



SAR EVALUATION REPORT

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

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

**Model: SM-A7000
FCC ID: A3LSMA7000**

**Report Number: 14I19355-S1A
Issue Date: 12/18/2014**

Prepared for
**SAMSUNG ELECTRONICS CO., LTD.
129 SAMSUNG-RO, YEONGTONG-GU
SUWON-CITY, GYEONGGI-DO 443-742, KOREA**

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



NVLAP LAB CODE 200065-0

REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
--	12/16/2014	Initial Issue	--
A	12/18/2014	Revised Report based on Reviewer's comment: 1. Sec. 6.3: Updated Table.	Krischelle Aurelio

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1. Attestation of Test Results

Applicant Name	SAMSUNG ELECTRONICS CO., LTD.			
FCC ID	A3LSMA7000			
Model Name	GSM/WCDMA/LTE Phone + Bluetooth, DTS/UNII a/b/g/n and ANT+			
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
Head		0.167 W/kg	0.662 W/kg	0.848 W/kg
Body-worn*		1.083 W/kg	0.140 W/kg	0.157 W/kg
Hotspot/Wi-Fi Direct		0.844 W/kg	0.275 W/kg	N/A
Simultaneous Transmission	Head	1.015 W/kg	0.829 W/kg	1.015 W/kg
	Body-worn	1.200 W/kg	1.200 W/kg	1.193 W/kg
	Hotspot/ Wi-Fi Direct	0.085 W/kg	0.085 W/kg	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	11/10/2014 - 12/15/2014			
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.		Krischelle Aurelio 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 1528-2013, the following FCC Published RF exposure KDB procedures, and TCB workshop updates:

- 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 SAR Reporting v01r01
- 941225 D01 SAR test for 3G devices v03
- 941225 D05 SAR for LTE Devices v02r03
- 941225 D06 Hotspot Mode SAR v02

3. Facilities and Accreditation

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

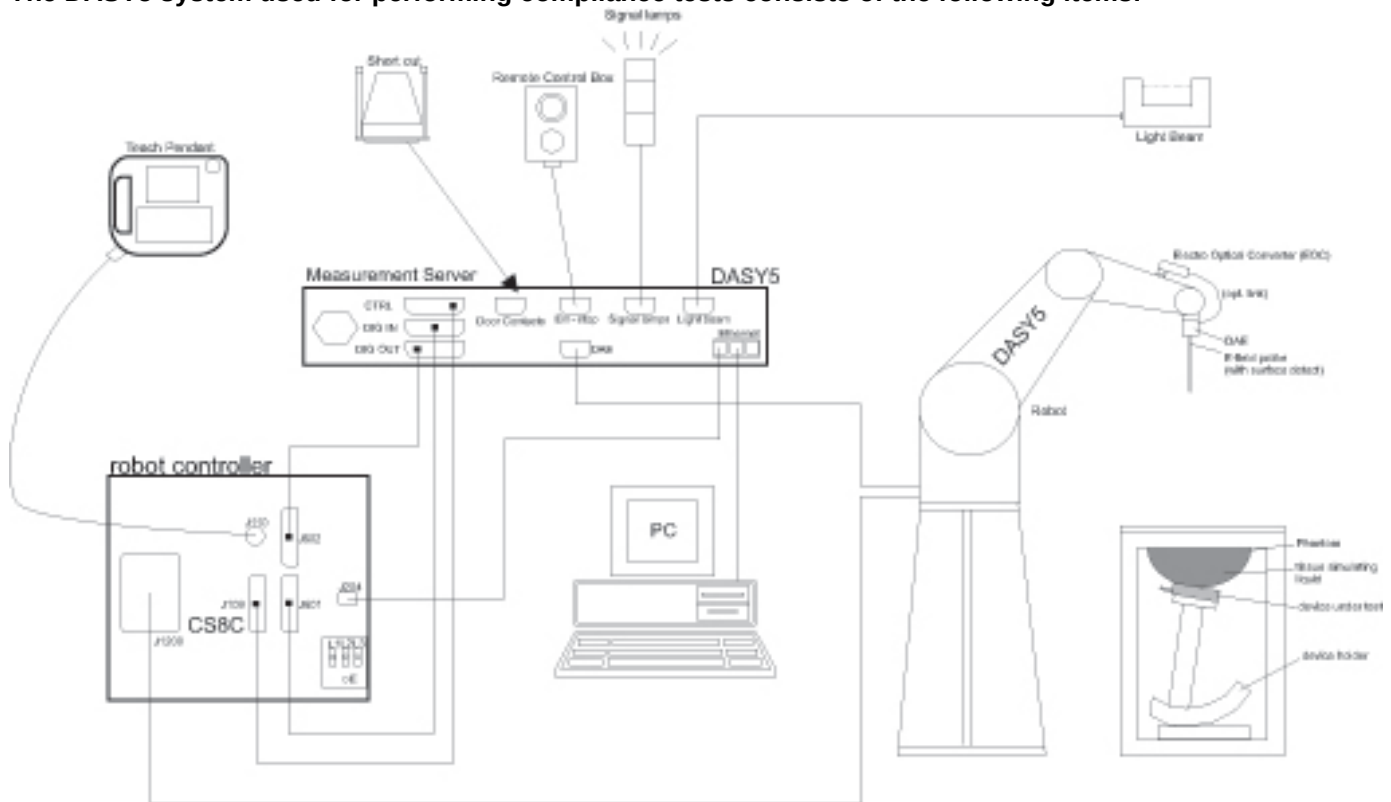
47173 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 3
SAR Lab D	SAR Lab 4
SAR Lab E	SAR Lab 5
SAR Lab F	
SAR Lab G	
SAR Lab H	

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 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	Control Company	4242	122529162	10/8/2015

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	2702A76223	9/17/2015
Power Sensor	HP	8481A	1926A27048	8/15/2015
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
E-Field Probe	SPEAG	EX3DV4	3772	2/26/2015
E-Field Probe	SPEAG	EX3DV4	3749	1/29/2015
E-Field Probe	SPEAG	EX3DV4	3686	3/18/2015
Data Acquisition Electronics	SPEAG	DAE4	1259	1/23/2015
Data Acquisition Electronics	SPEAG	DAE4	500	5/15/2015
Data Acquisition Electronics	SPEAG	DAE4	1258	5/15/2015
System Validation Dipole	SPEAG	D835V2	4d142	9/9/2015
System Validation Dipole	SPEAG	D1900V2	5d140	5/23/2015
System Validation Dipole	SPEAG	D2450V2	899	9/10/2015
System Validation Dipole	SPEAG	D2600V2	1006	9/10/2015
System Validation Dipole	SPEAG	D5GHzV2	1138	9/18/2015
System Validation Dipole	SPEAG	D5GHzV2	1003	2/26/2014

Others

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Base Station Simulator	R & S	CMW500	134855-bw	7/15/2015
Base Station Simulator	R & S	CMW500	134853-ud	7/17/2015
Power Meter	Agilent	N1911A	MY53060009	5/5/2015
Power Sensor	Agilent	N1921A	MY52260009	12/12/2014 ¹

Notes:

1. Power Sensor was used to measure Wi-Fi Output Power on 11/10/2014.

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

6. Device Under Test (DUT) Information

6.1. DUT Description

Model: SM-A7000	
Device Dimension	Overall (Length x Width): 150 mm x 75 mm Overall Diagonal: 165 mm Display Diagonal: 140 mm
Battery Back Cover	☒ The rechargeable battery is not user accessible.
Battery Options	☒ The rechargeable battery is not user accessible.
Accessory	Headset
Wireless Router (Hotspot)	Wi-Fi Hotspot mode permits the device to share its cellular data connection with other Wi-Fi-enabled devices. ☒ Mobile Hotspot (Wi-Fi 2.4 GHz) ☒ Mobile Hotspot (Wi-Fi 5 GHz)
Wi-Fi Direct	Wi-Fi Direct enabled devices transfer data directly between each other ☒ Wi-Fi Direct (Wi-Fi 2.4 GHz) ☒ Wi-Fi Direct (Wi-Fi 5.8 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. 5, CAT 24) HSUPA (Rel. 6, CAT 6)	100%
LTE (TDD)	Band 41	QPSK, 16QAM (Rel.10) Does not support Carrier Aggregation (CA).	63.3%
	Does this device SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No		
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): -1.5 ~ 0.5		RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
GSM850	Voice	33.0	33.5
	GPRS 1 slot	33.0	33.5
	GPRS 2 slots	30.5	31.0
	GPRS 3 slots	28.5	29.0
	GPRS 4 slots	27.0	27.5
	EGPRS 1 slot	27.0	27.5
	EGPRS 2 slots	27.0	27.5
	EGPRS 3 slots	25.5	26.0
	EGPRS 4 slots	24.5	25.0
GSM1900	Voice	29.5	30.0
	GPRS 1 slot	29.5	30.0
	GPRS 2 slots	27.0	27.5
	GPRS 3 slots	25.0	25.5
	GPRS 4 slots	23.5	24.0
	EGPRS 1 slot	26.0	26.5
	EGPRS 2 slots	25.0	25.5
	EGPRS 3 slots	24.0	24.5
	EGPRS 4 slots	23.0	23.5
W-CDMA Band V	R99	23.0	23.5
	HSDPA	22.5	23.0
	HSUPA	22.5	23.0
W-CDMA Band II	R99	22.5	23.0
	HSDPA	22.0	22.5
	HSUPA	22.0	22.5
LTE Band 41	QPSK	23.5	24.0

Upper limit (dB): -1.5 ~ 0.5		RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
W-CDMA Band II (Power Reduction)	R99	21.5	22.0
	HSDPA	21.0	21.5
	HSUPA	21.0	21.5

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	17.0	17.5
	802.11g	14.0	14.5
	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	12.0	12.5
Bluetooth		10.0	10.5
Bluetooth LE		1.0	1.5

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 4. LTE B41 + 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 7. LTE B41 + Wi-Fi 2.4/5GHz 8. LTE B41 + BT
Wireless Router (Hotspot)	1. GSM 850/1900 (GPRS/EDGE) + Wi-Fi 2.4/5.8GHz 2. WCDMA Band 2 + Wi-Fi 2.4/5.8GHz 3. LTE B41 + Wi-Fi 2.4/5.8GHz
Notes: 1. Wi-Fi 2.4/5.8GHz supports Hotspot and Wi-Fi Direct. 2. GPRS/EDGE, LTE, and WCDMA support Hotspot. 3. VoIP is supported in WCDMA, LTE, and GPRS. 4. Wi-Fi 2.4 GHz Radio cannot transmit simultaneously with Bluetooth Radio. 5. Wi-Fi 5 GHz Radio can transmit simultaneously with Bluetooth Radio.	

6.5. General LTE SAR Test and Reporting Considerations

Item	Description																																												
Frequency range, Channel Bandwidth, Numbers and Frequencies	Band 41	Frequency range: 2555 - 2635 MHz																																											
		Channel Bandwidth																																											
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																						
	Low	40340/ 2565	40315/ 2562.5	40290/ 2560	40265/ 2557.5																																								
	Mid	40640/ 2595	40640/ 2595	40640/ 2595	40640/ 2595																																								
	High	40940/ 2625	40620/ 2672.5	40620/ 2630	41015/ 2632.5																																								
LTE transmitter and antenna implementation	LTE has one (1) TX/RX antennas and one (1) RX antennas Refer to "Appendix A: SAR Photos & Ant. Locations."																																												
Maximum power reduction (MPR)	Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3 <table border="1"> <thead> <tr> <th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (RB)</th><th rowspan="2">MPR (dB)</th></tr> <tr> <th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr> </thead> <tbody> <tr> <td>QPSK</td><td>> 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> </tbody> </table> MPR Built-in by design A-MPR (additional MPR) was disabled during SAR testing							Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1	16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1	16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)																																						
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz																																							
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1																																						
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1																																						
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2																																						
Power reduction	No																																												
Spectrum plots for RB configurations	A properly configured base station simulator was used for the SAR and power measurements; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.																																												

6.6. LTE (TDD) Considerations

According to KDB 941225 D05 SAR for LTE Devices for Time-Division Duplex (TDD) systems, SAR must be tested using a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by the defined 3GPP LTE TDD configurations.

SAR was tested with the highest transmission duty factor (63.33%) using Uplink-downlink configuration 0 and Special subframe configuration 7.

LTE TDD Band 41 supports 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table 4.2-2 for uplink-downlink configurations and Table 4.2-1 for Special subframe configurations.

Table 4.2-1: Configuration of special subframe (lengths of DwPTS/GP/UpPTS).

Special subframe configuration	Normal cyclic prefix in downlink			Extended cyclic prefix in downlink		
	DwPTS	UpPTS		DwPTS	UpPTS	
		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink
0	$6592 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$	$7680 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$
1	$19760 \cdot T_s$			$20480 \cdot T_s$		
2	$21952 \cdot T_s$			$23040 \cdot T_s$		
3	$24144 \cdot T_s$			$25600 \cdot T_s$		
4	$26336 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$	$7680 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$
5	$6592 \cdot T_s$			$20480 \cdot T_s$		
6	$19760 \cdot T_s$			$23040 \cdot T_s$		
7	$21952 \cdot T_s$			$12800 \cdot T_s$		
8	$24144 \cdot T_s$			-	-	-
9	$13168 \cdot T_s$			-	-	-

Table 4.2-2: Uplink-downlink configurations.

Uplink-downlink configuration	Downlink-to-Uplink Switch-point periodicity	Subframe number									
		0	1	2	3	4	5	6	7	8	9
0	5 ms	D	S	U	U	U	D	S	U	U	U
1	5 ms	D	S	U	U	D	D	S	U	U	D
2	5 ms	D	S	U	D	D	D	S	U	D	D
3	10 ms	D	S	U	U	U	D	D	D	D	D
4	10 ms	D	S	U	U	D	D	D	D	D	D
5	10 ms	D	S	U	D	D	D	D	D	D	D
6	5 ms	D	S	U	U	U	D	S	U	U	D

Calculated Duty Cycle

Uplink-Downlink Configuration	Downlink-to-Uplink Switch-point Periodicity	Subframe Number										Calculated Duty Cycle (%)
		0	1	2	3	4	5	6	7	8	9	
0	5 ms	D	S	U	U	U	D	S	U	U	U	63.33
1	5 ms	D	S	U	U	D	D	S	U	U	D	43.33
2	5 ms	D	S	U	D	D	D	S	U	D	D	23.33
3	10 ms	D	S	U	U	U	D	D	D	D	D	31.67
4	10 ms	D	S	U	U	D	D	D	D	D	D	21.67
5	10 ms	D	S	U	D	D	D	D	D	D	D	11.67
6	5 ms	D	S	U	U	U	D	S	U	U	D	53.33

Calculated Duty Cycle = Extended cyclic prefix in uplink $\times (T_s) \times \#$ of S + $\#$ of U

Example for Calculated Duty Cycle for Uplink-Downlink Configuration 0:

Calculated Duty Cycle = $5120 \times [1/(15000 \times 2048)] \times 2 + 6 \text{ ms} = 63.33\%$

where

$T_s = 1/(15000 \times 2048)$ seconds

7. RF Exposure Conditions (Test Configurations)

Refer to "SAR Photos & Ant. Locations" 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	10 mm	Rear	N/A	Yes	
			Front	N/A	Yes	
	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	10 mm	Rear	N/A	Yes	
			Front	N/A	Yes	
	Hotspot / Wi-Fi Direct	10 mm	Rear	< 25 mm	Yes	
			Front	< 25 mm	Yes	
			Edge 1 (Top)	< 25 mm	Yes	
			Edge 2 (Right)	< 25 mm	Yes	
			Edge 3 (Bottom)	> 25 mm	No	1
			Edge 4 (Left)	> 25 mm	No	1

Notes:

- SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR. KDB 648474 D04 Handset SAR (Wi-Fi Direct).

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	33.1	24.1
				190	836.6	33.1	24.1
				251	848.8	33.2	24.2
	GPRS (GMSK)	CS1	1	128	824.2	33.1	24.1
				190	836.6	33.1	24.1
				251	848.8	33.2	24.2
			2	128	824.2	30.0	24.0
				190	836.6	30.0	24.0
				251	848.8	30.1	24.1
			3	128	824.2	28.2	23.9
				190	836.6	28.2	23.9
				251	848.8	28.3	24.0
			4	128	824.2	27.0	24.0
				190	836.6	26.9	23.9
				251	848.8	26.9	23.9
	EGPRS (8PSK)	MCS5	1	128	824.2	27.4	18.4
				190	836.6	27.4	18.4
				251	848.8	27.4	18.4
			2	128	824.2	26.5	20.5
				190	836.6	26.6	20.6
				251	848.8	26.6	20.6
			3	128	824.2	25.0	20.7
				190	836.6	24.9	20.6
				251	848.8	24.9	20.6
			4	128	824.2	23.6	20.6
				190	836.6	23.6	20.6
				251	848.8	23.6	20.6

Notes:

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

1. Head & Body-worn Accessory: GMSK Voice Mode
2. Hotspot mode: GMSK (GPRS) mode with 1 time slots, based on the output power measurements above
3. 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	29.8	20.8
				661	1880.0	30.0	21.0
				810	1909.8	29.8	20.8
	GPRS (GMSK)	CS1	1	512	1850.2	29.8	20.8
				661	1880.0	30.0	21.0
				810	1909.8	29.8	20.8
			2	512	1850.2	27.5	21.5
				661	1880.0	27.5	21.5
				810	1909.8	27.5	21.5
			3	512	1850.2	25.5	21.2
				661	1880.0	25.5	21.2
				810	1909.8	25.4	21.1
			4	512	1850.2	23.9	20.9
				661	1880.0	24.0	21.0
				810	1909.8	23.9	20.9
	EGPRS (8PSK)	MCS5	1	512	1850.2	26.4	17.4
				661	1880.0	26.4	17.4
				810	1909.8	26.5	17.5
			2	512	1850.2	24.9	18.9
				661	1880.0	25.0	19.0
				810	1909.8	25.0	19.0
			3	512	1850.2	24.0	19.7
				661	1880.0	24.0	19.7
				810	1909.8	24.0	19.7
			4	512	1850.2	23.3	20.3
				661	1880.0	23.4	20.4
				810	1909.8	23.3	20.3

Notes:

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

4. Head & Body-worn Accessory: GMSK Voice Mode
5. Hotspot mode: GMSK (GPRS) mode with 2 time slots, based on the output power measurements above
6. 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 2
	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)	Power Reduction (dBm)
W-CDMA Band V	Rel 99 (RMC, 12.2 kbps)	4132	826.4	22.6	
		4183	836.6	22.9	
		4233	846.6	22.5	
W-CDMA Band II	Rel 99 (RMC, 12.2 kbps)	9262	1852.4	22.9	22.0
		9400	1880.0	22.5	22.0
		9538	1907.6	22.3	22.0

Notes:

1. Power reduction applies only when Hotspot is ON, for UMTS Band 2 mode is in operation. All other output power levels for other modes or bands are not affected when Hotspot is turned on.

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	
	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			
	β_c	2/15	11/15	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	0	0.5	0.5
	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			

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

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)	Power Reduction (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	22.4	
		4183	836.6	22.5	
		4233	846.6	22.4	
	Subtest 2	4132	826.4	22.4	
		4183	836.6	22.5	
		4233	846.6	22.2	
	Subtest 3	4132	826.4	22.4	
		4183	836.6	22.4	
		4233	846.6	22.1	
	Subtest 4	4132	826.4	22.4	
		4183	836.6	22.4	
		4233	846.6	22.1	
W-CDMA Band II	Subtest 1	9262	1852.4	22.5	21.1
		9400	1880.0	22.4	21.1
		9538	1907.6	22.1	21.0
	Subtest 2	9262	1852.4	22.4	21.0
		9400	1880.0	22.3	21.0
		9538	1907.6	22.3	21.0
	Subtest 3	9262	1852.4	22.4	20.5
		9400	1880.0	22.3	20.5
		9538	1907.6	22.2	20.6
	Subtest 4	9262	1852.4	22.5	20.5
		9400	1880.0	22.4	20.6
		9538	1907.6	22.2	20.5

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

HSPA (HSDPA & HSUPA)

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

	Mode	HSPA				
	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
	β_c	11/15	6/15	15/15	2/15	15/15
	β_d	15/15	15/15	9/15	15/15	0
	β_{ec}	209/225	12/15	30/15	2/15	5/15
	β_c/β_d	11/15	11/15	15/9	2/15	15/0
	β_{hs}	22/15	12/15	30/15	4/15	5/15
	β_{ed}	1309/225	94/75	47/15 47/15	56/75	47/15
HSDPA Specific Settings	CM (dB)	1	3	2	3	1
	MPR (dB)	0	2	1	2	0
	DACK	8				0
	DNAK	8				0
	DCQI	8				0
	Ack-Nack repetition factor	3				
	CQI Feedback (Table 5.2B.4)	4ms				
HSUPA Specific Settings	CQI Repetition Factor (Table 5.2B.4)	2				
	A _{hs} = β_{hs}/β_c	30/15				
	E-DPDCCCH	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

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)	Power Reduction (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	21.2	
		4183	836.6	21.2	
		4233	846.6	21.2	
	Subtest 2	4132	826.4	21.2	
		4183	836.6	21.1	
		4233	846.6	21.2	
	Subtest 3	4132	826.4	21.1	
		4183	836.6	21.0	
		4233	846.6	21.0	
	Subtest 4	4132	826.4	21.3	
		4183	836.6	21.3	
		4233	846.6	21.1	
W-CDMA Band II	Subtest 1	4132	826.4	22.1	
		4183	836.6	22.2	
		4233	846.6	21.0	
	Subtest 1	9262	1852.4	20.7	20.5
		9400	1880.0	20.5	20.5
		9538	1907.6	20.5	20.7
	Subtest 2	9262	1852.4	21.6	19.6
		9400	1880.0	21.0	19.5
		9538	1907.6	21.3	19.5
	Subtest 3	9262	1852.4	21.5	19.6
		9400	1880.0	21.2	19.5
		9538	1907.6	20.6	20.0
	Subtest 4	9262	1852.4	22.2	19.9
		9400	1880.0	21.9	19.9
		9538	1907.6	21.7	19.8
	Subtest 5	9262	1852.4	21.8	21.1
		9400	1880.0	21.5	21.5
		9538	1907.6	21.1	21.5

8.3. LTE Band 41

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 Signaling 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	13	10	Table 6.2.4-2	Table 6.2.4-2
	6.6.3.3.2				
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2
NS_10		20	15, 20	Table 6.2.4-3	Table 6.2.4-3
NS_11	6.6.2.2.1	23 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 41 Measured Results**Procedure used to establish SAR test signal for LTE TDD Band 41**

Set to CMW-500 with following parameters:

- Turn the LTE Signaling off using “ON | OFF” key
- Operating Band: Select Band 41 and TDD
- Go to “Config...”

LTE Signaling 1 - X3.2.10.6

Connection Status

Cell: OFF

Packet Switched: OFF

RRC State: Idle

Event Log

- 03:21:26 State 'Cell Off'
- 03:21:17 State 'Cell On'
- 03:21:16 Signaling Failure
- 03:21:13 Network Originated Detach
- 03:21:02 State 'Connection Established'
- 03:21:02 EPS Dedicated Bearer Established
- 03:20:57 State 'Attached'
- 03:20:57 EPS Default Bearer Established

UE Info

IMEI: ---

IMSI: ---

UE IPv4 Address [0]: ---

UE IPv6 Prefix [0]: ---

Connection Setup

Scheduling: RMC

	Downlink	Uplink
Operating Band	Band 41	TDD
Channel	40620 Ch	40620 Ch
Frequency	2593.0 MHz	2593.0 MHz
Cell Bandwidth	20.0 MHz	20.0 MHz
RS EPRE	-85.8 dBm/15kHz	
Full Cell BW Pow.	-55.0 dBm	
PUSCH Open Loop Nom.Power		23 dBm
PUSCH Closed Loop Target Power		23.0 dBm
# RB	100	100
RB Pos./Start RB	low	low
Modulation	QPSK	QPSK
TBS Idx / Value	5 / 8760	2 / 4584
Throughput	3.970 Mbit/s	1.834 Mbit/s

LTE

LTE 1 TX Meas.

LTE 1 Ext.BLER

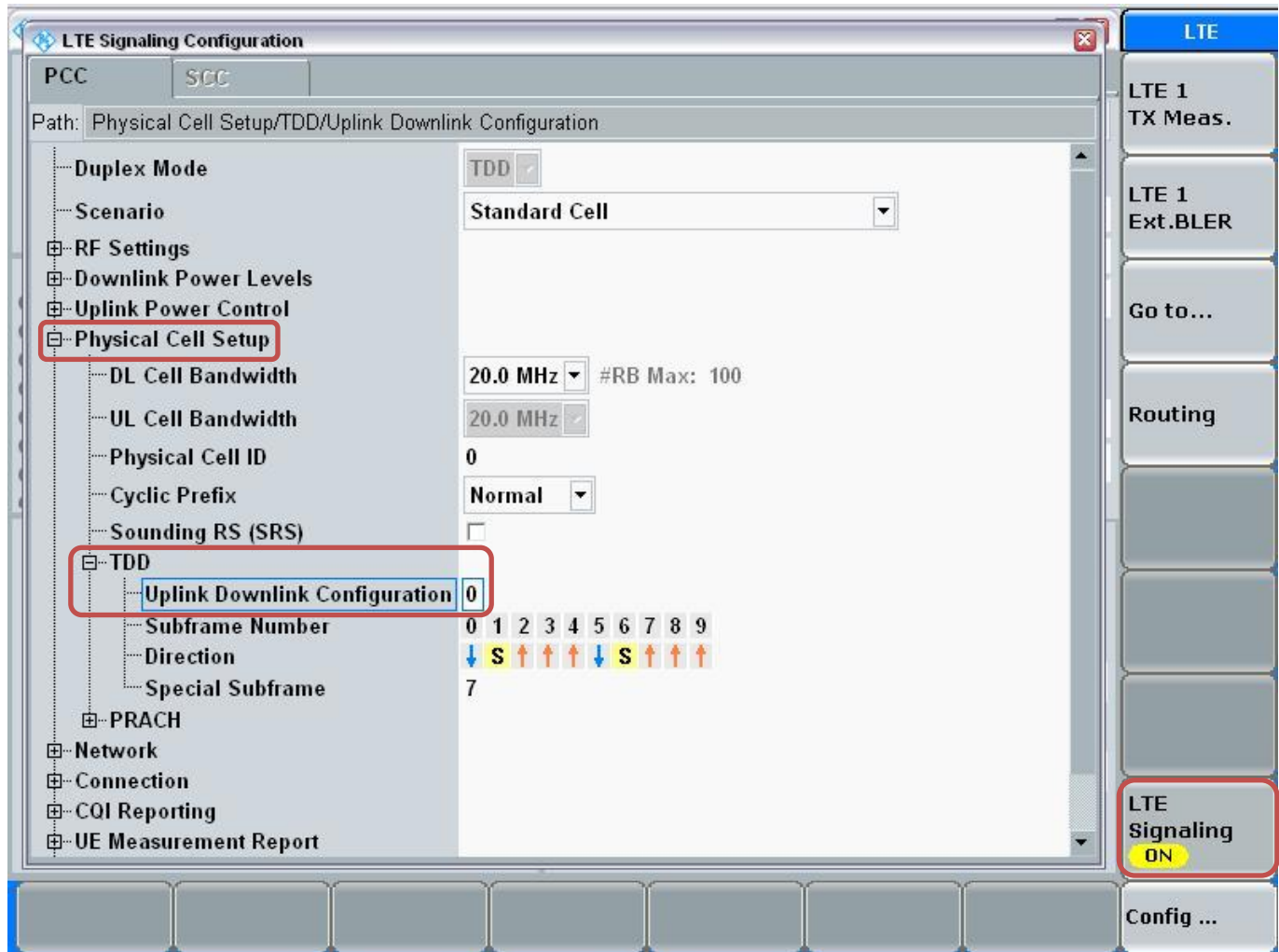
Go to...

Routing

LTE Signaling OFF

Config ...

- Go to "Physical Cell Setup"
- Select "TDD" and Set "Uplink Downlink Configuration" to "0"
- Turn the cell on using "ON | OFF" key



Connect to EUT

- Turn the cell on using "ON | OFF" key
- After EUT is Attached
- Select "Connect"

The screenshot displays the 'LTE Signaling 1 - X3.2.10.6' application window. The interface is divided into several sections:

- Connection Status:** Shows 'Cell' with a signal icon, 'Packet Switched' with a laptop icon, and 'RRC State' as 'Connected'. A red box highlights the 'Attached' status.
- Event Log:** Lists recent events such as 'State 'Attached'', 'EPS Default Bearer Established', 'RRC Connection Established', and 'Signaling Failure'.
- UE Info:** Displays fields for IMEI (001027009999998), IMSI (001010123456789), UE IPv4 Address [0] (192.168.48.129), and UE IPv6 Prefix [0] (fc01:abab:cdcd:efe0::).
- Connection Setup:**
 - PCC/SCC:** Operating Band is 'Band 41', TDD is selected.
 - Channel:** 40620 Ch for both Downlink and Uplink.
 - Frequency:** 2593.0 MHz for both.
 - Cell Bandwidth:** 20.0 MHz for both.
 - RS EPRE:** -85.8 dBm/15kHz.
 - Full Cell BW Pow.:** -55.0 dBm.
 - PUSCH Open Loop Nom.Power:** 23 dBm.
 - PUSCH Closed Loop Target Power:** 23.0 dBm.
 - Scheduling:** RMC.
 - # RB:** 100 for both Downlink and Uplink.
 - RB Pos./Start RB:** low for both, starting at 0.
 - Modulation:** QPSK for both.
 - TBS Idx / Value:** 5 / 8760 for Downlink, 2 / 4584 for Uplink.
 - Throughput:** 3.970 Mbit/s for Downlink, 1.834 Mbit/s for Uplink.
- Buttons:** 'Detach', 'Connect' (highlighted with a red box), 'Send SMS', 'Handover ...', and 'Config ...'.
- Right Panel:** Includes 'LTE 1 TX Meas.', 'LTE 1 Ext.BLER', 'Go to...', 'Routing', and 'LTE Signaling ON' (highlighted with a red box).

Max Power Setting

- Select "LTE 1 TX Meas."
- Press "RESTART | STOP" Soft key

LTE Signaling 1 - X3.2.10.6

Connection Status

Cell: Connection Established

Packet Switched: Connection Established

RRC State: Connected

Event Log

03:33:07 [i] State 'Connection Established'

03:33:07 [i] EPS Dedicated Bearer Established

03:31:31 [i] State 'Attached'

03:31:31 [i] EPS Default Bearer Established

03:31:31 [i] RRC Connection Established

03:31:02 [i] State 'Cell On'

03:31:00 [i] State 'Cell Off'

03:30:23 [i] State 'Cell On'

UE Info

IMEI: 001027009999998

IMSI: 001010123456789

UE IPv4 Address [0]: 192.168.48.129

UE IPv6 Prefix [0]: fc01:abab:cdcd:efe0::

Connection Setup

Scheduling: RMC

Operating Band: Band 41 **TDD**

Channel: 40620 Ch **Downlink** 40620 Ch **Uplink**

Frequency: 2593.0 MHz **Downlink** 2593.0 MHz **Uplink**

Cell Bandwidth: 20.0 MHz **Downlink** 20.0 MHz **Uplink**

RS EPRE: -85.8 dBm/15kHz

Full Cell BW Pow.: -55.0 dBm

PUSCH Open Loop Nom.Power: 23 dBm

PUSCH Closed Loop Target Power: 23.0 dBm

RB: 100 **Downlink** 100 **Uplink**

RB Pos./Start RB: low 0 low 0

Modulation: QPSK QPSK

TBS Idx / Value: 5 8760 2 4584

Throughput: 3.970 Mbit/s 1.834 Mbit/s

Buttons: Detach, Disconnect, Send SMS, Handover ..., Config ...

LTE 1 TX Meas. (highlighted)

LTE 1 Ext.BLER

Go to...

Routing

LTE Signaling ON (highlighted)

- Select “Signaling Parameter”
- Select “TX Power Control (TPC)” > Select “Active TPC Setup” to “Max Power” > Set “Closed Loop Target Power” to “23 dBm”

LTE Measurement - X3.2.10.6 - TX Measurement

Multi Evaluation PRACH SRS

Mode: TDD Freq.: 2593.0 MHz Ref. Level: 44.80 dBm Bandwidth: 20.0 MHz Cyclic Prefix: Normal Meas Subfr.: 0

EVM

Inband Emissions

Equalizer Spectrum Flatness

Spectrum ACLR

Spectrum

TX Measu

TX Power

PS:

Signaling TPC

TX Power Control (TPC)

Active TPC Setup Max Power

Closed Loop Target Power 23.0 dBm

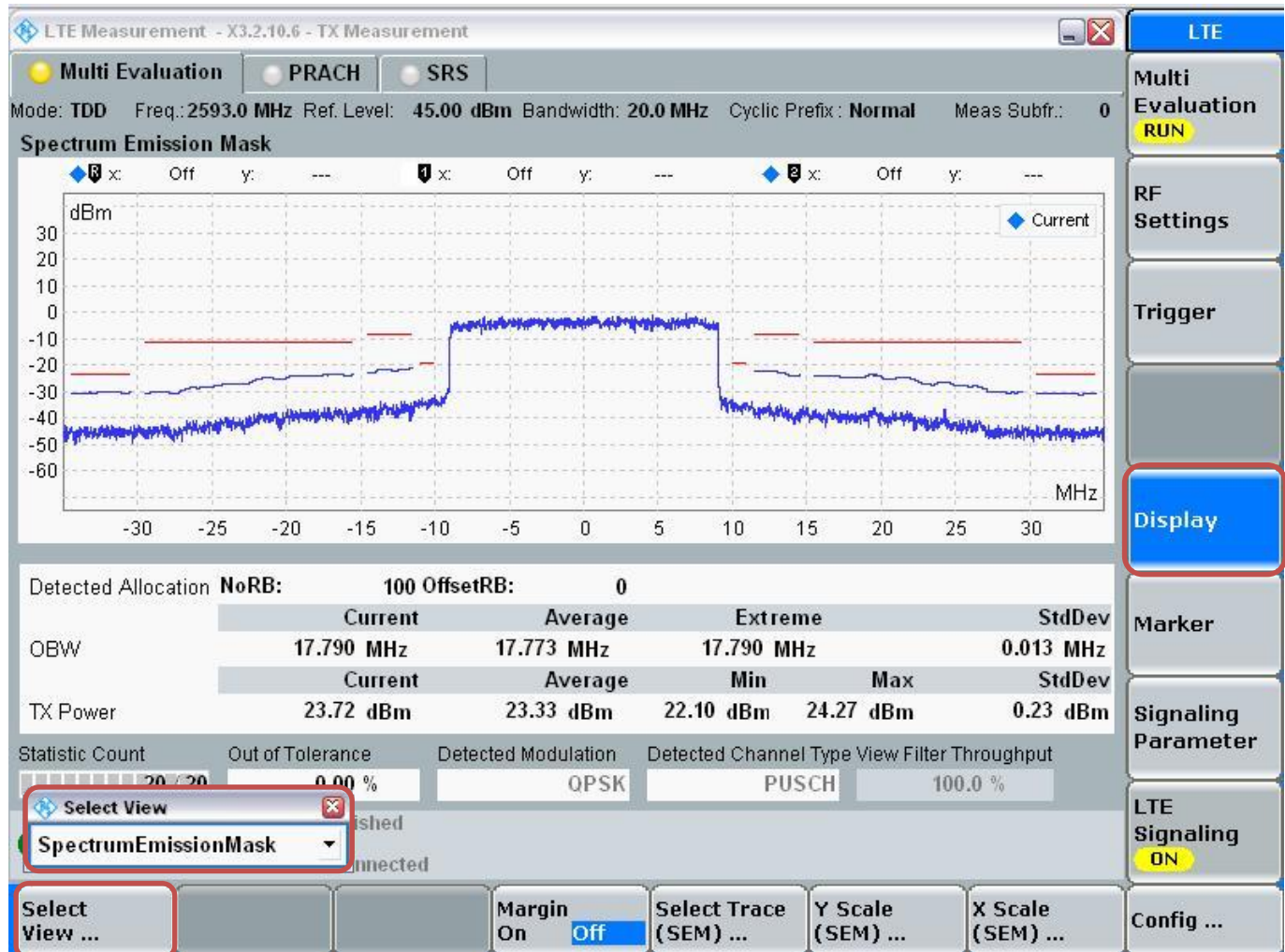
Signaling Parameter

LTE Signaling ON

Cell Setup ... Connection Setup ... DL Error Insertion ... TPC ... Power ... Enable ... Config ...

View TX Power

- Go to “Display”
- Select “Select View...”
- Select “Spectrum Emission Mask”



LTE Band 41 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							2565 MHz	2595 MHz	2625 MHz
LTE Band 41	20	QPSK	1	0	0	0	23.2	23.3	23.5
			1	49	0	1	23.0	22.8	23.0
			1	99	0	0	22.7	22.7	23.3
			50	0	1	1	22.1	22.0	21.9
			50	25	1	2	22.0	22.0	21.8
			50	49	1	2	21.9	21.8	21.8
			100	0	1	2	22.0	21.9	21.8
		16QAM	1	0	1	2	21.7	22.0	22.0
			1	49	1	2	21.7	21.8	22.0
			1	99	1	1	22.1	21.7	21.9
			50	0	2	2	21.2	21.0	20.9
			50	25	2	2	21.1	21.0	20.7
			50	50	2	3	21.0	20.9	20.7
			100	0	2	3	20.8	20.9	20.8
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							2562.5 MHz	2595 MHz	2627.5 MHz
LTE Band 41	15	QPSK	1	0	0	0	23.3	23.3	22.9
			1	36	0	0	23.4	23.2	22.7
			1	74	0	0	23.0	23.1	22.8
			36	0	1	1	22.2	22.1	22.0
			36	18	1	1	22.2	22.0	22.0
			36	37	1	2	21.9	21.9	21.9
			75	0	1	1	22.0	22.0	21.9
		16QAM	1	0	1	1	22.1	22.0	22.4
			1	36	1	1	22.0	21.9	22.3
			1	74	1	1	21.8	21.8	22.3
			36	0	2	2	21.3	21.0	20.9
			36	18	2	2	21.2	20.9	20.9
			36	37	2	2	21.0	20.7	20.9
			75	0	2	2	21.0	20.9	20.8
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							2560 MHz	2595 MHz	2630 MHz
LTE Band 41	10	QPSK	1	0	0	0	22.9	22.8	22.7
			1	24	0	0	23.1	22.8	22.7
			1	49	0	0	23.0	22.8	22.8
			25	0	1	1	22.1	22.0	22.0
			25	12	1	1	22.2	21.9	21.9
			25	24	1	1	22.2	22.0	21.8
			50	0	1	1	22.2	22.0	21.8
		16QAM	1	0	1	1	22.5	21.7	22.4
			1	24	1	1	22.5	21.5	22.4
			1	49	1	1	22.0	21.5	22.4
			25	0	2	2	21.1	21.0	20.8
			25	12	2	2	21.1	20.9	20.7
			25	24	2	2	21.1	20.9	20.9
			50	0	2	2	21.0	21.0	20.9

LTE Band 41 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							2557.5 MHz	2595 MHz	2632.5 MHz
LTE Band 41	5	QPSK	1	0	0	1	23.0	22.9	22.8
			1	12	0	0	23.5	22.8	22.7
			1	24	0	0	23.1	22.9	23.0
			12	0	1	2	22.0	22.0	21.8
			12	7	1	2	22.0	22.0	21.8
			12	13	1	2	22.0	21.9	21.9
			25	0	1	2	22.0	21.9	21.9
		16QAM	1	0	1	1	22.1	22.4	22.4
			1	12	1	1	22.4	21.7	22.3
			1	24	1	1	22.3	21.6	22.0
			12	0	2	2	21.1	20.9	20.7
			12	7	2	2	21.1	21.0	21.0
			12	13	2	2	21.2	21.0	21.0
			25	0	2	2	21.2	20.8	20.8

8.4. Wi-Fi (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	17.5	Yes
			6	2437	17.5	
			11	2462	17.5	
	802.11g	6 Mbps	1	2412	14.3	No
			6	2437	14.5	
			11	2462	14.5	
	802.11n (HT20)	MCS0	1	2412	12.4	No
			6	2437	12.5	
			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	17.1	No
			5.5 Mbps	17.0	No
			11 Mbps	17.0	No

8.5. Wi-Fi (5 GHz Bands)

Measured Results

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Avg Pwr (dBm)	SAR Test (Yes/No)
5.2 (UNII)	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	12.5	No
			40	5200	12.5	
			48	5240	12.3	
	802.11n (HT40)	MCS0	40	5200	12.5	No
			48	5240	12.5	
5.3 (UNII)	802.11a	6 Mbps	52	5260	13.5	Yes
			56	5280	13.5	
			60	5300	13.5	
			64	5320	13.5	
	802.11n (HT20)	MCS0	52	5260	12.5	No
			60	5300	12.4	
			64	5320	12.3	
	802.11n (HT40)	MCS0	56	5280	12.3	No
			60	5300	12.3	
5.5 (UNII)	802.11a	6 Mbps	100	5500	13.5	Yes
			104	5520	13.5	
			108	5540	13.2	
			112	5560	13.3	
			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	13.0	
	802.11n (HT20)	MCS0	100	5500	12.2	No
			116	5580	12.5	
			140	5700	12.2	
	802.11n (HT40)	MCS0	104	5520	12.2	No
			112	5560	12.5	
			136	5680	12.1	
5.8 (DTS)	802.11a	6 Mbps	149	5745	13.5	Yes
			153	5765	13.5	
			157	5785	13.5	
			161	5805	13.5	
			165	5825	13.5	
	802.11n (HT20)	MCS0	149	5745	12.1	No
			157	5785	12.3	
			161	5805	12.3	
	802.11n (HT40)	MCS0	153	5765	12.2	No
			161	5805	12.3	

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 (UNII)	802.11a	36	5180	6 Mbps	13.5	Yes
				9 Mbps	13.2	No
				12 Mbps	13.5	No
				18 Mbps	13.1	No
				24 Mbps	13.1	No
				36 Mbps	13.5	No
				48 Mbps	12.5	No
				54 Mbps	13.5	No
5.3 GHz (UNII)	802.11a	52	5260	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
				54 Mbps	13.3	No
5.5 GHz (UNII)	802.11a	104	5520	6 Mbps	13.5	Yes
				9 Mbps	13.5	No
				12 Mbps	13.0	No
				18 Mbps	13.0	No
				24 Mbps	13.1	No
				36 Mbps	13.0	No
				48 Mbps	13.1	No
				54 Mbps	13.5	No
5.8 GHz (DTS)	802.11a	157	5785	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
				54 Mbps	13.5	No

8.6. Bluetooth

Maximum tune-up tolerance limit is 10.5 dBm from the rated nominal maximum output power. This power level qualifies for exclusion of SAR testing.

9. Dielectric Property Measurements

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	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
11/10/2014	Head 2450	e'	39.9600	Relative Permittivity (ϵ_r):	39.96	39.20	1.94	5
		e"	13.3900	Conductivity (σ):	1.82	1.80	1.34	5
	Head 2410	e'	40.0800	Relative Permittivity (ϵ_r):	40.08	39.28	2.04	5
		e"	13.1000	Conductivity (σ):	1.76	1.76	-0.28	5
	Head 2475	e'	39.9800	Relative Permittivity (ϵ_r):	39.98	39.17	2.07	5
		e"	13.6100	Conductivity (σ):	1.87	1.83	2.52	5
11/10/2014	Body 2450	e'	51.5100	Relative Permittivity (ϵ_r):	51.51	52.70	-2.26	5
		e"	14.9500	Conductivity (σ):	2.04	1.95	4.44	5
	Body 2410	e'	51.3100	Relative Permittivity (ϵ_r):	51.31	52.76	-2.75	5
		e"	13.9600	Conductivity (σ):	1.87	1.91	-1.93	5
	Body 2475	e'	51.5900	Relative Permittivity (ϵ_r):	51.59	52.67	-2.05	5
		e"	14.5100	Conductivity (σ):	2.00	1.99	0.59	5
11/12/2014	Head 1900	e'	38.8000	Relative Permittivity (ϵ_r):	38.80	40.00	-3.00	5
		e"	12.6200	Conductivity (σ):	1.33	1.40	-4.77	5
	Head 1850	e'	39.3000	Relative Permittivity (ϵ_r):	39.30	40.00	-1.75	5
		e"	13.1700	Conductivity (σ):	1.35	1.40	-3.23	5
	Head 1910	e'	38.2800	Relative Permittivity (ϵ_r):	38.28	40.00	-4.30	5
		e"	12.5700	Conductivity (σ):	1.33	1.40	-4.65	5
11/12/2014	Body 1900	e'	51.8500	Relative Permittivity (ϵ_r):	51.85	53.30	-2.72	5
		e"	14.2000	Conductivity (σ):	1.50	1.52	-1.30	5
	Body 1850	e'	52.7300	Relative Permittivity (ϵ_r):	52.73	53.30	-1.07	5
		e"	15.0300	Conductivity (σ):	1.55	1.52	1.72	5
	Body 1910	e'	51.3000	Relative Permittivity (ϵ_r):	51.30	53.30	-3.75	5
		e"	14.1800	Conductivity (σ):	1.51	1.52	-0.92	5
11/13/2014	Head 835	e'	40.2600	Relative Permittivity (ϵ_r):	40.26	41.50	-2.99	5
		e"	19.5100	Conductivity (σ):	0.91	0.90	0.65	5
	Head 820	e'	40.4500	Relative Permittivity (ϵ_r):	40.45	41.60	-2.77	5
		e"	19.4700	Conductivity (σ):	0.89	0.90	-1.19	5
	Head 850	e'	40.0400	Relative Permittivity (ϵ_r):	40.04	41.50	-3.52	5
		e"	19.4300	Conductivity (σ):	0.92	0.92	0.36	5
11/13/2014	Body 835	e'	52.7500	Relative Permittivity (ϵ_r):	52.75	55.20	-4.44	5
		e"	21.7300	Conductivity (σ):	1.01	0.97	4.01	5
	Body 820	e'	52.9500	Relative Permittivity (ϵ_r):	52.95	55.28	-4.21	5
		e"	21.7800	Conductivity (σ):	0.99	0.97	2.54	5
	Body 850	e'	52.5700	Relative Permittivity (ϵ_r):	52.57	55.16	-4.69	5
		e"	21.7000	Conductivity (σ):	1.03	0.99	3.90	5

SAR Lab B

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
11/11/2014	Head 5180	e'	37.7400	Relative Permittivity (ϵ_r):	37.74	36.01	4.80	5
		e"	15.5600	Conductivity (σ):	4.48	4.63	-3.21	5
	Head 5200	e'	37.7500	Relative Permittivity (ϵ_r):	37.75	35.99	4.89	5
		e"	15.5100	Conductivity (σ):	4.48	4.65	-3.58	5
	Head 5600	e'	37.2200	Relative Permittivity (ϵ_r):	37.22	35.53	4.75	5
		e"	15.6800	Conductivity (σ):	4.88	5.06	-3.51	5
	Head 5800	e'	36.9900	Relative Permittivity (ϵ_r):	36.99	35.30	4.79	5
		e"	15.7700	Conductivity (σ):	5.09	5.27	-3.50	5
	Head 5825	e'	36.9300	Relative Permittivity (ϵ_r):	36.93	35.30	4.62	5
		e"	15.7900	Conductivity (σ):	5.11	5.27	-2.96	5
11/11/2014	Body 5180	e'	48.1900	Relative Permittivity (ϵ_r):	48.19	49.05	-1.75	5
		e"	18.4900	Conductivity (σ):	5.33	5.27	1.03	5
	Body 5200	e'	48.1400	Relative Permittivity (ϵ_r):	48.14	49.02	-1.79	5
		e"	18.4000	Conductivity (σ):	5.32	5.29	0.48	5
	Body 5600	e'	47.4800	Relative Permittivity (ϵ_r):	47.48	48.48	-2.06	5
		e"	18.7800	Conductivity (σ):	5.85	5.76	1.50	5
	Body 5800	e'	47.2100	Relative Permittivity (ϵ_r):	47.21	48.20	-2.05	5
		e"	18.9100	Conductivity (σ):	6.10	6.00	1.64	5
	Body 5825	e'	47.1000	Relative Permittivity (ϵ_r):	47.10	48.20	-2.28	5
		e"	18.9800	Conductivity (σ):	6.15	6.00	2.46	5
11/18/2014	Head 5180	e'	35.8800	Relative Permittivity (ϵ_r):	35.88	36.01	-0.37	5
		e"	15.7600	Conductivity (σ):	4.54	4.63	-1.97	5
	Head 5200	e'	35.8100	Relative Permittivity (ϵ_r):	35.81	35.99	-0.50	5
		e"	15.6800	Conductivity (σ):	4.53	4.65	-2.52	5
	Head 5600	e'	35.1900	Relative Permittivity (ϵ_r):	35.19	35.53	-0.97	5
		e"	15.8900	Conductivity (σ):	4.95	5.06	-2.22	5
	Head 5800	e'	34.9800	Relative Permittivity (ϵ_r):	34.98	35.30	-0.91	5
		e"	16.0200	Conductivity (σ):	5.17	5.27	-1.97	5
	Head 5825	e'	35.0000	Relative Permittivity (ϵ_r):	35.00	35.30	-0.85	5
		e"	16.0700	Conductivity (σ):	5.20	5.27	-1.24	5
11/17/2014	Body 5180	e'	47.9900	Relative Permittivity (ϵ_r):	47.99	49.05	-2.15	5
		e"	18.6200	Conductivity (σ):	5.36	5.27	1.74	5
	Body 5200	e'	47.8700	Relative Permittivity (ϵ_r):	47.87	49.02	-2.35	5
		e"	18.5000	Conductivity (σ):	5.35	5.29	1.03	5
	Body 5600	e'	47.2300	Relative Permittivity (ϵ_r):	47.23	48.48	-2.57	5
		e"	18.9900	Conductivity (σ):	5.91	5.76	2.64	5
	Body 5800	e'	47.2000	Relative Permittivity (ϵ_r):	47.20	48.20	-2.07	5
		e"	18.6400	Conductivity (σ):	6.01	6.00	0.19	5
	Body 5825	e'	47.0000	Relative Permittivity (ϵ_r):	47.00	48.20	-2.49	5
		e"	18.8400	Conductivity (σ):	6.10	6.00	1.70	5
12/8/2014	Head 2600	e'	37.9400	Relative Permittivity (ϵ_r):	37.94	39.01	-2.74	5
		e"	13.3600	Conductivity (σ):	1.93	1.96	-1.57	5
	Head 2500	e'	38.0500	Relative Permittivity (ϵ_r):	38.05	39.14	-2.78	5
		e"	13.2600	Conductivity (σ):	1.84	1.85	-0.58	5
	Head 2700	e'	37.6500	Relative Permittivity (ϵ_r):	37.65	38.88	-3.18	5
		e"	13.5200	Conductivity (σ):	2.03	2.07	-1.96	5
12/8/2014	Body 2600	e'	50.6400	Relative Permittivity (ϵ_r):	50.64	52.51	-3.56	5
		e"	14.5800	Conductivity (σ):	2.11	2.16	-2.45	5
	Body 2500	e'	50.5200	Relative Permittivity (ϵ_r):	50.52	52.64	-4.02	5
		e"	14.5900	Conductivity (σ):	2.03	2.02	0.39	5
	Body 2700	e'	50.3600	Relative Permittivity (ϵ_r):	50.36	52.38	-3.87	5
		e"	14.6500	Conductivity (σ):	2.20	2.30	-4.43	5

SAR Lab H

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
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
12/15/2014	Body 1900	e'	52.8800	Relative Permittivity (ϵ_r):	52.88	53.30	-0.79	5
		e"	14.3000	Conductivity (σ):	1.51	1.52	-0.61	5
	Body 1850	e'	53.0600	Relative Permittivity (ϵ_r):	53.06	53.30	-0.45	5
		e"	14.2400	Conductivity (σ):	1.46	1.52	-3.63	5
	Body 1910	e'	52.8400	Relative Permittivity (ϵ_r):	52.84	53.30	-0.86	5
		e"	14.3000	Conductivity (σ):	1.52	1.52	-0.09	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 re-measured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

10.1. System Performance Check Measurement Conditions

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ±0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube was chosen for the cube.
- Distance between probe sensors and phantom surface was set to 3 mm.
For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input power (forward power) was 100 mW.
- The results are normalized to 1 W input power.

10.2. Reference Target SAR Values

The reference SAR values are obtained from the calibration certificate of system validation dipoles. The measured values are normalized to 1 Watt.

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Target SAR Values (W/kg)		
				1g/10g	Head	Body
D835V2	4d142	9/9/2014	835	1g	8.91	9.22
				10g	5.77	6.05
D1900V2	5d140	4/23/2014	1900	1g	40.1	40.2
				10g	21.0	21.3
D2450V2	899	9/10/2014	2450	1g	52.3	50.5
				10g	24.3	23.5
D2600V2	1006	9/10/2014	2600	1g	58.6	56.3
				10g	26.1	25.1
D5GHzV2	1138	9/18/2014	5200	1g	81.4	75.4
				10g	23.3	21
			5600	1g	85.1	81.9
				10g	24.2	22.6
			5800	1g	80.6	75.2
				10g	23.0	20.8
D5GHzV2	1003	2/26/2014	5600	1g	78.3	73.8
				10g	22.1	20.4

10.3. 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 $\pm 10\%$	Plot No.
	Type	Serial #		Zoom Scan to 100 mW	Normalize to 1 W			
11/10/2014	D2450V2	899	Head	1g	5.61	56.10	52.3	1, 2
				10g	2.56	25.60	24.3	
11/10/2014	D2450V2	899	Body	1g	5.33	53.30	50.5	
				10g	2.46	24.60	23.5	
11/12/2014	D1900V2	5d140	Head	1g	4.11	41.10	40.1	3, 4
				10g	2.15	21.50	21.0	
11/12/2014	D1900V2	5d140	Body	1g	4.05	40.50	40.2	
				10g	2.09	20.90	21.3	
11/13/2014	D835V2	4d142	Head	1g	0.923	9.230	8.91	5, 6
				10g	0.603	6.030	5.77	
11/13/2014	D835V2	4d142	Body	1g	0.906	9.060	9.22	
				10g	0.593	5.930	6.05	

SAR Lab B

Date Tested	System Dipole		T.S. Liquid	Measured Results		Target (Ref. Value)	Delta $\pm 10\%$	Plot No.
	Type	Serial #		Zoom Scan to 100 mW	Normalize to 1 W			
11/11/2014	D5GHzV2 (5.2GHz)	1138	Head	1g	8.52	85.2	81.4	7, 8
				10g	2.46	24.6	23.3	
11/11/2014	D5GHzV2 (5.2GHz)	1138	Body	1g	7.79	77.9	75.40	
				10g	2.20	22.0	21	
11/11/2014	D5GHzV2 (5.6GHz)	1138	Head	1g	8.81	88.1	85.1	
				10g	2.51	25.1	24.2	
11/11/2014	D5GHzV2 (5.6GHz)	1138	Body	1g	8.41	84.1	81.9	
				10g	2.34	23.4	22.6	
11/11/2014	D5GHzV2 (5.8GHz)	1138	Head	1g	8.26	82.6	80.6	
				10g	2.36	23.6	23.0	
11/11/2014	D5GHzV2 (5.8GHz)	1138	Body	1g	7.66	76.6	75.2	
				10g	2.12	21.2	20.8	
11/17/2014	D5GHzV2 (5.8GHz)	1003	Body	1g	7.39	73.9	73.8	9, 10
				10g	2.04	20.4	20.4	
11/18/2014	D5GHzV2 (5.6GHz)	1138	Head	1g	8.38	83.8	85.1	
				10g	2.39	23.9	24.2	
12/8/2014	D2600V2	1006	Head	1g	5.53	55.30	58.6	11, 12
				10g	2.43	24.30	26.1	
12/8/2014	D2600V2	1006	Body	1g	5.45	54.50	56.3	
				10g	2.39	23.90	25.1	

SAR Lab H

Date Tested	System Dipole		T.S. Liquid	Measured Results		Target (Ref. Value)	Delta $\pm 10\%$	Plot No.
	Type	Serial #		Zoom Scan to 100 mW	Normalize to 1 W			
12/8/2014	D1900V2	5d140	Body	1g	3.85	38.5	40.20	13, 14
				10g	2.00	20.0	21.3	
12/15/2014	D1900V2	5d140	Head	1g	4.05	40.5	40.20	
				10g	2.08	20.8	21.3	

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.

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.

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	33.5	33.1	0.045	0.049	0.031	0.034	1
			Left Tilt	190	836.6	33.5	33.1	0.027	0.030	0.021	0.023	
			Right Touch	190	836.6	33.5	33.1	0.054	0.059	0.042	0.046	
			Right Tilt	190	836.6	33.5	33.1	0.022	0.024	0.017	0.019	
Head VoIP	GPRS 1 Slots	0	Left Touch	190	836.6	33.5	33.1	0.046	0.050	0.032	0.035	2
			Left Tilt	190	836.6	33.5	33.1	0.027	0.030	0.022	0.024	
			Right Touch	190	836.6	33.5	33.1	0.050	0.055	0.040	0.044	
			Right Tilt	190	836.6	33.5	33.1	0.021	0.023	0.016	0.018	
Body-worn	Voice	10	Rear	190	836.6	33.5	33.1	0.365	0.400	0.208	0.228	3
			Front	190	836.6	33.5	33.1	0.343	0.376	0.198	0.217	
Body-worn(VoIP) & Hotspot	GPRS 1 Slots	10	Rear	190	836.6	33.5	33.1	0.414	0.454	0.232	0.254	4
Front			190	836.6	33.5	33.1	0.367	0.402	0.207	0.227		
Hotspot			Edge 2	190	836.6	33.5	33.1	0.065	0.071	0.044	0.048	
			Edge 3	190	836.6	33.5	33.1	0.213	0.234	0.120	0.132	
			Edge 4	190	836.6	33.5	33.1	0.059	0.065	0.036	0.039	

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	0.100	0.100	0.060	0.060	5
			Left Tilt	661	1880.0	30.0	30.0	0.068	0.068	0.040	0.040	
			Right Touch	661	1880.0	30.0	30.0	0.052	0.052	0.032	0.032	
			Right Tilt	661	1880.0	30.0	30.0	0.054	0.054	0.032	0.032	
Head VoIP	GPRS 2 Slots	0	Left Touch	661	1880.0	27.5	27.5	0.117	0.117	0.069	0.069	6
			Left Tilt	661	1880.0	27.5	27.5	0.080	0.080	0.047	0.047	
			Right Touch	661	1880.0	27.5	27.5	0.061	0.061	0.039	0.039	
			Right Tilt	661	1880.0	27.5	27.5	0.064	0.064	0.038	0.038	
Body-worn	Voice	10	Rear	661	1880.0	30.0	30.0	0.672	0.672	0.385	0.385	7
			Front	661	1880.0	30.0	30.0	0.562	0.562	0.327	0.327	
Body-worn(VoIP) & Hotspot	GPRS 2 Slots	10	Rear	661	1880.0	30.0	30.0	0.686	0.686	0.394	0.394	
Front			661	1880.0	30.0	30.0	0.586	0.586	0.342	0.342		
Hotspot			Edge 2	661	1880.0	27.5	27.5	0.022	0.022	0.012	0.012	
			Edge 3	512	1850.2	27.5	27.5	0.718	0.718	0.398	0.398	
				661	1880.0	27.5	27.5	0.827	0.827	0.457	0.457	
				810	1909.8	27.5	27.5	0.844	0.844	0.464	0.464	8
			Edge 4	661	1880.0	27.5	27.5	0.199	0.199	0.104	0.104	

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	23.5	22.9	0.049	0.056	0.035	0.040	9
			Left Tilt	4183	836.6	23.5	22.9	0.028	0.032	0.016	0.018	
			Right Touch	4183	836.6	23.5	22.9	0.051	0.059	0.040	0.046	
			Right Tilt	4183	836.6	23.5	22.9	0.027	0.031	0.020	0.023	
Body-worn & Hptspot	Rel 99 RMC	10	Rear	4183	836.6	23.5	22.9	0.296	0.340	0.168	0.193	10
			Front	4183	836.6	23.5	22.9	0.247	0.284	0.144	0.165	
Hotspot	Rel 99 RMC	10	Edge 2	4183	836.6	23.5	22.9	0.062	0.072	0.042	0.048	
			Edge 3	4183	836.6	23.5	22.9	0.164	0.188	0.092	0.106	
			Edge 4	4183	836.6	23.5	22.9	0.048	0.055	0.030	0.034	

11.4. W-CDMA Band II

11.4.1. Full Power

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	22.5	0.149	0.167	0.091	0.102	11
			Left Tilt	9400	1880.0	23.0	22.5	0.112	0.126	0.067	0.075	
			Right Touch	9400	1880.0	23.0	22.5	0.077	0.086	0.037	0.042	
			Right Tilt	9400	1880.0	23.0	22.5	0.092	0.103	0.054	0.061	
Body-worn	Rel 99 RMC	10	Rear	9262	1852.4	23.0	22.9	0.968	0.991	0.557	0.570	
				9400	1880.0	23.0	22.5	0.849	0.953	0.484	0.543	
				9538	1907.6	23.0	22.3	0.882	1.036	0.496	0.583	
			Front	9262	1852.4	23.0	22.9	0.906	0.927	0.518	0.530	
				9400	1880.0	23.0	22.5	0.838	0.940	0.484	0.543	
				9538	1907.6	23.0	22.3	0.922	1.083	0.518	0.609	12

11.4.2. Power Reduction

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	
Htpspot	Rel 99 RMC	10	Rear	9400	1880.0	22.0	22.0	0.630	0.630	0.369	0.369	
			Front	9400	1880.0	22.0	22.0	0.602	0.602	0.350	0.350	
	Rel 99 RMC	10	Edge 2	9400	1880.0	22.0	22.0	0.045	0.045	0.020	0.020	
			Edge 3	9400	1880.0	22.0	22.0	0.662	0.662	0.368	0.368	13
			Edge 4	9400	1880.0	22.0	22.0	0.222	0.222	0.118	0.118	

11.5. LTE Band 41 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	Meas.	Scaled	
Head	QPSK	0	Left Touch	40640	2595.0	1	0	24.0	23.3	0.026	0.030	0.017	0.020	
						50	0	23.0	22.0	0.023	0.029	0.012	0.015	
			Left Tilt	40640	2595.0	1	0	24.0	23.3	0.019	0.022	0.011	0.012	
						50	0	23.0	22.0	0.012	0.015	0.006	0.008	
			Right Touch	40640	2595.0	1	0	24.0	23.3	0.037	0.043	0.019	0.022	14
						50	0	23.0	22.0	0.027	0.034	0.014	0.017	
			Right Tilt	40640	2595.0	1	0	24.0	23.3	0.032	0.038	0.016	0.019	
						50	0	23.0	22.0	0.021	0.026	0.010	0.013	
Body-worn & Hotspot	QPSK	10	Rear	40640	2595.0	1	0	24.0	23.3	0.242	0.284	0.117	0.137	
						50	0	23.0	22.0	0.167	0.210	0.081	0.101	
			Front	40640	2595.0	1	0	24.0	23.3	0.313	0.368	0.150	0.176	15
						50	0	23.0	22.0	0.215	0.271	0.104	0.131	
Hotspot	QPSK	10	Edge 2	40640	2595.0	1	0	24.0	23.3	0.044	0.051	0.022	0.026	
						50	0	23.0	22.0	0.033	0.042	0.017	0.021	
			Edge 3	40640	2595.0	1	0	24.0	23.3	0.456	0.536	0.225	0.264	16
						50	0	23.0	22.0	0.339	0.427	0.163	0.205	
			Edge 4	40640	2595.0	1	0	24.0	23.3	0.050	0.059	0.023	0.027	
						50	0	23.0	22.0	0.032	0.040	0.015	0.019	

11.6. Wi-Fi (DTS Band)

11.6.1. Wi-Fi 2.4 GHz

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	802.11b 1 Mbps	0	Left Touch	6	2437.0	17.5	17.5	0.662	0.662	0.307	0.307	17
			Left Tilt	6	2437.0	17.5	17.5	0.610	0.610	0.259	0.259	
			Right Touch	6	2437.0	17.5	17.5	0.614	0.614	0.278	0.278	
			Right Tilt	6	2437.0	17.5	17.5	0.622	0.622	0.281	0.281	
Body-worn & Hotspot	802.11b 1 Mbps	10	Rear	6	2437.0	17.5	17.5	0.140	0.140	0.065	0.065	18
			Front	6	2437.0	17.5	17.5	0.117	0.117	0.055	0.055	
Hotspot	802.11b 1 Mbps	10	Edge 1	6	2437.0	17.5	17.5	0.275	0.275	0.137	0.137	19
			Edge 2	6	2437.0	17.5	17.5	0.013	0.013	0.005	0.005	

11.6.2. Wi-Fi 5.8 GHz

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	802.11a 6 Mbps	0	Left Touch	157	5785	13.5	13.5	0.123	0.123	0.036	0.036	
			Left Tilt	157	5785	13.5	13.5	0.134	0.134	0.037	0.037	20
			Right Touch	157	5785	13.5	13.5	0.071	0.071	0.022	0.022	
			Right Tilt	157	5785	13.5	13.5	0.103	0.103	0.026	0.026	
Body-worn	802.11a 6 Mbps	10	Rear	157	5785	13.5	13.5	0.064	0.065	0.020	0.020	21
			Front	157	5785	13.5	13.5	0.035	0.035	0.012	0.012	
Hotspot	802.11a 6 Mbps	10	Edge 1	157	5785	13.5	13.5	0.019	0.019	0.006	0.006	22
			Edge 2	157	5785	13.5	13.5	0.008	0.008	0.003	0.003	

11.7. Wi-Fi (UNII 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	
Head	802.11a 6 Mbps	0	Left Touch	36	5180	13.5	13.5	0.547	0.547	0.127	0.127	23
				52	5260	13.5	13.5	0.848	0.848	0.207	0.207	24
				64	5300	13.5	13.5	0.816	0.816	0.202	0.202	
				104	5520	13.5	13.5	0.383	0.383	0.099	0.099	
				116	5580	13.5	13.5	0.533	0.533	0.154	0.154	25
				120	5600	13.5	13.5	0.413	0.413	0.115	0.115	
			Left Tilt	136	5680	13.5	13.5	0.365	0.365	0.107	0.107	
				36	5180	13.5	13.5	0.499	0.499	0.118	0.118	
				64	5300	13.5	13.5	0.693	0.693	0.171	0.171	
				104	5520	13.5	13.5	0.386	0.386	0.096	0.096	
				116	5580	13.5	13.5	0.460	0.460	0.128	0.128	
				120	5600	13.5	13.5	0.345	0.345	0.091	0.091	
			Right Touch	136	5680	13.5	13.5	0.312	0.312	0.090	0.090	
				36	5180	13.5	13.5	0.256	0.256	0.069	0.069	
				64	5300	13.5	13.5	0.392	0.392	0.108	0.108	
			Right Tilt	116	5580	13.5	13.5	0.260	0.260	0.074	0.074	
				36	5180	13.5	13.5	0.259	0.259	0.069	0.069	
				64	5300	13.5	13.5	0.392	0.392	0.108	0.108	
				116	5580	13.5	13.5	0.246	0.246	0.070	0.070	
Body-worn	802.11a 6 Mbps	10	Rear	36	5180	13.5	13.5	0.157	0.157	0.046	0.046	26
				64	5300	13.5	13.5	0.141	0.141	0.039	0.039	27
				116	5580	13.5	13.5	0.072	0.072	0.021	0.021	28
			Front	36	5180	13.5	13.5	0.082	0.082	0.025	0.025	
				64	5300	13.5	13.5	0.088	0.088	0.028	0.028	
				116	5580	13.5	13.5	0.062	0.062	0.022	0.022	

11.8. Bluetooth

11.8.1. 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)			
10.5	11	10	2.480	1.7

Conclusion:

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

11.8.2. 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	11	10	2.480	0.231

12. SAR Measurement Variability

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

- 1) Repeated measurement is not required when the original highest measured SAR is < 1.6 or 2 W/kg (1-g or 10-g respectively); steps 2) through 4) do not apply.
- 2) When the original highest measured SAR is ≥ 1.6 or 2 W/kg (1-g or 10-g respectively), 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 3 (1-g or 10-g respectively) or when the original or repeated measurement is ≥ 1.45 or 3.6 W/kg ($\sim 10\%$ from the 1-g or 10-g respective SAR limit).
- 4) Perform a third repeated measurement only if the original, first, or second repeated measurement is ≥ 1.5 or 3.75 W/kg (1-g or 10-g respectively) and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20 or 3 (1-g or 10-g respectively).

12.1. The Highest Measured SAR Configuration in Each Frequency Band

Frequency Band (MHz)	Air Interface	Head (W/kg)	Body-worn Accessory (W/kg)	Wireless Router (Hotspot) (W/kg)	Repeated SAR (Yes/No)
850	GSM 850	0.059	0.414	0.414	No
	WCDMA Band V	0.051	0.296	0.296	No
1900	GSM 1900	0.117	0.686	0.844	No
	WCDMA Band II	0.149	0.968	0.662	Yes
2400	Wi-Fi 802.11b/g/n	0.662	0.140	0.275	No
2600	LTE Band 41	0.037	0.313	0.456	No
5200	Wi-Fi 802.11a/n	0.547	0.157	N/A	No
5300	Wi-Fi 802.11a/n	0.848	0.141	N/A	Yes
5500	Wi-Fi 802.11a/n	0.533	0.072	N/A	No
5800	Wi-Fi 802.11a/n	0.134	0.065	0.019	No

12.2. Repeated Measurement Results

Head

Frequency band	Test Position	Mode	Ch #.	Freq. (MHz)	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio	Note
					Original	Repeated		
5.3 GHz	LHS Touch	802.11a 6 Mbps	52	5260.0	0.848	0.831	1.02	1

Body-worn Accessory

Frequency band	Test Position	Mode	Ch #.	Freq. (MHz)	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio	Note
					Original	Repeated		
W-CDMA Band II	Rear	Rel 99 RMC 12.2 kbps	9262	1852.4	0.968	0.938	1.03	1

Wireless Router (Hotspot)

N/A

Note(s):

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

13. 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:

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	0.050	0.662			0.712	No
		① + ③	0.050		0.848		0.898	No
	Left Tilt	① + ②	0.030	0.610			0.640	No
		① + ③	0.030		0.693		0.723	No
	Right Touch	① + ②	0.059	0.614			0.673	No
		① + ③	0.059		0.398		0.457	No
	Right Tilt	① + ②	0.024	0.622			0.646	No
		① + ③	0.024		0.392		0.416	No
Body-worn Accessory & Hotspot	Rear	① + ②	0.454	0.140			0.594	No
		① + ③	0.454		0.157		0.611	No
		① + ④	0.454			0.231	0.685	No
	Front	① + ②	0.402	0.117			0.519	No
		① + ③	0.402		0.088		0.490	No
		① + ④	0.402			0.231	0.633	No
Hotspot	Edge 2	① + ②	0.071	0.013			0.084	No

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	0.117	0.662			0.779	No
		① + ③	0.117		0.848		0.965	No
	Left Tilt	① + ②	0.080	0.610			0.690	No
		① + ③	0.080		0.693		0.773	No
	Right Touch	① + ②	0.061	0.614			0.675	No
		① + ③	0.061		0.398		0.459	No
	Right Tilt	① + ②	0.064	0.622			0.686	No
		① + ③	0.064		0.392		0.456	No
Body-worn Accessory & Hotspot	Rear	① + ②	0.686	0.140			0.826	No
		① + ③	0.686		0.157		0.843	No
		① + ④	0.686			0.231	0.917	No
	Front	① + ②	0.586	0.117			0.703	No
		① + ③	0.586		0.088		0.674	No
		① + ④	0.586			0.231	0.817	No
Hotspot	Edge 2	① + ②	0.022	0.013			0.035	No

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 Band V	② Wi-Fi(DTS)	③ Wi-Fi(UNII)	④ Bluetooth		
Head	Left Touch	① + ②	0.056	0.662		0.718	No
		① + ③	0.056	0.848		0.904	No
	Left Tilt	① + ②	0.032	0.610		0.642	No
		① + ③	0.032	0.693		0.725	No
	Right Touch	① + ②	0.059	0.614		0.673	No
		① + ③	0.059	0.398		0.457	No
	Right Tilt	① + ②	0.031	0.622		0.653	No
		① + ③	0.031	0.392		0.423	No
Body-w orn Accessory & Hotspot	Rear	① + ②	0.340	0.140		0.480	No
		① + ③	0.340	0.157		0.497	No
		① + ④	0.340		0.231	0.571	No
	Front	① + ②	0.284	0.117		0.401	No
		① + ③	0.284	0.088		0.372	No
		① + ④	0.284		0.231	0.515	No
Hotspot	Edge 2	① + ②	0.072	0.013		0.085	No

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 W-CDMA Band II	② Wi-Fi(DTS)	③ Wi-Fi(UNII)	④ Bluetooth		
Head	Left Touch	① + ②	0.167	0.662		0.829	No
		① + ③	0.167	0.848		1.015	No
	Left Tilt	① + ②	0.126	0.610		0.736	No
		① + ③	0.126	0.693		0.819	No
	Right Touch	① + ②	0.086	0.614		0.700	No
		① + ③	0.086	0.398		0.484	No
	Right Tilt	① + ②	0.103	0.622		0.725	No
		① + ③	0.103	0.392		0.495	No
Body-w orn Accessory & Hotspot	Rear	① + ②	1.036	0.140		1.176	No
		① + ③	1.036	0.157		1.193	No
		① + ④	1.036		0.231	1.267	No
	Front	① + ②	1.083	0.117		1.200	No
		① + ③	1.083	0.088		1.171	No
		① + ④	1.083		0.231	1.314	No
Hotspot	Edge 2	① + ②	0.045	0.013		0.058	No

13.5. Sum of the SAR for LTE Band 41 & Wi-Fi & BT

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① LTE Band 41	② Wi-Fi(DTS)	③ Wi-Fi(UNII)	④ Bluetooth		
Head	Left Touch	① + ②	0.030	0.662			0.692	No
		① + ③	0.030		0.848		0.878	No
	Left Tilt	① + ②	0.022	0.610			0.632	No
		① + ③	0.022		0.693		0.715	No
	Right Touch	① + ②	0.043	0.614			0.657	No
		① + ③	0.043		0.398		0.441	No
	Right Tilt	① + ②	0.038	0.622			0.660	No
		① + ③	0.038		0.392		0.430	No
Body-w orn Accessory & Hotspot	Rear	① + ②	0.284	0.140			0.424	No
		① + ③	0.284		0.157		0.441	No
		① + ④	0.284			0.231	0.515	No
	Front	① + ②	0.368	0.117			0.485	No
		① + ③	0.368		0.088		0.456	No
		① + ④	0.368			0.231	0.599	No
Hotspot	Edge 2	① + ②	0.051	0.013			0.064	No

Appendixes

Refer to separated files for the following appendixes.

A_14I19355v0 SAR Photos & Ant. Locations

B_14I19355v0 SAR System Check Plots

C_14I19355v0 SAR Highest Test Plots

D_14I19355v0 SAR Tissue Ingredients

E_14I19355v0 SAR Probe Cal. Certificates

F_14I19355v0 SAR Dipole Cal. Certificates

END OF REPORT