



SAR EVALUATION REPORT

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

The model FCC ID: A3LSMA500F shares the same enclosure and circuit board as model FCC ID: A3LSMA500H. The WLAN/Bluetooth circuitry and layout, including antenna, are almost identical between the two units. The WLAN/Bluetooth antenna and surrounding circuitry is the same between these two units, and tune up power targets are identical for WLAN and Bluetooth operations. For this reason the SAR data for the WLAN and Bluetooth operations for FCC ID: A3LSMA500F is considered representative for FCC ID: A3LSMA500H.

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

**Model: SM-A500H/DS and SM-A500H
FCC ID: A3LSMA500H**

**Report Number: 14U18541-S1C
Issue Date: 10/8/2014**

Prepared for
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REVISION HISTORY

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1. Attestation of Test Results

Applicant Name	SAMSUNG ELECTRONICS CO. LTD.			
Application Purpose	☒ Original Grant ☐ Class II Permissive Change			
FCC ID	A3LSMA500H			
DUT Description	GSM/WCDMA Phone + Bluetooth, DTS/UNII a/b/g/n, ANT+			
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	0.288 W/kg	0.573 W/kg	0.364 W/kg
	Body-worn Accessory	0.938 W/kg	0.141 W/kg	0.102 W/kg
	Wireless Router (Hotspot)	0.938 W/kg	0.141 W/kg	N/A
	Wi-Fi Direct	N/A	0.141 W/kg	0.066 W/kg
	Simultaneous Transmission	Head: 0.840 W/kg Body: 1.054 W/kg	Head: 0.840 W/kg Body: 1.054 W/kg	Head: 0.631 W/kg Body: 1.040 W/kg
Highest SAR across exposure conditions	0.938 W/kg			
Applicable Standards	FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013			
Test Results	Pass			
Date tested	9/9/2014 – 09/23/2014; 10/3/2014 – 10/7/2014			
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:		
				
Bobby Bayani Senior Engineer UL Verification Services Inc.		Hung Thai 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 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

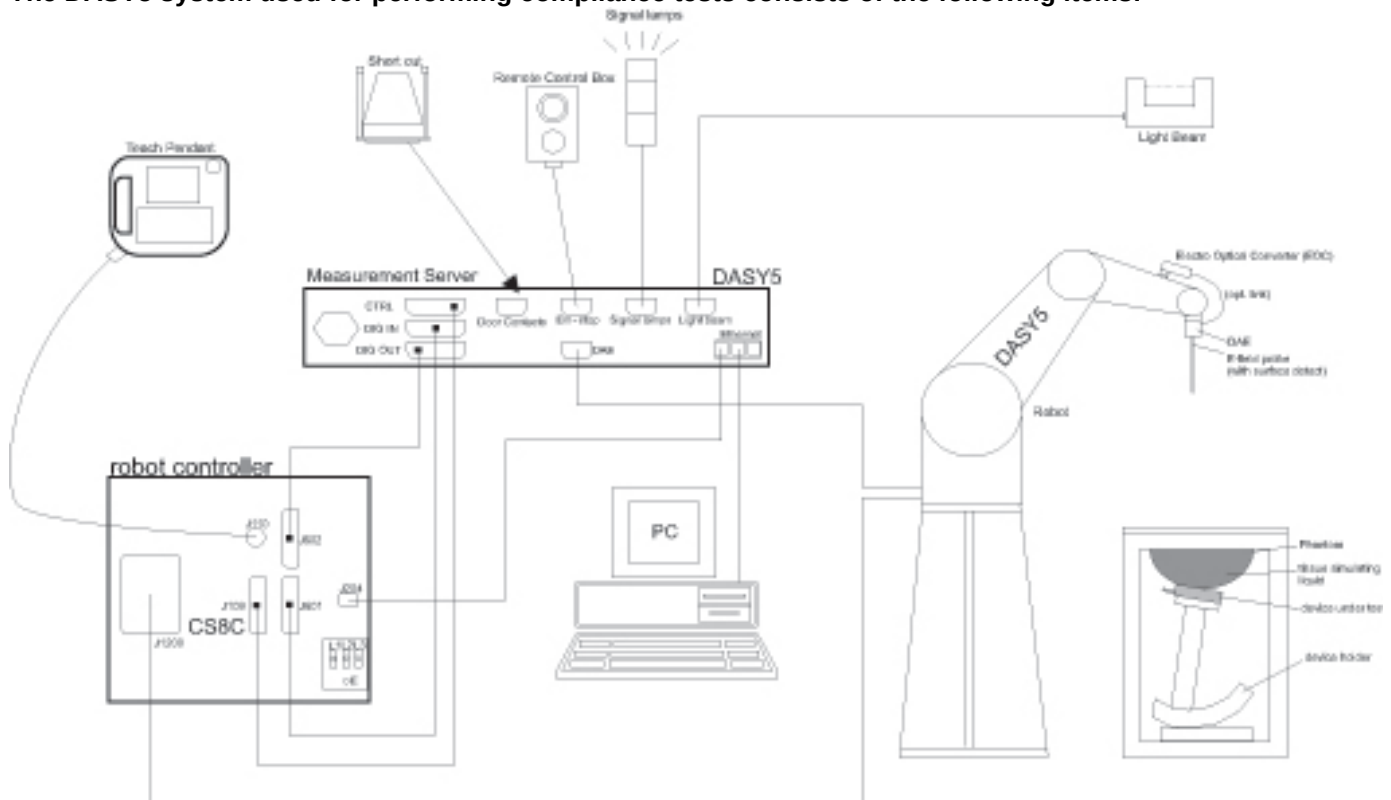
47173 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 3
SAR Lab D	SAR Lab 4
SAR Lab E	SAR Lab 5
SAR Lab F	
SAR Lab G	
SAR Lab H	

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0.

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. SAR Scan Procedure

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

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

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$
Maximum area scan spatial resolution: $\Delta x_{\text{Area}}, \Delta y_{\text{Area}}$	≤ 2 GHz: ≤ 15 mm $2 - 3$ GHz: ≤ 12 mm	$3 - 4$ GHz: ≤ 12 mm $4 - 6$ GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

Step 3: Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures points (refer to table below) within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

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

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: $\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{\text{Zoom}}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{\text{Zoom}}(1)$: between 1 st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{\text{Zoom}}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{\text{Zoom}}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.				
* When zoom scan is required and the <i>reported</i> SAR from the area scan based <i>1-g SAR estimation</i> procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

Step 4: Power drift measurement

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

Step 5: Z-Scan (FCC only)

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

4.3. 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	8753ES	MY40001647	7/17/2015
Dielectronic Probe kit	SPEAG	DAK-3.5	1103	2/18/2015
Dielectronic Probe kit	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	A Flir Company	445703	1212	3/11/2015

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Synthesized Signal Generator	HP	8665B	3744A01084	5/20/2015
Power Meter	Agilent	N1912A	MY53040016	5/5/2015
Power Sensor	Agilent	E9323A	MY53070005	5/1/2015
Power Sensor	Agilent	E9323A	MY53070009	5/28/2015
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1795093	N/A
Directional coupler	Werlatone	C8060-102	2149	N/A
DC Power Supply	AMETEK	XT 15-4	1319A02778	N/A
Synthesized Signal Generator	HP	8665B	3744A01155	3/12/2015
Power Meter	Agilent	N1912A	MY52310061	12/12/2014
Power Sensor	Agilent	E9323A	US40411681	10/4/2014
Power Sensor	Agilent	N1921A	MY52270022	12/12/2014
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1795092	N/A
Directional coupler	Werlatone	C8060-102	2141	N/A
DC Power Supply	BK PRECISION	1611	215-02292	N/A
E-Field Probe	SPEAG	EX3DV4	3749	1/29/2015
E-Field Probe	SPEAG	EX3DV4	3751	11/21/2014
E-Field Probe	SPEAG	EX3DV4	3686	3/18/2015
E-Field Probe	SPEAG	EX3DV4	3990	4/15/2015
E-Field Probe	SPEAG	EX3DV4	3936	7/24/2015
E-Field Probe	SPEAG	EX3DV4	3772	2/26/2015
Data Acquisition Electronics	SPEAG	DAE4	1259	1/23/2015
Data Acquisition Electronics	SPEAG	DAE3	500	5/15/2015
Data Acquisition Electronics	SPEAG	DAE4	1360	3/17/2015
Data Acquisition Electronics	SPEAG	DAE4	1258	5/15/2015
Data Acquisition Electronics	SPEAG	DAE4	1434	4/14/2015
Data Acquisition Electronics	SPEAG	DAE4	1239	4/15/2015
System Validation Dipole	SPEAG	D835V2	4d002	11/15/2014
System Validation Dipole	SPEAG	D1900V2	5d140	4/23/2015
System Validation Dipole	SPEAG	D2450V2	748	2/18/2015
System Validation Dipole	SPEAG	D5GHzV2	1003	2/26/2015
System Validation Dipole	SPEAG	D5GHzV2	1168	12/12/2014

Others

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Base Station Simulator	R & S	CMW500	135390-ws	7/3/2015
Base Station Simulator	R & S	CMW500	132911-tu	2/27/2015
Base Station Simulator	R & S	CMW500	112268-rf	6/6/2015
Power Meter	Agilent	N1911A	MY53060009	5/5/2015
Power Sensor	Agilent	E9323A	US40411681	10/4/2014

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

Model: SM-A500H/DS and SM-A500H	
Device Dimension	Overall (Length x Width): 139.3 mm x 70.3 mm Overall Diagonal: 150.8 mm Display Diagonal: 127 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 5.8 GHz only on Ch. 149)
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 5.2 GHz & 5.8 GHz)

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): Not support		
W-CDMA (UMTS)	Band V and II	UMTS Rel. 99 (Voice & Data) HSDPA (Rel. 7, CAT 14) HSUPA (Rel. 6, CAT 6) DC-HSDPA (Rel. 8, CAT 24)	100%
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20)	100%
	5 GHz	802.11a 802.11n (HT20) 802.11n (HT40)	100%
Bluetooth	2.4 GHz	Version 4.0 LE	N/A

6.3. Nominal and Maximum Output Power

Upper limit (dB): 0.5 ~ -1.5		RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
GSM850	Voice	32.5	33.0
	GPRS 1 slot	32.5	33.0
	GPRS 2 slots	31.0	31.5
	GPRS 3 slots	30.0	30.5
	GPRS 4 slots	28.5	29.0
	EGPRS 1 slot	27.0	27.5
	EGPRS 2 slots	26.0	26.5
	EGPRS 3 slots	25.0	25.5
	EGPRS 4 slots	23.5	24.0
GSM1900	Voice	29.5	30.0
	GPRS 1 slot	29.5	30.0
	GPRS 2 slots	28.0	28.5
	GPRS 3 slots	27.0	27.5
	GPRS 4 slots	25.5	26.0
	EGPRS 1 slot	26.0	26.5
	EGPRS 2 slots	25.0	25.5
	EGPRS 3 slots	24.0	24.5
	EGPRS 4 slots	22.5	23.0
W-CDMA Band V	R99	22.5	23.0
	HSDPA	22.5	23.0
	HSUPA	22.5	23.0
	DC-HSDPA	22.5	23.0
W-CDMA Band II	R99	22.5	23.0
	HSDPA	22.5	23.0
	HSUPA	22.5	23.0
	DC-HSDPA	22.5	23.0

Upper limit (dB): 0.5 ~ -1.5		RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
WiFi 2.4 GHz	802.11b	17.0	17.5
	802.11g	13.0	13.5
	802.11n HT20	12.0	12.5
WiFi 5 GHz	802.11a	13.0	13.5
	802.11n HT20	12.0	12.5
	802.11n HT40	11.0	11.5
Bluetooth		12.0	12.5
Bluetooth LE		3.0	3.5

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 2/5 + Wi-Fi 2.4/5GHz
Body-worn Accessory	1. GSM 850/1900 Voice + Wi-Fi 2.4/5GHz 2. GSM 850/1900 Voice + BT 3. GSM 850/1900 (GPRS/EDGE) + Wi-Fi 2.4/5GHz 4. GSM 850/1900 (GPRS/EDGE) + BT 5. WCDMA Band 2/5 + Wi-Fi 2.4/5GHz 6. WCDMA Band 2/5 + BT
Wireless Router (Hotspot)	1. GSM 850/1900 (GPRS/EDGE) + Wi-Fi 2.4GHz 2. WCDMA Band 2/5 + Wi-Fi 2.4GHz
Notes: 1. Wi-Fi 2.4GHz & 5.8GHz (Ch.149) supports Hotspot. 2. Wi-Fi 2.4 GHz Radio cannot transmit simultaneously with Bluetooth Radio. 3. Wi-Fi 5 GHz Radio can transmit simultaneously with Bluetooth Radio.	

7. RF Exposure Conditions (Test Configurations)

Refer to “Photos and Antenna Locations” Appendix 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) & 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)	124.4 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)	26.2 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 3 (Bottom)	5.6 mm	Yes	
Edge 4 (Left)	10.7 mm	Yes	

For Wi-Fi (2.4, 5.2, & 5.8GHz only)

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	<25 mm	Yes	
Front	<25 mm	Yes	
Edge 1 (Top)	2.6 mm	Yes	
Edge 2 (Right)	2.6 mm	Yes	
Edge 3 (Bottom)	128.2 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 648474 D04 Handset SAR
Edge 4 (Left)	62.9 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 648474 D04 Handset SAR

8. Conducted Output Power Measurements

8.1. GSM850 and GSM1900

GSM850 Measured Results

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Burst Pwr (dBm)	Frame Pwr (dBm)
850	GSM (Voice)	CS1	1	128	824.2	32.9	23.9
				190	836.6	33.0	24.0
				251	848.8	33.0	24.0
	GPRS (GMSK)	CS1	1	128	824.2	32.9	23.9
				190	836.6	33.0	24.0
				251	848.8	32.9	23.9
			2	128	824.2	31.0	25.0
				190	836.6	31.1	25.1
				251	848.8	31.1	25.1
			3	128	824.2	29.7	25.4
				190	836.6	29.8	25.5
				251	848.8	29.8	25.5
			4	128	824.2	27.1	24.1
				190	836.6	27.2	24.2
				251	848.8	27.2	24.2
	EGPRS (8PSK)	MCS5	1	128	824.2	27.1	18.1
				190	836.6	27.2	18.2
				251	848.8	27.2	18.2
			2	128	824.2	25.7	19.7
				190	836.6	25.7	19.7
				251	848.8	25.6	19.6
			3	128	824.2	23.5	19.2
				190	836.6	23.6	19.3
				251	848.8	23.6	19.3
			4	128	824.2	22.4	19.4
				190	836.6	22.5	19.5
				251	848.8	22.5	19.5

Notes:

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

- Head & Body-worn Accessory: GMSK Voice Mode
- Hotspot mode: GMSK (GPRS) mode with 3 time slots, based on the output power measurements above
- SAR is not required for EGPRS (8PSK) mode because its output power is less than that of GPRS Mode

GSM1900 Measured Results

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Burst Pwr (dBm)	Frame Pwr (dBm)
1900	GSM (Voice)	CS1	1	512	1850.2	29.9	20.9
				661	1880.0	30.0	21.0
				810	1909.8	30.0	21.0
	GPRS (GMSK)	CS1	1	512	1850.2	29.9	20.9
				661	1880.0	30.0	21.0
				810	1909.8	29.9	20.9
			2	512	1850.2	28.0	22.0
				661	1880.0	28.1	22.1
				810	1909.8	28.1	22.1
			3	512	1850.2	27.2	22.9
				661	1880.0	27.3	23.0
				810	1909.8	27.3	23.0
			4	512	1850.2	25.6	22.6
				661	1880.0	25.7	22.7
				810	1909.8	25.7	22.7
	EGPRS (8PSK)	MCS5	1	512	1850.2	26.4	17.4
				661	1880.0	26.5	17.5
				810	1909.8	26.5	17.5
			2	512	1850.2	25.0	19.0
				661	1880.0	25.1	19.1
				810	1909.8	25.1	19.1
			3	512	1850.2	24.1	19.8
				661	1880.0	24.2	19.9
				810	1909.8	24.2	19.9
			4	512	1850.2	21.9	18.9
				661	1880.0	22.0	19.0
				810	1909.8	22.0	19.0

Notes:

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

- Head & Body-worn Accessory: GMSK Voice Mode
- Hotspot mode: GMSK (GPRS) mode with 3 time slots, based on the output power measurements above
- SAR is not required for EGPRS (8PSK) mode because its output power is less than that of GPRS Mode

8.2. W-CDMA Band V and 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
	β_c/β_d	8/15

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band V	Rel 99 (RMC, 12.2 kbps)	4132	826.4	22.9
		4183	836.6	23.0
		4233	846.6	23.0
W-CDMA Band II	Rel 99 (RMC, 12.2 kbps)	9262	1852.4	22.9
		9400	1880.0	23.0
		9538	1907.6	22.9

HSDPA

The following 4 Sub-tests were completed according to Release 7 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			
	β_c	2/15	12/15	15/15	15/15
	β_d	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	β_c/β_d	2/15	12/15	15/8	15/4
	β_{hs}	4/15	24/15	30/15	30/15
HSDPA Specific Settings	MPR (dB)	0	1	1.5	1.5
	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)	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	21.8
		4183	836.6	21.7
		4233	846.6	21.7
	Subtest 2	4132	826.4	21.4
		4183	836.6	21.5
		4233	846.6	21.5
	Subtest 3	4132	826.4	21.4
		4183	836.6	21.5
		4233	846.6	21.5
	Subtest 4	4132	826.4	21.4
		4183	836.6	21.5
		4233	846.6	21.5
W-CDMA Band II	Subtest 1	9262	1852.4	22.2
		9400	1880.0	22.3
		9538	1907.6	22.3
	Subtest 2	9262	1852.4	22.1
		9400	1880.0	22.1
		9538	1907.6	22.0
	Subtest 3	9262	1852.4	22.0
		9400	1880.0	22.0
		9538	1907.6	21.9
	Subtest 4	9262	1852.4	21.9
		9400	1880.0	21.9
		9538	1907.6	21.9

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				
	β_c	11/15	6/15	15/15	2/15	15/15
	β_d	15/15	15/15	9/15	15/15	15/15
	β_{ec}	209/225	12/15	30/15	2/15	24/15
	β_c/β_d	11/15	6/15	15/9	2/15	15/15
	β_{hs}	22/15	12/15	30/15	4/15	30/15
	β_{ed}	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 = β_{hs}/β_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 11	E-TFCI 11	
		E-TFCI PO 4			E-TFCI PO 4	
		E-TFCI 67			E-TFCI 67	
		E-TFCI PO 18			E-TFCI PO 18	
E-TFCI 71		E-TFCI 71				
E-TFCI PO 23	E-TFCI 11 E-TFCI PO 4 E-TFCI 92 E-TFCI PO 18	E-TFCI PO 23				
E-TFCI 75		E-TFCI 75				
E-TFCI PO 26		E-TFCI PO 26				
E-TFCI 81		E-TFCI 81				
E-TFCI PO 27		E-TFCI PO 27				

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	21.5
		4183	836.6	21.6
		4233	846.6	21.6
	Subtest 2	4132	826.4	21.0
		4183	836.6	21.0
		4233	846.6	21.1
	Subtest 3	4132	826.4	21.2
		4183	836.6	21.1
		4233	846.6	21.1
	Subtest 4	4132	826.4	21.0
		4183	836.6	21.0
		4233	846.6	21.1
W-CDMA Band II	Subtest 1	4132	826.4	21.5
		4183	836.6	21.5
		4233	846.6	21.5
	Subtest 2	9262	1852.4	21.5
		9400	1880.0	21.5
		9538	1907.6	21.4
	Subtest 3	9262	1852.4	21.0
		9400	1880.0	21.1
		9538	1907.6	21.0
	Subtest 4	9262	1852.4	21.3
		9400	1880.0	21.3
		9538	1907.6	21.3
	Subtest 5	9262	1852.4	21.0
		9400	1880.0	21.0
		9538	1907.6	21.0

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.		

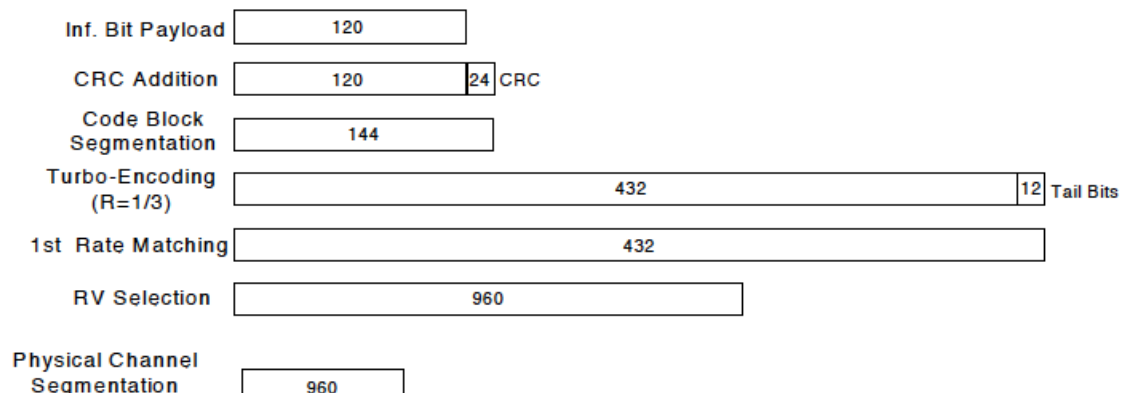


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

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			
	β_c	2/15	12/15	15/15	15/15
	β_d	15/15	15/15	8/15	4/15
	β_d (SF)	64			
	β_c/β_d	2/15	12/15	15/8	15/4
	β_{hs}	4/15	24/15	30/15	30/15
HSDPA Specific Settings	MPR (dB)	0	0	0.5	0.5
	DACK	8			
	DNAK	8			
	DCQI	8			
	Ack-Nack Repetition factor	3			
	CQI Feedback	4ms			
	CQI Repetition Factor	2			
	$A_{hs} = \beta_{hs}/\beta_c$	30/15			

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

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	22.5
		4183	836.6	22.6
		4233	846.6	22.6
	Subtest 2	4132	826.4	22.5
		4183	836.6	22.4
		4233	846.6	22.4
	Subtest 3	4132	826.4	22.5
		4183	836.6	22.4
		4233	846.6	22.3
	Subtest 4	4132	826.4	22.4
		4183	836.6	22.3
		4233	846.6	22.3
W-CDMA Band II	Subtest 1	9262	1852.4	22.3
		9400	1880.0	22.3
		9538	1907.6	22.5
	Subtest 2	9262	1852.4	22.3
		9400	1880.0	22.4
		9538	1907.6	22.6
	Subtest 3	9262	1852.4	21.9
		9400	1880.0	22.0
		9538	1907.6	22.0
	Subtest 4	9262	1852.4	21.8
		9400	1880.0	21.9
		9538	1907.6	22.1

8.3. Wi-Fi (2.4 GHz Band)

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	17.3	Yes
			6	2437	17.5	
			11	2462	17.3	
	802.11g	6 Mbps	1	2412	13.4	No
			6	2437	13.5	
			11	2462	13.5	
	802.11n (HT20)	MCS0	1	2412	12.5	No
			6	2437	12.2	
			11	2462	12.5	

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	17.5	Yes
			2 Mbps	17.4	No
			5.5 Mbps	17.4	No
			11 Mbps	17.4	No

8.4. Wi-Fi (5 GHz Bands)

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	13.5	Yes
			40	5200	13.5	
			44	5220	13.5	
			48	5240	13.5	
	802.11n (HT20)	MCS0	36	5180	12.1	No
			40	5200	12.1	
			48	5240	12.3	
	802.11n (HT40)	MCS0	38	5190	11.0	No
			46	5230	11.3	
5.3 (U-NII-2A)	802.11a	6 Mbps	52	5260	13.5	Yes
			56	5280	13.0	
			60	5300	13.0	
			64	5320	13.2	
	802.11n (HT20)	MCS0	52	5260	12.0	No
			60	5300	12.0	
			64	5320	12.1	
	802.11n (HT40)	MCS0	54	5270	11.5	No
			62	5310	11.5	
5.5 (U-NII-2C)	802.11a	6 Mbps	100	5500	13.5	Yes
			104	5520	13.5	
			108	5540	13.5	
			112	5560	13.5	
			116	5580	13.5	
			120	5600	13.5	
			124	5620	13.5	
			128	5640	13.5	
			132	5660	13.5	
			136	5680	13.5	
			140	5700	13.5	
	802.11n (HT20)	MCS0	100	5500	12.5	No
			116	5580	12.3	
			140	5700	12.5	
	802.11n (HT40)	MCS0	102	5510	11.5	No
			110	5550	11.5	
			134	5670	11.5	
5.8 (U-NII-3)	802.11a	6 Mbps	149	5745	13.5	Yes
			153	5765	13.4	
			157	5785	13.5	
			161	5805	13.4	
			165	5825	13.5	
	802.11n (HT20)	MCS0	149	5745	12.5	No
			157	5785	12.5	
			161	5805	12.2	
	802.11n (HT40)	MCS0	151	5755	11.5	No
			159	5795	11.5	

Note(s):

Per KDB 248227, SAR is not required for 802.11n HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a 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	13.5	Yes
				9 Mbps	13.5	No
				12 Mbps	13.5	No
				18 Mbps	13.5	No
				24 Mbps	13.5	No
				36 Mbps	13.5	No
				48 Mbps	13.5	No
5.3 GHz (U-NII-2A)	802.11a	52	5260	54 Mbps	13.5	No
				6 Mbps	13.5	Yes
				9 Mbps	13.5	No
				12 Mbps	13.5	No
				18 Mbps	13.5	No
				24 Mbps	13.5	No
				36 Mbps	13.5	No
5.5 GHz (U-NII-2C)	802.11a	104	5520	48 Mbps	13.5	No
				54 Mbps	13.5	No
				6 Mbps	13.4	Yes
				9 Mbps	13.5	No
				12 Mbps	13.5	No
				18 Mbps	13.5	No
				24 Mbps	13.5	No
5.8 GHz (U-NII-3)	802.11a	157	5785	36 Mbps	13.5	No
				48 Mbps	13.5	No
				54 Mbps	13.5	No
				6 Mbps	13.5	Yes
				9 Mbps	13.5	No
				12 Mbps	13.5	No
				18 Mbps	13.5	No

8.5. Bluetooth

Maximum tune-up tolerance limit is 12.5 dBm from the rated nominal maximum output power. This power level qualifies for exclusion of SAR testing.

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	
	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 within the IEEE Std 1528-2013

9.2. Dielectric Property Measurements Results

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.

SAR Lab A

Date Tested	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
10/6/2014	Body 5180	e'	47.7800	Relative Permittivity (ε _r):	47.78	49.05	-2.58	5
		e"	18.5400	Conductivity (σ):	5.34	5.27	1.30	5
	Body 5200	e'	47.9400	Relative Permittivity (ε _r):	47.94	49.02	-2.20	5
		e"	18.5400	Conductivity (σ):	5.36	5.29	1.24	5
	Body 5600	e'	47.2900	Relative Permittivity (ε _r):	47.29	48.48	-2.45	5
		e"	19.0100	Conductivity (σ):	5.92	5.76	2.75	5
	Body 5800	e'	46.8700	Relative Permittivity (ε _r):	46.87	48.20	-2.76	5
		e"	19.1100	Conductivity (σ):	6.16	6.00	2.72	5
	Body 5825	e'	46.9000	Relative Permittivity (ε _r):	46.90	48.20	-2.70	5
		e"	19.0600	Conductivity (σ):	6.17	6.00	2.89	5

SAR Lab B

Date Tested	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
9/11/2014	Head 2450	e'	39.1500	Relative Permittivity (ϵ_r):	39.15	39.20	-0.13	5
		e"	13.3700	Conductivity (σ):	1.82	1.80	1.19	5
	Head 2410	e'	39.4000	Relative Permittivity (ϵ_r):	39.40	39.28	0.31	5
		e"	13.2900	Conductivity (σ):	1.78	1.76	1.16	5
	Head 2475	e'	39.0000	Relative Permittivity (ϵ_r):	39.00	39.17	-0.43	5
		e"	13.4500	Conductivity (σ):	1.85	1.83	1.31	5
9/11/2014	Body 2450	e'	51.6600	Relative Permittivity (ϵ_r):	51.66	52.70	-1.97	5
		e"	14.5500	Conductivity (σ):	1.98	1.95	1.65	5
	Body 2410	e'	51.8900	Relative Permittivity (ϵ_r):	51.89	52.76	-1.65	5
		e"	14.5200	Conductivity (σ):	1.95	1.91	2.01	5
	Body 2475	e'	51.5200	Relative Permittivity (ϵ_r):	51.52	52.67	-2.18	5
		e"	14.6700	Conductivity (σ):	2.02	1.99	1.70	5

SAR Lab C

Date Tested	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
9/22/2014	Head 835	e'	40.3100	Relative Permittivity (ϵ_r):	40.31	41.50	-2.87	5
		e"	19.4500	Conductivity (σ):	0.90	0.90	0.34	5
	Head 820	e'	40.4900	Relative Permittivity (ϵ_r):	40.49	41.60	-2.67	5
		e"	19.4800	Conductivity (σ):	0.89	0.90	-1.14	5
	Head 850	e'	40.1600	Relative Permittivity (ϵ_r):	40.16	41.50	-3.23	5
		e"	19.4300	Conductivity (σ):	0.92	0.92	0.36	5
9/22/2014	Body 835	e'	53.0300	Relative Permittivity (ϵ_r):	53.03	55.20	-3.93	5
		e"	21.9300	Conductivity (σ):	1.02	0.97	4.97	5
	Body 820	e'	53.0800	Relative Permittivity (ϵ_r):	53.08	55.28	-3.97	5
		e"	21.9800	Conductivity (σ):	1.00	0.97	3.48	5
	Body 850	e'	52.9000	Relative Permittivity (ϵ_r):	52.90	55.16	-4.09	5
		e"	21.8300	Conductivity (σ):	1.03	0.99	4.52	5

SAR Lab F

Date Tested	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
9/19/2014	Body 5180	e'	48.5200	Relative Permittivity (ϵ_r):	48.52	49.05	-1.07	5
		e"	18.7700	Conductivity (σ):	5.41	5.27	2.56	5
	Body 5200	e'	48.5600	Relative Permittivity (ϵ_r):	48.56	49.02	-0.94	5
		e"	18.8100	Conductivity (σ):	5.44	5.29	2.72	5
	Body 5600	e'	47.9900	Relative Permittivity (ϵ_r):	47.99	48.48	-1.01	5
		e"	19.0900	Conductivity (σ):	5.94	5.76	3.18	5
	Body 5800	e'	47.8900	Relative Permittivity (ϵ_r):	47.89	48.20	-0.64	5
		e"	19.1200	Conductivity (σ):	6.17	6.00	2.77	5
	Body 5825	e'	47.8000	Relative Permittivity (ϵ_r):	47.80	48.20	-0.83	5
		e"	19.1300	Conductivity (σ):	6.20	6.00	3.27	5
10/3/2014	Body 5180	e'	47.4400	Relative Permittivity (ϵ_r):	47.44	49.05	-3.28	5
		e"	18.1200	Conductivity (σ):	5.22	5.27	-0.99	5
	Body 5200	e'	47.4500	Relative Permittivity (ϵ_r):	47.45	49.02	-3.20	5
		e"	18.0200	Conductivity (σ):	5.21	5.29	-1.60	5
	Body 5600	e'	46.7200	Relative Permittivity (ϵ_r):	46.72	48.48	-3.63	5
		e"	18.2400	Conductivity (σ):	5.68	5.76	-1.41	5
	Body 5800	e'	46.3600	Relative Permittivity (ϵ_r):	46.36	48.20	-3.82	5
		e"	18.5300	Conductivity (σ):	5.98	6.00	-0.40	5
	Body 5825	e'	46.3400	Relative Permittivity (ϵ_r):	46.34	48.20	-3.86	5
		e"	18.4700	Conductivity (σ):	5.98	6.00	-0.30	5

SAR Lab G

Date Tested	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
9/19/2014	Head 5180	e'	35.2300	Relative Permittivity (ϵ_r):	35.23	36.01	-2.17	5
		e"	15.4100	Conductivity (σ):	4.44	4.63	-4.15	5
	Head 5200	e'	35.2200	Relative Permittivity (ϵ_r):	35.22	35.99	-2.14	5
		e"	15.4600	Conductivity (σ):	4.47	4.65	-3.89	5
	Head 5600	e'	34.7200	Relative Permittivity (ϵ_r):	34.72	35.53	-2.29	5
		e"	15.5600	Conductivity (σ):	4.85	5.06	-4.25	5
	Head 5800	e'	34.5600	Relative Permittivity (ϵ_r):	34.56	35.30	-2.10	5
		e"	15.6000	Conductivity (σ):	5.03	5.27	-4.54	5
	Head 5825	e'	34.5100	Relative Permittivity (ϵ_r):	34.51	35.30	-2.24	5
		e"	15.6400	Conductivity (σ):	5.07	5.27	-3.88	5

SAR Lab H

Date Tested	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
9/9/2014	Body 1900	e'	54.1900	Relative Permittivity (ϵ_r):	54.19	53.30	1.67	5
		e"	14.7400	Conductivity (σ):	1.56	1.52	2.45	5
	Body 1850	e'	54.3800	Relative Permittivity (ϵ_r):	54.38	53.30	2.03	5
		e"	14.7400	Conductivity (σ):	1.52	1.52	-0.25	5
	Body 1910	e'	54.1700	Relative Permittivity (ϵ_r):	54.17	53.30	1.63	5
		e"	14.8000	Conductivity (σ):	1.57	1.52	3.41	5
9/9/2014	Body 1900	e'	54.1900	Relative Permittivity (ϵ_r):	54.19	53.30	1.67	5
		e"	14.7400	Conductivity (σ):	1.56	1.52	2.45	5
	Body 1850	e'	54.3800	Relative Permittivity (ϵ_r):	54.38	53.30	2.03	5
		e"	14.7400	Conductivity (σ):	1.52	1.52	-0.25	5
	Body 1910	e'	54.1700	Relative Permittivity (ϵ_r):	54.17	53.30	1.63	5
		e"	14.8000	Conductivity (σ):	1.57	1.52	3.41	5

10. 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.

10.1. 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	850	1g	9.49	9.43
				10g	6.18	6.21
D1900V2	5d140	4/23/2014	1900	1g	40.1	40.2
				10g	21.0	21.3
D2450V2	748	2/18/2014	2450	1g	51.6	50.7
				10g	24.0	23.7
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	1168	12/12/2013	5200	1g	79.3	75.2
				10g	22.7	21.0
			5600	1g	85.3	80.6
				10g	24.3	22.3
			5800	1g	81.0	75.7
				10g	22.9	20.9

10.2. 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 A

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				
10/6/2014	D5GhzV2 (5.8Ghz)	1003	Head	1g	7.18	7.56	75.6	73.8	2.44	-5.29	1,2
				10g	1.95	2.13	21.3	20.4	4.41		

SAR Lab B

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				
9/11/2014	D2450V2	748	Head	1g	4.97	4.95	49.5	51.6	-4.07	0.40	3,4
				10g	2.13	2.27	22.7	24.0	-5.42		
9/11/2014	D2450V2	748	Body	1g	5.07	5.17	51.7	50.7	1.97	-1.97	
				10g	2.11	2.37	23.7	23.7	0.00		

SAR Lab C

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				
9/22/2014	D835V2	4d002	Head	1g	0.953	0.938	9.38	9.49	-1.16	1.57	
				10g	0.644	0.615	6.15	6.18	-0.49		
9/22/2014	D835V2	4d002	Body	1g	1.000	0.971	9.71	9.43	2.97	2.90	5,6
				10g	0.668	0.638	6.38	6.21	2.74		

SAR Lab F

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					
9/19/2014	D5GHzV2 (5.2GHz)	1003	Body	1g	7.11	7.30	73.0	73.5	-0.68	-2.67	
				10g	1.95	2.08	20.8	20.5	1.46		
9/19/2014	D5GHzV2 (5.5GHz)	1003	Body	1g	7.51	7.98	79.8	79.6	0.25	-6.26	
				10g	2.06	2.27	22.7	22.1	2.71		
9/19/2014	D5GHzV2 (5.8GHz)	1003	Body	1g	6.43	6.84	68.4	73.8	-7.32	-6.38	7,8
				10g	1.76	1.93	19.3	20.4	-5.39		
10/3/2014	D5GHzV2 (5.2GHz)	1003	Body	1g	7.32	7.57	75.7	73.5	2.99	-3.42	
				10g	2.04	2.17	21.7	20.5	5.85		
10/3/2014	D5GHzV2 (5.8GHz)	1003	Body	1g	7.13	7.72	77.2	73.8	4.61	-8.27	
				10g	1.99	2.17	21.7	20.4	6.37		

SAR Lab G

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					
9/19/2014	D5GHzV2 (5.2GHz)	1168	Head	1g	7.77	7.93	79.3	79.3	0.00	-2.06	
				10g	2.15	2.29	22.9	22.7	0.88		
9/19/2014	D5GHzV2 (5.5GHz)	1168	Head	1g	7.99	8.52	85.2	85.3	-0.12	-6.63	
				10g	2.18	2.41	24.1	24.3	-0.82		
9/19/2014	D5GHzV2 (5.8GHz)	1168	Head	1g	7.38	7.93	79.3	81.0	-2.10	-7.45	9,10
				10g	2.02	2.25	22.5	22.9	-1.75		

SAR Lab H

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				
9/9/2014	D1900V2	5d140	Head	1g	4.40	4.16	41.6	40.1	3.74	5.45
				10g	2.27	2.13	21.3	21.0	1.43	
9/9/2014	D1900V2	5d140	Body	1g	4.34	4.24	42.4	40.2	5.47	2.30
				10g	2.21	2.09	20.9	21.3	-1.88	11,12

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

11.1. GSM850

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	
Head	Voice	0	Left Touch	190	836.6	33.0	33.0	0.169	0.169	0.118	0.118	1
			Left Tilt	190	836.6	33.0	33.0	0.112	0.112	0.086	0.086	
			Right Touch	190	836.6	33.0	33.0	0.206	0.206	0.161	0.161	
			Right Tilt	190	836.6	33.0	33.0	0.107	0.107	0.083	0.083	
Head VoIP	GPRS 3 Slots	0	Left Touch	190	836.6	30.5	29.8	0.227	0.267	0.159	0.158	2
			Left Tilt	190	836.6	30.5	29.8	0.140	0.164	0.109	0.108	
			Right Touch	190	836.6	30.5	29.8	0.245	0.288	0.193	0.191	
			Right Tilt	190	836.6	30.5	29.8	0.130	0.153	0.101	0.100	
Body-worn	Voice	10	Rear	190	836.6	33.0	33.0	0.578	0.578	0.384	0.384	3
			Front	190	836.6	33.0	33.0	0.466	0.466	0.298	0.298	
Body-worn(VoIP) & Hotspot	GPRS 3 Slots	10	Rear	128	824.2	30.5	29.7	0.672	0.808	0.398	0.386	4
				190	836.6	30.5	29.8	0.798	0.938	0.462	0.447	
				251	848.8	30.5	29.8	0.792	0.931	0.452	0.438	
			Front	190	836.6	30.5	29.8	0.549	0.645	0.364	0.356	
Hotspot	GPRS 3 Slots	10	Edge 3	190	836.6	30.5	29.8	0.363	0.426	0.190	0.187	
			Edge 4	190	836.6	30.5	29.8	0.183	0.215	0.122	0.121	

11.2. GSM1900

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	
Head	Voice	0	Left Touch	661	1880.0	30.0	30.0	0.011	0.011	0.007	0.007	5
			Left Tilt	661	1880.0	30.0	30.0	0.013	0.013	0.008	0.008	
			Right Touch	661	1880.0	30.0	30.0	0.017	0.017	0.011	0.011	
			Right Tilt	661	1880.0	30.0	30.0	0.008	0.008	0.005	0.005	
Head VoIP	GPRS 3 Slots	0	Left Touch	661	1880.0	27.5	27.3	0.009	0.010	0.006	0.006	6
			Left Tilt	661	1880.0	27.5	27.3	0.011	0.011	0.006	0.006	
			Right Touch	661	1880.0	27.5	27.3	0.016	0.017	0.010	0.010	
			Right Tilt	661	1880.0	27.5	27.3	0.008	0.009	0.005	0.005	
Body-worn	Voice	10	Rear	661	1880.0	30.0	30.0	0.038	0.038	0.020	0.020	7
			Front	661	1880.0	30.0	30.0	0.068	0.068	0.037	0.037	
Body-worn(VoIP) & Hotspot	GPRS 3 Slots	10	Rear	661	1880.0	27.5	27.3	0.037	0.039	0.019	0.019	
			Front	661	1880.0	27.5	27.3	0.054	0.057	0.030	0.030	
Hotspot			Edge 3	661	1880.0	27.5	27.3	0.060	0.063	0.032	0.032	
			Edge 4	661	1880.0	27.5	27.3	0.021	0.022	0.010	0.010	

11.3. W-CDMA Band V

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	
Head	Rel 99 RMC	0	Left Touch	4183	836.6	23.0	23.0	0.110	0.110	0.077	0.077	
			Left Tilt	4183	836.6	23.0	23.0	0.087	0.087	0.068	0.068	
			Right Touch	4183	836.6	23.0	23.0	0.164	0.164	0.128	0.128	9
			Right Tilt	4183	836.6	23.0	23.0	0.104	0.104	0.083	0.083	
Body-worn & Hptspot	Rel 99 RMC	10	Rear	4183	836.6	23.0	23.0	0.420	0.420	0.272	0.272	10
			Front	4183	836.6	23.0	23.0	0.354	0.354	0.227	0.227	
Hotspot	Rel 99 RMC	10	Edge 3	4183	836.6	23.0	23.0	0.228	0.228	0.118	0.118	11
			Edge 4	4183	836.6	23.0	23.0	0.106	0.106	0.071	0.071	

11.4. W-CDMA Band II

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	
Head	Rel 99 RMC	0	Left Touch	9400	1880.0	23.0	23.0	0.022	0.022	0.015	0.015	
			Left Tilt	9400	1880.0	23.0	23.0	0.027	0.027	0.015	0.015	
			Right Touch	9400	1880.0	23.0	23.0	0.039	0.039	0.024	0.024	12
			Right Tilt	9400	1880.0	23.0	23.0	0.011	0.011	0.007	0.007	
Body-worn & Hotspot	Rel 99 RMC	10	Rear	9400	1880.0	23.0	23.0	0.135	0.135	0.068	0.068	13
			Front	9400	1880.0	23.0	23.0	0.105	0.105	0.064	0.064	
Hotspot	Rel 99 RMC	10	Edge 3	9400	1880.0	23.0	23.0	0.148	0.148	0.082	0.082	14
			Edge 4	9400	1880.0	23.0	23.0	0.042	0.042	0.022	0.022	

11.5. Wi-Fi (DTS Band)

Freq. 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	17.5	17.5	0.573	0.573	0.278	0.278	15
				Left Tilt	6	2437.0	17.5	17.5	0.535	0.535	0.220	0.220	
				Right Touch	6	2437.0	17.5	17.5	0.387	0.387	0.184	0.184	
				Right Tilt	6	2437.0	17.5	17.5	0.401	0.401	0.177	0.177	
	Body-worn, Hotspot, & Wi-Fi Direct	802.11b 1 Mbps	10	Rear	6	2437.0	17.5	17.5	0.116	0.116	0.060	0.060	
				Front	6	2437.0	17.5	17.5	0.141	0.141	0.070	0.070	16
	Hotspot & Wi-Fi Direct	802.11b 1 Mbps	10	Edge 1	6	2437.0	17.5	17.5	0.119	0.119	0.049	0.049	
				Edge 2	6	2437.0	17.5	17.5	0.033	0.033	0.015	0.015	

11.6. Wi-Fi (UNII Band)

Freq. 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	13.5	13.5	0.268	0.268	0.068	0.068	17
				Left Tilt	36	5180.0	13.5	13.5	0.219	0.219	0.052	0.052	
				Right Touch	36	5180.0	13.5	13.5	0.083	0.083	0.023	0.023	
				Right Tilt	36	5180.0	13.5	13.5	0.073	0.073	0.019	0.019	
	Body-worn & Wi-Fi Direct	802.11a 6 Mbps	10	Rear	36	5180.0	13.5	13.5	0.066	0.066	0.036	0.036	18
				Front	36	5180.0	13.5	13.5	0.065	0.065	0.030	0.030	
	Wi-Fi Direct	802.11a 6 Mbps	10	Edge 1	36	5180.0	13.5	13.5	0.014	0.014	0.005	0.005	
				Edge 2	36	5180.0	13.5	13.5	0.005	0.005	0.001	0.001	
Freq. 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	
5.3 GHz (U-NII-2 A)	Head	802.11a 6 Mbps	0	Left Touch	52	5260.0	13.5	13.5	0.280	0.280	0.068	0.068	19
				Left Tilt	52	5260.0	13.5	13.5	0.205	0.205	0.048	0.048	
				Right Touch	52	5260.0	13.5	13.5	0.105	0.105	0.030	0.030	
				Right Tilt	52	5260.0	13.5	13.5	0.075	0.075	0.018	0.018	
	Body-worn	802.11a 6 Mbps	10	Rear	52	5260.0	13.5	13.5	0.102	0.102	0.037	0.037	20
				Front	52	5260.0	13.5	13.5	0.070	0.070	0.028	0.028	
Freq. 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	
5.5 GHz (U-NII-2 C)	Head	802.11a 6 Mbps	0	Left Touch	104	5520.0	13.5	13.5	0.232	0.232	0.052	0.052	21
				Left Tilt	104	5520.0	13.5	13.5	0.226	0.226	0.051	0.051	
				Right Touch	104	5520.0	13.5	13.5	0.147	0.147	0.040	0.040	
				Right Tilt	104	5520.0	13.5	13.5	0.100	0.100	0.025	0.025	
	Body-worn	802.11a 6 Mbps	10	Rear	104	5520.0	13.5	13.5	0.046	0.046	0.027	0.027	22
				Front	104	5520.0	13.5	13.5	0.041	0.041	0.023	0.023	
Freq. 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	
5.8 GHz (U-NII-3)	Head	802.11a 6 Mbps	0	Left Touch	157	5785.0	13.5	13.5	0.364	0.364	0.074	0.074	23
				Left Tilt	157	5785.0	13.5	13.5	0.261	0.261	0.053	0.053	
				Right Touch	157	5785.0	13.5	13.5	0.159	0.159	0.037	0.037	
				Right Tilt	157	5785.0	13.5	13.5	0.132	0.132	0.032	0.032	
	Body-worn, Hotspot, & Wi-Fi Direct	802.11a 6 Mbps	10	Rear	157	5785.0	13.5	13.5	0.031	0.031	0.021	0.021	
				Front	157	5785.0	13.5	13.5	0.035	0.035	0.023	0.023	24
	Hotspot	802.11a 6 Mbps	10	Edge 1	149	5745.0	13.5	13.5	0.014	0.014	0.004	0.004	
				Edge 2	149	5745.0	13.5	13.5	<0.001	<0.001	<0.001	<0.001	
	Wi-Fi Direct	802.11a 6 Mbps	10	Edge 1	157	5785.0	13.5	13.5	0.002	0.002	0.001	0.001	
				Edge 2	157	5785.0	13.5	13.5	<0.001	<0.001	<0.001	<0.001	

11.7. Bluetooth

11.7.1. Standalone SAR Test Exclusion Considerations

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

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

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

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

Body-worn Accessory Exposure Conditions

Max. tune-up tolerance limit		Min. test separation distance (mm)	Frequency (GHz)	Result
(dBm)	(mW)			
12.5	18	10	2.480	2.8

Conclusion:

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

11.7.2. Estimated SAR

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

- $(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f_{(\text{GHz})}/x}]$ W/kg for test separation distances ≤ 50 mm; where $x = 7.5$ for 1-g SAR, and $x = 18.75$ for 10-g SAR.
- 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is > 50 mm.

Estimated SAR Result for Body-worn Accessory Conditions:

Test Configuration	Max. tune-up tolerance limit (mW)	Min. test separation distance (mm)	Frequency (GHz)	Estimated 1-g SAR (W/kg)
Rear/Front	18	10	2.480	0.378

12. 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 ($\sim 10\%$ 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 .

12.1. The Highest Measured SAR Configuration in Each Frequency Band

N/A

12.2. Repeated Measurement Results

Head

N/A

Body-worn Accessory

N/A

Wireless Router (Hotspot)

N/A

13. 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:

SAR₁ 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

SAR₂ 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:

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

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

RF Exposure conditions	Test Position	Simultaneous Transmission Scenario				Σ 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	0.267	0.573		0.840	No
		① + ③	0.267	0.364		0.631	No
	Left Tilt	① + ②	0.164	0.535		0.699	No
		① + ③	0.164	0.261		0.425	No
	Right Touch	① + ②	0.288	0.387		0.675	No
		① + ③	0.288	0.159		0.447	No
	Right Tilt	① + ②	0.153	0.401		0.554	No
		① + ③	0.153	0.132		0.285	No
Body-worn Accessory & Hotspot	Rear	① + ②	0.938	0.116		1.054	No
		① + ③	0.938	0.102		1.040	No
		① + ④	0.938		0.378	1.316	No
	Front	① + ②	0.645	0.141		0.786	No
		① + ③	0.645	0.070		0.715	No
		① + ④	0.645		0.378	1.023	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.

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

RF Exposure conditions	Test Position	Simultaneous Transmission Scenario				Σ 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	0.011	0.573		0.584	No
		① + ③	0.011	0.364		0.375	No
	Left Tilt	① + ②	0.013	0.535		0.548	No
		① + ③	0.013	0.261		0.274	No
	Right Touch	① + ②	0.017	0.387		0.404	No
		① + ③	0.017	0.159		0.176	No
	Right Tilt	① + ②	0.009	0.401		0.410	No
		① + ③	0.009	0.132		0.141	No
Body-worn Accessory & Hotspot	Rear	① + ②	0.039	0.116		0.155	No
		① + ③	0.039	0.102		0.141	No
		① + ④	0.039		0.378	0.417	No
	Front	① + ②	0.068	0.141		0.209	No
		① + ③	0.068	0.070		0.138	No
		① + ④	0.068		0.378	0.446	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.

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

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① WCDMA V	② Wi-Fi(DTS)	③ Wi-Fi(UNII)	④ Bluetooth		
Head	Left Touch	① + ②	0.110	0.573			0.683	No
		① + ③	0.110		0.364		0.474	No
	Left Tilt	① + ②	0.087	0.535			0.622	No
		① + ③	0.087		0.261		0.348	No
	Right Touch	① + ②	0.164	0.387			0.551	No
		① + ③	0.164		0.159		0.323	No
	Right Tilt	① + ②	0.104	0.401			0.505	No
		① + ③	0.104		0.132		0.236	No
Body-worn Accessory & Hotspot	Rear	① + ②	0.420	0.116			0.536	No
		① + ③	0.420		0.102		0.522	No
		① + ④	0.420			0.378	0.798	No
	Front	① + ②	0.354	0.141			0.495	No
		① + ③	0.354		0.070		0.424	No
		① + ④	0.354			0.378	0.732	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.

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

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① WCDMA II	② Wi-Fi(DTS)	③ Wi-Fi(UNII)	④ Bluetooth		
Head	Left Touch	① + ②	0.022	0.573			0.595	No
		① + ③	0.022		0.364		0.386	No
	Left Tilt	① + ②	0.027	0.535			0.562	No
		① + ③	0.027		0.261		0.288	No
	Right Touch	① + ②	0.039	0.387			0.426	No
		① + ③	0.039		0.159		0.198	No
	Right Tilt	① + ②	0.011	0.401			0.412	No
		① + ③	0.011		0.132		0.143	No
Body-worn Accessory & Hotspot	Rear	① + ②	0.135	0.116			0.251	No
		① + ③	0.135		0.102		0.237	No
		① + ④	0.135			0.378	0.513	No
	Front	① + ②	0.105	0.141			0.246	No
		① + ③	0.105		0.070		0.175	No
		① + ④	0.105			0.378	0.483	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.

14. Appendixes

Refer to separated files for the following appendixes.

- 14.1. Photos and Antenna Locations
- 14.2. System Performance Check Plots
- 14.3. Highest SAR Test Plots
- 14.4. Calibration Certificate for E-Field Probe EX3DV4 - SN 3749
- 14.5. Calibration Certificate for E-Field Probe EX3DV4 - SN 3751
- 14.6. Calibration Certificate for E-Field Probe EX3DV4 - SN 3686
- 14.7. Calibration Certificate for E-Field Probe EX3DV4 - SN 3990
- 14.8. Calibration Certificate for E-Field Probe EX3DV4 - SN 3936
- 14.9. Calibration Certificate for E-Field Probe EX3DV4 - SN 3772
- 14.10. Calibration Certificate for D835V2 - SN 4d002
- 14.11. Calibration Certificate for D1900V2 - SN 5d140
- 14.12. Calibration Certificate for D2450V2 - SN 748
- 14.13. Calibration Certificate for D5GHzV2 - SN 1003
- 14.14. Calibration Certificate for D5GHzV2 - SN 1168
- 14.15. Tissue Material Ingredients

END OF REPORT