



## **SAR EVALUATION REPORT**

**FCC 47 CFR § 2.1093  
IEEE Std 1528-2003 & 2013**

*For*  
**GSM/WCDMA/LTE Phone + Bluetooth, DTS/UNII a/b/g/n/ac, ANT+ & NFC**

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*Prepared for*  
**SONY MOBILE COMMUNICATIONS INC.  
NYA VATTENTORNET MOBILVAGEN 10  
LUND 22188  
SWEDEN**

*Prepared by*  
**UL VERIFICATION SERVICES INC.  
47173 BENICIA STREET  
FREMONT, CA 94538, U.S.A.  
TEL: (510) 771-1000  
FAX: (510) 661-0888**



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### 1. Attestation of Test Results

Applicant Name	SONY MOBILE COMMUNICATIONS, INC.			
Application Purpose	<input checked="" type="checkbox"/> Original Grant <input type="checkbox"/> Class II Permissive Change			
FCC ID	PY7PM-0812			
DUT Description	GSM/WCDMA/LTE Phone + Bluetooth, DTS/UNII a/b/g/n/ac, ANT+ & NFC			
Exposure Category	General Population/Uncontrolled Exposure (1g SAR limit: 1.6 W/kg)			
The highest reported SAR	RF Exposure Conditions	Equipment Class		
		Licensed	DTS	UNII
	Head	0.917 W/kg	0.539 W/kg	0.578 W/kg
	Body-worn Accessory	0.695 W/kg	0.131 W/kg	0.293 W/kg
	Wireless Router (Hotspot)	0.990 W/kg	0.350 W/kg	N/A
Simultaneous Transmission	Head: 1.495 W/kg Body: 1.023 W/kg Hotspot: 1.340 W/kg	Head: 1.456 W/kg Body: 0.826 W/kg Hotspot: 1.340 W/kg	Head: 1.495 W/kg Body: 1.023 W/kg Hotspot: N/A	
Highest SAR across exposure conditions	0.990 W/kg			
Applicable Standards	FCC 47 CFR § 2.1093 KDB publication IEEE Std 1528-2003 & 2013			
Test Results	Pass			
Date tested	6/23/2014 – 7/18/2014			
<p>UL Verification Services Inc. 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 Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.</p> <p><b>Note:</b> The results documented in this report apply only to the tested sample, 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 Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. 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 NVLAP, NIST, any agency of the Federal Government, or any agency of any government (NIST Handbook 150, Annex A). This report is written to support regulatory compliance of the applicable standards stated above.</p>				
Approved & Released By:  Devin Chang Senior Engineer UL Verification Services Inc.		Prepared By:  Yu Chen Laboratory Technician UL Verification Services Inc.		

## 2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE STD 1528-2003 & 2013, the following FCC Published RF exposure KDB procedures, and TCB workshop updates:

- 447498 D01 General RF Exposure Guidance v05r02
- 648474 D04 Handset SAR v01r02
- 941225 D01 SAR test for 3G devices v02
- 941225 D02 HSPA and 1x Advanced v02r02
- 941225 D03 SAR Test Reduction GSM GPRS EDGE v01
- 941225 D04 SAR for GSM E GPRS Dual Xfer Mode v01
- 941225 D05 SAR for LTE Devices v02r03
- 941225 D05A LTE Rel.10 KDB Inquiry Sheet v01
- 941225 D06 Hotspot Mode SAR v01r01
- 248227 D01 SAR Meas for 802 11abg v01r02
- 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03
- 865664 D02 SAR Reporting v01r01
- 690783 D01 SAR Listings on Grants v01r03

## 3. Facilities and Accreditation

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

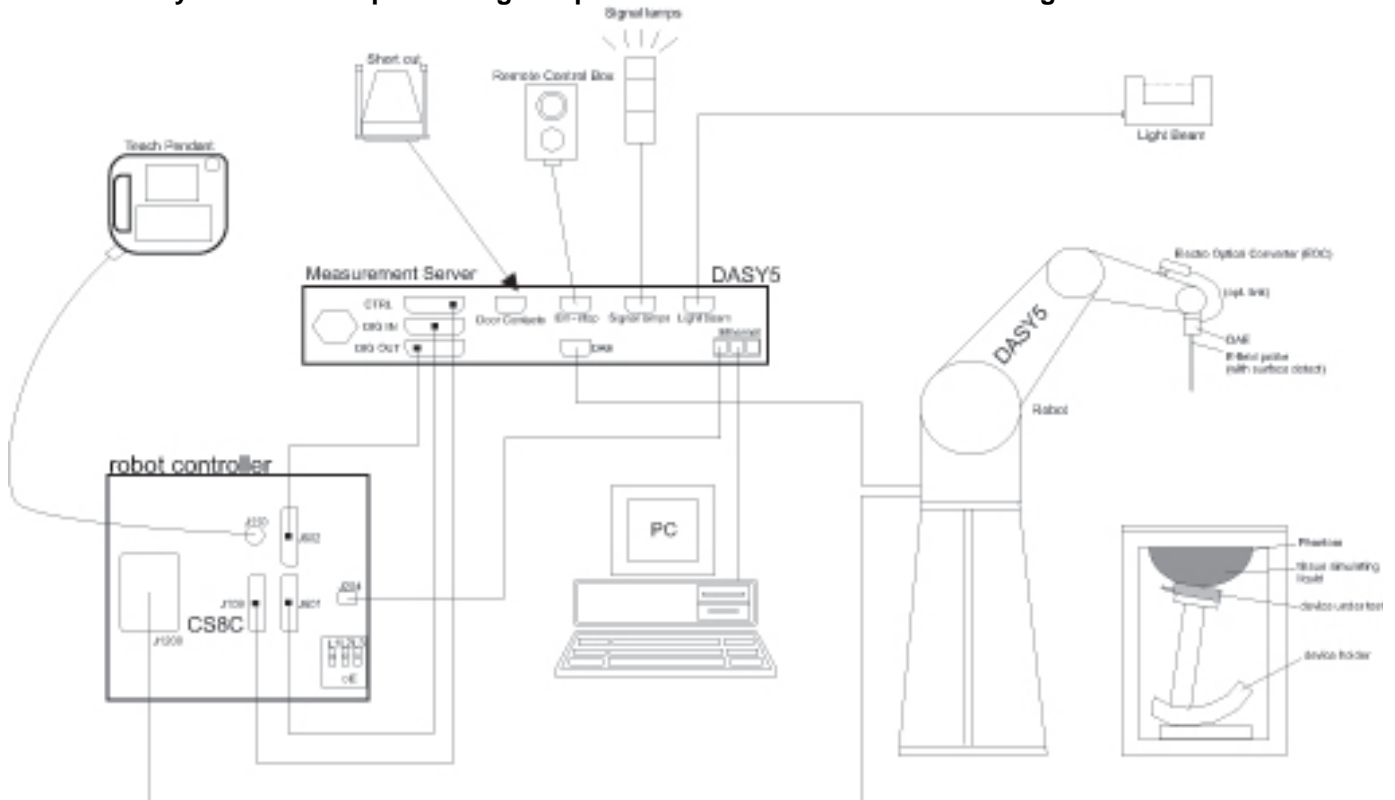
47173 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 3
SAR Lab D	SAR Lab 4
SAR Lab E	SAR Lab 5
SAR Lab F	
SAR Lab G	
SAR Lab H	

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

## 4. SAR Measurement System & Test Equipment

### 4.1. SAR Measurement System

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



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

## 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.

### Dielectric Property Measurements

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Network Analyzer	Agilent	ENA Series/E5071B	MY42100131	2/24/2015
Dielectronic Probe kit	SPEAG	DAK-3.5	1087	11/13/2014
Dielectronic Probe kit	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	Control Company	4242	122529163	9/19/2014
Thermometer	EXTECH	445703	CCS-200	3/24/2015

### System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
ESG Vecto Signal Generator	Agilent	E4438C	MY47271507	6/17/2015
Power Meter	HP	438A	2822A05684	10/10/2014
Power Sensor	Agilent	8481A	2237A31744	10/2/2014
Power Sensor	Agilent	8481A	2349A36506	9/30/2014
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1808939	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2710	N/A
DC Power Supply	Sorensen Ametek	XT15-4	1319A02778	N/A
ESG Vecto Signal Generator	Agilent	E4438C	MY47271045	6/18/2015
Power Meter	HP	438A	3513U04320	10/2/2014
Power Sensor	Agilent	8481A	2702A66876	9/30/2014
Power Sensor	Agilent	8481A	3318A95392	9/30/2014
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1622052	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2711	N/A
DC Power Supply	HP	6296A	2841A-05955	N/A
E-Field Probe (SAR 1)	SPEAG	EX3DV4	3902	5/19/2015
E-Field Probe (SAR 2)	SPEAG	EX3DV3	3531	11/21/2014
E-Field Probe (SAR 4)	SPEAG	EX3DV4	3929	5/9/2015
E-Field Probe (SAR 5)	SPEAG	EX3DV4	3991	5/6/2015
Data Acquisition Electronics (SAR 1)	SPEAG	DAE3	427	1/14/2015
Data Acquisition Electronics (SAR 2)	SPEAG	DAE4	1359	2/17/2015
Data Acquisition Electronics (SAR 4)	SPEAG	DAE4	1352	9/11/2014
Data Acquisition Electronics (SAR 5)	SPEAG	DAE4	1439	5/14/2015
System Validation Dipole	SPEAG	D835V2	4d002	11/15/2015
System Validation Dipole	SPEAG	D1900V2	5d043	11/12/2015
System Validation Dipole	SPEAG	D2450V2	899	9/10/2014
System Validation Dipole	SPEAG	D2600V2	1006	9/11/2014
System Validation Dipole	SPEAG	D5GHzV2	1003	2/26/2015
System Validation Dipole	SPEAG	D5GHzV2	1138	11/19/2014
Thermometer (SAR Lab 1)	EXTECH	445703	CCS-205	3/24/2015
Thermometer (SAR Lab 2)	EXTECH	445703	CCS-203	3/28/2015
Thermometer (SAR Lab 4)	EXTECH	445703	CCS-238	6/3/2015
Thermometer (SAR Lab 5)	EXTECH	445703	CCS-239	6/3/2015



**Others**

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Power Meter	Agilent	N1911A	MY53060016	8/3/2014
Power Sensor	Agilent	N1921A	MY52020011	5/6/2015
Base Station Simulator	R&S	CMW 500	132909-bd	6/6/2015
Base Station Simulator	R&S	CMW 500	135393-VQ	7/3/2015
Base Station Simulator	R&S	CMW 500	125236-eS	5/29/2015
Base Station Simulator	R&S	CMU 200	106291	10/18/2014
Base Station Simulator	Agilent	8960 Series 10	GB46160222	11/21/2014
Base Station Simulator	Agilent	8960 Series 10	MY53211024	9/11/2014
Bluetooth Tester	R & S	CBT	100900-ac	7/12/2015

## 5. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is  $< 1.5$  W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2003 & 2013 is not required in SAR reports submitted for equipment approval.

## 6. Device Under Test (DUT) Information

### 6.1. DUT Description

<p>This device has two power setting.</p> <p>When hotspot mode is activated, an automatic RF power reduction is activated and reduces the output RF power level.</p> <p>When hotspot mode is deactivated, the RF output power levels return to their maximum RF power level.</p>	
Device Dimension	<p>Overall (Length x Width): 127 mm x 64.9 mm</p> <p>Overall Diagonal: 138.91 mm</p> <p>Display Diagonal: 116 mm</p>
Battery Back Cover	The rechargeable battery is not user accessible.
Battery Options	The rechargeable battery is not user accessible.
Accessory	Headset
Wireless Router (Hotspot)	<p>Wi-Fi Hotspot mode permits the device to share its cellular data connection with other Wi-Fi-enabled devices.</p> <p><input checked="" type="checkbox"/> Mobile Hotspot (Wi-Fi 2.4 GHz)</p> <p><input type="checkbox"/> Mobile Hotspot (Wi-Fi 5 GHz)</p>
Wi-Fi Direct	<p>Wi-Fi Direct enabled devices transfer data directly between each other</p> <p><input checked="" type="checkbox"/> Wi-Fi Direct (Wi-Fi 2.4 GHz)</p> <p><input checked="" type="checkbox"/> Wi-Fi Direct (Wi-Fi 5 GHz) (Group Client only)</p>

### 6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode	Duty Cycle used for SAR testing
GSM	850 / 1900	Voice (GMSK), GPRS (GMSK) EGPRS (8PSK)	GSM Voice: 12.5%; GPRS/EGPRS: 1 Slot: 12.5%; 2 Slots: 25%, 3 Slots: 37.5%, 4 Slots: 50%,
		GPRS Multi-Slot Class: <input type="checkbox"/> Class 8 - One Up <input type="checkbox"/> Class 10 - Two Up <input checked="" type="checkbox"/> Class 12 - Four Up <input type="checkbox"/> Class 33 - Four Up DTM (Dual Transfer Mode): Supported	
W-CDMA (UMTS)	Band V / II	UMTS Rel. 99 (Voice & Data) HSDPA (Rel. 5) HSUPA (Rel. 6) DC-HSDPA (Rel. 8) HSPA+ (Rel. 7)	100%
LTE (FDD)	Band 5 / 7	QPSK, 16QAM (Rel. 10) Do not support Carrier Aggregation (CA).	100%
		Does this device SV-LTE (1xRTT-LTE)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20)	100%
	5 GHz	802.11a 802.11n (HT20) 802.11n (HT40) 802.11ac (VHT20) 802.11ac (VHT40) 802.11ac (VHT80)	100%
Bluetooth	2.4 GHz	Version 4.0 LE	32.25% (DH1), 66.68% (DH3), 77.52% (DH5)

### 6.3. Nominal and Maximum Output Power

RF Air interface	Mode		Full Power			Reduce Power		
			Target (dBm)	Tolerance (dB)	Max. Tune-up Limit (dBm)	Target (dBm)	Tolerance (dB)	Max. Tune-up Limit (dBm)
GSM850	GSM	Voice	33.0	-1.4 ~ 0.6	<b>33.6</b>	33.0	-1.4 ~ 0.6	<b>33.6</b>
		Tx Slot 1	33.0	-1.4 ~ 0.6	<b>33.6</b>	33.0	-1.4 ~ 0.6	<b>33.6</b>
	GPRS GMSK	Tx Slot 2	29.5	-1.5 ~ 0.6	<b>30.1</b>	29.1	-1.5 ~ 0.6	<b>29.7</b>
		Tx Slot 3	27.5	-1.3 ~ 0.6	<b>28.1</b>	27.0	-1.5 ~ 0.6	<b>27.6</b>
		Tx Slot 4	26.5	-1.5 ~ 0.6	<b>27.1</b>	25.6	-1.5 ~ 0.6	<b>26.2</b>
	EGPRS 8PSK	Tx Slot 1	27.0	-1.5 ~ 1.0	<b>28.0</b>	27.0	-1.5 ~ 1.0	<b>28.0</b>
		Tx Slot 2	25.0	-1.5 ~ 1.0	<b>26.0</b>	25.0	-1.5 ~ 1.0	<b>26.0</b>
Tx Slot 3		24.0	-1.5 ~ 1.0	<b>25.0</b>	24.0	-1.5 ~ 1.0	<b>25.0</b>	
		Tx Slot 4	22.0	-1.5 ~ 1.0	<b>23.0</b>	22.0	-1.5 ~ 1.0	<b>23.0</b>
GSM1900	GSM	Voice	30.0	-0.7 ~ 0.6	<b>30.6</b>	30.0	-0.7 ~ 0.6	<b>30.6</b>
		Tx Slot 1	30.0	-0.7 ~ 0.6	<b>30.6</b>	29.4	-0.7 ~ 0.6	<b>30.0</b>
	GPRS GMSK	Tx Slot 2	28.0	-1.5 ~ 0.6	<b>28.6</b>	26.9	-1.5 ~ 0.6	<b>27.5</b>
		Tx Slot 3	27.0	-1.5 ~ 0.6	<b>27.6</b>	25.1	-1.5 ~ 0.6	<b>25.7</b>
		Tx Slot 4	26.0	-1.5 ~ 0.6	<b>26.6</b>	23.9	-1.5 ~ 0.6	<b>24.5</b>
		Tx Slot 1	26.0	-1.5 ~ 1.0	<b>27.0</b>	26.0	-1.5 ~ 1.0	<b>27.0</b>
	EGPRS 8PSK	Tx Slot 2	24.0	-1.5 ~ 1.0	<b>25.0</b>	24.0	-1.5 ~ 1.0	<b>25.0</b>
		Tx Slot 3	23.0	-1.5 ~ 1.0	<b>24.0</b>	23.0	-1.5 ~ 1.0	<b>24.0</b>
		Tx Slot 4	22.0	-1.5 ~ 1.0	<b>23.0</b>	22.0	-1.5 ~ 1.0	<b>23.0</b>

#### Dual Transfer Mode

RF Air interface	Mode			Full Power			Reduce Power		
				Target (dBm)	Tolerance (dB)	Max. Tune-up Limit (dBm)	Target (dBm)	Tolerance (dB)	Max. Tune-up Limit (dBm)
GSM850	GSM(Voice) + GPRS(Data)	Tx Slot 1	CS	33.0	-1.4 ~ 0.6	<b>33.6</b>	33.0	-1.4 ~ 0.6	<b>33.6</b>
			PS	29.5	-1.5 ~ 0.6	<b>30.1</b>	29.1	-1.5 ~ 0.6	<b>29.7</b>
		Tx Slot 2	CS	29.5	-1.5 ~ 0.6	<b>30.1</b>	29.1	-1.5 ~ 0.6	<b>29.7</b>
			PS	29.5	-1.5 ~ 0.6	<b>30.1</b>	29.1	-1.5 ~ 0.6	<b>29.7</b>
	GSM(Voice) + EGPRS(Data)	Tx Slot 3	CS	27.5	-1.3 ~ 0.6	<b>28.1</b>	27.0	-1.5 ~ 0.6	<b>27.6</b>
			PS	27.5	-1.3 ~ 0.6	<b>28.1</b>	27.0	-1.5 ~ 0.6	<b>27.6</b>
		Tx Slot 1	CS	33.0	-1.4 ~ 0.6	<b>33.6</b>	33.0	-1.4 ~ 0.6	<b>33.6</b>
			PS	29.5	-1.5 ~ 1.0	<b>26.0</b>	25.0	-1.5 ~ 1.0	<b>26.0</b>
GSM1900	GSM(Voice) + GPRS(Data)	Tx Slot 2	CS	29.5	-1.5 ~ 0.6	<b>30.1</b>	29.1	-1.5 ~ 0.6	<b>29.7</b>
			PS	25.0	-1.5 ~ 1.0	<b>26.0</b>	25.0	-1.5 ~ 1.0	<b>26.0</b>
		Tx Slot 3	CS	27.5	-1.5 ~ 0.6	<b>28.1</b>	27.0	-1.5 ~ 0.6	<b>27.6</b>
			PS	24.0	-1.5 ~ 1.0	<b>25.0</b>	24.0	-1.5 ~ 1.0	<b>25.0</b>
	GSM(Voice) + EGPRS(Data)	Tx Slot 1	CS	30.0	-0.7 ~ 0.6	<b>30.6</b>	29.4	-0.7 ~ 0.6	<b>30.0</b>
			PS	28.0	-1.5 ~ 0.6	<b>28.6</b>	26.9	-1.5 ~ 1.5	<b>28.4</b>
		Tx Slot 2	CS	28.0	-1.5 ~ 0.6	<b>28.6</b>	26.9	-1.5 ~ 1.5	<b>28.4</b>
			PS	28.0	-1.5 ~ 0.6	<b>28.6</b>	26.9	-1.5 ~ 1.5	<b>28.4</b>
GSM(Voice) + EGPRS(Data)	Tx Slot 3	CS	27.0	-1.5 ~ 0.6	<b>27.6</b>	25.1	-1.5 ~ 1.5	<b>26.6</b>	
		PS	27.0	-1.5 ~ 0.6	<b>27.6</b>	25.1	-1.5 ~ 1.5	<b>26.6</b>	
	Tx Slot 1	CS	30.0	-0.7 ~ 0.6	<b>30.6</b>	29.4	-0.7 ~ 0.6	<b>30.0</b>	
		PS	28.0	-1.5 ~ 0.6	<b>28.6</b>	26.9	-1.5 ~ 1.5	<b>28.4</b>	
Tx Slot 2	CS	28.0	-1.5 ~ 0.6	<b>28.6</b>	26.9	-1.5 ~ 1.5	<b>28.4</b>		
	PS	24.0	-1.5 ~ 1.0	<b>25.0</b>	24.0	-1.5 ~ 1.5	<b>25.5</b>		
Tx Slot 3	CS	27.0	-1.5 ~ 0.6	<b>27.6</b>	25.1	-1.5 ~ 1.5	<b>26.6</b>		
	PS	23.0	-1.5 ~ 1.0	<b>24.0</b>	23.0	-1.5 ~ 1.5	<b>24.5</b>		

Note: CS : circuit switched PS : packet switched

RF Air interface	Mode	Full Power			Reduce Power			
		Target (dBm)	Tolerance (dB)	Max. Tune-up Limit (dBm)	Target (dBm)	Tolerance (dB)	Max. Tune-up Limit (dBm)	
WCDMA Band II	R99	22.7	-0.7 ~ 0.3	<b>23.0</b>	20.5	-0.7 ~ 0.5	<b>21.0</b>	
	HSDPA	Subtest 1	22.2	-1.5 ~ 0.8	<b>23.0</b>	20.5	-0.7 ~ 0.5	<b>21.0</b>
		Subtest 2	22.2	-1.5 ~ 0.8	<b>23.0</b>	20.5	-0.7 ~ 0.5	<b>21.0</b>
		Subtest 3	22.2	-1.5 ~ 0.8	<b>23.0</b>	20.5	-0.7 ~ 0.5	<b>21.0</b>
		Subtest 4	22.2	-1.5 ~ 0.8	<b>23.0</b>	20.5	-0.7 ~ 0.5	<b>21.0</b>
	HSUPA	Subtest 1	22.2	-1.5 ~ 0.8	<b>23.0</b>	20.5	-0.7 ~ 0.5	<b>21.0</b>
		Subtest 2	20.7	-1.5 ~ 2.0	<b>22.7</b>	20.5	-0.7 ~ 0.5	<b>21.0</b>
		Subtest 3	21.7	-1.5 ~ 1.3	<b>23.0</b>	20.5	-0.7 ~ 0.5	<b>21.0</b>
		Subtest 4	20.7	-1.5 ~ 2.0	<b>22.7</b>	20.5	-0.7 ~ 0.5	<b>21.0</b>
		Subtest 5	22.2	-1.5 ~ 0.8	<b>23.0</b>	20.5	-0.7 ~ 0.5	<b>21.0</b>
	DC-HSDPA	Subtest 1	22.2	-1.5 ~ 0.8	<b>23.0</b>	20.5	-0.7 ~ 0.5	<b>21.0</b>
		Subtest 2	22.2	-1.5 ~ 0.8	<b>23.0</b>	20.5	-0.7 ~ 0.5	<b>21.0</b>
		Subtest 3	22.2	-1.5 ~ 0.8	<b>23.0</b>	20.5	-0.7 ~ 0.5	<b>21.0</b>
Subtest 4		22.2	-1.5 ~ 0.8	<b>23.0</b>	20.5	-0.7 ~ 0.5	<b>21.0</b>	
WCDMA Band V	R99	24.0	-0.7 ~ 0.5	<b>24.5</b>	Not Supported			
	HSDPA	Subtest 1	24.0	-1.5 ~ 0.5				<b>24.5</b>
		Subtest 2	24.0	-1.5 ~ 0.5				<b>24.5</b>
		Subtest 3	23.5	-1.5 ~ 1.0				<b>24.5</b>
		Subtest 4	23.5	-1.5 ~ 1.0				<b>24.5</b>
	HSUPA	Subtest 1	24.0	-1.5 ~ 0.5				<b>24.5</b>
		Subtest 2	22.0	-1.5 ~ 2.0				<b>24.0</b>
		Subtest 3	23.0	-1.5 ~ 1.5				<b>24.5</b>
		Subtest 4	22.0	-1.5 ~ 2.0				<b>24.0</b>
		Subtest 5	24.0	-1.5 ~ 0.5				<b>24.5</b>
	DC-HSDPA	Subtest 1	24.0	-1.5 ~ 0.5				<b>24.5</b>
		Subtest 2	24.0	-1.5 ~ 0.5				<b>24.5</b>
		Subtest 3	23.5	-1.5 ~ 1.0				<b>24.5</b>
Subtest 4		23.5	-1.5 ~ 1.0	<b>24.5</b>				
RF Air interface	Mode	Full Power			Reduce Power			
		Target (dBm)	Tolerance (dB)	Max. Tune-up Limit (dBm)	Target (dBm)	Tolerance (dB)	Max. Tune-up Limit (dBm)	
LTE B5	QPSK	23.0	-1.0 ~ 0.7	<b>23.7</b>	Not Supported			
	16QAM	22.0	-1.0 ~ 0.7	<b>22.7</b>				
LTE B7	QPSK	23.0	-1.5 ~ 0.5	<b>23.5</b>	20.1	-1.5 ~ 1.5	<b>21.6</b>	
	16QAM	22.0	-1.5 ~ 0.5	<b>22.5</b>	20.1	-1.5 ~ 1.5	<b>21.6</b>	
RF Air interface	Mode	Full Power						
		Max. Tune-up Limit (dBm)						
Wi-Fi 2.4 GHz	802.11b	<b>16.0</b>						
	802.11g	<b>15.5</b>						
	802.11n HT20	<b>15.0</b>						
Wi-Fi 5 GHz	802.11a	<b>16.0</b>						
	802.11n HT20	<b>16.0</b>						
	802.11n HT40	<b>14.0</b>						
	802.11ac VHT20	<b>16.0</b>						
	802.11ac VHT40	<b>14.0</b>						
	802.11ac VHT80	<b>13.0</b>						
Bluetooth	BDR	<b>10.5</b>						
	EDR	<b>7.9</b>						
	BLE	<b>2.4</b>						

## 6.4. Simultaneous Transmission Condition

RF Exposure Condition	Capable Transmit Configurations
Head	<ol style="list-style-type: none"> <li>1. GSM 850/1900 Voice + Wi-Fi 2.4/5GHz</li> <li>2. GSM 850/1900 (GPRS/EDGE) + Wi-Fi 2.4/5GHz</li> <li>3. WCDMA Band 2/5 + Wi-Fi 2.4/5GHz</li> <li>4. LTE B5/7 + Wi-Fi 2.4/5GHz</li> </ol>
Body-worn Accessory	<ol style="list-style-type: none"> <li>5. GSM 850/1900 Voice + Wi-Fi 2.4/5GHz</li> <li>6. GSM 850/1900 Voice + BT</li> <li>7. GSM 850/1900 Voice + BT + Wi-Fi 5GHz</li> <li>8. GSM 850/1900 (GPRS/EDGE) + Wi-Fi 2.4/5GHz (VoIP)</li> <li>9. GSM 850/1900 (GPRS/EDGE) + BT (VoIP)</li> <li>10. GSM 850/1900 (GPRS/EDGE) + BT + Wi-Fi 5GHz (VoIP)</li> <li>11. WCDMA Band 2/5 + Wi-Fi 2.4/5GHz</li> <li>12. WCDMA Band 2/5 + BT</li> <li>13. WCDMA Band 2/5 + Wi-Fi 5GHz + BT</li> <li>14. LTE B5/7 + Wi-Fi 2.4/5GHz</li> <li>15. LTE B5/7 + BT</li> <li>16. LTE B5/7 + Wi-Fi 5GHz + BT</li> </ol>
Wireless Router (Hotspot)/ Wi-Fi Direct	<ol style="list-style-type: none"> <li>17. GSM 850/1900 (GPRS/EDGE) + Wi-Fi 2.4GHz</li> <li>18. WCDMA Band 2/5 + Wi-Fi 2.4GHz</li> <li>19. LTE B5/7 + Wi-Fi 2.4GHz</li> </ol>
<p>Notes:</p> <ol style="list-style-type: none"> <li>1. Wi-Fi 2.4GHz supports Hotspot and Wi-Fi Direct.</li> <li>2. Wi-Fi 5GHz does not support Hotspot but supports Wi-Fi Direct (Group Client only).</li> <li>3. GPRS/EDGE, WCDMA and LTE support Hotspot.</li> <li>4. VoIP is supported in LTE, WCDMA and GPRS/EDGE.</li> <li>5. Wi-Fi 2.4 GHz Radio cannot transmit simultaneously with Bluetooth Radio.</li> <li>6. Wi-Fi 5 GHz Radio can transmit simultaneously with Bluetooth Radio.</li> </ol>	

### 6.5. General LTE SAR Test and Reporting Considerations

Item	Description																																						
Frequency range, Channel Bandwidth, Numbers and Frequencies	Band 5	Frequency range: 824 - 849 MHz																																					
		Channel Bandwidth																																					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																
	Low			20450/ 829	20425/ 826.5	20415/ 825.5	20407/ 824.7																																
	Mid			20525/ 836.5	20525/ 836.5	20525/ 836.5	20525/ 836.5																																
	High			20600/ 844	20625/ 846.5	20635/ 847.5	20643/ 848.3																																
	Band 7	Frequency range: 2500 - 2570 MHz																																					
		Channel Bandwidth																																					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																
	Low	20850 2510	20825 2507.5	20800 2505	20775 2502.5																																		
	Mid	21100 2535	21100 2535	21100 2535	21100 2535																																		
	High	21350 2560	21375 2562.5	21400 2565	21425 2567.5																																		
LTE transmitter and antenna implementation	LTE has one (1) TX/RX antennas and one (1) RX antennas Refer to section 13.1. Photos and Antenna Locations																																						
Maximum power reduction (MPR)	<p><b>Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3</b></p> <table border="1"> <thead> <tr> <th rowspan="2">Modulation</th> <th colspan="6">Channel bandwidth / Transmission bandwidth (RB)</th> <th rowspan="2">MPR (dB)</th> </tr> <tr> <th>1.4 MHz</th> <th>3.0 MHz</th> <th>5 MHz</th> <th>10 MHz</th> <th>15 MHz</th> <th>20 MHz</th> </tr> </thead> <tbody> <tr> <td>QPSK</td> <td>&gt; 5</td> <td>&gt; 4</td> <td>&gt; 8</td> <td>&gt; 12</td> <td>&gt; 16</td> <td>&gt; 18</td> <td>≤ 1</td> </tr> <tr> <td>16 QAM</td> <td>≤ 5</td> <td>≤ 4</td> <td>≤ 8</td> <td>≤ 12</td> <td>≤ 16</td> <td>≤ 18</td> <td>≤ 1</td> </tr> <tr> <td>16 QAM</td> <td>&gt; 5</td> <td>&gt; 4</td> <td>&gt; 8</td> <td>&gt; 12</td> <td>&gt; 16</td> <td>&gt; 18</td> <td>≤ 2</td> </tr> </tbody> </table> <p>MPR Built-in by design A-MPR (additional MPR) was disabled during SAR testing</p>	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
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																																
Power reduction	Yes Refer to section 6.3. Nominal and Maximum Output Power																																						
Spectrum plots for RB configurations	A properly configured base station simulator was used for the SAR and power measurements; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.																																						

### 6.6. Antenna Dimensions and Separation Distances

Refer to Appendix 13.1. Photos and Antenna Locations.

## 7. RF Exposure Conditions (Test Configurations)

Refer to Appendix 13.1.Photos and Antenna Locations for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

### 7.1. Head

#### For WWAN, LTE and Wi-Fi

Test Configurations	SAR Required	Note
Left Touch	Yes	
Left Tilt (15°)	Yes	
Right Touch	Yes	
Right Tilt (15°)	Yes	

### 7.2. Body-worn Accessory

#### For WWAN and LTE

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	<25 mm	Yes	
Front	<25 mm	Yes	

#### For Wi-Fi

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	<25 mm	Yes	
Front	<25 mm	Yes	

### 7.3. Wireless Router (Hotspot) and Wi-Fi Direct

#### For WWAN and LTE

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	<25 mm	Yes	
Front	<25 mm	Yes	
Edge 1 (Top)	76.55 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR
Edge 2 (Right)	0 mm	Yes	
Edge 3 (Bottom)	0 mm	Yes	
Edge 4 (Left)	0 mm	Yes	

#### For Wi-Fi (2.4 GHz band only)

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	<25 mm	Yes	
Front	<25 mm	Yes	
Edge 1 (Top)	22.3 mm	Yes	
Edge 2 (Right)	0 mm	Yes	
Edge 3 (Bottom)	81.45 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR
Edge 4 (Left)	51 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR



## 8. Conducted Output Power Measurements

### 8.1. GSM850/1900

#### GSM850 Measured Results

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Full Pwr		Reduce Pwr				
						Burst (dBm)	Frame (dBm)	Burst (dBm)	Frame (dBm)			
850	GSM (Voice)	CS1	1	128	824.2	33.3	24.3	33.1	24.1			
				190	836.6	33.2	24.2	33.1	24.0			
				251	848.8	33.2	24.2	33.2	24.1			
	GPRS (GMSK)	CS1	1	1	128	824.2	<b>33.3</b>	<b>24.3</b>	<b>33.1</b>	<b>24.1</b>		
					190	836.6	<b>33.2</b>	<b>24.2</b>	<b>33.1</b>	<b>24.1</b>		
					251	848.8	<b>33.2</b>	<b>24.2</b>	<b>33.2</b>	<b>24.2</b>		
			2	1	128	824.2	29.8	23.8	28.5	22.5		
					190	836.6	29.8	23.8	28.5	22.5		
					251	848.8	29.9	23.9	28.5	22.5		
			3	1	128	824.2	27.8	23.5	26.3	22.0		
					190	836.6	27.8	23.5	26.3	22.0		
					251	848.8	27.9	23.6	26.3	22.0		
			4	1	128	824.2	26.9	23.9	25.2	22.2		
					190	836.6	26.9	23.9	25.2	22.2		
					251	848.8	27.0	24.0	25.2	22.2		
			EGPRS (8PSK)	MCS5	1	1	128	824.2	27.3	18.3	27.4	18.4
							190	836.6	27.3	18.3	27.3	18.3
							251	848.8	27.3	18.3	27.4	18.4
	2	1			128	824.2	25.3	19.3	25.3	19.3		
					190	836.6	25.3	19.3	25.3	19.2		
					251	848.8	25.4	19.4	25.3	19.3		
	3	1			128	824.2	24.5	20.2	24.3	20.1		
					190	836.6	24.5	20.2	24.3	20.0		
					251	848.8	24.5	20.2	24.4	20.1		
4	1	128			824.2	22.4	19.4	22.2	19.2			
		190			836.6	22.4	19.4	22.3	19.3			
		251			848.8	22.4	19.4	22.4	19.3			

#### Notes:

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

RF Exposure Conditions	Mode	Pwr Back-off	Tx Slot
Head	GSM (Voice)	OFF	1
Head	GPRS (GMSK)	OFF	1
Body-worn	GSM (Voice)	OFF	1
Body-worn	GPRS (GMSK)	OFF	1
Hotspot	GPRS (GMSK)	ON	1

- SAR is not required for EGPRS (8PSK) mode because its output power is less than that of GPRS Mode.

**GSM1900 Measured Results**

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Full Pwr		Reduce Pwr			
						Burst (dBm)	Frame (dBm)	Burst (dBm)	Frame (dBm)		
1900	GSM (Voice)	CS1	1	512	1850.2	30.2	21.2	29.3	20.3		
				661	1880.0	30.2	21.2	29.5	20.5		
				810	1909.8	30.2	21.2	29.4	20.4		
	GPRS (GMSK)	CS1	1	512	1850.2	30.1	21.1	<b>29.4</b>	<b>20.4</b>		
				661	1880.0	30.2	21.2	<b>29.5</b>	<b>20.5</b>		
				810	1909.8	30.2	21.2	<b>29.4</b>	<b>20.4</b>		
			2	512	1850.2	27.9	21.9	26.5	20.5		
				661	1880.0	28.2	22.2	26.5	20.5		
				810	1909.8	28.1	22.1	26.5	20.5		
			3	512	1850.2	27.0	22.7	24.4	20.1		
				661	1880.0	27.0	22.7	24.5	20.2		
				810	1909.8	27.1	22.8	24.5	20.2		
			4	512	1850.2	<b>26.0</b>	<b>23.0</b>	23.2	20.2		
				661	1880.0	<b>26.0</b>	<b>23.0</b>	23.3	20.3		
				810	1909.8	<b>26.0</b>	<b>23.0</b>	23.3	20.3		
			EGPRS (8PSK)	MCS5	1	512	1850.2	26.0	17.0	26.1	17.1
						661	1880.0	26.1	17.1	26.0	17.0
						810	1909.8	26.1	17.1	26.1	17.1
	2	512			1850.2	24.0	18.0	24.0	18.0		
		661			1880.0	24.0	18.0	24.1	18.1		
		810			1909.8	24.1	18.1	24.2	18.2		
	3	512			1850.2	23.1	18.8	23.2	18.9		
		661			1880.0	23.1	18.8	23.2	18.9		
		810			1909.8	23.2	18.9	23.3	19.0		
	4	512			1850.2	22.0	19.0	22.1	19.1		
		661			1880.0	22.0	19.0	22.1	19.1		
		810			1909.8	22.1	19.1	22.1	19.1		

**Notes:**

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

RF Exposure Conditions	Mode	Pwr Back-off	Tx Slot
Head	GSM (Voice)	OFF	1
Head	GPRS (GMSK)	OFF	4
Body-worn	GSM (Voice)	OFF	1
Body-worn	GPRS (GMSK)	OFF	4
Hotspot	GPRS (GMSK)	ON	1

- SAR is not required for EGPRS (8PSK) mode because its output power is less than that of GPRS Mode

**GSM850 DTM Measured Results**

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Full Pwr				Reduce Pwr			
						CS		PS		CS		PS	
						Burst (dBm)	Frame (dBm)	Burst (dBm)	Frame (dBm)	Burst (dBm)	Frame (dBm)	Burst (dBm)	Frame (dBm)
850	GSM(Voice) + GPRS(GMSK)	CS1	1	128	824.2	33.3	24.3			32.9	23.9		
				190	836.6	33.3	24.3			32.9	23.9		
				251	848.8	33.3	24.3			32.9	23.9		
			2	128	824.2	<b>29.5</b>	<b>23.5</b>	<b>29.6</b>	<b>23.6</b>	<b>28.0</b>	<b>22.0</b>	<b>28.1</b>	<b>22.1</b>
				190	836.6	<b>29.7</b>	<b>23.7</b>	<b>29.8</b>	<b>23.8</b>	<b>28.1</b>	<b>22.1</b>	<b>28.2</b>	<b>22.2</b>
				251	848.8	<b>29.8</b>	<b>23.8</b>	<b>29.9</b>	<b>23.9</b>	<b>28.2</b>	<b>22.2</b>	<b>28.3</b>	<b>22.3</b>
			3	128	824.2	27.6	23.3	27.6	23.3	25.8	21.5	25.8	21.5
				190	836.6	27.7	23.4	27.7	23.4	25.9	21.6	25.9	21.6
				251	848.8	27.8	23.5	27.8	23.5	26.0	21.7	26.0	21.7
	GSM(Voice) + EGPRS(8PSK)	MCS5	1	128	824.2	33.3	24.3			32.7	23.7		
				190	836.6	33.3	24.3			32.7	23.7		
				251	848.8	33.3	24.3			32.7	23.7		
			2	128	824.2	29.6	23.6	24.9	18.9	28.2	22.2	24.8	18.8
				190	836.6	29.6	23.6	24.9	18.9	28.2	22.2	24.8	18.8
				251	848.8	29.8	23.8	25.0	19.0	28.3	22.3	24.8	18.8
			3	128	824.2	27.7	23.4	24.1	19.8	26.0	21.7	23.8	19.5
				190	836.6	27.7	23.4	24.1	19.8	26.0	21.7	23.8	19.5
				251	848.8	27.9	23.6	24.3	20.0	26.1	21.8	23.9	19.6

**Notes:**

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

RF Exposure Conditions	Mode	Pwr Back-off	Tx Slot
Body-worn	GSM(Voice) + GPRS(GMSK)	OFF	2
Hotspot	GSM(Voice) + GPRS(GMSK)	ON	2

- SAR is not required for EGPRS (8PSK) mode because its output power is less than that of GPRS Mode

**GSM1900 DTM Measured Results**

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Full Pwr				Reduce Pwr			
						CS		PS		CS		PS	
						Burst (dBm)	Frame (dBm)	Burst (dBm)	Frame (dBm)	Burst (dBm)	Frame (dBm)	Burst (dBm)	Frame (dBm)
1900	GSM(Voice) + GPRS(GMSK)	CS1	1	512	1850.2	30.3	21.3			29.5	20.5		
				661	1880.0	30.2	21.2			29.7	20.7		
				810	1909.8	30.3	21.3			29.6	20.6		
			2	512	1850.2	28.0	22.0	28.0	22.0	<b>25.8</b>	<b>19.8</b>	<b>25.8</b>	<b>19.8</b>
				661	1880.0	28.2	22.2	28.2	22.2	<b>25.9</b>	<b>19.9</b>	<b>25.9</b>	<b>19.9</b>
				810	1909.8	28.2	22.2	28.2	22.2	<b>25.9</b>	<b>19.9</b>	<b>25.9</b>	<b>19.9</b>
			3	512	1850.2	<b>27.1</b>	<b>22.8</b>	<b>27.1</b>	<b>22.8</b>	23.9	19.6	23.9	19.6
				661	1880.0	<b>27.1</b>	<b>22.8</b>	<b>27.2</b>	<b>22.9</b>	23.9	19.6	24.0	19.7
				810	1909.8	<b>27.2</b>	<b>22.9</b>	<b>27.1</b>	<b>22.8</b>	24.0	19.7	24.0	19.7
	GSM(Voice) + EGPRS(8PSK)	MCS5	1	512	1850.2	30.3	21.3			29.5	20.5		
				661	1880.0	30.3	21.3			29.7	20.7		
				810	1909.8	30.3	21.3			29.6	20.6		
			2	512	1850.2	28.0	22.0	23.8	17.8	25.9	19.9	23.4	17.4
				661	1880.0	28.2	22.2	23.9	17.9	26.0	20.0	23.4	17.4
				810	1909.8	28.2	22.2	23.9	17.9	25.9	19.9	23.5	17.5
			3	512	1850.2	27.2	22.9	23.1	18.8	23.9	19.6	22.6	18.3
				661	1880.0	27.2	22.9	23.1	18.8	23.9	19.6	22.6	18.3
				810	1909.8	27.3	23.0	23.2	18.9	23.9	19.6	22.7	18.4

**Notes:**

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

RF Exposure Conditions	Mode	Pwr Back-off	Tx Slot
Body-worn	GSM(Voice) + GPRS(GMSK)	OFF	3
Hotspot	GSM(Voice) + GPRS(GMSK)	ON	2

- SAR is not required for EGPRS (8PSK) mode because its output power is less than that of GPRS Mode

## 8.2. W-CDMA Band V/II

### 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
	$\beta_c/\beta_d$	8/15

### Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Full Avg Pwr (dBm)	Reduce Avg Pwr (dBm)
W-CDMA Band V	Rel 99 (RMC, 12.2 kbps)	4132	826.4	24.4	Not Supported
		4183	836.6	24.4	
		4233	846.6	24.4	
W-CDMA Band II	Rel 99 (RMC, 12.2 kbps)	9262	1852.4	22.9	20.8
		9400	1880.0	23.0	20.9
		9538	1907.6	23.0	20.9

**HSDPA**

The following 4 Sub-tests were completed according to Release 5 procedures in section 5.2 of 3GPP TS34.121. 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			
	$\beta_c$	2/15	12/15	15/15	15/15
	$\beta_d$	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	$\beta_c/\beta_d$	2/15	12/15	15/8	15/4
	$\beta_{hs}$	4/15	24/15	30/15	30/15
MPR (dB)	0	1	1.5	1.5	
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			
	$A_{hs} = \beta_{hs}/\beta_c$	30/15			

**Measured Results**

Band	Mode	UL Ch No.	Freq. (MHz)	Full Avg Pwr (dBm)	Reduce Avg Pwr (dBm)		
W-CDMA Band V	Subtest 1	4132	826.4	24.4	Not Supported		
		4183	836.6	24.4			
		4233	846.6	24.4			
	Subtest 2	4132	826.4	24.4			
		4183	836.6	24.4			
		4233	846.6	24.4			
	Subtest 3	4132	826.4	24.0			
		4183	836.6	24.0			
		4233	846.6	23.8			
	Subtest 4	4132	826.4	23.9			
		4183	836.6	24.0			
		4233	846.6	23.8			
	W-CDMA Band II	Subtest 1	9262	1852.4		22.3	20.3
			9400	1880.0		22.5	20.4
			9538	1907.6		22.5	20.3
		Subtest 2	9262	1852.4		22.6	20.5
9400			1880.0	22.5	20.4		
9538			1907.6	22.4	20.5		
Subtest 3		9262	1852.4	22.7	20.7		
		9400	1880.0	22.7	20.5		
		9538	1907.6	22.6	20.4		
Subtest 4		9262	1852.4	22.7	20.6		
		9400	1880.0	22.7	20.6		
		9538	1907.6	22.6	20.5		

Maximum output power levels that are possible for all subtests reported.

**HSPA (HSDPA & HSUPA)**

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

	Mode	HSPA	HSPA	HSPA	HSPA	HSPA
	Subtest	1	2	3	4	5
WCDMA General Settings	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2kbps RMC				
	HSDPA FRC	H-Set1				
	HSUPA Test	HSUPA Loopback				
	Power Control Algorithm	Algorithm2				
	$\beta_c$	11/15	6/15	15/15	2/15	15/15
	$\beta_d$	15/15	15/15	9/15	15/15	15/15
	$\beta_{ec}$	209/225	12/15	30/15	2/15	24/15
	$\beta_c/\beta_d$	11/15	6/15	15/9	2/15	15/15
	$\beta_{hs}$	22/15	12/15	30/15	4/15	30/15
	$\beta_{ed}$	1309/225	94/75	47/15	56/75	134/15
CM (dB)	1.0	3.0	2.0	3.0	1.0	
MPR (dB)	0	2	1	2	0	
HSDPA Specific Settings	DACK	8				
	DNAK	8				
	DCQI	8				
	Ack-Nack repetition factor	3				
	CQI Feedback (Table 5.2B.4)	4ms				
	CQI Repetition Factor (Table 5.2B.4)	2				
A <sub>hs</sub> = $\beta_{hs}/\beta_c$	30/15					
HSUPA Specific Settings	D E-DPCCH	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	E-TFCI 11 E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO 23 E-TFCI 75 E-TFCI PO 26 E-TFCI 81 E-TFCI PO 27		E-TFCI 11 E-TFCI PO 4 E-TFCI 92 E-TFCI PO 18		E-TFCI 11 E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO 23 E-TFCI 75 E-TFCI PO 26 E-TFCI 81 E-TFCI PO 27

**Measured Results**

Band	Mode	UL Ch No.	Freq. (MHz)	Full Avg Pwr (dBm)	Reduce Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	23.9	Not Supported
		4183	836.6	24.2	
		4233	846.6	23.8	
	Subtest 2	4132	826.4	22.9	
		4183	836.6	22.9	
		4233	846.6	22.8	
	Subtest 3	4132	826.4	22.8	
		4183	836.6	23.2	
		4233	846.6	23.4	
	Subtest 4	4132	826.4	23.0	
		4183	836.6	23.0	
		4233	846.6	23.0	
	Subtest 5	4132	826.4	24.4	
		4183	836.6	24.3	
		4233	846.6	24.4	
W-CDMA Band II	Subtest 1	9262	1852.4	22.0	19.9
		9400	1880.0	22.4	20.3
		9538	1907.6	21.8	19.9
	Subtest 2	9262	1852.4	20.8	19.8
		9400	1880.0	21.2	19.8
		9538	1907.6	21.3	19.8
	Subtest 3	9262	1852.4	21.6	19.8
		9400	1880.0	21.5	19.9
		9538	1907.6	21.9	19.9
	Subtest 4	9262	1852.4	21.7	19.8
		9400	1880.0	21.4	19.8
		9538	1907.6	21.8	19.8
	Subtest 5	9262	1852.4	22.3	20.2
		9400	1880.0	22.5	20.4
		9538	1907.6	22.4	20.4

**DC-HSDPA**

The following tests were completed according to procedures in section 7.3.13 of 3GPP TS34.108 v9.5.0. A summary of these settings are illustrated below:

Downlink Physical Channels are set as per 3GPP TS34.121-1 v9.0.0 E.5.0

**Table E.5.0: Levels for HSDPA connection setup**

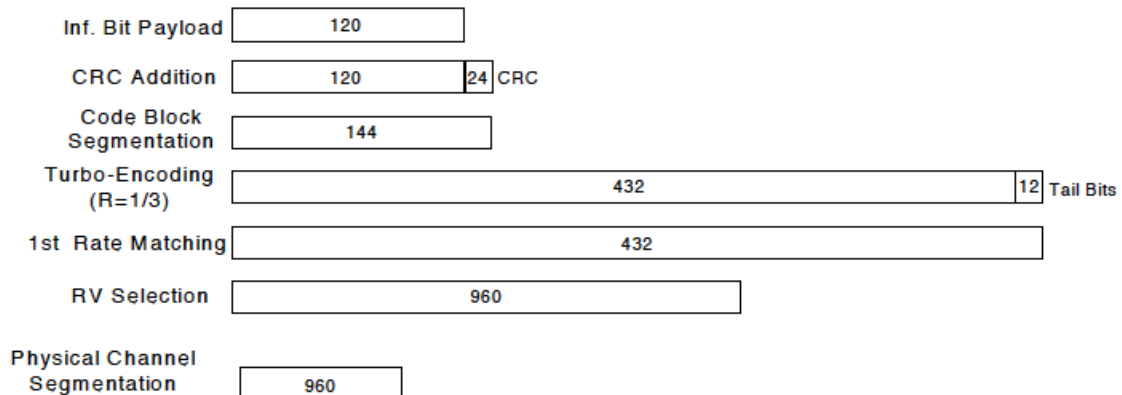
Parameter During Connection setup	Unit	Value
P-CPICH_Ec/Ior	dB	-10
P-CCPCH and SCH_Ec/Ior	dB	-12
PICH_Ec/Ior	dB	-15
HS-PDSCH	dB	off
HS-SCCH_1	dB	off
DPCH_Ec/Ior	dB	-5
OCNS_Ec/Ior	dB	-3.1

Call is set up as per 3GPP TS34.108 v9.5.0 sub clause 7.3.13

The configurations of the fixed reference channels for HSDPA RF tests are described in 3GPP TS 34.121, annex C for FDD and 3GPP TS 34.122.

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

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



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



The following 4 Sub-tests for HSDPA were completed according to Release 8 procedures in section 5.2 of 3GPP TS34.121. A summary of subtest settings are illustrated below:

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subtest	1	2	3	4
WCDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set1			
	Power Control Algorithm	Algorithm2			
	$\beta_c$	2/15	12/15	15/15	15/15
	$\beta_d$	15/15	15/15	8/15	4/15
	$\beta_d$ (SF)	64			
	$\beta_c/\beta_d$	2/15	12/15	15/8	15/4
	$\beta_{hs}$	4/15	24/15	30/15	30/15
MPR (dB)	0	0	0.5	0.5	
HSDPA Specific Settings	DACK	8			
	DNAK	8			
	DCQI	8			
	Ack-Nack Repetition factor	3			
	CQI Feedback	4ms			
	CQI Repetition Factor	2			
	A <sub>hs</sub> = $\beta_{hs}/\beta_c$	30/15			

Up commands are set continuously to set the UE to Max power.

**Measured Results**

Band	Mode	UL Ch No.	Freq. (MHz)	Full Avg Pwr (dBm)	Reduce Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	24.3	Not Supported
		4183	836.6	24.3	
		4233	846.6	24.4	
	Subtest 2	4132	826.4	24.4	
		4183	836.6	24.4	
		4233	846.6	24.4	
	Subtest 3	4132	826.4	23.8	
		4183	836.6	24.0	
		4233	846.6	23.8	
	Subtest 4	4132	826.4	23.9	
		4183	836.6	24.0	
		4233	846.6	23.8	
W-CDMA Band II	Subtest 1	9262	1852.4	22.5	20.3
		9400	1880.0	22.5	20.4
		9538	1907.6	22.4	20.3
	Subtest 2	9262	1852.4	22.6	20.5
		9400	1880.0	22.5	20.5
		9538	1907.6	22.5	20.5
	Subtest 3	9262	1852.4	22.7	20.6
		9400	1880.0	22.7	20.5
		9538	1907.6	22.5	20.4
	Subtest 4	9262	1852.4	22.8	20.3
		9400	1880.0	22.7	20.5
		9538	1907.6	22.5	20.4

**HSPA+**

Since 16QAM is not used for uplink, the uplink Category and release is same as HSUPA, i.e., CAT 6 Rel 6. Therefore, the RF conducted power is not measured.

### 8.3. LTE Band 5/7

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
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	13	10	Table 6.2.4-2	Table 6.2.4-2
	6.6.3.3.2				
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 <sup>1</sup>	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.

**LTE Band 5 Measured Results**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Full Avg Pwr (dBm)			Target MPR	Reduce Avg Pwr (dBm)		
						829 MHz	836.5 MHz	844 MHz		829 MHz	836.5 MHz	844 MHz
LTE Band 5	10	QPSK	1	0	0	23.1	23.1	23.1	Not Supported			
			1	25	0	23.0	23.0	23.1				
			1	49	0	23.1	23.1	23.1				
			25	0	1	22.1	22.1	22.1				
			25	12	1	22.1	22.0	22.1				
			25	25	1	22.1	22.1	22.1				
			50	0	1	22.1	22.1	22.1				
		16QAM	1	0	1	21.9	21.9	22.0				
			1	25	1	21.9	21.8	21.9				
			1	49	1	21.9	21.9	21.9				
			25	0	2	21.0	21.0	21.2				
			25	12	2	21.0	21.0	21.2				
			25	25	2	21.0	21.0	21.2				
			50	0	2	21.0	21.0	21.1				
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Full Avg Pwr (dBm)			Target MPR	Reduce Avg Pwr (dBm)		
						826.5 MHz	836.5 MHz	846.5 MHz		826.5 MHz	836.5 MHz	846.5 MHz
LTE Band 5	5	QPSK	1	0	0	23.0	22.9	23.0	Not Supported			
			1	12	0	23.0	22.9	23.0				
			1	24	0	23.1	22.9	23.0				
			12	0	1	22.1	22.0	22.1				
			12	6	1	22.1	22.0	22.1				
			12	11	1	22.1	22.0	22.1				
			25	0	1	22.1	22.0	22.5				
		16QAM	1	0	1	21.8	21.8	22.4				
			1	12	1	21.8	21.8	22.4				
			1	24	1	21.9	21.8	22.4				
			12	0	2	21.1	21.0	21.0				
			12	6	2	21.1	21.0	21.0				
			12	11	2	21.1	21.0	21.1				
			25	0	2	21.1	21.1	21.1				
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Full Avg Pwr (dBm)			Target MPR	Reduce Avg Pwr (dBm)		
						825.5 MHz	836.5 MHz	847.5 MHz		825.5 MHz	836.5 MHz	847.5 MHz
LTE Band 5	3	QPSK	1	0	0	23.1	23.1	23.1	Not Supported			
			1	7	0	23.1	23.0	23.0				
			1	14	0	23.1	23.1	23.0				
			8	0	1	22.0	22.0	22.1				
			8	4	1	22.0	22.0	22.1				
			8	7	1	22.0	22.0	22.1				
			15	0	1	22.1	22.0	22.1				
		16QAM	1	0	1	21.9	21.9	21.9				
			1	7	1	21.8	21.8	21.8				
			1	14	1	21.9	21.8	21.9				
			8	0	2	21.1	21.0	21.0				
			8	4	2	21.0	21.0	21.0				
			8	7	2	21.1	21.0	21.0				
			15	0	2	21.1	21.1	21.0				

**LTE Band 5 Measured Results (continued)**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Full Avg Pwr (dBm)			Target MPR	Reduce Avg Pwr (dBm)		
						824.7 MHz	836.5 MHz	848.3 MHz		824.7 MHz	836.5 MHz	848.3 MHz
LTE Band 5	1.4	QPSK	1	0	0	23.0	23.0	23.1	Not Supported			
			1	2	0	23.0	22.9	23.0				
			1	5	0	23.0	23.0	23.1				
			3	0	0	23.0	23.0	23.0				
			3	1	0	23.0	23.0	23.0				
			3	2	0	23.0	23.0	23.0				
		16QAM	6	0	1	22.1	22.0	22.1				
			1	0	1	22.1	22.1	21.9				
			1	2	1	22.1	22.0	22.0				
			1	5	1	22.1	22.1	22.2				
			3	0	1	22.0	22.0	22.2				
			3	1	1	22.0	21.9	22.2				
			3	2	1	22.0	22.0	22.2				
			6	0	2	21.1	21.1	21.1				

**LTE Band 7 Measured Results**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Full Avg Pwr (dBm)			Target MPR	Reduce Avg Pwr (dBm)		
						2510 MHz	2535 MHz	2560 MHz		2510 MHz	2535 MHz	2560 MHz
LTE Band 7	20	QPSK	1	0	0	23.0	23.0	23.0	0	20.1	20.3	20.2
			1	49	0	23.0	22.8	22.9	0	20.1	20.1	20.1
			1	99	0	23.0	22.8	22.9	0	20.2	20.1	20.0
			50	0	1	21.9	22.0	22.1	0	20.0	20.2	20.1
			50	24	1	22.0	22.0	22.1	0	20.0	20.2	20.0
			50	50	1	22.0	22.0	22.0	0	20.1	20.2	19.9
			100	0	1	22.0	22.0	22.0	0	20.1	20.2	20.0
		16QAM	1	0	1	22.2	22.3	22.2	0	20.2	20.3	20.3
			1	49	1	22.2	22.1	22.2	0	20.2	20.1	20.2
			1	99	1	22.3	22.1	22.0	0	20.4	20.1	20.1
			50	0	2	20.9	21.0	21.0	0	20.0	20.2	20.1
			50	24	2	20.9	21.0	21.0	0	20.0	20.2	20.0
			50	50	2	21.1	21.1	20.9	0	20.1	20.3	19.9
			100	0	2	21.0	21.0	21.0	0	20.1	20.2	20.0
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Full Avg Pwr (dBm)			Target MPR	Reduce Avg Pwr (dBm)		
						2507.5 MHz	2535 MHz	2562.5 MHz		2507.5 MHz	2535 MHz	2562.5 MHz
LTE Band 7	15	QPSK	1	0	0	23.3	23.1	23.1	0	20.0	20.2	20.1
			1	37	0	23.1	23.0	23.0	0	19.9	20.1	19.9
			1	74	0	23.1	23.0	23.0	0	20.0	20.2	19.8
			36	0	1	22.0	22.0	22.1	0	20.0	20.1	20.1
			36	20	1	21.9	22.0	22.0	0	19.9	20.1	20.0
			36	39	1	22.0	22.1	21.9	0	20.1	20.2	19.9
			75	0	1	22.0	22.1	22.0	0	20.0	20.2	20.0
		16QAM	1	0	1	21.9	22.0	22.5	0	19.9	20.6	19.9
			1	37	1	21.8	21.8	22.4	0	19.8	20.5	19.8
			1	74	1	21.9	21.8	22.3	0	19.9	20.5	19.7
			36	0	2	20.8	21.0	21.0	0	19.9	20.1	20.1
			36	20	2	20.8	21.0	20.8	0	19.9	20.1	20.0
			36	39	2	21.0	21.0	20.8	0	20.1	20.2	19.8
			75	0	2	21.0	21.0	20.9	0	20.0	20.2	20.0
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Full Avg Pwr (dBm)			Target MPR	Reduce Avg Pwr (dBm)		
						2505 MHz	2535 MHz	2565 MHz		2505 MHz	2535 MHz	2565 MHz
LTE Band 7	10	QPSK	1	0	0	23.2	23.1	23.1	0	20.0	20.1	20.1
			1	25	0	23.1	23.0	22.9	0	19.9	20.1	19.9
			1	49	0	23.1	23.1	23.0	0	20.0	20.1	20.0
			25	0	1	21.9	22.0	22.0	0	20.0	20.1	20.0
			25	12	1	22.0	22.1	21.9	0	20.1	20.2	19.9
			25	25	1	22.0	22.0	21.9	0	20.0	20.2	19.9
			50	0	1	21.9	22.1	21.9	0	20.0	20.2	20.0
		16QAM	1	0	1	21.9	21.9	21.8	0	19.9	20.0	20.3
			1	25	1	21.7	21.8	21.7	0	19.8	19.9	20.2
			1	49	1	21.8	21.9	21.7	0	19.9	20.0	20.2
			25	0	2	20.9	21.0	21.0	0	20.0	20.2	20.1
			25	12	2	20.9	21.0	20.9	0	20.0	20.3	19.9
			25	25	2	20.8	21.0	21.0	0	20.0	20.2	20.0
			50	0	2	20.8	21.0	20.9	0	20.0	20.2	20.0

**LTE Band 7 Measured Results (continued)**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Full Avg Pwr (dBm)			Target MPR	Reduce Avg Pwr (dBm)		
						2502.5 MHz	2535 MHz	2567.5 MHz		2502.5 MHz	2535 MHz	2567.5 MHz
LTE Band 7	5	QPSK	1	0	0	23.1	22.9	22.9	0	20.0	20.2	20.0
			1	12	0	23.0	22.9	22.9	0	19.9	20.2	20.0
			1	24	0	23.0	22.9	23.0	0	19.9	20.3	20.0
			12	0	1	22.0	22.1	21.9	0	20.1	20.2	19.9
			12	7	1	21.9	22.0	21.9	0	20.0	20.2	20.0
			12	13	1	21.9	22.0	21.9	0	20.0	20.2	19.9
			25	0	1	22.0	22.1	22.0	0	20.0	20.2	20.0
		16QAM	1	0	1	21.8	21.7	22.2	0	19.8	20.1	20.3
			1	12	1	21.7	21.7	22.2	0	19.7	20.1	20.3
			1	24	1	21.8	21.8	22.3	0	19.8	20.1	20.3
			12	0	2	21.0	21.0	20.8	0	20.1	20.3	19.9
			12	7	2	20.9	21.0	20.9	0	20.0	20.2	19.9
			12	13	2	20.9	21.0	20.9	0	20.0	20.2	20.0
			25	0	2	20.9	21.1	20.9	0	20.0	20.2	19.9

## 8.4. Wi-Fi (2.4 GHz Band)

Required Test Channels per KDB 248227 D01

Mode	Band	GHz	Channel	"Default Test Channels"	
				802.11b	802.11g
802.11b/g	2.4 GHz	2.412	1 <sup>#</sup>	√	∇
		2.437	6	√	∇
		2.462	11 <sup>#</sup>	√	∇

**Notes:**

√ = "default test channels"

∇ = possible 802.11g channels with maximum average output ¼ dB ≥ the "default test channels"

<sup>#</sup> = when output power is reduced for channel 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels should be tested.

### Measured Results

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Avg Pwr (dBm)	SAR Test (Yes/No)
2.4 (DTS)	802.11b	1 Mbps	1	2412	15.2	Yes
			6	2437	15.2	
			11	2462	14.8	
	802.11g	6 Mbps	1	2412	14.7	No
			6	2437	14.7	
			11	2462	14.3	
	802.11n (HT20)	6.5 Mbps	1	2412	14.0	No
			6	2437	13.9	
			11	2462	13.9	

**Note(s):**

Per KDB 248227 D01, SAR is not required for 802.11g/HT20 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels.

### Power measurements to determine worst-case data rates

Mode	Ch #	Freq. (MHz)	Data Rate	Avg Pwr (dBm)	SAR test (Yes/No)
802.11b	6	2437	1 Mbps	15.2	Yes
			2 Mbps	15.1	No
			5.5 Mbps	15.2	No
			11 Mbps	15.2	No

### 8.5. Wi-Fi (5 GHz Bands)

#### Required Test Channels per KDB 248227 D01

Mode		Band	GHz	Channel	"Default Test Channels"	
					802.11a	
802.11a	UNII (15.407)	5.2 GHz	5.180	36	√	
			5.200	40		*
			2.220	44		*
			5.240	48	√	
		5.3 GHz	5.260	52	√	
			5.280	56		*
			5.300	60		*
			5.320	64	√	
		5.5 GHz	5.500	100		
			5.520	104	√	
			5.540	108		*
			5.560	112		*
	5.580		116	√		
	5.600		120		*	
	5.620		124	√		
	5.640		128		*	
	5.8 GHz	5.745	149	√		
		5.765	153		*	
		5.785	157	√		
		5.805	161		*	
DTS (15.247)	5.8 GHz	5.825	165	√		

√ = "default test channels"

\* = possible 802.11a channels with maximum average output > the "default test channels"

# = when output power is reduced for channel 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels should be tested.



**Measured Results**

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Avg Pwr (dBm)	SAR Test (Yes/No)
5.2 (U-NII-1)	802.11a	6 Mbps	36	5180	14.9	Yes
			40	5200	14.7	
			44	5220	14.6	
			48	5240	14.6	
	802.11n (HT20)	6.5 Mbps	36	5180	14.7	No
			40	5200	14.7	
			48	5240	14.7	
	802.11n (HT40)	13.5 Mbps	38	5190	12.6	No
			46	5230	12.6	
	802.11ac (VHT20)	6.5 Mbps	36	5180	14.7	Yes
			40	5200	14.6	
			48	5240	14.7	
802.11ac (VHT40)	13.5 Mbps	38	5190	12.7	No	
		46	5230	12.6		
802.11ac (VHT80)	29.3 Mbps	42	5210	11.4	No	
5.3 (U-NII-2A)	802.11a	6 Mbps	52	5260	14.8	Yes
			56	5280	14.7	
			60	5300	14.7	
			64	5320	14.6	
	802.11n (HT20)	6.5 Mbps	52	5260	15.0	No
			60	5300	14.9	
			64	5320	14.4	
	802.11n (HT40)	13.5 Mbps	54	5270	12.8	No
			62	5310	12.8	
	802.11ac (VHT20)	6.5 Mbps	52	5260	15.0	Yes
			60	5300	14.9	
			64	5320	14.5	
802.11ac (VHT40)	13.5 Mbps	54	5270	12.8	No	
		62	5310	12.7		
802.11ac (VHT80)	29.3 Mbps	58	5290	11.6	No	

**Wi-Fi (5 GHz Bands) Measured Results (continued)**

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Avg Pwr (dBm)	SAR Test (Yes/No)
5.5 (U-NII-2C)	802.11a	6 Mbps	100	5500	15.2	Yes
			104	5520	15.0	
			108	5540	14.9	
			112	5560	14.9	
			116	5580	15.0	
			120	5600	Not supported	
			124	5620	Not supported	
			128	5640	Not supported	
			132	5660	15.0	
			136	5680	15.0	
	140	5700	14.9			
	802.11n (HT20)	6.5 Mbps	100	5500	15.0	No
			116	5580	15.1	
			140	5700	15.1	
	802.11n (HT40)	13.5 Mbps	102	5510	12.9	No
			110	5550	12.9	
			134	5670	12.8	
	802.11ac (VHT20)	6.5 Mbps	100	5500	15.0	Yes
			116	5580	15.0	
140			5700	14.7		
802.11ac (VHT40)	13.5 Mbps	102	5510	12.9	No	
		110	5550	12.9		
		134	5670	12.9		
802.11ac (VHT80)	29.3 Mbps	106	5530	11.8	No	
		122	5610	Not supported		
5.8 (U-NII-3)	802.11a	6 Mbps	149	5745	14.9	Yes
			153	5765	14.7	
			157	5785	14.4	
			161	5805	14.4	
			165	5825	14.4	
	802.11n (HT20)	6.5 Mbps	149	5745	14.9	No
			157	5785	14.6	
			161	5805	14.5	
	802.11n (HT40)	13.5 Mbps	151	5755	12.5	No
			159	5795	12.5	
	802.11ac (VHT20)	6.5 Mbps	149	5745	14.8	Yes
			157	5785	14.5	
			165	5825	14.6	
	802.11ac (VHT40)	13.5 Mbps	151	5755	12.5	No
			159	5795	12.5	
802.11ac (VHT80)	29.3 Mbps	155	5775	11.3	No	

**Note(s):**

Per KDB 248227, SAR is not required for 802.11n HT20/HT40 and 802.11ac VHT40/VHT80 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a and 802.11ac VHT20 channels.

**Power measurements to determine worst-case data rates**

Band	Mode	Ch #	Freq. (MHz)	Data Rate	Avg Pwr (dBm)	SAR test (Yes/No)
5.2 GHz (U-NII-1)	802.11a	36	5180	6 Mbps	14.9	Yes
				9 Mbps	14.7	No
				12 Mbps	14.8	No
				18 Mbps	14.8	No
				24 Mbps	14.9	No
				36 Mbps	14.9	No
				48 Mbps	15.0	No
				54 Mbps	14.0	No
5.3 GHz (U-NII-2A)	802.11a	52	5260	6 Mbps	14.9	Yes
				9 Mbps	14.8	No
				12 Mbps	14.7	No
				18 Mbps	14.7	No
				24 Mbps	15.0	No
				36 Mbps	15.0	No
				48 Mbps	15.0	No
				54 Mbps	14.0	No
5.5 GHz (U-NII-2C)	802.11a	100	5500	6 Mbps	15.2	Yes
				9 Mbps	15.2	No
				12 Mbps	15.2	No
				18 Mbps	15.2	No
				24 Mbps	15.3	No
				36 Mbps	15.3	No
				48 Mbps	15.3	No
				54 Mbps	14.2	No
5.8 GHz (U-NII-3)	802.11a	149	5745	6 Mbps	14.9	Yes
				9 Mbps	14.9	No
				12 Mbps	14.9	No
				18 Mbps	14.9	No
				24 Mbps	15.0	No
				36 Mbps	15.0	No
				48 Mbps	15.0	No
				54 Mbps	14.2	No

**8.6. Bluetooth**

Band (MHz)	Mode	Ch #	Freq. (MHz)	Freq. (MHz)	Conducted Avg Power	
					(dBm)	(mW)
2.4	V3.0 + EDR, GFSK	0	2402	2412	7.3	5.37
		39	2441	2437	9.7	9.33
		78	2480	2462	7.5	5.62
	V3.0 + EDR, $\pi/4$ DQPSK	0	2402	2412	4.3	2.69
		39	2441	2437	6.1	4.07
		78	2480	2462	3.7	2.34
	V3.0 + EDR, 8-DPSK	0	2402	2412	4.5	2.82
		39	2441	2437	6.2	4.17
		78	2480	2462	3.9	2.45
	V4.0 LE, GFSK	0	2402	2422	-1.6	0.69
		19	2440	2437	-1.5	0.71
		39	2480	2452	-1.4	0.72

## 9. Dielectric Property Measurements

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within  $\pm 2^\circ\text{C}$  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.

### 9.1. Tissue Dielectric Parameters

#### FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

Target Frequency (MHz)	Head		Body	
	$\epsilon_r$	$\sigma$ (S/m)	$\epsilon_r$	$\sigma$ (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
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
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
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

#### IEEE Std 1528-2013

Refer to Table 3

## 9.2. Dielectric Property Measurements Results

### SAR Lab 1

	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)		
7/1/2014	Head 5180	e'	36.1900	Relative Permittivity ( $\epsilon_r$ ):	36.19	36.01	0.49	5	
		e"	15.5100	Conductivity ( $\sigma$ ):	4.47	4.63	-3.53	5	
	Head 5200	e'	36.1600	Relative Permittivity ( $\epsilon_r$ ):	36.16	35.99	0.47	5	
		e"	15.5400	Conductivity ( $\sigma$ ):	4.49	4.65	-3.39	5	
	Head 5600	e'	35.6700	Relative Permittivity ( $\epsilon_r$ ):	35.67	35.53	0.38	5	
		e"	15.7400	Conductivity ( $\sigma$ ):	4.90	5.06	-3.15	5	
	Head 5800	e'	35.3900	Relative Permittivity ( $\epsilon_r$ ):	35.39	35.30	0.25	5	
		e"	15.8600	Conductivity ( $\sigma$ ):	5.11	5.27	-2.94	5	
	Head 5825	e'	35.5400	Relative Permittivity ( $\epsilon_r$ ):	35.54	35.30	0.68	5	
		e"	15.8700	Conductivity ( $\sigma$ ):	5.14	5.27	-2.46	5	
	7/1/2014	Body 5180	e'	47.7900	Relative Permittivity ( $\epsilon_r$ ):	47.79	49.05	-2.56	5
			e"	18.4500	Conductivity ( $\sigma$ ):	5.31	5.27	0.81	5
Body 5200		e'	47.7200	Relative Permittivity ( $\epsilon_r$ ):	47.72	49.02	-2.65	5	
		e"	18.4500	Conductivity ( $\sigma$ ):	5.33	5.29	0.75	5	
Body 5600		e'	47.0200	Relative Permittivity ( $\epsilon_r$ ):	47.02	48.48	-3.01	5	
		e"	18.8300	Conductivity ( $\sigma$ ):	5.86	5.76	1.77	5	
Body 5800		e'	46.7200	Relative Permittivity ( $\epsilon_r$ ):	46.72	48.20	-3.07	5	
		e"	19.0200	Conductivity ( $\sigma$ ):	6.13	6.00	2.23	5	
Body 5825		e'	46.6600	Relative Permittivity ( $\epsilon_r$ ):	46.66	48.20	-3.20	5	
		e"	19.0500	Conductivity ( $\sigma$ ):	6.17	6.00	2.83	5	
7/6/2014		Head 5180	e'	37.2500	Relative Permittivity ( $\epsilon_r$ ):	37.25	36.01	3.43	5
			e"	16.4100	Conductivity ( $\sigma$ ):	4.73	4.63	2.07	5
	Head 5200	e'	37.2300	Relative Permittivity ( $\epsilon_r$ ):	37.23	35.99	3.44	5	
		e"	16.4100	Conductivity ( $\sigma$ ):	4.74	4.65	2.02	5	
	Head 5600	e'	36.6500	Relative Permittivity ( $\epsilon_r$ ):	36.65	35.53	3.14	5	
		e"	16.5800	Conductivity ( $\sigma$ ):	5.16	5.06	2.02	5	
	Head 5800	e'	36.3500	Relative Permittivity ( $\epsilon_r$ ):	36.35	35.30	2.97	5	
		e"	16.6900	Conductivity ( $\sigma$ ):	5.38	5.27	2.13	5	
	Head 5825	e'	36.3100	Relative Permittivity ( $\epsilon_r$ ):	36.31	35.30	2.86	5	
		e"	16.7100	Conductivity ( $\sigma$ ):	5.41	5.27	2.70	5	

**SAR Lab 1 (Continued)**

	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
		e'						
7/10/2014	Head 835	e'	41.4300	Relative Permittivity ( $\epsilon_r$ ):	41.43	41.50	-0.17	5
		e"	19.4700	Conductivity ( $\sigma$ ):	0.90	0.90	0.44	5
	Head 820	e'	41.5900	Relative Permittivity ( $\epsilon_r$ ):	41.59	41.60	-0.03	5
		e"	19.4900	Conductivity ( $\sigma$ ):	0.89	0.90	-1.09	5
	Head 850	e'	41.2300	Relative Permittivity ( $\epsilon_r$ ):	41.23	41.50	-0.65	5
		e"	19.4300	Conductivity ( $\sigma$ ):	0.92	0.92	0.36	5
7/10/2014	Body 835	e'	53.8800	Relative Permittivity ( $\epsilon_r$ ):	53.88	55.20	-2.39	5
		e"	20.0800	Conductivity ( $\sigma$ ):	0.93	0.97	-3.89	5
	Body 820	e'	54.0300	Relative Permittivity ( $\epsilon_r$ ):	54.03	55.28	-2.26	5
		e"	20.2000	Conductivity ( $\sigma$ ):	0.92	0.97	-4.90	5
	Body 850	e'	53.7300	Relative Permittivity ( $\epsilon_r$ ):	53.73	55.16	-2.59	5
		e"	20.0700	Conductivity ( $\sigma$ ):	0.95	0.99	-3.91	5
7/14/2014	Head 835	e'	41.8700	Relative Permittivity ( $\epsilon_r$ ):	41.87	41.50	0.89	5
		e"	19.1300	Conductivity ( $\sigma$ ):	0.89	0.90	-1.31	5
	Head 820	e'	42.0100	Relative Permittivity ( $\epsilon_r$ ):	42.01	41.60	0.98	5
		e"	19.2400	Conductivity ( $\sigma$ ):	0.88	0.90	-2.36	5
	Head 850	e'	41.7100	Relative Permittivity ( $\epsilon_r$ ):	41.71	41.50	0.51	5
		e"	19.0700	Conductivity ( $\sigma$ ):	0.90	0.92	-1.50	5
7/14/2014	Body 835	e'	52.9700	Relative Permittivity ( $\epsilon_r$ ):	52.97	55.20	-4.04	5
		e"	20.8700	Conductivity ( $\sigma$ ):	0.97	0.97	-0.11	5
	Body 820	e'	53.0800	Relative Permittivity ( $\epsilon_r$ ):	53.08	55.28	-3.97	5
		e"	21.0100	Conductivity ( $\sigma$ ):	0.96	0.97	-1.09	5
	Body 850	e'	52.9000	Relative Permittivity ( $\epsilon_r$ ):	52.90	55.16	-4.09	5
		e"	20.7900	Conductivity ( $\sigma$ ):	0.98	0.99	-0.46	5

**SAR Lab 2**

	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
		e'						
7/8/2014	Head 2450	e'	38.6000	Relative Permittivity ( $\epsilon_r$ ):	38.60	39.20	-1.53	5
		e"	13.4200	Conductivity ( $\sigma$ ):	1.83	1.80	1.57	5
	Head 2410	e'	38.7600	Relative Permittivity ( $\epsilon_r$ ):	38.76	39.28	-1.32	5
		e"	13.3400	Conductivity ( $\sigma$ ):	1.79	1.76	1.54	5
	Head 2475	e'	38.5100	Relative Permittivity ( $\epsilon_r$ ):	38.51	39.17	-1.68	5
		e"	13.4800	Conductivity ( $\sigma$ ):	1.86	1.83	1.54	5
7/8/2014	Body 2450	e'	50.7300	Relative Permittivity ( $\epsilon_r$ ):	50.73	52.70	-3.74	5
		e"	14.3300	Conductivity ( $\sigma$ ):	1.95	1.95	0.11	5
	Body 2410	e'	50.8300	Relative Permittivity ( $\epsilon_r$ ):	50.83	52.76	-3.66	5
		e"	14.2800	Conductivity ( $\sigma$ ):	1.91	1.91	0.32	5
	Body 2475	e'	50.6700	Relative Permittivity ( $\epsilon_r$ ):	50.67	52.67	-3.79	5
		e"	14.3600	Conductivity ( $\sigma$ ):	1.98	1.99	-0.45	5

**SAR Lab 4**

	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
		e'						
7/11/2014	Head 2600	e'	39.1400	Relative Permittivity ( $\epsilon_r$ ):	39.14	39.01	0.33	5
		e"	14.0900	Conductivity ( $\sigma$ ):	2.04	1.96	3.81	5
	Head 2500	e'	39.4800	Relative Permittivity ( $\epsilon_r$ ):	39.48	39.14	0.88	5
		e"	13.8400	Conductivity ( $\sigma$ ):	1.92	1.85	3.77	5
	Head 2700	e'	38.7400	Relative Permittivity ( $\epsilon_r$ ):	38.74	38.88	-0.37	5
		e"	14.3200	Conductivity ( $\sigma$ ):	2.15	2.07	3.84	5
7/11/2014	Body 2600	e'	50.8400	Relative Permittivity ( $\epsilon_r$ ):	50.84	52.51	-3.18	5
		e"	15.2200	Conductivity ( $\sigma$ ):	2.20	2.16	1.83	5
	Body 2500	e'	51.1400	Relative Permittivity ( $\epsilon_r$ ):	51.14	52.64	-2.84	5
		e"	14.9700	Conductivity ( $\sigma$ ):	2.08	2.02	3.00	5
	Body 2700	e'	50.5200	Relative Permittivity ( $\epsilon_r$ ):	50.52	52.38	-3.56	5
		e"	15.4600	Conductivity ( $\sigma$ ):	2.32	2.30	0.85	5
7/14/2014	Head 1900	e'	40.3800	Relative Permittivity ( $\epsilon_r$ ):	40.38	40.00	0.95	5
		e"	13.4400	Conductivity ( $\sigma$ ):	1.42	1.40	1.42	5
	Head 1850	e'	40.5800	Relative Permittivity ( $\epsilon_r$ ):	40.58	40.00	1.45	5
		e"	13.3200	Conductivity ( $\sigma$ ):	1.37	1.40	-2.13	5
	Head 1910	e'	40.3400	Relative Permittivity ( $\epsilon_r$ ):	40.34	40.00	0.85	5
		e"	13.4500	Conductivity ( $\sigma$ ):	1.43	1.40	2.03	5
7/14/2014	Body 1950	e'	50.9900	Relative Permittivity ( $\epsilon_r$ ):	50.99	53.30	-4.33	5
		e"	13.9800	Conductivity ( $\sigma$ ):	1.52	1.52	-0.28	5
	Body 1920	e'	51.0900	Relative Permittivity ( $\epsilon_r$ ):	51.09	53.30	-4.15	5
		e"	13.9400	Conductivity ( $\sigma$ ):	1.49	1.52	-2.09	5
	Body 1980	e'	50.9100	Relative Permittivity ( $\epsilon_r$ ):	50.91	53.30	-4.48	5
		e"	14.0200	Conductivity ( $\sigma$ ):	1.54	1.52	1.55	5

**SAR Lab 5**

	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
		e'						
6/28/2014	Head 2450	e'	38.6800	Relative Permittivity ( $\epsilon_r$ ):	38.68	39.20	-1.33	5
		e"	13.7500	Conductivity ( $\sigma$ ):	1.87	1.80	4.06	5
	Head 2410	e'	38.8400	Relative Permittivity ( $\epsilon_r$ ):	38.84	39.28	-1.12	5
		e"	13.6400	Conductivity ( $\sigma$ ):	1.83	1.76	3.83	5
	Head 2475	e'	38.5800	Relative Permittivity ( $\epsilon_r$ ):	38.58	39.17	-1.50	5
		e"	13.8200	Conductivity ( $\sigma$ ):	1.90	1.83	4.10	5
6/28/2014	Body 2450	e'	51.8700	Relative Permittivity ( $\epsilon_r$ ):	51.87	52.70	-1.57	5
		e"	14.3600	Conductivity ( $\sigma$ ):	1.96	1.95	0.32	5
	Body 2410	e'	52.0200	Relative Permittivity ( $\epsilon_r$ ):	52.02	52.76	-1.40	5
		e"	14.2100	Conductivity ( $\sigma$ ):	1.90	1.91	-0.17	5
	Body 2475	e'	51.7900	Relative Permittivity ( $\epsilon_r$ ):	51.79	52.67	-1.67	5
		e"	14.4500	Conductivity ( $\sigma$ ):	1.99	1.99	0.17	5

## 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 remeasured 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 can be obtained from the calibration certificate of system validation dipoles

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Target SAR Values (W/kg)		
				1g/10g	Head	Body
D835V2	4d002	11/15/2013	835	1g	9.49	9.43
				10g	6.18	6.21
D1900V2	5d043	11/12/2013	1900	1g	40.1	39.0
				10g	21.1	20.8
D2450V2	899	9/10/2013	2450	1g	51.3	49.7
				10g	23.9	23.3
D2600V2	1006	9/11/2013	2600	1g	56.5	55.70
				10g	25.2	24.8
D5GHzV2	1003	2/26/2014	5200	1g	77.7	73.5
				10g	22.2	20.5
			5600	1g	81.8	79.6
				10g	23.2	22.1
			5800	1g	78.3	73.8
				10g	22.1	20.4
D5GHzV2	1138	11/19/2013	5200	1g	78.5	72.9
				10g	22.5	20.4
			5600	1g	82.7	78.3
				10g	23.5	21.7
			5800	1g	78.3	72.8
				10g	22.4	20.1



## 9.4. System Check Results

The 1-g 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.

### SAR Lab 1

Date Tested	System Dipole		T.S. Liquid	Measured Results			Target (Ref. Value)	Delta $\pm 10\%$	Est./Zoom Ratio	Plot No.	
	Type	Serial #		Area Scan	Zoom Scan	Normalize to 1 W					
7/1/2014	D5GHzV2 (5.2 GHz)	1003	Head	1g	6.78	7.22	72.2	77.7	-7.08	-6.49	1,2
				10g	1.88	2.08	20.8	22.2	-6.31		
7/1/2014	D5GHzV2 (5.6 GHz)	1003	Head	1g	7.79	8.33	83.3	81.8	1.83	-6.93	
				10g	2.13	2.38	23.8	23.2	2.59		
7/1/2014	D5GHzV2 (5.8 GHz)	1003	Head	1g	6.89	7.48	74.8	78.3	-4.47	-8.56	
				10g	1.90	2.13	21.3	22.1	-3.62		
7/1/2014	D5GHzV2 (5.2 GHz)	1003	Body	1g	6.79	7.08	70.8	73.5	-3.67	-4.27	
				10g	1.87	2.01	20.1	20.5	-1.95		
7/1/2014	D5GHzV2 (5.6 GHz)	1003	Body	1g	7.96	8.48	84.8	79.6	6.53	-6.53	
				10g	2.15	2.38	23.8	22.1	7.69		
7/1/2014	D5GHzV2 (5.8 GHz)	1003	Body	1g	6.79	7.23	72.3	73.8	-2.03	-6.48	
				10g	1.83	2.02	20.2	20.4	-0.98		
7/6/2014	D5GHzV2 (5.2 GHz)	1138	Head	1g	7.36	7.82	78.2	78.5	-0.38	-6.25	
				10g	2.09	2.26	22.6	22.5	0.44		
7/6/2014	D5GHzV2 (5.6 GHz)	1138	Head	1g	7.68	8.43	84.3	82.7	1.93	-9.77	
				10g	2.12	2.39	23.9	23.5	1.70		
7/6/2014	D5GHzV2 (5.8 GHz)	1138	Head	1g	7.49	8.26	82.6	78.3	5.49	-10.28	3,4
				10g	2.07	2.35	23.5	22.4	4.91		
7/10/2014	D835V2	4d002	Head	1g	0.994	0.97	9.70	9.49	2.21	2.41	
				10g	0.669	0.637	6.37	6.18	3.07		
7/10/2014	D835V2	4d002	Body	1g	0.963	0.944	9.44	9.43	0.11	1.97	
				10g	0.645	0.623	6.23	6.21	0.32		
7/14/2014	D835V2	4d002	Head	1g	1.01	0.965	9.65	9.49	1.69	4.46	
				10g	0.667	0.634	6.34	6.18	2.59		
7/14/2014	D835V2	4d002	Body	1g	1.00	0.979	9.79	9.43	3.82	2.10	5,6
				10g	0.673	0.645	6.45	6.21	3.86		

### SAR Lab 2

Date Tested	System Dipole		T.S. Liquid	Measured Results			Target (Ref. Value)	Delta $\pm 10\%$	Est./Zoom Ratio	Plot No.	
	Type	Serial #		Area Scan	Zoom Scan	Normalize to 1 W					
7/8/2014	D2450V2	899	Head	1g	5.42	5.35	53.5	51.3	4.29	1.29	
				10g	2.36	2.47	24.7	23.9	3.35		
7/8/2014	D2450V2	899	Body	1g	5.21	5.31	53.1	49.7	6.84	-1.92	7,8
				10g	2.28	2.50	25.0	23.3	7.30		

**SAR Lab 4**

Date Tested	System Dipole		T.S. Liquid	Measured Results			Target (Ref. Value)	Delta ±10 %	Est./Zoom Ratio	Plot No.	
	Type	Serial #		Area Scan	Zoom Scan	Normalize to 1 W					
7/11/2014	D2600V2	1006	Head	1g	6.46	6.21	62.1	56.5	9.91	3.87	9,10
				10g	2.89	2.75	27.5	25.2	9.13		
7/11/2014	D2600V2	1006	Body	1g	6.26	6.04	60.4	55.7	8.44	3.51	
				10g	2.72	2.67	26.7	24.8	7.66		
7/14/2014	D1900V2	5d043	Head	1g	4.41	4.23	42.3	40.1	5.49	4.08	11,12
				10g	2.23	2.17	21.7	21.1	2.84		
7/14/2014	D1900V2	5d043	Body	1g	3.67	3.73	37.3	39.0	-4.36	-1.63	
				10g	3.73	1.98	19.8	20.8	-4.81		

**SAR Lab 5**

Date Tested	System Dipole		T.S. Liquid	Measured Results			Target (Ref. Value)	Delta ±10 %	Est./Zoom Ratio	Plot No.	
	Type	Serial #		Area Scan	Zoom Scan	Normalize to 1 W					
6/28/2014	D2450V2	899	Head	1g	5.10	5.05	50.5	51.30	-1.56	0.98	
				10g	2.23	2.30	23.0	23.90	-3.77		
6/28/2014	D2450V2	899	Body	1g	4.96	5.07	50.7	49.70	2.01	-2.22	13,14
				10g	2.18	2.39	23.9	23.30	2.58		

## 10. Measured and Reported (Scaled) 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:

- $\leq 0.8$  W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is  $\leq 100$  MHz
- $\leq 0.6$  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
- $\leq 0.4$  W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is  $\geq 200$  MHz

**KDB 648474 D04 Handset SAR:**

With headset attached, 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.

**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  $\frac{1}{4}$  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.

**KDB 248227 D01 SAR Measurements Procedures for 802.11 a/b/g Transmitters v01r02 (pg.6):**

Each channel should be tested at the lowest data rate in each a-b/g mode or 4.9 GHz channel BW configuration.

When the extrapolated maximum peak SAR for the maximum output channel is  $\leq 1.6$  W/kg and the 1-g averaged SAR is  $\leq 0.8$  W/kg, testing of other channels in the "default test channels" or "required test channels" configuration is optional.

**April 2013 TCB Workshop Updates:**

Apply usual 802.11 test exclusion considerations, but include 802.11ac SAR for highest 802.11a configuration in each frequency band and each exposure condition.

**10.1. GSM850**

RF Exposure Conditions	Mode	Pwr Back off	Dist. (mm)	Test Position	6	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	Meas.	Scaled	
Head	Voice	OFF	0	Left Touch	190	836.6	33.6	33.2	0.314	0.344	0.240	0.263	
				Left Tilt	190	836.6	33.6	33.2	0.223	0.245	0.169	0.185	
				Right Touch	190	836.6	33.6	33.2	0.298	0.327	0.223	0.245	
				Right Tilt	190	836.6	33.6	33.2	0.199	0.218	0.152	0.167	
Head (VoIP)	GPRS 1 Slots	OFF	0	Left Touch	190	836.6	33.6	33.2	0.340	0.373	0.253	0.277	1
				Left Tilt	190	836.6	33.6	33.2	0.216	0.237	0.163	0.179	
				Right Touch	190	836.6	33.6	33.2	0.250	0.274	0.189	0.207	
				Right Tilt	190	836.6	33.6	33.2	0.187	0.205	0.142	0.156	
Body-worn	Voice	OFF	15	Rear	190	836.6	33.6	33.2	0.390	0.428	0.297	0.326	
				Front	190	836.6	33.6	33.2	0.399	0.437	0.301	0.330	2
Body-worn (VoIP)	GPRS 1 Slots	OFF	15	Rear	190	836.6	33.6	33.2	0.367	0.402	0.278	0.305	
				Front	190	836.6	33.6	33.2	0.371	0.407	0.283	0.310	
Hotspot	GPRS 1 Slots	ON	10	Rear	190	836.6	33.6	33.1	0.460	0.517	0.352	0.396	
				Front	190	836.6	33.6	33.1	0.413	0.464	0.316	0.355	
				Edge 2	190	836.6	33.6	33.1	0.221	0.249	0.155	0.174	
				Edge 3	190	836.6	33.6	33.1	0.028	0.031	0.017	0.019	
				Edge 4	190	836.6	33.6	33.1	0.176	0.198	0.124	0.139	

**Additional test in DTM (Dual Transfer Mode)**

RF Exposure Conditions	Mode	Pwr Back off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	Meas.	Scaled	
Body-worn	CS + GPRS 2 Slots	OFF	15	Rear	190	836.6	30.1	29.8	0.403	0.432	0.306	0.328	
Hotspot	CS + GPRS 2 Slots	ON	10	Rear	190	836.6	29.7	28.2	0.480	0.678	0.367	0.518	3
				Front	190	836.6	29.7	28.2	0.437	0.617	0.333	0.470	
				Edge 2	190	836.6	29.7	28.2	0.259	0.366	0.182	0.257	
				Edge 3	190	836.6	29.7	28.2	0.028	0.039	0.019	0.026	
				Edge 4	190	836.6	29.7	28.2	0.207	0.292	0.146	0.206	

### 10.2. GSM1900

RF Exposure Conditions	Mode	Pwr Back off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	Meas.	Scaled	
Head	Voice	OFF	0	Left Touch	661	1880.0	30.6	30.2	0.368	0.404	0.222	0.243	
				Left Tilt	661	1880.0	30.6	30.2	0.095	0.104	0.060	0.066	
				Right Touch	661	1880.0	30.6	30.2	0.199	0.218	0.131	0.144	
				Right Tilt	661	1880.0	30.6	30.2	0.093	0.102	0.056	0.061	
Head (VoIP)	GPRS 4 Slots	OFF	0	Left Touch	661	1880.0	26.6	26.0	0.522	0.599	0.311	0.357	4
				Left Tilt	661	1880.0	26.6	26.0	0.140	0.161	0.087	0.100	
				Right Touch	661	1880.0	26.6	26.0	0.293	0.336	0.191	0.219	
				Right Tilt	661	1880.0	26.6	26.0	0.131	0.150	0.079	0.091	
Body-worn	Voice	OFF	15	Rear	661	1880.0	30.6	30.2	0.366	0.401	0.232	0.254	
				Front	661	1880.0	30.6	30.2	0.304	0.333	0.192	0.211	
Body-worn (VoIP)	GPRS 4 Slots	OFF	15	Rear	661	1880.0	26.6	26.0	0.534	0.613	0.337	0.387	5
				Front	661	1880.0	26.6	26.0	0.403	0.463	0.255	0.293	
Hotspot	GPRS 1 Slots	ON	10	Rear	512	1850.2	30.6	29.4	0.531	0.700	0.331	0.436	
					661	1880.0	30.6	29.5	0.636	0.819	0.391	0.504	
					810	1909.8	30.6	29.4	0.751	<b>0.990</b>	0.461	0.608	6
				Front	661	1880.0	30.6	29.5	0.451	0.581	0.276	0.356	
				Edge 2	661	1880.0	30.6	29.5	0.069	0.089	0.041	0.053	
				Edge 3	661	1880.0	30.6	29.5	0.150	0.193	0.094	0.121	
Edge 4	661	1880.0	30.6	29.5	0.085	0.109	0.052	0.067					

#### Additional test in DTM (Dual Transfer Mode)

RF Exposure Conditions	Mode	Pwr Back off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	Meas.	Scaled	
Body-worn	CS + GPRS 3 Slots	OFF	15	Rear	661	1880.0	27.6	27.2	0.433	0.475	0.277	0.304	
Hotspot	CS + GPRS 2 Slots	ON	10	Rear	661	1880.0	27.0	25.9	0.539	0.694	0.337	0.434	

### 10.3. W-CDMA Band V

RF Exposure Conditions	Mode	Pwr Back off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	Meas.	Scaled	
Head	Rel 99 RMC	OFF	0	Left Touch	4183	836.6	24.5	24.4	0.396	0.405	0.298	0.305	7
				Left Tilt	4183	836.6	24.5	24.4	0.263	0.269	0.198	0.203	
				Right Touch	4183	836.6	24.5	24.4	0.391	0.400	0.295	0.302	
				Right Tilt	4183	836.6	24.5	24.4	0.248	0.254	0.189	0.193	
Body-Worn & Hotspot	Rel 99 RMC	OFF	10	Rear	4183	836.6	24.5	24.4	0.553	0.566	0.418	0.428	8
				Front	4183	836.6	24.5	24.4	0.472	0.483	0.361	0.369	
				Edge 2	4183	836.6	24.5	24.4	0.251	0.257	0.176	0.180	
				Edge 3	4183	836.6	24.5	24.4	0.025	0.026	0.017	0.017	
				Edge 4	4183	836.6	24.5	24.4	0.190	0.194	0.133	0.136	

### 10.4. W-CDMA Band II

RF Exposure Conditions	Mode	Pwr Back off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	Meas.	Scaled	
Head	Rel 99 RMC	OFF	0	Left Touch	9400	1880.0	23.0	23.0	0.694	0.694	0.421	0.421	9
				Left Tilt	9400	1880.0	23.0	23.0	0.180	0.180	0.113	0.113	
				Right Touch	9400	1880.0	23.0	23.0	0.396	0.396	0.256	0.256	
				Right Tilt	9400	1880.0	23.0	23.0	0.181	0.181	0.108	0.108	
Body-worn	Rel 99 RMC	OFF	15	Rear	9400	1880.0	23.0	23.0	0.695	<b>0.695</b>	0.439	0.439	10
				Front	9400	1880.0	23.0	23.0	0.567	0.567	0.356	0.356	
Hotspot	Rel 99 RMC	ON	10	Rear	9400	1880.0	21.0	20.9	0.683	0.699	0.421	0.431	11
				Front	9400	1880.0	21.0	20.9	0.512	0.524	0.312	0.319	
				Edge 2	9400	1880.0	21.0	20.9	0.081	0.083	0.046	0.047	
				Edge 3	9400	1880.0	21.0	20.9	0.143	0.146	0.090	0.092	
				Edge 4	9400	1880.0	21.0	20.9	0.091	0.093	0.057	0.058	

### 10.5. LTE Band 5 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Pwr Back off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
									Tune-up limit	Meas.	Meas.	Scaled	Meas.	Scaled	
Head	QPSK	OFF	0	Left Touch	20525	836.5	1	0	23.7	23.1	0.342	0.393	0.256	0.294	12
							25	0	22.7	22.1	0.270	0.310	0.203	0.233	
				Left Tilt	20525	836.5	1	0	23.7	23.1	0.230	0.264	0.173	0.199	
							25	0	22.7	22.1	0.188	0.216	0.142	0.163	
				Right Touch	20525	836.5	1	0	23.7	23.1	0.327	0.375	0.245	0.281	
							25	0	22.7	22.1	0.255	0.293	0.192	0.220	
				Right Tilt	20525	836.5	1	0	23.7	23.1	0.234	0.269	0.177	0.203	
							25	0	22.7	22.1	0.180	0.207	0.137	0.157	
Body-worn & Hotspot	QPSK	OFF	10	Rear	20525	836.5	1	0	23.7	23.1	0.456	0.524	0.345	0.396	13
							25	0	22.7	22.1	0.348	0.400	0.264	0.303	
				Front	20525	836.5	1	0	23.7	23.1	0.391	0.449	0.299	0.343	
							25	0	22.7	22.1	0.306	0.351	0.234	0.269	
				Edge 2	20525	836.5	1	0	23.7	23.1	0.218	0.250	0.153	0.176	
							25	0	22.7	22.1	0.160	0.184	0.111	0.127	
				Edge 3	20525	836.5	1	0	23.7	23.1	0.024	0.028	0.016	0.018	
							25	0	22.7	22.1	0.019	0.022	0.013	0.015	
				Edge 4	20525	836.5	1	0	23.7	23.1	0.195	0.224	0.137	0.157	
							25	0	22.7	22.1	0.142	0.163	0.100	0.115	

### 10.6. LTE Band 7 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Pwr Back off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.				
									Tune-up limit	Meas.	Meas.	Scaled	Meas.	Scaled					
Head	QPSK	OFF	0	Left Touch	20850	2510.0	1	0	23.5	23.0	0.817	<b>0.917</b>	0.435	0.488	14				
							1	0	23.5	23.0	0.749	0.840	0.389	0.436					
							50	0	22.5	22.0	0.614	0.689	0.316	0.355					
				Left Tilt	21100	2535.0	1	0	23.5	23.0	0.184	0.206	0.095	0.107					
							50	0	22.5	22.0	0.150	0.168	0.078	0.088					
							1	0	23.5	23.0	0.658	0.738	0.344	0.386					
				Right Touch	21100	2535.0	1	0	23.5	23.0	0.497	0.558	0.262	0.294					
							50	0	22.5	22.0	0.497	0.558	0.262	0.294					
				Right Tilt	21100	2535.0	1	0	23.5	23.0	0.115	0.129	0.061	0.068					
							50	0	22.5	22.0	0.096	0.107	0.051	0.057					
				Body-worn	QPSK	OFF	15	Rear	21100	2535.0	1	0	23.5	23.0	0.551	0.618	0.298	0.334	15
											50	0	22.5	22.0	0.440	0.494	0.237	0.266	
Front	21100	2535.0	1					0	23.5	23.0	0.390	0.438	0.218	0.245					
			50					0	22.5	22.0	0.301	0.338	0.169	0.190					
Hotspot	QPSK	ON	10	Rear	21100	2535.0	1	0	21.6	20.3	0.571	0.768	0.302	0.406	16				
							50	0	21.6	20.3	0.551	0.752	0.291	0.397					
				Front	21100	2535.0	1	0	21.6	20.3	0.362	0.487	0.196	0.264					
							50	0	21.6	20.3	0.337	0.460	0.182	0.248					
				Edge 2	21100	2535.0	1	0	21.6	20.3	0.115	0.155	0.067	0.090					
							50	0	21.6	20.3	0.096	0.131	0.054	0.074					
				Edge 3	21100	2535.0	1	0	21.6	20.3	0.248	0.334	0.117	0.157					
							50	0	21.6	20.3	0.279	0.381	0.128	0.175					
				Edge 4	21100	2535.0	1	0	21.6	20.3	0.152	0.205	0.081	0.109					
							50	0	21.6	20.3	0.133	0.181	0.071	0.097					

### 10.7. Wi-Fi (DTS Band)

Frequency Band	RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	Meas.	Scaled	
2.4 GHz	Head	802.11b 1 Mbps	0	Left Touch	6	2437.0	16.0	15.2	0.448	<b>0.539</b>	0.184	0.221	17
				Left Tilt	6	2437.0	16.0	15.2	0.141	0.170	0.071	0.085	
				Right Touch	6	2437.0	16.0	15.2	0.152	0.183	0.070	0.084	
				Right Tilt	6	2437.0	16.0	15.2	0.069	0.083	0.033	0.040	
	Body-worn	802.11b 1 Mbps	15	Rear	6	2437.0	16.0	15.2	0.109	<b>0.131</b>	0.054	0.065	18
				Front	6	2437.0	16.0	15.2	0.049	0.059	0.025	0.030	
	Hotspot	802.11b 1 Mbps	10	Rear	6	2437.0	16.0	15.2	0.291	<b>0.350</b>	0.128	0.154	19
				Front	6	2437.0	16.0	15.2	0.094	0.113	0.047	0.057	
				Edge 1	6	2437.0	16.0	15.2	0.020	0.024	0.011	0.013	
				Edge 2	6	2437.0	16.0	15.2	0.278	0.334	0.126	0.151	

### 10.8. Wi-Fi (U-NII Bands)

Frequency Band	RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	Meas.	Scaled	
5.2 GHz (U-NII-1)	Head	802.11a 6 Mbps	0	Left Touch	36	5180.0	16.0	14.9	0.231	0.298	0.069	0.089	20
				Left Tilt	36	5180.0	16.0	14.9	0.143	0.184	0.046	0.059	
				Right Touch	36	5180.0	16.0	14.9	0.083	0.107	0.023	0.030	
				Right Tilt	36	5180.0	16.0	14.9	0.055	0.071	0.017	0.022	
	Body-worn	802.11a 6 Mbps	15	Rear	36	5180.0	16.0	14.9	0.091	0.117	0.031	0.040	21
				Front	36	5180.0	16.0	14.9	0.022	0.028	0.007	0.009	
5.3 GHz (U-NII-2A)	Head	802.11a 6 Mbps	0	Left Touch	52	5260.0	16.0	14.8	0.318	0.419	0.099	0.131	22
				Left Tilt	52	5260.0	16.0	14.8	0.155	0.204	0.052	0.069	
				Right Touch	52	5260.0	16.0	14.8	0.114	0.150	0.035	0.046	
				Right Tilt	52	5260.0	16.0	14.8	0.085	0.112	0.025	0.033	
	Body-worn	802.11a 6 Mbps	15	Rear	52	5260.0	16.0	14.8	0.107	0.141	0.040	0.053	23
				Front	52	5260.0	16.0	14.8	0.022	0.029	0.008	0.011	
5.5 GHz (U-NII-2C)	Head	802.11a 6 Mbps	0	Left Touch	104	5520.0	16.0	15.0	0.459	<b>0.578</b>	0.138	0.174	24
				Left Tilt	104	5520.0	16.0	15.0	0.278	0.350	0.087	0.110	
				Right Touch	104	5520.0	16.0	15.0	0.241	0.303	0.081	0.102	
				Right Tilt	104	5520.0	16.0	15.0	0.213	0.268	0.059	0.074	
	Body-worn	802.11a 6 Mbps	15	Rear	104	5520.0	16.0	15.0	0.233	<b>0.293</b>	0.093	0.117	25
				Front	104	5520.0	16.0	15.0	0.023	0.029	0.007	0.009	
5.8 GHz (U-NII-3)	Head	802.11a 6 Mbps	0	Left Touch	149	5745.0	16.0	14.9	0.275	0.354	0.078	0.100	26
				Left Tilt	149	5745.0	16.0	14.9	0.190	0.245	0.055	0.071	
				Right Touch	149	5745.0	16.0	14.9	0.188	0.242	0.060	0.077	
				Right Tilt	149	5745.0	16.0	14.9	0.110	0.142	0.039	0.050	
	Body-worn	802.11a 6 Mbps	15	Rear	149	5745.0	16.0	14.9	0.222	0.286	0.085	0.110	27
				Front	149	5745.0	16.0	14.9	0.031	0.039	0.006	0.008	

**Additional test in 802.11ac mode**

Frequency Band	RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
5.2 GHz (U-NII-1)	Head	802.11ac VHT20	0	Left Touch	36	5180.0	16.0	14.7	0.194	0.262	
	Body-worn	802.11ac VHT20	15	Rear	36	5180.0	16.0	14.7	0.047	0.063	
Frequency Band	RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
5.3 GHz (U-NII-2A)	Head	802.11ac VHT20	0	Left Touch	52	5260.0	16.0	15.0	0.225	0.283	
	Body-worn	802.11ac VHT20	15	Rear	52	5260.0	16.0	15.0	0.105	0.132	
Frequency Band	RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
5.5 GHz (U-NII-2C)	Head	802.11ac VHT20	0	Left Touch	104	5520.0	16.0	15.0	0.420	0.529	
	Body-worn	802.11ac VHT20	15	Rear	104	5520.0	16.0	15.0	0.225	0.283	
Frequency Band	RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
5.8 GHz (U-NII-3)	Head	802.11ac VHT20	0	Left Touch	149	5745.0	16.0	14.8	0.256	0.337	
	Body-worn	802.11ac VHT20	15	Rear	149	5745.0	16.0	14.8	0.152	0.200	

**10.9. Bluetooth**

Frequency Band	RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
BT	Body-worn	GFSK	15	Rear	39	2441.0	10.5	9.7	0.029	0.035	28
				Front	39	2441.0	10.5	9.7	0.008	0.009	



## 11. SAR Measurement Variability

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz v01. 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  $\geq 0.80$  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  $\geq 1.45$  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  $\geq 1.5$  W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

### 11.1. The Highest Measured SAR Configuration in Each Frequency Band

Frequency Band (MHz)	Air Interface	Head (W/kg)	Body-worn Accessory (W/kg)	Wireless Router (Hotspot) (W/kg)	Repeated SAR (Yes/No)
850	GSM 850			0.480	No
	WCDMA Band V		0.553		No
	LTE Band 5		0.456		No
1900	GSM 1900			0.751	No
	WCDMA Band II	0.694			No
2400	Wi-Fi 802.11b/g/n	0.448			No
2600	LTE Band 7	0.817			Yes
5200	Wi-Fi 802.11a/n/ac	0.231			No
5300	Wi-Fi 802.11a/n/ac	0.318			No
5500	Wi-Fi 802.11a/n/ac	0.459			No
5800	Wi-Fi 802.11a/n/ac	0.275			No

### 11.2. Repeated Measurement Results

Frequency band	Test Position	Pwr Banck-off	Mode	Ch #.	Freq. (MHz)	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio	Note
						Original	Repeated		
LTE Band 7	Head	OFF	QPSK RB1/49	20850	2510.0	0.817	0.815	1.00	

#### Note(s):

1. Second Repeated Measurement is not required since the ratio of the largest to smallest SAR for the original and first repeated measurement is not > 1.20.

## 12. Simultaneous Transmission SAR Analysis

KDB 447498 D01 General RF Exposure Guidance v05, introduces a new formula for calculating the SAR to Peak Location Ratio (SPLSR) between pairs of simultaneously transmitting antennas:

$$\mathbf{SPLSR} = (\mathbf{SAR}_1 + \mathbf{SAR}_2)^{1.5} / \mathbf{Ri}$$

Where:

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

**SAR<sub>2</sub>** is the highest measured 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 of  $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$

A new threshold of 0.04 is also introduced in the draft KDB. Thus, in order for a pair of simultaneous 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:

$$(\mathbf{SAR}_1 + \mathbf{SAR}_2)^{1.5} / \mathbf{Ri} < 0.04$$

**12.1. Sum of the SAR for GSM850 & Wi-Fi & BT**

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				$\Sigma$ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① GSM850	② Wi-Fi(DTS)	③ Wi-Fi(UNII)	④ Bluetooth		
Head	Left Touch	① + ②	0.373	0.539			0.912	No
		① + ③	0.373		0.578		0.951	No
	Left Tilt	① + ②	0.245	0.170			0.415	No
		① + ③	0.245		0.350		0.595	No
	Right Touch	① + ②	0.327	0.183			0.510	No
		① + ③	0.327		0.303		0.630	No
	Right Tilt	① + ②	0.218	0.083			0.301	No
		① + ③	0.218		0.268		0.486	No
Body-worn	Rear	① + ②	0.428	0.131			0.559	No
		① + ③	0.428		0.293		0.721	No
		① + ④	0.428			0.035	0.463	No
		① + ③ + ④	0.428		0.293	0.035	0.756	No
	Front	① + ②	0.437	0.059			0.496	No
		① + ③	0.437		0.039		0.476	No
		① + ④	0.437			0.009	0.446	No
		① + ③ + ④	0.437		0.039	0.009	0.485	No
Hotspot	Rear	① + ②	0.678	0.350			1.028	No
	Front	① + ②	0.464	0.113			0.577	No
	Edge 1	① + ②		0.024			0.024	No
	Edge 2	① + ②	0.249	0.334			0.583	No
	Edge 3	① + ②	0.031				0.031	No
	Edge 4	① + ②	0.198				0.198	No

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

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

**12.2. Sum of the SAR for GSM1900 & Wi-Fi & BT**

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				$\Sigma$ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① GSM1900	② Wi-Fi(DTS)	③ Wi-Fi(UNII)	④ Bluetooth		
Head	Left Touch	① + ②	0.599	0.539			1.138	No
		① + ③	0.599		0.578		1.177	No
	Left Tilt	① + ②	0.161	0.170			0.331	No
		① + ③	0.161		0.350		0.511	No
	Right Touch	① + ②	0.336	0.183			0.519	No
		① + ③	0.336		0.303		0.639	No
	Right Tilt	① + ②	0.150	0.083			0.233	No
		① + ③	0.150		0.268		0.418	No
Body-worn	Rear	① + ②	0.613	0.131			0.744	No
		① + ③	0.613		0.293		0.906	No
		① + ④	0.613			0.035	0.648	No
		① + ③ + ④	0.613		0.293	0.035	0.941	No
	Front	① + ②	0.463	0.059			0.522	No
		① + ③	0.463		0.039		0.502	No
		① + ④	0.463			0.009	0.472	No
		① + ③ + ④	0.463		0.039	0.009	0.511	No
Hotspot	Rear	① + ②	0.990	0.350			<b>1.340</b>	No
	Front	① + ②	0.581	0.113			0.694	No
	Edge 1	① + ②		0.024			0.024	No
	Edge 2	① + ②	0.089	0.334			0.423	No
	Edge 3	① + ②	0.193				0.193	No
	Edge 4	① + ②	0.109				0.109	No

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

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

**12.3. Sum of the SAR for WCDMA Band V & Wi-Fi & BT**

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				$\Sigma$ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① W-CDMA Band V	② Wi-Fi(DTS)	③ Wi-Fi(UNII)	④ Bluetooth		
Head	Left Touch	① + ②	0.405	0.539			0.944	No
		① + ③	0.405		0.578		0.983	No
	Left Tilt	① + ②	0.269	0.170			0.439	No
		① + ③	0.269		0.350		0.619	No
	Right Touch	① + ②	0.400	0.183			0.583	No
		① + ③	0.400		0.303		0.703	No
	Right Tilt	① + ②	0.254	0.083			0.337	No
		① + ③	0.254		0.268		0.522	No
Body-worn	Rear	① + ②	0.566	0.131			0.697	No
		① + ③	0.566		0.293		0.859	No
		① + ④	0.566			0.035	0.601	No
		① + ③ + ④	0.566		0.293	0.035	0.894	No
	Front	① + ②	0.483	0.059			0.542	No
		① + ③	0.483		0.039		0.522	No
		① + ④	0.483			0.009	0.492	No
		① + ③ + ④	0.483		0.039	0.009	0.531	No
Hotspot	Rear	① + ②	0.566	0.350			0.916	No
	Front	① + ②	0.483	0.113			0.596	No
	Edge 1	① + ②		0.024			0.024	No
	Edge 2	① + ②	0.257	0.334			0.591	No
	Edge 3	① + ②	0.026				0.026	No
	Edge 4	① + ②	0.194				0.194	No

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

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

## 12.4. Sum of the SAR for WCDMA Band II & Wi-Fi & BT

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				$\Sigma$ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① W-CDMA Band II	② Wi-Fi(DTS)	③ Wi-Fi(UNII)	④ Bluetooth		
Head	Left Touch	① + ②	0.694	0.539			1.233	No
		① + ③	0.694		0.578		1.272	No
	Left Tilt	① + ②	0.180	0.170			0.350	No
		① + ③	0.180		0.350		0.530	No
	Right Touch	① + ②	0.396	0.183			0.579	No
		① + ③	0.396		0.303		0.699	No
	Right Tilt	① + ②	0.181	0.083			0.264	No
		① + ③	0.181		0.268		0.449	No
Body-worn	Rear	① + ②	0.695	0.131			<b>0.826</b>	No
		① + ③	0.695		0.293		0.988	No
		① + ④	0.695			0.035	0.730	No
		① + ③ + ④	0.695		0.293	0.035	<b>1.023</b>	No
	Front	① + ②	0.567	0.059			0.626	No
		① + ③	0.567		0.039		0.606	No
		① + ④	0.567			0.009	0.576	No
		① + ③ + ④	0.567		0.039	0.009	0.615	No
Hotspot	Rear	① + ②	0.699	0.350			1.049	No
	Front	① + ②	0.524	0.113			0.637	No
	Edge 1	① + ②		0.024			0.024	No
	Edge 2	① + ②	0.083	0.334			0.417	No
	Edge 3	① + ②	0.146				0.146	No
	Edge 4	① + ②	0.093				0.093	No

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

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

**12.5. Sum of the SAR for LTE Band 5 & Wi-Fi & BT**

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				$\Sigma$ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① LTE B5	② Wi-Fi(DTS)	③ Wi-Fi(UNII)	④ Bluetooth		
Head	Left Touch	① + ②	0.393	0.539			0.932	No
		① + ③	0.393		0.578		0.971	No
	Left Tilt	① + ②	0.264	0.170			0.434	No
		① + ③	0.264		0.350		0.614	No
	Right Touch	① + ②	0.375	0.183			0.558	No
		① + ③	0.375		0.303		0.678	No
	Right Tilt	① + ②	0.269	0.083			0.352	No
		① + ③	0.269		0.268		0.537	No
Body-worn	Rear	① + ②	0.524	0.131			0.655	No
		① + ③	0.524		0.293		0.817	No
		① + ④	0.524			0.035	0.559	No
		① + ③ + ④	0.525		0.293	0.035	0.853	No
	Front	① + ②	0.449	0.059			0.508	No
		① + ③	0.449		0.039		0.488	No
		① + ④	0.449			0.009	0.458	No
		① + ③ + ④	0.449		0.039	0.009	0.497	No
Hotspot	Rear	① + ②	0.524	0.350			0.874	No
	Front	① + ②	0.449	0.113			0.562	No
	Edge 1	① + ②		0.024			0.024	No
	Edge 2	① + ②	0.250	0.334			0.584	No
	Edge 3	① + ②	0.028				0.028	No
	Edge 4	① + ②	0.224				0.224	No

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

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

**12.6. Sum of the SAR for LTE Band 7 & Wi-Fi & BT**

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				$\Sigma$ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① LTE B7	② Wi-Fi(DTS)	③ Wi-Fi(UNII)	④ Bluetooth		
Head	Left Touch	① + ②	0.917	0.539			1.456	No
		① + ③	0.917		0.578		1.495	No
	Left Tilt	① + ②	0.206	0.170			0.376	No
		① + ③	0.206		0.350		0.556	No
	Right Touch	① + ②	0.738	0.183			0.921	No
		① + ③	0.738		0.303		1.041	No
	Right Tilt	① + ②	0.129	0.083			0.212	No
		① + ③	0.129		0.268		0.397	No
Body-worn	Rear	① + ②	0.618	0.131			0.749	No
		① + ③	0.618		0.293		0.911	No
		① + ④	0.618			0.035	0.653	No
		① + ③ + ④	0.618		0.293	0.035	0.946	No
	Front	① + ②	0.438	0.059			0.497	No
		① + ③	0.438		0.039		0.477	No
		① + ④	0.438			0.009	0.447	No
		① + ③ + ④	0.438		0.039	0.009	0.486	No
Hotspot	Rear	① + ②	0.768	0.350			1.118	No
	Front	① + ②	0.487	0.113			0.600	No
	Edge 1	① + ②		0.024			0.024	No
	Edge 2	① + ②	0.155	0.334			0.489	No
	Edge 3	① + ②	0.381				0.381	No
	Edge 4	① + ②	0.205				0.205	No

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

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.



## **13. Appendixes**

**Refer to separated files for the following appendixes.**

- 13.1. Photos and Antenna Locations**
- 13.2. System Performance Check Plots**
- 13.3. Highest SAR Test Plots**
- 13.4. Calibration Certificate for E-Field Probe EX3DV4 - SN 3902**
- 13.5. Calibration Certificate for E-Field Probe EX3DV4 - SN 3531**
- 13.6. Calibration Certificate for E-Field Probe EX3DV4 - SN 3929**
- 13.7. Calibration Certificate for E-Field Probe EX3DV4 - SN 3991**
- 13.8. Calibration Certificate for D835V2 - SN 4d002**
- 13.9. Calibration Certificate for D1900V2- SN 5d043**
- 13.10. Calibration Certificate for D2450V2 - SN 899**
- 13.11. Calibration Certificate for D2600V2 - SN 1006**
- 13.12. Calibration Certificate for D5GHzV2 - SN 1003**
- 13.13. Calibration Certificate for D5GHzV2 - SN 1138**

**END OF REPORT**