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SAR EVALUATION REPORT

Applicant Name:
Microsoft Corporation
One Microsoft Way
Redmond, WA 98052

Date of Testing:
02/18/15 – 03/31/15
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Document Serial No.:
0Y1502160488-R1.C3K

FCC ID: **C3K1657**

APPLICANT: **MICROSOFT CORPORATION**

DUT Type: Portable Computing Device
Application Type: Certification
FCC Rule Part(s): CFR §2.1093
Model(s): 1657

Equipment Class	Band & Mode	Tx Frequency	SAR
			1 gm Body (W/kg)
PCB	UMTS 850	826.40 - 846.60 MHz	1.14
PCB	UMTS 1900	1852.4 - 1907.6 MHz	1.29
PCB	LTE Band 17	706.5 - 713.5 MHz	1.23
PCB	LTE Band 13	779.5 - 784.5 MHz	1.34
PCB	LTE Band 5 (Cell)	824.7 - 848.3 MHz	1.24
PCB	LTE Band 4 (AWS)	1710.7 - 1754.3 MHz	1.05
PCB	LTE Band 2 (PCS)	1850.7 - 1909.3 MHz	1.30
Simultaneous SAR per KDB 690783 D01v01r03:			1.51

Note: The table above shows test data evaluated for the current test report. Please refer to WLAN SAR Test Report No. S-TR13-FCCSAR-2 for 2.4/5 GHz WLAN and 2.4 GHz Bluetooth compliance evaluation.

Note: This revised Test Report (S/N: 0Y1502160488-R1.C3K) supersedes and replaces the previously issued test report on the same subject device for the same type of test 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 the above mode of operations for uncontrolled environment/general population exposure SAR limits specified in ANSI/IEEE C95.1-1992 and has been tested in accordance with the measurement procedures specified in Section 1.8 of this report; for North American frequency bands only.

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

Randy Ortanez
President

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

TABLE OF CONTENTS

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 13	Data	779.5 - 784.5 MHz
LTE Band 5 (Cell)	Data	824.7 - 848.3 MHz
LTE Band 4 (AWS)	Data	1710.7 - 1754.3 MHz
LTE Band 2 (PCS)	Data	1850.7 - 1909.3 MHz
2.4 GHz WLAN	Data	2412 - 2462 MHz
U-NII-1	Data	5180 - 5240 MHz
U-NII-2A	Data	5260 - 5320 MHz
U-NII-2C	Data	5500 - 5700 MHz
U-NII-3	Data	5745 - 5825 MHz
Bluetooth	Data	2402 - 2480 MHz

1.2 Power Reduction for SAR

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

Since the device is a full sized portable computing device, the Body SAR was evaluated per FCC KDB Publication 616217 D04 for full sized portable computing devices.

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*	*3GPP Rel 8*
		RMC	*HSDPA*	*HSUPA*	*DC-HSDPA*
UMTS Band 5 (850 MHz)	Maximum	**24.5**	**24.5**	**24.5**	**24.5**
	Nominal	**23.5**	**23.5**	**23.5**	**23.5**
UMTS Band 2 (1900 MHz)	Maximum	**24.5**	**24.5**	**24.5**	**24.5**
	Nominal	**23.5**	**23.5**	**23.5**	**23.5**

Mode / Band		Modulated Average (dBm)
LTE Band 17	Maximum	**24.5**
	Nominal	**23.5**
LTE Band 13	Maximum	**24.0**
	Nominal	**23.0**
LTE Band 5 (Cell)	Maximum	**24.0**
	Nominal	**23.0**
LTE Band 4 (AWS)	Maximum	**25.0**
	Nominal	**24.0**
LTE Band 2 (PCS)	Maximum	**25.0**
	Nominal	**24.0**

1.3.2 Reduced Power (Body at 0.0 cm)

Mode / Band		Modulated Average (dBm)			
		3GPP Rel 99	*3GPP Rel 5*	*3GPP Rel 6*	*3GPP Rel 8*
		RMC	*HSDPA*	*HSUPA*	*DC-HSDPA*
UMTS Band 5 (850 MHz)	Maximum	**22.0**	**22.0**	**22.0**	**22.0**
	Nominal	**21.0**	**21.0**	**21.0**	**21.0**
UMTS Band 2 (1900 MHz)	Maximum	**15.5**	**15.5**	**15.5**	**15.5**
	Nominal	**14.5**	**14.5**	**14.5**	**14.5**

Mode / Band		Modulated Average (dBm)
LTE Band 17	Maximum	**22.5**
	Nominal	**21.5**
LTE Band 13	Maximum	**22.5**
	Nominal	**21.5**
LTE Band 5 (Cell)	Maximum	**22.0**
	Nominal	**21.0**
LTE Band 4 (AWS)	Maximum	**16.5**
	Nominal	**15.5**
LTE Band 2 (PCS)	Maximum	**15.0**
	Nominal	**14.0**

1.4 SAR Test Positioning Based on Form Factor

The device has beveled edges which can be held flat against the user's body. The antenna-adjacent edges of the device were tested for SAR with the device perpendicular to the phantom (e.g. "top" edge) and with the device tilted so the beveled edge is parallel to the phantom surface (e.g. "top tilt").

1.5 DUT Antenna Locations

The overall diagonal dimension of the device is > 200 mm. A diagram showing the location of the device antennas can be found in Appendix F. 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	Top	Top Tilt	Bottom	Bottom Tilt	Right	Right Tilt	Left	Left Tilt
UMTS 850	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UMTS 1900	Yes	Yes	Yes	No	No	No	No	Yes	Yes
LTE Band 17	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LTE Band 13	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LTE Band 5 (Cell)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LTE Band 4 (AWS)	Yes	Yes	Yes	No	No	No	No	Yes	Yes
LTE Band 2 (PCS)	Yes	Yes	Yes	No	No	No	No	Yes	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. Some edges for UMTS 850 and LTE Band 17/13/5 were not required to be evaluated for SAR, but were tested per the manufacturer's request.

1.6 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 1-1 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.

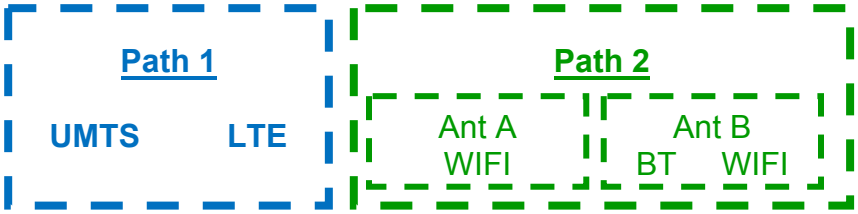


Figure 1-1
Simultaneous Transmission Paths

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	Notes
1	UMTS + WI-FI Ant A	Yes	
2	UMTS + 2.4 GHz Bluetooth	Yes	
3	LTE + WI-FI Ant A	Yes	
4	LTE + 2.4 GHz Bluetooth	Yes	
5	UMTS + WI-FI Ant B	N/A	Not supported by SW
6	LTE + WI-FI Ant B	N/A	Not supported by SW
7	UMTS + WI-FI MIMO (Ant A + B)	N/A	Not supported by SW
8	LTE + WI-FI MIMO (Ant A + B)	N/A	Not supported by SW

1. All licensed modes share the same antenna path and cannot transmit simultaneously.
2. This device supports 2 × 2 MIMO Tx for WLAN 802.11n/ac. WLAN antennas A and B can transmit independently or together.
3. WLAN antenna B cannot transmit simultaneously with any licensed mode.

1.7 Miscellaneous SAR Test Considerations

This report evaluates SAR compliance for UMTS 850 and 1900, and LTE Bands 17, 13, 5, 4, and 2. Please refer to WLAN SAR Test Report No. S-TR13-FCCSAR-2 for 2.4/5 GHz WLAN and 2.4 GHz Bluetooth compliance evaluation.

(A) 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 D01v03.

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 D05v02r03.

This device supports inter-band LTE Carrier Aggregation (CA) in the downlink only. All uplink communications are identical to Release 8 specifications. Per FCC KDB Publication 941225 D05A v01r01, SAR for LTE CA operations was not needed since the maximum average output power in LTE CA mode was not >0.25 dB higher than the maximum output power when downlink carrier aggregation was inactive.

1.8 Guidance Applied

- FCC KDB Publication 941225 D01v03, D05v02r03, D05Av01 (3G/4G)
- 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)

1.9 Device Serial Numbers

Several samples with identical hardware were used to support SAR testing. Power level was configured for testing via software only available to the manufacturer (end user cannot control power level) per KDB 616217. 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.

	Maximum Serial Number	Backoff Serial Number
UMTS 850	000369345152	000369345152
UMTS 1900	000366645152	000366645152
LTE Band 17	000369345152	000369345152
LTE Band 13	0S1303111511	0S1303111511
LTE Band 5 (Cell)	000369345152	000369345152
LTE Band 4 (AWS)	000280445152	000280445152
LTE Band 2 (PCS)	000369345152	000369345152

2 LTE INFORMATION

LTE Information				
FCC ID	**C3K1657**			
Form Factor	Portable Computing Device			
Frequency Range of each LTE transmission band	LTE Band 17 (706.5 - 713.5 MHz)			
	LTE Band 13 (779.5 - 784.5 MHz)			
	LTE Band 5 (Cell) (824.7 - 848.3 MHz)			
	LTE Band 4 (AWS) (1710.7 - 1754.3 MHz)			
	LTE Band 2 (PCS) (1850.7 - 1909.3 MHz)			
Channel Bandwidths	LTE Band 17: 5 MHz, 10 MHz			
	LTE Band 13: 5 MHz, 10 MHz			
	LTE Band 5 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz			
	LTE Band 4 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz			
	LTE Band 2 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz			
Channel Numbers and Frequencies (MHz)	Low	Mid	High	
LTE Band 17: 5 MHz	706.5 (23755)	710 (23790)	713.5 (23825)	
LTE Band 17: 10 MHz	709 (23780)	710 (23790)	711 (23800)	
LTE Band 13: 5 MHz	779.5 (23205)	782 (23230)	784.5 (23255)	
LTE Band 13: 10 MHz	782 (23230)	782 (23230)	782 (23230)	
LTE Band 5 (Cell): 1.4 MHz	824.7 (20407)	836.5 (20525)	848.3 (20643)	
LTE Band 5 (Cell): 3 MHz	825.5 (20415)	836.5 (20525)	847.5 (20635)	
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): 1.4 MHz	1710.7 (19957)	1732.5 (20175)	1754.3 (20393)	
LTE Band 4 (AWS): 3 MHz	1711.5 (19965)	1732.5 (20175)	1753.5 (20385)	
LTE Band 4 (AWS): 5 MHz	1712.5 (19975)	1732.5 (20175)	1752.5 (20375)	
LTE Band 4 (AWS): 10 MHz	1715 (20000)	1732.5 (20175)	1750 (20350)	
LTE Band 4 (AWS): 15 MHz	1717.5 (20025)	1732.5 (20175)	1747.5 (20325)	
LTE Band 4 (AWS): 20 MHz	1720 (20050)	1732.5 (20175)	1745 (20300)	
LTE Band 2 (PCS): 1.4 MHz	1850.7 (18607)	1880 (18900)	1909.3 (19193)	
LTE Band 2 (PCS): 3 MHz	1851.5 (18615)	1880 (18900)	1908.5 (19185)	
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)	
LTE Band 2 (PCS): 15 MHz	1857.5 (18675)	1880 (18900)	1902.5 (19125)	
LTE Band 2 (PCS): 20 MHz	1860 (18700)	1880 (18900)	1900 (19100)	
UE Category	4			
Modulations Supported in UL	QPSK, 16QAM			
LTE MPR Permanently implemented per 3GPP TS 36.101 section 6.2.3~6.2.5? (manufacturer attestation to be provided)	YES			
A-MPR (Additional MPR) disabled for SAR Testing?	YES			
LTE Carrier Aggregation Possible Combinations	*LTE B17 (PCC) + LTE B2 (SCC)*	*LTE B13 (PCC) + LTE B4 (SCC)*	*LTE B4 (PCC) + LTE B29 (SCC)*	*LTE B4 (PCC) + LTE B17 (SCC)*
	5MHz (B17) + 5MHz (B2)	10MHz (B13) + 5MHz (B4)	5MHz (B4) + 3MHz (B29)	5MHz (B4) + 5MHz (B17)
	5MHz (B17) + 10MHz (B2)	10MHz (B13) + 10MHz (B4)	5MHz (B4) + 5MHz (B29)	5MHz (B4) + 10MHz (B17)
	10MHz (B17) + 5MHz (B2)	10MHz (B13) + 15MHz (B4)	5MHz (B4) + 10MHz (B29)	10MHz (B4) + 5MHz (B17)
	10MHz (B17) + 10MHz (B2)	10MHz (B13) + 20MHz (B4)	10MHz (B4) + 3MHz (B29)	10MHz (B4) + 10MHz (B17)
			10MHz (B4) + 5MHz (B29)	
			10MHz (B4) + 10MHz (B29)	
			15MHz (B4) + 3MHz (B29)	
			15MHz (B4) + 5MHz (B29)	
			15MHz (B4) + 10MHz (B29)	
			20MHz (B4) + 3MHz (B29)	
			20MHz (B4) + 5MHz (B29)	
			20MHz (B4) + 10MHz (B29)	
	LTE B4 (PCC) + LTE B13 (SCC)	*LTE B2 (PCC) + LTE B29 (SCC)*	*LTE B2 (PCC) + LTE B17 (SCC)*	
	5MHz (B4) + 10MHz (B13)	10MHz (B2) + 3MHz (B29)	5MHz (B2) + 5MHz (B17)	
	10MHz (B4) + 10MHz (B13)	10MHz (B2) + 5MHz (B29)	5MHz (B2) + 10MHz (B17)	
	15MHz (B4) + 10MHz (B13)	10MHz (B2) + 10MHz (B29)	10MHz (B2) + 5MHz (B17)	
	20MHz (B4) + 10MHz (B13)	15MHz (B2) + 3MHz (B29)	10MHz (B2) + 10MHz (B17)	
		15MHz (B2) + 5MHz (B29)		
		15MHz (B2) + 10MHz (B29)		
		20MHz (B2) + 3MHz (B29)		
		20MHz (B2) + 5MHz (B29)		
		20MHz (B2) + 10MHz (B29)		
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. All uplink communications are identical to the Release 8 Specifications. Uplink communications are done on the PCC. Due to carrier capability, only the combinations listed above are supported. The following LTE Release 10 Features are not supported: Relay, HetNet, Enhanced MIMO, eICI, WIFI Offloading, MDH, eMBMA, Cross-Carrier Scheduling, Enhanced SC-FDMA.			

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:

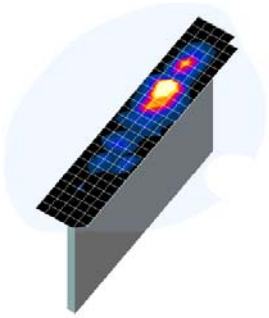


Figure 4-1
Sample SAR Area Scan

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 Portable Computing Device per KDB Publication 616217 D04v01

This device can be used in full sized portable computing device exposure conditions, due to its size. Per FCC KDB 616217, the back surface and edges of the device should be tested for SAR compliance with the device 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 device 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. The antenna-adjacent device edges were additionally tested for SAR with the beveled edges parallel to the phantom surface, with the device tilted rather than perpendicular to the phantom; see Section 1.4 for more information.

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. The sensor activation distances are tabulated for each applicable mode/band in Table 5-1 below. 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.

Table 5-1
Sensor Triggering and SAR Testing Distances

Mode / Band	Back Side distance (mm)		Top Edge distance (mm)		Top Edge Tilt distance (mm)	
	Trigger	***Test condition***	Trigger	***Test condition***	Trigger	***Test condition***
UMTS 850	40	**19**	34	**19**	24	**19**
UMTS 1900	44	**19**	35	**19**	24	**19**
LTE Band 17	39	**19**	32	**19**	23	**19**
LTE Band 13	39	**19**	32	**19**	23	**19**
LTE Band 5 (Cell.)	40	**19**	34	**19**	24	**19**
LTE Band 4 (AWS)	41	**19**	36	**19**	24	**19**
LTE Band 2 (PCS)	44	**19**	35	**19**	24	**19**

NOTE: All applicable modes/bands were tested for back side, top edge, and top edge tilt at a distance of 19 mm per manufacturer request, which is more conservative than that recommended in FCC KDB Publication 616217 D04.

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 for licensed transmitters are 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 3G SAR Test Reduction Procedure

In FCC KDB Publication 941225 D01v03, certain transmission modes within a frequency band and wireless mode evaluated for SAR are defined as primary modes. The equivalent modes considered for SAR test reduction are denoted as secondary modes. When the maximum output power including tune-up tolerance specified for production units in a secondary mode is $\leq$ 0.25 dB higher than the primary mode or when the highest reported SAR of the primary mode, scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode, is $\leq$ 1.2 W/kg, SAR measurements are not required for the secondary mode. These criteria are referred to as the 3G SAR test reduction procedure. When the 3G SAR test reduction procedure is not satisfied, SAR measurements are additionally required for the secondary mode.

7.3 Procedures Used to Establish RF Signal for SAR

The following procedures are according to FCC KDB Publication 941225 D01v03 “3G SAR Measurement Procedures.”

The device is 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 are 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 is 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 deviates by more than 5%, the SAR test and drift measurements are repeated.

7.4 SAR Measurement Conditions for UMTS

7.4.1 Output Power Verification

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, 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.

7.4.2 Body SAR Measurements

SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits all "1s". The 3G SAR test reduction procedure is applied to other spreading codes and multiple $DPDCH_n$ configurations supported by the handset with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured using an applicable RMC configuration with the corresponding spreading code or $DPDCH_n$, for the highest reported SAR configuration in 12.2 kbps RMC.

7.4.3 SAR Measurements with Rel 5 HSDPA

The 3G SAR test reduction procedure is applied to HSDPA body configurations with 12.2 kbps RMC as the primary mode. Otherwise, Body SAR for HSDPA is measured using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, for the highest reported SAR configuration in 12.2 kbps RMC without HSDPA. Handsets with both HSDPA and HSUPA are tested according to Release 6 HSPA test procedures.

7.4.4 SAR Measurements with Rel 6 HSUPA

The 3G SAR test reduction procedure is applied to HSPA (HSUPA/HSDPA with RMC) body configurations with 12.2 kbps RMC as the primary mode. Otherwise, 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 and power control algorithm 2, according to the highest reported body SAR configuration in 12.2 kbps RMC without HSPA.

When VOIP applies to head exposure, the 3G SAR test reduction procedure is applied with 12.2 kbps RMC as the primary mode; otherwise, the same HSPA configuration used for body SAR measurements are applied to head exposure testing.

7.4.5 SAR Measurement Conditions for DC-HSDPA

SAR is required for Rel. 8 DC-HSDPA when SAR is required for Rel. 5 HSDPA; otherwise, the 3G SAR test reduction procedure is applied to DC-HSDPA with 12.2 kbps RMC as the primary mode. Power is measured for DC-HSDPA according to the H-Set 12, FRC configuration in Table C.8.1.12 of 3GPP TS 34.121-1 to determine SAR test reduction. A primary and a secondary serving HS-DSCH Cell are required to perform the power measurement and for the results to be acceptable.

7.5 SAR Measurement Conditions for LTE

LTE modes are tested according to FCC KDB 941225 D05v02r03 publication. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The R&S CMW500 or Anritsu MT8820C simulators are 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).

7.5.1 Spectrum Plots for RB Configurations

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

7.5.2 MPR

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

7.5.3 A-MPR

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

7.5.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05v02r03:

a. Per Section 4.2.1, 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 4.2.2, SAR is required for 50% RB allocation using the largest bandwidth following the same procedures outlined in Section 5.2.1.
c. Per Section 4.2.3, 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 4.2.4 and 4.3, 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.

7.5.5 Downlink Carrier Aggregation

LTE Carrier Aggregation (CA) measurements are 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 are 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 KDB Publication 941225 D05A v01r01, no SAR measurements are required when the average output power with downlink carrier aggregation active is not more than 0.25 dB higher than the average output power with downlink carrier aggregation inactive.

8 RF CONDUCTED POWERS

8.1 UMTS Conducted Powers

Table 8-1
Maximum Average RF Output Powers

3GPP Release Version	Mode	3GPP 34.121 Subtest	Cellular Band [dBm]			PCS Band [dBm]			3GPP MPR [dB]
			4132	4183	4233	9262	9400	9538	
99	WCDMA	12.2 kbps RMC	23.42	23.45	23.35	23.41	23.17	23.10	-
6	HSDPA	Subtest 1	23.03	23.04	23.00	23.19	23.04	22.95	0
6		Subtest 2	22.55	22.66	22.62	22.73	22.58	22.46	0
6		Subtest 3	21.96	22.10	22.08	22.24	22.04	21.94	0.5
6		Subtest 4	21.72	21.81	21.74	21.95	21.76	21.71	0.5
6	HSUPA	Subtest 1	22.10	22.04	22.20	22.51	22.34	22.19	0
6		Subtest 2	20.05	20.24	20.30	20.67	20.53	20.32	2
6		Subtest 3	21.27	21.32	21.32	21.34	21.37	21.30	1
6		Subtest 4	20.50	20.57	20.57	20.83	20.73	20.51	2
6		Subtest 5	22.03	22.26	22.05	22.56	22.32	22.17	0
8	DC-HSDPA	Subtest 1	22.94	22.96	22.95	23.15	22.94	22.79	0
8		Subtest 2	22.94	22.98	22.96	23.14	22.95	22.82	0
8		Subtest 3	22.45	22.52	22.47	22.62	22.47	22.29	0.5
8		Subtest 4	22.44	22.49	22.43	22.61	22.49	22.20	0.5

Table 8-2
Reduced Average RF Output Powers – Body at 0.0 cm

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	21.33	21.35	21.32	15.32	15.33	15.01	-
6	HSDPA	Subtest 1	21.04	21.16	21.13	15.48	15.36	15.14	0
6		Subtest 2	21.06	21.15	21.08	15.47	15.33	15.14	0
6		Subtest 3	20.50	20.55	20.53	14.92	14.78	14.62	0.5
6		Subtest 4	20.19	20.37	20.32	14.73	14.58	14.39	0.5
6	HSUPA	Subtest 1	19.78	19.86	19.82	14.61	14.42	14.24	0
6		Subtest 2	18.44	18.56	18.52	12.78	12.64	12.58	2
6		Subtest 3	19.62	19.53	19.54	14.11	13.97	13.73	1
6		Subtest 4	18.28	18.36	18.33	13.13	12.99	12.72	2
6		Subtest 5	19.71	19.58	19.63	15.00	14.89	14.77	0
8	DC-HSDPA	Subtest 1	20.94	21.04	20.96	15.21	15.02	14.78	0
8		Subtest 2	20.95	21.03	20.96	15.17	15.03	14.77	0
8		Subtest 3	20.94	21.03	20.98	15.21	15.01	14.79	0.5
8		Subtest 4	20.94	21.05	20.95	15.22	15.03	14.78	0.5

DC-HSDPA considerations

- 3GPP Specification 34.121-1 Release 8 Ver 8.10.0 was used for DC-HSDPA guidance
- H-Set 12 (QPSK) was confirmed to be used during DC-HSDPA measurements
- The DUT supports UE category 24 for HSDPA

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Mid	710.0	23790	10	QPSK	1	0	22.90	23.5
	710.0	23790	10	QPSK	1	25	**22.96**	23.5
	710.0	23790	10	QPSK	1	49	22.88	23.5
	710.0	23790	10	QPSK	25	0	22.25	22.5
	710.0	23790	10	QPSK	25	12	**22.26**	22.5
	710.0	23790	10	QPSK	25	25	22.25	22.5
	710.0	23790	10	QPSK	50	0	22.25	22.5
	710.0	23790	10	16QAM	1	0	22.43	22.5
	710.0	23790	10	16QAM	1	25	22.49	22.5
	710.0	23790	10	16QAM	1	49	22.50	22.5
	710.0	23790	10	16QAM	25	0	21.30	21.5
	710.0	23790	10	16QAM	25	12	21.27	21.5
	710.0	23790	10	16QAM	25	25	21.28	21.5
	710.0	23790	10	16QAM	50	0	21.27	21.5

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Mid	710.0	23790	5	QPSK	1	0	23.23	23.5
	710.0	23790	5	QPSK	1	12	22.89	23.5
	710.0	23790	5	QPSK	1	24	23.21	23.5
	710.0	23790	5	QPSK	12	0	22.28	22.5
	710.0	23790	5	QPSK	12	6	22.12	22.5
	710.0	23790	5	QPSK	12	13	22.29	22.5
	710.0	23790	5	QPSK	25	0	22.27	22.5
	710.0	23790	5	16-QAM	1	0	22.43	22.5
	710.0	23790	5	16-QAM	1	12	22.48	22.5
	710.0	23790	5	16-QAM	1	24	22.44	22.5
	710.0	23790	5	16-QAM	12	0	21.39	21.5
	710.0	23790	5	16-QAM	12	6	21.19	21.5
	710.0	23790	5	16-QAM	12	13	21.32	21.5
	710.0	23790	5	16-QAM	25	0	21.31	21.5

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 0.0 cm

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Mid	710.0	23790	10	QPSK	1	0	21.42	21.5
	710.0	23790	10	QPSK	1	25	**21.55**	21.5
	710.0	23790	10	QPSK	1	49	21.39	21.5
	710.0	23790	10	QPSK	25	0	20.81	20.5
	710.0	23790	10	QPSK	25	12	**20.83**	20.5
	710.0	23790	10	QPSK	25	25	20.71	20.5
	710.0	23790	10	QPSK	50	0	**20.80**	20.5
	710.0	23790	10	16QAM	1	0	20.92	20.5
	710.0	23790	10	16QAM	1	25	21.00	20.5
	710.0	23790	10	16QAM	1	49	20.95	20.5
	710.0	23790	10	16QAM	25	0	19.88	19.5
	710.0	23790	10	16QAM	25	12	19.85	19.5
	710.0	23790	10	16QAM	25	25	19.81	19.5
	710.0	23790	10	16QAM	50	0	19.85	19.5

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 0.0 cm

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Mid	710.0	23790	5	QPSK	1	0	21.74	21.5
	710.0	23790	5	QPSK	1	12	21.46	21.5
	710.0	23790	5	QPSK	1	24	21.80	21.5
	710.0	23790	5	QPSK	12	0	20.86	20.5
	710.0	23790	5	QPSK	12	6	20.67	20.5
	710.0	23790	5	QPSK	12	13	20.81	20.5
	710.0	23790	5	QPSK	25	0	20.82	20.5
	710.0	23790	5	16-QAM	1	0	20.96	20.5
	710.0	23790	5	16-QAM	1	12	21.00	20.5
	710.0	23790	5	16-QAM	1	24	20.81	20.5
	710.0	23790	5	16-QAM	12	0	19.99	19.5
	710.0	23790	5	16-QAM	12	6	19.79	19.5
	710.0	23790	5	16-QAM	12	13	19.99	19.5
	710.0	23790	5	16-QAM	25	0	19.96	19.5

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 13

Table 8-7
LTE Band 13 Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Mid	782.0	23230	10	QPSK	1	0	**23.16**	23.0
	782.0	23230	10	QPSK	1	25	22.98	23.0
	782.0	23230	10	QPSK	1	49	22.74	23.0
	782.0	23230	10	QPSK	25	0	**22.19**	22.0
	782.0	23230	10	QPSK	25	12	22.16	22.0
	782.0	23230	10	QPSK	25	25	22.06	22.0
	782.0	23230	10	QPSK	50	0	22.12	22.0
	782.0	23230	10	16QAM	1	0	22.84	22.0
	782.0	23230	10	16QAM	1	25	22.55	22.0
	782.0	23230	10	16QAM	1	49	22.32	22.0
	782.0	23230	10	16QAM	25	0	21.39	21.0
	782.0	23230	10	16QAM	25	12	21.32	21.0
	782.0	23230	10	16QAM	25	25	21.31	21.0
	782.0	23230	10	16QAM	50	0	21.36	21.0

Table 8-8
LTE Band 13 Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Mid	782.0	23230	5	QPSK	1	0	23.13	23.0
	782.0	23230	5	QPSK	1	12	22.74	23.0
	782.0	23230	5	QPSK	1	24	23.07	23.0
	782.0	23230	5	QPSK	12	0	21.95	22.0
	782.0	23230	5	QPSK	12	6	21.81	22.0
	782.0	23230	5	QPSK	12	13	21.89	22.0
	782.0	23230	5	QPSK	25	0	21.90	22.0
	782.0	23230	5	16-QAM	1	0	22.42	22.0
	782.0	23230	5	16-QAM	1	12	22.36	22.0
	782.0	23230	5	16-QAM	1	24	22.15	22.0
	782.0	23230	5	16-QAM	12	0	21.12	21.0
	782.0	23230	5	16-QAM	12	6	21.00	21.0
	782.0	23230	5	16-QAM	12	13	21.07	21.0
	782.0	23230	5	16-QAM	25	0	21.10	21.0

Note: LTE Band 13 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 8-9
LTE Band 13 Conducted Powers - 10 MHz Bandwidth
Reduced Power – Body at 0.0 cm

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Mid	782.0	23230	10	QPSK	1	0	**22.23**	21.5
	782.0	23230	10	QPSK	1	25	21.76	21.5
	782.0	23230	10	QPSK	1	49	21.27	21.5
	782.0	23230	10	QPSK	25	0	**20.88**	20.5
	782.0	23230	10	QPSK	25	12	20.86	20.5
	782.0	23230	10	QPSK	25	25	20.85	20.5
	782.0	23230	10	QPSK	50	0	**20.86**	20.5
	782.0	23230	10	16QAM	1	0	21.49	20.5
	782.0	23230	10	16QAM	1	25	21.30	20.5
	782.0	23230	10	16QAM	1	49	20.71	20.5
	782.0	23230	10	16QAM	25	0	20.05	19.5
	782.0	23230	10	16QAM	25	12	19.95	19.5
	782.0	23230	10	16QAM	25	25	19.92	19.5
	782.0	23230	10	16QAM	50	0	19.95	19.5

Table 8-10
LTE Band 13 Conducted Powers - 5 MHz Bandwidth
Reduced Power – Body at 0.0 cm

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Mid	782.0	23230	5	QPSK	1	0	22.01	21.5
	782.0	23230	5	QPSK	1	12	21.68	21.5
	782.0	23230	5	QPSK	1	24	21.97	21.5
	782.0	23230	5	QPSK	12	0	20.82	20.5
	782.0	23230	5	QPSK	12	6	20.69	20.5
	782.0	23230	5	QPSK	12	13	20.77	20.5
	782.0	23230	5	QPSK	25	0	20.77	20.5
	782.0	23230	5	16-QAM	1	0	21.44	20.5
	782.0	23230	5	16-QAM	1	12	20.84	20.5
	782.0	23230	5	16-QAM	1	24	21.17	20.5
	782.0	23230	5	16-QAM	12	0	20.12	19.5
	782.0	23230	5	16-QAM	12	6	19.94	19.5
	782.0	23230	5	16-QAM	12	13	19.91	19.5
	782.0	23230	5	16-QAM	25	0	19.94	19.5

Note: LTE Band 13 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.

8.2.3 LTE Band 5 (Cell)

Table 8-11
LTE Band 5 (Cell) Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Mid	836.5	20525	10	QPSK	1	0	22.71	23.0
	836.5	20525	10	QPSK	1	25	**22.73**	23.0
	836.5	20525	10	QPSK	1	49	22.54	23.0
	836.5	20525	10	QPSK	25	0	**22.00**	22.0
	836.5	20525	10	QPSK	25	12	21.97	22.0
	836.5	20525	10	QPSK	25	25	21.98	22.0
	836.5	20525	10	QPSK	50	0	21.96	22.0
	836.5	20525	10	16QAM	1	0	22.35	22.0
	836.5	20525	10	16QAM	1	25	22.24	22.0
	836.5	20525	10	16QAM	1	49	22.18	22.0
	836.5	20525	10	16QAM	25	0	21.00	21.0
	836.5	20525	10	16QAM	25	12	20.99	21.0
	836.5	20525	10	16QAM	25	25	20.97	21.0
	836.5	20525	10	16QAM	50	0	20.98	21.0

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 8-12
LTE Band 5 (Cell) Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	826.5	20425	5	QPSK	1	0	22.84	23.0
	826.5	20425	5	QPSK	1	12	22.50	23.0
	826.5	20425	5	QPSK	1	24	22.87	23.0
	826.5	20425	5	QPSK	12	0	21.95	22.0
	826.5	20425	5	QPSK	12	6	21.84	22.0
	826.5	20425	5	QPSK	12	13	21.93	22.0
	826.5	20425	5	QPSK	25	0	21.97	22.0
	826.5	20425	5	16-QAM	1	0	22.35	22.0
	826.5	20425	5	16-QAM	1	12	22.07	22.0
	826.5	20425	5	16-QAM	1	24	22.44	22.0
	826.5	20425	5	16-QAM	12	0	21.01	21.0
	826.5	20425	5	16-QAM	12	6	20.85	21.0
	826.5	20425	5	16-QAM	12	13	21.01	21.0
	826.5	20425	5	16-QAM	25	0	20.98	21.0
Mid	836.5	20525	5	QPSK	1	0	22.88	23.0
	836.5	20525	5	QPSK	1	12	22.54	23.0
	836.5	20525	5	QPSK	1	24	22.80	23.0
	836.5	20525	5	QPSK	12	0	21.95	22.0
	836.5	20525	5	QPSK	12	6	21.83	22.0
	836.5	20525	5	QPSK	12	13	21.93	22.0
	836.5	20525	5	QPSK	25	0	21.96	22.0
	836.5	20525	5	16-QAM	1	0	22.33	22.0
	836.5	20525	5	16-QAM	1	12	22.11	22.0
	836.5	20525	5	16-QAM	1	24	22.45	22.0
	836.5	20525	5	16-QAM	12	0	21.07	21.0
	836.5	20525	5	16-QAM	12	6	20.86	21.0
	836.5	20525	5	16-QAM	12	13	21.01	21.0
	836.5	20525	5	16-QAM	25	0	20.94	21.0
High	846.5	20625	5	QPSK	1	0	23.05	23.0
	846.5	20625	5	QPSK	1	12	22.56	23.0
	846.5	20625	5	QPSK	1	24	22.85	23.0
	846.5	20625	5	QPSK	12	0	21.82	22.0
	846.5	20625	5	QPSK	12	6	21.65	22.0
	846.5	20625	5	QPSK	12	13	21.77	22.0
	846.5	20625	5	QPSK	25	0	21.76	22.0
	846.5	20625	5	16-QAM	1	0	22.24	22.0
	846.5	20625	5	16-QAM	1	12	21.76	22.0
	846.5	20625	5	16-QAM	1	24	22.00	22.0
	846.5	20625	5	16-QAM	12	0	20.88	21.0
	846.5	20625	5	16-QAM	12	6	20.71	21.0
	846.5	20625	5	16-QAM	12	13	20.76	21.0
	846.5	20625	5	16-QAM	25	0	20.84	21.0

Table 8-13
LTE Band 5 (Cell) Conducted Powers - 3 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	825.5	20415	3	QPSK	1	0	22.62	23.0
	825.5	20415	3	QPSK	1	7	22.60	23.0
	825.5	20415	3	QPSK	1	14	22.59	23.0
	825.5	20415	3	QPSK	8	0	21.98	22.0
	825.5	20415	3	QPSK	8	4	21.97	22.0
	825.5	20415	3	QPSK	8	7	21.99	22.0
	825.5	20415	3	QPSK	15	0	21.94	22.0
	825.5	20415	3	16-QAM	1	0	22.16	22.0
	825.5	20415	3	16-QAM	1	7	22.23	22.0
	825.5	20415	3	16-QAM	1	14	22.11	22.0
	825.5	20415	3	16-QAM	8	0	20.98	21.0
	825.5	20415	3	16-QAM	8	4	21.02	21.0
	825.5	20415	3	16-QAM	8	7	21.02	21.0
	825.5	20415	3	16-QAM	15	0	20.88	21.0
Mid	836.5	20525	3	QPSK	1	0	22.65	23.0
	836.5	20525	3	QPSK	1	7	22.67	23.0
	836.5	20525	3	QPSK	1	14	22.66	23.0
	836.5	20525	3	QPSK	8	0	22.03	22.0
	836.5	20525	3	QPSK	8	4	21.93	22.0
	836.5	20525	3	QPSK	8	7	21.93	22.0
	836.5	20525	3	QPSK	15	0	22.01	22.0
	836.5	20525	3	16-QAM	1	0	22.13	22.0
	836.5	20525	3	16-QAM	1	7	22.12	22.0
	836.5	20525	3	16-QAM	1	14	22.22	22.0
	836.5	20525	3	16-QAM	8	0	20.99	21.0
	836.5	20525	3	16-QAM	8	4	20.97	21.0
	836.5	20525	3	16-QAM	8	7	20.87	21.0
	836.5	20525	3	16-QAM	15	0	20.93	21.0
High	847.5	20635	3	QPSK	1	0	22.58	23.0
	847.5	20635	3	QPSK	1	7	22.51	23.0
	847.5	20635	3	QPSK	1	14	22.54	23.0
	847.5	20635	3	QPSK	8	0	21.80	22.0
	847.5	20635	3	QPSK	8	4	21.74	22.0
	847.5	20635	3	QPSK	8	7	21.74	22.0
	847.5	20635	3	QPSK	15	0	21.79	22.0
	847.5	20635	3	16-QAM	1	0	22.32	22.0
	847.5	20635	3	16-QAM	1	7	22.02	22.0
	847.5	20635	3	16-QAM	1	14	21.79	22.0
	847.5	20635	3	16-QAM	8	0	20.91	21.0
	847.5	20635	3	16-QAM	8	4	20.83	21.0
	847.5	20635	3	16-QAM	8	7	20.90	21.0
	847.5	20635	3	16-QAM	15	0	20.80	21.0

Table 8-14
LTE Band 5 (Cell) Conducted Powers -1.4 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	824.7	20407	1.4	QPSK	1	0	22.73	23.0
	824.7	20407	1.4	QPSK	1	2	22.70	23.0
	824.7	20407	1.4	QPSK	1	5	22.74	23.0
	824.7	20407	1.4	QPSK	3	0	22.71	23.0
	824.7	20407	1.4	QPSK	3	2	22.63	23.0
	824.7	20407	1.4	QPSK	3	3	22.75	23.0
	824.7	20407	1.4	QPSK	6	0	21.99	22.0
	824.7	20407	1.4	16-QAM	1	0	22.14	22.0
	824.7	20407	1.4	16-QAM	1	2	22.32	22.0
	824.7	20407	1.4	16-QAM	1	5	22.29	22.0
	824.7	20407	1.4	16-QAM	3	0	22.09	22.0
	824.7	20407	1.4	16-QAM	3	2	22.09	22.0
	824.7	20407	1.4	16-QAM	3	3	22.20	22.0
	824.7	20407	1.4	16-QAM	6	0	21.11	21.0
Mid	836.5	20525	1.4	QPSK	1	0	22.64	23.0
	836.5	20525	1.4	QPSK	1	2	22.71	23.0
	836.5	20525	1.4	QPSK	1	5	22.73	23.0
	836.5	20525	1.4	QPSK	3	0	22.72	23.0
	836.5	20525	1.4	QPSK	3	2	22.69	23.0
	836.5	20525	1.4	QPSK	3	3	22.63	23.0
	836.5	20525	1.4	QPSK	6	0	21.98	22.0
	836.5	20525	1.4	16-QAM	1	0	22.07	22.0
	836.5	20525	1.4	16-QAM	1	2	22.32	22.0
	836.5	20525	1.4	16-QAM	1	5	22.11	22.0
	836.5	20525	1.4	16-QAM	3	0	22.29	22.0
	836.5	20525	1.4	16-QAM	3	2	22.10	22.0
	836.5	20525	1.4	16-QAM	3	3	22.12	22.0
	836.5	20525	1.4	16-QAM	6	0	21.10	21.0
High	848.3	20643	1.4	QPSK	1	0	22.60	23.0
	848.3	20643	1.4	QPSK	1	2	22.53	23.0
	848.3	20643	1.4	QPSK	1	5	22.51	23.0
	848.3	20643	1.4	QPSK	3	0	22.59	23.0
	848.3	20643	1.4	QPSK	3	2	22.50	23.0
	848.3	20643	1.4	QPSK	3	3	22.54	23.0
	848.3	20643	1.4	QPSK	6	0	21.70	22.0
	848.3	20643	1.4	16-QAM	1	0	22.30	22.0
	848.3	20643	1.4	16-QAM	1	2	22.21	22.0
	848.3	20643	1.4	16-QAM	1	5	22.32	22.0
	848.3	20643	1.4	16-QAM	3	0	21.85	22.0
	848.3	20643	1.4	16-QAM	3	2	21.88	22.0
	848.3	20643	1.4	16-QAM	3	3	21.97	22.0
	848.3	20643	1.4	16-QAM	6	0	20.68	21.0

Table 8-15
LTE Band 5 (Cell) Conducted Powers - 10 MHz Bandwidth
Reduced Power – Body at 0.0 cm

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Mid	836.5	20525	10	QPSK	1	0	21.20	21.0
	836.5	20525	10	QPSK	1	25	**21.29**	21.0
	836.5	20525	10	QPSK	1	49	21.09	21.0
	836.5	20525	10	QPSK	25	0	**20.48**	20.0
	836.5	20525	10	QPSK	25	12	20.41	20.0
	836.5	20525	10	QPSK	25	25	20.42	20.0
	836.5	20525	10	QPSK	50	0	**20.41**	20.0
	836.5	20525	10	16QAM	1	0	20.48	20.0
	836.5	20525	10	16QAM	1	25	20.46	20.0
	836.5	20525	10	16QAM	1	49	20.48	20.0
	836.5	20525	10	16QAM	25	0	19.47	19.0
	836.5	20525	10	16QAM	25	12	19.44	19.0
	836.5	20525	10	16QAM	25	25	19.45	19.0
	836.5	20525	10	16QAM	50	0	19.39	19.0

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 8-16
LTE Band 5 (Cell) Conducted Powers - 5 MHz Bandwidth
Reduced Power – Body at 0.0 cm

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	826.5	20425	5	QPSK	1	0	21.34	21.0
	826.5	20425	5	QPSK	1	12	20.93	21.0
	826.5	20425	5	QPSK	1	24	21.30	21.0
	826.5	20425	5	QPSK	12	0	20.37	20.0
	826.5	20425	5	QPSK	12	6	20.26	20.0
	826.5	20425	5	QPSK	12	13	20.39	20.0
	826.5	20425	5	QPSK	25	0	20.38	20.0
	826.5	20425	5	16-QAM	1	0	20.50	20.0
	826.5	20425	5	16-QAM	1	12	20.38	20.0
	826.5	20425	5	16-QAM	1	24	20.48	20.0
	826.5	20425	5	16-QAM	12	0	19.40	19.0
	826.5	20425	5	16-QAM	12	6	19.20	19.0
	826.5	20425	5	16-QAM	12	13	19.37	19.0
	826.5	20425	5	16-QAM	25	0	19.37	19.0
Mid	836.5	20525	5	QPSK	1	0	21.34	21.0
	836.5	20525	5	QPSK	1	12	21.03	21.0
	836.5	20525	5	QPSK	1	24	21.26	21.0
	836.5	20525	5	QPSK	12	0	20.41	20.0
	836.5	20525	5	QPSK	12	6	20.22	20.0
	836.5	20525	5	QPSK	12	13	20.39	20.0
	836.5	20525	5	QPSK	25	0	20.37	20.0
	836.5	20525	5	16-QAM	1	0	20.48	20.0
	836.5	20525	5	16-QAM	1	12	20.16	20.0
	836.5	20525	5	16-QAM	1	24	20.47	20.0
	836.5	20525	5	16-QAM	12	0	19.43	19.0
	836.5	20525	5	16-QAM	12	6	19.22	19.0
	836.5	20525	5	16-QAM	12	13	19.42	19.0
	836.5	20525	5	16-QAM	25	0	19.38	19.0
High	846.5	20625	5	QPSK	1	0	21.26	21.0
	846.5	20625	5	QPSK	1	12	20.86	21.0
	846.5	20625	5	QPSK	1	24	21.10	21.0
	846.5	20625	5	QPSK	12	0	20.33	20.0
	846.5	20625	5	QPSK	12	6	20.12	20.0
	846.5	20625	5	QPSK	12	13	20.16	20.0
	846.5	20625	5	QPSK	25	0	20.23	20.0
	846.5	20625	5	16-QAM	1	0	20.50	20.0
	846.5	20625	5	16-QAM	1	12	20.48	20.0
	846.5	20625	5	16-QAM	1	24	20.46	20.0
	846.5	20625	5	16-QAM	12	0	19.31	19.0
	846.5	20625	5	16-QAM	12	6	19.18	19.0
	846.5	20625	5	16-QAM	12	13	19.15	19.0
	846.5	20625	5	16-QAM	25	0	19.20	19.0

Table 8-17
LTE Band 5 (Cell) Conducted Powers - 3 MHz Bandwidth
Reduced Power – Body at 0.0 cm

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	825.5	20415	3	QPSK	1	0	21.16	21.0
	825.5	20415	3	QPSK	1	7	21.08	21.0
	825.5	20415	3	QPSK	1	14	21.10	21.0
	825.5	20415	3	QPSK	8	0	20.44	20.0
	825.5	20415	3	QPSK	8	4	20.45	20.0
	825.5	20415	3	QPSK	8	7	20.46	20.0
	825.5	20415	3	QPSK	15	0	20.48	20.0
	825.5	20415	3	16-QAM	1	0	20.43	20.0
	825.5	20415	3	16-QAM	1	7	20.48	20.0
	825.5	20415	3	16-QAM	1	14	20.49	20.0
	825.5	20415	3	16-QAM	8	0	19.47	19.0
	825.5	20415	3	16-QAM	8	4	19.46	19.0
	825.5	20415	3	16-QAM	8	7	19.39	19.0
	825.5	20415	3	16-QAM	15	0	19.37	19.0
Mid	836.5	20525	3	QPSK	1	0	21.05	21.0
	836.5	20525	3	QPSK	1	7	21.00	21.0
	836.5	20525	3	QPSK	1	14	20.89	21.0
	836.5	20525	3	QPSK	8	0	20.28	20.0
	836.5	20525	3	QPSK	8	4	20.19	20.0
	836.5	20525	3	QPSK	8	7	20.20	20.0
	836.5	20525	3	QPSK	15	0	20.24	20.0
	836.5	20525	3	16-QAM	1	0	20.34	20.0
	836.5	20525	3	16-QAM	1	7	20.34	20.0
	836.5	20525	3	16-QAM	1	14	20.33	20.0
	836.5	20525	3	16-QAM	8	0	19.36	19.0
	836.5	20525	3	16-QAM	8	4	19.34	19.0
	836.5	20525	3	16-QAM	8	7	19.23	19.0
	836.5	20525	3	16-QAM	15	0	19.36	19.0
High	847.5	20635	3	QPSK	1	0	20.93	21.0
	847.5	20635	3	QPSK	1	7	20.93	21.0
	847.5	20635	3	QPSK	1	14	20.82	21.0
	847.5	20635	3	QPSK	8	0	20.23	20.0
	847.5	20635	3	QPSK	8	4	20.17	20.0
	847.5	20635	3	QPSK	8	7	20.20	20.0
	847.5	20635	3	QPSK	15	0	20.22	20.0
	847.5	20635	3	16-QAM	1	0	20.41	20.0
	847.5	20635	3	16-QAM	1	7	20.50	20.0
	847.5	20635	3	16-QAM	1	14	20.31	20.0
	847.5	20635	3	16-QAM	8	0	19.33	19.0
	847.5	20635	3	16-QAM	8	4	19.23	19.0
	847.5	20635	3	16-QAM	8	7	19.26	19.0
	847.5	20635	3	16-QAM	15	0	19.21	19.0

Table 8-18
LTE Band 5 (Cell) Conducted Powers – 1.4 MHz Bandwidth
Reduced Power – Body at 0.0 cm

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	824.7	20407	1.4	QPSK	1	0	21.19	21.0
	824.7	20407	1.4	QPSK	1	2	21.14	21.0
	824.7	20407	1.4	QPSK	1	5	21.11	21.0
	824.7	20407	1.4	QPSK	3	0	21.20	21.0
	824.7	20407	1.4	QPSK	3	2	21.19	21.0
	824.7	20407	1.4	QPSK	3	3	21.10	21.0
	824.7	20407	1.4	QPSK	6	0	20.38	20.0
	824.7	20407	1.4	16-QAM	1	0	20.40	20.0
	824.7	20407	1.4	16-QAM	1	2	20.42	20.0
	824.7	20407	1.4	16-QAM	1	5	20.40	20.0
	824.7	20407	1.4	16-QAM	3	0	20.48	20.0
	824.7	20407	1.4	16-QAM	3	2	20.46	20.0
	824.7	20407	1.4	16-QAM	3	3	20.47	20.0
	824.7	20407	1.4	16-QAM	6	0	19.41	19.0
Mid	836.5	20525	1.4	QPSK	1	0	21.18	21.0
	836.5	20525	1.4	QPSK	1	2	21.09	21.0
	836.5	20525	1.4	QPSK	1	5	21.14	21.0
	836.5	20525	1.4	QPSK	3	0	21.14	21.0
	836.5	20525	1.4	QPSK	3	2	21.22	21.0
	836.5	20525	1.4	QPSK	3	3	21.21	21.0
	836.5	20525	1.4	QPSK	6	0	20.44	20.0
	836.5	20525	1.4	16-QAM	1	0	20.47	20.0
	836.5	20525	1.4	16-QAM	1	2	20.38	20.0
	836.5	20525	1.4	16-QAM	1	5	20.42	20.0
	836.5	20525	1.4	16-QAM	3	0	20.42	20.0
	836.5	20525	1.4	16-QAM	3	2	20.45	20.0
	836.5	20525	1.4	16-QAM	3	3	20.40	20.0
	836.5	20525	1.4	16-QAM	6	0	19.40	19.0
High	848.3	20643	1.4	QPSK	1	0	21.01	21.0
	848.3	20643	1.4	QPSK	1	2	21.01	21.0
	848.3	20643	1.4	QPSK	1	5	20.90	21.0
	848.3	20643	1.4	QPSK	3	0	20.96	21.0
	848.3	20643	1.4	QPSK	3	2	20.82	21.0
	848.3	20643	1.4	QPSK	3	3	20.87	21.0
	848.3	20643	1.4	QPSK	6	0	20.20	20.0
	848.3	20643	1.4	16-QAM	1	0	20.32	20.0
	848.3	20643	1.4	16-QAM	1	2	20.38	20.0
	848.3	20643	1.4	16-QAM	1	5	20.29	20.0
	848.3	20643	1.4	16-QAM	3	0	20.23	20.0
	848.3	20643	1.4	16-QAM	3	2	20.19	20.0
	848.3	20643	1.4	16-QAM	3	3	20.21	20.0
	848.3	20643	1.4	16-QAM	6	0	19.22	19.0

8.2.4 LTE Band 4 (AWS)

Table 8-19
LTE Band 4 (AWS) Conducted Powers - 20 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Mid	1732.5	20175	20	QPSK	1	0	23.48	24.0
	1732.5	20175	20	QPSK	1	50	**23.55**	24.0
	1732.5	20175	20	QPSK	1	99	23.24	24.0
	1732.5	20175	20	QPSK	50	0	**21.25**	22.0
	1732.5	20175	20	QPSK	50	25	21.12	22.0
	1732.5	20175	20	QPSK	50	50	21.10	22.0
	1732.5	20175	20	QPSK	100	0	21.20	22.0
	1732.5	20175	20	16QAM	1	0	21.34	22.0
	1732.5	20175	20	16QAM	1	50	21.37	22.0
	1732.5	20175	20	16QAM	1	99	21.00	22.0
	1732.5	20175	20	16QAM	50	0	20.18	21.0
	1732.5	20175	20	16QAM	50	25	20.04	21.0
	1732.5	20175	20	16QAM	50	50	20.00	21.0
	1732.5	20175	20	16QAM	100	0	20.07	21.0

Note: LTE Band 4 (AWS) at 20 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 8-20
LTE Band 4 (AWS) Conducted Powers - 15 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	1717.5	20025	15	QPSK	1	0	23.19	24.0
	1717.5	20025	15	QPSK	1	36	23.37	24.0
	1717.5	20025	15	QPSK	1	74	23.40	24.0
	1717.5	20025	15	QPSK	36	0	21.29	22.0
	1717.5	20025	15	QPSK	36	18	21.08	22.0
	1717.5	20025	15	QPSK	36	37	21.13	22.0
	1717.5	20025	15	QPSK	75	0	21.15	22.0
	1717.5	20025	15	16QAM	1	0	21.82	22.0
	1717.5	20025	15	16QAM	1	36	21.17	22.0
	1717.5	20025	15	16QAM	1	74	21.52	22.0
	1717.5	20025	15	16QAM	36	0	20.26	21.0
	1717.5	20025	15	16QAM	36	18	20.06	21.0
	1717.5	20025	15	16QAM	36	37	20.05	21.0
	1717.5	20025	15	16QAM	75	0	20.21	21.0
Mid	1732.5	20175	15	QPSK	1	0	23.47	24.0
	1732.5	20175	15	QPSK	1	36	23.22	24.0
	1732.5	20175	15	QPSK	1	74	23.40	24.0
	1732.5	20175	15	QPSK	36	0	21.23	22.0
	1732.5	20175	15	QPSK	36	18	21.00	22.0
	1732.5	20175	15	QPSK	36	37	21.03	22.0
	1732.5	20175	15	QPSK	75	0	21.11	22.0
	1732.5	20175	15	16QAM	1	0	21.75	22.0
	1732.5	20175	15	16QAM	1	36	21.11	22.0
	1732.5	20175	15	16QAM	1	74	21.46	22.0
	1732.5	20175	15	16QAM	36	0	20.17	21.0
	1732.5	20175	15	16QAM	36	18	20.01	21.0
	1732.5	20175	15	16QAM	36	37	20.01	21.0
	1732.5	20175	15	16QAM	75	0	20.04	21.0
High	1747.5	20325	15	QPSK	1	0	23.50	24.0
	1747.5	20325	15	QPSK	1	36	23.24	24.0
	1747.5	20325	15	QPSK	1	74	23.41	24.0
	1747.5	20325	15	QPSK	36	0	21.15	22.0
	1747.5	20325	15	QPSK	36	18	21.00	22.0
	1747.5	20325	15	QPSK	36	37	21.02	22.0
	1747.5	20325	15	QPSK	75	0	21.09	22.0
	1747.5	20325	15	16QAM	1	0	21.75	22.0
	1747.5	20325	15	16QAM	1	36	21.07	22.0
	1747.5	20325	15	16QAM	1	74	21.76	22.0
	1747.5	20325	15	16QAM	36	0	20.16	21.0
	1747.5	20325	15	16QAM	36	18	20.00	21.0
	1747.5	20325	15	16QAM	36	37	20.01	21.0
	1747.5	20325	15	16QAM	75	0	20.08	21.0

Table 8-21
LTE Band 4 (AWS) Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	1715	20000	10	QPSK	1	0	23.53	24.0
	1715	20000	10	QPSK	1	25	23.51	24.0
	1715	20000	10	QPSK	1	49	23.48	24.0
	1715	20000	10	QPSK	25	0	21.29	22.0
	1715	20000	10	QPSK	25	12	21.29	22.0
	1715	20000	10	QPSK	25	25	21.20	22.0
	1715	20000	10	QPSK	50	0	21.28	22.0
	1715	20000	10	16QAM	1	0	21.52	22.0
	1715	20000	10	16QAM	1	25	21.45	22.0
	1715	20000	10	16QAM	1	49	21.62	22.0
	1715	20000	10	16QAM	25	0	20.36	21.0
	1715	20000	10	16QAM	25	12	20.27	21.0
	1715	20000	10	16QAM	25	25	20.17	21.0
	1715	20000	10	16QAM	50	0	20.28	21.0
Mid	1732.5	20175	10	QPSK	1	0	23.55	24.0
	1732.5	20175	10	QPSK	1	25	23.51	24.0
	1732.5	20175	10	QPSK	1	49	23.46	24.0
	1732.5	20175	10	QPSK	25	0	21.21	22.0
	1732.5	20175	10	QPSK	25	12	21.14	22.0
	1732.5	20175	10	QPSK	25	25	21.10	22.0
	1732.5	20175	10	QPSK	50	0	21.16	22.0
	1732.5	20175	10	16QAM	1	0	21.42	22.0
	1732.5	20175	10	16QAM	1	25	21.41	22.0
	1732.5	20175	10	16QAM	1	49	21.24	22.0
	1732.5	20175	10	16QAM	25	0	20.21	21.0
	1732.5	20175	10	16QAM	25	12	20.13	21.0
	1732.5	20175	10	16QAM	25	25	20.07	21.0
	1732.5	20175	10	16QAM	50	0	20.14	21.0
High	1750	20350	10	QPSK	1	0	23.55	24.0
	1750	20350	10	QPSK	1	25	23.54	24.0
	1750	20350	10	QPSK	1	49	23.48	24.0
	1750	20350	10	QPSK	25	0	21.24	22.0
	1750	20350	10	QPSK	25	12	21.18	22.0
	1750	20350	10	QPSK	25	25	21.12	22.0
	1750	20350	10	QPSK	50	0	21.15	22.0
	1750	20350	10	16QAM	1	0	21.47	22.0
	1750	20350	10	16QAM	1	25	21.39	22.0
	1750	20350	10	16QAM	1	49	21.25	22.0
	1750	20350	10	16QAM	25	0	20.24	21.0
	1750	20350	10	16QAM	25	12	20.17	21.0
	1750	20350	10	16QAM	25	25	20.11	21.0
	1750	20350	10	16QAM	50	0	20.20	21.0

Table 8-22
LTE Band 4 (AWS) Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	1712.5	19975	5	QPSK	1	0	23.49	24.0
	1712.5	19975	5	QPSK	1	12	23.12	24.0
	1712.5	19975	5	QPSK	1	24	23.28	24.0
	1712.5	19975	5	QPSK	12	0	21.33	22.0
	1712.5	19975	5	QPSK	12	6	21.19	22.0
	1712.5	19975	5	QPSK	12	13	21.29	22.0
	1712.5	19975	5	QPSK	25	0	21.29	22.0
	1712.5	19975	5	16-QAM	1	0	21.78	22.0
	1712.5	19975	5	16-QAM	1	12	21.45	22.0
	1712.5	19975	5	16-QAM	1	24	21.68	22.0
	1712.5	19975	5	16-QAM	12	0	20.42	21.0
	1712.5	19975	5	16-QAM	12	6	20.27	21.0
	1712.5	19975	5	16-QAM	12	13	20.38	21.0
	1712.5	19975	5	16-QAM	25	0	20.34	21.0
Mid	1732.5	20175	5	QPSK	1	0	23.36	24.0
	1732.5	20175	5	QPSK	1	12	23.00	24.0
	1732.5	20175	5	QPSK	1	24	23.25	24.0
	1732.5	20175	5	QPSK	12	0	21.21	22.0
	1732.5	20175	5	QPSK	12	6	21.08	22.0
	1732.5	20175	5	QPSK	12	13	21.15	22.0
	1732.5	20175	5	QPSK	25	0	21.18	22.0
	1732.5	20175	5	16-QAM	1	0	21.66	22.0
	1732.5	20175	5	16-QAM	1	12	21.24	22.0
	1732.5	20175	5	16-QAM	1	24	21.53	22.0
	1732.5	20175	5	16-QAM	12	0	20.29	21.0
	1732.5	20175	5	16-QAM	12	6	20.17	21.0
	1732.5	20175	5	16-QAM	12	13	20.25	21.0
	1732.5	20175	5	16-QAM	25	0	20.22	21.0
High	1752.5	20375	5	QPSK	1	0	23.34	24.0
	1752.5	20375	5	QPSK	1	12	23.19	24.0
	1752.5	20375	5	QPSK	1	24	23.05	24.0
	1752.5	20375	5	QPSK	12	0	21.23	22.0
	1752.5	20375	5	QPSK	12	6	21.05	22.0
	1752.5	20375	5	QPSK	12	13	21.16	22.0
	1752.5	20375	5	QPSK	25	0	21.17	22.0
	1752.5	20375	5	16-QAM	1	0	21.61	22.0
	1752.5	20375	5	16-QAM	1	12	21.28	22.0
	1752.5	20375	5	16-QAM	1	24	21.56	22.0
	1752.5	20375	5	16-QAM	12	0	20.27	21.0
	1752.5	20375	5	16-QAM	12	6	20.11	21.0
	1752.5	20375	5	16-QAM	12	13	20.22	21.0
	1752.5	20375	5	16-QAM	25	0	20.14	21.0

Table 8-23
LTE Band 4 (AWS) Conducted Powers - 3 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	1711.5	19965	3	QPSK	1	0	23.43	24.0
	1711.5	19965	3	QPSK	1	7	23.47	24.0
	1711.5	19965	3	QPSK	1	14	23.47	24.0
	1711.5	19965	3	QPSK	8	0	21.36	22.0
	1711.5	19965	3	QPSK	8	4	21.33	22.0
	1711.5	19965	3	QPSK	8	7	21.34	22.0
	1711.5	19965	3	QPSK	15	0	21.36	22.0
	1711.5	19965	3	16-QAM	1	0	21.46	22.0
	1711.5	19965	3	16-QAM	1	7	21.51	22.0
	1711.5	19965	3	16-QAM	1	14	21.44	22.0
	1711.5	19965	3	16-QAM	8	0	20.52	21.0
	1711.5	19965	3	16-QAM	8	4	20.46	21.0
	1711.5	19965	3	16-QAM	8	7	20.47	21.0
	1711.5	19965	3	16-QAM	15	0	20.39	21.0
Mid	1732.5	20175	3	QPSK	1	0	23.41	24.0
	1732.5	20175	3	QPSK	1	7	23.36	24.0
	1732.5	20175	3	QPSK	1	14	23.40	24.0
	1732.5	20175	3	QPSK	8	0	21.24	22.0
	1732.5	20175	3	QPSK	8	4	21.24	22.0
	1732.5	20175	3	QPSK	8	7	21.24	22.0
	1732.5	20175	3	QPSK	15	0	21.23	22.0
	1732.5	20175	3	16-QAM	1	0	21.36	22.0
	1732.5	20175	3	16-QAM	1	7	21.37	22.0
	1732.5	20175	3	16-QAM	1	14	21.29	22.0
	1732.5	20175	3	16-QAM	8	0	20.32	21.0
	1732.5	20175	3	16-QAM	8	4	20.33	21.0
	1732.5	20175	3	16-QAM	8	7	20.35	21.0
	1732.5	20175	3	16-QAM	15	0	20.24	21.0
High	1753.5	20385	3	QPSK	1	0	23.39	24.0
	1753.5	20385	3	QPSK	1	7	23.34	24.0
	1753.5	20385	3	QPSK	1	14	23.26	24.0
	1753.5	20385	3	QPSK	8	0	21.23	22.0
	1753.5	20385	3	QPSK	8	4	21.19	22.0
	1753.5	20385	3	QPSK	8	7	21.20	22.0
	1753.5	20385	3	QPSK	15	0	21.21	22.0
	1753.5	20385	3	16-QAM	1	0	21.38	22.0
	1753.5	20385	3	16-QAM	1	7	21.44	22.0
	1753.5	20385	3	16-QAM	1	14	21.34	22.0
	1753.5	20385	3	16-QAM	8	0	20.34	21.0
	1753.5	20385	3	16-QAM	8	4	20.31	21.0
	1753.5	20385	3	16-QAM	8	7	20.31	21.0
	1753.5	20385	3	16-QAM	15	0	20.26	21.0

Table 8-24
LTE Band 4 (AWS) Conducted Powers - 1.4 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	1710.7	19957	1.4	QPSK	1	0	23.59	24.0
	1710.7	19957	1.4	QPSK	1	2	23.56	24.0
	1710.7	19957	1.4	QPSK	1	5	23.45	24.0
	1710.7	19957	1.4	QPSK	3	0	23.41	24.0
	1710.7	19957	1.4	QPSK	3	2	23.39	24.0
	1710.7	19957	1.4	QPSK	3	3	23.33	24.0
	1710.7	19957	1.4	QPSK	6	0	21.40	22.0
	1710.7	19957	1.4	16-QAM	1	0	21.59	22.0
	1710.7	19957	1.4	16-QAM	1	2	21.53	22.0
	1710.7	19957	1.4	16-QAM	1	5	21.56	22.0
	1710.7	19957	1.4	16-QAM	3	0	21.42	22.0
	1710.7	19957	1.4	16-QAM	3	2	21.41	22.0
	1710.7	19957	1.4	16-QAM	3	3	21.37	22.0
	1710.7	19957	1.4	16-QAM	6	0	20.45	21.0
Mid	1732.5	20175	1.4	QPSK	1	0	23.59	24.0
	1732.5	20175	1.4	QPSK	1	2	23.44	24.0
	1732.5	20175	1.4	QPSK	1	5	23.50	24.0
	1732.5	20175	1.4	QPSK	3	0	23.31	24.0
	1732.5	20175	1.4	QPSK	3	2	23.22	24.0
	1732.5	20175	1.4	QPSK	3	3	23.21	24.0
	1732.5	20175	1.4	QPSK	6	0	21.19	22.0
	1732.5	20175	1.4	16-QAM	1	0	21.44	22.0
	1732.5	20175	1.4	16-QAM	1	2	21.41	22.0
	1732.5	20175	1.4	16-QAM	1	5	21.39	22.0
	1732.5	20175	1.4	16-QAM	3	0	21.29	22.0
	1732.5	20175	1.4	16-QAM	3	2	21.31	22.0
	1732.5	20175	1.4	16-QAM	3	3	21.24	22.0
	1732.5	20175	1.4	16-QAM	6	0	20.33	21.0
High	1754.3	20393	1.4	QPSK	1	0	23.45	24.0
	1754.3	20393	1.4	QPSK	1	2	23.49	24.0
	1754.3	20393	1.4	QPSK	1	5	23.40	24.0
	1754.3	20393	1.4	QPSK	3	0	23.16	24.0
	1754.3	20393	1.4	QPSK	3	2	23.13	24.0
	1754.3	20393	1.4	QPSK	3	3	23.18	24.0
	1754.3	20393	1.4	QPSK	6	0	21.24	22.0
	1754.3	20393	1.4	16-QAM	1	0	21.43	22.0
	1754.3	20393	1.4	16-QAM	1	2	21.43	22.0
	1754.3	20393	1.4	16-QAM	1	5	21.44	22.0
	1754.3	20393	1.4	16-QAM	3	0	21.24	22.0
	1754.3	20393	1.4	16-QAM	3	2	21.20	22.0
	1754.3	20393	1.4	16-QAM	3	3	21.22	22.0
	1754.3	20393	1.4	16-QAM	6	0	20.23	21.0

Table 8-25
LTE Band 4 (AWS) Conducted Powers - 20 MHz Bandwidth
Reduced Power – Body at 0.0 cm

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Mid	1732.5	20175	20	QPSK	1	0	**15.91**	15.5
	1732.5	20175	20	QPSK	1	50	15.90	15.5
	1732.5	20175	20	QPSK	1	99	15.47	15.5
	1732.5	20175	20	QPSK	50	0	**14.31**	14.5
	1732.5	20175	20	QPSK	50	25	14.21	14.5
	1732.5	20175	20	QPSK	50	50	14.17	14.5
	1732.5	20175	20	QPSK	100	0	**14.24**	14.5
	1732.5	20175	20	16QAM	1	0	14.33	14.5
	1732.5	20175	20	16QAM	1	50	14.44	14.5
	1732.5	20175	20	16QAM	1	99	14.00	14.5
	1732.5	20175	20	16QAM	50	0	13.25	13.5
	1732.5	20175	20	16QAM	50	25	13.18	13.5
	1732.5	20175	20	16QAM	50	50	13.11	13.5
	1732.5	20175	20	16QAM	100	0	13.18	13.5

Note: LTE Band 4 (AWS) at 20 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 8-26
LTE Band 4 (AWS) Conducted Powers - 15 MHz Bandwidth
Reduced Power – Body at 0.0 cm

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	1717.5	20025	15	QPSK	1	0	16.00	15.5
	1717.5	20025	15	QPSK	1	36	15.59	15.5
	1717.5	20025	15	QPSK	1	74	15.88	15.5
	1717.5	20025	15	QPSK	36	0	14.07	14.5
	1717.5	20025	15	QPSK	36	18	14.07	14.5
	1717.5	20025	15	QPSK	36	37	14.09	14.5
	1717.5	20025	15	QPSK	75	0	14.02	14.5
	1717.5	20025	15	16QAM	1	0	14.56	14.5
	1717.5	20025	15	16QAM	1	36	14.13	14.5
	1717.5	20025	15	16QAM	1	74	14.30	14.5
	1717.5	20025	15	16QAM	36	0	13.11	13.5
	1717.5	20025	15	16QAM	36	18	13.00	13.5
	1717.5	20025	15	16QAM	36	37	13.02	13.5
	1717.5	20025	15	16QAM	75	0	13.07	13.5
Mid	1732.5	20175	15	QPSK	1	0	15.90	15.5
	1732.5	20175	15	QPSK	1	36	15.18	15.5
	1732.5	20175	15	QPSK	1	74	15.68	15.5
	1732.5	20175	15	QPSK	36	0	14.00	14.5
	1732.5	20175	15	QPSK	36	18	14.02	14.5
	1732.5	20175	15	QPSK	36	37	14.09	14.5
	1732.5	20175	15	QPSK	75	0	14.09	14.5
	1732.5	20175	15	16QAM	1	0	14.47	14.5
	1732.5	20175	15	16QAM	1	36	14.02	14.5
	1732.5	20175	15	16QAM	1	74	14.24	14.5
	1732.5	20175	15	16QAM	36	0	13.03	13.5
	1732.5	20175	15	16QAM	36	18	13.04	13.5
	1732.5	20175	15	16QAM	36	37	13.07	13.5
	1732.5	20175	15	16QAM	75	0	13.11	13.5
High	1747.5	20325	15	QPSK	1	0	15.99	15.5
	1747.5	20325	15	QPSK	1	36	15.39	15.5
	1747.5	20325	15	QPSK	1	74	15.85	15.5
	1747.5	20325	15	QPSK	36	0	14.02	14.5
	1747.5	20325	15	QPSK	36	18	14.00	14.5
	1747.5	20325	15	QPSK	36	37	14.01	14.5
	1747.5	20325	15	QPSK	75	0	14.00	14.5
	1747.5	20325	15	16QAM	1	0	14.33	14.5
	1747.5	20325	15	16QAM	1	36	14.05	14.5
	1747.5	20325	15	16QAM	1	74	14.24	14.5
	1747.5	20325	15	16QAM	36	0	13.02	13.5
	1747.5	20325	15	16QAM	36	18	13.00	13.5
	1747.5	20325	15	16QAM	36	37	13.01	13.5
	1747.5	20325	15	16QAM	75	0	13.03	13.5

Table 8-27
LTE Band 4 (AWS) Conducted Powers - 10 MHz Bandwidth
Reduced Power – Body at 0.0 cm

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	1715	20000	10	QPSK	1	0	15.76	15.5
	1715	20000	10	QPSK	1	25	15.82	15.5
	1715	20000	10	QPSK	1	49	15.59	15.5
	1715	20000	10	QPSK	25	0	14.11	14.5
	1715	20000	10	QPSK	25	12	14.06	14.5
	1715	20000	10	QPSK	25	25	14.01	14.5
	1715	20000	10	QPSK	50	0	14.03	14.5
	1715	20000	10	16QAM	1	0	14.28	14.5
	1715	20000	10	16QAM	1	25	14.27	14.5
	1715	20000	10	16QAM	1	49	14.15	14.5
	1715	20000	10	16QAM	25	0	13.17	13.5
	1715	20000	10	16QAM	25	12	13.15	13.5
	1715	20000	10	16QAM	25	25	13.09	13.5
	1715	20000	10	16QAM	50	0	13.12	13.5
Mid	1732.5	20175	10	QPSK	1	0	15.74	15.5
	1732.5	20175	10	QPSK	1	25	15.67	15.5
	1732.5	20175	10	QPSK	1	49	15.61	15.5
	1732.5	20175	10	QPSK	25	0	14.07	14.5
	1732.5	20175	10	QPSK	25	12	14.09	14.5
	1732.5	20175	10	QPSK	25	25	14.03	14.5
	1732.5	20175	10	QPSK	50	0	14.01	14.5
	1732.5	20175	10	16QAM	1	0	14.03	14.5
	1732.5	20175	10	16QAM	1	25	14.09	14.5
	1732.5	20175	10	16QAM	1	49	14.10	14.5
	1732.5	20175	10	16QAM	25	0	13.06	13.5
	1732.5	20175	10	16QAM	25	12	13.02	13.5
	1732.5	20175	10	16QAM	25	25	13.01	13.5
	1732.5	20175	10	16QAM	50	0	13.01	13.5
High	1750	20350	10	QPSK	1	0	15.62	15.5
	1750	20350	10	QPSK	1	25	15.76	15.5
	1750	20350	10	QPSK	1	49	15.64	15.5
	1750	20350	10	QPSK	25	0	14.06	14.5
	1750	20350	10	QPSK	25	12	14.08	14.5
	1750	20350	10	QPSK	25	25	14.08	14.5
	1750	20350	10	QPSK	50	0	14.08	14.5
	1750	20350	10	16QAM	1	0	14.15	14.5
	1750	20350	10	16QAM	1	25	14.22	14.5
	1750	20350	10	16QAM	1	49	14.11	14.5
	1750	20350	10	16QAM	25	0	13.03	13.5
	1750	20350	10	16QAM	25	12	13.07	13.5
	1750	20350	10	16QAM	25	25	13.01	13.5
	1750	20350	10	16QAM	50	0	13.04	13.5

Table 8-28
LTE Band 4 (AWS) Conducted Powers - 5 MHz Bandwidth
Reduced Power – Body at 0.0 cm

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	1712.5	19975	5	QPSK	1	0	16.00	15.5
	1712.5	19975	5	QPSK	1	12	15.64	15.5
	1712.5	19975	5	QPSK	1	24	15.97	15.5
	1712.5	19975	5	QPSK	12	0	14.14	14.5
	1712.5	19975	5	QPSK	12	6	14.00	14.5
	1712.5	19975	5	QPSK	12	13	14.10	14.5
	1712.5	19975	5	QPSK	25	0	14.11	14.5
	1712.5	19975	5	16-QAM	1	0	14.53	14.5
	1712.5	19975	5	16-QAM	1	12	14.12	14.5
	1712.5	19975	5	16-QAM	1	24	14.43	14.5
	1712.5	19975	5	16-QAM	12	0	13.21	13.5
	1712.5	19975	5	16-QAM	12	6	13.07	13.5
	1712.5	19975	5	16-QAM	12	13	13.15	13.5
	1712.5	19975	5	16-QAM	25	0	13.13	13.5
Mid	1732.5	20175	5	QPSK	1	0	15.91	15.5
	1732.5	20175	5	QPSK	1	12	15.54	15.5
	1732.5	20175	5	QPSK	1	24	15.83	15.5
	1732.5	20175	5	QPSK	12	0	14.00	14.5
	1732.5	20175	5	QPSK	12	6	14.03	14.5
	1732.5	20175	5	QPSK	12	13	14.03	14.5
	1732.5	20175	5	QPSK	25	0	14.03	14.5
	1732.5	20175	5	16-QAM	1	0	14.31	14.5
	1732.5	20175	5	16-QAM	1	12	14.04	14.5
	1732.5	20175	5	16-QAM	1	24	14.22	14.5
	1732.5	20175	5	16-QAM	12	0	13.10	13.5
	1732.5	20175	5	16-QAM	12	6	13.00	13.5
	1732.5	20175	5	16-QAM	12	13	13.11	13.5
	1732.5	20175	5	16-QAM	25	0	13.05	13.5
High	1752.5	20375	5	QPSK	1	0	15.91	15.5
	1752.5	20375	5	QPSK	1	12	15.47	15.5
	1752.5	20375	5	QPSK	1	24	15.84	15.5
	1752.5	20375	5	QPSK	12	0	14.03	14.5
	1752.5	20375	5	QPSK	12	6	14.01	14.5
	1752.5	20375	5	QPSK	12	13	14.01	14.5
	1752.5	20375	5	QPSK	25	0	14.03	14.5
	1752.5	20375	5	16-QAM	1	0	14.37	14.5
	1752.5	20375	5	16-QAM	1	12	14.04	14.5
	1752.5	20375	5	16-QAM	1	24	14.24	14.5
	1752.5	20375	5	16-QAM	12	0	13.07	13.5
	1752.5	20375	5	16-QAM	12	6	13.03	13.5
	1752.5	20375	5	16-QAM	12	13	13.05	13.5
	1752.5	20375	5	16-QAM	25	0	13.02	13.5

Table 8-29
LTE Band 4 (AWS) Conducted Powers - 3 MHz Bandwidth
Reduced Power – Body at 0.0 cm

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	1711.5	19965	3	QPSK	1	0	15.82	15.5
	1711.5	19965	3	QPSK	1	7	15.80	15.5
	1711.5	19965	3	QPSK	1	14	15.76	15.5
	1711.5	19965	3	QPSK	8	0	14.12	14.5
	1711.5	19965	3	QPSK	8	4	14.11	14.5
	1711.5	19965	3	QPSK	8	7	14.09	14.5
	1711.5	19965	3	QPSK	15	0	14.13	14.5
	1711.5	19965	3	16-QAM	1	0	14.23	14.5
	1711.5	19965	3	16-QAM	1	7	14.25	14.5
	1711.5	19965	3	16-QAM	1	14	14.26	14.5
	1711.5	19965	3	16-QAM	8	0	13.21	13.5
	1711.5	19965	3	16-QAM	8	4	13.19	13.5
	1711.5	19965	3	16-QAM	8	7	13.18	13.5
	1711.5	19965	3	16-QAM	15	0	13.11	13.5
Mid	1732.5	20175	3	QPSK	1	0	15.65	15.5
	1732.5	20175	3	QPSK	1	7	15.69	15.5
	1732.5	20175	3	QPSK	1	14	15.62	15.5
	1732.5	20175	3	QPSK	8	0	14.03	14.5
	1732.5	20175	3	QPSK	8	4	14.05	14.5
	1732.5	20175	3	QPSK	8	7	14.07	14.5
	1732.5	20175	3	QPSK	15	0	14.00	14.5
	1732.5	20175	3	16-QAM	1	0	14.11	14.5
	1732.5	20175	3	16-QAM	1	7	14.12	14.5
	1732.5	20175	3	16-QAM	1	14	14.07	14.5
	1732.5	20175	3	16-QAM	8	0	13.06	13.5
	1732.5	20175	3	16-QAM	8	4	13.02	13.5
	1732.5	20175	3	16-QAM	8	7	13.03	13.5
	1732.5	20175	3	16-QAM	15	0	13.00	13.5
High	1753.5	20385	3	QPSK	1	0	15.65	15.5
	1753.5	20385	3	QPSK	1	7	15.58	15.5
	1753.5	20385	3	QPSK	1	14	15.62	15.5
	1753.5	20385	3	QPSK	8	0	14.00	14.5
	1753.5	20385	3	QPSK	8	4	14.01	14.5
	1753.5	20385	3	QPSK	8	7	14.03	14.5
	1753.5	20385	3	QPSK	15	0	14.00	14.5
	1753.5	20385	3	16-QAM	1	0	14.15	14.5
	1753.5	20385	3	16-QAM	1	7	14.16	14.5
	1753.5	20385	3	16-QAM	1	14	14.11	14.5
	1753.5	20385	3	16-QAM	8	0	13.13	13.5
	1753.5	20385	3	16-QAM	8	4	13.08	13.5
	1753.5	20385	3	16-QAM	8	7	13.07	13.5
	1753.5	20385	3	16-QAM	15	0	13.03	13.5

Table 8-30
LTE Band 4 (AWS) Conducted Powers - 1.4 MHz Bandwidth
Reduced Power – Body at 0.0 cm

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	1710.7	19957	1.4	QPSK	1	0	15.86	15.5
	1710.7	19957	1.4	QPSK	1	2	15.82	15.5
	1710.7	19957	1.4	QPSK	1	5	15.83	15.5
	1710.7	19957	1.4	QPSK	3	0	15.87	15.5
	1710.7	19957	1.4	QPSK	3	2	15.87	15.5
	1710.7	19957	1.4	QPSK	3	3	15.86	15.5
	1710.7	19957	1.4	QPSK	6	0	14.14	14.5
	1710.7	19957	1.4	16-QAM	1	0	14.23	14.5
	1710.7	19957	1.4	16-QAM	1	2	14.26	14.5
	1710.7	19957	1.4	16-QAM	1	5	14.33	14.5
	1710.7	19957	1.4	16-QAM	3	0	14.08	14.5
	1710.7	19957	1.4	16-QAM	3	2	14.09	14.5
	1710.7	19957	1.4	16-QAM	3	3	14.16	14.5
	1710.7	19957	1.4	16-QAM	6	0	13.21	13.5
Mid	1732.5	20175	1.4	QPSK	1	0	15.70	15.5
	1732.5	20175	1.4	QPSK	1	2	15.68	15.5
	1732.5	20175	1.4	QPSK	1	5	15.67	15.5
	1732.5	20175	1.4	QPSK	3	0	15.72	15.5
	1732.5	20175	1.4	QPSK	3	2	15.73	15.5
	1732.5	20175	1.4	QPSK	3	3	15.70	15.5
	1732.5	20175	1.4	QPSK	6	0	14.02	14.5
	1732.5	20175	1.4	16-QAM	1	0	14.13	14.5
	1732.5	20175	1.4	16-QAM	1	2	14.14	14.5
	1732.5	20175	1.4	16-QAM	1	5	14.05	14.5
	1732.5	20175	1.4	16-QAM	3	0	14.06	14.5
	1732.5	20175	1.4	16-QAM	3	2	14.03	14.5
	1732.5	20175	1.4	16-QAM	3	3	14.00	14.5
	1732.5	20175	1.4	16-QAM	6	0	13.07	13.5
High	1754.3	20393	1.4	QPSK	1	0	15.72	15.5
	1754.3	20393	1.4	QPSK	1	2	15.63	15.5
	1754.3	20393	1.4	QPSK	1	5	15.73	15.5
	1754.3	20393	1.4	QPSK	3	0	15.69	15.5
	1754.3	20393	1.4	QPSK	3	2	15.70	15.5
	1754.3	20393	1.4	QPSK	3	3	15.71	15.5
	1754.3	20393	1.4	QPSK	6	0	14.02	14.5
	1754.3	20393	1.4	16-QAM	1	0	14.05	14.5
	1754.3	20393	1.4	16-QAM	1	2	14.13	14.5
	1754.3	20393	1.4	16-QAM	1	5	14.08	14.5
	1754.3	20393	1.4	16-QAM	3	0	14.01	14.5
	1754.3	20393	1.4	16-QAM	3	2	14.00	14.5
	1754.3	20393	1.4	16-QAM	3	3	14.01	14.5
	1754.3	20393	1.4	16-QAM	6	0	13.10	13.5

8.2.5 LTE Band 2 (PCS)

Table 8-31
LTE Band 2 (PCS) Conducted Powers - 20 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	1860	18700	20	QPSK	1	0	23.21	24.0
	1860	18700	20	QPSK	1	50	23.53	24.0
	1860	18700	20	QPSK	1	99	23.01	24.0
	1860	18700	20	QPSK	50	0	21.17	22.0
	1860	18700	20	QPSK	50	25	21.03	22.0
	1860	18700	20	QPSK	50	50	21.03	22.0
	1860	18700	20	QPSK	100	0	21.04	22.0
	1860	18700	20	16QAM	1	0	21.62	22.0
	1860	18700	20	16QAM	1	50	21.56	22.0
	1860	18700	20	16QAM	1	99	21.36	22.0
	1860	18700	20	16QAM	50	0	20.09	21.0
	1860	18700	20	16QAM	50	25	20.05	21.0
	1860	18700	20	16QAM	50	50	20.01	21.0
	1860	18700	20	16QAM	100	0	20.02	21.0
Mid	1880.0	18900	20	QPSK	1	0	**23.55**	24.0
	1880.0	18900	20	QPSK	1	50	23.51	24.0
	1880.0	18900	20	QPSK	1	99	23.24	24.0
	1880.0	18900	20	QPSK	50	0	**21.18**	22.0
	1880.0	18900	20	QPSK	50	25	21.08	22.0
	1880.0	18900	20	QPSK	50	50	21.00	22.0
	1880.0	18900	20	QPSK	100	0	21.07	22.0
	1880.0	18900	20	16QAM	1	0	21.67	22.0
	1880.0	18900	20	16QAM	1	50	21.68	22.0
	1880.0	18900	20	16QAM	1	99	21.19	22.0
	1880.0	18900	20	16QAM	50	0	20.19	21.0
	1880.0	18900	20	16QAM	50	25	20.19	21.0
	1880.0	18900	20	16QAM	50	50	20.15	21.0
	1880.0	18900	20	16QAM	100	0	20.15	21.0
High	1900	19100	20	QPSK	1	0	23.52	24.0
	1900	19100	20	QPSK	1	50	23.54	24.0
	1900	19100	20	QPSK	1	99	23.16	24.0
	1900	19100	20	QPSK	50	0	21.10	22.0
	1900	19100	20	QPSK	50	25	21.13	22.0
	1900	19100	20	QPSK	50	50	21.05	22.0
	1900	19100	20	QPSK	100	0	21.00	22.0
	1900	19100	20	16QAM	1	0	21.63	22.0
	1900	19100	20	16QAM	1	50	21.43	22.0
	1900	19100	20	16QAM	1	99	21.13	22.0
	1900	19100	20	16QAM	50	0	20.17	21.0
	1900	19100	20	16QAM	50	25	20.14	21.0
	1900	19100	20	16QAM	50	50	20.11	21.0
	1900	19100	20	16QAM	100	0	20.10	21.0

Table 8-32
LTE Band 2 (PCS) Conducted Powers - 15 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	1857.5	18675	15	QPSK	1	0	23.01	24.0
	1857.5	18675	15	QPSK	1	36	23.36	24.0
	1857.5	18675	15	QPSK	1	74	23.54	24.0
	1857.5	18675	15	QPSK	36	0	21.40	22.0
	1857.5	18675	15	QPSK	36	18	21.06	22.0
	1857.5	18675	15	QPSK	36	37	21.23	22.0
	1857.5	18675	15	QPSK	75	0	21.20	22.0
	1857.5	18675	15	16QAM	1	0	21.97	22.0
	1857.5	18675	15	16QAM	1	36	21.67	22.0
	1857.5	18675	15	16QAM	1	74	21.82	22.0
	1857.5	18675	15	16QAM	36	0	20.43	21.0
	1857.5	18675	15	16QAM	36	18	20.20	21.0
	1857.5	18675	15	16QAM	36	37	20.22	21.0
	1857.5	18675	15	16QAM	75	0	20.33	21.0
Mid	1880.0	18900	15	QPSK	1	0	23.50	24.0
	1880.0	18900	15	QPSK	1	36	23.36	24.0
	1880.0	18900	15	QPSK	1	74	23.16	24.0
	1880.0	18900	15	QPSK	36	0	21.25	22.0
	1880.0	18900	15	QPSK	36	18	21.02	22.0
	1880.0	18900	15	QPSK	36	37	21.07	22.0
	1880.0	18900	15	QPSK	75	0	21.20	22.0
	1880.0	18900	15	16QAM	1	0	21.91	22.0
	1880.0	18900	15	16QAM	1	36	21.70	22.0
	1880.0	18900	15	16QAM	1	74	21.56	22.0
	1880.0	18900	15	16QAM	36	0	20.27	21.0
	1880.0	18900	15	16QAM	36	18	20.13	21.0
	1880.0	18900	15	16QAM	36	37	20.17	21.0
	1880.0	18900	15	16QAM	75	0	20.19	21.0
High	1902.5	19125	15	QPSK	1	0	23.58	24.0
	1902.5	19125	15	QPSK	1	36	23.01	24.0
	1902.5	19125	15	QPSK	1	74	23.33	24.0
	1902.5	19125	15	QPSK	36	0	21.31	22.0
	1902.5	19125	15	QPSK	36	18	21.15	22.0
	1902.5	19125	15	QPSK	36	37	21.12	22.0
	1902.5	19125	15	QPSK	75	0	21.19	22.0
	1902.5	19125	15	16QAM	1	0	21.84	22.0
	1902.5	19125	15	16QAM	1	36	21.30	22.0
	1902.5	19125	15	16QAM	1	74	21.38	22.0
	1902.5	19125	15	16QAM	36	0	20.37	21.0
	1902.5	19125	15	16QAM	36	18	20.08	21.0
	1902.5	19125	15	16QAM	36	37	20.14	21.0
	1902.5	19125	15	16QAM	75	0	20.26	21.0

Table 8-33
LTE Band 2 (PCS) Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	1855	18650	10	QPSK	1	0	23.28	24.0
	1855	18650	10	QPSK	1	25	23.13	24.0
	1855	18650	10	QPSK	1	49	23.13	24.0
	1855	18650	10	QPSK	25	0	21.40	22.0
	1855	18650	10	QPSK	25	12	21.29	22.0
	1855	18650	10	QPSK	25	25	21.28	22.0
	1855	18650	10	QPSK	50	0	21.35	22.0
	1855	18650	10	16QAM	1	0	21.99	22.0
	1855	18650	10	16QAM	1	25	21.89	22.0
	1855	18650	10	16QAM	1	49	21.92	22.0
	1855	18650	10	16QAM	25	0	20.48	21.0
	1855	18650	10	16QAM	25	12	20.35	21.0
	1855	18650	10	16QAM	25	25	20.31	21.0
	1855	18650	10	16QAM	50	0	20.37	21.0
Mid	1880.0	18900	10	QPSK	1	0	23.57	24.0
	1880.0	18900	10	QPSK	1	25	23.50	24.0
	1880.0	18900	10	QPSK	1	49	23.31	24.0
	1880.0	18900	10	QPSK	25	0	21.34	22.0
	1880.0	18900	10	QPSK	25	12	21.29	22.0
	1880.0	18900	10	QPSK	25	25	21.26	22.0
	1880.0	18900	10	QPSK	50	0	21.31	22.0
	1880.0	18900	10	16QAM	1	0	21.09	22.0
	1880.0	18900	10	16QAM	1	25	21.60	22.0
	1880.0	18900	10	16QAM	1	49	21.35	22.0
	1880.0	18900	10	16QAM	25	0	20.45	21.0
	1880.0	18900	10	16QAM	25	12	20.43	21.0
	1880.0	18900	10	16QAM	25	25	20.28	21.0
	1880.0	18900	10	16QAM	50	0	20.27	21.0
High	1905	19150	10	QPSK	1	0	23.29	24.0
	1905	19150	10	QPSK	1	25	23.21	24.0
	1905	19150	10	QPSK	1	49	23.08	24.0
	1905	19150	10	QPSK	25	0	21.35	22.0
	1905	19150	10	QPSK	25	12	21.32	22.0
	1905	19150	10	QPSK	25	25	21.20	22.0
	1905	19150	10	QPSK	50	0	21.32	22.0
	1905	19150	10	16QAM	1	0	21.60	22.0
	1905	19150	10	16QAM	1	25	21.89	22.0
	1905	19150	10	16QAM	1	49	21.72	22.0
	1905	19150	10	16QAM	25	0	20.37	21.0
	1905	19150	10	16QAM	25	12	20.32	21.0
	1905	19150	10	16QAM	25	25	20.29	21.0
	1905	19150	10	16QAM	50	0	20.31	21.0

Table 8-34
LTE Band 2 (PCS) Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	1852.5	18625	5	QPSK	1	0	23.54	24.0
	1852.5	18625	5	QPSK	1	12	23.16	24.0
	1852.5	18625	5	QPSK	1	24	23.42	24.0
	1852.5	18625	5	QPSK	12	0	21.29	22.0
	1852.5	18625	5	QPSK	12	6	21.26	22.0
	1852.5	18625	5	QPSK	12	13	21.34	22.0
	1852.5	18625	5	QPSK	25	0	21.34	22.0
	1852.5	18625	5	16-QAM	1	0	21.59	22.0
	1852.5	18625	5	16-QAM	1	12	21.65	22.0
	1852.5	18625	5	16-QAM	1	24	21.81	22.0
	1852.5	18625	5	16-QAM	12	0	20.43	21.0
	1852.5	18625	5	16-QAM	12	6	20.29	21.0
	1852.5	18625	5	16-QAM	12	13	20.43	21.0
	1852.5	18625	5	16-QAM	25	0	20.41	21.0
Mid	1880.0	18900	5	QPSK	1	0	23.50	24.0
	1880.0	18900	5	QPSK	1	12	23.08	24.0
	1880.0	18900	5	QPSK	1	24	23.46	24.0
	1880.0	18900	5	QPSK	12	0	21.36	22.0
	1880.0	18900	5	QPSK	12	6	21.17	22.0
	1880.0	18900	5	QPSK	12	13	21.34	22.0
	1880.0	18900	5	QPSK	25	0	21.35	22.0
	1880.0	18900	5	16-QAM	1	0	21.95	22.0
	1880.0	18900	5	16-QAM	1	12	21.74	22.0
	1880.0	18900	5	16-QAM	1	24	21.96	22.0
	1880.0	18900	5	16-QAM	12	0	20.43	21.0
	1880.0	18900	5	16-QAM	12	6	20.33	21.0
	1880.0	18900	5	16-QAM	12	13	20.44	21.0
	1880.0	18900	5	16-QAM	25	0	20.38	21.0
High	1907.5	19175	5	QPSK	1	0	23.46	24.0
	1907.5	19175	5	QPSK	1	12	23.08	24.0
	1907.5	19175	5	QPSK	1	24	23.17	24.0
	1907.5	19175	5	QPSK	12	0	21.37	22.0
	1907.5	19175	5	QPSK	12	6	21.30	22.0
	1907.5	19175	5	QPSK	12	13	21.30	22.0
	1907.5	19175	5	QPSK	25	0	21.28	22.0
	1907.5	19175	5	16-QAM	1	0	21.68	22.0
	1907.5	19175	5	16-QAM	1	12	21.78	22.0
	1907.5	19175	5	16-QAM	1	24	21.50	22.0
	1907.5	19175	5	16-QAM	12	0	20.42	21.0
	1907.5	19175	5	16-QAM	12	6	20.22	21.0
	1907.5	19175	5	16-QAM	12	13	20.44	21.0
	1907.5	19175	5	16-QAM	25	0	20.38	21.0

Table 8-35
LTE Band 2 (PCS) Conducted Powers - 3 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	1851.5	18615	3	QPSK	1	0	23.50	24.0
	1851.5	18615	3	QPSK	1	7	23.40	24.0
	1851.5	18615	3	QPSK	1	14	23.40	24.0
	1851.5	18615	3	QPSK	8	0	21.34	22.0
	1851.5	18615	3	QPSK	8	4	21.40	22.0
	1851.5	18615	3	QPSK	8	7	21.33	22.0
	1851.5	18615	3	QPSK	15	0	21.39	22.0
	1851.5	18615	3	16-QAM	1	0	21.52	22.0
	1851.5	18615	3	16-QAM	1	7	21.55	22.0
	1851.5	18615	3	16-QAM	1	14	21.76	22.0
	1851.5	18615	3	16-QAM	8	0	20.51	21.0
	1851.5	18615	3	16-QAM	8	4	20.48	21.0
	1851.5	18615	3	16-QAM	8	7	20.54	21.0
	1851.5	18615	3	16-QAM	15	0	20.46	21.0
Mid	1880.0	18900	3	QPSK	1	0	23.42	24.0
	1880.0	18900	3	QPSK	1	7	23.36	24.0
	1880.0	18900	3	QPSK	1	14	23.37	24.0
	1880.0	18900	3	QPSK	8	0	21.32	22.0
	1880.0	18900	3	QPSK	8	4	21.28	22.0
	1880.0	18900	3	QPSK	8	7	21.31	22.0
	1880.0	18900	3	QPSK	15	0	21.34	22.0
	1880.0	18900	3	16-QAM	1	0	21.71	22.0
	1880.0	18900	3	16-QAM	1	7	21.58	22.0
	1880.0	18900	3	16-QAM	1	14	21.66	22.0
	1880.0	18900	3	16-QAM	8	0	20.51	21.0
	1880.0	18900	3	16-QAM	8	4	20.42	21.0
	1880.0	18900	3	16-QAM	8	7	20.34	21.0
	1880.0	18900	3	16-QAM	15	0	20.42	21.0
High	1908.5	19185	3	QPSK	1	0	23.46	24.0
	1908.5	19185	3	QPSK	1	7	23.38	24.0
	1908.5	19185	3	QPSK	1	14	23.37	24.0
	1908.5	19185	3	QPSK	8	0	21.32	22.0
	1908.5	19185	3	QPSK	8	4	21.27	22.0
	1908.5	19185	3	QPSK	8	7	21.31	22.0
	1908.5	19185	3	QPSK	15	0	21.31	22.0
	1908.5	19185	3	16-QAM	1	0	21.43	22.0
	1908.5	19185	3	16-QAM	1	7	21.91	22.0
	1908.5	19185	3	16-QAM	1	14	21.84	22.0
	1908.5	19185	3	16-QAM	8	0	20.38	21.0
	1908.5	19185	3	16-QAM	8	4	20.40	21.0
	1908.5	19185	3	16-QAM	8	7	20.39	21.0
	1908.5	19185	3	16-QAM	15	0	20.35	21.0

Table 8-36
LTE Band 2 (PCS) Conducted Powers – 1.4 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	1850.7	18607	1.4	QPSK	1	0	23.56	24.0
	1850.7	18607	1.4	QPSK	1	2	23.56	24.0
	1850.7	18607	1.4	QPSK	1	5	23.49	24.0
	1850.7	18607	1.4	QPSK	3	0	23.17	24.0
	1850.7	18607	1.4	QPSK	3	2	23.05	24.0
	1850.7	18607	1.4	QPSK	3	3	23.05	24.0
	1850.7	18607	1.4	QPSK	6	0	21.32	22.0
	1850.7	18607	1.4	16-QAM	1	0	21.84	22.0
	1850.7	18607	1.4	16-QAM	1	2	21.92	22.0
	1850.7	18607	1.4	16-QAM	1	5	22.00	22.0
	1850.7	18607	1.4	16-QAM	3	0	21.45	22.0
	1850.7	18607	1.4	16-QAM	3	2	21.35	22.0
	1850.7	18607	1.4	16-QAM	3	3	21.44	22.0
	1850.7	18607	1.4	16-QAM	6	0	20.62	21.0
Mid	1880.0	18900	1.4	QPSK	1	0	23.29	24.0
	1880.0	18900	1.4	QPSK	1	2	23.25	24.0
	1880.0	18900	1.4	QPSK	1	5	23.26	24.0
	1880.0	18900	1.4	QPSK	3	0	23.09	24.0
	1880.0	18900	1.4	QPSK	3	2	23.07	24.0
	1880.0	18900	1.4	QPSK	3	3	23.04	24.0
	1880.0	18900	1.4	QPSK	6	0	21.39	22.0
	1880.0	18900	1.4	16-QAM	1	0	21.97	22.0
	1880.0	18900	1.4	16-QAM	1	2	21.88	22.0
	1880.0	18900	1.4	16-QAM	1	5	21.87	22.0
	1880.0	18900	1.4	16-QAM	3	0	21.40	22.0
	1880.0	18900	1.4	16-QAM	3	2	21.63	22.0
	1880.0	18900	1.4	16-QAM	3	3	21.48	22.0
	1880.0	18900	1.4	16-QAM	6	0	20.56	21.0
High	1909.3	19193	1.4	QPSK	1	0	23.48	24.0
	1909.3	19193	1.4	QPSK	1	2	23.42	24.0
	1909.3	19193	1.4	QPSK	1	5	23.17	24.0
	1909.3	19193	1.4	QPSK	3	0	23.25	24.0
	1909.3	19193	1.4	QPSK	3	2	23.47	24.0
	1909.3	19193	1.4	QPSK	3	3	23.44	24.0
	1909.3	19193	1.4	QPSK	6	0	21.33	22.0
	1909.3	19193	1.4	16-QAM	1	0	21.94	22.0
	1909.3	19193	1.4	16-QAM	1	2	21.80	22.0
	1909.3	19193	1.4	16-QAM	1	5	21.91	22.0
	1909.3	19193	1.4	16-QAM	3	0	21.46	22.0
	1909.3	19193	1.4	16-QAM	3	2	21.41	22.0
	1909.3	19193	1.4	16-QAM	3	3	21.55	22.0
	1909.3	19193	1.4	16-QAM	6	0	20.54	21.0

Table 8-37
LTE Band 2 (PCS) Conducted Powers - 20 MHz Bandwidth
Reduced Power – Body at 0.0 cm

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	1860	18700	20	QPSK	1	0	**14.47**	14.0
	1860	18700	20	QPSK	1	50	14.45	14.0
	1860	18700	20	QPSK	1	99	14.25	14.0
	1860	18700	20	QPSK	50	0	**12.76**	13.0
	1860	18700	20	QPSK	50	25	12.62	13.0
	1860	18700	20	QPSK	50	50	12.54	13.0
	1860	18700	20	QPSK	100	0	12.60	13.0
	1860	18700	20	16QAM	1	0	12.90	13.0
	1860	18700	20	16QAM	1	50	12.99	13.0
	1860	18700	20	16QAM	1	99	12.59	13.0
	1860	18700	20	16QAM	50	0	11.72	12.0
	1860	18700	20	16QAM	50	25	11.61	12.0
	1860	18700	20	16QAM	50	50	11.51	12.0
	1860	18700	20	16QAM	100	0	11.60	12.0
Mid	1880.0	18900	20	QPSK	1	0	**14.48**	14.0
	1880.0	18900	20	QPSK	1	50	14.47	14.0
	1880.0	18900	20	QPSK	1	99	14.45	14.0
	1880.0	18900	20	QPSK	50	0	**12.92**	13.0
	1880.0	18900	20	QPSK	50	25	12.70	13.0
	1880.0	18900	20	QPSK	50	50	12.64	13.0
	1880.0	18900	20	QPSK	100	0	12.68	13.0
	1880.0	18900	20	16QAM	1	0	13.20	13.0
	1880.0	18900	20	16QAM	1	50	13.05	13.0
	1880.0	18900	20	16QAM	1	99	12.52	13.0
	1880.0	18900	20	16QAM	50	0	11.76	12.0
	1880.0	18900	20	16QAM	50	25	11.61	12.0
	1880.0	18900	20	16QAM	50	50	11.57	12.0
	1880.0	18900	20	16QAM	100	0	11.58	12.0
High	1900	19100	20	QPSK	1	0	**14.47**	14.0
	1900	19100	20	QPSK	1	50	14.46	14.0
	1900	19100	20	QPSK	1	99	14.13	14.0
	1900	19100	20	QPSK	50	0	**12.75**	13.0
	1900	19100	20	QPSK	50	25	12.62	13.0
	1900	19100	20	QPSK	50	50	12.55	13.0
	1900	19100	20	QPSK	100	0	**12.71**	13.0
	1900	19100	20	16QAM	1	0	13.10	13.0
	1900	19100	20	16QAM	1	50	13.04	13.0
	1900	19100	20	16QAM	1	99	12.52	13.0
	1900	19100	20	16QAM	50	0	11.69	12.0
	1900	19100	20	16QAM	50	25	11.61	12.0
	1900	19100	20	16QAM	50	50	11.50	12.0
	1900	19100	20	16QAM	100	0	11.55	12.0

Table 8-38
LTE Band 2 (PCS) Conducted Powers - 15 MHz Bandwidth
Reduced Power – Body at 0.0 cm

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	1857.5	18675	15	QPSK	1	0	14.33	14.0
	1857.5	18675	15	QPSK	1	36	13.64	14.0
	1857.5	18675	15	QPSK	1	74	14.04	14.0
	1857.5	18675	15	QPSK	36	0	12.92	13.0
	1857.5	18675	15	QPSK	36	18	12.71	13.0
	1857.5	18675	15	QPSK	36	37	12.67	13.0
	1857.5	18675	15	QPSK	75	0	12.83	13.0
	1857.5	18675	15	16QAM	1	0	13.24	13.0
	1857.5	18675	15	16QAM	1	36	13.11	13.0
	1857.5	18675	15	16QAM	1	74	13.41	13.0
	1857.5	18675	15	16QAM	36	0	11.93	12.0
	1857.5	18675	15	16QAM	36	18	11.69	12.0
	1857.5	18675	15	16QAM	36	37	11.73	12.0
	1857.5	18675	15	16QAM	75	0	11.87	12.0
Mid	1880.0	18900	15	QPSK	1	0	14.16	14.0
	1880.0	18900	15	QPSK	1	36	13.89	14.0
	1880.0	18900	15	QPSK	1	74	14.05	14.0
	1880.0	18900	15	QPSK	36	0	12.93	13.0
	1880.0	18900	15	QPSK	36	18	12.72	13.0
	1880.0	18900	15	QPSK	36	37	12.82	13.0
	1880.0	18900	15	QPSK	75	0	12.91	13.0
	1880.0	18900	15	16QAM	1	0	13.46	13.0
	1880.0	18900	15	16QAM	1	36	13.07	13.0
	1880.0	18900	15	16QAM	1	74	13.19	13.0
	1880.0	18900	15	16QAM	36	0	11.99	12.0
	1880.0	18900	15	16QAM	36	18	11.73	12.0
	1880.0	18900	15	16QAM	36	37	11.83	12.0
	1880.0	18900	15	16QAM	75	0	11.87	12.0
High	1902.5	19125	15	QPSK	1	0	14.14	14.0
	1902.5	19125	15	QPSK	1	36	14.11	14.0
	1902.5	19125	15	QPSK	1	74	14.18	14.0
	1902.5	19125	15	QPSK	36	0	12.96	13.0
	1902.5	19125	15	QPSK	36	18	12.75	13.0
	1902.5	19125	15	QPSK	36	37	12.81	13.0
	1902.5	19125	15	QPSK	75	0	12.88	13.0
	1902.5	19125	15	16QAM	1	0	13.50	13.0
	1902.5	19125	15	16QAM	1	36	13.13	13.0
	1902.5	19125	15	16QAM	1	74	13.31	13.0
	1902.5	19125	15	16QAM	36	0	11.84	12.0
	1902.5	19125	15	16QAM	36	18	11.71	12.0
	1902.5	19125	15	16QAM	36	37	11.71	12.0
	1902.5	19125	15	16QAM	75	0	11.80	12.0

Table 8-39
LTE Band 2 (PCS) Conducted Powers - 10 MHz Bandwidth
Reduced Power – Body at 0.0 cm

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	1855	18650	10	QPSK	1	0	14.33	14.0
	1855	18650	10	QPSK	1	25	14.39	14.0
	1855	18650	10	QPSK	1	49	14.50	14.0
	1855	18650	10	QPSK	25	0	12.99	13.0
	1855	18650	10	QPSK	25	12	12.92	13.0
	1855	18650	10	QPSK	25	25	12.87	13.0
	1855	18650	10	QPSK	50	0	12.88	13.0
	1855	18650	10	16QAM	1	0	13.24	13.0
	1855	18650	10	16QAM	1	25	13.30	13.0
	1855	18650	10	16QAM	1	49	13.04	13.0
	1855	18650	10	16QAM	25	0	11.99	12.0
	1855	18650	10	16QAM	25	12	12.00	12.0
	1855	18650	10	16QAM	25	25	11.89	12.0
	1855	18650	10	16QAM	50	0	11.90	12.0
Mid	1880.0	18900	10	QPSK	1	0	14.39	14.0
	1880.0	18900	10	QPSK	1	25	14.36	14.0
	1880.0	18900	10	QPSK	1	49	14.30	14.0
	1880.0	18900	10	QPSK	25	0	13.02	13.0
	1880.0	18900	10	QPSK	25	12	12.96	13.0
	1880.0	18900	10	QPSK	25	25	12.89	13.0
	1880.0	18900	10	QPSK	50	0	12.98	13.0
	1880.0	18900	10	16QAM	1	0	13.32	13.0
	1880.0	18900	10	16QAM	1	25	13.39	13.0
	1880.0	18900	10	16QAM	1	49	13.27	13.0
	1880.0	18900	10	16QAM	25	0	11.97	12.0
	1880.0	18900	10	16QAM	25	12	11.96	12.0
	1880.0	18900	10	16QAM	25	25	11.96	12.0
	1880.0	18900	10	16QAM	50	0	11.95	12.0
High	1905	19150	10	QPSK	1	0	14.39	14.0
	1905	19150	10	QPSK	1	25	14.41	14.0
	1905	19150	10	QPSK	1	49	14.50	14.0
	1905	19150	10	QPSK	25	0	12.93	13.0
	1905	19150	10	QPSK	25	12	12.95	13.0
	1905	19150	10	QPSK	25	25	12.86	13.0
	1905	19150	10	QPSK	50	0	12.93	13.0
	1905	19150	10	16QAM	1	0	13.31	13.0
	1905	19150	10	16QAM	1	25	13.19	13.0
	1905	19150	10	16QAM	1	49	13.08	13.0
	1905	19150	10	16QAM	25	0	12.02	12.0
	1905	19150	10	16QAM	25	12	12.01	12.0
	1905	19150	10	16QAM	25	25	11.84	12.0
	1905	19150	10	16QAM	50	0	11.96	12.0

Table 8-40
LTE Band 2 (PCS) Conducted Powers - 5 MHz Bandwidth
Reduced Power – Body at 0.0 cm

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	1852.5	18625	5	QPSK	1	0	14.44	14.0
	1852.5	18625	5	QPSK	1	12	14.27	14.0
	1852.5	18625	5	QPSK	1	24	14.40	14.0
	1852.5	18625	5	QPSK	12	0	13.02	13.0
	1852.5	18625	5	QPSK	12	6	12.91	13.0
	1852.5	18625	5	QPSK	12	13	12.97	13.0
	1852.5	18625	5	QPSK	25	0	12.98	13.0
	1852.5	18625	5	16-QAM	1	0	13.20	13.0
	1852.5	18625	5	16-QAM	1	12	13.24	13.0
	1852.5	18625	5	16-QAM	1	24	13.33	13.0
	1852.5	18625	5	16-QAM	12	0	12.05	12.0
	1852.5	18625	5	16-QAM	12	6	11.89	12.0
	1852.5	18625	5	16-QAM	12	13	11.90	12.0
	1852.5	18625	5	16-QAM	25	0	11.96	12.0
Mid	1880.0	18900	5	QPSK	1	0	14.50	14.0
	1880.0	18900	5	QPSK	1	12	14.09	14.0
	1880.0	18900	5	QPSK	1	24	14.38	14.0
	1880.0	18900	5	QPSK	12	0	12.95	13.0
	1880.0	18900	5	QPSK	12	6	12.79	13.0
	1880.0	18900	5	QPSK	12	13	12.94	13.0
	1880.0	18900	5	QPSK	25	0	12.98	13.0
	1880.0	18900	5	16-QAM	1	0	13.30	13.0
	1880.0	18900	5	16-QAM	1	12	13.23	13.0
	1880.0	18900	5	16-QAM	1	24	13.17	13.0
	1880.0	18900	5	16-QAM	12	0	12.02	12.0
	1880.0	18900	5	16-QAM	12	6	11.87	12.0
	1880.0	18900	5	16-QAM	12	13	11.94	12.0
	1880.0	18900	5	16-QAM	25	0	12.04	12.0
High	1907.5	19175	5	QPSK	1	0	14.49	14.0
	1907.5	19175	5	QPSK	1	12	14.08	14.0
	1907.5	19175	5	QPSK	1	24	14.32	14.0
	1907.5	19175	5	QPSK	12	0	12.96	13.0
	1907.5	19175	5	QPSK	12	6	12.80	13.0
	1907.5	19175	5	QPSK	12	13	12.92	13.0
	1907.5	19175	5	QPSK	25	0	12.90	13.0
	1907.5	19175	5	16-QAM	1	0	13.28	13.0
	1907.5	19175	5	16-QAM	1	12	13.20	13.0
	1907.5	19175	5	16-QAM	1	24	13.19	13.0
	1907.5	19175	5	16-QAM	12	0	11.96	12.0
	1907.5	19175	5	16-QAM	12	6	11.82	12.0
	1907.5	19175	5	16-QAM	12	13	11.90	12.0
	1907.5	19175	5	16-QAM	25	0	11.98	12.0

Table 8-41
LTE Band 2 (PCS) Conducted Powers - 3 MHz Bandwidth
Reduced Power – Body at 0.0 cm

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	1851.5	18615	3	QPSK	1	0	14.32	14.0
	1851.5	18615	3	QPSK	1	7	14.26	14.0
	1851.5	18615	3	QPSK	1	14	14.23	14.0
	1851.5	18615	3	QPSK	8	0	12.98	13.0
	1851.5	18615	3	QPSK	8	4	13.00	13.0
	1851.5	18615	3	QPSK	8	7	13.01	13.0
	1851.5	18615	3	QPSK	15	0	12.98	13.0
	1851.5	18615	3	16-QAM	1	0	13.35	13.0
	1851.5	18615	3	16-QAM	1	7	13.17	13.0
	1851.5	18615	3	16-QAM	1	14	13.13	13.0
	1851.5	18615	3	16-QAM	8	0	12.08	12.0
	1851.5	18615	3	16-QAM	8	4	11.99	12.0
	1851.5	18615	3	16-QAM	8	7	12.04	12.0
	1851.5	18615	3	16-QAM	15	0	11.97	12.0
	1880.0	18900	3	QPSK	1	0	14.07	14.0
	1880.0	18900	3	QPSK	1	7	13.69	14.0
	1880.0	18900	3	QPSK	1	14	13.73	14.0
	1880.0	18900	3	QPSK	8	0	13.04	13.0
	1880.0	18900	3	QPSK	8	4	13.00	13.0
	1880.0	18900	3	QPSK	8	7	13.05	13.0
	1880.0	18900	3	QPSK	15	0	13.00	13.0
	1880.0	18900	3	16-QAM	1	0	13.24	13.0
	1880.0	18900	3	16-QAM	1	7	13.45	13.0
	1880.0	18900	3	16-QAM	1	14	13.35	13.0
	1880.0	18900	3	16-QAM	8	0	11.97	12.0
	1880.0	18900	3	16-QAM	8	4	11.99	12.0
	1880.0	18900	3	16-QAM	8	7	11.90	12.0
	1880.0	18900	3	16-QAM	15	0	11.99	12.0
High	1908.5	19185	3	QPSK	1	0	14.25	14.0
	1908.5	19185	3	QPSK	1	7	14.22	14.0
	1908.5	19185	3	QPSK	1	14	14.19	14.0
	1908.5	19185	3	QPSK	8	0	12.92	13.0
	1908.5	19185	3	QPSK	8	4	12.98	13.0
	1908.5	19185	3	QPSK	8	7	12.95	13.0
	1908.5	19185	3	QPSK	15	0	13.00	13.0
	1908.5	19185	3	16-QAM	1	0	13.31	13.0
	1908.5	19185	3	16-QAM	1	7	13.36	13.0
	1908.5	19185	3	16-QAM	1	14	13.18	13.0
	1908.5	19185	3	16-QAM	8	0	11.93	12.0
	1908.5	19185	3	16-QAM	8	4	11.94	12.0
	1908.5	19185	3	16-QAM	8	7	11.89	12.0
	1908.5	19185	3	16-QAM	15	0	11.92	12.0

Table 8-42
LTE Band 2 (PCS) Conducted Powers – 1.4 MHz Bandwidth
Reduced Power – Body at 0.0 cm

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Expected Power [dBm]
Low	1850.7	18607	1.4	QPSK	1	0	14.36	14.0
	1850.7	18607	1.4	QPSK	1	2	14.35	14.0
	1850.7	18607	1.4	QPSK	1	5	14.36	14.0
	1850.7	18607	1.4	QPSK	3	0	14.45	14.0
	1850.7	18607	1.4	QPSK	3	2	14.43	14.0
	1850.7	18607	1.4	QPSK	3	3	14.35	14.0
	1850.7	18607	1.4	QPSK	6	0	13.02	13.0
	1850.7	18607	1.4	16-QAM	1	0	13.24	13.0
	1850.7	18607	1.4	16-QAM	1	2	13.48	13.0
	1850.7	18607	1.4	16-QAM	1	5	13.37	13.0
	1850.7	18607	1.4	16-QAM	3	0	13.06	13.0
	1850.7	18607	1.4	16-QAM	3	2	12.93	13.0
	1850.7	18607	1.4	16-QAM	3	3	13.07	13.0
	1850.7	18607	1.4	16-QAM	6	0	12.13	12.0
Mid	1880.0	18900	1.4	QPSK	1	0	14.27	14.0
	1880.0	18900	1.4	QPSK	1	2	14.31	14.0
	1880.0	18900	1.4	QPSK	1	5	14.26	14.0
	1880.0	18900	1.4	QPSK	3	0	14.23	14.0
	1880.0	18900	1.4	QPSK	3	2	14.35	14.0
	1880.0	18900	1.4	QPSK	3	3	14.24	14.0
	1880.0	18900	1.4	QPSK	6	0	12.99	13.0
	1880.0	18900	1.4	16-QAM	1	0	13.31	13.0
	1880.0	18900	1.4	16-QAM	1	2	13.27	13.0
	1880.0	18900	1.4	16-QAM	1	5	13.36	13.0
	1880.0	18900	1.4	16-QAM	3	0	12.98	13.0
	1880.0	18900	1.4	16-QAM	3	2	13.02	13.0
	1880.0	18900	1.4	16-QAM	3	3	13.04	13.0
	1880.0	18900	1.4	16-QAM	6	0	12.08	12.0
High	1909.3	19193	1.4	QPSK	1	0	14.28	14.0
	1909.3	19193	1.4	QPSK	1	2	14.27	14.0
	1909.3	19193	1.4	QPSK	1	5	14.21	14.0
	1909.3	19193	1.4	QPSK	3	0	14.28	14.0
	1909.3	19193	1.4	QPSK	3	2	14.38	14.0
	1909.3	19193	1.4	QPSK	3	3	14.33	14.0
	1909.3	19193	1.4	QPSK	6	0	12.92	13.0
	1909.3	19193	1.4	16-QAM	1	0	13.25	13.0
	1909.3	19193	1.4	16-QAM	1	2	13.27	13.0
	1909.3	19193	1.4	16-QAM	1	5	13.27	13.0
	1909.3	19193	1.4	16-QAM	3	0	12.92	13.0
	1909.3	19193	1.4	16-QAM	3	2	12.88	13.0
	1909.3	19193	1.4	16-QAM	3	3	12.87	13.0
	1909.3	19193	1.4	16-QAM	6	0	12.08	12.0

8.2.6 LTE Carrier Aggregation Conducted Powers

Table 8-43
Maximum LTE Carrier Aggregation Conducted Powers
Band 17 (PCC) 5 MHz BW + Band 2 (SCC) 10 MHz BW

Band 17 (PCC) 5 MHz+ Band 2 (SCC), 10 MHz				
710 MHz / ch. 23790 + 1960 MHz / ch. 900	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE Rel. 8 Tx.Power (dBm)
	1	0	23.03	23.23

Table 8-44
Reduced LTE Carrier Aggregation Conducted Powers
Band 17 (PCC) 5 MHz BW + Band 2 (SCC) 10 MHz BW

Band 17 (PCC) 5 MHz+ Band 2 (SCC), 10 MHz				
710 MHz / ch. 23790 + 1960 MHz / ch. 900	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE Rel. 8 Tx.Power (dBm)
	1	24	21.85	21.80

Table 8-45
Maximum LTE Carrier Aggregation Conducted Powers
Band 13 (PCC) 10 MHz BW + Band 4 (SCC) 20 MHz BW

Band 13 (PCC), 10 MHz + Band 4 (SCC), 20 MHz				
782 MHz / ch. 23230 + 2132.5 MHz / ch. 2175	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE Rel. 8 Tx.Power (dBm)
	1	0	22.96	23.16

Table 8-46
Reduced LTE Carrier Aggregation Conducted Powers
Band 13 (PCC) 10 MHz BW + Band 4 (SCC) 20 MHz BW

Band 13 (PCC), 10 MHz + Band 4 (SCC), 20 MHz				
782 MHz / ch. 23230 + 2132.5 MHz / ch. 2175	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE Rel. 8 Tx.Power (dBm)
	1	0	21.96	22.23

Table 8-47
Maximum LTE Carrier Aggregation Conducted Powers
Band 4 (PCC) 20 MHz BW + Band 29 (SCC) 10 MHz BW

Band 4 (PCC), 20 MHz + Band 29 (SCC), 10 MHz				
1732.5 MHz / ch. 20175 + 722.5 MHz / ch. 9715	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE Rel. 8 Tx.Power (dBm)
	1	50	23.54	23.55

Table 8-48
Reduced LTE Carrier Aggregation Conducted Powers
Band 4 (PCC) 15 MHz BW + Band 29 (SCC) 10 MHz BW

Band 4 (PCC), 15 MHz + Band 29 (SCC), 10 MHz				
1717.5 MHz / ch. 20025 + 722.5 MHz / ch. 9715	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE Rel. 8 Tx.Power (dBm)
	1	0	15.80	16.00

Table 8-49
Maximum LTE Carrier Aggregation Conducted Powers
Band 4 (PCC) 10 MHz BW + Band 17 (SCC) 10 MHz BW

Band 4 (PCC), 10 MHz + Band 17 (SCC), 10 MHz				
1732.5 MHz / ch. 20175 + 740 MHz / ch. 5790	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE B4 Rel. 8 Tx.Power (dBm)
	1	0	23.49	23.55

Table 8-50
Reduced LTE Carrier Aggregation Conducted Powers
Band 4 (PCC) 5 MHz BW + Band 17 (SCC) 10 MHz BW

Band 4 (PCC), 5 MHz + Band 17 (SCC), 10 MHz				
1712.5 MHz / ch. 19975 + 740 MHz / ch. 5790	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE Rel. 8 Tx.Power (dBm)
	1	0	15.95	16.00

Table 8-51
Maximum LTE Carrier Aggregation Conducted Powers
Band 4 (PCC) 20 MHz BW + Band 13 (SCC) 10 MHz BW

Band 4 (PCC), 20 MHz + Band 13 (SCC), 10 MHz				
1732.5 MHz / ch. 20175 + 751 MHz / ch. 5230	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE Rel. 8 Tx.Power (dBm)
	1	50	23.19	23.55

Table 8-52
Reduced LTE Carrier Aggregation Conducted Powers
Band 4 (PCC) 15 MHz BW + Band 13 (SCC) 10 MHz BW

Band 4 (PCC), 15 MHz + Band 13 (SCC), 10 MHz				
1717.5 MHz / ch. 20025 + 751 MHz / ch. 5230	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE Rel. 8 Tx.Power (dBm)
	1	0	15.70	16.00

Table 8-53
Maximum LTE Carrier Aggregation Conducted Powers
Band 2 (PCC) 15 MHz BW + Band 29 (SCC) 10 MHz BW

Band 2 (PCC), 15 MHz + Band 29 (SCC), 10 MHz				
1902.5 MHz / ch. 19125 + 722.5MHz / ch. 9715	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE Rel. 8 Tx.Power (dBm)
	1	0	23.42	23.58

Table 8-54
Reduced LTE Carrier Aggregation Conducted Powers
Band 2 (PCC) 10 MHz BW + Band 29 (SCC) 10 MHz BW

Band 2 (PCC), 10 MHz + Band 29 (SCC), 10 MHz				
1905 MHz / ch. 19150 + 722.5MHz / ch. 9715	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE Rel. 8 Tx.Power (dBm)
	1	49	14.40	14.50

Table 8-55
Maximum LTE Carrier Aggregation Conducted Powers
Band 2 (PCC) 10 MHz BW + Band 17 (SCC) 10 MHz BW

Band 2 (PCC), 10 MHz + Band 17 (SCC), 10 MHz				
1880 MHz / ch. 18900 + 740 MHz / ch. 5790	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE Rel. 8 Tx.Power (dBm)
	1	0	23.50	23.57

Table 8-56
Reduced LTE Carrier Aggregation Conducted Powers
Band 2 (PCC) 10 MHz BW + Band 17 (SCC) 10 MHz BW

Band 2 (PCC), 10 MHz + Band 17 (SCC), 10 MHz				
1905 MHz / ch. 19150 + 740 MHz / ch. 5790	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE Rel. 8 Tx.Power (dBm)
	1	49	14.47	14.50

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 2 carriers (B17+B2, B13+B4, B4+B29, B4+B17, B4+B13, B2+29, B2+B17).
4. All control and acknowledge data is sent on uplink channels that operate identical to release 8 specifications.

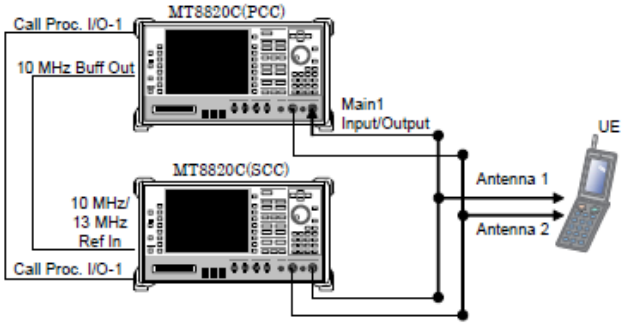


Figure 8-2
Power Measurement Setup

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
2/25/2015	750B	20.9	710	0.940	56.307	0.960	55.687	-2.08%	1.11%
			740	0.969	56.003	0.963	55.570	0.62%	0.78%
			755	0.982	55.830	0.964	55.512	1.87%	0.57%
3/31/2015	750B	21.0	740	0.968	55.892	0.963	55.570	0.52%	0.58%
			755	0.984	55.735	0.964	55.512	2.07%	0.40%
			770	0.998	55.556	0.965	55.453	3.42%	0.19%
			785	1.010	55.443	0.966	55.395	4.55%	0.09%
2/23/2015	835B	20.5	820	0.950	55.232	0.969	55.258	-1.96%	-0.05%
			835	0.965	55.112	0.970	55.200	-0.52%	-0.16%
			850	0.980	54.985	0.988	55.154	-0.81%	-0.31%
2/18/2015	1750B	22.1	1710	1.436	51.492	1.463	53.537	-1.85%	-3.82%
			1750	1.481	51.347	1.488	53.432	-0.47%	-3.90%
			1790	1.521	51.198	1.514	53.326	0.46%	-3.99%
2/19/2015	1900B	21.7	1850	1.524	52.209	1.520	53.300	0.26%	-2.05%
			1880	1.556	52.100	1.520	53.300	2.37%	-2.25%
			1910	1.592	51.970	1.520	53.300	4.74%	-2.50%

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)	$Deviation_{1g}$ (%)
B	750	BODY	02/25/2015	23.1	20.8	0.100	1003	3334	0.901	8.460	9.010	6.50%
J	750	BODY	03/31/2015	22.5	21.1	0.100	1003	3022	0.916	8.460	9.160	8.27%
B	835	BODY	02/23/2015	22.7	20.4	0.100	4d132	3334	0.936	9.140	9.360	2.41%
H	1750	BODY	02/18/2015	22.8	22.1	0.100	1008	3319	3.760	37.600	37.600	0.00%
J	1900	BODY	02/19/2015	22.8	22.0	0.100	5d149	3022	3.940	40.400	39.400	-2.48%

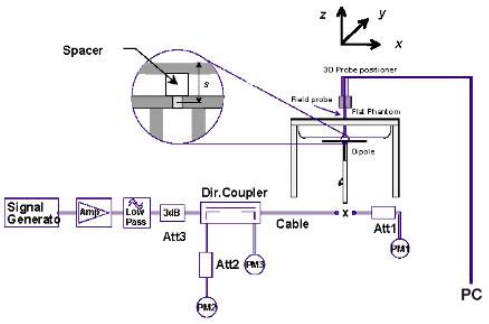


Figure 9-1
System Verification Setup Diagram

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	24.5	23.45	0.01	19 mm	000369345152	1:1	back	0.132	1.274	0.168	
836.60	4183	UMTS 850	RMC	24.5	23.45	0.00	19 mm	000369345152	1:1	top	0.152	1.274	0.194	
836.60	4183	UMTS 850	RMC	24.5	23.45	0.02	19 mm	000369345152	1:1	top tilt	0.156	1.274	0.199	
836.60	4183	UMTS 850	RMC	24.5	23.45	-0.02	0 mm	000369345152	1:1	bottom	0.020	1.274	0.025	
836.60	4183	UMTS 850	RMC	24.5	23.45	0.09	0 mm	000369345152	1:1	bottom tilt	0.019	1.274	0.024	
836.60	4183	UMTS 850	RMC	24.5	23.45	0.09	0 mm	000369345152	1:1	right	0.049	1.274	0.062	
836.60	4183	UMTS 850	RMC	24.5	23.45	-0.04	0 mm	000369345152	1:1	right tilt	0.041	1.274	0.052	
836.60	4183	UMTS 850	RMC	24.5	23.45	0.03	0 mm	000369345152	1:1	left	0.434	1.274	0.553	
836.60	4183	UMTS 850	RMC	24.5	23.45	-0.03	0 mm	000369345152	1:1	left tilt	0.400	1.274	0.510	
826.40	4132	UMTS 850	RMC	22.0	21.33	0.01	0 mm	000369345152	1:1	back	0.873	1.167	1.019	
836.60	4183	UMTS 850	RMC	22.0	21.35	-0.01	0 mm	000369345152	1:1	back	0.856	1.161	0.994	
846.60	4233	UMTS 850	RMC	22.0	21.32	0.04	0 mm	000369345152	1:1	back	0.837	1.169	0.978	
826.40	4132	UMTS 850	RMC	22.0	21.33	-0.01	0 mm	000369345152	1:1	top	0.877	1.167	1.023	
836.60	4183	UMTS 850	RMC	22.0	21.35	-0.01	0 mm	000369345152	1:1	top	0.980	1.161	1.138	A1
846.60	4233	UMTS 850	RMC	22.0	21.32	0.02	0 mm	000369345152	1:1	top	0.892	1.169	1.043	
826.40	4132	UMTS 850	RMC	22.0	21.33	0.05	0 mm	000369345152	1:1	top tilt	0.836	1.167	0.976	
836.60	4183	UMTS 850	RMC	22.0	21.35	0.02	0 mm	000369345152	1:1	top tilt	0.854	1.161	0.991	
846.60	4233	UMTS 850	RMC	22.0	21.32	-0.02	0 mm	000369345152	1:1	top tilt	0.835	1.169	0.976	
1880.00	9400	UMTS 1900	RMC	24.5	23.17	-0.01	19 mm	000366645152	1:1	back	0.162	1.358	0.220	
1880.00	9400	UMTS 1900	RMC	24.5	23.17	-0.02	19 mm	000366645152	1:1	top	0.329	1.358	0.447	
1880.00	9400	UMTS 1900	RMC	24.5	23.17	0.01	19 mm	000366645152	1:1	top tilt	0.303	1.358	0.411	
1880.00	9400	UMTS 1900	RMC	24.5	23.17	0.00	0 mm	000366645152	1:1	left	0.324	1.358	0.440	
1880.00	9400	UMTS 1900	RMC	24.5	23.17	0.11	0 mm	000366645152	1:1	left tilt	0.365	1.358	0.496	
1880.00	9400	UMTS 1900	RMC	15.5	15.33	0.02	0 mm	000366645152	1:1	back	0.513	1.040	0.534	
1852.40	9262	UMTS 1900	RMC	15.5	15.32	0.14	0 mm	000366645152	1:1	top	1.200	1.042	1.250	A2
1880.00	9400	UMTS 1900	RMC	15.5	15.33	-0.13	0 mm	000366645152	1:1	top	0.981	1.040	1.020	
1907.60	9538	UMTS 1900	RMC	15.5	15.01	0.08	0 mm	000366645152	1:1	top	1.150	1.119	1.287	
1852.40	9262	UMTS 1900	RMC	15.5	15.32	-0.17	0 mm	000366645152	1:1	top tilt	1.100	1.042	1.146	
1880.00	9400	UMTS 1900	RMC	15.5	15.33	0.06	0 mm	000366645152	1:1	top tilt	1.030	1.040	1.071	
1907.60	9538	UMTS 1900	RMC	15.5	15.01	0.08	0 mm	000366645152	1:1	top tilt	0.959	1.119	1.073	
1852.40	9262	UMTS 1900	RMC	15.5	15.32	-0.13	0 mm	000366645152	1:1	top	1.140	1.042	1.188	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram						

Note: Variability data is highlighted blue in the table above.

Table 10-2
LTE Band 17 Body SAR

MEASUREMENT RESULTS																		
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [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	24.5	22.96	0.05	000369345152	QPSK	1	25	19 mm	back	1:1	0.136	1.426	0.194	
710.00	23790	Mid	LTE Band 17	10	23.5	22.26	0.03	000369345152	QPSK	25	12	19 mm	back	1:1	0.110	1.330	0.146	
710.00	23790	Mid	LTE Band 17	10	24.5	22.96	-0.01	000369345152	QPSK	1	25	19 mm	top	1:1	0.064	1.426	0.091	
710.00	23790	Mid	LTE Band 17	10	23.5	22.26	0.11	000369345152	QPSK	25	12	19 mm	top	1:1	0.059	1.330	0.078	
710.00	23790	Mid	LTE Band 17	10	24.5	22.96	0.15	000369345152	QPSK	1	25	19 mm	top tilt	1:1	0.064	1.426	0.091	
710.00	23790	Mid	LTE Band 17	10	23.5	22.26	0.02	000369345152	QPSK	25	12	19 mm	top tilt	1:1	0.060	1.330	0.080	
710.00	23790	Mid	LTE Band 17	10	24.5	22.96	0.03	000369345152	QPSK	1	25	0 mm	bottom	1:1	0.018	1.426	0.026	
710.00	23790	Mid	LTE Band 17	10	23.5	22.26	0.03	000369345152	QPSK	25	12	0 mm	bottom	1:1	0.011	1.330	0.015	
710.00	23790	Mid	LTE Band 17	10	24.5	22.96	0.17	000369345152	QPSK	1	25	0 mm	bottom tilt	1:1	0.024	1.426	0.034	
710.00	23790	Mid	LTE Band 17	10	23.5	22.26	0.13	000369345152	QPSK	25	12	0 mm	bottom tilt	1:1	0.015	1.330	0.020	
710.00	23790	Mid	LTE Band 17	10	24.5	22.96	0.14	000369345152	QPSK	1	25	0 mm	right	1:1	0.044	1.426	0.063	
710.00	23790	Mid	LTE Band 17	10	23.5	22.26	-0.12	000369345152	QPSK	25	12	0 mm	right	1:1	0.027	1.330	0.036	
711.00	23800	High	LTE Band 17	10	24.5	22.96	-0.17	000369345152	QPSK	1	25	0 mm	right tilt	1:1	0.058	1.426	0.083	
710.00	23790	Mid	LTE Band 17	10	23.5	22.26	-0.17	000369345152	QPSK	25	12	0 mm	right tilt	1:1	0.033	1.330	0.044	
710.00	23790	Mid	LTE Band 17	10	24.5	22.96	0.10	000369345152	QPSK	1	25	0 mm	left	1:1	0.305	1.426	0.435	
710.00	23790	Mid	LTE Band 17	10	23.5	22.26	-0.05	000369345152	QPSK	25	12	0 mm	left	1:1	0.245	1.330	0.326	
710.00	23790	Mid	LTE Band 17	10	24.5	22.96	0.13	000369345152	QPSK	1	25	0 mm	left tilt	1:1	0.457	1.426	0.652	
710.00	23790	Mid	LTE Band 17	10	23.5	22.26	0.03	000369345152	QPSK	25	12	0 mm	left tilt	1:1	0.370	1.330	0.492	
710.00	23790	Mid	LTE Band 17	10	22.5	21.55	0.00	000369345152	QPSK	1	25	0 mm	back	1:1	0.987	1.245	1.229	A3
710.00	23790	Mid	LTE Band 17	10	21.5	20.83	-0.02	000369345152	QPSK	25	12	0 mm	back	1:1	0.947	1.167	1.105	
710.00	23790	Mid	LTE Band 17	10	21.5	20.80	0.18	000369345152	QPSK	50	0	0 mm	back	1:1	0.843	1.175	0.991	
710.00	23790	Mid	LTE Band 17	10	22.5	21.55	-0.03	000369345152	QPSK	1	25	0 mm	top	1:1	0.648	1.245	0.807	
710.00	23790	Mid	LTE Band 17	10	21.5	20.83	-0.02	000369345152	QPSK	25	12	0 mm	top	1:1	0.570	1.167	0.665	
710.00	23790	Mid	LTE Band 17	10	21.5	20.80	0.05	000369345152	QPSK	50	0	0 mm	top	1:1	0.557	1.175	0.654	
710.00	23790	Mid	LTE Band 17	10	22.5	21.55	-0.10	000369345152	QPSK	1	25	0 mm	top tilt	1:1	0.673	1.245	0.838	
710.00	23790	Mid	LTE Band 17	10	21.5	20.83	-0.04	000369345152	QPSK	25	12	0 mm	top tilt	1:1	0.609	1.167	0.711	
710.00	23790	Mid	LTE Band 17	10	21.5	20.80	-0.01	000369345152	QPSK	50	0	0 mm	top tilt	1:1	0.593	1.175	0.697	
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 13 Body SAR

MEASUREMENT RESULTS																		
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.														(W/kg)		(W/kg)	
782.00	23230	Mid	LTE Band 13	10	24.0	23.16	-0.02	0S1303111511	QPSK	1	0	19 mm	back	1:1	0.105	1.213	0.127	
782.00	23230	Mid	LTE Band 13	10	23.0	22.19	-0.04	0S1303111511	QPSK	25	0	19 mm	back	1:1	0.081	1.205	0.098	
782.00	23230	Mid	LTE Band 13	10	24.0	23.16	-0.07	0S1303111511	QPSK	1	0	19 mm	top	1:1	0.092	1.213	0.112	
782.00	23230	Mid	LTE Band 13	10	23.0	22.19	0.00	0S1303111511	QPSK	25	0	19 mm	top	1:1	0.062	1.205	0.075	
782.00	23230	Mid	LTE Band 13	10	24.0	23.16	0.01	0S1303111511	QPSK	1	0	19 mm	top tilt	1:1	0.080	1.213	0.097	
782.00	23230	Mid	LTE Band 13	10	23.0	22.19	-0.16	0S1303111511	QPSK	25	0	19 mm	top tilt	1:1	0.056	1.205	0.067	
782.00	23230	Mid	LTE Band 13	10	24.0	23.16	0.12	0S1303111511	QPSK	1	0	0 mm	bottom	1:1	0.014	1.213	0.017	
782.00	23230	Mid	LTE Band 13	10	23.0	22.19	0.04	0S1303111511	QPSK	25	0	0 mm	bottom	1:1	0.013	1.205	0.016	
782.00	23230	Mid	LTE Band 13	10	24.0	23.16	0.04	0S1303111511	QPSK	1	0	0 mm	bottom tilt	1:1	0.019	1.213	0.023	
782.00	23230	Mid	LTE Band 13	10	23.0	22.19	0.02	0S1303111511	QPSK	25	0	0 mm	bottom tilt	1:1	0.014	1.205	0.017	
782.00	23230	Mid	LTE Band 13	10	24.0	23.16	-0.18	0S1303111511	QPSK	1	0	0 mm	right	1:1	0.045	1.213	0.055	
782.00	23230	Mid	LTE Band 13	10	23.0	22.19	0.13	0S1303111511	QPSK	25	0	0 mm	right	1:1	0.028	1.205	0.034	
782.00	23230	Mid	LTE Band 13	10	24.0	23.16	0.11	0S1303111511	QPSK	1	0	0 mm	right tilt	1:1	0.066	1.213	0.080	
782.00	23230	Mid	LTE Band 13	10	23.0	22.19	-0.13	0S1303111511	QPSK	25	0	0 mm	right tilt	1:1	0.056	1.205	0.067	
782.00	23230	Mid	LTE Band 13	10	24.0	23.16	-0.05	0S1303111511	QPSK	1	0	0 mm	left	1:1	0.255	1.213	0.309	
782.00	23230	Mid	LTE Band 13	10	23.0	22.19	0.07	0S1303111511	QPSK	25	0	0 mm	left	1:1	0.194	1.205	0.234	
782.00	23230	Mid	LTE Band 13	10	24.0	23.16	-0.01	0S1303111511	QPSK	1	0	0 mm	left tilt	1:1	0.361	1.213	0.438	
782.00	23230	Mid	LTE Band 13	10	23.0	22.19	-0.04	0S1303111511	QPSK	25	0	0 mm	left tilt	1:1	0.274	1.205	0.330	
782.00	23230	Mid	LTE Band 13	10	22.5	22.23	-0.19	0S1303111511	QPSK	1	0	0 mm	back	1:1	1.260	1.064	1.341	A4
782.00	23230	Mid	LTE Band 13	10	21.5	20.88	-0.06	0S1303111511	QPSK	25	0	0 mm	back	1:1	0.988	1.153	1.139	
782.00	23230	Mid	LTE Band 13	10	21.5	20.86	-0.19	0S1303111511	QPSK	50	0	0 mm	back	1:1	1.020	1.159	1.182	
782.00	23230	Mid	LTE Band 13	10	22.5	22.23	-0.03	0S1303111511	QPSK	1	0	0 mm	top	1:1	1.020	1.064	1.085	
782.00	23230	Mid	LTE Band 13	10	21.5	20.88	-0.05	0S1303111511	QPSK	25	0	0 mm	top	1:1	0.763	1.153	0.880	
782.00	23230	Mid	LTE Band 13	10	21.5	20.86	-0.03	0S1303111511	QPSK	50	0	0 mm	top	1:1	0.772	1.159	0.895	
782.00	23230	Mid	LTE Band 13	10	22.5	22.23	-0.10	0S1303111511	QPSK	1	0	0 mm	top tilt	1:1	1.050	1.064	1.117	
782.00	23230	Mid	LTE Band 13	10	21.5	20.88	-0.13	0S1303111511	QPSK	25	0	0 mm	top tilt	1:1	0.796	1.153	0.918	
782.00	23230	Mid	LTE Band 13	10	21.5	20.86	0.01	0S1303111511	QPSK	50	0	0 mm	top tilt	1:1	0.696	1.159	0.807	
782.00	23230	Mid	LTE Band 13	10	22.5	22.23	-0.09	0S1303111511	QPSK	1	0	0 mm	back	1:1	1.180	1.064	1.256	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Body 1.6 W/kg (mW/g) averaged over 1 gram									

Note: Variability data is highlighted blue in the table above.

Table 10-4
LTE Band 5 (Cell) Body SAR

MEASUREMENT RESULTS																		
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.														(W/kg)		(W/kg)	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.73	0.06	000369345152	QPSK	1	25	19 mm	back	1:1	0.131	1.340	0.176	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	22.00	0.17	000369345152	QPSK	25	0	19 mm	back	1:1	0.117	1.259	0.147	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.73	0.15	000369345152	QPSK	1	25	19 mm	top	1:1	0.114	1.340	0.153	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	22.00	0.18	000369345152	QPSK	25	0	19 mm	top	1:1	0.096	1.259	0.121	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.73	-0.05	000369345152	QPSK	1	25	19 mm	top tilt	1:1	0.135	1.340	0.181	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	22.00	-0.05	000369345152	QPSK	25	0	19 mm	top tilt	1:1	0.128	1.259	0.161	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.73	-0.12	000369345152	QPSK	1	25	0 mm	bottom	1:1	0.018	1.340	0.024	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	22.00	0.16	000369345152	QPSK	25	0	0 mm	bottom	1:1	0.014	1.259	0.018	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.73	0.03	000369345152	QPSK	1	25	0 mm	bottom tilt	1:1	0.017	1.340	0.023	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	22.00	0.06	000369345152	QPSK	25	0	0 mm	bottom tilt	1:1	0.015	1.259	0.019	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.73	0.17	000369345152	QPSK	1	25	0 mm	right	1:1	0.045	1.340	0.060	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	22.00	0.04	000369345152	QPSK	25	0	0 mm	right	1:1	0.038	1.259	0.048	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.73	0.04	000369345152	QPSK	1	25	0 mm	right tilt	1:1	0.043	1.340	0.058	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	22.00	0.10	000369345152	QPSK	25	0	0 mm	right tilt	1:1	0.042	1.259	0.053	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.73	0.04	000369345152	QPSK	1	25	0 mm	left	1:1	0.375	1.340	0.503	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	22.00	0.02	000369345152	QPSK	25	0	0 mm	left	1:1	0.320	1.259	0.403	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.73	-0.04	000369345152	QPSK	1	25	0 mm	left tilt	1:1	0.449	1.340	0.602	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.0	22.00	-0.08	000369345152	QPSK	25	0	0 mm	left tilt	1:1	0.392	1.259	0.494	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.0	21.29	0.07	000369345152	QPSK	1	25	0 mm	back	1:1	1.050	1.178	1.237	A5
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.0	20.48	-0.06	000369345152	QPSK	25	0	0 mm	back	1:1	0.897	1.127	1.011	
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.0	20.41	0.04	000369345152	QPSK	50	0	0 mm	back	1:1	0.878	1.146	1.006	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.0	21.29	-0.18	000369345152	QPSK	1	25	0 mm	top	1:1	0.953	1.178	1.123	
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.0	20.48	-0.03	000369345152	QPSK	25	0	0 mm	top	1:1	0.718	1.127	0.809	
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.0	20.41	0.00	000369345152	QPSK	50	0	0 mm	top	1:1	0.782	1.146	0.896	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.0	21.29	0.00	000369345152	QPSK	1	25	0 mm	top tilt	1:1	0.923	1.178	1.087	
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.0	20.48	0.02	000369345152	QPSK	25	0	0 mm	top tilt	1:1	0.793	1.127	0.894	
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.0	20.41	0.00	000369345152	QPSK	50	0	0 mm	top tilt	1:1	0.792	1.146	0.908	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.0	21.29	-0.13	000369345152	QPSK	1	25	0 mm	back	1:1	0.988	1.178	1.164	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Body 1.6 W/kg (mW/g) averaged over 1 gram									

Note: Variability data is highlighted blue in the table above.

Table 10-5
LTE Band 4 (AWS) Body SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [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)	20	25.0	23.55	-0.18	000280445152	QPSK	1	50	19 mm	back	1:1	0.299	1.396	0.417	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	21.25	-0.08	000280445152	QPSK	50	0	19 mm	back	1:1	0.237	1.496	0.355	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	25.0	23.55	0.02	000280445152	QPSK	1	50	19 mm	top	1:1	0.330	1.396	0.461	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	21.25	0.16	000280445152	QPSK	50	0	19 mm	top	1:1	0.230	1.496	0.344	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	25.0	23.55	0.01	000280445152	QPSK	1	50	19 mm	top tilt	1:1	0.429	1.396	0.599	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	21.25	0.11	000280445152	QPSK	50	0	19 mm	top tilt	1:1	0.355	1.496	0.531	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	25.0	23.55	-0.01	000280445152	QPSK	1	50	0 mm	left	1:1	0.367	1.396	0.512	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	21.25	-0.17	000280445152	QPSK	50	0	0 mm	left	1:1	0.311	1.496	0.465	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	25.0	23.55	0.02	000280445152	QPSK	1	50	0 mm	left tilt	1:1	0.550	1.396	0.768	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	21.25	-0.07	000280445152	QPSK	50	0	0 mm	left tilt	1:1	0.384	1.496	0.574	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	16.5	15.91	0.07	000280445152	QPSK	1	0	0 mm	back	1:1	0.914	1.146	1.047	A6
1732.50	20175	Mid	LTE Band 4 (AWS)	20	15.5	14.31	0.08	000280445152	QPSK	50	0	0 mm	back	1:1	0.679	1.315	0.893	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	15.5	14.24	0.04	000280445152	QPSK	100	0	0 mm	back	1:1	0.765	1.337	1.023	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	16.5	15.91	0.02	000280445152	QPSK	1	0	0 mm	top	1:1	0.735	1.146	0.842	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	15.5	14.31	-0.09	000280445152	QPSK	50	0	0 mm	top	1:1	0.593	1.315	0.780	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	15.5	14.24	0.00	000280445152	QPSK	100	0	0 mm	top	1:1	0.425	1.337	0.568	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	16.5	15.91	-0.03	000280445152	QPSK	1	0	0 mm	top tilt	1:1	0.698	1.146	0.800	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	15.5	14.31	0.00	000280445152	QPSK	50	0	0 mm	top tilt	1:1	0.628	1.315	0.826	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	15.5	14.24	-0.03	000280445152	QPSK	100	0	0 mm	top tilt	1:1	0.436	1.337	0.583	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	16.5	15.91	0.00	000280445152	QPSK	1	0	0 mm	back	1:1	0.904	1.146	1.036	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Body 1.6 W/kg (mW/g) averaged over 1 gram								

Note: Variability data is highlighted blue in the table above.

Table 10-6
LTE Band 2 (PCS) Body SAR

MEASUREMENT RESULTS																		
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [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)	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	25.0	23.55	-0.05	000369345152	QPSK	1	0	19 mm	back	1:1	0.113	1.396	0.158	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	23.0	21.18	-0.06	000369345152	QPSK	50	0	19 mm	back	1:1	0.079	1.521	0.120	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	25.0	23.55	0.02	000369345152	QPSK	1	0	19 mm	top	1:1	0.406	1.396	0.567	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	23.0	21.18	0.12	000369345152	QPSK	50	0	19 mm	top	1:1	0.271	1.521	0.412	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	25.0	23.55	-0.18	000369345152	QPSK	1	0	19 mm	top tilt	1:1	0.402	1.396	0.561	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	23.0	21.18	-0.11	000369345152	QPSK	50	0	19 mm	top tilt	1:1	0.272	1.521	0.414	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	25.0	23.55	-0.04	000369345152	QPSK	1	0	0 mm	left	1:1	0.381	1.396	0.532	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	23.0	21.18	-0.02	000369345152	QPSK	50	0	0 mm	left	1:1	0.244	1.521	0.371	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	25.0	23.55	-0.02	000369345152	QPSK	1	0	0 mm	left tilt	1:1	0.422	1.396	0.589	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	23.0	21.18	-0.12	000369345152	QPSK	50	0	0 mm	left tilt	1:1	0.289	1.521	0.440	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	15.0	14.48	0.17	000369345152	QPSK	1	0	0 mm	back	1:1	0.597	1.127	0.673	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	14.0	12.92	-0.16	000369345152	QPSK	50	0	0 mm	back	1:1	0.345	1.282	0.442	
1860.00	18700	Low	LTE Band 2 (PCS)	20	15.0	14.47	-0.17	000369345152	QPSK	1	0	0 mm	top	1:1	0.995	1.130	1.124	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	15.0	14.48	-0.08	000369345152	QPSK	1	0	0 mm	top	1:1	1.150	1.127	1.296	A7
1900.00	19100	High	LTE Band 2 (PCS)	20	15.0	14.47	-0.10	000369345152	QPSK	1	0	0 mm	top	1:1	1.060	1.130	1.198	
1860.00	18700	Low	LTE Band 2 (PCS)	20	14.0	12.76	-0.02	000369345152	QPSK	50	0	0 mm	top	1:1	0.696	1.330	0.926	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	14.0	12.92	-0.12	000369345152	QPSK	50	0	0 mm	top	1:1	0.676	1.282	0.867	
1900.00	19100	High	LTE Band 2 (PCS)	20	14.0	12.75	-0.03	000369345152	QPSK	50	0	0 mm	top	1:1	0.715	1.334	0.954	
1900.00	19100	High	LTE Band 2 (PCS)	20	14.0	12.71	-0.09	000369345152	QPSK	100	0	0 mm	top	1:1	0.639	1.346	0.860	
1860.00	18700	Low	LTE Band 2 (PCS)	20	15.0	14.47	-0.07	000369345152	QPSK	1	0	0 mm	top tilt	1:1	1.000	1.130	1.130	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	15.0	14.48	-0.10	000369345152	QPSK	1	0	0 mm	top tilt	1:1	0.977	1.127	1.101	
1900.00	19100	High	LTE Band 2 (PCS)	20	15.0	14.47	-0.16	000369345152	QPSK	1	0	0 mm	top tilt	1:1	1.020	1.130	1.153	
1860.00	18700	Low	LTE Band 2 (PCS)	20	14.0	12.76	-0.02	000369345152	QPSK	50	0	0 mm	top tilt	1:1	0.632	1.330	0.841	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	14.0	12.92	-0.04	000369345152	QPSK	50	0	0 mm	top tilt	1:1	0.632	1.282	0.810	
1900.00	19100	High	LTE Band 2 (PCS)	20	14.0	12.75	-0.11	000369345152	QPSK	50	0	0 mm	top tilt	1:1	0.643	1.334	0.858	
1900.00	19100	High	LTE Band 2 (PCS)	20	14.0	12.71	0.00	000369345152	QPSK	100	0	0 mm	top tilt	1:1	0.631	1.346	0.849	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Body 1.6 W/kg (mW/g) averaged over 1 gram								

10.2 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in FCC KDB Publication 616217 D04 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 device with the device 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 edge, top edge tilt, left edge, and left edge tilt for the main antenna.

UMTS Notes:

1. UMTS mode in was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01v03. HSPA SAR was not required since the average output power target of the HSPA subtests was not more than 0.25 dB higher than the RMC level target.
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 D05v02r03. The general test procedures used for testing can be found in Section 7.5.4.
2. MPR is permanently implemented for this device by the manufacturer. 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 KDB Publication 941225 D05Av01r01, SAR for LTE CA operations was not needed since the maximum average output power in LTE CA mode was not >0.25 dB higher than the maximum output power when downlink carrier aggregation was inactive.

11 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

11.1 Introduction

The following procedures adopted from FCC KDB Publication 447498 D01v05r02 are applicable to devices with built-in unlicensed transmitters such as 802.11 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. The different test positions in an exposure condition may be considered collectively to determine SAR test exclusion according to the sum of 1-g or 10-g SAR.

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	4.00	5*	0.126
Bluetooth	2480	4.00	19	0.033

Note:

1. Please refer to WLAN SAR Test Report No. S-TR13-FCCSAR-2 for original compliance report containing 2.4 GHz Bluetooth output power measurements.
2. Per FCC KDB Publication 447498 D01v05, the maximum power of the channel was rounded to the nearest mW before calculation.
3. (*) – Per FCC KDB Publication 447498 D01v05, when the test separation distance is < 5 mm, a distance of 5 mm is applied to determine estimated 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.

11.3 Body SAR Simultaneous Transmission Analysis

Please refer to WLAN SAR Test Report No. S-TR13-FCCSAR-2 for original compliance report containing 2.4/5 GHz WLAN SAR data and MIMO WLAN compliance data.

Table 11-2
Simultaneous Transmission Scenario (2.4 GHz WLAN Ant A at 0.0 cm)

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	1.019	1.090	See Note 1	0.02
	Top	1.138	0.170	**1.308**	N/A
	Top Tilt	0.991	0.210	1.201	N/A
	Bottom	0.025	0.400	0.425	N/A
	Bottom Tilt	0.024	0.400	0.424	N/A
	Right	0.062	0.400	0.462	N/A
	Right Tilt	0.052	0.400	0.452	N/A
	Left	0.553	0.400	0.953	N/A
	Left Tilt	0.510	0.400	0.910	N/A

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	0.534	1.090	See Note 1	0.02
	Top	1.287	0.170	**1.457**	N/A
	Top Tilt	1.146	0.210	1.356	N/A
	Bottom	0.400	0.400	0.800	N/A
	Bottom Tilt	0.400	0.400	0.800	N/A
	Right	0.400	0.400	0.800	N/A
	Right Tilt	0.400	0.400	0.800	N/A
	Left	0.440	0.400	0.840	N/A
	Left Tilt	0.496	0.400	0.896	N/A

Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	2.4 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	1.229	1.090	See Note 1	0.03
	Top	0.807	0.170	0.977	N/A
	Top Tilt	0.838	0.210	1.048	N/A
	Bottom	0.026	0.400	0.426	N/A
	Bottom Tilt	0.034	0.400	0.434	N/A
	Right	0.063	0.400	0.463	N/A
	Right Tilt	0.083	0.400	0.483	N/A
	Left	0.435	0.400	0.835	N/A
	Left Tilt	0.652	0.400	**1.052**	N/A

Simult Tx	Configuration	LTE Band 13 SAR (W/kg)	2.4 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	1.341	1.090	See Note 1	0.03
	Top	1.085	0.170	1.255	N/A
	Top Tilt	1.117	0.210	**1.327**	N/A
	Bottom	0.017	0.400	0.417	N/A
	Bottom Tilt	0.023	0.400	0.423	N/A
	Right	0.055	0.400	0.455	N/A
	Right Tilt	0.080	0.400	0.480	N/A
	Left	0.309	0.400	0.709	N/A
	Left Tilt	0.438	0.400	0.838	N/A

Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	2.4 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	1.237	1.090	See Note 1	0.03
	Top	1.123	0.170	1.293	N/A
	Top Tilt	1.087	0.210	**1.297**	N/A
	Bottom	0.024	0.400	0.424	N/A
	Bottom Tilt	0.023	0.400	0.423	N/A
	Right	0.060	0.400	0.460	N/A
	Right Tilt	0.058	0.400	0.458	N/A
	Left	0.503	0.400	0.903	N/A
	Left Tilt	0.602	0.400	1.002	N/A

Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	1.047	1.090	See Note 1	0.02
	Top	0.842	0.170	1.012	N/A
	Top Tilt	0.826	0.210	1.036	N/A
	Bottom	0.400	0.400	0.800	N/A
	Bottom Tilt	0.400	0.400	0.800	N/A
	Right	0.400	0.400	0.800	N/A
	Right Tilt	0.400	0.400	0.800	N/A
	Left	0.512	0.400	0.912	N/A
	Left Tilt	0.768	0.400	**1.168**	N/A

Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	2.4 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	0.673	1.090	See Note 1	0.02
	Top	1.296	0.170	**1.466**	N/A
	Top Tilt	1.153	0.210	1.363	N/A
	Bottom	0.400	0.400	0.800	N/A
	Bottom Tilt	0.400	0.400	0.800	N/A
	Right	0.400	0.400	0.800	N/A
	Right Tilt	0.400	0.400	0.800	N/A
	Left	0.532	0.400	0.932	N/A
	Left Tilt	0.589	0.400	0.989	N/A

Table 11-3
Simultaneous Transmission Scenario (5 GHz WLAN Ant A at 0.0 cm)

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	1.019	0.450	**1.469**	N/A
	Top	1.138	0.820	See Note 1	0.02
	Top Tilt	0.991	0.790	See Note 1	0.02
	Bottom	0.025	0.400	0.425	N/A
	Bottom Tilt	0.024	0.400	0.424	N/A
	Right	0.062	0.400	0.462	N/A
	Right Tilt	0.052	0.400	0.452	N/A
	Left	0.553	0.400	0.953	N/A
	Left Tilt	0.510	0.400	0.910	N/A

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	0.534	0.450	**0.984**	N/A
	Top	1.287	0.820	See Note 1	0.02
	Top Tilt	1.146	0.790	See Note 1	0.02
	Bottom	0.400	0.400	0.800	N/A
	Bottom Tilt	0.400	0.400	0.800	N/A
	Right	0.400	0.400	0.800	N/A
	Right Tilt	0.400	0.400	0.800	N/A
	Left	0.440	0.400	0.840	N/A
	Left Tilt	0.496	0.400	0.896	N/A

Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	5 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	1.229	0.450	See Note 1	0.02
	Top	0.807	0.820	See Note 1	0.02
	Top Tilt	0.838	0.790	See Note 1	0.02
	Bottom	0.026	0.400	0.426	N/A
	Bottom Tilt	0.034	0.400	0.434	N/A
	Right	0.063	0.400	0.463	N/A
	Right Tilt	0.083	0.400	0.483	N/A
	Left	0.435	0.400	0.835	N/A
	Left Tilt	0.652	0.400	**1.052**	N/A

Simult Tx	Configuration	LTE Band 13 SAR (W/kg)	5 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	1.341	0.450	See Note 1	0.02
	Top	1.085	0.820	See Note 1	0.02
	Top Tilt	1.117	0.790	See Note 1	0.02
	Bottom	0.017	0.400	0.417	N/A
	Bottom Tilt	0.023	0.400	0.423	N/A
	Right	0.055	0.400	0.455	N/A
	Right Tilt	0.080	0.400	0.480	N/A
	Left	0.309	0.400	0.709	N/A
	Left Tilt	0.438	0.400	**0.838**	N/A

Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	5 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	1.237	0.450	See Note 1	0.02
	Top	1.123	0.820	See Note 1	0.02
	Top Tilt	1.087	0.790	See Note 1	0.02
	Bottom	0.024	0.400	0.424	N/A
	Bottom Tilt	0.023	0.400	0.423	N/A
	Right	0.060	0.400	0.460	N/A
	Right Tilt	0.058	0.400	0.458	N/A
	Left	0.503	0.400	0.903	N/A
	Left Tilt	0.602	0.400	**1.002**	N/A

Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	5 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	1.047	0.450	**1.497**	N/A
	Top	0.842	0.820	See Note 1	0.02
	Top Tilt	0.826	0.790	See Note 1	0.02
	Bottom	0.400	0.400	0.800	N/A
	Bottom Tilt	0.400	0.400	0.800	N/A
	Right	0.400	0.400	0.800	N/A
	Right Tilt	0.400	0.400	0.800	N/A
	Left	0.512	0.400	0.912	N/A
	Left Tilt	0.768	0.400	1.168	N/A

Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	5 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	0.673	0.450	**1.123**	N/A
	Top	1.296	0.820	See Note 1	0.03
	Top Tilt	1.153	0.790	See Note 1	0.02
	Bottom	0.400	0.400	0.800	N/A
	Bottom Tilt	0.400	0.400	0.800	N/A
	Right	0.400	0.400	0.800	N/A
	Right Tilt	0.400	0.400	0.800	N/A
	Left	0.532	0.400	0.932	N/A
	Left Tilt	0.589	0.400	0.989	N/A

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

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	1.019	0.126	1.145
	Top	1.138	0.126	**1.264**
	Top Tilt	0.991	0.126	1.117
	Bottom	0.025	0.400	0.425
	Bottom Tilt	0.024	0.400	0.424
	Right	0.062	0.400	0.462
	Right Tilt	0.052	0.400	0.452
	Left	0.553	0.400	0.953
	Left Tilt	0.510	0.400	0.910

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.534	0.126	0.660
	Top	1.287	0.126	**1.413**
	Top Tilt	1.146	0.126	1.272
	Bottom	0.400	0.400	0.800
	Bottom Tilt	0.400	0.400	0.800
	Right	0.400	0.400	0.800
	Right Tilt	0.400	0.400	0.800
	Left	0.440	0.400	0.840
	Left Tilt	0.496	0.400	0.896

Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	1.229	0.126	**1.355**
	Top	0.807	0.126	0.933
	Top Tilt	0.838	0.126	0.964
	Bottom	0.026	0.400	0.426
	Bottom Tilt	0.034	0.400	0.434
	Right	0.063	0.400	0.463
	Right Tilt	0.083	0.400	0.483
	Left	0.435	0.400	0.835
	Left Tilt	0.652	0.400	1.052

Simult Tx	Configuration	LTE Band 13 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	1.341	0.126	**1.467**
	Top	1.085	0.126	1.211
	Top Tilt	1.117	0.126	1.243
	Bottom	0.017	0.400	0.417
	Bottom Tilt	0.023	0.400	0.423
	Right	0.055	0.400	0.455
	Right Tilt	0.080	0.400	0.480
	Left	0.309	0.400	0.709
	Left Tilt	0.438	0.400	0.838

Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	1.237	0.126	**1.363**
	Top	1.123	0.126	1.249
	Top Tilt	1.087	0.126	1.213
	Bottom	0.024	0.400	0.424
	Bottom Tilt	0.023	0.400	0.423
	Right	0.060	0.400	0.460
	Right Tilt	0.058	0.400	0.458
	Left	0.503	0.400	0.903
	Left Tilt	0.602	0.400	1.002

Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	1.047	0.126	**1.173**
	Top	0.842	0.126	0.968
	Top Tilt	0.826	0.126	0.952
	Bottom	0.400	0.400	0.800
	Bottom Tilt	0.400	0.400	0.800
	Right	0.400	0.400	0.800
	Right Tilt	0.400	0.400	0.800
	Left	0.512	0.400	0.912
	Left Tilt	0.768	0.400	1.168

Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.673	0.126	0.799
	Top	1.296	0.126	**1.422**
	Top Tilt	1.153	0.126	1.279
	Bottom	0.400	0.400	0.800
	Bottom Tilt	0.400	0.400	0.800
	Right	0.400	0.400	0.800
	Right Tilt	0.400	0.400	0.800
	Left	0.532	0.400	0.932
	Left Tilt	0.589	0.400	0.989

Table 11-5
Simultaneous Transmission Scenario (2.4 GHz WLAN Ant A at 1.9 cm)

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.168	< 1.090	**< 1.258**
	Top	0.194	< 0.170	< 0.364
	Top Tilt	0.199	< 0.210	< 0.409

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.220	< 1.090	**< 1.310**
	Top	0.447	< 0.170	< 0.617
	Top Tilt	0.411	< 0.210	< 0.621

Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	2.4 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.194	< 1.090	**< 1.284**
	Top	0.091	< 0.170	< 0.261
	Top Tilt	0.091	< 0.210	< 0.301

Simult Tx	Configuration	LTE Band 13 SAR (W/kg)	2.4 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.127	< 1.090	**< 1.217**
	Top	0.112	< 0.170	< 0.282
	Top Tilt	0.097	< 0.210	< 0.307

Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	2.4 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.176	< 1.090	**< 1.266**
	Top	0.153	< 0.170	< 0.323
	Top Tilt	0.181	< 0.210	< 0.391

Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.417	< 1.090	**< 1.507**
	Top	0.461	< 0.170	< 0.631
	Top Tilt	0.599	< 0.210	< 0.809

Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	2.4 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.158	< 1.090	**< 1.248**
	Top	0.567	< 0.170	< 0.737
	Top Tilt	0.561	< 0.210	< 0.771

Table 11-6
Simultaneous Transmission Scenario (5 GHz WLAN Ant A at 1.9 cm)

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.168	< 0.450	< 0.618
	Top	0.194	< 0.820	**< 1.014**
	Top Tilt	0.199	< 0.790	< 0.989

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.220	< 0.450	< 0.670
	Top	0.447	< 0.820	**< 1.267**
	Top Tilt	0.411	< 0.790	< 1.201

Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	5 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.194	< 0.450	< 0.644
	Top	0.091	< 0.820	**< 0.911**
	Top Tilt	0.091	< 0.790	< 0.881

Simult Tx	Configuration	LTE Band 13 SAR (W/kg)	5 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.127	< 0.450	< 0.577
	Top	0.112	< 0.820	**< 0.932**
	Top Tilt	0.097	< 0.790	< 0.887

Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	5 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.176	< 0.450	< 0.626
	Top	0.153	< 0.820	**< 0.973**
	Top Tilt	0.181	< 0.790	< 0.971

Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	5 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.417	< 0.450	< 0.867
	Top	0.461	< 0.820	< 1.281
	Top Tilt	0.599	< 0.790	**< 1.389**

Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	5 GHz WLAN Ant A SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.158	< 0.450	< 0.608
	Top	0.567	< 0.820	**< 1.387**
	Top Tilt	0.561	< 0.790	< 1.351

Table 11-7
Simultaneous Transmission Scenario (2.4 GHz Bluetooth at 1.9 cm)

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.168	0.033	0.201	Body SAR	Back	0.220	0.033	0.253
	Top	0.194	0.033	0.227		Top	0.447	0.033	**0.480**
	Top Tilt	0.199	0.033	**0.232**		Top Tilt	0.411	0.033	0.444
Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 13 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.194	0.033	**0.227**	Body SAR	Back	0.127	0.033	**0.160**
	Top	0.091	0.033	0.124		Top	0.112	0.033	0.145
	Top Tilt	0.091	0.033	0.124		Top Tilt	0.097	0.033	0.130
Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.176	0.033	0.209	Body SAR	Back	0.417	0.033	0.450
	Top	0.153	0.033	0.186		Top	0.461	0.033	0.494
	Top Tilt	0.181	0.033	**0.214**		Top Tilt	0.599	0.033	**0.632**

Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.158	0.033	0.191
	Top	0.567	0.033	**0.600**
	Top Tilt	0.561	0.033	0.594

Notes:

1. No evaluation was performed to determine the aggregate 1g SAR for these configurations as the SPLS ratio between the antenna pairs was not higher than 0.04 per FCC KDB 447498 D01v05. See Section 11.4 for detailed SPLS ratio analysis.
2. For SAR summations for body at 1.9 cm, 2.4/5 GHz WLAN SAR values for 0.0 cm were used since the 0.0 cm test distance for 2.4/5 GHz WLAN were more conservative. "<" denotes that the 0.0 cm 2.4/5 GHz WLAN SAR values were used for summation purposes.

11.4 SPLSR Evaluation and Analysis

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

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

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

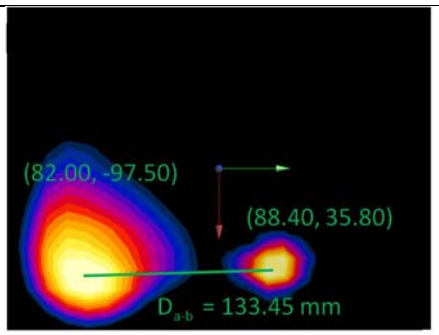
The sums of the standalone SAR values were above 1.6 W/kg for the Body Back Side configuration at a separation distance of 0.0 cm for 2.4 GHz WLAN Antenna A operating with UMTS 850, UMTS 1900, LTE Band 17, LTE Band 13, LTE Band 5 (Cell.), LTE Band 4 (AWS), and LTE Band 2 (PCS) operating at limited power.

Table 11-8
Peak SAR Locations for Body Back Side at 0.0 cm

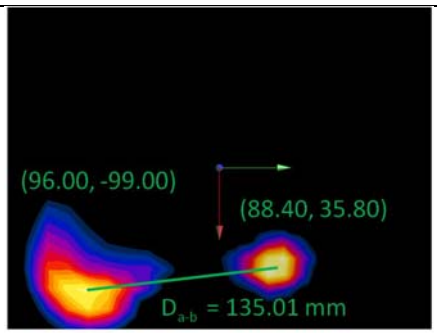
Mode/Band	x (mm)	y (mm)
2.4 GHz WLAN Ant A	88.40	35.80
UMTS 850	82.00	-97.50
UMTS 1900	96.00	-99.00
LTE Band 17	90.00	-97.00
LTE Band 13	68.00	-99.00
LTE Band 5 (Cell.)	84.00	-100.00
LTE Band 4 (AWS)	91.00	-104.00
LTE Band 2 (PCS)	75.50	-106.00

Table 11-9
SAR Sum to Peak Location Separation Ratio Calculations

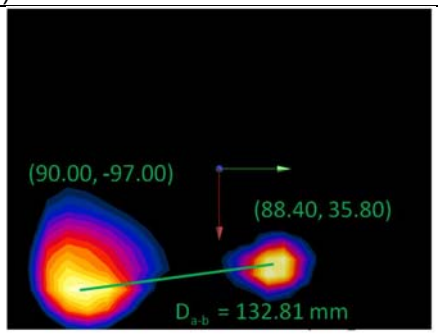
Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$
UMTS 850	2.4 GHz WLAN Ant A	1.019	1.090	2.109	133.45	0.02
UMTS 1900	2.4 GHz WLAN Ant A	0.534	1.090	1.624	135.01	0.02
LTE Band 17	2.4 GHz WLAN Ant A	1.229	1.090	2.319	132.81	0.03
LTE Band 13	2.4 GHz WLAN Ant A	1.341	1.090	2.431	136.34	0.03
LTE Band 5 (Cell.)	2.4 GHz WLAN Ant A	1.237	1.090	2.327	135.87	0.03
LTE Band 4 (AWS)	2.4 GHz WLAN Ant A	1.047	1.090	2.137	139.82	0.02
LTE Band 2 (PCS)	2.4 GHz WLAN Ant A	0.673	1.090	1.763	142.39	0.02



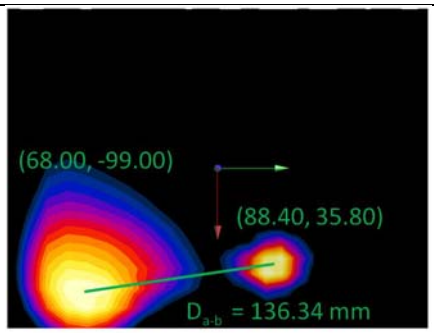
(a) UMTS 850 and 2.4 GHz WLAN Ant A



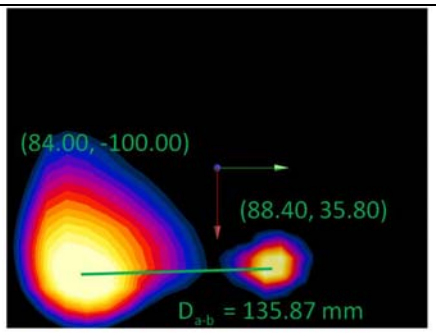
(b) UMTS 1900 and 2.4 GHz WLAN Ant A



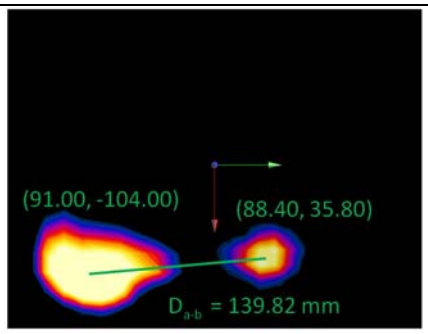
(c) LTE Band 17 and 2.4 GHz WLAN Ant A



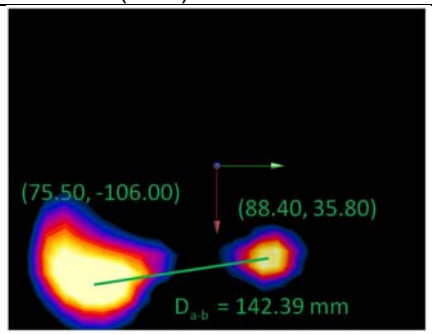
(d) LTE Band 13 and 2.4 GHz WLAN Ant A



(e) LTE Band 5 (Cell.) and 2.4 GHz WLAN Ant A



(f) LTE Band 4 (AWS) and 2.4 GHz WLAN Ant A



(g) LTE Band 2 (PCS) and 2.4 GHz WLAN Ant A

Figure 11-1
Peak SAR Locations for Body Back Side at 0.0 cm

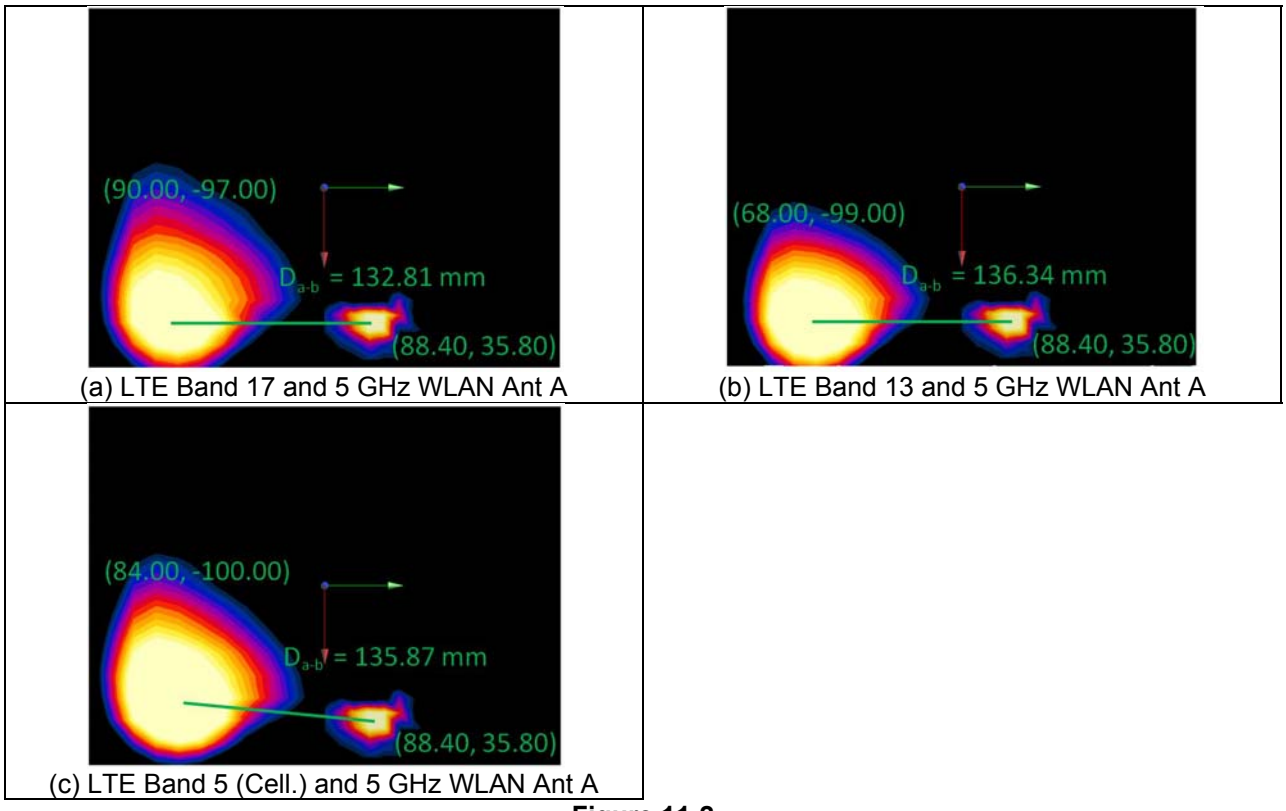
The sums of the standalone SAR values were above 1.6 W/kg for the Body Back Side configuration at a separation distance of 0.0 cm for 5 GHz WLAN Antenna A operating with LTE Band 17, LTE Band 13, and LTE Band 5 (Cell.) operating at limited power.

Table 11-10
Peak SAR Locations for Body Back Side at 0.0 cm

Mode/Band	x (mm)	y (mm)
5 GHz WLAN Ant A	88.40	35.80
LTE Band 17	90.00	-97.00
LTE Band 13	68.00	-99.00
LTE Band 5 (Cell.)	84.00	-100.00

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

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$
LTE Band 17	5 GHz WLAN Ant A	1.229	0.450	1.679	132.81	0.02
LTE Band 13	5 GHz WLAN Ant A	1.341	0.450	1.791	136.34	0.02
LTE Band 5 (Cell.)	5 GHz WLAN Ant A	1.237	0.450	1.687	135.87	0.02



(a) LTE Band 17 and 5 GHz WLAN Ant A

(b) LTE Band 13 and 5 GHz WLAN Ant A

(c) LTE Band 5 (Cell.) and 5 GHz WLAN Ant A

Figure 11-2
Peak SAR Locations for Body Back Side at 0.0 cm

The sums of the standalone SAR values were above 1.6 W/kg for the Top Edge configuration at a separation distance of 0.0 cm for 5 GHz WLAN Antenna A operating with UMTS 850, UMTS 1900, LTE Band 17, LTE Band 13, LTE Band 5 (Cell.), LTE Band 4 (AWS), and LTE Band 2 (PCS) operating at limited power.

Table 11-12
Peak SAR Locations for Top Edge at 0.0 cm

Mode/Band	x (mm)	y (mm)
5 GHz WLAN Ant A	2.80	36.20
UMTS 850	-2.50	-97.52
UMTS 1900	-2.50	-90.50
LTE Band 17	-2.53	-82.48
LTE Band 13	-4.50	-92.50
LTE Band 5 (Cell.)	-0.03	-97.48
LTE Band 4 (AWS)	0.00	-85.00
LTE Band 2 (PCS)	-2.50	-82.50

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

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$
UMTS 850	5 GHz WLAN Ant A	1.138	0.820	1.958	133.83	0.02
UMTS 1900	5 GHz WLAN Ant A	1.287	0.820	2.107	126.81	0.02
LTE Band 17	5 GHz WLAN Ant A	0.807	0.820	1.627	118.80	0.02
LTE Band 13	5 GHz WLAN Ant A	1.085	0.820	1.905	128.91	0.02
LTE Band 5 (Cell.)	5 GHz WLAN Ant A	1.123	0.820	1.943	133.71	0.02
LTE Band 4 (AWS)	5 GHz WLAN Ant A	0.842	0.820	1.662	121.23	0.02
LTE Band 2 (PCS)	5 GHz WLAN Ant A	1.296	0.820	2.116	118.82	0.03

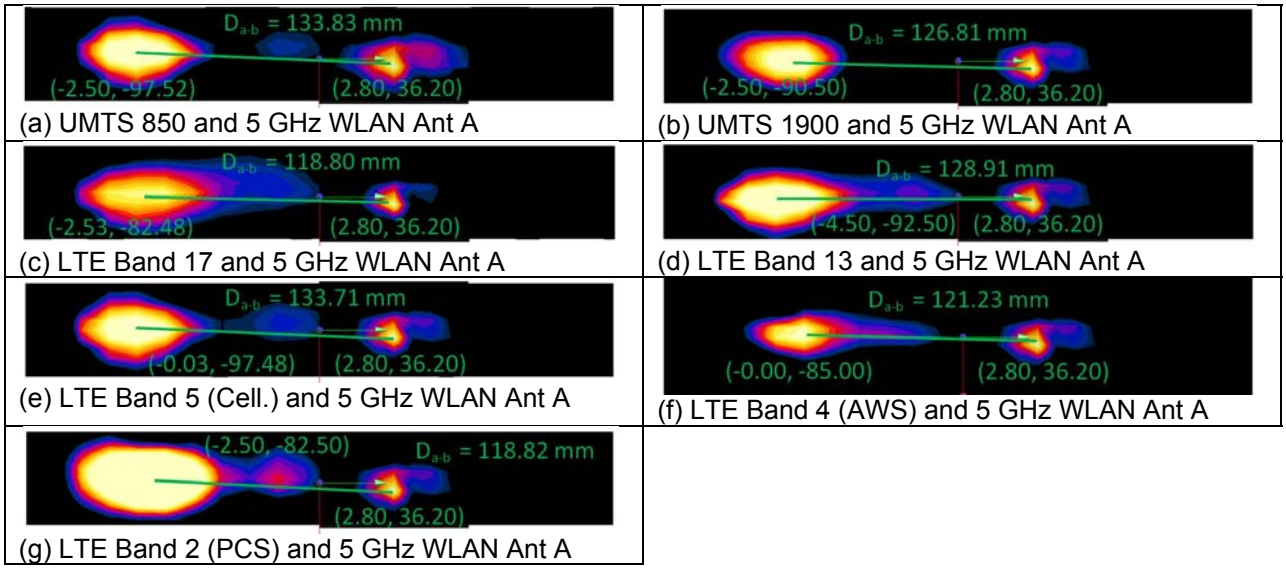


Figure 11-3
Peak SAR Locations for Top Edge at 0.0 cm

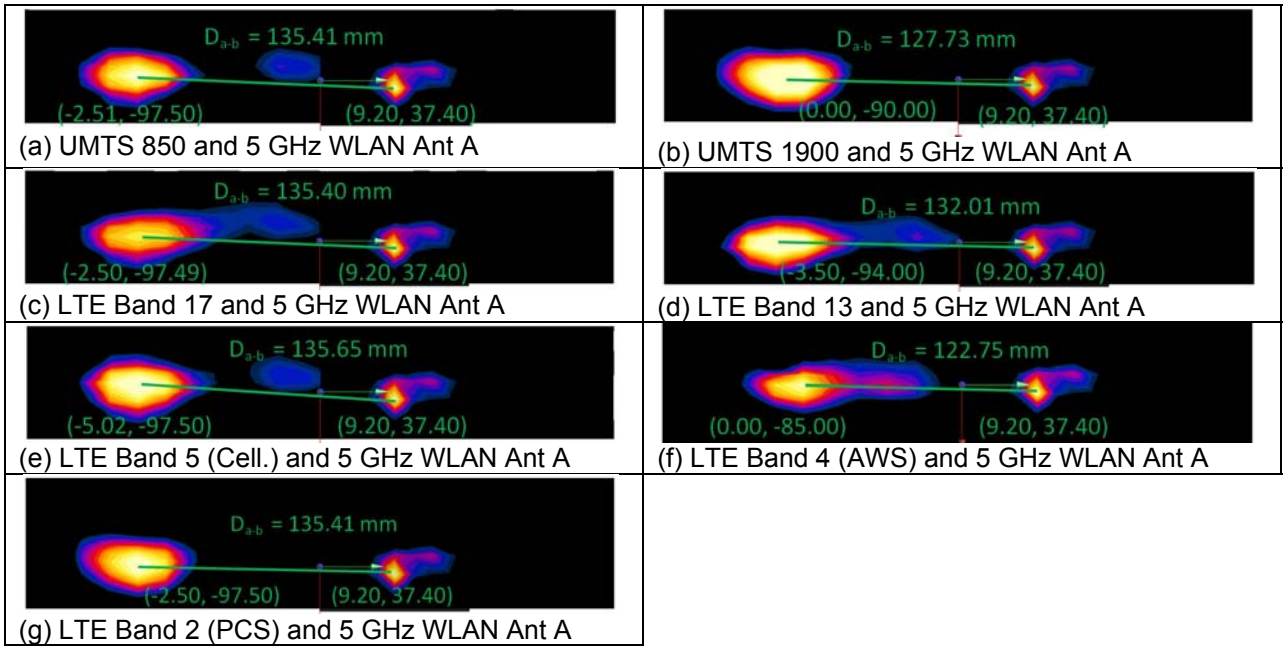
The sums of the standalone SAR values were above 1.6 W/kg for the Top Edge Tilt configuration at a separation distance of 0.0 cm for 5 GHz WLAN Antenna A operating with UMTS 850, UMTS 1900, LTE Band 17, LTE Band 13, LTE Band 5 (Cell.), LTE Band 4 (AWS), and LTE Band 2 (PCS) operating at limited power.

Table 11-14
Peak SAR Locations for Top Edge Tilt at 0.0 cm

Mode/Band	x (mm)	y (mm)
5 GHz WLAN Ant A	9.20	37.40
UMTS 850	-2.51	-97.50
UMTS 1900	0.00	-90.00
LTE Band 17	-2.50	-97.49
LTE Band 13	-3.50	-94.00
LTE Band 5 (Cell.)	-5.02	-97.50
LTE Band 4 (AWS)	0.00	-85.00
LTE Band 2 (PCS)	-2.50	-97.50

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

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$
UMTS 850	5 GHz WLAN Ant A	0.991	0.790	1.781	135.41	0.02
UMTS 1900	5 GHz WLAN Ant A	1.146	0.790	1.936	127.73	0.02
LTE Band 17	5 GHz WLAN Ant A	0.838	0.790	1.628	135.40	0.02
LTE Band 13	5 GHz WLAN Ant A	1.117	0.790	1.907	132.01	0.02
LTE Band 5 (Cell.)	5 GHz WLAN Ant A	1.087	0.790	1.877	135.65	0.02
LTE Band 4 (AWS)	5 GHz WLAN Ant A	0.826	0.790	1.616	122.75	0.02
LTE Band 2 (PCS)	5 GHz WLAN Ant A	1.153	0.790	1.943	135.41	0.02



(a) UMTS 850 and 5 GHz WLAN Ant A

(b) UMTS 1900 and 5 GHz WLAN Ant A

(c) LTE Band 17 and 5 GHz WLAN Ant A

(d) LTE Band 13 and 5 GHz WLAN Ant A

(e) LTE Band 5 (Cell.) and 5 GHz WLAN Ant A

(f) LTE Band 4 (AWS) and 5 GHz WLAN Ant A

(g) LTE Band 2 (PCS) and 5 GHz WLAN Ant A

Figure 11-4
Peak SAR Locations for Top Edge Tilt at 0.0 cm

11.5 Simultaneous Transmission Conclusion

The above numerical summed SAR and SPLSR analysis 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)	
750	782.00	23230	LTE Band 13	QPSK, 1 RB, 0 RB Offset	back	0 mm	1.260	1.180	1.07	N/A	N/A	N/A	N/A
835	836.50	20525	LTE Band 5 (Cell)	QPSK, 1 RB, 25 RB Offset	back	0 mm	1.050	0.988	1.06	N/A	N/A	N/A	N/A
1750	1732.50	20175	LTE Band 4 (AWS)	QPSK, 1 RB, 0 RB Offset	back	0 mm	0.914	0.904	1.01	N/A	N/A	N/A	N/A
1900	1852.40	9262	UMTS 1900	RMC	top	0 mm	1.200	1.140	1.05	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
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/6/2014	Annual	5/6/2015	1070
SPEAG	D750V3	750 MHz Dipole	1/16/2015	Annual	1/16/2016	1003
SPEAG	D835V2	835 MHz SAR Dipole	1/16/2015	Annual	1/16/2016	4d132
SPEAG	D1765V2	1750 MHz SAR Dipole	5/7/2014	Annual	5/7/2015	1008
SPEAG	D1900V2	1900 MHz SAR Dipole	7/23/2014	Annual	7/23/2015	5d149
SPEAG	ES3DV3	SAR Probe	12/16/2014	Annual	12/16/2015	3334
SPEAG	ES3DV3	SAR Probe	4/17/2014	Annual	4/17/2015	3319
SPEAG	ES3DV2	SAR Probe	8/19/2014	Annual	8/19/2015	3022
SPEAG	DAE4	Dasy Data Acquisition Electronics	12/12/2014	Annual	12/12/2015	1415
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/11/2014	Annual	4/11/2015	1368
SPEAG	DAE4	Dasy Data Acquisition Electronics	8/12/2014	Annual	8/12/2015	1322
Agilent	E8257D	(250kHz-20GHz) Signal Generator	4/15/2014	Annual	4/15/2015	MY45470194
Agilent	8753E	(30kHz-6GHz) Network Analyzer	12/30/2014	Annual	12/30/2015	JP38020182
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	E4438C	ESG Vector Signal Generator	4/15/2014	Annual	4/15/2015	MY45090700
Agilent	E4438C	ESG Vector Signal Generator	4/15/2014	Annual	4/15/2015	MY45091346
Agilent	N9020A	MXA Signal Analyzer	10/27/2014	Annual	10/27/2015	US46470561
Agilent	8753ES	S-Parameter Network Analyzer	5/22/2014	Annual	5/22/2015	US39170118
Agilent	E5515C	Wireless Communications Test Set	11/5/2013	Biennial	11/5/2015	GB46310798
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433975
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433977
Anritsu	ML2495A	Power Meter	10/31/2013	Biennial	10/31/2015	0941001
Anritsu	MA2411B	Pulse Power Sensor	11/13/2014	Annual	11/13/2015	1339018
Anritsu	MT8820C	Radio Communication Analyzer	9/19/2014	Annual	9/19/2015	6201144418
Anritsu	MT8820C	Radio Communication Analyzer	5/6/2014	Annual	5/6/2015	6201144419
Anritsu	MA24106A	USB Power Sensor	5/14/2014	Annual	5/14/2015	1231535
Anritsu	MA24106A	USB Power Sensor	5/14/2014	Annual	5/14/2015	1231538
Anritsu	MA24106A	USB Power Sensor	5/15/2014	Annual	5/15/2015	1244512
Anritsu	MA24106A	USB Power Sensor	5/14/2014	Annual	5/14/2015	1244515
Anritsu	MA24106A	USB Power Sensor	5/15/2014	Annual	5/15/2015	1244524
Anritsu	MA24106A	USB Power Sensor	5/14/2014	Annual	5/14/2015	1248508
COMTECH	AR85729-5/5759B	Solid State Amplifier	CBT	N/A	CBT	M3W1A00-1002
Control Company	4052	Long Stem Thermometer	9/27/2013	Biennial	9/27/2015	130567447
Control Company	61220-416	Long-Stem Thermometer	4/29/2014	Biennial	4/29/2016	111331323
Fisher Scientific	S97611	Thermometer	4/12/2013	Biennial	4/12/2015	130219304
Gigatronics	80701A	(0.05-18GHz) Power Sensor	10/30/2014	Annual	10/30/2015	1833460
Gigatronics	8651A	Universal Power Meter	10/30/2014	Annual	10/30/2015	8650319
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
MiniCircuits	SLP-2400+	Low Pass Filter	CBT	N/A	CBT	R8979500903
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-1200+	Low Pass Filter DC to 1000 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
Mitutoyo	CD-6"CSX	Digital Caliper	5/8/2014	Biennial	5/8/2016	13264162
Narda	BW-S3W2	Attenuator (3dB)	CBT	N/A	CBT	120
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Rohde & Schwarz	CMU200	Base Station Simulator	6/6/2014	Annual	6/6/2015	109892
Rohde & Schwarz	CMW500	Radio Communication Tester	7/22/2014	Annual	7/22/2015	116743
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
Tektronix	RSA6114A	Real Time Spectrum Analyzer	4/16/2014	Annual	4/16/2015	B010177
VWR	36934-158	Wall-Mounted Thermometer	4/29/2014	Biennial	4/29/2016	111859323
VWR	36934-158	Wall-Mounted Thermometer	8/8/2013	Biennial	8/8/2015	130477877

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

15 CONCLUSION

15.1 Measurement Conclusion

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

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

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APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC.

DUT: C3K1657; Type: Portable Computing Device; Serial: 000369345152

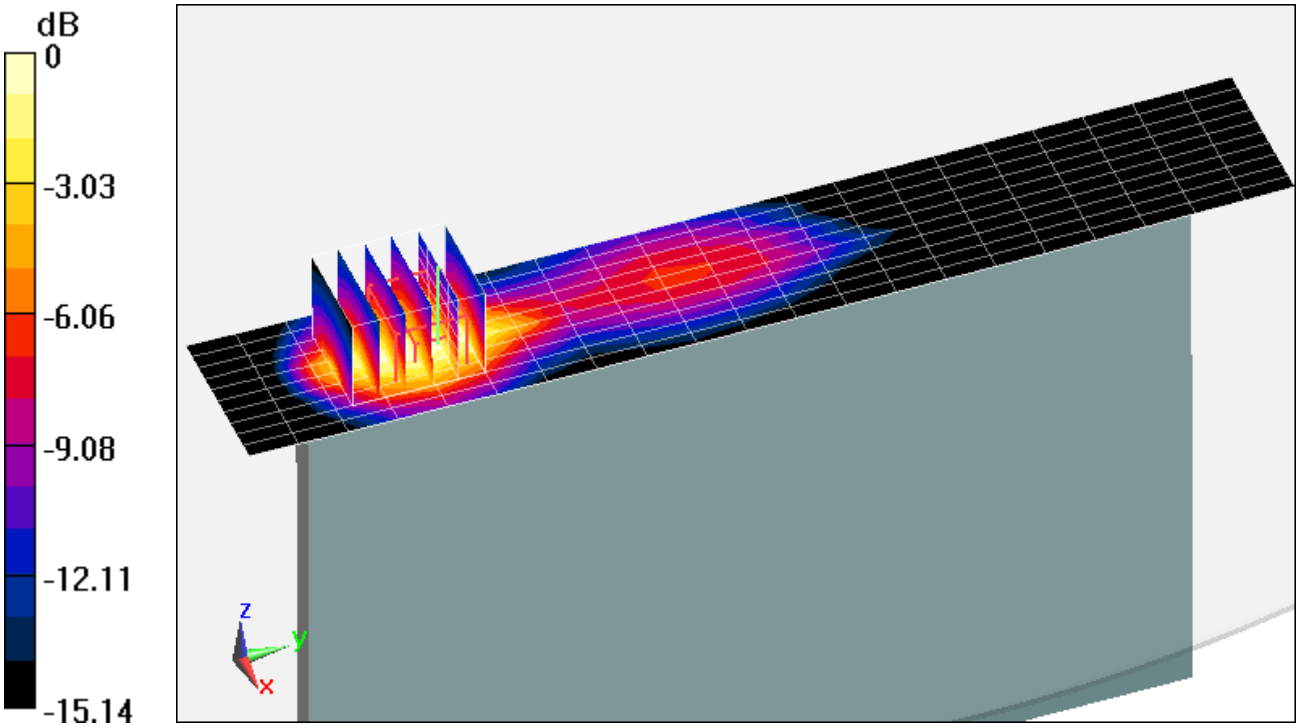
Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: 835 Body, Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.967 S/m; ε_r = 55.098; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 02-23-2015; Ambient Temp: 22.7°C; Tissue Temp: 20.4°C

Probe: ES3DV3 - SN3334; ConvF(6.14, 6.14, 6.14); Calibrated: 12/16/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 12/12/2014
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1158
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: UMTS 850, Body SAR, Top Edge, Mid.ch

Area Scan (11x22x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 31.41 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.86 W/kg
SAR(1 g) = 0.980 W/kg



0 dB = 1.26 W/kg = 1.00 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: C3K1657; Type: Portable Computing Device; Serial: 000366645152

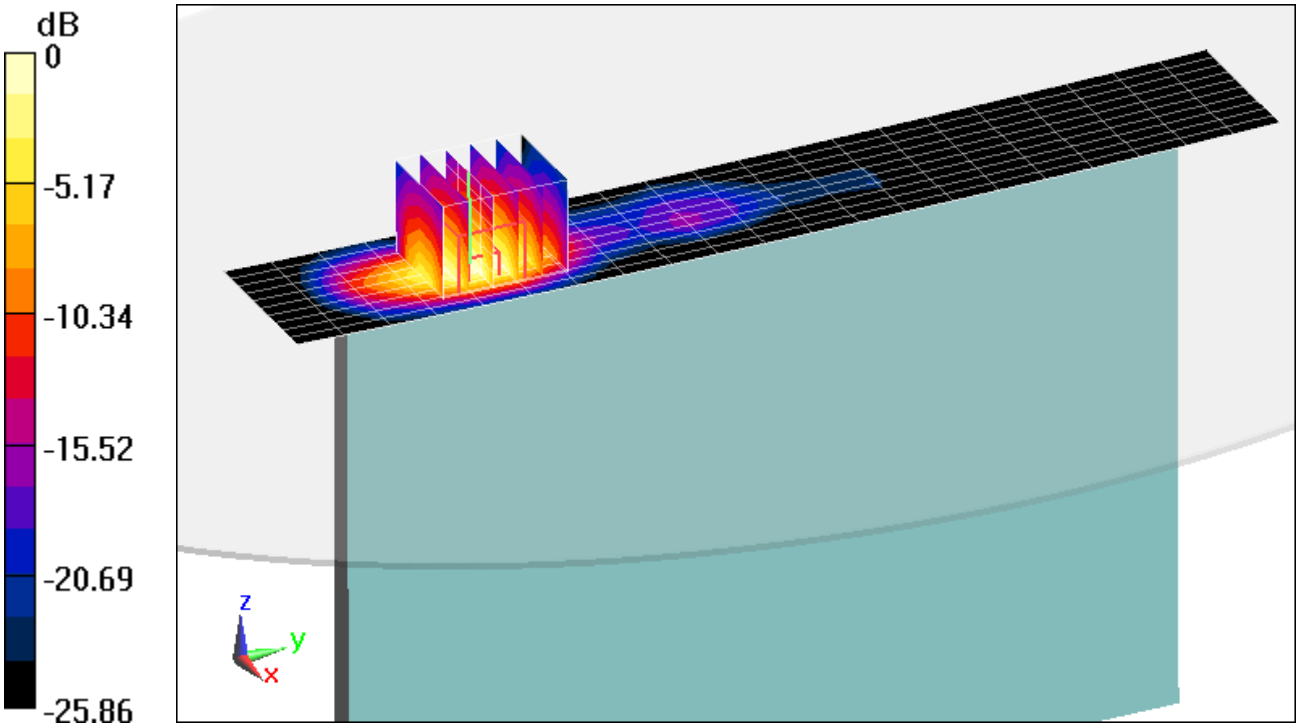
Communication System: UID 0, UMTS; Frequency: 1852.4 MHz; Duty Cycle: 1:1
Medium: 1900 Body, Medium parameters used (interpolated):
f = 1852.4 MHz; σ = 1.527 S/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 02-19-2015; Ambient Temp: 22.8°C; Tissue Temp: 22.0°C

Probe: ES3DV2 - SN3022; ConvF(4.49, 4.49, 4.49); Calibrated: 8/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/12/2014
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: UMTS 1900, Body SAR, Top Edge, Low.ch

Area Scan (11x22x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 29.70 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 2.51 W/kg
SAR(1 g) = 1.2 W/kg



0 dB = 1.40 W/kg = 1.46 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: C3K1657; Type: Portable Computing Device; Serial: 000369345152

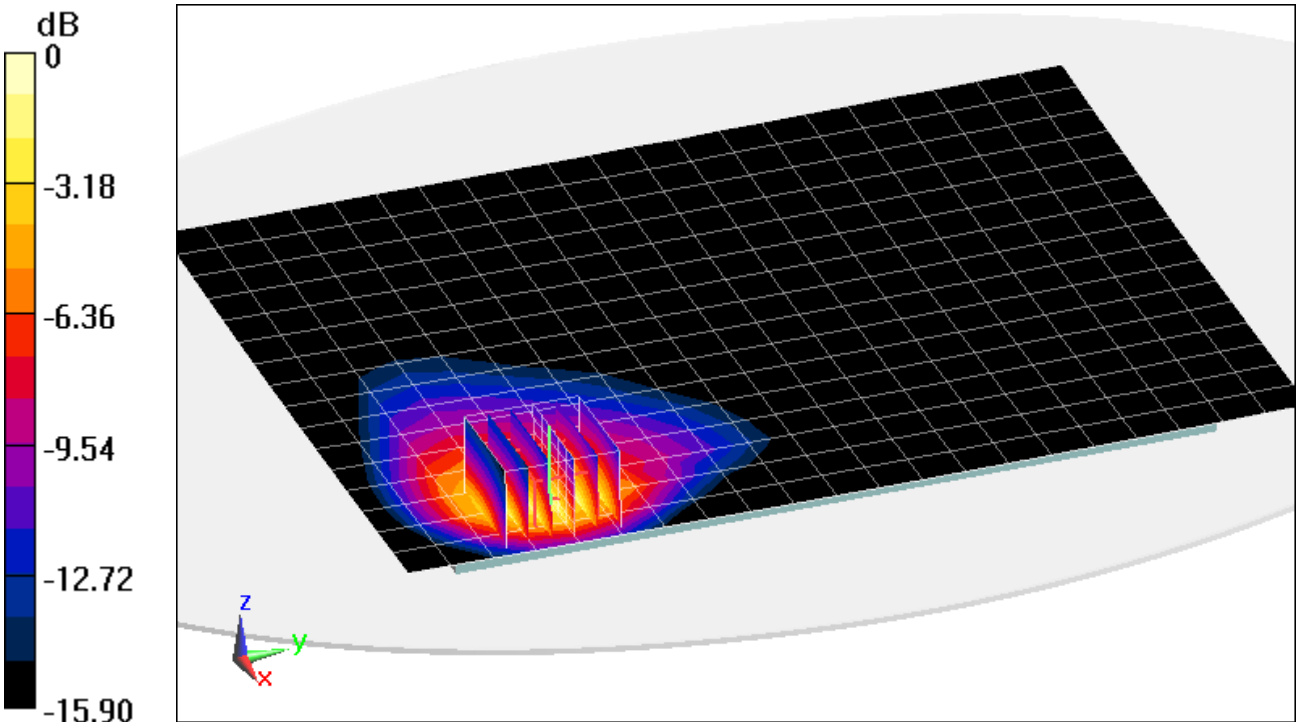
Communication System: UID 0, LTE Band 17; Frequency: 710 MHz; Duty Cycle: 1:1
Medium: 750 Body, Medium parameters used:
f = 710 MHz; σ = 0.94 S/m; ε_r = 56.307; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 02-25-2015; Ambient Temp: 23.1°C; Tissue Temp: 20.8°C

Probe: ES3DV3 - SN3334; ConvF(6.09, 6.09, 6.09); Calibrated: 12/16/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 12/12/2014
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1158
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 17, Body SAR, Back side, Mid.ch,
10 MHz Bandwidth, QPSK, 1 RB, 25 RB Offset

Area Scan (17x22x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 25.40 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.81 W/kg
SAR(1 g) = 0.987 W/kg



0 dB = 1.18 W/kg = 0.72 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: C3K1657; Type: Portable Computing Device; Serial: 0S1303111511

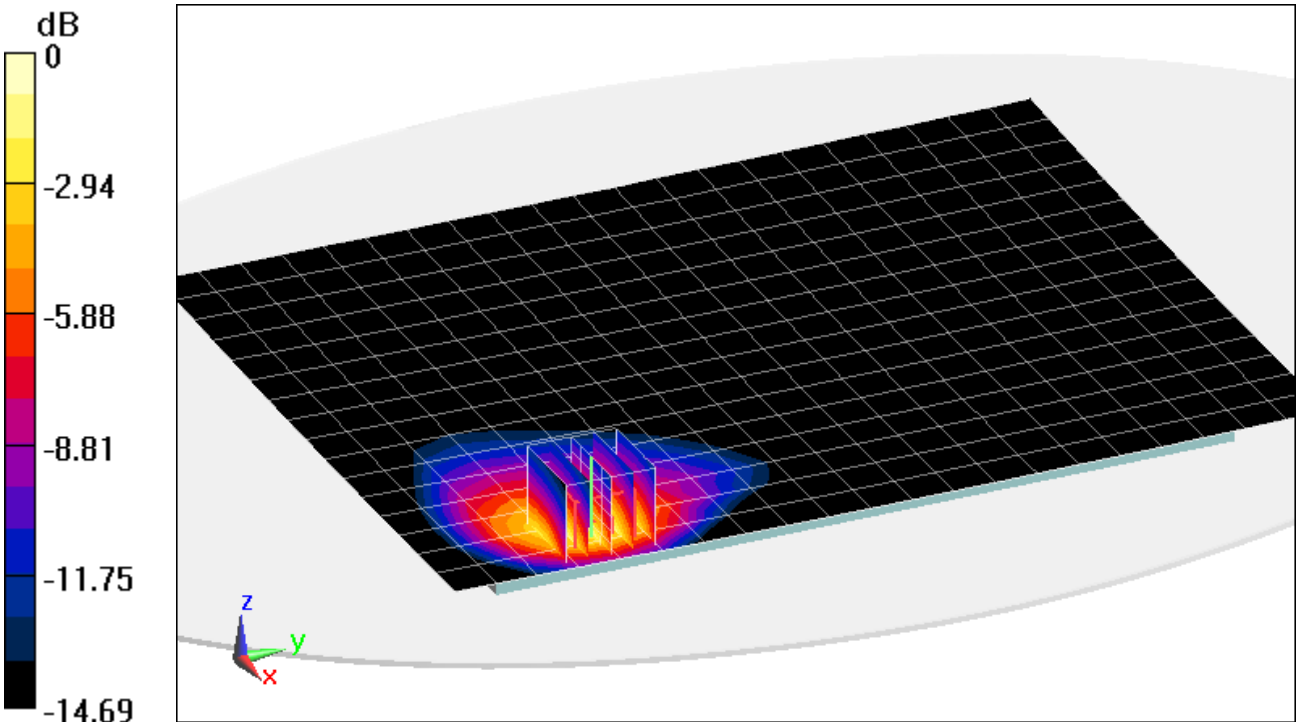
Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1
Medium: 750 Body, Medium parameters used (interpolated):
f = 782 MHz; σ = 1.008 S/m; ε_r = 55.466; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 03-31-2015; Ambient Temp: 22.5°C; Tissue Temp: 21.1°C

Probe: ES3DV2 - SN3022; ConvF(6.02, 6.02, 6.02); Calibrated: 08/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 08/12/2014
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 13, Body SAR, Back side, Mid.ch,
10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

Area Scan (17x22x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 25.85 V/m; Power Drift = -0.19 dB
Peak SAR (extrapolated) = 2.36 W/kg
SAR(1 g) = 1.26 W/kg



0 dB = 1.34 W/kg = 1.27 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: C3K1657; Type: Portable Computing Device; Serial: 000369345152

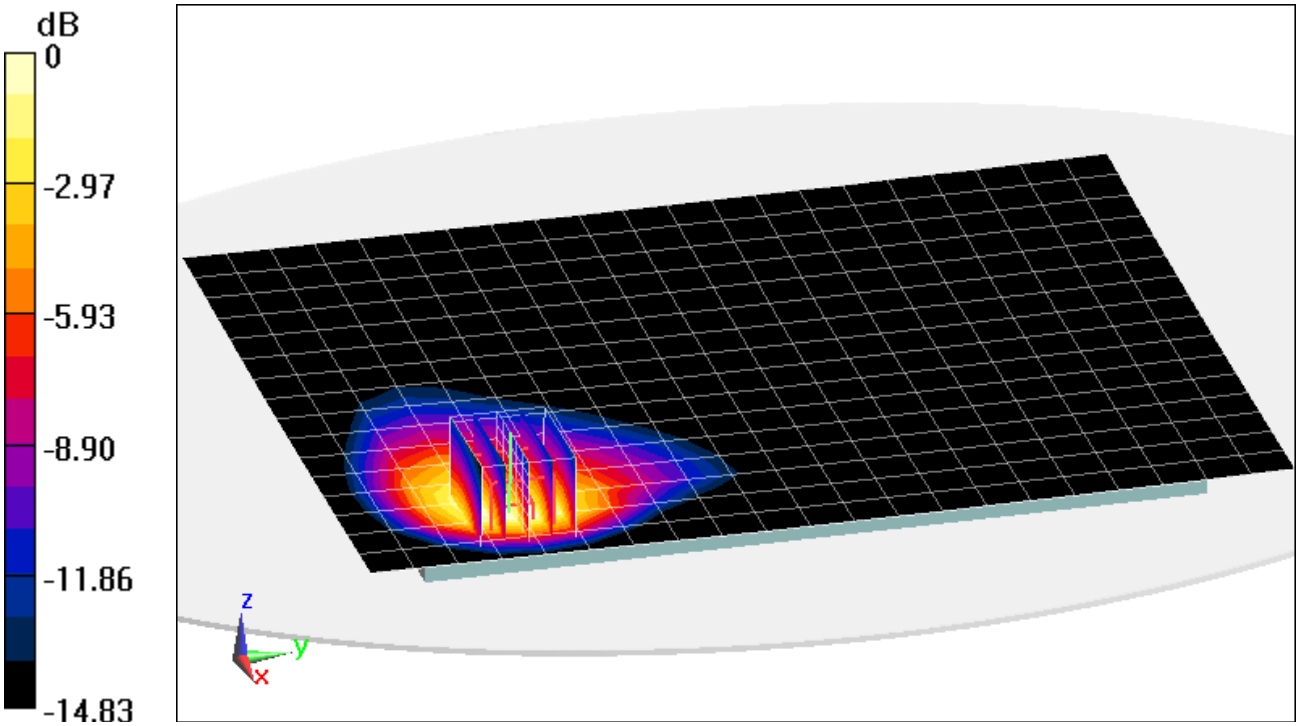
Communication System: UID 0, LTE Band 5; Frequency: 836.5 MHz; Duty Cycle: 1:1
Medium: 835 Body, Medium parameters used (interpolated):
f = 836.5 MHz; σ = 0.966 S/m; ε_r = 55.099; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 02-23-2015; Ambient Temp: 22.7°C; Tissue Temp: 20.4°C

Probe: ES3DV3 - SN3334; ConvF(6.14, 6.14, 6.14); Calibrated: 12/16/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 12/12/2014
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1158
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 5 (Cell.), Body SAR, Back side, Mid.ch,
10 MHz Bandwidth, QPSK, 1 RB, 25 RB Offset

Area Scan (17x22x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 38.45 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 1.93 W/kg
SAR(1 g) = 1.05 W/kg



0 dB = 1.28 W/kg = 1.07 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: C3K1657; Type: Portable Computing Device; Serial: 000280445152

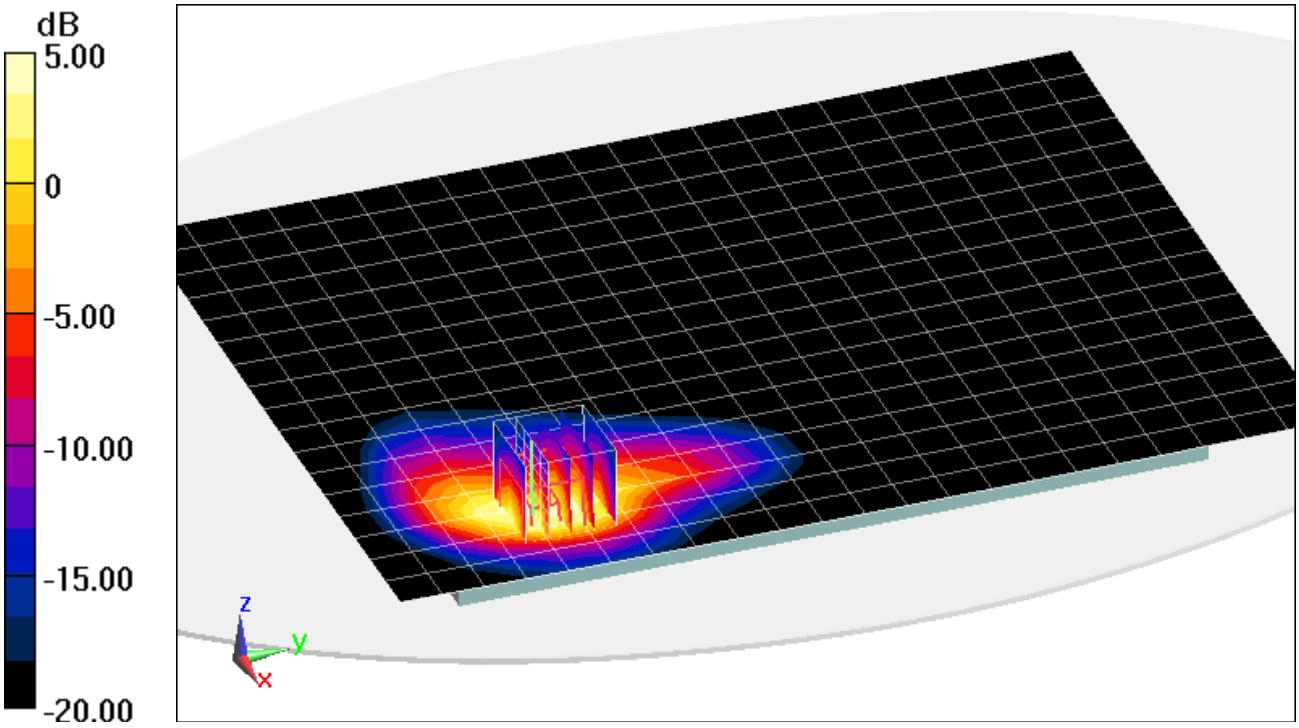
Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium: 1750 Body, Medium parameters used (interpolated):
f = 1732.5 MHz; σ = 1.461 S/m; ε_r = 51.41; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 02-18-2015; Ambient Temp: 22.8°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3319; ConvF(4.85, 4.85, 4.85); Calibrated: 4/17/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 4/11/2014
Phantom: ELI Front; Type: QDOVA002AA; Serial: TP:1202
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 4 (AWS), Body SAR, Back side, Mid.ch,
20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

Area Scan (18x23x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 27.00 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 1.72 W/kg
SAR(1 g) = 0.914 W/kg



0 dB = 1.27 W/kg = 1.04 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: C3K1657; Type: Portable Computing Device; Serial: 000369345152

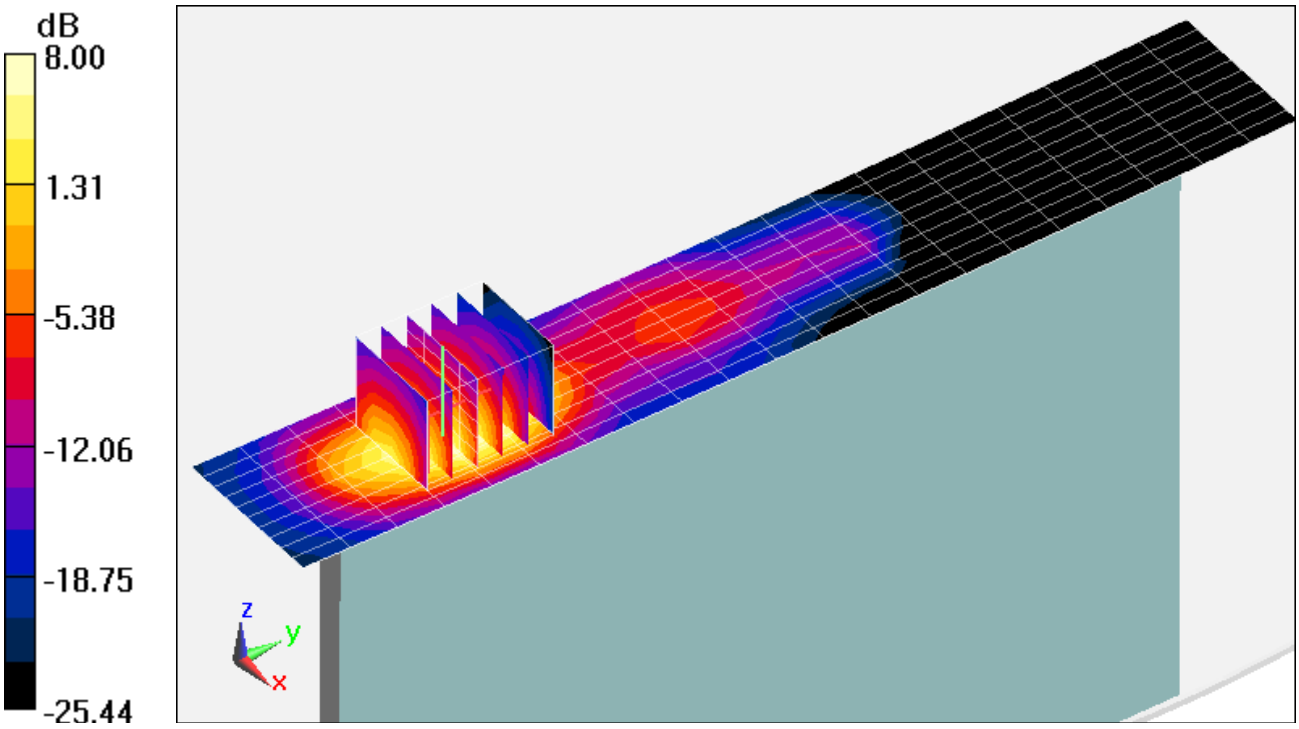
Communication System: UID 0, LTE Band 2 (PCS); Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Body, Medium parameters used:
f = 1880 MHz; σ = 1.556 S/m; ε_r = 52.1; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 02-19-2015; Ambient Temp: 22.8°C; Tissue Temp: 22.0°C

Probe: ES3DV2 - SN3022; ConvF(4.49, 4.49, 4.49); Calibrated: 8/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/12/2014
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 2 (PCS), Body SAR, Top Edge, Mid.ch,
20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

Area Scan (11x22x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 67.12 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 2.38 W/kg
SAR(1 g) = 1.15 W/kg



0 dB = 1.60 W/kg = 2.04 dBW/kg

APPENDIX B: SYSTEM VERIFICATION

PCTEST ENGINEERING LABORATORY, INC.

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

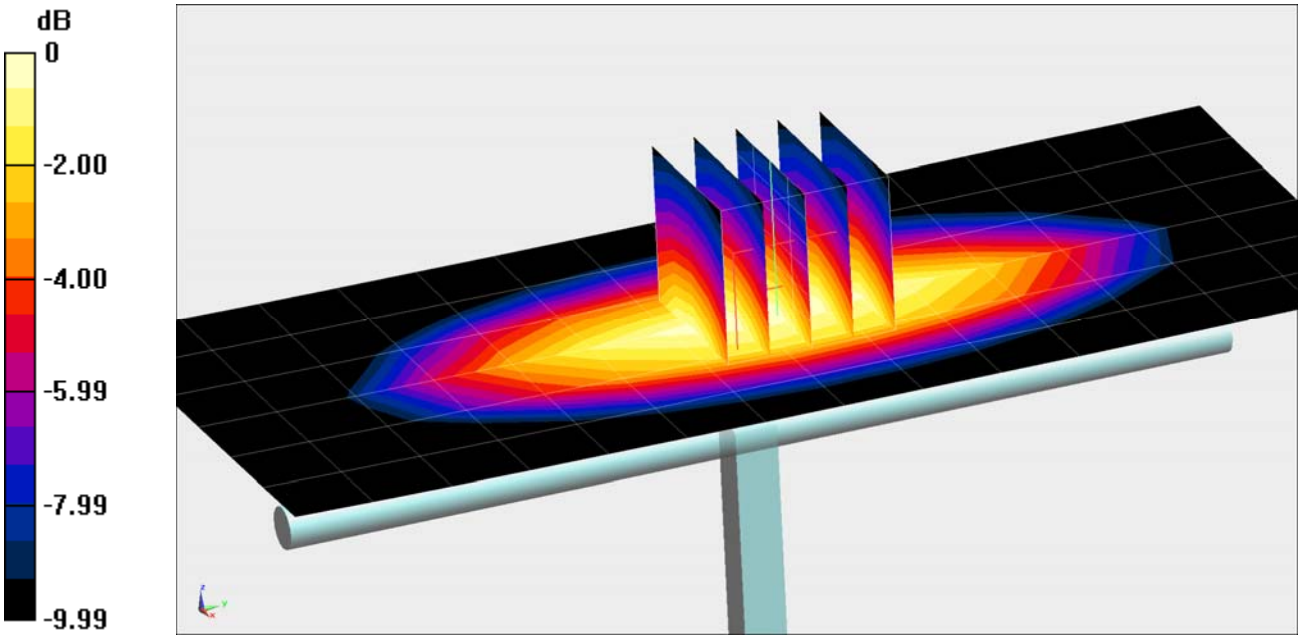
Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 750 MHz; σ = 0.978 S/m; ε_r = 55.888; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 02-25-2015; Ambient Temp: 23.1°C; Tissue Temp: 20.8°C

Probe: ES3DV3 - SN3334; ConvF(6.09, 6.09, 6.09); Calibrated: 12/16/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 12/12/2014
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1158
Measurement SW: DASY52, Version 52.8 (8); 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: 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 1.31 W/kg
SAR(1 g) = 0.901 W/kg
Deviation (1 g): 6.50%



0 dB = 1.04 W/kg = 0.17 dBW/kg

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

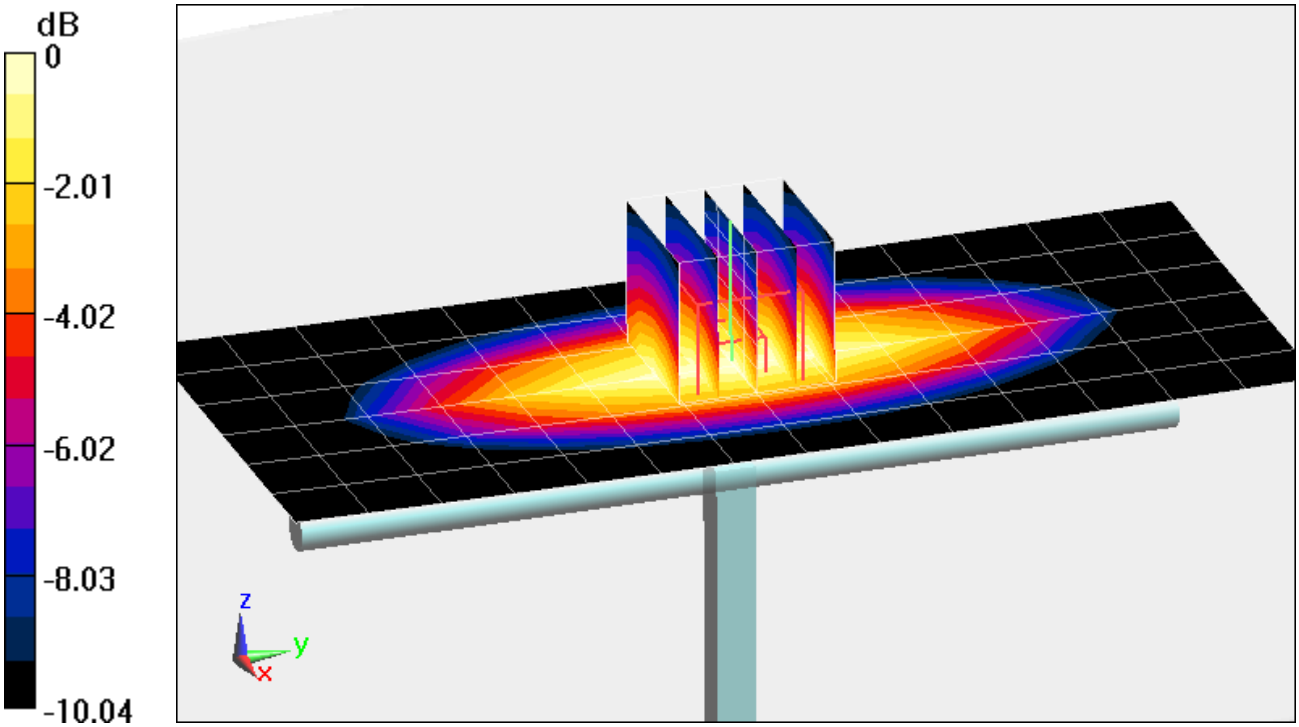
Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 750 Body, Medium parameters used (interpolated):
f = 750 MHz; σ = 0.979 S/m; ε_r = 55.787; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 03-31-2015; Ambient Temp: 22.5°C; Tissue Temp: 21.1°C

Probe: ES3DV2 - SN3022; ConvF(6.02, 6.02, 6.02); Calibrated: 8/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/12/2014
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226
Measurement SW: DASY52, Version 52.8 (8); 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: 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 1.32 W/kg
SAR(1 g) = 0.916 W/kg
Deviation(1 g): 8.27%



0 dB = 0.980 W/kg = -0.09 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d132

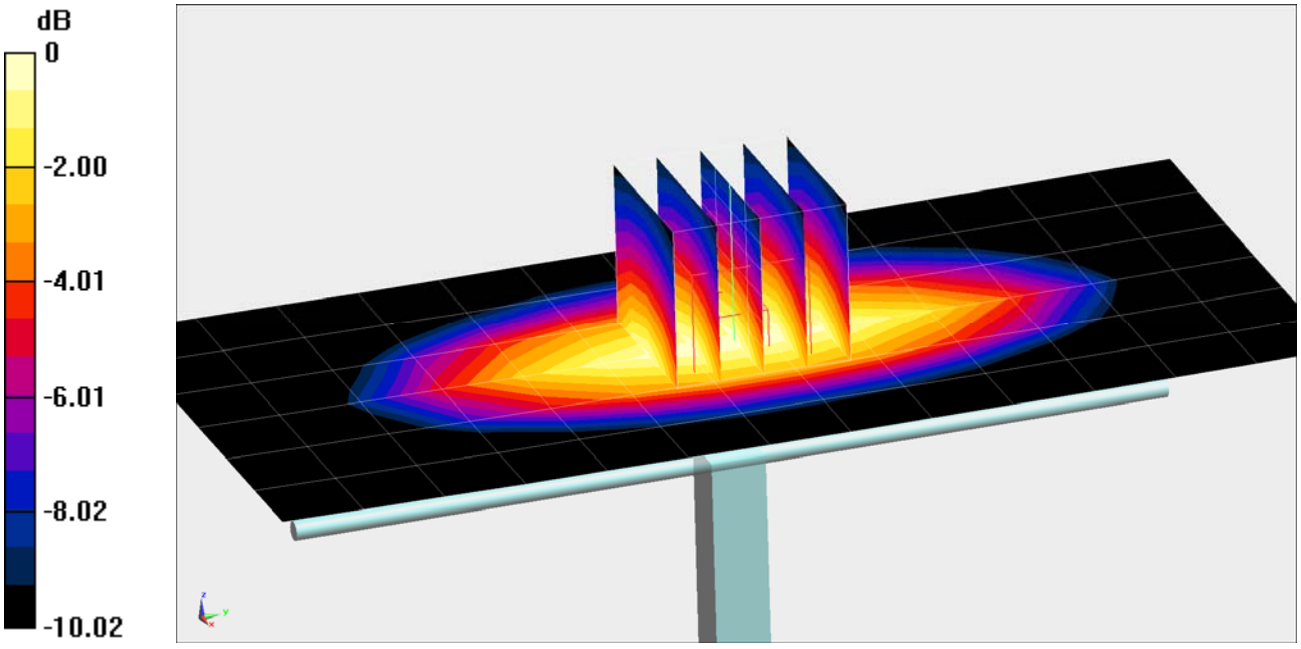
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used:
f = 835 MHz; σ = 0.965 S/m; ε_r = 55.112; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 02-23-2015; Ambient Temp: 22.7°C; Tissue Temp: 20.4°C

Probe: ES3DV3 - SN3334; ConvF(6.14, 6.14, 6.14); Calibrated: 12/16/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 12/12/2014
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1158
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

835 MHz System Verification

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power: 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 1.35 W/kg
SAR(1 g) = 0.936 W/kg
Deviation (1 g): 2.41%



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

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

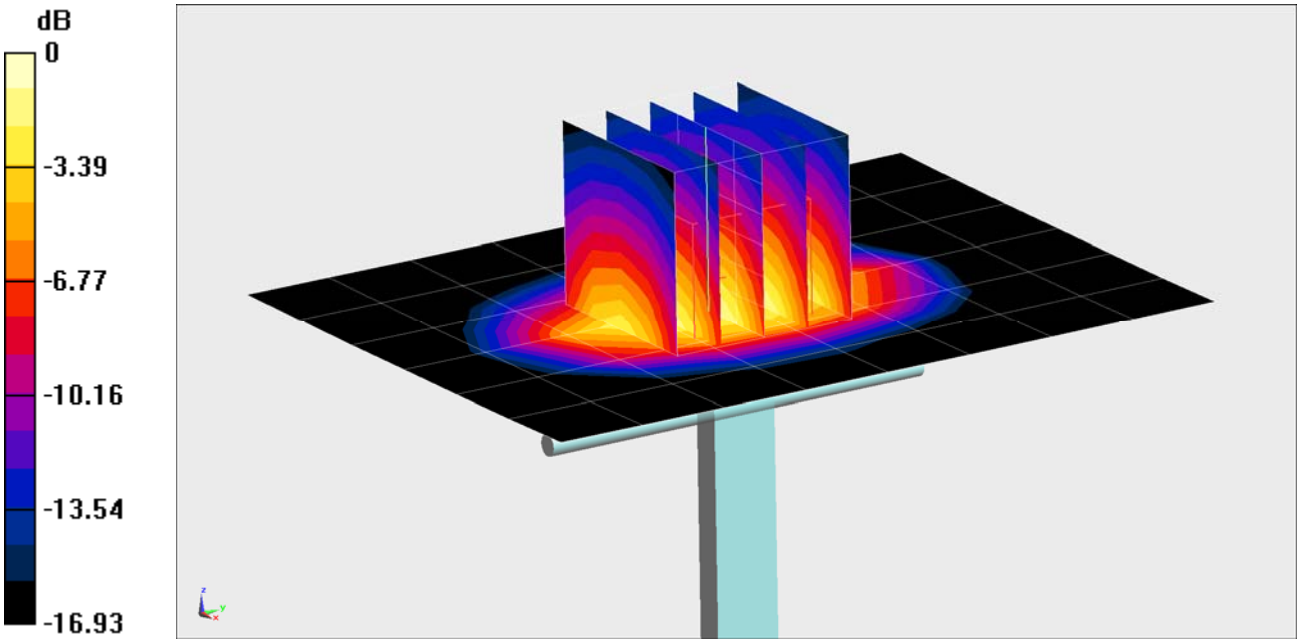
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used:
f = 1750 MHz; σ = 1.481 S/m; ε_r = 51.347; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-18-2015; Ambient Temp: 22.8°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3319; ConvF(4.85, 4.85, 4.85); Calibrated: 4/17/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 4/11/2014
Phantom: ELI Front; Type: QDOVA002AA; Serial: TP:1202
Measurement SW: DASY52, Version 52.8 (8); 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: 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 6.55 W/kg
SAR(1 g) = 3.76 W/kg
Deviation (1 g): 0.00%



0 dB = 4.71 W/kg = 6.73 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

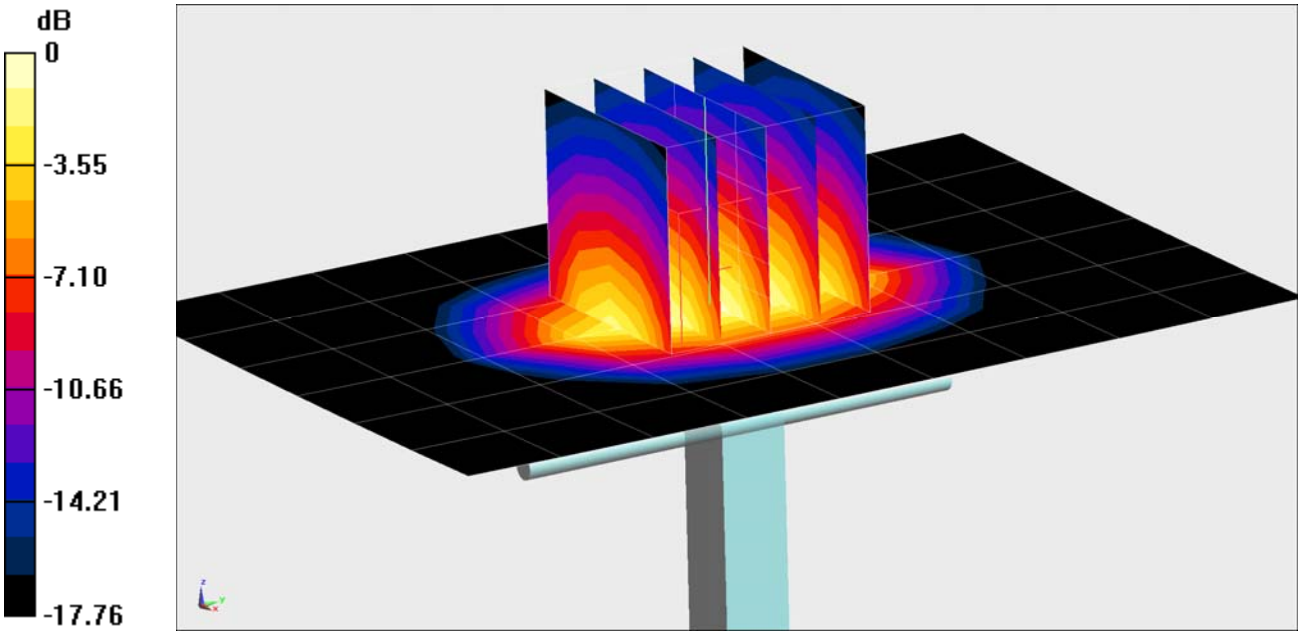
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.58 S/m; ε_r = 52.013; ρ = 1000 kg/m^3
Phantom section: Flat Section: Space: 1.0 cm

Test Date: 02-19-2015; Ambient Temp: 22.8°C; Tissue Temp: 22.0°C

Probe: ES3DV2 - SN3022; ConvF(4.49, 4.49, 4.49); Calibrated: 8/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/12/2014
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

1900 MHz System Verification

Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power: 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 6.92 W/kg
SAR(1 g) = 3.94 W/kg
Deviation (1 g): -2.48%



0 dB = 4.99 W/kg = 6.98 dBW/kg

APPENDIX C: PROBE CALIBRATION

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

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

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

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **ES3-3334_Dec14**

CALIBRATION CERTIFICATE

Object ES3DV3 - SN:3334

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

CC 12/31/14

Calibration date: December 16, 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: 789	30-Apr-14 (No. DAE4-789_Apr14)	Apr-15
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-14)	In house check: Oct-15

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

Issued: December 16, 2014

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**

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:3334

Manufactured:	January 24, 2012
Repaired:	December 9, 2014
Calibrated:	December 16, 2014

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3334

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.04	1.05	1.01	± 10.1 %
DCP (mV)[B]	106.5	105.0	105.6	

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	188.0	±3.0 %
		Y	0.0	0.0	1.0		183.2	
		Z	0.0	0.0	1.0		181.8	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	4.61	67.2	13.7	10.00	38.4	±1.4 %
		Y	20.36	82.7	18.7		38.0	
		Z	17.55	80.3	17.6		37.0	
10011-CAB	UMTS-FDD (WCDMA)	X	3.56	68.4	19.1	2.91	148.4	±0.7 %
		Y	3.44	68.1	19.2		146.9	
		Z	3.52	68.3	19.1		144.7	
10012-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	3.54	71.9	20.0	1.87	148.0	±0.7 %
		Y	3.51	72.2	20.5		148.9	
		Z	3.80	73.3	20.6		144.6	
10013-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	11.39	71.1	23.3	9.46	149.8	±3.8 %
		Y	11.54	71.8	24.0		149.5	
		Z	11.11	70.5	23.0		141.6	
10021-DAB	GSM-FDD (TDMA, GMSK)	X	15.29	91.3	25.0	9.39	131.9	±1.7 %
		Y	24.16	100.0	28.4		142.8	
		Z	13.05	89.2	24.5		126.5	
10023-DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	16.07	91.7	25.1	9.57	144.0	±2.2 %
		Y	19.00	95.3	26.8		136.4	
		Z	13.93	89.8	24.6		141.0	
10024-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	19.98	91.0	22.4	6.56	134.2	±1.9 %
		Y	34.78	99.7	25.5		145.0	
		Z	29.89	96.8	24.1		129.8	
10027-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	56.30	99.7	22.8	4.80	125.2	±1.9 %
		Y	41.16	99.6	23.9		131.2	
		Z	50.78	99.8	23.1		147.6	
10028-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	49.35	99.7	22.5	3.55	133.2	±2.2 %
		Y	46.49	99.6	22.9		139.2	
		Z	58.21	99.7	22.0		129.4	
10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	56.54	100.0	20.2	1.16	128.0	±1.7 %
		Y	20.03	99.3	22.4		130.3	
		Z	84.01	100.0	19.4		141.0	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.44	67.6	19.6	5.67	138.5	±1.4 %
		Y	6.50	67.9	20.0		142.1	
		Z	6.31	67.2	19.4		129.4	

10103-CAB	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	9.77	73.6	24.6	9.29	129.6	±3.3 %
		Y	10.52	76.0	26.3		132.1	
		Z	10.21	75.0	25.4		147.7	
10108-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.36	67.2	19.6	5.80	136.8	±1.4 %
		Y	6.31	67.3	19.8		137.2	
		Z	6.20	66.7	19.3		128.8	
10117-CAB	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	9.96	68.3	20.8	8.07	126.5	±2.5 %
		Y	10.12	68.8	21.3		126.6	
		Z	10.22	69.0	21.2		143.7	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	9.29	73.0	24.4	9.28	125.3	±3.3 %
		Y	9.65	74.5	25.6		124.4	
		Z	9.65	74.3	25.2		141.1	
10154-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	6.03	66.7	19.3	5.75	132.7	±1.4 %
		Y	5.97	66.7	19.5		132.7	
		Z	6.17	67.3	19.7		148.3	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.47	67.2	19.5	5.82	138.1	±1.4 %
		Y	6.44	67.3	19.8		138.2	
		Z	6.27	66.6	19.2		126.8	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	5.03	66.9	19.6	5.73	137.2	±1.2 %
		Y	4.97	67.0	19.9		135.7	
		Z	4.91	66.5	19.5		127.1	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	8.53	77.4	26.9	9.21	142.4	±2.7 %
		Y	9.59	81.3	29.3		142.3	
		Z	7.78	75.0	25.7		126.7	
10175-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	5.02	67.0	19.7	5.72	131.8	±1.2 %
		Y	4.98	67.0	19.9		136.1	
		Z	4.95	66.8	19.6		128.1	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	4.99	66.8	19.6	5.72	131.2	±1.2 %
		Y	4.99	67.1	20.0		136.2	
		Z	4.92	66.6	19.5		127.9	
10196-CAB	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.98	68.8	21.2	8.10	141.7	±2.5 %
		Y	10.14	69.5	21.8		147.2	
		Z	9.85	68.6	21.1		137.5	
10225-CAB	UMTS-FDD (HSPA+)	X	7.17	67.5	19.6	5.97	146.0	±1.4 %
		Y	7.13	67.7	19.9		149.9	
		Z	7.12	67.5	19.6		142.9	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	8.29	76.6	26.5	9.21	136.1	±2.7 %
		Y	9.60	81.4	29.3		142.3	
		Z	7.98	75.8	26.1		132.9	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	9.27	74.1	25.1	9.24	139.1	±3.3 %
		Y	10.25	77.5	27.4		146.3	
		Z	9.07	73.7	25.0		135.8	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	9.95	74.9	25.4	9.30	147.0	±3.3 %
		Y	9.80	75.0	25.9		125.9	
		Z	9.74	74.6	25.4		143.8	

10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.63	67.6	19.0	3.96	147.5	±0.7 %
		Y	4.41	66.9	18.9		129.5	
		Z	4.61	67.6	19.1		148.1	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.83	67.7	19.0	3.46	133.7	±0.7 %
		Y	3.71	67.4	19.0		139.0	
		Z	3.86	68.1	19.2		133.7	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.85	68.2	19.2	3.39	136.7	±0.5 %
		Y	3.67	67.5	19.1		141.3	
		Z	3.75	67.8	19.0		136.2	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.31	67.1	19.5	5.81	130.6	±1.4 %
		Y	6.32	67.3	19.8		135.1	
		Z	6.24	66.9	19.4		129.2	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.85	67.5	19.8	6.06	135.1	±1.4 %
		Y	6.90	67.9	20.2		141.5	
		Z	6.82	67.5	19.8		135.1	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	5.04	69.1	19.1	3.76	126.0	±0.5 %
		Y	4.90	69.0	19.3		129.6	
		Z	5.11	69.7	19.4		125.8	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	5.05	69.6	19.4	3.77	147.1	±0.7 %
		Y	4.84	69.2	19.5		127.8	
		Z	5.15	70.1	19.6		143.3	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	3.13	71.2	19.9	1.54	144.5	±0.5 %
		Y	2.93	70.4	19.9		149.8	
		Z	3.18	71.6	20.1		141.4	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	10.11	69.0	21.4	8.23	144.3	±2.5 %
		Y	10.21	69.6	21.9		148.3	
		Z	9.99	68.9	21.3		141.1	

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 7 and 8).
[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:3334

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	6.51	6.51	6.51	0.80	1.17	± 12.0 %
835	41.5	0.90	6.25	6.25	6.25	0.38	1.58	± 12.0 %
1750	40.1	1.37	5.21	5.21	5.21	0.43	1.63	± 12.0 %
1900	40.0	1.40	5.03	5.03	5.03	0.53	1.45	± 12.0 %
2450	39.2	1.80	4.51	4.51	4.51	0.80	1.26	± 12.0 %
2600	39.0	1.96	4.31	4.31	4.31	0.79	1.27	± 12.0 %

[C] Frequency validity above 300 MHz 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. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[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:3334

Calibration Parameter Determined in Body Tissue Simulating Media

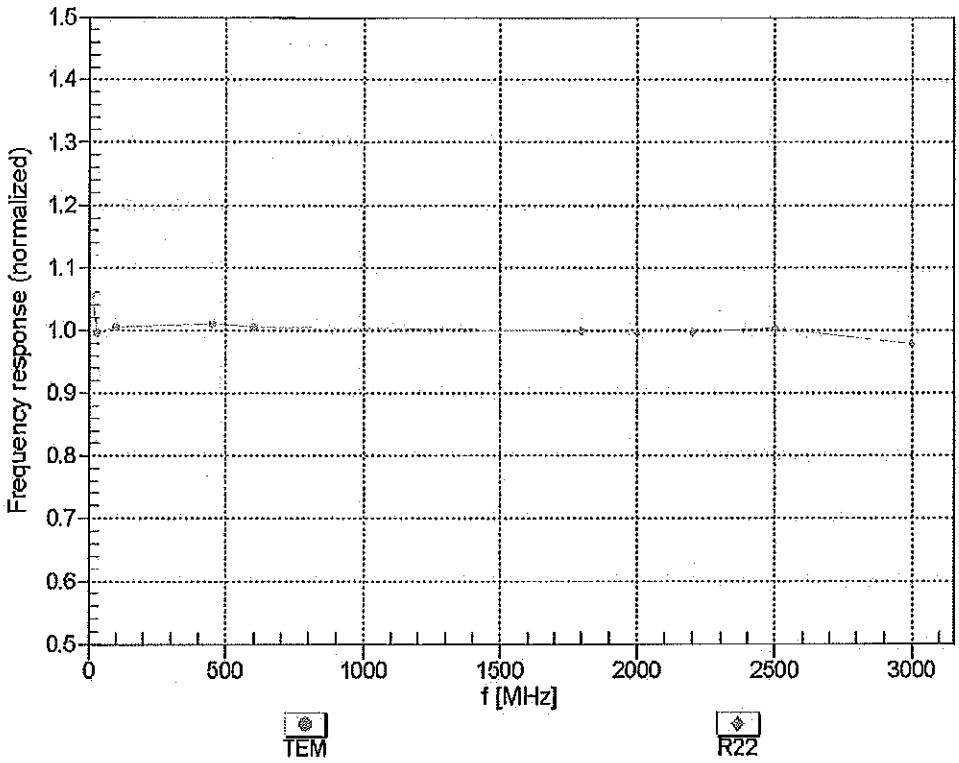
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	55.5	0.96	6.09	6.09	6.09	0.49	1.47	± 12.0 %
835	55.2	0.97	6.14	6.14	6.14	0.69	1.27	± 12.0 %
1750	53.4	1.49	4.94	4.94	4.94	0.80	1.24	± 12.0 %
1900	53.3	1.52	4.73	4.73	4.73	0.62	1.44	± 12.0 %
2450	52.7	1.95	4.28	4.28	4.28	0.80	1.13	± 12.0 %
2600	52.5	2.16	4.16	4.16	4.16	0.75	1.25	± 12.0 %

[C] Frequency validity above 300 MHz 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. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[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.

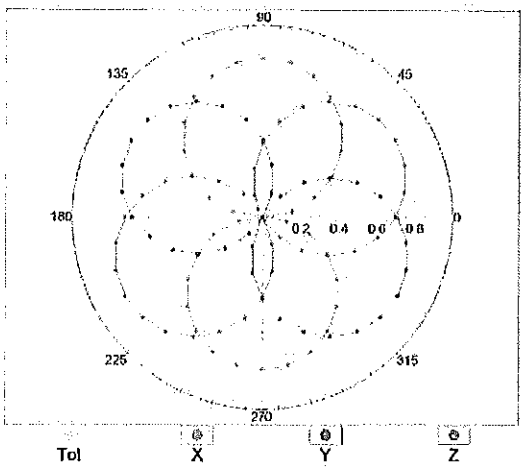
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



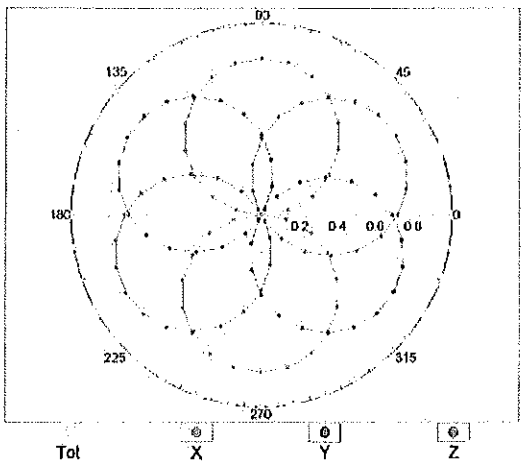
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

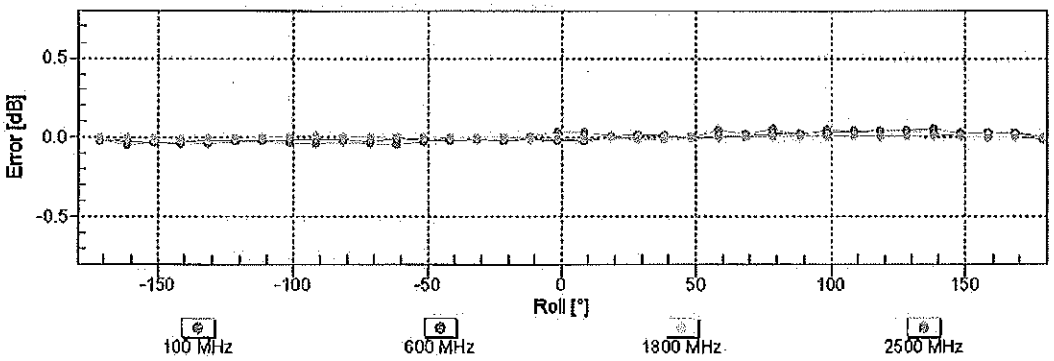
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



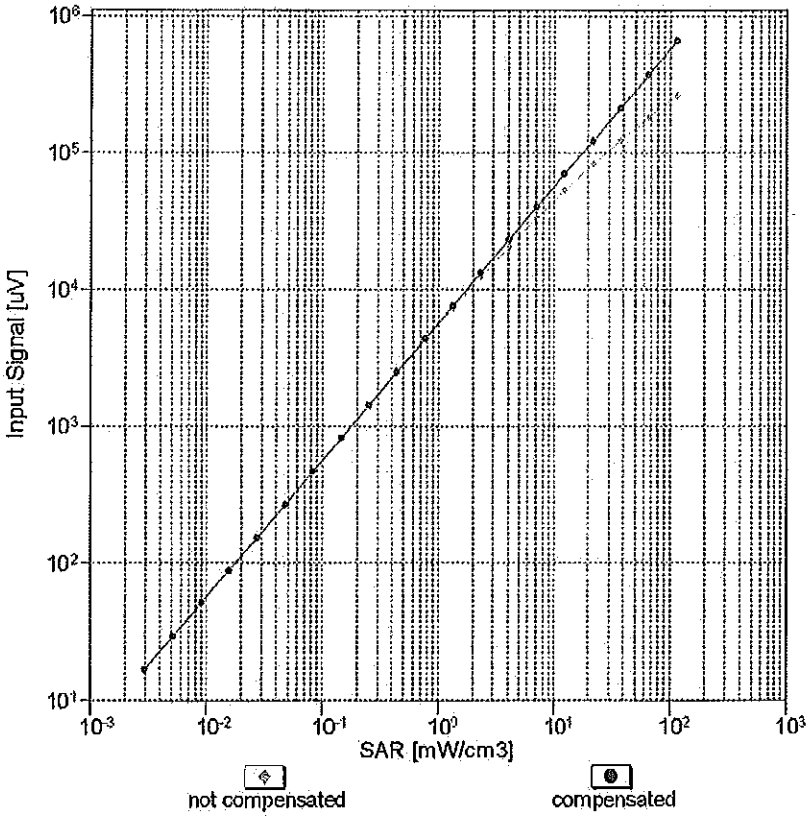
f=1800 MHz,R22

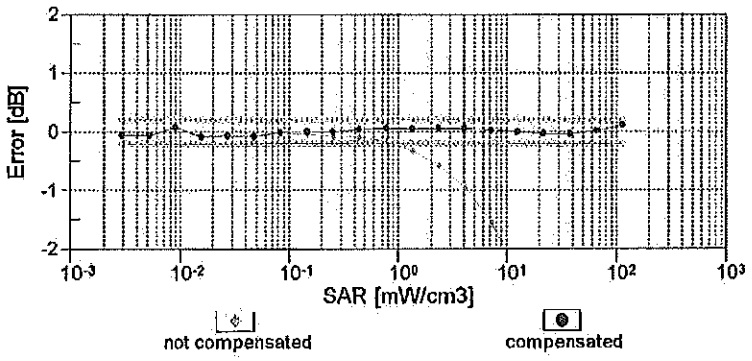




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

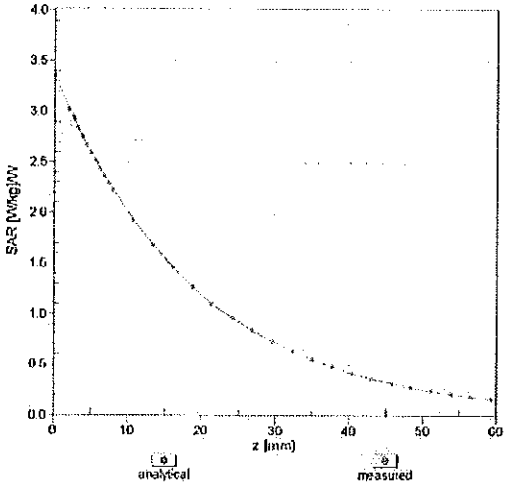




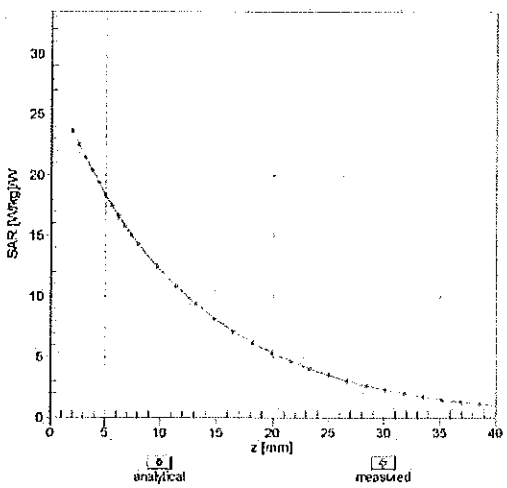
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

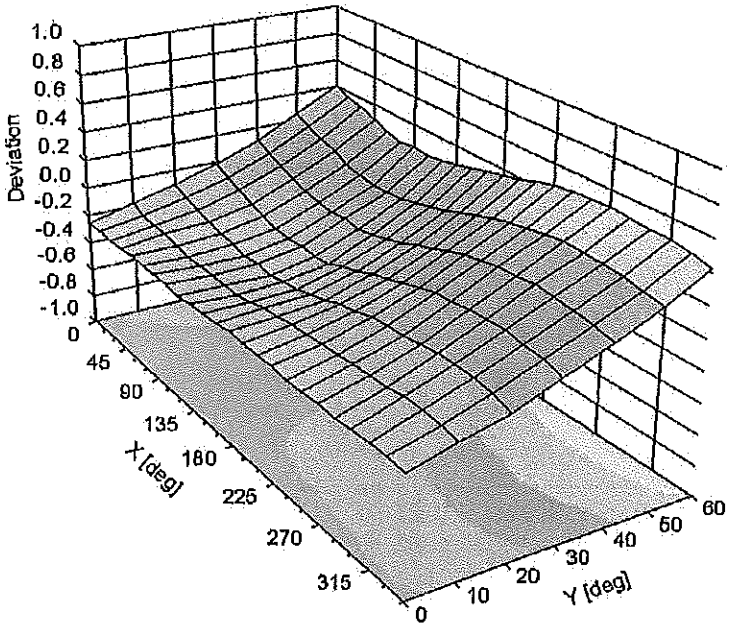


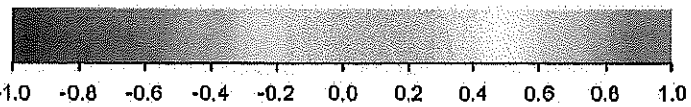
f = 1900 MHz,WGLS R22 (H_convF)



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:3334

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	18.5
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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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: **ES3-3319_Apr14**

CALIBRATION CERTIFICATE

Object ES3DV3 - SN:3319

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

Calibration date: April 17, 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:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 21, 2014

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

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

Probe ES3DV3

SN:3319

Manufactured:	January 10, 2012
Repaired:	April 11, 2014
Calibrated:	April 17, 2014

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3319

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.11	1.08	1.15	± 10.1 %
DCP (mV)[B]	102.6	104.2	103.7	

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	199.6	±3.5 %
		Y	0.0	0.0	1.0		188.8	
		Z	0.0	0.0	1.0		178.5	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	3.31	63.3	12.9	10.00	42.6	±2.2 %
		Y	5.10	68.0	14.1		38.8	
		Z	2.84	61.7	12.1		44.3	
10011-CAB	UMTS-FDD (WCDMA)	X	3.30	66.9	18.4	2.91	136.7	±0.5 %
		Y	3.32	67.1	18.4		127.0	
		Z	3.45	68.0	19.1		145.1	
10012-CAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	3.12	69.3	19.0	1.87	138.7	±0.7 %
		Y	3.22	70.2	19.3		127.0	
		Z	3.40	71.3	19.9		146.4	
10021-DAB	GSM-FDD (TDMA, GMSK)	X	25.66	99.7	28.3	9.39	139.0	±1.4 %
		Y	16.30	92.5	25.7		141.7	
		Z	25.20	99.5	28.1		144.9	
10023-DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	25.81	100.0	28.5	9.57	128.3	±2.2 %
		Y	13.99	89.5	24.6		129.0	
		Z	25.39	99.7	28.3		141.2	
10024-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	37.04	99.8	25.7	6.56	131.4	±2.2 %
		Y	37.62	99.7	25.0		139.6	
		Z	38.36	99.8	25.3		145.5	
10027-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	48.04	99.6	23.8	4.80	144.6	±1.9 %
		Y	29.62	94.2	22.1		129.3	
		Z	43.87	99.7	24.0		129.9	
10028-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	54.95	99.9	22.9	3.55	149.6	±1.7 %
		Y	57.76	99.6	22.2		138.2	
		Z	54.27	99.8	22.7		137.3	
10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	44.58	99.9	21.1	1.16	134.6	±1.7 %
		Y	96.74	98.9	18.8		149.0	
		Z	59.46	99.9	20.4		149.1	
10039-CAB	CDMA2000 (1xRTT, RC1)	X	4.70	66.3	18.7	4.57	130.9	±0.9 %
		Y	4.85	67.1	19.0		147.5	
		Z	4.88	67.3	19.3		147.2	

10081-CAB	CDMA2000 (1xRTT, RC3)	X	3.90	65.8	18.4	3.97	130.0	±0.7 %
		Y	4.00	66.5	18.6		140.8	
		Z	3.99	66.5	18.7		142.5	
10098-CAB	UMTS-FDD (HSUPA, Subtest 2)	X	4.64	66.7	18.6	3.98	143.1	±0.9 %
		Y	4.58	66.5	18.4		132.8	
		Z	4.60	66.7	18.6		131.9	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.32	67.1	19.5	5.67	125.8	±1.4 %
		Y	6.41	67.4	19.5		138.4	
		Z	6.51	67.9	19.9		143.6	
10108-CAB	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.48	67.7	20.0	5.80	148.0	±1.4 %
		Y	6.28	66.9	19.4		135.8	
		Z	6.39	67.4	19.8		141.0	
10110-CAB	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X	6.17	67.2	19.8	5.75	141.0	±1.4 %
		Y	5.94	66.3	19.1		132.2	
		Z	6.08	67.0	19.6		137.9	
10114-CAA	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	X	10.35	69.2	21.5	8.10	133.6	±2.2 %
		Y	9.93	68.1	20.7		124.5	
		Z	10.29	69.2	21.5		131.9	
10117-CAA	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.42	69.4	21.6	8.07	140.6	±2.2 %
		Y	9.93	68.1	20.7		125.5	
		Z	10.28	69.1	21.5		132.6	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	11.18	78.2	27.5	9.28	143.6	±3.3 %
		Y	9.33	73.0	24.5		124.3	
		Z	10.45	76.4	26.6		132.7	
10154-CAB	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	6.16	67.2	19.8	5.75	145.7	±1.4 %
		Y	5.96	66.4	19.1		133.0	
		Z	6.08	66.9	19.6		138.6	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.32	66.6	19.4	5.82	126.2	±1.4 %
		Y	6.40	66.9	19.4		137.3	
		Z	6.51	67.4	19.8		143.8	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	5.12	67.3	20.0	5.73	147.9	±1.2 %
		Y	4.90	66.4	19.4		134.4	
		Z	5.07	67.2	20.0		141.5	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	9.44	80.0	28.6	9.21	128.7	±3.3 %
		Y	8.63	77.8	27.1		143.9	
		Z	10.62	83.7	30.3		148.2	
10175-CAB	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	5.04	66.9	19.8	5.72	140.4	±1.4 %
		Y	4.92	66.6	19.5		133.7	
		Z	5.01	66.9	19.8		134.9	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	5.05	67.0	19.9	5.72	140.6	±1.4 %
		Y	4.90	66.5	19.4		132.4	
		Z	4.97	66.7	19.7		134.1	

10193-CAA	IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	X	9.98	68.8	21.4	8.09	131.1	±2.5 %
		Y	10.00	68.8	21.2		145.5	
		Z	10.14	69.4	21.7		144.7	
10196-CAA	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.99	68.9	21.5	8.10	132.0	±2.7 %
		Y	10.05	69.0	21.3		148.1	
		Z	10.16	69.5	21.8		145.8	
10219-CAA	IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)	X	9.88	68.8	21.4	8.03	131.3	±2.5 %
		Y	9.96	69.0	21.3		147.8	
		Z	10.03	69.3	21.6		144.7	
10222-CAA	IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)	X	10.34	69.3	21.6	8.06	137.1	±2.2 %
		Y	9.93	68.2	20.8		127.8	
		Z	10.07	68.6	21.2		125.1	
10225-CAB	UMTS-FDD (HSPA+)	X	6.97	66.8	19.4	5.97	133.6	±1.4 %
		Y	6.90	66.7	19.2		129.7	
		Z	7.14	67.5	19.8		147.4	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	9.18	79.3	28.2	9.21	128.1	±3.5 %
		Y	8.54	77.6	27.0		144.1	
		Z	9.99	81.9	29.4		141.7	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	9.65	75.1	26.1	9.24	126.1	±3.5 %
		Y	9.34	74.2	25.3		141.3	
		Z	10.46	77.6	27.3		144.1	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	10.46	76.2	26.5	9.30	133.6	±3.5 %
		Y	9.23	72.7	24.4		122.8	
		Z	9.90	74.8	25.7		123.8	
10274-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)	X	6.04	67.1	19.0	4.87	149.9	±1.2 %
		Y	6.02	67.1	18.9		142.8	
		Z	6.00	67.1	19.0		141.0	
10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.22	65.6	18.1	3.96	131.0	±0.9 %
		Y	4.49	66.9	18.6		144.3	
		Z	4.55	67.3	19.1		147.0	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.74	67.2	18.9	3.46	145.6	±0.5 %
		Y	3.66	66.8	18.5		136.7	
		Z	3.71	67.2	18.9		136.5	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.65	67.0	18.7	3.39	147.2	±0.7 %
		Y	3.61	66.8	18.4		139.6	
		Z	3.64	67.1	18.8		139.6	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.37	67.3	19.8	5.81	140.5	±1.4 %
		Y	6.24	66.8	19.3		134.0	
		Z	6.33	67.2	19.8		134.8	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	7.00	68.0	20.2	6.06	146.8	±1.7 %
		Y	6.82	67.4	19.7		140.3	
		Z	6.90	67.8	20.1		141.4	

10315-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)	X	2.85	68.5	18.8	1.71	129.5	±0.5 %
		Y	3.09	70.0	19.2		146.1	
		Z	3.15	70.6	19.8		146.8	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.73	67.9	18.7	3.76	137.5	±0.5 %
		Y	4.77	68.3	18.7		126.5	
		Z	4.77	68.1	18.8		128.1	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.55	67.6	18.6	3.77	132.0	±0.7 %
		Y	4.89	69.1	19.1		148.8	
		Z	4.90	69.1	19.3		148.0	

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:3319

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	41.9	0.89	6.48	6.48	6.48	0.28	2.09	± 12.0 %
835	41.5	0.90	6.27	6.27	6.27	0.34	1.72	± 12.0 %
1750	40.1	1.37	5.24	5.24	5.24	0.80	1.14	± 12.0 %
1900	40.0	1.40	5.05	5.05	5.05	0.72	1.24	± 12.0 %
2450	39.2	1.80	4.45	4.45	4.45	0.77	1.23	± 12.0 %
2600	39.0	1.96	4.29	4.29	4.29	0.80	1.27	± 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.

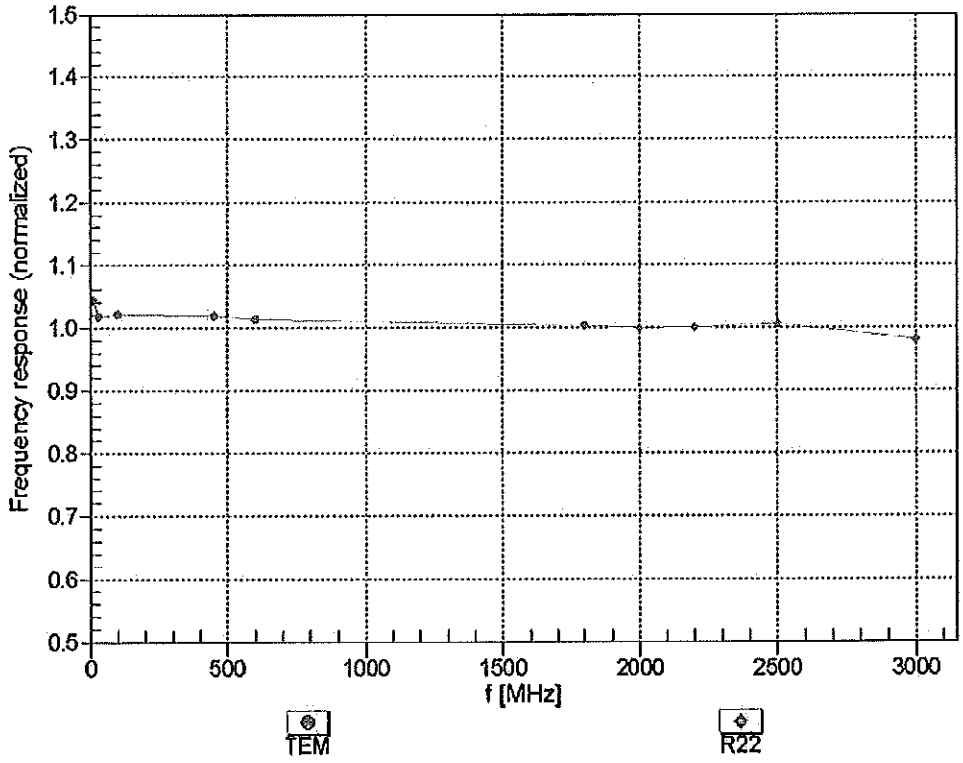
DASY/EASY - Parameters of Probe: ES3DV3 - SN:3319

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	55.5	0.96	6.25	6.25	6.25	0.39	1.65	± 12.0 %
835	55.2	0.97	6.18	6.18	6.18	0.56	1.37	± 12.0 %
1750	53.4	1.49	4.85	4.85	4.85	0.57	1.46	± 12.0 %
1900	53.3	1.52	4.67	4.67	4.67	0.53	1.58	± 12.0 %
2450	52.7	1.95	4.24	4.24	4.24	0.74	1.10	± 12.0 %
2600	52.5	2.16	4.05	4.05	4.05	0.80	1.02	± 12.0 %

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

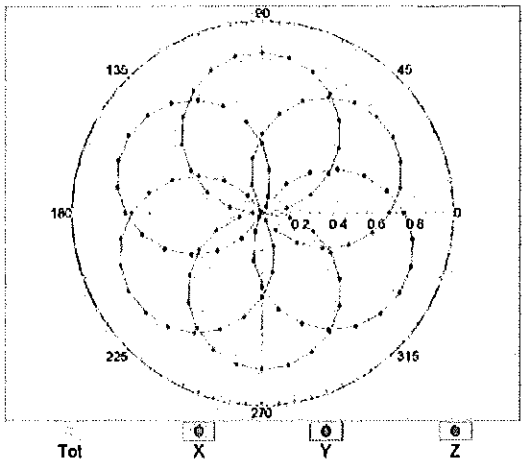
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



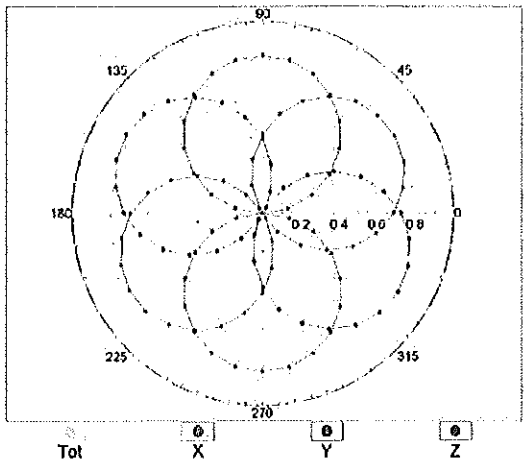
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

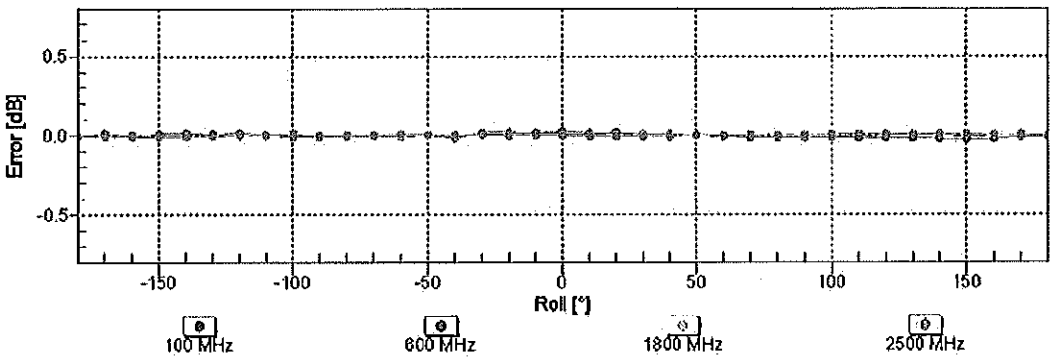
Receiving Pattern (ϕ), $\vartheta = 0°$

f=600 MHz,TEM



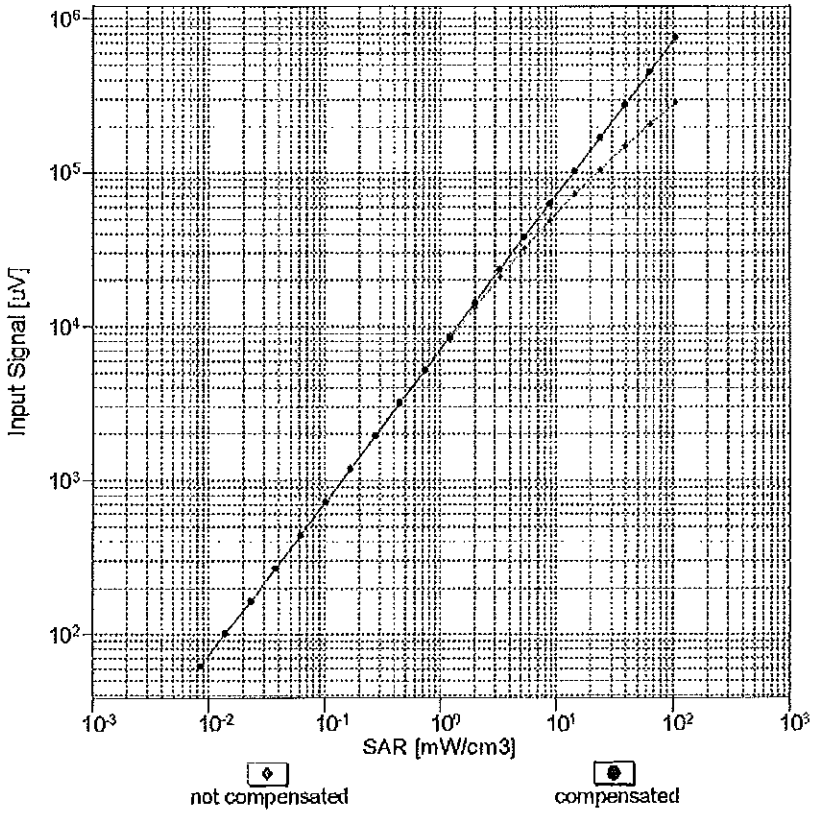
f=1800 MHz,R22

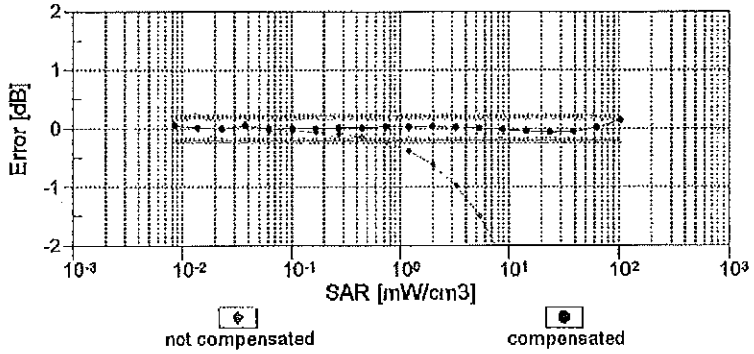




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

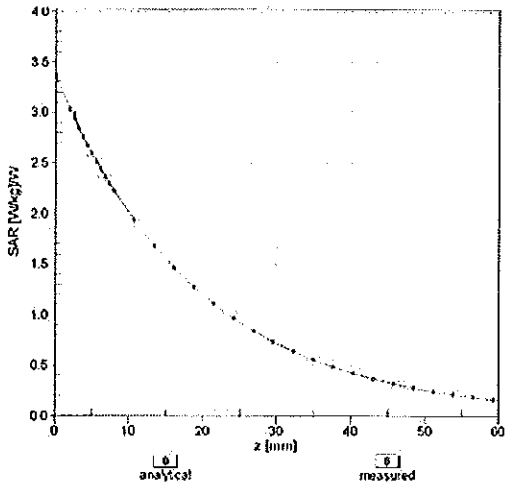




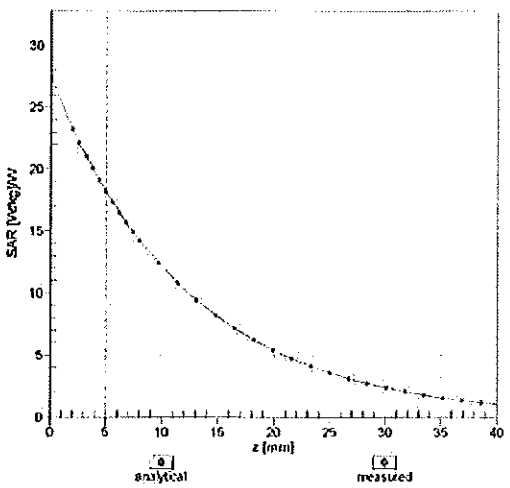
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

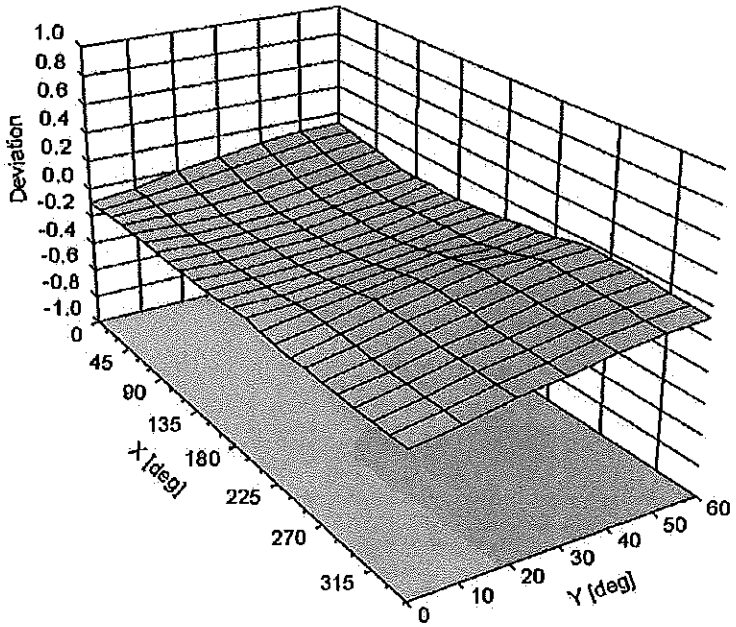


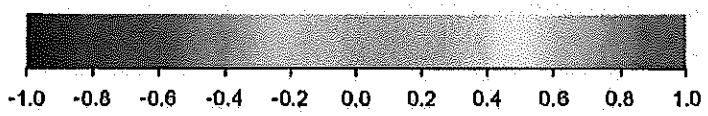
f = 1900 MHz,WGLS R22 (H_convF)



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:3319

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-119.8
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

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

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

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

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **ES3-3022_Aug14/2**

CALIBRATION CERTIFICATE (Replacement of No: ES3-3022_Aug14)

Object	ES3DV2 - SN:3022
Calibration procedure(s)	QA CAL-01.v9, QA CAL-12.v9, QA CAL-23.v5, QA CAL-25.v6 Calibration procedure for dosimetric E-field probes
Calibration date:	August 19, 2014

CC

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:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: November 3, 2014

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**

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 ES3DV2

SN:3022

Manufactured: April 15, 2003
Calibrated: August 19, 2014

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

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.00	1.04	0.96	± 10.1 %
DCP (mV)[B]	103.0	96.3	101.6	

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	181.8	±2.7 %
		Y	0.0	0.0	1.0		183.0	
		Z	0.0	0.0	1.0		192.3	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	2.51	63.1	12.7	10.00	42.6	±1.9 %
		Y	2.62	63.1	12.9		42.7	
		Z	3.12	65.7	13.6		40.4	
10011-CAB	UMTS-FDD (WCDMA)	X	3.33	67.8	19.2	2.91	145.9	±0.9 %
		Y	3.13	64.9	16.9		147.4	
		Z	3.20	66.4	18.2		139.6	
10012-CAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	3.05	70.1	19.8	1.87	147.2	±0.9 %
		Y	2.62	65.1	16.2		147.4	
		Z	2.85	68.2	18.4		141.7	
10013-CAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	11.10	70.9	23.6	9.46	143.9	±3.0 %
		Y	11.04	70.2	22.9		144.2	
		Z	10.77	70.2	23.1		134.7	
10021-DAB	GSM-FDD (TDMA, GMSK)	X	19.66	99.7	28.6	9.39	126.0	±1.9 %
		Y	11.04	89.6	25.5		138.9	
		Z	10.45	88.8	24.9		137.5	
10023-DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	20.19	99.6	28.5	9.57	142.0	±2.5 %
		Y	10.53	88.4	25.0		145.5	
		Z	15.52	96.5	27.8		147.6	
10024-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	31.93	99.6	25.2	6.56	149.5	±1.9 %
		Y	12.70	87.9	22.2		148.0	
		Z	27.00	99.8	25.7		135.3	
10027-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	38.32	99.8	23.8	4.80	148.1	±2.2 %
		Y	9.80	83.2	19.3		138.8	
		Z	31.96	99.9	24.2		128.9	
10028-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	40.03	99.5	22.8	3.55	130.5	±2.2 %
		Y	40.27	99.6	23.0		148.1	
		Z	43.09	99.7	22.5		140.1	
10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	38.93	99.4	20.4	1.16	146.7	±1.9 %
		Y	32.83	92.5	17.9		139.2	
		Z	31.94	99.5	20.8		133.1	
10039-CAB	CDMA2000 (1xRTT, RC1)	X	4.66	66.8	19.3	4.57	144.5	±1.2 %
		Y	4.56	65.3	17.9		137.2	
		Z	4.52	66.1	18.7		131.7	

10081-CAB	CDMA2000 (1xRTT, RC3)	X	3.82	66.0	18.7	3.97	140.3	±0.9 %
		Y	3.77	64.5	17.3		133.6	
		Z	3.79	65.7	18.4		128.2	
10098-CAB	UMTS-FDD (HSUPA, Subtest 2)	X	4.40	66.2	18.5	3.98	130.9	±1.2 %
		Y	4.39	65.0	17.4		131.1	
		Z	4.47	66.3	18.4		140.0	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.30	67.3	19.8	5.67	137.4	±1.7 %
		Y	6.25	66.3	18.9		135.9	
		Z	6.36	67.4	19.7		147.5	
10108-CAB	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.14	66.8	19.6	5.80	134.6	±1.7 %
		Y	6.17	66.1	18.9		133.9	
		Z	6.24	67.0	19.7		144.5	
10110-CAB	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X	5.82	66.3	19.4	5.75	131.2	±1.7 %
		Y	5.82	65.4	18.6		130.3	
		Z	5.91	66.5	19.4		140.4	
10114-CAA	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	X	10.00	68.5	21.2	8.10	124.3	±2.5 %
		Y	9.89	67.9	20.6		124.0	
		Z	10.05	68.6	21.2		133.2	
10117-CAA	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.01	68.6	21.2	8.07	125.8	±2.5 %
		Y	9.91	67.9	20.7		125.8	
		Z	10.09	68.8	21.3		134.7	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	9.69	75.5	26.4	9.28	144.7	±3.3 %
		Y	9.09	72.7	24.6		143.2	
		Z	8.54	72.0	24.5		124.8	
10154-CAB	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	5.82	66.2	19.4	5.75	131.3	±1.9 %
		Y	6.06	66.3	19.1		149.2	
		Z	5.91	66.5	19.4		140.7	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.27	66.9	19.7	5.82	136.5	±1.4 %
		Y	6.19	65.8	18.7		128.4	
		Z	6.33	67.0	19.6		145.4	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	4.81	66.4	19.7	5.73	134.8	±1.7 %
		Y	4.92	66.1	19.1		149.9	
		Z	4.78	66.4	19.6		141.2	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	7.83	76.6	27.2	9.21	131.4	±3.5 %
		Y	7.54	74.5	25.8		147.8	
		Z	7.71	76.7	27.4		145.3	
10175-CAB	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	4.90	66.9	20.0	5.72	147.6	±1.4 %
		Y	4.90	66.0	19.1		148.0	
		Z	4.78	66.4	19.6		141.6	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	4.90	66.9	20.0	5.72	148.1	±1.4 %
		Y	4.89	65.9	19.0		146.9	
		Z	4.80	66.5	19.7		142.1	
10193-CAA	IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	X	9.80	68.7	21.4	8.09	135.1	±2.7 %
		Y	9.78	68.2	20.9		135.5	
		Z	9.70	68.5	21.2		130.2	

10196-CAA	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.79	68.7	21.4	8.10	136.4	±2.7 %
		Y	9.81	68.3	20.9		138.0	
		Z	9.72	68.6	21.3		132.8	
10219-CAA	IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)	X	9.68	68.6	21.3	8.03	136.0	±2.7 %
		Y	9.74	68.3	21.0		137.4	
		Z	9.62	68.5	21.2		132.6	
10222-CAA	IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)	X	10.20	69.1	21.5	8.06	143.4	±2.6 %
		Y	9.91	68.0	20.7		125.8	
		Z	10.27	69.4	21.6		148.4	
10225-CAB	UMTS-FDD (HSPA+)	X	6.87	66.9	19.6	5.97	139.5	±1.9 %
		Y	7.04	66.9	19.3		149.3	
		Z	6.89	67.0	19.5		143.5	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	7.66	75.9	26.9	9.21	126.1	±3.0 %
		Y	7.17	73.1	25.1		132.1	
		Z	7.18	74.6	26.3		128.0	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	8.58	73.1	25.3	9.24	127.6	±3.3 %
		Y	8.22	71.0	23.7		126.9	
		Z	8.83	74.3	26.0		149.8	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	9.69	75.5	26.5	9.30	143.8	±3.3 %
		Y	8.88	72.0	24.2		135.2	
		Z	8.83	72.9	25.1		131.3	
10274-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)	X	5.87	67.0	19.2	4.87	141.2	±1.4 %
		Y	5.77	65.8	18.1		136.0	
		Z	5.71	66.3	18.6		132.7	
10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.44	67.2	19.2	3.96	147.3	±0.9 %
		Y	4.29	65.3	17.6		139.2	
		Z	4.31	66.3	18.5		139.6	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.60	67.1	19.1	3.46	137.8	±0.7 %
		Y	3.44	64.8	17.2		129.6	
		Z	3.48	66.2	18.4		130.5	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.50	66.9	18.9	3.39	139.5	±0.7 %
		Y	3.38	64.8	17.2		132.0	
		Z	3.48	66.5	18.5		133.1	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.12	66.7	19.6	5.81	133.3	±1.9 %
		Y	6.35	66.7	19.3		149.3	
		Z	6.17	66.8	19.5		132.7	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.72	67.4	20.0	6.06	138.7	±1.7 %
		Y	6.63	66.3	19.1		131.4	
		Z	6.72	67.3	19.9		138.7	
10315-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)	X	2.90	69.9	19.8	1.71	146.4	±0.5 %
		Y	2.54	65.2	16.5		139.3	
		Z	2.75	68.1	18.5		146.4	
10316-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 96pc duty cycle)	X	10.12	69.3	21.9	8.36	142.9	±3.0 %
		Y	10.01	68.5	21.3		135.2	
		Z	10.11	69.3	21.9		141.7	

10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.59	68.2	19.0	3.76	126.7	±0.7 %
		Y	4.59	67.2	18.0		142.4	
		Z	4.64	68.5	19.0		143.0	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.64	68.8	19.3	3.77	147.1	±0.9 %
		Y	4.47	67.1	17.9		139.6	
		Z	4.54	68.4	18.9		147.2	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	2.66	69.0	19.4	1.54	145.8	±0.5 %
		Y	2.40	64.8	16.2		140.0	
		Z	2.62	67.8	18.4		147.2	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	9.97	69.1	21.7	8.23	142.0	±3.0 %
		Y	10.08	68.9	21.4		145.8	
		Z	10.01	69.2	21.8		143.3	

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 8 and 9).
[D] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	41.9	0.89	6.39	6.39	6.39	0.20	2.24	± 12.0 %
835	41.5	0.90	6.18	6.18	6.18	0.23	1.98	± 12.0 %
1750	40.1	1.37	5.04	5.04	5.04	0.51	1.35	± 12.0 %
1900	40.0	1.40	4.85	4.85	4.85	0.38	1.66	± 12.0 %
2450	39.2	1.80	4.31	4.31	4.31	0.66	1.28	± 12.0 %
2600	39.0	1.96	4.13	4.13	4.13	0.76	1.28	± 12.0 %

[C] Frequency validity above 300 MHz 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. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[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: ES3DV2 - SN:3022

Calibration Parameter Determined in Body Tissue Simulating Media

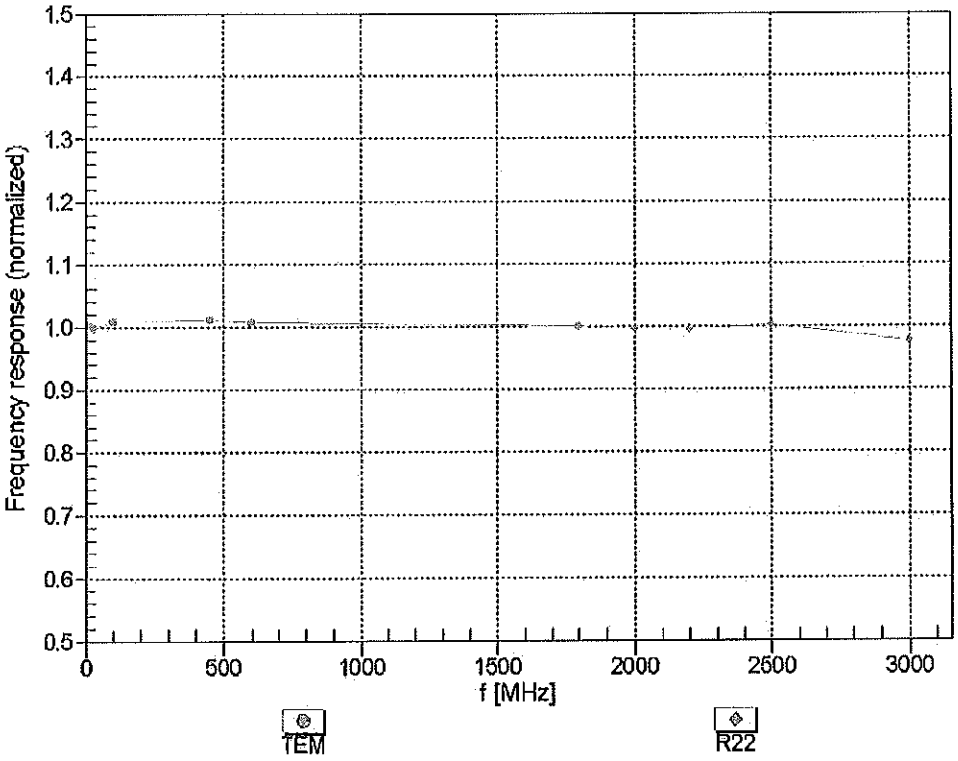
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
450	56.7	0.94	6.78	6.78	6.78	0.12	1.30	± 13.3 %
600	56.1	0.95	6.72	6.72	6.72	0.05	1.20	± 13.3 %
750	55.5	0.96	6.02	6.02	6.02	0.23	2.05	± 12.0 %
835	55.2	0.97	5.98	5.98	5.98	0.29	1.85	± 12.0 %
1750	53.4	1.49	4.70	4.70	4.70	0.66	1.25	± 12.0 %
1900	53.3	1.52	4.49	4.49	4.49	0.33	2.02	± 12.0 %
2450	52.7	1.95	4.05	4.05	4.05	0.80	1.01	± 12.0 %
2600	52.5	2.16	3.94	3.94	3.94	0.68	1.03	± 12.0 %

[C] Frequency validity above 300 MHz 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. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[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.

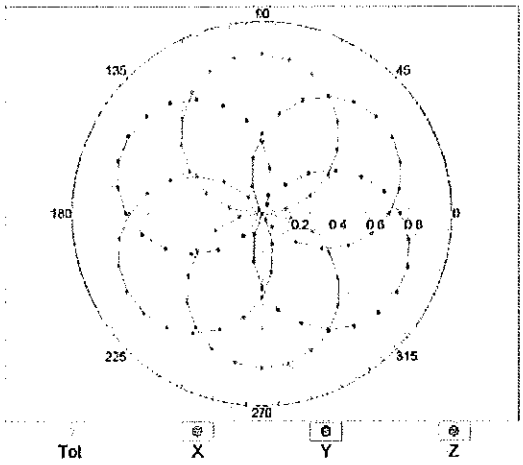
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



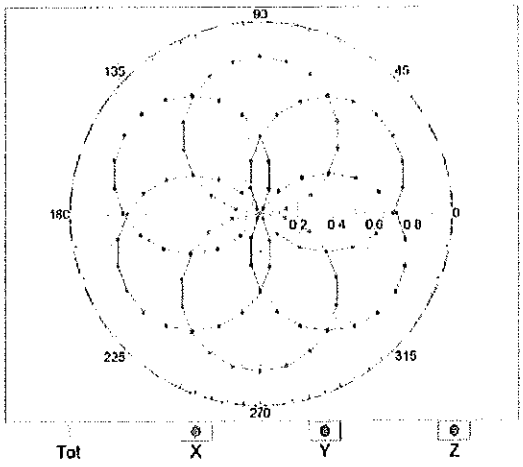
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

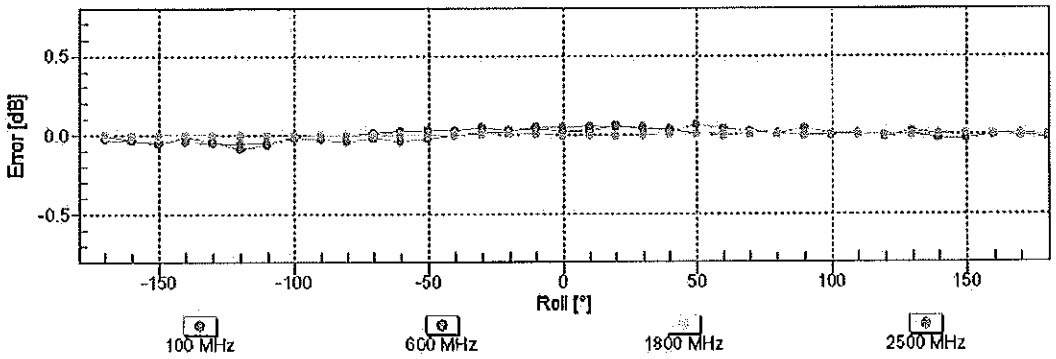
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



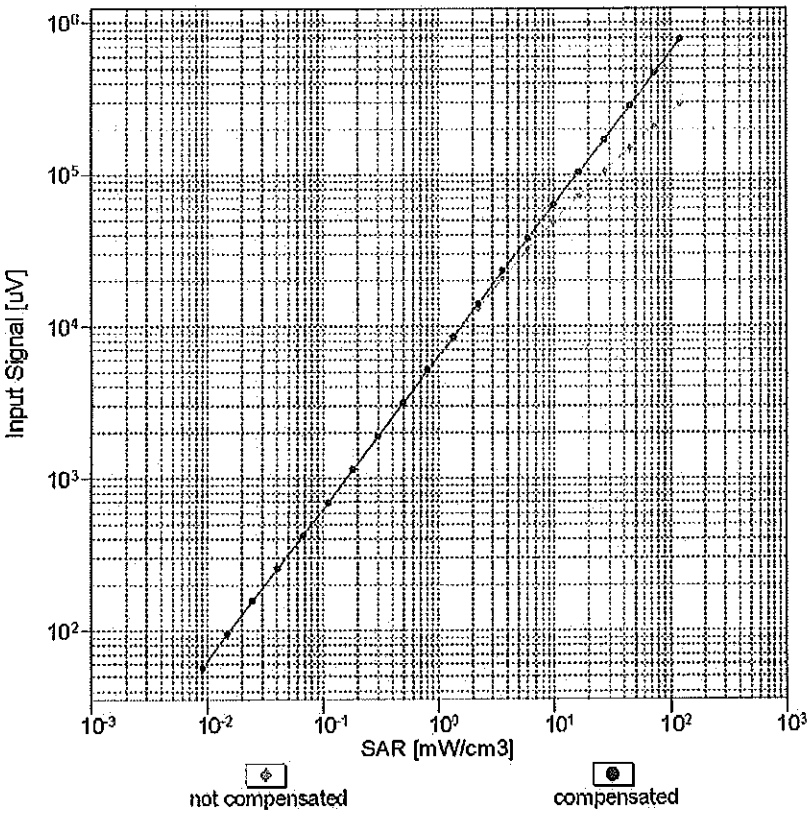
f=1800 MHz,R22

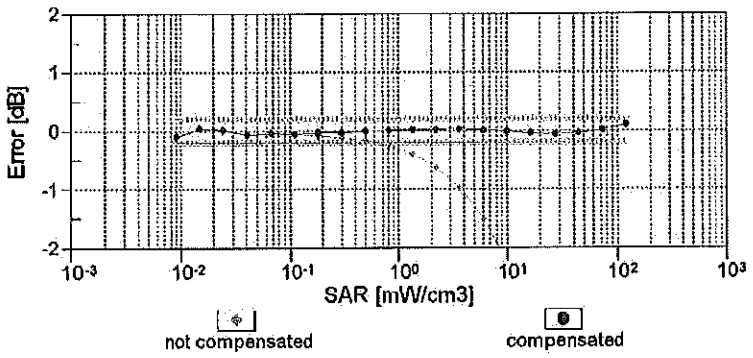




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

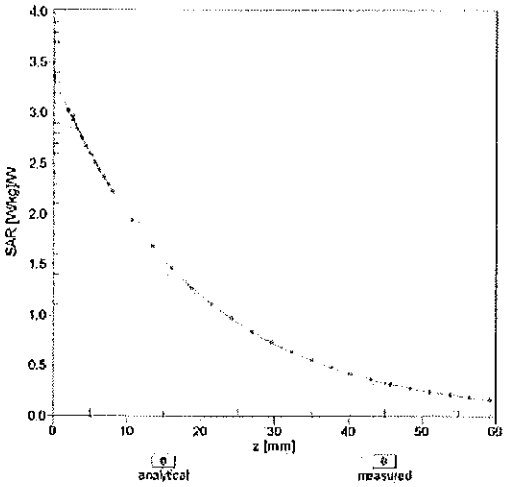




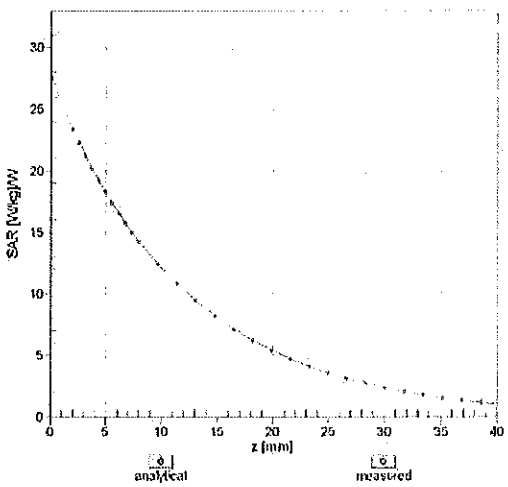
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

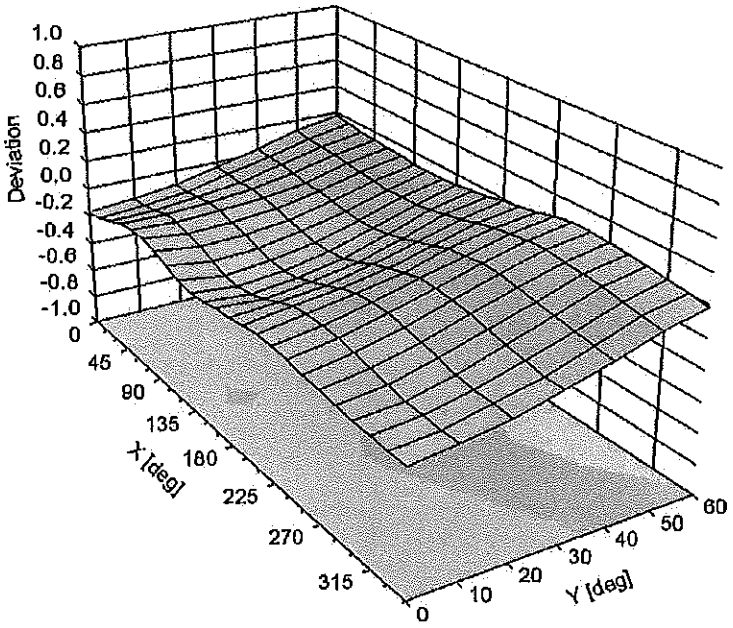


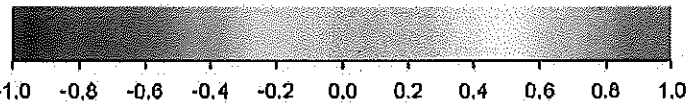
f = 1900 MHz,WGLS R22 (H_convF)



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: ES3DV2 - SN:3022

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-80.3
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
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 0108

Client **PC Test**

Certificate No: D750V3-1003_Jan15

CALIBRATION CERTIFICATE

Object	D750V3 - SN: 1003
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	January 16, 2015

CC 2/3/15

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-14 (No. ES3-3205_Dec14)	Dec-15
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: January 19, 2015

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

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S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
Accreditation No.: SCS 0108
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "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
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.7 ± 6 %	0.91 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.06 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.09 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.32 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	56.0 ± 6 %	0.99 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.16 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**8.46 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.42 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**5.58 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.7 Ω - 1.4 jΩ
Return Loss	- 28.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.3 Ω - 3.8 jΩ
Return Loss	- 27.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.043 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	January 21, 2009

DASY5 Validation Report for Head TSL

Date: 16.01.2015

Test Laboratory: SPEAG, Zurich, Switzerland

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

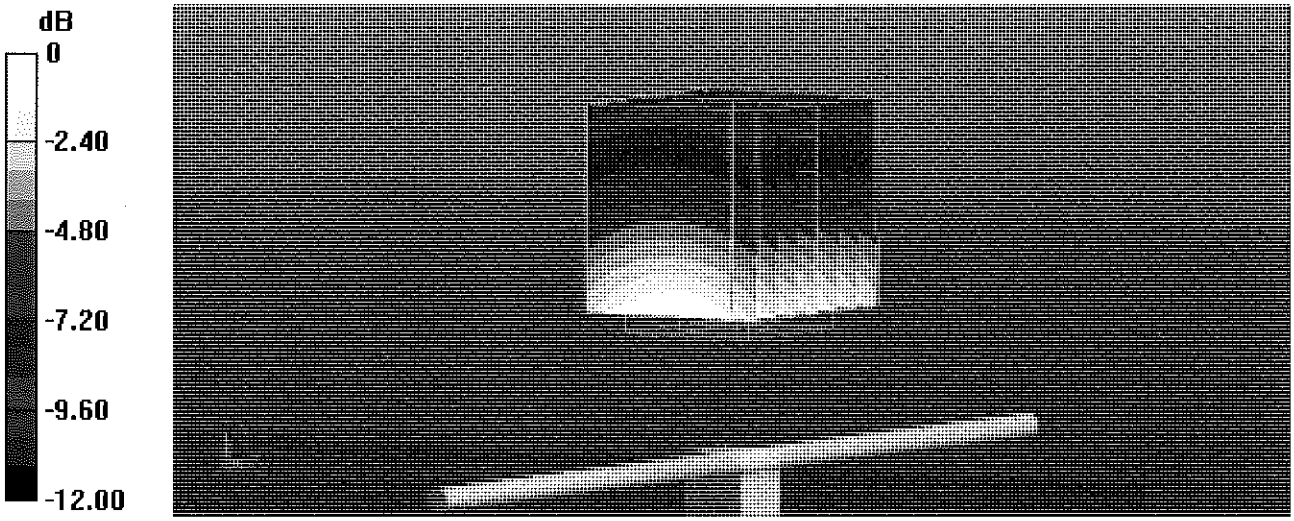
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.91 S/m; ε_r = 41.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.44, 6.44, 6.44); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

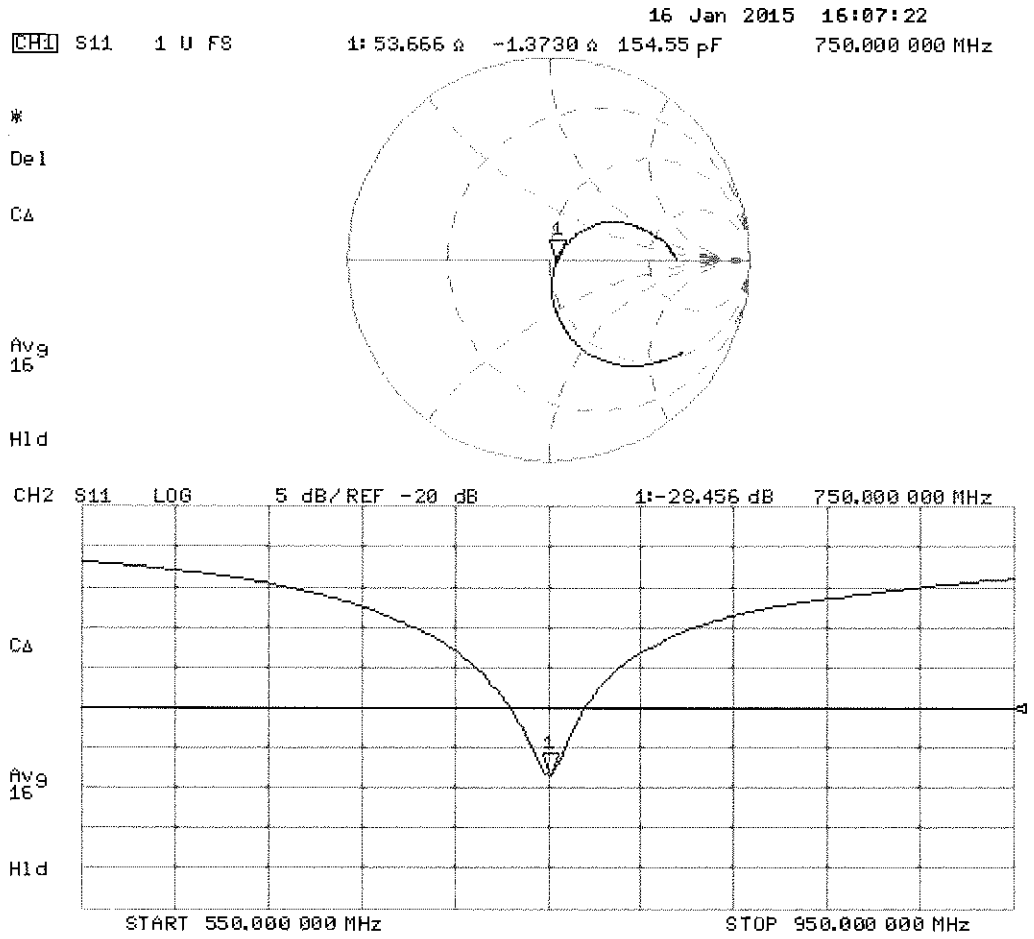
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.08 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.05 W/kg
SAR(1 g) = 2.06 W/kg; SAR(10 g) = 1.35 W/kg
Maximum value of SAR (measured) = 2.41 W/kg



0 dB = 2.41 W/kg = 3.82 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 16.01.2015

Test Laboratory: SPEAG, Zurich, Switzerland

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

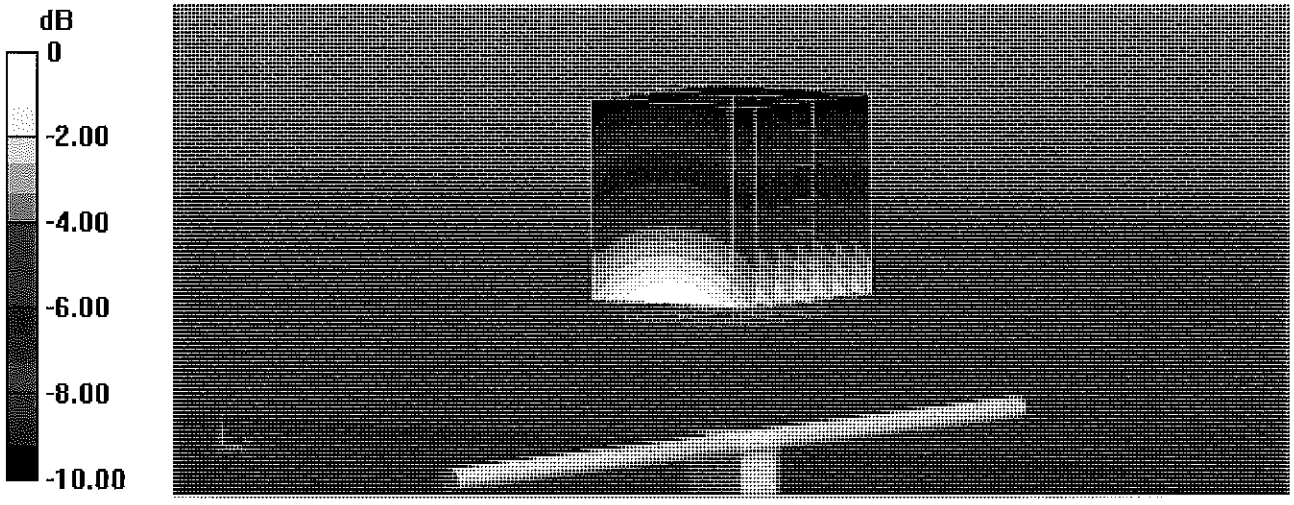
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.99 S/m; ε_r = 56; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.21, 6.21, 6.21); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

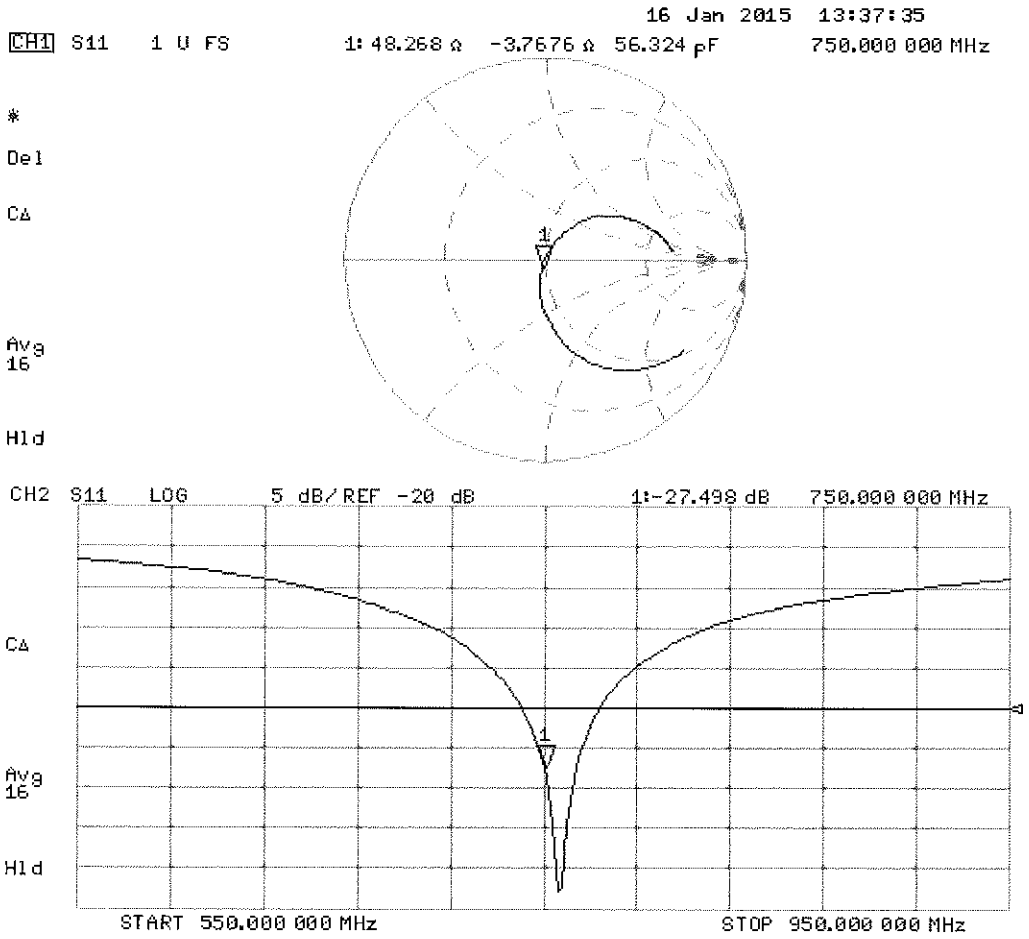
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.21 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 3.16 W/kg
SAR(1 g) = 2.16 W/kg; SAR(10 g) = 1.42 W/kg
Maximum value of SAR (measured) = 2.52 W/kg



0 dB = 2.52 W/kg = 4.01 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D835V2-4d132_Jan15

CALIBRATION CERTIFICATE

Object D835V2 - SN: 4d132

Calibration procedure(s) QA CAL-05.v9
Calibration procedure for dipole validation kits above 700 MHz

CC 2/3/15

Calibration date: January 16, 2015

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-14 (No. ES3-3205_Dec14)	Dec-15
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: January 19, 2015

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Accredited by the Swiss Accreditation Service (SAS) **Accreditation No.: SCS 0108**
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "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
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.5 ± 6 %	0.93 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.25 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.54 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.04 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.8 ± 6 %	1.01 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.35 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.14 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.53 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**5.98 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.8 Ω - 2.3 jΩ
Return Loss	- 30.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.5 Ω - 4.3 jΩ
Return Loss	- 25.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.385 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	July 22, 2011

DASY5 Validation Report for Head TSL

Date: 16.01.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d132

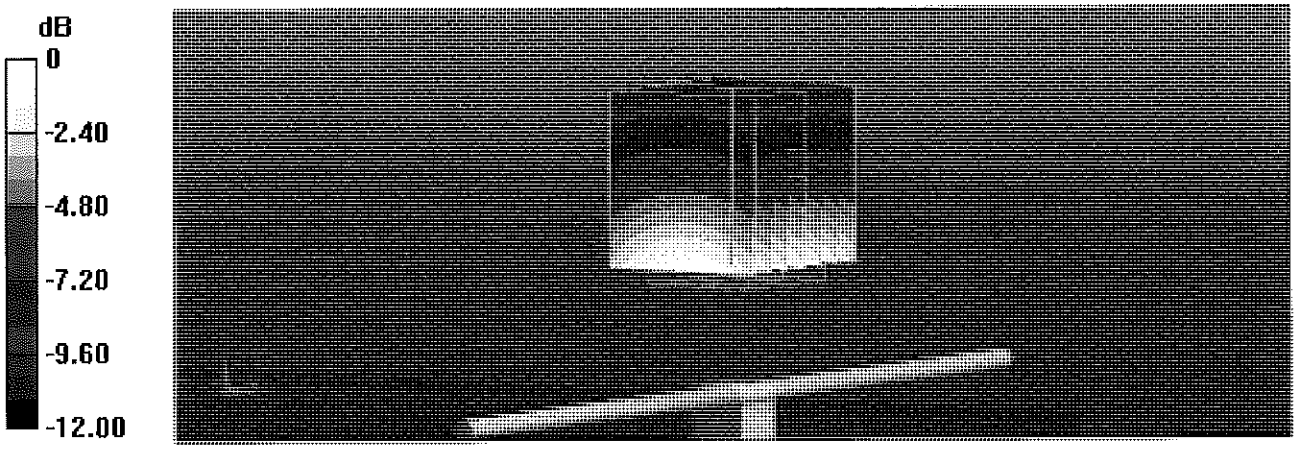
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.93 S/m; ε_r = 41.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.2, 6.2, 6.2); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

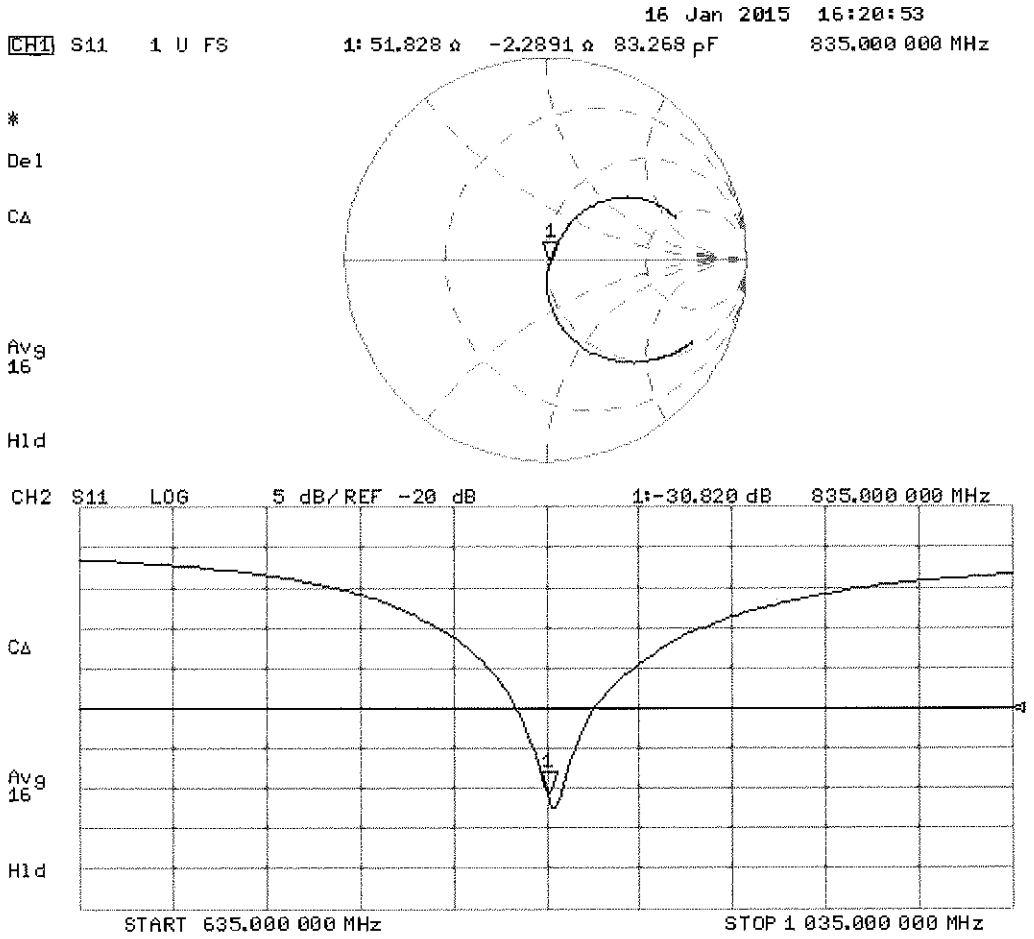
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.27 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 3.51 W/kg
SAR(1 g) = 2.37 W/kg; SAR(10 g) = 1.54 W/kg
Maximum value of SAR (measured) = 2.77 W/kg



0 dB = 2.77 W/kg = 4.42 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 16.01.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d132

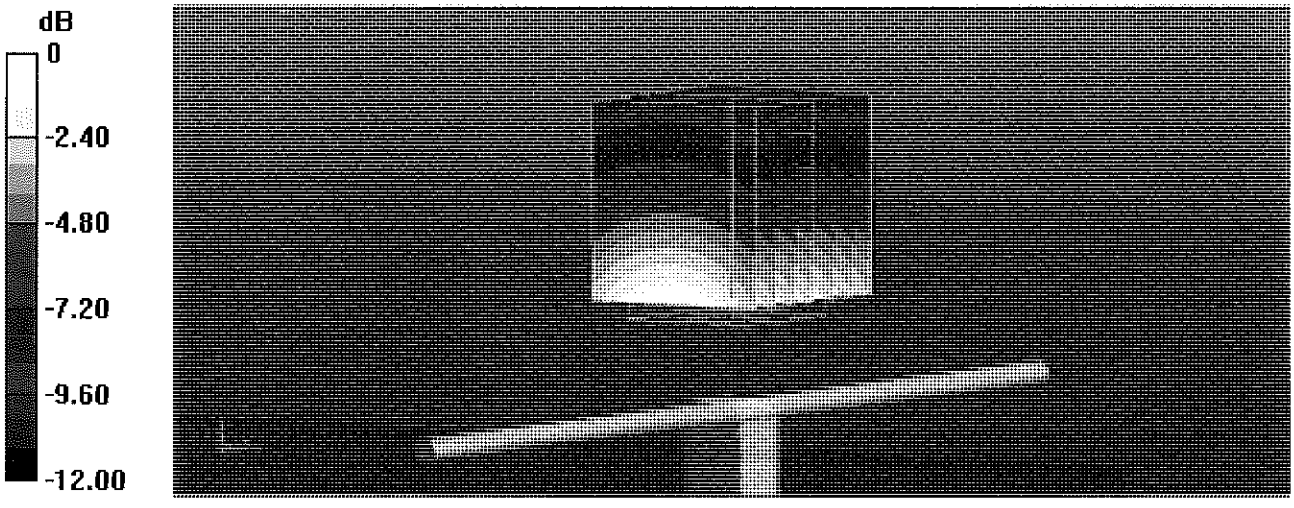
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 1.01 S/m; ε_r = 55.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.17, 6.17, 6.17); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

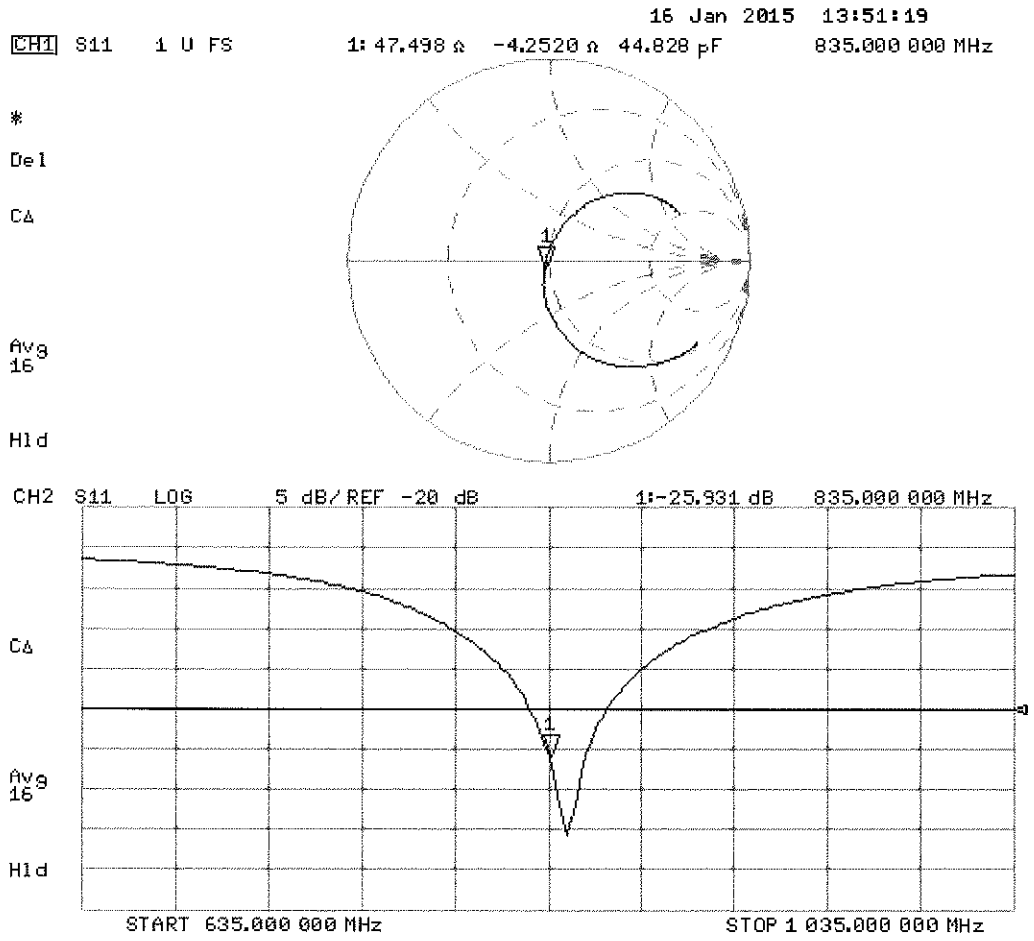
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.27 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 3.47 W/kg
SAR(1 g) = 2.35 W/kg; SAR(10 g) = 1.53 W/kg
Maximum value of SAR (measured) = 2.75 W/kg



0 dB = 2.75 W/kg = 4.39 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 108

Client **PC Test**

Certificate No: D1765V2-1008_May14

CALIBRATION CERTIFICATE

Object D1765V2 - SN: 1008

Calibration procedure(s) QA CAL-05.v9
Calibration procedure for dipole validation kits above 700 MHz

CCV
6R/H

Calibration date: May 07, 2014

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	30-Apr-14 (No. DAE4-601_Apr14)	Apr-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

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

Issued: May 12, 2014

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "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
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.0 ± 6 %	1.36 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.23 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**36.9 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.87 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**19.5 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.2 ± 6 %	1.48 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.41 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**37.6 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.02 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.1 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	47.7 Ω - 6.1 jΩ
Return Loss	- 23.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	43.7 Ω - 6.4 jΩ
Return Loss	- 20.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.211 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	October 06, 2005

DASY5 Validation Report for Head TSL

Date: 07.05.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1765 MHz; Type: D1765V2; Serial: D1765V2 - SN: 1008

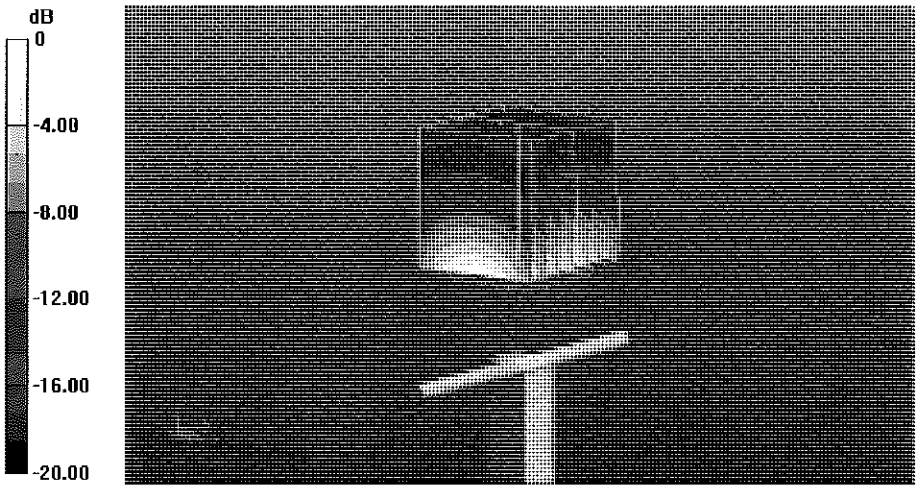
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.36 S/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.23, 5.23, 5.23); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

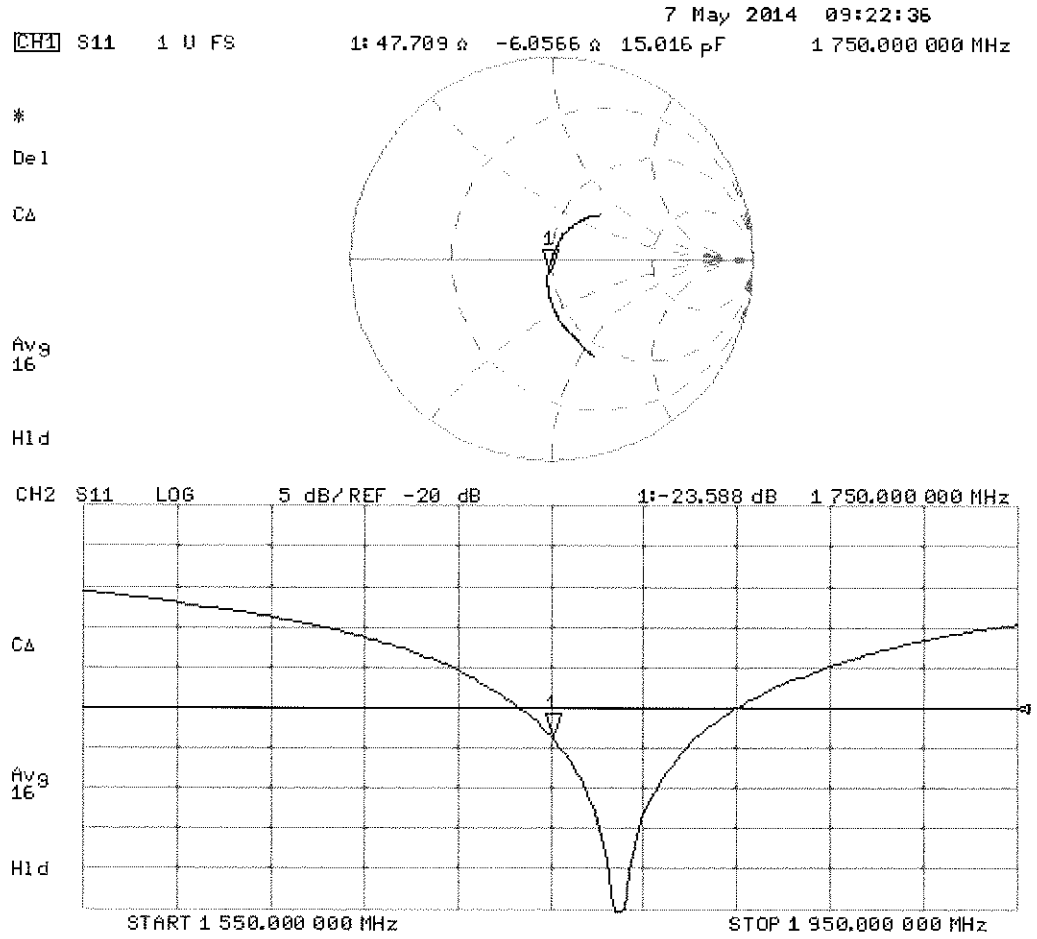
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.06 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 16.7 W/kg
SAR(1 g) = 9.23 W/kg; SAR(10 g) = 4.87 W/kg
Maximum value of SAR (measured) = 11.7 W/kg



0 dB = 11.7 W/kg = 10.68 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 07.05.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1765 MHz; Type: D1765V2; Serial: D1765V2 - SN: 1008

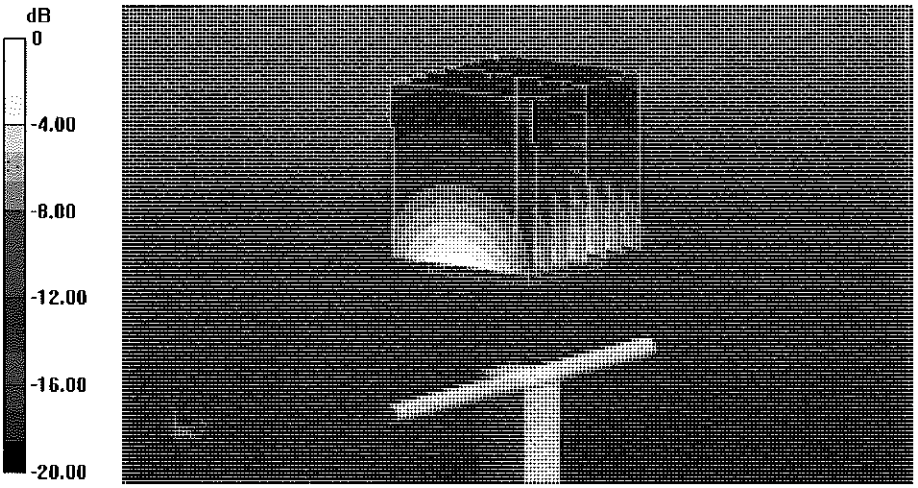
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.48 S/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.89, 4.89, 4.89); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

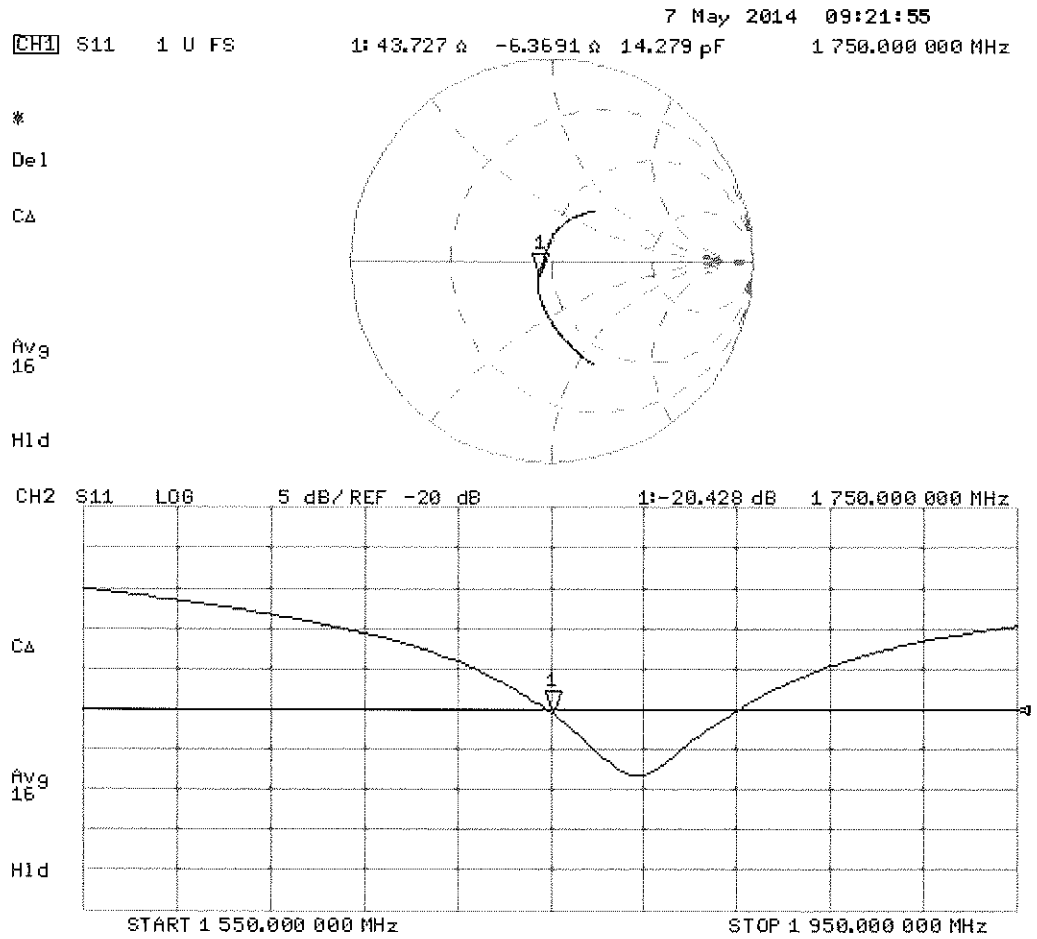
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 93.01 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 16.3 W/kg
SAR(1 g) = 9.41 W/kg; SAR(10 g) = 5.02 W/kg
Maximum value of SAR (measured) = 11.8 W/kg



0 dB = 11.8 W/kg = 10.72 dBW/kg

Impedance Measurement Plot for Body TSL



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

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

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

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D1900V2-5d149_Jul14**

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d149
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	July 23, 2014

CC 11/5/14

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 EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	30-Apr-14 (No. DAE4-601_Apr14)	Apr-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

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

Issued: July 23, 2014

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "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
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.5 ± 6 %	1.38 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.0 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**40.2 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.24 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**21.0 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.5 ± 6 %	1.51 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.1 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**40.4 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.33 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.3 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.6 Ω + 5.5 jΩ
Return Loss	- 24.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.8 Ω + 6.1 jΩ
Return Loss	- 24.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.197 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 11, 2011

DASY5 Validation Report for Head TSL

Date: 23.07.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

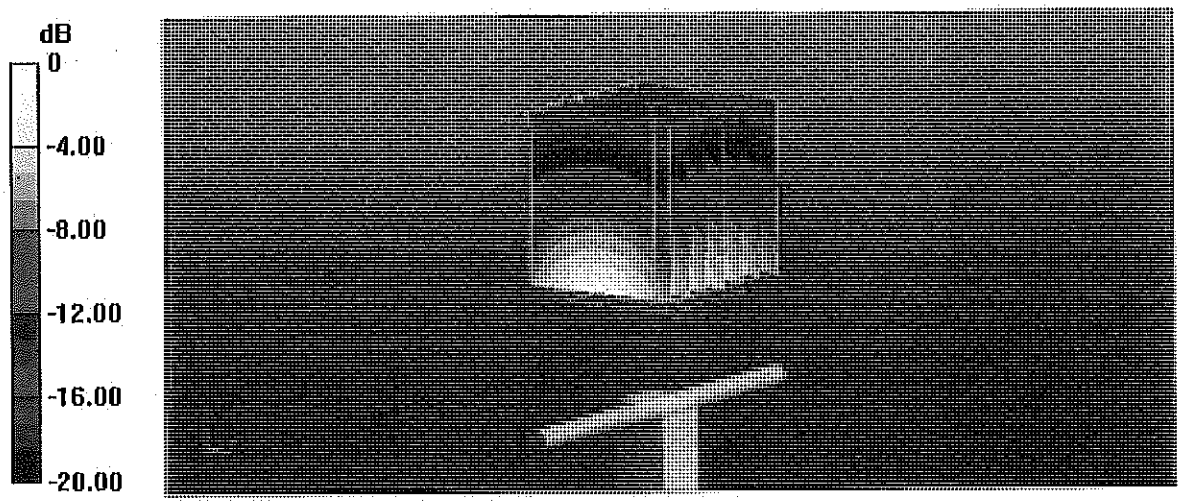
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.38 S/m; ε_r = 39.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.06, 5.06, 5.06); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

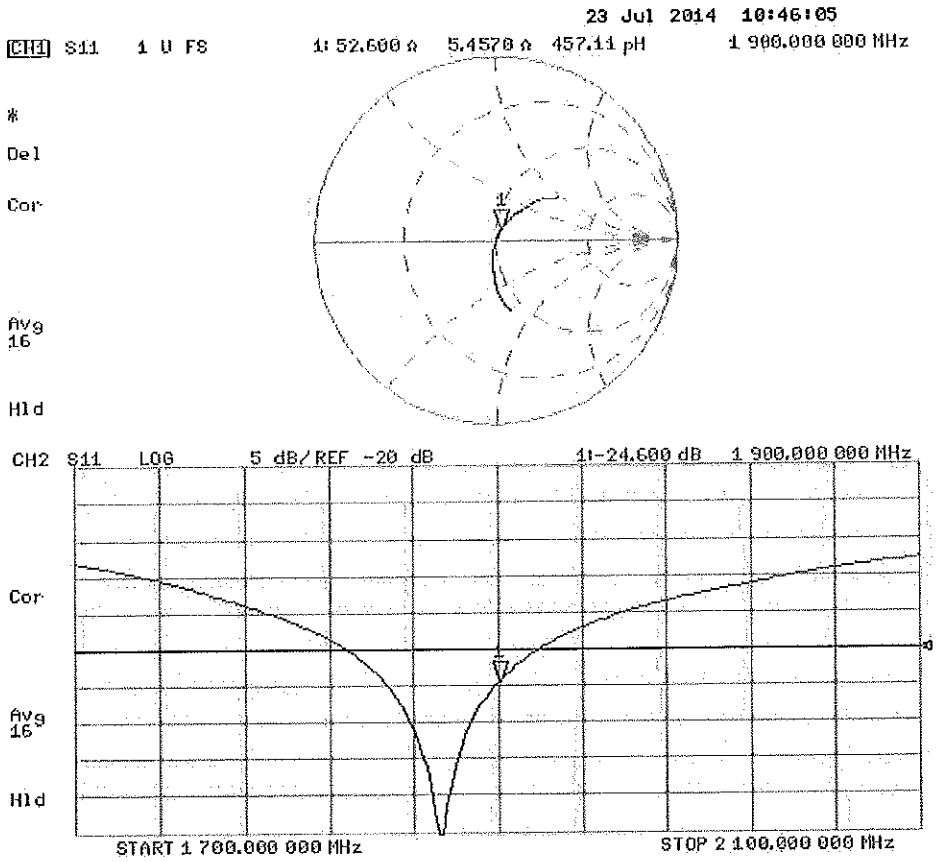
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 98.92 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 18.4 W/kg
SAR(1 g) = 10 W/kg; SAR(10 g) = 5.24 W/kg
Maximum value of SAR (measured) = 12.8 W/kg



0 dB = 12.8 W/kg = 11.07 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 23.07.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

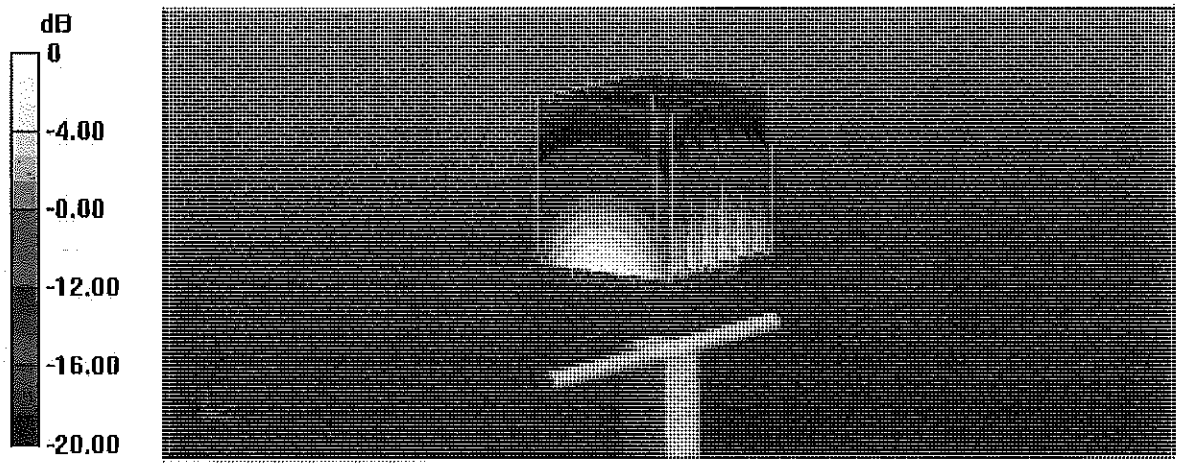
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.51 S/m; ε_r = 52.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.76, 4.76, 4.76); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

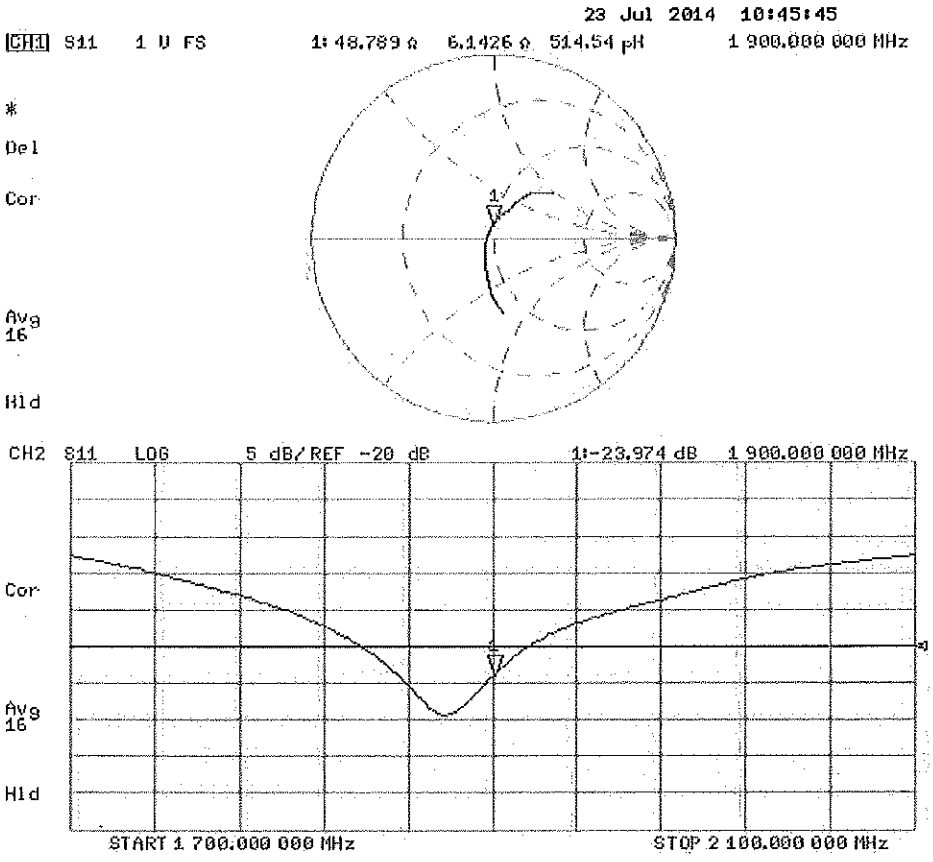
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.83 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 17.6 W/kg
SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.33 W/kg
Maximum value of SAR (measured) = 12.8 W/kg



0 dB = 12.8 W/kg = 11.07 dBW/kg

Impedance Measurement Plot for Body TSL



APPENDIX D: SAR TISSUE SPECIFICATIONS

Measurement Procedure for Tissue verification:

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

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

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

Table D-I
Composition of the Tissue Equivalent Matter

Frequency (MHz)	750	835	1750	1900
Tissue	Body	Body	Body	Body
Ingredients (% by weight)				
Bactericide	See page 2	0.1		
DGBE			31	29.44
HEC		1		
NaCl		0.94	0.2	0.39
Sucrose		44.9		
Water		53.06	68.8	70.17

2 Composition / Information on ingredients

The Item is composed of the following ingredients:

H_2O	Water, 35 – 58%
Sucrose	Sugar, white, refined, 40 – 60%
NaCl	Sodium Chloride, 0 – 6%
Hydroxyethyl-cellulose	Medium Viscosity (CAS# 9004-62-0), <0.3%
Preventol-D7	Preservative: aqueous preparation, (CAS# 55965-84-9), containing 5-chloro-2-methyl-3(2H)-isothiazolone and 2-methyyl-3(2H)-isothiazolone, 0.1 – 0.7% Relevant for safety; Refer to the respective Safety Data Sheet*.

Figure D-1
Composition of 750 MHz Head and Body Tissue Equivalent Matter

Note: 750MHz liquid recipes are proprietary SPEAG. Since the composition is approximate to the actual liquids utilized, the manufacturer tissue-equivalent liquid data sheets are provided below.

Measurement Certificate / Material Test

Item Name	**Body Tissue Simulating Liquid (MSL750V2)**
Product No.	SL AAM 075 AA (Charge: 130828-1)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

Setup Validation

Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

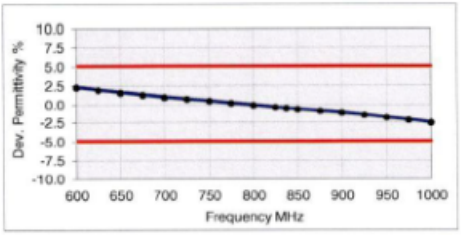
Test Condition

Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	28-Aug-13
Operator	IEN

Additional Information

TSL Density	1.212 g/cm³
TSL Heat-capacity	3.006 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	HP-e'	HP-e''	sigma	eps	sigma	Δ-eps	Δ-sigma
600	57.4	24.76	0.83	56.1	0.95	2.3	-13.2
625	57.1	24.42	0.85	56.0	0.95	2.0	-11.0
650	56.8	24.09	0.87	55.9	0.96	1.6	-8.9
675	56.6	23.80	0.89	55.8	0.96	1.3	-6.7
700	56.3	23.52	0.92	55.7	0.96	1.0	-4.5
725	56.1	23.27	0.94	55.6	0.96	0.8	-2.4
750	**55.8**	**23.03**	**0.96**	**55.5**	**0.96**	**0.5**	**-0.3**
775	55.6	22.87	0.99	55.4	0.97	0.2	2.1
800	55.3	22.71	1.01	55.3	0.97	-0.1	4.5
825	55.1	22.54	1.03	55.2	0.98	-0.3	5.8
838	54.9	22.45	1.05	55.2	0.98	-0.5	6.4
850	54.8	22.37	1.06	55.2	0.99	-0.6	7.0
875	54.6	22.25	1.08	55.1	1.02	-0.9	6.2
900	54.4	22.13	1.11	55.0	1.05	-1.1	5.5
925	54.2	22.02	1.13	55.0	1.06	-1.5	6.6
950	53.9	21.91	1.16	54.9	1.08	-1.8	7.7
975	53.7	21.84	1.18	54.9	1.09	-2.2	9.0
1000	53.5	21.77	1.21	54.8	1.10	-2.5	10.3



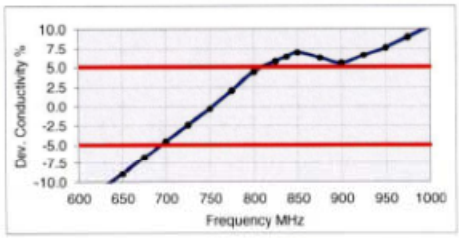


Figure D-2
750MHz Body Tissue Equivalent Matter

APPENDIX E: SAR SYSTEM VALIDATION

Per FCC KDB 865664 D02v01, SAR system validation status should be documented to confirm measurement accuracy. The SAR systems (including SAR probes, system components and software versions) used for this device were validated against its performance specifications prior to the SAR measurements. Reference dipoles were used with the required tissue- equivalent media for system validation, according to the procedures outlined in FCC KDB 865664 D01 v01 and IEEE 1528-2013. Since SAR probe calibrations are frequency dependent, each probe calibration point was validated at a frequency within the valid frequency range of the probe calibration point, using the system that normally operates with the probe for routine SAR measurements and according to the required tissue-equivalent media.

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

Table E-I
SAR System Validation Summary

SAR SYSTEM #	FREQ. [MHz]	DATE	PROBE SN	PROBE TYPE	PROBE CAL. POINT		COND.	PERM.	CW VALIDATION			MOD. VALIDATION		
							(σ)	(ε_r)	SENSI-TIVITY	PROBE LINEARITY	PROBE ISOTROPY	MOD. TYPE	DUTY FACTOR	PAR
B	750	1/3/2015	3334	ES3DV3	750	Body	0.987	56.40	PASS	PASS	PASS	N/A	N/A	N/A
J	750	9/29/2014	3022	ES3DV2	750	Body	0.955	53.59	PASS	PASS	PASS	N/A	N/A	N/A
B	835	1/7/2015	3334	ES3DV3	835	Body	0.950	52.57	PASS	PASS	PASS	GMSK	PASS	N/A
H	1750	6/27/2014	3319	ES3DV3	1750	Body	1.449	51.91	PASS	PASS	PASS	N/A	N/A	N/A
J	1900	9/4/2014	3022	ES3DV2	1900	Body	1.555	52.66	PASS	PASS	PASS	GMSK	PASS	N/A

NOTE: While the probes have been calibrated for both CW and modulated signals, all measurements were performed using communication systems calibrated for CW signals only. Modulations in the table above represent test configurations for which the measurement system has been validated per FCC KDB Publication 865664 D01v01 for scenarios when CW probe calibrations are used with other signal types. SAR systems were validated for modulated signals with a periodic duty cycle, such as GMSK, or with a high peak to average ratio (>5 dB), such as OFDM according to KDB 865664.

APPENDIX G: SENSOR TRIGGERING DATA SUMMARY

Sensor Triggering Data Summary

Per FCC KDB Publication 616217 D04v01, this device was tested by the manufacturer to determine the proximity sensor triggering distances for the device back side, top edge, and top edge tilt. The sensor state (triggered or not triggered) within ± 5 mm of the triggering points (or until touching the phantom) is included for back side and each applicable configuration. See the Technical Descriptions in the filing for the sensor triggering design, implementation, and relevant data.

FCC KDB 616217 D04v01 Section 6 was used as a guideline for ensuring the SAR test distances were conservative for this device for back side, top edge, and top edge tilt. All applicable modes/bands were tested for these configurations at a distance of 19 mm per the manufacturer's request, which is more conservative than that recommended in FCC KDB Publication 616217 D04v01.

The Technical Descriptions in the filing contains information explaining how this device remains compliant in the event of a sensor malfunction.

Triggering Data

Mode: LTE Band 17, LTE Band 13	Back Side		Top Edge (device perpendicular to phantom)		Top Edge Tilt 45° - Screen towards phantom (worst tilt)	
Towards or Away from Phantom?	Towards	Away	Towards	Away	Towards	Away
Trigger Distance (mm)	39	39	32	32	23	23
Distance from Phantom	Object Detect - Triggered (T) or Not Triggered (NT) ?					
Trigger - 5 mm	T	T	T	T	T	T
Trigger - 4 mm	T	T	T	T	T	T
Trigger - 3 mm	T	T	T	T	T	T
Trigger - 2 mm	T	T	T	T	T	T
Trigger - 1 mm	T	T	T	T	T	T
Trigger + 1 mm	NT	NT	NT	NT	NT	NT
Trigger + 2 mm	NT	NT	NT	NT	NT	NT
Trigger + 3 mm	NT	NT	NT	NT	NT	NT
Trigger + 4 mm	NT	NT	NT	NT	NT	NT
Trigger + 5 mm	NT	NT	NT	NT	NT	NT

Mode: LTE Band 5 (Cell.), UMTS 850	Back Side		Top Edge (device perpendicular to phantom)		Top Edge Tilt 45° - Screen towards phantom (worst tilt)	
Towards or Away from Phantom?	Towards	Away	Towards	Away	Towards	Away
Trigger Distance (mm)	40	40	34	34	24	24
Distance from Phantom	Object Detect - Triggered (T) or Not Triggered (NT) ?					
Trigger - 5 mm	T	T	T	T	T	T
Trigger - 4 mm	T	T	T	T	T	T
Trigger - 3 mm	T	T	T	T	T	T
Trigger - 2 mm	T	T	T	T	T	T
Trigger - 1 mm	T	T	T	T	T	T
Trigger + 1 mm	NT	NT	NT	NT	NT	NT
Trigger + 2 mm	NT	NT	NT	NT	NT	NT
Trigger + 3 mm	NT	NT	NT	NT	NT	NT
Trigger + 4 mm	NT	NT	NT	NT	NT	NT
Trigger + 5 mm	NT	NT	NT	NT	NT	NT

Mode: LTE Band 4 (AWS)	Back Side		Top Edge (device perpendicular to phantom)		Top Edge Tilt 45° - Screen towards phantom (worst tilt)	
Towards or Away from Phantom?	Towards	Away	Towards	Away	Towards	Away
Trigger Distance (mm)	41	41	36	36	24	24
Distance from Phantom	Object Detect - Triggered (T) or Not Triggered (NT) ?					
Trigger - 5 mm	T	T	T	T	T	T
Trigger - 4 mm	T	T	T	T	T	T
Trigger - 3 mm	T	T	T	T	T	T
Trigger - 2 mm	T	T	T	T	T	T
Trigger - 1 mm	T	T	T	T	T	T
Trigger + 1 mm	NT	NT	NT	NT	NT	NT
Trigger + 2 mm	NT	NT	NT	NT	NT	NT
Trigger + 3 mm	NT	NT	NT	NT	NT	NT
Trigger + 4 mm	NT	NT	NT	NT	NT	NT
Trigger + 5 mm	NT	NT	NT	NT	NT	NT

Mode: LTE Band 2 (PCS), UMTS 1900	Back Side		Top Edge (device perpendicular to phantom)		Top Edge Tilt 45° - Screen towards phantom (worst tilt)	
Towards or Away from Phantom?	Towards	Away	Towards	Away	Towards	Away
Trigger Distance (mm)	44	44	35	35	24	24
Distance from Phantom	Object Detect - Triggered (T) or Not Triggered (NT) ?					
Trigger - 5 mm	T	T	T	T	T	T
Trigger - 4 mm	T	T	T	T	T	T
Trigger - 3 mm	T	T	T	T	T	T
Trigger - 2 mm	T	T	T	T	T	T
Trigger - 1 mm	T	T	T	T	T	T
Trigger + 1 mm	NT	NT	NT	NT	NT	NT
Trigger + 2 mm	NT	NT	NT	NT	NT	NT
Trigger + 3 mm	NT	NT	NT	NT	NT	NT
Trigger + 4 mm	NT	NT	NT	NT	NT	NT
Trigger + 5 mm	NT	NT	NT	NT	NT	NT