SAR EVALUATION REPORT

IEEE Std 1528-2013

For
Body Worn Camera

FCC ID: X4GAB7610
Model Name: AX1023

Report Number: 12910430-S3V1
Issue Date: 7/15/2019

Prepared for
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Date	Revisions	Revised By
V1	7/15/2019	Initial Issue	--

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1. Attestation of Test Results

Applicant Name	Axon Enterprise, Inc.			
FCC ID	X4GAB7610			
Model Name	AX1023			
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	NII	DSS
Body-worn	0.765	0.043	0.091	<0.001
Extremity	2.112	0.248	0.448	0.019
Simultaneous TX (Body-worn)	0.856	0.808	0.856	0.856
Simultaneous TX (Extremity)	2.175	2.135	2.175	2.175
Date Tested	6/26/2019 to 7/10/2019			
Test Results	Pass			

***Note:** FCC ID: X4GAB7610 and FCC ID: X4GS01200share the same host device. The data used for Wi-Fi/BT Simultaneous TX has been leveraged from FCC ID: X4GS01200.

UL Verification Services Inc. 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.

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.

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Approved & Released By:	Prepared By:
	
Devin Chang Senior Test Engineer UL Verification Services Inc.	AJ Newcomer Laboratory Engineer UL Verification Services Inc.

2. Test Specification, Methods and Procedures

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

- 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 2015; RF Exposure Procedures (Overlapping LTE Bands)
- TCB workshop October 2016; RF Exposure Procedures (Bluetooth Duty Factor)
- TCB workshop October 2016; RF Exposure Procedures (DUT Holder Perturbations)
- TCB workshop May 2017; RF Exposure Procedures (Broadband Liquid Above 3 GHz)
- TCB workshop April 2019; RF Exposure Procedures (Tissue Simulating Liquids (TSL)

3. Facilities and Accreditation

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

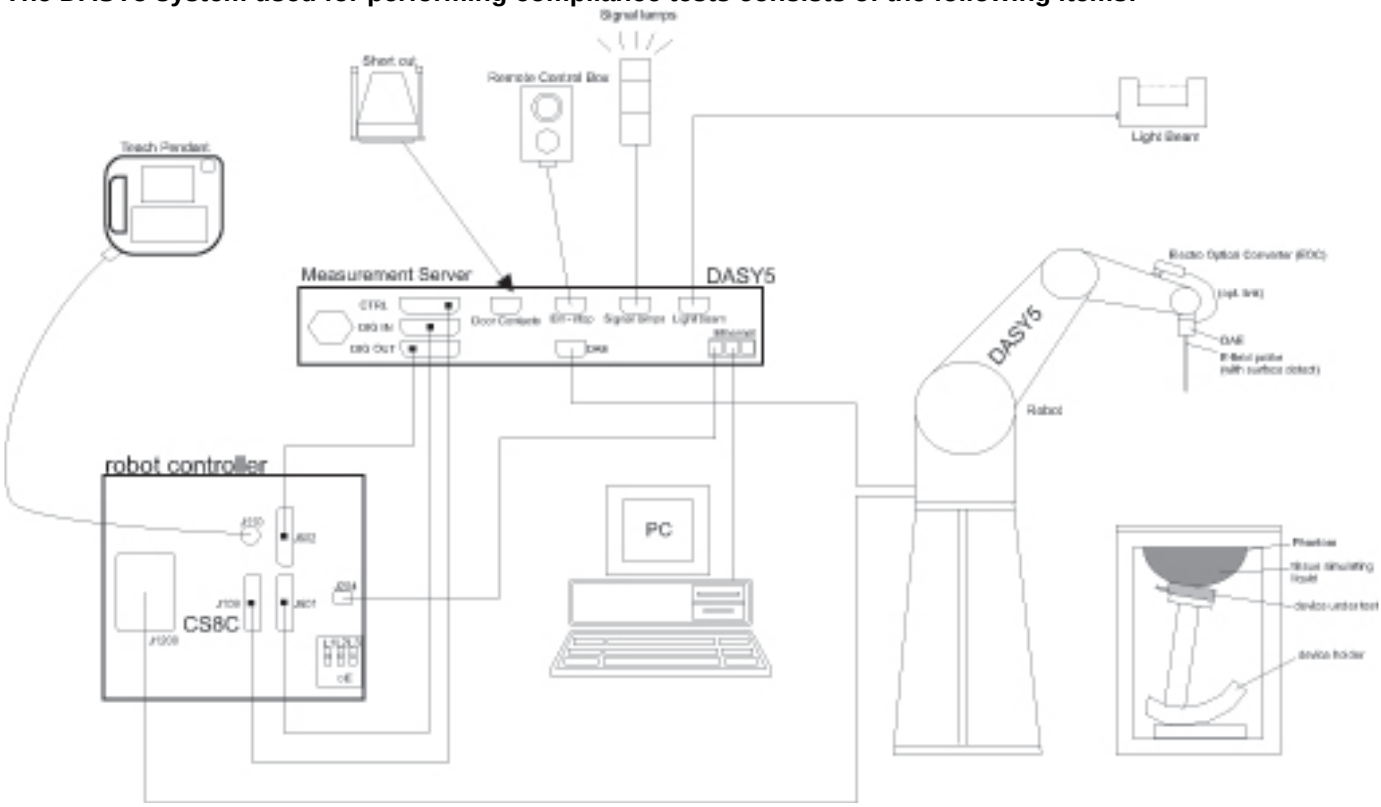
47173 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 3
SAR Lab D	SAR Lab 4
SAR Lab E	SAR Lab 5
SAR Lab F	SAR Lab 6
SAR Lab G	SAR Lab 7
SAR Lab H	SAR Lab 8

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0.

4. SAR Measurement System & Test Equipment

4.1. SAR Measurement System

The DASY5 system used for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

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

Step 3: Zoom Scan

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

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

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

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

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

Step 4: Power drift measurement

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

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
Vector Network Analyzer	Rhode & Schwarz	ZNLE6	101273-va	4/24/2020
Dielectric Probe kit	SPEAG	DAK-3.5	1103	2/12/2020
Shorting Block	SPEAG	DAK-3.5 Short	SM DAK 200 DA	9/11/2019
Thermometer	Keysight	Traceable	170064398	5/21/2020

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Signal Generator	Rhode & Schwarz	SMB100A	1890968-gX	2/14/2020
Power Sensor	Rhode & Schwarz	NRP18A	100995-hs	2/15/2020

Lab Equipment

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
E-Field Probe (SAR Lab 1)	SPEAG	EX3DV4	3885	9/18/2019
Data Acquisition Electronics (SAR Lab 1)	SPEAG	DAE4	1544	3/19/2020
System Validation Dipole	SPEAG	D750V3	1019	3/21/2020
System Validation Dipole	SPEAG	D750V3	1071	11/28/2019
System Validation Dipole	SPEAG	D835V2	4d142	8/23/2019
System Validation Dipole	SPEAG	D1750V2	1077	10/16/2019
System Validation Dipole	SPEAG	D1900V2	5d163	10/16/2019

Other

Name of Equipment	Manufacturer	Type/Model	T Number	Serial No.	Cal. Due Date
Power Meter	Agilent	N1921A	T1270	MY55196015	1/26/2020
Power Sensor	Agilent	N1921A	T309	MY52270022	2/6/2020
Base Station Simulator	R & S	CMW500	T978	135385-Fp	2/15/2020

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.

6. Device Under Test (DUT) Information

6.1. DUT Description

Device Dimension	Overall (Length x Width): 97 mm x 83 mm Overall Diagonal: 105 mm This is a Body camera that can be used in handheld conditions and be mounted on the body with a metal clip.
Back Cover	The Back Cover is not removable
Battery Options	The rechargeable battery is not user accessible.
Test sample information	**S/N** **IMEI** **Notes** X60000213 N/A WWAN
Hardware Version	PVT
Software Version	0.7.57

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 17 FDD Band 66	QPSK 16QAM Rel. 10 Does not support Carrier Aggregation (CA)	100% (FDD)

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		

Frequency range, Channel Bandwidth, Numbers and Frequencies

Band 17	Frequency range: 704 - 716 MHz (BW = 12 MHz)					
	Channel Bandwidth					
	20 MHz	15 MHz	10 MHz [1]	5 MHz [1]	3 MHz	1.4 MHz
Low			23780/ 709	23755/ 706.5		
Mid			**23790/ 710**	23790/ 710		
High			23800/ 711	23825/ 713.5		

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

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. 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	SAR Required	Note
WWAN	Body	0 mm	Rear w/ clip	Yes	
	Extremity	0 mm	Rear	Yes	
			Edge 1 (Top)	Yes	
			Edge 2 (Right)	Yes	
			Edge 3 (Bottom)	Yes	
			Edge 4 (Left)	Yes	

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

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 (εr)			Conductivity (σ)		
					Measured	Target	Delta (%)	Measured	Target	Delta (%)
1	6/26/2019	1900	Head	1900	39.07	40.00	-2.33	1.46	1.40	4.21
				1850	39.11	40.00	-2.23	1.43	1.40	2.36
				1920	39.00	40.00	-2.50	1.47	1.40	4.93
1	7/2/2019	750	Head	750	41.32	41.96	-1.53	0.88	0.89	-1.16
				660	41.48	42.42	-2.22	0.86	0.89	-3.81
				800	41.23	41.71	-1.15	0.90	0.90	0.42
1	7/2/2019	835	Head	835	40.89	41.50	-1.47	0.89	0.90	-0.89
				805	40.87	41.68	-1.94	0.89	0.90	-1.46
				850	40.82	41.50	-1.64	0.89	0.92	-2.78
1	7/2/2019	1750	Head	1750	41.84	40.08	4.39	1.34	1.37	-2.19
				1710	41.87	40.15	4.28	1.32	1.35	-2.44
				1755	41.85	40.08	4.42	1.34	1.37	-1.97
1	7/2/2019	1900	Head	1900	41.63	40.00	4.08	1.40	1.40	0.21
				1850	41.66	40.00	4.15	1.39	1.40	-1.00
				1920	41.54	40.00	3.85	1.41	1.40	0.64
1	7/8/2019	750	Head	750	40.91	41.96	-2.51	0.92	0.89	2.84
				660	41.58	42.42	-1.99	0.88	0.89	-0.32
				800	41.00	41.71	-1.69	0.94	0.90	4.42
1	7/8/2019	1750	Head	1750	38.82	40.08	-3.15	1.39	1.37	1.76
				1710	38.87	40.15	-3.18	1.37	1.35	1.68
				1755	38.82	40.08	-3.14	1.40	1.37	1.84

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.
  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 ±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 ±10 %	Zoom Scan to 100 mW	Normalize to 1 W	Target (Ref. Value)	Delta ±10 %	
1	6/26/2019	Head	D1900V2 SN:5d163	10/16/2019	4.250	42.50	42.19	0.73	2.190	21.90	21.73	0.78	
1	7/2/2019	Head	D750V3 SN:1071	11/28/2019	0.834	8.34	8.32	**0.24**	0.545	5.45	5.45	0.00	1,2
1	7/2/2019	Head	D835V2 SN:4d142	8/23/2019	0.957	9.57	9.48	**0.95**	0.622	6.22	6.10	1.97	3,4
1	7/2/2019	Head	D1750V2 SN:1077	10/16/2019	3.650	36.50	38.69	**-5.66**	1.930	19.30	20.46	-5.67	5,6
1	7/2/2019	Head	D1900V2 SN:5d163	10/16/2019	4.070	40.70	42.19	**-3.53**	2.100	21.00	21.73	-3.36	7,8
1	7/8/2019	Head	D750V3 SN:1019	3/21/2020	0.832	8.32	8.29	**0.36**	0.543	5.43	5.44	-0.18	9,10
1	7/8/2019	Head	D1750V2 SN:1077	10/16/2019	3.790	37.90	38.69	-2.04	1.990	19.90	20.46	-2.74	

9. Conducted Output Power Measurements

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:

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

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	24.0	N/A	24.0
		9400	1880.0	23.9		
		9538	1907.6	23.9		
HSDPA	Subtest 1	9262	1852.4	23.0	0	24.0
		9400	1880.0	22.9		
		9538	1907.6	23.0		
	Subtest 2	9262	1852.4	23.0	0	24.0
		9400	1880.0	22.9		
		9538	1907.6	23.0		
	Subtest 3	9262	1852.4	22.7	0.5	23.5
		9400	1880.0	22.4		
		9538	1907.6	22.5		
	Subtest 4	9262	1852.4	22.7	0.5	23.5
		9400	1880.0	22.4		
		9538	1907.6	22.5		
HSUPA	Subtest 1	9262	1852.4	22.6	0	24.0
		9400	1880.0	22.2		
		9538	1907.6	22.8		
	Subtest 2	9262	1852.4	21.8	2	22.0
		9400	1880.0	21.7		
		9538	1907.6	21.5		
	Subtest 3	9262	1852.4	21.3	1	23.0
		9400	1880.0	21.8		
		9538	1907.6	21.8		
	Subtest 4	9262	1852.4	21.8	2	22.0
		9400	1880.0	21.7		
		9538	1907.6	21.5		
	Subtest 5	9262	1852.4	23.0	0	24.0
		9400	1880.0	22.9		
		9538	1907.6	23.0		

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	23.8	N/A	24.0
		1413	1732.6	22.4		
		1513	1752.6	24.0		
HSDPA	Subtest 1	1312	1712.4	22.8	0	24.0
		1413	1732.6	22.0		
		1513	1752.6	23.0		
	Subtest 2	1312	1712.4	22.8	0	24.0
		1413	1732.6	22.0		
		1513	1752.6	23.0		
	Subtest 3	1312	1712.4	22.3	0.5	23.5
		1413	1732.6	21.6		
		1513	1752.6	22.5		
	Subtest 4	1312	1712.4	22.3	0.5	23.5
		1413	1732.6	21.6		
		1513	1752.6	22.4		
HSUPA	Subtest 1	1312	1712.4	22.4	0	24.0
		1413	1732.6	22.0		
		1513	1752.6	22.3		
	Subtest 2	1312	1712.4	21.5	2	22.0
		1413	1732.6	21.1		
		1513	1752.6	21.6		
	Subtest 3	1312	1712.4	21.0	1	23.0
		1413	1732.6	21.0		
		1513	1752.6	21.5		
	Subtest 4	1312	1712.4	22.0	2	22.0
		1413	1732.6	21.1		
		1513	1752.6	21.9		
	Subtest 5	1312	1712.4	22.8	0	24.0
		1413	1732.6	22.0		
		1513	1752.6	23.0		

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	23.7	N/A	24.0
		4183	836.6	23.5		
		4233	846.6	23.7		
HSDPA	Subtest 1	4132	826.4	22.8	0	24.0
		4183	836.6	22.7		
		4233	846.6	22.8		
	Subtest 2	4132	826.4	22.8	0	24.0
		4183	836.6	22.7		
		4233	846.6	22.8		
	Subtest 3	4132	826.4	22.2	0.5	23.5
		4183	836.6	22.0		
		4233	846.6	22.3		
	Subtest 4	4132	826.4	22.2	0.5	23.5
		4183	836.6	22.0		
		4233	846.6	22.3		
HSUPA	Subtest 1	4132	826.4	22.9	0	24.0
		4183	836.6	22.4		
		4233	846.6	22.9		
	Subtest 2	4132	826.4	21.5	2	22.0
		4183	836.6	21.5		
		4233	846.6	21.3		
	Subtest 3	4132	826.4	21.8	1	23.0
		4183	836.6	21.0		
		4233	846.6	21.5		
	Subtest 4	4132	826.4	22.0	2	22.0
		4183	836.6	22.0		
		4233	846.6	21.8		
	Subtest 5	4132	826.4	22.9	0	24.0
		4183	836.6	22.6		
		4233	846.6	22.9		

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

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 4 (1710-1755 MHz) is covered by LTE Band 66 (1710-1780 MHz)
   - LTE Band 17 (704-716 MHz) is covered by LTE Band 12 (699-716 MHz)

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 the 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.

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

LTE Band 2 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				18700	18900	19100		
				1860 MHz	1880 MHz	1900 MHz		
20 MHz	QPSK	1	0	23.1	23.3	22.9	0	24
		1	49	23.8	23.8	24.0	0	24
		1	99	23.9	23.0	22.8	0	24
		50	0	22.5	22.6	22.7	1	23
		50	24	22.6	22.6	22.8	1	23
		50	50	22.6	22.6	22.7	1	23
		100	0	22.6	22.6	22.7	1	23
	16QAM	1	0	22.3	22.6	22.5	1	23
		1	49	22.2	22.8	22.8	1	23
		1	99	22.3	22.3	22.1	1	23
		50	0	21.5	21.6	21.7	2	22
		50	24	21.3	21.7	21.7	2	22
		50	50	21.5	21.6	21.8	2	22
		100	0	21.5	21.7	21.7	2	22

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				18675	18900	19125		
				1857.5 MHz	1880 MHz	1902.5 MHz		
15 MHz	QPSK	1	0	23.3	23.5	23.6	0	24
		1	37	23.5	23.8	23.8	0	24
		1	74	23.4	23.3	22.8	0	24
		36	0	22.5	22.5	22.7	1	23
		36	20	22.6	22.6	22.7	1	23
		36	39	22.6	22.6	22.7	1	23
		75	0	22.5	22.6	22.7	1	23
	16QAM	1	0	22.6	22.7	22.8	1	23
		1	37	22.9	22.9	23.0	1	23
		1	74	22.9	22.5	22.1	1	23
		36	0	21.5	21.6	21.9	2	22
		36	20	21.5	21.6	21.8	2	22
		36	39	21.5	21.6	21.8	2	22
		75	0	21.5	21.6	21.8	2	22

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				18650	18900	19150		
				1855 MHz	1880 MHz	1905 MHz		
10 MHz	QPSK	1	0	23.5	23.2	23.9	0	24
		1	25	23.7	23.7	23.8	0	24
		1	49	23.2	23.5	23.1	0	24
		25	0	22.6	22.6	22.7	1	23
		25	12	22.6	22.7	22.9	1	23
		25	25	22.5	22.7	22.7	1	23
		50	0	22.6	22.8	22.8	1	23
	16QAM	1	0	22.5	22.5	22.7	1	23
		1	25	22.7	23.0	22.8	1	23
		1	49	22.5	22.4	22.6	1	23
		25	0	21.7	21.7	21.8	2	22
		25	12	21.8	21.8	21.8	2	22
		25	25	21.6	21.7	21.8	2	22
		50	0	21.5	21.8	21.7	2	22

LTE Band 2 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				18625	18900	19175		
				1852.5 MHz	1880 MHz	1907.5 MHz		
5 MHz	QPSK	1	0	23.4	23.5	23.6	0	24
		1	12	23.7	23.7	24.0	0	24
		1	24	23.6	23.6	23.6	0	24
		12	0	22.4	22.7	22.7	1	23
		12	7	22.4	22.6	22.7	1	23
		12	13	22.6	22.7	22.7	1	23
		25	0	22.5	22.7	22.8	1	23
	16QAM	1	0	21.9	22.3	22.7	1	23
		1	12	22.1	22.3	22.4	1	23
		1	24	22.0	22.2	22.5	1	23
		12	0	21.4	21.7	21.7	2	22
		12	7	21.5	21.7	21.7	2	22
		12	13	21.4	21.7	21.7	2	22
		25	0	21.5	21.8	21.8	2	22

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				18615	18900	19185		
				1851.5 MHz	1880 MHz	1908.5 MHz		
3 MHz	QPSK	1	0	23.4	23.6	23.7	0	24
		1	8	23.3	23.4	23.8	0	24
		1	14	23.4	23.4	23.7	0	24
		8	0	22.4	22.6	22.7	1	23
		8	4	22.4	22.6	22.8	1	23
		8	7	22.5	22.6	22.8	1	23
		15	0	22.5	22.7	22.8	1	23
	16QAM	1	0	22.4	22.5	22.7	1	23
		1	8	22.5	22.5	22.8	1	23
		1	14	22.5	22.3	22.6	1	23
		8	0	21.5	21.9	21.5	2	22
		8	4	21.5	21.8	21.6	2	22
		8	7	21.5	21.7	21.6	2	22
		15	0	21.4	21.7	21.9	2	22

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				18607	18900	19193		
				1850.7 MHz	1880 MHz	1909.3 MHz		
1.4 MHz	QPSK	1	0	23.4	23.7	23.4	0	24
		1	3	23.7	23.7	23.7	0	24
		1	5	23.8	23.8	23.7	0	24
		3	0	23.6	23.7	23.6	0	24
		3	1	23.5	23.7	23.7	0	24
		3	3	23.6	23.6	23.6	0	24
		6	0	22.5	22.7	22.7	1	23
	16QAM	1	0	22.4	23.0	22.7	1	23
		1	3	22.7	23.0	22.6	1	23
		1	5	22.4	22.6	22.6	1	23
		3	0	23.0	22.8	22.4	1	23
		3	1	23.0	22.8	22.5	1	23
		3	3	23.0	22.9	22.5	1	23
		6	0	21.4	21.9	21.8	2	22

LTE Band 5 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				[redacted]	20525	[redacted]		
					836.5 MHz			
10 MHz	QPSK	1	0		23.0		0	24
		1	25		23.1		0	24
		1	49		23.1		0	24
		25	0		22.1		1	23
		25	12		22.1		1	23
		25	25		22.0		1	23
		50	0		22.0		1	23
	16QAM	1	0		22.0		1	23
		1	25		22.1		1	23
		1	49		21.8		1	23
		25	0		21.1		2	22
		25	12		21.2		2	22
		25	25		21.0		2	22
		50	0		21.0		2	22

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				20425	20525	20625		
				826.5 MHz	836.5 MHz	846.5 MHz		
5 MHz	QPSK	1	0	23.0	22.9	22.9	0	24
		1	12	23.4	23.2	23.3	0	24
		1	24	23.2	22.9	23.1	0	24
		12	0	22.2	22.0	22.0	1	23
		12	7	22.4	22.0	22.0	1	23
		12	13	22.4	22.0	22.1	1	23
		25	0	22.3	22.0	21.9	1	23
	16QAM	1	0	21.9	21.4	22.1	1	23
		1	12	22.3	21.5	22.2	1	23
		1	24	22.0	21.6	21.8	1	23
		12	0	21.2	20.9	20.9	2	22
		12	7	21.2	20.9	21.0	2	22
		12	13	21.3	20.9	21.0	2	22
		25	0	21.2	21.0	21.0	2	22

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				20415	20525	20635		
				825.5 MHz	836.5 MHz	847.5 MHz		
3 MHz	QPSK	1	0	23.0	23.0	22.9	0	24
		1	8	23.3	22.9	23.0	0	24
		1	14	23.3	23.1	23.0	0	24
		8	0	22.3	22.0	21.9	1	23
		8	4	22.2	22.0	22.1	1	23
		8	7	22.3	22.0	22.1	1	23
		15	0	22.3	22.0	22.0	1	23
	16QAM	1	0	22.2	22.2	21.9	1	23
		1	8	22.4	22.0	22.3	1	23
		1	14	22.2	21.9	21.8	1	23
		8	0	21.3	20.8	20.7	2	22
		8	4	21.4	20.9	20.7	2	22
		8	7	21.7	20.9	20.6	2	22
		15	0	21.4	21.0	21.2	2	22

LTE Band 5 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				20407	20525	20643		
				824.7 MHz	836.5 MHz	848.3 MHz		
1.4 MHz	QPSK	1	0	23.1	23.1	22.7	0	24
		1	3	23.3	23.3	22.8	0	24
		1	5	23.2	23.0	23.0	0	24
		3	0	23.1	23.0	23.0	0	24
		3	1	23.3	23.0	23.0	0	24
		3	3	23.2	23.0	23.0	0	24
		6	0	22.2	21.9	22.1	1	23
	16QAM	1	0	22.2	22.2	21.9	1	23
		1	3	22.4	22.2	22.0	1	23
		1	5	22.3	22.2	22.0	1	23
		3	0	22.4	22.2	22.0	1	23
		3	1	22.3	22.2	21.9	1	23
		3	3	22.3	22.2	22.0	1	23
		6	0	21.4	20.8	21.0	2	22

LTE Band 12 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				[redacted]	23095	[redacted]		
					707.5 MHz			
10 MHz	QPSK	1	0		23.1		0	24
		1	25		23.2		0	24
		1	49		23.1		0	24
		25	0		22.2		1	23
		25	12		22.1		1	23
		25	25		22.1		1	23
		50	0		22.1		1	23
	16QAM	1	0		21.6		1	23
		1	25		22.1		1	23
		1	49		22.0		1	23
		25	0		21.3		2	22
		25	12		21.0		2	22
		25	25		21.1		2	22
		50	0		21.1		2	22

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	23.4	23.0	23.2	0	24
		1	12	23.6	23.3	23.4	0	24
		1	24	23.3	23.2	22.9	0	24
		12	0	22.4	22.2	22.2	1	23
		12	7	22.3	22.2	22.3	1	23
		12	13	22.2	22.1	22.2	1	23
		25	0	22.3	22.2	22.1	1	23
	16QAM	1	0	21.9	21.8	22.2	1	23
		1	12	22.4	21.7	22.5	1	23
		1	24	22.2	21.6	22.1	1	23
		12	0	21.4	21.1	21.1	2	22
		12	7	21.3	21.1	21.3	2	22
		12	13	21.2	21.2	21.2	2	22
		25	0	21.3	21.2	21.2	2	22

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	23.6	23.3	23.3	0	24
		1	8	23.5	23.1	23.3	0	24
		1	14	23.4	23.0	23.2	0	24
		8	0	22.5	22.2	22.3	1	23
		8	4	22.4	22.1	22.2	1	23
		8	7	22.3	22.1	22.1	1	23
		15	0	22.3	22.1	22.2	1	23
	16QAM	1	0	22.0	21.6	22.2	1	23
		1	8	22.5	22.3	22.8	1	23
		1	14	22.4	22.4	22.0	1	23
		8	0	21.5	21.2	21.2	2	22
		8	4	21.5	21.2	21.0	2	22
		8	7	21.4	21.5	21.0	2	22
		15	0	21.1	21.2	21.2	2	22

LTE Band 12 Measured Results (continued)

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	23.0	23.2	0	24
		1	3	23.3	23.0	23.0	0	24
		1	5	23.4	23.2	23.2	0	24
		3	0	23.2	23.1	23.1	0	24
		3	1	23.3	23.2	23.1	0	24
		3	3	23.3	23.1	23.1	0	24
		6	0	22.7	22.2	22.1	1	23
	16QAM	1	0	22.3	22.3	22.2	1	23
		1	3	22.4	22.4	22.1	1	23
		1	5	22.4	22.0	22.0	1	23
		3	0	22.2	22.1	22.3	1	23
		3	1	22.3	22.2	22.1	1	23
		3	3	22.3	22.2	22.2	1	23
		6	0	21.4	21.1	21.0	2	22

LTE Band 13 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				[redacted]	23230 / 782 MHz	[redacted]		
10 MHz	QPSK	1	0		23.0		0	24
		1	25		23.6		0	24
		1	49		23.0		0	24
		25	0		22.2		1	23
		25	12		22.2		1	23
		25	25		22.2		1	23
		50	0		22.0		1	23
	16QAM	1	0		22.1		1	23
		1	25		22.4		1	23
		1	49		22.1		1	23
		25	0		21.1		2	22
		25	12		21.3		2	22
		25	25		21.1		2	22
		50	0		21.0		2	22

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				[redacted]	23230 / 782 MHz	[redacted]		
5 MHz	QPSK	1	0		23.1		0	24
		1	12		23.8		0	24
		1	24		23.0		0	24
		12	0		22.1		1	23
		12	7		22.2		1	23
		12	13		22.2		1	23
		25	0		22.1		1	23
	16QAM	1	0		21.9		1	23
		1	12		22.1		1	23
		1	24		21.8		1	23
		12	0		20.9		2	22
		12	7		21.2		2	22
		12	13		21.3		2	22
		25	0		20.9		2	22

LTE Band 14 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)		MPR	Tune-up Limit
				[redacted]	23330 / 793 MHz		
10 MHz	QPSK	1	0		23.1	0	24
		1	25		23.5	0	24
		1	49		23.0	0	24
		25	0		22.2	1	23
		25	12		22.2	1	23
		25	25		22.2	1	23
		50	0		22.1	1	23
	16QAM	1	0		22.1	1	23
		1	25		22.0	1	23
		1	49		21.5	1	23
		25	0		21.3	2	22
		25	12		21.2	2	22
		25	25		21.1	2	22
		50	0		21.0	2	22

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)		MPR	Tune-up Limit
				[redacted]	23330 / 793 MHz		
5 MHz	QPSK	1	0		23.0	0	24
		1	12		23.3	0	24
		1	24		23.0	0	24
		12	0		22.3	1	23
		12	7		22.2	1	23
		12	13		22.2	1	23
		25	0		22.1	1	23
	16QAM	1	0		22.0	1	23
		1	12		21.6	1	23
		1	24		21.5	1	23
		12	0		21.0	2	22
		12	7		21.1	2	22
		12	13		21.0	2	22
		25	0		21.0	2	22

LTE Band 66 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				132072	132322	132572		
				1720 MHz	1745 MHz	1770 MHz		
20 MHz	QPSK	1	0	22.6	22.3	22.4	0	24
		1	49	22.8	22.1	22.6	0	24
		1	99	22.6	22.3	22.3	0	24
		50	0	21.4	21.6	21.3	1	23
		50	24	21.5	21.3	21.4	1	23
		50	50	21.5	21.4	21.5	1	23
		100	0	21.5	21.4	21.3	1	23
	16QAM	1	0	21.0	21.7	21.9	1	23
		1	49	21.0	21.1	21.3	1	23
		1	99	21.2	21.0	21.0	1	23
		50	0	20.2	20.7	20.3	2	22
		50	24	20.2	20.4	20.3	2	22
		50	50	20.4	20.3	20.4	2	22
		100	0	20.5	20.5	20.2	2	22

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				132047	132322	132597		
				1717.5 MHz	1745 MHz	1772.5 MHz		
15 MHz	QPSK	1	0	22.8	22.7	22.5	0	24
		1	37	22.6	23.0	22.3	0	24
		1	74	22.6	22.5	22.3	0	24
		36	0	21.6	21.6	21.4	1	23
		36	20	21.5	21.5	21.5	1	23
		36	39	21.6	21.4	21.4	1	23
		75	0	21.6	21.5	21.4	1	23
	16QAM	1	0	22.3	21.7	21.3	1	23
		1	37	21.8	21.9	21.6	1	23
		1	74	22.2	21.3	21.0	1	23
		36	0	20.5	20.6	20.4	2	22
		36	20	20.4	20.5	20.5	2	22
		36	39	20.5	20.5	20.4	2	22
		75	0	20.6	20.4	20.4	2	22

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				132022	132322	132622		
				1715 MHz	1745 MHz	1775 MHz		
10 MHz	QPSK	1	0	22.7	22.9	22.6	0	24
		1	25	22.6	22.9	22.8	0	24
		1	49	22.4	22.5	22.5	0	24
		25	0	21.7	21.6	21.5	1	23
		25	12	21.5	21.6	21.5	1	23
		25	25	21.4	21.5	21.4	1	23
		50	0	21.6	21.5	21.4	1	23
	16QAM	1	0	21.6	21.6	21.2	1	23
		1	25	21.4	21.3	21.5	1	23
		1	49	21.0	21.1	21.1	1	23
		25	0	21.0	20.6	20.7	2	22
		25	12	20.5	20.6	20.7	2	22
		25	25	20.6	20.5	20.6	2	22
		50	0	20.6	20.5	20.5	2	22

LTE Band 66 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				131997	132322	132647		
				1712.5 MHz	1745 MHz	1777.5 MHz		
5 MHz	QPSK	1	0	22.4	22.5	22.6	0	24
		1	12	22.4	22.5	22.6	0	24
		1	24	22.2	22.7	22.5	0	24
		12	0	21.6	21.6	21.6	1	23
		12	7	21.5	21.6	21.5	1	23
		12	13	21.6	21.6	21.6	1	23
		25	0	21.7	21.5	21.5	1	23
	16QAM	1	0	21.6	21.3	21.3	1	23
		1	12	21.8	21.6	21.5	1	23
		1	24	21.5	21.3	21.0	1	23
		12	0	20.6	20.4	20.8	2	22
		12	7	20.7	20.6	20.8	2	22
		12	13	20.7	20.7	20.4	2	22
		25	0	20.8	20.5	20.6	2	22

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				131987	132322	132657		
				1711.5 MHz	1745 MHz	1778.5 MHz		
3 MHz	QPSK	1	0	22.8	22.9	22.8	0	24
		1	8	23.0	23.1	22.8	0	24
		1	14	22.9	22.9	22.6	0	24
		8	0	21.8	21.5	21.6	1	23
		8	4	21.8	21.6	21.5	1	23
		8	7	21.9	21.6	21.6	1	23
		15	0	21.8	21.5	21.6	1	23
	16QAM	1	0	21.6	21.6	21.5	1	23
		1	8	21.5	21.6	21.7	1	23
		1	14	21.5	21.4	21.3	1	23
		8	0	20.4	20.5	20.6	2	22
		8	4	20.5	20.8	20.9	2	22
		8	7	20.7	20.7	20.9	2	22
		15	0	20.7	20.7	20.7	2	22

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				131979	132322	132665		
				1710.7 MHz	1745 MHz	1779.3 MHz		
1.4 MHz	QPSK	1	0	22.7	22.7	22.7	0	24
		1	3	23.1	22.9	23.0	0	24
		1	5	23.1	22.9	22.7	0	24
		3	0	22.9	22.7	22.7	0	24
		3	1	23.0	22.7	22.8	0	24
		3	3	23.0	22.7	22.8	0	24
		6	0	22.0	21.7	21.5	1	23
	16QAM	1	0	21.9	21.5	21.4	1	23
		1	3	21.7	21.6	21.4	1	23
		1	5	21.8	21.6	21.4	1	23
		3	0	21.9	21.4	21.2	1	23
		3	1	21.7	21.5	21.2	1	23
		3	3	21.7	21.6	21.6	1	23
		6	0	21.0	20.8	20.4	2	22

10. Measured and Reported (Scaled) SAR Results

SAR Test Reduction criteria are as follows:

- Reported SAR(W/kg) for WWAN and Bluetooth = 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.

10.1. W-CDMA Band II

RF Exposure Conditions	Mode	With Clip	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	Yes	0	Rear	9400	1880.0	24.0	23.9	0.311	**0.322**	1
RF Exposure Conditions	Mode	With Clip	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		10-g SAR (W/kg)		Plot No.
							Tune-up Limit	Meas.	Meas.	Scaled	
Extremity	Rel 99 RMC	No	0	Rear	9400	1880.0	24.0	23.9	0.751	0.777	
				Edge 1	9400	1880.0	24.0	23.9	0.088	0.091	
				Edge 2	9400	1880.0	24.0	23.9	0.672	0.696	
				Edge 3	9262	1852.4	24.0	24.0	1.160	1.160	
					9400	1880.0	24.0	23.9	2.040	**2.112**	2
					9538	1907.6	24.0	23.9	1.170	1.186	
				Edge 4	9400	1880.0	24.0	23.9	0.135	0.140	

10.2. W-CDMA Band IV

RF Exposure Conditions	Mode	With Clip	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	Yes	0	Rear	1513	1752.6	24.0	24.0	0.529	**0.529**	3
RF Exposure Conditions	Mode	With Clip	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		10-g SAR (W/kg)		Plot No.
							Tune-up Limit	Meas.	Meas.	Scaled	
Extremity	Rel 99 RMC 12.2 kbps	No	0	Rear	1513	1752.6	24.0	24.0	1.350	1.350	
				Edge 1	1513	1752.6	24.0	24.0	0.040	0.040	
				Edge 2	1513	1752.6	24.0	24.0	0.680	0.680	
				Edge 3	1513	1752.6	24.0	24.0	1.700	**1.700**	4
				Edge 4	1513	1752.6	24.0	24.0	0.111	0.111	

10.3. W-CDMA Band V

RF Exposure Conditions	Mode	With Clip	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	Yes	0	Rear	4183	836.6	24.0	23.5	0.321	**0.360**	5
RF Exposure Conditions	Mode	With Clip	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		10-g SAR (W/kg)		Plot No.
							Tune-up Limit	Meas.	Meas.	Scaled	
Extremity	Rel 99 RMC 12.2 kbps	No	0	Rear	4183	836.6	24.0	23.5	0.582	0.653	
				Edge 1	4183	836.6	24.0	23.5	0.057	0.064	
				Edge 2	4183	836.6	24.0	23.5	0.431	0.484	
				Edge 3	4183	836.6	24.0	23.5	0.974	**1.093**	6
				Edge 4	4183	836.6	24.0	23.5	0.409	0.459	

10.4. LTE Band 2 (20MHz Bandwidth)

RF Exposure Conditions	Mode	With Clip	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	Yes	0	Rear	18900	1880.0	1	49	24.0	23.8	0.678	**0.710**	7
							50	0	23.0	22.6	0.464	0.509	
RF Exposure Conditions	Mode	With Clip	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		10-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Extremity	QPSK	No	0	Rear	18900	1880.0	1	49	24.0	23.8	1.500	1.571	
							50	0	23.0	22.6	1.170	1.283	
				Edge 1	18900	1880.0	1	49	24.0	23.8	0.066	0.069	
							50	0	23.0	22.6	0.054	0.059	
				Edge 2	18900	1880.0	1	49	24.0	23.8	1.040	1.089	
							50	0	23.0	22.6	0.788	0.864	
				Edge 3	18900	1880.0	1	49	24.0	23.8	1.590	**1.665**	8
							50	0	23.0	22.6	1.260	1.382	
				Edge 4	18900	1880.0	1	49	24.0	23.8	0.090	0.094	
							50	0	23.0	22.6	0.072	0.079	

10.5. LTE Band 5 (10MHz Bandwidth)

RF Exposure Conditions	Mode	With Clip	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	Yes	0	Rear	20525	836.5	1	25	24.0	23.1	0.420	**0.517**	9
							25	0	23.0	22.1	0.335	0.412	
RF Exposure Conditions	Mode	With Clip	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		10-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Extremity	QPSK	No	0	Rear	20525	836.5	1	25	24.0	23.1	0.568	0.699	
							25	0	23.0	22.1	0.446	0.549	
				Edge 1	20525	836.5	1	25	24.0	23.1	0.076	0.094	
							25	0	23.0	22.1	0.061	0.075	
				Edge 2	20525	836.5	1	25	24.0	23.1	0.378	0.465	
							25	0	23.0	22.1	0.312	0.384	
				Edge 3	20525	836.5	1	25	24.0	23.1	0.926	**1.139**	10
							25	0	23.0	22.1	0.725	0.892	
				Edge 4	20525	836.5	1	25	24.0	23.1	0.331	0.407	
							25	0	23.0	22.1	0.266	0.327	

10.6. LTE Band 12 (10MHz Bandwidth)

RF Exposure Conditions	Mode	With Clip	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	Yes	0	Rear	23095	707.5	1	25	24.0	23.2	0.474	**0.570**	11
							25	0	23.0	22.2	0.360	0.433	
RF Exposure Conditions	Mode	With Clip	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		10-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Extremity	QPSK	No	0	Rear	23095	707.5	1	25	24.0	23.2	0.862	1.036	
							25	0	23.0	22.2	0.709	0.852	
				Edge 1	23095	707.5	1	25	24.0	23.2	0.151	0.182	
							25	0	23.0	22.2	0.111	0.133	
				Edge 2	23095	707.5	1	25	24.0	23.2	0.291	0.350	
							25	0	23.0	22.2	0.238	0.286	
				Edge 3	23095	707.5	1	25	24.0	23.2	0.661	0.795	
							25	0	23.0	22.2	0.488	0.587	
				Edge 4	23095	707.5	1	25	24.0	23.2	0.898	**1.080**	12
							25	0	23.0	22.2	0.680	0.818	

10.7. LTE Band 13 (10MHz Bandwidth)

RF Exposure Conditions	Mode	With Clip	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	Yes	0	Rear	23230	782.0	1	25	24.0	23.6	0.555	**0.609**	13
							25	0	23.0	22.2	0.408	0.491	
RF Exposure Conditions	Mode	With Clip	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		10-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Extremity	QPSK	No	0	Rear	23230	782.0	1	25	24.0	23.6	0.445	0.488	
							25	0	23.0	22.2	0.684	0.822	
				Edge 1	23230	782.0	1	25	24.0	23.6	0.119	0.130	
							25	0	23.0	22.2	0.097	0.117	
				Edge 2	23230	782.0	1	25	24.0	23.6	0.434	0.476	
							25	0	23.0	22.2	0.336	0.404	
				Edge 3	23230	782.0	1	25	24.0	23.6	1.080	**1.184**	14
							25	0	23.0	22.2	0.887	1.066	
				Edge 4	23230	782.0	1	25	24.0	23.6	0.445	0.488	
							25	0	23.0	22.2	0.351	0.422	

10.8. LTE Band 14 (10MHz Bandwidth)

RF Exposure Conditions	Mode	With Clip	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	Yes	0	Rear	23330	793.0	1	25	24.0	23.5	0.512	**0.574**	15
							25	0	23.0	22.2	0.383	0.460	
RF Exposure Conditions	Mode	With Clip	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		10-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Extremity	QPSK	No	0	Rear	23330	793.0	1	25	24.0	23.5	0.797	0.894	
							25	0	23.0	22.2	0.608	0.731	
				Edge 1	23330	793.0	1	25	24.0	23.5	0.148	0.166	
							25	0	23.0	22.2	0.115	0.138	
				Edge 2	23330	793.0	1	25	24.0	23.5	0.510	0.572	
							25	0	23.0	22.2	0.371	0.446	
				Edge 3	23330	793.0	1	25	24.0	23.5	1.040	**1.167**	16
							25	0	23.0	22.2	0.867	1.042	
				Edge 4	23330	793.0	1	25	24.0	23.5	0.590	0.662	
							25	0	23.0	22.2	0.446	0.536	

10.9. LTE Band 66 (20MHz Bandwidth)

RF Exposure Conditions	Mode	With Clip	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	Yes	0	Rear	132322	1745.0	1	0	24.0	22.3	0.517	**0.765**	17
							50	0	23.0	21.6	0.336	0.464	
RF Exposure Conditions	Mode	With Clip	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		10-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Extremity	QPSK	No	0	Rear	132322	1745.0	1	0	24.0	22.3	1.340	1.982	
							50	0	23.0	21.6	1.080	1.491	
				Edge 1	132322	1745.0	1	0	24.0	22.3	0.039	0.058	
							50	0	23.0	21.6	0.024	0.033	
				Edge 2	132322	1745.0	1	0	24.0	22.3	0.614	0.908	
							50	0	23.0	21.6	0.446	0.616	
				Edge 3	132072	1720.0	1	49	24.0	22.8	1.310	1.727	
					132322	1745.0	1	0	24.0	22.3	1.360	**2.012**	18
							50	0	23.0	21.6	1.020	1.408	
					132572	1770.0	1	49	24.0	22.6	1.310	1.808	
				Edge 4	132322	1745.0	1	0	24.0	22.3	0.124	0.183	
							50	0	23.0	21.6	0.091	0.126	

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 (~ 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)
1900	W-CDMA Band II	Extremity	Edge 3	Yes	2.040	1.750	1.17	N/A	N/A	N/A

Note(s):

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

12. Simultaneous Transmission Conditions

RF Exposure Condition	Item	Capable Transmit Configurations				
Body-worn & Extremity	1	WWAN	+	Wi-Fi DTS		
	2	WWAN	+	Wi-Fi U-NII		
	3	WWAN	+	BT		
	4	WWAN	+	Wi-Fi DTS	+	BT
	5	WWAN	+	Wi-Fi U-NII	+	BT

12.1. Simultaneous transmission SAR test exclusion considerations

KDB 447498 D01 General RF Exposure Guidance provides two procedures for determining simultaneous transmission SAR test exclusion: Sum of SAR and SAR to Peak Location Ratio (SPLSR)

12.1.1. Sum of SAR

To qualify for simultaneous transmission SAR test exclusion based upon Sum of SAR the sum of the reported standalone SARs for all simultaneously transmitting antennas shall be below the applicable standalone SAR limit. If the sum of the SARs is above the applicable limit then simultaneous transmission SAR test exclusion may still apply if the requirements of the SAR to Peak Location Ratio (SPLSR) evaluation are met.

12.2. Sum of the SAR for Body-worn WWAN & Wi-Fi & BT

RF Exposure conditions	Test Position	Standalone SAR (W/kg)				∑ 1-g SAR (W/kg)	
		1	2	3	4	1+2+4	1+3+4
		WWAN	Wi-Fi DTS	Wi-Fi U-NII	BT		
Body-worn	Rear	0.765	0.043	0.091	0.000	**0.808**	**0.856**

Conclusion:

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

12.3. Sum of the SAR for Extremity WWAN & Wi-Fi & BT

RF Exposure conditions	Test Position	Standalone SAR (W/kg)				∑ 10-g SAR (W/kg)	
		1	2	3	4	1+2+4	1+3+4
		WWAN	Wi-Fi DTS	Wi-Fi U-NII	BT		
Extremity	Rear	1.982	0.105	0.050	0.004	2.091	2.036
	Edge 1	0.182	0.077	0.016	0.004	0.263	0.202
	Edge 2	1.089	0.248	0.448	0.019	1.356	1.556
	Edge 3	2.112	0.023	0.063	0.000	**2.135**	**2.175**
	Edge 4	1.080	0.086	0.010	0.008	1.174	1.098

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because either the sum of the 10-g SAR is < 4.0 W/kg or the SPLSR is ≤ 0.10 for all circumstances that require SPLSR calculation.

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