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SAR EVALUATION REPORT

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

Date of Testing:
06/16/14
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Document Serial No.:
0Y1405211048.A3L

FCC ID:	**A3LSPHP500**
APPLICANT:	**SAMSUNG ELECTRONICS, CO. LTD.**

DUT Type:	Portable Tablet Computer
Application Type:	Class II Permissive Change
FCC Rule Part(s):	CFR §2.1093
Model(s):	SPH-P500
Permissive Change(s):	See FCC Change Document
Date of Original Certification:	10/02/2012

Equipment Class	Band & Mode	Tx Frequency	SAR
			1 gm Body (W/kg)
PCB	LTE Band 25 (PCS)	1850.7 - 1914.3 MHz	1.10
Simultaneous SAR per KDB 690783 D01v01r02:			1.50

Note: The table above shows test data evaluated for the current test report. Please refer to RF Exposure Technical Report 0Y1207301058-R3.A3L for original compliance evaluation.

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 te sted in accordance with the measurement procedures specified in Section 1.6 of this report; for North American frequency bands only.

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

Randy Ortanez
President

ACCREDITED
TESTING CERT#2041.01

TABLE OF CONTENTS

1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
CDMA BC10 (§90S)	Data	817.90 - 823.10 MHz
CDMA BC0 (§22H)	Data	824.70 - 848.31 MHz
PCS CDMA	Data	1851.25 - 1908.75 MHz
LTE Band 25 (PCS)	Data	1850.7 - 1914.3 MHz
2.4 GHz WLAN	Data	2412 - 2462 MHz
Bluetooth	Data	2402 - 2480 MHz

1.2 Power Reduction for SAR

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

Since the device is a full tablet size, the Body SAR was evaluated per FCC KDB Publication 616217 D04v01 for full sized tablets. Please refer to RF Exposure Technical Report 0Y1207301058-R3.A3L for additional details.

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.

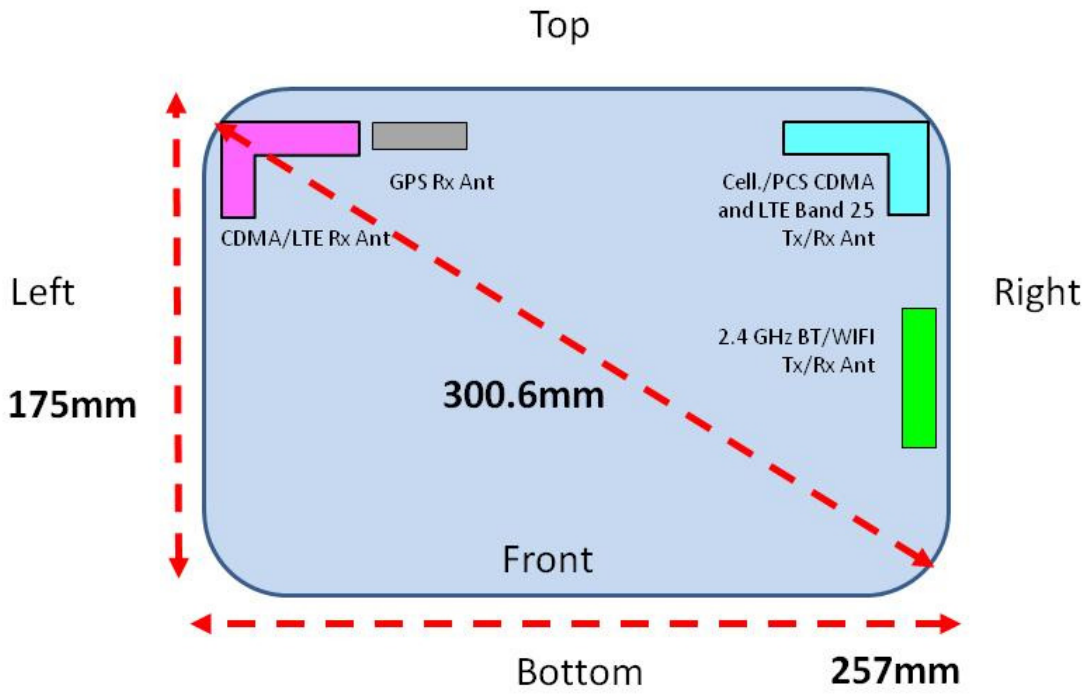
Maximum Output Power:

Mode / Band		Modulated Average (dBm)
LTE Band 25 (PCS)	Maximum	**23.5**
	Nominal	**23.0**

Reduced Output Power - Body at 0mm:

Mode / Band		Modulated Average (dBm)
LTE Band 25 (PCS)	Maximum	**14.5**
	Nominal	**14.0**

1.4 DUT Antenna Locations



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

Figure 1-1
DUT Antenna Locations

1.5 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D05v01, transmitters are considered to be transmitting simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. Possible transmission paths for the DUT are shown in Figure 1-2 and are color-coded to indicate communication modes which share the same path. Modes which share the same transmission path cannot transmit simultaneously with one another.

Figure 1-2
Simultaneous Transmission Paths

This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB Publication 447498 D01v05 3) procedures.

Table 1-1
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Body
1	LTE + 2.4 GHz WI-FI	Yes
2	LTE + 2.4 GHz Bluetooth	Yes
3	CDMA/EVDO data + 2.4 GHz WI-FI	Yes
4	CDMA/EVDO data + 2.4 GHz Bluetooth	Yes
5	CDMA/EVDO data + LTE	N/A

Notes:
1. 2.4 GHz WLAN and 2.4 GHz Bluetooth share the same antenna path and cannot transmit simultaneously

1.6 SAR Test Exclusions Applied

This report evaluates SAR compliance for LTE Band 25. Please refer to RF Exposure Technical Report 0Y1207301058-R3.A3L for original compliance report containing data for other main antenna and WLAN modes. No changes were made to any other mode or band.

(A) 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 D01-D06 (4G and Hotspot)
- FCC KDB Publication 447498 D01v05 (General SAR Guidance)
- FCC KDB Publication 865664 D01-D02 (SAR Measurements up to 6 GHz)
- FCC KDB Publication 616217 D04v01 (Tablet SAR Consideration)

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.

	Body Serial Number
LTE Band 25 (PCS) - Maximum Power	P500-1
LTE Band 25 (PCS) - Reduced Power	P500-2

2 LTE INFORMATION

LTE Information			
FCC ID	**A3LSPHP500**		
Form Factor	Portable Tablet Computer		
Frequency Range of each LTE transmission band	LTE Band 25 (PCS) (1850.7 - 1914.3 MHz)		
Channel Bandwidths	LTE Band 25 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz		
Channel Numbers and Frequencies (MHz)	Low	Mid	High
LTE Band 25 (PCS): 1.4 MHz	1850.7 (26047)	1882.5 (26365)	1914.3 (26683)
LTE Band 25 (PCS): 3 MHz	1851.5 (26055)	1882.5 (26365)	1913.5 (26675)
LTE Band 25 (PCS): 5 MHz	1852.5 (26065)	1882.5 (26365)	1912.5 (26665)
LTE Band 25 (PCS): 10 MHz	1855 (26090)	1882.5 (26365)	1910 (26640)
LTE Band 25 (PCS): 15 MHz	1857.5 (26115)	1882.5 (26365)	1907.5 (26615)
LTE Band 25 (PCS): 20 MHz	1860 (26140)	1882.5 (26365)	1905 (26590)
UE Category	3		
Modulations Supported in UL	QPSK, 16QAM		
LTE MPR Permanently implemented per 3GPP TS 36.101 section 6.2.3~6.2.5? (manufacturer attestation to be provided)	YES		
A-MPR (Additional MPR) disabled for SAR Testing?	YES		

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:

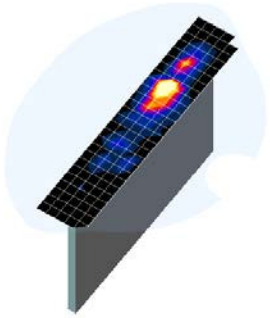


Figure 4-1
Sample SAR Area Scan

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 FCC KDB Publication 616217 D04v01

Due to its size this device can be used in full sized tablet exposure conditions. 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 Additional Test Positions due to Sensor Considerations

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

When the sensor detects a user is touching the device on or near to the antenna the device reduces the maximum allowed output power 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 12 mm, a conservative distance of 11 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 8 mm, a conservative distance of 7 mm was tested for SAR on the top 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

7.1 Measured and Reported SAR

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

7.2 Procedures Used to Establish RF Signal for SAR

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

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

7.3 SAR Measurement Conditions for 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 D05v02r01:

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

8 RF CONDUCTED POWERS

8.1 LTE Conducted Powers

8.1.1 LTE Band 25 – Maximum Power

Table 8-1
LTE Band 25 Conducted Powers - 20 MHz Bandwidth

	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	23.30	0	0
	1860	26140	20	QPSK	1	50	22.94	0	0
	1860	26140	20	QPSK	1	99	22.67	0	0
	1860	26140	20	QPSK	50	0	22.18	0-1	1
	1860	26140	20	QPSK	50	25	22.06	0-1	1
	1860	26140	20	QPSK	50	50	21.87	0-1	1
	1860	26140	20	QPSK	100	0	21.62	0-1	1
	1860	26140	20	16QAM	1	0	22.35	0-1	1
	1860	26140	20	16QAM	1	50	21.92	0-1	1
	1860	26140	20	16QAM	1	99	21.66	0-1	1
	1860	26140	20	16QAM	50	0	21.19	0-2	2
	1860	26140	20	16QAM	50	25	21.15	0-2	2
	1860	26140	20	16QAM	50	50	21.03	0-2	2
	1860	26140	20	16QAM	100	0	20.71	0-2	2
Mid	1882.5	26365	20	QPSK	1	0	22.59	0	0
	1882.5	26365	20	QPSK	1	50	22.72	0	0
	1882.5	26365	20	QPSK	1	99	23.09	0	0
	1882.5	26365	20	QPSK	50	0	21.70	0-1	1
	1882.5	26365	20	QPSK	50	25	21.85	0-1	1
	1882.5	26365	20	QPSK	50	50	21.94	0-1	1
	1882.5	26365	20	QPSK	100	0	21.72	0-1	1
	1882.5	26365	20	16QAM	1	0	21.56	0-1	1
	1882.5	26365	20	16QAM	1	50	21.52	0-1	1
	1882.5	26365	20	16QAM	1	99	21.96	0-1	1
	1882.5	26365	20	16QAM	50	0	20.99	0-2	2
	1882.5	26365	20	16QAM	50	25	20.95	0-2	2
	1882.5	26365	20	16QAM	50	50	21.03	0-2	2
	1882.5	26365	20	16QAM	100	0	21.00	0-2	2
High	1905	26590	20	QPSK	1	0	23.24	0	0
	1905	26590	20	QPSK	1	50	23.28	0	0
	1905	26590	20	QPSK	1	99	**23.50**	0	0
	1905	26590	20	QPSK	50	0	22.13	0-1	1
	1905	26590	20	QPSK	50	25	**22.22**	0-1	1
	1905	26590	20	QPSK	50	50	21.98	0-1	1
	1905	26590	20	QPSK	100	0	22.18	0-1	1
	1905	26590	20	16QAM	1	0	22.45	0-1	1
	1905	26590	20	16QAM	1	50	22.11	0-1	1
	1905	26590	20	16QAM	1	99	22.50	0-1	1
	1905	26590	20	16QAM	50	0	21.14	0-2	2
	1905	26590	20	16QAM	50	25	21.25	0-2	2
	1905	26590	20	16QAM	50	50	21.22	0-2	2
	1905	26590	20	16QAM	100	0	21.20	0-2	2

Table 8-2
LTE Band 25 Conducted Powers - 15 MHz Bandwidth

	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	23.13	0	0
	1857.5	26115	15	QPSK	1	36	22.74	0	0
	1857.5	26115	15	QPSK	1	74	22.53	0	0
	1857.5	26115	15	QPSK	36	0	21.92	0-1	1
	1857.5	26115	15	QPSK	36	18	21.92	0-1	1
	1857.5	26115	15	QPSK	36	37	21.74	0-1	1
	1857.5	26115	15	QPSK	75	0	21.54	0-1	1
	1857.5	26115	15	16QAM	1	0	22.13	0-1	1
	1857.5	26115	15	16QAM	1	36	22.01	0-1	1
	1857.5	26115	15	16QAM	1	74	21.57	0-1	1
	1857.5	26115	15	16QAM	36	0	21.28	0-2	2
	1857.5	26115	15	16QAM	36	18	21.11	0-2	2
	1857.5	26115	15	16QAM	36	37	21.32	0-2	2
	1857.5	26115	15	16QAM	75	0	20.77	0-2	2
Mid	1882.5	26365	15	QPSK	1	0	22.55	0	0
	1882.5	26365	15	QPSK	1	36	22.88	0	0
	1882.5	26365	15	QPSK	1	74	22.83	0	0
	1882.5	26365	15	QPSK	36	0	21.77	0-1	1
	1882.5	26365	15	QPSK	36	18	22.02	0-1	1
	1882.5	26365	15	QPSK	36	37	22.19	0-1	1
	1882.5	26365	15	QPSK	75	0	21.59	0-1	1
	1882.5	26365	15	16QAM	1	0	21.52	0-1	1
	1882.5	26365	15	16QAM	1	36	21.55	0-1	1
	1882.5	26365	15	16QAM	1	74	21.94	0-1	1
	1882.5	26365	15	16QAM	36	0	21.17	0-2	2
	1882.5	26365	15	16QAM	36	18	20.75	0-2	2
	1882.5	26365	15	16QAM	36	37	21.05	0-2	2
	1882.5	26365	15	16QAM	75	0	21.27	0-2	2
High	1907.5	26615	15	QPSK	1	0	23.02	0	0
	1907.5	26615	15	QPSK	1	36	22.98	0	0
	1907.5	26615	15	QPSK	1	74	23.36	0	0
	1907.5	26615	15	QPSK	36	0	22.41	0-1	1
	1907.5	26615	15	QPSK	36	18	22.14	0-1	1
	1907.5	26615	15	QPSK	36	37	22.28	0-1	1
	1907.5	26615	15	QPSK	75	0	22.22	0-1	1
	1907.5	26615	15	16QAM	1	0	22.42	0-1	1
	1907.5	26615	15	16QAM	1	36	22.14	0-1	1
	1907.5	26615	15	16QAM	1	74	22.28	0-1	1
	1907.5	26615	15	16QAM	36	0	21.00	0-2	2
	1907.5	26615	15	16QAM	36	18	21.26	0-2	2
	1907.5	26615	15	16QAM	36	37	21.23	0-2	2
	1907.5	26615	15	16QAM	75	0	21.06	0-2	2

Table 8-3
LTE Band 25 Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1855	26090	10	QPSK	1	0	23.41	0	0
	1855	26090	10	QPSK	1	25	22.99	0	0
	1855	26090	10	QPSK	1	49	22.54	0	0
	1855	26090	10	QPSK	25	0	21.97	0-1	1
	1855	26090	10	QPSK	25	12	21.72	0-1	1
	1855	26090	10	QPSK	25	25	21.59	0-1	1
	1855	26090	10	QPSK	50	0	21.55	0-1	1
	1855	26090	10	16QAM	1	0	22.03	0-1	1
	1855	26090	10	16QAM	1	25	21.99	0-1	1
	1855	26090	10	16QAM	1	49	21.82	0-1	1
	1855	26090	10	16QAM	25	0	21.06	0-2	2
	1855	26090	10	16QAM	25	12	21.08	0-2	2
	1855	26090	10	16QAM	25	25	21.30	0-2	2
	1855	26090	10	16QAM	50	0	20.68	0-2	2
Mid	1882.5	26365	10	QPSK	1	0	22.60	0	0
	1882.5	26365	10	QPSK	1	25	22.61	0	0
	1882.5	26365	10	QPSK	1	49	22.74	0	0
	1882.5	26365	10	QPSK	25	0	21.59	0-1	1
	1882.5	26365	10	QPSK	25	12	22.20	0-1	1
	1882.5	26365	10	QPSK	25	25	22.47	0-1	1
	1882.5	26365	10	QPSK	50	0	21.65	0-1	1
	1882.5	26365	10	16QAM	1	0	21.56	0-1	1
	1882.5	26365	10	16QAM	1	25	21.52	0-1	1
	1882.5	26365	10	16QAM	1	49	21.74	0-1	1
	1882.5	26365	10	16QAM	25	0	21.29	0-2	2
	1882.5	26365	10	16QAM	25	12	20.56	0-2	2
	1882.5	26365	10	16QAM	25	25	21.06	0-2	2
	1882.5	26365	10	16QAM	50	0	21.28	0-2	2
High	1910	26640	10	QPSK	1	0	23.18	0	0
	1910	26640	10	QPSK	1	25	23.22	0	0
	1910	26640	10	QPSK	1	49	23.40	0	0
	1910	26640	10	QPSK	25	0	22.48	0-1	1
	1910	26640	10	QPSK	25	12	22.33	0-1	1
	1910	26640	10	QPSK	25	25	22.23	0-1	1
	1910	26640	10	QPSK	50	0	22.18	0-1	1
	1910	26640	10	16QAM	1	0	22.33	0-1	1
	1910	26640	10	16QAM	1	25	21.88	0-1	1
	1910	26640	10	16QAM	1	49	22.14	0-1	1
	1910	26640	10	16QAM	25	0	20.88	0-2	2
	1910	26640	10	16QAM	25	12	21.36	0-2	2
	1910	26640	10	16QAM	25	25	21.04	0-2	2
	1910	26640	10	16QAM	50	0	21.32	0-2	2

Table 8-4
LTE Band 25 Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1852.5	26065	5	QPSK	1	0	23.24	0	0
	1852.5	26065	5	QPSK	1	12	22.97	0	0
	1852.5	26065	5	QPSK	1	24	22.79	0	0
	1852.5	26065	5	QPSK	12	0	21.88	0-1	1
	1852.5	26065	5	QPSK	12	6	21.80	0-1	1
	1852.5	26065	5	QPSK	12	13	21.58	0-1	1
	1852.5	26065	5	QPSK	25	0	21.87	0-1	1
	1852.5	26065	5	16-QAM	1	0	21.93	0-1	1
	1852.5	26065	5	16-QAM	1	12	22.03	0-1	1
	1852.5	26065	5	16-QAM	1	24	21.70	0-1	1
	1852.5	26065	5	16-QAM	12	0	21.26	0-2	2
	1852.5	26065	5	16-QAM	12	6	21.16	0-2	2
	1852.5	26065	5	16-QAM	12	13	21.28	0-2	2
	1852.5	26065	5	16-QAM	25	0	20.92	0-2	2
Mid	1882.5	26365	5	QPSK	1	0	22.59	0	0
	1882.5	26365	5	QPSK	1	12	22.68	0	0
	1882.5	26365	5	QPSK	1	24	22.88	0	0
	1882.5	26365	5	QPSK	12	0	21.58	0-1	1
	1882.5	26365	5	QPSK	12	6	22.42	0-1	1
	1882.5	26365	5	QPSK	12	13	22.30	0-1	1
	1882.5	26365	5	QPSK	25	0	21.90	0-1	1
	1882.5	26365	5	16-QAM	1	0	21.59	0-1	1
	1882.5	26365	5	16-QAM	1	12	21.56	0-1	1
	1882.5	26365	5	16-QAM	1	24	21.85	0-1	1
	1882.5	26365	5	16-QAM	12	0	21.32	0-2	2
	1882.5	26365	5	16-QAM	12	6	20.55	0-2	2
	1882.5	26365	5	16-QAM	12	13	21.04	0-2	2
	1882.5	26365	5	16-QAM	25	0	21.36	0-2	2
High	1912.5	26665	5	QPSK	1	0	23.24	0	0
	1912.5	26665	5	QPSK	1	12	23.21	0	0
	1912.5	26665	5	QPSK	1	24	23.38	0	0
	1912.5	26665	5	QPSK	12	0	22.38	0-1	1
	1912.5	26665	5	QPSK	12	6	22.23	0-1	1
	1912.5	26665	5	QPSK	12	13	22.42	0-1	1
	1912.5	26665	5	QPSK	25	0	22.04	0-1	1
	1912.5	26665	5	16-QAM	1	0	22.43	0-1	1
	1912.5	26665	5	16-QAM	1	12	21.65	0-1	1
	1912.5	26665	5	16-QAM	1	24	22.49	0-1	1
	1912.5	26665	5	16-QAM	12	0	20.59	0-2	2
	1912.5	26665	5	16-QAM	12	6	21.27	0-2	2
	1912.5	26665	5	16-QAM	12	13	20.85	0-2	2
	1912.5	26665	5	16-QAM	25	0	21.29	0-2	2

Table 8-5
LTE Band 25 Conducted Powers - 3 MHz Bandwidth

	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	23.41	0	0
	1851.5	26055	3	QPSK	1	7	22.90	0	0
	1851.5	26055	3	QPSK	1	14	22.59	0	0
	1851.5	26055	3	QPSK	8	0	22.05	0-1	1
	1851.5	26055	3	QPSK	8	4	21.85	0-1	1
	1851.5	26055	3	QPSK	8	7	21.77	0-1	1
	1851.5	26055	3	QPSK	15	0	21.83	0-1	1
	1851.5	26055	3	16-QAM	1	0	22.04	0-1	1
	1851.5	26055	3	16-QAM	1	7	21.87	0-1	1
	1851.5	26055	3	16-QAM	1	14	21.50	0-1	1
	1851.5	26055	3	16-QAM	8	0	21.42	0-2	2
	1851.5	26055	3	16-QAM	8	4	21.28	0-2	2
	1851.5	26055	3	16-QAM	8	7	21.36	0-2	2
	1851.5	26055	3	16-QAM	15	0	21.01	0-2	2
Mid	1882.5	26365	3	QPSK	1	0	22.78	0	0
	1882.5	26365	3	QPSK	1	7	22.71	0	0
	1882.5	26365	3	QPSK	1	14	23.01	0	0
	1882.5	26365	3	QPSK	8	0	21.69	0-1	1
	1882.5	26365	3	QPSK	8	4	22.23	0-1	1
	1882.5	26365	3	QPSK	8	7	22.18	0-1	1
	1882.5	26365	3	QPSK	15	0	22.00	0-1	1
	1882.5	26365	3	16-QAM	1	0	21.50	0-1	1
	1882.5	26365	3	16-QAM	1	7	21.58	0-1	1
	1882.5	26365	3	16-QAM	1	14	21.73	0-1	1
	1882.5	26365	3	16-QAM	8	0	21.44	0-2	2
	1882.5	26365	3	16-QAM	8	4	20.72	0-2	2
	1882.5	26365	3	16-QAM	8	7	20.84	0-2	2
	1882.5	26365	3	16-QAM	15	0	21.43	0-2	2
High	1913.5	26675	3	QPSK	1	0	23.22	0	0
	1913.5	26675	3	QPSK	1	7	23.01	0	0
	1913.5	26675	3	QPSK	1	14	23.50	0	0
	1913.5	26675	3	QPSK	8	0	22.42	0-1	1
	1913.5	26675	3	QPSK	8	4	22.03	0-1	1
	1913.5	26675	3	QPSK	8	7	22.24	0-1	1
	1913.5	26675	3	QPSK	15	0	21.94	0-1	1
	1913.5	26675	3	16-QAM	1	0	22.30	0-1	1
	1913.5	26675	3	16-QAM	1	7	21.67	0-1	1
	1913.5	26675	3	16-QAM	1	14	22.43	0-1	1
	1913.5	26675	3	16-QAM	8	0	20.63	0-2	2
	1913.5	26675	3	16-QAM	8	4	21.13	0-2	2
	1913.5	26675	3	16-QAM	8	7	20.83	0-2	2
	1913.5	26675	3	16-QAM	15	0	21.12	0-2	2

Table 8-6
LTE Band 25 Conducted Powers – 1.4 MHz Bandwidth

	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	22.80	0	0
	1850.7	26047	1.4	QPSK	1	2	22.66	0	0
	1850.7	26047	1.4	QPSK	1	5	22.84	0	0
	1850.7	26047	1.4	QPSK	3	0	22.64	0	0
	1850.7	26047	1.4	QPSK	3	2	23.30	0	0
	1850.7	26047	1.4	QPSK	3	3	23.22	0	0
	1850.7	26047	1.4	QPSK	6	0	22.15	0-1	1
	1850.7	26047	1.4	16-QAM	1	0	21.95	0-1	1
	1850.7	26047	1.4	16-QAM	1	2	21.93	0-1	1
	1850.7	26047	1.4	16-QAM	1	5	21.87	0-1	1
	1850.7	26047	1.4	16-QAM	3	0	22.03	0-1	1
	1850.7	26047	1.4	16-QAM	3	2	21.77	0-1	1
	1850.7	26047	1.4	16-QAM	3	3	21.93	0-1	1
	1850.7	26047	1.4	16-QAM	6	0	21.20	0-2	2
Mid	1882.5	26365	1.4	QPSK	1	0	22.80	0	0
	1882.5	26365	1.4	QPSK	1	2	22.66	0	0
	1882.5	26365	1.4	QPSK	1	5	22.77	0	0
	1882.5	26365	1.4	QPSK	3	0	22.59	0	0
	1882.5	26365	1.4	QPSK	3	2	23.21	0	0
	1882.5	26365	1.4	QPSK	3	3	23.18	0	0
	1882.5	26365	1.4	QPSK	6	0	22.14	0-1	1
	1882.5	26365	1.4	16-QAM	1	0	21.89	0-1	1
	1882.5	26365	1.4	16-QAM	1	2	21.85	0-1	1
	1882.5	26365	1.4	16-QAM	1	5	21.80	0-1	1
	1882.5	26365	1.4	16-QAM	3	0	22.02	0-1	1
	1882.5	26365	1.4	16-QAM	3	2	21.72	0-1	1
	1882.5	26365	1.4	16-QAM	3	3	21.84	0-1	1
	1882.5	26365	1.4	16-QAM	6	0	21.43	0-2	2
High	1914.3	26683	1.4	QPSK	1	0	22.72	0	0
	1914.3	26683	1.4	QPSK	1	2	22.58	0	0
	1914.3	26683	1.4	QPSK	1	5	22.78	0	0
	1914.3	26683	1.4	QPSK	3	0	22.64	0	0
	1914.3	26683	1.4	QPSK	3	2	23.34	0	0
	1914.3	26683	1.4	QPSK	3	3	23.30	0	0
	1914.3	26683	1.4	QPSK	6	0	22.09	0-1	1
	1914.3	26683	1.4	16-QAM	1	0	21.93	0-1	1
	1914.3	26683	1.4	16-QAM	1	2	21.92	0-1	1
	1914.3	26683	1.4	16-QAM	1	5	21.89	0-1	1
	1914.3	26683	1.4	16-QAM	3	0	22.00	0-1	1
	1914.3	26683	1.4	16-QAM	3	2	21.79	0-1	1
	1914.3	26683	1.4	16-QAM	3	3	21.91	0-1	1
	1914.3	26683	1.4	16-QAM	6	0	21.20	0-2	2

8.1.2 Reduced LTE Conducted Powers

Table 8-7
LTE Band 25 Conducted Powers - 20 MHz Bandwidth

	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	13.50	0	0
	1860	26140	20	QPSK	1	50	14.36	0	0
	1860	26140	20	QPSK	1	99	13.50	0	0
	1860	26140	20	QPSK	50	0	14.21	0-1	0
	1860	26140	20	QPSK	50	25	14.35	0-1	0
	1860	26140	20	QPSK	50	50	14.22	0-1	0
	1860	26140	20	QPSK	100	0	14.19	0-1	0
	1860	26140	20	16QAM	1	0	13.72	0-1	0
	1860	26140	20	16QAM	1	50	14.50	0-1	0
	1860	26140	20	16QAM	1	99	13.55	0-1	0
	1860	26140	20	16QAM	50	0	14.06	0-2	0
	1860	26140	20	16QAM	50	25	14.30	0-2	0
	1860	26140	20	16QAM	50	50	14.06	0-2	0
	1860	26140	20	16QAM	100	0	14.03	0-2	0
Mid	1882.5	26365	20	QPSK	1	0	13.63	0	0
	1882.5	26365	20	QPSK	1	50	14.27	0	0
	1882.5	26365	20	QPSK	1	99	13.50	0	0
	1882.5	26365	20	QPSK	50	0	14.01	0-1	0
	1882.5	26365	20	QPSK	50	25	14.30	0-1	0
	1882.5	26365	20	QPSK	50	50	13.97	0-1	0
	1882.5	26365	20	QPSK	100	0	14.04	0-1	0
	1882.5	26365	20	16QAM	1	0	13.77	0-1	0
	1882.5	26365	20	16QAM	1	50	14.34	0-1	0
	1882.5	26365	20	16QAM	1	99	13.74	0-1	0
	1882.5	26365	20	16QAM	50	0	14.09	0-2	0
	1882.5	26365	20	16QAM	50	25	14.29	0-2	0
	1882.5	26365	20	16QAM	50	50	14.02	0-2	0
	1882.5	26365	20	16QAM	100	0	14.06	0-2	0
High	1905	26590	20	QPSK	1	0	13.68	0	0
	1905	26590	20	QPSK	1	50	**14.48**	0	0
	1905	26590	20	QPSK	1	99	13.51	0	0
	1905	26590	20	QPSK	50	0	14.35	0-1	0
	1905	26590	20	QPSK	50	25	**14.37**	0-1	0
	1905	26590	20	QPSK	50	50	14.13	0-1	0
	1905	26590	20	QPSK	100	0	14.19	0-1	0
	1905	26590	20	16QAM	1	0	13.89	0-1	0
	1905	26590	20	16QAM	1	50	14.50	0-1	0
	1905	26590	20	16QAM	1	99	13.71	0-1	0
	1905	26590	20	16QAM	50	0	14.32	0-2	0
	1905	26590	20	16QAM	50	25	14.39	0-2	0
	1905	26590	20	16QAM	50	50	14.17	0-2	0
	1905	26590	20	16QAM	100	0	14.16	0-2	0

Table 8-8
LTE Band 25 Conducted Powers - 15 MHz Bandwidth

	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	13.75	0	0
	1857.5	26115	15	QPSK	1	36	14.21	0	0
	1857.5	26115	15	QPSK	1	74	13.78	0	0
	1857.5	26115	15	QPSK	36	0	14.11	0-1	0
	1857.5	26115	15	QPSK	36	18	14.29	0-1	0
	1857.5	26115	15	QPSK	36	37	14.28	0-1	0
	1857.5	26115	15	QPSK	75	0	14.25	0-1	0
	1857.5	26115	15	16QAM	1	0	13.92	0-1	0
	1857.5	26115	15	16QAM	1	36	14.30	0-1	0
	1857.5	26115	15	16QAM	1	74	13.88	0-1	0
	1857.5	26115	15	16QAM	36	0	14.03	0-2	0
	1857.5	26115	15	16QAM	36	18	14.38	0-2	0
	1857.5	26115	15	16QAM	36	37	14.15	0-2	0
	1857.5	26115	15	16QAM	75	0	14.12	0-2	0
Mid	1882.5	26365	15	QPSK	1	0	13.92	0	0
	1882.5	26365	15	QPSK	1	36	14.31	0	0
	1882.5	26365	15	QPSK	1	74	13.75	0	0
	1882.5	26365	15	QPSK	36	0	13.98	0-1	0
	1882.5	26365	15	QPSK	36	18	14.23	0-1	0
	1882.5	26365	15	QPSK	36	37	14.05	0-1	0
	1882.5	26365	15	QPSK	75	0	14.05	0-1	0
	1882.5	26365	15	16QAM	1	0	13.83	0-1	0
	1882.5	26365	15	16QAM	1	36	14.25	0-1	0
	1882.5	26365	15	16QAM	1	74	13.68	0-1	0
	1882.5	26365	15	16QAM	36	0	13.99	0-2	0
	1882.5	26365	15	16QAM	36	18	14.39	0-2	0
	1882.5	26365	15	16QAM	36	37	14.03	0-2	0
	1882.5	26365	15	16QAM	75	0	13.97	0-2	0
High	1907.5	26615	15	QPSK	1	0	13.97	0	0
	1907.5	26615	15	QPSK	1	36	14.25	0	0
	1907.5	26615	15	QPSK	1	74	13.94	0	0
	1907.5	26615	15	QPSK	36	0	14.33	0-1	0
	1907.5	26615	15	QPSK	36	18	14.26	0-1	0
	1907.5	26615	15	QPSK	36	37	14.17	0-1	0
	1907.5	26615	15	QPSK	75	0	14.23	0-1	0
	1907.5	26615	15	16QAM	1	0	13.80	0-1	0
	1907.5	26615	15	16QAM	1	36	14.22	0-1	0
	1907.5	26615	15	16QAM	1	74	13.61	0-1	0
	1907.5	26615	15	16QAM	36	0	14.26	0-2	0
	1907.5	26615	15	16QAM	36	18	14.34	0-2	0
	1907.5	26615	15	16QAM	36	37	14.22	0-2	0
	1907.5	26615	15	16QAM	75	0	14.18	0-2	0

Table 8-9
LTE Band 25 Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1855	26090	10	QPSK	1	0	13.88	0	0
	1855	26090	10	QPSK	1	25	14.30	0	0
	1855	26090	10	QPSK	1	49	14.02	0	0
	1855	26090	10	QPSK	25	0	13.94	0-1	0
	1855	26090	10	QPSK	25	12	14.43	0-1	0
	1855	26090	10	QPSK	25	25	14.38	0-1	0
	1855	26090	10	QPSK	50	0	14.13	0-1	0
	1855	26090	10	16QAM	1	0	13.74	0-1	0
	1855	26090	10	16QAM	1	25	14.12	0-1	0
	1855	26090	10	16QAM	1	49	13.80	0-1	0
	1855	26090	10	16QAM	25	0	14.10	0-2	0
	1855	26090	10	16QAM	25	12	14.29	0-2	0
	1855	26090	10	16QAM	25	25	14.09	0-2	0
	1855	26090	10	16QAM	50	0	14.11	0-2	0
Mid	1882.5	26365	10	QPSK	1	0	14.07	0	0
	1882.5	26365	10	QPSK	1	25	14.27	0	0
	1882.5	26365	10	QPSK	1	49	13.88	0	0
	1882.5	26365	10	QPSK	25	0	14.10	0-1	0
	1882.5	26365	10	QPSK	25	12	14.24	0-1	0
	1882.5	26365	10	QPSK	25	25	14.05	0-1	0
	1882.5	26365	10	QPSK	50	0	14.21	0-1	0
	1882.5	26365	10	16QAM	1	0	13.75	0-1	0
	1882.5	26365	10	16QAM	1	25	14.42	0-1	0
	1882.5	26365	10	16QAM	1	49	13.65	0-1	0
	1882.5	26365	10	16QAM	25	0	13.94	0-2	0
	1882.5	26365	10	16QAM	25	12	14.36	0-2	0
	1882.5	26365	10	16QAM	25	25	14.03	0-2	0
	1882.5	26365	10	16QAM	50	0	14.06	0-2	0
High	1910	26640	10	QPSK	1	0	14.15	0	0
	1910	26640	10	QPSK	1	25	14.12	0	0
	1910	26640	10	QPSK	1	49	13.87	0	0
	1910	26640	10	QPSK	25	0	14.22	0-1	0
	1910	26640	10	QPSK	25	12	14.36	0-1	0
	1910	26640	10	QPSK	25	25	14.13	0-1	0
	1910	26640	10	QPSK	50	0	14.43	0-1	0
	1910	26640	10	16QAM	1	0	13.65	0-1	0
	1910	26640	10	16QAM	1	25	14.24	0-1	0
	1910	26640	10	16QAM	1	49	14.32	0-1	0
	1910	26640	10	16QAM	25	0	14.34	0-2	0
	1910	26640	10	16QAM	25	12	14.25	0-2	0
	1910	26640	10	16QAM	25	25	14.40	0-2	0
	1910	26640	10	16QAM	50	0	14.20	0-2	0

Table 8-10
LTE Band 25 Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1852.5	26065	5	QPSK	1	0	13.80	0	0
	1852.5	26065	5	QPSK	1	12	14.10	0	0
	1852.5	26065	5	QPSK	1	24	14.08	0	0
	1852.5	26065	5	QPSK	12	0	13.84	0-1	0
	1852.5	26065	5	QPSK	12	6	14.41	0-1	0
	1852.5	26065	5	QPSK	12	13	14.23	0-1	0
	1852.5	26065	5	QPSK	25	0	14.11	0-1	0
	1852.5	26065	5	16-QAM	1	0	13.92	0-1	0
	1852.5	26065	5	16-QAM	1	12	14.02	0-1	0
	1852.5	26065	5	16-QAM	1	24	13.88	0-1	0
	1852.5	26065	5	16-QAM	12	0	14.19	0-2	0
	1852.5	26065	5	16-QAM	12	6	14.12	0-2	0
	1852.5	26065	5	16-QAM	12	13	14.05	0-2	0
	1852.5	26065	5	16-QAM	25	0	13.94	0-2	0
Mid	1882.5	26365	5	QPSK	1	0	14.17	0	0
	1882.5	26365	5	QPSK	1	12	14.25	0	0
	1882.5	26365	5	QPSK	1	24	13.96	0	0
	1882.5	26365	5	QPSK	12	0	14.24	0-1	0
	1882.5	26365	5	QPSK	12	6	14.04	0-1	0
	1882.5	26365	5	QPSK	12	13	14.22	0-1	0
	1882.5	26365	5	QPSK	25	0	14.16	0-1	0
	1882.5	26365	5	16-QAM	1	0	13.95	0-1	0
	1882.5	26365	5	16-QAM	1	12	14.41	0-1	0
	1882.5	26365	5	16-QAM	1	24	13.71	0-1	0
	1882.5	26365	5	16-QAM	12	0	13.79	0-2	0
	1882.5	26365	5	16-QAM	12	6	14.16	0-2	0
	1882.5	26365	5	16-QAM	12	13	13.85	0-2	0
	1882.5	26365	5	16-QAM	25	0	14.20	0-2	0
High	1912.5	26665	5	QPSK	1	0	14.00	0	0
	1912.5	26665	5	QPSK	1	12	14.11	0	0
	1912.5	26665	5	QPSK	1	24	13.82	0	0
	1912.5	26665	5	QPSK	12	0	14.30	0-1	0
	1912.5	26665	5	QPSK	12	6	14.46	0-1	0
	1912.5	26665	5	QPSK	12	13	14.33	0-1	0
	1912.5	26665	5	QPSK	25	0	14.34	0-1	0
	1912.5	26665	5	16-QAM	1	0	13.84	0-1	0
	1912.5	26665	5	16-QAM	1	12	14.22	0-1	0
	1912.5	26665	5	16-QAM	1	24	14.25	0-1	0
	1912.5	26665	5	16-QAM	12	0	14.21	0-2	0
	1912.5	26665	5	16-QAM	12	6	14.09	0-2	0
	1912.5	26665	5	16-QAM	12	13	14.29	0-2	0
	1912.5	26665	5	16-QAM	25	0	14.40	0-2	0

Table 8-11
LTE Band 25 Conducted Powers - 3 MHz Bandwidth

	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	13.89	0	0
	1851.5	26055	3	QPSK	1	7	14.09	0	0
	1851.5	26055	3	QPSK	1	14	14.14	0	0
	1851.5	26055	3	QPSK	8	0	13.67	0-1	0
	1851.5	26055	3	QPSK	8	4	14.28	0-1	0
	1851.5	26055	3	QPSK	8	7	14.14	0-1	0
	1851.5	26055	3	QPSK	15	0	14.02	0-1	0
	1851.5	26055	3	16-QAM	1	0	13.80	0-1	0
	1851.5	26055	3	16-QAM	1	7	13.97	0-1	0
	1851.5	26055	3	16-QAM	1	14	13.69	0-1	0
	1851.5	26055	3	16-QAM	8	0	14.03	0-2	0
	1851.5	26055	3	16-QAM	8	4	14.09	0-2	0
	1851.5	26055	3	16-QAM	8	7	13.99	0-2	0
	1851.5	26055	3	16-QAM	15	0	13.78	0-2	0
Mid	1882.5	26365	3	QPSK	1	0	14.24	0	0
	1882.5	26365	3	QPSK	1	7	14.34	0	0
	1882.5	26365	3	QPSK	1	14	14.02	0	0
	1882.5	26365	3	QPSK	8	0	14.19	0-1	0
	1882.5	26365	3	QPSK	8	4	14.22	0-1	0
	1882.5	26365	3	QPSK	8	7	14.35	0-1	0
	1882.5	26365	3	QPSK	15	0	14.06	0-1	0
	1882.5	26365	3	16-QAM	1	0	14.00	0-1	0
	1882.5	26365	3	16-QAM	1	7	14.27	0-1	0
	1882.5	26365	3	16-QAM	1	14	13.62	0-1	0
	1882.5	26365	3	16-QAM	8	0	13.72	0-2	0
	1882.5	26365	3	16-QAM	8	4	14.11	0-2	0
	1882.5	26365	3	16-QAM	8	7	13.87	0-2	0
	1882.5	26365	3	16-QAM	15	0	14.28	0-2	0
High	1913.5	26675	3	QPSK	1	0	13.85	0	0
	1913.5	26675	3	QPSK	1	7	14.00	0	0
	1913.5	26675	3	QPSK	1	14	13.76	0	0
	1913.5	26675	3	QPSK	8	0	14.25	0-1	0
	1913.5	26675	3	QPSK	8	4	14.28	0-1	0
	1913.5	26675	3	QPSK	8	7	14.38	0-1	0
	1913.5	26675	3	QPSK	15	0	14.34	0-1	0
	1913.5	26675	3	16-QAM	1	0	13.83	0-1	0
	1913.5	26675	3	16-QAM	1	7	14.23	0-1	0
	1913.5	26675	3	16-QAM	1	14	14.17	0-1	0
	1913.5	26675	3	16-QAM	8	0	14.07	0-2	0
	1913.5	26675	3	16-QAM	8	4	13.94	0-2	0
	1913.5	26675	3	16-QAM	8	7	14.32	0-2	0
	1913.5	26675	3	16-QAM	15	0	14.22	0-2	0

Table 8-12
LTE Band 25 Conducted Powers – 1.4 MHz Bandwidth

	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	14.04	0	0
	1850.7	26047	1.4	QPSK	1	2	13.99	0	0
	1850.7	26047	1.4	QPSK	1	5	14.23	0	0
	1850.7	26047	1.4	QPSK	3	0	13.66	0	0
	1850.7	26047	1.4	QPSK	3	2	14.44	0	0
	1850.7	26047	1.4	QPSK	3	3	14.21	0	0
	1850.7	26047	1.4	QPSK	6	0	14.01	0-1	0
	1850.7	26047	1.4	16-QAM	1	0	13.75	0-1	0
	1850.7	26047	1.4	16-QAM	1	2	13.79	0-1	0
	1850.7	26047	1.4	16-QAM	1	5	13.54	0-1	0
	1850.7	26047	1.4	16-QAM	3	0	14.23	0-1	0
	1850.7	26047	1.4	16-QAM	3	2	14.00	0-1	0
	1850.7	26047	1.4	16-QAM	3	3	14.14	0-1	0
	1850.7	26047	1.4	16-QAM	6	0	13.74	0-2	0
Mid	1882.5	26365	1.4	QPSK	1	0	14.44	0	0
	1882.5	26365	1.4	QPSK	1	2	14.43	0	0
	1882.5	26365	1.4	QPSK	1	5	13.97	0	0
	1882.5	26365	1.4	QPSK	3	0	14.35	0	0
	1882.5	26365	1.4	QPSK	3	2	14.31	0	0
	1882.5	26365	1.4	QPSK	3	3	14.49	0	0
	1882.5	26365	1.4	QPSK	6	0	14.05	0-1	0
	1882.5	26365	1.4	16-QAM	1	0	13.93	0-1	0
	1882.5	26365	1.4	16-QAM	1	2	14.35	0-1	0
	1882.5	26365	1.4	16-QAM	1	5	13.67	0-1	0
	1882.5	26365	1.4	16-QAM	3	0	13.62	0-1	0
	1882.5	26365	1.4	16-QAM	3	2	13.91	0-1	0
	1882.5	26365	1.4	16-QAM	3	3	13.98	0-1	0
	1882.5	26365	1.4	16-QAM	6	0	14.08	0-2	0
High	1914.3	26683	1.4	QPSK	1	0	13.67	0	0
	1914.3	26683	1.4	QPSK	1	2	14.04	0	0
	1914.3	26683	1.4	QPSK	1	5	13.58	0	0
	1914.3	26683	1.4	QPSK	3	0	14.08	0	0
	1914.3	26683	1.4	QPSK	3	2	14.40	0	0
	1914.3	26683	1.4	QPSK	3	3	14.24	0	0
	1914.3	26683	1.4	QPSK	6	0	14.22	0-1	0
	1914.3	26683	1.4	16-QAM	1	0	13.90	0-1	0
	1914.3	26683	1.4	16-QAM	1	2	14.33	0-1	0
	1914.3	26683	1.4	16-QAM	1	5	14.27	0-1	0
	1914.3	26683	1.4	16-QAM	3	0	13.96	0-1	0
	1914.3	26683	1.4	16-QAM	3	2	13.75	0-1	0
	1914.3	26683	1.4	16-QAM	3	3	14.15	0-1	0
	1914.3	26683	1.4	16-QAM	6	0	14.03	0-2	0

9 SYSTEM VERIFICATION

9.1 Tissue Verification

Table 9-1
Measured Tissue Properties

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (C°)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ε	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ε	% dev σ	% dev ε
6/16/2014	1900B	23.0	1850	1.448	51.557	1.520	53.300	*-4.74%*	*-3.27%*
			1880	1.482	51.503	1.520	53.300	*-2.50%*	*-3.37%*
			1910	1.516	51.372	1.520	53.300	*-0.26%*	*-3.62%*

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 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 SAR1g (W/kg)	1 W Target SAR1g (W/kg)	1 W Normalized SAR1g (W/kg)	Deviation$_{1g}$ (%)
D	1900	BODY	06/16/2014	24.1	23.0	0.100	5d149	3022	3.980	40.500	39.800	-1.73%

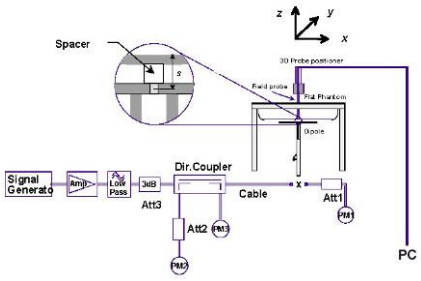


Figure 9-1
System Verification Setup Diagram

Figure 9-2
System Verification Setup Photo

10 SAR DATA SUMMARY

10.1 Standalone Body SAR Data

Table 10-1
LTE Band 25 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) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #
MHz	Ch.																		
1905.00	26590	High	LTE Band 25 (PCS)	20	23.5	23.50	-0.18	0	P500-1	QPSK	1	99	11mm	back	1:1	0.664	1.000	0.664	
1905.00	26590	High	LTE Band 25 (PCS)	20	22.5	22.22	-0.11	1	P500-1	QPSK	50	25	11mm	back	1:1	0.551	1.067	0.588	
1860.00	26140	Low	LTE Band 25 (PCS)	20	23.5	23.30	0.02	0	P500-1	QPSK	1	0	7mm	top	1:1	1.050	1.047	**1.099**	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.5	23.09	0.02	0	P500-1	QPSK	1	99	7mm	top	1:1	0.990	1.099	1.088	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.5	23.50	-0.02	0	P500-1	QPSK	1	99	7mm	top	1:1	1.060	1.000	1.060	A1
1905.00	26590	High	LTE Band 25 (PCS)	20	22.5	22.22	0.00	1	P500-1	QPSK	50	25	7mm	top	1:1	0.712	1.067	0.760	
1905.00	26590	High	LTE Band 25 (PCS)	20	22.5	22.18	0.00	1	P500-1	QPSK	100	0	7mm	top	1:1	0.680	1.076	0.732	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.5	23.50	0.04	0	P500-1	QPSK	1	99	0mm	right	1:1	0.347	1.000	0.347	
1905.00	26590	High	LTE Band 25 (PCS)	20	22.5	22.22	-0.03	1	P500-1	QPSK	50	25	0mm	right	1:1	0.181	1.067	0.193	
1905.00	26590	High	LTE Band 25 (PCS)	20	14.5	14.48	-0.03	0	P500-2	QPSK	1	50	0mm	back	1:1	0.748	1.005	0.752	
1905.00	26590	High	LTE Band 25 (PCS)	20	14.5	14.37	-0.04	0	P500-2	QPSK	50	25	0mm	back	1:1	0.745	1.030	0.767	
1905.00	26590	High	LTE Band 25 (PCS)	20	14.5	14.48	0.08	0	P500-2	QPSK	1	50	0mm	top	1:1	0.363	1.005	0.365	
1905.00	26590	High	LTE Band 25 (PCS)	20	14.5	14.37	-0.01	0	P500-2	QPSK	50	25	0mm	top	1:1	0.368	1.030	0.379	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.5	23.50	-0.20	0	P500-1	QPSK	1	99	7mm	top	1:1	1.050	1.000	1.050	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population														Body 1.6 W/kg (mW/g) averaged over 1 gram					

Note: Blue entry above represents variability SAR measurement.

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 447498 D01v05 and FCC KDB Publication 616217 v01r01.
2. Batteries are fully charged at the beginning of the SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v05.
6. Per FCC KDB 865664 D01 v01, variability SAR tests were performed when the measured SAR results for a frequency band were greater than 0.8 W/kg. Repeated SAR measurements are highlighted in the tables above for clarity. Please see Section 12 for variability analysis.
7. Per FCC KDB 616217 D04 Section 4.3, SAR tests are required for the back surface and edges of the tablet with the tablet touching the phantom. The SAR Exclusion Threshold in FCC KDB 447498 D01v05 was applied to determine SAR test exclusion for adjacent edge configurations. Top and Right Edge SAR tests were required for the LTE Band 25.

LTE Notes:

1. LTE Considerations: LTE test configurations are determined according to SAR Evaluation Considerations for LTE Devices in FCC KDB Publication 941225 D05v02r01. The general test procedures used for testing can be found in Section 7.3.4.
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).

11 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

11.1 Introduction

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

11.2 Simultaneous Transmission Procedures

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

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

Table 11-1
Estimated SAR

Mode	Configuration	Frequency	Maximum Allowed Power	Separation Distance (Body)	Estimated SAR (Body)
		[MHz]	[dBm]	[mm]	[W/kg]
Bluetooth	Touching*	2441	10.00	5	**0.400**

Note:
1. Per KDB Publication 447498 D01v05, the maximum power of the channel was rounded to the nearest mW before calculation.
2. (*) – Per FCC KDB Publication 447498, when the test separation distance is < 5 mm, a distance of 5 mm is applied to determine estimated SAR.
3. For configurations excluded per 447498 D01v05, an estimated SAR of 0.4 W/kg was used to determine simultaneous transmission SAR exclusion when the test separation distance was >50 mm.
4. Per FCC KDB Publication 447498, the estimated SAR of 0.4 W/kg was used for Bluetooth, since it was substantially conservative value.

The following SAR data has been scaled according to FCC KDB Publication 447498 D01v05 to show simultaneous transmission compliance for this C2PC application. Please refer to RF Exposure Technical Report 0Y1207301058-R3.A3L for original compliance report containing SAR data, conducted power measurements, and maximum allowed power for CDMA 850/1900 MHz and WLAN modes.

11.3 Body SAR Simultaneous Transmission Analysis

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

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

Simult Tx	Configuration	LTE Band 25 (PCS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.767	0.607	1.374
	Top	0.379	0.400	0.779
	Bottom	0.400	0.400	0.800
	Right	0.347	0.335	0.682
	Left	0.400	0.400	0.800

Table 11-3
Simultaneous Transmission Scenario with Bluetooth (Body at 0.0 cm)

Simult Tx	Configuration	LTE Band 25 (PCS) SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.767	0.400	1.167
	Top	0.379	0.400	0.779
	Bottom	0.400	0.400	0.800
	Right	0.347	0.400	0.747
	Left	0.400	0.400	0.800

Table 11-4
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Back at 1.1 cm)

Configuration	Mode	4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Back Side	LTE Band 25 (PCS)	0.664	<0.607	<1.271

Table 11-5
Simultaneous Transmission Scenario with Bluetooth (Back at 1.1 cm)

Configuration	Mode	4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Back Side	LTE Band 25 (PCS)	0.664	<0.400	<1.064

Table 11-6
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Top at 0.7 cm)

Configuration	Mode	4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Top Edge	LTE Band 25 (PCS)	1.099	0.400	1.499

Table 11-7
Simultaneous Transmission Scenario with Bluetooth (Top at 0.7 cm)

Configuration	Mode	4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Top Edge	LTE Band 25 (PCS)	1.099	0.400	1.499

Note:
1. For SAR summations for body back at 11 mm, 2.4 GHz WLAN SAR and Bluetooth Estimated SAR values for 0.0 cm were used since the 0.0 cm test distance for 2.4 GHz WLAN was more conservative. "<" denotes that the 0.0 cm WLAN SAR values were used for summation purposes.
2. For SAR summations for body top at 7 mm, 2.4 GHz WLAN and Bluetooth Estimated SAR values for 0.0 cm were used since SAR testing for 2.4 GHz WLAN and Bluetooth was excluded due a test separation distance greater than 50 mm.
3. For configurations excluded per 447498 D01v05, an estimated SAR of 0.4 W/kg was used to determine simultaneous transmission SAR exclusion when the test separation distance was >50 mm.

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.

12 SAR MEASUREMENT VARIABILITY

12.1 Measurement Variability

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

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

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

Table 12-1
Body SAR Measurement Variability Results

BODY VARIABILITY RESULTS													
Band	FREQUENCY		Mode	Service	Side	Spacing	Measured SAR (1g)	1st Repeated SAR (1g)	Ratio	2nd Repeated SAR (1g)	Ratio	3rd Repeated SAR (1g)	Ratio
	MHz	Ch.					(W/kg)	(W/kg)		(W/kg)		(W/kg)	
1900	1905.00	26590	LTE Band 25 (PCS)	QPSK, 1 RB, 99 RB Offset	top	7mm	1.060	1.050	1.01	N/A	N/A	N/A	N/A
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram						

12.2 Measurement Uncertainty

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

13 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Gigatronics	80701A	(0.05-18GHz) Power Sensor	10/30/2013	Annual	10/30/2014	1833460
Agilent	8648D	(9kHz-4GHz) Signal Generator	4/15/2014	Annual	4/15/2015	3629U00687
SPEAG	D1900V2	1900 MHz SAR Dipole	7/22/2013	Annual	7/22/2014	5d149
Narda	4014C-6	4 - 8 GHz SMA 6 dB Directional Coupler	CBT	N/A	CBT	N/A
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433971
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
SPEAG	DAE4	Dasy Data Acquisition Electronics	8/21/2013	Annual	8/21/2014	1322
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
SPEAG	DAK-3.5	Dielectric Assessment Kit	11/13/2013	Annual	11/13/2014	1091
Mitutoyo	CD-6"CSX	Digital Caliper	5/8/2014	Biennial	5/8/2016	13264162
Fisher Scientific	15-077-960	Digital Thermometer	11/6/2012	Biennial	11/6/2014	122640025
Rohde & Schwarz	NRVD	Dual Channel Power Meter	10/12/2012	Biennial	10/12/2014	101695
Agilent	E4438C	ESG Vector Signal Generator	3/31/2014	Annual	3/31/2015	MY42082659
Control Company	4353	Long Stem Thermometer	9/25/2012	Biennial	9/25/2014	122541143
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
MiniCircuits	SLP-2400+	Low Pass Filter	CBT	N/A	CBT	R8979500903
Mini-Circuits	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
Rohde & Schwarz	CMW500	Radio Communication Tester	10/4/2013	Annual	10/4/2014	108798
Agilent	N9020A	MXA Signal Analyzer	10/29/2013	Annual	10/29/2014	US46470561
Rohde & Schwarz	NRV-Z32	Peak Power Sensor	10/12/2012	Biennial	10/12/2014	836019/013
Mini-Circuits	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
Anritsu	ML2495A	Power Meter	10/31/2013	Annual	10/31/2014	1039008
Anritsu	MA2481A	Power Sensor	10/30/2013	Annual	10/30/2014	5605
Anritsu	MA2411B	Pulse Power Sensor	11/14/2013	Annual	11/14/2014	1126066
Anritsu	MA2411B	Pulse Power Sensor	2/3/2014	Annual	2/3/2015	1339018
Anritsu	MT8820C	Radio Communication Analyzer	12/12/2013	Annual	12/12/2014	6200901190
SPEAG	ES3DV2	SAR Probe	8/22/2013	Annual	8/22/2014	3022
Rohde & Schwarz	NRVS	Single Channel Power Meter	10/31/2013	Annual	10/31/2014	835360/0079
COMTECH	AR85729-5/5759B	Solid State Amplifier	CBT	N/A	CBT	M3W1A00-1002
Agilent	8753ES	S-Parameter Network Analyzer	5/22/2014	Annual	5/22/2015	US39170118
Fisher Scientific	S97611	Thermometer	4/12/2013	Biennial	4/12/2015	130219303
Seekonk	NC-100	Torque Wrench	3/18/2014	Biennial	3/18/2016	N/A
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	3/18/2014	Biennial	3/18/2016	N/A
Gigatronics	8651A	Universal Power Meter	10/30/2013	Annual	10/30/2014	8650319
Anritsu	MA24106A	USB Power Sensor	12/18/2013	Annual	12/18/2014	1344555
Anritsu	MA24106A	USB Power Sensor	12/18/2013	Annual	12/18/2014	1344556
VWR	36934-158	Wall-Mounted Thermometer	8/8/2013	Biennial	8/8/2015	130477877

Notes:

1. 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.
2. Each equipment item was used solely within its respective calibration period.

14 MEASUREMENT UNCERTAINTIES

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: A3LSPHP500; Type: Portable Tablet Computer; Serial: P500-1

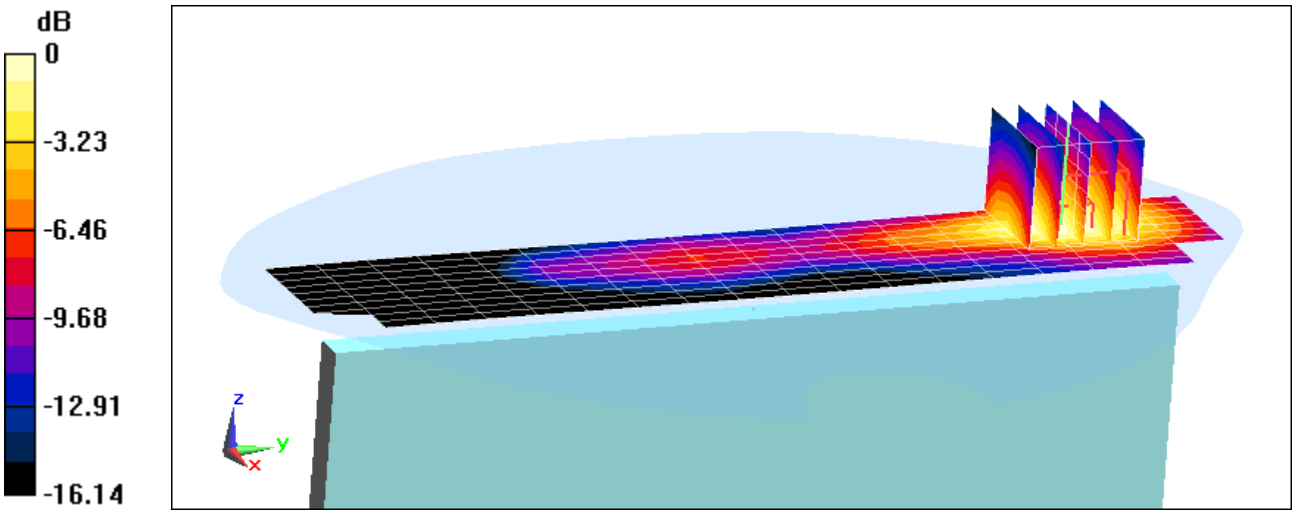
Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1905 MHz; Duty Cycle: 1:1
Medium: 1900 Body, Medium parameters used (interpolated):
f = 1905 MHz; σ = 1.51 S/m; ε_r = 51.394; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.7 cm

Test Date: 06-16-2014; Ambient Temp: 24.1°C; Tissue Temp: 23.0°C

Probe: ES3DV2 - SN3022; ConvF(4.49, 4.49, 4.49); Calibrated: 8/22/2013;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/21/2013
Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

Mode: LTE Band 25 (PCS), Body SAR, Top Edge, High.ch,
20 MHz Bandwidth, QPSK, 1 RB, 99 RB Offset

Area Scan (11x21x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.080 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.73 W/kg
SAR(1 g) = 1.06 W/kg



0 dB = 1.24 W/kg = 0.93 dBW/kg

APPENDIX B: SYSTEM VERIFICATION

PCTEST ENGINEERING LABORATORY, INC.

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

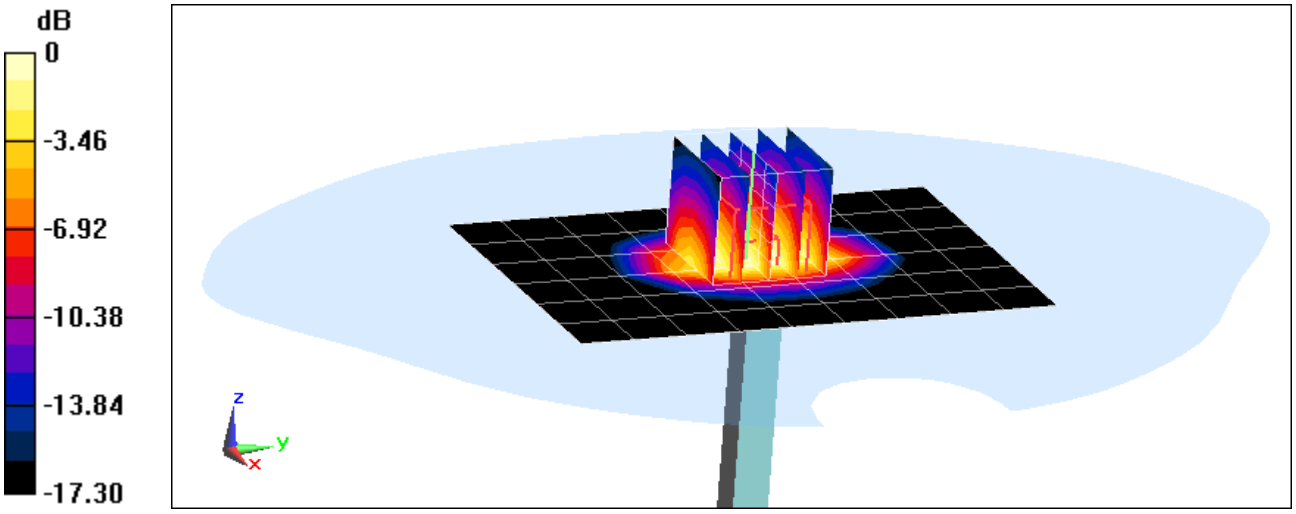
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Body, Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.505 S/m; ε_r = 51.416; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-16-2014; Ambient Temp: 24.1°C; Tissue Temp: 23.0°C

Probe: ES3DV2 - SN3022; ConvF(4.49, 4.49, 4.49); Calibrated: 8/22/2013;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/21/2013
Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7164)

1900 MHz System Verification

Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 6.86 W/kg
SAR(1 g) = 3.98 W/kg
Deviation = -1.73%



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

APPENDIX C: PROBE CALIBRATION

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

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

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

Accreditation No.: SCS 108

Client **PC Test**

Certificate No: ES3-3022_Aug13

CALIBRATION CERTIFICATE

Object: ES3DV2 - SN:3022

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

Calibration date: August 22, 2013

UCC
9/13/13

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
Reference Probe ES3DV2	SN: 3013	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
DAE4	SN: 660	31-Jan-13 (No. DAE4-660_Jan13)	Jan-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-15
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

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

Issued: August 23, 2013

Calibration Laboratory of
Schmid & Partner
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., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

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

Probe ES3DV2

SN:3022

Manufactured: April 15, 2003
Calibrated: August 22, 2013

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

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.00	1.04	0.99	± 10.1 %
DCP (mV)[B]	100.7	97.4	99.7	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	178.6	±3.0 %
		Y	0.0	0.0	1.0		141.9	
		Z	0.0	0.0	1.0		134.7	

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

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

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

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	6.21	6.21	6.21	0.19	2.37	± 12.0 %
835	41.5	0.90	6.09	6.09	6.09	0.30	1.70	± 12.0 %
1750	40.1	1.37	5.19	5.19	5.19	0.65	1.23	± 12.0 %
1900	40.0	1.40	5.03	5.03	5.03	0.51	1.43	± 12.0 %
2450	39.2	1.80	4.36	4.36	4.36	0.51	1.51	± 12.0 %
2600	39.0	1.96	4.16	4.16	4.16	0.74	1.29	± 12.0 %

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

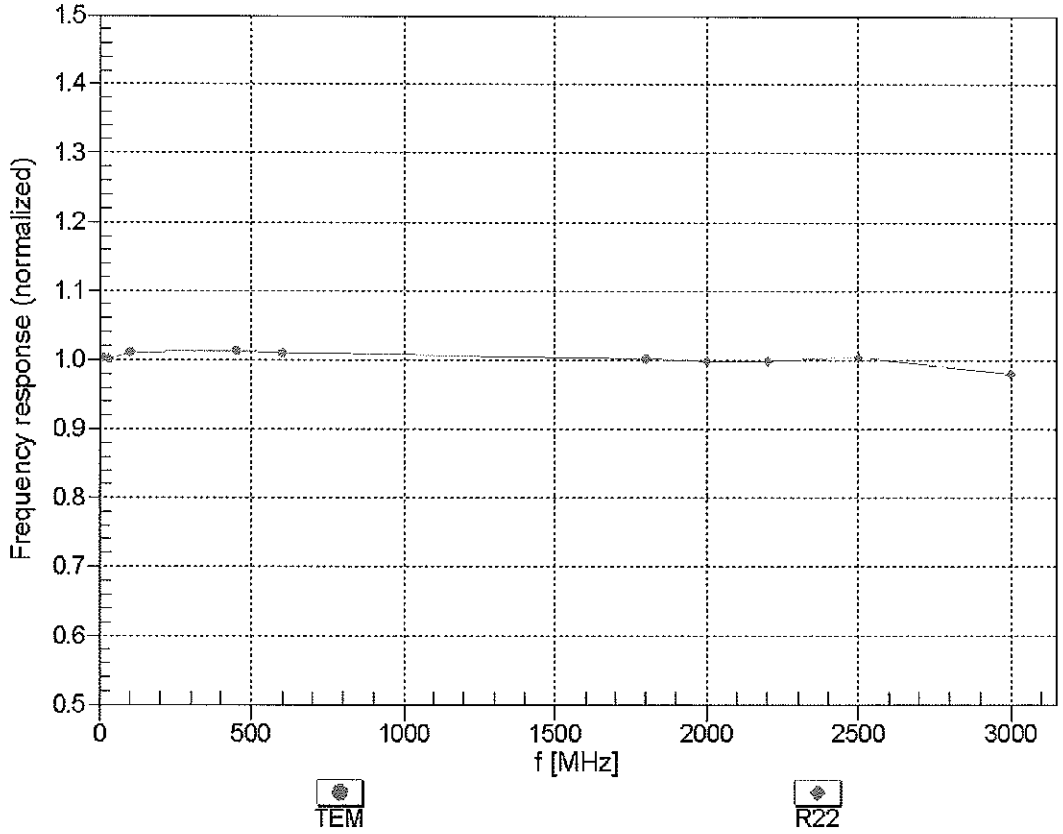
DASY/EASY - Parameters of Probe: ES3DV2 - SN:3022

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	5.92	5.92	5.92	0.24	1.99	± 12.0 %
835	55.2	0.97	5.91	5.91	5.91	0.29	1.85	± 12.0 %
1750	53.4	1.49	4.75	4.75	4.75	0.52	1.52	± 12.0 %
1900	53.3	1.52	4.49	4.49	4.49	0.49	1.56	± 12.0 %
2450	52.7	1.95	4.01	4.01	4.01	0.70	1.02	± 12.0 %
2600	52.5	2.16	3.85	3.85	3.85	0.58	0.90	± 12.0 %

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

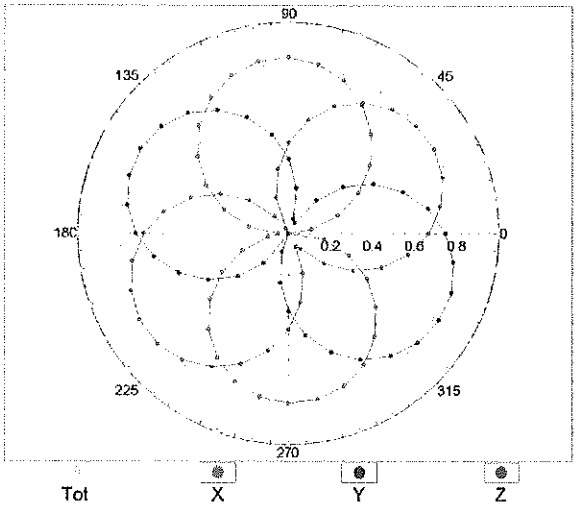
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



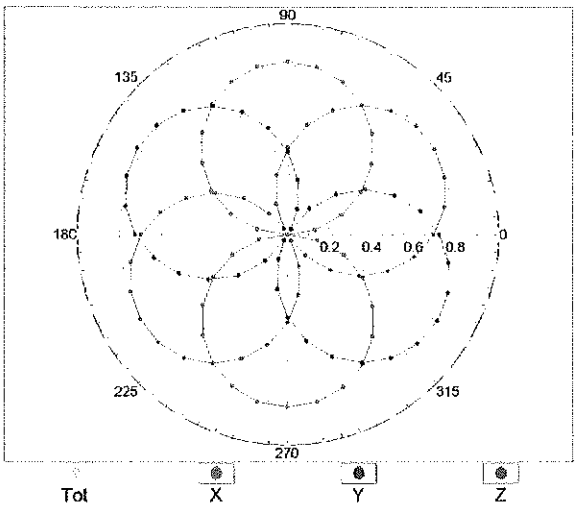
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

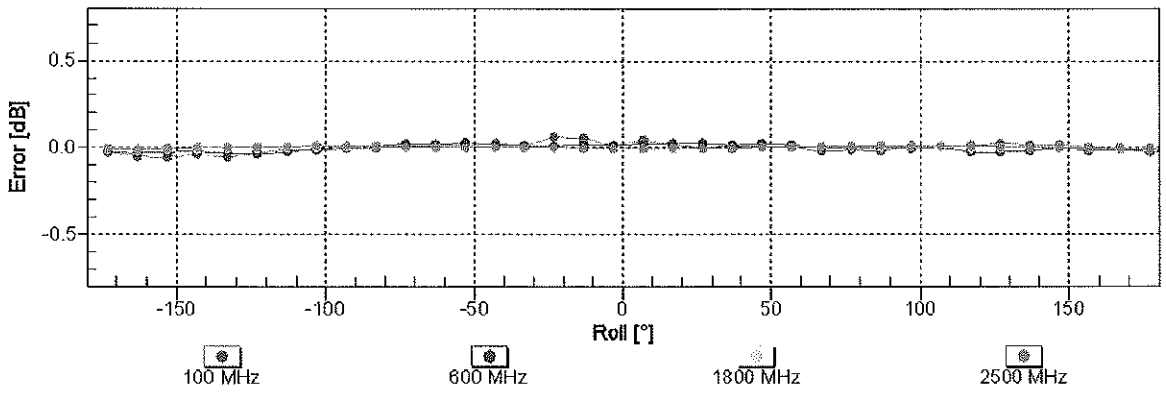
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



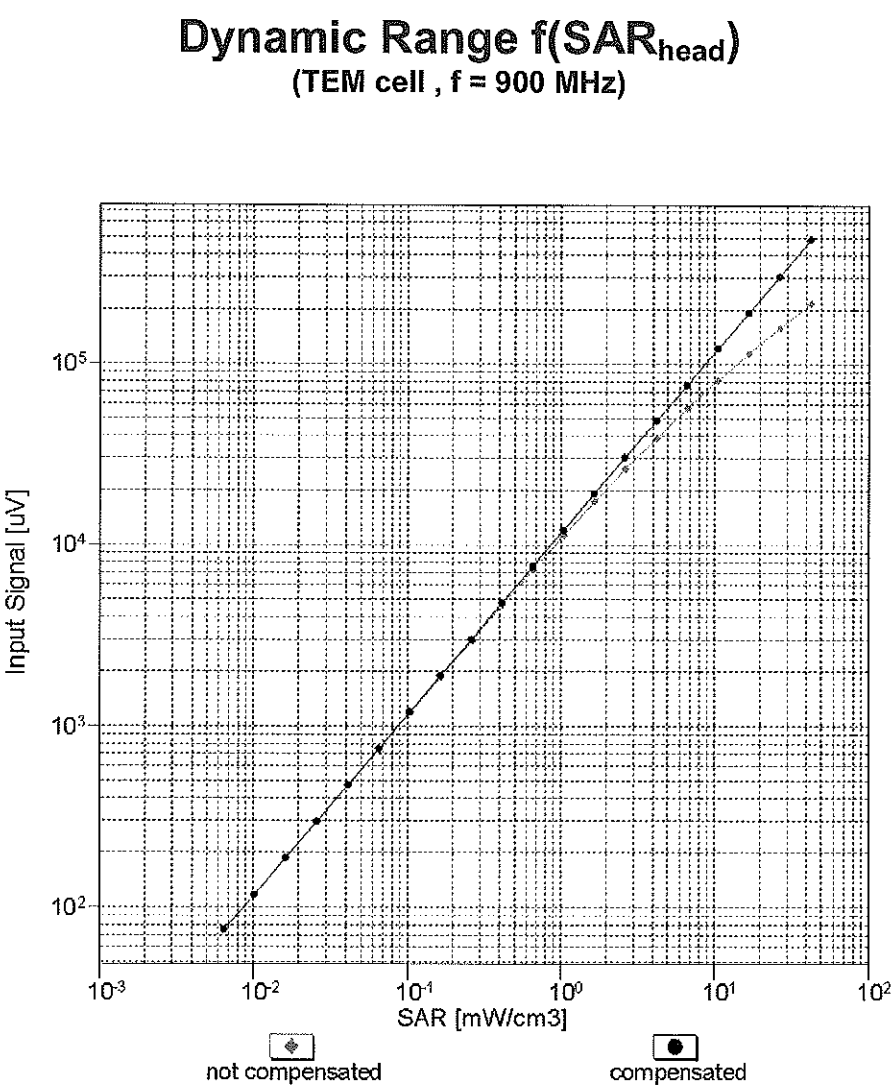
f=1800 MHz,R22

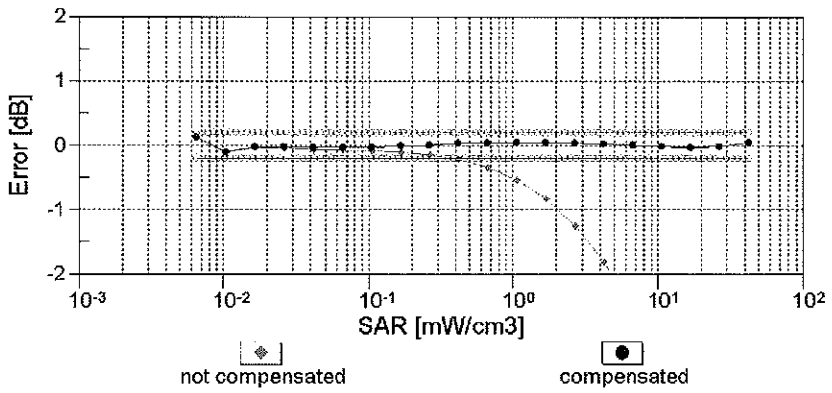




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

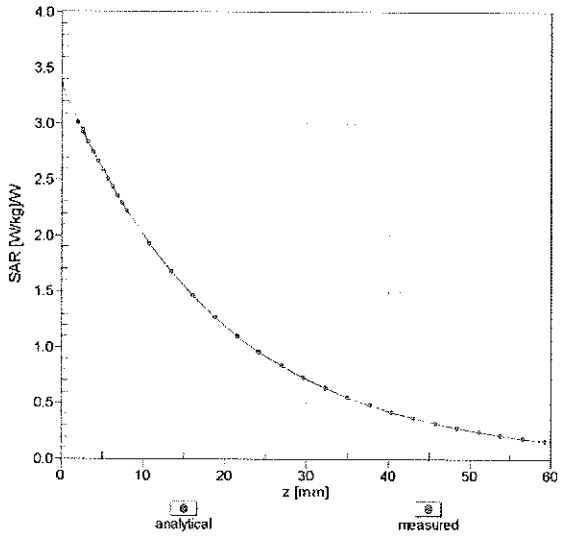




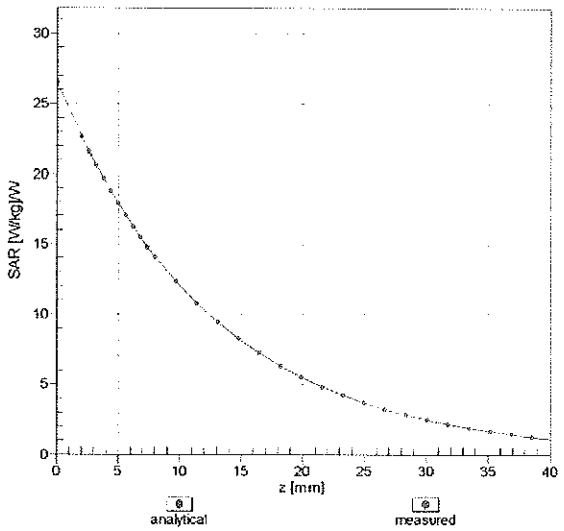
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

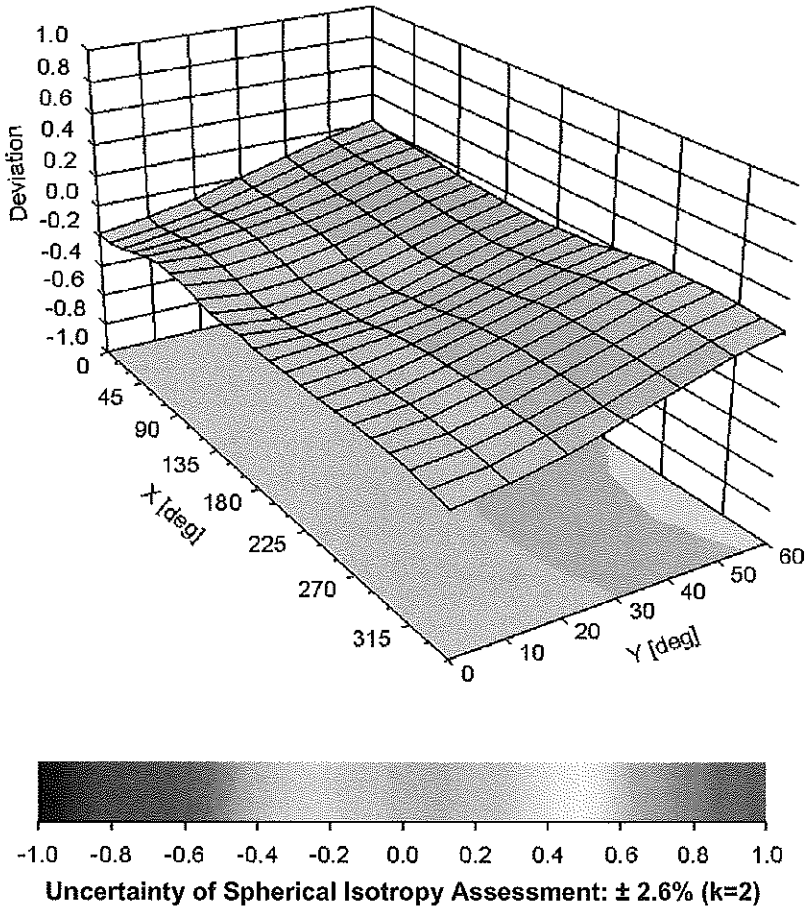


f = 1750 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

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

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-83.1
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

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S Swiss Calibration Service

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Accreditation No.: SCS 108

Client PC Test

Certificate No: D1900V2-5d149_Jul13

CALIBRATION CERTIFICATE

Object: D1900V2 - SN: 5d149

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

Calibration date: July 22, 2013

✓ JCK 8/19/13

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	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14

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

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

Issued: July 22, 2013

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.7
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	38.9 ± 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	9.99 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**40.4 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**21.3 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	53.4 ± 6 %	1.49 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	10.0 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**40.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.36 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	52.9 Ω + 6.0 jΩ
Return Loss	- 23.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.5 Ω + 6.4 jΩ
Return Loss	- 23.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.196 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: 22.07.2013

Test Laboratory: SPEAG, Zurich, Switzerland

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

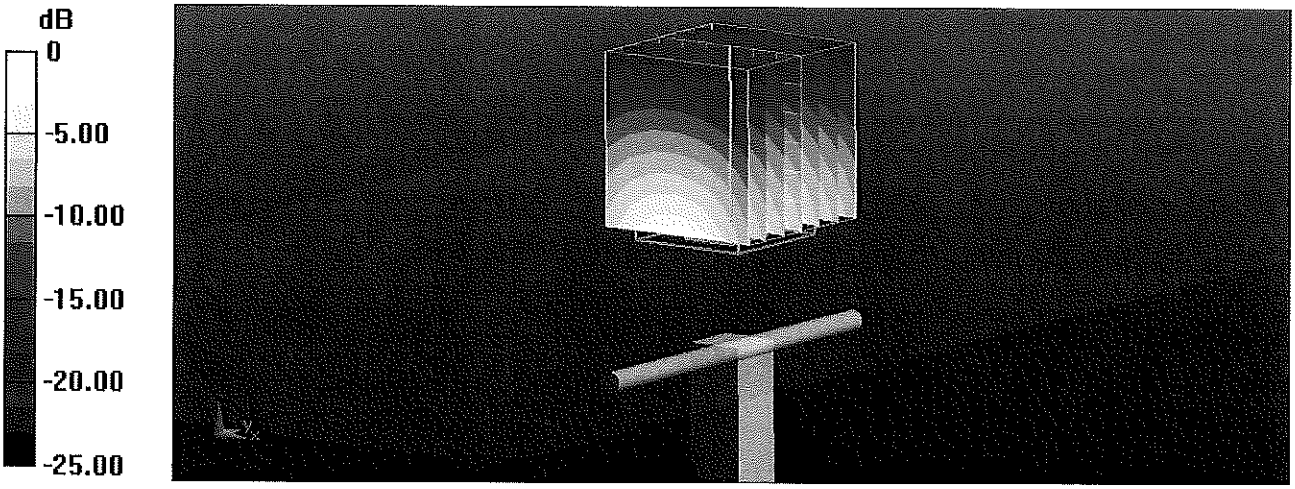
Communication System: UID 0 - CW ; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.36 S/m; ε_r = 38.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.98, 4.98, 4.98); Calibrated: 28.12.2012;
- 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)

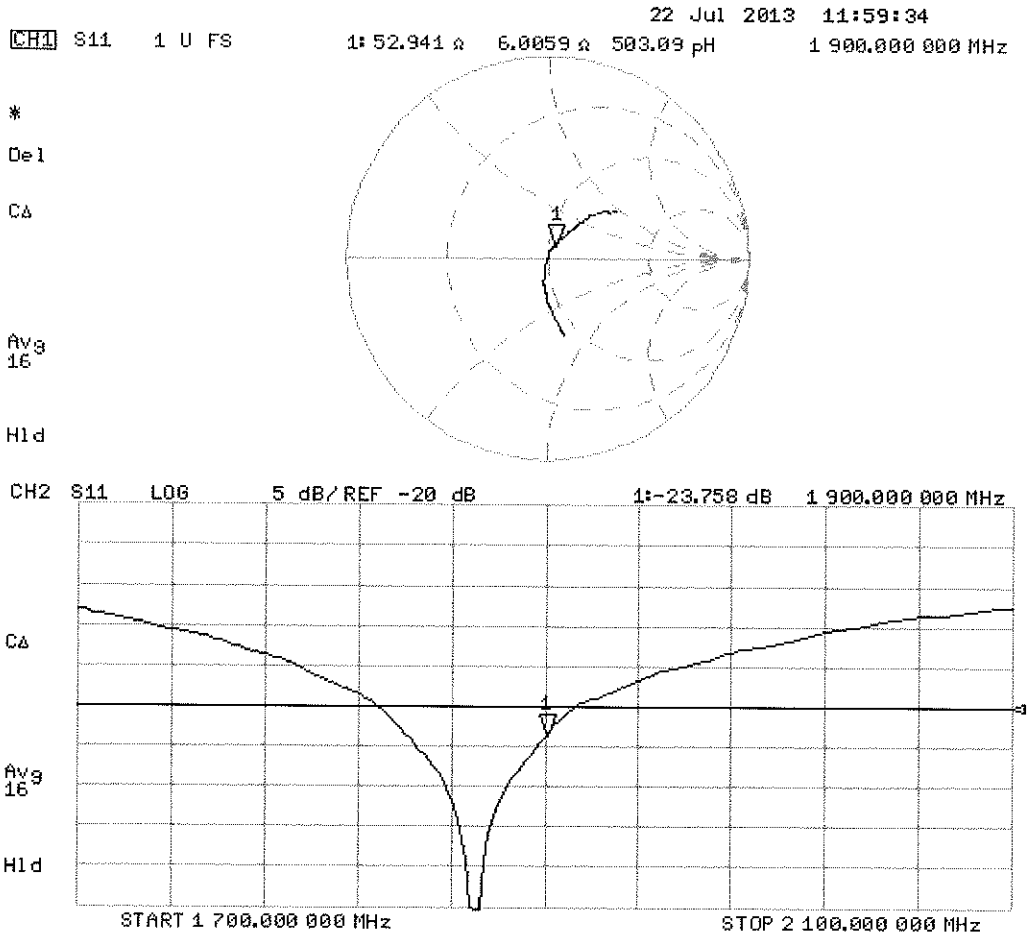
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.173 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 18.0 W/kg
SAR(1 g) = 9.99 W/kg; SAR(10 g) = 5.28 W/kg
Maximum value of SAR (measured) = 12.4 W/kg



0 dB = 12.4 W/kg = 10.93 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 22.07.2013

Test Laboratory: SPEAG, Zurich, Switzerland

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

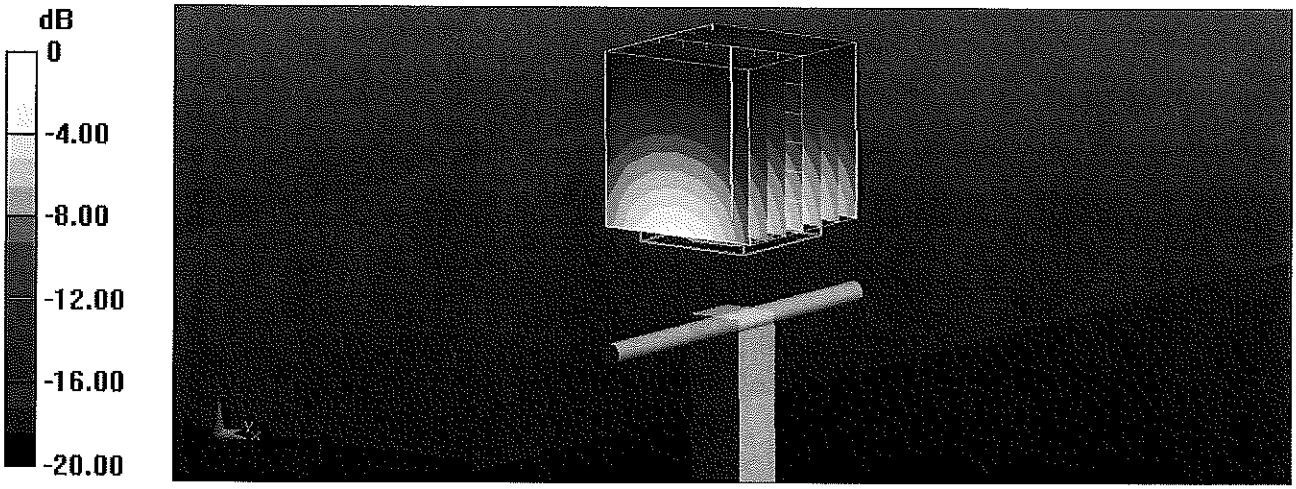
Communication System: UID 0 - CW ; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.49 S/m; ε_r = 53.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.6, 4.6, 4.6); Calibrated: 28.12.2012;
- 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)

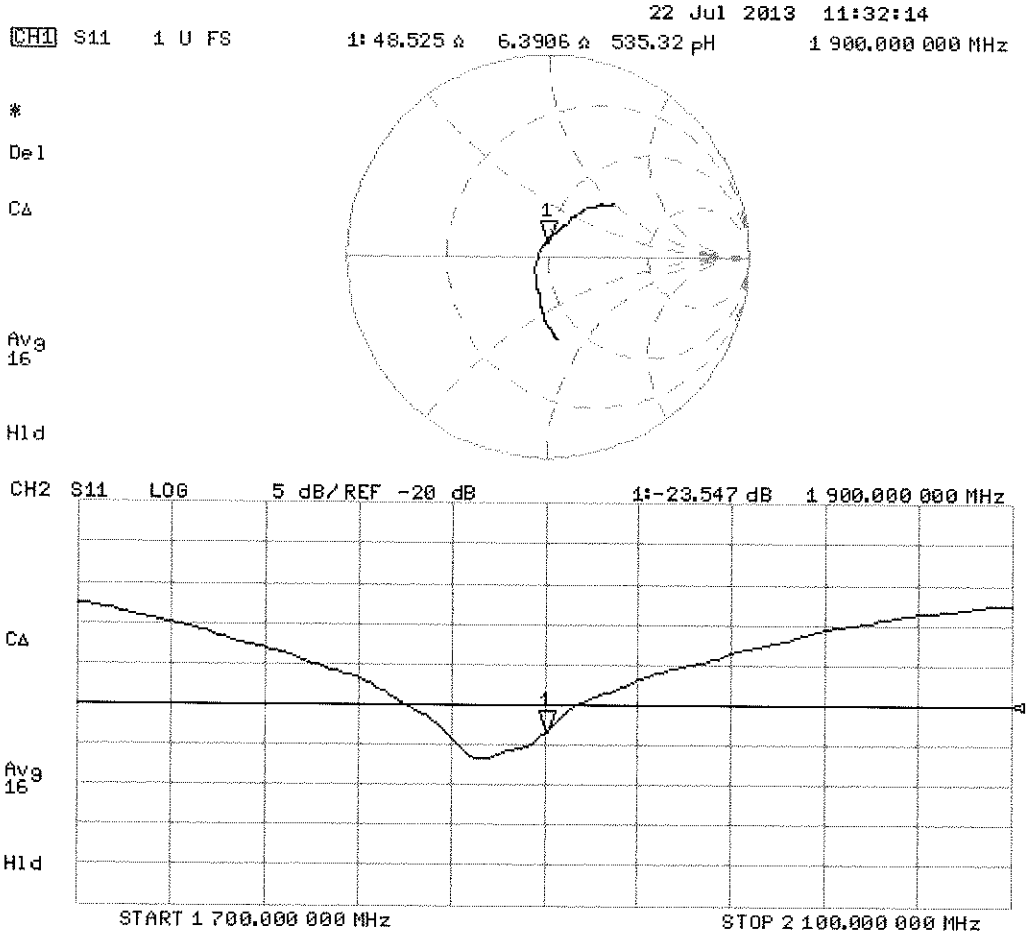
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.173 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 17.0 W/kg
SAR(1 g) = 10 W/kg; SAR(10 g) = 5.36 W/kg
Maximum value of SAR (measured) = 12.6 W/kg



0 dB = 12.6 W/kg = 11.00 dBW/kg

Impedance Measurement Plot for Body TSL



APPENDIX D: SAR TISSUE SPECIFICATIONS

Measurement Procedure for Tissue Verification:

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

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

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

Table D-I
Composition of the Tissue Equivalent Matter

Frequency (MHz)	1900
Tissue	Body
Ingredients (% by weight)	
DGBE	29.44
NaCl	0.39
Water	70.17

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
D	1900	6/16/2014	3022	ES3DV2	1900	Body	1.505	51.42	PASS	PASS	PASS	GMSK	PASS	N/A

NOTES: While the probes have been calibrated for both CW and modulated signals, all measurements were performed using probes 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

A3LSPHP500 Sensor Triggering Data Summary

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

To ensure all production units are compliant it is necessary to test SAR at a distance 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 V.A-9 - Moving Towards the Phantom Measured Power [dBm]											
Distance [mm]	17	16	15	14	13	12	11	10	9	8	7
Cell. CDMA - FCC Rule Part 22H	24.93	24.93	24.93	24.93	24.93	17.92	17.92	17.92	17.92	17.92	17.92
Cell. CDMA - FCC Rule Part 90S	24.91	24.91	24.91	24.91	24.91	17.93	17.93	17.93	17.93	17.93	17.93
PCS CDMA - FCC Rule Part 24E	24.93	24.93	24.93	24.93	24.93	13.91	13.91	13.91	13.91	13.91	13.91
LTE Band 25 - FCC Rule Part 24E	22.91	22.91	22.91	22.91	22.91	13.92	13.92	13.92	13.92	13.92	13.92

Moving device away from the phantom:

KDB 616217 V.A 9 - Moving Away from the Phantom Measured Power [dBm]										
Distance[mm]	17	16	15	14	13	12	11	10	9	8
Cell. CDMA - FCC Rule Part 22H	24.93	24.93	24.93	24.93	24.93	17.92	17.92	17.92	17.92	17.92
Cell. CDMA - FCC Rule Part 90S	24.91	24.91	24.91	24.91	24.91	17.93	17.93	17.93	17.93	17.93
PCS CDMA - FCC Rule Part 24E	24.93	24.93	24.93	24.93	24.93	13.91	13.91	13.91	13.91	13.91
LTE Band 25 - FCC Rule Part 24E	22.91	22.91	22.91	22.91	22.91	13.92	13.92	13.92	13.92	13.92

Based on the most conservative measured triggering distance of 12 mm, additional SAR measurements were required at 11 mm from the back side.

Top Edge

Moving device toward the phantom:

KDB 616217 V.A-9 - Moving Towards the Phantom Measured Power [dBm]											
Distance[mm]	13	12	11	10	9	8	7	6	5	4	3
Cell. CDMA - FCC Rule Part 22H	24.93	24.93	24.93	24.93	24.93	17.92	17.92	17.92	17.92	17.92	17.92
Cell. CDMA - FCC Rule Part 90S	24.91	24.91	24.91	24.91	24.91	17.93	17.93	17.93	17.93	17.93	17.93
PCS CDMA - FCC Rule Part 24E	24.93	24.93	24.93	24.93	24.93	13.91	13.91	13.91	13.91	13.91	13.91
LTE Band 25 - FCC Rule Part 24E	22.91	22.91	22.91	22.91	22.91	13.92	13.92	13.92	13.92	13.92	13.92

Moving device away from the phantom:

KDB 616217 V.A 9 - Moving Away from the Phantom Measured Power [dBm]										
Distance[mm]	13	12	11	10	9	8	7	6	5	4
Cell. CDMA - FCC Rule Part 22H	24.93	24.93	24.93	24.93	24.93	17.92	17.92	17.92	17.92	17.92
Cell. CDMA - FCC Rule Part 90S	24.91	24.91	24.91	24.91	24.91	17.93	17.93	17.93	17.93	17.93
PCS CDMA - FCC Rule Part 24E	24.93	24.93	24.93	24.93	24.93	13.91	13.91	13.91	13.91	13.91
LTE Band 25 - FCC Rule Part 24E	22.91	22.91	22.91	22.91	22.91	13.92	13.92	13.92	13.92	13.92

Based on the most conservative measured triggering distance of 8 mm, additional SAR measurements were required at 7 mm from the top edge