SAR EVALUATION REPORT

FCC 47 CFR § 2.1093
IEEE Std 1528-2013

The model FCC ID: A3LSMG360GY shares the same enclosure and circuit board as model FCC ID: A3LSMG360G. 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: A3LSMG360G is considered representative for FCC ID: A3LSMG360GY.

For
GSM/WCDMA/LTE Phone + Bluetooth and WLAN 2.4GHz b/g/n

FCC ID: A3LSMG360GY
Model Name: SM-G360GY

Report Number: 14I19572-S1
Issue Date: 12/16/2014

Prepared for
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Date	Revisions	Revised By
--	12/16/2014	Initial Issue	--

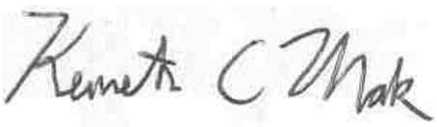
Table of Contents

1. Attestation of Test Results

Applicant Name		Samsung Electronics Co., Ltd.			
FCC ID		A3LSMG360GY			
Model Name		SM-G360GY			
Applicable Standards		FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013			
SAR Limits (W/Kg)					
Exposure Category		Peak spatial-average (1g of tissue)		Extremities (hands, wrists, ankles, etc.) (10g of tissue)	
General population / Uncontrolled exposure		1.6		4	
The Highest Reported SAR (W/kg)					
RF Exposure Conditions		**Equipment Class**			
		Licensed	**DTS**	**U-NII**	**DSS (BT)**
Head		0.588	0.078	N/A	N/A
Body-worn*		1.059	0.062	N/A	N/A
Hotspot/Wi-Fi Direct		1.074	0.062	N/A	N/A
Simultaneous TX	Head	0.634	0.634	N/A	N/A
	Body-worn*	1.133	1.133	N/A	N/A
	Hotspot/ Wi-Fi Direct	1.133	1.133	N/A	N/A
Note: The Body-worn minimum separation distance is 15 mm. To cover both body-worn and hotspot RF exposure conditions testing was performed at a separation distance of 10 mm.					
Date Tested		9/17/2014 to 9/18/2014; 12/8/2014 to 12/12/2014;			
Test Results		Pass			

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.	Kenneth Mak Laboratory Engineer 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 1528-2013, the following FCC Published RF exposure KDB procedures:

- 248227 D01 SAR Meas for 802 11abg v01r02
- 447498 D01 General RF Exposure Guidance v05r02
- 447498 D03 Supplement C Cross-Reference
- 648474 D04 Handset SAR v01r02
- 690783 D01 SAR Listings on Grants v01r03
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r03
- 865664 D02 RF Exposure Reporting v01r01
- 941225 D01 3G SAR Procedures v03
- 941225 D05 SAR for LTE Devices v02r03
- 941225 D06 Hotspot Mode v02

3. Facilities and Accreditation

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

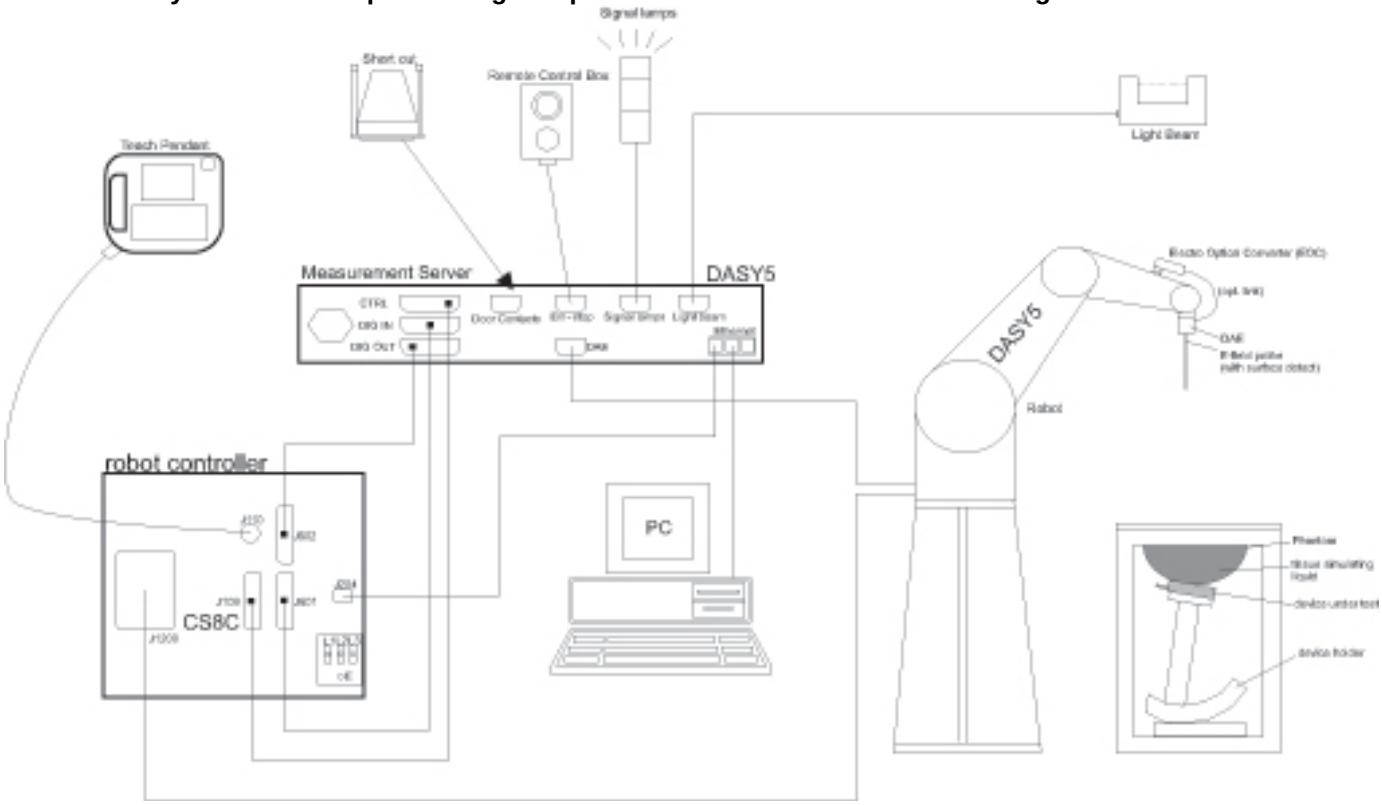
47173 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 3
SAR Lab D	SAR Lab 4
SAR Lab E	SAR Lab 5
SAR Lab F	
SAR Lab G	
SAR Lab H	

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 Procedures

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

Step 3: Zoom Scan

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

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

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	≤ 1.5·$\Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.

* When zoom scan is required and the *reported* SAR from the area scan based *1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

Step 4: Power drift measurement

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

Step 5: Z-Scan (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	Traceable Calibration Control Co.	4242	122529162	10/8/2015
Network Analyzer	Agilent	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	EXTECH	445703	CCS-200	3/24/2015

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	HP	437B	3125U11364	8/27/2015
Power Meter	HP	437B	3125U12345	8/15/2015
Power Sensor	HP	8481A	1926A27048	8/15/2015
Power Sensor	HP	8481A	2702A76223	9/17/2015
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
Synthesized Signal Generator	Agilent	8665B	3438A00633	8/29/2015
Power Meter	HP	438A	2822A05684	10/10/2104
Power Sensor	Agilent	8481A	2349A36506	9/30/2014
Power Sensor	Agilent	8481A	2237A31744	10/2/2014
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1808939	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2710	N/A
DC Power Supply	HP	6296A	2841A-05955	N/A
E-Field Probe	SPEAG	EX3DV4	3936	7/24/2015
E-Field Probe	SPEAG	EX3DV3	3531	11/21/2014
E-Field Probe	SPEAG	EX3DV4	3686	3/18/2015
Data Acquisition Electronics	SPEAG	DAE4	1239	4/15/2015
Data Acquisition Electronics	SPEAG	DAE4	1359	2/17/2015
Data Acquisition Electronics	SPEAG	DAE4	1258	5/15/2015
System Validation Dipole	SPEAG	D835V2	4d117	5/16/2015
System Validation Dipole	SPEAG	D1900V2	5d140	4/23/2015
System Validation Dipole	SPEAG	D2450V2	706	5/20/2015

Others

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Power Meter	Agilent	N1912A	MY53040015	7/10/2015
Power Sensor	Agilent	N1921A	MY52020011	5/6/2015
Base Station Simulator	Agilent	8960	MY53211024	9/19/2015
Base Station Simulator	R & S	CMW500	135390-WS	7/3/2015

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 1528-2013 is not required in SAR reports submitted for equipment approval.

6. Device Under Test (DUT) Information

6.1. DUT Description

Device Dimension	Overall (Length x Width): 131 mm x 69 mm Overall Diagonal: 140 mm Display Diagonal: 116 mm
Battery Back Cover	☒ Normal Battery Cover ☐ Normal Battery Cover with NFC ☐ Wireless Charger Battery Cover ☐ Wireless Charger Battery Cover with NFC ☐ The rechargeable battery is not user accessible.
Battery Options	☒ Standard – Lithium-ion battery, Rating 3.85Vdc, 7.70Wh ☐ Extended (large capacity) ☐ 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)
SIM Information	☒ Single SIM ☐ Dual SIM

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%; (E)GPRS: 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. 7) HSUPA (Rel. 6) DC-HSDPA (Rel. 8) HSPA+ (Rel. 6)	100%
LTE (FDD)	Band 5	QPSK 16QAM	100%
	Does this device SV-LTE (1xRTT-LTE)? ☐Yes ☒ No		
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20)	100%
Bluetooth	2.4 GHz	Version 4.0 LE	N/A

6.3. Nominal and Maximum Output Power

KDB 447498 sec.4.1.(3) at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit

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	29.5	**30.0**
	GPRS 4 slots	28.0	**28.5**
	EGPRS 1 slot	27.0	**27.5**
	EGPRS 2 slots	26.0	**26.5**
	EGPRS 3 slots	23.0	**23.5**
	EGPRS 4 slots	21.0	**21.5**
GSM1900	Voice	29.5	**30.0**
	GPRS 1 slot	29.5	**30.0**
	GPRS 2 slots	28.5	**29.0**
	GPRS 3 slots	26.5	**27.0**
	GPRS 4 slots	25.0	**25.5**
	EGPRS 1 slot	26.0	**26.5**
	EGPRS 2 slots	25.0	**25.5**
	EGPRS 3 slots	22.0	**22.5**
	EGPRS 4 slots	20.0	**20.5**
W-CDMA Band V	R99	22.0	**22.5**
	HSDPA	21.0	**21.5**
	HSUPA	21.5	**22.0**
	DC-DSPA	21.0	**21.5**
LTE Band 5	QPSK	22.5	**23.0**

Dual Transfer Mode

RF Air interface	Mode			Full Power		
				Target (dBm)	Tolerance(dB)	Max. Tune-up Limit (dBm)
GSM 850	GSM (Voice) + GPRS(Data)	Tx Slot 1	CS	32.5	-15 ~ 0.5	**33.0**
		Tx Slot 2	CS	315	-15 ~ 0.5	**32.0**
			PS	315	-15 ~ 0.5	**32.0**
		Tx Slot 3	CS	29.2	-15 ~ 0.5	**29.7**
			PS	29.2	-15 ~ 0.5	**29.7**
	GSM (Voice) + EGPRS(Data)	Tx Slot 1	CS	32.5	-15 ~ 0.5	**33.0**
		Tx Slot 2	CS	315	-15 ~ 0.5	**32.0**
			PS	315	-15 ~ 0.5	**32.0**
		Tx Slot 3	CS	29.5	-15 ~ 0.5	**30.0**
			PS	29.5	-15 ~ 0.5	**30.0**
GSM 1900	GSM (Voice) + GPRS(Data)	Tx Slot 1	CS	29.5	-15 ~ 0.5	**30.0**
		Tx Slot 2	CS	28.5	-15 ~ 0.5	**29.0**
			PS	28.5	-15 ~ 0.5	**29.0**
		Tx Slot 3	CS	26.2	-15 ~ 0.5	**26.7**
			PS	26.2	-15 ~ 0.5	**26.7**
	GSM (Voice) + EGPRS(Data)	Tx Slot 1	CS	29.5	-15 ~ 0.5	**30.0**
		Tx Slot 2	CS	28.5	-15 ~ 0.5	**29.0**
			PS	28.5	-15 ~ 0.5	**29.0**
		Tx Slot 3	CS	26.2	-15 ~ 0.5	**26.7**
			PS	26.2	-15 ~ 0.5	**26.7**

Note: CS : circuit switched PS : packet switched

Upper limit (dB): 0.5		RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
WiFi 2.4 GHz	802.11b	16.0	**16.5**
	802.11g	13.1	**13.6**
	802.11n HT20	12.2	**12.7**
Bluetooth		6.8	**7.3**
Bluetooth LE		0.5	**1.0**

6.4. General LTE SAR Test and Reporting Considerations

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>Frequency range, Channel Bandwidth, Numbers and Frequencies</td><td>
<table>
<tr><td rowspan="3">Band 5</td><td colspan="6">Frequency range: 824 - 849 MHz</td></tr>
<tr><td colspan="6">Channel Bandwidth</td></tr>
<tr><td>20 MHz</td><td>15 MHz</td><td>10 MHz</td><td>5 MHz</td><td>3 MHz</td><td>1.4 MHz</td></tr>
<tr><td>Low</td><td></td><td></td><td>20450/ 829</td><td>20425/ 826.5</td><td>20415/ 825.5</td><td>20407/ 824.7</td></tr>
<tr><td>Mid</td><td></td><td></td><td>20525/ 836.5</td><td>20525/ 836.5</td><td>20525/ 836.5</td><td>20525/ 836.5</td></tr>
<tr><td>High</td><td></td><td></td><td>20600/ 844</td><td>20625/ 846.5</td><td>20635/ 847.5</td><td>20643/ 848.3</td></tr>
</table>
</td></tr>
<tr><td>LTE transmitter and antenna implementation</td><td>LTE has one (1) TX/RX antennas
Refer to Appendix A. Photos and Antenna Locations.</td></tr>
<tr><td>Maximum power reduction (MPR)</td><td>
Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3
<table>
<tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (RB)</th><th rowspan="2">MPR (dB)</th></tr>
<tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr>
<tr><td>QPSK</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 2</td></tr>
</table>
MPR Built-in by design
A-MPR (additional MPR) was disabled during SAR testing
</td></tr>
<tr><td>Power reduction</td><td>No</td></tr>
<tr><td>Spectrum plots for RB configurations</td><td>A properly configured base station simulator was used for the SAR and power measurements; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.</td></tr>
</table>

7. RF Exposure Conditions (Test Configurations)

Refer to “SAR Photos and Ant locations” Appendix for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

Wireless technologies	RF Exposure Conditions	DUT-to-User Separation	Test Position	Antenna-to-edge/surface	SAR Required	Note
WWAN	Head	0 mm	Left Touch	N/A	Yes	
			Left Tilt (15°)	N/A	Yes	
			Right Touch	N/A	Yes	
			Right Tilt (15°)	N/A	Yes	
	Body	15 mm	Rear	N/A	Yes	2
			Front	N/A	Yes	2
	Hotspot	10 mm	Rear	< 25 mm	Yes	
			Front	< 25 mm	Yes	
			Edge 1 (Top)	> 25 mm	No	1
			Edge 2 (Right)	< 25 mm	Yes	
			Edge 3 (Bottom)	< 25 mm	Yes	
			Edge 4 (Left)	< 25 mm	Yes	
WLAN	Head	0 mm	Left Touch	N/A	Yes	
			Left Tilt (15°)	N/A	Yes	
			Right Touch	N/A	Yes	
			Right Tilt (15°)	N/A	Yes	
	Body	15 mm	Rear	N/A	Yes	2
			Front	N/A	Yes	2
	Hotspot / Wi-Fi Direct	10 mm	Rear	< 25 mm	Yes	
			Front	< 25 mm	Yes	
			Edge 1 (Top)	> 25 mm	No	1
			Edge 2 (Right)	> 25 mm	No	1
			Edge 3 (Bottom)	> 25 mm	No	1
			Edge 4 (Left)	< 25 mm	Yes	

Notes:

1. SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR.
2. The Body-worn minimum separation distance is 15 mm. To cover both body-worn and hotspot RF exposure conditions testing was performed at a separation distance of 10 mm.

8. Dielectric Property Measurements & System Check

8.1. 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.

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

Dielectric Property Measurements Results:

SAR Lab 2

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
9/17/2014	Head 2450	e'	39.3400	Relative Permittivity (ϵ_r):	39.34	39.20	0.36	5
		e''	13.3800	Conductivity (σ):	1.82	1.80	1.26	5
	Head 2410	e'	39.5100	Relative Permittivity (ϵ_r):	39.51	39.28	0.59	5
		e''	13.2400	Conductivity (σ):	1.77	1.76	0.78	5
	Head 2475	e'	39.3100	Relative Permittivity (ϵ_r):	39.31	39.17	0.36	5
		e''	13.4800	Conductivity (σ):	1.86	1.83	1.54	5
9/17/2014	Body 2450	e'	50.3100	Relative Permittivity (ϵ_r):	50.31	52.70	-4.54	5
		e''	14.8400	Conductivity (σ):	2.02	1.95	3.67	5
	Body 2410	e'	50.4400	Relative Permittivity (ϵ_r):	50.44	52.76	-4.40	5
		e''	14.7200	Conductivity (σ):	1.97	1.91	3.41	5
	Body 2475	e'	50.3400	Relative Permittivity (ϵ_r):	50.34	52.67	-4.42	5
		e''	14.9200	Conductivity (σ):	2.05	1.99	3.43	5

SAR Lab F

	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
12/9/2014	Head 835	e'	41.2400	Relative Permittivity (ϵ_r):	41.24	41.50	-0.63	5
		e''	19.3200	Conductivity (σ):	0.90	0.90	-0.33	5
	Head 820	e'	41.3600	Relative Permittivity (ϵ_r):	41.36	41.60	-0.58	5
		e''	19.4100	Conductivity (σ):	0.88	0.90	-1.50	5
	Head 850	e'	41.0900	Relative Permittivity (ϵ_r):	41.09	41.50	-0.99	5
		e''	19.1500	Conductivity (σ):	0.91	0.92	-1.08	5
12/9/2014	Body 835	e'	54.3100	Relative Permittivity (ϵ_r):	54.31	55.20	-1.61	5
		e''	20.7700	Conductivity (σ):	0.96	0.97	-0.59	5
	Body 820	e'	54.3900	Relative Permittivity (ϵ_r):	54.39	55.28	-1.60	5
		e''	20.9500	Conductivity (σ):	0.96	0.97	-1.37	5
	Body 850	e'	54.1700	Relative Permittivity (ϵ_r):	54.17	55.16	-1.79	5
		e''	20.5700	Conductivity (σ):	0.97	0.99	-1.51	5

SAR Lab H

	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
12/8/2014	Head 1900	e'	39.8800	Relative Permittivity (ϵ_r):	39.88	40.00	-0.30	5
		e''	13.4100	Conductivity (σ):	1.42	1.40	1.19	5
	Head 1850	e'	40.0900	Relative Permittivity (ϵ_r):	40.09	40.00	0.23	5
		e''	13.0600	Conductivity (σ):	1.34	1.40	-4.04	5
	Head 1910	e'	39.9000	Relative Permittivity (ϵ_r):	39.90	40.00	-0.25	5
		e''	13.4500	Conductivity (σ):	1.43	1.40	2.03	5
12/8/2014	Body 1900	e'	51.3700	Relative Permittivity (ϵ_r):	51.37	53.30	-3.62	5
		e''	14.5900	Conductivity (σ):	1.54	1.52	1.41	5
	Body 1850	e'	51.5900	Relative Permittivity (ϵ_r):	51.59	53.30	-3.21	5
		e''	14.1800	Conductivity (σ):	1.46	1.52	-4.04	5
	Body 1910	e'	51.3700	Relative Permittivity (ϵ_r):	51.37	53.30	-3.62	5
		e''	14.6500	Conductivity (σ):	1.56	1.52	2.36	5

8.2. System Check

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

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	4d117	5/16/2014	835	1g	9.23	9.61
				10g	5.98	6.31
D1900V2	5d140	4/23/2014	1900	1g	40.1	40.2
				10g	21.0	21.3
D2450V2	706	5/20/2014	2450	1g	53.0	50.2
				10g	24.5	23.4

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 2

Date Tested	System Dipole		T.S. Liquid		Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #			Zoom Scan to 100 mW	Normalize to 1 W			
9/18/2014	D2450V2	706	Head	1g	5.13	51.3	53.0	-3.21	
				10g	2.52	25.2	24.5	2.86	
9/17/2014	D2450V2	706	Body	1g	5.19	51.9	50.2	3.39	1,2
				10g	2.57	25.7	23.4	9.83	

SAR Lab F

Date Tested	System Dipole		T.S. Liquid		Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #			Zoom Scan to 100 mW	Normalize to 1 W			
12/9/2014	D835V2	4d117	Head	1g	0.946	9.46	9.23	2.49	3,4
				10g	0.618	6.18	5.98	3.34	
12/9/2014	D835V2	4d117	Body	1g	0.967	9.67	9.61	0.62	
				10g	0.636	6.36	6.31	0.79	

SAR Lab H

Date Tested	System Dipole		T.S. Liquid		Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #			Zoom Scan to 100 mW	Normalize to 1 W			
12/8/2014	D1900V2	5d140	Head	1g	3.85	38.5	40.1	-3.99	5,6
				10g	2.00	20.0	21.0	-4.76	
12/8/2014	D1900V2	5d140	Body	1g	4.03	40.3	40.2	0.25	
				10g	2.09	20.9	21.3	-1.88	

9. Conducted Output Power Measurements

9.1. GSM

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	32.0	23.0
				190	836.6	32.1	23.1
				251	848.8	32.1	23.1
	GPRS (GMSK)	CS1	1	128	824.2	32.0	23.0
				190	836.6	32.1	23.1
				251	848.8	32.1	23.1
			2	128	824.2	31.5	25.5
				190	836.6	31.5	25.5
				251	848.8	31.5	25.5
			3	128	824.2	29.9	25.6
				190	836.6	30.0	25.7
				251	848.8	30.0	25.7
			4	128	824.2	28.5	25.5
				190	836.6	28.5	25.5
				251	848.8	28.5	25.5
	EGPRS (8PSK)	MCS5	1	128	824.2	26.3	17.3
				190	836.6	26.3	17.3
				251	848.8	26.3	17.3
			2	128	824.2	25.8	19.8
				190	836.6	26.0	20.0
				251	848.8	25.9	19.9
			3	128	824.2	21.5	17.2
				190	836.6	21.5	17.2
				251	848.8	21.5	17.2
			4	128	824.2	20.5	17.5
				190	836.6	20.7	17.7
				251	848.8	20.7	17.7

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	29.0	20.0
				661	1880.0	29.0	20.0
				810	1909.8	28.9	19.9
	GPRS (GMSK)	CS1	1	512	1850.2	29.1	20.0
				661	1880.0	29.0	20.0
				810	1909.8	28.9	19.9
			2	512	1850.2	28.7	22.7
				661	1880.0	28.5	22.5
				810	1909.8	28.5	22.5
			3	512	1850.2	26.7	22.4
				661	1880.0	26.5	22.3
				810	1909.8	26.7	22.5
			4	512	1850.2	25.2	22.2
				661	1880.0	25.0	22.0
				810	1909.8	25.1	22.0
	EGPRS (8PSK)	MCS5	1	512	1850.2	25.3	16.3
				661	1880.0	25.1	16.1
				810	1909.8	25.2	16.2
			2	512	1850.2	24.9	18.8
				661	1880.0	24.6	18.6
				810	1909.8	24.7	18.7
			3	512	1850.2	20.5	16.2
				661	1880.0	20.5	16.2
				810	1909.8	20.5	16.2
			4	512	1850.2	18.5	15.5
				661	1880.0	18.5	15.5
				810	1909.8	18.5	15.5

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 2 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

GSM850 DTM Measured Results

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Full Pwr			
						CS		PS	
						Burst (dBm)	Frame (dBm)	Burst (dBm)	Frame (dBm)
850	GSM(Voice) + GPRS(GMSK)	CS1	1	128	824.2	32.0	23.0		
				190	836.6	32.1	23.1		
				251	848.8	32.1	23.1		
			2	128	824.2	31.9	25.9	31.6	25.6
				190	836.6	32.0	26.0	31.7	25.7
				251	848.8	32.0	26.0	31.8	25.8
			3	128	824.2	29.5	25.2	29.3	25.0
				190	836.6	29.7	25.4	29.5	25.2
				251	848.8	29.7	25.4	29.5	25.2
	GSM(Voice) + EGPRS(8PSK)	MCS5	1	128	824.2	32.0	23.0		
				190	836.6	32.1	23.1		
				251	848.8	32.1	23.1		
			2	128	824.2	31.8	25.8	26.0	20.0
				190	836.6	32.0	26.0	26.0	20.0
				251	848.8	32.0	26.0	26.0	20.0
			3	128	824.2	29.7	25.4	20.3	16.0
				190	836.6	29.8	25.5	20.6	16.3
				251	848.8	29.9	25.6	20.6	16.3

Notes:

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

- Head, Body-worn Accessory & Hotspot mode: GMSK Voice Mode + GMSK (GPRS) mode with 2 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 DTM Measured Results

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Full Pwr			
						CS		PS	
						Burst (dBm)	Frame (dBm)	Burst (dBm)	Frame (dBm)
1900	GSM(Voice) + GPRS(GMSK)	CS1	1	512	1850.2	29.0	20.0		
				661	1880.0	29.0	20.0		
				810	1909.8	28.9	19.9		
			2	512	1850.2	28.9	22.9	28.8	22.8
				661	1880.0	28.7	22.7	28.6	22.6
				810	1909.8	28.8	22.8	28.7	22.7
			3	512	1850.2	26.7	22.4	26.5	22.2
				661	1880.0	26.5	22.2	26.4	22.1
				810	1909.8	26.7	22.4	26.6	22.3
	GSM(Voice) + EGPRS(8PSK)	MCS5	1	512	1850.2	29.0	20.0		
				661	1880.0	29.0	20.0		
				810	1909.8	28.9	19.9		
			2	512	1850.2	28.8	22.8	25.0	19.0
				661	1880.0	28.7	22.7	24.5	18.5
				810	1909.8	28.8	22.8	24.6	18.6
			3	512	1850.2	26.7	22.4	19.0	14.7
				661	1880.0	26.6	22.3	19.0	14.7
				810	1909.8	26.7	22.4	19.0	14.7

Notes:

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

- Head, Body-worn Accessory & Hotspot mode: GMSK Voice Mode + GMSK (GPRS) mode with 2 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

9.2. W-CDMA

Release 99 Setup Procedures used to establish the test signals

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 2
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	βc/βd	8/15

HSDPA Setup Procedures used to establish the test signals

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-Set 1			
	Power Control Algorithm	Algorithm 2			
	βc	2/15	11/15	15/15	15/15
	βd	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	βc/βd	2/15	12/15	15/8	15/4
	βhs	4/15	24/15	30/15	30/15
	MPR (dB)	0	0	0.5	0.5
HSDPA Specific Settings	D_{ACK}	8			
	D_{NAK}	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
	Ahs=βhs/βc	30/15			

For the E-MPR setting, the table below was used referencing from 3GPP TS34.121-1 version 11.1.1 Release 11 specification.

Table 5.2B.5: Maximum Output Powers with HS-DPCCH and E-DCH for test

Sub-test in table C.11.1.3	Power Class 3		Power Class 4	
	Power (dBm)	Tol (dB)	Power (dBm)	Tol (dB)
1	+24	+1.7/-6.7	+21	+2.7/-5.7
2	+22	+3.7/-5.2	+19	+4.7/-4.2
3	+23	+2.7/-5.2	+20	+3.7/-4.2
4	+22	+3.7/-5.2	+19	+4.7/-4.2
5	+24	+1.7/-3.7	+21	+2.7/-2.7

HSPA (HSDPA & HSUPA) Setup Procedures used to establish the test signals

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

For the E-MPR setting, the table below was used referencing from 3GPP TS34.121-1 version 11.1.1 Release 11 specification.

Table 5.2B.5: Maximum Output Powers with HS-DPCCH and E-DCH for test

Sub-test in table C.11.1.3	Power Class 3		Power Class 4	
	Power (dBm)	Tol (dB)	Power (dBm)	Tol (dB)
1	+24	+1.7/-6.7	+21	+2.7/-5.7
2	+22	+3.7/-5.2	+19	+4.7/-4.2
3	+23	+2.7/-5.2	+20	+3.7/-4.2
4	+22	+3.7/-5.2	+19	+4.7/-4.2
5	+24	+1.7/-3.7	+21	+2.7/-2.7

DC-HSDPA Setup Procedures used to establish the test signals

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.		

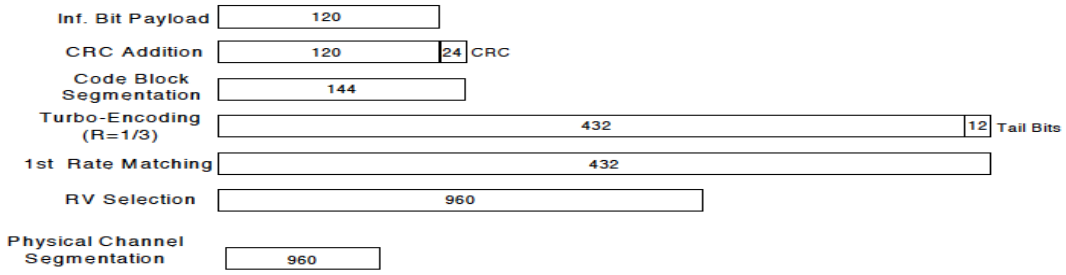


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

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-Set 1			
	Power Control Algorithm	Algorithm2			
	βc	2/15	11/15	15/15	15/15
	βd	15/15	15/15	8/15	4/15
	βd (SF)	64			
	βc/βd	2/15	11/15	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			

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.

Measured Results

Band	Mode		UL Ch No.	Freq. (MHz)	MPR (dB)	Avg Pwr (dBm)
W-CDMA Band V	Rel 99	RMC, 12.2 kbps	4132	826.4	N/A	22.5
			4183	836.6	N/A	22.5
			4233	846.6	N/A	22.5
	HSDPA	Subtest 1	4132	826.4	0	21.5
			4183	836.6	0	21.5
			4233	846.6	0	21.5
		Subtest 2	4132	826.4	0	21.5
			4183	836.6	0	21.2
			4233	846.6	0	21.5
		Subtest 3	4132	826.4	0.5	20.0
			4183	836.6	0.5	20.8
			4233	846.6	0.5	20.5
		Subtest 4	4132	826.4	0.5	19.8
			4183	836.6	0.5	19.9
			4233	846.6	0.5	19.9
	HSUPA	Subtest 1	4132	826.4	0	22.0
			4183	836.6	0	21.6
			4233	846.6	0	21.3
		Subtest 2	4132	826.4	2	20.0
			4183	836.6	2	20.0
			4233	846.6	2	20.0
		Subtest 3	4132	826.4	1	20.8
			4183	836.6	1	20.5
			4233	846.6	1	20.3
		Subtest 4	4132	826.4	2	20.0
			4183	836.6	2	20.0
			4233	846.6	2	20.0
		Subtest 5	4132	826.4	0	22.0
			4183	836.6	0	22.0
			4233	846.6	0	22.0
	DC-HSPA	Subtest 1	4132	826.4	0	21.5
			4183	836.6	0	21.5
			4233	846.6	0	21.3
		Subtest 2	4132	826.4	0	21.5
			4183	836.6	0	21.4
			4233	846.6	0	21.5
		Subtest 3	4132	826.4	0.5	21.0
			4183	836.6	0.5	21.0
			4233	846.6	0.5	20.9
		Subtest 4	4132	826.4	0.5	21.0
			4183	836.6	0.5	21.0
			4233	846.6	0.5	21.0

9.3. LTE

The following tests were conducted according to the test requirements outlined in section 6.2 of the 3GPP TS36.101 specification.

UE Power Class: 3 (23 +/- 2dBm). The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101.

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

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

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

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

LTE Band 5 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							829 MHz	836.5 MHz	844 MHz
LTE Band 5	10	QPSK	1	0	0	0	22.6	22.4	22.4
			1	25	0	0	22.5	22.4	22.3
			1	49	0	0	22.4	22.4	22.3
			25	0	1	1	21.4	21.3	21.2
			25	12	1	1	21.4	21.2	21.2
			25	25	1	1	21.3	21.3	21.2
			50	0	1	1	21.2	21.2	21.2
		16QAM	1	0	1	1	21.1	21.2	21.0
			1	25	1	1	21.1	21.5	21.0
			1	49	1	1	21.0	21.4	21.0
			25	0	2	2	20.4	20.3	20.3
			25	12	2	2	20.4	20.3	20.3
			25	25	2	2	20.3	20.3	20.3
			50	0	2	2	20.3	20.3	20.3

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							826.5 MHz	836.5 MHz	846.5 MHz
LTE Band 5	5	QPSK	1	0	0	0	22.6	22.4	22.4
			1	12	0	0	22.5	22.3	22.4
			1	24	0	0	22.4	22.3	22.3
			12	0	1	1	21.4	21.2	21.4
			12	7	1	1	21.3	21.3	21.3
			12	13	1	1	21.3	21.4	21.4
			25	0	1	1	21.3	21.2	21.2
		16QAM	1	0	1	1	21.7	21.0	21.7
			1	12	1	1	21.6	21.0	21.6
			1	24	1	1	21.5	21.0	21.5
			12	0	2	2	20.5	20.3	20.4
			12	7	2	2	20.5	20.2	20.4
			12	13	2	2	20.4	20.2	20.3
			25	0	2	2	20.4	20.3	20.2

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							825.5 MHz	836.5 MHz	847.5 MHz
LTE Band 5	3	QPSK	1	0	0	0	22.6	22.2	22.3
			1	8	0	0	22.5	22.2	22.3
			1	14	0	0	22.4	22.1	22.2
			8	0	1	1	21.4	21.2	21.4
			8	4	1	1	21.4	21.2	21.4
			8	7	1	1	21.4	21.2	21.3
			15	0	1	1	21.3	21.3	21.3
		16QAM	1	0	1	1	21.7	21.0	21.5
			1	8	1	1	21.6	21.0	21.4
			1	14	1	1	21.5	21.0	21.3
			8	0	2	2	20.4	20.4	20.5
			8	4	2	2	20.4	20.3	20.5
			8	7	2	2	20.4	20.4	20.4
			15	0	2	2	20.5	20.4	20.4

LTE Band 5 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							824.7 MHz	836.5 MHz	848.3 MHz
LTE Band 5	1.4	QPSK	1	0	0	0	22.4	22.3	22.3
			1	3	0	0	22.5	22.3	22.3
			1	5	0	0	22.4	22.3	22.3
			3	0	0	0	22.5	22.3	22.4
			3	1	0	0	22.4	22.3	22.3
			3	3	0	0	22.4	22.3	22.3
			6	0	1	1	21.4	21.4	21.4
		16QAM	1	0	1	1	21.0	21.1	21.6
			1	3	1	1	21.1	21.1	21.6
			1	5	1	1	21.0	21.0	21.6
			3	0	1	1	21.6	21.3	21.3
			3	1	1	1	21.6	21.3	21.3
			3	3	1	1	21.5	21.2	21.3
			6	0	2	2	20.6	20.4	20.2

9.4. Wi-Fi DTS (2.4 GHz) Band

Required Test Channels per KDB 248227 D01

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	15.8	Yes
			6	2437	16.4	
			11	2462	16.4	
	802.11g	6 Mbps	1	2412	12.9	No
			6	2437	13.4	
			11	2462	13.0	
	802.11n (HT20)	MCS0	1	2412	11.9	No
			6	2437	12.4	
			11	2462	12.0	

Note(s):

1. 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	16.4	Yes
			2 Mbps	16.4	No
			5.5 Mbps	16.4	No
			11 Mbps	16.4	No

Note(s):

1. Per KDB 248227 D01,
   - Testing at higher data rates and higher order modulations is not required when the maximum average output power for each of these configurations is < ¼ dB higher than those measured at the lowest data rate.
   - Each channel should be tested at the lowest data rate in each a-b/g mode channel BW configuration.

9.5. Bluetooth

Maximum tune-up tolerance limit is 7.3 dBm from the rated nominal maximum output power. This power level qualifies for exclusion of SAR testing.

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

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

10.1. 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	32.1	0.389	0.479	0.291	0.358	1
			Left Tilt	190	836.6	33.0	32.1	0.230	0.283	0.177	0.218	
			Right Touch	190	836.6	33.0	32.1	0.282	0.347	0.215	0.265	
			Right Tilt	190	836.6	33.0	32.1	0.231	0.284	0.177	0.218	
Head VoIP	GPRS 3 Slots	0	Left Touch	190	836.6	30.0	30.0	0.559	0.559	0.420	0.420	2
			Left Tilt	190	836.6	30.0	30.0	0.339	0.339	0.260	0.260	
			Right Touch	190	836.6	30.0	30.0	0.392	0.392	0.298	0.298	
			Right Tilt	190	836.6	30.0	30.0	0.355	0.355	0.271	0.271	
Body-worn	Voice	10	Rear	190	836.6	33.0	32.1	0.566	0.696	0.429	0.528	3
			Front	190	836.6	33.0	32.1	0.385	0.474	0.295	0.363	
Body-worn(VoIP) & Hotspot	GPRS 3 Slots	10	Rear	128	824.2	30.0	29.9	0.849	0.869	0.644	0.659	4
				190	836.6	30.0	30.0	0.864	0.864	0.656	0.656	
				251	848.8	30.0	30.0	0.861	0.861	0.650	0.650	
			Front	190	836.6	30.0	30.0	0.574	0.574	0.443	0.443	
Hotspot			Edge 2	190	836.6	30.0	30.0	0.331	0.331	0.228	0.228	
			Edge 3	190	836.6	30.0	30.0	0.095	0.095	0.057	0.057	
			Edge 4	190	836.6	30.0	30.0	0.654	0.654	0.453	0.453	

Additional Test in DTM (Dual Transfer Mode)

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	CS + PS GPRS (2 Slots)	0	Left Touch	190	836.6	32.0	32.0	0.573	0.573	0.436	0.436	5
			Left Tilt	190	836.6	32.0	32.0	0.359	0.359	0.275	0.275	
			Right Touch	190	836.6	32.0	32.0	0.400	0.400	0.307	0.307	
			Right Tilt	190	836.6	32.0	32.0	0.337	0.337	0.259	0.259	
Body-worn(VoIP) & Hotspot	CS + PS GPRS (2 Slots)	10	Rear	128	824.2	32.0	31.9	0.875	0.895	0.597	0.611	
				190	836.6	32.0	32.0	0.938	0.938	0.711	0.711	
				251	848.8	32.0	32.0	0.968	0.968	0.730	0.730	6
			Front	190	836.6	32.0	32.0	0.662	0.662	0.488	0.488	
Hotspot			Edge 2	190	836.6	32.0	32.0	0.707	0.707	0.491	0.491	
			Edge 3	190	836.6	32.0	32.0	0.104	0.104	0.062	0.062	
			Edge 4	128	824.2	32.0	31.9	1.050	1.074	0.728	0.745	7
				190	836.6	32.0	32.0	1.070	1.070	0.745	0.745	
				251	848.8	32.0	32.0	1.020	1.020	0.703	0.703	

10.2. 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	29.0	0.321	0.404	0.199	0.251	8
			Left Tilt	661	1880.0	30.0	29.0	0.112	0.141	0.062	0.078	
			Right Touch	661	1880.0	30.0	29.0	0.178	0.224	0.109	0.137	
			Right Tilt	661	1880.0	30.0	29.0	0.081	0.102	0.049	0.062	
Head VoIP	GPRS 2 Slots	0	Left Touch	661	1880.0	29.0	28.5	0.524	0.588	0.317	0.356	9
			Left Tilt	661	1880.0	29.0	28.5	0.183	0.205	0.103	0.116	
			Right Touch	661	1880.0	29.0	28.5	0.311	0.349	0.200	0.224	
			Right Tilt	661	1880.0	29.0	28.5	0.159	0.178	0.096	0.108	
Body-worn	Voice	10	Rear	661	1880.0	30.0	29.0	0.547	0.689	0.309	0.389	10
			Front	661	1880.0	30.0	29.0	0.448	0.564	0.263	0.331	
Body-worn(VoIP) & Hotspot	GPRS 2 Slots	10	Rear	512	1850.2	29.0	28.7	0.822	0.881	0.470	0.504	
				661	1880.0	29.0	28.5	0.944	1.059	0.534	0.599	11
				810	1909.8	29.0	28.5	0.858	0.963	0.480	0.539	
			Front	512	1850.2	29.0	28.7	0.734	0.786	0.438	0.469	
				661	1880.0	29.0	28.5	0.800	0.898	0.472	0.530	
				810	1909.8	29.0	28.5	0.679	0.762	0.395	0.443	
Hotspot			Edge 2	661	1880.0	29.0	28.5	0.088	0.099	0.052	0.058	
			Edge 3	661	1880.0	29.0	28.5	0.618	0.693	0.363	0.407	
			Edge 4	661	1880.0	29.0	28.5	0.586	0.658	0.297	0.333	

Additional Test in DTM (Dual Transfer Mode)

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	CS + PS GPRS (2 Slots)	0	Left Touch	661	1880.0	29.0	28.7	0.421	0.451	0.254	0.272	12
			Left Tilt	661	1880.0	29.0	28.7	0.164	0.176	0.093	0.100	
			Right Touch	661	1880.0	29.0	28.7	0.305	0.327	0.192	0.206	
			Right Tilt	661	1880.0	29.0	28.7	0.147	0.158	0.093	0.099	
Body-worn(VoIP) & Hotspot	CS + PS GPRS (2 Slots)	10	Rear	512	1850.2	29.0	28.9	0.763	0.781	0.428	0.438	
				661	1880.0	29.0	28.7	0.818	0.877	0.459	0.492	
				810	1909.8	29.0	28.8	0.948	0.993	0.533	0.558	13
			Front	512	1850.2	29.0	28.9	0.798	0.817	0.458	0.469	
				661	1880.0	29.0	28.7	0.830	0.889	0.477	0.511	
				810	1909.8	29.0	28.8	0.822	0.861	0.467	0.489	
Hotspot			Edge 2	661	1880.0	29.0	28.7	0.075	0.081	0.045	0.048	
			Edge 3	661	1880.0	29.0	28.7	0.728	0.780	0.422	0.452	
			Edge 4	661	1880.0	29.0	28.7	0.647	0.693	0.318	0.341	

10.3. 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	22.5	22.5	0.355	0.355	0.268	0.268	14
			Left Tilt	4183	836.6	22.5	22.5	0.210	0.210	0.161	0.161	
			Right Touch	4183	836.6	22.5	22.5	0.260	0.260	0.199	0.199	
			Right Tilt	4183	836.6	22.5	22.5	0.209	0.209	0.160	0.160	
Body-worn & Hptspot	Rel 99 RMC	10	Rear	4183	836.6	22.5	22.5	0.571	0.571	0.433	0.433	15
			Front	4183	836.6	22.5	22.5	0.433	0.433	0.331	0.331	
Hotspot	Rel 99 RMC	10	Edge 2	4183	836.6	22.5	22.5	0.255	0.255	0.176	0.176	
			Edge 3	4183	836.6	22.5	22.5	0.067	0.067	0.039	0.039	
			Edge 4	4183	836.6	22.5	22.5	0.449	0.449	0.311	0.311	

10.4. LTE Band 5 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	Meas.	Scaled	
Head	QPSK	0	Left Touch	20525	836.5	1	0	23.0	22.4	0.309	0.355	0.232	0.266	16
						25	0	22.0	21.3	0.243	0.286	0.182	0.214	
			Left Tilt	20525	836.5	1	0	23.0	22.4	0.177	0.203	0.136	0.156	
						25	0	22.0	21.3	0.139	0.163	0.106	0.125	
			Right Touch	20525	836.5	1	0	23.0	22.4	0.212	0.243	0.162	0.186	
						25	0	22.0	21.3	0.167	0.196	0.128	0.150	
			Right Tilt	20525	836.5	1	0	23.0	22.4	0.174	0.200	0.133	0.153	
						25	0	22.0	21.3	0.139	0.163	0.106	0.125	
Body-worn & Hotspot	QPSK	10	Rear	20525	836.5	1	0	23.0	22.4	0.476	0.547	0.361	0.414	17
						25	0	22.0	21.3	0.372	0.437	0.282	0.331	
			Front	20525	836.5	1	0	23.0	22.4	0.336	0.386	0.259	0.297	
						25	0	22.0	21.3	0.284	0.334	0.218	0.256	
Hotspot	QPSK	10	Edge 2	20525	836.5	1	0	23.0	22.4	0.282	0.324	0.195	0.224	
						25	0	22.0	21.3	0.220	0.258	0.152	0.179	
			Edge 3	20525	836.5	1	0	23.0	22.4	0.052	0.060	0.031	0.036	
						25	0	22.0	21.3	0.040	0.047	0.024	0.028	
			Edge 4	20525	836.5	1	0	23.0	22.4	0.456	0.524	0.316	0.363	
						25	0	22.0	21.3	0.352	0.414	0.244	0.287	

10.5. Wi-Fi (DTS Band)

Frequency Band	RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	Meas.	Scaled	
2.4 GHz	Head	802.11b 1 Mbps	0	Left Touch	6	2437.0	16.5	16.4	0.045	0.046	0.028	0.029	
				Left Tilt	6	2437.0	16.5	16.4	0.030	0.031	0.020	0.020	
				Right Touch	6	2437.0	16.5	16.4	0.076	0.078	0.044	0.045	18
				Right Tilt	6	2437.0	16.5	16.4	0.027	0.028	0.020	0.020	
	Body-worn & Hotspot	802.11b 1 Mbps	10	Rear	6	2437.0	16.5	16.4	0.061	0.062	0.039	0.040	19
				Front	6	2437.0	16.5	16.4	0.030	0.031	0.021	0.021	
	Hotspot	802.11b 1 Mbps	10	Edge 1	6	2437.0	16.5	16.4	0.022	0.023	0.017	0.017	
				Edge 4	6	2437.0	16.5	16.4	0.058	0.059	0.036	0.037	

10.6. Bluetooth

Standalone SAR Test Exclusion Considerations & Estimated SAR

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

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

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

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

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

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

Body-worn Accessory Exposure Conditions

Max. tune-up tolerance limit		Min. test separation distance (mm)	Frequency (GHz)	SAR test exclusion Result*	Test Configuration	Estimated 1-g SAR (W/kg)
(dBm)	(mW)					
7.3	5	10	2.480	0.8	Rear/Front	0.113

Conclusion:

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

11. SAR Measurement Variability

In accordance with published RF Exposure KDB 865664 D01 SAR measurement 100 MHz to 6 GHz. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)	Repeated Measured SAR (W/kg)	Largest to Smallest SAR Ratio
850	GSM 850	Hotspot	Edge 4	Yes	1.07	1.03	1.04
	WCDMA Band V	Body-worn & Hotspot	Rear	No	0.571	N/A	N/A
	LTE Band 5	Body-worn & Hotspot	Rear	No	0.476	N/A	N/A
1900	GSM 1900	Body-worn & Hotspot	Rear	Yes	0.948	0.941	1.01
2400	Wi-Fi 802.11b/g/n	Head	Right Touch	No	0.076	N/A	N/A

Note(s):

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 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 $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$

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:

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

Simultaneous Transmission Condition

RF Exposure Condition	Item	Capable Transmit Configurations				
Head	1	GSM(Voice)	+	Wi-Fi 2.4 GHz		
	2	GSM(GPRS/EDGE/DTM)	+	Wi-Fi 2.4 GHz		
	3	WCDMA	+	Wi-Fi 2.4 GHz		
	4	LTE	+	Wi-Fi 2.4 GHz		
Body-worn	1	GSM(Voice)	+	Wi-Fi 2.4 GHz		
	2	GSM(Voice)	+	BT		
	3	GSM(GPRS/EDGE/DTM)	+	Wi-Fi 2.4 GHz		
	4	GSM(GPRS/EDGE/DTM)	+	BT		
	5	WCDMA	+	Wi-Fi 2.4 GHz		
	6	WCDMA	+	BT		
	7	LTE	+	Wi-Fi 2.4 GHz		
	8	LTE	+	BT		
Hotspot & Wi-Fi Direct	1	GSM(GPRS/EDGE/DTM)	+	Wi-Fi 2.4 GHz		
	2	WCDMA	+	Wi-Fi 2.4 GHz		
	3	LTE	+	Wi-Fi 2.4 GHz		

Notes:

1. Wi-Fi only 2.4GHz supports Hotspot.
2. GPRS/EDGE/DTM, WCDMA, and LTE support Hotspot.
3. VoIP is supported in GPRS/EDGE/DTM, WCDMA, and LTE.
4. Wi-Fi 2.4 GHz Radio cannot transmit simultaneously with Bluetooth Radio.

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 Bluetooth		
Head	Left Touch	① + ②	0.573	0.046		0.619	No
	Left Tilt	① + ②	0.359	0.031		0.390	No
	Right Touch	① + ②	0.400	0.078		0.478	No
	Right Tilt	① + ②	0.355	0.028		0.383	No
Body-worn Accessory & Hotspot	Rear	① + ②	0.968	0.062		1.030	No
		① + ③	0.968		0.113	1.081	No
	Front	① + ②	0.662	0.031		0.693	No
		① + ③	0.662		0.113	0.775	No
Hotspot	Edge 4	① + ②	1.074	0.059		1.133	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 Bluetooth		
Head	Left Touch	① + ②	0.588	0.046		0.634	No
	Left Tilt	① + ②	0.205	0.031		0.236	No
	Right Touch	① + ②	0.349	0.078		0.427	No
	Right Tilt	① + ②	0.178	0.028		0.206	No
Body-worn Accessory & Hotspot	Rear	① + ②	1.059	0.062		1.121	No
		① + ③	1.059		0.113	1.172	No
	Front	① + ②	0.898	0.031		0.929	No
		① + ③	0.898		0.113	1.011	No
Hotspot	Edge 4	① + ②	0.658	0.059		0.717	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 Bluetooth		
Head	Left Touch	① + ②	0.355	0.046		0.401	No
	Left Tilt	① + ②	0.210	0.031		0.241	No
	Right Touch	① + ②	0.260	0.078		0.338	No
	Right Tilt	① + ②	0.209	0.028		0.237	No
Body-worn Accessory & Hotspot	Rear	① + ②	0.571	0.062		0.633	No
		① + ③	0.571		0.113	0.684	No
	Front	① + ②	0.433	0.031		0.464	No
		① + ③	0.433		0.113	0.546	No
Hotspot	Edge 4	① + ②	0.449	0.059		0.508	No

SAR to Peak Location Separation Ratio (SPLSR)

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

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

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario			∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① LTE Band 5	② Wi-Fi(DTS)	③ Bluetooth		
Head	Left Touch	① + ②	0.355	0.046		0.401	No
	Left Tilt	① + ②	0.203	0.031		0.234	No
	Right Touch	① + ②	0.243	0.078		0.321	No
	Right Tilt	① + ②	0.200	0.028		0.228	No
Body-worn Accessory & Hotspot	Rear	① + ②	0.547	0.062		0.609	No
		① + ③	0.547		0.113	0.660	No
	Front	① + ②	0.386	0.031		0.417	No
		① + ③	0.386		0.113	0.499	No
Hotspot	Edge 4	① + ②	0.524	0.059		0.583	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.

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the either sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

Appendixes

Refer to separated files for the following appendixes.

A_14I19572v0 SAR Photos & Ant. Locations

B_14I19572v0 SAR Highest Test Plots

C_14I19572v0 SAR System Check Plots

D_14I19572v0 SAR Tissue Ingredients

E_14I19572v0 SAR Probe Cal. Certificates

F_14I19572v0 SAR Dipole Cal. Certificates

END OF REPORT