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SAR EVALUATION REPORT

Applicant Name:
LG Electronics MobileComm U.S.A., Inc.
1000 Sylvan Avenue
Englewood Cliffs, NJ 07632
United States

Date of Testing:
05/27/14 - 06/10/14
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Document Serial No.:
0Y1406021146-R1.ZNF

FCC ID: **ZNFV410**

APPLICANT: **LG ELECTRONICS MOBILECOMM U.S.A., INC.**

DUT Type:	Portable Tablet
Application Type:	Class II Permissive Change
FCC Rule Part(s):	CFR §2.1093
Permissive Change(s):	See FCC Change Document
Model(s):	LG-V410, V410, LGV410
Date of Original Certification:	06/25/2014

Equipment Class	Band & Mode	Tx Frequency	SAR 1 gm Body (W/kg)
PCB	UMTS 850	826.40 - 846.60 MHz	1.01
PCB	UMTS 1900	1852.4 - 1907.6 MHz	0.63
PCB	LTE Band 17	706.5 - 713.5 MHz	0.60
PCB	LTE Band 5 (Cell)	826.5 - 846.5 MHz	1.11
PCB	LTE Band 4 (AWS)	1712.5 - 1752.5 MHz	0.55
PCB	LTE Band 2 (PCS)	1852.5 - 1907.5 MHz	0.65
DTS	2.4 GHz WLAN	2412 - 2462 MHz	0.34
DTS	5.8 GHz WLAN	5745 - 5825 MHz	0.16
NII	5.2 GHz WLAN	5180 - 5240 MHz	0.30
NII	5.3 GHz WLAN	5260 - 5320 MHz	0.25
NII	5.5 GHz WLAN	5500 - 5700 MHz	0.22
DSS/DTS	Bluetooth	2402 - 2480 MHz	N/A
Simultaneous SAR per KDB 690783 D01v01r02:			1.45

Note: This revised Test Report (S/N: 0Y1406021146-R1.ZNF) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE C95.1-1992 and has been tested in accordance with the measurement procedures specified in Section 1.7 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 CERT#2041.01

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1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
UMTS 850	Data	826.40 - 846.60 MHz
UMTS 1900	Data	1852.4 - 1907.6 MHz
LTE Band 17	Data	706.5 - 713.5 MHz
LTE Band 5 (Cell)	Data	826.5 - 846.5 MHz
LTE Band 4 (AWS)	Data	1712.5 - 1752.5 MHz
LTE Band 2 (PCS)	Data	1852.5 - 1907.5 MHz
2.4 GHz WLAN	Data	2412 - 2462 MHz
5.8 GHz WLAN	Data	5745 - 5825 MHz
5.2 GHz WLAN	Data	5180 - 5240 MHz
5.3 GHz WLAN	Data	5260 - 5320 MHz
5.5 GHz WLAN	Data	5500 - 5700 MHz
Bluetooth	Data	2402 - 2480 MHz

1.2 Power Reduction for SAR

This device uses a sensor for SAR compliance. The sensor is activated when used in close proximity to the user's body. The sensor triggers power reduction for data modes and is only applicable for tablet operations.

Since the device is a full size tablet, the Body SAR was evaluated per FCC KDB Publication 616217 D04 for full sized tablets.

1.3 Nominal and Maximum Output Power Specifications

This device operates using the following maximum and nominal output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D01v05.

1.3.1 Maximum Power

Mode / Band		Modulated Average (dBm)		
		3GPP Rel. 99	*3GPP Rel. 5*	*3GPP Rel. 6*
		RMC	*HSDPA*	*HSUPA*
UMTS Band 5 (850 MHz)	Maximum	**24.2**	**24.2**	**24.2**
	Nominal	**23.7**	**23.7**	**23.7**
UMTS Band 2 (1900 MHz)	Maximum	**23.7**	**23.7**	**23.7**
	Nominal	**23.2**	**23.2**	**23.2**

Mode / Band		Modulated Average (dBm)
LTE Band 17	Maximum	**24.2**
	Nominal	**23.7**
LTE Band 5 (Cell)	Maximum	**24.2**
	Nominal	**23.7**
LTE Band 4 (AWS)	Maximum	**23.7**
	Nominal	**23.2**
LTE Band 2 (PCS)	Maximum	**23.7**
	Nominal	**23.2**

Mode / Band		Modulated Average (dBm)
IEEE 802.11b (2.4 GHz)	Maximum	**14.0**
	Nominal	**13.0**
IEEE 802.11g (2.4 GHz)	Maximum	**11.0**
	Nominal	**10.0**
IEEE 802.11n (2.4 GHz)	Maximum	**9.0**
	Nominal	**8.0**
IEEE 802.11a (5 GHz)	Maximum	**12.0**
	Nominal	**11.0**
IEEE 802.11n (5 GHz)	Maximum	**11.0**
	Nominal	**10.0**
Bluetooth	Maximum	**9.0**
	Nominal	**8.0**
Bluetooth LE	Maximum	**2.0**
	Nominal	**1.0**

1.3.2 Reduced Power (Body at 0mm)

Mode / Band		Modulated Average (dBm)		
		3GPP RMC	*3GPP HSDPA*	*3GPP HSUPA*
UMTS Band 5 (850 MHz)	Maximum	**20.2**	**20.2**	**20.2**
	Nominal	**19.7**	**19.7**	**19.7**
UMTS Band 2 (1900 MHz)	Maximum	**14.7**	**14.7**	**14.7**
	Nominal	**14.2**	**14.2**	**14.2**

Mode / Band		Modulated Average (dBm)
LTE Band 17	Maximum	**20.2**
	Nominal	**19.7**
LTE Band 5 (Cell)	Maximum	**20.2**
	Nominal	**19.7**
LTE Band 4 (AWS)	Maximum	**14.7**
	Nominal	**14.2**
LTE Band 2 (PCS)	Maximum	**14.7**
	Nominal	**14.2**

1.4 DUT Antenna Locations

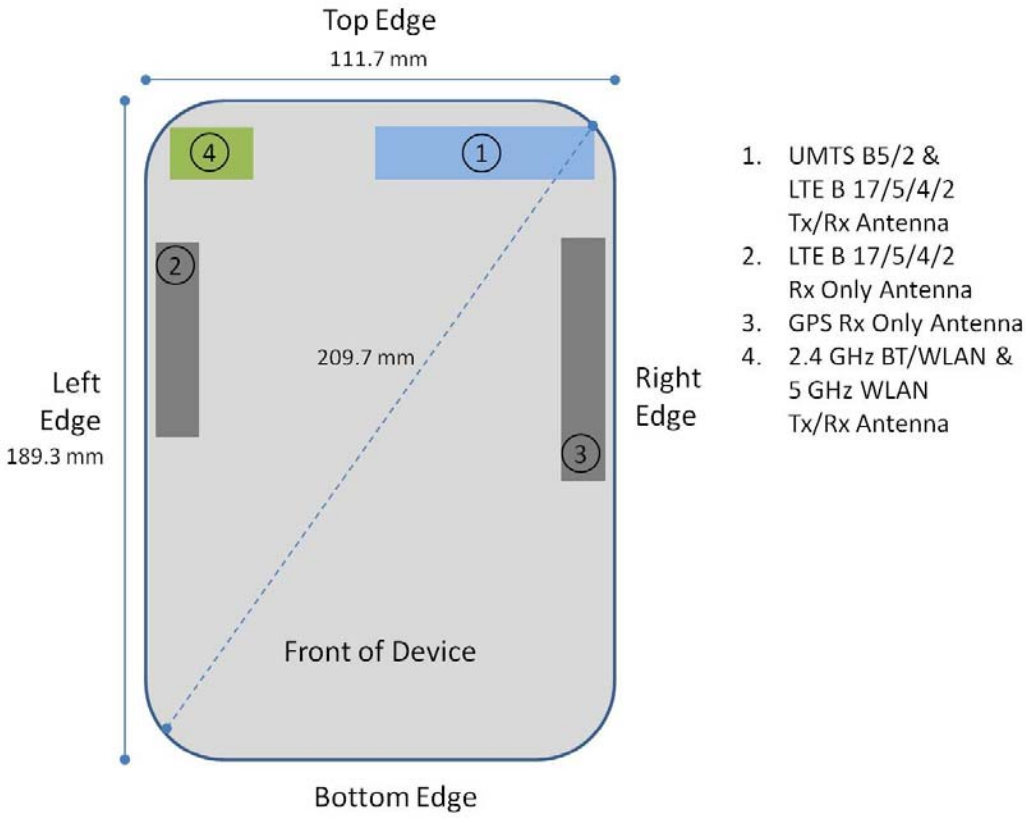

Figure 1-1
DUT Antenna Locations

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

Table 1-1
Sides for SAR Testing

Mode	Back	Front	Top	Bottom	Right	Left
UMTS 850	Yes	No	Yes	No	Yes	No
UMTS 1900	Yes	No	Yes	No	Yes	No
LTE Band 17	Yes	No	Yes	No	Yes	No
LTE Band 5 (Cell)	Yes	No	Yes	No	Yes	No
LTE Band 4 (AWS)	Yes	No	Yes	No	Yes	No
LTE Band 2 (PCS)	Yes	No	Yes	No	Yes	No
2.4 GHz WLAN	Yes	No	Yes	No	No	Yes
5 GHz WLAN	Yes	No	Yes	No	No	Yes

Note: Per FCC KDB 616217 D04v01r01, Particular DUT edges were not required to be evaluated for SAR based on the SAR exclusion threshold in KDB 447498 D01v05r01.

1.5 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D05v01, transmitters are considered to be transmitting simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. Possible transmission paths for the DUT are shown in Figure 1-2 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 1-2
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Body
1	UMTS + 2.4 GHz WI-FI	Yes
2	UMTS + 5 GHz WI-FI	Yes
3	UMTS + 2.4 GHz Bluetooth	Yes
4	LTE + 2.4 GHz WI-FI	Yes
5	LTE + 5 GHz WI-FI	Yes
6	LTE + 2.4 GHz Bluetooth	Yes

Notes:

1. UMTS and LTE share the share the same antenna path and cannot transmit simultaneously.
2. 2.4 GHz WI-FI, 2.4 GHz Bluetooth, and 5 GHz WI-FI share the same antenna path and cannot transmit simultaneously.

1.6 SAR Test Exclusions Applied

(A) WIFI/BT

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

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

Based on the maximum conducted power of Bluetooth (rounded to the nearest mW) and the antenna to user separation distance, Bluetooth SAR was not required; [(8/5)* √2.48] = 2.5< 3.0. Per KDB Publication 447498 D01v05, the maximum power of the channel was rounded to the nearest mW before calculation. To ensure worst case SAR is excluded the high channel frequency was used in the calculation.

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

(B) Licensed Transmitter(s)

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

LTE SAR for the higher modulations and lower bandwidths were not tested since the maximum average output power of all required channels and configurations was not more than 0.5 dB higher than the highest bandwidth; and the reported LTE SAR for the highest bandwidth was less than 1.45 W/kg for all configurations according to FCC KDB 941225 D05v02.

This device supports inter-band LTE Carrier Aggregation (CA) in the downlink only. All uplink communications are identical to Release 8 specifications. Per FCC Guidance, LTE CA SAR was not needed for testing since the data sent by uplink on uplink physical channels does not change between Rel 8 and Rel 10.

1.7 Guidance Applied

- FCC KDB Publication 941225 D01v02r02, D02v02r02, D05v02r03 (3G/4G)
- FCC KDB Publication 248227 D01v01r02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D01v05r02 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r03 & D02v01r01 (SAR Measurements up to 6 GHz)
- FCC KDB Publication 616217 D04v01r01 (Tablet SAR Considerations)

1.8 Device Serial Numbers

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

Band/Mode	Maximum Power Serial Number	Reduced Power Serial Number
UMTS 850	WCDMA SAR #1	WCDMA SAR #2
UMTS 1900	WCDMA SAR #1	WCDMA SAR #2
LTE Band 17	LTE SAR #1	LTE SAR #2
LTE Band 5 (Cell)	LTE SAR #1	LTE SAR #2
LTE Band 4 (AWS)	LTE SAR #1	LTE SAR #2
LTE Band 2 (PCS)	LTE SAR #1	LTE SAR #2
2.4 GHz WLAN	WIFI Rad SAR	-
5 GHz WLAN	WIFI Rad SAR	-

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2 LTE INFORMATION

LTE Information			
FCC ID	**ZNFV410**		
Form Factor	Portable Tablet		
Frequency Range of each LTE transmission band	LTE Band 17 (706.5 - 713.5 MHz)		
	LTE Band 5 (Cell) (826.5 - 846.5 MHz)		
	LTE Band 4 (AWS) (1712.5 - 1752.5 MHz)		
	LTE Band 2 (PCS) (1852.5 - 1907.5 MHz)		
Channel Bandwidths	LTE Band 17: 5 MHz, 10 MHz		
	LTE Band 5 (Cell): 5 MHz, 10 MHz		
	LTE Band 4 (AWS): 5 MHz, 10 MHz		
	LTE Band 2 (PCS): 5 MHz, 10 MHz		
Channel Numbers and Frequencies (MHz)	Low	Mid	High
LTE Band 17: 5 MHz	706.5 (23755)	710 (23790)	713.5 (23825)
LTE Band 17: 10 MHz	709 (23780)	710 (23790)	711 (23800)
LTE Band 5 (Cell): 5 MHz	826.5 (20425)	836.5 (20525)	846.5 (20625)
LTE Band 5 (Cell): 10 MHz	829 (20450)	836.5 (20525)	844 (20600)
LTE Band 4 (AWS): 5 MHz	1712.5 (19975)	1732.5 (20175)	1752.5 (20375)
LTE Band 4 (AWS): 10 MHz	1715 (20000)	1732.5 (20175)	1750 (20350)
LTE Band 2 (PCS): 5 MHz	1852.5 (18625)	1880 (18900)	1907.5 (19175)
LTE Band 2 (PCS): 10 MHz	1855 (18650)	1880 (18900)	1905 (19150)
UE Category	4		
Modulations Supported in UL	QPSK, 16QAM		
LTE Carrier Aggregation Possible Combinations	B17 (PCC) + B2 (SCC)	B4 (PCC) + B17 (SCC)	B2 (PCC) + B17 (SCC)
	5 MHz (B17) + 5 MHz (B2)	5 MHz (B4) + 5 MHz (B17)	5 MHz (B2) + 5 MHz (B17)
	5 MHz (B17) + 10 MHz (B2)	10 MHz (B4) + 5 MHz (B17)	5 MHz (B2) + 10 MHz (B17)
	10 MHz (B17) + 5 MHz (B2)	5 MHz (B4) + 10 MHz (B17)	10 MHz (B2) + 5 MHz (B17)
	10 MHz (B17) + 10 MHz (B2)	10 MHz (B4) + 10 MHz (B17)	10 MHz (B2) + 10 MHz (B17)
LTE Carrier Aggregation Additional Information	This device does not support full CA features on 3GPP Release 10. It supports a maximum of 2 carriers in the downlink with a total maximum bandwidth of 10 MHz of the spectrum. All uplink communications are identical to the Release 8 Specifications. Uplink communications are done on the PCC. Due to carrier capability, only B17 (PCC) + B2 (SCC), B4 (PCC) + B17 (SCC), and B2 (PCC) + B17 (SCC) is supported. The following LTE Release 10 Features are not supported: Relay, HetNet, Enhanced MIMO, eICI, WIFI Offloading, MDH, eMBMA, Cross-Carrier Scheduling, SC-FDMA.		
LTE MPR Permanently implemented per 3GPP TS 36.101 section 6.2.3~6.2.5? (manufacturer attestation to be provided)	YES		
A-MPR (Additional MPR) disabled for SAR Testing?	YES		

3 INTRODUCTION

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

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

3.1 SAR Definition

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

Equation 3-1
SAR Mathematical Equation

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

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

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

where:

σ = conductivity of the tissue-simulating material (S/m)
ρ = mass density of the tissue-simulating material (kg/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 compliant to FCC KDB Publication 865664 D01v01 and IEEE 1528-2013:

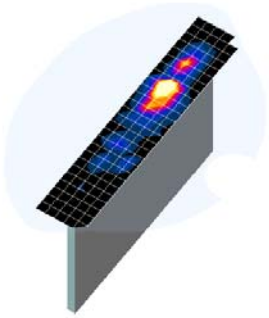


Figure 4-1
Sample SAR Area Scan

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) and IEEE 1528-2013.
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.
3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01 (See Table 4-1) and IEEE 1528-2013. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):

   a. SAR values at the inner surface of the phantom are extrapolated from the measured values along the line away from the surface with spacing no greater than that in Table 4-1. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).

   b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the "Not a knot" condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.

   c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete to calculate the SAR drift. If the drift deviated by more than 5%, the SAR test and drift measurements were repeated.

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

*Also compliant to IEEE 1528-2013 Table 6

5 SAR TESTING PROCEDURES

5.1 SAR Testing for Tablet per KDB Publication 616217 D04v01

This device can be used also in full sized tablet exposure conditions, due to its size. 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.

5.2 Proximity Sensor Considerations

This device uses a proximity sensor to reduce data powers in tablet-device use conditions.

While the device's antenna is within a certain distance of the user, the sensor activates and reduces the maximum output power allowed. However, the sensor is not active when the device is moved beyond the sensor triggering distance and the maximum output power is no longer limited. Therefore, an additional exposure condition is needed in the vicinity of the triggering distance to ensure SAR is compliant when the device is allowed to operate at a non-reduced output power level.

FCC KDB 616217 D04 Section 6 was used as a guideline for selecting SAR test distances for this device at these additional exposure conditions. Since the sensor activation distance for the back side and top edge of the device is 13 mm, a conservative distance of 12 mm was tested for SAR on the back side and top edge at maximum power. Since the sensor activation distance for the right edge of the device is 6 mm, a conservative distance of 5 mm was tested for SAR on the right edge at maximum power. Sensor triggering distance summary data is included in Appendix G. The sensor does not trigger power reduction from the front of the device.

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.

6 RF EXPOSURE LIMITS

6.1 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.

6.2 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 6-1
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)
Peak Spatial Average SAR Head	1.6	8.0
Whole Body SAR	0.08	0.4
Peak Spatial Average SAR Hands, Feet, Ankle, Wrists, etc.	4.0	20

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

7 FCC MEASUREMENT PROCEDURES

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

7.1 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.

7.2 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.

7.3 SAR Measurement Conditions for UMTS

7.3.1 Output Power Verification

Maximum output power is measured on the High, Middle and Low channels for each applicable transmission band according to the general descriptions in section 5.2 of 3GPP TS 34.121, using RMC 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.

7.3.2 Body SAR Measurements

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

7.3.3 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.

Sub-Test	β_c	β_d	β_d *(SF)*	β_c/β_d	β_{HS} *(Note1, Note 2)*	CM (dB) *(Note 3)*	MPR (dB) *(Note 3)*
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 *(Note 4)*	15/15 *(Note 4)*	64	12/15 *(Note 4)*	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

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

Figure 7-1
Table C.10.1.4 of TS 234.121-1

7.3.4 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 $\beta_c = 10/15$ and $\beta_d = 15/15$.
Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 14/15$ and $\beta_d = 15/15$.
Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g.
Note 6: β_{ed} can not be set directly; it is set by Absolute Grant Value.

7.4 SAR Measurement Conditions for LTE

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

7.4.1 Spectrum Plots for RB Configurations

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

7.4.2 MPR

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

7.4.3 A-MPR

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

7.4.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05v02r01:

a. Per Section 5.2.1, SAR is required for QPSK 1 RB Allocation for the largest bandwidth
   i. The required channel and offset combination with the highest maximum output power is required for SAR.
   ii. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required. Otherwise, SAR is required for the remaining required test channels using the RB offset configuration with highest output power for that channel.
   iii. When the reported SAR for a required test channel is > 1.45 W/kg, SAR is required for all RB offset configurations for that channel.
b. Per Section 5.2.2, SAR is required for 50% RB allocation using the largest bandwidth following the same procedures outlined in Section 5.2.1.
c. Per Section 5.2.3, QPSK SAR is not required for the 100% allocation when the highest maximum output power for the 100% allocation is less than the highest maximum output power of the 1 RB and 50% RB allocations and the reported SAR for the 1 RB and 50% RB allocations is < 0.8 W/kg.
d. Per Section 5.2.4 and 5.3, SAR tests for higher order modulations and lower bandwidths configurations are not required when the conducted power of the required test configurations determined by Sections 5.2.1 through 5.2.3 is less than or equal to ½ dB higher than the equivalent configuration using QPSK modulation and when the QPSK SAR for those configurations is <1.45 W/kg.

7.4.5 Carrier Aggregation

LTE Carrier Aggregation (CA) measurements were made in accordance to 3GPP TS 36.521-1 V10.4.0 (2012-12). The RRC connection is only handled by one cell, the Primary component carrier

(PCC) for downlink and uplink communications. After making a data connection to the PCC, the UE device adds the Secondary component carrier (SCC) on the downlink only. All uplink communications and acknowledgements remain identical to release 8 specifications on the PCC. Additional output powers were measured using two carriers in the downlink for the release 8 configurations with the highest output power among all channels, RB configurations and bandwidths for each uplink band. Per FCC Guidance, no SAR measurements were required.

7.5 SAR Testing with 802.11 Transmitters

Normal network operating configurations are not suitable for measuring the SAR of 802.11 a/b/g/n transmitters. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure the results are consistent and reliable. See KDB Publication 248227 D01v01r02 for more details.

7.5.1 General Device Setup

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

7.5.2 Frequency Channel Configurations [24]

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

For 5 GHz, the highest average RF output power channel across the default test channels at the lowest data rate was selected for SAR evaluation in 802.11a. When the adjacent channels are higher in power 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 higher than 0.25 dB or more than the 802.11a mode.

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

8 RF CONDUCTED POWERS

8.1 UMTS Conducted Powers

Table 8-1
Maximum UMTS Average RF Conducted Powers

3GPP Release Version	Mode	3GPP 34.121 Subtest	Cellular Band [dBm]			PCS Band [dBm]			3GPP MPR [dB]
			4132	4183	4233	9262	9400	9538	
99	WCDMA	12.2 kbps RMC	24.05	24.20	24.03	23.70	23.66	23.69	-
6	HSDPA	Subtest 1	23.21	23.22	23.20	22.74	22.80	22.74	0
6		Subtest 2	23.20	23.21	23.22	22.70	22.87	22.84	0
6		Subtest 3	22.71	22.80	22.75	22.22	22.39	22.37	0.5
6		Subtest 4	22.75	22.77	22.73	22.23	22.38	22.34	0.5
6	HSUPA	Subtest 1	22.71	22.85	22.70	22.20	22.44	22.53	0
6		Subtest 2	22.10	22.20	22.00	21.53	21.65	21.70	2
6		Subtest 3	21.72	22.07	22.17	21.55	21.61	21.56	1
6		Subtest 4	22.78	22.83	22.42	22.14	22.33	22.35	2
6		Subtest 5	23.30	23.49	23.36	22.61	22.85	22.81	0

Table 8-2
Reduced UMTS Average RF Conducted Powers – Representing Body at 0mm

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	20.20	20.19	20.20	14.69	14.57	14.68	-
6	HSDPA	Subtest 1	20.20	20.15	20.09	14.69	14.62	14.68	0
6		Subtest 2	20.19	20.15	20.19	14.68	14.59	14.69	0
6		Subtest 3	20.16	20.15	20.17	14.65	14.40	14.70	0.5
6		Subtest 4	20.20	20.18	20.17	14.63	14.40	14.70	0.5
6	HSUPA	Subtest 1	19.56	19.52	19.88	14.64	13.71	13.92	0
6		Subtest 2	19.65	19.60	20.19	14.04	13.98	14.10	2
6		Subtest 3	19.37	20.20	19.77	13.63	13.57	13.68	1
6		Subtest 4	19.42	19.49	19.91	13.81	13.81	13.85	2
6		Subtest 5	20.18	20.20	20.17	14.70	14.51	14.70	0

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

This device does not support DC-HSDPA.

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

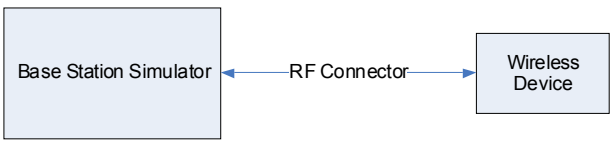


Figure 8-1
Power Measurement Setup

8.2 LTE Conducted Powers

8.2.1 LTE Band 17

Table 8-3
LTE Band 17 Conducted Powers – 10 MHz Bandwidth
Maximum Power

Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
710.0	23790	10	QPSK	1	0	23.61	0	0
710.0	23790	10	QPSK	1	25	23.63	0	0
710.0	23790	10	QPSK	1	49	**23.68**	0	0
710.0	23790	10	QPSK	25	0	22.56	0-1	1
710.0	23790	10	QPSK	25	12	22.62	0-1	1
710.0	23790	10	QPSK	25	25	**22.65**	0-1	1
710.0	23790	10	QPSK	50	0	22.64	0-1	1
710.0	23790	10	16QAM	1	0	22.36	0-1	1
710.0	23790	10	16QAM	1	25	22.38	0-1	1
710.0	23790	10	16QAM	1	49	22.48	0-1	1
710.0	23790	10	16QAM	25	0	21.58	0-2	2
710.0	23790	10	16QAM	25	12	21.66	0-2	2
710.0	23790	10	16QAM	25	25	21.68	0-2	2
710.0	23790	10	16QAM	50	0	21.69	0-2	2

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

Table 8-4
LTE Band 17 Conducted Powers – 5 MHz Bandwidth
Maximum Power

Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
710.0	23790	5	QPSK	1	0	23.66	0	0
710.0	23790	5	QPSK	1	12	23.64	0	0
710.0	23790	5	QPSK	1	24	23.67	0	0
710.0	23790	5	QPSK	12	0	22.69	0-1	1
710.0	23790	5	QPSK	12	6	22.63	0-1	1
710.0	23790	5	QPSK	12	13	22.69	0-1	1
710.0	23790	5	QPSK	25	0	22.73	0-1	1
710.0	23790	5	16-QAM	1	0	22.69	0-1	1
710.0	23790	5	16-QAM	1	12	22.69	0-1	1
710.0	23790	5	16-QAM	1	24	22.81	0-1	1
710.0	23790	5	16-QAM	12	0	21.80	0-2	2
710.0	23790	5	16-QAM	12	6	21.70	0-2	2
710.0	23790	5	16-QAM	12	13	21.78	0-2	2
710.0	23790	5	16-QAM	25	0	21.76	0-2	2

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

Table 8-5
LTE Band 17 Conducted Powers - 10 MHz Bandwidth
Reduced Power – Body at 0 mm

Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
710.0	23790	10	QPSK	1	0	19.47	0	0
710.0	23790	10	QPSK	1	25	20.02	0	0
710.0	23790	10	QPSK	1	49	**20.13**	0	0
710.0	23790	10	QPSK	25	0	20.02	0-1	0
710.0	23790	10	QPSK	25	12	20.05	0-1	0
710.0	23790	10	QPSK	25	25	**20.13**	0-1	0
710.0	23790	10	QPSK	50	0	19.77	0-1	0
710.0	23790	10	16QAM	1	0	19.20	0-1	0
710.0	23790	10	16QAM	1	25	20.01	0-1	0
710.0	23790	10	16QAM	1	49	20.12	0-1	0
710.0	23790	10	16QAM	25	0	20.09	0-2	0
710.0	23790	10	16QAM	25	12	20.11	0-2	0
710.0	23790	10	16QAM	25	25	20.12	0-2	0
710.0	23790	10	16QAM	50	0	19.39	0-2	0

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

Table 8-6
LTE Band 17 Conducted Powers - 5 MHz Bandwidth
Reduced Power – Body at 0 mm

Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
710.0	23790	5	QPSK	1	0	19.64	0	0
710.0	23790	5	QPSK	1	12	19.84	0	0
710.0	23790	5	QPSK	1	24	19.78	0	0
710.0	23790	5	QPSK	12	0	19.64	0-1	0
710.0	23790	5	QPSK	12	6	19.78	0-1	0
710.0	23790	5	QPSK	12	13	19.79	0-1	0
710.0	23790	5	QPSK	25	0	19.75	0-1	0
710.0	23790	5	16-QAM	1	0	19.89	0-1	0
710.0	23790	5	16-QAM	1	12	19.97	0-1	0
710.0	23790	5	16-QAM	1	24	19.90	0-1	0
710.0	23790	5	16-QAM	12	0	19.60	0-2	0
710.0	23790	5	16-QAM	12	6	19.71	0-2	0
710.0	23790	5	16-QAM	12	13	19.71	0-2	0
710.0	23790	5	16-QAM	25	0	19.72	0-2	0

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

8.2.2 LTE Band 5 (Cell)

Table 8-7
LTE Band 5 (Cell) Conducted Powers – 10 MHz Bandwidth
Maximum Power

Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
836.5	20525	10	QPSK	1	0	**24.13**	0	0
836.5	20525	10	QPSK	1	25	24.03	0	0
836.5	20525	10	QPSK	1	49	24.07	0	0
836.5	20525	10	QPSK	25	0	23.03	0-1	1
836.5	20525	10	QPSK	25	12	23.04	0-1	1
836.5	20525	10	QPSK	25	25	**23.17**	0-1	1
836.5	20525	10	QPSK	50	0	23.13	0-1	1
836.5	20525	10	16QAM	1	0	23.20	0-1	1
836.5	20525	10	16QAM	1	25	23.13	0-1	1
836.5	20525	10	16QAM	1	49	23.13	0-1	1
836.5	20525	10	16QAM	25	0	22.09	0-2	2
836.5	20525	10	16QAM	25	12	22.03	0-2	2
836.5	20525	10	16QAM	25	25	22.20	0-2	2
836.5	20525	10	16QAM	50	0	22.20	0-2	2

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

Table 8-8
LTE Band 5 (Cell) Conducted Powers – 5 MHz Bandwidth
Maximum Power

Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
826.5	20425	5	QPSK	1	0	24.15	0	0
826.5	20425	5	QPSK	1	12	24.00	0	0
826.5	20425	5	QPSK	1	24	24.16	0	0
826.5	20425	5	QPSK	12	0	23.02	0-1	1
826.5	20425	5	QPSK	12	6	23.03	0-1	1
826.5	20425	5	QPSK	12	13	23.12	0-1	1
826.5	20425	5	QPSK	25	0	23.02	0-1	1
826.5	20425	5	16-QAM	1	0	23.16	0-1	1
826.5	20425	5	16-QAM	1	12	23.05	0-1	1
826.5	20425	5	16-QAM	1	24	23.08	0-1	1
826.5	20425	5	16-QAM	12	0	22.06	0-2	2
826.5	20425	5	16-QAM	12	6	22.04	0-2	2
826.5	20425	5	16-QAM	12	13	22.14	0-2	2
826.5	20425	5	16-QAM	25	0	22.05	0-2	2
836.5	20525	5	QPSK	1	0	23.71	0	0
836.5	20525	5	QPSK	1	12	23.70	0	0
836.5	20525	5	QPSK	1	24	23.82	0	0
836.5	20525	5	QPSK	12	0	22.92	0-1	1
836.5	20525	5	QPSK	12	6	22.85	0-1	1
836.5	20525	5	QPSK	12	13	23.03	0-1	1
836.5	20525	5	QPSK	25	0	22.86	0-1	1
836.5	20525	5	16-QAM	1	0	22.87	0-1	1
836.5	20525	5	16-QAM	1	12	22.81	0-1	1
836.5	20525	5	16-QAM	1	24	22.96	0-1	1
836.5	20525	5	16-QAM	12	0	22.01	0-2	2
836.5	20525	5	16-QAM	12	6	21.88	0-2	2
836.5	20525	5	16-QAM	12	13	21.95	0-2	2
836.5	20525	5	16-QAM	25	0	21.96	0-2	2
846.5	20625	5	QPSK	1	0	23.88	0	0
846.5	20625	5	QPSK	1	12	23.96	0	0
846.5	20625	5	QPSK	1	24	23.77	0	0
846.5	20625	5	QPSK	12	0	22.87	0-1	1
846.5	20625	5	QPSK	12	6	22.79	0-1	1
846.5	20625	5	QPSK	12	13	22.89	0-1	1
846.5	20625	5	QPSK	25	0	22.94	0-1	1
846.5	20625	5	16-QAM	1	0	22.80	0-1	1
846.5	20625	5	16-QAM	1	12	22.85	0-1	1
846.5	20625	5	16-QAM	1	24	22.78	0-1	1
846.5	20625	5	16-QAM	12	0	22.05	0-2	2
846.5	20625	5	16-QAM	12	6	21.98	0-2	2
846.5	20625	5	16-QAM	12	13	22.00	0-2	2
846.5	20625	5	16-QAM	25	0	22.10	0-2	2

Table 8-9
LTE Band 5 (Cell) Conducted Powers – 10 MHz Bandwidth
Reduced Power – Body at 0 mm

Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
836.5	20525	10	QPSK	1	0	19.42	0	0
836.5	20525	10	QPSK	1	25	19.41	0	0
836.5	20525	10	QPSK	1	49	**19.47**	0	0
836.5	20525	10	QPSK	25	0	19.53	0-1	0
836.5	20525	10	QPSK	25	12	19.51	0-1	0
836.5	20525	10	QPSK	25	25	**19.55**	0-1	0
836.5	20525	10	QPSK	50	0	**19.54**	0-1	0
836.5	20525	10	16QAM	1	0	19.62	0-1	0
836.5	20525	10	16QAM	1	25	19.53	0-1	0
836.5	20525	10	16QAM	1	49	19.64	0-1	0
836.5	20525	10	16QAM	25	0	19.48	0-2	0
836.5	20525	10	16QAM	25	12	19.47	0-2	0
836.5	20525	10	16QAM	25	25	19.52	0-2	0
836.5	20525	10	16QAM	50	0	19.59	0-2	0

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

Table 8-10
LTE Band 5 (Cell) Conducted Powers – 5 MHz Bandwidth
Reduced Power – Body at 0 mm

Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
826.5	20425	5	QPSK	1	0	19.53	0	0
826.5	20425	5	QPSK	1	12	19.54	0	0
826.5	20425	5	QPSK	1	24	19.54	0	0
826.5	20425	5	QPSK	12	0	19.53	0-1	0
826.5	20425	5	QPSK	12	6	19.50	0-1	0
826.5	20425	5	QPSK	12	13	19.48	0-1	0
826.5	20425	5	QPSK	25	0	19.51	0-1	0
826.5	20425	5	16-QAM	1	0	19.54	0-1	0
826.5	20425	5	16-QAM	1	12	19.53	0-1	0
826.5	20425	5	16-QAM	1	24	19.54	0-1	0
826.5	20425	5	16-QAM	12	0	19.51	0-2	0
826.5	20425	5	16-QAM	12	6	19.54	0-2	0
826.5	20425	5	16-QAM	12	13	19.52	0-2	0
826.5	20425	5	16-QAM	25	0	19.49	0-2	0
836.5	20525	5	QPSK	1	0	19.25	0	0
836.5	20525	5	QPSK	1	12	19.30	0	0
836.5	20525	5	QPSK	1	24	19.32	0	0
836.5	20525	5	QPSK	12	0	19.49	0-1	0
836.5	20525	5	QPSK	12	6	19.53	0-1	0
836.5	20525	5	QPSK	12	13	19.54	0-1	0
836.5	20525	5	QPSK	25	0	19.50	0-1	0
836.5	20525	5	16-QAM	1	0	19.44	0-1	0
836.5	20525	5	16-QAM	1	12	19.48	0-1	0
836.5	20525	5	16-QAM	1	24	19.47	0-1	0
836.5	20525	5	16-QAM	12	0	19.47	0-2	0
836.5	20525	5	16-QAM	12	6	19.39	0-2	0
836.5	20525	5	16-QAM	12	13	19.41	0-2	0
836.5	20525	5	16-QAM	25	0	19.50	0-2	0
846.5	20625	5	QPSK	1	0	19.53	0	0
846.5	20625	5	QPSK	1	12	19.53	0	0
846.5	20625	5	QPSK	1	24	19.50	0	0
846.5	20625	5	QPSK	12	0	19.53	0-1	0
846.5	20625	5	QPSK	12	6	19.49	0-1	0
846.5	20625	5	QPSK	12	13	19.45	0-1	0
846.5	20625	5	QPSK	25	0	19.45	0-1	0
846.5	20625	5	16-QAM	1	0	19.40	0-1	0
846.5	20625	5	16-QAM	1	12	19.46	0-1	0
846.5	20625	5	16-QAM	1	24	19.58	0-1	0
846.5	20625	5	16-QAM	12	0	19.50	0-2	0
846.5	20625	5	16-QAM	12	6	19.46	0-2	0
846.5	20625	5	16-QAM	12	13	19.52	0-2	0
846.5	20625	5	16-QAM	25	0	19.45	0-2	0

8.2.3 LTE Band 4 (AWS)

Table 8-11
LTE Band 4 (AWS) Conducted Powers – 10 MHz Bandwidth
Maximum Power

Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
1715	20000	10	QPSK	1	0	23.00	0	0
1715	20000	10	QPSK	1	25	**23.25**	0	0
1715	20000	10	QPSK	1	49	23.20	0	0
1715	20000	10	QPSK	25	0	22.49	0-1	1
1715	20000	10	QPSK	25	12	22.62	0-1	1
1715	20000	10	QPSK	25	25	**22.66**	0-1	1
1715	20000	10	QPSK	50	0	22.45	0-1	1
1715	20000	10	16QAM	1	0	22.40	0-1	1
1715	20000	10	16QAM	1	25	22.69	0-1	1
1715	20000	10	16QAM	1	49	22.64	0-1	1
1715	20000	10	16QAM	25	0	21.39	0-2	2
1715	20000	10	16QAM	25	12	21.60	0-2	2
1715	20000	10	16QAM	25	25	21.70	0-2	2
1715	20000	10	16QAM	50	0	21.68	0-2	2
1732.5	20175	10	QPSK	1	0	23.20	0	0
1732.5	20175	10	QPSK	1	25	23.03	0	0
1732.5	20175	10	QPSK	1	49	23.00	0	0
1732.5	20175	10	QPSK	25	0	22.57	0-1	1
1732.5	20175	10	QPSK	25	12	22.50	0-1	1
1732.5	20175	10	QPSK	25	25	22.50	0-1	1
1732.5	20175	10	QPSK	50	0	22.53	0-1	1
1732.5	20175	10	16QAM	1	0	22.67	0-1	1
1732.5	20175	10	16QAM	1	25	22.66	0-1	1
1732.5	20175	10	16QAM	1	49	22.65	0-1	1
1732.5	20175	10	16QAM	25	0	21.45	0-2	2
1732.5	20175	10	16QAM	25	12	21.55	0-2	2
1732.5	20175	10	16QAM	25	25	21.59	0-2	2
1732.5	20175	10	16QAM	50	0	21.60	0-2	2
1750	20350	10	QPSK	1	0	22.97	0	0
1750	20350	10	QPSK	1	25	23.03	0	0
1750	20350	10	QPSK	1	49	22.96	0	0
1750	20350	10	QPSK	25	0	22.34	0-1	1
1750	20350	10	QPSK	25	12	22.40	0-1	1
1750	20350	10	QPSK	25	25	22.43	0-1	1
1750	20350	10	QPSK	50	0	22.44	0-1	1
1750	20350	10	16QAM	1	0	22.70	0-1	1
1750	20350	10	16QAM	1	25	22.67	0-1	1
1750	20350	10	16QAM	1	49	22.70	0-1	1
1750	20350	10	16QAM	25	0	21.38	0-2	2
1750	20350	10	16QAM	25	12	21.47	0-2	2
1750	20350	10	16QAM	25	25	21.50	0-2	2
1750	20350	10	16QAM	50	0	21.53	0-2	2

Table 8-12
LTE Band 4 (AWS) Conducted Powers – 5 MHz Bandwidth
Maximum Power

Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
1712.5	19975	5	QPSK	1	0	23.16	0	0
1712.5	19975	5	QPSK	1	12	23.24	0	0
1712.5	19975	5	QPSK	1	24	23.24	0	0
1712.5	19975	5	QPSK	12	0	22.30	0-1	1
1712.5	19975	5	QPSK	12	6	22.26	0-1	1
1712.5	19975	5	QPSK	12	13	22.38	0-1	1
1712.5	19975	5	QPSK	25	0	22.31	0-1	1
1712.5	19975	5	16-QAM	1	0	22.31	0-1	1
1712.5	19975	5	16-QAM	1	12	22.25	0-1	1
1712.5	19975	5	16-QAM	1	24	22.48	0-1	1
1712.5	19975	5	16-QAM	12	0	20.88	0-2	2
1712.5	19975	5	16-QAM	12	6	21.36	0-2	2
1712.5	19975	5	16-QAM	12	13	21.51	0-2	2
1712.5	19975	5	16-QAM	25	0	21.39	0-2	2
1732.5	20175	5	QPSK	1	0	23.20	0	0
1732.5	20175	5	QPSK	1	12	23.10	0	0
1732.5	20175	5	QPSK	1	24	23.12	0	0
1732.5	20175	5	QPSK	12	0	22.46	0-1	1
1732.5	20175	5	QPSK	12	6	22.50	0-1	1
1732.5	20175	5	QPSK	12	13	22.44	0-1	1
1732.5	20175	5	QPSK	25	0	22.49	0-1	1
1732.5	20175	5	16-QAM	1	0	22.67	0-1	1
1732.5	20175	5	16-QAM	1	12	22.59	0-1	1
1732.5	20175	5	16-QAM	1	24	22.55	0-1	1
1732.5	20175	5	16-QAM	12	0	21.44	0-2	2
1732.5	20175	5	16-QAM	12	6	21.51	0-2	2
1732.5	20175	5	16-QAM	12	13	21.45	0-2	2
1732.5	20175	5	16-QAM	25	0	21.53	0-2	2
1752.5	20375	5	QPSK	1	0	23.05	0	0
1752.5	20375	5	QPSK	1	12	22.87	0	0
1752.5	20375	5	QPSK	1	24	22.96	0	0
1752.5	20375	5	QPSK	12	0	22.43	0-1	1
1752.5	20375	5	QPSK	12	6	22.36	0-1	1
1752.5	20375	5	QPSK	12	13	22.48	0-1	1
1752.5	20375	5	QPSK	25	0	22.48	0-1	1
1752.5	20375	5	16-QAM	1	0	22.40	0-1	1
1752.5	20375	5	16-QAM	1	12	22.30	0-1	1
1752.5	20375	5	16-QAM	1	24	22.60	0-1	1
1752.5	20375	5	16-QAM	12	0	21.57	0-2	2
1752.5	20375	5	16-QAM	12	6	21.44	0-2	2
1752.5	20375	5	16-QAM	12	13	21.53	0-2	2
1752.5	20375	5	16-QAM	25	0	21.56	0-2	2

Table 8-13
LTE Band 4 (AWS) Conducted Powers – 10 MHz Bandwidth
Reduced Power – Body at 0 mm

Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
1715	20000	10	QPSK	1	0	14.46	0	0
1715	20000	10	QPSK	1	25	14.55	0	0
1715	20000	10	QPSK	1	49	14.63	0	0
1715	20000	10	QPSK	25	0	14.49	0-1	0
1715	20000	10	QPSK	25	12	14.48	0-1	0
1715	20000	10	QPSK	25	25	14.58	0-1	0
1715	20000	10	QPSK	50	0	14.55	0-1	0
1715	20000	10	16QAM	1	0	14.26	0-1	0
1715	20000	10	16QAM	1	25	14.25	0-1	0
1715	20000	10	16QAM	1	49	14.34	0-1	0
1715	20000	10	16QAM	25	0	14.35	0-2	0
1715	20000	10	16QAM	25	12	14.48	0-2	0
1715	20000	10	16QAM	25	25	14.54	0-2	0
1715	20000	10	16QAM	50	0	14.46	0-2	0
1732.5	20175	10	QPSK	1	0	**14.65**	0	0
1732.5	20175	10	QPSK	1	25	14.60	0	0
1732.5	20175	10	QPSK	1	49	14.61	0	0
1732.5	20175	10	QPSK	25	0	**14.68**	0-1	0
1732.5	20175	10	QPSK	25	12	14.63	0-1	0
1732.5	20175	10	QPSK	25	25	14.61	0-1	0
1732.5	20175	10	QPSK	50	0	14.61	0-1	0
1732.5	20175	10	16QAM	1	0	14.45	0-1	0
1732.5	20175	10	16QAM	1	25	14.38	0-1	0
1732.5	20175	10	16QAM	1	49	14.38	0-1	0
1732.5	20175	10	16QAM	25	0	14.66	0-2	0
1732.5	20175	10	16QAM	25	12	14.57	0-2	0
1732.5	20175	10	16QAM	25	25	14.61	0-2	0
1732.5	20175	10	16QAM	50	0	14.64	0-2	0
1750	20350	10	QPSK	1	0	14.58	0	0
1750	20350	10	QPSK	1	25	14.63	0	0
1750	20350	10	QPSK	1	49	14.58	0	0
1750	20350	10	QPSK	25	0	14.53	0-1	0
1750	20350	10	QPSK	25	12	14.62	0-1	0
1750	20350	10	QPSK	25	25	14.54	0-1	0
1750	20350	10	QPSK	50	0	14.62	0-1	0
1750	20350	10	16QAM	1	0	14.44	0-1	0
1750	20350	10	16QAM	1	25	14.45	0-1	0
1750	20350	10	16QAM	1	49	14.39	0-1	0
1750	20350	10	16QAM	25	0	14.62	0-2	0
1750	20350	10	16QAM	25	12	14.64	0-2	0
1750	20350	10	16QAM	25	25	14.53	0-2	0
1750	20350	10	16QAM	50	0	14.66	0-2	0

Table 8-14
LTE Band 4 (AWS) Conducted Powers – 5 MHz Bandwidth
Reduced Power – Body at 0 mm

Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
1712.5	19975	5	QPSK	1	0	14.43	0	0
1712.5	19975	5	QPSK	1	12	14.48	0	0
1712.5	19975	5	QPSK	1	24	14.53	0	0
1712.5	19975	5	QPSK	12	0	14.49	0-1	0
1712.5	19975	5	QPSK	12	6	14.44	0-1	0
1712.5	19975	5	QPSK	12	13	14.44	0-1	0
1712.5	19975	5	QPSK	25	0	14.46	0-1	0
1712.5	19975	5	16-QAM	1	0	14.41	0-1	0
1712.5	19975	5	16-QAM	1	12	14.41	0-1	0
1712.5	19975	5	16-QAM	1	24	14.47	0-1	0
1712.5	19975	5	16-QAM	12	0	14.49	0-2	0
1712.5	19975	5	16-QAM	12	6	14.47	0-2	0
1712.5	19975	5	16-QAM	12	13	14.46	0-2	0
1712.5	19975	5	16-QAM	25	0	14.40	0-2	0
1732.5	20175	5	QPSK	1	0	14.54	0	0
1732.5	20175	5	QPSK	1	12	14.51	0	0
1732.5	20175	5	QPSK	1	24	14.57	0	0
1732.5	20175	5	QPSK	12	0	14.58	0-1	0
1732.5	20175	5	QPSK	12	6	14.61	0-1	0
1732.5	20175	5	QPSK	12	13	14.67	0-1	0
1732.5	20175	5	QPSK	25	0	14.58	0-1	0
1732.5	20175	5	16-QAM	1	0	14.36	0-1	0
1732.5	20175	5	16-QAM	1	12	14.31	0-1	0
1732.5	20175	5	16-QAM	1	24	14.42	0-1	0
1732.5	20175	5	16-QAM	12	0	14.63	0-2	0
1732.5	20175	5	16-QAM	12	6	14.61	0-2	0
1732.5	20175	5	16-QAM	12	13	14.63	0-2	0
1732.5	20175	5	16-QAM	25	0	14.65	0-2	0
1752.5	20375	5	QPSK	1	0	14.61	0	0
1752.5	20375	5	QPSK	1	12	14.57	0	0
1752.5	20375	5	QPSK	1	24	14.51	0	0
1752.5	20375	5	QPSK	12	0	14.53	0-1	0
1752.5	20375	5	QPSK	12	6	14.47	0-1	0
1752.5	20375	5	QPSK	12	13	14.54	0-1	0
1752.5	20375	5	QPSK	25	0	14.62	0-1	0
1752.5	20375	5	16-QAM	1	0	14.52	0-1	0
1752.5	20375	5	16-QAM	1	12	14.47	0-1	0
1752.5	20375	5	16-QAM	1	24	14.41	0-1	0
1752.5	20375	5	16-QAM	12	0	14.67	0-2	0
1752.5	20375	5	16-QAM	12	6	14.61	0-2	0
1752.5	20375	5	16-QAM	12	13	14.61	0-2	0
1752.5	20375	5	16-QAM	25	0	14.67	0-2	0

8.2.4 LTE Band 2 (PCS)

Table 8-15
LTE Band 2 (PCS) Conducted Powers – 10 MHz Bandwidth
Maximum Power

Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
1855	18650	10	QPSK	1	0	23.20	0	0
1855	18650	10	QPSK	1	25	**23.33**	0	0
1855	18650	10	QPSK	1	49	23.20	0	0
1855	18650	10	QPSK	25	0	22.38	0-1	1
1855	18650	10	QPSK	25	12	**22.53**	0-1	1
1855	18650	10	QPSK	25	25	22.40	0-1	1
1855	18650	10	QPSK	50	0	22.50	0-1	1
1855	18650	10	16QAM	1	0	22.62	0-1	1
1855	18650	10	16QAM	1	25	22.70	0-1	1
1855	18650	10	16QAM	1	49	22.67	0-1	1
1855	18650	10	16QAM	25	0	21.41	0-2	2
1855	18650	10	16QAM	25	12	21.63	0-2	2
1855	18650	10	16QAM	25	25	21.55	0-2	2
1855	18650	10	16QAM	50	0	21.56	0-2	2
1880.0	18900	10	QPSK	1	0	23.22	0	0
1880.0	18900	10	QPSK	1	25	23.26	0	0
1880.0	18900	10	QPSK	1	49	23.26	0	0
1880.0	18900	10	QPSK	25	0	22.50	0-1	1
1880.0	18900	10	QPSK	25	12	22.45	0-1	1
1880.0	18900	10	QPSK	25	25	22.48	0-1	1
1880.0	18900	10	QPSK	50	0	22.47	0-1	1
1880.0	18900	10	16QAM	1	0	22.56	0-1	1
1880.0	18900	10	16QAM	1	25	22.56	0-1	1
1880.0	18900	10	16QAM	1	49	22.53	0-1	1
1880.0	18900	10	16QAM	25	0	21.52	0-2	2
1880.0	18900	10	16QAM	25	12	21.50	0-2	2
1880.0	18900	10	16QAM	25	25	21.47	0-2	2
1880.0	18900	10	16QAM	50	0	21.48	0-2	2
1905	19150	10	QPSK	1	0	23.32	0	0
1905	19150	10	QPSK	1	25	23.27	0	0
1905	19150	10	QPSK	1	49	23.23	0	0
1905	19150	10	QPSK	25	0	22.41	0-1	1
1905	19150	10	QPSK	25	12	22.38	0-1	1
1905	19150	10	QPSK	25	25	22.36	0-1	1
1905	19150	10	QPSK	50	0	22.44	0-1	1
1905	19150	10	16QAM	1	0	22.30	0-1	1
1905	19150	10	16QAM	1	25	22.36	0-1	1
1905	19150	10	16QAM	1	49	22.23	0-1	1
1905	19150	10	16QAM	25	0	21.34	0-2	2
1905	19150	10	16QAM	25	12	21.50	0-2	2
1905	19150	10	16QAM	25	25	21.45	0-2	2
1905	19150	10	16QAM	50	0	21.47	0-2	2

Table 8-16
LTE Band 2 (PCS) Conducted Powers – 5 MHz Bandwidth
Maximum Power

Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
1852.5	18625	5	QPSK	1	0	22.90	0	0
1852.5	18625	5	QPSK	1	12	22.77	0	0
1852.5	18625	5	QPSK	1	24	22.91	0	0
1852.5	18625	5	QPSK	12	0	22.57	0-1	1
1852.5	18625	5	QPSK	12	6	22.65	0-1	1
1852.5	18625	5	QPSK	12	13	22.64	0-1	1
1852.5	18625	5	QPSK	25	0	22.68	0-1	1
1852.5	18625	5	16-QAM	1	0	22.53	0-1	1
1852.5	18625	5	16-QAM	1	12	22.58	0-1	1
1852.5	18625	5	16-QAM	1	24	22.69	0-1	1
1852.5	18625	5	16-QAM	12	0	21.47	0-2	2
1852.5	18625	5	16-QAM	12	6	21.69	0-2	2
1852.5	18625	5	16-QAM	12	13	21.70	0-2	2
1852.5	18625	5	16-QAM	25	0	21.68	0-2	2
1880.0	18900	5	QPSK	1	0	23.00	0	0
1880.0	18900	5	QPSK	1	12	22.96	0	0
1880.0	18900	5	QPSK	1	24	23.10	0	0
1880.0	18900	5	QPSK	12	0	22.63	0-1	1
1880.0	18900	5	QPSK	12	6	22.63	0-1	1
1880.0	18900	5	QPSK	12	13	22.70	0-1	1
1880.0	18900	5	QPSK	25	0	22.63	0-1	1
1880.0	18900	5	16-QAM	1	0	22.70	0-1	1
1880.0	18900	5	16-QAM	1	12	22.56	0-1	1
1880.0	18900	5	16-QAM	1	24	22.61	0-1	1
1880.0	18900	5	16-QAM	12	0	21.31	0-2	2
1880.0	18900	5	16-QAM	12	6	21.58	0-2	2
1880.0	18900	5	16-QAM	12	13	21.62	0-2	2
1880.0	18900	5	16-QAM	25	0	21.67	0-2	2
1907.5	19175	5	QPSK	1	0	23.32	0	0
1907.5	19175	5	QPSK	1	12	23.30	0	0
1907.5	19175	5	QPSK	1	24	23.32	0	0
1907.5	19175	5	QPSK	12	0	22.55	0-1	1
1907.5	19175	5	QPSK	12	6	22.53	0-1	1
1907.5	19175	5	QPSK	12	13	22.47	0-1	1
1907.5	19175	5	QPSK	25	0	22.48	0-1	1
1907.5	19175	5	16-QAM	1	0	22.45	0-1	1
1907.5	19175	5	16-QAM	1	12	22.53	0-1	1
1907.5	19175	5	16-QAM	1	24	22.45	0-1	1
1907.5	19175	5	16-QAM	12	0	21.67	0-2	2
1907.5	19175	5	16-QAM	12	6	21.64	0-2	2
1907.5	19175	5	16-QAM	12	13	21.60	0-2	2
1907.5	19175	5	16-QAM	25	0	21.56	0-2	2

Table 8-17
LTE Band 2 (PCS) Conducted Powers – 10 MHz Bandwidth
Reduced Power – Body at 0 mm

Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
1855	18650	10	QPSK	1	0	**14.52**	0	0
1855	18650	10	QPSK	1	25	14.39	0	0
1855	18650	10	QPSK	1	49	14.40	0	0
1855	18650	10	QPSK	25	0	14.22	0-1	0
1855	18650	10	QPSK	25	12	14.43	0-1	0
1855	18650	10	QPSK	25	25	**14.51**	0-1	0
1855	18650	10	QPSK	50	0	13.83	0-1	0
1855	18650	10	16QAM	1	0	14.39	0-1	0
1855	18650	10	16QAM	1	25	14.40	0-1	0
1855	18650	10	16QAM	1	49	14.56	0-1	0
1855	18650	10	16QAM	25	0	14.14	0-2	0
1855	18650	10	16QAM	25	12	14.45	0-2	0
1855	18650	10	16QAM	25	25	14.42	0-2	0
1855	18650	10	16QAM	50	0	14.33	0-2	0
1880.0	18900	10	QPSK	1	0	14.45	0	0
1880.0	18900	10	QPSK	1	25	14.39	0	0
1880.0	18900	10	QPSK	1	49	14.14	0	0
1880.0	18900	10	QPSK	25	0	14.29	0-1	0
1880.0	18900	10	QPSK	25	12	14.45	0-1	0
1880.0	18900	10	QPSK	25	25	14.40	0-1	0
1880.0	18900	10	QPSK	50	0	14.14	0-1	0
1880.0	18900	10	16QAM	1	0	14.52	0-1	0
1880.0	18900	10	16QAM	1	25	14.38	0-1	0
1880.0	18900	10	16QAM	1	49	14.52	0-1	0
1880.0	18900	10	16QAM	25	0	14.34	0-2	0
1880.0	18900	10	16QAM	25	12	14.34	0-2	0
1880.0	18900	10	16QAM	25	25	14.37	0-2	0
1880.0	18900	10	16QAM	50	0	14.21	0-2	0
1905	19150	10	QPSK	1	0	14.11	0	0
1905	19150	10	QPSK	1	25	14.41	0	0
1905	19150	10	QPSK	1	49	14.02	0	0
1905	19150	10	QPSK	25	0	14.35	0-1	0
1905	19150	10	QPSK	25	12	14.06	0-1	0
1905	19150	10	QPSK	25	25	14.32	0-1	0
1905	19150	10	QPSK	50	0	13.96	0-1	0
1905	19150	10	16QAM	1	0	14.52	0-1	0
1905	19150	10	16QAM	1	25	14.21	0-1	0
1905	19150	10	16QAM	1	49	14.22	0-1	0
1905	19150	10	16QAM	25	0	14.38	0-2	0
1905	19150	10	16QAM	25	12	14.33	0-2	0
1905	19150	10	16QAM	25	25	14.34	0-2	0
1905	19150	10	16QAM	50	0	14.09	0-2	0

Table 8-18
LTE Band 2 (PCS) Conducted Powers – 5 MHz Bandwidth
Reduced Power – Body at 0 mm

Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
1852.5	18625	5	QPSK	1	0	13.70	0	0
1852.5	18625	5	QPSK	1	12	13.90	0	0
1852.5	18625	5	QPSK	1	24	13.71	0	0
1852.5	18625	5	QPSK	12	0	13.97	0-1	0
1852.5	18625	5	QPSK	12	6	14.06	0-1	0
1852.5	18625	5	QPSK	12	13	14.04	0-1	0
1852.5	18625	5	QPSK	25	0	14.05	0-1	0
1852.5	18625	5	16-QAM	1	0	13.86	0-1	0
1852.5	18625	5	16-QAM	1	12	14.01	0-1	0
1852.5	18625	5	16-QAM	1	24	13.90	0-1	0
1852.5	18625	5	16-QAM	12	0	13.91	0-2	0
1852.5	18625	5	16-QAM	12	6	13.93	0-2	0
1852.5	18625	5	16-QAM	12	13	13.87	0-2	0
1852.5	18625	5	16-QAM	25	0	13.88	0-2	0
1880.0	18900	5	QPSK	1	0	14.14	0	0
1880.0	18900	5	QPSK	1	12	14.12	0	0
1880.0	18900	5	QPSK	1	24	14.05	0	0
1880.0	18900	5	QPSK	12	0	14.08	0-1	0
1880.0	18900	5	QPSK	12	6	14.04	0-1	0
1880.0	18900	5	QPSK	12	13	13.92	0-1	0
1880.0	18900	5	QPSK	25	0	14.06	0-1	0
1880.0	18900	5	16-QAM	1	0	14.09	0-1	0
1880.0	18900	5	16-QAM	1	12	14.02	0-1	0
1880.0	18900	5	16-QAM	1	24	14.02	0-1	0
1880.0	18900	5	16-QAM	12	0	14.05	0-2	0
1880.0	18900	5	16-QAM	12	6	14.11	0-2	0
1880.0	18900	5	16-QAM	12	13	14.07	0-2	0
1880.0	18900	5	16-QAM	25	0	14.05	0-2	0
1907.5	19175	5	QPSK	1	0	14.00	0	0
1907.5	19175	5	QPSK	1	12	14.10	0	0
1907.5	19175	5	QPSK	1	24	13.99	0	0
1907.5	19175	5	QPSK	12	0	13.93	0-1	0
1907.5	19175	5	QPSK	12	6	13.95	0-1	0
1907.5	19175	5	QPSK	12	13	13.93	0-1	0
1907.5	19175	5	QPSK	25	0	13.94	0-1	0
1907.5	19175	5	16-QAM	1	0	14.12	0-1	0
1907.5	19175	5	16-QAM	1	12	13.96	0-1	0
1907.5	19175	5	16-QAM	1	24	14.09	0-1	0
1907.5	19175	5	16-QAM	12	0	13.91	0-2	0
1907.5	19175	5	16-QAM	12	6	13.91	0-2	0
1907.5	19175	5	16-QAM	12	13	13.90	0-2	0
1907.5	19175	5	16-QAM	25	0	13.99	0-2	0

Table 8-19
LTE Carrier Aggregation Conducted Powers – Band 17 (PCC) + Band 2 (SCC) 10 MHz BW
Maximum Power

Band 17 (PCC) + Band 2 (SCC), 10 MHz					
PCC Mid	[710 MHz/Ch. 23790] + [1855 MHz/Ch. 18650]	PCC UL # RB	PCC UL RB off.	Rel. 8 Tx. Power (dBm)	Rel. 10 Tx. Power (dBm)
		1	49	23.68	23.71

Table 8-20
LTE Carrier Aggregation Conducted Powers – Band 17 (PCC) + Band 2 (SCC) 10 MHz BW
Reduced Power – Body at 0 mm

Band 17 (PCC) + Band 2 (SCC), 10 MHz					
PCC Mid	[710 MHz/Ch. 23790] + [1855 MHz/Ch. 18650]	PCC UL # RB	PCC UL RB off.	Rel. 8 Tx. Power (dBm)	Rel. 10 Tx. Power (dBm)
		1	49	20.13	20.20

Table 8-21
LTE Carrier Aggregation Conducted Powers – Band 4 (PCC) + Band 17 (SCC) 10 MHz BW
Maximum Power

Band 4 (PCC) + Band 17 (SCC), 10 MHz					
PCC Low	[1715 MHz/Ch. 20000] + [710 MHz/Ch. 23790]	PCC UL # RB	PCC UL RB off.	Rel. 8 Tx. Power (dBm)	Rel. 10 Tx. Power (dBm)
		1	25	23.25	23.48

Table 8-22
LTE Carrier Aggregation Conducted Powers – Band 4 (PCC) + Band 17 (SCC) 10 MHz BW
Reduced Power – Body at 0 mm

Band 4 (PCC) + Band 17 (SCC), 10 MHz					
PCC Mid	[1732.5 MHz/Ch. 20175] + [710 MHz/Ch. 23790]	PCC UL # RB	PCC UL RB off.	Rel. 8 Tx. Power (dBm)	Rel. 10 Tx. Power (dBm)
		25	0	14.68	14.64

Table 8-23
LTE Carrier Aggregation Conducted Powers – Band 2 (PCC) + Band 17 (SCC) 10 MHz BW
Maximum Power

Band 2 (PCC) + Band 17 (SCC), 10 MHz					
PCC Low	[1855 MHz/Ch. 18650] + [710 MHz/Ch. 23790]	PCC UL # RB	PCC UL RB off.	Rel. 8 Tx. Power (dBm)	Rel. 10 Tx. Power (dBm)
		1	25	23.33	23.43

Table 8-24
LTE Carrier Aggregation Conducted Powers – Band 2 (PCC) + Band 17 (SCC) 10 MHz BW
Reduced Power – Body at 0 mm

Band 2 (PCC) + Band 17 (SCC), 10 MHz					
PCC Low	[1855 MHz/Ch. 18650] + [710 MHz/Ch. 23790]	PCC UL # RB	PCC UL RB off.	Rel. 8 Tx. Power (dBm)	Rel. 10 Tx. Power (dBm)
		1	0	14.52	14.16

Notes:

1. The device does not support all Rel. 10 Carrier Aggregation features due to modem chipset limitation.
2. The device only supports downlink Carrier Aggregation. Uplink Carrier Aggregation is not supported. Power measurements were performed with two DL carriers for the Release 8 configuration that had the highest output power (across all bandwidths, channels and RB Configurations) for each band
3. This device only supports inter-band CA with 3 carriers (B17+B2, B4+B17, B2+B17) with a maximum of 10 MHz of spectrum.
4. All control and acknowledge data is sent on uplink channels that operate identical to release 8 specifications.

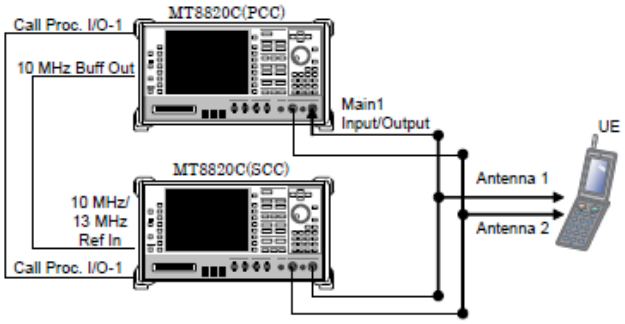


Figure 8-2
Power Measurement Setup

8.3 WLAN Conducted Powers

Table 8-25
IEEE 802.11b Average RF Power

Mode	Freq [MHz]	Channel	Detector	802.11b Conducted Power [dBm]
				Data Rate [Mbps]
				1
802.11b	2412	1*	AVG	13.38
802.11b	2437	6*	AVG	13.28
802.11b	2462	11*	AVG	**14.00**

Table 8-26
IEEE 802.11g Average RF Power

Mode	Freq [MHz]	Channel	Detector	802.11g Conducted Power [dBm]
				Data Rate [Mbps]
				6
802.11g	2412	1	AVG	9.61
802.11g	2437	6	AVG	9.64
802.11g	2462	11	AVG	10.14

Table 8-27
IEEE 802.11n Average RF Power

Mode	Freq [MHz]	Channel	Detector	802.11n (2.4GHz) Conducted Power [dBm]
				Data Rate [Mbps]
				6.5
802.11n	2412	1	AVG	7.31
802.11n	2437	6	AVG	7.90
802.11n	2462	11	AVG	7.51

Table 8-28
IEEE 802.11a Average RF Power

Mode	Freq [MHz]	Channel	Detector	802.11a Conducted Power [dBm]
				Data Rate [Mbps]
				6
802.11a	5180	36*	AVG	11.24
802.11a	5200	40	AVG	11.22
802.11a	5220	44	AVG	**11.29**
802.11a	5240	48*	AVG	11.06
802.11a	5260	52*	AVG	11.08
802.11a	5280	56	AVG	11.01
802.11a	5300	60	AVG	**11.09**
802.11a	5320	64*	AVG	10.98
802.11a	5500	100	AVG	11.06
802.11a	5520	104*	AVG	**11.29**
802.11a	5540	108	AVG	11.01
802.11a	5560	112	AVG	11.15
802.11a	5580	116*	AVG	11.18
802.11a	5600	120	N/A	N/A
802.11a	5620	124	N/A	N/A
802.11a	5640	128	N/A	N/A
802.11a	5660	132	AVG	11.24
802.11a	5680	136*	AVG	11.12
802.11a	5700	140	AVG	11.05
802.11a	5745	149*	AVG	11.24
802.11a	5765	153	AVG	**11.32**
802.11a	5785	157*	AVG	11.31
802.11a	5805	161	AVG	11.30
802.11a	5825	165*	AVG	11.30

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 8-29
IEEE 802.11n Average RF Power – 20 MHz Bandwidth

Mode	Freq [MHz]	Channel	Detector	20MHz BW 802.11n (5GHz) Conducted Power [dBm]
				Data Rate [Mbps]
				6.5
802.11n	5180	36	AVG	10.38
802.11n	5200	40	AVG	10.43
802.11n	5220	44	AVG	10.47
802.11n	5240	48	AVG	10.46
802.11n	5260	52	AVG	10.45
802.11n	5280	56	AVG	10.46
802.11n	5300	60	AVG	10.43
802.11n	5320	64	AVG	10.49
802.11n	5500	100	AVG	10.66
802.11n	5520	104	AVG	10.63
802.11n	5540	108	AVG	10.54
802.11n	5560	112	AVG	10.56
802.11n	5580	116	AVG	10.48
802.11n	5600	120	N/A	N/A
802.11n	5620	124	N/A	N/A
802.11n	5640	128	N/A	N/A
802.11n	5660	132	AVG	10.58
802.11n	5680	136	AVG	10.51
802.11n	5700	140	AVG	10.56
802.11n	5745	149	AVG	10.57
802.11n	5765	153	AVG	10.57
802.11n	5785	157	AVG	10.67
802.11n	5805	161	AVG	10.70
802.11n	5825	165	AVG	10.62

Table 8-30
IEEE 802.11n Average RF Power – 40 MHz Bandwidth

Mode	Freq [MHz]	Channel	Detector	40MHz BW 802.11n (5GHz) Conducted Power [dBm]
				Data Rate [Mbps]
				13.5
802.11n	5190	38	AVG	10.79
802.11n	5230	46	AVG	10.73
802.11n	5270	54	AVG	10.79
802.11n	5310	62	AVG	10.71
802.11n	5510	102	AVG	11.00
802.11n	5550	110	AVG	10.90
802.11n	5590	118	N/A	N/A
802.11n	5630	126	N/A	N/A
802.11n	5670	134	AVG	10.75
802.11n	5755	151	AVG	10.85
802.11n	5795	159	AVG	11.00

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

- For 2.4 GHz, highest average RF output power channel for the lowest data rate for IEEE 802.11b were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11g/n) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11b mode.
- For 5 GHz, highest average RF output power channel for the lowest data rate for IEEE 802.11a were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11n 20 MHz and 40 MHz 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.
- 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.

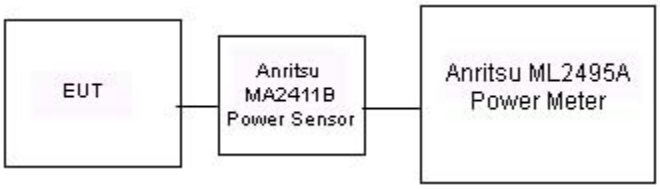


Figure 8-3
Power Measurement Setup

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
6/2/2014	750B	23.0	710	0.940	55.938	0.960	55.687	-2.08%	0.45%
			725	0.954	55.800	0.961	55.629	-0.73%	0.31%
			740	0.968	55.615	0.963	55.570	0.52%	0.08%
			755	0.981	55.465	0.964	55.512	1.76%	-0.08%
6/10/2014	835B	19.8	820	0.959	53.500	0.969	55.258	-1.03%	-3.18%
			835	0.976	53.307	0.970	55.200	0.62%	-3.43%
			850	0.992	53.175	0.988	55.154	0.40%	-3.59%
6/4/2014	1750B	22.8	1710	1.414	53.024	1.463	53.537	-3.35%	-0.96%
			1750	1.457	52.864	1.488	53.432	-2.08%	-1.06%
			1790	1.497	52.719	1.514	53.326	-1.12%	-1.14%
6/2/2014	1900B	21.5	1850	1.477	53.220	1.520	53.300	-2.83%	-0.15%
			1880	1.510	53.112	1.520	53.300	-0.66%	-0.35%
			1910	1.543	53.005	1.520	53.300	1.51%	-0.55%
6/2/2014	2450B	22.4	2401	1.883	51.238	1.903	52.765	-1.05%	-2.89%
			2450	1.952	51.042	1.950	52.700	0.10%	-3.15%
			2499	2.017	50.848	2.019	52.638	-0.10%	-3.40%
05/27/2014	5200B-5800B	22.7	5200	5.455	47.002	5.299	49.014	2.94%	-4.10%
			5220	5.501	47.141	5.323	48.987	3.34%	-3.77%
			5300	5.530	46.810	5.416	48.879	2.10%	-4.23%
			5500	5.844	46.929	5.650	48.607	3.43%	-3.45%
			5520	5.818	46.799	5.673	48.580	2.56%	-3.67%
			5765	6.166	46.502	5.959	48.248	3.47%	-3.62%
			5800	6.164	45.988	6.000	48.200	2.73%	-4.59%

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

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. Full system validation status and result summary can be found in Appendix E.

Table 9-2
System Verification Results

System Verification TARGET & MEASURED												
SAR System #	Tissue Frequency (MHz)	Tissue Type	Date:	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Dipole SN	Probe SN	Measured SAR_{1g} (W/kg)	1 W Target SAR_{1g} (W/kg)	1 W Normalized SAR_{1g} (W/kg)	$Deviation_{1g}$ (%)
J	750	BODY	06/02/2014	23.3	23.0	0.100	1003	3332	0.903	8.770	9.030	2.96%
C	835	BODY	06/10/2014	19.8	19.8	0.100	4d133	3213	0.964	9.610	9.640	0.31%
K	1750	BODY	06/04/2014	24.0	22.8	0.100	1051	3333	3.840	37.400	38.400	2.67%
B	1900	BODY	06/02/2014	23.0	21.9	0.100	5d148	3288	3.810	39.300	38.100	-3.05%
G	2450	BODY	06/02/2014	24.5	23.0	0.100	719	3258	5.050	51.700	50.500	-2.32%
A	5200	BODY	05/27/2014	23.8	22.6	0.100	1007	3920	7.530	72.600	75.300	3.72%
A	5300	BODY	05/27/2014	23.8	22.6	0.100	1007	3920	7.630	74.700	76.300	2.14%
A	5500	BODY	05/27/2014	23.8	22.6	0.100	1007	3920	7.970	75.900	79.700	5.01%
A	5800	BODY	05/27/2014	23.8	22.6	0.100	1007	3920	7.260	72.900	72.600	-0.41%

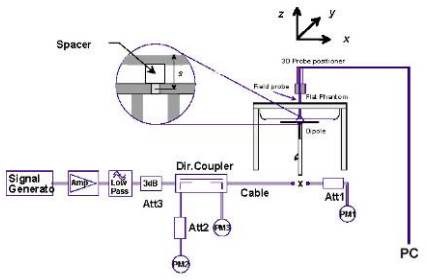


Figure 9-1
System Verification Setup Diagram

Figure 9-2
System Verification Setup Photo

10 SAR DATA SUMMARY

10.1 Standalone Body SAR Data

Table 10-1
UMTS 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)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
836.60	4183	UMTS 850	RMC	24.2	24.20	0.04	12 mm	WCDMA SAR #1	1:1	back	0.425	1.000	0.425	
836.60	4183	UMTS 850	RMC	24.2	24.20	-0.07	12 mm	WCDMA SAR #1	1:1	top	0.252	1.000	0.252	
836.60	4183	UMTS 850	RMC	24.2	24.20	-0.03	5 mm	WCDMA SAR #1	1:1	right	0.288	1.000	0.288	
826.40	4132	UMTS 850	RMC	20.2	20.20	-0.02	0 mm	WCDMA SAR #2	1:1	back	1.010	1.000	1.010	A1
836.60	4183	UMTS 850	RMC	20.2	20.19	-0.03	0 mm	WCDMA SAR #2	1:1	back	1.000	1.002	1.002	
846.60	4233	UMTS 850	RMC	20.2	20.20	0.05	0 mm	WCDMA SAR #2	1:1	back	0.992	1.000	0.992	
836.60	4183	UMTS 850	RMC	20.2	20.19	0.03	0 mm	WCDMA SAR #2	1:1	top	0.482	1.002	0.483	
836.60	4183	UMTS 850	RMC	20.2	20.19	-0.02	0 mm	WCDMA SAR #2	1:1	right	0.331	1.002	0.332	
826.40	4132	UMTS 850	RMC	20.2	20.20	0.00	0 mm	WCDMA SAR #2	1:1	back	0.926	1.000	0.926	
1880.00	9400	UMTS 1900	RMC	23.7	23.66	-0.02	12 mm	WCDMA SAR #1	1:1	back	0.596	1.009	0.601	
1880.00	9400	UMTS 1900	RMC	23.7	23.66	0.02	12 mm	WCDMA SAR #1	1:1	top	0.551	1.009	0.556	
1880.00	9400	UMTS 1900	RMC	23.7	23.66	0.18	5 mm	WCDMA SAR #1	1:1	right	0.309	1.009	0.312	
1880.00	9400	UMTS 1900	RMC	14.7	14.57	0.04	0 mm	WCDMA SAR #2	1:1	back	0.610	1.030	0.628	A2
1880.00	9400	UMTS 1900	RMC	14.7	14.57	0.01	0 mm	WCDMA SAR #2	1:1	top	0.330	1.030	0.340	
1880.00	9400	UMTS 1900	RMC	14.7	14.57	0.06	0 mm	WCDMA SAR #2	1:1	right	0.098	1.030	0.101	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram						

Blue entry represents variability data.

Table 10-2
LTE Band 17 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.															(W/kg)		(W/kg)	
710.00	23790	Mid	LTE Band 17	10	20.2	20.13	0.01	0	LTE SAR #2	QPSK	1	49	0 mm	back	1:1	0.567	1.016	0.576	
710.00	23790	Mid	LTE Band 17	10	20.2	20.13	-0.02	0	LTE SAR #2	QPSK	25	25	0 mm	back	1:1	0.594	1.016	0.604	A3
710.00	23790	Mid	LTE Band 17	10	20.2	20.13	-0.03	0	LTE SAR #2	QPSK	1	49	0 mm	top	1:1	0.340	1.016	0.345	
710.00	23790	Mid	LTE Band 17	10	20.2	20.13	-0.03	0	LTE SAR #2	QPSK	25	25	0 mm	top	1:1	0.349	1.016	0.355	
710.00	23790	Mid	LTE Band 17	10	20.2	20.13	0.08	0	LTE SAR #2	QPSK	1	49	0 mm	right	1:1	0.155	1.016	0.157	
710.00	23790	Mid	LTE Band 17	10	20.2	20.13	0.06	0	LTE SAR #2	QPSK	25	25	0 mm	right	1:1	0.165	1.016	0.168	
710.00	23790	Mid	LTE Band 17	10	24.2	23.68	0.01	0	LTE SAR #1	QPSK	1	49	12 mm	back	1:1	0.255	1.127	0.287	
710.00	23790	Mid	LTE Band 17	10	23.2	22.65	0.13	1	LTE SAR #1	QPSK	25	25	12 mm	back	1:1	0.222	1.135	0.252	
710.00	23790	Mid	LTE Band 17	10	24.2	23.68	0.03	0	LTE SAR #1	QPSK	1	49	12 mm	top	1:1	0.124	1.127	0.140	
710.00	23790	Mid	LTE Band 17	10	23.2	22.65	0.11	1	LTE SAR #1	QPSK	25	25	12 mm	top	1:1	0.105	1.135	0.119	
710.00	23790	Mid	LTE Band 17	10	24.2	23.68	0.00	0	LTE SAR #1	QPSK	1	49	5 mm	right	1:1	0.115	1.127	0.130	
710.00	23790	Mid	LTE Band 17	10	23.2	22.65	0.01	1	LTE SAR #1	QPSK	25	25	5 mm	right	1:1	0.100	1.135	0.114	
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 Band 5 (Cell) 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.															(W/kg)		(W/kg)	
836.50	20525	Mid	LTE Band 5 (Cell)	10	20.2	19.47	0.01	0	LTE SAR #2	QPSK	1	49	0 mm	back	1:1	0.930	1.183	1.100	
836.50	20525	Mid	LTE Band 5 (Cell)	10	20.2	19.55	-0.03	0	LTE SAR #2	QPSK	25	25	0 mm	back	1:1	0.940	1.161	1.091	
836.50	20525	Mid	LTE Band 5 (Cell)	10	20.2	19.54	-0.03	0	LTE SAR #2	QPSK	50	0	0 mm	back	1:1	0.951	1.164	1.107	A4
836.50	20525	Mid	LTE Band 5 (Cell)	10	20.2	19.47	0.01	0	LTE SAR #2	QPSK	1	49	0 mm	top	1:1	0.462	1.183	0.547	
836.50	20525	Mid	LTE Band 5 (Cell)	10	20.2	19.55	0.04	0	LTE SAR #2	QPSK	25	25	0 mm	top	1:1	0.464	1.161	0.539	
836.50	20525	Mid	LTE Band 5 (Cell)	10	20.2	19.54	0.05	0	LTE SAR #2	QPSK	50	0	0 mm	top	1:1	0.476	1.164	0.554	
836.50	20525	Mid	LTE Band 5 (Cell)	10	20.2	19.47	0.00	0	LTE SAR #2	QPSK	1	49	0 mm	right	1:1	0.278	1.183	0.329	
836.50	20525	Mid	LTE Band 5 (Cell)	10	20.2	19.55	0.08	0	LTE SAR #2	QPSK	25	25	0 mm	right	1:1	0.279	1.161	0.324	
836.50	20525	Mid	LTE Band 5 (Cell)	10	20.2	19.54	0.03	0	LTE SAR #2	QPSK	50	0	0 mm	right	1:1	0.288	1.164	0.335	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.2	24.13	-0.01	0	LTE SAR #1	QPSK	1	0	12 mm	back	1:1	0.423	1.016	0.430	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.2	23.17	0.07	1	LTE SAR #1	QPSK	25	25	12 mm	back	1:1	0.295	1.007	0.297	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.2	24.13	0.02	0	LTE SAR #1	QPSK	1	0	12 mm	top	1:1	0.340	1.016	0.345	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.2	23.17	0.04	1	LTE SAR #1	QPSK	25	25	12 mm	top	1:1	0.264	1.007	0.266	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.2	24.13	0.03	0	LTE SAR #1	QPSK	1	0	5 mm	right	1:1	0.310	1.016	0.315	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.2	23.17	-0.05	1	LTE SAR #1	QPSK	25	25	5 mm	right	1:1	0.245	1.007	0.247	
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
LTE Band 4 (AWS) 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.															(W/kg)		(W/kg)	
1732.50	20175	Mid	LTE Band 4 (AWS)	10	14.7	14.65	-0.03	0	LTE SAR #2	QPSK	1	0	0 mm	back	1:1	0.459	1.012	0.465	
1732.50	20175	Mid	LTE Band 4 (AWS)	10	14.7	14.68	-0.02	0	LTE SAR #2	QPSK	25	0	0 mm	back	1:1	0.470	1.005	0.472	
1732.50	20175	Mid	LTE Band 4 (AWS)	10	14.7	14.65	-0.02	0	LTE SAR #2	QPSK	1	0	0 mm	top	1:1	0.153	1.012	0.155	
1732.50	20175	Mid	LTE Band 4 (AWS)	10	14.7	14.68	-0.02	0	LTE SAR #2	QPSK	25	0	0 mm	top	1:1	0.163	1.005	0.164	
1732.50	20175	Mid	LTE Band 4 (AWS)	10	14.7	14.65	0.03	0	LTE SAR #2	QPSK	1	0	0 mm	right	1:1	0.092	1.012	0.093	
1732.50	20175	Mid	LTE Band 4 (AWS)	10	14.7	14.68	-0.02	0	LTE SAR #2	QPSK	25	0	0 mm	right	1:1	0.094	1.005	0.094	
1715.00	20000	Low	LTE Band 4 (AWS)	10	23.7	23.25	-0.03	0	LTE SAR #1	QPSK	1	25	12 mm	back	1:1	0.494	1.109	0.548	A5
1715.00	20000	Low	LTE Band 4 (AWS)	10	22.7	22.66	0.05	1	LTE SAR #1	QPSK	25	25	12 mm	back	1:1	0.376	1.009	0.379	
1715.00	20000	Low	LTE Band 4 (AWS)	10	23.7	23.25	0.11	0	LTE SAR #1	QPSK	1	25	12 mm	top	1:1	0.404	1.109	0.448	
1715.00	20000	Low	LTE Band 4 (AWS)	10	22.7	22.66	0.10	1	LTE SAR #1	QPSK	25	25	12 mm	top	1:1	0.314	1.009	0.317	
1715.00	20000	Low	LTE Band 4 (AWS)	10	23.7	23.25	-0.01	0	LTE SAR #1	QPSK	1	25	5 mm	right	1:1	0.482	1.109	0.535	
1715.00	20000	Low	LTE Band 4 (AWS)	10	22.7	22.66	0.00	1	LTE SAR #1	QPSK	25	25	5 mm	right	1:1	0.359	1.009	0.362	
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
LTE Band 2 (PCS) 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.															(W/kg)		(W/kg)	
1855.00	18650	Low	LTE Band 2 (PCS)	10	14.7	14.52	-0.03	0	LTE SAR #2	QPSK	1	0	0 mm	back	1:1	0.476	1.042	0.496	
1855.00	18650	Low	LTE Band 2 (PCS)	10	14.7	14.51	-0.03	0	LTE SAR #2	QPSK	25	25	0 mm	back	1:1	0.545	1.045	0.570	
1855.00	18650	Low	LTE Band 2 (PCS)	10	14.7	14.52	0.08	0	LTE SAR #2	QPSK	1	0	0 mm	top	1:1	0.300	1.042	0.313	
1855.00	18650	Low	LTE Band 2 (PCS)	10	14.7	14.51	0.04	0	LTE SAR #2	QPSK	25	25	0 mm	top	1:1	0.320	1.045	0.334	
1855.00	18650	Low	LTE Band 2 (PCS)	10	14.7	14.52	0.13	0	LTE SAR #2	QPSK	1	0	0 mm	right	1:1	0.078	1.042	0.081	
1855.00	18650	Low	LTE Band 2 (PCS)	10	14.7	14.51	-0.02	0	LTE SAR #2	QPSK	25	25	0 mm	right	1:1	0.078	1.045	0.082	
1855.00	18650	Low	LTE Band 2 (PCS)	10	23.7	23.33	-0.09	0	LTE SAR #1	QPSK	1	25	12 mm	back	1:1	0.598	1.089	0.651	A6
1855.00	18650	Low	LTE Band 2 (PCS)	10	22.7	22.53	0.18	1	LTE SAR #1	QPSK	25	12	12 mm	back	1:1	0.494	1.040	0.514	
1855.00	18650	Low	LTE Band 2 (PCS)	10	23.7	23.33	-0.01	0	LTE SAR #1	QPSK	1	25	12 mm	top	1:1	0.503	1.089	0.548	
1855.00	18650	Low	LTE Band 2 (PCS)	10	22.7	22.53	0.00	1	LTE SAR #1	QPSK	25	12	12 mm	top	1:1	0.405	1.040	0.421	
1855.00	18650	Low	LTE Band 2 (PCS)	10	23.7	23.33	0.00	0	LTE SAR #1	QPSK	1	25	5 mm	right	1:1	0.278	1.089	0.303	
1855.00	18650	Low	LTE Band 2 (PCS)	10	22.7	22.53	-0.06	1	LTE SAR #1	QPSK	25	12	5 mm	right	1:1	0.226	1.040	0.235	
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
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)	
2462	11	IEEE 802.11b	DSSS	14.0	14.00	-0.12	0 mm	WIFI Rad SAR	1	back	1:1	0.343	1.000	**0.343**	A7
2462	11	IEEE 802.11b	DSSS	14.0	14.00	0.06	0 mm	WIFI Rad SAR	1	top	1:1	0.151	1.000	0.151	
2462	11	IEEE 802.11b	DSSS	14.0	14.00	-0.09	0 mm	WIFI Rad SAR	1	left	1:1	0.196	1.000	0.196	
5765	153	IEEE 802.11a	OFDM	12.0	11.32	0.17	0 mm	WIFI Rad SAR	6	back	1:1	0.138	1.169	0.161	A8
5765	153	IEEE 802.11a	OFDM	12.0	11.32	-0.12	0 mm	WIFI Rad SAR	6	top	1:1	0.103	1.169	0.120	
5765	153	IEEE 802.11a	OFDM	12.0	11.32	-0.13	0 mm	WIFI Rad SAR	6	left	1:1	0.115	1.169	0.134	
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 10-7
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)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
5220	44	IEEE 802.11a	OFDM	12.0	11.29	0.08	0 mm	WIFI Rad SAR	6	back	1:1	0.251	1.178	**0.296**	A9
5220	44	IEEE 802.11a	OFDM	12.0	11.29	0.17	0 mm	WIFI Rad SAR	6	top	1:1	0.028	1.178	0.033	
5220	44	IEEE 802.11a	OFDM	12.0	11.29	0.17	0 mm	WIFI Rad SAR	6	left	1:1	0.105	1.178	0.124	
5300	60	IEEE 802.11a	OFDM	12.0	11.09	0.13	0 mm	WIFI Rad SAR	6	back	1:1	0.205	1.233	0.253	
5300	60	IEEE 802.11a	OFDM	12.0	11.09	-0.02	0 mm	WIFI Rad SAR	6	top	1:1	0.029	1.233	0.036	
5300	60	IEEE 802.11a	OFDM	12.0	11.09	-0.12	0 mm	WIFI Rad SAR	6	left	1:1	0.083	1.233	0.102	
5520	104	IEEE 802.11a	OFDM	12.0	11.29	0.15	0 mm	WIFI Rad SAR	6	back	1:1	0.185	1.178	0.218	
5520	104	IEEE 802.11a	OFDM	12.0	11.29	0.17	0 mm	WIFI Rad SAR	6	top	1:1	0.062	1.178	0.073	
5520	104	IEEE 802.11a	OFDM	12.0	11.29	-0.18	0 mm	WIFI Rad SAR	6	left	1:1	0.109	1.178	0.128	
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 616217, and FCC KDB Publication 447498 D01v05.
2. Batteries are fully charged at the beginning of the SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v05.
6. 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.

UMTS Notes:

1. UMTS mode in was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01v02. HSPA SAR was not required since the average output power of the HSPA subtests was not more than 0.25 dB higher than the RMC level and SAR was less than 1.2 W/kg.
2. Per FCC KDB Publication 447498 D01v05, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s). When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel was used.

LTE Notes:

1. LTE Considerations: LTE test configurations are determined according to SAR Evaluation Considerations for LTE Devices in FCC KDB Publication 941225 D05v02r01. The general test procedures used for testing can be found in Section 7.4.4.
2. MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.
3. A-MPR was disabled for all SAR tests by setting NS=01 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).
4. Per FCC Guidance, LTE CA SAR was not needed for testing since the data sent by uplink on the uplink physical channels does not change between Rel. 8 and Rel. 10.

WLAN Notes:

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

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 and IEEE 1528-2013 Section 6.3.4.1.2, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the simultaneous transmitting antennas in a specific 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.

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

Table 11-1
Estimated SAR

Mode	Frequency	Maximum Allowed Power	Separation Distance (Body)	Estimated SAR (Body)
	[MHz]	[dBm]	[mm]	[W/kg]
Bluetooth	2480	9.00	5	**0.336**
Bluetooth	2480	9.00	12	**0.140**

Notes:

1. (*) - Per FCC KDB Publication 447498, when the test separation distance is < 5 mm, a distance of 5 mm is applied to determine estimated SAR.
2. Per KDB Publication 447498 D01v05, the maximum power of the channel was rounded to the nearest mW before calculation.
3. High channel frequency was used for calculation to ensure worst case SAR.
4. When the test separation distance was > 50 mm, an estimated SAR of 0.4 W/kg was used to determine simultaneous transmission SAR exclusion, for configurations excluded per FCC KDB Publication 447498 D01v05. When the test separation distance was < 50 mm, an estimated SAR was determined per FCC KDB Publication 447498 D01v05.

11.3 Body Simultaneous Transmission Analysis

Table 11-2
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body at 0.0 cm)

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	1.010	0.343	**1.353**
	Top	0.483	0.151	0.634
	Bottom	0.400	0.400	0.800
	Right	0.332	0.400	0.732
	Left	0.400	0.196	0.596

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.628	0.343	**0.971**
	Top	0.340	0.151	0.491
	Bottom	0.400	0.400	0.800
	Right	0.101	0.400	0.501
	Left	0.400	0.196	0.596

Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.604	0.343	**0.947**
	Top	0.355	0.151	0.506
	Bottom	0.400	0.400	0.800
	Right	0.168	0.400	0.568
	Left	0.400	0.196	0.596

Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	1.107	0.343	**1.450**
	Top	0.554	0.151	0.705
	Bottom	0.400	0.400	0.800
	Right	0.335	0.400	0.735
	Left	0.400	0.196	0.596

Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.472	0.343	**0.815**
	Top	0.164	0.151	0.315
	Bottom	0.400	0.400	0.800
	Right	0.094	0.400	0.494
	Left	0.400	0.196	0.596

Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.570	0.343	**0.913**
	Top	0.334	0.151	0.485
	Bottom	0.400	0.400	0.800
	Right	0.082	0.400	0.482
	Left	0.400	0.196	0.596

Table 11-3
Simultaneous Transmission Scenario with 5 GHz WLAN (Body at 0.0 cm)

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	1.010	0.296	**1.306**
	Top	0.483	0.120	0.603
	Bottom	0.400	0.400	0.800
	Right	0.332	0.400	0.732
	Left	0.400	0.134	0.534

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.628	0.296	**0.924**
	Top	0.340	0.120	0.460
	Bottom	0.400	0.400	0.800
	Right	0.101	0.400	0.501
	Left	0.400	0.134	0.534

Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.604	0.296	**0.900**
	Top	0.355	0.120	0.475
	Bottom	0.400	0.400	0.800
	Right	0.168	0.400	0.568
	Left	0.400	0.134	0.534

Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	1.107	0.296	**1.403**
	Top	0.554	0.120	0.674
	Bottom	0.400	0.400	0.800
	Right	0.335	0.400	0.735
	Left	0.400	0.134	0.534

Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.472	0.296	0.768
	Top	0.164	0.120	0.284
	Bottom	0.400	0.400	**0.800**
	Right	0.094	0.400	0.494
	Left	0.400	0.134	0.534

Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.570	0.296	**0.866**
	Top	0.334	0.120	0.454
	Bottom	0.400	0.400	0.800
	Right	0.082	0.400	0.482
	Left	0.400	0.134	0.534

Table 11-4
Simultaneous Transmission Scenario with 2.4 GHz Bluetooth (Body at 0.0 cm)

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	1.010	0.336	**1.346**
	Top	0.483	0.336	0.819
	Bottom	0.400	0.400	0.800
	Right	0.332	0.400	0.732
	Left	0.400	0.336	0.736

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.628	0.336	**0.964**
	Top	0.340	0.336	0.676
	Bottom	0.400	0.400	0.800
	Right	0.101	0.400	0.501
	Left	0.400	0.336	0.736

Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.604	0.336	**0.940**
	Top	0.355	0.336	0.691
	Bottom	0.400	0.400	0.800
	Right	0.168	0.400	0.568
	Left	0.400	0.336	0.736

Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	1.107	0.336	**1.443**
	Top	0.554	0.336	0.890
	Bottom	0.400	0.400	0.800
	Right	0.335	0.400	0.735
	Left	0.400	0.336	0.736

Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.472	0.336	**0.808**
	Top	0.164	0.336	0.500
	Bottom	0.400	0.400	0.800
	Right	0.094	0.400	0.494
	Left	0.400	0.336	0.736

Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.570	0.336	**0.906**
	Top	0.334	0.336	0.670
	Bottom	0.400	0.400	0.800
	Right	0.082	0.400	0.482
	Left	0.400	0.336	0.736

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

Table 11-5
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body at 1.2 cm)

Configuration	Mode	3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Back Side	UMTS 850	0.425	< 0.343	< 0.768
Back Side	UMTS 1900	0.601	< 0.343	< 0.944
Back Side	LTE Band 17	0.287	< 0.343	< 0.63
Back Side	LTE Band 5 (Cell)	0.430	< 0.343	< 0.773
Back Side	LTE Band 4 (AWS)	0.548	< 0.343	< 0.891
Back Side	LTE Band 2 (PCS)	0.651	< 0.343	**< 0.994**

Configuration	Mode	3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Top Edge	UMTS 850	0.252	< 0.151	< 0.403
Top Edge	UMTS 1900	0.556	< 0.151	**< 0.707**
Top Edge	LTE Band 17	0.140	< 0.151	< 0.291
Top Edge	LTE Band 5 (Cell)	0.345	< 0.151	< 0.496
Top Edge	LTE Band 4 (AWS)	0.448	< 0.151	< 0.599
Top Edge	LTE Band 2 (PCS)	0.548	< 0.151	< 0.699

Table 11-6
Simultaneous Transmission Scenario with 5 GHz WLAN (Body at 1.2 cm)

Configuration	Mode	3G/4G SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Back Side	UMTS 850	0.425	< 0.296	< 0.721
Back Side	UMTS 1900	0.601	< 0.296	< 0.897
Back Side	LTE Band 17	0.287	< 0.296	< 0.583
Back Side	LTE Band 5 (Cell)	0.430	< 0.296	< 0.726
Back Side	LTE Band 4 (AWS)	0.548	< 0.296	< 0.844
Back Side	LTE Band 2 (PCS)	0.651	< 0.296	**< 0.947**

Configuration	Mode	3G/4G SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Top Edge	UMTS 850	0.252	< 0.12	< 0.372
Top Edge	UMTS 1900	0.556	< 0.12	**< 0.676**
Top Edge	LTE Band 17	0.140	< 0.12	< 0.26
Top Edge	LTE Band 5 (Cell)	0.345	< 0.12	< 0.465
Top Edge	LTE Band 4 (AWS)	0.448	< 0.12	< 0.568
Top Edge	LTE Band 2 (PCS)	0.548	< 0.12	< 0.668

Table 11-7
Simultaneous Transmission Scenario with 2.4 GHz Bluetooth (Body at 1.2 cm)

Configuration	Mode	3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Back Side	UMTS 850	0.425	0.140	0.565
Back Side	UMTS 1900	0.601	0.140	0.741
Back Side	LTE Band 17	0.287	0.140	0.427
Back Side	LTE Band 5 (Cell)	0.430	0.140	0.570
Back Side	LTE Band 4 (AWS)	0.548	0.140	0.688
Back Side	LTE Band 2 (PCS)	0.651	0.140	**0.791**
Configuration	Mode	3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Top Edge	UMTS 850	0.252	0.140	0.392
Top Edge	UMTS 1900	0.556	0.140	**0.696**
Top Edge	LTE Band 17	0.140	0.140	0.280
Top Edge	LTE Band 5 (Cell)	0.345	0.140	0.485
Top Edge	LTE Band 4 (AWS)	0.448	0.140	0.588
Top Edge	LTE Band 2 (PCS)	0.548	0.140	0.688

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

Table 11-8
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body at 0.5 cm)

Configuration	Mode	3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Right Edge	UMTS 850	0.288	0.400	0.688
Right Edge	UMTS 1900	0.312	0.400	0.712
Right Edge	LTE Band 17	0.130	0.400	0.530
Right Edge	LTE Band 5 (Cell)	0.315	0.400	0.715
Right Edge	LTE Band 4 (AWS)	0.535	0.400	**0.935**
Right Edge	LTE Band 2 (PCS)	0.303	0.400	0.703

Table 11-9
Simultaneous Transmission Scenario with 5 GHz WLAN (Body at 0.5 cm)

Configuration	Mode	3G/4G SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Right Edge	UMTS 850	0.288	0.400	0.688
Right Edge	UMTS 1900	0.312	0.400	0.712
Right Edge	LTE Band 17	0.130	0.400	0.530
Right Edge	LTE Band 5 (Cell)	0.315	0.400	0.715
Right Edge	LTE Band 4 (AWS)	0.535	0.400	**0.935**
Right Edge	LTE Band 2 (PCS)	0.303	0.400	0.703

Table 11-10
Simultaneous Transmission Scenario with 2.4 GHz Bluetooth (Body at 0.5 cm)

Configuration	Mode	3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Right Edge	UMTS 850	0.288	0.400	0.688
Right Edge	UMTS 1900	0.312	0.400	0.712
Right Edge	LTE Band 17	0.130	0.400	0.530
Right Edge	LTE Band 5 (Cell)	0.315	0.400	0.715
Right Edge	LTE Band 4 (AWS)	0.535	0.400	**0.935**
Right Edge	LTE Band 2 (PCS)	0.303	0.400	0.703

Notes:

1. When the test separation distance was > 50 mm, an estimated SAR of 0.4 W/kg was used to determine simultaneous transmission SAR exclusion, for configuration excluded per FCC KDB 447498 D01v05. Therefore, an estimated SAR of 0.4 W/kg for 2.4 GHz WLAN, 5 GHz WLAN, and Bluetooth was used to evaluate the simultaneous sums.
2. For body SAR summations for back side and top edge at 1.2 cm, 2.4 GHz WLAN and 5 GHz WLAN SAR values for 0.0 cm were used since the 0.0 cm test distance for 2.4 GHz WLAN and 5 GHz WLAN were more conservative. “<” denotes that the 0.0 cm 2.4 GHz WLAN and 5 GHz WLAN SAR values were used for summation purposes.

11.4 Simultaneous Transmission Conclusion

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

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	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)	
835	826.40	4132	UMTS 850	RMC	back	0 mm	1.010	0.926	1.09	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 extended 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	8594A	(9kHz-2.9GHz) Spectrum Analyzer	N/A	N/A	N/A	3051A00187
Agilent	8648D	(9kHz-4GHz) Signal Generator	4/15/2014	Annual	4/15/2015	3629U00687
Agilent	8753E	(30kHz-6GHz) Network Analyzer	7/23/2013	Annual	7/23/2014	US37390350
Agilent	8753ES	S-Parameter Network Analyzer	10/29/2013	Annual	10/29/2014	US39170122
Agilent	E4438C	ESG Vector Signal Generator	4/25/2014	Annual	4/25/2015	MY42082385
Agilent	E8257D	(250kHz-20GHz) Signal Generator	4/15/2014	Annual	4/15/2015	MY45470194
Agilent	N5182A	MXG Vector Signal Generator	4/15/2014	Annual	4/15/2015	MY47420651
Agilent	N5182A	MXG Vector Signal Generator	4/15/2014	Annual	4/15/2015	MY47420800
Agilent	N9020A	MXA Signal Analyzer	10/29/2013	Annual	10/29/2014	US46470561
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433971
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433972
Anritsu	MA24106A	USB Power Sensor	12/18/2013	Annual	12/18/2014	1344545
Anritsu	MA24106A	USB Power Sensor	1/3/2014	Annual	1/3/2015	1344554
Anritsu	MA24106A	USB Power Sensor	12/18/2013	Annual	12/18/2014	1344555
Anritsu	MA24106A	USB Power Sensor	12/18/2013	Annual	12/18/2014	1344556
Anritsu	MA2411B	Pulse Power Sensor	11/14/2013	Annual	11/14/2014	1126066
Anritsu	MA2411B	Pulse Power Sensor	3/25/2014	Annual	3/25/2015	1207470
Anritsu	MA2411B	Pulse Power Sensor	2/3/2014	Annual	2/3/2015	1339018
Anritsu	ML2469A	Power Meter	3/14/2014	Annual	3/14/2015	1306009
Anritsu	ML2495A	Power Meter	10/31/2013	Annual	10/31/2014	1039008
Anritsu	MT8820C	Radio Communication Analyzer	12/12/2013	Annual	12/12/2014	6200901190
COMTech	AR85729-5	Solid State Amplifier	CBT	N/A	CBT	M1S5A00-009
COMTECH	AR85729-5/5759B	Solid State Amplifier	CBT	N/A	CBT	M3W1A00-1002
Control Company	36934-158	Wall-Mounted Thermometer	4/29/2014	Biennial	4/29/2016	122014488
Control Company	61220-416	Long-Stem Thermometer	4/29/2014	Biennial	4/29/2016	111331323
Fisher Scientific	15-077-960	Digital Thermometer	11/6/2012	Biennial	11/6/2014	122640025
Fisher Scientific	15-078J	Long Stem Thermometer	10/30/2012	Biennial	10/30/2014	122626059
Fisher Scientific	S97611	Thermometer	4/12/2013	Biennial	4/12/2015	130219303
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
MiniCircuits	SLP-2400+	Low Pass Filter	CBT	N/A	CBT	R8979500903
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-1200+	Low Pass Filter DC to 1000 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Mitutoyo	CD-6"CSX	Digital Caliper	5/8/2014	Biennial	5/8/2016	13264162
Mitutoyo	CD-6"CSX	Digital Caliper	5/8/2014	Biennial	5/8/2016	13264165
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	6/6/2014	Annual	6/6/2015	109892
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	10/18/2013	Annual	10/18/2014	100976
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	4/18/2014	Annual	4/18/2015	101699
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	4/15/2014	Annual	4/15/2015	102060
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	2/20/2014	Annual	2/20/2015	128633
Seekonk	NC-100	Torque Wrench	3/18/2014	Biennial	3/18/2016	22313
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	3/18/2014	Biennial	3/18/2016	N/A
SPEAG	D1750V2	1750 MHz SAR Dipole	4/10/2014	Annual	4/10/2015	1051
SPEAG	D1900V2	1900 MHz SAR Dipole	2/27/2014	Annual	2/27/2015	5d148
SPEAG	D2450V2	2450 MHz SAR Dipole	8/23/2013	Annual	8/23/2014	719
SPEAG	D5GHzV2	5 GHz SAR Dipole	9/23/2013	Annual	9/23/2014	1007
SPEAG	D750V3	750 MHz Dipole	1/20/2014	Annual	1/20/2015	1003
SPEAG	D835V2	835 MHz SAR Dipole	7/17/2013	Annual	7/17/2014	4d133
SPEAG	DAE4	Dasy Data Acquisition Electronics	12/12/2013	Annual	12/12/2014	649
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/26/2014	Annual	2/26/2015	665
SPEAG	DAE4	Dasy Data Acquisition Electronics	9/17/2013	Annual	9/17/2014	1323
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/17/2014	Annual	3/17/2015	1364
SPEAG	DAE4	Dasy Data Acquisition Electronics	11/18/2013	Annual	11/18/2014	1407
SPEAG	DAE4	Dasy Data Acquisition Electronics	11/19/2013	Annual	11/19/2014	1408
SPEAG	ES3DV3	SAR Probe	4/11/2014	Annual	4/11/2015	3213
SPEAG	ES3DV3	SAR Probe	2/25/2014	Annual	2/25/2015	3258
SPEAG	ES3DV3	SAR Probe	9/23/2013	Annual	9/23/2014	3288
SPEAG	ES3DV3	SAR Probe	11/25/2013	Annual	11/25/2014	3332
SPEAG	ES3DV3	SAR Probe	11/22/2013	Annual	11/22/2014	3333
SPEAG	EX3DV4	SAR Probe	12/18/2013	Annual	12/18/2014	3920
VWR	23226-658	Long Stem Thermometer	6/27/2012	Biennial	6/27/2014	122363923
VWR	36934-158	Wall-Mounted Thermometer	4/29/2014	Biennial	4/29/2016	111859323

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] IEEE Standards Coordinating Committee 39 –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.

[6] 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.

[7] 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.

[8] 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.

[9] 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.

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

[11] 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.

[12] 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.

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

[14] 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.

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

[16] 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.

[17] 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.

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

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

[20] 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.

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

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

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

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

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

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

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

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

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

[30] 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: ZNFV410; Type: Portable Tablet; Serial: WCDMA SAR #2

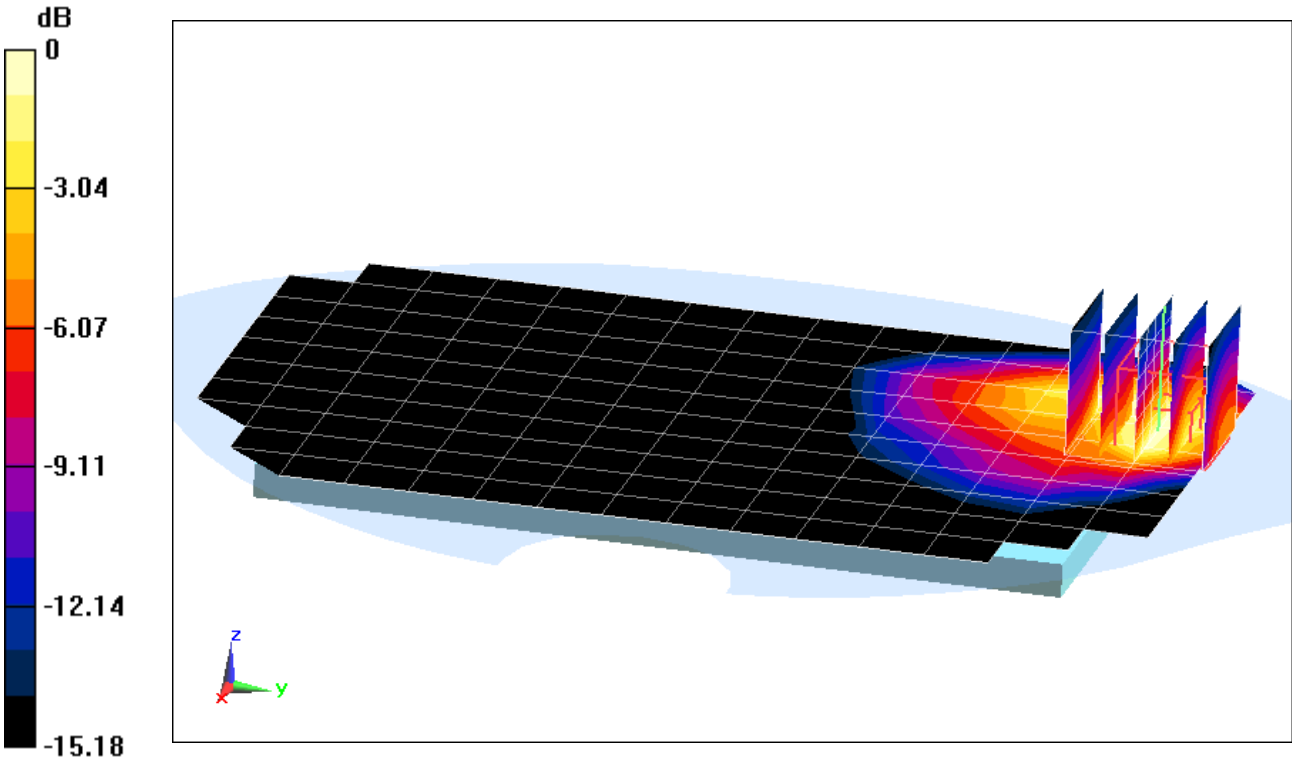
Communication System: UID 0, UMTS850; Frequency: 826.4 MHz;Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 826.4 MHz; σ = 0.966 S/m; ε_r = 53.418; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 06-10-2014; Ambient Temp: 19.8°C; Tissue Temp: 19.8°C

Probe: ES3DV3 - SN3213; ConvF(6.18, 6.18, 6.18); Calibrated: 4/11/2014;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1364; Calibrated: 3/17/2014
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

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

Area Scan (11x16x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 30.22 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 2.03 W/kg
SAR(1 g) = 1.01 W/kg



0 dB = 1.11 W/kg = 0.45 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFV410; Type: Portable Tablet; Serial: WCDMA SAR #2

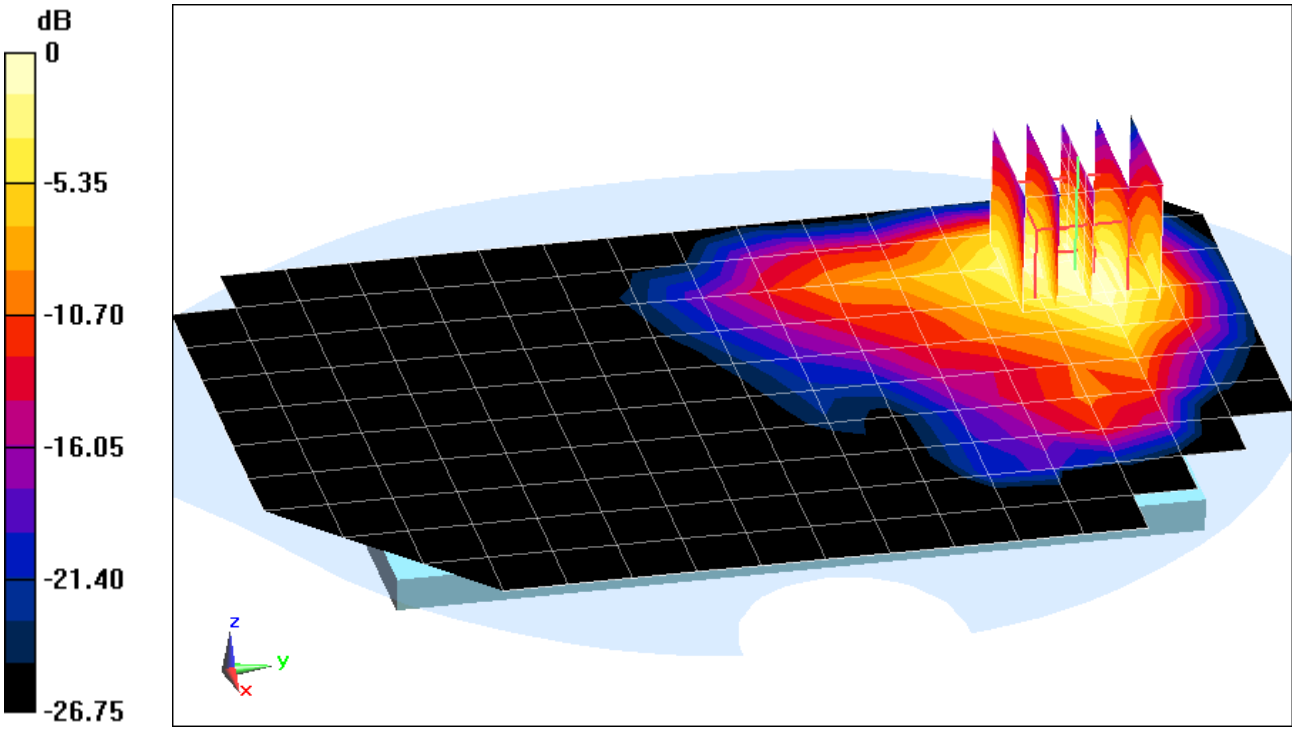
Communication System: UID 0, WCDMA1900; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.51 S/m; ε_r = 53.112; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 06-02-2014; Ambient Temp: 23.0°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3288; ConvF(4.82, 4.82, 4.82); Calibrated: 9/23/2013;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/17/2013
Phantom: SAM Sub Dasy B; Type: SAM 5.0; Serial: TP-1626
Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

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

Area Scan (11x17x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.20 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 1.27 W/kg
SAR(1 g) = 0.610 W/kg



0 dB = 0.651 W/kg = -1.86 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFV410; Type: Portable Tablet; Serial: LTE SAR #2

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

Medium: 750 Body Medium parameters used:

f = 710 MHz; σ = 0.94 S/m; ε_r = 55.938; ρ = 1000 kg/m^3

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 06-02-2014; Ambient Temp: 23.3°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3332; ConvF(6.21, 6.21, 6.21); Calibrated: 11/25/2013;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 11/18/2013
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226
Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7331)

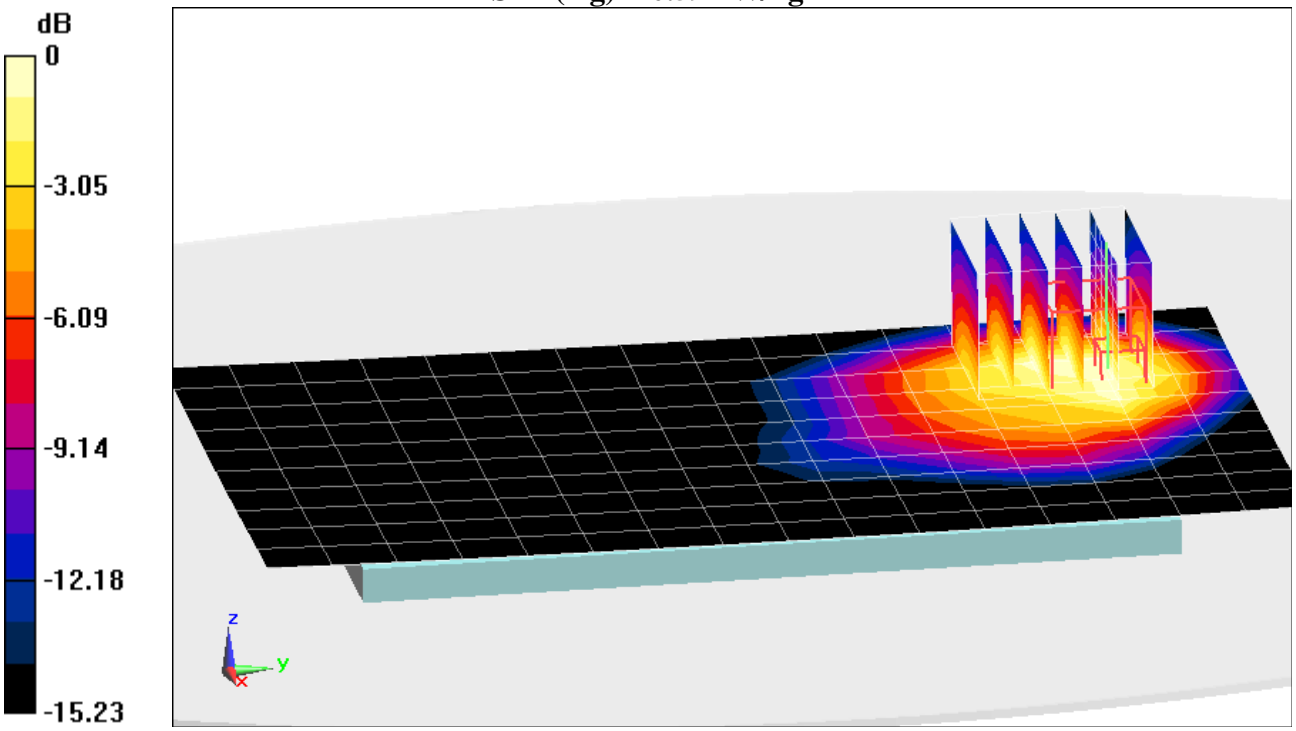
Mode: LTE Band 17, Body SAR, Back side, Mid.ch
10 MHz Bandwidth, QPSK, 25 RB, 25 RB Offset

Area Scan (11x17x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 25.87 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 1.12 W/kg

SAR(1 g) = 0.594 W/kg



0 dB = 0.638 W/kg = -1.95 dBW/kg

DUT: ZNFV410; Type: Portable Tablet; Serial: LTE SAR #2

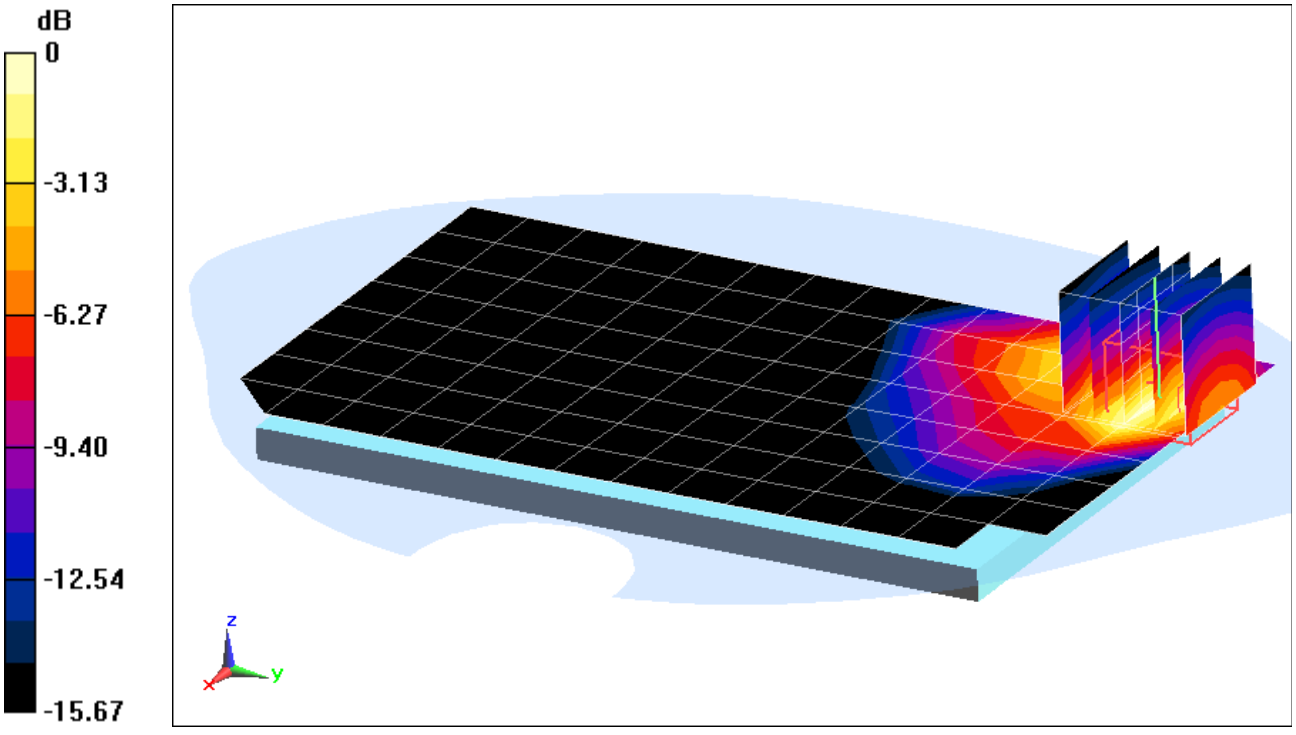
Communication System: UID 0, LTE BAND 5; Frequency: 836.5 MHz;Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 836.5 MHz; σ = 0.978 S/m; ε_r = 53.294; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 06-10-2014; Ambient Temp: 19.8°C; Tissue Temp: 19.8°C

Probe: ES3DV3 - SN3213; ConvF(6.18, 6.18, 6.18); Calibrated: 4/11/2014;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1364; Calibrated: 3/17/2014
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 5 (Cell), Body SAR, Back side, Mid.ch
10 MHz Bandwidth, QPSK, 50 RB, 0 RB Offset

Area Scan (10x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.19 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.95 W/kg
SAR(1 g) = 0.951 W/kg



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFV410; Type: Portable Tablet; Serial: LTE SAR #1

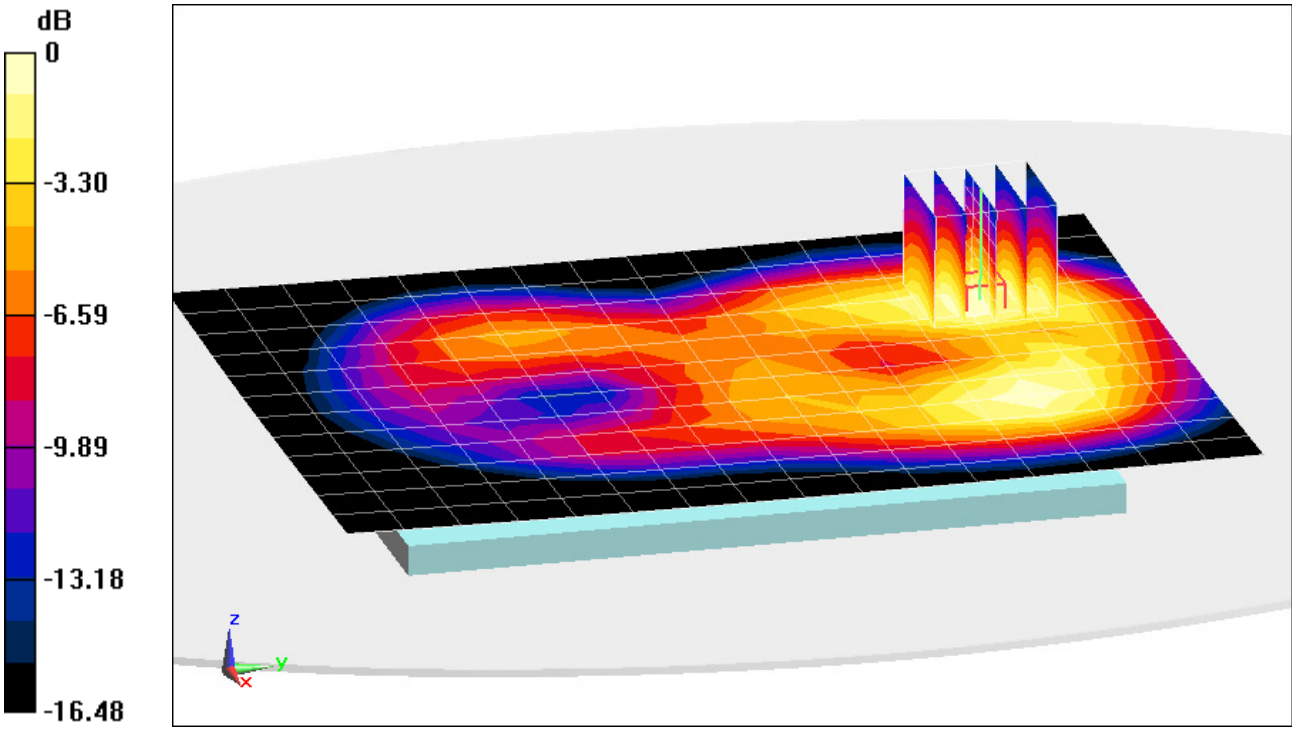
Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1715 MHz;Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
f = 1715 MHz; σ = 1.419 S/m; ε_r = 53.004; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.2 cm

Test Date: 06-04-2014; Ambient Temp: 24.0°C; Tissue Temp: 22.8°C

Probe: ES3DV3 - SN3333; ConvF(4.95, 4.95, 4.95); Calibrated: 11/22/2013;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1408; Calibrated: 11/19/2013
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1229
Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 4 (AWS), Body SAR, Back side, Low.ch
10 MHz Bandwidth, QPSK, 1 RB, 25 RB Offset

Area Scan (13x17x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.83 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.812 W/kg
SAR(1 g) = 0.494 W/kg



0 dB = 0.536 W/kg = -2.71 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFV410; Type: Portable Tablet; Serial: LTE SAR #1

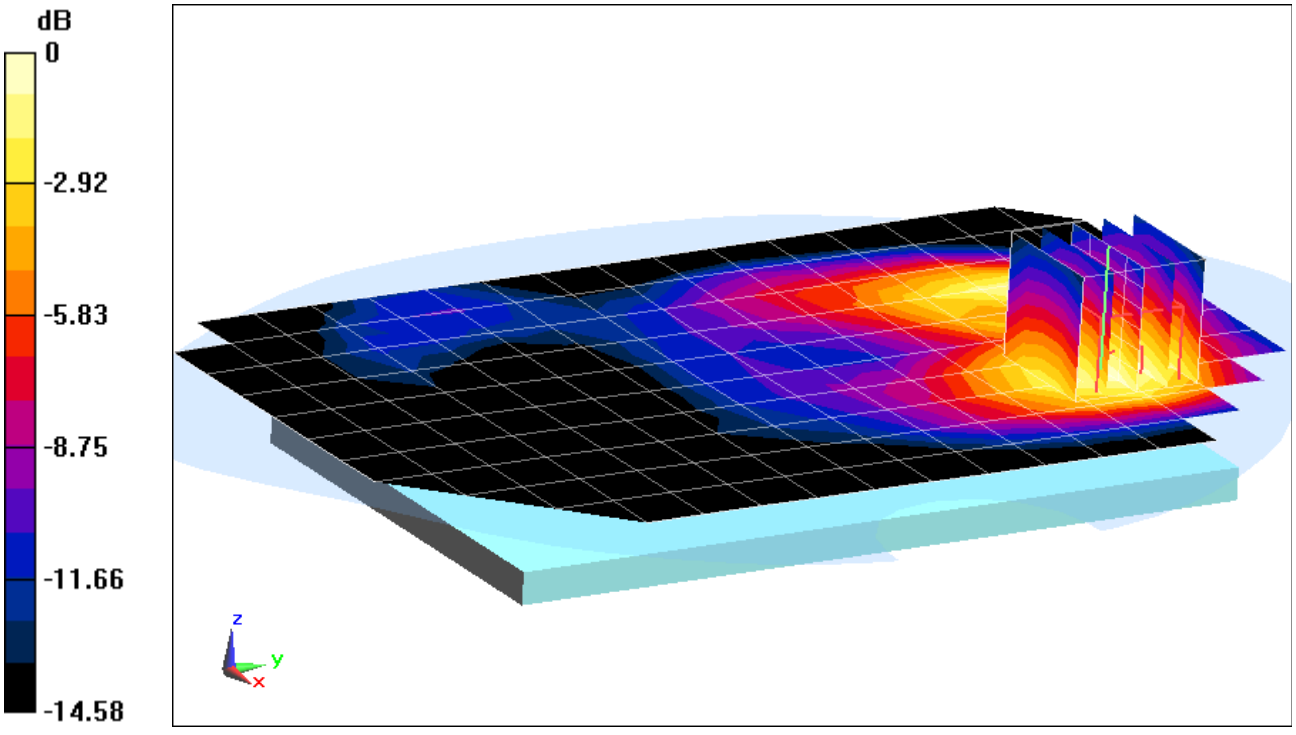
Communication System: UID 0, LTE PCS 10 Mhz; Frequency: 1855 MHz;Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1855 MHz; σ = 1.483 S/m; ε_r = 53.202; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.2 cm

Test Date: 06-02-2014; Ambient Temp: 23.0°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3288; ConvF(4.82, 4.82, 4.82); Calibrated: 9/23/2013;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/17/2013
Phantom: SAM Sub Dasy B; Type: SAM 5.0; Serial: TP-1626
Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 2 (PCS), Body SAR, Back side, Low.ch
10 MHz Bandwidth, QPSK, 1 RB, 25 RB Offset

Area Scan (11x17x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.46 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 0.908 W/kg
SAR(1 g) = 0.598 W/kg



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFV410; Type: Portable Tablet; Serial: WIFI Rad SAR

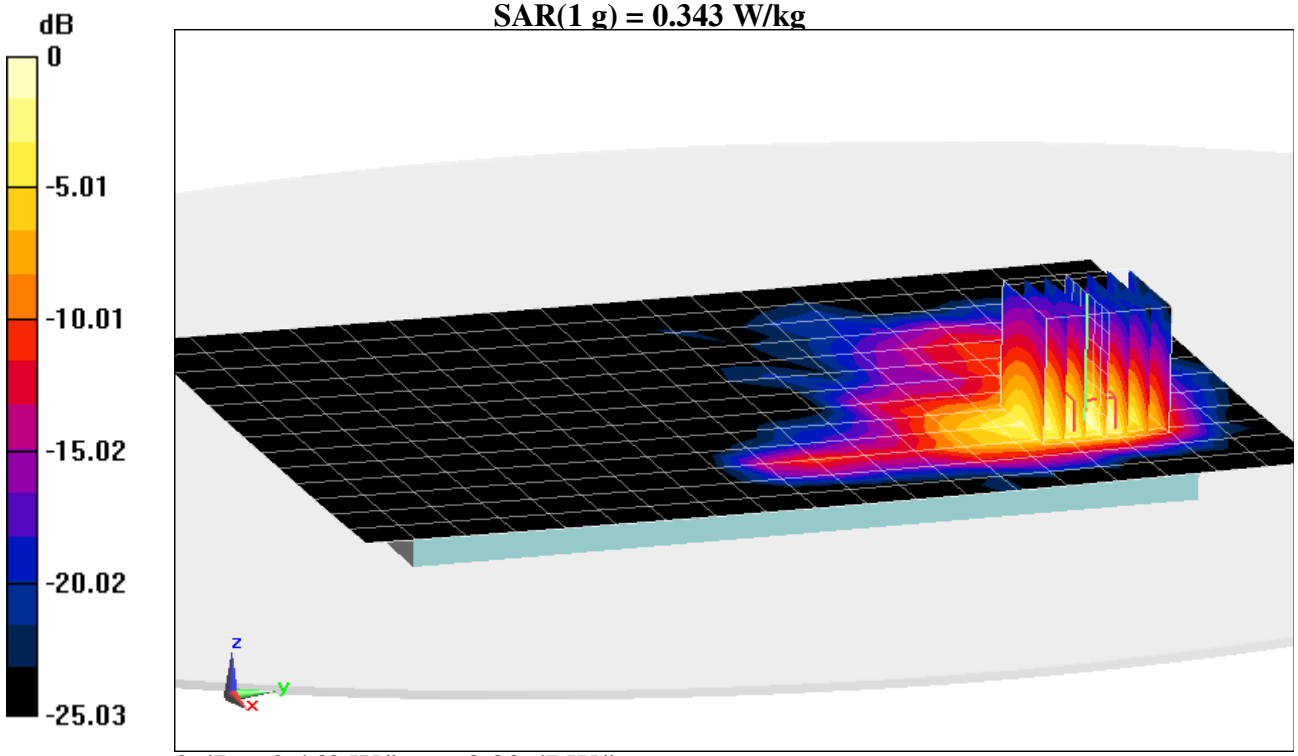
Communication System: UID 0, IEEE 802.11b; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used (interpolated):
f = 2462 MHz; σ = 1.968 S/m; ε_r = 50.994; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 06-02-2014; Ambient Temp: 24.5°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3258; ConvF(4.14, 4.14, 4.14); Calibrated: 2/25/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/26/2014
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP-1158
Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7331)

Mode: IEEE 802.11b, Body SAR, Ch 11, 1 Mbps, Back Side

Area Scan (14x20x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.64 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 0.825 W/kg
SAR(1 g) = 0.343 W/kg



0 dB = 0.468 W/kg = -3.30 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFV410; Type: Portable Tablet; Serial: WIFI Rad SAR

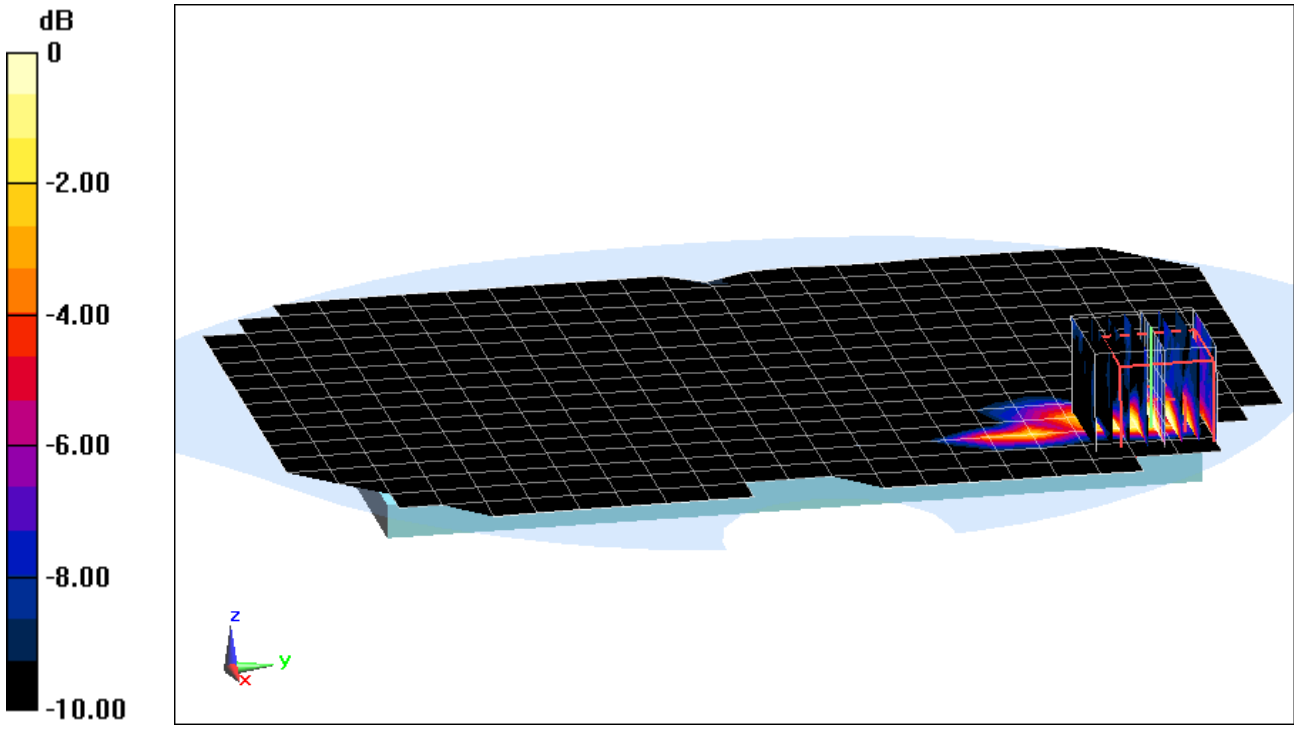
Communication System: UID 0, IEEE 802.11a; Frequency: 5765 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5765 MHz; σ = 6.166 S/m; ε_r = 46.502; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 05-27-2014; Ambient Temp: 23.8°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN3920; ConvF(4, 4, 4); Calibrated: 12/18/2013;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 12/12/2013
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

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

Area Scan (17x24x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Reference Value = 3.098 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 0.650 W/kg
SAR(1 g) = 0.138 W/kg



0 dB = 0.384 W/kg = -4.16 dBW/kg

DUT: ZNFV410; Type: Portable Tablet; Serial: WIFI Rad SAR

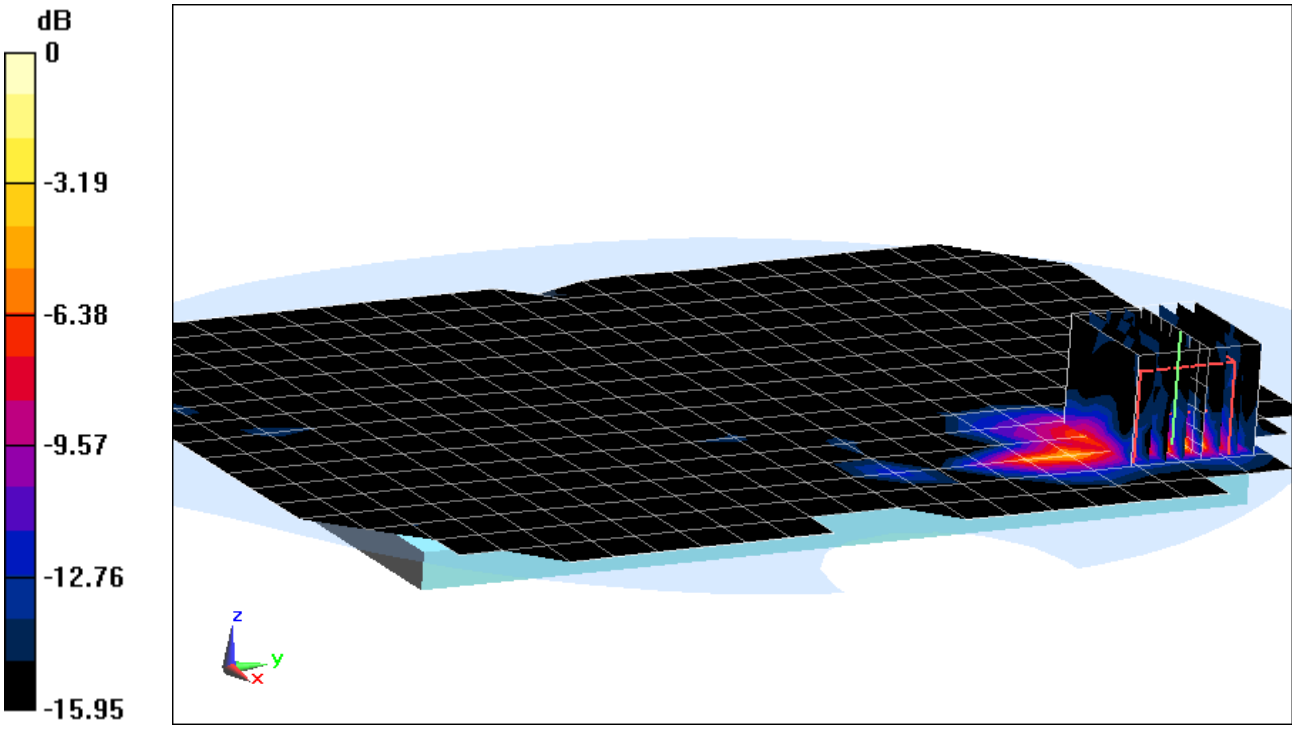
Communication System: UID 0, IEEE 802.11a; Frequency: 5220 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5220 MHz; σ = 5.501 S/m; ε_r = 47.141; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space; 0.0 cm

Test Date: 05-27-2014; Ambient Temp: 23.8°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN3920; ConvF(4.23, 4.23, 4.23); Calibrated: 12/18/2013;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 12/12/2013
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

Mode: IEEE 802.11a, 5.2 GHz, Body SAR, Ch 44, 6 Mbps, Back Side

Area Scan (17x24x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio:1.4
Reference Value = 5.617 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 1.24 W/kg
SAR(1 g) = 0.251 W/kg



0 dB = 0.699 W/kg = -1.56 dBW/kg

APPENDIX B: SYSTEM VERIFICATION

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 750 Body Medium parameters used (interpolated):

f = 750 MHz; σ = 0.977 S/m; ε_r = 55.515; ρ = 1000 kg/m^3

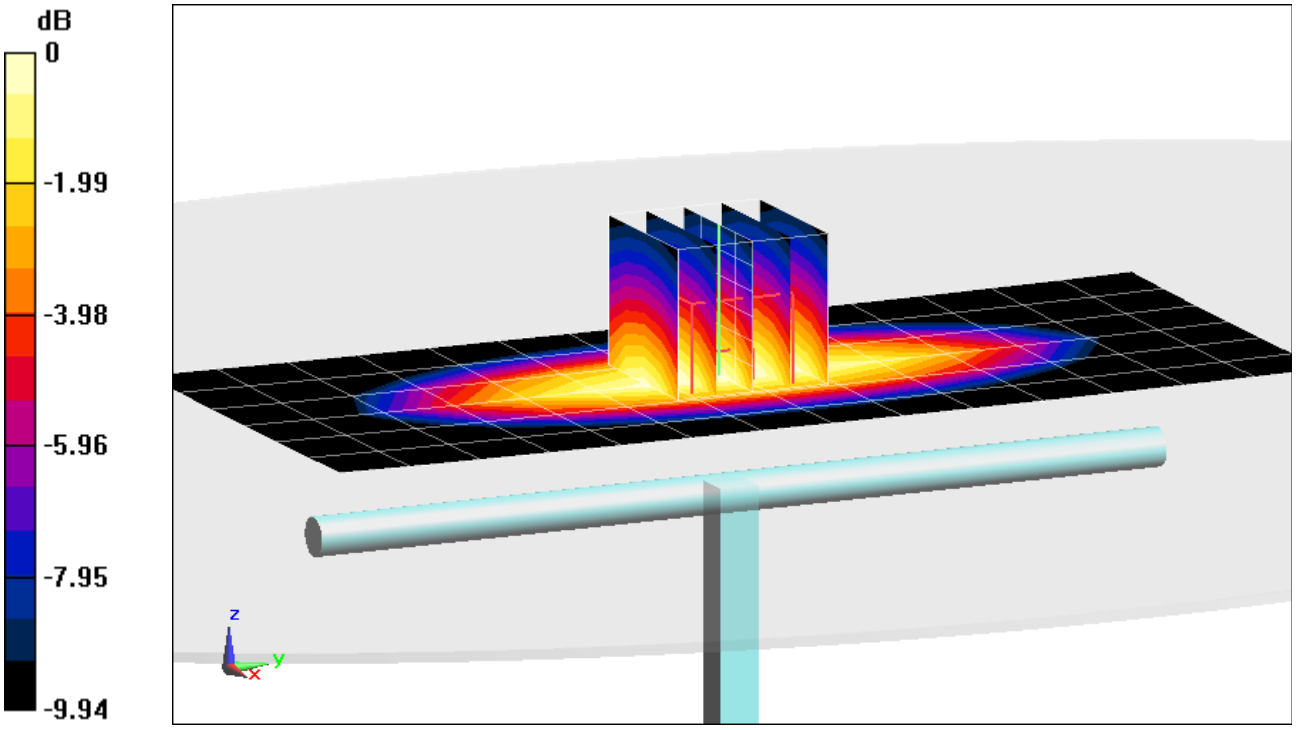
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 06-02-2014; Ambient Temp: 23.3°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3332; ConvF(6.21, 6.21, 6.21); Calibrated: 11/25/2013;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 11/18/2013
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226
Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7331)

750 MHz System Verification

Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 1.32 W/kg
SAR(1 g) = 0.903 W/kg
Deviation = 2.96%



0 dB = 0.973 W/kg = -0.12 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

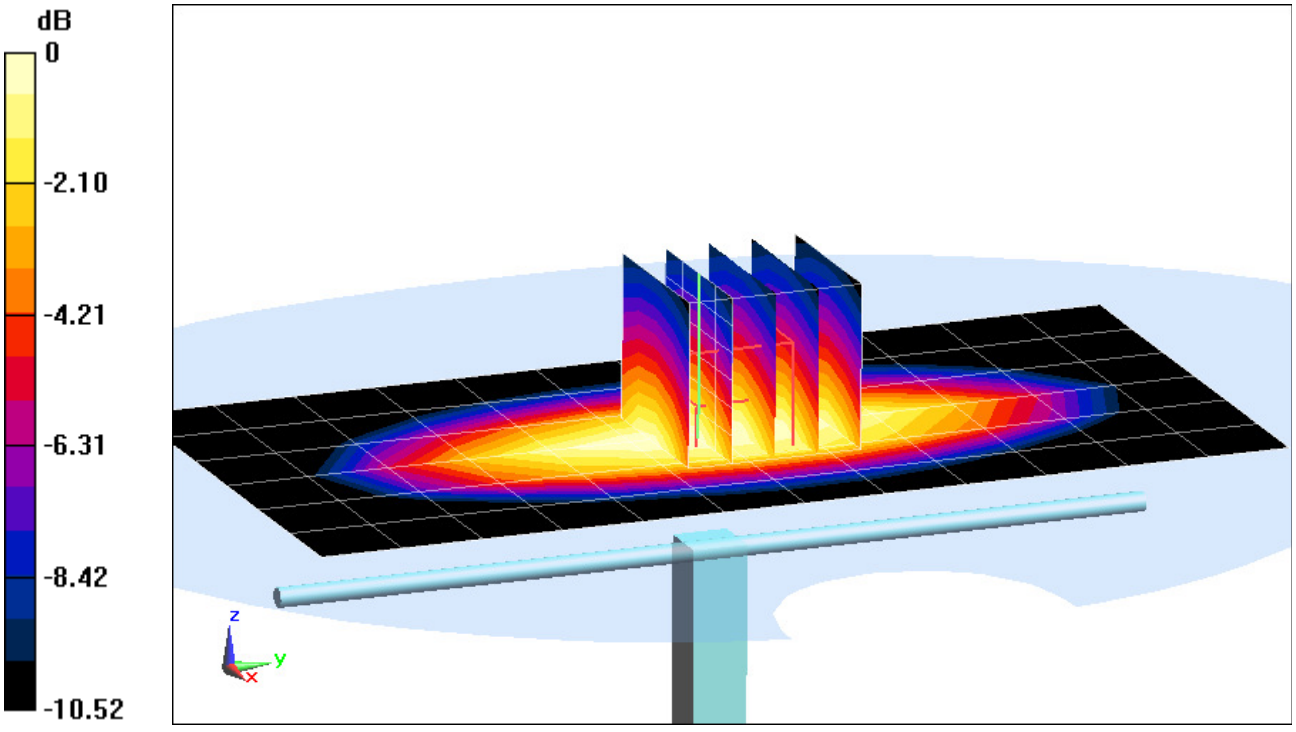
Communication System: UID 0, CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: 835 Body Medium parameters used:
f = 835 MHz; σ = 0.976 S/m; ε_r = 53.307; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 06-10-2014; Ambient Temp: 19.8°C; Tissue Temp: 19.8°C

Probe: ES3DV3 - SN3213; ConvF(6.18, 6.18, 6.18); Calibrated: 4/11/2014;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1364; Calibrated: 3/17/2014
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

835MHz System Verification

Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 1.44 W/kg
SAR(1 g) = 0.964 W/kg
Deviation = 0.31%



0 dB = 1.11 W/kg = 0.45 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

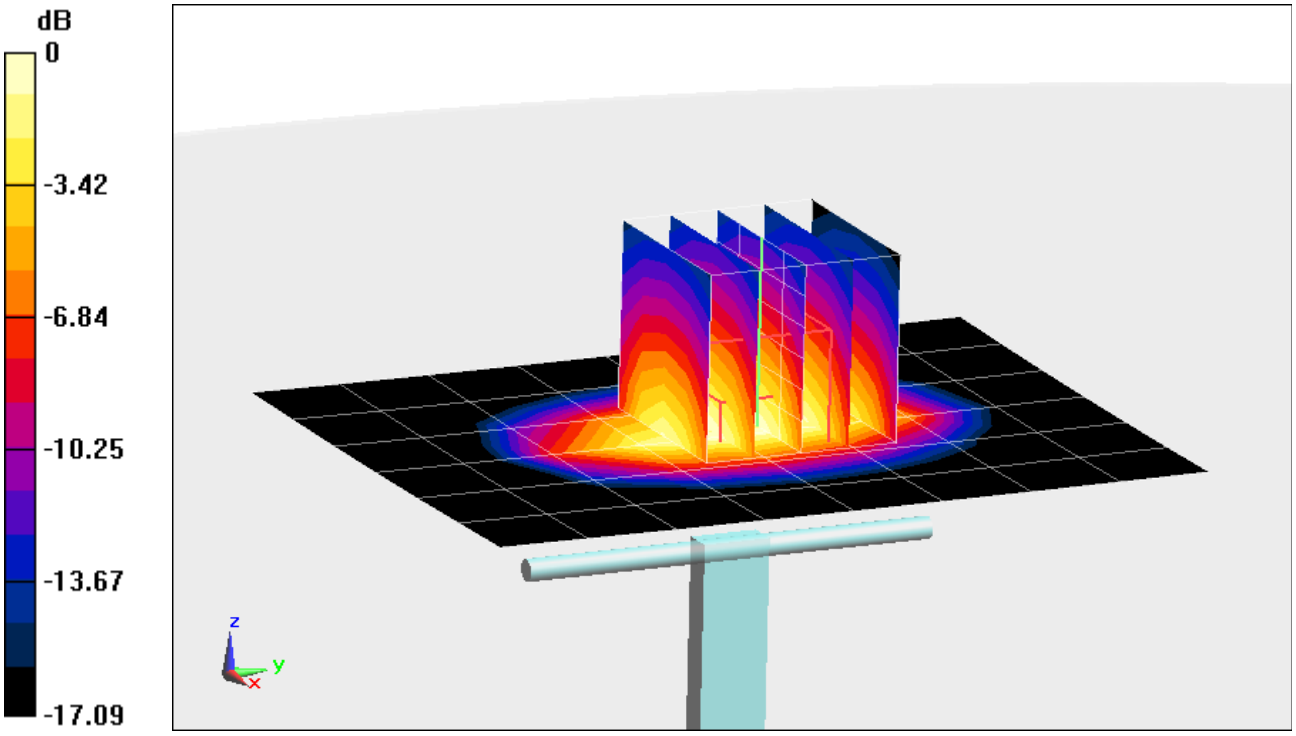
Communication System: UID 0, CW; Frequency: 1750 MHz;Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used:
f = 1750 MHz; σ = 1.457 S/m; ε_r = 52.864; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-04-2014; Ambient Temp: 24.0°C; Tissue Temp: 22.8°C

Probe: ES3DV3 - SN3333; ConvF(4.95, 4.95, 4.95); Calibrated: 11/22/2013;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1408; Calibrated: 11/19/2013
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1229
Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7331)

1750 MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 6.80 W/kg
SAR(1 g) = 3.84 W/kg
Deviation = 2.67%



0 dB = 4.22 W/kg = 6.25 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

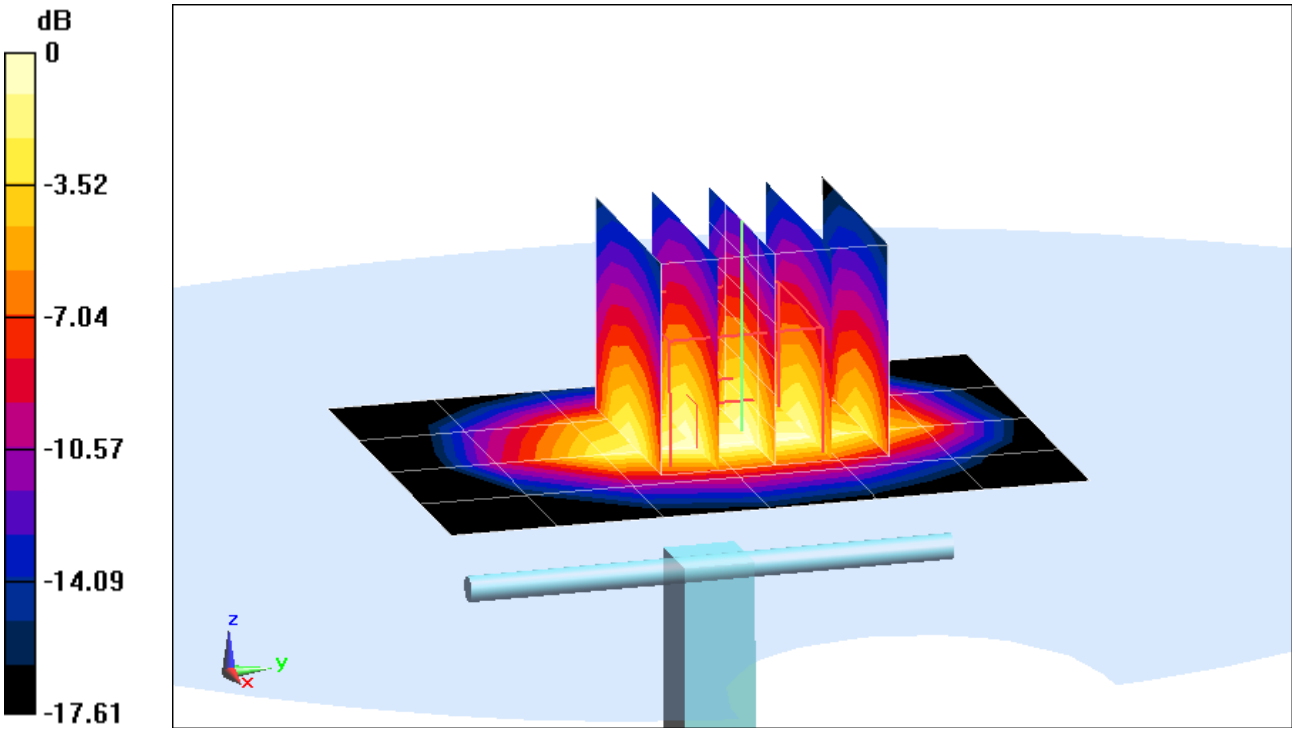
Communication System: UID 0, CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.532 S/m; ε_r = 53.041; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-02-2014; Ambient Temp: 23.0°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3288; ConvF(4.82, 4.82, 4.82); Calibrated: 9/23/2013;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/17/2013
Phantom: SAM Sub Dasy B; Type: SAM 5.0; Serial: TP-1626
Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

1900MHz System Verification

Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 6.61 W/kg
SAR(1 g) = 3.81 W/kg
Deviation = -3.05%



0 dB = 4.22 W/kg = 6.25 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

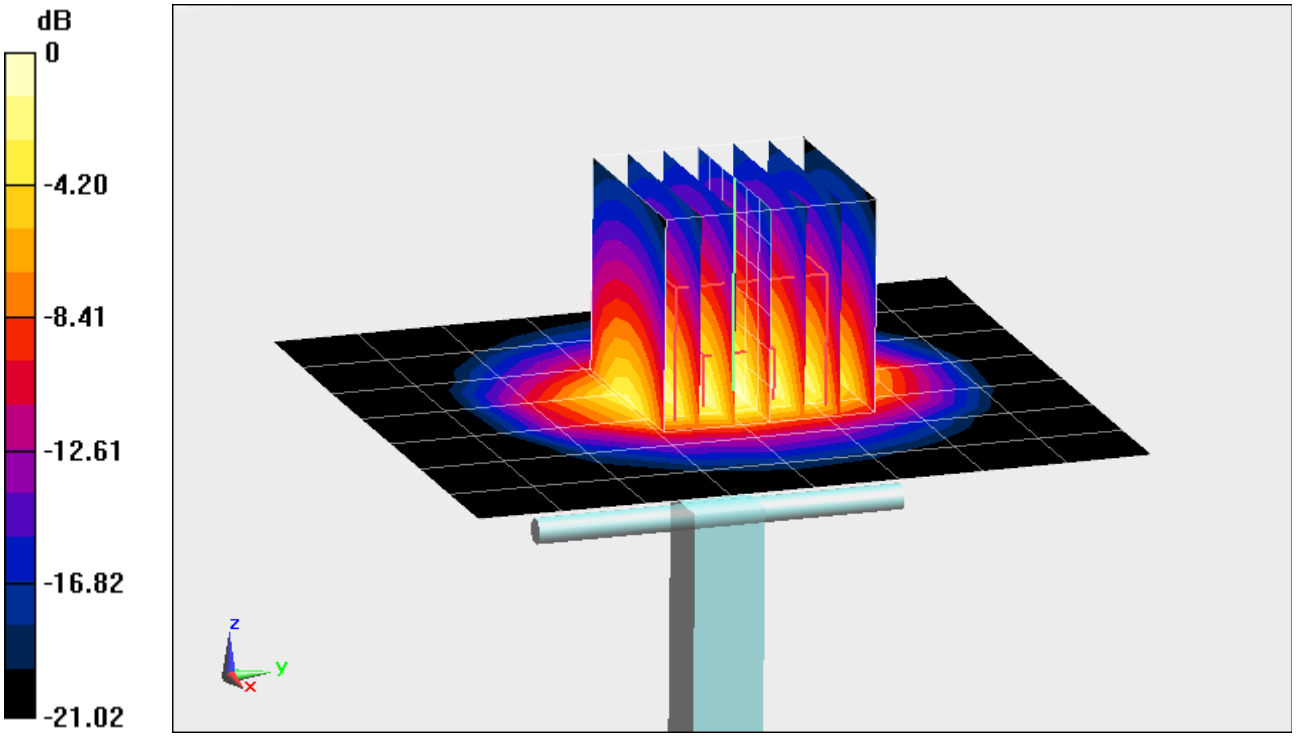
Communication System: UID 0, CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used:
f = 2450 MHz; σ = 1.952 S/m; ε_r = 51.042; ρ = 1000 kg/m^3
Phantom section: Flat Section, Space: 1.0 cm

Test Date: 06-02-2014; Ambient Temp: 24.5°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3258; ConvF(4.14, 4.14, 4.14); Calibrated: 2/25/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/26/2014
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP-1158
Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7331)

2450 MHz System Verification

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 10.4 W/kg
SAR(1 g) = 5.05 W/kg
Deviation = -2.32%



0 dB = 6.67 W/kg = 8.24 dBW/kg

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

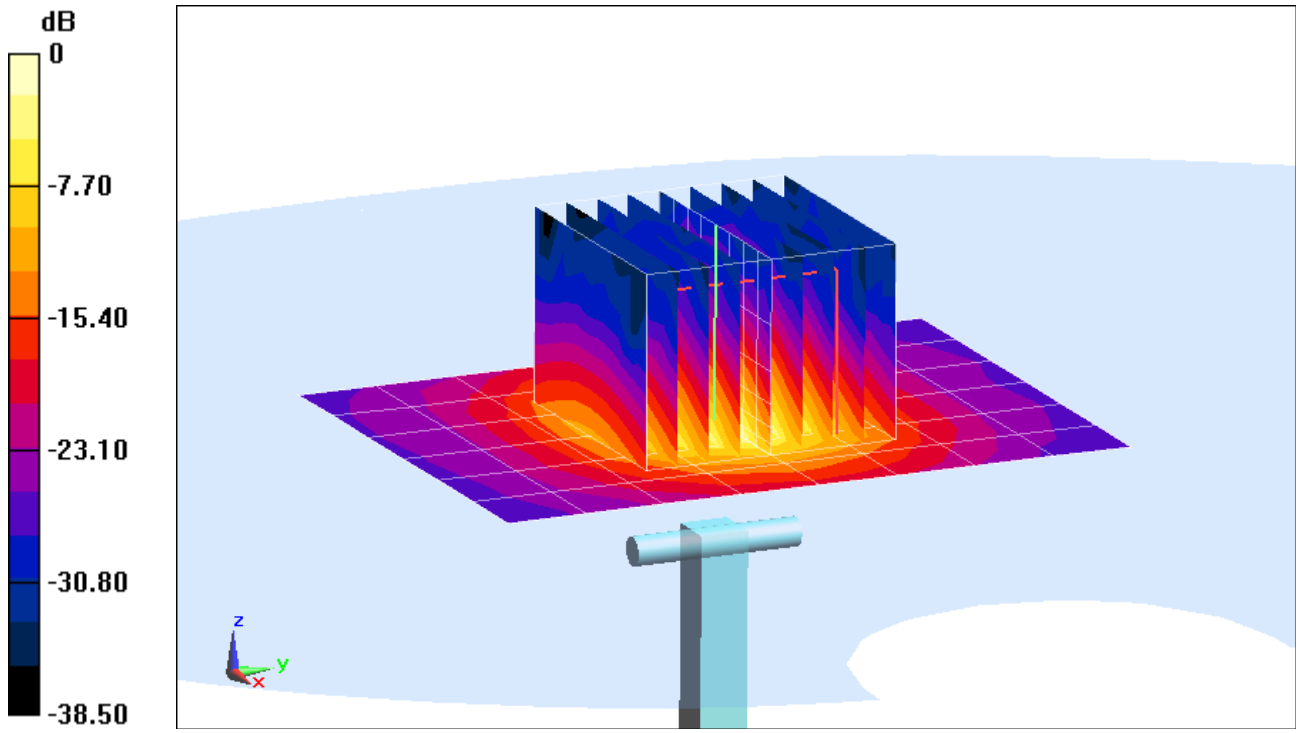
Communication System: UID 0, CW; Frequency: 5200 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5200 MHz; σ = 5.455 S/m; ε_r = 47.002; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 05-27-2014; Ambient Temp: 23.8°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN3920; ConvF(4.23, 4.23, 4.23); Calibrated: 12/18/2013;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 12/12/2013
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

5200MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 26.9 W/kg
SAR(1 g) = 7.53 W/kg
Deviation = 3.72%



0 dB = 18.4 W/kg = 12.65 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

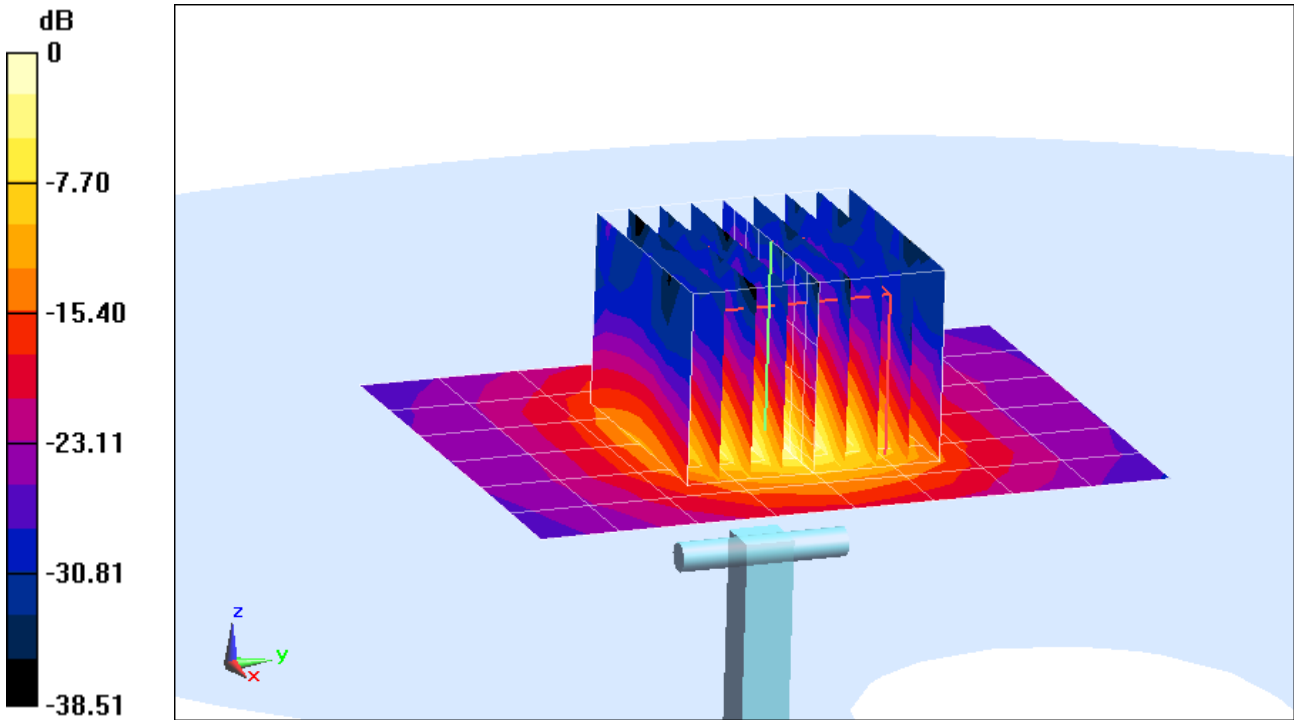
Communication System: UID 0, CW; Frequency: 5300 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5300 MHz; σ = 5.53 S/m; ε_r = 46.81; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 05-27-2014; Ambient Temp: 23.8°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN3920; ConvF(4.11, 4.11, 4.11); Calibrated: 12/18/2013;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 12/12/2013
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

5300MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 32.6 W/kg
SAR(1 g) = 7.63 W/kg
Deviation = 2.14%



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

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

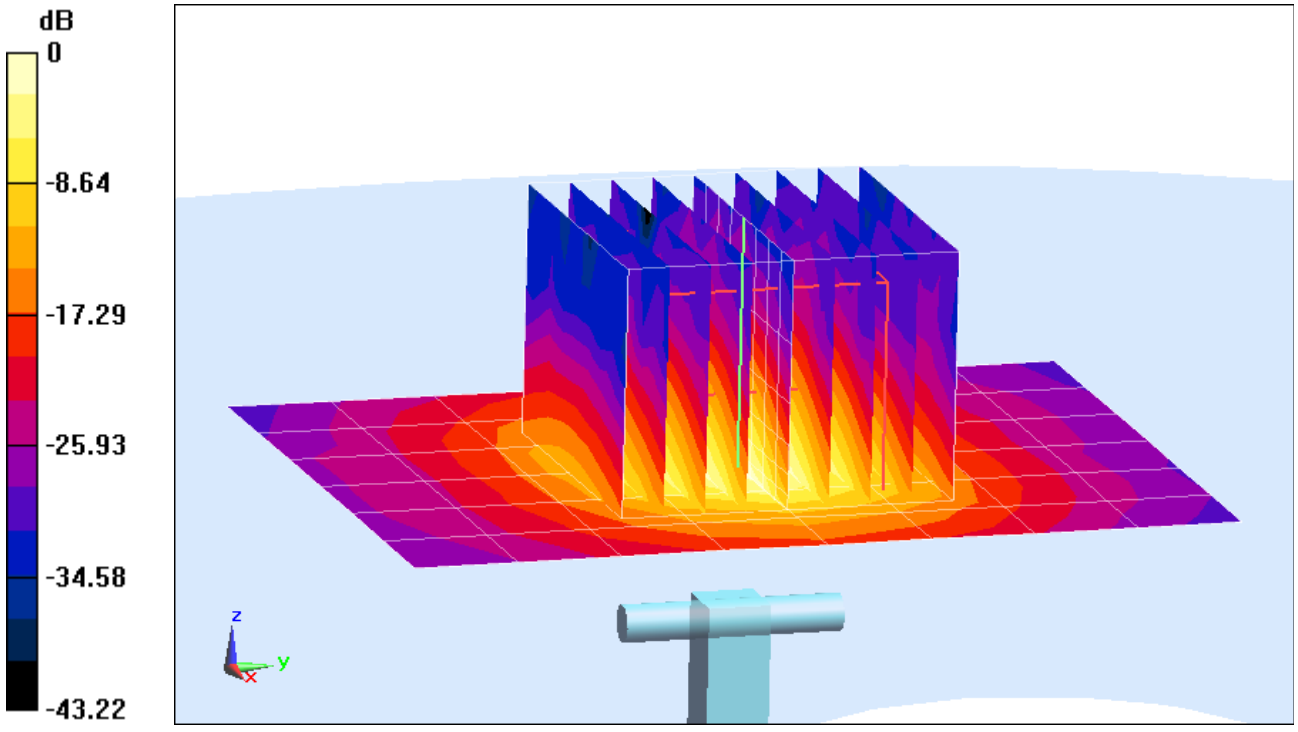
Communication System: UID 0, CW; Frequency: 5500 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5500 MHz; σ = 5.844 S/m; ε_r = 46.929; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 05-27-2014; Ambient Temp: 23.8°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN3920; ConvF(3.8, 3.8, 3.8); Calibrated: 12/18/2013;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 12/12/2013
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

5500MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 31.4 W/kg
SAR(1 g) = 7.97 W/kg
Deviation = 5.01%



0 dB = 20.2 W/kg = 13.05 dBW/kg

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

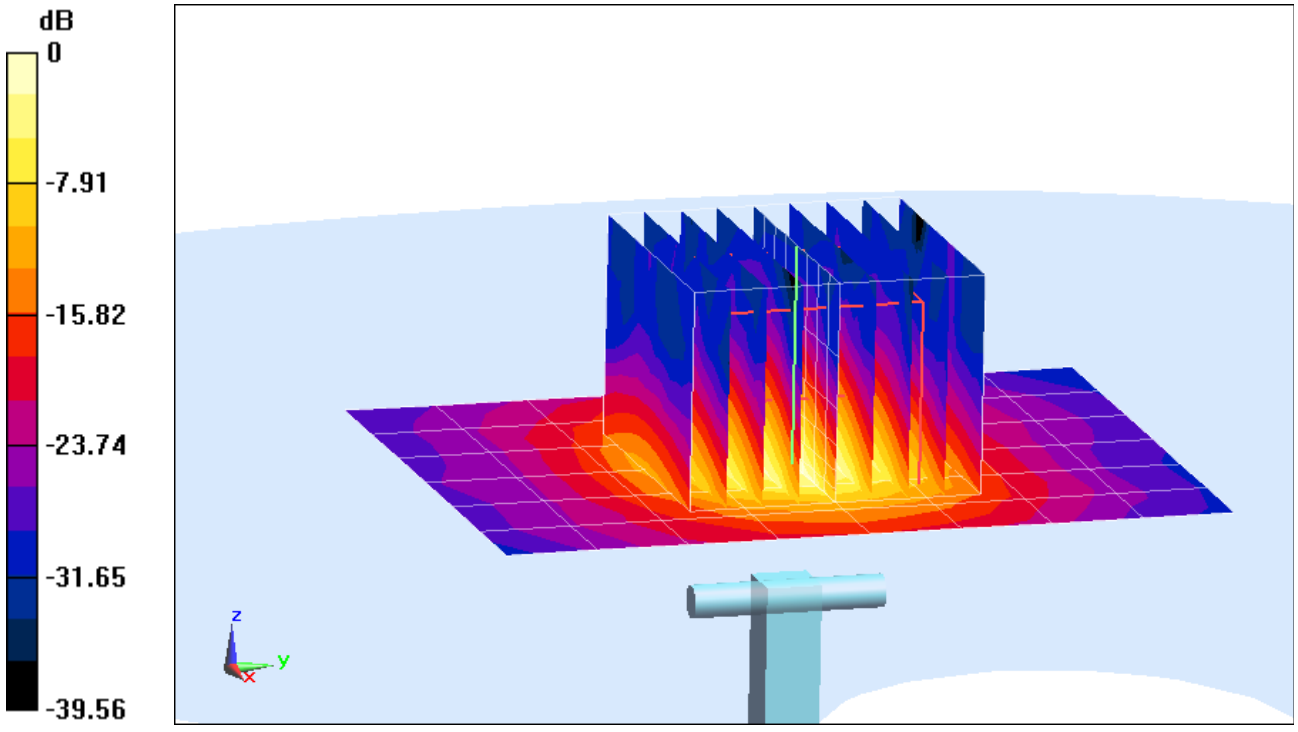
Communication System: UID 0, CW; Frequency: 5800 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5800 MHz; σ = 6.164 S/m; ε_r = 45.988; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 05-27-2014; Ambient Temp: 23.8°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN3920; ConvF(4, 4, 4); Calibrated: 12/18/2013;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 12/12/2013
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

5800MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 32.4 W/kg
SAR(1 g) = 7.26 W/kg
Deviation = -0.41%



0 dB = 18.8 W/kg = 12.74 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
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: ES3-3213_Apr14

CALIBRATION CERTIFICATE

Object: ES3DV3 - SN:3213

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

CCV 5/7/14

Calibration date: April 11, 2014

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	03-Apr-14 (No. 217-01911)	Apr-15
Power sensor E4412A	MY41498087	03-Apr-14 (No. 217-01911)	Apr-15
Reference 3 dB Attenuator	SN: S5054 (3c)	03-Apr-14 (No. 217-01915)	Apr-15
Reference 20 dB Attenuator	SN: S5277 (20x)	03-Apr-14 (No. 217-01919)	Apr-15
Reference 30 dB Attenuator	SN: S5129 (30b)	03-Apr-14 (No. 217-01920)	Apr-15
Reference Probe ES3DV2	SN: 3013	30-Dec-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 660	13-Dec-13 (No. DAE4-660_Dec13)	Dec-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

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

Issued: April 14, 2014

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, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
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; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 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.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe ES3DV3

SN:3213

Manufactured: October 14, 2008
Calibrated: April 11, 2014

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3213

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.47	1.36	1.32	± 10.1 %
DCP (mV)[B]	102.9	101.6	102.7	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	197.4	±3.8 %
		Y	0.0	0.0	1.0		219.1	
		Z	0.0	0.0	1.0		195.3	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	5.05	68.5	14.4	10.00	41.4	±0.9 %
		Y	9.83	75.4	16.6		39.8	
		Z	10.63	76.7	17.0		40.3	
10011-CAB	UMTS-FDD (WCDMA)	X	3.25	67.1	18.8	2.91	135.4	±0.5 %
		Y	3.21	66.6	18.4		131.4	
		Z	3.43	68.3	19.4		133.5	
10012-CAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	3.39	71.8	20.4	1.87	137.8	±0.7 %
		Y	2.98	69.1	19.1		133.1	
		Z	3.26	71.3	20.3		133.8	
10021-DAB	GSM-FDD (TDMA, GMSK)	X	22.08	99.1	27.6	9.39	143.1	±2.2 %
		Y	21.57	99.6	28.2		141.4	
		Z	13.61	90.9	24.9		137.1	
10023-DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	16.13	94.0	26.2	9.57	133.8	±1.9 %
		Y	22.39	99.7	28.1		137.8	
		Z	18.99	97.5	27.4		129.2	
10024-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	21.23	93.4	23.4	6.56	148.9	±1.9 %
		Y	33.62	99.9	25.4		148.5	
		Z	32.72	99.7	25.1		141.6	
10027-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	49.20	99.7	23.0	4.80	138.6	±2.5 %
		Y	40.22	99.8	23.9		134.7	
		Z	43.82	99.8	23.4		131.9	
10028-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	50.05	99.8	22.4	3.55	146.5	±2.2 %
		Y	51.41	99.6	22.3		144.4	
		Z	46.36	99.5	22.4		140.0	
10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	40.43	99.5	20.4	1.16	135.1	±1.7 %
		Y	24.55	99.5	21.7		133.5	
		Z	32.87	99.9	21.0		131.0	
10039-CAB	CDMA2000 (1xRTT, RC1)	X	4.69	66.6	19.0	4.57	133.4	±0.9 %
		Y	4.76	66.9	19.3		133.2	
		Z	4.71	66.8	19.2		130.1	

10081-CAB	CDMA2000 (1xRTT, RC3)	X	3.87	66.1	18.6	3.97	129.0	±0.7 %
		Y	3.89	66.1	18.7		129.6	
		Z	3.97	66.6	19.0		146.7	
10098-CAB	UMTS-FDD (HSUPA, Subtest 2)	X	4.59	66.8	18.8	3.98	141.1	±0.7 %
		Y	4.64	67.0	19.0		140.0	
		Z	4.67	67.2	19.1		138.5	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.52	68.0	20.1	5.67	147.5	±1.4 %
		Y	6.61	68.3	20.4		148.5	
		Z	6.51	68.0	20.1		145.4	
10108-CAB	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.39	67.5	19.9	5.80	145.2	±1.4 %
		Y	6.44	67.8	20.2		145.8	
		Z	6.41	67.7	20.1		145.5	
10110-CAB	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X	6.02	66.7	19.5	5.75	141.3	±1.4 %
		Y	6.10	67.2	20.0		141.0	
		Z	6.05	67.0	19.8		141.2	
10114-CAA	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	X	10.19	68.9	21.4	8.10	135.6	±2.2 %
		Y	10.43	69.6	21.9		135.7	
		Z	10.21	69.0	21.5		134.5	
10117-CAA	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.17	68.9	21.3	8.07	137.7	±2.5 %
		Y	10.45	69.6	21.9		137.2	
		Z	10.22	69.1	21.5		136.9	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	9.70	74.8	25.8	9.28	133.6	±3.0 %
		Y	9.81	75.7	26.7		130.1	
		Z	9.49	74.4	25.7		131.6	
10154-CAB	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	6.07	67.0	19.7	5.75	142.9	±1.4 %
		Y	6.19	67.6	20.2		145.4	
		Z	6.06	67.0	19.8		141.7	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.50	67.5	19.9	5.82	148.5	±1.4 %
		Y	6.35	67.0	19.7		127.0	
		Z	6.52	67.6	20.0		147.9	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	5.00	66.8	19.8	5.73	145.4	±1.4 %
		Y	5.13	67.5	20.4		148.9	
		Z	5.06	67.3	20.2		144.8	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	9.02	79.7	28.5	9.21	148.9	±3.0 %
		Y	8.14	77.1	27.6		125.0	
		Z	8.82	79.5	28.6		147.1	
10175-CAB	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	5.05	67.2	20.0	5.72	146.2	±1.4 %
		Y	5.14	67.6	20.4		145.9	
		Z	5.00	67.1	20.1		140.8	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	5.07	67.2	20.0	5.72	149.7	±1.4 %
		Y	5.15	67.6	20.4		146.0	
		Z	5.00	67.0	20.0		141.0	

10193-CAA	IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	X	9.92	68.8	21.4	8.09	135.2	±2.2 %
		Y	10.06	69.3	21.8		130.6	
		Z	9.78	68.4	21.2		126.9	
10196-CAA	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.93	68.9	21.4	8.10	136.4	±2.2 %
		Y	10.06	69.3	21.9		131.1	
		Z	9.84	68.7	21.4		128.8	
10219-CAA	IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)	X	9.81	68.8	21.4	8.03	135.3	±2.2 %
		Y	9.95	69.3	21.8		130.1	
		Z	9.71	68.5	21.2		127.4	
10222-CAA	IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)	X	10.24	69.1	21.5	8.06	141.2	±2.2 %
		Y	10.45	69.7	22.0		136.8	
		Z	10.13	68.9	21.4		133.6	
10225-CAB	UMTS-FDD (HSPA+)	X	6.95	66.9	19.5	5.97	137.9	±1.4 %
		Y	7.03	67.2	19.8		133.2	
		Z	6.92	66.9	19.5		130.6	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	8.08	76.6	27.0	9.21	127.8	±3.0 %
		Y	10.15	84.0	31.2		149.6	
		Z	8.67	79.0	28.3		145.4	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	8.92	73.6	25.3	9.24	126.0	±3.5 %
		Y	9.19	75.1	26.5		124.0	
		Z	9.66	76.2	26.8		149.1	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	9.59	74.5	25.7	9.30	131.9	±3.0 %
		Y	9.87	75.8	26.8		130.6	
		Z	9.36	73.9	25.5		127.8	
10274-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)	X	5.84	66.6	18.8	4.87	128.6	±0.9 %
		Y	5.87	66.7	19.0		128.8	
		Z	6.08	67.6	19.4		149.9	
10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.35	66.6	18.8	3.96	134.0	±0.9 %
		Y	4.46	67.0	19.1		138.5	
		Z	4.39	66.8	19.0		129.4	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.72	67.5	19.2	3.46	149.2	±0.7 %
		Y	3.66	67.1	19.1		129.6	
		Z	3.72	67.6	19.3		143.2	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.54	66.9	18.8	3.39	128.3	±0.5 %
		Y	3.61	67.2	19.1		130.4	
		Z	3.69	67.8	19.4		146.2	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.38	67.4	19.9	5.81	145.8	±1.4 %
		Y	6.50	68.0	20.4		148.6	
		Z	6.35	67.4	19.9		140.8	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.70	67.2	19.7	6.06	127.8	±1.4 %
		Y	6.85	67.7	20.3		130.2	
		Z	6.98	68.2	20.4		147.9	

10315-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)	X	2.82	69.1	19.2	1.71	135.1	±0.7 %
		Y	2.92	69.5	19.6		136.9	
		Z	3.22	71.8	20.6		130.9	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.77	68.3	18.9	3.76	140.0	±0.5 %
		Y	4.80	68.4	19.1		141.4	
		Z	4.86	68.9	19.3		134.8	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.61	68.0	18.8	3.77	138.2	±0.7 %
		Y	4.67	68.2	19.0		139.3	
		Z	4.69	68.5	19.1		133.9	

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

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 8 and 9).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3213

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	41.9	0.89	6.58	6.58	6.58	0.34	1.79	± 12.0 %
835	41.5	0.90	6.37	6.37	6.37	0.29	1.94	± 12.0 %
1750	40.1	1.37	5.18	5.18	5.18	0.79	1.17	± 12.0 %
1900	40.0	1.40	4.99	4.99	4.99	0.57	1.36	± 12.0 %
2450	39.2	1.80	4.40	4.40	4.40	0.78	1.28	± 12.0 %
2600	39.0	1.96	4.25	4.25	4.25	0.77	1.23	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

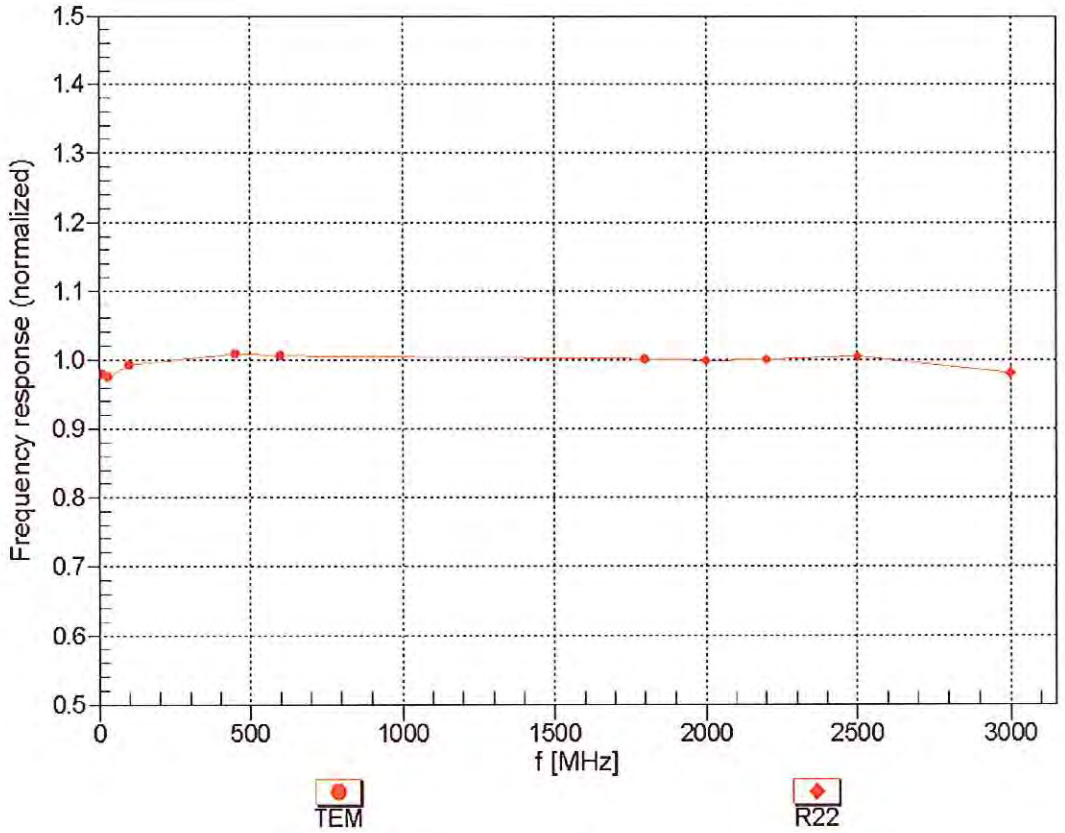
DASY/EASY - Parameters of Probe: ES3DV3 - SN:3213

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	55.5	0.96	6.21	6.21	6.21	0.77	1.19	± 12.0 %
835	55.2	0.97	6.18	6.18	6.18	0.54	1.37	± 12.0 %
1750	53.4	1.49	4.89	4.89	4.89	0.73	1.27	± 12.0 %
1900	53.3	1.52	4.68	4.68	4.68	0.47	1.70	± 12.0 %
2450	52.7	1.95	4.26	4.26	4.26	0.70	1.16	± 12.0 %
2600	52.5	2.16	4.05	4.05	4.05	0.67	1.00	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

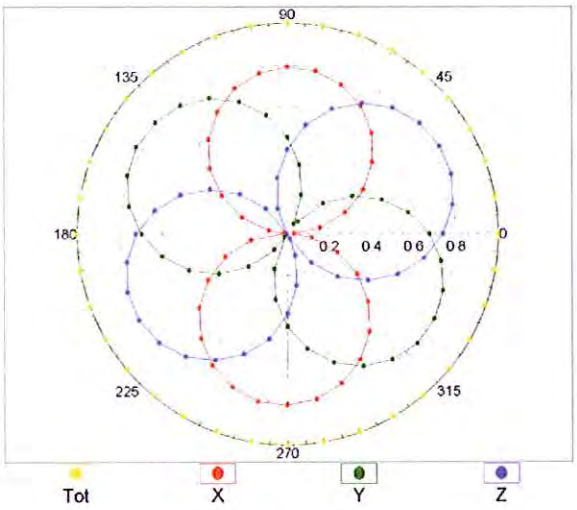
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



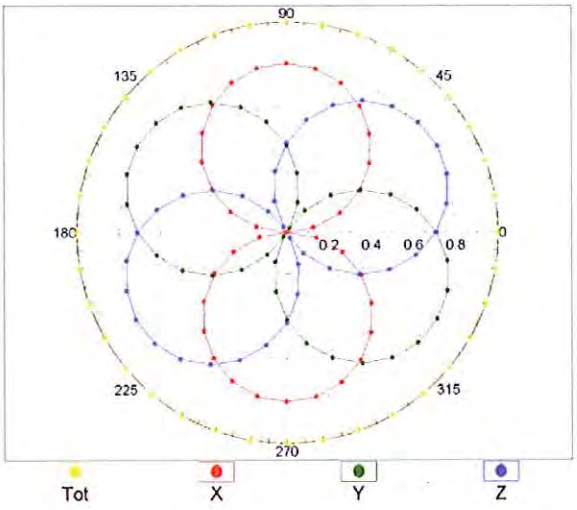
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

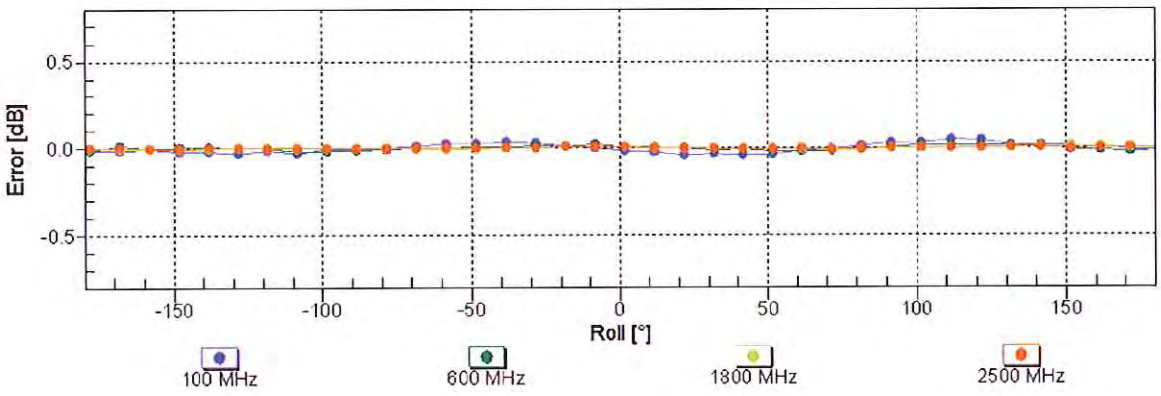
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



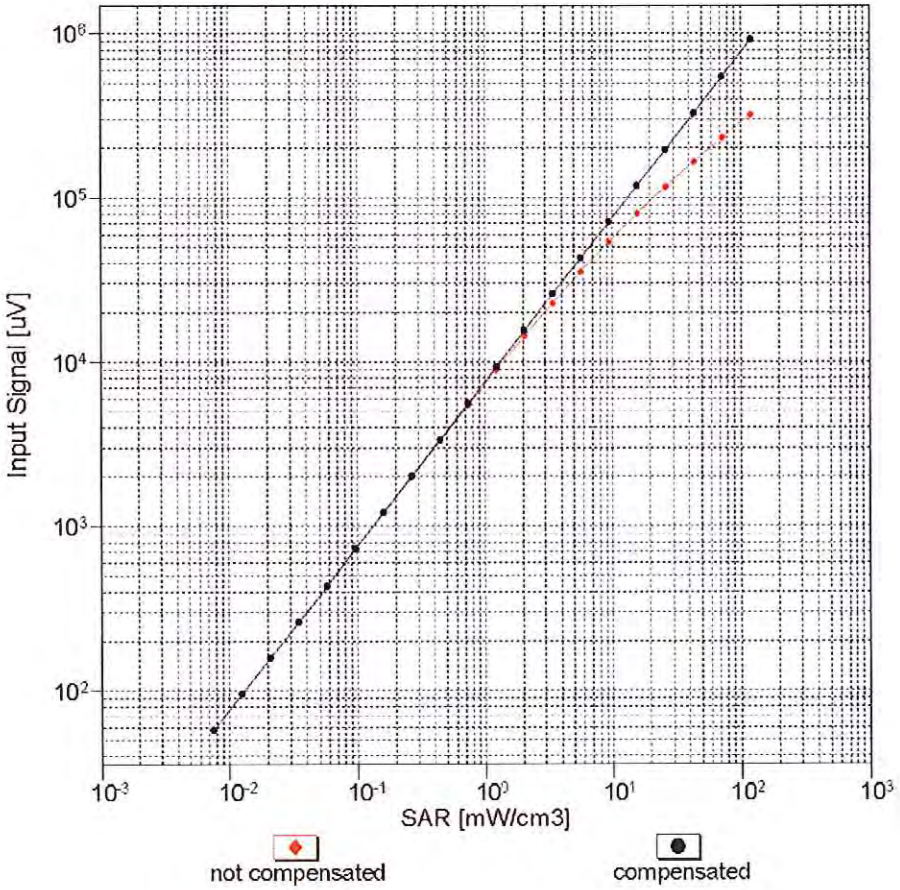
f=1800 MHz,R22

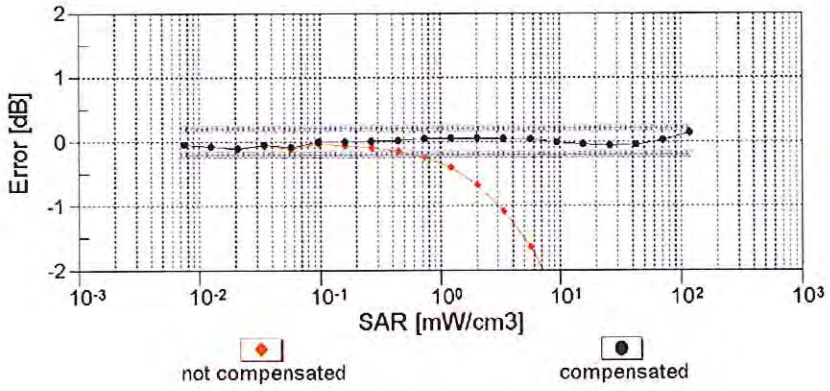




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

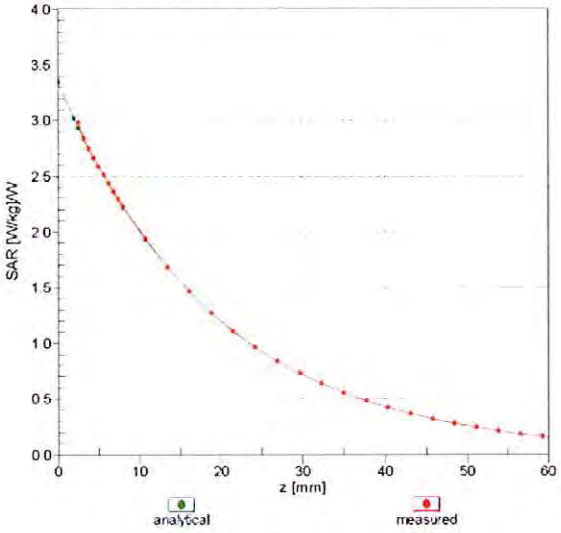




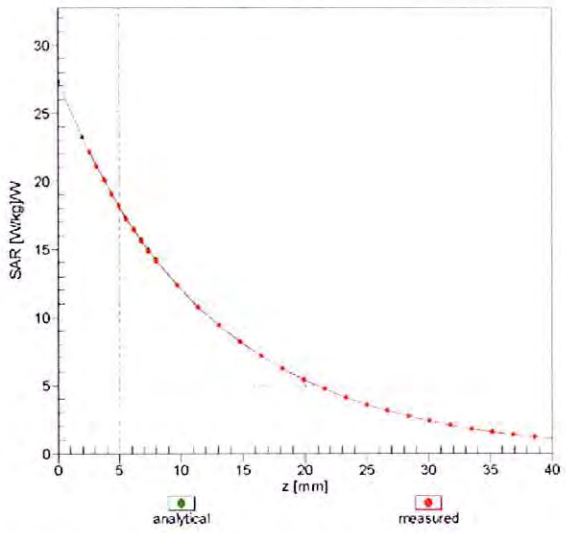
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

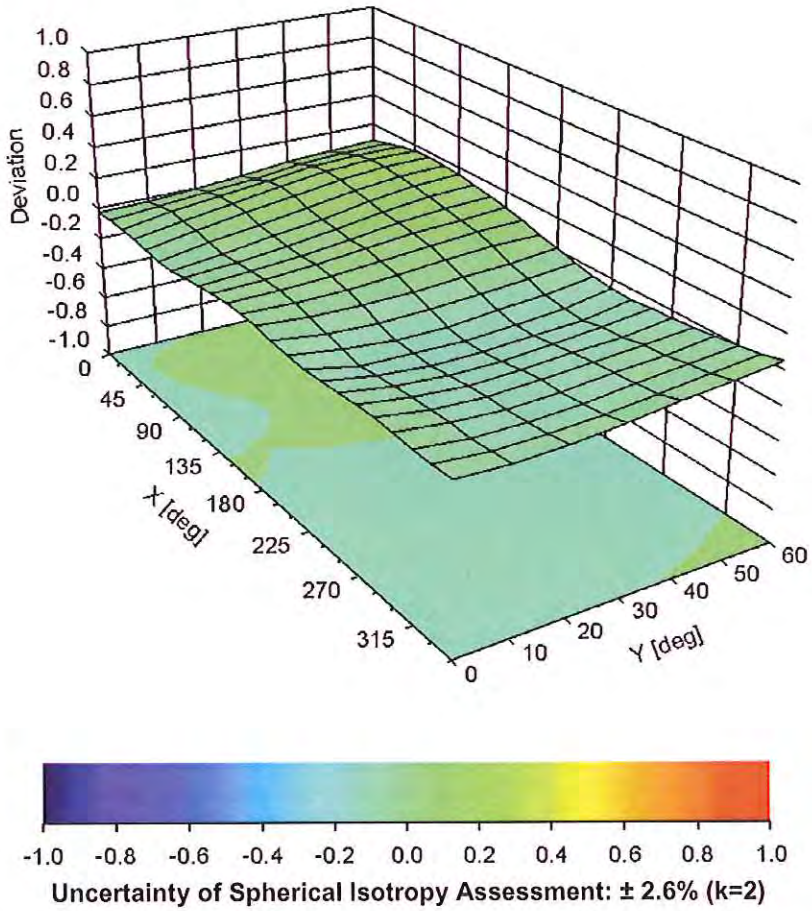


f = 1900 MHz,WGLS R22 (H_convF)



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:3213

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-68.3
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

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

Accreditation No.: SCS 108

Client **PC Test**

Certificate No: ES3-3258_Feb14

CALIBRATION CERTIFICATE

Object: ES3DV3 - SN:3258

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

CCV 3/6/14

Calibration date: February 25, 2014

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
Reference Probe ES3DV2	SN: 3013	30-Dec-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 660	13-Dec-13 (No. DAE4-660_Dec13)	Dec-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

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

Issued: February 27, 2014

PCT# 80615

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, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
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; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 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.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe ES3DV3

SN:3258

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

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

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.29	1.19	1.23	± 10.1 %
DCP (mV)[B]	104.5	107.0	103.0	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	222.4	±3.8 %
		Y	0.0	0.0	1.0		202.2	
		Z	0.0	0.0	1.0		207.1	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	5.09	65.6	14.1	10.00	44.8	±1.9 %
		Y	1.68	57.4	9.3		40.7	
		Z	4.01	62.4	13.0		51.1	
10011-CAB	UMTS-FDD (WCDMA)	X	3.34	67.5	18.9	2.91	131.2	±0.5 %
		Y	3.43	67.9	18.7		137.1	
		Z	3.42	67.8	19.0		146.0	
10012-CAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	3.40	70.9	19.8	1.87	134.2	±0.7 %
		Y	3.19	70.2	19.2		137.9	
		Z	3.46	70.8	19.6		149.6	
10021-DAB	GSM-FDD (TDMA, GMSK)	X	30.24	99.7	28.7	9.39	131.2	±1.4 %
		Y	12.91	88.5	23.9		147.5	
		Z	30.37	99.5	28.9		128.0	
10023-DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	29.88	100.0	29.0	9.57	123.0	±1.9 %
		Y	16.02	92.5	25.4		140.7	
		Z	30.01	100.0	29.4		125.8	
10024-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	44.57	99.7	25.9	6.56	119.6	±1.7 %
		Y	28.97	95.3	23.2		127.6	
		Z	43.72	99.8	26.3		120.1	
10027-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	53.52	99.7	24.4	4.80	129.4	±2.2 %
		Y	54.55	99.9	22.9		143.3	
		Z	51.63	99.7	24.8		127.5	
10028-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	58.93	99.8	23.4	3.55	133.4	±2.2 %
		Y	77.54	99.7	21.3		125.3	
		Z	56.64	99.8	23.8		130.8	
10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	47.03	99.5	21.3	1.16	136.3	±1.7 %
		Y	95.86	95.2	17.1		138.2	
		Z	39.68	100.0	22.2		132.3	
10039-CAB	CDMA2000 (1xRTT, RC1)	X	4.84	66.8	19.1	4.57	131.3	±0.9 %
		Y	4.75	67.0	18.9		135.2	
		Z	4.86	66.7	19.0		127.2	

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

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

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

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

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 8 and 9).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	41.9	0.89	6.53	6.53	6.53	0.40	1.60	± 12.0 %
835	41.5	0.90	6.27	6.27	6.27	0.80	1.17	± 12.0 %
1750	40.1	1.37	5.19	5.19	5.19	0.80	1.10	± 12.0 %
1900	40.0	1.40	5.04	5.04	5.04	0.68	1.27	± 12.0 %
2450	39.2	1.80	4.52	4.52	4.52	0.78	1.23	± 12.0 %
2600	39.0	1.96	4.34	4.34	4.34	0.76	1.33	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

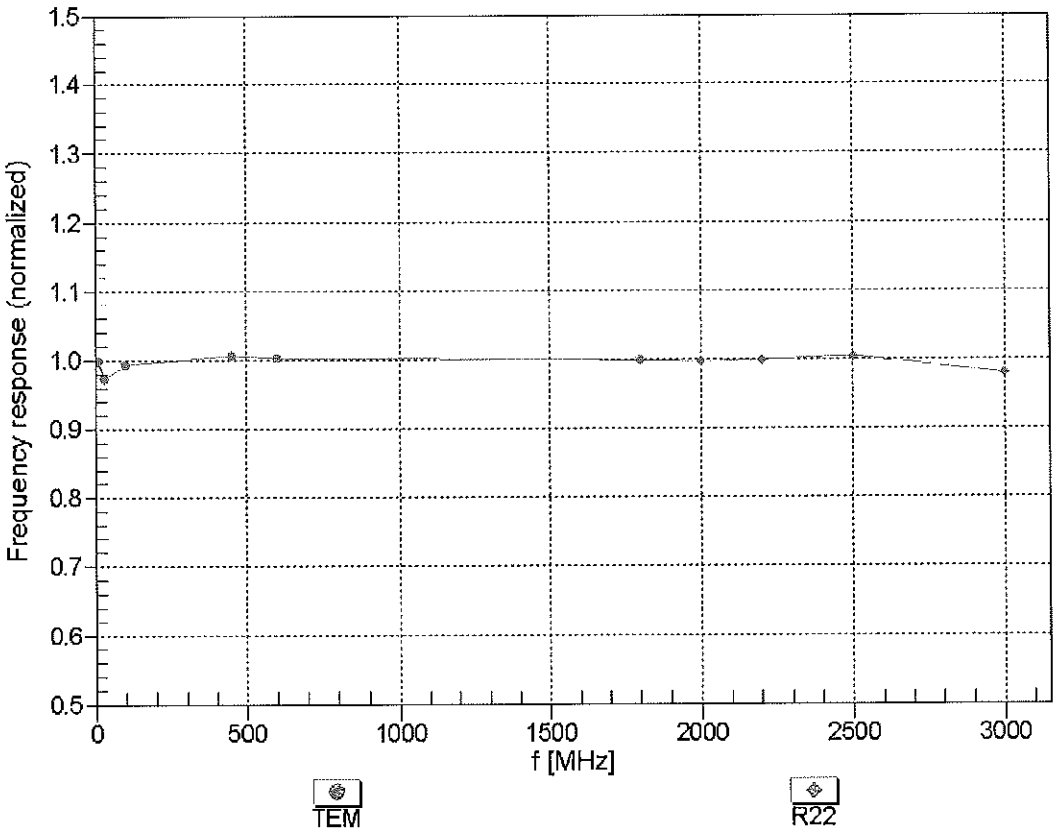
DASY/EASY - Parameters of Probe: ES3DV3 - SN:3258

Calibration Parameter Determined in Body Tissue Simulating Media

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

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

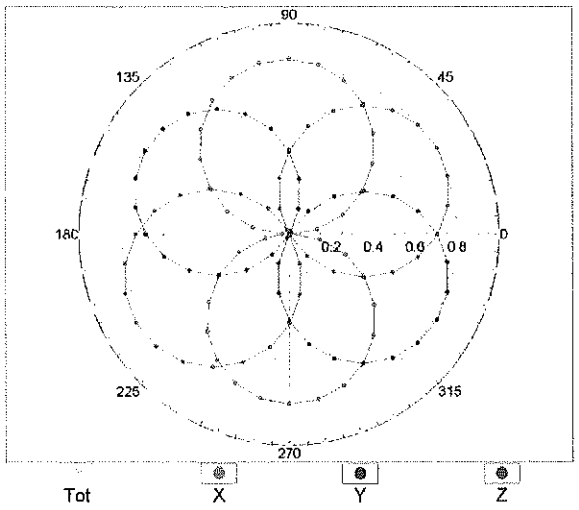
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



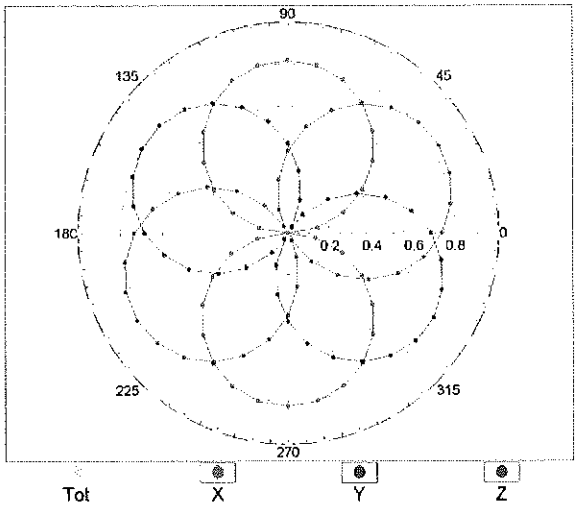
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

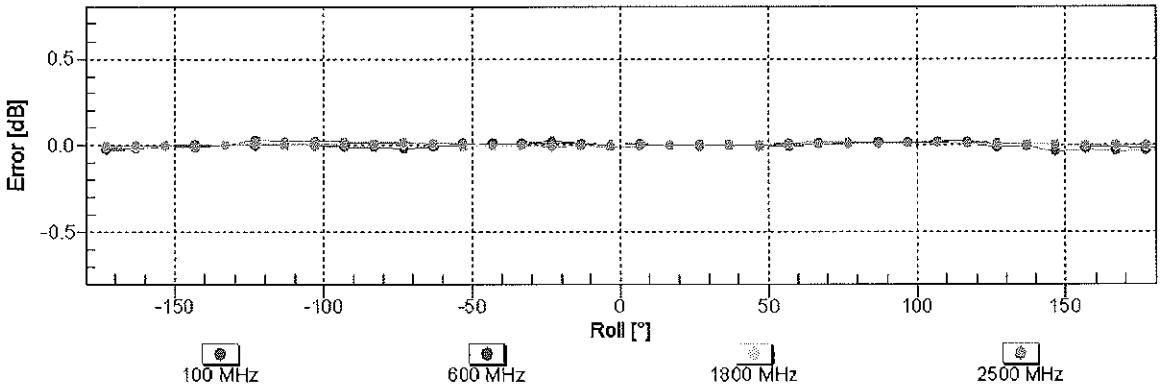
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



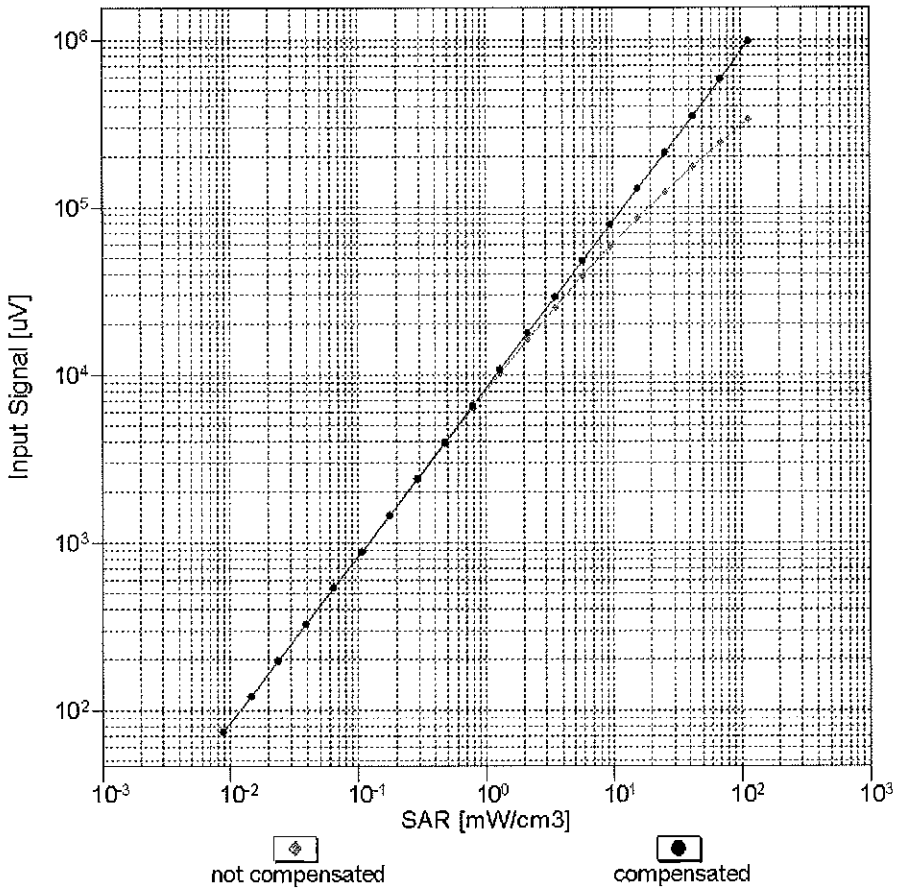
f=1800 MHz,R22

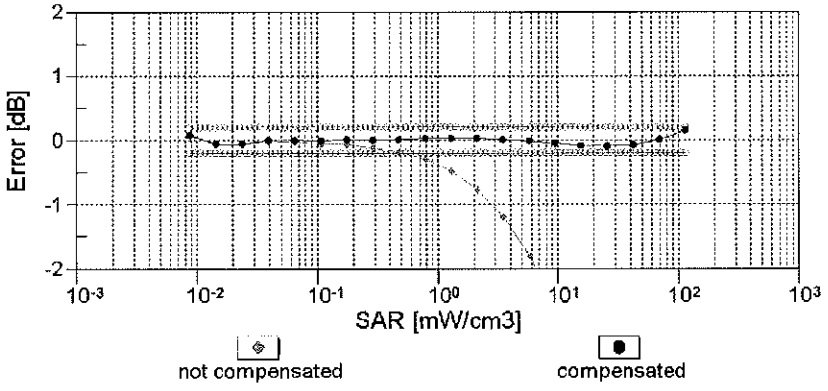




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

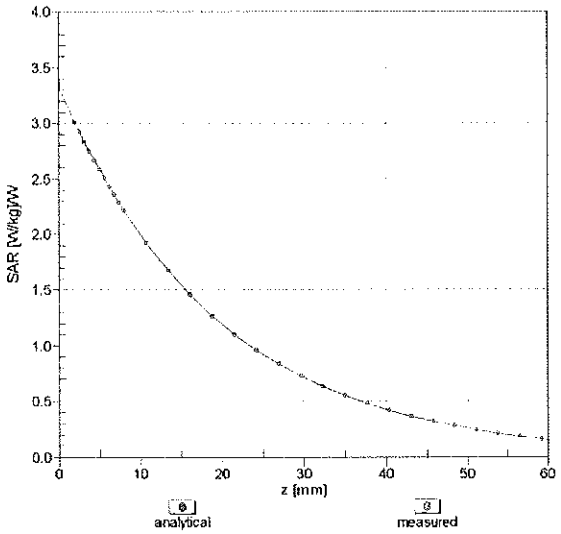




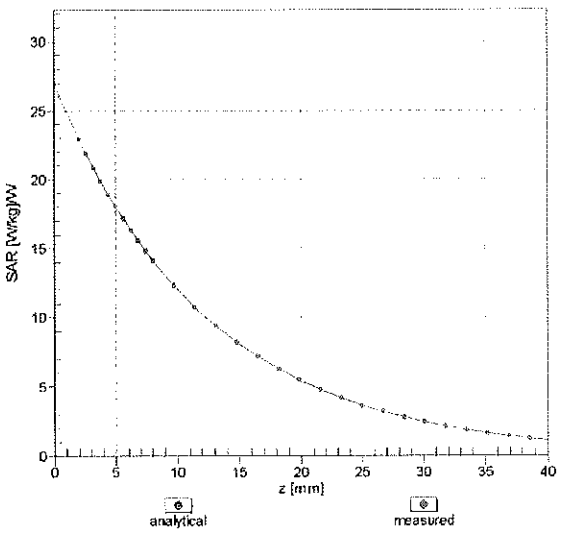
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

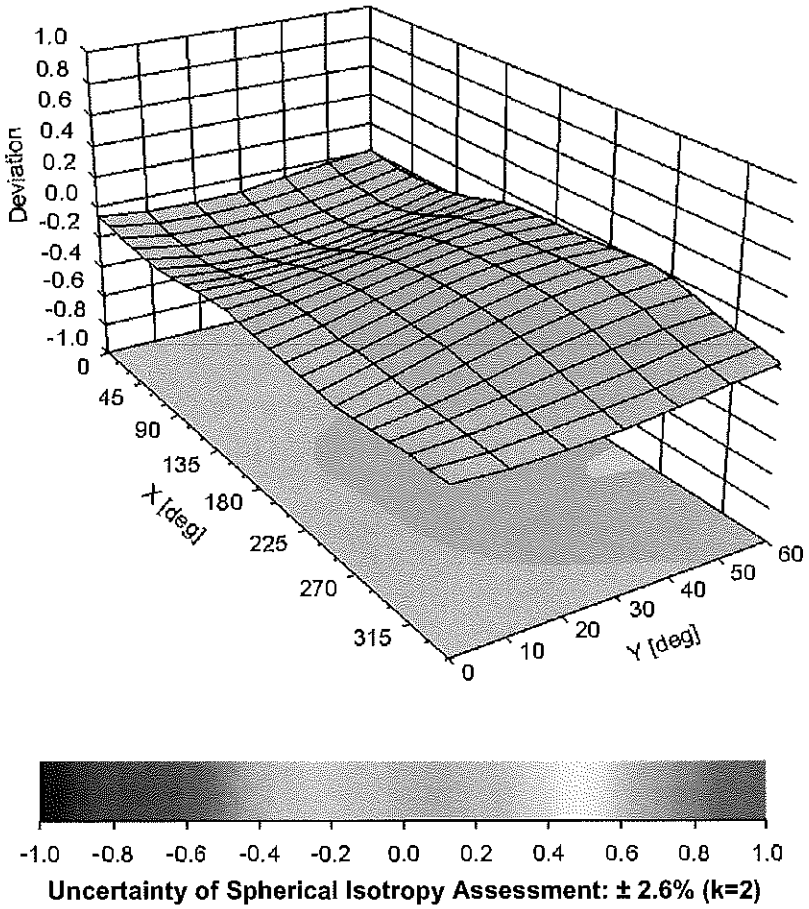


f = 1750 MHz,WGLS R22 (H_convF)



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:3258

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-123.1
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

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)
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_Sep13/2

CALIBRATION CERTIFICATE (Replacement of No: ES3-3288_Sep13)

CCV 10/5/13

Object: ES3DV3 - SN:3288

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

Calibration date: September 23, 2013

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
Reference Probe ES3DV2	SN: 3013	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
DAE4	SN: 660	4-Sep-13 (No. DAE4-660_Sep13)	Apr-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-15
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

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

Issued: October 4, 2013

PCT# 80828

Probe ES3DV3

SN:3288

Manufactured: July 6, 2010
Calibrated: September 23, 2013

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

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) **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, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
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; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *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.

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]	103.3	103.2	100.2	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB$\sqrt{\mu V}$	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	171.1	±3.5 %
		Y	0.0	0.0	1.0		135.0	
		Z	0.0	0.0	1.0		154.3	

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

[A] The uncertainties of NormX,Y,Z do not affect the 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	6.56	6.56	6.56	0.32	1.89	± 12.0 %
835	41.5	0.90	6.37	6.37	6.37	0.34	1.82	± 12.0 %
1750	40.1	1.37	5.67	5.67	5.67	0.56	1.51	± 12.0 %
1900	40.0	1.40	5.47	5.47	5.47	0.80	1.29	± 12.0 %
2450	39.2	1.80	4.63	4.63	4.63	0.80	1.34	± 12.0 %
2600	39.0	1.96	4.55	4.55	4.55	0.80	1.41	± 12.0 %

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

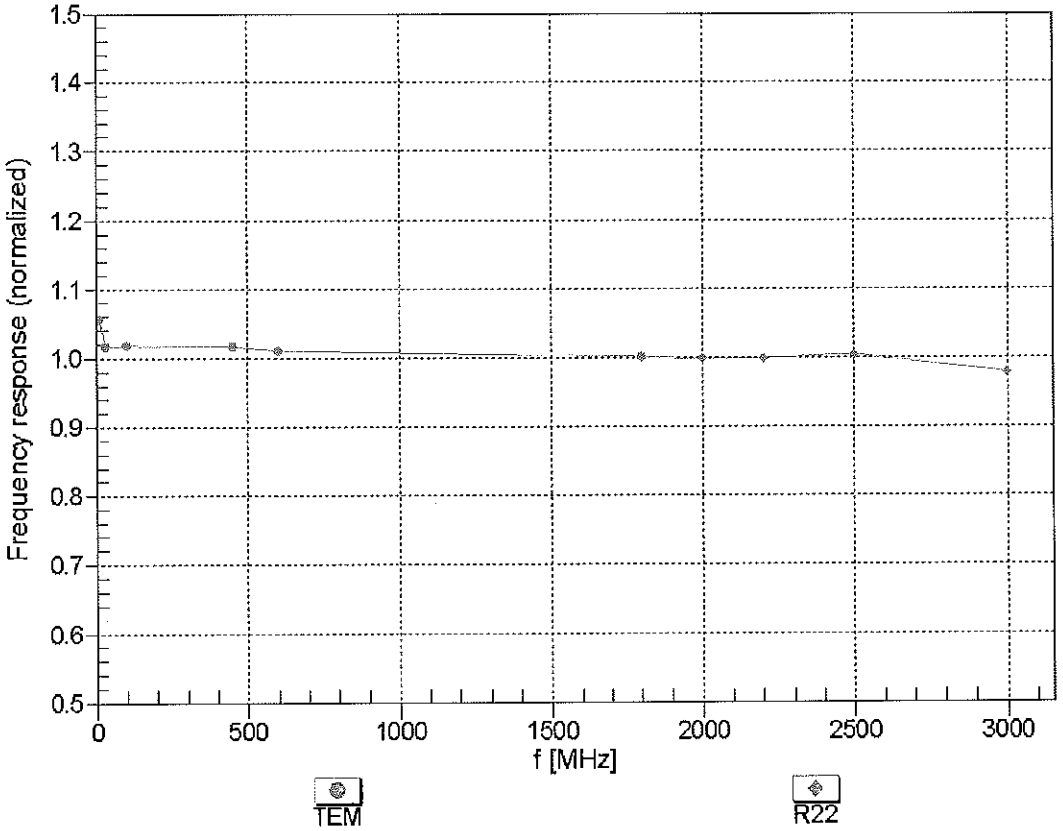
DASY/EASY - Parameters of Probe: ES3DV3 - SN:3288

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	6.25	6.25	6.25	0.70	1.27	± 12.0 %
835	55.2	0.97	6.27	6.27	6.27	0.75	1.22	± 12.0 %
1750	53.4	1.49	5.10	5.10	5.10	0.59	1.46	± 12.0 %
1900	53.3	1.52	4.82	4.82	4.82	0.53	1.54	± 12.0 %
2450	52.7	1.95	4.37	4.37	4.37	0.80	1.02	± 12.0 %
2600	52.5	2.16	4.14	4.14	4.14	0.64	0.94	± 12.0 %

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

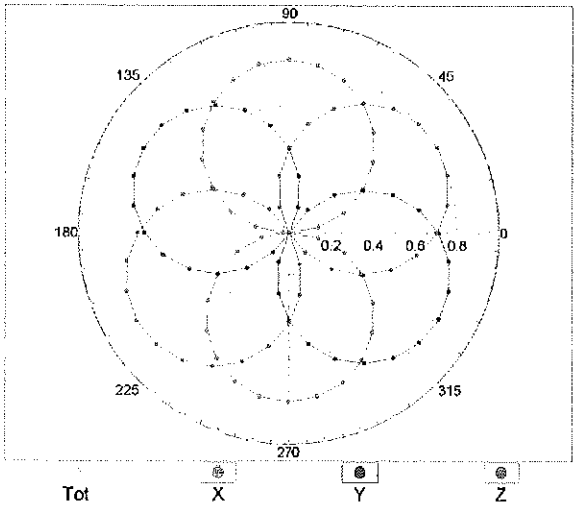
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



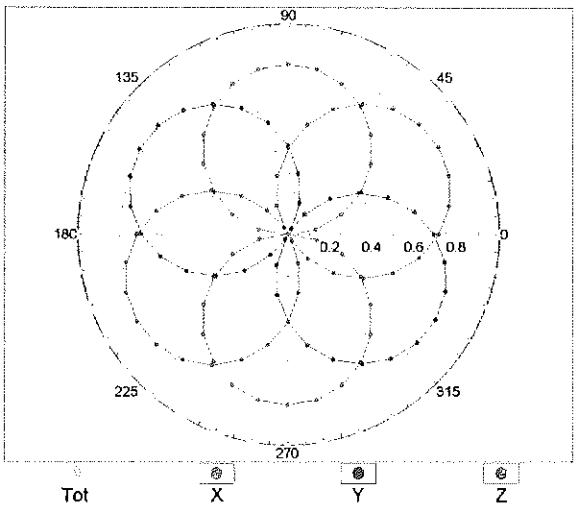
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

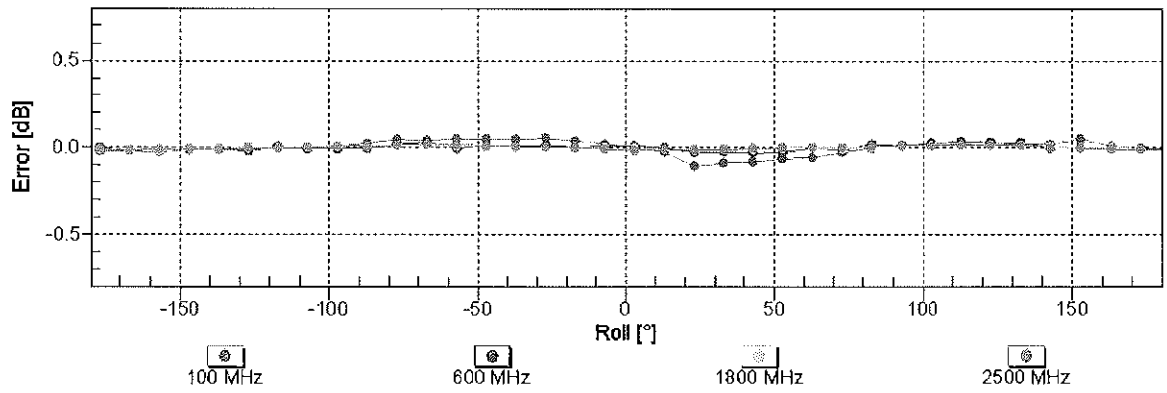
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



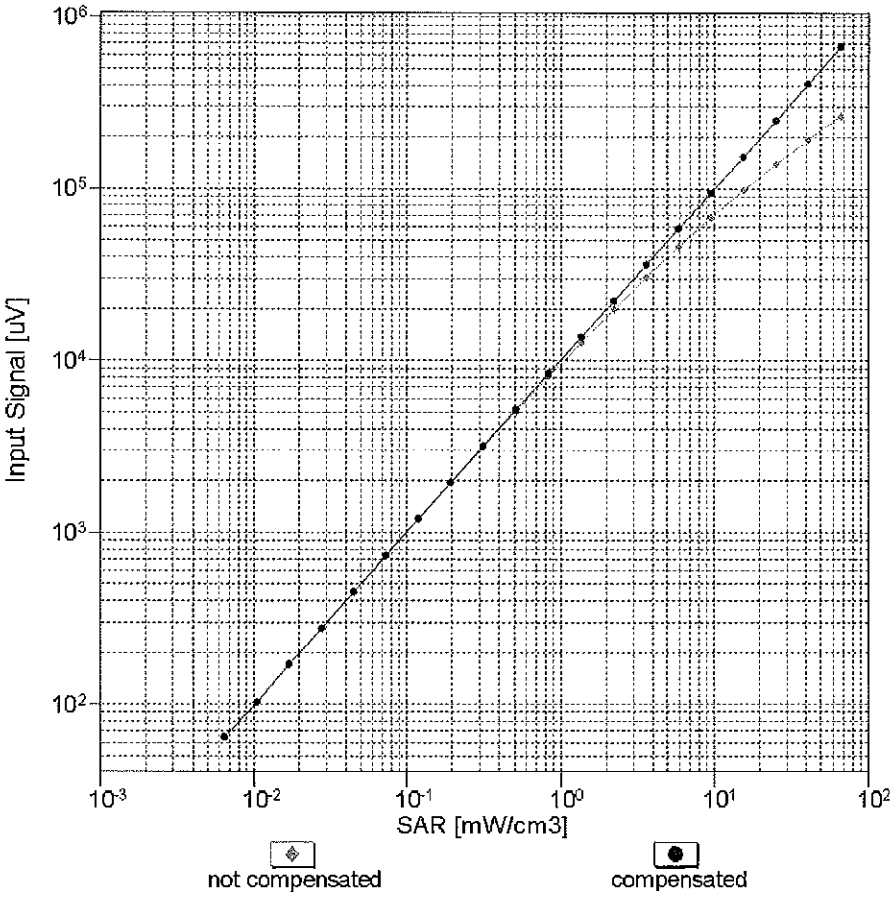
f=1800 MHz,R22

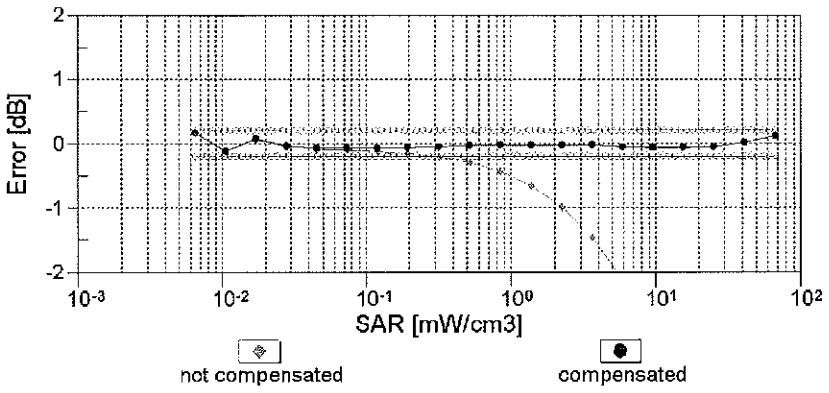




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

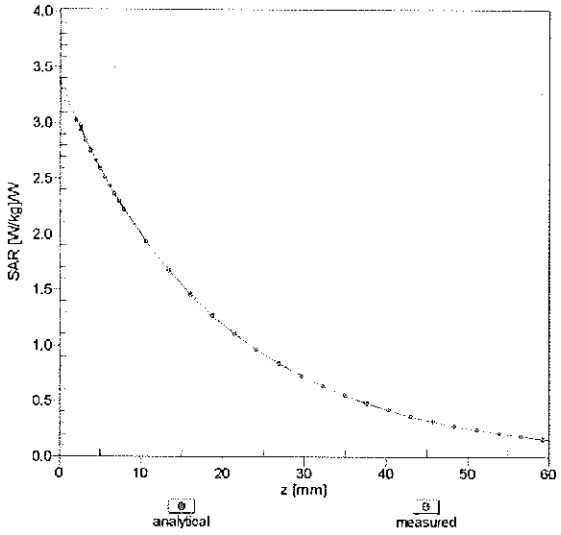




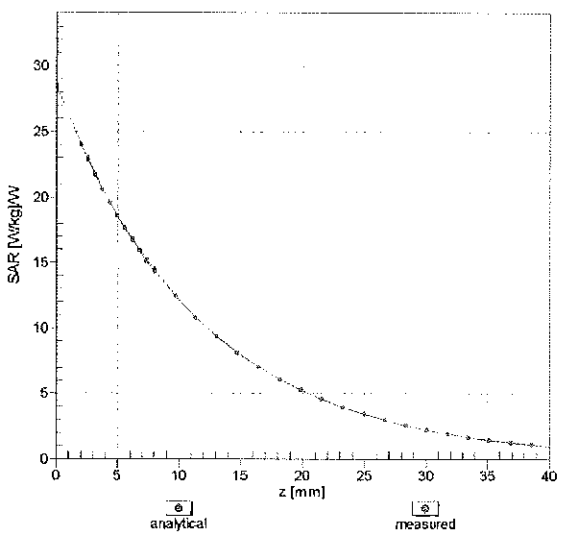
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

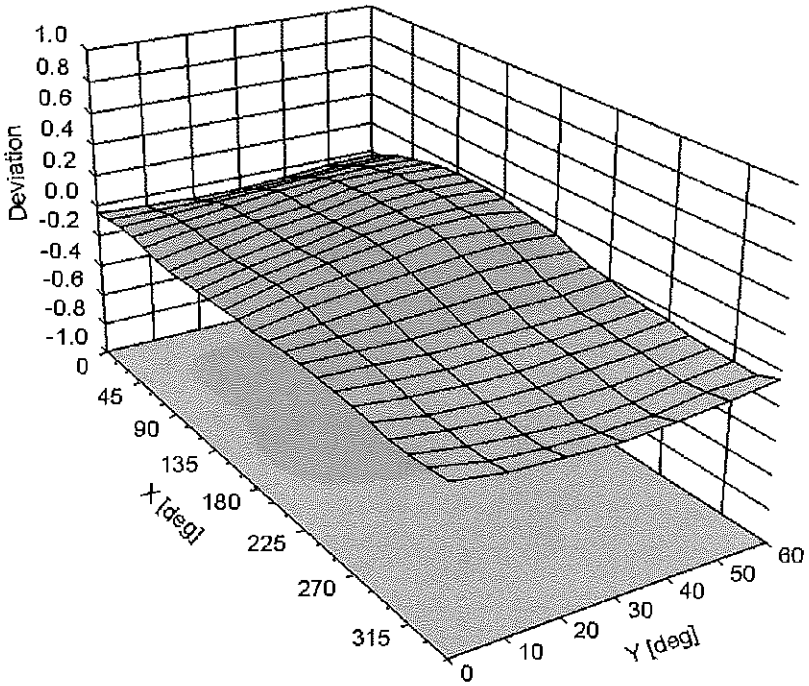


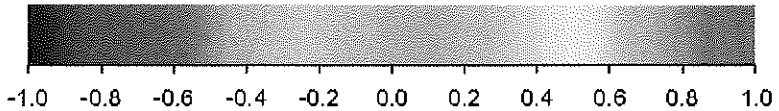
f = 1900 MHz,WGLS R22 (H_convF)



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:3288

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-127.1
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

Calibration Laboratory of
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Engineering AG
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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: ES3-3332_Nov13

CALIBRATION CERTIFICATE

Object: ES3DV3 - SN:3332

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

VCC 1/12/14

Calibration date: November 25, 2013

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
Reference Probe ES3DV2	SN: 3013	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
DAE4	SN: 660	4-Sep-13 (No. DAE4-660_Sep13)	Sep-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-15
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

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

Issued: November 25, 2013

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

S Schweizerischer Kalibrierdienst
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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, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
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; Dx,y,z; VRx,y,z*: *A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *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.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe ES3DV3

SN:3332

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

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3332

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.94	1.16	0.97	± 10.1 %
DCP (mV)[B]	103.5	101.0	111.0	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	179.7	±2.5 %
		Y	0.0	0.0	1.0		147.3	
		Z	0.0	0.0	1.0		188.8	

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

[A] The uncertainties of NormX,Y,Z do not affect the 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:3332

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	41.9	0.89	6.46	6.46	6.46	0.52	1.42	± 12.0 %
850	41.5	0.92	6.29	6.29	6.29	0.78	1.17	± 12.0 %
1750	40.1	1.37	5.27	5.27	5.27	0.80	1.10	± 12.0 %
1900	40.0	1.40	5.06	5.06	5.06	0.80	1.18	± 12.0 %
2450	39.2	1.80	4.50	4.50	4.50	0.80	1.19	± 12.0 %
2600	39.0	1.96	4.38	4.38	4.38	0.76	1.31	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

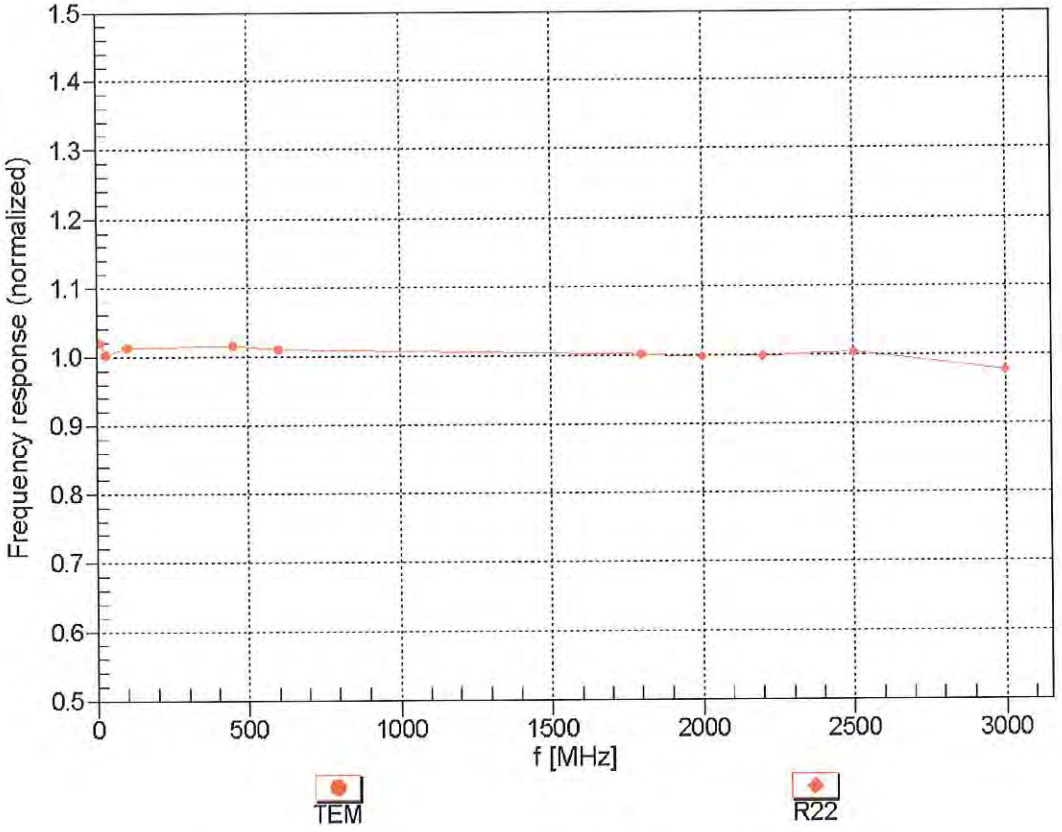
DASY/EASY - Parameters of Probe: ES3DV3 - SN:3332

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	55.5	0.96	6.21	6.21	6.21	0.80	1.19	± 12.0 %
850	55.2	0.99	6.08	6.08	6.08	0.51	1.48	± 12.0 %
1750	53.4	1.49	4.93	4.93	4.93	0.42	1.72	± 12.0 %
1900	53.3	1.52	4.70	4.70	4.70	0.48	1.59	± 12.0 %
2450	52.7	1.95	4.24	4.24	4.24	0.80	1.01	± 12.0 %
2600	52.5	2.16	4.07	4.07	4.07	0.80	0.50	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

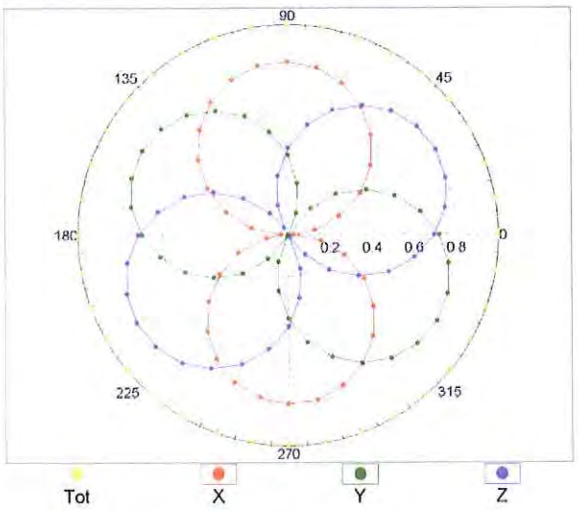
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



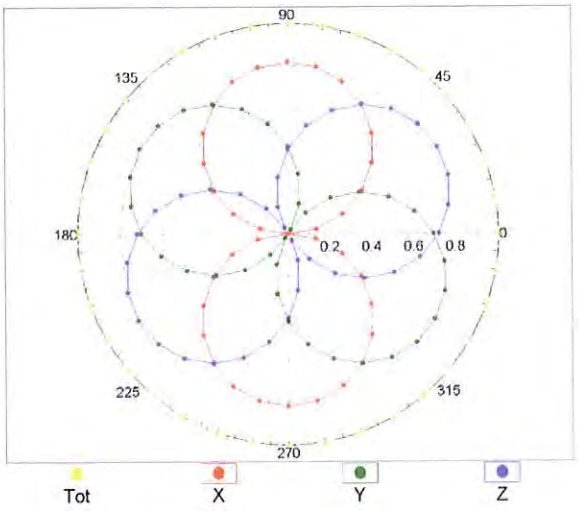
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

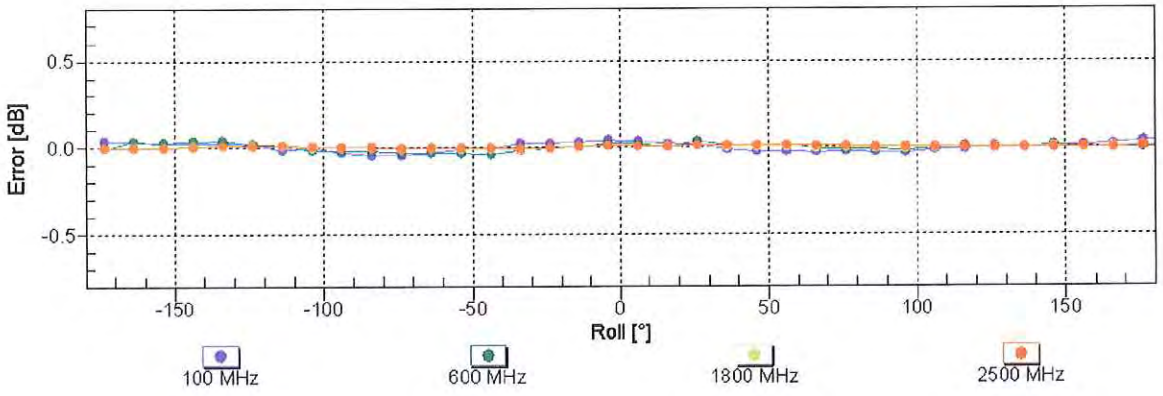
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



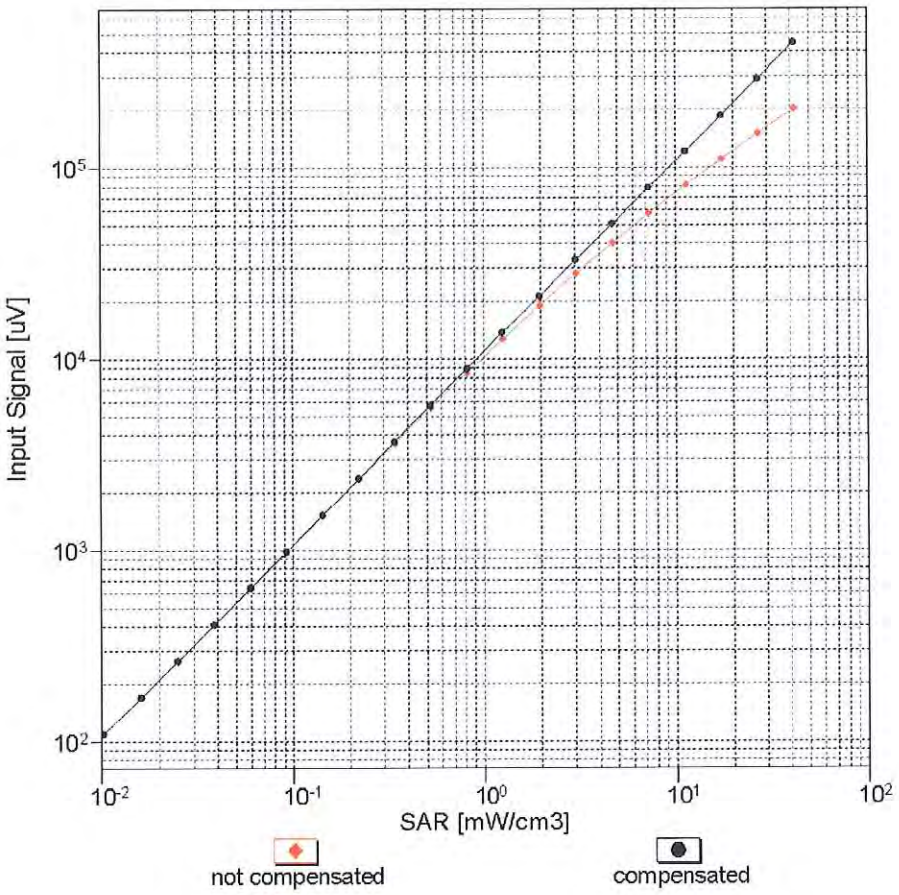
f=1800 MHz,R22

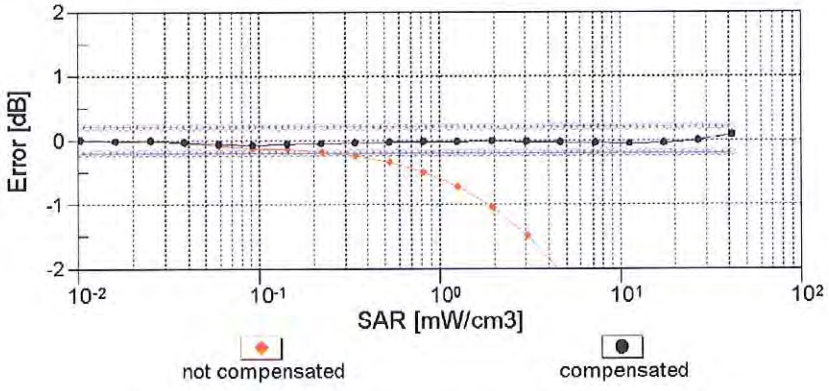




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

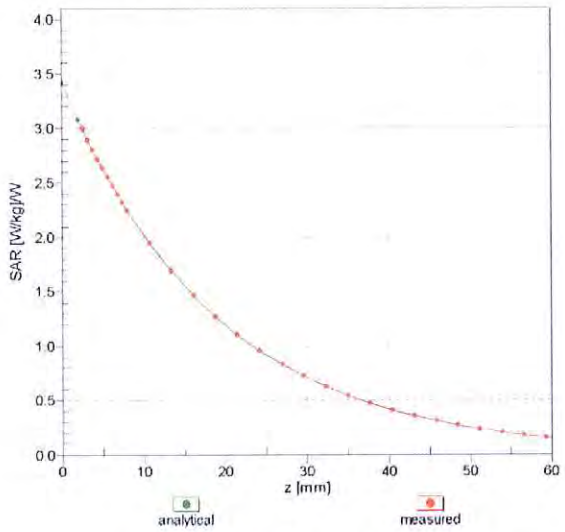




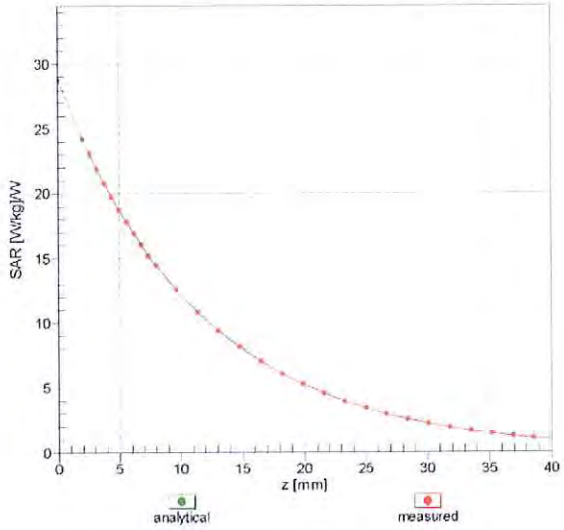
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 850 MHz,WGLS R9 (H_convF)

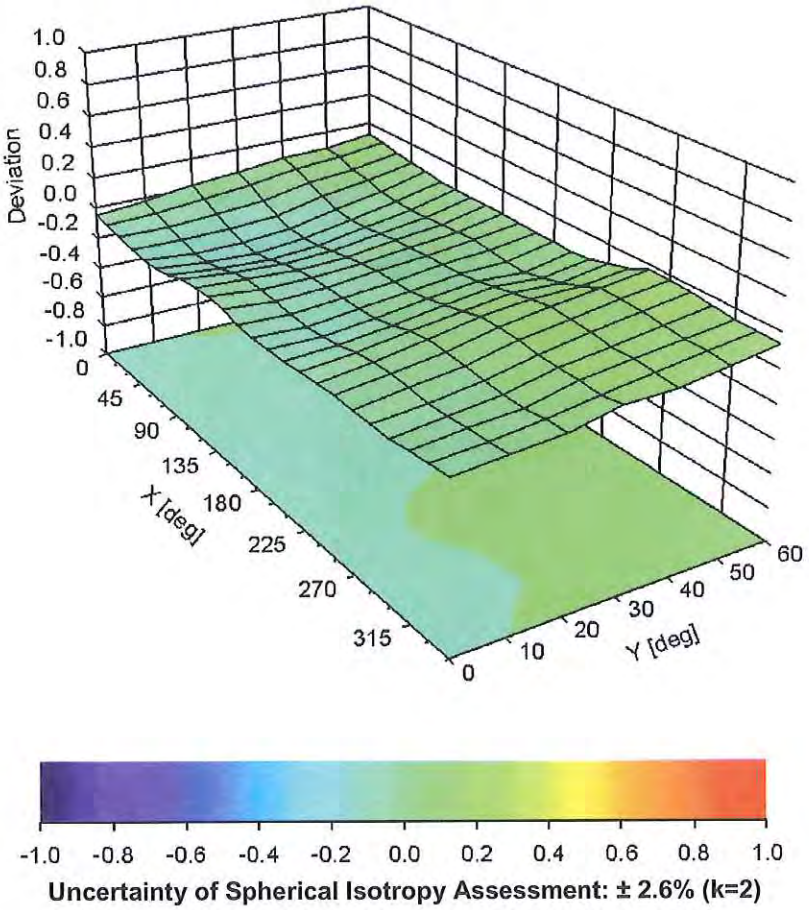


f = 1900 MHz,WGLS R22 (H_convF)



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:3332

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-3.9
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

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

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Client PC Test **Certificate No: ES3-3333_Nov13**

CALIBRATION CERTIFICATE

Object ES3DV3 - SN:3333

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

Calibration date: November 22, 2013

1/7/14

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
Reference Probe ES3DV2	SN: 3013	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
DAE4	SN: 660	4-Sep-13 (No. DAE4-660_Sep13)	Sep-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-15
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

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

Issued: November 25, 2013

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

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Accredited by the Swiss Accreditation Service (SAS) **Accreditation No.: SCS 108**
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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, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
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; Dx,y,z; VRx,y,z*: *A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 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.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe ES3DV3

SN:3333

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

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

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

Basic Calibration Parameters

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

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	140.9	±2.2 %
		Y	0.0	0.0	1.0		132.0	
		Z	0.0	0.0	1.0		170.3	

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

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

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

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	41.9	0.89	6.56	6.56	6.56	0.44	1.54	± 12.0 %
850	41.5	0.92	6.30	6.30	6.30	0.46	1.48	± 12.0 %
1750	40.1	1.37	5.23	5.23	5.23	0.77	1.17	± 12.0 %
1900	40.0	1.40	5.05	5.05	5.05	0.80	1.19	± 12.0 %
2450	39.2	1.80	4.42	4.42	4.42	0.74	1.31	± 12.0 %
2600	39.0	1.96	4.28	4.28	4.28	0.80	1.30	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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

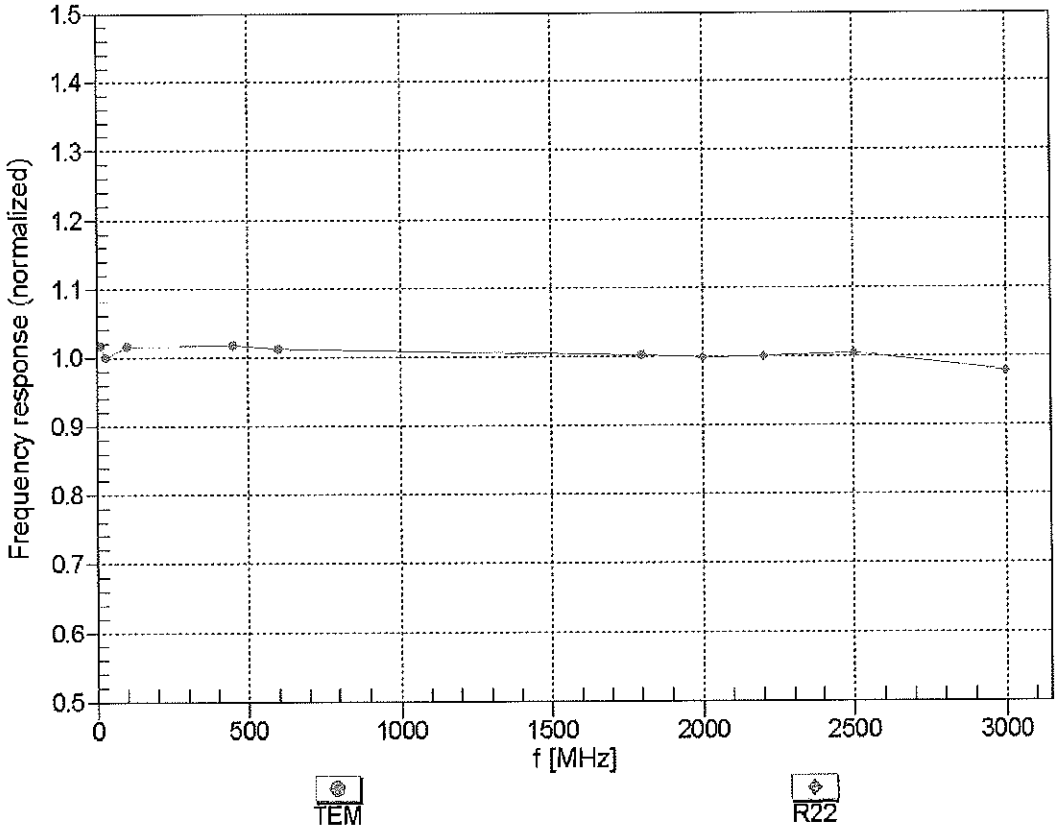
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	55.5	0.96	6.11	6.11	6.11	0.33	1.90	± 12.0 %
850	55.2	0.99	6.07	6.07	6.07	0.80	1.19	± 12.0 %
1750	53.4	1.49	4.95	4.95	4.95	0.80	1.26	± 12.0 %
1900	53.3	1.52	4.71	4.71	4.71	0.49	1.54	± 12.0 %
2450	52.7	1.95	4.22	4.22	4.22	0.80	0.95	± 12.0 %
2600	52.5	2.16	4.16	4.16	4.16	0.80	1.07	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

Frequency Response of E-Field

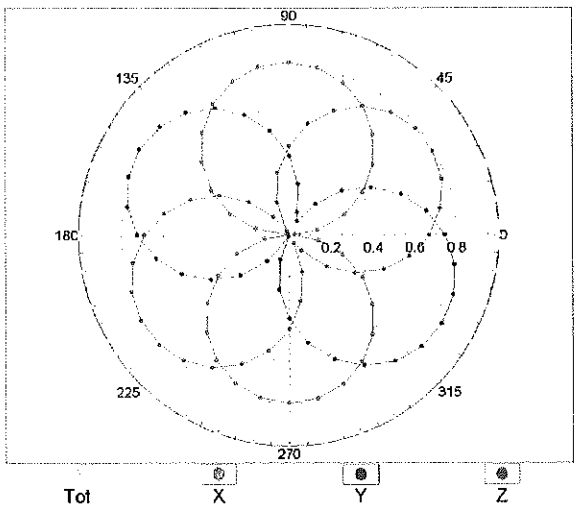
(TEM-Cell:ifi110 EXX, Waveguide: R22)



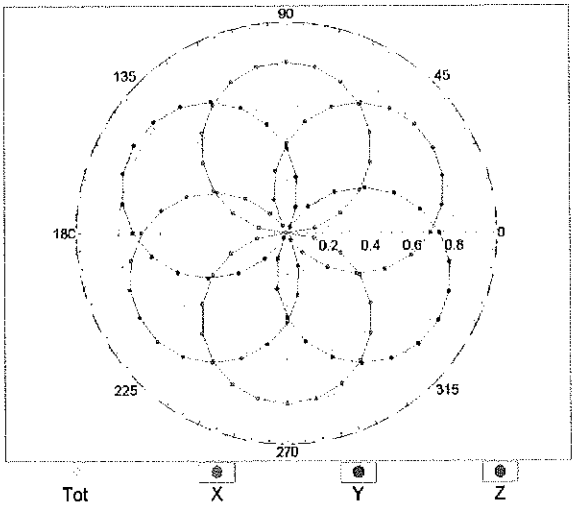
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

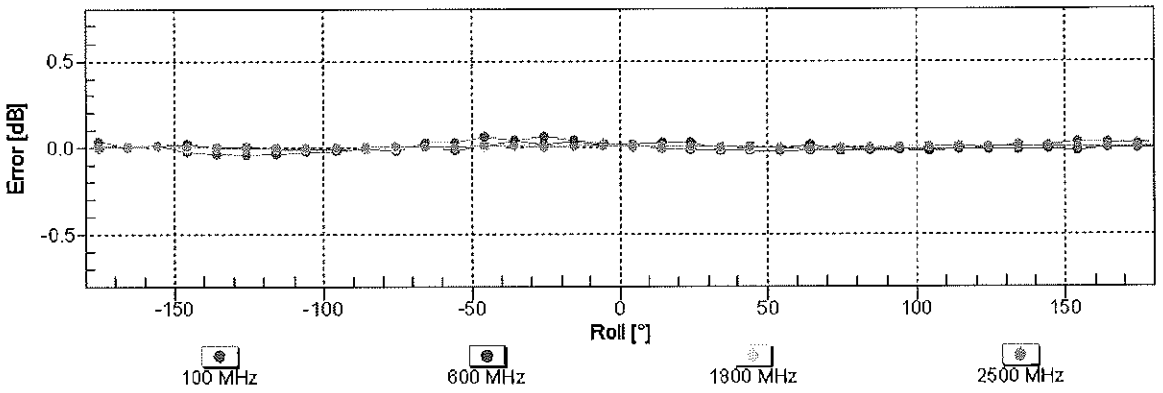
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



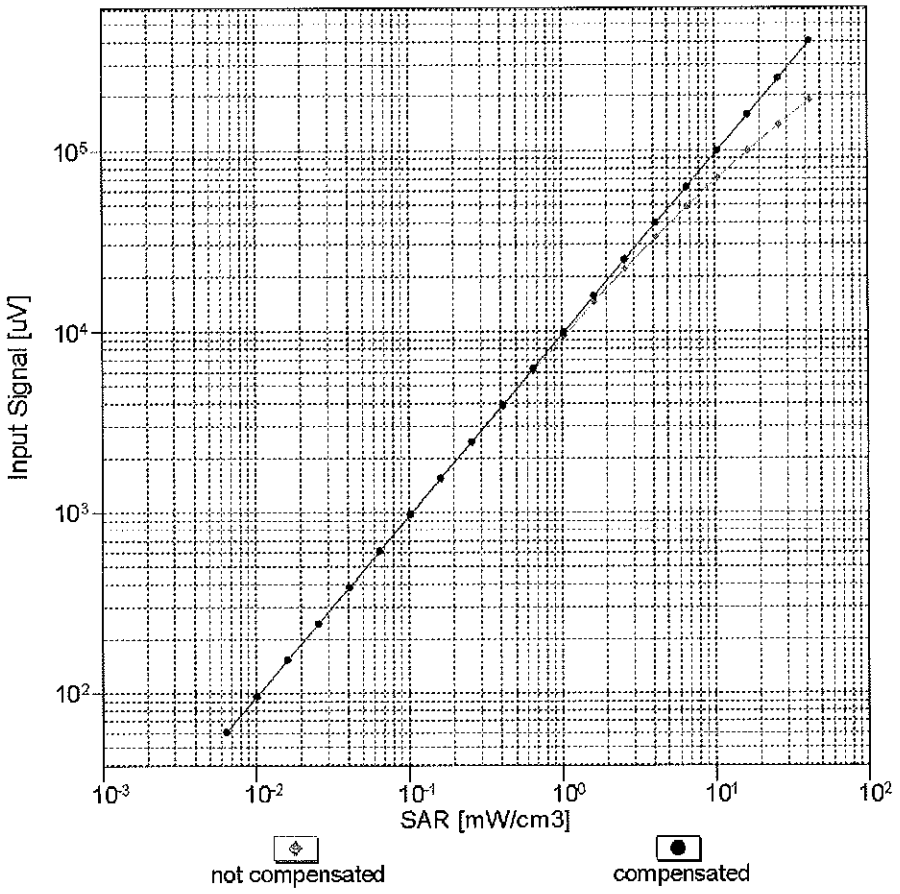
f=1800 MHz,R22

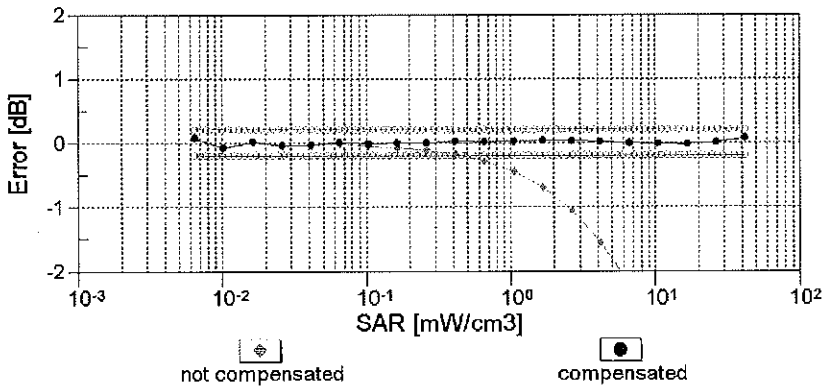




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

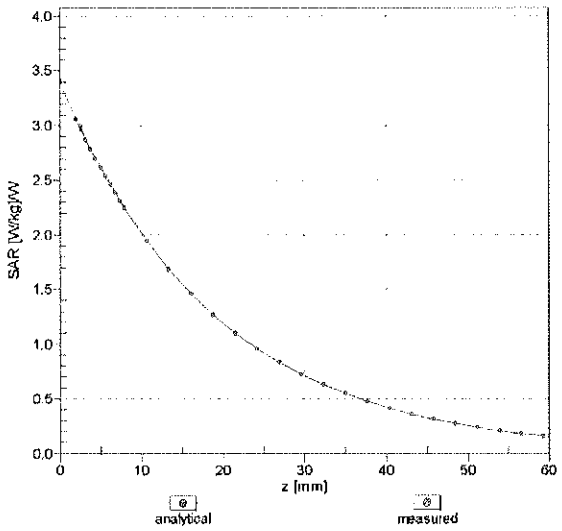




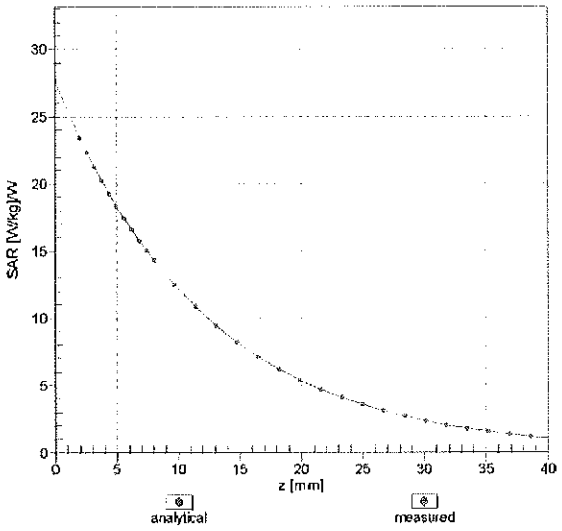
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 850 MHz,WGLS R9 (H_convF)

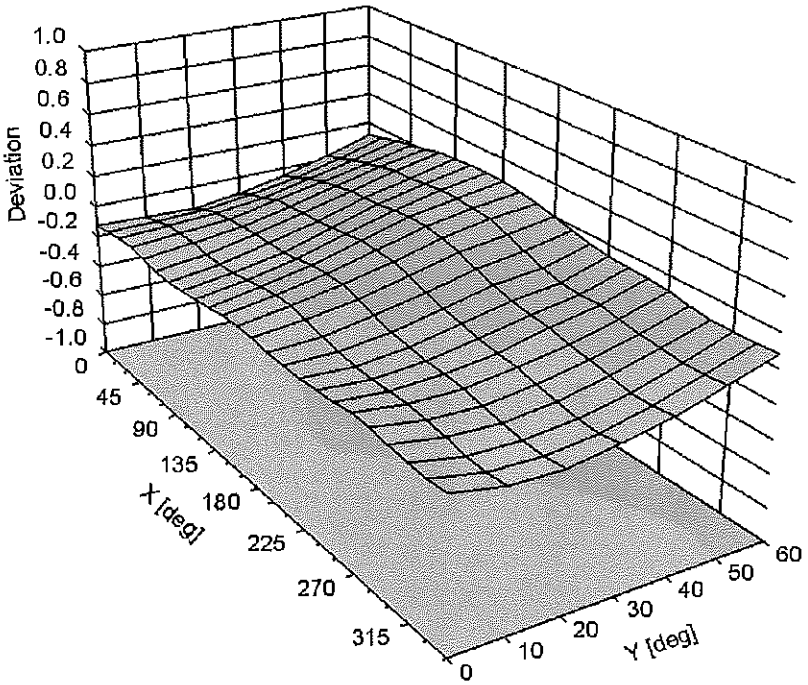


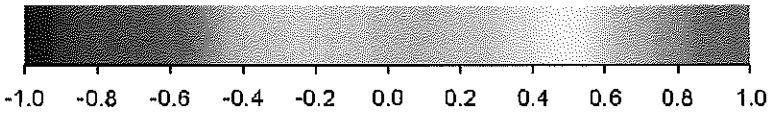
f = 1900 MHz,WGLS R22 (H_convF)



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:3333

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-35.7
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

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Accreditation No.: SCS 108

Client **PC Test**

Certificate No: EX3-3920_Dec13

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3920

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

Calibration date: December 18, 2013

JCC
1/12/14

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
Reference Probe ES3DV2	SN: 3013	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
DAE4	SN: 660	13-Dec-13 (No. DAE4-660_Dec13)	Dec-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-15
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

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

Issued: December 19, 2013

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Accredited by the Swiss Accreditation Service (SAS) **Accreditation No.: SCS 108**
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL	tissue simulating liquid
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, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
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; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *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.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe EX3DV4

SN:3920

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

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

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

Basic Calibration Parameters

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

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	182.5	±2.7 %
		Y	0.0	0.0	1.0		164.9	
		Z	0.0	0.0	1.0		153.0	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	0.76	53.8	6.5	10.00	44.1	±2.2 %
		Y	2.33	62.8	11.4		43.7	
		Z	1.15	55.6	7.5		53.0	
10011-CAA	UMTS-FDD (WCDMA)	X	3.36	66.5	17.5	2.91	142.4	±0.5 %
		Y	3.15	65.0	16.7		131.4	
		Z	3.26	66.0	17.7		121.6	
10012-CAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	2.69	66.4	16.9	1.87	138.1	±0.5 %
		Y	2.56	65.1	16.2		130.7	
		Z	2.72	66.6	17.2		121.4	
10021-DAA	GSM-FDD (TDMA, GMSK)	X	2.06	63.4	11.7	9.39	99.7	±1.9 %
		Y	2.43	66.1	14.1		94.7	
		Z	2.90	69.9	16.1		121.8	
10023-DAA	GPRS-FDD (TDMA, GMSK, TN 0)	X	1.94	62.4	11.3	9.57	95.1	±1.9 %
		Y	2.31	64.8	13.1		90.1	
		Z	2.98	70.4	16.4		117.0	
10024-DAA	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	2.19	67.1	12.2	6.56	140.1	±1.4 %
		Y	2.35	67.0	12.9		134.0	
		Z	3.45	73.5	16.1		131.4	
10027-DAA	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	1.18	61.7	8.5	4.80	121.6	±1.2 %
		Y	1.57	63.4	10.0		116.0	
		Z	1.57	65.5	11.9		109.2	
10028-DAA	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	3.80	74.5	13.3	3.55	130.3	±0.9 %
		Y	1.00	60.5	8.0		123.9	
		Z	1.58	66.1	11.1		119.0	
10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	0.18	55.2	3.4	1.16	111.6	±0.7 %
		Y	0.34	57.4	4.4		143.6	
		Z	0.40	59.2	5.7		136.6	
10039-CAA	CDMA2000 (1xRTT, RC1)	X	4.49	65.9	18.1	4.57	131.8	±0.9 %
		Y	4.57	65.1	17.5		123.0	
		Z	4.66	65.9	18.3		118.6	
10062-CAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps)	X	10.09	68.6	21.3	8.68	126.5	±2.5 %
		Y	10.31	68.5	21.1		121.9	
		Z	10.12	68.3	21.3		115.8	

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

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

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

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

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 8 and 9).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	41.9	0.89	10.05	10.05	10.05	0.27	1.13	± 12.0 %
835	41.5	0.90	9.69	9.69	9.69	0.50	0.76	± 12.0 %
1750	40.1	1.37	7.91	7.91	7.91	0.72	0.62	± 12.0 %
1900	40.0	1.40	7.70	7.70	7.70	0.77	0.61	± 12.0 %
2450	39.2	1.80	6.98	6.98	6.98	0.37	0.86	± 12.0 %
2600	39.0	1.96	6.74	6.74	6.74	0.34	0.97	± 12.0 %
5200	36.0	4.66	4.87	4.87	4.87	0.40	1.80	± 13.1 %
5300	35.9	4.76	4.66	4.66	4.66	0.40	1.80	± 13.1 %
5500	35.6	4.96	4.54	4.54	4.54	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.37	4.37	4.37	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.11	4.11	4.11	0.50	1.80	± 13.1 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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

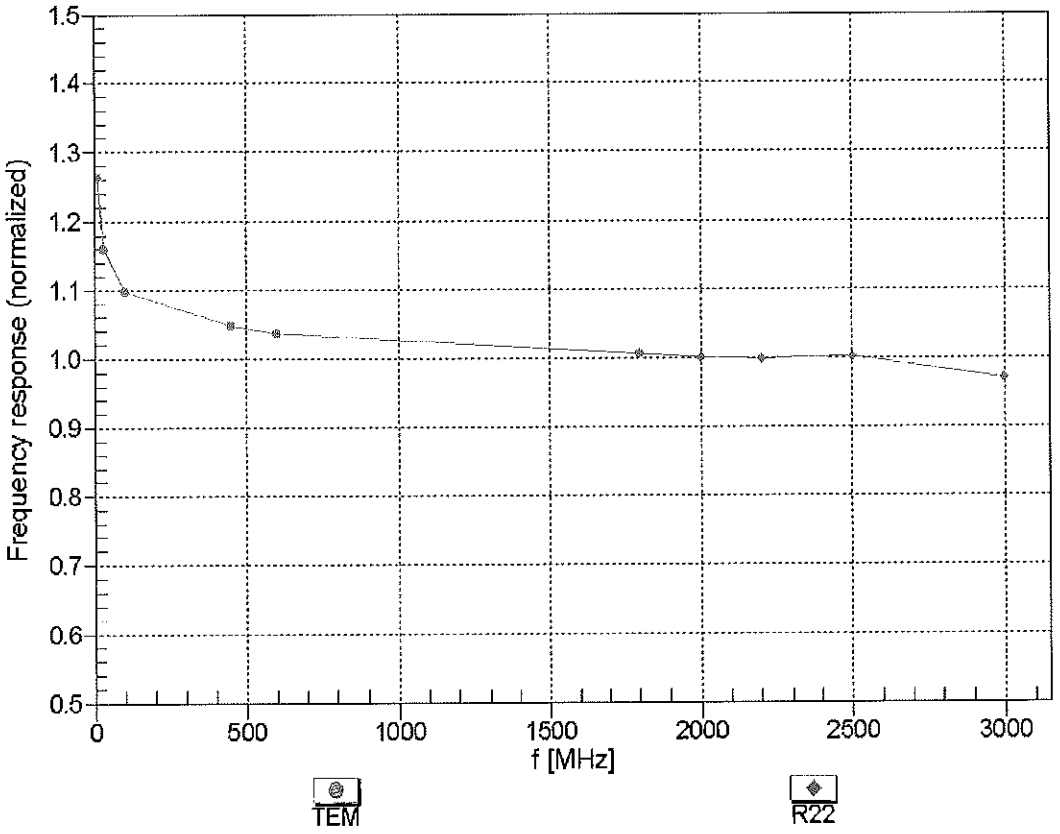
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	55.5	0.96	9.54	9.54	9.54	0.32	1.07	± 12.0 %
835	55.2	0.97	9.47	9.47	9.47	0.45	0.85	± 12.0 %
1750	53.4	1.49	7.77	7.77	7.77	0.59	0.74	± 12.0 %
1900	53.3	1.52	7.50	7.50	7.50	0.37	0.91	± 12.0 %
2450	52.7	1.95	7.18	7.18	7.18	0.80	0.56	± 12.0 %
2600	52.5	2.16	6.91	6.91	6.91	0.80	0.57	± 12.0 %
5200	49.0	5.30	4.23	4.23	4.23	0.50	1.90	± 13.1 %
5300	48.9	5.42	4.11	4.11	4.11	0.50	1.90	± 13.1 %
5500	48.6	5.65	3.80	3.80	3.80	0.50	1.90	± 13.1 %
5600	48.5	5.77	3.62	3.62	3.62	0.50	1.90	± 13.1 %
5800	48.2	6.00	4.00	4.00	4.00	0.50	1.90	± 13.1 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

Frequency Response of E-Field

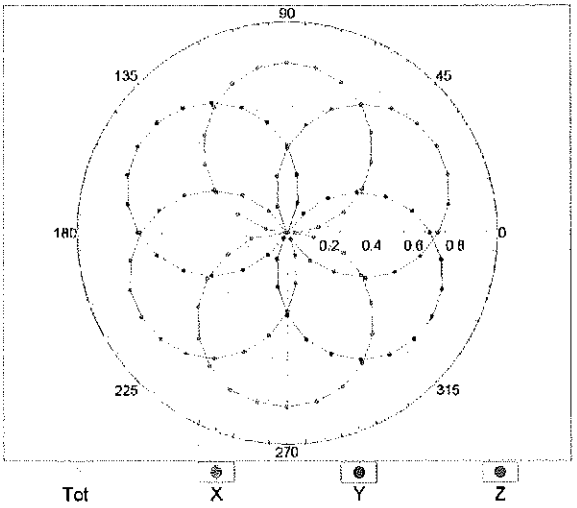
(TEM-Cell:ifi110 EXX, Waveguide: R22)



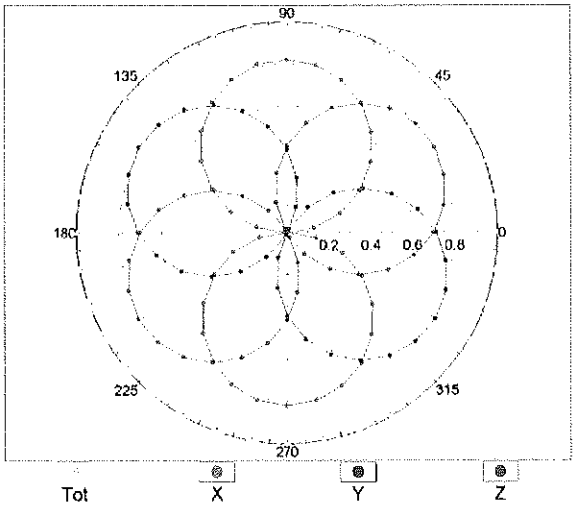
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

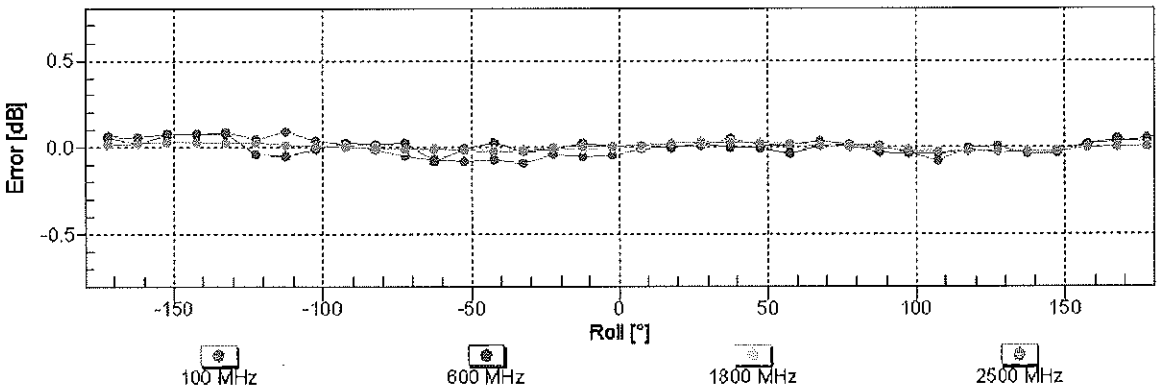
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



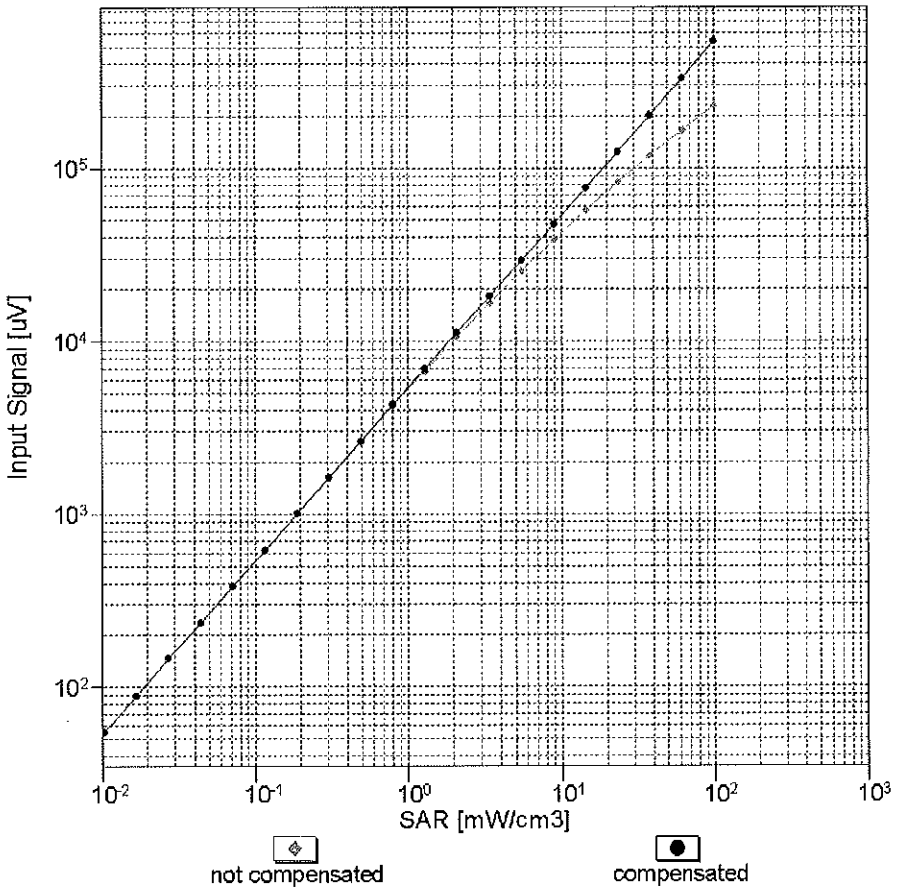
f=1800 MHz,R22

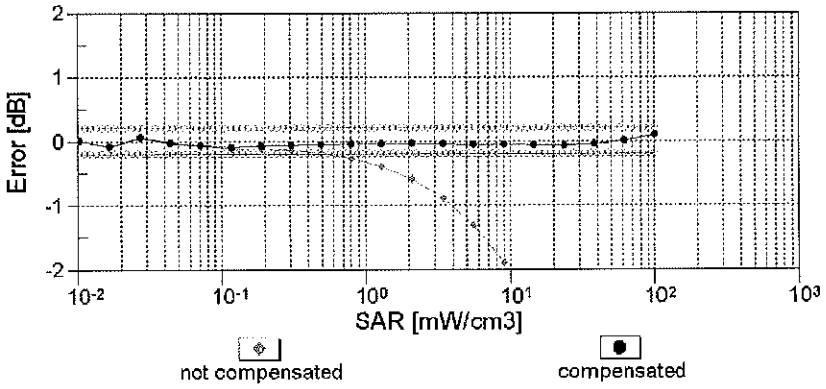




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

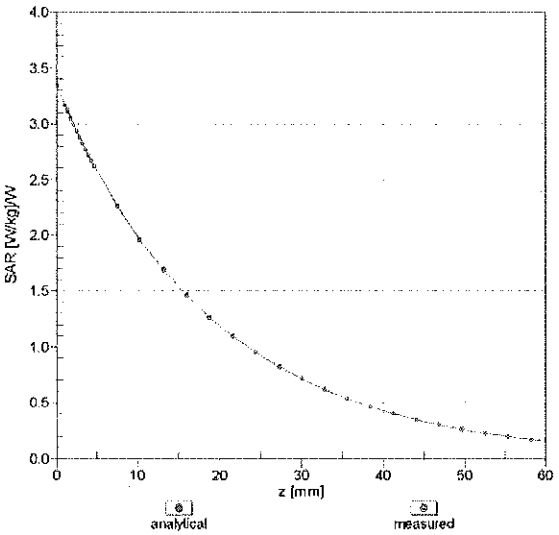




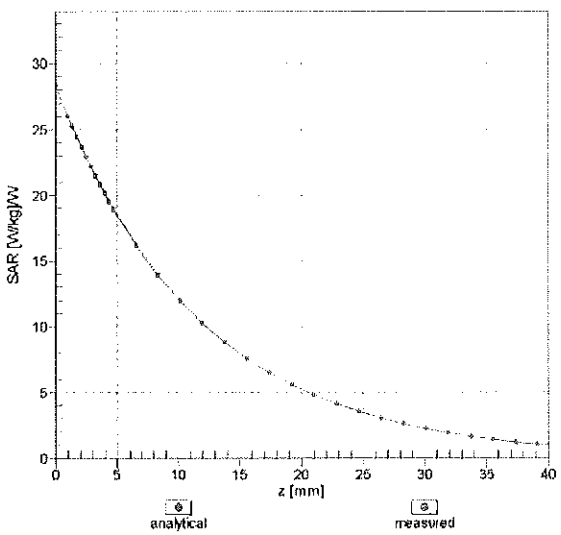
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

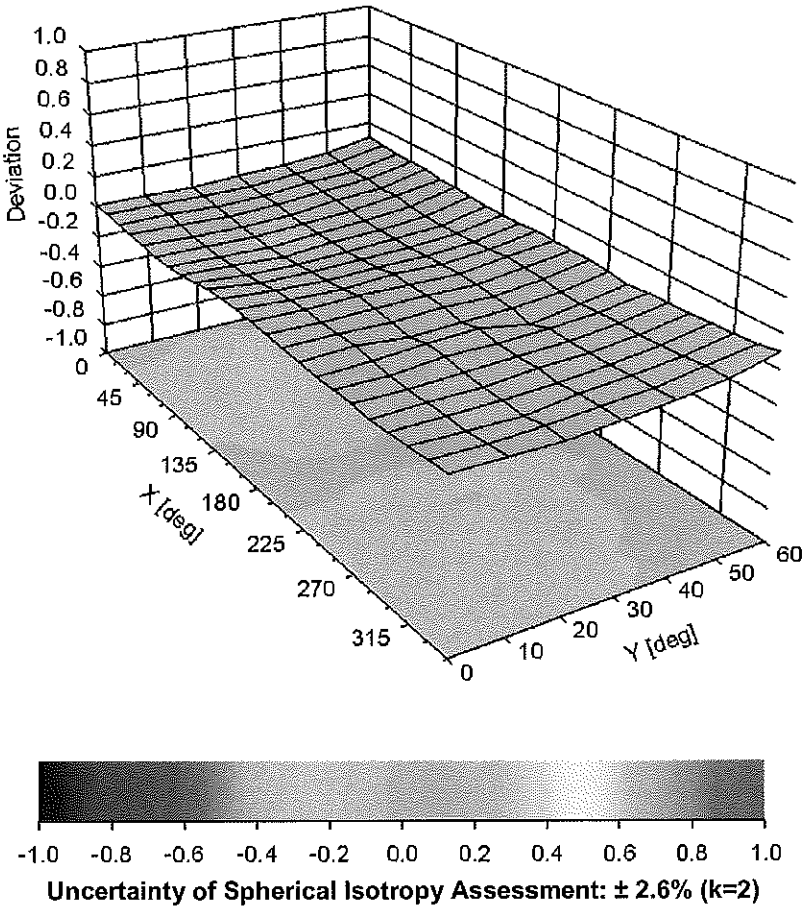


f = 1900 MHz,WGLS R22 (H_convF)



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: EX3DV4 - SN:3920

Other Probe Parameters

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