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

SAR EVALUATION REPORT

For

Sony

FCC ID: PY7PM-0807

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Prepared for

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REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
--	18 July 2014	Initial Issue	--
1	01 Aug 2014	Made the following changes: 1. In Section 1, The EUT is a "GSM/WCDMA/LTE Phone + Bluetooth, DTS/UNII a/b/g/n/ac + NFC & ANT+ " 2. Description sentence removed in section 6.2	Naseer Mirza

TABLE OF CONTENTS

1. Attestation of Test Results

Applicant Name:	Sony Mobile Communications Inc			
Application Purpose	☒ Original Grant			
DUT Description	The EUT is a GSM/WCDMA/LTE Phone + Bluetooth, DTS/UNII a/b/g/n/ac + NFC & ANT+			
Test Device is	An identical prototype			
Device category	Portable			
Exposure Category	General Population/Uncontrolled Exposure (1g SAR limit: 1.6 W/kg)			
Date Tested	07 July 2014 to 15 July 2014			
The highest reported SAR values	RF Exposure Conditions	Equipment Class		
		Licensed	DTS	UNII
	Head	0.495 W/kg	0.406 W/kg	0.446 W/kg
	Body-worn Accessory	0.746 W/kg	0.078 W/kg	0.366 W/kg
	Wireless Router (Hotspot)	1.202 W/kg	0.078 W/kg	0.366 W/kg
	Simultaneous Transmission	1.202 W/kg	1.202 W/kg	1.202 W/kg
Applicable Standards	FCC 47 CFR part 2 (2.1093) KDB publication IEEE Std 1528-2013			
Test Results	Pass			

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.

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 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.

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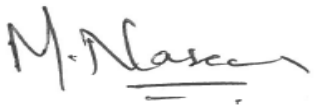
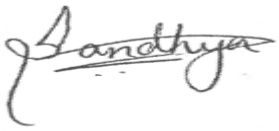
	
Naseer Mirza Project Lead UL Verification Services Ltd.	Sandhya Menon Laboratory Engineer UL Verification Services Ltd.

2. Test Specification, Methods and Procedures

2.1. Test Specification

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 draft standard IEEE P1528-2011.
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) and ANSI C95.1-1992 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 248227 D01 SAR measurements for 802.11a/b/g v01r02

KDB 447498 D01 General RF Exposure Guidance v05r02

KDB 648474 D04 SAR Handsets SAR v01r02

KDB 941225 D01 SAR test for 3G devices v02

KDB 941225 D03 SAR Test Reduction GSM GPRS EDGE v01

KDB 941225 D04 SAR for GSM E GPRS Dual Xfer Mode v01

KDB 941225 D06 Hotspot Mode SAR v01r01

KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r03

KDB 865664 D02 RF Exposure Reporting v01r01

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

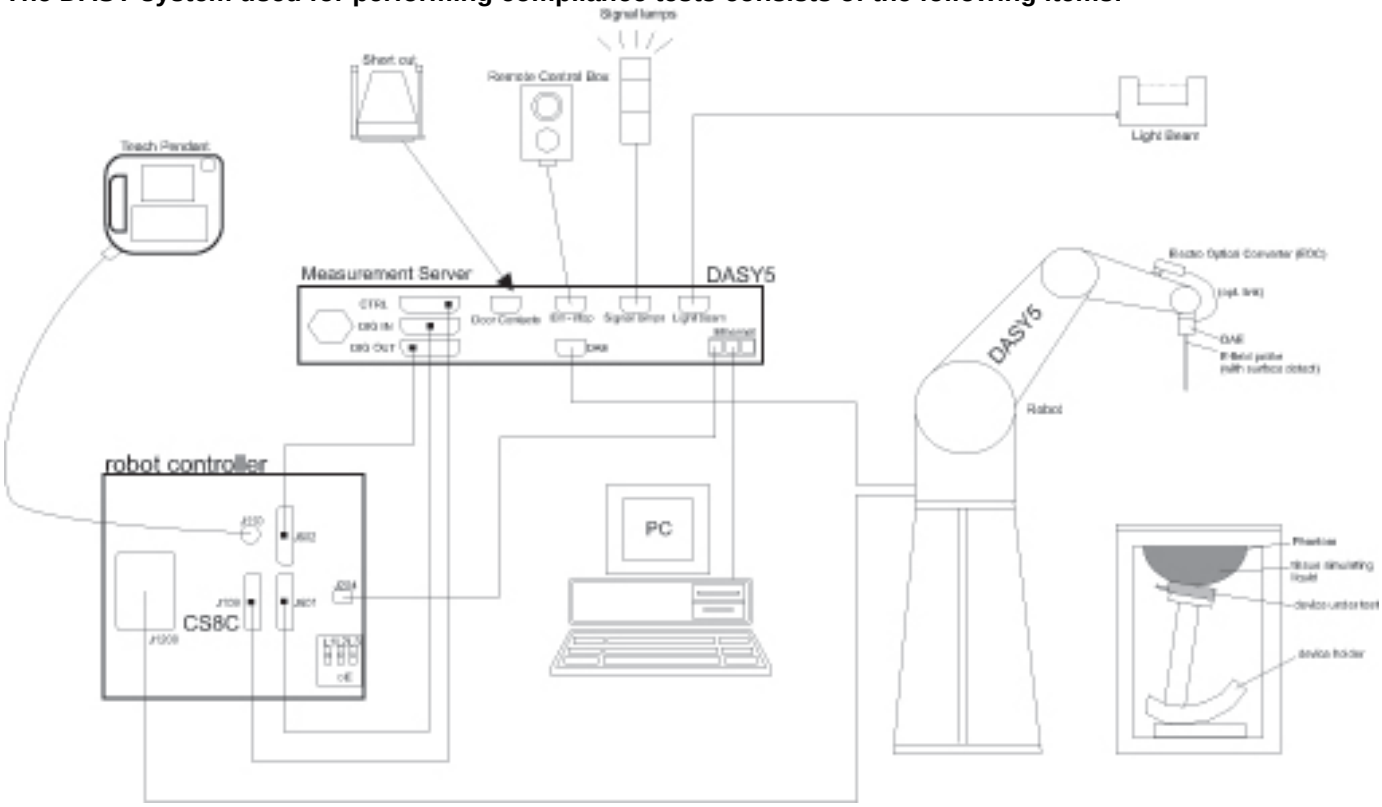
Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire, RG23 8BG UK	Facility Type
SAR Lab 56	Controlled Environment Chamber
SAR Lab 57	Controlled Environment Chamber
SAR Lab 58	Controlled Environment Chamber
SAR Lab 59	Controlled Environment Chamber
SAR Lab 60	Controlled Environment Chamber
SAR 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. 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
Specific Absorption Rate-GSM 850 / UMTS FDD 5 Head Configuration 1g	95%	±18.77%
Specific Absorption Rate-GSM / GPRS / EDGE 850 / UMTS FDD 5 Body Configurations 1g	95%	±18.36%
Specific Absorption Rate-PCS 1900 Head Configuration 1g	95%	±18.88%
Specific Absorption Rate-PCS / GPRS / EDGE 1900 Body Configuration 1g	95%	±18.26%
Specific Absorption Rate- Wi-Fi 2450 MHz Head Configuration 1g	95%	±18.13%
Specific Absorption Rate- Wi-Fi 2450 MHz Body Configuration 1g	95%	±18.35%
Specific Absorption Rate-Wi-Fi 5GHz Head Configuration 1g	95%	±20.53%
Specific Absorption Rate-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.

6. Equipment Under Test (EUT)

6.1. Identification of Equipment Under Test (EUT)

Serial Number/ IMEI Number:	**Cellular Radiated Samples:** CB5A1ZG8XL; 004402452693918– used to perform GSM850 Head and PCS 1900 Head SAR measurements only. CB5A1ZG8Z5; 004402452692746– used to perform GSM850 Body and PCS1900 Body SAR measurements only. CB5A1ZG8WJ; 004402452692696– used to perform UMTS FDD 5 Body SAR measurements only. CB5A1ZG8X9; 004402452692563– used to perform UMTS FDD 5 Head SAR measurements only. **Cellular Conducted Sample:** CB5A1ZG8UM; 004402452693769 – used to perform Cellular Conducted power measurements. CB5A1ZG8YJ; 004402452693785 – used to perform Cellular Conducted power measurements. **WLAN Radiated Samples:** CB5A1ZG8Z2; 004402452692704 – used to perform WLAN 2.4GHz SAR measurements only. CB5A1ZG8VN; 004402452692647 – used to perform WLAN 5GHz Head SAR measurements only. CB5A1ZG8V6; 004402452692712 – used to perform WLAN 5GHz Body SAR measurements only. **WLAN Conducted Sample:** CB5A1ZG8VD; 004402452693777 – used to perform WLAN Conducted power measurements.
Hardware Version Number:	Cellular Sample: A; WLAN Sample: A
Software Version Number:	Cellular Sample: ATPV:1283-9868 ; WLAN Sample: 0_25_3_16_A
Country of Manufacture:	China
Date of Receipt:	07 July 2014

6.2. Further Description of EUT

The EUT supports GSM 850/1900MHz bands, UMTS FDD band 5. It also supports Dual Transfer Mode Class 11 (DTM ~Voice +Data), GPRS service with multi-slots class 33, EGPRS service with multi-slots class 33, HSPA with HSDPA (Category 10) and HSUPA (Category 6) features are also supported. It has MP3, camera, FM radio, USB memory, GPS receiver, NFC, ANT+, Mobile High-Definition Link (MHL 3.0), Bluetooth (EDR and Bluetooth 4.0), WLAN (802.11 a/b/g/n/ac), Antenna Tuner and Wi-Fi hotspot functions with 'Auto RF Power Back-Off' (PCS1900) mode capabilities.

6.3. Modifications Incorporated in the EUT

There were no modification during the course of testing the device

6.4. Accessories

The following accessories were supplied with the EUT during testing:

Description:	Memory Card	Dummy Battery	Personal Hands-Free Kit (PHF)
Brand Name:	None Stated (Generic)	None Stated	Sony
Model Name or Number:	None Stated	None Stated	MH410c
Serial Number:	None Stated	None Stated	None Stated
Cable Length and Type:	Not Applicable	~0.5m	~1.2 m
Country of Manufacture:	China	None Stated	None Stated
Connected to Port	Micro SD Slot	Unique to Manufacturer	3.5mm Audio jack and custom type

Note(s):

1. This Dummy Battery was only used to perform conducted power measurements.
2. Body worn configurations were not evaluated with PHF attached, As per 648474 D04 Handsets SAR v01r02, ''When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset''.

6.5. 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	145922	~4.0m Utiflex Cable	RF (Input / Output) Air Link
Communication Test Set	R & S	CMW500	146526	~4.0m Utiflex Cable	RF (Input / Output) Air Link
Communication Test Set	R & S	CMW500	145921	~4.0m Utiflex Cable	RF (Input / Output) Air Link

6.6.Additional Information Related to Testing

Equipment Category	2G GSM / PCS	TDMA 850/ 1900	Voice DTM (Voice + Data) GPRS (Data) EDGE (Data)
	3G UMTS Band	FDD 5	RMC12.2Kbps HSDPA Cat 10 (Data) HSUPA Data Cat 6 (Data)
	Wi-Fi Band	(2.4 / 5.0) GHz	Data 802.11a/b/g/n/ac
Type of Unit	Portable Transceiver		
Intended Operating Environment:	Within GSM, UMTS, Wi-Fi and *Bluetooth* Coverage		
Transmitter Maximum Output Power Characteristics:	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.	
	UMTS FDD 5	Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D01.	
	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 7.6	
	5.0 GHz Sub band 1 Wi-Fi 802.11a/n/ac	Test Software was used to configure the EUT to transmit at a maximum measured power as per section 7.6	
	5.0 GHz Sub band 2 Wi-Fi 802.11a/n/ac	Test Software was used to configure the EUT to transmit at a maximum measured power as per section 7.6	
	5.0 GHz Sub band 3 Wi-Fi 802.11a/n/ac	Test Software was used to configure the EUT to transmit at a maximum measured power as per section 7.6	
	5.0 GHz Sub band 4 Wi-Fi 802.11a/n/ac	Test Software was used to configure the EUT to transmit at a maximum measured power as per section 7.6	
Transmitter Frequency Range:	GSM850	(824 to 849) MHz	
	PCS1900	(1850 to 1910) MHz	
	UMTS FDD 5	(826 to 847) 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/ac	(5180 to 5240) MHz	
	5.0 GHz Sub band 2 Wi-Fi 802.11a/n/ac	(5260 to 5320) MHz	
	5.0 GHz Sub band 3 Wi-Fi 802.11a/n/ac	(5500 to 5700) MHz	
	5.0 GHz Sub band 4 Wi-Fi 802.11a/n/ac	(5745 to 5825) MHz	

Additional Information Related to Testing (Continued)

Transmitter Frequency Allocation of EUT When Under Test:	Bands	Channel Number	Channel Description	Frequency (MHz)
	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
	UMTS FDD 5	4132	Low	826.4
		4183	Middle	836.6
		4233	High	846.6

Transmitter Frequency Allocation of EUT When Under Test:	Band: 2.4 / 5.0 GHz Wi-Fi 802.11a/n/ac (HT20 / HT40/HT80)						
	Rule	20 MHz BW Ch.#	Frq. (MHz)	40 MHz BW Ch.#	Frq. (MHz)	80 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			42	5210.0
		44	5220.0	46	5230.0		
		48	5240.0				
	5.3 U-NII-2A	52	5260.0	54	5270.0		
		56	5280.0			58	5290.0
		60	5300.0	62	5310.0		
		64	5320.0				
	5.6 U-NII-2C	100	5500.0	102	5510.0		
		104	5520.0			106	5530.0
		108	5540.0	110	5550.0		
		112	5560.0				
		116	5580.0	118	5590.0		
		120	5600.0			122	5610.0
		124	5620.0	126	5630.0		
		128	5640.0				
		132	5660.0	134	5670.0		
		136	5680.0				
		140	5700.0				
	5.8 UNII-3	149	5745.0	151	5755.0		
		153	5765.0			155	5775.0
		157	5785.0	159	5795.0		
		161	5805.0				
		165	5825.0				

Additional Information Related to Testing (Continued)

Modulation(s):	GMSK (DTM / GSM / GPRS):	217 Hz
	QPSK(UMTS / HSDPA/HSPA):	0Hz
	DBPSK, BPSK, CCK (Wi-Fi):	0 Hz
Modulation Scheme (Crest Factor):	GMSK (DTM Class 11)	4
	GMSK (DTM Class 9)	2.67
	GMSK (DTM Class 5)	2.67
	GMSK (GPRS/EDGE 4 Uplink)	4
	GMSK (GPRS/EDGE 3 Uplink)	2.67
	GMSK (GPRS/EDGE 2 Uplink)	4
	GMSK (GPRS/EDGE 1 Uplink)	8.3
	DBPSK, BPSK, CCK (Wi-Fi802.11a/b/g/n/ac):	1
	QPSK(UMTS/ FDD / HSDPA):	1
Antenna Type:	Internal integral	
Antenna Length:	As specified in Appendix 9	
Number of Antenna Positions:	WWAN ~ LTE / UMTS / GSM	1 fixed
	WLAN/ BT	1 fixed
	Felica/NFC	1 fixed
	Sub/GPS	1 fixed
Power Supply Requirement:	4.2 V	
Battery Type(s):	Embedded Li-ion	

6.6.1. Operating Modes

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

- GSM850 Head and Body-Worn – DTM (Voice + 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 with DTM multi class 9 (1 uplink for voice + 1 uplink for GPRS with CS1).
- GSM850 Hotspot Mode –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. Hotspot was tested using 2 Uplink time slots with CS1 for GPRS.
- PCS1900 Head and Body-Worn (DTM) – DTM (Voice + 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 3 Uplink time slots with DTM multi class 11 (1 uplink for voice + 2 uplink for GPRS with CS1).
- PCS1900 Hotspot Mode – 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. Hotspot was tested using 4 Uplink time slots with CS1 for GPRS.

GSM850: Power Table Settings used for Test Set	
Power Control Level PCL	Nominal Power (dBm)
0 … 2	39
3	37
4	35
5	**33**
6	31
7	29
8	27
9	25
10	23
11	21
12	19
13	17
14	15
15	13
16	11
17	9
18	7
19 ... 31	5

PCS1900: Power Table Settings used for Test Set	
Power Control Level PCL	Nominal Power (dBm)
22 … 29	Reserved
30	33
31	32
0	**30**
1	28
2	26
3	24
4	22
5	20
6	18
7	16
8	14
9	12
10	10
11	8
12	6
13	4
14	2
15	0
16 … 21	Reserved

- UMTS FDD 5 - RMC 12.2kbps with Test loop mode 1 and TPC bits configured to all "1's", to allow the EUT to transmit at a maximum as per KDB 941225 D01.
- UMTS FDD 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.
- UMTS FDD 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.

Operating Modes (Continued)

- 2.4 GHz Wi-Fi802.11b/g/n - Data allocated mode using 'HyperTerminal' software to excise mode ‘b’, ‘g’ and ‘n’, with maximum power of up to 12.9 dBm for ‘b’ mode and 12.8 dBm for ‘g’ and 12.8 dBm for ‘n’ modes.
- 5.0 GHz Wi-Fi802.11a/n/ac Sub band 1 - Data allocated mode using 'HyperTerminal' software to excise mode ‘a’ ‘n’ and ‘ac’, with maximum power of up to 16.2 dBm for ‘a’ mode, 16.2 dBm for ‘n’ mode and 16.2 dBm for ‘ac’ modes.
- 5.0 GHz Wi-Fi802.11a/n/ac Sub band 2 - Data allocated mode using 'HyperTerminal' software to excise mode ‘a’ ‘n’ and ‘ac’, with maximum power of up to 16.1 dBm for ‘a’ mode, 16.1 dBm for ‘n’ mode and 16.3 dBm for ‘ac’ modes.
- 5.0 GHz Wi-Fi802.11a/n/ac Sub band 3 - Data allocated mode using 'HyperTerminal' software to excise mode ‘a’ ‘n’ and ‘ac’, with maximum power of up to 16.5 dBm for ‘a’ mode, 16.6 dBm for ‘n’ mode and 16.6 dBm for ‘ac’ modes.
- 5.0 GHz Wi-Fi802.11a/n/ac Sub band 4 - Data allocated mode using 'HyperTerminal' software to excise mode ‘a’ ‘n’ and ‘ac’, with maximum power of up to 16.2 dBm for ‘a’ mode, 16.3 dBm for ‘n’ mode and 16.2 dBm for ‘ac’ modes.

6.7.Nominal and Maximum Output power:

Power Back-Off Not Supported

Bands	Speech (Voice Mode)	
	Target (dBm)	Tolerance ± (dB)
GSM850	32.5	-1.2~+0.6

Power Back-Off Supported & Disabled

Bands	Speech (Voice Mode)	
	Target (dBm)	Tolerance ± (dB)
PCS1900	30.0	-0.7~+0.7

Power Back-Off Supported & Enabled

Bands	Speech (Voice Mode)	
	Target (dBm)	Tolerance ± (dB)
PCS1900	25.0	-1.5~+1.5

Power Back-Off Not Supported

Bands	GPRS							
	Tx Slot 1		Tx Slot 2		Tx Slot 3		Tx Slot 4	
	Target (dBm)	Tolerance ± (dB)	Target (dBm)	Tolerance ± (dB)	Target (dBm)	Tolerance ± (dB)	Target (dBm)	Tolerance ± (dB)
GSM850	32.5	-1.2~+0.6	31.0	-1.5~+0.6	29.0	-1.5~+0.6	28.0	-1.5~+0.6
Bands	**EDGE GMSK (MCS1-4)**							
GSM850	32.5	-1.2~+0.6	31.0	-1.5~+0.6	29.0	-1.5~+0.6	28.0	-1.5~+0.6
Bands	**EDGE 8PSK (MCS5-9)**							
GSM850	27.0	-1.5~+1.0	25.0	-1.5~+1.0	24.0	-1.5~+1.0	22.0	-1.5~+1.0

Bands	DTM (GSM + GPRS [GMSK])									
	Tx Slot 1		Tx Slot 2				Tx Slot 3			
	CS_GMSK	Tol ± (dB)	CS_GMSK	Tol ± (dB)	PS_GMSK	Tol ± (dB)	CS_GMSK	Tol ± (dB)	PS_GMSK	Tol ± (dB)
GSM850	32.5	-1.2~+0.6	31.0	-1.5~+0.6	31.0	-1.5~+0.6	29.0	-1.5~+0.6	29.0	-1.5~+0.6

Bands	DTM (GSM + EDGE [GMSK])									
	Tx Slot 1		Tx Slot 2				Tx Slot 3			
	CS_GMSK	Tol ± (dB)	CS_GMSK	Tol ± (dB)	PS_GMSK	Tol ± (dB)	CS_GMSK	Tol ± (dB)	PS_GMSK	Tol ± (dB)
GSM850	32.5	-1.2~+0.6	31.0	-1.5~+0.6	31.0	-1.5~+0.6	29.0	-1.5~+0.6	29.0	-1.5~+0.6

Bands	DTM (GSM + EDGE [8PSK])									
	Tx Slot 1		Tx Slot 2				Tx Slot 3			
	CS_GMSK	Tol ± (dB)	CS_GMSK	Tol ± (dB)	PS_8PSK	Tol ± (dB)	CS_GMSK	Tol ± (dB)	PS_8PSK	Tol ± (dB)
GSM850	32.5	-1.2~+0.6	31.0	-1.5~+0.6	25.0	-1.5~+1.0	29.0	-1.5~+0.6	24.0	-1.5~+1.0

Nominal and Maximum Output power (Continued):

Power Back-Off Supported & Disabled

Bands	GPRS							
	Tx Slot 1		Tx Slot 2		Tx Slot 3		Tx Slot 4	
	Target (dBm)	Tolerance ± (dB)	Target (dBm)	Tolerance ± (dB)	Target (dBm)	Tolerance ± (dB)	Target (dBm)	Tolerance ± (dB)
PCS1900	30.0	-0.7~+0.7	28.0	-1.5~+0.6	27.0	-1.5~+0.6	26.0	-1.5~+0.6
Bands	**EDGE GMSK (MCS1-4)**							
PCS1900	30.0	-0.7~+0.7	28.0	-1.5~+0.6	27.0	-1.5~+0.6	26.0	-1.5~+0.6
Bands	**EDGE 8PSK (MCS5-9)**							
PCS1900	26.0	-1.5~+1.0	24.5	-1.5~+1.0	23.5	-1.5~+1.0	22.5	-1.5~+1.0

Bands	DTM (GSM + GPRS [GMSK])									
	Tx Slot 1		Tx Slot 2				Tx Slot 3			
	CS_GMSK	Tol ± (dB)	CS_GMSK	Tol ± (dB)	PS_GMSK	Tol ± (dB)	CS_GMSK	Tol ± (dB)	PS_GMSK	Tol ± (dB)
PCS1900	30.0	-0.7~+0.7	28.0	-1.5~+0.6	28.0	-1.5~+0.6	27.0	-1.5~+0.6	27.0	-1.5~+0.6
Bands	**DTM (GSM + EDGE [GMSK])**									
	Tx Slot 1		Tx Slot 2				Tx Slot 3			
	CS_GMSK	Tol ± (dB)	CS_GMSK	Tol ± (dB)	PS_GMSK	Tol ± (dB)	CS_GMSK	Tol ± (dB)	PS_GMSK	Tol ± (dB)
PCS1900	30.0	-0.7~+0.7	28.0	-1.5~+0.6	28.0	-1.5~+0.6	27.0	-1.5~+0.6	27.0	-1.5~+0.6
Bands	**DTM (GSM + EDGE [8PSK])**									
	Tx Slot 1		Tx Slot 2				Tx Slot 3			
	CS_GMSK	Tol ± (dB)	CS_GMSK	Tol ± (dB)	PS_8PSK	Tol ± (dB)	CS_GMSK	Tol ± (dB)	PS_8PSK	Tol ± (dB)
PCS1900	30.0	-0.7~+0.7	28.0	-1.5~+0.6	24.0	-1.5~+1.0	27.0	-1.5~+0.6	23.0	-1.5~+1.0

Power Back-Off Supported & Enabled

Bands	GPRS							
	Tx Slot 1		Tx Slot 2		Tx Slot 3		Tx Slot 4	
	Target (dBm)	Tolerance ± (dB)	Target (dBm)	Tolerance ± (dB)	Target (dBm)	Tolerance ± (dB)	Target (dBm)	Tolerance ± (dB)
PCS1900	25.0	-1.5~+1.5	23.0	-1.5~+1.5	22.0	-1.5~+1.5	21.0	-1.5~+1.5
Bands	**EDGE GMSK (MCS1-4)**							
PCS1900	25.0	-1.5~+1.5	23.0	-1.5~+1.5	22.0	-1.5~+1.5	21.0	-1.5~+1.5
Bands	**EDGE 8PSK (MCS5-9)**							
PCS1900	24.5	-1.5~+1.5	22.5	-1.5~+1.5	21.5	-1.5~+1.5	20.5	-1.5~+1.5

Bands	DTM (GSM + GPRS [GMSK])									
	Tx Slot 1		Tx Slot 2				Tx Slot 3			
	CS_GMSK	Tol ± (dB)	CS_GMSK	Tol ± (dB)	PS_GMSK	Tol ± (dB)	CS_GMSK	Tol ± (dB)	PS_GMSK	Tol ± (dB)
PCS1900	25.0	-1.5~+1.5	23.0	-1.5~+1.5	23.0	-1.5~+1.5	22.0	-1.5~+1.5	22.0	-1.5~+1.5
Bands	**DTM (GSM + EDGE [GMSK])**									
	Tx Slot 1		Tx Slot 2				Tx Slot 3			
	CS_GMSK	Tol ± (dB)	CS_GMSK	Tol ± (dB)	PS_GMSK	Tol ± (dB)	CS_GMSK	Tol ± (dB)	PS_GMSK	Tol ± (dB)
PCS1900	25.0	-1.5~+1.5	23.0	-1.5~+1.5	23.0	-1.5~+1.5	22.0	-1.5~+1.5	22.0	-1.5~+1.5
Bands	**DTM (GSM + EDGE [8PSK])**									
	Tx Slot 1		Tx Slot 2				Tx Slot 3			
	CS_GMSK	Tol ± (dB)	CS_GMSK	Tol ± (dB)	PS_8PSK	Tol ± (dB)	CS_GMSK	Tol ± (dB)	PS_8PSK	Tol ± (dB)
PCS1900	25.0	-1.5~+1.5	23.0	-1.5~+1.5	22.5	-1.5~+1.5	22.0	-1.5~+1.5	21.5	-1.5~+1.5

Nominal and Maximum Output power (Continued):

Power Back-Off Not Supported

Band	CS		HS	
	Target (dBm)	Tolerance ± (dB)	Target (dBm)	Tolerance ± (dB)
UMTS FDD 5	24.0	-0.7~+0.5	24.0	-0.7~+0.5

Power Back-Off Not Supported

	WLAN Modes					
	2.4 GHz 802.11b		2.4 GHz 802.11g		2.4 GHz 802.11n	
	1 Mbps	11 Mbps	6 Mbps	54 Mbps	6.5 Mbps	65 Mbps
Max Power {Target + Upper Tolerance} (dBm)	13.5	13.5	13.4	13.4	13.4	13.4

Power Back-Off Not Supported

5.0 GHz 802.11a	5.2 GHz		5.3 GHz		5.5 GHz		5.8 GHz	
	6 Mbps	54 Mbps	6 Mbps	54 Mbps	6 Mbps	54 Mbps	6 Mbps	54 Mbps
Max Power {Target + Upper Tolerance} (dBm)	16.3	16.3	16.3	16.3	16.5	16.5	16.5	16.5
5.0 GHz 802.11n HT-20 / 11ac VHT-20	**5.2 GHz**		**5.3 GHz**		**5.5 GHz**		**5.8 GHz**	
	6.5 Mbps	65 Mbps	6.5 Mbps	65 Mbps	6.5 Mbps	65 Mbps	6.5 Mbps	65 Mbps
Max Power {Target + Upper Tolerance} (dBm)	16.3	13.3	16.3	13.3	16.6	13.7	16.6	13.7
5.0 GHz 802.11n HT-40 / 11ac VHT-40	**5.2 GHz**		**5.3 GHz**		**5.5 GHz**		**5.8 GHz**	
	13.5 Mbps	135 Mbps	13.5 Mbps	135 Mbps	13.5 Mbps	135 Mbps	13.5 Mbps	135 Mbps
Max Power {Target + Upper Tolerance} (dBm)	14.3	12.3	14.3	12.3	14.7	12.7	14.7	12.7
5.0 GHz 802.11ac VHT-80	**5.2 GHz**		**5.3 GHz**		**5.5 GHz**		**5.8 GHz**	
	13.5 Mbps	135 Mbps	13.5 Mbps	135 Mbps	13.5 Mbps	135 Mbps	13.5 Mbps	135 Mbps
Max Power {Target + Upper Tolerance} (dBm)	14.2	12.2	14.2	12.2	14.5	12.6	14.5	12.6

Band	Max Power {Target (dBm) + Upper Tolerance (dBm)}		
Bluetooth	BR	EDR	BLE
	10.0	7.9	2.4

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.

6.8. 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 / DTM	UMTS Voice / Data	Wi-Fi 802.11b/g/n	Wi-Fi 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	X
9		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
5. WWAN + WLAN 5.0 GHz + WPAN

7. RF Exposure Conditions (Test Configurations)

Refer to Appendix 9 “Antenna Locations and Separation Distances” for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

7.1. Configuration and Peripherals

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

- Standalone fully charged battery powered.
- Head, Hotspot mode and Body-worn configurations were evaluated.
- The applied FCC body-worn Personal Hotspot orientations where the corresponding edge(s) closest to the user with the most conservative exposure condition were all evaluated at 10 mm from the body. For configuration that did overlap and power back-off not supported with Personal hotspot, SAR evaluation results for 10mm was used for Body worn.
- GSM, DTM, GPRS and EDGE power measurement were all measured as per FCC publication 941225 D03 and D04. Although power reduction was allowed SAR test was performed on using GMSK (GPRS and /or DTM). Test reduction was applied to EDGE using GMSK and 8PSK modulation scheme.

Head Configuration

a) The EUT was placed in a normal operating position with the centre of the ear-piece aligned with the ear canal on the phantom.

b) With the ear-piece touching the phantom the centre line of the EUT was aligned with an imaginary plane (X and Y axis) consisting of three lines connecting both ears and the mouth.

c) For the cheek position the EUT was gradually moved towards the cheek until any point of the mouth-piece or keypad touched the cheek.

d) For the tilted position the EUT was positioned as for the cheek position, and then the horizontal angle was increased by fifteen degrees (the phone keypad was moved away from the cheek by fifteen degrees).

e) 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.

f) The device was keyed to operate continuously in the transmit mode for the duration of the test.

g) The location of the maximum spatial SAR distribution (hotspot) was determined relative to the EUT and its antenna.

h) The EUT was transmitting at full power throughout the duration of the test powered by a fully charged battery.

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 ‘SAM’ or ‘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 ‘SAM’ phantom until any point of the EUT touched the phantom.

d) For position(s) greater then 0mm separation the EUT was positioned as per the touch-safe position, and then the vertical height was decreased/adjusted as required.

e) 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.

f) The device was keyed to operate continuously in the transmit mode for the duration of the test.

g) The location of the maximum spatial SAR distribution (hotspot) was determined relative to the EUT and its antenna.

h) The EUT was transmitting at full power throughout the duration of the test powered by a fully charged battery.

7.2. Configuration Consideration

Technology Antenna	Configuration	Antenna-to-User Separation	Position	Antenna-to-Edge Separation	Evaluation Considered
WWAN	Head	0mm	Touch Left	<25mm	Yes
			Tilt Left	<25mm	Yes
			Touch Right	<25mm	Yes
			Tilt Right	<25mm	Yes
	Hotspot	10mm	Front	<25mm	Yes
			Back	<25mm	Yes
			Top Edge	>25mm	No
			Bottom Edge	<25mm	Yes
			Right Edge	<25mm	Yes
			Left Edge	<25mm	Yes
	Body	15mm	Front	<25mm	Yes
			Back	<25mm	Yes
WLAN	Head	0mm	Touch Left	<25mm	Yes
			Tilt Left	<25mm	Yes
			Touch Right	<25mm	Yes
			Tilt Right	<25mm	Yes
	Hotspot	10mm	Front	<25mm	Yes
			Back	<25mm	Yes
			Top Edge	<25mm	Yes
			Bottom Edge	>25mm	No
			Right Edge	>25mm	No
			Left Edge	<25mm	Yes
	Body	15mm	Front	<25mm	Yes
			Back	<25mm	Yes

Note:

1. The Antenna to Edge distances is included in the Appendix 9 of the report.
2. Test exemption is as per FCC KDB publication 447498 D01v05 for mobile handsets.
3. Bluetooth standalone SAR is excluded as the output power meets the exclusion threshold:

1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:

[(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] · [$\sqrt{f_{(GHz)}}$] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR,[16] where

- $f_{(GHz)}$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation[17]
- The result is rounded to one decimal place for comparison

" **Taken from FCC KDB publication 447498 D01v05r02**

7.3. SAR Test Exclusion Consideration

Frequency Band	Configuration(s)		
	Head	Hotspot Mode	Body-worn
GSM850	No	No	No
PCS1900	No	No	No
UMTS FDD 5	No	No	No
WLAN 2.4 GHz	No	No	No
WLAN 5.0 GHz	No	No	No
Bluetooth	N/A	Yes	Yes

Note:

1. As per KDB 447498 D01 General RF Exposure Guidance v05r02, The Frequency Bands with Rated Power including Upper tolerance, which qualify for **Standalone SAR Test Exclusion,** are as per the above table.

   The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
   [(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] * [$\sqrt{f_{(GHz)}}$] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

   - $f_{(GHz)}$ is the RF channel transmit frequency in GHz
   - Power and distance are rounded to the nearest *mW* and *mm* before calculation
   - The result is rounded to one decimal place for comparison

   The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

   Applying the above formula for *Bluetooth* Hotspot Mode we get:
   - For 2450MHz, [(10)/10]*[√2.45] =1.6 ≤ 3.0

   Applying the above formula for *Bluetooth* Body-worn we get:
   - For 2450MHz, [(10)/15]*[√2.45] =1.1 ≤ 3.0

   Hence, no testing was performed on *Bluetooth* mode.

2. The details for the ***Maximum Rated Power*** and tolerance(s) can be found in section 6.7.

7.4. RF Output Average Power Measurement: 2G

7.4.1. GSM850
Power Back-Off NOT Supported

Voice Mode GSM (GMSK)

Channel Number	Frequency (MHZ)	Avg Burst Power (dBm)	Frame Power (dB*m*)
128	824.2	32.2	23.2
190	836.6	32.2	23.2
251	848.8	32.2	23.2

GPRS (GMSK) – Coding Scheme: CS1

Channel Number	Frequency (MHZ)	Avg Burst Power (dBm)				Frame Power (dB*m*)			
		1Uplink	2Uplink	3Uplink	4Uplink	1Uplink	2Uplink	3Uplink	4Uplink
128	824.2	32.2	30.8	28.7	27.7	23.2	24.8	24.4	24.7
190	836.6	32.2	30.8	28.7	27.6	23.2	24.8	24.4	24.6
251	848.8	32.2	30.8	28.7	27.6	23.2	24.8	24.4	24.6

EDGE (GMSK) – Coding Scheme: MCS4

128	824.2	32.2	30.8	28.7	27.6	23.2	24.8	24.4	24.6
190	836.6	32.2	30.8	28.7	27.6	23.2	24.8	24.4	24.6
251	848.8	32.2	30.8	28.7	27.6	23.2	24.8	24.4	24.6

EDGE (8PSK) – Coding Scheme: MCS9

128	824.2	27.7	25.4	24.5	22.4	18.7	19.4	20.2	19.4
190	836.6	27.7	25.3	24.5	22.4	18.7	19.3	20.2	19.4
251	848.8	27.6	25.3	24.5	22.4	18.6	19.3	20.2	19.4

DTM - Voice Mode GSM (GMSK) + GPRS (GMSK) – Coding Scheme: CS1

Channel Number	Frequency (MHZ)	Avg Burst Power (dBm)						Frame Power (dBm)					
		Class 5		Class 9		Class 11		Class 5		Class 9		Class 11	
		GSM 1 Uplink	GPRS 1 Uplink	GSM 1 Uplink	GPRS 1 Uplink	GSM 1 Uplink	GPRS 2 Uplink	GSM 1 Uplink	GPRS 1 Uplink	GSM 1 Uplink	GPRS 1 Uplink	GSM 1 Uplink	GPRS 2 Uplink
128	824.2	30.8	30.8	30.9	30.8	28.8	28.7	24.8	24.8	24.9	24.8	24.5	24.4
190	836.6	30.9	30.8	30.8	30.8	28.9	28.7	24.9	24.8	24.8	24.8	24.6	24.4
251	848.8	30.8	30.8	30.9	30.8	28.9	28.8	24.8	24.8	24.9	24.8	24.6	24.5

DTM - Voice Mode GSM (GMSK) + EDGE (GMSK) – Coding Scheme: MCS4

128	824.2	30.8	30.8	30.8	30.8	28.8	28.7	24.8	24.8	24.8	24.8	24.5	24.4
190	836.6	30.8	30.8	30.8	30.8	28.8	28.7	24.8	24.8	24.8	24.8	24.5	24.4
251	848.8	30.8	30.8	30.9	30.8	28.9	28.7	24.8	24.8	24.9	24.8	24.6	24.4

DTM - Voice Mode GSM (GMSK) + EDGE (8PSK) – Coding Scheme: MCS9

128	824.2	30.8	25.3	30.9	25.3	28.7	24.4	24.8	19.3	24.9	19.3	24.4	20.1
190	836.6	30.9	25.3	30.9	25.2	28.7	24.3	24.9	19.3	24.9	19.2	24.4	20.0
251	848.8	30.9	25.3	30.9	25.2	28.7	24.3	24.9	19.3	24.9	19.2	24.4	20.0

GSM850 (Continued)

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**

Conclusions:

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

- For Head SAR Testing, GSM and DTM should be evaluated; therefore the EUT was set in **DTM Multi-slot class 9** due its highest Frame Average Power (dBm)
- For Hotspot Mode SAR Testing, GPRS and DTM should be evaluated; therefore the EUT was set in **GPRS 2 Tx** due its highest Frame Average Power (dBm)
- For Body worn SAR Testing, GSM and DTM should be evaluated, therefore the EUT was set in **DTM Multi-slot class 9** due its highest Frame Average Power (dBm)

7.4.2.PCS1900
Power Back-Off Supported & Disabled

Voice Mode GSM (GMSK)

Channel Number	Frequency (MHZ)	Avg Burst Power (dBm)	Frame Power (dB*m*)
512	1850.2	30.2	21.2
661	1880.0	30.1	21.1
810	1909.8	30.2	21.2

GPRS (GMSK) – Coding Scheme: CS1

Channel Number	Frequency (MHZ)	Avg Burst Power (dBm)				Frame Power (dB*m*)			
		1Uplink	2Uplink	3Uplink	4Uplink	1Uplink	2Uplink	3Uplink	4Uplink
512	1850.2	30.2	27.5	26.6	25.5	21.2	21.5	22.3	**22.5**
661	1880.0	30.1	27.8	26.5	25.5	21.1	21.8	22.2	**22.5**
810	1909.8	30.2	27.8	26.5	25.5	21.2	21.8	22.2	**22.5**

EDGE (GMSK) – Coding Scheme: MCS4

512	1850.2	30.2	27.5	26.5	25.5	21.2	21.5	22.2	22.5
661	1880.0	30.1	27.6	26.5	25.5	21.1	21.6	22.2	22.5
810	1909.8	30.2	27.8	26.5	25.5	21.2	21.8	22.2	22.5

EDGE (8PSK) – Coding Scheme: MCS9

512	1850.2	26.1	24.4	23.4	22.5	17.1	18.4	19.1	19.5
661	1880.0	26.2	24.4	23.4	22.5	17.2	18.4	19.1	19.5
810	1909.8	26.2	24.4	23.3	22.6	17.2	18.4	19.0	19.6

DTM - Voice Mode GSM (GMSK) + GPRS (GMSK) – Coding Scheme: CS1

Channel Number	Frequency (MHZ)	Avg Burst Power (dBm)						Frame Power (dBm)					
		Class 5		Class 9		Class 11		Class 5		Class 9		Class 11	
		GSM 1 Uplink	GPRS 1 Uplink	GSM 1 Uplink	GPRS 1 Uplink	GSM 1 Uplink	GPRS 2 Uplink	GSM 1 Uplink	GPRS 1 Uplink	GSM 1 Uplink	GPRS 1 Uplink	GSM 1 Uplink	GPRS 2 Uplink
512	1850.2	27.6	27.6	27.6	27.6	26.6	26.5	21.6	21.6	21.6	21.6	**22.3**	**22.2**
661	1880.0	27.7	27.7	27.7	27.7	26.6	26.5	21.7	21.7	21.7	21.7	**22.3**	**22.2**
810	1909.8	27.8	27.7	27.8	27.7	26.5	26.5	21.8	21.7	21.8	21.7	**22.2**	**22.2**

DTM - Voice Mode GSM (GMSK) + EDGE (GMSK) – Coding Scheme: MCS4

512	1850.2	27.6	27.6	27.6	27.6	26.6	26.5	21.6	21.6	21.6	21.6	22.3	22.2
661	1880.0	27.7	27.6	27.7	27.7	26.6	26.5	21.7	21.6	21.7	21.7	22.3	22.2
810	1909.8	27.7	27.7	27.7	27.7	26.5	26.5	21.7	21.7	21.7	21.7	22.2	22.2

DTM - Voice Mode GSM (GMSK) + EDGE (8PSK) – Coding Scheme: MCS9

512	1850.2	27.6	24.3	27.6	24.2	26.5	23.2	21.6	18.3	21.6	18.2	22.2	18.9
661	1880.0	27.8	24.3	27.8	24.3	26.5	23.2	21.8	18.3	21.8	18.3	22.2	18.9
810	1909.8	27.9	24.3	27.9	24.3	26.5	23.2	21.9	18.3	21.9	18.3	22.2	18.9

PCS1900
Power Back-Off Supported & Enabled

Voice Mode GSM (GMSK)

Channel Number	Frequency (MHZ)	Avg Burst Power (dBm)	Frame Power (dB*m*)
512	1850.2	25.9	16.9
661	1880.0	25.8	16.8
810	1909.8	25.8	16.8

GPRS (GMSK) – Coding Scheme: CS1

Channel Number	Frequency (MHZ)	Avg Burst Power (dBm)				Frame Power (dB*m*)			
		1Uplink	2Uplink	3Uplink	4Uplink	1Uplink	2Uplink	3Uplink	4Uplink
512	1850.2	25.8	23.3	22.2	21.3	16.8	17.3	17.9	**18.3**
661	1880.0	25.8	23.3	22.2	21.3	16.8	17.3	17.9	**18.3**
810	1909.8	25.8	23.3	22.1	21.3	16.8	17.3	17.8	**18.3**

EDGE (GMSK) – Coding Scheme: MCS4

512	880.2	25.8	23.3	22.2	21.3	16.8	17.3	17.9	18.3
661	897.4	25.8	23.3	22.2	21.3	16.8	17.3	17.9	18.3
810	914.8	25.8	23.3	22.1	21.2	16.8	17.3	17.8	18.2

EDGE (8PSK) – Coding Scheme: MCS9

512	1850.2	25.0	22.8	21.2	20.3	16.0	16.8	16.9	17.3
661	1880.0	25.0	22.6	21.3	20.3	16.0	16.6	17.0	17.3
810	1909.8	25.0	22.7	21.2	20.4	16.0	16.7	16.9	17.4

DTM - Voice Mode GSM (GMSK) + GPRS (GMSK) – Coding Scheme: CS1

Channel Number	Frequency (MHZ)	Avg Burst Power (dBm)						Frame Power (dBm)					
		Class 5		Class 9		Class 11		Class 5		Class 9		Class 11	
		GSM 1 Uplink	GPRS 1 Uplink	GSM 1 Uplink	GPRS 1 Uplink	GSM 1 Uplink	GPRS 2 Uplink	GSM 1 Uplink	GPRS 1 Uplink	GSM 1 Uplink	GPRS 1 Uplink	GSM 1 Uplink	GPRS 2 Uplink
512	1850.2	23.4	23.3	23.4	23.4	22.3	22.2	17.4	17.3	17.4	17.4	**18.0**	**17.9**
661	1880.0	23.4	23.3	23.4	23.4	22.2	22.2	17.4	17.3	17.4	17.4	**17.9**	**17.9**
810	1909.8	23.3	23.2	23.3	23.2	22.1	22.2	17.3	17.2	17.3	17.2	**17.8**	**17.9**

DTM - Voice Mode GSM (GMSK) + EDGE (GMSK) – Coding Scheme: MCS4

512	1850.2	23.4	23.3	23.4	23.4	22.3	22.2	17.4	17.3	17.4	17.4	18.0	17.9
661	1880.0	23.4	23.3	23.4	23.4	22.2	22.2	17.4	17.3	17.4	17.4	17.9	17.9
810	1909.8	23.3	23.2	23.3	23.2	22.1	22.2	17.3	17.2	17.3	17.2	17.8	17.9

DTM - Voice Mode GSM (GMSK) + EDGE (8PSK) – Coding Scheme: MCS9

512	1850.2	23.5	23.5	23.3	22.6	22.2	21.2	17.5	17.5	17.3	16.6	17.9	16.9
661	1880.0	23.4	23.4	23.3	22.5	22.2	21.2	17.4	17.4	17.3	16.5	17.9	16.9
810	1909.8	23.4	23.4	23.3	22.5	22.1	21.2	17.4	17.4	17.3	16.5	17.8	16.9

PCS1900 (Continued):
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**

Conclusions:

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

- For Head SAR Testing, GSM and DTM should be evaluated; therefore the EUT was set in **DTM Multi-slot class 11, Power Back-Off Disabled Mode** due its highest Frame Average Power (dBm)
- For Hotspot Mode SAR Testing, GSM and DTM should be evaluated, therefore the EUT was set in **GPRS 4Tx, Power Back-Off Enabled Mode** due its highest Frame Average Power (dBm)
- For Body worn SAR Testing, GSM and DTM should be evaluated, therefore the EUT was set in **DTM Multi-slot class 11, Power Back-off Disabled Mode** due its highest Frame Average Power (dBm)

7.5. RF Output Average Power Measurement: WCDMA

7.5.1. RMC / HSDPA / HSUPA
Power Back-off Not Supported

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 5 (850 MHz)	UL: 4132 DL: 4357	23.9	23.9	24.0	23.9	23.5	22.6	23.2	22.6	24.3	24.4
	UL: 4183 DL: 4408	24.0	24.0	23.9	24.0	24.1	22.8	23.8	22.7	24.3	24.4
	UL: 4233 DL: 4458	23.8	23.8	24.0	24.0	24.2	22.2	23.9	22.3	24.3	24.3

7.6.RF Output Average Power Measurement: Wi-Fi

7.6.1.WiFi 802.11b/g/n (2.4 GHz)
Power Back-off NOT Supported

		Avg Power (dBm)	
Channel Number	Frequency (MHZ)	(1Mbps)	Operating Mode
1	2412.0	12.8	802.11b
6	2437.0	12.9	
11	2462.0	12.8	
Channel Number	Frequency (MHZ)	(6Mbps)	Operating Mode
1	2412.0	12.8	802.11g
6	2437.0	12.8	
11	2462.0	12.8	
Channel Number	Frequency (MHZ)	(6.5Mbps)	Operating Mode
1	2412.0	12.8	802.11n HT20
6	2437.0	12.8	
11	2462.0	12.6	

7.6.2.Wi-Fi802.11a/n/ac (5.0 GHz) –Sub Band 1 (5.2 GHz UNII)
Power Back-off NOT Supported

		Avg Power (dBm)	
Channel Number	**Frequency (MHZ)**	**6 Mbps**	**Operating Mode**
36	5180.0	16.0	**802.11a**
40	5200.0	16.0	
44	5220.0	15.6	
48	5240.0	16.2	
Channel Number	**Frequency (MHZ)**	**6.5 Mbps**	**Operating Mode**
36	5180.0	16.0	**802.11n, HT20**
40	5200.0	16.0	
44	5220.0	16.0	
48	5240.0	16.2	
36	5180.0	16.0	**802.11ac, VHT20**
40	5200.0	16.0	
44	5220.0	16.2	
48	5240.0	16.1	
Channel Number	**Frequency (MHZ)**	**13.5 Mbps**	**Operating Mode**
38	5190.0	14.0	**802.11n, HT40**
46	5230.0	14.0	
Channel Number	**Frequency (MHZ)**	**13.5 Mbps**	**Operating Mode**
38	5190.0	14.3	**802.11ac, VHT40**
46	5230.0	14.3	
Channel Number	**Frequency (MHZ)**	**29.3 Mbps**	**Operating Mode**
42	5210.0	14.2	**802.11ac, VHT80**

7.6.3.Wi-Fi802.11a/n/ac (5.0 GHz) –Sub Band 2 (5.3 GHz UNII)
Power Back-off NOT Supported

		Avg Power (dBm)	
Channel Number	**Frequency (MHZ)**	**6 Mbps**	**Operating Mode**
52	5260.0	16.1	**802.11a**
56	5280.0	15.8	
60	5300.0	16.1	
64	5320.0	15.9	
Channel Number	**Frequency (MHZ)**	**6.5 Mbps**	**Operating Mode**
52	5260.0	15.8	**802.11n, HT20**
56	5280.0	16.0	
60	5300.0	16.0	
64	5320.0	16.1	
52	5260.0	16.0	**802.11ac, VHT20**
56	5280.0	16.2	
60	5300.0	16.0	
64	5320.0	16.3	
Channel Number	**Frequency (MHZ)**	**13.5 Mbps**	**Operating Mode**
54	5270.0	14.2	**802.11n, HT40**
62	5310.0	14.1	
Channel Number	**Frequency (MHZ)**	**13.5 Mbps**	**Operating Mode**
54	5270.0	14.3	**802.11ac, VHT40**
62	5310.0	14.1	
Channel Number	**Frequency (MHZ)**	**29.3 Mbps**	**Operating Mode**
58	5290.0	14.2	**802.11ac, VHT80**

7.6.4.Wi-Fi802.11a/n/ac (5.0 GHz) –Sub Band 3 (5.5 GHz UNII)
Power Back-off NOT Supported

		Avg Power (dBm)	
Channel Number	**Frequency (MHZ)**	**6 Mbps**	**Operating Mode**
100	5500.0	16.5	**802.11a**
104	5520.0	16.3	
108	5540.0	16.4	
112	5560.0	16.5	
116	5580.0	16.5	
132	5660.0	16.3	
136	5680.0	16.2	
140	5700.0	16.2	
Channel Number	**Frequency (MHZ)**	**6.5 Mbps**	**Operating Mode**
100	5500.0	16.6	**802.11n, HT20**
104	5520.0	16.3	
108	5540.0	16.3	
112	5560.0	16.6	
116	5580.0	16.4	
132	5660.0	16.3	
136	5680.0	16.0	
140	5700.0	16.0	
100	5500.0	16.6	**802.11ac, VHT20**
104	5520.0	16.5	
108	5540.0	16.2	
112	5560.0	16.6	
116	5580.0	16.4	
132	5660.0	16.3	
136	5680.0	16.4	
140	5700.0	16.4	
Channel Number	**Frequency (MHZ)**	**13.5 Mbps**	**Operating Mode**
102	5510.0	14.5	**802.11n, HT40**
110	5550.0	14.5	
134	5670.0	14.3	
Channel Number	**Frequency (MHZ)**	**13.5 Mbps**	**Operating Mode**
102	5510.0	14.2	**802.11ac, VHT40**
110	5550.0	14.7	
134	5670.0	14.4	
Channel Number	**Frequency (MHZ)**	**29.3 Mbps**	**Operating Mode**
106	5530.0	14.5	**802.11ac, VHT80**

7.6.5.Wi-Fi802.11a/n/ac (5.0 GHz) –Sub Band 4 (5.8 GHz UNII)
Power Back-off NOT Supported

		Avg Power (dBm)	
Channel Number	**Frequency (MHZ)**	**6 Mbps**	**Operating Mode**
149	5745.0	16.2	**802.11a**
153	5765.0	16.2	
157	5785.0	16.2	
161	5805.0	16.2	
165	5825.0	16.2	
Channel Number	**Frequency (MHZ)**	**6.5 Mbps**	**Operating Mode**
149	5745.0	16.3	**802.11n, HT20**
153	5765.0	16.1	
157	5785.0	15.9	
161	5805.0	16.1	
165	5825.0	16.2	
149	5745.0	16.1	**802.11ac, VHT20**
153	5765.0	16.1	
157	5785.0	16.2	
161	5805.0	16.2	
165	5825.0	16.1	
Channel Number	**Frequency (MHZ)**	**13.5 Mbps**	**Operating Mode**
151	5755.0	13.9	**802.11n, HT40**
159	5795.0	13.9	
Channel Number	**Frequency (MHZ)**	**13.5 Mbps**	**Operating Mode**
151	5755.0	14.6	**802.11ac, VHT40**
159	5795.0	14.6	
Channel Number	**Frequency (MHZ)**	**29.3 Mbps**	**Operating Mode**
155	5775.0	14.5	**802.11ac, VHT80**

8. System Check and Dielectric Parameters

See Appendix 5 and Appendix 6 for tables and measurements.

9. Measurements, Examinations and Derived Results

9.1. 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 8 for details of measurement uncertainties.

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

9.2.1. GSM 850 Head - Power Back-Off Not Supported

Max Reported SAR = 0.376 (W/kg)

					For LTE Only		Power (dBm)		1g : SAR Results (W/kg)			
Mode or Modulation	Dist (mm)	Test Position	Channel No.	Freq (MHz)	RB Allocation	RB Offset	Tune-up limit	Meas.	Meas.	Scaled	Note(s)	Scan No.
GMSK (DTM Class 9)	0.0	Touch Left	190	836.6	N/A	N/A	31.6	30.8	0.313	0.376	1, 2	1
GMSK (DTM Class 9)	0.0	Tilt Left	190	836.6	N/A	N/A	31.6	30.8	0.212	0.255	1, 2	2
GMSK (DTM Class 9)	0.0	Touch Right	190	836.6	N/A	N/A	31.6	30.8	0.293	0.352	1, 2	3
GMSK (DTM Class 9)	0.0	Tilt Right	190	836.6	N/A	N/A	31.6	30.8	0.176	0.212	1, 2	4

Note(s):

1. DTM Multi-slot Class 9 - Tested using 2 Uplink time slots (with 1 time slots set as CS1 for GPRS and 1 time slot set for voice).
2. 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 for 1-g, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg for 1-g, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg for 1-g, when the transmission band is ≥ 200 MHz

9.2.2. GPRS 850 Hotspot Mode - Power Back-Off Not Supported

Max Reported SAR = 0.506 (W/kg)

					For LTE Only		Power (dBm)		1g : SAR Results (W/kg)			
Mode or Modulation	Dist (mm)	Test Position	Channel No.	Freq (MHz)	RB Allocation	RB Offset	Tune-up limit	Meas.	Meas.	Scaled	Note(s)	Scan No.
GMSK (Data 2 Slot)	10.0	Front	190	836.6	N/A	N/A	31.6	30.8	0.391	0.470	1	5
GMSK (Data 2 Slot)	10.0	Back	190	836.6	N/A	N/A	31.6	30.8	0.395	0.475	1	6
GMSK (Data 2 Slot)	10.0	Left Hand Side	190	836.6	N/A	N/A	31.6	30.8	0.290	0.349	1	7
GMSK (Data 2 Slot)	10.0	Right Hand Side	190	836.6	N/A	N/A	31.6	30.8	0.421	0.506	1	8
GMSK (Data 2 Slot)	10.0	Bottom	190	836.6	N/A	N/A	31.6	30.8	0.133	0.160	1	9

Note(s):

1. 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 for 1-g, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg for 1-g, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg for 1-g, when the transmission band is ≥ 200 MHz

*KDB 941225 D03 - SAR is not required for EDGE and DTM(Data Mode) technology when the maximum average output power is lower than that measured on the corresponding GPRS channels.

9.2.3.GSM 850 Body-Worn - Power Back-Off Not Supported

Max Reported SAR = 0.469 (W/kg)

					For LTE Only		Power (dBm)		1g : SAR Results (W/kg)			
Mode or Modulation	Dist (mm)	Test Position	Channel No.	Freq (MHz)	RB Allocation	RB Offset	Tune-up limit	Meas.	Meas.	Scaled	Note(s)	Scan No.
GMSK (DTM Class 9)	15.0	Front	190	836.6	N/A	N/A	31.6	30.8	0.390	0.469	1, 2	10
GMSK (DTM Class 9)	15.0	Back	190	836.6	N/A	N/A	31.6	30.8	0.382	0.459	1, 2	11

Note(s):

1. DTM Multi-slot Class 9 - Tested using 2 Uplink time slots (with 1 time slots set as CS1 for GPRS and 1 time slot set for voice).
2. 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 for 1-g, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg for 1-g, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg for 1-g, when the transmission band is ≥ 200 MHz

* Body worn configurations were not evaluated with PHF attached, as per KDB 648474 Section 2.3, “when the reported SAR for body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.”

9.2.4.PCS 1900 Head - Power Back-Off Supported and Disabled

Max Reported SAR = 0.495 (W/kg)

					For LTE Only		Power (dBm)		1g : SAR Results (W/kg)			
Mode or Modulation	Dist (mm)	Test Position	Channel No.	Freq (MHz)	RB Allocation	RB Offset	Tune-up limit	Meas.	Meas.	Scaled	Note(s)	Scan No.
GMSK (DTM Class 11)	0.0	Touch Left	661	1880.0	N/A	N/A	27.6	26.5	0.215	0.277	1, 2	12
GMSK (DTM Class 11)	0.0	Tilt Left	661	1880.0	N/A	N/A	27.6	26.5	0.087	0.112	1, 2	13
GMSK (DTM Class 11)	0.0	Touch Right	661	1880.0	N/A	N/A	27.6	26.5	0.384	0.495	1, 2	14
GMSK (DTM Class 11)	0.0	Tilt Right	661	1880.0	N/A	N/A	27.6	26.5	0.086	0.111	1, 2	15

Note(s):

1. DTM Multi-slot Class 11 - Tested using 3 Uplink time slots (with 2 time slots set as CS1 for GPRS and 1 time slot set for voice).
2. 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 for 1-g, when the transmission band is ≤ 100 MHz
   ・≤ 0.6 W/kg for 1-g, when the transmission band is between 100 MHz and 200 MHz
   ・≤ 0.4 W/kg for 1-g, when the transmission band is ≥ 200 MHz

9.2.5.GPRS 1900 Hotspot Mode - Power Back-Off Supported and Enabled

Max Reported SAR = 1.202 (W/kg)

					For LTE Only		Power (dBm)		1g : SAR Results (W/kg)			
Mode or Modulation	Dist (mm)	Test Position	Channel No.	Freq (MHz)	RB Allocation	RB Offset	Tune-up limit	Meas.	Meas.	Scaled	Note(s)	Scan No.
GMSK (Data 4 Slot)	10.0	Front	661	1880.0	N/A	N/A	22.5	21.3	0.539	0.711	1	16
GMSK (Data 4 Slot)	10.0	Back	661	1880.0	N/A	N/A	22.5	21.3	0.467	0.616	1	17
GMSK (Data 4 Slot)	10.0	Left Hand Side	661	1880.0	N/A	N/A	22.5	21.3	0.043	0.057	1	18
GMSK (Data 4 Slot)	10.0	Right Hand Side	661	1880.0	N/A	N/A	22.5	21.3	0.035	0.046	1	19
GMSK (Data 4 Slot)	10.0	Bottom	661	1880.0	N/A	N/A	22.5	21.3	0.716	0.944	-	20
GMSK (Data 4 Slot)	10.0	Bottom	512	1850.0	N/A	N/A	22.5	21.3	0.563	0.742	-	21
GMSK (Data 4 Slot)	10.0	Bottom	810	1909.8	N/A	N/A	22.5	21.3	0.912	1.202	2	22

Note(s):

1. 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 for 1-g, when the transmission band is ≤ 100 MHz
   ・≤ 0.6 W/kg for 1-g, when the transmission band is between 100 MHz and 200 MHz
   ・≤ 0.4 W/kg for 1-g, when the transmission band is ≥ 200 MHz

2. As per 865664 D01, the highest SAR measured > 0.8 W/kg has been re-measured and included in the report in section 10.4 under ***SAR Measurement Variability and Measurement Uncertainty Analysis Results*** Table.

*KDB 941225 D03 - SAR is not required for EDGE and DTM(Data Mode) technology when the maximum average output power is lower than that measured on the corresponding GPRS channels.

9.2.6.PCS 1900 Body-Worn - Power Back-Off Supported and Disabled

Max Reported SAR = 0.746 (W/kg)

					For LTE Only		Power (dBm)		1g : SAR Results (W/kg)			
Mode or Modulation	Dist (mm)	Test Position	Channel No.	Freq (MHz)	RB Allocation	RB Offset	Tune-up limit	Meas.	Meas.	Scaled	Note(s)	Scan No.
GMSK (DTM Class 11)	15.0	Front	661	1880.0	N/A	N/A	27.6	26.5	0.579	0.746	1, 2	23
GMSK (DTM Class 11)	15.0	Back	661	1880.0	N/A	N/A	27.6	26.5	0.537	0.692	1, 2	24

Note(s):

1. DTM Multi-slot Class 11 - Tested using 3 Uplink time slots (with 2 time slots set as CS1 for GPRS and 1 time slot set for voice).
2. 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 for 1-g, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg for 1-g, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg for 1-g, when the transmission band is ≥ 200 MHz

* Body worn configurations were not evaluated with PHF attached, as per KDB 648474 Section 2.3, “when the reported SAR for body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.”

9.2.7.UMTS-FDD 5 Head - Power Back-Off Not Supported

Max Reported SAR = 0.170 (W/kg)

					For LTE Only		Power (dBm)		1g : SAR Results (W/kg)			
Mode or Modulation	Dist (mm)	Test Position	Channel No.	Freq (MHz)	RB Allocation	RB Offset	Tune-up limit	Meas.	Meas.	Scaled	Note(s)	Scan No.
QPSK	0.0	Touch Left	4183	836.6	N/A	N/A	24.5	24.4	0.166	0.170	1, 2	25
QPSK	0.0	Tilt Left	4183	836.6	N/A	N/A	24.5	24.4	0.046	0.047	1, 2	26
QPSK	0.0	Touch Right	4183	836.6	N/A	N/A	24.5	24.4	0.149	0.152	1, 2	27
QPSK	0.0	Tilt Right	4183	836.6	N/A	N/A	24.5	24.4	0.070	0.072	1, 2	28

Note(s):

1. Circuit Switch (CS) - RMC 12.2kbps with Test loop mode 1 and TPC bits configured to All "1's"
2. 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 for 1-g, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg for 1-g, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg for 1-g, when the transmission band is ≥ 200 MHz

9.2.8.UMTS-FDD 5 Hotspot Mode - Power Back-Off Not Supported

Max Reported SAR = 0.533 (W/kg)

					For LTE Only		Power (dBm)		1g : SAR Results (W/kg)			
Mode or Modulation	Dist (mm)	Test Position	Channel No.	Freq (MHz)	RB Allocation	RB Offset	Tune-up limit	Meas.	Meas.	Scaled	Note(s)	Scan No.
QPSK	10.0	Front	4183	836.6	N/A	N/A	24.5	24.4	0.405	0.414	1, 2	29
QPSK	10.0	Back	4183	836.6	N/A	N/A	24.5	24.4	0.426	0.436	1, 2	30
QPSK	10.0	Left Hand Side	4183	836.6	N/A	N/A	24.5	24.4	0.331	0.339	1, 2	31
QPSK	10.0	Right Hand Side	4183	836.6	N/A	N/A	24.5	24.4	0.521	0.533	1, 2	32
QPSK	10.0	Bottom	4183	836.6	N/A	N/A	24.5	24.4	0.140	0.143	1, 2	33

Note(s):

1. Circuit Switch (CS) - RMC 12.2kbps with Test loop mode 1 and TPC bits configured to All "1's"
2. 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 for 1-g, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg for 1-g, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg for 1-g, when the transmission band is ≥ 200 MHz

9.2.9. UMTS FDD 5 - Body-Worn - Power Back-Off Not Supported

Max Reported SAR = 0.436 (W/kg)

For body-worn configuration indicated below the test position overlap with hotspot and the power back –off was not supported meaning hotspot mode was most conservative.

					For LTE Only		Power (dBm)		1g: SAR Results (W/kg)			
Mode or Modulation	Separation 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	10.0	Front	4183	836.6	N/A	N/A	24.5	24.4	0.405	0.414	1, 2	29
QPSK	10.0	Back	4183	836.6	N/A	N/A	24.5	24.4	0.426	0.436	1, 2	30

Note(s):

1. Circuit Switch (CS) - RMC 12.2kbps with Test loop mode 1 and TPC bits configured to All "1's"
2. 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 for 1-g, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg for 1-g, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg for 1-g, when the transmission band is ≥ 200 MHz

*KDB 941225 D01 - SAR is not required for RMC+HSPA (HSDPA/HSUPA) 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.

* Body worn configurations were not evaluated with PHF attached, as per KDB 648474 Section 2.3, "when the reported SAR for body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.''

9.2.10.Wi-Fi 2450 Head - Power Back-Off Not Supported

Max Reported SAR = 0.406 (W/kg)

					For LTE Only		Power (dBm)		1g : SAR Results (W/kg)			
Mode or Modulation	Dist (mm)	Test Position	Channel No.	Freq (MHz)	RB Allocation	RB Offset	Tune-up limit	Meas.	Meas.	Scaled	Note(s)	Scan No.
DBPSK (802.11b 1Mbps)	0.0	Touch Left	6	2437.0	N/A	N/A	13.5	12.9	0.117	0.134	1	34
DBPSK (802.11b 1Mbps)	0.0	Tilt Left	6	2437.0	N/A	N/A	13.5	12.9	0.055	0.063	1	35
DBPSK (802.11b 1Mbps)	0.0	Touch Right	6	2437.0	N/A	N/A	13.5	12.9	0.354	0.406	1	36
DBPSK (802.11b 1Mbps)	0.0	Tilt Right	6	2437.0	N/A	N/A	13.5	12.9	0.242	0.278	1	37

Note(s):

1. Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g SAR for the mid-band or highest output power channel is:

   - ≤ 0.8 W/kg for 1-g, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg for 1-g, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg for 1-g, when the transmission band is ≥ 200 MHz

*KDB 248227 - SAR is not required for 802.11g/n channels when the maximum average output power is < ¼ dB lower than that measured on the corresponding 802.11b channels.

9.2.11.Wi-Fi 2450 Hotspot Mode - Power Back-Off Not Supported

Max Reported SAR = 0.078 (W/kg)

					For LTE Only		Power (dBm)		1g : SAR Results (W/kg)			
Mode or Modulation	Dist (mm)	Test Position	Channel No.	Freq (MHz)	RB Allocation	RB Offset	Tune-up limit	Meas.	Meas.	Scaled	Note(s)	Scan No.
DBPSK (802.11b 1Mbps)	10.0	Front	6	2437.0	N/A	N/A	13.5	12.9	0.068	0.078	1	38
DBPSK (802.11b 1Mbps)	10.0	Back	6	2437.0	N/A	N/A	13.5	12.9	0.015	0.017	1	39
DBPSK (802.11b 1Mbps)	10.0	Left Hand Side	6	2437.0	N/A	N/A	13.5	12.9	0.006	0.007	1	40
DBPSK (802.11b 1Mbps)	10.0	Top	6	2437.0	N/A	N/A	13.5	12.9	0.003	0.004	1	41

Note(s):

1. Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g SAR for the mid-band or highest output power channel is:

   - ≤ 0.8 W/kg for 1-g, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg for 1-g, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg for 1-g, when the transmission band is ≥ 200 MHz

*KDB 248227 - SAR is not required for 802.11g/n channels when the maximum average output power is < ¼ dB lower than that measured on the corresponding 802.11b channels.

9.2.12. Wi-Fi 2.4 GHz - Body-Worn - Power Back-Off Not Supported

Max Reported SAR = 0.078 (W/kg)

For body-worn configuration indicated below the test position overlap with hotspot and the power back –off was not supported meaning hotspot mode was most conservative.

					For LTE Only		Power (dBm)		1g: SAR Results (W/kg)			
Mode or Modulation	Separation 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.
DBPSK (802.11b 1Mbps)	10.0	Front	6	2437.0	N/A	N/A	13.5	12.9	0.068	0.078	1	38
DBPSK (802.11b 1Mbps)	10.0	Back	6	2437.0	N/A	N/A	13.5	12.9	0.015	0.017	1	39

Note(s):

1. Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g SAR for the mid-band or highest output power channel is:

   - ≤ 0.8 W/kg for 1-g, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg for 1-g, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg for 1-g, when the transmission band is ≥ 200 MHz

*KDB 248227 - SAR is not required for 802.11g/n channels when the maximum average output power is < ¼ dB lower than that measured on the corresponding 802.11b channels.

* Body worn configurations were not evaluated with PHF attached, as per KDB 648474 Section 2.3, “when the reported SAR for body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.’’

9.2.13.Wi-Fi 5.0 GHz Head - Power Back-Off Not Supported

Max Reported SAR = 0.446 (W/kg)

					For LTE Only		Power (dBm)		1g : SAR Results (W/kg)			
Mode or Modulation	Dist (mm)	Test Position	Channel No.	Freq (MHz)	RB Allocation	RB Offset	Tune-up limit	Meas.	Meas.	Scaled	Note(s)	Scan No.
BPSK (802.11a HT20 6Mbps)												
WiFi 5.0 GHz Sub Band 1	0.0	Touch Left	48	5240.0	N/A	N/A	16.3	16.2	0.102	0.104	1	42
WiFi 5.0 GHz Sub Band 1	0.0	Tilt Left	48	5240.0	N/A	N/A	16.3	16.2	0.053	0.054	1	43
WiFi 5.0 GHz Sub Band 1	0.0	Touch Right	48	5240.0	N/A	N/A	16.3	16.2	0.436	0.446	1	44
WiFi 5.0 GHz Sub Band 1	0.0	Tilt Right	48	5240.0	N/A	N/A	16.3	16.2	0.308	0.315	1	45
WiFi 5.0 GHz Sub Band 2	0.0	Touch Right	60	5300.0	N/A	N/A	16.3	16.1	0.349	0.365	1	46
WiFi 5.0 GHz Sub Band 3	0.0	Touch Right	100	5500.0	N/A	N/A	16.5	16.5	0.174	0.174	1	47
WiFi 5.0 GHz Sub Band 4	0.0	Touch Right	157	5785.0	N/A	N/A	16.5	16.2	0.255	0.273	1	48
BPSK (802.11ac VHT40 13.5Mbps)												
WiFi 5.0 GHz Sub Band 1	0.0	Touch Right	38	5190.0	N/A	N/A	14.3	14.3	0.146	0.146	1	49
WiFi 5.0 GHz Sub Band 2	0.0	Touch Right	54	5270.0	N/A	N/A	14.3	14.3	0.181	0.181	1	50
WiFi 5.0 GHz Sub Band 3	0.0	Touch Right	110	5550.0	N/A	N/A	14.7	14.7	0.106	0.106	1	51
WiFi 5.0 GHz Sub Band 4	0.0	Touch Right	159	5795.0	N/A	N/A	14.7	14.6	0.093	0.095	1	52
BPSK (802.11ac VHT80 29.3Mbps)												
WiFi 5.0 GHz Sub Band 1	0.0	Touch Right	42	5210.0	N/A	N/A	14.2	14.2	0.142	0.142	1	53
WiFi 5.0 GHz Sub Band 2	0.0	Touch Right	58	5290.0	N/A	N/A	14.2	14.2	0.218	0.218	1	54
WiFi 5.0 GHz Sub Band 3	0.0	Touch Right	106	5530.0	N/A	N/A	14.5	14.5	0.125	0.125	1	55
WiFi 5.0 GHz Sub Band 4	0.0	Touch Right	155	5775.0	N/A	N/A	14.5	14.5	0.082	0.082	1	56

Note(s):

1. 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 for 1-g, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg for 1-g, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg for 1-g, when the transmission band is ≥ 200 MHz

* SAR test is not required for 802.11n HT20 / 802.11ac VHT20 channels as the maximum average output power is less than ¼ dB higher than 802.11a.

* SAR test is not required for 802.11n HT40 channels as the maximum average output power is less than ¼ dB higher than 802.11ac VHT40.

* Body worn configurations were not evaluated with PHF attached, as per KDB 648474 Section 2.3, "when the reported SAR for body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset."

9.2.14.Wi-Fi 5.0 GHz Hotspot Mode - Power Back-Off Not Supported

Max Reported SAR = 0.366 (W/kg)

					For LTE Only		Power (dBm)		1g : SAR Results (W/kg)			
Mode or Modulation	Dist (mm)	Test Position	Channel No.	Freq (MHz)	RB Allocation	RB Offset	Tune-up limit	Meas.	Meas.	Scaled	Note(s)	Scan No.
BPSK (802.11a HT20 6Mbps)												
WiFi 5.0 GHz Sub Band 1	10.0	Front	48	5240.0	N/A	N/A	16.3	16.2	0.028	0.029	1	57
WiFi 5.0 GHz Sub Band 1	10.0	Back	48	5240.0	N/A	N/A	16.3	16.2	0.233	0.238	1	58
WiFi 5.0 GHz Sub Band 1	10.0	Left Hand Side	48	5240.0	N/A	N/A	16.3	16.2	0.047	0.048	1	59
WiFi 5.0 GHz Sub Band 1	10.0	Top	48	5240.0	N/A	N/A	16.3	16.2	0.000	0.000	1, 2	-
WiFi 5.0 GHz Sub Band 2	10.0	Back	60	5300.0	N/A	N/A	16.3	16.1	0.350	0.366	1	60
WiFi 5.0 GHz Sub Band 3	10.0	Back	100	5500.0	N/A	N/A	16.5	16.5	0.136	0.136	1	61
WiFi 5.0 GHz Sub Band 4	10.0	Back	157	5785.0	N/A	N/A	16.5	16.2	0.093	0.100	1	62
BPSK (802.11ac VHT40 13.5Mbps)												
WiFi 5.0 GHz Sub Band 1	10.0	Back	38	5190.0	N/A	N/A	14.3	14.3	0.100	0.100	1	63
WiFi 5.0 GHz Sub Band 2	10.0	Back	54	5270.0	N/A	N/A	14.3	14.3	0.176	0.176	1	64
WiFi 5.0 GHz Sub Band 3	10.0	Back	110	5550.0	N/A	N/A	14.7	14.7	0.050	0.050	1	65
WiFi 5.0 GHz Sub Band 4	10.0	Back	159	5795.0	N/A	N/A	14.7	14.6	0.042	0.043	1	66
BPSK (802.11ac VHT80 29.3Mbps)												
WiFi 5.0 GHz Sub Band 1	10.0	Back	42	5210.0	N/A	N/A	14.2	14.2	0.135	0.135	1	67
WiFi 5.0 GHz Sub Band 2	10.0	Back	58	5290.0	N/A	N/A	14.2	14.2	0.189	0.189	1	68
WiFi 5.0 GHz Sub Band 3	10.0	Back	106	5530.0	N/A	N/A	14.5	14.5	0.076	0.076	1	69
WiFi 5.0 GHz Sub Band 4	10.0	Back	155	5775.0	N/A	N/A	14.5	14.5	0.063	0.063	1	70

Note(s):

1. 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 for 1-g, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg for 1-g, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg for 1-g, when the transmission band is ≥ 200 MHz

2. The results measured are below Noise floor.

* SAR test is not required for 802.11n HT20 / 802.11ac VHT20 channels as the maximum average output power is less than ¼ dB higher than 802.11a.

* SAR test is not required for 802.11n HT40 channels as the maximum average output power is less than ¼ dB higher than 802.11ac VHT40.

9.2.15.Wi-Fi 5.0 GHz Body-Worn - Power Back-Off Not Supported

Max Reported SAR = 0.366 (W/kg)

For body-worn configuration indicated below the test position overlap with hotspot and the power back –off was not supported meaning hotspot mode was most conservative.

					For LTE Only		Power (dBm)		1g : SAR Results (W/kg)			
Mode or Modulation	Dist (mm)	Test Position	Channel No.	Freq (MHz)	RB Allocation	RB Offset	Tune-up limit	Meas.	Meas.	Scaled	Note(s)	Scan No.
BPSK (802.11a HT20 6Mbps)												
WiFi 5.0 GHz Sub Band 1	10.0	Front	48	5240.0	N/A	N/A	16.3	16.2	0.028	0.029	1	57
WiFi 5.0 GHz Sub Band 1	10.0	Back	48	5240.0	N/A	N/A	16.3	16.2	0.233	0.238	1	58
WiFi 5.0 GHz Sub Band 2	10.0	Back	60	5300.0	N/A	N/A	16.3	16.1	0.350	0.366	1	60
WiFi 5.0 GHz Sub Band 3	10.0	Back	100	5500.0	N/A	N/A	16.5	16.5	0.136	0.136	1	61
WiFi 5.0 GHz Sub Band 4	10.0	Back	157	5785.0	N/A	N/A	16.5	16.2	0.093	0.100	1	62
BPSK (802.11ac VHT40 13.5Mbps)												
WiFi 5.0 GHz Sub Band 1	10.0	Back	38	5190.0	N/A	N/A	14.3	14.3	0.100	0.100	1	63
WiFi 5.0 GHz Sub Band 2	10.0	Back	54	5270.0	N/A	N/A	14.3	14.3	0.176	0.176	1	64
WiFi 5.0 GHz Sub Band 3	10.0	Back	110	5550.0	N/A	N/A	14.7	14.7	0.050	0.050	1	65
WiFi 5.0 GHz Sub Band 4	10.0	Back	159	5795.0	N/A	N/A	14.7	14.6	0.042	0.043	1	66
BPSK (802.11ac VHT80 29.3Mbps)												
WiFi 5.0 GHz Sub Band 1	10.0	Back	42	5210.0	N/A	N/A	14.2	14.2	0.135	0.135	1	67
WiFi 5.0 GHz Sub Band 2	10.0	Back	58	5290.0	N/A	N/A	14.2	14.2	0.189	0.189	1	68
WiFi 5.0 GHz Sub Band 3	10.0	Back	106	5530.0	N/A	N/A	14.5	14.5	0.076	0.076	1	69
WiFi 5.0 GHz Sub Band 4	10.0	Back	155	5775.0	N/A	N/A	14.5	14.5	0.063	0.063	1	70

Note(s):

3. 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 for 1-g, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg for 1-g, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg for 1-g, when the transmission band is ≥ 200 MHz

4. The results measured are below Noise floor.

* SAR test is not required for 802.11n HT20 / 802.11ac VHT20 channels as the maximum average output power is less than ¼ dB higher than 802.11a.

* SAR test is not required for 802.11n HT40 channels as the maximum average output power is less than ¼ dB higher than 802.11ac VHT40.

9.3. Bluetooth

9.3.1. Standalone SAR Test Exclusion Considerations

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)]·[√f(GHz)] ≤ 3.0, for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- $f_{(GHz)}$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Body-worn Accessory Exposure Conditions

Max. tune-up tolerance limit		Min. test separation distance (mm)	Frequency (GHz)	Result
(dBm)	(mW)			
10.0	1	10	2.480	0.2

Conclusion:

The computed value is < 3; therefore, Bluetooth qualifies for Standalone SAR test exclusion.

9.3.2. Estimated SAR

When the standalone SAR test exclusion is applied to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

- *(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)]·[√f(GHz)/x]* W/kg for test separation distances ≤ 50 mm;
  where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.
- 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is > 50 mm.

Estimated SAR Result for Body-worn Accessory Conditions:

Test Configuration	Max. tune-up tolerance limit (mW)	Min. test separation distance (mm)	Frequency (GHz)	Estimated 1-g SAR (W/kg)
Back/Front	10	10	2.4	0.207
Back/Front	10	15	2.4	0.138

10. 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.

10.1. Repeated Measurement Results

Exposure Configuration	Technology Band	Measured 1g -SAR (W/Kg)	Equipment Class	Max Meas. Source base Avg Power [dBm]	Ratio of Largest to Smallest SAR Measured
HOTSPOT (Separation Distance 10mm)	PCS1900	0.912	PCE	22.5	1.01
		0.909			

11. 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:

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

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

Overall Worst Cases considered in this section are indicated below:

1. WWAN + WLAN 2.4 GHz
2. WWAN + WLAN 5.0 GHz
3. WWAN + WPAN
4. WPAN + WLAN 5.0 GHz
5. WWAN + WLAN 5.0 GHz + WPAN

Simultaneous Transmission SAR Analysis (Continued)

Head 1g – Worst cases measurements WWAN + WLAN 2.4GHz

	Reported SAR 1g (W/Kg)				
	WWAN			WLAN	Sum of WWAN & WLAN
EUT Position	GSM850	PCS1900	UMTS FDD 5	Wi-Fi 802.11b/g/n	
Touch Left	0.376			0.134	0.510
Tilt Left	0.255			0.063	0.318
Touch Right	0.352			0.406	0.758
Tilt Right	0.212			0.278	0.490
Touch Left		0.277		0.134	0.411
Tilt Left		0.112		0.063	0.175
Touch Right		0.495		0.406	0.901
Tilt Right		0.111		0.278	0.389
Touch Left			0.170	0.134	0.304
Tilt Left			0.047	0.063	0.110
Touch Right			0.152	0.406	0.558
Tilt Right			0.072	0.278	0.350

Hotspot Mode 1g – Worst cases measurements WWAN + WLAN 2.4GHz

	Reported SAR 1g (W/Kg)				
	WWAN			WLAN	Sum of WWAN & WLAN
EUT Position	GSM850	PCS1900	UMTS FDD 5	Wi-Fi 802.11b/g/n	
Front	0.470			0.078	0.548
Back	0.475			0.017	0.492
Left Hand Side	0.349			0.007	0.356
Right Hand Side	0.506				0.506
Bottom	0.160				0.160
Top				0.004	0.004
Front		0.711		0.078	0.789
Back		0.616		0.017	0.633
Left Hand Side		0.057		0.007	0.064
Right Hand Side		0.046			0.046
Bottom		1.202			1.202
Top				0.004	0.004
Front			0.414	0.078	0.492
Back			0.436	0.017	0.453
Left Hand Side			0.339	0.007	0.346
Right Hand Side			0.533		0.533
Bottom			0.143		0.143
Top				0.004	0.004

Simultaneous Transmission SAR Analysis (Continued)

Body-worn 1g – Worst cases measurements WWAN + WLAN 2.4GHz

	Reported SAR 1g (W/Kg)				
	WWAN			WLAN	Sum of WWAN & WLAN
EUT Position	GSM850	PCS1900	UMTS FDD 2	Wi-Fi 802.11b/g/n	
Front	0.469			0.078	0.547
Back	0.459			0.017	0.476
Front		0.746		0.078	0.824
Back		0.692		0.017	0.709
Front			0.414	0.078	0.492
Back			0.436	0.017	0.453

Conclusion:

1. The sum of reported SAR does not exceed 1.6 W/kg in any of the above cases and hence, the SAR to peak location separation ratio distance was not calculated.

Simultaneous Transmission SAR Analysis (Continued)

Head 1g – Worst cases measurements WWAN + WLAN 5.0GHz

	Reported SAR 1g (W/Kg)				
	WWAN			WLAN	Sum of WWAN & WLAN
EUT Position	GSM850	PCS1900	UMTS FDD 5	Wi-Fi 802.11a/n/ac	
Touch Left	0.376			0.104	0.480
Tilt Left	0.255			0.054	0.309
Touch Right	0.352			0.446	0.798
Tilt Right	0.212			0.315	0.527
Touch Left		0.277		0.104	0.381
Tilt Left		0.112		0.054	0.166
Touch Right		0.495		0.446	0.941
Tilt Right		0.111		0.315	0.426
Touch Left			0.170	0.104	0.274
Tilt Left			0.047	0.054	0.101
Touch Right			0.152	0.446	0.598
Tilt Right			0.072	0.315	0.387

Hotspot Mode 1g – Worst cases measurements WWAN + WLAN 5.0GHz

	Reported SAR 1g (W/Kg)				
	WWAN			WLAN	Sum of WWAN & WLAN
EUT Position	GSM850	PCS1900	UMTS FDD 5	Wi-Fi 802.11a/n/ac	
Front	0.470			0.029	0.499
Back	0.475			0.366	0.841
Left Hand Side	0.349			0.048	0.397
Right Hand Side	0.506				0.506
Bottom	0.160				0.160
Top				0.000	0.000
Front		0.711		0.029	0.740
Back		0.616		0.366	0.982
Left Hand Side		0.057		0.048	0.105
Right Hand Side		0.046			0.046
Bottom		1.202			1.202
Top				0.000	0.000
Front			0.414	0.029	0.443
Back			0.436	0.366	0.802
Left Hand Side			0.339	0.048	0.387
Right Hand Side			0.533		0.533
Bottom			0.143		0.143
Top				0.000	0.000

Simultaneous Transmission SAR Analysis (Continued)

Body-worn 1g – Worst cases measurements WWAN + WLAN 5.0GHz

	Reported SAR 1g (W/Kg)				
	WWAN			WLAN	Sum of WWAN & WLAN
EUT Position	GSM850	PCS1900	UMTS FDD 2	Wi-Fi 802.11a/n/ac	
Front	0.469			0.029	0.498
Back	0.459			0.366	0.825
Front		0.746		0.029	0.775
Back		0.692		0.366	1.058
Front			0.414	0.029	0.443
Back			0.436	0.366	0.802

Conclusion:

1. The sum of reported SAR does not exceed 1.6 W/kg in any of the above cases and hence, the SAR to peak location separation ratio distance was not calculated.

Simultaneous Transmission SAR Analysis (Continued)

Hotspot Mode 1g – Worst cases measurements WWAN + WPAN

	Reported SAR 1g (W/Kg)				
	WWAN			WPAN	Sum of WWAN & WLAN
EUT Position	GSM850	PCS1900	UMTS FDD 5	*Bluetooth*	
Front	0.470			0.207	0.677
Back	0.475			0.207	0.682
Left Hand Side	0.349			0.207	0.556
Right Hand Side	0.506				0.506
Bottom	0.160				0.160
Top				0.207	0.207
Front		0.711		0.207	0.918
Back		0.616		0.207	0.823
Left Hand Side		0.057		0.207	0.264
Right Hand Side		0.046			0.046
Bottom		1.202			1.202
Top				0.207	0.207
Front			0.414	0.207	0.621
Back			0.436	0.207	0.643
Left Hand Side			0.339	0.207	0.546
Right Hand Side			0.533		0.533
Bottom			0.143		0.143
Top				0.207	0.207

Body-worn 1g – Worst cases measurements WWAN + WPAN

	Reported SAR 1g (W/Kg)				
	WWAN			WPAN	Sum of WWAN & WLAN
EUT Position	GSM850	PCS1900	UMTS FDD 2	*Bluetooth*	
Front	0.469			0.138	0.607
Back	0.459			0.138	0.597
Front		0.746		0.138	0.884
Back		0.692		0.138	0.830
Front			0.414	0.138	0.552
Back			0.436	0.138	0.574

Conclusion:

1. The sum of reported SAR does not exceed 1.6 W/kg in any of the above cases and hence, the SAR to peak location separation ratio distance was not calculated.

Simultaneous Transmission SAR Analysis (Continued)

Hotspot Mode 1g – Worst cases measurements WWAN + WLAN 5.0GHz + WPAN

	Reported SAR 1g (W/Kg)					
	WWAN			WLAN	WPAN	Sum of WWAN & WLAN
EUT Position	GSM850	PCS1900	UMTS FDD 5	802.11a/n/ac	*Bluetooth*	
Front	0.470			0.029	0.207	0.706
Back	0.475			0.366	0.207	1.048
Left Hand Side	0.349			0.048	0.207	0.604
Right Hand Side	0.506					0.506
Bottom	0.160					0.160
Top				0.000	0.207	0.207
Front		0.711		0.029	0.207	0.947
Back		0.616		0.366	0.207	1.189
Left Hand Side		0.057		0.048	0.207	0.312
Right Hand Side		0.046				0.046
Bottom		1.202				1.202
Top				0.000	0.207	0.207
Front			0.414	0.029	0.207	0.650
Back			0.436	0.366	0.207	1.009
Left Hand Side			0.339	0.048	0.207	0.594
Right Hand Side			0.533			0.533
Bottom			0.143			0.143
Top				0.000	0.207	0.207

Body-worn 1g – Worst cases measurements WWAN + WLAN 5.0GHz + WPAN

	Reported SAR 1g (W/Kg)					
	WWAN			WLAN	WPAN	Sum of WWAN & WLAN
EUT Position	GSM850	PCS1900	UMTS FDD 2	802.11a/n/ac	*Bluetooth*	
Front	0.469			0.029	0.138	0.636
Back	0.459			0.366	0.138	0.963
Front		0.746		0.029	0.138	0.913
Back		0.692		0.366	0.138	1.196
Front			0.414	0.029	0.138	0.581
Back			0.436	0.366	0.138	0.940

Conclusion:

1. The sum of reported SAR does not exceed 1.6 W/kg in any of the above cases and hence, the SAR to peak location separation ratio distance was not calculated.

Appendix 1. Test Equipment Used

UL No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
A034	Narda 20W Termination	Narda	374BNM	8706	Calibrated as part of system	-
A1097	SMA Directional Coupler	MiDISCO	MDC6223-30	None	Calibrated as part of system	-
A1137	3dB Attenuator	Narda	779	04690	Calibrated as part of system	-
A1174	Dielectric Probe Kit	Agilent Technologies	85070C	Us99360072	Calibrated before use	-
A1328	Handset Positioner	Schmid & Partner Engineering AG	Modification	SD 000 H01 DA	-	-
A1182	Handset Positioner	Schmid & Partner Engineering AG	V3.0	None	-	-
A2111	Data Acquisition Electronics	Schmid & Partner Engineering AG	DAE3	432	28 Aug 2013	12
A2110	Data Acquisition Electronics	Schmid & Partner Engineering AG	DAE3	431	18 Nov 2013	12
A1234	Data Acquisition Electronics	Schmid & Partner Engineering AG	DAE3	450	12 Nov 2013	12
A2546	Data Acquisition Electronics	Schmid & Partner Engineering AG	DAE4	1435	12 May 2014	12
A2547	Data Acquisition Electronics	Schmid & Partner Engineering AG	DAE4	1438	12 May 2014	12
A2077	Probe	Schmid & Partner Engineering AG	EX3 DV4	3814	24 Sep 2013	12
A2112	Probe	Schmid & Partner Engineering AG	ET3 DV6	1586	22 May 2014	12
A2243	Probe	Schmid & Partner Engineering AG	ES3 DV3	3304	02 Sept 2013	12
A2544	Probe	Schmid & Partner Engineering AG	EX3 DV4	3994	07 May 2014	12
A2545	Probe	Schmid & Partner Engineering AG	EX3 DV4	3995	09 May 2014	12
A2201	900 MHz Dipole Kit	Schmid & Partner Engineering AG	D900V2	035	20 Jan 2014	12
A2200	1900 MHz Dipole Kit	Schmid & Partner Engineering AG	D1900V2	537	22 Jan 2014	12
A2202	2440 MHz Dipole Kit	Schmid & Partner Engineering AG	D2440V2	701	14 Jan 2014	12
A1377	5.0 GHz Dipole Kit	Schmid & Partner Engineering AG	D5GHzV2	1016	26 Mar 2014	12
A1497	Amplifier	Mini-Circuits	zhl-42w (sma)	e020105	Calibrated as part of system	-
A1566	SAM Phantom	Schmid & Partner Engineering AG	SAM a (Site 56)	002	Calibrated before use	-
A1238	SAM Phantom	Schmid & Partner Engineering AG	SAM b (Site 56)	001	Calibrated before use	-
A2125	SAM Phantom	Schmid & Partner Engineering AG	SAM b (Site 57)	TP-1031	Calibrated before use	-
A2124	SAM Phantom	Schmid & Partner Engineering AG	SAM a (Site 57)	TP-1030	Calibrated before use	-
A2438	SAM Phantom	Schmid & Partner Engineering AG	SAM a	1805	Calibrated before use	-
A2551	SAM Phantom	Schmid & Partner	SAM a	1832	Calibrated	-

UL No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
		Engineering AG			before use	
A2552	SAM Phantom	Schmid & Partner Engineering AG	SAM a	1836	Calibrated before use	-
A2437	Eli Phantom	Schmid & Partner Engineering AG	Eli5	1235	Calibrated before use	-
A2252	2mm Oval Phantom	Schmid & Partner Engineering AG	Eli5	1177	Calibrated before use	-
A2549	2mm Oval Phantom	Schmid & Partner Engineering AG	Eli5	00T01 DA	Calibrated before use	-
A2550	2mm Oval Phantom	Schmid & Partner Engineering AG	Eli5	00T01 DA	Calibrated before use	-
A215	20 dB Attenuator	Narda	766-20	9402	Calibrated as part of system	-
A1531	Antenna	AARONIA AG	7025	02458	-	-
A2263	Digital Camera	Samsung	PL211	9453C90B 607487L	-	-
M1015	Network Analyser	Agilent Technologies	8753ES	US39172406	04 Oct 2013	12
C1145	Cable	Rosenberger MICRO-COAX	FA147A F003003030	41843-1	Calibrated as part of system	-
C1146	Cable	Rosenberger MICRO-COAX	FA147A F030003030	41752-1	Calibrated as part of system	-
G0528	Robot Power Supply	Schmid & Partner Engineering AG	DASY4	None	Calibrated before use	-
GO591	Robot Power Supply	Schmid & Partner Engineering AG	DASY4	None	Calibrated before use	-
G0592	Robot Power Supply	Schmid & Partner Engineering AG	DASY53	None	Calibrated before use	-
G0610	Robot Power Supply	Schmid & Partner Engineering AG	DASY53	None	Calibrated before use	-
G0611	Robot Power Supply	Schmid & Partner Engineering AG	DASY53	None	Calibrated before use	-
G0612	Robot Power Supply	Schmid & Partner Engineering AG	DASY53	None	Calibrated before use	-
G087	PSU	Thurlby Thandar	CPX200	100701	Calibrated before use	-
M1047	Robot Arm	Staubli	RX908 L	F00/SD8 9A1/A/01	Calibrated before use	-
M1653	Robot Arm	Staubli	RX908 L	F01/5J8 6A1/C/01	Calibrated before use	-
M1680	Robot Arm	Staubli	TX60 L	F12/5MZ7 A1/A/01	Calibrated before use	-
M1875	Robot Arm	Staubli	TX60 L	F13/5SC6F1/A/01	Calibrated before use	-
M1876	Robot Arm	Staubli	TX60 L	F14/5T5ZA1/A/01	Calibrated before use	-
M1877	Robot Arm	Staubli	TX60 L	F14/5UA6A1/A/01	Calibrated before use	-
M1839	Signal Generator	R&S	SME06	837633/001	15 Apr 2014	12
M1838	Signal Generator	R&S	SME06	831377/005	15 Apr 2014	12
M1270	Digital Thermometer	RS	N/A	N/A	Internal Cal 06 May 2014	12

UL No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
M1023	Dual Channel Power Meter	R & S	NRVD	863715/030	01 May 2014	12
S0566	SAR Lab	UL	Site 56	N/A	Calibrated before use	-
S0567	SAR Lab	UL	Site 57	N/A	Calibrated before use	-
S0568	SAR Lab	UL	Site 58	N/A	Calibrated before use	-
S0569	SAR Lab	UL	Site 59	N/A	Calibrated before use	-
S0570	SAR Lab	UL	Site 60	N/A	Calibrated before use	-
S0571	SAR Lab	UL	Site 61	N/A	Calibrated before use	-