REPORT No.: SZ20110391S01

TEST REPORT

APPLICANT	:	Reliance Communications LLC
PRODUCT NAME	:	Orbic Smartwrist
MODEL NAME	:	RC178LW
BRAND NAME	:	Orbic
FCC ID	:	2ABGH-RC178LW
STANDARD(S)	:	FCC 47 CFR Part 2(2.1093)
RECEIPT DATE	:	2021-02-09
TEST DATE	:	2021-02-15 to 2021-02-19
ISSUE DATE	:	2021-03-17

Edited by: Gan Yueming

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Approved by: Peng Huarui

Peng Huarui (Supervisor)

DIRECTORY

Changed History		
Version	**Date**	**Reason for Change**
1.0	2021-03-17	First edition

1. SAR Results Summary

The maximum results of Specific Absorption Rate (SAR) found during test as bellows:

Frequency Band		Highest SAR Summary	
		Next to mouth (Separation 10mm)	Wrist-worn (Separation 0mm)
		1g(W/kg)	10g (W/kg)
WCDMA	Band II	0.412	0.972
	Band IV	0.296	0.795
	Band V	0.013	0.044
LTE	LTE Band 2	0.29	0.762
	LTE Band 4	0.199	0.57
	LTE Band 5	0.01	0.034
	LTE Band 12	0.003	0.006
	LTE Band 13	0.004	0.008
	LTE Band 66	0.292	0.741
	LTE Band 71	0.004	0.007
2.4GHz Bands	WLAN 2.4GHz	0.162	0.242
	Bluetooth	0.056	0.045

Maximum Scaled SAR 1g/10g (W/kg)	Next to mouth	0.412 W/Kg	Limit: 1.6 W/Kg
	Wrist-worn	0.972 W/Kg	Limit: 4.0 W/Kg

Highest Simultaneous Transmission 1g/10g (W/kg)	Next to mouth	0.574 W/Kg	Limit: 1.6 W/Kg
	Wrist-worn	1.214 W/Kg	Limit: 4.0 W/Kg

Note:

1. This device is in compliance with Specific Absorption Rate (SAR) for general population or uncontrolled exposure limits 1.6W/kg as averaged over any 1 gram of tissue and 4.0W/kg as averaged over any 10 gram of tissue; specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992
2. The highest simultaneous transmission is scalar summation of Reported standalone SAR per FCC KDB 690783 D01 v01r03, and scalar SAR summation of all possible simultaneous transmission scenarios are<1.6W/kg(for next to mouth mode) or <4.0W/kg(for wrist-worn mode).
3. This device is compliance with Specific Absorption Rate (SAR) for general population or uncontrolled exposure limits specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-2005, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013.
4. When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% risk level.

2. Technical Information

Note: Provide by Applicant.

2.1. Applicant and Manufacturer Information

Applicant:	Reliance Communications LLC
ApplicantAddress:	91 Colin Drive, Unit 1, HOLBROOK, New York 11741, United States
Manufacturer:	Unimaxcomm
ManufacturerAddress:	Room 602, Floor 6th, Building B, Software Park T3,Hi-Tech Park South, Nanshan District, Shenzhen, P.R. China

2.2. Equipment under Test (EUT) Description

Product Name:	Orbic Smartwrist
Hardware Version:	V1.1
Software Version:	ORB178LW_v1.0.2_BVZWS
Operation Frequency:	WCDMA Band II: 1850 MHz ~ 1910 MHz WCDMA Band IV: 1710 MHz ~ 1755 MHz WCDMA Band V: 824 MHz ~ 849 MHz LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 66: 1710 MHz ~ 1780 MHz LTE Band 71: 663 MHz ~ 698 MHz WLAN 2.4GHz: 2412 MHz ~ 2462 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Modulation Technology:	WCDMA: QPSK, 16QAM LTE: QPSK, 16QAM 802.11b: DSSS 802.11g/n20: OFDM Bluetooth:GFSK(1Mbps),π/4-DQPSK(2Mbps),8-DPSK(3Mbps)
VoLTE Mode:	Support
Antenna Type:	WWAN: PIFA Antenna WLAN/Bluetooth: PIFA Antenna

Note: For a more detailed description, please refer to specification or user's manual supplied by the applicant and/or manufacturer.

2.3. Environment of Test Site

Temperature:	18°C~25°C
Humidity:	35%~75% RH
Atmospheric Pressure:	1010 mbar
Test frequency:	WCDMA Band II/IV/V FDD-LTE Band 2/4/5/12/13/66/71 WLAN 2.4GHz; Bluetooth;
Operation mode:	Call established
Power Level:	WCDMA Band II/IV/V (All Up Bits) FDD-LTE Band 2/4/5/12/13/66/71 (Maximum output power) WLAN 2.4GHz; Bluetooth

During SAR test, EUT is in Traffic Mode (Channel Allocated) at Normal Voltage Condition. A communication link is set up with a System Simulator (SS) by air link, and a call is established.

The EUT shall use its internal transmitter. The antenna(s), battery and accessories shall be those specified by the Factory. The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output. If a wireless link is used, the antenna connected to the output of the base station simulator shall be placed at least 50 cm away from the handset.
The signal transmitted by the simulator to the antenna feeding point shall be lower than the output power level of the handset by at least 35 dB.

3. Introduction

3.1. 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 or controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational or controlled exposure limits are higher than the limits for general population or uncontrolled.

3.2. 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:

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

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

SAR measurement can be either related to the temperature elevation in tissue by

$$SAR = C\left(\frac{\delta T}{\delta t}\right)$$

Where: C is the specific heat capacity, δT is the temperature rise and δt is the exposure duration, or related to the electrical field in the tissue by

$$SAR = \frac{\sigma \cdot E^2}{\rho}$$

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength. However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

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 or 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. This 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 or 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.

4.3. RF Exposure Limits

SAR Human Exposure Specified in ANSI/IEEE C95.1-1992 and Health Canada Safety Code 6

HUMAN EXPOSURE LIMITS		
	UNCONTROLLED ENVIRONMENT *General Population* (W/kg) or (mW/g)	CONTROLLED ENVIRONMENT *Occupational* (W/kg) or (mW/g)
SPATIAL PEAK SAR Brain	1.6	8.0
SPATIAL AVERAGE SAR Whole Body	0.08	0.4
SPATIAL PEAK SAR Hands, Feet, Ankles, Wrists	4.0	20

Note:

1. The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
2. The Spatial Average value of the SAR averaged over the whole body.
3. The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue

volume in the shape of acube) and over the appropriate averaging time.

5. Applied Reference Documents

Leading reference documents for testing:

Identity	Document Title	Method Determination /Remark
47 CFR Part 2.1093	Radio Frequency Radiation Exposure Evaluation: Portable Devices	No deviation
IEEE 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	No deviation
KDB 447498 D01v06	General RF Exposure Guidance	No deviation
KDB 248227 D01v02r02	SAR Measurement Procedures for 802.11 Transmitters	No deviation
KDB 865664 D01v01r04	SAR Measurement 100 MHz to 6 GHz	No deviation
KDB 865664 D02v01r02	RF Exposure Reporting	No deviation
KDB 941225 D06v02r01	SAR Evaluation Procedures For Portable Devices With Wireless Router Capabilities	No deviation
Note 1: The test item is not applicable. **Note 2:** Additions to, deviation, or exclusions from the method shall be judged in the "method determination" column of add, deviate or exclude from the specific method shall be explained in the "Remark" of the above table.		

6. SAR Measurement System

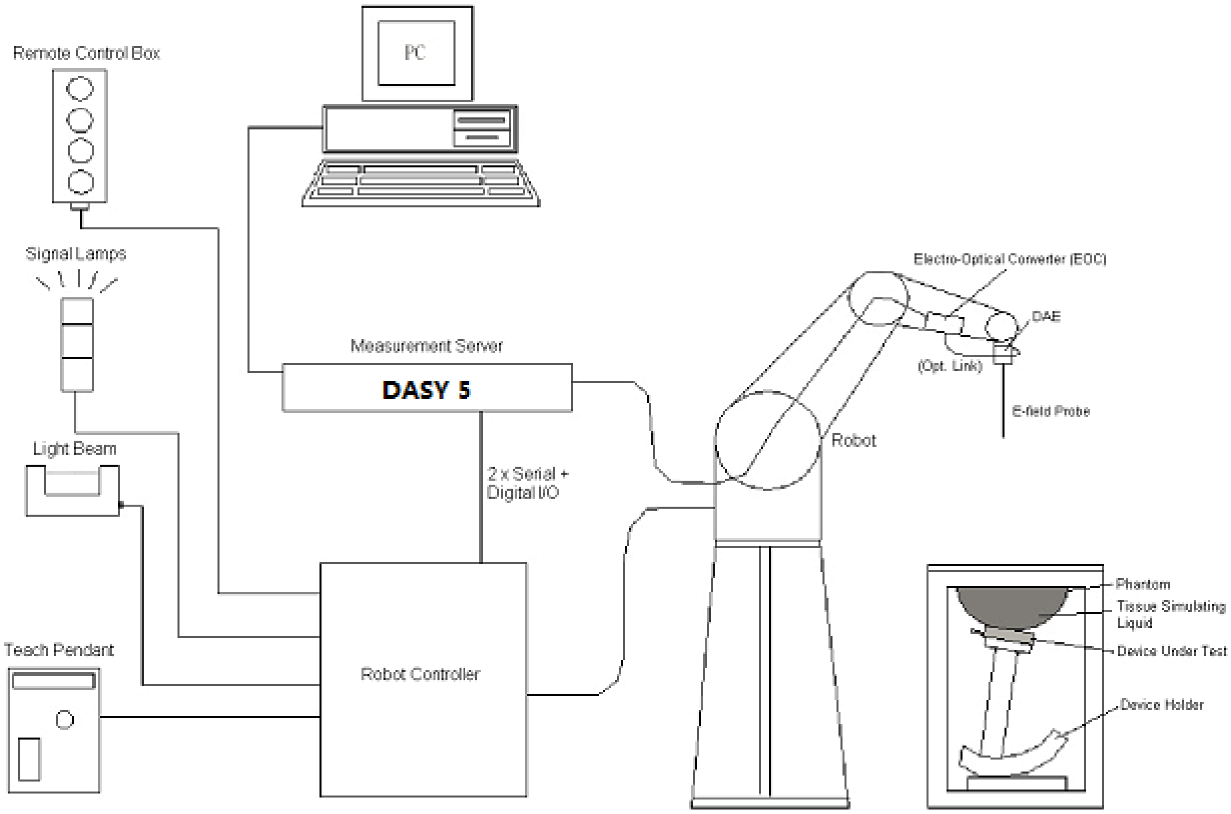

Fig.6.1 SPEAG DASY System Configurations

The DASY system for performance compliance tests is illustrated above graphically. This system consists of thefollowing items:

- A standard high precision 6-axis robot with controller, a teach pendant and software.
- A data acquisition electronic (DAE) attached to the robot arm extension.
- A dosimetric probe equipped with an optical surface detector system.
- The electro-optical converter (EOC) performs the conversion between optical and electrical signals.
- A measurement server performs the time critical tasks such as signal filtering, control of the robot operationand fast movement interrupts.
- A probe alignment unit which improves the accuracy of the probe positioning.
- A computer operating Windows XP.
- DASY software.
- Remove control with teach pendant and additional circuitry for robot safety such as warming lamps, etc.
- The SAM twin phantom.
- A device holder.
- Tissue simulating liquid.
- Dipole for evaluating the proper functioning of the system.

Component details are described in the following sub-sections.

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.

➢ **E-Field Probe Specification**

<EX3DV3 Probe>

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection system. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	10 MHz to 3 GHz; Linearity: ± 0.2 dB
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.4 dB in HSL (rotation normal to probe axis)
Dynamic Range	5 µW/g to 100 mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 330 mm (Tip: 16 mm) Tip diameter: 6.8 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.7 mm

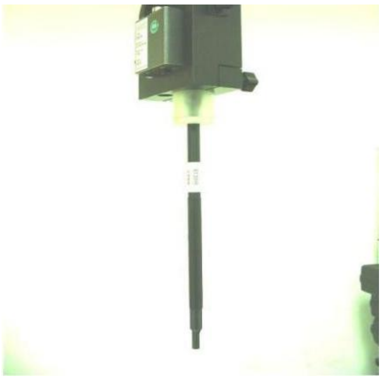

Fig 6.2 Photo of ES3DV3

<EX3DV4 Probe>

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
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm

Fig 6.3 Photo of EX3DV4

➢ **E-Field Probe Calibration**

Each probe needs to be calibrated according to a dosimetric assessment procedure with accuracy better than ±10%. The spherical isotropy shall be evaluated and within ±0.25 dB. The sensitivity parameters (Norm X, Norm Y and Norm Z), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested. The calibration data can be referred to Annex E of this report.

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. 6.4 Photo of DAE

6.3. Robot

The SPEAG DASY system uses the high precision robots (DASY5: TX60XL) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version (DASY5: CS8c) from Stäubliis used. The Stäubli robot series have many features that are important for our application:

- High precision (repeatability   0.02 mm)
- High reliability (industrial design)
- Low maintenance costs (virtually maintenance free due to direct drive gears; nobelt drives)
- Jerk-free straight movements
- Low ELF interference (motor control fields shielded via the closed metallic construction shields)

Fig. 6.5 Photo of Robot

6.4. Measurement Server

The measurement server is based on a PC/104 CPU board with CPU (DASY5: 400MHz, Intel Celeron), chip-disk (DASY5: 128 MB), RAM (DASY5: 128 MB). The necessary circuits for communication with the DAE electronic box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY I/O board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all the real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operations.

Fig. 6.6 Photo of Server for DASY5

6.5. Light Beam Unit

The light beam switch allows automatic "tooling" of the probe. During the process, the actual position of the probe tip with respect to the robot arm is measured, as well as the probe length and the horizontal probe offset. The software then corrects all movements, such that the robot coordinates are valid for the probe tip.

The repeatability of this process is better than 0.1 mm. If a position has been taught with an aligned probe, the same position will be reached with another aligned probe within 0.1 mm, even if the other probe has different dimensions. During probe rotations, the probe tip will keep its actual position.

Fig. 6.7 Photo of Light Beam

6.6. Phantom

<SAM Twin Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%) Center ear point: 6 ± 0.2 mm	
Filling Volume Dimensions	Approx. 25 liters Length: 1000 mm; Width: 500 mm; Height: adjustable feet	
Measurement Areas	Left Head, Right Head, Flat phantom	**Fig. 6.8 Photo of SAM 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.

6.7. Device Holder

<Device Holder for SAM Twin Phantom>

The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5 mm distance, a positioning uncertainty of ±0.5 mm would produce a SAR uncertainty of ± 20 %. Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions in which the devices must be measured are defined by the standards.

The DASY device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with

respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (ERP).
Thus the device needs no repositioning when changing the angles.
The DASY device holder is constructed of low-low POM material having the following dielectric parameters: relative permittivity ε = 3 and loss tangent δ = 0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

<Laptop Extension Kit>
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.

Fig 6.9 Device Holder

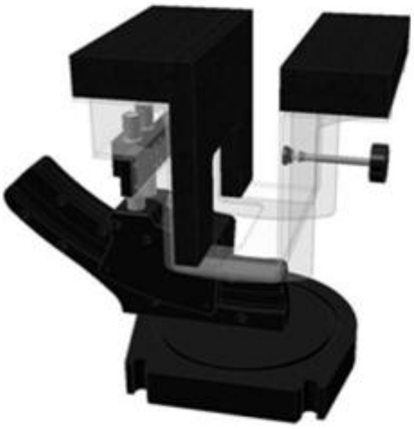

Fig 6.10 Laptop Extension Kit

6.8. Data Storage and Evaluation

- **Data Storage**

The DASY software stores the assessed data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all the necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files. The post-processing software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verifications of the complete software setup even after the measurement and allows correction of erroneous parameter settings. For example, if a measurement has been performed with an incorrect crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be reevaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type (e.g., [V/m], [mW/g]). Some of these units are not available in certain situations or give meaningless results, e.g., a SAR-output in a non-lose media, will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

- **Data Evaluation**

The DASY post-processing software (SEMCAD) automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe Parameters:	- Sensitivity	$Norm_i$, a_{i0}, a_{i1}, a_{i2}
	- Conversion	$ConvF_i$
	- Diode compression point	dcp_i
Device Parameters:	- Frequency	f
	- Crest	cf
Media Parameters:	- Conductivity	σ
	- Density	ρ

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY components. In the direct measuring mode of the multi-meter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power.

The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

WithVi = compensated signal of channel i, (i = x, y, z)

Ui= input signal of channel i, (i = x, y, z)

cf = crest factor of exciting field (DASY parameter)

dcpi= diode compression point (DASY parameter)

From the compensated input signals, the primary field data for each channel can be evaluated:

E- Field Probes: $E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$

H-Field Probes: $H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1} f + a_{i2} f^2}{f}$

WithVi = compensated signal of channel i, (i = x, y, z)

Normi= senor sensitivity of channel i, (i = x, y, z), µV/ (V/m) 2

ConvF = sensitivity enhancement in solution

aij = sensor sensitivity factors for H-field probes

f = carrier frequency (GHz)

Ei = electric field strength of channel i in V/m

Hi = magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

The primary field data are used to calculate the derived field units.

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$

With SAR = local specific absorption rate in mW/g

Etot= total field strength in V/m

σ = conductivity in (mho/m) or (Siemens/m)

ρ= equipment tissue density in g/cm3

Note that the density is set to 1, to account for actual head tissue density rather than the density of the tissue simulating liquid.

6.9. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V3	1173	2018.06.21	2021.06.20
SPEAG	835MHz System Validation Kit	D835V2	4d227	2018.06.22	2021.06.21
SPEAG	1750MHz System Validation Kit	D1750V2	1160	2018.06.25	2021.06.24
SPEAG	1900MHz System Validation Kit	D1900V2	5d211	2018.06.22	2021.06.21
SPEAG	2450MHz System Validation Kit	D2450V2	805	2018.10.26	2021.10.25
SPEAG	Dosimetric E-Field Probe	EX3DV4	7515	2020.11.30	2021.11.29
SPEAG	Data Acquisition Electronics	DAE4	480	2020.06.02	2021.06.01
SPEAG	Dielectric Assessment KIT	DAK-3.5	1279	2020.10.19	2021.10.18
SPEAG	SAM Twin Phantom 2	QD 000 P40 CB	TP-1464	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
R&S	Network Emulator	CMW500	124534	2020.03.31	2021.03.30
Agilent	Network Analyzer	E5071B	MY42404762	2020.04.01	2021.03.31
mini-circuits	Amplifier	ZHL-42W+	608501717	NCR	NCR
Agilent	Signal Generator	N5182B	MY53050509	2020.03.31	2021.03.30
Agilent	Power Senor	N8482A	MY41090849	2020.10.19	2021.10.18
Agilent	Power Meter	E4416A	MY45102093	2020.10.19	2021.10.18
Anritsu	Power Sensor	MA2411B	N/A	2020.10.19	2021.10.18
Anritsu	Power Meter	NRVD	101066	2020.10.19	2021.10.18
Agilent	Dual Directional Coupler	778D	50422	NA	NA
MCL	Attenuation1	351-218-010	N/A	NA	NA
KTJ	Thermo meter	TA298	N/A	201.01.15	2022.01.14
N/A	Tissue Simulating Liquids	700-6000MHz	N/A	24H	

Note:

1. The calibration certificate of DASY can be referred to Annex C of this report.
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 Insertion Loss calibration of Dual Directional Coupler and Attenuator were characterized via the network analyzer and compensated during system check.
4. The dielectric probe kit was calibrated via the network analyzer, with the specified procedure (calibrated in pure water) and calibration kit (standard) short circuit, before the dielectric measurement. The specific procedure and calibration kit are provided by Speag.
5. In system check we need to monitor the level on the power meter, and adjust the power amplifier level to have precise power level to the dipole; the measured SAR will be normalized

to 1W input power according to the ratio of 1W to the input power to the dipole. For system check, the calibration of the power amplifier is deemed not critically required for correct measurement; the power meter is critical and we do have calibration for it.

6. Attenuator insertion loss is calibrated by the network Analyzer, which the calibration is valid, before system check.
7. N.C.R means No Calibration Requirement.

7. 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. 7.1, for body SAR testing, the liquid height from the centre of the flat phantom to liquid top surface is larger than 15 cm, which is shown in Fig. 7.2.

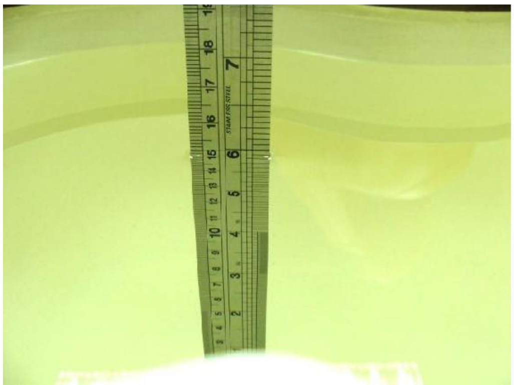

Fig 7.1 Photo of Liquid Height for Head SAR

Fig 7.2 Photo of Liquid Height for Body SAR

The following table gives the recipes for tissue simulating liquids

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
Head								
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
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%

The relative permittivity and conductivity of the tissue material should be within±5% of the values given in the table below recommended by the FCC OET 65supplement C and RSS 102 Issue 5.

Target Frequency	Head		Body	
(MHz)	ε r	σ (S/m)	ε r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800-2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

(ε r = relative permittivity, σ = conductivity and ρ = 1000 kg/m^3)

The dielectric parameters of liquids were verified prior to the SAR evaluation using a Speag Dielectric Probe Kit and an Agilent Network Analyzer.

The following table shows the measuring results for simulating liquid

Frequency (MHz)	**Tissue Type**	**Liquid Temp. (℃)**	**Conductivity (σ)**	**Conductivity Target (σ)**	**Delta (σ)(%)**	**Limit (%)**	**Date**
750	HSL	22.3	0.904	0.89	1.57	±5	2021.02.15
835	HSL	22.1	0.918	0.90	2.00	±5	2021.02.16
1750	HSL	22.3	1.389	1.37	1.39	±5	2021.02.17
1900	HSL	22.7	1.431	1.40	2.21	±5	2021.02.18
2450	HSL	22.4	1.851	1.80	2.83	±5	2021.02.19

Frequency (MHz)	**Tissue Type**	**Liquid Temp. (℃)**	**Permittivity (εr)**	**Permittivity Target (εr)**	**Delta (εr) (%)**	**Limit (%)**	**Date**
750	HSL	22.3	42.081	41.90	0.43	±5	2021.02.15
835	HSL	22.1	41.962	41.50	1.11	±5	2021.02.16
1750	HSL	22.3	41.233	40.10	2.83	±5	2021.02.17
1900	HSL	22.7	41.164	40.00	2.91	±5	2021.02.18
2450	HSL	22.4	40.321	39.20	2.86	±5	2021.02.19

8. SAR System Verification

Each DASY system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the DASY software, enable the user to conduct the system performance check and system validation. System validation kit includes a dipole, tripod holder to fix it underneath the flat phantom and a corresponding distance holder.

➢ **Purpose of System Performance check**

The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected. It is recommended that the system performance check be performed prior to any usage of the system in order to guarantee reproducible results. The system performance check uses normal SAR measurements in a simplified setup with a well characterized source. This setup was selected to give a high sensitivity to all parameters that might fail or vary over time. The system check does not intend to replace the calibration of the components, but indicates situations where the system uncertainty is exceeded due to drift or failure.

➢ **System Setup**

In the simplified setup for system evaluation, the EUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:

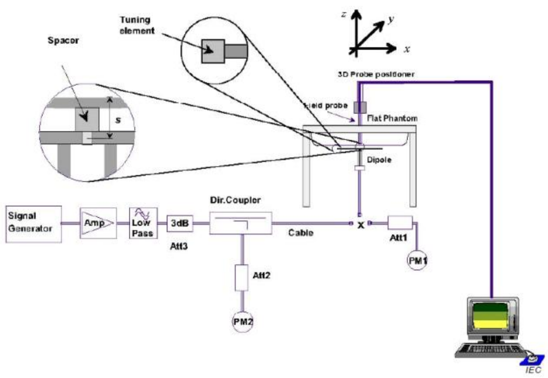

Fig.8.1 System Verification Setup Diagram

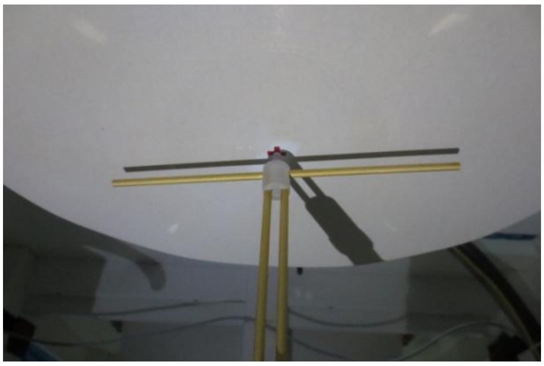

Fig.8.2 Photo of Dipole setup

➢ System Verification 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 as below indicates the system performance check can meet the variation criterion and the plots can be referred to Annex C of this report.

Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N
750	HSL	250	D750V3-1173	7515	480
835	HSL	250	D835V2-4d227	7515	480
1750	HSL	250	D1750V3-1160	7515	480
1900	HSL	250	D1900V2_5d221	7515	480
2450	HSL	250	D2450V2-805	7515	480

<1g SAR>

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2021.02.15	750	HSL	250	2.01	8.26	8.04	-2.66
2021.02.16	835	HSL	250	2.36	9.34	9.44	1.07
2021.02.17	1750	HSL	250	9.19	37.10	36.76	-0.92
2021.02.18	1900	HSL	250	10.01	39.50	40.04	1.37
2021.02.19	2450	HSL	250	13.33	52.00	53.32	2.54

<10g SAR>

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Measured 10g SAR (W/kg)	Targeted 10g SAR (W/kg)	Normalized 10g SAR (W/kg)	Deviation (%)
2021.02.15	750	HSL	250	1.34	5.45	5.36	-1.65
2021.02.16	835	HSL	250	1.51	6.07	6.04	-0.49
2021.02.17	1750	HSL	250	5.08	20.00	20.32	1.60
2021.02.18	1900	HSL	250	5.11	20.60	20.44	-0.78
2021.02.19	2450	HSL	250	6.12	24.10	24.48	1.58

Note: System checks the specific test data please see Annex C

9. EUT Testing Position

This EUT was tested in two different positions. They are front of face for head with phantom 10 mm gap, wrist-worn of the EUT with phantom 0 mm gap, as illustrated below, please refer to Annex B for the test setup photos.

9.1. SAR Evaluations near the Mouth/Jaw Regions of the SAM

Transmitters that are built-in within a wrist watch or similar wrist-worn devices typically operate in speaker mode for voice communication, with the device worn on the wrist and positioned next to the mouth. Next to the mouth exposure requires 1-g SAR and the wrist-worn condition requires 10-g extremity SAR. The 10-g extremity and 1-g SAR test exclusions may be applied to the wrist and face exposure conditions. When SAR evaluation is required, next to the mouth use is evaluated with the front of the device positioned at 10 mm from a flat phantom filled with head tissue-equivalent medium. The wrist bands should be strapped together to represent normal use conditions. SAR for wrist exposure is evaluated with the back of the device positioned in direct contact against a flat phantom filled with body tissue-equivalent medium. The wrist bands should be unstrapped and touching the phantom. The space introduced by the watch or wrist bands and the phantom must be representative of actual use conditions; otherwise, if applicable, the neck or a curved head region of the SAM phantom may be used, provided the device positioning and SAR probe access issues have been addressed through a KDB inquiry. When other device positioning and SAR measurement considerations are necessary, a KDB inquiry is also required for the test results to be acceptable; for example, devices with rigid wrist bands or electronic circuitry and/or antenna(s) incorporated in the wrist bands. These test configurations are applicable only to devices that are worn on the wrist and cannot support other use conditions; therefore, the operating restrictions must be fully demonstrated in both the test reports and user manuals.

9.2. Limb-worn Accessory Configurations

- To position the device parallel to the phantom surface with either keypad up or down.
- To adjust the device parallel to the flat phantom.
- To adjust the distance between the device surface and the flat phantom to 10 mm or holster surface and the flat phantom to 0 mm.

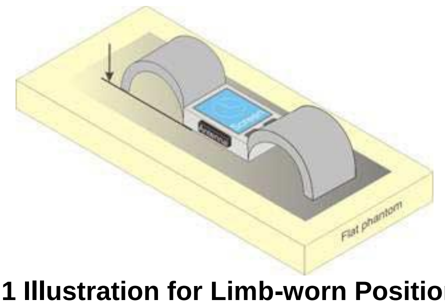

Fig.8.1 Illustration for Limb-worn Position

10. Measurement Procedures

The measurement procedures are as bellows:

<Conducted power measurement>

- For WWAN power measurement, use base station simulator to configure EUT WWAN transition in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
- Read the WWAN RF power level from the base station simulator.
- 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.
- Connect EUT RF port through RF cable to the power meter or spectrum analyzer, and measure WLAN/BT output power.

<Conducted power measurement>

- 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.
- Place the EUT in positions as Annex B demonstrates.
- Set scan area, grid size and other setting on the DASY software.
- Measure SAR results for the highest power channel on each testing position.
- Find out the largest SAR result on these testing positions of each band.
- Measure SAR results for other channels in worst SAR testing position if the Reported SAR or 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:

- Power reference measurement
- Area scan
- Zoom scan
- Power drift measurement

10.1. 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 10 g 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 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

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

10.2. Power Reference Measurement

The Power Reference Measurement and Power Drift Measurement 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.

10.3. Area & Zoom Scan Procedures

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 10g. Area scan and zoom scan resolution setting follows KDB 865664 D01v01r04 quoted below.

<table>
<tr><td colspan="3"></td><td>≤ 3 GHz</td><td>> 3 GHz</td></tr>
<tr><td colspan="3">Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 ± 1 mm</td><td>½·δ·ln(2) ± 0.5 mm</td></tr>
<tr><td colspan="3">Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30° ± 1°</td><td>20° ± 1°</td></tr>
<tr><td colspan="3" rowspan="2">Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}</td><td>≤ 2 GHz: ≤ 15 mm
2 – 3 GHz: ≤ 12 mm</td><td>3 – 4 GHz: ≤ 12 mm
4 – 6 GHz: ≤ 10 mm</td></tr>
<tr><td colspan="2">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.</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}</td><td>≤ 2 GHz: ≤ 8 mm
2 – 3 GHz: ≤ 5 mm*</td><td>3 – 4 GHz: ≤ 5 mm*
4 – 6 GHz: ≤ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>≤ 5 mm</td><td>3 – 4 GHz: ≤ 4 mm
4 – 5 GHz: ≤ 3 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>≤ 4 mm</td><td>3 – 4 GHz: ≤ 3 mm
4 – 5 GHz: ≤ 2.5 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>≥ 30 mm</td><td>3 – 4 GHz: ≥ 28 mm
4 – 5 GHz: ≥ 25 mm
5 – 6 GHz: ≥ 22 mm</td></tr>
<tr><td colspan="5">Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.
* When zoom scan is required and the <u>reported</u> SAR from the 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.</td></tr>
</table>

10.4. 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 post-processor scan combine and subsequently superpose these measurement data to calculating the multiband SAR.

10.5. 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 1g and 10g cubes, the extrapolation distance should not be larger than 5 mm.

10.6. 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.

11. Conducted RF Output Power

➢ **WCDMA Conducted Power**

Band		WCDMA II			Tune-up Limit (dBm)
TX Channel		9262	9400	9538	
Rx Channel		9662	9800	9938	
Frequency (MHz)		1852.4	1880	1907.6	
3GPP Rel 99	RMC 12.2Kbps	23.21	23.32	23.28	24.00
3GPP Rel 6	HSDPA Subtest-1	21.93	22.02	22.03	22.50
3GPP Rel 6	HSDPA Subtest-2	21.95	21.97	22.04	22.50
3GPP Rel 6	HSDPA Subtest-3	21.50	21.51	21.64	22.00
3GPP Rel 6	HSDPA Subtest-4	21.43	21.55	21.65	22.00
3GPP Rel 6	HSUPA Subtest-1	22.05	22.12	22.19	22.50
3GPP Rel 6	HSUPA Subtest-2	21.53	21.66	21.72	22.00
3GPP Rel 6	HSUPA Subtest-3	22.02	22.15	22.09	22.50
3GPP Rel 6	HSUPA Subtest-4	21.98	22.12	22.15	22.50
3GPP Rel 6	HSUPA Subtest-5	22.03	22.07	22.02	22.50
3GPP Rel 7	HSPA+ (16QAM) Subtest-1	21.97	21.99	22.01	22.50

Band		WCDMA IV			Tune-up Limit (dBm)
TX Channel		1312	1413	1513	
Rx Channel		1537	1638	1738	
Frequency (MHz)		1712.4	1732.6	1752.6	
3GPP Rel 99	RMC 12.2Kbps	23.06	23.12	23.09	24.00
3GPP Rel 6	HSDPA Subtest-1	21.73	21.94	21.73	22.50
3GPP Rel 6	HSDPA Subtest-2	21.85	22.11	22.21	22.50
3GPP Rel 6	HSDPA Subtest-3	21.43	21.55	21.79	22.00
3GPP Rel 6	HSDPA Subtest-4	21.45	21.59	21.42	22.00
3GPP Rel 6	HSUPA Subtest-1	22.24	22.18	22.27	23.00
3GPP Rel 6	HSUPA Subtest-2	21.62	21.70	21.72	22.00
3GPP Rel 6	HSUPA Subtest-3	22.34	22.26	22.25	22.50
3GPP Rel 6	HSUPA Subtest-4	22.09	22.01	22.06	22.50
3GPP Rel 6	HSUPA Subtest-5	22.29	22.25	22.26	23.00
3GPP Rel 7	HSPA+ (16QAM) Subtest-1	21.92	21.93	21.98	22.50

Band		WCDMA V			Tune-up Limit (dBm)
TX Channel		4132	4182	4233	
Rx Channel		4357	4407	4458	
Frequency (MHz)		826.4	836.4	846.6	
3GPP Rel 99	RMC 12.2Kbps	23.16	23.21	23.11	24.00
3GPP Rel 6	HSDPA Subtest-1	22.41	22.06	22.07	23.00
3GPP Rel 6	HSDPA Subtest-2	22.49	22.16	22.15	23.00
3GPP Rel 6	HSDPA Subtest-3	22.05	21.66	21.77	22.50
3GPP Rel 6	HSDPA Subtest-4	21.95	21.69	21.67	22.50
3GPP Rel 6	HSUPA Subtest-1	22.62	22.22	22.26	23.00
3GPP Rel 6	HSUPA Subtest-2	21.97	21.62	21.73	22.50
3GPP Rel 6	HSUPA Subtest-3	22.54	22.23	22.27	23.00
3GPP Rel 6	HSUPA Subtest-4	22.22	22.07	22.08	22.50

3GPP Rel 6	HSUPA Subtest-5	22.66	22.16	22.22	23.00
3GPP Rel 7	HSPA+ (16QAM) Subtest-1	22.09	22.13	22.10	22.50

- **LTE Conducted Power**

<FDD-LTE Band 2>

BW [MHz]	Modulation	RB Size	RB Offset	Low Channel	Middle Channel	High Channel	Tune-up limit (dBm)
Channel				18700	18900	19100	
Frequency (MHz)				1860	1880	1900	
20	QPSK	1	0	23.11	23.18	23.15	24
20	QPSK	1	49	23.08	22.93	23.01	
20	QPSK	1	99	23.07	23.14	23.12	
20	QPSK	50	0	22.48	22.52	22.23	23
20	QPSK	50	24	22.31	22.31	22.26	
20	QPSK	50	50	22.41	22.38	22.33	
20	QPSK	100	0	22.45	22.26	22.36	
20	16QAM	1	0	22.58	22.32	22.22	23
20	16QAM	1	49	22.35	22.64	22.45	
20	16QAM	1	99	22.36	22.26	22.35	
20	16QAM	50	0	22.23	22.06	22.22	23
20	16QAM	50	24	22.19	22.16	22.34	
20	16QAM	50	50	22.35	22.04	22.00	
20	16QAM	100	0	22.28	22.04	22.24	
Channel				18675	18900	19125	Tune-up limit (dBm)
Frequency (MHz)				1857.5	1880	1902.5	
15	QPSK	1	0	23.14	22.97	23.04	24
15	QPSK	1	37	22.97	23.01	23.04	
15	QPSK	1	74	22.97	23.01	23.14	
15	QPSK	36	0	22.29	22.18	21.91	23
15	QPSK	36	20	22.34	22.03	22.02	
15	QPSK	36	39	22.22	22.06	22.27	
15	QPSK	75	0	22.32	22.09	22.35	
15	16QAM	1	0	22.38	22.19	22.34	23
15	16QAM	1	37	22.54	22.01	22.12	
15	16QAM	1	74	22.15	22.14	22.18	
15	16QAM	36	0	22.42	22.05	22.23	23
15	16QAM	36	20	22.36	22.12	22.27	
15	16QAM	36	39	22.28	22.08	22.22	
15	16QAM	75	0	22.31	22.19	22.24	
Channel				18650	18900	19150	Tune-up limit (dBm)
Frequency (MHz)				1855	1880	1905	
10	QPSK	1	0	23.03	22.88	23.03	24
10	QPSK	1	25	23.00	22.91	22.92	

10	QPSK	1	49	22.97	22.90	23.03	
10	QPSK	25	0	22.31	22.05	22.33	23
10	QPSK	25	12	22.28	22.04	22.24	
10	QPSK	25	25	22.26	22.09	22.34	
10	QPSK	50	0	22.24	22.02	22.04	
10	16QAM	1	0	22.30	22.26	21.88	23
10	16QAM	1	25	22.38	22.21	22.16	
10	16QAM	1	49	22.36	22.26	22.03	
10	16QAM	25	0	22.29	22.02	22.07	23
10	16QAM	25	12	22.11	22.19	22.05	
10	16QAM	25	25	22.15	22.25	22.16	
10	16QAM	50	0	22.17	22.14	22.23	
Channel				18625	18900	19175	Tune-up limit (dBm)
Frequency (MHz)				1852.5	1880	1907.5	
5	QPSK	1	0	22.88	22.93	22.91	24
5	QPSK	1	12	23.03	23.04	23.01	
5	QPSK	1	24	22.92	22.96	22.88	
5	QPSK	12	0	22.31	22.04	22.37	23
5	QPSK	12	7	22.33	22.03	22.21	
5	QPSK	12	13	22.21	22.01	22.29	
5	QPSK	25	0	22.29	22.19	22.44	
5	16QAM	1	0	22.50	22.12	22.47	23
5	16QAM	1	12	22.46	22.42	22.44	
5	16QAM	1	24	22.51	22.26	22.25	
5	16QAM	12	0	22.28	22.27	22.38	23
5	16QAM	12	7	22.30	22.07	22.26	
5	16QAM	12	13	22.20	22.19	22.33	
5	16QAM	25	0	22.36	22.10	22.29	
Channel				18615	18900	19185	Tune-up limit (dBm)
Frequency (MHz)				1851.5	1880	1908.5	
3	QPSK	1	0	23.09	23.02	23.01	24
3	QPSK	1	8	23.05	23.04	23.05	
3	QPSK	1	14	23.03	22.97	23.11	
3	QPSK	8	0	22.22	22.05	22.24	23
3	QPSK	8	4	22.27	22.07	22.15	
3	QPSK	8	7	22.31	22.07	22.09	
3	QPSK	15	0	22.26	22.04	22.18	
3	16QAM	1	0	22.30	22.44	22.25	23
3	16QAM	1	8	22.39	22.19	22.23	
3	16QAM	1	14	22.35	22.21	22.44	
3	16QAM	8	0	22.47	22.04	22.18	23
3	16QAM	8	4	22.25	22.11	22.16	
3	16QAM	8	7	22.33	22.08	22.18	
3	16QAM	15	0	22.32	22.23	22.22	

Channel				18607	18900	19193	Tune-up limit (dBm)
Frequency (MHz)				1850.7	1880	1909.3	
1.4	QPSK	1	0	23.07	23.03	23.05	24
1.4	QPSK	1	3	23.08	22.97	22.98	
1.4	QPSK	1	5	22.95	23.11	23.00	
1.4	QPSK	3	0	23.12	22.90	23.06	
1.4	QPSK	3	1	23.14	23.01	23.05	
1.4	QPSK	3	3	23.09	22.96	22.95	
1.4	QPSK	6	0	22.38	22.21	22.20	23
1.4	16QAM	1	0	22.42	22.42	22.36	23
1.4	16QAM	1	3	22.49	22.47	22.13	
1.4	16QAM	1	5	22.43	22.48	22.13	
1.4	16QAM	3	0	22.41	22.34	22.38	
1.4	16QAM	3	1	22.59	22.33	22.40	
1.4	16QAM	3	3	22.45	22.27	22.43	
1.4	16QAM	6	0	22.25	22.29	22.26	23

<FDD-LTE Band 4>

BW [MHz]	Modulation	RB Size	RB Offset	Low Channel	Middle Channel	High Channel	Tune-up limit (dBm)
Channel				20050	20175	20300	
Frequency (MHz)				1720	1732.5	1745	
20	QPSK	1	0	23.32	23.54	23.51	24
20	QPSK	1	49	23.16	23.15	22.94	
20	QPSK	1	99	22.98	22.96	22.98	
20	QPSK	50	0	22.22	22.25	22.21	23
20	QPSK	50	24	22.10	22.06	22.21	
20	QPSK	50	50	22.22	22.01	22.12	
20	QPSK	100	0	22.03	22.16	22.14	
20	16QAM	1	0	22.21	22.15	22.08	23
20	16QAM	1	49	22.02	22.11	22.34	
20	16QAM	1	99	22.22	22.12	22.12	
20	16QAM	50	0	22.36	22.17	22.28	23
20	16QAM	50	24	22.30	22.20	22.13	
20	16QAM	50	50	22.23	22.04	22.01	
20	16QAM	100	0	22.25	22.11	22.15	
Channel				20025	20175	20325	Tune-up limit (dBm)
Frequency (MHz)				1717.5	1732.5	1747.5	
15	QPSK	1	0	23.19	23.14	23.02	24
15	QPSK	1	37	22.93	23.04	23.04	
15	QPSK	1	74	23.07	22.95	23.00	
15	QPSK	36	0	22.31	22.16	22.21	23
15	QPSK	36	20	22.32	22.24	22.22	
15	QPSK	36	39	22.24	22.22	22.13	

15	QPSK	75	0	22.34	22.17	22.22	
15	16QAM	1	0	22.13	22.15	22.03	23
15	16QAM	1	37	22.03	22.03	22.27	
15	16QAM	1	74	22.31	21.92	22.20	
15	16QAM	36	0	22.30	22.19	22.16	23
15	16QAM	36	20	22.23	22.18	22.19	
15	16QAM	36	39	22.19	22.10	22.04	
15	16QAM	75	0	22.29	22.16	22.11	
Channel				20000	20175	20350	Tune-up limit (dBm)
Frequency (MHz)				1715	1732.5	1750	
10	QPSK	1	0	22.88	23.15	23.07	24
10	QPSK	1	25	22.88	23.05	22.92	
10	QPSK	1	49	23.11	23.02	23.08	
10	QPSK	25	0	22.34	22.23	22.24	23
10	QPSK	25	12	22.38	22.28	22.17	
10	QPSK	25	25	22.27	22.17	22.18	
10	QPSK	50	0	22.31	22.24	22.29	
10	16QAM	1	0	22.12	22.15	22.24	23
10	16QAM	1	25	22.03	22.19	22.25	
10	16QAM	1	49	22.22	22.26	22.08	
10	16QAM	25	0	22.21	22.28	22.26	23
10	16QAM	25	12	21.93	22.35	22.18	
10	16QAM	25	25	22.20	22.25	22.20	
10	16QAM	50	0	22.32	22.16	22.20	
Channel				19975	20175	20375	Tune-up limit (dBm)
Frequency (MHz)				1712.5	1732.5	1752.5	
5	QPSK	1	0	23.17	23.02	23.00	24
5	QPSK	1	12	23.16	23.04	22.98	
5	QPSK	1	24	23.01	22.86	23.02	
5	QPSK	12	0	22.28	22.16	22.26	23
5	QPSK	12	7	22.34	22.21	22.17	
5	QPSK	12	13	22.26	22.14	22.23	
5	QPSK	25	0	22.28	22.22	22.25	
5	16QAM	1	0	22.04	22.26	22.16	23
5	16QAM	1	12	22.12	22.18	22.24	
5	16QAM	1	24	22.24	22.17	22.24	
5	16QAM	12	0	22.26	22.13	22.26	23
5	16QAM	12	7	22.24	22.26	22.33	
5	16QAM	12	13	22.16	22.17	22.15	
5	16QAM	25	0	22.23	22.06	22.25	
Channel				19965	20175	20385	Tune-up limit (dBm)
Frequency (MHz)				1711.5	1732.5	1753.5	
3	QPSK	1	0	22.99	23.10	23.12	24
3	QPSK	1	8	23.07	23.00	23.03	

3	QPSK	1	14	22.71	23.06	23.00	
3	QPSK	8	0	22.12	22.04	22.03	23
3	QPSK	8	4	22.03	22.03	22.08	
3	QPSK	8	7	22.22	22.25	22.12	
3	QPSK	15	0	22.15	22.16	22.10	
3	16QAM	1	0	22.13	22.02	22.13	23
3	16QAM	1	8	22.03	22.15	22.26	
3	16QAM	1	14	22.12	22.12	22.23	
3	16QAM	8	0	21.95	22.21	21.99	23
3	16QAM	8	4	21.99	21.91	21.95	
3	16QAM	8	7	21.92	22.15	21.96	
3	16QAM	15	0	21.98	22.03	22.26	
Channel				19957	20175	20393	Tune-up limit (dBm)
Frequency (MHz)				1710.7	1732.5	1754.3	
1.4	QPSK	1	0	23.12	23.07	22.95	24
1.4	QPSK	1	3	23.07	23.10	22.95	
1.4	QPSK	1	5	23.10	22.98	23.02	
1.4	QPSK	3	0	22.94	23.11	23.09	
1.4	QPSK	3	1	22.74	23.07	23.00	
1.4	QPSK	3	3	23.07	22.81	23.07	
1.4	QPSK	6	0	22.23	22.12	22.21	23
1.4	16QAM	1	0	22.26	22.06	21.92	23
1.4	16QAM	1	3	22.03	22.22	22.03	
1.4	16QAM	1	5	22.05	22.05	22.04	
1.4	16QAM	3	0	22.09	22.03	22.10	
1.4	16QAM	3	1	21.92	22.23	22.02	
1.4	16QAM	3	3	22.26	22.13	22.16	
1.4	16QAM	6	0	22.11	22.11	22.15	23

<FDD-LTE Band 5>

BW [MHz]	Modulation	RB Size	RB Offset	Low Channel	Middle Channel	High Channel	Tune-up limit (dBm)
Channel				20450	20525	20600	
Frequency (MHz)				829	836.5	844	
10	QPSK	1	0	23.05	23.18	23.08	24
10	QPSK	1	25	23.03	23.13	23.14	
10	QPSK	1	49	22.99	23.11	23.09	
10	QPSK	25	0	22.42	22.56	22.49	23
10	QPSK	25	12	22.49	22.42	22.49	
10	QPSK	25	25	22.41	22.49	22.41	
10	QPSK	50	0	22.53	22.40	22.24	
10	16QAM	1	0	22.32	22.36	22.01	23
10	16QAM	1	25	22.49	22.42	22.07	
10	16QAM	1	49	22.29	22.02	22.17	

10	16QAM	25	0	21.92	22.14	22.06	23
10	16QAM	25	12	22.24	22.11	22.03	
10	16QAM	25	25	22.06	22.13	22.12	
10	16QAM	50	0	22.24	22.12	22.06	
Channel				20425	20525	20625	Tune-up limit (dBm)
Frequency (MHz)				826.5	836.5	846.5	
5	QPSK	1	0	22.98	23.09	23.11	24
5	QPSK	1	12	22.89	22.93	23.06	
5	QPSK	1	24	22.98	23.01	22.99	
5	QPSK	12	0	22.25	22.55	22.21	23
5	QPSK	12	7	22.51	22.58	22.16	
5	QPSK	12	13	22.45	22.49	22.23	
5	QPSK	25	0	22.31	22.60	22.23	
5	16QAM	1	0	22.03	22.24	22.07	23
5	16QAM	1	12	22.12	22.10	22.56	
5	16QAM	1	24	22.06	22.11	22.36	
5	16QAM	12	0	22.25	22.13	22.13	23
5	16QAM	12	7	22.12	22.15	22.14	
5	16QAM	12	13	22.22	22.02	22.18	
5	16QAM	25	0	22.34	22.24	22.21	
Channel				20415	20525	20635	Tune-up limit (dBm)
Frequency (MHz)				825.5	836.5	847.5	
3	QPSK	1	0	22.69	23.03	22.83	24
3	QPSK	1	8	22.69	22.98	22.91	
3	QPSK	1	14	22.69	23.11	22.89	
3	QPSK	8	0	22.42	22.32	22.53	23
3	QPSK	8	4	22.49	22.35	22.43	
3	QPSK	8	7	22.37	22.41	22.32	
3	QPSK	15	0	22.43	22.45	22.24	
3	16QAM	1	0	22.12	22.00	22.33	23
3	16QAM	1	8	22.12	22.24	22.23	
3	16QAM	1	14	22.10	22.12	22.31	
3	16QAM	8	0	22.24	22.09	22.11	23
3	16QAM	8	4	22.03	22.14	22.32	
3	16QAM	8	7	22.13	22.25	22.21	
3	16QAM	15	0	22.12	22.19	22.14	
Channel				20407	20525	20643	Tune-up limit (dBm)
Frequency (MHz)				824.7	836.5	848.3	
1.4	QPSK	1	0	23.12	23.00	23.21	24
1.4	QPSK	1	3	23.31	23.06	23.21	
1.4	QPSK	1	5	23.20	22.90	22.98	
1.4	QPSK	3	0	23.19	23.06	23.08	
1.4	QPSK	3	1	23.04	23.14	23.15	
1.4	QPSK	3	3	23.13	23.06	23.15	

1.4	QPSK	6	0	22.29	22.07	22.24	23
1.4	16QAM	1	0	22.11	22.07	22.12	23
1.4	16QAM	1	3	22.18	22.15	22.17	
1.4	16QAM	1	5	22.16	22.17	22.17	
1.4	16QAM	3	0	22.22	22.21	22.20	
1.4	16QAM	3	1	22.12	22.14	22.17	
1.4	16QAM	3	3	22.37	22.15	22.24	
1.4	16QAM	6	0	22.15	22.29	22.24	23

<FDD-LTE Band 12>

BW [MHz]	Modulation	RB Size	RB Offset	Low Channel	Middle Channel	High Channel	Tune-up limit (dBm)
Channel				23060	23095	23130	
Frequency (MHz)				704	707.5	711	
10	QPSK	1	0	23.09	23.23	22.99	24
10	QPSK	1	25	22.99	23.14	23.08	
10	QPSK	1	49	22.96	23.14	23.01	
10	QPSK	25	0	22.15	22.20	22.08	23
10	QPSK	25	12	22.13	22.00	22.18	
10	QPSK	25	25	22.17	22.08	22.15	
10	QPSK	50	0	22.04	22.08	22.00	
10	16QAM	1	0	22.32	22.13	22.35	23
10	16QAM	1	25	22.35	22.50	22.36	
10	16QAM	1	49	22.54	22.43	22.38	
10	16QAM	25	0	21.45	21.33	21.41	22
10	16QAM	25	12	21.30	21.46	21.50	
10	16QAM	25	25	21.54	21.49	21.36	
10	16QAM	50	0	21.58	21.39	21.34	
Channel				23035	23095	23155	Tune-up limit (dBm)
Frequency (MHz)				701.5	707.5	713.5	
5	QPSK	1	0	22.99	22.92	22.94	24
5	QPSK	1	12	22.81	23.13	23.10	
5	QPSK	1	24	22.82	22.99	23.02	
5	QPSK	12	0	21.82	21.87	22.11	23
5	QPSK	12	7	21.81	22.02	22.14	
5	QPSK	12	13	22.00	22.10	22.26	
5	QPSK	25	0	22.11	21.92	22.21	
5	16QAM	1	0	22.22	22.29	22.31	23
5	16QAM	1	12	22.28	22.52	22.29	
5	16QAM	1	24	22.24	22.30	22.53	
5	16QAM	12	0	21.20	21.22	21.17	22
5	16QAM	12	7	21.17	21.46	21.26	
5	16QAM	12	13	21.25	21.33	21.26	
5	16QAM	25	0	21.23	21.36	21.25	

Channel				23025	23095	23165	Tune-up limit (dBm)
Frequency (MHz)				700.5	707.5	714.5	
3	QPSK	1	0	22.70	22.98	23.11	24
3	QPSK	1	8	22.72	23.01	23.11	
3	QPSK	1	14	22.84	22.99	23.15	
3	QPSK	8	0	22.12	21.99	22.25	23
3	QPSK	8	4	22.30	22.10	22.32	
3	QPSK	8	7	22.31	22.04	22.23	
3	QPSK	15	0	22.34	21.91	22.26	
3	16QAM	1	0	22.19	22.50	22.33	23
3	16QAM	1	8	22.29	22.45	22.31	
3	16QAM	1	14	22.22	22.48	22.33	
3	16QAM	8	0	21.32	21.01	21.19	22
3	16QAM	8	4	21.11	21.06	21.17	
3	16QAM	8	7	21.09	21.20	21.35	
3	16QAM	15	0	21.12	21.03	21.32	
Channel				23017	23095	23173	Tune-up limit (dBm)
Frequency (MHz)				699.7	707.5	715.3	
1.4	QPSK	1	0	22.74	22.89	23.18	24
1.4	QPSK	1	3	22.68	22.95	23.01	
1.4	QPSK	1	5	22.72	22.99	23.09	
1.4	QPSK	3	0	22.83	23.03	23.01	
1.4	QPSK	3	1	22.75	23.06	22.88	
1.4	QPSK	3	3	22.90	23.07	22.99	
1.4	QPSK	6	0	22.32	22.11	22.28	23
1.4	16QAM	1	0	22.22	22.40	22.34	23
1.4	16QAM	1	3	22.13	22.20	22.20	
1.4	16QAM	1	5	22.19	22.11	22.30	
1.4	16QAM	3	0	22.29	22.02	22.03	
1.4	16QAM	3	1	22.23	22.14	22.18	
1.4	16QAM	3	3	22.17	21.98	22.25	
1.4	16QAM	6	0	21.13	21.15	21.46	22

<FDD-LTE Band 13>

BW [MHz]	Modulation	RB Size	RB Offset	Low Channel	Middle Channel	High Channel	Tune-up limit (dBm)
Channel					23230		
Frequency (MHz)					782		
10	QPSK	1	0	-	22.72	-	24
10	QPSK	1	25	-	22.68	-	
10	QPSK	1	49	-	22.71	-	
10	QPSK	25	0	-	21.95	-	23
10	QPSK	25	12	-	21.77	-	
10	QPSK	25	25	-	21.75	-	
10	QPSK	50	0	-	21.75	-	
10	16QAM	1	0	-	21.46	-	23
10	16QAM	1	25	-	21.68	-	
10	16QAM	1	49	-	21.49	-	
10	16QAM	25	0	-	21.69	-	23
10	16QAM	25	12	-	21.61	-	
10	16QAM	25	25	-	21.52	-	
10	16QAM	50	0	-	21.40	-	
Channel				23205	23230	23255	Tune-up limit (dBm)
Frequency (MHz)				779.5	782	784.5	
5	QPSK	1	0	22.51	22.70	22.37	24
5	QPSK	1	12	22.63	22.65	22.34	
5	QPSK	1	24	22.34	22.47	22.54	
5	QPSK	12	0	21.17	21.23	21.30	23
5	QPSK	12	7	21.27	21.31	21.39	
5	QPSK	12	13	21.37	21.26	21.24	
5	QPSK	25	0	21.56	21.59	21.46	
5	16QAM	1	0	21.40	21.38	21.15	23
5	16QAM	1	12	21.25	21.17	21.25	
5	16QAM	1	24	21.48	21.17	21.49	
5	16QAM	12	0	21.27	21.37	21.49	23
5	16QAM	12	7	21.24	21.29	21.48	
5	16QAM	12	13	21.33	21.20	21.59	
5	16QAM	25	0	21.32	21.22	21.24	

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BW [MHz]	Modulation	RB Size	RB Offset	Low Channel	Middle Channel	High Channel	Tune-up limit (dBm)
Channel				132072	132322	132572	
Frequency (MHz)				1720	1745	1770	
20	QPSK	1	0	23.40	23.64	23.51	24
20	QPSK	1	49	23.34	23.57	23.32	
20	QPSK	1	99	23.24	23.16	23.22	
20	QPSK	50	0	22.36	22.79	22.50	23
20	QPSK	50	24	22.48	22.68	22.63	
20	QPSK	50	50	22.50	22.62	22.79	
20	QPSK	100	0	22.55	22.62	22.19	
20	16QAM	1	0	22.42	22.37	22.35	23
20	16QAM	1	49	22.52	22.35	22.31	
20	16QAM	1	99	22.38	22.37	22.39	
20	16QAM	50	0	21.35	21.56	21.28	22
20	16QAM	50	24	21.45	21.67	21.25	
20	16QAM	50	50	21.50	21.70	21.32	
20	16QAM	100	0	21.49	21.64	21.22	
Channel				132047	132322	132597	Tune-up limit (dBm)
Frequency (MHz)				1717.5	1745	1772.5	
15	QPSK	1	0	23.11	23.39	23.08	24
15	QPSK	1	37	23.37	23.37	23.04	
15	QPSK	1	74	23.38	23.20	23.34	
15	QPSK	36	0	22.37	22.59	22.24	23
15	QPSK	36	20	22.38	22.65	22.19	
15	QPSK	36	39	22.40	22.64	22.29	
15	QPSK	75	0	22.43	22.56	22.08	
15	16QAM	1	0	22.25	22.50	22.30	23
15	16QAM	1	37	22.49	22.75	22.25	
15	16QAM	1	74	22.51	22.32	22.35	
15	16QAM	36	0	21.31	21.53	21.54	22
15	16QAM	36	20	21.33	21.61	21.55	
15	16QAM	36	39	21.36	21.49	21.50	
15	16QAM	75	0	21.40	21.56	21.44	
Channel				132022	132322	132622	Tune-up limit (dBm)
Frequency (MHz)				1715	1745	1775	
10	QPSK	1	0	23.39	23.48	23.52	24
10	QPSK	1	25	23.44	23.60	23.39	
10	QPSK	1	49	23.22	23.35	23.37	
10	QPSK	25	0	22.35	22.65	22.52	23
10	QPSK	25	12	22.39	22.66	22.39	
10	QPSK	25	25	22.40	22.70	22.54	
10	QPSK	50	0	22.39	22.70	22.39	

10	16QAM	1	0	22.32	22.69	22.35	23
10	16QAM	1	25	22.49	22.44	22.35	
10	16QAM	1	49	22.38	22.35	22.39	
10	16QAM	25	0	21.38	21.68	21.55	22
10	16QAM	25	12	21.45	21.35	21.66	
10	16QAM	25	25	21.67	21.22	21.25	
10	16QAM	50	0	21.44	21.71	21.51	
Channel				131997	132322	132647	Tune-up limit (dBm)
Frequency (MHz)				1712.5	1745	1777.5	
5	QPSK	1	0	23.31	23.32	23.30	24
5	QPSK	1	12	23.18	23.56	23.24	
5	QPSK	1	24	23.23	23.34	23.29	
5	QPSK	12	0	22.37	22.62	22.63	23
5	QPSK	12	7	22.31	22.59	22.62	
5	QPSK	12	13	22.33	22.61	22.55	
5	QPSK	25	0	22.22	22.62	22.62	
5	16QAM	1	0	22.17	22.59	22.42	23
5	16QAM	1	12	22.29	22.12	22.39	
5	16QAM	1	24	22.31	22.52	22.40	
5	16QAM	12	0	21.52	21.64	21.70	22
5	16QAM	12	7	21.59	21.66	21.49	
5	16QAM	12	13	21.53	21.66	21.22	
5	16QAM	25	0	21.35	21.63	21.14	
Channel				131987	132322	132657	Tune-up limit (dBm)
Frequency (MHz)				1711.5	1745	1778.5	
3	QPSK	1	0	23.31	23.35	23.32	24
3	QPSK	1	8	23.28	23.43	23.42	
3	QPSK	1	14	23.19	23.19	23.19	
3	QPSK	8	0	22.58	22.56	22.52	23
3	QPSK	8	4	22.57	22.54	22.56	
3	QPSK	8	7	22.52	22.55	22.45	
3	QPSK	15	0	22.47	22.49	22.38	
3	16QAM	1	0	22.52	22.49	22.53	23
3	16QAM	1	8	22.62	22.63	22.62	
3	16QAM	1	14	22.41	22.47	22.46	
3	16QAM	8	0	21.77	21.55	21.62	22
3	16QAM	8	4	21.55	21.62	21.55	
3	16QAM	8	7	21.62	21.55	21.54	
3	16QAM	15	0	21.55	21.64	21.56	
Channel				131979	132322	132665	Tune-up limit (dBm)
Frequency (MHz)				1710.7	1745	1779.3	
1.4	QPSK	1	0	23.32	23.36	23.33	24
1.4	QPSK	1	3	23.48	23.44	23.43	
1.4	QPSK	1	5	23.20	23.20	23.20	

1.4	QPSK	3	0	22.59	22.57	22.53	
1.4	QPSK	3	1	22.58	22.55	22.57	
1.4	QPSK	3	3	22.53	22.56	22.46	
1.4	QPSK	6	0	22.48	22.50	22.39	23
1.4	16QAM	1	0	22.53	22.50	22.54	23
1.4	16QAM	1	3	22.63	22.64	22.63	
1.4	16QAM	1	5	22.42	22.48	22.47	
1.4	16QAM	3	0	22.49	22.27	22.34	
1.4	16QAM	3	1	22.27	22.34	22.27	
1.4	16QAM	3	3	22.34	22.27	22.26	
1.4	16QAM	6	0	21.27	21.36	21.28	22

<FDD-LTE Band 71>

BW [MHz]	Modulation	RB Size	RB Offset	Low Channel	Middle Channel	High Channel	Tune-up limit (dBm)
Channel				133222	133322	133372	
Frequency (MHz)				673	683	688	
20	QPSK	1	0	23.24	23.42	23.13	24
20	QPSK	1	49	23.36	23.38	23.34	
20	QPSK	1	99	23.21	23.32	23.19	
20	QPSK	50	0	22.60	22.73	22.63	23
20	QPSK	50	24	22.53	22.59	22.63	
20	QPSK	50	50	22.66	22.61	22.51	
20	QPSK	100	0	22.46	22.49	22.38	
20	16QAM	1	0	22.70	22.64	22.67	23
20	16QAM	1	49	23.04	22.67	22.77	
20	16QAM	1	99	22.67	22.64	22.66	
20	16QAM	50	0	21.49	21.49	21.56	22
20	16QAM	50	24	21.53	21.51	21.48	
20	16QAM	50	50	21.45	21.41	21.32	
20	16QAM	100	0	21.49	21.47	21.40	
Channel				133197	133297	133397	Tune-up limit (dBm)
Frequency (MHz)				670.8	680.5	690.5	
15	QPSK	1	0	23.25	23.12	23.12	24
15	QPSK	1	37	23.17	23.29	23.26	
15	QPSK	1	74	23.18	23.16	23.12	
15	QPSK	36	0	22.22	22.29	22.26	23
15	QPSK	36	20	22.20	22.17	22.12	
15	QPSK	36	39	22.26	22.13	22.00	
15	QPSK	75	0	22.21	22.17	22.16	
15	16QAM	1	0	22.33	22.45	22.27	23
15	16QAM	1	37	22.63	22.58	22.47	
15	16QAM	1	74	22.37	22.37	22.44	
15	16QAM	36	0	21.24	21.39	21.20	22

15	16QAM	36	20	21.33	21.22	21.22	
15	16QAM	36	39	21.24	21.14	21.04	
15	16QAM	75	0	21.28	21.15	21.22	
Channel				133172	133272	133422	Tune-up limit (dBm)
Frequency (MHz)				668	678	693	
10	QPSK	1	0	23.27	23.27	23.29	24
10	QPSK	1	25	23.32	23.26	23.21	
10	QPSK	1	49	23.21	23.03	23.11	
10	QPSK	25	0	22.32	22.21	22.27	23
10	QPSK	25	12	22.40	22.30	22.25	
10	QPSK	25	25	22.31	22.23	22.19	
10	QPSK	50	0	22.40	22.30	22.08	
10	16QAM	1	0	22.32	22.38	22.34	23
10	16QAM	1	25	22.77	22.75	22.38	
10	16QAM	1	49	22.71	22.37	22.35	
10	16QAM	25	0	21.34	21.21	21.29	22
10	16QAM	25	12	21.37	21.34	21.17	
10	16QAM	25	25	21.38	21.26	21.25	
10	16QAM	50	0	21.36	21.32	21.18	
Channel				133147	133247	133447	Tune-up limit (dBm)
Frequency (MHz)				665.5	675.5	695.5	
5	QPSK	1	0	23.18	23.08	23.08	24
5	QPSK	1	12	23.26	23.29	23.24	
5	QPSK	1	24	23.18	23.10	23.02	
5	QPSK	12	0	22.24	22.25	22.22	23
5	QPSK	12	7	22.36	22.29	22.23	
5	QPSK	12	13	22.26	22.19	22.22	
5	QPSK	25	0	22.32	22.28	22.27	
5	16QAM	1	0	22.38	22.18	22.52	23
5	16QAM	1	12	22.42	22.53	22.44	
5	16QAM	1	24	22.34	22.09	22.49	
5	16QAM	12	0	21.31	21.23	21.25	22
5	16QAM	12	7	21.30	21.37	21.22	
5	16QAM	12	13	21.28	21.19	21.17	
5	16QAM	25	0	21.29	21.26	21.15	

➢ **WLAN 2.4GHz Conducted Power**

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Power Setting	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	CH 1	2412	17.07	17.5	15	97.62
		CH 6	2437	15.58	16.0	15	
		CH 11	2462	17.49	18.0	15	
	802.11g 6Mbps	CH 1	2412	14.64	15.0	13	87.22
		CH 6	2437	13.43	14.0	13	
		CH 11	2462	14.95	15.5	13	
	802.11n-HT20 MCS0	CH 1	2412	13.72	14.5	12	86.44
		CH 6	2437	12.81	13.5	12	
		CH 11	2462	14.01	14.5	12	

Note:

1. Per KDB 248227 D01v02r02, selected the highest output power channel to test SAR and determine further SAR exclusion.
2. Per KDB 248227 D01v02r02, In the 2.4 GHz band, separate SAR procedures are applied to DSSS and OFDM configurations to simplify DSSS test requirements.SAR is not required for the following 2.4 GHz OFDM conditions:
   1）When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.
   2）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.
3. The output power of all data rate were pre-scan, just the worst case (the lowest data rate) of all mode were shown in report.
4. Per KDB 248227 D01V02r02 section 2.2, when the EUT in continuously transmitting mode, the actual duty cycle is 97.62%, so the duty cycle factor is 1.024.
5. Per KDB248227 D01v02r02, 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 required for operations in the U.S. 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. Unless it is permitted by specific KDB procedures or continuous transmission is specifically restricted by the device, the reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit. When a device is not capable of sustaining continuous transmission or the output can become nonlinear, and it

is limited by hardware design and unable to transmit at higher than 85% duty factor, a periodic duty factor within 15% of the maximum duty factor the device is capable of transmitting should be used. The reported SAR must be scaled to the maximum transmission duty factor to determine compliance. Descriptions of the procedures applied to establish the specific duty factor used for SAR testing are required in SAR reports to support the test results.

- **Bluetooth Conducted Power**

Mode	Channel	Frequency (MHz)	Average power (dBm)		
			1Mbps	2Mbps	3Mbps
BR / EDR	CH 00	2402	-3.62	-3.34	-3.24
	CH 39	2441	-3.49	-3.18	-3.05
	CH 78	2480	-2.42	-2.33	-2.09
Tune-up Limit (dBm)			-2.0	-2.0	-1.5
Duty Cycle %			76.8	76.8	77.2

Mode	Channel	Frequency (MHz)	Average power (dBm)
			GFSK
LE	CH 00	2402	-3.17
	CH 19	2440	-2.76
	CH 39	2480	-2.02
Tune-up Limit (dBm)			-1.5
Duty Cycle %			62.5

- **Bluetooth Exclusion SAR Evaluation**

When standalone SAR is not required to be measured, per FCC KDB 447498 D01v06 4.3.2), the following equation must be used to estimate the standalone 1g/10g SAR.

$$\text{Estimated SAR} = \frac{\sqrt{f(GHz)}}{3.0} \cdot \frac{\text{Max. power of channel, mW}}{\text{Min. Separation Distance, mm}}$$

$$\text{Estimated SAR} = \frac{\sqrt{f(GHz)}}{7.5} \cdot \frac{\text{Max. power of channel, mW}}{\text{Min. Separation Distance, mm}}$$

Channel	Frequency (GHz)	Max. Tune-up Power (dBm)	Max. Power(mW)	Min. Distance (mm)	Result	Exclusion Thresholds for 1g/10g SAR
CH 78	2.48	-1.5	0.71	5	0.11	3.0/7.5

Mode	Max. Tune-up Power (dBm)	Exposure Position	Next to mouth
		Test Distance (mm)	10
Bluetooth	-1.5	Estimated SAR (W/kg)	0.037

Mode	Max. Tune-up Power (dBm)	Exposure Position	Wrist-worn
		Test Distance (mm)	0
Bluetooth	-1.5	Estimated SAR (W/kg)	0.03

Note:

According to 2016 Oct. TCB workshop for Bluetooth SAR consideration and the theoretical duty cycle is 83.3%, therefore the actual duty cycle will be scaled up to the theoretical value of Bluetooth reported SAR calculation.

12. Exposure Positions Consideration

➢ **EUT Antenna Locations**

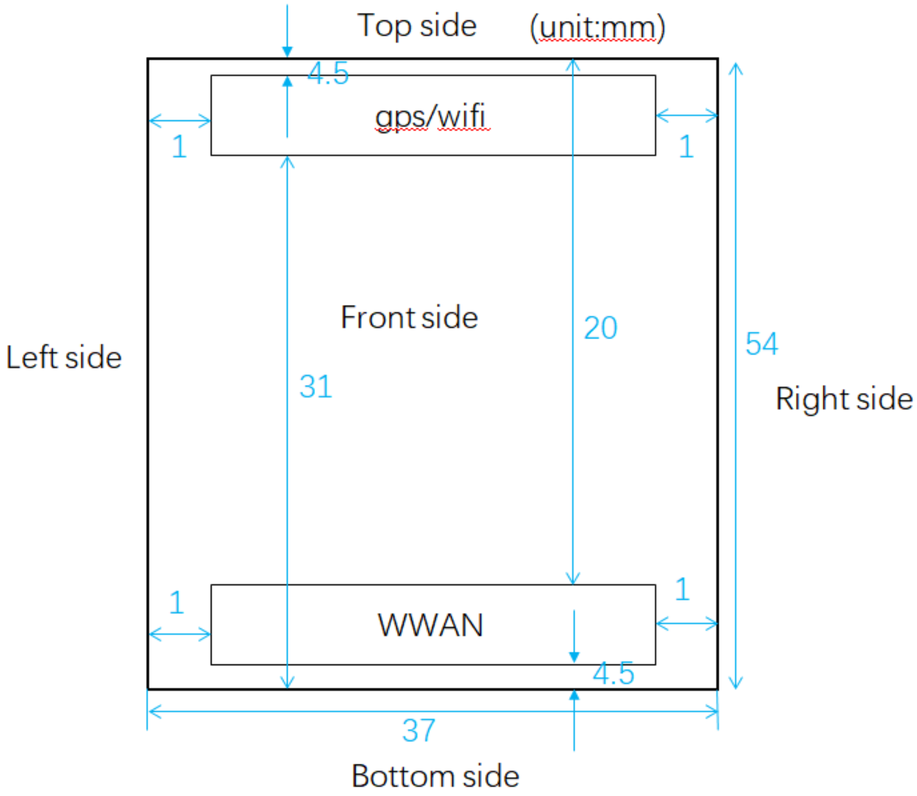

Fig.12.1 EUT Antenna Locations

Note:

1. Next to mouth/Wrist-worn mode SAR assessments are required.
2. Per KDB 447498 D01v06, When SAR evaluation is required, next to the mouth use is evaluated with the front of the device positioned at 10 mm from a flat phantom and the wrist exposure is evaluated with the back of the devices positioned in direct contact against a flat phantom fill with head tissue-equivalent medium.

13. SAR Test Results Summary

➢ **General Note**

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   1） 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.
   2） 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)".
   3） For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor.
   4） For WLAN/Bluetooth: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor.
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:
   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
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
4. Per KDB 447498 D01v06, for each exposure position, if the highest output power channel Reported SAR ≤0.8W/kg, other channels SAR testing is not necessary.
5. Per KDB 447498 D01v06, next to the mouth use is evaluated with the front of the device positioned at 10mm from a flat phantom filled with head tissue-equivalent medium.
6. Per KDB 447498 D01v06, the wrist-worn exposure is evaluated with the back of the device positioned at 0mm from a flat phantom filled with head tissue-equivalent medium, and the condition requires 10-g extremity SAR.
7. Per KDB 447498 D01v06, for each exposure position, if the highest output channel Reported SAR ≤0.8W/kg for next to mouth, other channels SAR testing is not necessary.
8. Per KDB 447498 D01v06, for each exposure position, if the highest output channel Reported SAR ≤2.0W/kg for wrist-worn, other channels SAR testing is not necessary.

➢ **Next to Mouth SAR Data**

Plot No.	Band/Mode	Test Position	CH.	Ave. Power (dBm)	Tune-Up Limit (dBm)	Tune-Up Scaling Factor	Meas. SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
1#	WCDMA II/ RMC 12.2Kbps	Front Side	9400	23.32	24.00	1.169	0.352	0.412
2#	WCDMA IV/ RMC 12.2Kbps	Front Side	1413	23.12	24.00	1.225	0.242	0.296
3#	WCDMA V/ RMC 12.2Kbps	Front Side	4182	23.21	24.00	1.199	0.011	0.013
4#	LTE Band 2/QPSK/1RB#0 20M	Front Side	18900	23.18	24.00	1.208	0.240	0.290
	LTE Band 2/QPSK/50RB#0 20M	Front Side	18900	22.52	23.00	1.117	0.219	0.245
5#	LTE Band 4/QPSK/1RB#0 20M	Front Side	20175	23.54	24.00	1.112	0.179	0.199
	LTE Band 4/QPSK/1RB#0 20M	Front Side	20175	22.25	23.00	1.189	0.157	0.187
6#	LTE Band 5/QPSK/1RB#0 10M	Front Side	20525	23.18	24.00	1.208	0.008	0.010
	LTE Band 5/QPSK/50RB#0 10M	Front Side	20525	22.56	23.00	1.107	0.007	0.008
7#	LTE Band 12/QPSK/1RB#0 10M	Front Side	23095	23.23	24.00	1.194	0.003	0.003
	LTE Band 12/QPSK/50RB#0 10M	Front Side	23095	22.20	23.00	1.202	0.002	0.003
8#	LTE Band 13/QPSK/1RB#0 10M	Front Side	23230	22.72	24.00	1.343	0.003	0.004
	LTE Band 13/QPSK/50RB#0 10M	Front Side	23230	21.95	23.00	1.274	0.003	0.003
9#	LTE Band 66/QPSK/1RB#0 10M	Front Side	132322	23.64	24.00	1.086	0.269	0.292
	LTE Band 66/QPSK/50RB#0 10M	Front Side	132322	22.79	23.00	1.050	0.226	0.237
10#	LTE Band 71/QPSK/1RB#0 20M	Front Side	133322	23.42	24.00	1.143	0.003	0.004
	LTE Band 71/QPSK/1RB#0 20M	Front Side	133322	22.73	23.00	1.064	0.002	0.002
11#	WLAN 2.4GHz/802.11b	Front Side	11	17.49	18.00	1.125	0.141	0.162
	Bluetooth/LE	Front Side	39	-2.02	-1.50	1.127	0.037	0.056

Note:

1. Per KDB248227 D01v02r02, OFDM 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 the adjusted SAR is≤1.2 W/kg. Cuz the maximum output power specified for OFDM and DSSS are 63mW(18.0dBm) and 32mW(15.0dBm), the scaled SAR would be 0.412× (63/32)=0.811W/Kg<1.2 W/kg, therefore SAR measurement is not required for OFDM.
2. The duty cycle factor of 1.333 of Bluetooth should be applied to the scaled SAR calculation.

➢ Wrist-worn SAR Data

Plot No.	Band/Mode	Test Position	CH.	Ave. Power (dBm)	Tune-Up Limit (dBm)	Tune-Up Scaling Factor	Meas. SAR_{10g} (W/kg)	Reported SAR_{10g} (W/kg)
12#	WCDMA II/ RMC 12.2Kbps	Back Side	9400	23.32	24.00	1.169	0.831	0.972
13#	WCDMA IV/ RMC 12.2Kbps	Back Side	1413	23.12	24.00	1.225	0.649	0.795
14#	WCDMA V/ RMC 12.2Kbps	Back Side	4182	23.21	24.00	1.199	0.037	0.044
15#	LTE Band 2/QPSK/1RB#0 20M	Back Side	18900	23.18	24.00	1.208	0.631	0.762
	LTE Band 2/QPSK/50RB#0 20M	Back Side	18900	22.52	23.00	1.117	0.563	0.629
16#	LTE Band 4/QPSK/1RB#0 20M	Back Side	20175	23.54	24.00	1.112	0.513	0.570
	LTE Band 4/QPSK/50RB#0 20M	Back Side	20175	22.25	23.00	1.189	0.457	0.543
17#	LTE Band 5/QPSK/1RB#0 10M	Back Side	20525	23.18	24.00	1.208	0.029	0.034
	LTE Band 5/QPSK/50RB#0 10M	Back Side	20525	22.56	23.00	1.107	0.022	0.025
18#	LTE Band 12/QPSK/1RB#0 10M	Back Side	23095	23.23	24.00	1.194	0.005	0.006
	LTE Band 12/QPSK/50RB#0 10M	Back Side	23095	22.20	23.00	1.202	0.004	0.002
19#	LTE Band 13/QPSK/1RB#0 10M	Back Side	23230	22.72	24.00	1.343	0.006	0.008
	LTE Band 13/QPSK/50RB#0 10M	Back Side	23230	21.95	23.00	1.274	0.006	0.007
20#	LTE Band 66/QPSK/1RB#0 10M	Back Side	132322	23.64	24.00	1.086	0.682	0.741
	LTE Band 66/QPSK/50RB#0 10M	Back Side	132322	22.79	23.00	1.050	0.563	0.591
21#	LTE Band 71/QPSK/1RB#0 20M	Back Side	133322	23.42	24.00	1.143	0.006	0.007
	LTE Band 71/QPSK/1RB#0 20M	Back Side	133322	22.73	23.00	1.064	0.002	0.002
22#	WLAN 2.4GHz/802.11b	Back Side	11	17.49	18.00	1.125	0.210	0.242
	Bluetooth/LE	Back Side	39	-2.02	-1.50	1.127	0.030	0.045

14. SAR Simultaneous Transmission Analysis

➢ **Simultaneous Transmission Consideration**

No.	Simultaneous Transmission Consideration	Next to Mouth	Wrist-Worn
1	WWAN(3G/4G)+WLAN 2.4GHz	Yes	Yes
2	WWAN(3G/4G)+Bluetooth	Yes	Yes

Note:

1. Simultaneous Transmission SAR evaluation is not required for BT and Wi-Fi, because the software mechanism have been incorporated to guarantee that the WLAN and Bluetooth transmitters would not simultaneously operate.
2. Per KDB 447498D01v06, simultaneous transmission SAR evaluation procedures is as followed:

   Step 1: If sum of 1 g SAR < 1.6 W/kg, Simultaneous SAR measurement is not required.

   Step 2: If sum of 1 g SAR > 1.6 W/kg, ratio of SAR to peak separation distance for pair of transmitters calculated.

   Step 3: If the ratio of SAR to peak separation distance is ≤ 0.04, Simultaneous SAR measurement is not required.

   Step 4: If the ratio of SAR to peak separation distance is > 0.04, Simultaneous SAR measurement is required and simultaneous transmission SAR value is calculated.

   (The ratio is determined by: (SAR1 + SAR2) ^ 1.5/Ri ≤ 0.04,

   Ri is the separation distance between the peak SAR locations for the antenna pair in mm.

➢ **Simultaneous Transmission for WWAN+WLAN 2.4GHz**

WWAN Band	Exposure Position	1	2	3	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)
		WWAN	2.4GHz WLAN	Bluetooth		
		1g SAR (W/kg)	1g SAR (W/kg)	Estimated 1g SAR (W/kg)		
WCDMA II	Front Side	0.412	0.162	0.056	0.574	0.468
WCDMA IV	Front Side	0.296	0.162	0.056	0.458	0.352
WCDMA V	Front Side	0.013	0.162	0.056	0.175	0.069
LTE Band 2	Front Side	0.290	0.162	0.056	0.452	0.346
LTE Band 4	Front Side	0.199	0.162	0.056	0.361	0.255
LTE Band 5	Front Side	0.010	0.162	0.056	0.172	0.066
LTE Band 12	Front Side	0.003	0.162	0.056	0.165	0.059
LTE Band 13	Front Side	0.004	0.162	0.056	0.166	0.060
LTE Band 66	Front Side	0.292	0.162	0.056	0.454	0.348
LTE Band 71	Front Side	0.004	0.162	0.056	0.166	0.060

WWAN Band	Exposure Position	1	2	6	1+2 Summed 1g SAR (W/kg)	1+6 Summed 1g SAR (W/kg)
		WWAN	2.4GHz WLAN	Bluetooth		
		1g SAR (W/kg)	1g SAR (W/kg)	Estimated 1g SAR (W/kg)		
WCDMA II	Back Side	0.972	0.242	0.045	1.214	1.017
WCDMA IV	Back Side	0.795	0.242	0.045	1.037	0.840
WCDMA V	Back Side	0.044	0.242	0.045	0.286	0.089
LTE Band 2	Back Side	0.762	0.242	0.045	1.004	0.807
LTE Band 4	Back Side	0.570	0.242	0.045	0.812	0.615
LTE Band 5	Back Side	0.034	0.242	0.045	0.276	0.079
LTE Band 12	Back Side	0.006	0.242	0.045	0.248	0.051
LTE Band 13	Back Side	0.008	0.242	0.045	0.250	0.053
LTE Band 66	Back Side	0.741	0.242	0.045	0.983	0.786
LTE Band 71	Back Side	0.007	0.242	0.045	0.249	0.052

15. Measurement Uncertainty

The component of uncertainly may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainly by the statistical analysis of a series of observations is termed a Type A evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. This includes calculating the standard deviation of the mean of a series of independent observations; using the method of least squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; or carrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A Type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience, and knowledge of the behavior and properties of relevant materials and instruments, manufacture's specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in below Table.

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor	1/k(b)	$1/\sqrt{3}$	$1/\sqrt{6}$	$1/\sqrt{2}$

Standard Uncertainty for Assumed Distribution

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual "root-sum-squares" (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95%.

Uncertainty Evaluation For Handset SAR Test

a	b	c	d	e= f(d,k)	f	g	h= c*f/e	i= c*g/e	j
Uncertainty Component	Sec.	Tol (+- %)	Prob. Dist.	Div.	Ci (1g)	Ci (10g)	1g Ui (+-%)	10g Ui (+-%)	Vi
Measurement System									
Probe calibration	E.2.1	5.83	N	1	1	1	5.83	5.83	∞
Axial Isotropy	E.2.2	3.5	R	$\sqrt{3}$	1	1	2.02	2.02	∞
Hemispherical Isotropy	E.2.2	5.9	R	$\sqrt{3}$	1	1	3.41	3.41	∞
Boundary effect	E.2.3	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Linearity	E.2.4	4.7	R	$\sqrt{3}$	1	1	2.71	2.71	∞
System detection limits	E.2.5	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Modulation Response	E.2.4	4.1	R	$\sqrt{3}$	1	1	2.4	2.4	∞
Readout Electronics	E.2.6	0.5	N	1	1	1	0.5	0.5	∞
Reponse Time	E.2.7	3.0	R	$\sqrt{3}$	1	1	3.0	3.0	∞
Integration Time	E.2.8	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
RF ambient Conditions	E.6.1	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	∞
Probe positioner Mechanical Tolerance	E.6.2	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
Probepositioning with respect to Phantom Shell	E.6.3	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
Extrapolation, interpolation and integration Algoritms for Max. SAR Evaluation	E.5.2	2.3	R	$\sqrt{3}$	1	1	1.33	1.33	∞
Test sample Related									
Test sample positioning	E.4.2.1	2.6	N	1	1	1	2.6	2.6	N-1
Device Holder Uncertainty	E.4.1.1	3.0	N	1	1	1	3.0	3.0	N-1
Output power Power drift - SAR drift measurement	6.6.2	5.0	R	$\sqrt{3}$	1	1	2.89	2.89	∞
Phantom and Tissue Parameters									
Phantom Uncertainty (Shape and thickness tolerances)	E.3.1	4.0	R	$\sqrt{3}$	1	1	2.31	2.31	∞
Liquid conductivity - deviation from target value	E.3.2	2.0	R	$\sqrt{3}$	0.64	0.43	1.69	1.13	∞
Liquid conductivity - measurement uncertainty	E.3.3	2.5	N	1	0.64	0.43	3.20	2.15	M
Liquid permittivity - deviation from target value	E.3.2	2.5	R	$\sqrt{3}$	0.6	0.49	1.28	1.04	∞

Liquid permittivity - measurement uncertainty	E.3.3	5.0	N	1	0.6	0.49	6.00	4.90	M
Liquid conductivity –temperature uncertainty	E.3.4		R	$\sqrt{3}$	0.78	0.41			∞
Liquid permittivity –temperature uncertainty	E.3.4		R	$\sqrt{3}$	0.23	0.26			∞
Combined Standard Uncertainty			RSS				11.55	12.07	
Expanded Uncertainty (95% Confidence interval)			K=2				±23.20	±24.17	

Uncertainty For System Performance Check

a	b	c	d	e= f(d,k)	f	g	h= c*f/e	i= c*g/e	k
Uncertainty Component	Sec.	Tol (+- %)	Prob. Dist.	Div.	Ci (1g)	Ci (10g)	1g Ui (+-%)	10g Ui (+-%)	Vi
Measurement System									
Probe calibration	E.2.1	4.76	N	1	1	1	4.76	4.76	∞
Axial Isotropy	E.2.2	2.5	R	$\sqrt{3}$	1	1	1.44	1.41	∞
Hemispherical Isotropy	E.2.2	4.0	R	$\sqrt{3}$	1	1	2.31	2.32	∞
Boundary effect	E.2.3	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Linearity	E.2.4	5.0	R	$\sqrt{3}$	1	1	2.89	2.89	∞
System detection limits	E.2.5	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Readout Electronics	E.2.6	0.02	N	1	1	1	0.02	0.02	∞
Reponse Time	E.2.7	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	∞
Integration Time	E.2.8	2.0	R	$\sqrt{3}$	1	1	1.15	1.15	∞
RF ambient Conditions	E.6.1	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	∞
Probe positioner Mechanical Tolerance	E.6.2	2.0	R	$\sqrt{3}$	1	1	1.15	1.15	∞
Probe positioning with respect to Phantom Shell	E.6.3	0.05	R	$\sqrt{3}$	1	1	0.03	0.03	∞
Extrapolation, interpolation and integration Algoritms for Max. SAR Evaluation	E.5.2	5.0	R	$\sqrt{3}$	1	1	2.89	2.89	∞
Dipole									
Dipole axis to liquid Distance	8,E.4.2	1.00	N	$\sqrt{3}$	1	1	0.58	0.58	∞
Input power and SAR drift measurement	8,6.6.2	4.04	R	$\sqrt{3}$	1	1	2.33	2.33	∞

Phantom and Tissue Parameters									
Phantom Uncertainty (Shape and thickness tolerances)	E.3.1	0.05	R	$\sqrt{3}$	1	1	0.03	0.03	∞
Liquid conductivity - deviation from target value	E.3.2	4.57	R	$\sqrt{3}$	0.64	0.43	1.69	1.13	∞
Liquid conductivity - measurement uncertainty	E.3.3	5.00	N	$\sqrt{3}$	0.64	0.43	1.85	1.24	M
Liquid permittivity - deviation from target value	E.3.2	3.69	R	$\sqrt{3}$	0.6	0.49	1.28	1.04	∞
Liquid permittivity - measurement uncertainty	E.3.3	10.00	N	$\sqrt{3}$	0.6	0.49	3.46	2.83	M
Combined Standard Uncertainty			RSS				8.83	8.37	
Expanded Uncertainty (95% Confidence interval)			K=2				17.66	16.73	

16. Measurement Conclusion

The SAR evaluation indicates that the EUT complies with the RF radiation exposure limits of FCC, with respect to all parameters subject to this test. These measurements were taken to simulate the RF effects of RF exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The results and statements relate only to the item(s) tested. Please note that the absorption and distribution of electromagnetic energy in the body are very complex phenomena that depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because various factors may interact with one another to vary the specific biological outcome of an exposure to electromagnetic fields, any protection guide should consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables.

Annex A General Information

1. Identification of the Responsible Testing Laboratory

Laboratory Name:	Shenzhen Morlab Communications Technology Co., Ltd.Morlab Laboratory
Laboratory Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

3. Facilities and Accreditations

The FCC designation number is CN1192, the test firm registration number is 226174.

Note:

The main report is end here and the other Annex (B,C,D,E) will be submitted separately.

****** END OF MAIN REPORT ******