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SAR EVALUATION REPORT

Applicant Name:
Samsung Electronics Co., Ltd.
416 Maetan 3-Dong, Yeongtong-gu
Suwon-si, Gyeonggi-do
443-742, Republic of Korea

Date of Testing:
11/19/12 - 11/28/12
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Document Serial No.:
0Y1211151645.A3L

FCC ID: **A3LSPHP600**

APPLICANT: **SAMSUNG ELECTRONICS CO., LTD.**

DUT Type: Portable Tablet Computer
Application Type: Certification
FCC Rule Part(s): CFR §2.1093
Model(s): SPH-P600

Equipment Class	Band & Mode	Tx Frequency	Measured Conducted Power [dBm]	SAR 1 gm Body (W/kg)
PCB	Cell. CDMA - FCC Rule Part 90S	817.90 - 823.10 MHz	24.49	0.58
PCB	Cell. CDMA - FCC Rule Part 22H	824.70 - 848.31 MHz	24.54	0.64
PCB	PCS CDMA - FCC Rule Part 24E	1851.25 - 1908.75 MHz	24.65	0.78
PCB	GPRS/EDGE 850	824.20 - 848.80 MHz	31.54	0.81
PCB	GPRS/EDGE 1900	1850.20 - 1909.80 MHz	28.68	1.10
PCB	UMTS 850	826.40 - 846.60 MHz	23.41	0.38
PCB	UMTS 1900	1852.4 - 1907.6 MHz	23.33	0.91
PCB	LTE Band 25	1852.5 - 1912.5 MHz	23.75	1.04
DTS	2.4 GHz WLAN	2412 - 2462 MHz	12.98	1.09
DTS	5.8 GHz WLAN	5745 - 5825 MHz	13.19	0.89
UNII	5.2 GHz WLAN	5180 - 5240 MHz	13.22	0.68
UNII	5.3 GHz WLAN	5260 - 5320 MHz	13.07	0.79
UNII	5.5 GHz WLAN	5500 - 5700 MHz	13.30	0.78
DSS	Bluetooth	2402 - 2480 MHz	11.49	0.19
Simultaneous SAR per KDB 690783 D01v01r02:				1.60

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

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 1.7 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

ACCREDITED
TESTING LABORATORY
CERTIFICATE #2041.01

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1 DEVICE UNDER TEST

1.1 Device Overview

Equipment Class	Band & Mode	Operating Modes
PCB	Cell. CDMA - FCC Rule Part 90S	Data
PCB	Cell. CDMA - FCC Rule Part 22H	Data
PCB	PCS CDMA - FCC Rule Part 24E	Data
PCB	GPRS/EDGE 850	Data
PCB	GPRS/EDGE 1900	Data
PCB	UMTS 850	Data
PCB	UMTS 1900	Data
PCB	LTE Band 25	Data
DTS	2.4 GHz WLAN	Data
DTS	5.8 GHz WLAN	Data
UNII	5.2 GHz WLAN	Data
UNII	5.3 GHz WLAN	Data
UNII	5.5 GHz WLAN	Data
DSS	Bluetooth	Data

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	Proximity Sensor State		Burst Average GMSK (dBm)		Burst Average 8-PSK (dBm)	
			1 TX Slots	*2 TX Slots*	*1 TX Slots*	*2 TX Slots*
GPRS/EDGE 850	Inactive	Maximum	**33.5**	**32.0**	**27.5**	**27.5**
		Nominal	**33.0**	**31.5**	**27.0**	**27.0**
	Active	Maximum	**27.5**	**26.0**	**21.5**	**20.5**
		Nominal	**27.0**	**25.5**	**21.0**	**20.0**
GPRS/EDGE 1900	Inactive	Maximum	**30.5**	**29.0**	**25.5**	**25.5**
		Nominal	**30.0**	**28.5**	**25.0**	**25.0**
	Active	Maximum	**22.5**	**20.5**	**17.5**	**16.5**
		Nominal	**22.0**	**20.0**	**17.0**	**16.0**

Mode / Band	Proximity Sensor State		Modulated Average		
			3GPP RMC	*3GPP HSDPA*	*3GPP HSUPA*
UMTS Band 5 (850 MHz)	Inactive	Maximum	**23.5**	**23.0**	**22.5**
		Nominal	**23.0**	**22.5**	**22.0**
	Active	Maximum	**18.0**	**17.5**	**17.5**
		Nominal	**17.5**	**17.0**	**17.0**
UMTS Band 2 (1900 MHz)	Inactive	Maximum	**23.5**	**23.0**	**22.5**
		Nominal	**23.0**	**22.5**	**22.0**
	Active	Maximum	**14.5**	**13.5**	**13.5**
		Nominal	**14.0**	**13.0**	**13.0**

Mode / Band	Proximity Sensor State		Modulated Average (dBm)
Cell. CDMA/EVDO - FCC Rule Part 90S	Inactive	Maximum	**25.0**
		Nominal	**24.5**
	Active	Maximum	**18.5**
		Nominal	**18.0**
Cell. CDMA/EVDO - FCC Rule Part 22H	Inactive	Maximum	**25.0**
		Nominal	**24.5**
	Active	Maximum	**18.5**
		Nominal	**18.0**
PCS CDMA/EVDO - FCC Rule Part 24E	Inactive	Maximum	**25.0**
		Nominal	**24.5**
	Active	Maximum	**15.5**
		Nominal	**15.0**

Mode / Band	Proximity Sensor State		Modulated Average (dBm)
LTE Band 25	Inactive	Maximum	**24.0**
		Nominal	**23.5**
	Active	Maximum	**14.8**
		Nominal	**14.3**

Mode / Band	IEEE 802.11		Modulated Average (dBm)
IEEE 802.11b (2.4 GHz)	b	Maximum	**13.5**
		Nominal	**13.0**
IEEE 802.11g (2.4 GHz)	g	Maximum	**13.0**
		Nominal	**12.5**
IEEE 802.11n (2.4 GHz)	n	Maximum	**12.0**
		Nominal	**11.5**
IEEE 802.11a (5 GHz)	a	Maximum	**13.5**
		Nominal	**13.0**
IEEE 802.11n (5 GHz)	n (20 MHz BW)	Maximum	**13.5**
		Nominal	**13.0**
	n (40 MHz BW)	Maximum	**11.0**
		Nominal	**10.5**
Bluetooth	N/A	Maximum	**11.5**
		Nominal	**11.0**

1.3 DUT Antenna Locations

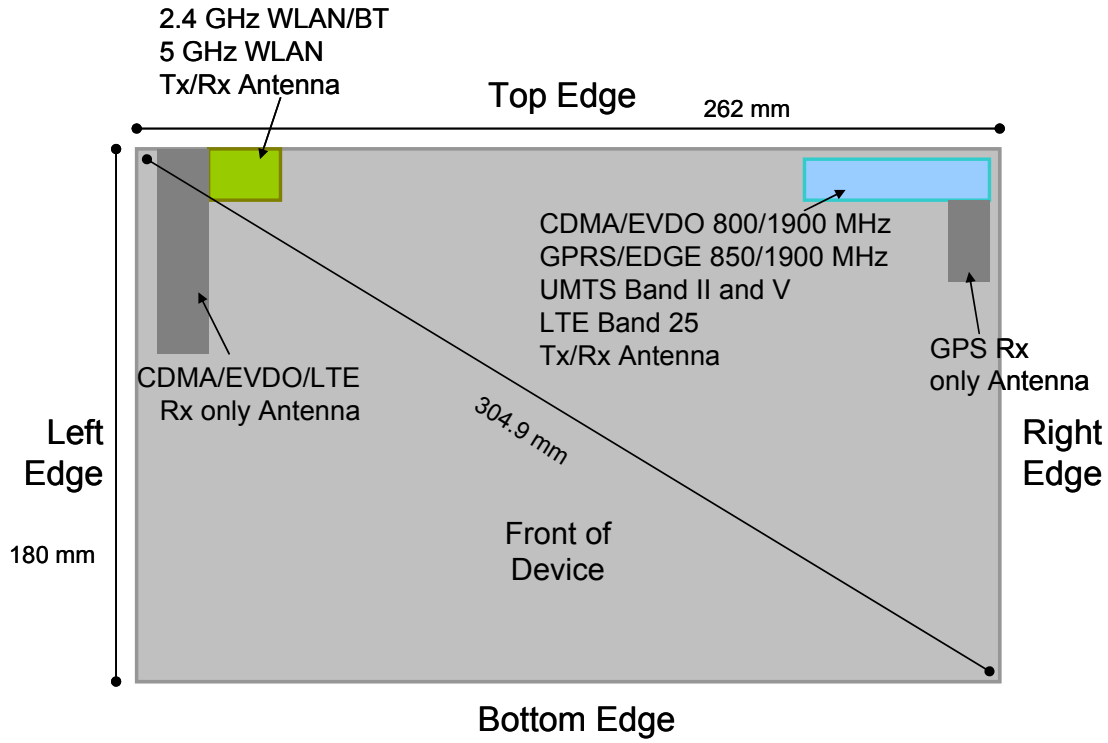


Figure 1-1
DUT Antenna Locations

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

1.4 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 1-2 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 1-2
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 1-1
Simultaneous Transmission Scenarios

No.	Simultaneous Transmit Scenarios	Body	Note
		FCC KDB 616217	
1	CDMA/EVDO data + WiFi 2.4GHz	Yes	2G Hotspot
2	LTE B25 Data + WIFI 2.4GHz	Yes	4G Hotspot
3	850/1900MHz GPRS/EDGE data + WiFi 2.4GHz	Yes	2G Hotspot
4	850/1900 MHz UMTS Data + WIFI 2.4GHz	Yes	3G Hotspot
5	CDMA/EVDO data + WiFi 5GHz	Yes	WiFi Direct
6	LTE B25 Data + WIFI 5GHz	Yes	WiFi Direct
7	850/1900MHz GPRS/EDGE data + WiFi 5GHz	Yes	WiFi Direct
8	850/1900 MHz WCDMA Data + WIFI 5GHz	Yes	WiFi Direct
9	CDMA/EVDO data + Bluetooth	Yes	
10	LTE B25 Data + Bluetooth	Yes	
11	850/1900MHz GPRS/EDGE data + Bluetooth	Yes	
12	850/1900 MHz WCDMA Data + Bluetooth	Yes	

1.5 SAR Test Exclusions Applied

(A) WIFI/BT

2.4 GHz WLAN and 5 GHz WLAN and Bluetooth share the same antenna path and cannot transmit simultaneously.

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

(B) Licensed Transmitter(s)

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.

This device is not capable of network based voice services.

1.6 Power Reduction for SAR

Proximity Sensors were utilized in the device for SAR purposes. FCC KDB Publication 616217 D04 v01 was used for guidance for SAR testing. See Appendix G for more information.

1.7 Guidance Applied

- FCC KDB Publication 941225 D01-D06 (2G/3G/4G and Hotspot)
- FCC KDB Publication 248227 D01v01r02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D01v05 (General SAR Guidance)
- FCC KDB Publication 865664 D01-D02 (SAR Measurements up to 6 GHz)
- FCC KDB Publication 616217 D04v01 (SAR for Laptop and Tablets)

1.8 Device Serial Numbers

Seven samples with identical hardware were used to facilitate SAR testing. For maximum power devices S/N: ZC802W1J, ZC802W0F, ZC802W76, and ZC802W1K, power reduction was disabled via software (only available to the manufacturer – end user cannot disable power reduction) to ensure the device was always transmitting at maximum power when testing at a conservative distance. The reduced power devices S/N: ZC802W75, ZC802WBB, ZC802W73, and ZC802W17 were tuned to the reduced power levels. There is no power reduction for 2.4 GHz WLAN, 5 GHz WLAN, and Bluetooth.

Mode/Band	Max Power Sample Serial	Reduced Power Serial Number
Cell. CDMA - FCC Rule Part 90S	ZC802W1J	ZC802W75
Cell. CDMA - FCC Rule Part 22H	ZC802W1J	ZC802W75
PCS CDMA - FCC Rule Part 24E	ZC802W1J	ZC802W75
GSM/GPRS/EDGE 850	ZC802W0F	ZC802WBB
GSM/GPRS/EDGE 1900	ZC802W0F	ZC802WBB
UMTS 850	ZC802W76	ZC802W73
UMTS 1900	ZC802W76	ZC802W73
LTE Band 25	ZC802W1K	ZC802W17
2.4 GHz Bluetooth	ZC802W0F	N/A
2.4 GHz WLAN	ZC802W76	N/A
5 GHz WLAN	ZC802W0F	N/A

2 LTE INFORMATION

LTE Information				
Ref	FCC ID	A3LSPHP600		
	Form Factor	Portable Tablet Computer		
1)	Frequency Range of each LTE transmission band	LTE Band 25 (1852.5 - 1912.5 MHz)		
2)	Channel Bandwidths	LTE Band 25: 5 MHz		
3)	Channel Numbers and Frequencies (MHz)	Low	Mid	High
	LTE Band 25: 5 MHz	1852.5 (26065)	1882.5 (26365)	1912.5 (26665)
4)(a)	UE Category	3		
(b)	Modulations Supported in UL	QPSK, 16QAM		
	LTE Transmitter and Antenna Implementation	CDMA/GSM/UMTS/LTE share the same transmission path.		
5)	Description of LTE Tx and Ant. Implementation	1 Main Tx/Rx Ant and 1 Diversity Rx Ant		
6)	LTE Voice available?	NO		
	Hotspot with LTE+WIFI	YES		
	Hotspot with LTE+WIFI active with 1XVoice sessions?	NO		
7)	LTE MPR Permanently implemented per 3GPP TS 36.101 section 6.2.3~6.2.5? (manufacturer attestation to be provided)	See Section 8.4		
	A-MPR (Additional MPR) disabled for SAR Testing?	YES		
8)	Conducted power Table provided for 1RB (low, mid, and high offsets), 50% RB (low, mid, and high offsets), 100% RB	YES		

3 INTRODUCTION

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

The safety limits used for the environmental evaluation measurements are based on the criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95.1-1992 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz [3] and Health Canada RF Exposure Guidelines Safety Code 6 [24]. The measurement procedure described in IEEE/ANSI C95.3-2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave [4] is used for guidance in measuring the Specific Absorption Rate (SAR) due to the RF radiation exposure from the Equipment Under Test (EUT). These criteria for SAR evaluation are similar to those recommended by the International Committee for Non-Ionizing Radiation Protection (ICNIRP) in Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," Report No. Vol 74. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards.

3.1 SAR Definition

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

Equation 3-1
SAR Mathematical Equation

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

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

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

where:

σ = conductivity of the tissue-simulating material (S/m)
ρ = mass density of the tissue-simulating material (kg/m^3)
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].

4 DOSIMETRIC ASSESSMENT

4.1 Measurement Procedure

The evaluation was performed using the following procedure:

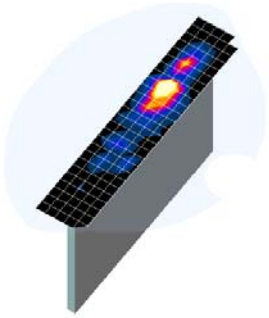


Figure 4-1
Sample SAR Area Scan

1. The SAR distribution at the exposed side of the head or body was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the device-head and body interface and the horizontal grid resolution was determined per FCC KDB Publication 865664 D01v01 (See Table 4-1).
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.
3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01 (See Table 4-1). On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):
   a. The data was extrapolated to the surface of the outer-shell of the phantom. The combined distance extrapolated was the combined distance from the center of the dipoles 2.7mm away from the tip of the probe housing plus the 1.2 mm distance between the surface and the lowest measuring point. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).
   b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the "Not a knot" condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.
   c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete to calculate the SAR drift. If the drift deviated by more than 5%, the SAR test and drift measurements were repeated.

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

Frequency	Maximum Area Scan Resolution (mm) (Δx_{area}, Δy_{area})	Maximum Zoom Scan Resolution (mm) (Δx_{zoom}, Δy_{zoom})	Maximum Zoom Scan Spatial Resolution (mm) $\Delta z_{zoom}(n)$	Minimum Zoom Scan Volume (mm) (x,y,z)
≤ 2 GHz	≤ 15	≤ 8	≤ 5	≥ 30
2-3 GHz	≤ 12	≤ 5	≤ 5	≥ 30
3-4 GHz	≤ 12	≤ 5	≤ 4	≥ 28
4-5 GHz	≤ 10	≤ 4	≤ 3	≥ 25
5-6 GHz	≤ 10	≤ 4	≤ 2	≥ 22

5 RF EXPOSURE LIMITS

5.1 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.

5.2 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 5-1
SAR Human Exposure Specified in ANSI/IEEE C95.1-1992 and Health Canada Safety Code 6

HUMAN EXPOSURE LIMITS		
	UNCONTROLLED ENVIRONMENT *General Population* (W/kg) or (mW/g)	CONTROLLED ENVIRONMENT *Occupational* (W/kg) or (mW/g)
SPATIAL PEAK SAR Brain	1.6	8.0
SPATIAL AVERAGE SAR Whole Body	0.08	0.4
SPATIAL PEAK SAR Hands, Feet, Ankles, Wrists	4.0	20

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

6 FCC MEASUREMENT PROCEDURES

Power measurements were performed using a base station simulator under digital average power.

6.1 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.

6.2 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.

6.3 SAR Measurement Conditions for CDMA2000

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

6.3.1 Output Power Verification

See 3GPP2 C.S0011/TIA-98-E as recommended by "SAR Measurement Procedures for 3G Devices" v02, October 2007. Maximum output power is verified on the High, Middle and Low channels according to procedures in section 4.4.5.2 of 3GPP2 C.S0011/TIA-98-E. SAR tests were measured with power control bits in the "All Up" condition.

1. If the mobile station (MS) supports Reverse TCH RC 1 and Forward TCH RC 1, set up a call using Fundamental Channel Test Mode 1 (RC=1/1) with 9600 bps data rate only.
2. Under RC1, C.S0011 Table 4.4.5.2-1, Table 6-1 parameters were applied.
3. If the MS supports the RC 3 Reverse FCH, RC3 Reverse SCH_0 and demodulation of RC 3,4, or 5, set up a call using Supplemental Channel Test Mode 3 (RC 3/3) with 9600 bps Fundamental Channel and 9600 bps SCH0 data rate.
4. Under RC3, C.S0011 Table 4.4.5.2-2, Table 6-2 was applied.

Table 6-1
Parameters for Max. Power for RC1

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

Table 6-2
Parameters for Max. Power for RC3

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

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

6.3.2 Body SAR Measurements for EVDO Data Devices

Body SAR is measured using Subtype 0/1 Physical Layer configurations for Rev. 0 per KDB Publication 941225 D01 procedures for "1x Ev-Do data Devices". SAR for Subtype 2 Physical layer configurations is not required for Rev. A when the maximum average output of each RF channels is less than that measured in Subtype 0/1 Physical layer configurations. Otherwise, SAR is measured on the maximum output channel for Rev. A using the exposure configuration that results in the highest SAR for the RF channels in Rev. 0. The AT is tested with a Reverse Data Channel rate of 153.6 kbps in Subtype 0/1 Physical Layer configurations; and a Reverse Data Channel payload size of 4096 bits and Termination Target of 16 slots in Subtype 2 Physical Layer configurations.

SAR is not required for 1x RTT for Ev-Do devices that also support 1x RTT voice and/or data operations, when the maximum average output of each channel is less than ¼ dB higher than that measured in Subtype 0/1 Physical Layer configurations for Rev. 0.

6.4 SAR Measurement Conditions for UMTS

6.4.1 Output Power Verification

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

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

6.4.2 Body SAR Measurements

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

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

The following procedures are applicable to HSDPA data devices operating under 3GPP Release 5. Body exposure conditions are typically applicable to these devices, including handsets and data modems operating in various electronic devices. HSDPA operates in conjunction with UMTS and

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

6.4.4 SAR Measurement Conditions for HSUPA Data Devices

SAR for body exposure configurations are measured according to the 'Body SAR Measurements' procedures in the 'WCDMA Handsets' section of the KDB 941225 D01 FCC 3G document. In addition, Body SAR is also measured for HSPA when the maximum average output of each RF channel with HSPA active is at least ¼ dB higher of that measured without HSPA in 12.2 kbps RMC mode or the maximum SAR for 12.2 kbps RMC is above 75% of the SAR limit. Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 with power control algorithm 2, according to the highest body SAR configuration in 12.2 kbps RMC without HSPA. When VOIP is applicable for head exposure, SAR is not required when the maximum output of each RF channel with HSPA is less than ¼ dB higher than that measured using 12.2 kbps RMC; otherwise, the same HSPA configuration used for body measurements should be used to test for head exposure.

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

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (1)	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (codes)	CM (2) (dB)	MPR (dB)	AG (4) Index	E-TFCI
1	11/15 (3)	15/15 (3)	64	11/15 (3)	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1}: 47/15 β_{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 $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$.
Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_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 β_c = 10/15 and β_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 β_c = 14/15 and β_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.

6.5 SAR Measurement Conditions for LTE

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

6.5.1 Spectrum Plots for RB Configurations

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

6.5.2 MPR

MPR is implemented for this device by the manufacturer when the proximity sensor is not active (maximum power scenarios). 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.

6.5.3 A-MPR

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

6.5.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05v02:

a. Per Section 5.2.1, SAR is required for QPSK 1 RB Allocation
    i. The required channel and offset combination with the highest maximum output power is required for SAR.
    ii. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required. Otherwise, SAR is required for the remaining required test channels using the RB offset configuration with highest output power for that channel.
    iii. When the reported SAR for a required test channel is > 1.45 W/kg, SAR is required for all RB offset configurations for that channel.
b. Per Section 5.2.2, SAR is required for 50% RB allocation following the same procedures outlined in Section 5.2.1.
c. Per Section 5.2.3, QPSK SAR is not required for the 100% allocation when the highest maximum output power for the 100% allocation is less than the highest maximum output power of the 1 RB and 50% RB allocations and the reported SAR for the 1 RB and 50% RB allocations is < 0.8 W/kg.
d. Per Section 5.2.4 and 5.3, SAR tests for higher order modulations 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.

6.6 SAR Testing with 802.11 Transmitters

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

6.6.1 General Device Setup

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

6.6.2 Frequency Channel Configurations [27]

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

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

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

7 TABLET SAR TEST PROCEDURES

7.1 SAR Testing for Table per KDB Publication 616217 D04v01

Per FCC KDB 616217, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. The SAR Exclusion Threshold in KDB 447498 D01v05 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

Based on the location and output power of the main antenna, back side and top and right edges were required to be evaluated for SAR. Back side and top and left edges were required to be evaluated for the BT/WLAN Antenna. Front side was not required to be evaluated.

7.2 Proximity Sensor Information

The technical description contains information about sensor size and locations. Power reduction levels are provided in Section 8.

FCC KDB 616217 was used as a guideline for selecting SAR test distances for this device. Since the back-off sensor activation distance for back is 13 mm, a conservative distance of 12 mm was tested for the back side and top edge. Sensor triggering distance summary data is included in Appendix G.

The sensor is designed to support sufficient detection range and sensitivity to cover regions of the sensors in all applicable directions since the sensor entirely covers the antenna.

7.3 Method of SAR Measurement with Power Reduction

This tablet was tested in accordance with FCC KDB 616217 D04v01 for proximity sensor and power reduction.

Based on the power-reduction activation vs. distance results for the sensors, the samples representative of the device with the sensors activated (reduced power S/N: ZC802W75, ZC802WBB, ZC802W73, and ZC802W17) were tested for SAR at 0 mm. For the additional SAR measurements with the sensors de-activated (max power, no power reduction S/N: ZC802W1J, ZC802W0F, ZC802W76, and ZC802W1K) when the device is positioned away from the user, SAR evaluation is required at 12 mm (from the back side and top edge) distance from the phantom. Since the device sensor detection mechanism is active at these distances, the power reduction was disabled via manufacturer test software, and the device was placed in maximum power transmit mode with a base station simulator under the tissue equivalent liquid-filled flat phantom at the required distances for testing.

8 RF CONDUCTED POWERS

8.1 CDMA Conducted Powers

Table 8-1
Maximum CDMA Average RF Conducted Powers
(Representing Proximity Sensor Inactive)

Band	Channel	Rule Part	Frequency	TDSO SO32 [dBm]	TDSO SO32 [dBm]	1x EvDO Rev. 0 [dBm]	1x EvDO Rev. A [dBm]
	F-RC		MHz	FCH+SCH	FCH	(RTAP)	(RETAP)
Cellular	564	90S	820.1	24.40	24.45	24.49	24.48
Cellular	1013	22H	824.7	24.49	24.49	24.51	24.50
	384	22H	836.52	24.51	24.56	24.54	24.48
	777	22H	848.31	24.53	24.55	24.55	24.53
PCS	25	24E	1851.25	24.47	24.53	24.66	24.63
	600	24E	1880	24.52	24.58	24.65	24.55
	1175	24E	1908.75	24.50	24.55	24.62	24.51

Table 8-2
Reduced CDMA Average RF Conducted Powers
(Representing Proximity Sensor Active)

Band	Channel	Rule Part	Frequency	TDSO SO32 [dBm]	TDSO SO32 [dBm]	1x EvDO Rev. 0 [dBm]	1x EvDO Rev. A [dBm]
	F-RC		MHz	FCH+SCH	FCH	(RTAP)	(RETAP)
Cellular	564	90S	820.1	18.14	18.06	18.10	18.05
Cellular	1013	22H	824.7	18.16	18.02	18.22	18.22
	384	22H	836.52	18.13	18.01	18.22	18.16
	777	22H	848.31	18.14	18.04	18.30	18.28
PCS	25	24E	1851.25	14.57	14.66	15.14	14.98
	600	24E	1880	14.85	14.91	15.06	15.04
	1175	24E	1908.75	14.99	14.78	15.03	15.02

Note: For FCC Rule Part 90S, only one channel is required since the device operates within the transmission range of 817.90 – 823.10 MHz.

Per KDB Publication 941225 D01v02:

Body SAR is measured using Subtype 0/1 Physical Layer configurations for Rev. 0. Since the average output power of Subtype 2 for Rev. A was less than the Rev. 0 power levels, Rev. A SAR was not required. SAR is not required for 1x RTT for Ev-Do data devices when the maximum average output of each channel is less than ¼ dB higher than that measured in Subtype 0/1 Physical Layer configurations for Rev. 0.

Figure 8-1
Power Measurement Setup

8.2 GSM Conducted Powers

Table 8-3
Maximum GPRS/EDGE Average RF Conducted Powers
(Representing Proximity Sensor Inactive)

		Maximum Burst-Averaged Output Power			
		GPRS/EDGE Data (GMSK)		*EDGE Data (8-PSK)*	
Band	**Channel**	**GPRS [dBm] 1 Tx Slot**	**GPRS [dBm] 2 Tx Slot**	**EDGE [dBm] 1 Tx Slot**	**EDGE [dBm] 2 Tx Slot**
GSM 850	128	32.84	**31.16**	27.07	26.87
	190	32.63	**31.54**	27.09	26.83
	251	32.92	**31.65**	27.26	27.02
GSM 1900	512	29.88	**28.35**	25.09	25.02
	661	30.13	**28.68**	25.26	25.19
	810	29.72	**28.32**	24.85	24.84
		Calculated Maximum Frame-Averaged Output Power			
		GPRS/EDGE Data (GMSK)		*EDGE Data (8-PSK)*	
Band	**Channel**	**GPRS [dBm] 1 Tx Slot**	**GPRS [dBm] 2 Tx Slot**	**EDGE [dBm] 1 Tx Slot**	**EDGE [dBm] 2 Tx Slot**
GSM 850	128	23.81	**25.14**	18.04	20.85
	190	23.60	**25.52**	18.06	20.81
	251	23.89	**25.63**	18.23	21.00
GSM 1900	512	20.85	**22.33**	16.06	19.00
	661	21.10	**22.66**	16.23	19.17
	810	20.69	**22.30**	15.82	18.82

Table 8-4
Reduced GPRS/EDGE Average RF Conducted Powers
(Representing Proximity Sensor Active)

		Maximum Burst-Averaged Output Power			
		GPRS/EDGE Data (GMSK)		*EDGE Data (8-PSK)*	
Band	**Channel**	**GPRS [dBm] 1 Tx Slot**	**GPRS [dBm] 2 Tx Slot**	**EDGE [dBm] 1 Tx Slot**	**EDGE [dBm] 2 Tx Slot**
GSM 850	128	27.03	**25.29**	20.58	19.66
	190	26.94	**25.30**	20.61	19.54
	251	27.33	**25.74**	20.92	20.02
GSM 1900	512	22.01	**20.18**	16.81	15.61
	661	22.13	**20.23**	16.86	15.76
	810	22.12	**20.25**	16.88	15.73
		Calculated Maximum Frame-Averaged Output Power			
		GPRS/EDGE Data (GMSK)		*EDGE Data (8-PSK)*	
Band	**Channel**	**GPRS [dBm] 1 Tx Slot**	**GPRS [dBm] 2 Tx Slot**	**EDGE [dBm] 1 Tx Slot**	**EDGE [dBm] 2 Tx Slot**
GSM 850	128	18.00	**19.27**	11.55	13.64
	190	17.91	**19.28**	11.58	13.52
	251	18.30	**19.72**	11.89	14.00
GSM 1900	512	12.98	**14.16**	7.78	9.59
	661	13.10	**14.21**	7.83	9.74
	810	13.09	**14.23**	7.85	9.71

Note:

1. 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.

2. The bolded GPRS modes were selected for SAR testing according to the highest frame-averaged output power table according to KDB 941225 D03v01.

3. GPRS/EDGE (GMSK) output powers were measured with coding scheme setting of 1 (CS1) on the base station simulator. CS1 was configured to measure GPRS output power measurements and SAR to ensure GMSK modulation in the signal. Our Investigation has shown that CS1 - CS4 settings do not have any impact on the output levels or modulation in the GPRS modes.

4. EDGE (8-PSK) output powers were measured with MCS7 on the base station simulator. MCS7 coding scheme was used to measure the output powers for EDGE since investigation has shown that choosing MCS7 coding scheme will ensure 8-PSK modulation. It has been shown that MCS levels that produce 8PSK modulation do not have an impact on output power.

5. This device does not support evolved EDGE (eEDGE)

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

Figure 8-2
Power Measurement Setup

8.3 UMTS Conducted Powers

Table 8-5
Maximum UMTS Average RF Conducted Powers
(Representing Proximity Sensor Inactive)

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	23.43	23.41	23.47	23.19	23.33	23.16	-
6	HSDPA	Subtest 1	22.28	22.31	22.30	22.36	22.39	22.25	0
6		Subtest 2	22.37	22.40	22.31	22.54	22.58	22.31	0
6		Subtest 3	22.10	22.00	21.80	22.34	22.26	21.78	0.5
6		Subtest 4	21.83	21.76	21.98	22.33	22.25	21.96	0.5
6	HSUPA	Subtest 1	21.65	21.86	21.60	22.30	22.32	22.29	0
6		Subtest 2	21.30	21.48	21.31	21.21	21.62	21.16	2
6		Subtest 3	21.17	21.06	20.96	21.69	21.32	21.51	1
6		Subtest 4	21.66	21.77	21.72	21.88	21.80	21.77	2
6		Subtest 5	21.97	21.99	21.53	22.09	21.91	21.97	0

Table 8-6
Reduced UMTS Average RF Conducted Powers
(Representing Proximity Sensor Active)

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	17.41	17.46	17.53	14.25	14.26	14.23	-
6	HSDPA	Subtest 1	16.20	16.53	16.64	12.91	12.96	12.92	0
6		Subtest 2	16.32	16.35	16.75	13.19	13.25	13.05	0
6		Subtest 3	16.12	15.00	16.30	12.58	12.90	12.48	0.5
6		Subtest 4	16.20	15.07	16.36	12.60	12.62	12.54	0.5
6	HSUPA	Subtest 1	16.67	15.95	16.75	11.69	12.36	11.72	0
6		Subtest 2	15.20	14.42	15.43	11.73	11.95	11.97	2
6		Subtest 3	14.93	15.51	15.58	11.96	11.42	12.07	1
6		Subtest 4	16.02	16.10	15.97	12.67	12.66	12.60	2
6		Subtest 5	16.65	16.29	16.53	12.54	12.62	12.60	0

Note :

1. 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.

2. This device does not support DC-HSDPA.

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

Figure 8-3
Power Measurement Setup

8.4 LTE Conducted Powers

8.4.1 LTE Band 25

Table 8-7
LTE Band 25 Maximum RF Conducted Powers - 5 MHz Bandwidth
(Representing Proximity Sensor Inactive)

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Low	1852.5	26065	5	QPSK	1	0	23.64	0	0
	1852.5	26065	5	QPSK	1	12	23.62	0	0
	1852.5	26065	5	QPSK	1	24	23.54	0	0
	1852.5	26065	5	QPSK	12	0	22.70	1	0-1
	1852.5	26065	5	QPSK	12	6	22.41	1	0-1
	1852.5	26065	5	QPSK	12	13	22.53	1	0-1
	1852.5	26065	5	QPSK	25	0	22.42	1	0-1
	1852.5	26065	5	16-QAM	1	0	22.68	1	0-1
	1852.5	26065	5	16-QAM	1	12	22.51	1	0-1
	1852.5	26065	5	16-QAM	1	24	22.61	1	0-1
	1852.5	26065	5	16-QAM	12	0	21.74	2	0-2
	1852.5	26065	5	16-QAM	12	6	21.61	2	0-2
	1852.5	26065	5	16-QAM	12	13	21.47	2	0-2
	1852.5	26065	5	16-QAM	25	0	21.45	2	0-2
Mid	1882.5	26365	5	QPSK	1	0	**23.75**	0	0
	1882.5	26365	5	QPSK	1	12	23.63	0	0
	1882.5	26365	5	QPSK	1	24	23.43	0	0
	1882.5	26365	5	QPSK	12	0	22.68	1	0-1
	1882.5	26365	5	QPSK	12	6	22.65	1	0-1
	1882.5	26365	5	QPSK	12	13	22.55	1	0-1
	1882.5	26365	5	QPSK	25	0	22.64	1	0-1
	1882.5	26365	5	16-QAM	1	0	22.64	1	0-1
	1882.5	26365	5	16-QAM	1	12	22.52	1	0-1
	1882.5	26365	5	16-QAM	1	24	22.43	1	0-1
	1882.5	26365	5	16-QAM	12	0	21.83	2	0-2
	1882.5	26365	5	16-QAM	12	6	21.66	2	0-2
	1882.5	26365	5	16-QAM	12	13	21.60	2	0-2
	1882.5	26365	5	16-QAM	25	0	21.58	2	0-2
High	1912.5	26665	5	QPSK	1	0	23.58	0	0
	1912.5	26665	5	QPSK	1	12	23.36	0	0
	1912.5	26665	5	QPSK	1	24	23.25	0	0
	1912.5	26665	5	QPSK	12	0	22.68	1	0-1
	1912.5	26665	5	QPSK	12	6	**22.71**	1	0-1
	1912.5	26665	5	QPSK	12	13	22.46	1	0-1
	1912.5	26665	5	QPSK	25	0	22.57	1	0-1
	1912.5	26665	5	16-QAM	1	0	22.84	1	0-1
	1912.5	26665	5	16-QAM	1	12	22.93	1	0-1
	1912.5	26665	5	16-QAM	1	24	22.67	1	0-1
	1912.5	26665	5	16-QAM	12	0	21.92	2	0-2
	1912.5	26665	5	16-QAM	12	6	21.92	2	0-2
	1912.5	26665	5	16-QAM	12	13	21.73	2	0-2
	1912.5	26665	5	16-QAM	25	0	21.69	2	0-2

Table 8-8
LTE Band 25 Reduced RF Conducted Powers - 5 MHz Bandwidth
(Representing Proximity Sensor Active)

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Low	1852.5	26065	5	QPSK	1	0	14.27	0	0
	1852.5	26065	5	QPSK	1	12	**14.34**	0	0
	1852.5	26065	5	QPSK	1	24	14.03	0	0
	1852.5	26065	5	QPSK	12	0	14.42	0	0-1
	1852.5	26065	5	QPSK	12	6	**14.59**	0	0-1
	1852.5	26065	5	QPSK	12	13	14.42	0	0-1
	1852.5	26065	5	QPSK	25	0	14.38	0	0-1
	1852.5	26065	5	16-QAM	1	0	14.61	0	0-1
	1852.5	26065	5	16-QAM	1	12	14.68	0	0-1
	1852.5	26065	5	16-QAM	1	24	14.38	0	0-1
	1852.5	26065	5	16-QAM	12	0	14.36	0	0-2
	1852.5	26065	5	16-QAM	12	6	14.55	0	0-2
	1852.5	26065	5	16-QAM	12	13	14.38	0	0-2
	1852.5	26065	5	16-QAM	25	0	14.35	0	0-2
Mid	1882.5	26365	5	QPSK	1	0	14.25	0	0
	1882.5	26365	5	QPSK	1	12	**14.64**	0	0
	1882.5	26365	5	QPSK	1	24	14.47	0	0
	1882.5	26365	5	QPSK	12	0	14.48	0	0-1
	1882.5	26365	5	QPSK	12	6	**14.69**	0	0-1
	1882.5	26365	5	QPSK	12	13	14.62	0	0-1
	1882.5	26365	5	QPSK	25	0	**14.59**	0	0-1
	1882.5	26365	5	16-QAM	1	0	14.28	0	0-1
	1882.5	26365	5	16-QAM	1	12	14.77	0	0-1
	1882.5	26365	5	16-QAM	1	24	14.38	0	0-1
	1882.5	26365	5	16-QAM	12	0	14.47	0	0-2
	1882.5	26365	5	16-QAM	12	6	14.72	0	0-2
	1882.5	26365	5	16-QAM	12	13	14.48	0	0-2
	1882.5	26365	5	16-QAM	25	0	14.58	0	0-2
High	1912.5	26665	5	QPSK	1	0	14.13	0	0
	1912.5	26665	5	QPSK	1	12	**14.47**	0	0
	1912.5	26665	5	QPSK	1	24	13.80	0	0
	1912.5	26665	5	QPSK	12	0	14.39	0	0-1
	1912.5	26665	5	QPSK	12	6	**14.45**	0	0-1
	1912.5	26665	5	QPSK	12	13	13.87	0	0-1
	1912.5	26665	5	QPSK	25	0	14.23	0	0-1
	1912.5	26665	5	16-QAM	1	0	14.48	0	0-1
	1912.5	26665	5	16-QAM	1	12	14.67	0	0-1
	1912.5	26665	5	16-QAM	1	24	13.88	0	0-1
	1912.5	26665	5	16-QAM	12	0	14.30	0	0-2
	1912.5	26665	5	16-QAM	12	6	14.36	0	0-2
	1912.5	26665	5	16-QAM	12	13	13.96	0	0-2
	1912.5	26665	5	16-QAM	25	0	14.18	0	0-2

8.5 IEEE 802.11 Transmitter Conducted Powers

Table 8-9
IEEE 802.11b Average RF Power

Mode	Freq	Channel	802.11b (2.4 GHz) Conducted Power [dBm]			
			Data Rate [Mbps]			
	[MHz]		1	2	5.5	11
802.11b	2412	1*	**12.98**	13.06	13.05	13.13
802.11b	2437	6*	**12.93**	13.03	12.98	13.09
802.11b	2462	11*	**12.34**	12.37	12.45	12.42

Table 8-10
IEEE 802.11g Average RF Power

Mode	Freq	Channel	802.11g (2.4 GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		6	9	12	18	24	36	48	54
802.11g	2412	1	12.71	12.73	12.71	12.74	12.65	12.72	12.70	12.72
802.11g	2437	6	12.67	12.68	12.64	12.66	12.69	12.63	12.70	12.66
802.11g	2462	11	12.11	12.07	12.08	12.04	12.10	12.11	12.04	12.03

Table 8-11
IEEE 802.11n Average RF Power

Mode	Freq	Channel	802.11n (2.4 GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		6.5	13	20	26	39	52	58	65
802.11n	2412	1	11.67	11.61	11.63	11.62	11.64	11.58	11.64	11.66
802.11n	2437	6	11.65	11.53	11.59	11.51	11.67	11.55	11.54	11.58
802.11n	2462	11	10.91	10.97	10.97	10.96	10.92	10.95	10.95	10.97

Table 8-12
IEEE 802.11a Average RF Power

Mode	Freq	Channel	802.11a (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		6	9	12	18	24	36	48	54
802.11a	5180	36*	**13.22**	13.23	13.18	13.15	13.19	13.22	13.21	13.21
802.11a	5200	40	13.16	13.13	13.15	13.13	13.12	13.14	13.11	13.13
802.11a	5220	44	13.06	13.08	13.09	13.07	13.12	13.10	13.11	13.16
802.11a	5240	48*	**13.12**	13.05	13.06	13.06	13.04	13.13	13.08	13.13
802.11a	5260	52*	**13.07**	13.08	13.04	13.11	13.09	13.09	13.12	13.08
802.11a	5280	56	13.03	13.00	13.05	13.07	13.09	13.04	13.08	13.10
802.11a	5300	60	**13.00**	13.04	13.03	13.02	13.05	13.10	13.14	13.06
802.11a	5320	64*	12.96	12.95	12.96	12.98	12.99	12.99	12.98	13.03
802.11a	5500	100	**13.30**	13.28	13.29	13.33	13.28	13.33	13.39	13.29
802.11a	5520	104*	13.23	13.30	13.26	13.29	13.30	13.28	13.35	13.31
802.11a	5540	108	13.26	13.30	13.33	13.30	13.38	13.37	13.35	13.38
802.11a	5560	112	**13.29**	13.31	13.25	13.30	13.33	13.34	13.34	13.42
802.11a	5580	116*	13.25	13.27	13.31	13.31	13.34	13.40	13.28	13.38
802.11a	5600	120	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5620	124*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5640	128	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5660	132	13.25	13.23	13.31	13.37	13.34	13.27	13.37	13.30
802.11a	5680	136*	**13.28**	13.25	13.26	13.24	13.25	13.33	13.28	13.31
802.11a	5700	140	13.24	13.30	13.24	13.39	13.37	13.29	13.25	13.32
802.11a	5745	149*	**13.18**	13.26	13.25	13.24	13.27	13.20	13.25	13.27
802.11a	5765	153	**13.19**	13.21	13.21	13.24	13.21	13.18	13.30	13.32
802.11a	5785	157*	13.16	13.20	13.19	13.24	13.21	13.23	13.19	13.18
802.11a	5805	161*	**13.16**	13.20	13.24	13.31	13.20	13.19	13.23	13.21
802.11a	5825	165	13.11	13.13	13.18	13.16	13.11	13.09	13.34	13.19

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.

Table 8-13
IEEE 802.11n Average RF Power – 20 MHz Bandwidth

Mode	Freq	Channel	20MHz BW 802.11n (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		6.5	13	20	26	39	52	58	65
802.11n	5180	36	13.13	13.20	13.12	13.20	13.19	13.16	13.17	13.13
802.11n	5200	40	13.07	13.03	13.16	13.09	13.19	13.17	13.11	13.07
802.11n	5220	44	13.02	13.06	13.04	13.10	13.06	13.04	13.07	13.07
802.11n	5240	48	12.99	13.02	13.04	13.01	13.12	13.15	13.15	13.06
802.11n	5260	52	13.06	13.01	12.98	13.08	13.10	13.02	13.10	13.20
802.11n	5280	56	13.06	13.01	12.98	13.01	13.03	13.06	13.01	13.10
802.11n	5300	60	13.02	13.00	12.94	13.08	13.02	13.07	13.07	13.09
802.11n	5320	64	13.12	13.07	13.12	12.99	13.00	13.01	13.11	12.99
802.11n	5500	100	13.28	13.33	13.33	13.32	13.31	13.30	13.32	13.35
802.11n	5520	104	13.29	13.28	13.36	13.27	13.32	13.36	13.37	13.27
802.11n	5540	108	13.27	13.26	13.29	13.22	13.28	13.31	13.31	13.24
802.11n	5560	112	13.18	13.20	13.20	13.28	13.28	13.31	13.25	13.25
802.11n	5580	116	13.13	13.23	13.19	13.14	13.15	13.17	13.14	13.23
802.11a	5600	120	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5620	124	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5640	128	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5660	132	13.10	13.13	13.18	13.12	13.19	13.03	13.09	13.09
802.11n	5680	136	13.05	13.09	13.04	13.10	13.03	13.06	13.03	12.95
802.11n	5700	140	13.33	13.32	13.28	13.32	13.33	13.38	13.43	13.33
802.11n	5745	149	13.01	13.07	13.05	12.96	13.05	13.03	13.17	13.12
802.11n	5765	153	13.14	13.08	13.08	13.12	13.01	13.06	13.12	13.12
802.11n	5785	157	13.08	13.09	13.04	13.16	13.00	13.11	13.12	13.13
802.11n	5805	161	13.05	13.04	13.11	13.09	13.12	13.12	13.07	13.09
802.11n	5825	165	13.03	13.09	13.12	13.18	13.14	13.16	13.08	13.09

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

Table 8-14
IEEE 802.11n Average RF Power – 40 MHz Bandwidth

Mode	Freq	Channel	40MHz BW 802.11n (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		13.5/15	27/30	40.5/45	54/60	81/90	108/120	121.5/135	135/150
802.11n	5190	38	10.54	10.58	10.55	10.55	10.63	10.61	10.58	10.63
802.11n	5230	46	10.62	10.80	10.81	10.66	10.65	10.72	10.73	10.78
802.11n	5270	54	9.68	9.75	9.84	9.86	9.83	9.80	9.80	9.87
802.11n	5310	62	9.57	9.53	9.51	9.39	9.55	9.45	9.57	9.53
802.11n	5510	102	10.48	10.51	10.63	10.43	10.63	10.55	10.61	10.51
802.11n	5550	110	10.41	10.49	10.48	10.54	10.46	10.60	10.59	10.53
802.11n	5590	118	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5630	126	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5670	134	10.33	10.33	10.37	10.35	10.26	10.26	10.30	10.43
802.11n	5755	151	10.27	10.42	10.29	10.39	10.24	10.41	10.39	10.49
802.11n	5795	159	10.26	10.42	10.32	10.45	10.40	10.41	10.47	10.52

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

Table 8-15
Bluetooth RF Conducted Powers

Frequency [MHz]	Data Rate [Mbps]	Channel No.	Peak Conducted Power		Avg Conducted Power	
			[dBm]	[mW]	[dBm]	[mW]
2402	1.0	0	11.027	12.668	10.72	11.803
2441	1.0	39	11.783	15.076	**11.49**	14.093
2480	1.0	78	10.060	10.139	9.54	8.995
2402	2.0	0	10.968	12.497	8.02	6.339
2441	2.0	39	11.147	13.023	8.76	7.516
2480	2.0	78	9.148	8.219	6.32	4.285
2402	3.0	0	10.783	11.976	8.08	6.427
2441	3.0	39	11.513	14.168	8.79	7.568
2480	3.0	78	9.539	8.993	6.41	4.375

Justification for reduced test configurations for WIFI channels per KDB Publication 248227 D01v01r02 and April 2010 FCC/TCB Meeting Notes:

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

Figure 8-4
Power Measurement Setup

9 SYSTEM VERIFICATION

9.1 Tissue Verification

Table 9-1
Measured Tissue Properties

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (C°)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ε	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ε	% dev σ	% dev ε
11/26/2012	835B	21.2	820	0.960	53.49	0.969	55.258	-0.93%	-3.20%
			835	0.977	53.29	0.970	55.200	0.72%	-3.46%
			850	0.991	53.14	0.988	55.154	0.30%	-3.65%
11/28/2012	835B	22.9	820	0.947	53.55	0.969	55.258	-2.27%	-3.09%
			835	0.959	53.32	0.970	55.200	-1.13%	-3.41%
			850	0.973	53.25	0.988	55.154	-1.52%	-3.45%
11/20/2012	1900B	21.8	1850	1.499	51.10	1.520	53.300	-1.38%	-4.13%
			1880	1.506	51.16	1.520	53.300	-0.92%	-4.02%
			1910	1.568	50.99	1.520	53.300	3.16%	-4.33%
11/26/2012	1900B	23.0	1850	1.513	52.62	1.520	53.300	-0.46%	-1.28%
			1880	1.525	52.46	1.520	53.300	0.33%	-1.58%
			1910	1.552	52.40	1.520	53.300	2.11%	-1.69%
			1920	1.586	52.35	1.520	53.300	4.34%	-1.78%
11/26/2012	2450B	22.1	2401	1.958	51.53	1.903	52.765	2.89%	-2.34%
			2450	2.023	51.37	1.950	52.700	3.74%	-2.52%
			2499	2.090	51.19	2.019	52.638	3.52%	-2.75%
11/19/2012	5200-5800B	23.6	5180	5.188	47.83	5.276	49.041	-1.67%	-2.47%
			5200	5.224	47.76	5.299	49.014	-1.42%	-2.56%
			5240	5.288	47.73	5.346	48.933	-1.08%	-2.46%
			5260	5.295	47.71	5.369	48.906	-1.38%	-2.45%
			5300	5.378	47.61	5.416	48.851	-0.70%	-2.54%
			5500	5.668	47.13	5.650	48.580	0.32%	-2.98%
			5560	5.781	47.01	5.720	48.499	1.07%	-3.07%
			5600	5.855	46.93	5.766	48.444	1.54%	-3.13%
			5680	5.968	46.72	5.860	48.336	1.84%	-3.34%
			5745	6.086	46.56	5.936	48.248	2.53%	-3.50%
			5765	6.121	46.54	5.959	48.220	2.72%	-3.48%
			5800	6.149	46.46	6.000	48.200	2.48%	-3.61%
			5805	6.171	46.44	6.005	48.166	2.76%	-3.58%

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

9.2 Test System Verification

Prior to SAR assessment, the system is verified to ±10% of the SAR measurement on the reference dipole at the time of calibration by the calibration facility.

Table 9-2
System Verification Results

System Verification TARGET & MEASURED											
Tissue Frequency (MHz)	Tissue Type	Date:	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Dipole SN	Probe SN	Measured SAR_{1g} (W/kg)	1 W Target SAR_{1g} (W/kg)	1 W Normalized SAR_{1g} (W/kg)	Deviation (%)
835	BODY	11/26/2012	23.0	21.4	0.100	4d026	3209	0.966	9.580	9.660	0.84%
835	BODY	11/28/2012	23.4	22.7	0.100	4d026	3209	0.945	9.580	9.450	-1.36%
1900	BODY	11/20/2012	23.1	22.3	0.100	5d149	3288	3.970	39.300	39.700	1.02%
1900	BODY	11/26/2012	21.5	21.3	0.100	5d149	3288	4.080	39.300	40.800	3.82%
2450	BODY	11/26/2012	23.2	21.3	0.020	797	3022	1.020	50.800	51.000	0.39%
5200	BODY	11/19/2012	24.1	22.5	0.040	1007	3561	2.820	73.300	70.500	-3.82%
5300	BODY	11/19/2012	24.2	22.6	0.040	1007	3561	2.870	75.600	71.750	-5.09%
5500	BODY	11/19/2012	24.3	22.6	0.040	1007	3561	2.950	78.500	73.750	-6.05%
5600	BODY	11/19/2012	24.2	22.8	0.040	1007	3561	3.180	80.000	79.500	-0.63%
5800	BODY	11/19/2012	24.0	22.5	0.040	1007	3561	2.870	74.300	71.750	-3.43%

System validation status information can be found in Appendix E.

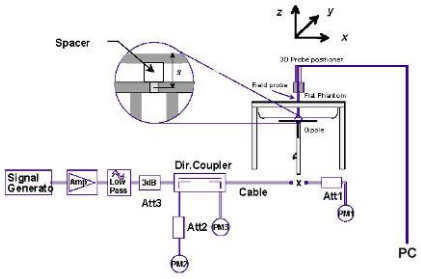


Figure 9-1
System Verification Setup Diagram

Figure 9-2
System Verification Setup Photo

10 SAR DATA SUMMARY

10.1 Standalone Body SAR Data

Table 10-1
CDMA/EVDO Body SAR Data

MEASUREMENT RESULTS														
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Duty Cycle	Side	SAR (1g) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #
MHz	Ch.													
820.10	564	Cell. CDMA - FCC Rule Part 90S	EVDO Rev. 0	25.00	24.49	-0.03	12 mm	ZC802W1J	1:1	back	0.517	1.125	0.582	A1
820.10	564	Cell. CDMA - FCC Rule Part 90S	EVDO Rev. 0	18.50	18.10	-0.18	0 mm	ZC802W75	1:1	back*	0.349	1.096	0.383	
820.10	564	Cell. CDMA - FCC Rule Part 90S	EVDO Rev. 0	25.00	24.49	0.00	12 mm	ZC802W1J	1:1	top	0.196	1.125	0.221	
820.10	564	Cell. CDMA - FCC Rule Part 90S	EVDO Rev. 0	18.50	18.10	-0.15	0 mm	ZC802W75	1:1	top*	0.088	1.096	0.096	
820.10	564	Cell. CDMA - FCC Rule Part 90S	EVDO Rev. 0	25.00	24.49	0.05	0 mm	ZC802W1J	1:1	right	0.306	1.125	0.344	
836.52	384	Cell. CDMA - FCC Rule Part 22H	EVDO Rev. 0	25.00	24.54	0.10	12 mm	ZC802W1J	1:1	back	0.579	1.112	0.644	A2
836.52	384	Cell. CDMA - FCC Rule Part 22H	EVDO Rev. 0	18.50	18.22	-0.02	0 mm	ZC802W75	1:1	back*	0.415	1.067	0.443	
836.52	384	Cell. CDMA - FCC Rule Part 22H	EVDO Rev. 0	25.00	24.54	-0.13	12 mm	ZC802W1J	1:1	top	0.142	1.112	0.158	
836.52	384	Cell. CDMA - FCC Rule Part 22H	EVDO Rev. 0	18.50	18.22	0.00	0 mm	ZC802W75	1:1	top*	0.096	1.067	0.102	
836.52	384	Cell. CDMA - FCC Rule Part 22H	EVDO Rev. 0	25.00	24.54	-0.06	0 mm	ZC802W1J	1:1	right	0.484	1.112	0.538	
1880.00	600	PCS CDMA - FCC Rule Part 24E	EVDO Rev. 0	25.00	24.65	0.05	12 mm	ZC802W1J	1:1	back	0.721	1.084	0.782	A3
1880.00	600	PCS CDMA - FCC Rule Part 24E	EVDO Rev. 0	15.50	15.06	0.02	0 mm	ZC802W75	1:1	back*	0.686	1.107	0.759	
1880.00	600	PCS CDMA - FCC Rule Part 24E	EVDO Rev. 0	25.00	24.65	0.01	12 mm	ZC802W1J	1:1	top	0.537	1.084	0.582	
1880.00	600	PCS CDMA - FCC Rule Part 24E	EVDO Rev. 0	15.50	15.06	-0.11	0 mm	ZC802W75	1:1	top*	0.352	1.107	0.390	
1880.00	600	PCS CDMA - FCC Rule Part 24E	EVDO Rev. 0	25.00	24.65	0.05	0 mm	ZC802W1J	1:1	right	0.401	1.084	0.435	
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 10-2
GPRS/UMTS Body SAR Data

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	# of GPRS Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	190	GSM 850	GPRS	32.00	31.54	0.01	12 mm	ZC802W0F	2	1:4.15	back	0.371	1.112	0.413	
824.20	128	GSM 850	GPRS	26.00	25.29	0.00	0 mm	ZC802WBB	2	1:4.15	back*	0.431	1.178	0.508	
836.60	190	GSM 850	GPRS	26.00	25.30	0.04	0 mm	ZC802WBB	2	1:4.15	back*	0.692	1.175	0.813	A4
848.80	251	GSM 850	GPRS	26.00	25.74	0.09	0 mm	ZC802WBB	2	1:4.15	back*	0.446	1.062	0.474	
836.60	190	GSM 850	GPRS	32.00	31.54	0.01	12 mm	ZC802W0F	2	1:4.15	top	0.109	1.112	0.121	
836.60	190	GSM 850	GPRS	26.00	25.30	0.04	0 mm	ZC802WBB	2	1:4.15	top*	0.160	1.175	0.188	
836.60	190	GSM 850	GPRS	32.00	31.54	0.01	0 mm	ZC802W0F	2	1:4.15	right	0.490	1.112	0.545	
1880.00	661	GSM 1900	GPRS	29.00	28.68	-0.03	12 mm	ZC802W0F	2	1:4.15	back	0.671	1.076	0.722	
1850.20	512	GSM 1900	GPRS	20.50	20.18	-0.06	0 mm	ZC802WBB	2	1:4.15	back*	1.020	1.076	**1.098**	
1880.00	661	GSM 1900	GPRS	20.50	20.23	-0.17	0 mm	ZC802WBB	2	1:4.15	back*	1.030	1.064	1.096	A5
1909.80	810	GSM 1900	GPRS	20.50	20.25	-0.04	0 mm	ZC802WBB	2	1:4.15	back*	0.912	1.059	0.966	
1880.00	661	GSM 1900	GPRS	29.00	28.68	-0.04	12 mm	ZC802W0F	2	1:4.15	top	0.394	1.076	0.424	
1880.00	661	GSM 1900	GPRS	20.50	20.23	-0.05	0 mm	ZC802WBB	2	1:4.15	top*	0.476	1.064	0.506	
1880.00	661	GSM 1900	GPRS	29.00	28.68	-0.08	0 mm	ZC802W0F	2	1:4.15	right	0.320	1.076	0.344	
1880.00	661	GSM 1900	GPRS	20.50	20.23	-0.01	0 mm	ZC802WBB	2	1:4.15	back*	0.996	1.064	1.060	
836.60	4183	UMTS 850	RMC	23.50	23.41	0.03	12 mm	ZC802W76	N/A	1:1	back	0.218	1.021	0.223	
836.60	4183	UMTS 850	RMC	18.00	17.46	0.01	0 mm	ZC802W73	N/A	1:1	back*	0.334	1.132	0.378	A6
836.60	4183	UMTS 850	RMC	23.50	23.41	0.21	12 mm	ZC802W76	N/A	1:1	top	0.065	1.021	0.067	
836.60	4183	UMTS 850	RMC	18.00	17.46	-0.01	0 mm	ZC802W73	N/A	1:1	top*	0.077	1.132	0.087	
836.60	4183	UMTS 850	RMC	23.50	23.41	-0.07	0 mm	ZC802W76	N/A	1:1	right	0.253	1.021	0.258	
1880.00	9400	UMTS 1900	RMC	23.50	23.33	0.03	12 mm	ZC802W76	N/A	1:1	back	0.675	1.040	0.702	
1852.40	9262	UMTS 1900	RMC	14.50	14.25	-0.05	0 mm	ZC802W73	N/A	1:1	back*	0.799	1.059	0.846	
1880.00	9400	UMTS 1900	RMC	14.50	14.26	-0.03	0 mm	ZC802W73	N/A	1:1	back*	0.857	1.057	0.906	A7
1907.60	9538	UMTS 1900	RMC	14.50	14.23	-0.05	0 mm	ZC802W73	N/A	1:1	back*	0.736	1.064	0.783	
1880.00	9400	UMTS 1900	RMC	23.50	23.33	0.02	12 mm	ZC802W76	N/A	1:1	top	0.463	1.040	0.482	
1880.00	9400	UMTS 1900	RMC	14.50	14.26	-0.02	0 mm	ZC802W73	N/A	1:1	top*	0.429	1.057	0.453	
1880.00	9400	UMTS 1900	RMC	23.50	23.33	-0.06	0 mm	ZC802W76	N/A	1:1	right	0.441	1.040	0.459	
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 10-3
LTE Body SAR Data

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.	High														(W/kg)		(W/kg)	
1882.50	26365	Mid	LTE Band 25	5	24	23.75	0.04	0	ZC802W1K	QPSK	1	0	12 mm	back	1:1	0.750	1.059	0.794	
1912.50	26665	High	LTE Band 25	5	23	22.71	-0.13	1	ZC802W1K	QPSK	12	6	12 mm	back	1:1	0.481	1.069	0.514	
1852.50	26065	Low	LTE Band 25	5	14.8	14.34	-0.11	0	ZC802W17	QPSK	1	12	0 mm	back*	1:1	0.934	1.112	1.039	
1882.50	26365	Mid	LTE Band 25	5	14.8	14.64	-0.10	0	ZC802W17	QPSK	1	12	0 mm	back*	1:1	0.939	1.038	0.975	
1912.50	26665	High	LTE Band 25	5	14.8	14.47	-0.07	0	ZC802W17	QPSK	1	12	0 mm	back*	1:1	0.614	1.079	0.663	
1852.50	26065	Low	LTE Band 25	5	14.8	14.59	-0.05	0	ZC802W17	QPSK	12	6	0 mm	back*	1:1	0.968	1.050	1.016	A8
1882.50	26365	Mid	LTE Band 25	5	14.8	14.69	-0.08	0	ZC802W17	QPSK	12	6	0 mm	back*	1:1	0.967	1.026	0.992	
1912.50	26665	High	LTE Band 25	5	14.8	14.45	-0.14	0	ZC802W17	QPSK	12	6	0 mm	back*	1:1	0.622	1.084	0.674	
1882.50	26365	Mid	LTE Band 25	5	14.8	14.59	-0.09	0	ZC802W17	QPSK	25	0	0 mm	back*	1:1	0.934	1.050	0.981	
1882.50	26365	Mid	LTE Band 25	5	24	23.75	0.13	0	ZC802W1K	QPSK	1	0	12 mm	top	1:1	0.496	1.059	0.525	
1912.50	26665	High	LTE Band 25	5	23	22.71	0.04	1	ZC802W1K	QPSK	12	6	12 mm	top	1:1	0.343	1.069	0.367	
1882.50	26365	Mid	LTE Band 25	5	14.8	14.64	-0.03	0	ZC802W17	QPSK	1	12	0 mm	top*	1:1	0.472	1.038	0.490	
1882.50	26365	Mid	LTE Band 25	5	14.8	14.69	-0.03	0	ZC802W17	QPSK	12	6	0 mm	top*	1:1	0.481	1.026	0.494	
1882.50	26365	Mid	LTE Band 25	5	24	23.75	0.04	0	ZC802W1K	QPSK	1	0	0 mm	right	1:1	0.436	1.059	0.462	
1912.50	26665	High	LTE Band 25	5	23	22.71	-0.05	1	ZC802W1K	QPSK	12	6	0 mm	right	1:1	0.324	1.069	0.346	
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 10-4
DTS Body SAR Data

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
2412	1	IEEE 802.11b	DSSS	13.50	12.98	0.03	0 mm	ZC802W76	1	back	1:1	0.969	1.127	1.092	A9
2437	6	IEEE 802.11b	DSSS	13.50	12.93	0.04	0 mm	ZC802W76	1	back	1:1	0.864	1.140	0.985	
2462	11	IEEE 802.11b	DSSS	13.50	12.34	0.11	0 mm	ZC802W76	1	back	1:1	0.727	1.306	0.949	
2412	1	IEEE 802.11b	DSSS	13.50	12.98	0.07	0 mm	ZC802W76	1	top	1:1	0.366	1.127	0.412	
2412	1	IEEE 802.11b	DSSS	13.50	12.98	-0.03	0 mm	ZC802W76	1	left	1:1	0.157	1.127	0.177	
2412	1	IEEE 802.11b	DSSS	13.50	12.98	0.03	0 mm	ZC802W76	1	back	1:1	0.940	1.127	1.059	
5745	149	IEEE 802.11a	OFDM	13.50	13.18	0.16	0 mm	ZC802W0F	6	back	1:1	0.801	1.076	0.862	
5765	153	IEEE 802.11a	OFDM	13.50	13.19	0.14	0 mm	ZC802W0F	6	back	1:1	0.628	1.074	0.674	
5805	161	IEEE 802.11a	OFDM	13.50	13.16	0.11	0 mm	ZC802W0F	6	back	1:1	0.826	1.081	0.893	A10
5745	149	IEEE 802.11a	OFDM	13.50	13.18	0.15	0 mm	ZC802W0F	6	top	1:1	0.519	1.076	0.558	
5765	153	IEEE 802.11a	OFDM	13.50	13.19	0.17	0 mm	ZC802W0F	6	top	1:1	0.531	1.074	0.570	
5805	161	IEEE 802.11a	OFDM	13.50	13.16	0.14	0 mm	ZC802W0F	6	top	1:1	0.591	1.081	0.639	
5765	153	IEEE 802.11a	OFDM	13.50	13.19	0.14	0 mm	ZC802W0F	6	left	1:1	0.098	1.074	0.106	
5805	161	IEEE 802.11a	OFDM	13.50	13.16	0.11	0 mm	ZC802W0F	6	back	1:1	0.763	1.081	0.825	
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 10-5
NII Body SAR Data

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #
MHz	Ch.														
5180	36	IEEE 802.11a	OFDM	13.50	13.22	0.10	0 mm	ZC802W0F	6	back	1:1	0.475	1.067	0.507	
5240	48	IEEE 802.11a	OFDM	13.50	13.12	0.06	0 mm	ZC802W0F	6	back	1:1	0.546	1.091	0.596	
5180	36	IEEE 802.11a	OFDM	13.50	13.22	0.02	0 mm	ZC802W0F	6	top	1:1	0.546	1.067	0.583	
5240	48	IEEE 802.11a	OFDM	13.50	13.12	0.05	0 mm	ZC802W0F	6	top	1:1	0.619	1.091	0.675	
5180	36	IEEE 802.11a	OFDM	13.50	13.22	0.03	0 mm	ZC802W0F	6	left	1:1	0.010	1.067	0.010	
5260	52	IEEE 802.11a	OFDM	13.50	13.07	-0.13	0 mm	ZC802W0F	6	back	1:1	0.570	1.104	0.629	
5300	60	IEEE 802.11a	OFDM	13.50	13.00	0.07	0 mm	ZC802W0F	6	back	1:1	0.595	1.122	0.668	
5260	52	IEEE 802.11a	OFDM	13.50	13.07	-0.09	0 mm	ZC802W0F	6	top	1:1	0.626	1.104	0.691	
5300	60	IEEE 802.11a	OFDM	13.50	13.00	0.02	0 mm	ZC802W0F	6	top	1:1	0.706	1.122	**0.792**	
5260	52	IEEE 802.11a	OFDM	13.50	13.07	-0.02	0 mm	ZC802W0F	6	left	1:1	0.013	1.104	0.014	
5500	100	IEEE 802.11a	OFDM	13.50	13.30	0.03	0 mm	ZC802W0F	6	back	1:1	0.687	1.047	0.719	
5560	112	IEEE 802.11a	OFDM	13.50	13.29	-0.03	0 mm	ZC802W0F	6	back	1:1	0.700	1.050	0.735	
5680	136	IEEE 802.11a	OFDM	13.50	13.28	0.12	0 mm	ZC802W0F	6	back	1:1	0.713	1.052	0.750	
5500	100	IEEE 802.11a	OFDM	13.50	13.30	0.16	0 mm	ZC802W0F	6	top	1:1	0.741	1.047	0.776	A11
5560	112	IEEE 802.11a	OFDM	13.50	13.29	-0.01	0 mm	ZC802W0F	6	top	1:1	0.654	1.050	0.687	
5680	136	IEEE 802.11a	OFDM	13.50	13.28	0.18	0 mm	ZC802W0F	6	top	1:1	0.575	1.052	0.605	
5500	100	IEEE 802.11a	OFDM	13.50	13.30	0.00	0 mm	ZC802W0F	6	left	1:1	0.069	1.047	0.072	
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 10-6
DSS Body SAR Data

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #
MHz	Ch.														
2441	39	Bluetooth	FHSS	11.50	11.49	-0.05	0 mm	ZC802W0F	1	back	1:1	0.192	1.002	**0.192**	A12
2441	39	Bluetooth	FHSS	11.50	11.49	-0.08	0 mm	ZC802W0F	1	top	1:1	0.088	1.002	0.089	
2441	39	Bluetooth	FHSS	11.50	11.49	-0.13	0 mm	ZC802W0F	1	left	1:1	0.035	1.002	0.035	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								**Body 1.6 W/kg (mW/g) averaged over 1 gram**							

10.2 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in FCC KDB Publication 616217 D04.
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. Per FCC KDB 865664 D01 v01, variability SAR tests were performed when the measured SAR results for a frequency band were greater than 0.8 W/kg. Repeated SAR measurements are highlighted in the tables above for clarity. Please see Section 12 for variability analysis.
7. Per FCC KDB 616217 D04 Section 4.3, SAR tests are required for the back surface and edges of the tablet with the tablet touching the phantom. The SAR Exclusion Threshold in FCC KDB 447498 D01v05 was applied to determine SAR test exclusion for adjacent edge configurations. SAR tests were required for top and right edge for the main antenna and top and left edge for the BT/WLAN Antenna.
8. Asterisks (*) denotes power reduction active.

GSM Test Notes:

1. Justification for reduced test configurations per KDB Publication 941225 D03v01: The source-based time-averaged output power was evaluated for all multi-slot operations. The multi-slot configuration with the highest frame averaged output power was evaluated for SAR.
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 > ½ dB, instead of the middle channel, the highest output power channel must be used.

CDMA Notes:

1. Body SAR is measured using Subtype 0/1 Physical Layer configurations for Rev. 0 according to KDB 941225 D01 procedures for data devices. Since the average output power of Subtype 2 for Rev. A was less than the Rev. 0 power levels, EVDO Rev. A SAR was not required. SAR is not required for 1x RTT since the maximum average output of each channel is less than ¼ dB higher than that measured in Subtype 0/1 Physical Layer configurations for Rev. 0.
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 > ½ dB, instead of the middle channel, the highest output power channel must be used.

UMTS Notes:

1. UMTS mode in Body SAR was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01v02. HSPA SAR was not required since the average output power of the HSPA subtests was not more than 0.25 dB higher than the RMC level and SAR was less than 1.2 W/kg.
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 > ½ dB, instead of the middle channel, the highest output power channel must be used.

LTE Notes:

1. LTE Considerations: LTE test configurations are determined according to SAR Evaluation Considerations for LTE Devices in FCC KDB Publication 941225 D05v02. Implementation of the general test procedures can be found in Section 6.5.4.
2. MPR is implemented for this device by the manufacturer when the proximity sensor is not active (device at maximum power). 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.

IEEE 802.11 Notes:

1. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 D01v01r02 and April 2010 FCC/TCB Meeting Notes for 2.4 GHz WIFI: Highest average RF output power channel for the lowest data rate was selected for SAR evaluation in 802.11b. Other IEEE 802.11 modes (including 802.11g/n) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11b mode.
2. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 D01v01r02 and April 2010 FCC/TCB Meeting Notes for 5 GHz WIFI: Highest average RF output power channel for the lowest data rate was selected for SAR evaluation in 802.11a. Other IEEE 802.11 modes (including 802.11n 20 MHz and 40 MHz bandwidths) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11a mode.
3. WIFI transmission was verified using an uncalibrated spectrum analyzer.
4. Since the maximum extrapolated peak SAR of the zoom scan for the maximum output channel was greater 1.6 W/kg or the reported 1g averaged SAR was greater than 0.8 W/kg, SAR testing on other default (or corresponding) channels were required for SAR.
5. There is no proximity sensor power reduction mechanism applied for WIFI/BT modes.

11 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

11.1 Introduction

The following procedures adopted from FCC KDB Publication 447498 D01v05 are applicable to handsets with built-in unlicensed transmitters such as 802.11a/b/g/n and Bluetooth devices which may simultaneously transmit with the licensed transmitter.

11.2 Simultaneous Transmission Procedures

This device contains transmitters that may operate simultaneously. Therefore simultaneous transmission analysis is required. Per FCC KDB 447498 D01v05 IV.C.1.iii, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the simultaneous transmitting antennas in a specific a 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.

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

11.3 Body SAR Simultaneous Transmission Analysis

Table 11-1
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body-Worn at 0 mm)

Simult Tx	Configuration	Cell. EVDO - FCC Rule Part 90S SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	0.383	1.092	1.475	N/A
	Top	0.096	0.412	0.508	N/A
	Bottom	0.400	0.400	0.800	N/A
	Right	0.344	0.400	0.744	N/A
	Left	0.400	0.177	0.577	N/A
Simult Tx	Configuration	Cell. EVDO - FCC Rule Part 22H SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	0.443	1.092	1.535	N/A
	Top	0.102	0.412	0.514	N/A
	Bottom	0.400	0.400	0.800	N/A
	Right	0.538	0.400	0.938	N/A
	Left	0.400	0.177	0.577	N/A
Simult Tx	Configuration	PCS EVDO - FCC Rule Part 24E SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	0.759	1.092	See Note	0.02
	Top	0.390	0.412	0.802	N/A
	Bottom	0.400	0.400	0.800	N/A
	Right	0.435	0.400	0.835	N/A
	Left	0.400	0.177	0.577	N/A

Simult Tx	Configuration	GPRS 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	0.813	1.092	See Note	0.01
	Top	0.188	0.412	0.600	N/A
	Bottom	0.400	0.400	0.800	N/A
	Right	0.545	0.400	0.945	N/A
	Left	0.400	0.177	0.577	N/A
Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	1.098	1.092	See Note	0.02
	Top	0.506	0.412	0.918	N/A
	Bottom	0.400	0.400	0.800	N/A
	Right	0.344	0.400	0.744	N/A
	Left	0.400	0.177	0.577	N/A
Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	0.378	1.092	1.470	N/A
	Top	0.087	0.412	0.499	N/A
	Bottom	0.400	0.400	0.800	N/A
	Right	0.258	0.400	0.658	N/A
	Left	0.400	0.177	0.577	N/A
Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	0.906	1.092	See Note	0.02
	Top	0.453	0.412	0.865	N/A
	Bottom	0.400	0.400	0.800	N/A
	Right	0.459	0.400	0.859	N/A
	Left	0.400	0.177	0.577	N/A
Simult Tx	Configuration	LTE Band 25 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	1.039	1.092	See Note	0.02
	Top	0.494	0.412	0.906	N/A
	Bottom	0.400	0.400	0.800	N/A
	Right	0.462	0.400	0.862	N/A
	Left	0.400	0.177	0.577	N/A

Note: No evaluation was performed to determine the aggregate 1g SAR for these configurations as the SPLS ratio between the antenna pairs was below 0.04 per FCC KDB 447498 D01v05. See Section 11.4 for detailed SPLS ratio analysis.

Note: For configurations excluded per 447498 D01v05, an estimated SAR of 0.4 W/kg was used to determine simultaneous transmission SAR exclusion since the test separation distance was >50 mm.

Table 11-2
Simultaneous Transmission Scenario with 5 GHz WLAN (Body at 0 mm)

Simult Tx	Configuration	Cell. EVDO - FCC Rule Part 90S SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	0.383	0.893	1.276	N/A
	Top	0.096	0.675	0.771	N/A
	Bottom	0.400	0.400	0.800	N/A
	Right	0.344	0.400	0.744	N/A
	Left	0.400	0.106	0.506	N/A
Simult Tx	Configuration	Cell. EVDO - FCC Rule Part 22H SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	0.443	0.893	1.336	N/A
	Top	0.102	0.675	0.777	N/A
	Bottom	0.400	0.400	0.800	N/A
	Right	0.538	0.400	0.938	N/A
	Left	0.400	0.106	0.506	N/A
Simult Tx	Configuration	PCS EVDO - FCC Rule Part 24E SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	0.759	0.893	See Note	0.01
	Top	0.390	0.675	1.065	N/A
	Bottom	0.400	0.400	0.800	N/A
	Right	0.435	0.400	0.835	N/A
	Left	0.400	0.106	0.506	N/A
Simult Tx	Configuration	GPRS 850 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	0.813	0.893	See Note	0.01
	Top	0.188	0.675	0.863	N/A
	Bottom	0.400	0.400	0.800	N/A
	Right	0.545	0.400	0.945	N/A
	Left	0.400	0.106	0.506	N/A
Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	1.098	0.893	See Note	0.02
	Top	0.506	0.675	1.181	N/A
	Bottom	0.400	0.400	0.800	N/A
	Right	0.344	0.400	0.744	N/A
	Left	0.400	0.106	0.506	N/A
Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	0.378	0.893	1.271	N/A
	Top	0.087	0.675	0.762	N/A
	Bottom	0.400	0.400	0.800	N/A
	Right	0.258	0.400	0.658	N/A
	Left	0.400	0.106	0.506	N/A

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	0.906	0.893	See Note	0.02
	Top	0.453	0.675	1.128	N/A
	Bottom	0.400	0.400	0.800	N/A
	Right	0.459	0.400	0.859	N/A
	Left	0.400	0.106	0.506	N/A
Simult Tx	Configuration	LTE Band 25 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	1.039	0.893	See Note	0.02
	Top	0.494	0.675	1.169	N/A
	Bottom	0.400	0.400	0.800	N/A
	Right	0.462	0.400	0.862	N/A
	Left	0.400	0.106	0.506	N/A

Note: No evaluation was performed to determine the aggregate 1g SAR for these configurations as the SPLS ratio between the antenna pairs was below 0.04 per FCC KDB 447498 D01v05. See Section 11.4 for detailed SPLS ratio analysis.
Note: The above table considers the 1g Body SAR in a possible scenario in which 5 GHz Wifi Direct (Ch. 36-48, 149-161 only) function is operating simultaneously with the GPRS/CDMA/UMTS/LTE antenna.
Note: For configurations excluded per 447498 D01v05, an estimated SAR of 0.4 W/kg was used to determine simultaneous transmission SAR exclusion since the test separation distance was >50 mm.

Table 11-3
Simultaneous Transmission Scenario with Bluetooth (Body-Worn at 0 mm)

Simult Tx	Configuration	Cell. EVDO - FCC Rule Part 90S SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	Cell. EVDO - FCC Rule Part 22H SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.383	0.192	0.575	Body SAR	Back	0.443	0.192	0.635
	Top	0.096	0.089	0.185		Top	0.102	0.089	0.191
	Bottom	0.400	0.400	0.800		Bottom	0.400	0.400	0.800
	Right	0.344	0.400	0.744		Right	0.538	0.400	0.938
	Left	0.400	0.035	0.435		Left	0.400	0.035	0.435
Simult Tx	Configuration	PCS EVDO - FCC Rule Part 24E SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GPRS 850 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.759	0.192	0.951	Body SAR	Back	0.813	0.192	1.005
	Top	0.390	0.089	0.479		Top	0.188	0.089	0.277
	Bottom	0.400	0.400	0.800		Bottom	0.400	0.400	0.800
	Right	0.435	0.400	0.835		Right	0.545	0.400	0.945
	Left	0.400	0.035	0.435		Left	0.400	0.035	0.435
Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 850 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	1.098	0.192	1.290	Body SAR	Back	0.378	0.192	0.570
	Top	0.506	0.089	0.595		Top	0.087	0.089	0.176
	Bottom	0.400	0.400	0.800		Bottom	0.400	0.400	0.800
	Right	0.344	0.400	0.744		Right	0.258	0.400	0.658
	Left	0.400	0.035	0.435		Left	0.400	0.035	0.435
Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 25 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.906	0.192	1.098	Body SAR	Back	1.039	0.192	1.231
	Top	0.453	0.089	0.542		Top	0.494	0.089	0.583
	Bottom	0.400	0.400	0.800		Bottom	0.400	0.400	0.800
	Right	0.459	0.400	0.859		Right	0.462	0.400	0.862
	Left	0.400	0.035	0.435		Left	0.400	0.035	0.435

Note: For configurations excluded per 447498 D01v05, an estimated SAR of 0.4 W/kg was used to determine simultaneous transmission SAR exclusion since the test separation distance was >50 mm.

Table 11-4
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Back Side at 12 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Back Side	Cell. CDMA - FCC Rule Part 90S	0.582	<1.092	See Note	<0.01
Back Side	Cell. CDMA - FCC Rule Part 22H	0.644	<1.092	See Note	<0.01
Back Side	PCS CDMA - FCC Rule Part 24E	0.782	<1.092	See Note	<0.02
Back Side	GSM 850	0.413	<1.092	<1.505	N/A
Back Side	GSM 1900	0.722	<1.092	See Note	<0.02
Back Side	UMTS 850	0.223	<1.092	<1.315	N/A
Back Side	UMTS 1900	0.702	<1.092	See Note	<0.01
Back Side	LTE Band 25	0.794	<1.092	See Note	<0.02

Note: No evaluation was performed to determine the aggregate 1g SAR for these configurations as the SPLS ratio between the antenna pairs was below 0.04 per FCC KDB 447498 D01v05. See Section 11.4 for detailed SPLS ratio analysis.

Table 11-5
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Top Edge at 12 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Top Edge	Cell. CDMA - FCC Rule Part 90S	0.221	<0.412	<0.633	N/A
Top Edge	Cell. CDMA - FCC Rule Part 22H	0.158	<0.412	<0.57	N/A
Top Edge	PCS CDMA - FCC Rule Part 24E	0.582	<0.412	<0.994	N/A
Top Edge	GSM 850	0.121	<0.412	<0.533	N/A
Top Edge	GSM 1900	0.424	<0.412	<0.836	N/A
Top Edge	UMTS 850	0.067	<0.412	<0.479	N/A
Top Edge	UMTS 1900	0.482	<0.412	<0.894	N/A
Top Edge	LTE Band 25	0.525	<0.412	<0.937	N/A

Table 11-6
Simultaneous Transmission Scenario with 5 GHz WLAN (Back Side at 12 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Back Side	Cell. CDMA - FCC Rule Part 90S	0.582	<0.893	<1.475	N/A
Back Side	Cell. CDMA - FCC Rule Part 22H	0.644	<0.893	<1.537	N/A
Back Side	PCS CDMA - FCC Rule Part 24E	0.782	<0.893	See Note	<0.01
Back Side	GSM 850	0.413	<0.893	<1.306	N/A
Back Side	GSM 1900	0.722	<0.893	See Note	<0.01
Back Side	UMTS 850	0.223	<0.893	<1.116	N/A
Back Side	UMTS 1900	0.702	<0.893	<1.595	N/A
Back Side	LTE Band 25	0.794	<0.893	See Note	<0.01

Note: No evaluation was performed to determine the aggregate 1g SAR for these configurations as the SPLS ratio between the antenna pairs was below 0.04 per FCC KDB 447498 D01v05. See Section 11.4 for detailed SPLS ratio analysis.
Note: The above table considers the 1g Body SAR in a possible scenario in which 5 GHz Wifi Direct (Ch. 36-48, 149-161 only) function is operating simultaneously with the GPRS/CDMA/UMTS/LTE antenna.

Table 11-7
Simultaneous Transmission Scenario with 5 GHz WLAN (Top Edge at 12 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Top Edge	Cell. CDMA - FCC Rule Part 90S	0.221	<0.675	<0.896	N/A
Top Edge	Cell. CDMA - FCC Rule Part 22H	0.158	<0.675	<0.833	N/A
Top Edge	PCS CDMA - FCC Rule Part 24E	0.582	<0.675	<1.257	N/A
Top Edge	GSM 850	0.121	<0.675	<0.796	N/A
Top Edge	GSM 1900	0.424	<0.675	<1.099	N/A
Top Edge	UMTS 850	0.067	<0.675	<0.742	N/A
Top Edge	UMTS 1900	0.482	<0.675	<1.157	N/A
Top Edge	LTE Band 25	0.525	<0.675	<1.2	N/A

Table 11-8
Simultaneous Transmission Scenario with Bluetooth (Back side at 12 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Back Side	Cell. CDMA - FCC Rule Part 90S	0.582	<0.192	<0.774	N/A
Back Side	Cell. CDMA - FCC Rule Part 22H	0.644	<0.192	<0.836	N/A
Back Side	PCS CDMA - FCC Rule Part 24E	0.782	<0.192	<0.974	N/A
Back Side	GSM 850	0.413	<0.192	<0.605	N/A
Back Side	GSM 1900	0.722	<0.192	<0.914	N/A
Back Side	UMTS 850	0.223	<0.192	<0.415	N/A
Back Side	UMTS 1900	0.702	<0.192	<0.894	N/A
Back Side	LTE Band 25	0.794	<0.192	<0.986	N/A

Table 11-9
Simultaneous Transmission Scenario with Bluetooth (Top Edge at 12 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Top Edge	Cell. CDMA - FCC Rule Part 90S	0.221	<0.089	<0.31	N/A
Top Edge	Cell. CDMA - FCC Rule Part 22H	0.158	<0.089	<0.247	N/A
Top Edge	PCS CDMA - FCC Rule Part 24E	0.582	<0.089	<0.671	N/A
Top Edge	GSM 850	0.121	<0.089	<0.21	N/A
Top Edge	GSM 1900	0.424	<0.089	<0.513	N/A
Top Edge	UMTS 850	0.067	<0.089	<0.156	N/A
Top Edge	UMTS 1900	0.482	<0.089	<0.571	N/A
Top Edge	LTE Band 25	0.525	<0.089	<0.614	N/A

11.4 SPLSR Evaluation Analysis

Per FCC KDB Publication 447498 D01v05, when the sum of the standalone transmitters is more than 1.6 W/kg, the SAR sum to peak locations can be analyzed to determine SAR distribution overlaps. When the SAR peak to location ratio (shown below) for each pair of antennas is ≤ 0.04, simultaneous SAR evaluation is not required. The distance between the transmitters was calculated using the following formula.

$$\text{Distance}_{Tx1-Tx2} = R_i = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$$

$$\text{SPLS Ratio} = \frac{(SAR_1 + SAR_2)^{1.5}}{R_i}$$

The sum of the standalone SAR values was above 1.6 W/kg for the Body Back side configuration at a separation distance of 0cm with PCS EVDO potentially operating with 2.4 GHz WIFI.

Table 11-10
Peak SAR Locations for Body Back Side PCS EVDO and 2.4 GHz WLAN

Mode/Band	x (mm)	y (mm)	z (mm)
PCS CDMA - FCC Rule Part 24E	-3.50	67.00	-203.00
IEEE 802.11b	-28.40	-95.80	-205.00

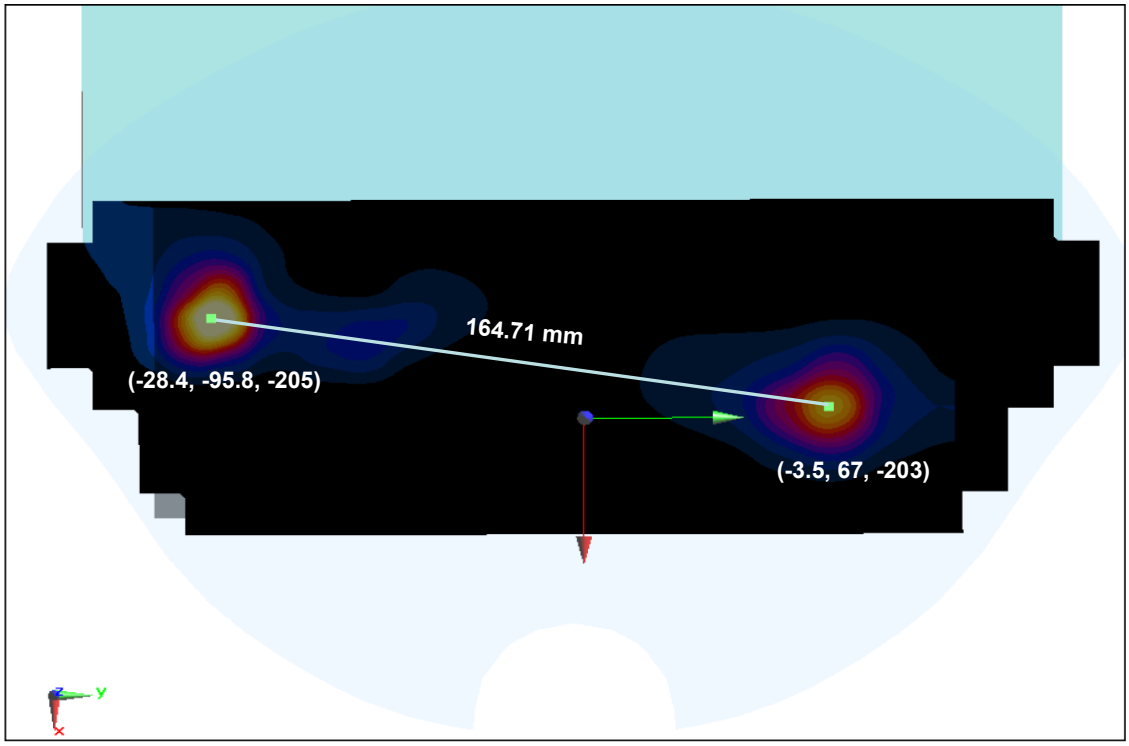


Figure 11-1
Peak SAR Location Plot of PCS EVDO and 2.4 GHz WLAN

Table 11-11
SAR Sum to Peak Location Separation Ratio Calculation

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$
PCS CDMA - FCC Rule Part 24E	IEEE 802.11b	0.759	1.092	1.851	164.71	0.02

The sum of the standalone SAR values was above 1.6 W/kg for the Body Back side configuration at a separation distance of 0cm with GPRS 850 potentially operating with 2.4 GHz WIFI.

Table 11-12
Peak SAR Locations for Body Back Side GPRS 850 and 2.4 GHz WLAN

Mode/Band	x (mm)	y (mm)	z (mm)
GPRS 850	-33.60	99.00	-202.00
IEEE 802.11b	-28.40	-95.80	-205.00

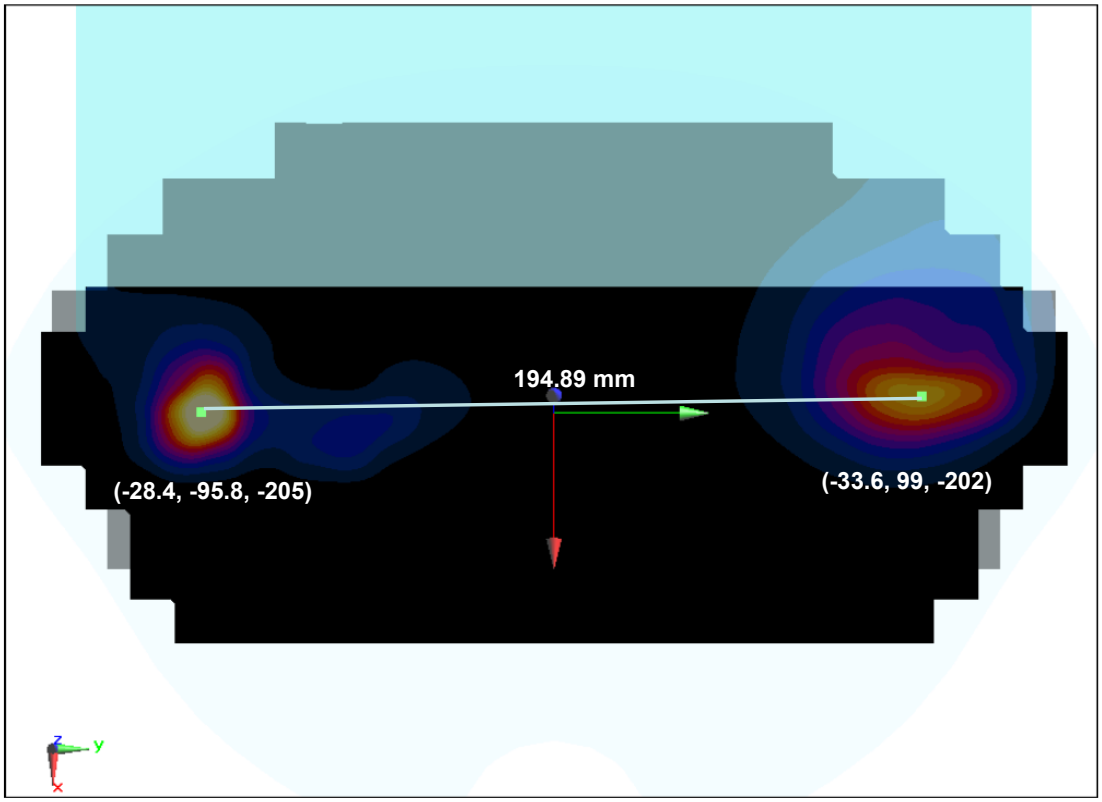


Figure 11-2
Peak SAR Location Plot of GPRS 850 and 2.4 GHz WLAN

Table 11-13
SAR Sum to Peak Location Separation Ratio Calculation

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$
GPRS 850	IEEE 802.11b	0.813	1.092	1.905	194.89	0.01

The sum of the standalone SAR values was above 1.6 W/kg for the Body Back side configuration at a separation distance of 0cm with GPRS 1900 potentially operating with 2.4 GHz WIFI.

Table 11-14
Peak SAR Locations for Body Back Side GRPS 1900 and 2.4 GHz WLAN

Mode/Band	x (mm)	y (mm)	z (mm)
GPRS 1900	-10.00	70.00	-203.00
IEEE 802.11b	-28.40	-95.80	-205.00

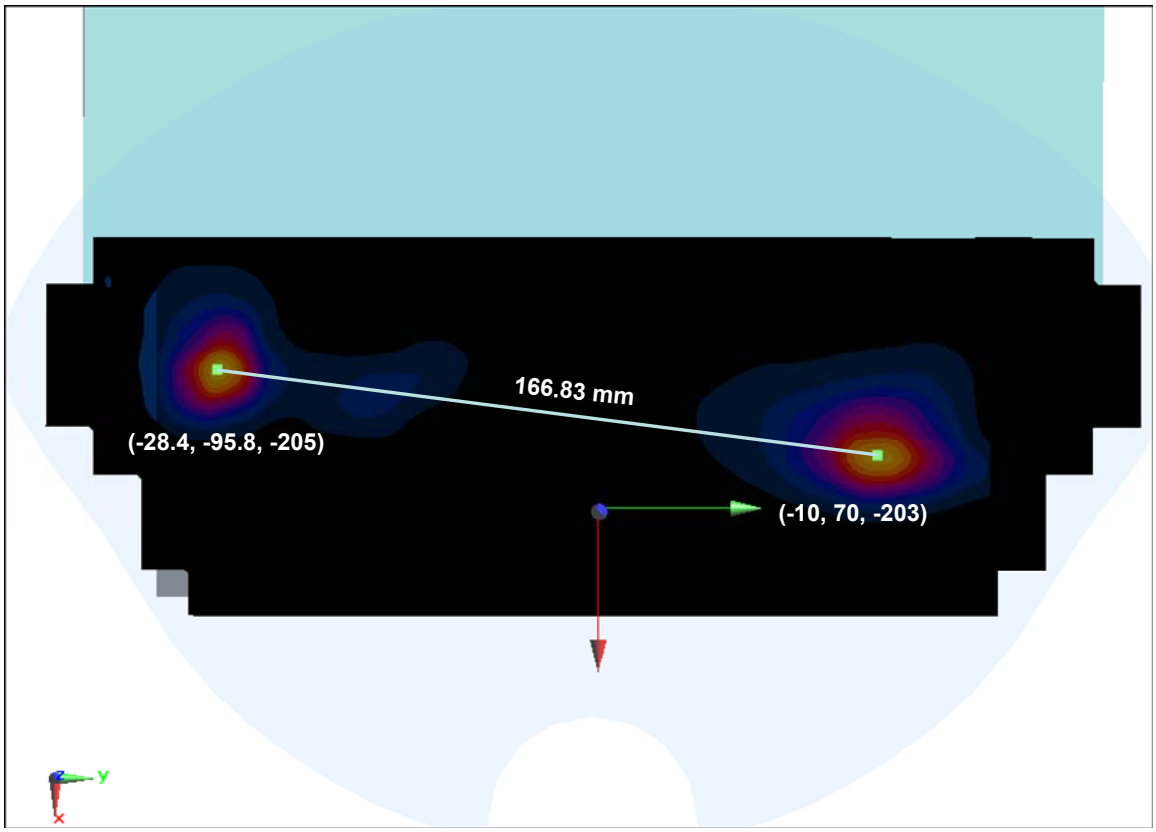


Figure 11-3
Peak SAR Location Plot of GPRS 1900 and 2.4 GHz WLAN

Table 11-15
SAR Sum to Peak Location Separation Ratio Calculation

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$
GPRS 1900	IEEE 802.11b	1.098	1.092	2.19	166.83	0.02

The sum of the standalone SAR values was above 1.6 W/kg for the Body Back side configuration at a separation distance of 0cm with UMTS 1900 potentially operating with 2.4 GHz WIFI.

Table 11-16
Peak SAR Locations for Body Back Side UMTS 1900 and 2.4 GHz WLAN

Mode/Band	x (mm)	y (mm)	z (mm)
UMTS 1900	-15.50	52.50	-203.00
IEEE 802.11b	-28.40	-95.80	-205.00

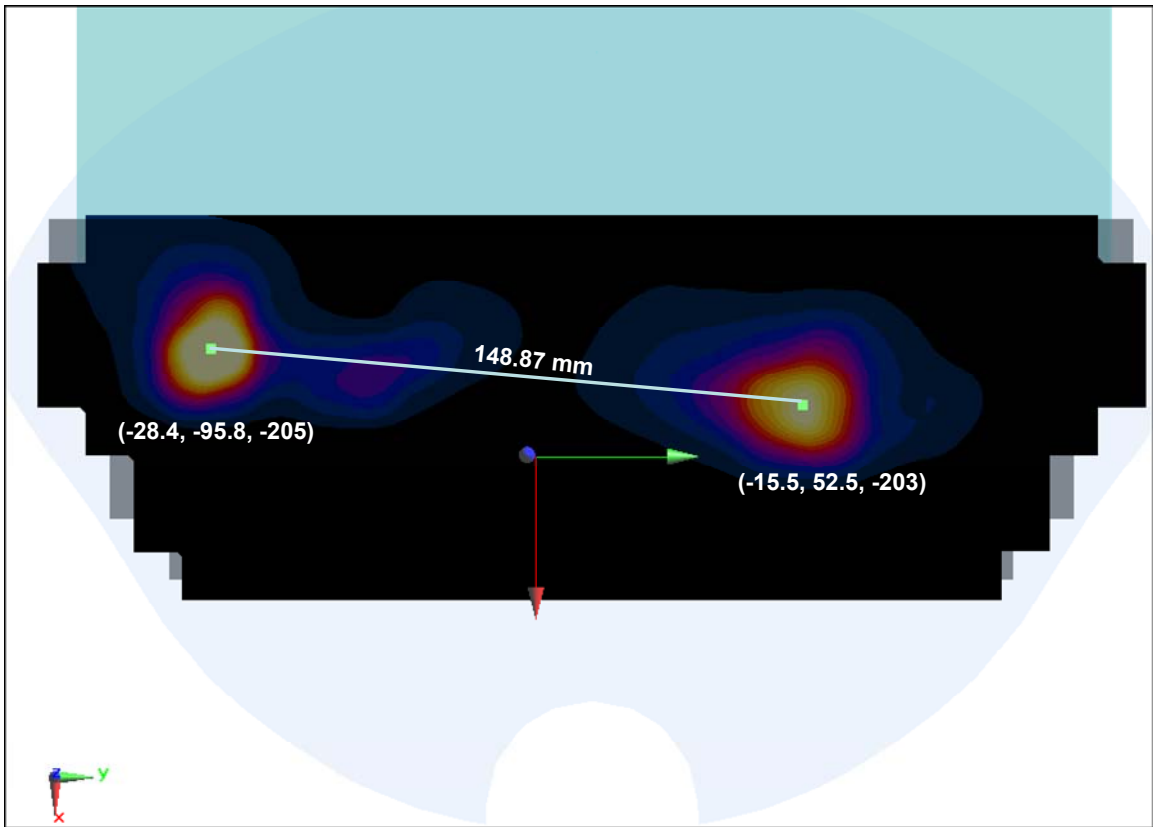


Figure 11-4
Peak SAR Location Plot of UMTS 1900 and 2.4 GHz WLAN

Table 11-17
SAR Sum to Peak Location Separation Ratio Calculation

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$
UMTS 1900	IEEE 802.11b	0.906	1.092	1.998	148.87	0.02

The sum of the standalone SAR values was above 1.6 W/kg for the Body Back side configuration at a separation distance of 0cm with LTE Band 25 potentially operating with 2.4 GHz WIFI.

Table 11-18
Peak SAR Locations for Body Back Side LTE Band 25 and 2.4 GHz WLAN

Mode/Band	x (mm)	y (mm)	z (mm)
LTE Band 25	-24.50	64.50	-203.00
IEEE 802.11b	-28.40	-95.80	-205.00

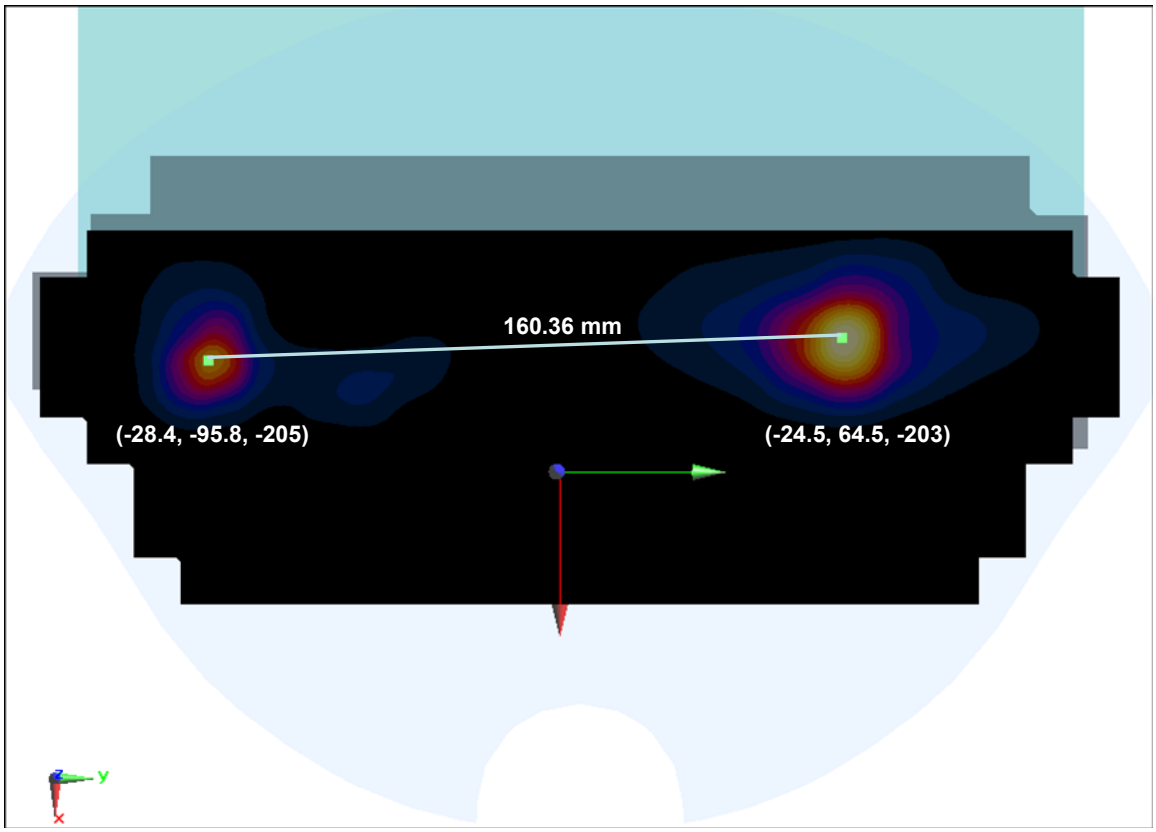


Figure 11-5
Peak SAR Location Plot of LTE Band 25 and 2.4 GHz WLAN

Table 11-19
SAR Sum to Peak Location Separation Ratio Calculation

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$
LTE Band 25	IEEE 802.11b	1.039	1.092	2.131	160.36	0.02

The sum of the standalone SAR values was above 1.6 W/kg for the Body Back side configuration at a separation distance of 0cm with PCS EVDO potentially operating with 5 GHz WIFI.

Table 11-20
Peak SAR Locations for Body Back Side PCS EVDO and 5 GHz WLAN

Mode/Band	x (mm)	y (mm)	z (mm)
PCS CDMA - FCC Rule Part 24E	-3.50	67.00	-203.00
IEEE 802.11a	-5.03	-92.00	-208.00

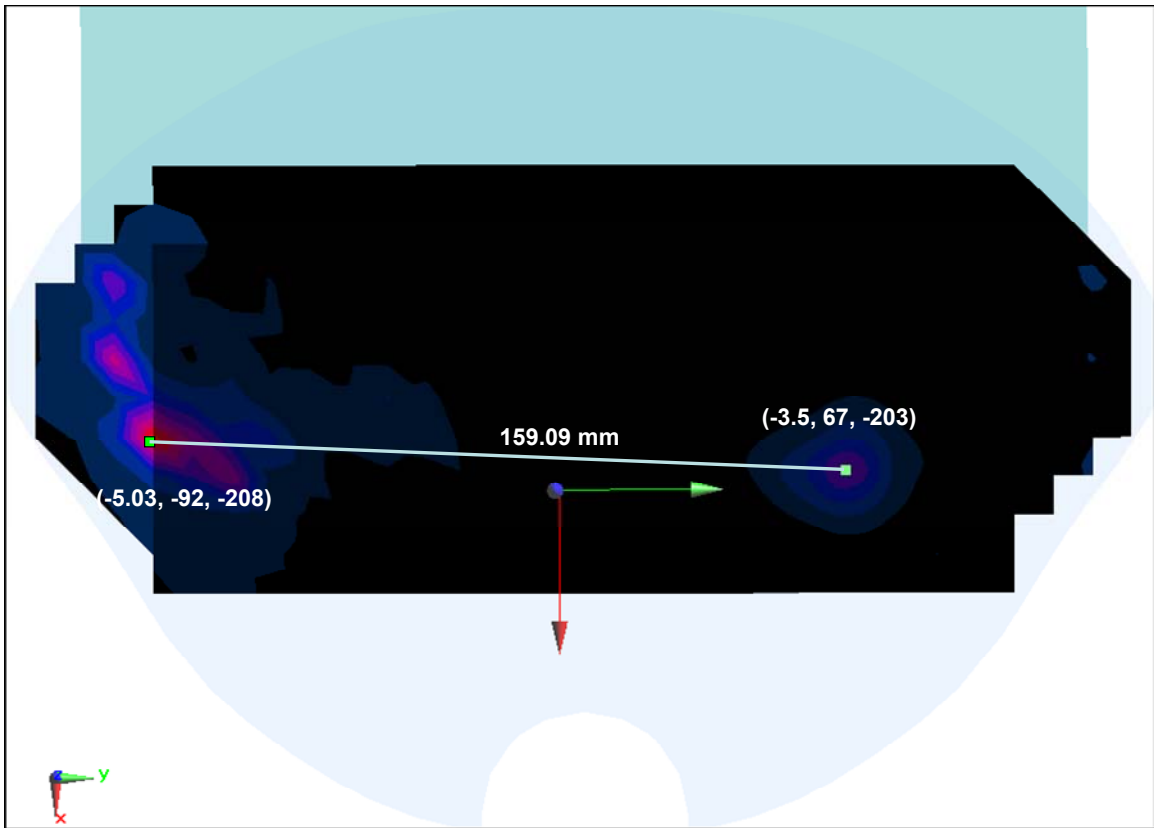


Figure 11-6
Peak SAR Location Plot of PCS EVDO and 5 GHz WLAN

Table 11-21
SAR Sum to Peak Location Separation Ratio Calculation

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$
PCS CDMA - FCC Rule Part 24E	IEEE 802.11a	0.759	0.893	1.652	159.09	0.01

The sum of the standalone SAR values was above 1.6 W/kg for the Body Back side configuration at a separation distance of 0cm with GPRS 850 potentially operating with 5 GHz WIFI.

Table 11-22
Peak SAR Locations for Body Back Side GPRS 850 and 5 GHz WLAN

Mode/Band	x (mm)	y (mm)	z (mm)
GPRS 850	-33.60	99.00	-202.00
IEEE 802.11a	-5.03	-92.00	-208.00

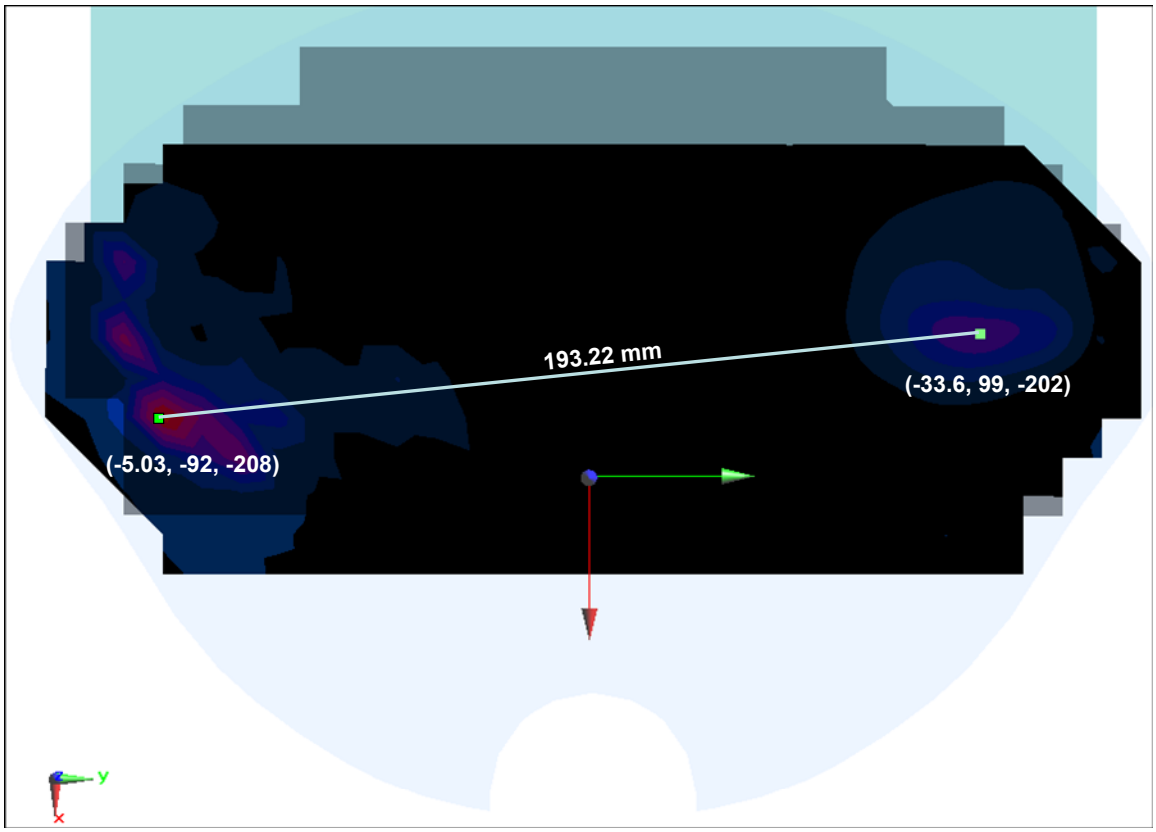


Figure 11-7
Peak SAR Location Plot of GPRS 850 and 5 GHz WLAN

Table 11-23
SAR Sum to Peak Location Separation Ratio Calculation

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$
GPRS 850	IEEE 802.11a	0.813	0.893	1.706	193.22	0.01

The sum of the standalone SAR values was above 1.6 W/kg for the Body Back side configuration at a separation distance of 0cm with GPRS 1900 potentially operating with 5 GHz WIFI.

Table 11-24
Peak SAR Locations for Body Back Side GRPS 1900 and 5 GHz WLAN

Mode/Band	x (mm)	y (mm)	z (mm)
GPRS 1900	-10.00	70.00	-203.00
IEEE 802.11a	-5.03	-92.00	-208.00

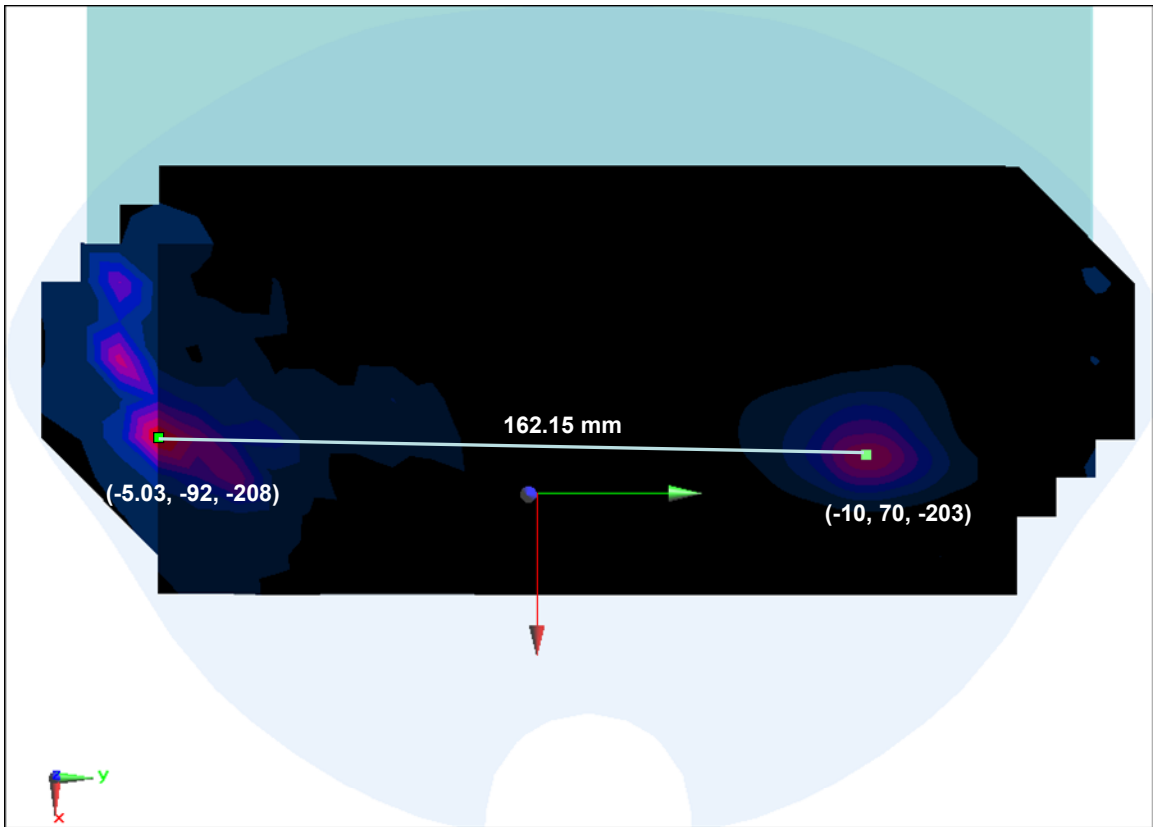


Figure 11-8
Peak SAR Location Plot of GPRS 1900 and 5 GHz WLAN

Table 11-25
SAR Sum to Peak Location Separation Ratio Calculation

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$
GPRS 1900	IEEE 802.11a	1.098	0.893	1.991	162.15	0.02

The sum of the standalone SAR values was above 1.6 W/kg for the Body Back side configuration at a separation distance of 0cm with UMTS 1900 potentially operating with 5 GHz WIFI.

Table 11-26
Peak SAR Locations for Body Back Side UMTS 1900 and 5 GHz WLAN

Mode/Band	x (mm)	y (mm)	z (mm)
UMTS 1900	-15.50	52.50	-203.00
IEEE 802.11a	-5.03	-92.00	-208.00

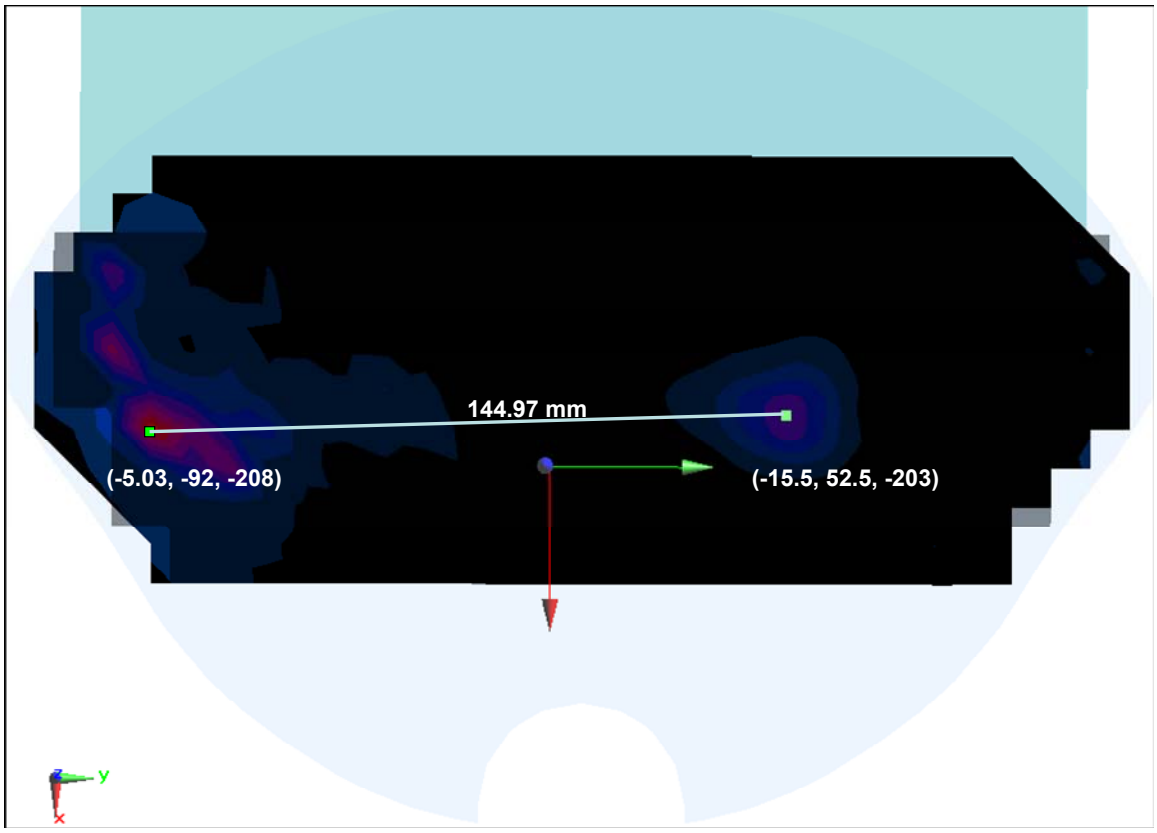


Figure 11-9
Peak SAR Location Plot of UMTS 1900 and 5 GHz WLAN

Table 11-27
SAR Sum to Peak Location Separation Ratio Calculation

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$
UMTS 1900	IEEE 802.11a	0.906	0.893	1.799	144.97	0.02

The sum of the standalone SAR values was above 1.6 W/kg for the Body Back side configuration at a separation distance of 0cm with LTE Band 25 potentially operating with 5 GHz WIFI.

Table 11-28
Peak SAR Locations for Body Back Side LTE Band 25 and 5 GHz WLAN

Mode/Band	x (mm)	y (mm)	z (mm)
LTE Band 25	-24.50	64.50	-203.00
IEEE 802.11a	-5.03	-92.00	-208.00

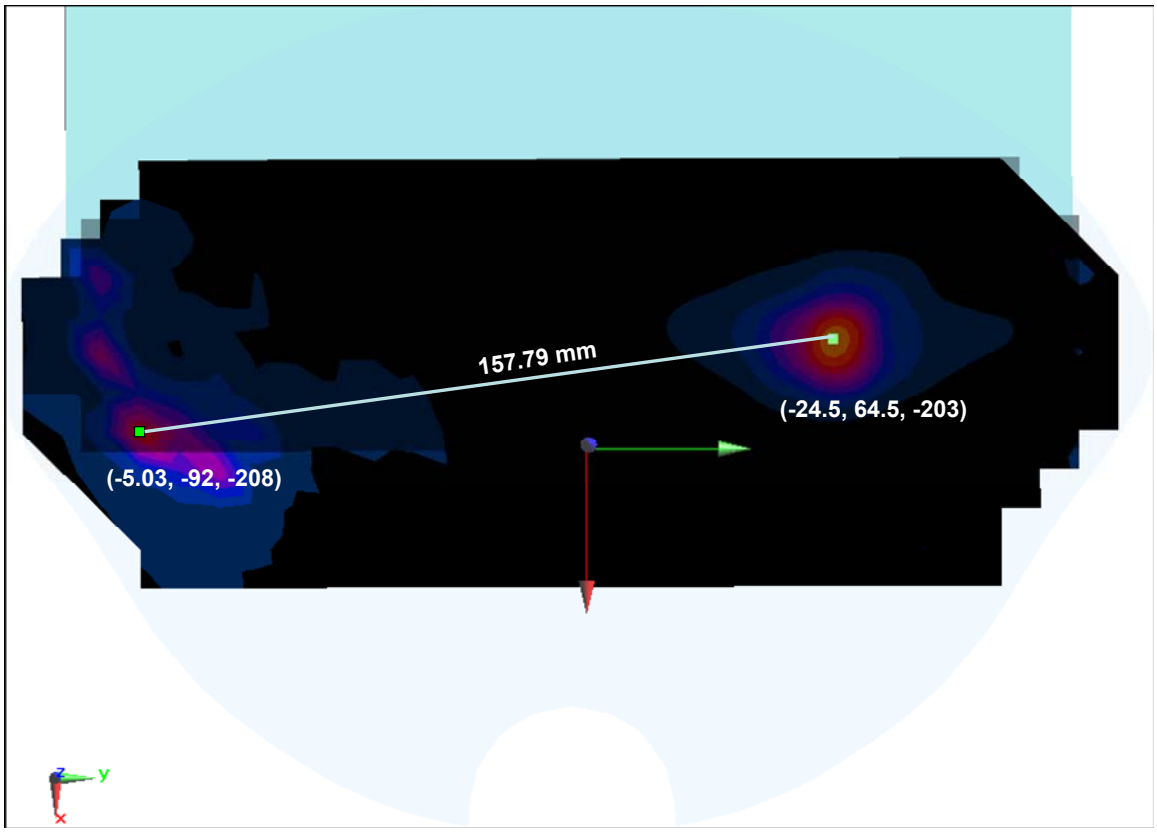


Figure 11-10
Peak SAR Location Plot of LTE Band 25 and 5 GHz WLAN

Table 11-29
SAR Sum to Peak Location Separation Ratio Calculation

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$
LTE Band 25	IEEE 802.11a	1.039	0.893	1.932	157.79	0.02

The sum of the standalone SAR values was above 1.6 W/kg for the Body Back side configuration at a separation distance of 1.2 cm with Cell. EVDO FCC Rule Part 90S potentially operating with 2.4 GHz WIFI.

Table 11-30
Peak SAR Locations for Body Back Side Cell. EVDO- FCC Rule Part 90S and 2.4 GHz WLAN

Mode/Band	x (mm)	y (mm)	z (mm)
Cell. CDMA - FCC Rule Part 90S	-24.00	95.00	-202.00
IEEE 802.11b	-28.40	-95.80	-205.00

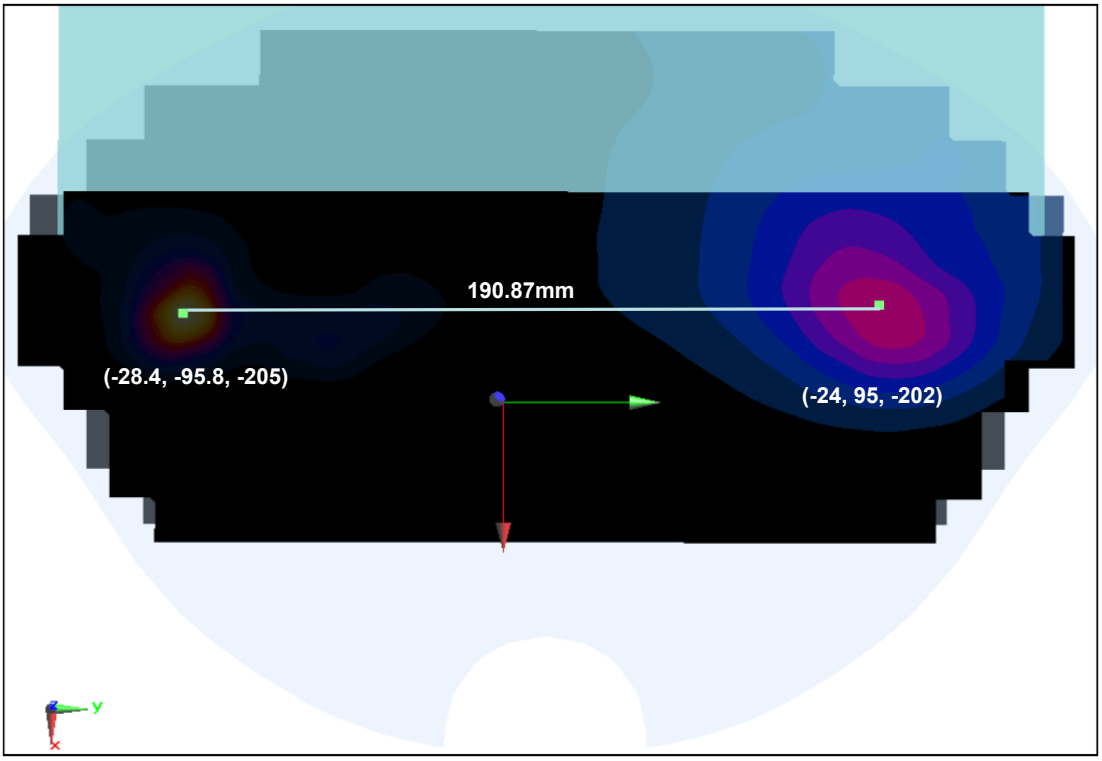


Figure 11-11
Peak SAR Location Plot of Cell. EVDO- FCC Rule Part 90S and 2.4 GHz WLAN

Table 11-31
SAR Sum to Peak Location Separation Ratio Calculation

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$
Cell. CDMA - FCC Rule Part 90S	IEEE 802.11b	0.582	<1.092	<1.674	190.87	<0.01

The sum of the standalone SAR values was above 1.6 W/kg for the Body Back side configuration at a separation distance of 1.2 cm with Cell. EVDO FCC Rule Part 22H potentially operating with 2.4 GHz WIFI.

Table 11-32
Peak SAR Locations for Body Back Side Cell. EVDO- FCC Rule Part 22H and 2.4 GHz WLAN

Mode/Band	x (mm)	y (mm)	z (mm)
Cell. CDMA - FCC Rule Part 22H	-33.50	87.00	-202.00
IEEE 802.11b	-28.40	-95.80	-205.00

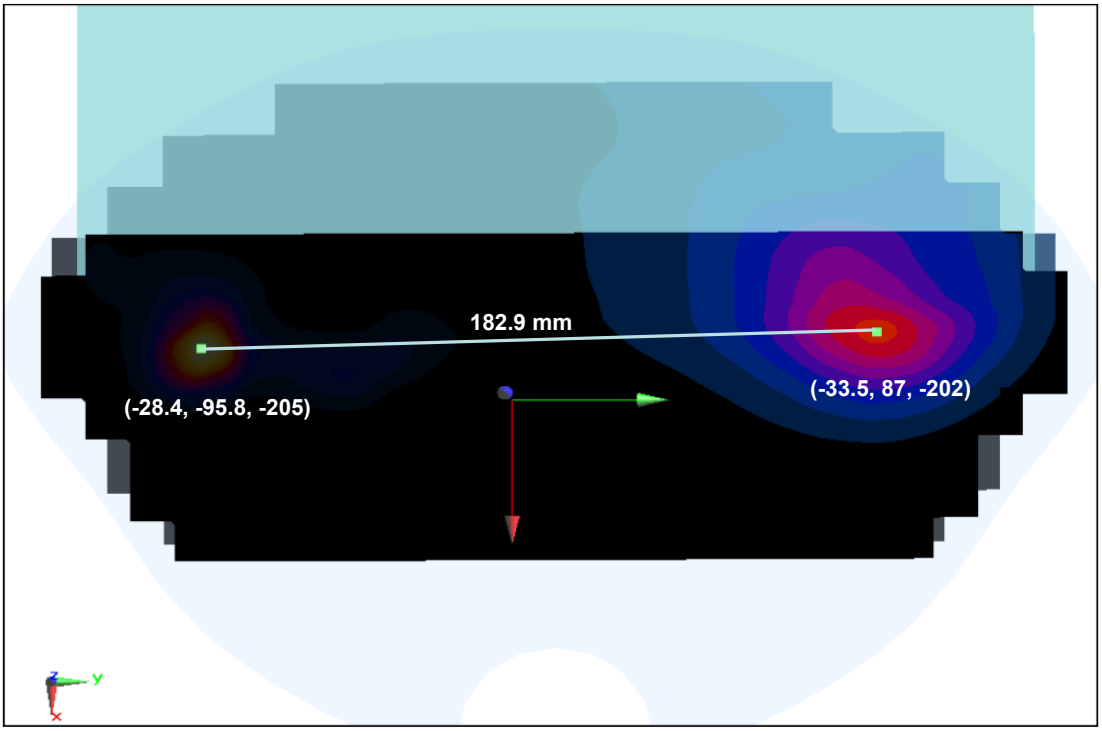


Figure 11-12
Peak SAR Location Plot of Cell. EVDO- FCC Rule Part 22H and 2.4 GHz WLAN

Table 11-33
SAR Sum to Peak Location Separation Ratio Calculation

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$
Cell. CDMA - FCC Rule Part 22H	IEEE 802.11b	0.644	<1.092	<1.736	182.9	<0.01

The sum of the standalone SAR values was above 1.6 W/kg for the Body Back side configuration at a separation distance of 1.2 cm with PCS EVDO potentially operating with 2.4 GHz WIFI.

Table 11-34
Peak SAR Locations for Body Back Side PCS EVDO and 2.4 GHz WLAN

Mode/Band	x (mm)	y (mm)	z (mm)
PCS CDMA - FCC Rule Part 24E	-23.00	58.50	-203.00
IEEE 802.11b	-28.40	-95.80	-205.00

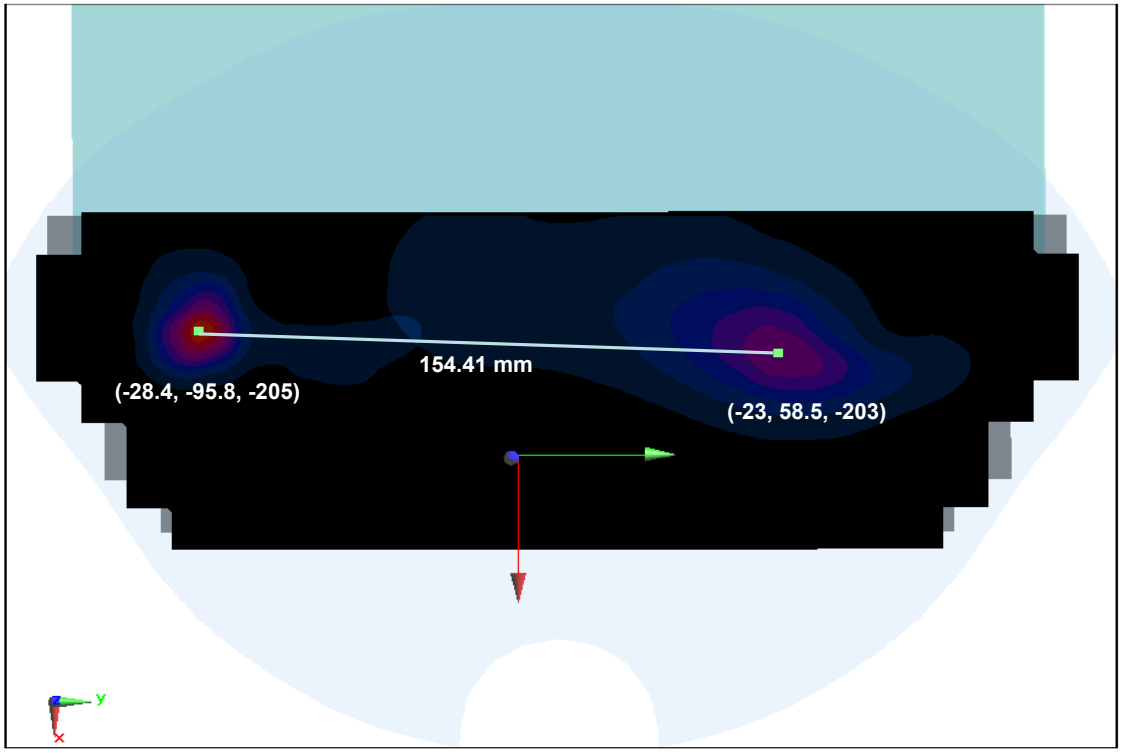


Figure 11-13
Peak SAR Location Plot of PCS EVDO and 2.4 GHz WLAN

Table 11-35
SAR Sum to Peak Location Separation Ratio Calculation

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$
PCS CDMA - FCC Rule Part 24E	IEEE 802.11b	0.782	<1.092	<1.874	154.41	<0.02

The sum of the standalone SAR values was above 1.6 W/kg for the Body Back side configuration at a separation distance of 1.2 cm with GPRS 1900 potentially operating with 2.4 GHz WIFI.

Table 11-36
Peak SAR Locations for Body Back Side GPRS 1900 and 2.4 GHz WLAN

Mode/Band	x (mm)	y (mm)	z (mm)
GPRS 1900	-9.50	47.50	-203.00
IEEE 802.11b	-28.40	-95.80	-205.00

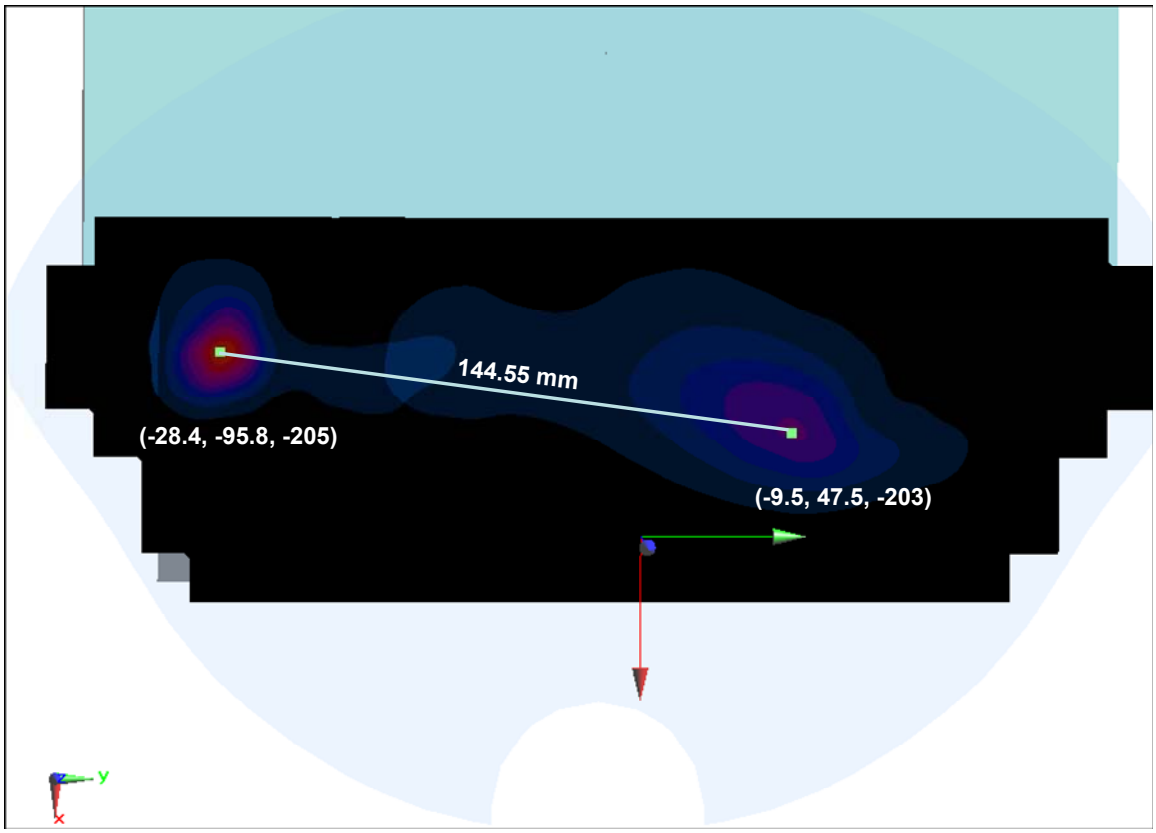


Figure 11-14
Peak SAR Location Plot of GPRS 1900 and 2.4 GHz WLAN

Table 11-37
SAR Sum to Peak Location Separation Ratio Calculation

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$
GPRS 1900	IEEE 802.11b	0.722	<1.092	<1.886	144.55	<0.02

The sum of the standalone SAR values was above 1.6 W/kg for the Body Back side configuration at a separation distance of 1.2 cm with UMTS 1900 potentially operating with 2.4 GHz WIFI.

Table 11-38
Peak SAR Locations for Body Back Side GPRS 1900 and 2.4 GHz WLAN

Mode/Band	x (mm)	y (mm)	z (mm)
UMTS 1900	-21.50	66.00	-203.00
IEEE 802.11b	-28.40	-95.80	-205.00

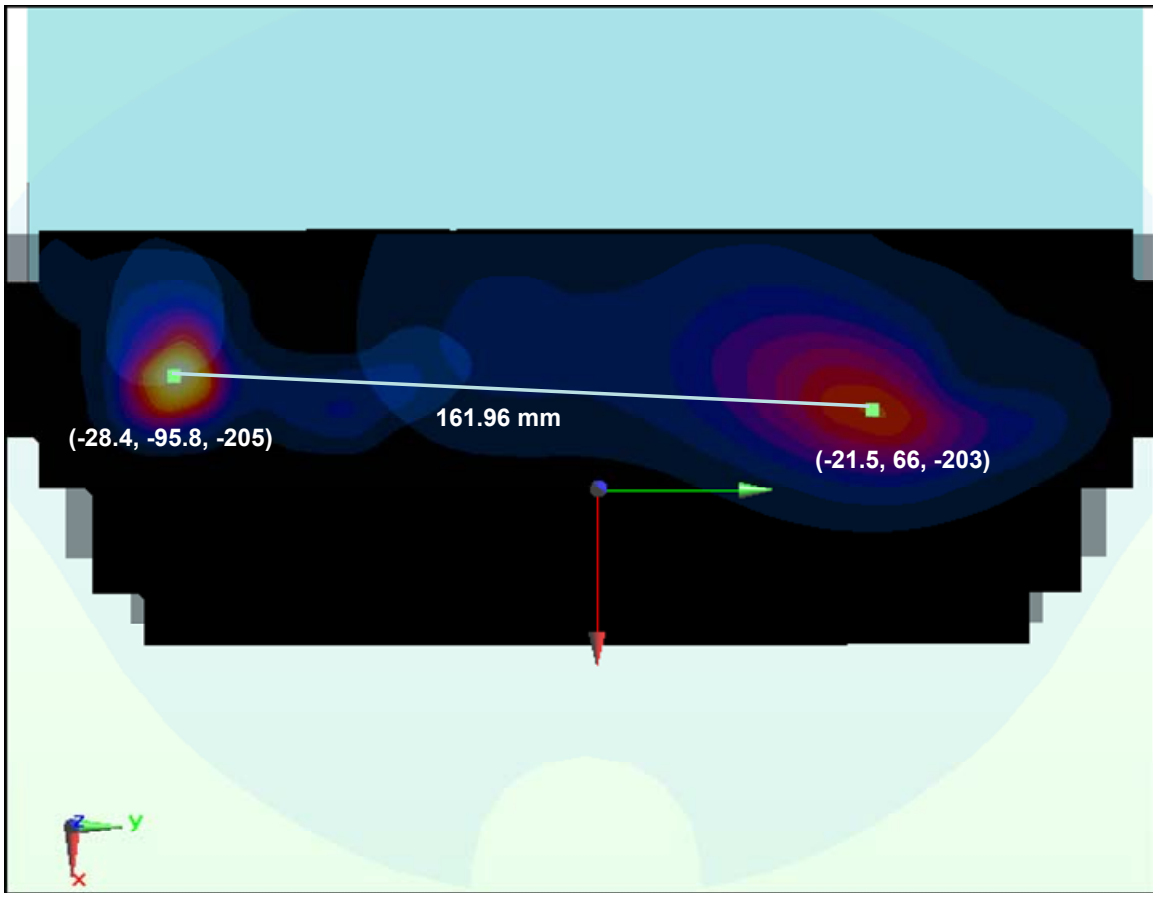


Figure 11-15
Peak SAR Location Plot of UMTS 1900 and 2.4 GHz WLAN

Table 11-39
SAR Sum to Peak Location Separation Ratio Calculation

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$
UMTS 1900	IEEE 802.11b	0.702	<1.092	<1.794	161.96	<0.01

The sum of the standalone SAR values was above 1.6 W/kg for the Body Back side configuration at a separation distance of 1.2 cm with LTE Band 25 potentially operating with 2.4 GHz WIFI.

Table 11-40
Peak SAR Locations for Body Back Side LTE Band 25 and 2.4 GHz WLAN

Mode/Band	x (mm)	y (mm)	z (mm)
LTE Band 25	-24.00	70.00	-203.00
IEEE 802.11b	-28.40	-95.80	-205.00

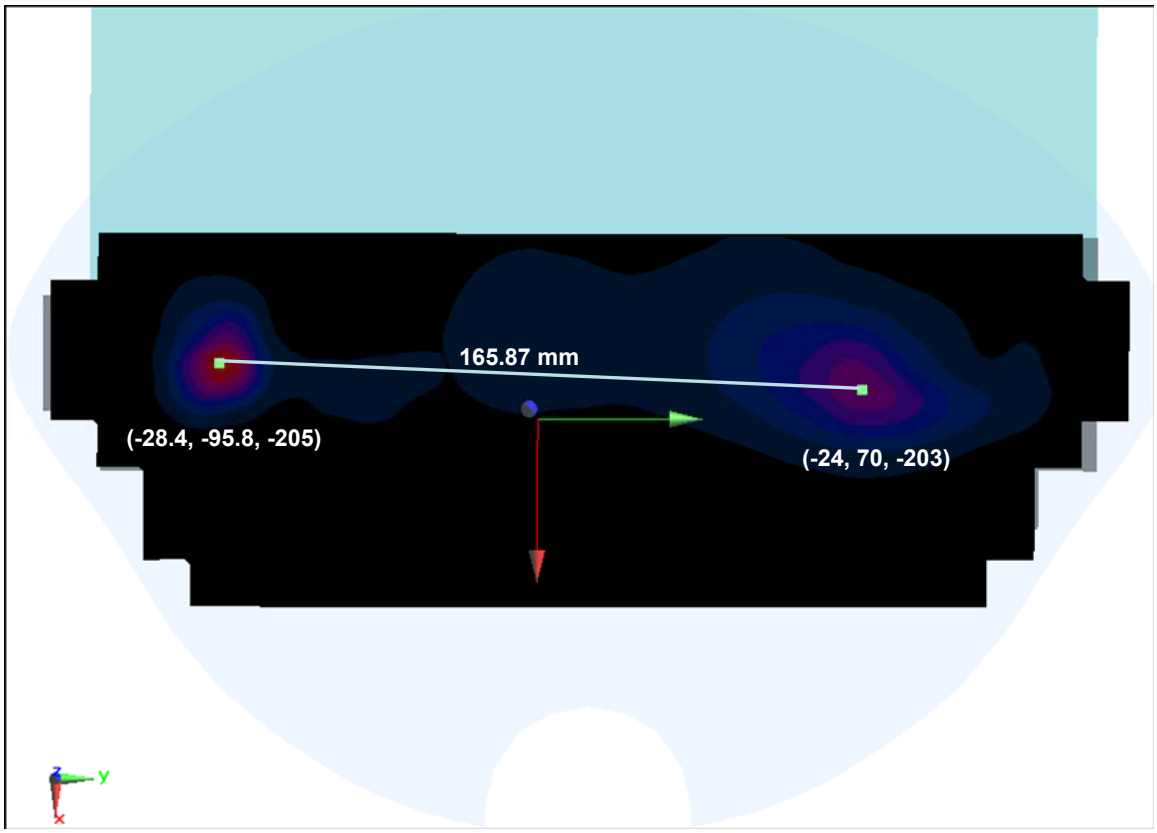


Figure 11-16
Peak SAR Location Plot of LTE Band 25 and 2.4 GHz WLAN

Table 11-41
SAR Sum to Peak Location Separation Ratio Calculation

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$
LTE Band 25	IEEE 802.11b	0.794	<1.092	<1.886	165.87	<0.02

The sum of the standalone SAR values was above 1.6 W/kg for the Body Back side configuration at a separation distance of 1.2 cm with PCS EVDO potentially operating with 5 GHz WIFI.

Table 11-42
Peak SAR Locations for Body Back Side PCS EVDO and 5 GHz WLAN

Mode/Band	x (mm)	y (mm)	z (mm)
PCS CDMA - FCC Rule Part 24E	-23.00	58.50	-203.00
IEEE 802.11a	-5.03	-92.00	-208.00

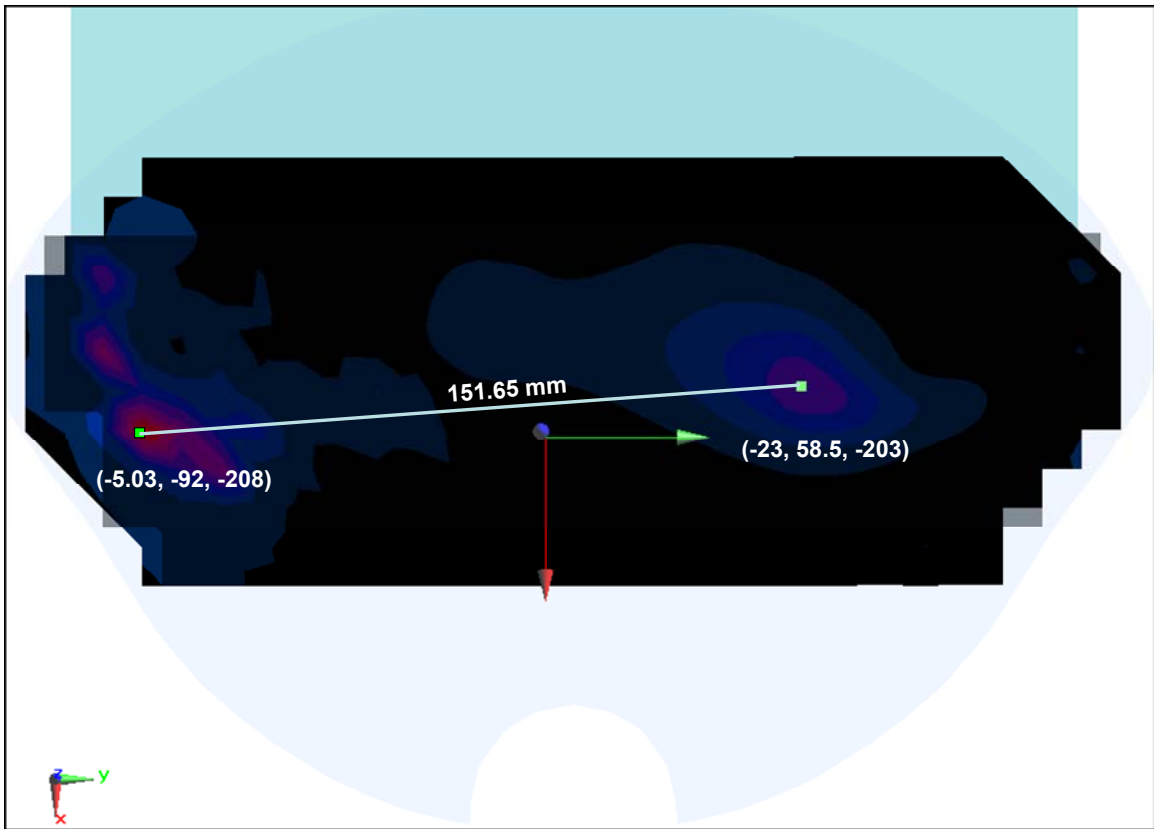


Figure 11-17
Peak SAR Location Plot of PCS EVDO and 5 GHz WLAN

Table 11-43
SAR Sum to Peak Location Separation Ratio Calculation

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$
PCS CDMA - FCC Rule Part 24E	IEEE 802.11a	0.782	<0.893	<1.675	151.65	<0.01

The sum of the standalone SAR values was above 1.6 W/kg for the Body Back side configuration at a separation distance of 1.2 cm with GPRS 1900 potentially operating with 5 GHz WIFI.

Table 11-44
Peak SAR Locations for Body Back Side GPRS 1900 and 5 GHz WLAN

Mode/Band	x (mm)	y (mm)	z (mm)
GPRS 1900	-9.50	47.50	-203.00
IEEE 802.11a	-5.03	-92.00	-208.00

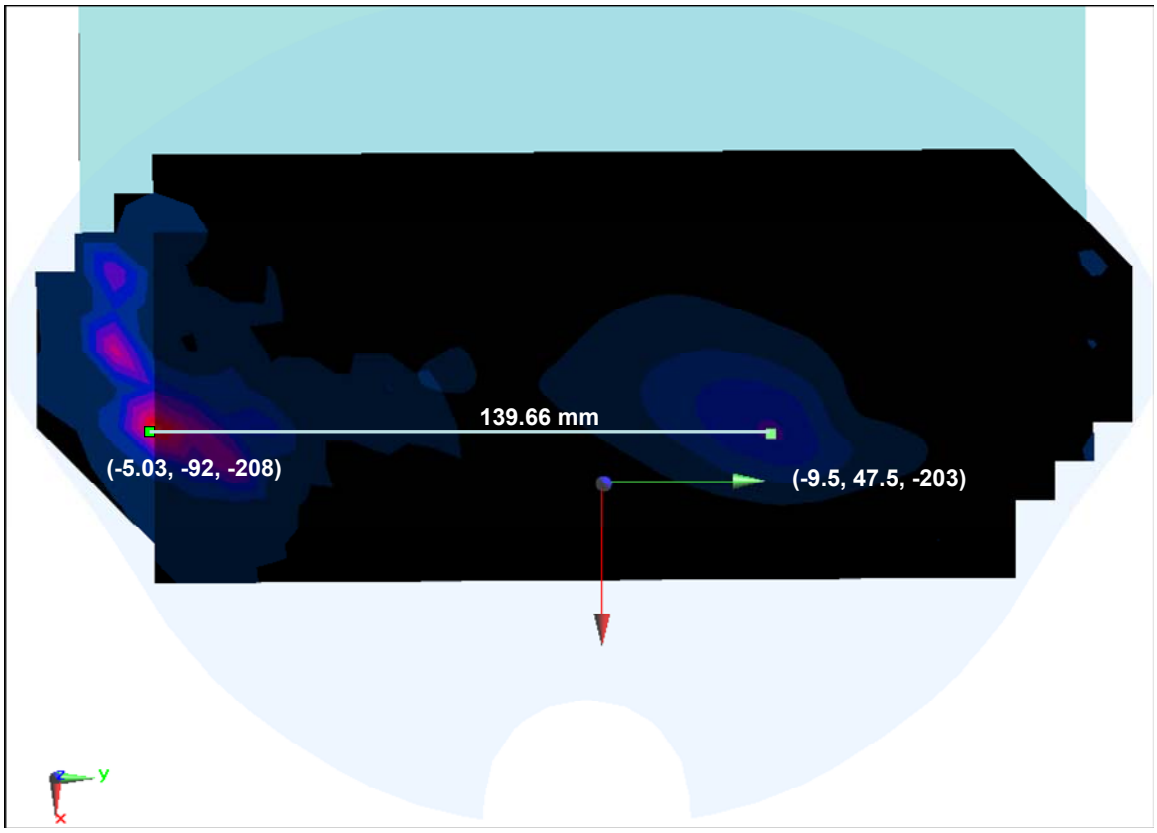


Figure 11-18
Peak SAR Location Plot of GPRS 1900 and 5 GHz WLAN

Table 11-45
SAR Sum to Peak Location Separation Ratio Calculation

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$
GPRS 1900	IEEE 802.11a	0.722	<0.893	<1.615	139.66	<0.01

The sum of the standalone SAR values was above 1.6 W/kg for the Body Back side configuration at a separation distance of 1.2 cm with LTE Band 25 potentially operating with 5 GHz WIFI.

Table 11-46
Peak SAR Locations for Body Back Side LTE Band 25 and 5 GHz WLAN

Mode/Band	x (mm)	y (mm)	z (mm)
LTE Band 25	-24.00	70.00	-203.00
IEEE 802.11a	-5.03	-92.00	-208.00

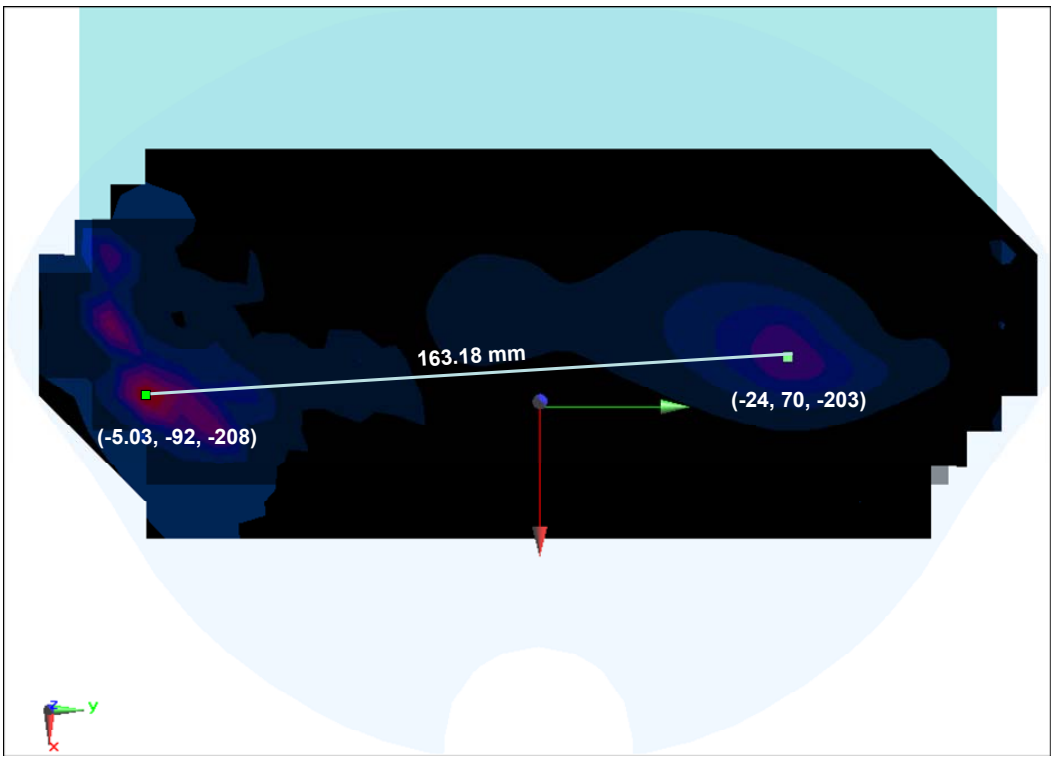


Figure 11-19
Peak SAR Location Plot of LTE Band 25 and 5 GHz WLAN

Table 11-47
SAR Sum to Peak Location Separation Ratio Calculation

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$
LTE Band 25	IEEE 802.11a	0.794	<0.893	<1.687	163.18	<0.01

11.5 Simultaneous Transmission Conclusion

The above numerical summed SAR results and SPLSR 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.

12 SAR MEASUREMENT VARIABILITY

12.1 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 preformed 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 12-1
Body SAR Measurement Variability Results

BODY VARIABILITY RESULTS															
Band	FREQUENCY		Mode	Service	# of Time Slots	Data Rate (Mbps)	Side	Spacing	Measured SAR (1g)	1st Repeated SAR (1g)	Ratio	2nd Repeated SAR (1g)	Ratio	3rd Repeated SAR (1g)	Ratio
	MHz	Ch.							(W/kg)	(W/kg)		(W/kg)		(W/kg)	
1900	1880.00	661	GSM 1900	GPRS	2	N/A	back	0 mm	1.030	0.996	1.0	N/A	N/A	N/A	N/A
2450	2412.00	1	IEEE 802.11b	DSSS	N/A	1	back	0 mm	0.969	0.940	1.0	N/A	N/A	N/A	N/A
5800	5805.00	161	IEEE 802.11a	OFDM	N/A	6	back	0 mm	0.826	0.763	1.1	N/A	N/A	N/A	N/A
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram							

12.2 Measurement Uncertainty

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

13 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	E8257D	(250kHz-20GHz) Signal Generator	4/5/2012	Annual	4/5/2013	MY45470194
Agilent	8753E	(30kHz-6GHz) Network Analyzer	4/3/2012	Annual	4/3/2013	US37390350
Agilent	8753E	(30kHz-6GHz) Network Analyzer	4/4/2012	Annual	4/4/2013	JP38020182
Agilent	8594A	(9kHz-2.9GHz) Spectrum Analyzer	N/A	N/A	N/A	3051A00187
Agilent	8648D	(9kHz-4GHz) Signal Generator	10/10/2012	Annual	10/10/2013	3613A00315
Agilent	85070E	Dielectric Probe Kit	3/8/2012	Annual	3/8/2013	MY44300633
Agilent	8648D	Signal Generator	4/3/2012	Annual	4/3/2013	3629U00687
Agilent	85047A	S-Parameter Test Set	N/A	N/A	N/A	2904A00579
Agilent	E5515C	Wireless Communications Test Set	9/24/2012	Annual	9/24/2013	GB43163447
Agilent	E5515C	Wireless Communications Test Set	10/18/2012	Biennial	10/18/2014	GB43193563
Amplifier Research	5S1G4	5W, 800MHz-4.2GHz	CBT	N/A	CBT	21910
Anritsu	ML2438A	Power Meter	2/14/2012	Annual	2/14/2013	1190013
Anritsu	ML2438A	Power Meter	2/14/2012	Annual	2/14/2013	98150041
Anritsu	ML2438A	Power Meter	10/11/2012	Annual	10/11/2013	1070030
Anritsu	ML2495A	Power Meter	10/11/2012	Annual	10/11/2013	1039008
Anritsu	MA2481A	Power Sensor	2/14/2012	Annual	2/14/2013	5318
Anritsu	MA2481A	Power Sensor	2/14/2012	Annual	2/14/2013	5821
Anritsu	MA2481A	Power Sensor	2/14/2012	Annual	2/14/2013	2400
Anritsu	MA2411B	Power Sensor	3/5/2012	Annual	3/5/2013	846215
Anritsu	MA2481A	Power Sensor	4/5/2012	Annual	4/5/2013	5605
Anritsu	MA2411B	Pulse Sensor	9/19/2012	Annual	9/19/2013	1027293
Anritsu	MT8820C	Radio Communication Tester	11/6/2012	Annual	11/6/2013	6200901190
Anritsu	MA24106A	USB Power Sensor	8/22/2012	Annual	8/22/2013	1231538
Anritsu	MA24106A	USB Power Sensor	8/22/2012	Annual	8/22/2013	1231535
COMTECH	AR85729-5/5759B	Solid State Amplifier	CBT	N/A	CBT	M3W1A00-1002
COMTech	AR85729-5	Solid State Amplifier	CBT	N/A	CBT	M1S5A00-009
Gigatronics	80701A	(0.05-18GHz) Power Sensor	10/10/2012	Annual	10/10/2013	1833460
Gigatronics	8651A	Universal Power Meter	10/10/2012	Annual	10/10/2013	8650319
Intelligent Weigh	PD-3000	Electronic Balance	3/27/2012	Annual	3/27/2013	11081534
Intelligent Weighing	PD-3000	Electronic Balance	6/29/2012	Annual	6/29/2013	120405017
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
MiniCircuits	SLP-2400+	Low Pass Filter	CBT	N/A	CBT	R8979500903
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-1200+	Low Pass Filter DC to 1000 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
Narda	4014C-6	4 - 8 GHz SMA 6 dB Directional Coupler	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Narda	BW-S3W2	Attenuator (3dB)	CBT	N/A	CBT	120
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Rohde & Schwarz	CMU200	Base Station Simulator	5/22/2012	Annual	5/22/2013	109892
Rohde & Schwarz	NRVD	Dual Channel Power Meter	10/12/2012	Biennial	10/12/2014	101695
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	9/26/2012	Annual	9/26/2013	106084
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	10/7/2011	Biennial	10/7/2013	103962
Rohde & Schwarz	NRV-Z32	Peak Power Sensor	10/12/2012	Biennial	10/12/2014	836019/013
Rohde & Schwarz	SMIQ03B	Signal Generator	4/5/2012	Annual	4/5/2013	DE27259
Rohde & Schwarz	SME06	Signal Generator	10/11/2012	Annual	10/11/2013	832026
Seekonk	NC-100	Torque Wrench (8" lb)	11/29/2011	Triennial	11/29/2014	21053
Seekonk	NC-100	Torque Wrench (8" lb)	3/5/2012	Triennial	3/5/2015	N/A
SPEAG	D1900V2	1900 MHz SAR Dipole	2/22/2012	Annual	2/22/2013	5d149
SPEAG	D2450V2	2450 MHz SAR Dipole	1/24/2012	Annual	1/24/2013	797
SPEAG	D5GHzV2	5 GHz SAR Dipole	10/30/2012	Annual	10/30/2013	1007
SPEAG	D835V2	835 MHz SAR Dipole	8/23/2012	Annual	8/23/2013	4d026
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/20/2012	Annual	2/20/2013	649
SPEAG	DAE4	Dasy Data Acquisition Electronics	8/24/2012	Annual	8/24/2013	1322
SPEAG	DAE4	Dasy Data Acquisition Electronics	9/19/2012	Annual	9/19/2013	1323
SPEAG	DAK-3.5	Dielectic Assessment Kit	6/19/2012	Annual	6/19/2013	1070
SPEAG	ES3DV3	SAR Probe	3/16/2012	Annual	3/16/2013	3209
SPEAG	EX3DV4	SAR Probe	7/26/2012	Annual	7/26/2013	3561
SPEAG	ES3DV2	SAR Probe	8/28/2012	Annual	8/28/2013	3022
SPEAG	ES3DV3	SAR Probe	9/20/2012	Annual	9/20/2013	3288
Tektronix	RSA-6114A	Real Time Spectrum Analyzer	4/5/2012	Annual	4/5/2013	B010177
VWR	23226-658	Long Stem Thermometer	3/30/2012	Biennial	3/30/2014	122179874
VWR	23226-658	Long Stem Thermometer	6/27/2012	Biennial	6/27/2014	122363923
VWR	36934-158	Wall-Mounted Thermometer	1/21/2011	Biennial	1/21/2013	111286454
VWR	36934-158	Wall-Mounted Thermometer	9/30/2011	Biennial	9/30/2013	111859323
VWR	36934-158	Wall-Mounted Thermometer	9/30/2011	Biennial	9/30/2013	111859332

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.

14 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	299
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				24.2	23.5	

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

Applicable for frequencies up to 6 GHz.

a	b	c	d	e= f(d,k)	f	g	h = c x f/e	i = c x g/e	k
Uncertainty Component	**IEEE 1528 Sec.**	**Tol. (± %)**	**Prob. Dist.**	**Div.**	**c_i 1gm**	**c_i 10 gms**	**1gm u_i (± %)**	**10gms u_i (± %)**	**v_i**
Measurement System									
Probe Calibration	E.2.1	6.55	N	1	1.0	1.0	6.6	6.6	∞
Axial Isotropy	E.2.2	0.25	N	1	0.7	0.7	0.2	0.2	∞
Hemishperical Isotropy	E.2.2	1.3	N	1	1.0	1.0	1.3	1.3	∞
Boundary Effect	E.2.3	0.4	N	1	1.0	1.0	0.4	0.4	∞
Linearity	E.2.4	0.3	N	1	1.0	1.0	0.3	0.3	∞
System Detection Limits	E.2.5	5.1	N	1	1.0	1.0	5.1	5.1	∞
Readout Electronics	E.2.6	1.0	N	1	1.0	1.0	1.0	1.0	∞
Response Time	E.2.7	0.8	R	1.73	1.0	1.0	0.5	0.5	∞
Integration Time	E.2.8	2.6	R	1.73	1.0	1.0	1.5	1.5	∞
RF Ambient Conditions	E.6.1	3.0	R	1.73	1.0	1.0	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1.0	1.0	0.2	0.2	∞
Probe Positioning w/ respect to Phantom	E.6.3	2.9	R	1.73	1.0	1.0	1.7	1.7	∞
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E.5	1.0	R	1.73	1.0	1.0	0.6	0.6	∞
Test Sample Related									
Test Sample Positioning	E.4.2	6.0	N	1	1.0	1.0	6.0	6.0	287
Device Holder Uncertainty	E.4.1	3.32	R	1.73	1.0	1.0	1.9	1.9	∞
Output Power Variation - SAR drift measurement	6.6.2	5.0	R	1.73	1.0	1.0	2.9	2.9	∞
Phantom & Tissue Parameters									
Phantom Uncertainty (Shape & Thickness tolerances)	E.3.1	4.0	R	1.73	1.0	1.0	2.3	2.3	∞
Liquid Conductivity - deviation from target values	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity - measurement uncertainty	E.3.3	3.8	N	1	0.64	0.43	2.4	1.6	6
Liquid Permittivity - deviation from target values	E.3.2	5.0	R	1.73	0.60	0.49	1.7	1.4	∞
Liquid Permittivity - measurement uncertainty	E.3.3	4.5	N	1	0.60	0.49	2.7	2.2	6
Combined Standard Uncertainty (k=1)			RSS				12.4	12.0	299
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				24.7	24.0	

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

15 CONCLUSION

15.1 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]

16 REFERENCES

[1] Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation, Aug. 1996.

[2] ANSI/IEEE C95.1-2005, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3kHz to 300GHz, New York: IEEE, 2006.

[3] ANSI/IEEE C95.1-1992, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3kHz to 300GHz, New York: IEEE, Sept. 1992.

[4] ANSI/IEEE C95.3-2002, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave, New York: IEEE, December 2002.

[5] Federal Communications Commission, OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01), Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields, June 2001.

[6] IEEE Standards Coordinating Committee 34 – IEEE Std. 1528-2003, Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices.

[7] NCRP, National Council on Radiation Protection and Measurements, Biological Effects and Exposure Criteria for RadioFrequency Electromagnetic Fields, NCRP Report No. 86, 1986. Reprinted Feb. 1995.

[8] T. Schmid, O. Egger, N. Kuster, Automated E-field scanning system for dosimetric assessments, IEEE Transaction on Microwave Theory and Techniques, vol. 44, Jan. 1996, pp. 105-113.

[9] K. Pokovic, T. Schmid, N. Kuster, Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies, ICECOM97, Oct. 1997, pp. -124.

[10] K. Pokovic, T. Schmid, and N. Kuster, E-field Probe with improved isotropy in brain simulating liquids, Proceedings of the ELMAR, Zadar, Croatia, June 23-25, 1996, pp. 172-175.

[11] Schmid & Partner Engineering AG, Application Note: Data Storage and Evaluation, June 1998, p2.

[12] V. Hombach, K. Meier, M. Burkhardt, E. Kuhn, N. Kuster, The Dependence of EM Energy Absorption upon Human Modeling at 900 MHz, IEEE Transaction on Microwave Theory and Techniques, vol. 44 no. 10, Oct. 1996, pp. 1865-1873.

[13] N. Kuster and Q. Balzano, Energy absorption mechanism by biological bodies in the near field of dipole antennas above 300MHz, IEEE Transaction on Vehicular Technology, vol. 41, no. 1, Feb. 1992, pp. 17-23.

[14] G. Hartsgrove, A. Kraszewski, A. Surowiec, Simulated Biological Materials for Electromagnetic Radiation Absorption Studies, University of Ottawa, Bioelectromagnetics, Canada: 1987, pp. 29-36.

[15] Q. Balzano, O. Garay, T. Manning Jr., Electromagnetic Energy Exposure of Simulated Users of Portable Cellular Telephones, IEEE Transactions on Vehicular Technology, vol. 44, no.3, Aug. 1995.

[16] W. Gander, Computermathematick, Birkhaeuser, Basel, 1992.

[17] W.H. Press, S.A. Teukolsky, W.T. Vetterling, and B.P. Flannery, Numerical Recipes in C, The Art of Scientific Computing, Second edition, Cambridge University Press, 1992.

[18] Federal Communications Commission, OET Bulletin 65, Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields. Supplement C, Dec. 1997.

[19] N. Kuster, R. Kastle, T. Schmid, Dosimetric evaluation of mobile communications equipment with known precision, IEEE Transaction on Communications, vol. E80-B, no. 5, May 1997, pp. 645-652.

[20] CENELEC CLC/SC111B, European Prestandard (prENV 50166-2), Human Exposure to Electromagnetic Fields High-frequency: 10kHz-300GHz, Jan. 1995.

[21] Prof. Dr. Niels Kuster, ETH, Eidgenössische Technische Hoschschule Zürich, Dosimetric Evaluation of the Cellular Phone.

[22] IEC 62209-1, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 1: Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz), Feb. 2005.

[23] Industry Canada RSS-102 Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) Issue 4, March 2010.

[24] Health Canada Safety Code 6 Limits of Human Exposure to Radio Frequency Electromagnetic Fields in the Frequency Range from 3 kHz – 300 GHz, 2009

[25] FCC Public Notice DA-02-1438. Office of Engineering and Technology Announces a Transition Period for the Phantom Requirements of Supplement C to OET Bulletin 65, June 19, 2002

[26] FCC SAR Test Procedures for 2G-3G Devices, Mobile Hotspot and UMPC Devices KDB Publications 941225, D01-D07

[27] SAR Measurement procedures for IEEE 802.11a/b/g KDB Publication 248227 D01v01r02

[28] FCC SAR Considerations for Handsets with Multiple Transmitters and Antennas, KDB Publications 648474 D02-D04

[29] FCC SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers, FCC KDB Publication 616217 D04

[30] FCC SAR Measurement and Reporting Requirements for 100MHz – 6 GHz, KDB Publications 865664 D01-D02

[31] FCC General RF Exposure Guidance and SAR Procedures for Dongles, KDB Publication 447498, D01-D02

[32] Anexo à Resolução No. 533, de 10 de Septembro de 2009.

[33] IEC 62209-2, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz), Mar. 2010.

APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHP600; Type: Portable Tablet Computer; Serial: ZC802W1J

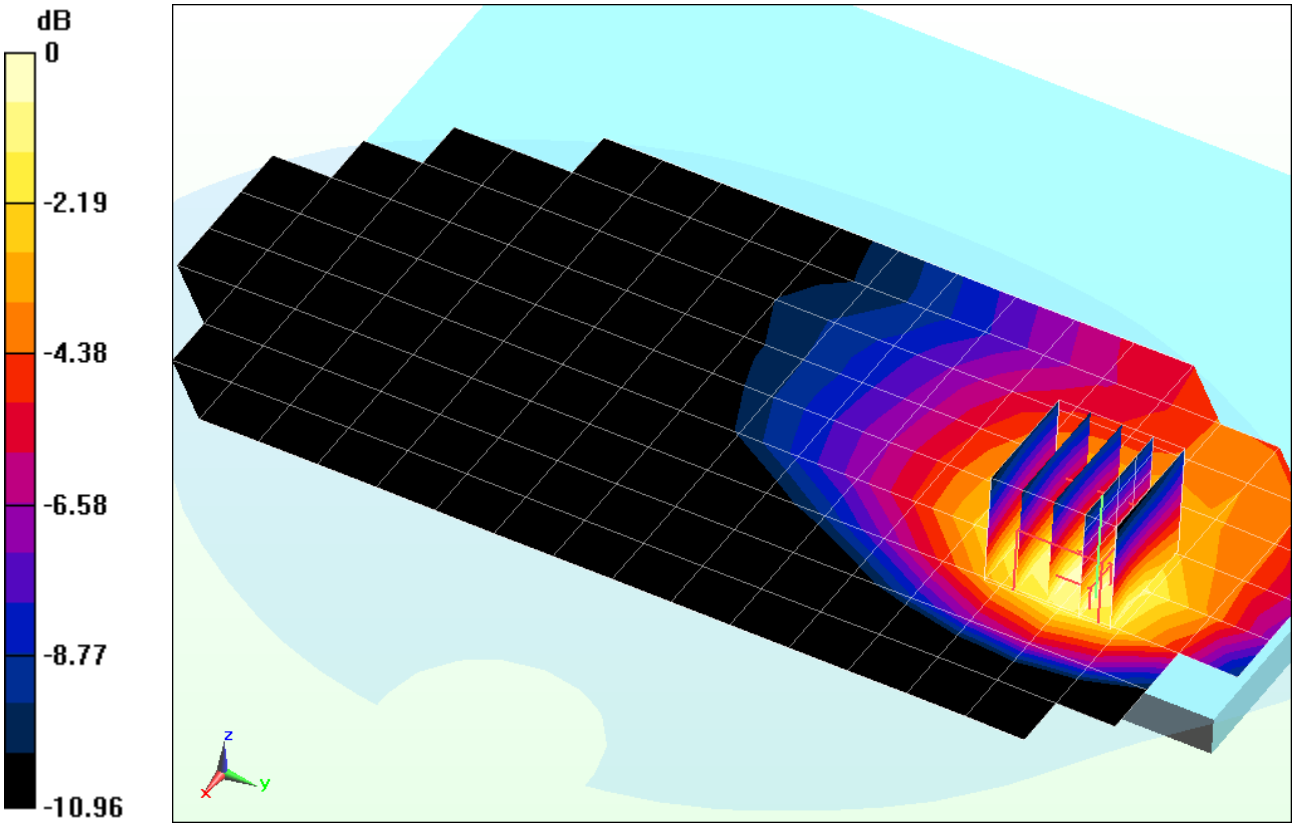
Communication System: Cellular CDMA; Frequency: 820.1 MHz; Duty Cycle: 1:1
Medium: 835 Body; Medium parameters used (interpolated):
$f = 820.1$ MHz; $\sigma = 0.96$ mho/m; $\varepsilon_r = 53.489$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.2 cm

Test Date: 11-26-2012; Ambient Temp: 23.0°C; Tissue Temp: 21.4°C

Probe: ES3DV3 - SN3209; ConvF(6.13, 6.13, 6.13); Calibrated: 3/16/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/20/2012
Phantom: SAM with CRP; Type: SAM; Serial: TP1375
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.7 (6848)

Mode: Cellular EVDO - FCC Rule Part 90S, Body SAR, Back side, Mid.ch

Area Scan (10x21x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.610 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.761 W/kg
SAR(1 g) = 0.517 W/kg; SAR(10 g) = 0.336 W/kg



0 dB = 0.558 W/kg = -2.53 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHP600; Type: Portable Tablet Computer; Serial: ZC802W1J

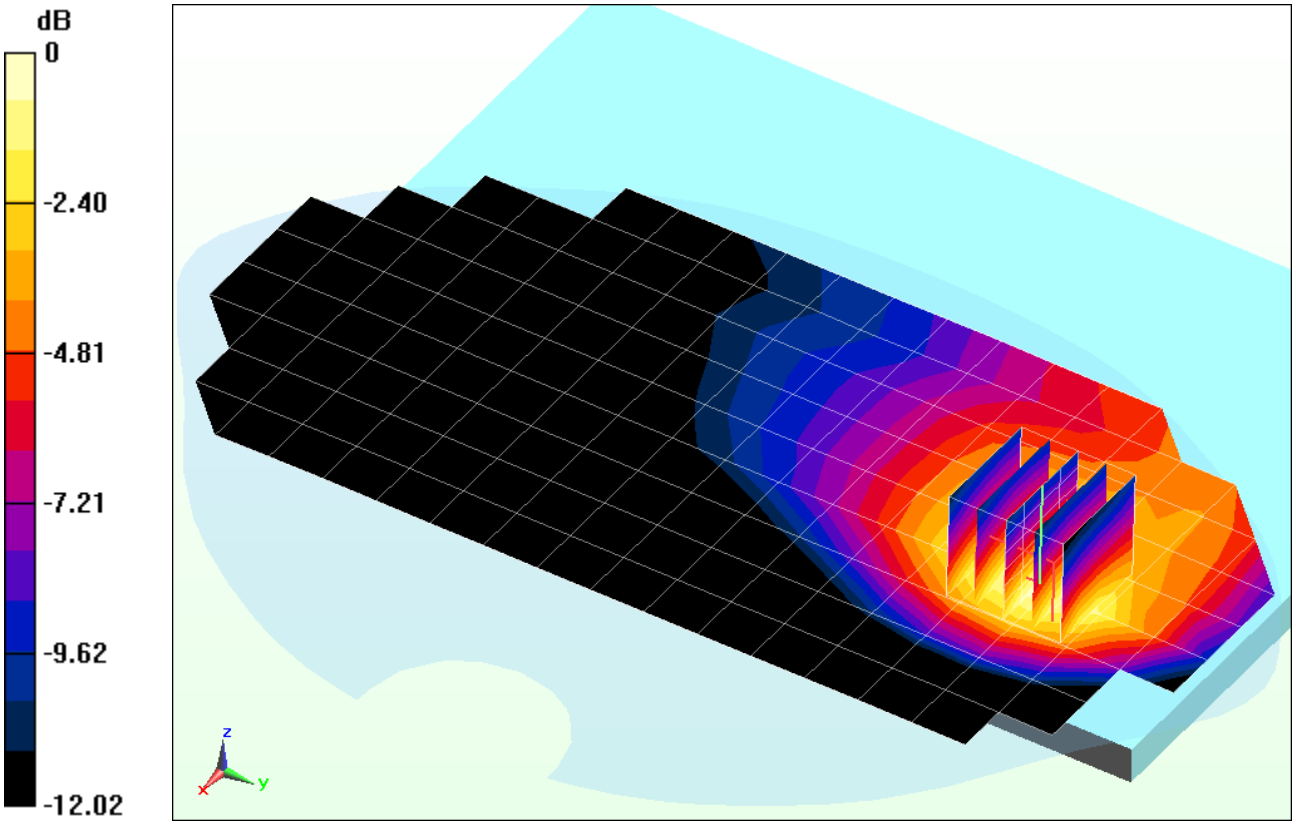
Communication System: Cellular CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1
Medium: 835 Body; Medium parameters used (interpolated):
f = 836.52 MHz; σ = 0.978 mho/m; ε_r = 53.275; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.2 cm

Test Date: 11-26-2012; Ambient Temp: 23.0°C; Tissue Temp: 21.4°C

Probe: ES3DV3 - SN3209; ConvF(6.13, 6.13, 6.13); Calibrated: 3/16/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/20/2012
Phantom: SAM with CRP; Type: SAM; Serial: TP1375
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.7 (6848)

Mode: Cellular EVDO - FCC Rule Part 22H, Body SAR, Back side, Mid.ch

Area Scan (10x21x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 27.791 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 0.839 W/kg
SAR(1 g) = 0.579 W/kg; SAR(10 g) = 0.373 W/kg



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

DUT: A3LSPHP600; Type: Portable Tablet Computer; Serial: ZC802W1J

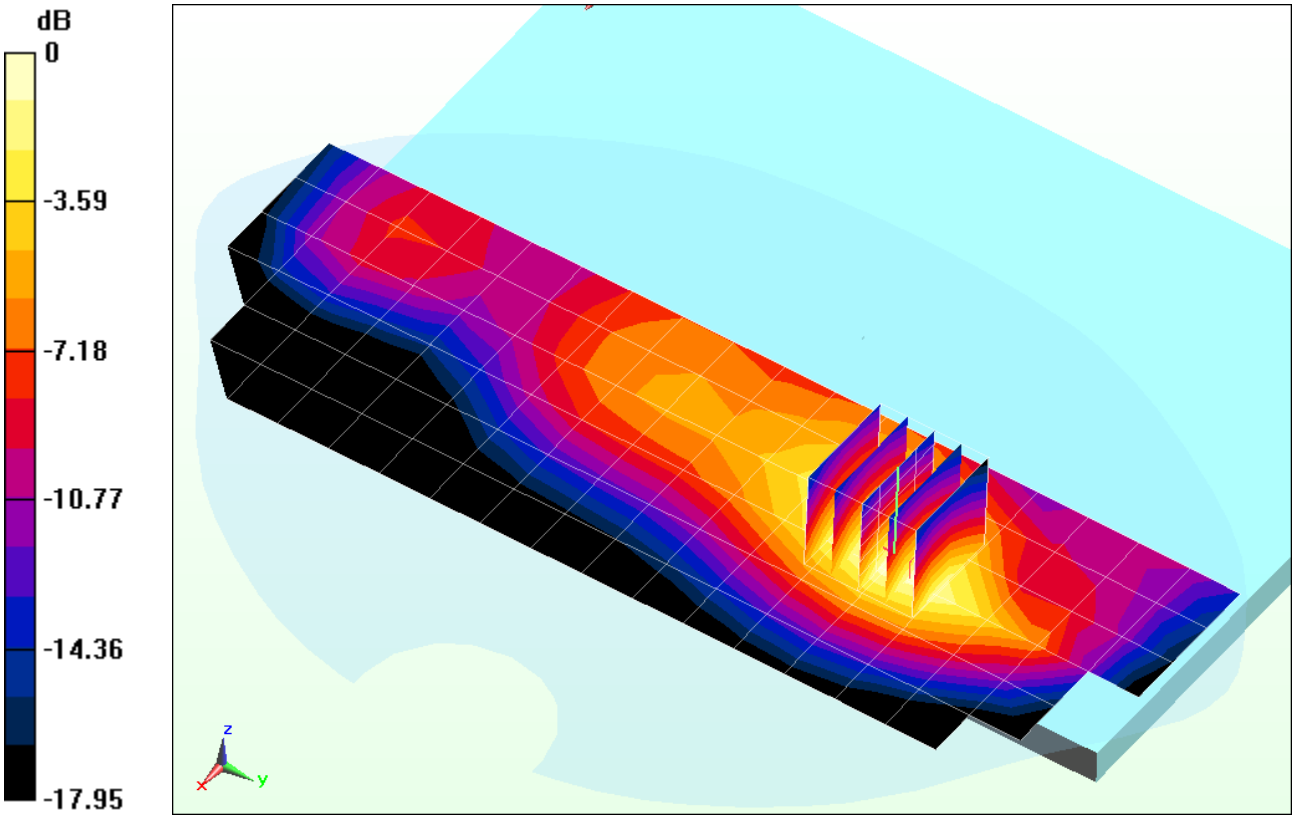
Communication System: CDMA; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Body; Medium parameters used:
f = 1880 MHz; σ = 1.506 mho/m; ε_r = 51.16; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.2 cm

Test Date: 11-20-2012; Ambient Temp: 23.1°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3288; ConvF(4.89, 4.89, 4.89); Calibrated: 9/20/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/19/2012
Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646
Measurement SW: DASY52, Version 52.8 (3);SEMCAD X Version 14.6.7 (6848)

Mode: PCS EVDO - FCC Rule Parts 24E, Body SAR, Back side, Mid.ch

Area Scan (7x21x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.990 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 1.24 W/kg
SAR(1 g) = 0.721 W/kg



0 dB = 0.779 W/kg = -1.08 dBW/kg

DUT: A3LSPHP600; Type: Portable Tablet Computer; Serial: ZC802WBB

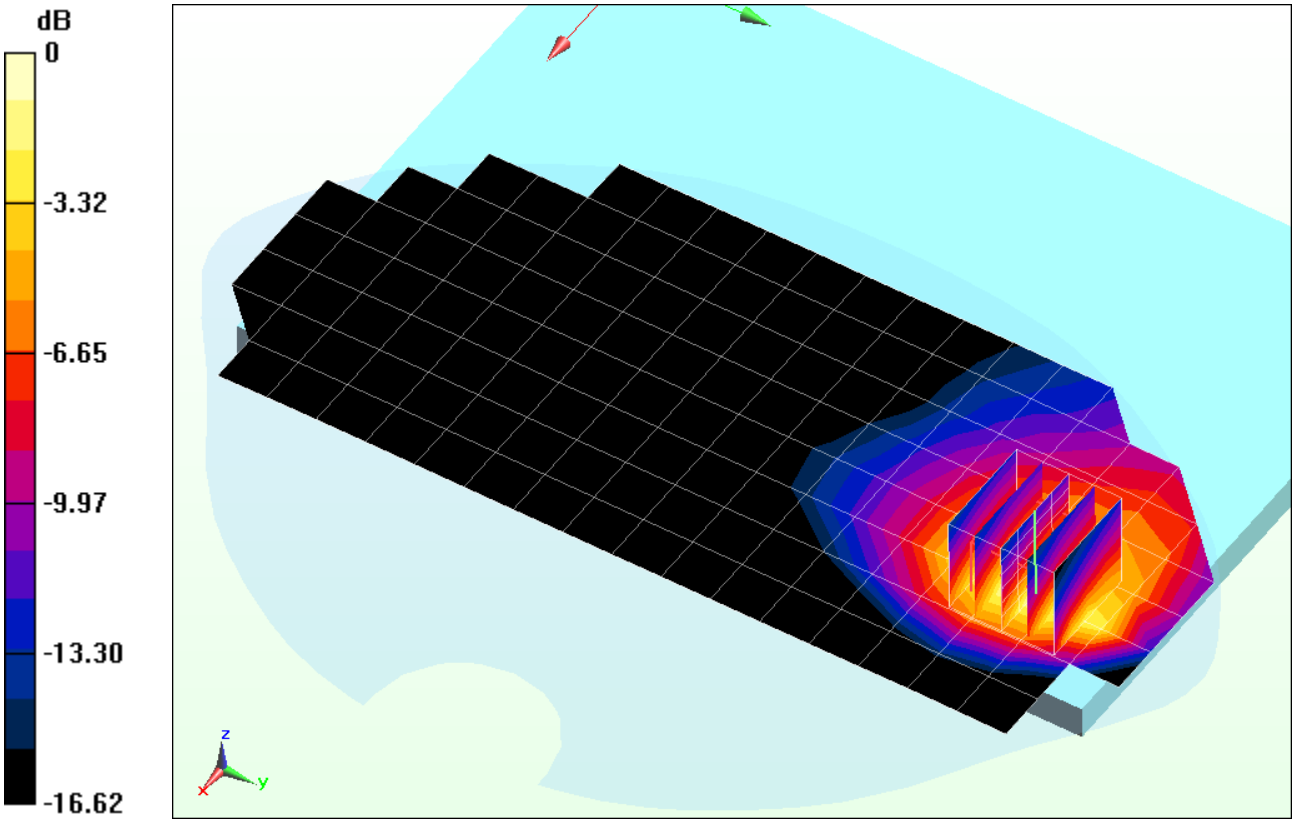
Communication System: GPRS850; Frequency: 836.6 MHz; Duty Cycle: 1:4.15
Medium: 835 Body; Medium parameters used (interpolated):
$f = 836.6$ MHz; $\sigma = 0.978$ mho/m; $\varepsilon_r = 53.274$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 11-26-2012; Ambient Temp: 23.0°C; Tissue Temp: 21.4°C

Probe: ES3DV3 - SN3209; ConvF(6.13, 6.13, 6.13); Calibrated: 3/16/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/20/2012
Phantom: SAM with CRP; Type: SAM; Serial: TP1375
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.7 (6848)

Mode: GPRS 850, Body SAR, Back side, Mid ch, 2 Tx Slots

Area Scan (9x21x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.296 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 1.32 W/kg
SAR(1 g) = 0.692 W/kg; SAR(10 g) = 0.374 W/kg



0 dB = 0.807 W/kg = -0.93 dBW/kg

DUT: A3LSPHP600; Type: Portable Tablet Computer; Serial: ZC802WBB

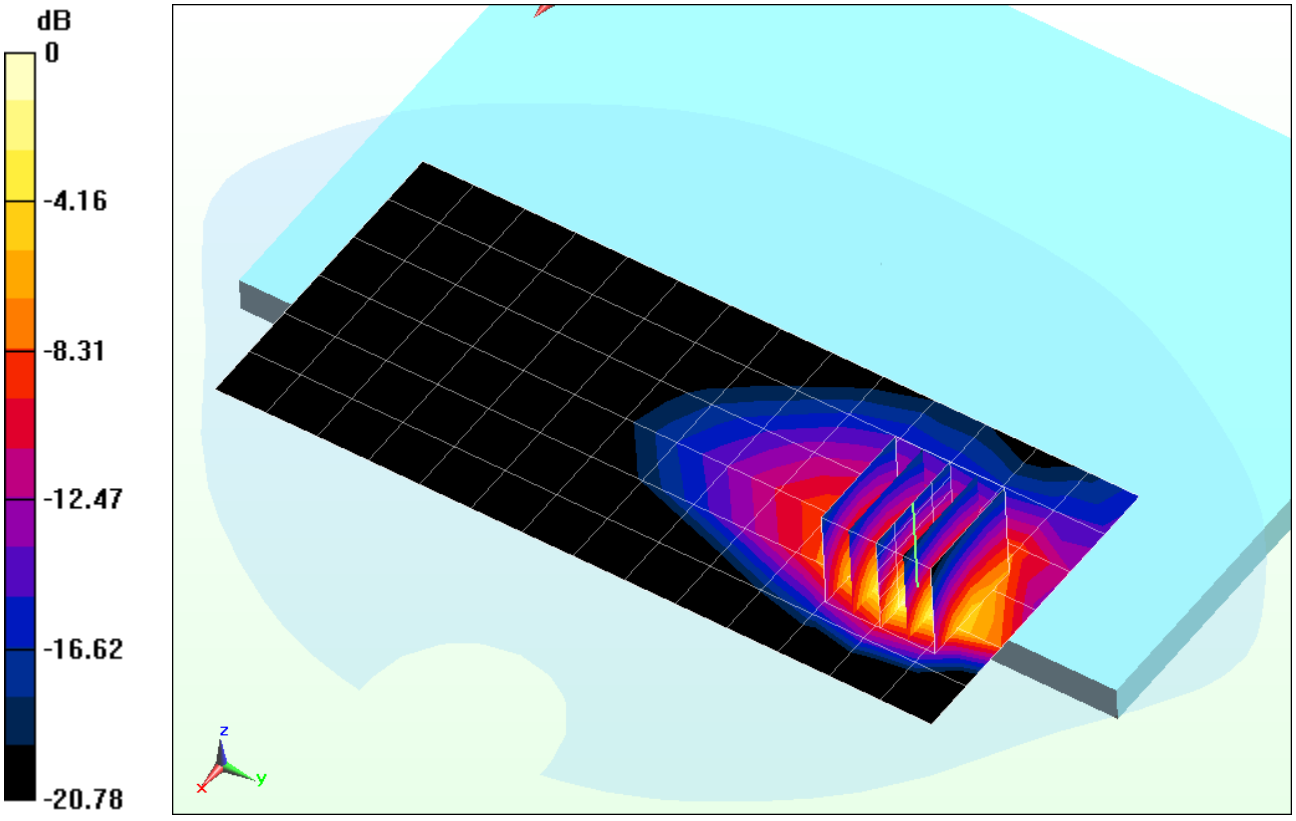
Communication System: GSM GPRS; 2 Tx slots; Frequency: 1880 MHz; Duty Cycle: 1:4.15
Medium: 1900 Body; Medium parameters used:
f = 1880 MHz; σ = 1.525 mho/m; ε_r = 52.46; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 11-26-2012; Ambient Temp: 21.5°C; Tissue Temp: 21.3°C

Probe: ES3DV3 - SN3288; ConvF(4.89, 4.89, 4.89); Calibrated: 9/20/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/19/2012
Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646
Measurement SW: DASY52, Version 52.8 (3);SEMCAD X Version 14.6.7 (6848)

Mode: GPRS 1900, Body SAR, Back side, Mid.ch, 2 Tx Slots

Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.353 V/m; Power Drift = -0.17 dB
Peak SAR (extrapolated) = 2.29 W/kg
SAR(1 g) = 1.03 W/kg



0 dB = 1.21 W/kg = 0.83 dBW/kg

DUT: A3LSPHP600; Type: Portable Tablet Computer; Serial: ZC802W73

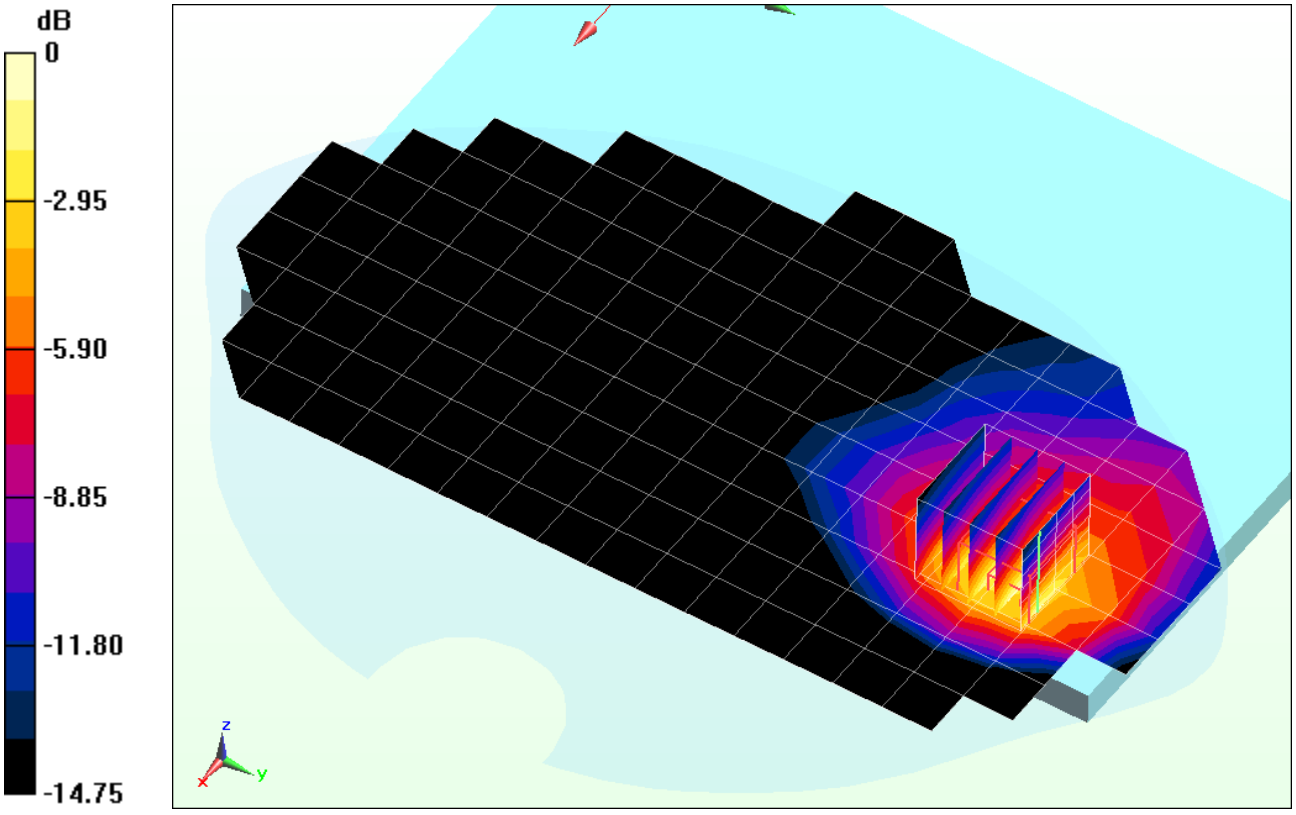
Communication System: WCDMA850; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: 835 Body; Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.96 mho/m; ε_r = 53.313; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 11-28-2012; Ambient Temp: 23.4°C; Tissue Temp: 22.7°C

Probe: ES3DV3 - SN3209; ConvF(6.13, 6.13, 6.13); Calibrated: 3/16/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/20/2012
Phantom: SAM with CRP; Type: SAM; Serial: TP1375
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.7 (6848)

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

Area Scan (11x21x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.621 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.658 W/kg
SAR(1 g) = 0.334 W/kg; SAR(10 g) = 0.188 W/kg



0 dB = 0.363 W/kg = -4.40 dBW/kg

DUT: A3LSPHP600; Type: Portable Tablet Computer; Serial: ZC802W73

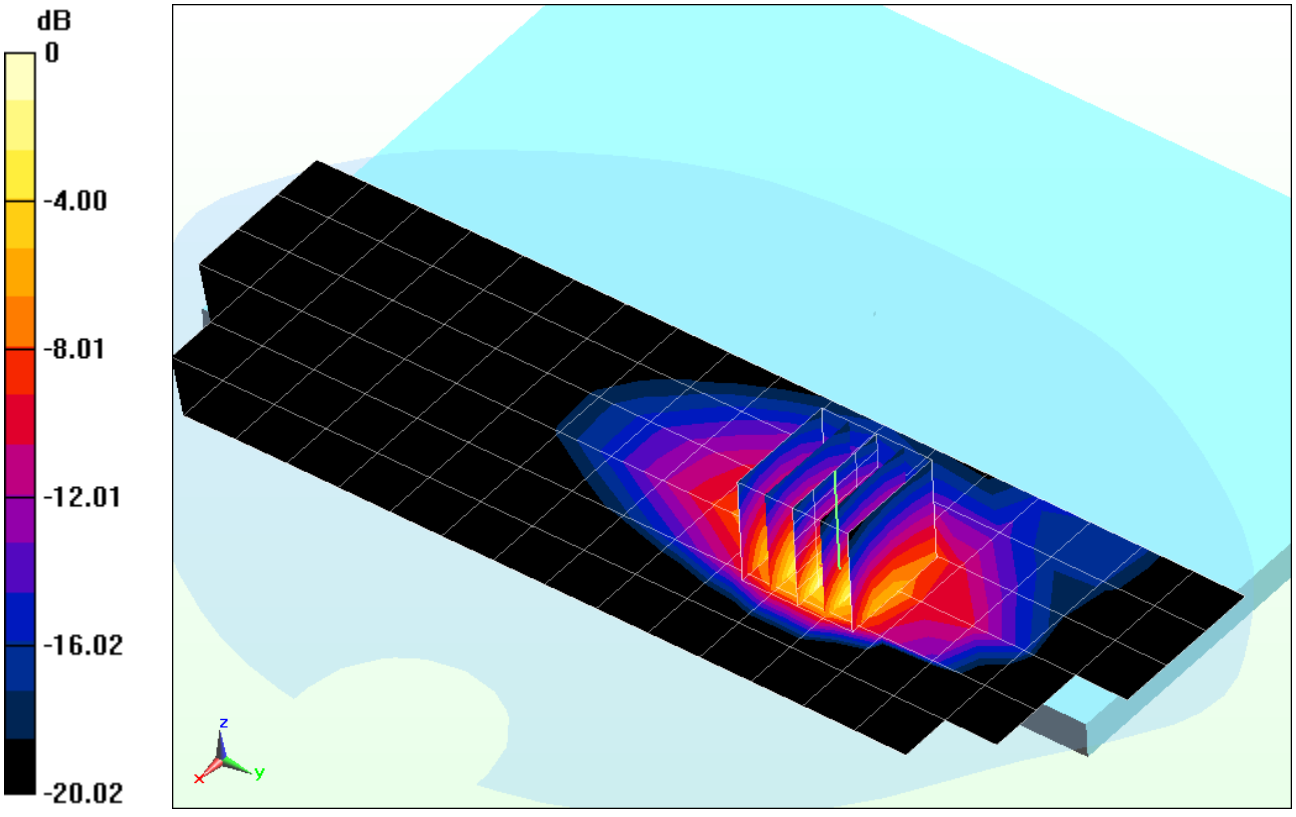
Communication System: UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Body; Medium parameters used:
f = 1880 MHz; σ = 1.525 mho/m; ε_r = 52.46; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 11-26-2012; Ambient Temp: 21.5°C; Tissue Temp: 21.3°C

Probe: ES3DV3 - SN3288; ConvF(4.89, 4.89, 4.89); Calibrated: 9/20/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/19/2012
Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646
Measurement SW: DASY52, Version 52.8 (3);SEMCAD X Version 14.6.7 (6848)

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

Area Scan (7x21x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 26.014 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.89 W/kg
SAR(1 g) = 0.857 W/kg



0 dB = 0.987 W/kg = -0.06 dBW/kg

DUT: A3LSPHP600; Type: Portable Tablet Computer; Serial: ZC802W17

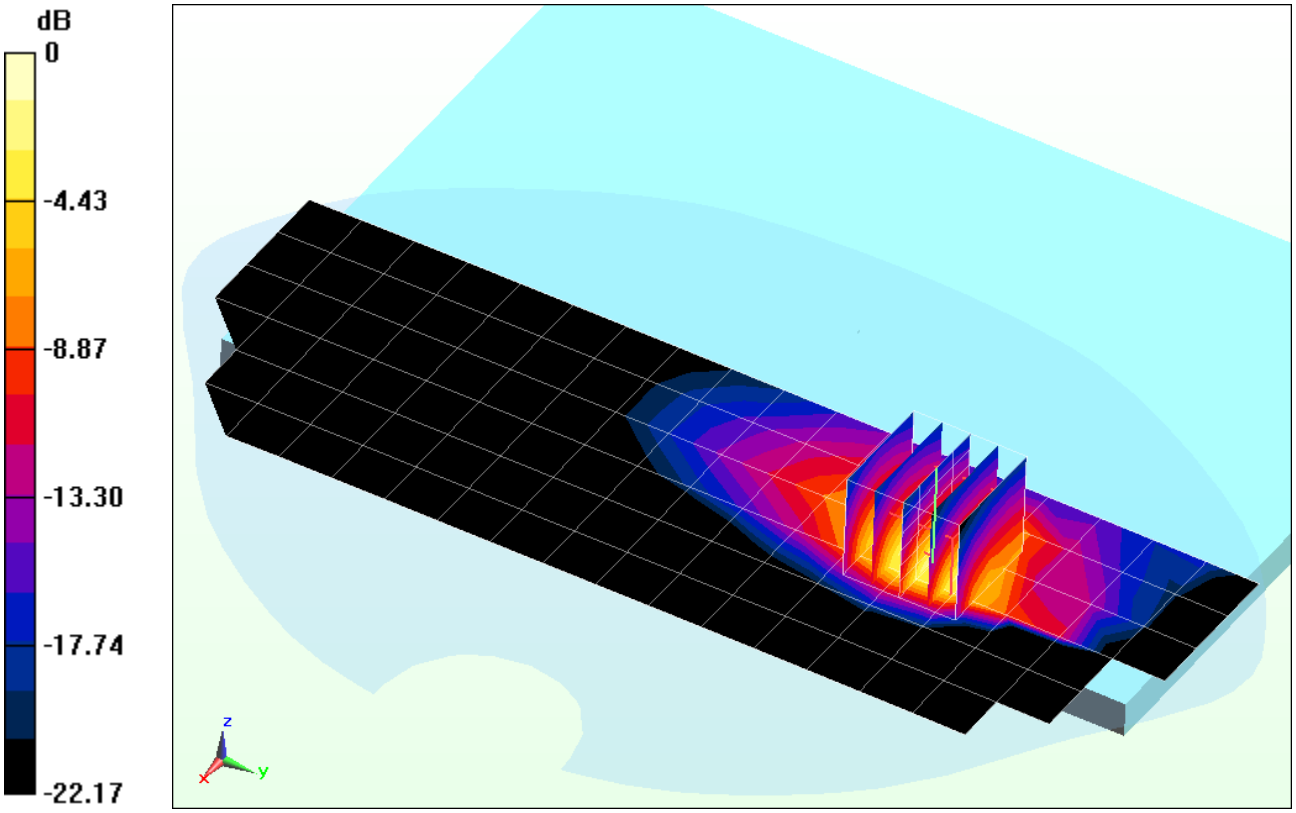
Communication System: LTE Band 25 (PCS); Frequency: 1852.5 MHz; Duty Cycle: 1:1
Medium: 1900 Body; Medium parameters used (interpolated):
f = 1852.5 MHz; σ = 1.514 mho/m; ε_r = 52.607; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 11-26-2012; Ambient Temp: 21.5°C; Tissue Temp: 21.3°C

Probe: ES3DV3 - SN3288; ConvF(4.89, 4.89, 4.89); Calibrated: 9/20/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/19/2012
Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646
Measurement SW: DASY52, Version 52.8 (3);SEMCAD X Version 14.6.7 (6848)

Mode: LTE Band 25 (PCS), Body SAR, Back side, Low.ch,
5 MHz Bandwidth, QPSK, 12 RB, 6 RB Offset

Area Scan (7x21x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.997 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 2.19 W/kg
SAR(1 g) = 0.968 W/kg; SAR(10 g) = 0.428 W/kg



0 dB = 1.14 W/kg = 0.57 dBW/kg

DUT: A3LSPHP600; Type: Portable Tablet Computer; Serial: ZC802W76

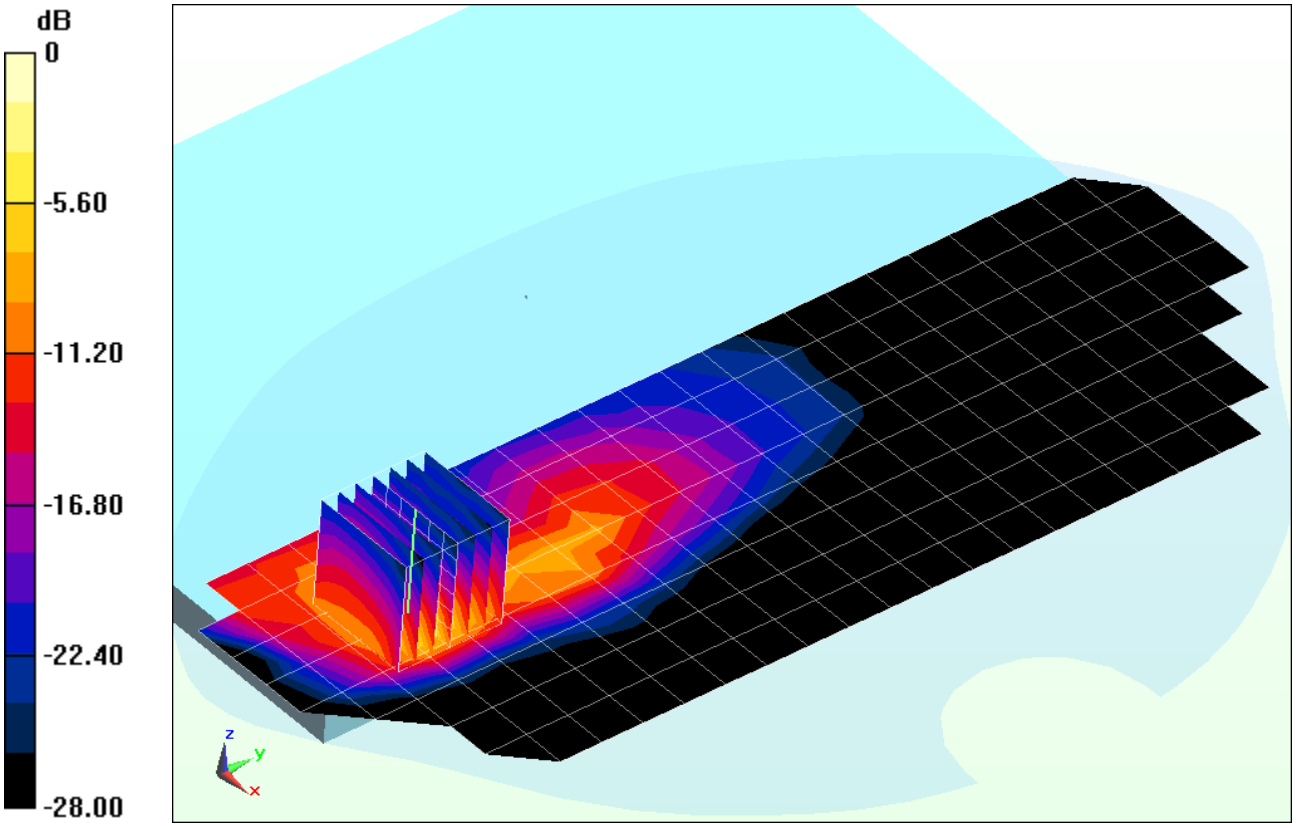
Communication System: IEEE 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium: 2450 Body; Medium parameters used (interpolated):
f = 2412 MHz; σ = 1.973 mho/m; ε_r = 51.494; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 11-26-2012; Ambient Temp: 23.2°C; Tissue Temp: 21.3°C

Probe: ES3DV2 - SN3022; ConvF(3.97, 3.97, 3.97); Calibrated: 8/28/2012;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/24/2012
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.7 (6848)

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

Area Scan (9x26x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 20.319 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 3.14 W/kg
SAR(1 g) = 0.969 W/kg; SAR(10 g) = 0.331 W/kg



0 dB = 1.46 W/kg = 1.64 dBW/kg

DUT: A3LSPHP600; Type: Portable Tablet Computer; Serial: ZC802W0F

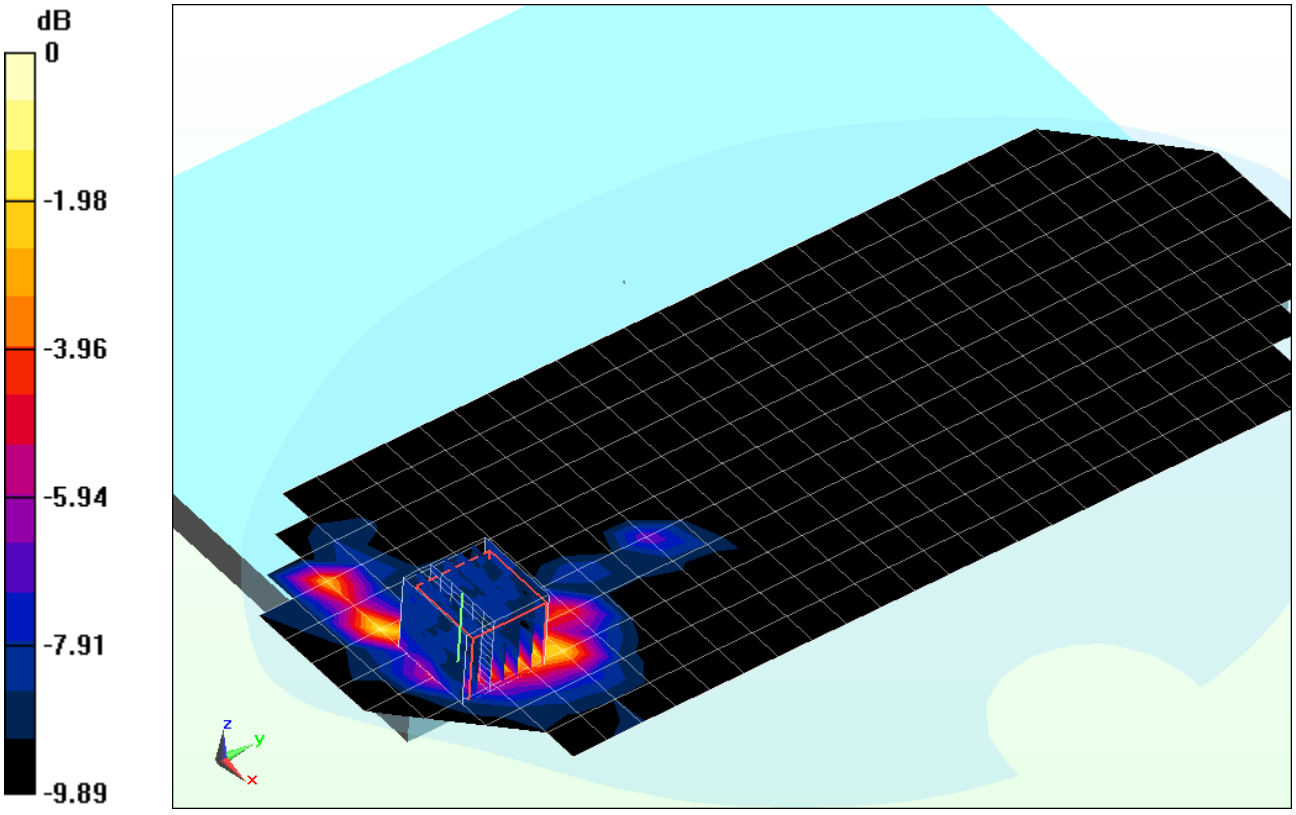
Communication System: IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5805 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body; Medium parameters used:
f = 5805 MHz; σ = 6.171 mho/m; ε_r = 46.44; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 11-19-2012; Ambient Temp: 24.0°C; Tissue Temp: 22.5°C

Probe: EX3DV4 - SN3561; ConvF(3.42, 3.42, 3.42); Calibrated: 7/26/2012;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/24/2012
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.7 (6848)

Mode: IEEE 802.11a, 5.8 GHz, Body SAR, Ch 161, 6 Mbps, Back Side

Area Scan (12x31x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 5.520 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 3.27 W/kg
SAR(1 g) = 0.826 W/kg; SAR(10 g) = 0.367 W/kg



0 dB = 1.58 W/kg = 1.99 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSPHP600; Type: Portable Tablet Computer; Serial: ZC802W0F

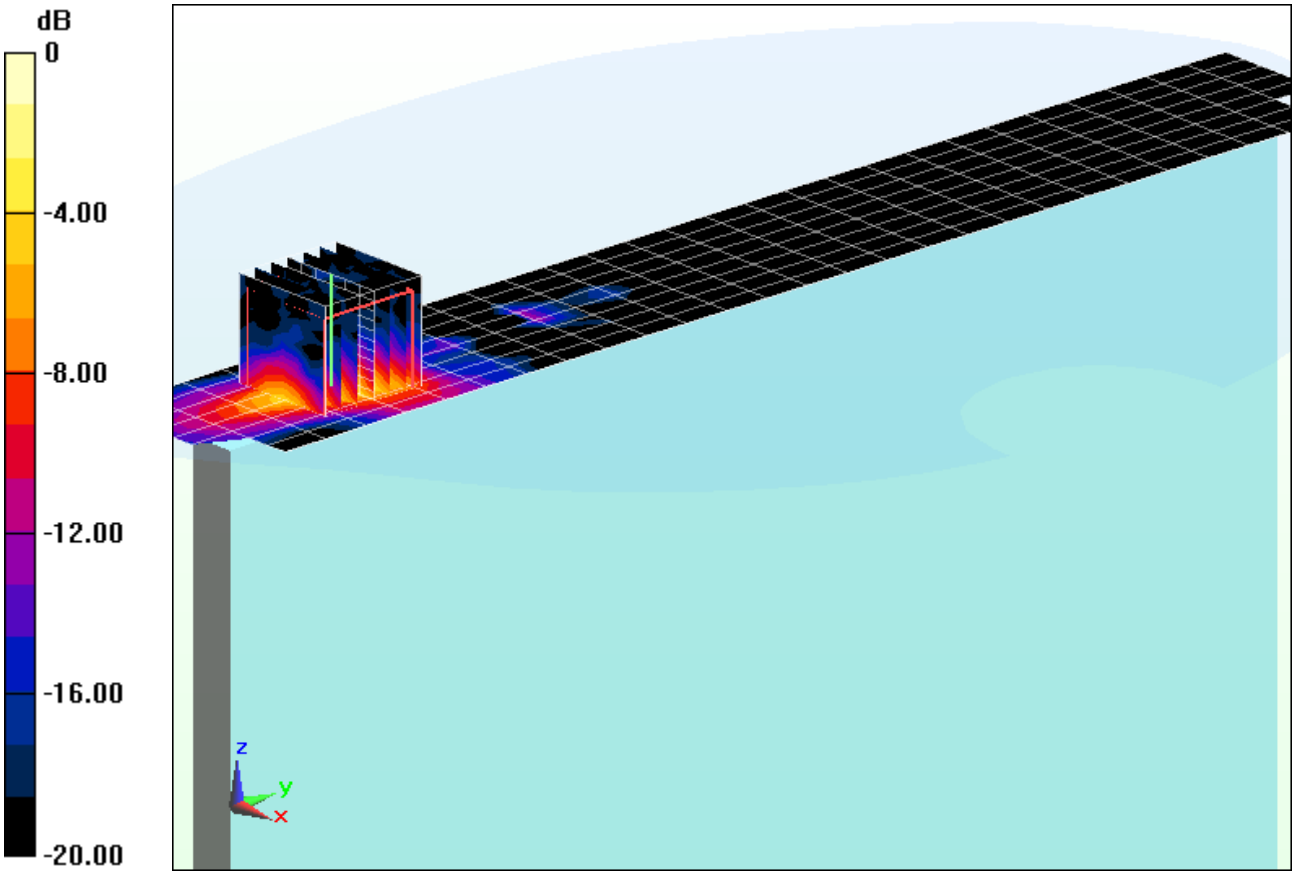
Communication System: IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5500 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body; Medium parameters used:
f = 5500 MHz; σ = 5.668 mho/m; ε_r = 47.13; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 11-19-2012; Ambient Temp: 24.3°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN3561; ConvF(3.33, 3.33, 3.33); Calibrated: 7/26/2012;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/24/2012
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.7 (6848)

Mode: IEEE 802.11a, 5.5 GHz, Body SAR, Ch 100, 6 Mbps, Top Edge

Area Scan (9x31x1): Measurement grid: dx=5mm, dy=10mm
Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 9.932 V/m; Power Drift = 0.16 dB
Peak SAR (extrapolated) = 4.17 W/kg
SAR(1 g) = 0.741 W/kg; SAR(10 g) = 0.175 W/kg



0 dB = 1.72 W/kg = 2.36 dBW/kg

DUT: A3LSPHP600; Type: Portable Tablet Computer; Serial: ZC802W0F

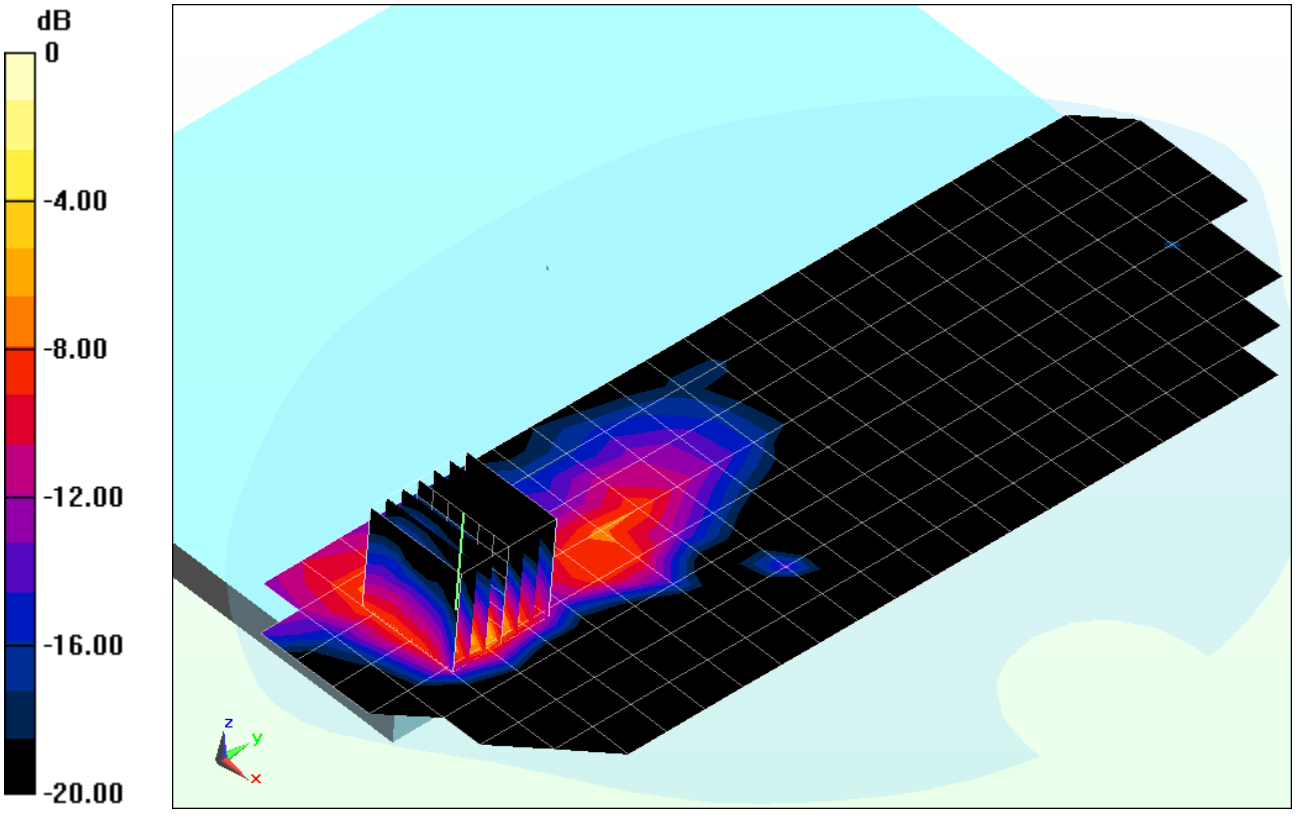
Communication System: Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1
Medium: 2450 Body; Medium parameters used (interpolated):
$f = 2441$ MHz; $\sigma = 2.011$ mho/m; $\varepsilon_r = 51.399$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 11-26-2012; Ambient Temp: 23.2°C; Tissue Temp: 21.3°C

Probe: ES3DV2 - SN3022; ConvF(3.97, 3.97, 3.97); Calibrated: 8/28/2012;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/24/2012
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.7 (6848)

Mode: Bluetooth, Body SAR, Ch 39, 1 Mbps, Back Side

Area Scan (9x26x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.891 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 0.602 W/kg
SAR(1 g) = 0.192 W/kg; SAR(10 g) = 0.068 W/kg



0 dB = 0.276 W/kg = -5.59 dBW/kg

APPENDIX B: SYSTEM VERIFICATION

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

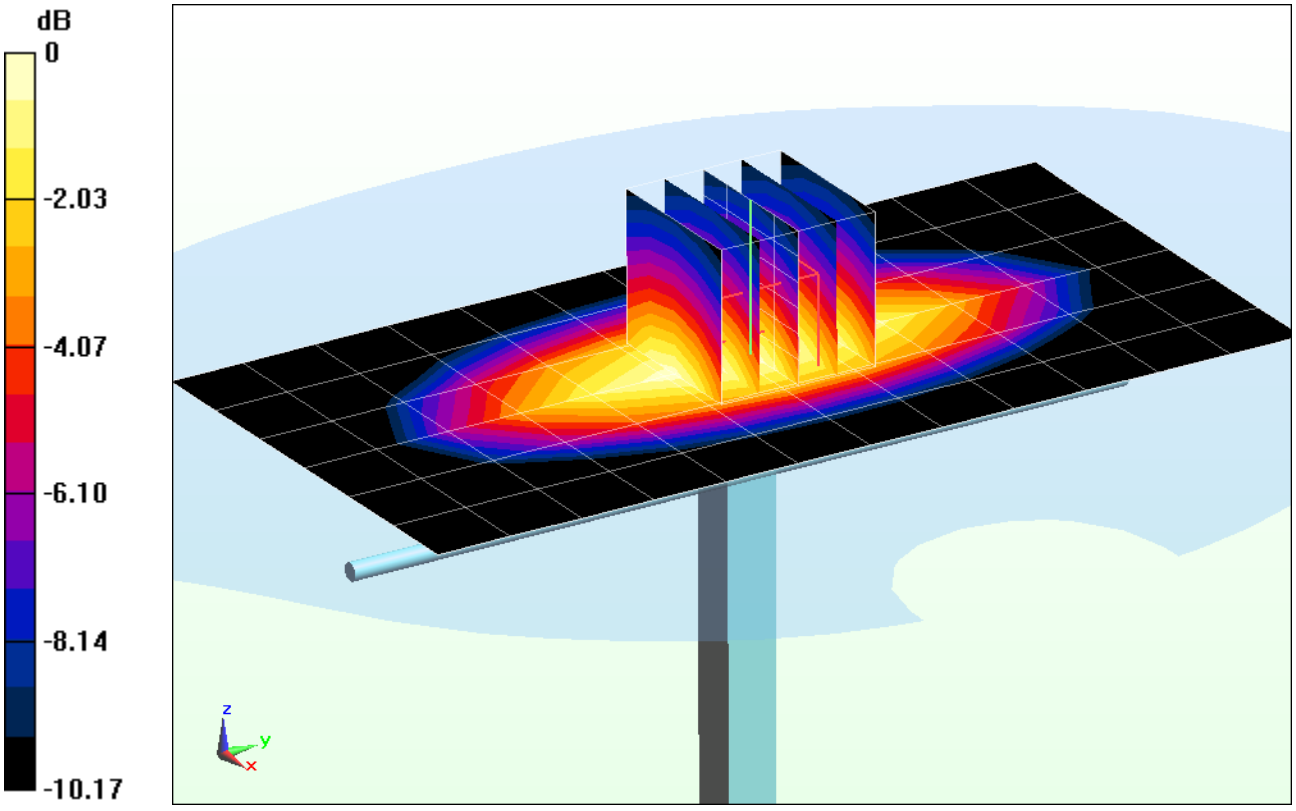
Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Body; Medium parameters used:
f = 835 MHz; σ = 0.959 mho/m; ε_r = 53.32; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5cm

Test Date: 11-28-2012; Ambient Temp: 23.4°C; Tissue Temp: 22.7°C

Probe: ES3DV3 - SN3209; ConvF(6.13, 6.13, 6.13); Calibrated: 3/16/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/20/2012
Phantom: SAM with CRP; Type: SAM; Serial: TP1375
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.7 (6848)

835MHz System Verification

Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 1.34 W/kg
SAR(1 g) = 0.945 W/kg; SAR(10 g) = 0.625 W/kg
Deviation = -1.36%



0 dB = 1.02 W/kg = 0.09 dBW/kg

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

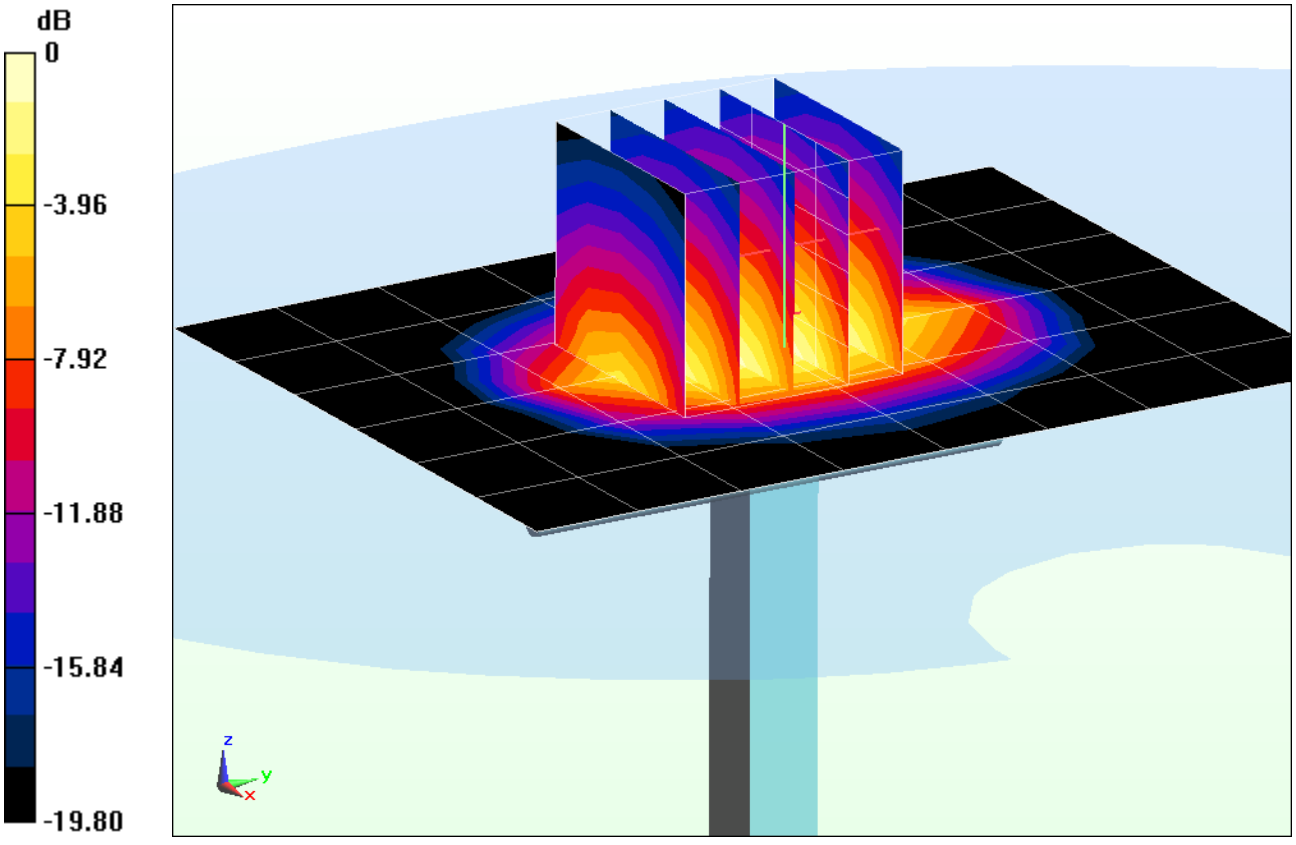
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Body; Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.543 mho/m; ε_r = 52.42; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-26-2012; Ambient Temp: 21.5°C; Tissue Temp: 21.3°C

Probe: ES3DV3 - SN3288; ConvF(4.89, 4.89, 4.89); Calibrated: 9/20/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/19/2012
Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646
Measurement SW: DASY52, Version 52.8 (3);SEMCAD X Version 14.6.7 (6848)

1900 MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 7.58 W/kg
SAR(1 g) = 4.08 W/kg; SAR(10 g) = 2.08 W/kg
Deviation = 3.82%



0 dB = 4.55 W/kg = 6.58 dBW/kg

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

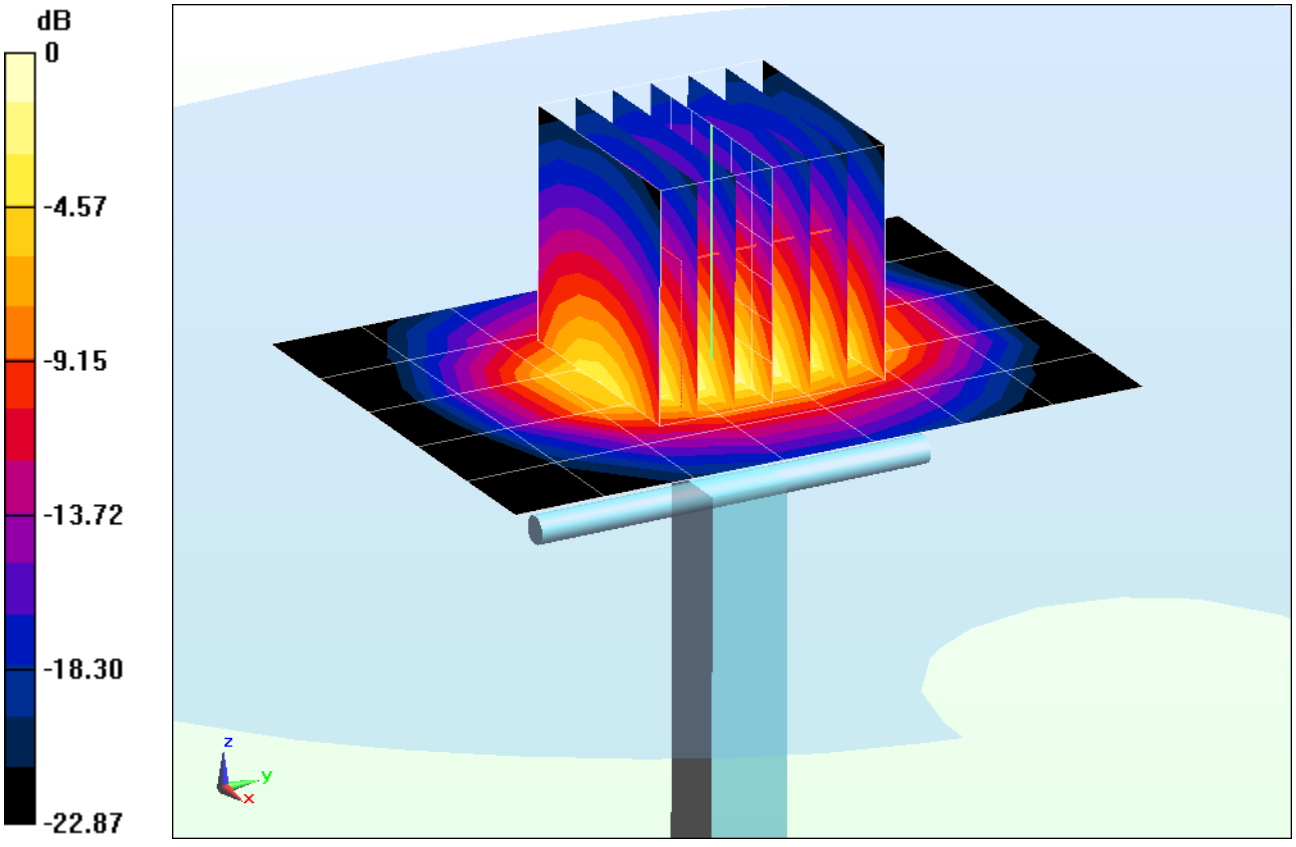
Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Body; Medium parameters used:
f = 2450 MHz; σ = 2.023 mho/m; ε_r = 51.37; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-26-2012; Ambient Temp: 23.2°C; Tissue Temp: 21.3°C

Probe: ES3DV2 - SN3022; ConvF(3.97, 3.97, 3.97); Calibrated: 8/28/2012;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/24/2012
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.7 (6848)

2450MHz System Verification

Area Scan (6x8x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Input Power = 13.0 dBm (20 mW)
Peak SAR (extrapolated) = 2.24 W/kg
SAR(1 g) = 1.02 W/kg; SAR(10 g) = 0.460 W/kg
Deviation = 0.39%



0 dB = 1.36 W/kg = 1.34 dBW/kg

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

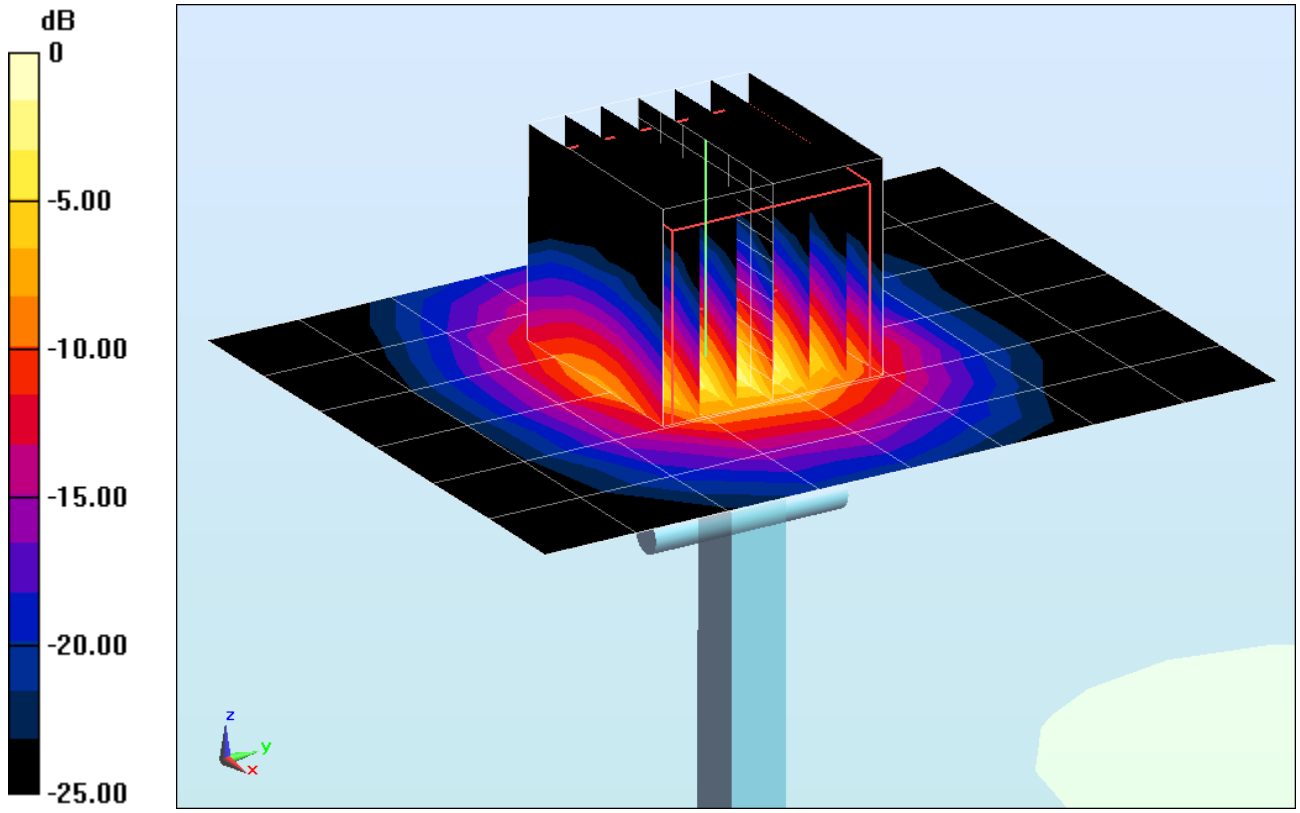
Communication System: CW; Frequency: 5200 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body; Medium parameters used:
f = 5200 MHz; σ = 5.224 mho/m; ε_r = 47.76; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-19-2012; Ambient Temp: 24.1°C; Tissue Temp: 22.5°C

Probe: EX3DV4 - SN3561; ConvF(3.76, 3.76, 3.76); Calibrated: 7/26/2012;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/24/2012
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.7 (6848)

5200MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Input Power = 16.0 dBm (40.0 mW)
Peak SAR (extrapolated) = 11.0 W/kg
SAR(1 g) = 2.82 W/kg; SAR(10 g) = 0.784 W/kg
Deviation = -3.82%



0 dB = 5.86 W/kg = 7.68 dBW/kg

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

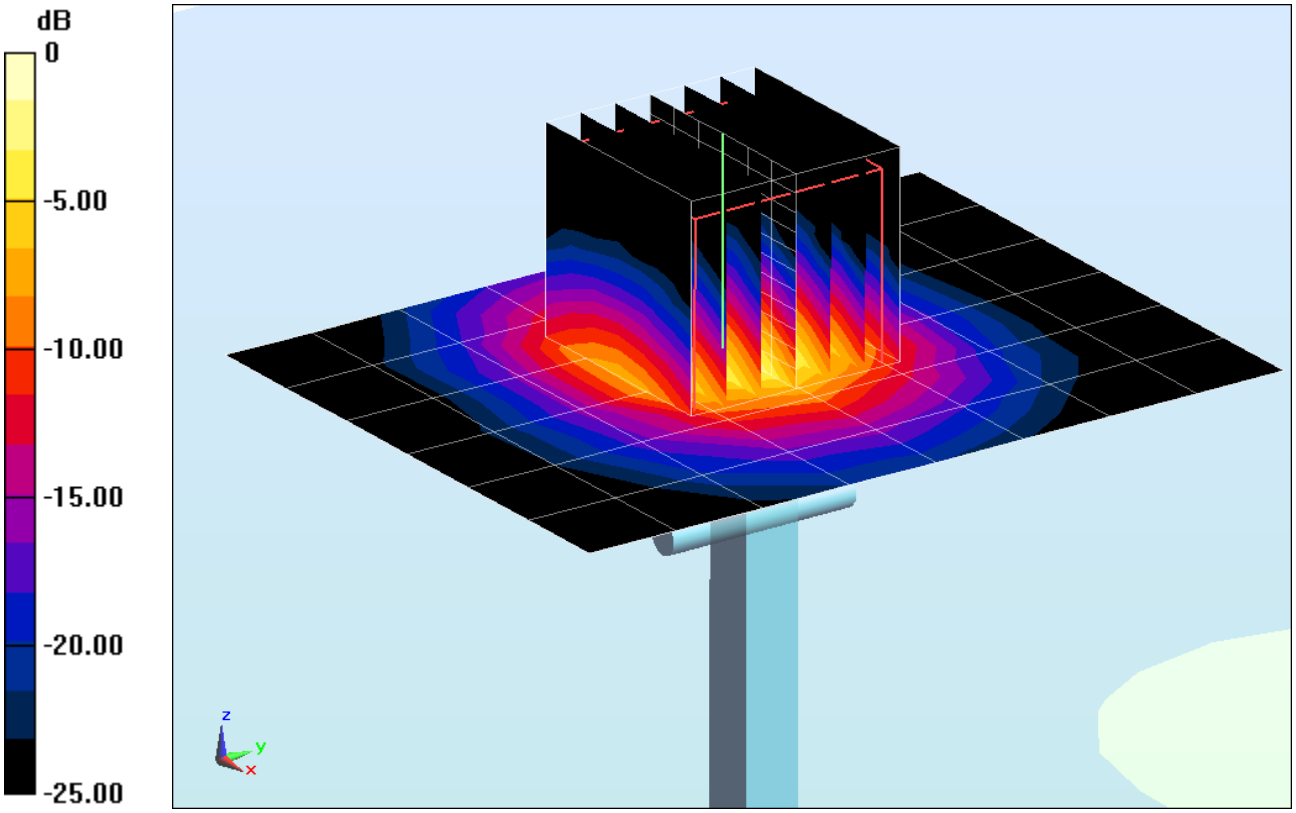
Communication System: CW; Frequency: 5300 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body; Medium parameters used:
f = 5300 MHz; σ = 5.378 mho/m; ε_r = 47.61; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-19-2012; Ambient Temp: 24.2°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN3561; ConvF(3.54, 3.54, 3.54); Calibrated: 7/26/2012;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/24/2012
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.7 (6848)

5300MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Input Power = 16.0 dBm (40 mW)
Peak SAR (extrapolated) = 11.3 W/kg
SAR(1 g) = 2.87 W/kg; SAR(10 g) = 0.788 W/kg
Deviation = -5.09%



0 dB = 6.01 W/kg = 7.79 dBW/kg

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

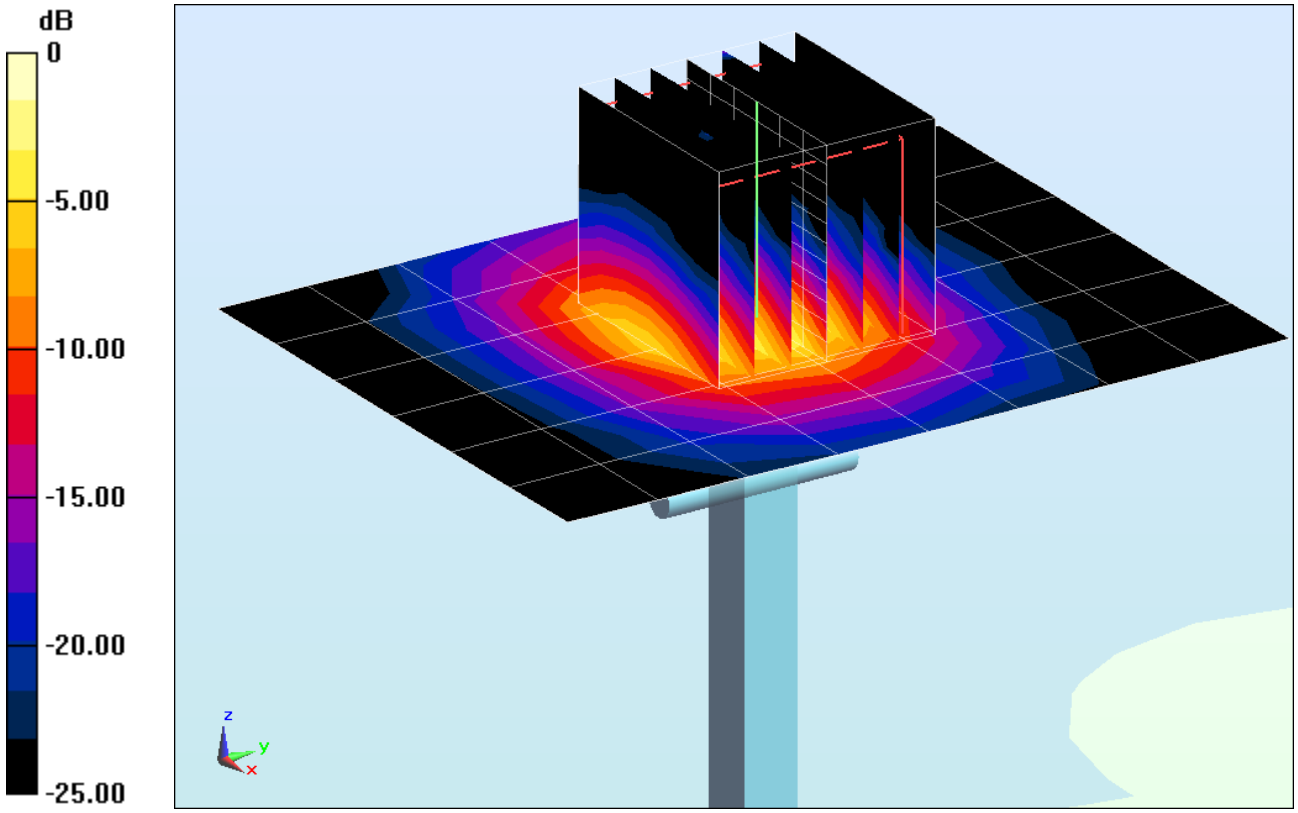
Communication System: CW; Frequency: 5500 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body; Medium parameters used:
f = 5500 MHz; σ = 5.668 mho/m; ε_r = 47.13; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-19-2012; Ambient Temp: 24.3°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN3561; ConvF(3.33, 3.33, 3.33); Calibrated: 7/26/2012;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/24/2012
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.7 (6848)

5500MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Input Power = 16.0 dBm (40 mW)
Peak SAR (extrapolated) = 11.8 W/kg
SAR(1 g) = 2.95 W/kg; SAR(10 g) = 0.805 W/kg
Deviation = -6.05%



0 dB = 5.90 W/kg = 7.71 dBW/kg

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

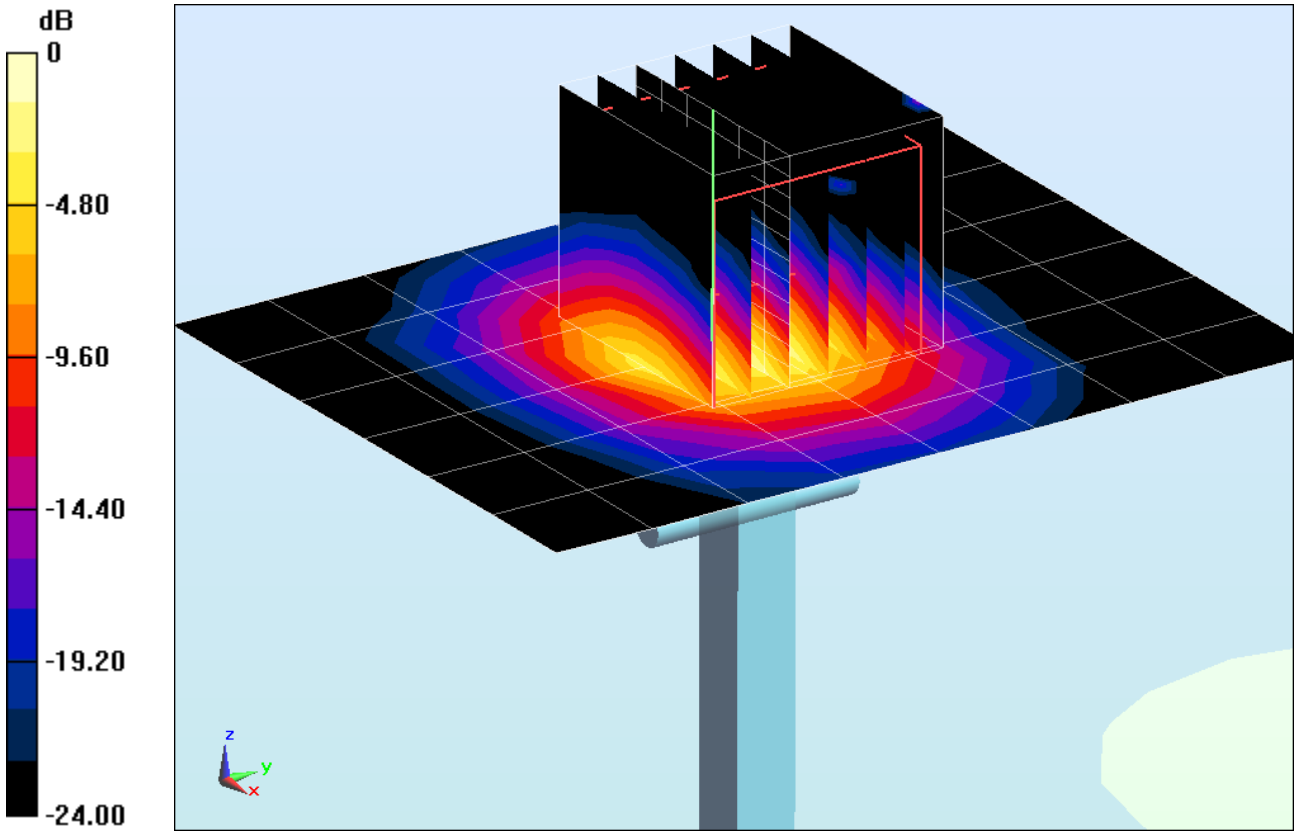
Communication System: CW; Frequency: 5600 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body; Medium parameters used:
f = 5600 MHz; σ = 5.855 mho/m; ε_r = 46.93; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-19-2012; Ambient Temp: 24.2°C; Tissue Temp: 22.8°C

Probe: EX3DV4 - SN3561; ConvF(3.17, 3.17, 3.17); Calibrated: 7/26/2012;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/24/2012
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.7 (6848)

5600MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Input Power = 16.0 dBm (40 mW)
Peak SAR (extrapolated) = 13.9 W/kg
SAR(1 g) = 3.18 W/kg; SAR(10 g) = 0.850 W/kg
Deviation = -0.63%



0 dB = 6.56 W/kg = 8.17 dBW/kg

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

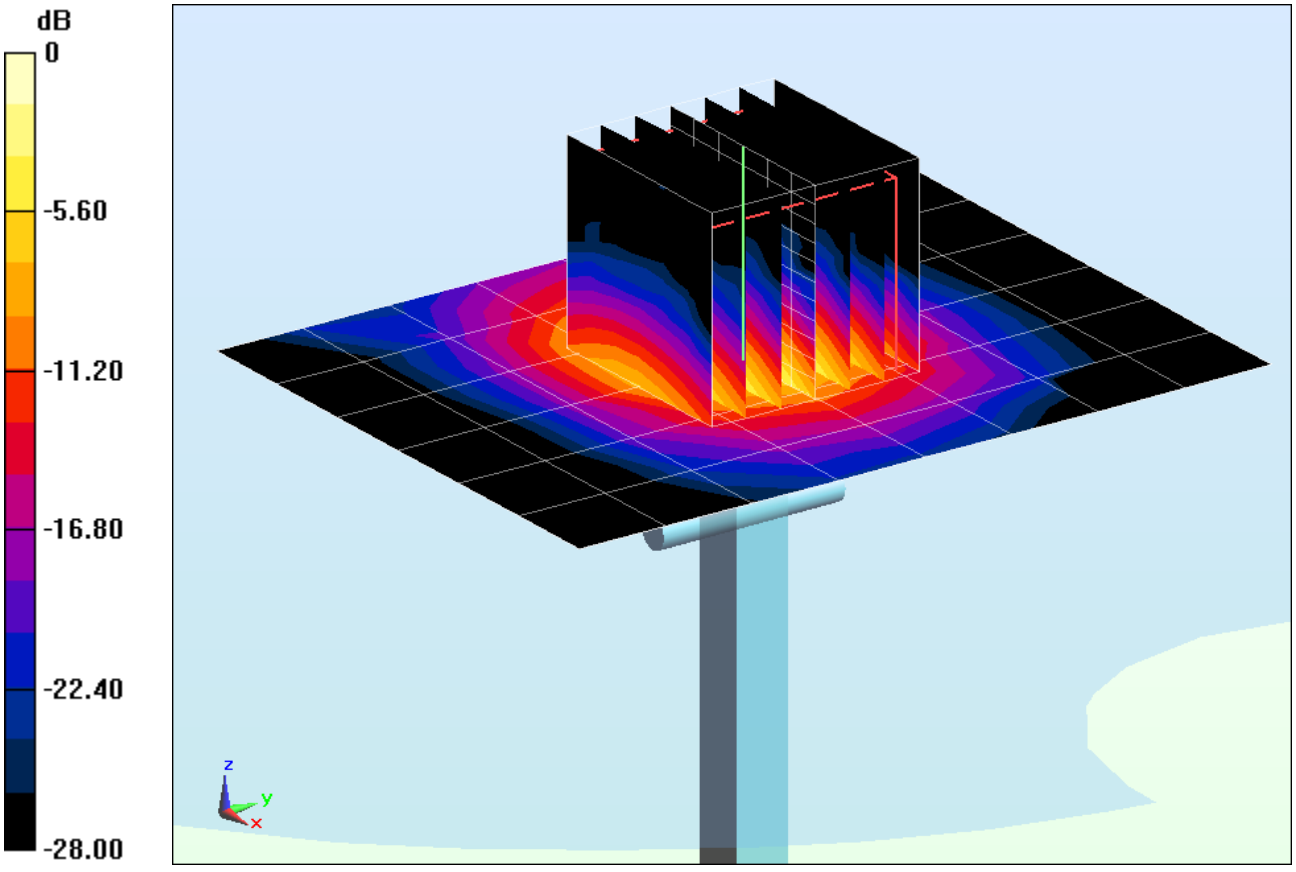
Communication System: CW; Frequency: 5800 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body; Medium parameters used:
f = 5800 MHz; σ = 6.149 mho/m; ε_r = 46.46; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-19-2012; Ambient Temp: 24.0°C; Tissue Temp: 22.5°C

Probe: EX3DV4 - SN3561; ConvF(3.42, 3.42, 3.42); Calibrated: 7/26/2012;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/24/2012
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.7 (6848)

5800MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Input Power = 16.0 dBm (40 mW)
Peak SAR (extrapolated) = 12.6 W/kg
SAR(1 g) = 2.87 W/kg; SAR(10 g) = 0.784 W/kg
Deviation = -3.43%



0 dB = 6.24 W/kg = 7.95 dBW/kg

APPENDIX C: PROBE CALIBRATION

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

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

Accreditation No.: SCS 108

Client **PC Test**

Certificate No: D835V2-4d026_Aug12

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 4d026
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	August 23, 2012

OK 9/17/12

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

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.2 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-13

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	Israe El-Naouq
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 23, 2012

Calibration Laboratory of
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Accreditation No.: SCS 108

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 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 ± 0.2) °C	41.3 ± 6 %	0.90 mho/m ± 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	2.35 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**9.39 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.53 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**6.12 mW /g ± 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 ± 0.2) °C	53.2 ± 6 %	1.00 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.47 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**9.58 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.62 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**6.33 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.7 Ω - 3.4 jΩ
Return Loss	- 26.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.6 Ω - 4.8 jΩ
Return Loss	- 26.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.389 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	December 17, 2004

DASY5 Validation Report for Head TSL

Date: 23.08.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

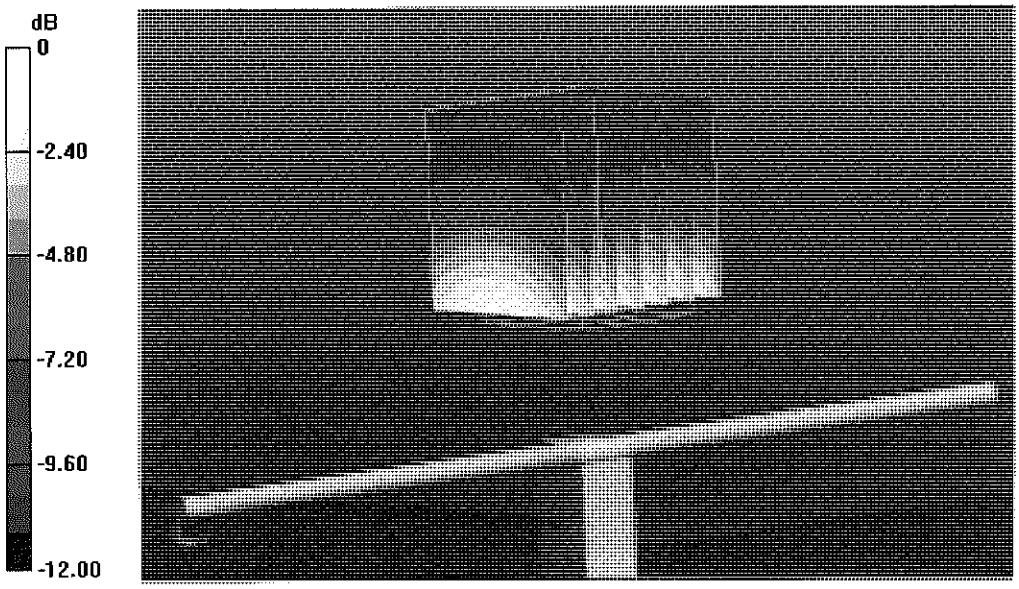
Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.9 mho/m; ε_r = 41.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.07, 6.07, 6.07); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.2(969); SEMCAD X 14.6.6(6824)

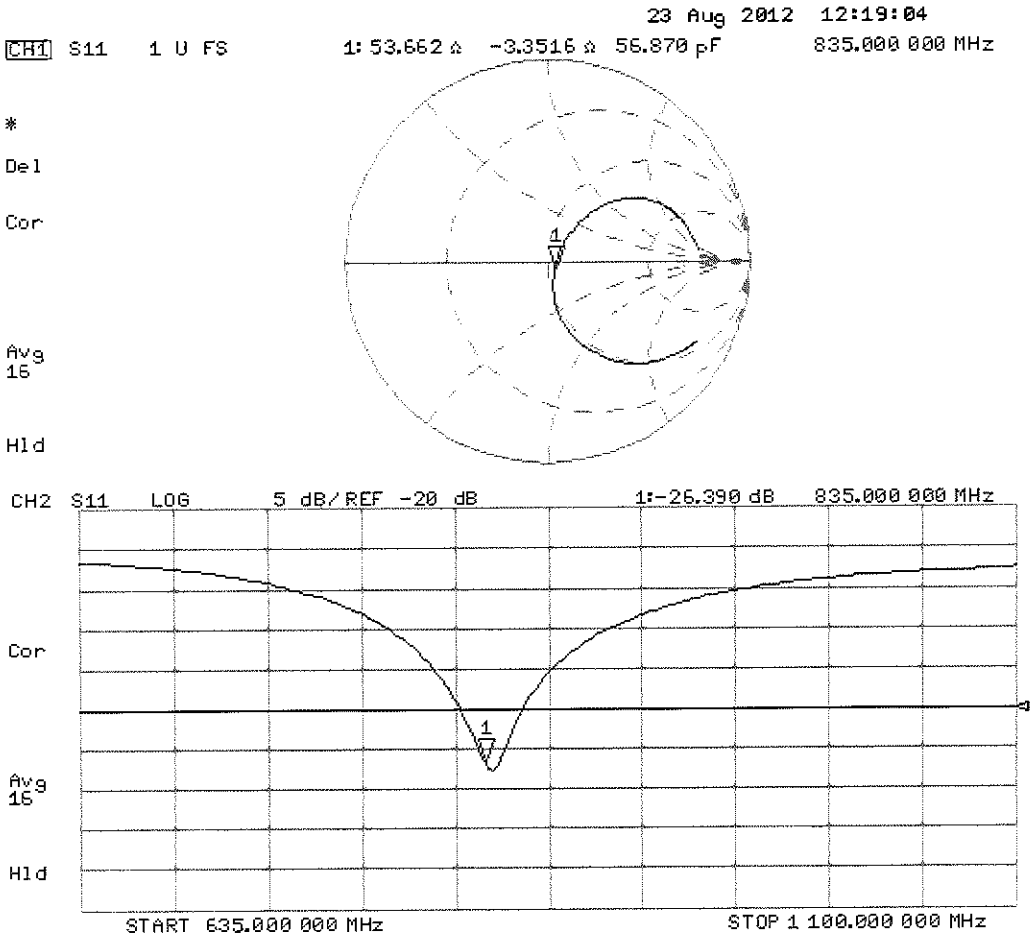
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm 2/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.824 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 3.482 mW/g
SAR(1 g) = 2.35 mW/g; SAR(10 g) = 1.53 mW/g
Maximum value of SAR (measured) = 2.72 W/kg



0 dB = 2.72 W/kg = 8.69 dB W/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 23.08.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

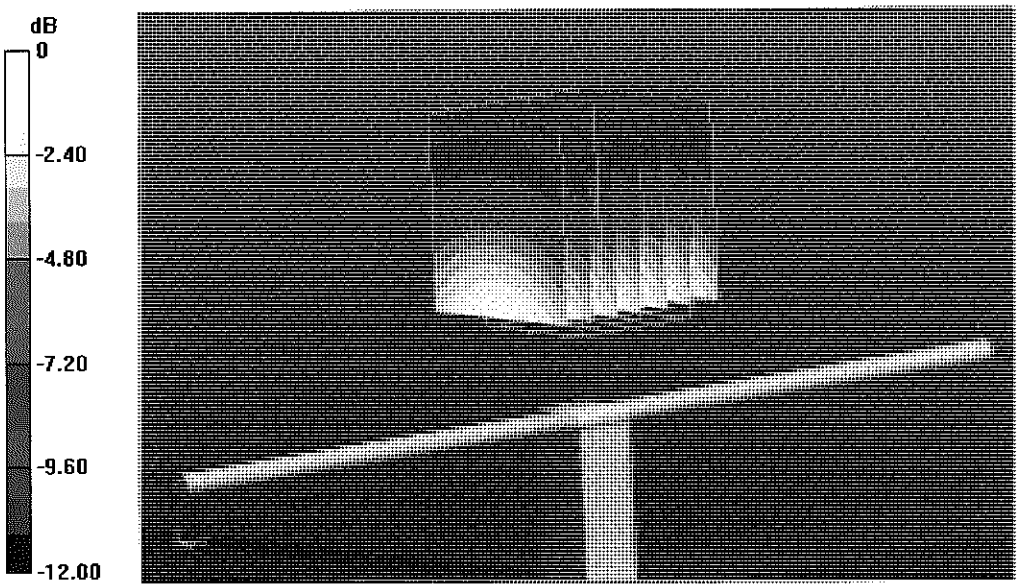
Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 1 mho/m; ε_r = 53.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.02, 6.02, 6.02); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.2(969); SEMCAD X 14.6.6(6824)

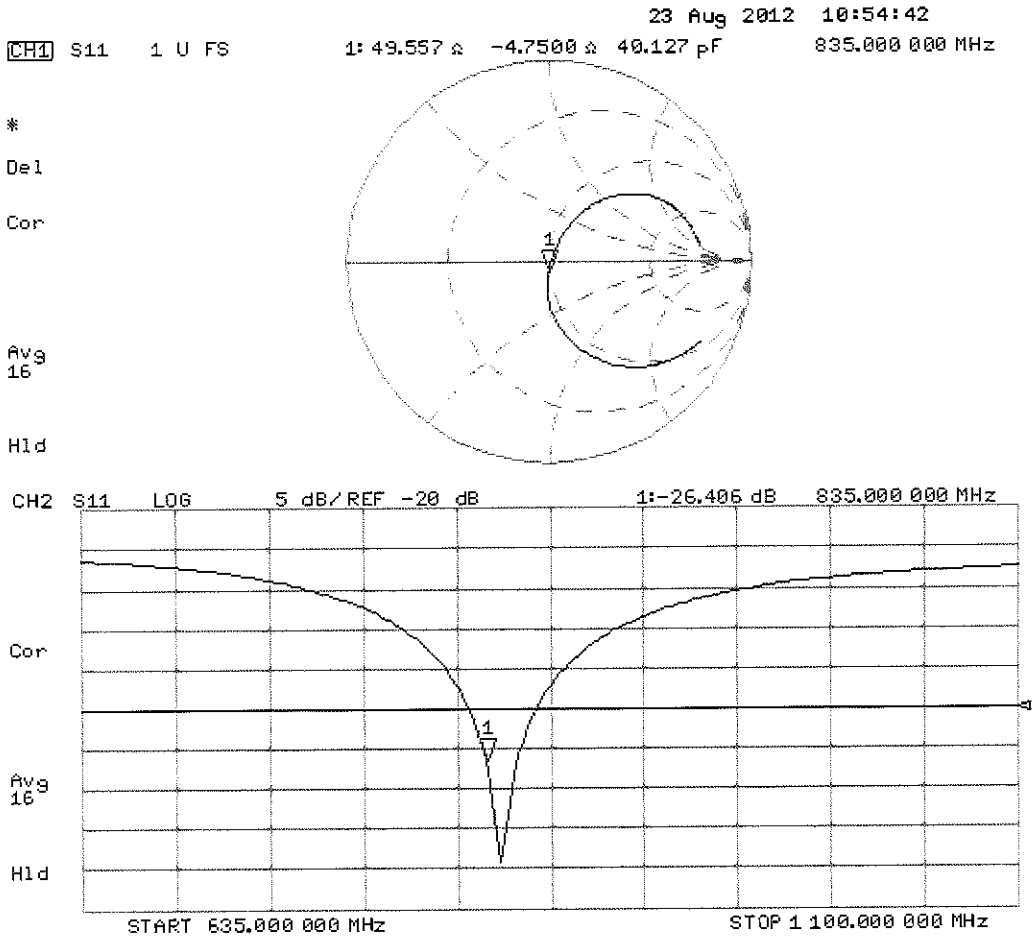
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.339 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 3.592 mW/g
SAR(1 g) = 2.47 mW/g; SAR(10 g) = 1.62 mW/g
Maximum value of SAR (measured) = 2.87 W/kg



0 dB = 2.87 W/kg = 9.16 dB W/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 108

Client PC Test

Certificate No: D1900V2-5d149_Feb12

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d149
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	February 22, 2012

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

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5086 (20g)	29-Mar-11 (No. 217-01368)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 23, 2012

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

Accreditation No.: SCS 108

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.4 ± 6 %	1.40 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.80 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**39.3 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.18 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**20.7 mW /g ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.0 ± 6 %	1.56 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.99 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**39.3 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.23 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**20.7 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.4 Ω + 5.5 jΩ
Return Loss	- 24.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.0 Ω + 6.7 jΩ
Return Loss	- 23.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.199 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 11, 2011

Date: 22.02.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

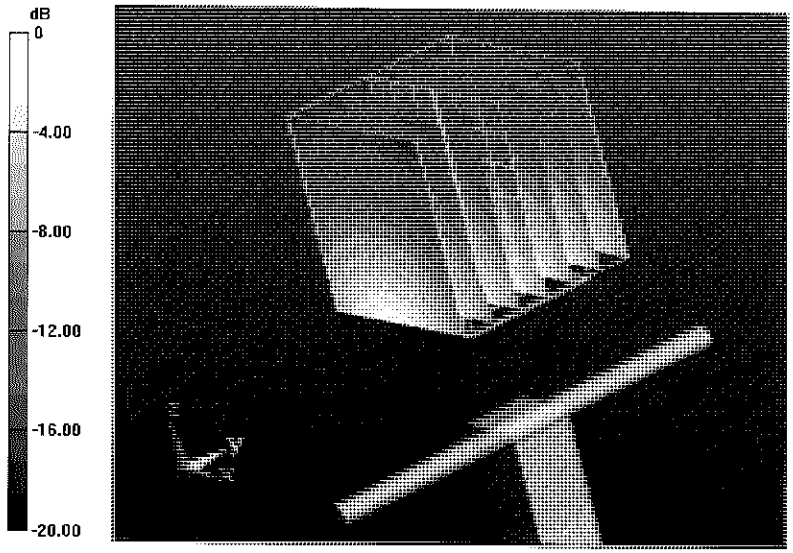
Communication System: CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.4 mho/m; ε_r = 40.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.01, 5.01, 5.01); Calibrated: 30.12.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

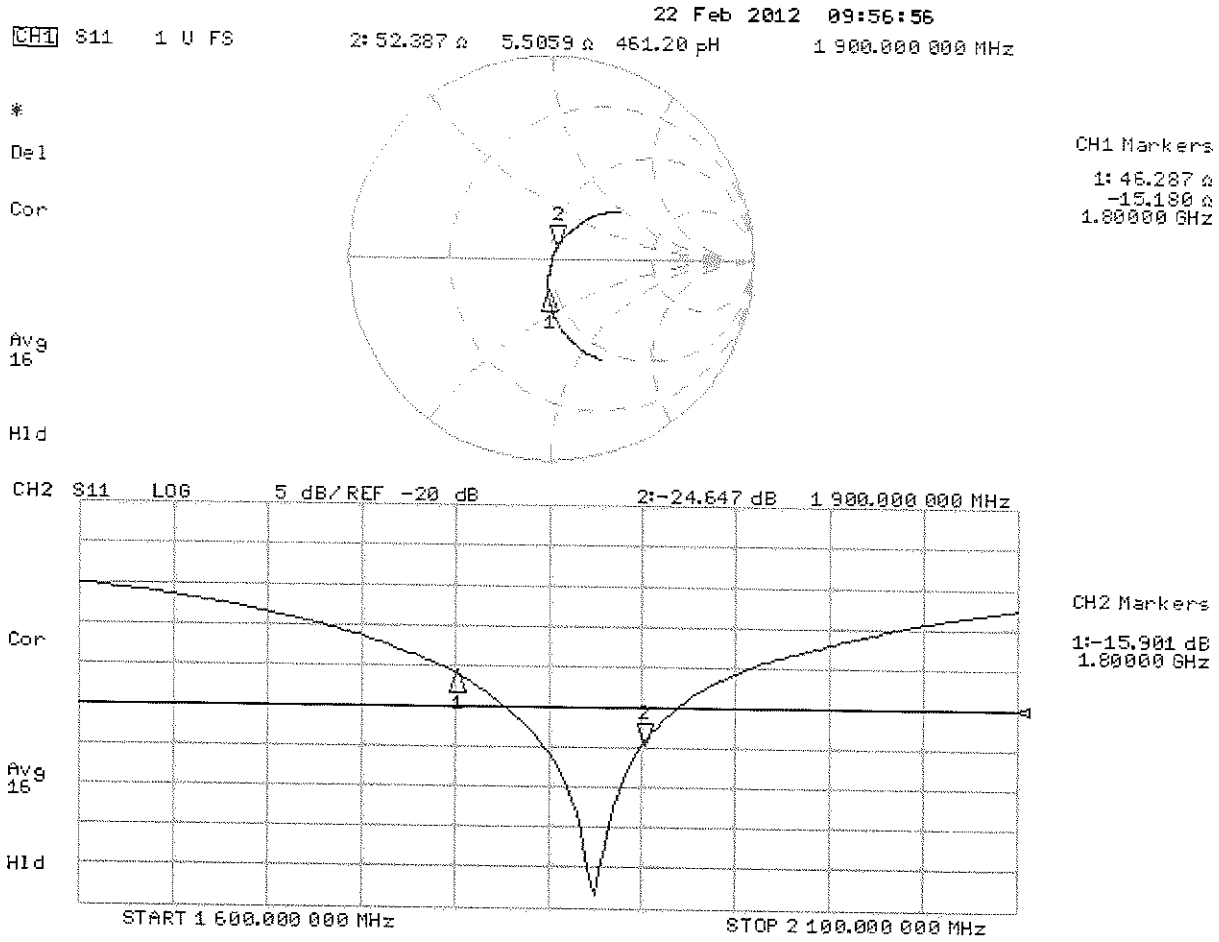
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.685 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 17.4710
SAR(1 g) = 9.8 mW/g; SAR(10 g) = 5.18 mW/g
Maximum value of SAR (measured) = 12.114 mW/g



0 dB = 12.110mW/g = 21.66 dB mW/g

Impedance Measurement Plot for Head TSL



Date: 06.02.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

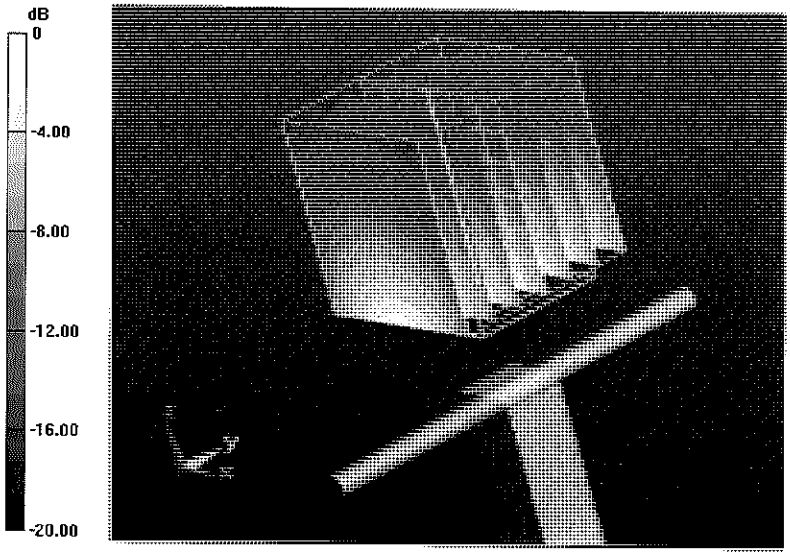
Communication System: CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.56 mho/m; ε_r = 53; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.62, 4.62, 4.62); Calibrated: 30.12.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

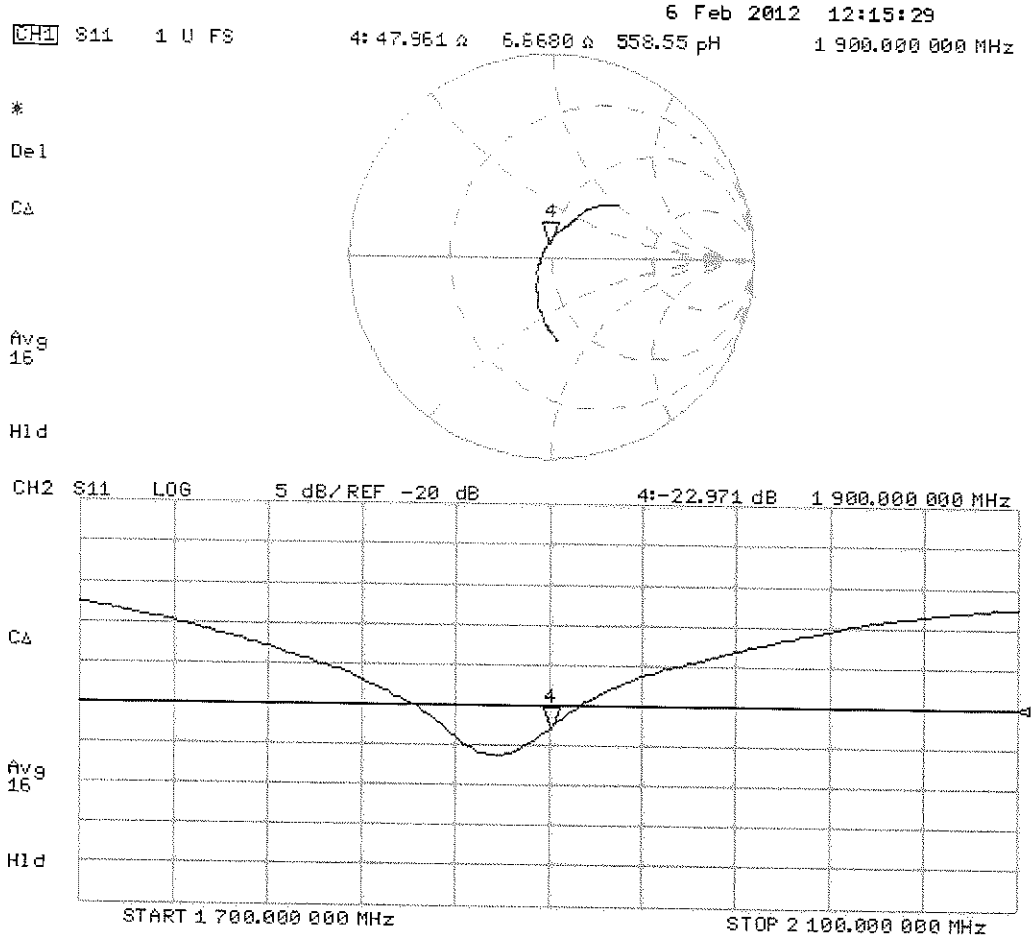
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.047 V/m; Power Drift = 0.0017 dB
Peak SAR (extrapolated) = 18.1310
SAR(1 g) = 9.99 mW/g; SAR(10 g) = 5.23 mW/g
Maximum value of SAR (measured) = 12.672 mW/g



0 dB = 12.670mW/g = 22.06 dB mW/g

Impedance Measurement Plot for Body TSL



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S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS) Accreditation No.: **SCS 108**

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

Client **PC Test** Certificate No: **D2450V2-797_Jan12**

CALIBRATION CERTIFICATE

Object D2450V2 - SN: 797

Calibration procedure(s) QA CAL-05.v8
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: January 24, 2012

✓ KOK 2/6/2012

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

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5086 (20g)	29-Mar-11 (No. 217-01368)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	Israe El-Naouq
Approved by:	Katja Pokovic	Technical Manager	

Issued: January 24, 2012

Glossary:

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

Calibration is Performed According to the Following Standards:

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

b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.2 ± 6 %	1.85 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.2 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**52.1 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.12 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**24.3 mW /g ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	50.6 ± 6 %	2.01 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.0 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**50.8 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.01 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**23.7 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.0 Ω + 4.7 jΩ
Return Loss	- 24.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.1 Ω + 5.4 jΩ
Return Loss	- 25.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.151 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	January 24, 2006

DASY5 Validation Report for Head TSL

Date: 24.01.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

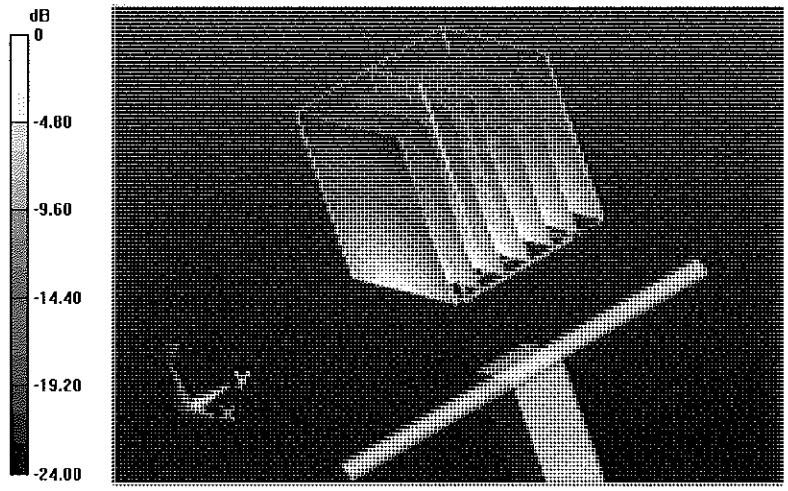
Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.85 mho/m; ε_r = 39.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.45, 4.45, 4.45); Calibrated: 30.12.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

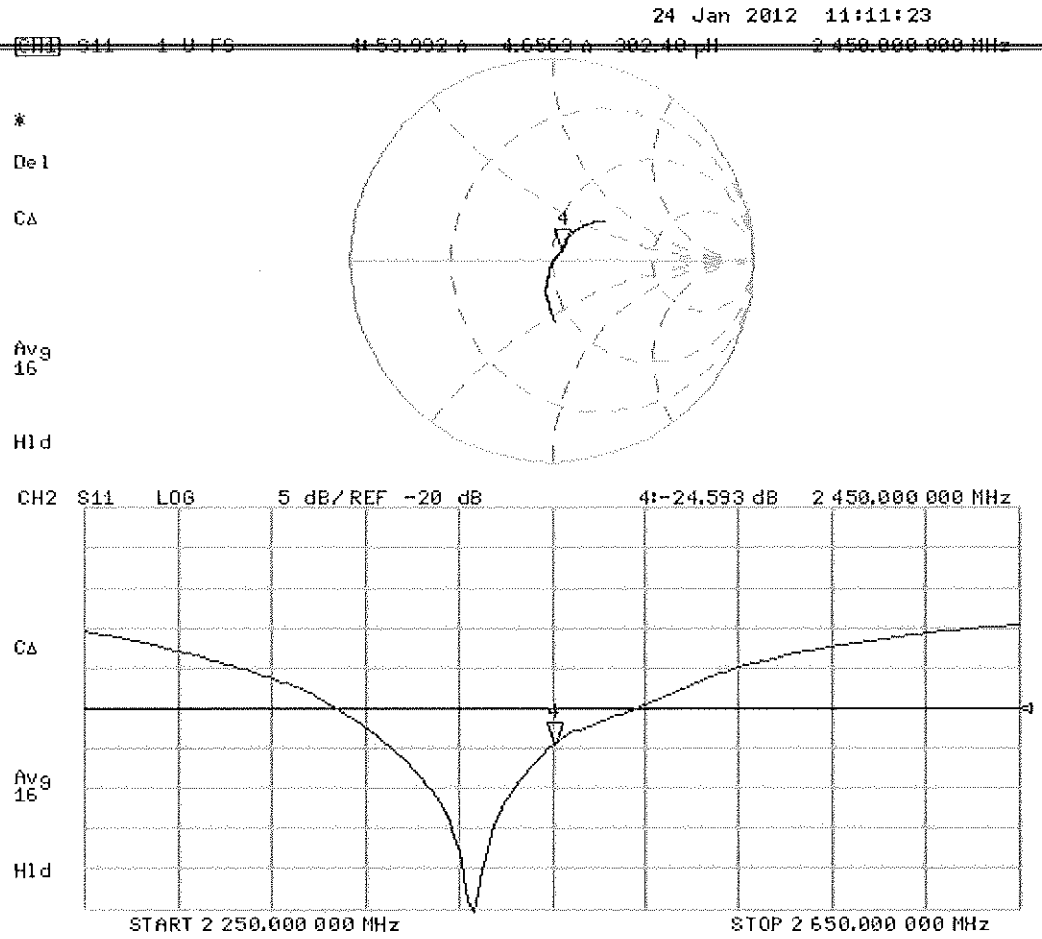
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 99.248 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 27.3550
SAR(1 g) = 13.2 mW/g; SAR(10 g) = 6.12 mW/g
Maximum value of SAR (measured) = 17.017 mW/g



0 dB = 17.020mW/g = 24.62 dB mW/g

Impedance Measurement Plot for Head TSL



Date: 23.01.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

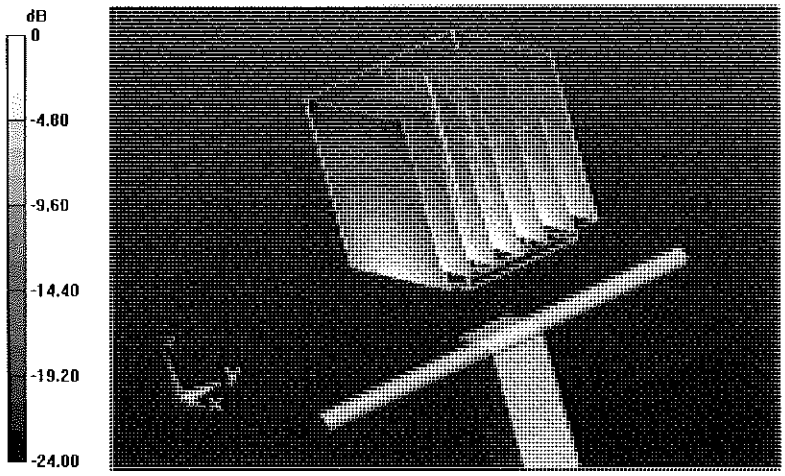
Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 50.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.26, 4.26, 4.26); Calibrated: 30.12.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

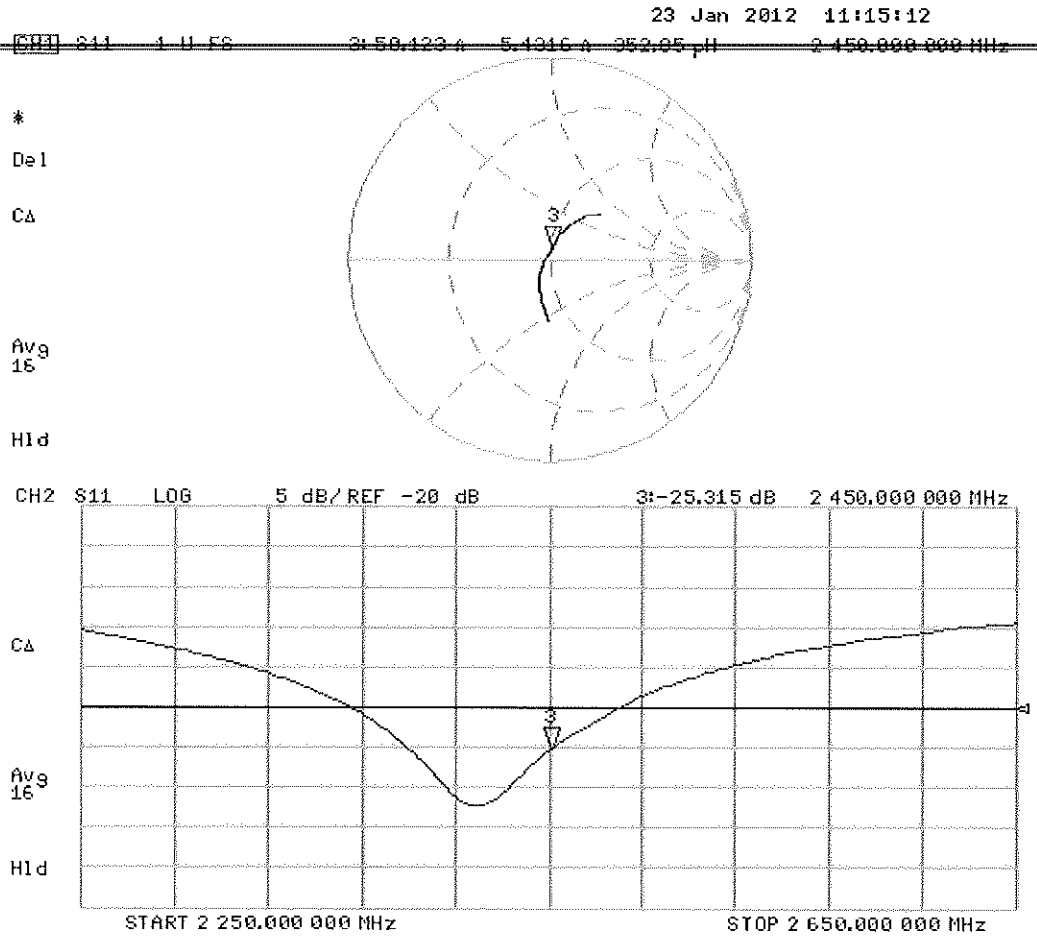
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.727 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 26.9680
SAR(1 g) = 13 mW/g; SAR(10 g) = 6.01 mW/g
Maximum value of SAR (measured) = 17.222 mW/g



0 dB = 17.220mW/g = 24.72 dB mW/g

Impedance Measurement Plot for Body TSL



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

Accreditation No.: SCS 108

Client **PC Test**

Certificate No: D5GHzV2-1007_Oct12

CALIBRATION CERTIFICATE

Object	D5GHzV2 - SN: 1007
Calibration procedure(s)	QA CAL-22.v1 Calibration procedure for dipole validation kits between 3-6 GHz
Calibration date:	October 30, 2012

KOK 11/15/12

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

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.2 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe EX3DV4	SN: 3503	30-Dec-11 (No. EX3-3503_Dec11)	Dec-12
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-13

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	Israe El-Naouq
Approved by:	Katja Pokovic	Technical Manager	

Issued: October 31, 2012

Calibration Laboratory of
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Zeughausstrasse 43, 8004 Zurich, Switzerland

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

Accreditation No.: SCS 108

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEC 62209-2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures"; Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", March 2010

b) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

c) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.3
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz ± 1 MHz 5300 MHz ± 1 MHz 5500 MHz ± 1 MHz 5600 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.8 ± 6 %	4.53 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.04 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**79.8 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.31 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.9 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	35.9	4.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.7 ± 6 %	4.63 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5300 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**83.1 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.41 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.9 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.4 ± 6 %	4.83 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.56 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**84.9 W / kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.44 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.1 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.2 ± 6 %	4.93 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.53 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**84.5 W / kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.43 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.0 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.0 ± 6 %	5.15 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.05 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**79.8 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.29 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.7 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.8 ± 6 %	5.41 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.40 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**73.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.08 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.6 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.42 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.7 ± 6 %	5.52 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5300 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.63 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**75.6 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.2 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.6	5.65 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.3 ± 6 %	5.78 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.92 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**78.5 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.21 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.8 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.2 ± 6 %	5.90 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.07 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**80.0 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.25 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**22.2 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	45.9 ± 6 %	6.18 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	-----	-----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.49 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**74.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.08 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.6 W/kg ± 19.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	55.1 Ω - 11.2 jΩ
Return Loss	- 18.7 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	56.8 Ω - 1.2 jΩ
Return Loss	- 23.8 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	49.5 Ω - 4.3 jΩ
Return Loss	- 27.3 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	59.3 Ω - 7.4 jΩ
Return Loss	- 19.3 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	57.2 Ω + 5.4 jΩ
Return Loss	- 21.6 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	52.1 Ω - 10.0 jΩ
Return Loss	- 20.1 dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	55.6 Ω - 3.0 jΩ
Return Loss	- 24.4 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	50.1 Ω - 3.3 jΩ
Return Loss	- 29.5 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	57.6 Ω - 6.2 jΩ
Return Loss	- 20.8 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	59.7 Ω + 4.5 jΩ
Return Loss	- 20.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.201 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	August 28, 2003

DASY5 Validation Report for Head TSL

Date: 30.10.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1007

Communication System: CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 4.53 mho/m; ε_r = 34.8; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 4.63 mho/m; ε_r = 34.7; ρ = 1000 kg/m^3 , Medium parameters used: f = 5500 MHz; σ = 4.83 mho/m; ε_r = 34.4; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 4.93 mho/m; ε_r = 34.2; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 5.15 mho/m; ε_r = 34; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.41, 5.41, 5.41); Calibrated: 30.12.2011, ConvF(5.1, 5.1, 5.1); Calibrated: 30.12.2011, ConvF(4.91, 4.91, 4.91); Calibrated: 30.12.2011, ConvF(4.76, 4.76, 4.76); Calibrated: 30.12.2011, ConvF(4.81, 4.81, 4.81); Calibrated: 30.12.2011;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.3(988); SEMCAD X 14.6.7(6848)

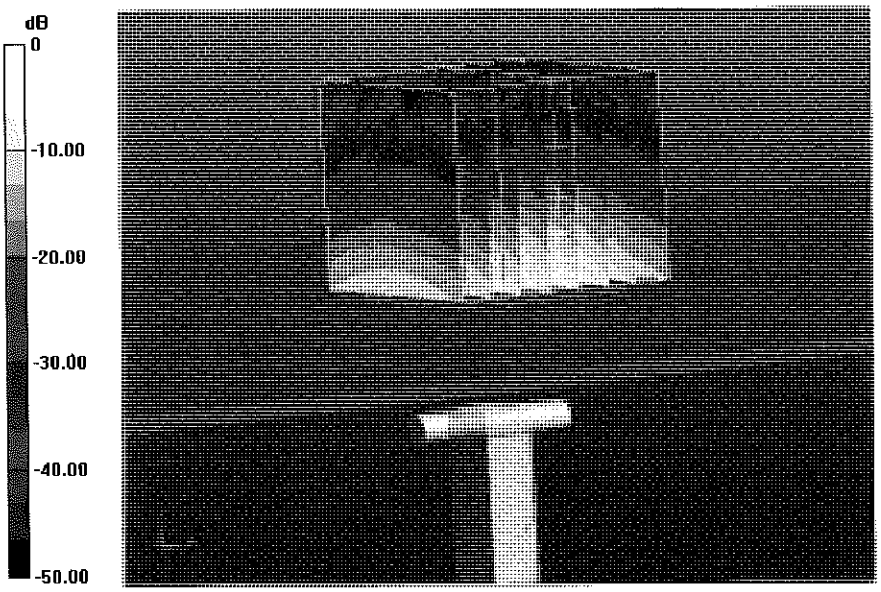
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.518 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 29.8 W/kg
SAR(1 g) = 8.04 W/kg; SAR(10 g) = 2.31 W/kg
Maximum value of SAR (measured) = 18.7 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.964 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 31.8 W/kg
SAR(1 g) = 8.38 W/kg; SAR(10 g) = 2.41 W/kg
Maximum value of SAR (measured) = 19.8 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.435 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 33.8 W/kg
SAR(1 g) = 8.56 W/kg; SAR(10 g) = 2.44 W/kg
Maximum value of SAR (measured) = 20.5 W/kg

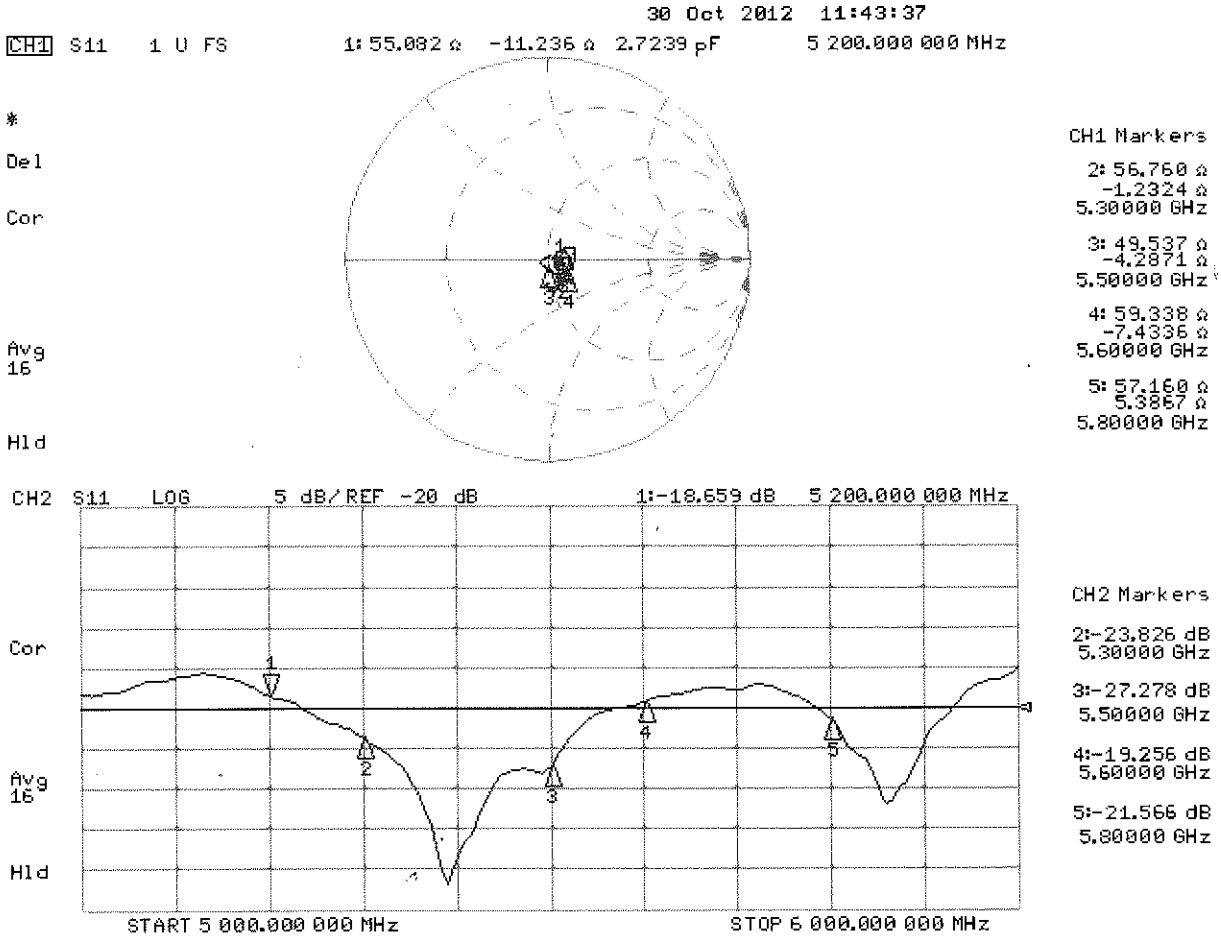
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.179 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 33.9 W/kg
SAR(1 g) = 8.53 W/kg; SAR(10 g) = 2.43 W/kg
Maximum value of SAR (measured) = 20.4 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 61.223 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 33.5 W/kg
SAR(1 g) = 8.05 W/kg; SAR(10 g) = 2.29 W/kg
Maximum value of SAR (measured) = 19.6 W/kg



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

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 30.10.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1007

Communication System: CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 5.41 mho/m; ε_r = 46.8; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 5.52 mho/m; ε_r = 46.7; ρ = 1000 kg/m^3 , Medium parameters used: f = 5500 MHz; σ = 5.78 mho/m; ε_r = 46.3; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 5.9 mho/m; ε_r = 46.2; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 6.18 mho/m; ε_r = 45.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.91, 4.91, 4.91); Calibrated: 30.12.2011, ConvF(4.67, 4.67, 4.67); Calibrated: 30.12.2011, ConvF(4.43, 4.43, 4.43); Calibrated: 30.12.2011, ConvF(4.22, 4.22, 4.22); Calibrated: 30.12.2011, ConvF(4.38, 4.38, 4.38); Calibrated: 30.12.2011;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.3(988); SEMCAD X 14.6.7(6848)

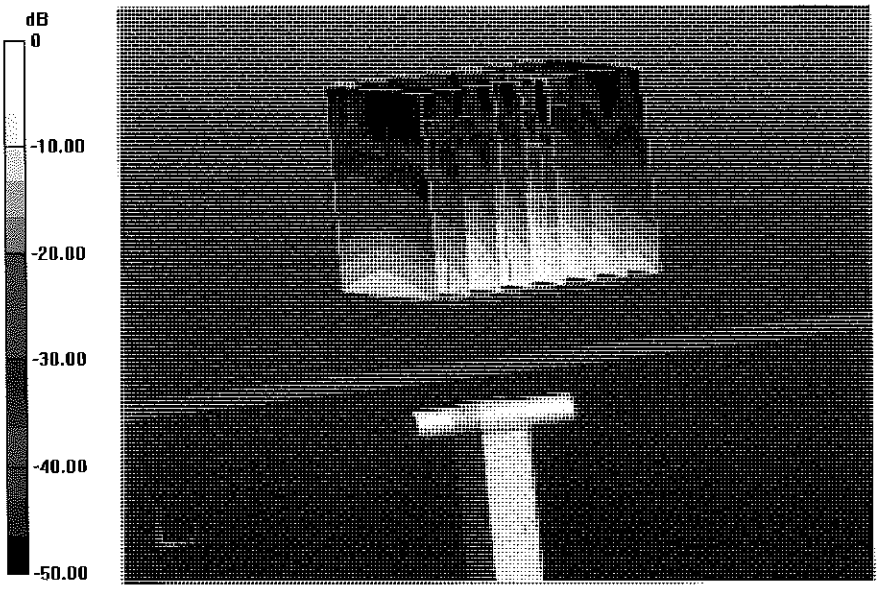
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.536 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 29.4 W/kg
SAR(1 g) = 7.4 W/kg; SAR(10 g) = 2.08 W/kg
Maximum value of SAR (measured) = 17.6 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.637 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 31.3 W/kg
SAR(1 g) = 7.63 W/kg; SAR(10 g) = 2.14 W/kg
Maximum value of SAR (measured) = 18.4 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.216 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 34.4 W/kg
SAR(1 g) = 7.92 W/kg; SAR(10 g) = 2.21 W/kg
Maximum value of SAR (measured) = 19.4 W/kg

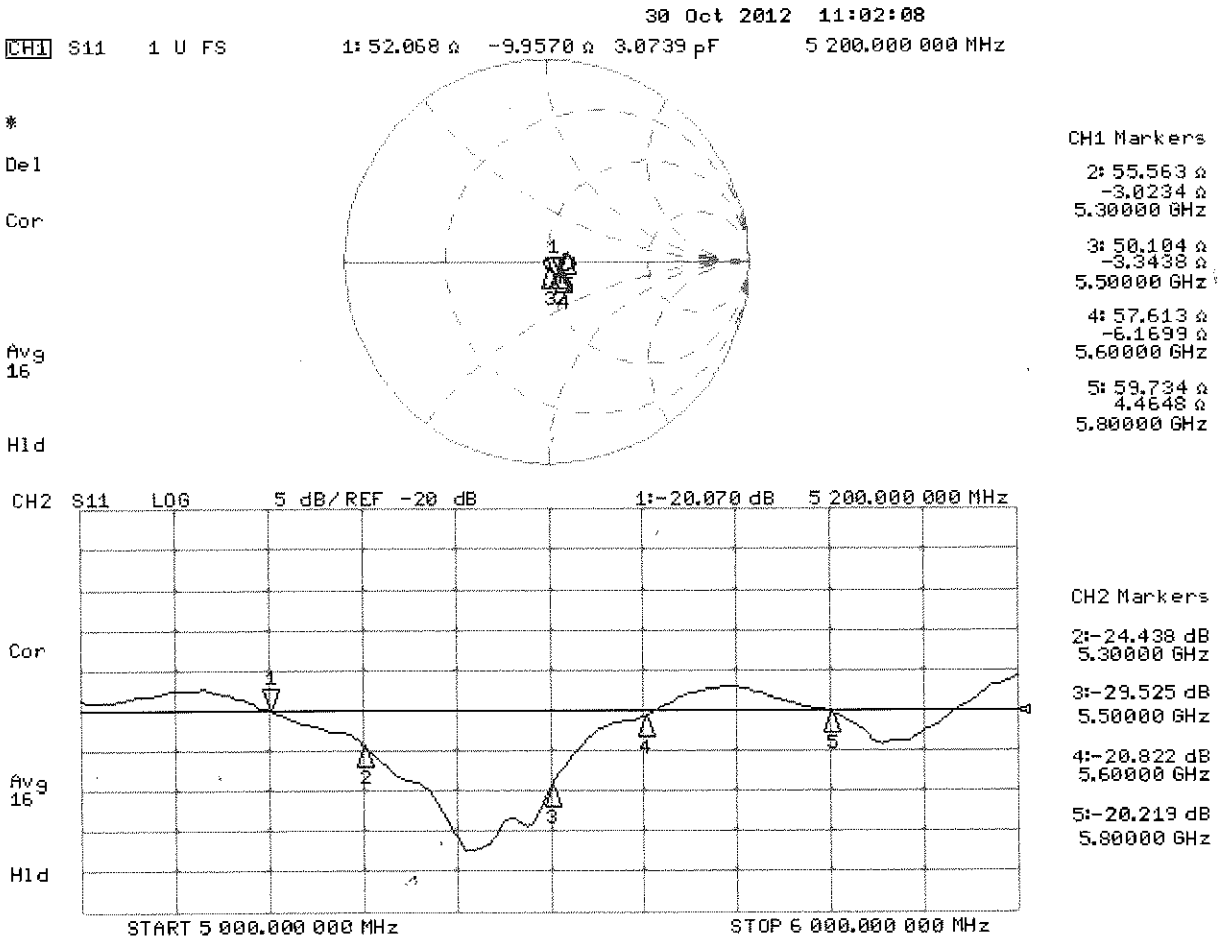
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.347 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 35.9 W/kg
SAR(1 g) = 8.07 W/kg; SAR(10 g) = 2.25 W/kg
Maximum value of SAR (measured) = 19.9 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 55.261 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 35.4 W/kg
SAR(1 g) = 7.49 W/kg; SAR(10 g) = 2.08 W/kg
Maximum value of SAR (measured) = 18.9 W/kg



0 dB = 18.9 W/kg = 12.76 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 108

Client PC Test

Certificate No: ES3-3209_Mar12

CALIBRATION CERTIFICATE

Object: ES3DV3 - SN:3209

Calibration procedure(s): QA CAL-01.v8, QA CAL-12.v7, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes

Calibration date: March 16, 2012

✓ KOK 4/5/12

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

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

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

Issued: March 19, 2012

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Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization $\vartheta = 0$ ($f \le 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \le 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe ES3DV3

SN:3209

Manufactured: October 14, 2008
Calibrated: March 16, 2012

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3209

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.36	1.34	1.15	± 10.1 %
DCP (mV)[B]	98.2	97.4	98.7	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	119.2	±3.5 %
			Y	0.00	0.00	1.00	89.3	
			Z	0.00	0.00	1.00	111.5	

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

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3209

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	6.47	6.47	6.47	0.37	1.61	± 12.0 %
835	41.5	0.90	6.22	6.22	6.22	0.24	2.24	± 12.0 %
1640	40.3	1.29	5.38	5.38	5.38	0.41	1.56	± 12.0 %
1750	40.1	1.37	5.26	5.26	5.26	0.41	1.60	± 12.0 %
1900	40.0	1.40	5.15	5.15	5.15	0.80	1.16	± 12.0 %
2450	39.2	1.80	4.46	4.46	4.46	0.64	1.39	± 12.0 %
2600	39.0	1.96	4.30	4.30	4.30	0.69	1.42	± 12.0 %

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

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3209

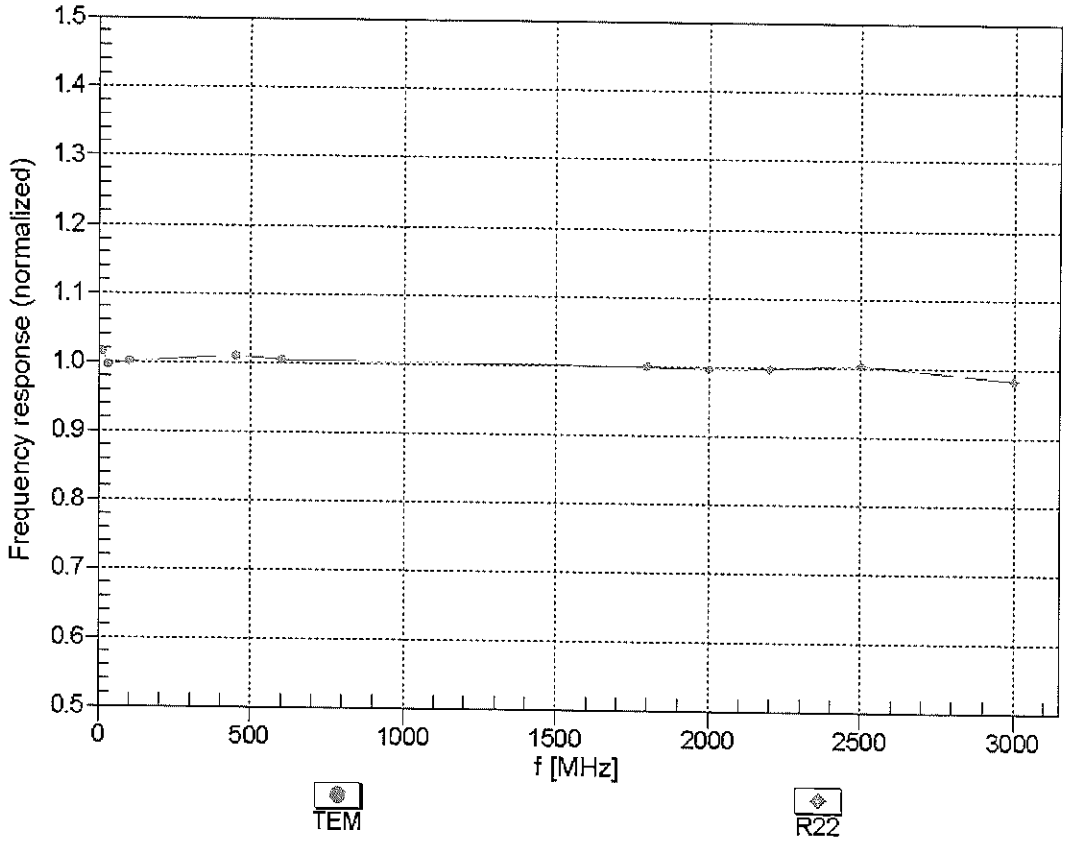
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	56.7	0.94	7.11	7.11	7.11	0.07	1.00	± 13.4 %
750	55.5	0.96	6.23	6.23	6.23	0.54	1.40	± 12.0 %
835	55.2	0.97	6.13	6.13	6.13	0.24	2.27	± 12.0 %
1640	53.8	1.40	5.21	5.21	5.21	0.72	1.29	± 12.0 %
1750	53.4	1.49	4.83	4.83	4.83	0.59	1.44	± 12.0 %
1900	53.3	1.52	4.63	4.63	4.63	0.57	1.50	± 12.0 %
2450	52.7	1.95	4.23	4.23	4.23	0.80	1.00	± 12.0 %
2600	52.5	2.16	4.02	4.02	4.02	0.62	0.90	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

Frequency Response of E-Field

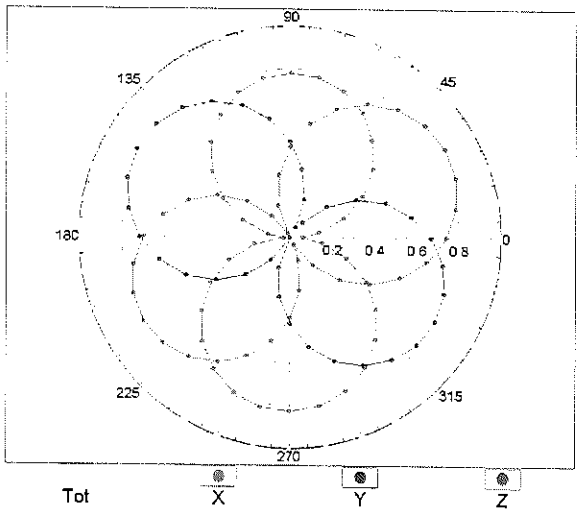
(TEM-Cell:ifi110 EXX, Waveguide: R22)



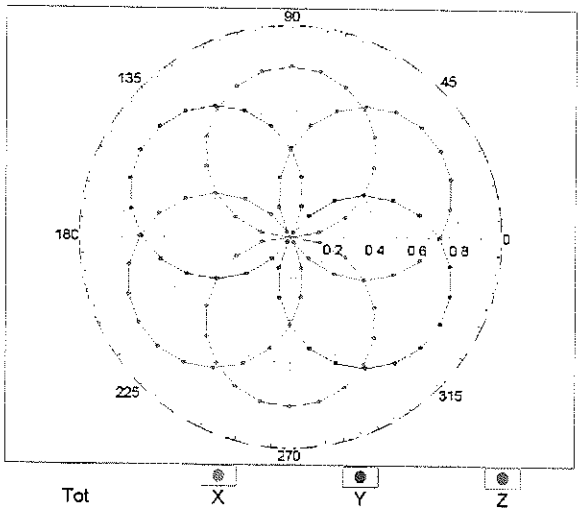
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

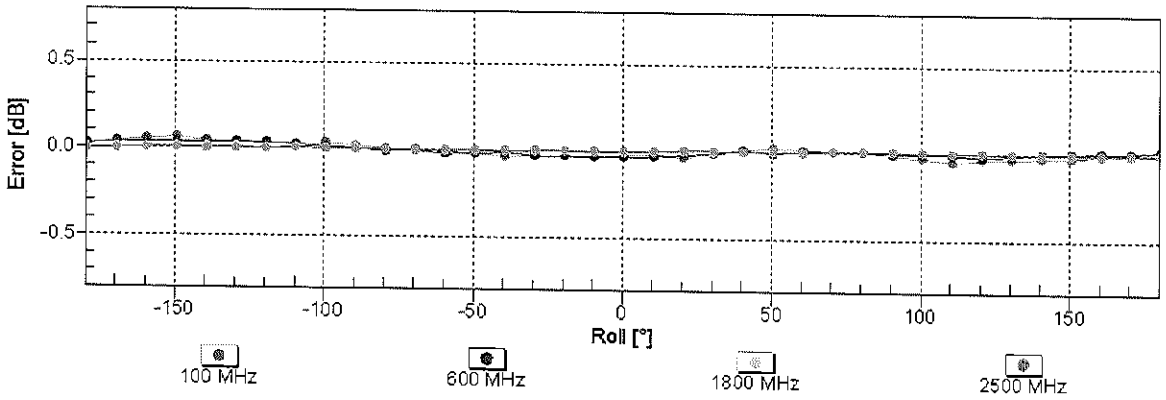
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



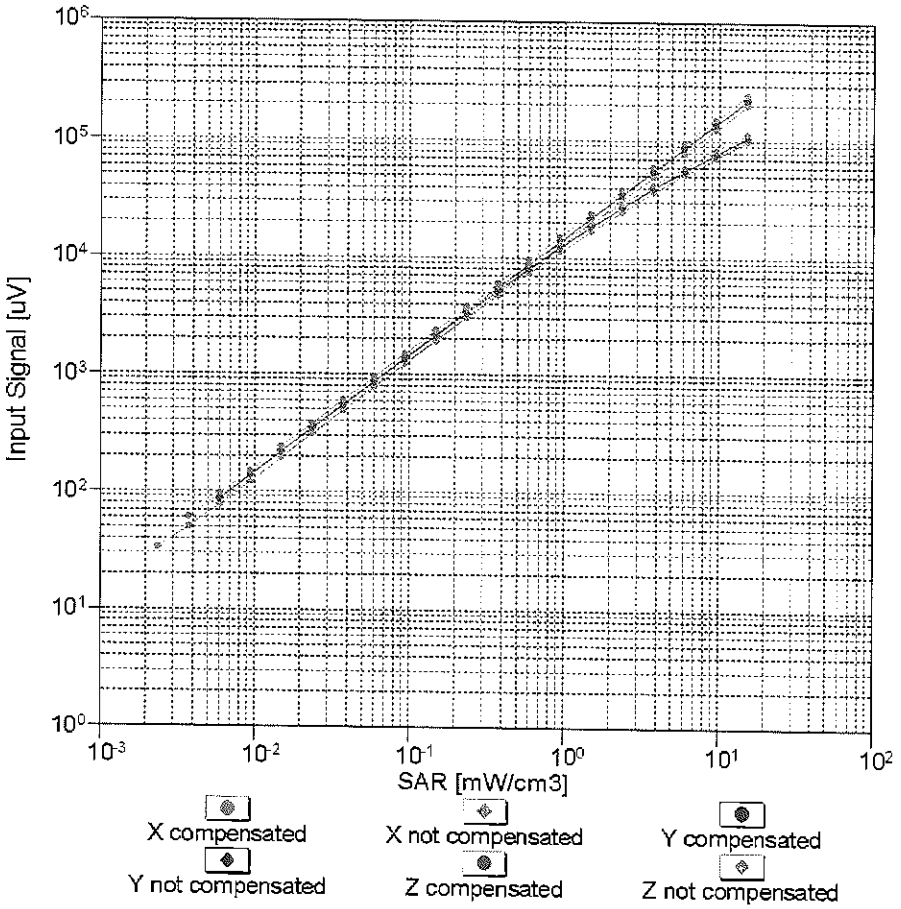
f=1800 MHz,R22

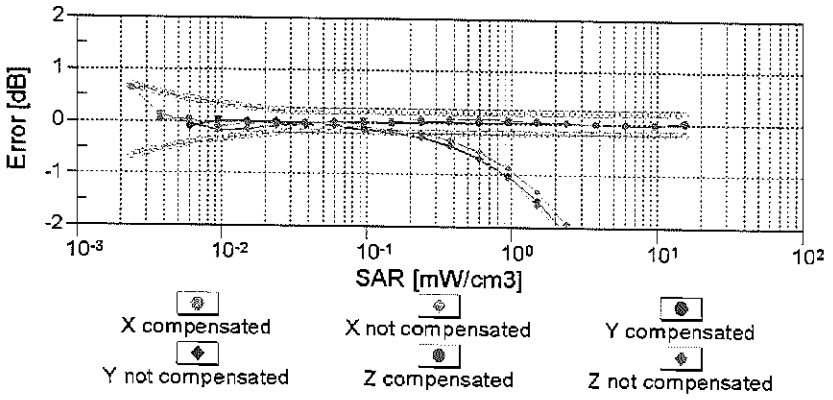




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

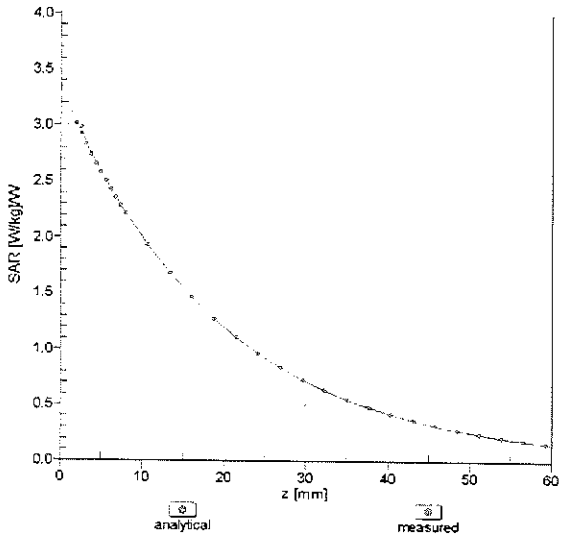




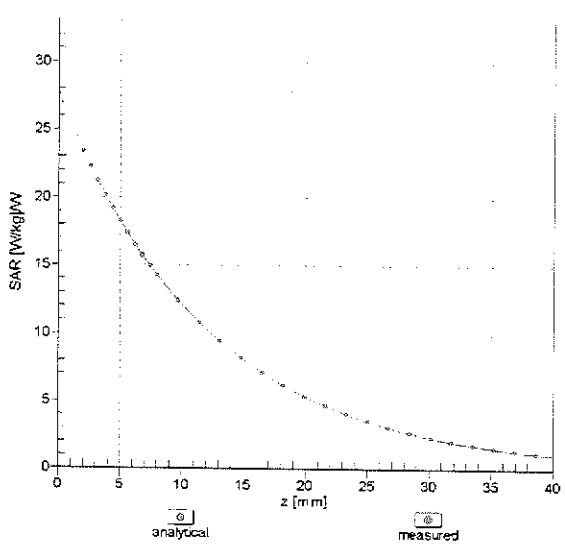
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

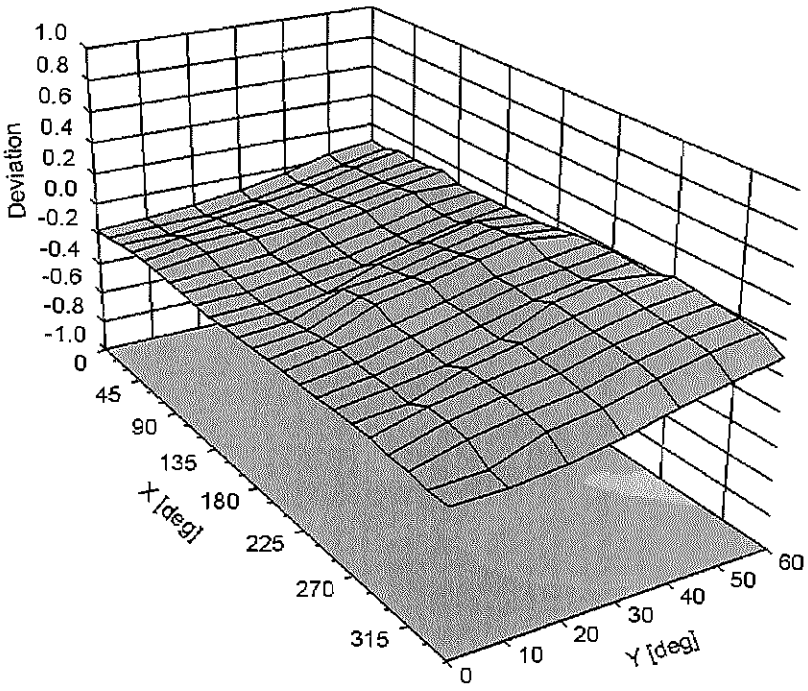


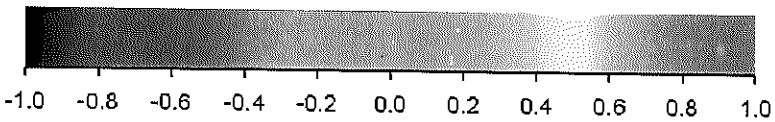
f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3209

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

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

Accreditation No.: SCS 108

Client PC Test

Certificate No: ES3-3288_Sep12

CALIBRATION CERTIFICATE

Object: ES3DV3 - SN:3288

Calibration procedure(s): QA CAL-01.v8, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes

Calibration date: September 20, 2012

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

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Reference 30 dB Attenuator	SN: S5129 (30b)	27-Mar-12 (No. 217-01532)	Apr-13
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 660	20-Jun-12 (No. DAE4-660_Jun12)	Jun-13
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

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

Issued: September 20, 2012

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS) **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
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z*: *A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe ES3DV3

SN:3288

Manufactured: July 6, 2010
Calibrated: September 20, 2012

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3288

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.87	0.97	0.75	± 10.1 %
DCP (mV)[B]	101.3	102.4	103.9	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
0	CW	0.00	X	0.00	0.00	1.00	168.6	±3.3 %
			Y	0.00	0.00	1.00	132.2	
			Z	0.00	0.00	1.00	156.8	

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

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3288

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	6.67	6.67	6.67	0.80	1.14	± 12.0 %
835	41.5	0.90	6.41	6.41	6.41	0.76	1.18	± 12.0 %
1750	40.1	1.37	5.51	5.51	5.51	0.70	1.28	± 12.0 %
1900	40.0	1.40	5.28	5.28	5.28	0.80	1.22	± 12.0 %
2450	39.2	1.80	4.61	4.61	4.61	0.80	1.26	± 12.0 %
2600	39.0	1.96	4.45	4.45	4.45	0.80	1.31	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

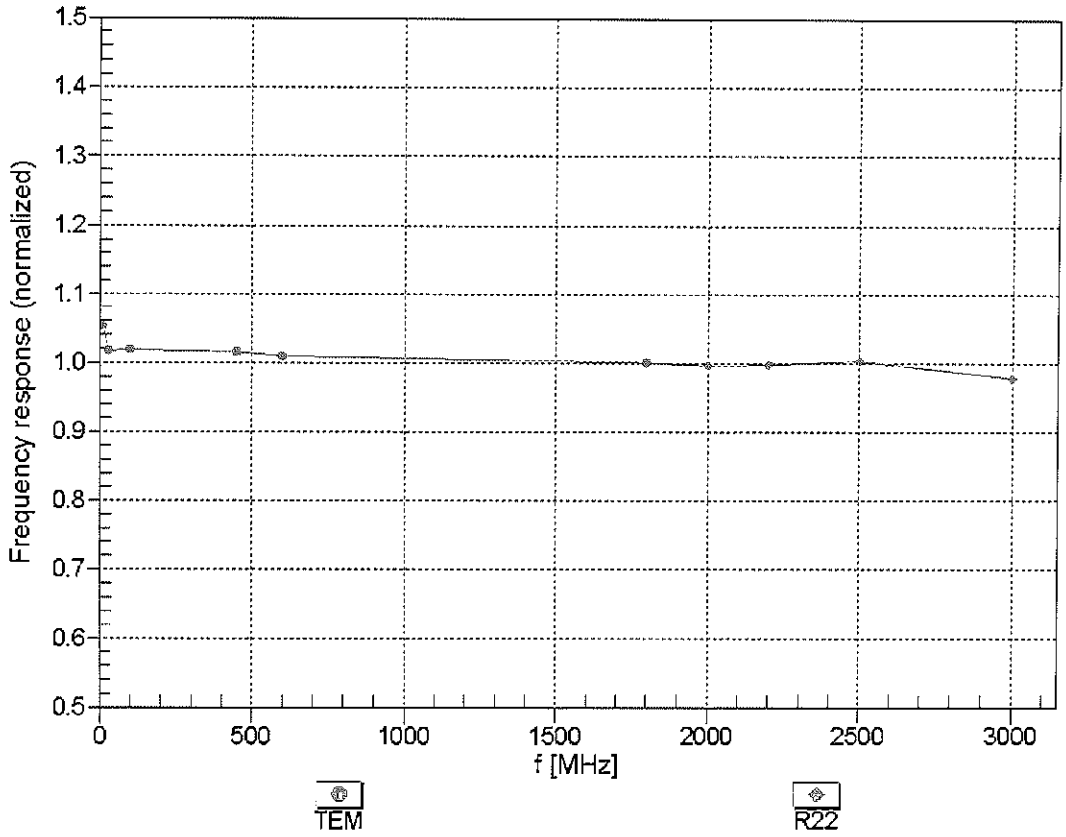
DASY/EASY - Parameters of Probe: ES3DV3 - SN:3288

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	6.44	6.44	6.44	0.62	1.31	± 12.0 %
835	55.2	0.97	6.31	6.31	6.31	0.38	1.78	± 12.0 %
1750	53.4	1.49	5.18	5.18	5.18	0.64	1.43	± 12.0 %
1900	53.3	1.52	4.89	4.89	4.89	0.50	1.64	± 12.0 %
2450	52.7	1.95	4.35	4.35	4.35	0.74	1.23	± 12.0 %
2600	52.5	2.16	4.09	4.09	4.09	0.80	1.07	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

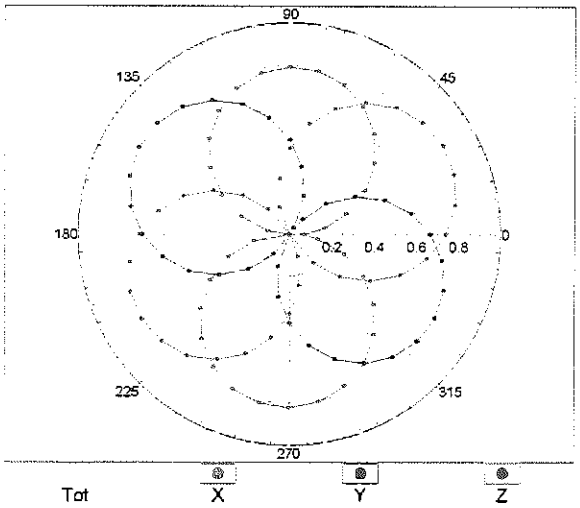
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



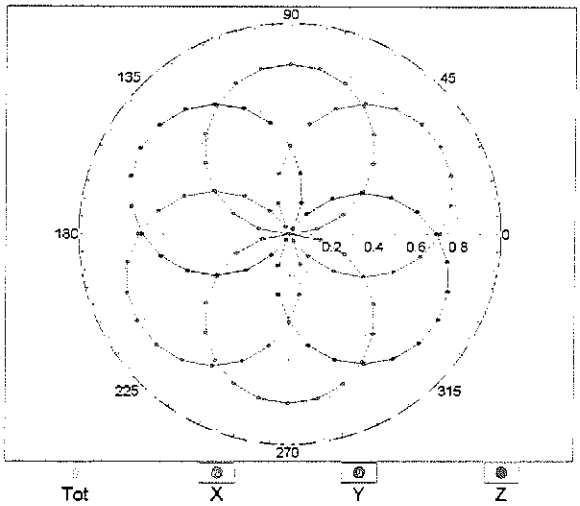
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

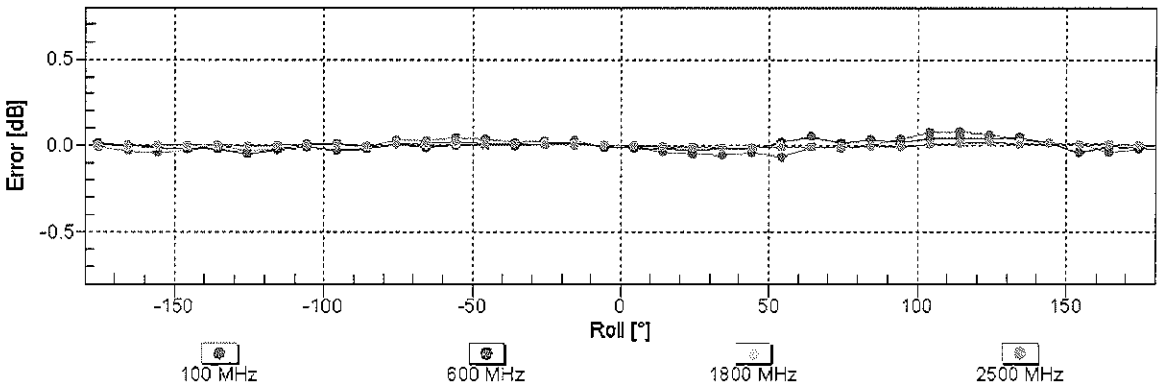
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



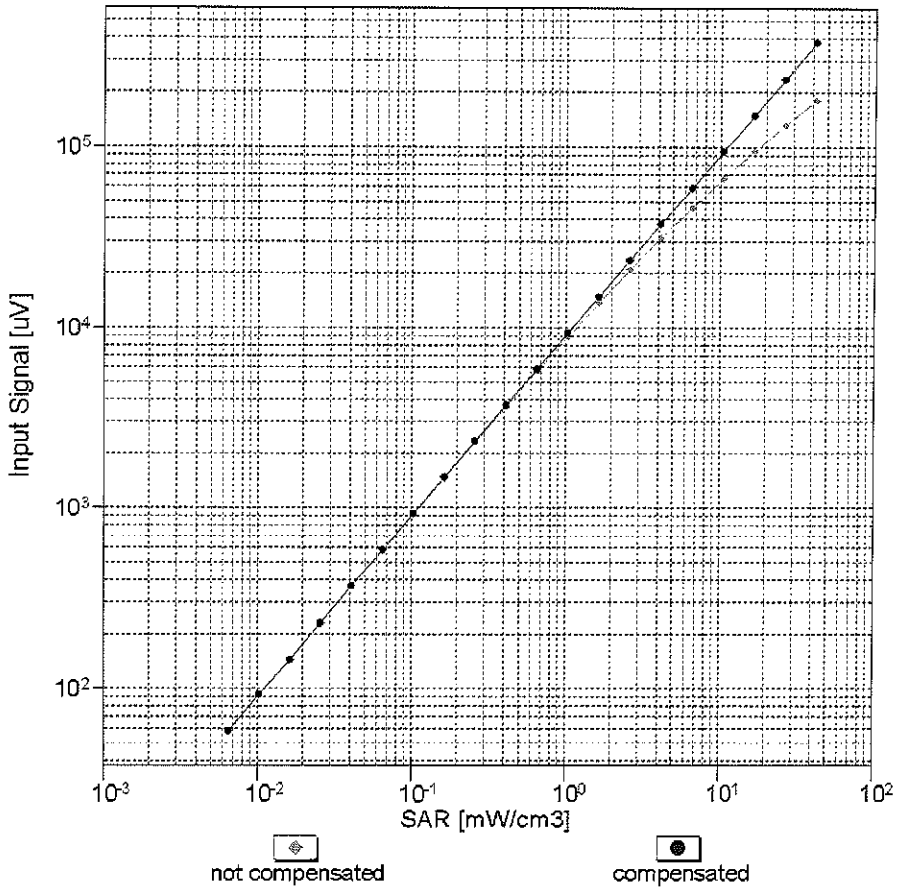
f=1800 MHz,R22

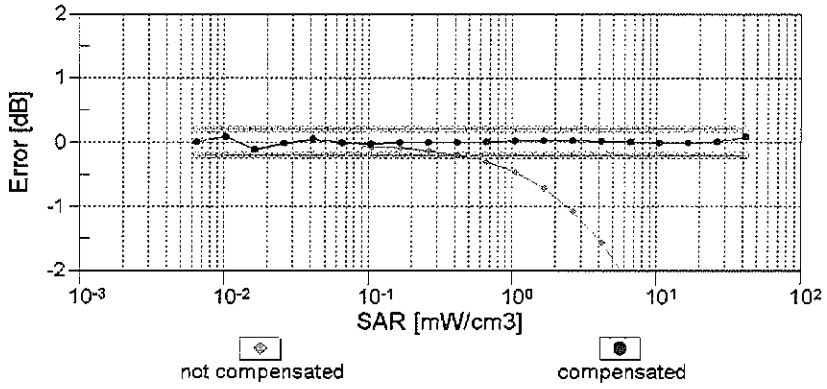




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

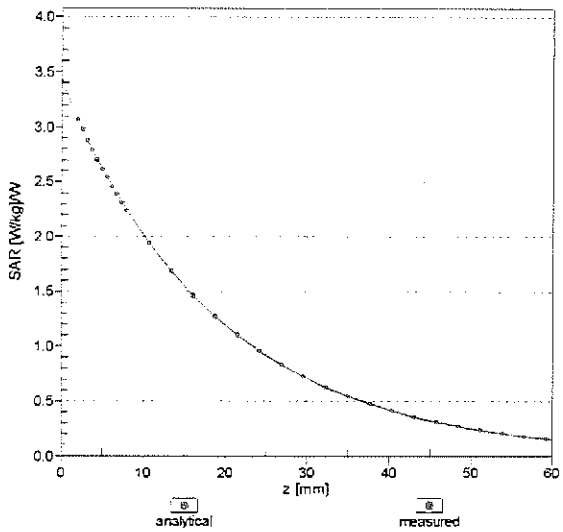




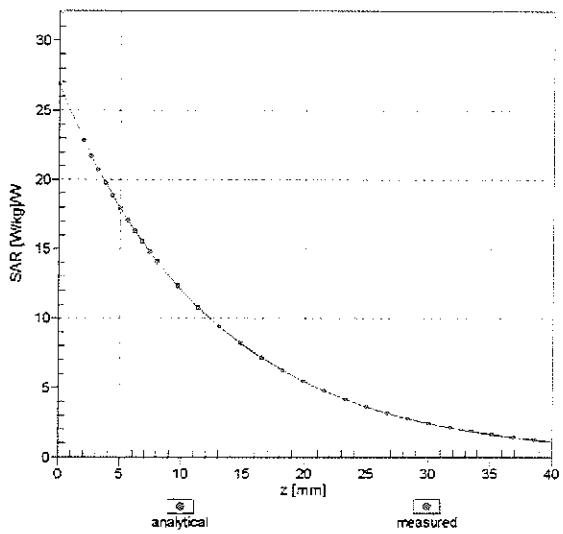
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

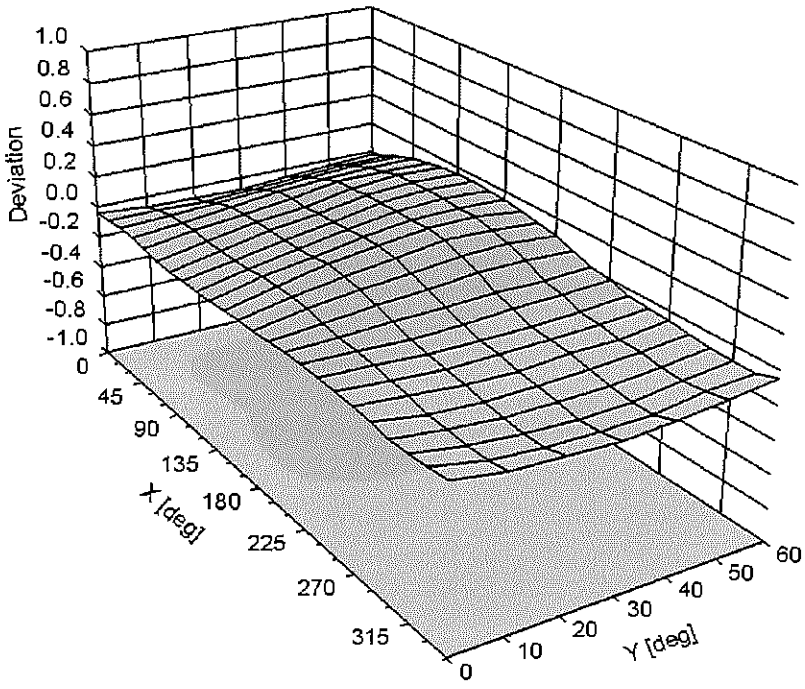


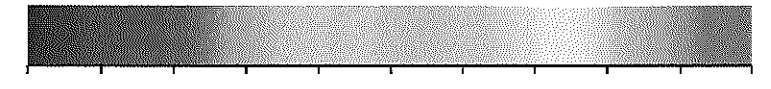
f = 1750 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3288

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	54.3
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

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Accreditation No.: SCS 108

Client PC Test

Certificate No: ES3-3022_Aug12

CALIBRATION CERTIFICATE

Object: ES3DV2 - SN:3022

Calibration procedure(s): QA CAL-01.v8, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes

Calibration date: August 28, 2012

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

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Reference 30 dB Attenuator	SN: S5129 (30b)	27-Mar-12 (No. 217-01532)	Apr-13
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 660	20-Jun-12 (No. DAE4-660_Jun12)	Jun-13
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

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

Issued: August 28, 2012

Calibration Laboratory of
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Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization $\vartheta = 0$ ($f \le 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z*: *A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \le 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe ES3DV2

SN:3022

Manufactured: April 15, 2003
Calibrated: August 28, 2012

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

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.00	1.04	0.99	± 10.1 %
DCP (mV)[B]	98.3	99.5	101.3	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
0	CW	0.00	X	0.00	0.00	1.00	133.3	±2.7 %
			Y	0.00	0.00	1.00	140.3	
			Z	0.00	0.00	1.00	178.9	

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

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	6.30	6.30	6.30	0.30	1.72	± 12.0 %
835	41.5	0.90	6.03	6.03	6.03	0.35	1.63	± 12.0 %
1750	40.1	1.37	5.07	5.07	5.07	0.32	1.89	± 12.0 %
1900	40.0	1.40	4.86	4.86	4.86	0.40	1.57	± 12.0 %
2450	39.2	1.80	4.23	4.23	4.23	0.59	1.44	± 12.0 %
2600	39.0	1.96	4.10	4.10	4.10	0.67	1.37	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

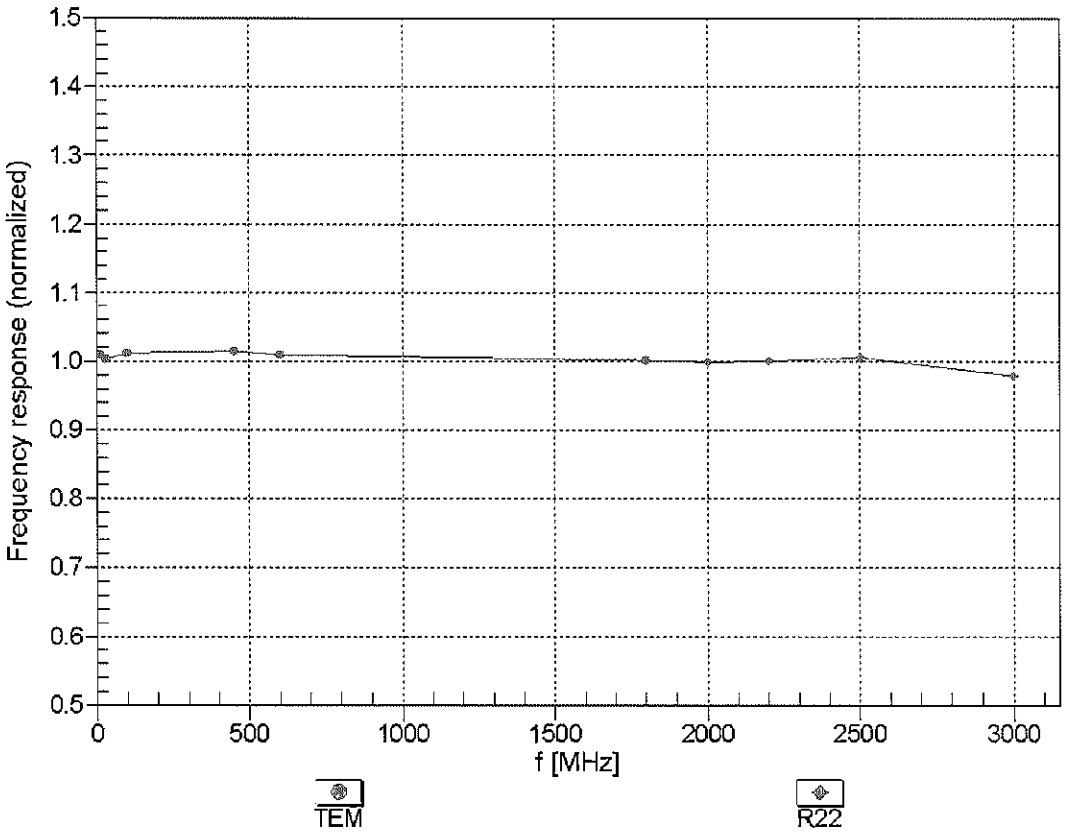
DASY/EASY - Parameters of Probe: ES3DV2 - SN:3022

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	6.07	6.07	6.07	0.23	2.09	± 12.0 %
835	55.2	0.97	6.02	6.02	6.02	0.47	1.44	± 12.0 %
1750	53.4	1.49	4.70	4.70	4.70	0.46	1.55	± 12.0 %
1900	53.3	1.52	4.43	4.43	4.43	0.36	1.87	± 12.0 %
2450	52.7	1.95	3.97	3.97	3.97	0.65	1.06	± 12.0 %
2600	52.5	2.16	3.80	3.80	3.80	0.54	0.75	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

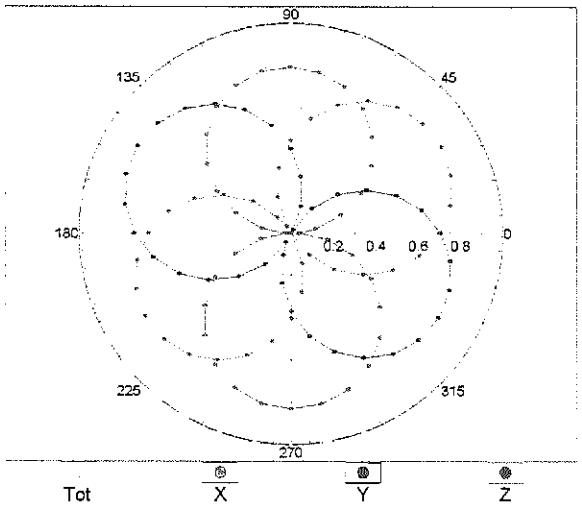
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



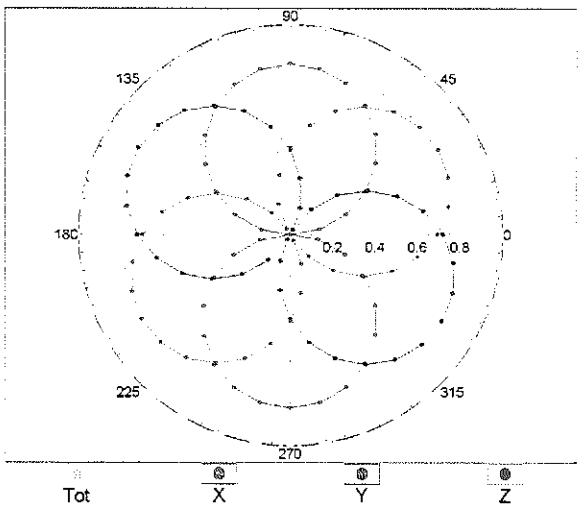
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

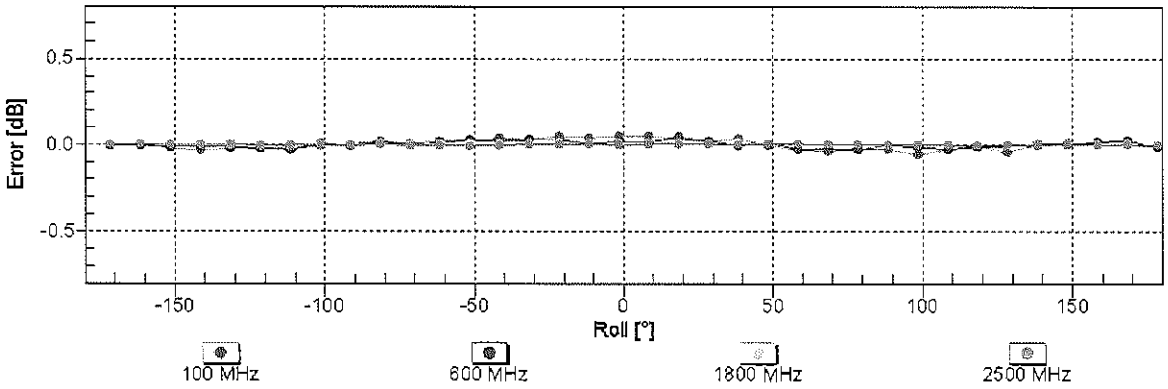
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



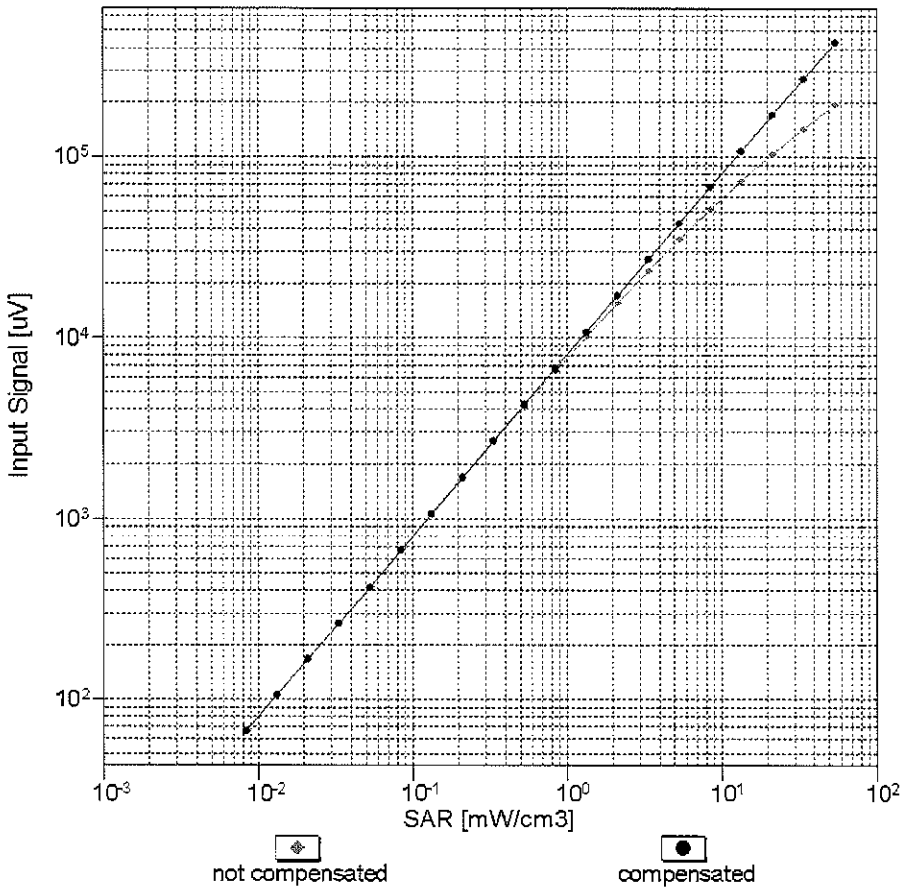
f=1800 MHz,R22

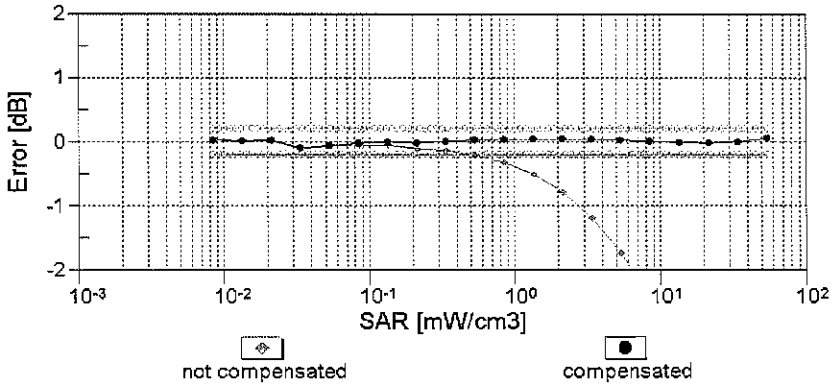




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

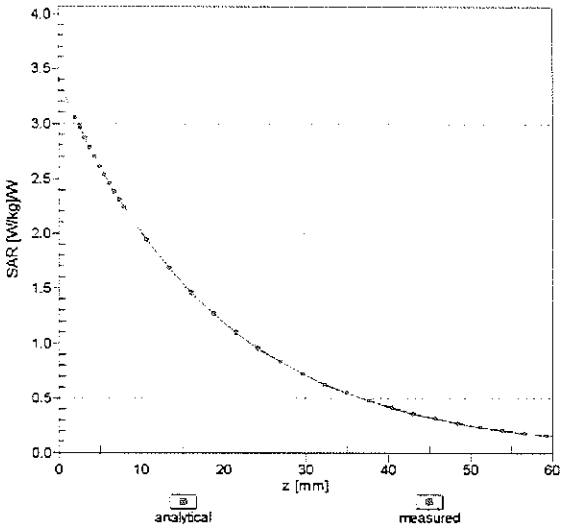




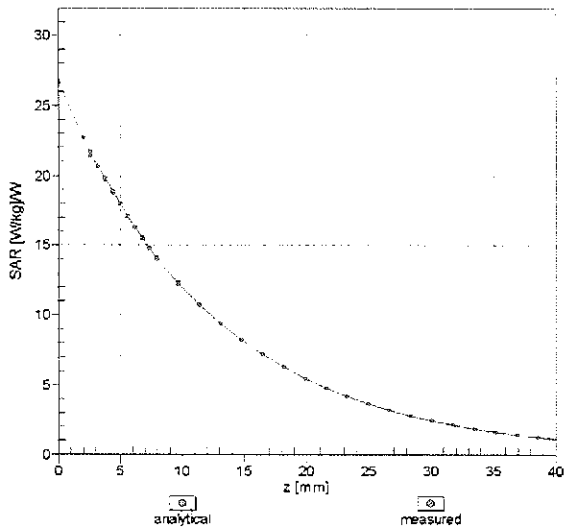
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

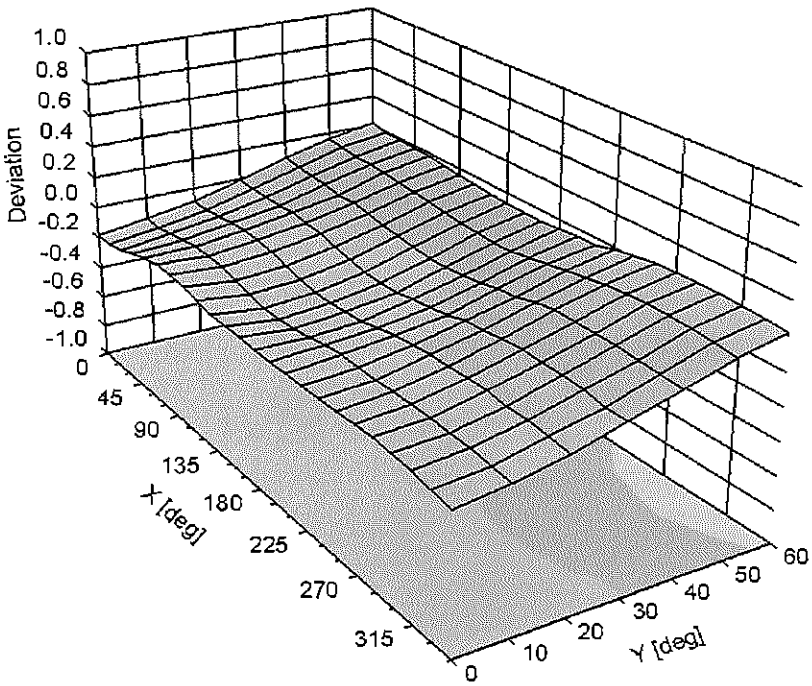


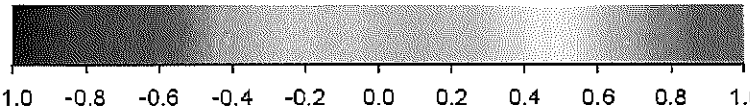
f = 1750 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

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

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	98.5
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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Swiss Calibration Service

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

Accreditation No.: SCS 108

Client PC Test

Certificate No: EX3-3561_Jul12

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3561

Calibration procedure(s): QA CAL-01.v8, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes

Calibration date: July 26, 2012

VLK 8/13/12

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

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Reference 30 dB Attenuator	SN: S5129 (30b)	27-Mar-12 (No. 217-01532)	Apr-13
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 660	20-Jun-12 (No. DAE4-660_Jun12)	Jun-13
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

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

Issued: July 26, 2012

Calibration Laboratory of
Schmid & Partner
Engineering AG
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Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe EX3DV4

SN:3561

Manufactured: February 14, 2005
Calibrated: July 26, 2012

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3561

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.43	0.48	0.43	± 10.1 %
DCP (mV)[B]	95.3	100.0	98.1	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
0	CW	0.00	X	0.00	0.00	1.00	147.3	±1.7 %
			Y	0.00	0.00	1.00	112.4	
			Z	0.00	0.00	1.00	109.9	

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

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3561

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	8.41	8.41	8.41	0.65	0.69	± 12.0 %
835	41.5	0.90	7.98	7.98	7.98	0.22	1.34	± 12.0 %
1750	40.1	1.37	7.27	7.27	7.27	0.60	0.73	± 12.0 %
1900	40.0	1.40	6.95	6.95	6.95	0.47	0.81	± 12.0 %
2450	39.2	1.80	6.23	6.23	6.23	0.50	0.81	± 12.0 %
2600	39.0	1.96	6.12	6.12	6.12	0.54	0.79	± 12.0 %
4950	36.3	4.40	4.66	4.66	4.66	0.35	1.80	± 13.1 %
5200	36.0	4.66	4.45	4.45	4.45	0.35	1.80	± 13.1 %
5300	35.9	4.76	4.16	4.16	4.16	0.40	1.80	± 13.1 %
5500	35.6	4.96	4.18	4.18	4.18	0.43	1.80	± 13.1 %
5600	35.5	5.07	4.00	4.00	4.00	0.40	1.80	± 13.1 %
5800	35.3	5.27	3.92	3.92	3.92	0.45	1.80	± 13.1 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

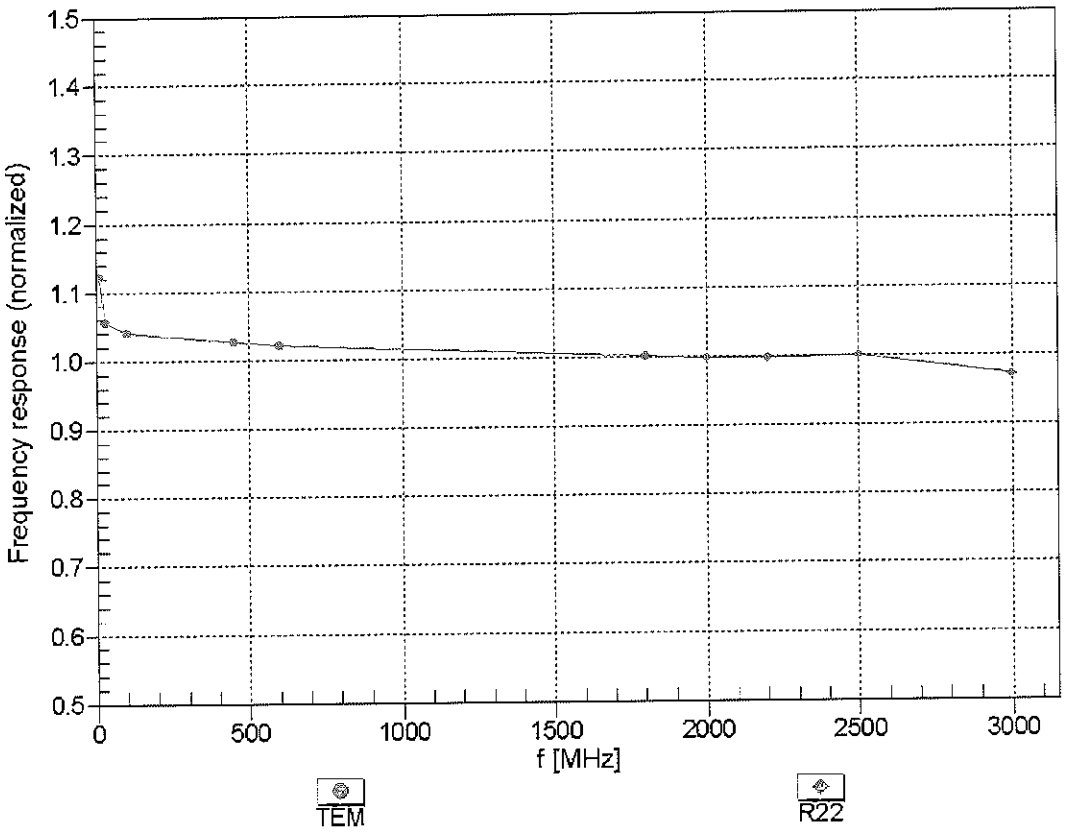
DASY/EASY - Parameters of Probe: EX3DV4 - SN:3561

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	8.18	8.18	8.18	0.37	0.97	± 12.0 %
835	55.2	0.97	8.11	8.11	8.11	0.48	0.81	± 12.0 %
1750	53.4	1.49	6.78	6.78	6.78	0.35	0.96	± 12.0 %
1900	53.3	1.52	6.51	6.51	6.51	0.31	1.01	± 12.0 %
2450	52.7	1.95	6.22	6.22	6.22	0.80	0.60	± 12.0 %
2600	52.5	2.16	6.09	6.09	6.09	0.80	0.50	± 12.0 %
4950	49.4	5.01	3.91	3.91	3.91	0.45	1.90	± 13.1 %
5200	49.0	5.30	3.76	3.76	3.76	0.50	1.90	± 13.1 %
5300	48.9	5.42	3.54	3.54	3.54	0.52	1.90	± 13.1 %
5500	48.6	5.65	3.33	3.33	3.33	0.55	1.90	± 13.1 %
5600	48.5	5.77	3.17	3.17	3.17	0.50	1.90	± 13.1 %
5800	48.2	6.00	3.42	3.42	3.42	0.55	1.90	± 13.1 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

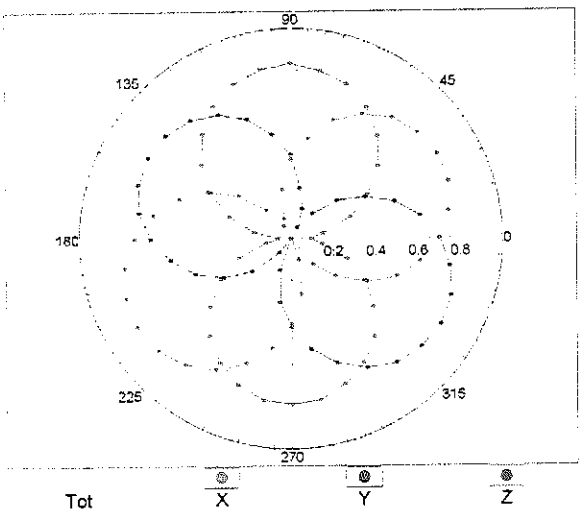
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



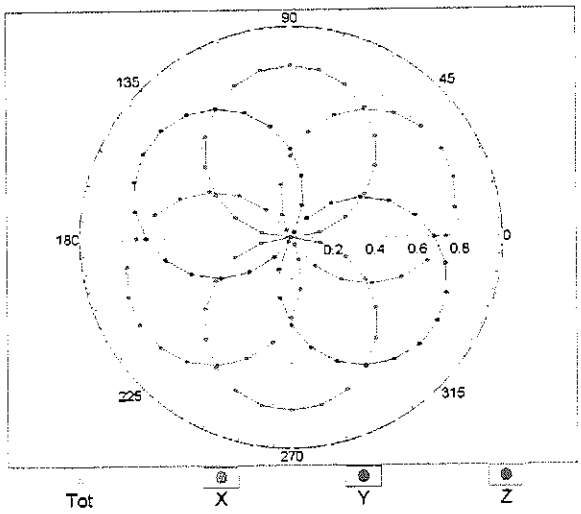
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

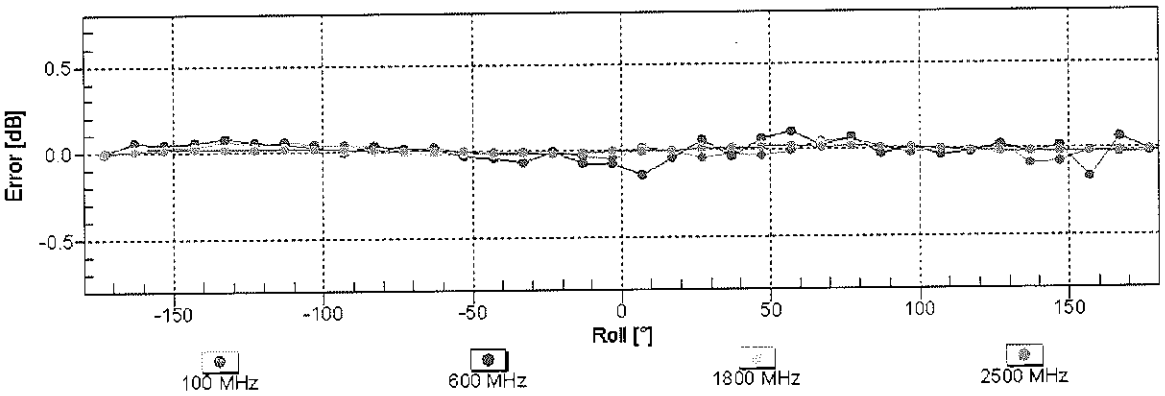
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



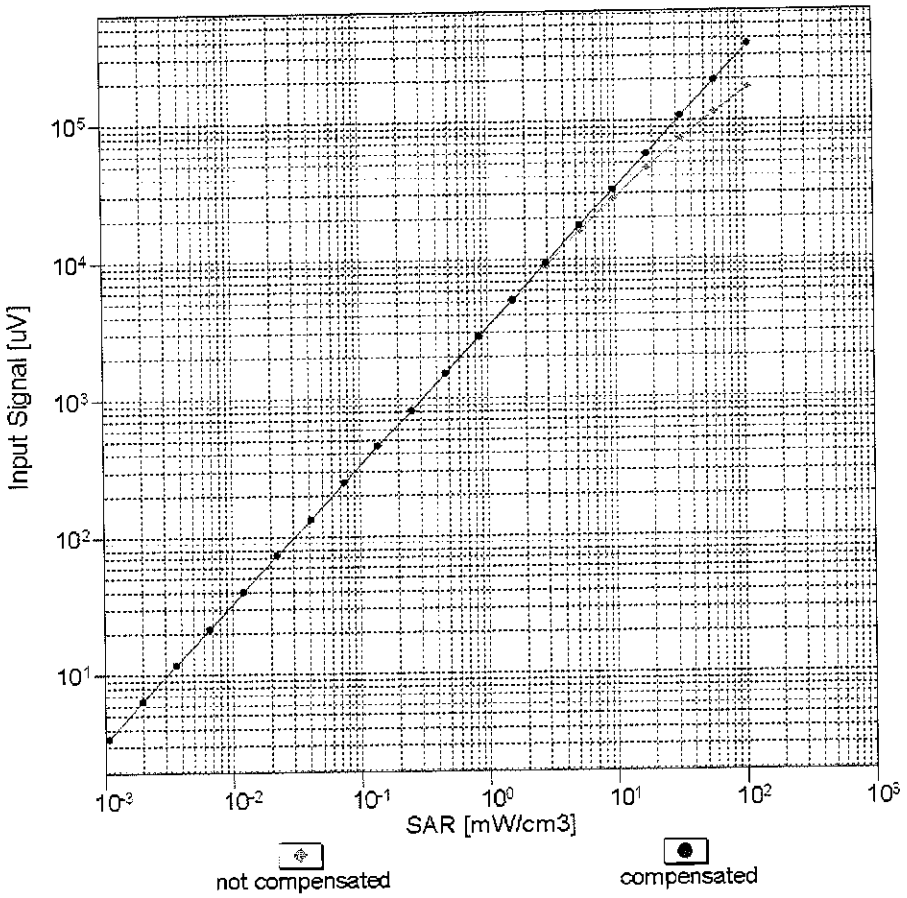
f=1800 MHz,R22

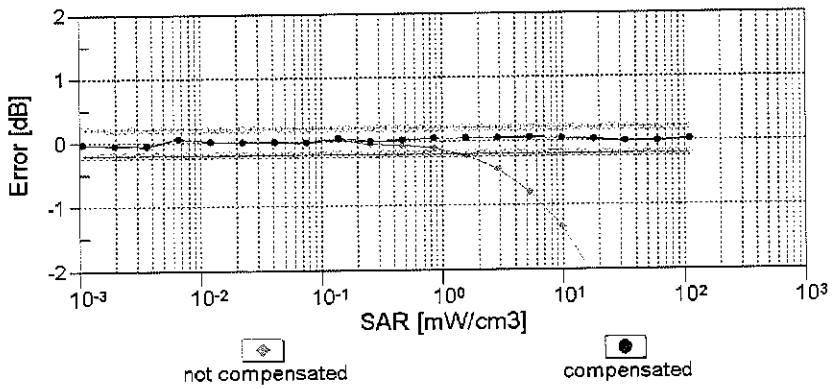




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

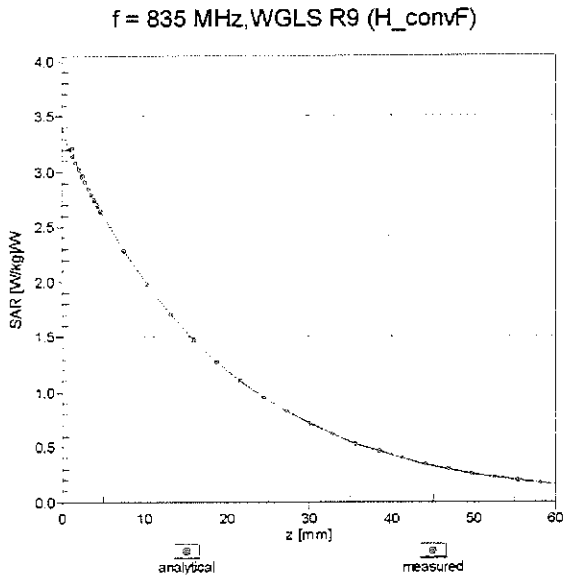
Dynamic Range f(SAR_{head})
(TEM cell , f = 900 MHz)

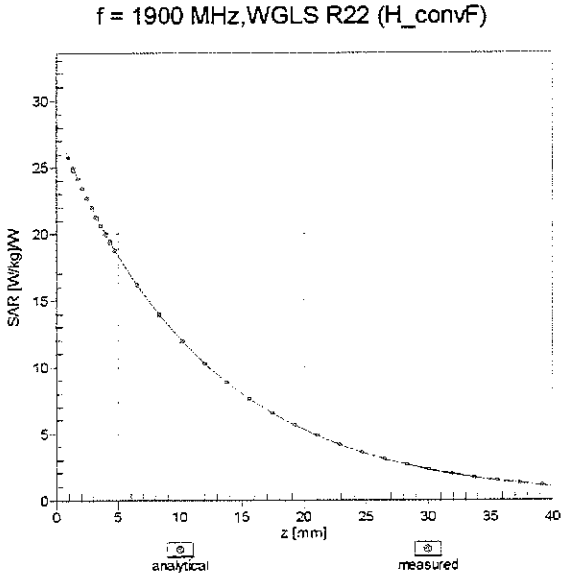




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

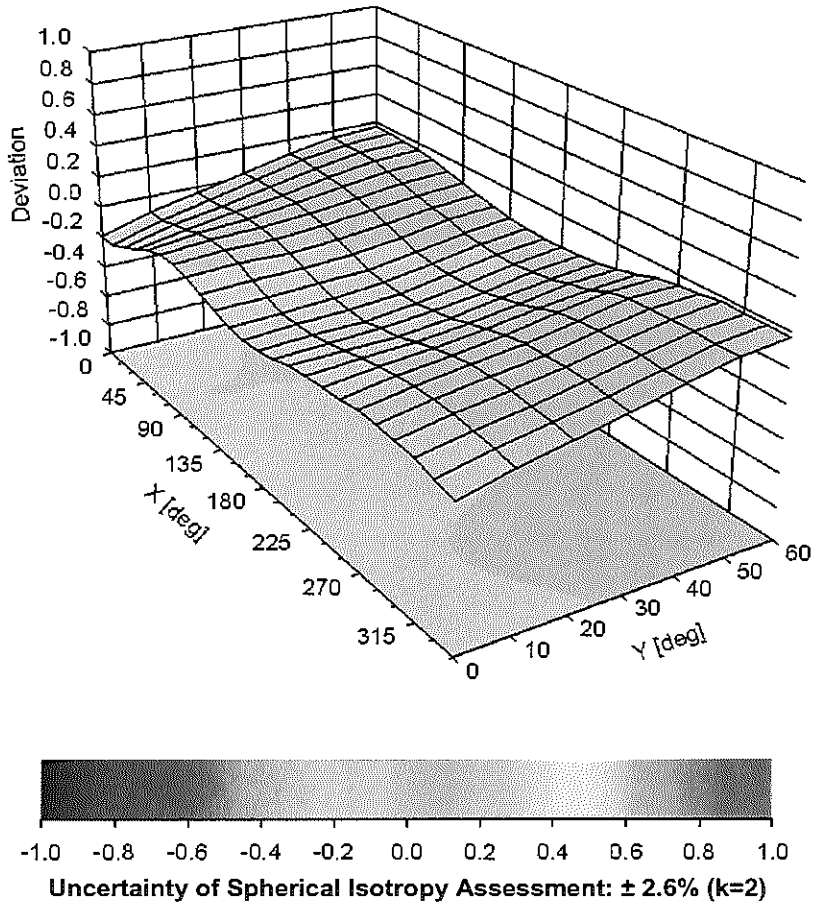
Conversion Factor Assessment





Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3561

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	77.1
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

APPENDIX D: SAR TISSUE SPECIFICATIONS

APPENDIX D: SAR TISSUE SPECIFICATIONS

Measurement Procedure for Tissue verification:

1) The network analyzer and probe system was configured and calibrated.
2) The probe was immersed in the tissue. The tissue was placed in a nonmetallic container. Trapped air bubbles beneath the flange were minimized by placing the probe at a slight angle.
3) The complex admittance with respect to the probe aperture was measured
4) The complex relative permittivity ε' can be calculated from the below equation (Pournaropoulos and Misra):

$$Y = \frac{j2\omega\varepsilon_r\varepsilon_0}{\left[\ln(b/a)\right]^2}\int_a^b\int_a^b\int_0^\pi \cos\phi' \frac{\exp\left[-j\omega r(\mu_0\varepsilon_r'\varepsilon_0)^{1/2}\right]}{r} d\phi' d\rho' d\rho$$

where *Y* is the admittance of the probe in contact with the sample, the primed and unprimed coordinates refer to source and observation points, respectively, $r^2 = \rho^2 + \rho'^2 - 2\rho\rho'\cos\phi'$, ω is the angular frequency, and $j = \sqrt{-1}$.

Table D-I
Composition of the Tissue Equivalent Matter

Frequency (MHz)	835	1900	2450	5200-5800
Tissue	Body	Body	Body	Body
Ingredients (% by weight)				
Bactericide	0.1			
DGBE		29.44	26.7	
HEC	1			
NaCl	0.94	0.39	0.1	
Sucrose	44.9			
Polysorbate (Tween) 80				20
Water	53.06	70.17	73.2	80

APPENDIX E: SAR SYSTEM VALIDATION

APPENDIX E: SAR SYSTEM VALIDATION

Per FCC KDB 865664 D02v01, SAR system validation status should be documented to confirm measurement accuracy. The SAR systems (including SAR probes, system components and software versions) used for this device were validated against its performance specifications prior to the SAR measurements. Reference dipoles were used with the required tissue- equivalent media for system validation, according to the procedures outlined in IEEE 1528-2003 and FCC KDB 865664 D01 v01. Since SAR probe calibrations are frequency dependent, each probe calibration point was validated at a frequency within the valid frequency range of the probe calibration point, using the system that normally operates with the probe for routine SAR measurements and according to the required tissue-equivalent media.

A tabulated summary of the system validation status including the validation date(s), measurement frequencies, SAR probes and tissue dielectric parameters has been included.

Table E-I
SAR System Validation Summary

SAR SYSTEM #	FREQ. [MHz]	DATE	PROBE SN	PROBE TYPE	PROBE CAL. POINT		COND.	PERM.	CW VALIDATION			MOD. VALIDATION		
							(σ)	(ε_r)	SENSI-TIVITY	PROBE LINEARITY	PROBE ISOTROPY	MOD. TYPE	DUTY FACTOR	PAR
B	835	10/15/2012	3209	ES3DV3	835	Body	0.984	55.43	PASS	PASS	PASS	GMSK	PASS	N/A
D	1900	10/17/2012	3288	ES3DV3	1900	Body	1.562	52.56	PASS	PASS	PASS	GMSK	PASS	N/A
C	2450	11/8/2012	3022	ES3DV2	2450	Body	2.038	51.100	PASS	PASS	PASS	OFDM	N/A	PASS
C	5200	11/9/2012	3561	EX3DV4	5200	Body	5.344	48.480	PASS	PASS	PASS	OFDM	N/A	PASS
C	5300	11/10/2012	3561	EX3DV4	5300	Body	5.498	48.160	PASS	PASS	PASS	OFDM	N/A	PASS
C	5500	11/10/2012	3561	EX3DV4	5500	Body	5.770	47.710	PASS	PASS	PASS	OFDM	N/A	PASS
C	5600	11/12/2012	3561	EX3DV4	5600	Body	5.955	47.470	PASS	PASS	PASS	OFDM	N/A	PASS
C	5800	11/10/2012	3561	EX3DV4	5800	Body	6.260	46.930	PASS	PASS	PASS	OFDM	N/A	PASS

APPENDIX G: SENSOR TRIGGERING DATA SUMMARY

A3LSPHP600 Sensor Triggering Data Summary

Per FCC KDB Publication 616217 D04v01, this device was tested by the manufacturer to determine the proximity sensor triggering distances for the back and top edge of the device. The measured output power within ± 5 mm of the triggering points (or until touching the phantom) is included for back side and each applicable edge.

To ensure all production units are compliant it is necessary to test SAR at a distance 1mm less than the smallest distance from the device and SAR phantom (determined from these triggering tests according to the KDB 616217 D04v01) with the device at maximum output power without power reduction. These additional SAR Tests are included additionally to the SAR tests for the device touching the SAR phantom, with reduced power.

Back Side

Moving device toward the phantom:

KDB 616217 6.2.6 Measured Power[dBm]											
Distance[mm]	18	17	16	15	14	13	12	11	10	9	8
GPRS 850 1 Tx	33.01	33.03	33.06	33.12	33.07	27.05	27.01	27.03	27.09	27.09	27.13
GPRS 850 2 Tx	31.51	31.51	31.55	31.59	31.57	25.54	25.56	25.57	25.60	25.51	25.59
GPRS 1900 1 Tx	30.05	30.02	30.08	30.11	30.03	21.97	22.01	22.01	22.06	22.02	22.07
GPRS 1900 2 Tx	28.53	28.56	28.56	28.55	28.51	20.06	20.00	20.07	20.03	20.01	20.09
UMTS 850	22.97	23.06	22.98	22.96	22.99	17.46	17.47	17.47	17.42	17.45	17.43
UMTS 1900	23.08	23.01	23.10	23.07	23.09	14.09	14.03	14.05	14.05	14.07	14.06
EDGE 850 1 Tx	27.03	27.10	27.10	27.10	27.12	21.03	21.10	21.09	21.11	21.15	21.14
EDGE 850 2 Tx	27.01	27.04	27.03	27.05	27.01	20.06	20.04	20.10	20.10	20.09	20.07
EDGE 1900 1 Tx	25.04	25.08	25.10	25.02	25.06	17.06	17.02	17.01	17.05	17.04	17.08
EDGE 1900 2 Tx	24.96	24.92	24.95	25.01	24.97	15.99	15.97	16.03	15.97	15.99	16.07
CDMA BC0	24.52	24.49	24.55	24.47	24.51	18.01	18.05	18.12	18.05	18.13	17.99
CDMA BC1	24.48	24.55	24.45	24.51	24.48	15.13	15.11	15.01	14.91	15.01	15.15
CDMA BC10	24.46	24.49	24.45	24.49	24.50	17.99	17.94	17.93	17.98	18.05	18.02
LTE B25	23.55	23.56	23.45	23.51	23.49	14.40	14.35	14.31	14.36	14.31	14.34

Moving device away from the phantom:

KDB 616217 6.2.6 Measured Power[dBm]															
Distance[mm]	25	22	19	17	16	15	14	13	12	11	10	9	6	3	0
GPRS 850 1 Tx	33.01	33.02	33.04	32.97	32.99	33.07	32.97	27.03	27.01	27.03	27.08	27.01	27.06	27.08	27.06
GPRS 850 2 Tx	31.59	31.44	31.44	31.49	31.51	31.49	31.49	25.53	25.51	25.56	25.53	25.53	25.58	25.51	25.55
GPRS 1900 1 Tx	30.07	29.99	30.01	30.05	30.02	30.01	30.03	21.91	21.92	21.97	21.91	21.91	21.93	21.87	21.92
GPRS 1900 2 Tx	28.51	28.49	28.47	28.52	28.51	28.49	28.48	20.03	20.05	20.08	20.01	20.08	20.05	20.06	20.07
UMTS 850	22.98	22.95	22.91	22.96	22.96	22.95	22.97	17.51	17.48	17.49	17.53	17.51	17.41	17.49	17.52
UMTS 1900	22.93	22.95	22.95	22.97	22.91	22.95	22.96	14.02	14.03	14.01	14.05	14.02	14.02	14.01	14.06
EDGE 850 1 Tx	26.96	26.95	26.95	26.97	26.91	26.96	26.92	21.02	21.04	21.03	21.05	21.07	21.04	21.09	21.06
EDGE 850 2 Tx	26.98	26.95	26.95	26.98	26.92	26.96	26.98	20.01	20.10	20.06	20.05	20.05	20.13	20.11	20.09
EDGE 1900 1 Tx	25.09	25.03	25.01	25.09	25.09	25.03	25.11	16.99	17.07	16.97	16.91	16.97	17.07	16.97	17.01
EDGE 1900 2 Tx	25.01	25.03	25.03	25.05	25.09	25.03	25.06	16.01	15.97	15.98	16.02	16.05	15.99	15.98	16.04
CDMA BC0	24.42	24.51	24.42	24.48	24.42	24.51	24.48	18.01	18.05	18.05	18.01	18.14	18.09	18.07	18.11
CDMA BC1	24.54	24.48	24.52	24.51	24.43	24.48	24.51	15.06	15.08	15.11	15.07	15.12	15.05	15.09	15.08
CDMA BC10	24.42	24.42	24.49	24.46	24.42	24.43	24.48	17.98	17.96	17.98	17.98	18.02	18.04	18.02	18.03
LTE B25	23.59	23.55	23.51	23.59	23.59	23.55	23.51	14.34	14.29	14.31	14.36	14.32	14.33	14.25	14.31

Based on the most conservative measured triggering distance of 13 mm, additional SAR measurements were required at 12 mm from the back side.

Top Edge

Moving device toward the phantom:

KDB 616217 6.2.6 Measured Power[dBm]											
Distance[mm]	18	17	16	15	14	13	12	11	10	9	8
GPRS 850 1 Tx	33.21	33.21	33.21	33.21	33.21	27.07	27.01	27.03	27.05	27.09	27.10
GPRS 850 2 Tx	31.61	31.61	31.61	31.61	31.61	25.71	25.71	25.70	25.71	25.71	25.70
GPRS 1900 1 Tx	29.99	29.99	30.00	29.99	30.01	21.99	22.03	22.01	22.02	22.02	22.01
GPRS 1900 2 Tx	28.63	28.63	28.66	28.65	28.65	20.01	20.00	20.09	20.00	20.01	20.00
UMTS 850	22.96	23.02	22.99	22.96	22.95	17.49	17.47	17.41	17.47	17.45	17.47
UMTS 1900	23.05	23.01	23.10	23.04	23.03	14.01	14.03	14.03	14.05	14.05	14.00
EDGE 850 1 Tx	27.13	27.12	27.16	27.17	27.17	21.22	21.17	21.19	21.20	21.16	21.16
EDGE 850 2 Tx	27.11	27.14	27.13	27.15	27.15	20.16	20.14	20.19	20.17	20.19	20.19
EDGE 1900 1 Tx	25.24	25.18	25.19	25.23	25.23	17.05	17.02	17.01	17.02	17.04	17.04
EDGE 1900 2 Tx	24.97	24.92	24.91	24.92	24.92	15.96	15.92	16.01	15.97	15.97	15.97
CDMA BC0	24.42	24.42	24.55	24.42	24.55	18.01	18.05	18.12	18.05	18.13	17.99
CDMA BC1	24.48	24.54	24.48	24.51	24.48	15.13	15.11	15.01	14.91	15.01	15.15
CDMA BC10	24.44	24.42	24.42	24.49	24.50	17.99	17.98	17.91	17.98	18.08	18.09
LTE B25	23.55	23.59	23.55	23.51	23.51	14.40	14.41	14.33	14.27	14.31	14.31

Moving device away from the phantom:

KDB 616217 6.2.6 Measured Power[dBm]																
Distance[mm]	25	22	19	17	16	15	14	13	12	11	10	9	6	3	0
GPRS 850 1 Tx	32.90	32.90	32.91	32.90	32.90	32.90	32.91	27.06	27.01	27.03	27.05	27.01	27.06	27.08	27.10
GPRS 850 2 Tx	31.49	31.49	31.45	31.49	31.49	31.49	31.45	25.53	25.56	25.51	25.53	25.53	25.51	25.51	25.53
GPRS 1900 1 Tx	30.02	29.98	30.01	30.02	30.02	29.98	30.01	21.81	21.82	21.87	21.81	21.81	21.82	21.87	21.81
GPRS 1900 2 Tx	28.52	28.49	28.45	28.52	28.52	28.49	28.45	20.01	20.05	20.08	20.01	20.01	20.05	20.08	20.01
UMTS 850	22.96	22.95	22.97	22.96	22.96	22.95	22.97	17.51	17.45	17.49	17.51	17.51	17.45	17.49	17.51
UMTS 1900	22.91	22.93	22.95	22.91	22.91	22.93	22.95	14.02	14.03	14.01	14.02	14.02	14.02	14.01	14.02
EDGE 850 1 Tx	26.87	26.87	26.85	26.87	26.87	26.87	26.85	21.14	21.04	21.13	21.14	21.14	21.04	21.13	21.14
EDGE 850 2 Tx	26.88	26.85	26.85	26.88	26.88	26.85	26.85	20.05	20.19	20.16	20.05	20.05	20.19	20.16	20.05
EDGE 1900 1 Tx	25.19	25.23	25.21	25.19	25.19	25.23	25.21	16.91	17.07	16.97	16.91	16.91	17.07	16.97	16.91
EDGE 1900 2 Tx	25.05	25.03	25.05	25.05	25.05	25.03	25.05	16.02	15.94	15.98	16.02	16.02	15.94	15.98	16.02
CDMA BC0	24.42	24.55	24.42	24.42	24.42	24.55	24.42	18.01	18.05	18.05	18.01	18.14	18.09	18.07	18.11
CDMA BC1	24.54	24.48	24.51	24.54	24.54	24.48	24.51	15.04	15.01	15.11	15.04	15.12	15.05	15.09	15.03
CDMA BC10	24.42	24.42	24.49	24.42	24.42	24.42	24.49	17.98	17.93	17.98	17.98	18.12	18.14	18.09	18.07
LTE B25	23.59	23.55	23.51	23.59	23.59	23.55	23.51	14.42	14.29	14.31	14.42	14.32	14.35	14.25	14.30

Based on the most conservative measured triggering distance of 13 mm, additional SAR measurements were required at 12 mm from the top edge.