SAR EVALUATION REPORT

IEEE Std 1528-2013

For

Automated External Defibrillator (AED) with WWAN & Wi-Fi

FCC IDs: CZO23LPCR2
CZO23LPCR2T
Model Name: LIFEPAK CR2

Report Number: R14887019-S1V3
Issue Date: 11/30/2023

Prepared for

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CERT #0751.06

Revision History

Rev.	Date	Revisions	Revised By
V1	9/15/2023	Initial Issue	--
V2	11/29/2023	Added calibration dates §4.3	Sarah Kuhaneck
V3	11/29/2023	Corrected calibration due date for signal generator S/N MY50140788, §4.3	Sarah Kuhaneck

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1. Attestation of Test Results

Applicant Name	Physio-Control, Inc. (now part of Stryker)	
FCC ID	CZO23LPCR2 CZO23LPCR2T	
Model Name	LIFEPAK CR2	
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	DTS
Body-worn*	0.853	0.071
Date Tested	7/24/2023 to 8/5/2023	
Test Results	Pass	

***Note:** The Body-worn exposure condition testing was performed at a separation distance of 30 mm.

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.

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.

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.

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.

Approved & Released By:	Prepared By:
Richard Jankovics Staff Engineer UL LLC	Sarah Kuhaneck Engineer UL LLC

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2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE Std 1528-2013, the following FCC Published RF exposure KDB procedures:

- 248227 D01 802.11 Wi-Fi SAR v02r02
- 447498 D01 General RF Exposure Guidance v06
- 447498 D03 Supplement C Cross-Reference v01
- 447498 D04 Interim General RF Exposure Guidance 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
- 941225 D05A LTE Rel.10 KDB Inquiry Sheet v01r02

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

- TCB Workshop October 2014; RF Exposure Procedures (Other LTE Considerations)
- TCB Workshop April 2015; RF Exposure Procedures (Overlapping LTE Bands)
- TCB Workshop October 2015; RF Exposure Procedures (KDB 941225 D05A)
- TCB Workshop October 2016; RF Exposure Procedures (DUT Holder Perturbations)
- TCB Workshop April 2019; RF Exposure Procedures (Tissue Simulating Liquids (TSL))

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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.

The test sites and measurement facilities used to collect data are located at 2800 Perimeter Park Dr, Morrisville, NC, USA.

- SAR Lab 1A
- SAR Lab 2A
- SAR Lab 2B

	Address	ISED CABID	ISED Company Number	FCC Registration
☐	Building: 12 Laboratory Dr RTP, NC 27709, U.S.A	US0067	2180C	825374
☒	Building: 2800 Perimeter Park Dr. Suite B Morrisville, NC 27560, U.S.A	US0067	27265	825374

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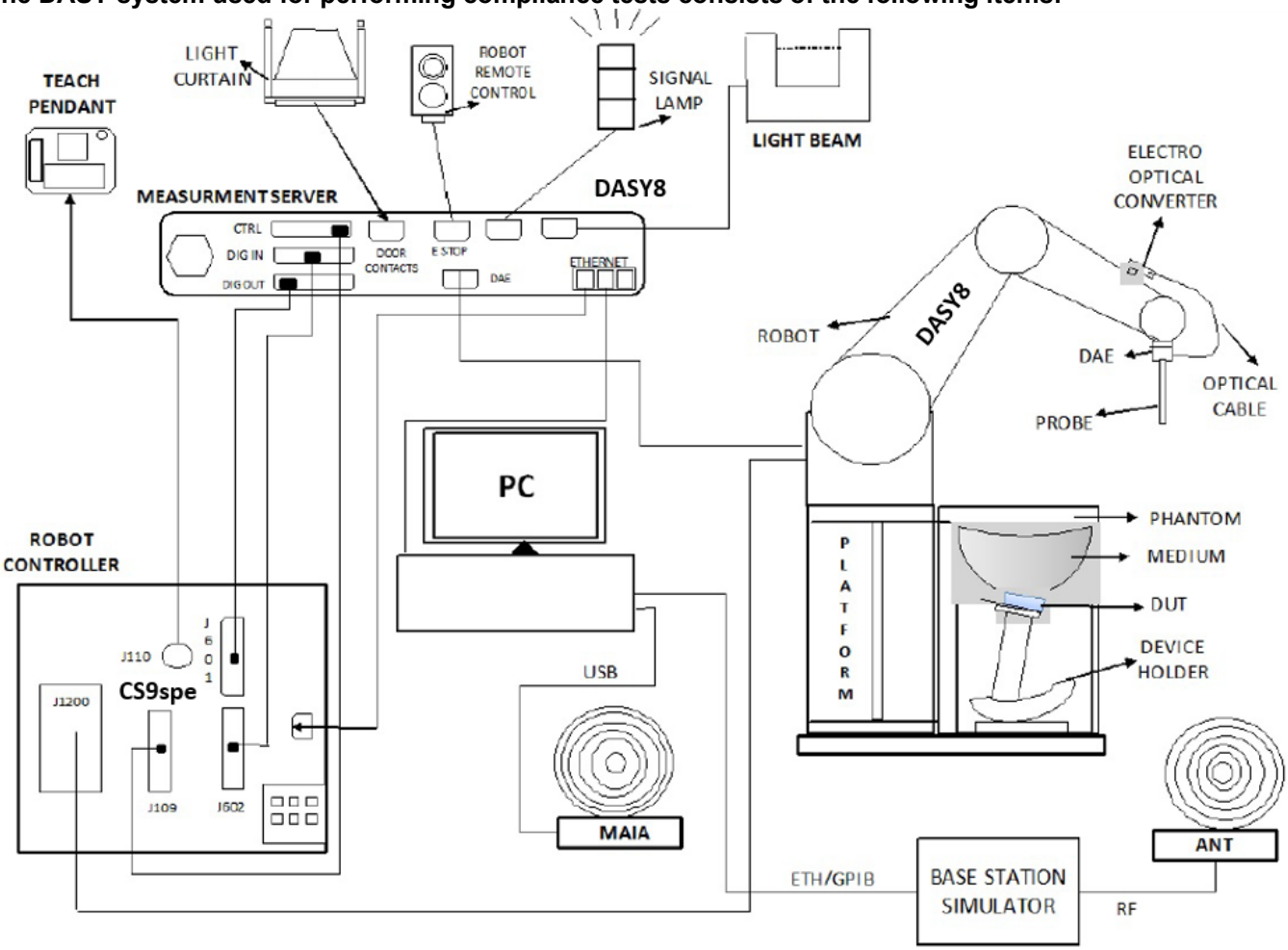
4. SAR Measurement System & Test Equipment

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 Win10 and the DASY8[1] 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] DASY8 software used: DASY16.2.2.1588 and older generations.

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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 IEC/IEEE 62209-1528, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

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

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

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Step 3: Zoom Scan

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

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

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

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

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

Step 4: Power drift measurement

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

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4.3. Test Equipment

The measuring equipment used to perform the tests documented in this report has been calibrated in accordance with the manufacturers' recommendations, and is traceable to recognized national standards.

Dielectric Property Measurements

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Date	Cal. Due Date
Network Analyzer	Keysight	E5063A	MY54100681	9/30/2022	9/30/2023
Dielectric Probe	SPEAG	DAKS-3.5	1051	10/17/2022	10/17/2023
Shorting Block	SPEAG	DAK-3.5 Short	SMDAK 200 DA	10/17/2022	10/17/2023
Thermometer	Fisher Scientific	15-078-181	1817705017	3/30/2023	3/30/2024

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Date	Cal. Due Date
Signal Generator	Keysight	N5181A	MY50140788	1/12/2023	1/12/2024
Power Meter	Keysight	N1912A	MY55116004	9/2/2023	9/02/2024
Power Sensor	Keysight	N1921A	MY55090047	2/2/2023	2/02/2024
3-Path Diode Power Sensor	Rohde & Schwarz	NRP8S	112236	6/2/2023	6/02/2024
3-Path Diode Power Sensor	Rohde & Schwarz	NRP8S	112237	6/2/2023	6/02/2024
Amplifier	MITEQ	AMF-4D-00400600-50-30P	N/A	N/A	N/A
Directional coupler	Mini-Circuits	ZUDC10-183+	1438	N/A	N/A
DC Power Supply	Miteq	PS 15V1	1990186	N/A	N/A
RF Power Source	Speag	PowerSource1	4278	6/13/2023	6/13/2024

Lab Equipment

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Date	Cal. Due Date
E-Field Probe	SPEAG	EX3DV4	7709	12/12/2022	12/12/2023
E-Field Probe	SPEAG	EX3DV4	7710	2/3/2023	2/3/2024
E-Field Probe	SPEAG	EX3DV4	7711	3/29/2023	3/29/2024
Data Acquisition Electronics	SPEAG	DAE4	1714	11/23/2022	11/23/2023
Data Acquisition Electronics	SPEAG	DAE4	1715	1/23/2023	1/23/2024
Data Acquisition Electronics	SPEAG	DAE4	1716	3/16/2023	3/16/2024
System Validation Dipole	SPEAG	D750V3	1139	10/12/2022	10/12/2023
System Validation Dipole	SPEAG	D900V2	1d180	10/12/2022	10/12/2023
System Validation Dipole	SPEAG	D1750V2	1136	10/17/2022	10/17/2023
System Validation Dipole	SPEAG	D1900V2	5d202	10/12/2022	10/12/2023
System Validation Dipole	SPEAG	D2300V2	1050	10/14/2022	10/14/2023
System Validation Dipole	SPEAG	D2450V2	963	10/18/2022	10/18/2023
System Validation Dipole	SPEAG	D2600V2	1104	10/21/2022	10/21/2023
Environmental Indicator	Control Company	06-662-4	200037610	2/24/2023	2/24/2024
Environmental Indicator	Control Company	06-662-4	200037635	2/24/2023	2/24/2024

Other

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Date	Cal. Due Date
RF Power Meter	Keysight	N1911a	MY55116002	9/10/2022	9/10/2023
RF Power Meter	Keysight	N1912a	MY55116004	9/2/2022	9/2/2023
RF Power Sensor	Keysight	N1921a	MY55090025	9/27/2022	9/27/2023
Base Station Simulator	R & S	CMW 500	170733	12/14/2022	12/14/2023
Base Station Simulator	R & S	CMW 500	170732	12/8/2022	12/8/2023
Base Station Simulator	R & S	CMW 500	170193	1/6/2023	1/6/2024
Base Station Simulator	R & S	CMW 500	170194	6/6/2023	6/6/2024
Base Station Simulator	Anritsu	MT8821C	6262116751	6/5/2023	6/5/2024
Base Station Simulator	Anritsu	MT8000A	6272354129	6/9/2023	6/9/2024

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5. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be ≤ 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.

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6. Device Under Test (DUT) Information

6.1. DUT Description

Device Dimension	Overall (Length x Width x Thickness): 217 mm x 217 mm x 81.3 mm		
Back Cover	Normal Battery Cover		
Battery Options	Extended (large capacity)		
Test sample information	**S/N**	**IMEI**	**Notes**
	50628744	862771044648346	SAR/Conducted Cellular #1
	50628739	862771044646647	SAR/Conducted Cellular #2
	50628694	862771044648528	SAR/Conducted Cellular #3
	50628736	862771044645144	SAR/Conducted Wi-Fi
Hardware Version	3315185-004 Rev AC		
Software Version	3319936-003 Rev A		

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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 7 FDD Band 12 FDD Band 13 FDD Band 25 FDD Band 26 TDD Band 38 TDD Band 41	QPSK 16QAM Rel. 11 Does not support Carrier Aggregation (CA)	100% (FDD) 63.3% (TDD) Power Class 3 Refer to §6.4
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20)	100% (802.11b) [1]

Notes:

1. Duty cycle for Wi-Fi is referenced from §9.

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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 7	Frequency range: 2500 - 2570 MHz (BW = 70 MHz)					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low	**20850 2510**	20825 2507.5	20800 2505	20775 2502.5		
	Mid	**21100 2535**	21100 2535	21100 2535	21100 2535		
	High	**21350 2560**	21375 2562.5	21400 2565	21425 2567.5		
	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 25	Frequency range: 1850 - 1915 MHz (BW = 65 MHz)					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low	**26140/ 1860**	26115/ 1857.5	26090/ 1855	26065/ 1852.5	26055/ 1851.5	26047/ 1850.7
	Mid	**26365/ 1882.5**	26365/ 1882.5	26365/ 1882.5	26365/ 1882.5	26365/ 1882.5	26365/ 1882.5
	High	**26590/**	26615/	26640/	26665/	26675/	26683/

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		1905	1907.5	1910	1912.5	1913.5	1914.3
	Band 26	Frequency range: 814 - 849 MHz (BW = 35 MHz)					
		Channel Bandwidth					
		20 MHz	15 MHz [1]	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low		26765/ 821.5	26740/ 819	26715/ 816.5	26705/ 815.5	26697/ 814.7
	Mid		**26865/ 831.5**	26865/ 831.5	26865/ 831.5	26865/ 831.5	26865/ 831.5
	High		26965/ 841.5	26990/ 844	27015/ 846.5	27025/ 847.5	27033/ 848.3
	Band 38	Frequency range: 2570 - 2620 MHz (BW = 50 MHz)					
		Channel Bandwidth					
		20 MHz [1]	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low	37850/ 2580	37825/ 2577.5	37800/ 2575	37775/ 2572.5		
	Mid	**38000/ 2595**	38000/ 2595	38000/ 2595	38000/ 2595		
	High	38150 2610	38175/ 2612.5	38200/ 2615	38225/ 2617.5		
	Band 41[2]	Frequency range: 2496 - 2690 MHz (BW = 194 MHz)					
		Channel Bandwidth					
		20 MHz	15 `MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low	**39750 / 2506.0**					
	Mid- Low	**40185 / 2549.5**					
	Mid	**40620 / 2593.0**					
	Mid-High	**41055 / 2636.5**					
	High	**41490 / 2680.0**					
LTE transmitter and antenna implementation	Refer to Appendix A.						
Maximum power reduction (MPR)	**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

MPR Built-in by design
The manufacturer MPR values are always within the 3GPP maximum MPR allowance but may not follow the default MPR values.
A-MPR (additional MPR) was disabled during SAR testing

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:

1. 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.
2. LTE band 41 test channels in accordance with October 2014 TCB workshop for all channels bandwidths.
3. SAR Testing for LTE was performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

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6.4. LTE (TDD) Considerations

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

LTE TDD Bands support 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	$6592 \cdot T_s$	$(1+X) \cdot 2192 \cdot T_s$	$(1+X) \cdot 2560 \cdot T_s$	$7680 \cdot T_s$	$(1+X) \cdot 2192 \cdot T_s$	$(1+X) \cdot 2560 \cdot T_s$
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	$26336 \cdot T_s$			$7680 \cdot T_s$	$(2+X) \cdot 2192 \cdot T_s$	$(2+X) \cdot 2560 \cdot T_s$
5	$6592 \cdot T_s$	$(2+X) \cdot 2192 \cdot T_s$	$(2+X) \cdot 2560 \cdot T_s$	$20480 \cdot T_s$		
6	$19760 \cdot T_s$			$23040 \cdot T_s$		
7	$21952 \cdot T_s$			$12800 \cdot T_s$		
8	$24144 \cdot T_s$			-	-	-
9	$13168 \cdot T_s$			-	-	-
10	$13168 \cdot T_s$	$13152 \cdot T_s$	$12800 \cdot T_s$	-	-	-

Table 4.2-2: Uplink-downlink configurations & 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	63.3%
1	5 ms	D	S	U	U	D	D	S	U	U	D	43.3%
2	5 ms	D	S	U	D	D	D	S	U	D	D	23.3%
3	10 ms	D	S	U	U	U	D	D	D	D	D	31.7%
4	10 ms	D	S	U	U	D	D	D	D	D	D	21.7%
5	10 ms	D	S	U	D	D	D	D	D	D	D	11.7%
6	5 ms	D	S	U	U	U	D	S	U	U	D	53.3%

Calculated Duty Cycle = Extended cyclic prefix in uplink * (T_s) * # of S + # of U / period

Note(s):

This device supports uplink-downlink configurations 0-6. The configuration with highest duty cycle was used for SAR Testing: configuration 0 at 63.3% duty cycle.

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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.

7.1. Standalone SAR Test Exclusion Considerations

Since the *Dedicated Host Approach* is applied, the standalone SAR test exclusion procedure in KDB 447498 § 4.3.1 is applied in conjunction with KDB 616217 § 4.3 to determine the minimum test separation distance:

- When the separation distance from the antenna to an adjacent edge is ≤ 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.
- When the separation distance from the antenna to an adjacent edge is > 5 mm, the actual antenna-to-edge separation distance is applied to determine SAR test exclusion.

SAR Test Exclusion Calculations for WWAN

- The following separation distances are the antenna-to-edge separation distances + 30 mm. This additional 30 mm separation distance addresses the common use case for this device.

Antennas < 50mm to adjacent edges

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
			dBm	mW	Back	Top	Right	Bottom	Left	Front	Back	Top	Right	Bottom	Left	Front
LTE Main	W-CDMA 2	1907.6	25.00	316	46	183	232	46	33	52	9.5 -MEASURE-	> 50 mm	> 50 mm	9.5 -MEASURE-	13.2 -MEASURE-	> 50 mm
	W-CDMA 4	1752.6	25.00	316	46	183	232	46	33	52	9.1 -MEASURE-	> 50 mm	> 50 mm	9.1 -MEASURE-	12.7 -MEASURE-	> 50 mm
	W-CDMA 5	846.6	25.00	316	46	183	232	46	33	52	6.3 -MEASURE-	> 50 mm	> 50 mm	6.3 -MEASURE-	8.8 -MEASURE-	> 50 mm
	LTE Band 2	1900.0	25.00	316	46	183	232	46	33	52	9.5 -MEASURE-	> 50 mm	> 50 mm	9.5 -MEASURE-	13.2 -MEASURE-	> 50 mm
	LTE Band 4	1754.3	25.00	316	46	183	232	46	33	52	9.1 -MEASURE-	> 50 mm	> 50 mm	9.1 -MEASURE-	12.7 -MEASURE-	> 50 mm
	LTE Band 5	844.0	25.00	316	46	183	232	46	33	52	6.3 -MEASURE-	> 50 mm	> 50 mm	6.3 -MEASURE-	8.8 -MEASURE-	> 50 mm
	LTE Band 7	2560.0	25.00	316	46	183	232	46	33	52	11 -MEASURE-	> 50 mm	> 50 mm	11 -MEASURE-	15.3 -MEASURE-	> 50 mm
	LTE Band 12	711.0	25.00	316	46	183	232	46	33	52	5.8 -MEASURE-	> 50 mm	> 50 mm	5.8 -MEASURE-	8.1 -MEASURE-	> 50 mm
	LTE Band 13	782.0	25.00	316	46	183	232	46	33	52	6.1 -MEASURE-	> 50 mm	> 50 mm	6.1 -MEASURE-	8.5 -MEASURE-	> 50 mm
	LTE Band 25	1905.0	25.00	316	46	183	232	46	33	52	9.5 -MEASURE-	> 50 mm	> 50 mm	9.5 -MEASURE-	13.2 -MEASURE-	> 50 mm
	LTE Band 26	841.4	25.00	316	46	183	232	46	33	52	6.3 -MEASURE-	> 50 mm	> 50 mm	6.3 -MEASURE-	8.8 -MEASURE-	> 50 mm
	LTE Band 38	2595.0	25.00	316	46	183	232	46	33	52	11.1 -MEASURE-	> 50 mm	> 50 mm	11.1 -MEASURE-	15.4 -MEASURE-	> 50 mm
	LTE Band 41	2680.0	25.00	316	46	183	232	46	33	52	11.2 -MEASURE-	> 50 mm	> 50 mm	11.2 -MEASURE-	15.7 -MEASURE-	> 50 mm

Note(s):

According to KDB 447498, if the calculated threshold value is >3 then SAR testing is required.

Antennas > 50mm to adjacent edges

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
			dBm	mW	Back	Top	Right	Bottom	Left	Front	Back	Top	Right	Bottom	Left	Front
LTE Main	W-CDMA 2	1907.6	25.00	316	46	183	232	46	33	52	< 50 mm	1438.6 mW -EXEMPT-	1928.6 mW -EXEMPT-	< 50 mm	< 50 mm	128.4 mW -MEASURE-
	W-CDMA 4	1752.6	25.00	316	46	183	232	46	33	52	< 50 mm	1443.3 mW -EXEMPT-	1933.3 mW -EXEMPT-	< 50 mm	< 50 mm	133.1 mW -MEASURE-
	W-CDMA 5	846.6	25.00	316	46	183	232	46	33	52	< 50 mm	913.7 mW -EXEMPT-	1190.2 mW -EXEMPT-	< 50 mm	< 50 mm	174.2 mW -MEASURE-
	LTE Band 2	1900.0	25.00	316	46	183	232	46	33	52	< 50 mm	1438.8 mW -EXEMPT-	1928.8 mW -EXEMPT-	< 50 mm	< 50 mm	128.6 mW -MEASURE-
	LTE Band 4	1754.3	25.00	316	46	183	232	46	33	52	< 50 mm	1443.3 mW -EXEMPT-	1933.3 mW -EXEMPT-	< 50 mm	< 50 mm	133.1 mW -MEASURE-
	LTE Band 5	844.0	25.00	316	46	183	232	46	33	52	< 50 mm	911.6 mW -EXEMPT-	1187.3 mW -EXEMPT-	< 50 mm	< 50 mm	174.4 mW -MEASURE-
	LTE Band 7	2560.0	25.00	316	46	183	232	46	33	52	< 50 mm	1423.8 mW -EXEMPT-	1913.8 mW -EXEMPT-	< 50 mm	< 50 mm	113.6 mW -MEASURE-
	LTE Band 12	711.0	25.00	316	46	183	232	46	33	52	< 50 mm	808.3 mW -EXEMPT-	1040.6 mW -EXEMPT-	< 50 mm	< 50 mm	187.3 mW -MEASURE-
	LTE Band 13	782.0	25.00	316	46	183	232	46	33	52	< 50 mm	863 mW -EXEMPT-	1118.5 mW -EXEMPT-	< 50 mm	< 50 mm	179.9 mW -MEASURE-
	LTE Band 25	1905.0	25.00	316	46	183	232	46	33	52	< 50 mm	1438.7 mW -EXEMPT-	1928.7 mW -EXEMPT-	< 50 mm	< 50 mm	128.5 mW -MEASURE-
	LTE Band 26	841.4	25.00	316	46	183	232	46	33	52	< 50 mm	909.6 mW -EXEMPT-	1184.4 mW -EXEMPT-	< 50 mm	< 50 mm	174.6 mW -MEASURE-
	LTE Band 38	2595.0	25.00	316	46	183	232	46	33	52	< 50 mm	1423.1 mW -EXEMPT-	1913.1 mW -EXEMPT-	< 50 mm	< 50 mm	112.9 mW -MEASURE-
	LTE Band 41	2680.0	25.00	316	46	183	232	46	33	52	< 50 mm	1421.6 mW -EXEMPT-	1911.6 mW -EXEMPT-	< 50 mm	< 50 mm	111.4 mW -MEASURE-

Note(s):

According to KDB 447498, if the calculated Power threshold is less than the output power then SAR testing is required.

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SAR Test Exclusion Calculations for WLAN

Antennas < 50mm to adjacent edges

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	mW	Back	Top	Right	Bottom	Left	Front	Back	Top	Right	Bottom	Left	Front
Wi-Fi 2.4 GHz	2462	17.84	61	45	219	35	51	238	40	2.1 -EXEMPT-	> 50 mm	2.7 -EXEMPT-	> 50 mm	> 50 mm	2.4 -EXEMPT-

Note(s):

According to KDB 447498, if the calculated threshold value is >3 then SAR testing is required.

Antennas > 50mm to adjacent edges

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	mW	Back	Top	Right	Bottom	Left	Front	Back	Top	Right	Bottom	Left	Front
Wi-Fi 2.4 GHz	2462	17.84	61	45	219	35	51	238	40	< 50 mm	1785.6 mW -EXEMPT-	< 50 mm	105.6 mW -EXEMPT-	1975.6 mW -EXEMPT-	< 50 mm

Note(s):

According to KDB 447498, if the calculated Power threshold is less than the output power, then SAR testing is required.

7.2. Required Test Configurations

The table below identifies the standalone test configurations required for this device according to the findings in Section 7.1:

Test Configurations	Front	Back	Edge 1 (Top Edge)	Edge 2 (Right Edge)	Edge 3 (Bottom Edge)	Edge 4 (Left Edge)
W-CDMA Band 2	Yes	Yes	No	No	Yes	Yes
W-CDMA Band 4	Yes	Yes	No	No	Yes	Yes
W-CDMA Band 5	Yes	Yes	No	No	Yes	Yes
LTE Band 2	Yes	Yes	No	No	Yes	Yes
LTE Band 4	Yes	Yes	No	No	Yes	Yes
LTE Band 5	Yes	Yes	No	No	Yes	Yes
LTE Band 7	Yes	Yes	No	No	Yes	Yes
LTE Band 12	Yes	Yes	No	No	Yes	Yes
LTE Band 13	Yes	Yes	No	No	Yes	Yes
LTE Band 25	Yes	Yes	No	No	Yes	Yes
LTE Band 26	Yes	Yes	No	No	Yes	Yes
LTE Band 38	Yes	Yes	No	No	Yes	Yes
LTE Band 41	Yes	Yes	No	No	Yes	Yes
Wi-Fi 2.4 GHz	Yes	Yes	No	Yes	Yes	No

Note(s):

Yes = Testing is required.

No = Testing is not required.

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8. Dielectric Property Measurements & System Check

8.1. Dielectric Property Measurements

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

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

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

The dielectric constant (εr) and conductivity (σ) of typical tissue-equivalent media recipes are expected to be within ± 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 εr and σ may be relaxed to ± 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

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Dielectric Property Measurements Results:

SAR Lab	Date	Band (MHz)	Tissue Type	Frequency (MHz)	Relative Permittivity (εr)			Conductivity (σ)		
					Measured	Target	Delta (%)	Measured	Target	Delta (%)
1A	7/24/2023	2600	Head	2600	38.0	39.0	-2.59	1.93	1.96	-1.59
				2495	38.2	39.1	-2.51	1.85	1.85	-0.04
				2690	38.8	38.9	-0.35	2.00	2.06	-2.79
1A	7/27/2023	2600	Head	2600	38.3	39.0	-1.87	1.94	1.96	-0.98
				2495	38.5	39.1	-1.75	1.86	1.85	0.51
				2690	38.1	38.9	-2.00	2.01	2.06	-2.30
2A	7/24/2023	1750	Head	1750	38.3	40.1	-4.45	1.31	1.37	-4.31
				1710	38.4	40.1	-4.40	1.29	1.35	-4.19
				1785	38.3	40.0	-4.42	1.33	1.39	-4.23
2A	7/24/2023	1900	Head	1900	38.1	40.0	-4.77	1.40	1.40	0.00
				1850	38.2	40.0	-4.55	1.37	1.40	-2.14
				1980	38.0	40.0	-5.00	1.44	1.40	2.86
2A	7/27/2023	1900	Head	1900	38.1	40.0	-4.77	1.40	1.40	0.14
				1850	38.2	40.0	-4.50	1.37	1.40	-1.93
				1920	38.1	40.0	-4.77	1.42	1.40	1.07
2A	8/1/2023	1750	Head	1750	38.5	40.1	-4.03	1.33	1.37	-3.07
				1710	38.5	40.1	-4.10	1.30	1.35	-3.15
				1785	38.4	40.0	-4.02	1.35	1.39	-3.00
2B	7/27/2023	2450	Head	2450	39.4	39.2	0.46	1.83	1.80	1.78
				2400	39.5	39.3	0.39	1.79	1.75	2.13
				2500	39.3	39.1	0.47	1.87	1.85	0.86
2B	7/28/2023	750	Head	750	41.1	42.0	-2.12	0.92	0.89	3.52
				660	41.3	42.4	-2.58	0.90	0.89	1.00
				850	40.8	41.5	-1.69	0.96	0.92	4.83
2B	7/31/2023	750	Head	750	40.3	42.0	-4.05	0.91	0.89	1.98
				660	40.5	42.4	-4.51	0.88	0.89	-0.51
				850	40.0	41.5	-3.61	0.95	0.92	3.31
2B	7/31/2023	900	Head	900	39.8	41.5	-4.05	0.96	0.97	-1.01
				810	40.1	41.7	-3.85	0.93	0.90	3.34
				915	39.8	41.5	-4.17	0.97	0.98	-1.22
2B	8/1/2023	900	Head	900	40.1	41.5	-3.45	0.97	0.97	0.33
				810	40.5	41.7	-2.72	0.94	0.90	4.99
				915	40.0	41.5	-3.59	0.98	0.98	-0.05

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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 ±0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
  For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube was chosen for the cube.
- Distance between probe sensors and phantom surface was set to 3 mm.
- The dipole input power (forward power) was recorded and the results were 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 ±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	Dipole Power (dBm)	Measured Results for 1g SAR				Measured Results for 10g SAR				Plot No.
						Zoom Scan	Normalize to 1 W	Target (Ref. Value)	Delta ±10 %	Zoom Scan	Normalize to 1 W	Target (Ref. Value)	Delta ±10 %	
1A	7/24/2023	Head	D2600V2 SN: 1104	10/21/2023	17.00	2.860	57.06	56.70	0.64	1.280	25.54	25.30	0.95	
1A	7/27/2023	Head	D2600V2 SN: 1104	10/21/2023	17.00	2.860	57.06	56.70	0.64	1.280	25.54	25.30	0.95	1
2A	7/24/2023	Head	D1750V2 SN: 1136	10/17/2023	17.00	1.790	35.72	36.10	-1.07	0.953	19.01	19.10	-0.45	2
2A	7/24/2023	Head	D1900V2 SN: 5d202	10/12/2023	17.00	1.970	39.31	39.20	0.27	1.030	20.55	20.40	0.74	
2A	7/27/2023	Head	D1900V2 SN: 5d202	10/12/2023	17.00	1.980	39.51	39.20	0.78	1.030	20.55	20.40	0.74	
2A	8/1/2023	Head	D1750V2 SN: 1136	10/17/2023	17.00	1.790	35.72	36.10	-1.07	0.956	19.07	19.10	-0.13	
2A	8/1/2023	Head	D1900V2 SN: 5d202	10/12/2023	17.00	2.010	40.10	39.20	2.31	1.050	20.95	20.40	2.70	3
2B	7/27/2023	Head	D2450V2 SN: 963	10/18/2023	17.00	2.410	48.09	52.40	-8.23	1.120	22.35	24.50	-8.79	4
2B	7/28/2023	Head	D750V3 SN: 1139	10/12/2023	17.00	0.424	8.46	8.51	-0.59	0.276	5.51	5.58	-1.31	
2B	7/31/2023	Head	D750V3 SN: 1139	10/12/2023	17.00	0.420	8.38	8.51	-1.53	0.274	5.47	5.58	-2.02	5
2B	7/31/2023	Head	D900V2 SN: 1d180	10/12/2023	17.00	0.534	10.65	10.90	-2.25	0.343	6.84	6.99	-2.09	
2B	8/1/2023	Head	D900V2 SN: 1d180	10/12/2023	17.00	0.534	10.65	10.90	-2.25	0.343	6.84	6.99	-2.09	6

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9. Conducted Output Power Measurements

Tune-Up Power Limits provided by the manufacturer are used to scale measured SAR values.

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
	βc/βd	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} (Note1, 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 Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_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 Δ_{NACK} = 30/15 with β_{hs} = 30/15 * β_c, and Δ_{CQI} = 24/15 with β_{hs} = 24/15 * β_c.

Note 3: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH 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 β_c = 11/15 and β_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:

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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} (Note1)	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	$\beta_{ed}1$: 47/15 $\beta_{ed}2$: 47/15	4 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

Note 1: For sub-test 1 to 4, Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c . For sub-test 5, Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 5/15 with β_{hs} = 5/15 * β_c .

Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_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.

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 β_c = 10/15 and β_d = 15/15.

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.

Note 5: β_{ed} can not be set directly; it is set by Absolute Grant Value.

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.

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 ≤ ¼ dB higher than the primary mode

RF Air interface	Mode	Tune-up PowerLimit (dBm)
		Main Antenna
W-CDMA Band 2	R99	25.0
	HSDPA	24.0
	HSUPA	24.0
W-CDMA Band 4	R99	25.0
	HSDPA	24.0
	HSUPA	24.0
W-CDMA Band 5	R99	25.0
	HSDPA	24.0
	HSUPA	24.0

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W-CDMA Band II 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)	9262	1852.4	23.4	N/A	25.0
		9400	1880.0	23.6		
		9538	1907.6	23.8		
HSDPA	Subtest 1	9262	1852.4	22.7	0	24.0
		9400	1880.0	22.8		
		9538	1907.6	23.1		
	Subtest 2	9262	1852.4	22.7	0	24.0
		9400	1880.0	22.9		
		9538	1907.6	23.0		
	Subtest 3	9262	1852.4	22.2	0.5	23.5
		9400	1880.0	22.3		
		9538	1907.6	22.6		
	Subtest 4	9262	1852.4	22.2	0.5	23.5
		9400	1880.0	22.4		
		9538	1907.6	22.5		
HSUPA	Subtest 1	9262	1852.4	22.3	0	24.0
		9400	1880.0	22.5		
		9538	1907.6	22.7		
	Subtest 2	9262	1852.4	21.2	2	22.0
		9400	1880.0	21.4		
		9538	1907.6	21.8		
	Subtest 3	9262	1852.4	21.5	1	23.0
		9400	1880.0	21.8		
		9538	1907.6	21.9		
	Subtest 4	9262	1852.4	21.7	2	22.0
		9400	1880.0	21.9		
		9538	1907.6	22.0		
	Subtest 5	9262	1852.4	22.6	0	24.0
		9400	1880.0	22.8		
		9538	1907.6	23.0		

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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	25.0
		1413	1732.6	23.6		
		1513	1752.6	23.6		
HSDPA	Subtest 1	1312	1712.4	22.6	0	24.0
		1413	1732.6	22.8		
		1513	1752.6	22.7		
	Subtest 2	1312	1712.4	22.7	0	24.0
		1413	1732.6	22.8		
		1513	1752.6	22.7		
	Subtest 3	1312	1712.4	22.2	0.5	23.5
		1413	1732.6	22.4		
		1513	1752.6	22.2		
	Subtest 4	1312	1712.4	22.2	0.5	23.5
		1413	1732.6	22.3		
		1513	1752.6	22.2		
HSUPA	Subtest 1	1312	1712.4	22.3	0	24.0
		1413	1732.6	22.5		
		1513	1752.6	22.4		
	Subtest 2	1312	1712.4	21.3	2	22.0
		1413	1732.6	21.6		
		1513	1752.6	21.5		
	Subtest 3	1312	1712.4	21.3	1	23.0
		1413	1732.6	21.4		
		1513	1752.6	21.0		
	Subtest 4	1312	1712.4	21.3	2	22.0
		1413	1732.6	21.9		
		1513	1752.6	20.7		
	Subtest 5	1312	1712.4	22.6	0	24.0
		1413	1732.6	22.8		
		1513	1752.6	22.7		

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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	23.4	N/A	25.0
		4183	836.6	23.4		
		4233	846.6	23.5		
HSDPA	Subtest 1	4132	826.4	22.6	0	24.0
		4183	836.6	22.5		
		4233	846.6	22.7		
	Subtest 2	4132	826.4	22.6	0	24.0
		4183	836.6	22.5		
		4233	846.6	22.6		
	Subtest 3	4132	826.4	22.1	0.5	23.5
		4183	836.6	22.1		
		4233	846.6	22.1		
	Subtest 4	4132	826.4	22.1	0.5	23.5
		4183	836.6	22.1		
		4233	846.6	22.1		
HSUPA	Subtest 1	4132	826.4	22.4	0	24.0
		4183	836.6	22.5		
		4233	846.6	22.1		
	Subtest 2	4132	826.4	21.3	2	22.0
		4183	836.6	21.5		
		4233	846.6	21.6		
	Subtest 3	4132	826.4	21.3	1	23.0
		4183	836.6	21.4		
		4233	846.6	21.8		
	Subtest 4	4132	826.4	21.6	2	22.0
		4183	836.6	22.0		
		4233	846.6	22.0		
	Subtest 5	4132	826.4	22.8	0	24.0
		4183	836.6	22.8		
		4233	846.6	22.8		

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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

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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 ≤ 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.
   - LTE Band 2 (1850-1910 MHz) is covered by LTE Band 25 (1850-1915 MHz)
   - LTE Band 5 (824-849 MHz) is covered by LTE Band 26 (814-849 MHz)
   - LTE Band 38 (2570-2620 MHz) is covered by LTE Band 41 (2496-2690 MHz)

For some LTE Bands, certain channel bandwidths do not support at least three non-overlapping channels. When a device supports overlapping channel assignments 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. Please refer to section 6.3. for a detailed list of LTE test channels

- LTE Band 4 (1710-1755 MHz)
- LTE Band 5 (824-849 MHz)
- LTE Band 12 (699-716 MHz)
- LTE Band 13 (777-787 MHz)

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 ≤ ½ dB higher than the QPSK or when the reported SAR for the QPSK configuration is ≤ 1.45 W/kg.

RF Air interface	Mode	Tune-up PowerLimit (dBm)
		Main Antenna
LTE Band 2	QPSK	25.0
LTE Band 4	QPSK	25.0
LTE Band 5	QPSK	25.0
LTE Band 7	QPSK	25.0
LTE Band 12	QPSK	25.0
LTE Band 13	QPSK	25.0
LTE Band 25	QPSK	25.0
LTE Band 26	QPSK	25.0
LTE Band 38	QPSK	25.0
LTE Band 41	QPSK	25.0

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LTE Band 4 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				20050	20175	20300		
				1720 MHz	1732.5 MHz	1745 MHz		
20 MHz	QPSK	1	0	23.3	23.2	23.5	0	25
		1	49	23.7	23.6	23.8	0	25
		1	99	23.6	23.2	23.5	0	25
		50	0	22.7	22.7	22.7	1	24
		50	24	22.7	22.7	22.7	1	24
		50	50	22.7	22.8	22.7	1	24
		100	0	22.7	22.8	22.8	1	24
	16QAM	1	0	22.3	23.1	22.8	1	24
		1	49	22.2	23.4	23.0	1	24
		1	99	22.1	23.0	22.8	1	24
		12	0	22.0	22.0	22.2	2	23
		12	24	22.2	22.4	22.4	2	23
		12	50	22.2	22.3	22.2	2	23
		27	0	21.1	21.3	21.6	2	23

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				20025	20175	20325		
				1717.5 MHz	1732.5 MHz	1747.5 MHz		
15 MHz	QPSK	1	0	23.2	23.5	23.3	0	25
		1	37	23.4	23.4	23.3	0	25
		1	74	23.5	23.3	23.2	0	25
		36	0	22.5	22.4	22.3	1	24
		36	20	22.7	22.3	22.4	1	24
		36	39	22.7	22.3	22.2	1	24
		75	0	22.7	22.2	22.3	1	24
	16QAM	1	0	22.8	22.8	22.4	1	24
		1	37	22.8	23.4	22.5	1	24
		1	74	22.8	22.8	22.4	1	24
		12	0	22.4	22.5	22.3	2	23
		12	20	22.3	22.6	22.6	2	23
		12	39	22.3	22.4	22.5	2	23
		27	0	21.3	21.6	21.6	2	23

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LTE Band 4 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				20000	20175	20350		
				1715 MHz	1732.5 MHz	1750 MHz		
10 MHz	QPSK	1	0	23.6	23.5	23.7	0	25
		1	25	23.7	23.7	23.7	0	25
		1	49	23.5	23.5	23.6	0	25
		25	0	22.6	22.8	22.6	1	24
		25	12	22.6	22.8	22.7	1	24
		25	25	22.6	22.7	22.7	1	24
		50	0	22.6	22.7	22.8	1	24
	16QAM	1	0	22.8	23.0	23.1	1	24
		1	25	23.4	23.7	23.7	1	24
		1	49	22.8	22.9	23.2	1	24
		12	0	22.1	22.4	21.7	2	23
		12	12	22.2	22.5	22.5	2	23
		12	25	22.2	22.4	22.4	2	23
		27	0	21.3	21.6	21.5	2	23

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				19975	20175	20375		
				1712.5 MHz	1732.5 MHz	1752.5 MHz		
5 MHz	QPSK	1	0	23.2	23.4	23.1	0	25
		1	12	23.3	23.6	23.4	0	25
		1	24	23.4	23.4	23.3	0	25
		12	0	22.4	22.6	22.6	1	24
		12	7	22.4	22.6	22.6	1	24
		12	13	22.5	22.6	22.5	1	24
		25	0	22.4	22.6	22.6	1	24
	16QAM	1	0	22.5	22.2	22.1	1	24
		1	12	22.2	22.4	22.3	1	24
		1	24	22.6	22.1	22.3	1	24
		12	0	21.3	21.4	21.6	2	23
		12	7	21.4	21.5	21.6	2	23
		12	13	21.5	21.5	21.5	2	23
		25	0	21.2	21.6	21.7	2	23

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LTE Band 4 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				19965	20175	20385		
				1711.5 MHz	1732.5 MHz	1753.5 MHz		
3 MHz	QPSK	1	0	23.6	23.6	23.4	0	25
		1	8	23.8	23.5	23.6	0	25
		1	14	23.7	23.5	23.5	0	25
		8	0	22.6	22.6	22.4	1	24
		8	4	22.4	22.6	22.5	1	24
		8	7	22.5	22.6	22.5	1	24
		15	0	22.5	22.6	22.4	1	24
	16QAM	1	0	22.4	22.5	22.2	1	24
		1	8	22.6	22.7	22.5	1	24
		1	14	22.4	22.3	22.6	1	24
		8	0	21.5	21.6	21.6	2	23
		8	4	21.5	21.7	21.6	2	23
		8	7	21.7	21.7	21.8	2	23
		15	0	21.5	21.7	21.4	2	23

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				19957	20175	20393		
				1710.7 MHz	1732.5 MHz	1754.3 MHz		
1.4 MHz	QPSK	1	0	23.2	23.6	23.6	0	25
		1	3	23.3	23.7	23.5	0	25
		1	5	23.1	23.5	23.6	0	25
		3	0	23.4	23.7	23.6	1	24
		3	1	23.4	23.7	23.6	1	24
		3	3	23.5	23.7	23.6	1	24
		6	0	22.5	22.7	22.6	1	24
	16QAM	1	0	22.3	22.5	22.4	1	24
		1	3	22.4	22.6	22.6	1	24
		1	5	22.3	22.6	22.4	1	24
		3	0	22.3	22.8	22.6	2	23
		3	1	22.4	22.7	22.7	2	23
		3	3	22.6	22.8	22.7	2	23
		6	0	21.3	21.8	21.9	2	23

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LTE Band 7 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				20850	21100	21350		
				2510 MHz	2535 MHz	2560 MHz		
20 MHz	QPSK	1	0	24.2	24.5	24.8	0	25
		1	49	24.4	24.8	23.7	0	25
		1	99	24.4	24.7	23.8	0	25
		50	0	23.4	23.9	23.1	0	25
		50	24	23.5	23.8	23.2	0	25
		50	50	23.5	23.9	22.9	0	25
		100	0	23.4	23.8	23.2	0	25
	16QAM	1	0	23.5	23.1	23.5	0	25
		1	49	23.2	23.9	23.7	0	25
		1	99	23.9	23.1	23.2	0	25
		12	0	22.8	22.9	22.9	0	25
		12	24	22.1	22.9	22.9	0	25
		12	50	22.3	22.9	23.2	0	25
		27	0	22.3	22.6	22.4	0	25

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				20825	21100	21375		
				2507.5 MHz	2535 MHz	2562.5 MHz		
15 MHz	QPSK	1	0	23.3	24.3	24.7	0	25
		1	37	23.7	24.6	24.8	0	25
		1	74	23.8	24.3	24.9	0	25
		36	0	22.9	23.6	23.8	0	25
		36	20	23.0	23.5	23.8	0	25
		36	39	23.3	23.4	23.5	0	25
		75	0	23.3	23.4	23.7	0	25
	16QAM	1	0	23.8	23.8	23.4	0	25
		1	37	23.9	23.7	24.4	0	25
		1	74	23.9	23.1	23.9	0	25
		12	0	23.5	23.2	24.0	0	25
		12	20	23.4	23.3	24.0	0	25
		12	39	23.3	23.5	24.0	0	25
		27	0	22.4	22.7	22.7	0	25

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LTE Band 7 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				20800	21100	21400		
				2505 MHz	2535 MHz	2565 MHz		
10 MHz	QPSK	1	0	24.3	24.5	24.3	0	25
		1	25	24.9	24.5	24.5	0	25
		1	49	25.0	24.7	24.7	0	25
		25	0	23.6	23.6	23.3	0	25
		25	12	23.8	23.7	23.4	0	25
		25	25	23.8	23.6	23.5	0	25
		50	0	23.8	23.6	23.4	0	25
	16QAM	1	0	24.0	23.8	23.8	0	25
		1	25	23.9	24.3	24.5	0	25
		1	49	24.0	23.3	24.1	0	25
		12	0	23.3	23.9	24.1	0	25
		12	12	23.4	23.8	24.0	0	25
		12	25	23.3	23.8	23.9	0	25
		27	0	22.5	23.0	22.9	0	25

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				20775	21100	21425		
				2502.5 MHz	2535 MHz	2567.5 MHz		
5 MHz	QPSK	1	0	23.5	24.4	24.4	0	25
		1	12	24.1	24.6	24.8	0	25
		1	24	23.8	24.4	24.3	0	25
		12	0	23.0	23.5	23.8	0	25
		12	7	23.0	23.5	23.8	0	25
		12	13	23.1	23.5	23.9	0	25
		25	0	23.0	23.5	23.8	0	25
	16QAM	1	0	22.8	23.1	23.6	0	25
		1	12	22.8	23.2	23.4	0	25
		1	24	22.6	22.8	23.4	0	25
		12	0	22.2	22.5	22.7	0	25
		12	7	22.0	22.5	22.7	0	25
		12	13	22.0	22.3	22.7	0	25
		25	0	22.1	22.6	22.9	0	25

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LTE Band 12 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				23060	23095	23130		
				704 MHz	707.5 MHz	711 MHz		
10 MHz	QPSK	1	0	23.5	23.5	23.5	0	25
		1	25	23.5	23.8	23.4	0	25
		1	49	23.6	23.4	23.2	0	25
		25	0	22.5	22.5	22.3	1	24
		25	12	22.3	22.5	22.4	1	24
		25	25	22.1	22.4	22.5	1	24
		50	0	22.4	22.5	22.3	1	24
	16QAM	1	0	22.7	22.0	22.3	1	24
		1	25	23.1	22.3	22.2	1	24
		1	49	23.2	22.9	22.1	1	24
		12	0	22.3	22.8	22.9	2	23
		12	12	22.8	22.8	22.9	2	23
		12	25	22.9	22.7	22.6	2	23
		27	0	21.6	22.0	22.0	2	23

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				23035	23095	23155		
				701.5 MHz	707.5 MHz	713.5 MHz		
5 MHz	QPSK	1	0	23.3	23.8	23.6	0	25
		1	12	23.7	24.0	23.6	0	25
		1	24	23.8	23.5	23.2	0	25
		12	0	22.5	22.9	22.7	1	24
		12	7	22.7	22.8	22.6	1	24
		12	13	22.8	22.9	22.5	1	24
		25	0	22.4	22.7	22.2	1	24
	16QAM	1	0	22.2	22.0	23.0	1	24
		1	12	22.3	22.8	23.0	1	24
		1	24	22.6	22.2	23.0	1	24
		12	0	21.4	21.7	21.4	2	23
		12	7	21.5	21.6	21.3	2	23
		12	13	21.7	21.9	21.2	2	23
		25	0	21.4	21.7	21.5	2	23

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LTE Band 12 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				23025	23095	23165		
				700.5 MHz	707.5 MHz	714.5 MHz		
3 MHz	QPSK	1	0	23.2	23.8	23.6	0	25
		1	8	23.8	24.1	23.7	0	25
		1	14	23.6	23.8	23.6	0	25
		8	0	22.6	23.0	22.7	1	24
		8	4	22.6	23.0	22.6	1	24
		8	7	22.6	22.9	22.5	1	24
		15	0	22.5	22.9	22.5	1	24
	16QAM	1	0	22.7	22.1	22.6	1	24
		1	8	22.4	22.0	22.4	1	24
		1	14	22.3	23.0	22.4	1	24
		8	0	21.4	21.7	21.4	2	23
		8	4	21.4	21.7	21.6	2	23
		8	7	21.3	21.7	21.7	2	23
		15	0	21.4	21.7	21.3	2	23

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				23017	23095	23173		
				699.7 MHz	707.5 MHz	715.3 MHz		
1.4 MHz	QPSK	1	0	23.2	24.1	23.4	0	25
		1	3	23.5	23.9	23.4	0	25
		1	5	23.4	23.9	23.4	0	25
		3	0	23.5	23.9	23.4	1	24
		3	1	23.6	23.9	23.4	1	24
		3	3	23.5	23.9	23.5	1	24
		6	0	22.2	22.8	22.4	1	24
	16QAM	1	0	22.7	23.0	22.7	1	24
		1	3	22.3	22.9	22.9	1	24
		1	5	22.7	22.9	22.8	1	24
		3	0	22.3	22.9	22.7	2	23
		3	1	22.5	22.8	22.8	2	23
		3	3	22.6	22.9	22.7	2	23
		6	0	21.3	21.7	21.4	2	23

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LTE Band 13 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				[redacted]	23230 782 MHz	[redacted]	MPR	Tune-up Limit
10 MHz	QPSK	1	0	[redacted]	23.1	[redacted]	0	25
		1	25	[redacted]	23.2	[redacted]	0	25
		1	49	[redacted]	23.4	[redacted]	0	25
		25	0	[redacted]	22.3	[redacted]	1	24
		25	12	[redacted]	22.3	[redacted]	1	24
		25	25	[redacted]	22.3	[redacted]	1	24
		50	0	[redacted]	22.4	[redacted]	1	24
	16QAM	1	0	[redacted]	22.9	[redacted]	1	24
		1	25	[redacted]	23.2	[redacted]	1	24
		1	49	[redacted]	22.8	[redacted]	1	24
		12	0	[redacted]	22.7	[redacted]	2	23
		12	12	[redacted]	23.0	[redacted]	2	23
		12	25	[redacted]	22.9	[redacted]	2	23
		27	0	[redacted]	21.6	[redacted]	2	23

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				[redacted]	23230 782 MHz	[redacted]	MPR	Tune-up Limit
5 MHz	QPSK	1	0	[redacted]	23.6	[redacted]	0	25
		1	12	[redacted]	23.6	[redacted]	0	25
		1	24	[redacted]	23.7	[redacted]	0	25
		12	0	[redacted]	22.7	[redacted]	1	24
		12	7	[redacted]	22.8	[redacted]	1	24
		12	13	[redacted]	22.7	[redacted]	1	24
		25	0	[redacted]	22.8	[redacted]	1	24
	16QAM	1	0	[redacted]	22.9	[redacted]	1	24
		1	12	[redacted]	23.0	[redacted]	1	24
		1	24	[redacted]	23.1	[redacted]	1	24
		12	0	[redacted]	21.3	[redacted]	2	23
		12	7	[redacted]	21.2	[redacted]	2	23
		12	13	[redacted]	21.1	[redacted]	2	23
		25	0	[redacted]	21.4	[redacted]	2	23

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LTE Band 25 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				26140	26365	26590		
				1860 MHz	1882.5 MHz	1905 MHz		
20 MHz	QPSK	1	0	23.9	23.9	24.0	0	25
		1	49	24.4	24.3	24.4	0	25
		1	99	24.1	24.1	24.0	0	25
		50	0	23.4	23.4	23.6	0	25
		50	24	23.4	23.5	23.6	0	25
		50	50	23.4	23.3	23.6	0	25
		100	0	23.5	23.5	23.6	0	25
	16QAM	1	0	23.8	23.6	23.4	0	25
		1	49	23.8	23.1	23.6	0	25
		1	99	23.3	23.1	22.6	0	25
		12	0	23.4	23.4	23.2	0	25
		12	24	23.3	23.6	23.5	0	25
		12	50	23.4	23.3	23.2	0	25
		27	0	22.3	22.5	22.3	0	25
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				26115	26365	26615		
				1857.5 MHz	1882.5 MHz	1907.5 MHz		
15 MHz	QPSK	1	0	23.8	24.2	23.7	0	25
		1	37	24.2	24.6	24.5	0	25
		1	74	24.1	24.3	23.2	0	25
		36	0	23.1	23.6	23.4	0	25
		36	20	23.2	23.6	23.3	0	25
		36	39	23.2	23.6	23.3	0	25
		75	0	23.2	23.4	23.3	0	25
	16QAM	1	0	23.5	23.5	23.3	0	25
		1	37	23.9	23.5	23.4	0	25
		1	74	23.8	23.1	23.3	0	25
		12	0	23.2	23.4	23.1	0	25
		12	20	23.2	23.7	23.5	0	25
		12	39	23.2	23.5	23.4	0	25
		27	0	22.0	22.7	22.4	0	25

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LTE Band 25 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				26090	26365	26640		
				1855 MHz	1882.5 MHz	1910 MHz		
10 MHz	QPSK	1	0	24.2	24.3	24.2	0	25
		1	25	24.6	24.7	24.2	0	25
		1	49	24.4	24.5	22.7	0	25
		25	0	23.3	23.6	23.3	0	25
		25	12	23.4	23.6	23.4	0	25
		25	25	23.5	23.5	23.2	0	25
		50	0	23.4	23.6	23.5	0	25
	16QAM	1	0	23.2	23.5	23.6	0	25
		1	25	23.2	23.4	23.9	0	25
		1	49	23.0	23.2	21.9	0	25
		12	0	23.2	23.7	23.6	0	25
		12	12	23.5	23.9	23.3	0	25
		12	25	23.4	23.8	23.3	0	25
		27	0	22.2	22.7	22.5	0	25

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				26065	26365	26665		
				1852.5 MHz	1882.5 MHz	1912.5 MHz		
5 MHz	QPSK	1	0	24.2	24.5	24.2	0	25
		1	12	24.3	24.6	24.0	0	25
		1	24	24.3	24.5	22.9	0	25
		12	0	23.4	23.6	23.5	0	25
		12	7	23.4	23.6	23.2	0	25
		12	13	23.4	23.6	23.1	0	25
		25	0	23.3	23.7	22.7	0	25
	16QAM	1	0	23.1	23.2	23.5	0	25
		1	12	23.1	23.2	22.2	0	25
		1	24	23.1	22.9	21.3	0	25
		12	0	22.2	22.5	22.5	0	25
		12	7	22.1	22.5	22.0	0	25
		12	13	22.2	22.6	22.3	0	25
		25	0	22.3	22.7	22.0	0	25

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LTE Band 25 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				26055	26365	26675		
				1851.5 MHz	1882.5 MHz	1913.5 MHz		
3 MHz	QPSK	1	0	24.1	24.6	23.3	0	25
		1	8	24.2	24.6	22.8	0	25
		1	14	24.1	24.5	21.7	0	25
		8	0	23.2	23.5	23.3	0	25
		8	4	23.1	23.5	22.5	0	25
		8	7	23.2	23.5	22.2	0	25
		15	0	23.2	23.6	22.1	0	25
	16QAM	1	0	23.1	23.8	22.4	0	25
		1	8	23.1	23.7	22.0	0	25
		1	14	23.0	23.2	21.1	0	25
		8	0	22.3	22.6	22.5	0	25
		8	4	22.1	22.6	21.6	0	25
		8	7	22.1	22.7	21.2	0	25
		15	0	22.1	22.4	21.3	0	25

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				26047	26365	26683		
				1850.7 MHz	1882.5 MHz	1914.3 MHz		
1.4 MHz	QPSK	1	0	24.0	24.5	23.6	0	25
		1	3	24.3	24.5	23.6	0	25
		1	5	23.9	24.4	23.0	0	25
		3	0	24.1	24.4	23.2	0	25
		3	1	24.2	24.6	22.9	0	25
		3	3	24.3	24.6	22.7	0	25
		6	0	23.2	23.4	22.7	0	25
	16QAM	1	0	23.0	23.4	22.0	0	25
		1	3	23.0	23.4	21.7	0	25
		1	5	22.9	23.3	21.5	0	25
		3	0	22.9	23.1	21.9	0	25
		3	1	22.9	23.4	21.8	0	25
		3	3	23.2	23.5	21.6	0	25
		6	0	22.0	22.5	21.6	0	25

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LTE Band 26 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				26765	26865	26965		
				821.5 MHz	831.5 MHz	841.5 MHz		
15 MHz	QPSK	1	0	23.5	23.6	23.6	0	25
		1	37	23.5	24.0	23.7	0	25
		1	74	23.8	23.7	23.7	0	25
		36	0	22.8	22.8	22.9	1	24
		36	20	22.8	22.9	22.8	1	24
		36	39	22.8	22.9	22.9	1	24
		75	0	22.7	22.9	23.0	1	24
	16QAM	1	0	23.1	23.1	22.6	1	24
		1	37	23.1	23.9	23.0	1	24
		1	74	23.0	23.1	22.4	1	24
		12	0	22.7	22.9	22.8	2	23
		12	20	22.6	22.8	23.0	2	23
		12	39	22.7	22.9	22.7	2	23
		27	0	21.6	21.7	21.6	2	23

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				26740	26865	26990		
				819 MHz	831.5 MHz	844 MHz		
10 MHz	QPSK	1	0	23.6	23.6	23.9	0	25
		1	25	24.1	24.1	24.1	0	25
		1	49	23.6	23.5	23.8	0	25
		25	0	22.8	22.8	22.9	1	24
		25	12	22.8	22.9	22.9	1	24
		25	25	22.7	22.8	22.9	1	24
		50	0	22.7	22.8	22.9	1	24
	16QAM	1	0	22.6	22.7	23.3	1	24
		1	25	23.9	22.8	23.4	1	24
		1	49	23.1	22.3	22.7	1	24
		12	0	23.0	22.9	22.8	2	23
		12	12	22.8	22.9	22.9	2	23
		12	25	22.8	22.7	22.9	2	23
		27	0	21.8	21.8	21.7	2	23

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LTE Band 26 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				26715	26865	27015		
				816.5 MHz	831.5 MHz	846.5 MHz		
5 MHz	QPSK	1	0	23.7	23.8	23.8	0	25
		1	12	23.9	23.8	24.1	0	25
		1	24	23.3	23.6	23.9	0	25
		12	0	22.8	22.7	22.9	1	24
		12	7	22.8	22.7	22.9	1	24
		12	13	22.7	22.9	22.8	1	24
		25	0	22.8	22.8	22.9	1	24
	16QAM	1	0	22.0	22.6	22.9	1	24
		1	12	22.3	22.9	22.4	1	24
		1	24	23.2	22.9	22.3	1	24
		12	0	21.4	21.2	21.7	2	23
		12	7	21.5	21.2	21.7	2	23
		12	13	21.3	21.3	21.4	2	23
		25	0	21.5	21.5	21.7	2	23

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				26705	26865	27025		
				815.5 MHz	831.5 MHz	847.5 MHz		
3 MHz	QPSK	1	0	23.8	23.7	23.8	0	25
		1	8	24.0	23.9	24.1	0	25
		1	14	23.8	23.8	24.1	0	25
		8	0	22.8	22.7	22.9	1	24
		8	4	22.9	22.7	22.8	1	24
		8	7	22.8	22.8	22.8	1	24
		15	0	22.9	22.7	22.9	1	24
	16QAM	1	0	22.3	22.3	23.2	1	24
		1	8	23.1	22.2	22.9	1	24
		1	14	23.7	22.2	22.7	1	24
		8	0	21.9	22.3	21.8	2	23
		8	4	21.5	21.6	21.8	2	23
		8	7	21.4	21.5	21.6	2	23
		15	0	21.8	21.6	21.8	2	23

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LTE Band 26 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				26697	26865	27033		
				814.7 MHz	831.5 MHz	848.3 MHz		
1.4 MHz	QPSK	1	0	23.5	23.6	23.9	0	25
		1	3	23.4	23.8	24.0	0	25
		1	5	23.5	23.8	24.0	0	25
		3	0	23.6	23.5	23.8	0	25
		3	1	23.6	23.6	24.0	0	25
		3	3	23.8	23.7	23.8	0	25
		6	0	22.7	22.8	22.8	1	24
	16QAM	1	0	23.2	22.3	23.0	1	24
		1	3	23.3	22.6	23.1	1	24
		1	5	23.3	22.4	23.0	1	24
		3	0	22.9	22.6	22.8	1	24
		3	1	22.9	22.8	22.8	1	24
		3	3	22.8	23.2	22.7	1	24
		6	0	21.9	21.4	22.0	2	23

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LTE Band 41 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)					MPR	Tune-up Limit
				39750	40185	40620	41055	41490		
				2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz		
20 MHz	QPSK	1	0	24.1	24.4	24.3	25.0	24.8	0	25
		1	49	24.6	24.6	24.6	24.8	24.7	0	25
		1	99	24.3	24.2	24.2	24.7	24.5	0	25
		50	0	22.9	23.7	23.3	23.8	23.6	0	25
		50	24	23.0	23.7	23.2	23.7	23.5	0	25
		50	50	23.3	23.6	23.3	23.7	23.5	0	25
		100	0	23.1	23.7	23.3	23.7	23.6	0	25
	16QAM	1	0	22.9	23.6	22.9	24.1	23.1	0	25
		1	49	23.5	23.8	22.9	24.3	23.1	0	25
		1	99	23.3	23.7	22.9	23.9	22.8	0	25
		12	0	23.1	23.5	23.3	23.9	24.0	0	25
		12	44	23.4	23.5	23.5	23.8	24.0	0	25
		12	88	23.3	23.5	23.5	23.6	23.9	0	25
		27	0	22.0	22.7	22.7	22.8	22.9	0	25

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)					MPR	Tune-up Limit
				39750	40185	40620	41055	41490		
				2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz		
15 MHz	QPSK	1	0	24.1	24.4	24.2	24.3	24.7	0	25
		1	37	24.4	24.6	24.6	24.5	24.8	0	25
		1	74	24.2	24.3	24.4	24.3	24.8	0	25
		36	0	23.3	23.8	23.6	23.6	23.7	0	25
		36	20	23.4	23.7	23.6	23.7	23.7	0	25
		36	39	23.6	23.7	23.6	23.6	23.8	0	25
		75	0	23.2	23.7	23.5	23.8	23.8	0	25
	16QAM	1	0	23.6	23.7	23.0	23.7	24.6	0	25
		1	37	24.2	24.0	23.4	24.4	24.7	0	25
		1	74	24.0	23.7	23.7	23.5	23.6	0	25
		12	0	23.2	23.9	23.9	23.9	24.2	0	25
		12	20	23.4	23.8	23.8	24.0	24.2	0	25
		12	39	23.4	23.9	23.5	23.8	24.1	0	25
		27	0	22.2	22.7	22.8	22.9	23.2	0	25

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LTE Band 41 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)					MPR	Tune-up Limit
				39750	40185	40620	41055	41490		
				2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz		
10 MHz	QPSK	1	0	23.8	24.7	24.2	24.8	24.8	0	25
		1	25	24.2	24.6	24.3	24.7	24.9	0	25
		1	49	24.1	24.6	24.3	24.9	24.7	0	25
		25	0	23.2	23.8	23.5	23.9	23.8	0	25
		25	12	23.4	23.8	23.5	24.0	23.8	0	25
		25	25	23.4	23.8	23.5	23.9	23.7	0	25
		50	0	23.2	23.7	23.5	23.8	23.8	0	25
	16QAM	1	0	23.5	23.1	23.6	24.1	23.8	0	25
		1	25	24.1	23.0	23.8	24.3	24.2	0	25
		1	49	23.9	23.1	23.5	24.2	23.7	0	25
		12	0	23.1	22.8	23.5	23.7	23.9	0	25
		12	12	23.4	22.8	23.6	23.7	24.1	0	25
		12	25	23.4	22.7	23.5	23.7	24.2	0	25
		27	0	22.2	22.7	22.5	22.9	22.8	0	25
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)					MPR	Tune-up Limit
				39750	40185	40620	41055	41490		
				2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz		
5 MHz	QPSK	1	0	23.9	24.3	24.3	24.8	24.3	0	25
		1	12	24.7	24.4	24.5	24.7	24.5	0	25
		1	24	24.1	24.4	24.3	24.8	24.5	0	25
		12	0	23.1	23.5	23.5	23.9	23.8	0	25
		12	7	23.3	23.6	23.5	23.9	23.8	0	25
		12	13	23.3	23.5	23.5	23.8	23.6	0	25
		25	0	23.3	23.6	23.4	23.8	23.9	0	25
	16QAM	1	0	22.4	23.1	22.9	23.9	23.3	0	25
		1	12	23.4	23.7	23.4	24.1	23.6	0	25
		1	24	22.7	23.0	22.8	23.9	23.3	0	25
		12	0	22.0	22.4	22.3	22.7	22.8	0	25
		12	7	22.3	22.4	22.3	22.8	22.7	0	25
		12	13	22.3	22.5	22.3	22.9	22.9	0	25
		25	0	22.2	22.7	22.5	22.7	22.9	0	25

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9.3. Wi-Fi 2.4GHz (DTS Band)

Maximum Output Power (Tune-up Limit) for Wi-Fi 2.4 GHz

The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures.

For "Not required", SAR Test reduction was applied from KDB 248227 guidance, Sec. 2.1, b), 1) when the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11b/g/n mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration, for each frequency band. Additional output power measurements were not deemed necessary.

SAR testing is not required for OFDM mode(s) when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

Mode	Bandwidth	Channel	Frequency (MHz)	Tune-up PowerLimit (dBm)
				Main Antenna
802.11b DSSS	20 MHz	1	2412	17.34
		6	2437	17.34
		11	2462	17.34
802.11g OFDM	20 MHz	1	2412	16.24
		6	2437	16.24
		11	2462	16.24
802.11n OFDM	20 MHz	1	2412	15.75
		6	2437	15.75
		11	2462	15.75

Wi-Fi 2.4GHz Measured Results

Band	Mode	Data Rate	Ch #	Freq. (MHz)	Chain 0 Average Power (dBm)		
					Meas Pwr	Tune-up	SAR Test (Yes/No)
DSSS 2.4 GHz	802.11b	1 Mbps	1	2412	16.28	17.34	Yes
			6	2437	16.91	17.34	
			11	2462	17.21	17.34	
OFDM 2.4 GHz	802.11g	6 Mbps	1	2412	16.18	16.24	No
			6	2437	16.22	16.24	
			11	2462	16.17	16.24	
	802.11n (HT20)	6.5 Mbps	1	2412	15.44	15.75	No
			6	2437	15.38	15.75	
			11	2462	15.05	15.75	

Duty Factor Measured Results

Mode	Data Rate	T on (ms)	Period (ms)	Duty Cycle	Crest Factor (1/duty cycle)
802.11b	1 Mbps	100	100	100.00%	1.00

Note(s):

Duty Cycle = (T on / period) * 100%

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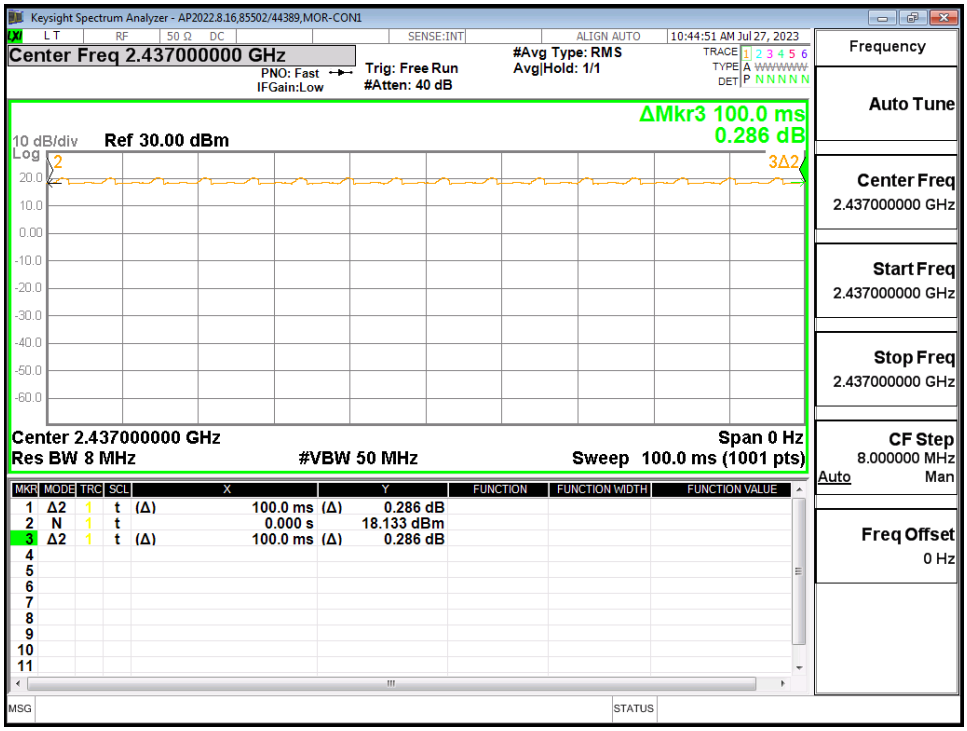
Duty Cycle plots

2.4 GHz Wi-Fi 802.11b 1 Mbps



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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
- Reported SAR(W/kg) for Wi-Fi = Measured SAR * Tune-up scaling factor * Duty Cycle scaling factor
- Duty Cycle scaling factor = 1 / Duty cycle (%)

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 ≤ ¼ 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.

KDB 248227 D01 SAR meas for 802.11:

SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS procedure is applied to reduce the number of SAR tests; these are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

The multiple test positions require SAR measurements in head, hotspot mode or UMPC mini-tablet configurations may be reduced according to the highest reported SAR determined using the *initial test position(s)* by applying the DSSS or OFDM SAR measurement procedures in the required wireless mode test configuration(s). The *initial test position(s)* is measured using the highest measured maximum output power channel in the required wireless mode test configuration(s). When the *reported* SAR for the *initial test position* is:

- ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and wireless mode combination within the frequency band or aggregated band. DSSS and OFDM configurations are considered separately according to the required SAR procedures.

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- > 0.4 W/kg, SAR is repeated using the same wireless mode test configuration tested in the *initial test position* to measure the subsequent next closet/smallest test separation distance and maximum coupling test position, on the highest maximum output power channel, until the *reported* SAR is ≤ 0.8 W/kg or all required test positions are tested.
  - For subsequent test positions with equivalent test separation distance or when exposure is dominated by coupling conditions, the position for maximum coupling condition should be tested.
  - When it is unclear, all equivalent conditions must be tested.
- For all positions/configurations tested using the *initial test position* and subsequent test positions, when the *reported* SAR is > 0.8 W/kg, measure the SAR for these positions/configurations on the subsequent next highest measured output power channel(s) until the *reported* SAR is ≤ 1.2 W/kg or all required test channels are considered.
  - The additional power measurements required for this step should be limited to those necessary for identifying subsequent highest output power channels to apply the test reduction.
- When the specified maximum output power is the same for both UNII 1 and UNII 2A, begin SAR measurements in UNII 2A with the channel with the highest measured output power. If the reported SAR for UNII 2A is ≤ 1.2 W/kg, SAR is not required for UNII 1; otherwise treat the remaining bands separately and test them independently for SAR.
- When the specified maximum output power is different between UNII 1 and UNII 2A, begin SAR with the band that has the higher specified maximum output. If the highest reported SAR for the band with the highest specified power is ≤ 1.2 W/kg, testing for the band with the lower specified output power is not required; otherwise test the remaining bands independently for SAR.

To determine the *initial test position*, Area Scans were performed to determine the position with the *Maximum Value of SAR (measured)*. The position that produced the highest *Maximum Value of SAR* is considered the worst case position; thus used as the *initial test position*.

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10.1. W-CDMA Band II

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up Limit	Meas.	Meas.	Scaled	
Body-Worn	Rel. 99 RMC 12.2 kbps	LTE Main	30	Back	9538	1907.6	25.0	23.8	0.198	0.261	
				Front	9538	1907.6	25.0	23.8	0.053	0.070	
				Edge Bottom	9538	1907.6	25.0	23.8	0.063	0.083	
				Edge Left	9538	1907.6	25.0	23.8	0.575	0.758	1

10.2. W-CDMA Band IV

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Pow er (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up Limit	Meas.	Meas.	Scaled	
Body-Worn	Rel. 99 RMC 12.2 kbps	LTE Main	30	Back	1413	1732.6	25.0	23.6	0.186	0.257	
				Front	1413	1732.6	25.0	23.6	0.050	0.069	
				Edge Bottom	1413	1732.6	25.0	23.6	0.043	0.059	
				Edge Left	1312	1712.4	25.0	23.5	0.468	0.661	
					1413	1732.6	25.0	23.6	0.614	0.848	
					1513	1752.6	25.0	23.6	0.618	**0.853**	2

10.3. W-CDMA Band V

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up Limit	Meas.	Meas.	Scaled	
Body-Worn	Rel. 99 RMC 12.2 kbps	LTE Main	30	Back	4233	846.6	25.0	23.5	0.067	0.095	3
				Front	4233	846.6	25.0	23.5	0.045	0.064	
				Edge Bottom	4233	846.6	25.0	23.5	0.053	0.075	
				Edge Left	4233	846.6	25.0	23.5	0.035	0.049	

10.4. LTE Band 4 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Body	QPSK	LTE Main	30	Back	20175	1732.5	1	49	25.0	23.6	0.100	0.138	
							50	50	24.0	22.8	0.079	0.104	
				Front	20175	1732.5	1	49	25.0	23.6	0.034	0.047	
							50	50	24.0	22.8	0.028	0.037	
				Edge Bottom	20175	1732.5	1	49	25.0	23.6	0.035	0.048	
							50	50	24.0	22.8	0.027	0.036	
				Edge Left	20175	1732.5	1	49	25.0	23.6	0.535	0.739	4
							50	50	24.0	22.8	0.426	0.562	

10.5. LTE Band 7 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Body	QPSK	LTE Main	30	Back	21100	2535.0	1	49	25.0	24.8	0.260	0.272	
							50	0	25.0	23.9	0.193	0.249	
				Front	21100	2535.0	1	49	25.0	24.8	0.059	0.062	
							50	0	25.0	23.9	0.043	0.055	
				Edge Bottom	21100	2535.0	1	49	25.0	24.8	0.067	0.070	
							50	0	25.0	23.9	0.050	0.064	
				Edge Left	21100	2535.0	1	49	25.0	24.8	0.512	0.536	5
							50	0	25.0	23.9	0.369	0.475	

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10.6. LTE Band 12 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Body	QPSK	LTE Main	30	Back	23095	707.5	1	25	25.0	23.8	0.048	0.063	
							25	0	24.0	22.5	0.039	0.055	
				Front	23095	707.5	1	25	25.0	23.8	0.028	0.037	
							25	0	24.0	22.5	0.022	0.031	
				Edge Bottom	23095	707.5	1	25	25.0	23.8	0.030	0.040	
							25	0	24.0	22.5	0.026	0.037	
				Edge Left	23095	707.5	1	25	25.0	23.8	0.134	0.177	6
							25	0	24.0	22.5	0.097	0.137	

10.7. LTE Band 13 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Body	QPSK	LTE Main	30	Back	23230	782.0	1	49	25	23.4	0.038	0.055	
							25	0	24	22.3	0.029	0.043	
				Front	23230	782.0	1	49	25	23.4	0.037	0.053	
							25	0	24	22.3	0.028	0.041	
				Edge Bottom	23230	782.0	1	49	25	23.4	0.037	0.053	
							25	0	24	22.3	0.028	0.041	
				Edge Left	23230	782.0	1	49	25	23.4	0.043	0.062	7
							25	0	24	22.3	0.035	0.052	

10.8. LTE Band 25 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Body-worn	QPSK	LTE Main	30	Back	26590	1905.0	1	49	25.0	24.4	0.196	0.225	
							50	0	25.0	23.6	0.167	0.231	
				Front	26590	1905.0	1	49	25.0	24.4	0.057	0.065	
							50	0	25.0	23.6	0.048	0.066	
				Edge Bottom	26590	1905.0	1	49	25.0	24.4	0.067	0.077	
							50	0	25.0	23.6	0.055	0.076	
				Edge Left	26590	1905.0	1	49	25.0	24.4	0.549	0.630	8
							50	0	25.0	23.6	0.418	0.577	

10.9. LTE Band 26 (15MHz Bandwidth)

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Body-worn	QPSK	LTE Main	30	Back	26865	831.5	1	37	25.0	24.0	0.037	0.047	
							36	20	24.0	22.9	0.027	0.035	
				Front	26865	831.5	1	37	25.0	24.0	0.042	0.053	
							36	20	24.0	22.9	0.030	0.039	
				Edge Bottom	26865	831.5	1	37	25.0	24.0	0.042	0.053	9
							36	20	24.0	22.9	0.035	0.045	
				Edge Left	26865	831.5	1	37	25.0	24.0	0.038	0.048	
							36	20	24.0	22.9	0.033	0.043	

10.10. LTE Band 41 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Body-worn	QPSK	LTE Main	30	Back	41055	2636.5	1	0	25.0	25.0	0.175	0.175	
							50	0	25.0	23.8	0.128	0.169	
				Front	41055	2636.5	1	0	25.0	25.0	0.047	0.047	
							50	0	25.0	23.8	0.034	0.045	
				Edge Bottom	41055	2636.5	1	0	25.0	25.0	0.045	0.045	
							50	0	25.0	23.8	0.035	0.046	
				Edge Left	41055	2636.5	1	0	25.0	25.0	0.294	0.294	10
							50	0	25.0	23.8	0.217	0.286	

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10.11. Wi-Fi (DTS Band)

When the 802.11b reported SAR of the highest measured maximum output power channel is ≤ 0.8 W/kg, no further SAR testing is required. If SAR is > 0.8 W/kg and ≤ 1.2 W/kg, SAR is required for the next highest measured output power channel. Finally, if SAR is > 1.2 W/kg, SAR is required for the third channel.

SAR testing is not required for OFDM mode(s) when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max SAR (W/kg)	Duty Cycle	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Body	802.11b	WiFi	30	Back	11	2462.0	0.008	100%	17.84	17.21			
				Front	11	2462.0	0.007	100%	17.84	17.21			
				Edge Right	11	2462.0	0.062	100%	17.84	17.21	0.061	**0.071**	11
				Edge Bottom	11	2462.0	0.031	100%	17.84	17.21			

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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.

Note(s):

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

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12. Simultaneous Transmission Conditions

This device does not support Simultaneous Transmission.

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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

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