



**FCC 47 CFR parts 1 & 2  
Published RF Exposure KDB Procedures  
IEEE Std 1528-2013**

**SAR EVALUATION REPORT**

*For*

**Tablet with cellular GSM / GPRS / EDGE / WCDMA / HSPA+ / DC-HSDPA / LTE radio, IEEE  
802.11a/b/g/n radio (MIMO 2X2) and Bluetooth Radio**

**Model: A1601  
FCC ID: BCGA1601**

**Report Number UL-SAR-RP10407435JD12A V2.0  
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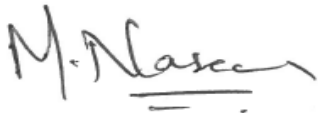
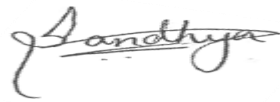
**REVISION HISTORY**

Rev.	Issue Date	Revisions	Revised By
--	05 Sept 2014	Initial Issue	--
1	11 Sept 2014	Following amendments are made: <ol style="list-style-type: none"> <li>1. All measurements relating to LTE Band 7 have been removed from the report</li> <li>2. SAR scan procedures as per Section 2.7.1 of KDB865664 D01 are included in the report</li> </ol>	Sandhya Menon

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### 1. Attestation of Test Results

Applicant Name:	Apple Inc.			
Application Purpose	<input checked="" type="checkbox"/> Original Grant			
DUT Description	Tablet with cellular GSM / GPRS / EDGE / WCDMA / HSPA+ / DC-HSDPA / LTE radio, IEEE 802.11a/b/g/n radio (MIMO 2X2) and Bluetooth Radio			
Test Device is	An identical prototype			
Device category	Portable			
Exposure Category	General Population/Uncontrolled Exposure (1g SAR limit: 1.6 W/kg)			
Date Tested	17 July 2014 to 04 September 2014			
The highest reported SAR values	RF Exposure Conditions	Equipment Class		
		Licensed	DTS	UNII
	Body	1.101 W/kg	1.001 W/kg	0.924 W/kg
Simultaneous Transmission	1.158 W/kg	1.158 W/kg	1.158 W/kg	
Applicable Standards	FCC 47 CFR part 1 & 2 FCC Published RF Exposure KDB Procedures IEEE Std 1528-2013			
Test Results	Pass			
<p>UL Verification Services Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties are in accordance with the above standard and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.</p> <p><b>Note:</b> The results documented in this report apply only to the tested sample(s), under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by UKAS. This report is written to support regulatory compliance of the applicable standards stated above.</p>				
Approved & Released By:		Prepared By:		
				
Naseer Mirza Project Lead UL Verification Services Ltd.		Sandhya Menon Laboratory Engineer UL Verification Services Ltd.		

## **2. Test Specification, Methods and Procedures**

### **2.1. Test Specification**

The tests documented in this report were performed in accordance with FCC 47 CFR part 1 & 2, IEEE Std 1528-2013, and has been tested in accordance with the reference documents in section 2.2 of this report.

### **2.2. Methods and Procedures Reference Documentation**

The methods and procedures used were as detailed in:

#### **IEEE 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

Thomas Schmid, Oliver Egger and Neils Kuster, "Automated E-field scanning system for dosimetric assessments", IEEE Transaction on microwave theory and techniques, Vol. 44, pp. 105-113, January 1996.

Neils Kuster, Ralph Kastle and Thomas Schmid, "Dosimetric evaluation of mobile communications equipment with known precision", IEICE Transactions of communications, Vol. E80-B, No.5, pp. 645-652, May 1997.

#### **FCC KDB Publication:**

KDB 447498 D01 General RF Exposure Guidance v05r02  
KDB 616217 D04 SAR for laptop and tablets v01r01  
KDB 941225 D01 SAR test for 3G devices v02  
KDB 941225 D02 HSPA and 1x Advanced v02r02  
KDB 941225 D03 SAR Test Reduction GSM GPRS EDGE v01  
KDB 941225 D04 SAR for GSM E GPRS Dual Xfer Mode v01  
KDB 941225 D05 SAR for LTE Devices v02r03  
KDB 248227 D01 SAR meas for 802 11a b g v01r02  
KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r03  
KDB 865664 D02 SAR Reporting v01r01  
KDB 690783 D01 SAR Listings on Grants v01r03

### **2.3. Definition of Measurement Equipment**

The measurement equipment used complied with the requirements of the standards referenced in the methods & procedures section above. Appendix 1 contains a list of the test equipment used.

### **3. Facilities and Accreditation**

The test sites and measurement facilities used to collect data are located at

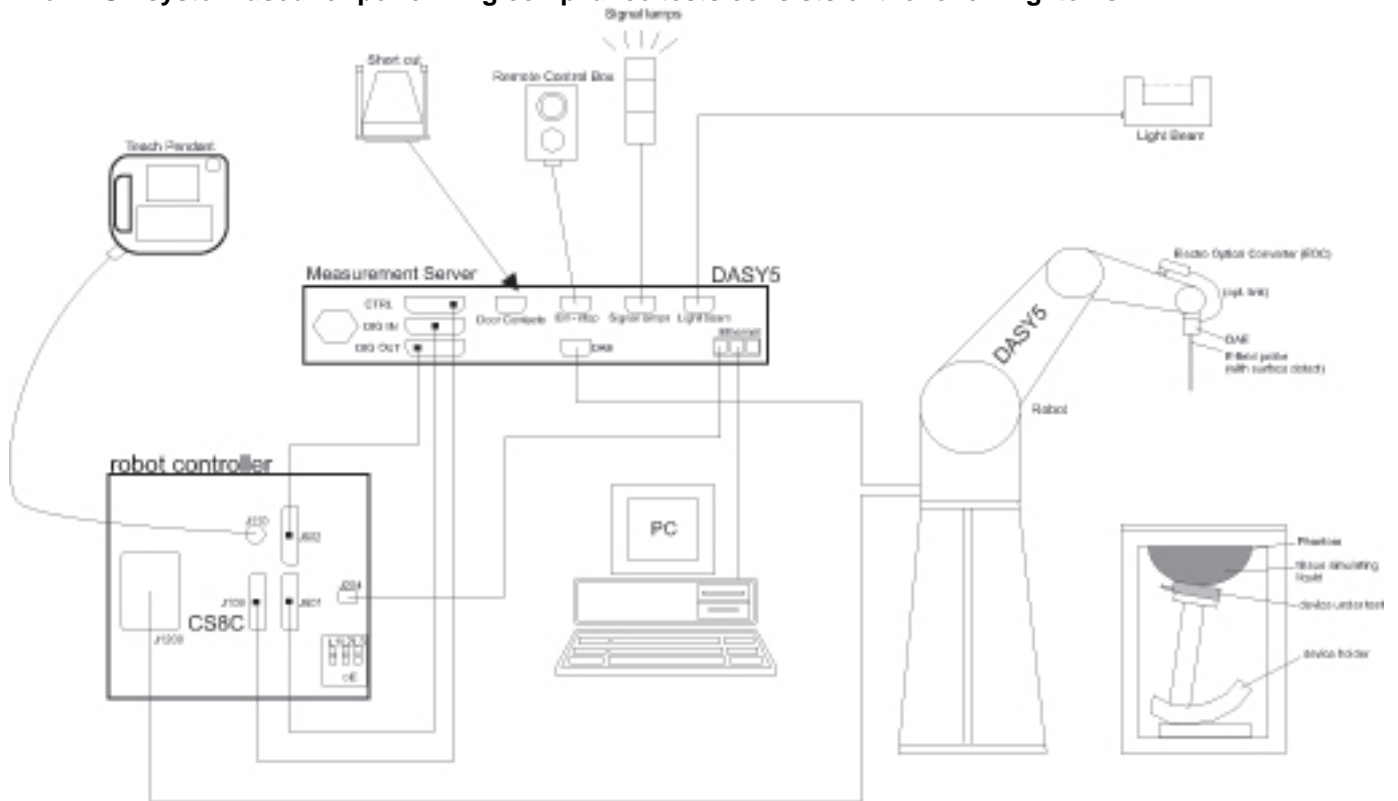
Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire, RG23 8BG UK	Facility Type
SAR Lab 57	Controlled Environment Chamber
SAR Lab 59	Controlled Environment Chamber
SAR Lab 60	Controlled Environment Chamber
SAR Lab 61	Controlled Environment Chamber

UL Verification Services Ltd, is accredited by UKAS (United Kingdom Accreditation Service), Laboratory UKAS Code 0644.

## 4. SAR Measurement System & Test Equipment

### 4.1. SAR Measurement System

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 DASY 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.

### 4.2. Test Equipment

The measuring equipment used to perform the tests documented in this report has been calibrated in accordance with the manufacturers' recommendations, and is traceable to recognized national standards. [Appendix 1](#) of the report details the equipment used.

## 5. SAR Measurement Procedure

### 5.1. Normal SAR Measurement Procedure

#### Step 1: 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. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties

#### Step 2: 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 locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) 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 KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r01

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: $\Delta x_{Area}$ , $\Delta y_{Area}$	≤ 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.	



**Step 3: Zoom Scan**

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures points (refer to table below) within a cube whose 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 g and 10 g and displays these values next to the job's label.

Zoom Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r01

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: $\Delta x_{Zoom}$ , $\Delta y_{Zoom}$			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$ : between 1 <sup>st</sup> two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$ : between subsequent points	≤ 1.5 · $\Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm
Note: $\delta$ 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 <i>reported</i> SAR from the area scan based <i>1-g SAR estimation</i> procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 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.				

**Step 4: Power drift measurement**

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

**Step 5: Z-Scan (FCC only)**

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation the extrapolated distance should not be larger than the step size in Z- direction.

## 5.2. Volumetric Scan Procedure

### Step 1: Repeat Step 1-4 in Section 5.1

### Step 2: Volume Scan

Volume Scans are used to assess peak SAR and averaged SAR measurements in largely extended 3-dimensional volumes within any phantom. This measurement does not need any previous area scan. The grid can be anchored to a user specific point or to the current probe location.

### Step 3: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

## **6. Measurement Uncertainty**

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently, the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor, such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

<b>Test Name</b>	<b>Confidence Level</b>	<b>Calculated Uncertainty</b>
GSM / GPRS / EDGE 850 / WCDMA FDD 5 / LTE Band 5 / Body Configurations 1g	95%	±18.36%
GSM / GPRS / EDGE 1900 / WCDMA FDD 2 / LTE Band 2 Body Configuration 1g	95%	±18.26%
Wi-Fi 2450 MHz Body Configuration 1g	95%	±18.35%
Wi-Fi 5GHz Body Configuration 1g	95%	±19.90%

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty, the published guidance of the appropriate accreditation body is followed.

See [Appendix 7](#) for all uncertainty tables.

## 7. Equipment Under Test (EUT)

### 7.1. Identification of Equipment Under Test (EUT)

<p><b>Test Sample Serial Number:</b></p>	<p><b>The following samples with serial numbers were used for the SAR testing:</b></p> <p>F4KMW02NG54F: GSM850 WCDMA FDD 5</p> <p>F4KMW02DG54F: PCS1900 WCDMA FDD 2 LTE 2</p> <p>F4KMW01XG54F: LTE 5</p> <p><b><u>VARIANT 1</u></b></p> <p>F4KMW00GG54F: Wi-Fi 2.4GHz (802.11b/g/n SISO/MIMO)</p> <p>F4KMW01XG54F: Wi-Fi 5.0 GHz Sub band 1 (802.11n HT40 SISO) Wi-Fi 5.0 GHz Sub band 2 (802.11a ANT 2 SISO, 802.11n HT20 SISO, 802.11n HT40 MIMO) Wi-Fi 5.0 GHz Sub band 3 (802.11n HT20 SISO, 802.11n HT20 MIMO, 802.11n HT40 ANT 1 SISO)</p> <p>F4KMW02DG54F: Wi-Fi 5.0 GHz Sub band 1 (802.11n HT40 MIMO) Wi-Fi 5.0 GHz Sub band 2 (802.11n HT20 MIMO, 802.11n HT40 SISO) Wi-Fi 5.0 GHz Sub band 4 (802.11a ANT2 SISO, 802.11n HT20 SISO, 802.11n HT20 MIMO, 802.11n HT40 ANT 1 SISO)</p> <p><i>Bluetooth</i></p> <p>F4KMW02NG54F: Wi-Fi 5.0 GHz Sub band 1 (802.11a ANT 2 SISO, 802.11n HT 20 SISO/MIMO) Wi-Fi 5.0 GHz Sub band 3 (802.11a ANT 2 SISO, 802.11n HT 40 ANT 2 SISO, 802.11n HT 40 MIMO)</p> <p>Wi-Fi 5.0 GHz Sub band 3 (802.11n HT40 ANT 2 SISO, 802.11n HT40 MIMO)</p> <p><b><u>VARIANT 2</u></b></p> <p>F4KMW01XG54F: <i>Bluetooth</i> Wi-Fi 2.4GHz (802.11n HT20 MIMO) Wi-Fi 5.0 GHz Sub band 1 (802.11n HT20 ANT 1 SISO)</p> <p>F4KMW00GG54F: Wi-Fi 5.0 GHz Sub band 2 (802.11n HT40 ANT 1 SISO) Wi-Fi 5.0 GHz Sub band 3 (802.11n HT40 ANT 2 SISO) Wi-Fi 5.0 GHz Sub band 4 (802.11n HT20 ANT 1 SISO)</p> <p><b>The following samples with serial numbers were used for the conducted power measurements:</b></p> <p>F4KMW01XG54F: GSM850/1900</p> <p>F4KMW02DG54F: WCDMA 2/5, LTE 2/5</p> <p>F4KMW014G54F: Wi-Fi 2.4 GHz / 5.0 GHz, <i>Bluetooth</i></p>
<p><b>Hardware Version Number:</b></p>	<p>REV 1.0</p>
<p><b>Software Version Number:</b></p>	<p>iOS 12A314 BB: 3.08.08</p>
<p><b>Country of Manufacture:</b></p>	<p>China</p>
<p><b>Date of Receipt:</b></p>	<p>14 July 2014</p>

## 7.2. Further Description of EUT

The EUT supports GSM 850/1900MHz, WCDMA FDD 2/5, LTE FDD 2/5/7, Wi-Fi 2.4 GHz / 5.0 GHz and *Bluetooth* bands. It also supports GPRS service with multi-slots class 10, EGPRS service with multi-slots class 10, HSPA with HSDPA Rel 6 (Category 10), HSUPA Rel 6 (Category 6) and DC-HSDPA Rel 8 (Category 24), WLAN 2.4 GHz (802.11 b/g/n) with MIMO, WLAN 5.0 GHz (802.11a/n) with MIMO, *Bluetooth* (EDR and *Bluetooth* 4.0), GPS, GLONASS and Airplay capabilities are also supported.

### Note:

Airplay feature supported in Wi-Fi 2.4 GHz and 5.0 GHz bands.

LTE FDD Band 7 is supported but it is disabled in the US version of this product.

## 7.3. Modifications Incorporated in the EUT

There were no modification during the course of testing the device

## 7.4. Support Equipment

The following support equipment was used to exercise the EUT during testing:

Description:	Brand Name:	Model Name or Number:	Serial Number:	Cable Length and Type:	Connected to Port
Communication Test Set	Agilent	8960 Series 10 (E5515C)	GB46311280	~4.0m Utiflex Cable	RF (Input / Output) Air Link
Communication Test Set	Agilent	8960 Series 10 (E5515E)	GB46200666	~4.0m Utiflex Cable	RF (Input / Output) Air Link
Communication Test Set	R&S	CMW500 (1201.0002K50)	145922	~4.0m Utiflex Cable	RF (Input / Output) Air Link
Communication Test Set	R&S	CMW500 (1201.0002K50)	146526	~4.0m Utiflex Cable	RF (Input / Output) Air Link
Communication Test Set	R&S	CMW500 (1201.0002K50)	145921	~4.0m Utiflex Cable	RF (Input / Output) Air Link
Communication Test Set	R&S	CMW500 (1201.0002K50)	145922	~4.0m Utiflex Cable	RF (Input / Output) Air Link

**7.5.Additional Information Related to Testing**

<b>Equipment Category</b>	2G GSM / PCS	TDMA 850/ 1900	GPRS EDGE
	3G WCDMA Band	FDD 2 / 5	RMC12.2 Kbps HSDPA Cat 6 HSPA Data Cat 6 DC-HSDPA Cat 24
	4G LTE Band	FDD 2 / 5	QPSK 16QAM
	Wi-Fi Band	(2.4 / 5.0) GHz	Data 802.11a/b/g/n
<b>Type of Unit</b>	Portable Transceiver		
<b>Intended Operating Environment:</b>	Within GSM, WCDMA, LTE , Wi-Fi and <i>Bluetooth</i> Coverage		
<b>Transmitter Maximum Output Power Characteristics:</b>	GSM850	Communication Test Set was configured to allow the EUT to transmit at a maximum power using Power Control Level (PCL) setting of 5.	
	PCS1900	Communication Test Set was configured to allow the EUT to transmit at a maximum power using Power Control Level (PCL) setting of 0.	
	WCDMA Band FDD 2 / 5	Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D01.	
	LTE Band FDD 2 / 5	Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D05.	
	2.4 GHz Wi-Fi 802.11b/g/n	Test Software was used to configure the EUT to transmit at a maximum measured power as per section 8.6	
	5.0 GHz Sub band 1 Wi-Fi 802.11a/n	Test Software was used to configure the EUT to transmit at a maximum measured power as per section 8.6	
	5.0 GHz Sub band 2 Wi-Fi 802.11a/n	Test Software was used to configure the EUT to transmit at a maximum measured power as per section 8.6	
	5.0 GHz Sub band 3 Wi-Fi 802.11a/n	Test Software was used to configure the EUT to transmit at a maximum measured power as per section 8.6	
5.0 GHz Sub band 4 Wi-Fi 802.11a/n	Test Software was used to configure the EUT to transmit at a maximum measured power as per section 8.6		

**Additional Information Related to Testing (Continued):**

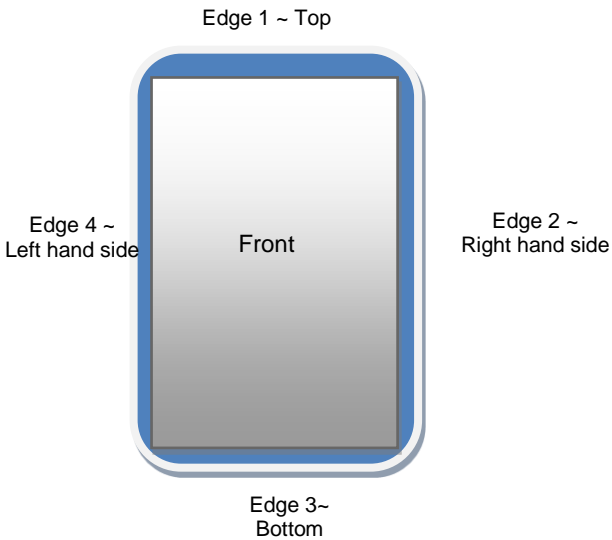
<b>Transmitter Frequency Range:</b>	GSM850	(824 to 849) MHz		
	PCS1900	(1850 to 1910) MHz		
	WCDMA FDD 2	(1852 to 1908) MHz		
	WCDMA FDD 5	(826 to 847) MHz		
	LTE Band 2	(1850 to 1910) MHz		
	LTE Band 5	(824 to 849) MHz		
	2.4 GHz Wi-Fi 802.11b/g/n	(2412 to 2462) MHz		
	5.0 GHz Sub band 1 Wi-Fi 802.11a/n	(5180 to 5240) MHz		
	5.0 GHz Sub band 2 Wi-Fi 802.11a/n	(5260 to 5320) MHz		
	5.0 GHz Sub band 3 Wi-Fi 802.11a/n	(5500 to 5700) MHz		
	5.0 GHz Sub band 4 Wi-Fi 802.11a/n	(5745 to 5825) MHz		
<b>Transmitter Frequency Allocation of EUT When Under Test:</b>	<b>Bands</b>	<b>Channel Number</b>	<b>Channel Description</b>	<b>Frequency (MHz)</b>
	GSM850	128	Low	824.2
		190	Middle	836.6
		251	High	848.8
	PCS1900	512	Low	1850.2
		661	Middle	1880.0
		810	High	1909.8
	WCDMA FDD 2	9262	Low	1852.4
		9400	Middle	1880.0
		9538	High	1907.6
	WCDMA FDD 5	4132	Low	826.4
		4183	Middle	836.6
		4233	High	846.6
	LTE Band 2	18700	Low	1860.0
		18900	Middle	1880.0
19100		High	1900.0	
LTE Band 5	20450	Low	829.0	
	20525	Middle	836.5	
	20625	High	844.0	

**Additional Information Related to Testing (Continued)**

Transmitter Frequency Allocation of EUT When Under Test:	Band: 2.4 / 5.0 GHz Wi-Fi 802.11a/n (HT20 / HT40)				
	Rule	20 MHz BW Ch.#	Frq. (MHz)	40 MHz BW Ch.#	Frq. (MHz)
	15.247	1	2412.0		
		6	2436.0		
		11	2462.0		
	5.2 U-NII-1	36	5180.0	38	5190.0
		40	5200.0		
		44	5220.0	46	5230.0
		48	5240.0		
	5.3 U-NII-2A	52	5260.0	54	5270.0
		56	5280.0		
		60	5300.0	62	5310.0
		64	5320.0		
	5.6 U-NII-2C	100	5500.0	102	5510.0
		104	5520.0		
		108	5540.0	110	5550.0
		112	5560.0		
		116	5580.0	118	5590.0
		120	5600.0		
		124	5620.0	126	5630.0
		128	5640.0		
		132	5660.0	134	5670.0
136		5680.0			
5.8 UNII-3	149	5745.0	151	5755.0	
	153	5765.0			
	157	5785.0	159	5795.0	
	161	5805.0			
	165	5825.0			
<b>Modulation(s):</b>	GMSK (GPRS/EDGE):				217 Hz
	QPSK(WCDMA / HSDPA/HSPA):				0Hz
	DBPSK, BPSK, CCK (Wi-Fi):				0 Hz
	QPSK, 16QAM (LTE):				0 Hz
<b>Modulation Scheme (Crest Factor):</b>	GMSK (GPRS/EDGE 2 Uplink)				4
	GMSK (GPRS/EDGE 1 Uplink)				8.3
	QPSK(WCDMA/ FDD / HSDPA)				1
	QPSK, 16QAM (LTE):				1
	DBPSK, BPSK, CCK (Wi-Fi802.11a/b/g/n):				1
<b>Antenna Type:</b>	Internal integral				
<b>Antenna Length:</b>	As specified in <a href="#">Appendix 10</a>				
<b>Number of Antenna Positions:</b>	WWAN ~ Primary Cellular Antenna			1 fixed	
	WWAN ~ Secondary Cellular Antenna – Rx Only			1 fixed	
	WLAN/WPAN ~ Primary Wi-Fi/Bluetooth Antenna			1 fixed	
	WLAN ~ Secondary Wi-Fi Antenna			1 fixed	
<b>Power Supply Requirement:</b>	5.1 V				
<b>Battery Type(s):</b>	Embedded Li-Ion				



**Additional Information Related to LTE Test parameter**

#	Description	Parameter
1	Identify the operating frequency range of each LTE transmission FCC band used by the device	LTE Band 2: frequency range – (1850 to 1910) MHz LTE Band 5: frequency range – (824 to 849) MHz
2	Identify the channel bandwidths used in each frequency band; e.g.: 1.4, 3, 5, 10, 15, 20 MHz etc.	Channel Bandwidths used are: B2 (1.4, 3, 5, 10, 15, 20) MHz B5 (1.4, 3, 5, 10) MHz
3	Identify the high, middle and low (H, M, L) channel numbers and frequencies tested in each LTE frequency band	B2 -20 MHz (H,M,L)= CH (19100,18900,18700); Freq (1900, 1880, 1860) MHz B5 -10 MHz (H,M,L)= CH (20625, 20525, 20450); Freq (844, 836.5, 829) MHz
4	Specify the UE category and uplink modulations used	The UE Category is 4 and the Uplink modulations used are QPSK, 16QAM.
5	Descriptions of the LTE transmitter and antenna implementation & identify whether it is a standalone transmitter operating independently of other wireless transmitters in the device or sharing hardware components and/or antenna(s) with other transmitters etc.	This model has only 1 main WWAN antenna for GSM/WCDMA/CDMA/LTE bands and 1 secondary antenna for Tx Receive only (as indicated in Appendix 10).
6	Identify the LTE Band Voice/data requirements in each operating mode and exposure condition with respect to head and body test configurations, antenna locations, handset flip-cover or slide positions, antenna diversity conditions, etc.	<p>The following exposure conditions with respect to body test are required for data modes due to EUT functionality and antenna locations.</p> <ol style="list-style-type: none"> <li>1) Body SAR is required at 0 mm separation distance.</li> <li>2) Hotspot Mode is not required, in accordance to KDB 616217 D04 SAR for laptop and tablets v01r01, as the overall dimension of the display section of the tablet is greater than 20 cm, SAR testing for hotspot mode is not required</li> <li>3) Body SAR with consideration for the following configurations with respect to the antenna location. The test separation distance between the EUT edge and phantom flat surface for this mode will be 0mm:</li> </ol> <p>Back of EUT Edge 1 (Top Edge) of EUT Edge 2 (Right Hand side) of EUT Edge 3 (Bottom Edge of EUT) Edge 4 (Left Hand side) of EUT</p>  <p>Note: Body SAR evaluation for the device, on the Front Surface with the separation distance of 0 mm to the flat phantom, is NOT performed because there is no use case for this configuration.</p>

**Additional Information Related to LTE Test parameter (Continued):**

#	Description	Parameter
7	Identify if Maximum Power Reduction (MPR) is optional or mandatory, i.e. built-in by design: a) only mandatory MPR may be considered during SAR testing, when the maximum output power is permanently limited by the MPR implemented within the UE; and only for the applicable RB (resource block) configurations specified in LTE standards b) A-MPR (additional MPR) must be disabled.	The EUT incorporates MPR as per 36.101 as shown in the section 8. MPR cannot be disabled after the phone is manufactured, MPR is mandatory. * Target MPR
8	Include the maximum average conducted output power measured on the required test channels for each channel bandwidth and UL modulation used in each frequency band: a) using 1 RB allocated at the low edge, centered and high edge of a channel b) using 50% RB allocated at the low edge, centered and high edge of a channel c) using 100% RB allocation	This is included in the section 8.6 of this report.
9	Identify all other U.S. wireless operating modes (GSM, 3G, Wi-Fi, Wi-Max, Bluetooth etc.), device/exposure configurations (head and body, antenna and handset flip-cover or slide positions, antenna diversity conditions etc.) and frequency bands used for these modes	The following bands are supported for the exposure conditions 1) GSM (850/1900), WCDMA FDD (2/5) - Exposure conditions: SAR required for GSM / WCDMA FDD / CDMA for Body configuration. 2) Bluetooth 2.4GHz (Basic Rate & EDR) - Exposure conditions: SAR required for Body configuration. 3) Wi-Fi 2.4GHz - Exposure conditions: SAR required for Body configuration. 4) Wi-Fi 5 GHz - Exposure conditions: SAR required for Body configuration.

**Additional Information Related to LTE Test parameter (Continued):**

#	Description	Parameter
10	Include the maximum average conducted output power measured for the other wireless mode and frequency bands	This is included in the section 8.5 to 8.9 of this report.
11	Identify the simultaneous transmission conditions for the voice and data configurations supported by all wireless modes, device configurations and frequency bands, for the head and body exposure conditions and device operating configurations (handset flip or cover positions, antenna diversity conditions etc.)	Bluetooth average power measurement is below the rated threshold therefore Individual SAR will not be tested. Simultaneous transmission consideration will be based on the <u>reported</u> SAR level. All simultaneous transmission combinations are identified and summarised in Section 12 of the report.
12	When power reduction is applied to certain wireless modes to satisfy SAR compliance for simultaneous transmission conditions, other equipment certification or operating requirements, include the maximum average conducted output power measured in each power reduction mode applicable to the simultaneous voice/data transmission configurations for such wireless configurations and frequency bands; and also include details of the power reduction implementation and measurement setup	Not applicable.
13	Include descriptions of the test equipment, test software, built-in test firmware etc. required to support testing the device when power reduction is applied to one or more transmitters/antennas for simultaneous voice/data transmission	R&S CMW500 communication simulator Communication tester which support LTE modes (Data) were used for testing.
14	When appropriate, include a SAR test plan proposal with respect to the above.	Not Applicable
15	If applicable, include preliminary SAR test data and/or supporting information in laboratory testing inquiries to address specific issues and concerns or for requesting further test reduction considerations appropriate for the device; for example simultaneous transmission configurations.	Not Applicable

**7.5.1. Operating Modes**

The EUT was tested in the following operating mode(s) unless otherwise stated:

- GSM850 Body – data allocated mode with Communication Test Set configured to allow the EUT to transmit at a maximum power using Power Control Level (PCL) setting of 5. Tested using 2 Uplink time slots.
- PCS1900 Body – data allocated mode with Communication Test Set configured to allow the EUT to transmit at a maximum power using Power Control Level (PCL) setting of 0. Tested using 2 Uplink time slots.

<b>GSM850: Power Table Settings used for Test Set</b>		<b>PCS1900: Power Table Settings used for Test Set</b>	
Power Control Level PCL	Nominal Power (dBm)	Power Control Level PCL	Nominal Power (dBm)
0 ... 2	39	22 ... 29	Reserved
3	37	30	33
4	35	31	32
<b>5</b>	<b>33</b>	<b>0</b>	<b>30</b>
6	31	1	28
7	29	2	26
8	27	3	24
9	25	4	22
10	23	5	20
11	21	6	18
12	19	7	16
13	17	8	14
14	15	9	12
15	13	10	10
16	11	11	8
17	9	12	6
18	7	13	4
19 ... 31	5	14	2
		15	0
		16 ... 21	Reserved

- WCDMA FDD 2, 5 - RMC 12.2kbps allocated mode with Communication Test Set configured to all "1's" to allow the EUT to transmit at a maximum as per KDB 941225 D01.
- WCDMA FDD 2, 5 - RMC 12.2kbps + HSUPA with Test loop mode 1 and TPC bits configured to all "1's", Sub-test 5, AG Index set to 21 and E-TFCI set to 81 with Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D01.
- WCDMA FDD 2, 5 - RMC 12.2kbps + HSDPA with Test loop mode 1 and TPC bits configured to all "1's", Sub-test 1 with Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D01.
- WCDMA FDD 2, 5 - DC HSDPA (Cat 24) with Test loop mode 1 and TPC bits configured to all "1's", Sub-test 1 with Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D01.

**Operating Modes (Continued)**

- LTE Band 2 - data allocated mode at QPSK on 20MHz BW channels, using a Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D05.
- LTE Band 5 - data allocated mode at QPSK on 10MHz BW channels, using a Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D05.
- 2.4 GHz Wi-Fi802.11b/g/n (SISO) - Data allocated mode using 'HyperTerminal' software to excise mode 'b', 'g' and 'n', with maximum power of up to 16.40 dBm, 16.32 dBm and 16.36 dBm respectively.
- 2.4 GHz Wi-Fi802.11n (MIMO) - Data allocated mode using 'HyperTerminal' software to excise mode 'n', with maximum power of up to 16.34 dBm, and 16.05 dBm respectively on Ant 1 and Ant 2.
- 5.0 GHz Wi-Fi802.11a/n Sub band 1 (SISO) - Data allocated mode using 'HyperTerminal' software to excise mode 'a' and 'n', with maximum power of up to 15.9 dBm and 15.9 dBm respectively.
- 5.0 GHz Wi-Fi802.11n Sub band 1 (MIMO) - Data allocated mode using 'HyperTerminal' software to excise mode 'n', with maximum power of up to 15.9 dBm and 15.0 dBm respectively on HT20 Ant 1 and Ant 2; 15.7 dBm and 14.3 dBm respectively on HT40 Ant 1 and Ant 2 respectively.
- 5.0 GHz Wi-Fi802.11a/n Sub band 2 (SISO) - Data allocated mode using 'HyperTerminal' software to excise mode 'a' and 'n', with maximum power of up to 15.9 dBm and 16.0 dBm respectively.
- 5.0 GHz Wi-Fi802.11n Sub band 2 (MIMO) - Data allocated mode using 'HyperTerminal' software to excise mode 'n', with maximum power of up to 15.8 dBm, and 15.4 dBm respectively on HT20 Ant 1 and Ant 2; 15.6 dBm and 14.3 dBm respectively on HT40 Ant 1 and Ant 2 respectively.
- 5.0 GHz Wi-Fi802.11a/n Sub band 3 (SISO) - Data allocated mode using 'HyperTerminal' software to excise mode 'a' and 'n', with maximum power of up to 14.9 dBm and 14.9 dBm respectively.
- 5.0 GHz Wi-Fi802.11n Sub band 3 (MIMO) - Data allocated mode using 'HyperTerminal' software to excise mode 'n', with maximum power of up to 13.1 dBm and 11.7 dBm respectively on HT20 Ant 1 and Ant 2; 14.8 dBm and 13.5 dBm respectively on HT40 Ant 1 and Ant 2 respectively.
- 5.0 GHz Wi-Fi802.11a/n Sub band 4 (SISO) - Data allocated mode using 'HyperTerminal' software to excise mode 'a' and 'n', with maximum power of up to 15.4 dBm, and 15.4 dBm respectively.
- 5.0 GHz Wi-Fi802.11n Sub band 4 (MIMO) - Data allocated mode using 'HyperTerminal' software to excise mode 'n', with maximum power of up to 15.3 dBm, and 13.9 dBm respectively on HT20 Ant 1 and Ant 2; 14.9 dBm and 13.8 dBm respectively on HT40 Ant 1 and Ant 2 respectively.

**7.6.Nominal and Maximum Output power:**

Bands	GPRS (GMSK)	
	Tx Slot 1	Tx Slot 2
	Target + Tolerance ± (dB)	Target + Tolerance ± (dB)
GSM850	27.50	24.50
PCS1900	22.25	19.75
Bands	EDGE GMSK (MCS1-4)	
GSM850	27.50	24.50
PCS1900	22.25	19.75
Bands	EDGE 8PSK (MCS5-9)	
GSM850	27.25	24.25
PCS1900	22.25	19.25

Band	CS	HS
	Target + Tolerance ± (dB)	Target + Tolerance ± (dB)
WCDMA FDD 2	13.25	13.25
WCDMA FDD 5	18.75	18.75

Bands	Target + Tolerance ± (dB)					
	QPSK			16QAM		
	1RB	50% RB	100% RB	1RB	50% RB	100% RB
LTE Band 2	13.00	13.00	13.00	13.00	13.00	13.00
LTE Band 5	18.75	18.75	18.75	18.75	18.75	18.75

Channel	Center Frequency (MHz)	Target + Tolerance ± (dB)			
		802.11b (SISO)	802.11g (SISO)	802.11n HT20 (SISO)	802.11n HT20 (MIMO CDD)
1	2412.0	16.50	15.50	15.50	14.50
6	2437.0	16.50	16.50	16.50	16.50
11	2462.0	16.50	15.00	15.00	14.00

**Nominal and Maximum Output power (Continued):**

Channel	Center Frequency (MHz)	Target + Tolerance $\pm$ (dB)			
		802.11a (SISO)	802.11n HT20 (SISO)	802.11 n HT20 (MIMO CDD)	802.11n HT20 (MIMO STBC)
36	5180.0	16.00	16.00	16.00	16.00
40	5200.0	16.00	16.00	16.00	16.00
44	5220.0	16.00	16.00	16.00	16.00
48	5240.0	16.00	16.00	16.00	16.00
52	5260.0	16.00	16.00	16.00	16.00
56	5280.0	16.00	16.00	16.00	16.00
60	5300.0	16.00	16.00	16.00	16.00
64	5320.0	15.00	15.00	14.00	14.00
100	5500.0	14.00	14.00	13.50	13.50
104	5520.0	15.00	15.00	15.00	15.00
108	5540.0	15.00	15.00	15.00	15.00
112	5560.0	15.00	15.00	15.00	15.00
116	5580.0	15.00	15.00	15.00	15.00
120	5600.0	15.00	15.00	15.00	15.00
124	5620.0	15.00	15.00	15.00	15.00
128	5640.0	15.00	15.00	15.00	15.00
132	5660.0	15.00	15.00	15.00	15.00
136	5680.0	15.00	15.00	15.00	15.00
140	5700.0	14.00	14.00	13.00	13.00
149	5745.0	14.00	14.00	12.50	12.50
153	5765.0	15.50	15.50	15.50	15.50
157	5785.0	15.50	15.50	15.50	15.50
161	5805.0	15.50	15.50	15.50	15.50
165	5825.0	15.50	15.50	15.50	15.50

**Nominal and Maximum Output power (Continued):**

Channel	Center Frequency (MHz)	Target + Tolerance ± (dB)		
		802.11n HT40 (SISO)	802.11N HT40 (MIMO CDD)	802.11n HT40 (MIMO STBC)
38	5190.0	13.50	11.50	11.50
46	5230.0	16.00	16.00	16.00
54	5270.0	16.00	16.00	16.00
62	5310.0	13.50	11.50	11.50
102	5510.0	14.00	12.00	12.00
110	5550.0	15.00	15.00	15.00
118	5590.0	15.00	15.00	15.00
126	5630.0	15.00	15.00	15.00
134	5670.0	15.00	15.00	15.00
151	5755.0	12.00	10.50	10.50
159	5795.0	15.50	15.50	15.50

Band	Target + Tolerance ± (dB)
Bluetooth	BR
	13.0

**Note:**

1. As per KDB865664 D02 SAR Reporting v01, 2.1.4(a), the nominal and maximum average source based rated power, declared and supplied by manufacturer are shown in the above tables.
2. These are specified maximum allowed average power for all the wireless modes and frequencies bands supported.



**7.7. Simultaneous Transmission Conditions**

Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneous transmitting antenna.

#	Simultaneous transmission conditions								
	WWAN			WLAN					WPAN
	GSM Data	WCDMA Data	LTE Data	Wi-Fi 802.11b/g/n		Wi-Fi 802.11a/n			Bluetooth
SISO (Ant 1)				MIMO (Ant 1 + Ant 2)	SISO (Ant 1)	SISO (Ant 2)	MIMO (Ant 1 + Ant 2)		
1	X			X					
2		X		X					
3			X	X					
4	X				X				
5		X			X				
6			X		X				
7	X					X			X
8		X				X			X
9			X			X			X
10	X						X		X
11		X					X		X
12			X				X		X
13	X							X	X
14		X						X	X
15			X					X	X
16	X								X
17		X							X
18			X						X
19						X			X
20							X		X
21								X	X

**Note:**

Based on the customer declaration, the combinations mentioned above are considered for Simultaneous Transmission analysis in Section 12 of this report. 2.4 GHz cannot transmit simultaneously with Bluetooth as the Wi-Fi Ant 1 antenna is shared between Wi-Fi 2.4 GHz and BT. 2.4 GHz Ant 2 does not support standalone operation hence, is not considered for Simultaneous analysis.

## **8. RF Exposure Conditions (Test Configurations)**

Refer to [Appendix 10](#) "Antenna Locations and Separation Distances" for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

### **8.1. Configuration and Peripherals**

The EUT was tested in the following configuration(s) unless otherwise stated:

- Standalone fully charged battery powered.
- Body configurations were evaluated at 0mm separation.

#### **Body Configuration**

- a) The EUT was placed in a normal operating position where the centre of EUT was aligned with the centre reference point on the flat section of the 'Eli' phantom.
- b) With the EUT touching the phantom at an imaginary centre line. The EUT was aligned with a marked plane (X and Y axis) consisting of two lines.
- c) For the touch-safe position the EUT was gradually moved towards the flat section of the 'Eli' phantom until any point of the EUT touched the phantom.
- d) SAR measurements were evaluated at maximum power and the unit was operated for an appropriate period prior to the evaluation in order to minimise the drift.
- e) The device was keyed to operate continuously in the transmit mode for the duration of the test.
- f) The location of the maximum spatial SAR distribution (hotspot) was determined relative to the EUT and its antenna.
- g) The EUT was transmitting at full power throughout the duration of the test powered by a fully charged battery.

### **8.2. Wi-Fi/ BT Vendors**

Model A1601 is a tablet with multimedia functions (music, application support and video), IEEE 802.11 a/b/g/n, MIMO 2X2, Bluetooth radio

There are two vendors of the Wi-Fi/Bluetooth radio modules to support the production volumes of the device. The two variants are referenced in this report as:

**VARIANT 1 = Wi-Fi/BT module vendor 1**

**VARIANT 2 = Wi-Fi/BT module vendor 2**

The Wi-Fi/Bluetooth radio modules have the same mechanical outline (e.g., the same package dimension and pin-out layout), use the same on-board antenna matching circuit, have an identical antenna structure, and are built and tested to conform to the same specifications and to operate within the same tolerances.

Complete SAR evaluation is performed on the device with one Wi-Fi/Bluetooth radio module and then, the test is repeated on the device with the other Wi-Fi/Bluetooth module at the highest peak SAR value.

**8.3. Configuration Consideration**

Technology Antenna	Configuration	Antenna-to-User Separation	Position	Antenna-to-Edge Separation (mm)	Evaluation Considered
WWAN (~ Primary Cellular)	Body	0mm	Back	2.0	Yes
			Edge 1 (Top Edge)	2.0	Yes
			Edge 2 (Right Edge)	24.8	Yes
			Edge 3 (Bottom Edge)	185.1	No
			Edge 4 (Left Edge)	64.1	No
WLAN/WPAN (~ Primary Wi-Fi /BT ~ Wi-Fi 1)	Body	0mm	Back	6.5	Yes
			Edge 1 (Top Edge)	181.3	No
			Edge 2 (Right Edge)	93.5	No
			Edge 3 (Bottom Edge)	3.4	Yes
			Edge 4 (Left Edge)	9.8	Yes
WLAN (~ Primary Wi-Fi ~ Wi-Fi 2)	Body	0mm	Back	6.5	Yes
			Edge 1 (Top Edge)	191.1	No
			Edge 2 (Right Edge)	14.4	Yes
			Edge 3 (Bottom Edge)	3.4	Yes
			Edge 4 (Left Edge)	93.5	No

**Note:**

1. The Antenna to Edge distances is included in the Appendix 10 of the report.
2. Test exemption is as per FCC KDB publication 447498
  - 1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances*  $\leq 50$  mm are determined by:
 
$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f_{\text{GHz}}}] \leq 3.0$$
 for 1-g SAR and  $\leq 7.5$  for 10-g extremity SAR,<sup>16</sup> where
    - $f_{\text{GHz}}$  is the RF channel transmit frequency in GHz
    - Power and distance are rounded to the nearest mW and mm before calculation<sup>17</sup>
    - The result is rounded to one decimal place for comparison

**8.4. SAR Test Exclusion Consideration**

Frequency Band	Configuration(s)	
	Hotspot Mode	Body
GSM850	Yes	No
PCS1900	Yes	No
WCDMA FDD 2	Yes	No
WCDMA FDD 5	Yes	No
LTE Band 2	Yes	No
LTE Band 5	Yes	No
WLAN 2.4 GHz	Yes	No
WLAN 5.0 GHz	Yes	No
<i>Bluetooth</i>	Yes	No

**Note:**

1. In accordance to KDB 616217 D04 SAR for laptop and tablets v01r01, as the overall dimension of the display section of the tablet is greater than 20 cm, SAR testing for hotspot mode is not required.
2. The details for the Maximum Rated Power and tolerance(s) can be found in section 7.6.

**8.5. RF Output Average Power Measurement: 2G**

**8.5.1. GSM850  
GPRS (GMSK) – Coding Scheme: CS1**

Channel Number	Frequency (MHZ)	Avg Burst Power (dBm)		Frame Power (dBm)	
		1Uplink	2Uplink	1Uplink	2Uplink
128	824.2	28.1	25.0	19.1	19.0
190	836.6	28.2	24.9	19.2	18.9
251	848.8	28.2	25.0	19.2	19.0

**EDGE (GMSK) – Coding Scheme: MCS4**

Channel Number	Frequency (MHZ)	Avg Burst Power (dBm)		Frame Power (dBm)	
		1Uplink	2Uplink	1Uplink	2Uplink
128	824.2	28.1	25.0	19.1	19.0
190	836.6	28.2	24.9	19.2	18.9
251	848.8	28.2	25.0	19.2	19.0

**EDGE (8PSK) – Coding Scheme: MCS9**

Channel Number	Frequency (MHZ)	Avg Burst Power (dBm)		Frame Power (dBm)	
		1Uplink	2Uplink	1Uplink	2Uplink
128	824.2	26.7	23.3	16.8	17.3
190	836.6	26.7	23.3	16.7	17.3
251	848.8	26.7	23.3	16.8	17.3

**Note:**

**Scale factor for uplink time slot:**

- 1 Uplink: time slot ratio = 8:1 =>  $10 \cdot \log(8/1) = 9.03 \text{ dB}$
- 2 Uplink: time slot ratio = 8:2 =>  $10 \cdot \log(8/2) = 6.02 \text{ dB}$

The worst-case configuration and mode for SAR testing is determined to be as follows:

- GMSK (GPRS) mode with **1 uplink**, based on the output power measurements above
- SAR is not required for EGPRS (8PSK) mode because its output power is less than that of GPRS Mode

### 8.5.2. PCS1900 GPRS (GMSK) – Coding Scheme: CS1

Channel Number	Frequency (MHZ)	Avg Burst Power (dBm)		Frame Power (dBm)	
		1Uplink	2Uplink	1Uplink	2Uplink
512	1850.2	21.8	18.9	12.8	12.9
661	1880.0	21.7	19.0	12.7	13.0
810	1909.8	21.8	18.9	12.8	12.9

### EDGE (GMSK) – Coding Scheme: MCS4

Channel Number	Frequency (MHZ)	Avg Burst Power (dBm)		Frame Power (dBm)	
		1Uplink	2Uplink	1Uplink	2Uplink
512	1850.2	21.8	18.9	12.8	12.9
661	1880.0	21.7	19.0	12.7	13.0
810	1909.8	21.8	18.9	12.8	12.9

### EDGE (8PSK) – Coding Scheme: MCS9

Channel Number	Frequency (MHZ)	Avg Burst Power (dBm)		Frame Power (dBm)	
		1Uplink	2Uplink	1Uplink	2Uplink
512	1850.2	20.7	17.6	11.7	11.6
661	1880.0	20.6	17.7	11.6	11.7
810	1909.8	20.8	17.8	11.8	11.8

#### Note:

#### Scale factor for uplink time slot:

- 1 Uplink: time slot ratio = 8:1 =>  $10 \cdot \log(8/1) = 9.03 \text{ dB}$
- 2 Uplink: time slot ratio = 8:2 =>  $10 \cdot \log(8/2) = 6.02 \text{ dB}$

The worst-case configuration and mode for SAR testing is determined to be as follows:

- GMSK (GPRS) mode with **2 uplink**, based on the output power measurements above
- SAR is not required for EGPRS (8PSK) mode because its output power is less than that of GPRS Mode

**8.6. RF Output Average Power Measurement: WCDMA**

**8.6.1. RMC / HSDPA / HSUPA**

Modes		HSDPA				HSUPA					WCDMA
Sets		1	2	3	4	1	2	3	4	5	Voice / RMC 12.2kbps
Band	Channel	Power [dBm]	Power [dBm]	Power [dBm]	Power [dBm]	Power [dBm]	Power [dBm]	Power [dBm]	Power [dBm]	Power [dBm]	Power [dBm]
Band 2 (1900 MHz)	UL:9262 DL:9662	10.9	10.9	10.5	10.4	11.0	9.3	9.9	10.9	10.8	12.2
	UL:9400 DL:9800	10.3	10.4	9.9	9.9	10.5	9.1	9.0	10.4	10.2	11.7
	UL:9538 DL:9938	11.2	11.2	10.7	10.8	10.5	10.1	10.3	10.4	11.0	12.7
Band 5 (850 MHz)	UL: 4132 DL: 4357	16.7	16.7	16.2	16.2	16.0	15.4	15.0	15.9	16.6	18.0
	UL: 4183 DL: 4408	16.5	16.5	16.1	16.0	16.3	15.5	15.5	16.2	16.4	17.8
	UL: 4233 DL: 4458	16.6	16.6	16.1	16.1	16.6	15.1	14.9	16.5	16.6	17.9
βc		2	12	15	15	11	6	15	2	15	
βd		15	15	8	4	15	15	9	15	15	
ΔACK, ΔNACK, ΔCQI		8	8	8	8	8	8	8	8	8	
AGV		-	-	-	-	20	12	15	17	21	

**8.6.2. DC-HSDPA (Cat 24)**

Modes		DC-HSDPA (Cat 24)				WCDMA
Sets		1	2	3	4	Voice / RMC 12.2kbps
Band	Channel	Power [dBm]	Power [dBm]	Power [dBm]	Power [dBm]	Power [dBm]
1900 (Band 2)	UL:9262 DL:9662	10.5	10.5	10.5	10.5	12.2
	UL:9400 DL:9800	10.5	10.1	10.1	10.1	11.7
	UL:9538 DL:9938	11.2	10.4	10.4	10.4	12.7
Band 5 (850 MHz)	UL: 4132 DL: 4357	16.8	16.4	16.4	16.4	18.0
	UL: 4183 DL: 4408	16.8	16.4	16.4	16.4	17.8
	UL: 4233 DL: 4458	16.8	16.4	16.4	16.4	17.9
βc		2	12	15	15	
βd		15	15	8	4	
ΔACK, ΔNACK, ΔCQI		8	8	8	8	
AGV		-	-	-	-	

**8.7. RF Output Average Power Measurement: LTE**

**8.7.1. LTE Band 2 (1900 MHz)**

Ch. BW	Modulations	RB Config	Start RB Offset		Power Back-off	Actual Max Power (dBm)	Measured Avg Power (dBm).		
							Frequency 1860.0 MHz (Low)	Frequency 1880.0 MHz (Middle)	Frequency 1900.0 MHz (High)
20 MHz	QPSK	1	Low	0	(0)	12.9	12.2	12.3	12.2
		1	Mid	49	(0)	12.9	12.3	12.5	12.0
		1	High	99	(0)	12.9	12.3	12.1	11.7
		50	low	0	(0)	12.9	12.2	12.2	12.0
		50	Mid	25	(0)	12.9	12.2	12.2	12.2
		50	High	50	(0)	12.9	12.2	12.2	11.9
		100	-	0	(1)	12.9	12.2	12.4	12.1
	16QAM	1	Low	0	(1)	12.9	12.1	12.2	12.3
		1	Mid	49	(1)	12.9	12.0	12.2	12.3
		1	High	99	(1)	12.9	12.0	11.8	11.9
		50	low	0	(2)	12.9	12.1	12.2	12.1
		50	Mid	25	(2)	12.9	12.0	12.2	12.0
		50	High	50	(2)	12.9	12.1	12.2	12.0
		100	-	0	(2)	12.9	12.3	12.3	12.2
Ch. BW	Modulations	RB Config	Start RB Offset		Power Back-off	Actual Max Power (dBm)	Measured Avg Power (dBm).		
							Frequency 1857.5 MHz (Low)	Frequency 1880.0 MHz (Middle)	Frequency 1902.5 MHz (High)
15 MHz	QPSK	1	Low	0	(0)	12.9	12.3	12.1	12.3
		1	Mid	37	(0)	12.9	12.3	12.3	11.9
		1	High	74	(0)	12.9	12.5	12.2	11.9
		36	low	0	(1)	12.9	12.1	12.2	12.1
		36	Mid	19	(1)	12.9	12.0	12.2	12.0
		36	High	39	(1)	12.9	12.2	12.3	11.9
		75	-	0	(1)	12.9	12.1	12.1	12.1
	16QAM	1	Low	0	(1)	12.9	11.9	12.2	12.2
		1	Mid	37	(1)	12.9	11.7	12.2	11.7
		1	High	74	(1)	12.9	11.9	12.1	11.7
		36	low	0	(2)	12.9	12.1	12.3	12.2
		36	Mid	19	(2)	12.9	12.2	12.3	11.8
		36	High	39	(2)	12.9	12.2	12.2	11.9
		75	-	0	(2)	12.9	12.2	12.2	12.1



**LTE Band 2 (1900 MHz) (Continued)**

Ch. BW	Modulations	RB Config	Start RB Offset		Power Back-off	Actual Max Power (dBm)	Measured Avg Power (dBm).		
							Frequency 1855.0 MHz (Low)	Frequency 1880.0 MHz (Middle)	Frequency 1905.0 MHz (High)
10 MHz	QPSK	1	Low	0	(0)	12.9	11.9	12.3	12.0
		1	Mid	24	(0)	12.9	12.1	12.4	12.2
		1	High	49	(0)	12.9	11.9	12.3	11.9
		25	Low	0	(1)	12.9	12.0	12.5	11.9
		25	Mid	12	(1)	12.9	12.0	12.2	12.0
		25	High	25	(1)	12.9	11.9	12.4	12.0
		50	-	0	(1)	12.9	12.0	12.4	11.9
	16QAM	1	Low	0	(1)	12.9	12.1	12.1	11.9
		1	mid	24	(1)	12.9	11.6	12.3	11.9
		1	High	49	(1)	12.9	11.7	12.0	11.9
		25	Low	0	(2)	12.9	11.9	12.4	12.0
		25	Mid	12	(2)	12.9	12.1	12.3	12.1
		25	High	25	(2)	12.9	12.0	12.3	11.9
		50	-	0	(2)	12.9	11.8	12.1	12.0
Ch. BW	Modulations	RB Config	Start RB Offset		Power Back-off	Actual Max Power (dBm)	Measured Avg Power (dBm).		
							Frequency 1852.5 MHz (Low)	Frequency 1880.0 MHz (Middle)	Frequency 1907.5 MHz (High)
5 MHz	QPSK	1	Low	0	(0)	12.9	12.2	12.2	12.0
		1	Mid	12	(0)	12.9	12.2	12.1	12.1
		1	High	24	(0)	12.9	12.1	12.4	11.7
		12	low	0	(1)	12.9	12.1	12.2	12.0
		12	Mid	6	(1)	12.9	12.3	12.2	12.0
		12	High	13	(1)	12.9	12.3	12.3	11.9
		25	-	0	(1)	12.9	12.1	12.3	12.1
	16QAM	1	Low	0	(1)	12.9	12.1	12.0	11.8
		1	Mid	12	(1)	12.9	12.2	12.2	11.8
		1	High	24	(1)	12.9	12.3	12.4	11.8
		12	low	0	(2)	12.9	12.3	12.4	11.9
		12	Mid	6	(2)	12.9	12.1	12.5	12.0
		12	High	13	(2)	12.9	12.3	12.4	11.9
		25	-	0	(2)	12.9	12.3	12.4	12.1

**LTE Band 2 (1900 MHz) (Continued)**

Ch. BW	Modulations	RB Config	Start RB Offset		Power Back-off	Actual Max Power (dBm)	Measured Avg Power (dBm).		
							Frequency 1851.5 MHz (Low)	Frequency 1880 MHz (Middle)	Frequency 1908.5 MHz (High)
3 MHz	QPSK	1	Low	0	(0)	12.9	12.5	12.3	11.7
		1	Mid	7	(0)	12.9	12.2	12.5	11.7
		1	High	14	(0)	12.9	12.1	12.4	11.6
		8	Low	0	(1)	12.9	12.0	12.3	12.0
		8	Mid	4	(1)	12.9	12.2	12.2	12.0
		8	High	7	(1)	12.9	12.3	12.4	12.0
		15	-	0	(1)	12.9	12.1	12.2	11.9
	16QAM	1	Low	0	(1)	12.9	12.1	12.0	12.1
		1	Mid	7	(1)	12.9	12.1	12.3	11.9
		1	High	14	(1)	12.9	12.0	12.4	11.8
		8	Low	0	(2)	12.9	12.1	12.2	12.1
		8	Mid	4	(2)	12.9	11.9	12.4	12.0
		8	High	7	(2)	12.9	12.1	12.3	11.8
		15	-	0	(2)	12.9	12.3	12.4	12.1
Ch. BW	Modulations	RB Config	Start RB Offset		Power Back-off	Actual Max Power (dBm)	Measured Avg Power (dBm).		
							Frequency 1850.7 MHz (Low)	Frequency 1880 MHz (Middle)	Frequency 1909.3 MHz (High)
1.4 MHz	QPSK	1	Low	0	(0)	12.9	12.3	12.4	11.9
		1	Mid	3	(0)	12.9	12.3	12.5	12.1
		1	High	5	(0)	12.9	12.3	12.3	12.1
		3	Low	0	(0)	12.9	12.3	12.4	11.9
		3	Mid	1	(0)	12.9	12.1	12.4	11.9
		3	high	3	(0)	12.9	12.0	12.1	11.8
		6	-	0	(1)	12.9	12.0	12.7	12.0
	16QAM	1	Low	0	(1)	12.9	11.8	12.3	11.8
		1	Mid	3	(1)	12.9	11.8	12.3	11.6
		1	High	5	(1)	12.9	11.8	12.1	11.6
		3	Low	0	(1)	12.9	12.1	11.9	12.0
		3	Mid	1	(1)	12.9	12.2	12.0	11.8
		3	high	3	(1)	12.9	12.3	12.1	11.8
		6	-	0	(2)	12.9	12.2	12.2	11.9

**8.7.2.LTE Band 5 (850 MHz)**

Ch. BW	Modulations	RB Config	Start RB Offset		Power Back-off	Actual Max Power (dBm)	Measured Avg Power (dBm).		
							Frequency 829.0 MHz (Low)	Frequency 836.5 MHz (Middle)	Frequency 844.0 MHz (High)
10 MHz	QPSK	1	Low	0	(0)	17.75	17.5	17.3	17.4
		1	Mid	24	(0)	17.75	17.1	17.4	17.3
		1	High	49	(0)	17.75	17.3	17.5	17.2
		25	Low	0	(1)	17.75	17.4	17.2	17.3
		25	Mid	12	(1)	17.75	17.2	17.2	17.3
		25	High	25	(1)	17.75	17.2	17.3	17.2
		50	-	0	(1)	17.75	17.1	17.2	17.2
	16QAM	1	Low	0	(1)	17.75	17.5	17.1	17.2
		1	mid	24	(1)	17.75	17.2	17.2	17.1
		1	High	49	(1)	17.75	17.3	17.3	17.0
		25	Low	0	(2)	17.75	17.3	17.2	17.3
		25	Mid	12	(2)	17.75	17.3	17.2	17.4
		25	High	25	(2)	17.75	17.2	17.3	17.3
50	-	0	(2)	17.75	17.1	17.1	17.2		
Ch. BW	Modulations	RB Config	Start RB Offset		Power Back-off	Actual Max Power (dBm)	Measured Avg Power (dBm).		
							Frequency 826.5 MHz (Low)	Frequency 836.5 MHz (Middle)	Frequency 846.5 MHz (High)
5 MHz	QPSK	1	Low	0	(0)	17.75	17.5	17.3	17.3
		1	Mid	12	(0)	17.75	17.4	17.3	17.2
		1	High	24	(0)	17.75	17.3	17.3	17.0
		12	low	0	(1)	17.75	17.3	17.3	17.2
		12	Mid	6	(1)	17.75	17.3	17.3	17.2
		12	High	13	(1)	17.75	17.3	17.3	17.2
		25	-	0	(1)	17.75	17.3	17.3	17.2
	16QAM	1	Low	0	(1)	17.75	17.6	17.2	17.2
		1	Mid	12	(1)	17.75	17.6	17.1	17.0
		1	High	24	(1)	17.75	17.3	17.2	16.9
		12	low	0	(2)	17.75	17.3	17.3	17.2
		12	Mid	6	(2)	17.75	17.3	17.4	17.3
		12	High	13	(2)	17.75	17.2	17.4	17.2
25	-	0	(2)	17.75	17.2	17.2	17.2		

**LTE Band 5 (850 MHz) (Continued)**

Ch. BW	Modulations	RB Config	Start RB Offset		Power Back-off	Actual Max Power (dBm)	Measured Avg Power (dBm).		
							Frequency 825.5 MHz (Low)	Frequency 836.5 MHz (Middle)	Frequency 847.5 MHz (High)
3 MHz	QPSK	1	Low	0	(0)	17.75	17.6	17.3	17.2
		1	Mid	7	(0)	17.75	17.5	17.3	17.2
		1	High	14	(0)	17.75	17.1	17.3	16.9
		8	Low	0	(1)	17.75	17.5	17.3	17.3
		8	Mid	4	(1)	17.75	17.3	17.3	17.3
		8	High	7	(1)	17.75	17.2	17.3	17.2
		15	-	0	(1)	17.75	17.2	17.3	17.2
	16QAM	1	Low	0	(1)	17.75	17.4	17.2	17.4
		1	Mid	7	(1)	17.75	17.3	17.2	17.3
		1	High	14	(1)	17.75	17.0	17.1	17.1
		8	Low	0	(2)	17.75	17.4	17.3	17.4
		8	Mid	4	(2)	17.75	17.3	17.3	17.4
		8	High	7	(2)	17.75	17.1	17.3	17.3
		15	-	0	(2)	17.75	17.3	17.3	17.3
Ch. BW	Modulations	RB Config	Start RB Offset		Power Back-off	Actual Max Power (dBm)	Measured Avg Power (dBm).		
							Frequency 824.7 MHz (Low)	Frequency 836.5 MHz (Middle)	Frequency 848.3 MHz (High)
1.4 MHz	QPSK	1	Low	0	(0)	17.75	17.6	17.3	17.3
		1	Mid	3	(0)	17.75	17.6	17.4	17.1
		1	High	5	(0)	17.75	17.5	17.4	16.9
		3	Low	0	(0)	17.75	17.5	17.2	17.2
		3	Mid	1	(0)	17.75	17.5	17.3	17.2
		3	high	3	(0)	17.75	17.5	17.3	17.1
		6	-	0	(1)	17.75	17.5	17.3	17.1
	16QAM	1	Low	0	(1)	17.75	17.3	17.2	16.8
		1	Mid	3	(1)	17.75	17.3	17.2	17.1
		1	High	5	(1)	17.75	17.4	17.2	16.8
		3	Low	0	(1)	17.75	17.1	17.3	17.2
		3	Mid	1	(1)	17.75	17.1	17.3	17.2
		3	high	3	(1)	17.75	17.1	17.4	17.0
		6	-	0	(2)	17.75	17.4	17.3	17.2

**8.8. RF Output Average Power Measurement: Wi-Fi**

**8.8.1. Wi-Fi 802.11b/g/n (2.4 GHz) - SISO**

		Avg Power (dBm)		
		Antenna 1	Antenna 2	
Channel Number	Frequency (MHZ)	(1Mbps)	(1Mbps)	Operating Mode
1	2412.0	16.40	Not Supported	802.11b
6	2437.0	16.40		
11	2462.0	16.40		
Channel Number	Frequency (MHZ)	(6Mbps)	(6Mbps)	Operating Mode
1	2412.0	15.30	Not Supported	802.11g
6	2437.0	16.32		
11	2462.0	14.85		
Channel Number	Frequency (MHZ)	(6.5Mbps)	(6.5Mbps)	Operating Mode
1	2412.0	15.20	Not Supported	802.11n HT20
6	2437.0	16.36		
11	2462.0	14.85		

**8.8.2. Wi-Fi 802.11b/g/n (2.4 GHz) - MIMO**

		Avg Power (dBm)		
		Antenna 1	Antenna 2	
Channel Number	Frequency (MHZ)	(1Mbps)	(1Mbps)	Operating Mode
1	2412.0	14.50	13.70	802.11n, HT20 (CDD)
6	2437.0	16.34	16.05	
11	2462.0	14.00	13.10	

**8.8.3. Wi-Fi802.11a/n (5.0 GHz) – SISO Sub Band 1 (5.2 GHz UNII)**

		Avg Power (dBm)		
		Antenna 1	Antenna 2	
Channel Number	Frequency (MHZ)	6 Mbps	6 Mbps	Operating Mode
36	5180.0	Not Supported	15.9	802.11a
40	5200.0		15.7	
48	5240.0		15.9	
Channel Number	Frequency (MHZ)	6 Mbps	6 Mbps	Operating Mode
36	5180.0	15.8	15.9	802.11n, HT20
40	5200.0	15.7	15.8	
48	5240.0	15.9	16.0	
Channel Number	Frequency (MHZ)	13.5 Mbps	13.5 Mbps	Operating Mode
38	5190.0	13.3	13.4	802.11n, HT40
46	5230.0	15.8	15.9	

**8.8.4. Wi-Fi802.11a/n (5.0 GHz) – MIMO Sub Band 1 (5.2 GHz UNII)**

		Avg Power (dBm)		
		Antenna 1	Antenna 2	
Channel Number	Frequency (MHZ)	6 Mbps	6 Mbps	Operating Mode
36	5180.0	15.9	14.9	802.11n, HT20 CDD
40	5200.0	15.9	14.9	
48	5240.0	15.8	15.0	
Channel Number	Frequency (MHZ)	13.5 Mbps	13.5 Mbps	Operating Mode
38	5190.0	11.3	10.0	802.11n, HT40 CDD
46	5230.0	15.7	14.3	

**8.8.5. Wi-Fi802.11a/n (5.0 GHz) – SISO Sub Band 2 (5.3 GHz UNII)**

		Avg Power (dBm)		
		Antenna 1	Antenna 2	
Channel Number	Frequency (MHZ)	6 Mbps	6 Mbps	Operating Mode
52	5260.0	Not Supported	15.8	802.11a
60	5300.0		15.7	
64	5320.0		14.9	
Channel Number	Frequency (MHZ)	6 Mbps	6 Mbps	Operating Mode
52	5260.0	15.8	15.9	802.11n, HT20
60	5300.0	15.8	15.9	
64	5320.0	14.8	14.8	
Channel Number	Frequency (MHZ)	13.5 Mbps	13.5 Mbps	Operating Mode
54	5270.0	15.9	16.0	802.11n, HT40
62	5310.0	13.1	13.4	

**8.8.6. Wi-Fi802.11a/n (5.0 GHz) – MIMO Sub Band 2 (5.3 GHz UNII)**

		Avg Power (dBm)		
		Antenna 1	Antenna 2	
Channel Number	Frequency (MHZ)	6.5 Mbps	6.5 Mbps	Operating Mode
52	5260.0	15.8	15.2	802.11n, HT20 CDD
60	5300.0	15.8	15.4	
64	5320.0	13.7	12.4	
Channel Number	Frequency (MHZ)	13.5 Mbps	13.5 Mbps	Operating Mode
54	5270.0	15.6	14.3	802.11n, HT40 CDD
62	5310.0	11.2	9.9	

**8.8.7. Wi-Fi802.11a/n (5.0 GHz) – SISO Sub Band 3 (5.5 GHz UNII)**

		Avg Power (dBm)		
		Antenna 1	Antenna 2	
Channel Number	Frequency (MHZ)	6 Mbps	6 Mbps	Operating Mode
100	5500.0	Not Supported	13.5	802.11a
116	5580.0		14.9	
140	5700.0		13.8	
Channel Number	Frequency (MHZ)	6.5 Mbps	6.5 Mbps	Operating Mode
100	5500.0	13.9	13.9	802.11n, HT20
116	5580.0	14.9	14.9	
140	5700.0	13.8	13.9	
Channel Number	Frequency (MHZ)	13.5 Mbps	13.5 Mbps	Operating Mode
102	5510.0	13.8	13.9	802.11n, HT40
110	5550.0	14.8	14.7	
134	5670.0	14.8	14.8	

**8.8.8. Wi-Fi802.11a/n (5.0 GHz) – MIMO Sub Band 3 (5.5 GHz UNII)**

		Avg Power (dBm)		
		Antenna 1	Antenna 2	
Channel Number	Frequency (MHZ)	6.5 Mbps	6.5 Mbps	Operating Mode
100	5500.0	13.1	11.7	802.11n, HT20 CDD
116	5580.0	12.8	11.5	
140	5700.0	12.6	11.2	
Channel Number	Frequency (MHZ)	13.5 Mbps	13.5 Mbps	Operating Mode
102	5510.0	11.7	10.4	802.11n, HT40 CDD
110	5550.0	14.8	13.5	
134	5670.0	14.8	13.5	



**8.8.9. Wi-Fi802.11a/n (5.0 GHz) – SISO Sub Band 4 (5.8 GHz UNII)**

		Avg Power (dBm)		
		Antenna 1	Antenna 2	
Channel Number	Frequency (MHZ)	6 Mbps	6 Mbps	Operating Mode
149	5745.0	Not Supported	13.8	802.11a
157	5785.0		15.4	
165	5825.0		15.4	
Channel Number	Frequency (MHZ)	6.5 Mbps	6.5 Mbps	Operating Mode
149	5745.0	13.9	13.7	802.11n, HT20
157	5785.0	15.2	15.4	
165	5825.0	15.2	15.3	
Channel Number	Frequency (MHZ)	13.5 Mbps	13.5 Mbps	Operating Mode
151	5755.0	12.0	11.8	802.11n, HT40
159	5795.0	15.2	15.3	

**8.8.10. Wi-Fi802.11a/n (5.0 GHz) – MIMO Sub Band 4 (5.8 GHz UNII)**

		Avg Power (dBm)		
		Antenna 1	Antenna 2	
Channel Number	Frequency (MHZ)	6.5 Mbps	6.5 Mbps	Operating Mode
149	5745.0	12.2	10.9	802.11n, HT20 CDD
157	5785.0	15.3	13.9	
165	5825.0	15.3	13.9	
Channel Number	Frequency (MHZ)	13.5 Mbps	13.5 Mbps	Operating Mode
151	5755.0	10.1	9.0	802.11n, HT40 CDD
159	5795.0	14.9	13.8	

**8.9.RF Output Average Power Measurement: Bluetooth****8.9.1. Bluetooth**

		Avg Power (dBm)			
Channel Number	Frequency (MHZ)	V3.0 + EDR, GFSK	V3.0 + EDR, $\pi/4$ DQPSK	V3.0 + EDR, 8-DPSK	V4.0 LE, GFSK
0	2402.0	12.5	10.6	10.3	7.4
39	2441.0	13.0	10.6	10.4	7.4
78	2480.0	12.4	10.4	9.6	7.4

Note: For BLE (V4.0 LE, GFSK mode) the channel numbers are 0, 19, 39

## **9. System Check and Dielectric Parameters**

See [Appendix 5](#) and [Appendix 6](#) for tables and measurements.

## **10. Measurements, Examinations and Derived Results**

### **10.1. General Comments**

This section contains test results only.

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to section 5 for details of measurement uncertainties.

**10.2. Specific Absorption Rate - Test Results****For All SAR measurement in this report the 1g-SAR limit tested to is 1.6 W/Kg****10.2.1. GSM850 – Body Configuration 1g****Max. Measured SAR (W/kg): 1.010****Max. Reported SAR (W/kg): 1.045**

Mod.	Dist (mm)	EUT Position	Channel Number	Freq (MHz)	RB allocation		Power (dBm)		1g: SAR Results (W/kg)		Scan No.
					#RB	Start RB	Tune up Limit	Meas. Power	Meas. Level (W/kg)	Reported SAR (W/kg)	
GMSK (1 uplink Tx)	0.0	Back	190	836.6	N/A	N/A	28.25	28.20	0.977	0.988	1
GMSK (1 uplink Tx)	0.0	Back	128	824.4	N/A	N/A	28.25	28.10	1.010	1.045	2
GMSK (1 uplink Tx)	0.0	Back	251	848.8	N/A	N/A	28.25	28.20	0.927	0.938	3
GMSK (1 uplink Tx)	0.0	Top	190	836.6	N/A	N/A	28.25	28.20	0.840	0.850	4
GMSK (1 uplink Tx)	0.0	Top	128	824.4	N/A	N/A	28.25	28.10	0.945	0.978	5
GMSK (1 uplink Tx)	0.0	Top	251	848.8	N/A	N/A	28.25	28.20	0.778	0.787	6
GMSK (1 uplink Tx)	0.0	Right	190	836.6	N/A	N/A	28.25	28.20	0.137	0.139	7

**10.2.2. PCS1900 – Body Configuration 1g**

**Max. Measured SAR (W/kg): 0.973**

**Max. Reported SAR (W/kg): 0.996**

Mod.	Dist (mm)	EUT Position	Channel Number	Freq (MHz)	RB allocation		Power (dBm)		1g: SAR Results (W/kg)		Scan No.
					#RB	Start RB	Tune up Limit	Meas. Power	Meas. Level (W/kg)	Reported SAR (W/kg)	
GMSK (2 uplink Tx)	0.0	Back	661	1880.0	N/A	N/A	19.00	19.00	0.956	0.956	8
GMSK (2 uplink Tx)	0.0	Back	512	1850.2	N/A	N/A	19.00	18.90	0.963	0.985	9
GMSK (2 uplink Tx)	0.0	Back	810	1909.8	N/A	N/A	19.00	18.90	0.973	0.996	10
GMSK (2 uplink Tx)	0.0	Top	661	1880.0	N/A	N/A	19.00	19.00	0.835	0.835	11
GMSK (2 uplink Tx)	0.0	Top	512	1850.2	N/A	N/A	19.00	18.90	0.884	0.905	12
GMSK (2 uplink Tx)	0.0	Top	810	1909.8	N/A	N/A	19.00	18.90	0.786	0.804	13
GMSK (2 uplink Tx)	0.0	Right	661	1880.0	N/A	N/A	19.00	19.00	0.072	0.072	14

**10.2.3. WCDMA FDD 2 – Body Configuration 1g****Max. Measured SAR (W/kg): 0.960****Max. Reported SAR (W/kg): 0.977**

Mod.	Dist (mm)	EUT Position	Channel Number	Freq (MHz)	RB allocation		Power (dBm)		1g: SAR Results (W/kg)		Scan No.
					#RB	Start RB	Tune up Limit	Meas. Power	Meas. Level (W/kg)	Reported SAR (W/kg)	
QPSK (RMC 12.2kbps)	0.0	Back	9538	1907.6	N/A	N/A	12.75	12.70	0.901	0.911	15
QPSK (RMC 12.2kbps)	0.0	Back	9400	1880.0	N/A	N/A	12.75	11.700	0.703	0.895	16
QPSK (RMC 12.2kbps)	0.0	Back	9262	1852.4	N/A	N/A	12.75	12.20	0.852	0.967	17
QPSK (RMC 12.2kbps)	0.0	Top	9538	1907.6	N/A	N/A	12.75	12.70	0.960	0.971	18
QPSK (RMC 12.2kbps)	0.0	Top	9400	1880.0	N/A	N/A	12.75	11.70	0.767	0.977	19
QPSK (RMC 12.2kbps)	0.0	Top	9262	1852.4	N/A	N/A	12.75	12.20	0.721	0.818	20
QPSK (RMC 12.2kbps)	0.0	Right	9538	1880.0	N/A	N/A	12.75	11.70	0.063	0.080	21

\*KDB 941225 D02 - SAR is not required for RMC+HSPA or RMC+DC-HSDPA (HSDPA/HSUPA/DC-HSDPA) channels when the maximum average output power is less than ¼ dB higher than that measured on the corresponding RMC channels and 1g SAR level reported in 'RMC 12.2kbps' is <75% SAR limit.

**10.2.4. WCDMA FDD 5 – Body Configuration 1g**

**Max. Measured SAR (W/kg): 0.993**

**Max. Reported SAR (W/kg): 1.101**

Mod.	Dist (mm)	EUT Position	Channel Number	Freq (MHz)	RB allocation		Power (dBm)		1g: SAR Results (W/kg)		Scan No.
					#RB	Start RB	Tune up Limit	Meas. Power	Meas. Level (W/kg)	Reported SAR (W/kg)	
QPSK (RMC 12.2kbps)	0.0	Back	4183	836.6	N/A	N/A	18.25	17.80	0.993	1.101	22
QPSK (RMC 12.2kbps)	0.0	Back	4132	826.4	N/A	N/A	18.25	18.00	0.898	0.951	23
QPSK (RMC 12.2kbps)	0.0	Back	4233	846.6	N/A	N/A	18.25	17.90	0.876	0.950	24
QPSK (RMC 12.2kbps)	0.0	Top	4183	836.6	N/A	N/A	18.25	17.80	0.693	0.769	25
QPSK (RMC 12.2kbps)	0.0	Right	4183	836.6	N/A	N/A	18.25	17.80	0.093	0.103	26

\*KDB 941225 D02 - SAR is not required for RMC+HSPA or RMC+DC-HSDPA (HSDPA/HSUPA/DC-HSDPA) channels when the maximum average output power is less than ¼ dB higher than that measured on the corresponding RMC channels and 1g SAR level reported in 'RMC 12.2kbps' is <75% SAR limit.



## 10.2.5. GENERAL NOTE FOR LTE

As per KDB 941225 D05 SAR for LTE Devices v02r02, the following steps were followed to perform SAR evaluation Largest Channel BW

1. QPSK 1RB Allocation

Start with 1RB offset Config with the highest maximum output power on required test channel (1RB low, 1RB high or 1RB mid). If value in (1) is  $<0.8\text{W/kg}$ , testing of remaining RB offset configurations and test channels not required for 1RB

2. QPSK 50% RB Allocation

Apply steps followed in (1) for measuring 50% RB

3. QPSK 100% RB Allocation

SAR not required if highest output power from (1) and (2) is higher than 100% RB output power and if SAR Values in step (1) and (2)  $\leq 0.8\text{W/kg}$

4. 16 QAM

Apply steps (1), (2) and (3) for testing 16-QAM/64-QAM, for each configuration SAR required only when highest maximum output power for the highest order modulation (ex. 16-QAM)  $>$  QPSK by 0.5dB or when reported SAR for QPSK  $> 1.45\text{W/kg}$

**10.2.6. LTE Band 2; 20MHz Channel BW – Body Configuration 1g**

**Max. Measured SAR (W/kg): 0.899**

**Max. Reported SAR (W/kg): 1.025**

Mod.	Dist (mm)	EUT Position	Channel Number	Freq (MHz)	RB allocation		Power (dBm)		1g: SAR Results (W/kg)		Scan No.
					#RB	Start RB	Tune up Limit	Meas. Power	Meas. Level (W/kg)	Reported SAR (W/kg)	
QPSK	0.0	Back	18900	1880.0	1	49	12.90	12.50	0.852	0.934	27
QPSK	0.0	Back	18700	1860.0	1	49	12.90	12.30	0.819	0.940	28
QPSK	0.0	Back	19100	1900.0	1	49	12.90	12.00	0.813	1.000	29
QPSK	0.0	Back	18900	1880.0	50	25	12.90	12.20	0.872	1.025	30
QPSK	0.0	Back	18700	1860.0	50	25	12.90	12.20	0.827	0.972	31
QPSK	0.0	Back	19100	1900.0	50	25	12.90	12.20	0.844	0.992	32
QPSK	0.0	Back	18900	1880.0	100	0	12.90	12.40	0.899	1.009	33
QPSK	0.0	Top	18900	1880.0	1	49	12.90	12.50	0.798	0.875	34
QPSK	0.0	Top	18700	1860.0	1	49	12.90	12.30	0.637	0.731	35
QPSK	0.0	Top	19100	1900.0	1	49	12.90	12.00	0.756	0.930	36
QPSK	0.0	Top	18900	1880.0	50	25	12.90	12.20	0.816	0.959	37
QPSK	0.0	Top	18700	1860.0	50	25	12.90	12.20	0.657	0.772	38
QPSK	0.0	Top	19100	1900.0	50	25	12.90	12.20	0.749	0.880	39
QPSK	0.0	Top	18900	1880.0	100	0	12.90	12.40	0.810	0.909	40
QPSK	0.0	Right	18900	1880.0	1	49	12.90	12.50	0.067	0.073	41
QPSK	0.0	Right	18900	1880.0	50	25	12.90	12.20	0.071	0.083	42

**10.2.7. LTE Band 5; 10MHz Channel BW – Body Configuration 1g**

**Max. Measured SAR (W/kg): 0.975**

**Max. Reported SAR (W/kg): 1.033**

Mod.	Dist (mm)	EUT Position	Channel Number	Freq (MHz)	RB allocation		Power (dBm)		1g: SAR Results (W/kg)		Scan No.
					#RB	Start RB	Tune up Limit	Meas. Power	Meas. Level (W/kg)	Reported SAR (W/kg)	
QPSK	0.0	Back	20525	836.5	1	49	17.75	17.50	0.975	1.033	43
QPSK	0.0	Back	20450	829.0	1	49	17.75	17.30	0.707	0.784	44
QPSK	0.0	Back	20600	844.0	1	49	17.75	17.20	0.751	0.852	45
QPSK	0.0	Back	20450	829.0	25	0	17.75	17.40	0.734	0.796	46
QPSK	0.0	Back	20525	844.0	50	0	17.75	17.20	0.854	0.969	47
QPSK	0.0	Top	20525	836.5	1	49	17.75	17.50	0.542	0.574	48
QPSK	0.0	Top	20450	829.0	25	0	17.75	17.40	0.462	0.501	49
QPSK	0.0	Right	20525	836.5	1	49	17.75	17.50	0.023	0.024	50
QPSK	0.0	Right	20450	829.0	25	0	17.75	17.40	0.022	0.024	51

**10.2.8. Wi-Fi 2.4 GHz – Body Configuration 1g VARIANT 1**

**Max. Measured SAR (W/kg): 0.965**

**Max. Reported SAR (W/kg):1.001**

						Power (dBm) - ANT 1		1g: SAR Results (W/kg) - ANT 1		Power (dBm) - ANT 2		1g: SAR Results (W/kg) - ANT 2		
Mod.	Dist (mm)	EUT Position	CH #	Freq (MHz)	Tune up Limit	Meas. Power	Meas.	Report ed	Tune up Limit	Meas. Power	Meas.	Report ed	Scan No.	
<b>SISO</b>														
DPBSK (802.11b 1Mbps)	0.0	Back	6	2437.0	16.50	16.40	0.047	0.048	Not Supported				52	
	0.0	Left	6	2437.0	16.50	16.40	0.140	0.143					53	
	0.0	Bottom	6	2437.0	16.50	16.40	0.884	0.905					54	
	0.0	Bottom	1	2412.0	16.50	16.40	0.709	0.726					55	
	0.0	Bottom	11	2462.0	16.50	16.40	0.823	0.842					56	
DPBSK (802.11n HT20 6.5Mbps)	0.0	Back	6	2437.0	16.50	16.36	0.035	0.036					57	
	0.0	Left	6	2437.0	16.50	16.36	0.144	0.149					58	
	0.0	Bottom	6	2437.0	16.50	16.36	0.900	0.929					59	
	0.0	Bottom	1	2412.0	15.50	15.20	0.578	0.619					60	
	0.0	Bottom	11	2462.0	15.00	14.85	0.570	0.590					61	
<b>MIMO (Ant 1 + Ant 2)</b>														
DPBSK (802.11n HT20 6.5Mbps)	0.0	Back	6	2437.0	16.50	16.34	0.037	0.038	16.50	16.05	-	-	62	
	0.0	Right	6	2437.0	16.50	16.34	0.014	0.015	16.50	16.05	-	-	63	
	0.0	Left	6	2437.0	16.50	16.34	0.129	0.134	16.50	16.05	-	-	64	
	0.0	Bottom	6	2437.0	16.50	16.34	0.965	1.001	16.50	16.05	0.683	0.758	65	
	0.0	Bottom	1	2412.0	14.50	14.50	0.398	0.398	14.50	13.70	0.382	0.459	66	
	0.0	Bottom	11	2462.0	14.50	14.00	0.501	0.562	14.50	13.10	0.325	0.449	67	

**Wi-Fi 2.4 GHz – Body Configuration 1g VARIANT 2**

						Power (dBm) - ANT 1		1g: SAR Results (W/kg) - ANT 1		Power (dBm) - ANT 2		1g: SAR Results (W/kg) - ANT 2		
Mod.	Dist (mm)	EUT Position	CH #	Freq (MHz)	Tune up Limit	Meas. Power	Meas.	Report ed	Tune up Limit	Meas. Power	Meas.	Report ed	Scan No.	
<b>MIMO (Ant 1 + Ant 2)</b>														
DPBSK (802.11n HT20 6.5Mbps)	0.0	Bottom	6	2437.0	16.50	16.34	0.911	0.945	16.50	16.05	0.823	0.913	68	

**NOTE: The worst case configuration obtained from VARIANT 1 was repeated on VARIANT 2**

**10.2.9. Wi-Fi 5.0 GHz (Sub Band 1) – Body Configuration 1g VARIANT 1**

**Max. Measured SAR (W/kg): 0.755**

**Max. Reported SAR (W/kg): 0.773**

Mod.	Dist (mm)	EUT Position	CH #	Freq (MHz)	Power (dBm) - ANT 1		1g: SAR Results (W/kg) - ANT 1		Power (dBm) - ANT 2		1g: SAR Results (W/kg) - ANT 2		Scan No.
					Tune up Limit	Meas. Power	Meas.	Reported	Tune up Limit	Meas. Power	Meas.	Reported	
<b>SISO</b>													
BPSK (802.11a 6Mbps)	0.0	Back	48	5240.0	Not supported				16.00	15.90	0.004	0.004	69
	0.0	Right	48	5240.0					16.00	15.90	0.009	0.009	70
	0.0	Bottom	48	5240.0					16.00	15.90	0.479	0.490	71
<b>SISO</b>													
BPSK (802.11n HT20 6Mbps)	0.0	Back	48	5240.0	16.00	15.90	0.046	0.047	N/A				72
	0.0	Left	48	5240.0	16.00	15.90	0.144	0.147					73
	0.0	Bottom	48	5240.0	16.00	15.90	0.755	0.773					74
<b>SISO</b>													
BPSK (802.11n HT20 6Mbps)	0.0	Back	48	5240.0	N/A				16.00	16.00	0.003	0.003	75
	0.0	Right	48	5240.0					16.00	16.00	0.005	0.005	76
	0.0	Bottom	48	5240.0					16.00	16.00	0.426	0.426	77
<b>MIMO (Ant 1 + Ant 2)</b>													
BPSK (802.11n HT20 6Mbps)	0.0	Back	40	5200.0	16.00	15.90	0.046	0.047	15.00	14.90	-	-	78
	0.0	Right	40	5200.0	16.00	15.90	-	-	15.00	14.90	0.017	0.017	79
	0.0	Left	40	5200.0	16.00	15.90	0.047	0.048	15.00	14.90	-	-	80
	0.0	Bottom	40	5200.0	16.00	15.90	0.749	0.766	15.00	14.90	-	-	81
<b>SISO</b>													
BPSK (802.11n HT40 13.5Mbps)	0.0	Back	46	5230.0	16.00	15.80	0.029	0.030	N/A				82
	0.0	Left	46	5230.0	16.00	15.80	0.084	0.088					83
	0.0	Bottom	46	5230.0	16.00	15.80	0.653	0.684					84
<b>SISO</b>													
BPSK (802.11n HT40 13.5Mbps)	0.0	Back	46	5230.0	N/A				16.00	15.90	0.110	0.113	85
	0.0	Right	46	5230.0					16.00	15.90	0.039	0.040	86
	0.0	Bottom	46	5230.0					16.00	15.90	0.740	0.757	87
<b>MIMO (Ant 1 + Ant 2)</b>													
OBPSK (802.11n HT40 13.5Mbps)	0.0	Back	46	5230.0	16.00	15.70	-	-	16.00	14.30	0.005	0.008	88
	0.0	Right	46	5230.0	16.00	15.70	-	-	16.00	14.30	0.002	0.003	89
	0.0	Left	46	5230.0	16.00	15.70	0.120	0.129	16.00	14.30	-	-	90
	0.0	Bottom	46	5230.0	16.00	15.70	0.574	0.615	16.00	14.30	0.482	0.713	91

**Wi-Fi 5.0 GHz (Sub Band 1) – Body Configuration 1g VARIANT 2**

					Power (dBm) - ANT 1		1g: SAR Results (W/kg) - ANT 1		Power (dBm) - ANT 2		1g: SAR Results (W/kg) - ANT 2		
Mod.	Dist (mm)	EUT Position	CH #	Freq (MHz)	Tune up Limit	Meas. Power	Meas.	Reported	Tune up Limit	Meas. Power	Meas.	Reported	Scan No.
SISO													
BPSK (802.11n HT20 6Mbps)	0.0	Bottom	48	5240.0	16.00	15.90	0.735	0.752	N/A				92

**NOTE: The worst case configuration obtained from VARIANT 1 was repeated on VARIANT 2**

**10.2.10. Wi-Fi 5.0 GHz (Sub Band 2) – Body Configuration 1g VARIANT 1**

**Max. Measured SAR (W/kg): 0.792**

**Max. Reported SAR (W/kg): 0.810**

Mod.	Dist (mm)	EUT Position	CH #	Freq (MHz)	Power (dBm) - ANT 1		1g: SAR Results (W/kg) - ANT 1		Power (dBm) - ANT 2		1g: SAR Results (W/kg) - ANT 2		Scan No.
					Tune up Limit	Meas. Power	Meas.	Reported	Tune up Limit	Meas. Power	Meas.	Reported	
<b>SISO</b>													
BPSK (802.11a 6Mbps)	0.0	Back	52	5260.0	Not supported				16.00	15.80	0.021	0.022	93
	0.0	Right	52	5260.0					16.00	15.80	0.023	0.024	94
	0.0	Bottom	52	5260.0					16.00	15.80	0.689	0.721	95
<b>SISO</b>													
BPSK (802.11n HT20 6Mbps)	0.0	Back	52	5260.0	16.00	15.80	0.005	0.005	N/A				96
	0.0	Left	52	5260.0	16.00	15.80	0.055	0.058					97
	0.0	Bottom	52	5260.0	16.00	15.80	0.751	0.786					98
<b>SISO</b>													
BPSK (802.11n HT20 6Mbps)	0.0	Back	52	5260.0	N/A				16.00	15.90	0.027	0.028	99
	0.0	Right	52	5260.0					16.00	15.90	0.023	0.023	100
	0.0	Bottom	52	5260.0					16.00	15.90	0.761	0.779	101
<b>MIMO (Ant 1 + Ant 2)</b>													
BPSK (802.11n HT20 6Mbps)	0.0	Back	60	5300.0	16.00	15.80	0.011	0.011	16.00	15.40	-	-	102
	0.0	Right	60	5300.0	16.00	15.80	-	-	16.00	15.40	0.013	0.015	103
	0.0	Left	60	5300.0	16.00	15.80	0.089	0.093	16.00	15.40	-	-	104
	0.0	Bottom	60	5300.0	16.00	15.80	0.680	0.712	16.00	15.40	-	-	105
<b>SISO</b>													
BPSK (802.11n HT40 13.5Mbps)	0.0	Back	54	5270.0	16.00	15.90	0.071	0.073	N/A				106
	0.0	Left	54	5270.0	16.00	15.90	0.001	0.001					107
	0.0	Bottom	54	5270.0	16.00	15.90	0.792	0.810					108
	0.0	Bottom	62	5310.0	13.50	13.10	0.448	0.491					109
<b>SISO</b>													
BPSK (802.11n HT40 13.5Mbps)	0.0	Back	54	5270.0	N/A				16.00	16.00	0.011	0.011	110
	0.0	Right	54	5270.0					16.00	16.00	0.012	0.012	111
	0.0	Bottom	54	5270.0					16.00	16.00	0.474	0.474	112
<b>MIMO (Ant 1 + Ant 2)</b>													
BPSK (802.11n HT40 13.5Mbps)	0.0	Back	54	5270.0			-	-	15.00	14.30	0.045	0.053	113
	0.0	Right	54	5270.0			-	-	15.00	14.30	0.007	0.008	114
	0.0	Left	54	5270.0	16.00	15.60	0.029	0.032	15.00	14.30	-	-	115
	0.0	Bottom	54	5270.0	16.00	15.60	0.592	0.649	15.00	14.30	0.575	0.676	116

**Wi-Fi 5.0 GHz (Sub Band 2) – Body Configuration 1g VARIANT 2**

Mod.	Dist (mm)	EUT Position	CH #	Freq (MHz)	Power (dBm) - ANT 1		1g: SAR Results (W/kg) - ANT 1		Power (dBm) - ANT 2		1g: SAR Results (W/kg) - ANT 2		Scan No.
					Tune up Limit	Meas. Power	Meas.	Reported	Tune up Limit	Meas. Power	Meas.	Reported	
<b>SISO</b>													
BPSK (802.11n HT40 13.5Mbps)	0.0	Bottom	54	5270.0	16.00	15.90	0.788	0.806	N/A				117

**NOTE: The worst case configuration obtained from VARIANT 1 was repeated on VARIANT 2**



**10.2.11. Wi-Fi 5.0 GHz (Sub Band 3) – Body Configuration 1g VARIANT 1**

**Max. Measured SAR (W/kg): 0.862**

**Max. Reported SAR (W/kg): 0.924**

Mod.	Dist (mm)	EUT Position	CH #	Freq (MHz)	Power (dBm) - ANT 1		1g: SAR Results (W/kg) - ANT 1		Power (dBm) - ANT 2		1g: SAR Results (W/kg) - ANT 2		Scan No.
					Tune up Limit	Meas. Power	Meas.	Reported	Tune up Limit	Meas. Power	Meas.	Reported	
<b>SISO</b>													
BPSK (802.11a 6Mbps) BPS	0.0	Back	116	5240.0	Not supported				15.00	14.90	0.052	0.053	118
	0.0	Right	116	5240.0					15.00	14.90	0.000	0.000	119
	0.0	Bottom	116	5580.0					15.00	14.90	0.675	0.691	120
	0.0	Bottom	100	5500.0					14.00	13.50	0.607	0.681	121
	0.0	Bottom	140	5700.0					14.00	13.80	0.482	0.505	122
<b>SISO</b>													
BPSK (802.11n HT20 6Mbps) BPS	0.0	Back	116	5580.0	15.00	14.90	0.031	0.032	N/A				123
	0.0	Left	116	5580.0	15.00	14.90	0.000	0.000					124
	0.0	Bottom	116	5580.0	15.00	14.90	0.671	0.687					125
	0.0	Bottom	100	5500.0	14.00	13.90	0.579	0.592					126
	0.0	Bottom	140	5700.0	14.00	13.80	0.336	0.352					127
<b>SISO</b>													
BPSK (802.11n HT20 6Mbps)	0.0	Back	116	5580.0	N/A				15.00	14.90	0.040	0.041	128
	0.0	Right	116	5580.0					15.00	14.90	0.000	0.000	129
	0.0	Bottom	116	5580.0					15.00	14.90	0.667	0.683	130
	0.0	Bottom	100	5500.0					14.00	13.90	0.524	0.536	131
	0.0	Bottom	140	5700.0					14.00	13.90	0.466	0.477	132
<b>MIMO (Ant 1 + Ant 2)</b>													
BPSK (802.11n HT20 6Mbps)	0.0	Back	100	5500.0	14.00	13.10	0.016	0.020	13.50	11.70	-	-	133
	0.0	Right	100	5500.0	14.00	13.10	-	-	13.50	11.70	0.006	0.009	134
	0.0	Left	100	5500.0	14.00	13.10	0.005	0.006	13.50	11.70	-	-	135
	0.0	Bottom	100	5500.0	14.00	13.10	0.391	0.481	13.50	11.70	0.347	0.525	136
	0.0	Bottom	116	5580.0	13.00	12.80	0.390	0.408	13.00	11.50	0.389	0.549	137
	0.0	Bottom	140	5700.0	13.00	12.60	0.327	0.359	13.00	11.20	-	-	138

**Wi-Fi 5.0 GHz (Sub Band 3) – Body Configuration 1g VARIANT 1 (Continued)**

Mod.	Dist (mm)	EUT Position	CH #	Freq (MHz)	Power (dBm) - ANT 1		1g: SAR Results (W/kg) - ANT 1		Power (dBm) - ANT 2		1g: SAR Results (W/kg) - ANT 2		Scan No.
					Tune up Limit	Meas. Power	Meas.	Reported	Tune up Limit	Meas. Power	Meas.	Reported	
<b>SISO</b>													
BPSK (802.11n HT40 13.5Mbps)	0.0	Back	134	5670.0	15.00	14.80	0.006	0.006	N/A				139
	0.0	Left	134	5670.0	15.00	14.80	0.004	0.004					140
	0.0	Bottom	134	5670.0	15.00	14.80	0.672	0.704					141
	0.0	Bottom	102	5510.0	14.00	13.80	0.450	0.471					142
	0.0	Bottom	110	5550.0	15.00	14.90	0.561	0.574					143
<b>SISO</b>													
BPSK (802.11n HT40 13.5Mbps)	0.0	Back	134	5670.0	N/A				15.00	14.80	0.000	0.000	144
	0.0	Right	134	5670.0					15.00	14.80	0.000	0.000	145
	0.0	Bottom	134	5670.0					15.00	14.80	0.653	0.684	146
	0.0	Bottom	102	5510.0					14.00	13.90	0.618	0.632	147
	0.0	Bottom	110	5550.0					15.00	14.70	0.862	0.924	148
<b>MIMO (Ant 1 + Ant 2)</b>													
BPSK (802.11n HT40 13.5Mbps)	0.0	Back	134	5670.0	15.00	14.80	0.000	0.000	15.00	13.50	0.000	0.000	149
	0.0	Right	134	5670.0	15.00	14.80	0.000	0.000	15.00	13.50	0.000	0.000	150
	0.0	Left	134	5670.0	15.00	14.80	0.000	0.000	15.00	13.50	0.000	0.000	151
	0.0	Bottom	134	5670.0	15.00	14.80	0.364	0.381	15.00	13.50	0.489	0.691	152
	0.0	Bottom	102	5510.0	12.00	11.70	0.306	0.328	12.00	10.40	0.000	0.000	153
	0.0	Bottom	110	5550.0	15.00	14.80	0.761	0.797	15.00	13.50	0.000	0.000	154

**Wi-Fi 5.0 GHz (Sub Band 3) – Body Configuration 1g VARIANT 2 (Continued)**

Mod.	Dist (mm)	EUT Position	CH #	Freq (MHz)	Power (dBm) - ANT 1		1g: SAR Results (W/kg) - ANT 1		Power (dBm) - ANT 2		1g: SAR Results (W/kg) - ANT 2		Scan No.
					Tune up Limit	Meas. Power	Meas.	Reported	Tune up Limit	Meas. Power	Meas.	Reported	
<b>SISO</b>													
BPSK (802.11n HT40 13.5Mbps)	0.0	Back	110	5550.0	N/A				15.00	14.70	0.837	0.897	155

**NOTE: The worst case configuration obtained from VARIANT 1 was repeated on VARIANT 2**

**10.2.12. Wi-Fi 5.0 GHz (Sub Band 4) – Body Configuration 1g VARIANT 1**

**Max. Measured SAR (W/kg): 0.744**

**Max. Reported SAR (W/kg): 0.797**

Mod.	Dist (mm)	EUT Position	CH #	Freq (MHz)	Power (dBm) - ANT 1		1g: SAR Results (W/kg) - ANT 1		Power (dBm) - ANT 2		1g: SAR Results (W/kg) - ANT 2		Scan No.
					Tune up Limit	Meas. Power	Meas.	Reported	Tune up Limit	Meas. Power	Meas.	Reported	
<b>SISO</b>													
BPSK (802.11a 6Mbps)	0.0	Back	157	5785.0	Not supported				15.50	15.40	0.000	0.000	156
	0.0	Right	157	5785.0					15.50	15.40	0.000	0.000	157
	0.0	Bottom	157	5785.0					15.50	15.40	0.335	0.343	158
<b>SISO</b>													
BPSK (802.11n HT20 6Mbps)	0.0	Back	157	5785.0	15.50	15.20	0.000	0.000	N/A				159
	0.0	Left	157	5785.0	15.50	15.20	0.071	0.076					160
	0.0	Bottom	157	5785.0	15.50	15.20	0.744	0.797					161
<b>SISO</b>													
BPSK (802.11n HT20 6Mbps)	0.0	Back	157	5785.0	N/A				15.50	15.40	0.000	0.000	162
	0.0	Right	157	5785.0					15.50	15.40	0.000	0.000	163
	0.0	Bottom	157	5785.0					15.50	15.40	0.341	0.349	164
<b>MIMO (Ant 1 + Ant 2)</b>													
BPSK (802.11n HT20 6Mbps)	0.0	Back	157	5785.0	15.50	15.30	0.000	0.000	15.50	13.90	0.000	0.000	165
	0.0	Right	157	5785.0	15.50	15.30	0.000	0.000	15.50	13.90	0.000	0.000	166
	0.0	Left	157	5785.0	15.50	15.30	0.062	0.065	15.50	13.90	-	-	167
	0.0	Bottom	157	5785.0	15.50	15.30	0.505	0.529	15.50	13.90	-	-	168
<b>SISO</b>													
BPSK (802.11n HT40 13.5Mbps)	0.0	Back	159	5795.0	15.50	15.20	0.000	0.000	N/A				169
	0.0	Left	159	5795.0	15.50	15.20	0.063	0.068					170
	0.0	Bottom	159	5795.0	15.50	15.20	0.526	0.564					171
<b>SISO</b>													
BPSK (802.11n HT40 13.5Mbps)	0.0	Back	159	5795.0	N/A				15.50	15.30	0.000	0.000	172
	0.0	Right	159	5795.0					15.50	15.30	0.000	0.000	173
	0.0	Bottom	159	5795.0					15.50	15.30	0.401	0.420	174
<b>MIMO (Ant 1 + Ant 2)</b>													
BPSK (802.11n HT40 13.5Mbps)	0.0	Back	159	5795.0	15.50	14.90	0.000	0.000	15.50	13.80	-	-	175
	0.0	Right	159	5795.0	15.50	14.90	0.000	0.000	15.50	13.80	-	-	176
	0.0	Left	159	5795.0	15.50	14.90	0.052	0.060	15.50	13.80	-	-	177
	0.0	Bottom	159	5795.0	15.50	14.90	0.406	0.466	15.50	13.80	-	-	178

**Wi-Fi 5.0 GHz (Sub Band 4) – Body Configuration 1g VARIANT 2**

Mod.	Dist (mm)	EUT Position	CH #	Freq (MHz)	Power (dBm) - ANT 1		1g: SAR Results (W/kg) - ANT 1		Power (dBm) - ANT 2		1g: SAR Results (W/kg) - ANT 2		Scan No.
					Tune up Limit	Meas. Power	Meas.	Reported	Tune up Limit	Meas. Power	Meas.	Reported	
<b>SISO</b>													
BPSK (802.11n HT20 6Mbps)	0.0	Bottom	157	5785.0	15.50	15.20	0.553	0.593	N/A				179

**NOTE: The worst case configuration obtained from VARIANT 1 was repeated on VARIANT 2**

**10.2.13. Bluetooth – Body Configuration 1g VARIANT 1**

**Max. Measured SAR (W/kg): 0.074**

**Max. Reported SAR (W/kg): 0.074**

Mod.	Dist (mm)	EUT Position	Channel Number	Freq (MHz)	Power (dBm)		1g: SAR Results (W/kg)		Scan No.
					Tune up Limit	Meas. Power	Meas. Level (W/kg)	Reported SAR (W/kg)	
GFSK	0.0	Back	39	2441.00	13.00	13.00	0.000	0.000	180
GFSK	0.0	Left	39	2441.00	13.00	13.00	0.000	0.000	181
GFSK	0.0	Bottom	39	2441.00	13.00	13.00	0.074	0.074	182
GFSK	0.0	Bottom	0	2402.00	13.00	12.50	0.002	0.002	183
GFSK	0.0	Bottom	78	2480.00	13.00	12.40	0.007	0.008	184

**Bluetooth – Body Configuration 1g VARIANT 2**

Mod.	Dist (mm)	EUT Position	Channel Number	Freq (MHz)	Power (dBm)		1g: SAR Results (W/kg)		Scan No.
					Tune up Limit	Meas. Power	Meas. Level (W/kg)	Reported SAR (W/kg)	
GFSK	0.0	Bottom	39	2441.00	13.00	13.00	0.020	0.020	185

### 11. SAR measurement variability

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz. These 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.

#### 11.1. Repeated Measurement Results

Exposure Configuration	Technology Band	Measured 1g -SAR (W/Kg)	Max Meas. Source base Avg Power [dBm]	Ratio of Largest to Smallest SAR Measured	Equipment Class
BODY (Separation Distance 0mm)	GSM 850	1.010	28.25	1.00	PCE
		1.010			
	PCS 1900	0.973	19.00	1.06	
		0.920			
	WCDMA FDD 2	0.960	12.75	1.00	
		0.958			
	WCDMA FDD 5	0.993	18.25	1.02	
		0.974			
	LTE Band 2	0.899	12.90	1.01	
		0.887			
	LTE Band 5	0.975	17.75	1.03	
		0.950			
	WLAN 2.4 GHz	0.965	16.50	1.06	DTS
		0.911			
WLAN 5.0 GHz	0.862	15.00	1.02	UNII	
	0.844				

## 12. Simultaneous Transmission SAR Analysis

KDB 447498 D01 General RF Exposure Guidance introduces a new formula for calculating the SAR to Peak Location Ratio (SPLSR) between pairs of simultaneously transmitting antennas:

$$SPLSR = (SAR_1 + SAR_2)^{1.5} / Ri$$

Where:

**SAR<sub>1</sub>** is the highest reported or estimated SAR for the first of a pair of simultaneous transmitting antennas, in a specific test operating mode and exposure condition

**SAR<sub>2</sub>** is the highest reported or estimated SAR for the second of a pair of simultaneous transmitting antennas, in the same test operating mode and exposure condition as the first

**Ri** is the separation distance between the pair of simultaneous transmitting antennas. When the SAR is measured for both antennas in the pair, it is determined by the actual x, y, and z coordinates in the 1-g SAR for each SAR Peak Location; based on the extrapolated and interpolated result in the zoom scan measurement using the formula:

$$[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$$

A new threshold of 0.04 is also introduced in the KDB 447498. Thus, in order for a pair of simultaneously transmitting antennas, with the sum of 1-g SAR > 1.6 W/kg, to qualify for exemption from Simultaneous Transmission SAR measurements, it has to satisfy the condition of:

$$(SAR_1 + SAR_2)^{1.5} / Ri < 0.04$$

According to the worst case configuration Simultaneous transmission analysis of worst cases is shown in the tables below.

Top and Bottom configurations are not considered in the tables below as there is no possible combination for simultaneous transmission of these two edges.

**Conclusion:** As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required for combinations considered in the tables below.

**12.1. Simultaneous consideration for GSM + Wi-Fi + BT**

**12.1.1. GSM 850 + 2.4 GHz / GSM 850 + BT**

EUT Position	Simultaneous Transmission Condition				Σ 1g SAR (W/kg)	SPLSR (Yes/ No)
	WWAN	WLAN - 802.11 b/g/n		WPAN		
	GSM850	SISO (Ant 1)	MIMO (Ant 1 + Ant 2)	Bluetooth		
Back	1.045	0.048			1.093	No
Right	0.139				0.139	No
Left		0.149			0.149	No
Back	1.045		0.038		1.083	No
Right	0.139		0.015		0.154	No
Left			0.134		0.134	No
Back	1.045			0.000	1.045	No
Right	0.139				0.139	No
Left				0.000	0.000	No

**12.1.2. GSM 850 + 5.0 GHz + BT**

EUT Position	Simultaneous Transmission Condition					Σ 1g SAR (W/kg)	SPLSR (Yes/ No)
	WWAN	WLAN - 802.11 a/n			WPAN		
	GSM850	SISO (Ant 1)	SISO (Ant 2)	MIMO (Ant 1 + Ant 2)	Bluetooth		
Back	1.045	0.073			0.000	1.118	No
Right	0.139					0.139	No
Left		0.147			0.000	0.147	No
Back	1.045		0.113		0.000	1.158	No
Right	0.139		0.040			0.179	No
Left					0.000	0.000	No
Back	1.045			0.053	0.000	1.098	No
Right	0.139			0.017		0.156	No
Left				0.129	0.000	0.129	No



**12.1.3. PCS 1900 + 2.4 GHz / PCS 1900 + BT**

EUT Position	Simultaneous Transmission Condition				Σ 1g SAR (W/kg)	SPLSR (Yes/ No)
	WWAN	WLAN - 802.11 b/g/n		WPAN		
	PCS1900	SISO (Ant 1)	MIMO (Ant 1 + Ant 2)	Bluetooth		
Back	0.996	0.048			1.044	No
Right	0.072				0.072	No
Left		0.149			0.149	No
Back	0.996		0.038		1.034	No
Right	0.072		0.015		0.087	No
Left			0.134		0.134	No
Back	0.996			0.000	0.996	No
Right	0.072				0.072	No
Left				0.000	0.000	No

**12.1.4. PCS 1900 + 5.0 GHz + BT**

EUT Position	Simultaneous Transmission Condition					Σ 1g SAR (W/kg)	SPLSR (Yes/ No)
	WWAN	WLAN - 802.11 a/n			WPAN		
	PCS1900	SISO (Ant 1)	SISO (Ant 2)	MIMO (Ant 1 + Ant 2)	Bluetooth		
Back	0.996	0.073			0.000	1.069	No
Right	0.072					0.072	No
Left		0.147			0.000	0.147	No
Back	0.996		0.113		0.000	1.109	No
Right	0.072		0.040			0.112	No
Left					0.000	0.000	No
Back	0.996			0.053	0.000	1.049	No
Right	0.072			0.017		0.089	No
Left				0.129	0.000	0.129	No

**SAR to Peak Location Separation Ratio (SPLSR)**

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required for combinations specified in this sub-section.

**12.2. Simultaneous consideration for WCDMA + Wi-Fi + BT**

**12.2.1. WCDMA FDD 2 + 2.4 GHz / WCDMA FDD 2 + BT**

EUT Position	Simultaneous Transmission Condition					Σ 1g SAR (W/kg)	SPLSR (Yes/ No)
	WWAN	WLAN - 802.11 b/g/n		WPAN			
	WCDMA FDD 2	SISO (Ant 1)	MIMO (Ant 1 + Ant 2)	Bluetooth			
Back	0.967	0.048				1.015	No
Right	0.080					0.080	No
Left		0.149				0.149	No
Back	0.967		0.038			1.005	No
Right	0.080		0.015			0.095	No
Left			0.134			0.134	No
Back	0.967			0.000		0.967	No
Right	0.080					0.080	No
Left				0.000		0.000	No

**12.2.2. WCDMA FDD 2 + 5.0 GHz + BT**

EUT Position	Simultaneous Transmission Condition						Σ 1g SAR (W/kg)	SPLSR (Yes/ No)
	WWAN	WLAN - 802.11 a/n			WPAN			
	WCDMA FDD 2	SISO (Ant 1)	SISO (Ant 2)	MIMO (Ant 1 + Ant 2)	Bluetooth			
Back	0.967	0.073			0.000		1.040	No
Right	0.080						0.080	No
Left		0.147			0.000		0.147	No
Back	0.967		0.113		0.000		1.080	No
Right	0.080		0.040				0.120	No
Left					0.000		0.000	No
Back	0.967			0.053	0.000		1.020	No
Right	0.080			0.017			0.097	No
Left				0.129	0.000		0.129	No

**12.2.3. WCDMA FDD 5 + 2.4 GHz / WCDMA FDD 5 + BT**

EUT Position	Simultaneous Transmission Condition				Σ 1g SAR (W/kg)	SPLSR (Yes/ No)
	WWAN	WLAN - 802.11 b/g/n		WPAN		
	WCDMA FDD 5	SISO (Ant 1)	MIMO (Ant 1 + Ant 2)	Bluetooth		
Back	1.010	0.048			1.058	No
Right	0.103				0.103	No
Left		0.149			0.149	No
Back	1.010		0.038		1.048	No
Right	0.103		0.015		0.118	No
Left			0.134		0.134	No
Back	1.010			0.000	1.010	No
Right	0.103				0.103	No
Left				0.000	0.000	No

**12.2.4. WCDMA FDD 5 + 5.0 GHz + BT**

EUT Position	Simultaneous Transmission Condition					Σ 1g SAR (W/kg)	SPLSR (Yes/ No)
	WWAN	WLAN - 802.11 a/n			WPAN		
	WCDMA FDD 5	SISO (Ant 1)	SISO (Ant 2)	MIMO (Ant 1 + Ant 2)	Bluetooth		
Back	1.010	0.073			0.000	1.083	No
Right	0.103					0.103	No
Left		0.147			0.000	0.147	No
Back	1.010		0.113		0.000	1.123	No
Right	0.103		0.040			0.143	No
Left					0.000	0.000	No
Back	1.010			0.053	0.000	1.063	No
Right	0.103			0.017		0.120	No
Left				0.129	0.000	0.129	No

**SAR to Peak Location Separation Ratio (SPLSR)**

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required for combinations specified in this sub-section

**12.3. Simultaneous consideration for LTE + Wi-Fi + BT**

**12.3.1. LTE Band 2 + 2.4 GHz / LTE Band 2 + BT**

EUT Position	Simultaneous Transmission Condition					Σ 1g SAR (W/kg)	SPLSR (Yes/ No)
	WWAN	WLAN - 802.11 b/g/n		WPAN			
	LTE Band 2	SISO (Ant 1)	MIMO (Ant 1 + Ant 2)	Bluetooth			
Back	1.025	0.048				1.073	No
Right	0.083					0.083	No
Left		0.149				0.149	No
Back	1.025		0.038			1.063	No
Right	0.083		0.015			0.098	No
Left			0.134			0.134	No
Back	1.025			0.000		1.025	No
Right	0.083					0.083	No
Left				0.000		0.000	No

**12.3.2. LTE Band 2 + 5.0 GHz + BT**

EUT Position	Simultaneous Transmission Condition					Σ 1g SAR (W/kg)	SPLSR (Yes/ No)
	WWAN	WLAN - 802.11 a/n			WPAN		
	LTE Band 2	SISO (Ant 1)	SISO (Ant 2)	MIMO (Ant 1 + Ant 2)	Bluetooth		
Back	1.025	0.073			0.000	1.098	No
Right	0.083					0.083	No
Left		0.147			0.000	0.147	No
Back	1.025		0.113		0.000	1.138	No
Right	0.083		0.040			0.123	No
Left					0.000	0.000	No
Back	1.025			0.053	0.000	1.078	No
Right	0.083			0.017		0.100	No
Left				0.129	0.000	0.129	No

**12.3.3. LTE Band 5 + 2.4 GHz / LTE Band 5 + BT**

	Simultaneous Transmission Condition					Σ 1g SAR (W/kg)	SPLSR (Yes/ No)
	WWAN	WLAN - 802.11 b/g/n		WPAN			
EUT Position	LTE Band 5	SISO (Ant 1)	MIMO (Ant 1 + Ant 2)	Bluetooth			
Back	1.033	0.048				1.081	No
Right	0.024					0.024	No
Left		0.149				0.149	No
Back	1.033		0.038			1.071	No
Right	0.024		0.015			0.039	No
Left			0.134			0.134	No
Back	1.033			0.000		1.033	No
Right	0.024					0.024	No
Left				0.000		0.000	No

**12.3.4. LTE Band 5 + 5.0 GHz + BT**

	Simultaneous Transmission Condition					Σ 1g SAR (W/kg)	SPLSR (Yes/ No)
	WWAN	WLAN - 802.11 a/n			WPAN		
EUT Position	LTE Band 5	SISO (Ant 1)	SISO (Ant 2)	MIMO (Ant 1 + Ant 2)	Bluetooth		
Back	1.033	0.073			0.000	1.106	No
Right	0.024					0.024	No
Left		0.147			0.000	0.147	No
Back	1.033		0.113		0.000	1.146	No
Right	0.024		0.040			0.064	No
Left					0.000	0.000	No
Back	1.033			0.053	0.000	1.086	No
Right	0.024			0.017		0.041	No
Left				0.129	0.000	0.129	No

**SAR to Peak Location Separation Ratio (SPLSR)**

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required for combinations specified in this sub-section.

**12.4. Simultaneous consideration for Wi-Fi + BT**

**12.4.1. 5.0 GHz + BT**

EUT Position	Simultaneous Transmission Condition					Σ 1g SAR (W/kg)	SPLSR (Yes/ No)
	WLAN - 802.11 a/n			WPAN			
	SISO (Ant 1)	SISO (Ant 2)	MIMO (Ant 1 + Ant 2)	Bluetooth			
Back	0.073			0.000		0.073	No
Right						0.000	No
Left	0.147			0.000		0.147	No
Back		0.113		0.000		0.113	No
Right		0.040				0.040	No
Left				0.000		0.000	No
Back			0.053	0.000		0.053	No
Right			0.017			0.017	No
Left			0.129	0.000		0.129	No

**SAR to Peak Location Separation Ratio (SPLSR)**

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required for combinations specified in this sub-section.