FCC SAR Test Report

FCC ID: 2AUSF-BKW700

Project No.	:	1909C175
Equipment	:	Borqs Kids Smartwatch
Brand Name	:	WatchMeGo
Test Model	:	BKW700, ANSBKW700
Series Model	:	N/A
Date of Receipt	:	Sep. 27, 2019
Date of Test	:	Nov. 29, 2019
Issued Date	:	Dec. 19, 2019
Report Version	:	R02
Test Sample	:	Engineering Sample No.: DG2019112533
Standard(s)	:	Please refer to page 2.
Applicant	:	BORQS INTERNATIONAL HOLDING CORP
Address	:	Building B23-A,Universal Business Park, No.10 jiuxianqiao Road,Chaoyang District Beijing, 100015 China
Manufacturer	:	BORQS INTERNATIONAL HOLDING CORP
Address	:	Building B23-A,Universal Business Park, No.10 jiuxianqiao Road,Chaoyang District Beijing, 100015 China
Factory	:	BORQS INTERNATIONAL HOLDING CORP
Address	:	Building B23-A,Universal Business Park, No.10 jiuxianqiao Road,Chaoyang District Beijing, 100015 China

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

Prepared by : Rot Liang

Approved by : Herbort Liu

Certificate #5123.02

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Standard(s)	:	**FCC 47CFR §2.1093** Radio frequency Radiation Exposure Evaluation: Portable Devices **ANSI Std C95.1-1992** Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.(IEEE Std C95.1-1991) **IEEE Std 1528-2013** Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques **KDB941225 D05** SAR for LTE Devices v02r05 **KDB447498 D01** General RF Exposure Guidance v06 **KDB248227 D01** 802. 11 Wi-Fi SAR v02r02 **KDB865664 D01** SAR measurement 100 MHz to 6 GHz v01r04 **KDB865664 D02** RF Exposure Reporting v01r02 **KDB690783 D01** SAR Listings on Grants v01r03

Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

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BTL's laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

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REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	Original Issue.	Dec. 13, 2019
R01	1. Updated the model name. 2. Updated the power rating of battery.	Dec. 17, 2019
R02	Deleted the data of Face to Face SAR.	Dec. 19, 2019

1. RF EMISSIONS MEASUREMENT

1.1 TEST FACILITY

The test facilities used to collect the test data in this report is **SAR room** at the location of No.3,Jinshagang 1st Road, ShiXia, Dalang Town,Dong Guan, China.523792

1.2 MEASUREMENT UNCERTAINTY

Note: Per KDB865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04,when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. The equivalent ratio (1.5/1.6) is applied to extremity and occupational exposure conditions.

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

<table>
<tr><td>Equipment</td><td colspan="3">Borqs Kids Smartwatch</td></tr>
<tr><td>Brand Name</td><td colspan="3">WatchMeGo</td></tr>
<tr><td>Model Name</td><td colspan="3">BKW700, ANSBKW700</td></tr>
<tr><td>Hardware Version</td><td colspan="3">DVT1</td></tr>
<tr><td>Software Version</td><td colspan="3">SW_MD_034_190920_GCF_USERDEBUG</td></tr>
<tr><td>Modulation</td><td colspan="3">LTE(QPSK/16QAM), WiFi(DSSS/OFDM)</td></tr>
<tr><td rowspan="8">Operation Frequency Range(s)</td><td>Band</td><td>TX (MHz)</td><td>RX (MHz)</td></tr>
<tr><td>LTE B2</td><td>1850~1910</td><td>1930~1990</td></tr>
<tr><td>LTE B4</td><td>1710~1755</td><td>2110~2155</td></tr>
<tr><td>LTE B12</td><td>699~716</td><td>729~746</td></tr>
<tr><td>LTE B25</td><td>1850~1915</td><td>1930~1995</td></tr>
<tr><td>LTE B26</td><td>814~849</td><td>859~894</td></tr>
<tr><td>Bluetooth</td><td colspan="2">2400-2483.5</td></tr>
<tr><td>2.4G WLAN</td><td colspan="2">2400-2483.5</td></tr>
<tr><td>Power Class</td><td colspan="3">3, tested with power control “all Max” (LTE B2/4/12/25/26)</td></tr>
<tr><td rowspan="10">Test Channels (low-mid-high)</td><td colspan="3">18700-18900-19100 (LTE B2 BW=20MHz)</td></tr>
<tr><td colspan="3">20050-20175-20300 (LTE B4 BW=20MHz)</td></tr>
<tr><td colspan="3">23060-23095-23130 (LTE B12 BW=10MHz)</td></tr>
<tr><td colspan="3">26140-26365-26590 (LTE B25 BW=20MHz)</td></tr>
<tr><td colspan="3">26765-26865-26965 (LTE B26 BW=15MHz)</td></tr>
<tr><td colspan="3">0-39-78 (BT)</td></tr>
<tr><td colspan="3">0-19-39 (BLE)</td></tr>
<tr><td colspan="3">1-6-11 (2.4G WIFI 802.11b)</td></tr>
<tr><td colspan="3">1-6-10-11 (2.4G WIFI 802.11g/n HT20)</td></tr>
<tr><td colspan="3">3-6-9 (2.4G WIFI 802.11n HT40)</td></tr>
<tr><td rowspan="8">Antenna Gain</td><td>Band</td><td>Main Ant (dBi)</td><td>WiFi Ant (dBi)</td></tr>
<tr><td>LTE B2</td><td>-3.5</td><td>/</td></tr>
<tr><td>LTE B4</td><td>-2.0</td><td>/</td></tr>
<tr><td>LTE B12</td><td>0.0</td><td>/</td></tr>
<tr><td>LTE B25</td><td>-3.5</td><td>/</td></tr>
<tr><td>LTE B26</td><td>1.0</td><td>/</td></tr>
<tr><td>Bluetooth</td><td>/</td><td>-1.5</td></tr>
<tr><td>2.4G WIFI</td><td>/</td><td>-1.5</td></tr>
<tr><td colspan="4">Other Information</td></tr>
<tr><td rowspan="3">Battery</td><td>Model Name</td><td colspan="2">ZWD512724V</td></tr>
<tr><td>Power Rating</td><td colspan="2">DC 4.35V(Limited Charge), 400mAh</td></tr>
<tr><td>Manufacturer</td><td colspan="2">ZHONGSHAN ZHONGWANGDE NEW ENERGY TECHNOLOGY Co., LTD</td></tr>
</table>

2.2 STATEMENT OF COMPLIANCE

Mode	Highest Reported Extremity 10g SAR (W/kg)
LTE B2	0.88
LTE B4	1.32
LTE B12	0.21
LTE B25	0.81
LTE B26	0.20
Bluetooth	/
2.4G WLAN	0.05
Note: The highest reported SAR for extremity and simultaneous transmission exposure conditions are 1.32W/kg and 1.37W/kg respectively.	

Note: The device is in compliance with Specific Absorption Rate (SAR) for general population/ uncontrolled exposure limits according to the FCC rule §2.1093, the ANSI/IEEE C95.1:1992, the NCRP Report Number 86 for uncontrolled environment, and had been tested in accordance with the measurement methods and procedures specified in IEEE Std 1528-2013.

2.3 LABORATORY ENVIRONMENT

Temperature	Min. = 18ºC, Max. = 25ºC
Relative humidity	Min. = 30%, Max. = 70%
Ground system resistance	< 0.5Ω
Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

2.4 MAIN TEST INSTRUMENTS

Item	Equipment	Manufacturer	Model	Serial No.	Cal. Date	Cal. Interval
1	Data Acquisition Electronics	Speag	DAE3	420	Jun. 21, 2019	1 Year
2	E-field Probe	Speag	ES3DV3	3162	Apr. 12, 2019	1 Year
3	System Validation Dipole	Speag	D750V3	1095	Jun. 05, 2018	3 Years
4	System Validation Dipole	Speag	D835V2	4d160	Jun. 05, 2018	3 Years
5	System Validation Dipole	Speag	D1750V2	1101	Jun. 07, 2018	3 Years
6	System Validation Dipole	Speag	D1900V2	5d179	Jun. 07, 2018	3 Years
7	System Validation Dipole	Speag	D2450V2	919	Jun. 11, 2018	3 Years
8	Twin Sam Phantom	Speag	Twin Sam Phantom V5.0	1469	N/A	N/A
9	CMW500-Wideband Radio Communication Tester	R&S	CMW500	153883	Mar. 10, 2019	1 Year
10	Power Amplifier	Mini-Circuits	ZHL-42W+	QA1333003	Feb. 25, 2019	1 Year
11	DC Source	Iteck	OT6154	M00157	Aug. 03, 2019	1 Year
12	ENA Network Analyzer	Agilent	E5071C	MY46102965	Mar. 10, 2019	1 Year
13	MXG Analog Signal Generator	Agilent	N5181A	MY49060710	Aug. 03, 2019	1 Year
14	Signal Generator	Agilent	E4438C	MY4907131	Mar. 10, 2019	1 Year
15	P-series power meter	Agilent	N1911A	MY45100473	Sep. 23, 2019	1 Year
16	Wideband power sensor	Agilent	N1921A	MY51100041	Sep. 23, 2019	1 Year
17	Smart Power Sensor	R&S	NRP-Z21	102209	Mar. 01, 2019	1 Year
18	Dielectric Assessment Kit	Speag	DAK-3.5	1226	N/A	N/A
19	Dual directional coupler	Woken	TS-PCC0M-05	107090019	Mar. 10, 2019	1 Year
20	Coupler	Woken	0110A05601O-10	COM5BNW1A2	Mar. 10, 2019	1 Year
21	Digital Themometer	LKM	DTM3000	3519	Jul. 08, 2019	1 Year

Remark: "N/A" denotes no model name, serial No. or calibration specified.
All calibration period of equipment list is one year.

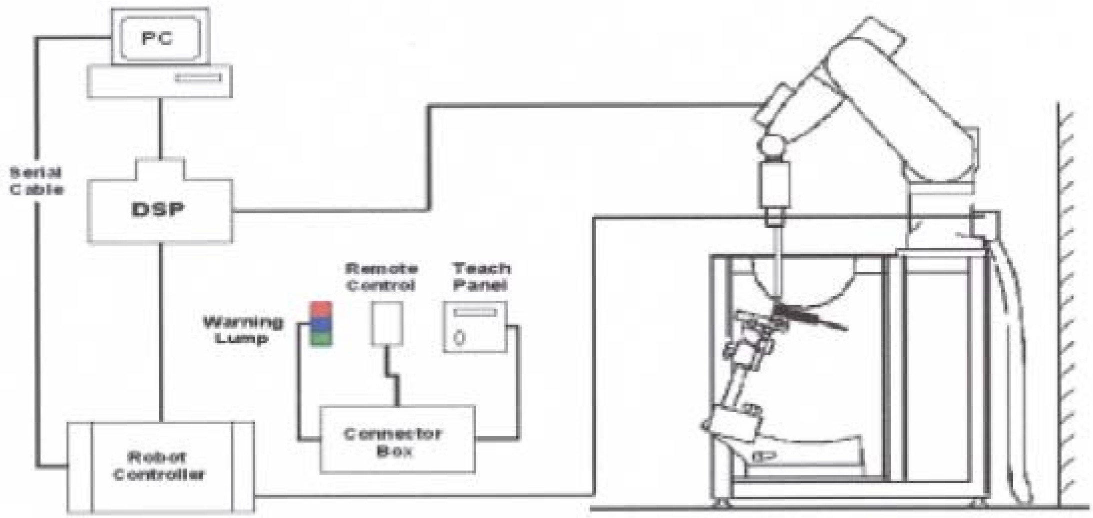
3. SAR MEASUREMENTS SYSTEM CONFIGURATION

3.1 SAR MEASUREMENT SET-UP

The DASY5 system for performing compliance tests consists of the following items:

1. A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
2. A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
3. A data acquisition electronic (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.
4. A unit to operate the optical surface detector which is connected to the EOC.
5. The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY5 measurement server.
6. TheDASY5 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows.
7. DASY5 software and SEMCAD data evaluation software.
8. Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
9. The generic twin phantom enabling the testing of left-hand and right-hand usage.
10. The device holder for handheld mobile phones.
11. Tissue simulating liquid mixed according to the given recipes.
12. System validation dipoles allowing to validate the proper functioning of the system.

3.1.1 TEST SETUP LAYOUT



3.2 DASY5 E-FIELD PROBE SYSTEM

The SAR measurements were conducted with the dosimetric probe ES3DV3 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

3.2.1 ES3DV3 PROBE SPECIFICATION

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available
Frequency	10 MHz to 4 GHz Linearity: ± 0.2 dB (30 MHz to 4 GHz)
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	5 µW/g to > 100 mW/g Linearity:± 0.2dB
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 4 mm (Body: 12 mm) Distance from probe tip to dipole centers: 1.0 mm

ES3DV3 E-field Probe

3.2.2 E-FIELD PROBE CALIBRATION

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than ±10%. The spherical isotropy was evaluated and found to be better than ± 0.25dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies bellow 1 GHz, and in a wave guide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in a dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

$$\mathbf{SAR} = \mathbf{C}\frac{\Delta T}{\Delta t}$$

Where: Δt = Exposure time (30 seconds),

C = Heat capacity of tissue (brain or muscle),

ΔT = Temperature increase due to RF exposure.

Or

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

Where: σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m3).

3.2.3 OTHER TEST EQUIPMENT

3.2.3.1 Device Holder for Transmitters

Construction: Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices (e.g., laptops, cameras, etc.) It is light weight and fits easily on the upper part of the Mounting Device in place of the phone positioner. The extension is fully compatible with the Twin SAM, ELI4 and SAM v6.0 Phantoms.
Material: POM, Acrylic glass, Foam

3.2.3.2 Phantom

Model	Twin SAM	
Construction	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.	
Shell Thickness	2 ± 0.2 mm	
Filling Volume	Approx. 25 liters	
Dimensions	Length:1000mm; Width: 500mm Height: adjustable feet	
Aailable	Special	

3.2.4 SCANNING PROCEDURE

The DASY5 installation includes predefined files with recommended procedures for measurements and validation. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or Body) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

The “reference” and “drift” measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the DUT’s output power and should vary max. ± 5 %.

The “surface check” measurement tests the optical surface detection system of the DASY5 system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above ± 0.1mm). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe. (It does not depend on the surface reflectivity or the probe angle to the surface within ± 30°.)

- Area Scan

The “area scan” measures the SAR above the DUT or verification dipole on a parallel plane to the surface. It is used to locate the approximate location of the peak SAR with 2D spline interpolation. The robot performs a stepped movement along one grid axis while the local electrical field strength is measured by the probe. The probe is touching the surface of the SAM during acquisition of measurement values. The standard scan uses large grid spacing for faster measurement. Standard grid spacing for head measurements is 15 mm in x- and y- dimension (≤2GHz), 12 mm in x- and y- dimension (2-4 GHz) and 10mm in x- and y- dimension (4-6GHz). If a finer resolution is needed, the grid spacing can be reduced. Grid spacing and orientation have no influence on the SAR result. For special applications where the standard scan method does not find the peak SAR within the grid, e.g. mobile phones with flip cover, the grid can be adapted in orientation.

- Zoom Scan

A “zoom scan” measures the field in a volume around the 2D peak SAR value acquired in the previous “coarse” scan. This is a fine grid with maximum scan spatial resolution: Δx_{zoom}, Δy_{zoom}≤2GHz -≤8mm, 2-4GHz -≤5 mm and 4-6 GHz-≤4mm; Δz_{zoom}≤3GHz -≤5 mm, 3-4 GHz-≤4mm and 4-6GHz-≤2mm where the robot additionally moves the probe along the z-axis away from the bottom of the Phantom. DASY is also able to perform repeated zoom scans if more than 1 peak is found during area scan. In this document, the evaluated peak 1g and 10g averaged SAR values are shown in the 2D-graphics in Appendix B. Test results relevant for the specified standard (see chapter 1.4.) are shown in table form in chapter 7.2.

A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 2 mm steps. This measurement shows the continuity of the liquid and can - depending in the field strength – also show the liquid depth.

The following table summarizes the area scan and zoom scan resolutions per FCC KDB 865664D01:

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

3.2.5 SPATIAL PEAK SAR EVALUATION

The spatial peak SAR - value for 1 and 10 g is evaluated after the Cube measurements have been done. The basis of the evaluation are the SAR values measured at the points of the fine cube grid consisting of 5 x 5 x 7 points (with 8mm horizontal resolution) or 7 x 7 x 7 points (with 5mm horizontal resolution) or 8 x 8 x 7 points (with 4mm horizontal resolution). The algorithm that finds the maximal averaged volume is separated into three different stages.

- The data between the dipole center of the probe and the surface of the phantom are extrapolated. This data cannot be measured since the center of the dipole is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is about 1 mm (see probe calibration sheet). The extrapolated data from a cube measurement can be visualized by selecting “Graph Evaluated”.
- The maximum interpolated value is searched with a straight-forward algorithm. Around this maximum the SAR - values averaged over the spatial volumes (1g or 10 g) are computed using the 3d-spline interpolation algorithm. If the volume cannot be evaluated (i.e., if a part of the grid was cut off by the boundary of the measurement area) the evaluation will be started on the corners of the bottom plane of the cube.
- All neighboring volumes are evaluated until no neighboring volume with a higher average value is found.

Extrapolation

The extrapolation is based on a least square algorithm [W. Gander, Computer mathematic, p.168-180]. Through the points in the first 3 cm along the z-axis, polynomials of order four are calculated. These polynomials are then used to evaluate the points between the surface and the probe tip. The points, calculated from the surface, have a distance of 1 mm from each other.

Interpolation

The interpolation of the points is done with a 3d-Spline. The 3d-Spline is composed of three one-dimensional splines with the "Not a knot"-condition [W. Gander, Computer mathematic, p.141-150] (x, y and z -direction) [Numerical Recipes in C, Second Edition, p.123ff].

Volume Averaging

At First the size of the cube is calculated. Then the volume is integrated with the trapezoidal algorithm. 8000 points (20x20x20) are interpolated to calculate the average.

Advanced Extrapolation

DASY5 uses the advanced extrapolation option which is able to compensate boundary effects on E-field probes.

3.2.6 DATA STORAGE AND EVALUATION

3.2.6.1 Data Storage

The DASY5 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension “DAE”. The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [mW/g], [mW/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

3.2.6.2 Data Evaluation by SEMCAD

The SEMCAD software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters:	Sensitivity	Normi, a_{i0}, a_{i1}, a_{i2}
	Conversion factor	$ConvF_i$
	Diode compression point	Dcp_i
Device parameters:	Frequency	f
	Crest factor	cf
Media parameters:	Conductivity	
	Density	

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY5 components. In the direct measuring mode of the multi meter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics.

If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot cf / dcp_i$$

With	V_i = compensated signal of channel i	(i = x, y, z)
	U_i = input signal of channel i	(i = x, y, z)
	cf = crest factor of exciting field	(DASY parameter)
	dcp_i = diode compression point	(DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

E-field probes: $E_i = (V_i \, / \, Norm_i \cdot ConvF \,)^{1/2}$

H-field probes: $H_i = (V_i \,)^{1/2} \cdot (a_{i0} + a_{i1} f + a_{i2} f^2 \,) \, / \, f$

With V_i = compensated signal of channel i (i = x, y, z)

$Norm_i$ = sensor sensitivity of channel i (i = x, y, z)

[mV/(V/m)^2] for E-field Probes

ConvF = sensitivity enhancement in solution

aij = sensor sensitivity factors for H-field probes

f = carrier frequency [GHz]

E_i = electric field strength of channel i in V/m

H_i = magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = (E_X^2 + E_Y^2 + E_Z^2)^{1/2}$$

The primary field data are used to calculate the derived field units.

$$SAR = (E_{tot})^2 \cdot \boldsymbol{\sigma} / (\boldsymbol{\rho} \cdot 1000)$$

With SAR = local specific absorption rate in mW/g

E_{tot} = total field strength in V/m

= conductivity in [mho/m] or [Siemens/m]

= equivalent tissue density in g/cm^3

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid. The power flow density is calculated assuming the excitation field to be a free space field.

$$P_{pwe} = E_{tot}^2 / 3770 \text{ or } P_{pwe} = H_{tot}^2 \cdot 37.7$$

With P_{pwe} = equivalent power density of a plane wave in mW/cm^2

E_{tot} = total field strength in V/m

H_{tot} = total magnetic field strength in A/m

4. SYSTEM VERIFICATION PROCEDURE

4.1 TISSUE VERIFICATION

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine of the dielectic parameter are within the tolerances of the specified target values. The measured conductivity and relative permittivity should be within ± 5% of the target values.

The following materials are used for producing the tissue-equivalent materials.

Tissue Type	Bactericide	DGBE	HEC	NaCl	Sucrose	Triton X-100	Water	Diethylene Glycol Mono-hexylether
Head 750	0.2	-	0.2	1.5	56.0	-	42.1	-
Head 835	0.2	-	0.2	1.5	57.0	-	41.1	-
Head 1750	-	47.0	-	0.4	-	-	52.6	-
Head 1900	-	44.5	-	0.2	-	-	55.3	-
Head 2450	-	45.0	-	0.1	-	-	54.9	-

Salt: 99+% Pure Sodium Chloride; Sugar: 98+% Pure Sucrose; Water: De-ionized, 16M + resistivity
HEC: Hydroxyethyl Cellulose; DGBE: 99+% Di(ethylene glycol) butyl ether,[2-(2-butoxyethoxy)ethanol]
Triton X-100(ultra pure): Polyethylene glycol mono [4-(1,1,3,3-tetramethylbutyl)phenyl]ether

Tissue Verification									
Tissue Type	Frequency (MHz)	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (εr)	Targeted Conductivity (σ)	Targeted Permittivity (εr)	Deviation Conductivity (σ) (%)	Deviation Permittivity (εr) (%)	Date
Head	750	22.5	0.901	41.069	0.89	41.9	1.24	-1.98	Nov. 29, 2019
Head	835	22.3	0.901	42.791	0.90	41.5	0.11	3.11	Nov. 29, 2019
Head	1750	22.4	1.421	38.420	1.37	40.1	3.72	-4.19	Nov. 29, 2019
Head	1900	22.4	1.443	38.941	1.40	40.0	3.07	-2.65	Nov. 29, 2019
Head	2450	22.5	1.859	38.018	1.80	39.2	3.28	-3.02	Nov. 29, 2019

Note:
1)The dielectric parameters of the tissue-equivalent liquid should be measured under similar ambient conditions and within 2 °C of the conditions expected during the SAR evaluation to satisfy protocol requirements.
2)KDB 865664 was ensured to be applied for probe calibration frequencies greater than or equal to 50MHz of the EUT frequencies.
3)The above measured tissue parameters were used in the DASY software to perform interpolation via the DASY software to determine actual dielectric parameters at the test frequencies. The SAR test plots may slightly differ from the table above since the DASY rounds to three significant digits.

4.2 SYSTEM CHECK

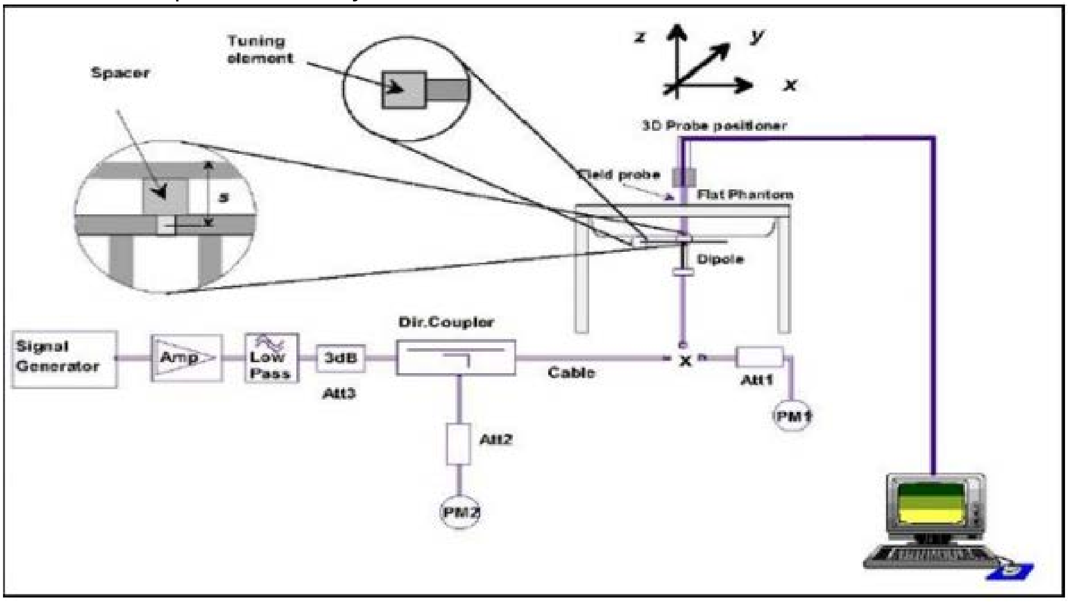
The system check is performed for verifying the accuracy of the complete measurement system and performance of the software. The system check is performed with tissue equivalent material according to IEEE P1528 (described above). The following table shows system check results for all frequency bands and tissue liquids used during the tests.

System Check	Date	Frequency (MHz)	Targeted SAR-1g (W/kg)	Measured SAR-1g (W/kg)	normalized SAR-1g (W/kg)	Deviation (%)	Dipole S/N
Head	Nov. 29, 2019	750	8.47	2.22	8.88	4.84	1095
Head	Nov. 29, 2019	835	9.23	2.33	9.32	0.98	4d160
Head	Nov. 29, 2019	1750	37.00	9.67	38.68	4.54	1101
Head	Nov. 29, 2019	1900	39.50	10.35	41.40	4.81	5d179
Head	Nov. 29, 2019	2450	52.10	13.00	52.00	-0.19	919

4.3 SYSTEM CHECK PROCEDURE

The system check is performed by using a system check dipole which is positioned parallel to the planar part of the SAM phantom at the reference point. The distance of the dipole to the SAM phantom is determined by a plexiglass spacer. The dipole is connected to the signal source consisting of signal generator and amplifier via a directional coupler, N-connector cable and adaption to SMA. It is fed with a power of 250mW (below 3GHz) or 100mW (3-6GHz). To adjust this power a power meter is used.
The power sensor is connected to the cable before the system check to measure the power at this point and do adjustments at the signal generator. At the outputs of the directional coupler both return loss as well as forward power are controlled during the system check to make sure that emitted power at the dipole is kept constant. This can also be checked by the power drift measurement after the test.

System check results have to be equal or near the values determined during dipole calibration (target SAR in table above) with the relevant liquids and test system.



5. SAR MEASUREMENT VARIABILITY AND UNCERTAINTY

5.1 SAR MEASUREMENT VARIABILITY

Per KDB865664 D01 SAR measurement 100 MHz to 6 GHz v01r04, SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. The additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

The same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.

The detailed repeated measurement results are shown in Section 7.2.

5.2 SAR MEASUREMENT UNCERTAINTY

Per KDB865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis.

6. OPERATIONAL CONDITIONS DURING TEST

6.1 GENERAL DESCRIPTION OF TEST PROCEDURES

Connection to the EUT is established via air interface with Agilent 8960 & RS CMW500, and the EUT is set to maximum output power by Agilent 8960 & RS CMW500. The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output. The antenna connected to the output of the base station simulator shall be placed at least 50cm away from the EUT. The signal transmitted by the simulator to the antenna feeding point shall be lower than the output power level of the EUT by at least 30dB.

6.2 TEST CONFIGURATION

6.2.1 LTE TEST CONFIGURATION

SAR for LTE band exposure configurations is measured according to the procedures of KDB 941225 D05 SAR for LTE Devices. The CMW500 Wide Band Radio Communication Tester was used for LTE output power measurements and SAR testing. Closed loop power control was used so the UE transmits with maximum output power during SAR testing. SAR test were performed with the same number of RB and RB offsets transmitting on all TTI frames (Maximum TTI)

1. Spectrum Plots for RB configurations

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

2. MPR

When MPR is implemented permanently within the UE, regardless of network requirements, only those RB configurations allowed by 3GPP for the channel bandwidth and modulation combinations may be tested with MPR active. Configurations with RB allocations less than the RB thresholds required by 3GPP must be tested without MPR.

The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101:

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

Modulation	Channel bandwidth / Transmission bandwidth (N_{RB})						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

3. A-MPR

A-MPR (Additional MPR) has been disabled for all SAR tests by using Network Signaling Value of “NS_01”on the base station simulator.

4. LTE procedures for SAR testing

A) Largest channel bandwidth standalone SAR test requirements

i) QPSK with 1 RB allocation

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. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel. When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.

ii) QPSK with 50% RB allocation

The procedures required for 1 RB allocation in i) are applied to measure the SAR for QPSK with 50% RB allocation

iii) QPSK with 100% RB allocation

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 in i) and ii) 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.

iv) Higher order modulations

For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in above sections to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

B) Other channel bandwidth standalone SAR test requirements

For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in section A) to determine the channels and RB configurations that need SAR testing and only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is > ½ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the reported SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg.

6.2.2 WIFI TEST CONFIGURATION

For WLAN SAR testing, WLAN engineering testing software installed on the DUT can provide continuous transmitting RF signal.

2.4G

Mode	802.11b	802.11g	802.11n HT20	802.11n HT40
Duty cycle	100%			
Crest factor	1			

6.2.2.1 2.4G SAR Test Requirements

802.11b DSSS SAR Test Requirements
SAR is measured for 2.4 GHz 802.11b DSSS using either a fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:
1) When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
2) When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

2.4 GHz 802.11g/n OFDM SAR Test Exclusion Requirements
When SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations, the measurement and test reduction procedures for OFDM are applied. SAR is not required for the following 2.4 GHz OFDM conditions.
1) When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.
2) 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.

SAR Test Requirements for OFDM configurations
When SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations, each standalone and frequency aggregated band is considered separately for SAR test reduction. In applying the initial test configuration and subsequent test configuration procedures, the 802.11 transmission configuration with the highest specified maximum output power and the channel within a test configuration with the highest measured maximum output power should be clearly distinguished to apply the procedures.

6.3 TEST POSITION OF PORTABLE DEVICES

6.3.1 LIMB-WORN DEVICE

A limb-worn device is a unit whose intended use includes being strapped to the arm or leg of the user while transmitting (except in idle mode). It is similar to a body-worn device. Therefore, the test positions of body-worn device also apply. The device shall be positioned directly against the phantom surface with the strap straightened as much as possible and the back of the device towards the phantom.

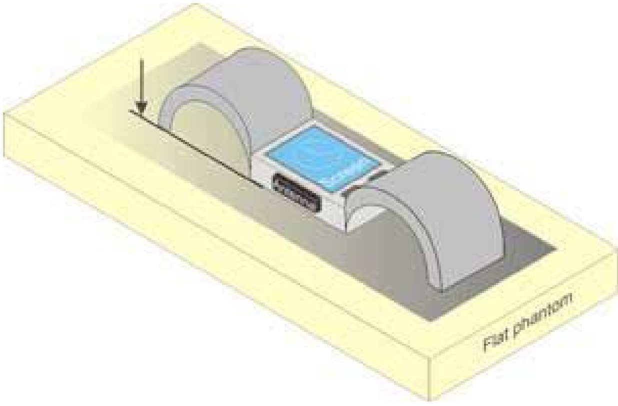


Figure: Test position for limb-worn devices

The location of the antenna inside EUT is as below:

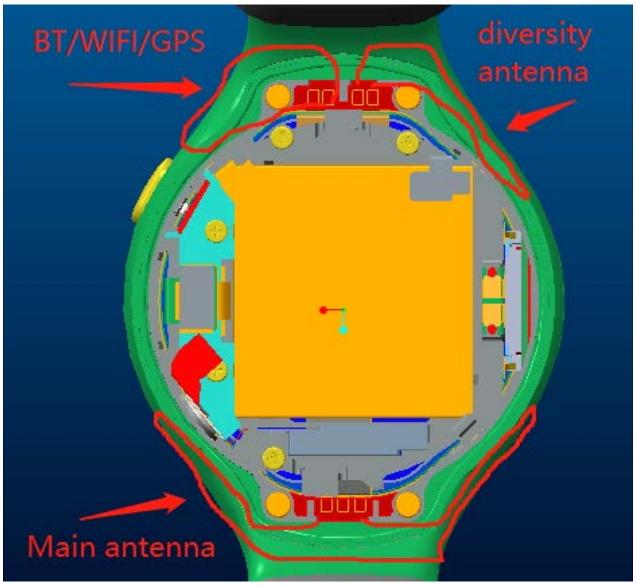


Figure: The location of the antennas

Note: The Div antenna does not have the transmit function.

7. TEST RESULT

7.1 CONDUCTED POWER RESULTS

7.1.1 CONDUCTED POWER MEASUREMENTS OF LTE

1. Conducted power measurements of LTE B2

LTE B2/BW=1.4M		Average Conducted Power(dBm)			
Modula-tion	RB Size/ Offset	Max. Tune-up	Channel/Frequency(MHz)		
			18607/ 1850.7	18900/ 1880	19193/ 1909.3
QPSK	1/0	23.50	22.53	22.30	22.21
	1/2	23.50	22.69	22.58	22.24
	1/5	23.50	22.55	22.39	22.49
	3/0	23.50	22.68	22.33	22.33
	3/1	23.50	22.78	22.33	22.39
	3/3	23.50	22.71	22.25	22.43
	6/0	22.50	21.42	21.21	21.32
16QAM	1/0	22.50	21.58	21.43	21.01
	1/2	22.50	21.60	21.54	21.05
	1/5	22.50	21.69	21.48	20.99
	3/0	22.50	21.33	21.27	21.20
	3/1	22.50	21.56	21.13	21.01
	3/3	22.50	21.79	21.49	21.02
	6/0	21.50	20.50	20.40	20.27

LTE B2/BW=3M		Average Conducted Power(dBm)			
Modula-tion	RB Size/ Offset	Max. Tune-up	Channel/Frequency(MHz)		
			18615/ 1851.5	18900/ 1880	19185/ 1908.5
QPSK	1/0	23.50	22.90	22.24	22.11
	1/7	23.50	22.86	22.44	22.23
	1/14	23.50	22.83	22.27	22.03
	8/0	22.50	21.52	21.24	20.96
	8/3	22.50	21.53	21.11	20.99
	8/7	22.50	21.55	21.11	20.93
	15/0	22.50	21.53	21.15	20.96
16QAM	1/0	22.50	21.12	21.37	21.08
	1/7	22.50	21.45	20.92	21.02
	1/14	22.50	21.16	21.12	20.94
	8/0	21.50	21.07	20.49	20.33
	8/3	21.50	21.09	20.36	20.06
	8/7	21.50	21.09	20.38	20.11
	15/0	21.50	20.78	20.54	20.10

LTE B2/BW=5M		Average Conducted Power(dBm)				LTE B2/BW=10M		Average Conducted Power(dBm)			
Modula-tion	RB Size/ Offset	Max. Tune-up	Channel/Frequency(MHz)			Modula-tion	RB Size/ Offset	Max. Tune-up	Channel/Frequency(MHz)		
			18625/ 1852.5	18900/ 1880	19175/ 1907.5				18650/ 1855	18900/ 1880	19150/ 1905
QPSK	1/0	23.50	22.75	22.28	21.94	QPSK	1/0	23.50	22.68	22.30	22.32
	1/12	23.50	22.94	22.40	22.00		1/24	23.50	23.05	22.72	22.09
	1/24	23.50	22.71	22.13	21.83		1/49	23.50	22.68	22.16	22.12
	12/0	22.50	21.57	21.40	21.00		25/0	22.50	21.72	21.32	20.98
	12/6	22.50	21.68	21.39	21.03		25/12	22.50	21.70	21.40	21.09
	12/13	22.50	21.66	21.37	21.01		25/25	22.50	21.66	21.28	20.99
	25/0	22.50	21.51	21.28	21.04		50/0	22.50	21.64	21.34	20.95
16QAM	1/0	22.50	21.60	21.51	21.04	16QAM	1/0	22.50	21.88	21.17	21.36
	1/12	22.50	21.65	21.14	21.16		1/24	22.50	22.19	21.64	21.06
	1/24	22.50	21.54	20.94	20.78		1/49	22.50	21.80	21.32	21.16
	12/0	21.50	20.83	20.43	20.07		25/0	21.50	20.75	20.40	20.26
	12/6	21.50	20.88	20.43	20.16		25/12	21.50	20.82	20.52	20.16
	12/13	21.50	20.86	20.37	20.12		25/25	21.50	20.88	20.40	20.36
	25/0	21.50	21.08	20.65	20.00		50/0	21.50	20.83	20.42	20.01
LTE B2/BW=15M		Average Conducted Power(dBm)				LTE B2/BW=20M		Average Conducted Power(dBm)			
Modula-tion	RB Size/ Offset	Max. Tune-up	Channel/Frequency(MHz)			Modula-tion	RB Size/ Offset	Max. Tune-up	Channel/Frequency(MHz)		
			18675/ 1857.5	18900/ 1880	19125/ 1902.5				18700/ 1860	18900/ 1880	19100/ 1900
QPSK	1/0	23.50	22.87	22.41	22.21	QPSK	1/0	23.50	22.51	22.66	22.22
	1/37	23.50	22.93	22.56	22.12		1/50	23.50	**22.78**	22.71	22.40
	1/74	23.50	22.66	22.15	22.05		1/99	23.50	22.50	22.51	21.81
	36/0	22.50	21.70	21.35	21.08		50/0	22.50	**21.67**	21.49	21.27
	36/19	22.50	21.69	21.31	21.20		50/25	22.50	21.62	21.48	21.15
	36/39	22.50	21.54	21.19	21.02		50/50	22.50	21.57	21.35	21.14
	75/0	22.50	21.68	21.26	21.02		100/0	22.50	21.64	21.37	21.31
16QAM	1/0	22.50	20.86	21.25	21.74	16QAM	1/0	22.50	21.30	21.37	20.55
	1/37	22.50	20.93	21.65	21.56		1/50	22.50	21.32	21.83	20.86
	1/74	22.50	20.62	21.00	21.56		1/99	22.50	21.16	21.13	20.57
	36/0	21.50	20.71	20.51	20.20		50/0	21.50	20.83	20.40	19.92
	36/19	21.50	20.80	20.45	20.24		50/25	21.50	20.73	20.46	19.92
	36/39	21.50	20.52	20.34	20.05		50/50	21.50	20.68	20.26	19.78
	75/0	21.50	20.66	20.41	20.08		100/0	21.50	20.70	20.48	19.85

Note: The tested channel results are marks in bold.

2. Conducted power measurements of LTE B4

LTE B4/BW=1.4M		Average Conducted Power(dBm)				LTE B4/BW=3M		Average Conducted Power(dBm)			
Modula-tion	RB Size/ Offset	Max. Tune-up	Channel/Frequency(MHz)			Modula-tion	RB Size/ Offset	Max. Tune-up	Channel/Frequency(MHz)		
			19957/ 1710.7	20175/ 1732.5	20393/ 1754.3				19965/ 1711.5	20175/ 1732.5	20385/ 1753.5
QPSK	1/0	23.50	22.25	23.08	22.84	QPSK	1/0	23.50	22.32	23.04	22.86
	1/2	23.50	22.30	23.22	22.92		1/7	23.50	22.28	23.06	22.71
	1/5	23.50	22.26	23.13	22.88		1/14	23.50	22.31	23.13	22.78
	3/0	23.50	22.28	23.09	22.79		8/0	22.50	21.30	22.02	21.82
	3/1	23.50	22.22	23.01	22.76		8/3	22.50	21.32	22.02	21.85
	3/3	23.50	22.20	22.95	22.75		8/7	22.50	21.33	22.05	21.78
	6/0	22.50	21.30	22.01	21.83		15/0	22.50	21.29	22.05	21.87
16QAM	1/0	22.50	21.48	22.12	21.93	16QAM	1/0	22.50	21.47	22.00	21.88
	1/2	22.50	21.51	21.96	22.01		1/7	22.50	21.36	21.81	21.91
	1/5	22.50	21.47	21.87	21.99		1/14	22.50	21.54	21.70	22.01
	3/0	22.50	21.22	22.16	21.77		8/0	21.50	20.35	20.94	20.81
	3/1	22.50	21.30	21.99	21.89		8/3	21.50	20.30	21.00	20.78
	3/3	22.50	21.29	22.03	21.93		8/7	21.50	20.39	21.04	20.80
	6/0	21.50	20.29	21.05	20.75		15/0	21.50	20.30	20.99	20.80
LTE B4/BW=5M		Average Conducted Power(dBm)				LTE B4/BW=10M		Average Conducted Power(dBm)			
Modula-tion	RB Size/ Offset	Max. Tune-up	Channel/Frequency(MHz)			Modula-tion	RB Size/ Offset	Max. Tune-up	Channel/Frequency(MHz)		
			19975/ 1712.5	20175/ 1732.5	20375/ 1752.5				20000/ 1715	20175/ 1732.5	20350/ 1750
QPSK	1/0	23.50	22.11	22.92	23.06	QPSK	1/0	23.50	22.78	23.03	23.18
	1/12	23.50	22.27	23.04	22.94		1/24	23.50	22.45	23.11	23.21
	1/24	23.50	22.24	22.99	22.94		1/49	23.50	22.56	22.92	23.03
	12/0	22.50	21.30	22.01	22.00		25/0	22.50	21.37	21.97	22.10
	12/6	22.50	21.30	22.01	22.01		25/12	22.50	21.36	21.98	22.11
	12/13	22.50	21.28	22.00	22.02		25/25	22.50	21.53	22.09	22.01
	25/0	22.50	21.28	22.02	21.93		50/0	22.50	21.33	21.98	22.14
16QAM	1/0	22.50	21.19	21.94	22.21	16QAM	1/0	22.50	21.48	21.90	22.30
	1/12	22.50	21.42	22.06	22.01		1/24	22.50	21.52	21.89	22.23
	1/24	22.50	21.35	22.00	21.88		1/49	22.50	21.54	21.89	22.09
	12/0	21.50	20.22	20.91	20.95		25/0	21.50	20.37	20.96	21.09
	12/6	21.50	20.23	20.97	20.91		25/12	21.50	20.33	20.93	21.10
	12/13	21.50	20.22	20.92	20.97		25/25	21.50	20.44	20.92	21.02
	25/0	21.50	20.30	20.97	20.99		50/0	21.50	20.33	20.98	21.09

LTE B4/BW=15M		Average Conducted Power(dBm)				LTE B4/BW=20M		Average Conducted Power(dBm)			
Modula -tion	RB Size/ Offset	Max. Tune-up	Channel/Frequency(MHz)			Modula -tion	RB Size/ Offset	Max. Tune-up	Channel/Frequency(MHz)		
			20025/ 1717.5	20175/ 1732.5	20325/ 1747.5				20050/ 1720	20175/ 1732.5	20300/ 1745
QPSK	1/0	23.50	22.95	22.97	23.01	QPSK	1/0	23.50	22.84	23.12	**23.22**
	1/37	23.50	22.35	23.01	23.01		1/50	23.50	22.53	22.93	23.03
	1/74	23.50	22.41	23.05	22.92		1/99	23.50	22.42	22.81	22.74
	36/0	22.50	21.26	21.86	21.99		50/0	22.50	21.27	21.81	**22.04**
	36/19	22.50	21.17	21.86	22.02		50/25	22.50	21.30	21.80	21.95
	36/39	22.50	21.44	21.81	21.90		50/50	22.50	21.83	21.75	21.87
	75/0	22.50	21.41	21.95	21.97		100/0	22.50	21.61	21.81	21.88
16QAM	1/0	22.50	21.14	21.95	22.00	16QAM	1/0	22.50	21.01	21.58	21.74
	1/37	22.50	21.36	21.82	21.89		1/50	22.50	21.40	22.05	22.07
	1/74	22.50	21.41	21.77	21.71		1/99	22.50	21.60	21.88	21.84
	36/0	21.50	20.22	20.86	21.02		50/0	21.50	20.20	20.73	20.99
	36/19	21.50	20.29	20.90	21.04		50/25	21.50	20.24	20.74	20.91
	36/39	21.50	20.46	20.82	20.92		50/50	21.50	20.64	20.66	20.83
	75/0	21.50	20.41	20.89	21.05		100/0	21.50	20.61	20.67	20.89

Note: The tested channel results are marks in bold.

3. Conducted power measurements of LTE B12

LTE B12/BW=1.4M		Average Conducted Power(dBm)				LTE B12/BW=3M		Average Conducted Power(dBm)			
Modula-tion	RB Size/ Offset	Max. Tune-up	Channel/Frequency(MHz)			Modula-tion	RB Size/ Offset	Max. Tune-up	Channel/Frequency(MHz)		
			23017/ 699.7	23095/ 707.5	23173/ 715.3				23025/ 700.5	23095/ 707.5	23165/ 714.5
QPSK	1/0	23.00	22.70	22.68	22.62	QPSK	1/0	23.00	22.71	22.74	22.50
	1/2	23.00	22.77	22.81	22.59		1/7	23.00	22.69	22.69	22.46
	1/5	23.00	22.67	22.72	22.60		1/14	23.00	22.79	22.82	22.44
	3/0	23.00	22.73	22.64	22.55		8/0	22.00	21.75	21.70	21.44
	3/1	23.00	22.71	22.67	22.48		8/3	22.00	21.76	21.71	21.44
	3/3	23.00	22.71	22.66	22.57		8/7	22.00	21.62	21.72	21.47
	6/0	22.00	21.69	21.61	21.45		15/0	22.00	21.65	21.51	21.46
16QAM	1/0	22.00	21.63	21.63	21.67	16QAM	1/0	22.00	21.61	21.60	21.67
	1/2	22.00	21.70	21.74	21.67		1/7	22.00	21.74	21.63	21.39
	1/5	22.00	21.75	21.53	21.57		1/14	22.00	21.62	21.53	21.38
	3/0	22.00	21.64	21.61	21.42		8/0	21.00	20.71	20.65	20.35
	3/1	22.00	21.72	21.69	21.62		8/3	21.00	20.66	20.72	20.38
	3/3	22.00	21.67	21.61	21.48		8/7	21.00	20.60	20.49	20.44
	6/0	21.00	20.77	20.62	20.59		15/0	21.00	20.65	20.53	20.44
LTE B12/BW=5M		**Average Conducted Power(dBm)**				**LTE B12/BW=10M**		**Average Conducted Power(dBm)**			
Modula-tion	**RB Size/ Offset**	**Max. Tune-up**	**Channel/Frequency(MHz)**			**Modula-tion**	**RB Size/ Offset**	**Max. Tune-up**	**Channel/Frequency(MHz)**		
			23035/ 701.5	**23095/ 707.5**	**23155/ 713.5**				**23060/ 704**	**23095/ 707.5**	**23130/ 711**
QPSK	1/0	23.00	22.59	22.58	22.73	QPSK	1/0	23.00	22.59	22.60	22.65
	1/12	23.00	22.68	22.59	22.57		1/24	23.00	22.65	22.69	**22.81**
	1/24	23.00	22.59	22.53	22.49		1/49	23.00	22.67	22.70	22.50
	12/0	22.00	21.65	21.60	21.56		25/0	22.00	21.43	21.43	21.58
	12/6	22.00	21.67	21.65	21.60		25/12	22.00	21.45	21.47	**21.59**
	12/13	22.00	21.67	21.64	21.62		25/25	22.00	21.46	21.51	21.51
	25/0	22.00	21.64	21.59	21.49		50/0	22.00	21.58	21.49	21.49
16QAM	1/0	22.00	21.72	21.35	21.67	16QAM	1/0	22.00	21.65	21.53	21.40
	1/12	22.00	21.61	21.59	21.84		1/24	22.00	21.70	21.71	21.61
	1/24	22.00	21.62	21.51	21.58		1/49	22.00	21.58	21.55	21.31
	12/0	21.00	20.58	20.55	20.50		25/0	21.00	20.47	20.41	20.55
	12/6	21.00	20.57	20.57	20.59		25/12	21.00	20.44	20.42	20.57
	12/13	21.00	20.70	20.66	20.75		25/25	21.00	20.51	20.60	20.49
	25/0	21.00	20.55	20.61	20.47		50/0	21.00	20.55	20.49	20.54

Note: The tested channel results are marks in bold.

4. Conducted power measurements of LTE B25

LTE B25/BW=1.4M		Average Conducted Power(dBm)				LTE B25/BW=3M		Average Conducted Power(dBm)			
Modula-tion	RB Size/ Offset	Max. Tune-up	Channel/Frequency(MHz)			Modula-tion	RB Size/ Offset	Max. Tune-up	Channel/Frequency(MHz)		
			26047/ 1850.7	26365/ 1882.5	26683/ 1914.3				26055/ 1851.5	26365/ 1882.5	26675/ 1913.5
QPSK	1/0	23.50	22.60	22.56	22.31	QPSK	1/0	23.50	22.21	22.31	22.35
	1/2	23.50	22.69	22.59	22.42		1/7	23.50	22.44	22.57	22.57
	1/5	23.50	22.61	22.58	22.18		1/14	23.50	22.27	22.29	22.34
	3/0	23.50	22.47	22.47	22.01		8/0	22.50	21.18	21.21	21.22
	3/1	23.50	22.50	22.50	22.05		8/3	22.50	21.18	21.23	21.29
	3/3	23.50	22.52	22.54	22.06		8/7	22.50	21.21	21.26	21.30
	6/0	22.50	21.41	21.43	21.00		15/0	22.50	21.21	21.25	21.29
16QAM	1/0	22.50	21.01	21.01	20.91	16QAM	1/0	22.50	21.09	21.02	21.35
	1/2	22.50	21.14	21.29	20.95		1/7	22.50	21.30	21.34	21.46
	1/5	22.50	21.01	21.20	20.84		1/14	22.50	21.16	20.93	21.19
	3/0	22.50	21.18	21.20	21.12		8/0	21.50	20.33	20.20	20.20
	3/1	22.50	21.23	21.23	21.20		8/3	21.50	20.29	20.21	20.25
	3/3	22.50	21.23	21.21	21.18		8/7	21.50	20.29	20.26	20.21
	6/0	21.50	20.21	20.20	20.11		15/0	21.50	20.31	20.22	20.24
LTE B25/BW=5M		Average Conducted Power(dBm)				LTE B25/BW=10M		Average Conducted Power(dBm)			
Modula-tion	RB Size/ Offset	Max. Tune-up	Channel/Frequency(MHz)			Modula-tion	RB Size/ Offset	Max. Tune-up	Channel/Frequency(MHz)		
			26065/ 1852.5	26365/ 1882.5	26665/ 1912.5				26090/ 1855	26365/ 1882.5	26640/ 1910
QPSK	1/0	23.50	22.19	22.13	22.03	QPSK	1/0	23.50	22.39	22.33	22.57
	1/12	23.50	22.34	22.14	22.14		1/24	23.50	22.41	22.39	22.46
	1/24	23.50	22.31	22.16	22.15		1/49	23.50	22.41	22.37	22.50
	12/0	22.50	21.73	21.84	22.01		25/0	22.50	21.20	21.31	21.30
	12/6	22.50	21.24	21.09	21.10		25/12	22.50	21.23	21.33	21.40
	12/13	22.50	20.83	20.67	20.69		25/25	22.50	21.28	21.27	21.41
	25/0	22.50	21.12	21.13	21.13		50/0	22.50	21.25	21.30	21.37
16QAM	1/0	22.50	20.83	20.63	20.72	16QAM	1/0	22.50	21.12	20.95	21.02
	1/12	22.50	21.00	20.81	20.73		1/24	22.50	21.18	20.93	21.09
	1/24	22.50	21.10	20.78	20.70		1/49	22.50	20.98	20.95	21.10
	12/0	21.50	20.81	20.99	21.39		25/0	21.50	20.20	20.15	20.09
	12/6	21.50	21.11	20.98	20.97		25/12	21.50	20.30	20.20	20.15
	12/13	21.50	20.05	20.14	19.99		25/25	21.50	20.25	20.24	20.15
	25/0	21.50	20.26	20.08	20.02		50/0	21.50	20.25	20.21	20.15

LTE B25/BW=15M		Average Conducted Power(dBm)				LTE B25/BW=20M		Average Conducted Power(dBm)			
Modula-tion	RB Size/ Offset	Max. Tune-up	Channel/Frequency(MHz)			Modula-tion	RB Size/ Offset	Max. Tune-up	Channel/Frequency(MHz)		
			26115/ 1857.5	26365/ 1882.5	26615/ 1907.5				26140/ 1860	26365/ 1882.5	26590/ 1905
QPSK	1/0	23.50	22.61	22.46	22.41	QPSK	1/0	23.50	22.12	22.12	22.42
	1/37	23.50	22.59	22.40	22.37		1/50	23.50	22.16	22.23	**22.55**
	1/74	23.50	22.59	22.44	22.09		1/99	23.50	21.97	22.09	22.46
	36/0	22.50	21.42	21.44	21.02		50/0	22.50	21.21	21.21	21.02
	36/19	22.50	21.43	21.42	20.96		50/25	22.50	21.21	21.17	21.09
	36/39	22.50	21.37	21.42	21.00		50/50	22.50	21.11	**21.21**	21.06
	75/0	22.50	21.41	21.44	20.98		100/0	22.50	21.24	21.25	21.14
16QAM	1/0	22.50	21.21	21.07	21.32	16QAM	1/0	22.50	21.03	21.00	21.06
	1/37	22.50	21.16	21.02	21.15		1/50	22.50	21.02	21.10	21.34
	1/74	22.50	21.09	20.96	21.27		1/99	22.50	20.81	20.98	21.07
	36/0	21.50	20.35	20.31	20.34		50/0	21.50	20.45	20.39	20.41
	36/19	21.50	20.33	20.32	20.25		50/25	21.50	20.43	20.36	20.45
	36/39	21.50	20.35	20.34	20.28		50/50	21.50	20.27	20.37	20.32
	75/0	21.50	20.36	20.29	20.25		100/0	21.50	20.45	20.37	20.44

Note: The tested channel results are marks in bold.

5. Conducted power measurements of LTE B26

LTE B26/BW=1.4M		Average Conducted Power(dBm)				LTE B26/BW=3M		Average Conducted Power(dBm)			
Modula-tion	RB Size/ Offset	Max. Tune-up	Channel/Frequency(MHz)			Modula-tion	RB Size/ Offset	Max. Tune-up	Channel/Frequency(MHz)		
			26697/ 814.7	26865/ 831	27033/ 848.3				26705/ 815.5	26865/ 831	27025/ 847.5
QPSK	1/0	23.50	22.78	22.83	22.87	QPSK	1/0	23.50	22.92	22.81	22.85
	1/2	23.50	23.05	23.05	22.76		1/7	23.50	22.85	22.77	22.81
	1/5	23.50	22.95	22.96	22.68		1/14	23.50	22.90	22.91	22.68
	3/0	23.50	22.98	22.67	22.65		8/0	22.50	21.86	21.81	21.71
	3/1	23.50	22.88	22.88	22.64		8/3	22.50	21.94	21.72	21.70
	3/3	23.50	22.77	22.70	22.64		8/7	22.50	21.81	21.88	21.65
	6/0	22.50	21.83	21.66	21.69		15/0	22.50	21.93	21.76	21.69
16QAM	1/0	22.50	21.81	21.66	21.82	16QAM	1/0	22.50	21.88	21.69	21.87
	1/2	22.50	22.09	21.78	21.80		1/7	22.50	21.89	21.69	21.86
	1/5	22.50	21.91	21.84	21.63		1/14	22.50	21.95	21.86	21.53
	3/0	22.50	21.94	21.58	21.63		8/0	21.50	20.79	20.83	20.68
	3/1	22.50	21.65	21.72	21.72		8/3	21.50	20.82	20.73	20.71
	3/3	22.50	21.68	21.59	21.74		8/7	21.50	20.80	20.88	20.67
	6/0	21.50	20.67	20.68	20.67		15/0	21.50	20.90	20.67	20.65
LTE B26/BW=5M		Average Conducted Power(dBm)				LTE B26/BW=10M		Average Conducted Power(dBm)			
Modula-tion	RB Size/ Offset	Max. Tune-up	Channel/Frequency(MHz)			Modula-tion	RB Size/ Offset	Max. Tune-up	Channel/Frequency(MHz)		
			26715/ 816.5	26865/ 831	27015/ 846.5				26740/ 819	26865/ 831	26990/ 844
QPSK	1/0	23.50	22.75	22.69	22.59	QPSK	1/0	23.50	22.99	23.01	22.40
	1/12	23.50	22.78	22.80	22.72		1/24	23.50	22.98	22.87	22.83
	1/24	23.50	22.90	22.87	22.70		1/49	23.50	22.82	22.99	22.69
	12/0	22.50	21.82	21.71	21.71		25/0	22.50	21.81	21.78	21.60
	12/6	22.50	21.80	21.69	21.69		25/12	22.50	21.80	21.75	21.60
	12/13	22.50	21.79	21.80	21.68		25/25	22.50	21.84	21.87	21.67
	25/0	22.50	21.83	21.66	21.69		50/0	22.50	21.77	21.73	21.52
16QAM	1/0	22.50	21.76	21.78	21.74	16QAM	1/0	22.50	21.62	21.91	21.64
	1/12	22.50	21.95	21.76	21.88		1/24	22.50	21.88	21.79	22.02
	1/24	22.50	21.88	21.93	21.76		1/49	22.50	21.76	22.01	21.36
	12/0	21.50	20.89	20.64	20.65		25/0	21.50	20.76	20.74	20.61
	12/6	21.50	20.84	20.67	20.70		25/12	21.50	20.80	20.76	20.66
	12/13	21.50	20.86	20.80	20.67		25/25	21.50	20.78	20.81	20.64
	25/0	21.50	20.84	20.64	20.72		50/0	21.50	20.83	20.71	20.58

LTE B26/BW=15M		Average Conducted Power(dBm)			
Modula-tion	**RB Size/ Offset**	**Max. Tune-up**	**Channel/Frequency(MHz)**		
			26765/ 821.5	**26865/ 831**	**26965/ 841.5**
QPSK	1/0	23.50	22.89	22.90	22.72
	1/37	23.50	22.86	22.90	22.71
	1/74	23.50	22.90	**22.93**	22.64
	36/0	22.50	**21.79**	21.70	21.70
	36/19	22.50	21.78	21.77	21.54
	36/39	22.50	21.77	21.78	21.59
	75/0	22.50	21.81	21.76	21.66
16QAM	1/0	22.50	21.79	21.56	21.65
	1/37	22.50	21.72	21.54	21.51
	1/74	22.50	21.54	21.56	21.61
	36/0	21.50	20.85	20.74	20.60
	36/19	21.50	20.84	20.82	20.59
	36/39	21.50	20.79	20.75	20.55
	75/0	21.50	20.83	20.79	20.67

Note: The tested channel results are marks in bold.

7.1.2 CONDUCTED POWER MEASUREMENTS OF BT

BT	Average Conducted Power(dBm)			
	Max. Tune up	CH0 2402MHz	CH39 2441MHz	CH78 2480MHz
DH5	5.50	3.78	5.41	4.26
2DH5	5.50	3.52	5.16	4.02
3DH5	5.50	3.56	5.23	4.11

BT	Average Conducted Power(dBm)			
	Max. Tune up	CH0 2402MHz	CH19 2441MHz	CH39 2480MHz
BLE(1M)	1.50	-0.98	1.15	-0.53

Note: The conducted power of BT is measured with RMS detector.

7.1.3 CONDUCTED POWER MEASUREMENTS OF WIFI

1. Conducted power measurements of WiFi 2.4G

Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Max. Tune up	Average Power(dBm)
802.11b	1	2412	1	14.50	13.62
	6	2437		14.50	14.01
	11	2462		14.50	**14.06**
802.11g	1	2412	6	13.00	12.55
	6	2437		13.00	12.75
	10	2457		13.00	12.54
	11	2462		12.50	12.12
802.11n HT20	1	2412	6.5	12.00	11.57
	6	2437		12.00	11.86
	10	2457		12.00	11.56
	11	2462		11.50	11.35
802.11n HT40	3	2422	13.5	12.00	11.62
	6	2437		12.00	11.66
	9	2452		12.00	11.88

Note:
1) The Average conducted power of WiFi 2.4G is measured with RMS detector.
2) Per KDB248227, for WiFi 2.4GHz, the highest measured maximum output power Channel for DSSS modes (802.11b) was selected for SAR measurement. SAR for OFDM modes (2.4GHz 802.11g/n) was not required When the highest reported SAR for DSSS is adjusted by the ratio of OFDM modes (802.11g/n) to DSSS modes (802.11b) specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.
3) The tested channel results are marks in bold.

7.2 SAR TEST RESULTS

General Notes:

1) Per KDB447498 D01, all measurement SAR results are scaled to the maximum tune-up tolerance limit to demonstrate compliant.
2) Per KDB447498 D01, 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. When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel must be used.
3) Per KDB865664 D01,for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥ 0.8W/kg; if the deviation among the repeated measurement is ≤ 20%,and the measured SAR < 1.45W/kg, only one repeated measurement is required.
4) Per KDB865664 D02, SAR plot is only required for the highest measured SAR in each exposure configuration, wireless mode and frequency band combination; Plots are also required when the measured SAR is > 1.5 W/kg, or > 7.0 W/kg for occupational exposure. The published RF exposure KDB procedures may require additional plots; for example, to support SAR to peak location separation ratio test exclusion and/or volume scan post-processing.

LTE Notes:

1) The LTE test configurations are determined according to KDB941225 D05 SAR for LTE Devices. The general test procedures used for SAR testing can be found in Section 7.1.3.
2) A-MPR was disabled for all SAR test by setting NS_01 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames(maximum TTI)

WLAN Notes:

1) For exposure conditions with multiple test positions, such as handset operating next to the ear, devices with hotspot mode, procedures for initial test position can be applied. Using the transmission mode determined by the DSSS procedure or initial test configuration, area scans are measured for all positions in an exposure condition. The test position with the highest extrapolated (peak) SAR is used as the initial test position. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other (remaining) test positions. Otherwise, SAR is evaluated at the subsequent highest peak SAR position until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.
2) Justification for test configurations for WLAN per KDB Publication 248227 for 2.4GHZ WIFI single transmission chain operations, the highest measured maximum output power Channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4GHz 802.11g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR. See Section 6.2.2.1 for more information.

7.2.1 SAR MEASUREMENT RESULT

1. Extremity SAR test results of LTE

Test No.	Band	Mode	Channel	RB	offset	Test Position	Separation Distance (cm)	Maximum Tune-up (dBm)	Conducted Power (dBm)	Power Drift (dB)	SAR 1g (W/kg)	SAR 10g (W/kg)	Reported 1g SAR
T11	LTE B2	QPSK20M	18700	1	50	Rear Face	0	23.5	22.78	-0.03	**1.34**	**0.749**	**0.884**
T12	LTE B2	QPSK20M	18700	50	0	Rear Face	0	22.5	21.67	0	1.06	0.602	0.729
T13	LTE B4	QPSK20M	20300	1	0	Rear Face	0	23.5	23.22	0.02	**2.23**	**1.24**	**1.323**
T14	LTE B4	QPSK20M	20300	50	0	Rear Face	0	22.5	22.04	-0.01	2.02	1.14	1.267
T15	LTE B12	QPSK10M	23130	1	24	Rear Face	0	23	22.81	-0.08	**0.329**	**0.203**	**0.212**
T16	LTE B12	QPSK10M	23130	25	12	Rear Face	0	22	21.59	0.03	0.259	0.165	0.181
T17	LTE B25	QPSK20M	26590	1	50	Rear Face	0	23.5	22.55	-0.02	**1.55**	**0.653**	**0.813**
T18	LTE B25	QPSK20M	26365	50	50	Rear Face	0	22.5	22.21	0	1.22	0.536	0.573
T19	LTE B26	QPSK15M	26865	1	74	Rear Face	0	23.5	22.93	0.05	**0.31**	**0.172**	**0.196**
T20	LTE B26	QPSK15M	26765	36	0	Rear Face	0	22.5	21.79	-0.02	0.197	0.119	0.140

Note: The value with boldface is the maximum SAR Value of each test band.

2. Extremity SAR test results of WiFi

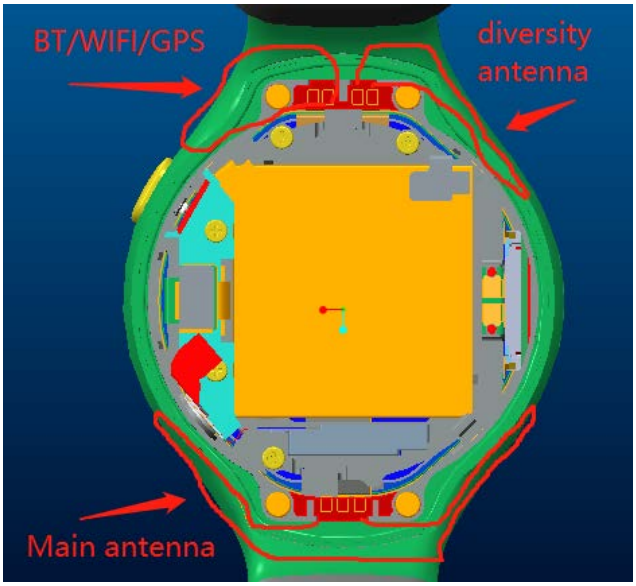
Test No.	Band	Channel	Test Position	Separation Distance (cm)	Data Rate	Maximum Tune-up (dBm)	Conducted Power (dBm)	Power Drift (dB)	SAR 1g (W/kg)	SAR 10g (W/kg)	Reported 1g SAR
T22	802.11b	11	Rear Face	0	1	14.5	14.06	0.15	**0.080**	**0.042**	**0.047**

Note: The value with boldface is the maximum SAR Value of each test band.

7.3 MULTIPLE TRANSMITTER EVALUATION

The following tables list information which is relevant for the decision if a simultaneous transmit evaluation is necessary according to FCC KDB 447498D01 General RF Exposure Guidance v06.

The location of the antenna inside EUT is as below:



7.3.1 STAND-ALONE SAR TEST EXCLUSION

Per FCC KDB 447498 D01, the 1-g SAR 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 product specific 10-g SAR, where:

- 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

When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Standalone SAR test exclusion for BT

Mode	Position	P_{max} (dBm)*	P_{max} (mW)	Distance (mm)	f (GHz)	Calculation Result	SAR Exclusion threshold	SAR test exclusion
BT	Extremity 10-g SAR	5.5	3.55	5	2.48	1.12	7.5	Yes

Note:
1)* - maximum possible output power declared by manufacturer
2) Held to ear configurations are not applicable to Bluetooth for this device.

When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:
(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.
When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

According to KDB 447498 D01, when standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standslone SAR was estimated according to following formula to result in substantially conservative SAR values of ≤ 0.4W/kg to determine simultaneous transmission SAR test exclusion.

$$\text{Estimated SAR} = \frac{\text{Max. Tune up Power}_{(mW)}}{\text{Min. Test Separation Distance}_{(mm)}} \times \frac{\sqrt{f_{(GHz)}}}{7.5}$$

Estimated SAR calculation

Mode	Position	P_{max} (dBm)*	P_{max} (mW)	Distance (mm)	f (GHz)	X	Estimated SAR (W/kg)*
BT	Extremity 10-g SAR	5.5	3.55	5	2.48	18.75	0.060

Note: * - maximum possible output power declared by manufacturer

7.3.2 SIMULTANEOUS TRANSMISSION CONDITIONS

Per FCC KDB 447498D01, SAR compliance for simultaneous transmission must be considered when the maximum duration of overlapping transmissions, including network hand-offs, is greater than 30 seconds. This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis.

The Simultaneous Transmission Possibilities of this device are as below:

No.	Configuration	Extremity
1	LTE + WiFi 2.4G	Yes
2	LTE + BT	Yes

Note: WiFi 2.4G and BT share the same antenna and can't transmit simultaneously.

7.3.3 SAR SUMMATION SCENARIO

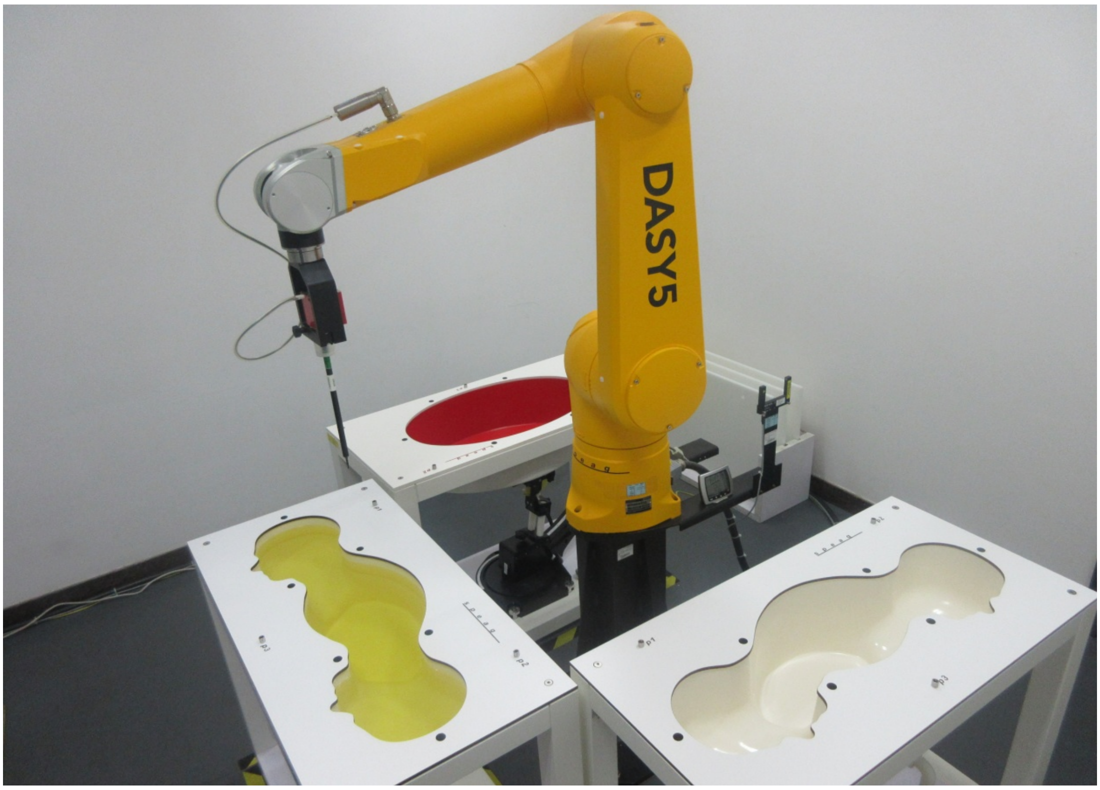
SAR10g(W/Kg) \ Position	Rear Face
LTE B2	0.884
LTE B4	1.323
LTE B12	0.212
LTE B25	0.813
LTE B26	0.196
Bluetooth	0.060
WiFi 2.4G	0.047
MAX $\sum SAR_{10g}$	**1.370**

Note:
$SAR_{MAX.total} = SAR_{LTE\ B4} + SAR_{WiFi\ 2.4G}$ = 1.323W/Kg + 0.047W/Kg = 1.370W/Kg.
Thus $SAR_{MAX.total}$=1.370W/Kg <4.0 W/Kg, it is compliant with 1999/519/EC, so Simultaneous SAR are not required for WiFi and LTE antenna.

APPENDIX

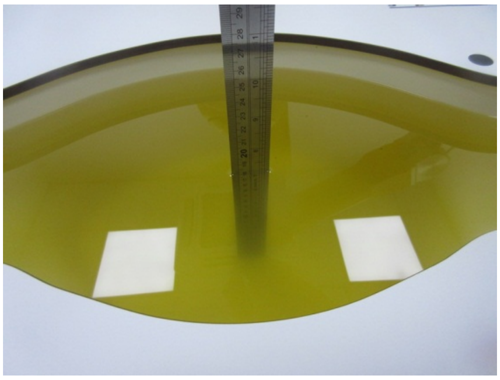
1. TEST LAYOUT

Specific Absorption Rate Test Layout

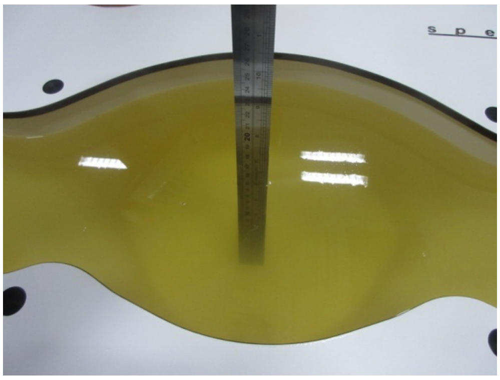


Liquid depth in the flat Phantom (≥15cm depth)

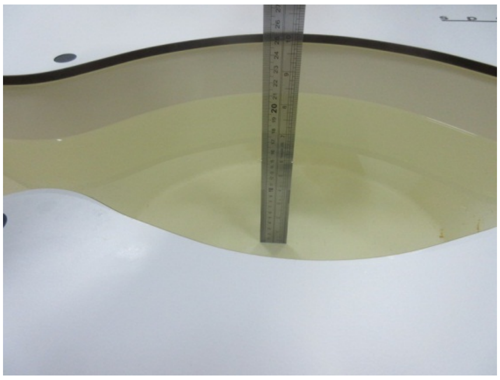
HSL750MHz_Body_18.2cm



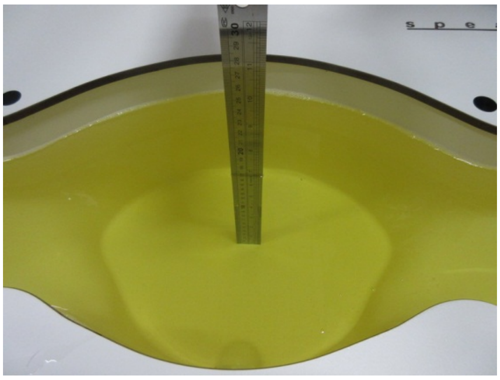
HSL835MHz_Body_16.3cm



HSL1750MHz_Body_15.4cm



HSL1900MHz-2600MHz_Body_17.2cm



Appendix A. SAR Plots of System Verification

(Pls See BTL-FCC SAR-1-1909C175_Appendix A.)

Appendix B. SAR Plots of SAR Measurement

(Pls See BTL-FCC SAR-1-1909C175_Appendix B.)

Appendix C. Calibration Certificate

(Pls See BTL-FCC SAR-1-1909C175_Appendix C.)

Appendix D. Photographs of the Test Set-Up

(Pls See BTL-FCC SAR-1-1909C175_Appendix D.)

End of Test Report