEE 802.11n	OFDM	15.5	14.92	0.00	Left	Cheek	MIMO	20	F1923	13	1:1	0.001	1.143	0.001	
5745	149	IEEE 802.11n	OFDM	15.5	14.92	0.03	Left	Tilt	MIMO	20	F1923	13	1:1	0.026	1.143	0.030	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram										

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**Table 11-7
NII Head SAR**

MEASUREMENT RESULTS																	
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Antenna Config.	Bandwidth (MHz)	Device Serial Number	Data Rate (Mbps)	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #
MHz	Ch.													(W/kg)		(W/kg)	
5180	36	IEEE 802.11a	OFDM	12.5	12.39	-0.10	Right	Cheek	1	20	F1923	6	1:1	0.060	1.026	0.062	
5210	42	IEEE 802.11ac	OFDM	10.5	10.06	0.03	Right	Cheek	1	80	F1923	29.3	1:1	0.020	1.107	0.022	
5180	36	IEEE 802.11a	OFDM	12.5	12.39	-0.05	Right	Tilt	1	20	F1923	6	1:1	0.026	1.026	0.027	
5180	36	IEEE 802.11a	OFDM	12.5	12.39	-0.16	Left	Cheek	1	20	F1923	6	1:1	0.035	1.026	0.036	
5180	36	IEEE 802.11a	OFDM	12.5	12.39	0.03	Left	Tilt	1	20	F1923	6	1:1	0.006	1.026	0.006	
5280	56	IEEE 802.11a	OFDM	12.5	12.23	0.05	Right	Cheek	1	20	F1923	6	1:1	0.078	1.064	0.083	
5290	58	IEEE 802.11ac	OFDM	10.5	10.16	0.13	Right	Cheek	1	80	F1923	29.3	1:1	0.024	1.081	0.026	
5270	54	IEEE 802.11n	OFDM	12.5	12.45	0.03	Right	Cheek	1	40	F1923	13.5	1:1	0.103	1.012	0.104	
5280	56	IEEE 802.11a	OFDM	12.5	12.23	0.03	Right	Tilt	1	20	F1923	6	1:1	0.031	1.064	0.033	
5280	56	IEEE 802.11a	OFDM	12.5	12.23	-0.05	Left	Cheek	1	20	F1923	6	1:1	0.049	1.064	0.052	
5280	56	IEEE 802.11a	OFDM	12.5	12.23	0.02	Left	Tilt	1	20	F1923	6	1:1	0.001	1.064	0.001	
5560	112	IEEE 802.11a	OFDM	12.5	11.96	0.03	Right	Cheek	1	20	F1923	6	1:1	0.143	1.132	0.162	A8
5530	106	IEEE 802.11ac	OFDM	10.5	9.71	0.03	Right	Cheek	1	80	F1923	29.3	1:1	0.063	1.199	0.076	
5510	102	IEEE 802.11n	OFDM	12.5	12.06	0.06	Right	Cheek	1	40	F1923	13.5	1:1	0.084	1.107	0.093	
5560	112	IEEE 802.11a	OFDM	12.5	11.96	0.03	Right	Tilt	1	20	F1923	6	1:1	0.083	1.132	0.094	
5560	112	IEEE 802.11a	OFDM	12.5	11.96	-0.20	Left	Cheek	1	20	F1923	6	1:1	0.033	1.132	0.037	
5560	112	IEEE 802.11a	OFDM	12.5	11.96	-0.03	Left	Tilt	1	20	F1923	6	1:1	0.033	1.132	0.037	
5180	36	IEEE 802.11a	OFDM	12.5	12.27	0.00	Right	Cheek	2	20	F1923	6	1:1	0.000	1.054	0.000	
5180	36	IEEE 802.11a	OFDM	12.5	12.27	0.00	Right	Tilt	2	20	F1923	6	1:1	0.000	1.054	0.000	
5210	42	IEEE 802.11ac	OFDM	10.5	9.50	0.00	Right	Tilt	2	80	F1923	29.3	1:1	0.000	1.259	0.000	
5180	36	IEEE 802.11a	OFDM	12.5	12.27	0.00	Left	Cheek	2	20	F1923	6	1:1	0.000	1.054	0.000	
5180	36	IEEE 802.11a	OFDM	12.5	12.27	0.00	Left	Tilt	2	20	F1923	6	1:1	0.000	1.054	0.000	
5260	52	IEEE 802.11a	OFDM	12.5	11.77	0.00	Right	Cheek	2	20	F1923	6	1:1	0.000	1.183	0.000	
5260	52	IEEE 802.11a	OFDM	12.5	11.77	0.00	Right	Tilt	2	20	F1923	6	1:1	0.000	1.183	0.000	
5290	58	IEEE 802.11ac	OFDM	10.5	9.99	0.00	Right	Tilt	2	80	F1923	29.3	1:1	0.000	1.125	0.000	
5270	54	IEEE 802.11n	OFDM	12.5	11.99	0.00	Right	Tilt	2	40	F1923	13.5	1:1	0.000	1.125	0.000	
5260	52	IEEE 802.11a	OFDM	12.5	11.77	0.00	Left	Cheek	2	20	F1923	6	1:1	0.000	1.183	0.000	
5260	52	IEEE 802.11a	OFDM	12.5	11.77	0.00	Left	Tilt	2	20	F1923	6	1:1	0.000	1.183	0.000	
5520	104	IEEE 802.11a	OFDM	12.5	12.21	0.00	Right	Cheek	2	20	F1923	6	1:1	0.000	1.069	0.000	
5520	104	IEEE 802.11a	OFDM	12.5	12.21	0.00	Right	Tilt	2	20	F1923	6	1:1	0.000	1.069	0.000	
5530	106	IEEE 802.11ac	OFDM	10.5	9.81	0.00	Right	Tilt	2	80	F1923	29.3	1:1	0.000	1.172	0.000	
5510	102	IEEE 802.11n	OFDM	12.5	12.22	0.00	Right	Tilt	2	40	F1923	13.5	1:1	0.000	1.067	0.000	
5520	104	IEEE 802.11a	OFDM	12.5	12.21	0.00	Left	Cheek	2	20	F1923	6	1:1	0.000	1.069	0.000	
5520	104	IEEE 802.11a	OFDM	12.5	12.21	0.00	Left	Tilt	2	20	F1923	6	1:1	0.000	1.069	0.000	
5180	36	IEEE 802.11n	OFDM	15.5	15.35	-0.04	Right	Cheek	MIMO	20	F1923	13	1:1	0.028	1.035	0.029	
5180	36	IEEE 802.11n	OFDM	15.5	15.35	0.03	Right	Tilt	MIMO	20	F1923	13	1:1	0.027	1.035	0.028	
5180	36	IEEE 802.11n	OFDM	15.5	15.35	-0.11	Left	Cheek	MIMO	20	F1923	13	1:1	0.021	1.035	0.022	
5180	36	IEEE 802.11n	OFDM	15.5	15.35	0.06	Left	Tilt	MIMO	20	F1923	13	1:1	0.003	1.035	0.003	
5260	52	IEEE 802.11n	OFDM	15.5	15.07	-0.04	Right	Cheek	MIMO	20	F1923	13	1:1	0.047	1.104	0.052	
5260	52	IEEE 802.11n	OFDM	15.5	15.07	0.19	Right	Tilt	MIMO	20	F1923	13	1:1	0.018	1.104	0.020	
5260	52	IEEE 802.11n	OFDM	15.5	15.07	-0.07	Left	Cheek	MIMO	20	F1923	13	1:1	0.026	1.104	0.029	
5260	52	IEEE 802.11n	OFDM	15.5	15.07	0.10	Left	Tilt	MIMO	20	F1923	13	1:1	0.000	1.104	0.000	
5520	104	IEEE 802.11n	OFDM	15.5	14.86	0.11	Right	Cheek	MIMO	20	F1923	13	1:1	0.020	1.159	0.023	
5520	104	IEEE 802.11n	OFDM	15.5	14.86	0.10	Right	Tilt	MIMO	20	F1923	13	1:1	0.019	1.159	0.022	
5520	104	IEEE 802.11n	OFDM	15.5	14.86	-0.10	Left	Cheek	MIMO	20	F1923	13	1:1	0.002	1.159	0.002	
5520	104	IEEE 802.11n	OFDM	15.5	14.86	0.10	Left	Tilt	MIMO	20	F1923	13	1:1	0.023	1.159	0.027	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram										

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11.2 Standalone Body-Worn SAR Data

Table 11-8
GSM/UMTS Body-Worn SAR Data

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	# of Time Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	4183	UMTS 850	RMC	23.5	22.97	0.02	10 mm	F1926	n/a	1:1	back	0.449	1.130	0.507	A9
1880.00	661	GSM 1900	GSM	30.5	29.52	0.02	10 mm	F1924	1	1:8.3	back	0.166	1.253	0.208	A11
1880.00	9400	UMTS 1900	RMC	23.5	22.95	0.02	10 mm	F1924	n/a	1:1	back	0.457	1.135	0.519	A13
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 11-9
LTE Body-Worn SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
710.00	23790	Mid	LTE Band 17	10	23.5	23.50	-0.03	0	F1926	QPSK	1	0	10 mm	back	1:1	0.118	1.000	0.118	A15
710.00	23790	Mid	LTE Band 17	10	22.5	22.35	0.04	1	F1926	QPSK	25	0	10 mm	back	1:1	0.087	1.035	0.090	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	23.78	0.02	0	F1926	QPSK	1	0	10 mm	back	1:1	0.572	1.052	0.602	A17
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	22.38	-0.04	1	F1926	QPSK	25	12	10 mm	back	1:1	0.411	1.153	0.474	
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 11-10
DTS Body-Worn SAR

MEASUREMENT RESULTS																	
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Bandwidth (MHz)	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	16.5	16.24	0.04	10 mm	1	20	F1923	1	back	1:1	0.051	1.062	0.054	
2412	1	IEEE 802.11n	OFDM	11.5	11.36	0.10	10 mm	1	20	F1923	6.5	back	1:1	0.013	1.033	0.013	
2437	6	IEEE 802.11b	DSSS	16.5	16.28	0.02	10 mm	2	20	F1923	1	back	1:1	0.052	1.052	0.055	A19
2437	6	IEEE 802.11n	OFDM	11.5	11.29	0.09	10 mm	2	20	F1923	6.5	back	1:1	0.005	1.050	0.005	
2437	6	IEEE 802.11n	OFDM	14.5	14.18	0.10	10 mm	MIMO	20	F1923	13	back	1:1	0.014	1.076	0.015	
5825	165	IEEE 802.11a	OFDM	12.5	11.72	0.03	10 mm	1	20	F1922	6	back	1:1	0.036	1.197	0.043	
5775	155	IEEE 802.11ac	OFDM	10.5	10.36	0.03	10 mm	1	80	F1922	29.3	back	1:1	0.014	1.033	0.014	
5755	151	IEEE 802.11n	OFDM	12.5	11.94	0.08	10 mm	1	40	F1922	13.5	back	1:1	0.044	1.138	0.050	
5805	161	IEEE 802.11a	OFDM	12.5	11.78	0.07	10 mm	2	20	F1922	6	back	1:1	0.087	1.180	0.103	
5775	155	IEEE 802.11ac	OFDM	10.5	10.14	0.03	10 mm	2	80	F1922	29.3	back	1:1	0.089	1.086	0.097	A20
5795	159	IEEE 802.11n	OFDM	12.5	12.01	0.19	10 mm	2	40	F1922	13.5	back	1:1	0.039	1.119	0.044	
5745	149	IEEE 802.11n	OFDM	15.5	14.92	0.04	10 mm	MIMO	20	F1922	13	back	1:1	0.015	1.143	0.017	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram										

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Table 11-11
NII Body-Worn SAR

MEASUREMENT RESULTS																	
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Bandwidth (MHz)	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	12.5	12.39	0.02	10 mm	1	20	F1922	6	back	1:1	0.075	1.026	0.077	
5210	42	IEEE 802.11ac	OFDM	10.5	10.06	0.02	10 mm	1	80	F1922	29.3	back	1:1	0.024	1.107	0.027	
5280	56	IEEE 802.11a	OFDM	12.5	12.23	0.08	10 mm	1	20	F1922	6	back	1:1	0.040	1.064	0.043	
5290	58	IEEE 802.11ac	OFDM	10.5	10.16	0.15	10 mm	1	80	F1922	29.3	back	1:1	0.016	1.081	0.017	
5270	54	IEEE 802.11n	OFDM	12.5	12.45	0.03	10 mm	1	40	F1922	13.5	back	1:1	0.060	1.012	0.061	
5560	112	IEEE 802.11a	OFDM	12.5	11.96	0.07	10 mm	1	20	F1922	6	back	1:1	0.063	1.132	0.071	
5530	106	IEEE 802.11ac	OFDM	10.5	9.71	0.10	10 mm	1	80	F1922	29.3	back	1:1	0.022	1.199	0.026	
5510	102	IEEE 802.11n	OFDM	12.5	12.06	0.03	10 mm	1	40	F1922	13.5	back	1:1	0.060	1.107	0.066	
5180	36	IEEE 802.11a	OFDM	12.5	12.27	0.08	10 mm	2	20	F1922	6	back	1:1	0.021	1.054	0.022	
5210	42	IEEE 802.11ac	OFDM	10.5	9.50	0.10	10 mm	2	80	F1922	29.3	back	1:1	0.013	1.259	0.016	
5260	52	IEEE 802.11a	OFDM	12.5	11.77	0.12	10 mm	2	20	F1922	6	back	1:1	0.026	1.183	0.031	
5290	58	IEEE 802.11ac	OFDM	10.5	9.99	0.07	10 mm	2	80	F1922	29.3	back	1:1	0.019	1.125	0.021	
5270	54	IEEE 802.11n	OFDM	12.5	11.99	0.10	10 mm	2	40	F1922	13.5	back	1:1	0.003	1.125	0.003	
5520	104	IEEE 802.11a	OFDM	12.5	12.21	-0.04	10 mm	2	20	F1922	6	back	1:1	0.064	1.069	0.068	
5530	106	IEEE 802.11ac	OFDM	10.5	9.81	0.07	10 mm	2	80	F1922	29.3	back	1:1	0.071	1.172	0.083	
5510	102	IEEE 802.11n	OFDM	12.5	12.22	0.03	10 mm	2	40	F1922	13.5	back	1:1	0.014	1.067	0.015	
5180	36	IEEE 802.11n	OFDM	15.5	15.35	0.14	10 mm	MIMO	20	F1922	13	back	1:1	0.077	1.035	0.080	A21
5260	52	IEEE 802.11n	OFDM	15.5	15.07	0.05	10 mm	MIMO	20	F1922	13	back	1:1	0.040	1.104	0.044	
5520	104	IEEE 802.11n	OFDM	15.5	14.86	0.06	10 mm	MIMO	20	F1922	13	back	1:1	0.026	1.159	0.030	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram										

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11.3 Standalone Wireless Router SAR Data

Table 11-12
GPRS/UMTS Hotspot SAR Data

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	# of GPRS Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	4183	UMTS 850	RMC	23.5	22.97	0.02	10 mm	F1926	n/a	1:1	back	0.449	1.130	0.507	A10
836.60	4183	UMTS 850	RMC	23.5	22.97	0.05	10 mm	F1926	n/a	1:1	front	0.486	1.130	0.549	
836.60	4183	UMTS 850	RMC	23.5	22.97	0.06	10 mm	F1926	n/a	1:1	bottom	0.220	1.130	0.249	
836.60	4183	UMTS 850	RMC	23.5	22.97	-0.01	10 mm	F1926	n/a	1:1	left	0.239	1.130	0.270	
1880.00	661	GSM 1900	GPRS	28.5	26.88	0.04	10 mm	F1924	2	1:4.15	back	0.158	1.452	0.229	A12
1880.00	661	GSM 1900	GPRS	28.5	26.88	-0.08	10 mm	F1924	2	1:4.15	front	0.145	1.452	0.211	
1880.00	661	GSM 1900	GPRS	28.5	26.88	0.09	10 mm	F1924	2	1:4.15	bottom	0.321	1.452	0.466	
1880.00	661	GSM 1900	GPRS	28.5	26.88	0.10	10 mm	F1924	2	1:4.15	left	0.063	1.452	0.091	
1880.00	9400	UMTS 1900	RMC	23.5	22.95	0.02	10 mm	F1924	n/a	1:1	back	0.457	1.135	0.519	A14
1880.00	9400	UMTS 1900	RMC	23.5	22.95	0.08	10 mm	F1924	n/a	1:1	front	0.449	1.135	0.510	
1852.40	9262	UMTS 1900	RMC	23.5	22.83	-0.07	10 mm	F1924	n/a	1:1	bottom	0.883	1.167	1.030	
1880.00	9400	UMTS 1900	RMC	23.5	22.95	-0.06	10 mm	F1924	n/a	1:1	bottom	0.911	1.135	1.034	
1907.60	9538	UMTS 1900	RMC	23.5	23.13	-0.06	10 mm	F1924	n/a	1:1	bottom	0.793	1.089	0.864	A14
1880.00	9400	UMTS 1900	RMC	23.5	22.95	-0.04	10 mm	F1924	n/a	1:1	left	0.179	1.135	0.203	
1880.00	9400	UMTS 1900	RMC	23.5	22.95	0.04	10 mm	F1924	n/a	1:1	bottom	0.906	1.135	1.028	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram								

Note: Blue entry represents variability measurement.

Table 11-13
LTE Band 17 Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR[dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
710.00	23790	Mid	LTE Band 17	10	23.5	23.50	-0.03	0	F1926	QPSK	1	0	10 mm	back	1:1	0.118	1.000	0.118	A16
710.00	23790	Mid	LTE Band 17	10	22.5	22.35	0.04	1	F1926	QPSK	25	0	10 mm	back	1:1	0.087	1.035	0.090	
710.00	23790	Mid	LTE Band 17	10	23.5	23.50	-0.01	0	F1926	QPSK	1	0	10 mm	front	1:1	0.142	1.000	0.142	
710.00	23790	Mid	LTE Band 17	10	22.5	22.35	-0.01	1	F1926	QPSK	25	0	10 mm	front	1:1	0.105	1.035	0.109	
710.00	23790	Mid	LTE Band 17	10	23.5	23.50	0.06	0	F1926	QPSK	1	0	10 mm	bottom	1:1	0.072	1.000	0.072	
710.00	23790	Mid	LTE Band 17	10	22.5	22.35	-0.08	1	F1926	QPSK	25	0	10 mm	bottom	1:1	0.065	1.035	0.067	
710.00	23790	Mid	LTE Band 17	10	23.5	23.50	0.15	0	F1926	QPSK	1	0	10 mm	left	1:1	0.046	1.000	0.046	
710.00	23790	Mid	LTE Band 17	10	22.5	22.35	0.04	1	F1926	QPSK	25	0	10 mm	left	1:1	0.033	1.035	0.034	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram											

Table 11-14
LTE Band 5 (Cell) Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	23.78	0.02	0	F1926	QPSK	1	0	10 mm	back	1:1	0.572	1.052	0.602	A18
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	22.38	-0.04	1	F1926	QPSK	25	12	10 mm	back	1:1	0.411	1.153	0.474	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	23.78	0.06	0	F1926	QPSK	1	0	10 mm	front	1:1	0.681	1.052	0.716	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	22.38	-0.03	1	F1926	QPSK	25	12	10 mm	front	1:1	0.491	1.153	0.566	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	23.78	-0.02	0	F1926	QPSK	1	0	10 mm	bottom	1:1	0.263	1.052	0.277	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	22.38	0.04	1	F1926	QPSK	25	12	10 mm	bottom	1:1	0.180	1.153	0.208	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	23.78	0.00	0	F1926	QPSK	1	0	10 mm	left	1:1	0.296	1.052	0.311	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	22.38	-0.02	1	F1926	QPSK	25	12	10 mm	left	1:1	0.208	1.153	0.240	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Body											
Spatial Peak								1.6 W/kg (mW/g)											
Uncontrolled Exposure/General Population								averaged over 1 gram											

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Table 11-15
WLAN Hotspot SAR

MEASUREMENT RESULTS																	
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Bandwidth (MHz)	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scale d SAR (1g)	Plot #
MHz	Ch.													(W/kg)		(W/kg)	
2437	6	IEEE 802.11b	DSSS	16.5	16.24	0.04	10 mm	1	20	F1923	1	back	1:1	0.051	1.062	0.054	
2412	1	IEEE 802.11n	OFDM	11.5	11.36	0.10	10 mm	1	20	F1923	6.5	back	1:1	0.013	1.033	0.013	
2437	6	IEEE 802.11b	DSSS	16.5	16.24	0.11	10 mm	1	20	F1923	1	front	1:1	0.015	1.062	0.016	
2437	6	IEEE 802.11b	DSSS	16.5	16.24	-0.02	10 mm	1	20	F1923	1	top	1:1	0.007	1.062	0.007	
2437	6	IEEE 802.11b	DSSS	16.5	16.24	0.17	10 mm	1	20	F1923	1	left	1:1	0.018	1.062	0.019	
2437	6	IEEE 802.11b	DSSS	16.5	16.28	0.02	10 mm	2	20	F1923	1	back	1:1	0.052	1.052	0.055	A19
2437	6	IEEE 802.11n	OFDM	11.5	11.29	0.09	10 mm	2	20	F1923	6.5	back	1:1	0.005	1.050	0.005	
2437	6	IEEE 802.11b	DSSS	16.5	16.28	-0.06	10 mm	2	20	F1923	1	front	1:1	0.031	1.052	0.033	
2437	6	IEEE 802.11b	DSSS	16.5	16.28	-0.10	10 mm	2	20	F1923	1	top	1:1	0.013	1.052	0.014	
2437	6	IEEE 802.11n	OFDM	14.5	14.18	0.10	10 mm	MIMO	20	F1923	13	back	1:1	0.014	1.076	0.015	
2437	6	IEEE 802.11n	OFDM	14.5	14.18	0.08	10 mm	MIMO	20	F1923	13	front	1:1	0.010	1.076	0.011	
2437	6	IEEE 802.11n	OFDM	14.5	14.18	0.09	10 mm	MIMO	20	F1923	13	top	1:1	0.004	1.076	0.004	
2437	6	IEEE 802.11n	OFDM	14.5	14.18	0.10	10 mm	MIMO	20	F1923	13	left	1:1	0.006	1.076	0.006	
5825	165	IEEE 802.11a	OFDM	12.5	11.72	0.03	10 mm	1	20	F1922	6	back	1:1	0.036	1.197	0.043	
5825	165	IEEE 802.11a	OFDM	12.5	11.72	0.13	10 mm	1	20	F1922	6	front	1:1	0.016	1.197	0.019	
5825	165	IEEE 802.11a	OFDM	12.5	11.72	0.00	10 mm	1	20	F1922	6	top	1:1	0.010	1.197	0.012	
5825	165	IEEE 802.11a	OFDM	12.5	11.72	0.15	10 mm	1	20	F1922	6	left	1:1	0.038	1.197	0.045	
5775	155	IEEE 802.11ac	OFDM	10.5	10.36	0.04	10 mm	1	80	F1922	29.3	left	1:1	0.034	1.033	0.035	
5755	151	IEEE 802.11n	OFDM	12.5	11.94	-0.06	10 mm	1	40	F1922	13.5	left	1:1	0.001	1.138	0.001	
5805	161	IEEE 802.11a	OFDM	12.5	11.78	0.07	10 mm	2	20	F1922	6	back	1:1	0.087	1.180	0.103	
5775	155	IEEE 802.11ac	OFDM	10.5	10.14	0.03	10 mm	2	80	F1922	29.3	back	1:1	0.089	1.086	0.097	A20
5795	159	IEEE 802.11n	OFDM	12.5	12.01	0.19	10 mm	2	40	F1922	13.5	back	1:1	0.039	1.119	0.044	
5805	161	IEEE 802.11a	OFDM	12.5	11.78	0.03	10 mm	2	20	F1922	6	front	1:1	0.022	1.180	0.026	
5805	161	IEEE 802.11a	OFDM	12.5	11.78	0.03	10 mm	2	20	F1922	6	top	1:1	0.017	1.180	0.020	
5745	149	IEEE 802.11n	OFDM	15.5	14.92	0.04	10 mm	MIMO	20	F1922	13	back	1:1	0.015	1.143	0.017	
5745	149	IEEE 802.11n	OFDM	15.5	14.92	0.04	10 mm	MIMO	20	F1922	13	front	1:1	0.002	1.143	0.002	
5745	149	IEEE 802.11n	OFDM	15.5	14.92	0.04	10 mm	MIMO	20	F1922	13	top	1:1	0.025	1.143	0.029	
5745	149	IEEE 802.11n	OFDM	15.5	14.92	0.08	10 mm	MIMO	20	F1922	13	left	1:1	0.028	1.143	0.032	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT							Body										
Spatial Peak							1.6 W/kg (mW/g)										
Uncontrolled Exposure/General Population							averaged over 1 gram										

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11.4 Standalone Hand SAR Data

Table 11-16
WLAN Hand SAR

MEASUREMENT RESULTS																	
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Bandwidth (MHz)	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (10g)	Scaling Factor	Scaled SAR (10g) (W/kg)	Plot #
MHz	Ch.													(W/kg)		(W/kg)	
5180	36	IEEE 802.11a	OFDM	12.5	12.39	0.14	0 mm	1	20	F1922	6	back	1:1	0.217	1.026	0.223	A22
5210	42	IEEE 802.11ac	OFDM	10.5	10.06	0.02	0 mm	1	80	F1922	29.3	back	1:1	0.095	1.107	0.105	
5180	36	IEEE 802.11a	OFDM	12.5	12.39	0.20	0 mm	1	20	F1922	6	front	1:1	0.045	1.026	0.046	
5180	36	IEEE 802.11a	OFDM	12.5	12.39	0.04	0 mm	1	20	F1922	6	top	1:1	0.006	1.026	0.006	
5180	36	IEEE 802.11a	OFDM	12.5	12.39	0.12	0 mm	1	20	F1922	6	left	1:1	0.049	1.026	0.050	
5280	56	IEEE 802.11a	OFDM	12.5	12.23	0.18	0 mm	1	20	F1922	6	back	1:1	0.184	1.064	0.196	
5290	58	IEEE 802.11ac	OFDM	10.5	10.16	0.18	0 mm	1	80	F1922	29.3	back	1:1	0.083	1.081	0.090	
5270	54	IEEE 802.11n	OFDM	12.5	12.45	0.10	0 mm	1	40	F1922	13.5	back	1:1	0.150	1.012	0.152	
5280	56	IEEE 802.11a	OFDM	12.5	12.23	0.04	0 mm	1	20	F1922	6	front	1:1	0.030	1.064	0.032	
5280	56	IEEE 802.11a	OFDM	12.5	12.23	0.11	0 mm	1	20	F1922	6	top	1:1	0.006	1.064	0.006	
5280	56	IEEE 802.11a	OFDM	12.5	12.23	0.10	0 mm	1	20	F1922	6	left	1:1	0.046	1.064	0.049	
5560	112	IEEE 802.11a	OFDM	12.5	11.96	0.02	0 mm	1	20	F1922	6	back	1:1	0.141	1.132	0.160	
5530	106	IEEE 802.11ac	OFDM	10.5	9.71	0.06	0 mm	1	80	F1922	29.3	back	1:1	0.080	1.199	0.096	
5510	102	IEEE 802.11n	OFDM	12.5	12.06	0.04	0 mm	1	40	F1922	13.5	back	1:1	0.163	1.107	0.180	
5560	112	IEEE 802.11a	OFDM	12.5	11.96	0.09	0 mm	1	20	F1922	6	front	1:1	0.044	1.132	0.050	
5560	112	IEEE 802.11a	OFDM	12.5	11.96	0.04	0 mm	1	20	F1922	6	top	1:1	0.004	1.132	0.005	
5560	112	IEEE 802.11a	OFDM	12.5	11.96	0.07	0 mm	1	20	F1922	6	left	1:1	0.050	1.132	0.057	
5180	36	IEEE 802.11a	OFDM	12.5	12.27	0.13	0 mm	2	20	F1922	6	back	1:1	0.012	1.054	0.013	
5180	36	IEEE 802.11a	OFDM	12.5	12.27	-0.12	0 mm	2	20	F1922	6	front	1:1	0.001	1.054	0.001	
5180	36	IEEE 802.11a	OFDM	12.5	12.27	0.03	0 mm	2	20	F1922	6	top	1:1	0.018	1.054	0.019	
5210	42	IEEE 802.11ac	OFDM	10.5	9.50	0.07	0 mm	2	20	F1922	29.3	top	1:1	0.019	1.259	0.024	
5260	52	IEEE 802.11a	OFDM	12.5	11.77	0.09	0 mm	2	20	F1922	6	back	1:1	0.013	1.183	0.015	
5260	52	IEEE 802.11a	OFDM	12.5	11.77	0.11	0 mm	2	20	F1922	6	front	1:1	0.017	1.183	0.020	
5260	52	IEEE 802.11a	OFDM	12.5	11.77	0.02	0 mm	2	20	F1922	6	top	1:1	0.023	1.183	0.027	
5290	58	IEEE 802.11ac	OFDM	10.5	9.99	0.17	0 mm	2	80	F1922	29.3	top	1:1	0.020	1.125	0.023	
5270	54	IEEE 802.11n	OFDM	12.5	11.99	0.08	0 mm	2	40	F1922	13.5	top	1:1	0.000	1.125	0.000	
5520	104	IEEE 802.11a	OFDM	12.5	12.21	0.04	0 mm	2	20	F1922	6	back	1:1	0.050	1.069	0.053	
5530	106	IEEE 802.11ac	OFDM	10.5	9.81	0.04	0 mm	2	80	F1922	29.3	back	1:1	0.023	1.172	0.027	
5510	102	IEEE 802.11n	OFDM	12.5	12.22	0.00	0 mm	2	40	F1922	13.5	back	1:1	0.061	1.067	0.065	
5520	104	IEEE 802.11a	OFDM	12.5	12.21	0.04	0 mm	2	20	F1922	6	front	1:1	0.014	1.069	0.015	
5520	104	IEEE 802.11a	OFDM	12.5	12.21	0.03	0 mm	2	20	F1922	6	top	1:1	0.031	1.069	0.033	
5180	36	IEEE 802.11n	OFDM	15.5	15.35	0.02	0 mm	MIMO	20	F1922	13	back	1:1	0.216	1.035	0.224	
5180	36	IEEE 802.11n	OFDM	15.5	15.35	0.02	0 mm	MIMO	20	F1922	13	front	1:1	0.034	1.035	0.035	
5180	36	IEEE 802.11n	OFDM	15.5	15.35	0.07	0 mm	MIMO	20	F1922	13	top	1:1	0.003	1.035	0.003	
5180	36	IEEE 802.11n	OFDM	15.5	15.35	0.03	0 mm	MIMO	20	F1922	13	left	1:1	0.056	1.035	0.058	
5260	52	IEEE 802.11n	OFDM	15.5	15.07	0.05	0 mm	MIMO	20	F1922	13	back	1:1	0.172	1.104	0.190	
5260	52	IEEE 802.11n	OFDM	15.5	15.07	0.19	0 mm	MIMO	20	F1922	13	front	1:1	0.025	1.104	0.028	
5260	52	IEEE 802.11n	OFDM	15.5	15.07	-0.03	0 mm	MIMO	20	F1922	13	top	1:1	0.004	1.104	0.004	
5260	52	IEEE 802.11n	OFDM	15.5	15.07	-0.03	0 mm	MIMO	20	F1922	13	left	1:1	0.032	1.104	0.035	
5520	104	IEEE 802.11n	OFDM	15.5	14.86	-0.05	0 mm	MIMO	20	F1922	13	back	1:1	0.142	1.159	0.165	
5520	104	IEEE 802.11n	OFDM	15.5	14.86	0.20	0 mm	MIMO	20	F1922	13	front	1:1	0.038	1.159	0.044	
5520	104	IEEE 802.11n	OFDM	15.5	14.86	0.00	0 mm	MIMO	20	F1922	13	top	1:1	0.005	1.159	0.006	
5520	104	IEEE 802.11n	OFDM	15.5	14.86	-0.05	0 mm	MIMO	20	F1922	13	left	1:1	0.013	1.159	0.015	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Hand 4.0 W/kg (mW/g) averaged over 10 grams										

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11.5 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2003, and FCC KDB Publication 447498 D01v05.
2. Batteries are fully charged at the beginning of the SAR measurements.
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, body-worn SAR was evaluated without a headset connected to the device. Since the standalone reported body-worn SAR was ≤ 1.2 W/kg, no additional body-worn SAR evaluations using a headset cable were required.
8. Per FCC KDB 865664 D01 v01, variability SAR tests were performed when the measured 1g SAR results for a frequency bands were greater than 0.8 W/kg. Please see Section 13 for variability analysis.
9. During SAR Testing for the Wireless Router conditions per FCC KDB Publication 941225 D06v01, the actual Portable Hotspot operation (with actual simultaneous transmission of a transmitter with WIFI) was not activated (See Section 6.7 for more details).
10. Per FCC KDB Publication 648474 D04v01r01, this device is considered a "phablet" since the diagonal dimension is > 160 mm and < 200 mm. Therefore, hand SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 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 and October 2013 TCB Workshop Notes: The source-based frame-averaged output power was evaluated for all GPRS slot configurations. The configuration with the highest target frame averaged output power was evaluated for hotspot SAR. When the maximum frame-averaged powers are equivalent across two or more slots (within 0.25 dB), the configuration with the most number of time slots was tested.
3. Per FCC KDB Publication 447498 D01v05, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s). When the maximum output power variation across the required test channels is $> \frac{1}{2}$ dB, instead of the middle channel, the highest output power channel was used.

UMTS Notes:

1. UMTS mode in was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01v02. HSPA SAR was not required since the average output power of the HSPA subtests was not more than 0.25 dB higher than the RMC level and SAR was less than 1.2 W/kg.
2. Per FCC KDB Publication 447498 D01v05, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s). When the maximum output power variation across the required test channels is $> \frac{1}{2}$ dB, instead of the middle channel, the highest output power channel was used.

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LTE Notes:

1. LTE Considerations: LTE test configurations are determined according to SAR Evaluation Considerations for LTE Devices in FCC KDB Publication 941225 D05v02r01. The general test procedures used for testing can be found in Section 8.4.4.
2. MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.
3. A-MPR was disabled for all SAR tests by setting NS=01 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

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 SISO operations: Highest average RF output power channel for the lowest data rate was selected for SAR evaluation in 802.11b. Other SISO IEEE 802.11 modes (including 802.11g/n) were not required 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. Some additional IEEE 802.11n SAR tests for the highest measured SAR positions were included in this report, per manufacturer request.
2. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 D01v01r02 and October 2012 FCC/TCB Meeting Notes for SISO 5 GHz WIFI operations: Highest average RF output power channel for the lowest data rate was selected for SAR evaluation in 802.11a. Other IEEE SISO 802.11 modes (including 802.11n 20 MHz and 40 MHz bandwidths) were not required 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. Some additional IEEE 802.11n and IEEE 802.11ac SAR tests for the highest measured SAR positions were included in this report, per manufacturer request.
3. Per April 2013 TCB Workshop notes, full SISO SAR tests for all IEEE 802.11ac configurations were not required because the average output power was not more than 0.25 dB higher than IEEE 802.11a mode. IEEE 802.11ac SISO was evaluated for the highest IEEE 802.11a position in each 5 GHz band and exposure condition.
4. When Hotspot is enabled, 5.2-5.7 GHz bands are disabled. Therefore no 5.2 – 5.7 GHz WIFI Wireless Router SAR Data was required.
5. Per KDB 248227, SAR for MIMO was measured with both transmitting simultaneously and was evaluated in dependently of SISO operation. For 2.4 GHz MIMO, 802.11n was evaluated. For 5 GHz MIMO, 20 MHz Bandwidth 802.11n was evaluated.
6. WIFI transmission was verified using an uncalibrated spectrum analyzer.
7. SAR testing on other default channels is not required 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.

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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 and IEEE 1528-2013 Section 6.3.4.1.2, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the simultaneous transmitting antennas in a specific physical test configuration is ≤ 1.6 W/kg. When standalone SAR is not required to be measured, per FCC KDB 447498 D01v05 4.3.2 2), the following equation must be used to estimate the standalone 1g SAR for simultaneous transmission assessment involving that transmitter.

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

Table 12-1
Estimated SAR

Mode	Frequency	Maximum Allowed Power	Separation Distance (Body)	Estimated SAR (Body)
	[MHz]	[dBm]	[mm]	[W/kg]
Bluetooth	2480	11.50	10	0.294

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

Main antenna SAR testing was not required for extremity exposure conditions per FCC KDB 648474. Therefore, no further analysis was required to determine that possible simultaneous scenarios would not exceed the SAR limit.

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12.3 Head SAR Simultaneous Transmission Analysis

Table 12-2
Simultaneous Transmission Scenario with 2.4 GHz WLAN Ant 1 (Held to Ear)

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GSM 1900 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.059	0.149	0.208	Head SAR	Right Cheek	0.043	0.149	0.192
	Right Tilt	0.040	0.091	0.131		Right Tilt	0.039	0.091	0.130
	Left Cheek	0.118	0.048	0.166		Left Cheek	0.081	0.048	0.129
	Left Tilt	0.044	0.032	0.076		Left Tilt	0.011	0.032	0.043
Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.119	0.149	0.268	Head SAR	Right Cheek	0.015	0.149	0.164
	Right Tilt	0.089	0.091	0.180		Right Tilt	0.008	0.091	0.099
	Left Cheek	0.195	0.048	0.243		Left Cheek	0.030	0.048	0.078
	Left Tilt	0.034	0.032	0.066		Left Tilt	0.009	0.032	0.041
Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)					
Head SAR	Right Cheek	0.068	0.149	0.217					
	Right Tilt	0.041	0.091	0.132					
	Left Cheek	0.138	0.048	0.186					
	Left Tilt	0.050	0.032	0.082					

Table 12-3
Simultaneous Transmission Scenario with 2.4 GHz WLAN Ant 2 (Held to Ear)

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GSM 1900 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.059	0.419	0.478	Head SAR	Right Cheek	0.043	0.419	0.462
	Right Tilt	0.040	0.299	0.339		Right Tilt	0.039	0.299	0.338
	Left Cheek	0.118	0.113	0.231		Left Cheek	0.081	0.113	0.194
	Left Tilt	0.044	0.120	0.164		Left Tilt	0.011	0.120	0.131
Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.119	0.419	0.538	Head SAR	Right Cheek	0.015	0.419	0.434
	Right Tilt	0.089	0.299	0.388		Right Tilt	0.008	0.299	0.307
	Left Cheek	0.195	0.113	0.308		Left Cheek	0.030	0.113	0.143
	Left Tilt	0.034	0.120	0.154		Left Tilt	0.009	0.120	0.129
Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)					
Head SAR	Right Cheek	0.068	0.419	0.487					
	Right Tilt	0.041	0.299	0.340					
	Left Cheek	0.138	0.113	0.251					
	Left Tilt	0.050	0.120	0.170					

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Table 12-4
Simultaneous Transmission Scenario with 2.4 GHz WLAN MIMO (Held to Ear)

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GSM 1900 SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.059	0.113	0.172	Head SAR	Right Cheek	0.043	0.113	0.156
	Right Tilt	0.040	0.080	0.120		Right Tilt	0.039	0.080	0.119
	Left Cheek	0.118	0.042	0.160		Left Cheek	0.081	0.042	0.123
	Left Tilt	0.044	0.030	0.074		Left Tilt	0.011	0.030	0.041
Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.119	0.113	0.232	Head SAR	Right Cheek	0.015	0.113	0.128
	Right Tilt	0.089	0.080	0.169		Right Tilt	0.008	0.080	0.088
	Left Cheek	0.195	0.042	0.237		Left Cheek	0.030	0.042	0.072
	Left Tilt	0.034	0.030	0.064		Left Tilt	0.009	0.030	0.039

Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.068	0.113	0.181
	Right Tilt	0.041	0.080	0.121
	Left Cheek	0.138	0.042	0.180
	Left Tilt	0.050	0.030	0.080

Table 12-5
Simultaneous Transmission Scenario with 5 GHz WLAN Ant 1 (Held to Ear)

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GSM 1900 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.059	0.188	0.247	Head SAR	Right Cheek	0.043	0.188	0.231
	Right Tilt	0.040	0.115	0.155		Right Tilt	0.039	0.115	0.154
	Left Cheek	0.118	0.052	0.170		Left Cheek	0.081	0.052	0.133
	Left Tilt	0.044	0.045	0.089		Left Tilt	0.011	0.045	0.056
Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.119	0.188	0.307	Head SAR	Right Cheek	0.015	0.188	0.203
	Right Tilt	0.089	0.115	0.204		Right Tilt	0.008	0.115	0.123
	Left Cheek	0.195	0.052	0.247		Left Cheek	0.030	0.052	0.082
	Left Tilt	0.034	0.045	0.079		Left Tilt	0.009	0.045	0.054

Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.068	0.188	0.256
	Right Tilt	0.041	0.115	0.156
	Left Cheek	0.138	0.052	0.190
	Left Tilt	0.050	0.045	0.095

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Table 12-6
Simultaneous Transmission Scenario with 5 GHz WLAN Ant 2 (Held to Ear)

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GSM 1900 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.059	0.000	0.059	Head SAR	Right Cheek	0.043	0.000	0.043
	Right Tilt	0.040	0.000	0.040		Right Tilt	0.039	0.000	0.039
	Left Cheek	0.118	0.000	0.118		Left Cheek	0.081	0.000	0.081
	Left Tilt	0.044	0.000	0.044		Left Tilt	0.011	0.000	0.011
Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.119	0.000	0.119	Head SAR	Right Cheek	0.015	0.000	0.015
	Right Tilt	0.089	0.000	0.089		Right Tilt	0.008	0.000	0.008
	Left Cheek	0.195	0.000	0.195		Left Cheek	0.030	0.000	0.030
	Left Tilt	0.034	0.000	0.034		Left Tilt	0.009	0.000	0.009

Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.068	0.000	0.068
	Right Tilt	0.041	0.000	0.041
	Left Cheek	0.138	0.000	0.138
	Left Tilt	0.050	0.000	0.050

Table 12-7
Simultaneous Transmission Scenario with 5 GHz WLAN MIMO (Held to Ear)

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GSM 1900 SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.059	0.052	0.111	Head SAR	Right Cheek	0.043	0.052	0.095
	Right Tilt	0.040	0.028	0.068		Right Tilt	0.039	0.028	0.067
	Left Cheek	0.118	0.029	0.147		Left Cheek	0.081	0.029	0.110
	Left Tilt	0.044	0.030	0.074		Left Tilt	0.011	0.030	0.041
Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.119	0.052	0.171	Head SAR	Right Cheek	0.015	0.052	0.067
	Right Tilt	0.089	0.028	0.117		Right Tilt	0.008	0.028	0.036
	Left Cheek	0.195	0.029	0.224		Left Cheek	0.030	0.029	0.059
	Left Tilt	0.034	0.030	0.064		Left Tilt	0.009	0.030	0.039

Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.068	0.052	0.120
	Right Tilt	0.041	0.028	0.069
	Left Cheek	0.138	0.029	0.167
	Left Tilt	0.050	0.030	0.080

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12.4 Body-Worn Simultaneous Transmission Analysis

Table 12-8
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body-Worn at 1.0 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Back Side	UMTS 850	0.507	0.054	0.561
Back Side	GSM 1900	0.208	0.054	0.262
Back Side	UMTS 1900	0.519	0.054	0.573
Back Side	LTE Band 17	0.118	0.054	0.172
Back Side	LTE Band 5 (Cell)	0.602	0.054	0.656

Table 12-9
Simultaneous Transmission Scenario with 2.4 GHz WLAN Ant 2 (Body-Worn at 1.0 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Back Side	UMTS 850	0.507	0.055	0.562
Back Side	GSM 1900	0.208	0.055	0.263
Back Side	UMTS 1900	0.519	0.055	0.574
Back Side	LTE Band 17	0.118	0.055	0.173
Back Side	LTE Band 5 (Cell)	0.602	0.055	0.657

Table 12-10
Simultaneous Transmission Scenario with 2.4 GHz WLAN MIMO (Body-Worn at 1.0 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Back Side	UMTS 850	0.507	0.015	0.522
Back Side	GSM 1900	0.208	0.015	0.223
Back Side	UMTS 1900	0.519	0.015	0.534
Back Side	LTE Band 17	0.118	0.015	0.133
Back Side	LTE Band 5 (Cell)	0.602	0.015	0.617

Table 12-11
Simultaneous Transmission Scenario with 5 GHz WLAN Ant 1 (Body-Worn at 1.0 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Back Side	UMTS 850	0.507	0.077	0.584
Back Side	GSM 1900	0.208	0.077	0.285
Back Side	UMTS 1900	0.519	0.077	0.596
Back Side	LTE Band 17	0.118	0.077	0.195
Back Side	LTE Band 5 (Cell)	0.602	0.077	0.679

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Table 12-12
Simultaneous Transmission Scenario with 5 GHz WLAN Ant 2 (Body-Worn at 1.0 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Back Side	UMTS 850	0.507	0.103	0.610
Back Side	GSM 1900	0.208	0.103	0.311
Back Side	UMTS 1900	0.519	0.103	0.622
Back Side	LTE Band 17	0.118	0.103	0.221
Back Side	LTE Band 5 (Cell)	0.602	0.103	0.705

Table 12-13
Simultaneous Transmission Scenario with 5 GHz WLAN MIMO (Body-Worn at 1.0 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Back Side	UMTS 850	0.507	0.080	0.587
Back Side	GSM 1900	0.208	0.080	0.288
Back Side	UMTS 1900	0.519	0.080	0.599
Back Side	LTE Band 17	0.118	0.080	0.198
Back Side	LTE Band 5 (Cell)	0.602	0.080	0.682

Table 12-14
Simultaneous Transmission Scenario with Bluetooth (Body-Worn at 1.0 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Back Side	UMTS 850	0.507	0.294	0.801
Back Side	GSM 1900	0.208	0.294	0.502
Back Side	UMTS 1900	0.519	0.294	0.813
Back Side	LTE Band 17	0.118	0.294	0.412
Back Side	LTE Band 5 (Cell)	0.602	0.294	0.896

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

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12.5 Hotspot SAR Simultaneous Transmission Analysis

Per FCC KDB Publication 941225 D06v01, the devices edges with antennas more than 2.5 cm from edge are not required to be evaluated for SAR (“-”).

Table 12-15
Simultaneous Transmission Scenario (2.4 GHz WLAN Ant 1 Hotspot at 1.0 cm)

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.507	0.054	0.561	Body SAR	Back	0.229	0.054	0.283
	Front	0.549	0.016	0.565		Front	0.211	0.016	0.227
	Top	-	0.007	0.007		Top	-	0.007	0.007
	Bottom	0.249	-	0.249		Bottom	0.466	-	0.466
	Right	-	-	0.000		Right	-	-	0.000
	Left	0.270	0.019	0.289		Left	0.091	0.019	0.110
Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.519	0.054	0.573	Body SAR	Back	0.118	0.054	0.172
	Front	0.510	0.016	0.526		Front	0.142	0.016	0.158
	Top	-	0.007	0.007		Top	-	0.007	0.007
	Bottom	1.034	-	1.034		Bottom	0.072	-	0.072
	Right	-	-	0.000		Right	-	-	0.000
	Left	0.203	0.019	0.222		Left	0.046	0.019	0.065
Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)					
Body SAR	Back	0.602	0.054	0.656					
	Front	0.716	0.016	0.732					
	Top	-	0.007	0.007					
	Bottom	0.277	-	0.277					
	Right	-	-	0.000					
	Left	0.311	0.019	0.330					

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Table 12-16
Simultaneous Transmission Scenario (2.4 GHz WLAN Ant 2 at 1.0 cm)

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.507	0.055	0.562	Body SAR	Back	0.229	0.055	0.284
	Front	0.549	0.033	0.582		Front	0.211	0.033	0.244
	Top	-	0.014	0.014		Top	-	0.014	0.014
	Bottom	0.249	-	0.249		Bottom	0.466	-	0.466
	Right	-	-	0.000		Right	-	-	0.000
	Left	0.270	-	0.270		Left	0.091	-	0.091
Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.519	0.055	0.574	Body SAR	Back	0.118	0.055	0.173
	Front	0.510	0.033	0.543		Front	0.142	0.033	0.175
	Top	-	0.014	0.014		Top	-	0.014	0.014
	Bottom	1.034	-	1.034		Bottom	0.072	-	0.072
	Right	-	-	0.000		Right	-	-	0.000
	Left	0.203	-	0.203		Left	0.046	-	0.046
Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)					
Body SAR	Back	0.602	0.055	0.657					
	Front	0.716	0.033	0.749					
	Top	-	0.014	0.014					
	Bottom	0.277	-	0.277					
	Right	-	-	0.000					
	Left	0.311	-	0.311					

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Table 12-17
Simultaneous Transmission Scenario (2.4 GHz WLAN MIMO at 1.0 cm)

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.507	0.015	0.522	Body SAR	Back	0.229	0.015	0.244
	Front	0.549	0.011	0.560		Front	0.211	0.011	0.222
	Top	-	0.004	0.004		Top	-	0.004	0.004
	Bottom	0.249	-	0.249		Bottom	0.466	-	0.466
	Right	-	-	0.000		Right	-	-	0.000
	Left	0.270	0.006	0.276		Left	0.091	0.006	0.097
Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.519	0.015	0.534	Body SAR	Back	0.118	0.015	0.133
	Front	0.510	0.011	0.521		Front	0.142	0.011	0.153
	Top	-	0.004	0.004		Top	-	0.004	0.004
	Bottom	1.034	-	1.034		Bottom	0.072	-	0.072
	Right	-	-	0.000		Right	-	-	0.000
	Left	0.203	0.006	0.209		Left	0.046	0.006	0.052
	Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)				
Body SAR	Back		0.602	0.015	0.617				
	Front		0.716	0.011	0.727				
	Top		-	0.004	0.004				
	Bottom		0.277	-	0.277				
	Right		-	-	0.000				
	Left		0.311	0.006	0.317				

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Table 12-18
Simultaneous Transmission Scenario (5 GHz WLAN Ant 1 Hotspot at 1.0 cm)

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.507	0.043	0.550	Body SAR	Back	0.229	0.043	0.272
	Front	0.549	0.019	0.568		Front	0.211	0.019	0.230
	Top	-	0.012	0.012		Top	-	0.012	0.012
	Bottom	0.249	-	0.249		Bottom	0.466	-	0.466
	Right	-	-	0.000		Right	-	-	0.000
	Left	0.270	0.045	0.315		Left	0.091	0.045	0.136
Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.519	0.043	0.562	Body SAR	Back	0.118	0.043	0.161
	Front	0.510	0.019	0.529		Front	0.142	0.019	0.161
	Top	-	0.012	0.012		Top	-	0.012	0.012
	Bottom	1.034	-	1.034		Bottom	0.072	-	0.072
	Right	-	-	0.000		Right	-	-	0.000
	Left	0.203	0.045	0.248		Left	0.046	0.045	0.091
Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)					
Body SAR	Back	0.602	0.043	0.645					
	Front	0.716	0.019	0.735					
	Top	-	0.012	0.012					
	Bottom	0.277	-	0.277					
	Right	-	-	0.000					
	Left	0.311	0.045	0.356					

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Table 12-19
Simultaneous Transmission Scenario (5 GHz WLAN Ant 2 at 1.0 cm)

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.507	0.103	0.610	Body SAR	Back	0.229	0.103	0.332
	Front	0.549	0.026	0.575		Front	0.211	0.026	0.237
	Top	-	0.020	0.020		Top	-	0.020	0.020
	Bottom	0.249	-	0.249		Bottom	0.466	-	0.466
	Right	-	-	0.000		Right	-	-	0.000
	Left	0.270	-	0.270		Left	0.091	-	0.091
Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.519	0.103	0.622	Body SAR	Back	0.118	0.103	0.221
	Front	0.510	0.026	0.536		Front	0.142	0.026	0.168
	Top	-	0.020	0.020		Top	-	0.020	0.020
	Bottom	1.034	-	1.034		Bottom	0.072	-	0.072
	Right	-	-	0.000		Right	-	-	0.000
	Left	0.203	-	0.203		Left	0.046	-	0.046
Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)					
Body SAR	Back	0.602	0.103	0.705					
	Front	0.716	0.026	0.742					
	Top	-	0.020	0.020					
	Bottom	0.277	-	0.277					
	Right	-	-	0.000					
	Left	0.311	-	0.311					

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Table 12-20
Simultaneous Transmission Scenario (5 GHz WLAN MIMO at 1.0 cm)

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.507	0.017	0.524	Body SAR	Back	0.229	0.017	0.246
	Front	0.549	0.002	0.551		Front	0.211	0.002	0.213
	Top	-	0.029	0.029		Top	-	0.029	0.029
	Bottom	0.249	-	0.249		Bottom	0.466	-	0.466
	Right	-	-	0.000		Right	-	-	0.000
	Left	0.270	0.032	0.302		Left	0.091	0.032	0.123
Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.519	0.017	0.536	Body SAR	Back	0.118	0.017	0.135
	Front	0.510	0.002	0.512		Front	0.142	0.002	0.144
	Top	-	0.029	0.029		Top	-	0.029	0.029
	Bottom	1.034	-	1.034		Bottom	0.072	-	0.072
	Right	-	-	0.000		Right	-	-	0.000
	Left	0.203	0.032	0.235		Left	0.046	0.032	0.078

	Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
	Body SAR	Back	0.602	0.017	0.619
		Front	0.716	0.002	0.718
		Top	-	0.029	0.029
		Bottom	0.277	-	0.277
		Right	-	-	0.000
		Left	0.311	0.032	0.343

12.6 Simultaneous Transmission Conclusion

The above numerical summed SAR results for all the worst-case simultaneous transmission conditions were below the SAR limit. Therefore, the above analysis is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit and therefore no measured volumetric simultaneous SAR summation is required per FCC KDB Publication 447498 D01v05 and IEEE 1528-2013 Section 6.3.4.1.2.

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13 SAR MEASUREMENT VARIABILITY

13.1 Measurement Variability

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

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

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

Table 13-1
Body SAR Measurement Variability Results

BODY VARIABILITY RESULTS												
Band	FREQUENCY		Mode	Service	Side	Spacing	Measured SAR (1g)	1st Repeated SAR (1g)	Ratio	2nd Repeated SAR (1g)	3rd Repeated SAR (1g)	Ratio
	MHz	Ch.					(W/kg)	(W/kg)		(W/kg)	(W/kg)	
1900	1880.00	9400	UMTS 1900	RMC	bottom	10 mm	0.911	0.906	1.01	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	E8257D	(250kHz-20GHz) Signal Generator	4/15/2014	Annual	4/15/2015	MY45470194
Agilent	8594A	(9kHz-2.9GHz) Spectrum Analyzer	N/A	N/A	N/A	3051A00187
Agilent	8648D	(9kHz-4GHz) Signal Generator	4/15/2014	Annual	4/15/2015	3629J00687
Agilent	E4438C	ESG Vector Signal Generator	4/1/2014	Annual	4/1/2015	MY47270002
Agilent	N9020A	MXA Signal Analyzer	10/29/2013	Annual	10/29/2014	US46470561
Agilent	N5182A	MXG Vector Signal Generator	4/15/2014	Annual	4/15/2015	MY47420651
Agilent	N5182A	MXG Vector Signal Generator	4/15/2014	Annual	4/15/2015	MY47420800
Agilent	8753ES	S-Parameter Network Analyzer	5/22/2014	Annual	5/22/2015	US39170118
Agilent	8753ES	S-Parameter Network Analyzer	10/29/2013	Annual	10/29/2014	US39170122
Amplifier Research	1551G6	Amplifier	CBT	N/A	CBT	433977
Amplifier Research	1551G6	Amplifier	CBT	N/A	CBT	433978
Anritsu	ML2495A	Power Meter	10/31/2013	Annual	10/31/2014	1039008
Anritsu	ML2469A	Power Meter	3/14/2014	Annual	3/14/2015	1306009
Anritsu	MA2481A	Power Sensor	10/30/2013	Annual	10/30/2014	5605
Anritsu	MA2411B	Pulse Power Sensor	11/14/2013	Annual	11/14/2014	1126066
Anritsu	MA2411B	Pulse Power Sensor	2/3/2014	Annual	2/3/2015	1339018
Anritsu	MT8820C	Radio Communication Analyzer	12/12/2013	Annual	12/12/2014	6201300731
Anritsu	MA24106A	USB Power Sensor	1/3/2014	Annual	1/3/2015	1349503
Anritsu	MA24106A	USB Power Sensor	1/3/2014	Annual	1/3/2015	1349509
Anritsu	MA24106A	USB Power Sensor	1/3/2014	Annual	1/3/2015	1349514
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	122541139
Control Company	4353	Long Stem Thermometer	9/25/2012	Biennial	9/25/2014	122541143
Fisher Scientific	15-077-960	Digital Thermometer	12/4/2013	Biennial	12/4/2015	130764551
Fisher Scientific	15-077-960	Digital Thermometer	12/4/2013	Biennial	12/4/2015	130764558
Gigatronics	80701A	(0.05-18GHz) Power Sensor	10/30/2013	Annual	10/30/2014	1833460
Gigatronics	8651A	Universal Power Meter	10/30/2013	Annual	10/30/2014	8650319
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
MiniCircuits	SLP-2400+	Low Pass Filter	CBT	N/A	CBT	R8979500903
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-1200+	Low Pass Filter DC to 1000 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
Mitutoyo	CD-6"CSX	Digital Caliper	5/8/2014	Biennial	5/8/2016	13264162
Narda	4014C-6	4 - 8 GHz SMA 6 dB Directional Coupler	CBT	N/A	CBT	N/A
Narda	BW-S3W2	Attenuator (3dB)	CBT	N/A	CBT	120
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Rohde & Schwarz	CMU200	Base Station Simulator	6/6/2014	Annual	6/6/2015	109892
Rohde & Schwarz	NRVD	Dual Channel Power Meter	10/12/2012	Biennial	10/12/2014	101695
Rohde & Schwarz	NRV-Z32	Peak Power Sensor	10/12/2012	Biennial	10/12/2014	836019/013
Rohde & Schwarz	CMW500	Radio Communication Tester	10/18/2013	Annual	10/18/2014	100976
Rohde & Schwarz	CMW500	Radio Communication Tester	4/18/2014	Annual	4/18/2015	101699
Rohde & Schwarz	SME06	Signal Generator	10/30/2013	Annual	10/30/2014	832026
Rohde & Schwarz	NRVS	Single Channel Power Meter	10/31/2013	Annual	10/31/2014	835360/0079
Seekonk	NC-100	Torque Wrench	3/18/2014	Biennial	3/18/2016	22313
Seekonk	NC-100	Torque Wrench	3/18/2014	Biennial	3/18/2016	N/A
SPEAG	D1900V2	1900 MHz SAR Dipole	4/9/2014	Annual	4/9/2015	5d141
SPEAG	D2450V2	2450 MHz SAR Dipole	1/21/2014	Annual	1/21/2015	797
SPEAG	D5GHZV2	5 GHz SAR Dipole	1/27/2014	Annual	1/27/2015	1057
SPEAG	D750V3	750 MHz Dipole	1/20/2014	Annual	1/20/2015	1003
SPEAG	D835V2	835 MHz SAR Dipole	4/7/2014	Annual	4/7/2015	4d119
SPEAG	DAE4	Dasy Data Acquisition Electronics	8/21/2013	Annual	8/21/2014	1322
SPEAG	DAE4	Dasy Data Acquisition Electronics	11/19/2013	Annual	11/19/2014	1333
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/17/2014	Annual	3/17/2015	1334
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/11/2014	Annual	4/11/2015	1368
SPEAG	DAE4	Dasy Data Acquisition Electronics	11/19/2013	Annual	11/19/2014	1408
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/6/2014	Annual	5/6/2015	1070
SPEAG	DAK-3.5	Dielectric Assessment Kit	11/13/2013	Annual	11/13/2014	1091
SPEAG	ES3DV2	SAR Probe	8/22/2013	Annual	8/22/2014	3022
SPEAG	ES3DV3	SAR Probe	3/19/2014	Annual	3/19/2015	3209
SPEAG	ES3DV3	SAR Probe	11/20/2013	Annual	11/20/2014	3287
SPEAG	ES3DV3	SAR Probe	4/17/2014	Annual	4/17/2015	3319
SPEAG	EX3DV4	SAR Probe	1/29/2014	Annual	1/29/2015	3589
SPEAG	EX3DV4	SAR Probe	10/23/2013	Annual	10/23/2014	3914
Tektronix	RSA6114A	Real Time Spectrum Analyzer	4/16/2014	Annual	4/16/2015	8010177

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

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15 MEASUREMENT UNCERTAINTIES

Applicable for frequencies less than 3000 MHz.

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

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

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Applicable for frequencies up to 6 GHz.

a	b	c	d	e= f(d,k)	f	g	h = c x f/e	i = c x g/e	k
Uncertainty Component	IEEE 1528 Sec.	Tol. (± %)	Prob. Dist.	Div.	c _i 1gm	c _i 10 gms	1gm u _i (± %)	10gms u _i (± %)	v _i
Measurement System									
Probe Calibration	E.2.1	6.55	N	1	1.0	1.0	6.6	6.6	∞
Axial Isotropy	E.2.2	0.25	N	1	0.7	0.7	0.2	0.2	∞
Hemishperical Isotropy	E.2.2	1.3	N	1	1.0	1.0	1.3	1.3	∞
Boundary Effect	E.2.3	0.4	N	1	1.0	1.0	0.4	0.4	∞
Linearity	E.2.4	0.3	N	1	1.0	1.0	0.3	0.3	∞
System Detection Limits	E.2.5	5.1	N	1	1.0	1.0	5.1	5.1	∞
Readout Electronics	E.2.6	1.0	N	1	1.0	1.0	1.0	1.0	∞
Response Time	E.2.7	0.8	R	1.73	1.0	1.0	0.5	0.5	∞
Integration Time	E.2.8	2.6	R	1.73	1.0	1.0	1.5	1.5	∞
RF Ambient Conditions	E.6.1	3.0	R	1.73	1.0	1.0	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1.0	1.0	0.2	0.2	∞
Probe Positioning w/ respect to Phantom	E.6.3	2.9	R	1.73	1.0	1.0	1.7	1.7	∞
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E.5	1.0	R	1.73	1.0	1.0	0.6	0.6	∞
Test Sample Related									
Test Sample Positioning	E.4.2	6.0	N	1	1.0	1.0	6.0	6.0	287
Device Holder Uncertainty	E.4.1	3.32	R	1.73	1.0	1.0	1.9	1.9	∞
Output Power Variation - SAR drift measurement	6.6.2	5.0	R	1.73	1.0	1.0	2.9	2.9	∞
Phantom & Tissue Parameters									
Phantom Uncertainty (Shape & Thickness tolerances)	E.3.1	4.0	R	1.73	1.0	1.0	2.3	2.3	∞
Liquid Conductivity - deviation from target values	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity - measurement uncertainty	E.3.3	3.8	N	1	0.64	0.43	2.4	1.6	6
Liquid Permittivity - deviation from target values	E.3.2	5.0	R	1.73	0.60	0.49	1.7	1.4	∞
Liquid Permittivity - measurement uncertainty	E.3.3	4.5	N	1	0.60	0.49	2.7	2.2	6
Combined Standard Uncertainty (k=1)							RSS	12.4	12.0
Expanded Uncertainty (95% CONFIDENCE LEVEL)							k=2	24.7	24.0

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

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16 CONCLUSION

16.1 Measurement Conclusion

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

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

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APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910KOR; Type: Portable Handset; Serial: F1926

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

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.93 \text{ S/m}$; $\epsilon_r = 42.485$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 07-28-2014; Ambient Temp: 23.0°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3319; ConvF(6.27, 6.27, 6.27); Calibrated: 4/17/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/11/2014

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

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

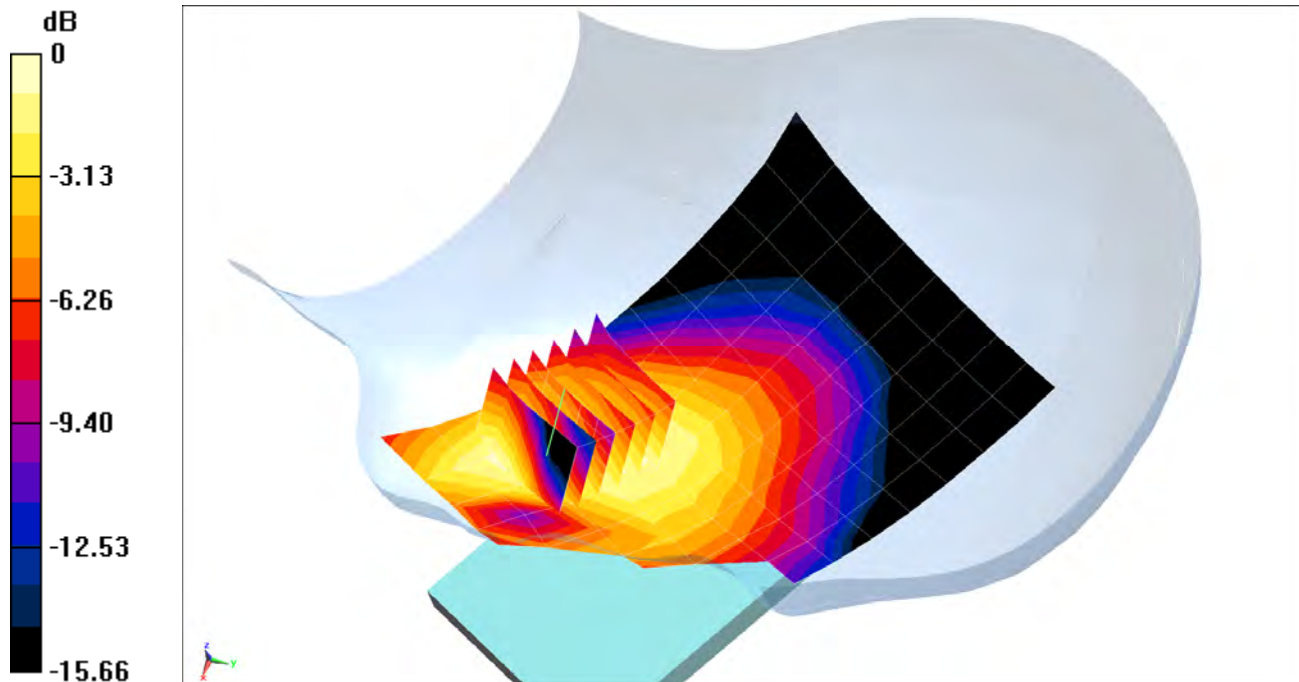
Area Scan (9x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 10.497 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.132 W/kg

SAR(1 g) = 0.104 W/kg



0 dB = 0.114 W/kg = -9.43 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910KOR; Type: Portable Handset; Serial: F1924

Communication System: UID 0, GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium: 1900 Head Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.376 \text{ S/m}$; $\epsilon_r = 39.077$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 07-29-2014; Ambient Temp: 23.4°C; Tissue Temp: 22.9°C

Probe: ES3DV3 - SN3209; ConvF(5.13, 5.13, 5.13); Calibrated: 3/19/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/17/2014

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

Mode: GSM 1900, Left Head, Cheek, Mid.ch

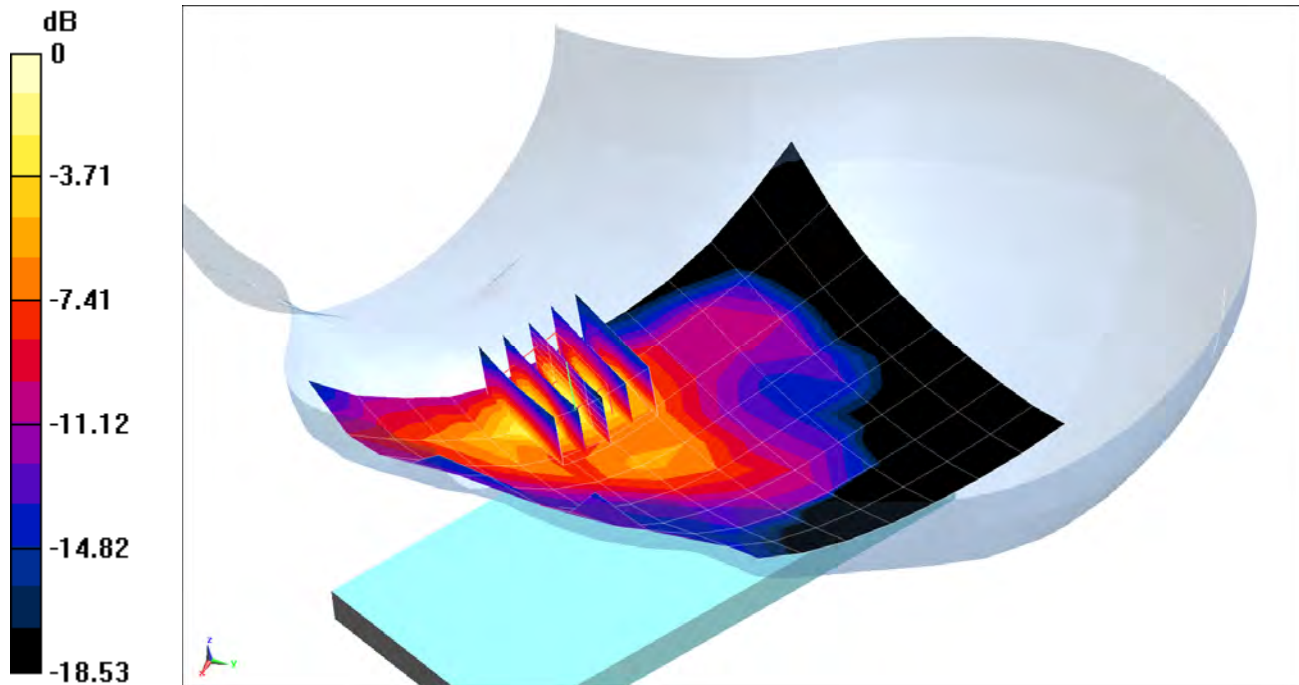
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 7.420 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.130 W/kg

SAR(1 g) = 0.065 W/kg



0 dB = 0.0923 W/kg = -10.35 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910KOR; Type: Portable Handset; Serial: F1924

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

Medium: 1900 Head Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.376 \text{ S/m}$; $\epsilon_r = 39.077$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 07-29-2014; Ambient Temp: 23.4°C; Tissue Temp: 22.9°C

Probe: ES3DV3 - SN3209; ConvF(5.13, 5.13, 5.13); Calibrated: 3/19/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/17/2014

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

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

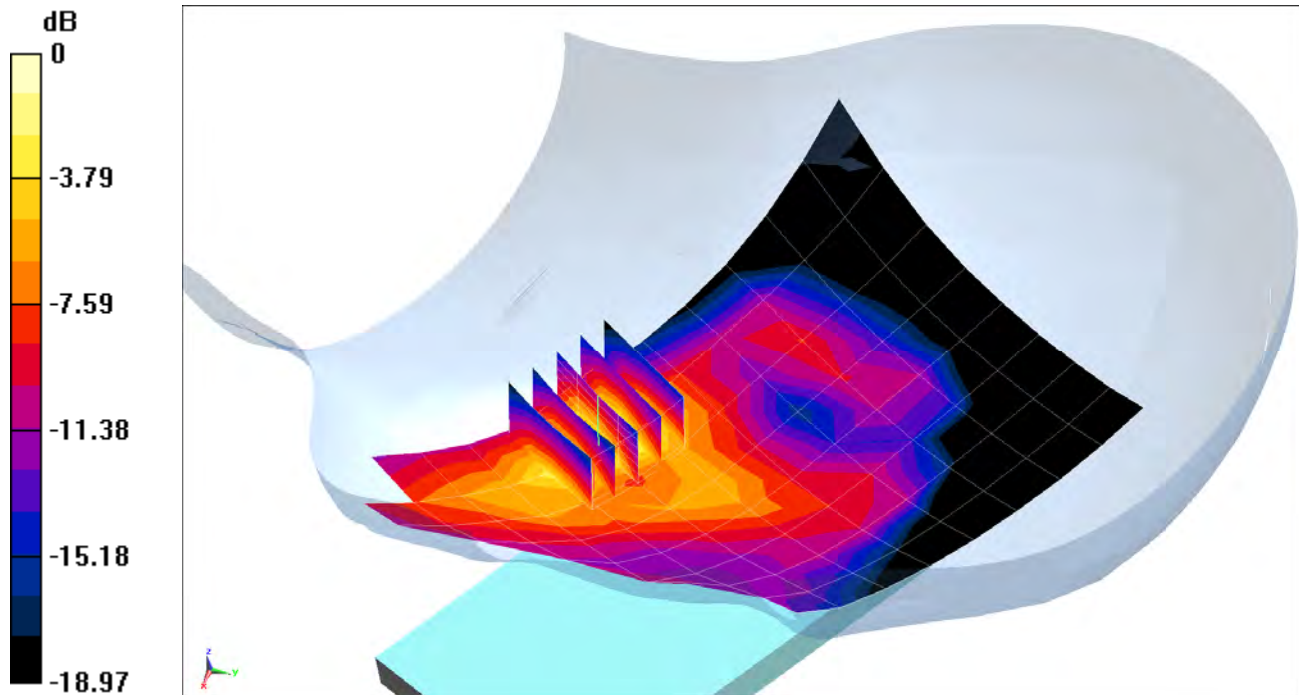
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 12.511 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.317 W/kg

SAR(1 g) = 0.172 W/kg



0 dB = 0.235 W/kg = -6.29 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910KOR; Type: Portable Handset; Serial: F1924

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

Medium: 750 Head Medium parameters used:

$f = 710 \text{ MHz}$; $\sigma = 0.883 \text{ S/m}$; $\epsilon_r = 42.522$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 07-31-2014; Ambient Temp: 24.5°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3287; ConvF(6.52, 6.52, 6.52); Calibrated: 11/20/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

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

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

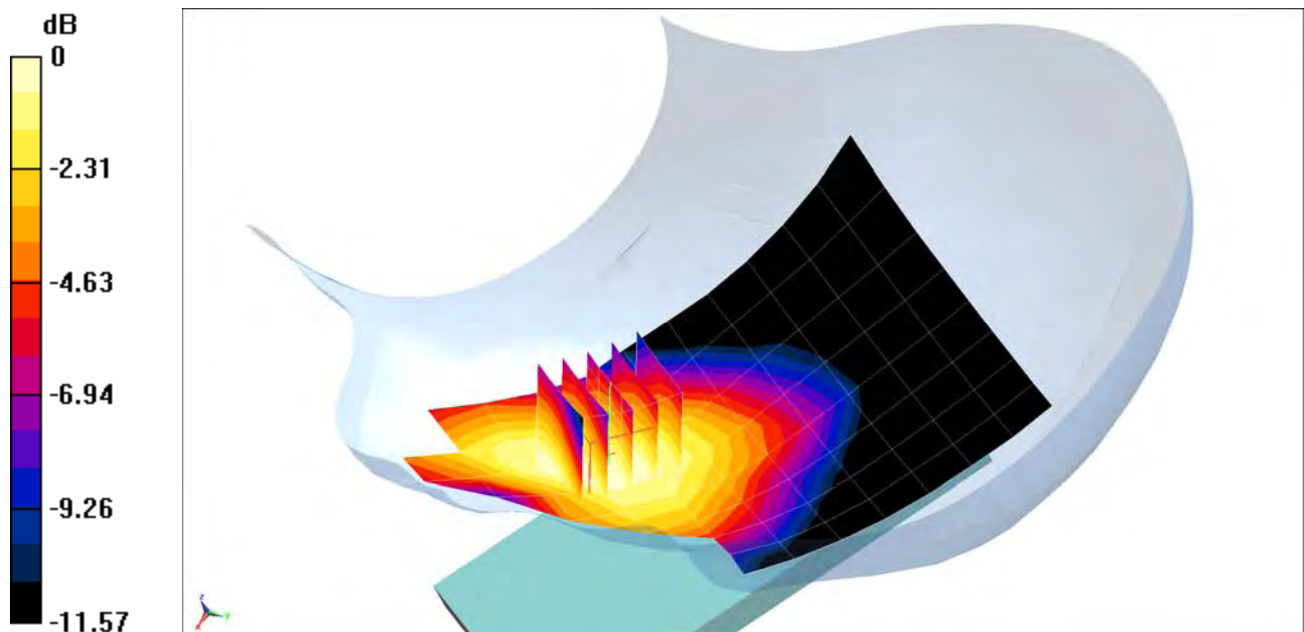
Area Scan (9x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 6.310 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.0380 W/kg

SAR(1 g) = 0.030 W/kg



0 dB = 0.0330 W/kg = -14.81 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910KOR; Type: Portable Handset; Serial: F1926

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

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.5 \text{ MHz}$; $\sigma = 0.93 \text{ S/m}$; $\epsilon_r = 42.487$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 07-28-2014; Ambient Temp: 23.0°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3319; ConvF(6.27, 6.27, 6.27); Calibrated: 4/17/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/11/2014

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

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

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

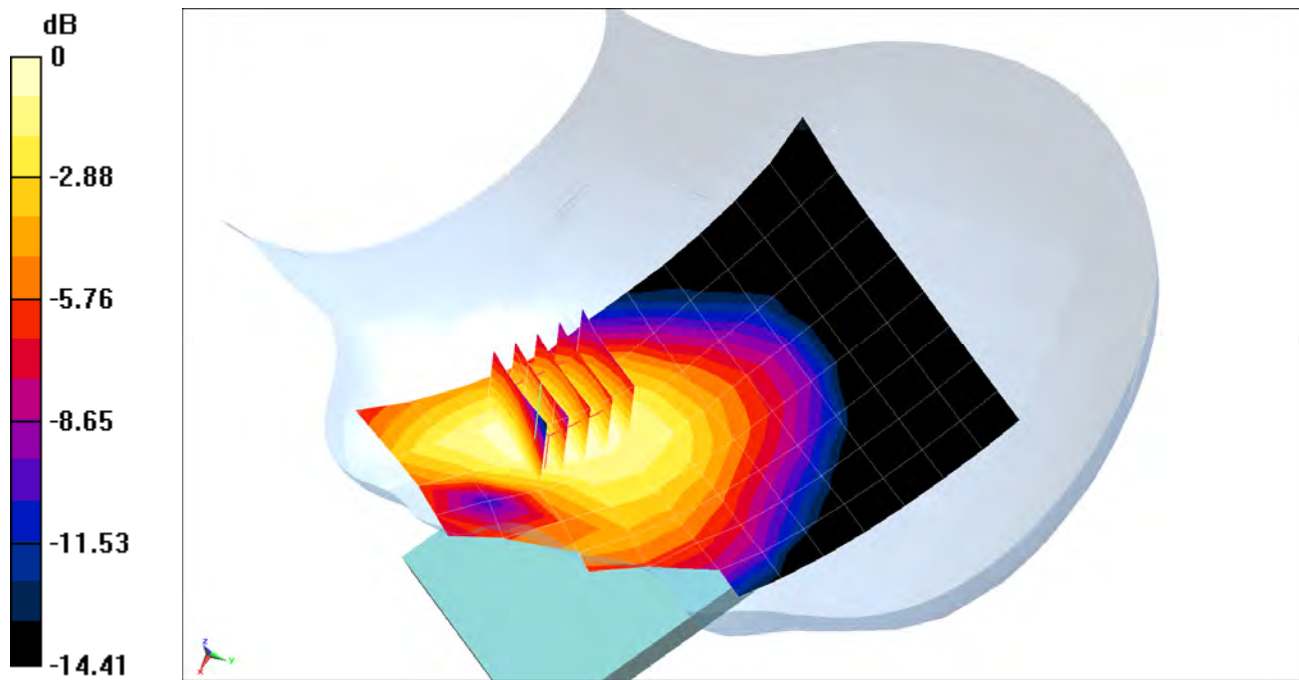
Area Scan (9x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 12.213 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 0.166 W/kg

SAR(1 g) = 0.131 W/kg



0 dB = 0.144 W/kg = -8.42 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910KOR; Type: Portable Handset; Serial: F1926

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

Medium: 2450 Head Medium parameters used (interpolated):

$f = 2437 \text{ MHz}$; $\sigma = 1.729 \text{ S/m}$; $\epsilon_r = 40.962$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 08-04-2014; Ambient Temp: 23.6°C; Tissue Temp: 23.7°C

Probe: ES3DV3 - SN3319; ConvF(4.45, 4.45, 4.45); Calibrated: 4/17/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/11/2014

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

Mode: IEEE 802.11b, Right Head, Cheek, Ch 06, 1 Mbps Antenna 2

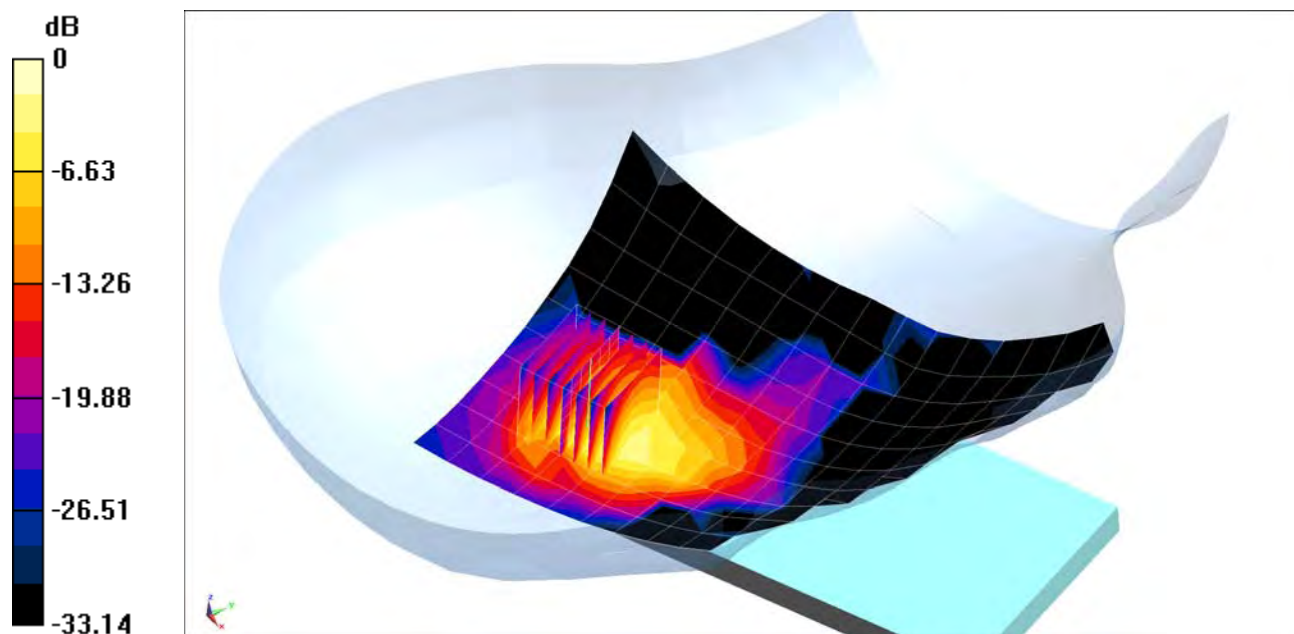
Area Scan (11x18x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 15.969 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.791 W/kg

SAR(1 g) = 0.398 W/kg



0 dB = 0.513 W/kg = -2.90 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910KOR; Type: Portable Handset; Serial: F1923

Communication System: UID 0, IEEE 802.11a; Frequency: 5825 MHz; Duty Cycle: 1:1

Medium: 5 GHz Head Medium parameters used:

$f = 5825 \text{ MHz}$; $\sigma = 5.218 \text{ S/m}$; $\epsilon_r = 36.281$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 07-31-2014; Ambient Temp: 24.7°C; Tissue Temp: 23.0°C

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

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

**Mode: IEEE 802.11a, 5.8 GHz, 20 MHz Bandwidth, Right Head, Cheek
Ch 165, 6 Mbps, Antenna 1**

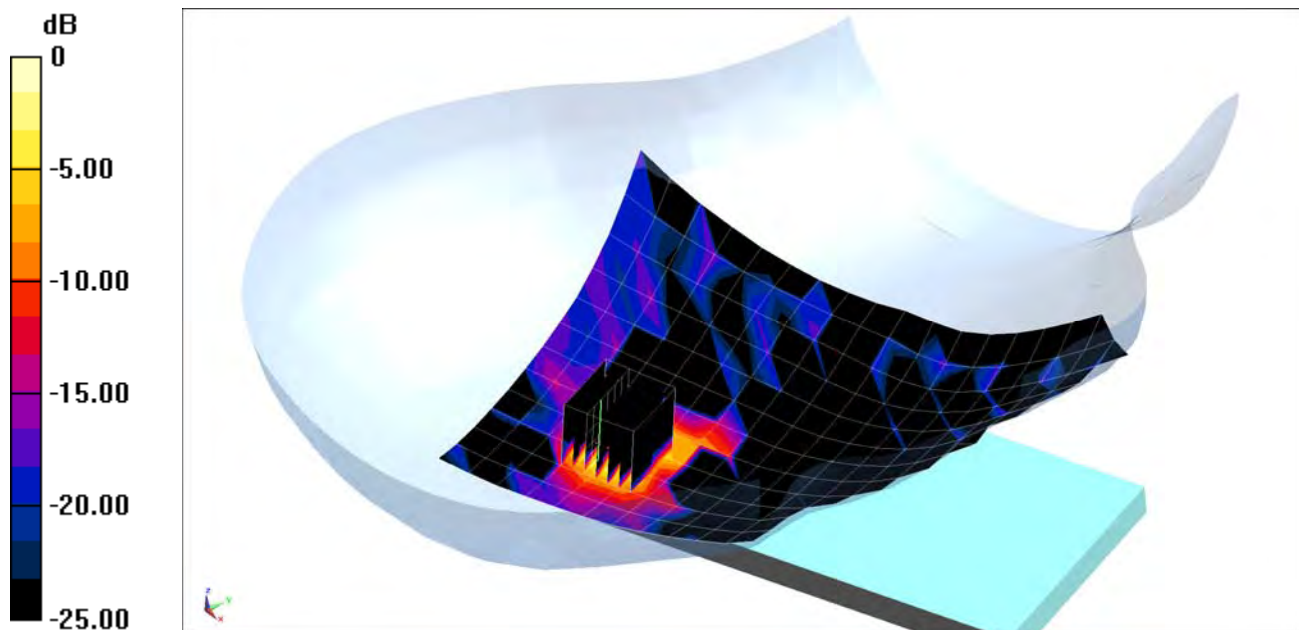
Area Scan (13x22x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 6.000 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.740 W/kg

SAR(1 g) = 0.157 W/kg



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910KOR; Type: Portable Handset; Serial: F1923

Communication System: UID 0, IEEE 802.11a; Frequency: 5560 MHz; Duty Cycle: 1:1

Medium: 5 GHz Head Medium parameters used:

$f = 5560 \text{ MHz}$; $\sigma = 4.935 \text{ S/m}$; $\epsilon_r = 36.66$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 07-31-2014; Ambient Temp: 24.8°C; Tissue Temp: 23.0°C

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

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

**Mode: IEEE 802.11a, 5.5 GHz, 20 MHz Bandwidth, Right Head, Cheek
Ch 112, 6 Mbps, Antenna 1**

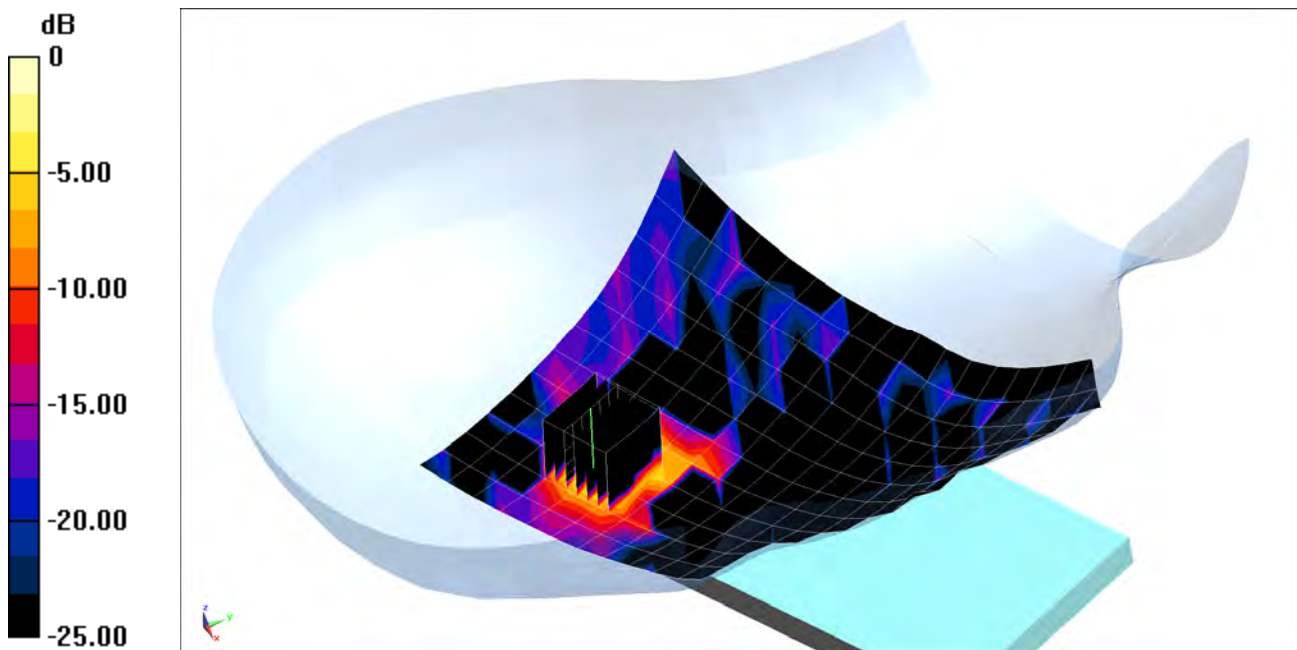
Area Scan (13x22x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

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

Reference Value = 5.942 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.659 W/kg

SAR(1 g) = 0.143 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910KOR; Type: Portable Handset; Serial: F1926

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

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 1.001 \text{ S/m}$; $\epsilon_r = 54.159$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-28-2014; Ambient Temp: 24.4°C; Tissue Temp: 23.0°C

Probe: ES3DV2 - SN3022; ConvF(5.91, 5.91, 5.91); Calibrated: 8/22/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

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

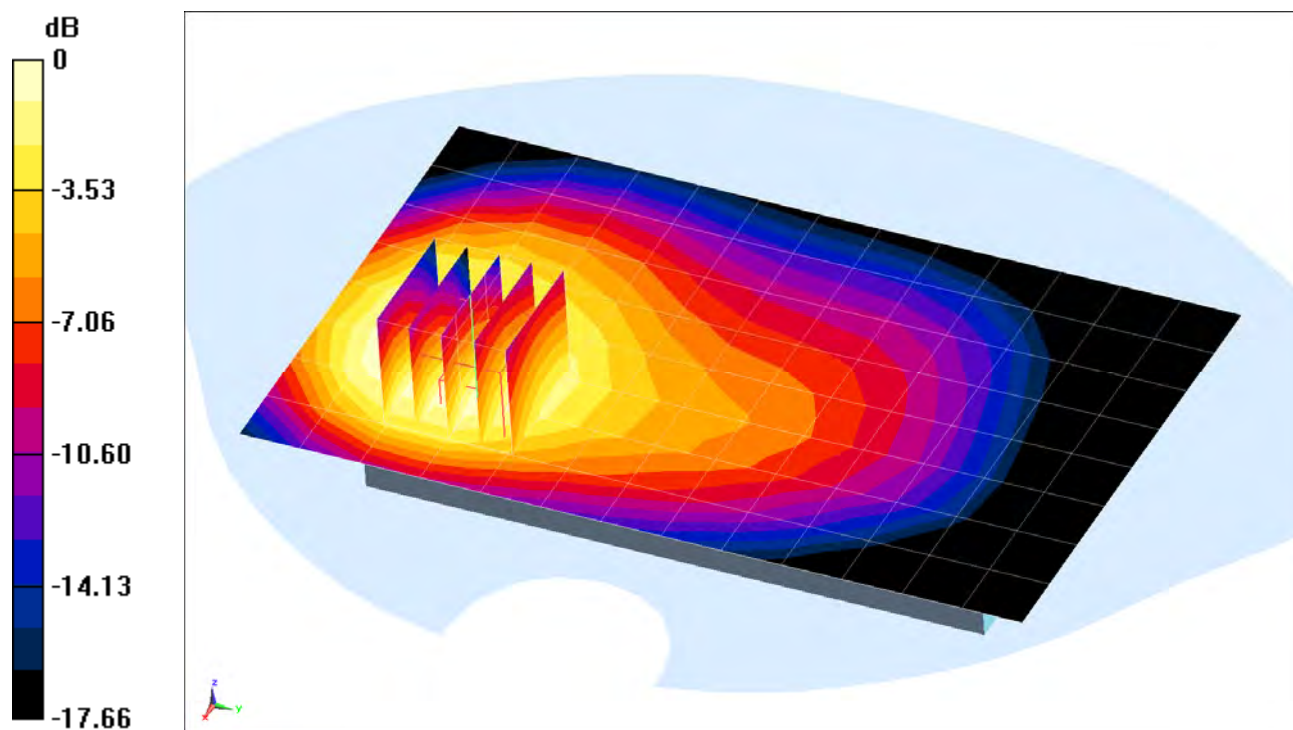
Area Scan (9x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 22.189 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.683 W/kg

SAR(1 g) = 0.449 W/kg



0 dB = 0.525 W/kg = -2.80 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910KOR; Type: Portable Handset; Serial: F1926

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

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 1.001 \text{ S/m}$; $\epsilon_r = 54.159$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-28-2014; Ambient Temp: 24.4°C; Tissue Temp: 23.0°C

Probe: ES3DV2 - SN3022; ConvF(5.91, 5.91, 5.91); Calibrated: 8/22/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

Mode: UMTS 850, Body SAR, Front side, Mid.ch

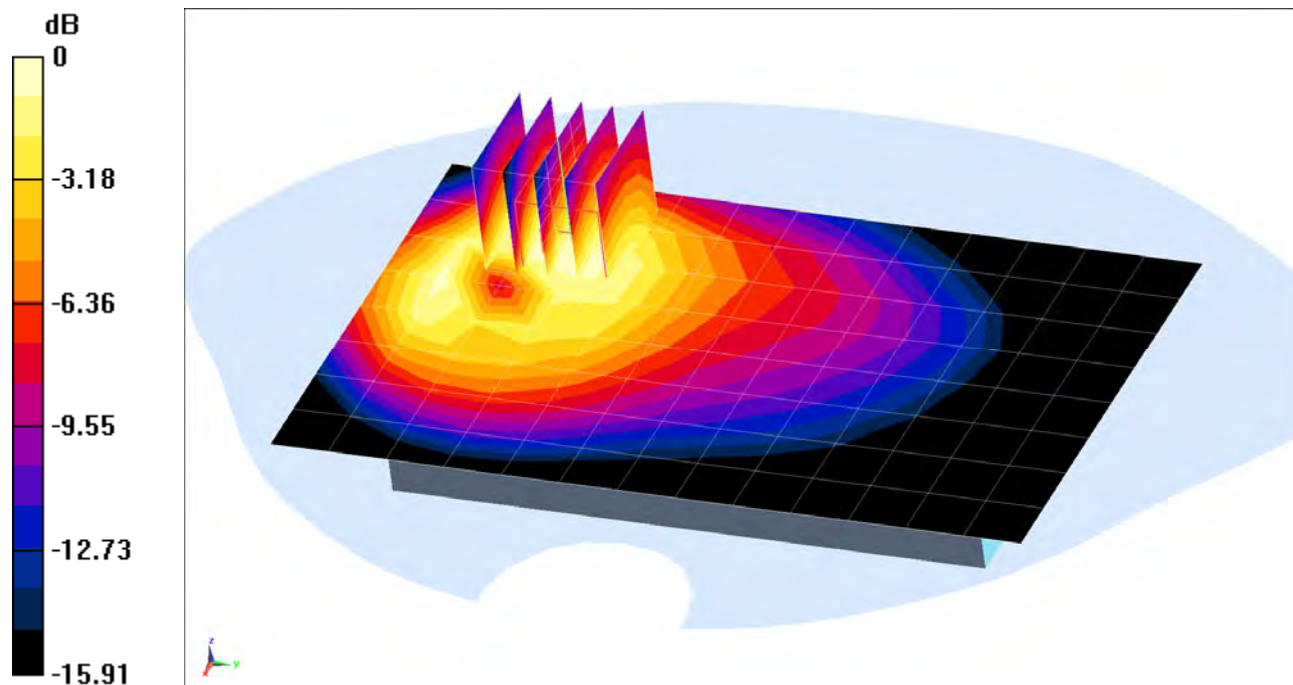
Area Scan (9x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 22.632 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.739 W/kg

SAR(1 g) = 0.486 W/kg



0 dB = 0.571 W/kg = -2.43 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910KOR; Type: Portable Handset; Serial: F1924

Communication System: UID 0, GSM; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.497 \text{ S/m}$; $\epsilon_r = 53.978$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-28-2014; Ambient Temp: 24.3°C; Tissue Temp: 23.2°C

Probe: ES3DV3 - SN3287; ConvF(4.67, 4.67, 4.67); Calibrated: 11/20/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

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

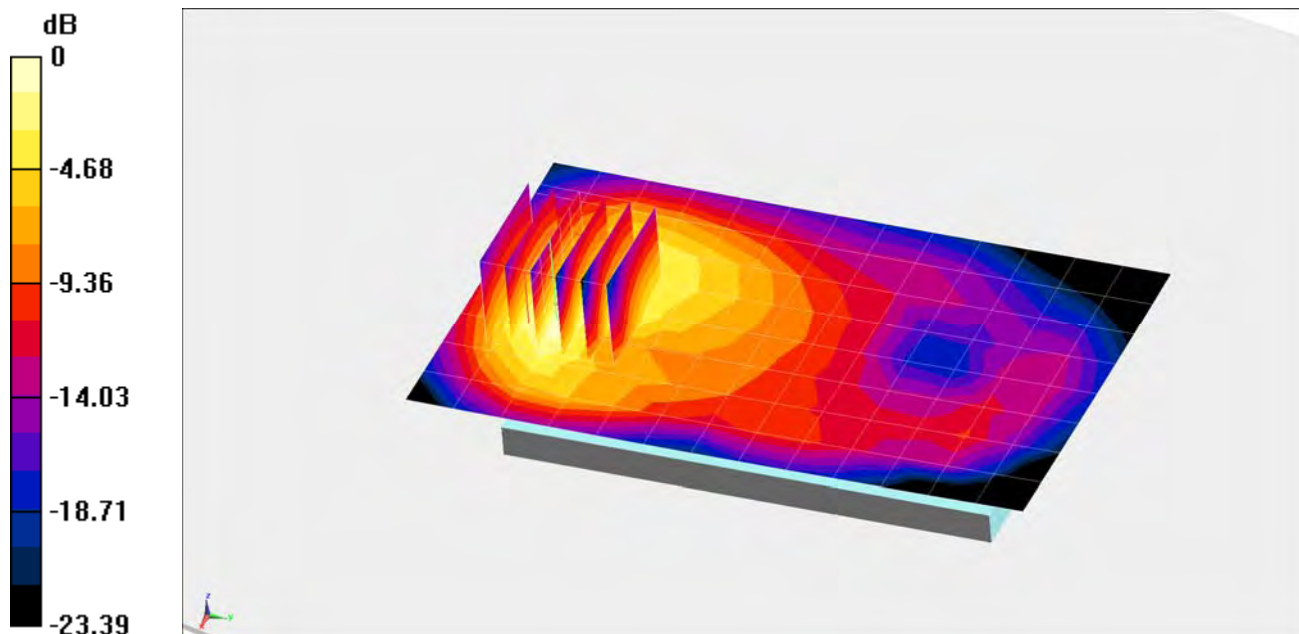
Area Scan (9x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 10.411 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.281 W/kg

SAR(1 g) = 0.166 W/kg



0 dB = 0.201 W/kg = -6.97 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910KOR; Type: Portable Handset; Serial: F1924

Communication System: UID 0, GSM GPRS; 2 Tx slots; Frequency: 1880 MHz; Duty Cycle: 1:4.15

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.497 \text{ S/m}$; $\epsilon_r = 53.978$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-28-2014; Ambient Temp: 24.3°C; Tissue Temp: 23.2°C

Probe: ES3DV3 - SN3287; ConvF(4.67, 4.67, 4.67); Calibrated: 11/20/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

Mode: GPRS 1900, Body SAR, Bottom Edge, Mid.ch, 2 Tx Slots

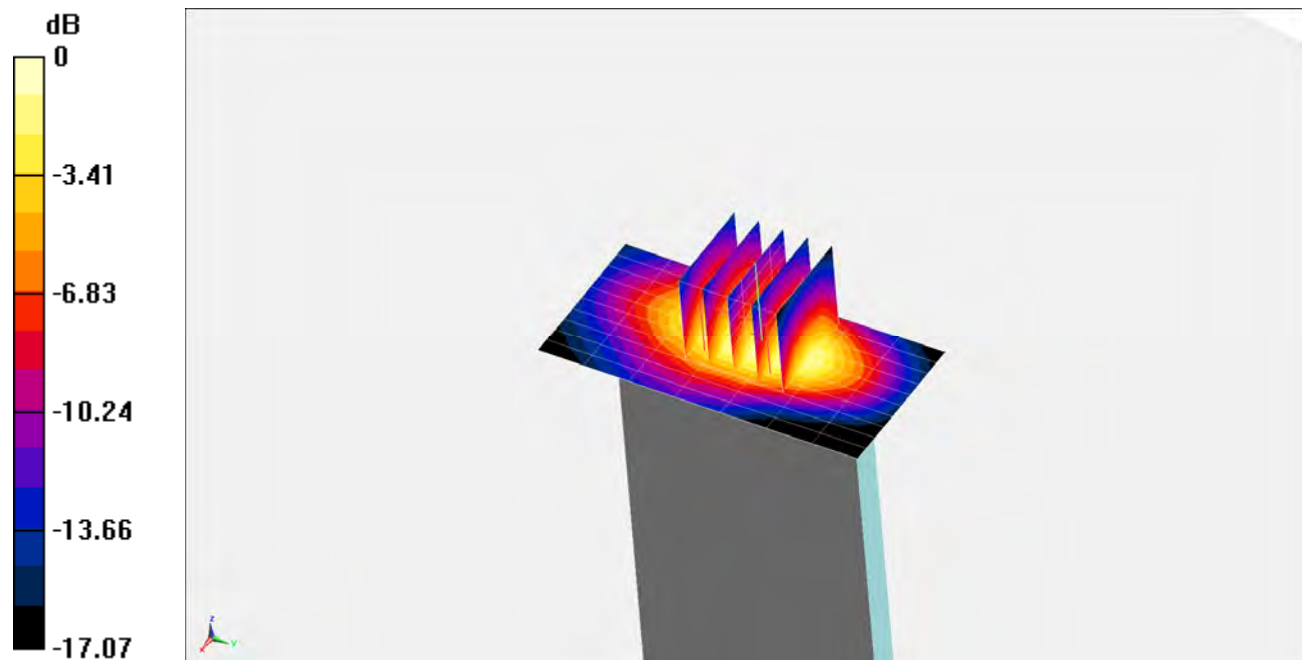
Area Scan (11x8x1): Measurement grid: dx=5mm, dy=15mm

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

Reference Value = 15.335 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.511 W/kg

SAR(1 g) = 0.321 W/kg



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910KOR; Type: Portable Handset; Serial: F1924

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

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.497 \text{ S/m}$; $\epsilon_r = 53.978$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-28-2014; Ambient Temp: 24.3°C; Tissue Temp: 23.2°C

Probe: ES3DV3 - SN3287; ConvF(4.67, 4.67, 4.67); Calibrated: 11/20/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

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

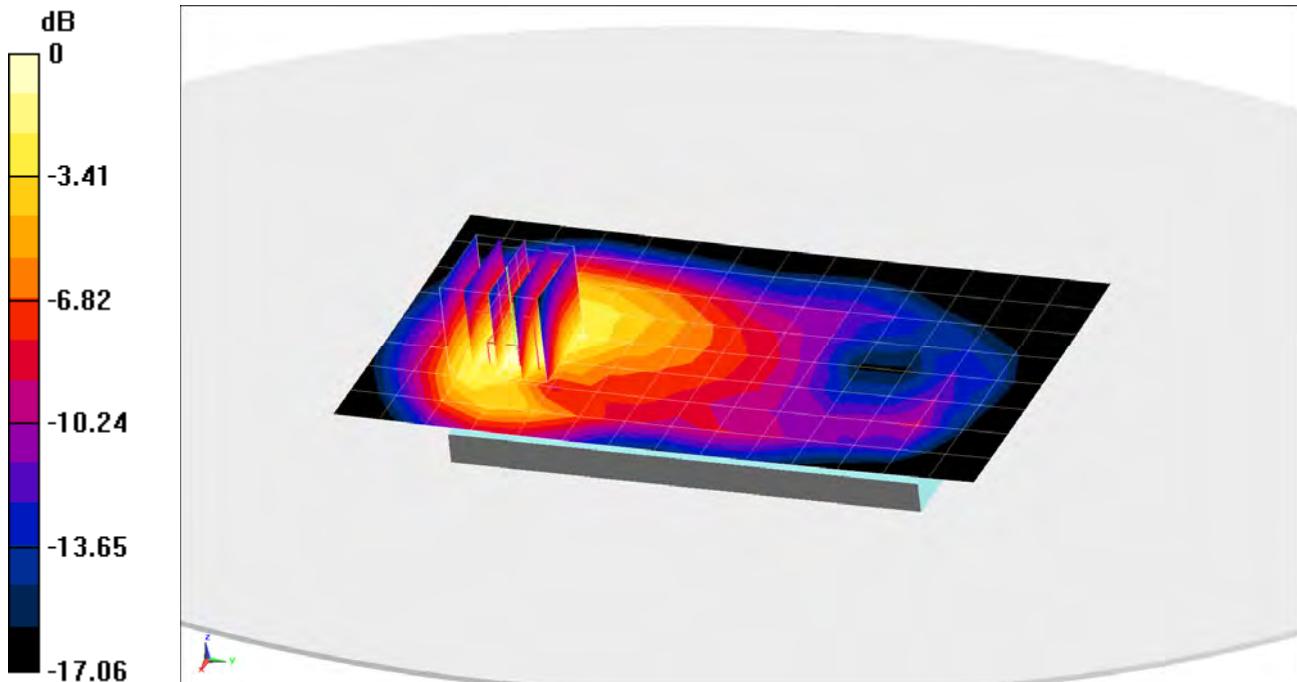
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 18.352 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.767 W/kg

SAR(1 g) = 0.457 W/kg



0 dB = 0.548 W/kg = -2.61 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910KOR; Type: Portable Handset; Serial: F1924

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

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.497 \text{ S/m}$; $\epsilon_r = 53.978$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-28-2014; Ambient Temp: 24.3°C; Tissue Temp: 23.2°C

Probe: ES3DV3 - SN3287; ConvF(4.67, 4.67, 4.67); Calibrated: 11/20/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

Mode: UMTS 1900, Body SAR, Bottom Edge, Mid.ch

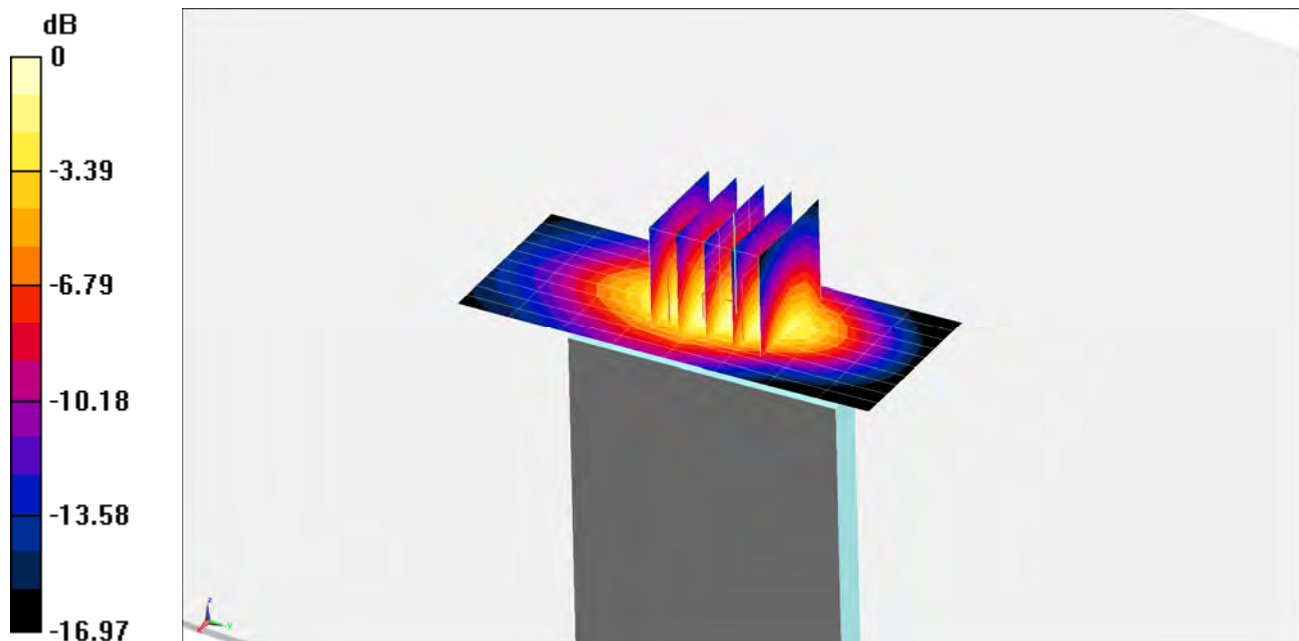
Area Scan (11x9x1): Measurement grid: dx=5mm, dy=15mm

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

Reference Value = 26.002 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 1.46 W/kg

SAR(1 g) = 0.911 W/kg



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910KOR; Type: Portable Handset; Serial: F1926

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

Medium: 750 Body Medium parameters used:

$f = 710 \text{ MHz}$; $\sigma = 0.928 \text{ S/m}$; $\epsilon_r = 53.864$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-30-2014; Ambient Temp: 24.1°C; Tissue Temp: 23.6°C

Probe: ES3DV3 - SN3287; ConvF(6.09, 6.09, 6.09); Calibrated: 11/20/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

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

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

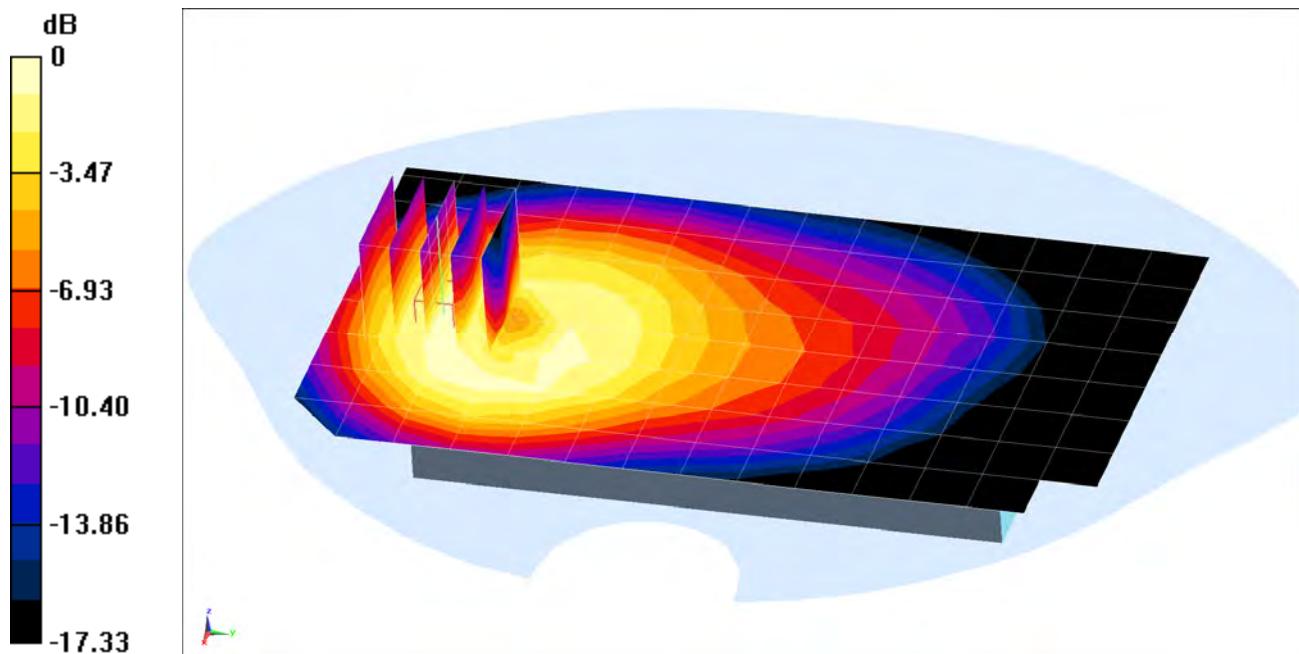
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 11.627 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.201 W/kg

SAR(1 g) = 0.118 W/kg



0 dB = 0.145 W/kg = -8.39 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910KOR; Type: Portable Handset; Serial: F1926

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

Medium: 750 Body Medium parameters used:

$f = 710 \text{ MHz}$; $\sigma = 0.928 \text{ S/m}$; $\epsilon_r = 53.864$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-30-2014; Ambient Temp: 24.1°C; Tissue Temp: 23.6°C

Probe: ES3DV3 - SN3287; ConvF(6.09, 6.09, 6.09); Calibrated: 11/20/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

Mode: LTE Band 17, Body SAR, Front Side, Mid.ch

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

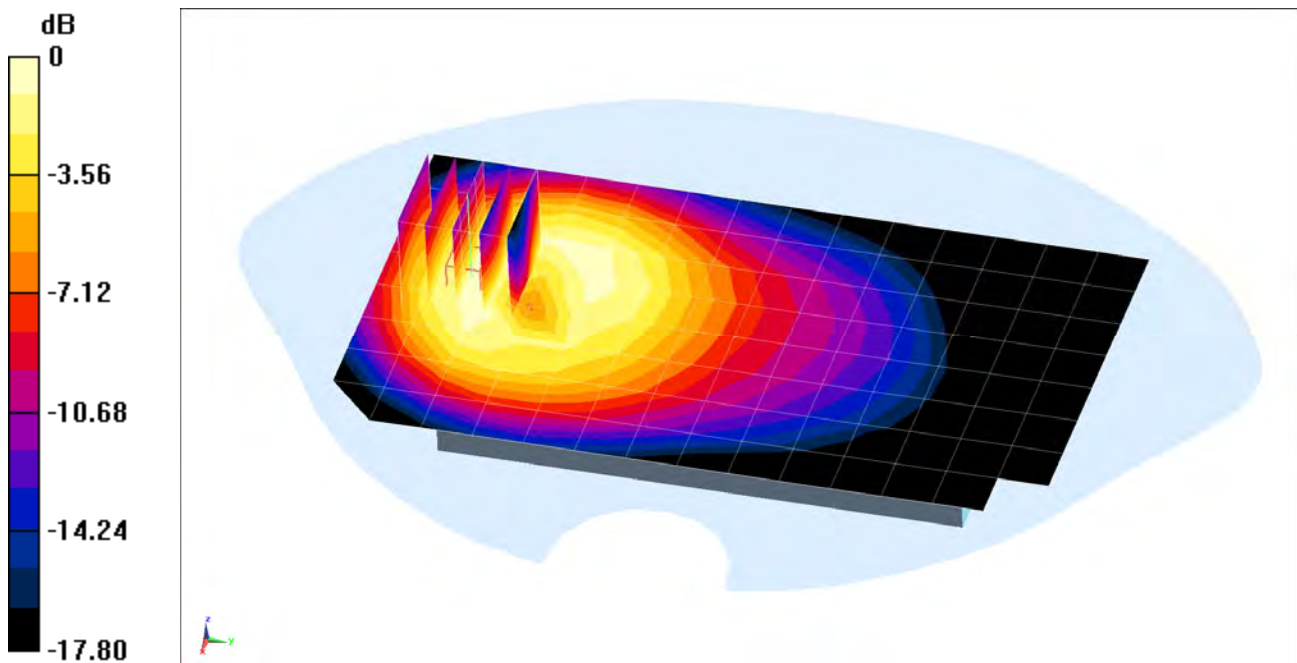
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 12.678 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.239 W/kg

SAR(1 g) = 0.142 W/kg



0 dB = 0.173 W/kg = -7.62 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910KOR; Type: Portable Handset; Serial: F1926

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

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.5 \text{ MHz}$; $\sigma = 1.001 \text{ S/m}$; $\epsilon_r = 54.16$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-28-2014; Ambient Temp: 24.4°C; Tissue Temp: 23.0°C

Probe: ES3DV2 - SN3022; ConvF(5.91, 5.91, 5.91); Calibrated: 8/22/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

Mode: LTE Band 5 (Cell.), Body SAR, Back side, Mid.ch
10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

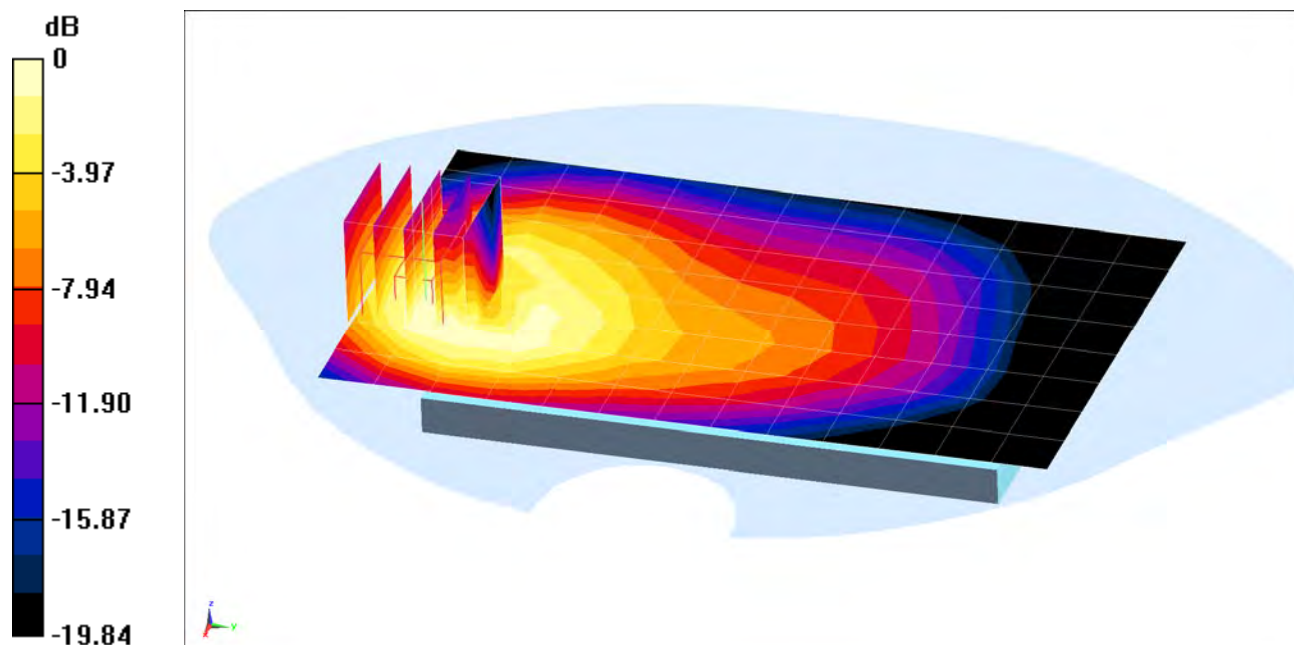
Area Scan (9x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 25.403 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.951 W/kg

SAR(1 g) = 0.572 W/kg



0 dB = 0.698 W/kg = -1.56 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910KOR; Type: Portable Handset; Serial: F1926

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

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.5$ MHz; $\sigma = 1.001$ S/m; $\epsilon_r = 54.16$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-28-2014; Ambient Temp: 24.4°C; Tissue Temp: 23.0°C

Probe: ES3DV2 - SN3022; ConvF(5.91, 5.91, 5.91); Calibrated: 8/22/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

Mode: LTE Band 5 (Cell.), Body SAR, Front side, Mid.ch
10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

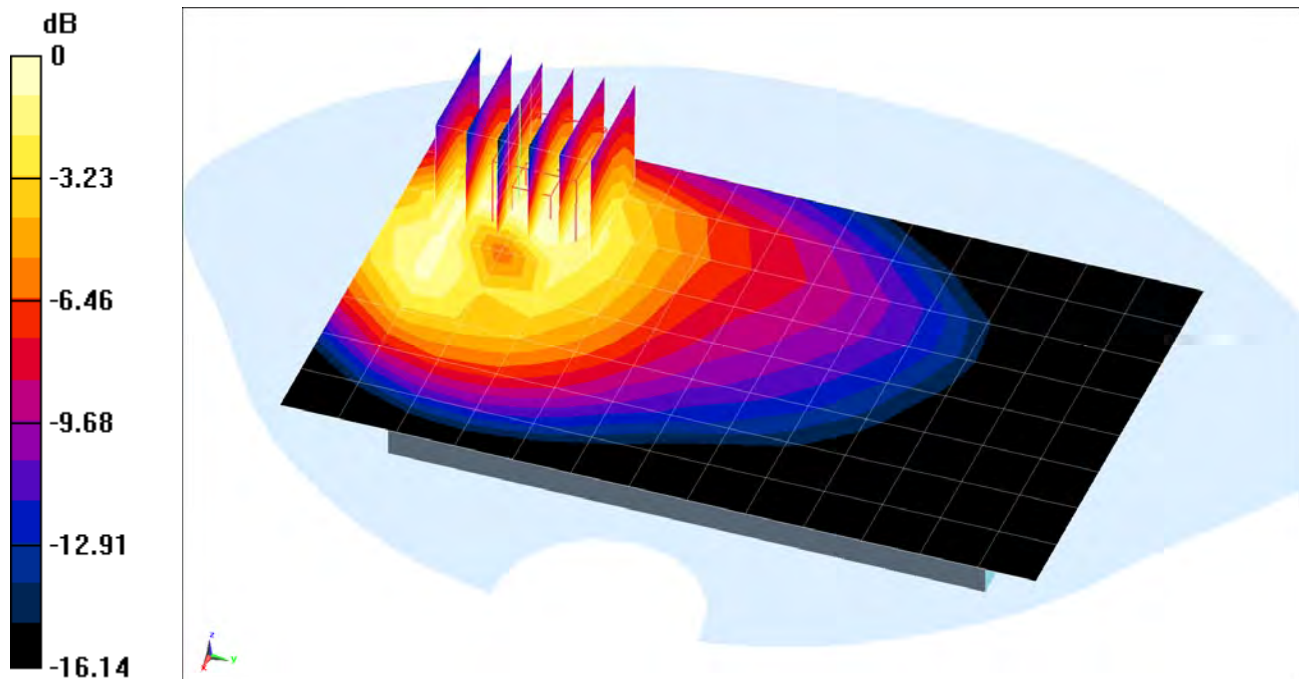
Area Scan (9x14x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 27.189 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 1.05 W/kg

SAR(1 g) = 0.681 W/kg



0 dB = 0.798 W/kg = -0.98 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910KOR; Type: Portable Handset; Serial: F1923

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

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2437 \text{ MHz}$; $\sigma = 1.919 \text{ S/m}$; $\epsilon_r = 51.166$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2014; Ambient Temp: 24.3°C; Tissue Temp: 22.8°C

Probe: ES3DV3 - SN3319; ConvF(4.24, 4.24, 4.24); Calibrated: 4/17/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/11/2014

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

Mode: IEEE 802.11b, Body SAR, Ch 06, 1 Mbps, Back Side, Antenna 2

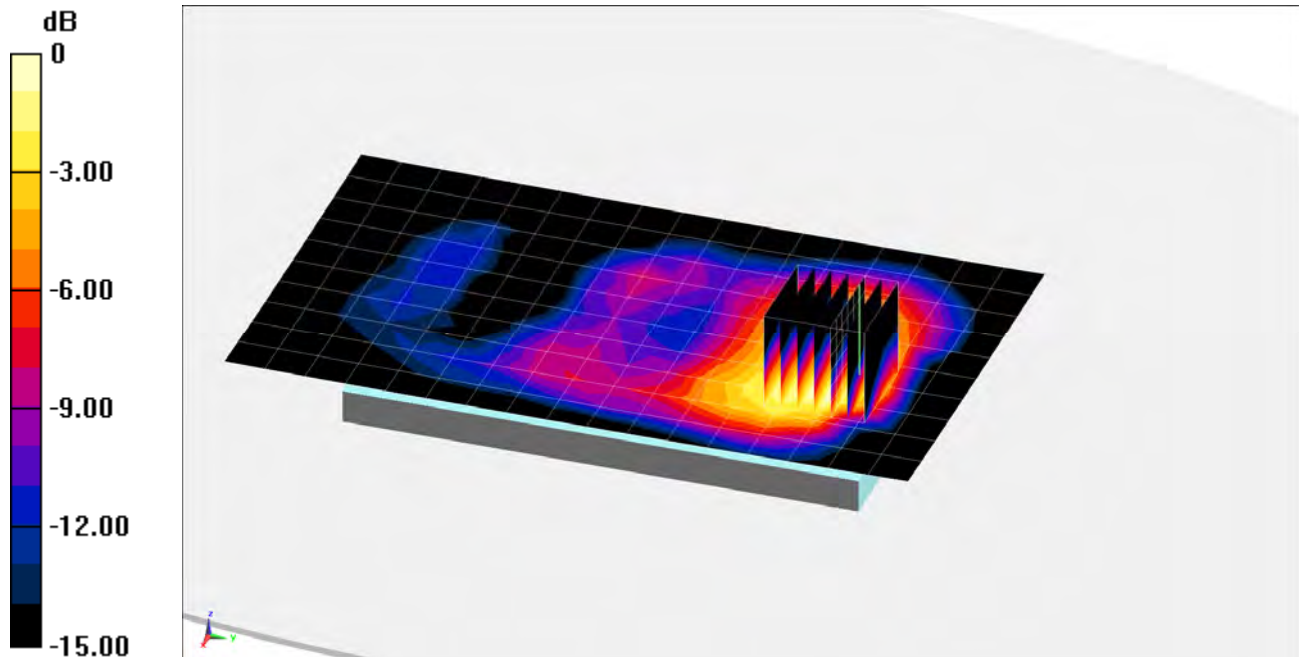
Area Scan (11x18x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 5.406 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.110 W/kg

SAR(1 g) = 0.052 W/kg



0 dB = 0.0646 W/kg = -11.90 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910KOR; Type: Portable Handset; Serial: F1922

Communication System: UID 0, IEEE 802.11ac; Frequency: 5775 MHz; Duty Cycle: 1:1

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

$f = 5775 \text{ MHz}$; $\sigma = 6.139 \text{ S/m}$; $\epsilon_r = 46.652$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section: Space: 1.0 cm

Test Date: 07-31-2014; Ambient Temp: 24.1°C; Tissue Temp: 22.7°C

Probe: EX3DV4 - SN3589; ConvF(3.97, 3.97, 3.97); Calibrated: 1/29/2014;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/17/2014

Phantom: SAM left; Type: QD000P40CD; Serial: TP:1715

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

**Mode: IEEE 802.11ac, 5.8 GHz, 80 MHz Bandwidth Body SAR
Ch 155, 29.3 Mbps, Back Side, Antenna 2**

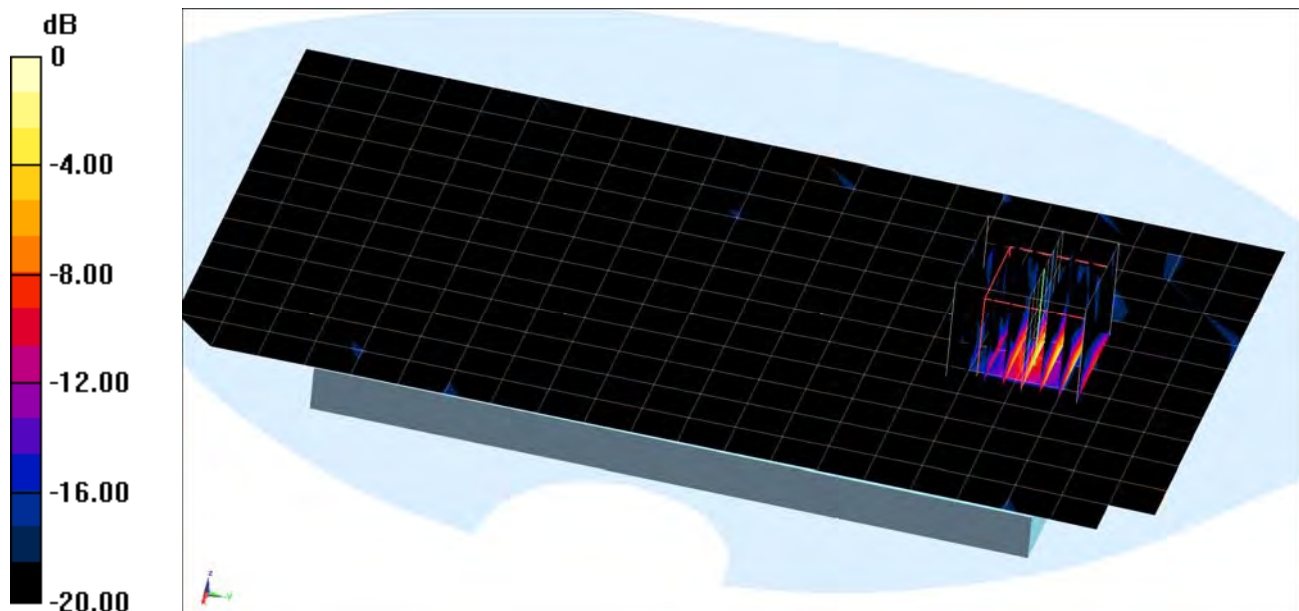
Area Scan (13x22x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 3.576 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.447 W/kg

SAR(1 g) = 0.089 W/kg



0 dB = 0.236 W/kg = -6.27 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910KOR; Type: Portable Handset; Serial: F1922

Communication System: UID 0, IEEE 802.11n; Frequency: 5180 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5180 \text{ MHz}$; $\sigma = 5.237 \text{ S/m}$; $\epsilon_r = 48.042$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2014; Ambient Temp: 24.1°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN3589; ConvF(4.19, 4.19, 4.19); Calibrated: 1/29/2014;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/17/2014

Phantom: SAM left; Type: QD000P40CD; Serial: TP:1715

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

**Mode: IEEE 802.11n, 5.2 GHz, 20 MHz Bandwidth, Body SAR
Ch 36, 13 Mbps, Back Side, MIMO**

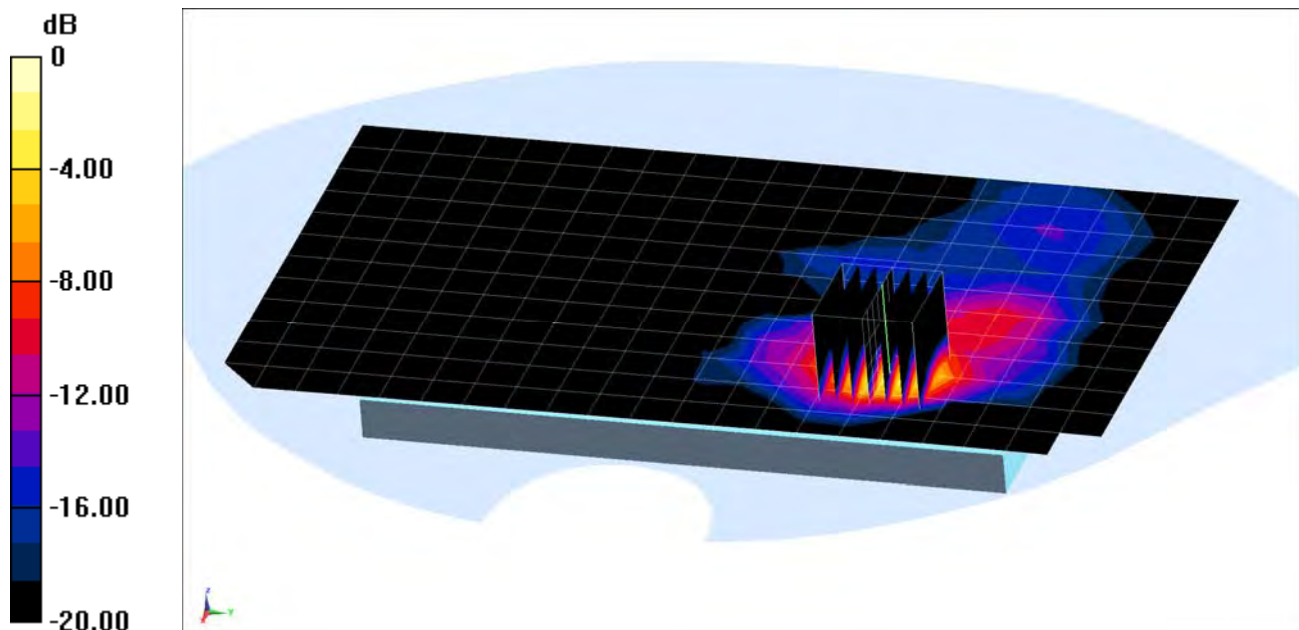
Area Scan (13x22x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

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

Reference Value = 9.628 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 0.348 W/kg

SAR(1 g) = 0.077 W/kg



0 dB = 0.217 W/kg = -6.64 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910KOR; Type: Portable Handset; Serial: F1922

Communication System: UID 0, IEEE 802.11a; Frequency: 5180 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5180 \text{ MHz}$; $\sigma = 5.15 \text{ S/m}$; $\epsilon_r = 48.048$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 08-04-2014; Ambient Temp: 23.9°C; Tissue Temp: 23.3°C

Probe: EX3DV4 - SN3589; ConvF(4.19, 4.19, 4.19); Calibrated: 1/29/2014;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/17/2014

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

Mode: IEEE 802.11a, 5.2 GHz, 20 MHz Bandwidth, Hand SAR

Ch 36, 6 Mbps, Back Side, Antenna 1

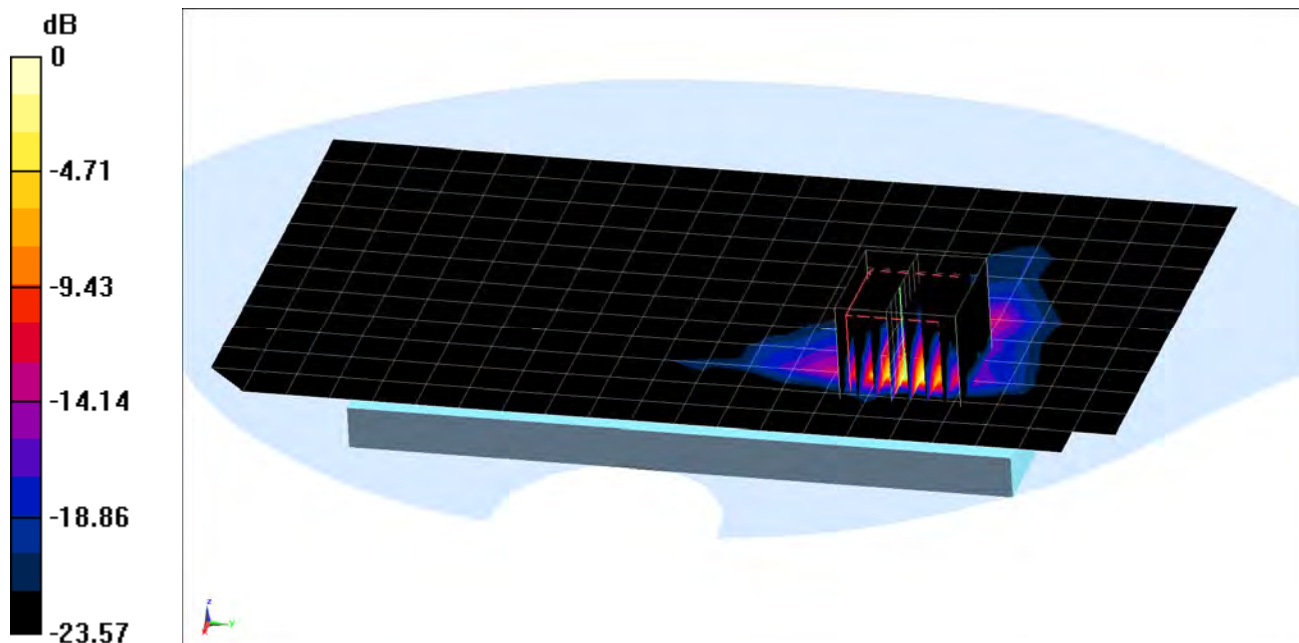
Area Scan (13x22x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

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

Reference Value = 15.966 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 6.04 W/kg

SAR(10 g) = 0.217 W/kg



0 dB = 3.15 W/kg = 4.98 dBW/kg

APPENDIX B: SYSTEM VERIFICATION

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 750 Head Medium parameters used (interpolated):

$f = 750 \text{ MHz}$; $\sigma = 0.92 \text{ S/m}$; $\epsilon_r = 42.001$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 07-31-2014; Ambient Temp: 24.5°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3287; ConvF(6.52, 6.52, 6.52); Calibrated: 11/20/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

750 MHz System Verification

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

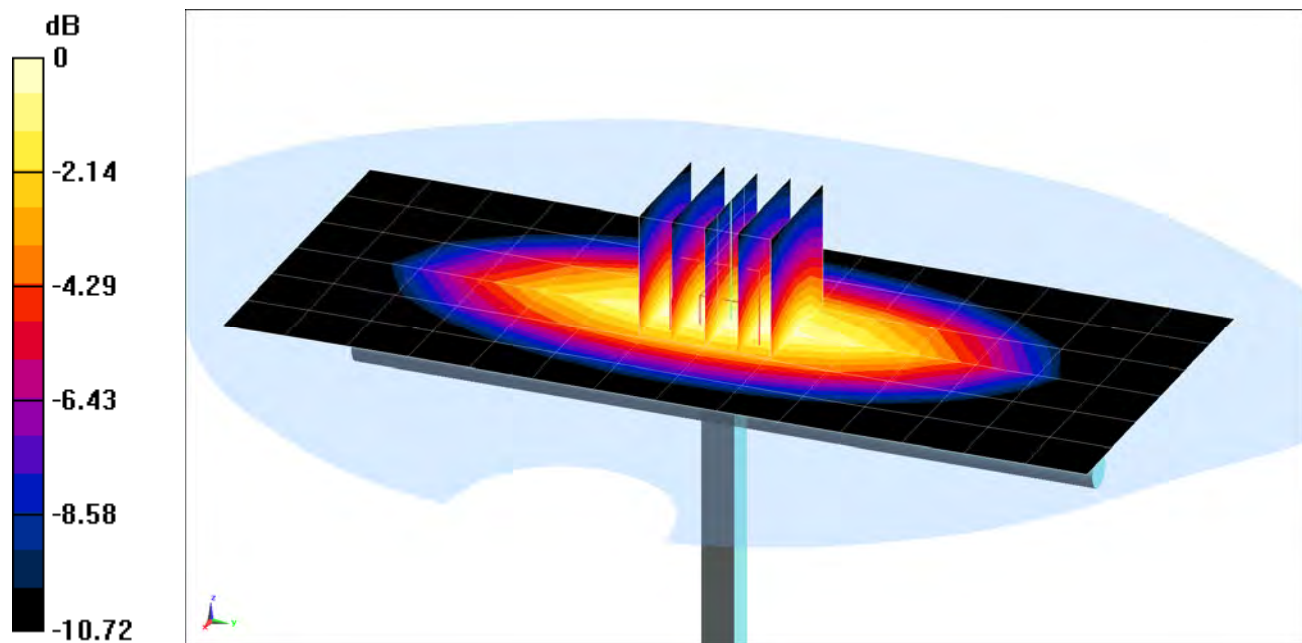
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.26 W/kg

SAR(1 g) = 0.837 W/kg

Deviation = 0.00%



0 dB = 0.983 W/kg = -0.07 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 835 Head Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 0.928 \text{ S/m}$; $\epsilon_r = 42.507$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 07-28-2014; Ambient Temp: 23.0°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3319; ConvF(6.27, 6.27, 6.27); Calibrated: 4/17/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/11/2014

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

835 MHz System Verification

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

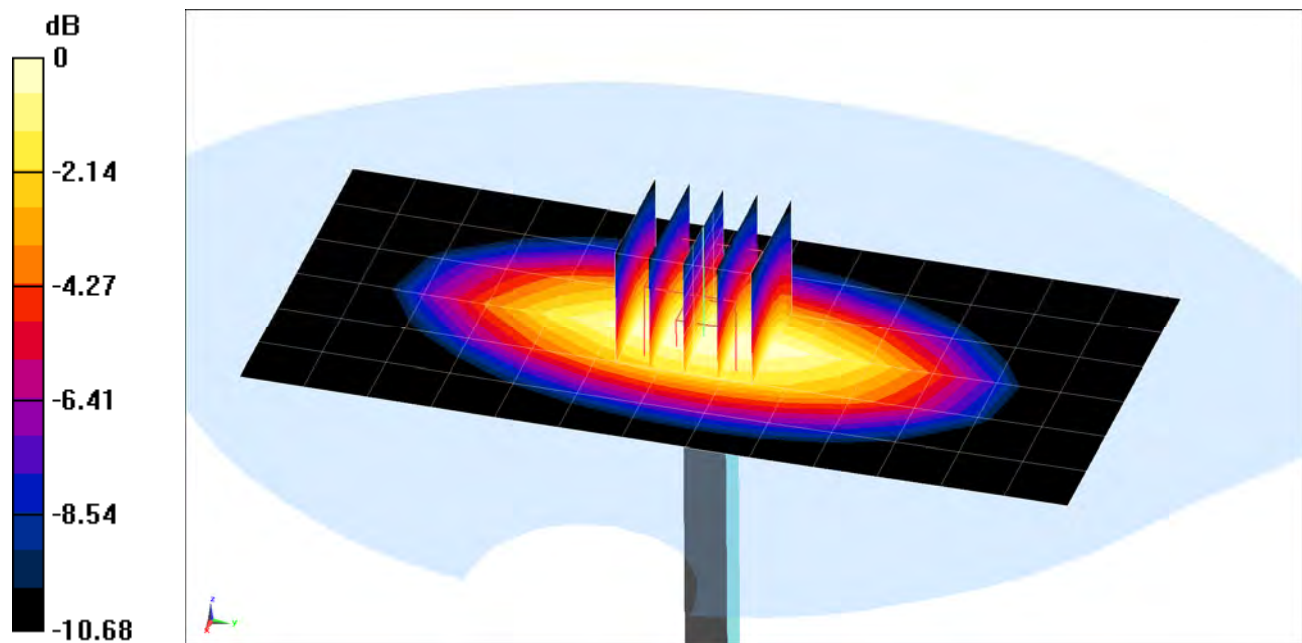
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.44 W/kg

SAR(1 g) = 0.966 W/kg

Deviation = 4.77%



0 dB = 1.13 W/kg = 0.53 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 1900 Head Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.397 \text{ S/m}$; $\epsilon_r = 39.001$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-29-2014; Ambient Temp: 23.4°C; Tissue Temp: 22.9°C

Probe: ES3DV3 - SN3209; ConvF(5.13, 5.13, 5.13); Calibrated: 3/19/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/17/2014

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

1900 MHz System Verification

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

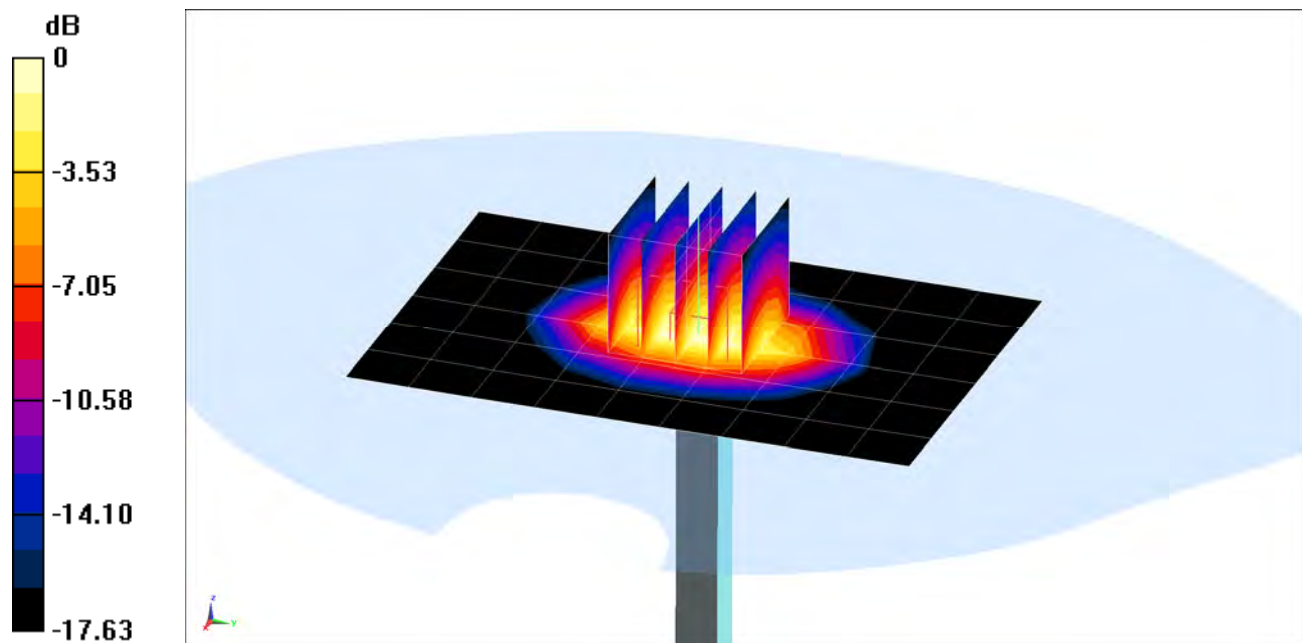
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 7.38 W/kg

SAR(1 g) = 4.03 W/kg

Deviation = 0.50%



0 dB = 5.12 W/kg = 7.09 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 2450 Head Medium parameters used:

$f = 2450 \text{ MHz}$; $\sigma = 1.743 \text{ S/m}$; $\epsilon_r = 40.91$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-04-2014; Ambient Temp: 23.6°C; Tissue Temp: 23.7°C

Probe: ES3DV3 - SN3319; ConvF(4.45, 4.45, 4.45); Calibrated: 4/17/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/11/2014

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

2450 MHz System Verification

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

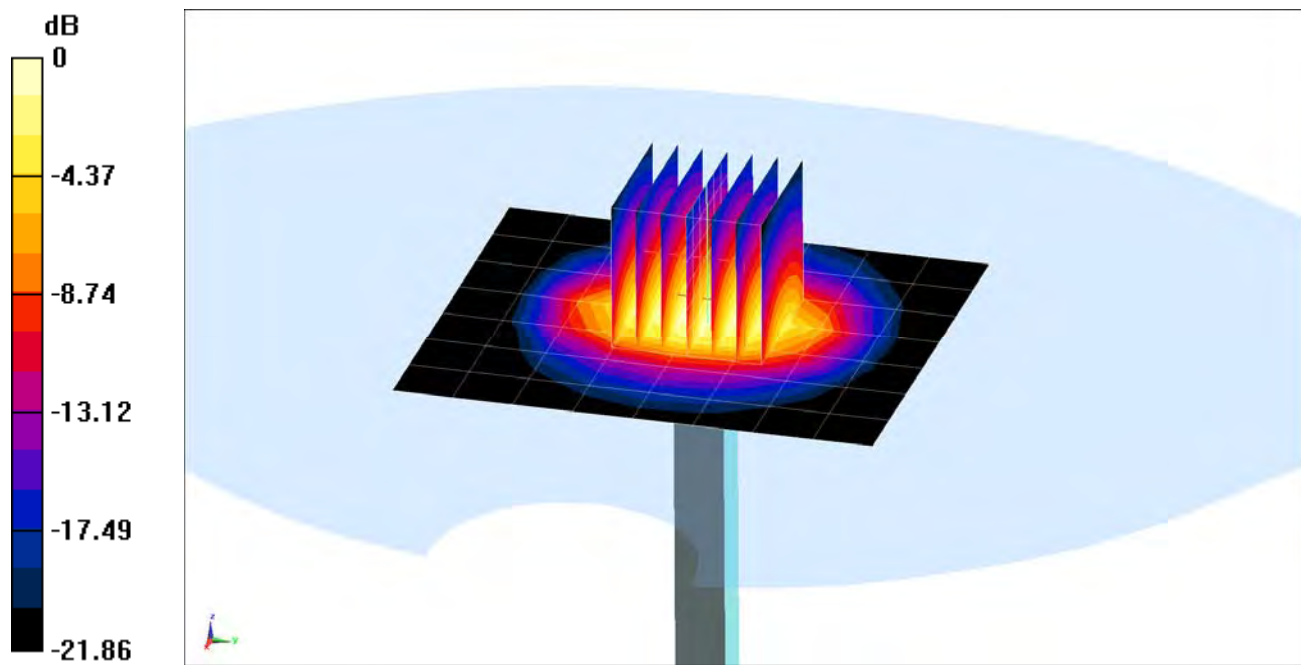
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 10.4 W/kg

SAR(1 g) = 5.16 W/kg

Deviation = -0.39%



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

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 5 GHz Head Medium parameters used:

$f = 5200 \text{ MHz}$; $\sigma = 4.565 \text{ S/m}$; $\epsilon_r = 37.099$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2014; Ambient Temp: 24.5°C; Tissue Temp: 22.9°C

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

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

5200 MHz System Verification

Area Scan (8x7x1): Measurement grid: dx=10mm, dy=10mm

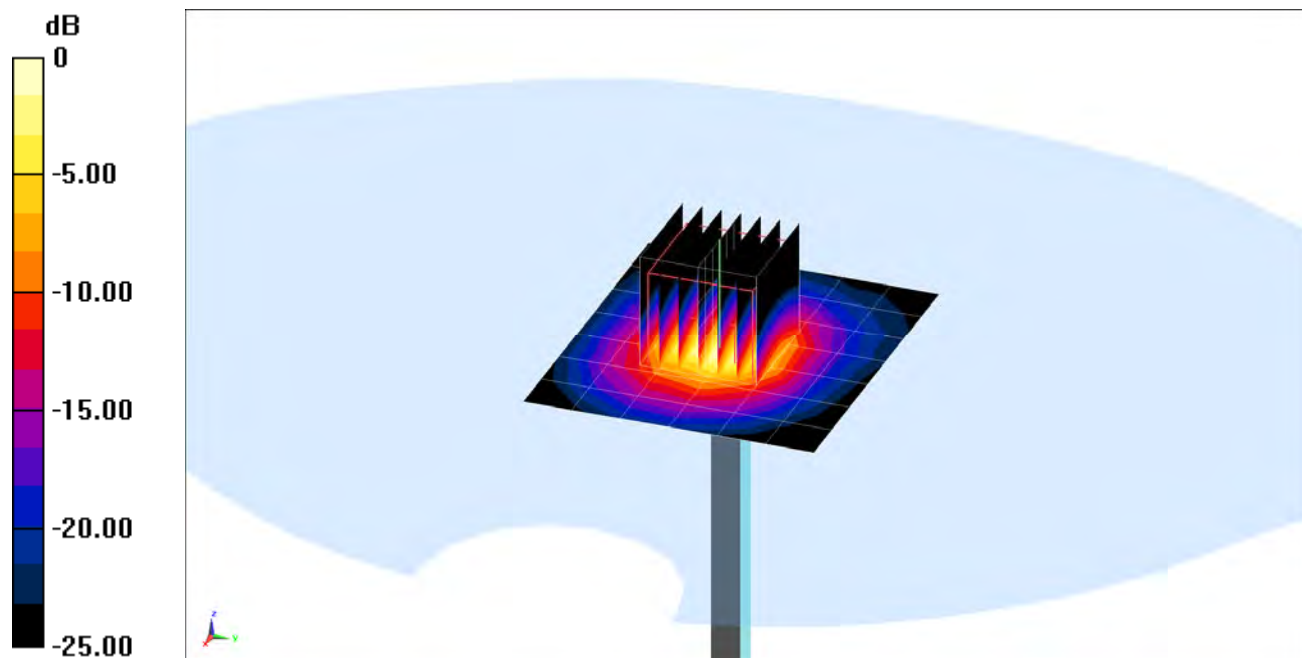
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio = 1.4

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 32.0 W/kg

SAR(1 g) = 7.48 W/kg

Deviation = -4.10%



PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 5 GHz Head Medium parameters used:

$f = 5300 \text{ MHz}$; $\sigma = 4.664 \text{ S/m}$; $\epsilon_r = 36.989$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2014; Ambient Temp: 24.9°C; Tissue Temp: 22.9°C

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

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

5300 MHz System Verification

Area Scan (7x8x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

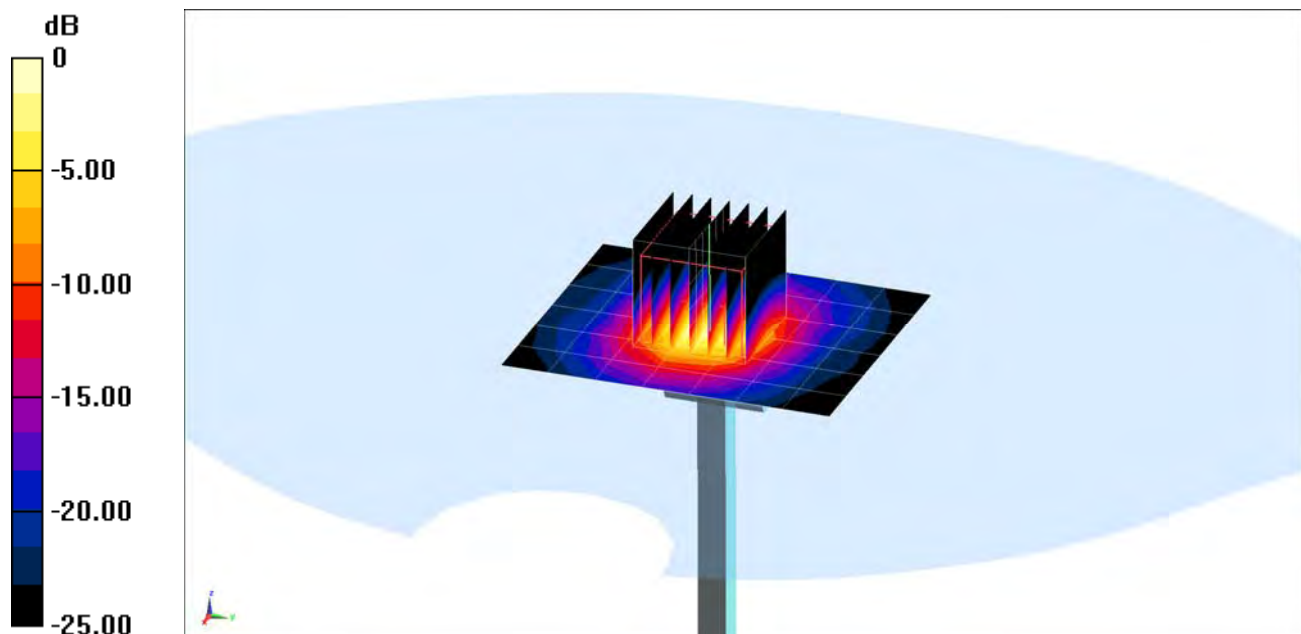
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio = 1.4

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 35.7 W/kg

SAR(1 g) = 8.09 W/kg

Deviation = -2.53%



0 dB = 20.9 W/kg = 13.20 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5500 MHz; Type: D5GHzV2; Serial: 1057

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

Medium: 5 GHz Head Medium parameters used:

$f = 5500 \text{ MHz}$; $\sigma = 4.88 \text{ S/m}$; $\epsilon_r = 36.728$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2014; Ambient Temp: 24.8°C; Tissue Temp: 23.0°C

Probe: EX3DV4 - SN3914; ConvF(4.55, 4.55, 4.55); Calibrated: 10/23/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

5500 MHz System Verification

Area Scan (8x7x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

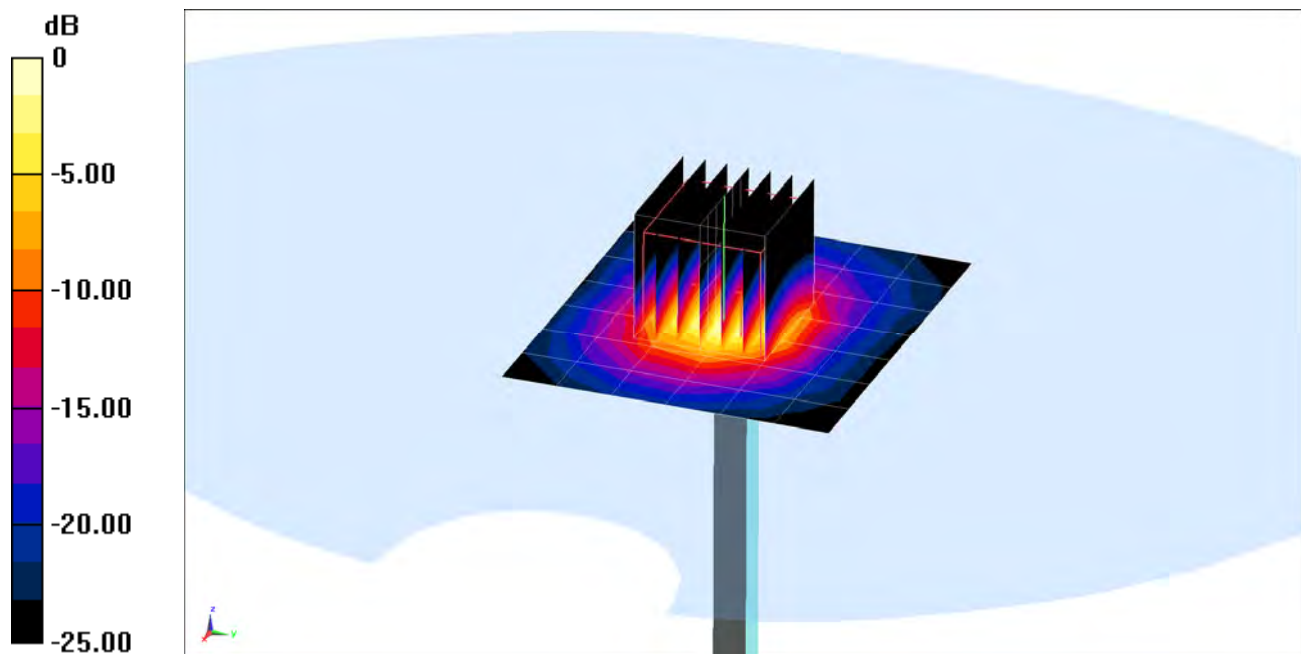
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio = 1.4

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 36.7 W/kg

SAR(1 g) = 8.32 W/kg

Deviation = -1.30%



0 dB = 21.5 W/kg = 13.32 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 5 GHz Head Medium parameters used:

$f = 5600 \text{ MHz}$; $\sigma = 4.986 \text{ S/m}$; $\epsilon_r = 36.583$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2014; Ambient Temp: 24.8°C; Tissue Temp: 23.0°C

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

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

5600 MHz System Verification

Area Scan (8x7x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

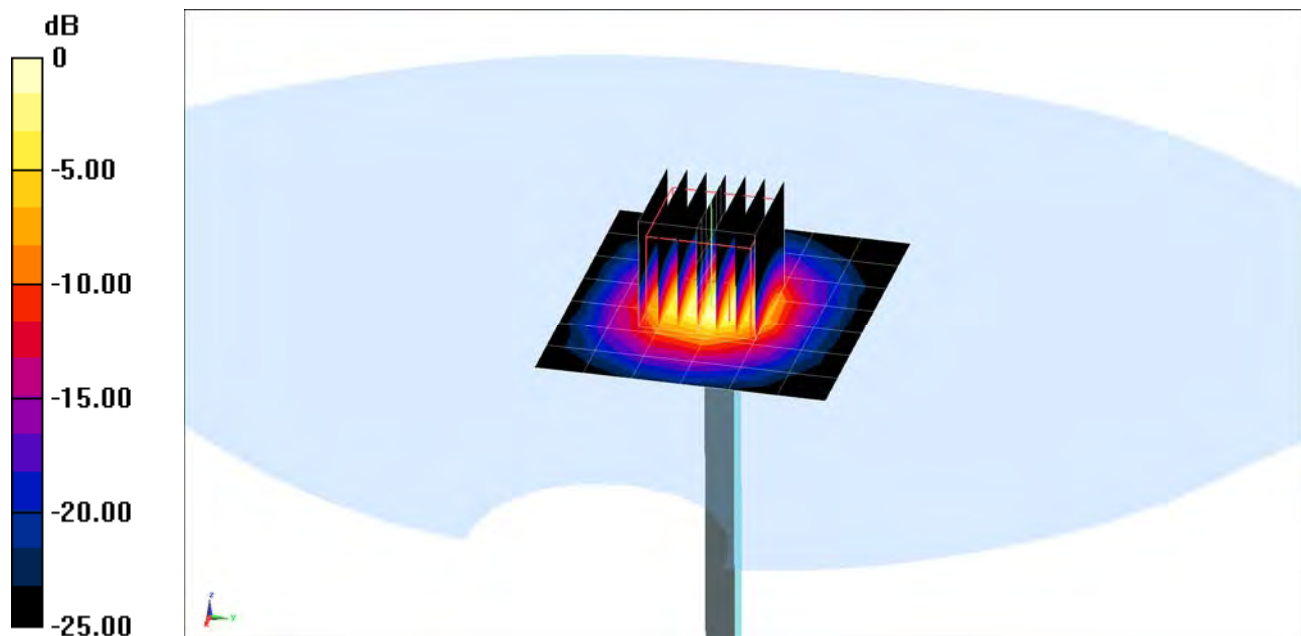
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio = 1.4

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 35.8 W/kg

SAR(1 g) = 7.95 W/kg

Deviation = -4.79%



0 dB = 20.7 W/kg = 13.16 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 5 GHz Head Medium parameters used:

$f = 5800 \text{ MHz}$; $\sigma = 5.188 \text{ S/m}$; $\epsilon_r = 36.346$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2014; Ambient Temp: 24.7°C; Tissue Temp: 23.0°C

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

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

5800 MHz System Verification

Area Scan (8x7x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

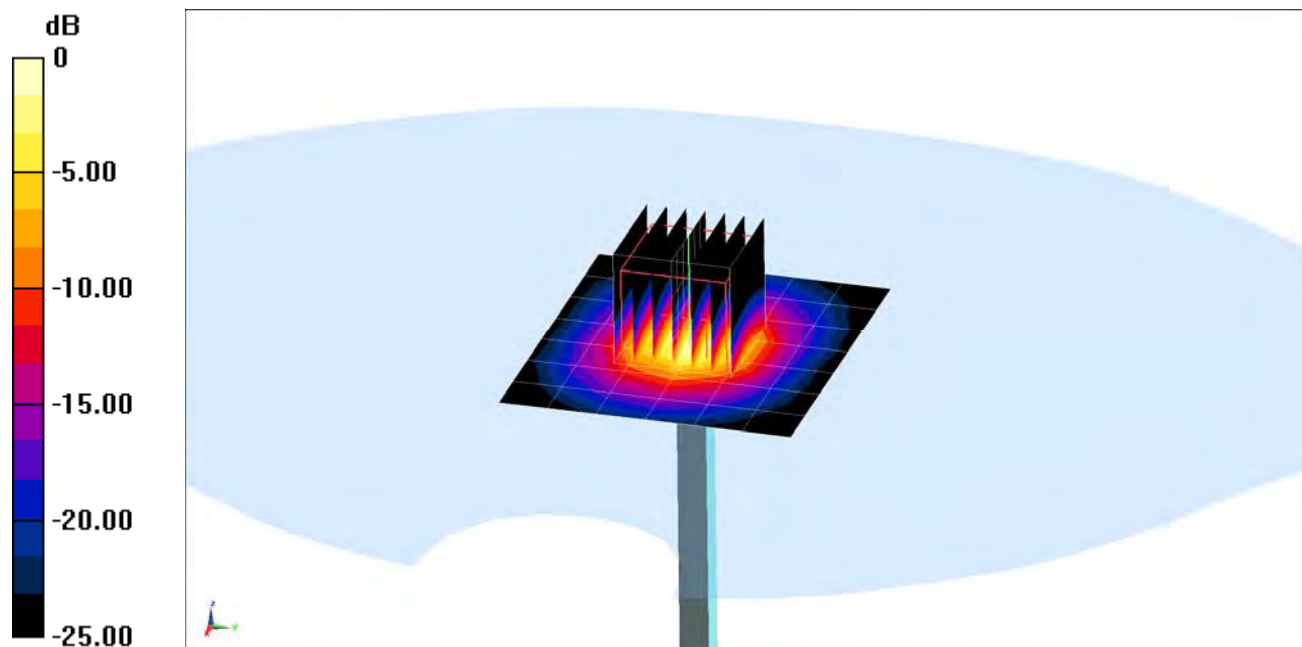
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio = 1.4

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 36.7 W/kg

SAR(1 g) = 7.67 W/kg

Deviation = -3.28%



0 dB = 20.4 W/kg = 13.10 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 750 Body Medium parameters used (interpolated):

$f = 750 \text{ MHz}$; $\sigma = 0.964 \text{ S/m}$; $\epsilon_r = 53.425$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 07-30-2014; Ambient Temp: 24.1°C; Tissue Temp: 23.6°C

Probe: ES3DV3 - SN3287; ConvF(6.09, 6.09, 6.09); Calibrated: 11/20/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

750 MHz System Verification

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

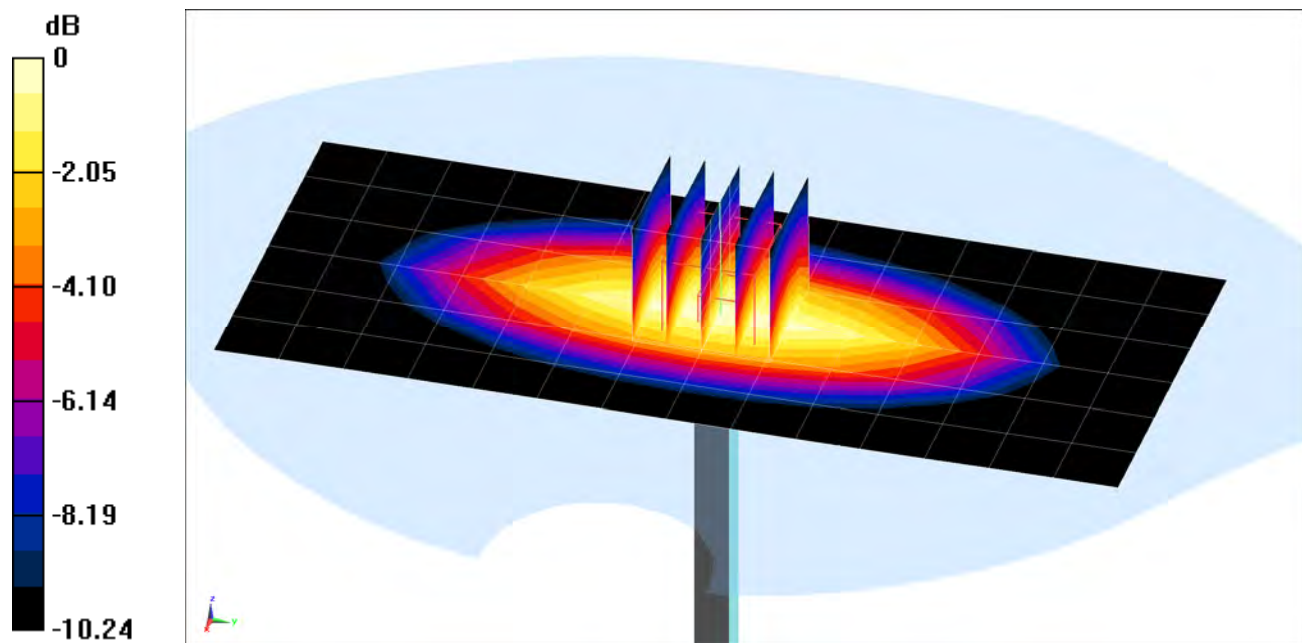
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.30 W/kg

SAR(1 g) = 0.887 W/kg

Deviation = 1.14%



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

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 835 Body Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 1 \text{ S/m}$; $\epsilon_r = 54.176$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 07-28-2014; Ambient Temp: 24.4°C; Tissue Temp: 23.0°C

Probe: ES3DV2 - SN3022; ConvF(5.91, 5.91, 5.91); Calibrated: 8/22/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

835 MHz System Verification

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

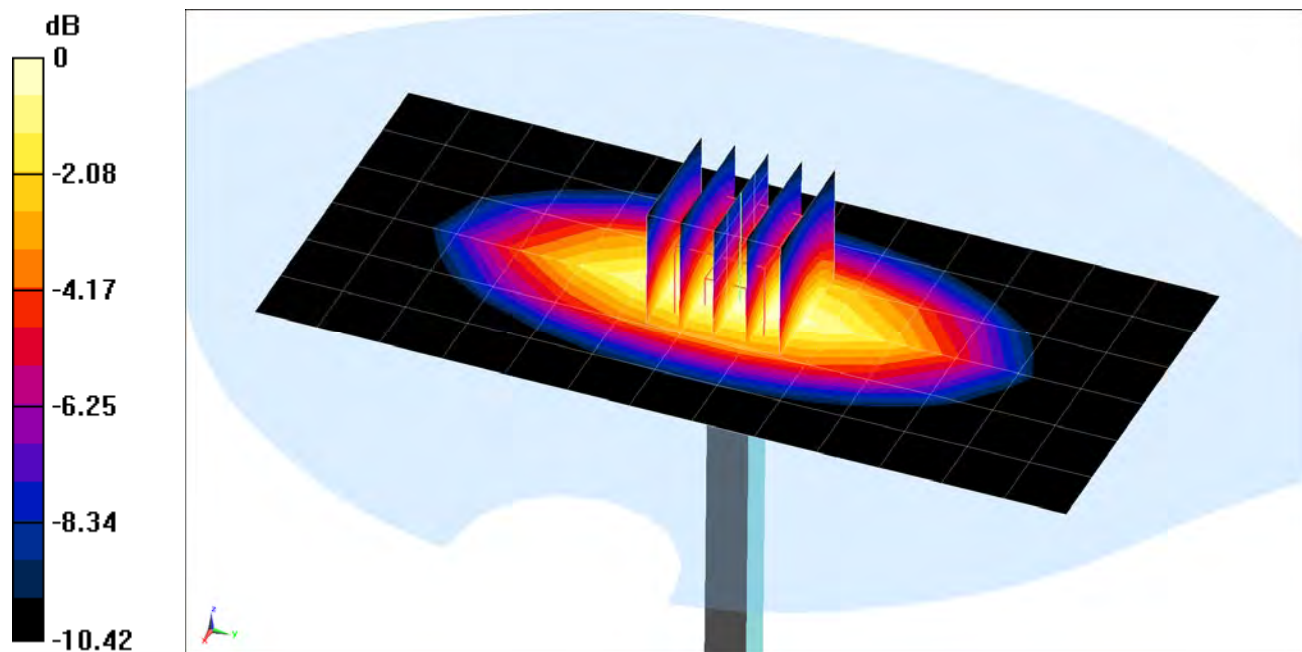
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.45 W/kg

SAR(1 g) = 1 W/kg

Deviation = 7.07%



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

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.521 \text{ S/m}$; $\epsilon_r = 53.914$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-28-2014; Ambient Temp: 24.3°C; Tissue Temp: 23.2°C

Probe: ES3DV3 - SN3287; ConvF(4.67, 4.67, 4.67); Calibrated: 11/20/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

1900 MHz System Verification

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

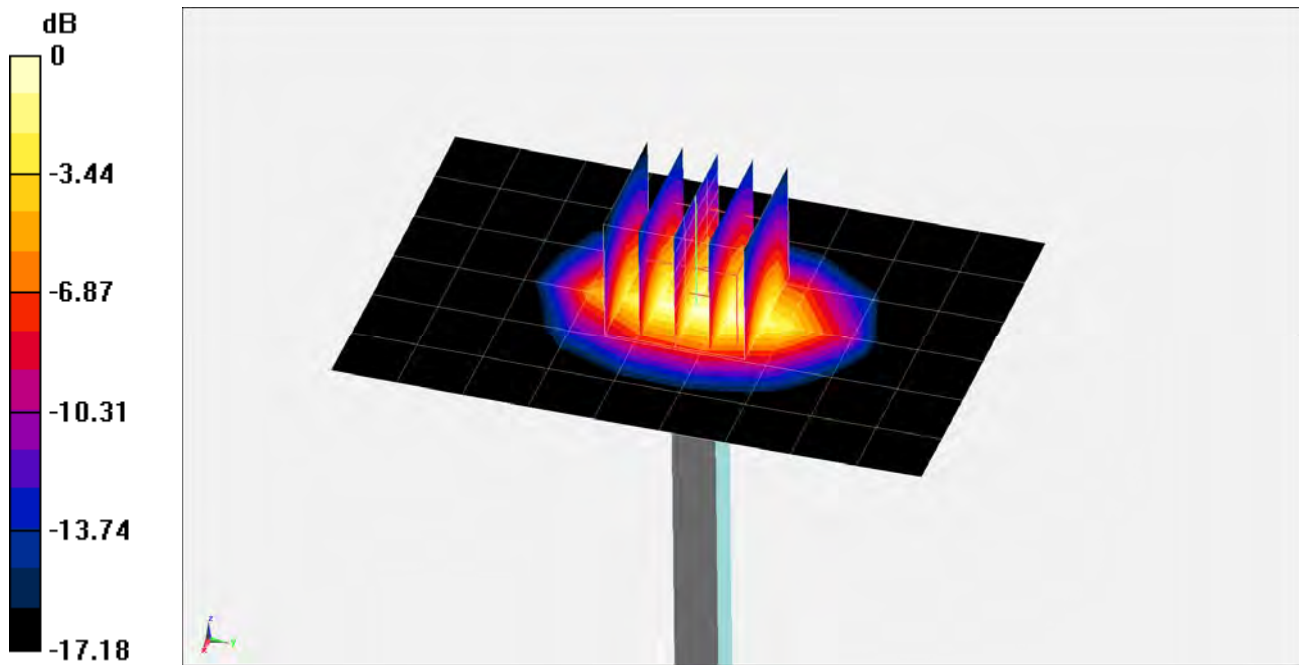
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 7.28 W/kg

SAR(1 g) = 4.16 W/kg

Deviation = 2.46%



0 dB = 5.20 W/kg = 7.16 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 2450 Body Medium parameters used:

$f = 2450 \text{ MHz}$; $\sigma = 1.94 \text{ S/m}$; $\epsilon_r = 53.858$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2014; Ambient Temp: 24.3°C; Tissue Temp: 22.8°C

Probe: ES3DV3 - SN3319; ConvF(4.24, 4.24, 4.24); Calibrated: 4/17/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/11/2014

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

2450 MHz System Verification

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

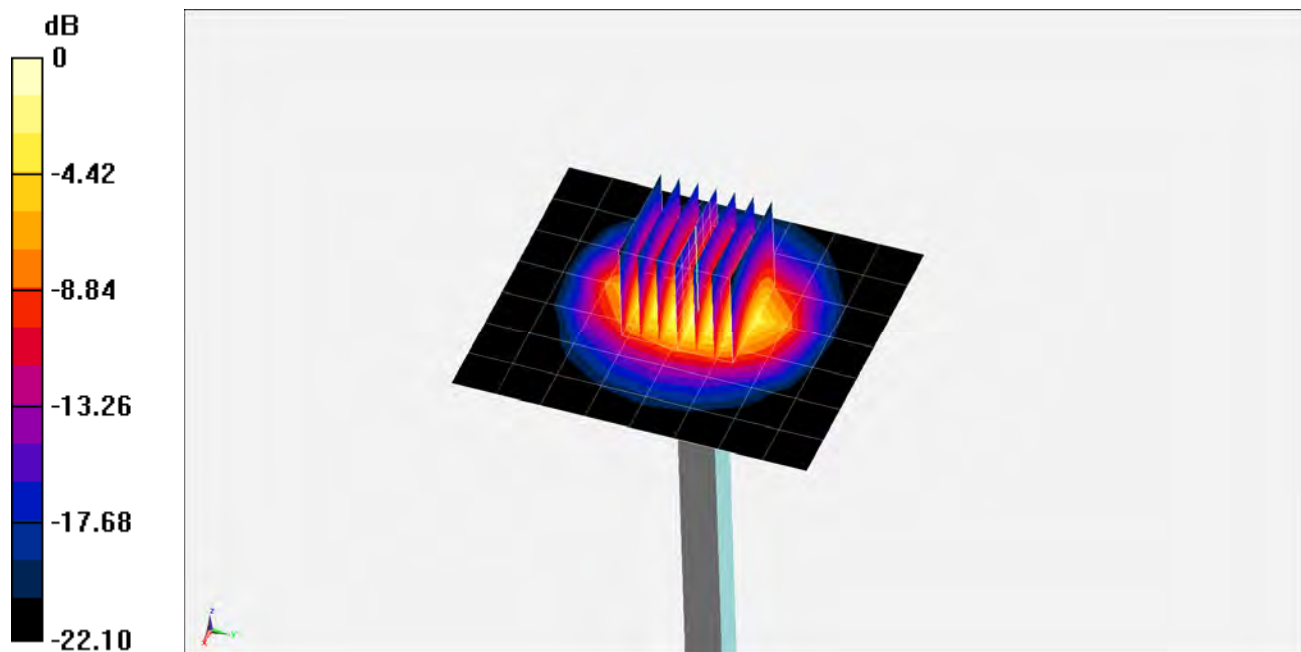
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 10.1 W/kg

SAR(1 g) = 4.8 W/kg

Deviation = -2.83%



0 dB = 6.21 W/kg = 7.93 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 5 GHz Body Medium parameters used:

$f = 5200 \text{ MHz}$; $\sigma = 5.26 \text{ S/m}$; $\epsilon_r = 47.955$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2014; Ambient Temp: 24.1°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN3589; ConvF(4.19, 4.19, 4.19); Calibrated: 1/29/2014;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/17/2014

Phantom: SAM left; Type: QD000P40CD; Serial: TP:1715

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

5200 MHz System Verification

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

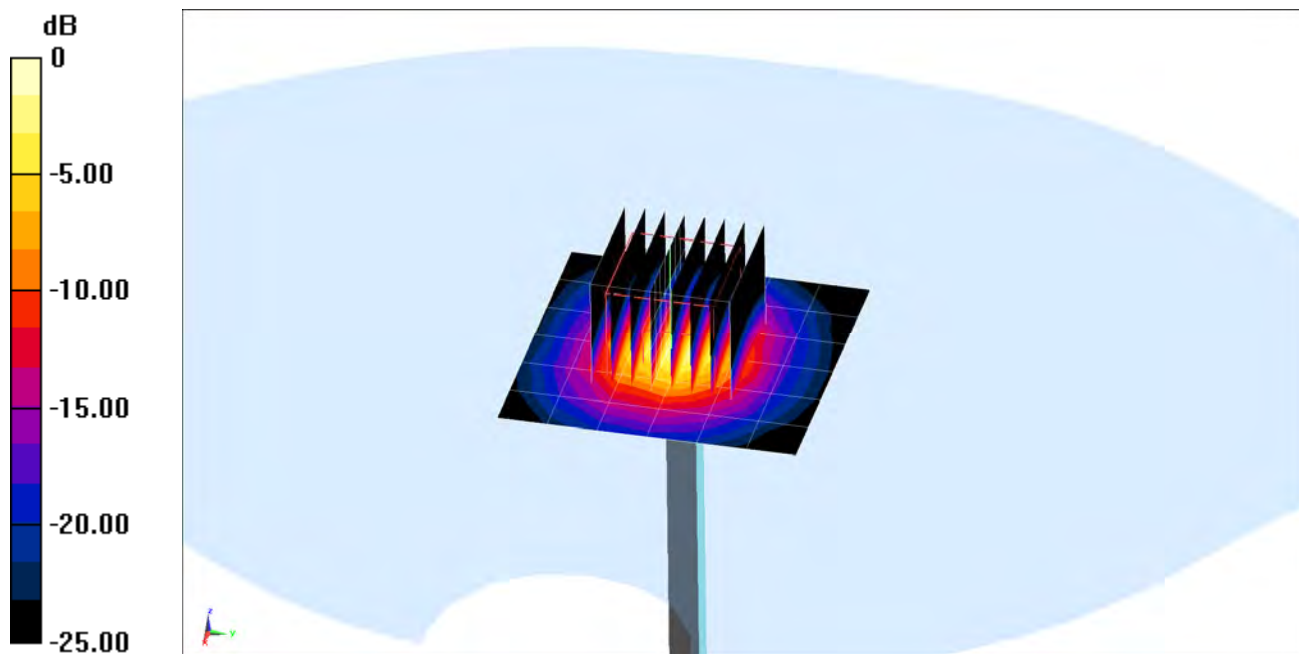
Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio = 1.4

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 33.1 W/kg

SAR(1 g) = 7.77 W/kg

Deviation = 3.19%



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

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 5 GHz Body Medium parameters used:

$f = 5300 \text{ MHz}$; $\sigma = 5.412 \text{ S/m}$; $\epsilon_r = 47.761$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2014; Ambient Temp: 24.0°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN3589; ConvF(3.98, 3.98, 3.98); Calibrated: 1/29/2014;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/17/2014

Phantom: SAM left; Type: QD000P40CD; Serial: TP:1715

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

5300 MHz System Verification

Area Scan (7x8x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

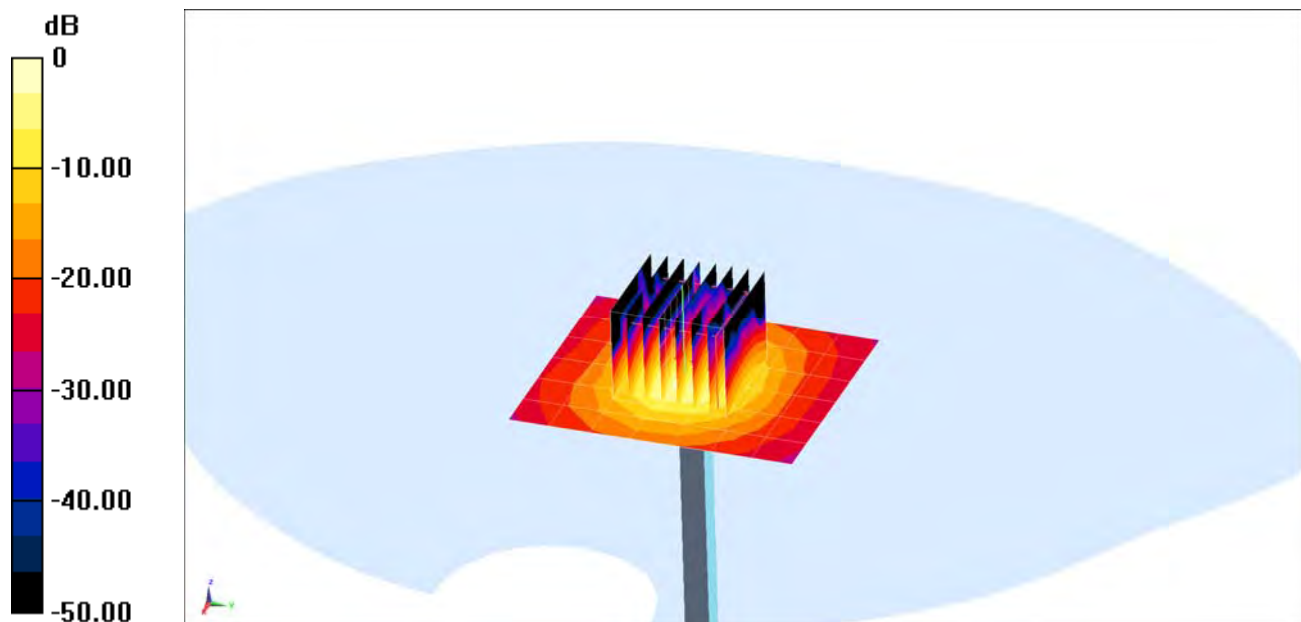
Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio = 1.4

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 34.7 W/kg

SAR(1 g) = 8.13 W/kg

Deviation = 5.04%



0 dB = 15.7 W/kg = 11.96 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5500 MHz; Type: D5GHzV2; Serial: 1057

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

Medium: 5 GHz Body Medium parameters used:

$f = 5500 \text{ MHz}$; $\sigma = 5.727 \text{ S/m}$; $\epsilon_r = 47.243$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2014; Ambient Temp: 24.0°C; Tissue Temp: 22.7°C

Probe: EX3DV4 - SN3589; ConvF(3.76, 3.76, 3.76); Calibrated: 1/29/2014;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/17/2014

Phantom: SAM left; Type: QD000P40CD; Serial: TP:1715

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

5500 MHz System Verification

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

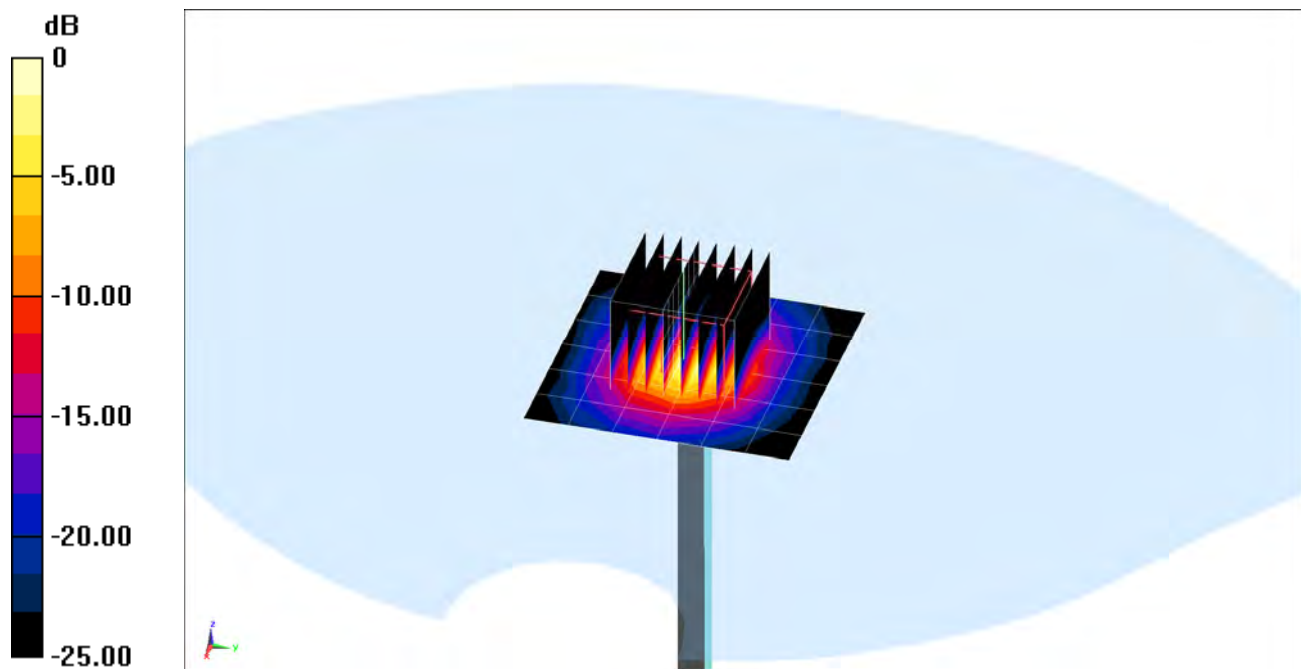
Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio = 1.4

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 36.5 W/kg

SAR(1 g) = 8.07 W/kg

Deviation = 2.02%



PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 5 GHz Body Medium parameters used:

$f = 5600 \text{ MHz}$; $\sigma = 5.86 \text{ S/m}$; $\epsilon_r = 47.011$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2014; Ambient Temp: 24.0°C; Tissue Temp: 22.8°C

Probe: EX3DV4 - SN3589; ConvF(3.81, 3.81, 3.81); Calibrated: 1/29/2014;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/17/2014

Phantom: SAM left; Type: QD000P40CD; Serial: TP:1715

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

5600 MHz System Verification

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

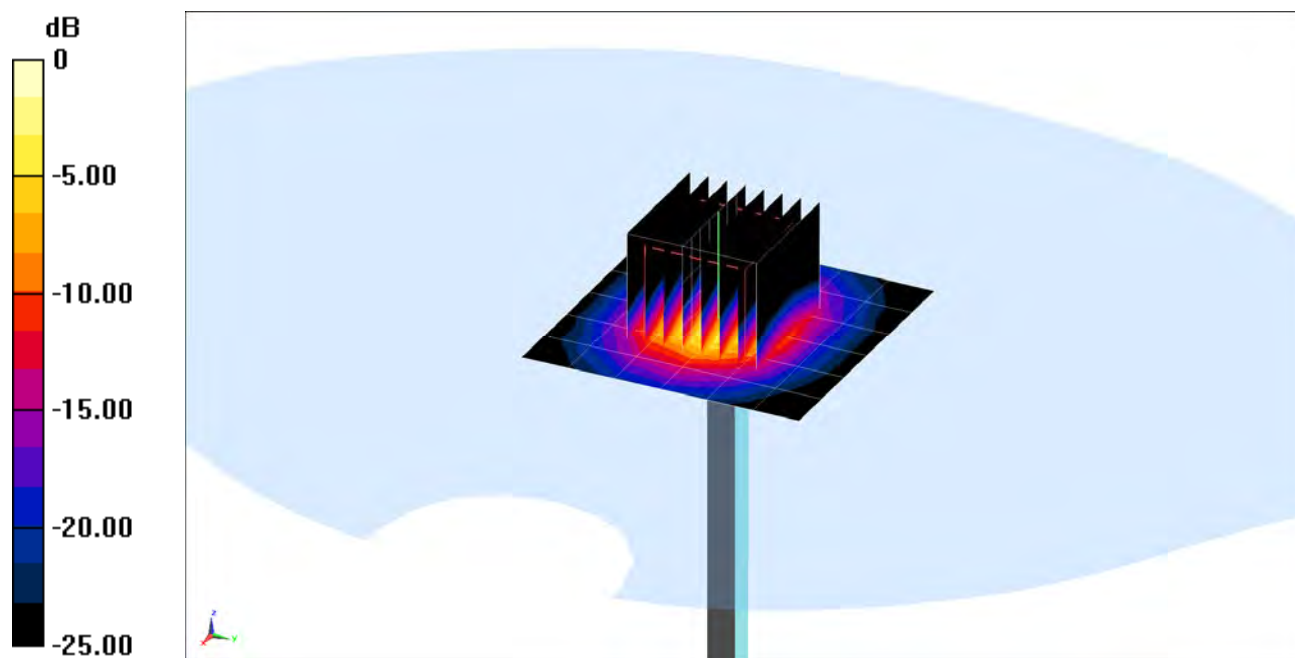
Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio = 1.4

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 39.6 W/kg

SAR(1 g) = 7.9 W/kg

Deviation = -1.50%



0 dB = 19.5 W/kg = 12.90 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 5 GHz Body Medium parameters used:

$f = 5800 \text{ MHz}$; $\sigma = 6.162 \text{ S/m}$; $\epsilon_r = 46.575$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2014; Ambient Temp: 24.1°C; Tissue Temp: 22.7°C

Probe: EX3DV4 - SN3589; ConvF(3.97, 3.97, 3.97); Calibrated: 1/29/2014;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/17/2014

Phantom: SAM left; Type: QD000P40CD; Serial: TP:1715

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

5800 MHz System Verification

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

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

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 34.2 W/kg

SAR(1 g) = 7.01 W/kg

Deviation = -5.65%



0 dB = 17.6 W/kg = 12.46 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 5 GHz Body Medium parameters used:

$f = 5200 \text{ MHz}$; $\sigma = 5.175 \text{ S/m}$; $\epsilon_r = 47.948$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-04-2014; Ambient Temp: 23.9°C; Tissue Temp: 23.3°C

Probe: EX3DV4 - SN3589; ConvF(4.19, 4.19, 4.19); Calibrated: 1/29/2014;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/17/2014

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

5200 MHz System Verification

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

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

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 32.1 W/kg

SAR(10 g) = 2.15 W/kg

Deviation = 2.38%



0 dB = 18.2 W/kg = 12.60 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 5 GHz Body Medium parameters used:

$f = 5300 \text{ MHz}$; $\sigma = 5.317 \text{ S/m}$; $\epsilon_r = 47.776$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-04-2014; Ambient Temp: 24.0°C; Tissue Temp: 23.3°C

Probe: EX3DV4 - SN3589; ConvF(3.98, 3.98, 3.98); Calibrated: 1/29/2014;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/17/2014

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

5300 MHz System Verification

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

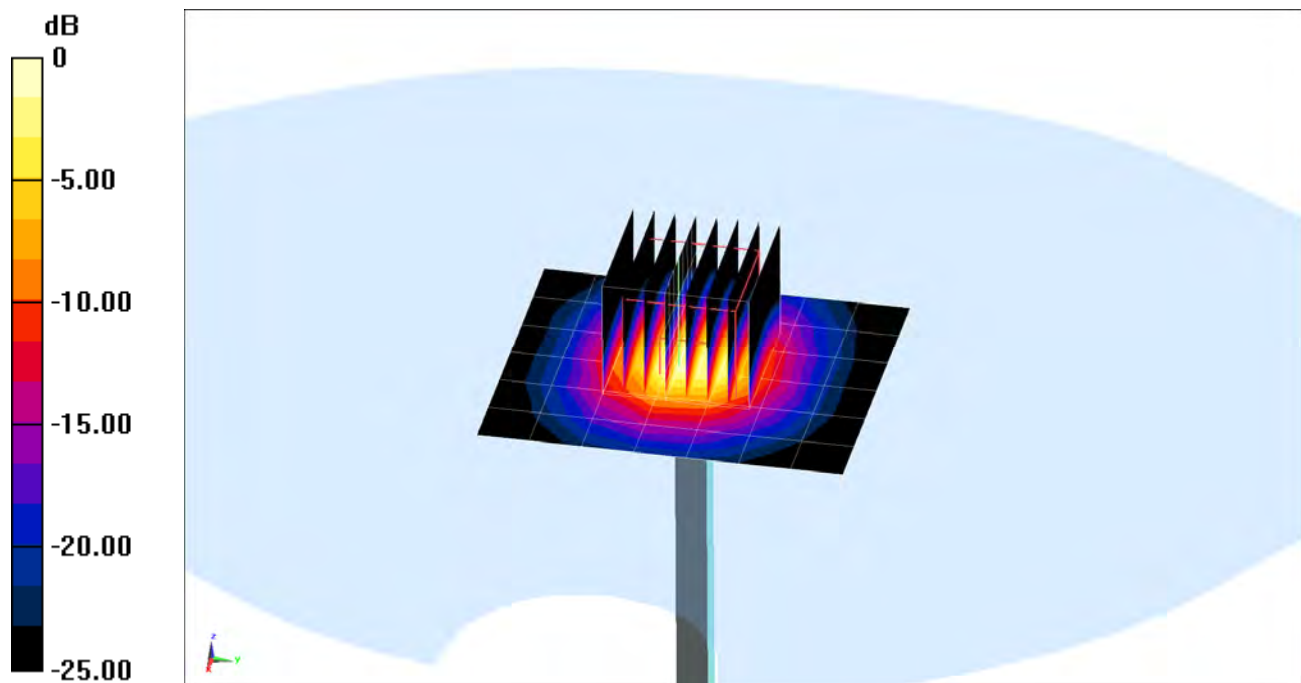
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio = 1.4

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 34.2 W/kg

SAR(10 g) = 2.29 W/kg

Deviation = 6.51%



0 dB = 15.7 W/kg = 11.96 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5500 MHz; Type: D5GHzV2; Serial: 1057

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

Medium: 5 GHz Body Medium parameters used:

$f = 5500 \text{ MHz}$; $\sigma = 5.624 \text{ S/m}$; $\epsilon_r = 47.265$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-04-2014; Ambient Temp: 24.0°C; Tissue Temp: 23.3°C

Probe: EX3DV4 - SN3589; ConvF(3.76, 3.76, 3.76); Calibrated: 1/29/2014;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/17/2014

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

5500 MHz System Verification

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

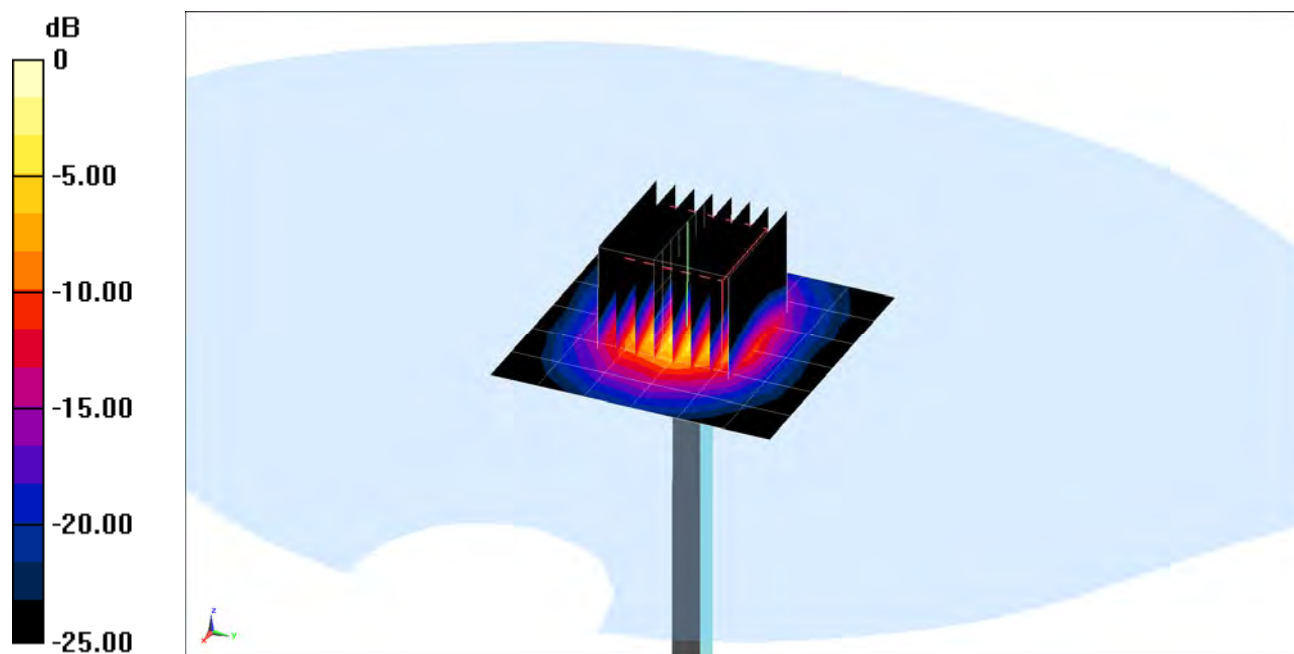
Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio = 1.4

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 37.3 W/kg

SAR(10 g) = 2.32 W/kg

Deviation = 5.45%



0 dB = 20.6 W/kg = 13.14 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 5 GHz Body Medium parameters used:

$f = 5600 \text{ MHz}$; $\sigma = 5.772 \text{ S/m}$; $\epsilon_r = 47.041$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-04-2014; Ambient Temp: 24.0°C; Tissue Temp: 23.3°C

Probe: EX3DV4 - SN3589; ConvF(3.81, 3.81, 3.81); Calibrated: 1/29/2014;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/17/2014

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

5600 MHz System Verification

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

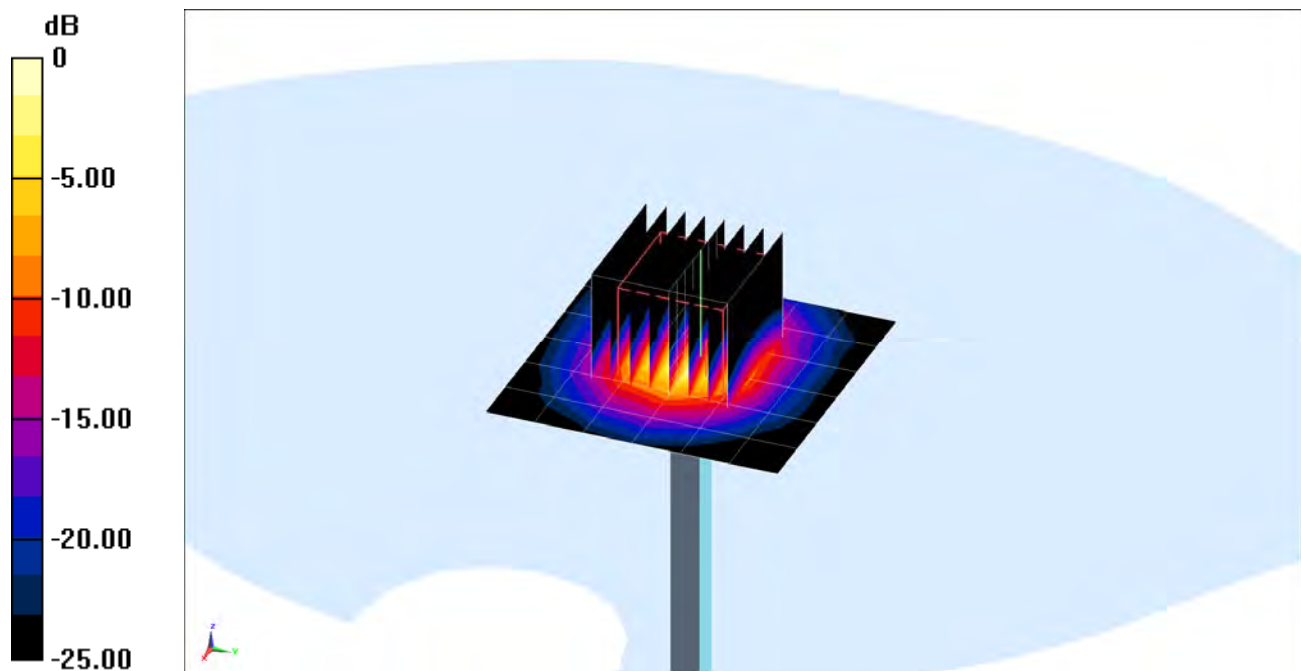
Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio = 1.4

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 38.5 W/kg

SAR(10 g) = 2.14 W/kg

Deviation = -3.60%



0 dB = 19.2 W/kg = 12.83 dBW/kg

APPENDIX C: PROBE CALIBRATION



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

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D750V3-1003_Jan14**

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 20, 2014**

CC
21/14 ✓

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

Calibrated by: **Israe El-Naouq** **Laboratory Technician**

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

Signature

Israe El-Naouq
Katja Pokovic

Issued: January 21, 2014

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



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

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

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	40.8 $\pm$ 6 %	0.92 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	2.16 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.37 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	1.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.46 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	54.0 $\pm$ 6 %	0.98 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	2.24 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	8.77 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	1.47 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	5.78 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.7 Ω - 0.2 j Ω
Return Loss	- 27.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.5 Ω - 2.6 j Ω
Return Loss	- 31.4 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: 20.01.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

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

Medium parameters used: $f = 750$ MHz; $\sigma = 0.92$ S/m; $\epsilon_r = 40.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.37, 6.37, 6.37); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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

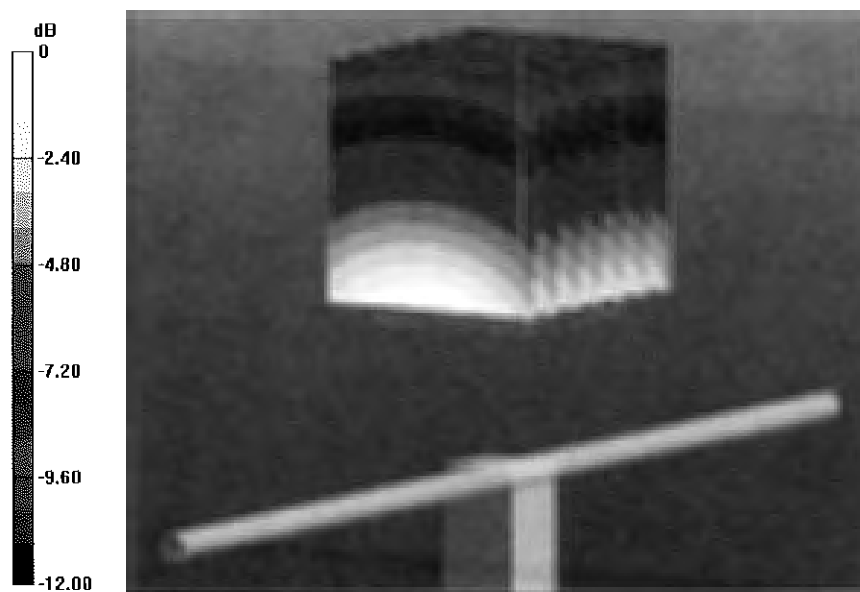
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 53.711 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 3.27 W/kg

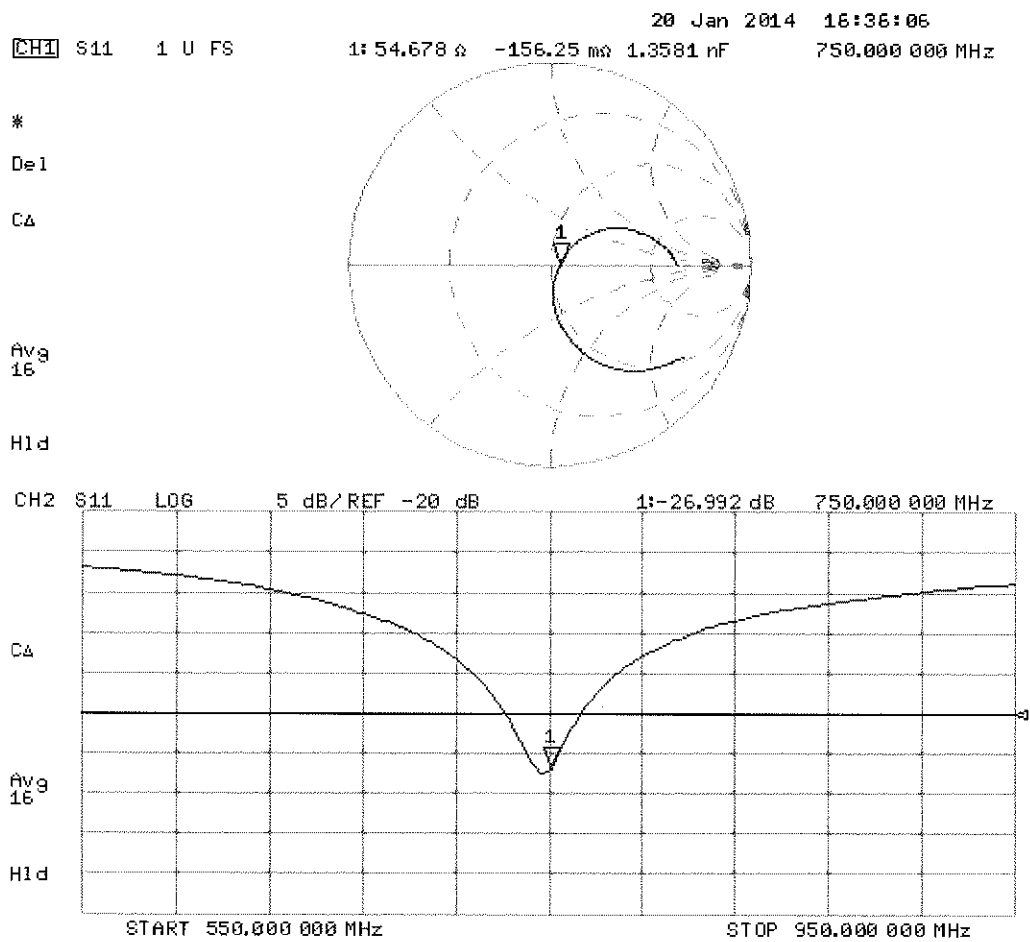
SAR(1 g) = 2.16 W/kg; SAR(10 g) = 1.4 W/kg

Maximum value of SAR (measured) = 2.51 W/kg



0 dB = 2.51 W/kg = 4.00 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 20.01.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

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

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.98 \text{ S/m}$; $\epsilon_r = 54$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.13, 6.13, 6.13); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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

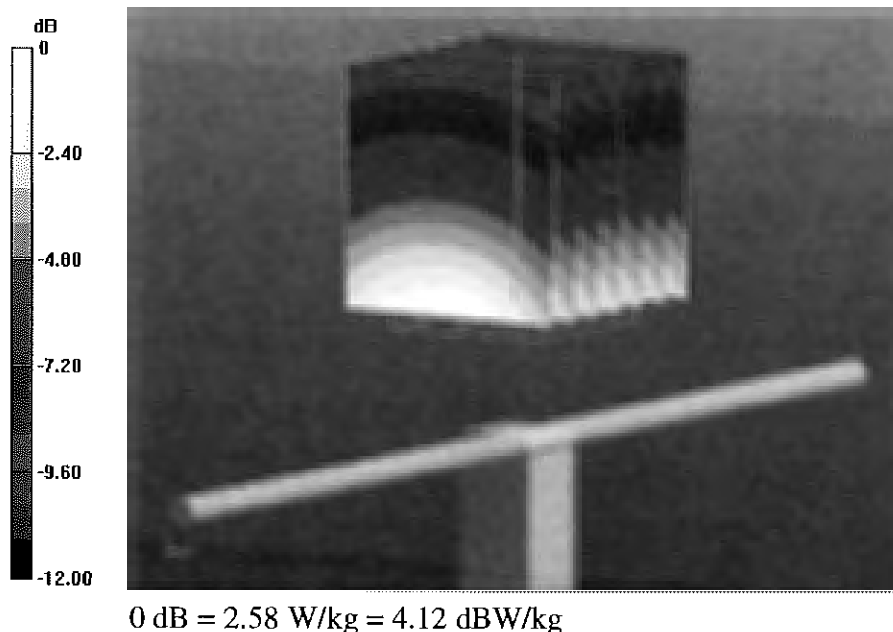
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 53.082 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 3.31 W/kg

SAR(1 g) = 2.24 W/kg; SAR(10 g) = 1.47 W/kg

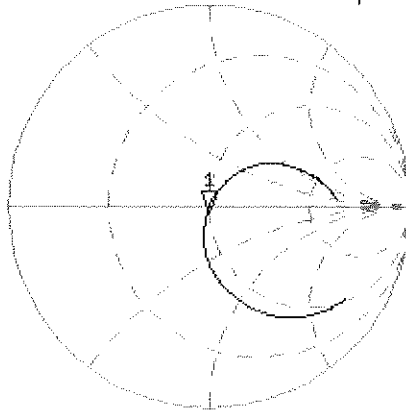
Maximum value of SAR (measured) = 2.58 W/kg



Impedance Measurement Plot for Body TSL

20 Jan 2014 10:20:18
 [CH1] S11 1 U FS 1: 49.459 Ω -2.6367 Ω 80.481 pF 750.000 000 MHz

*
 De1
 CA



Avg
 16

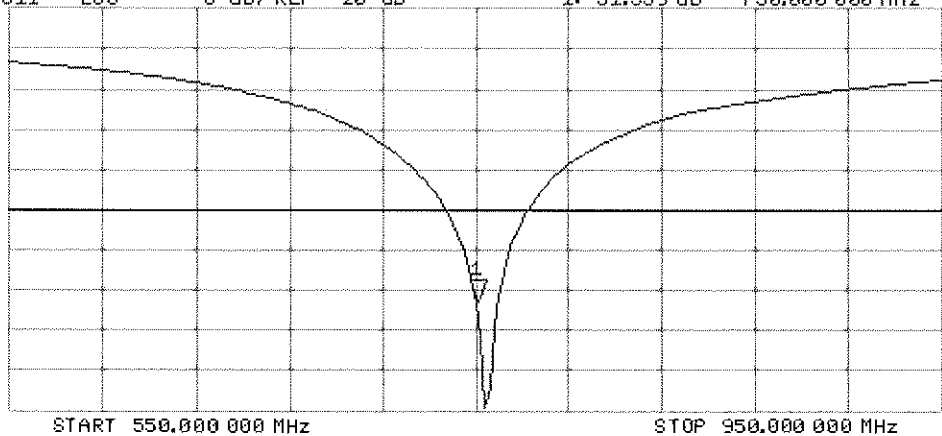
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-31.359 dB 750.000 000 MHz

CA

Avg
 16

H1d





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Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D835V2-4d119_Apr14**

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 4d119**

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

CCV
 4/25/14

Calibration date: **April 07, 2014**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

Calibrated by: **Name** **Leif Klysner** **Function** **Laboratory Technician**

Signature

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

Leif Klysner
Katja Pokovic

Issued: April 9, 2014

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

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.7
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	41.6 $\pm$ 6 %	0.94 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.22 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.53 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.97 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	53.6 $\pm$ 6 %	1.02 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.44 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	9.34 W/kg $\pm$ 17.0 % (k=2)

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

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.2 Ω - 1.6 j Ω
Return Loss	- 34.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.3 Ω - 4.5 j Ω
Return Loss	- 24.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.386 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	June 29, 2010

DASY5 Validation Report for Head TSL

Date: 07.04.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

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

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.94 \text{ S/m}$; $\epsilon_r = 41.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.22, 6.22, 6.22); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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

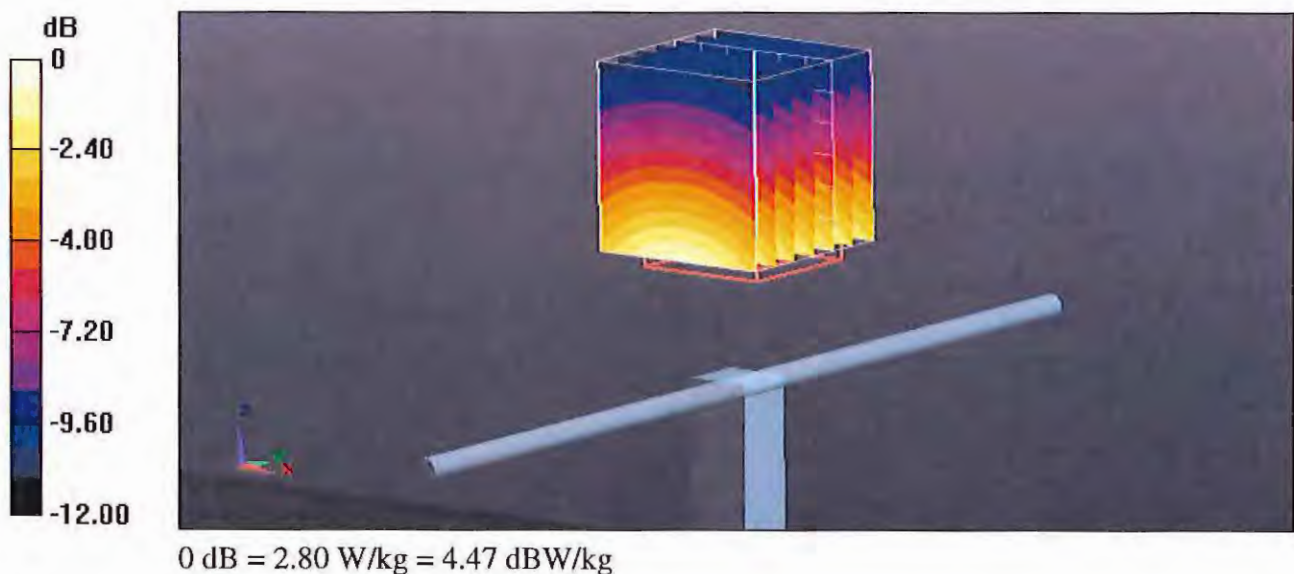
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 56.289 V/m; Power Drift = 0.01 dB

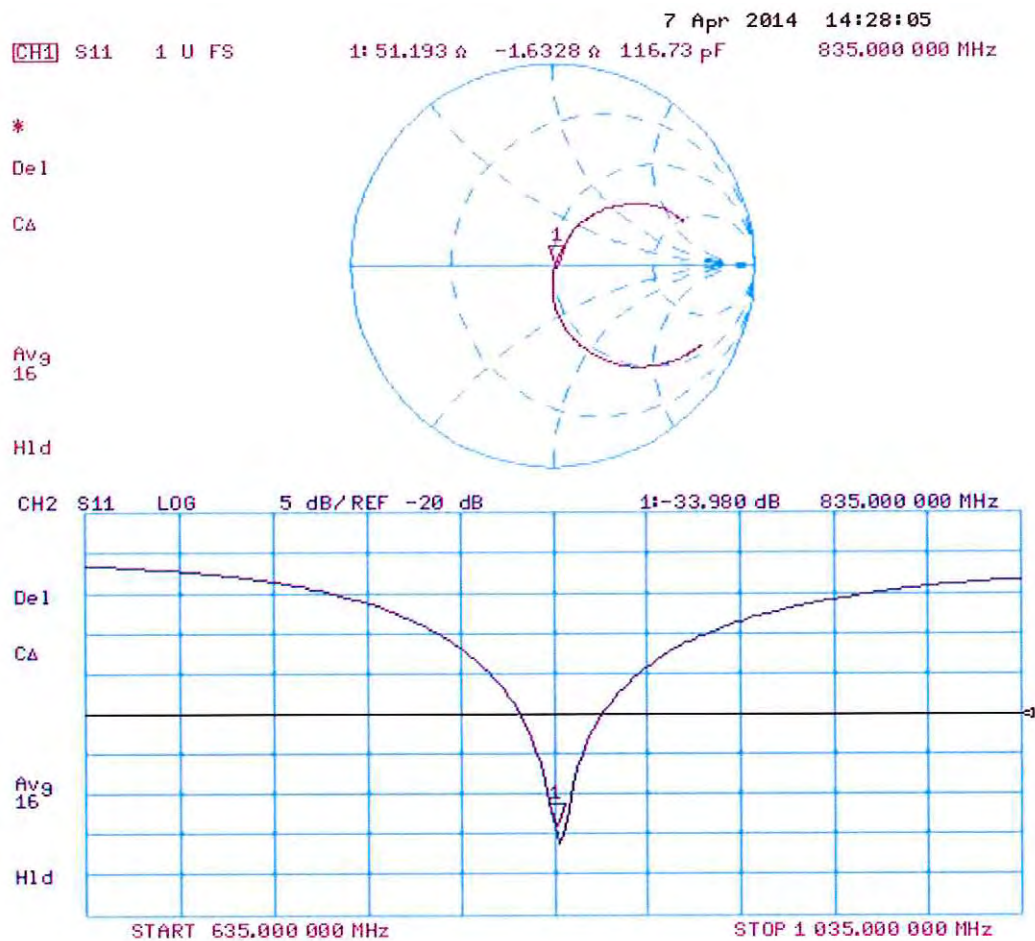
Peak SAR (extrapolated) = 3.59 W/kg

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

Maximum value of SAR (measured) = 2.80 W/kg



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 07.04.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

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

Medium parameters used: $f = 835$ MHz; $\sigma = 1.02$ S/m; $\epsilon_r = 53.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.09, 6.09, 6.09); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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

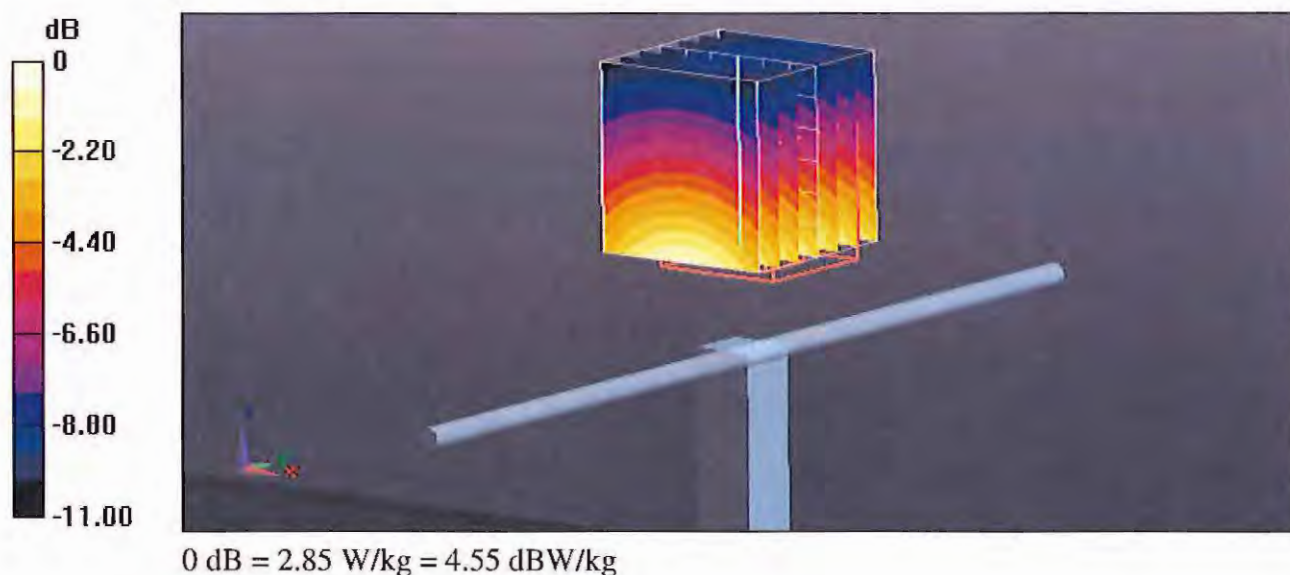
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54.594 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.61 W/kg

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

Maximum value of SAR (measured) = 2.85 W/kg



Impedance Measurement Plot for Body TSL

