FCC 47 CFR Parts 1 & 2
Published RF Exposure KDB Procedures
IEEE Std 1528-2003 and IEEE Std 1528a-2005

SAR EVALUATION REPORT

For
CDMA + WiFi + LTE Mobile Hotspot

Model: AC778S
FCC ID: PY3AC778S

Report Number: 13U15465-5
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1. Attestation of Test Results

Applicant	Netgear Inc.			
DUT description	CDMA + WiFi + LTE USB Mobile Hotspot			
Model	AC778S			
Test device is	An identical prototype			
Device category	Portable and Mobile			
Exposure category	General Population/Uncontrolled Exposure			
Date tested	08/16/2013 - 09/13/2013			
The highest reported SAR values	RF exposure conditions	Licensed	DTS	UNII
	Wireless Router (Hotspot)	1.476 W/kg	0.181 W/kg	N/A
	Simultaneous Transmission	1.517 W/kg	1.517 W/kg	N/A
Applicable Standards	FCC 47 CFR Parts 1 & 2 Published RF Exposure KDB Procedures, and TCB workshop updates IEEE Std 1528-2003 and IEEE Std 1528a-2005			
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:

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WiSE Laboratory Engineer
UL Verification Services Inc.

2. Test Methodology

The tests documented in this report were performed in accordance with FCC 47 CFR Parts 1 & 2, IEEE STD 1528-2003, IEEE Std 1528a-2005, the following FCC Published RF exposure KDB procedures, and TCB workshop updates:

- 941225 D01 SAR test for 3G devices v02
- 941225 D05 SAR for LTE Devices v02r02
- 447498 D01 General RF Exposure Guidance v05r01
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r01
- 865664 D02 SAR Reporting v01r01
- 248227 D01 SAR meas for 802.11abg v01r02
- 941225 D06 Hotspot Mode SAR v01r01

3. Facilities and Accreditation

The test sites and measurement facilities used to collect data are located at 47173 & 47266 Benicia Street, Fremont, California, USA.

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 F	

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

4. Calibration and Uncertainty

4.1. Measuring Instrument Calibration

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.

Tissue Dielectric Properties

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
S-Parameter Network Analyzer	Agilent	8753ES	MY40000980	2/20/2014
Dielectronic Probe kit	SPEAG	SM DAK 040 CA	1082	9/18/2013
ENA Series Network Analyzer	Agilent	E5071B	MY42100131	2/21/2014
Dielectronic Probe kit	HP	85070E	594	N/A
Thermometer	TRACEABLE	4242	122529162	9/19/2013

System Performance Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Synthesized Signal Generator	HP	8665B	3546A00784	3/26/2014
Power Meter	HP	438A	3513U04320	9/24/2013
Power Sensor A	HP	8481A	2237A31744	9/24/2013
Power Sensor B	HP	8481A	1926A16917	8/28/2014
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1795093	N/A
Directional coupler	Werlatone	C8060-102	2711	N/A
DC Power Supply	Sorensen	XT20-3	1318A00529	N/A
Synthesized Signal Generator	HP	8665B	3744A01084	5/7/2014
Power Meter	HP	437B	3125U12345	7/29/2014
Power Meter	HP	437B	3125U09248	9/24/2013
Power Sensor A	HP	8481A	1926A27048	7/29/2014
Power Sensor B	HP	8481A	3318A95392	9/24/2013
Amplifier	MITEQ	4D00400600-50-30P	1620606	N/A
Directional coupler	Werlatone	C8060-102	2141	N/A
DC Power Supply	Sorensen	XT 20-3	1318A00530	N/A
System Validation Dipole	SPEAG	D835V2	4d142	10/4/2013
System Validation Dipole	SPEAG	D835V2	4d002	10/24/2013
System Validation Dipole	SPEAG	D1900V2	5d163	10/4/2013
System Validation Dipole	SPEAG	D2450V2	899	10/5/2013
System Validation Dipole	SPEAG	D2600V2	1036	3/11/2014

DASY System

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due date
E-Field Probe (SAR D)	SPEAG	EX3DV4	3686	3/11/2014
Data Acquisition Electronics (SAR D)	SPEAG	DAE4	1360	2/7/2014
E-Field Probe (SAR 1)	SPEAG	EX3DV4	3929	6/24/2014
Data Acquisition Electronics (SAR 1)	SPEAG	DAE4	1259	2/7/2014

Others

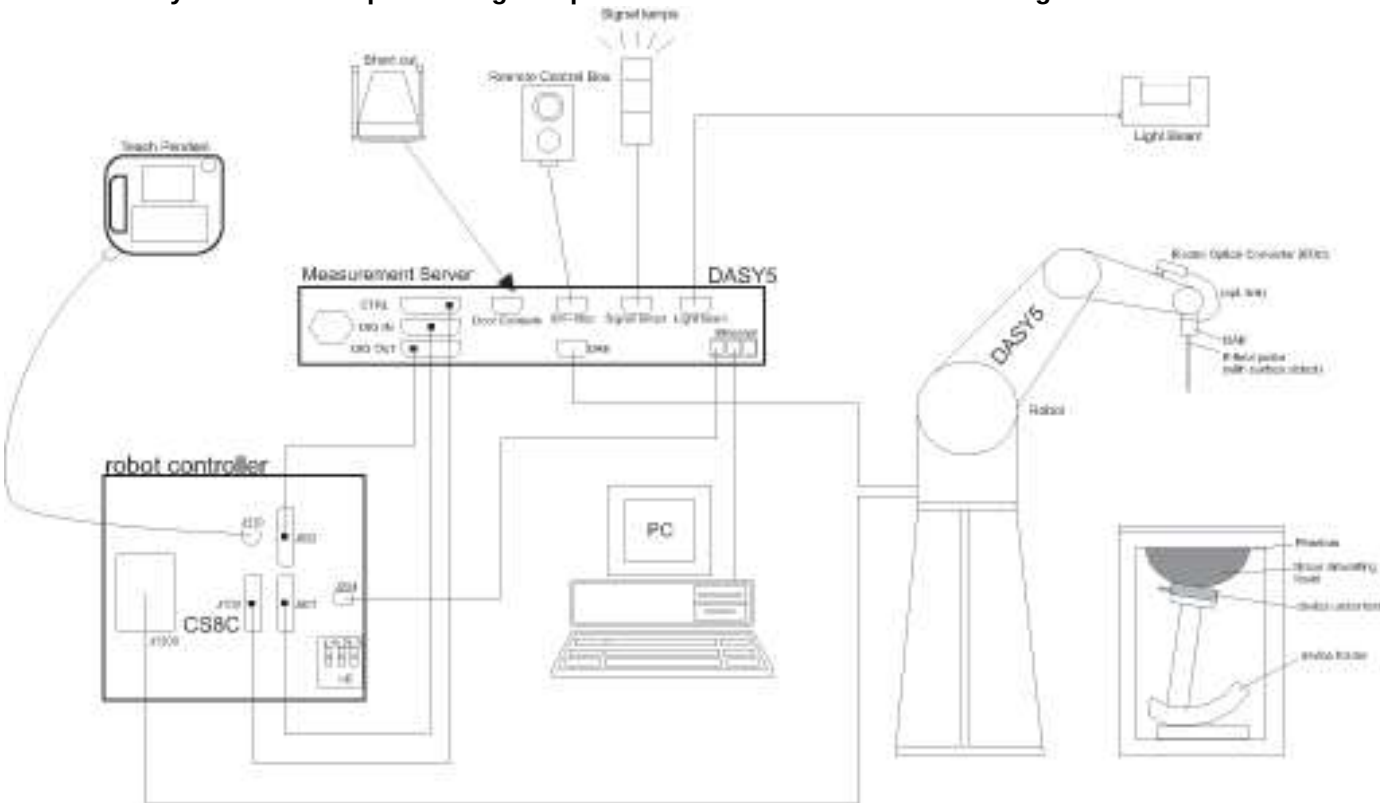
Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due date
Base Station Simulator	Agilent	8960	GB46160222	11/10/2013
Base Station Simulator	Agilent	8960	GB47050526	9/20/2013
Base Station Simulator	R & S	CMW500	124594-HX	7/2/2014

4.2. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r01 Section 2.8.1., 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 is not required in SAR reports submitted for equipment approval.

5. Measurement System Description and Setup

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.

6. SAR Measurement Procedure

6.1. Normal SAR Measurement 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 v01

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

Step 3: Zoom Scan

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

Zoom Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01 (Draft)

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

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

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

Step 4: Power drift measurement

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

Step 5: Z-Scan (FCC only)

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

6.2. Volume Scan Procedures

Step 1: Repeat Step 1-4 in Section 6.1

Step 2: Volume Scan
Volume Scans are used to assess peak SAR and averaged SAR measurements in largely extended 3-dimensional volumes within any phantom. This measurement does not need any previous area scan. The grid can be anchored to a user specific point or to the current probe location.

Step 3: 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.

7. Device Under Test

7.1. General Information

CDMA + WiFi + LTE Mobile Hotspot Model: AC778S	
Operating Configuration(s)	Body-worn device/body-supported device
Exposure Condition(s)	Front, Rear, Edge 1, Edge 2, Edge3, and Edge 4
Device dimension	Overall (Length x Width): 60.5 mm x 109.5 mm Overall Diagonal: 116 mm Display Diagonal: 47.5 mm
Battery Options	☒ Standard – Lithium-ion battery, Rating 3.7 Vdc, 6.66 Wh ☐ Extended (large capacity)

7.2. Wireless Technologies

Wireless Technology and Frequency Bands	CDMA BC0 / BC1 / BC10 LTE FDD Band 25, 26, and TDD Band 41 WLAN/Wi-Fi (2.4GHz bgn 20/40MHz)
Mode	CDMA: 1xRTT 1xEv-Do (Rel. 0) 1xEv-Do (Rev. A) LTE: QPSK, 16QAM
Duty Cycle	CDMA BC0, BC1, BC10: 100% LTE (FDD) Band 25, 26: 100% LTE (TDD) Band 41: 63% WLAN/Wi-Fi (2.4GHz bgn 20/40MHz): 100%

7.3. RF Output Power Tune-up Tolerance

Upper limit (dB):	1.0	RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
CDMA BC0	1xRTT	23.5	**24.5**
	1xAdvanced	23.5	**24.5**
	1xEVDO Rel. 0	23.5	**24.5**
	1xEVDO Rev. A	23.5	**24.5**
CDMA BC1	1xRTT	22.5	**23.5**
	1xAdvanced	22.5	**23.5**
	1xEVDO Rel. 0	22.5	**23.5**
	1xEVDO Rev. A	22.5	**23.5**
CDMA BC10	1xRTT	23.5	**24.5**
	1xAdvanced	23.5	**24.5**
	1xEVDO Rel. 0	23.5	**24.5**
	1xEVDO Rev. A	23.5	**24.5**
Upper limit (dB):	1.0	RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
LTE Band 25	QPSK	23.0	**24.0**
LTE Band 26	QPSK	23.0	**24.0**
LTE Band 41	QPSK	23.0	**24.0**
Upper limit (dB):	0.0	RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
Wi-Fi 2.4 GHz	802.11b	12.0	**12.0**
	802.11g	12.0	**12.0**
	802.11n HT20	12.0	**12.0**
	802.11n HT40	12.0	**12.0**

7.4. Simultaneous Transmission Condition

RF Exposure Condition	Capable Transmit Configurations
Wireless Router (Hotspot)	1. CDMA 1xEVDO BC0 / BC1 / BC10 + WiFi 2.4GHz 2. LTE Band 25 / 26 / 41 + Wi-Fi 2.4GHz
Note:	
1. CDMA or LTE radio may transmit simultaneously with Wi-Fi.	

7.5. General LTE SAR Test and Reporting Considerations

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>Frequency range, Channel Bandwidth, Numbers and Frequencies</td><td>
<table>
<tr><td rowspan="3">Band 25</td><td colspan="6">Frequency range: 1850 - 1915 MHz</td></tr>
<tr><td colspan="6">Channel Bandwidth</td></tr>
<tr><td>20 MHz</td><td>15 MHz</td><td>10 MHz</td><td>5 MHz</td><td>3 MHz</td><td>1.4 MHz</td></tr>
<tr><td>Low</td><td></td><td></td><td>26090/ 1855</td><td>26065/ 1852.5</td><td>26055/ 1851.5</td><td></td></tr>
<tr><td>Mid</td><td></td><td></td><td>26365/ 1882.5</td><td>26365/ 1882.5</td><td>26365/ 1882.5</td><td></td></tr>
<tr><td>High</td><td></td><td></td><td>26640/ 1910</td><td>26665/ 1912.5</td><td>26675/ 1913.5</td><td></td></tr>
<tr><td rowspan="3">Band 26</td><td colspan="6">Frequency range: 814 - 849 MHz</td></tr>
<tr><td colspan="6">Channel Bandwidth</td></tr>
<tr><td>20 MHz</td><td>15 MHz</td><td>10 MHz</td><td>5 MHz</td><td>3 MHz</td><td>1.4 MHz</td></tr>
<tr><td>Low</td><td></td><td></td><td>26740/ 819.0</td><td>26715/ 816.5</td><td>26705/ 815.5</td><td>26697/ 814.7</td></tr>
<tr><td>Mid</td><td></td><td></td><td>26865/ 831.5</td><td>26865/ 831.5</td><td>26865/ 831.5</td><td>26865/ 831.5</td></tr>
<tr><td>High</td><td></td><td></td><td>26990/ 844.0</td><td>27015/ 846.5</td><td>27025/ 847.5</td><td>27033/ 848.3</td></tr>
<tr><td rowspan="3">Band 41</td><td colspan="6">Frequency range: 2496 - 2690 MHz</td></tr>
<tr><td colspan="6">Channel Bandwidth</td></tr>
<tr><td>20 MHz</td><td>15 MHz</td><td>10 MHz</td><td>5 MHz</td><td>3 MHz</td><td>1.4 MHz</td></tr>
<tr><td>Low</td><td>39750/ 2506.0</td><td>39725/ 2503.5</td><td>39700/ 2501.0</td><td></td><td></td><td></td></tr>
<tr><td>Low-Mid</td><td>40185/ 2549.5</td><td>40173/ 2548.3</td><td>40148/ 2545.8</td><td></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></td><td></td><td></td></tr>
<tr><td>Mid-High</td><td>41055/ 2636.5</td><td>41067/ 2637.75</td><td>41092/ 2640.25</td><td></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></td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>LTE transmitter and antenna implementation</td><td>LTE and CDMA share the same Tx/Rx and Rx antenna
Refer to Section 17 for 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>☐ Yes
☒ No</td></tr>
<tr><td>Spectrum plots for RB configurations</td><td>A properly configured basestation simulator was used for the SAR and power measurements; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.</td></tr>
</table>

7.5.1. TDD LTE 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	$13168 \cdot T_s$			-	-	-

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

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

8. Exposure Conditions

Refer to Section 17 “Antenna Dimensions and Separation Distances” for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

For WWAN (❶)

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	2.0 mm	Yes	
Front	2.0 mm	Yes	
Edge 1 (Top)	6.5 mm	Yes	
Edge 2 (Right)	3.0 mm	Yes	
Edge 3 (Bottom)	7.4 mm	Yes	
Edge 4 (Left)	91.8 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR v01r01

For WiFi (❷)

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	7.1 mm	Yes	
Front	4.9 mm	Yes	
Edge 1 (Top)	2.4 mm	Yes	
Edge 2 (Right)	63.7 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR v01r01
Edge 3 (Bottom)	52.3 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR v01r01
Edge 4 (Left)	39.6 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR v01r01

9. RF Output Power Measurement

9.1. CDMA

1xRTT Measured Results

Band	Mode	Ch	Freq.(MHz)	Avg Pwr (dBm)
BC 0	RC3 SO32 (+F-SCH)	1013	824.7	23.6
			836.52	23.5
			848.31	23.5
BC 1	RC3 SO32 (+F-SCH)	25	1851.25	22.9
			1880	23.4
			1908.75	23.0
BC 10	RC3 SO32 (+F-SCH)	476	817.9	23.8
			820.5	23.8
			823.1	23.8

1xEv-Do Rel. 0 Measured Results

Band	FTAP Rate	RTAP Rate	Channel	Freq. (MHz)	Avg Pwr (dBm)
BC 0	307.2 kbps (2 slot, QPSK)	153.6 kbps	1013	824.7	23.7
			384	836.52	23.6
			777	848.31	23.5
BC1	307.2 kbps (2 slot, QPSK)	153.6 kbps	25	1851.25	23.0
			600	1880.0	23.5
			1175	1908.8	23.1
BC10	307.2 kbps (2 slot, QPSK)	153.6 kbps	476	817.9	23.9
			580	820.5	23.9
			684	823.1	24.0

1xEv-Do Rev. A Measured Results

Band	FETAP Traffic Format	RETAP Data Payload Size	Channel	Freq. (MHz)	Avg Pwr (dBm)
BC 0	307.2k, QPSK/ ACK channel is transmitted at all the slots	4096	1013	824.7	23.4
			384	836.52	23.3
			777	848.31	23.2
BC1	307.2k, QPSK/ ACK channel is transmitted at all the slots	4096	25	1851.25	22.6
			600	1880.0	23.1
			1175	1908.8	22.7
BC10	307.2k, QPSK/ ACK channel is transmitted at all the slots	4096	476	817.9	23.6
			580	820.5	23.7
			684	823.1	23.6

9.2. LTE

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

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

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

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

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

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

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

LTE Band 25 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1860 MHz	1882.5 MHz	1905 MHz
LTE Band 25	10	QPSK	1	0	0	0	24.0	23.9	23.4
			1	25	0	0	23.8	23.6	23.4
			1	49	0	0	23.9	23.5	23.2
			25	0	1	0	23.1	23.0	22.9
			25	12	1	0	23.1	23.0	22.8
			25	25	1	0	23.2	22.9	22.7
			50	0	1	0	23.2	22.9	22.7
		16QAM	1	0	1	0	23.5	23.1	22.7
			1	25	1	0	23.4	23.1	22.6
			1	49	1	0	23.3	22.9	22.5
			25	0	2	0	22.3	22.1	21.9
			25	12	2	0	22.1	22.1	21.8
			25	25	2	0	22.3	22.0	21.7
			50	0	2	0	22.2	21.9	21.7
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1857.5 MHz	1882.5 MHz	1907.5 MHz
LTE Band 25	5	QPSK	1	0	0	0	23.9	23.7	23.5
			1	12	0	0	23.8	23.6	23.4
			1	24	0	0	23.8	23.6	23.3
			12	0	1	0	23.4	23.1	22.9
			12	6	1	0	23.4	23.1	22.8
			12	11	1	0	23.3	23.0	22.7
			25	0	1	0	23.2	22.9	22.7
		16QAM	1	0	1	0	23.3	23.1	22.9
			1	12	1	0	23.1	23.0	22.8
			1	24	1	0	23.0	23.0	22.7
			12	0	2	0	22.4	22.1	21.9
			12	6	2	0	22.4	22.1	21.8
			12	11	2	0	22.3	22.0	21.8
			25	0	2	0	22.2	22.0	21.6
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1855 MHz	1882.5 MHz	1910 MHz
LTE Band 25	3	QPSK	1	0	0	0	23.9	23.6	23.2
			1	7	0	0	23.8	23.5	23.1
			1	14	0	0	23.8	23.5	23.1
			8	0	1	0	23.4	23.1	22.8
			8	4	1	0	23.3	23.0	22.7
			8	7	1	0	23.4	23.0	22.7
			15	0	1	0	23.3	22.9	22.7
		16QAM	1	0	1	0	23.4	23.1	22.5
			1	7	1	0	23.3	23.1	22.5
			1	14	1	0	23.2	23.0	22.4
			8	0	2	0	22.4	22.0	21.8
			8	4	2	0	22.4	22.0	21.7
			8	7	2	0	22.4	22.0	21.7
			15	0	2	0	22.3	22.0	21.7

LTE Band 26 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							821 MHz	831.5 MHz	844 MHz
LTE Band 26	10	QPSK	1	0	0	0	23.4	23.1	23.8
			1	25	0	0	23.3	23.8	24.0
			1	49	0	0	22.9	23.8	23.7
			25	0	1	1	22.4	22.5	22.7
			25	12	1	1	22.3	22.8	22.6
			25	25	1	1	22.1	22.8	22.6
			50	0	1	1	22.3	22.5	22.6
		16QAM	1	0	1	2	22.0	22.3	22.2
			1	25	1	1	22.0	23.0	21.9
			1	49	1	1	21.6	23.0	22.1
			25	0	2	2	21.5	21.6	21.8
			25	12	2	2	21.4	21.8	21.7
			25	25	2	2	21.2	21.8	21.7
			50	0	2	2	21.3	21.6	21.7
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							818.5 MHz	831.5 MHz	846.5 MHz
LTE Band 26	5	QPSK	1	0	0	0	23.4	23.5	23.5
			1	12	0	0	23.6	23.8	23.7
			1	24	0	0	23.5	23.8	23.7
			12	0	1	0	22.4	22.7	23.6
			12	6	1	1	22.5	22.8	22.8
			12	11	1	1	22.5	22.7	22.7
			25	0	1	1	22.5	22.7	22.7
		16QAM	1	0	1	1	22.3	21.7	22.5
			1	12	1	1	22.5	22.0	22.7
			1	24	1	1	22.5	22.1	22.8
			12	0	2	2	21.4	21.8	21.7
			12	6	2	2	21.6	21.8	21.8
			12	11	2	2	21.5	21.8	21.8
			25	0	2	2	21.5	21.8	21.8
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							817.5 MHz	831.5 MHz	847.5 MHz
LTE Band 26	3	QPSK	1	0	0	0	23.2	23.7	23.6
			1	7	0	0	23.4	23.7	23.6
			1	14	0	0	23.4	23.7	23.7
			8	0	1	0	22.3	22.8	22.7
			8	4	1	0	22.4	22.8	22.7
			8	7	1	0	22.4	22.8	22.8
			15	0	1	0	22.3	22.8	22.7
		16QAM	1	0	1	0	22.4	22.1	22.5
			1	7	1	0	22.5	22.1	22.4
			1	14	1	0	22.6	22.1	22.7
			8	0	2	0	21.3	21.8	21.9
			8	4	2	0	21.4	21.8	21.7
			8	7	2	0	21.4	21.8	21.9
			15	0	2	0	21.3	21.8	21.7

LTE Band 26 Measured Results (continued)

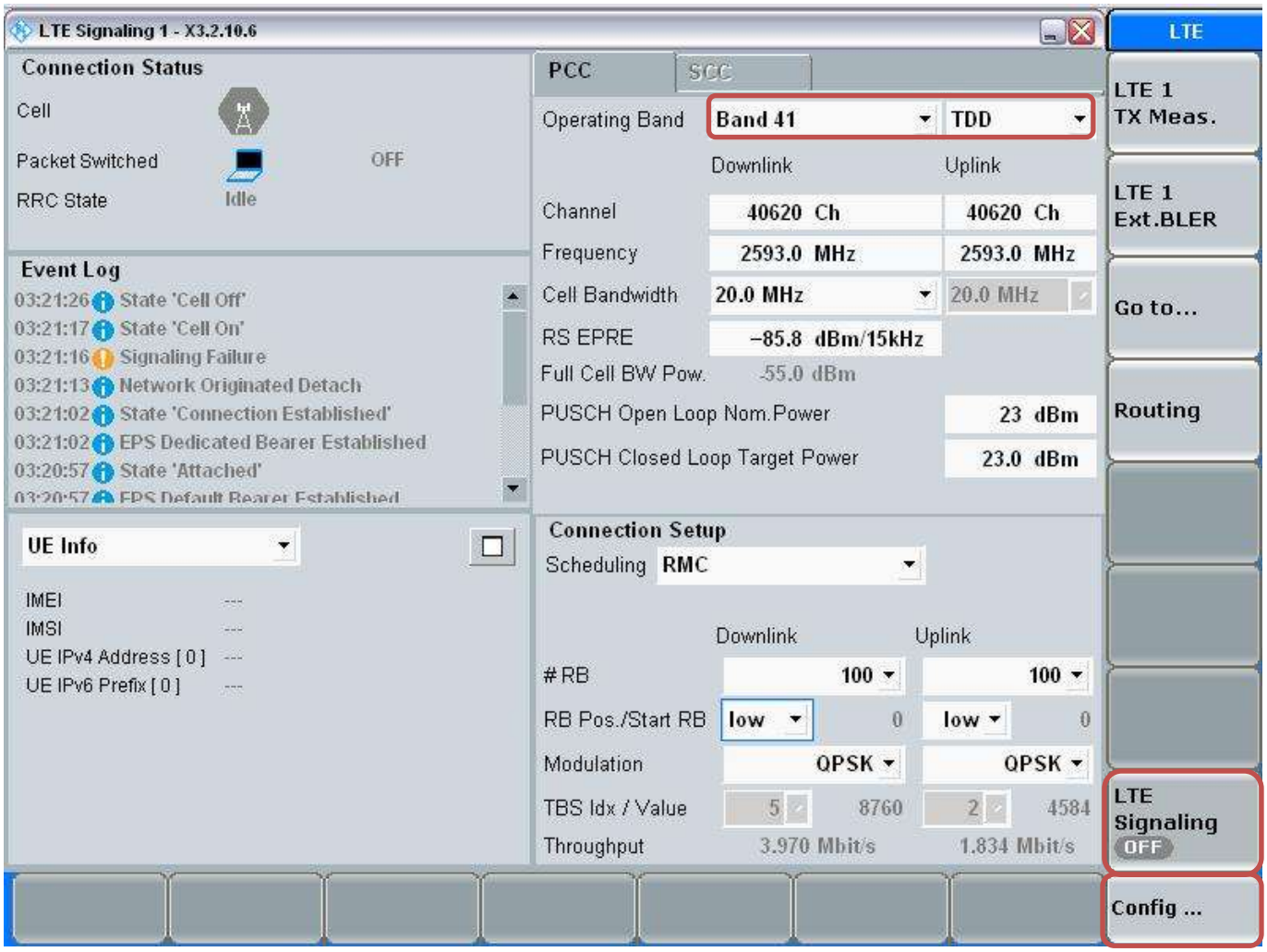
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							816.7 MHz	831.5 MHz	841.5 MHz
LTE Band 26	1.4	QPSK	1	0	0	0	23.4	23.8	23.6
			1	2	0	0	23.4	23.7	23.6
			1	5	0	0	23.4	23.8	23.7
			3	0	0	0	23.3	23.8	23.7
			3	1	0	0	23.4	23.8	23.7
			3	2	0	0	23.4	23.7	23.7
			6	0	1	0	22.5	22.7	22.7
		16QAM	1	0	1	0	21.9	22.9	22.0
			1	2	1	0	21.9	22.9	22.0
			1	5	1	0	22.0	22.9	22.0
			3	0	1	0	22.4	22.8	22.8
			3	1	1	0	22.5	22.8	22.8
			3	2	1	0	22.5	22.8	22.8
			6	0	2	0	21.6	21.6	21.9

LTE Band 41 Measured Results

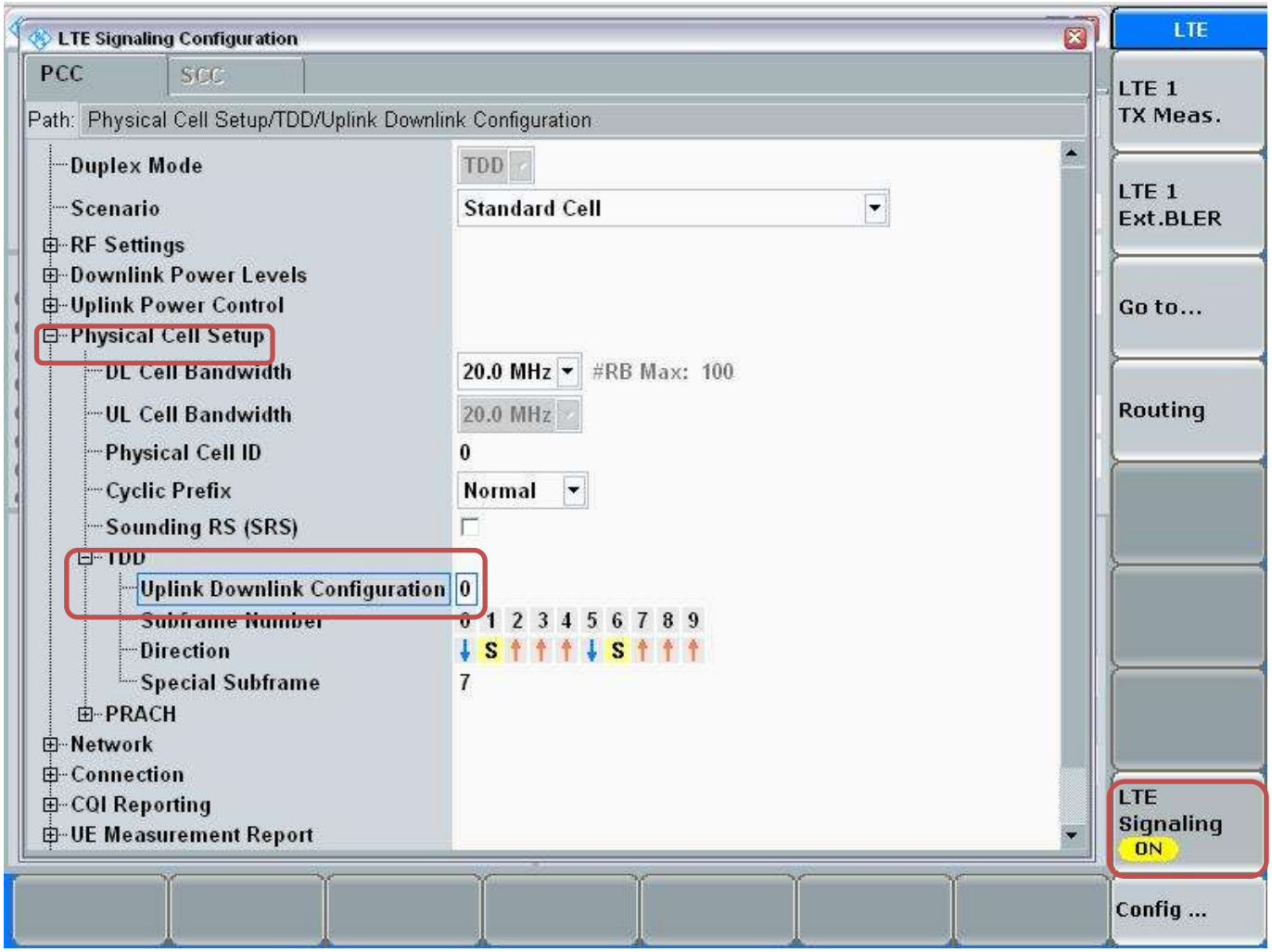
Procedure used to establish SAR test signal for LTE TDD Band 41

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….”

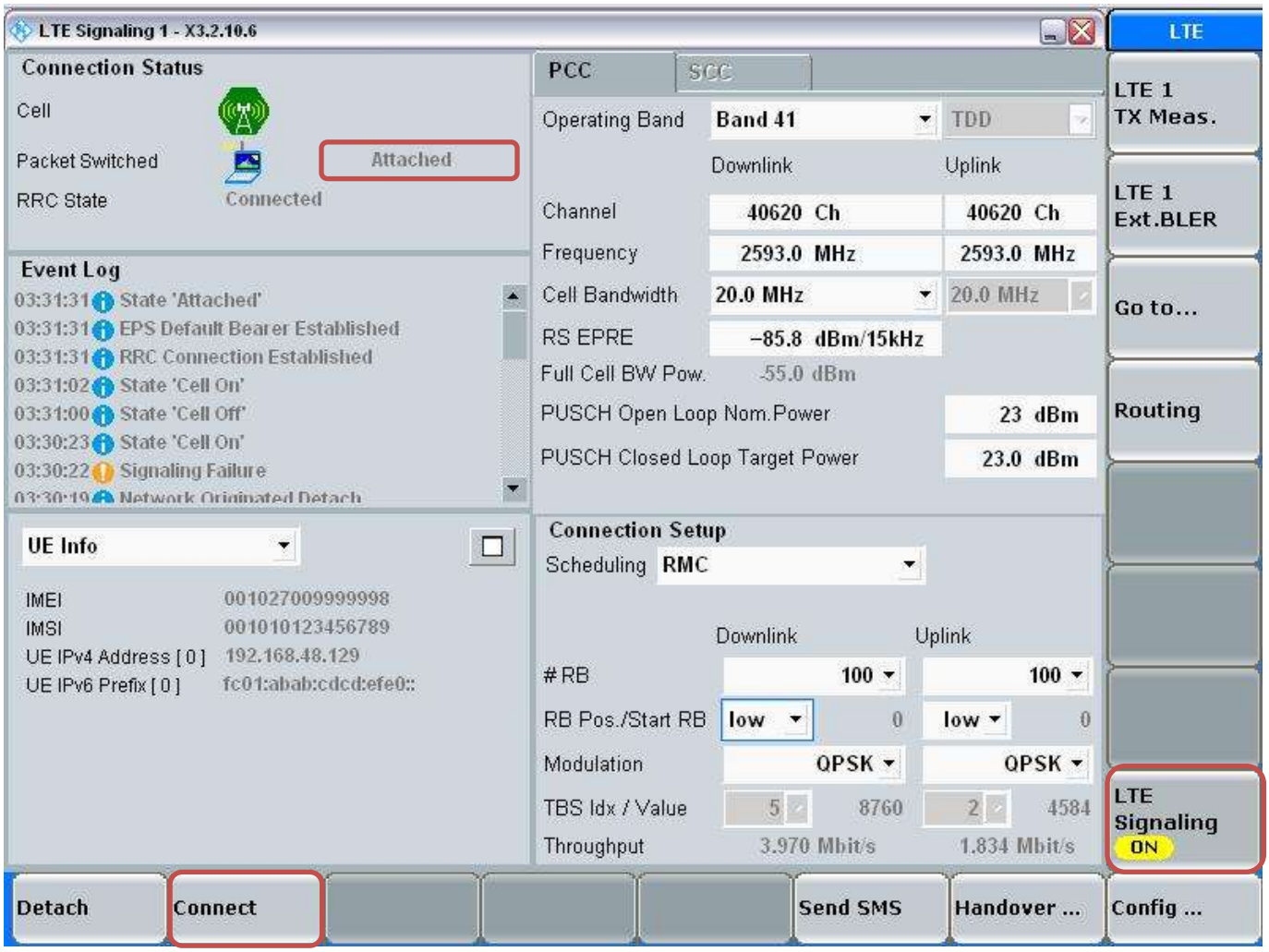


- Go to “Physical Cell Setup”
- Select “TDD” and Set “Uplink Downlink Configuration” to “0”
- Turn the cell on using “ON | OFF” key



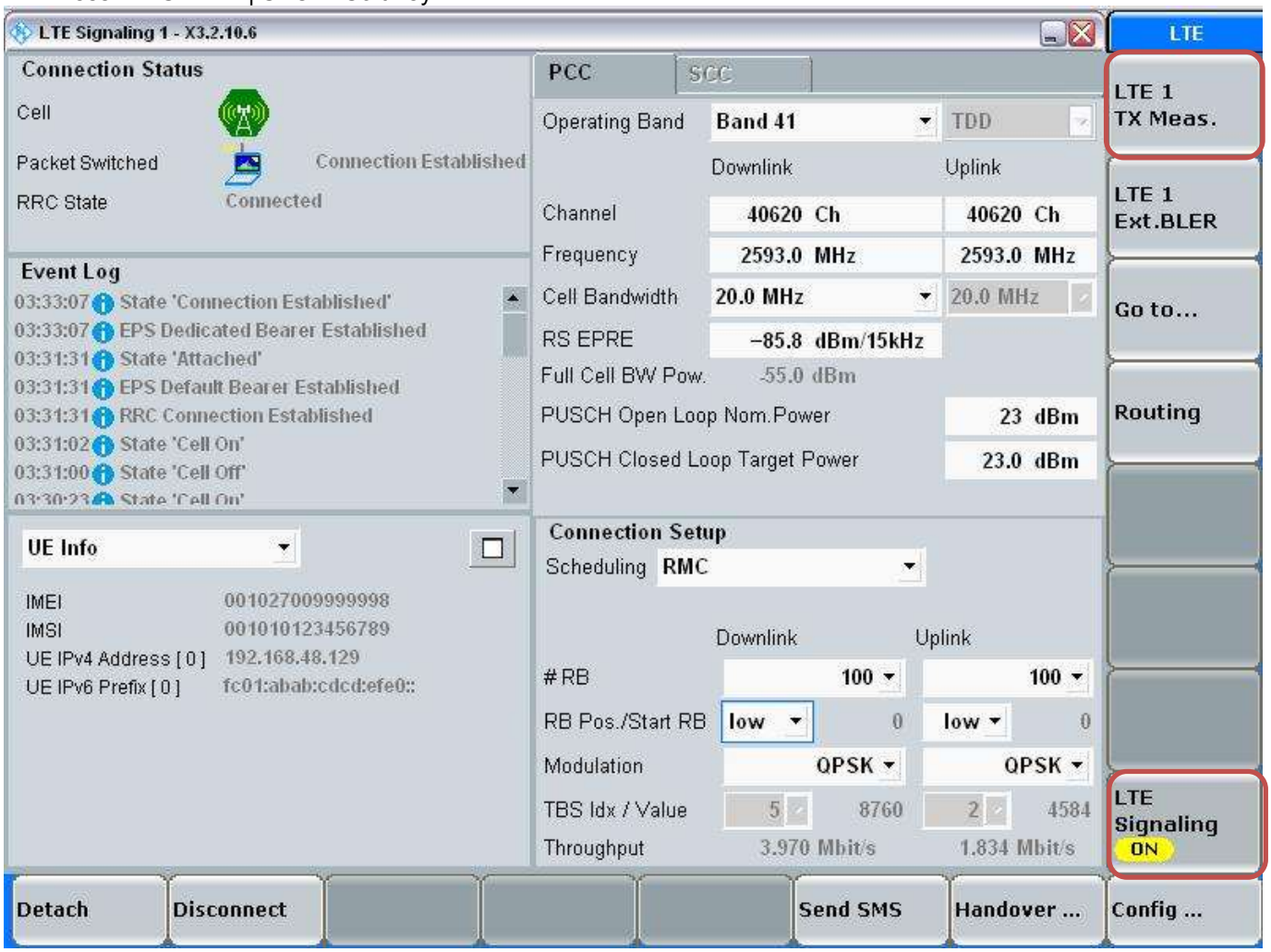
Connect to EUT

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

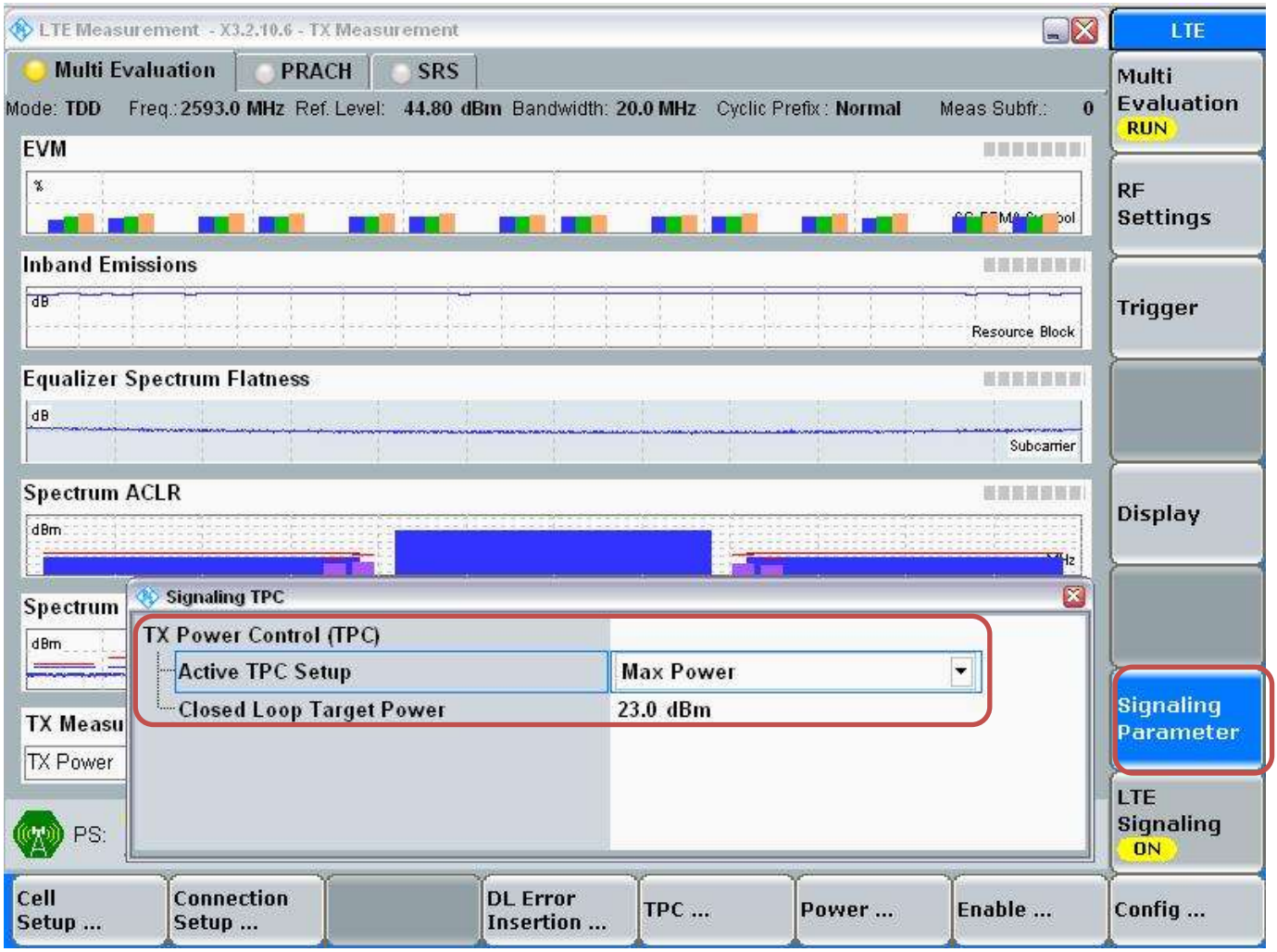


Max Power Setting

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

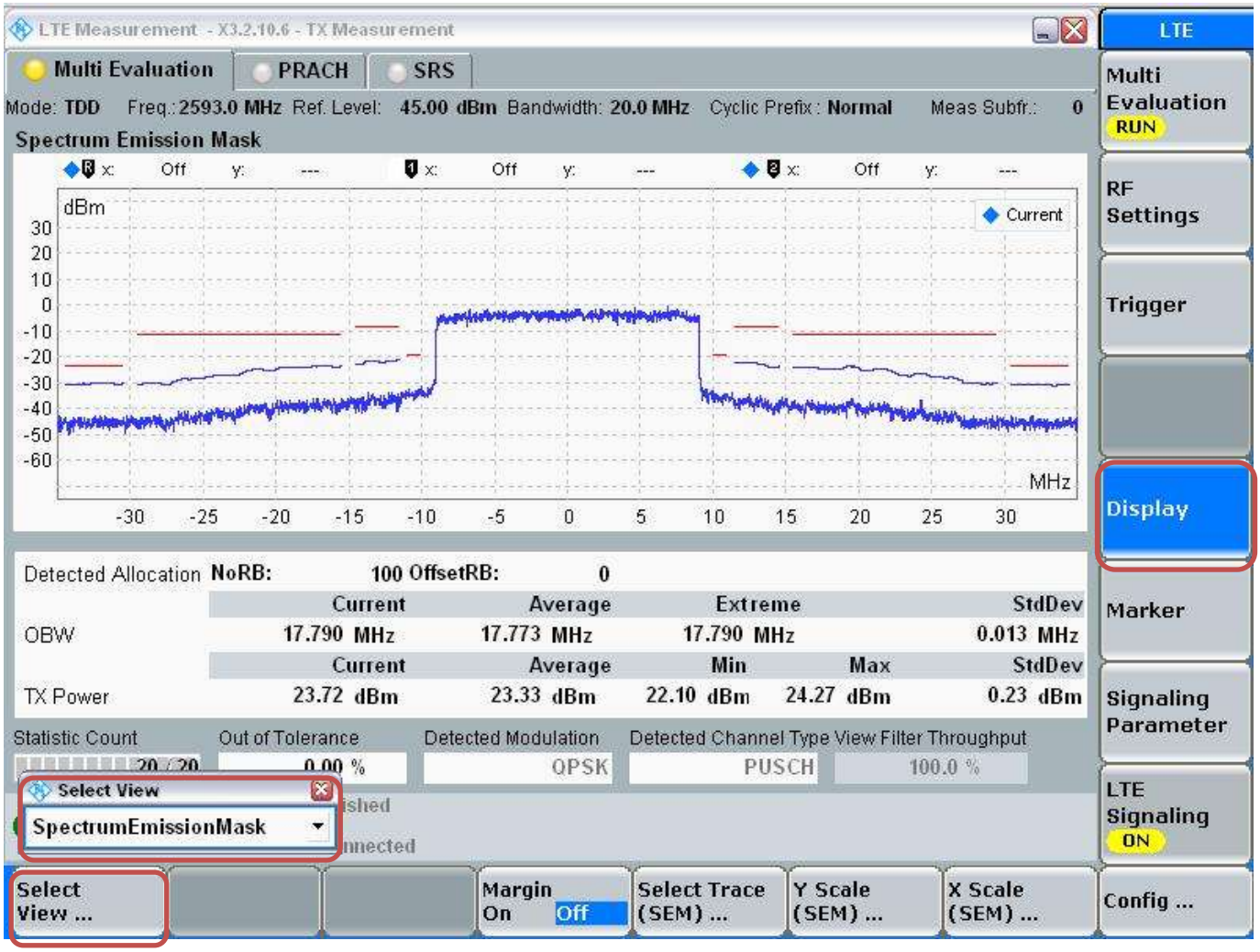


- Select “Signaling Parameter”
- Select “TX Power Control (TPC)” > Select “Active TPC Setup” to “Max Power” > Set “Closed Loop Target Power” to “23 dBm”



View TX Power

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



LTE Band 41 Measured Results (continued)

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	22.4	23.1	22.4	22.4	22.4
			1	50	0	0	22.4	22.7	22.4	22.3	22.3
			1	99	0	0	22.5	22.6	22.3	22.3	22.2
			50	0	1	1	21.6	21.3	21.4	21.2	21.0
			50	25	1	1	21.4	21.4	21.4	21.3	21.1
			50	50	1	1	21.5	21.2	21.5	21.3	21.0
			100	0	1	1	21.4	21.3	21.4	21.3	21.0
		16QAM	1	0	1	1	21.7	21.8	21.5	21.7	21.3
			1	50	1	1	21.8	21.5	21.5	21.6	21.1
			1	99	1	1	21.9	21.4	21.4	21.7	21.2
			50	0	2	2	20.3	20.3	20.4	20.1	20.0
			50	25	2	2	21.3	20.3	20.4	20.2	20.0
			50	50	2	2	20.3	20.1	20.4	20.2	20.0
			100	0	2	2	20.4	20.4	20.6	20.3	20.1

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)				
							2503.5 MHz	2548.3 MHz	2593 MHz	2637.75 MHz	2682.5 MHz
LTE Band 41	15	QPSK	1	0	0	0	22.4	23.0	22.4	22.3	22.4
			1	36	0	0	22.5	22.7	22.3	22.3	22.3
			1	74	0	0	22.5	22.7	22.3	22.3	22.3
			36	0	1	1	21.6	21.4	21.4	21.2	21.0
			36	18	1	1	21.6	21.4	21.4	21.3	21.1
			36	37	1	1	21.5	21.2	21.3	21.3	21.0
			75	0	1	1	21.4	21.3	21.4	21.3	21.0
		16QAM	1	0	1	1	21.8	21.5	21.4	21.6	21.3
			1	36	1	1	21.8	21.5	21.5	21.6	21.1
			1	74	1	1	21.9	21.4	21.4	21.7	21.2
			36	0	2	2	20.3	20.3	20.4	20.2	20.0
			36	18	2	2	20.5	20.3	20.4	20.2	20.0
			36	37	2	2	20.3	20.2	20.4	20.2	20.1
			75	0	2	2	20.4	20.4	20.5	20.3	20.1

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)				
							2498.5 MHz	2545.8 MHz	2593 MHz	2640.25 MHz	2687.5 MHz
LTE Band 41	10	QPSK	1	0	0	0	22.4	22.8	22.4	22.3	22.2
			1	25	0	0	22.4	22.7	22.4	22.2	22.3
			1	49	0	0	22.4	22.7	22.3	22.1	22.3
			25	0	1	1	21.6	21.2	21.4	21.2	21.0
			25	12	1	1	21.5	21.3	21.2	21.1	21.1
			25	25	1	1	21.5	21.2	21.3	21.3	21.1
			50	0	1	1	21.4	21.3	21.3	21.1	21.0
		16QAM	1	0	1	1	21.8	21.5	21.4	21.6	21.3
			1	25	1	1	21.8	21.5	21.2	21.5	21.1
			1	49	1	1	21.8	21.4	21.2	21.7	21.2
			25	0	2	2	20.3	20.3	20.2	20.2	20.0
			25	12	2	2	20.5	20.2	20.2	20.3	20.1
			25	25	2	2	20.3	20.2	20.4	20.2	20.1
			50	0	2	2	20.4	20.4	20.4	20.3	20.3

9.3. WiFi (2.4 GHz Band)

Required Test Channels per KDB 248227 D01

Mode	Band	GHz	Channel	"Default Test Channels"	
				802.11b	802.11g
802.11b/g	2.4 GHz	**2.412**	1#	√	∇
		2.437	6	√	∇
		2.462	11#	√	∇

Notes:
√ = "default test channels"
∇ = possible 802.11g channels with maximum average output ¼ dB ≥ the "default test channels"
= when output power is reduced for channel 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels should be tested.

Measured Results

Band (GHz)	Mode	Ch #	Freq. (MHz)	Avg Pwr (dBm)
2.4	802.11b	1	2412	11.3
		6	2437	11.4
		11	2462	11.4
	802.11g	1	2412	10.2
		6	2437	10.9
		11	2462	10.9
	802.11n (HT20)	1	2412	10.6
		6	2437	10.8
		11	2462	10.8
	802.11n (HT40)	3	2422	10.3
		6	2437	10.6
		9	2452	10.6

Note(s):
Per KDB 248227 D01, SAR is not required for 802.11g/HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels.

10. Tissue Dielectric Properties

IEEE Std 1528-2003 Table 2

Target Frequency (MHz)	Head	
	ε_r	σ (S/m)
300	45.3	0.87
450	43.5	0.87
835	41.5	0.90
900	41.5	0.97
1450	40.5	1.20
1800 – 2000	40.0	1.40
2450	39.2	1.80
2600	39.0	1.96
3000	38.5	2.40

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r01

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

10.1. Composition of Ingredients for the Tissue Material Used in the SAR Tests

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Ingredients (% by weight)	Frequency (MHz)									
	450		835		915		1900		2450-2600	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

Salt: 99+% Pure Sodium Chloride Sugar: 98+% Pure Sucrose
Water: De-ionized, 16 MΩ+ resistivity HEC: Hydroxyethyl Cellulose
DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]
Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

10.2. Tissue Dielectric Parameter Check 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 Room D

	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
8/16/2013	Body 1900	e'	52.8500	Relative Permittivity (ϵ_r):	52.85	53.30	-0.84	5
		e"	14.4400	Conductivity (σ):	1.53	1.52	0.36	5
	Body 1850	e'	53.0600	Relative Permittivity (ϵ_r):	53.06	53.30	-0.45	5
		e"	14.3100	Conductivity (σ):	1.47	1.52	-3.16	5
	Body 1915	e'	52.8000	Relative Permittivity (ϵ_r):	52.80	53.30	-0.94	5
		e"	14.4600	Conductivity (σ):	1.54	1.52	1.30	5
8/20/2013	Body 835	e'	53.1800	Relative Permittivity (ϵ_r):	53.18	55.20	-3.66	5
		e"	21.8200	Conductivity (σ):	1.01	0.97	4.44	5
	Body 820	e'	53.3500	Relative Permittivity (ϵ_r):	53.35	55.28	-3.49	5
		e"	21.8600	Conductivity (σ):	1.00	0.97	2.92	5
	Body 850	e'	53.0500	Relative Permittivity (ϵ_r):	53.05	55.16	-3.82	5
		e"	21.6800	Conductivity (σ):	1.02	0.99	3.80	5
9/9/2013	Body 835	e'	53.3900	Relative Permittivity (ϵ_r):	53.39	55.20	-3.28	5
		e"	21.7100	Conductivity (σ):	1.01	0.97	3.91	5
	Body 820	e'	53.5500	Relative Permittivity (ϵ_r):	53.55	55.28	-3.12	5
		e"	21.7300	Conductivity (σ):	0.99	0.97	2.30	5
	Body 850	e'	53.2500	Relative Permittivity (ϵ_r):	53.25	55.16	-3.46	5
		e"	21.6500	Conductivity (σ):	1.02	0.99	3.66	5
9/13/2013	Body 835	e'	53.7700	Relative Permittivity (ϵ_r):	53.77	55.20	-2.59	5
		e"	21.6900	Conductivity (σ):	1.01	0.97	3.82	5
	Body 820	e'	53.9200	Relative Permittivity (ϵ_r):	53.92	55.28	-2.45	5
		e"	21.7300	Conductivity (σ):	0.99	0.97	2.30	5
	Body 850	e'	53.6100	Relative Permittivity (ϵ_r):	53.61	55.16	-2.80	5
		e"	21.6000	Conductivity (σ):	1.02	0.99	3.42	5

Tissue Dielectric Parameter Check Results (continued)

SAR Room 1 (continued)

	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
8/21/2013	Body 1900	e'	51.9000	Relative Permittivity (ε_r):	51.90	53.30	-2.63	5
		e''	14.6200	Conductivity (σ):	1.54	1.52	1.61	5
	Body 1850	e'	52.0700	Relative Permittivity (ε_r):	52.07	53.30	-2.31	5
		e''	14.5100	Conductivity (σ):	1.49	1.52	-1.80	5
	Body 1910	e'	51.8800	Relative Permittivity (ε_r):	51.88	53.30	-2.66	5
		e''	14.6500	Conductivity (σ):	1.56	1.52	2.63	5
8/22/2013	Body 2450	e'	52.0200	Relative Permittivity (ε_r):	52.02	52.70	-1.29	5
		e''	14.2600	Conductivity (σ):	1.94	1.95	-0.38	5
	Body 2400	e'	52.1600	Relative Permittivity (ε_r):	52.16	52.77	-1.16	5
		e''	14.1200	Conductivity (σ):	1.88	1.90	-0.72	5
	Body 2480	e'	51.9400	Relative Permittivity (ε_r):	51.94	52.66	-1.37	5
		e''	14.3700	Conductivity (σ):	1.98	1.99	-0.53	5
8/26/2013	Body 835	e'	53.1000	Relative Permittivity (ε_r):	53.10	55.20	-3.80	5
		e''	21.9200	Conductivity (σ):	1.02	0.97	4.92	5
	Body 820	e'	53.2400	Relative Permittivity (ε_r):	53.24	55.28	-3.68	5
		e''	21.9900	Conductivity (σ):	1.00	0.97	3.53	5
	Body 850	e'	52.9700	Relative Permittivity (ε_r):	52.97	55.16	-3.97	5
		e''	21.8000	Conductivity (σ):	1.03	0.99	4.37	5
8/28/2013	Body 1900	e'	52.9900	Relative Permittivity (ε_r):	52.99	53.30	-0.58	5
		e''	14.2700	Conductivity (σ):	1.51	1.52	-0.82	5
	Body 1850	e'	53.1800	Relative Permittivity (ε_r):	53.18	53.30	-0.23	5
		e''	14.0800	Conductivity (σ):	1.45	1.52	-4.71	5
	Body 1915	e'	52.9400	Relative Permittivity (ε_r):	52.94	53.30	-0.68	5
		e''	14.3100	Conductivity (σ):	1.52	1.52	0.25	5
8/28/2013	Body 2450	e'	51.0500	Relative Permittivity (ε_r):	51.05	52.70	-3.13	5
		e''	15.0000	Conductivity (σ):	2.04	1.95	4.79	5
	Body 2400	e'	51.2100	Relative Permittivity (ε_r):	51.21	52.77	-2.96	5
		e''	14.8600	Conductivity (σ):	1.98	1.90	4.48	5
	Body 2480	e'	51.0000	Relative Permittivity (ε_r):	51.00	52.66	-3.16	5
		e''	15.0800	Conductivity (σ):	2.08	1.99	4.38	5
8/30/2013	Body 2600	e'	51.4400	Relative Permittivity (ε_r):	51.44	52.51	-2.04	5
		e''	15.1300	Conductivity (σ):	2.19	2.16	1.23	5
	Body 2495	e'	51.8300	Relative Permittivity (ε_r):	51.83	52.64	-1.54	5
		e''	14.7300	Conductivity (σ):	2.04	2.01	1.50	5
	Body 2690	e'	51.0200	Relative Permittivity (ε_r):	51.02	52.40	-2.63	5
		e''	15.5300	Conductivity (σ):	2.32	2.29	1.55	5

11. System Performance 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.

11.1. 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 ± 0.5 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm ± 0.5 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.

11.2. Reference SAR Values for System Performance Check

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 (mW/g)		
				1g/10g	Head	Body
D835V2	4d142	10/4/2012	835	1g	9.45	9.50
				10g	6.23	6.29
D835V2	4d002	10/24/2012	835	1g	9.58	9.48
				10g	6.28	6.26
D1900V2	5d163	10/4/2012	1900	1g	39.4	39.6
				10g	20.7	21.1
D2450V2	899	10/5/2012	2450	1g	53.6	51.7
				10g	25.0	24.3
D2600V2	1036	3/11/2013	2600	1g	57.8	55.2
				10g	25.9	24.4

11.3. System Performance 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 D

Date Tested	System Dipole		T.S. Liquid		Measured Results			Target (Ref. Value)	Delta ±10 %	Est./Zoom Ratio ±3 %	Plot No.
	Type	Serial #			Area Scan	Zoom Scan	Normalize to 1 W				
8/16/2013	D1900V2	5d163	Body	1g	3.81	3.85	38.50	39.60	-2.78	-1.05	1,2
				10g	1.91	2.07	20.70	21.10	-1.90		
8/20/2013	D835V2	4d142	Body	1g	0.96	0.94	9.39	9.50	-1.16	2.29	3,4
				10g	0.64	0.63	6.27	6.29	-0.32		
9/9/2013	D835V2	4d002	Body	1g	0.96	0.95	9.48	9.48	0.00	1.46	
				10g	0.64	0.63	6.26	6.26	0.00		
9/13/2013	D835V2	4d002	Body	1g	0.96	0.95	9.51	9.48	0.32	0.83	5,6
				10g	0.64	0.63	6.25	6.26	-0.16		

SAR Lab 1

Date Tested	System Dipole		T.S. Liquid		Measured Results			Target (Ref. Value)	Delta ±10 %	Est./Zoom Ratio ±3 %	Plot No.
	Type	Serial #			Area Scan	Zoom Scan	Normalize to 1 W				
8/21/2013	D1900V2	5d163	Body	1g	4.20	4.28	42.80	39.60	8.08	-1.90	7,8
				10g	2.11	2.27	22.70	21.10	7.58		
8/22/2013	D2450V2	899	Body	1g	5.67	5.64	56.40	51.70	9.09	0.53	9,10
				10g	2.59	2.61	26.10	24.30	7.41		
8/26/2013	D835V2	4d142	Body	1g	1.04	1.01	10.10	9.50	6.32	2.88	11,12
				10g	0.70	0.67	6.66	6.29	5.88		
8/28/2013	D1900V2	5d163	Body	1g	3.79	3.83	38.30	39.60	-3.28	-1.06	
				10g	1.93	2.05	20.50	21.10	-2.84		
8/28/2013	D2450V2	899	Body	1g	5.47	5.48	54.80	51.70	6.00	-0.18	
				10g	2.50	2.55	25.50	24.30	4.94		
8/30/2013	D2600V2	1036	Body	1g	5.79	5.58	55.80	55.20	1.09	3.63	13,14
				10g	2.54	2.44	24.40	24.40	0.00		

12. SAR Test Results

12.1. CDMA BC 0

Test Position	Dist. (mm)	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Rear	10	1xEVDO (Rel. 0)	1013	824.70	24.5	23.7	1.130	1.359		
			384	836.52	24.5	23.6	1.200	**1.476**	1	
			777	848.31	24.5	23.5	1.130	1.423		
Front	10	1xEVDO (Rel. 0)	1013	824.70	24.5	23.7	0.794	0.955		
			384	836.52	24.5	23.6	0.875	1.076		
			777	848.31	24.5	23.5	0.847	1.066		
Edge 1	10	1xEVDO (Rel. 0)	1013	824.70	24.5	23.7				
			384	836.52	24.5	23.6	0.499	0.614		
			777	848.31	24.5	23.5				
Edge 2	10	1xEVDO (Rel. 0)	1013	824.70	24.5	23.7				
			384	836.52	24.5	23.6	0.058	0.071		
			777	848.31	24.5	23.5				
Edge 3	10	1xEVDO (Rel. 0)	1013	824.70	24.5	23.7				
			384	836.52	24.5	23.6	0.417	0.513		
			777	848.31	24.5	23.5				

12.2. CDMA BC 1

Test Position	Dist. (mm)	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Rear	10	1xEVDO (Rel. 0)	25	1851.25	23.5	23.0				
			600	1880.00	23.5	23.5	0.546	0.546		
			1175	1908.75	23.5	23.1				
Front	10	1xEVDO (Rel. 0)	25	1851.25	23.5	23.0				
			600	1880.00	23.5	23.5	0.753	**0.753**	2	
			1175	1908.75	23.5	23.2				
Edge 1	10	1xEVDO (Rel. 0)	25	1851.25	23.5	23.0				
			600	1880.00	23.5	23.5	0.320	0.320		
			1175	1908.75	23.5	23.1				
Edge 2	10	1xEVDO (Rel. 0)	25	1851.25	23.5	23.0				
			600	1880.00	23.5	23.5	0.100	0.100		
			1175	1908.75	23.5	23.1				
Edge 3	10	1xEVDO (Rel. 0)	25	1851.25	23.5	23.0				
			600	1880.00	23.5	23.5	0.365	0.365		
			1175	1908.75	23.5	23.1				

Note(s):

1. 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

12.3. CDMA BC 10

Test Position	Dist. (mm)	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Rear	10	1xEVDO (Rel. 0)	476	817.90	24.5	23.9	1.110	**1.274**	3	
			580	820.50	24.5	23.9	1.110	**1.274**	4	
			684	823.10	24.5	24.0	1.120	1.257		
Front	10	1xEVDO (Rel. 0)	476	817.90	24.5	23.9	0.764	0.877		
			580	820.50	24.5	23.9	0.777	0.892		
			684	823.10	24.5	24.0	0.794	0.891		
Edge 1	10	1xEVDO (Rel. 0)	476	817.90	24.5	23.9				
			580	820.50	24.5	23.9	0.413	0.474		
			684	823.10	24.5	24.0				
Edge 2	10	1xEVDO (Rel. 0)	476	817.90	24.5	23.9				
			580	820.50	24.5	23.9	0.047	0.054		
			684	823.10	24.5	24.0				
Edge 3	10	1xEVDO (Rel. 0)	476	817.90	24.5	23.9				
			580	820.50	24.5	23.9	0.342	0.393		
			684	823.10	24.5	24.0				

Note(s):

1. 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

12.4. LTE FDD Band 25 (10 MHz Bandwidth)

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
Rear	QPSK	10	26090	1860.0	1						
					25						
			26365	1882.5	1	0	24.0	23.7	0.715	0.766	
					25	0	23.0	23.0	0.612	0.612	
			26640	1905.0	1						
					25						
Front	QPSK	10	26090	1860.0	1						
					25						
			26365	1882.5	1	0	24.0	23.9	0.754	**0.772**	5
					25	0	23.0	23.0	0.701	0.701	
			26640	1905.0	1						
					25						
Edge 1	QPSK	10	26090	1860.0	1						
					25						
			26365	1882.5	1	0	24.0	23.7	0.328	0.351	
					25	0	23.0	23.0	0.293	0.293	
			26640	1905.0	1						
					25						
Edge 2	QPSK	10	26090	1860.0	1						
					25						
			26365	1882.5	1	0	24.0	23.7	0.100	0.107	
					25	0	23.0	23.0	0.082	0.082	
			26640	1905.0	1						
					25						
Edge 3	QPSK	10	26090	1860.0	1						
					25						
			26365	1882.5	1	0	24.0	23.7	0.347	0.372	
					25	0	23.0	23.0	0.335	0.335	
			26640	1905.0	1						
					25						

Note(s):

1. 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
2. Per KDB 941225 D05 SAR for LTE Devices v02, SAR test reduction is applied using the following criteria:
   - Testing for Low and High Channel 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.

12.5. LTE FDD Band 26 (10 MHz Bandwidth)

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
Rear	QPSK	10	26740	819.0	1	0	24.0	23.4	1.060	1.217	
					25	0	23.0	22.4	0.865	0.993	
			26865	831.5	1	24	24.0	23.8	1.340	**1.403**	6
					25	12	23.0	22.8	1.060	1.110	
			26990	844.0	1	24	24.0	24.0	1.220	1.220	
					25	0	23.0	22.7	1.040	1.114	
					50	0	23.0	22.6	1.000	1.096	
Front	QPSK	10	26740	819.0	1	0	24.0	23.4	0.798	0.916	
					25	0	23.0	22.4	0.661	0.759	
			26865	831.5	1	24	24.0	23.8	1.040	1.089	
					25	12	23.0	22.8	0.820	0.859	
			26990	844.0	1	24	24.0	24.0	0.961	0.961	
					25	0	23.0	22.7	0.803	0.860	
					50	0	23.0	22.6	0.781	0.856	
Edge 1	QPSK	10	26740	819.0	1	0	24.0	23.4	0.492	0.565	
					25	0	23.0	22.4			
			26865	831.5	1	24	24.0	23.8	0.770	0.806	
					25	12	23.0	22.8	0.596	0.624	
			26990	844.0	1	24	24.0	24.0	0.523	0.523	
					25	0	23.0	22.7			
Edge 2	QPSK	10	26740	819.0	1	0	24.0	23.4			
					25	0	23.0	22.4			
			26865	831.5	1	24	24.0	23.8	0.059	0.062	
					25	12	23.0	22.8	0.047	0.049	
			26990	844.0	1	24	24.0	24.0			
					25	0	23.0	22.7			
Edge 3	QPSK	10	26740	819.0	1	0	24.0	23.4			
					25	0	23.0	22.4			
			26865	831.5	1	24	24.0	23.8	0.552	0.578	
					25	12	23.0	22.8	0.425	0.445	
			26990	844.0	1	24	24.0	24.0			
					25	0	23.0	22.7			

Note(s):

1. 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
2. Per KDB 941225 D05 SAR for LTE Devices v02, SAR test reduction is applied using the following criteria:
   - Testing for Low and High Channel 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.

12.6. LTE TDD Band 41 (20 MHz Bandwidth)

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
							Tune-up limit	Meas.	Meas.	Scaled		
Rear	QPSK	10	39750	2506.0	1	99	24.0	22.5	0.668	0.944		
					50	0	23.0	21.6	0.646	0.892		
					100	0	23.0	21.4				2
			40185	2549.5	1	0	24.0	23.1	0.504	0.620		
					50	24	23.0	21.4	0.568	0.821		
					100	0	23.0	21.3				2
			40620	2593.0	1	0	24.0	22.4	0.729	1.054		
					50	49	23.0	21.5	0.747	1.055		
					100	0	23.0	21.4	0.659	0.953		
			41055	2636.5	1	0	24.0	22.4	0.805	**1.164**	7	
					50	24	23.0	21.3	0.670	0.991		
					100	0	23.0	21.3				2
			41490	2680.0	1	0	24.0	22.4	0.716	1.035		
					50	24	23.0	21.1	0.612	0.948		
					100	0	23.0	21.0				2
Front	QPSK	10	39750	2506.0	1	99	24.0	22.5	0.494	0.698		
					50	0	23.0	21.6	0.475	0.656		
					100	0	23.0	21.4				2
			40185	2549.5	1	0	24.0	23.1	0.472	0.581		
					50	24	23.0	21.4	0.506	0.731		
					100	0	23.0	21.3				2
			40620	2593.0	1	0	24.0	22.4	0.592	0.856		
					50	49	23.0	21.5	0.446	0.630		
					100	0	23.0	21.4	0.425	0.614		
			41055	2636.5	1	0	24.0	22.4	0.572	0.827		
					50	24	23.0	21.3	0.635	0.939		
					100	0	23.0	21.3				2
			41490	2680.0	1	0	24.0	22.4	0.419	0.606		
					50	24	23.0	21.1	0.489	0.757		
					100	0	23.0	21.0				2

Note(s):

1. 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
2. Per KDB 941225 D05 SAR for LTE Devices v02, SAR test reduction is applied using the following criteria:
   - Testing for Low and High Channel 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 $\geq$ 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.

LTE TDD Band 41 (20 MHz Bandwidth) continued

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
							Tune-up limit	Meas.	Meas.	Scaled		
Edge 1	QPSK	10	39750	2506.0	1	99	24.0	22.5				1
					50	0	23.0	21.6				1
			40185	2549.5	1	0	24.0	23.1				1
					50	24	23.0	21.4				1
			40620	2593.0	1	0	24.0	22.4	0.412	0.596		
					50	49	23.0	21.5	0.399	0.564		
			41055	2636.5	1	0	24.0	22.4				1
					50	24	23.0	21.3				1
			41490	2680.0	1	0	24.0	22.4				1
					50	24	23.0	21.1				1
Edge 2	QPSK	10	39750	2506.0	1	99	24.0	22.5				1
					50	0	23.0	21.6				1
			40185	2549.5	1	0	24.0	23.1				1
					50	24	23.0	21.4	0.217	0.314		
			40620	2593.0	1	0	24.0	22.4	0.401	0.580		
					50	49	23.0	21.5	0.442	0.624		
			41055	2636.5	1	0	24.0	22.4				1
					50	24	23.0	21.3	0.436	0.645		
			41490	2680.0	1	0	24.0	22.4				1
					50	24	23.0	21.1	0.506	0.784		
Edge 3	QPSK	10	39750	2506.0	1	99	24.0	22.5				1
					50	0	23.0	21.6				1
			40185	2549.5	1	0	24.0	23.1				1
					50	24	23.0	21.4				1
			40620	2593.0	1	0	24.0	22.4	0.124	0.179		
					50	49	23.0	21.5	0.138	0.195		
			41055	2636.5	1	0	24.0	22.4				1
					50	24	23.0	21.3				1
			41490	2680.0	1	0	24.0	22.4				1
					50	24	23.0	21.1				1

Note(s):

1. 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
2. Per KDB 941225 D05 SAR for LTE Devices v02, SAR test reduction is applied using the following criteria:
   - Testing for Low and High Channel 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.

12.7. WiFi (2.4GHz Band)

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Rear	802.11b	10	1	2412	12.0	11.3				1
			6	2437	12.0	11.4	0.035	0.041		
			11	2462	12.0	11.4				1
Front	802.11b	10	1	2412	12.0	11.3				1
			6	2437	12.0	11.4	0.101	0.116		
			11	2462	12.0	11.4				1
Edge 1	802.11b	10	1	2412	12.0	11.3				1
			6	2437	12.0	11.4	0.158	**0.181**	8	
			11	2462	12.0	11.4				1

Note(s):

1. 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
2. Apply usual 802.11 test exclusion considerations, but include 802.11ac SAR for highest 802.11a configuration in each frequency band and each exposure condition according to April 2013 TCB Workshop Updates.

13. 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.

13.1. The Highest Measured SAR Configuration in Each Frequency Band

Frequency Band (MHz)	Air Interface	Hotspot (W/kg)
850	CDMA BC0	1.200
	CDMA BC10	1.120
	LTE Band 26	1.340
1900	CDMA BC1	0.753
	LTE Band 25	0.754
2400	WiFi 802.11b/g/n	0.158
2600	LTE Band 41	0.805

13.2. Repeated Measurement Results

Hotspot Exposure Condition

Frequency band	Test Position	Mode	Ch #.	Freq. (MHz)	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio	Note
					Original	Repeated		
LTE Band 26	Rear	QPSK	26865	831.5	1.340	1.260	1.06	1
LTE Band 41	Rear	QPSK	41055	2636.5	0.805	0.764	1.05	1

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.

14. Simultaneous Transmission SAR Analysis

KDB 447498 D01 General RF Exposure Guidance v05, introduces a new formula for calculating the SAR to Peak Location Ratio (SPLSR) between pairs of simultaneously transmitting antennas:

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

Where:

SAR_1 is the highest measured or estimated SAR for the first of a pair of simultaneous transmitting antennas, in a specific test operating mode and exposure condition

SAR_2 is the highest measured or estimated SAR for the second of a pair of simultaneous transmitting antennas, in the same test operating mode and exposure condition as the first

Ri is the separation distance between the pair of simultaneous transmitting antennas. When the SAR is measured, for both antennas in the pair, it is determined by the actual x, y and z coordinates in the 1-g SAR for each SAR peak location, based on the extrapolated and interpolated result in the zoom scan measurement, using the formula of $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$

A new threshold of 0.04 is also introduced in the draft KDB. Thus, in order for a pair of simultaneous transmitting antennas with the sum of 1-g SAR > 1.6 W/kg to qualify for exemption from Simultaneous Transmission SAR measurements, it has to satisfy the condition of:

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

14.1. Sum of the SAR for CDMA & WiFi

RF Exposure conditions	Test Position	Simultaneous Transmission Scenario		∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
		CDMA BC 0	WiFi 2.4GHz		
Hotspot	Rear	1.476	0.041	**1.517**	No
	Front	1.076	0.116	1.192	No
	Edge 1	0.614	0.181	0.795	No
	Edge 2	0.071		0.071	No
	Edge 3	0.513		0.513	No
RF Exposure conditions	Test Position	Simultaneous Transmission Scenario		∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
		CDMA BC 1	WiFi 2.4GHz		
Hotspot	Rear	0.546	0.041	0.587	No
	Front	0.753	0.116	0.869	No
	Edge 1	0.320	0.181	0.501	No
	Edge 2	0.100		0.100	No
	Edge 3	0.365		0.365	No
RF Exposure conditions	Test Position	Simultaneous Transmission Scenario		∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
		CDMA BC 10	WiFi 2.4GHz		
Hotspot	Rear	1.274	0.041	1.315	No
	Front	0.892	0.116	1.008	No
	Edge 1	0.474	0.181	0.655	No
	Edge 2	0.054		0.054	No
	Edge 3	0.393		0.393	No

SAR to Peak Location Separation Ratio (SPLSR)

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

14.2. Sum of the SAR for LTE & WiFi

RF Exposure conditions	Test Position	Simultaneous Transmission Scenario		∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
		LTE Band 25	WiFi 2.4GHz		
Hotspot	Rear	0.766	0.041	0.807	No
	Front	0.772	0.116	0.888	No
	Edge 1	0.351	0.181	0.532	No
	Edge 2	0.107		0.107	No
	Edge 3	0.372		0.372	No
RF Exposure conditions	Test Position	Simultaneous Transmission Scenario		∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
		LTE Band 26	WiFi 2.4GHz		
Hotspot	Rear	1.403	0.041	1.444	No
	Front	1.089	0.116	1.205	No
	Edge 1	0.806	0.181	0.987	No
	Edge 2	0.062		0.062	No
	Edge 3	0.578		0.578	No
RF Exposure conditions	Test Position	Simultaneous Transmission Scenario		∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
		LTE Band 41	WiFi 2.4GHz		
Hotspot	Rear	1.164	0.041	1.205	No
	Front	0.939	0.116	1.055	No
	Edge 1	0.596	0.181	0.777	No
	Edge 2	0.784		0.784	No
	Edge 3	0.195		0.195	No

SAR to Peak Location Separation Ratio (SPLSR)
As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

15. Appendices

Refer to separated files for the following appendices.

15.1. System Performance Check Plots

15.2. Highest SAR Test Plots

15.3. Calibration Certificate for E-Field Probe EX3DV4 - SN 3686

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

15.5. Calibration Certificate for D835V2 - SN 4d142

15.6. Calibration Certificate for D835V2 - SN 4d002

15.7. Calibration Certificate for D1900V2 - SN 5d163

15.8. Calibration Certificate for D2450V2 - SN 899

15.9. Calibration Certificate for D2600V2 - SN 1036