FCC SAR Test Report

Report No.	:	**W7L-P21100025SA01**
Applicant	:	**COOSEA GROUP (HK) COMPANY LIMITED**
Address	:	**UNIT 5-6 16/F MULTIFIELD PLAZA 3-7A PRAT AVENUE TSIMSHATSUI KL, HONG KONG, CHINA**
Product	:	**LTE Smartphone**
FCC ID	:	**2A28USL100EA**
Brand	:	**Cricket**
Model No.	:	**SL100EA**
Standards	:	**FCC 47 CFR Part 2 (2.1093) / IEEE C95.1:1992 / IEEE 1528:2013 KDB 865664 D01 v01r04 / KDB 865664 D02 v01r02 / KDB 248227 D01 v02r02 KDB 447498 D01 v06 / KDB 648474 D04 v01r03 / KDB 941225 D05 v02r05 KDB 941225 D05A v01r02 / KDB 941225 D06 v02r01**
Sample Received Date	:	**Nov. 22, 2021**
Date of Testing	:	**Dec. 02, 2021 ~ Dec. 07, 2021**
FCC Designation No.	:	**CN1171**

CERTIFICATION: The above equipment have been tested by **BV 7LAYERS COMMUNICATIONS TECHNOLOGY (SHENZHEN) CO. LTD.**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's SAR characteristics under the conditions specified in this report. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product certification, approval, or endorsement by A2LA or any government agencies.

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ACCREDITED
Certificate # 3939.01

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Release Control Record

Report No.	Reason for Change	Date Issued
W7L-P21100025SA01	Initial release	Dec. 25, 2021

1. Summary of Maximum SAR Value

Equipment Class	Mode	Highest Reported Head SAR_{1g} (W/kg)	Highest Reported Body-worn SAR_{1g} (1.0 cm Gap) (W/kg)	Highest Reported Hotspot SAR_{1g} (1.0 cm Gap) (W/kg)	Highest Reported Extremity SAR_{10g} (0 cm Gap) (W/kg)
PCE	LTE 2	0.30	0.55	0.55	N/A
	LTE 4	0.49	0.59	0.59	N/A
	LTE 5	0.47	0.65	0.65	N/A
	LTE 12	0.23	0.42	0.42	N/A
	LTE 14	0.47	0.71	0.71	N/A
	LTE 30	0.45	0.50	0.50	1.81
DTS	2.4G WLAN	1.04	0.55	0.55	N/A
NII	5.2G WLAN	N/A	N/A	0.67	N/A
	5.3G WLAN	0.70	0.48	N/A	1.12
	5.6G WLAN	1.05	0.65	N/A	1.75
	5.8G WLAN	1.09	0.76	1.12	N/A
DSS	Bluetooth	0.15	0.10	0.10	N/A
Highest Simultaneous Transmission SAR		Head (W/kg)	Body-worn (W/kg)	Hotspot (W/kg)	Extremity (W/kg)
		1.56	1.56	1.56	3.37

Note:

1. The SAR limit **(Head & Body: SAR_{1g} 1.6 W/kg, Extremity: SAR_{10g} 4.0 W/kg)** for general population / uncontrolled exposure is specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992.

2. Description of Equipment Under Test

EUT Type	LTE Smartphone
FCC ID	2A28USL100EA
Brand Name	Cricket
Model Name	SL100EA
HW Version	HW 1.0
SW Version	SL100EAC010001
Tx Frequency Bands (Unit: MHz)	LTE Band 2 : 1850.7 ~ 1909.3 (1.4M), 1851.5 ~ 1908.5 (3M), 1852.5 ~ 1907.5 (5M), 1855 ~ 1905 (10M), 1857.5 ~ 1902.5 (15M), 1860 ~ 1900 (20M) LTE Band 4 : 1710.7 ~ 1754.3 (1.4M), 1711.5 ~ 1753.5 (3M), 1712.5 ~ 1752.5 (5M), 1715 ~ 1750 (10M), 1717.5 ~ 1747.5 (15M), 1720 ~ 1745 (20M) LTE Band 5 : 824.7 ~ 848.3 (1.4M), 825.5 ~ 847.5 (3M), 826.5 ~ 846.5 (5M), 829 ~ 844 (10M) LTE Band 12 : 699.7 ~ 715.3 (1.4M), 700.5 ~ 714.5 (3M), 701.5 ~ 713.5 (5M), 704 ~ 711 (10M) LTE Band 14 : 790.5 ~ 795.5 (5M), 793 (10M) LTE Band 30 : 2307.5 ~ 2312.5 (5M), 2310 (10M) WLAN : 2412 ~ 2462, 5180 ~ 5240, 5260 ~ 5320, 5500 ~ 5700, 5745 ~ 5805/5825 Bluetooth : 2402 ~ 2480
Uplink Modulations	LTE : QPSK, 16QAM, 64QAM 802.11b : DSSS 802.11a/g/n/ac : OFDM Bluetooth : GFSK, π/4-DQPSK, 8-DPSK
Maximum Tune-up Conducted Power (Unit: dBm)	Please refer to section 4.5.1 of this report.
Antenna Type	WLAN: Fixed Internal Antenna WWAN: Fixed Internal Antenna
EUT Stage	Identical Prototype

Note:

1. The above EUT information is declared by manufacturer and for more detailed features description please refers to the manufacturer's specifications or User's Manual.
2. For WLAN, when the audio is actively routed through the earpiece receiver on head exposure condition, power reduction will be activated to limit the maximum power.
3. For WWAN Antenna, when the p-sensor is detect close to the body sate, power reduction will be activated to limit the maximum power.
4. Power reduction for RF exposure consideration:

Test Scenario	SAR sensor	Receiver	TX Power reduce
Head	Off	On	Yes
Body-Worn	On	Off	Yes
Hotspot	On	Off	Yes
Extremity	On	Off	Yes

3. SAR Measurement System

3.1 Definition of Specific Absorption Rate (SAR)

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.

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)

SAR measurement can be related to the electrical field in the tissue by

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

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

3.2 SPEAG DASY System

DASY system consists of high precision robot, probe alignment sensor, phantom, robot controller, controlled measurement server and near-field probe. The robot includes six axes that can move to the precision position of the DASY5 software defined. The DASY software can define the area that is detected by the probe. The robot is connected to controlled box. Controlled measurement server is connected to the controlled robot box. The DAE includes amplifier, signal multiplexing, AD converter, offset measurement and surface detection. It is connected to the Electro-optical coupler (ECO). The ECO performs the conversion form the optical into digital electric signal of the DAE and transfers data to the PC.

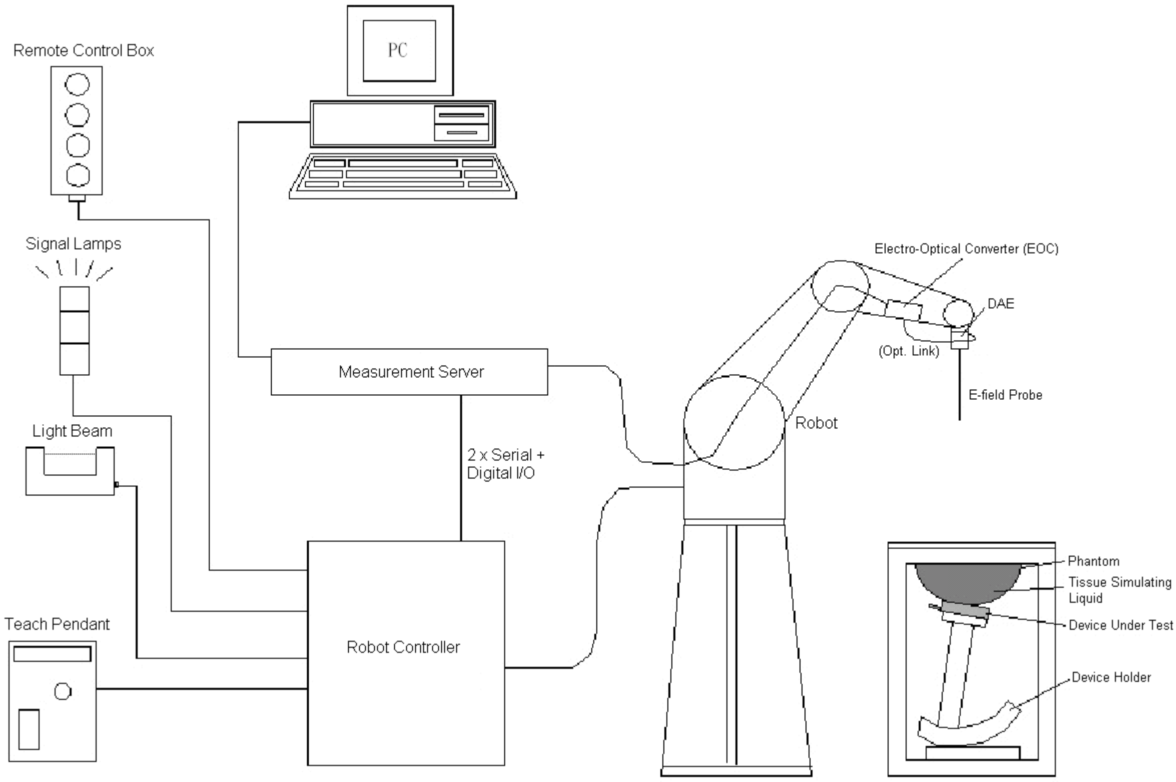


Fig-3.1 DASY System Setup

3.2.1 Robot

The DASY system uses the high precision robots from Stäubli SA (France). For the 6-axis controller system, the robot controller version (DASY5: CS8c) from Stäubli is used. The Stäubli robot series have many features that are important for our application:

- High precision (repeatability ±0.035 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)

Fig-3.2 DASY5

3.2.2 Probes

The SAR measurement is conducted with the dosimetric probe. 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.

Model	EX3DV4
Construction	Symmetrical design with triangular core. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE).
Frequency	10 MHz to 6 GHz Linearity: ± 0.2 dB
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 µW/g to 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

Model	ES3DV3
Construction	Symmetrical 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 to 4 GHz Linearity: ± 0.2 dB
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.3 dB in tissue material (rotation normal to probe axis)
Dynamic Range	5 µW/g to 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: 2.0 mm

3.2.3 Data Acquisition Electronics (DAE)

Model	DAE3, DAE4
Construction	Signal amplifier, multiplexer, A/D converter and control logic. Serial optical link for communication with DASY embedded system (fully remote controlled). Two step probe touch detector for mechanical surface detection and emergency robot stop.
Measurement Range	-100 to +300 mV (16 bit resolution and two range settings: 4mV, 400mV)
Input Offset Voltage	< 5µV (with auto zero)
Input Bias Current	< 50 fA
Dimensions	60 x 60 x 68 mm

3.2.4 Phantoms

Model	Twin SAM
Construction	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.
Material	Vinylester, glass fiber reinforced (VE-GF)
Shell Thickness	2 ± 0.2 mm (6 ± 0.2 mm at ear point)
Dimensions	Length: 1000 mm Width: 500 mm Height: adjustable feet
Filling Volume	approx. 25 liters

Model	ELI
Construction	Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.
Material	Vinylester, glass fiber reinforced (VE-GF)
Shell Thickness	2.0 ± 0.2 mm (bottom plate)
Dimensions	Major axis: 600 mm Minor axis: 400 mm
Filling Volume	approx. 30 liters

3.2.5 Device Holder

Model	Mounting Device	
Construction	In combination with the Twin SAM Phantom or ELI4, the Mounting Device enables the rotation of the mounted transmitter device in spherical coordinates. Rotation point is the ear opening point. Transmitter devices can be easily and accurately positioned according to IEC, IEEE, FCC or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat).	
Material	POM	

Model	Laptop Extensions Kit	
Construction	Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices according to IEC 62209-2 (e.g., laptops, cameras, etc.). It is lightweight and fits easily on the upper part of the Mounting Device in place of the phone positioner.	
Material	POM, Acrylic glass, Foam	

3.2.6 System Validation Dipoles

Model	D-Serial	
Construction	Symmetrical dipole with l/4 balun. Enables measurement of feed point impedance with NWA. Matched for use near flat phantoms filled with tissue simulating solutions.	
Frequency	750 MHz to 5800 MHz	
Return Loss	> 20 dB	
Power Capability	> 100 W (f < 1GHz), > 40 W (f > 1GHz)	

3.2.7 Tissue Simulating Liquids

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15 cm. 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. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm. The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5% are listed in Table-3.1.

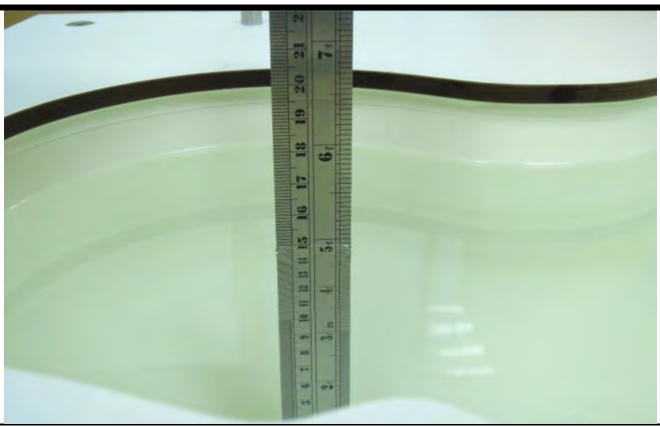
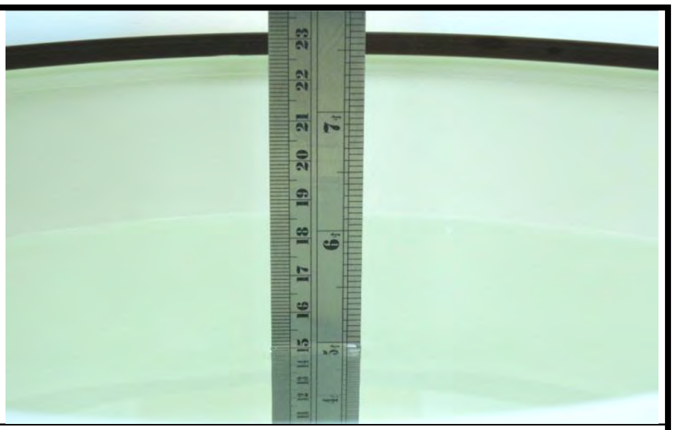
	

Photo of Liquid Height for Head Position	**Photo of Liquid Height for Body Position**

The dielectric properties of the head tissue simulating liquids are defined in IEEE 1528, and KDB 865664 D01 Appendix A. For the body tissue simulating liquids, the dielectric properties are defined in KDB 865664 D01 Appendix A. The dielectric properties of the tissue simulating liquids were verified prior to the SAR evaluation using a dielectric assessment kit and a network analyzer.

Table-3.1 Targets of Tissue Simulating Liquid

Frequency (MHz)	Target Permittivity	Range of ±5%	Target Conductivity	Range of ±5%
For Head				
750	41.9	39.8 ~ 44.0	0.89	0.85 ~ 0.93
835	41.5	39.4 ~ 43.6	0.90	0.86 ~ 0.95
900	41.5	39.4 ~ 43.6	0.97	0.92 ~ 1.02
1450	40.5	38.5 ~ 42.5	1.20	1.14 ~ 1.26
1640	40.3	38.3 ~ 42.3	1.29	1.23 ~ 1.35
1750	40.1	38.1 ~ 42.1	1.37	1.30 ~ 1.44
1800	40.0	38.0 ~ 42.0	1.40	1.33 ~ 1.47
1900	40.0	38.0 ~ 42.0	1.40	1.33 ~ 1.47
2000	40.0	38.0 ~ 42.0	1.40	1.33 ~ 1.47
2300	39.5	37.5 ~ 41.5	1.67	1.59 ~ 1.75
2450	39.2	37.2 ~ 41.2	1.80	1.71 ~ 1.89
2600	39.0	37.1 ~ 41.0	1.96	1.86 ~ 2.06
3500	37.9	36.0 ~ 39.8	2.91	2.76 ~ 3.06
5200	36.0	34.2 ~ 37.8	4.66	4.43 ~ 4.89
5300	35.9	34.1 ~ 37.7	4.76	4.52 ~ 5.00
5500	35.6	33.8 ~ 37.4	4.96	4.71 ~ 5.21
5600	35.5	33.7 ~ 37.3	5.07	4.82 ~ 5.32
5800	35.3	33.5 ~ 37.1	5.27	5.01 ~ 5.53

The following table gives the recipes for tissue simulating liquids.

Table-3.2 Recipes of Tissue Simulating Liquid

Tissue Type	Bactericide	DGBE	HEC	NaCl	Sucrose	Triton X-100	Water	Diethylene Glycol Mono-hexylether
H750	0.2	-	0.2	1.5	56.0	-	42.1	-
H835	0.2	-	0.2	1.5	57.0	-	41.1	-
H900	0.2	-	0.2	1.4	58.0	-	40.2	-
H1450	-	43.3	-	0.6	-	-	56.1	-
H1640	-	45.8	-	0.5	-	-	53.7	-
H1750	-	47.0	-	0.4	-	-	52.6	-
H1800	-	44.5	-	0.3	-	-	55.2	-
H1900	-	44.5	-	0.2	-	-	55.3	-
H2000	-	44.5	-	0.1	-	-	55.4	-
H2300	-	44.9	-	0.1	-	-	55.0	-
H2450	-	45.0	-	0.1	-	-	54.9	-
H2600	-	45.1	-	0.1	-	-	54.8	-
H3500	-	28.0	-	0.2	-	20.0	71.8	-
H5G	-	-	-	-	-	17.2	65.5	17.3

3.3 SAR System Verification

The system check verifies that the system operates within its specifications. It is performed daily or before every SAR measurement. The system check uses normal SAR measurements in the flat section of the phantom with a matched dipole at a specified distance. The system verification setup is shown as below.

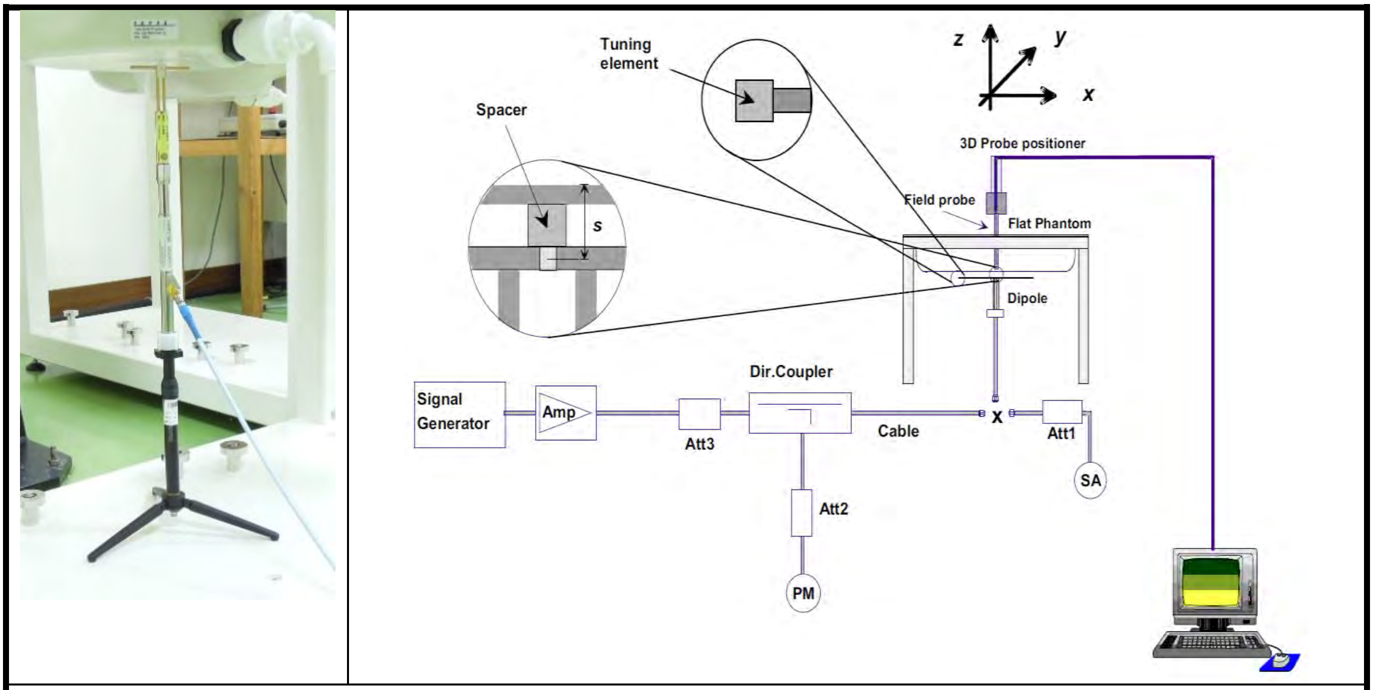


Fig-3.4 System Verification Setup

The validation dipole is placed beneath the flat phantom with the specific spacer in place. The distance spacer is touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The spectrum analyzer measures the forward power at the location of the system check dipole connector. The signal generator is adjusted for the desired forward power (250 mW is used for 700 MHz to 3 GHz, 100 mW is used for 3.5 GHz to 6 GHz) at the dipole connector and the power meter is read at that level. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter.

After system check testing, the SAR result will be normalized to 1W forward input power and compared with the reference SAR value derived from validation dipole certificate report. The deviation of system check should be within 10 %.

3.4 SAR Measurement Procedure

According to the SAR 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

The SAR measurement procedures for each of test conditions are as follows:

(a) Make EUT to transmit maximum output power
(b) Measure conducted output power through RF cable
(c) Place the EUT in the specific position of phantom
(d) Perform SAR testing steps on the DASY system
(e) Record the SAR value

3.4.1 Area & Zoom Scan Procedure

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g. According to KDB 865664 D01, the resolution for Area and Zoom scan is specified in the table below.

Items	<= 2 GHz	2-3 GHz	3-4 GHz	4-5 GHz	5-6 GHz
Area Scan (Δx, Δy)	<= 15 mm	<= 12 mm	<= 12 mm	<= 10 mm	<= 10 mm
Zoom Scan (Δx, Δy)	<= 8 mm	<= 5 mm	<= 5 mm	<= 4 mm	<= 4 mm
Zoom Scan (Δz)	<= 5 mm	<= 5 mm	<= 4 mm	<= 3 mm	<= 2 mm
Zoom Scan Volume	>= 30 mm	>= 30 mm	>= 28 mm	>= 25 mm	>= 22 mm

Note:

When zoom scan is required and report SAR is <= 1.4 W/kg, the zoom scan resolution of Δx / Δy (2-3GHz: <= 8 mm, 3-4GHz: <= 7 mm, 4-6GHz: <= 5 mm) may be applied.

3.4.2 Volume Scan Procedure

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.

3.4.3 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 drift more than 5%, the SAR will be retested.

3.4.4 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

3.4.5 SAR Averaged Methods

In DASY, the interpolation and extrapolation are both based on the modified Quadratic Shepard's method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5 mm.

4. SAR Measurement Evaluation

4.1 EUT Configuration and Setting

<Connections between EUT and System Simulator>

For WWAN SAR testing, the EUT was linked and controlled by base station emulator (Agilent E5515C is used for GSM/WCDMA/CDMA, and Anritsu MT8820C is used for LTE). Communication between the EUT and the emulator was established by air link. The distance between the EUT and the communicating antenna of the emulator is larger than 50 cm and the output power radiated from the emulator antenna is at least 30 dB smaller than the output power of EUT. The EUT was set from the emulator to radiate maximum output power during SAR testing.

< Proximity Sensor Triggering Distances >

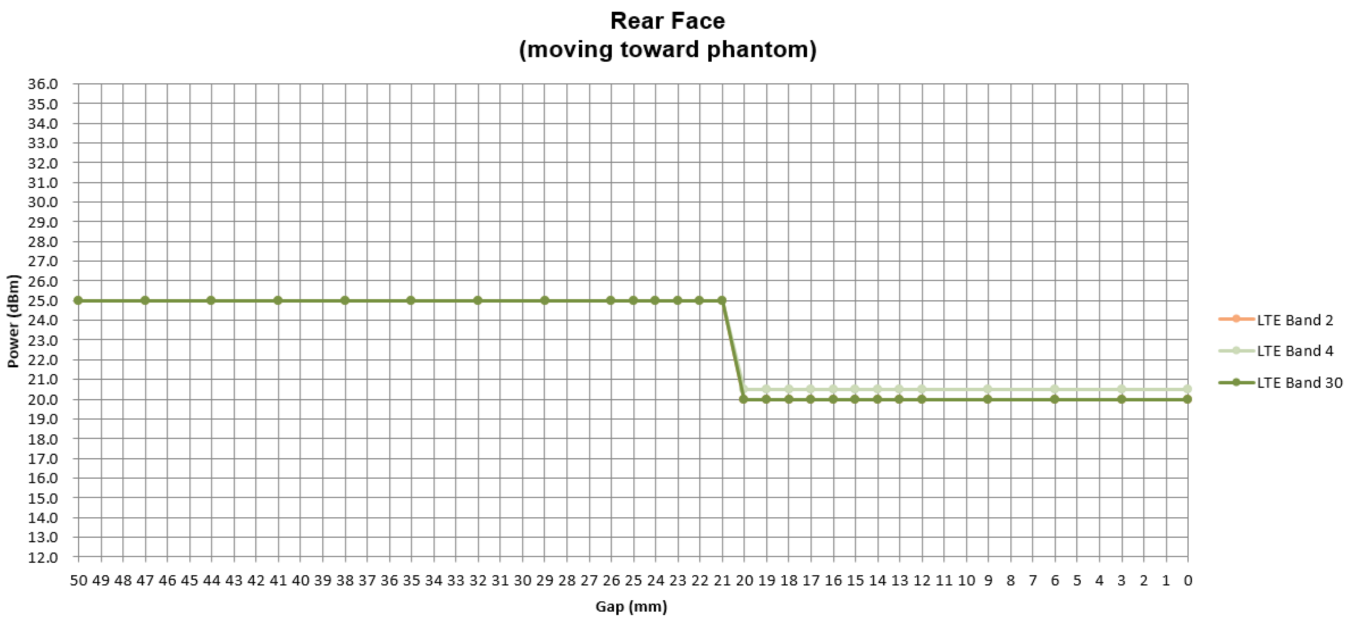
The proximity sensor triggering distance was determined per KDB 616217 section 6.2, and EUT moving further away from the flat phantom and EUT moving toward the flat phantom were both assessed.

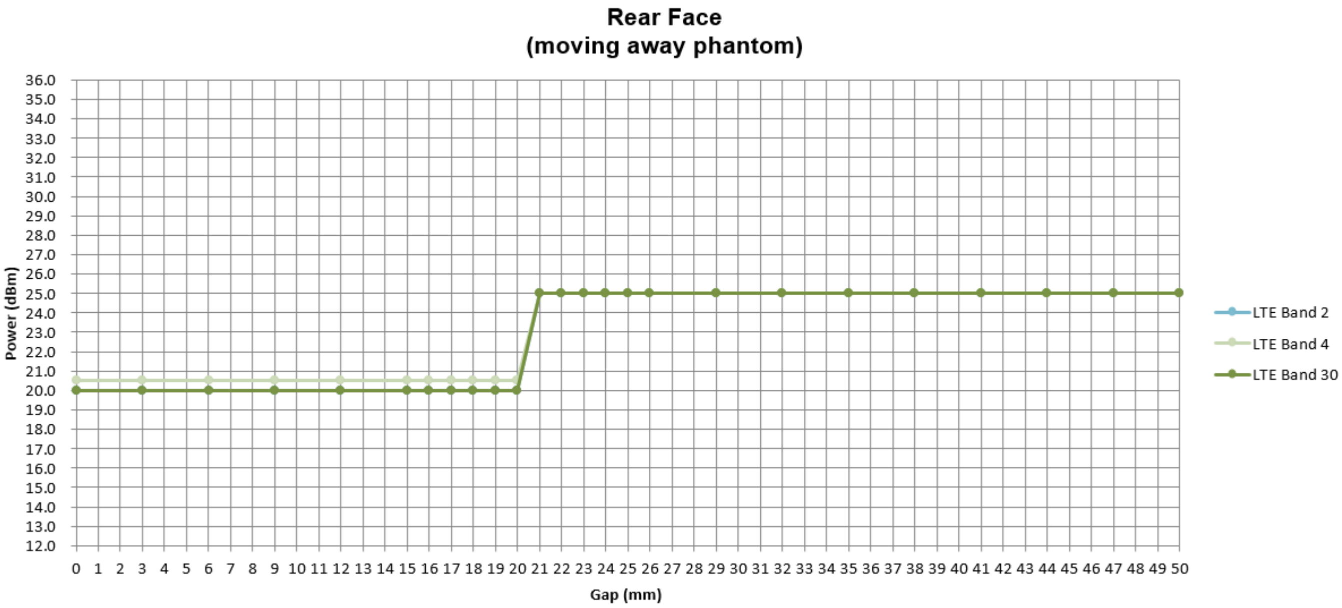
In the preliminary triggering distance testing, the tissue-equivalent medium for different frequency bands were used for verification; no other frequency bands tissue-equivalent medium was found to result in shortest triggering than that for 5700MHz, and the tissue-equivalent medium for 5700MHz was used for formal proximity sensor triggering testing.

Summary for power verification per distance was tabulated in the below table.

WWAN

Output Power Verification in dBm for EUT Rear Face											
Distance (mm)	15	16	17	18	19	20	21	22	23	24	25
LTE 2	20	20	20	20	20	20	25	25	25	25	25
LTE 4	20.5	20.5	20.5	20.5	20.5	20.5	25	25	25	25	25
LTE 30	20	20	20	20	20	20	25	25	25	25	25





< Proximity Sensor Coverage >

In KDB 616217 section 6.3, if a sensor is spatially offset from the antenna(s), it is necessary to verify sensor triggering for conditions where the antenna is next to the user but the sensor is laterally further away to ensure sensor coverage is sufficient for reducing the power to maintain compliance. For p-sensor coverage testing, the device is moved and "along the direction of maximum antenna and sensor offset".

However, this device uses a capacitive proximity sensor that is same metallic component as the transmitting antenna to facilitate triggering in any condition the user may use the device in proximity of the antenna in the device. Therefore, no further sensor coverage assessments were required.

<Summary for Proximity Sensor Triggering Test>

According to the procedures noticed in KDB 616217 D04,

The WWAN for proximity sensor triggering distance is 20 mm for EUT Rear Face. The conservation triggering distances based on the separation distance for the sensor trigger / not triggered as EUT with power reduction at 0 mm, and EUT without power reduction at 19 mm for EUT Rear Face were used to test SAR.

The power reduction is depends on the proximity sensor input. For a steady SAR test, the power reduction was enabled or disabled manually by engineering software during SAR testing.

<Considerations Related to LTE for Setup and Testing>

This device contains LTE transmitter which follows 3GPP standards, supports both QPSK 16QAM and 64QAM modulations, and supported LTE band and channel bandwidth is listed in below. The output power was tested per 3GPP TS 36.521-1 maximum transmit procedures for both QPSK and 16QAM modulation. The results please refer to section 4.6 of this report.

EUT Supported LTE Band and Channel Bandwidth						
LTE Band	BW 1.4 MHz	BW 3 MHz	BW 5 MHz	BW 10 MHz	BW 15 MHz	BW 20 MHz
2	V	V	V	V	V	V
4	V	V	V	V	V	V
5	V	V	V	V		
12	V	V	V	V		
14			V	V		
30			V	V		

The LTE maximum power reduction (MPR) in accordance with 3GPP TS 36.101 is active all times during LTE operation. The allowed MPR for the maximum output power is specified in below.

Modulation	Channel Bandwidth / RB Configurations						LTE MPR Setting (dB)
	BW 1.4 MHz	BW 3 MHz	BW 5 MHz	BW 10 MHz	BW 15 MHz	BW 20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	1
16QAM	<= 5	<= 4	<= 8	<= 12	<= 16	<= 18	1
16QAM	> 5	> 4	> 8	> 12	> 16	> 18	2
64QAM	<= 5	<= 4	<= 8	<= 12	<= 16	<= 18	2
64QAM	> 5	> 4	> 8	> 12	> 16	> 18	3

Note: MPR is according to the standard and implemented in the circuit (mandatory).

In addition, the device is compliant with additional maximum power reduction (A-MPR) requirements defined in 3GPP TS 36.101 section 6.2.4 that was disabled for all FCC compliance testing.

During LTE SAR testing, the related parameters of operating band, channel bandwidth, uplink channel number, modulation type, and RB was set in base station simulator. When the EUT has registered and communicated to base station simulator, the simulator set to make EUT transmitting the maximum radiated power.

<Considerations Related to WLAN for Setup and Testing>

In general, various vendor specific external test software and chipset based internal test modes are typically used for SAR measurement. These chipset based test mode utilities are generally hardware and manufacturer dependent, and often include substantial flexibility to reconfigure or reprogram a device. A Wi-Fi device must be configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools for SAR measurement. The test frequencies established using test mode must correspond to the actual channel frequencies. When 802.11 frame gaps are accounted for in the transmission, a maximum transmission duty factor of 92 - 96% is typically achievable in most test mode configurations. A minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. In addition, a periodic transmission duty factor is required for current generation SAR systems to measure SAR correctly. The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

According to KDB 248227 D01, this device has installed WLAN engineering testing software which can provide continuous transmitting RF signal. During WLAN SAR testing, this device was operated to transmit continuously at the maximum transmission duty with specified transmission mode, operating frequency, lowest data rate, and maximum output power.

Initial Test Configuration

An initial test configuration is determined for OFDM transmission modes in 2.4 GHz and 5 GHz bands according to the channel bandwidth, modulation and data rate combination(s) with the highest maximum output power specified for production units in each standalone and aggregated frequency band. 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 in the initial test configuration, for each frequency band.

Subsequent Test Configuration

SAR measurement requirements for the remaining 802.11 transmission mode configurations that have not been tested in the initial test configuration are determined separately for each standalone and aggregated frequency band, in each exposure condition, according to the maximum output power specified for production units. Additional power measurements may be required to determine if SAR measurements are required for subsequent highest output power channels in a subsequent test configuration. When the highest reported SAR for the initial test configuration according to the initial test position or fixed exposure position requirements, is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for that subsequent test configuration.

SAR Test Configuration and Channel Selection

When multiple channel bandwidth configurations in a frequency band have the same specified maximum output power, the initial test configuration is using largest channel bandwidth, lowest order modulation, lowest data rate, and lowest order 802.11 mode (i.e., 802.11a is chosen over 802.11n then 802.11ac or 802.11g is chosen over 802.11n). After an initial test configuration is determined, if multiple test channels have the same measured maximum output power, the channel chosen for SAR measurement is determined according to the following.

1) The channel closest to mid-band frequency is selected for SAR measurement.

2) For channels with equal separation from mid-band frequency; for example, high and low channels or two mid-band channels, the higher frequency (number) channel is selected for SAR measurement.

Test Reduction for U-NII-1 (5.2 GHz) and U-NII-2A (5.3 GHz) Bands

For devices that operate in both U-NII bands using the same transmitter and antenna(s), SAR test reduction is determined according to the following.

1) When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition).

2) When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration.

<Considerations Related to Bluetooth for Setup and Testing>

This device has installed Bluetooth engineering testing software which can provide continuous transmitting RF signal. During Bluetooth SAR testing, this device was operated to transmit continuously at the maximum transmission duty with specified transmission mode, operating frequency, lowest data rate, and maximum output power.

4.2 EUT Testing Position

According to KDB 648474 D04, handsets are tested for SAR compliance in head, body-worn accessory and other use configurations described in the following subsections.

4.2.1 Head Exposure Conditions

Head exposure is limited to next to the ear voice mode operations. Head SAR compliance is tested according to the test positions defined in IEEE Std 1528-2013 using the SAM phantom illustrated as below.

1. Define two imaginary lines on the handset

(a) The vertical centerline passes through two points on the front side of the handset - the midpoint of the width w_t of the handset at the level of the acoustic output, and the midpoint of the width w_b of the bottom of the handset.

(b) The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output. The horizontal line is also tangential to the face of the handset at point A.

(c) The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset, especially for clamshell handsets, handsets with flip covers, and other irregularly shaped handsets.

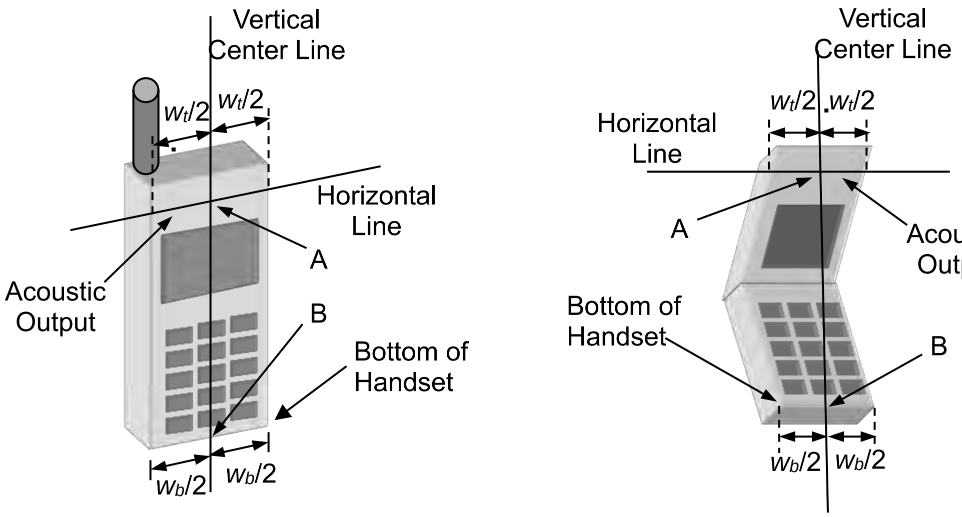


Fig-4.1 Illustration for Handset Vertical and Horizontal Reference Lines

2. Cheek Position

(a) To position the device with the vertical center line of the body of the device and the horizontal line crossing the center piece in a plane parallel to the sagittal plane of the phantom. While maintaining the device in this plane, align the vertical center line with the reference plane containing the three ear and mouth reference point (M: Mouth, RE: Right Ear, and LE: Left Ear) and align the center of the ear piece with the line RE-LE.

(b) To move the device towards the phantom with the ear piece aligned with the line LE-RE until the phone touched the ear. While maintaining the device in the reference plane and maintaining the phone contact with the ear, move the bottom of the phone until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost (see Fig-4.2).

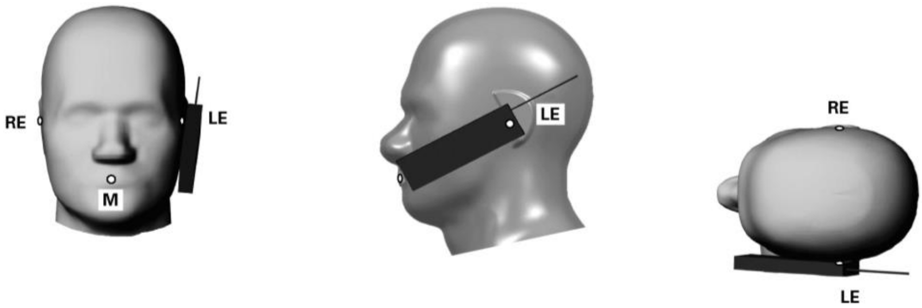


Fig-4.2 Illustration for Cheek Position

3. Tilted Position
(a) To position the device in the “cheek” position described above.
(b) While maintaining the device the reference plane described above and pivoting against the ear, moves it outward away from the mouth by an angle of 15 degrees or until contact with the ear is lost (see Fig-4.3).

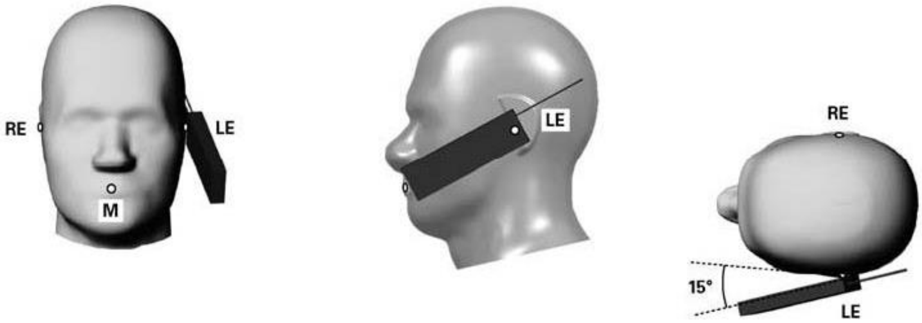


Fig-4.3 Illustration for Tilted Position

4.2.2 Body-worn Accessory Exposure Conditions

Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in KDB 447498 D01 are used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

Body-worn accessories that do not contain metallic or conductive components may be tested according to worst-case exposure configurations, typically according to the smallest test separation distance required for the group of body-worn accessories with similar operating and exposure characteristics. All body-worn accessories containing metallic components are tested in conjunction with the host device.

Body-worn accessory SAR compliance is based on a single minimum test separation distance for all wireless and operating modes applicable to each body-worn accessory used by the host, and according to the relevant voice and/or data mode transmissions and operations. If a body-worn accessory supports voice only operations in its normal and expected use conditions, testing of data mode for body-worn compliance is not required.

A conservative minimum test separation distance for supporting off-the-shelf body-worn accessories that may be acquired by users of consumer handsets is used to test for body-worn accessory SAR compliance. This distance is determined by the handset manufacturer, according to the requirements of Supplement C 01-01. Devices that are designed to operate on the body of users using lanyards and straps, or without requiring additional body-worn accessories, will be tested using a conservative minimum test separation distance <= 5 mm to support compliance.

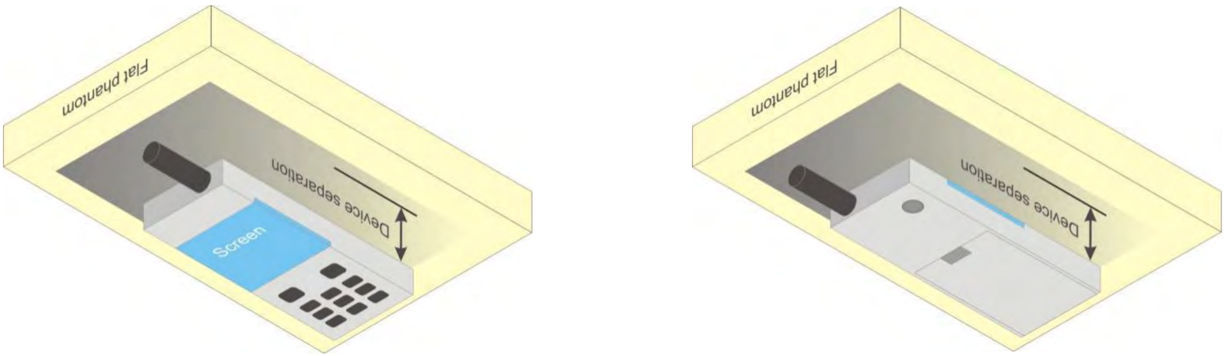
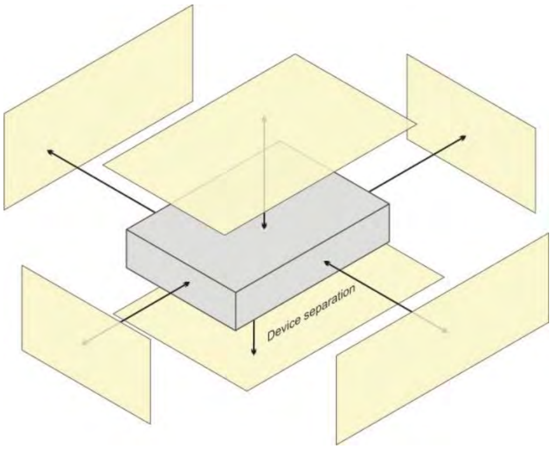


Fig-4.4 Illustration for Body Worn Position

4.2.3 Hotspot Mode Exposure Conditions

For handsets that support hotspot mode operations, with wireless router capabilities and various web browsing functions, the relevant hand and body exposure conditions are tested according to the hotspot SAR procedures in KDB 941225 D06. A test separation distance of 10 mm is required between the phantom and all surfaces and edges with a transmitting antenna located within 25 mm from that surface or edge. When the form factor of a handset is smaller than 9 cm x 5 cm, a test separation distance of 5 mm (instead of 10 mm) is required for testing hotspot mode. When the separation distance required for body-worn accessory testing is larger than or equal to that tested for hotspot mode, in the same wireless mode and for the same surface of the phone, the hotspot mode SAR data may be used to support body-worn accessory SAR compliance for that particular configuration (surface).



Based on the antenna location shown on appendix D of this report, the SAR testing required for hotspot mode is listed as below.

Antenna	Front Face	Rear Face	Left Side	Right Side	Top Side	Bottom Side
WWAN Ant	V	V	V	V		V
WLAN / BT	V	V	V	V	V	

4.2.4 Extremity Exposure Conditions

For smart phones with a display diagonal dimension > 15 cm or an overall diagonal dimension > 16 cm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that support voice calls next to the ear, the following phablet procedures should be applied to evaluate SAR compliance for each applicable wireless modes and frequency band. Devices marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance.

1. The normally required head and body-worn accessory SAR test procedures for handsets, including hotspot mode, must be applied.
2. The UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna located at <= 25 mm from that surface or edge, in direct contact with a flat phantom, for 10-g extremity SAR according to the body-equivalent tissue dielectric parameters in KDB 865664 to address interactive hand use exposure conditions. The UMPC mini-tablet 1-g SAR at 5 mm is not required. When hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g SAR > 1.2 W/kg. The normal tablet procedures in KDB 616217 are required when the over diagonal dimension of the device is > 20 cm. Hotspot mode SAR is not required when normal tablet procedures are applied. Extremity 10-g SAR is also not required for the front (top) surface of large form factor full size tablets. The more conservative tablet SAR results can be used to support the 10-g extremity SAR for phablet mode.
3. The simultaneous transmission operating configurations applicable to voice and data transmissions for both phone and mini-tablet modes must be taken into consideration separately for 1-g and 10-g SAR to determine the simultaneous transmission SAR test exclusion and measurement requirements for the relevant wireless modes and exposure conditions.

4.2.5 SAR Test Exclusion Evaluations

According to KDB 447498 D01, the SAR test exclusion condition is based on source-based time-averaged maximum conducted output power, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions. The SAR exclusion threshold is determined by the following formula.

$$\frac{\text{Max. Tune up Power}_{(\text{mW})}}{\text{Min. Test Separation Distance}_{(\text{mm})}} \times \sqrt{f_{(\text{GHz})}} \leq 3.0 \text{ for SAR-1g}, \leq 7.5 \text{ for SAR-10g}$$

When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Mode	Max. Tune-up Power (dBm)	Max. Tune-up Power (mW)	Ant. to Surface (mm)	Calculated Result	Require SAR Testing?
BT	10.5	11.22	5	3.53	Yes

Note:

1. When separation distance <= 50 mm and the calculated result shown in above table is <= 3.0 for SAR-1g exposure condition, or <= 7.5 for SAR-10g exposure condition, the SAR testing exclusion is applied.

4.2.6 Simultaneous Transmission Possibilities

The simultaneous transmission possibilities for this device are listed as below.

Simultaneous TX Combination	Capable Transmit Configurations	Head	Body-worn	Hotspot	Extremity
1	LTE 2 (Data) + 2.4G WLAN (Data)	Yes			
2	LTE 4 (Data) +2.4G WLAN (Data)	Yes			
3	LTE 5 (Data) + 2.4G WLAN (Data)	Yes			
4	LTE 12 (Data) + 2.4G WLAN (Data)	Yes			
5	LTE 14 (Data) + 2.4G WLAN (Data)	Yes			
6	LTE 30 (Data) + 2.4G WLAN (Data)	Yes			
7	LTE 2 (Data) + 5G WLAN (Data)	Yes			
8	LTE 4 (Data) + 5G WLAN (Data)	Yes			
9	LTE 5 (Data) + 5G WLAN (Data)	Yes			
10	LTE 12 (Data) + 5G WLAN (Data)	Yes			
11	LTE 14 (Data) + 5G WLAN (Data)	Yes			
12	LTE 30 (Data) + 5G WLAN (Data)	Yes			
13	LTE 2 (Data) + BT (Data) + 5G WLAN (Data)	Yes			
14	LTE 4 (Data) + BT (Data) + 5G WLAN (Data)	Yes			
15	LTE 5 (Data) + BT (Data) + 5G WLAN (Data)	Yes			
16	LTE 12 (Data) + BT (Data) + 5G WLAN (Data)	Yes			
17	LTE 14 (Data) + BT (Data) + 5G WLAN (Data)	Yes			
18	LTE 30 (Data) + BT (Data) + 5G WLAN (Data)	Yes			

Note :

1. The 2.4G WLAN and 5G WLAN cannot transmit simultaneously.
2. The 2.4G WLAN and BT cannot transmit simultaneously.

4.3 Tissue Verification

The measuring results for tissue simulating liquid are shown as below.

Test Date	Tissue Type	Frequency (MHz)	Liquid Temp. (℃)	Measured Conductivity (σ)	Measured Permittivity (ε_r)	Target Conductivity (σ)	Target Permittivity (ε_r)	Conductivity Deviation (%)	Permittivity Deviation (%)
2021.12.03	Head	750	22.4	0.89	43.45	0.89	41.90	0.00	3.57
2021.12.03	Head	835	22.4	0.92	43.18	0.90	41.50	2.49	3.89
2021.12.02	Head	1750	22.3	1.33	40.11	1.37	40.10	-2.70	0.01
2021.12.02	Head	1900	22.3	1.42	40.02	1.40	40.00	1.55	0.04
2021.12.04	Head	2300	22.5	1.68	39.70	1.67	39.50	0.42	0.51
2021.12.04	Head	2450	22.5	1.78	39.46	1.80	39.20	-1.01	0.67
2021.12.05	Head	5250	22.5	4.64	37.09	4.71	35.90	-1.55	3.20
2021.12.06	Head	5600	22.5	5.03	36.51	5.07	35.50	-0.72	2.76
2021.12.06	Head	5750	22.5	5.20	36.25	5.27	35.30	-1.29	2.63

Note:

The dielectric properties of the tissue simulating liquid must be measured within 24 hours before the SAR testing and within ±5% of the target values. Liquid temperature during the SAR testing must be within ±2 ℃.

4.4 System Verification

The measuring result for system verification is tabulated as below.

Test Date	Mode	Frequency (MHz)	1W Target SAR-1g (W/kg)	Measured SAR-1g (W/kg)	Normalized to 1W SAR-1g (W/kg)	Deviation (%)	Dipole S/N	Probe S/N	DAE S/N
2021.12.03	Head	750	8.58	2.18	8.68	1.15	1078	3985	775
2021.12.03	Head	835	9.49	2.51	9.99	5.29	4d092	3985	775
2021.12.02	Head	1750	36.40	9.27	36.90	1.39	1111	3985	775
2021.12.02	Head	1900	40.10	10.10	40.21	0.27	5d142	3985	775
2021.12.04	Head	2300	49.10	12.50	49.76	1.35	1091	3985	775
2021.12.04	Head	2450	52.50	13.97	55.62	5.93	735	3985	775
2021.12.05	Head	5250	78.50	8.27	82.70	5.35	1203	3985	775
2021.12.06	Head	5600	81.60	8.59	85.90	5.27	1203	3985	775
2021.12.06	Head	5750	76.70	8.14	81.40	6.13	1203	3985	775

Note:

Comparing to the reference SAR value provided by SPEAG, the validation data should be within its specification of 10 %. The result indicates the system check can meet the variation criterion and the plots can be referred to Appendix A of this report.

4.5 Maximum Output Power

4.5.1 Maximum Conducted Power

The maximum conducted average power (Unit: dBm) including tune-up tolerance is shown as below.

Mode	LTE 2		LTE 4		LTE 5	LTE 12	LTE 14	LTE 30	
	Full Power	Reduce Power	Full Power	Reduce Power	Full Power	Full Power	Full Power	Full Power	Reduce Power
QPSK	25	20	25	20.5	25.0	25.0	25.0	25.0	20
16QAM	24	20	24	20.5	24.0	24.0	24.0	24.0	20
64QAM	23	20	23	20.5	23.0	23.0	23.0	23.0	20

Mode	2.4G WLAN	5.2G WLAN		5.3G WLAN		5.6G WLAN		5.8G WLAN	
	Full Power	Full Power	Reduce Power	Full Power	Reduce Power	Full Power	Reduce Power	Full Power	Reduce Power
802.11b	19.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11g	17.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	N/A	17.0	14.0	17.0	14.0	17.0	13.0	17.0	13.0
802.11n HT20	14.0	16.0	14.0	16.0	14.0	16.0	13.0	16.0	13.0
802.11n HT40	14.0	15.0	13.5	15.0	13.5	16.0	13.0	16.0	13.0
802.11ac VHT20	N/A	15.0	13.5	15.0	13.5	15.0	10.0	15.0	10.0
802.11ac VHT40	N/A	14.0	13.5	14.0	13.5	14.0	10.0	14.0	10.0
802.11ac VHT80	N/A	13.5	13.0	13.5	13.0	13.5	10.0	13.5	10.0

Mode	2.4G Bluetooth
GFSK	10.5
LE	-1

4.5.2 Measured Conducted Power Result

The measuring conducted average power (Unit: dBm) is shown as below.

<WWAN Full Power>

LTE Band 2							
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		18700	18900	19100	
		Frequency (MHz)		1860	1880	1900	
20M	QPSK	1	0	24.35	24.15	23.97	0
		1	50	**24.51**	24.35	24.18	0
		1	99	24.07	23.91	23.74	0
		50	0	23.49	23.33	23.23	1
		50	25	23.56	23.38	23.21	1
		50	50	23.41	23.25	23.16	1
		100	0	23.51	23.31	23.18	1
	16QAM	1	0	23.57	23.42	23.23	1
		1	50	23.75	23.57	23.46	1
		1	99	23.25	23.12	22.97	1
		50	0	22.52	22.29	22.22	2
		50	25	22.48	22.35	22.20	2
		50	50	22.46	22.26	22.16	2
		100	0	22.50	22.29	22.12	2
	64QAM	1	0	22.40	22.26	22.11	2
		1	50	22.69	22.47	22.35	2
		1	99	22.31	22.12	22.04	2
		50	0	21.53	21.35	21.15	3
		50	25	21.49	21.31	21.19	3
		50	50	21.45	21.29	21.12	3
		1	0	24.35	24.15	23.97	3
BW	MCS Index	Channel		18675	18900	19125	3GPP MPR
		Frequency (MHz)		1857.5	1880	1902.5	
15M	QPSK	1	0	24.34	24.11	23.89	0
		1	37	24.47	24.32	24.12	0
		1	74	24.05	23.90	23.70	0
		36	0	23.43	23.28	23.22	1
		36	19	23.55	23.36	23.16	1
		36	39	23.33	23.18	23.14	1
		75	0	23.50	23.27	23.15	1
	16QAM	1	0	23.54	23.41	23.17	1
		1	37	23.71	23.52	23.44	1
		1	74	23.19	23.10	22.94	1
		36	0	22.50	22.21	22.21	2
		36	19	22.40	22.31	22.15	2
		36	39	22.43	22.20	22.14	2
		75	0	22.49	22.24	22.04	2
	64QAM	1	0	22.34	22.23	22.07	2
		1	37	22.67	22.40	22.30	2
		1	74	22.25	22.04	22.02	2
		36	0	21.52	21.33	21.07	3
		36	19	21.42	21.23	21.13	3
		36	39	21.43	21.28	21.08	3
		75	0	21.47	21.18	21.18	3

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR
		Channel		18650	18900	19150	
		Frequency (MHz)		1855	1880	1905	
10M	QPSK	1	0	24.27	24.11	23.92	0
		1	24	24.49	24.27	24.17	0
		1	49	23.99	23.87	23.69	0
		25	0	23.46	23.27	23.21	1
		25	12	23.54	23.31	23.16	1
		25	25	23.35	23.17	23.14	1
		50	0	23.50	23.29	23.10	1
	16QAM	1	0	23.50	23.34	23.17	1
		1	24	23.72	23.51	23.44	1
		1	49	23.23	23.05	22.92	1
		25	0	22.46	22.21	22.20	2
		25	12	22.46	22.27	22.19	2
		25	25	22.38	22.22	22.11	2
		50	0	22.48	22.21	22.11	2
	64QAM	1	0	22.32	22.22	22.06	2
		1	24	22.66	22.41	22.33	2
		1	49	22.29	22.05	21.99	2
		25	0	21.47	21.27	21.13	3
		25	12	21.48	21.29	21.11	3
		25	25	21.40	21.21	21.06	3
		50	0	21.48	21.20	21.17	3
BW	MCS Index	Channel		18625	18900	19175	3GPP MPR
		Frequency (MHz)		1852.5	1880	1907.5	
5M	QPSK	1	0	24.30	24.08	23.92	0
		1	12	24.49	24.27	24.16	0
		1	24	24.02	23.83	23.73	0
		12	0	23.45	23.28	23.18	1
		12	6	23.48	23.37	23.16	1
		12	13	23.37	23.20	23.15	1
		25	0	23.45	23.29	23.13	1
	16QAM	1	0	23.50	23.37	23.21	1
		1	12	23.67	23.55	23.41	1
		1	24	23.23	23.04	22.95	1
		12	0	22.44	22.23	22.14	2
		12	6	22.42	22.33	22.14	2
		12	13	22.39	22.21	22.14	2
		25	0	22.44	22.22	22.07	2
	64QAM	1	0	22.33	22.21	22.09	2
		1	12	22.61	22.45	22.29	2
		1	24	22.23	22.11	22.02	2
		12	0	21.49	21.30	21.07	3
		12	6	21.41	21.30	21.17	3
		12	13	21.41	21.24	21.04	3
		25	0	21.43	21.24	21.16	3

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR
		Channel		18615	18900	19185	
		Frequency (MHz)		1851.5	1880	1908.5	
3M	QPSK	1	0	24.29	24.13	23.91	0
		1	7	24.44	24.30	24.16	0
		1	14	24.01	23.84	23.69	0
		8	0	23.42	23.28	23.21	1
		8	3	23.48	23.36	23.15	1
		8	7	23.33	23.24	23.14	1
		15	0	23.47	23.26	23.10	1
	16QAM	1	0	23.49	23.41	23.21	1
		1	7	23.70	23.52	23.42	1
		1	14	23.23	23.04	22.96	1
		8	0	22.44	22.25	22.17	2
		8	3	22.45	22.29	22.18	2
		8	7	22.44	22.19	22.11	2
		15	0	22.44	22.21	22.10	2
	64QAM	1	0	22.39	22.24	22.03	2
		1	7	22.64	22.39	22.29	2
		1	14	22.30	22.06	22.02	2
		8	0	21.48	21.33	21.08	3
		8	3	21.47	21.23	21.18	3
		8	7	21.37	21.25	21.07	3
		15	0	21.47	21.18	21.18	3
BW	MCS Index	Channel		18700	18900	19100	3GPP MPR
		Frequency (MHz)		1860	1880	1900	
1.4M	QPSK	1	0	24.27	24.11	23.92	0
		1	2	24.48	24.29	24.16	0
		1	5	24.05	23.84	23.69	0
		3	0	24.43	24.25	24.21	0
		3	1	24.55	24.36	24.13	0
		3	3	24.36	24.17	24.10	0
		6	0	23.50	23.25	23.16	1
	16QAM	1	0	23.52	23.35	23.18	1
		1	2	23.73	23.49	23.44	1
		1	5	23.20	23.04	22.96	1
		3	0	23.48	23.24	23.17	1
		3	1	23.40	23.34	23.15	1
		3	3	23.42	23.21	23.15	1
		6	0	22.44	22.27	22.07	2
	64QAM	1	0	22.33	22.21	22.09	2
		1	2	22.61	22.45	22.30	2
		1	5	22.29	22.04	22.02	2
		3	0	22.45	22.29	22.07	2
		3	1	22.43	22.29	22.13	2
		3	3	22.40	22.21	22.11	2
		6	0	21.45	21.21	21.14	3

LTE Band 4							
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20050	20175	20300	
		Frequency (MHz)		1720	1732.5	1745	
20M	QPSK	1	0	23.92	23.95	24.00	0
		1	50	24.23	24.30	**24.36**	0
		1	99	23.88	23.95	24.01	0
		50	0	23.26	23.33	23.46	1
		50	25	23.29	23.34	23.40	1
		50	50	23.10	23.17	23.31	1
		100	0	23.26	23.29	23.39	1
	16QAM	1	0	23.12	23.20	23.24	1
		1	50	23.46	23.51	23.63	1
		1	99	23.07	23.17	23.25	1
		50	0	22.29	22.29	22.45	2
		50	25	22.20	22.30	22.38	2
		50	50	22.14	22.17	22.30	2
		100	0	22.24	22.26	22.32	2
	64QAM	1	0	22.03	22.12	22.20	2
		1	50	22.42	22.43	22.54	2
		1	99	22.01	22.05	22.20	2
		50	0	21.31	21.36	21.39	3
		50	25	21.21	21.26	21.37	3
		50	50	21.18	21.25	21.31	3
		100	0	21.25	21.25	21.41	3
BW	MCS Index	Channel		20025	20175	20325	3GPP MPR
		Frequency (MHz)		1717.5	1732.5	1747.5	
15M	QPSK	1	0	23.91	23.91	23.92	0
		1	37	24.19	24.27	24.30	0
		1	74	23.86	23.94	23.97	0
		36	0	23.20	23.28	23.45	1
		36	19	23.28	23.32	23.35	1
		36	39	23.02	23.10	23.29	1
		75	0	23.25	23.25	23.36	1
	16QAM	1	0	23.09	23.19	23.18	1
		1	37	23.42	23.46	23.61	1
		1	74	23.01	23.15	23.22	1
		36	0	22.27	22.21	22.44	2
		36	19	22.12	22.26	22.33	2
		36	39	22.11	22.11	22.28	2
		75	0	22.23	22.21	22.24	2
	64QAM	1	0	21.97	22.09	22.16	2
		1	37	22.40	22.36	22.49	2
		1	74	21.95	21.97	22.18	2
		36	0	21.30	21.34	21.31	3
		36	19	21.14	21.18	21.31	3
		36	39	21.16	21.24	21.27	3
		75	0	21.23	21.17	21.40	3

BW	MCS Index	Channel		20000	20175	20350	3GPP MPR
		Frequency (MHz)		1715	1732.5	1750	
10M	QPSK	1	0	23.84	23.91	23.95	0
		1	24	24.21	24.22	24.35	0
		1	49	23.80	23.91	23.96	0
		25	0	23.23	23.27	23.44	1
		25	12	23.27	23.27	23.35	1
		25	25	23.04	23.09	23.29	1
		50	0	23.25	23.27	23.31	1
	16QAM	1	0	23.05	23.12	23.18	1
		1	24	23.43	23.45	23.61	1
		1	49	23.05	23.10	23.20	1
		25	0	22.23	22.21	22.43	2
		25	12	22.18	22.22	22.37	2
		25	25	22.06	22.13	22.25	2
		50	0	22.22	22.18	22.31	2
	64QAM	1	0	21.95	22.08	22.15	2
		1	24	22.39	22.37	22.52	2
		1	49	21.99	21.98	22.15	2
		25	0	21.25	21.28	21.37	3
		25	12	21.20	21.24	21.29	3
		25	25	21.13	21.17	21.25	3
		50	0	21.24	21.19	21.39	3
BW	MCS Index	Channel		19975	20175	20375	3GPP MPR
		Frequency (MHz)		1712.5	1732.5	1752.5	
5M	QPSK	1	0	23.87	23.88	23.95	0
		1	12	24.21	24.22	24.34	0
		1	24	23.83	23.87	24.00	0
		12	0	23.22	23.28	23.41	1
		12	6	23.21	23.33	23.35	1
		12	13	23.06	23.12	23.30	1
		25	0	23.20	23.27	23.34	1
	16QAM	1	0	23.05	23.15	23.22	1
		1	12	23.38	23.49	23.58	1
		1	24	23.05	23.09	23.23	1
		12	0	22.21	22.23	22.37	2
		12	6	22.14	22.28	22.32	2
		12	13	22.07	22.12	22.28	2
		25	0	22.18	22.19	22.27	2
	64QAM	1	0	21.96	22.07	22.18	2
		1	12	22.34	22.41	22.48	2
		1	24	21.93	22.04	22.18	2
		12	0	21.27	21.31	21.31	3
		12	6	21.13	21.25	21.35	3
		12	13	21.14	21.20	21.23	3
		25	0	21.19	21.23	21.38	3

BW	MCS Index	Channel		19965	20175	20385	3GPP MPR
		Frequency (MHz)		1711.5	1732.5	1753.5	
3M	QPSK	1	0	23.86	23.93	23.94	0
		1	7	24.16	24.25	24.34	0
		1	14	23.82	23.88	23.96	0
		8	0	23.19	23.28	23.44	1
		8	3	23.21	23.32	23.34	1
		8	7	23.02	23.16	23.29	1
		15	0	23.22	23.24	23.31	1
	16QAM	1	0	23.04	23.19	23.22	1
		1	7	23.41	23.46	23.59	1
		1	14	23.05	23.09	23.24	1
		8	0	22.21	22.25	22.40	2
		8	3	22.17	22.24	22.36	2
		8	7	22.12	22.10	22.25	2
		15	0	22.18	22.18	22.30	2
	64QAM	1	0	22.02	22.10	22.12	2
		1	7	22.37	22.35	22.48	2
		1	14	22.00	21.99	22.18	2
		8	0	21.26	21.34	21.32	3
		8	3	21.19	21.18	21.36	3
		8	7	21.10	21.21	21.26	3
		15	0	21.23	21.17	21.40	3
BW	MCS Index	Channel		19957	20175	20393	3GPP MPR
		Frequency (MHz)		1710.7	1732.5	1754.3	
1.4M	QPSK	1	0	23.84	23.91	23.95	0
		1	2	24.20	24.24	24.34	0
		1	5	23.86	23.88	23.96	0
		3	0	24.20	24.25	24.44	0
		3	1	24.28	24.32	24.32	0
		3	3	24.05	24.09	24.25	0
		6	0	23.25	23.23	23.37	1
	16QAM	1	0	23.07	23.13	23.19	1
		1	2	23.44	23.43	23.61	1
		1	5	23.02	23.09	23.24	1
		3	0	23.25	23.24	23.40	1
		3	1	23.12	23.29	23.33	1
		3	3	23.10	23.12	23.29	1
		6	0	22.18	22.24	22.27	2
	64QAM	1	0	21.96	22.07	22.18	2
		1	2	22.34	22.41	22.49	2
		1	5	21.99	21.97	22.18	2
		3	0	22.23	21.30	21.31	2
		3	1	22.15	21.24	21.31	2
		3	3	22.13	21.17	21.30	2
		6	0	21.21	21.20	21.36	3

LTE Band 5							
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20450	20525	20600	
		Frequency (MHz)		829	836.5	844	
10M	QPSK	1	0	23.80	23.95	23.95	0
		1	24	24.04	**24.19**	24.15	0
		1	49	23.76	23.90	23.95	0
		25	0	22.91	23.07	23.05	1
		25	12	22.91	23.15	23.09	1
		25	25	22.97	23.13	23.14	1
		50	0	22.93	23.14	23.09	1
	16QAM	1	0	23.07	23.26	23.27	1
		1	24	23.23	23.46	23.41	1
		1	49	23.07	23.18	23.22	1
		25	0	21.87	22.06	22.02	2
		25	12	21.93	22.14	22.08	2
		25	25	21.94	22.13	22.14	2
		50	0	21.92	22.08	22.08	2
	64QAM	1	0	21.99	22.18	22.19	2
		1	24	22.13	22.36	22.30	2
		1	49	21.96	22.20	22.17	2
		25	0	20.91	21.07	21.02	3
		25	12	20.92	21.16	21.13	3
		25	25	20.94	21.10	21.05	3
		50	0	20.94	21.15	21.12	3
BW	MCS Index	Channel		20425	20525	20625	3GPP MPR
		Frequency (MHz)		826.5	836.5	846.5	
5M	QPSK	1	0	23.75	23.88	23.90	0
		1	12	24.02	24.11	24.13	0
		1	24	23.71	23.82	23.94	0
		12	0	22.87	23.02	23.00	1
		12	6	22.83	23.14	23.04	1
		12	13	22.93	23.08	23.13	1
		25	0	22.87	23.12	23.04	1
	16QAM	1	0	23.00	23.21	23.25	1
		1	12	23.15	23.44	23.36	1
		1	24	23.05	23.10	23.20	1
		12	0	21.79	22.00	21.94	2
		12	6	21.87	22.12	22.02	2
		12	13	21.87	22.08	22.12	2
		25	0	21.86	22.01	22.03	2
	64QAM	1	0	21.92	22.13	22.17	2
		1	12	22.05	22.34	22.24	2
		1	24	21.88	22.19	22.15	2
		12	0	20.87	21.02	20.94	3
		12	6	20.84	21.15	21.11	3
		12	13	20.90	21.05	20.97	3
		25	0	20.88	21.13	21.09	3

BW	MCS Index	Channel		20415	20525	20635	3GPP MPR
		Frequency (MHz)		825.5	836.5	847.5	
3M	QPSK	1	0	23.74	23.93	23.89	0
		1	7	23.97	24.14	24.13	0
		1	14	23.70	23.83	23.90	0
		8	0	22.84	23.02	23.03	1
		8	3	22.83	23.13	23.03	1
		8	7	22.89	23.12	23.12	1
		15	0	22.89	23.09	23.01	1
	16QAM	1	0	22.99	23.25	23.25	1
		1	7	23.18	23.41	23.37	1
		1	14	23.05	23.10	23.21	1
		8	0	21.79	22.02	21.97	2
		8	3	21.90	22.08	22.06	2
		8	7	21.92	22.06	22.09	2
		15	0	21.86	22.00	22.06	2
	64QAM	1	0	21.98	22.16	22.11	2
		1	7	22.08	22.28	22.24	2
		1	14	21.95	22.14	22.15	2
		8	0	20.86	21.05	20.95	3
		8	3	20.90	21.08	21.12	3
		8	7	20.86	21.06	21.00	3
		15	0	20.92	21.07	21.11	3
BW	MCS Index	Channel		20407	20525	20643	3GPP MPR
		Frequency (MHz)		824.7	836.5	848.3	
1.4M	QPSK	1	0	23.72	23.91	23.90	0
		1	2	24.01	24.13	24.13	0
		1	5	23.74	23.83	23.90	0
		3	0	23.85	23.99	24.03	0
		3	1	23.90	24.13	24.01	0
		3	3	23.92	24.05	24.08	0
		6	0	22.92	23.08	23.07	1
	16QAM	1	0	23.02	23.19	23.22	1
		1	2	23.21	23.38	23.39	1
		1	5	23.02	23.10	23.21	1
		3	0	22.83	23.01	22.97	1
		3	1	22.85	23.13	23.03	1
		3	3	22.90	23.08	23.13	1
		6	0	21.86	22.06	22.03	2
	64QAM	1	0	21.92	22.13	22.17	2
		1	2	22.05	22.34	22.25	2
		1	5	21.94	22.12	22.15	2
		3	0	21.83	22.01	21.94	2
		3	1	21.86	22.14	22.07	2
		3	3	21.89	22.02	22.04	2
		6	0	20.90	21.10	21.07	3

LTE Band 12							
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		23060	23095	23130	
		Frequency (MHz)		704	707.5	711	
10M	QPSK	1	0	23.51	23.74	24.02	0
		1	24	23.72	23.91	**24.23**	0
		1	49	23.67	23.89	24.22	0
		25	0	22.72	22.96	23.22	1
		25	12	22.71	23.03	23.25	1
		25	25	22.80	23.04	23.34	1
		50	0	22.75	23.04	23.27	1
	16QAM	1	0	22.84	23.11	23.40	1
		1	24	22.89	23.20	23.43	1
		1	49	22.87	23.06	23.38	1
		25	0	21.69	21.96	22.20	2
		25	12	21.73	22.02	22.24	2
		25	25	21.71	21.98	22.27	2
		50	0	21.74	21.98	22.26	2
	64QAM	1	0	21.68	21.95	22.24	2
		1	24	21.83	22.14	22.36	2
		1	49	21.79	22.11	22.36	2
		25	0	20.75	20.99	21.22	3
		25	12	20.69	21.01	21.26	3
		25	25	20.80	21.04	21.27	3
		50	0	20.76	21.05	21.30	3
BW	MCS Index	Channel		23060	23095	23130	3GPP MPR
		Frequency (MHz)		704	707.5	711	
5M	QPSK	1	0	23.46	23.67	23.97	0
		1	12	23.70	23.83	24.21	0
		1	24	23.62	23.81	24.21	0
		12	0	22.68	22.91	23.17	1
		12	6	22.63	23.02	23.20	1
		12	13	22.76	22.99	23.33	1
		25	0	22.69	23.02	23.22	1
	16QAM	1	0	22.77	23.06	23.38	1
		1	12	22.81	23.18	23.38	1
		1	24	22.85	22.98	23.36	1
		12	0	21.61	21.90	22.12	2
		12	6	21.67	22.00	22.18	2
		12	13	21.64	21.93	22.25	2
		25	0	21.68	21.91	22.21	2
	64QAM	1	0	21.61	21.90	22.22	2
		1	12	21.75	22.12	22.30	2
		1	24	21.71	22.10	22.34	2
		12	0	20.71	20.94	21.14	3
		12	6	20.61	21.00	21.24	3
		12	13	20.76	20.99	21.19	3
		25	0	20.70	21.03	21.27	3

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		23060	23095	23130	
		Frequency (MHz)		704	707.5	711	
3M	QPSK	1	0	23.45	23.72	23.96	0
		1	7	23.65	23.86	24.21	0
		1	14	23.61	23.82	24.17	0
		8	0	22.65	22.91	23.20	1
		8	3	22.63	23.01	23.19	1
		8	7	22.72	23.03	23.32	1
		15	0	22.71	22.99	23.19	1
	16QAM	1	0	22.76	23.10	23.38	1
		1	7	22.84	23.15	23.39	1
		1	14	22.85	22.98	23.37	1
		8	0	21.61	21.92	22.15	2
		8	3	21.70	21.96	22.22	2
		8	7	21.69	21.91	22.22	2
		15	0	21.68	21.90	22.24	2
	64QAM	1	0	21.67	21.93	22.16	2
		1	7	21.78	22.06	22.30	2
		1	14	21.78	22.05	22.34	2
		8	0	20.70	20.97	21.15	3
		8	3	20.67	20.93	21.25	3
		8	7	20.72	21.00	21.22	3
		15	0	20.74	20.97	21.29	3
BW	MCS Index	Channel		23060	23095	23130	3GPP MPR
		Frequency (MHz)		704	707.5	711	
1.4M	QPSK	1	0	23.43	23.70	23.97	0
		1	2	23.69	23.85	24.21	0
		1	5	23.65	23.82	24.17	0
		3	0	23.66	23.88	24.20	0
		3	1	23.70	24.01	24.17	0
		3	3	23.75	23.96	24.28	0
		6	0	22.74	22.98	23.25	1
	16QAM	1	0	22.79	23.04	23.35	1
		1	2	22.87	23.12	23.41	1
		1	5	22.82	22.98	23.37	1
		3	0	22.65	22.91	23.15	1
		3	1	22.65	23.01	23.19	1
		3	3	22.67	22.93	23.26	1
		6	0	21.68	21.96	22.21	2
	64QAM	1	0	21.61	21.90	22.22	2
		1	2	21.75	22.12	22.31	2
		1	5	21.77	22.03	22.34	2
		3	0	21.67	21.93	22.14	2
		3	1	21.63	21.99	22.20	2
		3	3	21.75	21.96	22.26	2
		6	0	20.72	21.00	21.25	3

LTE Band 14

BW	MCS Index	RB Size	RB Offset	Mid	3GPP MPR (dB)
		Channel		23330	
		Frequency (MHz)		793	
10M	QPSK	1	0	23.81	0
		1	24	**23.91**	0
		1	49	23.73	0
		25	0	22.97	1
		25	12	22.95	1
		25	25	22.83	1
		50	0	22.94	1
	16QAM	1	0	23.08	1
		1	24	23.17	1
		1	49	23.01	1
		25	0	21.93	2
		25	12	21.95	2
		25	25	21.81	2
		50	0	21.92	2
	64QAM	1	0	22.02	2
		1	24	22.13	2
		1	49	21.97	2
		25	0	20.95	3
		25	12	20.93	3
		25	25	20.84	3
		50	0	20.93	3

BW	MCS Index	Channel		23305	23330	23355	3GPP MPR
		Frequency (MHz)		790.5	793	795.5	
5M	QPSK	1	0	23.76	23.74	23.76	0
		1	12	23.89	23.83	23.89	0
		1	24	23.68	23.65	23.72	0
		12	0	22.93	22.92	22.92	1
		12	6	22.87	22.94	22.90	1
		12	13	22.79	22.78	22.82	1
		25	0	22.88	22.92	22.89	1
	16QAM	1	0	23.01	23.03	23.06	1
		1	12	23.09	23.15	23.12	1
		1	24	22.99	22.93	22.99	1
		12	0	21.85	21.87	21.85	2
		12	6	21.89	21.93	21.89	2
		12	13	21.74	21.76	21.79	2
		25	0	21.86	21.85	21.87	2
	64QAM	1	0	21.95	21.97	22.00	2
		1	12	22.05	22.11	22.07	2
		1	24	21.89	21.96	21.95	2
		12	0	20.91	20.90	20.87	3
		12	6	20.85	20.92	20.91	3
		12	13	20.80	20.79	20.76	3
		25	0	20.87	20.91	20.90	3

LTE Band 30						
BW	MCS Index	RB Size	RB Offset	Mid		3GPP MPR (dB)
		Channel		27710		
		Frequency (MHz)		2310		
10M	QPSK	1	0	24.68		0
		1	24	**24.82**		0
		1	49	24.69		0
		25	0	23.92		1
		25	12	23.88		1
		25	25	23.82		1
		50	0	23.86		1
	16QAM	1	0	23.80		1
		1	24	23.96		1
		1	49	23.88		1
		25	0	22.86		2
		25	12	22.82		2
		25	25	22.79		2
		50	0	22.87		2
	64QAM	1	0	22.77		2
		1	24	22.94		2
		1	49	22.85		2
		25	0	21.80		3
		25	12	21.83		3
		25	25	21.72		3
		50	0	21.79		3

BW	MCS Index	Channel		27685	27710	27735	0
		Frequency (MHz)		2307.5	2310	2312.5	
5M	QPSK	1	0	23.76	23.74	23.76	0
		1	12	23.89	23.83	23.89	0
		1	24	23.68	23.65	23.72	0
		12	0	22.93	22.92	22.92	1
		12	6	22.87	22.94	22.90	1
		12	13	22.79	22.78	22.82	1
		25	0	22.88	22.92	22.89	1
	16QAM	1	0	23.01	23.03	23.06	1
		1	12	23.09	23.15	23.12	1
		1	24	22.99	22.93	22.99	1
		12	0	21.85	21.87	21.85	2
		12	6	21.89	21.93	21.89	2
		12	13	21.74	21.76	21.79	2
		25	0	21.86	21.85	21.87	2
	64QAM	1	0	21.95	21.97	22.00	2
		1	12	22.05	22.11	22.07	2
		1	24	21.89	21.96	21.95	2
		12	0	20.91	20.90	20.87	3
		12	6	20.85	20.92	20.91	3
		12	13	20.80	20.79	20.76	3
		25	0	20.87	20.91	20.90	3

<WLAN 2.4G>

Mode	Channel	Frequency (MHz)	Avg. Power (dBm)
802.11b	1	2412	18.03
	6	2437	18.27
	11	2462	18.07
802.11g	1	2412	16.14
	6	2437	16.15
	11	2462	16.01
802.11n HT20	1	2412	15.38
	6	2437	15.16
	11	2462	14.93
802.11n HT40	3	2422	15.15
	6	2437	15.24
	9	2452	15.13

< Bluetooth >

Mode	Channel	Frequency (MHz)	Avg. Power (dBm)
BR / EDR	0	2402	9.82
	39	2441	8.55
	78	2480	9.04
LE	0	2402	-2.62
	19	2440	-2.02
	39	2480	-2.88

<WLAN 5.2G>

Mode	Channel	Frequency (MHz)	Avg. Power (dBm)
802.11a	36	5180	15.85
	40	5200	15.88
	44	5220	15.82
	48	5240	15.84
802.11n HT20	36	5180	15.21
	40	5200	15.20
	44	5220	15.19
	48	5240	15.17
802.11n HT40	38	5190	15.04
	46	5230	14.96
802.11ac HT20	36	5180	14.01
	40	5200	14.14
	44	5220	14.08
	48	5240	14.04
802.11ac HT40	38	5190	13.02
	46	5230	12.92
802.11ac VHT80	42	5210	12.57

<WLAN 5.3G>

Mode	Channel	Frequency (MHz)	Avg. Power (dBm)
802.11a	52	5260	16.24
	56	5280	16.20
	60	5300	16.16
	64	5320	16.14
802.11n HT20	52	5260	15.00
	56	5280	15.02
	60	5300	15.06
	64	5320	15.04
802.11n HT40	54	5270	14.91
	62	5310	14.96
802.11ac VHT20	52	5260	14.06
	56	5280	14.05
	60	5300	14.03
	64	5320	14.05
802.11ac VHT40	54	5270	12.87
	62	5310	12.94
802.11ac VHT80	58	5290	12.47

<WLAN 5.6G>

	Mode	Channel	Frequency (MHz)	Average power (dBm)
5.6GHz WLAN	802.11a 6Mbps	100	5500	16.04
		116	5580	15.92
		124	5620	16.16
		132	5660	16.20
		140	5700	16.25
	802.11n-HT20 MCS0	100	5500	14.89
		116	5580	14.92
		124	5620	14.99
		132	5660	15.06
		140	5700	15.14
	802.11n-HT40 MCS0	102	5510	15.18
		110	5550	15.02
		126	5630	15.00
		134	5670	15.03
	802.11ac-VHT20 MCS0	100	5500	14.32
		116	5580	14.27
		124	5620	14.23
		132	5660	14.18
		140	5700	14.13
	802.11ac-VHT40 MCS0	102	5510	12.96
		110	5550	12.84
		126	5630	12.90
		134	5670	12.93
	802.11ac-VHT80 MCS0	106	5530	12.64
		122	5610	12.73

<WLAN 5.8G>

Mode	Channel	Frequency (MHz)	Avg. Power (dBm)
802.11a	149	5745	16.25
	157	5785	16.22
	165	5825	16.23
802.11n HT20	149	5745	15.28
	157	5785	15.25
	165	5825	15.16
802.11n HT40	151	5755	15.05
	159	5795	14.97
802.11ac VHT20	149	5745	14.16
	157	5785	14.23
	165	5825	14.17
802.11ac VHT40	151	5755	13.02
	159	5795	12.97
802.11ac VHT80	155	5775	12.67

<WWAN Reduce Power>

LTE Band 2							
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		18700	18900	19100	
		Frequency (MHz)		1860	1880	1900	
20M	QPSK	1	0	18.68	18.70	18.68	0
		1	50	**19.17**	19.16	19.10	0
		1	99	18.77	18.80	18.73	0
		50	0	18.91	18.92	18.92	1
		50	25	18.97	18.90	18.94	1
		50	50	18.90	18.91	18.87	1
		100	0	18.97	18.93	18.96	1
	16QAM	1	0	18.99	18.97	18.94	1
		1	50	19.10	19.04	19.07	1
		1	99	19.03	19.09	19.03	1
		50	0	19.02	19.00	19.02	2
		50	25	19.02	18.98	19.02	2
		50	50	19.00	18.98	18.95	2
		100	0	19.03	19.04	19.02	2
	64QAM	1	0	18.72	18.70	18.67	2
		1	50	19.03	18.97	19.01	2
		1	99	18.94	18.87	18.88	2
		50	0	18.95	18.96	18.99	3
		50	25	19.02	18.95	18.96	3
		50	50	19.00	19.01	19.04	3
		1	0	19.02	18.98	18.99	3
BW	MCS Index	Channel		18675	18900	19125	3GPP MPR
		Frequency (MHz)		1857.5	1880	1902.5	
15M	QPSK	1	0	18.67	18.66	18.60	0
		1	37	19.06	19.13	19.04	0
		1	74	18.75	18.79	18.69	0
		36	0	18.85	18.87	18.91	1
		36	19	18.96	18.88	18.89	1
		36	39	18.82	18.84	18.85	1
		75	0	18.96	18.89	18.93	1
	16QAM	1	0	18.96	18.96	18.88	1
		1	37	19.06	18.99	19.05	1
		1	74	18.97	19.07	19.00	1
		36	0	19.00	18.92	19.01	2
		36	19	18.94	18.94	18.97	2
		36	39	18.97	18.92	18.93	2
		75	0	19.02	18.99	18.94	2
	64QAM	1	0	18.66	18.67	18.63	2
		1	37	19.01	18.90	18.96	2
		1	74	18.88	18.79	18.86	2
		36	0	18.94	18.94	18.91	3
		36	19	18.95	18.87	18.90	3
		36	39	18.98	19.00	19.00	3
		75	0	19.00	18.90	18.98	3

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR
		Channel		18650	18900	19150	
		Frequency (MHz)		1855	1880	1905	
10M	QPSK	1	0	18.60	18.66	18.63	0
		1	24	19.08	19.08	19.09	0
		1	49	18.69	18.76	18.68	0
		25	0	18.88	18.86	18.90	1
		25	12	18.95	18.83	18.89	1
		25	25	18.84	18.83	18.85	1
		50	0	18.96	18.91	18.88	1
	16QAM	1	0	18.92	18.89	18.88	1
		1	24	19.07	18.98	19.05	1
		1	49	19.01	19.02	18.98	1
		25	0	18.96	18.92	19.00	2
		25	12	19.00	18.90	19.01	2
		25	25	18.92	18.94	18.90	2
		50	0	19.01	18.96	19.01	2
	64QAM	1	0	18.64	18.66	18.62	2
		1	24	19.00	18.91	18.99	2
		1	49	18.92	18.80	18.83	2
		25	0	18.89	18.88	18.97	3
		25	12	19.01	18.93	18.88	3
		25	25	18.95	18.93	18.98	3
		50	0	19.01	18.92	18.97	3
BW	MCS Index	Channel		18625	18900	19175	3GPP MPR
		Frequency (MHz)		1852.5	1880	1907.5	
5M	QPSK	1	0	18.55	18.59	18.58	0
		1	12	19.06	19.00	19.07	0
		1	24	18.64	18.68	18.67	0
		12	0	18.84	18.81	18.85	1
		12	6	18.87	18.82	18.84	1
		12	13	18.80	18.78	18.84	1
		25	0	18.90	18.89	18.83	1
	16QAM	1	0	18.85	18.84	18.86	1
		1	12	18.99	18.96	19.00	1
		1	24	18.99	18.94	18.96	1
		12	0	18.88	18.86	18.92	2
		12	6	18.94	18.88	18.95	2
		12	13	18.85	18.89	18.88	2
		25	0	18.95	18.89	18.96	2
	64QAM	1	0	18.57	18.61	18.60	2
		1	12	18.92	18.89	18.93	2
		1	24	18.84	18.79	18.81	2
		12	0	18.85	18.83	18.89	3
		12	6	18.93	18.92	18.86	3
		12	13	18.91	18.88	18.90	3
		25	0	18.95	18.90	18.94	3

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR
		Channel		18615	18900	19185	
		Frequency (MHz)		1851.5	1880	1908.5	
3M	QPSK	1	0	18.62	18.68	18.62	0
		1	7	19.03	19.11	19.08	0
		1	14	18.71	18.73	18.68	0
		8	0	18.84	18.87	18.90	1
		8	3	18.89	18.88	18.88	1
		8	7	18.82	18.90	18.85	1
		15	0	18.93	18.88	18.88	1
	16QAM	1	0	19.21	19.26	19.22	1
		1	7	19.65	19.59	19.63	1
		1	14	19.31	19.31	19.32	1
		8	0	18.94	18.96	18.97	2
		8	3	18.99	18.92	19.00	2
		8	7	18.98	18.91	18.90	2
		15	0	18.97	18.96	19.00	2
	64QAM	1	0	18.71	18.68	18.59	2
		1	7	18.98	18.89	18.95	2
		1	14	18.93	18.81	18.86	2
		8	0	18.90	18.94	18.92	3
		8	3	19.00	18.87	18.95	3
		8	7	18.92	18.97	18.99	3
		15	0	19.00	18.90	18.98	3
BW	MCS Index	Channel		18700	18900	19100	3GPP MPR
		Frequency (MHz)		1860	1880	1900	
1.4M	QPSK	1	0	18.60	18.66	18.63	0
		1	2	19.07	19.10	19.08	0
		1	5	18.75	18.73	18.68	0
		3	0	18.85	18.84	18.90	0
		3	1	18.96	18.88	18.86	0
		3	3	18.85	18.83	18.81	0
		6	0	17.96	17.87	17.94	1
	16QAM	1	0	18.94	18.90	18.89	1
		1	2	19.08	18.96	19.05	1
		1	5	18.98	19.01	19.02	1
		3	0	18.98	18.95	18.97	1
		3	1	18.94	18.97	18.97	1
		3	3	18.96	18.93	18.94	1
		6	0	17.97	18.02	17.97	2
	64QAM	1	0	18.65	18.65	18.65	2
		1	2	18.95	18.95	18.96	2
		1	5	18.92	18.79	18.86	2
		3	0	18.87	18.90	18.91	2
		3	1	18.96	18.93	18.90	2
		3	3	18.95	18.93	19.03	2
		6	0	17.98	17.93	17.94	3

LTE Band 4							
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20050	20175	20300	
		Frequency (MHz)		1720	1732.5	1745	
20M	QPSK	1	0	19.17	19.19	19.17	0
		1	50	19.57	19.63	**19.67**	0
		1	99	19.23	19.26	19.19	0
		50	0	19.38	19.39	19.56	1
		50	25	19.49	19.42	19.52	1
		50	50	19.41	19.42	19.48	1
		100	0	19.45	19.41	19.54	1
	16QAM	1	0	19.42	19.40	19.47	1
		1	50	19.55	19.49	19.62	1
		1	99	19.46	19.52	19.56	1
		50	0	19.51	19.49	19.61	2
		50	25	19.47	19.43	19.57	2
		50	50	19.49	19.47	19.54	2
		100	0	19.49	19.50	19.58	2
	64QAM	1	0	19.54	19.52	19.59	2
		1	50	19.55	19.49	19.62	2
		1	99	19.56	19.49	19.60	2
		50	0	19.45	19.46	19.59	3
		50	25	19.55	19.48	19.59	3
		50	50	19.48	19.49	19.62	3
		100	0	19.45	19.41	19.52	3
BW	MCS Index	Channel		20025	20175	20325	3GPP MPR
		Frequency (MHz)		1717.5	1732.5	1747.5	
15M	QPSK	1	0	19.16	19.15	19.09	0
		1	37	19.53	19.60	19.51	0
		1	74	19.21	19.25	19.15	0
		36	0	19.32	19.34	19.38	1
		36	19	19.48	19.40	19.41	1
		36	39	19.33	19.35	19.36	1
		75	0	19.44	19.37	19.41	1
	16QAM	1	0	19.39	19.39	19.31	1
		1	37	19.51	19.44	19.50	1
		1	74	19.40	19.50	19.43	1
		36	0	19.49	19.41	19.50	2
		36	19	19.39	19.39	19.42	2
		36	39	19.46	19.41	19.42	2
		75	0	19.48	19.45	19.40	2
	64QAM	1	0	19.48	19.49	19.45	2
		1	37	19.59	19.48	19.54	2
		1	74	19.50	19.41	19.48	2
		36	0	19.44	19.44	19.41	3
		36	19	19.48	19.40	19.43	3
		36	39	19.46	19.48	19.48	3
		75	0	19.43	19.33	19.41	3

BW	MCS Index	Channel		20000	20175	20350	3GPP MPR
		Frequency (MHz)		1715	1732.5	1750	
10M	QPSK	1	0	19.09	19.15	19.12	0
		1	24	19.55	19.55	19.56	0
		1	49	19.15	19.22	19.14	0
		25	0	19.35	19.33	19.37	1
		25	12	19.47	19.35	19.41	1
		25	25	19.35	19.34	19.36	1
		50	0	19.44	19.39	19.36	1
	16QAM	1	0	19.35	19.32	19.31	1
		1	24	19.52	19.43	19.50	1
		1	49	19.44	19.45	19.41	1
		25	0	19.45	19.41	19.49	2
		25	12	19.45	19.35	19.46	2
		25	25	19.41	19.43	19.39	2
		50	0	19.47	19.42	19.47	2
	64QAM	1	0	19.46	19.48	19.44	2
		1	24	19.58	19.49	19.57	2
		1	49	19.54	19.42	19.45	2
		25	0	19.39	19.38	19.47	3
		25	12	19.54	19.46	19.41	3
		25	25	19.43	19.41	19.46	3
		50	0	19.44	19.35	19.40	3
BW	MCS Index	Channel		19975	20175	20375	3GPP MPR
		Frequency (MHz)		1712.5	1732.5	1752.5	
5M	QPSK	1	0	19.07	19.05	19.07	0
		1	12	19.53	19.47	19.53	0
		1	24	19.13	19.10	19.17	0
		12	0	19.30	19.29	19.29	1
		12	6	19.33	19.40	19.36	1
		12	13	19.33	19.32	19.36	1
		25	0	19.33	19.37	19.34	1
	16QAM	1	0	19.28	19.30	19.33	1
		1	12	19.39	19.45	19.42	1
		1	24	19.42	19.36	19.42	1
		12	0	19.35	19.37	19.35	2
		12	6	19.35	19.39	19.35	2
		12	13	19.35	19.37	19.40	2
		25	0	19.37	19.36	19.38	2
	64QAM	1	0	19.40	19.42	19.45	2
		1	12	19.45	19.51	19.47	2
		1	24	19.40	19.47	19.46	2
		12	0	19.37	19.36	19.33	3
		12	6	19.39	19.46	19.45	3
		12	13	19.40	19.39	19.36	3
		25	0	19.33	19.37	19.36	3

BW	MCS Index	Channel		19965	20175	20385	3GPP MPR
		Frequency (MHz)		1711.5	1732.5	1753.5	
3M	QPSK	1	0	19.11	19.17	19.11	0
		1	7	19.50	19.58	19.55	0
		1	14	19.17	19.19	19.14	0
		8	0	19.31	19.34	19.37	1
		8	3	19.41	19.40	19.40	1
		8	7	19.33	19.41	19.36	1
		15	0	19.41	19.36	19.36	1
	16QAM	1	0	19.34	19.39	19.35	1
		1	7	19.50	19.44	19.48	1
		1	14	19.44	19.44	19.45	1
		8	0	19.43	19.45	19.46	2
		8	3	19.44	19.37	19.45	2
		8	7	19.47	19.40	19.39	2
		15	0	19.43	19.42	19.46	2
	64QAM	1	0	19.53	19.50	19.41	2
		1	7	19.56	19.47	19.53	2
		1	14	19.55	19.43	19.48	2
		8	0	19.40	19.44	19.42	3
		8	3	19.53	19.40	19.48	3
		8	7	19.40	19.45	19.47	3
		15	0	19.43	19.33	19.41	3
BW	MCS Index	Channel		19957	20175	20393	3GPP MPR
		Frequency (MHz)		1710.7	1732.5	1754.3	
1.4M	QPSK	1	0	19.09	19.15	19.12	0
		1	2	19.54	19.57	19.55	0
		1	5	19.21	19.19	19.14	0
		3	0	19.32	19.31	19.37	0
		3	1	19.48	19.40	19.38	0
		3	3	19.36	19.34	19.32	0
		6	0	19.44	19.35	19.42	1
	16QAM	1	0	19.37	19.33	19.32	1
		1	2	19.53	19.53	19.54	1
		1	5	19.41	19.44	19.45	1
		3	0	19.47	19.44	19.46	1
		3	1	19.39	19.42	19.42	1
		3	3	19.45	19.42	19.43	1
		6	0	19.43	19.48	19.43	2
	64QAM	1	0	19.47	19.47	19.47	2
		1	2	19.53	19.53	19.54	2
		1	5	19.54	19.41	19.48	2
		3	0	19.37	18.40	18.41	2
		3	1	19.49	18.46	18.43	2
		3	3	19.43	18.41	18.51	2
		6	0	19.41	19.36	19.37	3

LTE Band 30							
BW	MCS Index	RB Size	RB Offset	Mid			3GPP MPR (dB)
		Channel		27710			
		Frequency (MHz)		2310			
10M	QPSK	1	0	19.12			0
		1	24	**19.33**			0
		1	49	19.15			0
		25	0	19.29			1
		25	12	19.28			1
		25	25	19.21			1
		50	0	19.19			1
	16QAM	1	0	19.32			1
		1	24	19.27			1
		1	49	19.29			1
		25	0	19.29			2
		25	12	19.32			2
		25	25	19.27			2
		50	0	19.26			2
	64QAM	1	0	19.18			2
		1	24	19.19			2
		1	49	19.22			2
		25	0	19.30			3
		25	12	19.27			3
		25	25	19.25			3
		50	0	19.27			3
BW	MCS Index	Channel		27685	27710	27735	0
		Frequency (MHz)		2307.5	2310	2312.5	
5M	QPSK	1	0	19.00	19.05	19.08	0
		1	12	19.23	19.25	19.29	0
		1	24	19.02	19.07	19.10	0
		12	0	19.16	19.18	19.21	1
		12	6	19.19	19.27	19.27	1
		12	13	19.12	19.16	19.17	1
		25	0	19.11	19.17	19.15	1
	16QAM	1	0	19.00	19.07	19.11	1
		1	12	19.07	19.15	19.12	1
		1	24	18.99	19.01	19.02	1
		12	0	19.15	19.23	19.16	2
		12	6	19.24	19.30	19.29	2
		12	13	19.15	19.22	19.22	2
		25	0	19.13	19.19	19.22	2
	64QAM	1	0	18.96	19.03	19.05	2
		1	12	19.19	19.27	19.26	2
		1	24	19.03	19.11	19.11	2
		12	0	19.21	19.25	19.25	3
		12	6	19.18	19.26	19.30	3
		12	13	19.16	19.20	19.16	3
		25	0	19.19	19.25	19.23	3

<WLAN Reduce Power>

<WLAN 5.2G>

Mode	Channel	Frequency (MHz)	Avg. Power (dBm)
802.11a	36	5180	13.01
	40	5200	12.95
	48	5240	12.83
	36	5180	12.96
802.11n HT20	40	5200	12.91
	48	5240	12.81
	38	5190	12.75
	46	5230	12.80
802.11n HT40	36	5180	12.62
	40	5200	12.61
802.11ac HT20	48	5240	12.75
	38	5190	12.67
	46	5230	12.71
	42	5210	12.64
802.11ac HT40	36	5180	12.76
	40	5200	12.69
802.11ac VHT80	48	5240	12.31

<WLAN 5.3G>

Mode	Channel	Frequency (MHz)	Avg. Power (dBm)
802.11a	52	5260	12.92
	60	5300	12.94
	64	5320	13.06
802.11n HT20	52	5260	13.03
	60	5300	12.96
	64	5320	12.80
802.11n HT40	54	5270	12.89
	62	5310	12.93
802.11ac VHT20	52	5260	12.80
	60	5300	12.67
	64	5320	12.80
802.11ac VHT40	54	5270	12.88
	62	5310	12.73
802.11ac VHT80	58	5290	12.87
	52	5260	12.70
	60	5300	12.78
	64	5320	12.53

<WLAN 5.6G>

Mode	Channel	Frequency (MHz)	Avg. Power (dBm)
802.11a	100	5500	11.56
	116	5580	12.15
	124	5620	12.12
	132	5660	12.02
	140	5700	12.13
802.11n HT20	100	5500	11.52
	116	5580	12.11
	124	5620	12.03
	132	5660	11.74
	140	5700	11.80
802.11n HT40	102	5510	11.88
	110	5550	11.88
	126	5630	11.83
	134	5670	11.70
802.11ac VHT20	100	5500	8.51
	116	5580	8.13
	124	5620	8.63
	132	5660	8.68
	140	5700	8.75
802.11ac VHT40	102	5510	8.43
	110	5550	8.30
	126	5630	8.81
	134	5670	8.68
802.11ac VHT80	106	5530	8.99
	122	5610	8.73

<WLAN 5.8G>

Mode	Channel	Frequency (MHz)	Avg. Power (dBm)
802.11a	149	5745	11.86
	157	5785	11.83
	165	5825	11.62
802.11n HT20	149	5745	11.70
	157	5785	11.49
	165	5825	11.49
802.11n HT40	151	5755	11.48
	159	5795	11.48
802.11ac VHT20	149	5745	8.82
	157	5785	8.69
	165	5825	8.47
802.11ac VHT40	151	5755	8.66
	159	5795	8.56
802.11ac VHT80	155	5775	8.36

4.6 SAR Testing Results

4.6.1 SAR Test Reduction Considerations

<KDB 447498 D01, General RF Exposure Guidance>

Testing of other required channels within the operating mode of a frequency band is not required when the reported SAR for the mid-band or highest output power channel is:

(1) ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
(2) ≤ 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
(3) ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

<KDB 941225 D05, SAR Evaluation Considerations for LTE Devices>

(1) QPSK with 1 RB and 50% RB allocation

Start with the largest channel bandwidth and measure SAR, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle and lower edge of each required test channel. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel. When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.

(2) 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.

(3) Higher order modulations

SAR is required only when the highest maximum output power for the configuration in the higher order modulation is > 1/2 dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

(4) Other channel bandwidth

SAR is required when the highest maximum output power of the smaller channel bandwidth is > 1/2 dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the reported SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg.

<KDB 248227 D01, SAR Guidance for Wi-Fi Transmitters>

(1) For handsets operating next to ear, hotspot mode or mini-tablet configurations, the initial test position procedures were applied. The test position with the highest extrapolated peak SAR will be used as the initial test position. When the reported SAR of initial test position is <= 0.4 W/kg, SAR testing for remaining test positions is not required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is <= 0.8 W/kg or all test positions are measured.
(2) For WLAN 2.4 GHz, the highest measured maximum output power channel for DSSS was selected for SAR measurement. When the reported SAR is <= 0.8 W/kg, no further SAR testing is required. Otherwise, SAR is evaluated at the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel. For OFDM modes (802.11g/n), SAR is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and it is <= 1.2 W/kg.

(3) For WLAN 5 GHz, the initial test configuration was selected according to the transmission mode with the highest maximum output power. When the reported SAR of initial test configuration is > 0.8 W/kg, SAR is required for the subsequent highest measured output power channel until the reported SAR result is <= 1.2 W/kg or all required channels are measured. For other transmission modes, SAR is not required when the highest reported SAR for initial test configuration is adjusted by the ratio of subsequent test configuration to initial test configuration specified maximum output power and it is <= 1.2 W/kg.

(4) For WLAN MIMO mode, the power-based standalone SAR test exclusion or the sum of SAR provision in KDB 447498 to determine simultaneous transmission SAR test exclusion should be applied. Otherwise, SAR for MIMO mode will be measured with all applicable antennas transmitting simultaneously at the specified maximum output power of MIMO operation.