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SAR EVALUATION REPORT

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

Date of Testing:
01/16/15 – 01/26/15
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Document Serial No.:
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FCC ID:	**ZNFLK430**
APPLICANT:	**LG ELECTRONICS MOBILECOMM U.S.A., INC.**

DUT Type:	Portable Tablet
Application Type:	Class II Permissive Change
FCC Rule Part(s):	CFR §2.1093
Model(s):	LG-LK430, LGLK430, LK430
Permissive Change(s):	See FCC Change Document
Date of Original Certification:	01/14/2015

Equipment Class	Band & Mode	Tx Frequency	SAR 1 gm Body (W/kg)
PCB	LTE Band 26	814.7 - 848.3 MHz	0.68
PCB	LTE Band 25 (PCS)	1850.7 - 1914.3 MHz	0.66
PCB	LTE Band 41	2498.5 - 2687.5 MHz	0.56
DTS	2.4 GHz WLAN	2412 - 2462 MHz	0.66
DTS	Bluetooth LE	2402 - 2480 MHz	N/A
DSS	Bluetooth	2402 - 2480 MHz	0.19
Simultaneous SAR per KDB 690783 D01v01r03:			1.34

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

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

Randy Ortanez
President

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

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1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
LTE Band 26	Data	814.7 - 848.3 MHz
LTE Band 25 (PCS)	Data	1850.7 - 1914.3 MHz
LTE Band 41	Data	2498.5 - 2687.5 MHz
2.4 GHz WLAN	Data	2412 - 2462 MHz
Bluetooth	Data	2402 - 2480 MHz
Bluetooth LE	Data	2402 - 2480 MHz

1.2 Power Reduction for SAR

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

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

1.3 Nominal and Maximum Output Power Specifications

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

1.3.1 Maximum Power

Mode / Band		Modulated Average (dBm)
LTE Band 26	Maximum	**24.2**
	Nominal	**23.7**
LTE Band 25 (PCS)	Maximum	**24.2**
	Nominal	**23.7**
LTE Band 41	Maximum	**24.7**
	Nominal	**24.2**

Mode / Band		Modulated Average (dBm)
IEEE 802.11b (2.4 GHz)	Maximum	**12.0**
	Nominal	**11.0**
IEEE 802.11g (2.4 GHz)	Maximum	**11.0**
	Nominal	**10.0**
IEEE 802.11n (2.4 GHz)	Maximum	**10.0**
	Nominal	**9.0**
Bluetooth	Maximum	**11.0**
	Nominal	**10.0**
Bluetooth LE	Maximum	**1.5**
	Nominal	**0.5**

1.3.2 Reduced Power (Body at 0.0 cm)

Mode / Band		Modulated Average (dBm)
LTE Band 26	Maximum	**18.2**
	Nominal	**17.7**
LTE Band 25 (PCS)	Maximum	**14.2**
	Nominal	**13.7**
LTE Band 41	Maximum	**13.7**
	Nominal	**13.2**

1.4 Sides for SAR Testing

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	Front	Top	Bottom	Right	Left
LTE Band 26	Yes	No	Yes	No	Yes	Yes
LTE Band 25 (PCS)	Yes	No	Yes	No	Yes	Yes
LTE Band 41	Yes	No	Yes	No	Yes	Yes
2.4 GHz WLAN	Yes	No	Yes	No	No	Yes
Bluetooth	Yes	No	Yes	No	No	Yes

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

1.5 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D05v01, transmitters are considered to be transmitting simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. Possible transmission paths for the DUT are shown in Figure 1-1 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
1	LTE + 2.4 GHz WI-FI	Yes
2	LTE + 2.4 GHz Bluetooth	Yes

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

1.6 SAR Test Exclusions Applied

(A) WIFI/BT

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

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

Based on the maximum conducted power of Bluetooth LE (rounded to the nearest mW) and the antenna to user separation distance, body Bluetooth LE SAR was not required; [(1/5)* √2.480] = 0.3 < 3.0. Per KDB Publication 447498 D01v05, the maximum power of the channel was rounded to the nearest mW before calculation.

(B) Licensed Transmitter(s)

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

1.7 Guidance Applied

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

1.8 Device Serial Numbers

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

	Max Power Serial Number	Reduced Power Serial Number
LTE Band 26	1401-1	1401-2
LTE Band 25 (PCS)	1401-1	1401-2
LTE Band 41	1401-1	1401-2
2.4 GHz WLAN	1501-9	-
Bluetooth	1501-9	-

2 LTE INFORMATION

LTE Information					
FCC ID	**ZNFLK430**				
Form Factor	Portable Tablet				
Frequency Range of each LTE transmission band	LTE Band 26 (814.7 - 848.3 MHz)				
	LTE Band 25 (PCS) (1850.7 - 1914.3 MHz)				
	LTE Band 41 (2498.5 - 2687.5 MHz)				
Channel Bandwidths	LTE Band 26: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz				
	LTE Band 25 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 41: 5 MHz, 10 MHz, 15 MHz, 20 MHz				
Channel Numbers and Frequencies (MHz)	Low	Low-Mid	Mid	High-Mid	High
LTE Band 26: 1.4 MHz	814.7 (26697)	N/A	831.5 (26865)	N/A	848.3 (27033)
LTE Band 26: 3 MHz	815.5 (26705)	N/A	831.5 (26865)	N/A	847.5 (27025)
LTE Band 26: 5 MHz	816.5 (26715)	N/A	831.5 (26865)	N/A	846.5 (27015)
LTE Band 26: 10 MHz	819 (26740)	N/A	831.5 (26865)	N/A	844 (26990)
LTE Band 26: 15 MHz	831.5 (26865)	N/A	836.5 (26915)	N/A	841.5 (26965)
LTE Band 25 (PCS): 1.4 MHz	1850.7 (26047)	N/A	1882.5 (26365)	N/A	1914.3 (26683)
LTE Band 25 (PCS): 3 MHz	1851.5 (26055)	N/A	1882.5 (26365)	N/A	1913.5 (26675)
LTE Band 25 (PCS): 5 MHz	1852.5 (26065)	N/A	1882.5 (26365)	N/A	1912.5 (26665)
LTE Band 25 (PCS): 10 MHz	1855 (26090)	N/A	1882.5 (26365)	N/A	1910 (26640)
LTE Band 25 (PCS): 15 MHz	1857.5 (26115)	N/A	1882.5 (26365)	N/A	1907.5 (26615)
LTE Band 25 (PCS): 20 MHz	1860 (26140)	N/A	1882.5 (26365)	N/A	1905 (26590)
LTE Band 41: 5 MHz	2498.5 (39675)	2545.8 (40148)	2593 (40620)	2640.3 (41093)	2687.5 (41565)
LTE Band 41: 10 MHz	2501 (39700)	2547 (40160)	2593 (40620)	2639 (41080)	2685 (41540)
LTE Band 41: 15 MHz	2503.5 (39725)	2548.3 (40173)	2593 (40620)	2637.8 (41068)	2682.5 (41515)
LTE Band 41: 20 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
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				

3 INTRODUCTION

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

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

3.1 SAR Definition

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

Equation 3-1
SAR Mathematical Equation

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

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

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

where:

σ = conductivity of the tissue-simulating material (S/m)
ρ = mass density of the tissue-simulating material (kg/m^3)
E = Total RMS electric field strength (V/m)

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

4 DOSIMETRIC ASSESSMENT

4.1 Measurement Procedure

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

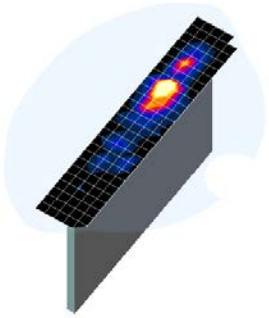

Figure 4-1
Sample SAR Area Scan

1. The SAR distribution at the exposed side of the head or body was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the device-head and body interface and the horizontal grid resolution was determined per FCC KDB Publication 865664 D01v01 (See Table 4-1) and IEEE 1528-2013.
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.
3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01 (See Table 4-1) and IEEE 1528-2013. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):

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

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

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

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

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

*Also compliant to IEEE 1528-2013 Table 6

5 SAR TESTING PROCEDURES

5.1 SAR Testing for Tablet per KDB Publication 616217 D04v01

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

5.2 Proximity Sensor Considerations

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

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

FCC KDB 616217 D04 Section 6 was used as a guideline for selecting SAR test distances for this device at these additional exposure conditions. Since the sensor activation distance for the back side of the device is 15 mm, a conservative distance of 14 mm was tested for SAR on the back side at maximum power. Since the sensor activation distance for the top edge of the device is 17 mm, a conservative distance of 16 mm was tested for SAR on the top edge at maximum power. Since the sensor activation distance for the right edge of the device is 6 mm, a conservative distance of 5 mm was tested for SAR on the right edge at maximum power. Sensor triggering distance summary data is included in Appendix G. The sensor does not trigger power reduction from the front of the device.

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

6 RF EXPOSURE LIMITS

6.1 Uncontrolled Environment

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

6.2 Controlled Environment

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

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

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

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

7 FCC MEASUREMENT PROCEDURES

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

7.1 Measured and Reported SAR

Per FCC KDB Publication 447498 D01v05, When SAR is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance. For simultaneous transmission, the measured aggregate SAR must be scaled according to the sum of the differences between the maximum tune-up tolerance and actual power used to test each transmitter. When SAR is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as *reported* SAR. The highest *reported* SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r02.

7.2 Procedures Used to Establish RF Signal for SAR

The following procedures are according to FCC KDB Publication 941225 D01 "SAR Measurement Procedures" v03, October 2014.

The device was placed into a simulated call using a base station simulator in a RF shielded chamber. Establishing connections in this manner ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. Devices under test were evaluated prior to testing, with a fully charged battery and were configured to operate at maximum output power. In order to verify that the device was tested throughout the SAR test at maximum output power, the SAR measurement system measures a "point SAR" at an arbitrary reference point at the start and end of the 1 gram SAR evaluation, to assess for any power drifts during the evaluation. If the power drift deviated by more than 5%, the SAR test and drift measurements were repeated.

7.3 SAR Measurement Conditions for LTE

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

7.3.1 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.

7.3.2 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.

7.3.3 A-MPR

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

7.3.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05v02r03:

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

7.3.5 TDD

LTE TDD testing procedures were performed using guidance from FCC KDB 941225 D05v02r03 and the SAR test guidance provided in April 2013 TCB workshop notes. TDD was tested at the highest duty factor using UL-DL configuration 0 with special subframe configuration 6 and applying the FDD LTE procedures in KDB 941225. SAR testing was performed using the normal cyclic prefix listed in 3GPP TS 36.211 Section 4.

7.4 SAR Testing with 802.11 Transmitters

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

7.4.1 General Device Setup

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

7.4.2 Frequency Channel Configurations [24]

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

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

8 RF CONDUCTED POWERS

8.1 LTE Conducted Powers

8.1.1 LTE Band 26

Table 8-1
LTE Band 26 Conducted Powers - 15 MHz Bandwidth
Maximum Power

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Mid	836.5	26915	15	QPSK	1	0	**24.17**	0	0
	836.5	26915	15	QPSK	1	36	24.09	0	0
	836.5	26915	15	QPSK	1	74	24.08	0	0
	836.5	26915	15	QPSK	36	0	23.13	0-1	1
	836.5	26915	15	QPSK	36	18	**23.17**	0-1	1
	836.5	26915	15	QPSK	36	37	23.16	0-1	1
	836.5	26915	15	QPSK	75	0	23.11	0-1	1
	836.5	26915	15	16QAM	1	0	23.20	0-1	1
	836.5	26915	15	16QAM	1	36	23.14	0-1	1
	836.5	26915	15	16QAM	1	74	23.06	0-1	1
	836.5	26915	15	16QAM	36	0	22.07	0-2	2
	836.5	26915	15	16QAM	36	18	21.99	0-2	2
	836.5	26915	15	16QAM	36	37	21.98	0-2	2
	836.5	26915	15	16QAM	75	0	22.03	0-2	2

Note: LTE Band 26 at 15 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 8-2
LTE Band 26 Conducted Powers - 10 MHz Bandwidth
Maximum Power

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	819	26740	10	QPSK	1	0	24.16	0	0
	819	26740	10	QPSK	1	25	24.10	0	0
	819	26740	10	QPSK	1	49	24.04	0	0
	819	26740	10	QPSK	25	0	23.16	0-1	1
	819	26740	10	QPSK	25	12	23.18	0-1	1
	819	26740	10	QPSK	25	25	23.11	0-1	1
	819	26740	10	QPSK	50	0	23.18	0-1	1
	819	26740	10	16QAM	1	0	23.17	0-1	1
	819	26740	10	16QAM	1	25	23.12	0-1	1
	819	26740	10	16QAM	1	49	23.13	0-1	1
	819	26740	10	16QAM	25	0	22.07	0-2	2
	819	26740	10	16QAM	25	12	21.99	0-2	2
	819	26740	10	16QAM	25	25	21.99	0-2	2
	819	26740	10	16QAM	50	0	22.01	0-2	2
Mid	831.5	26865	10	QPSK	1	0	24.13	0	0
	831.5	26865	10	QPSK	1	25	24.14	0	0
	831.5	26865	10	QPSK	1	49	24.10	0	0
	831.5	26865	10	QPSK	25	0	23.08	0-1	1
	831.5	26865	10	QPSK	25	12	23.07	0-1	1
	831.5	26865	10	QPSK	25	25	23.11	0-1	1
	831.5	26865	10	QPSK	50	0	23.19	0-1	1
	831.5	26865	10	16QAM	1	0	23.04	0-1	1
	831.5	26865	10	16QAM	1	25	23.09	0-1	1
	831.5	26865	10	16QAM	1	49	23.02	0-1	1
	831.5	26865	10	16QAM	25	0	22.15	0-2	2
	831.5	26865	10	16QAM	25	12	21.94	0-2	2
	831.5	26865	10	16QAM	25	25	22.01	0-2	2
	831.5	26865	10	16QAM	50	0	22.12	0-2	2
High	844	26990	10	QPSK	1	0	24.20	0	0
	844	26990	10	QPSK	1	25	24.13	0	0
	844	26990	10	QPSK	1	49	24.14	0	0
	844	26990	10	QPSK	25	0	23.19	0-1	1
	844	26990	10	QPSK	25	12	23.16	0-1	1
	844	26990	10	QPSK	25	25	23.14	0-1	1
	844	26990	10	QPSK	50	0	23.14	0-1	1
	844	26990	10	16QAM	1	0	23.16	0-1	1
	844	26990	10	16QAM	1	25	23.15	0-1	1
	844	26990	10	16QAM	1	49	23.15	0-1	1
	844	26990	10	16QAM	25	0	22.05	0-2	2
	844	26990	10	16QAM	25	12	22.08	0-2	2
	844	26990	10	16QAM	25	25	21.96	0-2	2
	844	26990	10	16QAM	50	0	22.00	0-2	2

Table 8-3
LTE Band 26 Conducted Powers - 5 MHz Bandwidth
Maximum Power

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	816.5	26715	5	QPSK	1	0	24.17	0	0
	816.5	26715	5	QPSK	1	12	24.15	0	0
	816.5	26715	5	QPSK	1	24	24.07	0	0
	816.5	26715	5	QPSK	12	0	23.15	0-1	1
	816.5	26715	5	QPSK	12	6	23.18	0-1	1
	816.5	26715	5	QPSK	12	13	23.17	0-1	1
	816.5	26715	5	QPSK	25	0	23.12	0-1	1
	816.5	26715	5	16-QAM	1	0	23.18	0-1	1
	816.5	26715	5	16-QAM	1	12	23.17	0-1	1
	816.5	26715	5	16-QAM	1	24	23.05	0-1	1
	816.5	26715	5	16-QAM	12	0	22.14	0-2	2
	816.5	26715	5	16-QAM	12	6	22.05	0-2	2
	816.5	26715	5	16-QAM	12	13	22.00	0-2	2
	816.5	26715	5	16-QAM	25	0	22.08	0-2	2
Mid	831.5	26865	5	QPSK	1	0	24.20	0	0
	831.5	26865	5	QPSK	1	12	24.04	0	0
	831.5	26865	5	QPSK	1	24	24.07	0	0
	831.5	26865	5	QPSK	12	0	23.12	0-1	1
	831.5	26865	5	QPSK	12	6	23.15	0-1	1
	831.5	26865	5	QPSK	12	13	23.11	0-1	1
	831.5	26865	5	QPSK	25	0	23.07	0-1	1
	831.5	26865	5	16-QAM	1	0	23.20	0-1	1
	831.5	26865	5	16-QAM	1	12	23.17	0-1	1
	831.5	26865	5	16-QAM	1	24	23.12	0-1	1
	831.5	26865	5	16-QAM	12	0	22.02	0-2	2
	831.5	26865	5	16-QAM	12	6	21.96	0-2	2
	831.5	26865	5	16-QAM	12	13	22.08	0-2	2
	831.5	26865	5	16-QAM	25	0	22.00	0-2	2
High	846.5	27015	5	QPSK	1	0	24.16	0	0
	846.5	27015	5	QPSK	1	12	24.15	0	0
	846.5	27015	5	QPSK	1	24	24.06	0	0
	846.5	27015	5	QPSK	12	0	23.13	0-1	1
	846.5	27015	5	QPSK	12	6	23.14	0-1	1
	846.5	27015	5	QPSK	12	13	23.12	0-1	1
	846.5	27015	5	QPSK	25	0	23.17	0-1	1
	846.5	27015	5	16-QAM	1	0	23.18	0-1	1
	846.5	27015	5	16-QAM	1	12	23.18	0-1	1
	846.5	27015	5	16-QAM	1	24	23.06	0-1	1
	846.5	27015	5	16-QAM	12	0	22.11	0-2	2
	846.5	27015	5	16-QAM	12	6	21.96	0-2	2
	846.5	27015	5	16-QAM	12	13	21.96	0-2	2
	846.5	27015	5	16-QAM	25	0	22.03	0-2	2

Table 8-4
LTE Band 26 Conducted Powers - 3 MHz Bandwidth
Maximum Power

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	815.5	26705	3	QPSK	1	0	24.20	0	0
	815.5	26705	3	QPSK	1	7	24.11	0	0
	815.5	26705	3	QPSK	1	14	24.08	0	0
	815.5	26705	3	QPSK	8	0	23.11	0-1	1
	815.5	26705	3	QPSK	8	4	23.15	0-1	1
	815.5	26705	3	QPSK	8	7	23.15	0-1	1
	815.5	26705	3	QPSK	15	0	23.17	0-1	1
	815.5	26705	3	16-QAM	1	0	23.16	0-1	1
	815.5	26705	3	16-QAM	1	7	23.20	0-1	1
	815.5	26705	3	16-QAM	1	14	23.05	0-1	1
	815.5	26705	3	16-QAM	8	0	22.07	0-2	2
	815.5	26705	3	16-QAM	8	4	21.96	0-2	2
	815.5	26705	3	16-QAM	8	7	21.99	0-2	2
	815.5	26705	3	16-QAM	15	0	22.07	0-2	2
Mid	831.5	26865	3	QPSK	1	0	24.19	0	0
	831.5	26865	3	QPSK	1	7	24.05	0	0
	831.5	26865	3	QPSK	1	14	24.11	0	0
	831.5	26865	3	QPSK	8	0	23.20	0-1	1
	831.5	26865	3	QPSK	8	4	23.19	0-1	1
	831.5	26865	3	QPSK	8	7	23.20	0-1	1
	831.5	26865	3	QPSK	15	0	23.16	0-1	1
	831.5	26865	3	16-QAM	1	0	23.13	0-1	1
	831.5	26865	3	16-QAM	1	7	23.12	0-1	1
	831.5	26865	3	16-QAM	1	14	23.07	0-1	1
	831.5	26865	3	16-QAM	8	0	22.17	0-2	2
	831.5	26865	3	16-QAM	8	4	21.96	0-2	2
	831.5	26865	3	16-QAM	8	7	21.99	0-2	2
	831.5	26865	3	16-QAM	15	0	22.12	0-2	2
High	847.5	27025	3	QPSK	1	0	24.14	0	0
	847.5	27025	3	QPSK	1	7	24.15	0	0
	847.5	27025	3	QPSK	1	14	24.06	0	0
	847.5	27025	3	QPSK	8	0	23.18	0-1	1
	847.5	27025	3	QPSK	8	4	23.19	0-1	1
	847.5	27025	3	QPSK	8	7	23.12	0-1	1
	847.5	27025	3	QPSK	15	0	23.19	0-1	1
	847.5	27025	3	16-QAM	1	0	23.16	0-1	1
	847.5	27025	3	16-QAM	1	7	23.18	0-1	1
	847.5	27025	3	16-QAM	1	14	23.06	0-1	1
	847.5	27025	3	16-QAM	8	0	22.05	0-2	2
	847.5	27025	3	16-QAM	8	4	21.97	0-2	2
	847.5	27025	3	16-QAM	8	7	22.05	0-2	2
	847.5	27025	3	16-QAM	15	0	21.99	0-2	2

Table 8-5
LTE Band 26 Conducted Powers -1.4 MHz Bandwidth
Maximum Power

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	814.7	26697	1.4	QPSK	1	0	24.20	0	0
	814.7	26697	1.4	QPSK	1	2	24.07	0	0
	814.7	26697	1.4	QPSK	1	5	24.12	0	0
	814.7	26697	1.4	QPSK	3	0	24.13	0	0
	814.7	26697	1.4	QPSK	3	2	24.19	0	0
	814.7	26697	1.4	QPSK	3	3	24.16	0	0
	814.7	26697	1.4	QPSK	6	0	23.19	0-1	1
	814.7	26697	1.4	16-QAM	1	0	23.17	0-1	1
	814.7	26697	1.4	16-QAM	1	2	23.19	0-1	1
	814.7	26697	1.4	16-QAM	1	5	23.13	0-1	1
	814.7	26697	1.4	16-QAM	3	0	23.16	0-1	1
	814.7	26697	1.4	16-QAM	3	2	23.02	0-1	1
	814.7	26697	1.4	16-QAM	3	3	23.04	0-1	1
	814.7	26697	1.4	16-QAM	6	0	22.13	0-2	2
Mid	831.5	26865	1.4	QPSK	1	0	24.17	0	0
	831.5	26865	1.4	QPSK	1	2	24.02	0	0
	831.5	26865	1.4	QPSK	1	5	24.17	0	0
	831.5	26865	1.4	QPSK	3	0	24.08	0	0
	831.5	26865	1.4	QPSK	3	2	24.12	0	0
	831.5	26865	1.4	QPSK	3	3	24.15	0	0
	831.5	26865	1.4	QPSK	6	0	23.17	0-1	1
	831.5	26865	1.4	16-QAM	1	0	23.20	0-1	1
	831.5	26865	1.4	16-QAM	1	2	23.15	0-1	1
	831.5	26865	1.4	16-QAM	1	5	23.19	0-1	1
	831.5	26865	1.4	16-QAM	3	0	23.11	0-1	1
	831.5	26865	1.4	16-QAM	3	2	23.09	0-1	1
	831.5	26865	1.4	16-QAM	3	3	22.99	0-1	1
	831.5	26865	1.4	16-QAM	6	0	22.13	0-2	2
High	848.3	27033	1.4	QPSK	1	0	24.16	0	0
	848.3	27033	1.4	QPSK	1	2	24.10	0	0
	848.3	27033	1.4	QPSK	1	5	24.10	0	0
	848.3	27033	1.4	QPSK	3	0	24.20	0	0
	848.3	27033	1.4	QPSK	3	2	24.20	0	0
	848.3	27033	1.4	QPSK	3	3	24.16	0	0
	848.3	27033	1.4	QPSK	6	0	23.13	0-1	1
	848.3	27033	1.4	16-QAM	1	0	23.14	0-1	1
	848.3	27033	1.4	16-QAM	1	2	23.11	0-1	1
	848.3	27033	1.4	16-QAM	1	5	23.14	0-1	1
	848.3	27033	1.4	16-QAM	3	0	23.16	0-1	1
	848.3	27033	1.4	16-QAM	3	2	23.03	0-1	1
	848.3	27033	1.4	16-QAM	3	3	23.13	0-1	1
	848.3	27033	1.4	16-QAM	6	0	22.18	0-2	2

Table 8-6
LTE Band 26 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]	MPR Allowed per 3GPP [dB]	MPR [dB]
Mid	836.5	26915	15	QPSK	1	0	**18.19**	0	0
	836.5	26915	15	QPSK	1	36	18.18	0	0
	836.5	26915	15	QPSK	1	74	18.18	0	0
	836.5	26915	15	QPSK	36	0	**18.18**	0-1	0
	836.5	26915	15	QPSK	36	18	18.09	0-1	0
	836.5	26915	15	QPSK	36	37	18.08	0-1	0
	836.5	26915	15	QPSK	75	0	18.15	0-1	0
	836.5	26915	15	16QAM	1	0	17.57	0-1	0
	836.5	26915	15	16QAM	1	36	17.28	0-1	0
	836.5	26915	15	16QAM	1	74	17.30	0-1	0
	836.5	26915	15	16QAM	36	0	18.08	0-2	0
	836.5	26915	15	16QAM	36	18	18.06	0-2	0
	836.5	26915	15	16QAM	36	37	18.06	0-2	0
	836.5	26915	15	16QAM	75	0	18.07	0-2	0

Note: LTE Band 26 at 15 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 8-7
LTE Band 26 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]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	819	26740	10	QPSK	1	0	18.20	0	0
	819	26740	10	QPSK	1	25	18.14	0	0
	819	26740	10	QPSK	1	49	18.16	0	0
	819	26740	10	QPSK	25	0	18.15	0-1	0
	819	26740	10	QPSK	25	12	18.07	0-1	0
	819	26740	10	QPSK	25	25	18.15	0-1	0
	819	26740	10	QPSK	50	0	18.11	0-1	0
	819	26740	10	16QAM	1	0	17.55	0-1	0
	819	26740	10	16QAM	1	25	17.33	0-1	0
	819	26740	10	16QAM	1	49	17.32	0-1	0
	819	26740	10	16QAM	25	0	18.13	0-2	0
	819	26740	10	16QAM	25	12	18.07	0-2	0
	819	26740	10	16QAM	25	25	18.15	0-2	0
	819	26740	10	16QAM	50	0	18.11	0-2	0
Mid	831.5	26865	10	QPSK	1	0	18.16	0	0
	831.5	26865	10	QPSK	1	25	18.13	0	0
	831.5	26865	10	QPSK	1	49	18.17	0	0
	831.5	26865	10	QPSK	25	0	18.15	0-1	0
	831.5	26865	10	QPSK	25	12	18.05	0-1	0
	831.5	26865	10	QPSK	25	25	18.17	0-1	0
	831.5	26865	10	QPSK	50	0	18.12	0-1	0
	831.5	26865	10	16QAM	1	0	17.56	0-1	0
	831.5	26865	10	16QAM	1	25	17.36	0-1	0
	831.5	26865	10	16QAM	1	49	17.29	0-1	0
	831.5	26865	10	16QAM	25	0	18.12	0-2	0
	831.5	26865	10	16QAM	25	12	18.10	0-2	0
	831.5	26865	10	16QAM	25	25	18.09	0-2	0
	831.5	26865	10	16QAM	50	0	18.16	0-2	0
High	844	26990	10	QPSK	1	0	18.13	0	0
	844	26990	10	QPSK	1	25	18.06	0	0
	844	26990	10	QPSK	1	49	18.02	0	0
	844	26990	10	QPSK	25	0	18.19	0-1	0
	844	26990	10	QPSK	25	12	18.05	0-1	0
	844	26990	10	QPSK	25	25	18.05	0-1	0
	844	26990	10	QPSK	50	0	18.11	0-1	0
	844	26990	10	16QAM	1	0	17.66	0-1	0
	844	26990	10	16QAM	1	25	17.24	0-1	0
	844	26990	10	16QAM	1	49	17.26	0-1	0
	844	26990	10	16QAM	25	0	18.17	0-2	0
	844	26990	10	16QAM	25	12	18.15	0-2	0
	844	26990	10	16QAM	25	25	18.10	0-2	0
	844	26990	10	16QAM	50	0	18.16	0-2	0

Table 8-8
LTE Band 26 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]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	816.5	26715	5	QPSK	1	0	18.12	0	0
	816.5	26715	5	QPSK	1	12	18.03	0	0
	816.5	26715	5	QPSK	1	24	18.14	0	0
	816.5	26715	5	QPSK	12	0	18.16	0-1	0
	816.5	26715	5	QPSK	12	6	18.09	0-1	0
	816.5	26715	5	QPSK	12	13	18.03	0-1	0
	816.5	26715	5	QPSK	25	0	18.16	0-1	0
	816.5	26715	5	16-QAM	1	0	17.66	0-1	0
	816.5	26715	5	16-QAM	1	12	17.35	0-1	0
	816.5	26715	5	16-QAM	1	24	17.31	0-1	0
	816.5	26715	5	16-QAM	12	0	18.17	0-2	0
	816.5	26715	5	16-QAM	12	6	18.12	0-2	0
	816.5	26715	5	16-QAM	12	13	18.01	0-2	0
	816.5	26715	5	16-QAM	25	0	18.14	0-2	0
Mid	831.5	26865	5	QPSK	1	0	18.12	0	0
	831.5	26865	5	QPSK	1	12	18.13	0	0
	831.5	26865	5	QPSK	1	24	18.20	0	0
	831.5	26865	5	QPSK	12	0	18.06	0-1	0
	831.5	26865	5	QPSK	12	6	18.10	0-1	0
	831.5	26865	5	QPSK	12	13	18.12	0-1	0
	831.5	26865	5	QPSK	25	0	18.01	0-1	0
	831.5	26865	5	16-QAM	1	0	17.63	0-1	0
	831.5	26865	5	16-QAM	1	12	17.25	0-1	0
	831.5	26865	5	16-QAM	1	24	17.38	0-1	0
	831.5	26865	5	16-QAM	12	0	18.10	0-2	0
	831.5	26865	5	16-QAM	12	6	18.08	0-2	0
	831.5	26865	5	16-QAM	12	13	18.07	0-2	0
	831.5	26865	5	16-QAM	25	0	18.07	0-2	0
High	846.5	27015	5	QPSK	1	0	18.13	0	0
	846.5	27015	5	QPSK	1	12	18.08	0	0
	846.5	27015	5	QPSK	1	24	18.20	0	0
	846.5	27015	5	QPSK	12	0	18.19	0-1	0
	846.5	27015	5	QPSK	12	6	18.17	0-1	0
	846.5	27015	5	QPSK	12	13	18.04	0-1	0
	846.5	27015	5	QPSK	25	0	18.13	0-1	0
	846.5	27015	5	16-QAM	1	0	17.60	0-1	0
	846.5	27015	5	16-QAM	1	12	17.35	0-1	0
	846.5	27015	5	16-QAM	1	24	17.35	0-1	0
	846.5	27015	5	16-QAM	12	0	18.08	0-2	0
	846.5	27015	5	16-QAM	12	6	18.10	0-2	0
	846.5	27015	5	16-QAM	12	13	18.08	0-2	0
	846.5	27015	5	16-QAM	25	0	18.12	0-2	0

Table 8-9
LTE Band 26 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]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	815.5	26705	3	QPSK	1	0	18.15	0	0
	815.5	26705	3	QPSK	1	7	18.15	0	0
	815.5	26705	3	QPSK	1	14	18.16	0	0
	815.5	26705	3	QPSK	8	0	18.14	0-1	0
	815.5	26705	3	QPSK	8	4	18.04	0-1	0
	815.5	26705	3	QPSK	8	7	18.03	0-1	0
	815.5	26705	3	QPSK	15	0	18.12	0-1	0
	815.5	26705	3	16-QAM	1	0	17.56	0-1	0
	815.5	26705	3	16-QAM	1	7	17.23	0-1	0
	815.5	26705	3	16-QAM	1	14	17.35	0-1	0
	815.5	26705	3	16-QAM	8	0	18.11	0-2	0
	815.5	26705	3	16-QAM	8	4	18.07	0-2	0
	815.5	26705	3	16-QAM	8	7	18.16	0-2	0
	815.5	26705	3	16-QAM	15	0	18.05	0-2	0
Mid	831.5	26865	3	QPSK	1	0	18.16	0	0
	831.5	26865	3	QPSK	1	7	18.02	0	0
	831.5	26865	3	QPSK	1	14	18.16	0	0
	831.5	26865	3	QPSK	8	0	18.13	0-1	0
	831.5	26865	3	QPSK	8	4	18.12	0-1	0
	831.5	26865	3	QPSK	8	7	18.18	0-1	0
	831.5	26865	3	QPSK	15	0	18.20	0-1	0
	831.5	26865	3	16-QAM	1	0	17.57	0-1	0
	831.5	26865	3	16-QAM	1	7	17.31	0-1	0
	831.5	26865	3	16-QAM	1	14	17.38	0-1	0
	831.5	26865	3	16-QAM	8	0	18.18	0-2	0
	831.5	26865	3	16-QAM	8	4	18.12	0-2	0
	831.5	26865	3	16-QAM	8	7	18.04	0-2	0
	831.5	26865	3	16-QAM	15	0	18.04	0-2	0
High	847.5	27025	3	QPSK	1	0	18.14	0	0
	847.5	27025	3	QPSK	1	7	18.20	0	0
	847.5	27025	3	QPSK	1	14	18.20	0	0
	847.5	27025	3	QPSK	8	0	18.15	0-1	0
	847.5	27025	3	QPSK	8	4	18.08	0-1	0
	847.5	27025	3	QPSK	8	7	18.06	0-1	0
	847.5	27025	3	QPSK	15	0	18.18	0-1	0
	847.5	27025	3	16-QAM	1	0	17.64	0-1	0
	847.5	27025	3	16-QAM	1	7	17.31	0-1	0
	847.5	27025	3	16-QAM	1	14	17.35	0-1	0
	847.5	27025	3	16-QAM	8	0	18.04	0-2	0
	847.5	27025	3	16-QAM	8	4	18.10	0-2	0
	847.5	27025	3	16-QAM	8	7	18.13	0-2	0
	847.5	27025	3	16-QAM	15	0	18.08	0-2	0

Table 8-10
LTE Band 26 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]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	814.7	26697	1.4	QPSK	1	0	18.20	0	0
	814.7	26697	1.4	QPSK	1	2	18.17	0	0
	814.7	26697	1.4	QPSK	1	5	18.18	0	0
	814.7	26697	1.4	QPSK	3	0	18.18	0	0
	814.7	26697	1.4	QPSK	3	2	18.09	0	0
	814.7	26697	1.4	QPSK	3	3	18.13	0	0
	814.7	26697	1.4	QPSK	6	0	18.14	0-1	0
	814.7	26697	1.4	16-QAM	1	0	17.54	0-1	0
	814.7	26697	1.4	16-QAM	1	2	17.30	0-1	0
	814.7	26697	1.4	16-QAM	1	5	17.39	0-1	0
	814.7	26697	1.4	16-QAM	3	0	18.05	0-1	0
	814.7	26697	1.4	16-QAM	3	2	18.07	0-1	0
	814.7	26697	1.4	16-QAM	3	3	18.01	0-1	0
	814.7	26697	1.4	16-QAM	6	0	18.12	0-2	0
Mid	831.5	26865	1.4	QPSK	1	0	18.19	0	0
	831.5	26865	1.4	QPSK	1	2	18.13	0	0
	831.5	26865	1.4	QPSK	1	5	18.17	0	0
	831.5	26865	1.4	QPSK	3	0	18.20	0	0
	831.5	26865	1.4	QPSK	3	2	18.16	0	0
	831.5	26865	1.4	QPSK	3	3	18.10	0	0
	831.5	26865	1.4	QPSK	6	0	18.17	0-1	0
	831.5	26865	1.4	16-QAM	1	0	17.53	0-1	0
	831.5	26865	1.4	16-QAM	1	2	17.32	0-1	0
	831.5	26865	1.4	16-QAM	1	5	17.36	0-1	0
	831.5	26865	1.4	16-QAM	3	0	18.09	0-1	0
	831.5	26865	1.4	16-QAM	3	2	18.07	0-1	0
	831.5	26865	1.4	16-QAM	3	3	18.14	0-1	0
	831.5	26865	1.4	16-QAM	6	0	18.07	0-2	0
High	848.3	27033	1.4	QPSK	1	0	18.19	0	0
	848.3	27033	1.4	QPSK	1	2	18.20	0	0
	848.3	27033	1.4	QPSK	1	5	18.15	0	0
	848.3	27033	1.4	QPSK	3	0	18.00	0	0
	848.3	27033	1.4	QPSK	3	2	18.19	0	0
	848.3	27033	1.4	QPSK	3	3	18.17	0	0
	848.3	27033	1.4	QPSK	6	0	18.17	0-1	0
	848.3	27033	1.4	16-QAM	1	0	17.56	0-1	0
	848.3	27033	1.4	16-QAM	1	2	17.29	0-1	0
	848.3	27033	1.4	16-QAM	1	5	17.29	0-1	0
	848.3	27033	1.4	16-QAM	3	0	18.17	0-1	0
	848.3	27033	1.4	16-QAM	3	2	18.06	0-1	0
	848.3	27033	1.4	16-QAM	3	3	18.04	0-1	0
	848.3	27033	1.4	16-QAM	6	0	18.17	0-2	0

8.1.2 LTE Band 25 (PCS)

Table 8-11
LTE Band 25 (PCS) Conducted Powers - 20 MHz Bandwidth
Maximum Power

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1860	26140	20	QPSK	1	0	24.00	0	0
	1860	26140	20	QPSK	1	50	23.56	0	0
	1860	26140	20	QPSK	1	99	23.83	0	0
	1860	26140	20	QPSK	50	0	23.14	0-1	1
	1860	26140	20	QPSK	50	25	23.01	0-1	1
	1860	26140	20	QPSK	50	50	23.02	0-1	1
	1860	26140	20	QPSK	100	0	23.03	0-1	1
	1860	26140	20	16QAM	1	0	22.95	0-1	1
	1860	26140	20	16QAM	1	50	22.66	0-1	1
	1860	26140	20	16QAM	1	99	23.18	0-1	1
	1860	26140	20	16QAM	50	0	22.15	0-2	2
	1860	26140	20	16QAM	50	25	22.08	0-2	2
	1860	26140	20	16QAM	50	50	22.04	0-2	2
	1860	26140	20	16QAM	100	0	22.06	0-2	2
Mid	1882.5	26365	20	QPSK	1	0	24.08	0	0
	1882.5	26365	20	QPSK	1	50	**24.20**	0	0
	1882.5	26365	20	QPSK	1	99	23.97	0	0
	1882.5	26365	20	QPSK	50	0	22.92	0-1	1
	1882.5	26365	20	QPSK	50	25	22.83	0-1	1
	1882.5	26365	20	QPSK	50	50	22.87	0-1	1
	1882.5	26365	20	QPSK	100	0	22.89	0-1	1
	1882.5	26365	20	16QAM	1	0	22.88	0-1	1
	1882.5	26365	20	16QAM	1	50	23.02	0-1	1
	1882.5	26365	20	16QAM	1	99	22.84	0-1	1
	1882.5	26365	20	16QAM	50	0	22.01	0-2	2
	1882.5	26365	20	16QAM	50	25	21.88	0-2	2
	1882.5	26365	20	16QAM	50	50	21.79	0-2	2
	1882.5	26365	20	16QAM	100	0	21.77	0-2	2
High	1905	26590	20	QPSK	1	0	24.11	0	0
	1905	26590	20	QPSK	1	50	24.00	0	0
	1905	26590	20	QPSK	1	99	23.91	0	0
	1905	26590	20	QPSK	50	0	**23.19**	0-1	1
	1905	26590	20	QPSK	50	25	22.95	0-1	1
	1905	26590	20	QPSK	50	50	22.98	0-1	1
	1905	26590	20	QPSK	100	0	23.07	0-1	1
	1905	26590	20	16QAM	1	0	23.08	0-1	1
	1905	26590	20	16QAM	1	50	23.13	0-1	1
	1905	26590	20	16QAM	1	99	22.86	0-1	1
	1905	26590	20	16QAM	50	0	22.14	0-2	2
	1905	26590	20	16QAM	50	25	22.07	0-2	2
	1905	26590	20	16QAM	50	50	22.01	0-2	2
	1905	26590	20	16QAM	100	0	22.11	0-2	2

Table 8-12
LTE Band 25 (PCS) Conducted Powers - 15 MHz Bandwidth
Maximum Power

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1857.5	26115	15	QPSK	1	0	24.03	0	0
	1857.5	26115	15	QPSK	1	36	23.92	0	0
	1857.5	26115	15	QPSK	1	74	23.86	0	0
	1857.5	26115	15	QPSK	36	0	23.17	0-1	1
	1857.5	26115	15	QPSK	36	18	23.06	0-1	1
	1857.5	26115	15	QPSK	36	37	23.06	0-1	1
	1857.5	26115	15	QPSK	75	0	23.03	0-1	1
	1857.5	26115	15	16QAM	1	0	22.91	0-1	1
	1857.5	26115	15	16QAM	1	36	22.70	0-1	1
	1857.5	26115	15	16QAM	1	74	23.19	0-1	1
	1857.5	26115	15	16QAM	36	0	22.20	0-2	2
	1857.5	26115	15	16QAM	36	18	22.04	0-2	2
	1857.5	26115	15	16QAM	36	37	22.14	0-2	2
	1857.5	26115	15	16QAM	75	0	22.05	0-2	2
Mid	1882.5	26365	15	QPSK	1	0	24.11	0	0
	1882.5	26365	15	QPSK	1	36	24.17	0	0
	1882.5	26365	15	QPSK	1	74	24.00	0	0
	1882.5	26365	15	QPSK	36	0	22.90	0-1	1
	1882.5	26365	15	QPSK	36	18	22.89	0-1	1
	1882.5	26365	15	QPSK	36	37	22.90	0-1	1
	1882.5	26365	15	QPSK	75	0	22.84	0-1	1
	1882.5	26365	15	16QAM	1	0	22.96	0-1	1
	1882.5	26365	15	16QAM	1	36	22.97	0-1	1
	1882.5	26365	15	16QAM	1	74	22.88	0-1	1
	1882.5	26365	15	16QAM	36	0	22.11	0-2	2
	1882.5	26365	15	16QAM	36	18	21.91	0-2	2
	1882.5	26365	15	16QAM	36	37	21.79	0-2	2
	1882.5	26365	15	16QAM	75	0	21.84	0-2	2
High	1907.5	26615	15	QPSK	1	0	24.13	0	0
	1907.5	26615	15	QPSK	1	36	23.96	0	0
	1907.5	26615	15	QPSK	1	74	23.99	0	0
	1907.5	26615	15	QPSK	36	0	23.20	0-1	1
	1907.5	26615	15	QPSK	36	18	22.91	0-1	1
	1907.5	26615	15	QPSK	36	37	23.06	0-1	1
	1907.5	26615	15	QPSK	75	0	23.02	0-1	1
	1907.5	26615	15	16QAM	1	0	23.18	0-1	1
	1907.5	26615	15	16QAM	1	36	23.14	0-1	1
	1907.5	26615	15	16QAM	1	74	22.94	0-1	1
	1907.5	26615	15	16QAM	36	0	22.17	0-2	2
	1907.5	26615	15	16QAM	36	18	22.03	0-2	2
	1907.5	26615	15	16QAM	36	37	22.08	0-2	2
	1907.5	26615	15	16QAM	75	0	22.12	0-2	2

Table 8-13
LTE Band 25 (PCS) Conducted Powers - 10 MHz Bandwidth
Maximum Power

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1855	26090	10	QPSK	1	0	24.04	0	0
	1855	26090	10	QPSK	1	25	23.69	0	0
	1855	26090	10	QPSK	1	49	23.84	0	0
	1855	26090	10	QPSK	25	0	23.18	0-1	1
	1855	26090	10	QPSK	25	12	22.98	0-1	1
	1855	26090	10	QPSK	25	25	23.04	0-1	1
	1855	26090	10	QPSK	50	0	23.07	0-1	1
	1855	26090	10	16QAM	1	0	23.00	0-1	1
	1855	26090	10	16QAM	1	25	22.89	0-1	1
	1855	26090	10	16QAM	1	49	23.19	0-1	1
	1855	26090	10	16QAM	25	0	22.15	0-2	2
	1855	26090	10	16QAM	25	12	22.16	0-2	2
	1855	26090	10	16QAM	25	25	22.00	0-2	2
	1855	26090	10	16QAM	50	0	22.11	0-2	2
Mid	1882.5	26365	10	QPSK	1	0	24.05	0	0
	1882.5	26365	10	QPSK	1	25	24.19	0	0
	1882.5	26365	10	QPSK	1	49	24.00	0	0
	1882.5	26365	10	QPSK	25	0	22.99	0-1	1
	1882.5	26365	10	QPSK	25	12	22.83	0-1	1
	1882.5	26365	10	QPSK	25	25	22.85	0-1	1
	1882.5	26365	10	QPSK	50	0	22.88	0-1	1
	1882.5	26365	10	16QAM	1	0	22.95	0-1	1
	1882.5	26365	10	16QAM	1	25	22.97	0-1	1
	1882.5	26365	10	16QAM	1	49	22.89	0-1	1
	1882.5	26365	10	16QAM	25	0	21.97	0-2	2
	1882.5	26365	10	16QAM	25	12	21.97	0-2	2
	1882.5	26365	10	16QAM	25	25	21.85	0-2	2
	1882.5	26365	10	16QAM	50	0	21.75	0-2	2
High	1910	26640	10	QPSK	1	0	24.13	0	0
	1910	26640	10	QPSK	1	25	24.09	0	0
	1910	26640	10	QPSK	1	49	23.98	0	0
	1910	26640	10	QPSK	25	0	23.16	0-1	1
	1910	26640	10	QPSK	25	12	22.90	0-1	1
	1910	26640	10	QPSK	25	25	23.01	0-1	1
	1910	26640	10	QPSK	50	0	23.11	0-1	1
	1910	26640	10	16QAM	1	0	23.18	0-1	1
	1910	26640	10	16QAM	1	25	23.13	0-1	1
	1910	26640	10	16QAM	1	49	22.83	0-1	1
	1910	26640	10	16QAM	25	0	22.18	0-2	2
	1910	26640	10	16QAM	25	12	22.05	0-2	2
	1910	26640	10	16QAM	25	25	22.11	0-2	2
	1910	26640	10	16QAM	50	0	22.14	0-2	2

Table 8-14
LTE Band 25 (PCS) Conducted Powers - 5 MHz Bandwidth
Maximum Power

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1852.5	26065	5	QPSK	1	0	24.08	0	0
	1852.5	26065	5	QPSK	1	12	23.78	0	0
	1852.5	26065	5	QPSK	1	24	23.89	0	0
	1852.5	26065	5	QPSK	12	0	23.09	0-1	1
	1852.5	26065	5	QPSK	12	6	22.96	0-1	1
	1852.5	26065	5	QPSK	12	13	22.98	0-1	1
	1852.5	26065	5	QPSK	25	0	22.99	0-1	1
	1852.5	26065	5	16-QAM	1	0	22.94	0-1	1
	1852.5	26065	5	16-QAM	1	12	22.71	0-1	1
	1852.5	26065	5	16-QAM	1	24	23.17	0-1	1
	1852.5	26065	5	16-QAM	12	0	22.18	0-2	2
	1852.5	26065	5	16-QAM	12	6	22.18	0-2	2
	1852.5	26065	5	16-QAM	12	13	22.11	0-2	2
	1852.5	26065	5	16-QAM	25	0	22.04	0-2	2
Mid	1882.5	26365	5	QPSK	1	0	24.18	0	0
	1882.5	26365	5	QPSK	1	12	24.15	0	0
	1882.5	26365	5	QPSK	1	24	24.03	0	0
	1882.5	26365	5	QPSK	12	0	22.92	0-1	1
	1882.5	26365	5	QPSK	12	6	22.84	0-1	1
	1882.5	26365	5	QPSK	12	13	22.87	0-1	1
	1882.5	26365	5	QPSK	25	0	22.92	0-1	1
	1882.5	26365	5	16-QAM	1	0	22.94	0-1	1
	1882.5	26365	5	16-QAM	1	12	22.98	0-1	1
	1882.5	26365	5	16-QAM	1	24	22.91	0-1	1
	1882.5	26365	5	16-QAM	12	0	21.98	0-2	2
	1882.5	26365	5	16-QAM	12	6	21.85	0-2	2
	1882.5	26365	5	16-QAM	12	13	21.88	0-2	2
	1882.5	26365	5	16-QAM	25	0	21.85	0-2	2
High	1912.5	26665	5	QPSK	1	0	24.17	0	0
	1912.5	26665	5	QPSK	1	12	23.96	0	0
	1912.5	26665	5	QPSK	1	24	23.89	0	0
	1912.5	26665	5	QPSK	12	0	23.16	0-1	1
	1912.5	26665	5	QPSK	12	6	23.03	0-1	1
	1912.5	26665	5	QPSK	12	13	22.98	0-1	1
	1912.5	26665	5	QPSK	25	0	23.11	0-1	1
	1912.5	26665	5	16-QAM	1	0	23.04	0-1	1
	1912.5	26665	5	16-QAM	1	12	23.12	0-1	1
	1912.5	26665	5	16-QAM	1	24	22.96	0-1	1
	1912.5	26665	5	16-QAM	12	0	22.16	0-2	2
	1912.5	26665	5	16-QAM	12	6	22.06	0-2	2
	1912.5	26665	5	16-QAM	12	13	22.07	0-2	2
	1912.5	26665	5	16-QAM	25	0	22.19	0-2	2

Table 8-15
LTE Band 25 (PCS) Conducted Powers - 3 MHz Bandwidth
Maximum Power

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1851.5	26055	3	QPSK	1	0	24.09	0	0
	1851.5	26055	3	QPSK	1	7	23.77	0	0
	1851.5	26055	3	QPSK	1	14	23.81	0	0
	1851.5	26055	3	QPSK	8	0	23.12	0-1	1
	1851.5	26055	3	QPSK	8	4	23.07	0-1	1
	1851.5	26055	3	QPSK	8	7	23.05	0-1	1
	1851.5	26055	3	QPSK	15	0	23.07	0-1	1
	1851.5	26055	3	16-QAM	1	0	23.03	0-1	1
	1851.5	26055	3	16-QAM	1	7	22.73	0-1	1
	1851.5	26055	3	16-QAM	1	14	23.20	0-1	1
	1851.5	26055	3	16-QAM	8	0	22.19	0-2	2
	1851.5	26055	3	16-QAM	8	4	22.07	0-2	2
	1851.5	26055	3	16-QAM	8	7	22.01	0-2	2
	1851.5	26055	3	16-QAM	15	0	22.04	0-2	2
Mid	1882.5	26365	3	QPSK	1	0	24.12	0	0
	1882.5	26365	3	QPSK	1	7	24.20	0	0
	1882.5	26365	3	QPSK	1	14	24.00	0	0
	1882.5	26365	3	QPSK	8	0	22.98	0-1	1
	1882.5	26365	3	QPSK	8	4	22.93	0-1	1
	1882.5	26365	3	QPSK	8	7	22.96	0-1	1
	1882.5	26365	3	QPSK	15	0	22.91	0-1	1
	1882.5	26365	3	16-QAM	1	0	22.90	0-1	1
	1882.5	26365	3	16-QAM	1	7	23.01	0-1	1
	1882.5	26365	3	16-QAM	1	14	22.87	0-1	1
	1882.5	26365	3	16-QAM	8	0	22.03	0-2	2
	1882.5	26365	3	16-QAM	8	4	21.83	0-2	2
	1882.5	26365	3	16-QAM	8	7	21.74	0-2	2
	1882.5	26365	3	16-QAM	15	0	21.82	0-2	2
High	1913.5	26675	3	QPSK	1	0	24.06	0	0
	1913.5	26675	3	QPSK	1	7	24.06	0	0
	1913.5	26675	3	QPSK	1	14	23.89	0	0
	1913.5	26675	3	QPSK	8	0	23.16	0-1	1
	1913.5	26675	3	QPSK	8	4	22.93	0-1	1
	1913.5	26675	3	QPSK	8	7	23.00	0-1	1
	1913.5	26675	3	QPSK	15	0	23.04	0-1	1
	1913.5	26675	3	16-QAM	1	0	23.05	0-1	1
	1913.5	26675	3	16-QAM	1	7	23.20	0-1	1
	1913.5	26675	3	16-QAM	1	14	22.83	0-1	1
	1913.5	26675	3	16-QAM	8	0	22.13	0-2	2
	1913.5	26675	3	16-QAM	8	4	22.15	0-2	2
	1913.5	26675	3	16-QAM	8	7	22.10	0-2	2
	1913.5	26675	3	16-QAM	15	0	22.14	0-2	2

Table 8-16
LTE Band 25 (PCS) Conducted Powers -1.4 MHz Bandwidth
Maximum Power

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1850.7	26047	1.4	QPSK	1	0	23.95	0	0
	1850.7	26047	1.4	QPSK	1	2	23.97	0	0
	1850.7	26047	1.4	QPSK	1	5	23.91	0	0
	1850.7	26047	1.4	QPSK	3	0	24.18	0	0
	1850.7	26047	1.4	QPSK	3	2	23.96	0	0
	1850.7	26047	1.4	QPSK	3	3	23.97	0	0
	1850.7	26047	1.4	QPSK	6	0	23.05	0-1	1
	1850.7	26047	1.4	16-QAM	1	0	23.00	0-1	1
	1850.7	26047	1.4	16-QAM	1	2	22.89	0-1	1
	1850.7	26047	1.4	16-QAM	1	5	23.18	0-1	1
	1850.7	26047	1.4	16-QAM	3	0	23.20	0-1	1
	1850.7	26047	1.4	16-QAM	3	2	23.14	0-1	1
	1850.7	26047	1.4	16-QAM	3	3	23.08	0-1	1
	1850.7	26047	1.4	16-QAM	6	0	22.03	0-2	2
Mid	1882.5	26365	1.4	QPSK	1	0	23.95	0	0
	1882.5	26365	1.4	QPSK	1	2	23.79	0	0
	1882.5	26365	1.4	QPSK	1	5	23.86	0	0
	1882.5	26365	1.4	QPSK	3	0	24.20	0	0
	1882.5	26365	1.4	QPSK	3	2	24.03	0	0
	1882.5	26365	1.4	QPSK	3	3	23.95	0	0
	1882.5	26365	1.4	QPSK	6	0	23.08	0-1	1
	1882.5	26365	1.4	16-QAM	1	0	22.96	0-1	1
	1882.5	26365	1.4	16-QAM	1	2	22.70	0-1	1
	1882.5	26365	1.4	16-QAM	1	5	23.15	0-1	1
	1882.5	26365	1.4	16-QAM	3	0	23.19	0-1	1
	1882.5	26365	1.4	16-QAM	3	2	23.13	0-1	1
	1882.5	26365	1.4	16-QAM	3	3	23.10	0-1	1
	1882.5	26365	1.4	16-QAM	6	0	22.03	0-2	2
High	1914.3	26683	1.4	QPSK	1	0	24.00	0	0
	1914.3	26683	1.4	QPSK	1	2	23.72	0	0
	1914.3	26683	1.4	QPSK	1	5	23.89	0	0
	1914.3	26683	1.4	QPSK	3	0	24.18	0	0
	1914.3	26683	1.4	QPSK	3	2	23.97	0	0
	1914.3	26683	1.4	QPSK	3	3	23.98	0	0
	1914.3	26683	1.4	QPSK	6	0	23.10	0-1	1
	1914.3	26683	1.4	16-QAM	1	0	23.08	0-1	1
	1914.3	26683	1.4	16-QAM	1	2	22.72	0-1	1
	1914.3	26683	1.4	16-QAM	1	5	23.19	0-1	1
	1914.3	26683	1.4	16-QAM	3	0	23.20	0-1	1
	1914.3	26683	1.4	16-QAM	3	2	23.11	0-1	1
	1914.3	26683	1.4	16-QAM	3	3	23.08	0-1	1
	1914.3	26683	1.4	16-QAM	6	0	22.06	0-2	2

Table 8-17
LTE Band 25 (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]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1860	26140	20	QPSK	1	0	**14.19**	0	0
	1860	26140	20	QPSK	1	50	14.16	0	0
	1860	26140	20	QPSK	1	99	14.17	0	0
	1860	26140	20	QPSK	50	0	14.01	0-1	0
	1860	26140	20	QPSK	50	25	14.10	0-1	0
	1860	26140	20	QPSK	50	50	**14.18**	0-1	0
	1860	26140	20	QPSK	100	0	14.01	0-1	0
	1860	26140	20	16QAM	1	0	14.14	0-1	0
	1860	26140	20	16QAM	1	50	14.15	0-1	0
	1860	26140	20	16QAM	1	99	14.05	0-1	0
	1860	26140	20	16QAM	50	0	14.04	0-2	0
	1860	26140	20	16QAM	50	25	14.03	0-2	0
	1860	26140	20	16QAM	50	50	14.10	0-2	0
	1860	26140	20	16QAM	100	0	14.15	0-2	0
Mid	1882.5	26365	20	QPSK	1	0	14.17	0	0
	1882.5	26365	20	QPSK	1	50	14.11	0	0
	1882.5	26365	20	QPSK	1	99	14.15	0	0
	1882.5	26365	20	QPSK	50	0	14.15	0-1	0
	1882.5	26365	20	QPSK	50	25	14.13	0-1	0
	1882.5	26365	20	QPSK	50	50	14.17	0-1	0
	1882.5	26365	20	QPSK	100	0	14.10	0-1	0
	1882.5	26365	20	16QAM	1	0	14.18	0-1	0
	1882.5	26365	20	16QAM	1	50	14.13	0-1	0
	1882.5	26365	20	16QAM	1	99	14.14	0-1	0
	1882.5	26365	20	16QAM	50	0	14.16	0-2	0
	1882.5	26365	20	16QAM	50	25	14.16	0-2	0
	1882.5	26365	20	16QAM	50	50	14.10	0-2	0
	1882.5	26365	20	16QAM	100	0	14.11	0-2	0
High	1905	26590	20	QPSK	1	0	14.10	0	0
	1905	26590	20	QPSK	1	50	14.15	0	0
	1905	26590	20	QPSK	1	99	14.15	0	0
	1905	26590	20	QPSK	50	0	14.10	0-1	0
	1905	26590	20	QPSK	50	25	14.14	0-1	0
	1905	26590	20	QPSK	50	50	14.15	0-1	0
	1905	26590	20	QPSK	100	0	14.05	0-1	0
	1905	26590	20	16QAM	1	0	14.19	0-1	0
	1905	26590	20	16QAM	1	50	14.03	0-1	0
	1905	26590	20	16QAM	1	99	14.00	0-1	0
	1905	26590	20	16QAM	50	0	14.01	0-2	0
	1905	26590	20	16QAM	50	25	14.03	0-2	0
	1905	26590	20	16QAM	50	50	14.01	0-2	0
	1905	26590	20	16QAM	100	0	14.10	0-2	0

Table 8-18
LTE Band 25 (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]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1857.5	26115	15	QPSK	1	0	14.20	0	0
	1857.5	26115	15	QPSK	1	36	14.13	0	0
	1857.5	26115	15	QPSK	1	74	14.07	0	0
	1857.5	26115	15	QPSK	36	0	14.06	0-1	0
	1857.5	26115	15	QPSK	36	18	14.16	0-1	0
	1857.5	26115	15	QPSK	36	37	14.14	0-1	0
	1857.5	26115	15	QPSK	75	0	13.96	0-1	0
	1857.5	26115	15	16QAM	1	0	14.12	0-1	0
	1857.5	26115	15	16QAM	1	36	14.10	0-1	0
	1857.5	26115	15	16QAM	1	74	14.10	0-1	0
	1857.5	26115	15	16QAM	36	0	14.02	0-2	0
	1857.5	26115	15	16QAM	36	18	14.03	0-2	0
	1857.5	26115	15	16QAM	36	37	14.13	0-2	0
	1857.5	26115	15	16QAM	75	0	14.12	0-2	0
Mid	1882.5	26365	15	QPSK	1	0	14.12	0	0
	1882.5	26365	15	QPSK	1	36	14.06	0	0
	1882.5	26365	15	QPSK	1	74	14.18	0	0
	1882.5	26365	15	QPSK	36	0	14.18	0-1	0
	1882.5	26365	15	QPSK	36	18	14.16	0-1	0
	1882.5	26365	15	QPSK	36	37	14.08	0-1	0
	1882.5	26365	15	QPSK	75	0	14.08	0-1	0
	1882.5	26365	15	16QAM	1	0	14.15	0-1	0
	1882.5	26365	15	16QAM	1	36	14.20	0-1	0
	1882.5	26365	15	16QAM	1	74	14.15	0-1	0
	1882.5	26365	15	16QAM	36	0	14.13	0-2	0
	1882.5	26365	15	16QAM	36	18	14.15	0-2	0
	1882.5	26365	15	16QAM	36	37	14.18	0-2	0
	1882.5	26365	15	16QAM	75	0	14.09	0-2	0
High	1907.5	26615	15	QPSK	1	0	14.10	0	0
	1907.5	26615	15	QPSK	1	36	14.20	0	0
	1907.5	26615	15	QPSK	1	74	14.08	0	0
	1907.5	26615	15	QPSK	36	0	14.17	0-1	0
	1907.5	26615	15	QPSK	36	18	14.15	0-1	0
	1907.5	26615	15	QPSK	36	37	14.14	0-1	0
	1907.5	26615	15	QPSK	75	0	14.00	0-1	0
	1907.5	26615	15	16QAM	1	0	14.20	0-1	0
	1907.5	26615	15	16QAM	1	36	14.09	0-1	0
	1907.5	26615	15	16QAM	1	74	14.10	0-1	0
	1907.5	26615	15	16QAM	36	0	14.09	0-2	0
	1907.5	26615	15	16QAM	36	18	14.02	0-2	0
	1907.5	26615	15	16QAM	36	37	13.99	0-2	0
	1907.5	26615	15	16QAM	75	0	14.13	0-2	0

Table 8-19
LTE Band 25 (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]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1855	26090	10	QPSK	1	0	14.18	0	0
	1855	26090	10	QPSK	1	25	14.20	0	0
	1855	26090	10	QPSK	1	49	14.19	0	0
	1855	26090	10	QPSK	25	0	14.10	0-1	0
	1855	26090	10	QPSK	25	12	14.08	0-1	0
	1855	26090	10	QPSK	25	25	14.20	0-1	0
	1855	26090	10	QPSK	50	0	13.96	0-1	0
	1855	26090	10	16QAM	1	0	14.18	0-1	0
	1855	26090	10	16QAM	1	25	14.07	0-1	0
	1855	26090	10	16QAM	1	49	14.13	0-1	0
	1855	26090	10	16QAM	25	0	14.07	0-2	0
	1855	26090	10	16QAM	25	12	13.98	0-2	0
	1855	26090	10	16QAM	25	25	14.19	0-2	0
	1855	26090	10	16QAM	50	0	14.18	0-2	0
Mid	1882.5	26365	10	QPSK	1	0	14.09	0	0
	1882.5	26365	10	QPSK	1	25	14.13	0	0
	1882.5	26365	10	QPSK	1	49	14.16	0	0
	1882.5	26365	10	QPSK	25	0	14.14	0-1	0
	1882.5	26365	10	QPSK	25	12	14.14	0-1	0
	1882.5	26365	10	QPSK	25	25	14.12	0-1	0
	1882.5	26365	10	QPSK	50	0	14.11	0-1	0
	1882.5	26365	10	16QAM	1	0	14.19	0-1	0
	1882.5	26365	10	16QAM	1	25	14.15	0-1	0
	1882.5	26365	10	16QAM	1	49	14.15	0-1	0
	1882.5	26365	10	16QAM	25	0	14.20	0-2	0
	1882.5	26365	10	16QAM	25	12	14.17	0-2	0
	1882.5	26365	10	16QAM	25	25	14.20	0-2	0
	1882.5	26365	10	16QAM	50	0	14.13	0-2	0
High	1910	26640	10	QPSK	1	0	14.10	0	0
	1910	26640	10	QPSK	1	25	14.13	0	0
	1910	26640	10	QPSK	1	49	14.11	0	0
	1910	26640	10	QPSK	25	0	14.15	0-1	0
	1910	26640	10	QPSK	25	12	14.19	0-1	0
	1910	26640	10	QPSK	25	25	14.14	0-1	0
	1910	26640	10	QPSK	50	0	14.12	0-1	0
	1910	26640	10	16QAM	1	0	14.20	0-1	0
	1910	26640	10	16QAM	1	25	14.00	0-1	0
	1910	26640	10	16QAM	1	49	14.04	0-1	0
	1910	26640	10	16QAM	25	0	14.07	0-2	0
	1910	26640	10	16QAM	25	12	13.98	0-2	0
	1910	26640	10	16QAM	25	25	14.09	0-2	0
	1910	26640	10	16QAM	50	0	14.08	0-2	0

Table 8-20
LTE Band 25 (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]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1852.5	26065	5	QPSK	1	0	14.16	0	0
	1852.5	26065	5	QPSK	1	12	14.13	0	0
	1852.5	26065	5	QPSK	1	24	14.13	0	0
	1852.5	26065	5	QPSK	12	0	14.09	0-1	0
	1852.5	26065	5	QPSK	12	6	14.18	0-1	0
	1852.5	26065	5	QPSK	12	13	14.03	0-1	0
	1852.5	26065	5	QPSK	25	0	13.99	0-1	0
	1852.5	26065	5	16-QAM	1	0	14.15	0-1	0
	1852.5	26065	5	16-QAM	1	12	14.15	0-1	0
	1852.5	26065	5	16-QAM	1	24	14.04	0-1	0
	1852.5	26065	5	16-QAM	12	0	14.03	0-2	0
	1852.5	26065	5	16-QAM	12	6	14.01	0-2	0
	1852.5	26065	5	16-QAM	12	13	14.18	0-2	0
	1852.5	26065	5	16-QAM	25	0	14.16	0-2	0
Mid	1882.5	26365	5	QPSK	1	0	14.13	0	0
	1882.5	26365	5	QPSK	1	12	14.15	0	0
	1882.5	26365	5	QPSK	1	24	14.02	0	0
	1882.5	26365	5	QPSK	12	0	14.15	0-1	0
	1882.5	26365	5	QPSK	12	6	14.15	0-1	0
	1882.5	26365	5	QPSK	12	13	14.09	0-1	0
	1882.5	26365	5	QPSK	25	0	14.05	0-1	0
	1882.5	26365	5	16-QAM	1	0	14.15	0-1	0
	1882.5	26365	5	16-QAM	1	12	14.18	0-1	0
	1882.5	26365	5	16-QAM	1	24	14.19	0-1	0
	1882.5	26365	5	16-QAM	12	0	14.16	0-2	0
	1882.5	26365	5	16-QAM	12	6	14.17	0-2	0
	1882.5	26365	5	16-QAM	12	13	14.20	0-2	0
	1882.5	26365	5	16-QAM	25	0	14.19	0-2	0
High	1912.5	26665	5	QPSK	1	0	14.15	0	0
	1912.5	26665	5	QPSK	1	12	14.20	0	0
	1912.5	26665	5	QPSK	1	24	14.12	0	0
	1912.5	26665	5	QPSK	12	0	14.05	0-1	0
	1912.5	26665	5	QPSK	12	6	14.09	0-1	0
	1912.5	26665	5	QPSK	12	13	14.18	0-1	0
	1912.5	26665	5	QPSK	25	0	14.03	0-1	0
	1912.5	26665	5	16-QAM	1	0	14.13	0-1	0
	1912.5	26665	5	16-QAM	1	12	14.11	0-1	0
	1912.5	26665	5	16-QAM	1	24	14.05	0-1	0
	1912.5	26665	5	16-QAM	12	0	13.98	0-2	0
	1912.5	26665	5	16-QAM	12	6	14.00	0-2	0
	1912.5	26665	5	16-QAM	12	13	14.09	0-2	0
	1912.5	26665	5	16-QAM	25	0	14.07	0-2	0

Table 8-21
LTE Band 25 (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]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1851.5	26055	3	QPSK	1	0	14.16	0	0
	1851.5	26055	3	QPSK	1	7	14.12	0	0
	1851.5	26055	3	QPSK	1	14	14.19	0	0
	1851.5	26055	3	QPSK	8	0	13.97	0-1	0
	1851.5	26055	3	QPSK	8	4	14.13	0-1	0
	1851.5	26055	3	QPSK	8	7	14.16	0-1	0
	1851.5	26055	3	QPSK	15	0	14.06	0-1	0
	1851.5	26055	3	16-QAM	1	0	14.15	0-1	0
	1851.5	26055	3	16-QAM	1	7	14.15	0-1	0
	1851.5	26055	3	16-QAM	1	14	14.04	0-1	0
	1851.5	26055	3	16-QAM	8	0	13.99	0-2	0
	1851.5	26055	3	16-QAM	8	4	14.04	0-2	0
	1851.5	26055	3	16-QAM	8	7	14.12	0-2	0
	1851.5	26055	3	16-QAM	15	0	14.14	0-2	0
Mid	1882.5	26365	3	QPSK	1	0	14.15	0	0
	1882.5	26365	3	QPSK	1	7	14.12	0	0
	1882.5	26365	3	QPSK	1	14	14.10	0	0
	1882.5	26365	3	QPSK	8	0	14.14	0-1	0
	1882.5	26365	3	QPSK	8	4	14.18	0-1	0
	1882.5	26365	3	QPSK	8	7	14.16	0-1	0
	1882.5	26365	3	QPSK	15	0	14.18	0-1	0
	1882.5	26365	3	16-QAM	1	0	14.16	0-1	0
	1882.5	26365	3	16-QAM	1	7	14.13	0-1	0
	1882.5	26365	3	16-QAM	1	14	14.08	0-1	0
	1882.5	26365	3	16-QAM	8	0	14.12	0-2	0
	1882.5	26365	3	16-QAM	8	4	14.17	0-2	0
	1882.5	26365	3	16-QAM	8	7	14.13	0-2	0
	1882.5	26365	3	16-QAM	15	0	14.20	0-2	0
High	1913.5	26675	3	QPSK	1	0	14.13	0	0
	1913.5	26675	3	QPSK	1	7	14.16	0	0
	1913.5	26675	3	QPSK	1	14	14.10	0	0
	1913.5	26675	3	QPSK	8	0	14.19	0-1	0
	1913.5	26675	3	QPSK	8	4	14.15	0-1	0
	1913.5	26675	3	QPSK	8	7	14.12	0-1	0
	1913.5	26675	3	QPSK	15	0	14.02	0-1	0
	1913.5	26675	3	16-QAM	1	0	14.14	0-1	0
	1913.5	26675	3	16-QAM	1	7	14.07	0-1	0
	1913.5	26675	3	16-QAM	1	14	13.96	0-1	0
	1913.5	26675	3	16-QAM	8	0	14.00	0-2	0
	1913.5	26675	3	16-QAM	8	4	14.03	0-2	0
	1913.5	26675	3	16-QAM	8	7	14.07	0-2	0
	1913.5	26675	3	16-QAM	15	0	14.20	0-2	0

Table 8-22
LTE Band 25 (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]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1850.7	26047	1.4	QPSK	1	0	14.20	0	0
	1850.7	26047	1.4	QPSK	1	2	14.14	0	0
	1850.7	26047	1.4	QPSK	1	5	14.13	0	0
	1850.7	26047	1.4	QPSK	3	0	14.11	0	0
	1850.7	26047	1.4	QPSK	3	2	14.18	0	0
	1850.7	26047	1.4	QPSK	3	3	14.19	0	0
	1850.7	26047	1.4	QPSK	6	0	14.02	0-1	0
	1850.7	26047	1.4	16-QAM	1	0	14.09	0-1	0
	1850.7	26047	1.4	16-QAM	1	2	14.12	0-1	0
	1850.7	26047	1.4	16-QAM	1	5	14.13	0-1	0
	1850.7	26047	1.4	16-QAM	3	0	14.13	0-1	0
	1850.7	26047	1.4	16-QAM	3	2	13.99	0-1	0
	1850.7	26047	1.4	16-QAM	3	3	14.06	0-1	0
	1850.7	26047	1.4	16-QAM	6	0	14.15	0-2	0
Mid	1882.5	26365	1.4	QPSK	1	0	14.14	0	0
	1882.5	26365	1.4	QPSK	1	2	14.08	0	0
	1882.5	26365	1.4	QPSK	1	5	14.03	0	0
	1882.5	26365	1.4	QPSK	3	0	14.14	0	0
	1882.5	26365	1.4	QPSK	3	2	14.19	0	0
	1882.5	26365	1.4	QPSK	3	3	14.07	0	0
	1882.5	26365	1.4	QPSK	6	0	14.16	0-1	0
	1882.5	26365	1.4	16-QAM	1	0	14.16	0-1	0
	1882.5	26365	1.4	16-QAM	1	2	14.10	0-1	0
	1882.5	26365	1.4	16-QAM	1	5	14.03	0-1	0
	1882.5	26365	1.4	16-QAM	3	0	14.19	0-1	0
	1882.5	26365	1.4	16-QAM	3	2	14.14	0-1	0
	1882.5	26365	1.4	16-QAM	3	3	14.13	0-1	0
	1882.5	26365	1.4	16-QAM	6	0	14.20	0-2	0
High	1914.3	26683	1.4	QPSK	1	0	14.13	0	0
	1914.3	26683	1.4	QPSK	1	2	14.16	0	0
	1914.3	26683	1.4	QPSK	1	5	14.13	0	0
	1914.3	26683	1.4	QPSK	3	0	14.14	0	0
	1914.3	26683	1.4	QPSK	3	2	14.16	0	0
	1914.3	26683	1.4	QPSK	3	3	14.19	0	0
	1914.3	26683	1.4	QPSK	6	0	14.06	0-1	0
	1914.3	26683	1.4	16-QAM	1	0	14.16	0-1	0
	1914.3	26683	1.4	16-QAM	1	2	14.09	0-1	0
	1914.3	26683	1.4	16-QAM	1	5	14.08	0-1	0
	1914.3	26683	1.4	16-QAM	3	0	14.06	0-1	0
	1914.3	26683	1.4	16-QAM	3	2	14.12	0-1	0
	1914.3	26683	1.4	16-QAM	3	3	14.11	0-1	0
	1914.3	26683	1.4	16-QAM	6	0	14.17	0-2	0

8.1.3 LTE Band 41

Table 8-23
LTE Band 41 Conducted Powers - 20 MHz Bandwidth
Maximum Power

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	2506	39750	20	QPSK	1	0	**24.70**	0	0
	2506	39750	20	QPSK	1	50	24.50	0	0
	2506	39750	20	QPSK	1	99	24.24	0	0
	2506	39750	20	QPSK	50	0	**23.61**	0-1	1
	2506	39750	20	QPSK	50	25	23.40	0-1	1
	2506	39750	20	QPSK	50	50	23.55	0-1	1
	2506	39750	20	QPSK	100	0	23.39	0-1	1
	2506	39750	20	16QAM	1	0	23.29	0-1	1
	2506	39750	20	16QAM	1	50	23.40	0-1	1
	2506	39750	20	16QAM	1	99	23.39	0-1	1
	2506	39750	20	16QAM	50	0	22.38	0-2	2
	2506	39750	20	16QAM	50	25	22.48	0-2	2
	2506	39750	20	16QAM	50	50	22.43	0-2	2
	2506	39750	20	16QAM	100	0	22.30	0-2	2
Low Mid	2549.5	40185	20	QPSK	1	0	24.57	0	0
	2549.5	40185	20	QPSK	1	50	24.50	0	0
	2549.5	40185	20	QPSK	1	99	24.51	0	0
	2549.5	40185	20	QPSK	50	0	23.47	0-1	1
	2549.5	40185	20	QPSK	50	25	23.44	0-1	1
	2549.5	40185	20	QPSK	50	50	23.20	0-1	1
	2549.5	40185	20	QPSK	100	0	23.23	0-1	1
	2549.5	40185	20	16-QAM	1	0	23.27	0-1	1
	2549.5	40185	20	16-QAM	1	50	23.45	0-1	1
	2549.5	40185	20	16-QAM	1	99	23.33	0-1	1
	2549.5	40185	20	16-QAM	50	0	22.28	0-2	2
	2549.5	40185	20	16-QAM	50	25	22.47	0-2	2
	2549.5	40185	20	16-QAM	50	50	22.49	0-2	2
	2549.5	40185	20	16-QAM	100	0	22.30	0-2	2
Mid	2593	40620	20	QPSK	1	0	24.60	0	0
	2593	40620	20	QPSK	1	50	24.59	0	0
	2593	40620	20	QPSK	1	99	24.40	0	0
	2593	40620	20	QPSK	50	0	23.53	0-1	1
	2593	40620	20	QPSK	50	25	23.60	0-1	1
	2593	40620	20	QPSK	50	50	23.55	0-1	1
	2593	40620	20	QPSK	100	0	23.38	0-1	1
	2593	40620	20	16-QAM	1	0	23.40	0-1	1
	2593	40620	20	16-QAM	1	50	23.54	0-1	1
	2593	40620	20	16-QAM	1	99	23.44	0-1	1
	2593	40620	20	16-QAM	50	0	22.25	0-2	2
	2593	40620	20	16-QAM	50	25	22.37	0-2	2
	2593	40620	20	16-QAM	50	50	22.30	0-2	2
	2593	40620	20	16-QAM	100	0	22.30	0-2	2
Mid High	2636.5	41055	20	QPSK	1	0	24.47	0	0
	2636.5	41055	20	QPSK	1	50	24.46	0	0
	2636.5	41055	20	QPSK	1	99	24.30	0	0
	2636.5	41055	20	QPSK	50	0	23.38	0-1	1
	2636.5	41055	20	QPSK	50	25	23.34	0-1	1
	2636.5	41055	20	QPSK	50	50	23.50	0-1	1
	2636.5	41055	20	QPSK	100	0	23.28	0-1	1
	2636.5	41055	20	16-QAM	1	0	23.40	0-1	1
	2636.5	41055	20	16-QAM	1	50	23.33	0-1	1
	2636.5	41055	20	16-QAM	1	99	23.35	0-1	1
	2636.5	41055	20	16-QAM	50	0	22.29	0-2	2
	2636.5	41055	20	16-QAM	50	25	22.45	0-2	2
	2636.5	41055	20	16-QAM	50	50	22.39	0-2	2
	2636.5	41055	20	16-QAM	100	0	22.35	0-2	2
High	2680	41490	20	QPSK	1	0	24.52	0	0
	2680	41490	20	QPSK	1	50	24.53	0	0
	2680	41490	20	QPSK	1	99	24.55	0	0
	2680	41490	20	QPSK	50	0	23.40	0-1	1
	2680	41490	20	QPSK	50	25	23.48	0-1	1
	2680	41490	20	QPSK	50	50	23.34	0-1	1
	2680	41490	20	QPSK	100	0	23.32	0-1	1
	2680	41490	20	16-QAM	1	0	23.36	0-1	1
	2680	41490	20	16-QAM	1	50	23.45	0-1	1
	2680	41490	20	16-QAM	1	99	23.24	0-1	1
	2680	41490	20	16-QAM	50	0	22.29	0-2	2
	2680	41490	20	16-QAM	50	25	22.27	0-2	2
	2680	41490	20	16-QAM	50	50	22.34	0-2	2
	2680	41490	20	16-QAM	100	0	22.31	0-2	2

Table 8-24
LTE Band 41 Conducted Powers - 15 MHz Bandwidth
Maximum Power

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	2503.5	39725	15	QPSK	1	0	24.70	0	0
	2503.5	39725	15	QPSK	1	36	24.49	0	0
	2503.5	39725	15	QPSK	1	74	24.20	0	0
	2503.5	39725	15	QPSK	36	0	23.62	0-1	1
	2503.5	39725	15	QPSK	36	18	23.36	0-1	1
	2503.5	39725	15	QPSK	36	37	23.52	0-1	1
	2503.5	39725	15	QPSK	75	0	23.37	0-1	1
	2503.5	39725	15	16QAM	1	0	23.30	0-1	1
	2503.5	39725	15	16QAM	1	36	23.38	0-1	1
	2503.5	39725	15	16QAM	1	74	23.43	0-1	1
	2503.5	39725	15	16QAM	36	0	22.40	0-2	2
	2503.5	39725	15	16QAM	36	18	22.49	0-2	2
	2503.5	39725	15	16QAM	36	37	22.52	0-2	2
	2503.5	39725	15	16QAM	75	0	22.31	0-2	2
Low Mid	2548.25	40173	15	QPSK	1	0	24.53	0	0
	2548.25	40173	15	QPSK	1	36	24.47	0	0
	2548.25	40173	15	QPSK	1	74	24.54	0	0
	2548.25	40173	15	QPSK	36	0	23.49	0-1	1
	2548.25	40173	15	QPSK	36	18	23.48	0-1	1
	2548.25	40173	15	QPSK	36	37	23.23	0-1	1
	2548.25	40173	15	QPSK	75	0	23.20	0-1	1
	2548.25	40173	15	16-QAM	1	0	23.23	0-1	1
	2548.25	40173	15	16-QAM	1	36	23.42	0-1	1
	2548.25	40173	15	16-QAM	1	74	23.37	0-1	1
	2548.25	40173	15	16-QAM	36	0	22.25	0-2	2
	2548.25	40173	15	16-QAM	36	18	22.54	0-2	2
	2548.25	40173	15	16-QAM	36	37	22.45	0-2	2
	2548.25	40173	15	16-QAM	75	0	22.33	0-2	2
Mid	2593	40620	15	QPSK	1	0	24.69	0	0
	2593	40620	15	QPSK	1	36	24.69	0	0
	2593	40620	15	QPSK	1	74	24.36	0	0
	2593	40620	15	QPSK	36	0	23.63	0-1	1
	2593	40620	15	QPSK	36	18	23.65	0-1	1
	2593	40620	15	QPSK	36	37	23.57	0-1	1
	2593	40620	15	QPSK	75	0	23.42	0-1	1
	2593	40620	15	16-QAM	1	0	23.39	0-1	1
	2593	40620	15	16-QAM	1	36	23.57	0-1	1
	2593	40620	15	16-QAM	1	74	23.54	0-1	1
	2593	40620	15	16-QAM	36	0	22.22	0-2	2
	2593	40620	15	16-QAM	36	18	22.46	0-2	2
	2593	40620	15	16-QAM	36	37	22.25	0-2	2
	2593	40620	15	16-QAM	75	0	22.26	0-2	2
Mid High	2637.75	41068	15	QPSK	1	0	24.56	0	0
	2637.75	41068	15	QPSK	1	36	24.46	0	0
	2637.75	41068	15	QPSK	1	74	24.39	0	0
	2637.75	41068	15	QPSK	36	0	23.39	0-1	1
	2637.75	41068	15	QPSK	36	18	23.31	0-1	1
	2637.75	41068	15	QPSK	36	37	23.60	0-1	1
	2637.75	41068	15	QPSK	75	0	23.26	0-1	1
	2637.75	41068	15	16-QAM	1	0	23.45	0-1	1
	2637.75	41068	15	16-QAM	1	36	23.28	0-1	1
	2637.75	41068	15	16-QAM	1	74	23.45	0-1	1
	2637.75	41068	15	16-QAM	36	0	22.37	0-2	2
	2637.75	41068	15	16-QAM	36	18	22.46	0-2	2
	2637.75	41068	15	16-QAM	36	37	22.37	0-2	2
	2637.75	41068	15	16-QAM	75	0	22.33	0-2	2
High	2682.5	41515	15	QPSK	1	0	24.54	0	0
	2682.5	41515	15	QPSK	1	36	24.63	0	0
	2682.5	41515	15	QPSK	1	74	24.64	0	0
	2682.5	41515	15	QPSK	36	0	23.41	0-1	1
	2682.5	41515	15	QPSK	36	18	23.58	0-1	1
	2682.5	41515	15	QPSK	36	37	23.39	0-1	1
	2682.5	41515	15	QPSK	75	0	23.30	0-1	1
	2682.5	41515	15	16-QAM	1	0	23.32	0-1	1
	2682.5	41515	15	16-QAM	1	36	23.51	0-1	1
	2682.5	41515	15	16-QAM	1	74	23.24	0-1	1
	2682.5	41515	15	16-QAM	36	0	22.34	0-2	2
	2682.5	41515	15	16-QAM	36	18	22.22	0-2	2
	2682.5	41515	15	16-QAM	36	37	22.30	0-2	2
	2682.5	41515	15	16-QAM	75	0	22.31	0-2	2

Table 8-25
LTE Band 41 Conducted Powers - 10 MHz Bandwidth
Maximum Power

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	2501	39700	10	QPSK	1	0	24.70	0	0
	2501	39700	10	QPSK	1	25	24.49	0	0
	2501	39700	10	QPSK	1	49	24.33	0	0
	2501	39700	10	QPSK	25	0	23.68	0-1	1
	2501	39700	10	QPSK	25	12	23.37	0-1	1
	2501	39700	10	QPSK	25	25	23.50	0-1	1
	2501	39700	10	QPSK	50	0	23.44	0-1	1
	2501	39700	10	16QAM	1	0	23.33	0-1	1
	2501	39700	10	16QAM	1	25	23.41	0-1	1
	2501	39700	10	16QAM	1	49	23.37	0-1	1
	2501	39700	10	16QAM	25	0	22.40	0-2	2
	2501	39700	10	16QAM	25	12	22.52	0-2	2
	2501	39700	10	16QAM	25	25	22.39	0-2	2
	2501	39700	10	16QAM	50	0	22.39	0-2	2
Low Mid	2547	40160	10	QPSK	1	0	24.53	0	0
	2547	40160	10	QPSK	1	25	24.60	0	0
	2547	40160	10	QPSK	1	49	24.53	0	0
	2547	40160	10	QPSK	25	0	23.56	0-1	1
	2547	40160	10	QPSK	25	12	23.41	0-1	1
	2547	40160	10	QPSK	25	25	23.24	0-1	1
	2547	40160	10	QPSK	50	0	23.24	0-1	1
	2547	40160	10	16-QAM	1	0	23.24	0-1	1
	2547	40160	10	16-QAM	1	25	23.45	0-1	1
	2547	40160	10	16-QAM	1	49	23.28	0-1	1
	2547	40160	10	16-QAM	25	0	22.36	0-2	2
	2547	40160	10	16-QAM	25	12	22.56	0-2	2
	2547	40160	10	16-QAM	25	25	22.54	0-2	2
	2547	40160	10	16-QAM	50	0	22.28	0-2	2
Mid	2593	40620	10	QPSK	1	0	24.68	0	0
	2593	40620	10	QPSK	1	25	24.68	0	0
	2593	40620	10	QPSK	1	49	24.35	0	0
	2593	40620	10	QPSK	25	0	23.59	0-1	1
	2593	40620	10	QPSK	25	12	23.57	0-1	1
	2593	40620	10	QPSK	25	25	23.59	0-1	1
	2593	40620	10	QPSK	50	0	23.42	0-1	1
	2593	40620	10	16-QAM	1	0	23.49	0-1	1
	2593	40620	10	16-QAM	1	25	23.59	0-1	1
	2593	40620	10	16-QAM	1	49	23.54	0-1	1
	2593	40620	10	16-QAM	25	0	22.20	0-2	2
	2593	40620	10	16-QAM	25	12	22.36	0-2	2
	2593	40620	10	16-QAM	25	25	22.25	0-2	2
	2593	40620	10	16-QAM	50	0	22.25	0-2	2
Mid High	2639	41080	10	QPSK	1	0	24.53	0	0
	2639	41080	10	QPSK	1	25	24.53	0	0
	2639	41080	10	QPSK	1	49	24.30	0	0
	2639	41080	10	QPSK	25	0	23.48	0-1	1
	2639	41080	10	QPSK	25	12	23.32	0-1	1
	2639	41080	10	QPSK	25	25	23.47	0-1	1
	2639	41080	10	QPSK	50	0	23.38	0-1	1
	2639	41080	10	16-QAM	1	0	23.44	0-1	1
	2639	41080	10	16-QAM	1	25	23.40	0-1	1
	2639	41080	10	16-QAM	1	49	23.45	0-1	1
	2639	41080	10	16-QAM	25	0	22.36	0-2	2
	2639	41080	10	16-QAM	25	12	22.40	0-2	2
	2639	41080	10	16-QAM	25	25	22.34	0-2	2
	2639	41080	10	16-QAM	50	0	22.43	0-2	2
High	2685	41540	10	QPSK	1	0	24.49	0	0
	2685	41540	10	QPSK	1	25	24.55	0	0
	2685	41540	10	QPSK	1	49	24.59	0	0
	2685	41540	10	QPSK	25	0	23.42	0-1	1
	2685	41540	10	QPSK	25	12	23.46	0-1	1
	2685	41540	10	QPSK	25	25	23.40	0-1	1
	2685	41540	10	QPSK	50	0	23.33	0-1	1
	2685	41540	10	16-QAM	1	0	23.43	0-1	1
	2685	41540	10	16-QAM	1	25	23.45	0-1	1
	2685	41540	10	16-QAM	1	49	23.34	0-1	1
	2685	41540	10	16-QAM	25	0	22.33	0-2	2
	2685	41540	10	16-QAM	25	12	22.30	0-2	2
	2685	41540	10	16-QAM	25	25	22.41	0-2	2
	2685	41540	10	16-QAM	50	0	22.40	0-2	2

Table 8-26
LTE Band 41 Conducted Powers - 5 MHz Bandwidth
Maximum Power

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	2498.5	39675	5	QPSK	1	0	24.68	0	0
	2498.5	39675	5	QPSK	1	12	24.54	0	0
	2498.5	39675	5	QPSK	1	24	24.28	0	0
	2498.5	39675	5	QPSK	12	0	23.66	0-1	1
	2498.5	39675	5	QPSK	12	6	23.43	0-1	1
	2498.5	39675	5	QPSK	12	13	23.63	0-1	1
	2498.5	39675	5	QPSK	25	0	23.47	0-1	1
	2498.5	39675	5	16-QAM	1	0	23.27	0-1	1
	2498.5	39675	5	16-QAM	1	12	23.50	0-1	1
	2498.5	39675	5	16-QAM	1	24	23.35	0-1	1
	2498.5	39675	5	16-QAM	12	0	22.45	0-2	2
	2498.5	39675	5	16-QAM	12	6	22.45	0-2	2
	2498.5	39675	5	16-QAM	12	13	22.42	0-2	2
	2498.5	39675	5	16-QAM	25	0	22.30	0-2	2
Low Mid	2545.75	40148	5	QPSK	1	0	24.61	0	0
	2545.75	40148	5	QPSK	1	12	24.51	0	0
	2545.75	40148	5	QPSK	1	24	24.61	0	0
	2545.75	40148	5	QPSK	12	0	23.49	0-1	1
	2545.75	40148	5	QPSK	12	6	23.51	0-1	1
	2545.75	40148	5	QPSK	12	13	23.26	0-1	1
	2545.75	40148	5	QPSK	25	0	23.22	0-1	1
	2545.75	40148	5	16-QAM	1	0	23.31	0-1	1
	2545.75	40148	5	16-QAM	1	12	23.49	0-1	1
	2545.75	40148	5	16-QAM	1	24	23.29	0-1	1
	2545.75	40148	5	16-QAM	12	0	22.27	0-2	2
	2545.75	40148	5	16-QAM	12	6	22.49	0-2	2
	2545.75	40148	5	16-QAM	12	13	22.56	0-2	2
	2545.75	40148	5	16-QAM	25	0	22.39	0-2	2
Mid	2593	40620	5	QPSK	1	0	24.67	0	0
	2593	40620	5	QPSK	1	12	24.56	0	0
	2593	40620	5	QPSK	1	24	24.46	0	0
	2593	40620	5	QPSK	12	0	23.51	0-1	1
	2593	40620	5	QPSK	12	6	23.58	0-1	1
	2593	40620	5	QPSK	12	13	23.60	0-1	1
	2593	40620	5	QPSK	25	0	23.46	0-1	1
	2593	40620	5	16-QAM	1	0	23.40	0-1	1
	2593	40620	5	16-QAM	1	12	23.62	0-1	1
	2593	40620	5	16-QAM	1	24	23.49	0-1	1
	2593	40620	5	16-QAM	12	0	22.31	0-2	2
	2593	40620	5	16-QAM	12	6	22.43	0-2	2
	2593	40620	5	16-QAM	12	13	22.35	0-2	2
	2593	40620	5	16-QAM	25	0	22.33	0-2	2
Mid High	2640.25	41093	5	QPSK	1	0	24.47	0	0
	2640.25	41093	5	QPSK	1	12	24.41	0	0
	2640.25	41093	5	QPSK	1	24	24.37	0	0
	2640.25	41093	5	QPSK	12	0	23.48	0-1	1
	2640.25	41093	5	QPSK	12	6	23.40	0-1	1
	2640.25	41093	5	QPSK	12	13	23.55	0-1	1
	2640.25	41093	5	QPSK	25	0	23.25	0-1	1
	2640.25	41093	5	16-QAM	1	0	23.45	0-1	1
	2640.25	41093	5	16-QAM	1	12	23.40	0-1	1
	2640.25	41093	5	16-QAM	1	24	23.30	0-1	1
	2640.25	41093	5	16-QAM	12	0	22.31	0-2	2
	2640.25	41093	5	16-QAM	12	6	22.50	0-2	2
	2640.25	41093	5	16-QAM	12	13	22.38	0-2	2
	2640.25	41093	5	16-QAM	25	0	22.42	0-2	2
High	2687.5	41565	5	QPSK	1	0	24.53	0	0
	2687.5	41565	5	QPSK	1	12	24.57	0	0
	2687.5	41565	5	QPSK	1	24	24.50	0	0
	2687.5	41565	5	QPSK	12	0	23.41	0-1	1
	2687.5	41565	5	QPSK	12	6	23.52	0-1	1
	2687.5	41565	5	QPSK	12	13	23.38	0-1	1
	2687.5	41565	5	QPSK	25	0	23.27	0-1	1
	2687.5	41565	5	16-QAM	1	0	23.46	0-1	1
	2687.5	41565	5	16-QAM	1	12	23.42	0-1	1
	2687.5	41565	5	16-QAM	1	24	23.21	0-1	1
	2687.5	41565	5	16-QAM	12	0	22.27	0-2	2
	2687.5	41565	5	16-QAM	12	6	22.23	0-2	2
	2687.5	41565	5	16-QAM	12	13	22.32	0-2	2
	2687.5	41565	5	16-QAM	25	0	22.31	0-2	2

Table 8-27
LTE Band 41 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]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	2506	39750	20	QPSK	1	0	**13.70**	0	0
	2506	39750	20	QPSK	1	50	13.65	0	0
	2506	39750	20	QPSK	1	99	13.66	0	0
	2506	39750	20	QPSK	50	0	13.54	0-1	0
	2506	39750	20	QPSK	50	25	**13.68**	0-1	0
	2506	39750	20	QPSK	50	50	13.65	0-1	0
	2506	39750	20	QPSK	100	0	13.54	0-1	0
	2506	39750	20	16QAM	1	0	13.66	0-1	0
	2506	39750	20	16QAM	1	50	13.67	0-1	0
	2506	39750	20	16QAM	1	99	13.56	0-1	0
	2506	39750	20	16QAM	50	0	13.68	0-2	0
	2506	39750	20	16QAM	50	25	13.65	0-2	0
	2506	39750	20	16QAM	50	50	13.55	0-2	0
	2506	39750	20	16QAM	100	0	13.59	0-2	0
Low Mid	2549.5	40185	20	QPSK	1	0	13.68	0	0
	2549.5	40185	20	QPSK	1	50	13.66	0	0
	2549.5	40185	20	QPSK	1	99	13.65	0	0
	2549.5	40185	20	QPSK	50	0	13.58	0-1	0
	2549.5	40185	20	QPSK	50	25	13.44	0-1	0
	2549.5	40185	20	QPSK	50	50	13.66	0-1	0
	2549.5	40185	20	QPSK	100	0	13.54	0-1	0
	2549.5	40185	20	16-QAM	1	0	13.55	0-1	0
	2549.5	40185	20	16-QAM	1	50	13.49	0-1	0
	2549.5	40185	20	16-QAM	1	99	13.67	0-1	0
	2549.5	40185	20	16-QAM	50	0	13.69	0-2	0
	2549.5	40185	20	16-QAM	50	25	13.60	0-2	0
	2549.5	40185	20	16-QAM	50	50	13.55	0-2	0
	2549.5	40185	20	16-QAM	100	0	13.40	0-2	0
Mid	2593	40620	20	QPSK	1	0	13.57	0	0
	2593	40620	20	QPSK	1	50	13.68	0	0
	2593	40620	20	QPSK	1	99	13.64	0	0
	2593	40620	20	QPSK	50	0	13.53	0-1	0
	2593	40620	20	QPSK	50	25	13.56	0-1	0
	2593	40620	20	QPSK	50	50	13.66	0-1	0
	2593	40620	20	QPSK	100	0	13.55	0-1	0
	2593	40620	20	16-QAM	1	0	13.50	0-1	0
	2593	40620	20	16-QAM	1	50	13.55	0-1	0
	2593	40620	20	16-QAM	1	99	13.69	0-1	0
	2593	40620	20	16-QAM	50	0	13.48	0-2	0
	2593	40620	20	16-QAM	50	25	13.60	0-2	0
	2593	40620	20	16-QAM	50	50	13.50	0-2	0
	2593	40620	20	16-QAM	100	0	13.55	0-2	0
Mid High	2636.5	41055	20	QPSK	1	0	13.60	0	0
	2636.5	41055	20	QPSK	1	50	13.66	0	0
	2636.5	41055	20	QPSK	1	99	13.58	0	0
	2636.5	41055	20	QPSK	50	0	13.55	0-1	0
	2636.5	41055	20	QPSK	50	25	13.59	0-1	0
	2636.5	41055	20	QPSK	50	50	13.67	0-1	0
	2636.5	41055	20	QPSK	100	0	13.57	0-1	0
	2636.5	41055	20	16-QAM	1	0	13.62	0-1	0
	2636.5	41055	20	16-QAM	1	50	13.62	0-1	0
	2636.5	41055	20	16-QAM	1	99	13.65	0-1	0
	2636.5	41055	20	16-QAM	50	0	13.66	0-2	0
	2636.5	41055	20	16-QAM	50	25	13.53	0-2	0
	2636.5	41055	20	16-QAM	50	50	13.40	0-2	0
	2636.5	41055	20	16-QAM	100	0	13.49	0-2	0
High	2680	41490	20	QPSK	1	0	13.60	0	0
	2680	41490	20	QPSK	1	50	13.55	0	0
	2680	41490	20	QPSK	1	99	13.49	0	0
	2680	41490	20	QPSK	50	0	13.55	0-1	0
	2680	41490	20	QPSK	50	25	13.59	0-1	0
	2680	41490	20	QPSK	50	50	13.60	0-1	0
	2680	41490	20	QPSK	100	0	13.50	0-1	0
	2680	41490	20	16-QAM	1	0	13.57	0-1	0
	2680	41490	20	16-QAM	1	50	13.53	0-1	0
	2680	41490	20	16-QAM	1	99	13.52	0-1	0
	2680	41490	20	16-QAM	50	0	13.58	0-2	0
	2680	41490	20	16-QAM	50	25	13.44	0-2	0
	2680	41490	20	16-QAM	50	50	13.59	0-2	0
	2680	41490	20	16-QAM	100	0	13.58	0-2	0

Table 8-28
LTE Band 41 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]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	2503.5	39725	15	QPSK	1	0	13.70	0	0
	2503.5	39725	15	QPSK	1	36	13.68	0	0
	2503.5	39725	15	QPSK	1	74	13.65	0	0
	2503.5	39725	15	QPSK	36	0	13.50	0-1	0
	2503.5	39725	15	QPSK	36	18	13.67	0-1	0
	2503.5	39725	15	QPSK	36	37	13.65	0-1	0
	2503.5	39725	15	QPSK	75	0	13.49	0-1	0
	2503.5	39725	15	16QAM	1	0	13.63	0-1	0
	2503.5	39725	15	16QAM	1	36	13.69	0-1	0
	2503.5	39725	15	16QAM	1	74	13.59	0-1	0
	2503.5	39725	15	16QAM	36	0	13.65	0-2	0
	2503.5	39725	15	16QAM	36	18	13.62	0-2	0
	2503.5	39725	15	16QAM	36	37	13.61	0-2	0
	2503.5	39725	15	16QAM	75	0	13.66	0-2	0
Low Mid	2548.25	40173	15	QPSK	1	0	13.70	0	0
	2548.25	40173	15	QPSK	1	36	13.63	0	0
	2548.25	40173	15	QPSK	1	74	13.67	0	0
	2548.25	40173	15	QPSK	36	0	13.68	0-1	0
	2548.25	40173	15	QPSK	36	18	13.51	0-1	0
	2548.25	40173	15	QPSK	36	37	13.61	0-1	0
	2548.25	40173	15	QPSK	75	0	13.49	0-1	0
	2548.25	40173	15	16-QAM	1	0	13.65	0-1	0
	2548.25	40173	15	16-QAM	1	36	13.52	0-1	0
	2548.25	40173	15	16-QAM	1	74	13.66	0-1	0
	2548.25	40173	15	16-QAM	36	0	13.67	0-2	0
	2548.25	40173	15	16-QAM	36	18	13.64	0-2	0
	2548.25	40173	15	16-QAM	36	37	13.60	0-2	0
	2548.25	40173	15	16-QAM	75	0	13.39	0-2	0
Mid	2593	40620	15	QPSK	1	0	13.56	0	0
	2593	40620	15	QPSK	1	36	13.67	0	0
	2593	40620	15	QPSK	1	74	13.56	0	0
	2593	40620	15	QPSK	36	0	13.48	0-1	0
	2593	40620	15	QPSK	36	18	13.62	0-1	0
	2593	40620	15	QPSK	36	37	13.63	0-1	0
	2593	40620	15	QPSK	75	0	13.52	0-1	0
	2593	40620	15	16-QAM	1	0	13.45	0-1	0
	2593	40620	15	16-QAM	1	36	13.64	0-1	0
	2593	40620	15	16-QAM	1	74	13.55	0-1	0
	2593	40620	15	16-QAM	36	0	13.51	0-2	0
	2593	40620	15	16-QAM	36	18	13.56	0-2	0
	2593	40620	15	16-QAM	36	37	13.48	0-2	0
	2593	40620	15	16-QAM	75	0	13.55	0-2	0
Mid High	2637.75	41068	15	QPSK	1	0	13.58	0	0
	2637.75	41068	15	QPSK	1	36	13.66	0	0
	2637.75	41068	15	QPSK	1	74	13.60	0	0
	2637.75	41068	15	QPSK	36	0	13.50	0-1	0
	2637.75	41068	15	QPSK	36	18	13.60	0-1	0
	2637.75	41068	15	QPSK	36	37	13.70	0-1	0
	2637.75	41068	15	QPSK	75	0	13.57	0-1	0
	2637.75	41068	15	16-QAM	1	0	13.68	0-1	0
	2637.75	41068	15	16-QAM	1	36	13.61	0-1	0
	2637.75	41068	15	16-QAM	1	74	13.69	0-1	0
	2637.75	41068	15	16-QAM	36	0	13.65	0-2	0
	2637.75	41068	15	16-QAM	36	18	13.59	0-2	0
	2637.75	41068	15	16-QAM	36	37	13.36	0-2	0
	2637.75	41068	15	16-QAM	75	0	13.48	0-2	0
High	2682.5	41515	15	QPSK	1	0	13.61	0	0
	2682.5	41515	15	QPSK	1	36	13.58	0	0
	2682.5	41515	15	QPSK	1	74	13.57	0	0
	2682.5	41515	15	QPSK	36	0	13.57	0-1	0
	2682.5	41515	15	QPSK	36	18	13.54	0-1	0
	2682.5	41515	15	QPSK	36	37	13.59	0-1	0
	2682.5	41515	15	QPSK	75	0	13.57	0-1	0
	2682.5	41515	15	16-QAM	1	0	13.65	0-1	0
	2682.5	41515	15	16-QAM	1	36	13.63	0-1	0
	2682.5	41515	15	16-QAM	1	74	13.59	0-1	0
	2682.5	41515	15	16-QAM	36	0	13.60	0-2	0
	2682.5	41515	15	16-QAM	36	18	13.44	0-2	0
	2682.5	41515	15	16-QAM	36	37	13.59	0-2	0
	2682.5	41515	15	16-QAM	75	0	13.54	0-2	0

Table 8-29
LTE Band 41 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]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	2501	39700	10	QPSK	1	0	13.68	0	0
	2501	39700	10	QPSK	1	25	13.66	0	0
	2501	39700	10	QPSK	1	49	13.62	0	0
	2501	39700	10	QPSK	25	0	13.59	0-1	0
	2501	39700	10	QPSK	25	12	13.70	0-1	0
	2501	39700	10	QPSK	25	25	13.65	0-1	0
	2501	39700	10	QPSK	50	0	13.62	0-1	0
	2501	39700	10	16QAM	1	0	13.70	0-1	0
	2501	39700	10	16QAM	1	25	13.64	0-1	0
	2501	39700	10	16QAM	1	49	13.51	0-1	0
	2501	39700	10	16QAM	25	0	13.63	0-2	0
	2501	39700	10	16QAM	25	12	13.66	0-2	0
	2501	39700	10	16QAM	25	25	13.56	0-2	0
	2501	39700	10	16QAM	50	0	13.60	0-2	0
Low Mid	2547	40160	10	QPSK	1	0	13.49	0	0
	2547	40160	10	QPSK	1	25	13.48	0	0
	2547	40160	10	QPSK	1	49	13.67	0	0
	2547	40160	10	QPSK	25	0	13.58	0-1	0
	2547	40160	10	QPSK	25	12	13.39	0-1	0
	2547	40160	10	QPSK	25	25	13.66	0-1	0
	2547	40160	10	QPSK	50	0	13.61	0-1	0
	2547	40160	10	16-QAM	1	0	13.63	0-1	0
	2547	40160	10	16-QAM	1	25	13.49	0-1	0
	2547	40160	10	16-QAM	1	49	13.70	0-1	0
	2547	40160	10	16-QAM	25	0	13.67	0-2	0
	2547	40160	10	16-QAM	25	12	13.63	0-2	0
	2547	40160	10	16-QAM	25	25	13.51	0-2	0
	2547	40160	10	16-QAM	50	0	13.46	0-2	0
Mid	2593	40620	10	QPSK	1	0	13.54	0	0
	2593	40620	10	QPSK	1	25	13.68	0	0
	2593	40620	10	QPSK	1	49	13.70	0	0
	2593	40620	10	QPSK	25	0	13.50	0-1	0
	2593	40620	10	QPSK	25	12	13.51	0-1	0
	2593	40620	10	QPSK	25	25	13.63	0-1	0
	2593	40620	10	QPSK	50	0	13.65	0-1	0
	2593	40620	10	16-QAM	1	0	13.49	0-1	0
	2593	40620	10	16-QAM	1	25	13.53	0-1	0
	2593	40620	10	16-QAM	1	49	13.70	0-1	0
	2593	40620	10	16-QAM	25	0	13.51	0-2	0
	2593	40620	10	16-QAM	25	12	13.66	0-2	0
	2593	40620	10	16-QAM	25	25	13.50	0-2	0
	2593	40620	10	16-QAM	50	0	13.65	0-2	0
Mid High	2639	41080	10	QPSK	1	0	13.65	0	0
	2639	41080	10	QPSK	1	25	13.48	0	0
	2639	41080	10	QPSK	1	49	13.62	0	0
	2639	41080	10	QPSK	25	0	13.57	0-1	0
	2639	41080	10	QPSK	25	12	13.64	0-1	0
	2639	41080	10	QPSK	25	25	13.70	0-1	0
	2639	41080	10	QPSK	50	0	13.66	0-1	0
	2639	41080	10	16-QAM	1	0	13.67	0-1	0
	2639	41080	10	16-QAM	1	25	13.63	0-1	0
	2639	41080	10	16-QAM	1	49	13.61	0-1	0
	2639	41080	10	16-QAM	25	0	13.49	0-2	0
	2639	41080	10	16-QAM	25	12	13.62	0-2	0
	2639	41080	10	16-QAM	25	25	13.45	0-2	0
	2639	41080	10	16-QAM	50	0	13.58	0-2	0
High	2685	41540	10	QPSK	1	0	13.59	0	0
	2685	41540	10	QPSK	1	25	13.64	0	0
	2685	41540	10	QPSK	1	49	13.47	0	0
	2685	41540	10	QPSK	25	0	13.62	0-1	0
	2685	41540	10	QPSK	25	12	13.64	0-1	0
	2685	41540	10	QPSK	25	25	13.67	0-1	0
	2685	41540	10	QPSK	50	0	13.59	0-1	0
	2685	41540	10	16-QAM	1	0	13.61	0-1	0
	2685	41540	10	16-QAM	1	25	13.61	0-1	0
	2685	41540	10	16-QAM	1	49	13.57	0-1	0
	2685	41540	10	16-QAM	25	0	13.64	0-2	0
	2685	41540	10	16-QAM	25	12	13.42	0-2	0
	2685	41540	10	16-QAM	25	25	13.67	0-2	0
	2685	41540	10	16-QAM	50	0	13.65	0-2	0

Table 8-30
LTE Band 41 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]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	2498.5	39675	5	QPSK	1	0	13.66	0	0
	2498.5	39675	5	QPSK	1	12	13.65	0	0
	2498.5	39675	5	QPSK	1	24	13.64	0	0
	2498.5	39675	5	QPSK	12	0	13.56	0-1	0
	2498.5	39675	5	QPSK	12	6	13.69	0-1	0
	2498.5	39675	5	QPSK	12	13	13.69	0-1	0
	2498.5	39675	5	QPSK	25	0	13.61	0-1	0
	2498.5	39675	5	16-QAM	1	0	13.70	0-1	0
	2498.5	39675	5	16-QAM	1	12	13.68	0-1	0
	2498.5	39675	5	16-QAM	1	24	13.57	0-1	0
	2498.5	39675	5	16-QAM	12	0	13.67	0-2	0
	2498.5	39675	5	16-QAM	12	6	13.62	0-2	0
	2498.5	39675	5	16-QAM	12	13	13.54	0-2	0
	2498.5	39675	5	16-QAM	25	0	13.64	0-2	0
Low Mid	2545.75	40148	5	QPSK	1	0	13.64	0	0
	2545.75	40148	5	QPSK	1	12	13.64	0	0
	2545.75	40148	5	QPSK	1	24	13.66	0	0
	2545.75	40148	5	QPSK	12	0	13.56	0-1	0
	2545.75	40148	5	QPSK	12	6	13.41	0-1	0
	2545.75	40148	5	QPSK	12	13	13.60	0-1	0
	2545.75	40148	5	QPSK	25	0	13.56	0-1	0
	2545.75	40148	5	16-QAM	1	0	13.59	0-1	0
	2545.75	40148	5	16-QAM	1	12	13.54	0-1	0
	2545.75	40148	5	16-QAM	1	24	13.70	0-1	0
	2545.75	40148	5	16-QAM	12	0	13.67	0-2	0
	2545.75	40148	5	16-QAM	12	6	13.60	0-2	0
	2545.75	40148	5	16-QAM	12	13	13.64	0-2	0
	2545.75	40148	5	16-QAM	25	0	13.39	0-2	0
Mid	2593	40620	5	QPSK	1	0	13.53	0	0
	2593	40620	5	QPSK	1	12	13.59	0	0
	2593	40620	5	QPSK	1	24	13.66	0	0
	2593	40620	5	QPSK	12	0	13.52	0-1	0
	2593	40620	5	QPSK	12	6	13.53	0-1	0
	2593	40620	5	QPSK	12	13	13.56	0-1	0
	2593	40620	5	QPSK	25	0	13.62	0-1	0
	2593	40620	5	16-QAM	1	0	13.51	0-1	0
	2593	40620	5	16-QAM	1	12	13.63	0-1	0
	2593	40620	5	16-QAM	1	24	13.70	0-1	0
	2593	40620	5	16-QAM	12	0	13.43	0-2	0
	2593	40620	5	16-QAM	12	6	13.57	0-2	0
	2593	40620	5	16-QAM	12	13	13.47	0-2	0
	2593	40620	5	16-QAM	25	0	13.63	0-2	0
Mid High	2640.25	41093	5	QPSK	1	0	13.67	0	0
	2640.25	41093	5	QPSK	1	12	13.69	0	0
	2640.25	41093	5	QPSK	1	24	13.63	0	0
	2640.25	41093	5	QPSK	12	0	13.63	0-1	0
	2640.25	41093	5	QPSK	12	6	13.59	0-1	0
	2640.25	41093	5	QPSK	12	13	13.64	0-1	0
	2640.25	41093	5	QPSK	25	0	13.67	0-1	0
	2640.25	41093	5	16-QAM	1	0	13.57	0-1	0
	2640.25	41093	5	16-QAM	1	12	13.63	0-1	0
	2640.25	41093	5	16-QAM	1	24	13.70	0-1	0
	2640.25	41093	5	16-QAM	12	0	13.70	0-2	0
	2640.25	41093	5	16-QAM	12	6	13.50	0-2	0
	2640.25	41093	5	16-QAM	12	13	13.36	0-2	0
	2640.25	41093	5	16-QAM	25	0	13.44	0-2	0
High	2687.5	41565	5	QPSK	1	0	13.69	0	0
	2687.5	41565	5	QPSK	1	12	13.64	0	0
	2687.5	41565	5	QPSK	1	24	13.59	0	0
	2687.5	41565	5	QPSK	12	0	13.54	0-1	0
	2687.5	41565	5	QPSK	12	6	13.61	0-1	0
	2687.5	41565	5	QPSK	12	13	13.70	0-1	0
	2687.5	41565	5	QPSK	25	0	13.52	0-1	0
	2687.5	41565	5	16-QAM	1	0	13.53	0-1	0
	2687.5	41565	5	16-QAM	1	12	13.50	0-1	0
	2687.5	41565	5	16-QAM	1	24	13.51	0-1	0
	2687.5	41565	5	16-QAM	12	0	13.68	0-2	0
	2687.5	41565	5	16-QAM	12	6	13.47	0-2	0
	2687.5	41565	5	16-QAM	12	13	13.62	0-2	0
	2687.5	41565	5	16-QAM	25	0	13.56	0-2	0

8.2 WLAN Conducted Powers

Table 8-31
IEEE 802.11b Average RF Power

Mode	Freq	Channel	802.11b (2.4 GHz) Conducted Power [dBm]			
			Data Rate [Mbps]			
	[MHz]		1	2	5.5	11
802.11b	2412	1*	11.89	11.91	11.89	11.86
802.11b	2437	6*	**11.91**	11.92	11.94	11.91
802.11b	2462	11*	11.85	11.78	11.81	11.80

Table 8-32
IEEE 802.11g Average RF Power

Mode	Freq	Channel	802.11g (2.4 GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		6	9	12	18	24	36	48	54
802.11g	2412	1	10.55	10.62	10.53	10.47	10.49	10.54	10.54	10.45
802.11g	2437	6	10.61	10.64	10.61	10.80	10.63	10.53	10.61	10.66
802.11g	2462	11	10.52	10.48	10.51	10.46	10.30	10.48	10.30	10.45

Table 8-33
IEEE 802.11n Average RF Power

Mode	Freq	Channel	802.11n (2.4 GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		6.5	13	20	26	39	52	58	65
802.11n	2412	1	9.81	9.97	9.99	9.88	9.96	9.86	9.83	9.81
802.11n	2437	6	9.89	9.90	9.84	9.96	9.88	9.82	9.76	9.73
802.11n	2462	11	9.66	9.63	9.64	9.63	9.62	9.63	9.57	9.59

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

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

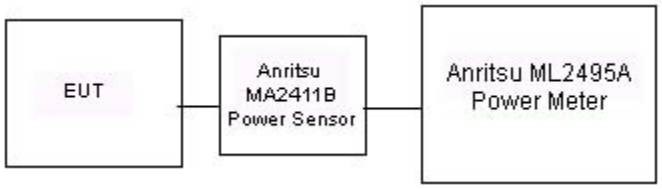

Figure 8-1
Power Measurement Setup

8.3 Bluetooth Conducted Powers

Table 8-34
Bluetooth RF Conducted Powers

Frequency [MHz]	Data Rate [Mbps]	Channel No.	Avg Conducted Power	
			[dBm]	[mW]
2402	1.0	0	9.46	8.835
2441	1.0	39	**10.68**	11.682
2480	1.0	78	9.60	9.121
2402	2.0	0	7.02	5.030
2441	2.0	39	8.23	6.659
2480	2.0	78	7.06	5.078
2402	3.0	0	7.07	5.092
2441	3.0	39	8.33	6.808
2480	3.0	78	7.23	5.287

Note: The bolded data rate and channel above was tested for SAR.

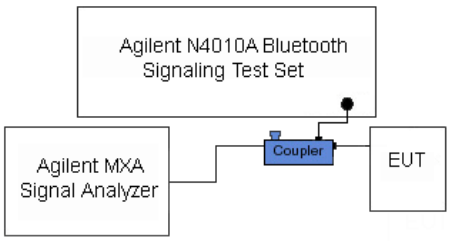

Figure 8-2
Power Measurement Setup

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
1/20/2015	835B	20.1	820	0.940	54.370	0.969	55.258	-2.99%	-1.61%
			835	0.956	54.224	0.970	55.200	-1.44%	-1.77%
			850	0.971	54.072	0.988	55.154	-1.72%	-1.96%
1/16/2015	1900B	20.9	1850	1.514	51.093	1.520	53.300	-0.39%	-4.14%
			1880	1.546	50.970	1.520	53.300	1.71%	-4.37%
			1910	1.579	50.829	1.520	53.300	3.88%	-4.64%
1/19/2015	2450B	22.8	2401	1.956	51.267	1.903	52.765	2.79%	-2.84%
			2450	2.031	51.040	1.950	52.700	4.15%	-3.15%
			2500	2.094	50.848	2.021	52.636	3.61%	-3.40%
			2550	2.168	50.583	2.092	52.573	3.63%	-3.79%
1/26/2015	2450B	23.5	2401	1.931	51.976	1.903	52.765	1.47%	-1.50%
			2450	1.997	51.723	1.950	52.700	2.41%	-1.85%
			2499	2.062	51.582	2.019	52.638	2.13%	-2.01%

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	835	BODY	01/20/2015	22.6	20.0	0.100	4d119	3334	0.910	9.340	9.100	-2.57%
J	1900	BODY	01/16/2015	23.2	20.9	0.100	5d141	3022	4.010	40.600	40.100	-1.23%
I	2450	BODY	01/19/2015	24.0	22.8	0.100	719	3209	5.150	51.800	51.500	-0.58%
I	2450	BODY	01/26/2015	22.5	23.5	0.100	719	3209	5.470	51.800	54.700	5.60%

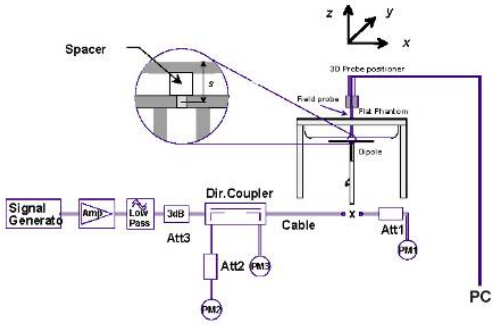

Figure 9-1
System Verification Setup Diagram

Figure 9-2
System Verification Setup Photo

10 SAR DATA SUMMARY

10.1 Standalone Body SAR Data

Table 10-1
LTE Band 26 Body SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
836.50	26915	Mid	LTE Band 26	15	24.2	24.17	-0.06	0	1401-1	QPSK	1	0	14 mm	back	1:1	0.377	1.007	0.380	
836.50	26915	Mid	LTE Band 26	15	23.2	23.17	0.01	1	1401-1	QPSK	36	18	14 mm	back	1:1	0.294	1.006	0.296	
836.50	26915	Mid	LTE Band 26	15	24.2	24.17	-0.03	0	1401-1	QPSK	1	0	16 mm	top	1:1	0.189	1.007	0.190	
836.50	26915	Mid	LTE Band 26	15	23.2	23.17	0.10	1	1401-1	QPSK	36	18	16 mm	top	1:1	0.151	1.006	0.152	
836.50	26915	Mid	LTE Band 26	15	24.2	24.17	0.06	0	1401-1	QPSK	1	0	5 mm	right	1:1	0.275	1.007	0.277	
836.50	26915	Mid	LTE Band 26	15	23.2	23.17	0.01	1	1401-1	QPSK	36	18	5 mm	right	1:1	0.235	1.006	0.236	
836.50	26915	Mid	LTE Band 26	15	24.2	24.17	0.00	0	1401-1	QPSK	1	0	0 mm	left	1:1	0.534	1.007	0.538	
836.50	26915	Mid	LTE Band 26	15	23.2	23.17	0.11	1	1401-1	QPSK	36	18	0 mm	left	1:1	0.420	1.006	0.423	
836.50	26915	Mid	LTE Band 26	15	18.2	18.19	-0.17	0	1401-2	QPSK	1	0	0 mm	back	1:1	0.678	1.002	**0.679**	A1
836.50	26915	Mid	LTE Band 26	15	18.2	18.18	-0.19	0	1401-2	QPSK	36	0	0 mm	back	1:1	0.591	1.005	0.594	
836.50	26915	Mid	LTE Band 26	15	18.2	18.19	0.03	0	1401-2	QPSK	1	0	0 mm	top	1:1	0.226	1.002	0.226	
836.50	26915	Mid	LTE Band 26	15	18.2	18.18	-0.09	0	1401-2	QPSK	36	0	0 mm	top	1:1	0.214	1.005	0.215	
836.50	26915	Mid	LTE Band 26	15	18.2	18.19	0.20	0	1401-2	QPSK	1	0	0 mm	right	1:1	0.198	1.002	0.198	
836.50	26915	Mid	LTE Band 26	15	18.2	18.18	0.11	0	1401-2	QPSK	36	0	0 mm	right	1:1	0.188	1.005	0.189	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population														Body 1.6 W/kg (mW/g) averaged over 1 gram						

Table 10-2
LTE Band 25 (PCS) Body SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.2	24.20	-0.11	0	1401-1	QPSK	1	50	14 mm	back	1:1	0.648	1.000	0.648	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.2	23.19	0.01	1	1401-1	QPSK	50	0	14 mm	back	1:1	0.566	1.002	0.567	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.2	24.20	0.14	0	1401-1	QPSK	1	50	16 mm	top	1:1	0.195	1.000	0.195	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.2	23.19	0.02	1	1401-1	QPSK	50	0	16 mm	top	1:1	0.148	1.002	0.148	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.2	24.20	-0.09	0	1401-1	QPSK	1	50	5 mm	right	1:1	0.658	1.000	0.658	A2
1905.00	26590	High	LTE Band 25 (PCS)	20	23.2	23.19	0.00	1	1401-1	QPSK	50	0	5 mm	right	1:1	0.588	1.002	0.589	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.2	24.20	-0.09	0	1401-1	QPSK	1	50	0 mm	left	1:1	0.251	1.000	0.251	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.2	23.19	-0.04	1	1401-1	QPSK	50	0	0 mm	left	1:1	0.199	1.002	0.199	
1860.00	26140	Low	LTE Band 25 (PCS)	20	14.2	14.19	0.00	0	1401-2	QPSK	1	0	0 mm	back	1:1	0.548	1.002	0.549	
1860.00	26140	Low	LTE Band 25 (PCS)	20	14.2	14.18	-0.05	0	1401-2	QPSK	50	50	0 mm	back	1:1	0.546	1.005	0.549	
1860.00	26140	Low	LTE Band 25 (PCS)	20	14.2	14.19	0.04	0	1401-2	QPSK	1	0	0 mm	top	1:1	0.098	1.002	0.098	
1860.00	26140	Low	LTE Band 25 (PCS)	20	14.2	14.18	-0.03	0	1401-2	QPSK	50	50	0 mm	top	1:1	0.101	1.005	0.102	
1860.00	26140	Low	LTE Band 25 (PCS)	20	14.2	14.19	0.14	0	1401-2	QPSK	1	0	0 mm	right	1:1	0.134	1.002	0.134	
1860.00	26140	Low	LTE Band 25 (PCS)	20	14.2	14.18	0.16	0	1401-2	QPSK	50	50	0 mm	right	1:1	0.124	1.005	0.125	
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 41 Body SAR

MEASUREMENT RESULTS																					
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor (Cond. Power)	Scaling Factor (CP Duty)	Scaled SAR (1g)	Plot #
MHz	Ch.															(W/kg)			(W/kg)	
2506.00	39750	Low	LTE Band 41	20	24.7	24.70	0.19	0	1401-1	QPSK	1	0	14 mm	back	1:1.59	0.532	1.000	1.010	0.537	
2506.00	39750	Low	LTE Band 41	20	23.7	23.61	-0.02	1	1401-1	QPSK	50	0	14 mm	back	1:1.59	0.406	1.021	1.010	0.419	
2506.00	39750	Low	LTE Band 41	20	24.7	24.70	0.02	0	1401-1	QPSK	1	0	16 mm	top	1:1.59	0.521	1.000	1.010	0.526	
2506.00	39750	Low	LTE Band 41	20	23.7	23.61	-0.02	1	1401-1	QPSK	50	0	16 mm	top	1:1.59	0.382	1.021	1.010	0.394	
2506.00	39750	Low	LTE Band 41	20	24.7	24.70	-0.14	0	1401-1	QPSK	1	0	5 mm	right	1:1.59	0.161	1.000	1.010	0.163	
2506.00	39750	Low	LTE Band 41	20	23.7	23.61	-0.04	1	1401-1	QPSK	50	0	5 mm	right	1:1.59	0.131	1.021	1.010	0.135	
2506.00	39750	Low	LTE Band 41	20	24.7	24.70	0.09	0	1401-1	QPSK	1	0	0 mm	left	1:1.59	0.046	1.000	1.010	0.046	
2506.00	39750	Low	LTE Band 41	20	23.7	23.61	-0.02	1	1401-1	QPSK	50	0	0 mm	left	1:1.59	0.039	1.021	1.010	0.040	
2506.00	39750	Low	LTE Band 41	20	13.7	13.70	-0.03	0	1401-2	QPSK	1	0	0 mm	back	1:1.59	0.557	1.000	1.010	0.563	A3
2506.00	39750	Low	LTE Band 41	20	13.7	13.68	-0.04	0	1401-2	QPSK	50	25	0 mm	back	1:1.59	0.516	1.005	1.010	0.524	
2506.00	39750	Low	LTE Band 41	20	13.7	13.70	0.17	0	1401-2	QPSK	1	0	0 mm	top	1:1.59	0.379	1.000	1.010	0.383	
2506.00	39750	Low	LTE Band 41	20	13.7	13.68	0.02	0	1401-2	QPSK	50	25	0 mm	top	1:1.59	0.346	1.005	1.010	0.351	
2506.00	39750	Low	LTE Band 41	20	13.7	13.70	0.18	0	1401-2	QPSK	1	0	0 mm	right	1:1.59	0.028	1.000	1.010	0.028	
2506.00	39750	Low	LTE Band 41	20	13.7	13.68	0.15	0	1401-2	QPSK	50	25	0 mm	right	1:1.59	0.026	1.005	1.010	0.026	

ANSI / IEEE C95.1 1992 - SAFETY LIMIT	Body
Spatial Peak	1.6 W/kg (mW/g)
Uncontrolled Exposure/General Population	averaged over 1 gram

Table 10-4
WLAN Body SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
2412	1	IEEE 802.11b	DSSS	12.0	11.89	0.02	0 mm	1501-9	1	back	1:1	0.647	1.026	**0.664**	A4
2437	6	IEEE 802.11b	DSSS	12.0	11.91	0.01	0 mm	1501-9	1	back	1:1	0.641	1.021	0.654	
2462	11	IEEE 802.11b	DSSS	12.0	11.85	-0.04	0 mm	1501-9	1	back	1:1	0.642	1.035	**0.664**	
2437	6	IEEE 802.11b	DSSS	12.0	11.91	0.11	0 mm	1501-9	1	top	1:1	0.159	1.021	0.162	
2437	6	IEEE 802.11b	DSSS	12.0	11.91	-0.07	0 mm	1501-9	1	left	1:1	0.209	1.021	0.213	

ANSI / IEEE C95.1 1992 - SAFETY LIMIT	Body
Spatial Peak	1.6 W/kg (mW/g)
Uncontrolled Exposure/General Population	averaged over 1 gram

Table 10-5
Bluetooth Body SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
2441	39	Bluetooth	FHSS	11.0	10.68	0.06	0 mm	1501-9	1	back	1:1	0.176	1.076	**0.189**	A5
2441	39	Bluetooth	FHSS	11.0	10.68	0.17	0 mm	1501-9	1	top	1:1	0.051	1.076	0.055	
2441	39	Bluetooth	FHSS	11.0	10.68	-0.06	0 mm	1501-9	1	left	1:1	0.075	1.076	0.081	

ANSI / IEEE C95.1 1992 - SAFETY LIMIT	Body
Spatial Peak	1.6 W/kg (mW/g)
Uncontrolled Exposure/General Population	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 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 not required since the measured SAR results for all frequency bands was less than 0.8 W/kg. Please see Section 12 for more information.
7. Per FCC KDB 616217 D04 Section 4.3, SAR tests are required for the back surface and edges of the tablet with the tablet touching the phantom. The SAR Exclusion Threshold in FCC KDB 447498 D01v05 was applied to determine SAR test exclusion for adjacent edge configurations. SAR tests were required for top, right, and left edges for the main antenna and top and left edges for the BT/WLAN antenna.

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 7.3.4.
2. MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.
3. A-MPR was disabled for all SAR tests by setting NS=01 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).
4. Per FCC KDB Publication 447498 D01v05r01, since the reported (scaled) for LTE Band 41 SAR measured at the highest output power channel in a given a test configuration was < 0.6 W/kg, testing at the other channels was not required for such test configurations.
5. TDD LTE was tested per FCC KDB 941225 D05v02r03 and using the guidance provided in April 2013 TCB workshop notes. Testing was performed using UL-DL configuration 0 with 6 UL subframes and 2 S subframes using normal cyclic prefix only and special subframe configuration 6. Per manufacturer request, test samples were configured for normal cyclic prefix. SAR tests were performed at maximum output power and worst-case transmission duty factor in normal cyclic prefix. Results were then scaled to the duty factor required for extended cyclic prefix listed in 3GPP TS 36.211 Section 4. The cyclic prefix scaling factor for LTE Band 41 was calculated by dividing the extended cyclic prefix duty factor by the normal cyclic prefix duty factor. Per 3GPP 36.211 Section 4, the duty factor for special subframe configuration 6 using normal cyclic prefix is 0.629. The duty factor for special subframe configuration 6 using extended cyclic prefix is 0.633.

WLAN Notes:

1. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 D01v01r02 and October 2012 FCC/TCB Meeting Notes for 2.4 GHz WIFI operations: Highest average RF output power channel for the lowest data rate was selected for SAR evaluation in 802.11b. Other IEEE 802.11 modes (including 802.11g/n) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11b mode.
2. WIFI transmission was verified using an uncalibrated spectrum analyzer.
3. When the maximum extrapolated peak SAR of the zoom scan for the maximum output channel is >1.6 W/kg or the reported 1g averaged SAR is >0.8 W/kg, SAR testing on other default channels was required.

11 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

11.1 Introduction

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

11.2 Simultaneous Transmission Procedures

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

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

Estimated BT LE SAR was considered but was less than the measured Bluetooth SAR. Therefore, the measured Bluetooth SAR was used in the calculations below.

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

Note: For SAR summations for body at 1.4 cm and 1.6 cm, 2.4 GHz WLAN/Bluetooth SAR values for 0.0 cm were used since the 0.0 cm test distance for 2.4 GHz WLAN/Bluetooth were more conservative. "<" denotes that the 0.0 cm 2.4 GHz WLAN/Bluetooth SAR values were used for summations purposes.

Table 11-1
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body at 0.0 cm)

Simult Tx	Configuration	LTE Band 26 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.679	0.664	**1.343**
	Top	0.226	0.162	0.388
	Right	0.198	0.400	0.598
	Left	0.538	0.213	0.751

Simult Tx	Configuration	LTE Band 25 (PCS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.549	0.664	**1.213**
	Top	0.102	0.162	0.264
	Right	0.134	0.400	0.534
	Left	0.251	0.213	0.464

Simult Tx	Configuration	LTE Band 41 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.563	0.664	**1.227**
	Top	0.383	0.162	0.545
	Right	0.028	0.400	0.428
	Left	0.046	0.213	0.259

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

Simult Tx	Configuration	LTE Band 26 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.679	0.189	**0.868**
	Top	0.226	0.055	0.281
	Right	0.198	0.400	0.598
	Left	0.538	0.081	0.619

Simult Tx	Configuration	LTE Band 25 (PCS) SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.549	0.189	**0.738**
	Top	0.102	0.055	0.157
	Right	0.134	0.400	0.534
	Left	0.251	0.081	0.332

Simult Tx	Configuration	LTE Band 41 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.563	0.189	**0.752**
	Top	0.383	0.055	0.438
	Right	0.028	0.400	0.428
	Left	0.046	0.081	0.127

Table 11-3
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body at 1.4 cm)

Configuration	Mode	LTE SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Back Side	LTE Band 26	0.380	< 0.664	< 1.044
Back Side	LTE Band 25 (PCS)	0.648	< 0.664	< 1.312
Back Side	LTE Band 41	0.537	< 0.664	< 1.201

Table 11-4
Simultaneous Transmission Scenario with 2.4 GHz Bluetooth (Body at 1.4 cm)

Configuration	Mode	LTE SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Back Side	LTE Band 26	0.380	< 0.189	< 0.569
Back Side	LTE Band 25 (PCS)	0.648	< 0.189	< 0.837
Back Side	LTE Band 41	0.537	< 0.189	< 0.726

Table 11-5
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body at 1.6 cm)

Configuration	Mode	LTE SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Top Edge	LTE Band 26	0.190	< 0.162	< 0.352
Top Edge	LTE Band 25 (PCS)	0.195	< 0.162	< 0.357
Top Edge	LTE Band 41	0.526	< 0.162	< 0.688

Table 11-6
Simultaneous Transmission Scenario with 2.4 GHz Bluetooth (Body at 1.6 cm)

Configuration	Mode	LTE SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Top Edge	LTE Band 26	0.190	< 0.055	< 0.245
Top Edge	LTE Band 25 (PCS)	0.195	< 0.055	< 0.250
Top Edge	LTE Band 41	0.526	< 0.055	< 0.581

Table 11-7
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body at 0.5 cm)

Configuration	Mode	LTE SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Right Edge	LTE Band 26	0.277	0.400	0.677
Right Edge	LTE Band 25 (PCS)	0.658	0.400	1.058
Right Edge	LTE Band 41	0.163	0.400	0.563

Note: 2.4 GHz WLAN right edge SAR was excluded per FCC KDB 447498. Estimated SAR results were used in the above table to determine simultaneous transmission SAR test exclusion.

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

Configuration	Mode	LTE SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Right Edge	LTE Band 26	0.277	0.400	0.677
Right Edge	LTE Band 25 (PCS)	0.658	0.400	1.058
Right Edge	LTE Band 41	0.163	0.400	0.563

Note: 2.4 GHz Bluetooth right edge SAR was excluded per FCC KDB 447498. Estimated SAR results were used in the above table to determine simultaneous transmission SAR test exclusion.

11.4 Simultaneous Transmission Conclusion

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

12 SAR MEASUREMENT VARIABILITY

12.1 Measurement Variability

Per FCC KDB Publication 865664 D01v01, SAR measurement variability analysis was not required since all measured SAR values were < 0.8 W/kg.

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	D835V2	835 MHz SAR Dipole	4/7/2014	Annual	4/7/2015	4d119
SPEAG	D1900V2	1900 MHz SAR Dipole	4/9/2014	Annual	4/9/2015	5d141
SPEAG	D2450V2	2450 MHz SAR Dipole	8/11/2014	Annual	8/11/2015	719
SPEAG	ES3DV3	SAR Probe	12/16/2014	Annual	12/16/2015	3334
SPEAG	ES3DV2	SAR Probe	8/19/2014	Annual	8/19/2015	3022
SPEAG	ES3DV3	SAR Probe	3/19/2014	Annual	3/19/2015	3209
SPEAG	DAE4	Dasy Data Acquisition Electronics	12/12/2014	Annual	12/12/2015	1415
SPEAG	DAE4	Dasy Data Acquisition Electronics	8/12/2014	Annual	8/12/2015	1322
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/17/2014	Annual	3/17/2015	1334
Agilent	E4438C	ESG Vector Signal Generator	4/15/2014	Annual	4/15/2015	MY45091346
Agilent	8753ES	S-Parameter Network Analyzer	5/22/2014	Annual	5/22/2015	US39170118
Agilent	E8257D	(250kHz-20GHz) Signal Generator	4/15/2014	Annual	4/15/2015	MY45470194
Agilent	N5182A	MXG Vector Signal Generator	4/15/2014	Annual	4/15/2015	MY47420651
Agilent	E5515C	Wireless Communications Test Set	3/18/2014	Annual	3/18/2015	GB46110872
Agilent	N4010A	Wireless Connectivity Test Set	N/A	N/A	N/A	GB46170464
Agilent	N9020A	MXA Signal Analyzer	10/27/2014	Annual	10/27/2015	US46470561
Agilent	8594A	(9kHz-2.9GHz) Spectrum Analyzer	N/A	N/A	N/A	3051A00187
Agilent	8753E	(30kHz-6GHz) Network Analyzer	12/30/2014	Annual	12/30/2015	JP38020182
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433977
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433978
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433975
Anritsu	MA24106A	USB Power Sensor	5/14/2014	Annual	5/14/2015	1231535
Anritsu	MT8820C	Radio Communication Analyzer	5/6/2014	Annual	5/6/2015	6201144419
Anritsu	ML2469A	Power Meter	3/14/2014	Annual	3/14/2015	1306009
Anritsu	MT8820C	Radio Communication Analyzer	11/18/2014	Annual	11/18/2015	6201300731
Anritsu	MA2411B	Pulse Power Sensor	3/25/2014	Annual	3/25/2015	1207470
Anritsu	ML2495A	Power Meter	10/31/2013	Biennial	10/31/2015	1039008
Anritsu	MA24106A	USB Power Sensor	5/14/2014	Annual	5/14/2015	1231538
Anritsu	MA24106A	USB Power Sensor	5/14/2014	Annual	5/14/2015	1244515
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
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	13264165
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Narda	BW-S3W2	Attenuator (3dB)	CBT	N/A	CBT	120
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Rohde & Schwarz	CMU200	Base Station Simulator	6/6/2014	Annual	6/6/2015	109892
Rohde & Schwarz	CMW500	Radio Communication Tester	2/20/2014	Annual	2/20/2015	128633
Rohde & Schwarz	CMW500	Radio Communication Tester	6/3/2014	Annual	6/3/2015	108843
Seekonk	NC-100	Torque Wrench	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	8/8/2013	Biennial	8/8/2015	130477866
VWR	36934-158	Wall-Mounted Thermometer	4/29/2014	Biennial	4/29/2016	111859332

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

14 MEASUREMENT UNCERTAINTIES

Applicable for frequencies less than 3000 MHz.

a	b	c	d	e= f(d,k)	f	g	h = c x f/e	i = c x g/e	k
Uncertainty Component	**IEEE 1528 Sec.**	**Tol. (± %)**	**Prob. Dist.**	**Div.**	**c_i 1gm**	**c_i 10 gms**	**1gm u_i (± %)**	**10gms u_i (± %)**	**v_i**
Measurement System									
Probe Calibration	E.2.1	6.0	N	1	1.0	1.0	6.0	6.0	∞
Axial Isotropy	E.2.2	0.25	N	1	0.7	0.7	0.2	0.2	∞
Hemishperical Isotropy	E.2.2	1.3	N	1	1.0	1.0	1.3	1.3	∞
Boundary Effect	E.2.3	0.4	N	1	1.0	1.0	0.4	0.4	∞
Linearity	E.2.4	0.3	N	1	1.0	1.0	0.3	0.3	∞
System Detection Limits	E.2.5	5.1	N	1	1.0	1.0	5.1	5.1	∞
Readout Electronics	E.2.6	1.0	N	1	1.0	1.0	1.0	1.0	∞
Response Time	E.2.7	0.8	R	1.73	1.0	1.0	0.5	0.5	∞
Integration Time	E.2.8	2.6	R	1.73	1.0	1.0	1.5	1.5	∞
RF Ambient Conditions	E.6.1	3.0	R	1.73	1.0	1.0	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1.0	1.0	0.2	0.2	∞
Probe Positioning w/ respect to Phantom	E.6.3	2.9	R	1.73	1.0	1.0	1.7	1.7	∞
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E.5	1.0	R	1.73	1.0	1.0	0.6	0.6	∞
Test Sample Related									
Test Sample Positioning	E.4.2	6.0	N	1	1.0	1.0	6.0	6.0	287
Device Holder Uncertainty	E.4.1	3.32	R	1.73	1.0	1.0	1.9	1.9	∞
Output Power Variation - SAR drift measurement	6.6.2	5.0	R	1.73	1.0	1.0	2.9	2.9	∞
Phantom & Tissue Parameters									
Phantom Uncertainty (Shape & Thickness tolerances)	E.3.1	4.0	R	1.73	1.0	1.0	2.3	2.3	∞
Liquid Conductivity - deviation from target values	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity - measurement uncertainty	E.3.3	3.8	N	1	0.64	0.43	2.4	1.6	6
Liquid Permittivity - deviation from target values	E.3.2	5.0	R	1.73	0.60	0.49	1.7	1.4	∞
Liquid Permittivity - measurement uncertainty	E.3.3	4.5	N	1	0.60	0.49	2.7	2.2	6
Combined Standard Uncertainty (k=1)			RSS				12.1	11.7	299
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				24.2	23.5	

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

15 CONCLUSION

15.1 Measurement Conclusion

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

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

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APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLK430; Type: Portable Tablet; Serial: 1401-2

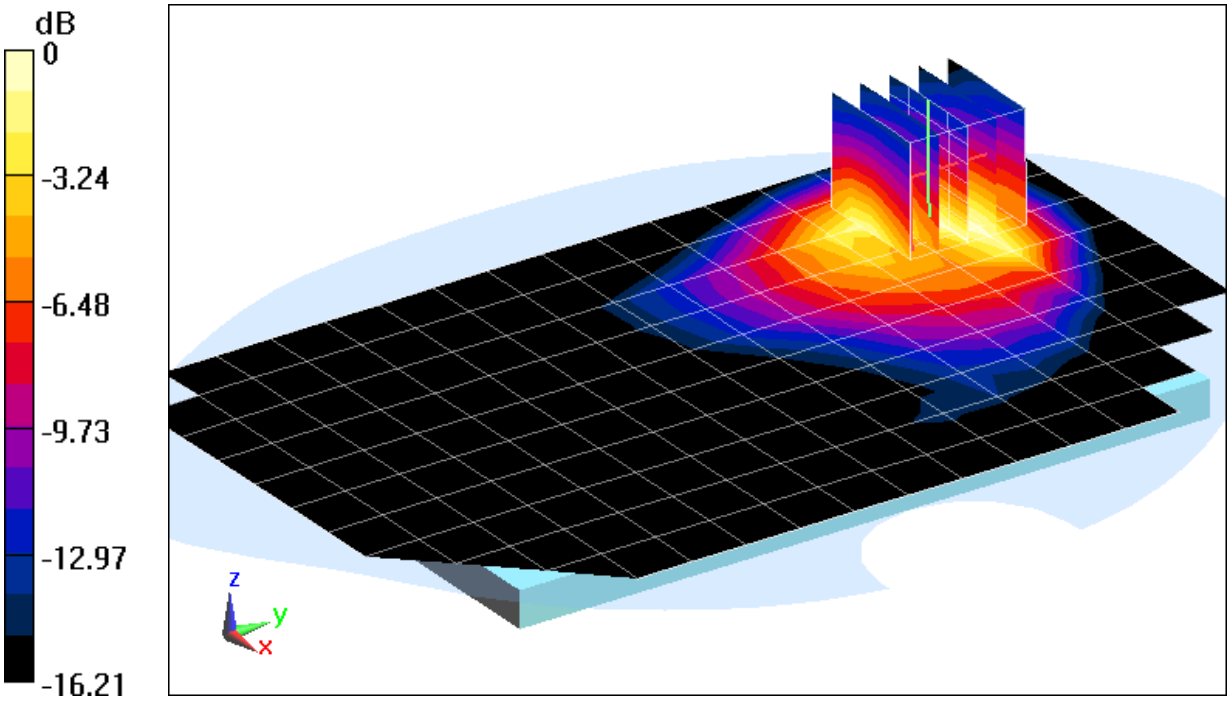
Communication System: UID 0, LTE Band 26; Frequency: 836.5 MHz; Duty Cycle: 1:1
Medium: 835 Body, Medium parameters used (interpolated):
f = 836.5 MHz; σ = 0.957 S/m; ε_r = 54.209; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 01-20-2015; Ambient Temp: 22.6°C; Tissue Temp: 20.0°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: Main Twin Sam; Type: QD000P40CC; Serial: TP: 1375
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 26, Body SAR, Back side, Mid.ch,
15 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

Area Scan (11x17x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.578 V/m; Power Drift = -0.17 dB
Peak SAR (extrapolated) = 1.45 W/kg
SAR(1 g) = 0.678 W/kg



0 dB = 0.859 W/kg = -0.66 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLK430; Type: Portable Tablet; Serial: 1401-1

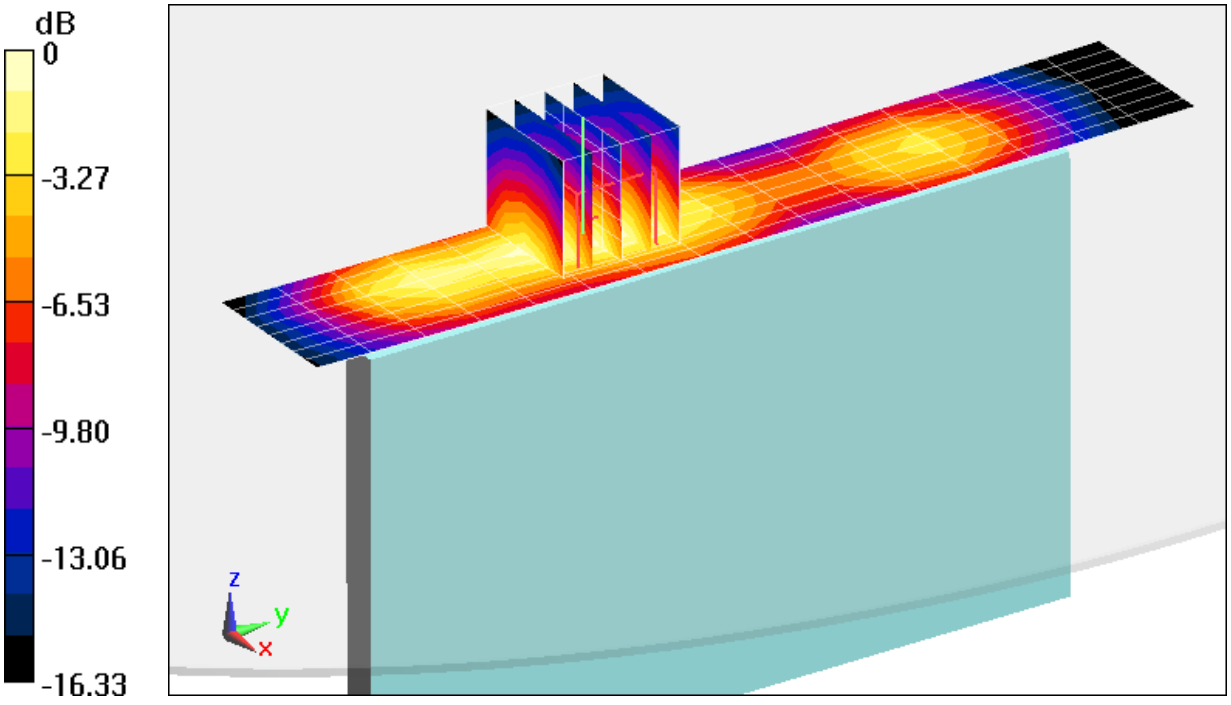
Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1882.5 MHz; Duty Cycle: 1:1
Medium: 1900 Body, Medium parameters used (interpolated):
f = 1882.5 MHz; σ = 1.549 S/m; ε_r = 50.958; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.5 cm

Test Date: 01-16-2015; Ambient Temp: 23.2°C; Tissue Temp: 20.9°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 25 (PCS), Body SAR, Right Edge, Mid.ch,
20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset

Area Scan (9x17x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.016 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 1.09 W/kg
SAR(1 g) = 0.658 W/kg



0 dB = 0.816 W/kg = -0.88 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLK430; Type: Portable Tablet; Serial: 1401-2

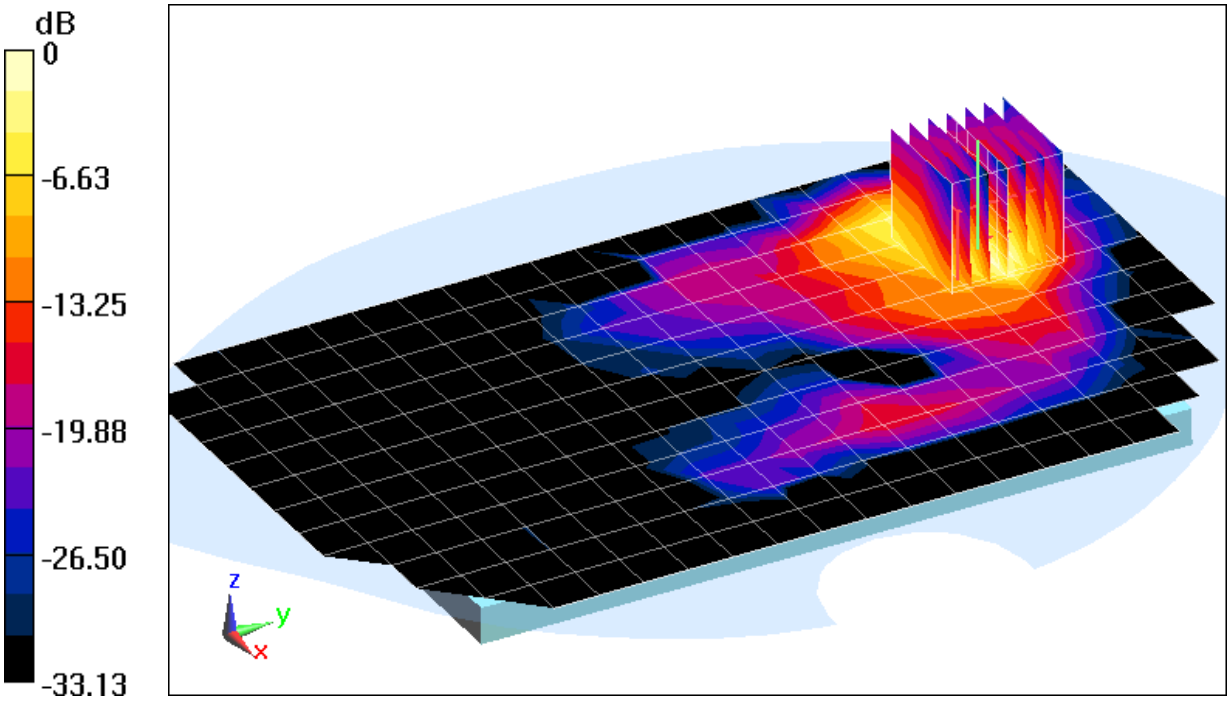
Communication System: UID 0, LTE Band 41; Frequency: 2506 MHz; Duty Cycle: 1:1.59
Medium: 2450 Body, Medium parameters used (interpolated):
f = 2506 MHz; σ = 2.103 S/m; ε_r = 50.816; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 01-19-2015; Ambient Temp: 24.0°C; Tissue Temp: 22.8°C

Probe: ES3DV3 - SN3209; ConvF(4.2, 4.2, 4.2); Calibrated: 3/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/17/2014
Phantom: SAM left; Type: QD000P40CD; Serial: TP:1715
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 41, Body SAR, Back side, Low.ch,
20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

Area Scan (13x21x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 17.634 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.58 W/kg
SAR(1 g) = 0.557 W/kg



0 dB = 0.771 W/kg = -1.13 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLK430; Type: Portable Tablet; Serial: 1501-9

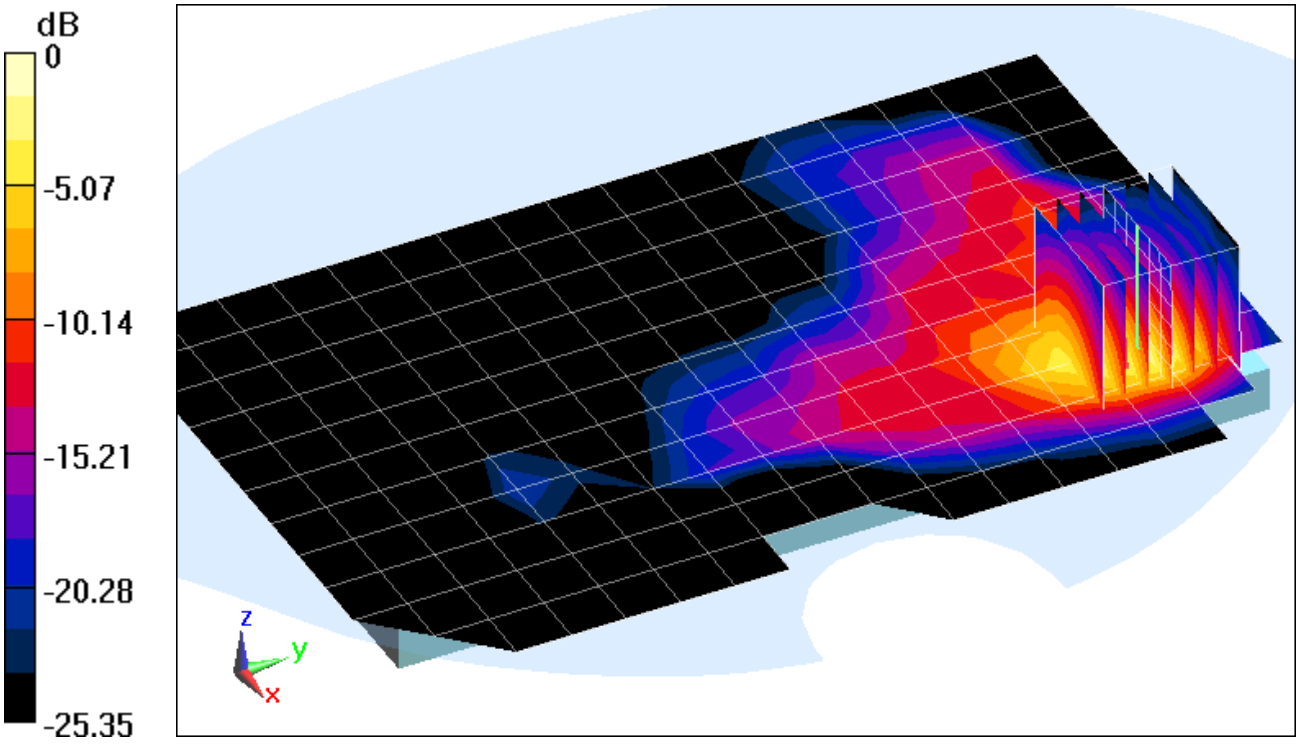
Communication System: UID 0, IEEE 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium: 2450 Body, Medium parameters used (interpolated):
f = 2412 MHz; σ = 1.973 S/m; ε_r = 51.216; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 01-19-2015; Ambient Temp: 24.0°C; Tissue Temp: 22.8°C

Probe: ES3DV3 - SN3209; ConvF(4.2, 4.2, 4.2); Calibrated: 3/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/17/2014
Phantom: SAM left; Type: QD000P40CD; Serial: TP:1715
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

Area Scan (12x18x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 19.459 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 1.65 W/kg
SAR(1 g) = 0.647 W/kg



0 dB = 0.929 W/kg = -0.32 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLK430; Type: Portable Tablet; Serial: 1501-9

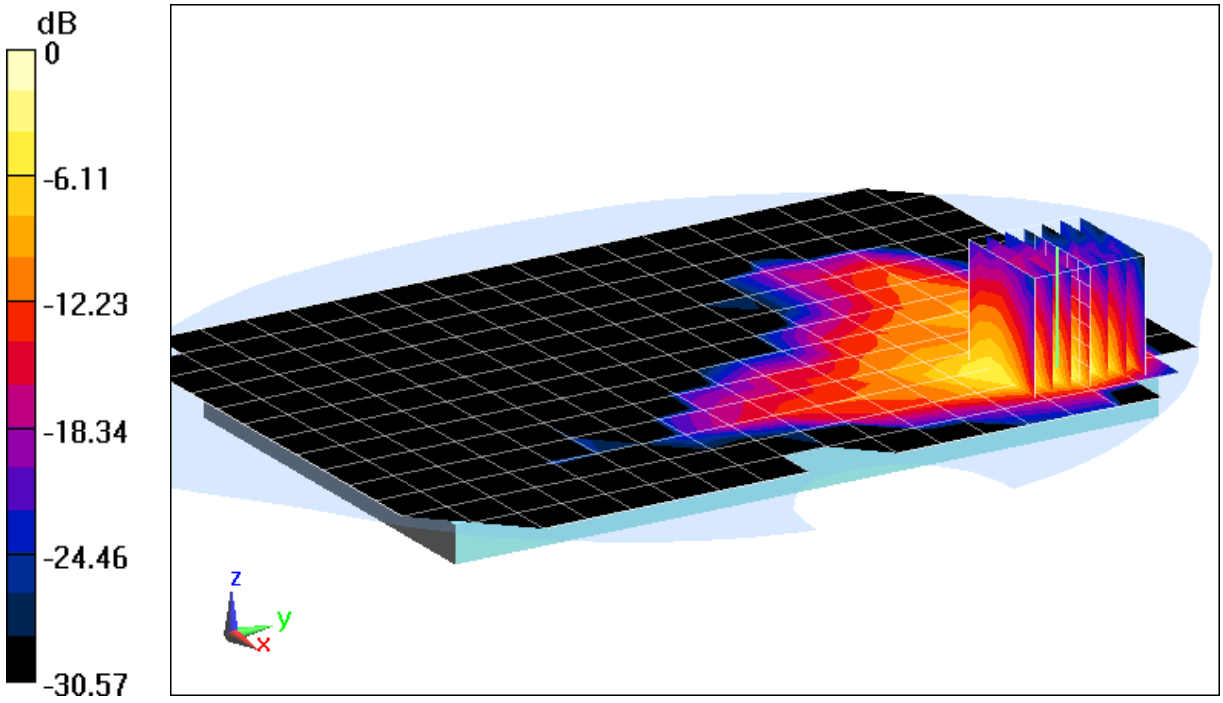
Communication System: UID 0, Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1
Medium: 2450 Body, Medium parameters used (interpolated):
f = 2441 MHz; σ = 1.985 S/m; ε_r = 51.769; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 01-26-2015; Ambient Temp: 22.5°C; Tissue Temp: 23.5°C

Probe: ES3DV3 - SN3209; ConvF(4.2, 4.2, 4.2); Calibrated: 3/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/17/2014
Phantom: SAM left; Type: QD000P40CD; Serial: TP:1715
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

Area Scan (14x19x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.072 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 0.462 W/kg
SAR(1 g) = 0.176 W/kg



0 dB = 0.284 W/kg = -5.47 dBW/kg

APPENDIX B: SYSTEM VERIFICATION

PCTEST ENGINEERING LABORATORY, INC.

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

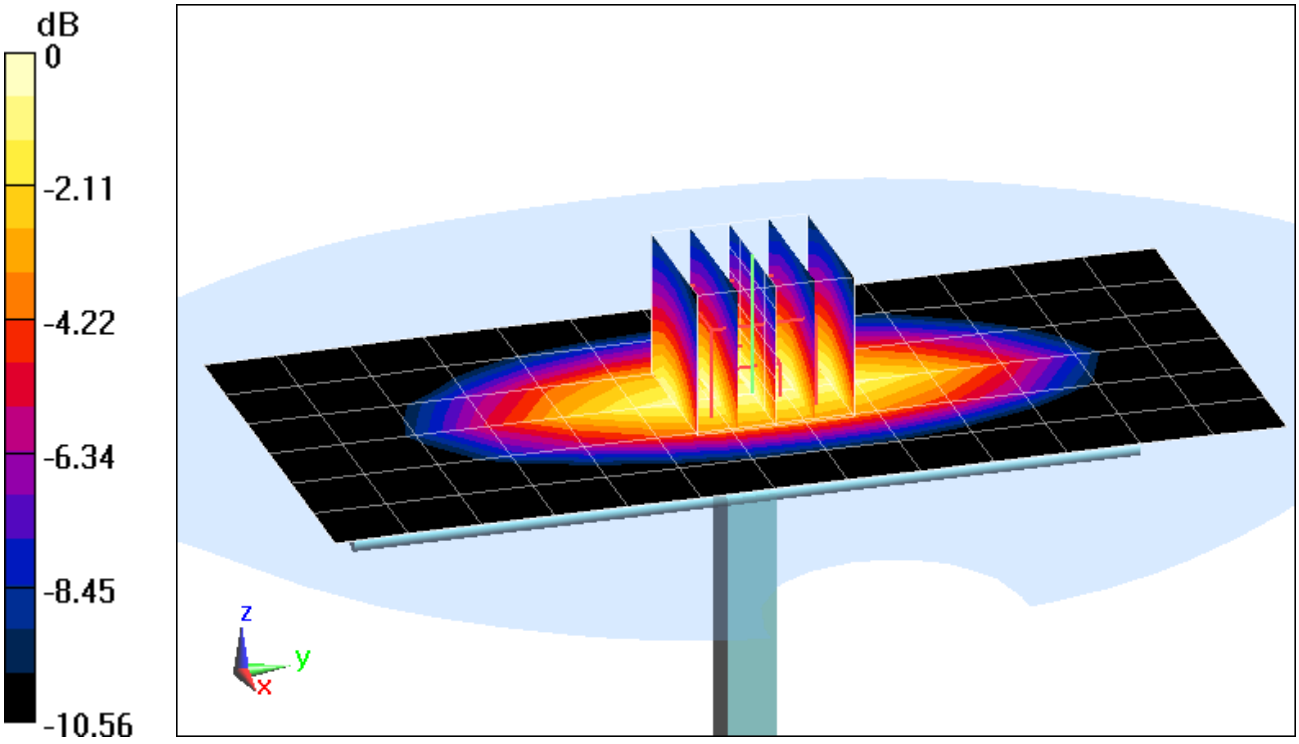
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Body, Medium parameters used:
f = 835 MHz; σ = 0.956 S/m; ε_r = 54.224; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 01-20-2015; Ambient Temp: 22.6°C; Tissue Temp: 20.0°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: Main Twin Sam; Type: QD000P40CC; Serial: TP: 1375
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) = 1.34 W/kg
SAR(1 g) = 0.910 W/kg
Deviation(1 g): -2.57%



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

PCTEST ENGINEERING LABORATORY, INC.

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

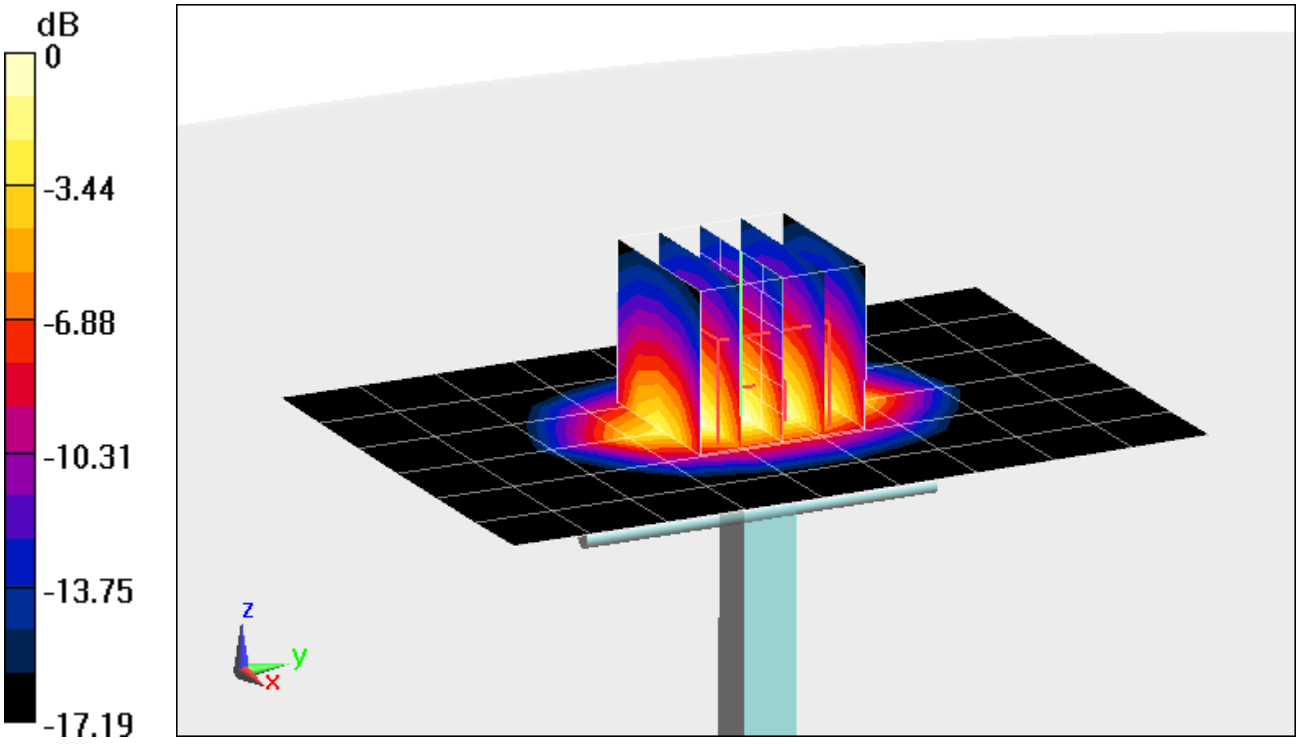
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Body, Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.568 S/m; ε_r = 50.876; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-16-2015; Ambient Temp: 23.2°C; Tissue Temp: 20.9°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) = 7.01 W/kg
SAR(1 g) = 4.01 W/kg
Deviation(1 g): -1.23%



0 dB = 5.06 W/kg = 7.04 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

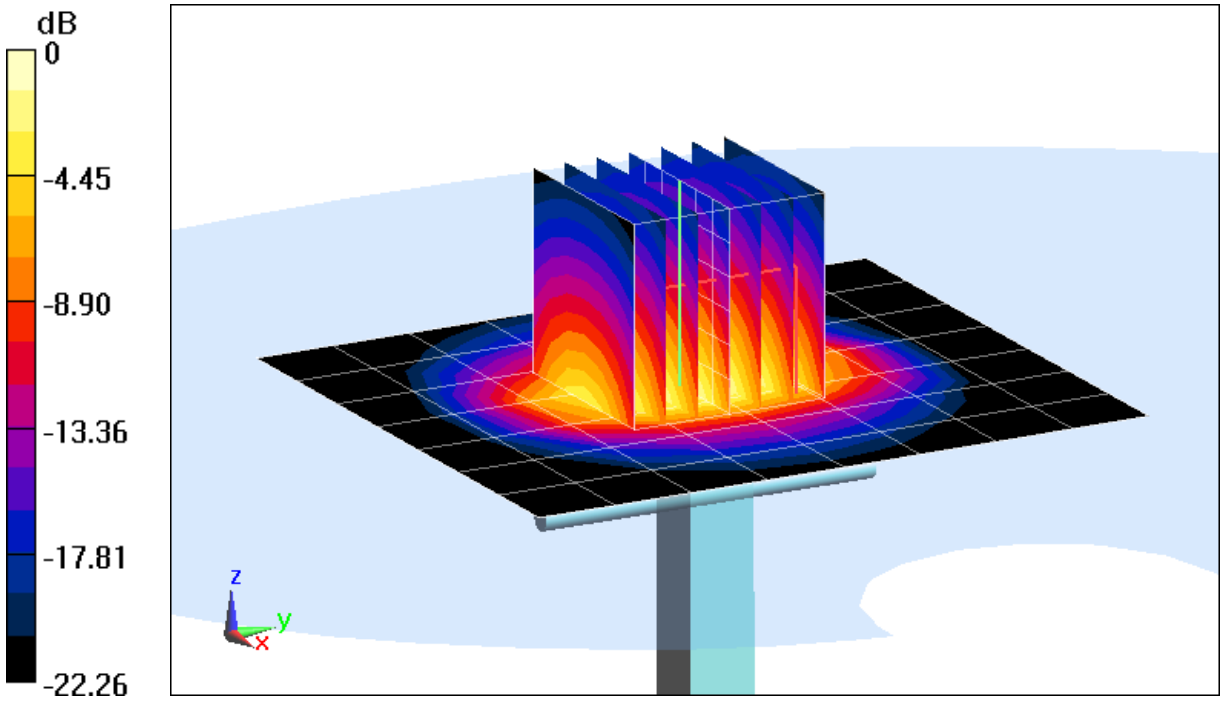
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Body, Medium parameters used:
f = 2450 MHz; σ = 1.997 S/m; ε_r = 51.723; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-26-2015; Ambient Temp: 22.5°C; Tissue Temp: 23.5°C

Probe: ES3DV3 - SN3209; ConvF(4.2, 4.2, 4.2); Calibrated: 3/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/17/2014
Phantom: SAM left; Type: QD000P40CD; Serial: TP:1715
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

2450 MHz System Verification

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Input Power: 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 11.9 W/kg
SAR(1 g) = 5.47 W/kg
Deviation(1 g): 5.60%



0 dB = 7.23 W/kg = 8.59 dBW/kg

APPENDIX C: PROBE CALIBRATION

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

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

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

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D835V2-4d119_Apr14**

CALIBRATION CERTIFICATE

Object D835V2 - SN: 4d119

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

CC✓ 4/25/14

Calibration date: April 07, 2014

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14

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

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

Issued: April 9, 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
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**

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	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 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	41.6 ± 6 %	0.94 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.22 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.53 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.97 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.6 ± 6 %	1.02 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.44 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.34 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.59 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.15 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.2 Ω - 1.6 jΩ
Return Loss	- 34.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.3 Ω - 4.5 jΩ
Return Loss	- 24.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.386 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	June 29, 2010

DASY5 Validation Report for Head TSL

Date: 07.04.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

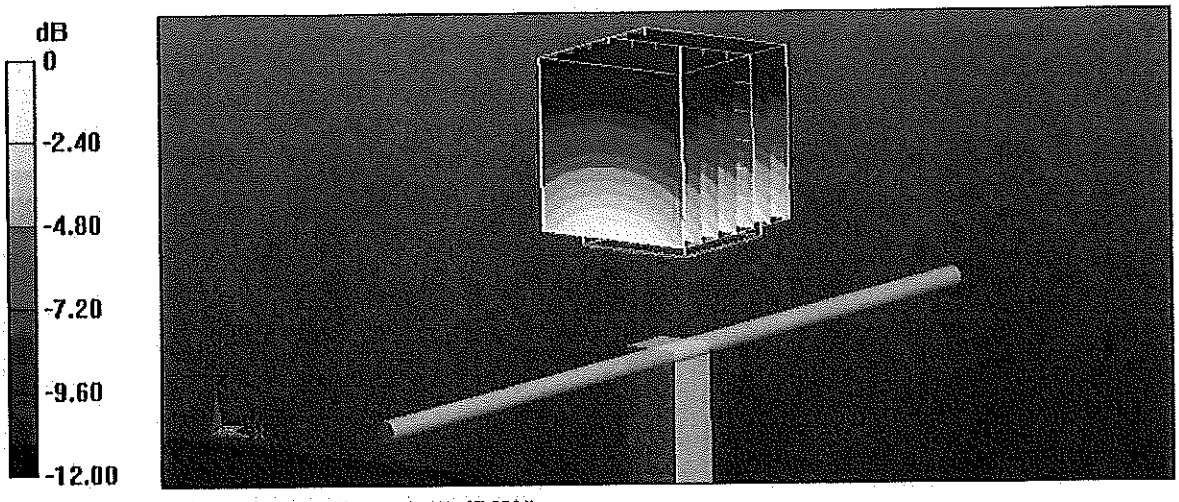
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.94 S/m; ε_r = 41.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.22, 6.22, 6.22); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

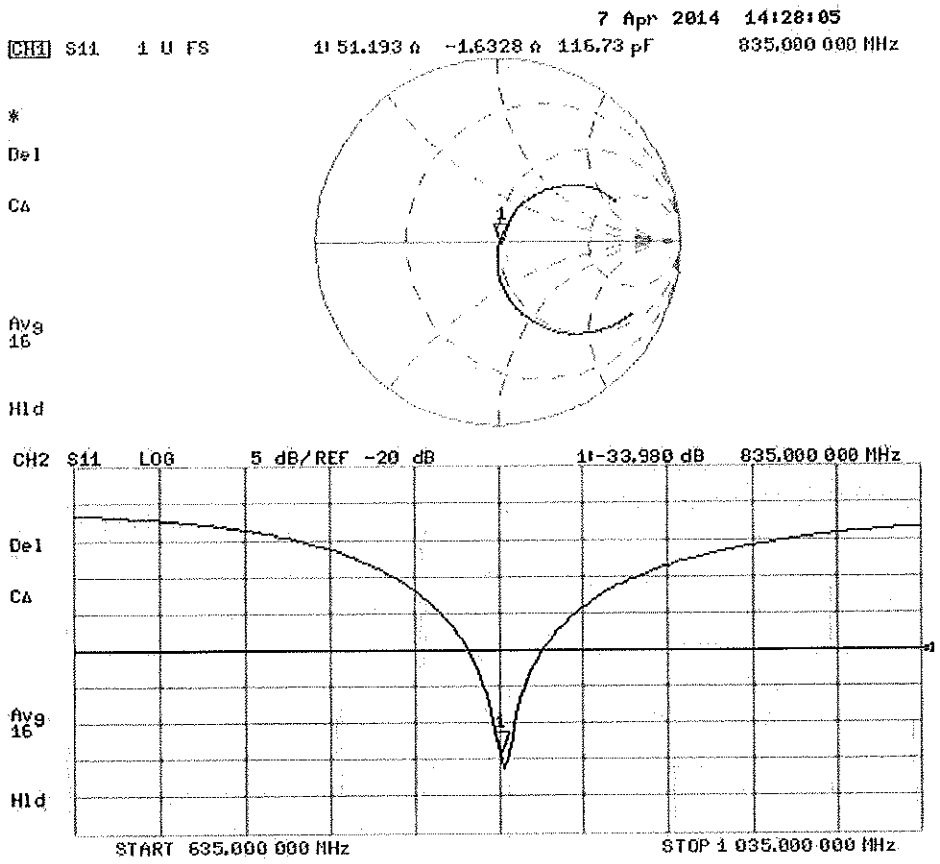
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.289 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 3.59 W/kg
SAR(1 g) = 2.38 W/kg; SAR(10 g) = 1.53 W/kg
Maximum value of SAR (measured) = 2.80 W/kg



0 dB = 2.80 W/kg = 4.47 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 07.04.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

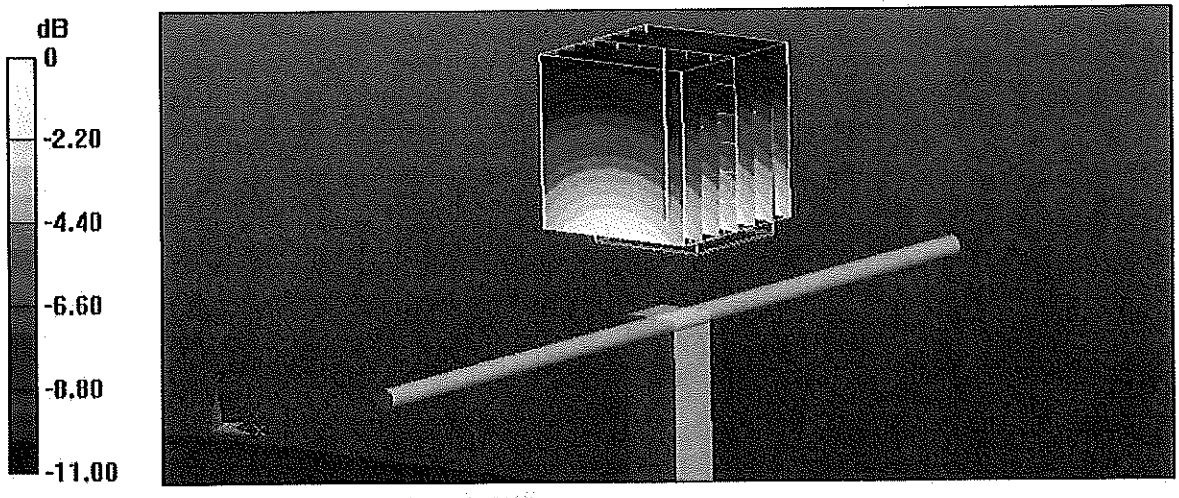
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 1.02 S/m; ε_r = 53.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.09, 6.09, 6.09); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

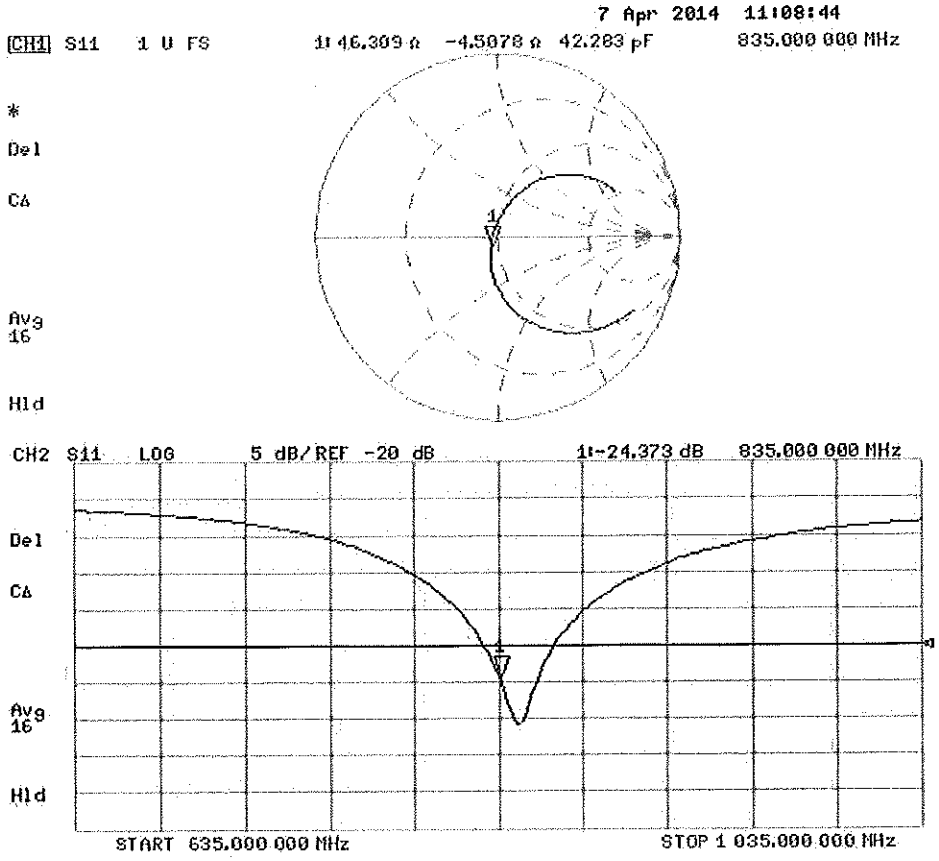
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.594 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.61 W/kg
SAR(1 g) = 2.44 W/kg; SAR(10 g) = 1.59 W/kg
Maximum value of SAR (measured) = 2.85 W/kg



0 dB = 2.85 W/kg = 4.55 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D1900V2-5d141_Apr14**

CALIBRATION CERTIFICATE

Object D1900V2 - SN: 5d141

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

Calibration date: April 09, 2014

✓ KOK 5/7/14

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14

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

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 9, 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	V52.8.7
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	39.1 ± 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	9.91 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**40.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.17 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**20.8 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	52.4 ± 6 %	1.52 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	10.2 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**40.6 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.41 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.6 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.8 Ω + 5.5 jΩ
Return Loss	- 24.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.8 Ω + 6.3 jΩ
Return Loss	- 23.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.199 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 11, 2011

DASY5 Validation Report for Head TSL

Date: 09.04.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

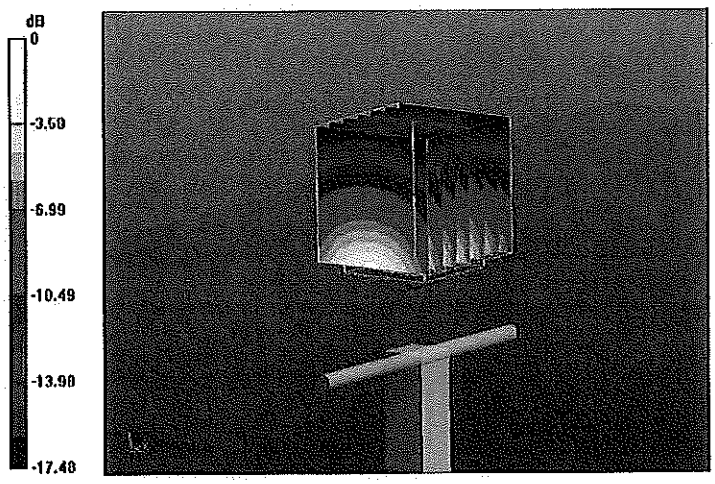
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.36 S/m; ε_r = 39.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.06, 5.06, 5.06); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

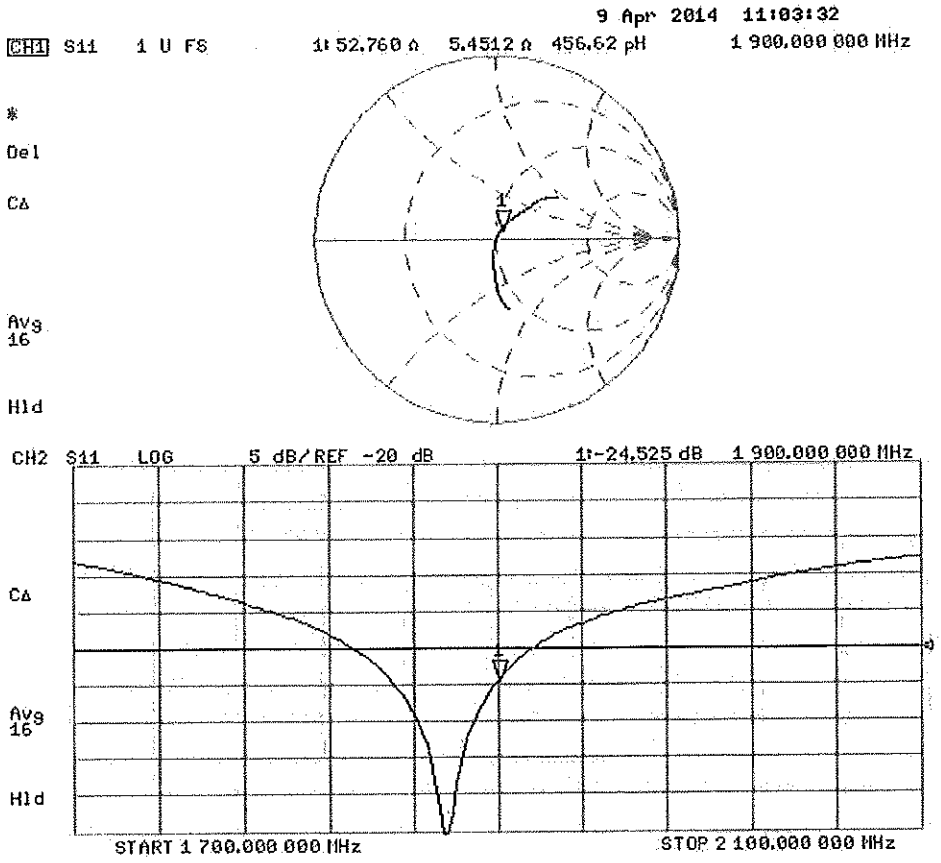
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 99.080 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 18.2 W/kg
SAR(1 g) = 9.91 W/kg; SAR(10 g) = 5.17 W/kg
Maximum value of SAR (measured) = 12.5 W/kg



0 dB = 12.5 W/kg = 10.97 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 09.04.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

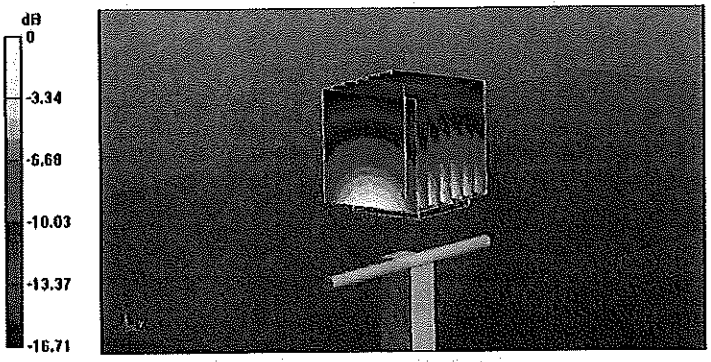
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.52 S/m; ε_r = 52.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.76, 4.76, 4.76); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom; Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

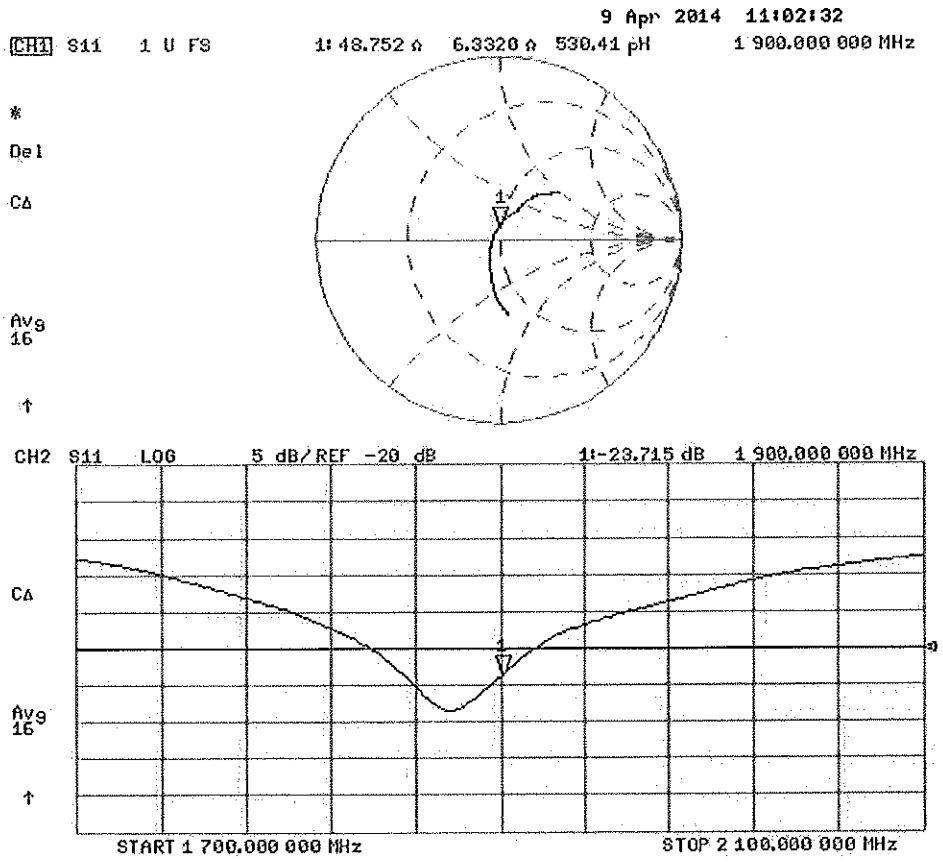
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.820 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 17.9 W/kg
SAR(1 g) = 10.2 W/kg; SAR(10 g) = 5.41 W/kg
Maximum value of SAR (measured) = 12.9 W/kg



0 dB = 12.9 W/kg = 11.11 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 108

Client **PC Test**

Certificate No: D2450V2-719_Aug14

CALIBRATION CERTIFICATE

Object D2450V2 - SN: 719

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

Calibration date: August 11, 2014

✓ KOK 9/8/14

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:	Michael Weber	Laboratory Technician	M. Weber
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 12, 2014

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Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: SCS 108

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "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	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.0 ± 6 %	1.82 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

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

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.09 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.2 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	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	50.5 ± 6 %	2.02 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.3 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**51.8 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.10 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**24.0 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.9 Ω + 3.0 jΩ
Return Loss	- 25.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.9 Ω + 5.8 jΩ
Return Loss	- 24.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.149 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	September 10, 2002

DASY5 Validation Report for Head TSL

Date: 11.08.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

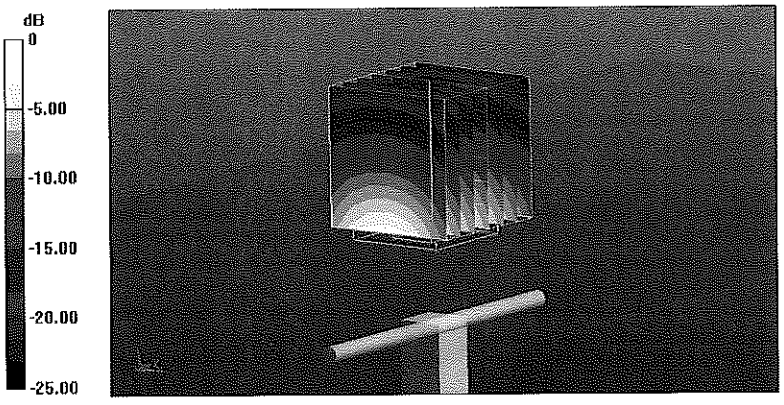
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.82 S/m; ε_r = 38; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); 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)

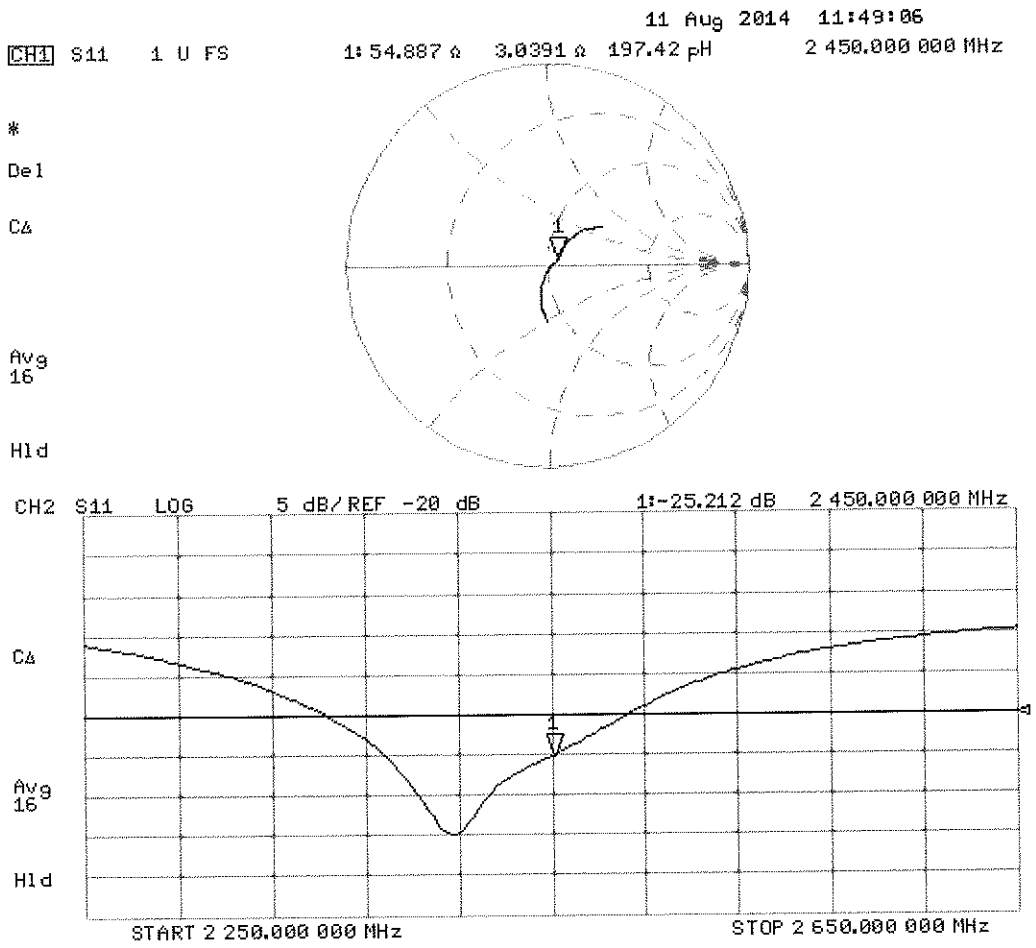
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 101.6 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 27.5 W/kg
SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.09 W/kg
Maximum value of SAR (measured) = 17.4 W/kg



0 dB = 17.4 W/kg = 12.41 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 11.08.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

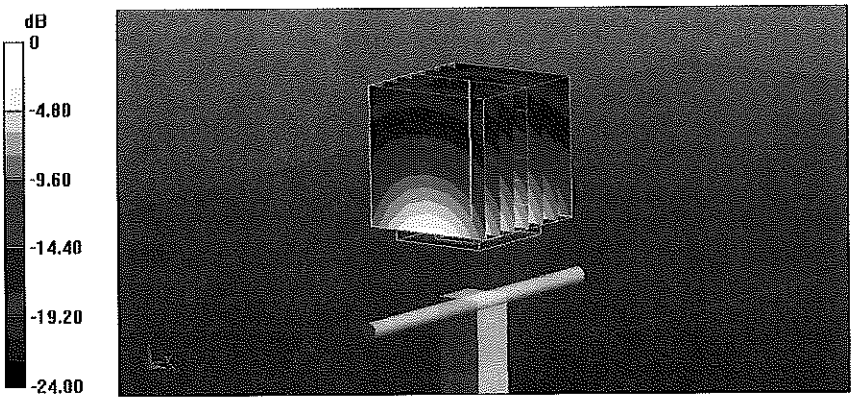
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.02 S/m; ε_r = 50.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.35, 4.35, 4.35); 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)

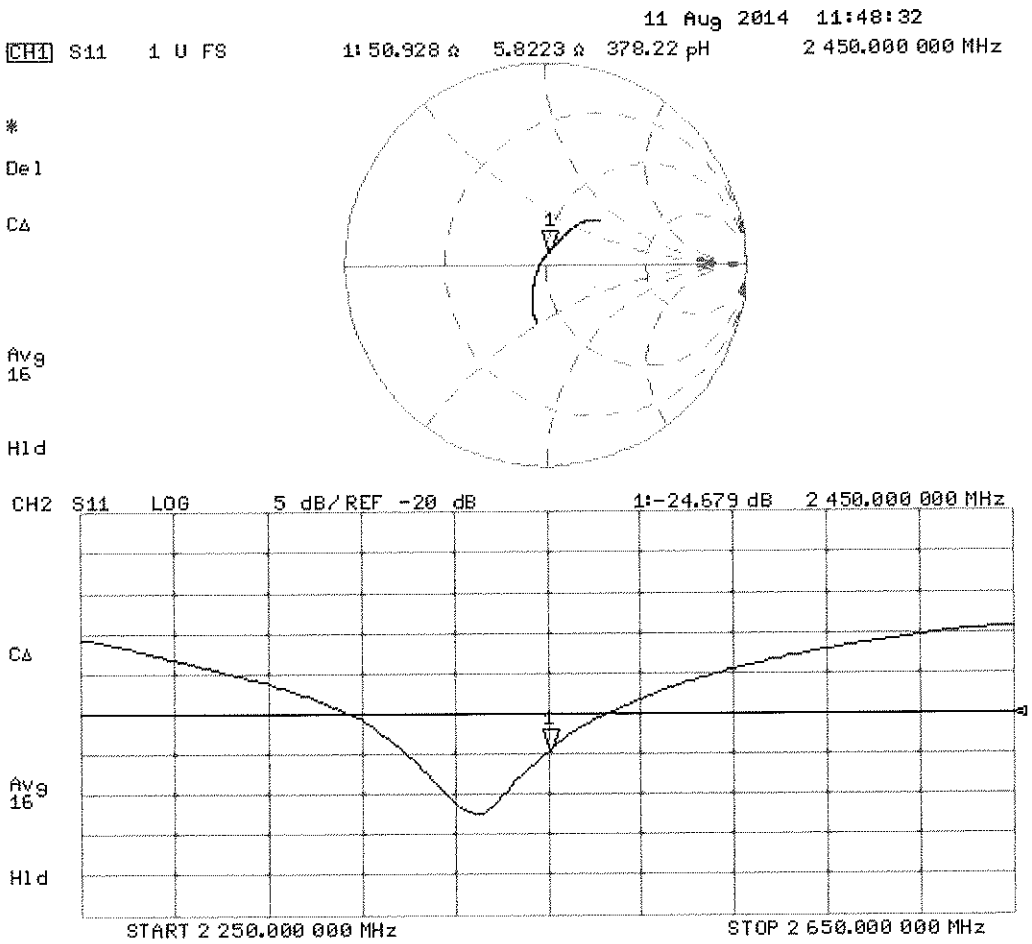
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.08 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 27.9 W/kg
SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.1 W/kg
Maximum value of SAR (measured) = 17.6 W/kg



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

Impedance Measurement Plot for Body TSL



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

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **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
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Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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Swiss Calibration Service

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

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

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

Probe ES3DV3

SN: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

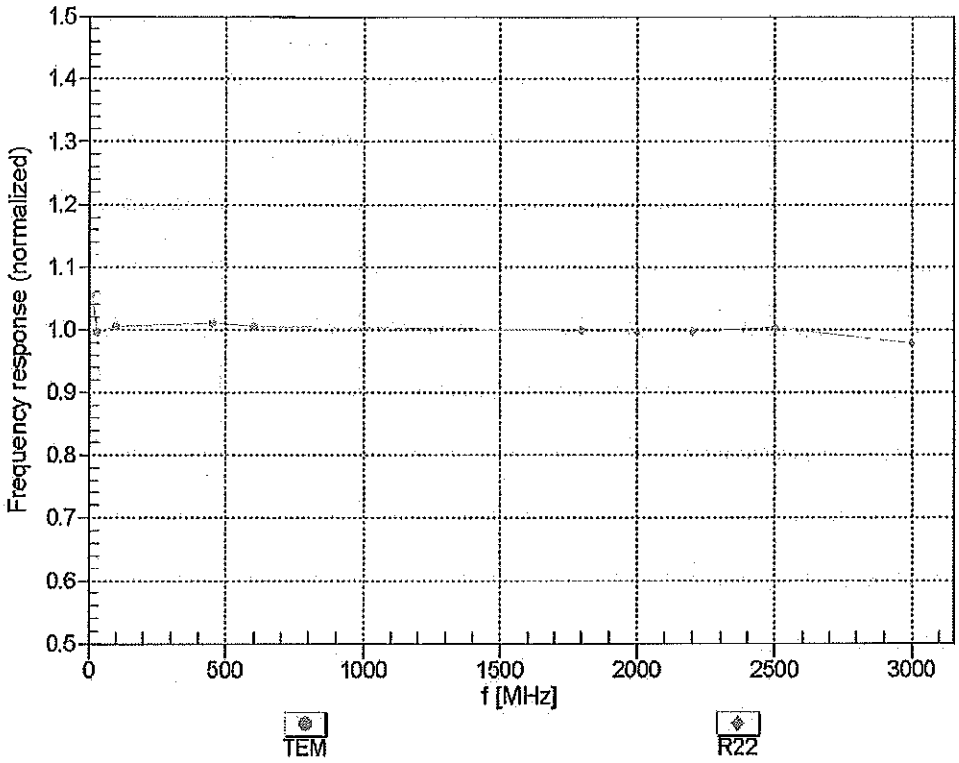
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	55.5	0.96	6.09	6.09	6.09	0.49	1.47	± 12.0 %
835	55.2	0.97	6.14	6.14	6.14	0.69	1.27	± 12.0 %
1750	53.4	1.49	4.94	4.94	4.94	0.80	1.24	± 12.0 %
1900	53.3	1.52	4.73	4.73	4.73	0.62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

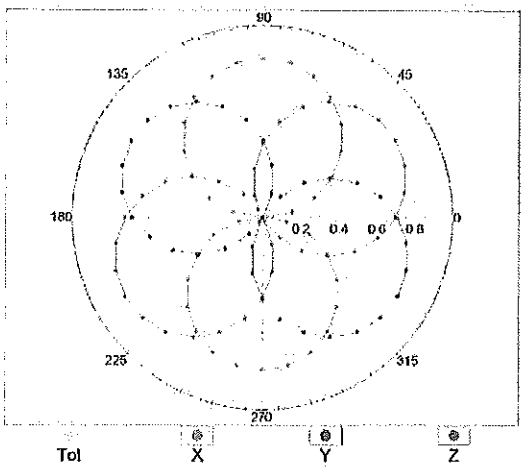
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



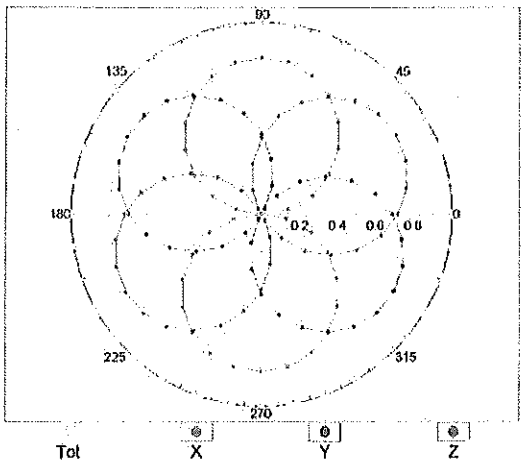
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

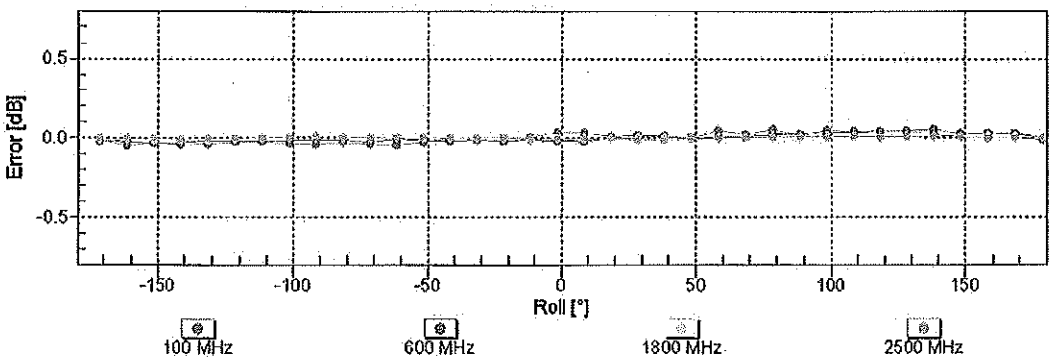
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



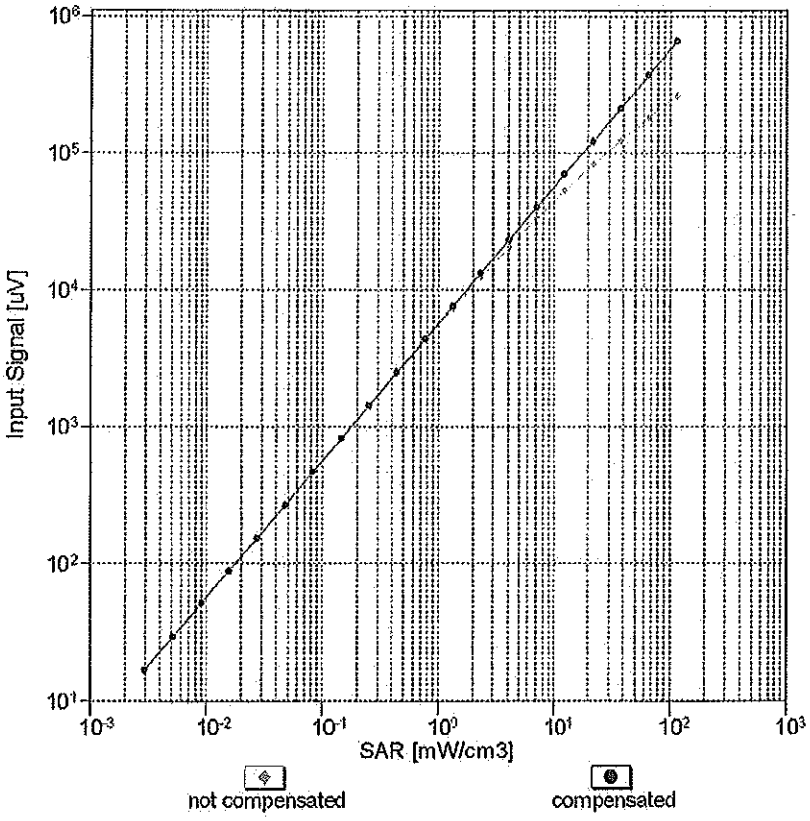
f=1800 MHz,R22

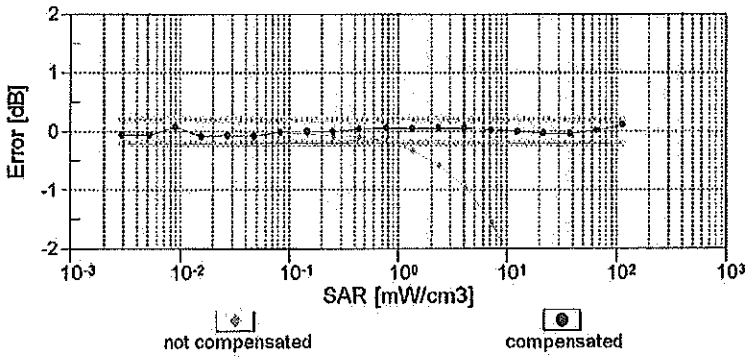




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

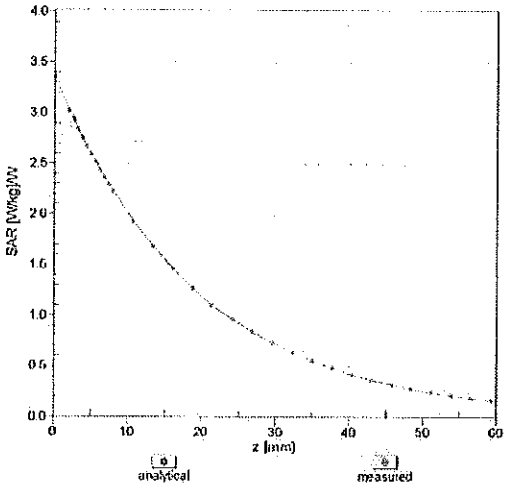




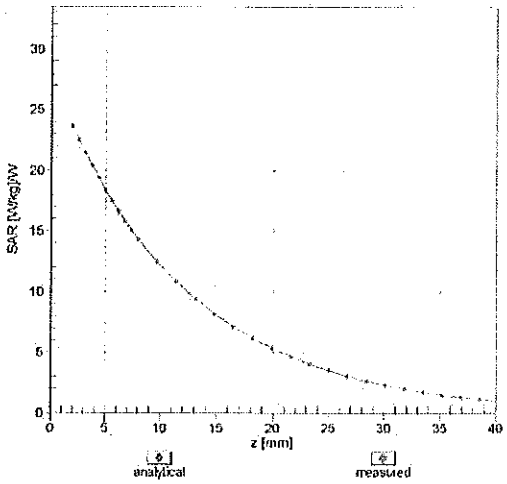
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

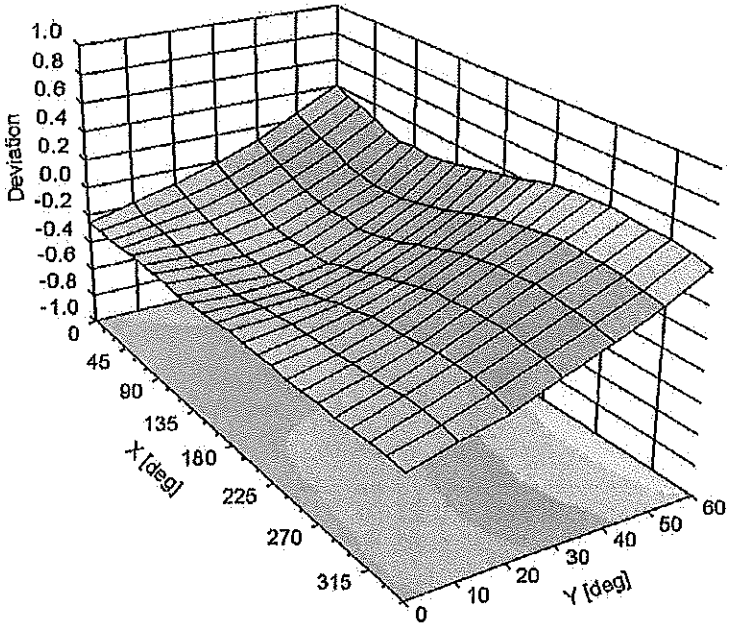


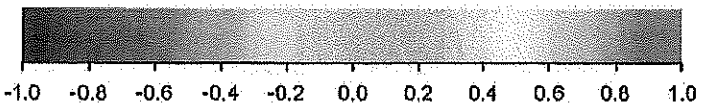
f = 1900 MHz,WGLS R22 (H_convF)



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
S Servizio svizzero di taratura
Swiss Calibration Service

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

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **ES3-3022_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

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	±2.5 %
		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).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [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

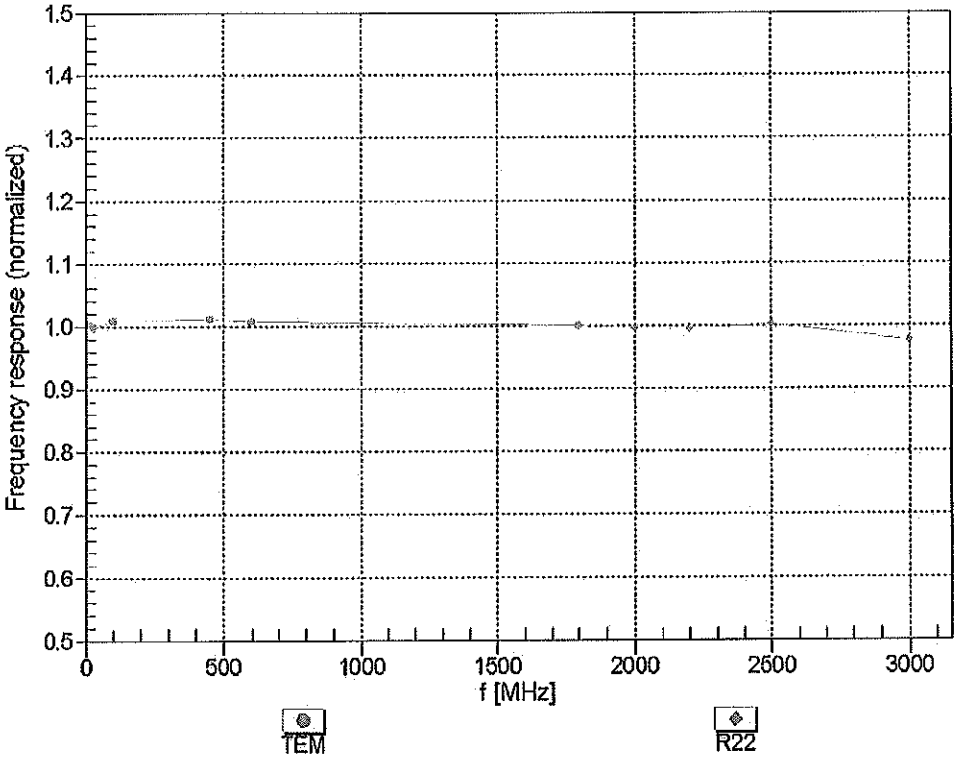
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
450	56.7	0.94	6.78	6.78	6.78	0.12	1.30	± 13.3 %
600	56.1	0.95	6.72	6.72	6.72	0.05	1.20	± 13.3 %
750	55.5	0.96	6.02	6.02	6.02	0.23	2.05	± 12.0 %
835	55.2	0.97	5.98	5.98	5.98	0.29	1.85	± 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.

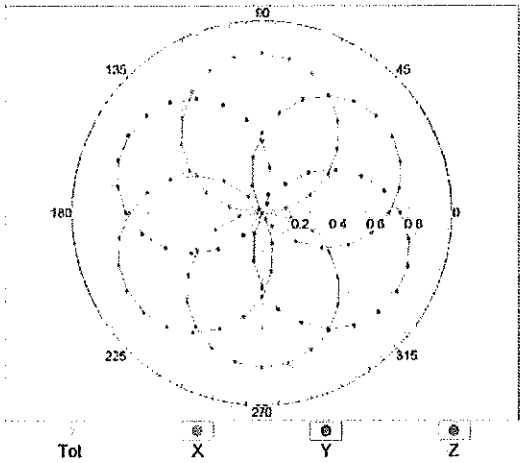
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



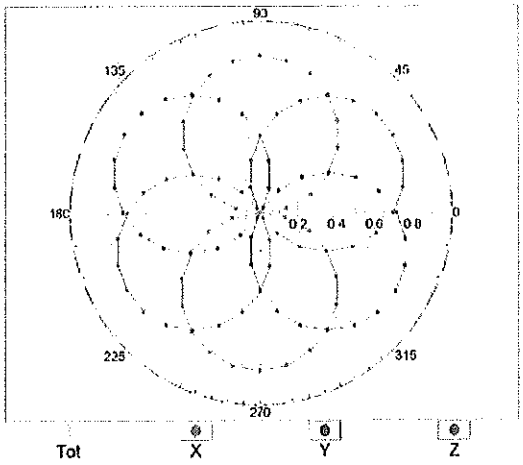
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

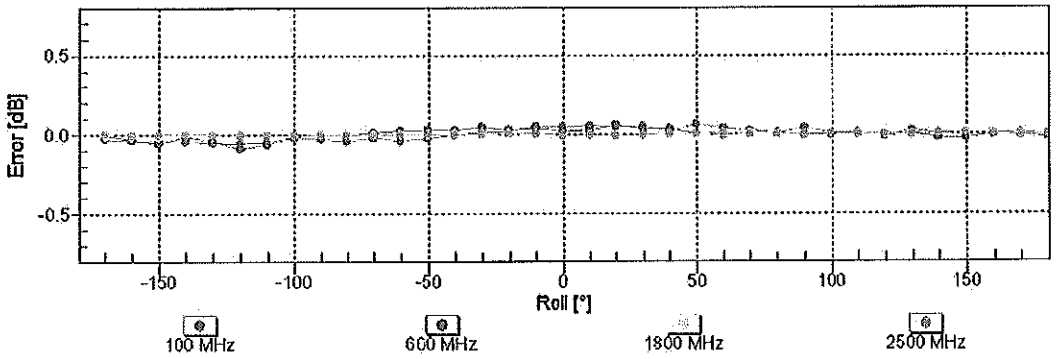
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



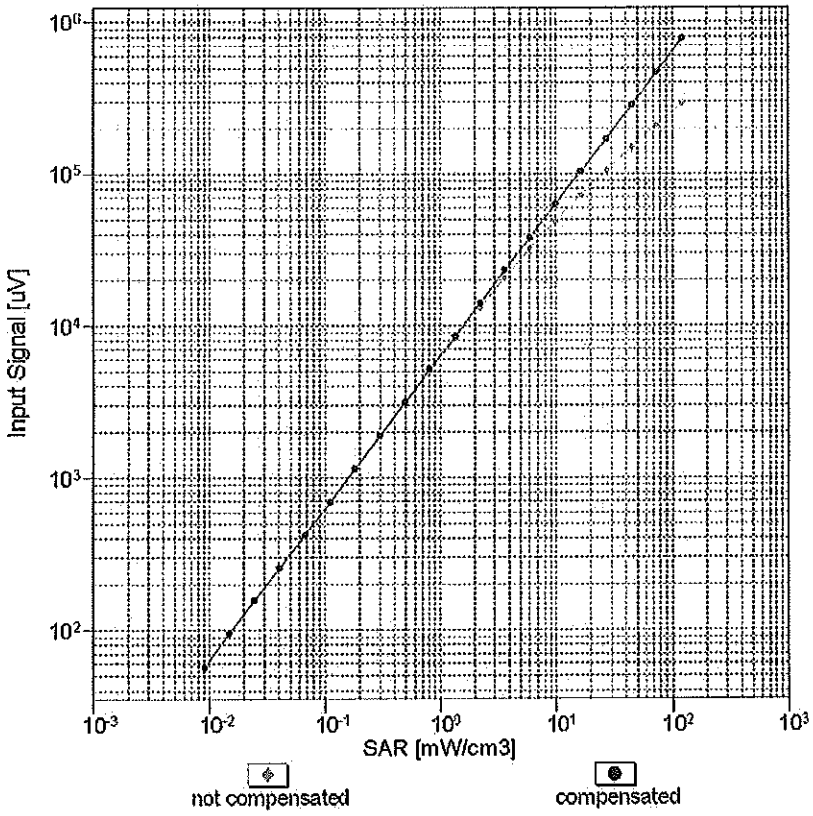
f=1800 MHz,R22

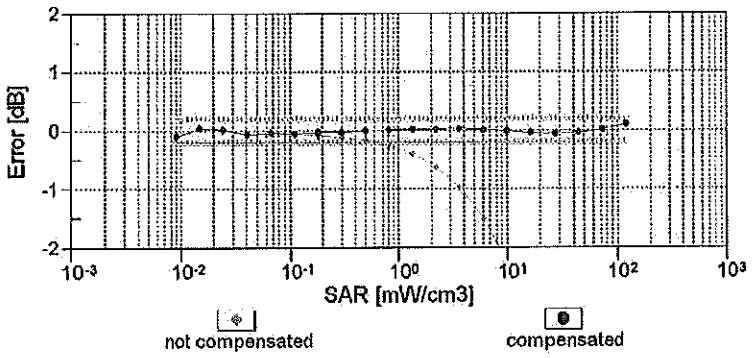




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

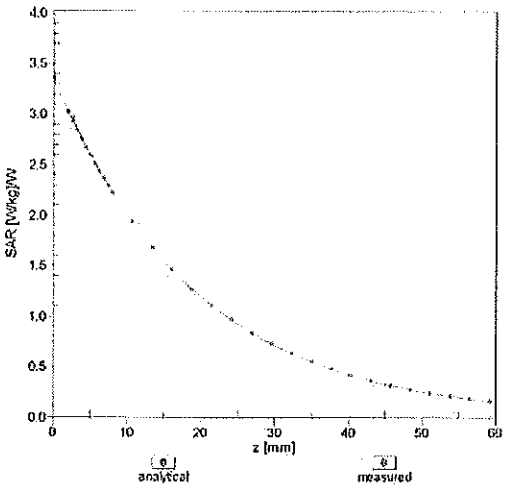




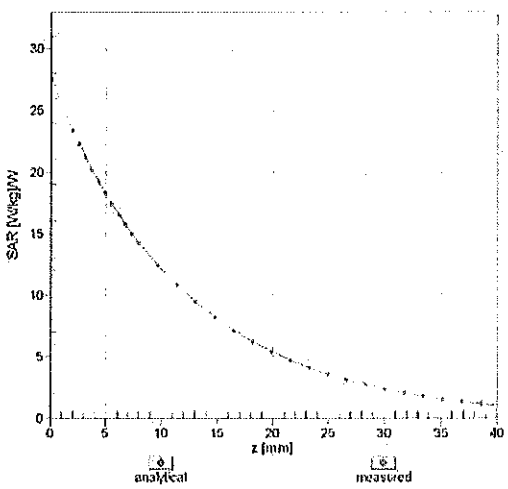
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

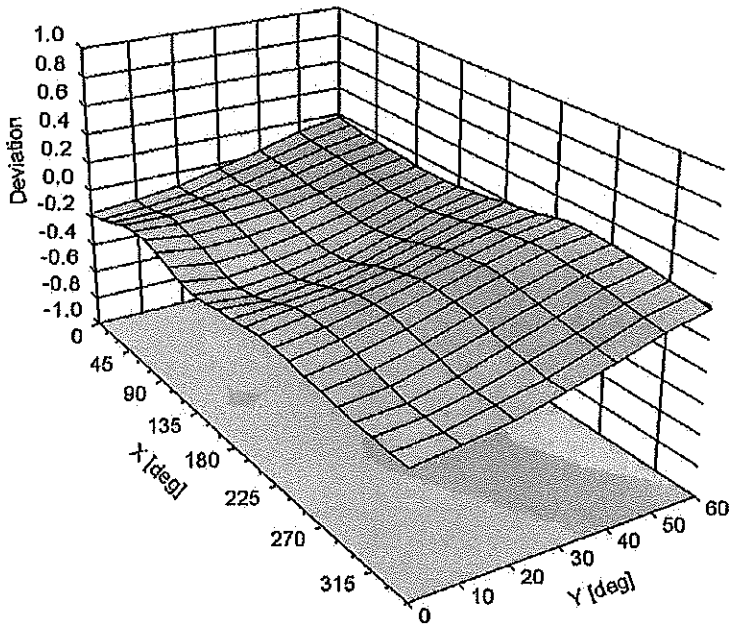


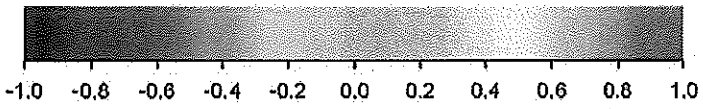
f = 1900 MHz,WGLS R22 (H_convF)



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
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: ES3-3209_Mar14

CALIBRATION CERTIFICATE

Object ES3DV3 - SN:3209

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

CCV 3/27/14

Calibration date: March 19, 2014

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

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

Calibration Equipment used (M&TE critical for calibration)

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

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 20, 2014

PCT # 80249

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

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

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

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

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

Probe ES3DV3

SN:3209

Manufactured: October 14, 2008
Calibrated: March 19, 2014

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

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.35	1.32	1.13	± 10.1 %
DCP (mV)[B]	101.5	101.0	102.5	

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	188.4	±3.8 %
		Y	0.0	0.0	1.0		180.7	
		Z	0.0	0.0	1.0		200.1	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	2.80	64.7	12.3	10.00	43.2	±1.4 %
		Y	3.12	65.6	13.1		41.9	
		Z	2.67	64.0	11.7		39.4	
10011-CAB	UMTS-FDD (WCDMA)	X	3.39	67.7	19.0	2.91	149.2	±0.5 %
		Y	3.38	67.7	19.0		146.1	
		Z	3.35	67.6	18.7		136.1	
10012-CAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	3.01	69.8	19.4	1.87	149.4	±0.7 %
		Y	3.06	70.1	19.6		147.1	
		Z	2.98	69.7	19.2		136.4	
10021-DAB	GSM-FDD (TDMA, GMSK)	X	5.47	79.6	20.4	9.39	146.9	±1.7 %
		Y	7.76	84.9	22.9		134.2	
		Z	4.34	75.3	18.5		134.2	
10023-DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	6.66	82.9	21.6	9.57	139.8	±2.5 %
		Y	9.36	88.2	24.2		131.5	
		Z	4.67	76.1	18.8		144.8	
10024-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	5.89	79.1	17.9	6.56	141.2	±1.9 %
		Y	27.58	99.6	24.8		145.8	
		Z	5.42	77.8	17.4		129.3	
10027-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	9.68	85.3	19.0	4.80	136.9	±2.2 %
		Y	36.47	100.0	23.3		139.2	
		Z	31.63	96.5	21.4		149.2	
10028-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	40.09	99.7	21.7	3.55	125.9	±1.9 %
		Y	47.92	99.6	21.7		127.6	
		Z	61.98	99.9	20.8		136.2	
10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	99.32	95.7	16.5	1.16	145.1	±1.7 %
		Y	55.30	99.5	19.3		145.6	
		Z	0.54	60.4	5.7		132.7	
10039-CAB	CDMA2000 (1xRTT, RC1)	X	4.77	67.1	19.2	4.57	145.6	±0.9 %
		Y	4.85	67.5	19.5		147.8	
		Z	4.67	66.7	18.9		133.4	

10081-CAB	CDMA2000 (1xRTT, RC3)	X	3.93	66.4	18.8	3.97	140.9	±0.7 %
		Y	4.02	66.9	19.1		146.0	
		Z	3.86	66.1	18.5		129.1	
10098-CAB	UMTS-FDD (HSUPA, Subtest 2)	X	4.56	66.6	18.6	3.98	132.8	±0.7 %
		Y	4.58	66.7	18.7		135.9	
		Z	4.63	67.0	18.7		143.0	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.42	67.5	19.8	5.67	139.3	±1.4 %
		Y	6.49	67.9	20.1		143.0	
		Z	6.18	66.7	19.3		126.9	
10108-CAB	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.28	67.1	19.7	5.80	136.9	±1.4 %
		Y	6.35	67.5	20.0		140.4	
		Z	6.36	67.5	19.8		147.1	
10110-CAB	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X	5.94	66.5	19.4	5.75	134.0	±1.4 %
		Y	6.01	66.9	19.8		136.4	
		Z	5.99	66.8	19.5		143.6	
10114-CAA	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	X	10.02	68.5	21.1	8.10	127.2	±2.2 %
		Y	10.31	69.3	21.8		130.2	
		Z	10.12	68.8	21.2		139.0	
10117-CAA	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.03	68.5	21.1	8.07	129.2	±2.2 %
		Y	10.31	69.3	21.7		131.2	
		Z	10.15	68.9	21.3		141.0	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	8.54	72.4	24.8	9.28	139.6	±3.0 %
		Y	9.29	75.2	26.7		144.1	
		Z	8.55	72.5	24.7		149.7	
10154-CAB	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	5.94	66.5	19.4	5.75	134.7	±1.4 %
		Y	6.00	66.9	19.7		136.7	
		Z	6.01	66.9	19.5		143.3	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.40	67.1	19.7	5.82	139.9	±1.7 %
		Y	6.48	67.5	20.0		142.9	
		Z	6.43	67.3	19.7		148.7	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	4.90	66.8	19.8	5.73	136.1	±1.4 %
		Y	5.03	67.2	20.2		141.1	
		Z	5.08	67.3	20.0		148.1	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	6.56	72.5	25.2	9.21	125.7	±2.5 %
		Y	7.28	75.4	27.1		128.8	
		Z	6.78	73.0	25.2		138.3	
10175-CAB	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	4.86	66.6	19.7	5.72	133.7	±1.4 %
		Y	4.97	66.9	20.0		136.3	
		Z	5.04	67.2	19.9		145.7	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	4.88	66.7	19.7	5.72	133.3	±1.4 %
		Y	4.99	67.0	20.0		136.5	
		Z	5.06	67.3	19.9		145.7	

10193-CAA	IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	X	10.05	69.2	21.7	8.09	146.7	±2.5 %
		Y	10.20	69.8	22.1		146.9	
		Z	9.76	68.5	21.1		132.1	
10196-CAA	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	10.05	69.2	21.7	8.10	148.5	±2.2 %
		Y	10.21	69.9	22.2		148.0	
		Z	9.75	68.5	21.2		133.6	
10219-CAA	IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)	X	9.96	69.2	21.6	8.03	148.9	±2.5 %
		Y	10.09	69.7	22.1		147.4	
		Z	9.67	68.5	21.1		133.4	
10222-CAA	IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)	X	10.00	68.5	21.1	8.06	127.8	±2.2 %
		Y	10.21	69.1	21.6		127.3	
		Z	10.11	68.9	21.2		140.4	
10225-CAB	UMTS-FDD (HSPA+)	X	6.81	66.5	19.3	5.97	125.8	±1.4 %
		Y	7.07	67.5	19.9		149.0	
		Z	6.92	67.0	19.4		136.8	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	6.62	72.8	25.3	9.21	128.5	±2.2 %
		Y	7.33	75.7	27.2		129.5	
		Z	6.87	73.4	25.5		141.8	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	7.92	71.5	24.4	9.24	131.3	±3.0 %
		Y	8.35	73.3	25.7		131.3	
		Z	7.94	71.6	24.3		140.2	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	8.52	72.3	24.8	9.30	138.8	±3.0 %
		Y	9.10	74.5	26.3		139.5	
		Z	8.53	72.3	24.6		149.4	
10274-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)	X	5.98	67.1	19.1	4.87	144.4	±0.9 %
		Y	5.99	67.3	19.2		144.0	
		Z	5.80	66.6	18.7		131.0	
10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.51	67.2	19.0	3.96	148.6	±0.7 %
		Y	4.30	66.3	18.6		127.3	
		Z	4.40	66.9	18.7		135.9	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.61	66.9	18.8	3.46	138.3	±0.7 %
		Y	3.67	67.2	19.0		140.5	
		Z	3.62	67.0	18.7		128.8	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.59	67.1	18.9	3.39	141.5	±0.7 %
		Y	3.59	67.1	18.9		142.0	
		Z	3.59	67.2	18.8		130.8	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.27	67.0	19.7	5.81	135.3	±1.7 %
		Y	6.31	67.3	19.9		136.0	
		Z	6.36	67.4	19.8		147.2	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.91	67.9	20.2	6.06	141.9	±1.7 %
		Y	6.94	68.1	20.4		142.7	
		Z	6.68	67.1	19.7		130.3	

10315-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)	X	2.94	69.9	19.6	1.71	148.6	±0.5 %
		Y	2.81	68.8	19.0		148.8	
		Z	2.92	69.7	19.2		138.1	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.76	68.7	19.1	3.76	128.0	±0.5 %
		Y	4.71	68.2	18.9		129.2	
		Z	4.85	68.8	19.0		141.9	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.64	68.5	19.0	3.77	126.3	±0.7 %
		Y	4.60	68.2	18.9		127.9	
		Z	4.74	68.8	19.0		140.6	

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:3209

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	41.9	0.89	6.43	6.43	6.43	0.29	2.01	± 12.0 %
835	41.5	0.90	6.23	6.23	6.23	0.34	1.70	± 12.0 %
1750	40.1	1.37	5.24	5.24	5.24	0.80	1.13	± 12.0 %
1900	40.0	1.40	5.13	5.13	5.13	0.46	1.49	± 12.0 %
2450	39.2	1.80	4.54	4.54	4.54	0.63	1.38	± 12.0 %
2600	39.0	1.96	4.38	4.38	4.38	0.76	1.28	± 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.

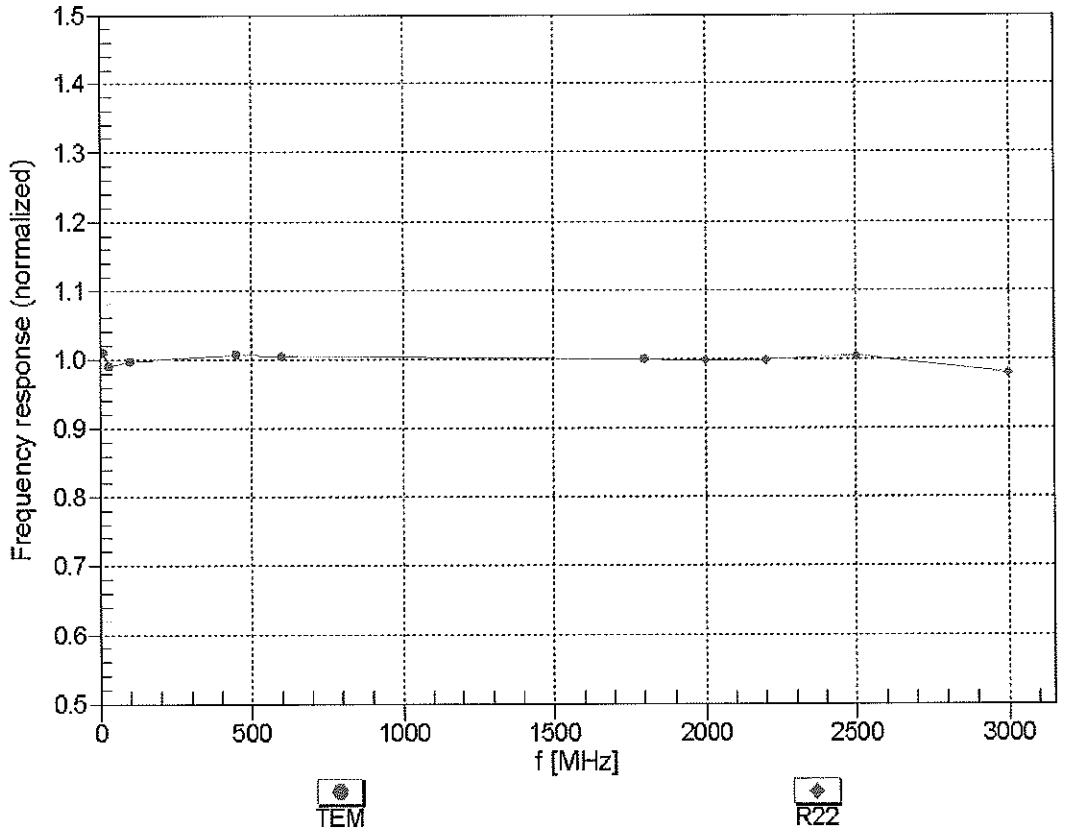
DASY/EASY - Parameters of Probe: ES3DV3 - SN:3209

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	55.5	0.96	6.16	6.16	6.16	0.26	2.23	± 12.0 %
835	55.2	0.97	6.14	6.14	6.14	0.80	1.13	± 12.0 %
1750	53.4	1.49	4.85	4.85	4.85	0.59	1.42	± 12.0 %
1900	53.3	1.52	4.68	4.68	4.68	0.52	1.59	± 12.0 %
2450	52.7	1.95	4.20	4.20	4.20	0.73	1.08	± 12.0 %
2600	52.5	2.16	4.04	4.04	4.04	0.80	1.00	± 12.0 %

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

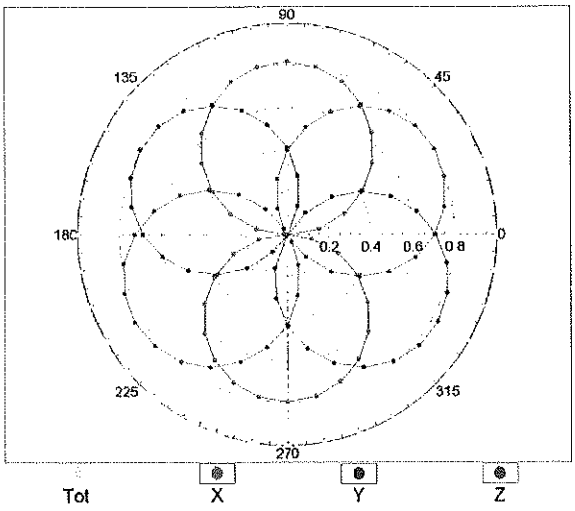
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



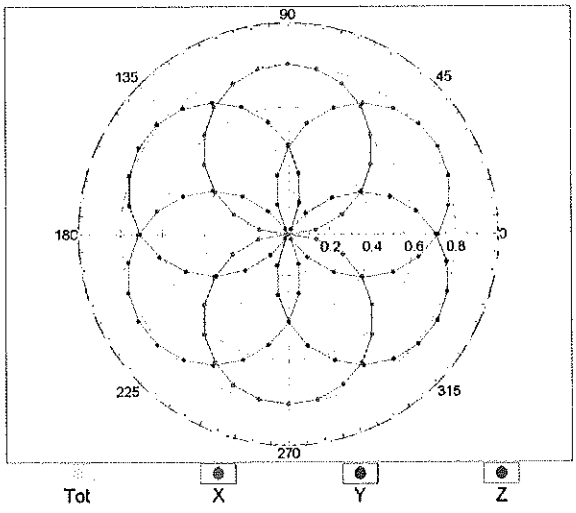
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

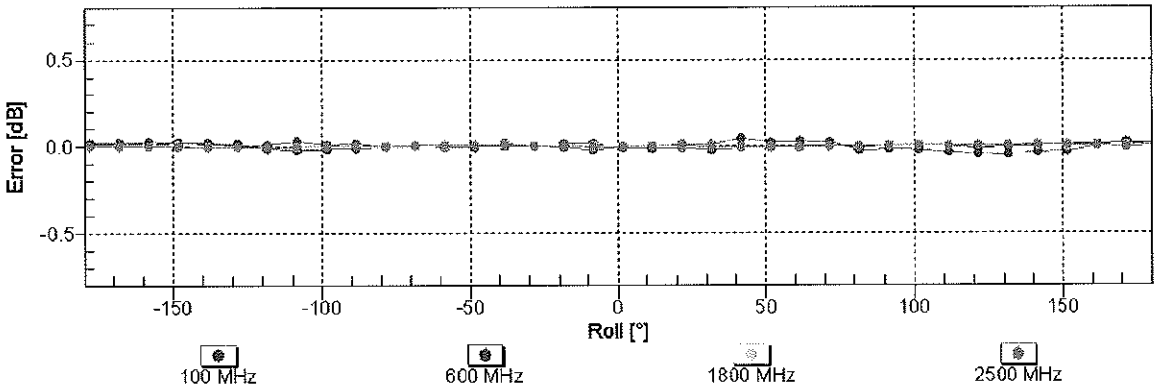
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



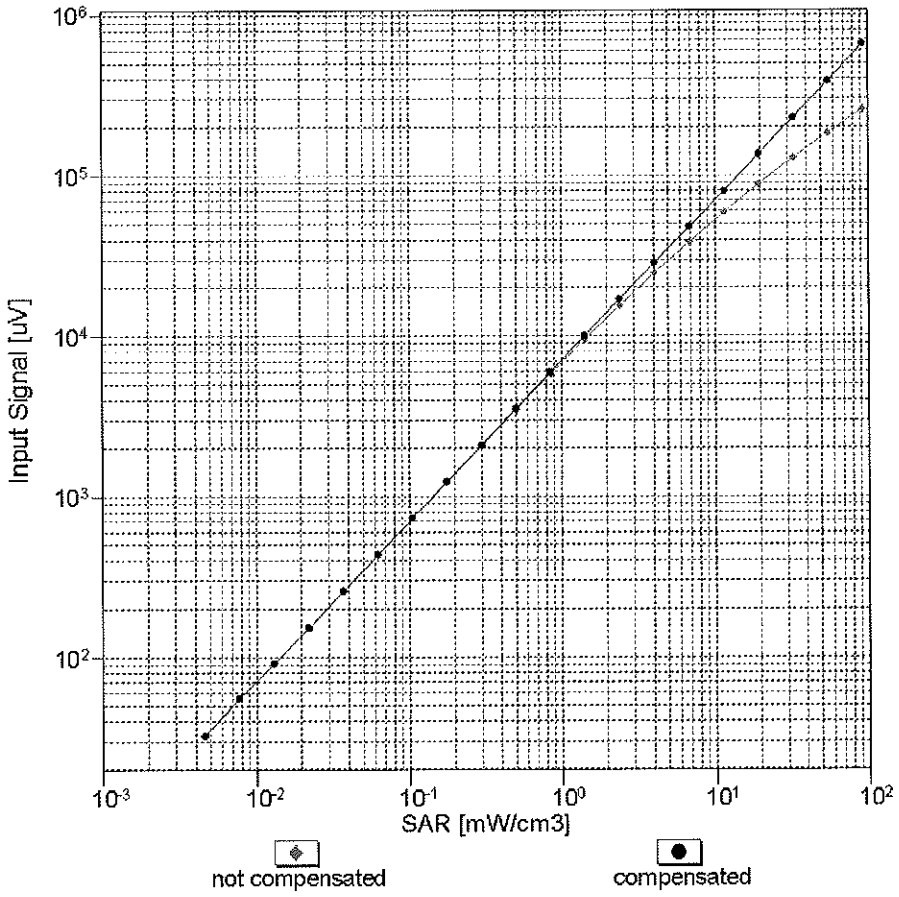
f=1800 MHz,R22

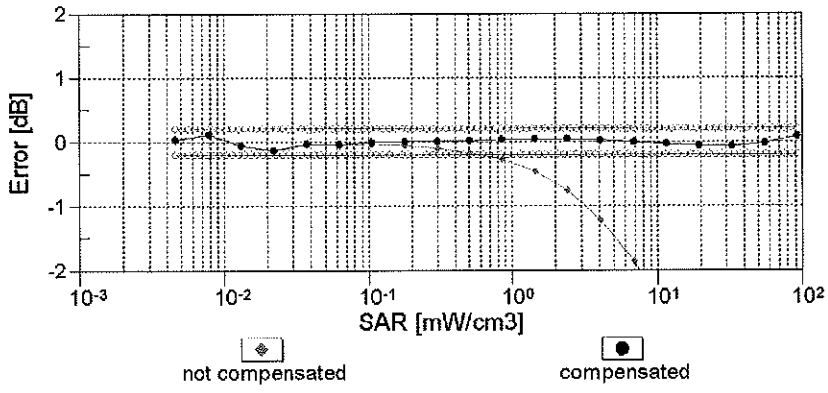




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

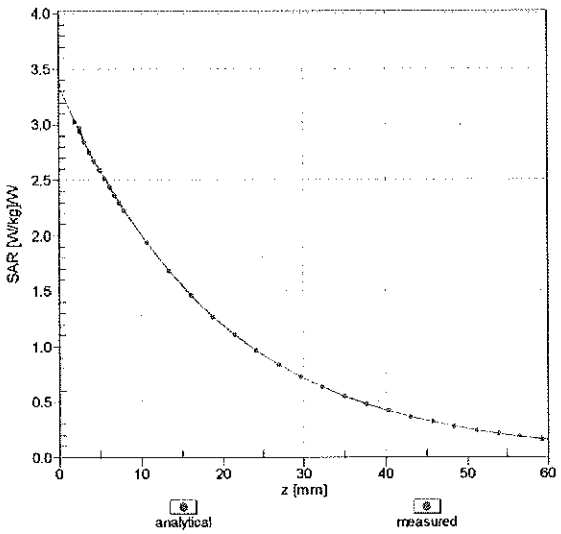




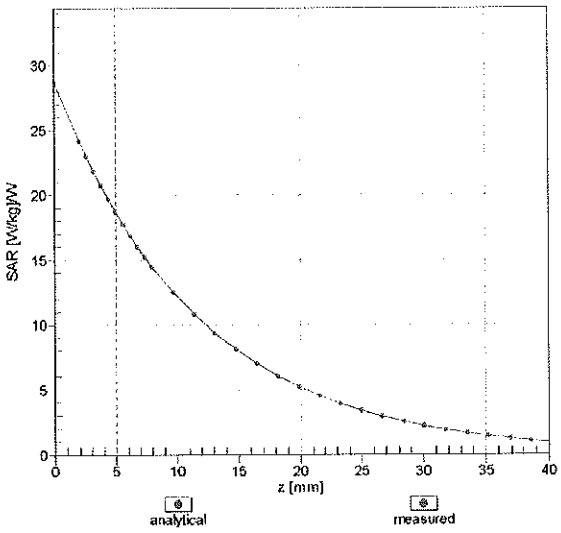
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

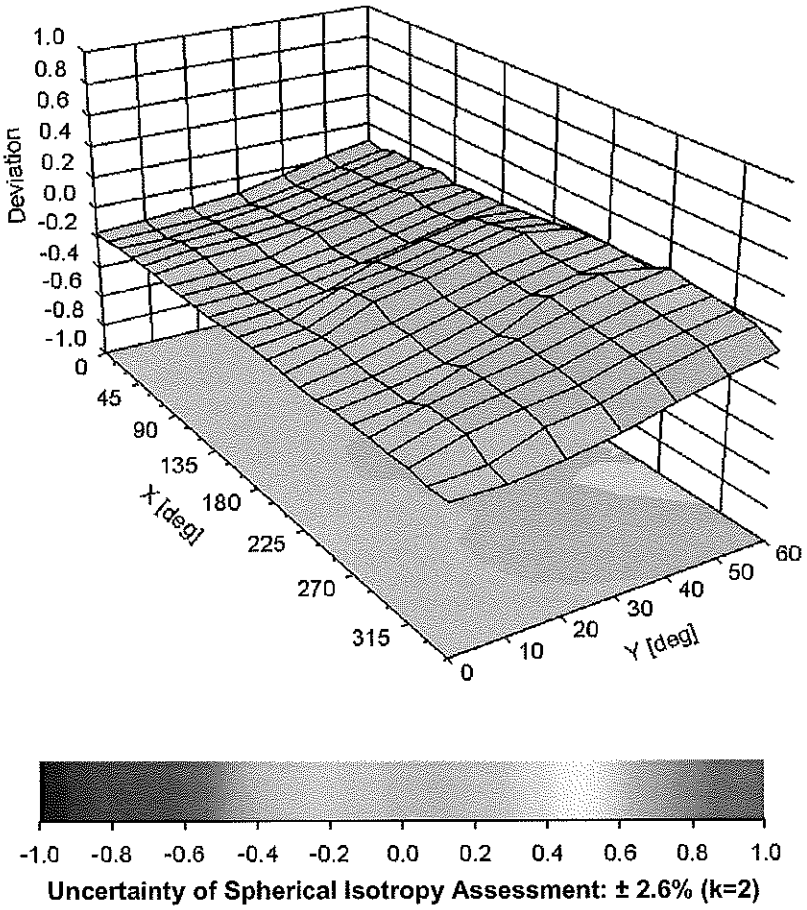


f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

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

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-38.3
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

APPENDIX D: SAR TISSUE SPECIFICATIONS

Measurement Procedure for Tissue verification:

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

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

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

Table D-I
Composition of the Tissue Equivalent Matter

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

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	835	1/7/2015	3334	ES3DV3	835	Body	0.950	52.57	PASS	PASS	PASS	GMSK	PASS	N/A
J	1900	9/4/2014	3022	ES3DV2	1900	Body	1.555	52.66	PASS	PASS	PASS	GMSK	PASS	N/A
I	2450	7/14/2014	3209	ES3DV3	2450	Body	1.928	51.04	PASS	PASS	PASS	OFDM/TDD	PASS	PASS

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

ZNFLK430 Sensor Triggering Data Summary

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

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

The operational description contains information explaining how this device remains compliant in the event of a sensor malfunction.

Back Side

Moving device toward the phantom:

KDB 616217 §6.2.6 Measured Power [dBm]											
Distance[mm]	20	19	18	17	16	15	14	13	12	11	10
LTE B26	24.20	24.20	24.20	24.20	24.20	18.20	18.20	18.20	18.20	18.20	18.20
LTE B25	24.20	24.20	24.20	24.20	24.20	14.20	14.20	14.20	14.20	14.20	14.20
LTE B41	24.70	24.70	24.70	24.70	24.70	13.70	13.70	13.70	13.70	13.70	13.70

Moving device away from the phantom:

KDB 616217 §6.2.8 Measured Power [dBm]																	
Distance[mm]	0	3	6	9	10	11	12	13	14	15	16	17	18	19	20	23	26
LTE B26	18.20	18.20	18.20	18.20	18.20	18.20	18.20	18.20	18.20	18.20	24.20	24.20	24.20	24.20	24.20	24.20	24.20
LTE B25	14.20	14.20	14.20	14.20	14.20	14.20	14.20	14.20	14.20	14.20	24.20	24.20	24.20	24.20	24.20	24.20	24.20
LTE B41	13.70	13.70	13.70	13.70	13.70	13.70	13.70	13.70	13.70	13.70	24.70	24.70	24.70	24.70	24.70	24.70	24.70

Based on the most conservative measured triggering distance of 15 mm, additional SAR measurements were required at 14 mm from the back side.

Top Edge

Moving device toward the phantom:

KDB 616217 §6.2.6 Measured Power [dBm]											
Distance[mm]	22	21	20	19	18	17	16	15	14	13	12
LTE B26	24.20	24.20	24.20	24.20	24.20	18.20	18.20	18.20	18.20	18.20	18.20
LTE B25	24.20	24.20	24.20	24.20	24.20	14.20	14.20	14.20	14.20	14.20	14.20
LTE B41	24.70	24.70	24.70	24.70	24.70	13.70	13.70	13.70	13.70	13.70	13.70

Moving device away from the phantom:

KDB 616217 §6.2.8 Measured Power [dBm]																	
Distance[mm]	0	3	6	9	12	13	14	15	16	17	18	19	20	21	22	25	28
LTE B26	18.20	18.20	18.20	18.20	18.20	18.20	18.20	18.20	18.20	18.20	24.20	24.20	24.20	24.20	24.20	24.20	24.20
LTE B25	14.20	14.20	14.20	14.20	14.20	14.20	14.20	14.20	14.20	14.20	24.20	24.20	24.20	24.20	24.20	24.20	24.20
LTE B41	13.70	13.70	13.70	13.70	13.70	13.70	13.70	13.70	13.70	13.70	24.70	24.70	24.70	24.70	24.70	24.70	24.70

Based on the most conservative measured triggering distance of 17 mm, additional SAR measurements were required at 16 mm from the top edge.

Right Edge

Moving device toward the phantom:

KDB 616217 §6.2.6 Measured Power [dBm]											
Distance[mm]	11	10	9	8	7	6	5	4	3	2	1
LTE B26	24.20	24.20	24.20	24.20	24.20	18.20	18.20	18.20	18.20	18.20	18.20
LTE B25	24.20	24.20	24.20	24.20	24.20	14.20	14.20	14.20	14.20	14.20	14.20
LTE B41	24.70	24.70	24.70	24.70	24.70	13.70	13.70	13.70	13.70	13.70	13.70

Moving device away from the phantom:

KDB 616217 §6.2.8 Measured Power [dBm]														
Distance[mm]	0	1	2	3	4	5	6	7	8	9	10	11	14	17
LTE B26	18.20	18.20	18.20	18.20	18.20	18.20	18.20	24.20	24.20	24.20	24.20	24.20	24.20	24.20
LTE B25	14.20	14.20	14.20	14.20	14.20	14.20	14.20	24.20	24.20	24.20	24.20	24.20	24.20	24.20
LTE B41	13.70	13.70	13.70	13.70	13.70	13.70	13.70	24.70	24.70	24.70	24.70	24.70	24.70	24.70

Based on the most conservative measured triggering distance of 6 mm, additional SAR measurements were required at 5 mm from the right edge