KDB 865664 D01 SAR Measurement 100MHz to 6GHz
FCC 47 CFR part 2 (2.1093)

SAR EVALUATION REPORT
(Class II Permissive Change)

For

Sony

Partial Test of FCC ID: PY7PM-0801

Report Number UL-SAR-RP10770035JD01A V2.0
ISSUE DATE: 22 May 2015

Prepared for

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REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
--	19 May 2015	Initial Issue	--
1	22 May 2015	The following amendments were made in the report: 1. The Front sheet updated to 'partial test of FCC ID: PY7PM-0801'. 2. Section 1 - updated note in 'Application Purpose'. 3. Section 1 – updated SAR values for 'Hotspot Mode/Licensed', 'simultaneous transmission' based on the partial testing only, deleted SAR values not applicable in the report and added a note. 4. Section 2.2 - updated the KDB list, applicable to partial testing only. 5. Section 6.1 - updated 'operating configuration' applicable to partial testing only. 6. Section 6.2 – note included to detail the partial testing performed in Hotspot Mode on 1900 MHz bands only. 7. Section 7.1 – note 2 removed. 8. Section 8.2.1 – updated the measured power for HSUPA. 9. Section 10 - updated the 'SAR test reduction criteria' applicable to partial testing, 10. Section 12 – note included under each sub section.	Naseer Mirza

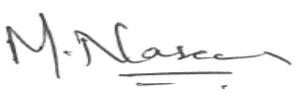
TABLE OF CONTENTS

1. Attestation of Test Results

Applicant Name:	Sony Mobile Communications Inc				
Application Purpose	☒ Class II Permissive Change Partial testing was performed due to additional power reduction being applied in Hotspot mode in the bands PCS1900, UMTS FDD 2 and LTE Band 2 by a software update. Testing was performed in the Wireless Router (Hotspot) RF exposure condition on these bands only.				
DUT Description	The EUT is a GSM/WCDMA/LTE Phone + Bluetooth, DTS/UNII a/b/g/n/ac + NFC & ANT+				
Test Device is	Mass Production sample				
Device category	Portable				
Exposure Category	General Population/Uncontrolled Exposure (1g SAR limit: 1.6 W/kg)				
Date Tested	05 May 2015 to 11 May 2015				
The highest reported SAR values	RF Exposure Conditions	Equipment Class			
		Licensed	DTS	DSS	UNII
	Head	see note below	see note below	N/A	see note below
	Body-worn Accessory	see note below	see note below	N/A	see note below
	Wireless Router (Hotspot)	0.775 W/kg	see note below	N/A	see note below
	Simultaneous Transmission	1.270 W/kg	1.170 W/kg	1.270 W/kg	1.270 W/kg
	Note: Refer to original SAR test report UL-SAR-RP10295122JD06A for the highest report values for this RF Exposure condition / Equipment Class				
Applicable Standards	FCC 47 CFR part 2 (2.1093) FCC KDB publications IEEE Std 1528-2013				
Test Results	Pass				

UL VS 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 VS 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.

Note: 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 VS Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL VS 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.

Approved & Released By:	Prepared By:
	
Naseer Mirza Project Lead UL VS Ltd.	Sandhya Menon Senior Engineer UL VS Ltd.

2. Test Specification, Methods and Procedures

2.1. Test Specification

Reference:	KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03
Title:	SAR Measurement Requirements for 100 MHz to 6 GHz
Purpose of Test:	Field probes, tissue dielectric properties, SAR scans, measurement accuracy and variability of the measured results are discussed. The field probe and SAR scan requirements are derived from criteria considered in standard IEEE 1528-2013.
The Equipment Under Test complied with the Specific Absorption Rate for general population/uncontrolled exposure limit of 1.6 W/kg as specified in FCC 47 CFR part 2 (2.1093).	

2.2. Methods and Procedures Reference Documentation

The test tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE STD 1528- 2013, the following FCC Published RF exposure KDB procedures, and TCB workshop updates:

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

FCC KDB Publications:
447498 D01 General RF Exposure Guidance v05r02
648474 D04 Handset SAR v01r02
865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03
865664 D02 RF Exposure Reporting v01r01
941225 D01 3G SAR Procedures v03
941225 D05 SAR for LTE Devices v02r03
941225 D06 Hotspot Mode v02

2.3. Definition of Measurement Equipment

The measurement equipment used complied with the requirements of the standards referenced in the methods & procedures section above. Section 4.2 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

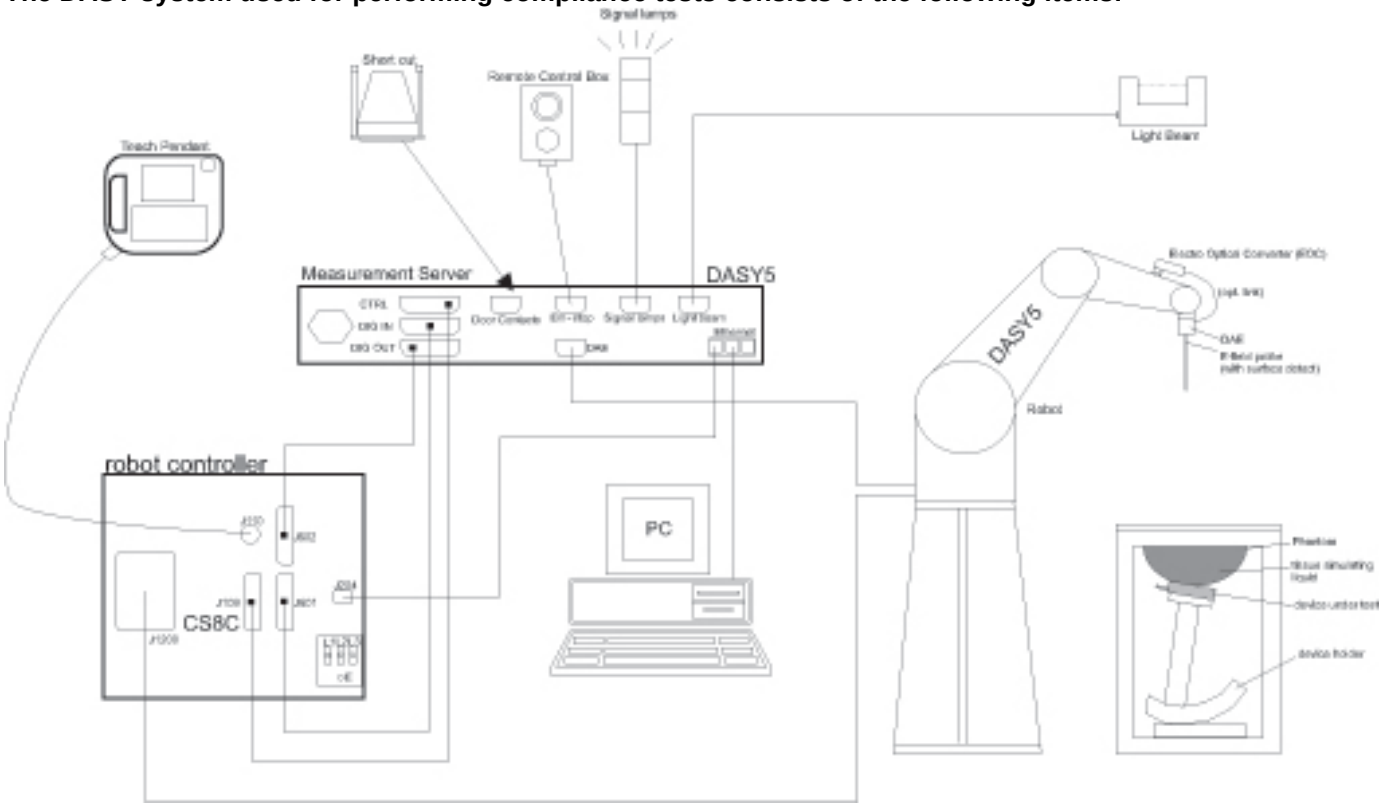
Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire, RG23 8BG UK	Facility Type
SAR Lab 57	Controlled Environment Chamber

UL VS 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.

UL No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
A2111	Data Acquisition Electronics	SPEAG	DAE3	432	20 Aug 2014	12
A2243	Probe	SPEAG	ES3 DV3	3304	21 Aug 2014	12
A1237	1900 MHz Dipole Kit	SPEAG	D1900V2	540	08 Dec 2014	12
GO591	Robot Power Supply	SPEAG	DASY4	None	Calibrated before use	-
M1653	Robot Arm	Staubli	RX908 L	F01/5J86A1/C/01	Calibrated before use	-
A1328	Handset Positioner	SPEAG	Modification	SD 000 H01 DA	-	-
A1182	Handset Positioner	SPEAG	V3.0	None	-	-
A2443	Handset Positioner	SPEAG	MD4HHTV5	None	-	-
M1755	DAK Fluid Probe	SPEAG	SM DAK 040 CA	1089	Calibrated before use	-
M1015	Network Analyser	Agilent Technologies	8753ES	US39172406	26 Sept 2014	12
A2621	Digital Camera	Nikon	S3600	41010357	-	-
M1908	Signal Generator	R&S	SMIQ03B	1125555503	02 Dec 2014	12
M1841	Dual Channel Power Meter	R & S	NRVD	834501/069	27 Mar 2015	12
M1044	Power Sensor	R & S	ZRPZ1	893350/0019	05 Sep 2014	12
M265	Power Sensor	R & S	ZRPZ1	893350/0017	05 Sep 2014	12
A2100	Directional Coupler	RF-Lambda	11101300748	None	Calibrated as part of system	-
A1938	Amplifier	Mini-Circuits	ZHL-42	QA0826002	Calibrated as part of system	-

4.3. SAR System Specifications

Robot System	
Positioner:	Stäubli Unimation Corp. Robot Model: RX90L
Repeatability:	0.025 mm
No. of Axis:	6
Serial Number(s):	F01/5J86A1/A/01
Reach:	1185 mm
Payload:	3.5 kg
Control Unit:	CS7
Programming Language:	V+
Data Acquisition Electronic (DAE) System	
Serial Number:	DAE3 SN: 432
PC Controller	
PC:	Dell Precision 340
Operating System:	Windows 2000
Data Card:	DASY4 Measurement Server
Serial Number:	1080
Data Converter	
Features:	Signal Amplifier, multiplexer, A/D converted and control logic.
Software:	DASY4 Software
Connecting Lines:	Optical downlink for data and status info. Optical uplink for commands and clock.
PC Interface Card	
Function:	24 bit (64 MHz) DSP for real time processing Link to DAE3 16 nit A/D converter for surface detection system serial link to robot direct emergency stop output for robot.
E-Field Probe	
Model:	ES3DV3
Serial No:	3304
Construction:	Triangular core
Frequency:	10 MHz to >4 GHz
Linearity:	±0.2 dB (30 MHz to 4 GHz)
Probe Length (mm):	337
Probe Diameter (mm):	10
Tip Length (mm):	10
Tip Diameter (mm):	4
Sensor X Offset (mm):	2
Sensor Y Offset (mm):	2
Sensor Z Offset (mm):	2
Phantom	
Phantom:	SAM Phantom, Eli Phantom
Shell Material:	Fibreglass
Thickness:	2.0 ±0.1 mm

4.4. SAR Measurement Procedure

4.4.1. 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. 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 v01r03

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

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 v01r03

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{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 1st 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	≤ $1.5 \cdot \Delta z_{Zoom}(n-1)$	
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: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.

* When zoom scan is required and the *reported* SAR from the area scan based *1-g SAR estimation* 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

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.

4.5. Volumetric Scan Procedure

Step 1: Repeat Step 1-4 in Section 4.3

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.

5. 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”.

Test Name	Confidence Level	Calculated Uncertainty
Uncertainty-GSM / GPRS / EDGE 1900 / WCDMA FDD 2 / LTE Band 2 Body Configuration 1g	95%	±18.26%

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.

5.1. Uncertainty -PCS / GPRS / EDGE 1900 / WCDMA FDD 2 / LTE Band 2 Body Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	$c_{i\ (1g)}$	Standard Uncertainty		υ_i or υ_{eff}
							+ u (%)	- u (%)	
B	Probe calibration	6.000	6.000	normal (k=1)	1.0000	1.0000	6.000	6.000	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.160	0.160	normal (k=1)	1.0000	1.0000	0.160	0.160	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	1.730	1.730	Rectangular	1.7321	1.0000	0.999	0.999	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration / Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	1.860	1.860	normal (k=1)	1.0000	1.0000	1.860	1.860	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	2.610	2.610	normal (k=1)	1.0000	0.6400	1.670	1.670	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	2.140	2.140	normal (k=1)	1.0000	0.6000	1.284	1.284	5
	Combined standard uncertainty			t-distribution			9.32	9.32	>500
	Expanded uncertainty			k = 1.96			18.26	18.26	>500

6. Equipment Under Test (EUT)

6.1. Identification of Equipment Under Test (EUT)

IMEI Number:	**Cellular Radiated Sample:** 354278060011016 - used to PCS1900, WCDMA FDD 2 and LTE Band 2 Hotspot mode SAR measurements only. **Cellular Conducted Sample:** 004402452751229 - used to perform Cellular conducted power measurements on PCS1900, WCDMA FDD 2 and LTE FDD Band 2 Hotspot Mode only.
Hardware Version Number:	Cellular Sample: A WLAN Sample: A
Software Version Number:	Cellular Sample: 23.1.C.0.357 WLAN Sample: 0_25_3_16_A
Country of Manufacture:	China
Date of Receipt:	04 May 2015

DUT Descriptions	The EUT supports GSM 850/1900MHz bands, WCDMA FDD bands 2/4/5, LTE FDD bands 2/4/12 bands. It also supports GPRS service with multi-slots class 12, EGPRS service with multi-slots class 12, HSPA with HSDPA (Category 24) and HSUPA (Category 6) features are also supported. It has MP3, camera, FM radio, USB memory, GPS receiver, NFC, Mobile High-Definition Link (MHL), Bluetooth (EDR and Bluetooth 4.0), WLAN (802.11 a/b/g/n/ac), IR Proximity Sensor and Wi-Fi hotspot functions with 'Auto RF Power Back-Off' mode capabilities." Note: The Wi-Fi hotspot function with 'Auto RF Power Back-Off' works on PCS1900, WCDMA FDD 2, and LTE Band 2 bands only. The Class II permissive change is to allow additional RF Power reduction at 'Hotspot Mode' in PCS1900, WCDMA FDD 2 and LTE 2 bands only.
Operating Configurations	Hotspot Mode
Device dimension	Overall (Length x Width): 72.40 mm x 146.46mm Overall Diagonal: 159.381mm Display Diagonal: 132.00mm
Back Cover	☒ Normal Battery Cover ☐ Normal Battery Cover with NFC ☐ Wireless Charger Battery Cover ☐ Wireless Charger Battery Cover with NFC
Accessory	☒ Headset
Battery Options	☒ Standard – Lithium-ion battery, Rating 3.8Vdc ☐ Extended (large capacity)
Mobile Hotspot	Wi-Fi Hotspot mode permits the device to share its cellular data connection with other Wi-Fi -enabled devices. ☒ Mobile Hotspot (Wi-Fi 2.4 GHz) ☒ Mobile Hotspot (Wi-Fi 5 GHz) ☒ Mobile Hotspot (Bluetooth 2.4 GHz)
Wi-Fi Direct	Wi-Fi Direct enabled devices transfer data directly between each other ☒ Wi-Fi Direct (Wi-Fi 2.4 GHz) ☒ Wi-Fi Direct (Wi-Fi 5 GHz)

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode	Duty Cycle
GSM	850, 1900	Voice (GMSK) GPRS (GMSK) EGPRS (GMSK / 8PSK)	GSM Voice: 12.0%; GPRS / EGPRS: 1 Slot: 12.0% ; 2 Slots: 25% 3 Slots: 37.5% ; 4 Slots: 50%
	GPRS / EGPRS Multi-Slot Class: ☐ Class 8 - One Up ☐ Class 10 - Two Up ☒ Class 12 - Four Up ☐ Class 33 - Four Up ☐ DTM (Dual Transfer Mode)		
W-CDMA (FDD)	Band 2 / 4 / 5	WCDMA Rel. 99 (Voice & Data) HSDPA (Rel. 5) HSUPA (Rel. 6) DC-HSDPA (Rel. 7) HSPA+ (Rel. 9)	Rel. 99: 100%
LTE (FDD)	Band 2 / 4 / 12	QPSK, 16QAM Rel. 10 Carrier Aggregation (1 Uplink and 2 Downlinks)	100%
	Does this device SV-LTE (1xRTT-LTE)? ☐Yes ☒ No		
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20) 802.11n (HT40)	100%
	5 GHz	802.11a 802.11n (HT20) 802.11n (HT40) 802.11ac (VHT20) 802.11ac (VHT40) 802.11ac (VHT80)	100%
Bluetooth 4.0	-	BR EDR BLE	<100%

Note: Partial testing was performed in the Wireless Router (Hotspot) RF exposure condition on PCS1900, UMTS FDD 2 and LTE Band 2 bands only.

Wireless Technologies (Continued)

Equipment Category	2G PCS	TDMA 1900	Voice GPRS (Data) EDGE (Data)
	3G WCDMA Band	FDD 2	RMC12.2 Kbps HSDPA Rel 5 HSUPA Rel 6 DC-HSDPA Rel 8
	4G LTE Band	FDD 2	QPSK Data
Type of Unit	Portable Transceiver		
Intended Operating Environment:	Within GSM, WCDMA, LTE , Wi-Fi and *Bluetooth* Coverage		
Transmitter Maximum Output Power Characteristics:	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 FDD 2	Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D01.	
	LTE Band 2	Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D05.	
Transmitter Frequency Range:	PCS1900	(1850 to 1910) MHz	
	WCDMA FDD 2	(1852 to 1908) MHz	
	LTE Band 2	(1850 to 1910) MHz	

Transmitter Frequency Allocation of EUT When Under Test:

Bands	Channel Number	Channel Description	Frequency (MHz)
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
LTE Band 2	18700	Low	1860.0
	18900	Middle	1880.0
	19100	High	1900.0

Antenna Type:	Internal integral	
Antenna Length:	As specified in Appendix A.1	
Number of Antenna Positions:	WWAN ~ LTE / WCDMA / GSM	1 fixed
	WLAN/ BT	1 fixed
	Felica/NFC	1 fixed
	Sub/GPS	1 fixed

6.3. Nominal and Maximum Output Power

		RF Output Power (dBm)	
RF Air interface	**Mode**	**Target**	**Max. tune-up tolerance limit**
GSM1900 (Power Back-off Supported & Enabled)	Voice	27.5	-1.5~+1.5
	GPRS / EGPRS 1 slot (GMSK)	27.5	-1.5~+1.5
	GPRS / EGPRS 2 slots (GMSK)	25.5	-1.5~+1.5
	GPRS / EGPRS 3 slots (GMSK)	24.5	-1.5~+1.5
	GPRS / EGPRS 4 slots (GMSK)	23.5	-1.5~+1.5
	EGPRS 1 slot (8PSK)	23.5	-1.5~+1.5
	EGPRS 2 slots (8PSK)	21.5	-1.5~+1.5
	EGPRS 3 slots (8PSK)	20.5	-1.5~+1.5
	EGPRS 4 slots (8PSK)	19.5	-1.5~+1.5
WCDMA FDD 2 (Power Back-off Supported & Enabled)	R99	19.0	-0.7~+0.5
	HSDPA	19.0	-0.7~+0.5
	HSUPA	19.0	-0.7~+0.5
	DC-HSDPA	19.0	-0.7~+0.5
LTE Band 2 (Power Back-off Supported & Enabled)	QPSK (1RB)	21.0	-1.0 ~ +0.7
	QPSK (50%RB)	21.0	-1.0 ~ +0.7
	QPSK (100%RB)	21.0	-1.0 ~ +0.7
	16QAM (1RB)	21.0	-1.0 ~ +0.7
	16QAM (50%RB)	21.0	-1.0 ~ +0.7
	16QAM (100%RB)	21.0	-1.0 ~ +0.7

6.4. 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 Voice / Data	LTE BAND Data	WCDMA Voice / Data	Wi-Fi 2.4 GHz 802.11b/g/n	Wi-Fi 5.0 GHz 802.11a/n/ac	*Bluetooth*
1	X			X		
2		X		X		
3			X	X		
4	X				X	
5		X			X	
6			X		X	
7	X					X
8		X				X
9			X			X
10					X	X
11	X				X	X
12		X			X	X
13			X		X	X

Note:

Based on the customer declaration, the following are the possible combination of the Simultaneous Transmission possibilities in the EUT:

1. WWAN + WLAN 2.4 GHz
2. WWAN + WLAN 5.0 GHz
3. WWAN + WPAN
4. WPAN + WLAN 5.0 GHz (This simultaneous transmission was evaluated in original report)
5. WWAN + WPAN + WLAN 5.0 GHz

7. RF Exposure Conditions (Test Configurations)

Refer to Appendix A.1 “Antenna Locations and Separation Distances” for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

7.1. Wireless Router (Hotspot)

For WWAN (GSM, WCDMA, LTE)

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	<25 mm	Yes	
Front	<25 mm	Yes	
Edge 1 (Top)	>25 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 648474 D04, Handset SAR v01r02
Edge 2 (Right)	<25 mm	Yes	
Edge 3 (Bottom)	<25 mm	Yes	
Edge 4 (Left)	<25 mm	Yes	

Note:

1. This Class II Permissive change only affects the 1900 MHz band (PCE Equipment Class) and 2.4 GHz (DTS Equipment Class) Hotspot mode operation. Therefore partial SAR retesting was performed only on those bands in Hotspot mode where additional power reduction has been applied i.e. PCS1900, WCDMA Band 2, and LTE Band 2.

8. Conducted Output Power Measurements

8.1.RF Output Average Power Measurement: 2G
Power Back-off Supported & Enabled

Voice Mode GSM (GMSK) – applicable to Body configuration only		
Channel Number	**Frequency (MHZ)**	**Avg Power (dBm)**
512	1850.2	27.8
661	1880.0	28.0
810	1909.8	28.0

GPRS (GMSK) – Coding Scheme: CS1

Channel Number	Frequency (MHZ)	Avg Burst Power (dBm)				Frame Power (dBm)			
		1Uplink	2Uplink	3Uplink	4Uplink	1Uplink	2Uplink	3Uplink	4Uplink
512	1850.2	27.9	25.7	24.5	23.4	18.9	19.7	20.2	20.4
661	1880.0	27.9	25.9	24.8	23.6	18.9	19.9	20.5	20.6
810	1909.8	27.9	25.7	24.5	23.5	18.9	19.7	20.2	20.5

EDGE (GMSK) – Coding Scheme: MCS4

Channel Number	Frequency (MHZ)	Avg Burst Power (dBm)				Frame Power (dBm)			
		1Uplink	2Uplink	3Uplink	4Uplink	1Uplink	2Uplink	3Uplink	4Uplink
512	1850.2	27.9	25.7	24.5	23.5	18.9	19.7	20.2	20.5
661	1880.0	27.9	25.8	24.7	23.6	18.9	19.8	20.4	20.6
810	1909.8	27.9	25.7	24.5	23.4	18.9	19.7	20.2	20.4

EDGE (8PSK) – Coding Scheme: MCS9

Channel Number	Frequency (MHZ)	Avg Burst Power (dBm)				Frame Power (dBm)			
		1Uplink	2Uplink	3Uplink	4Uplink	1Uplink	2Uplink	3Uplink	4Uplink
512	1850.2	23.8	21.7	20.9	19.9	14.8	15.7	16.6	16.9
661	1880.0	23.9	21.8	20.9	20.0	14.9	15.8	16.6	17.0
810	1909.8	23.8	21.8	21.0	20.0	14.8	15.8	16.7	17.0

Note:

Scale factor for uplink time slot:

1. 1 Uplink: time slot ratio = 8:1 => 10*log(8/1) = **9.03 dB**
2. 2 Uplink: time slot ratio = 8:2 => 10*log(8/2) = **6.02 dB**
3. 3 Uplink: time slot ratio = 8:3 => 10*log(8/3) = **4.26 dB**
4. 4 Uplink: time slot ratio = 8:4 => 10*log(8/4) = **3.01 dB**
5. The worst-case configuration and mode for SAR testing is determined to be as follows:
    - Hotspot Mode (Data): GMSK (GPRS) mode with **4 uplink**, based on the output power measurements above
6. No further SAR test required on PCS1900 Body configuration, as the measured average output power for voice mode GSM (GMSK) on *power back off supported & disabled* is the most conservative than the *power back off supported & enabled (Reduced power)*. The Body SAR test on *power back off supported & disabled* is already performed in original FCC SAR report **UL-SAR-RP10295122JD06.**

8.2.RF Output Average Power Measurement: 3G

Release 99

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 specification. The DUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7).

Mode	Subtest	Rel99
WCDMA General Settings	Loopback Mode	Test Mode 1
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	βc/βd	8/15

HSDPA

The following 4 Sub-tests were completed according to Release 5 procedures in section 5.2 of 3GPP TS34.121-1. A summary of these settings are illustrated below:

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subtest	1	2	3	4
W-CDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set1			
	Power Control Algorithm	Algorithm 2			
	βc	2/15	12/15	15/15	15/15
	βd	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	βc/βd	2/15	12/15	15/8	15/4
	βhs	4/15	24/15	30/15	30/15
	MPR (dB)	0	0	0.5	0.5
HSDPA Specific Settings	D_{ACK}	8			
	D_{NAK}	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
	Ahs=βhs/βc	30/15			

HSPA (HSDPA & HSUPA)

The following 5 Sub-tests were completed according to Release 6procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

	Mode	HSPA				
	Subtest	**1**	**2**	**3**	**4**	**5**
WCMDA General Settings	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2kbps RMC				
	HSDPA FRC	H-Set 1				
	HSUPA Test	HSPA				
	Power Control Algorithm	Algorithm 2				Algorithm 1
	βc	11/15	6/15	15/15	2/15	15/15
	βd	15/15	15/15	9/15	15/15	0
	βec	209/225	12/15	30/15	2/15	5/15
	βc/βd	11/15	11/15	15/9	2/15	15/0
	βhs	22/15	12/15	30/15	4/15	5/15
	βed	1309/225	94/75	47/15 47/15	56/75	47/15
	CM (dB)	1	3	2	3	1
	MPR (dB)	0	2	1	2	0
HSDPA Specific Settings	DACK	8				0
	DNAK	8				0
	DCQI	8				0
	Ack-Nack repetition factor	3				
	CQI Feedback (Table 5.2B.4)	4ms				
	CQI Repetition Factor (Table 5.2B.4)	2				
	Ahs = βhs/βc	30/15				
HSUPA Specific Settings	E-DPDCCH	6	8	8	5	7
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	21
	ETFCI (from 34.121 Table C.11.1.3)	75	67	92	71	81
	Associated Max UL Data Rate kbps	242.1	174.9	482.8	205.8	308.9
	Reference E-TFCIs	5	5	2	5	1
	Reference E-TFCI	11	11	11	11	67
	Reference E-TFCI PO	4	4	4	4	18
	Reference E-TFCI	67	67	92	67	67
	Reference E-TFCI PO	18	18	18	18	18
	Reference E-TFCI	71	71	71	71	71
	Reference E-TFCI PO	23	23	23	23	23
	Reference E-TFCI	75	75	75	75	75
	Reference E-TFCI PO	26	26	26	26	26
	Reference E-TFCI	81	81	81	81	81
	Reference E-TFCI PO	27	27	27	27	27
	Maximum Channelization Codes	2xSF2				SF4

DC-HSDPA

The following 4 Sub-tests were completed according to Release 7 procedures in section 5.2 of 3GPP TS34.121-1, since DC-HSDPA has only one transmitting uplink. A summary of these settings are illustrated below:

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subtest	**1**	**2**	**3**	**4**
W-CDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set 1			
	Power Control Algorithm	Algorithm 2			
	βc	2/15	11/15	15/15	15/15
	βd	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	βc/βd	2/15	12/15	15/8	15/4
	βhs	4/15	24/15	30/15	30/15
	MPR (dB)	0	0	0.5	0.5
HSDPA Specific Settings	D_{ACK}	8			
	D_{NAK}	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
	Ahs=βhs/βc	30/15			

8.2.1. RMC / HSDPA / HSUPA
Power Back-off Supported & Enabled

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	18.7	18.7	18.7	18.7	18.3	17.6	17.8	17.5	17.6	19.2
	UL: 9400 DL: 9800	18.7	18.7	18.7	18.7	18.0	17.6	17.7	17.5	17.6	19.2
	UL: 9538 DL: 9938	18.5	18.6	18.5	18.5	17.8	17.6	17.7	17.5	17.7	19.1
ßc		2	12	15	15	11	6	15	2	15	
ßd		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	

8.2.2. DC-HSDPA (Cat 24)
Power Back-off Supported & Enabled

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]
Band 2 (1900 MHz)	UL: 9262 DL: 9662	18.7	18.7	18.6	18.7	19.2
	UL: 9400 DL: 9800	18.7	18.7	18.7	18.7	19.2
	UL: 9538 DL: 9938	18.7	18.6	18.7	18.8	19.1
ßc		2	12	15	15	
ßd		15	15	8	4	
ΔACK, ΔNACK, ΔCQI		8	8	8	8	
AGV		-	-	-	-	

8.3.RF Output Average Power Measurement: LTE

The following tests were conducted according to the test requirements outlined in section 6.2 of the 3GPP TS36.101 specification.
UE Power Class: 3 (23 +/- 2dBm). 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 (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

The allowed A-MPR values specified below in Table 6.2.4.-1 of 3GPP TS36.101 are in addition to the allowed MPR requirements. All the measurements below were performed with A-MPR disabled, by using Network Signalling Value of “NS_01”.

Table 6.2.4-1: Additional Maximum Power Reduction (A-MPR)

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks (N_{RB})	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	NA
NS_03	6.6.2.2.1	2, 4,10, 23, 25, 35, 36	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
			20	>10	≤ 1
NS_04	6.6.2.2.2	41	5	>6	≤ 1
			10, 15, 20	See Table 6.2.4-4	
NS_05	6.6.3.3.1	1	10,15,20	≥ 50	≤ 1
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	Table 5.6-1	n/a
NS_07	6.6.2.2.3 6.6.3.3.2	13	10	Table 6.2.4-2	Table 6.2.4-2
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2
NS_10		20	15, 20	Table 6.2.4-3	Table 6.2.4-3
NS_11	6.6.2.2.1	23[1]	1.4, 3, 5, 10	Table 6.2.4-5	Table 6.2.4-5
..					
NS_32	-	-	-	-	-
Note 1: Applies to the lower block of Band 23, i.e. a carrier placed in the 2000-2010 MHz region.					

8.3.1. LTE Band 2 (1900 MHz)
Power Back-off Supported & Enabled

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)	21.7	20.9	20.9	20.8
		1	Mid	49	(0)	21.7	21.0	20.9	20.9
		1	High	99	(0)	21.7	20.9	20.8	20.8
		50	low	0	(0)	21.7	21.0	21.0	20.9
		50	Mid	24	(0)	21.7	21.0	20.9	20.8
		50	High	49	(0)	21.7	21.0	21.0	20.9
		100	-	0	(0)	21.7	21.0	21.0	20.8
	16QAM	1	Low	0	(0)	21.7	20.8	21.1	20.8
		1	Mid	49	(0)	21.7	20.9	21.0	20.8
		1	High	99	(0)	21.7	20.8	21.1	20.8
		50	low	0	(0)	21.7	21.0	20.9	20.9
		50	Mid	24	(0)	21.7	21.0	20.9	20.9
		50	High	49	(0)	21.7	21.0	20.9	21.0
		100	-	0	(0)	21.7	21.0	21.0	20.9
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)	21.7	20.9	20.9	20.8
		1	Mid	37	(0)	21.7	20.9	20.9	20.8
		1	High	74	(0)	21.7	20.9	21.0	20.9
		36	low	0	(0)	21.7	21.0	20.9	21.0
		36	Mid	16	(0)	21.7	21.0	20.9	20.9
		36	High	35	(0)	21.7	21.0	21.0	20.9
		75	-	0	(0)	21.7	21.1	21.0	20.9
	16QAM	1	Low	0	(0)	21.7	21.0	20.3	20.7
		1	Mid	37	(0)	21.7	21.0	21.0	20.8
		1	High	74	(0)	21.7	21.1	21.0	21.0
		36	low	0	(0)	21.7	21.0	21.0	21.0
		36	Mid	16	(0)	21.7	21.0	20.9	20.9
		36	High	35	(0)	21.7	21.1	21.0	20.9
		75	-	0	(0)	21.7	21.0	21.0	20.9

LTE Band 2 (1900 MHz) (Continued)
Power Back-off Supported & Enabled

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)	21.7	20.8	21.0	20.9
		1	Mid	24	(0)	21.7	21.0	20.9	20.8
		1	High	49	(0)	21.7	21.0	20.8	20.8
		25	Low	0	(0)	21.7	21.0	21.0	20.9
		25	Mid	12	(0)	21.7	21.0	20.9	20.8
		25	High	24	(0)	21.7	21.0	20.9	20.9
		50	-	0	(0)	21.7	21.0	20.9	20.9
	16QAM	1	Low	0	(0)	21.7	21.0	20.8	21.0
		1	mid	24	(0)	21.7	21.0	20.8	21.0
		1	High	49	(0)	21.7	20.9	20.9	21.0
		25	Low	0	(0)	21.7	21.1	21.0	20.9
		25	Mid	12	(0)	21.7	21.0	21.0	20.8
		25	High	24	(0)	21.7	21.0	21.0	20.9
		50	-	0	(0)	21.7	21.0	20.9	20.9
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)	21.7	20.9	20.9	20.8
		1	Mid	12	(0)	21.7	20.9	20.9	20.7
		1	High	24	(0)	21.7	21.0	20.9	20.9
		12	low	0	(0)	21.7	21.0	21.0	20.9
		12	Mid	6	(0)	21.7	21.0	20.9	20.8
		12	High	11	(0)	21.7	21.0	20.9	20.8
		25	-	0	(0)	21.7	21.0	20.9	20.8
	16QAM	1	Low	0	(0)	21.7	20.8	20.8	20.8
		1	Mid	12	(0)	21.7	20.8	20.8	20.7
		1	High	24	(0)	21.7	20.9	20.9	20.8
		12	low	0	(0)	21.7	21.0	20.9	20.7
		12	Mid	6	(0)	21.7	21.0	20.9	20.7
		12	High	11	(0)	21.7	21.1	20.9	20.7
		25	-	0	(0)	21.7	20.9	20.9	20.8

LTE Band 2 (1900 MHz) (Continued)
Power Back-off Supported & Enabled

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)	21.7	21.0	20.9	20.7
		1	Mid	7	(0)	21.7	21.0	20.8	20.7
		1	High	14	(0)	21.7	21.0	20.9	20.8
		8	Low	0	(0)	21.7	20.9	20.9	20.9
		8	Mid	4	(0)	21.7	21.0	20.9	20.9
		8	High	7	(0)	21.7	21.0	20.9	20.9
		15	-	0	(0)	21.7	21.0	21.0	20.9
	16QAM	1	Low	0	(0)	21.7	21.1	20.9	20.8
		1	Mid	7	(0)	21.7	21.0	20.9	20.8
		1	High	14	(0)	21.7	21.1	20.9	20.9
		8	Low	0	(0)	21.7	21.0	20.9	20.9
		8	Mid	4	(0)	21.7	21.0	20.9	20.9
		8	High	7	(0)	21.7	21.0	20.9	20.9
		15	-	0	(0)	21.7	21.0	20.9	20.9
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)	21.7	20.9	20.9	20.9
		1	Mid	2	(0)	21.7	20.8	20.8	21.0
		1	High	5	(0)	21.7	20.9	20.9	21.0
		3	Low	0	(0)	21.7	20.9	20.9	20.9
		3	Mid	1	(0)	21.7	20.9	20.9	20.9
		3	high	2	(0)	21.7	20.9	20.9	20.9
		6	-	0	(0)	21.7	21.0	21.0	21.0
	16QAM	1	Low	0	(0)	21.7	21.1	21.0	20.8
		1	Mid	2	(0)	21.7	21.0	20.9	20.8
		1	High	5	(0)	21.7	21.0	21.0	20.8
		3	Low	0	(0)	21.7	20.8	20.7	20.9
		3	Mid	1	(0)	21.7	20.8	20.7	20.9
		3	high	2	(0)	21.7	20.9	20.6	21.0
		6	-	0	(0)	21.7	21.1	21.0	20.9

9. Dielectric Property Measurements & System Check

9.1.Tissue Dielectric Parameters

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized.
The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.
Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz; IEEE1528:2013 & IEC 62209-1:2005

Target Frequency (MHz)	Head		Body	
	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
750	41.9	0.89		
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1500	40.4	1.23		
1610	40.3	1.29	53.8	1.40
1640	40.2	1.31		
1750	40.1	1.37		
1800	40.0	1.40	53.3	1.52
1900	40.0	1.40	53.3	1.52
2000	40.0	1.40	53.3	1.52
2100	39.8	1.49		
2300	39.5	1.67		
2450	39.2	1.80	52.7	1.95
2600	39.0	1.96		
3000	38.5	2.40	52.0	2.73
3500	37.9	2.91		
4000	37.4	3.43		
4500	36.8	3.94		
5000	36.2	4.45	49.3	5.07
5100	36.1	4.55	49.1	5.18
5200	36.0	4.66	49.0	5.30
5300	35.9	4.76	48.9	5.42
5400	35.8	4.86	48.7	5.53
5500	35.6	4.96	48.6	5.65
5600	35.5	5.07	48.5	5.77
5700	35.4	5.17	48.3	5.88
5800	35.3	5.27	48.2	6.00
6000	35.1	5.48		

NOTE: For convenience, permittivity and conductivity values at some frequencies that are not part of the original data from Drossos et al. [B60] or the extension to 5800 MHz are provided (i.e., the values shown in italics). These values were linearly interpolated between the values in this table that are immediately above and below these values, except the values at 6000 MHz that were linearly extrapolated from the values at 3000 MHz and 5800 MHz.

9.2. System Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are re-measured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

9.3. Reference Target SAR Values

The reference SAR values are obtained from the calibration certificate of system validation dipoles. The measured values are normalised to 1 Watt.

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Target SAR Values (mW/g)		
				1g/10g	Head	Body
D1900V2	540	08/12/2014	1900	1g	40.10	40.00
				10g	20.90	21.10

9.4. Dielectric Property Measurements & System Check Results

The 1-g SAR and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within 10% of the manufacturer calibrated dipole SAR target. The internal limit is set to 5%.

Site 57
System Check 1900 Body
Date: 05/05/2015
Validation Dipole and Serial Number: D1900V2: SN: 540

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1900	24.0 ºC	23.5 ºC	ε_r	53.30	53.12	-0.34	5.00
				σ	1.57	1.52	0.14	5.00
				1g SAR	40.00	41.20	3.00	5.00
				10g SAR	21.10	21.96	4.08	5.00

System Check 1900 Body
Date: 11/05/2015
Validation Dipole and Serial Number: D1900V2: SN: 540

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1900	24.0 ºC	23.5 ºC	ε_r	53.30	52.79	-0.96	5.00
				σ	1.57	1.57	3.61	5.00
				1g SAR	40.00	40.80	2.00	5.00
				10g SAR	21.10	21.88	3.70	5.00

10.Measured SAR Results

SAR Test Reduction criteria are as follows:

KDB 447498 D01 General RF Exposure Guidance:
Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

- ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
- ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
- ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

KDB 941225 D01 SAR test for 3G devices:
Body SAR is also measured for HSPA when the maximum average output of each RF channel with HSPA active is at least ¼ dB higher than that measured without HSPA using 12.2 kbps RMC or the maximum SAR for 12.2 kbps RMC is above 75% of the SAR limit. Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 with power control algorithm 2.

KDB 941225 D05 SAR for LTE Devices:
SAR test reduction is applied using the following criteria:

- Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB, and 50% RB allocation, using the RB offset and required test channel combination with the highest maximum output power among 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 for other Channels is performed at the highest output power level for 1RB, and 50% RB configuration for that channel.
- Testing for 100% RB configuration is performed at the highest output power level for 100% RB configuration across the Low, Mid and High Channel when the highest reported SAR for 1 RB and 50% RB are > 0.8 W/kg. Testing for the remaining required channels is not needed because the reported SAR for 100% RB Allocation < 1.45 W/kg.
- Testing for 16-QAM modulation is not required because the reported SAR for QPSK is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of QPSK.
- Testing for the other channel bandwidths is not required because the reported SAR for the highest channel bandwidth is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of the highest channel bandwidth.

10.1. Specific Absorption Rate - Test Results
For All SAR measurement in this report the 1g-SAR limit tested to is 1.6 W/Kg

10.1.1. PCS 1900 - Hotspot Mode - Power Back-Off Supported and Enabled
Max Reported SAR = 0.621 (W/kg)

					For LTE Only		Power (dBm)		1g: SAR Results (W/kg)			
Mode or Modulation	Dist (mm)	EUT Position	Channel No.	Freq (MHz)	RB Allocation	RB Offset	Tune up limit	Meas.	Meas. Level (W/kg)	Reported SAR (W/kg)	Note(s)	Scan No.
GMSK (Data 4 Slot)	10	Front	661	1880.0	N/A	N/A	25.0	23.6	0.346	0.478	-	1
	10	Back	661	1880.0	N/A	N/A	25.0	23.6	0.307	0.424	-	2
	10	Left Hand Side	661	1880.0	N/A	N/A	25.0	23.6	0.118	0.163	-	3
	10	Right Hand Side	661	1880.0	N/A	N/A	25.0	23.6	0.159	0.219	-	4
	10	Bottom	661	1880.0	N/A	N/A	25.0	23.6	0.450	0.621	-	5

10.1.2. WCDMA FDD 2- Hotspot Mode - Power Back-Off Supported and Enabled
Max Reported SAR = 0.539 (W/kg)

					For LTE Only		Power (dBm)		1g: SAR Results (W/kg)			
Mode or Modulation	Dist (mm)	EUT Position	Channel No.	Freq (MHz)	RB Allocation	RB Offset	Tune up limit	Meas.	Meas. Level (W/kg)	Reported SAR (W/kg)	Note(s)	Scan No.
QPSK	10	Front	9400	1880.0	N/A	N/A	19.5	19.2	0.361	0.387	-	6
	10	Back	9400	1880.0	N/A	N/A	19.5	19.2	0.337	0.361	-	7
	10	Left Hand Side	9400	1880.0	N/A	N/A	19.5	19.2	0.147	0.158	-	8
	10	Right Hand Side	9400	1880.0	N/A	N/A	19.5	19.2	0.177	0.190	-	9
	10	Bottom	9400	1880.0	N/A	N/A	19.5	19.2	0.503	0.539	-	10

10.1.3. LTE Band 2- Hotspot Mode - Power Back-Off Supported and Enabled
Max Reported SAR = 0.775 (W/kg)

					For LTE Only		Power (dBm)		1g: SAR Results (W/kg)			
Mode or Modulation	Dist (mm)	EUT Position	Channel No.	Freq (MHz)	RB Allocation	RB Offset	Tune up limit	Meas.	Meas. Level (W/kg)	Reported SAR (W/kg)	Note(s)	Scan No.
QPSK	10	Front	18700	1860.0	1	49	21.7	21.0	0.462	0.543	-	11
	10	Front	18700	1860.0	50	24	21.7	21.0	0.463	0.544	-	12
	10	Back	18700	1860.0	1	49	21.7	21.0	0.660	0.775	-	13
	10	Back	18700	1860.0	50	24	21.7	21.0	0.530	0.623	-	14
	10	Left Hand Side	18700	1860.0	1	49	21.7	21.0	0.369	0.434	-	15
	10	Left Hand Side	18700	1860.0	50	24	21.7	21.0	0.289	0.340	-	16
	10	Right Hand Side	18700	1860.0	1	49	21.7	21.0	0.294	0.345	-	17
	10	Right Hand Side	18700	1860.0	50	24	21.7	21.0	0.235	0.276	-	18
	10	Bottom	18700	1860.0	1	49	21.7	21.0	0.657	0.772	-	19
	10	Bottom	18700	1860.0	50	24	21.7	21.0	0.658	0.773	-	20

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

None of the measured 1g-SAR Results were >0.8W/kg hence no measurements were repeated.

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_1 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_2 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:

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

The Sum of reported SAR did not exceed 1.6 W/Kg in any of the below cases and hence, the SAR to peak location ratio distance was not calculated.

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

12.1.1. PCS 1900 + 2.4 GHz / PCS 1900 + BT

RF Exposure Conditions	EUT Position		Simultaneous Transmission Condition				
			PCS1900 ①	Wi-Fi (DTS) ②	*Bluetooth* ③	Σ 1g SAR (W/kg)	SPLSR (Yes/ No)
Hotspot	Front	① + ②	0.478	0.486		0.964	No
		① + ③	0.478		0.207	0.685	No
	Back	① + ②	0.424	0.395		0.819	No
		① + ③	0.424		0.207	0.631	No
	Left	① + ②	0.163	0.019		0.182	No
		① + ③	0.163		0.207	0.370	No
	Right	① + ②	0.279	-		0.279	No
		① + ③	0.279		-	0.279	No
	Top	① + ②	-	0.080		0.080	No
		① + ③	-		0.207	0.207	No
	Bottom	① + ②	0.621	-		0.621	No
		① + ③	0.621		-	0.621	No

12.1.2. PCS 1900 + 5.0 GHz / PCS 1900 + 5.0 GHz + BT

RF Exposure Conditions	EUT Position		Simultaneous Transmission Condition				
			PCS1900 ①	Wi-Fi (UNII) ②	*Bluetooth* ③	Σ 1g SAR (W/kg)	SPLSR (Yes/ No)
Hotspot	Front	① + ②	0.478	0.045		0.523	No
		① + ②+ ③	0.478	0.045	0.207	0.730	No
	Back	① + ②	0.424	0.288		0.712	No
		① + ②+ ③	0.424	0.288	0.207	0.919	No
	Left	① + ②	0.163	0.036		0.199	No
		① + ②+ ③	0.163	0.036	0.207	0.406	No
	Right	① + ②	0.279	-		0.279	No
		① + ②+ ③	0.279	-	-	0.279	No
	Top	① + ②	-	0.029		0.029	No
		① + ②+ ③	-	0.029	0.207	0.236	No
	Bottom	① + ②	0.621	-		0.621	No
		① + ②+ ③	0.621	-	-	0.621	No

Note: The 1g SAR values reported in the above tables for Wi-Fi (DTS), Wi-Fi (UNII) and Bluetooth were taken from the values reported in the original test report.

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

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

RF Exposure Conditions	EUT Position		Simultaneous Transmission Condition				
			WCDMA FDD 2 ①	Wi-Fi (DTS) ②	*Bluetooth* ③	Σ 1g SAR (W/kg)	SPLSR (Yes/ No)
Hotspot	Front	① + ②	0.387	0.486		0.873	No
		① + ③	0.387		0.207	0.594	No
	Back	① + ②	0.361	0.395		0.756	No
		① + ③	0.361		0.207	0.568	No
	Left	① + ②	0.158	0.019		0.177	No
		① + ③	0.158		0.207	0.365	No
	Right	① + ②	0.190	-		0.190	No
		① + ③	0.190		-	0.190	No
	Top	① + ②	-	0.080		0.080	No
		① + ③	-		0.207	0.207	No
	Bottom	① + ②	0.539	-		0.539	No
		① + ③	0.539		-	0.539	No

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

RF Exposure Conditions	EUT Position		Simultaneous Transmission Condition				
			WCDMA FDD 2 ①	Wi-Fi (UNII) ②	*Bluetooth* ③	Σ 1g SAR (W/kg)	SPLSR (Yes/ No)
Hotspot	Front	① + ②	0.387	0.045		0.432	No
		① + ②+ ③	0.387	0.045	0.207	0.639	No
	Back	① + ②	0.361	0.288		0.649	No
		① + ②+ ③	0.361	0.288	0.207	0.856	No
	Left	① + ②	0.158	0.036		0.194	No
		① + ②+ ③	0.158	0.036	0.207	0.401	No
	Right	① + ②	0.190	-		0.190	No
		① + ②+ ③	0.190	-	-	0.190	No
	Top	① + ②	-	0.029		0.029	No
		① + ②+ ③	-	0.029	0.207	0.236	No
	Bottom	① + ②	0.539	-		0.539	No
		① + ②+ ③	0.539	-	-	0.539	No

Note: The 1g SAR values reported in the above tables for Wi-Fi (DTS), Wi-Fi (UNII) and Bluetooth were taken from the values reported in the original test report.

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

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

RF Exposure Conditions	EUT Position		Simultaneous Transmission Condition				
			LTE 2 ①	Wi-Fi (DTS) ②	*Bluetooth* ③	Σ 1g SAR (W/kg)	SPLSR (Yes/ No)
Hotspot	Front	① + ②	0.544	0.486		1.030	No
		① + ③	0.544		0.207	0.751	No
	Back	① + ②	0.775	0.395		1.170	No
		① + ③	0.775		0.207	0.982	No
	Left	① + ②	0.434	0.019		0.453	No
		① + ③	0.434		0.207	0.641	No
	Right	① + ②	0.345	-		0.345	No
		① + ③	0.345		-	0.345	No
	Top	① + ②	-	0.080		0.080	No
		① + ③	-		0.207	0.207	No
	Bottom	① + ②	0.773	-		0.773	No
		① + ③	0.773		-	0.773	No

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

RF Exposure Conditions	EUT Position		Simultaneous Transmission Condition				
			LTE 2 ①	Wi-Fi (UNII) ②	*Bluetooth* ③	Σ 1g SAR (W/kg)	SPLSR (Yes/ No)
Hotspot	Front	① + ②	0.544	0.045		0.589	No
		① + ②+ ③	0.544	0.045	0.207	0.796	No
	Back	① + ②	0.775	0.288		1.063	No
		① + ②+ ③	0.775	0.288	0.207	1.270	No
	Left	① + ②	0.434	0.036		0.470	No
		① + ②+ ③	0.434	0.036	0.207	0.677	No
	Right	① + ②	0.345	-		0.345	No
		① + ②+ ③	0.345	-	-	0.345	No
	Top	① + ②	-	0.029		0.029	No
		① + ②+ ③	-	0.029	0.207	0.236	No
	Bottom	① + ②	0.773	-		0.773	No
		① + ②+ ③	0.773	-	-	0.773	No

Note: The 1g SAR values reported in the above tables for Wi-Fi (DTS), Wi-Fi (UNII) and Bluetooth were taken from the values reported in the original test report.