SAR EVALUATION REPORT

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

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

FCC ID: PY7PM-0813

Report Number: 14U17919-S1
Issue Date: 7/25/2014

Prepared for
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NVLAP LAB CODE 200065-0

REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
--	7/25/2014	Initial Issue	--

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1. Attestation of Test Results

Applicant Name	SONY MOBILE COMMUNICATIONS, INC.			
Application Purpose	☒ Original Grant ☐ Class II Permissive Change			
FCC ID	PY7PM-0813			
DUT Description	GSM/WCDMA 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	0.546 W/kg	0.705 W/kg	0.578 W/kg
	Body-worn Accessory	0.714 W/kg	0.179 W/kg	0.293 W/kg
	Wireless Router (Hotspot)	0.986 W/kg	0..396 W/kg	N/A
	Simultaneous Transmission	Head: 1.208 W/kg Body: 1.042 W/kg Hotspot: 1.382 W/kg	Head: 1.208 W/kg Body: 0.893 W/kg Hotspot: 1.382 W/kg	Head: 1.081 W/kg Body: 1.042 W/kg Hotspot: N/A
Highest SAR across exposure conditions	0.986 W/kg			
Applicable Standards	FCC 47 CFR § 2.1093 KDB publication IEEE Std 1528-2003 & 2013			
Test Results	Pass			
Date tested	6/23/2014 – 7/23/2014			

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.

Note: 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.

Approved & Released By:	Prepared By:
	
Devin Chang Senior Engineer UL Verification Services Inc.	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 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

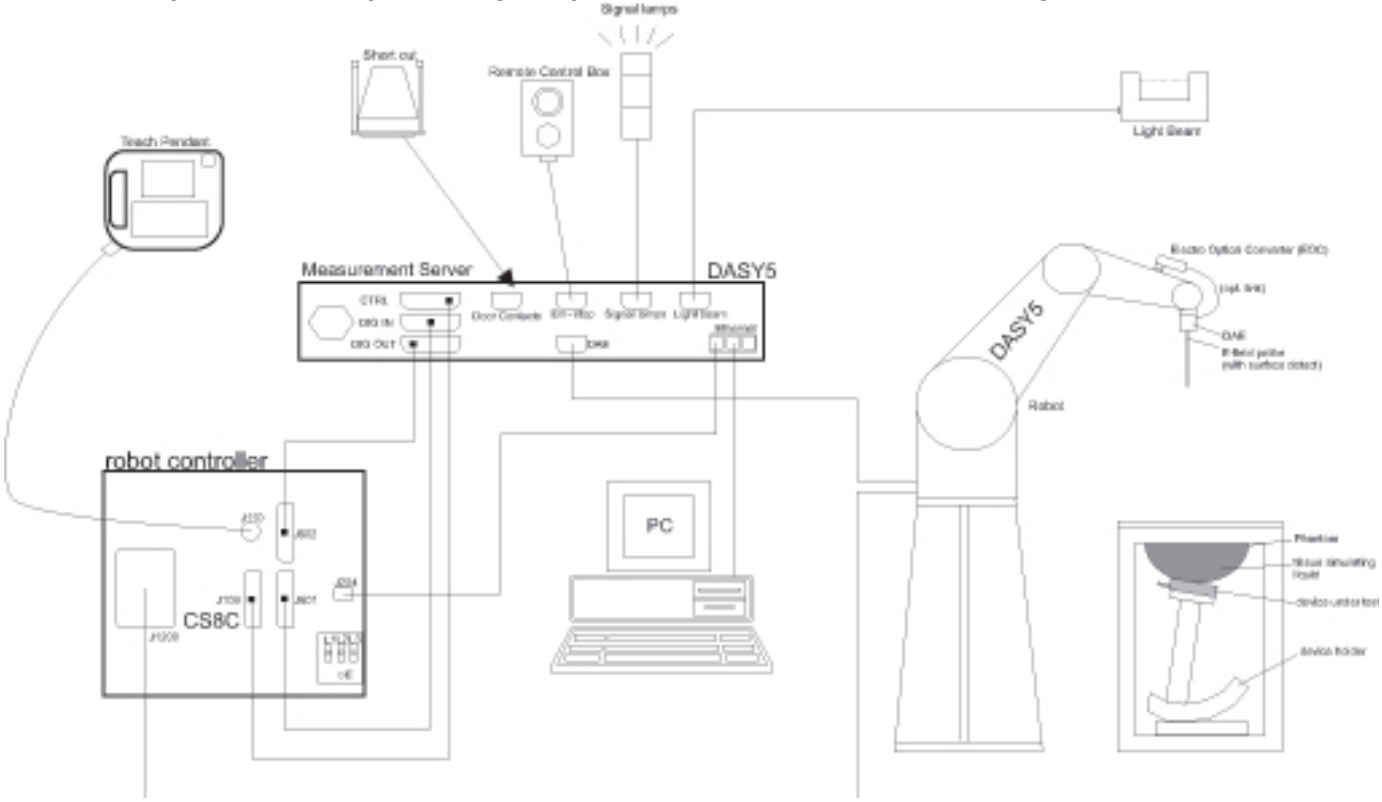
47173 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 3
SAR Lab D	SAR Lab 4
SAR Lab E	SAR Lab 5
SAR Lab F	
SAR Lab G	
SAR Lab H	

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
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
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	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

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	CMU 200	106291	10/18/2014
Base Station Simulator	Agilent	8960 Series 10	GB46160222	11/21/2014
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

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

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: ☐ Class 8 - One Up ☐ Class 10 - Two Up ☒ Class 12 - Four Up ☐ Class 33 - Four Up DTM (Dual Transfer Mode): Supported		
W-CDMA (UMTS)	Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Rel. 5) HSUPA (Rel. 6) DC-HSDPA (Rel. 8) HSPA+ (Rel. 7)	100%
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	**33.6**	32.5	-1.5 ~ 0.6	**33.1**
	GPRS GMSK	Tx Slot 1	33.0	-1.4 ~ 0.6	**33.6**	32.5	-1.5 ~ 0.6	**33.1**
		Tx Slot 2	29.5	-1.4 ~ 0.6	**30.1**	29.1	-1.5 ~ 0.6	**29.7**
		Tx Slot 3	27.5	-1.4 ~ 0.6	**28.1**	27.0	-1.5 ~ 0.6	**27.6**
		Tx Slot 4	26.5	-1.4 ~ 0.6	**27.1**	25.6	-1.5 ~ 0.6	**26.2**
	EGPRS 8PSK	Tx Slot 1	27.0	-1.5 ~ 1.0	**28.0**	27.0	-1.5 ~ 1.0	**28.0**
		Tx Slot 2	25.0	-1.5 ~ 1.0	**26.0**	25.0	-1.5 ~ 1.0	**26.0**
		Tx Slot 3	24.0	-1.5 ~ 1.0	**25.0**	24.0	-1.5 ~ 1.0	**25.0**
		Tx Slot 4	22.0	-1.5 ~ 1.0	**23.0**	22.0	-1.5 ~ 1.0	**23.0**
GSM1900	GSM	Voice	30.0	-0.7 ~ 0.6	**30.6**	29.5	-1.5 ~ 0.6	**30.1**
	GPRS GMSK	Tx Slot 1	30.0	-0.7 ~ 0.6	**30.6**	29.5	-1.5 ~ 0.6	**30.1**
		Tx Slot 2	27.0	-0.7 ~ 0.6	**27.6**	25.4	-1.5 ~ 0.6	**26.0**
		Tx Slot 3	26.0	-0.7 ~ 0.6	**26.6**	23.6	-1.5 ~ 0.6	**24.2**
		Tx Slot 4	25.0	-0.7 ~ 0.6	**25.6**	22.4	-1.5 ~ 0.6	**23.0**
	EGPRS 8PSK	Tx Slot 1	26.0	-1.5 ~ 1.0	**27.0**	26.0	-1.5 ~ 1.0	**27.0**
		Tx Slot 2	24.0	-1.5 ~ 1.0	**25.0**	24.0	-1.5 ~ 1.0	**25.0**
		Tx Slot 3	23.0	-1.5 ~ 1.0	**24.0**	23.0	-1.5 ~ 1.0	**24.0**
		Tx Slot 4	22.0	-1.5 ~ 1.0	**23.0**	22.0	-1.5 ~ 1.0	**23.0**

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	**33.6**	32.5	-1.5 ~ 0.6	**33.1**
		Tx Slot 2	CS	29.5	-1.5 ~ 0.6	**30.1**	29.1	-1.5 ~ 0.6	**29.7**
			PS	29.5	-1.5 ~ 0.6	**30.1**	29.1	-1.5 ~ 0.6	**29.7**
		Tx Slot 3	CS	27.5	-1.3 ~ 0.6	**28.1**	27.0	-1.5 ~ 0.6	**27.6**
			PS	27.5	-1.3 ~ 0.6	**28.1**	27.0	-1.5 ~ 0.6	**27.6**
	GSM(Voice) + EGPRS(Data)	Tx Slot 1	CS	33.0	-1.4 ~ 0.6	**33.6**	32.5	-1.5 ~ 0.6	**33.1**
		Tx Slot 2	CS	29.5	-1.5 ~ 0.6	**30.1**	29.1	-1.5 ~ 0.6	**29.7**
			PS	25.0	-1.5 ~ 1.0	**26.0**	25.0	-1.5 ~ 1.0	**26.0**
		Tx Slot 3	CS	27.5	-1.3 ~ 0.6	**28.1**	27.0	-1.5 ~ 0.6	**27.6**
			PS	24.0	-1.5 ~ 1.0	**25.0**	24.0	-1.5 ~ 1.0	**25.0**
GSM1900	GSM(Voice) + GPRS(Data)	Tx Slot 1	CS	30.0	-0.7 ~ 0.6	**30.6**	29.5	-0.7 ~ 0.6	**30.1**
		Tx Slot 2	CS	27.0	-1.5 ~ 0.6	**27.6**	25.4	-1.5 ~ 1.5	**26.9**
			PS	27.0	-1.5 ~ 0.6	**27.6**	25.4	-1.5 ~ 1.5	**26.9**
		Tx Slot 3	CS	26.0	-1.5 ~ 0.6	**26.6**	23.6	-1.5 ~ 1.5	**25.1**
			PS	26.0	-1.5 ~ 0.6	**26.6**	23.6	-1.5 ~ 1.5	**25.1**
	GSM(Voice) + EGPRS(Data)	Tx Slot 1	CS	30.0	-0.7 ~ 0.6	**30.6**	29.5	-0.7 ~ 0.6	**30.1**
		Tx Slot 2	CS	27.0	-1.5 ~ 0.6	**27.6**	25.4	-1.5 ~ 1.5	**26.9**
			PS	24.0	-1.5 ~ 1.0	**25.0**	24.0	-1.5 ~ 1.5	**25.5**
		Tx Slot 3	CS	26.0	-1.5 ~ 0.6	**26.6**	23.6	-1.5 ~ 1.5	**25.1**
			PS	23.0	-1.5 ~ 1.0	**24.0**	23.0	-1.5 ~ 1.5	**24.5**

Note: CS : circuid 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 V	R99		24.0	-0.7 ~ 0.5	**24.5**	Not Supported		
	HSDPA	Subtest 1	23.5	-1.5 ~ 1.0	**24.5**			
		Subtest 2	23.5	-1.5 ~ 1.0	**24.5**			
		Subtest 3	23.5	-1.5 ~ 1.0	**24.5**			
		Subtest 4	23.5	-1.5 ~ 1.0	**24.5**			
	HSUPA	Subtest 1	23.5	-1.5 ~ 1.0	**24.5**			
		Subtest 2	22.0	-1.5 ~ 2.0	**24.0**			
		Subtest 3	23.0	-1.5 ~ 1.5	**24.5**			
		Subtest 4	22.0	-1.5 ~ 2.0	**24.0**			
		Subtest 5	23.5	-1.5 ~ 1.0	**24.5**			
	DC-HSDPA	Subtest 1	23.5	-1.5 ~ 1.0	**24.5**			
		Subtest 2	23.5	-1.5 ~ 1.0	**24.5**			
		Subtest 3	23.5	-1.5 ~ 1.0	**24.5**			
		Subtest 4	23.5	-1.5 ~ 1.0	**24.5**			

RF Air interface	Mode	Full Power
		Max. Tune-up Limit (dBm)
Wi-Fi 2.4 GHz	802.11b	**16.8**
	802.11g	**16.0**
	802.11n HT20	**15.0**
Wi-Fi 5 GHz	802.11a	**16.0**
	802.11n HT20	**16.0**
	802.11n HT40	**14.0**
	802.11ac VHT20	**16.0**
	802.11ac VHT40	**14.0**
	802.11ac VHT80	**13.0**
Bluetooth	BDR	**10.5**
	EDR	**7.9**
	BLE	**2.4**

6.4. Simultaneous Transmission Condition

RF Exposure Condition	Capable Transmit Configurations
Head	1. GSM 850/1900 Voice + Wi-Fi 2.4/5GHz 2. GSM 850/1900 (GPRS/EDGE) + Wi-Fi 2.4/5GHz 3. WCDMA Band 5 + Wi-Fi 2.4/5GHz
Body-worn Accessory	4. GSM 850/1900 Voice + Wi-Fi 2.4/5GHz 5. GSM 850/1900 Voice + BT 6. GSM 850/1900 Voice + BT + Wi-Fi 5GHz 7. GSM 850/1900 (GPRS/EDGE) + Wi-Fi 2.4/5GHz (VoIP) 8. GSM 850/1900 (GPRS/EDGE) + BT (VoIP) 9. GSM 850/1900 (GPRS/EDGE) + BT + Wi-Fi 5GHz (VoIP) 10. WCDMA Band 5 + Wi-Fi 2.4/5GHz 11. WCDMA Band 5 + BT 12. WCDMA Band 5 + Wi-Fi 5GHz + BT
Wireless Router (Hotspot)/ Wi-Fi Direct	13. GSM 850/1900 (GPRS/EDGE) + Wi-Fi 2.4GHz 14. WCDMA Band 5 + Wi-Fi 2.4GHz

Notes:

1. Wi-Fi 2.4GHz supports Hotspot and Wi-Fi Direct.
2. Wi-Fi 5GHz does not support Hotspot but supports Wi-Fi Direct (Group Client only).
3. GPRS/EDGE and WCDMA support Hotspot.
4. VoIP is supported in WCDMA and GPRS/EDGE.
5. Wi-Fi 2.4 GHz Radio cannot transmit simultaneously with Bluetooth Radio.
6. Wi-Fi 5 GHz Radio can transmit simultaneously with Bluetooth Radio.

6.5. 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 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

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

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 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	33.1	24.1	31.8	22.8
				190	836.6	33.2	24.2	32.0	23.0
				251	848.8	33.2	24.2	32.0	23.0
	GPRS (GMSK)	CS1	1	128	824.2	**33.1**	**24.1**	**31.8**	**22.8**
				190	836.6	**33.2**	**24.2**	**32.0**	**23.0**
				251	848.8	**33.2**	**24.2**	**32.0**	**23.0**
			2	128	824.2	29.8	23.8	28.6	22.6
				190	836.6	29.9	23.9	28.7	22.7
				251	848.8	30.0	24.0	28.8	22.8
			3	128	824.2	27.9	23.6	26.4	22.1
				190	836.6	28.0	23.7	26.4	22.1
				251	848.8	28.1	23.8	26.5	22.2
			4	128	824.2	27.0	24.0	25.2	22.2
				190	836.6	27.1	24.1	25.4	22.4
				251	848.8	27.1	24.1	25.4	22.4
	EGPRS (8PSK)	MCS5	1	128	824.2	27.4	18.4	27.3	18.3
				190	836.6	27.4	18.4	27.3	18.3
				251	848.8	27.4	18.4	27.3	18.3
			2	128	824.2	25.2	19.2	25.2	19.2
				190	836.6	25.3	19.3	25.3	19.3
				251	848.8	25.3	19.3	25.3	19.3
			3	128	824.2	24.4	20.1	24.3	20.0
				190	836.6	24.5	20.2	24.4	20.1
				251	848.8	24.5	20.2	24.4	20.1
			4	128	824.2	22.4	19.4	22.4	19.4
				190	836.6	22.4	19.4	22.4	19.4
				251	848.8	22.4	19.4	22.4	19.4

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
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	29.9	20.9	28.8	19.8
				661	1880.0	29.8	20.8	29.0	20.0
				810	1909.8	29.7	20.7	29.0	20.0
	GPRS (GMSK)	CS1	1	512	1850.2	30.0	21.0	**29.1**	**20.1**
				661	1880.0	29.9	20.9	**29.0**	**20.0**
				810	1909.8	29.8	20.8	**29.0**	**20.0**
			2	512	1850.2	26.9	20.9	24.7	18.7
				661	1880.0	27.0	21.0	24.9	18.9
				810	1909.8	27.0	21.0	24.8	18.8
			3	512	1850.2	25.8	21.5	23.5	19.2
				661	1880.0	26.0	21.7	23.7	19.4
				810	1909.8	26.0	21.7	23.6	19.3
			4	512	1850.2	**25.0**	**22.0**	22.4	19.4
				661	1880.0	**25.1**	**22.1**	22.6	19.6
				810	1909.8	**25.1**	**22.1**	22.6	19.6
	EGPRS (8PSK)	MCS5	1	512	1850.2	25.7	16.7	25.8	16.8
				661	1880.0	25.8	16.8	25.7	16.7
				810	1909.8	25.8	16.8	25.8	16.8
			2	512	1850.2	24.0	18.0	24.0	18.0
				661	1880.0	24.1	18.1	24.2	18.2
				810	1909.8	24.1	18.1	24.1	18.1
			3	512	1850.2	22.9	18.6	22.9	18.6
				661	1880.0	23.0	18.7	23.0	18.7
				810	1909.8	23.0	18.7	23.0	18.7
			4	512	1850.2	21.8	18.8	21.8	18.8
				661	1880.0	21.9	18.9	22.0	19.0
				810	1909.8	21.9	18.9	21.9	18.9

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	32.7	23.7			31.7	22.7		
				190	836.6	32.9	23.9			31.7	22.7		
				251	848.8	32.9	23.9			31.7	22.7		
			2	128	824.2	**29.2**	**23.2**	**29.3**	**23.3**	**28.3**	**22.3**	**28.4**	**22.4**
				190	836.6	**29.4**	**23.4**	**29.5**	**23.5**	**28.3**	**22.3**	**28.4**	**22.4**
				251	848.8	**29.5**	**23.5**	**29.6**	**23.6**	**28.7**	**22.7**	**28.7**	**22.7**
			3	128	824.2	27.2	22.9	27.3	23.0	26.3	22.0	26.4	22.1
				190	836.6	27.4	23.1	27.5	23.2	26.3	22.0	26.3	22.0
				251	848.8	27.6	23.3	27.7	23.4	26.6	22.3	26.7	22.4
	GSM(Voice) + EGPRS(8PSK)	MCS5	1	128	824.2	32.7	23.7			31.7	22.7		
				190	836.6	32.9	23.9			31.8	22.8		
				251	848.8	32.9	23.9			31.8	22.8		
			2	128	824.2	29.2	23.2	24.8	18.8	28.4	22.4	24.8	18.8
				190	836.6	29.4	23.4	24.9	18.9	28.4	22.4	24.8	18.8
				251	848.8	29.6	23.6	25.0	19.0	28.7	22.7	25.0	19.0
			3	128	824.2	27.3	23.0	24.0	19.7	26.4	22.1	23.9	19.6
				190	836.6	27.5	23.2	24.0	19.7	26.4	22.1	23.9	19.6
				251	848.8	27.7	23.4	24.0	19.7	26.7	22.4	24.0	19.7

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	29.5	20.5			28.8	19.8		
				661	1880.0	29.5	20.5			28.8	19.8		
				810	1909.8	29.5	20.5			28.8	19.8		
			2	512	1850.2	26.6	20.6	26.7	20.7	**25.6**	**19.6**	**25.6**	**19.6**
				661	1880.0	26.6	20.6	26.6	20.6	**25.5**	**19.5**	**25.5**	**19.5**
				810	1909.8	26.6	20.6	26.7	20.7	**25.5**	**19.5**	**25.6**	**19.6**
			3	512	1850.2	**25.7**	**21.4**	**25.7**	**21.4**	24.0	19.7	24.0	19.7
				661	1880.0	**25.5**	**21.2**	**25.5**	**21.2**	23.9	19.6	23.9	19.6
				810	1909.8	**25.6**	**21.3**	**25.6**	**21.3**	23.9	19.6	23.9	19.6
	GSM(Voice) + EGPRS(8PSK)	MCS5	1	512	1850.2	29.5	20.5			28.8	19.8		
				661	1880.0	29.5	20.5			28.8	19.8		
				810	1909.8	29.5	20.5			28.8	19.8		
			2	512	1850.2	26.7	20.7	23.8	17.8	25.7	19.7	23.8	17.8
				661	1880.0	26.6	20.6	23.9	17.9	25.4	19.4	23.9	17.9
				810	1909.8	26.7	20.7	23.7	17.7	25.6	19.6	23.9	17.9
			3	512	1850.2	25.7	21.4	22.8	18.5	24.0	19.7	22.8	18.5
				661	1880.0	25.7	21.4	22.8	18.5	23.9	19.6	22.8	18.5
				810	1909.8	25.8	21.5	22.8	18.5	23.9	19.6	22.8	18.5

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

Release 99

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

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

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	24.3	Not Supported
		4183	836.6	24.4	
		4233	846.6	24.4	

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			
	βc	2/15	12/15	15/15	15/15
	βd	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	βc/βd	2/15	12/15	15/8	15/4
	βhs	4/15	24/15	30/15	30/15
	MPR (dB)	0	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			
	Ahs =βhs/βc	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	24.1	Not Supported
		4183	836.6	24.3	
		4233	846.6	24.4	
	Subtest 2	4132	826.4	23.9	
		4183	836.6	24.0	
		4233	846.6	24.0	
	Subtest 3	4132	826.4	23.8	
		4183	836.6	23.9	
		4233	846.6	23.9	
	Subtest 4	4132	826.4	23.9	
		4183	836.6	23.7	
		4233	846.6	23.9	

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				
	βc	11/15	6/15	15/15	2/15	15/15
	βd	15/15	15/15	9/15	15/15	15/15
	βec	209/225	12/15	30/15	2/15	24/15
	βc/βd	11/15	6/15	15/9	2/15	15/15
	βhs	22/15	12/15	30/15	4/15	30/15
	βed	1309/225	94/75	47/15 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				
	Ahs = βhs/βc	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	23.8	Not Supported
		4183	836.6	24.3	
		4233	846.6	23.4	
	Subtest 2	4132	826.4	22.4	
		4183	836.6	22.8	
		4233	846.6	22.6	
	Subtest 3	4132	826.4	23.3	
		4183	836.6	23.0	
		4233	846.6	22.9	
	Subtest 4	4132	826.4	22.6	
		4183	836.6	23.0	
		4233	846.6	22.8	
	Subtest 5	4132	826.4	24.3	
		4183	836.6	24.4	
		4233	846.6	24.4	

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.		

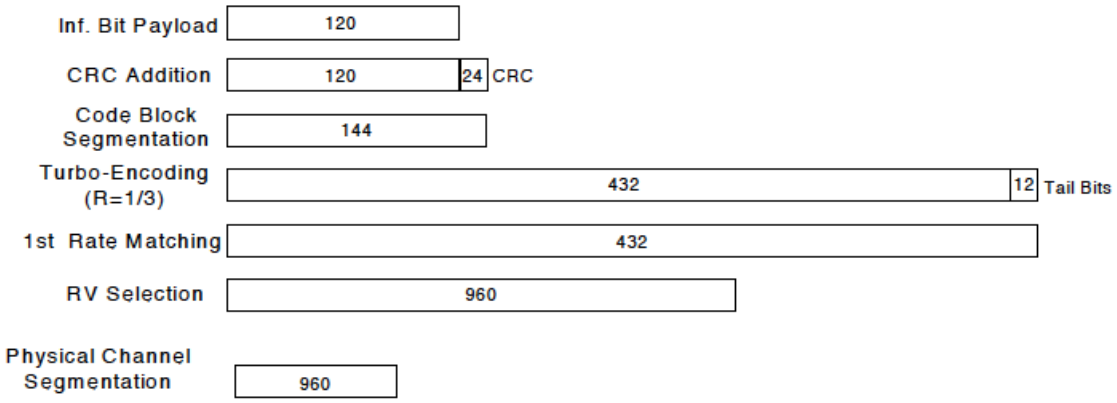


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

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			
	βc	2/15	12/15	15/15	15/15
	βd	15/15	15/15	8/15	4/15
	βd (SF)	64			
	βc/βd	2/15	12/15	15/8	15/4
	βhs	4/15	24/15	30/15	30/15
	MPR (dB)	0	0	0.5	0.5
HSDPA Specific Settings	DACK	8			
	DNAK	8			
	DCQI	8			
	Ack-Nack Repetition factor	3			
	CQI Feedback	4ms			
	CQI Repetition Factor	2			
	Ahs = βhs/ βc	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	23.9	
		4183	836.6	23.0	
		4233	846.6	24.0	
	Subtest 3	4132	826.4	23.9	
		4183	836.6	24.0	
		4233	846.6	23.9	
	Subtest 4	4132	826.4	23.9	
		4183	836.6	23.9	
		4233	846.6	23.8	

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. 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#	√	∇
		2.437	6	√	∇
		2.462	11#	√	∇

Notes:
√ = "default test channels"
∇ = possible 802.11g channels with maximum average output ¼ dB ≥ 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)
2.4 (DTS)	802.11b	1 Mbps	1	2412	15.4	Yes
			6	2437	14.3	
			11	2462	14.3	
	802.11g	6 Mbps	1	2412	15.0	No
			6	2437	14.1	
			11	2462	14.1	
	802.11n (HT20)	6.5 Mbps	1	2412	14.3	No
			6	2437	13.4	
			11	2462	13.4	

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	1	2412	1 Mbps	15.4	Yes
			2 Mbps	15.2	No
			5.5 Mbps	15.3	No
			11 Mbps	15.4	No

8.4. 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		*
			5.660	132		*
			5.680	136	√	
			5.700	140		*
	DTS (15.247)	5.8 GHz	5.745	149	√	
			5.765	153		*
			5.785	157	√	
			5.805	161		*
			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	15.0	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	14.9	
			140	5700	15.0	
	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

8.5. 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, π/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 ± 2°C of the temperature when the tissue parameters are characterized.

The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.

Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.

9.1. Tissue Dielectric Parameters

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

Target Frequency (MHz)	Head		Body	
	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
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 (ϵ_r):	36.19	36.01	0.49	5
		e"	15.5100	Conductivity (σ):	4.47	4.63	-3.53	5
	Head 5200	e'	36.1600	Relative Permittivity (ϵ_r):	36.16	35.99	0.47	5
		e"	15.5400	Conductivity (σ):	4.49	4.65	-3.39	5
	Head 5600	e'	35.6700	Relative Permittivity (ϵ_r):	35.67	35.53	0.38	5
		e"	15.7400	Conductivity (σ):	4.90	5.06	-3.15	5
	Head 5800	e'	35.3900	Relative Permittivity (ϵ_r):	35.39	35.30	0.25	5
		e"	15.8600	Conductivity (σ):	5.11	5.27	-2.94	5
	Head 5825	e'	35.5400	Relative Permittivity (ϵ_r):	35.54	35.30	0.68	5
		e"	15.8700	Conductivity (σ):	5.14	5.27	-2.46	5
7/1/2014	Body 5180	e'	47.7900	Relative Permittivity (ϵ_r):	47.79	49.05	-2.56	5
		e"	18.4500	Conductivity (σ):	5.31	5.27	0.81	5
	Body 5200	e'	47.7200	Relative Permittivity (ϵ_r):	47.72	49.02	-2.65	5
		e"	18.4500	Conductivity (σ):	5.33	5.29	0.75	5
	Body 5600	e'	47.0200	Relative Permittivity (ϵ_r):	47.02	48.48	-3.01	5
		e"	18.8300	Conductivity (σ):	5.86	5.76	1.77	5
	Body 5800	e'	46.7200	Relative Permittivity (ϵ_r):	46.72	48.20	-3.07	5
		e"	19.0200	Conductivity (σ):	6.13	6.00	2.23	5
	Body 5825	e'	46.6600	Relative Permittivity (ϵ_r):	46.66	48.20	-3.20	5
		e"	19.0500	Conductivity (σ):	6.17	6.00	2.83	5
7/6/2014	Head 5180	e'	37.2500	Relative Permittivity (ϵ_r):	37.25	36.01	3.43	5
		e"	16.4100	Conductivity (σ):	4.73	4.63	2.07	5
	Head 5200	e'	37.2300	Relative Permittivity (ϵ_r):	37.23	35.99	3.44	5
		e"	16.4100	Conductivity (σ):	4.74	4.65	2.02	5
	Head 5600	e'	36.6500	Relative Permittivity (ϵ_r):	36.65	35.53	3.14	5
		e"	16.5800	Conductivity (σ):	5.16	5.06	2.02	5
	Head 5800	e'	36.3500	Relative Permittivity (ϵ_r):	36.35	35.30	2.97	5
		e"	16.6900	Conductivity (σ):	5.38	5.27	2.13	5
	Head 5825	e'	36.3100	Relative Permittivity (ϵ_r):	36.31	35.30	2.86	5
		e"	16.7100	Conductivity (σ):	5.41	5.27	2.70	5
7/21/2014	Head 835	e'	40.8900	Relative Permittivity (ϵ_r):	40.89	41.50	-1.47	5
		e"	20.1300	Conductivity (σ):	0.93	0.90	3.85	5
	Head 820	e'	41.0800	Relative Permittivity (ϵ_r):	41.08	41.60	-1.26	5
		e"	20.1900	Conductivity (σ):	0.92	0.90	2.46	5
	Head 850	e'	40.7000	Relative Permittivity (ϵ_r):	40.70	41.50	-1.93	5
		e"	20.0500	Conductivity (σ):	0.95	0.92	3.56	5
7/21/2014	Body 835	e'	52.8100	Relative Permittivity (ϵ_r):	52.81	55.20	-4.33	5
		e"	21.1600	Conductivity (σ):	0.98	0.97	1.28	5
	Body 820	e'	52.9200	Relative Permittivity (ϵ_r):	52.92	55.28	-4.26	5
		e"	21.2600	Conductivity (σ):	0.97	0.97	0.09	5
	Body 850	e'	52.7100	Relative Permittivity (ϵ_r):	52.71	55.16	-4.44	5
		e"	21.1300	Conductivity (σ):	1.00	0.99	1.17	5
7/22/2014	Body 2450	e'	53.7700	Relative Permittivity (ϵ_r):	53.77	52.70	2.03	5
		e"	15.0200	Conductivity (σ):	2.05	1.95	4.93	5
	Body 2410	e'	53.9300	Relative Permittivity (ϵ_r):	53.93	52.76	2.22	5
		e"	14.8500	Conductivity (σ):	1.99	1.91	4.32	5
	Body 2475	e'	53.6800	Relative Permittivity (ϵ_r):	53.68	52.67	1.92	5
		e"	15.1300	Conductivity (σ):	2.08	1.99	4.89	5
7/23/2014	Head 2450	e'	38.0000	Relative Permittivity (ϵ_r):	38.00	39.20	-3.06	5
		e"	13.8600	Conductivity (σ):	1.89	1.80	4.90	5
	Head 2410	e'	38.1400	Relative Permittivity (ϵ_r):	38.14	39.28	-2.90	5
		e"	13.7500	Conductivity (σ):	1.84	1.76	4.66	5
	Head 2475	e'	37.9000	Relative Permittivity (ϵ_r):	37.90	39.17	-3.24	5
		e"	13.9200	Conductivity (σ):	1.92	1.83	4.85	5

SAR Lab 2

	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
7/8/2014	Body 2450	e'	50.7300	Relative Permittivity (ϵ_r):	50.73	52.70	-3.74	5
		e"	14.3300	Conductivity (σ):	1.95	1.95	0.11	5
	Body 2410	e'	50.8300	Relative Permittivity (ϵ_r):	50.83	52.76	-3.66	5
		e"	14.2800	Conductivity (σ):	1.91	1.91	0.32	5
	Body 2475	e'	50.6700	Relative Permittivity (ϵ_r):	50.67	52.67	-3.79	5
		e"	14.3600	Conductivity (σ):	1.98	1.99	-0.45	5

SAR Lab 4

	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
7/21/2014	Head 1900	e'	39.9500	Relative Permittivity (ϵ_r):	39.95	40.00	-0.12	5
		e"	13.0800	Conductivity (σ):	1.38	1.40	-1.30	5
	Head 1850	e'	40.1500	Relative Permittivity (ϵ_r):	40.15	40.00	0.37	5
		e"	12.9800	Conductivity (σ):	1.34	1.40	-4.63	5
	Head 1910	e'	39.9000	Relative Permittivity (ϵ_r):	39.90	40.00	-0.25	5
		e"	13.1000	Conductivity (σ):	1.39	1.40	-0.63	5
7/21/2014	Body 1900	e'	51.1000	Relative Permittivity (ϵ_r):	51.10	53.30	-4.13	5
		e"	14.4100	Conductivity (σ):	1.52	1.52	0.16	5
	Body 1850	e'	51.3000	Relative Permittivity (ϵ_r):	51.30	53.30	-3.75	5
		e"	14.2900	Conductivity (σ):	1.47	1.52	-3.29	5
	Body 1910	e'	51.0600	Relative Permittivity (ϵ_r):	51.06	53.30	-4.20	5
		e"	14.4200	Conductivity (σ):	1.53	1.52	0.75	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
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 ±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	77.70	-7.08	-6.49	1,2
				10g	1.88	2.08	20.8	22.20	-6.31		
7/1/2014	D5GHzV2 (5.6 GHz)	1003	Head	1g	7.79	8.33	83.3	81.80	1.83	-6.93	
				10g	2.13	2.38	23.8	23.20	2.59		
7/1/2014	D5GHzV2 (5.8 GHz)	1003	Head	1g	6.89	7.48	74.8	78.30	-4.47	-8.56	
				10g	1.90	2.13	21.3	22.10	-3.62		
7/1/2014	D5GHzV2 (5.2 GHz)	1003	Body	1g	6.79	7.08	70.8	73.50	-3.67	-4.27	
				10g	1.87	2.01	20.1	20.50	-1.95		
7/1/2014	D5GHzV2 (5.6 GHz)	1003	Body	1g	7.96	8.48	84.8	79.60	6.53	-6.53	
				10g	2.15	2.38	23.8	22.10	7.69		
7/1/2014	D5GHzV2 (5.8 GHz)	1003	Body	1g	6.79	7.23	72.3	73.80	-2.03	-6.48	
				10g	1.83	2.02	20.2	20.40	-0.98		
7/6/2014	D5GHzV2 (5.2 GHz)	1138	Head	1g	7.36	7.82	78.2	78.50	-0.38	-6.25	
				10g	2.09	2.26	22.6	22.50	0.44		
7/6/2014	D5GHzV2 (5.6 GHz)	1138	Head	1g	7.68	8.43	84.3	82.70	1.93	-9.77	
				10g	2.12	2.39	23.9	23.50	1.70		
7/6/2014	D5GHzV2 (5.8 GHz)	1138	Head	1g	7.49	8.26	82.6	78.30	5.49	-10.28	3,4
				10g	2.07	2.35	23.5	22.40	4.91		
7/21/2014	D835V2	4d002	Head	1g	1.01	1.00	10.0	9.49	5.37	0.99	5,6
				10g	0.678	0.658	6.6	6.18	6.47		
7/21/2014	D835V2	4d002	Body	1g	0.95	0.906	9.1	9.43	-3.92	4.73	
				10g	0.638	0.602	6.0	6.21	-3.06		
7/22/2014	D2450V2	899	Body	1g	5.27	5.31	53.1	49.7	6.84	-0.76	7,8
				10g	2.26	2.43	24.3	23.3	4.29		
7/23/2014	D2450V2	899	Head	1g	5.50	5.47	54.7	51.3	6.63	0.55	
				10g	2.41	2.48	24.8	23.9	3.77		

SAR Lab 2

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				
7/8/2014	D2450V2	899	Body	1g	5.21	5.31	53.1	49.7	6.84	-1.92	9,10
				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				
7/21/2014	D1900V2	5d043	Head	1g	4.21	4.02	40.2	40.10	0.25	4.51	11,12
				10g	2.16	2.08	20.8	21.10	-1.42		
7/21/2014	D1900V2	5d043	Body	1g	3.93	3.89	38.9	39.00	-0.26	1.02	
				10g	1.97	2.03	20.3	20.80	-2.40		

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:

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

KDB 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 ¼ dB higher than that measured without HSPA using 12.2 kbps RMC or the maximum SAR for 12.2 kbps RMC is above 75% of the SAR limit. Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 with power control algorithm 2.

KDB 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 ≤ 1.6 W/kg and the 1-g averaged SAR is ≤ 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	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
Head	Voice	OFF	0	Left Touch	190	836.6	33.6	33.2	0.386	0.423	
				Left Tilt	190	836.6	33.6	33.2	0.263	0.288	
				Right Touch	190	836.6	33.6	33.2	0.427	0.468	1
				Right Tilt	190	836.6	33.6	33.2	0.253	0.277	
Head (VoIP)	GPRS 1 Slots	OFF	0	Left Touch	190	836.6	33.6	33.2	0.427	0.468	
				Left Tilt	190	836.6	33.6	33.2	0.249	0.273	
				Right Touch	190	836.6	33.6	33.2	0.395	0.433	
				Right Tilt	190	836.6	33.6	33.2	0.275	0.302	
Body-worn	Voice	OFF	15	Rear	190	836.6	33.6	33.2	0.473	0.519	2
				Front	190	836.6	33.6	33.2	0.451	0.495	
Body-worn (VoIP)	GPRS 1 Slots	OFF	15	Rear	190	836.6	33.6	33.2	0.420	0.461	
				Front	190	836.6	33.6	33.2	0.431	0.473	
Hotspot	GPRS 1 Slots	ON	10	Rear	190	836.6	33.1	32.0	0.480	0.618	3
				Front	190	836.6	33.1	32.0	0.393	0.506	
				Edge 2	190	836.6	33.1	32.0	0.168	0.216	
				Edge 3	190	836.6	33.1	32.0	0.020	0.026	
				Edge 4	190	836.6	33.1	32.0	0.186	0.240	

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)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
Body-worn	CS + GPRS 2 Slots	OFF	15	Rear	190	836.6	30.1	29.5	0.391	0.449	
Hotspot	CS + GPRS 2 Slots	ON	10	Rear	190	836.6	29.7	28.4	0.417	0.563	

10.2. GSM1900

RF Exposure Conditions	Mode	Pwr Back off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
Head	Voice	OFF	0	Left Touch	661	1880.0	30.6	29.8	0.384	0.462	
				Left Tilt	661	1880.0	30.6	29.8	0.121	0.145	
				Right Touch	661	1880.0	30.6	29.8	0.438	0.527	
				Right Tilt	661	1880.0	30.6	29.8	0.103	0.124	
Head (VoIP)	GPRS 4 Slots	OFF	0	Left Touch	661	1880.0	25.6	25.1	0.448	0.503	
				Left Tilt	661	1880.0	25.6	25.1	0.124	0.139	
				Right Touch	661	1880.0	25.6	25.1	0.487	**0.546**	4
				Right Tilt	661	1880.0	25.6	25.1	0.110	0.123	
Body-worn	Voice	OFF	15	Rear	661	1880.0	30.6	29.8	0.539	0.648	
				Front	661	1880.0	30.6	29.8	0.441	0.530	
Body-worn (VoIP)	GPRS 4 Slots	OFF	15	Rear	661	1880.0	25.6	25.1	0.636	**0.714**	5
				Front	661	1880.0	25.6	25.1	0.511	0.573	
Hotspot	GPRS 1 Slots	ON	10	Rear	512	1850.2	30.1	28.8	0.659	0.889	
					661	1880.0	30.1	29.0	0.730	0.940	
					810	1909.8	30.1	29.0	0.765	**0.986**	6
				Front	661	1880.0	30.1	29.0	0.583	0.751	
				Edge 2	661	1880.0	30.1	29.0	0.060	0.077	
				Edge 3	661	1880.0	30.1	29.0	0.142	0.183	
				Edge 4	661	1880.0	30.1	29.0	0.057	0.073	

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)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
Body-worn	CS + GPRS 3 Slots	OFF	15	Rear	661	1880.0	26.6	25.5	0.396	0.510	
Hotspot	CS + GPRS 2 Slots	ON	10	Rear	661	1880.0	26.9	25.5	0.433	0.598	

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)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
Head	Rel 99 RMC	OFF	0	Left Touch	4183	836.6	24.5	24.4	0.488	0.499	7
				Left Tilt	4183	836.6	24.5	24.4	0.317	0.324	
				Right Touch	4183	836.6	24.5	24.4	0.451	0.462	
				Right Tilt	4183	836.6	24.5	24.4	0.313	0.320	
Body-Worn & Hotspot	Rel 99 RMC	OFF	10	Rear	4183	836.6	24.5	24.4	0.653	0.668	8
				Front	4183	836.6	24.5	24.4	0.598	0.612	
				Edge 2	4183	836.6	24.5	24.4	0.365	0.374	
				Edge 3	4183	836.6	24.5	24.4	0.027	0.027	
				Edge 4	4183	836.6	24.5	24.4	0.287	0.294	

10.4. Wi-Fi (DTS Band)

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	
2.4 GHz	Head	802.11b 1 Mbps	0	Left Touch	1	2412.0	16.8	15.4	0.511	**0.705**	9
				Left Tilt	1	2412.0	16.8	15.4	0.165	0.228	
				Right Touch	1	2412.0	16.8	15.4	0.188	0.260	
				Right Tilt	1	2412.0	16.8	15.4	0.080	0.110	
	Body-worn	802.11b 1 Mbps	15	Rear	1	2412.0	16.8	15.4	0.130	**0.179**	10
				Front	1	2412.0	16.8	15.4	0.057	0.079	
	Hotspot	802.11b 1 Mbps	10	Rear	1	2412.0	16.8	15.4	0.287	**0.396**	11
				Front	1	2412.0	16.8	15.4	0.109	0.150	
				Edge 1	1	2412.0	16.8	15.4	0.022	0.031	
				Edge 2	1	2412.0	16.8	15.4	0.230	0.317	

10.5. 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)		Plot No.
							Tune-up limit	Meas.	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	12
				Left Tilt	36	5180.0	16.0	14.9	0.143	0.184	
				Right Touch	36	5180.0	16.0	14.9	0.083	0.107	
				Right Tilt	36	5180.0	16.0	14.9	0.055	0.071	
	Body-worn	802.11a 6 Mbps	15	Rear	36	5180.0	16.0	14.9	0.091	0.117	13
				Front	36	5180.0	16.0	14.9	0.022	0.028	
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	802.11a 6 Mbps	0	Left Touch	52	5260.0	16.0	14.8	0.318	0.419	14
				Left Tilt	52	5260.0	16.0	14.8	0.155	0.204	
				Right Touch	52	5260.0	16.0	14.8	0.114	0.150	
				Right Tilt	52	5260.0	16.0	14.8	0.085	0.112	
	Body-worn	802.11a 6 Mbps	15	Rear	52	5260.0	16.0	14.8	0.107	0.141	15
				Front	52	5260.0	16.0	14.8	0.022	0.029	
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	802.11a 6 Mbps	0	Left Touch	104	5520.0	16.0	15.0	0.459	**0.578**	16
				Left Tilt	104	5520.0	16.0	15.0	0.278	0.350	
				Right Touch	104	5520.0	16.0	15.0	0.241	0.303	
				Right Tilt	104	5520.0	16.0	15.0	0.213	0.268	
	Body-worn	802.11a 6 Mbps	15	Rear	104	5520.0	16.0	15.0	0.233	**0.293**	17
				Front	104	5520.0	16.0	15.0	0.023	0.029	
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	802.11a 6 Mbps	0	Left Touch	149	5745.0	16.0	14.9	0.275	0.354	18
				Left Tilt	149	5745.0	16.0	14.9	0.190	0.245	
				Right Touch	149	5745.0	16.0	14.9	0.188	0.242	
				Right Tilt	149	5745.0	16.0	14.9	0.110	0.142	
	Body-worn	802.11a 6 Mbps	15	Rear	149	5745.0	16.0	14.9	0.222	0.286	19
				Front	149	5745.0	16.0	14.9	0.031	0.039	

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	

10.6. 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	20
				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 ≥ 0.80 W/kg, repeat that measurement once.
3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

11.1. 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		0.653		No
1900	GSM 1900			0.765	No
2400	Wi-Fi 802.11b/g/n	0.511			No
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

N/A

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:

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

Where:

SAR_1 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_2 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:

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

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

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				∑ 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	0.468	0.705			1.173	No
		① + ③	0.468		0.578		1.046	No
	Left Tilt	① + ②	0.288	0.228			0.516	No
		① + ③	0.288		0.350		0.638	No
	Right Touch	① + ②	0.468	0.260			0.728	No
		① + ③	0.468		0.303		0.771	No
	Right Tilt	① + ②	0.302	0.110			0.412	No
		① + ③	0.302		0.268		0.570	No
Body-worn	Rear	① + ②	0.519	0.179			0.698	No
		① + ③	0.519		0.293		0.812	No
		① + ④	0.519			0.035	0.554	No
		① + ③ + ④	0.519		0.293	0.035	0.847	No
	Front	① + ②	0.495	0.079			0.574	No
		① + ③	0.495		0.039		0.534	No
		① + ④	0.495			0.009	0.504	No
		① + ③ + ④	0.495		0.039	0.009	0.543	No
Hotspot	Rear	① + ②	0.618	0.396			1.014	No
	Front	① + ②	0.506	0.150			0.656	No
	Edge 1	① + ②		0.031			0.031	No
	Edge 2	① + ②	0.216	0.317			0.533	No
	Edge 3	① + ②	0.026				0.026	No
	Edge 4	① + ②	0.240				0.240	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				∑ 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	0.503	0.705			**1.208**	No
		① + ③	0.503		0.578		**1.081**	No
	Left Tilt	① + ②	0.145	0.228			0.373	No
		① + ③	0.145		0.350		0.495	No
	Right Touch	① + ②	0.546	0.260			0.806	No
		① + ③	0.546		0.303		0.849	No
	Right Tilt	① + ②	0.124	0.110			0.234	No
		① + ③	0.124		0.268		0.392	No
Body-worn	Rear	① + ②	0.714	0.179			**0.893**	No
		① + ③	0.714		0.293		1.007	No
		① + ④	0.714			0.035	0.749	No
		① + ③ + ④	0.714		0.293	0.035	**1.042**	No
	Front	① + ②	0.573	0.079			0.652	No
		① + ③	0.573		0.039		0.612	No
		① + ④	0.573			0.009	0.582	No
		① + ③ + ④	0.573		0.039	0.009	0.621	No
Hotspot	Rear	① + ②	0.986	0.396			**1.382**	No
	Front	① + ②	0.751	0.150			0.901	No
	Edge 1	① + ②		0.031			0.031	No
	Edge 2	① + ②	0.077	0.317			0.394	No
	Edge 3	① + ②	0.183				0.183	No
	Edge 4	① + ②	0.073				0.073	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				∑ 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	0.499	0.705			1.204	No
		① + ③	0.499		0.578		1.077	No
	Left Tilt	① + ②	0.324	0.228			0.552	No
		① + ③	0.324		0.350		0.674	No
	Right Touch	① + ②	0.462	0.260			0.722	No
		① + ③	0.462		0.303		0.765	No
	Right Tilt	① + ②	0.320	0.110			0.430	No
		① + ③	0.320		0.268		0.588	No
Body-worn	Rear	① + ②	0.668	0.179			0.847	No
		① + ③	0.668		0.293		0.961	No
		① + ④	0.668			0.035	0.703	No
		① + ③ + ④	0.668		0.293	0.035	0.996	No
	Front	① + ②	0.612	0.079			0.691	No
		① + ③	0.612		0.039		0.651	No
		① + ④	0.612			0.009	0.621	No
		① + ③ + ④	0.612		0.039	0.009	0.660	No
Hotspot	Rear	① + ②	0.668	0.396			1.064	No
	Front	① + ②	0.612	0.150			0.762	No
	Edge 1	① + ②		0.031			0.031	No
	Edge 2	① + ②	0.374	0.317			0.691	No
	Edge 3	① + ②	0.027				0.027	No
	Edge 4	① + ②	0.294				0.294	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 D835V2 - SN 4d002

13.8. Calibration Certificate for D1900V2- SN 5d043

13.9. Calibration Certificate for D2450V2 - SN 899

13.10. Calibration Certificate for D5GHzV2 - SN 1003

13.11. Calibration Certificate for D5GHzV2 - SN 1138

END OF REPORT