FCC SAR Test Report

APPLICANT	:	**Lenovo(Shanghai) Electronics Technology Co., Ltd.**
EQUIPMENT	:	**Portable Tablet Computer**
BRAND NAME	:	**Lenovo**
MODEL NAME	:	**Lenovo TB2-X30L**
FCC ID	:	**O57TB2X30L**
STANDARD	:	**FCC 47 CFR Part 2 (2.1093)** **ANSI/IEEE C95.1-1992** **IEEE 1528-2013**

We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and had been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by: Eric Huang / Deputy Manager

Approved by: Jones Tsai / Manager

Testing Laboratory
1190

SPORTON INTERNATIONAL INC.
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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA5N2801	Rev. 01	Initial issue of report	Jan. 25, 2016

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for Lenovo(Shanghai) Electronics Technology Co., Ltd. , Portable Tablet Computer, Lenovo TB2-X30L, are as follows.

Equipment Class	Frequency Band		Highest SAR Summary Body 1g SAR (W/kg)	Highest Simultaneous Transmission 1g SAR (W/kg)
Licensed	GSM	GSM850	0.71	1.55
		GSM1900	0.68	
	WCDMA	WCDMA V	0.79	
		WCDMA II	1.12	
	LTE	LTE Band 7	1.10	
DTS	WLAN	2.4GHz WLAN	1.20	1.55
Date of Testing:			2015/12/07 ~ 2016/01/15	

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications

2. Administration Data

Testing Laboratory	
Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978

Applicant	
Company Name	Lenovo(Shanghai) Electronics Technology Co., Ltd.
Address	NO.68 BUILDING, 199 FENJU RD, China (Shanghai) Pilot Free Trade Zone, 200131, CHINA

Manufacturer	
Company Name	Lenovo PC HK Limited
Address	'23/F, Lincoln House, Taikoo Place 979 King's Road, Quarry Bay, Hong Kong

3. Guidance Standard

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards:

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB 616217 D04 SAR for laptop and tablets v01r02
- FCC KDB 941225 D01 3G SAR Procedures v03r01
- FCC KDB 941225 D05 SAR for LTE Devices v02r05

4. Equipment Under Test (EUT) Information

4.1 General Information

Product Feature & Specification	
Equipment Name	Portable Tablet Computer
Brand Name	Lenovo
Model Name	Lenovo TB2-X30L
FCC ID	O57TB2X30L
IMEI Code	004400152020002
Wireless Technology and Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz LTE Band 7: 2502.5 MHz ~ 2567.5 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	· GPRS/EGPRS · RMC 12.2Kbps · HSDPA · HSUPA · DC-HSDPA · LTE: QPSK, 16QAM · 802.11b/g/n HT20 · Bluetooth v3.0+EDR , Bluetooth v4.0-LE
HW Version	LenovoPad TB2-X30L
SW Version	TB2-X30L_S000006_150820_ROW
EUT Stage	Identical Prototype

Battery Information			
Brand Name	Lenovo(XWD)	Model Name	L14D2P31
Power Rating	3.8Vdc, 7000mAh	Type	Li-ion

WWAN Antenna Information		
Ant. Type	PIFA Antenna	
Antenna Gain(dBi)	824~849 MHz (GSM 850, WCDMA band 5)	-4.36
	1850~1910 MHz (GSM 1900, WCDMA band 2)	-3.14
	2502.5~2567.5 MHz (FDD 7)	-4.16

WLAN Antenna Information		
Ant. Type	PIFA Antenna	
Antenna Gain(dBi)	2.4~2.4835 GHz	-1.27

4.2 General LTE SAR Test and Reporting Considerations

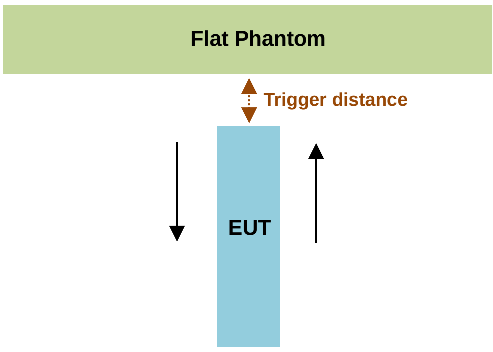
<table>
<tr><th colspan="2">Summarized necessary items addressed in KDB 941225 D05 v02r05</th></tr>
<tr><td>FCC ID</td><td>O57TB2X30L</td></tr>
<tr><td>Equipment Name</td><td>Portable Tablet Computer</td></tr>
<tr><td>Operating Frequency Range of each LTE transmission band</td><td>LTE Band 07: 2502.5 MHz ~ 2567.5 MHz</td></tr>
<tr><td>Channel Bandwidth</td><td>LTE Band 07: 5MHz, 10MHz, 15MHz, 20MHz</td></tr>
<tr><td>uplink modulations used</td><td>QPSK, and 16QAM</td></tr>
<tr><td>LTE Voice / Data requirements</td><td>Data only</td></tr>
<tr><td>LTE MPR permanently built-in by design</td><td>
Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3
<table>
<tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (RB)</th><th rowspan="2">MPR (dB)</th></tr>
<tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr>
<tr><td>QPSK</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 2</td></tr>
</table>
</td></tr>
<tr><td>LTE A-MPR</td><td>In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)</td></tr>
<tr><td>Spectrum plots for RB configuration</td><td>A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.</td></tr>
<tr><td>Power reduction applied to satisfy SAR compliance</td><td>Yes, Proximity Sensor.</td></tr>
</table>

<table>
<tr><th colspan="9">Transmission (H, M, L) channel numbers and frequencies in each LTE band</th></tr>
<tr><th colspan="9">LTE Band 7</th></tr>
<tr><th rowspan="2"></th><th colspan="2">Bandwidth 5 MHz</th><th colspan="2">Bandwidth 10 MHz</th><th colspan="2">Bandwidth 15 MHz</th><th colspan="2">Bandwidth 20 MHz</th></tr>
<tr><th>Ch. #</th><th>Freq. (MHz)</th><th>Ch. #</th><th>Freq. (MHz)</th><th>Ch. #</th><th>Freq. (MHz)</th><th>Ch. #</th><th>Freq. (MHz)</th></tr>
<tr><td>L</td><td>20775</td><td>2502.5</td><td>20800</td><td>2505</td><td>20825</td><td>2507.5</td><td>20850</td><td>2510</td></tr>
<tr><td>M</td><td>21100</td><td>2535</td><td>21100</td><td>2535</td><td>21100</td><td>2535</td><td>21100</td><td>2535</td></tr>
<tr><td>H</td><td>21425</td><td>2567.5</td><td>21400</td><td>2565</td><td>21375</td><td>2562.5</td><td>21350</td><td>2560</td></tr>
</table>

5. Proximity Sensor Triggering Test

<Proximity Sensor Triggering Distance (KDB 616217 D04 section 6.2)>:

Proximity sensor triggering distance testing was performed according to the procedures outlined in KDB 616217 D04 section 6.2, and EUT moving further away from the flat phantom and EUT moving toward the flat phantom were both assessed. The details are illustrated in the exhibit “P-Sensor operational description”, and the shortest triggering distances were reported and used for SAR assessment.
In the preliminary triggering distance testing, the tissue-equivalent medium for different frequency bands were used for verification; no other frequency bands tissue-equivalent medium was found to result in shortest triggering distance than that for 1900MHz, and the tissue-equivalent medium for 1900MHz was used for formal proximity sensor triggering testing.



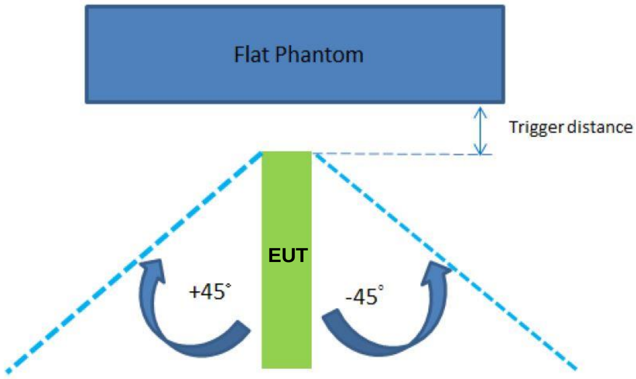
Proximity Sensor Trigger Distance (mm)		
Position	Bottom Face	Edge 1
Minimum	17	12

<Proximity Sensor Triggering Coverage (KDB 616217 D04 section 6.3)>:

Proximity sensors are not normally designed to cover the entire back surface or edges of a tablet. The sensing regions are usually limited to areas near the sensor element. If a sensor is spatially offset from the antenna(s), it is necessary to verify sensor triggering for conditions where the antenna is next to the user but the sensor is laterally further away to ensure sensor coverage is sufficient for reducing the power to maintain compliance. Except when the SAR test exclusion provisions of KDB Publication 447498 D01 are applied, or when SAR is tested at the normal full power for the tablet edges, if an antenna is located near the corner of a tablet, the adjacent edges within 50 mm from the corner antenna must be tested for sensor triggering coverage. Depending on how the antenna and sensor are overlapping, if the required procedures cannot be fully applied, a KDB inquiry must be submitted to determine sensor coverage test procedures.

<Tablet Tilt angle influences to proximity sensor triggering (KDB 616217 D04 section 6.4)>:

The influence of table tilt angles to proximity sensor triggering was determined by positioning each tablet edge that contains a transmitting antenna, perpendicular to the flat phantom, at 12 mm separation.
Rotating the tablet around the edge next to the phantom in ≤ 10° increments until the tablet is ± 45° from the vertical position at 0°, and the maximum output power remains in the reduced mode.



The Sensor Trigger Distance (mm)	
Position	Edge 1
Minimum	12

Proximity sensor power reduction

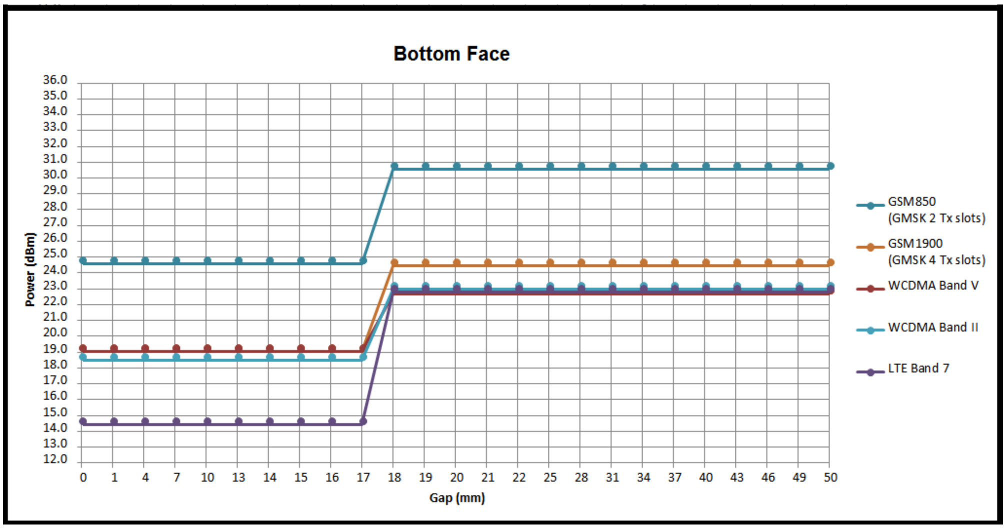
Exposure Position / wireless mode	Bottom Face(1)	Edge 1(1)	Edge 2	Edge 3	Edge 4
GSM850 GPRS (GMSK 1 Tx slot) - CS1	4.5 dB	4.5 dB	0 dB	0 dB	0 dB
GSM850 GPRS (GMSK 2 Tx slot) - CS1	6.0 dB	6.0 dB			
GSM850 GPRS (GMSK 3 Tx slot) - CS1	5.5 dB	5.5 dB			
GSM850 GPRS (GMSK 4 Tx slot) - CS1	5.5 dB	5.5 dB			
GSM850 EDGE (8PSK 1 Tx slot) - MCS5	4.0 dB	4.0 dB			
GSM850 EDGE (8PSK 2 Tx slot) - MCS5	5.5 dB	5.5 dB			
GSM850 EDGE (8PSK 3 Tx slot) - MCS5	5.5 dB	5.5 dB			
GSM850 EDGE (8PSK 4 Tx slot) - MCS5	5.5 dB	5.5 dB			
GSM1900 GPRS (GMSK 1 Tx slot) - CS1	4.5 dB	4.5 dB			
GSM1900 GPRS (GMSK 2 Tx slot) - CS1	5.5 dB	5.5 dB			
GSM1900 GPRS (GMSK 3 Tx slot) - CS1	5.5 dB	5.5 dB			
GSM1900 GPRS (GMSK 4 Tx slot) - CS1	5.5 dB	5.5 dB			
GSM1900 EDGE (8PSK 1 Tx slot) - MCS5	6.5 dB	6.5 dB			
GSM1900 EDGE (8PSK 2 Tx slot) - MCS5	7.0 dB	7.0 dB			
GSM1900 EDGE (8PSK 3 Tx slot) - MCS5	7.0 dB	7.0 dB			
GSM1900 EDGE (8PSK 4 Tx slot) - MCS5	7.0 dB	7.0 dB			
WCDMA Band II	4.5 dB	4.5 dB			
WCDMA Band V	4.0 dB	4.0 dB			
LTE Band 7	8.0 dB	8.0 dB			

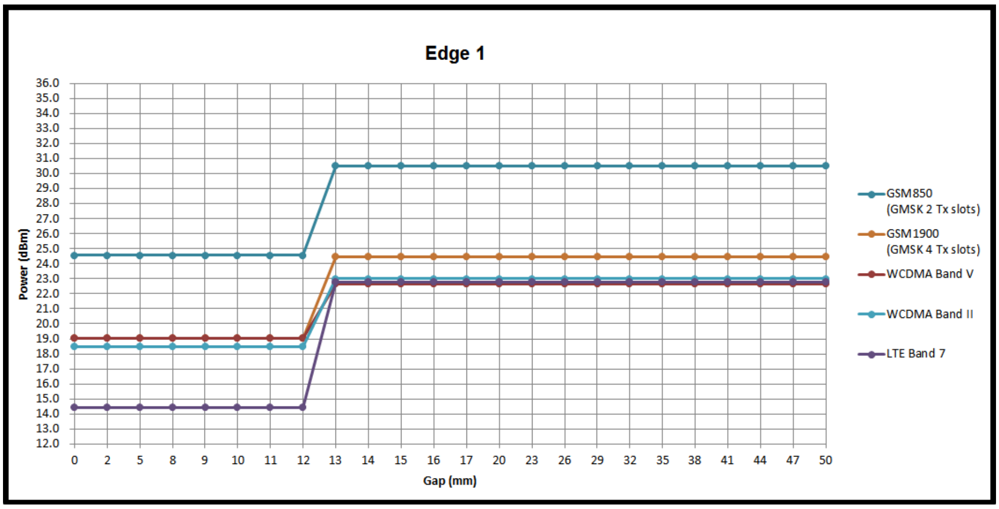
Remark:

1. (1): Reduced maximum limit applied by activation of proximity sensor.
2. Power reduction is not applicable for WLAN and Bluetooth.
3. Tests were performed in accordance with KDB 616217 D04 section 6.1, 6.2, 6.3, 6.4 and 6.5 and compliant results are shown and described in exhibit “P-Sensor operational description
4. For verification of compliance of power reduction scheme, additional SAR testing with EUT transmitting at full RF power at a conservative trigger distance was performed:
   - Bottom Face: 10 mm
   - Edge1: 10 mm

Power Measurement during Sensor Trigger distance testing

Band/Mode	Ch #	Measured power reduction (dBm)		Reduction Levels
		w/o power back-off	w/ power back-off	(dB)
GSM850 (GMSK 2Tx slots)	251	29.59	24.65	4.94
GSM1900 (GMSK 4Tx slots)	810	24.49	19.00	5.49
WCDMA Band V	4233	22.51	18.53	3.98
WCDMA Band II	9538	23.00	18.48	4.52
LTE Band 7	21350	22.78	14.43	8.35





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. The 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.

Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

1. Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

7. Specific Absorption Rate (SAR)

7.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

7.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

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

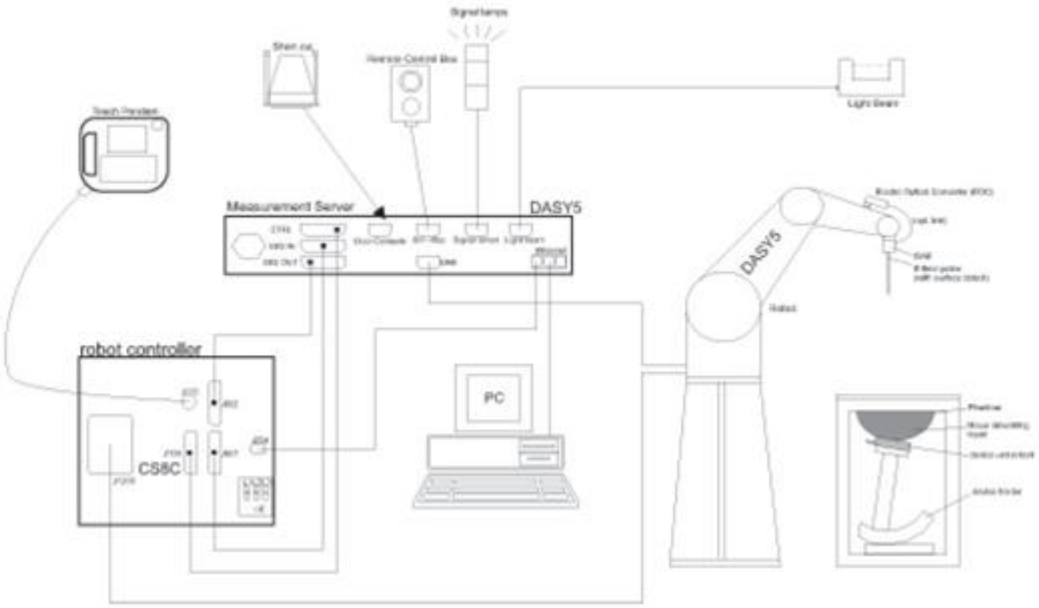
SAR is expressed in units of Watts per kilogram (W/kg)

$$\mathbf{SAR} = \frac{\boldsymbol{\sigma}|\mathbf{E}|^2}{\boldsymbol{\rho}}$$

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

8. System Description and Setup

The DASY system used for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

8.1 E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG).The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

<ES3DV3 Probe>

Construction	Symmetric design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	10 MHz – 4 GHz; Linearity: ±0.2 dB (30 MHz – 4 GHz)
Directivity	±0.2 dB in TSL (rotation around probe axis) ±0.3 dB in TSL (rotation normal to probe axis)
Dynamic Range	5 µW/g – >100 mW/g; Linearity: ±0.2 dB
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 3.9 mm (body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm

<EX3DV4 Probe>

Construction	Symmetric design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	10 MHz – >6 GHz Linearity: ±0.2 dB (30 MHz – 6 GHz)
Directivity	±0.3 dB in TSL (rotation around probe axis) ±0.5 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 µW/g – >100 mW/g Linearity: ±0.2 dB (noise: typically <1 µW/g)
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 2.5 mm (body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm

8.2 Data Acquisition Electronics (DAE)

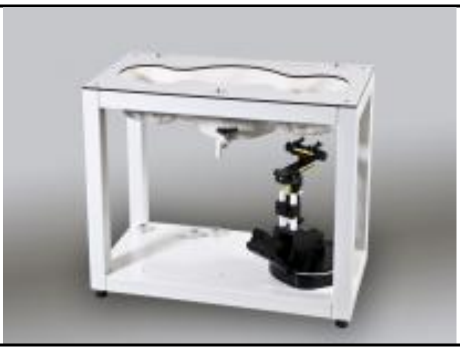
The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.
The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

Fig 5.1 Photo of DAE

8.3 Phantom

<SAM Twin Phantom>

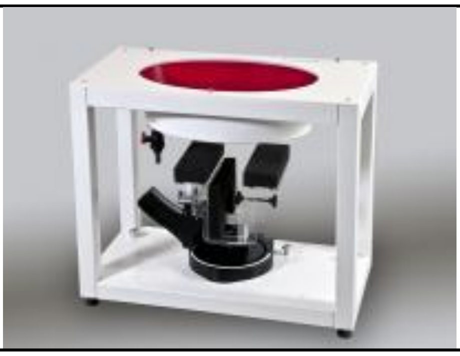
Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm
Filling Volume	Approx. 25 liters
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet
Measurement Areas	Left Hand, Right Hand, Flat Phantom



The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

<ELI Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%)
Filling Volume	Approx. 30 liters
Dimensions	Major ellipse axis: 600 mm Minor axis: 400 mm



The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

8.4 Device Holder

<Mounting Device for Hand-Held Transmitter>

In combination with the Twin SAM V5.0/V5.0c or ELI phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). And upgrade kit to Mounting Device to enable easy mounting of wider devices like big smart-phones, e-books, small tablets, etc. It holds devices with width up to 140 mm.

Mounting Device for Hand-Held Transmitters

Mounting Device Adaptor for Wide-Phones

<Mounting Device for Laptops and other Body-Worn Transmitters>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.

Mounting Device for Laptops

9. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

(a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
(b) Read the WWAN RF power level from the base station simulator.
(c) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band
(d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

<SAR measurement>

(a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
(b) Place the EUT in the positions as Appendix D demonstrates.
(c) Set scan area, grid size and other setting on the DASY software.
(d) Measure SAR results for the highest power channel on each testing position.
(e) Find out the largest SAR result on these testing positions of each band
(f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

(a) Power reference measurement
(b) Area scan
(c) Zoom scan
(d) Power drift measurement

9.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

9.2 Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

9.3 Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB0 is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

9.4 Zoom Scan

Zoom scans are used assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube shoes base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

<table>
<tr><th colspan="3"></th><th>$\leq$ 3 GHz</th><th>> 3 GHz</th></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}</td><td>$\leq$ 2 GHz: $\leq$ 8 mm
2 – 3 GHz: $\leq$ 5 mm*</td><td>3 – 4 GHz: $\leq$ 5 mm*
4 – 6 GHz: $\leq$ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>$\leq$ 5 mm</td><td>3 – 4 GHz: $\leq$ 4 mm
4 – 5 GHz: $\leq$ 3 mm
5 – 6 GHz: $\leq$ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>$\leq$ 4 mm</td><td>3 – 4 GHz: $\leq$ 3 mm
4 – 5 GHz: $\leq$ 2.5 mm
5 – 6 GHz: $\leq$ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>$\geq$ 30 mm</td><td>3 – 4 GHz: $\geq$ 28 mm
4 – 5 GHz: $\geq$ 25 mm
5 – 6 GHz: $\geq$ 22 mm</td></tr>
<tr><td colspan="5">Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.
* When zoom scan is required and the <u>reported</u> SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is $\leq$ 1.4 W/kg, $\leq$ 8 mm, $\leq$ 7 mm and $\leq$ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.</td></tr>
</table>

9.5 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

9.6 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.

10. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	835MHz System Validation Kit	D835V2	499	Mar. 20, 2015	Mar. 19, 2016
SPEAG	1900MHz System Validation Kit	D1900V2	5d041	Oct. 22, 2015	Oct. 21, 2016
SPEAG	2450MHz System Validation Kit	D2450V2	736	Aug. 20, 2015	Aug. 19, 2016
SPEAG	2600MHz System Validation Kit	D2600V2	1008	Aug. 19, 2015	Aug. 18, 2016
SPEAG	Data Acquisition Electronics	DAE3	495	May. 22, 2015	May. 21, 2016
SPEAG	Data Acquisition Electronics	DAE4	778	Aug. 25, 2015	Aug. 24, 2016
SPEAG	Data Acquisition Electronics	DAE3	577	Sep. 24, 2015	Sep. 23, 2016
SPEAG	Data Acquisition Electronics	DAE4	1399	Nov. 23, 2015	Nov. 22, 2016
SPEAG	Dosimetric E-Field Probe	EX3DV4	3925	May. 27, 2015	May. 26, 2016
SPEAG	Dosimetric E-Field Probe	ES3DV3	3270	Sep. 28, 2015	Sep. 27, 2016
SPEAG	Dosimetric E-Field Probe	EX3DV4	3931	Oct. 01, 2015	Sep. 30, 2016
SPEAG	Dosimetric E-Field Probe	EX3DV4	3955	Nov. 24, 2015	Nov. 23, 2016
WonDer	Thermometer	WD-5015	TM642	Oct. 16, 2015	Oct. 15, 2016
WonDer	Thermometer	WD-5015	TM281	Oct. 16, 2015	Oct. 15, 2016
Wisewind	Thermometer	HTC-1	TM560	Oct. 16, 2015	Oct. 15, 2016
Wisewind	Thermometer	HTC-1	TM225	Oct. 16, 2015	Oct. 15, 2016
Anritsu	Radio Communication Analyzer	MT8820C	6201074414	Feb. 06, 2015	Feb. 05, 2016
Agilent	Wireless Communication Test Set	E5515C	MY50266977	May. 14, 2015	May. 13, 2016
SPEAG	Device Holder	N/A	N/A	N/A	N/A
R&S	Signal Generator	MG3710A	6201502524	May. 25, 2015	May. 24, 2016
Agilent	ENA Network Analyzer	E5071C	MY46316648	Feb. 11, 2015	Feb. 10, 2016
SPEAG	Dielectric Probe Kit	DAK-3.5	1126	Jul. 21, 2015	Jul. 20, 2016
LINE SEIKI	Digital Thermometer	LKMelectronic	DTM3000SPEZIAL	Jul. 17, 2015	Jul. 16, 2016
Anritsu	Power Meter	ML2495A	1419002	May. 13, 2015	May. 12, 2016
Anritsu	Power Sensor	MA2411B	1339124	May. 13, 2015	May. 12, 2016
Anritsu	Spectrum Analyzer	MS2830A	6201396378	Jun. 17, 2015	Jun. 16, 2016
ATM	Dual Directional Coupler	C122H-10	P610410z-02	Note 1	
Woken	Attenuator 1	WK0602-XX	N/A	Note 1	
PE	Attenuator 2	PE7005-10	N/A	Note 1	
PE	Attenuator 3	PE7005- 3	N/A	Note 1	
AR	Power Amplifier	5S1G4M2	0328767	Note 1	
Mini-Circuits	Power Amplifier	ZVE-3W	162601250	Note 1	

General Note:

1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.

11. System Verification

11.1 Tissue Verification

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
For Head								
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
900	40.3	57.9	0.2	1.4	0.2	0	0.97	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
2600	54.8	0	0	0.1	0	45.1	1.96	39.0
For Body								
750	51.7	47.2	0	0.9	0.1	0	0.96	55.5
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
900	50.8	48.2	0	0.9	0.1	0	1.05	55.0
1800, 1900, 2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0	0	31.4	1.95	52.7
2600	68.1	0	0	0.1	0	31.8	2.16	52.5

Simulating Liquid for 5GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	64~78%
Mineral oil	11~18%
Emulsifiers	9~15%
Additives and Salt	2~3%

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
835	MSL	22.5	1.001	56.556	0.97	55.20	3.20	2.46	±5	2016/1/12
1900	MSL	22.7	1.574	54.700	1.52	53.30	3.55	2.63	±5	2015/12/7
2450	MSL	22.5	1.993	53.418	1.95	52.70	2.21	1.36	±5	2016/1/15
2600	MSL	22.1	2.204	53.024	2.16	52.50	2.04	1.00	±5	2015/12/9

11.2 System Performance Check Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2016/1/12	835	MSL	250	D835V2-499	EX3DV4 - SN3955	DAE4 Sn1399	2.48	9.30	9.92	6.67
2015/12/7	1900	MSL	250	D1900V2_5d041	EX3DV4 - SN3931	DAE3 Sn577	10.10	40.00	40.4	1.00
2016/1/15	2450	MSL	250	D2450V2-736	EX3DV4 - SN3925	DAE3 Sn495	12.40	51.90	49.6	-4.43
2015/12/9	2600	MSL	250	D2600V2-1008	ES3DV3 - SN3270	DAE4 Sn778	14.30	55.80	57.2	2.51

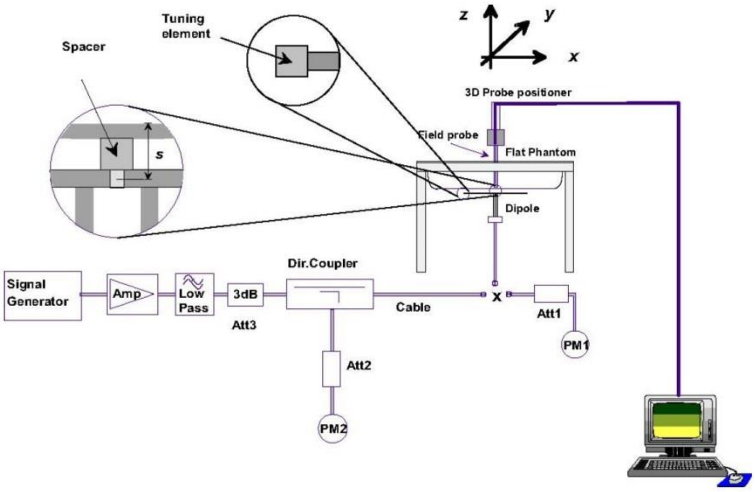


Fig 8.3.1 System Performance Check Setup

Fig 8.3.2 Setup Photo

12. RF Exposure Positions

12.1 SAR Testing for Tablet

This device can be used also in full sized tablet exposure conditions, due to its size. Per FCC KDB 616217, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. The SAR exclusion threshold in KDB 447498 D01v06 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.

13. Conducted RF Output Power (Unit: dBm)

<GSM Conducted Power>

1. Per KDB 447498 D01v06, the maximum output power channel is used for SAR testing and for further SAR test reduction.
2. Per KDB 941225 D01v03r01, for Body SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power including tune-up tolerance, for modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested, therefore, the GSM850 GPRS 2Tx slots and GSM 1900 GPRS 4Tx slots modes was selected when EUT operating without power back-off, the GSM850 GPRS 2Tx slots and GSM1900 GPRS 4Tx slots modes was selected when EUT operating with power back-off, according to the highest source-based time-averaged output power.

Full Power Mode

Band GSM850	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
TX Channel	128	189	251		128	189	251	
Frequency (MHz)	824.2	836.4	848.8		824.2	836.4	848.8	
GPRS 1 Tx slot	32.07	32.22	32.31	32.50	23.07	23.22	23.31	23.50
GPRS 2 Tx slots	29.34	29.32	29.59	31.00	23.34	23.32	23.59	25.00
GPRS 3 Tx slots	28.33	28.30	28.37	28.50	24.07	24.04	24.11	24.24
GPRS 4 Tx slots	26.83	26.71	26.75	27.00	23.83	23.71	23.75	24.00
EDGE 1 Tx slot	26.25	26.21	26.27	26.50	17.25	17.21	17.27	17.50
EDGE 2 Tx slots	24.20	24.31	24.20	24.50	18.20	18.31	18.20	18.50
EDGE 3 Tx slots	22.39	22.31	22.36	22.50	18.13	18.05	18.10	18.24
EDGE 4 Tx slots	21.09	21.07	21.14	21.50	18.09	18.07	18.14	18.50

Band GSM1900	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
TX Channel	512	661	810		512	661	810	
Frequency (MHz)	1850.2	1880	1909.8		1850.2	1880	1909.8	
GPRS 1 Tx slot	29.46	29.48	29.54	30.00	20.46	20.48	20.54	21.00
GPRS 2 Tx slots	27.62	27.57	27.66	28.00	21.62	21.57	21.66	22.00
GPRS 3 Tx slots	25.66	25.67	25.72	26.00	21.40	21.41	21.46	21.74
GPRS 4 Tx slots	24.41	24.48	24.49	25.00	21.41	21.48	21.49	22.00
EDGE 1 Tx slot	25.73	25.76	25.77	26.00	16.73	16.76	16.77	17.00
EDGE 2 Tx slots	23.69	23.71	23.73	24.00	17.69	17.71	17.73	18.00
EDGE 3 Tx slots	21.62	21.64	21.61	22.00	17.36	17.38	17.35	17.74
EDGE 4 Tx slots	20.48	20.53	20.51	21.00	17.48	17.53	17.51	18.00

Reduced Power Mode

Band GSM850	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
TX Channel	128	189	251		128	189	251	
Frequency (MHz)	824.2	836.4	848.8		824.2	836.4	848.8	
GPRS 1 Tx slot	27.75	27.86	27.92	28.00	18.75	18.86	18.92	19.00
GPRS 2 Tx slots	24.59	24.63	24.65	25.00	18.59	18.63	18.65	19.00
GPRS 3 Tx slots	22.46	22.48	22.53	23.00	18.20	18.22	18.27	18.74
GPRS 4 Tx slots	21.21	21.24	21.32	21.50	18.21	18.24	18.32	18.50
EDGE 1 Tx slot	22.04	22.08	22.12	22.50	13.04	13.08	13.12	13.50
EDGE 2 Tx slots	18.85	18.79	18.85	19.00	12.85	12.79	12.85	13.00
EDGE 3 Tx slots	16.79	16.77	16.79	17.00	12.53	12.51	12.53	12.74
EDGE 4 Tx slots	15.70	15.63	15.78	16.00	12.70	12.63	12.78	13.00

Band GSM1900	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
TX Channel	512	661	810		512	661	810	
Frequency (MHz)	1850.2	1880	1909.8		1850.2	1880	1909.8	
GPRS 1 Tx slot	25.18	25.14	25.08	25.50	16.18	16.14	16.08	16.50
GPRS 2 Tx slots	22.11	22.16	22.13	22.50	16.11	16.16	16.13	16.50
GPRS 3 Tx slots	20.11	20.11	19.89	20.50	15.85	15.85	15.63	16.24
GPRS 4 Tx slots	18.99	19.02	19.00	19.50	15.99	16.02	16.00	16.50
EDGE 1 Tx slot	19.25	19.28	19.24	19.50	10.25	10.28	10.24	10.50
EDGE 2 Tx slots	16.30	16.34	16.43	17.00	10.30	10.34	10.43	11.00
EDGE 3 Tx slots	14.58	14.58	14.62	15.00	10.32	10.32	10.36	10.74
EDGE 4 Tx slots	13.70	13.71	13.71	14.00	10.70	10.71	10.71	11.00

<WCDMA Conducted Power>

1. The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification.
2. The procedures in KDB 941225 D01v03r01 are applied for 3GPP Rel. 6 HSPA to configure the device in the required sub-test mode(s) to determine SAR test exclusion.
3. For DC-HSDPA, the device was configured according to the H-Set 12, Fixed Reference Channel (FRC) configuration in Table C.8.1.12 of 3GPP TS 34.121-1, with the primary and the secondary serving HS-DSCH Cell enabled during the power measurement.

A summary of these settings are illustrated below:

HSDPA Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting:
   i. Set Gain Factors (β_c and β_d) and parameters were set according to each
   ii. Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
   iii. Set RMC 12.2Kbps + HSDPA mode.
   iv. Set Cell Power = -86 dBm
   v. Set HS-DSCH Configuration Type to FRC (H-set 1, QPSK)
   vi. Select HSDPA Uplink Parameters
   vii. Set Delta ACK, Delta NACK and Delta CQI = 8
   viii. Set Ack-Nack Repetition Factor to 3
   ix. Set CQI Feedback Cycle (k) to 4 ms
   x. Set CQI Repetition Factor to 2
   xi. Power Ctrl Mode = All Up bits
d. The transmitted maximum output power was recorded.

Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH

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

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with $\beta_{hs} = 30/15 * \beta_c$.

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, Δ_{ACK} and Δ_{NACK} = 30/15 with $\beta_{hs} = 30/15 * \beta_c$, and Δ_{CQI} = 24/15 with $\beta_{hs} = 24/15 * \beta_c$.

Note 3: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 4: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 11/15 and β_d = 15/15.

Setup Configuration

HSUPA Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting * :
   i. Call Configs = 5.2B, 5.9B, 5.10B, and 5.13.2B with QPSK
   ii. Set the Gain Factors (β_c and β_d) and parameters (AG Index) were set according to each specific sub-test in the following table, C11.1.3, quoted from the TS 34.121
   iii. Set Cell Power = -86 dBm
   iv. Set Channel Type = 12.2k + HSPA
   v. Set UE Target Power
   vi. Power Ctrl Mode= Alternating bits
   vii. Set and observe the E-TFCI
   viii. Confirm that E-TFCI is equal to the target E-TFCI of 75 for sub-test 1, and other subtest's E-TFCI
d. The transmitted maximum output power was recorded.

Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH

Sub-test	β_c	β_d	β_d *(SF)*	β_c/β_d	β_{HS} *(Note1)*	β_{ec}	β_{ed} *(Note 5) (Note 6)*	β_{ed} *(SF)*	β_{ed} *(Codes)*	CM *(dB)* *(Note 2)*	MPR *(dB)* *(Note 2)*	*AG Index* *(Note 6)*	*E-TFCI*
1	11/15 *(Note 3)*	15/15 *(Note 3)*	64	11/15 *(Note 3)*	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed}1: 47/15 β_{ed}2: 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 *(Note 4)*	15/15 *(Note 4)*	64	15/15 *(Note 4)*	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c .
Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.
Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 14/15 and β_d = 15/15.
Note 5: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.
Note 6: β_{ed} can not be set directly, it is set by Absolute Grant Value.

Setup Configuration

DC-HSDPA 3GPP release 8 Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration below
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting:
   i. Set RMC 12.2Kbps + HSDPA mode.
   ii. Set Cell Power = -25 dBm
   iii. Set HS-DSCH Configuration Type to FRC (H-set 12, QPSK)
   iv. Select HSDPA Uplink Parameters
   v. Set Gain Factors (β_c and β_d) and parameters were set according to each Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
      a). Subtest 1: β_c/β_d=2/15
      b). Subtest 2: β_c/β_d=12/15
      c). Subtest 3: β_c/β_d=15/8
      d). Subtest 4: β_c/β_d=15/4
   vi. Set Delta ACK, Delta NACK and Delta CQI = 8
   vii. Set Ack-Nack Repetition Factor to 3
   viii. Set CQI Feedback Cycle (k) to 4 ms
   ix. Set CQI Repetition Factor to 2
   x. Power Ctrl Mode = All Up bits
d. The transmitted maximum output power was recorded.

The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification.
A summary of these settings are illustrated below:

C.8.1.12 Fixed Reference Channel Definition H-Set 12

Table C.8.1.12: Fixed Reference Channel H-Set 12

Parameter	Unit	Value
Nominal Avg. Inf. Bit Rate	kbps	60
Inter-TTI Distance	TTI's	1
Number of HARQ Processes	Processes	6
Information Bit Payload (N_{INF})	Bits	120
Number Code Blocks	Blocks	1
Binary Channel Bits Per TTI	Bits	960
Total Available SML's in UE	SML's	19200
Number of SML's per HARQ Proc.	SML's	3200
Coding Rate		0.15
Number of Physical Channel Codes	Codes	1
Modulation		QPSK
Note 1: The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table. Note 2: Maximum number of transmission is limited to 1, i.e., retransmission is not allowed. The redundancy and constellation version 0 shall be used.		

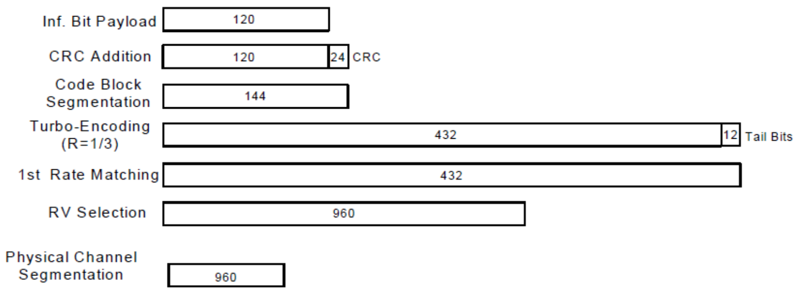


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

Setup Configuration

<WCDMA Conducted Power>

General Note:

1. Per KDB 941225 D01v03r01, SAR for Body exposure is measured using a 12.2 kbps RMC with TPC bits configured to all "1's".
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. If the maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / DC-HSDPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA.

Full Power Mode

Band		WCDMA V			Tune-up Limit (dBm)	WCDMA II			Tune-up Limit (dBm)
TX Channel		4132	4182	4233		9262	9400	9538	
Rx Channel		4357	4407	4458		9662	9800	9938	
Frequency (MHz)		826.4	836.4	846.6		1852.4	1880	1907.6	
3GPP Rel 99	RMC 12.2Kbps	22.37	22.46	22.51	23.50	22.88	22.98	23.00	23.00
3GPP Rel 6	HSDPA Subtest-1	21.65	21.80	21.77	23.00	22.04	22.10	22.14	23.00
3GPP Rel 6	HSDPA Subtest-2	21.62	21.74	21.70	23.00	21.96	22.00	22.12	23.00
3GPP Rel 6	HSDPA Subtest-3	21.18	21.28	21.24	22.50	21.59	21.64	21.68	22.50
3GPP Rel 6	HSDPA Subtest-4	21.15	21.22	21.18	22.50	21.57	21.60	21.62	22.50
3GPP Rel 8	DC-HSDPA Subtest-1	21.62	21.76	21.69	23.00	21.97	22.09	22.13	23.00
3GPP Rel 8	DC-HSDPA Subtest-2	21.60	21.69	21.65	23.00	21.91	22.00	22.03	23.00
3GPP Rel 8	DC-HSDPA Subtest-3	21.18	21.24	21.23	22.50	21.53	21.55	21.61	22.50
3GPP Rel 8	DC-HSDPA Subtest-4	21.09	21.22	21.12	22.50	21.54	21.58	21.56	22.50
3GPP Rel 6	HSUPA Subtest-1	21.09	21.27	21.64	23.00	22.00	21.50	21.50	23.00
3GPP Rel 6	HSUPA Subtest-2	20.05	20.15	20.49	21.00	20.78	20.29	20.31	21.00
3GPP Rel 6	HSUPA Subtest-3	20.10	20.20	20.75	22.00	21.02	20.55	20.69	22.00
3GPP Rel 6	HSUPA Subtest-4	20.12	20.18	20.68	21.00	21.00	20.92	20.98	21.00
3GPP Rel 6	HSUPA Subtest-5	21.66	21.75	21.86	23.00	22.15	22.06	22.10	23.00

Reduced Power Mode

Band		WCDMA V			Tune-up Limit (dBm)	WCDMA II			Tune-up Limit (dBm)
TX Channel		4132	4182	4233		9262	9400	9538	
Rx Channel		4357	4407	4458		9662	9800	9938	
Frequency (MHz)		826.4	836.4	846.6		1852.4	1880	1907.6	
3GPP Rel 99	RMC 12.2Kbps	18.42	18.46	18.53	19.50	18.37	18.45	18.48	18.50
3GPP Rel 6	HSDPA Subtest-1	17.82	17.96	18.06	19.00	17.37	17.46	17.52	18.00
3GPP Rel 6	HSDPA Subtest-2	17.86	17.93	17.94	19.00	17.37	17.41	17.45	18.00
3GPP Rel 6	HSDPA Subtest-3	17.37	17.51	17.52	18.50	16.82	16.87	16.98	17.50
3GPP Rel 6	HSDPA Subtest-4	17.35	17.40	17.45	18.50	16.82	16.89	16.95	17.50
3GPP Rel 8	DC-HSDPA Subtest-1	17.80	17.90	18.02	19.00	17.35	17.41	17.51	18.00
3GPP Rel 8	DC-HSDPA Subtest-2	17.84	17.89	17.92	19.00	17.33	17.40	17.45	18.00
3GPP Rel 8	DC-HSDPA Subtest-3	17.33	17.45	17.51	18.50	16.81	16.88	16.92	17.50
3GPP Rel 8	DC-HSDPA Subtest-4	17.33	17.38	17.43	18.50	16.80	16.87	16.93	17.50
3GPP Rel 6	HSUPA Subtest-1	17.27	17.33	17.59	19.00	16.97	16.46	16.99	18.00
3GPP Rel 6	HSUPA Subtest-2	16.63	16.60	16.39	17.00	15.52	15.79	15.96	16.00
3GPP Rel 6	HSUPA Subtest-3	16.43	16.24	16.47	18.00	15.45	15.51	15.47	17.00
3GPP Rel 6	HSUPA Subtest-4	16.93	16.63	16.92	17.00	15.72	16.00	15.99	16.00
3GPP Rel 6	HSUPA Subtest-5	17.67	17.61	17.74	19.00	16.97	16.81	16.99	18.00

<LTE Conducted Power>

General Note:

1. Anritsu MT8820C base station simulator was used to setup the connection with EUT; the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
2. Per KDB 941225 D05v02r05, when a properly configured base station simulator is used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration is not required.
3. Per KDB 941225 D05v02r05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
4. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. Per KDB 941225 D05v02r05, For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
6. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
7. Per KDB 941225 D05v02r05, Smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.

Full Power Mode

<LTE Band 7>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20850	21100	21350		
Frequency (MHz)				2510	2535	2560		
20	QPSK	1	0	22.65	22.67	22.78	23	0
20	QPSK	1	49	22.60	22.63	22.67		
20	QPSK	1	99	22.57	22.61	22.73		
20	QPSK	50	0	21.76	21.76	21.82	22	1
20	QPSK	50	24	21.67	21.74	21.75		
20	QPSK	50	50	21.60	21.66	21.72		
20	QPSK	100	0	21.67	21.67	21.71		
20	16QAM	1	0	21.69	21.72	21.87	22	1
20	16QAM	1	49	21.74	21.72	21.86		
20	16QAM	1	99	21.79	21.80	21.81		
20	16QAM	50	0	20.54	20.67	20.70	21	2
20	16QAM	50	24	20.62	20.65	20.77		
20	16QAM	50	50	20.71	20.59	20.67		
20	16QAM	100	0	20.61	20.59	20.66		
Channel				20825	21100	21375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2507.5	2535	2562.5		
15	QPSK	1	0	22.65	22.66	22.70	23	0
15	QPSK	1	37	22.56	22.58	22.61		
15	QPSK	1	74	22.60	22.64	22.55		
15	QPSK	36	0	21.60	21.68	21.80	22	1
15	QPSK	36	20	21.64	21.69	21.70		
15	QPSK	36	39	21.68	21.64	21.72		
15	QPSK	75	0	21.65	21.69	21.76		
15	16QAM	1	0	21.63	21.63	21.87	22	1
15	16QAM	1	37	21.69	21.69	21.80		
15	16QAM	1	74	21.71	21.71	21.84		
15	16QAM	36	0	20.54	20.61	20.72	21	2
15	16QAM	36	20	20.59	20.63	20.76		
15	16QAM	36	39	20.62	20.57	20.68		
15	16QAM	75	0	20.60	20.60	20.71		
Channel				20800	21100	21400	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2505	2535	2565		
10	QPSK	1	0	22.61	22.67	22.69	23	0
10	QPSK	1	25	22.57	22.63	22.65		
10	QPSK	1	49	22.54	22.53	22.54		
10	QPSK	25	0	21.57	21.66	21.73	22	1
10	QPSK	25	12	21.61	21.67	21.76		
10	QPSK	25	25	21.62	21.63	21.70		
10	QPSK	50	0	21.61	21.66	21.73		
10	16QAM	1	0	21.60	21.61	21.80	22	1
10	16QAM	1	25	21.64	21.67	21.85		
10	16QAM	1	49	21.71	21.73	21.88		
10	16QAM	25	0	20.49	20.58	20.69	21	2
10	16QAM	25	12	20.54	20.60	20.72		
10	16QAM	25	25	20.57	20.56	20.65		
10	16QAM	50	0	20.55	20.57	20.68		

Channel				20775	21100	21425	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2502.5	2535	2567.5		
5	QPSK	1	0	22.68	22.72	22.75	23	0
5	QPSK	1	12	22.60	22.63	22.71		
5	QPSK	1	24	22.58	22.64	22.73		
5	QPSK	12	0	21.58	21.64	21.85	22	1
5	QPSK	12	7	21.64	21.68	21.80		
5	QPSK	12	13	21.63	21.67	21.76		
5	QPSK	25	0	21.62	21.67	21.77		
5	16QAM	1	0	21.64	21.67	21.84	22	1
5	16QAM	1	12	21.73	21.75	21.93		
5	16QAM	1	24	21.66	21.69	21.85		
5	16QAM	12	0	20.59	20.55	20.72	21	2
5	16QAM	12	7	20.57	20.61	20.75		
5	16QAM	12	13	20.57	20.59	20.72		
5	16QAM	25	0	20.55	20.58	20.69		

Reduced Power Mode

<LTE Band 7>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20850	21100	21350		
Frequency (MHz)				2510	2535	2560		
20	QPSK	1	0	14.08	14.04	14.43	15	0
20	QPSK	1	49	14.05	14.03	13.95		
20	QPSK	1	99	14.07	14.02	13.61		
20	QPSK	50	0	14.07	14.00	14.08	15	0
20	QPSK	50	24	13.93	13.96	13.77		
20	QPSK	50	50	14.04	13.95	13.73		
20	QPSK	100	0	14.01	13.93	14.05		
20	16QAM	1	0	14.41	14.28	14.70	15	0
20	16QAM	1	49	14.29	13.78	13.98		
20	16QAM	1	99	14.56	14.17	13.87		
20	16QAM	50	0	13.97	14.01	14.03	15	0
20	16QAM	50	24	13.91	13.93	13.75		
20	16QAM	50	50	13.96	13.91	13.71		
20	16QAM	100	0	13.93	14.03	13.76		
Channel				20825	21100	21375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2507.5	2535	2562.5		
15	QPSK	1	0	14.06	14.05	14.39	15	0
15	QPSK	1	37	13.86	13.84	13.59		
15	QPSK	1	74	14.41	13.93	13.55		
15	QPSK	36	0	13.77	13.94	14.10	15	0
15	QPSK	36	20	13.77	13.83	13.63		
15	QPSK	36	39	14.08	13.83	13.57		
15	QPSK	75	0	13.87	13.87	13.83		
15	16QAM	1	0	14.23	14.26	14.81	15	0
15	16QAM	1	37	13.94	14.17	13.87		
15	16QAM	1	74	14.22	14.17	13.82		
15	16QAM	36	0	13.82	13.91	14.04	15	0
15	16QAM	36	20	13.73	13.87	13.68		
15	16QAM	36	39	14.01	13.64	13.64		
15	16QAM	75	0	13.83	13.91	13.78		
Channel				20800	21100	21400	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2505	2535	2565		
10	QPSK	1	0	13.69	13.83	13.88	15	0
10	QPSK	1	25	13.92	13.80	13.62		
10	QPSK	1	49	13.79	13.74	13.58		
10	QPSK	25	0	13.68	13.82	13.62	15	0
10	QPSK	25	12	13.66	13.83	13.63		
10	QPSK	25	25	13.72	13.74	13.57		
10	QPSK	50	0	13.76	13.81	13.61		
10	16QAM	1	0	14.13	14.31	14.24	15	0
10	16QAM	1	25	13.97	13.94	13.75		
10	16QAM	1	49	13.94	14.25	13.77		
10	16QAM	25	0	13.75	13.84	13.57	15	0
10	16QAM	25	12	13.85	13.64	13.60		
10	16QAM	25	25	13.70	13.64	13.54		
10	16QAM	50	0	13.76	13.71	13.52		

Channel				20775	21100	21425	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2502.5	2535	2567.5		
5	QPSK	1	0	13.73	13.62	14.30	15	0
5	QPSK	1	12	13.72	13.73	13.63		
5	QPSK	1	24	13.53	13.54	13.21		
5	QPSK	12	0	13.64	13.62	13.44	15	0
5	QPSK	12	7	13.59	13.57	13.43		
5	QPSK	12	13	13.52	13.63	13.43		
5	QPSK	25	0	13.58	13.60	13.44		
5	16QAM	1	0	13.85	14.11	14.04	15	0
5	16QAM	1	12	13.79	13.81	13.69		
5	16QAM	1	24	13.74	13.84	13.62		
5	16QAM	12	0	13.62	13.70	13.42	15	0
5	16QAM	12	7	13.59	13.65	13.29		
5	16QAM	12	13	13.53	13.61	13.20		
5	16QAM	25	0	13.58	13.55	13.30		

<WLAN Conducted Power>

General Note:

1. Per KDB 248227 D01v02r02, SAR test reduction is determined according to 802.11 transmission mode configurations and certain exposure conditions with multiple test positions. In the 2.4 GHz band, separate SAR procedures are applied to DSSS and OFDM configurations to simplify DSSS test requirements. For OFDM, in both 2.4 and 5 GHz bands, an initial test configuration must be determined for each standalone and aggregated frequency band, according to the transmission mode configuration with the highest maximum output power specified for production units to perform SAR measurements. If the same highest maximum output power applies to different combinations of channel bandwidths, modulations and data rates, additional procedures are applied to determine which test configurations require SAR measurement. When applicable, an initial test position may be applied to reduce the number of SAR measurements required for next to the ear, UMPC mini-tablet or hotspot mode configurations with multiple test positions.
2. For 2.4 GHz 802.11b DSSS, either the initial test position procedure for multiple exposure test positions or the DSSS procedure for fixed exposure position is applied; these are mutually exclusive. For 2.4 GHz and 5 GHz OFDM configurations, the initial test configuration is applied to measure SAR using either the initial test position procedure for multiple exposure test position configurations or the initial test configuration procedures for fixed exposure test conditions. Based on the reported SAR of the measured configurations and maximum output power of the transmission mode configurations that are not included in the initial test configuration, the subsequent test configuration and initial test position procedures are applied to determine if SAR measurements are required for the remaining OFDM transmission configurations. In general, the number of test channels that require SAR measurement is minimized based on maximum output power measured for the test sample(s).
3. For OFDM transmission configurations in the 2.4 GHz and 5 GHz bands, When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel for each frequency band.
4. DSSS and OFDM configurations are considered separately according to the required SAR procedures. SAR is measured in the initial test position using the 802.11 transmission mode configuration required by the DSSS procedure or initial test configuration and subsequent test configuration(s) according to the OFDM procedures.18 The initial test position procedure is described in the following:
   a. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and 802.11 transmission mode combinations within the frequency band or aggregated band.
   b. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.
   c. For all positions/configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

<2.4GHz WLAN>

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b	CH 1	2412	1Mbps	13.03	13.50	97.81
		CH 6	2437		13.32	13.50	
		CH 11	2462		12.19	13.50	
	802.11g	CH 1	2412	6Mbps	12.84	13.50	87.99
		CH 6	2437		13.13	13.50	
		CH 11	2462		12.10	13.50	
	802.11n-HT20	CH 1	2412	MCS0	13.07	13.50	86.49
		CH 6	2437		13.28	13.50	
		CH 11	2462		12.83	13.50	

14. Bluetooth Exclusions Applied

Mode Band	Average power(dBm)	
	Bluetooth v3.0+EDR	Bluetooth v4.0+LE
2.4GHz Bluetooth	8.00	1.50

Note:

1. Per KDB 447498 D01v06, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:
   [(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR
   - f(GHz) is the RF channel transmit frequency in GHz
   - Power and distance are rounded to the nearest mW and mm before calculation
   - The result is rounded to one decimal place for comparison

Bluetooth Max Power (dBm)	Separation Distance (mm)	Frequency (GHz)	exclusion thresholds
8	< 5	2.48	1.89

Note:

Per KDB 447498 D01v06, when the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion. The test exclusion threshold is 1.89 which is <= 3, SAR testing is not required.

15. Test Exclusion Applied

General Note:

1. The below table, when the distance is < 50 mm exclusion threshold is "Ratio", when the distance is > 50 mm exclusion threshold is "mW"
2. Maximum power is the source-based time-average power and represents the maximum RF output power among production units
3. Per KDB 447498 D01v06, for larger devices, the test separation distance of adjacent edge configuration is determined by the closest separation between the antenna and the user.
4. Per KDB 447498 D01v06, standalone SAR test exclusion threshold is applied; If the test separation distance is < 5mm, 5mm is used to determine SAR exclusion threshold.
5. Per KDB 447498 D01v06, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:
   [(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR
   - f(GHz) is the RF channel transmit frequency in GHz
   - Power and distance are rounded to the nearest mW and mm before calculation
   - The result is rounded to one decimal place for comparison
6. Per KDB 447498 D01v06, at 100 MHz to 6 GHz and for *test separation distances* > 50 mm, the SAR test exclusion threshold is determined according to the following
   a) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·(f(MHz)/150)] mW, at 100 MHz to 1500 MHz
   b) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·10] mW at > 1500 MHz and ≤ 6 GHz
7. The detail antenna location please refers to Appendix D.

Exposure Position	Wireless Interface	GPRS 850 Class 10	GPRS 1900 Class 12	WCDMA Band V	WCDMA Band II	LTE Band 7	2.4GHz WLAN
	Calculated Frequency	848MHz	1909MHz	846MHz	1907MHz	2570MHz	2462MHz
	Maximum power (dBm)	25.0	22.0	23.5	23.5	23.0	13.5
	Maximum rated power(mW)	316.0	158.0	224.0	224.0	200.0	22.0
Bottom Face	Separation distance(mm)	5.0					5.0
	exclusion threshold	58.2	43.7	41.2	61.9	64.1	6.9
	Testing required?	Yes	Yes	Yes	Yes	Yes	Yes
Edge 1	Separation distance(mm)	5.0					5.0
	exclusion threshold	58.2	43.7	41.2	61.9	64.1	6.9
	Testing required?	Yes	Yes	Yes	Yes	Yes	Yes
Edge 2	Separation distance(mm)	24.6					234.4
	exclusion threshold	11.8	8.9	8.4	12.6	11.8	1940.0
	Testing required?	Yes	Yes	Yes	Yes	Yes	No
Edge 3	Separation distance(mm)	156.7					147.8
	exclusion threshold	766.0	1176.0	765.0	1176.0	1161.0	1074.0
	Testing required?	No	No	No	No	No	No
Edge 4	Separation distance(mm)	130.0					5.0
	exclusion threshold	615.0	909.0	614.0	909.0	894.0	6.9
	Testing required?	No	No	No	No	No	Yes

16. SAR Test Results

General Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
   c. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
   d. For WLAN: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
2. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. For the exposure positions that proximity sensor power reduction is applied for SAR compliance, additional SAR testing with EUT transmitting full power in normal mode was performed; 10mm for bottom face, 10mm for edge1

GSM Note:

1. Per KDB 941225 D01v03r01, for Body SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power including tune-up tolerance, for modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested, therefore, the GSM850 GPRS 2Tx slots and GSM1900 GPRS 4Tx slots modes was selected when EUT operating without power back-off, the GSM850 GPRS 2Tx slots and GSM1900 GPRS 4Tx slots modes was selected when EUT operating with power back-off, according to the highest source-based time-averaged output power.

UMTS Note:

1. Per KDB 941225 D01v03r01, SAR for Body exposure is measured using a 12.2 kbps RMC with TPC bits configured to all "1's".
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. If the maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / DC-HSDPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA.

LTE Note:

1. Per KDB 941225 D05v02r05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
2. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
3. Per KDB 941225 D05v02r05, For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
4. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
5. Per KDB 941225 D05v02r05, Smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.

WLAN Note:

1. Per KDB 248227 D01v02r02, for 2.4GHz 802.11g/n SAR testing is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.
2. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.
3. For all positions / configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions / configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.
4. During SAR testing the WLAN transmission was verified using a spectrum analyzer.

16.1 Body SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
01	GSM850	GPRS (2 Tx slots)	Bottom Face	0mm	ON	251	848.8	24.65	25.00	1.084	-0.14	0.653	0.708
	GSM850	GPRS (2 Tx slots)	Edge 1	0mm	ON	251	848.8	24.65	25.00	1.084	-0.13	0.435	0.472
	GSM850	GPRS (2 Tx slots)	Bottom Face	10mm	OFF	251	848.8	29.59	31.00	1.384	-0.13	0.384	0.531
	GSM850	GPRS (2 Tx slots)	Edge 1	10mm	OFF	251	848.8	29.59	31.00	1.384	-0.08	0.368	0.509
	GSM850	GPRS (2 Tx slots)	Edge 2	0mm	OFF	251	848.8	29.59	31.00	1.384	-0.03	0.150	0.208
02	GSM1900	GPRS (4 Tx slots)	Bottom Face	0mm	ON	661	1880	19.02	19.50	1.117	-0.18	0.609	0.680
	GSM1900	GPRS (4 Tx slots)	Edge 1	0mm	ON	661	1880	19.02	19.50	1.117	-0.15	0.317	0.354
	GSM1900	GPRS (4 Tx slots)	Bottom Face	10mm	OFF	810	1909.8	24.49	25.00	1.125	-0.1	0.296	0.333
	GSM1900	GPRS (4 Tx slots)	Edge 1	10mm	OFF	810	1909.8	24.49	25.00	1.125	0.11	0.154	0.173
	GSM1900	GPRS (4 Tx slots)	Edge 2	0mm	OFF	810	1909.8	24.49	25.00	1.125	-0.18	0.128	0.144

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WCDMA V	RMC 12.2Kbps	Bottom Face	0mm	ON	4233	846.6	18.53	19.50	1.250	-0.19	0.543	0.679
03	WCDMA V	RMC 12.2Kbps	Edge 1	0mm	ON	4233	846.6	18.53	19.50	1.250	-0.02	0.633	0.791
	WCDMA V	RMC 12.2Kbps	Bottom Face	10mm	OFF	4233	846.6	22.51	23.50	1.256	-0.03	0.275	0.345
	WCDMA V	RMC 12.2Kbps	Edge 1	10mm	OFF	4233	846.6	22.51	23.50	1.256	-0.04	0.240	0.301
	WCDMA V	RMC 12.2Kbps	Edge 2	0mm	OFF	4233	846.6	22.51	23.50	1.256	0.02	0.159	0.200
04	WCDMA II	RMC 12.2Kbps	Bottom Face	0mm	ON	9538	1907.6	18.48	18.50	1.005	-0.09	1.110	1.115
	WCDMA II	RMC 12.2Kbps	Bottom Face	0mm	ON	9262	1852.4	18.37	18.50	1.030	-0.01	1.040	1.072
	WCDMA II	RMC 12.2Kbps	Bottom Face	0mm	ON	9400	1880	18.45	18.50	1.012	-0.16	1.080	1.093
	WCDMA II	RMC 12.2Kbps	Edge 1	0mm	ON	9538	1907.6	18.48	18.50	1.005	0.1	0.647	0.650
	WCDMA II	RMC 12.2Kbps	Bottom Face	10mm	OFF	9538	1907.6	23.00	23.00	1.000	-0.14	0.605	0.605
	WCDMA II	RMC 12.2Kbps	Edge 1	10mm	OFF	9538	1907.6	23.00	23.00	1.000	0.04	0.285	0.285
	WCDMA II	RMC 12.2Kbps	Edge 2	0mm	OFF	9538	1907.6	23.00	23.00	1.000	0.08	0.194	0.194

<LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 7	20M	QPSK	1	0	Bottom Face	0mm	ON	21350	2560	14.43	15.00	1.140	0.06	0.676	0.771
	LTE Band 7	20M	QPSK	50	0	Bottom Face	0mm	ON	21350	2560	14.08	15.00	1.236	-0.1	0.513	0.634
05	LTE Band 7	20M	QPSK	1	0	Edge 1	0mm	ON	21350	2560	14.43	15.00	1.140	-0.11	0.961	1.096
	LTE Band 7	20M	QPSK	1	0	Edge 1	0mm	ON	20850	2510	14.08	15.00	1.236	0.02	0.611	0.755
	LTE Band 7	20M	QPSK	1	0	Edge 1	0mm	ON	21100	2535	14.04	15.00	1.247	0.03	0.776	0.968
	LTE Band 7	20M	QPSK	50	0	Edge 1	0mm	ON	21350	2560	14.08	15.00	1.236	0.02	0.843	1.042
	LTE Band 7	20M	QPSK	50	0	Edge 1	0mm	ON	20850	2510	14.07	15.00	1.239	0.04	0.608	0.753
	LTE Band 7	20M	QPSK	50	0	Edge 1	0mm	ON	21100	2535	14.00	15.00	1.259	-0.01	0.672	0.846
	LTE Band 7	20M	QPSK	100	0	Edge 1	0mm	ON	21350	2560	14.05	15.00	1.245	0.04	0.812	1.011
	LTE Band 7	20M	QPSK	1	0	Bottom Face	10mm	OFF	21350	2560	22.78	23.00	1.052	-0.05	0.608	0.640
	LTE Band 7	20M	QPSK	50	0	Bottom Face	10mm	OFF	21350	2560	21.82	22.00	1.042	-0.13	0.498	0.519
	LTE Band 7	20M	QPSK	1	0	Edge 1	10mm	OFF	21350	2560	22.78	23.00	1.052	-0.09	0.821	0.864
	LTE Band 7	20M	QPSK	1	0	Edge 1	10mm	OFF	20850	2510	22.65	23.00	1.084	0.03	0.677	0.734
	LTE Band 7	20M	QPSK	1	0	Edge 1	10mm	OFF	21100	2535	22.67	23.00	1.079	-0.01	0.745	0.804
	LTE Band 7	20M	QPSK	50	0	Edge 1	10mm	OFF	21350	2560	21.82	22.00	1.042	0.04	0.681	0.710
	LTE Band 7	20M	QPSK	100	0	Edge 1	10mm	OFF	21350	2560	21.71	22.00	1.069	0.01	0.683	0.730
	LTE Band 7	20M	QPSK	1	0	Edge 2	0mm	OFF	21350	2560	22.78	23.00	1.052	-0.12	0.039	0.041
	LTE Band 7	20M	QPSK	50	0	Edge 2	0mm	OFF	21350	2560	21.82	22.00	1.042	0.13	0.031	0.032

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
06	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0mm	6	2437	13.32	13.50	1.042	97.81	1.022	-0.09	1.130	1.204
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0mm	1	2412	13.03	13.50	1.114	97.81	1.022	-0.17	1.050	1.196
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0mm	11	2462	12.19	13.50	1.352	97.81	1.022	-0.03	0.733	1.013
	WLAN2.4GHz	802.11b 1Mbps	Edge 1	0mm	6	2437	13.32	13.50	1.042	97.81	1.022	-0.14	0.119	0.127
	WLAN2.4GHz	802.11b 1Mbps	Edge 4	0mm	6	2437	13.32	13.50	1.042	97.81	1.022	-0.11	0.129	0.137
	WLAN2.4GHz	802.11g 6Mbps	Bottom Face	0mm	6	2437	13.13	13.50	1.089	87.99	1.136	-0.06	0.973	1.204
	WLAN2.4GHz	802.11g 6Mbps	Bottom Face	0mm	1	2412	12.84	13.50	1.164	87.99	1.136	-0.16	0.910	1.203
	WLAN2.4GHz	802.11g 6Mbps	Bottom Face	0mm	11	2462	12.10	13.50	1.380	87.99	1.136	-0.1	0.657	1.030
	WLAN2.4GHz	802.11g 6Mbps	Edge 1	0mm	6	2437	13.13	13.50	1.089	87.99	1.136	-0.01	0.190	0.235
	WLAN2.4GHz	802.11g 6Mbps	Edge 4	0mm	6	2437	13.13	13.50	1.089	87.99	1.136	-0.08	0.196	0.242

16.2 Repeated SAR Measurement

No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	WCDMA II					RMC 12.2Kbps	Bottom Face	0mm	ON	9538	1907.6	18.48	18.50	1.005		1.000	-0.09	1.110		1.115
2nd	WCDMA II					RMC 12.2Kbps	Bottom Face	0mm	ON	9538	1907.6	18.48	18.50	1.005		1.000	-0.11	1.100	1.01	1.105
1st	LTE Band 7	20M	QPSK	1	0		Edge 1	0mm	ON	21350	2560	14.43	15.00	1.140		1.000	-0.11	0.961		1.096
2nd	LTE Band 7	20M	QPSK	1	0		Edge 1	0mm	ON	21350	2560	14.43	15.00	1.140		1.000	-0.01	0.937	1.03	1.068
1st	WLAN2.4GHz					802.11b 1Mbps	Bottom Face	0mm		6	2437	13.32	13.50	1.042	97.81	1.022	-0.09	1.130		1.204
2nd	WLAN2.4GHz					802.11b 1Mbps	Bottom Face	0mm		6	2437	13.32	13.50	1.042	97.81	1.022	-0.16	1.010	1.12	1.076

General Note:

1. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
2. Per KDB 865664 D01v01r04, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR <1.45W/kg, only one repeated measurement is required.
3. The ratio is the difference in percentage between original and repeated *measured SAR*.
4. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

17. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Body
1.	GPRS/EDGE + WLAN2.4GHz	Yes
2.	WCDMA + WLAN2.4GHz	Yes
3.	LTE + WLAN2.4GHz	Yes
4.	GPRS/EDGE + Bluetooth	Yes
5.	WCDMA+ Bluetooth	Yes
6.	LTE + Bluetooth	Yes

General Note:

1. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
2. The worst case WLAN reported SAR for each configuration was used for SAR summation. Therefore, the following summations represent the absolute worst cases for simultaneous transmission with WLAN.
3. The Scaled SAR summation is calculated based on the same configuration and test position.
4. For simultaneous transmission analysis for exposure position of 10mm for bottom face, 10mm for edge1, WLAN SAR tested at 0mm separation is worse and the test data is used for conservative SAR summation.
5. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
   i) Scalar SAR summation < 1.6W/kg.
   ii) SPLSR = (SAR1 + SAR2)^1.5 / (min. separation distance, mm), and the peak separation distance is determined from the square root of [(x1-x2)2 + (y1-y2)2 + (z1-z2)2], where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
   iii) If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.
   iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.
   v) The SPLSR calculated results please refer to section 17.2.
6. For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v06 based on the formula below.
   i) (*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)]·[√f(GHz)/*x*] W/kg for *test separation distances* ≤ 50 mm; where *x* = 7.5 for 1-g SAR, and *x* = 18.75 for 10-g SAR.
   ii) When the minimum separation distance is < 5mm, the distance is used 5mm to determine SAR test exclusion.
   iii) 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the *test separation distances* is > 50 mm.
   iv) Bluetooth estimated SAR is conservatively determined by 5mm separation, for all applicable exposure positions.

Bluetooth Max Power	Exposure Position	All Positions
8.0 dBm	Estimated SAR (W/kg)	0.252 W/kg

17.1 Body Exposure Conditions

WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	2 2.4GHz WLAN 1g SAR (W/kg)	1+2 Summed 1g SAR (W/kg)	SPLSR	Case No
GSM	GSM850	Bottom Face at 10mm	0.531	1.204	1.74	0.010	Case 1
		Edge 1 at 10mm	0.509	0.235	0.74		
		Bottom Face at 0mm	0.708	1.204	1.91	0.010	Case 2
		Edge 1 at 0mm	0.472	0.235	0.71		
		Edge 2 at 0mm	0.208		0.21		
		Edge 4 at 0mm		0.242	0.24		
	GSM1900	Bottom Face at 10mm	0.333	1.204	1.54		
		Edge 1 at 10mm	0.173	0.235	0.41		
		Bottom Face at 0mm	0.680	1.204	1.88	0.010	Case 3
		Edge 1 at 0mm	0.354	0.235	0.59		
		Edge 2 at 0mm	0.144		0.14		
		Edge 4 at 0mm		0.242	0.24		
WCDMA	WCDMA V	Bottom Face at 10mm	0.345	1.204	1.55		
		Edge 1 at 10mm	0.301	0.235	0.54		
		Bottom Face at 0mm	0.679	1.204	1.88	0.010	Case 4
		Edge 1 at 0mm	0.791	0.235	1.03		
		Edge 2 at 0mm	0.200		0.20		
		Edge 4 at 0mm		0.242	0.24		
	WCDMA II	Bottom Face at 10mm	0.605	1.204	1.81	0.010	Case 5
		Edge 1 at 10mm	0.285	0.235	0.52		
		Bottom Face at 0mm	1.115	1.204	2.32	0.020	Case 6
		Edge 1 at 0mm	0.650	0.235	0.89		
		Edge 2 at 0mm	0.194		0.19		
		Edge 4 at 0mm		0.242	0.24		
LTE	LTE Band 7	Bottom Face at 10mm	0.640	1.204	1.84	0.010	Case 7
		Edge 1 at 10mm	0.864	0.235	1.10		
		Bottom Face at 0mm	0.771	1.204	1.98	0.020	Case 8
		Edge 1 at 0mm	1.096	0.235	1.33		
		Edge 2 at 0mm	0.041		0.04		
		Edge 4 at 0mm		0.242	0.24		

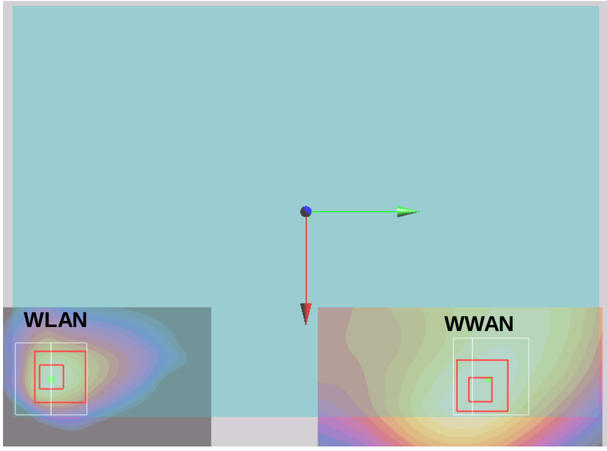
WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	3 2.4GHz Bluetooth Estimated 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)	SPLSR	Case No
GSM	GSM850	Bottom Face at 10mm	0.531	0.252	**0.78**		
		Edge 1 at 10mm	0.509	0.252	**0.76**		
		Bottom Face at 0mm	0.708	0.252	**0.96**		
		Edge 1 at 0mm	0.472	0.252	**0.72**		
		Edge 2 at 0mm	0.208		**0.21**		
		Edge 4 at 0mm		0.252	**0.25**		
	GSM1900	Bottom Face at 10mm	0.333	0.252	**0.59**		
		Edge 1 at 10mm	0.173	0.252	**0.43**		
		Bottom Face at 0mm	0.680	0.252	**0.93**		
		Edge 1 at 0mm	0.354	0.252	**0.61**		
		Edge 2 at 0mm	0.144		**0.14**		
		Edge 4 at 0mm		0.252	**0.25**		
WCDMA	WCDMA V	Bottom Face at 10mm	0.345	0.252	**0.60**		
		Edge 1 at 10mm	0.301	0.252	**0.55**		
		Bottom Face at 0mm	0.679	0.252	**0.93**		
		Edge 1 at 0mm	0.791	0.252	**1.04**		
		Edge 2 at 0mm	0.200		**0.20**		
		Edge 4 at 0mm		0.252	**0.25**		
	WCDMA II	Bottom Face at 10mm	0.605	0.252	**0.86**		
		Edge 1 at 10mm	0.285	0.252	**0.54**		
		Bottom Face at 0mm	1.115	0.252	**1.37**		
		Edge 1 at 0mm	0.650	0.252	**0.90**		
		Edge 2 at 0mm	0.194		**0.19**		
		Edge 4 at 0mm		0.252	**0.25**		
LTE	LTE Band 7	Bottom Face at 10mm	0.640	0.252	**0.89**		
		Edge 1 at 10mm	0.864	0.252	**1.12**		
		Bottom Face at 0mm	0.771	0.252	**1.02**		
		Edge 1 at 0mm	1.096	0.252	**1.35**		
		Edge 2 at 0mm	0.041		**0.04**		
		Edge 4 at 0mm		0.252	**0.25**		

17.2 SPLSR Evaluation and Analysis

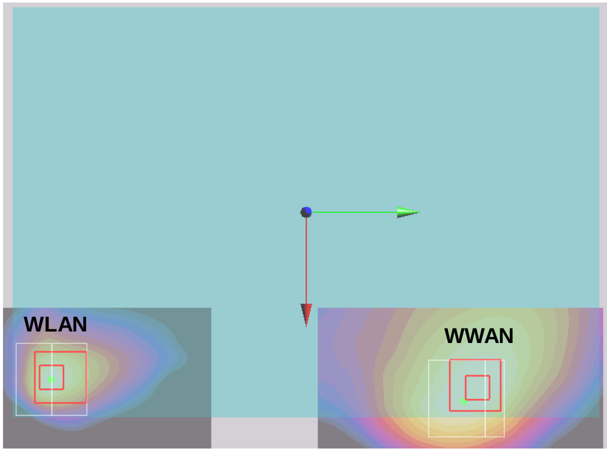
General Note:

1. SPLSR = $(SAR_1 + SAR_2)^{1.5}$ / (*min. separation distance, mm*). If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary

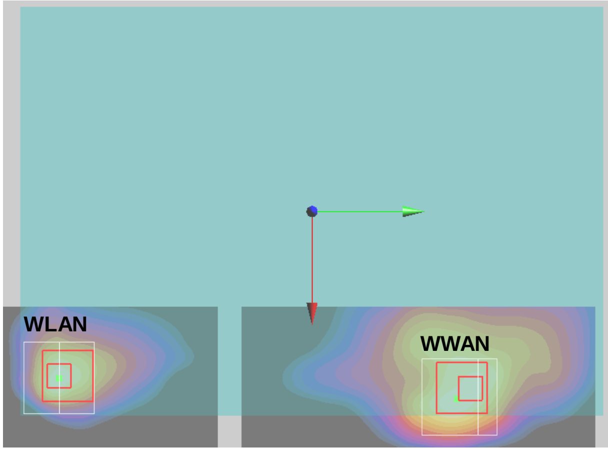
Case 1	Band	Position	SAR (W/kg)	Gap	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(cm)	X	Y	Z				
	GSM850	Bottom Face	0.531	1	0.077	0.07	-0.178	177.1	1.74	0.01	Not required
	WLAN2.4GHz		1.204	0	0.07	-0.107	-0.179				



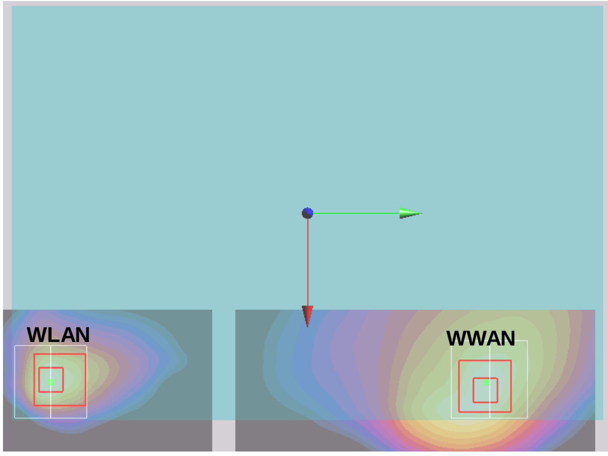
Case 2	Band	Position	SAR (W/kg)	Gap	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(cm)	X	Y	Z				
	GSM850	Bottom Face	0.708	0	0.07	0.0755	-0.177	182.5	1.91	0.01	Not required
	WLAN2.4GHz		1.204	0	0.07	-0.107	-0.179				



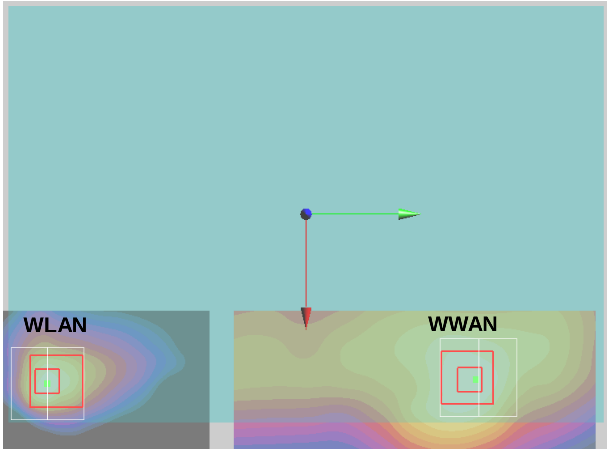
Case 3	Band	Position	SAR (W/kg)	Gap	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(cm)	X	Y	Z				
	GSM1900	Bottom Face	0.68	0	0.07	0.0705	-0.175	177.5	1.88	0.01	Not required
	WLAN2.4GHz		1.204	0	0.07	-0.107	-0.179				



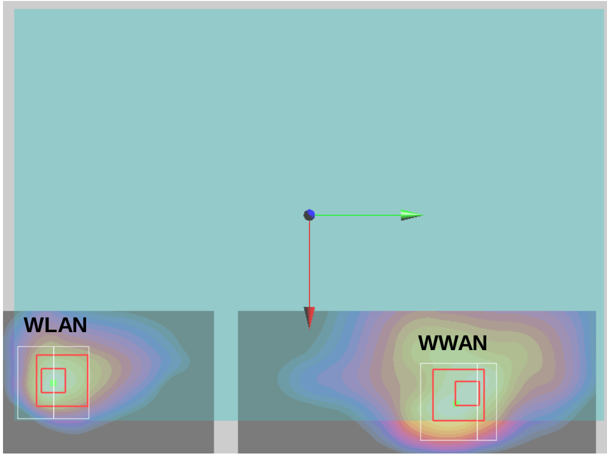
Case 4	Band	Position	SAR (W/kg)	Gap	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(cm)	X	Y	Z				
	WCDMA V	Bottom Face	0.679	0	0.069	0.076	-0.177	183.0	1.88	0.01	Not required
	WLAN2.4GHz		1.204	0	0.07	-0.107	-0.179				



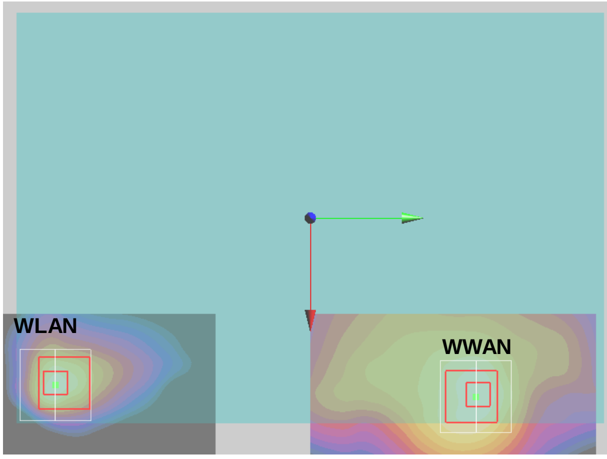
Case 5	Band	Position	SAR (W/kg)	Gap	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(cm)	X	Y	Z				
	WCDMA II	Bottom Face	0.605	1	0.0676	0.0715	-0.176	178.5	1.81	0.01	Not required
	WLAN2.4GHz		1.204	0	0.07	-0.107	-0.179				



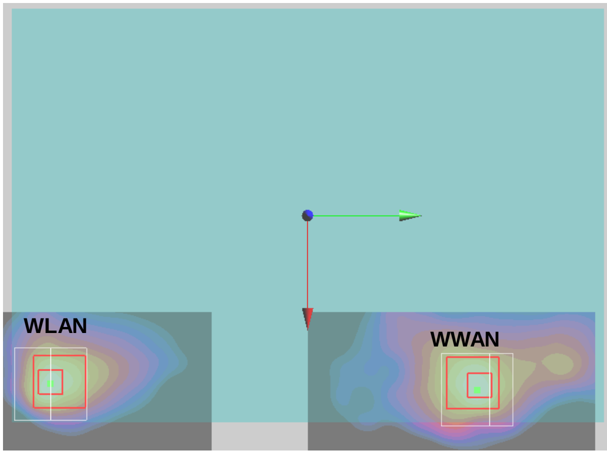
Case 6	Band	Position	SAR (W/kg)	Gap	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(cm)	X	Y	Z				
	WCDMA II	Bottom Face	1.115	0	0.07	0.0705	-0.172	177.6	2.32	0.02	Not required
	WLAN2.4GHz		1.204	0	0.07	-0.107	-0.179				



Case 7	Band	Position	SAR (W/kg)	Gap	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(cm)	X	Y	Z				
	LTE Band 7	Bottom Face	0.64	1	0.0748	0.0696	-0.179	176.7	1.84	0.01	Not required
	WLAN2.4GHz		1.204	0	0.07	-0.107	-0.179				



Case 8	Band	Position	SAR (W/kg)	Gap	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(cm)	X	Y	Z				
	LTE Band 7	Bottom Face	0.771	0	0.0724	0.0758	-0.178	182.8	1.98	0.02	Not required
	WLAN2.4GHz		1.204	0	0.07	-0.107	-0.179				



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18. Uncertainty Assessment

The component of uncertainly may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainly by the statistical analysis of a series of observations is termed a Type An evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. This includes calculating the standard deviation of the mean of a series of independent observations; using the method of least squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; or carrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience, and knowledge of the behavior and properties of relevant materials and instruments, manufacture's specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in table below.

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor[(a)]	$1/k^{(b)}$	$1/\sqrt{3}$	$1/\sqrt{6}$	$1/\sqrt{2}$

(a) standard uncertainty is determined as the product of the multiplying factor and the estimated range of variations in the measured quantity

(b) κ is the coverage factor

Table 18.1. Standard Uncertainty for Assumed Distribution

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual "root-sum-squares" (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The DASY uncertainty Budget is shown in the following tables.

Error Description	Uncertainty Value (±%)	Probability	Divisor	(Ci) 1g	(Ci) 10g	Standard Uncertainty (1g) (±%)	Standard Uncertainty (10g) (±%)
Measurement System							
Probe Calibration	6.0	N	1	1	1	6.0	6.0
Axial Isotropy	4.7	R	1.732	0.7	0.7	1.9	1.9
Hemispherical Isotropy	9.6	R	1.732	0.7	0.7	3.9	3.9
Boundary Effects	1.0	R	1.732	1	1	0.6	0.6
Linearity	4.7	R	1.732	1	1	2.7	2.7
System Detection Limits	1.0	R	1.732	1	1	0.6	0.6
Modulation Response	3.2	R	1.732	1	1	1.8	1.8
Readout Electronics	0.3	N	1	1	1	0.3	0.3
Response Time	0.0	R	1.732	1	1	0.0	0.0
Integration Time	2.6	R	1.732	1	1	1.5	1.5
RF Ambient Noise	3.0	R	1.732	1	1	1.7	1.7
RF Ambient Reflections	3.0	R	1.732	1	1	1.7	1.7
Probe Positioner	0.4	R	1.732	1	1	0.2	0.2
Probe Positioning	2.9	R	1.732	1	1	1.7	1.7
Max. SAR Eval.	2.0	R	1.732	1	1	1.2	1.2
Test Sample Related							
Device Positioning	3.0	N	1	1	1	3.0	3.0
Device Holder	3.6	N	1	1	1	3.6	3.6
Power Drift	5.0	R	1.732	1	1	2.9	2.9
Power Scaling	0.0	R	1.732	1	1	0.0	0.0
Phantom and Setup							
Phantom Uncertainty	6.1	R	1.732	1	1	3.5	3.5
SAR correction	0.0	R	1.732	1	0.84	0.0	0.0
Liquid Conductivity Repeatability	0.2	N	1	0.78	0.71	0.1	0.1
Liquid Conductivity (target)	5.0	R	1.732	0.78	0.71	2.3	2.0
Liquid Conductivity (mea.)	2.5	R	1.732	0.78	0.71	1.1	1.0
Temp. unc. - Conductivity	3.4	R	1.732	0.78	0.71	1.5	1.4
Liquid Permittivity Repeatability	0.15	N	1	0.23	0.26	0.0	0.0
Liquid Permittivity (target)	5.0	R	1.732	0.23	0.26	0.7	0.8
Liquid Permittivity (mea.)	2.5	R	1.732	0.23	0.26	0.3	0.4
Temp. unc. - Permittivity	0.83	R	1.732	0.23	0.26	0.1	0.1
Combined Std. Uncertainty						11.4%	11.4%
Coverage Factor for 95 %						K=2	K=2
Expanded STD Uncertainty						22.9%	22.7%

Table 18.2. Uncertainty Budget for frequency range 300 MHz to 3 GHz

19. References

[1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”

[2] ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992

[3] IEEE Std. 1528-2013, “IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, Sep 2013

[4] SPEAG DASY System Handbook

[5] FCC KDB 248227 D01 v02r02, “SAR Guidance for IEEE 802.11 (WiFi) Transmitters”, Oct 2015.

[6] FCC KDB 447498 D01 v06, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Oct 2015

[7] FCC KDB 941225 D01 v03r01, “3G SAR MEAUREMENT PROCEDURES”, Oct 2015

[8] FCC KDB 941225 D05 v02r05, “SAR Evaluation Considerations for LTE Devices”, Dec 2015

[9] FCC KDB 616217 D04 v01r02, “SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers”, Oct 2015

[10] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.

[11] FCC KDB 865664 D02 v01r02, “RF Exposure Compliance Reporting and Documentation Considerations” Oct 2015.