SAR EVALUATION REPORT

FCC 47 CFR § 2.1093
IEEE Std 1528-2013

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

Model: SM-G7508W
FCC ID: A3LSMG7508W

Report Number: 14I18943-S1B
Issue Date: 10/30/2014

Prepared for
SAMSUNG ELECTRONICS CO., LTD.
416, MAETAN 3-DONG, YEONGTONG-GU
SUWON-CITY, GYEONGGI-DO 443-742, South 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
--	10/07/2014	Initial Issue	--
A	10/29/2014	Updated Hotspot mode and Wi-Fi Direct Information Section 7 – Justified body-worn test separation distance	Coltyce Sanders
B	10/30/2014	Corrected body worn separation distance.	Dave Weaver

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1. Attestation of Test Results

Applicant Name	SAMSUNG ELECTRONICS CO., LTD.			
Application Purpose	☒ Original Grant ☐ Class II Permissive Change			
FCC ID	A3LSMG7508W			
DUT Description	GSM/WCDMA/LTE Phablet + Bluetooth, DTS/UNII a/b/g/n, ANT+ & NFC			
Exposure Category	General Population/Uncontrolled Exposure (1g SAR limit: 1.6 W/kg)			
The Highest Reported SAR Values	RF Exposure Conditions	Equipment Class		
		Licensed	DTS	UNII
	Head	0.304 W/kg	0.213 W/kg	0.098 W/kg
	Body-worn Accessory	1.006 W/kg	0.255 W/kg	0.383 W/kg
	Wireless Router (Hotspot)			N/A
	Wi-Fi Direct	N/A		N/A
	Simultaneous Transmission	Head: 0.517 W/kg Body: 1.170 W/kg	Head: 0.517 W/kg Body: 1.042 W/kg	Head: 0.402 W/kg Body: 1.170 W/kg
Applicable Standards	FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013			
Test Results	Pass			
Date tested	9/29/2014 – 10/03/2014			

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government (NIST Handbook 150, Annex A). This report is written to support regulatory compliance of the applicable standards stated above.

Approved & Released By:	Prepared By:
Dave Weaver Program Manager UL Verification Services Inc.	AJ Newcomer Laboratory Technician UL Verification Services Inc.

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2. Test Specification, Methods and Procedures

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

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

3. Facilities and Accreditation

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

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

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://ts.nist.gov/standards/scopes/2000650.htm.

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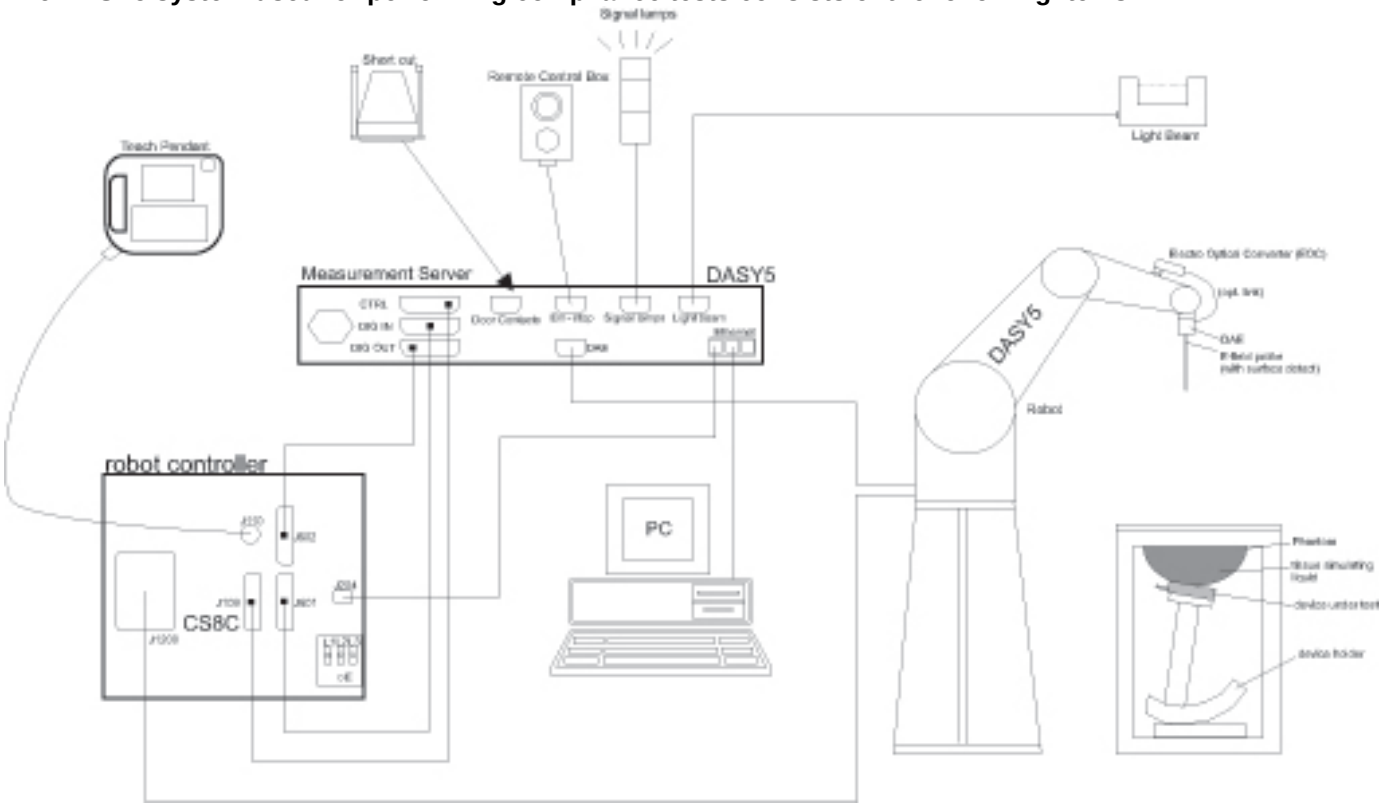
4. SAR Measurement System & Test Equipment

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.

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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	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.	

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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	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
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.

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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	E753ES	MY40000980	4/7/2015
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	Cole-Parmer Instrument Co.	91100-50	1007	7/31/2015
Thermometer	EXTECH	445703	CCS-200	3/24/2015

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
HP Signal Generator	HP	8665B	3546A00784	6/23/2015
Power Meter	HP	437B	3125U16345	6/16/2015
Power Sensor	Agilent	8481A	2702A60780	6/16/2015
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1622052	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2711	N/A
DC Power Supply	Sorensen Ametek	XT20-3	1318A00530	N/A
Synthesized Signal Generator	Agilent	8665B	3438A00633	7/10/2015
Power Meter	Agilent	N1911A	MY53060016	8/7/2015
Power Sensor	Agilent	E9323A	MY53070003	5/1/2015
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1808938	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2710	N/A
DC Power Supply	HP	6296A	2841A-05955	N/A
E-Field Probe (SAR 1)	SPEAG	EX3DV4	3902	5/19/2015
E-Field Probe (SAR 4)	SPEAG	EX3DV4	3929	5/9/2015
E-Field Probe (SAR 5)	SPEAG	EX3DV4	3991	5/16/2015
Data Acquisition Electronics (SAR 1)	SPEAG	DAE3	427	1/21/2015
Data Acquisition Electronics (SAR 4)	SPEAG	DAE4	1377	8/27/2015
Data Acquisition Electronics (SAR 5)	SPEAG	DAE4	1439	5/14/2015
System Validation Dipole	SPEAG	D835V2	4d117	5/16/2015
System Validation Dipole	SPEAG	D1900V2	5d043	11/12/2014
System Validation Dipole	SPEAG	D2450V2	706	5/20/2015
System Validation Dipole	SPEAG	D2600V2	1036	8/11/2015
System Validation Dipole	SPEAG	D5GHzV2	1003	2/26/2015
Thermometer (SAR Lab 1)	EXTECH	445703	CCS-205	3/24/2015
Thermometer (SAR Lab 4)	EXTECH	445703	CCS-238	6/3/2015
Thermometer (SAR Lab 5)	EXTECH	445703	CCS-239	6/3/2015

Others

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Power Meter	Agilent	N1912A	MY53040015	7/10/2015
Power Sensor	Agilent	N1921A	MY52020011	5/6/2015
Base Station Simulator	R & S	CMW500	137873-WG	7/14/2015
Base Station Simulator	R & S	CMW500	132910-cp	4/25/2015
Base Station Simulator	R & S	CMW500	13593-vQ	7/3/2015
Base Station Simulator	R & S	CMW500	104245-jz	3/26/2015

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5. Measurement Uncertainty

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

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6. Device Under Test (DUT) Information

6.1. DUT Description

Model: SM-G7508W	
Device Dimension	Overall (Length x Width): 163.6 mm x 84.8 mm Overall Diagonal: 177.2 mm Display Diagonal: 152.7 mm
Battery Back Cover	☒ Normal Battery Cover ☐ Normal Battery Cover with NFC ☐ Wireless Charger Battery Cover ☐ Wireless Charger Battery Cover with NFC.
Battery Options	☒ Standard – Lithium-ion battery, Rating 3.8Vdc, 10.64Wh ☐ Extended (large capacity)
Accessory	Headset
Wireless Router (Hotspot)	Wi-Fi Hotspot mode permits the device to share its cellular data connection with other Wi-Fi-enabled devices. ☒ Mobile Hotspot (Wi-Fi 2.4 GHz) ☒ Mobile Hotspot (Wi-Fi 5.8 GHz)
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 supported		
W-CDMA (UMTS)	Band V and II	UMTS Rel. 99 (Voice & Data) HSDPA (Rel. 7, CAT 14) HSUPA (Rel. 6, CAT 6) DC-HSDPA (Rel. 8, CAT 24) HSPA+ (Rel. 6, CAT 6)	100%
LTE (TDD)	Band 41	QPSK, 16QAM	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	32.25% (DH1), 66.68% (DH3), 77.52% (DH5)

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6.3. Nominal and Maximum Output Power

Upper limit (dB): 0.5 ~ -1.5		RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
GSM850	Voice	32.5	**33.0**
	GPRS 1 slot	32.5	**33.0**
	GPRS 2 slots	30.5	**31.0**
	GPRS 3 slots	29.5	**30.0**
	GPRS 4 slots	27.0	**27.5**
	EGPRS 1 slot	27.0	**27.5**
	EGPRS 2 slots	26.0	**26.5**
	EGPRS 3 slots	25.0	**25.5**
	EGPRS 4 slots	24.0	**24.5**
GSM1900	Voice	29.5	**30.0**
	GPRS 1 slot	29.5	**30.0**
	GPRS 2 slots	27.5	**28.0**
	GPRS 3 slots	26.0	**26.5**
	GPRS 4 slots	24.0	**24.5**
	EGPRS 1 slot	26.5	**27.0**
	EGPRS 2 slots	25.0	**25.5**
	EGPRS 3 slots	23.0	**23.5**
	EGPRS 4 slots	22.5	**23.0**
W-CDMA Band V	R99	23.0	**23.5**
	HSDPA	22.0	**22.5**
	HSUPA	21.5	**22.0**
	DC-DSPA	22.0	**22.5**
W-CDMA Band II	R99	23.0	**23.5**
	HSDPA	20.5	**21.0**
	HSUPA	22.0	**22.5**
	DC-DSPA	20.5	**21.0**
LTE Band 41	QPSK	23.0	**23.5**

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		12.0	**12.5**
Bluetooth LE		1.0	**1.5**

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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 2/5 + Wi-Fi 2.4/5.8GHz 3. LTE B41 + Wi-Fi 2.4/5.8GHz

Notes:
1. Wi-Fi 2.4GHz and 5.8GHz supports Hotspot mode and Wi-Fi Direct.
2. GPRS/EDGE, WCDMA and LTE support Hotspot.
3. VoIP is supported in LTE, WCDMA 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

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td rowspan="7">Frequency range, Channel Bandwidth, Numbers and Frequencies</td><td>
<table>
<tr><th rowspan="3">Band 41</th><th colspan="6">Frequency range: 2496 - 2690 MHz</th></tr>
<tr><th colspan="6">Channel Bandwidth</th></tr>
<tr><th>20 MHz</th><th>15 MHz</th><th>10 MHz</th><th>5 MHz</th><th>3 MHz</th><th>1.4 MHz</th></tr>
<tr><td>Low</td><td>39750/
2506.0</td><td>39725/
2503.5</td><td>39700/
2501</td><td>39675/
2498.5</td><td></td><td></td></tr>
<tr><td>Low-Mid</td><td>40185/
2549.5</td><td>40173/
2548.3</td><td>40160/
2547.0</td><td>40148/
2545.8</td><td></td><td></td></tr>
<tr><td>Mid</td><td>40620/
2593.0</td><td>40620/
2593.0</td><td>40620/
2593.0</td><td>40620/
2593.0</td><td></td><td></td></tr>
<tr><td>Mid-High</td><td>41055/
2636.5</td><td>41068/
2547.8</td><td>41080/
2639.0</td><td>41093/
2640.3</td><td></td><td></td></tr>
<tr><td>High</td><td>41490/
2680.0</td><td>41515/
2682.5</td><td>41540/
2685.0</td><td>41565/
2687.5</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>LTE transmitter and antenna implementation</td><td>LTE has one (1) TX/RX antenna and one (1) RX Diversity antenna
Refer to Appendix 14.1. 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>

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6.6. LTE (TDD) Considerations

According to KDB 941225 D05 SAR for LTE Devices v02r02, 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	$26336 \cdot T_s$			$7680 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$
5	$6592 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$	$20480 \cdot T_s$		
6	$19760 \cdot T_s$			$23040 \cdot T_s$		
7	$21952 \cdot T_s$			$12800 \cdot T_s$		
8	$24144 \cdot T_s$			-	-	-
9	$13168 \cdot T_s$			-	-	-

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 x (T_s) x # of S + # of U

<u>Example for Calculated Duty Cycle for Uplink-Downlink Configuration 0:</u>
Calculated Duty Cycle = 5120 x [1/(15000 x 2048)] x 2 + 6 ms = 63.33%
where
T_s = 1/(15000 x 2048) seconds

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7. RF Exposure Conditions (Test Configurations)

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

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

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.

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8. Conducted Output Power Measurements

8.1. GSM850 and GSM1900

GSM850 Measured Results

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Burst Pwr (dBm)	Frame Pwr (dBm)
850	GSM (Voice)	CS1	1	128	824.2	32.8	23.8
				190	836.6	32.8	23.8
				251	848.8	32.6	23.6
	GPRS (GMSK)	CS1	1	128	824.2	32.8	23.8
				190	836.6	32.8	23.8
				251	848.8	32.6	23.6
			2	128	824.2	31.0	25.0
				190	836.6	31.0	25.0
				251	848.8	31.0	25.0
			3	**128**	**824.2**	**29.9**	**25.6**
				190	**836.6**	**29.8**	**25.5**
				251	**848.8**	**29.6**	**25.3**
			4	128	824.2	27.4	24.4
				190	836.6	27.5	24.5
				251	848.8	27.2	24.2
	EGPRS (8PSK)	MCS5	1	128	824.2	26.1	17.1
				190	836.6	25.9	16.9
				251	848.8	25.8	16.8
			2	128	824.2	26.1	20.1
				190	836.6	25.9	19.9
				251	848.8	25.7	19.7
			3	128	824.2	24.0	19.7
				190	836.6	23.9	19.6
				251	848.8	23.7	19.4
			4	128	824.2	24.0	21.0
				190	836.6	23.9	20.9
				251	848.8	23.7	20.7

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

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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	29.6	20.6
				661	1880.0	30.0	21.0
				810	1909.8	30.0	21.0
	GPRS (GMSK)	CS1	1	512	1850.2	29.6	20.6
				661	1880.0	30.0	21.0
				810	1909.8	30.0	21.0
			2	512	1850.2	27.7	21.7
				661	1880.0	28.0	22.0
				810	1909.8	28.0	22.0
			3	**512**	**1850.2**	**25.8**	**21.5**
				661	**1880.0**	**26.0**	**21.7**
				810	**1909.8**	**26.0**	**21.7**
			4	512	1850.2	24.3	21.3
				661	1880.0	24.5	21.5
				810	1909.8	24.5	21.5
	EGPRS (8PSK)	MCS5	1	512	1850.2	25.0	16.0
				661	1880.0	25.1	16.1
				810	1909.8	25.1	16.1
			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	22.7	18.4
				661	1880.0	22.8	18.5
				810	1909.8	22.8	18.5
			4	512	1850.2	22.6	19.6
				661	1880.0	22.7	19.7
				810	1909.8	22.7	19.7

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

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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
	βc/βd	8/15

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band V	Rel 99 (RMC, 12.2 kbps)	4132	826.4	21.9
		4183	836.6	22.0
		4233	846.6	21.9
W-CDMA Band II	Rel 99 (RMC, 12.2 kbps)	9262	1852.4	22.0
		9400	1880.0	22.1
		9538	1907.6	22.1

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HSDPA

The following 4 Sub-tests were completed according to Release 7 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subtest	1	2	3	4
W-CDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-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			

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	MPR	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	0	20.9
		4183	836.6	0	21.0
		4233	846.6	0	20.8
	Subtest 2	4132	826.4	0	21.0
		4183	836.6	0	20.9
		4233	846.6	0	20.8
	Subtest 3	4132	826.4	0.5	20.3
		4183	836.6	0.5	20.3
		4233	846.6	0.5	20.2
	Subtest 4	4132	826.4	0.5	20.4
		4183	836.6	0.5	20.5
		4233	846.6	0.5	20.3
W-CDMA Band II	Subtest 1	9262	1852.4	0	20.9
		9400	1880.0	0	21.0
		9538	1907.6	0	20.9
	Subtest 2	9262	1852.4	0	20.9
		9400	1880.0	0	21.0
		9538	1907.6	0	21.0
	Subtest 3	9262	1852.4	0.5	20.5
		9400	1880.0	0.5	20.5
		9538	1907.6	0.5	20.5
	Subtest 4	9262	1852.4	0.5	20.5
		9400	1880.0	0.5	20.5
		9538	1907.6	0.5	20.5

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

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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
	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	11/15	15/9	2/15	15/0
	βhs	22/15	12/15	30/15	4/15	5/15
	βed	1309/225	94/75	47/15 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

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Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	MPR	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	0	20.8
		4183	836.6	0	21.0
		4233	846.6	0	20.8
	Subtest 2	4132	826.4	2	19.7
		4183	836.6	2	19.4
		4233	846.6	2	19.3
	Subtest 3	4132	826.4	1	19.7
		4183	836.6	1	19.5
		4233	846.6	1	19.6
	Subtest 4	4132	826.4	2	19.8
		4183	836.6	2	19.9
		4233	846.6	2	20.0
	Subtest 5	4132	826.4	0	21.0
		4183	836.6	0	21.0
		4233	846.6	0	20.9
W-CDMA Band II	Subtest 1	9262	1852.4	0	20.9
		9400	1880.0	0	21.0
		9538	1907.6	0	21.1
	Subtest 2	9262	1852.4	2	19.9
		9400	1880.0	2	19.8
		9538	1907.6	2	19.4
	Subtest 3	9262	1852.4	1	19.9
		9400	1880.0	1	19.9
		9538	1907.6	1	19.7
	Subtest 4	9262	1852.4	2	19.7
		9400	1880.0	2	20.2
		9538	1907.6	2	20.1
	Subtest 5	9262	1852.4	0	20.9
		9400	1880.0	0	21.0
		9538	1907.6	0	21.0

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DC-HSDPA

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

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

Table E.5.0: Levels for HSDPA connection setup

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

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

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

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

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

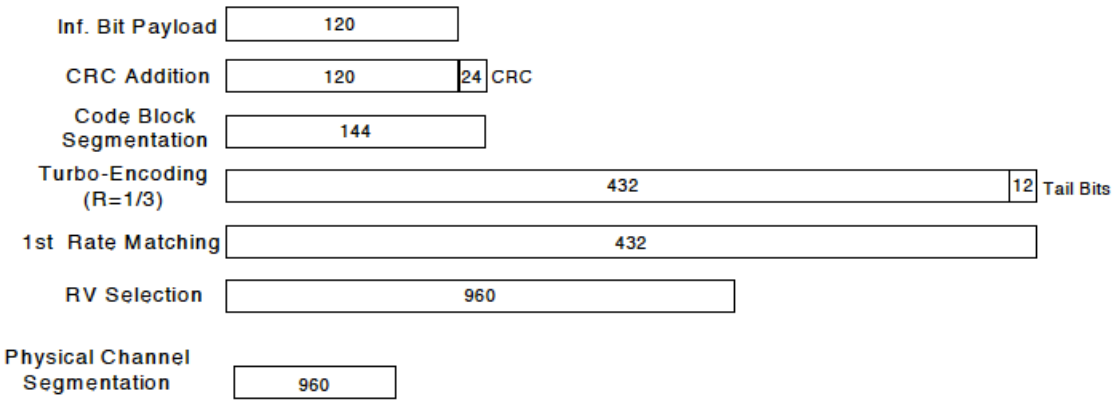

Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

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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	12/15	15/8	15/4
	βhs	4/15	24/15	30/15	30/15
	MPR (dB)	0	0	0.5	0.5
HSDPA Specific Settings	DACK	8			
	DNAK	8			
	DCQI	8			
	Ack-Nack Repetition factor	3			
	CQI Feedback	4ms			
	CQI Repetition Factor	2			
	Ahs = βhs/ βc	30/15			

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

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	MPR	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	0	20.9
		4183	836.6	0	21.0
		4233	846.6	0	20.8
	Subtest 2	4132	826.4	0	21.0
		4183	836.6	0	20.9
		4233	846.6	0	20.8
	Subtest 3	4132	826.4	0.5	20.3
		4183	836.6	0.5	20.3
		4233	846.6	0.5	20.2
	Subtest 4	4132	826.4	0.5	20.4
		4183	836.6	0.5	20.5
		4233	846.6	0.5	20.3
W-CDMA Band II	Subtest 1	9262	1852.4	0	20.9
		9400	1880.0	0	21.0
		9538	1907.6	0	20.9
	Subtest 2	9262	1852.4	0	20.9
		9400	1880.0	0	21.0
		9538	1907.6	0	21.0
	Subtest 3	9262	1852.4	0.5	20.5
		9400	1880.0	0.5	20.5
		9538	1907.6	0.5	20.5
	Subtest 4	9262	1852.4	0.5	20.5
		9400	1880.0	0.5	20.5
		9538	1907.6	0.5	20.5

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.

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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 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.					

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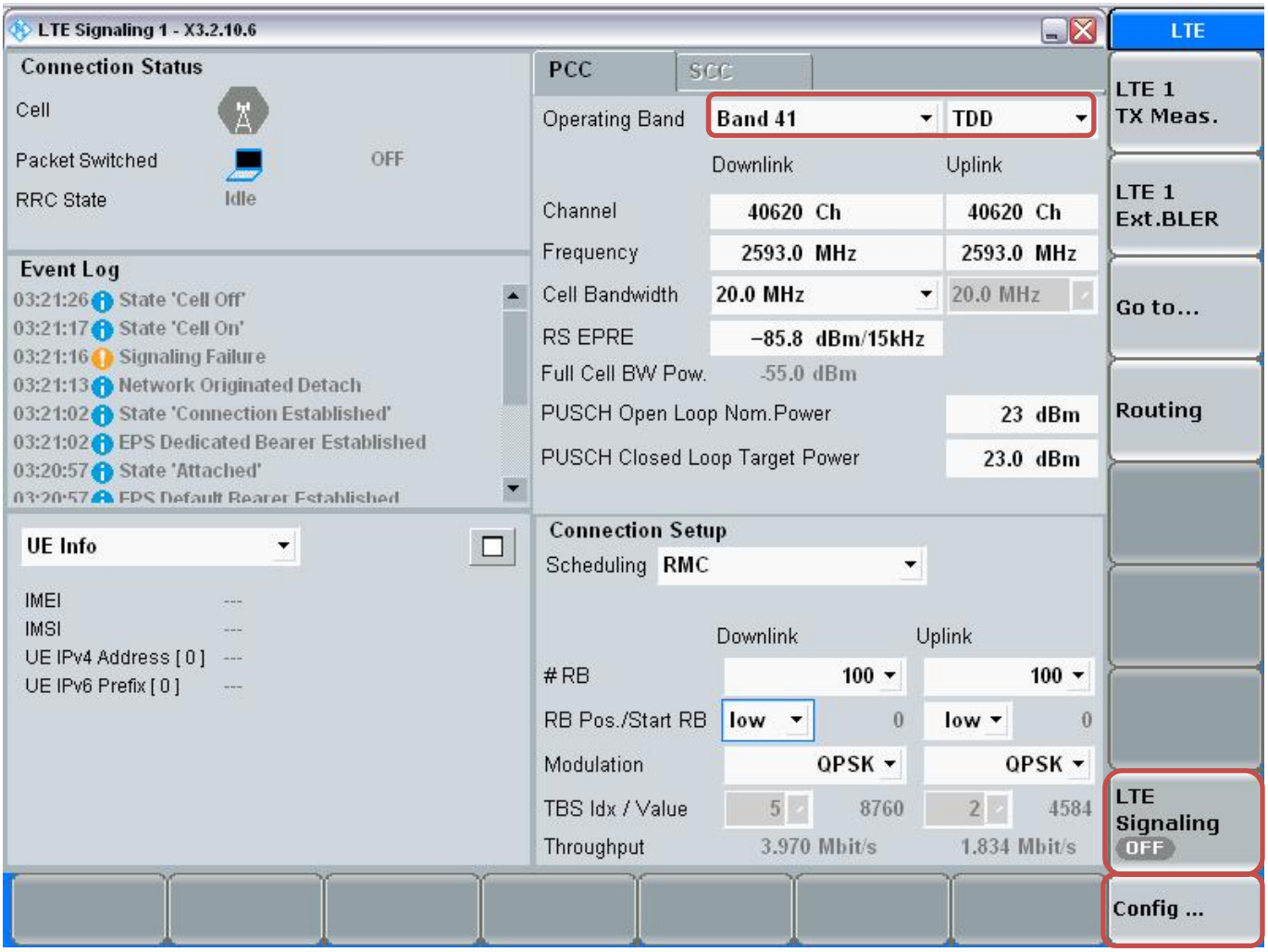
LTE Band 41 Measured Results

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….”



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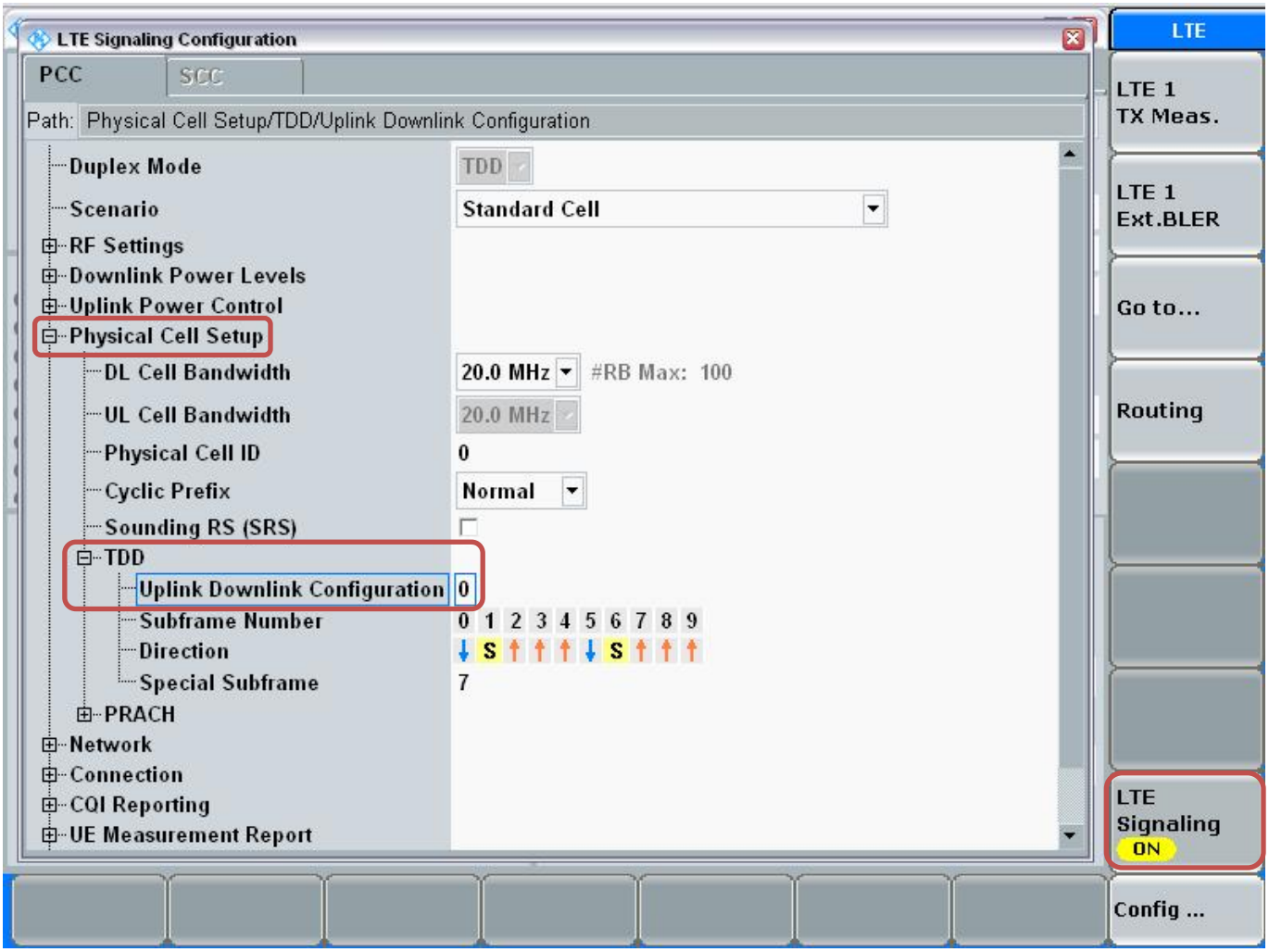
- Go to “Physical Cell Setup”
- Select “TDD” and Set “Uplink Downlink Configuration” to “0”
- Turn the cell on using “ON | OFF” key



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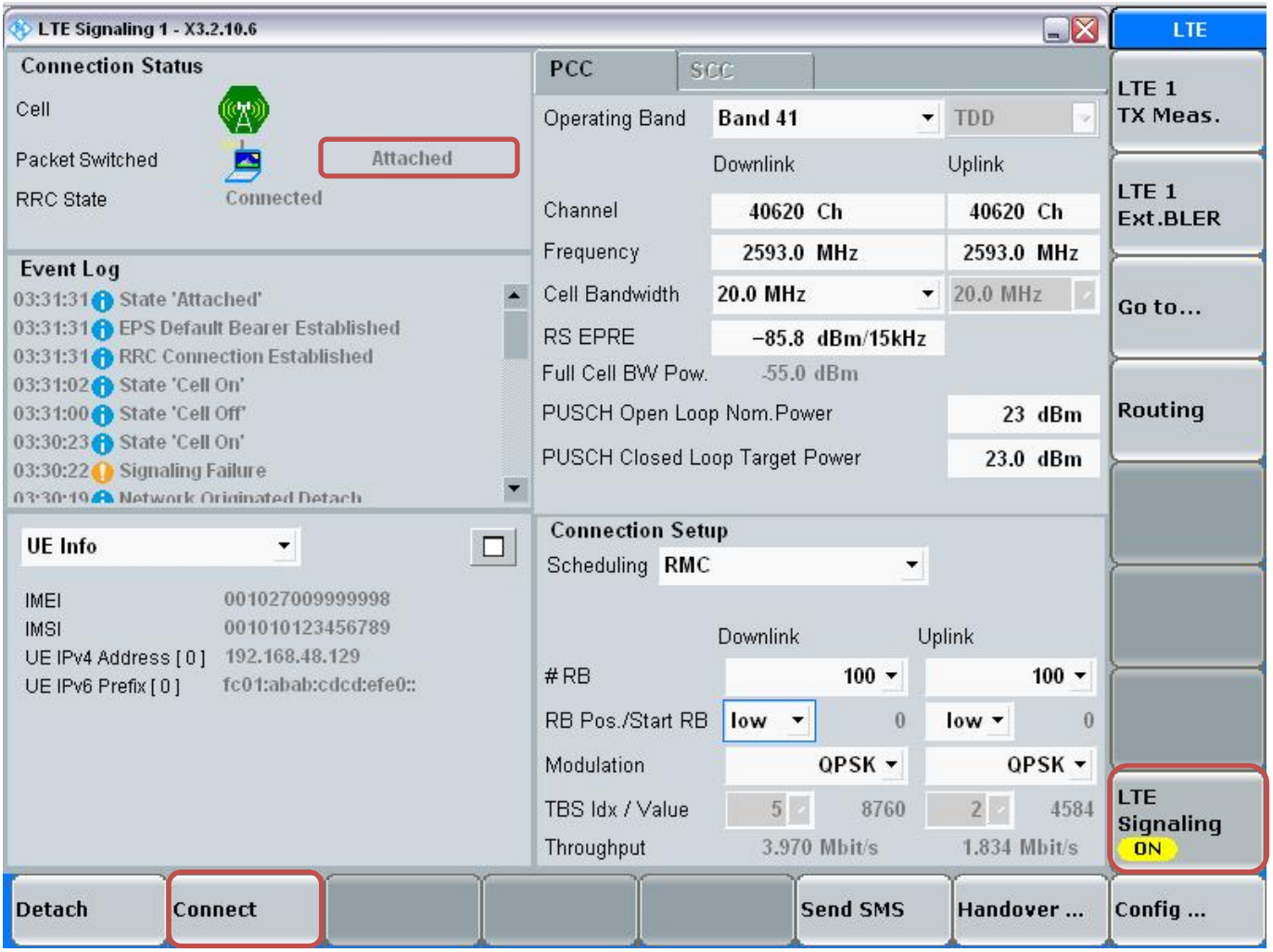
Connect to EUT

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



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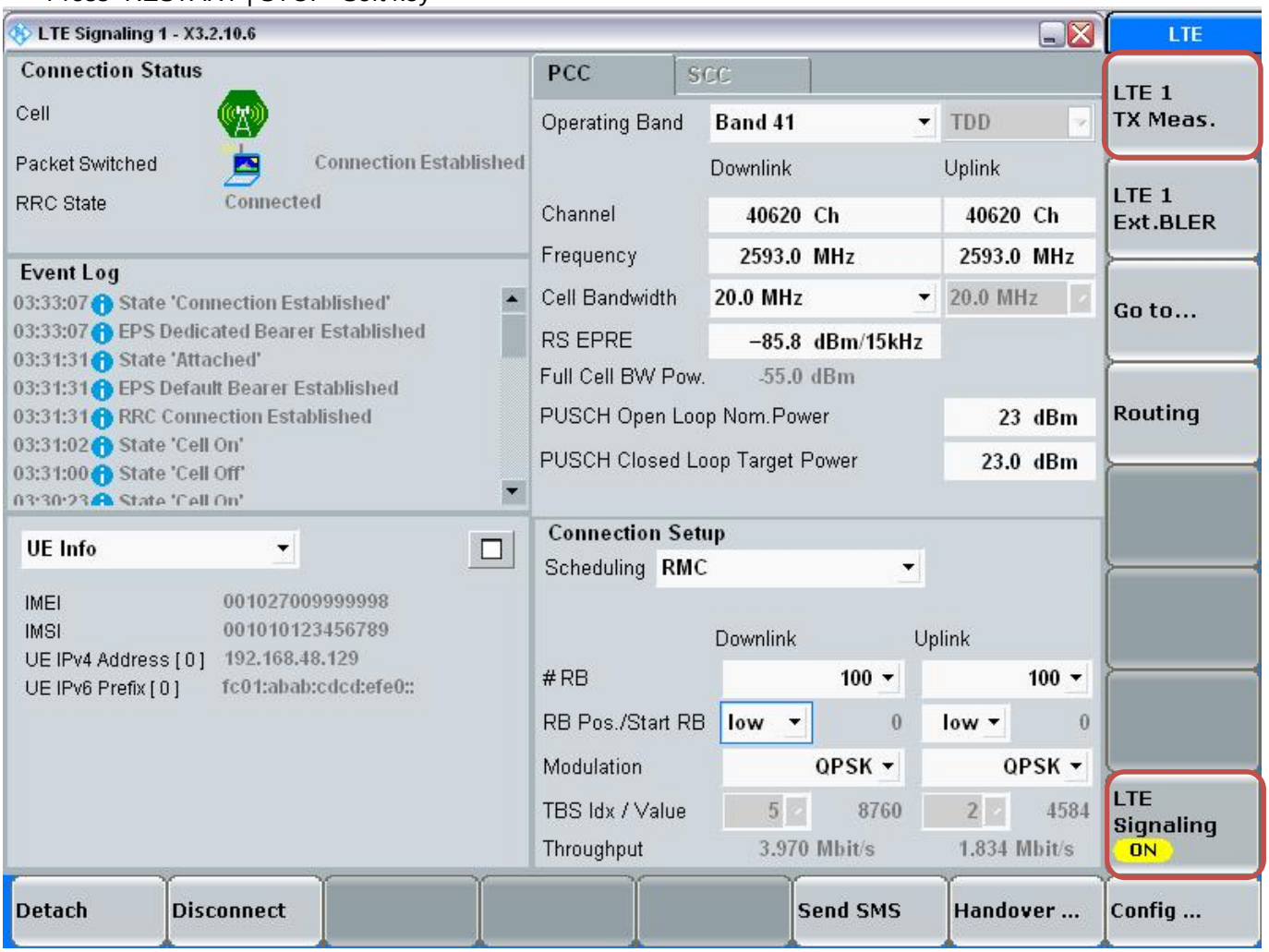
Max Power Setting

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



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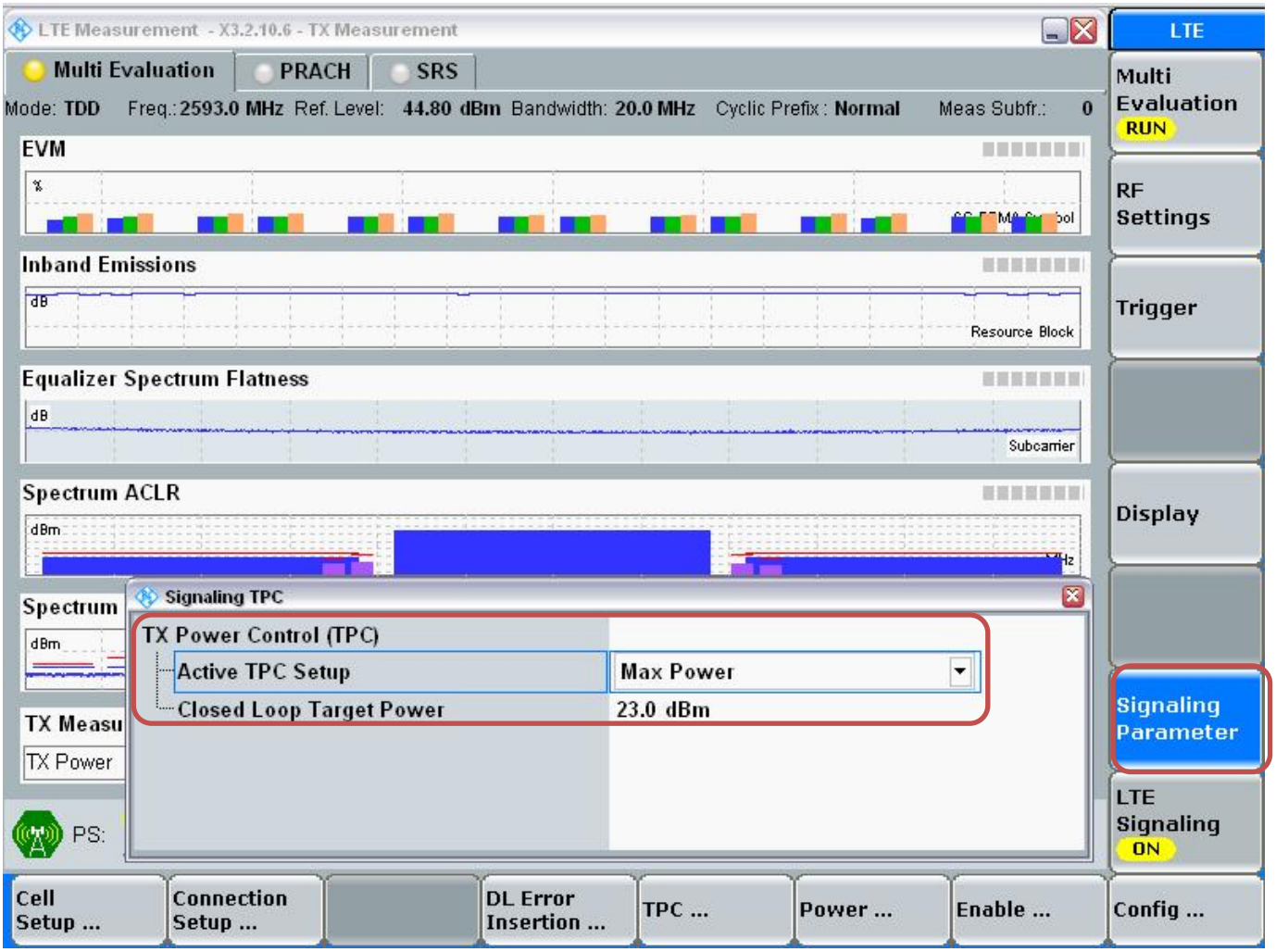
- Select “Signaling Parameter”
- Select “TX Power Control (TPC)” > Select “Active TPC Setup” to “Max Power” > Set “Closed Loop Target Power” to “23 dBm”



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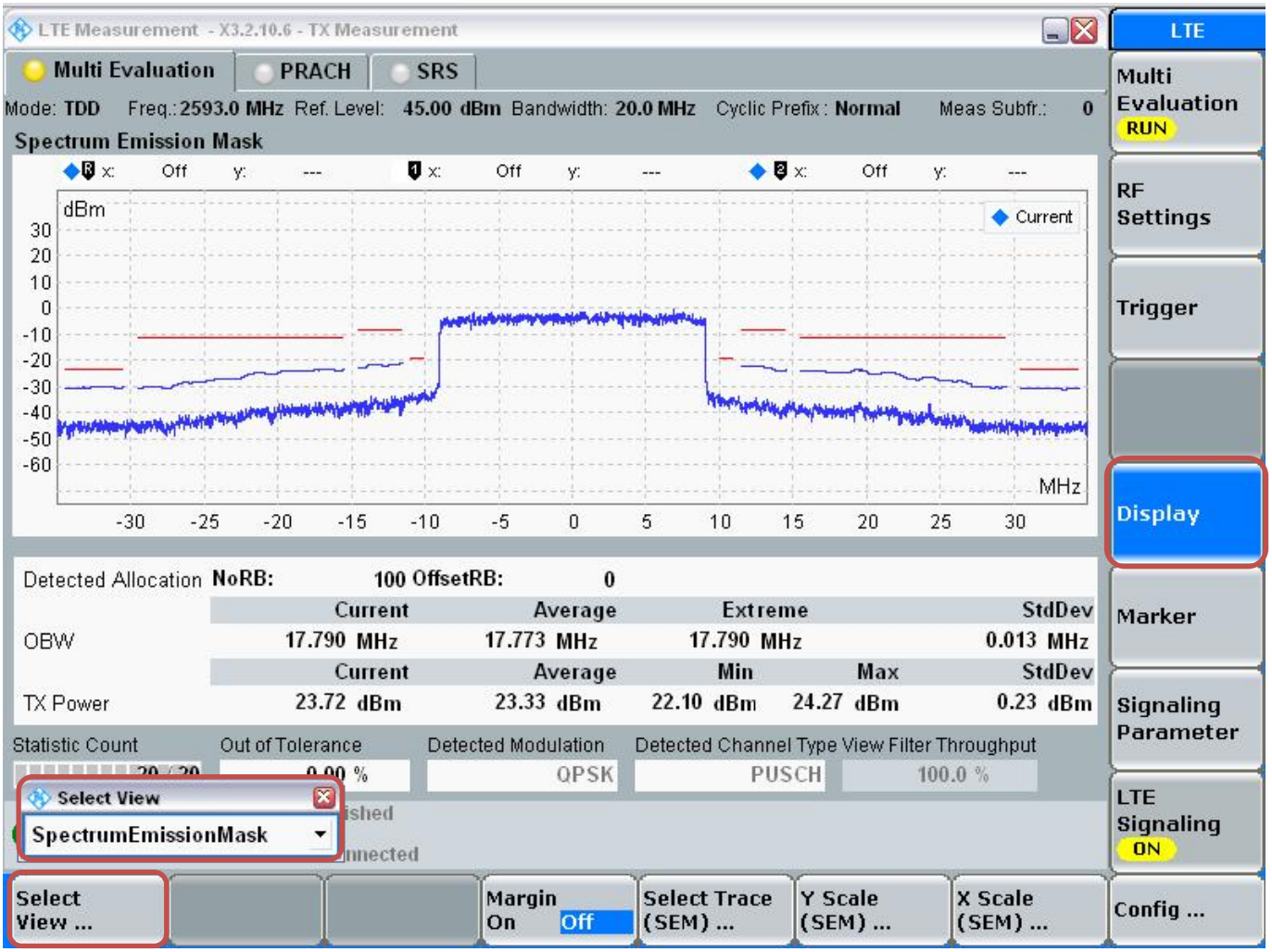
View TX Power

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



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LTE Band 41 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)				
							2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz
LTE Band 41	20	QPSK	1	0	0	0	23.0	23.0	23.2	23.0	22.9
			1	50	0	0	22.8	23.1	23.1	22.9	23.0
			1	99	0	0	22.8	23.0	22.5	22.7	23.1
			50	0	1	1	21.9	22.0	22.0	21.9	22.0
			50	25	1	1	21.8	22.1	21.9	21.9	21.9
			50	50	1	1	21.7	22.1	21.8	21.8	21.9
			100	0	1	1	21.8	22.1	21.9	21.9	22.0
		16QAM	1	0	1	1	21.7	21.5	22.3	21.8	21.5
			1	50	1	1	21.6	21.6	22.2	21.7	21.5
			1	99	1	1	21.6	21.5	21.8	21.6	21.5
			50	0	2	2	20.9	21.0	20.9	21.0	20.9
			50	25	2	2	20.8	21.0	20.9	21.0	20.8
			50	50	2	2	20.7	21.0	20.8	20.8	20.9
			100	0	2	2	20.8	20.9	20.8	21.0	20.8

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)				
							2503.5 MHz	2548.3 MHz	2593 MHz	2637.8 MHz	2682.5 MHz
LTE Band 41	15	QPSK	1	0	0	0	22.8	23.0	22.9	22.9	22.9
			1	36	0	0	22.7	23.0	22.7	22.8	22.9
			1	74	0	0	22.7	23.0	22.5	22.7	22.9
			36	0	1	1	21.9	22.0	21.9	22.0	21.9
			36	18	1	1	21.9	22.1	21.8	22.0	21.9
			36	37	1	1	21.8	22.0	21.8	21.9	21.9
			75	0	1	1	21.8	22.1	21.9	22.0	21.9
		16QAM	1	0	1	1	22.2	21.7	22.0	22.2	21.5
			1	36	1	1	22.0	21.7	21.8	22.2	21.6
			1	74	1	1	22.0	21.7	21.8	22.1	21.5
			36	0	2	2	20.8	21.0	20.7	20.9	20.9
			36	18	2	2	20.8	21.0	20.7	21.0	20.8
			36	37	2	2	20.7	21.0	20.6	20.9	20.8
			75	0	2	2	20.8	21.1	20.8	21.0	20.9

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)				
							2501 MHz	2547 MHz	2593 MHz	2639 MHz	2685 MHz
LTE Band 41	10	QPSK	1	0	0	0	22.9	23.1	22.7	22.9	23.0
			1	25	0	0	22.8	23.1	22.6	22.8	23.0
			1	49	0	0	22.7	23.0	22.5	22.7	22.9
			25	0	1	1	21.9	22.0	21.8	22.0	21.9
			25	12	1	1	21.9	22.0	21.8	21.9	21.9
			25	25	1	1	21.9	22.0	21.7	21.9	21.9
			50	0	1	1	21.9	22.0	21.8	22.0	21.9
		16QAM	1	0	1	1	22.2	21.7	22.4	22.2	21.6
			1	25	1	1	22.1	21.7	22.2	22.1	21.6
			1	49	1	1	22.0	21.7	22.1	22.1	21.5
			25	0	2	2	20.9	20.9	20.7	21.0	20.8
			25	12	2	2	20.8	20.9	20.7	21.0	20.8
			25	25	2	2	20.9	20.8	20.6	21.0	20.8
			50	0	2	2	20.8	21.0	20.8	21.0	20.8

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LTE Band 41 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)				
							2498.5 MHz	2545.8 MHz	2593 MHz	2640.3 MHz	2687.5 MHz
LTE Band 41	5	QPSK	1	0	0	0	22.8	23.1	22.7	22.7	23.0
			1	12	0	0	22.7	23.1	22.6	22.6	23.0
			1	24	0	0	22.6	23.0	22.5	22.7	23.0
			12	0	1	1	21.9	21.9	21.7	21.9	21.9
			12	7	1	1	21.9	22.0	21.7	21.8	21.9
			12	13	1	1	21.9	22.0	21.7	21.9	21.9
			25	0	1	1	22.0	22.0	21.7	21.9	21.9
		16QAM	1	0	1	1	22.5	22.0	21.5	22.5	21.8
			1	12	1	1	22.5	22.1	21.5	22.4	21.9
			1	24	1	1	22.5	22.0	21.5	22.5	21.9
			12	0	2	2	21.2	20.9	20.8	21.2	20.8
			12	7	2	2	21.2	20.9	20.7	21.2	20.7
			12	13	2	2	21.2	20.9	20.7	21.2	20.8
			25	0	2	2	20.9	20.9	20.8	20.9	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	17.1	
	802.11g	6 Mbps	1	2412	14.5	No
			6	2437	13.8	
			11	2462	14.0	
	802.11n (HT20)	MCS0	1	2412	12.0	No
			6	2437	12.0	
			11	2462	12.1	

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

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8.5. Wi-Fi (5 GHz Bands)

Required Test Channels per KDB 248227 D01

Measured Results

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Avg Pwr (dBm)	SAR Test (Yes/No)
5.2 (U-NII-1)	802.11a	6 Mbps	36	5180	13.1	Yes
			40	5200	12.7	
			44	5220	13.1	
			48	5240	13.2	
	802.11n (HT20)	MCS0	36	5180	12.2	No
			40	5200	12.5	
			48	5240	12.4	
	802.11n (HT40)	MCS0	38	5190	12.3	No
			46	5230	12.4	
5.3 (U-NII-2A)	802.11a	6 Mbps	52	5260	12.9	Yes
			56	5280	13.5	
			60	5300	13.5	
			64	5320	12.8	
	802.11n (HT20)	MCS0	52	5260	11.9	No
			60	5300	12.0	
			64	5320	12.5	
	802.11n (HT40)	MCS0	54	5270	11.9	No
			62	5310	11.7	
5.5 (U-NII-2C)	802.11a	6 Mbps	100	5500	13.1	Yes
			104	5520	13.0	
			108	5540	13.3	
			112	5560	12.9	
			116	5580	13.3	
			120	5600	12.9	
			124	5620	12.7	
			128	5640	13.5	
			132	5660	12.8	
			136	5680	13.4	
			140	5700	13.4	
	802.11n (HT20)	MCS0	100	5500	12.0	No
			116	5580	12.5	
			140	5700	12.5	
	802.11n (HT40)	MCS0	102	5510	11.7	No
			110	5550	12.3	
			134	5670	12.2	
5.8 (U-NII-3)	802.11a	6 Mbps	149	5745	13.2	Yes
			153	5765	13.0	
			157	5785	12.9	
			161	5805	13.5	
			165	5825	13.4	
	802.11n (HT20)	MCS0	149	5745	12.3	No
			157	5785	12.0	
			161	5805	11.9	
	802.11n (HT40)	MCS0	151	5755	11.8	No
			159	5795	12.5	

Note(s):

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

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Power measurements to determine worst-case data rates

Band	Mode	Ch #	Freq. (MHz)	Data Rate	Avg Pwr (dBm)	SAR test (Yes/No)
5.2 GHz (U-NII-1)	802.11a	36	5180	6 Mbps	13.1	Yes
				9 Mbps	13.1	No
				12 Mbps	13.0	No
				18 Mbps	12.8	No
				24 Mbps	12.6	No
				36 Mbps	12.3	No
				48 Mbps	11.9	No
				54 Mbps	11.8	No
5.3 GHz (U-NII-2A)	802.11a	56	5280	6 Mbps	12.9	Yes
				9 Mbps	12.7	No
				12 Mbps	12.6	No
				18 Mbps	12.4	No
				24 Mbps	12.1	No
				36 Mbps	11.8	No
				48 Mbps	11.6	No
				54 Mbps	11.5	No
5.5 GHz (U-NII-2C)	802.11a	116	5580	6 Mbps	13.1	Yes
				9 Mbps	12.9	No
				12 Mbps	12.7	No
				18 Mbps	12.6	No
				24 Mbps	12.3	No
				36 Mbps	11.9	No
				48 Mbps	11.6	No
				54 Mbps	11.4	No
5.8 GHz (U-NII-3)	802.11a	149	5745	6 Mbps	13.2	Yes
				9 Mbps	13.0	No
				12 Mbps	12.8	No
				18 Mbps	12.7	No
				24 Mbps	12.5	No
				36 Mbps	12.1	No
				48 Mbps	11.8	No
				54 Mbps	11.7	No

8.6. Bluetooth

Maximum tune-up tolerance limit is 12.50 dBm. This power level qualifies for exclusion of SAR testing.

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9. Dielectric Property Measurements

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized.

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

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

9.1. Tissue Dielectric Parameters

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

Target Frequency (MHz)	Head		Body	
	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5000	36.2	4.45	49.3	5.07
5100	36.1	4.55	49.1	5.18
5200	36.0	4.66	49.0	5.30
5300	35.9	4.76	48.9	5.42
5400	35.8	4.86	48.7	5.53
5500	35.6	4.96	48.6	5.65
5600	35.5	5.07	48.5	5.77
5700	35.4	5.17	48.3	5.88
5800	35.3	5.27	48.2	6.00

IEEE Std 1528-2013

Refer to Table 3 within the IEEE Std 1528-2013

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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 ± 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.

SAR Lab 1

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
9/30/2014	Head 2450	e'	38.4800	Relative Permittivity (ε_r):	38.48	39.20	-1.84	5
		e''	13.7200	Conductivity (σ):	1.87	1.80	3.84	5
	Head 2410	e'	38.7200	Relative Permittivity (ε_r):	38.72	39.28	-1.42	5
		e''	13.6100	Conductivity (σ):	1.82	1.76	3.60	5
	Head 2475	e'	38.3000	Relative Permittivity (ε_r):	38.30	39.17	-2.22	5
		e''	13.7900	Conductivity (σ):	1.90	1.83	3.87	5
9/29/2014	Body 2450	e'	50.8100	Relative Permittivity (ε_r):	50.81	52.70	-3.59	5
		e''	14.7800	Conductivity (σ):	2.01	1.95	3.25	5
	Body 2410	e'	50.8900	Relative Permittivity (ε_r):	50.89	52.76	-3.54	5
		e''	14.6300	Conductivity (σ):	1.96	1.91	2.78	5
	Body 2475	e'	50.8000	Relative Permittivity (ε_r):	50.80	52.67	-3.55	5
		e''	14.7800	Conductivity (σ):	2.03	1.99	2.46	5

SAR Lab 4

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
9/30/2014	Head 2600	e'	37.5100	Relative Permittivity (ε_r):	37.51	39.01	-3.85	5
		e''	14.1800	Conductivity (σ):	2.05	1.96	4.48	5
	Head 2500	e'	37.8900	Relative Permittivity (ε_r):	37.89	39.14	-3.19	5
		e''	13.9600	Conductivity (σ):	1.94	1.85	4.67	5
	Head 2700	e'	37.1400	Relative Permittivity (ε_r):	37.14	38.88	-4.49	5
		e''	14.3500	Conductivity (σ):	2.15	2.07	4.06	5
9/30/2014	Body 2600	e'	50.7900	Relative Permittivity (ε_r):	50.79	52.51	-3.28	5
		e''	15.4900	Conductivity (σ):	2.24	2.16	3.64	5
	Body 2500	e'	51.1100	Relative Permittivity (ε_r):	51.11	52.64	-2.90	5
		e''	15.2400	Conductivity (σ):	2.12	2.02	4.86	5
	Body 2700	e'	50.4700	Relative Permittivity (ε_r):	50.47	52.38	-3.66	5
		e''	15.6800	Conductivity (σ):	2.35	2.30	2.29	5

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SAR Lab 5

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
9/30/2014	Head 835	e'	39.7700	Relative Permittivity (ε_r):	39.77	41.50	-4.17	5
		e''	19.8200	Conductivity (σ):	0.92	0.90	2.25	5
	Head 820	e'	39.8800	Relative Permittivity (ε_r):	39.88	41.60	-4.14	5
		e''	19.8400	Conductivity (σ):	0.90	0.90	0.68	5
	Head 850	e'	39.6200	Relative Permittivity (ε_r):	39.62	41.50	-4.53	5
		e''	19.8300	Conductivity (σ):	0.94	0.92	2.43	5
9/30/2014	Body 835	e'	53.0200	Relative Permittivity (ε_r):	53.02	55.20	-3.95	5
		e''	21.8900	Conductivity (σ):	1.02	0.97	4.78	5
	Body 820	e'	53.1100	Relative Permittivity (ε_r):	53.11	55.28	-3.92	5
		e''	21.8900	Conductivity (σ):	1.00	0.97	3.06	5
	Body 850	e'	52.8700	Relative Permittivity (ε_r):	52.87	55.16	-4.15	5
		e''	21.8900	Conductivity (σ):	1.03	0.99	4.81	5
9/29/2014	Body 1900	e'	51.5700	Relative Permittivity (ε_r):	51.57	53.30	-3.25	5
		e''	14.4300	Conductivity (σ):	1.52	1.52	0.29	5
	Body 1850	e'	51.7700	Relative Permittivity (ε_r):	51.77	53.30	-2.87	5
		e''	14.3100	Conductivity (σ):	1.47	1.52	-3.16	5
	Body 1910	e'	51.5400	Relative Permittivity (ε_r):	51.54	53.30	-3.30	5
		e''	14.4600	Conductivity (σ):	1.54	1.52	1.03	5
9/29/2014	Head 1900	e'	38.4700	Relative Permittivity (ε_r):	38.47	40.00	-3.83	5
		e''	13.1300	Conductivity (σ):	1.39	1.40	-0.92	5
	Head 1850	e'	38.7000	Relative Permittivity (ε_r):	38.70	40.00	-3.25	5
		e''	13.0200	Conductivity (σ):	1.34	1.40	-4.33	5
	Head 1910	e'	38.4300	Relative Permittivity (ε_r):	38.43	40.00	-3.93	5
		e''	13.1500	Conductivity (σ):	1.40	1.40	-0.25	5
10/1/2014	Body 5180	e'	47.0700	Relative Permittivity (ε_r):	47.07	49.05	-4.03	5
		e''	18.4200	Conductivity (σ):	5.31	5.27	0.65	5
	Body 5200	e'	47.0300	Relative Permittivity (ε_r):	47.03	49.02	-4.06	5
		e''	18.4500	Conductivity (σ):	5.33	5.29	0.75	5
	Body 5600	e'	46.3800	Relative Permittivity (ε_r):	46.38	48.48	-4.33	5
		e''	18.8100	Conductivity (σ):	5.86	5.76	1.67	5
	Body 5800	e'	46.0600	Relative Permittivity (ε_r):	46.06	48.20	-4.44	5
		e''	19.0000	Conductivity (σ):	6.13	6.00	2.12	5
	Body 5825	e'	46.0100	Relative Permittivity (ε_r):	46.01	48.20	-4.54	5
		e''	19.0300	Conductivity (σ):	6.16	6.00	2.73	5
10/1/2014	Head 5180	e'	37.4000	Relative Permittivity (ε_r):	37.40	36.01	3.85	5
		e''	15.2900	Conductivity (σ):	4.40	4.63	-4.89	5
	Head 5200	e'	37.3700	Relative Permittivity (ε_r):	37.37	35.99	3.83	5
		e''	15.3000	Conductivity (σ):	4.42	4.65	-4.88	5
	Head 5600	e'	36.8200	Relative Permittivity (ε_r):	36.82	35.53	3.62	5
		e''	15.4800	Conductivity (σ):	4.82	5.06	-4.75	5
	Head 5800	e'	36.5600	Relative Permittivity (ε_r):	36.56	35.30	3.57	5
		e''	15.5900	Conductivity (σ):	5.03	5.27	-4.60	5
	Head 5825	e'	36.5100	Relative Permittivity (ε_r):	36.51	35.30	3.43	5
		e''	15.6200	Conductivity (σ):	5.06	5.27	-4.00	5

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10. System Check

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

10.1. 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.

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10.2. 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	5d043	11/12/2013	1900	1g	40.1	39.0
				10g	21.1	20.8
D2450V2	706	5/20/2014	2450	1g	53.0	50.2
				10g	24.5	23.4
D2600V2	1036	8/11/2014	2600	1g	57.5	57.3
				10g	25.7	25.4
D5GHzV2	1003	2/26/2014	5200	1g	77.7	73.5
				10g	22.2	20.5
			5600	1g	81.8	79.6
				10g	23.2	22.1
			5800	1g	78.3	73.8
				10g	22.1	20.4

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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 1

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			
9/29/2014	D2450V2	706	Body	1g	5.08	50.8	50.2	1.20	
				10g	2.34	23.4	23.4	0.00	
9/30/2014	D2450V2	706	Head	1g	5.60	56.0	53.0	5.66	1,2
				10g	2.53	25.3	24.5	3.27	

SAR Lab 4

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			
9/30/2014	D2600V2	1036	Head	1g	6.00	60.0	57.50	4.35	
				10g	2.65	26.5	25.70	3.11	
9/30/2014	D2600V2	1036	Body	1g	6.08	60.8	57.30	6.11	3,4
				10g	2.67	26.7	25.40	5.12	

SAR Lab 5

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			
9/30/2014	D835V2	4d117	Head	1g	0.96	9.6	9.23	3.79	
				10g	0.630	6.30	5.98	5.35	
9/30/2014	D835V2	4d117	Body	1g	1.00	10.0	9.61	4.06	5,6
				10g	0.658	6.58	6.31	4.28	
9/29/2014	D1900V2	5d043	Body	1g	3.75	37.5	39.0	-3.85	
				10g	1.97	19.7	20.8	-5.29	
9/29/2014	D1900V2	5d043	Head	1g	3.75	37.5	40.1	-6.48	7,8
				10g	1.96	19.6	21.1	-7.11	
10/1/2014	D5GHzV2 (5.2GHz)	1003	Body	1g	7.79	77.9	73.5	5.99	9,10
				10g	2.21	22.1	20.5	7.80	
10/1/2014	D5GHzV2 (5.6GHz)	1003	Body	1g	8.19	81.9	79.6	2.89	
				10g	2.28	22.8	22.1	3.17	
10/1/2014	D5GHzV2 (5.8GHz)	1003	Body	1g	6.97	69.7	73.8	-5.56	
				10g	1.96	19.6	20.4	-3.92	
10/1/2014	D5GHzV2 (5.2GHz)	1003	Head	1g	7.94	79.4	77.7	2.19	
				10g	2.30	23.0	22.2	3.60	
10/1/2014	D5GHzV2 (5.6GHz)	1003	Head	1g	8.42	84.2	81.8	2.93	
				10g	2.40	24.0	23.2	3.45	
10/1/2014	D5GHzV2 (5.8GHz)	1003	Head	1g	8.10	81.0	78.3	3.45	
				10g	2.31	23.1	22.1	4.52	

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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.

Additional 1-g SAR testing at 5 mm is not required. For hotspot mode, 10-g extremity SAR is not required for the surfaces and edges since all 1-g reported SAR < 1.2 W/kg.

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.

KDB 248227 D01 SAR Measurements Procedures for 802.11 a/b/g Transmitters v01r02 (pg.6):
Each channel should be tested at the lowest data rate in each a-b/g mode or 4.9 GHz channel BW configuration.
When the extrapolated maximum peak SAR for the maximum output channel is ≤ 1.6 W/kg and the 1-g averaged SAR is ≤ 0.8 W/kg, testing of other channels in the “default test channels” or “required test channels” configuration is optional.

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11.1. GSM850

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Voice	0	Left Touch	190	836.6	33.0	32.8	0.107	0.112	
			Left Tilt	190	836.6	33.0	32.8	0.086	0.090	
			Right Touch	190	836.6	33.0	32.8	0.144	**0.151**	1
			Right Tilt	190	836.6	33.0	32.8	0.077	0.081	
Head VoIP	GPRS 3 Slots	0	Left Touch	190	836.6	30.0	29.8	0.220	0.230	
			Left Tilt	190	836.6	30.0	29.8	0.167	0.175	
			Right Touch	190	836.6	30.0	29.8	0.290	**0.304**	2
			Right Tilt	190	836.6	30.0	29.8	0.155	0.162	
Body-worn	Voice	10	Rear	190	836.6	33.0	32.8	0.375	**0.393**	3
			Front	190	836.6	33.0	32.8	0.263	0.275	
Body-worn(VoIP) & Hotspot	GPRS 3 Slots	10	Rear	190	836.6	30.0	29.8	0.752	**0.787**	4
			Front	190	836.6	30.0	29.8	0.540	0.565	
Hotspot			Edge 2	190	836.6	30.0	29.8	0.172	0.180	
			Edge 3	190	836.6	30.0	29.8	0.413	0.432	

11.2. GSM1900

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Voice	0	Left Touch	661	1880.0	30.0	30.0	0.063	0.063	
			Left Tilt	661	1880.0	30.0	30.0	0.037	0.037	
			Right Touch	661	1880.0	30.0	30.0	0.081	**0.081**	5
			Right Tilt	661	1880.0	30.0	30.0	0.032	0.032	
Head VoIP	GPRS 3 Slots	0	Left Touch	661	1880.0	26.5	26.0	0.084	0.094	
			Left Tilt	661	1880.0	26.5	26.0	0.047	0.053	
			Right Touch	661	1880.0	26.5	26.0	0.108	**0.121**	6
			Right Tilt	661	1880.0	26.5	26.0	0.038	0.043	
Body-worn	Voice	10	Rear	661	1880.0	30.0	30.0	0.343	0.343	
			Front	661	1880.0	30.0	30.0	0.443	**0.443**	7
Body-worn(VoIP) & Hotspot	GPRS 3 Slots	10	Rear	661	1880.0	26.5	26.0	0.463	0.519	
			Front	661	1880.0	26.5	26.0	0.630	**0.707**	8
Hotspot			Edge 2	661	1880.0	26.5	26.0	0.103	0.116	
			Edge 3	661	1880.0	26.5	26.0	0.486	0.545	

11.3. W-CDMA Band V

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Rel 99 RMC	0	Left Touch	4183	836.6	23.5	22.0	0.067	0.095	
			Left Tilt	4183	836.6	23.5	22.0	0.052	0.074	
			Right Touch	4183	836.6	23.5	22.0	0.096	**0.135**	9
			Right Tilt	4183	836.6	23.5	22.0	0.052	0.073	
Body-worn & Hotspot	Rel 99 RMC	10	Rear	4183	836.6	23.5	22.0	0.304	**0.429**	10
			Front	4183	836.6	23.5	22.0	0.222	0.314	
Hotspot	Rel 99 RMC	10	Edge 2	4183	836.6	23.5	22.0	0.123	0.174	
			Edge 3	4183	836.6	23.5	22.0	0.149	0.210	

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11.4. W-CDMA Band II

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Rel 99 RMC	0	Left Touch	9400	1880.0	23.5	22.1	0.090	0.124	
			Left Tilt	9400	1880.0	23.5	22.1	0.046	0.063	
			Right Touch	9400	1880.0	23.5	22.1	0.102	**0.141**	11
			Right Tilt	9400	1880.0	23.5	22.1	0.034	0.047	
Body-worn & Hotspot	Rel 99 RMC	10	Rear	9400	1880.0	23.5	22.1	0.500	0.690	
			Front	9262	1852.4	23.5	22.0	0.658	0.929	
				9400	1880.0	23.5	22.1	0.697	0.962	
				9538	1907.6	23.5	22.1	0.729	**1.006**	12
Hotspot	Rel 99 RMC	10	Edge 2	9400	1880.0	23.5	22.1	0.106	0.146	
			Edge 3	9400	1880.0	23.5	22.1	0.577	0.796	

11.5. LTE Band 41 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
Head	QPSK	0	Left Touch	40620	2593.0	1	0.0	23.5	23.2	0.067	0.071	
						50	0.0	22.5	22.0	0.054	0.061	
			Left Tilt	40620	2593.0	1	0.0	23.5	23.2	0.070	0.075	
						50	0.0	22.5	22.0	0.060	0.068	
			Right Touch	40620	2593.0	1	0.0	23.5	23.2	0.087	**0.093**	13
						50	0.0	22.5	22.0	0.066	0.075	
			Right Tilt	40620	2593.0	1	0.0	23.5	23.2	0.034	0.036	
						50	0.0	22.5	22.0	0.031	0.035	
Body-worn & Hotspot	QPSK	10	Rear	40620	2593.0	1	0.0	23.5	23.2	0.477	0.509	
						50	0.0	22.5	22.0	0.399	0.450	
			Front	40620	2593.0	1	0.0	23.5	23.2	0.554	**0.591**	14
						50	0.0	22.5	22.0	0.467	0.526	
Hotspot	QPSK	10	Edge 2	40620	2593.0	1	0.0	23.5	23.2	0.272	0.290	
						50	0.0	22.5	22.0	0.230	0.259	
			Edge 3	40620	2593.0	1	0.0	23.5	23.2	0.429	0.458	
						50	0.0	22.5	22.0	0.358	0.404	

11.6. Wi-Fi (DTS Band)

Frequency Band	Mode	RF Exposure Conditions	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
2.4 GHz	802.11b 1 Mbps	Head	0	Left Touch	6	2437.0	17.5	17.5	0.101	0.101	
				Left Tilt	6	2437.0	17.5	17.5	0.080	0.080	
				Right Touch	6	2437.0	17.5	17.5	0.213	**0.213**	15
				Right Tilt	6	2437.0	17.5	17.5	0.201	0.201	
		Body-worn & Hotspot & Wi-Fi Direct	10	Rear	6	2437.0	17.5	17.5	0.255	**0.255**	16
				Front	6	2437.0	17.5	17.5	0.071	0.071	
		Hotspot & Wi-Fi Direct	10	Edge 1	6	2437.0	17.5	17.5	0.058	0.058	
				Edge 4	6	2437.0	17.5	17.5	0.072	0.072	

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11.7. Wi-Fi (UNII Band)

Frequency Band	Mode	RF Exposure Conditions	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
5.2 GHz (U-NII-1)	802.11a 6 Mbps	Head	0	Left Touch	48	5240.0	13.5	13.2	0.000	0.000	
				Left Tilt	48	5240.0	13.5	13.2	0.000	0.000	
				Right Touch	48	5240.0	13.5	13.2	0.025	**0.027**	17
				Right Tilt	48	5240.0	13.5	13.2	0.012	0.013	
		Body-worn	10	Rear	48	5240.0	13.5	13.2	0.145	**0.155**	18
				Front	48	5240.0	13.5	13.2	0.000	0.000	
Frequency Band	Mode	RF Exposure Conditions	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
5.3 GHz (U-NII-2A)	802.11a 6 Mbps	Head	0	Left Touch	60	5300.0	13.5	13.5	0.000	0.000	
				Left Tilt	60	5300.0	13.5	13.5	0.000	0.000	
				Right Touch	60	5300.0	13.5	13.5	0.033	**0.033**	19
				Right Tilt	60	5300.0	13.5	13.5	0.016	0.016	
		Body-worn	10	Rear	60	5300.0	13.5	13.5	0.201	**0.201**	20
				Front	60	5300.0	13.5	13.5	0.000	0.000	
Frequency Band	Mode	RF Exposure Conditions	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
5.5 GHz (U-NII-2C)	802.11a 6 Mbps	Head	0	Left Touch	128	5640.0	13.5	13.5	0.022	0.022	
				Left Tilt	128	5640.0	13.5	13.5	0.000	0.000	
				Right Touch	128	5640.0	13.5	13.5	0.092	**0.092**	21
				Right Tilt	128	5640.0	13.5	13.5	0.059	0.059	
		Body-worn	10	Rear	128	5640.0	13.5	13.5	0.383	**0.383**	22
				Front	128	5640.0	13.5	13.5	0.022	0.022	
Frequency Band	Mode	RF Exposure Conditions	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
5.8 GHz (U-NII-3)	802.11a 6 Mbps	Head	0	Left Touch	165	5825.0	13.5	13.4	0.000	0.000	
				Left Tilt	165	5825.0	13.5	13.4	0.038	0.039	
				Right Touch	165	5825.0	13.5	13.4	0.095	**0.098**	23
				Right Tilt	165	5825.0	13.5	13.4	0.065	0.067	
		Body-worn & Hotspot & Wi-Fi Direct	10	Rear	165	5825.0	13.5	13.4	0.185	**0.189**	24
				Front	165	5825.0	13.5	13.4	0.016	0.016	
		Hotspot & Wi-Fi Direct	10	Edge 1	165	5825.0	13.5	13.4	0.041	0.042	
				Edge 4	165	5825.0	13.5	13.4	0.080	0.082	

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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:

[(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.

Body-worn Accessory Exposure Conditions

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

Conclusion:

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

11.8.2. 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:

- *(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.

Estimated SAR Result for Body-worn Accessory Conditions:

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

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12. SAR Measurement Variability

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz v01. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

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

12.1. The Highest Measured SAR Configuration in Each Frequency Band

Frequency Band (MHz)	Air Interface	Head (W/kg)	Body-worn Accessory (W/kg)	Wireless Router (Hotspot)/Wi-Fi Direct (W/kg)	Repeated SAR (Yes/No)
850	GSM 850		0.752		No
	WCDMA Band V				No
1900	GSM 1900				No
	WCDMA Band II		0.729		No
2400	Wi-Fi 802.11b/g/n		0.255		No
2600	LTE Band 41		0.554		No
5200	Wi-Fi 802.11a/n/ac		0.145		No
5300	Wi-Fi 802.11a/n/ac		0.201		No
5600	Wi-Fi 802.11a/n/ac		0.383		No
5800	Wi-Fi 802.11a/n/ac		0.185		No

12.2. Repeated Measurement Results

Repeated Measurements were not required since no measured SAR value was > 0.8 W/kg.

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13. Simultaneous Transmission SAR Analysis

13.1. Sum of the SAR for GSM 850 & Wi-Fi & BT

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① GSM 850	② Wi-Fi(DTS)	③ Wi-Fi(UNII)	④ Bluetooth		
Head	Left Touch	① + ②	0.230	0.101			0.331	No
		① + ③	0.230		0.022		0.252	No
	Left Tilt	① + ②	0.175	0.080			0.255	No
		① + ③	0.175		0.039		0.214	No
	Right Touch	① + ②	0.304	0.213			**0.517**	No
		① + ③	0.304		0.098		**0.402**	No
	Right Tilt	① + ②	0.162	0.201			0.363	No
		① + ③	0.162		0.067		0.229	No
Body-worn Accessory & Hotspot	Rear	① + ②	0.787	0.255			**1.042**	No
		① + ③	0.787		0.383		**1.170**	No
		① + ③ + ④	0.787		0.383	0.378	1.548	No
	Front	① + ②	0.565	0.071			0.636	No
		① + ③	0.565		0.022		0.587	No
		① + ③ + ④	0.565		0.022	0.378	0.965	No
Hotspot	Edge 1	① + ②		0.058			0.058	No
		① + ②			0.042		0.042	No
	Edge 2	① + ②	0.180				0.180	No
	Edge 3	① + ②	0.432				0.432	No
	Edge 4	① + ②		0.072			0.072	No
		① + ②			0.082		0.082	No

13.2. Sum of the SAR for GSM 1900 & Wi-Fi & BT

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① GSM 1900	② Wi-Fi(DTS)	③ Wi-Fi(UNII)	④ Bluetooth		
Head	Left Touch	① + ②	0.094	0.101			0.195	No
		① + ③	0.094		0.022		0.116	No
	Left Tilt	① + ②	0.053	0.080			0.133	No
		① + ③	0.053		0.039		0.092	No
	Right Touch	① + ②	0.121	0.213			0.334	No
		① + ③	0.121		0.098		0.219	No
	Right Tilt	① + ②	0.043	0.201			0.244	No
		① + ③	0.043		0.067		0.110	No
Body-worn Accessory & Hotspot	Rear	① + ②	0.519	0.255			0.774	No
		① + ③	0.519		0.383		0.902	No
		① + ③ + ④	0.519		0.383	0.378	1.280	No
	Front	① + ②	0.707	0.071			0.778	No
		① + ③	0.707		0.022		0.729	No
		① + ③ + ④	0.707		0.022	0.378	1.107	No
Hotspot	Edge 1	① + ②		0.058			0.058	No
		① + ②			0.042		0.042	No
	Edge 2	① + ②	0.116				0.116	No
	Edge 3	① + ②	0.545				0.545	No
	Edge 4	① + ②		0.072			0.072	No
		① + ②			0.082		0.082	No

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

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① W-CDMA V	② Wi-Fi(DTS)	③ Wi-Fi(UNII)	④ Bluetooth		
Head	Left Touch	① + ②	0.095	0.101			0.196	No
		① + ③	0.095		0.022		0.117	No
	Left Tilt	① + ②	0.074	0.080			0.154	No
		① + ③	0.074		0.039		0.113	No
	Right Touch	① + ②	0.135	0.213			0.348	No
		① + ③	0.135		0.098		0.233	No
	Right Tilt	① + ②	0.073	0.201			0.274	No
		① + ③	0.073		0.067		0.140	No
Body-worn Accessory & Hotspot	Rear	① + ②	0.429	0.255			0.684	No
		① + ③	0.429		0.383		0.812	No
		① + ③ + ④	0.429		0.383	0.378	1.190	No
	Front	① + ②	0.314	0.071			0.385	No
		① + ③	0.314		0.022		0.336	No
		① + ③ + ④	0.314		0.022	0.378	0.714	No
Hotspot	Edge 1	① + ②		0.058			0.058	No
		① + ②			0.042		0.042	No
	Edge 2	① + ②	0.174				0.174	No
	Edge 3	① + ②	0.210				0.210	No
	Edge 4	① + ②		0.072			0.072	No
		① + ②			0.082		0.082	No

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

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① W-CDMA II	② Wi-Fi(DTS)	③ Wi-Fi(UNII)	④ Bluetooth		
Head	Left Touch	① + ②	0.124	0.101			0.225	No
		① + ③	0.124		0.022		0.146	No
	Left Tilt	① + ②	0.063	0.080			0.143	No
		① + ③	0.063		0.039		0.102	No
	Right Touch	① + ②	0.141	0.213			0.354	No
		① + ③	0.141		0.098		0.239	No
	Right Tilt	① + ②	0.047	0.201			0.248	No
		① + ③	0.047		0.067		0.114	No
Body-worn Accessory & Hotspot	Rear	① + ②	0.690	0.255			0.945	No
		① + ③	0.690		0.383		1.073	No
		① + ③ + ④	0.690		0.383	0.378	1.451	No
	Front	① + ②	1.006	0.071			1.077	No
		① + ③	1.006		0.022		1.028	No
		① + ③ + ④	1.006		0.022	0.378	1.406	No
Hotspot	Edge 1	① + ②		0.058			0.058	No
		① + ②			0.042		0.042	No
	Edge 2	① + ②	0.146				0.146	No
	Edge 3	① + ②	0.796				0.796	No
	Edge 4	① + ②		0.072			0.072	No
		① + ②			0.082		0.082	No

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

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① LTE 41	② Wi-Fi(DTS)	③ Wi-Fi(UNII)	④ Bluetooth		
Head	Left Touch	① + ②	0.071	0.101			0.172	No
		① + ③	0.071		0.022		0.094	No
	Left Tilt	① + ②	0.075	0.080			0.155	No
		① + ③	0.075		0.039		0.114	No
	Right Touch	① + ②	0.093	0.213			0.306	No
		① + ③	0.093		0.098		0.191	No
	Right Tilt	① + ②	0.036	0.201			0.237	No
		① + ③	0.036		0.067		0.103	No
Body-worn Accessory & Hotspot	Rear	① + ②	0.509	0.255			0.764	No
		① + ③	0.509		0.383		0.892	No
		① + ③ + ④	0.509		0.383	0.378	1.270	No
	Front	① + ②	0.591	0.071			0.662	No
		① + ③	0.591		0.022		0.613	No
		① + ③ + ④	0.591		0.022	0.378	0.991	No
Hotspot	Edge 1	① + ②		0.058			0.058	No
		① + ②			0.042		0.042	No
	Edge 2	① + ②	0.290				0.290	No
	Edge 3	① + ②	0.458				0.458	No
	Edge 4	① + ②		0.072			0.072	No
		① + ②			0.082		0.082	No

Conclusion:

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

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14. Appendixes

Refer to separated files for the following appendixes.

14.1. Photos and Antenna Locations

14.2. System Performance Check Plots

14.3. Highest SAR Test Plots

14.4. Tissue Material Ingredients

14.5. Calibration Certificate for E-Field Probe EX3DV4 - SN 3902

14.6. Calibration Certificate for E-Field Probe EX3DV4 - SN 3929

14.7. Calibration Certificate for E-Field Probe EX3DV4 - SN 3991

14.8. Calibration Certificate for D835V2 - SN 4d117

14.9. Calibration Certificate for D1900V2- SN 5d043

14.10. Calibration Certificate for D2450V2 - SN 706

14.11. Calibration Certificate for D2600V2 - SN 1036

14.12. Calibration Certificate for D5GHzV2 - SN 1003

END OF REPORT

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