



SAR EVALUATION REPORT

IEEE Std 1528-2013

For

WIRELESS AMBULATORY ECG MONITORING AND DETECTION SYSTEM

**FCC ID: 2AHLC01855
Model Name: 01854 REV B**

**Report Number: R13999443-S1V4
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Revision History



Rev.	Date	Revisions	Revised By
V1	11/23/2021	Initial Issue	--
V2	12/14/2021	Added reference to ANSI C63.26:2015	Richard Jankovics
V3	12/28/2021	Updated measured output power for LTE Bands 12 and 71	Richard Jankovics
V4	12/31/2021	Updated measured output power for LTE Bands 12 and 71 16QAM	Richard Jankovics

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1. Attestation of Test Results

Applicant Name	INFOBIONIC	
FCC ID	2AHLC01855	
Model Name	01854 REV B	
Applicable Standards	Published RF exposure KDB procedures IEEE Std 1528-2013	
Exposure Category	SAR Limits (W/Kg)	
	Peak spatial-average (1g of tissue)	Extremities (hands, wrists, ankles, etc.) (10g of tissue)
General population / Uncontrolled exposure	1.6	4
RF Exposure Conditions	Equipment Class - Highest Reported SAR (W/kg)	
	PCE	
Body-worn	1.441	
Date Tested	10/12/2021 to 11/19/2021	
Test Results	Pass	
<p>UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.</p> <p>This report contains data provided by the customer which can impact the validity of results. UL LLC is only responsible for the validity of results after the integration of the data provided by the customer.</p> <p>The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.</p> <p>This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC 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 A2LA, NIST, or any agency of the U.S. Government, or any agency of the U.S. government.</p>		
Approved & Released By:	Prepared By:	
		
Devin Chang Senior Test Engineer UL LLC	Richard Jankovics Operations Leader UL LLC	

2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE STD 1528-2013, ANSI C63.26:2015, the following FCC Published RF exposure [KDB](#) procedures:

- 447498 D01 General RF Exposure Guidance v06
- 447498 D03 Supplement C Cross-Reference v01
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
- 865664 D02 RF Exposure Reporting v01r02
- 941225 D01 3G SAR Procedures v03r01
- 941225 D05 SAR for LTE Devices v02r05

In addition to the above, the following information was used:

- TCB Workshop April 2019; RF Exposure Procedures (Tissue Simulating Liquids (TSL))

3. Facilities and Accreditation

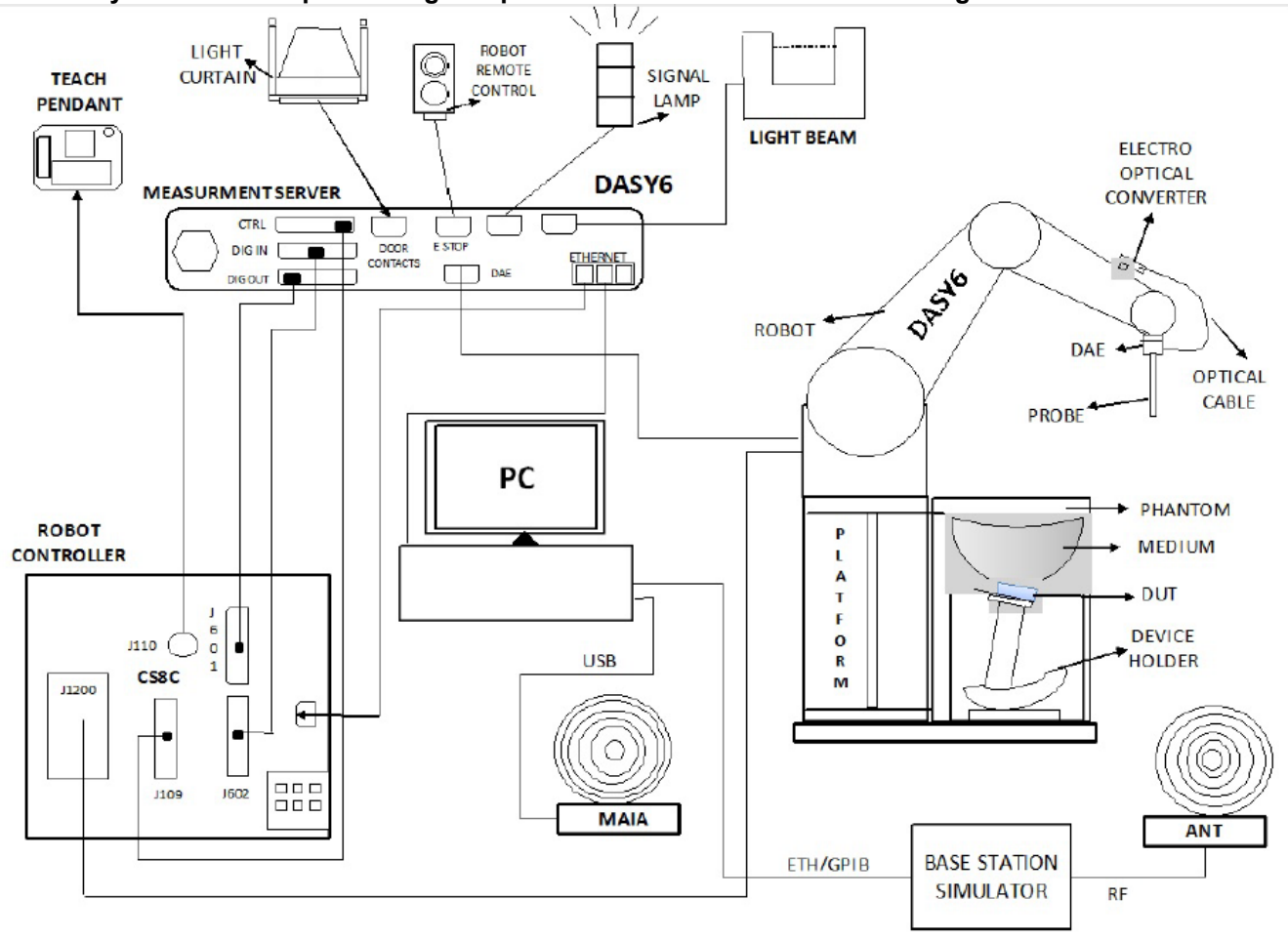
UL LLC is accredited by A2LA, cert. # 0751.06 for all testing performed within the scope of this report. Testing was performed at the locations noted below.

	Address	ISED CABID	ISED Company Number	FCC Registration
<input type="checkbox"/>	Building: 12 Laboratory Dr RTP, NC 27709, U.S.A	US0067	2180C	703469
<input checked="" type="checkbox"/>	Building: 2800 Perimeter Park Dr. Suite B Morrisville, NC 27560, U.S.A	US0067	27265	703469

4. SAR Measurement System & Test Equipment

4.1. SAR Measurement System

The DASY 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 Win7, Win10 and the DASY52¹ and DASY6² 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.

¹ DASY52 software used: DASY52.10.4 & S 14.6.14 and older generations.

² DASY6 software used: DASY6.14 & S 14.6.14 and older generations.

4.2. SAR Scan Procedures

Step 1: Power Reference Measurement

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

Step 2: Area Scan

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

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

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

Step 3: Zoom Scan

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

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

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

Step 4: Power drift measurement

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

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	Copper Mountain	R140	190514	2022-04-29
Dielectric Probe kit	SPEAG	DAKS-3.5	1087	2021-11-12
Thermometer	Traceable	15-078-181	210204689	2023-03-13

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Signal Generator	Keysight	N5181A	MY50140788	2021-11-20
Power Meter	Keysight	N1912A	MY55136012	2022-07-16
Power Sensor	Agilent	N1921A	MY55090030	2022-05-27
Power Sensor	Agilent	N1921A	MY55090047	2021-11-25
Amplifier	Amplicial	AMP0.4G-34-27	150507	N/A
Directional coupler	Werlatone, Inc.	C8060-102	3266	N/A
DC Power Supply	Miteq	PS15V1	1990186	N/A
Environmental Meter	Traceable	06-662-4	200037610	2022-01-21

Lab Equipment

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
E-Field Probe	SPEAG	EX3DV4	7569	2022-04-26
Data Acquisition Electronics	SPEAG	DAE4	1439	2022-08-11
System Validation Dipole	SPEAG	D1750V2	1136	2022-10-12
System Validation Dipole	SPEAG	D750V3	1139	2022-10-06
System Validation Dipole	SPEAG	D1900V2	5d202	2022-10-06
System Validation Dipole	SPEAG	D900V2	1d180	2022-10-06
Communications Tester	R&S	CMW500	147543-Bg	2022-02-26

Note(s):

*Equipment not used past calibration due date.

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 and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be $\leq 30\%$, for a confidence interval of $k = 2$. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval.

Therefore, the measurement uncertainty is not required.

6. Device Under Test (DUT) Information

6.1. DUT Description

Device Dimension	Overall (Length x Width x Depth): 112 mm x 68 mm x 20 mm This is a belt worn device						
Back Cover	Removable cover with integrated belt clip. Removes to provide access to battery With back cover: (Length x Width x Depth): 116 mm x 71 mm x 28 mm						
Battery Options	Standard – Lithium-ion battery, Rating 3.7 Vdc, 7.03 Wh						
Accessory	ECG Leads						
Test sample information	<table> <tr> <th>S/N</th><th>Notes</th></tr> <tr> <td>MIB1003</td><td></td></tr> <tr> <td>MIB1003</td><td></td></tr> </table>	S/N	Notes	MIB1003		MIB1003	
S/N	Notes						
MIB1003							
MIB1003							

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode	Duty Cycle used for SAR testing
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Rel. 5) HSUPA (Rel. 6)	100%
LTE	FDD Band 2 FDD Band 4 FDD Band 5 FDD Band 12 FDD Band 13 FDD Band 14 FDD Band 66 FDD Band 71	QPSK 16QAM (limited to max of 27 RB configuration; LTE Cat 1 device) Release 8	100% (FDD)
Does this device support SV-LTE (1xRTT-LTE)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			

Notes:

- None

6.3. General LTE SAR Test and Reporting Considerations

Item	Description						
Frequency range, Channel Bandwidth, Numbers and Frequencies	Band 2	Frequency range: 1850 - 1910 MHz (BW = 60 MHz)					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low	18700 /1860	18675/ 1857.5	18650/ 1855	18625/ 1852.5	18615/ 1851.5	18607/ 1850.7
	Mid	18900/ 1880	18900/ 1880	18900/ 1880	18900/ 1880	18900/ 1880	18900/ 1880
	High	19100/ 1900	19125/ 1902.5	19150/ 1905	19175/ 1907.5	19185/ 1908.5	19193/ 1909.3
	Band 4	Frequency range: 1710 - 1755 MHz (BW = 45 MHz)					
		Channel Bandwidth					
		20 MHz ¹	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low	20050/ 1720	20025/ 1717.5	20000/ 1715	19975/ 1712.5	19965/ 1711.5	19957/ 1710.7
	Mid	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5
	High	20300/ 1745	20325/ 1747.5	20350/ 1750	20375/ 1752.5	20385/ 1753.5	20393/ 1754.3
	Band 5	Frequency range: 824 - 849 MHz (BW = 25 MHz)					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz ¹	5 MHz	3 MHz	1.4 MHz
	Low			20450/ 829	20425/ 826.5	20415/ 825.5	20407/ 824.7
	Mid			20525/ 836.5	20525/ 836.5	20525/ 836.5	20525/ 836.5
	High			20600/ 844	20625/ 846.5	20635/ 847.5	20643/ 848.3
	Band 12	Frequency range: 699 - 716 MHz (BW = 17 MHz)					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz ¹	5 MHz	3 MHz	1.4 MHz
	Low			23060/ 704	23035/ 701.5	23025/ 700.5	23017/ 699.7
	Mid			23095/ 707.5	23095/ 707.5	23095/ 707.5	23095/ 707.5
	High			23130/ 711	23155/ 713.5	23165/ 714.5	23173/ 715.3
	Band 13	Frequency range: 777 - 787 MHz (BW = 10 MHz)					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz ¹	5 MHz ¹	3 MHz	1.4 MHz
	Low				23205/ 779.5		
	Mid			23230/ 782	23230/ 782		
	High				23255/ 784.5		
	Band 14	Frequency range: 788 - 798 MHz (BW = 10 MHz)					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz ¹	5 MHz ¹	3 MHz	1.4 MHz
	Low				23305/ 790.5		
	Mid			23330/ 793	23330/ 793		
	High				23355/ 795.5		

	Band 66	Frequency range: 1710 - 1780 MHz (BW = 70 MHz)																																																																			
		Channel Bandwidth																																																																			
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																																														
	Low	132072/1720	132047/1717.5	132022/1715	131997/1712.5	131987/1711.5	131979/1710.7																																																														
	Mid	132322/1745	132322/1745	132322/1745	132322/1745	132322/1745	132322/1745																																																														
	High	132572/1770	132597/1772.5	132622/1775	132647/1777.5	132657/1778.5	132665/1779.3																																																														
	Band 71	Frequency range: 663 - 698 MHz (BW = 35 MHz)																																																																			
		Channel Bandwidth																																																																			
		20 MHz ¹	15 MHz ¹	10 MHz	5 MHz	3 MHz	1.4 MHz																																																														
	Low	133222/673	133197/670.5	133172/668	133147/665.5																																																																
	Mid	133297/680.5	133297/680.5	133297/680.5	133297/680.5																																																																
	High	133372/688	133397/690.5	133422/693	133447/695.5																																																																
LTE transmitter and antenna implementation	Refer to Appendix A.																																																																				
Maximum power reduction (MPR)	<p>Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3</p> <table> <tr> <th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (N_{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> <tr> <td>64 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 2</td></tr> <tr> <td>64 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 3</td></tr> <tr> <td>256 QAM</td><td colspan="6">≥ 1</td><td>≤ 5</td></tr> </table> <p>MPR Built-in by design</p> <p>The manufacturer MPR values are always within the 3GPP maximum MPR allowance but may not follow the default MPR values.</p> <p>A-MPR (additional MPR) was disabled during SAR testing</p>							Modulation	Channel bandwidth / Transmission bandwidth (N _{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	64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2	64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3	256 QAM	≥ 1						≤ 5
Modulation	Channel bandwidth / Transmission bandwidth (N _{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																																																														
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2																																																														
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3																																																														
256 QAM	≥ 1						≤ 5																																																														
Power reduction	No																																																																				
Spectrum plots for RB configurations	A properly configured base station simulator was used for the SAR and power measurements; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.																																																																				

Notes:

- Maximum bandwidth does not support at least three non-overlapping channels in certain channel bandwidths. When a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing per KDB 941225 D05 SAR for LTE Devices.
- SAR Testing for LTE was performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

7. RF Exposure Conditions (Test Configurations)

Refer to Appendix A for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

Wireless technologies	RF Exposure Conditions	DUT-to-User Separation	Test Position	Antenna-to-edge/surface	SAR Required	Note
WWAN	Body	0 mm	Rear	N/A	Yes	
			Front	N/A	No	1

Notes:

1. Device is belt-worn, so only the surface including the belt clip will be exposing the body

8. Dielectric Property Measurements & System Check

8.1. Dielectric Property Measurements

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within $\pm 2^\circ\text{C}$ of the temperature when the tissue parameters are characterized.

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

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

The dielectric constant (ϵ_r) and conductivity (σ) of typical tissue-equivalent media recipes are expected to be within $\pm 5\%$ of the required target values; but for SAR measurement systems that have implemented the SAR error compensation algorithms documented in IEEE Std 1528-2013, to automatically compensate the measured SAR results for deviations between the measured and required tissue dielectric parameters, the tolerance for ϵ_r and σ may be relaxed to $\pm 10\%$. This is limited to frequencies ≤ 3 GHz.

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

IEC 62209-1

Refer to Table A.3 within the IEC 62209-1

Dielectric Property Measurements Results:

SAR Lab	Date	Band (MHz)	Tissue Type	Frequency (MHz)	Relative Permittivity (ϵ_r)			Conductivity (σ)		
					Measured	Target	Delta (%)	Measured	Target	Delta (%)
1A	10/26/2021	1900	Head	1900	40.53	40.00	1.33	1.492	1.40	6.57
				1850	40.67	40.00	1.68	1.466	1.40	4.71
				1920	40.50	40.00	1.25	1.503	1.40	7.36
1A	10/29/2021	1750	Head	1750	40.20	40.08	0.29	1.367	1.37	-0.14
				1710	40.24	40.15	0.23	1.347	1.35	0.04
				1755	40.20	40.08	0.31	1.370	1.37	-0.13
1A	11/01/2021	900	Head	900	42.23	41.50	1.76	0.953	0.97	-1.78
				820	42.42	41.60	1.96	0.922	0.90	2.62
				915	42.19	41.50	1.66	0.959	0.98	-2.13
1A	11/02/2021	750	Head	750	42.66	41.96	1.66	0.898	0.89	0.55
				660	42.97	42.42	1.29	0.865	0.89	-2.43
				800	42.47	41.71	1.83	0.916	0.90	2.09
1A	11/03/2021	1750	Head	1750	39.53	40.08	-1.38	1.365	1.37	-0.29
				1710	39.60	40.15	-1.36	1.338	1.35	-0.62
				1780	39.47	40.04	-1.42	1.384	1.39	-0.14
1A	11/05/2021	1750	Head	1750	39.02	40.08	-2.66	1.319	1.37	-3.65
				1710	38.99	40.15	-2.88	1.294	1.35	-3.89
				1755	39.02	40.08	-2.64	1.323	1.37	-3.56
1A	11/05/2021	1900	Head	1900	38.72	40.00	-3.20	1.422	1.40	1.57
				1850	38.86	40.00	-2.85	1.392	1.40	-0.57
				1920	38.68	40.00	-3.30	1.434	1.40	2.43

8.2. System Check

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

System Performance Check Measurement Conditions:

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 \pm 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 \geq 15.0 cm for SAR measurements \leq 3 GHz and \geq 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.

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 $\pm 10\%$ of the manufacturer calibrated dipole SAR target. Refer to Appendix B for the SAR System Check Plots.

SAR Lab	Date	Tissue Type	Dipole Type_Serial #	Dipole Cal. Due Data	Measured Results for 1g SAR				Measured Results for 10g SAR				Plot No.
					Zoom Scan to 100 mW	Normalize to 1 W	Target (Ref. Value)	Delta $\pm 10\%$	Zoom Scan to 100 mW	Normalize to 1 W	Target (Ref. Value)	Delta $\pm 10\%$	
1A	10/26/2021	Head	D1900V2 SN: 5d202	2022-10-06	3.990	39.90	37.86	5.39	2.080	20.80	20.26	2.67	1,2
1A	10/29/2021	Head	D1750V2 SN: 1136	2022-10-12	3.520	35.20	34.44	2.21	1.880	18.80	18.63	0.91	3,4
1A	11/01/2021	Head	D900V2 SN: 1d180	2022-10-06	0.990	9.90	10.63	-6.87	0.645	6.45	6.97	-7.46	5,6
1A	11/02/2021	Head	D750V3 SN: 1139	2022-10-06	0.859	8.59	8.12	5.79	0.567	5.67	5.41	4.81	7,8
1A	11/03/2021	Head	D1750V2 SN: 1136	2022-10-12	3.470	34.70	34.44	0.75	1.850	18.50	18.63	-0.70	9,10
1A	11/05/2021	Head	D1750V2 SN: 1136	2022-10-12	3.440	34.40	34.44	-0.12	1.830	18.30	18.63	-1.77	11,12
1A	11/05/2021	Head	D1900V2 SN: 5d202	2022-10-06	3.830	38.30	37.86	1.16	1.990	19.90	20.26	-1.78	13,14

9. Conducted Output Power Measurements

Tune-Up Power Limits provided by the manufacturer are used to scale measured SAR values. Measurements were taken in accordance with ANSI C63.26:2015.

9.1. W-CDMA

Per KDB 941225 D01 3G SAR Procedures for W-CDMA:

Maximum output power is verified on the high, middle and low channels and using the appropriate 12.2 kbps RMC with TPC (transmit power control) set to all "1's"

Release 99 Setup Procedures used to establish the test signals

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1. A summary of these settings is illustrated below:

Mode	Subtest	Rel99
WCDMA General Settings	Loopback Mode	Test Mode 2
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	β_c/β_d	8/15

HSDPA Setup Procedures used to establish the test signals

The following 4 Sub-tests were completed according to procedures in table C.10.1.4 of 3GPP TS 34.121-1. A summary of these settings is illustrated below:

Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (Note 1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 (Note 4)	15/15 (Note 4)	64	12/15 (Note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1: Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 30/15$ with $\beta_{hs} = 30/15 * \beta_c$.

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, Δ_{ACK} and $\Delta_{NACK} = 30/15$ with $\beta_{hs} = 30/15 * \beta_c$, and $\Delta_{CQI} = 24/15$ with $\beta_{hs} = 24/15 * \beta_c$.

Note 3: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCCH, DPCCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 4: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 11/15$ and $\beta_d = 15/15$.

HSUPA Setup Procedures used to establish the test signals

The following 5 Sub-tests were completed according to procedures in table C.11.1.3 of 3GPP TS 34.121-1. A summary of these settings is illustrated below:

Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note 1)	β_{ec}	β_{ed} (Note 4) (Note 5)	β_{ed} (SF)	β_{ed} (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2) (Note 6)	AG Index (Note 5)	E-TFCI
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1} : 47/15 β_{ed2} : 47/15	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15	0	-	-	5/15	5/15	47/15	4	1	1.0	0.0	12	67
<p>Note 1: For sub-test 1 to 4, Δ_{ACK}, Δ_{NACK} and $\Delta_{CQI} = 30/15$ with $\beta_{hs} = 30/15 * \beta_c$. For sub-test 5, Δ_{ACK}, Δ_{NACK} and $\Delta_{CQI} = 5/15$ with $\beta_{hs} = 5/15 * \beta_c$.</p> <p>Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.</p> <p>Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 10/15$ and $\beta_d = 15/15$.</p> <p>Note 4: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.</p> <p>Note 5: β_{ed} can not be set directly; it is set by Absolute Grant Value.</p> <p>Note 6: For subtests 2, 3 and 4, UE may perform E-DPDCH power scaling at max power which could results in slightly smaller MPR values.</p>													

Maximum Output Power (Tune-up Limit) for W-CDMA

SAR measurement is not required for the HSDPA, and HSUPA when primary mode and the adjusted SAR is ≤ 1.2 W/kg and secondary mode is $\leq \frac{1}{4}$ dB higher than the primary mode

RF Air interface	Mode	Tune-up Power Limit (dBm)
		Maximum
W-CDMA Band 2	R99	23.80
	HSDPA	23.80
	HSUPA	23.80
W-CDMA Band 4	R99	24.00
	HSDPA	24.00
	HSUPA	24.00
W-CDMA Band 5	R99	25.00
	HSDPA	25.00
	HSUPA	25.00

W-CDMA Band II Measured Results

Mode		UL Ch No.	Freq. (MHz)	Maximum Average Power (dBm)		
				Measured Power	MPR	Tune-up Limit
Release 99	Rel 99 (RMC, 12.2 kbps)	9262	1852.4	23.2	N/A	23.8
		9400	1880.0	23.3		
		9538	1907.6	23.3		
HSDPA	Subtest 1	9262	1852.4	22.1	0	23.8
		9400	1880.0	22.3		
		9538	1907.6	22.3		
	Subtest 2	9262	1852.4	22.0	0	23.8
		9400	1880.0	22.2		
		9538	1907.6	22.3		
	Subtest 3	9262	1852.4	21.7	0.5	23.3
		9400	1880.0	21.8		
		9538	1907.6	21.8		
	Subtest 4	9262	1852.4	21.7	0.5	23.3
		9400	1880.0	21.8		
		9538	1907.6	21.8		
HSUPA	Subtest 1	9262	1852.4	22.3	0	23.8
		9400	1880.0	22.1		
		9538	1907.6	22.3		
	Subtest 2	9262	1852.4	20.5	2	21.8
		9400	1880.0	21.0		
		9538	1907.6	21.0		
	Subtest 3	9262	1852.4	21.2	1	22.8
		9400	1880.0	21.2		
		9538	1907.6	21.1		
	Subtest 4	9262	1852.4	21.2	2	21.8
		9400	1880.0	21.7		
		9538	1907.6	21.2		
	Subtest 5	9262	1852.4	21.8	0	23.8
		9400	1880.0	21.9		
		9538	1907.6	21.9		

Notes:

None.

W-CDMA Band IV Measured Results

Mode		UL Ch No.	Freq. (MHz)	Maximum Average Power (dBm)		
				Measured Pwr	MPR	Tune-up Limit
Release 99	Rel 99 (RMC, 12.2 kbps)	1312	1712.4	23.5	N/A	24.0
		1413	1732.6	23.6		
		1513	1752.6	23.7		
HSDPA	Subtest 1	1312	1712.4	22.6	0	24.0
		1413	1732.6	22.7		
		1513	1752.6	22.8		
	Subtest 2	1312	1712.4	22.6	0	24.0
		1413	1732.6	22.6		
		1513	1752.6	22.9		
	Subtest 3	1312	1712.4	22.0	0.5	23.5
		1413	1732.6	22.0		
		1513	1752.6	22.3		
	Subtest 4	1312	1712.4	22.0	0.5	23.5
		1413	1732.6	22.0		
		1513	1752.6	22.3		
HSUPA	Subtest 1	1312	1712.4	21.9	0	24.0
		1413	1732.6	22.6		
		1513	1752.6	22.1		
	Subtest 2	1312	1712.4	21.6	2	22.0
		1413	1732.6	21.4		
		1513	1752.6	21.8		
	Subtest 3	1312	1712.4	21.4	1	23.0
		1413	1732.6	21.1		
		1513	1752.6	21.4		
	Subtest 4	1312	1712.4	22.0	2	22.0
		1413	1732.6	21.6		
		1513	1752.6	22.0		
	Subtest 5	1312	1712.4	22.1	0	24.0
		1413	1732.6	22.2		
		1513	1752.6	22.3		

Notes:

None.

W-CDMA Band V Measured Results

Mode		UL Ch No.	Freq. (MHz)	Maximum Average Power (dBm)		
				Measured Pwr	MPR	Tune-up Limit
Release 99	Rel 99 (RMC, 12.2 kbps)	4132	826.4	23.0	N/A	25.0
		4183	836.6	23.0		
		4233	846.6	23.2		
HSDPA	Subtest 1	4132	826.4	21.9	0	25.0
		4183	836.6	22.0		
		4233	846.6	22.2		
	Subtest 2	4132	826.4	21.9	0	25.0
		4183	836.6	21.9		
		4233	846.6	22.2		
	Subtest 3	4132	826.4	21.3	0.5	24.5
		4183	836.6	21.5		
		4233	846.6	21.7		
	Subtest 4	4132	826.4	21.4	0.5	24.5
		4183	836.6	21.4		
		4233	846.6	21.7		
HSUPA	Subtest 1	4132	826.4	21.9	0	25.0
		4183	836.6	21.8		
		4233	846.6	22.0		
	Subtest 2	4132	826.4	21.2	2	23.0
		4183	836.6	21.1		
		4233	846.6	21.1		
	Subtest 3	4132	826.4	21.2	1	24.0
		4183	836.6	21.1		
		4233	846.6	21.1		
	Subtest 4	4132	826.4	21.2	2	23.0
		4183	836.6	21.1		
		4233	846.6	21.0		
	Subtest 5	4132	826.4	21.4	0	25.0
		4183	836.6	21.4		
		4233	846.6	21.6		

Notes:

None.

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 1, 2 and 3

Modulation	Channel bandwidth / Transmission bandwidth (N_{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
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3
256 QAM	≥ 1						≤ 5

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 (subclause)	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	N/A

Per the manufacturer, the radio is a category 1 device, limited to a max UL throughput of 5 Mbps or less. For bandwidths who's maximum RB configuration yields greater than 5 Mbps, the maximum RB config supported by the radio is limited to the maximum RB config yielding ≤ 5 Mbps. This only impacts 16QAM modes operating at 10, 15, and 20 MHz bandwidths, where 27 RB is the highest config not exceeding 5 Mbps.

Maximum Output Power (Tune-up Limit) for LTE

According to April 2015 TCB workshop, SAR test exclusion can be applied for testing overlapping LTE bands as follows:

- a) The maximum output power, including tolerance, for the smaller band must be \leq the larger band to qualify for the SAR test exclusion.
- b) The channel bandwidth and other operating parameters for the smaller band must be fully supported by the larger band.

Maximum bandwidth does not support at least three non-overlapping channels in certain channel bandwidths. When a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing per KDB 941225 D05 SAR for LTE Devices.

LTE QPSK configuration has the highest maximum average output power per 3GPP standard.

SAR measurement is not required for 16QAM when the highest maximum output power for 16QAM is $\leq \frac{1}{2}$ dB higher than the QPSK or when the reported SAR for the QPSK configuration is ≤ 1.45 W/kg.

Please refer to section 6.3. for LTE detail test channels.

RF Air interface	Mode	Tune-up Power Limit (dBm)
		Maximum
LTE Band 2	QPSK	24.5
LTE Band 4	QPSK	25.0
LTE Band 5	QPSK	25.0
LTE Band 12	QPSK	25.0
LTE Band 13	QPSK	25.0
LTE Band 14	QPSK	25.0
LTE Band 66	QPSK	25.0
LTE Band 71	QPSK	25.0

LTE Band 2 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				18700	18900	19100	MFR	Tune-up Limit
				1860 MHz	1880 MHz	1900 MHz		
20 MHz	QPSK	1	0	24.3	24.0	24.0	0	24.5
		1	49	24.1	24.1	24.2	0	24.5
		1	99	24.0	24.0	24.1	0	24.5
		50	0	23.2	23.3	23.4	1	23.5
		50	24	23.2	23.4	23.4	1	23.5
		50	50	23.2	23.3	23.2	1	23.5
		100	0	23.3	23.3	23.2	1	23.5
	16QAM	1	0	23.0	23.2	23.3	1	23.5
		1	49	23.3	23.3	23.3	1	23.5
		1	99	23.2	23.0	23.0	1	23.5
		12	0	22.4	22.4	22.3	2	22.5
		12	44	22.5	22.5	22.3	2	22.5
		12	88	22.4	22.5	22.0	2	22.5
		27	0	21.5	21.7	21.7	2	22.5
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				18675	18900	19125	MFR	Tune-up Limit
				1857.5 MHz	1880 MHz	1902.5 MHz		
15 MHz	QPSK	1	0	24.2	24.2	24.3	0	24.5
		1	37	24.2	24.4	24.3	0	24.5
		1	74	24.2	24.2	24.2	0	24.5
		36	0	23.0	23.2	23.3	1	23.5
		36	20	23.1	23.3	23.2	1	23.5
		36	39	23.2	23.2	23.2	1	23.5
		75	0	23.0	23.2	23.2	1	23.5
	16QAM	1	0	23.2	23.4	23.4	1	23.5
		1	37	23.4	23.4	23.5	1	23.5
		1	74	23.3	23.0	22.8	1	23.5
		12	0	22.4	22.5	22.5	2	22.5
		12	31	22.3	22.5	22.3	2	22.5
		12	63	22.3	22.1	21.7	2	22.5
		27	0	21.5	21.6	21.4	2	22.5
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				18650	18900	19150	MFR	Tune-up Limit
				1855 MHz	1880 MHz	1905 MHz		
10 MHz	QPSK	1	0	24.4	24.4	24.4	0	24.5
		1	25	24.5	24.4	24.2	0	24.5
		1	49	24.2	24.4	24.0	0	24.5
		25	0	23.1	23.3	23.2	1	23.5
		25	12	23.2	23.2	23.3	1	23.5
		25	25	23.2	23.2	23.1	1	23.5
		50	0	23.1	23.1	23.2	1	23.5
	16QAM	1	0	23.1	23.2	23.1	1	23.5
		1	25	23.1	23.1	23.4	1	23.5
		1	49	22.8	22.6	23.1	1	23.5
		12	0	22.4	22.5	22.3	2	22.5
		12	19	22.5	22.4	22.5	2	22.5
		12	38	22.4	22.2	22.4	2	22.5
		27	0	21.6	21.9	21.8	2	22.5
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				18625	18900	19175	MFR	Tune-up Limit
				1852.5 MHz	1880 MHz	1907.5 MHz		
5 MHz	QPSK	1	0	23.6	23.9	23.5	0	24.5
		1	12	23.8	24.1	23.7	0	24.5
		1	24	23.7	23.9	23.4	0	24.5
		12	0	22.7	23.1	23.0	1	23.5
		12	7	22.8	23.2	23.0	1	23.5
		12	13	22.7	23.1	23.0	1	23.5
		25	0	22.7	23.1	23.0	1	23.5
	16QAM	1	0	22.6	22.9	23.0	1	23.5
		1	12	22.7	22.7	22.5	1	23.5
		1	24	22.1	22.5	22.5	1	23.5
		12	0	21.5	22.1	21.9	2	22.5
		12	7	21.6	22.1	21.9	2	22.5
		12	13	21.5	22.0	21.9	2	22.5
		25	0	21.7	22.3	22.0	2	22.5

LTE Band 2 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				18615	18900	19185	MFR	Tune-up Limit
				1851.5 MHz	1880 MHz	1908.5 MHz		
3 MHz	QPSK	1	0	24.0	24.5	24.2	0	24.5
		1	8	23.8	24.5	24.2	0	24.5
		1	14	23.7	23.7	24.3	0	24.5
		8	0	23.0	23.1	23.2	1	23.5
		8	4	23.0	23.2	23.2	1	23.5
		8	7	22.9	23.2	23.1	1	23.5
		15	0	22.9	23.3	23.2	1	23.5
	16QAM	1	0	22.9	23.4	23.3	1	23.5
		1	8	22.9	22.7	23.4	1	23.5
		1	14	23.1	23.5	23.1	1	23.5
		8	0	21.8	22.0	22.2	2	22.5
		8	4	21.9	22.2	22.2	2	22.5
		8	7	21.7	22.1	22.3	2	22.5
		15	0	21.7	22.2	22.3	2	22.5
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				18607	18900	19193	MFR	Tune-up Limit
				1850.7 MHz	1880 MHz	1909.3 MHz		
1.4 MHz	QPSK	1	0	23.9	24.0	23.7	0	24.5
		1	3	23.8	24.2	23.9	0	24.5
		1	5	23.8	24.2	23.8	0	24.5
		3	0	23.8	24.2	23.9	0	24.5
		3	1	23.8	24.2	23.8	0	24.5
		3	3	23.8	24.3	23.9	0	24.5
		6	0	22.8	23.1	22.9	1	23.5
	16QAM	1	0	22.9	23.2	23.0	1	23.5
		1	3	23.0	23.2	23.2	1	23.5
		1	5	22.7	23.1	22.9	1	23.5
		3	0	22.5	22.8	23.1	1	23.5
		3	1	22.7	22.8	23.1	1	23.5
		3	3	22.7	23.0	23.1	1	23.5
		6	0	21.9	22.0	22.0	2	22.5

LTE Band 4 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
					20175		MFR	Tune-up Limit
					1732.5 MHz			
20 MHz	QPSK	1	0		24.4		0	25
		1	49		24.7		0	25
		1	99		24.6		0	25
		50	0		23.2		1	24
		50	24		23.4		1	24
		50	50		23.2		1	24
		100	0		23.2		1	24
	16QAM	1	0		23.1		1	24
		1	49		23.4		1	24
		1	99		23.0		1	24
		12	0		21.7		2	23
		12	44		22.1		2	23
		12	88		21.8		2	23
		27	0		21.0		2	23
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				20025	20175	20325	MFR	Tune-up Limit
				1717.5 MHz	1732.5 MHz	1747.5 MHz		
15 MHz	QPSK	1	0	24.4	24.8	24.9	0	25
		1	37	24.6	24.8	24.8	0	25
		1	74	24.5	24.7	24.7	0	25
		36	0	22.9	23.2	23.2	1	24
		36	20	22.8	22.8	23.0	1	24
		36	39	23.0	23.1	23.0	1	24
		75	0	22.9	22.9	23.0	1	24
	16QAM	1	0	23.1	23.4	23.7	1	24
		1	37	23.3	23.4	23.7	1	24
		1	74	22.7	23.0	23.1	1	24
		12	0	21.8	21.7	21.9	2	23
		12	35	22.6	22.0	22.0	2	23
		12	63	21.6	21.9	21.6	2	23
		27	0	20.8	20.7	20.9	2	23
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				20000	20175	20350	MFR	Tune-up Limit
				1715 MHz	1732.5 MHz	1750 MHz		
10 MHz	QPSK	1	0	24.5	24.5	24.2	0	25
		1	25	24.6	24.6	24.4	0	25
		1	49	24.5	24.4	24.3	0	25
		25	0	23.4	23.3	23.1	1	24
		25	12	23.4	23.3	23.2	1	24
		25	25	23.4	23.3	23.1	1	24
		50	0	23.3	23.2	23.0	1	24
	16QAM	1	0	23.3	22.8	23.4	1	24
		1	25	23.3	23.2	23.4	1	24
		1	49	22.8	23.0	23.2	1	24
		12	0	21.8	22.0	21.9	2	23
		12	19	22.1	22.0	22.3	2	23
		12	38	21.7	22.0	21.8	2	23
		27	0	20.7	20.9	20.8	2	23
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				19975	20175	20375	MFR	Tune-up Limit
				1712.5 MHz	1732.5 MHz	1752.5 MHz		
5 MHz	QPSK	1	0	24.1	23.6	24.0	0	25
		1	12	24.1	24.0	23.8	0	25
		1	24	23.9	23.9	23.8	0	25
		12	0	23.0	22.8	23.2	1	24
		12	7	22.9	22.9	23.2	1	24
		12	13	22.8	22.9	23.1	1	24
		25	0	22.8	22.9	23.2	1	24
	16QAM	1	0	23.0	22.7	23.3	1	24
		1	12	23.1	23.1	23.3	1	24
		1	24	22.7	22.7	23.2	1	24
		12	0	21.8	21.7	22.2	2	23
		12	7	21.9	21.8	22.1	2	23
		12	13	21.9	21.8	22.1	2	23
		25	0	21.9	22.0	22.0	2	23

LTE Band 4 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				19965	20175	20385	MPR	Tune-up Limit
				1711.5 MHz	1732.5 MHz	1753.5 MHz		
3 MHz	QPSK	1	0	24.3	24.2	24.0	0	25
		1	8	24.3	24.1	24.0	0	25
		1	14	23.9	24.0	24.0	0	25
		8	0	22.5	22.5	22.6	1	24
		8	4	22.5	22.6	22.5	1	24
		8	7	22.4	22.5	22.5	1	24
		15	0	23.0	23.0	23.0	1	24
	16QAM	1	0	23.1	23.1	23.1	1	24
		1	8	23.0	23.4	23.2	1	24
		1	14	22.2	22.3	22.2	1	24
		8	0	22.2	22.2	22.3	2	23
		8	4	22.3	22.2	22.2	2	23
		8	7	22.1	22.2	22.2	2	23
		15	0	22.1	22.1	22.1	2	23
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				19957	20175	20393	MPR	Tune-up Limit
				1710.7 MHz	1732.5 MHz	1754.3 MHz		
1.4 MHz	QPSK	1	0	24.4	24.2	24.5	0	25
		1	3	24.7	24.4	24.4	0	25
		1	5	24.5	24.2	24.3	0	25
		3	0	24.4	24.0	24.1	0	25
		3	1	24.5	24.2	24.4	0	25
		3	3	24.4	24.4	24.3	0	25
		6	0	23.4	23.2	23.3	1	24
	16QAM	1	0	23.4	23.3	23.3	1	24
		1	3	23.4	23.3	23.2	1	24
		1	5	23.3	23.3	23.3	1	24
		3	0	23.1	23.4	22.9	1	24
		3	1	23.4	23.7	23.1	1	24
		3	3	23.3	23.6	22.9	1	24
		6	0	22.1	22.2	22.1	2	23

LTE Band 5 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
					20525		MFR	Tune-up Limit
					836.5 MHz			
10 MHz	QPSK	1	0		24.4		0	25
		1	25		23.9		0	25
		1	49		23.8		0	25
		25	0		22.8		1	24
		25	12		22.8		1	24
		25	25		22.8		1	24
		50	0		22.7		1	24
	16QAM	1	0		23.3		1	24
		1	25		22.8		1	24
		1	49		22.8		1	24
		25	0		22.0		2	23
		25	19		22.1		2	23
		25	38		22.0		2	23
		27	0		21.6		2	23
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				20425	20525	20625	MFR	Tune-up Limit
				826.5 MHz	836.5 MHz	846.5 MHz		
5 MHz	QPSK	1	0	23.5	23.8	23.9	0	25
		1	12	24.0	23.9	24.5	0	25
		1	24	23.7	23.8	24.1	0	25
		12	0	23.0	22.8	23.4	1	24
		12	7	23.1	22.8	23.4	1	24
		12	13	23.0	22.8	23.3	1	24
		25	0	22.9	22.9	23.3	1	24
	16QAM	1	0	22.6	22.6	23.1	1	24
		1	12	23.4	22.4	23.4	1	24
		1	24	22.8	22.3	22.9	1	24
		12	0	21.8	21.7	22.2	2	23
		12	7	22.0	21.6	22.2	2	23
		12	13	22.0	21.9	22.1	2	23
		25	0	22.1	21.8	22.1	2	23
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				20415	20525	20635	MFR	Tune-up Limit
				825.5 MHz	836.5 MHz	847.5 MHz		
3 MHz	QPSK	1	0	23.9	24.1	24.5	0	25
		1	8	24.1	24.2	24.5	0	25
		1	14	24.2	24.1	24.3	0	25
		8	0	23.0	23.0	23.4	1	24
		8	4	23.1	22.9	23.3	1	24
		8	7	23.2	23.0	23.5	1	24
		15	0	23.0	23.0	23.4	1	24
	16QAM	1	0	23.0	22.8	23.5	1	24
		1	8	23.2	22.7	23.3	1	24
		1	14	23.1	22.7	23.3	1	24
		8	0	22.0	22.2	22.4	2	23
		8	4	22.3	21.9	22.4	2	23
		8	7	22.2	21.9	22.3	2	23
		15	0	22.1	21.9	22.4	2	23
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				20407	20525	20643	MFR	Tune-up Limit
				824.7 MHz	836.5 MHz	848.3 MHz		
1.4 MHz	QPSK	1	0	24.1	24.3	24.6	0	25
		1	3	24.3	24.2	24.7	0	25
		1	5	24.2	24.3	24.5	0	25
		3	0	24.2	24.3	24.8	0	25
		3	1	24.4	24.3	24.6	0	25
		3	3	24.4	24.2	24.5	0	25
		6	0	23.3	23.1	23.6	1	24
	16QAM	1	0	23.3	23.2	23.7	1	24
		1	3	23.2	23.3	23.8	1	24
		1	5	23.3	23.1	23.7	1	24
		3	0	22.8	23.0	22.8	1	24
		3	1	22.9	23.1	24.0	1	24
		3	3	22.9	23.3	23.9	1	24
		6	0	21.8	22.0	22.8	2	23

LTE Band 12 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				23095	MFR	Tune-up Limit		
				707.5 MHz				
10 MHz	QPSK	1	0	23.8	0	25		
		1	25	23.8	0	25		
		1	49	23.4	0	25		
		25	0	22.6	1	24		
		25	12	22.3	1	24		
		25	25	22.4	1	24		
	16QAM	50	0	22.6	1	24		
		1	0	22.4	1	24		
		1	25	22.1	1	24		
		1	49	22.1	1	24		
		12	0	22.3	2	23		
		12	19	22.1	2	23		
		12	38	22.2	2	23		
		27	0	21.3	2	23		
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				23035	23095	23155	MFR	Tune-up Limit
				701.5 MHz	707.5 MHz	713.5 MHz		
5 MHz	QPSK	1	0	22.5	22.4	22.4	0	25
		1	12	22.6	22.5	22.9	0	25
		1	24	22.5	22.5	22.6	0	25
		12	0	22.6	22.4	22.1	1	24
		12	7	22.5	22.4	22.3	1	24
		12	13	22.6	22.5	22.2	1	24
	16QAM	25	0	22.6	22.4	22.6	1	24
		1	0	21.7	22.2	22.0	1	24
		1	12	21.8	21.9	22.4	1	24
		1	24	21.9	21.9	22.4	1	24
		12	0	21.2	21.2	21.4	2	23
		12	7	21.0	21.2	21.6	2	23
3 MHz	QPSK	12	13	21.1	21.1	21.6	2	23
		25	0	21.1	21.4	21.5	2	23
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				23025	23095	23165	MFR	Tune-up Limit
				700.5 MHz	707.5 MHz	714.5 MHz		
3 MHz	QPSK	1	0	22.0	22.4	22.5	0	25
		1	8	22.3	22.5	22.7	0	25
		1	14	22.6	22.6	22.9	0	25
		8	0	22.3	22.3	22.6	1	24
		8	4	22.3	22.4	22.6	1	24
		8	7	22.3	22.5	22.7	1	24
	16QAM	15	0	22.1	22.5	22.7	1	24
		1	0	21.7	22.3	22.4	1	24
		1	8	21.8	22.3	22.6	1	24
		1	14	21.9	22.2	23.1	1	24
		8	0	20.9	21.2	21.9	2	23
		8	4	20.7	21.0	22.0	2	23
1.4 MHz	QPSK	8	7	21.0	21.0	21.9	2	23
		15	0	20.8	21.4	21.7	2	23
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				23017	23095	23173	MFR	Tune-up Limit
				699.7 MHz	707.5 MHz	715.3 MHz		
1.4 MHz	QPSK	1	0	22.6	22.5	22.9	0	25
		1	3	22.2	22.4	22.9	0	25
		1	5	22.2	22.4	22.9	0	25
		3	0	22.5	22.3	22.8	0	25
		3	1	22.5	22.4	22.9	0	25
		3	3	22.5	22.3	22.7	0	25
	16QAM	6	0	22.2	22.5	22.8	1	24
		1	0	21.8	21.8	22.1	1	24
		1	3	21.9	21.7	22.4	1	24
		1	5	21.9	21.8	22.4	1	24
		3	0	21.7	21.8	22.2	1	24
		3	1	21.7	22.1	22.8	1	24
		3	3	21.7	21.9	22.9	1	24
		6	0	20.6	20.7	21.3	2	23

LTE Band 13 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			
				23230 782 MHz	MFR	Tune-up Limit	
10 MHz	QPSK	1	0	23.5	0	25	
		1	25	24.7	0	25	
		1	49	24.7	0	25	
		25	0	22.9	1	24	
		25	12	23.3	1	24	
		25	25	23.4	1	24	
		50	0	22.3	1	24	
	16QAM	1	0	22.9	1	24	
		1	25	22.9	1	24	
		1	49	23.5	1	24	
		12	0	22.5	2	23	
		12	19	22.8	2	23	
		12	38	22.9	2	23	
		27	0	21.7	2	23	
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			
				23230 782 MHz	MFR	Tune-up Limit	
5 MHz	QPSK	1	0	24.4	0	25	
		1	12	24.9	0	25	
		1	24	24.8	0	25	
		12	0	23.8	1	24	
		12	7	24.0	1	24	
		12	13	24.0	1	24	
		25	0	23.9	1	24	
	16QAM	1	0	23.1	1	24	
		1	12	23.4	1	24	
		1	24	23.9	1	24	
		12	0	22.7	2	23	
		12	7	22.8	2	23	
		12	13	22.9	2	23	
		25	0	22.9	2	23	

LTE Band 14 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			
				23330 793 MHz	MFR	Tune-up Limit	
10 MHz	QPSK	1	0	24.5	0	25	
		1	25	24.5	0	25	
		1	49	24.4	0	25	
		25	0	23.2	1	24	
		25	12	23.2	1	24	
		25	25	23.0	1	24	
		50	0	23.2	1	24	
	16QAM	1	0	23.0	1	24	
		1	25	23.1	1	24	
		1	49	23.0	1	24	
		12	0	21.6	2	23	
		12	19	21.8	2	23	
		12	38	21.8	2	23	
		27	0	21.2	2	23	
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			
				23330 793 MHz	MFR	Tune-up Limit	
5 MHz	QPSK	1	0	24.7	0	25	
		1	12	24.9	0	25	
		1	24	24.8	0	25	
		12	0	23.8	1	24	
		12	7	23.9	1	24	
		12	13	23.9	1	24	
		25	0	23.7	1	24	
	16QAM	1	0	23.3	1	24	
		1	12	23.8	1	24	
		1	24	23.2	1	24	
		12	0	22.8	2	23	
		12	7	23.0	2	23	
		12	13	22.7	2	23	
		25	0	22.9	2	23	

LTE Band 66 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				132072	132322	132572	MFR	Tune-up Limit
				1720 MHz	1745 MHz	1770 MHz		
20 MHz	QPSK	1	0	24.2	24.7	24.2	0	25
		1	49	24.3	24.7	24.2	0	25
		1	99	24.2	24.2	23.8	0	25
		50	0	23.1	23.4	23.3	1	24
		50	24	23.3	23.4	23.3	1	24
		50	50	22.7	23.3	23.3	1	24
		100	0	23.2	23.5	23.6	1	24
	16QAM	1	0	22.9	23.7	23.7	1	24
		1	49	23.1	23.3	23.3	1	24
		1	99	22.7	23.0	23.0	1	24
		12	0	21.6	21.8	22.2	2	23
		12	44	21.8	22.2	21.9	2	23
		12	88	21.5	21.7	22.1	2	23
		27	0	20.9	21.3	21.1	2	23
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				132047	132322	132597	MFR	Tune-up Limit
				1717.5 MHz	1745 MHz	1772.5 MHz		
15 MHz	QPSK	1	0	23.8	24.6	24.2	0	25
		1	37	23.9	24.4	24.0	0	25
		1	74	23.6	24.2	23.8	0	25
		36	0	22.6	22.7	22.8	1	24
		36	20	23.1	23.0	22.9	1	24
		36	39	22.8	22.8	22.7	1	24
		75	0	22.7	22.9	22.9	1	24
	16QAM	1	0	23.2	22.9	22.8	1	24
		1	37	23.1	23.5	23.0	1	24
		1	74	22.8	22.7	22.4	1	24
		12	0	21.8	22.0	21.8	2	23
		12	35	21.8	22.1	21.9	2	23
		12	63	21.8	21.6	21.6	2	23
		27	0	20.8	21.1	21.1	2	23
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				132022	132322	132622	MFR	Tune-up Limit
				1715 MHz	1745 MHz	1775 MHz		
10 MHz	QPSK	1	0	24.0	24.9	24.4	0	25
		1	25	24.3	25.0	24.5	0	25
		1	49	23.7	24.6	24.2	0	25
		25	0	22.7	23.5	23.2	1	24
		25	12	22.8	23.5	23.2	1	24
		25	25	22.7	23.4	23.1	1	24
		50	0	23.2	23.5	23.2	1	24
	16QAM	1	0	22.8	23.6	22.9	1	24
		1	25	23.8	23.6	22.8	1	24
		1	49	22.7	23.3	22.5	1	24
		12	0	21.8	21.8	22.1	2	23
		12	12	21.7	22.1	22.3	2	23
		12	25	21.7	22.0	21.9	2	23
		27	0	20.9	21.2	20.9	2	23
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				131997	132322	132647	MFR	Tune-up Limit
				1712.5 MHz	1745 MHz	1777.5 MHz		
5 MHz	QPSK	1	0	23.8	23.7	23.6	0	25
		1	12	24.1	23.9	23.9	0	25
		1	24	23.9	23.8	23.5	0	25
		12	0	22.8	22.9	22.7	1	24
		12	7	22.8	23.0	22.8	1	24
		12	13	22.8	23.1	22.8	1	24
		25	0	22.7	23.0	22.7	1	24
	16QAM	1	0	22.7	22.7	22.8	1	24
		1	12	22.7	22.9	22.7	1	24
		1	24	22.7	22.7	22.6	1	24
		12	0	21.5	21.9	21.8	2	23
		12	7	21.7	21.9	21.8	2	23
		12	13	21.7	22.0	21.8	2	23
		25	0	21.7	22.3	21.8	2	23

LTE Band 66 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				131987	132322	132657	MPR	Tune-up Limit
				1711.5 MHz	1745 MHz	1778.5 MHz		
3 MHz	QPSK	1	0	24.0	23.8	23.8	0	25
		1	8	24.0	24.0	23.8	0	25
		1	14	23.7	23.9	23.7	0	25
		8	0	22.7	23.1	22.7	1	24
		8	4	22.8	23.2	22.7	1	24
		8	7	22.7	23.1	22.6	1	24
		15	0	22.8	23.1	22.7	1	24
	16QAM	1	0	22.9	23.1	22.8	1	24
		1	8	23.3	23.2	22.9	1	24
		1	14	23.2	23.2	22.6	1	24
		8	0	22.3	22.0	21.8	2	23
		8	4	21.9	22.1	21.8	2	23
		8	7	22.2	22.2	21.7	2	23
		15	0	21.7	22.1	21.6	2	23
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				131979	132322	132665	MPR	Tune-up Limit
				1710.7 MHz	1745 MHz	1779.3 MHz		
1.4 MHz	QPSK	1	0	24.6	24.0	23.8	0	25
		1	3	24.6	24.3	23.8	0	25
		1	5	24.4	24.1	23.6	0	25
		3	0	24.1	24.2	23.7	0	25
		3	1	24.1	24.2	23.8	0	25
		3	3	24.2	24.3	23.6	0	25
		6	0	23.0	23.1	22.8	1	24
	16QAM	1	0	23.1	23.2	22.8	1	24
		1	3	23.1	23.2	22.8	1	24
		1	5	23.1	23.1	22.7	1	24
		3	0	23.2	22.8	23.0	1	24
		3	1	23.1	22.8	23.0	1	24
		3	3	23.3	22.8	22.9	1	24
		6	0	22.2	22.0	21.8	2	23

LTE Band 71 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				133297	680.5 MHz	MFR	Tune-up Limit	
20 MHz	QPSK	1	0	24.1		0	25	
		1	49	24.1		0	25	
		1	99	23.8		0	25	
		50	0	22.6		1	24	
		50	24	22.7		1	24	
		50	50	22.4		1	24	
		100	0	22.7		1	24	
	16QAM	1	0	21.2		1	24	
		1	49	22.0		1	24	
		1	99	21.4		1	24	
		12	0	22.0		2	23	
		12	44	22.1		2	23	
		12	88	21.5		2	23	
		27	0	21.0		2	23	
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				133297	680.5 MHz	MFR	Tune-up Limit	
15 MHz	QPSK	1	0	22.5		0	25	
		1	37	22.8		0	25	
		1	74	22.4		0	25	
		36	0	22.7		1	24	
		36	20	22.7		1	24	
		36	39	22.5		1	24	
		75	0	22.5		1	24	
	16QAM	1	0	22.2		1	24	
		1	37	22.8		1	24	
		1	74	22.2		1	24	
		12	0	22.7		2	23	
		12	35	22.8		2	23	
		12	63	22.1		2	23	
		27	0	21.5		2	23	
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				133172	133297	133422	MFR	Tune-up Limit
10 MHz	QPSK	1	0	22.5	22.5	22.2	0	25
		1	25	22.5	22.8	22.7	0	25
		1	49	22.1	22.4	22.8	0	25
		25	0	22.3	22.4	22.3	1	24
		25	12	22.2	22.4	22.4	1	24
		25	25	22.2	22.3	22.5	1	24
		50	0	22.6	22.5	22.6	1	24
	16QAM	1	0	22.2	22.1	22.1	1	24
		1	25	22.4	22.4	22.9	1	24
		1	49	22.0	22.3	22.3	1	24
		12	0	22.6	22.6	22.3	2	23
		12	12	22.6	22.5	22.4	2	23
		12	25	22.2	22.4	22.3	2	23
		27	0	21.3	21.6	21.1	2	23
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				133147	133297	133447	MFR	Tune-up Limit
5 MHz	QPSK	1	0	22.4	22.4	22.3	0	25
		1	12	22.5	22.5	22.8	0	25
		1	24	22.3	22.3	22.2	0	25
		12	0	22.3	22.4	22.5	1	24
		12	7	22.3	22.4	22.5	1	24
		12	13	22.3	22.4	22.5	1	24
		25	0	22.4	22.4	22.4	1	24
	16QAM	1	0	22.2	22.3	22.1	1	24
		1	12	22.6	22.6	22.6	1	24
		1	24	22.0	22.0	22.0	1	24
		12	0	21.4	21.3	21.3	2	23
		12	7	21.3	21.3	21.4	2	23
		12	13	21.1	21.3	21.4	2	23
		25	0	21.3	21.5	21.5	2	23

10. Measured and Reported (Scaled) SAR Results

SAR Test Reduction criteria are as follows:

- Reported SAR(W/kg) for WWAN = Measured SAR *Tune-up Scaling Factor

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 941225 D01 SAR test for 3G devices:

When the maximum output power and tune-up tolerance specified for production units in a secondary mode is $\leq \frac{1}{4}$ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode.

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.
- For LTE bands that do not support at least three non-overlapping channels in certain channel bandwidths, test the available non-overlapping channels instead. When a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing; therefore, the requirement for H, M and L channels may not fully apply.

10.1. W-CDMA Band II

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
						Tune-up Limit	Meas.	Meas.	Scaled	Meas.	Scaled	
Body-worn	Rel 99 RMC 12.2 kbps	0	Rear	9262	1852.4	23.8	23.2	1.040	1.200	0.615	0.709	1
				9400	1880.0	23.8	23.3	0.926	1.037	0.545	0.610	
				9538	1907.6	23.8	23.3	0.929	1.050	0.544	0.615	

10.2. W-CDMA Band IV

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
						Tune-up Limit	Meas.	Meas.	Scaled	Meas.	Scaled	
Body-worn	Rel 99 RMC 12.2 kbps	0	Rear	1312	1712.4	24.0	23.5	0.804	0.904	0.485	0.545	
				1413	1732.6	24.0	23.6	0.935	1.025	0.559	0.613	
				1513	1752.6	24.0	23.7	1.080	1.147	0.651	0.691	2

10.3. W-CDMA Band V

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
						Tune-up Limit	Meas.	Meas.	Scaled	Meas.	Scaled	
Body-worn	Rel 99 RMC 12.2 kbps	0	Rear	4183	836.6	25.0	23.0	0.164	0.258	0.111	0.174	3

10.4. LTE Band 2 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
								Tune-up Limit	Meas.	Meas.	Scaled	Meas.	Scaled	
Body-worn	QPSK	0	Rear	18700	1860.0	1	0	24.5	24.3	1.370	1.441	0.807	0.849	4
						50	24	23.5	23.2	0.981	1.051	0.573	0.614	
				18900	1880.0	1	49	24.5	24.1	0.961	1.054	0.568	0.623	
						50	24	23.5	23.4	0.816	0.843	0.483	0.499	
				19100	1900.0	100	0	23.5	23.3	0.913	0.960	0.540	0.568	
						1	49	24.5	24.2	1.070	1.141	0.616	0.657	
						50	24	23.5	23.4	0.843	0.859	0.490	0.499	

10.5. LTE Band 4 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
								Tune-up Limit	Meas.	Meas.	Scaled	Meas.	Scaled	
Body-worn	QPSK	0	Rear	20175	1732.5	1	49	25.0	24.7	0.859	0.923	0.505	0.542	5
						50	24	24.0	23.4	0.633	0.735	0.374	0.434	
						100	0	24.0	23.2	0.637	0.759	0.373	0.444	

10.6. LTE Band 5 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
								Tune-up Limit	Meas.	Meas.	Scaled	Meas.	Scaled	
Body-worn	QPSK	0	Rear	20525	836.5	1	0	25.0	24.4	0.221	0.256	0.151	0.175	6
						25	25	24.0	22.8	0.178	0.234	0.123	0.162	

10.7. LTE Band 12 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
								Tune-up Limit	Meas.	Meas.	Scaled	Meas.	Scaled	
Body-worn	QPSK	0	Rear	23095	707.5	1	25	25.0	23.8	0.117	0.155	0.076	0.101	7
						25	0	24.0	22.6	0.092	0.128	0.065	0.090	

10.8. LTE Band 13 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
								Tune-up Limit	Meas.	Meas.	Scaled	Meas.	Scaled	
Body-worn	QPSK	0	Rear	23230	782.0	1	49	25.0	24.7	0.223	0.239	0.147	0.158	8
						25	25	24.0	23.4	0.180	0.206	0.124	0.142	

10.9. LTE Band 14 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
								Tune-up Limit	Meas.	Meas.	Scaled	Meas.	Scaled	
Body-worn	QPSK	0	Rear	23330	793.0	1	25	25.0	24.5	0.197	0.222	0.132	0.149	9
						25	0	24.0	23.2	0.136	0.164	0.091	0.110	

10.10. LTE Band 66 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
								Tune-up Limit	Meas.	Meas.	Scaled	Meas.	Scaled	
Body-worn	QPSK	0	Rear	132072	1720.0	1	49	25.0	24.3	0.776	0.908	0.460	0.538	
				132322	1745.0	1	49	25.0	24.7	0.891	0.948	0.532	0.566	
						50	0	24.0	23.4	0.646	0.738	0.387	0.442	
				132572	1770.0	1	49	25.0	24.2	0.965	1.155	0.578	0.692	10

10.11. LTE Band 71 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
								Tune-up Limit	Meas.	Meas.	Scaled	Meas.	Scaled	
Body-worn	QPSK	0	Rear	133297	680.5	1	49	25.0	24.1	0.104	0.127	0.071	0.086	11
						50	24	24.0	22.7	0.073	0.099	0.047	0.064	

11. SAR Measurement Variability

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

- 1) Repeated measurement is not required when the original highest measured SAR is < 0.8 or 2 W/kg (1-g or 10-g respectively); steps 2) through 4) do not apply.
- 2) When the original highest measured SAR is ≥ 0.8 or 2 W/kg (1-g or 10-g respectively), repeat that measurement once.
- 3) Perform a second repeated measurement only if the **ratio of largest to smallest SAR** for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 or 3.6 W/kg ($\sim 10\%$ from the 1-g or 10-g respective SAR limit).
- 4) Perform a third repeated measurement only if the original, first, or second repeated measurement is ≥ 1.5 or 3.75 W/kg (1-g or 10-g respectively) and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20 .

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)	First Repeated		Second Repeated		Third Repeated
						Measured SAR (W/kg)	Largest to Smallest SAR Ratio	Measured SAR (W/kg)	Largest to Smallest SAR Ratio	Measured SAR (W/kg)
700	LTE Band 12	Body	Rear	No	0.117	N/A	N/A	N/A	N/A	N/A
	LTE Band 13	Body	Rear	No	0.223	N/A	N/A	N/A	N/A	N/A
	LTE Band 14	Body	Rear	No	0.197	N/A	N/A	N/A	N/A	N/A
	LTE Band 71	Body	Rear	No	0.104	N/A	N/A	N/A	N/A	N/A
850	WCDMA Band V	Body	Rear	No	0.164	N/A	N/A	N/A	N/A	N/A
	LTE Band 5	Body	Rear	No	0.221	N/A	N/A	N/A	N/A	N/A
1700	WCDMA Band IV	Body	Rear	Yes	1.080	1.070	1.01	N/A	N/A	N/A
	LTE Band 4	Body	Rear	Yes	0.859	0.843	1.02	N/A	N/A	N/A
	LTE Band 66	Body	Rear	Yes	0.965	0.955	1.01	N/A	N/A	N/A
1900	WCDMA Band II	Body	Rear	No	1.040	1.020	1.02	N/A	N/A	N/A
	LTE Band 2	Body	Rear	Yes	1.370	1.350	1.01	N/A	N/A	N/A

Note(s):

Repeated measurement is not required since the original highest measured SAR is $< 0.8 \text{ W/kg}$ (1-g) or 2 W/kg (10-g) .

Appendixes

Refer to separated files for the following appendixes.

Appendix A: SAR Setup Photos

Appendix B: SAR System Check Plots

Appendix C: SAR Highest Test Plots

Appendix D: SAR Tissue Ingredients

Appendix E: SAR Probe Certificates

Appendix F: SAR Dipole Certificates

END OF REPORT