FCC SAR TEST REPORT

FCC ID	:	**APYHRO00283**
Equipment	:	**Wireless router**
Applicant	:	**SHARP CORPORATION** **1 Takumi-cho, Sakai-ku, Sakai City, Osaka, Japan 590-8522**
Manufacturer	:	**SHARP CORPORATION** **2-13-1, HACHIHONMATSU-IIDA, HIGASHI-HIROSHIMA-SHI, HIROSHIMA PREFECTURE 739-0192, JAPAN**
Standard	:	**FCC 47 CFR Part 2 (2.1093)** **ANSI/IEEE C95.1-1992** **IEEE 1528-2013**

The product was received on Dec. 17, 2019 and testing was started from Dec. 28, 2019 and completed on Jan. 01, 2020. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Approved by: Cona Huang / Deputy Manager

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)

Table of Contents

1. Statement of Compliance **4**
2. Guidance Applied **4**
3. Equipment Under Test (EUT) Information **5**
3.1 General Information 5
3.2 General LTE SAR Test and Reporting Considerations 6
4. RF Exposure Limits **8**
4.1 Uncontrolled Environment 8
4.2 Controlled Environment 8
5. Specific Absorption Rate (SAR) **9**
5.1 Introduction 9
5.2 SAR Definition 9
6. System Description and Setup **10**
6.1 E-Field Probe 11
6.2 Data Acquisition Electronics (DAE) 11
6.3 Phantom 12
6.4 Device Holder 13
7. Measurement Procedures **14**
7.1 Spatial Peak SAR Evaluation 14
7.2 Power Reference Measurement 15
7.3 Area Scan 15
7.4 Zoom Scan 16
7.5 Volume Scan Procedures 16
7.6 Power Drift Monitoring 16
8. Test Equipment List **17**
9. System Verification **18**
9.1 Tissue Simulating Liquids 18
9.2 Tissue Verification 19
9.3 System Performance Check Results 20
10. RF Exposure Positions **20**
10.1 Wireless Router 20
11. UMTS/LTE Output Power (Unit: dBm) **21**
12. WiFi/Bluetooth Output Power (Unit: dBm) **48**
13. Antenna Location **51**
14. SAR Test Results **52**
14.1 Hotspot SAR 54
14.2 Repeated SAR Measurement 57
14.3 LTE Band 41 Power Class 2 and Power Class 3 Linearity 57
15. Simultaneous Transmission Analysis **58**
15.1 Hotspot Exposure Conditions 58
16. Uncertainty Assessment **60**
17. References **60**
Appendix A. Plots of System Performance Check
Appendix B. Plots of High SAR Measurement
Appendix C. DASY Calibration Certificate
Appendix D. Test Setup Photos

History of this test report

Report No.	Version	Description	Issued Date
FA9O0422-06	01	Initial issue of report	Feb. 14, 2020

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for SHARP CORPORATION, Wireless router, are as follows.

Equipment Class	Frequency Band	Highest SAR Summary Hotspot (Separation 10mm) 1g SAR (W/kg)	Highest Simultaneous Transmission 1g SAR (W/kg)
Licensed	WCDMA II	1.37	1.38
	WCDMA IV	1.17	
	WCDMA V	1.06	
	LTE Band 2	1.16	
	LTE Band 4	0.85	
	LTE Band 5	0.77	
	LTE Band 7	0.85	
	LTE Band 12 / 17	0.27	
	LTE Band 13	0.39	
	LTE Band 38 / 41	0.60	
DTS	2.4GHz WLAN	0.12	
Date of Testing:		2019/12/28 ~ 2020/1/1	

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190) and the FCC designation No. TW1190 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC test. This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications

Reviewed by: Jason Wang
Report Producer: Wan Liu

2. Guidance Applied

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards:

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB 941225 D01 3G SAR Procedures v03r01
- FCC KDB 941225 D05 SAR for LTE Devices v02r05
- FCC KDB 941225 D05A Rel.10 LTE SAR Test Guidance v01r02
- FCC KDB 941225 D06 Hotspot Mode SAR v02r01

3. Equipment Under Test (EUT) Information

3.1 General Information

Product Feature & Specification	
Equipment Name	Wireless router
FCC ID	APYHRO00283
IMEI Code	004401117164638
Wireless Technology and Frequency Range	WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz WCDMA Band IV: 1712.4 MHz ~ 1752.6 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz LTE Band 2: 1850.7 MHz ~ 1909.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 7: 2502.5 MHz ~ 2567.5 MHz LTE Band 12: 699.7 MHz ~ 715.3 MHz LTE Band 13: 779.5 MHz ~ 784.5 MHz LTE Band 17: 706.5 MHz ~ 713.5 MHz LTE Band 38: 2572.5 MHz ~ 2617.5 MHz LTE Band 41: 2498.5 MHz ~ 2687.5 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz
Mode	RMC 12.2Kbps HSDPA HSUPA LTE: QPSK, 16QAM, 64QAM WLAN: 802.11b/g/n/ax HT20 / HT40 / HE20 / HE40
EUT Stage	Identical Prototype

3.2 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r05	
FCC ID	APYHRO00283
Equipment Name	Wireless router
Operating Frequency Range of each LTE transmission band	LTE Band 2: 1850.7 MHz ~ 1909.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 7: 2502.5 MHz ~ 2567.5 MHz LTE Band 12: 699.7 MHz ~ 715.3 MHz LTE Band 13: 779.5 MHz ~ 784.5 MHz LTE Band 17: 706.5 MHz ~ 713.5 MHz LTE Band 38: 2572.5 MHz ~ 2617.5 MHz LTE Band 41: 2498.5 MHz ~ 2687.5 MHz
Channel Bandwidth	LTE Band 02:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 04:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 05:1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 07: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 12:1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 13: 5MHz, 10MHz LTE Band 17: 5MHz, 10MHz LTE Band 38: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 41: 5MHz, 10MHz, 15MHz, 20MHz
uplink modulations used	QPSK / 16QAM / 64QAM
LTE Voice / Data requirements	Data only
LTE MPR permanently built-in by design	**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

LTE A-MPR	In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)
Spectrum plots for RB configuration	A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.
LTE Carrier Aggregation Combinations	Intra-Band possible combinations and the detail power measurement please referred to section 12.
LTE Carrier Aggregation Additional Information	1. This device supports LTE Carrier Aggregation (CA) in the uplink for LTE B41 with two component carriers in the uplink. SAR Measurements and conducted powers were evaluated per FCC Guidance. 2. Additional following LTE Release features are not supported: Relay, HetNet, Enhanced MIMO, eICI, WiFi Offloading, MDH, eMBMA, Cross-Carrier Scheduling, Enhanced SC-FDMA.

Transmission (H, M, L) channel numbers and frequencies in each LTE band

LTE Band 2

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	18607	1850.7	18615	1851.5	18625	1852.5	18650	1855	18675	1857.5	18700	1860
M	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880
H	19193	1909.3	19185	1908.5	19175	1907.5	19150	1905	19125	1902.5	19100	1900

LTE Band 4												
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	19957	1710.7	19965	1711.5	19975	1712.5	20000	1715	20025	1717.5	20050	1720
M	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5
H	20393	1754.3	20385	1753.5	20375	1752.5	20350	1750	20325	1747.5	20300	1745

LTE Band 5								
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20407	824.7	20415	825.5	20425	826.5	20450	829
M	20525	836.5	20525	836.5	20525	836.5	20525	836.5
H	20643	848.3	20635	847.5	20625	846.5	20600	844

LTE Band 7								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20775	2502.5	20800	2505	20825	2507.5	20850	2510
M	21100	2535	21100	2535	21100	2535	21100	2535
H	21425	2567.5	21400	2565	21375	2562.5	21350	2560

LTE Band 12								
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	23017	699.7	23025	700.5	23035	701.5	23060	704
M	23095	707.5	23095	707.5	23095	707.5	23095	707.5
H	23173	715.3	23165	714.5	23155	713.5	23130	711

LTE Band 13				
	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Freq.(MHz)	Channel #	Freq.(MHz)
L	23205	779.5	23230	782
M	23230	782		
H	23255	784.5		

LTE Band 17				
	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Freq.(MHz)	Channel #	Freq. (MHz)
L	23755	706.5	23780	709
M	23790	710	23790	710
H	23825	713.5	23800	711

LTE Band 38								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	37775	2572.5	37800	2575	37825	2577.5	37850	2580
M	38000	2595	38000	2595	38000	2595	38000	2595
H	38225	2617.5	38200	2615	38175	2612.5	38150	2610

LTE Band 41								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	39675	2498.5	39700	2501	39725	2503.5	39750	2506
L M	40148	2545.8	40160	2547	40173	2548.3	40185	2549.5
M	40620	2593	40620	2593	40620	2593	40620	2593
H M	41093	2640.3	41080	2639	41068	2637.8	41055	2636.5
H	41565	2687.5	41540	2685	41515	2682.5	41490	2680

4. RF Exposure Limits

4.1 Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

4.2 Controlled Environment

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. The exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

1. Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

5. Specific Absorption Rate (SAR)

5.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

5.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

$$\mathbf{SAR} = \frac{\mathbf{d}}{\mathbf{dt}}\left(\frac{\mathbf{dW}}{\mathbf{dm}}\right) = \frac{\mathbf{d}}{\mathbf{dt}}\left(\frac{\mathbf{dW}}{\boldsymbol{\rho}\mathbf{dv}}\right)$$

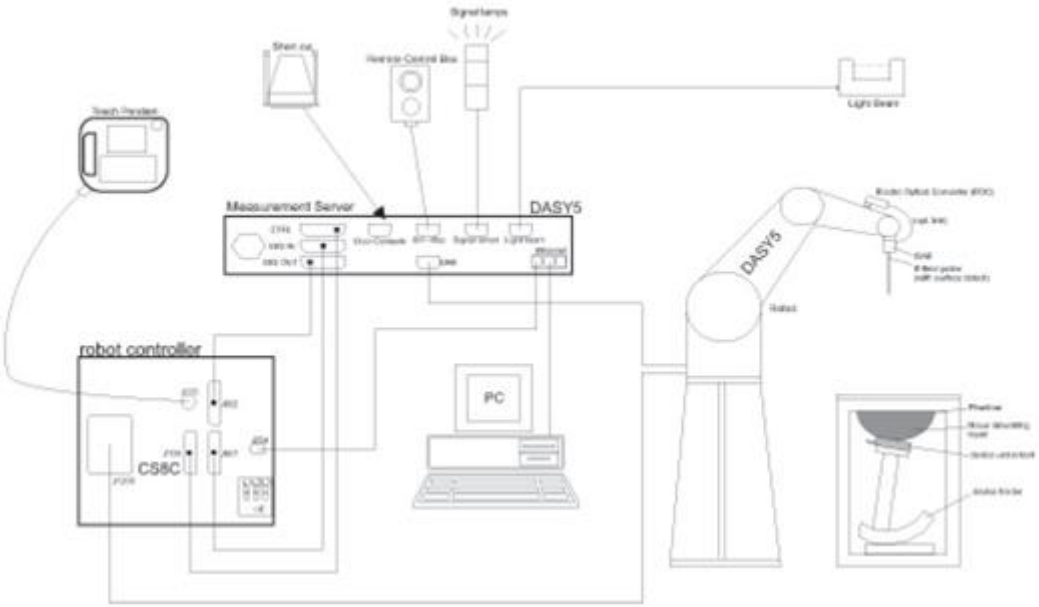
SAR is expressed in units of Watts per kilogram (W/kg)

$$\mathbf{SAR} = \frac{\boldsymbol{\sigma}|\mathbf{E}|^{\mathbf{2}}}{\boldsymbol{\rho}}$$

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

6. System Description and Setup

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 WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

6.1 E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG).The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

<ES3DV3 Probe>

Construction	Symmetric design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz – 4 GHz; Linearity: ±0.2 dB (30 MHz – 4 GHz)	
Directivity	±0.2 dB in TSL (rotation around probe axis) ±0.3 dB in TSL (rotation normal to probe axis)	
Dynamic Range	5 µW/g – >100 mW/g; Linearity: ±0.2 dB	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 3.9 mm (body: 12 mm) Distance from probe tip to dipole centers: 3.0 mm	

<EX3DV4 Probe>

Construction	Symmetric design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz – >6 GHz Linearity: ±0.2 dB (30 MHz – 6 GHz)	
Directivity	±0.3 dB in TSL (rotation around probe axis) ±0.5 dB in TSL (rotation normal to probe axis)	
Dynamic Range	10 µW/g – >100 mW/g Linearity: ±0.2 dB (noise: typically <1 µW/g)	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 2.5 mm (body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	

6.2 Data Acquisition Electronics (DAE)

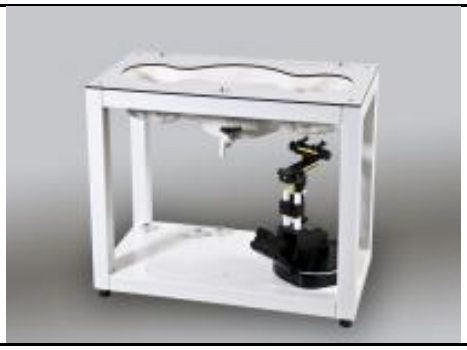
The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.

The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

Fig 5.1 Photo of DAE

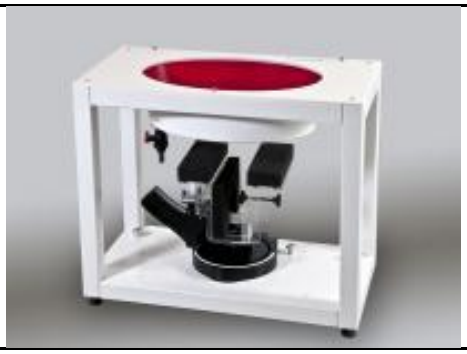
6.3 Phantom

<SAM Twin Phantom>

Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm	
Filling Volume	Approx. 25 liters	
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet	
Measurement Areas	Left Hand, Right Hand, Flat Phantom	

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

<ELI Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%)	
Filling Volume	Approx. 30 liters	
Dimensions	Major ellipse axis: 600 mm Minor axis: 400 mm	

The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

6.4 Device Holder

<Mounting Device for Hand-Held Transmitter>

In combination with the Twin SAM V5.0/V5.0c or ELI phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). And upgrade kit to Mounting Device to enable easy mounting of wider devices like big smart-phones, e-books, small tablets, etc. It holds devices with width up to 140 mm.

Mounting Device for Hand-Held Transmitters

Mounting Device Adaptor for Wide-Phones

<Mounting Device for Laptops and other Body-Worn Transmitters>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.

Mounting Device for Laptops

7. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

(a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
(b) Read the WWAN RF power level from the base station simulator.
(c) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band
(d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

<SAR measurement>

(a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
(b) Place the EUT in the positions as Appendix D demonstrates.
(c) Set scan area, grid size and other setting on the DASY software.
(d) Measure SAR results for the highest power channel on each testing position.
(e) Find out the largest SAR result on these testing positions of each band
(f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

(a) Power reference measurement
(b) Area scan
(c) Zoom scan
(d) Power drift measurement

7.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

7.2 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. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

7.3 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 found in the scanned area, within a range of the global maximum. The range (in dB0 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 FCC KDB 865664 D01v01r04 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.	

7.4 Zoom Scan

Zoom scans are used assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube shoes 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 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01v01r04 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.

7.5 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

7.6 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.

8. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V3	1107	Mar. 08, 2019	Mar. 07, 2020
SPEAG	835MHz System Validation Kit	D835V2	4d167	Nov. 25, 2019	Nov. 24, 2020
SPEAG	1750MHz System Validation Kit	D1750V2	1112	Mar. 07, 2019	Mar. 06, 2020
SPEAG	1900MHz System Validation Kit	D1900V2	5d185	Mar. 07, 2019	Mar. 06, 2020
SPEAG	2450MHz System Validation Kit	D2450V2	929	Nov. 21, 2019	Nov. 20, 2020
SPEAG	2600MHz System Validation Kit	D2600V2	1008	Aug. 31, 2018	Aug. 29, 2020
SPEAG	Data Acquisition Electronics	DAE3	495	May. 21, 2019	May. 20, 2020
SPEAG	Data Acquisition Electronics	DAE4	778	May. 21, 2019	May. 20, 2020
SPEAG	Dosimetric E-Field Probe	EX3DV4	3728	Jan. 15, 2019	Jan. 14, 2020
SPEAG	Dosimetric E-Field Probe	EX3DV4	3931	Sep. 26, 2019	Sep. 25, 2020
RCPTWN	Thermometer	HTC-1	TM685-1	Nov. 12, 2019	Nov. 11, 2020
RCPTWN	Thermometer	HTC-1	TM560-2	Nov. 12, 2019	Nov. 11, 2020
Anritsu	Radio Communication Analyzer	MT8821C	6201341950	Oct. 31, 2019	Oct. 30, 2020
Agilent	Wireless Communication Test Set	E5515C	MY50267236	Apr. 01, 2019	Mar. 31, 2020
SPEAG	Device Holder	N/A	N/A	N/A	N/A
Anritsu	Signal Generator	MG3710A	6201502524	Nov. 20, 2019	Nov. 19, 2020
Agilent	ENA Network Analyzer	E5071C	MY46104758	Sep. 06, 2019	Sep. 05, 2020
SPEAG	Dielectric Probe Kit	DAK-3.5	1126	Sep. 18, 2019	Sep. 17, 2020
LINE SEIKI	Digital Thermometer	DTM3000-spezial	3169	Sep. 10, 2019	Sep. 09, 2020
Anritsu	Power Meter	ML2495A	1036004	Aug. 08, 2019	Aug. 07, 2020
Anritsu	Power Sensor	MA2411B	1027253	Aug. 08, 2019	Aug. 07, 2020
Anritsu	Power Meter	ML2495A	1419002	May. 29, 2019	May. 28, 2020
Anritsu	Power Sensor	MA2411B	1339124	May. 29, 2019	May. 28, 2020
Agilent	Spectrum Analyzer	E4408B	MY44211028	Aug. 27, 2019	Aug. 26, 2020
Anritsu	Spectrum Analyzer	MS2830A	6201396378	Jun. 27, 2019	Jun. 26, 2020
Mini-Circuits	Power Amplifier	ZVE-8G+	6418	Oct. 16, 2019	Oct. 15, 2020
Mini-Circuits	Power Amplifier	ZVE-8G+	6382	Aug. 12, 2019	Aug. 11, 2020
ATM	Dual Directional Coupler	C122H-10	P610410z-02	Note 1	
Woken	Attenuator 1	WK0602-XX	N/A	Note 1	
PE	Attenuator 2	PE7005-10	N/A	Note 1	
PE	Attenuator 3	PE7005- 3	N/A	Note 1	

General Note:

1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.
2. Referring to KDB 865664 D01v01r04, the dipole calibration interval can be extended to 3 years with justification. The dipoles are also not physically damaged, or repaired during the interval.
3. The justification data of dipole D2600V2, SN: 1008 can be found in appendix C. The return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration.

9. System Verification

9.1 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.1. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.2.

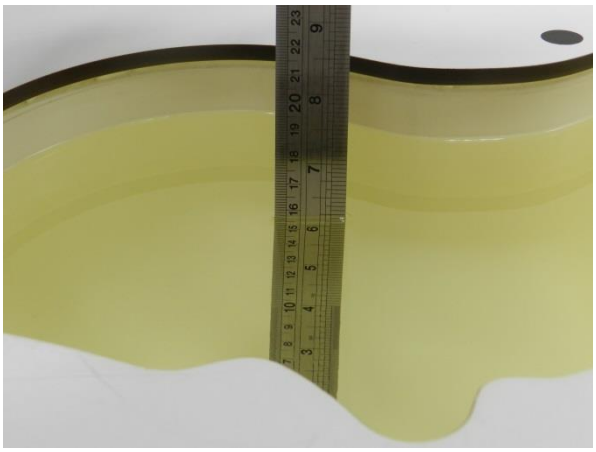


Fig 10.1Photo of Liquid Height for Head SAR

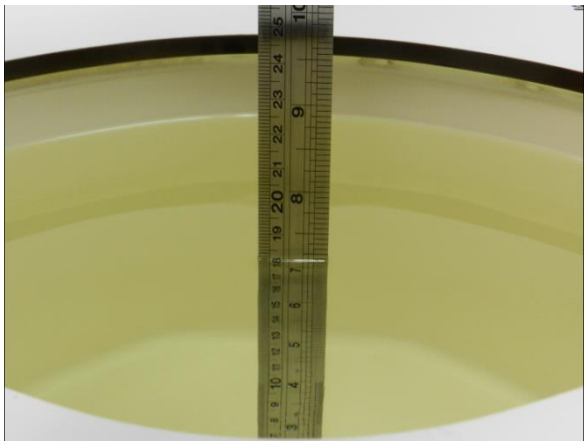


Fig 10.2 Photo of Liquid Height for Body SAR

9.2 Tissue Verification

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

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
900	40.3	57.9	0.2	1.4	0.2	0	0.97	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
2600	54.8	0	0	0.1	0	45.1	1.96	39.0

Simulating Liquid for 5GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	64~78%
Mineral oil	11~18%
Emulsifiers	9~15%
Additives and Salt	2~3%

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
750	22.7	0.890	42.349	0.89	41.90	0.00	1.07	±5	2019/12/31
835	22.7	0.894	42.284	0.90	41.50	-0.67	1.89	±5	2019/12/31
1750	22.5	1.385	40.729	1.37	40.10	1.09	1.57	±5	2019/12/29
1900	22.5	1.450	40.254	1.40	40.00	3.57	0.63	±5	2019/12/29
2450	22.3	1.818	39.796	1.80	39.20	1.00	1.52	±5	2020/1/1
2600	22.6	1.947	38.429	1.96	39.00	-0.66	-1.46	±5	2019/12/28

9.3 System Performance Check Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

Date	Frequency (MHz)	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2019/12/31	750	250	D750V3-1107	EX3DV4 - SN3931	DAE3 Sn495	2.24	8.32	8.96	7.69
2019/12/31	835	250	D835V2-4d167	EX3DV4 - SN3931	DAE3 Sn495	2.36	9.55	9.44	-1.15
2019/12/29	1750	250	D1750V2-1112	EX3DV4 - SN3728	DAE4 Sn778	8.60	36.70	34.4	-6.27
2019/12/29	1900	250	D1900V2-5d185	EX3DV4 - SN3728	DAE4 Sn778	9.83	39.40	39.32	-0.20
2020/1/1	2450	250	D2450V2-929	EX3DV4 - SN3931	DAE4 Sn778	12.40	53.10	49.6	-6.59
2019/12/28	2600	250	D2600V2-1008	EX3DV4 - SN3728	DAE4 Sn778	14.60	56.40	58.4	3.55

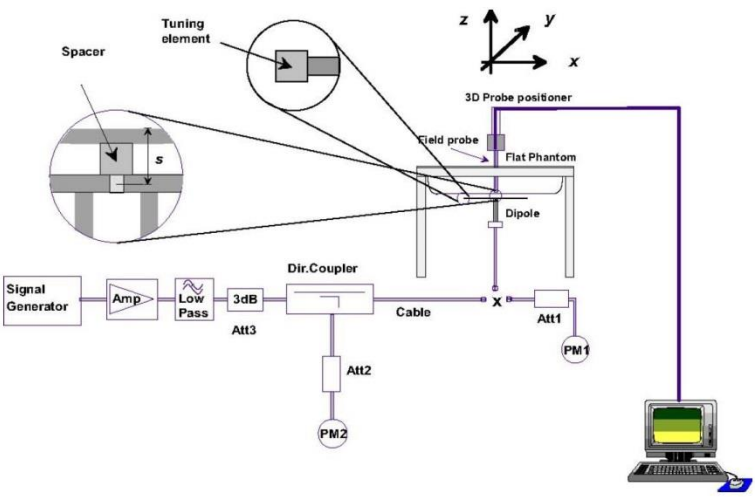


Fig 8.3.1 System Performance Check Setup

Fig 8.3.2 Setup Photo

10. RF Exposure Positions

10.1 Wireless Router

Some battery-operated handsets have the capability to transmit and receive user through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06 v02r01 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10mm from the front, back and edges of the device containing transmitting antennas within 2.5cm of their edges, determined form general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions due to the limitations of the SAR assessment probes. Therefore, SAR must be evaluated for each frequency transmission and mode separately and spatially summed with the WIFI transmitter according to FCC KDB Publication 447498 D01v06 publication procedures. The “Portable Hotspot” feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

11. UMTS/LTE Output Power (Unit: dBm)

<WCDMA Conducted Power>

1. The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification.
2. The procedures in KDB 941225 D01v03r01 are applied for 3GPP Rel. 6 HSPA to configure the device in the required sub-test mode(s) to determine SAR test exclusion.

A summary of these settings are illustrated below:

HSDPA Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting:
   i. Set Gain Factors (β_c and β_d) and parameters were set according to each
   ii. Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
   iii. Set RMC 12.2Kbps + HSDPA mode.
   iv. Set Cell Power = -86 dBm
   v. Set HS-DSCH Configuration Type to FRC (H-set 1, QPSK)
   vi. Select HSDPA Uplink Parameters
   vii. Set Delta ACK, Delta NACK and Delta CQI = 8
   viii. Set Ack-Nack Repetition Factor to 3
   ix. Set CQI Feedback Cycle (k) to 4 ms
   x. Set CQI Repetition Factor to 2
   xi. Power Ctrl Mode = All Up bits
d. The transmitted maximum output power was recorded.

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.

Setup Configuration

HSUPA Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting * :
   i. Call Configs = 5.2B, 5.9B, 5.10B, and 5.13.2B with QPSK
   ii. Set the Gain Factors (β_c and β_d) and parameters (AG Index) were set according to each specific sub-test in the following table, C11.1.3, quoted from the TS 34.121
   iii. Set Cell Power = -86 dBm
   iv. Set Channel Type = 12.2k + HSPA
   v. Set UE Target Power
   vi. Power Ctrl Mode= Alternating bits
   vii. Set and observe the E-TFCI
   viii. Confirm that E-TFCI is equal to the target E-TFCI of 75 for sub-test 1, and other subtest's E-TFCI
d. The transmitted maximum output power was recorded.

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.

Setup Configuration

<WCDMA Conducted Power>

General Note:

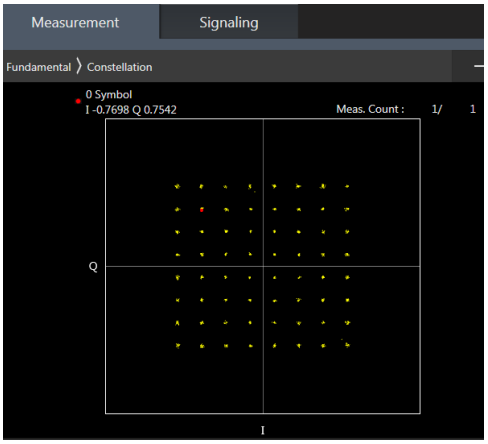
1. Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all "1's".
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. The maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA, and according to the following RF output power, the output power results of the secondary modes (HSUPA, HSDPA) are less than ¼ dB higher than the primary modes; therefore, SAR measurement is not required for HSDPA / HSUPA.

Band		WCDMA II			Tune-up Limit (dBm)	WCDMA IV			Tune-up Limit (dBm)	WCDMA V			Tune-up Limit (dBm)
TX Channel		9262	9400	9538		1312	1413	1513		4132	4182	4233	
Rx Channel		9662	9800	9938		1537	1638	1738		4357	4407	4458	
Frequency (MHz)		1852.4	1880	1907.6		1712.4	1732.6	1752.6		826.4	836.4	846.6	
3GPP Rel 99	RMC 12.2Kbps	19.20	19.12	19.30	20.40	21.80	21.61	21.56	23.00	23.33	23.29	22.80	24.00
3GPP Rel 6	HSDPA Subtest-1	19.15	19.13	19.15	20.40	21.42	21.55	21.51	23.00	23.08	23.14	22.93	24.00
3GPP Rel 6	HSDPA Subtest-2	18.56	18.66	18.65	20.40	21.06	21.16	21.16	23.00	22.05	21.85	22.03	24.00
3GPP Rel 6	HSDPA Subtest-3	18.05	18.16	18.11	19.90	20.66	20.72	20.66	22.50	21.37	21.44	21.56	23.50
3GPP Rel 6	HSDPA Subtest-4	18.02	18.01	18.06	19.90	20.62	20.63	20.59	22.50	21.48	21.33	21.56	23.50
3GPP Rel 6	HSUPA Subtest-1	17.66	17.62	17.51	19.40	20.35	20.33	20.32	22.00	21.05	21.04	21.01	23.00
3GPP Rel 6	HSUPA Subtest-2	16.58	16.40	16.53	17.40	19.42	19.50	19.44	20.00	20.51	20.45	20.41	21.00
3GPP Rel 6	HSUPA Subtest-3	16.58	16.64	16.75	18.40	20.96	20.06	19.93	21.00	20.45	20.56	20.56	22.00
3GPP Rel 6	HSUPA Subtest-4	16.42	16.23	16.45	17.40	19.38	19.47	19.41	20.00	20.30	20.17	20.34	21.00
3GPP Rel 6	HSUPA Subtest-5	17.66	17.48	17.54	19.40	20.19	20.13	20.22	22.00	21.61	21.41	21.44	23.00

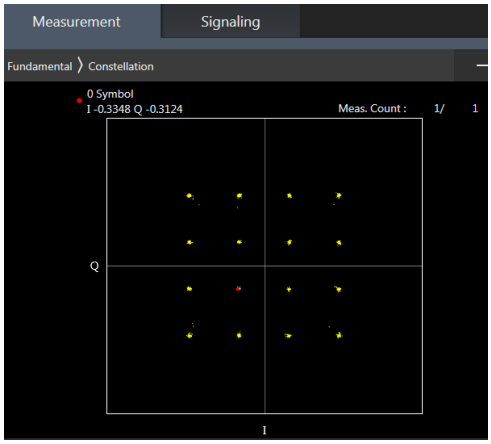
<LTE Conducted Power>

General Note:

1. Anritsu MT8820C base station simulator was used to setup the connection with EUT; the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
2. Per KDB 941225 D05v02r05, when a properly configured base station simulator is used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration is not required.
3. Per KDB 941225 D05v02r05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
4. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. Per KDB 941225 D05v02r05, For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
6. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
7. Per KDB 941225 D05v02r05, Smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
8. For LTE B4 / B5 / B12 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, 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.
9. LTE band 17 / 38 SAR test was covered by Band 12 / 41; according to April 2015 TCB workshop, SAR test for overlapping LTE bands can be reduced if
   a. the maximum output power, including tolerance, for the smaller band is ≤ the larger band to qualify for the SAR test exclusion
   b. the channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band
10. According to 2017 TCB workshop, for 64 QAM and 16 QAM should be verified by checking the signal constellation with a call box to avoid incorrect maximum power levels due to MPR and other requirements associated with signal modulation, and the following figure is taken from the "Fundamental Measurement >> Modulation Analysis >> constellation" mode of the device connect to the MT8821C base station, therefore, the device 64QAM and 16QAM signal modulation are correct.



64QAM



16QAM

<LTE Band 2>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				18700	18900	19100		
Frequency (MHz)				1860	1880	1900		
20	QPSK	1	0	19.32	19.19	19.20	20.4	0
20	QPSK	1	49	19.13	19.02	18.98		
20	QPSK	1	99	19.04	19.13	18.87		
20	QPSK	50	0	18.12	18.08	17.96	19.4	1
20	QPSK	50	24	18.07	18.11	17.94		
20	QPSK	50	50	17.88	18.06	17.72		
20	QPSK	100	0	17.99	18.12	17.82		
20	16QAM	1	0	18.49	18.31	18.04	19.4	1
20	16QAM	1	49	18.27	18.22	18.09		
20	16QAM	1	99	18.21	18.27	18.20		
20	16QAM	50	0	17.17	16.94	16.72	18.4	2
20	16QAM	50	24	17.02	17.20	16.73		
20	16QAM	50	50	17.01	17.23	16.78		
20	16QAM	100	0	17.00	17.09	16.56		
20	64QAM	1	0	16.71	16.72	16.59	18.4	2
20	64QAM	1	49	16.64	16.73	16.58		
20	64QAM	1	99	16.61	16.84	16.42		
20	64QAM	50	0	16.67	16.46	16.12	17.4	3
20	64QAM	50	24	16.51	16.25	16.26		
20	64QAM	50	50	16.57	16.04	16.15		
20	64QAM	100	0	15.59	15.61	15.46		
Channel				18675	18900	19125	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1857.5	1880	1902.5		
15	QPSK	1	0	19.27	19.29	19.10	20.4	0
15	QPSK	1	37	19.01	18.90	18.89		
15	QPSK	1	74	18.93	19.03	18.90		
15	QPSK	36	0	18.11	17.88	17.93	19.4	1
15	QPSK	36	20	18.01	18.14	17.81		
15	QPSK	36	39	17.92	18.13	17.68		
15	QPSK	75	0	17.94	18.12	17.75		
15	16QAM	1	0	18.46	18.33	18.16	19.4	1
15	16QAM	1	37	18.27	18.33	17.99		
15	16QAM	1	74	18.21	18.43	18.20		
15	16QAM	36	0	17.09	16.98	16.82	18.4	2
15	16QAM	36	20	17.13	17.24	16.63		
15	16QAM	36	39	16.99	17.03	16.74		
15	16QAM	75	0	16.92	17.07	16.60		
15	64QAM	1	0	16.69	16.59	16.45	18.4	2
15	64QAM	1	37	16.75	16.75	16.54		
15	64QAM	1	74	16.70	16.70	16.51		
15	64QAM	36	0	16.53	16.48	16.24	17.4	3
15	64QAM	36	20	16.67	16.31	16.20		
15	64QAM	36	39	16.64	16.20	16.20		
15	64QAM	75	0	15.45	15.75	15.42		
Channel				18650	18900	19150	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1855	1880	1905		
10	QPSK	1	0	19.25	19.21	19.09	20.4	0
10	QPSK	1	25	19.02	19.02	19.05		
10	QPSK	1	49	18.96	19.08	19.03		
10	QPSK	25	0	18.16	18.06	17.92	19.4	1
10	QPSK	25	12	17.92	18.18	17.89		

10	QPSK	25	25	17.94	18.18	17.81		
10	QPSK	50	0	17.96	18.18	17.91		
10	16QAM	1	0	18.55	18.39	17.98	19.4	1
10	16QAM	1	25	18.16	18.30	18.09		
10	16QAM	1	49	18.07	18.26	18.14		
10	16QAM	25	0	17.21	17.10	16.78	18.4	2
10	16QAM	25	12	17.15	17.10	16.66		
10	16QAM	25	25	16.91	17.22	16.80		
10	16QAM	50	0	16.86	17.08	16.60		
10	64QAM	1	0	16.69	16.70	16.59	18.4	2
10	64QAM	1	25	16.71	16.76	16.46		
10	64QAM	1	49	16.79	16.70	16.48		
10	64QAM	25	0	16.66	16.32	16.23	17.4	3
10	64QAM	25	12	16.55	16.17	16.19		
10	64QAM	25	25	16.51	16.08	16.17		
10	64QAM	50	0	15.53	15.59	15.51		
Channel				18625	18900	19175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1852.5	1880	1907.5		
5	QPSK	1	0	19.21	19.25	19.06	20.4	0
5	QPSK	1	12	18.98	18.91	18.96		
5	QPSK	1	24	18.92	19.16	18.93		
5	QPSK	12	0	18.08	18.07	17.98	19.4	1
5	QPSK	12	7	17.93	18.22	17.81		
5	QPSK	12	13	18.01	18.23	17.77		
5	QPSK	25	0	17.91	18.04	17.77		
5	16QAM	1	0	18.49	18.25	18.10	19.4	1
5	16QAM	1	12	18.18	18.31	17.98		
5	16QAM	1	24	18.15	18.40	18.07		
5	16QAM	12	0	17.28	17.05	16.77	18.4	2
5	16QAM	12	7	17.03	17.18	16.71		
5	16QAM	12	13	17.05	17.16	16.88		
5	16QAM	25	0	16.92	17.02	16.71		
5	64QAM	1	0	16.73	16.71	16.49	18.4	2
5	64QAM	1	12	16.59	16.73	16.50		
5	64QAM	1	24	16.72	16.75	16.52		
5	64QAM	12	0	16.57	16.50	16.25	17.4	3
5	64QAM	12	7	16.50	16.31	16.19		
5	64QAM	12	13	16.51	16.10	16.02		
5	64QAM	25	0	15.46	15.62	15.51		
Channel				18615	18900	19185	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1851.5	1880	1908.5		
3	QPSK	1	0	19.18	19.25	19.14	20.4	0
3	QPSK	1	8	19.15	18.95	18.91		
3	QPSK	1	14	18.91	18.98	18.98		
3	QPSK	8	0	18.12	17.99	17.88	19.4	1
3	QPSK	8	4	17.97	18.23	17.92		
3	QPSK	8	7	17.97	18.10	17.80		
3	QPSK	15	0	18.00	18.01	17.90		
3	16QAM	1	0	18.51	18.22	18.15	19.4	1
3	16QAM	1	8	18.21	18.35	17.96		
3	16QAM	1	14	18.06	18.26	18.19		
3	16QAM	8	0	17.25	16.98	16.65	18.4	2
3	16QAM	8	4	17.08	17.13	16.65		
3	16QAM	8	7	17.02	17.21	16.83		
3	16QAM	15	0	16.86	17.15	16.63		
3	64QAM	1	0	16.65	16.70	16.55	18.4	2

3	64QAM	1	8	16.76	16.91	16.46		
3	64QAM	1	14	16.68	16.85	16.49		
3	64QAM	8	0	16.55	16.43	16.30	17.4	3
3	64QAM	8	4	16.63	16.26	16.06		
3	64QAM	8	7	16.49	16.13	16.21		
3	64QAM	15	0	15.55	15.75	15.45		
Channel				18607	18900	19193	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1850.7	1880	1909.3		
1.4	QPSK	1	0	18.49	18.50	18.52	20.4	0
1.4	QPSK	1	3	18.50	18.52	18.49		
1.4	QPSK	1	5	18.41	18.47	18.47		
1.4	QPSK	3	0	18.46	18.58	18.43		
1.4	QPSK	3	1	18.49	18.58	18.41		
1.4	QPSK	3	3	18.49	18.42	18.40		
1.4	QPSK	6	0	17.98	18.06	18.05	19.4	1
1.4	16QAM	1	0	17.88	17.72	17.60	19.4	1
1.4	16QAM	1	3	17.92	17.92	17.65		
1.4	16QAM	1	5	17.80	17.87	17.47		
1.4	16QAM	3	0	17.72	17.54	17.46		
1.4	16QAM	3	1	17.59	17.76	17.51		
1.4	16QAM	3	3	17.67	17.61	17.42		
1.4	16QAM	6	0	16.96	17.01	16.89	18.4	2
1.4	64QAM	1	0	16.69	16.79	16.69	18.4	2
1.4	64QAM	1	3	16.78	16.73	16.68		
1.4	64QAM	1	5	16.71	16.63	16.69		
1.4	64QAM	3	0	16.83	16.65	16.60		
1.4	64QAM	3	1	16.79	16.79	16.69		
1.4	64QAM	3	3	16.73	16.81	16.71		
1.4	64QAM	6	0	15.67	15.58	15.41	17.4	3

<LTE Band 4>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20050	20175	20300		
Frequency (MHz)				1720	1732.5	1745		
20	QPSK	1	0	22.59	22.58	22.57	23	0
20	QPSK	1	49	22.38	22.40	22.32		
20	QPSK	1	99	22.19	22.15	22.08		
20	QPSK	50	0	21.38	21.44	21.31	22	1
20	QPSK	50	24	21.56	21.48	21.52		
20	QPSK	50	50	21.46	21.46	21.44		
20	QPSK	100	0	21.45	21.45	21.43		
20	16QAM	1	0	21.56	21.53	21.47	22	1
20	16QAM	1	49	21.71	21.79	21.71		
20	16QAM	1	99	21.56	21.50	21.48		
20	16QAM	50	0	20.39	20.44	20.38	21	2
20	16QAM	50	24	20.54	20.52	20.50		
20	16QAM	50	50	20.48	20.49	20.44		
20	16QAM	100	0	20.46	20.41	20.44		
20	64QAM	1	0	19.86	20.38	19.86	21	2
20	64QAM	1	49	20.57	20.65	20.17		
20	64QAM	1	99	20.43	20.14	20.37		
20	64QAM	50	0	19.19	19.47	18.78	20	3
20	64QAM	50	24	19.56	19.51	18.96		
20	64QAM	50	50	19.48	18.87	19.33		
20	64QAM	100	0	19.50	19.44	19.03		
Channel				20025	20175	20325	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1717.5	1732.5	1747.5		
15	QPSK	1	0	22.35	22.40	22.31	23	0
15	QPSK	1	37	22.22	22.29	22.24		
15	QPSK	1	74	22.20	22.14	22.14		
15	QPSK	36	0	21.23	21.31	21.22	22	1
15	QPSK	36	20	21.37	21.36	21.30		
15	QPSK	36	39	21.32	21.36	21.31		
15	QPSK	75	0	21.30	21.30	21.27		
15	16QAM	1	0	21.43	21.44	21.11	22	1
15	16QAM	1	37	21.51	21.61	21.57		
15	16QAM	1	74	21.44	21.45	21.47		
15	16QAM	36	0	20.27	20.31	20.25	21	2
15	16QAM	36	20	20.38	20.35	20.30		
15	16QAM	36	39	20.33	20.37	20.33		
15	16QAM	75	0	20.34	20.32	20.26		
15	64QAM	1	0	19.69	20.29	19.55	21	2
15	64QAM	1	37	20.28	20.48	20.00		
15	64QAM	1	74	20.42	19.77	20.37		
15	64QAM	36	0	18.77	19.36	18.73	20	3
15	64QAM	36	20	19.32	19.27	19.03		
15	64QAM	36	39	19.38	18.79	19.26		
15	64QAM	75	0	19.24	19.16	18.95		
Channel				20000	20175	20350	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1715	1732.5	1750		
10	QPSK	1	0	22.09	22.17	22.16	23	0
10	QPSK	1	25	21.75	21.86	21.77		
10	QPSK	1	49	21.52	21.53	21.51		
10	QPSK	25	0	20.85	20.85	20.77	22	1
10	QPSK	25	12	20.93	20.94	20.84		

10	QPSK	25	25	20.77	20.86	20.81		
10	QPSK	50	0	20.83	20.81	20.77		
10	16QAM	1	0	20.90	20.91	20.91	22	1
10	16QAM	1	25	21.14	21.26	21.21		
10	16QAM	1	49	20.88	20.87	20.93		
10	16QAM	25	0	19.84	19.86	19.79	21	2
10	16QAM	25	12	19.91	19.93	19.86		
10	16QAM	25	25	19.77	19.85	19.78		
10	16QAM	50	0	19.84	19.82	19.76		
10	64QAM	1	0	19.16	19.74	19.41	21	2
10	64QAM	1	25	19.61	20.21	20.10		
10	64QAM	1	49	19.81	19.43	19.80		
10	64QAM	25	0	18.23	18.88	18.74	20	3
10	64QAM	25	12	18.52	18.95	18.91		
10	64QAM	25	25	18.80	18.59	18.83		
10	64QAM	50	0	18.49	18.83	18.81		
Channel				19975	20175	20375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1712.5	1732.5	1752.5		
5	QPSK	1	0	22.12	22.21	22.19	23	0
5	QPSK	1	12	21.72	21.89	21.80		
5	QPSK	1	24	21.71	21.78	21.68		
5	QPSK	12	0	20.87	20.89	20.90	22	1
5	QPSK	12	7	20.93	20.92	20.91		
5	QPSK	12	13	20.83	20.89	20.84		
5	QPSK	25	0	20.83	20.88	20.82		
5	16QAM	1	0	20.99	21.10	21.11	22	1
5	16QAM	1	12	21.10	21.19	21.10		
5	16QAM	1	24	21.01	21.10	21.05		
5	16QAM	12	0	19.92	19.90	19.91	21	2
5	16QAM	12	7	19.97	19.93	19.95		
5	16QAM	12	13	19.87	19.91	19.87		
5	16QAM	25	0	19.91	19.89	19.89		
5	64QAM	1	0	19.18	20.01	20.03	21	2
5	64QAM	1	12	19.25	20.09	20.01		
5	64QAM	1	24	19.27	19.72	19.89		
5	64QAM	12	0	18.16	18.99	18.98	20	3
5	64QAM	12	7	18.23	18.97	19.01		
5	64QAM	12	13	18.32	18.80	18.93		
5	64QAM	25	0	18.12	18.91	18.89		
Channel				19965	20175	20385	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1711.5	1732.5	1753.5		
3	QPSK	1	0	22.12	22.28	22.31	23	0
3	QPSK	1	8	22.09	21.97	21.94		
3	QPSK	1	14	21.92	21.96	21.81		
3	QPSK	8	0	21.11	21.04	21.10	22	1
3	QPSK	8	4	21.23	21.31	21.19		
3	QPSK	8	7	21.14	21.07	21.18		
3	QPSK	15	0	21.15	21.03	20.99		
3	16QAM	1	0	21.49	21.07	21.27	22	1
3	16QAM	1	8	21.50	21.44	21.28		
3	16QAM	1	14	21.21	21.31	21.11		
3	16QAM	8	0	20.21	20.06	20.19	21	2
3	16QAM	8	4	20.12	20.08	20.13		
3	16QAM	8	7	19.98	20.05	20.11		
3	16QAM	15	0	20.22	20.04	20.06		
3	64QAM	1	0	20.20	20.02	19.45	21	2

3	64QAM	1	8	20.31	20.29	19.45		
3	64QAM	1	14	20.26	20.32	19.37		
3	64QAM	8	0	19.33	19.13	18.48	20	3
3	64QAM	8	4	19.25	19.25	18.39		
3	64QAM	8	7	19.29	19.15	18.47		
3	64QAM	15	0	19.04	19.17	18.09		
Channel				19957	20175	20393	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1710.7	1732.5	1754.3		
1.4	QPSK	1	0	21.21	21.19	21.17	23	0
1.4	QPSK	1	3	21.12	21.18	21.11		
1.4	QPSK	1	5	21.01	21.07	21.02		
1.4	QPSK	3	0	21.03	21.09	21.07		
1.4	QPSK	3	1	21.05	21.16	21.09		
1.4	QPSK	3	3	21.09	21.13	21.06		
1.4	QPSK	6	0	20.88	20.76	20.59	22	1
1.4	16QAM	1	0	20.23	20.40	20.40	22	1
1.4	16QAM	1	3	20.34	20.48	20.41		
1.4	16QAM	1	5	20.28	20.42	20.30		
1.4	16QAM	3	0	20.13	20.16	20.15		
1.4	16QAM	3	1	20.14	20.29	20.23		
1.4	16QAM	3	3	20.10	20.20	20.13		
1.4	16QAM	6	0	19.65	19.71	19.65	21	2
1.4	64QAM	1	0	19.42	19.29	19.31	21	2
1.4	64QAM	1	3	19.31	19.41	19.35		
1.4	64QAM	1	5	19.22	19.31	19.24		
1.4	64QAM	3	0	19.12	19.24	19.27		
1.4	64QAM	3	1	19.31	19.38	19.30		
1.4	64QAM	3	3	19.21	19.30	19.26		
1.4	64QAM	6	0	18.21	18.15	18.14	20	3

<LTE Band 5>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20450	20525	20600		
Frequency (MHz)				829	836.5	844		
10	QPSK	1	0	22.83	22.78	22.66	23	0
10	QPSK	1	25	22.35	22.31	22.45		
10	QPSK	1	49	22.14	22.11	21.95		
10	QPSK	25	0	21.15	21.13	21.12	22	1
10	QPSK	25	12	21.21	21.19	21.17		
10	QPSK	25	25	21.18	21.14	21.15		
10	QPSK	50	0	21.16	21.12	21.04		
10	16QAM	1	0	21.55	21.50	21.42	22	1
10	16QAM	1	25	21.50	21.46	21.44		
10	16QAM	1	49	21.51	21.52	21.28		
10	16QAM	25	0	20.16	20.10	20.11	21	2
10	16QAM	25	12	20.26	20.22	20.16		
10	16QAM	25	25	20.22	20.17	20.17		
10	16QAM	50	0	20.15	20.12	20.02		
10	64QAM	1	0	20.36	20.28	20.29	21	2
10	64QAM	1	25	20.39	20.35	20.14		
10	64QAM	1	49	20.34	20.27	19.28		
10	64QAM	25	0	19.18	19.13	19.14	20	3
10	64QAM	25	12	19.25	19.24	19.17		
10	64QAM	25	25	19.22	19.20	18.73		
10	64QAM	50	0	19.19	19.12	18.90		
Channel				20425	20525	20625	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				826.5	836.5	846.5		
5	QPSK	1	0	22.22	22.30	22.19	23	0
5	QPSK	1	12	22.15	22.11	22.10		
5	QPSK	1	24	22.11	22.06	21.77		
5	QPSK	12	0	21.17	21.06	21.06	22	1
5	QPSK	12	7	21.24	21.17	21.11		
5	QPSK	12	13	21.18	21.14	20.99		
5	QPSK	25	0	21.20	21.14	21.08		
5	16QAM	1	0	21.44	21.32	21.27	22	1
5	16QAM	1	12	21.50	21.41	21.33		
5	16QAM	1	24	21.43	21.36	21.11		
5	16QAM	12	0	20.23	20.11	20.07	21	2
5	16QAM	12	7	20.27	20.19	20.14		
5	16QAM	12	13	20.24	20.18	20.07		
5	16QAM	25	0	20.21	20.16	20.11		
5	64QAM	1	0	20.25	20.24	19.99	21	2
5	64QAM	1	12	20.40	20.30	19.80		
5	64QAM	1	24	20.31	20.29	19.22		
5	64QAM	12	0	19.21	19.11	18.88	20	3
5	64QAM	12	7	19.31	19.25	18.64		
5	64QAM	12	13	19.27	19.20	18.36		
5	64QAM	25	0	19.18	19.16	18.56		
Channel				20415	20525	20635	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				825.5	836.5	847.5		
3	QPSK	1	0	22.28	22.38	22.23	23	0
3	QPSK	1	8	22.15	22.06	22.13		
3	QPSK	1	14	22.20	21.96	21.87		
3	QPSK	8	0	21.20	20.99	20.99	22	1
3	QPSK	8	4	21.25	21.11	21.06		

3	QPSK	8	7	21.28	21.04	20.92		
3	QPSK	15	0	21.22	21.05	21.03		
3	16QAM	1	0	21.44	21.29	21.19	22	1
3	16QAM	1	8	21.44	21.48	21.28		
3	16QAM	1	14	21.36	21.37	21.12		
3	16QAM	8	0	20.27	20.12	20.12	21	2
3	16QAM	8	4	20.33	20.14	20.07		
3	16QAM	8	7	20.15	20.21	20.17		
3	16QAM	15	0	20.13	20.25	20.12		
3	64QAM	1	0	20.21	20.15	19.98	21	2
3	64QAM	1	8	20.30	20.21	19.73		
3	64QAM	1	14	20.27	20.22	19.29		
3	64QAM	8	0	19.30	19.19	18.86	20	3
3	64QAM	8	4	19.33	19.21	18.57		
3	64QAM	8	7	19.30	19.14	18.30		
3	64QAM	15	0	19.21	19.19	18.48		
Channel				20407	20525	20643	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				824.7	836.5	848.3		
1.4	QPSK	1	0	21.61	21.58	21.52	23	0
1.4	QPSK	1	3	21.51	21.50	21.09		
1.4	QPSK	1	5	21.49	21.40	21.01		
1.4	QPSK	3	0	21.51	21.37	21.16		
1.4	QPSK	3	1	21.57	21.41	21.33		
1.4	QPSK	3	3	21.56	21.42	21.05		
1.4	QPSK	6	0	20.89	20.78	20.91	22	1
1.4	16QAM	1	0	20.77	20.69	20.36	22	1
1.4	16QAM	1	3	20.85	20.83	20.41		
1.4	16QAM	1	5	20.81	20.74	20.32		
1.4	16QAM	3	0	20.62	20.48	20.26		
1.4	16QAM	3	1	20.66	20.51	20.26		
1.4	16QAM	3	3	20.58	20.54	20.27		
1.4	16QAM	6	0	19.67	19.57	19.36	21	2
1.4	64QAM	1	0	19.58	19.66	19.41	21	2
1.4	64QAM	1	3	19.64	19.77	19.32		
1.4	64QAM	1	5	19.61	19.70	19.29		
1.4	64QAM	3	0	19.55	19.59	19.31		
1.4	64QAM	3	1	19.60	19.66	19.58		
1.4	64QAM	3	3	19.54	19.66	19.42		
1.4	64QAM	6	0	18.44	18.52	18.41	20	3

<LTE Band 7>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20850	21100	21350		
Frequency (MHz)				2510	2535	2560		
20	QPSK	1	0	22.89	22.97	22.91	23	0
20	QPSK	1	49	22.31	22.35	22.42		
20	QPSK	1	99	22.07	22.04	21.88		
20	QPSK	50	0	21.13	20.98	20.88	22	1
20	QPSK	50	24	21.17	21.01	20.88		
20	QPSK	50	50	21.21	21.10	20.97		
20	QPSK	100	0	21.11	20.97	20.82		
20	16QAM	1	0	21.44	21.37	21.19	22	1
20	16QAM	1	49	21.40	21.38	21.18		
20	16QAM	1	99	21.48	21.41	21.19		
20	16QAM	50	0	20.18	20.00	19.89	21	2
20	16QAM	50	24	20.21	20.03	19.90		
20	16QAM	50	50	20.13	20.08	19.98		
20	16QAM	100	0	20.12	19.96	19.81		
20	64QAM	1	0	20.28	20.12	19.82	21	2
20	64QAM	1	49	20.28	20.20	19.50		
20	64QAM	1	99	20.31	20.29	19.30		
20	64QAM	50	0	19.18	19.03	18.45	20	3
20	64QAM	50	24	19.22	19.04	18.34		
20	64QAM	50	50	19.22	19.11	18.20		
20	64QAM	100	0	19.14	18.96	18.19		
Channel				20825	21100	21375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2507.5	2535	2562.5		
15	QPSK	1	0	22.48	22.47	22.35	23	0
15	QPSK	1	37	22.45	22.40	22.31		
15	QPSK	1	74	22.53	22.49	22.23		
15	QPSK	36	0	21.57	21.46	21.41	22	1
15	QPSK	36	20	21.63	21.49	21.55		
15	QPSK	36	39	21.64	21.58	21.53		
15	QPSK	75	0	21.56	21.45	21.41		
15	16QAM	1	0	21.74	21.71	21.71	22	1
15	16QAM	1	37	21.81	21.72	21.60		
15	16QAM	1	74	21.92	21.83	21.55		
15	16QAM	36	0	20.60	20.47	20.45	21	2
15	16QAM	36	20	20.64	20.49	20.54		
15	16QAM	36	39	20.64	20.58	20.55		
15	16QAM	75	0	20.58	20.45	20.44		
15	64QAM	1	0	20.59	20.53	20.31	21	2
15	64QAM	1	37	20.76	20.65	19.61		
15	64QAM	1	74	20.76	20.69	19.41		
15	64QAM	36	0	19.61	19.51	18.89	20	3
15	64QAM	36	20	19.67	19.51	18.75		
15	64QAM	36	39	19.68	19.64	18.75		
15	64QAM	75	0	19.60	19.47	18.73		
Channel				20800	21100	21400	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2505	2535	2565		
10	QPSK	1	0	22.05	21.95	21.83	23	0
10	QPSK	1	25	21.99	21.94	21.82		
10	QPSK	1	49	21.67	21.78	21.45		
10	QPSK	25	0	21.13	20.98	20.88	22	1
10	QPSK	25	12	21.17	21.01	20.88		

10	QPSK	25	25	21.21	21.10	20.97		
10	QPSK	50	0	21.11	20.97	20.82		
10	16QAM	1	0	21.44	21.37	21.19	22	1
10	16QAM	1	25	21.40	21.38	21.18		
10	16QAM	1	49	21.48	21.41	21.19		
10	16QAM	25	0	20.18	20.00	19.89	21	2
10	16QAM	25	12	20.21	20.03	19.90		
10	16QAM	25	25	20.13	20.08	19.98		
10	16QAM	50	0	20.12	19.96	19.81		
10	64QAM	1	0	20.28	20.12	19.82	21	2
10	64QAM	1	25	20.28	20.20	19.50		
10	64QAM	1	49	20.31	20.29	19.30		
10	64QAM	25	0	19.18	19.03	18.45	20	3
10	64QAM	25	12	19.22	19.04	18.34		
10	64QAM	25	25	19.22	19.11	18.20		
10	64QAM	50	0	19.14	18.96	18.19		
Channel				20775	21100	21425	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2502.5	2535	2567.5		
5	QPSK	1	0	22.28	22.32	21.99	23	0
5	QPSK	1	12	22.11	22.01	21.85		
5	QPSK	1	24	22.08	22.03	21.87		
5	QPSK	12	0	21.10	20.97	20.92	22	1
5	QPSK	12	7	21.19	21.04	20.96		
5	QPSK	12	13	21.14	21.08	20.93		
5	QPSK	25	0	21.12	20.96	20.89		
5	16QAM	1	0	21.39	21.28	21.14	22	1
5	16QAM	1	12	21.37	21.29	21.08		
5	16QAM	1	24	21.43	21.33	21.17		
5	16QAM	12	0	20.16	19.98	19.94	21	2
5	16QAM	12	7	20.21	20.03	19.96		
5	16QAM	12	13	20.16	20.09	19.94		
5	16QAM	25	0	20.13	19.99	19.93		
5	64QAM	1	0	20.34	20.20	19.46	21	2
5	64QAM	1	12	20.28	20.23	19.39		
5	64QAM	1	24	20.33	20.27	19.37		
5	64QAM	12	0	19.22	19.08	18.33	20	3
5	64QAM	12	7	19.26	19.10	18.31		
5	64QAM	12	13	19.22	19.15	18.24		
5	64QAM	25	0	19.15	19.04	18.20		

<LTE Band 12>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				23060	23095	23130		
Frequency (MHz)				704	707.5	711		
10	QPSK	1	0	22.38	22.35	22.61	23	0
10	QPSK	1	25	21.91	21.98	22.07		
10	QPSK	1	49	22.11	22.16	22.22		
10	QPSK	25	0	20.86	20.96	21.03	22	1
10	QPSK	25	12	21.10	21.09	21.24		
10	QPSK	25	25	21.11	21.15	21.23		
10	QPSK	50	0	21.03	21.03	21.11		
10	16QAM	1	0	21.20	21.20	21.38	22	1
10	16QAM	1	25	21.32	21.37	21.46		
10	16QAM	1	49	21.53	21.52	21.54		
10	16QAM	25	0	19.91	19.98	20.04	21	2
10	16QAM	25	12	20.09	20.09	20.25		
10	16QAM	25	25	20.11	20.15	20.21		
10	16QAM	50	0	20.03	20.03	20.11		
10	64QAM	1	0	20.05	20.15	20.17	21	2
10	64QAM	1	25	19.92	20.36	20.41		
10	64QAM	1	49	20.26	20.24	20.03		
10	64QAM	25	0	18.78	18.95	19.04	20	3
10	64QAM	25	12	18.94	19.15	19.28		
10	64QAM	25	25	19.08	19.19	19.25		
10	64QAM	50	0	18.88	19.04	19.09		
Channel				23035	23095	23155	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				701.5	707.5	713.5		
5	QPSK	1	0	22.12	22.25	22.21	23	0
5	QPSK	1	12	21.94	22.09	22.19		
5	QPSK	1	24	21.97	22.12	22.16		
5	QPSK	12	0	20.95	21.07	21.18	22	1
5	QPSK	12	7	21.04	21.19	21.28		
5	QPSK	12	13	21.04	21.17	21.23		
5	QPSK	25	0	21.00	21.08	21.17		
5	16QAM	1	0	21.15	21.23	21.38	22	1
5	16QAM	1	12	21.21	21.37	21.47		
5	16QAM	1	24	21.29	21.41	21.47		
5	16QAM	12	0	19.98	20.09	20.16	21	2
5	16QAM	12	7	20.08	20.18	20.29		
5	16QAM	12	13	20.05	20.21	20.26		
5	16QAM	25	0	20.02	20.10	20.18		
5	64QAM	1	0	19.90	20.17	20.31	21	2
5	64QAM	1	12	20.02	20.30	20.38		
5	64QAM	1	24	20.01	20.27	20.21		
5	64QAM	12	0	18.85	19.12	19.20	20	3
5	64QAM	12	7	18.93	19.24	19.33		
5	64QAM	12	13	18.90	19.24	19.27		
5	64QAM	25	0	18.82	19.10	19.21		
Channel				23025	23095	23165	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				700.5	707.5	714.5		
3	QPSK	1	0	22.15	22.24	22.11	23	0
3	QPSK	1	8	21.91	22.09	22.25		
3	QPSK	1	14	21.90	22.05	22.18		
3	QPSK	8	0	20.90	21.15	21.15	22	1
3	QPSK	8	4	21.13	21.27	21.24		

3	QPSK	8	7	21.08	21.23	21.26		
3	QPSK	15	0	20.98	21.16	21.19		
3	16QAM	1	0	21.12	21.20	21.42	22	1
3	16QAM	1	8	21.13	21.28	21.49		
3	16QAM	1	14	21.25	21.33	21.50		
3	16QAM	8	0	19.99	20.17	20.06	21	2
3	16QAM	8	4	19.99	20.28	20.33		
3	16QAM	8	7	20.15	20.18	20.18		
3	16QAM	15	0	20.09	20.06	20.18		
3	64QAM	1	0	20.00	20.26	20.22	21	2
3	64QAM	1	8	20.07	20.31	20.42		
3	64QAM	1	14	20.04	20.33	20.15		
3	64QAM	8	0	18.83	19.11	19.29	20	3
3	64QAM	8	4	18.94	19.31	19.36		
3	64QAM	8	7	18.89	19.27	19.37		
3	64QAM	15	0	18.86	19.11	19.19		
Channel				23017	23095	23173	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				699.7	707.5	715.3		
1.4	QPSK	1	0	21.13	21.25	21.39	23	0
1.4	QPSK	1	3	21.28	21.42	21.43		
1.4	QPSK	1	5	21.23	21.35	21.39		
1.4	QPSK	3	0	21.24	21.29	21.41		
1.4	QPSK	3	1	21.27	21.33	21.42		
1.4	QPSK	3	3	21.25	21.36	21.00		
1.4	QPSK	6	0	20.26	20.43	20.13	22	1
1.4	16QAM	1	0	20.48	20.60	20.56	22	1
1.4	16QAM	1	3	20.62	20.76	20.84		
1.4	16QAM	1	5	20.32	20.67	20.71		
1.4	16QAM	3	0	20.32	20.41	20.31		
1.4	16QAM	3	1	20.35	20.44	20.53		
1.4	16QAM	3	3	20.31	20.44	20.30		
1.4	16QAM	6	0	19.37	19.47	19.58	21	2
1.4	64QAM	1	0	19.51	19.52	19.50	21	2
1.4	64QAM	1	3	19.04	19.65	19.70		
1.4	64QAM	1	5	19.42	19.57	19.50		
1.4	64QAM	3	0	19.41	19.50	19.57		
1.4	64QAM	3	1	19.38	19.52	19.65		
1.4	64QAM	3	3	19.27	19.54	19.50		
1.4	64QAM	6	0	18.21	18.41	18.43	20	3

<LTE Band 13>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel					23230			
Frequency (MHz)					782			
10	QPSK	1	0		22.80		23	0
10	QPSK	1	25		22.51			
10	QPSK	1	49		22.26			
10	QPSK	25	0		21.38		22	1
10	QPSK	25	12		21.39			
10	QPSK	25	25		21.39			
10	QPSK	50	0		21.35			
10	16QAM	1	0		21.68		22	1
10	16QAM	1	25		21.68			
10	16QAM	1	49		21.66			
10	16QAM	25	0		20.42		21	2
10	16QAM	25	12		20.36			
10	16QAM	25	25		20.42			
10	16QAM	50	0		20.33			
10	64QAM	1	0		20.50		21	2
10	64QAM	1	25		20.63			
10	64QAM	1	49		20.57			
10	64QAM	25	0		19.45		20	3
10	64QAM	25	12		19.46			
10	64QAM	25	25		19.48			
10	64QAM	50	0		19.38			
Channel				23205	23230	23255	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				779.5	782	784.5		
5	QPSK	1	0	22.36	22.41	22.38	23	0
5	QPSK	1	12	22.28	22.34	22.33		
5	QPSK	1	24	22.37	22.35	22.32		
5	QPSK	12	0	21.37	21.34	21.35	22	1
5	QPSK	12	7	21.45	21.39	21.42		
5	QPSK	12	13	21.43	21.43	21.42		
5	QPSK	25	0	21.38	21.38	21.28		
5	16QAM	1	0	21.56	21.59	21.59	22	1
5	16QAM	1	12	21.57	21.55	21.60		
5	16QAM	1	24	21.67	21.66	21.60		
5	16QAM	12	0	20.37	20.36	20.37	21	2
5	16QAM	12	7	20.46	20.40	20.42		
5	16QAM	12	13	20.43	20.43	20.51		
5	16QAM	25	0	20.42	20.37	20.40		
5	64QAM	1	0	20.40	20.46	20.62	21	2
5	64QAM	1	12	20.47	20.41	20.54		
5	64QAM	1	24	20.44	20.54	20.56		
5	64QAM	12	0	19.47	19.41	19.41	20	3
5	64QAM	12	7	19.53	19.46	19.49		
5	64QAM	12	13	19.49	19.50	19.50		
5	64QAM	25	0	19.45	19.42	19.37		

<LTE Band 17>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				23780	23790	23800		
Frequency (MHz)				709	710	711		
10	QPSK	1	0	22.45	22.51	22.49	23	0
10	QPSK	1	25	22.01	22.06	22.08		
10	QPSK	1	49	22.23	22.20	22.22		
10	QPSK	25	0	20.97	21.01	21.08	22	1
10	QPSK	25	12	21.19	21.14	21.17		
10	QPSK	25	25	21.22	21.22	21.24		
10	QPSK	50	0	21.09	21.12	21.13		
10	16QAM	1	0	21.28	21.27	21.30	22	1
10	16QAM	1	25	21.40	21.46	21.46		
10	16QAM	1	49	21.56	21.57	21.57		
10	16QAM	25	0	19.99	20.00	20.09	21	2
10	16QAM	25	12	20.23	20.16	20.17		
10	16QAM	25	25	20.18	20.20	20.28		
10	16QAM	50	0	20.09	20.13	20.14		
10	64QAM	1	0	19.80	20.10	20.20	21	2
10	64QAM	1	25	20.08	20.18	20.17		
10	64QAM	1	49	19.81	19.89	19.76		
10	64QAM	25	0	18.80	18.93	19.02	20	3
10	64QAM	25	12	19.07	19.16	19.20		
10	64QAM	25	25	19.23	19.26	19.27		
10	64QAM	50	0	18.98	19.14	19.09		
Channel				23755	23790	23825	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				706.5	710	713.5		
5	QPSK	1	0	22.31	22.29	22.32	23	0
5	QPSK	1	12	22.02	22.15	22.13		
5	QPSK	1	24	22.08	22.16	22.15		
5	QPSK	12	0	20.97	21.06	21.12	22	1
5	QPSK	12	7	21.12	21.14	21.19		
5	QPSK	12	13	21.14	21.20	21.24		
5	QPSK	25	0	21.08	21.12	21.16		
5	16QAM	1	0	21.18	21.25	21.32	22	1
5	16QAM	1	12	21.29	21.45	21.43		
5	16QAM	1	24	21.39	21.45	21.46		
5	16QAM	12	0	20.04	20.11	20.16	21	2
5	16QAM	12	7	20.15	20.16	20.22		
5	16QAM	12	13	20.15	20.22	20.26		
5	16QAM	25	0	20.11	20.13	20.18		
5	64QAM	1	0	19.40	20.15	20.22	21	2
5	64QAM	1	12	20.07	20.36	20.32		
5	64QAM	1	24	20.01	19.93	19.88		
5	64QAM	12	0	18.76	19.07	19.16	20	3
5	64QAM	12	7	19.00	19.19	19.25		
5	64QAM	12	13	18.99	19.26	19.15		
5	64QAM	25	0	18.71	19.13	19.17		

<TDD LTE SAR Measurement>

TDD LTE configuration setup for SAR measurement

SAR was tested with a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by 3GPP.

a. 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table 4.2-2 for uplink-downlink configurations
b. "special subframe S" contains both uplink and downlink transmissions, it has been taken into consideration to determine the transmission duty factor according to the worst case uplink and downlink cyclic prefix requirements for UpPTS
c. Establishing connections with base station simulators ensure a consistent means for testing SAR and recommended for evaluating SAR. The Anritsu MT8820C (firmware: #22.52#004) was used for LTE output power measurements and SAR testing.

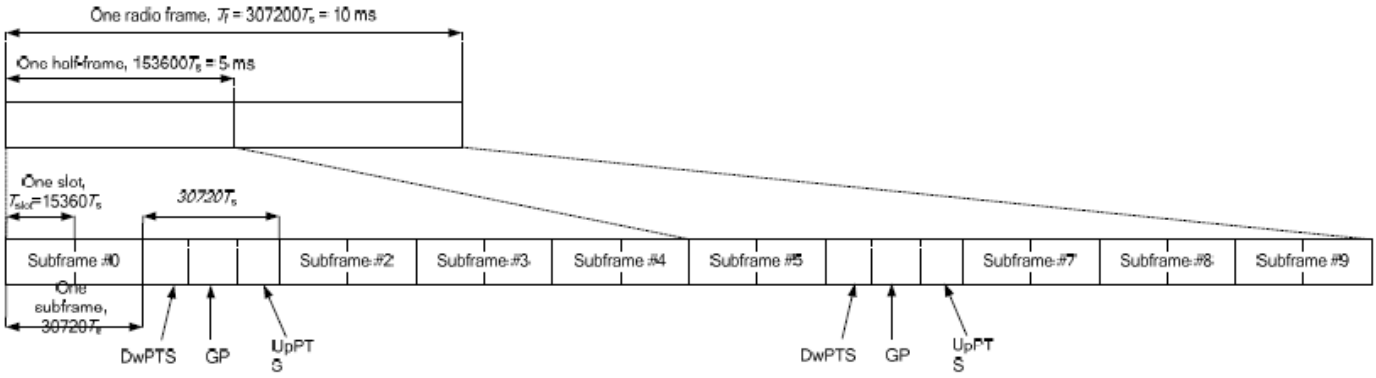


Figure 4.2-1: Frame structure type 2 (for 5 ms switch-point periodicity).

Table 4.2-2: Uplink-downlink configurations.

Uplink-downlink configuration	Downlink-to-Uplink Switch-point periodicity	Subframe number									
		0	1	2	3	4	5	6	7	8	9
0	5 ms	D	S	U	U	U	D	S	U	U	U
1	5 ms	D	S	U	U	D	D	S	U	U	D
2	5 ms	D	S	U	D	D	D	S	U	D	D
3	10 ms	D	S	U	U	U	D	D	D	D	D
4	10 ms	D	S	U	U	D	D	D	D	D	D
5	10 ms	D	S	U	D	D	D	D	D	D	D
6	5 ms	D	S	U	U	U	D	S	U	U	D

Table 4.2-1: Configuration of special subframe (lengths of DwPTS/GP/UpPTS).

Special subframe configuration	Normal cyclic prefix in downlink			Extended cyclic prefix in downlink		
	DwPTS	UpPTS		DwPTS	UpPTS	
		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink
0	$6592 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$	$7680 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$
1	$19760 \cdot T_s$			$20480 \cdot T_s$		
2	$21952 \cdot T_s$			$23040 \cdot T_s$		
3	$24144 \cdot T_s$			$25600 \cdot T_s$		
4	$26336 \cdot T_s$			$7680 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$
5	$6592 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$	$20480 \cdot T_s$		
6	$19760 \cdot T_s$			$23040 \cdot T_s$		
7	$21952 \cdot T_s$			$12800 \cdot T_s$		
8	$24144 \cdot T_s$			-	-	-
9	$13168 \cdot T_s$			-	-	-

Special subframe (30720·T_s): Normal cyclic prefix in downlink (UpPTS)			
	Special subframe configuration	**Normal cyclic prefix in uplink**	**Extended cyclic prefix in uplink**
Uplink duty factor in one special subframe	**0~4**	7.13%	8.33%
	5~9	14.3%	16.7%

Special subframe(30720·T_s): Extended cyclic prefix in downlink (UpPTS)			
	Special subframe configuration	**Normal cyclic prefix in uplink**	**Extended cyclic prefix in uplink**
Uplink duty factor in one special subframe	**0~3**	7.13%	8.33%
	4~7	14.3%	16.7%

The highest duty factor is resulted from:

i. Uplink-downlink configuration: 0. In a half-frame consisted of 5 subfames, uplink operation is in 3 uplink subframes and 1 special subframe.

ii. special subframe configuration: 5-9 for normal cyclic prefix in downlink, 4-7 for extended cyclic prefix in downlink

iii. for special subframe with extended cyclic prefix in uplink, the total uplink duty factor in one half-frame is: (3+0.167)/5 = 63.3%

iv. for special subframe with normal cyclic prefix in uplink, the total uplink duty factor in one half-frame is: (3+0.143)/5 = 62.9%

v. For TDD LTE SAR measurement, the duty cycle 1:1.59 (62.9 %) was used perform testing and considering the theoretical duty cycle of 63.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 62.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix 63.3%/62.9% = 1.006 is applied to scale-up the measured SAR result. The scaled TDD LTE SAR = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.

<Default Power Mode>

<LTE Band 38>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				37850	38000	38150		
Frequency (MHz)				2580	2595	2610		
20	QPSK	1	0	22.97	23.00	22.96	23	0
20	QPSK	1	49	22.39	22.43	22.32		
20	QPSK	1	99	22.00	22.06	21.83		
20	QPSK	50	0	21.08	21.04	20.85	22	1
20	QPSK	50	24	21.15	21.09	20.85		
20	QPSK	50	50	21.12	21.02	21.05		
20	QPSK	100	0	21.02	20.87	20.85		
20	16QAM	1	0	21.52	21.43	21.11	22	1
20	16QAM	1	49	21.48	21.32	21.21		
20	16QAM	1	99	21.51	21.38	21.22		
20	16QAM	50	0	20.19	19.96	19.90	21	2
20	16QAM	50	24	20.17	19.99	19.82		
20	16QAM	50	50	20.10	20.15	19.91		
20	16QAM	100	0	20.07	19.90	19.76		
20	64QAM	1	0	20.35	20.22	19.78	21	2
20	64QAM	1	49	20.18	20.28	19.44		
20	64QAM	1	99	20.33	20.38	19.22		
20	64QAM	50	0	19.08	18.99	18.43	20	3
20	64QAM	50	24	19.15	19.10	18.34		
20	64QAM	50	50	19.21	19.17	18.24		
20	64QAM	100	0	19.21	18.93	18.28		
Channel				37825	38000	38175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2577.5	2595	2612.5		
15	QPSK	1	0	22.73	22.71	22.75	23	0
15	QPSK	1	37	22.25	22.25	22.20		
15	QPSK	1	74	21.70	21.85	21.73		
15	QPSK	36	0	20.82	20.80	20.68	22	1
15	QPSK	36	20	21.01	20.86	20.65		
15	QPSK	36	39	20.99	20.90	20.78		
15	QPSK	75	0	20.73	20.61	20.67		
15	16QAM	1	0	21.33	21.30	20.94	22	1
15	16QAM	1	37	21.28	21.20	20.94		
15	16QAM	1	74	21.40	21.14	20.97		
15	16QAM	36	0	20.05	19.78	19.71	21	2
15	16QAM	36	20	19.96	19.71	19.68		
15	16QAM	36	39	19.84	19.95	19.72		
15	16QAM	75	0	19.97	19.76	19.52		
15	64QAM	1	0	20.19	19.94	19.49	21	2
15	64QAM	1	37	19.99	20.02	19.32		
15	64QAM	1	74	20.06	20.10	19.09		
15	64QAM	36	0	18.91	18.74	18.31	20	3
15	64QAM	36	20	18.97	18.82	18.56		
15	64QAM	36	39	18.91	18.92	18.46		
15	64QAM	75	0	18.98	18.80	18.09		
Channel				37800	38000	38200	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2575	2595	2615		
10	QPSK	1	0	22.53	22.41	22.58	23	0
10	QPSK	1	25	22.04	22.03	22.02		
10	QPSK	1	49	21.43	21.72	21.60		
10	QPSK	25	0	20.63	20.62	20.54	22	1

10	QPSK	25	12	20.80	20.57	20.38		
10	QPSK	25	25	20.80	20.78	20.60		
10	QPSK	50	0	20.56	20.41	20.57		
10	16QAM	1	0	21.20	21.20	20.80	22	1
10	16QAM	1	25	21.04	21.03	20.75		
10	16QAM	1	49	21.15	20.93	20.73		
10	16QAM	25	0	19.90	19.61	19.46	21	2
10	16QAM	25	12	19.77	19.48	19.57		
10	16QAM	25	25	19.61	19.83	19.58		
10	16QAM	50	0	19.79	19.48	19.39		
10	64QAM	1	0	20.02	19.77	19.20	21	2
10	64QAM	1	25	19.85	19.78	19.08		
10	64QAM	1	49	19.86	19.98	19.45		
10	64QAM	25	0	18.71	18.47	18.16	20	3
10	64QAM	25	12	18.87	18.66	18.47		
10	64QAM	25	25	18.75	18.71	18.27		
10	64QAM	50	0	18.83	18.56	18.32		
Channel				37775	38000	38225	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2572.5	2595	2617.5		
5	QPSK	1	0	22.48	22.50	22.64	23	0
5	QPSK	1	12	22.08	21.98	22.08		
5	QPSK	1	24	21.36	21.71	21.67		
5	QPSK	12	0	20.60	20.54	20.63	22	1
5	QPSK	12	7	20.71	20.60	20.36		
5	QPSK	12	13	20.86	20.85	20.59		
5	QPSK	25	0	20.64	20.46	20.65		
5	16QAM	1	0	21.17	21.19	20.87	22	1
5	16QAM	1	12	20.94	20.96	20.80		
5	16QAM	1	24	21.06	20.83	20.82		
5	16QAM	12	0	19.89	19.70	19.54	21	2
5	16QAM	12	7	19.82	19.38	19.50		
5	16QAM	12	13	19.64	19.79	19.61		
5	16QAM	25	0	19.79	19.39	19.37		
5	64QAM	1	0	20.11	19.80	19.25	21	2
5	64QAM	1	12	19.78	19.88	19.10		
5	64QAM	1	24	19.85	20.05	19.54		
5	64QAM	12	0	18.61	18.46	18.16	20	3
5	64QAM	12	7	18.81	18.57	18.52		
5	64QAM	12	13	18.78	18.71	18.36		
5	64QAM	25	0	18.85	18.65	18.41		

<LTE Band 41>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Low Middle Ch. / Freq.	Power Middle Ch. / Freq.	Power High Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				39750	40185	40620	41055	41490		
Frequency (MHz)				2506	2549.5	2593	2636.5	2680		
20	QPSK	1	0	23.00	22.94	22.65	23.00	22.98	23	0
20	QPSK	1	49	22.42	22.34	22.30	22.44	22.37		
20	QPSK	1	99	21.90	22.06	22.05	22.05	22.07		
20	QPSK	50	0	21.21	21.13	21.13	21.24	20.97	22	1
20	QPSK	50	24	21.06	21.10	21.07	21.07	21.07		
20	QPSK	50	50	21.16	20.92	21.07	21.17	21.09		
20	QPSK	100	0	21.11	20.80	21.02	21.20	20.78		
20	16QAM	1	0	21.51	21.38	21.47	21.52	21.40	22	1
20	16QAM	1	49	21.56	21.29	21.47	21.57	21.32		
20	16QAM	1	99	21.41	21.40	21.58	21.54	21.36		
20	16QAM	50	0	20.11	19.90	20.09	20.27	19.99	21	2
20	16QAM	50	24	20.13	20.01	20.20	20.17	19.97		
20	16QAM	50	50	20.13	20.24	20.19	20.03	20.19		
20	16QAM	100	0	20.02	19.89	20.00	20.00	19.88		
20	64QAM	1	0	20.30	20.28	20.43	20.39	20.17	21	2
20	64QAM	1	49	20.09	20.21	20.20	20.21	20.27		
20	64QAM	1	99	20.31	20.46	20.36	20.29	20.48		
20	64QAM	50	0	19.09	18.94	19.00	19.15	19.02	20	3
20	64QAM	50	24	19.13	19.02	19.13	19.12	19.04		
20	64QAM	50	50	19.27	19.26	19.23	19.29	19.26		
20	64QAM	100	0	19.18	18.84	19.13	19.21	18.88		
Channel				39725	40173	40620	41068	41515	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2503.5	2548.3	2593	2637.8	2682.5		
15	QPSK	1	0	22.88	22.88	22.45	22.95	22.85	23	0
15	QPSK	1	37	22.19	22.12	22.19	22.34	22.25		
15	QPSK	1	74	21.69	21.93	21.83	21.92	21.92		
15	QPSK	36	0	20.93	20.92	21.00	20.80	20.67	22	1
15	QPSK	36	20	20.78	20.98	20.80	20.90	20.86		
15	QPSK	36	39	20.99	20.80	20.80	20.99	20.88		
15	QPSK	75	0	20.96	20.61	20.78	20.85	20.66		
15	16QAM	1	0	21.38	21.13	21.19	21.24	21.13	22	1
15	16QAM	1	37	21.44	21.18	21.33	21.32	21.12		
15	16QAM	1	74	21.13	21.28	21.32	21.41	21.17		
15	16QAM	36	0	19.81	19.79	19.85	19.99	19.89	21	2
15	16QAM	36	20	19.95	19.88	20.06	19.90	19.80		
15	16QAM	36	39	19.96	20.01	20.08	19.81	19.91		
15	16QAM	75	0	19.87	19.79	19.81	19.73	19.59		
15	64QAM	1	0	20.18	19.98	20.28	20.13	19.98	21	2
15	64QAM	1	37	19.86	20.09	19.92	19.94	20.15		
15	64QAM	1	74	20.15	20.36	20.12	20.17	20.29		
15	64QAM	36	0	18.95	18.70	18.77	18.89	18.86	20	3
15	64QAM	36	20	18.95	18.87	19.04	19.03	18.92		
15	64QAM	36	39	19.08	19.16	18.96	19.19	19.09		
15	64QAM	75	0	19.00	18.61	19.03	19.03	18.71		
Channel				39700	40160	40620	41080	41540	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2501	2547	2593	2639	2685		
10	QPSK	1	0	22.67	22.62	22.27	22.84	22.56	23	0
10	QPSK	1	25	22.04	21.90	21.99	22.06	21.95		
10	QPSK	1	49	21.47	21.66	21.56	21.76	21.72		
10	QPSK	25	0	20.77	20.75	20.77	20.66	20.57	22	1
10	QPSK	25	12	20.55	20.82	20.62	20.71	20.56		

10	QPSK	25	25	20.70	20.70	20.52	20.89	20.71		
10	QPSK	50	0	20.74	20.41	20.53	20.59	20.41		
10	16QAM	1	0	21.21	20.90	21.04	20.95	20.93	22	1
10	16QAM	1	25	21.32	20.89	21.10	21.10	20.99		
10	16QAM	1	49	21.02	21.01	21.23	21.18	20.95		
10	16QAM	25	0	19.67	19.58	19.74	19.72	19.64	21	2
10	16QAM	25	12	19.82	19.59	19.95	19.65	19.57		
10	16QAM	25	25	19.68	19.89	19.88	19.65	19.64		
10	16QAM	50	0	19.77	19.61	19.67	19.63	19.34		
10	64QAM	1	0	19.88	19.71	19.99	19.98	19.68	21	2
10	64QAM	1	25	19.68	19.96	19.66	19.77	19.85		
10	64QAM	1	49	19.96	20.24	20.03	20.08	20.07		
10	64QAM	25	0	18.65	18.52	18.50	18.65	18.72	20	3
10	64QAM	25	12	18.77	18.72	18.75	18.76	18.78		
10	64QAM	25	25	18.95	19.02	18.82	18.99	18.82		
10	64QAM	50	0	18.73	18.48	18.86	18.75	18.48		
Channel				39675	40148	40620	41093	41565	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2498.5	2545.8	2593	2640.30	2687.5		
5	QPSK	1	0	22.58	22.58	22.32	22.72	22.52	23	0
5	QPSK	1	12	21.94	21.85	21.88	21.98	21.80		
5	QPSK	1	24	21.36	21.54	21.53	21.70	21.59		
5	QPSK	12	0	20.63	20.74	20.72	20.67	20.55	22	1
5	QPSK	12	7	20.48	20.83	20.55	20.66	20.41		
5	QPSK	12	13	20.57	20.75	20.55	20.94	20.56		
5	QPSK	25	0	20.78	20.30	20.48	20.53	20.31		
5	16QAM	1	0	21.10	20.92	21.01	20.97	20.85	22	1
5	16QAM	1	12	21.36	20.82	21.06	21.10	20.98		
5	16QAM	1	24	20.95	21.04	21.27	21.15	20.83		
5	16QAM	12	0	19.64	19.56	19.72	19.69	19.58	21	2
5	16QAM	12	7	19.72	19.53	19.97	19.53	19.46		
5	16QAM	12	13	19.67	19.83	19.88	19.50	19.69		
5	16QAM	25	0	19.73	19.55	19.53	19.52	19.34		
5	64QAM	1	0	19.87	19.62	19.92	19.83	19.69	21	2
5	64QAM	1	12	19.67	19.87	19.53	19.69	19.75		
5	64QAM	1	24	19.85	20.25	20.07	20.00	20.09		
5	64QAM	12	0	18.61	18.40	18.49	18.56	18.76	20	3
5	64QAM	12	7	18.78	18.69	18.65	18.80	18.65		
5	64QAM	12	13	18.96	18.98	18.69	18.90	18.79		
5	64QAM	25	0	18.69	18.35	18.77	18.80	18.38		

<LTE Band 41 HPUE>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Low Middle Ch. / Freq.	Power Middle Ch. / Freq.	Power High Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				39750	40185	40620	41055	41490		
Frequency (MHz)				2506	2549.5	2593	2636.5	2680		
20	QPSK	1	0	25.12	25.40	25.08	25.31	25.39	26	0
20	QPSK	1	49	24.44	24.31	24.48	24.54	24.54		
20	QPSK	1	99	24.22	24.20	24.12	24.09	24.02		
20	QPSK	50	0	23.21	23.22	23.20	23.15	23.33	25	1
20	QPSK	50	24	23.26	23.11	23.15	23.07	23.19		
20	QPSK	50	50	23.08	23.24	23.17	23.22	23.34		
20	QPSK	100	0	22.99	23.16	23.11	22.91	23.11		
20	16QAM	1	0	23.47	23.47	23.54	23.51	23.69	25	1
20	16QAM	1	49	23.36	23.48	23.69	23.32	23.67		
20	16QAM	1	99	23.47	23.60	23.66	23.53	23.46		
20	16QAM	50	0	22.04	22.11	22.39	22.15	22.23	24	2
20	16QAM	50	24	22.19	22.31	22.27	22.15	22.14		
20	16QAM	50	50	22.43	22.32	22.13	22.21	22.31		
20	16QAM	100	0	22.02	22.11	22.12	22.05	22.04		
20	64QAM	1	0	22.44	22.45	22.41	22.37	22.49	24	2
20	64QAM	1	49	22.26	22.32	22.30	22.40	22.21		
20	64QAM	1	99	22.56	22.39	22.49	22.49	22.51		
20	64QAM	50	0	21.52	21.54	21.49	21.42	21.44	23	3
20	64QAM	50	24	21.15	21.28	21.28	21.10	21.22		
20	64QAM	50	50	21.30	21.42	21.33	21.36	21.30		
20	64QAM	100	0	21.26	21.25	21.33	21.32	21.37		
Channel				39725	40173	40620	41068	41515	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2503.5	2548.3	2593	2637.8	2682.5		
15	QPSK	1	0	24.58	24.19	24.63	24.52	24.56	26	0
15	QPSK	1	37	24.42	24.21	24.39	24.34	24.54		
15	QPSK	1	74	24.13	24.09	24.11	24.05	24.07		
15	QPSK	36	0	23.11	23.18	23.05	22.82	23.33	25	1
15	QPSK	36	20	23.06	23.03	22.98	23.24	23.06		
15	QPSK	36	39	22.91	22.95	23.17	22.91	23.19		
15	QPSK	75	0	22.99	23.02	23.05	22.75	23.08		
15	16QAM	1	0	23.24	23.40	23.43	23.44	23.37	25	1
15	16QAM	1	37	23.36	23.45	23.54	23.32	23.70		
15	16QAM	1	74	23.41	23.52	23.56	23.31	23.24		
15	16QAM	36	0	22.12	22.15	22.23	22.16	22.18	24	2
15	16QAM	36	20	22.08	22.19	22.13	22.09	22.13		
15	16QAM	36	39	22.10	22.31	22.05	22.14	22.23		
15	16QAM	75	0	22.05	22.12	22.00	22.01	22.02		
15	64QAM	1	0	22.23	22.25	22.35	22.18	22.22	24	2
15	64QAM	1	37	22.25	22.10	22.27	22.26	22.06		
15	64QAM	1	74	22.52	22.35	22.24	22.39	22.23		
15	64QAM	36	0	21.05	21.12	21.04	21.04	21.07	23	3
15	64QAM	36	20	21.10	21.31	21.08	21.12	21.15		
15	64QAM	36	39	21.39	21.15	21.18	21.11	21.18		
15	64QAM	75	0	21.12	21.25	21.06	21.15	21.15		
Channel				39700	40160	40620	41080	41540	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2501	2547	2593	2639	2685		
10	QPSK	1	0	24.45	24.06	24.66	24.64	24.52	26	0
10	QPSK	1	25	24.46	24.22	24.43	24.54	24.43		
10	QPSK	1	49	24.21	24.15	24.15	24.25	24.01		
10	QPSK	25	0	23.14	23.27	23.12	22.94	23.20	25	1
10	QPSK	25	12	23.14	23.03	22.90	23.09	23.06		

10	QPSK	25	25	23.06	23.07	23.19	23.09	23.29		
10	QPSK	50	0	23.05	23.04	23.01	23.05	23.00		
10	16QAM	1	0	23.27	23.45	23.64	23.57	23.43	25	1
10	16QAM	1	25	23.45	23.58	23.76	23.22	23.40		
10	16QAM	1	49	23.44	23.54	23.59	23.32	23.41		
10	16QAM	25	0	22.10	22.12	22.35	22.10	22.01	24	2
10	16QAM	25	12	22.05	22.34	22.29	22.08	21.98		
10	16QAM	25	25	22.20	22.34	22.20	22.14	22.18		
10	16QAM	50	0	22.07	22.05	22.06	22.06	22.07		
10	64QAM	1	0	22.15	22.27	22.35	22.21	22.26	24	2
10	64QAM	1	25	22.14	22.17	22.18	22.27	22.11		
10	64QAM	1	49	22.43	22.26	22.40	22.50	22.31		
10	64QAM	25	0	21.22	21.08	21.04	21.15	21.09	23	3
10	64QAM	25	12	21.14	21.17	21.10	21.24	21.06		
10	64QAM	25	25	21.26	21.26	21.15	21.24	21.34		
10	64QAM	50	0	21.12	21.23	21.35	21.09	21.13		
Channel				39675	40148	40620	41093	41565	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2498.5	2545.8	2593	2640.30	2687.5		
5	QPSK	1	0	24.46	24.32	24.66	24.55	24.44	26	0
5	QPSK	1	12	24.39	24.21	24.41	24.35	24.26		
5	QPSK	1	24	24.09	24.09	24.12	24.33	24.12		
5	QPSK	12	0	23.19	23.02	23.09	23.08	23.13	25	1
5	QPSK	12	7	23.03	23.01	23.02	23.07	23.10		
5	QPSK	12	13	23.00	23.05	23.03	23.06	23.05		
5	QPSK	25	0	22.81	23.09	22.92	22.79	23.04		
5	16QAM	1	0	23.20	23.45	23.61	23.23	23.42	25	1
5	16QAM	1	12	23.08	23.29	23.32	23.19	23.33		
5	16QAM	1	24	23.36	23.55	23.42	23.14	23.26		
5	16QAM	12	0	22.12	22.04	22.04	22.15	22.09	24	2
5	16QAM	12	7	22.12	22.03	22.10	22.05	22.04		
5	16QAM	12	13	22.13	22.10	22.02	22.22	22.19		
5	16QAM	25	0	22.08	22.00	22.00	22.10	22.06		
5	64QAM	1	0	22.27	22.33	22.19	22.21	22.12	24	2
5	64QAM	1	12	22.09	22.00	22.16	22.27	22.03		
5	64QAM	1	24	22.23	22.20	22.24	22.43	22.21		
5	64QAM	12	0	21.28	21.29	21.22	21.06	21.13	23	3
5	64QAM	12	7	21.12	21.15	21.15	21.12	21.21		
5	64QAM	12	13	21.16	21.08	21.25	21.28	21.20		
5	64QAM	25	0	21.08	21.12	21.06	21.06	21.03		

<LTE Uplink carrier aggregation>

2CC Uplink Carrier Aggregation				
Number	Combination	4X4 MIMO	Restriction	Covered by Measurement Superset
1	41C	41C,41A		

<Intra-band>

General Note:

i. The device supports intra-band uplink carrier aggregation for LTE B41 with a maximum of two 20MHz component carriers. For intra band contiguous carrier aggregation scenarios, 3GPP 36.101 table 6.2.2A-1 specifies that the aggregate maximum allowed output power is equivalent to the single carrier scenario. 3GPP 36.101 6.2.3A allows for several dB of MPR to be applied when not-contiguous RB allocation is implemented. The conducted power and MPR setting in this device are permanently implemented pre 3GPP requirement.

ii. The device supports uplink carrier aggregation with a maximum of two 20MHz component carriers. For intra band contiguous carrier aggregation scenarios, 3GPP 36.101 table 6.2.2A-1 specifies that the aggregate maximum allowed output power is equivalent to the single carrier scenario. 3GPP 36.101 6.2.3A allows for several dB of MPR to be applied when not-contiguous RB allocation is implemented. The conducted power and MPR setting in this device are permanently implemented pre the 3GPP requirement.

iii. According TCB workshop, the output power with uplink CA active was measured for the configuration with the highest reported SAR with single carrier for each exposure condition. The power was measured with wideband signal integration over both component carriers.

iv. According TCB workshop, the output power with uplink CA active was measured for the configuration with the highest reported SAR with single carrier for each exposure condition. The power was measured with wideband signal integration over both component carriers.

v. Additional SAR measurement for LTE UL CA whit other DL CA combinations active were not required since the maximum output power for this configuration was not > 0.25dB higher than the maximum output power for UL CA active.

<Full power>

CA_41C										
Combination 20MHz+20MHz (100RB+100RB)										
PCC Channel	SCC Channel	Modulation	PCC		SCC		Total RB Size	Target MPR Level (dB)	Measured Power (dBm)	Tune up Power (dBm)
			RB Size	RB offset	RB Size	RB offset				
39750	39948	QPSK	1	0	0	0	1	0	23	23
40185	39987	QPSK	1	0	1	99	2	0	21.45	23
40620	40422	QPSK	1	0	1	99	2	0	21.38	23
41055	40857	QPSK	1	0	1	99	2	0	21.6	23
41490	41292	QPSK	1	0	1	99	2	0	21.36	23

12. WiFi/Bluetooth Output Power (Unit: dBm)

General Note:

1. For each antenna, transmit power in SISO operation is larger than (or equal to) the power in MIMO operation, RF exposure compliance of MIMO mode can be deduced from the compliance simultaneous transmission of antennas operating in SISO mode.
2. Per KDB 248227 D01v02r02, the simultaneous SAR provisions in KDB publication 447498 should be applied to determine simultaneous transmission SAR test exclusion for WiFi MIMO. If the sum of 1g single transmission chain SAR measurements is < 1.6W/kg and SAR peak to location ratio ≤ 0.04, no additional SAR measurements for MIMO.
3. Per KDB 248227 D01v02r02, SAR test reduction is determined according to 802.11 transmission mode configurations and certain exposure conditions with multiple test positions. In the 2.4 GHz band, separate SAR procedures are applied to DSSS and OFDM configurations to simplify DSSS test requirements. For OFDM, in both 2.4 and 5 GHz bands, an initial test configuration must be determined for each standalone and aggregated frequency band, according to the transmission mode configuration with the highest maximum output power specified for production units to perform SAR measurements. If the same highest maximum output power applies to different combinations of channel bandwidths, modulations and data rates, additional procedures are applied to determine which test configurations require SAR measurement. When applicable, an initial test position may be applied to reduce the number of SAR measurements required for next to the ear, UMPC mini-tablet or hotspot mode configurations with multiple test positions.
4. For 2.4 GHz 802.11b DSSS, either the initial test position procedure for multiple exposure test positions or the DSSS procedure for fixed exposure position is applied; these are mutually exclusive. For 2.4 GHz and 5 GHz OFDM configurations, the initial test configuration is applied to measure SAR using either the initial test position procedure for multiple exposure test position configurations or the initial test configuration procedures for fixed exposure test conditions. Based on the reported SAR of the measured configurations and maximum output power of the transmission mode configurations that are not included in the initial test configuration, the subsequent test configuration and initial test position procedures are applied to determine if SAR measurements are required for the remaining OFDM transmission configurations. In general, the number of test channels that require SAR measurement is minimized based on maximum output power measured for the test sample(s).
5. For OFDM transmission configurations in the 2.4 GHz and 5 GHz bands, 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 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel for each frequency band.
6. DSSS and OFDM configurations are considered separately according to the required SAR procedures. SAR is measured in the initial test position using the 802.11 transmission mode configuration required by the DSSS procedure or initial test configuration and subsequent test configuration(s) according to the OFDM procedures.18 The initial test position procedure is described in the following:
   a. When the reported SAR of 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 802.11 transmission mode combinations within the frequency band or aggregated band.
   b. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode 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 report SAR is ≤ 0.8 W/kg or all required test position are tested.
   c. For all positions/configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.
7. Per 201904 TCBC workshops, General principles of FCC KDB Publication 248227 D01 can be applied to determine the SAR Initial Test Configurations and test reduction for 802.11ax SAR testing. For the table below the 802.11ax maximum power is SU (non-OFDMA).
8. In applying the test guidance, the IEEE 802.11 mode with the maximum output power (out of all modes) should be considered for testing
9. For modes with the same maximum output power, the guidance from section 5.3.2 a) of FCC KDB Publication 248227 D01 should be applied, with 802.11ax being considered as the highest 802.11 mode for the appropriate frequency bands
10. When SAR testing for 802.11ax is required
    a. If the maximum output power is highest for OFDMA scenarios, choose the tone size with the maximum number of tones and the highest maximum output power
    b. Otherwise, consider the fully allocated channel for SAR testing
    c. When SAR testing is required on RU sizes less than the fully allocated channel, use the RU number closest to the middle of the channel, choosing the higher RU number when two RUs are equidistant to the middle of the channel

<Non-beamforming power mode>

<2.4GHz WLAN ANT 1>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	1	2412	11.80	12.00	98.01
		6	2437	11.70	12.00	
		11	2462	11.90	12.00	
	802.11g 6Mbps	1	2412	11.80	12.00	99.00
		6	2437	11.70	12.00	
		11	2462	11.60	12.00	
	802.11n-HT20 MCS0	1	2412	11.80	12.00	99.01
		6	2437	11.70	12.00	
		11	2462	11.70	12.00	
	802.11n-HT40 MCS0	3	2422	11.50	12.00	99.41
		6	2437	11.50	12.00	
		9	2452	11.40	12.00	
	802.11ax-HE20 MCS0	1	2412	11.60	12.00	99.58
		6	2437	11.50	12.00	
		11	2462	11.70	12.00	
	802.11ax-HE40 MCS0	3	2422	10.90	12.00	99.01
		6	2437	11.50	12.00	
		9	2452	10.20	12.00	

<2.4GHz WLAN ANT 2>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	1	2412	11.70	12.00	98.29
		6	2437	11.60	12.00	
		11	2462	11.60	12.00	
	802.11g 6Mbps	1	2412	11.90	12.00	99.25
		6	2437	11.80	12.00	
		11	2462	11.80	12.00	
	802.11n-HT20 MCS0	1	2412	11.70	12.00	99.04
		6	2437	11.60	12.00	
		11	2462	11.60	12.00	
	802.11n-HT40 MCS0	3	2422	11.80	12.00	99.41
		6	2437	11.70	12.00	
		9	2452	11.10	12.00	
	802.11ax-HE20 MCS0	1	2412	11.80	12.00	99.47
		6	2437	11.70	12.00	
		11	2462	11.80	12.00	
	802.11ax-HE40 MCS0	3	2422	11.00	12.00	99.26
		6	2437	11.70	12.00	
		9	2452	10.40	12.00	

<2.4GHz WLAN ANT 1+2>

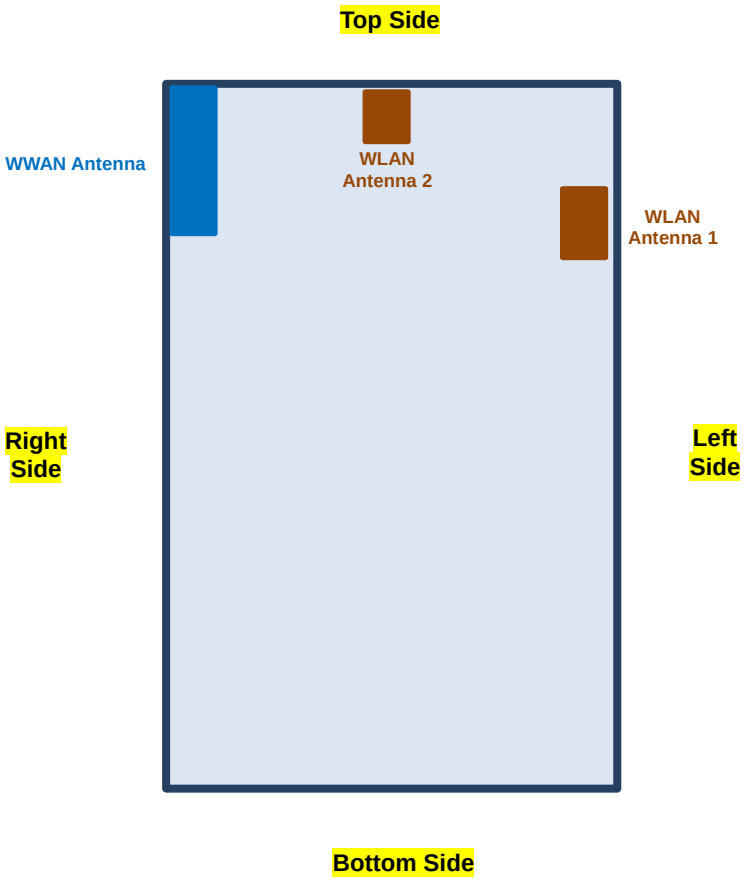
	Mode	Channel	Frequency (MHz)	Average power Ant(1)	Tune-Up Limit Ant(1)	Average power Ant(2)	Tune-Up Limit Ant(2)	Average power (1+2)	Tune-Up Limit Ant(1+2)	Duty Cycle %
2.4GHz WLAN	802.11n-HT20 MCS0	1	2412	11.50	12.00	12.00	12.00	14.77	15.00	99.14
		6	2437	11.50	12.00	12.00	12.00	14.77	15.00	
		11	2462	11.40	12.00	11.90	12.00	14.67	15.00	
	802.11n-HT40 MCS0	3	2422	11.60	12.00	12.00	12.00	14.81	15.00	99.41
		6	2437	11.60	12.00	11.90	12.00	14.76	15.00	
		9	2452	11.40	12.00	11.50	12.00	14.46	15.00	
	802.11ax-HE20 MCS0	1	2412	11.70	12.00	11.90	12.00	14.81	15.00	99.55
		6	2437	11.60	12.00	11.80	12.00	14.71	15.00	
		11	2462	11.70	12.00	12.00	12.00	14.86	15.00	
	802.11ax-HE40 MCS0	3	2422	11.00	12.00	11.10	12.00	14.06	15.00	99.01
		6	2437	11.60	12.00	11.90	12.00	14.76	15.00	
		9	2452	10.40	12.00	10.50	12.00	13.46	15.00	

<Beamforming power mode>

<2.4GHz WLAN ANT 1+2>

	Mode	Channel	Frequency (MHz)	Average power Ant(1)	Tune-Up Limit	Average power Ant(2)	Tune-Up Limit	Average power (1+2)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11n-HT20 MCS0	1	2412	11.60	12.00	11.60	12.00	14.61	15.00	100
		6	2437	11.50	12.00	11.50	12.00	14.51	15.00	
		11	2462	11.50	12.00	11.60	12.00	14.56	15.00	
	802.11n-HT40 MCS0	3	2422	11.70	12.00	12.00	12.00	14.86	15.00	100
		6	2437	11.70	12.00	12.00	12.00	14.86	15.00	
		9	2452	11.80	12.00	12.00	12.00	14.91	15.00	
	802.11ax-HE20 MCS0	1	2412	11.90	12.00	11.70	12.00	14.81	15.00	100
		6	2437	11.80	12.00	11.50	12.00	14.66	15.00	
		11	2462	11.70	12.00	11.50	12.00	14.61	15.00	
	802.11ax-HE40 MCS0	3	2422	12.00	12.00	11.80	12.00	14.91	15.00	100
		6	2437	11.80	12.00	11.70	12.00	14.76	15.00	
		9	2452	10.00	12.00	9.50	10.00	12.77	13.00	

13. Antenna Location



Back View

The separation distance for antenna to edge:

Antenna	Front (mm)	Back (mm)	Top Side (mm)	Bottom Side (mm)	Right Side (mm)	Left Side (mm)
WWAN Antenna	< 25	< 25	< 25	≥25	< 25	< 25
WLAN Antenna 1	< 25	< 25	< 25	≥25	< 25	< 25
WLAN Antenna 2	< 25	< 25	< 25	≥25	< 25	< 25

General Note:

1. Referring to KDB 941225 D06 v02r01, when the overall device length and width are ≥ 9cm*5cm, the test distance is 10 mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge

14. SAR Test Results

General Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
   c. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
   d. For WLAN: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
   e. For TDD LTE SAR measurement, the duty cycle 1:1.59 (62.9 %) was used perform testing and considering the theoretical duty cycle of 63.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 62.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix 63.3%/62.9% = 1.006 is applied to scale-up the measured SAR result. The Reported TDD LTE SAR = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.
2. Per KDB 447498 D01v06, for each exposure position, 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
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.

UMTS Note:

1. Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”.
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. The maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA, and according to the following RF output power, the output power results of the secondary modes (HSUPA, HSDPA, DC-HSDPA) are less than ¼ dB higher than the primary modes; therefore, SAR measurement is not required for HSDPA / HSUPA.

LTE Note:

1. Per KDB 941225 D05v02r05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
2. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
3. Per KDB 941225 D05v02r05, For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
4. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
5. Per KDB 941225 D05v02r05, Smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
6. For LTE B12 / B5 / B4 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, 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.
7. LTE band 17/38 SAR test was covered by Band 12/41; according to TCB workshop, SAR test for overlapping LTE bands can be reduced if
   a. The maximum output power, including tolerance, for the smaller band is ≤ the larger band to qualify for the SAR test exclusion.
   b. The channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band.

WLAN Note:

1. Per KDB 248227 D01v02r02, for 2.4GHz 802.11g/n SAR testing is not required 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.
2. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode 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 report SAR is ≤ 0.8 W/kg or all required test position are tested.
3. For all positions / configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions / configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.
4. For WLAN SAR testing was performed on single antenna RF power in SISO mode is larger or equal to the single antenna RF power in MIMO mode, and for RF exposure assessment of MIMO mode simultaneous transmission exclusion analysis was performed with SAR test results of each antenna in SISO mode.
5. Per KDB 248227 D01v02r02, the simultaneous SAR provisions in KDB publication 447498 should be applied to determine simultaneous transmission SAR test exclusion for WiFi MIMO. If the sum of 1g single transmission chain SAR measurements is < 1.6W/kg and SAR peak to location ratio ≤ 0.04, no additional SAR measurements for MIMO.
6. During SAR testing the WLAN transmission was verified using a spectrum analyzer.

14.1 Hotspot SAR

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WCDMA II	RMC 12.2Kbps	Front	10mm	9538	1907.6	19.30	20.40	1.288	-0.14	0.567	0.730
	WCDMA II	RMC 12.2Kbps	Back	10mm	9538	1907.6	19.30	20.40	1.288	0.14	0.811	1.045
	WCDMA II	RMC 12.2Kbps	Back	10mm	9262	1852.4	19.20	20.40	1.318	0.16	0.627	0.827
	WCDMA II	RMC 12.2Kbps	Back	10mm	9400	1880	19.12	20.40	1.343	0.13	0.714	0.959
	WCDMA II	RMC 12.2Kbps	Left Side	10mm	9538	1907.6	19.30	20.40	1.288	0.11	0.007	0.009
01	WCDMA II	RMC 12.2Kbps	Right Side	10mm	9538	1907.6	19.30	20.40	1.288	0	1.060	1.366
	WCDMA II	RMC 12.2Kbps	Right Side	10mm	9262	1852.4	19.20	20.40	1.318	-0.07	0.875	1.153
	WCDMA II	RMC 12.2Kbps	Right Side	10mm	9400	1880	19.12	20.40	1.343	-0.05	1.010	1.356
	WCDMA II	RMC 12.2Kbps	Top Side	10mm	9538	1907.6	19.30	20.40	1.288	0	0.102	0.131
	WCDMA IV	RMC 12.2Kbps	Front	10mm	1312	1712.4	21.80	23.00	1.318	-0.17	0.449	0.592
	WCDMA IV	RMC 12.2Kbps	Back	10mm	1312	1712.4	21.80	23.00	1.318	0.12	0.602	0.794
	WCDMA IV	RMC 12.2Kbps	Left Side	10mm	1312	1712.4	21.80	23.00	1.318	-0.18	0.034	0.045
	WCDMA IV	RMC 12.2Kbps	Right Side	10mm	1312	1712.4	21.80	23.00	1.318	-0.02	0.745	0.982
	WCDMA IV	RMC 12.2Kbps	Right Side	10mm	1413	1732.6	21.61	23.00	1.377	-0.01	0.822	1.132
02	WCDMA IV	RMC 12.2Kbps	Right Side	10mm	1513	1752.6	21.56	23.00	1.393	-0.01	0.839	1.169
	WCDMA IV	RMC 12.2Kbps	Top Side	10mm	1312	1712.4	21.80	23.00	1.318	0.01	0.247	0.326
	WCDMA V	RMC 12.2Kbps	Front	10mm	4132	826.4	23.33	24.00	1.167	-0.01	0.636	0.742
	WCDMA V	RMC 12.2Kbps	Back	10mm	4132	826.4	23.33	24.00	1.167	0.07	0.856	0.999
03	WCDMA V	RMC 12.2Kbps	Back	10mm	4182	836.4	23.29	24.00	1.178	0.01	0.901	1.061
	WCDMA V	RMC 12.2Kbps	Back	10mm	4233	846.6	22.80	24.00	1.318	0.01	0.678	0.894
	WCDMA V	RMC 12.2Kbps	Left Side	10mm	4132	826.4	23.33	24.00	1.167	-0.02	0.213	0.249
	WCDMA V	RMC 12.2Kbps	Right Side	10mm	4132	826.4	23.33	24.00	1.167	0.02	0.195	0.228
	WCDMA V	RMC 12.2Kbps	Top Side	10mm	4132	826.4	23.33	24.00	1.167	-0.06	0.375	0.438

<FDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 2	20M	QPSK	1	0	Front	10mm	18700	1860	19.32	20.40	1.282	-0.11	0.417	0.535
	LTE Band 2	20M	QPSK	50	0	Front	10mm	18700	1860	18.12	19.40	1.343	-0.12	0.333	0.447
	LTE Band 2	20M	QPSK	1	0	Back	10mm	18700	1860	19.32	20.40	1.282	-0.01	0.646	0.828
	LTE Band 2	20M	QPSK	1	0	Back	10mm	18900	1880	19.19	20.40	1.321	0.08	0.647	0.855
	LTE Band 2	20M	QPSK	1	0	Back	10mm	19100	1900	19.20	20.40	1.318	0.07	0.726	0.957
	LTE Band 2	20M	QPSK	50	0	Back	10mm	18700	1860	18.12	19.40	1.343	-0.04	0.520	0.698
	LTE Band 2	20M	QPSK	100	0	Back	10mm	18900	1880	18.12	19.40	1.343	0.05	0.545	0.732
	LTE Band 2	20M	QPSK	1	0	Left Side	10mm	18700	1860	19.32	20.40	1.282	0.17	0.013	0.017
	LTE Band 2	20M	QPSK	50	0	Left Side	10mm	18700	1860	18.12	19.40	1.343	0.11	0.010	0.013
	LTE Band 2	20M	QPSK	1	0	Right Side	10mm	18700	1860	19.32	20.40	1.282	-0.09	0.670	0.859
	LTE Band 2	20M	QPSK	1	0	Right Side	10mm	18900	1880	19.19	20.40	1.321	-0.1	0.859	1.135
04	LTE Band 2	20M	QPSK	1	0	Right Side	10mm	19100	1900	19.20	20.40	1.318	-0.13	0.876	1.155
	LTE Band 2	20M	QPSK	50	0	Right Side	10mm	18700	1860	18.12	19.40	1.343	-0.12	0.529	0.710
	LTE Band 2	20M	QPSK	100	0	Right Side	10mm	18900	1880	18.12	19.40	1.343	-0.1	0.744	0.999
	LTE Band 2	20M	QPSK	1	0	Top Side	10mm	18700	1860	19.32	20.40	1.282	0	0.098	0.126
	LTE Band 2	20M	QPSK	50	0	Top Side	10mm	18700	1860	18.12	19.40	1.343	0.06	0.076	0.102

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 4	20M	QPSK	1	0	Front	10mm	20175	1732.5	22.58	23.00	1.102	-0.14	0.527	0.581
	LTE Band 4	20M	QPSK	50	24	Front	10mm	20175	1732.5	21.48	22.00	1.127	-0.14	0.478	0.539
05	LTE Band 4	20M	QPSK	1	0	Back	10mm	20175	1732.5	22.58	23.00	1.102	0.14	0.775	0.854
	LTE Band 4	20M	QPSK	50	24	Back	10mm	20175	1732.5	21.48	22.00	1.127	0.16	0.658	0.742
	LTE Band 4	20M	QPSK	100	0	Back	10mm	20175	1732.5	21.45	22.00	1.135	0.16	0.634	0.720
	LTE Band 4	20M	QPSK	1	0	Left Side	10mm	20175	1732.5	22.58	23.00	1.102	0.14	0.040	0.044
	LTE Band 4	20M	QPSK	50	24	Left Side	10mm	20175	1732.5	21.48	22.00	1.127	-0.07	0.038	0.043
	LTE Band 4	20M	QPSK	1	0	Right Side	10mm	20175	1732.5	22.58	23.00	1.102	-0.13	0.702	0.773
	LTE Band 4	20M	QPSK	50	24	Right Side	10mm	20175	1732.5	21.48	22.00	1.127	-0.13	0.635	0.716
	LTE Band 4	20M	QPSK	1	0	Top Side	10mm	20175	1732.5	22.58	23.00	1.102	0	0.323	0.356
	LTE Band 4	20M	QPSK	50	24	Top Side	10mm	20175	1732.5	21.48	22.00	1.127	0.02	0.287	0.324
	LTE Band 5	10M	QPSK	1	0	Front	10mm	20525	836.5	22.78	23.00	1.052	-0.05	0.528	0.555
	LTE Band 5	10M	QPSK	25	12	Front	10mm	20525	836.5	21.19	22.00	1.205	-0.01	0.434	0.523
06	LTE Band 5	10M	QPSK	1	0	Back	10mm	20525	836.5	22.78	23.00	1.052	0.02	0.735	0.773
	LTE Band 5	10M	QPSK	25	12	Back	10mm	20525	836.5	21.19	22.00	1.205	0.06	0.612	0.737
	LTE Band 5	10M	QPSK	1	0	Left Side	10mm	20525	836.5	22.78	23.00	1.052	0	0.161	0.169
	LTE Band 5	10M	QPSK	25	12	Left Side	10mm	20525	836.5	21.19	22.00	1.205	-0.06	0.132	0.159
	LTE Band 5	10M	QPSK	1	0	Right Side	10mm	20525	836.5	22.78	23.00	1.052	-0.15	0.168	0.177
	LTE Band 5	10M	QPSK	25	12	Right Side	10mm	20525	836.5	21.19	22.00	1.205	-0.07	0.127	0.153
	LTE Band 5	10M	QPSK	1	0	Top Side	10mm	20525	836.5	22.78	23.00	1.052	-0.07	0.332	0.349
	LTE Band 5	10M	QPSK	25	12	Top Side	10mm	20525	836.5	21.19	22.00	1.205	-0.03	0.272	0.328
	LTE Band 7	20M	QPSK	1	0	Front	10mm	21100	2535	22.97	23.00	1.007	0.07	0.382	0.385
	LTE Band 7	20M	QPSK	50	50	Front	10mm	20850	2510	21.21	22.00	1.199	0.01	0.318	0.381
	LTE Band 7	20M	QPSK	1	0	Back	10mm	21100	2535	22.97	23.00	1.007	-0.16	0.796	0.802
	LTE Band 7	20M	QPSK	1	0	Back	10mm	20850	2510	22.89	23.00	1.026	0.17	0.564	0.578
	LTE Band 7	20M	QPSK	1	0	Back	10mm	21350	2560	22.91	23.00	1.021	0.04	0.725	0.740
	LTE Band 7	20M	QPSK	50	50	Back	10mm	20850	2510	21.21	22.00	1.199	0.17	0.659	0.790
	LTE Band 7	20M	QPSK	100	0	Back	10mm	20850	2510	21.11	22.00	1.227	0.06	0.649	0.797
	LTE Band 7	20M	QPSK	1	0	Left Side	10mm	21100	2535	22.97	23.00	1.007	0.18	0.011	0.011
	LTE Band 7	20M	QPSK	50	50	Left Side	10mm	20850	2510	21.21	22.00	1.199	0.15	0.009	0.011
	LTE Band 7	20M	QPSK	1	0	Right Side	10mm	21100	2535	22.97	23.00	1.007	-0.16	0.820	0.826
	LTE Band 7	20M	QPSK	1	0	Right Side	10mm	20850	2510	22.89	23.00	1.026	-0.06	0.655	0.672
	LTE Band 7	20M	QPSK	1	0	Right Side	10mm	21350	2560	22.91	23.00	1.021	-0.09	0.758	0.774
	LTE Band 7	20M	QPSK	50	50	Right Side	10mm	20850	2510	21.21	22.00	1.199	-0.12	0.700	0.840
07	LTE Band 7	20M	QPSK	100	0	Right Side	10mm	20850	2510	21.11	22.00	1.227	-0.05	0.693	0.851
	LTE Band 7	20M	QPSK	1	0	Top Side	10mm	21100	2535	22.97	23.00	1.007	0.03	0.054	0.054
	LTE Band 7	20M	QPSK	50	50	Top Side	10mm	20850	2510	21.21	22.00	1.199	0.05	0.043	0.052
08	LTE Band 12	10M	QPSK	1	0	Front	10mm	23095	707.5	22.35	23.00	1.161	-0.03	0.236	0.274
	LTE Band 12	10M	QPSK	25	25	Front	10mm	23095	707.5	21.15	22.00	1.216	0.05	0.162	0.197
	LTE Band 12	10M	QPSK	1	0	Back	10mm	23095	707.5	22.35	23.00	1.161	-0.14	0.193	0.224
	LTE Band 12	10M	QPSK	25	25	Back	10mm	23095	707.5	21.15	22.00	1.216	-0.07	0.124	0.151
	LTE Band 12	10M	QPSK	1	0	Left Side	10mm	23095	707.5	22.35	23.00	1.161	-0.08	0.078	0.091
	LTE Band 12	10M	QPSK	25	25	Left Side	10mm	23095	707.5	21.15	22.00	1.216	-0.14	0.042	0.051
	LTE Band 12	10M	QPSK	1	0	Right Side	10mm	23095	707.5	22.35	23.00	1.161	0.01	0.112	0.130
	LTE Band 12	10M	QPSK	25	25	Right Side	10mm	23095	707.5	21.15	22.00	1.216	-0.01	0.068	0.083
	LTE Band 12	10M	QPSK	1	0	Top Side	10mm	23095	707.5	22.35	23.00	1.161	-0.07	0.075	0.087
	LTE Band 12	10M	QPSK	25	25	Top Side	10mm	23095	707.5	21.15	22.00	1.216	-0.01	0.052	0.063

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 13	10M	QPSK	1	0	Front	10mm	23230	782	22.80	23.00	1.047	-0.06	0.300	0.314
	LTE Band 13	10M	QPSK	25	12	Front	10mm	23230	782	21.39	22.00	1.151	0.11	0.227	0.261
09	LTE Band 13	10M	QPSK	1	0	Back	10mm	23230	782	22.80	23.00	1.047	-0.1	0.373	0.391
	LTE Band 13	10M	QPSK	25	12	Back	10mm	23230	782	21.39	22.00	1.151	-0.13	0.207	0.238
	LTE Band 13	10M	QPSK	1	0	Left Side	10mm	23230	782	22.80	23.00	1.047	0.03	0.032	0.034
	LTE Band 13	10M	QPSK	25	12	Left Side	10mm	23230	782	21.39	22.00	1.151	-0.11	0.030	0.035
	LTE Band 13	10M	QPSK	1	0	Right Side	10mm	23230	782	22.80	23.00	1.047	-0.03	0.081	0.085
	LTE Band 13	10M	QPSK	25	12	Right Side	10mm	23230	782	21.39	22.00	1.151	-0.1	0.083	0.096
	LTE Band 13	10M	QPSK	1	0	Top Side	10mm	23230	782	22.80	23.00	1.047	-0.13	0.072	0.075
	LTE Band 13	10M	QPSK	25	12	Top Side	10mm	23230	782	21.39	22.00	1.151	0.14	0.054	0.062

<TDD LTE SAR>

Note	Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
		LTE Band 41	20M	QPSK	1	0	Front	10mm	41055	2636.5	23.00	23.00	1.000	62.9	1.006	-0.03	0.232	0.233
		LTE Band 41	20M	QPSK	50	0	Front	10mm	41055	2636.5	21.24	22.00	1.191	62.9	1.006	-0.17	0.188	0.225
		LTE Band 41	20M	QPSK	1	0	Back	10mm	41055	2636.5	23.00	23.00	1.000	62.9	1.006	0.13	0.428	0.431
		LTE Band 41	20M	QPSK	50	0	Back	10mm	41055	2636.5	21.24	22.00	1.191	62.9	1.006	0.16	0.351	0.421
		LTE Band 41	20M	QPSK	1	0	Left Side	10mm	41055	2636.5	23.00	23.00	1.000	62.9	1.006	0.19	0.014	0.014
		LTE Band 41	20M	QPSK	50	0	Left Side	10mm	41055	2636.5	21.24	22.00	1.191	62.9	1.006	0.17	0.011	0.013
		LTE Band 41	20M	QPSK	1	0	Right Side	10mm	41055	2636.5	23.00	23.00	1.000	62.9	1.006	-0.01	0.423	0.426
		LTE Band 41	20M	QPSK	50	0	Right Side	10mm	41055	2636.5	21.24	22.00	1.191	62.9	1.006	-0.02	0.339	0.406
		LTE Band 41	20M	QPSK	1	0	Top Side	10mm	41055	2636.5	23.00	23.00	1.000	62.9	1.006	0.03	0.058	0.058
		LTE Band 41	20M	QPSK	50	0	Top Side	10mm	41055	2636.5	21.24	22.00	1.191	62.9	1.006	0.05	0.047	0.056
UL CA		LTE Band 41	20M	QPSK	1	0	Back	10mm	39750 + 39948	2506	23.00	23.00	1.000	62.9	1.006	0.13	0.322	0.324
HPUE	10	LTE Band 41	20M	QPSK	1	0	Back	10mm	40185	2549.5	25.40	26.00	1.148	42.9	1.009	0.05	0.515	0.597

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN2.4GHz	802.11b 1Mbps	Front	10mm	Ant 1	11	2462	11.90	12.00	1.023	98.01	1.020	-0.13	0.085	0.089
	WLAN2.4GHz	802.11b 1Mbps	Back	10mm	Ant 1	11	2462	11.90	12.00	1.023	98.01	1.020	0.03	0.074	0.077
11	WLAN2.4GHz	802.11b 1Mbps	Left Side	10mm	Ant 1	11	2462	11.90	12.00	1.023	98.01	1.020	-0.04	0.115	0.120
	WLAN2.4GHz	802.11b 1Mbps	Right Side	10mm	Ant 1	11	2462	11.90	12.00	1.023	98.01	1.020	-0.06	0.001	0.001
	WLAN2.4GHz	802.11b 1Mbps	Top Side	10mm	Ant 1	11	2462	11.90	12.00	1.023	98.01	1.020	0.1	0.005	0.005
	WLAN2.4GHz	802.11b 1Mbps	Front	10mm	Ant 2	1	2412	11.70	12.00	1.072	98.29	1.017	0.14	0.034	0.037
	WLAN2.4GHz	802.11b 1Mbps	Back	10mm	Ant 2	1	2412	11.70	12.00	1.072	98.29	1.017	-0.07	0.039	0.042
	WLAN2.4GHz	802.11b 1Mbps	Left Side	10mm	Ant 2	1	2412	11.70	12.00	1.072	98.29	1.017	0.15	0.007	0.008
	WLAN2.4GHz	802.11b 1Mbps	Right Side	10mm	Ant 2	1	2412	11.70	12.00	1.072	98.29	1.017	0.19	0.007	0.008
	WLAN2.4GHz	802.11b 1Mbps	Top Side	10mm	Ant 2	1	2412	11.70	12.00	1.072	98.29	1.017	0.03	0.042	0.046

14.2 Repeated SAR Measurement

No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	WCDMA II	RMC 12.2Kbps	Right Side	10mm	9538	1907.6	19.30	20.40	1.288	0	1.060	-	1.366
2nd	WCDMA II	RMC 12.2Kbps	Right Side	10mm	9538	1907.6	19.30	20.40	1.288	-0.05	1.030	1.03	1.327
1st	WCDMA IV	RMC 12.2Kbps	Right Side	10mm	1513	1752.6	21.56	23.00	1.393	-0.01	0.839	-	1.169
2nd	WCDMA IV	RMC 12.2Kbps	Right Side	10mm	1513	1752.6	21.56	23.00	1.393	-0.19	0.827	1.01	1.152
1st	WCDMA V	RMC 12.2Kbps	Back	10mm	4182	836.4	23.29	24.00	1.178	0.01	0.901	-	1.061
2nd	WCDMA V	RMC 12.2Kbps	Back	10mm	4182	836.4	23.29	24.00	1.178	-0.01	0.865	1.04	1.019

General Note:

1. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
2. Per KDB 865664 D01v01r04, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR <1.45W/kg, only one repeated measurement is required.
3. The ratio is the difference in percentage between original and repeated *measured SAR*.
4. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

14.3 LTE Band 41 Power Class 2 and Power Class 3 Linearity

This device support Power Class 2 and Power Class 3 operations for LTE Band 41. The highest available duty cycle for Power Class 2 operation is 43.3% using UL-DL configuration 1. Per FCC Guidance based on the device behavior, all SAR tests were performed using Power Class 3. Power Class 2 is tested using the highest SAR test configuration in Power Class 3 for each LTE configuration and exposure condition combination, according to the highest time averaged power for all applicable uplink-downlink configurations in Power Class 2. When the reported SAR vs. output power is linearly scaled with < 10% discrepancy between power classes and all reported SAR are < 1.4 W/kg, Separate SAR testing for Power Class 2 is not required

	LTE Band 41	LTE Band 41
	(Power Class 3)	(Power Class 2)
Maximum Tune up Power (dBm)	23	26
Reported 1g SAR (W/kg)	0.431	0.597
Duty Cycle	63.30%	43.30%
Frame Averaged (mW)	126.30	172.38
Linearity SAR(W/kg)	0.59	
% deviation from expected linearity		1.49%

15. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Body
1.	WWAN + WLAN2.4GHz ANT 1 + WLAN2.4GHz ANT 2	Yes
2.	WWAN + WLAN2.4GHz ANT 1 + WLAN2.4GHz ANT 2	Yes

General Note:

1. All licensed modes share the same antenna part and cannot transmit simultaneously.
2. The Scaled SAR summation is calculated based on the same configuration and test position.
3. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
   i) Scalar SAR summation < 1.6W/kg.
   ii) SPLSR = (SAR1 + SAR2)^1.5 / (min. separation distance, mm), and the peak separation distance is determined from the square root of [(x1-x2)2 + (y1-y2)2 + (z1-z2)2], where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
   iii) If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.
   iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.

15.1 Hotspot Exposure Conditions

WWAN Band		Exposure Position	1	2	3	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)	1+2+3 Summed 1g SAR (W/kg)
			WWAN	2.4GHz WLAN Ant 1	2.4GHz WLAN Ant 2			
			1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)			
WCDMA	WCDMA II	Front	0.730	0.089	0.037	**0.819**	**0.767**	**0.856**
		Back	1.045	0.077	0.042	**1.122**	**1.087**	**1.164**
		Left side	0.009	0.120	0.008	**0.129**	**0.017**	**0.137**
		Right side	1.366	0.001	0.008	**1.367**	**1.374**	**1.375**
		Top side	0.131	0.005	0.046	**0.136**	**0.177**	**0.182**
	WCDMA IV	Front	0.592	0.089	0.037	**0.681**	**0.629**	**0.718**
		Back	0.794	0.077	0.042	**0.871**	**0.836**	**0.913**
		Left side	0.045	0.120	0.008	**0.165**	**0.053**	**0.173**
		Right side	1.169	0.001	0.008	**1.170**	**1.177**	**1.178**
		Top side	0.326	0.005	0.046	**0.331**	**0.372**	**0.377**
	WCDMA V	Front	0.742	0.089	0.037	**0.831**	**0.779**	**0.868**
		Back	1.061	0.077	0.042	**1.138**	**1.103**	**1.180**
		Left side	0.249	0.120	0.008	**0.369**	**0.257**	**0.377**
		Right side	0.228	0.001	0.008	**0.229**	**0.236**	**0.237**
		Top side	0.438	0.005	0.046	**0.443**	**0.484**	**0.489**

WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	2 2.4GHz WLAN Ant 1 1g SAR (W/kg)	3 2.4GHz WLAN Ant 2 1g SAR (W/kg)	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)	1+2+3 Summed 1g SAR (W/kg)
LTE	LTE Band 2	Front	0.535	0.089	0.037	**0.624**	**0.572**	**0.661**
		Back	0.957	0.077	0.042	**1.034**	**0.999**	**1.076**
		Left side	0.017	0.120	0.008	**0.137**	**0.025**	**0.145**
		Right side	1.155	0.001	0.008	**1.156**	**1.163**	**1.164**
		Top side	0.126	0.005	0.046	**0.131**	**0.172**	**0.177**
	LTE Band 4	Front	0.581	0.089	0.037	**0.670**	**0.618**	**0.707**
		Back	0.854	0.077	0.042	**0.931**	**0.896**	**0.973**
		Left side	0.044	0.120	0.008	**0.164**	**0.052**	**0.172**
		Right side	0.773	0.001	0.008	**0.774**	**0.781**	**0.782**
		Top side	0.356	0.005	0.046	**0.361**	**0.402**	**0.407**
	LTE Band 5	Front	0.555	0.089	0.037	**0.644**	**0.592**	**0.681**
		Back	0.773	0.077	0.042	**0.850**	**0.815**	**0.892**
		Left side	0.169	0.120	0.008	**0.289**	**0.177**	**0.297**
		Right side	0.177	0.001	0.008	**0.178**	**0.185**	**0.186**
		Top side	0.349	0.005	0.046	**0.354**	**0.395**	**0.400**
	LTE Band 7	Front	0.385	0.089	0.037	**0.474**	**0.422**	**0.511**
		Back	0.802	0.077	0.042	**0.879**	**0.844**	**0.921**
		Left side	0.011	0.120	0.008	**0.131**	**0.019**	**0.139**
		Right side	0.851	0.001	0.008	**0.852**	**0.859**	**0.860**
		Top side	0.054	0.005	0.046	**0.059**	**0.100**	**0.105**
	LTE Band 12	Front	0.274	0.089	0.037	**0.363**	**0.311**	**0.400**
		Back	0.224	0.077	0.042	**0.301**	**0.266**	**0.343**
		Left side	0.091	0.120	0.008	**0.211**	**0.099**	**0.219**
		Right side	0.130	0.001	0.008	**0.131**	**0.138**	**0.139**
		Top side	0.087	0.005	0.046	**0.092**	**0.133**	**0.138**
	LTE Band 13	Front	0.314	0.089	0.037	**0.403**	**0.351**	**0.440**
		Back	0.391	0.077	0.042	**0.468**	**0.433**	**0.510**
		Left side	0.035	0.120	0.008	**0.155**	**0.043**	**0.163**
		Right side	0.096	0.001	0.008	**0.097**	**0.104**	**0.105**
		Top side	0.075	0.005	0.046	**0.080**	**0.121**	**0.126**
	LTE Band 41	Front	0.233	0.089	0.037	**0.322**	**0.270**	**0.359**
		Back	0.597	0.077	0.042	**0.674**	**0.639**	**0.716**
		Left side	0.014	0.120	0.008	**0.134**	**0.022**	**0.142**
		Right side	0.426	0.001	0.008	**0.427**	**0.434**	**0.435**
		Top side	0.058	0.005	0.046	**0.063**	**0.104**	**0.109**

Test Engineer： Jack Yang Ray Sun and Jay Jian

16. Uncertainty Assessment

Per KDB 865664 D01 SAR measurement 100MHz to 6GHz, 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. For this device, the highest measured 1-g SAR is less 1.5W/kg. Therefore, the measurement uncertainty table is not required in this report.

17. References

[1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”

[2] ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992

[3] IEEE Std. 1528-2013, “IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, Sep 2013

[4] SPEAG DASY System Handbook

[5] FCC KDB 248227 D01 v02r02, “SAR Guidance for IEEE 802.11 (WiFi) Transmitters”, Oct 2015.

[6] FCC KDB 447498 D01 v06, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Oct 2015

[7] FCC KDB 648474 D04 v01r03, “SAR Evaluation Considerations for Wireless Handsets”, Oct 2015.

[8] FCC KDB 941225 D01 v03r01, “3G SAR MEAUREMENT PROCEDURES”, Oct 2015

[9] FCC KDB 941225 D05 v02r05, “SAR Evaluation Considerations for LTE Devices”, Dec 2015

[10] FCC KDB 941225 D05A v01r02, “Rel. 10 LTE SAR Test Guidance and KDB Inquiries”, Oct 2015

[11] FCC KDB 941225 D06 v02r01, "SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities", Oct 2015.

[12] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.

[13] FCC KDB 865664 D02 v01r02, “RF Exposure Compliance Reporting and Documentation Considerations” Oct 2015.