



TEST REPORT

APPLICANT : Reliance Communications LLC

PRODUCT NAME : Orbic Tab8 5G

MODEL NAME : R8L5T

BRAND NAME : Orbic

FCC ID : 2ABGH-R8L5T

STANDARD(S) : FCC 47CFR Part 2(2.1093)
IEEE 1528-2013

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Change History		
Version	Date	Reason for Change
1.0	2021-10-15	First edition

1 SAR Results Summary

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

Frequency Band		Highest SAR Summary	
		Head (Separation 0mm)	Body (Separation 0mm)
		1g SAR (W/kg)	
WCDMA	Band II	0.141	1.068
	Band IV	0.137	1.086
	Band V	0.522	0.778
LTE	Band 2	0.300	1.132
	Band 5	0.591	0.887
	Band 12	1.144	0.691
	Band 13	1.116	0.581
	Band 48	0.012	1.091
	Band 66/4	0.203	1.021
5G NR	n2	0.121	1.150
	n5	0.544	1.159
	n66	0.165	1.162
	n77(EN-DC)	0.015	0.509
WLAN	2.4GHz WLAN	0.750	1.141
	5GHz WLAN	0.296	1.148
2.4GHz Band	Bluetooth	N/A	0.206

Max Scaled SAR _{1g} (W/Kg):	Head:	1.144 W/kg	Limit(W/kg): 1.6 W/kg
	Body:	1.162 W/kg	Limit(W/kg): 1.6 W/kg

Highest Simultaneous Transmission 1g SAR (W/kg)	1.576 W/kg	Limit(W/kg): 1.6 W/kg
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Note:

1. This device is compliance with Specific Absorption Rate (SAR) for general population or uncontrolled exposure limits (1.6 W/kg) 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.
2. For LTE Band 4 is full covered by LTE Band 66, therefore only LTE Band 66 was tested.



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3. 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
Applicant Address:	91 Colin Drive, Unit 1, HOLBROOK, New York 11741, United States
Manufacturer:	ZJY RIGHT SOURCE INDIA PRIVATE LIMITED
Manufacturer Address:	MIDC industrial Area, Shiravane, Nerul, India

2.2 Equipment under Test (EUT) Description

Product Name:	Orbic Tab8 5G
IMEI:	354753170003673
Hardware Version:	V1.1
Software Version:	ORB8L5T_v1.0.28_BVZ
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 48: 3550 MHz ~ 3700 MHz LTE Band 66: 1710 MHz ~ 1780 MHz 5G NR n2: 1850 MHz ~ 1910 MHz 5G NR n5: 824 MHz ~ 849 MHz 5G NR n66: 1710 MHz ~ 1780 MHz 5G NR n77(EN-DC): 3700 MHz ~ 3980 MHz WLAN 2.4GHz: 2412 MHz ~ 2462 MHz WLAN 5.2GHz: 5180 MHz ~ 5240 MHz WLAN 5.3GHz: 5260 MHz ~ 5320 MHz WLAN 5.6GHz: 5500 MHz ~ 5720 MHz WLAN 5.8GHz: 5745 MHz ~ 5825 MHz



	Bluetooth: 2402 MHz ~ 2480 MHz	
Modulation Technology:	WCDMA: QPSK, 16QAM LTE: QPSK, 16QAM, 64QAM, 256QAM (Down Link) 5G NR: CP-OFDM/DFT-s-OFDM, PI/2 BPSK QPSK, 16QAM, 64QAM, 256QAM 802.11a/g/n-HT20/HT40/ac-VHT20/40/80: OFDM Bluetooth: GFSK(1Mbps), $\pi/4$ -DQPSK(2Mbps), 8-DPSK(3Mbps)	
Antenna Type:	WWAN: Fixed Internal WLAN: PIFA Antenna Bluetooth: PIFA Antenna	
SIM Cards Description:	SIM 1	WCDMA+LTE+5G NR
	SIM 2	WCDMA+LTE+5G NR
	For dual SIM card version, both SIM 1 and SIM 2 share the same chipset unit and tested as a single chipset, the SIM 1 was selected for testing.	



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 TDD-LTE Band 48 5G NR n2/5/66/77(EN-DC) WLAN2.4GHz WLAN5GHz Bluetooth
Power Level:	WCDMA Band II/IV/V (All Up Bits) FDD-LTE Band 2/4/5/12/13/66 (Maximum output power) TDD-LTE Band 48 (Maximum output power) 5G NR n2/5/66/77(EN-DC) (Maximum output power) WLAN 2.4GHz WLAN5GHz Bluetooth
Operation Mode:	Call established

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 Specific Absorption Rate (SAR)

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 or 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/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/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

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

Type Exposure	Uncontrolled Environment Limit
Spatial Peak SAR (1g cube tissue for head and trunk)	1.6 W/kg
Spatial Peak SAR (10g cube tissue for limbs)	4.0 W/kg
Spatial Peak SAR (1g cube tissue for whole body)	0.08 W/kg

Note:

1. Occupational/Uncontrolled Environments are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure (i.e. as a result of employment or occupation).
2. Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

5 Applied Reference Documents

Leading reference documents for testing:

Identity	Document Title	Method Determination /Remark
FCC 47CFR Part 2(2.1093)	Radio Frequency Radiation Exposure valuation: 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 616217 D04 v01r01	SAR Evaluation Considerations for Laptop, Notebook, Notebook and Tablet Computers	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

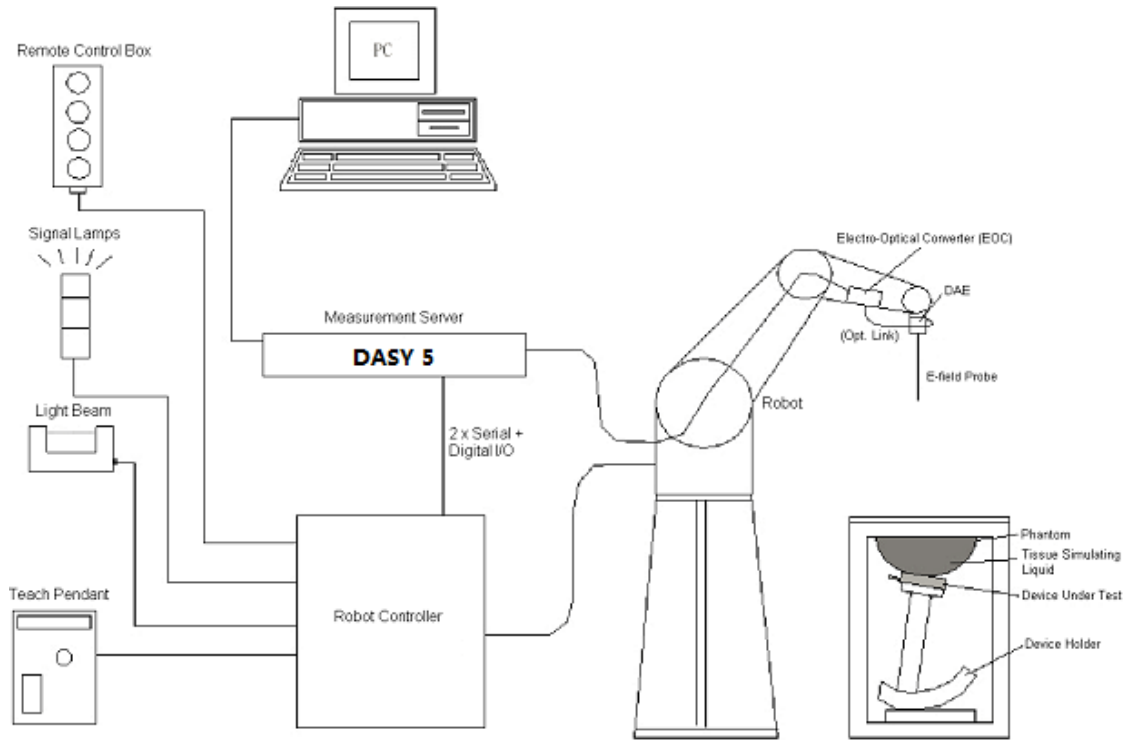


Fig.6.1 SPEAG DASY System Configurations

The DASY system for performance compliance tests is illustrated above graphically. This system consists of the following 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 operation and fast movement interrupts.
- A probe alignment unit which improves the accuracy of the probe positioning.
- A computer operating Windows XP.
- DASY software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning 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

<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 μ W/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 6.2 Photo of EX3DV4

➤ E-Field Probe Calibration

Each probe needs to be calibrated according to a dosimetric assessment procedure with accuracy better than $\pm 10\%$. 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.

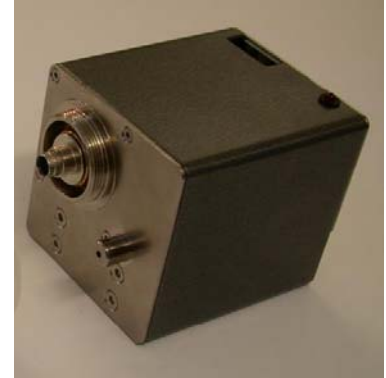


Fig 6.2 Photo of DAE

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 Stäubli is 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. 6.3 Photo of Robot

6.4 Measurement Server

The measurement server is based on a PC/104 CPU board with CPU (DASY 5: 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. 6.4 Photo of Server for DASYS5

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. 6.5 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

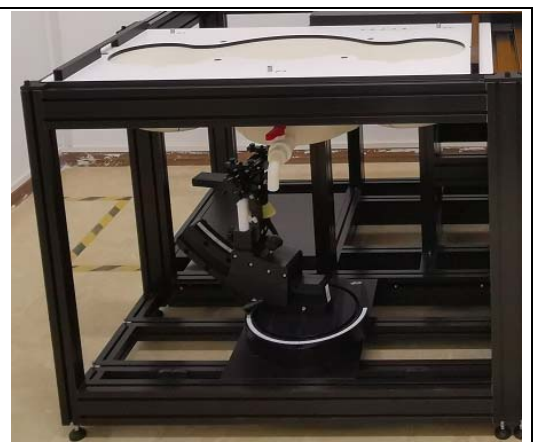


Fig. 6.6 Photo of SAM Phantom

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-loss POM material having the following dielectric parameters: relative permittivity $\epsilon = 3$ and loss tangent $\delta = 0.02$. 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 6.7 Device Holder

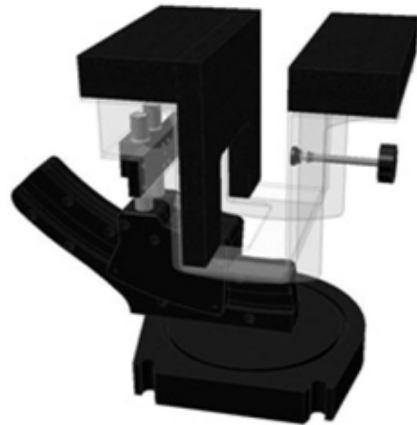


Fig 6.8 Laptop Extension Kit

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:

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

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

U_i = 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:

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

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

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

Norm_i = sensor sensitivity of channel i, (i = x, y, z), $\mu\text{V}/(\text{V/m})^2$

ConvF = sensitivity enhancement in solution

a_{ij} = sensor sensitivity factors for H-field probes

f = carrier frequency (GHz)

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

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

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

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

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

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

With

SAR = local specific absorption rate in mW/g

E_{tot} = 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 Num.	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V3	1173	2021.06.21	2024.06.20
SPEAG	900MHz System Validation Kit	D900V2	1d064	2018.10.29	2021.10.28
SPEAG	1800MHz System Validation Kit	D1800V2	2d158	2018.10.31	2021.10.30
SPEAG	2000MHz System Validation Kit	D2000V2	1050	2018.10.31	2021.10.30
SPEAG	2450MHz System Validation Kit	D2450V2	805	2018.10.26	2021.10.25
SPEAG	3500MHz System Validation Kit	D3500V2	1104	2020.06.03	2023.06.02
SPEAG	3700MHz System Validation Kit	D3700V2	1076	2020.06.03	2023.06.02
SPEAG	3900MHz System Validation Kit	D3900V2	1046	2023.06.02	2023.06.01
SPEAG	5000MHz System Validation Kit	D5GHzV2	1176	2018.11.06	2021.11.05
SPEAG	DOSIMETRIC ASSESSMENT SYSTEM	DASY52	52.10.4.1527	NCR	NCR
SPEAG	Dosimetric E-Field Probe	EX3DV4	3823	2021.01.22	2022.01.21
SPEAG	Dosimetric E-Field Probe	EX3DV4	7608	2020.11.27	2021.11.26
SPEAG	Data Acquisition Electronics	DAE4	480	2021.06.22	2022.06.21
SPEAG	Dielectric Assessment KIT	DAK-3.5	1279	2020.10.20	2021.10.19
SPEAG	SAM Phantom 2	QD 000 P40 CB	TP-1464	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
R&S	Network Emulator	CMW500	165755	2021.02.25	2022.02.24
Agilent	Network Analyzer	E5071B	MY42404762	2021.03.29	2022.03.28
mini-circuits	Amplifier	ZHL-42W+	608501717	NCR	NCR
mini-circuits	Amplifier	ZVE-8G+	754401735	NCR	NCR
Agilent	Signal Generator	N5182B	MY53050509	2021.03.29	2022.03.28
Agilent	Power Sensor	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	Attenuation	351-218-010	N/A	NA	NA
KTJ	Thermo meter	TA298	N/A	2021.01.15	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 F 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.

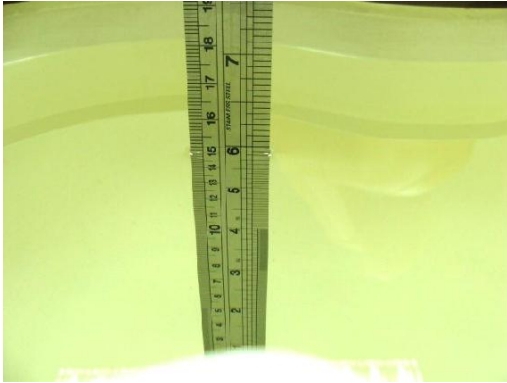


Fig 7.1 Photo of Liquid Height for Head SAR



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 (ϵ_r)
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 $\pm 5\%$ of the values given in the table below recommended by the FCC OET 65 supplement 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 $\rho = 1000 \text{ kg/m}^3$)

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.

Table 1: Dielectric Performance of Tissue Simulating Liquid

Frequency (MHz)	Tissue Type	Liquid Temp.(°C)	Conductivity (σ)	Conductivity Target (σ)	Delta (σ) (%)	Limit (%)	Date
750	HSL	22.1	0.902	0.89	1.35	± 5	2021.08.05
900	HSL	22.2	0.962	0.97	-0.82	± 5	2021.08.10
1800	HSL	22.2	1.411	1.40	0.79	± 5	2021.08.18
2000	HSL	22.3	1.382	1.40	-1.29	± 5	2021.08.13
2450	HSL	22.2	1.831	1.80	1.72	± 5	2021.08.24
3500	HSL	22.3	3.015	2.91	3.61	± 5	2021.09.07
3700	HSL	22.3	3.122	3.05	2.36	± 5	2021.09.12
3900	HSL	22.2	3.241	3.15	2.89	± 5	2021.09.10
5250	HSL	22.1	4.692	4.71	-0.32	± 5	2021.09.02
5600	HSL	22.2	5.232	5.07	3.20	± 5	2021.08.23
5750	HSL	22.2	5.257	5.22	0.71	± 5	2021.08.27



Frequency (MHz)	Tissue Type	Liquid Temp.(°C)	Permittivity (ϵ_r)	Permittivity Target (ϵ_r)	Delta (ϵ_r) (%)	Limit (%)	Date
750	HSL	22.1	42.253	41.90	0.84	±5	2021.08.05
900	HSL	22.2	40.825	41.50	-1.63	±5	2021.08.10
1800	HSL	22.2	40.526	40.00	1.32	±5	2021.08.18
2000	HSL	22.3	39.428	40.00	-1.43	±5	2021.08.13
2450	HSL	22.2	38.224	39.20	-2.49	±5	2021.08.24
3500	HSL	22.3	38.640	37.90	1.95	±5	2021.09.07
3700	HSL	22.3	38.552	37.70	2.26	±5	2021.09.12
3900	HSL	22.2	38.422	37.50	2.46	±5	2021.09.10
5250	HSL	22.1	36.078	35.95	0.36	±5	2021.09.02
5600	HSL	22.2	36.224	35.50	2.04	±5	2021.08.23
5750	HSL	22.2	36.242	35.35	2.52	±5	2021.08.27

Note:

According to April 2019 TCB Workshop that FCC has permitted the use of single head-tissue simulating liquid specified in IEC 62209-1 for all SAR tests.



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.

➤ System Validation

According to FCC KDB 865664 D02, SAR system verification is required to confirm measurement accuracy. The SAR systems (including SAR probes, system components and software versions) used for this device were validated against its performance specifications prior to the SAR measurements. Reference dipoles are used with the required tissue-equivalent media for system validation, according to the procedures outlined in FCC KDB 865664 D01 and IEEE 1528-2013. Since SAR probe calibrations are frequency dependent, each probe calibration point must be validated at a frequency within the valid frequency range of the probe calibration point, using the system that normally operates with the probe for routine SAR measurements and according to the required tissue-equivalent media. A tabulated summary of the system validation status, measurement frequencies, SAR probes, calibrated signal type(s) and tissue dielectric parameters has been included.

➤ 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 Photo of Dipole Setup

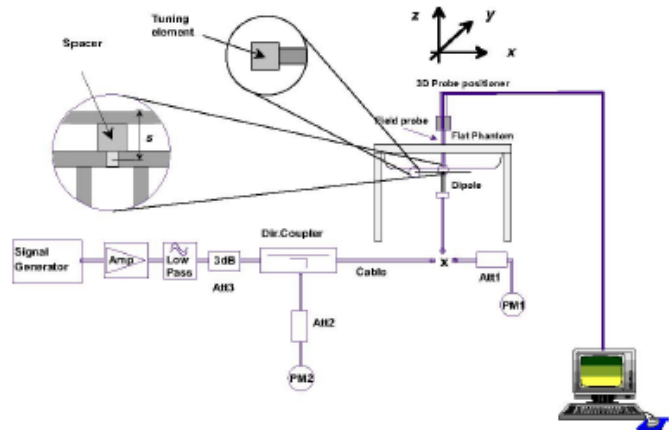


Fig 8.2 System Setup for System Evaluation

➤ 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.

Dipole S/N	Probe S/N	DAE S/N
D750V3-1173	7608	480
D900V2-1d064	3823	480
D1800V2-2d158	3823	480
D2000V2-1050	3823	480
D2450V2-805	3823	480
D3500V2-1104	3823	480
D3700V2-1076	3823	480
D3900V2-1176	3823	480
D5GHzV2-1176-5250	3823	480
D5GHzV2-1176-5600	3823	480
D5GHzV2-1176-5750	3823	480



Frequency (MHz)	Tissue Type	Conductivity (σ)	Permittivity (ϵ_r)	CW Signal Validation		
				Sensitivity	Probe Linearity	Probe Isotropy
750	HSL	0.851	42.43	PASS	PASS	PASS
835	HSL	0.898	41.88	PASS	PASS	PASS
1750	HSL	1.386	39.91	PASS	PASS	PASS
1800	HSL	1.449	41.26	PASS	PASS	PASS
1900	HSL	1.435	39.65	PASS	PASS	PASS
2000	HSL	1.451	39.42	PASS	PASS	PASS
2300	HSL	1.764	38.99	PASS	PASS	PASS
2450	HSL	1.863	38.85	PASS	PASS	PASS
2600	HSL	1.973	38.58	PASS	PASS	PASS
5250	HSL	4.528	35.32	PASS	PASS	PASS
5600	HSL	4.905	34.89	PASS	PASS	PASS
5750	HSL	5.077	34.28	PASS	PASS	PASS

Frequency (MHz)	Tissue Type	Conductivity (σ)	Permittivity (ϵ_r)	Modulation Signal Validation		
				Mod. Type	Duty Factor	PAR
750	HSL	0.851	42.43	N/A	N/A	N/A
835	HSL	0.898	41.88	GMSK	PASS	N/A
1750	HSL	1.386	39.91	N/A	N/A	N/A
1800	HSL	1.449	41.26	N/A	N/A	N/A
1900	HSL	1.435	39.65	GMSK	PASS	N/A
2000	HSL	1.451	39.42	GMSK	PASS	N/A
2300	HSL	1.764	38.99	OFDM	PASS	PASS
2450	HSL	1.863	38.85	OFDM	PASS	PASS
2600	HSL	1.973	38.58	TDD	PASS	N/A
5250	HSL	4.528	35.32	OFDM	N/A	PASS
5600	HSL	4.905	34.89	OFDM	N/A	PASS
5750	HSL	5.077	34.28	OFDM	N/A	PASS



<Validation Results>

Date	Freq. (MHz)	Tissue Type	Input Power (mW)	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2021.08.05	750	HSL	250	2.08	8.26	8.32	0.73
2021.08.10	900	HSL	250	2.71	10.90	10.84	-0.55
2021.08.18	1800	HSL	250	10.08	39.30	40.32	2.60
2021.08.13	2000	HSL	250	10.35	40.90	41.4	1.22
2021.08.24	2450	HSL	250	13.21	52.00	52.84	1.62
2021.09.07	3500	HSL	250	16.23	67.20	64.92	-3.39
2021.09.12	3700	HSL	250	16.54	67.50	66.16	-1.99
2021.09.10	3900	HSL	250	17.25	69.90	69	-1.29
2021.09.02	5250	HSL	100	8.02	78.90	80.2	1.65
2021.08.23	5600	HSL	100	8.11	80.90	81.1	0.25
2021.08.27	5750	HSL	100	8.12	80.00	81.2	1.50

Date	Freq. (MHz)	Tissue Type	Input Power (mW)	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2021.08.05	750	HSL	250	1.35	5.45	5.4	-0.92
2021.08.10	900	HSL	250	1.75	6.97	7	0.43
2021.08.18	1800	HSL	250	5.21	20.60	20.84	1.17
2021.08.13	2000	HSL	250	5.27	20.90	21.08	0.86
2021.08.24	2450	HSL	250	6.15	24.10	24.6	2.07
2021.09.07	3500	HSL	250	6.28	25.10	25.12	0.08
2021.09.12	3700	HSL	250	5.92	24.20	23.68	-2.15
2021.09.10	3900	HSL	250	6.14	24.10	24.56	1.91
2021.09.02	5250	HSL	100	2.31	22.50	23.1	2.67
2021.08.23	5600	HSL	100	2.32	23.10	23.2	0.43
2021.08.27	5750	HSL	100	2.24	22.60	22.4	-0.88

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

9 EUT Testing Position

This EUT was tested in six different positions. They are right cheek/right tilted/left cheek/left tilted for head, Front/Back of the EUT with phantom 0 mm gap, as illustrated below, please refer to Annex B for the test setup photos.

9.1 Handset Reference Points

The vertical centre line 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.

The horizontal line is perpendicular to the vertical centre line and passes the center of the acoustic output. The horizontal line is also tangential to the handset at point A.

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 centre line 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. 9.1 Illustration for Cheek Position

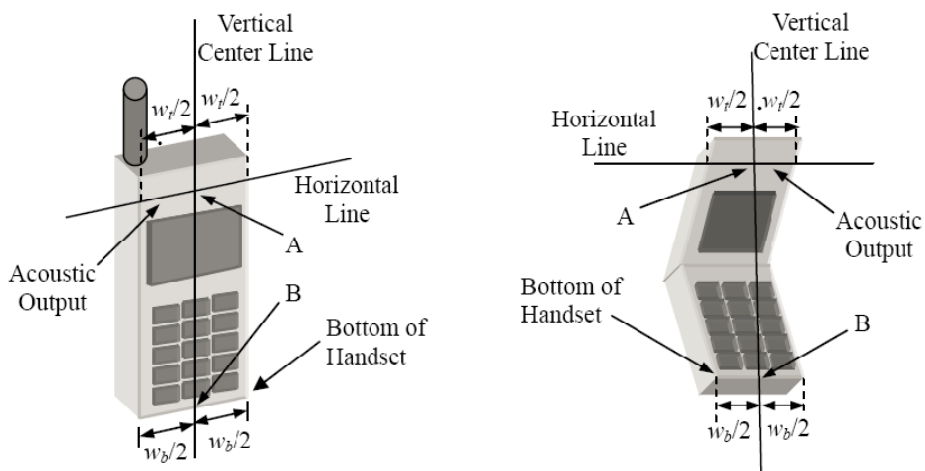


Fig. 9.2 Illustration for Handset Vertical and Horizontal Reference Lines

9.2 Positioning for Cheek / Touch

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.

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 below figure)

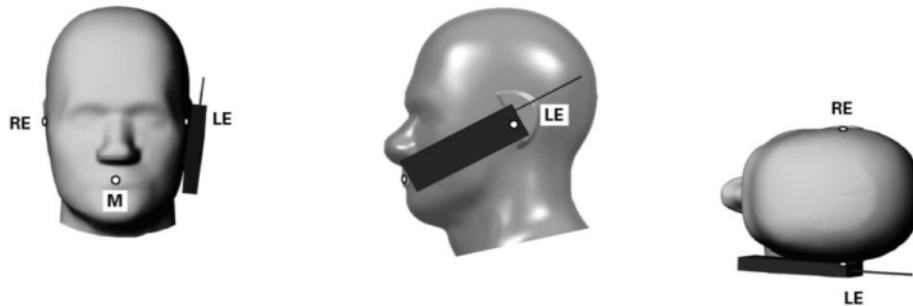


Fig 9.3 Illustration for Cheek Position

9.3 Positioning for Ear / 15° Tilt

To position the device in the “cheek” position described above.

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 figure below).

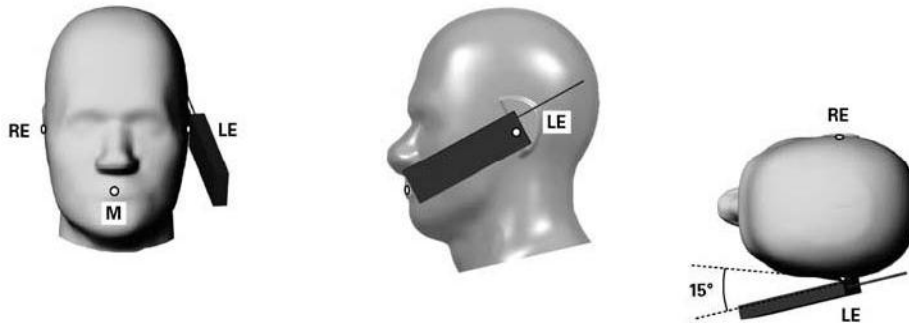


Fig 9.4 Illustration for Tilted Position

9.4 SAR Evaluation near the Mouth/Jaw Regions of the Phantom

Antennas located near the bottom of a phone may require SAR measurements around the mouth and jaw regions of the SAM head phantom. This typically applies to clam-shell style phones that are generally longer in the unfolded normal use positions or to certain older style long rectangular phones.

Under these circumstances, the following procedures apply, adopted from the FCC guidance on SAR handsets document FCC KDB Publication 648474 D04v01r03. The SAR required in these regions of SAM should be measured using a flat phantom. The phone should be positioned with a separation distance of 4 mm between the ear reference point (ERP) and the outer surface of the flat phantom shell. While maintaining this distance at the ERP location, the low (bottom) edge of the phone should be lowered from the phantom to establish the same separation distance between the peak SAR locations identified by the truncated partial SAR distribution measured with the SAM phantom. The distance from the peak SAR location to the phone is determined by the straight line passing perpendicularly through the phantom surface. When it is not feasible to maintain 4 mm separation at the ERP while also establishing the required separation at the peak SAR location, the top edge of the phone will be allowed to touch the phantom with a separation < 4 mm at the ERP. The phone should not be tilted to the left or right while placed in this inclined position to the flat phantom.

9.5 Body-Supported Device Configurations

According to KDB 616217 section 4.3, SAR should be separately assessed with each surface and separation distance positioned against the flat phantom that correspond to the intended use as specified by the manufacturer. The antennas in tablets are typically located near the back (bottom) surface and/or along the edges of the devices; therefore, SAR evaluation is required for these configurations. Exposures from antennas through the front (top) surface of the display section of a full-size tablet, away from the edges, are generally limited to the user's hands. Exposures to hands for typical consumer transmitters used in tablets are not expected to exceed the extremity SAR limit; therefore, SAR evaluation for the front surface of tablet display screens are generally not necessary, except for tablets that are designed to require continuous operations with the hand(s) next to the antenna(s).

- 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 0 mm.
- When each surface is measurement, the SAR Test Exclusion Threshold in KDB 447498 should be applied.

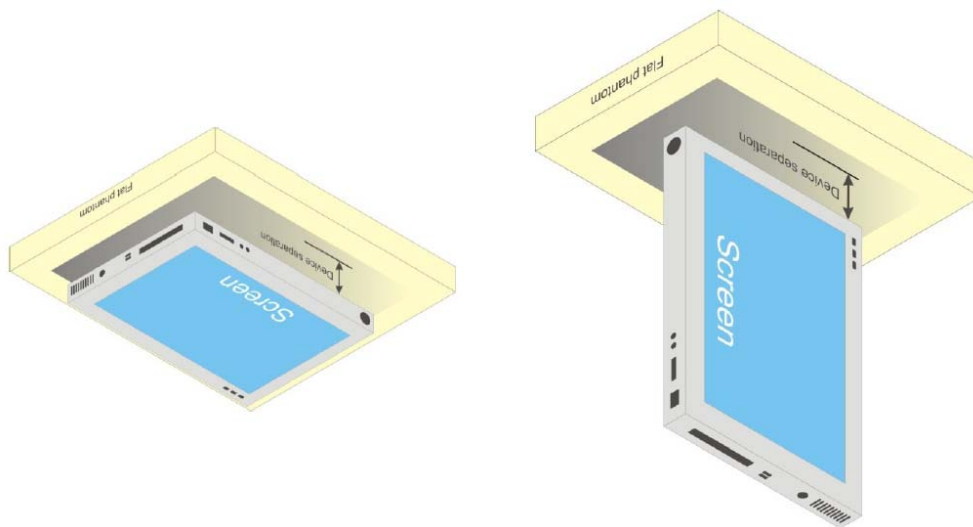


Fig.9.5 Illustration for Body Position

9.6 Wireless Router (Hotspot) Configurations

Some battery-operated handsets have the capability to transmit and receive internet connectivity through simultaneous transmission of WIFI in conjunction with a separate licensed transmitter. The FCC has provided guidance in KDB Publication 941225 D06 where SAR test considerations for handsets ($L \times W \geq$

9 cm x 5 cm) are based on a composite test separation distance of 10 mm from the front, back and edges of the device with antennas 2.5 cm or closer to the edge of the device, determined from general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions. Therefore, SAR must be evaluated for each frequency transmission and mode separately and summed with the WIFI transmitter according to KDB 648474 publication procedures. The “Portable Hotspot” feature on the handset was NOT activated, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal.

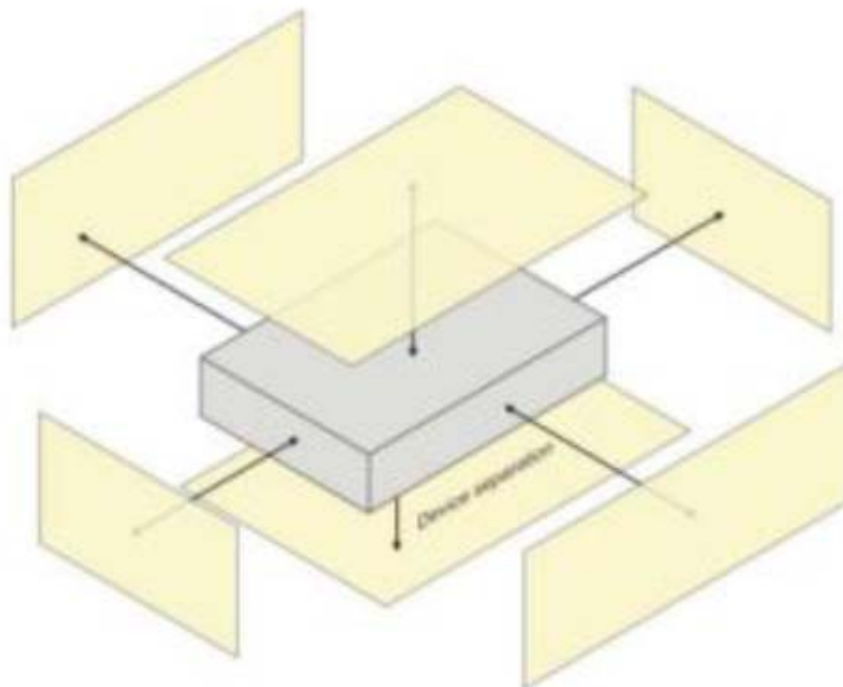


Fig.9.6 Illustration for Hotspot Position

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 from 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 Scan Procedures

Area scans are defined prior to the measurement process being executed with a user defined variable spacing between each measurement point (integral) allowing low uncertainty measurements to be conducted. Scans defined for FCC applications utilize a 10mm^2 step integral, with 1mm interpolation used to locate the peak SAR area used for zoom scan assessments.



When an Area Scan has measured all reachable points, it computes the field maxima found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing.

10.4 Zoom Scan Procedures

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. A density of 1000 kg/m^3 is used to represent the head and body tissue density and not the phantom liquid density, in order to be consistent with the definition of the liquid dielectric properties, i.e. the side length of the 1g cube is 10mm, with the side length of the 10 g cube 21,5mm. The zoom scan integer steps can be user defined so as to reduce uncertainty, but normal practice for typical test applications utilize a physical step of 5x5x7 (8mmx8mmx5mm) providing a volume of 32mm in the X & Y axis, and 30mm in the Z axis.

10.5 SAR Averaged Methods

In DASY, the interpolation and extrapolation are both based on the modified Quadratic Sheppard'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 SAR Test Configuration

<GSM Mode>

A summary of these settings are illustrated below:

For GSM850 frequency band, the power control is set to 5 for GSM/GPRS mode (GSMK-CS1) and set to 8 for EDGE mode (MCS5); For GSM1900 frequency band, the power control is set to 0 for GSM/GPRS mode (GSMK-CS1) and set to 2 for EDGE mode (MCS5).

1. Per KDB 447498 D01v06, the maximum output power channel is used for SAR testing and for further SAR test reduction.
2. Per KDB 941225 D01v03r01, SAR test reduction for GSM / GPRS / EDGE modes is determined by the source-based time-averaged output power including tune-up tolerance. The mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested. Therefore, the GPRS (4Tx slots) for GSM850/GSM1900 is considered as the primary mode.
3. Other configurations of GSM / GPRS / EDGE are considered as secondary modes.

Timeslot consignations:

Remark:

- The frame-averaged power is linearly reported the maximum burst averaged power over 8 time slots. The calculated method are shown as below:

The duty cycle "x" of different time slots as below:

1 TX slot is 1/8, 2 TX slots is 2/8, 3 TX slots is 3/8 and 4 TX slots is 4/8

Based on the calculation formula:

Frame-averaged power = Burst averaged power + 10 log (x)

So,

Frame-averaged power (1 TX slot) = Burst averaged power (1 TX slot)– 9.03

Frame-averaged power (2 TX slots) = Burst averaged power (2 TX slots)– 6.02

Frame-averaged power (3 TX slots) = Burst averaged power (3 TX slots)– 4.26

Frame-averaged power (4 TX slots) = Burst averaged power (4 TX slots) – 3.01

- CS1 coding scheme was used in GPRS conducted power measurements and SAR testing, MCS5 coding scheme was used in EGPRS conducted power measurements and SAR testing (if necessary).

No. of Slots:	Slot 1	Slot 2	Slot 3	Slot 4
Slot Consignation:	1Up4Down	2Up3Down	3Up2Down	4Up1Down
Duty Cycle:	1:8.3	1:4.15	1:2.77	1:2.08
Correct Factor:	-9.03dB	-6.02dB	-4.26dB	-3.01dB

<WCDMA Mode>

Summary of UMTS conducted power measurement:

1. The 3G SAR test reduction procedure is applied, when the maximum output power and tune-up tolerance specified for production units in a secondary mode is $\leq \frac{1}{4}$ dB higher than the primary mode, SAR measurement is not required for the secondary mode.
2. The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification.
3. The procedures in KDB 941225 D01v03r01 are applied for 3GPP Rel. 6 HSPA to configure the device in the required sub-test mode(s) to determine SAR test exclusion.
4. For HSPA+ devices supporting 16 QAM in the uplink, power measurements procedure is according to the configurations in Table C.11.1.4 of 3GPP TS 34.121-1.
5. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. The maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA / HSPA+ is $\leq \frac{1}{4}$ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / DC-HSDPA / HSPA+ to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA / HSPA+, and according to the following RF output power, the output power results of the secondary modes (HSDPA / HSUPA / DC-HSDPA / HSPA+) are less than $\frac{1}{4}$ dB higher than the primary modes; therefore, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA / HSPA+.
6. A fixed level power reduction is applied for WCDMA Band II when handset open Hotspot mode, the power reduction triggered.

HSDPA Setup Configuration

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	$\beta_{hs}^{(2)}$	CM (dB) ⁽²⁾
1	2/15	15/15	64	2/15	4/15	0.0
2	12/15 ⁽³⁾	15/15 ⁽³⁾	64	12/15 ⁽³⁾	24/15	1.0
3	15/15	8/15	64	15/8	30/15	1.5
4	15/15	4/15	64	15/4	30/15	1.5

Note 1: Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$
Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$.
Note 3: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 11/15$ and $\beta_d = 15/15$.

HSUPA Setup Configuration

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	$\beta_{hs}^{(1)}$	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (codes)	CM ⁽²⁾ (dB)	MPR (dB)	AG ⁽⁴⁾ Index	E-TFCI
1	11/15 ⁽³⁾	15/15 ⁽³⁾	64	11/15 ⁽³⁾	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	$\beta_{ed1}: 47/15$ $\beta_{ed2}: 47/15$	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 ⁽⁴⁾	15/15 ⁽⁴⁾	64	15/15 ⁽⁴⁾	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$.

Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.

Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 10/15$ and $\beta_d = 15/15$.

Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 14/15$ and $\beta_d = 15/15$.

Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g.

Note 6: β_{ed} cannot be set directly; it is set by Absolute Grant Value.

HSPA+ 3GPP release 7 (uplink category 7) 16QAM, Setup Configuration:

Table C.11.1.4: β values for transmitter characteristics tests with HS-DPCCH and E-DCH with 16QAM

Sub-test	β_c (Note 3)	β_d	β_{hs} (Note 1)	β_{ec}	β_{ed} (2xSF2) (Note 4)	β_{ed} (2xSF4) (Note 4)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 4)	E-TFCI (Note 5)	E-TFCI (boost)
1	1	0	30/15	30/15	$\beta_{ed1}: 30/15$ $\beta_{ed2}: 30/15$	$\beta_{ed3}: 24/15$ $\beta_{ed4}: 24/15$	3.5	2.5	14	105	105

Note 1: Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 30/15$ with $\beta_{hs} = 30/15 * \beta_c$.

Note 2: CM = 3.5 and the MPR is based on the relative CM difference, MPR = MAX(CM-1,0).

Note 3: DPDCH is not configured, therefore the β_c is set to 1 and $\beta_d = 0$ by default.

Note 4: β_{ed} can not be set directly; it is set by Absolute Grant Value.

Note 5: All the sub-tests require the UE to transmit 2SF2+2SF4 16QAM EDCH and they apply for UE using E-DPDCH category 7. E-DCH TTI is set to 2ms TTI and E-DCH table index = 2. To support these E-DCH configurations DPDCH is not allocated. The UE is signaled to use the extrapolation algorithm.

DC-HSDPA Setup Configuration

The following tests were completed according to procedures in section 7.3.13 of 3GPP TS34.108 v9.5.0. A summary of these settings are illustrated below:

Downlink Physical Channels are set as per 3GPP TS34.121-1 v9.0.0 E.5.

Table E.5.0: Levels for HSDPA connection setup

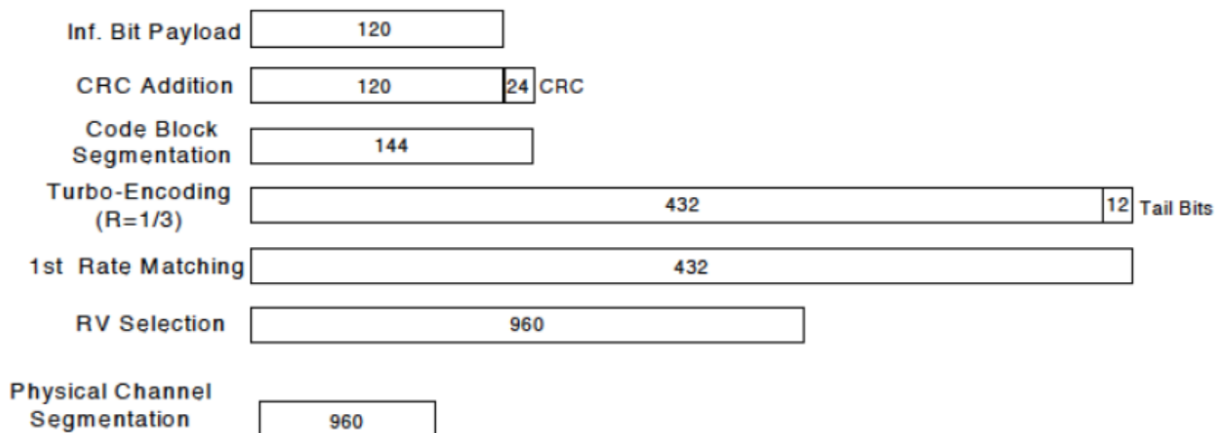
Parameter During Connection setup	Unit	Value
P-CPICH_Ec/Ior	dB	-10
P-CCPCH and SCH_Ec/Ior	dB	-12
PICH_Ec/Ior	dB	-15
HS-PDSCH	dB	off
HS-SCCH_1	dB	off
DPCH_Ec/Ior	dB	-5
OCNS_Ec/Ior	dB	-3.1

Call is set up as per 3GPP TS34.108 v9.5.0 sub clause 7.3.13

The configurations of the fixed reference channels for HSDPA RF tests are described in 3GPP TS 34.121, annex C for FDD and 3GPP TS 34.122.

Table C.8.1.12: Fixed Reference Channel H-Set 12

Parameter	Unit	Value
Nominal Avg. Inf. Bit Rate	kbps	60
Inter-TTI Distance	TTI's	1
Number of HARQ Processes	Processes	6
Information Bit Payload (N_{INF})	Bits	120
Number Code Blocks	Blocks	1
Binary Channel Bits Per TTI	Bits	960
Total Available SML's in UE	SML's	19200
Number of SML's per HARQ Proc.	SML's	3200
Coding Rate		0.15
Number of Physical Channel Codes	Codes	1
Modulation		QPSK
Note 1: The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table. Note 2: Maximum number of transmission is limited to 1, i.e., retransmission is not allowed. The redundancy and constellation version 0 shall be used.		


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)



<LTE Mode>

LTE Target MPR level

The device implements maximum power reduction per 3GPP 36.101 requirements where the MPR target is as below table. The MPR settings are implemented configured into firmware and cannot be disabled by the end user or LTE carrier network.

Modulation	el bandwidth / Transmission bandwidth configuration [RB]						MPR	3GPP
	1.4	3.0	5	10	15	20	Target	
	MHz	MHz	MHz	MHz	MHz	MHz	(dB)	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	1	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	1	≤ 1
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	2	≤ 2

Note: The measurement result showed some difference from the target MPR level, due to expected 0.5dB measurement tolerance

LTE Bands

LTE Bands	el bandwidth / Transmission bandwidth configuration [RB]					
	1.4	3.0	5	10	15	20
	MHz	MHz	MHz	MHz	MHz	MHz
2	✓	✓	✓	✓	✓	✓
4	✓	✓	✓	✓	✓	✓
5	✓	✓	✓	✓	N/A	N/A
12	✓	✓	✓	✓	N/A	N/A
13	N/A	N/A	✓	✓	N/A	N/A
48	N/A	N/A	✓	✓	✓	✓
66	✓	✓	✓	✓	✓	✓

Note:

1. Per KDB 941225 D05v02r05, when a properly configured base station simulator is used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration is not required.
2. Per KDB 941225 D05v02r05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
3. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
4. Per KDB 941225 D05v02r05, for QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB

allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.

5. Per KDB 941225 D05v02r05, 16QAM/64QAM output power for each RB allocation configuration is $>$ not $\frac{1}{2}$ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB941225 D05v02r05, 16QAM/64QAM SAR testing is not required.
6. Per KDB 941225 D05v02r05, smaller bandwidth output power for each RB allocation configuration is $>$ not $\frac{1}{2}$ Db higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported band width is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
7. For LTE B4 / B5 / B7 / B17 the maximum bandwidth does not support three non-overlapping channels, per KDB941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.
8. LTE band 2 / 4 / 12 SAR test was covered by Band 25 / 66 / 17; according to April 2015 TCB workshop, SAR test for overlapping LTE bands can be reduced if
 - a. The maximum output power, including tolerance, for the smaller band is $\leq$ the larger band to qualify for the SAR test exclusion.
 - b. The channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band.
9. According to 2017 TCB workshop, for 64 QAM and 16 QAM should be verified by checking the signal constellation with a call box to avoid incorrect maximum power levels due to MPR and other requirements associated with signal modulation, and the following figure is taken from the "Fundamental Measurement >> Modulation Analysis >>constellation" mode of the device connect to the CMW500 base station, therefore, the device 64QAM and 16QAMsignal modulation are correct. Identify if Maximum Power Reduction (MPR) is optional or mandatory, i.e. built-in by design: only mandatory MPR may be considered during SAR testing, when the maximum output power is permanently limited by the MPR implemented within the UE; and only for the applicable RB (resource block) configurations specified in LTE standards: b) A-MPR (additional MPR) must be disabled.
10. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
 - a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
 - b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
 - c. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
 - d. For WLAN/Bluetooth: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling

factor * Tune-up scaling factor

- e. For TDD LTE SAR measurement, the duty cycle 1:1.59 (62.9 %) was used perform testing and considering the theoretical duty cycle of 63.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 62.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix $63.3\%/62.9\% = 1.006$ is applied to scale-up the measured SAR result. The Reported TDD LTE SAR = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.
11. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is: ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
12. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥ 0.8 W/kg.
13. Per KDB 648474 D04v01r03, when the reported SAR for a body-worn accessory measured without a headset connected to the handset is ≤ 1.2 W/kg, SAR testing with a headset connected to the handset is not required.

<WLAN 2.4GHz>

1. SAR is measured for 2.4 GHz 802.11b DSSS using either the fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:
 - a. When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
 - b. When the reported SAR is > 0.8 W/kg, SAR is required for that position using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.
2. 2.4 GHz 802.11 g/n OFDM are additionally evaluated for SAR if the highest reported SAR for 802.11b, adjusted by the ratio of the OFDM to DSSS specified maximum output power, is > 1.2 W/kg. When SAR is required for OFDM modes in 2.4 GHz band, the Initial Test configuration Procedures should be followed.
3. For held-to-ear and hotspot operations, 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 reported SAR for the initial test position is ≤ 0.4 W/kg, no additional testing for the remaining test positions was 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.
4. Justification for test configurations for WLAN per KDB Publication 248227 D02DR02-41929 for



2.4 GHz WI-FI single transmission chain operations, the highest measured maximum output power channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4 GHz 802.11g/n) was not required due to the maximum allowed powers and the highest reported SAR.

5. A fixed level power reduction is applied for WiFi when handset operates "held to the body" condition or "held to the ear" condition, the power reduction triggered by audio receiver detection and call establish status.
6. 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:
 - a. When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.
 - b. 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.

<WLAN 5GHz>

A) U-NII-1 and U-NII-2A Bands

For devices that operate in only one of the U-NII-1 and U-NII-2A bands, the normally required SAR procedures for OFDM configurations are applied. 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); otherwise, both bands are tested independently for SAR.
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; otherwise, both bands are tested independently for SAR.
3. The two U-NII bands may be aggregated to support a 160 MHz channel on channel number 50.
4. Without additional testing, the maximum output power for this is limited to the lower of the maximum output power certified for the two bands. When SAR measurement is required for at least one of the bands and the highest reported SAR adjusted by the ratio of specified maximum output power of aggregated to standalone band is > 1.2 W/kg, SAR is required for the 160 MHz channel. This procedure does not apply to an aggregated band with maximum output higher than the standalone band(s); the aggregated band must be tested independently for SAR. SAR is not required when the 160 MHz channel is operating at a reduced maximum power and also qualifies for SAR test exclusion.

B) U-NII-2C and U-NII-3 Bands

The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. when Terminal Doppler Weather Radar (TDWR) restriction applies, all channels that operate at 5.60 – 5.65 GHz must be included to apply the SAR test reduction and measurement procedures. When the same transmitter and antenna(s) are used for U-NII-2C band and U-NII-3 band or 5.8 GHz band of §15.247, the bands may be aggregated to enable additional channels with 20, 40 or 80 MHz bandwidth to span across the band gap, as illustrated in Appendix B. The maximum output power for the additional band gap channels is limited to the lower of those certified for the bands. Unless band gap channels are permanently disabled, they must be considered for SAR testing. The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. To maintain SAR measurement accuracy and to facilitate test reduction, the channels in U-NII-2C band above 5.65 GHz may be grouped with the 5.8 GHz channels in U-NII-3 or §15.247 band to enable two SAR probe calibration frequency points to cover the bands, including the band gap channels. When band gap channels are supported and the bands are not aggregated for SAR testing, band gap channels must be considered independently in each band according to the normally required OFDM SAR measurement and probe calibration frequency points requirements.

C) OFDM Transmission Mode SAR Test Configuration and Channel Selection Requirements

The initial test configuration for 5 GHz OFDM transmission modes is determined by the 802.11 configuration with the highest maximum output power specified for production units, including tune-up tolerance, in each standalone and aggregated frequency band. SAR for the initial test configuration is measured using the highest maximum output power channel determined by the default power measurement procedures. When multiple configurations in a frequency band have the same specified maximum output power, the initial test configuration is determined according to the following steps applied sequentially.

1. The largest channel bandwidth configuration is selected among the multiple configurations with the same specified maximum output power.
2. If multiple configurations have the same specified maximum output power and largest channel bandwidth, the lowest order modulation among the largest channel bandwidth configurations is selected.
3. If multiple configurations have the same specified maximum output power, largest channel bandwidth and lowest order modulation, the lowest data rate configuration among these configurations is selected.
4. When multiple transmission modes (802.11a/g/n/ac) have the same specified maximum output power, largest channel bandwidth, lowest order modulation and lowest data rate, the lowest order 802.11 mode is selected; 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. These channel selection procedures apply to both the initial test configuration and subsequent test configuration(s), with respect to the default power measurement procedures or additional power measurements required for further SAR test reduction. The same procedures also apply to subsequent highest output power channel(s) selection.

5. The channel closest to mid-band frequency is selected for SAR measurement.
6. 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.

D) SAR Test Requirements for OFDM configurations

When SAR measurement is required for 802.11 a/n/ac OFDM configurations, each standalone and frequency aggregated band is considered separately for SAR test reduction. When the same transmitter and antenna(s) are used for U-NII-1 and U-NII-2A bands, additional SAR test reduction applies. When band gap channels between U-NII-2C band and 5.8 GHz U-NII-3 or §15.247 band are supported, the highest maximum output power transmission mode configuration and maximum output power channel across the bands must be used to determine SAR test reduction, according to the initial test configuration and subsequent test configuration requirements. In applying the initial test configuration and subsequent test configuration procedures, the 802.11 transmission configuration with the highest specified maximum output power and the channel within a test configuration with the highest measured maximum output power should be clearly distinguished to apply the procedures.

12 Conducted Output Power

Remark: The output power of WCDMA/LTE/5G NR/WLAN/Bluetooth refers to the annex E of this report.

13 LTE Carrier Aggregation

13.1 LTE Uplink Carrier Aggregation

➤ Carrier Aggregation Configuration

<Intra-band>

2CC Uplink Carrier Aggregation for Intra-band				
No.	Combination	UL MIMO	Restriction	Completely Covered by Measurement Superset
1	CA_5B	5B	-	No
2	CA_48C	48C	-	No
3	CA_48E	48E	-	No

Note:

1. According to the 3GPP 36.101 table 6.2.2A-1 specifics that the aggregation maximum allowed output power is equivalent to the signal carrier scenario for intra-band contiguous carrier aggregation scenarios. When the non-contiguous RB allocation is applied the MPR shell complies with the table 6.2.3A defined in 3GPP 36.101.
2. According to the TCB Workshop publication, the output power of uplink CA would be measured with the wideband signal integration over the component carriers. And SAR measurement would be performed at the worst exposure condition of each band.
3. Additional SAR measurement for LTE UL CA with other DL CA combinations are not required when the maximum output power of this configuration is not $>1/4$ dB higher than the maximum output power for UL CA active.



<Inter-band>

2CC Uplink Carrier Aggregation for Inter-band				
No.	Combination	UL MIMO	Restriction	Completely Covered by Measurement Superset
1	CA_5A_66A	5A_66A	-	No
2	CA_4A_5A	4A_5A	-	No
3	CA_4A_13A	4A_13A	-	No
4	CA_2A_5A	2A_5A	-	No
5	CA_2A_13A	2A_13A	-	No
6	CA_13A_66A	13A_66A	-	No

Note:

According to October 2018 TCB Workshop publication, LTE uplink CA SAR assessment should follow:

1. If the signal uplink 1-g SAR values for each band are both less than 0.8 W/kg and the algebraic summation of the 1-g SAR values are less than 1.45 W/kg no additional measurements need to be performed.
2. If one or the signal uplink 1-g SAR values is greater than 0.8 W/kg, instead of algebraically summing the 1-g SAR values, sum up the SAR distributions, similar to the enlarged zoom scan (volume scan) procedures found in FCC KDB Publication 865664 D01. And PAG is required for this case.
3. If the algebraic sum of the 1-g SAR values is > 1.45 W/kg additional measurements may have to be made. Submit a KDB inquiry for additional guidance. And PAG is required for this case.

13.2 LTE Downlink Carrier Aggregation

➤ Carrier Aggregation Configuration

For the device supports bands and bandwidths and configurations are provided as follow table was according to 3GPP.

2CC Downlink Carrier Aggregation				
No.	Combination	UL MIMO	Restriction	Completely Covered by Measurement Superset
1	CA_2A_13A	2A	-	No
2	CA_2A_2A	2A_2A	-	No
3	CA_2A_5A	2A	-	No
4	CA_4A_13A	4A	-	No
5	CA_4A_4A	4A_4A	-	No
6	CA_4A_5A	4A	-	No
7	CA_5A_66A	66A	-	No
8	CA_66A_66A	66A_66A	-	No
9	CA_13A_48A	13A_48A	-	No

3CC Downlink Carrier Aggregation				
No.	Combination	UL MIMO	Restriction	Completely Covered by Measurement Superset
1	CA_2A_5B	2A	-	No
2	CA_4A_5B	4A	-	No
3	CA_5A_5A_66A	66A	-	No
4	CA_5B_66A	66A	-	No

➤ LTE Downlink Carrier Aggregation Conducted Power

1. According to KDB941225 D05A v01r02, Uplink maximum output power measurement with downlink carrier aggregation active should be measured, using the highest output channel measured without downlink carrier aggregation, to confirm that uplink maximum output power with downlink carrier aggregation active remains within the specified tune-up tolerance limits and not more than ¼ dB higher than the maximum output measured without downlink carrier aggregation active.
2. Uplink maximum output power with downlink carrier aggregation active does not show more than ¼ dB higher than the maximum output power without downlink carrier aggregation active, therefore SAR evaluation with downlink carrier aggregation active can be excluded.

3. For power measurement were control and acknowledge data is sent on uplink channels that operate identical to specifications when downlink carrier aggregation is inactive.
4. Selected highest measured power when downlink carrier aggregation is inactive for conducted power comparison with downlink carrier aggregation is active, to confirm that when downlink carrier aggregation is active uplink maximum output power remains within the specified tune-up tolerance limits and not more than ¼ dB higher than the maximum output power measured when downlink carrier aggregation inactive.
5. For non-contiguous intra-band CA, the SCC selected to provide maximum separation from the PCC and must remain fully within the downlink transmission band.
6. For Intra-band, contiguous CA, the downlink channels selected to perform the uplink power measurement must satisfy
7. 3GPP channel spacing (5.4.1A of 3GPP TS 36.521 or equivalent) and channel bandwidth (5.4.2A) requirements.

$$\text{Nominal channel spacing} = \left\lceil \frac{BW_{\text{Channel}(1)} + BW_{\text{Channel}(2)} - 0.1|BW_{\text{Channel}(1)} - BW_{\text{Channel}(2)}|}{0.6} \right\rceil 0.3 \text{ [MHz]}$$

8. The output power of CA downlink refers to the annex E of this report.

14 5G NR EN-DC Consideration

➤ General Guidance

4. It is only limited to operate at EN-DC (NSA) for 5G NR implementation According to the character of the device. SAR measurement should be performed separately for the limitations of the probe calculation factors.
5. When the EN-DC is active the output power of the LTE anchors is equal or less than the standalone carrier, therefore the LTE output power and SAR were estimated based on the standalone carrier to performed sim-TX analysis with 5G NR, WLAN and Bluetooth.
6. According to October 2020 TCB Workshop publication, EN-DC SAR assessment should follow:
 1. If the signal uplink 1-g SAR values for each band are both less than 0.8 W/kg and the algebraic summation of the 1-g SAR values are less than 1.45 W/kg no additional measurements need to be performed.
 2. If one or the signal uplink 1-g SAR values is greater than 0.8 W/kg, instead of algebraically summing the 1-g SAR values, sum up the SAR distributions, similar to the enlarged zoom scan (volume scan) procedures found in FCC KDB Publication 865664 D01. And PAG is required for this case.
 3. If the algebraic sum of the 1-g SAR values is > 1.45 W/kg additional measurements may have to be made. Submit a KDB inquiry for additional guidance and PAG is required for this case.
 4. When the algebraic sum of the 1-g SAR values is > 1.6 W/kg, SPLSR analysis procedure should be applied.

➤ 5G NR anchor combination

5G-NR	EN-DC Combination	LTE Uplink	5G-NR Uplink	SCS (kHz)	Maximum Bandwidth (MHz)
FDD	DC_2A_5A_n5A	2A	n5A	15	20
FDD	DC_2A_66A_n5A	2A, 66A	n5A	15	20
FDD	DC_13A_n66A	13A	n66A	15	20
FDD	DC_2A_13A_n66A	2A, 13A	n66A	15	20
FDD	DC_13A_66A_n66A	13A	n66A	15	20
FDD	DC_5A_n2A	5A	n2A	15	20
FDD	DC_2A_n5A	2A	n5A	15	20
FDD	DC_66A_n5A	66A	n5A	15	20
FDD	DC_5A_n66A	5A	n66A	15	20
FDD	DC_2A_5A_n2A	5A	n2A	15	20
FDD	DC_5A_66A_n2A	5A, 66A	n2A	15	20
FDD	DC_2A_2A_n5A	2A	n5A	15	20
FDD	DC_5A_66A_n5A	66A	n5A	15	20



FDD	DC_66A_66A_n5A	66A	n5A	15	20
FDD	DC_2A_5A_n66A	2A, 5A	n66A	15	20
FDD	DC_5A_66A_n66A	5A	n66A	15	20
FDD	DC_66A_n2A	66A	n2A	15	20
FDD	DC_13A_n2A	13A	n2A	15	20
FDD	DC_13A_66A_n2A	13A, 66A	n2A	15	20
FDD	DC_13A_66A_n5A	66A	n5A	15	20
FDD	DC_2A_13A_n5A	2A	n5A	15	20
FDD	DC_5A_13A_n66A	5A, 13A	n66A	15	20
FDD	DC_5A_5A_n66A	5A	n66A	15	20
FDD	DC_5B_n66A	5A	n66A	15	20
FDD	DC_5A_13A_n2A	5A, 13A	n2A	15	20
FDD	DC_2A_13A_n2A	13A	n2A	15	20
FDD	DC_5A_5A_n2A	5A	n2A	15	20
FDD	DC_5B_n2A	5A	n2A	15	20
FDD	DC_66B_n5A	66A	n5A	15	20
FDD	DC_66C_n5A	66A	n5A	15	20
FDD	DC_48A_n5A	48A	n5A	15	20
FDD	DC_48A_66A_n5A	48A, 66A	n5A	15	20
TDD	DC_2A_n77A	2A	n77A	30	100
TDD	DC_5A_n77A	5A	n77A	30	100
TDD	DC_13A_n77A	13A	n77A	30	100
TDD	DC_2A_2A_n77A	2A	n77A	30	100
TDD	DC_66A_n77A	66A	n77A	30	100

EN-DC Configuration	LTE Signal Carrier				5G NR		
	Band	BW (MHz)	Maximum Power(dBm)		Band	BW (MHz)	Maximum Power(dBm)
			Standalone	EN-DC Active			EN-DC Active
DC_2A_5A_n5A	2	20	16.0	21.5	n5A	20	24.0
DC_2A_66A_n5A	2	20	16.0	21.5	n5A	20	24.0
DC_13A_n66A	13	10	24.5	14.0	n66A	20	15.5
DC_2A_13A_n66A	2	20	16.0	14.0	n66A	20	15.5
DC_13A_66A_n66A	13	10	24.5	14.0	n66A	20	15.5
DC_5A_n2A	5	10	19.0	12.5	n2A	20	15.0
DC_2A_n5A	2	20	16.0	21.5	n5A	20	24.0
DC_66A_n5A	66	20	15.0	21.5	n5A	20	24.0



DC_5A_n66A	5	10	19.0	14.0	n66A	20	15.5
DC_2A_5A_n2A	2	20	16.0	12.5	n2A	20	15.0
DC_5A_66A_n2A	5	10	19.0	12.5	n2A	20	15.0
DC_2A_2A_n5A	2	20	16.0	21.5	n5A	20	24.0
DC_5A_66A_n5A	5	10	19.0	21.5	n5A	20	24.0
DC_66A_66A_n5A	66	20	15.0	21.5	n5A	20	24.0
DC_2A_5A_n66A	2	20	16.0	14.0	n66A	20	15.5
DC_5A_66A_n66A	5	10	19.0	14.0	n66A	20	15.5
DC_66A_n2A	66	20	15.0	12.5	n2A	20	15.0
DC_13A_n2A	13	10	24.5	12.5	n2A	20	15.0
DC_13A_66A_n2A	13	10	24.5	12.5	n2A	20	15.0
DC_13A_66A_n5A	2	20	16.0	21.5	n5A	20	24.0
DC_2A_13A_n5A	2	20	16.0	21.5	n5A	20	24.0
DC_5A_13A_n66A	5	10	19.0	14.0	n66A	20	15.5
DC_5A_5A_n66A	5	10	19.0	14.0	n66A	20	15.5
DC_5B_n66A	5	10	19.0	14.0	n66A	20	15.5
DC_5A_13A_n2A	5	10	19.0	12.5	n2A	20	15.0
DC_2A_13A_n2A	2	20	16.0	12.5	n2A	20	15.0
DC_5A_5A_n2A	5	10	19.0	12.5	n2A	20	15.0
DC_5B_n2A	5	10	19.0	12.5	n2A	20	15.0
DC_66B_n5A	66	20	15.0	21.5	n5A	20	24.0
DC_66C_n5A	66	20	15.0	21.5	n5A	20	24.0
DC_48A_n5A	48	20	15.0	21.5	n5A	20	24.0
DC_48A_66A_n5A	48	20	15.0	21.5	n5A	20	24.0
DC_2A_n77A	2	20	16.0	18.0	n77A	100	18.0
DC_5A_n77A	5	10	19.0	18.0	n77A	100	18.0
DC_13A_n77A	13	10	24.5	18.0	n77A	100	18.0
DC_2A_2A_n77A	2	20	16.0	15.0	n77A	100	18.0
DC_66A_n77A	66	20	15.0	15.0	n77A	100	18.0

Note:

The total power of EN-DC refers to SZ21030417W11.

15 Exposure Positions Consideration

15.1 EUT Antenna Locations

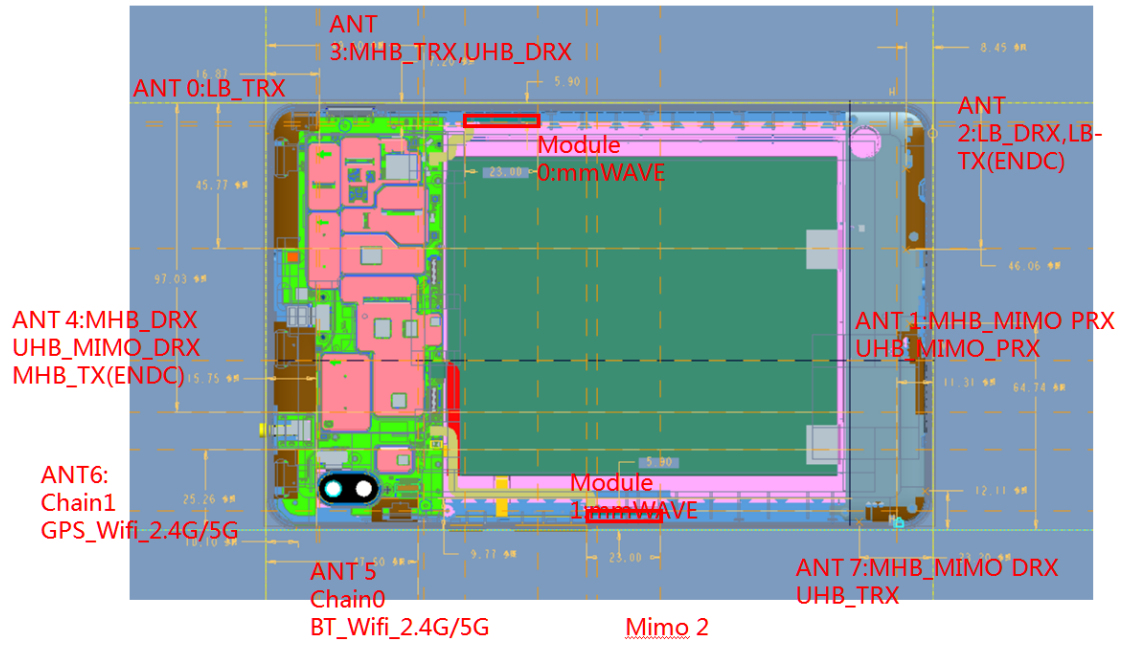


Fig.11.1 EUT Antenna Locations



15.2 Test Positions Consideration

Bands	Frequency (MHz)	Maximum Power		Exposure Position/Distance between the antennas and edge/surface of EUT (mm)				
		dBm	mW	Bottom Face	Edge 1	Edge 2	Edge 3	Edge 4
WCDMA II Ant.3	1910	13.0	20.0	5.0	73.7	112.3	124	5
WCDMA IV Ant.3	1755	14.0	25.1	5.0	73.7	112.33	124	5
WCDMA V Ant.0	849	17.0	50.1	5.0	5.0	88.2	192.1	5
LTE Band 2 Ant.3	1910	16.0	39.8	5.0	73.7	112.33	124	5
LTE Band 2 Ant.4	1910	12.0	15.8	5.0	5.0	36.97	192.1	81.3
LTE Band 4 Ant.3	1755	15.0	31.6	5.0	73.7	112.33	124	5
LTE Band 4 Ant.4	1755	11.5	14.1	5.0	5.0	36.97	192.1	81.3
LTE Band 5 Ant.0	849	24.5	281.8	5.0	5.0	88.2	192.1	5
LTE Band 5 Ant.2	849	24.5	281.8	5.0	200.6	87.9	8.5	5
LTE Band 12 Ant.0	716	24.5	281.8	5.0	5.0	88.2	192.1	5
LTE Band 13 Ant.0	784.5	24.5	281.8	5.0	5.0	88.2	192.1	5
LTE Band 13 Ant.2	784.5	23.0	199.5	5.0	200.6	87.9	8.5	5
LTE Band 17 Ant.0	716	24.5	281.8	5.0	5.0	88.2	192.1	5
LTE Band 48 Ant.7	3700	15.0	31.6	5.0	185.8	5.0	5.0	121.9
LTE Band 66 Ant.3	1780	15.0	31.6	5.0	73.7	112.33	124	5
LTE Band 66 Ant.4	1780	11.5	14.1	5.0	5.0	36.97	192.1	81.3
5G NR n2 Ant.3	1910	15.0	31.6	5.0	73.7	112.33	124	5
5G NR n2 Ant.4	1910	12.0	15.8	5.0	5.0	36.97	192.1	81.3
5G NR n5 Ant.0	849	23.5	251.2	5.0	5.0	88.2	192.1	5
5G NR n5 Ant.2	849	20.5	112.2	5.0	200.6	87.9	8.5	5
5G NR n66 Ant.3	1780	15.5	35.5	5.0	73.7	112.33	124	5
5G NR n66 Ant.4	1780	14.0	25.1	5.0	5.0	36.97	192.1	81.3
5G NR n77 Ant.7	3790	18.0	63.1	5.0	185.8	5.0	5.0	121.9
WLAN 2.4G Ant.5	2472	14.0	25.1	5.0	37.5	5	161.4	123.9
WLAN 2.4G Ant.6	2472	15.50	35.5	5.0	5.0	10.1	198.9	108.7
WLAN 5G Ant.5	5825	11.0	12.6	5.0	37.5	5	161.4	123.9
WLAN 5G Ant.6	5825	9.5	8.9	5.0	5.0	10.1	198.9	108.7
Bluetooth Ant.5	2480	10	10.0	5.0	37.5	5	161.4	123.9



Bands	Frequency (MHz)	Exposure Position/Calculated Threshold Value (SAR test exclusion power, mW)				
		Bottom Face	Edge 1	Edge 2	Edge 3	Edge 4
WCDMA II Ant.3	1910	5.5	346.0	732.0	849.0	5.5
WCDMA IV Ant.3	1755	6.6	350.0	736.0	853.0	6.6
WCDMA V Ant.0	849	9.2	9.2	379.0	965.0	9.2
LTE Band 2 Ant.3	1910	11.1	346.0	732.0	849.0	11.1
LTE Band 2 Ant.4	1910	3.9	3.9	0.5	1530.0	422.0
LTE Band 4 Ant.3	1755	8.5	350.0	736.0	853.0	8.5
LTE Band 4 Ant.4	1755	3.7	3.7	0.5	1535.0	426.0
LTE Band 5 Ant.0	849	14.6	14.6	379.0	966.0	14.6
LTE Band 5 Ant.2	849	51.9	1127.0	377.0	30.6	51.9
LTE Band 12 Ant.0	716	78.0	78.0	491.0	1530.0	78.0
LTE Band 13 Ant.0	784.5	90.4	90.4	476.0	1515.0	90.4
LTE Band 13 Ant.2	784.5	64.1	1800.0	473.0	37.7	64.1
LTE Band 17 Ant.0	716	78.0	78.0	491.0	1530.0	78.0
LTE Band 48 Ant.7	3698	10.3	1452.0	10.3	10.3	813.0
LTE Band 66 Ant.3	1780	10.5	328.0	714.0	831.0	10.5
LTE Band 66 Ant.4	1780	4.6	4.6	0.6	1513.0	404.0
5G NR n2 Ant.3	1910	8.8	346.0	732.0	849.0	8.8
5G NR n2 Ant.4	1910	4.4	4.4	0.6	1530.0	422.0
5G NR n5 Ant.0	849	46.2	46.2	379.0	966.0	46.2
5G NR n5 Ant.2	849	20.6	1127.0	377.0	12.1	20.6
5G NR n66 Ant.3	1780	11.5	328.0	714.0	831.0	11.5
5G NR n66 Ant.4	1780	8.2	8.2	1.1	1513.0	404.0
5G NR n77 Ant.7	3790	20.7	1449.0	20.7	20.7	810.0
WLAN 2.4G Ant.5	2472	10.0	1.3	10.0	1210.0	835.0
WLAN 2.4G Ant.6	2472	78.8	78.8	39.0	1585.0	683.0
WLAN 5G Ant.5	5825	3.9	0.5	3.9	1176.0	801.0
WLAN 5G Ant.6	5825	3.9	3.9	1.9	1551.0	649.0
Bluetooth Ant.5	2480	10.0	1.3	10.0	1210.0	835.0

Note:

1. Per KDB 616217 D04v01r02, when the overall diagonal dimension of display is > 20 cm, the test distance is 0mm; the SAR Test Exclusion Threshold in KDB 447498 section 4.3.1 can be applied to determine SAR test exclusion for adjacent edge configurations.
2. Per KDB 616217 D04v01r02, SAR evaluation for the front surface of tablet display screens is generally not necessary.
3. Per KDB 616217 D04v01r02, additional testing for hotspot SAR is not required.



16 SAR Test Results Summary

16.1 Test Guidance

1. 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 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:
 - a. ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
 - b. ≤ 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
 - c. ≤ 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 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.
4. When the WLAN MIMO is active, the reduced power will be applied to the WLAN transmitter of

antenna 5 and antenna 6.

5. This device will implements the power and sensor detection for SAR compliance in different usage scenario and Qualcomm smart transmit will manage to ensure the power level is not exceeding the average power of the actual usage scenario. The power level in different usage scenario as follows:

Transmit Condition	Wireless System	Head	Body
Standalone	WWAN	Reduced Power Level 1	Reduced Power Level 2
	WLAN 2.4GHz	Reduced Power Level 1	Reduced Power Level 2
	WLAN 5GHz	Reduced Power Level 1	Reduced Power Level 2
	Bluetooth	-	Full Power

Transmit Condition	Head	Body
Carrier Aggregation	Reduced Power Level 3	Reduced Power Level 3
LTE + 5G NR (EN-DC)	Reduced Power Level 4	Reduced Power Level 4
WWAN + WLAN MIMO	Reduced Power Level 5	Reduced Power Level 5
WWAN + WLAN MIMO + Bluetooth	-	Reduced Power Level 5



16.2 Head SAR Data

➤ WCDMA Head SAR

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)
Ant. 3 (Reduced Power Level 1)								
1#	Band II/RMC 12.2Kbps	Right Cheek	9400	18.79	19.50	1.178	0.608	0.716
	Band II/RMC 12.2Kbps	Right Tilt	9400	18.79	19.50	1.178	0.262	0.308
	Band II/RMC 12.2Kbps	Left Cheek	9400	18.79	19.50	1.178	0.426	0.501
	Band II/RMC 12.2Kbps	Left Tilt	9400	18.79	19.50	1.178	0.167	0.197
Ant. 3 (Reduced Power Level 1)								
2#	Band IV/RMC 12.2Kbps	Right Cheek	1413	19.01	19.50	1.119	0.680	0.761
	Band IV/RMC 12.2Kbps	Right Tilt	1413	19.01	19.50	1.119	0.298	0.333
	Band IV/RMC 12.2Kbps	Left Cheek	1413	19.01	19.50	1.119	0.598	0.669
	Band IV/RMC 12.2Kbps	Left Tilt	1413	19.01	19.50	1.119	0.184	0.206
Ant. 0 (Reduced Power Level 1)								
3#	Band V/RMC 12.2Kbps	Right Cheek	4182	18.33	19.00	1.167	0.674	0.786
	Band V/RMC 12.2Kbps	Right Tilt	4182	18.33	19.00	1.167	0.221	0.257
	Band V/RMC 12.2Kbps	Left Cheek	4182	18.33	19.00	1.167	0.437	0.510
	Band V/RMC 12.2Kbps	Left Tilt	4182	18.33	19.00	1.167	0.351	0.409



➤ **LTE QPSK Head SAR**

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)
Ant 3 (Reduced Power Level 1)								
4#	LTE Band 2/1RB#0 20M	Right Cheek	18900	18.88	19.50	1.153	0.986	1.137
	LTE Band 2/1RB#0 20M	Right Tilt	18900	18.88	19.50	1.153	0.272	0.313
	LTE Band 2/1RB#0 20M	Left Cheek	18900	18.88	19.50	1.153	0.629	0.726
	LTE Band 2/1RB#0 20M	Left Tilt	18900	18.88	19.50	1.153	0.223	0.257
	LTE Band 2/1RB#0 20M	Right Cheek	18700	18.84	19.50	1.164	0.940	1.094
	LTE Band 2/1RB#0 20M	Right Cheek	19100	18.77	19.50	1.183	0.842	0.996
	LTE Band 2/100RB#0 20M	Right Cheek	18900	17.39	18.50	1.291	0.511	0.660
	LTE Band 2/50RB#0 20M	Right Cheek	18900	17.63	18.50	1.222	0.791	0.966
	LTE Band 2/50RB#0 20M	Right Tilt	18900	17.63	18.50	1.222	0.212	0.259
	LTE Band 2/50RB#0 20M	Left Cheek	18900	17.63	18.50	1.222	0.541	0.661
	LTE Band 2/50RB#0 20M	Left Tilt	18900	17.63	18.50	1.222	0.174	0.213
	LTE Band 2/50RB#0 20M	Right Cheek	18700	17.59	18.50	1.233	0.762	0.940
	LTE Band 2/50RB#0 20M	Right Cheek	19100	17.50	18.50	1.259	0.714	0.899
Ant. 3 for CA (Reduced Power Level 3)								
	LTE Band 2/1RB#0 20M	Right Cheek	18900	11.21	12.00	1.199	0.093	0.112
	LTE Band 2/1RB#0 20M	Right Tilt	18900	11.21	12.00	1.199	0.026	0.031
	LTE Band 2/1RB#0 20M	Left Cheek	18900	11.21	12.00	1.199	0.059	0.071
	LTE Band 2/1RB#0 20M	Left Tilt	18900	11.21	12.00	1.199	0.021	0.025
	LTE Band 2/50RB#0 20M	Right Cheek	18900	9.91	11.00	1.285	0.075	0.096
	LTE Band 2/50RB#0 20M	Right Tilt	18900	9.91	11.00	1.285	0.020	0.026
	LTE Band 2/50RB#0 20M	Left Cheek	18900	9.91	11.00	1.285	0.051	0.066
	LTE Band 2/50RB#0 20M	Left Tilt	18900	9.91	11.00	1.285	0.016	0.021
Ant. 4 for EN-DC (Reduced Power Level 4)								
	LTE Band 2/1RB#0 20M	Right Cheek	18900	11.08	11.50	1.102	0.185	0.204
	LTE Band 2/1RB#0 20M	Right Tilt	18900	11.08	11.50	1.102	0.131	0.144
	LTE Band 2/1RB#0 20M	Left Cheek	18900	11.08	11.50	1.102	0.217	0.239
	LTE Band 2/1RB#0 20M	Left Tilt	18900	11.08	11.50	1.102	0.140	0.154
	LTE Band 2/50RB#0 20M	Right Cheek	18900	9.90	10.50	1.148	0.134	0.154
	LTE Band 2/50RB#0 20M	Right Tilt	18900	9.90	10.50	1.148	0.096	0.111
	LTE Band 2/50RB#0 20M	Left Cheek	18900	9.90	10.50	1.148	0.206	0.237
	LTE Band 2/50RB#0 20M	Left Tilt	18900	9.90	10.50	1.148	0.148	0.170



Ant 0 (Reduced Power Level 1)								
5#	LTE Band 5/1RB#0 10M	Right Cheek	20525	20.26	21.00	1.186	0.959	1.137
	LTE Band 5/1RB#0 10M	Right Tilt	20525	20.26	21.00	1.186	0.591	0.701
	LTE Band 5/1RB#0 10M	Left Cheek	20525	20.26	21.00	1.186	0.691	0.820
	LTE Band 5/1RB#0 10M	Left Tilt	20525	20.26	21.00	1.186	0.542	0.642
	LTE Band 5/1RB#0 10M	Right Cheek	20450	20.17	21.00	1.211	0.887	1.074
	LTE Band 5/1RB#0 10M	Right Cheek	20600	20.20	21.00	1.202	0.924	1.111
	LTE Band 5/1RB#0 10M	Left Cheek	20450	20.17	21.00	1.211	0.637	0.771
	LTE Band 5/1RB#0 10M	Left Cheek	20600	20.20	21.00	1.202	0.653	0.785
	LTE Band 5/50RB#0 10M	Right Cheek	20525	18.91	19.50	1.146	0.472	0.541
	LTE Band 5/25RB#0 10M	Right Cheek	20525	19.17	19.50	1.079	0.801	0.865
	LTE Band 5/25RB#0 10M	Right Tilt	20525	19.17	19.50	1.079	0.480	0.518
	LTE Band 5/25RB#0 10M	Left Cheek	20525	19.17	19.50	1.079	0.575	0.620
	LTE Band 5/25RB#0 10M	Left Tilt	20525	19.17	19.50	1.079	0.437	0.472
	LTE Band 5/25RB#0 10M	Left Cheek	20450	19.15	19.50	1.084	0.675	0.732
	LTE Band 5/25RB#0 10M	Left Cheek	20600	19.13	19.50	1.089	0.702	0.764
	LTE Band 5B/1RB#0 10M	Right Cheek	20525	20.06	21.00	1.242	0.759	0.942
Ant. 0 for CA (Reduced Power Level 3)								
	LTE Band 5/1RB#0 10M	Right Cheek	20525	14.06	14.50	1.107	0.264	0.292
	LTE Band 5/1RB#0 10M	Right Tilt	20525	14.06	14.50	1.107	0.163	0.180
	LTE Band 5/1RB#0 10M	Left Cheek	20525	14.06	14.50	1.107	0.190	0.211
	LTE Band 5/1RB#0 10M	Left Tilt	20525	14.06	14.50	1.107	0.149	0.165
	LTE Band 5/25RB#0 10M	Right Cheek	20525	12.99	13.50	1.125	0.221	0.248
	LTE Band 5/25RB#0 10M	Right Tilt	20525	12.99	13.50	1.125	0.132	0.149
	LTE Band 5/25RB#0 10M	Left Cheek	20525	12.99	13.50	1.125	0.158	0.178
	LTE Band 5/25RB#0 10M	Left Tilt	20525	12.99	13.50	1.125	0.120	0.135
Ant. 2 for EN-DC (Reduced Power Level 4)								
	LTE Band 5/1RB#0 10M	Right Cheek	20525	24.15	24.50	1.084	0.028	0.030
	LTE Band 5/1RB#0 10M	Right Tilt	20525	24.15	24.50	1.084	0.015	0.016
	LTE Band 5/1RB#0 10M	Left Cheek	20525	24.15	24.50	1.084	0.030	0.032
	LTE Band 5/1RB#0 10M	Left Tilt	20525	24.15	24.50	1.084	0.016	0.018
	LTE Band 5/25RB#0 10M	Right Cheek	20525	23.06	23.50	1.107	0.021	0.023
	LTE Band 5/25RB#0 10M	Right Tilt	20525	23.06	23.50	1.107	0.012	0.013
	LTE Band 5/25RB#0 10M	Left Cheek	20525	23.06	23.50	1.107	0.023	0.025



	LTE Band 5/25RB#0 10M	Left Tilt	20525	23.06	23.50	1.107	0.012	0.014
Ant 0 (Full Power)								
	LTE Band 12/1RB#0 10M	Right Cheek	23095	24.08	24.50	1.102	0.979	1.078
	LTE Band 12/1RB#0 10M	Right Tilt	23095	24.08	24.50	1.102	0.756	0.833
	LTE Band 12/1RB#0 10M	Left Cheek	23095	24.08	24.50	1.102	0.275	0.303
	LTE Band 12/1RB#0 10M	Left Tilt	23095	24.08	24.50	1.102	0.240	0.264
	LTE Band 12/1RB#0 10M	Right Cheek	23060	23.97	24.50	1.130	0.997	1.126
6#	LTE Band 12/1RB#0 10M	Right Cheek	23130	24.00	24.50	1.122	1.020	1.144
	LTE Band 12/1RB#0 10M	Right Tilt	23060	23.97	24.50	1.130	0.751	0.848
	LTE Band 12/1RB#0 10M	Right Tilt	23130	24.00	24.50	1.122	0.772	0.866
	LTE Band 12/25RB#0 10M	Right Cheek	23095	22.91	23.50	1.146	0.812	0.930
	LTE Band 12/25RB#0 10M	Right Tilt	23095	22.91	23.50	1.146	0.627	0.718
	LTE Band 12/25RB#0 10M	Left Cheek	23095	22.91	23.50	1.146	0.223	0.255
	LTE Band 12/25RB#0 10M	Left Tilt	23095	22.91	23.50	1.146	0.193	0.221
	LTE Band 12/25RB#0 10M	Right Cheek	23060	22.84	23.50	1.164	0.825	0.960
	LTE Band 12/25RB#0 10M	Right Cheek	23130	22.86	23.50	1.159	0.950	1.101
	LTE Band 12/50RB#0 10M	Right Cheek	23095	22.74	23.50	1.191	0.720	0.858
Ant 0 (Full Power)								
7#	LTE Band 13/1RB#0 10M	Right Cheek	23230	24.11	24.50	1.094	1.020	1.116
	LTE Band 13/1RB#0 10M	Right Tilt	23230	24.11	24.50	1.094	0.772	0.845
	LTE Band 13/1RB#0 10M	Left Cheek	23230	24.11	24.50	1.094	0.421	0.461
	LTE Band 13/1RB#0 10M	Left Tilt	23230	24.11	24.50	1.094	0.378	0.414
	LTE Band 13/25RB#0 10M	Right Cheek	23230	23.08	23.50	1.102	0.855	0.942
	LTE Band 13/25RB#0 10M	Right Tilt	23230	23.08	23.50	1.102	0.640	0.705
	LTE Band 13/25RB#0 10M	Left Cheek	23230	23.08	23.50	1.102	0.348	0.383
	LTE Band 13/25RB#0 10M	Left Tilt	23230	23.08	23.50	1.102	0.305	0.336
	LTE Band 13/50RB#0 10M	Right Cheek	23230	22.82	23.50	1.169	0.756	0.884
Ant. 0 for CA (Reduced Power Level 3)								
	LTE Band 13/1RB#0 10M	Right Cheek	23230	18.61	19.00	1.094	0.294	0.322
	LTE Band 13/1RB#0 10M	Right Tilt	23230	18.61	19.00	1.094	0.223	0.244
	LTE Band 13/1RB#0 10M	Left Cheek	23230	18.61	19.00	1.094	0.115	0.126
	LTE Band 13/1RB#0 10M	Left Tilt	23230	18.61	19.00	1.094	0.103	0.113
	LTE Band 13/25RB#0 10M	Right Cheek	23230	17.58	18.00	1.102	0.247	0.272
	LTE Band 13/25RB#0 10M	Right Tilt	23230	17.58	18.00	1.102	0.174	0.192
	LTE Band 13/25RB#0 10M	Left Cheek	23230	17.58	18.00	1.102	0.095	0.105



	LTE Band 13/25RB#0 10M	Left Tilt	23230	17.58	18.00	1.102	0.083	0.091
Ant. 2 for EN-DC (Reduced Power Level 4)								
	LTE Band 13/1RB#0 10M	Right Cheek	23230	22.53	23.00	1.114	0.036	0.040
	LTE Band 13/1RB#0 10M	Right Tilt	23230	22.53	23.00	1.114	0.021	0.023
	LTE Band 13/1RB#0 10M	Left Cheek	23230	22.53	23.00	1.114	0.028	0.031
	LTE Band 13/1RB#0 10M	Left Tilt	23230	22.53	23.00	1.114	0.018	0.020
	LTE Band 13/25RB#0 10M	Right Cheek	23230	21.50	22.00	1.122	0.032	0.036
	LTE Band 13/25RB#0 10M	Right Tilt	23230	21.50	22.00	1.122	0.018	0.020
	LTE Band 13/25RB#0 10M	Left Cheek	23230	21.50	22.00	1.122	0.028	0.031
	LTE Band 13/25RB#0 10M	Left Tilt	23230	21.50	22.00	1.122	0.016	0.018
Ant. 7 (Full Power)								
8#	LTE Band 48/1RB#0 20M	Right Cheek	55990	22.74	23.50	1.191	0.145	0.173
	LTE Band 48/1RB#0 20M	Right Tilt	55990	22.74	23.50	1.191	0.077	0.092
	LTE Band 48/1RB#0 20M	Left Cheek	55990	22.74	23.50	1.191	0.077	0.092
	LTE Band 48/1RB#0 20M	Left Tilt	55990	22.74	23.50	1.191	0.058	0.069
	LTE Band 48/50RB#0 20M	Right Cheek	55990	21.64	22.00	1.086	0.096	0.104
	LTE Band 48/50RB#0 20M	Right Tilt	55990	21.64	22.00	1.086	0.058	0.063
	LTE Band 48/50RB#0 20M	Left Cheek	55990	21.64	22.00	1.086	0.077	0.083
	LTE Band 48/50RB#0 20M	Left Tilt	55990	21.64	22.00	1.086	0.038	0.042
	LTE Band 48C/1RB#0 20M	Right Cheek	55990	22.51	23.00	1.119	0.008	0.008
	LTE Band 48E/1RB#0 20M	Right Cheek	55990	22.47	23.00	1.130	0.007	0.007
Ant. 7 for CA (Reduced Power Level 3)								
	LTE Band 48/1RB#0 20M	Right Cheek	55990	10.24	11.00	1.191	0.009	0.010
	LTE Band 48/1RB#0 20M	Right Tilt	55990	10.24	11.00	1.191	0.008	0.010
	LTE Band 48/1RB#0 20M	Left Cheek	55990	10.24	11.00	1.191	0.008	0.010
	LTE Band 48/1RB#0 20M	Left Tilt	55990	10.24	11.00	1.191	0.006	0.007
	LTE Band 48/50RB#0 20M	Right Cheek	55990	9.14	10.00	1.219	0.006	0.007
	LTE Band 48/50RB#0 20M	Right Tilt	55990	9.14	10.00	1.219	0.005	0.006
	LTE Band 48/50RB#0 20M	Left Cheek	55990	9.14	10.00	1.219	0.004	0.005
	LTE Band 48/50RB#0 20M	Left Tilt	55990	9.14	10.00	1.219	0.003	0.004
Ant. 7 for EN-DC (Reduced Power Level 4)								
	LTE Band 48/1RB#0 20M	Right Cheek	55990	8.11	8.50	1.094	0.007	0.008
	LTE Band 48/1RB#0 20M	Right Tilt	55990	8.11	8.50	1.094	0.006	0.007
	LTE Band 48/1RB#0 20M	Left Cheek	55990	8.11	8.50	1.094	0.006	0.007



	LTE Band 48/1RB#0 20M	Left Tilt	55990	8.11	8.50	1.094	0.004	0.004
	LTE Band 48/50RB#0 20M	Right Cheek	55990	7.01	7.50	1.119	0.008	0.008
	LTE Band 48/50RB#0 20M	Right Tilt	55990	7.01	7.50	1.119	0.004	0.004
	LTE Band 48/50RB#0 20M	Left Cheek	55990	7.01	7.50	1.119	0.004	0.004
	LTE Band 48/50RB#0 20M	Left Tilt	55990	7.01	7.50	1.119	0.003	0.003
Ant 3 (Reduced Power Level 1)								
9#	LTE Band 66/1RB#0 20M	Right Cheek	132322	20.32	21.00	1.169	1.010	1.181
	LTE Band 66/1RB#0 20M	Right Tilt	132322	20.32	21.00	1.169	0.335	0.392
	LTE Band 66/1RB#0 20M	Left Cheek	132322	20.32	21.00	1.169	0.763	0.892
	LTE Band 66/1RB#0 20M	Left Tilt	132322	20.32	21.00	1.169	0.270	0.030
	LTE Band 66/1RB#0 20M	Right Cheek	132072	20.26	21.00	1.186	0.787	0.933
	LTE Band 66/1RB#0 20M	Right Cheek	132372	20.25	21.00	1.189	0.974	1.158
	LTE Band 66/1RB#0 20M	Left Cheek	132072	20.26	21.00	1.186	0.724	0.858
	LTE Band 66/1RB#0 20M	Left Cheek	132372	20.25	21.00	1.189	0.752	0.894
	LTE Band 66/100RB#0 20M	Right Cheek	132322	19.06	20.00	1.242	0.624	0.775
	LTE Band 66/50RB#0 20M	Right Cheek	132322	19.31	20.00	1.172	0.870	1.020
	LTE Band 66/50RB#0 20M	Right Tilt	132322	19.31	20.00	1.172	0.305	0.358
	LTE Band 66/50RB#0 20M	Left Cheek	132322	19.31	20.00	1.172	0.655	0.768
	LTE Band 66/50RB#0 20M	Left Tilt	132322	19.31	20.00	1.172	0.219	0.256
	LTE Band 66/50RB#0 20M	Right Cheek	132072	19.21	20.00	1.199	0.811	0.973
	LTE Band 66/50RB#0 20M	Right Cheek	132372	19.18	20.00	1.208	0.783	0.946
Ant. 3 for CA (Reduced Power Level 3)								
	LTE Band 66/1RB#0 20M	Right Cheek	132322	10.62	11.00	1.091	0.082	0.090
	LTE Band 66/1RB#0 20M	Right Tilt	132322	10.62	11.00	1.091	0.027	0.030
	LTE Band 66/1RB#0 20M	Left Cheek	132322	10.62	11.00	1.091	0.062	0.068
	LTE Band 66/1RB#0 20M	Left Tilt	132322	10.62	11.00	1.091	0.022	0.030
	LTE Band 66/50RB#0 20M	Right Cheek	132322	9.52	10.00	1.117	0.070	0.079
	LTE Band 66/50RB#0 20M	Right Tilt	132322	9.52	10.00	1.117	0.025	0.028
	LTE Band 66/50RB#0 20M	Left Cheek	132322	9.52	10.00	1.117	0.053	0.059
	LTE Band 66/50RB#0 20M	Left Tilt	132322	9.52	10.00	1.117	0.018	0.020
Ant. 4 for EN-DC (Reduced Power Level 4)								
	LTE Band 66/1RB#0 20M	Right Cheek	132322	11.05	11.50	1.109	0.244	0.271
	LTE Band 66/1RB#0 20M	Right Tilt	132322	11.05	11.50	1.109	0.142	0.158
	LTE Band 66/1RB#0 20M	Left Cheek	132322	11.05	11.50	1.109	0.281	0.312



	LTE Band 66/1RB#0 20M	Left Tilt	132322	11.05	11.50	1.109	0.186	0.206
	LTE Band 66/50RB#0 20M	Right Cheek	132322	10.11	10.50	1.094	0.223	0.244
	LTE Band 66/50RB#0 20M	Right Tilt	132322	10.11	10.50	1.094	0.140	0.153
	LTE Band 66/50RB#0 20M	Left Cheek	132322	10.11	10.50	1.094	0.232	0.254
	LTE Band 66/50RB#0 20M	Left Tilt	132322	10.11	10.50	1.094	0.175	0.191

➤ **5G NR DFT-s-QPSK Head SAR**

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)
Ant 3 (Reduced Power Level 1)								
10#	NR n2/1RB#1 20M	Right Cheek	376000	20.31	21.00	1.172	0.970	1.137
	NR n2/1RB#1 20M	Right Tilt	376000	20.31	21.00	1.172	0.772	0.905
	NR n2/1RB#1 20M	Left Cheek	376000	20.31	21.00	1.172	0.862	1.011
	NR n2/1RB#1 20M	Left Tilt	376000	20.31	21.00	1.172	0.377	0.442
	NR n2/1RB#1 20M	Right Cheek	372000	20.24	21.00	1.191	0.914	1.089
	NR n2/1RB#1 20M	Right Cheek	380000	20.28	21.00	1.180	0.869	1.026
	NR n2/1RB#1 20M	Right Tilt	372000	20.24	21.00	1.191	0.914	1.089
	NR n2/1RB#1 20M	Right Tilt	380000	20.28	21.00	1.180	0.869	1.026
	NR n2/1RB#1 20M	Left Cheek	372000	20.24	21.00	1.191	0.914	1.089
	NR n2/1RB#1 20M	Left Cheek	380000	20.28	21.00	1.180	0.869	1.026
	NR n2/100RB#1 20M	Right Cheek	376000	19.59	20.00	1.099	0.477	0.524
	NR n2/50RB#1 20M	Right Cheek	376000	19.88	20.50	1.153	0.862	0.995
	NR n2/50RB#1 20M	Right Tilt	376000	19.88	20.50	1.153	0.530	0.611
	NR n2/50RB#1 20M	Left Cheek	376000	19.88	20.50	1.153	0.539	0.622
	NR n2/50RB#1 20M	Left Tilt	376000	19.88	20.50	1.153	0.260	0.300
	NR n2/50RB#1 20M	Left Cheek	372000	19.80	20.50	1.175	0.763	0.896
	NR n2/50RB#1 20M	Left Cheek	380000	19.77	20.50	1.183	0.811	0.959
Ant. 4 for EN-DC (Reduced Power Level 4)								
	NR n2/1RB#1 20M	Right Cheek	376000	11.82	12.50	1.169	0.173	0.202
	NR n2/1RB#1 20M	Right Tilt	376000	11.82	12.50	1.169	0.154	0.180
	NR n2/1RB#1 20M	Left Cheek	376000	11.82	12.50	1.169	0.237	0.277
	NR n2/1RB#1 20M	Left Tilt	376000	11.82	12.50	1.169	0.137	0.160
	NR n2/50RB#1 20M	Right Cheek	376000	11.25	12.00	1.189	0.102	0.121
	NR n2/50RB#1 20M	Right Tilt	376000	11.25	12.00	1.189	0.079	0.094
	NR n2/50RB#1 20M	Left Cheek	376000	11.25	12.00	1.189	0.112	0.133



	NR n2/50RB#1 20M	Left Tilt	376000	11.25	12.00	1.189	0.081	0.096
Ant 0 (Full Power)								
11#	NR n5/1RB#1 20M	Right Cheek	167300	23.53	24.00	1.114	0.488	0.544
	NR n5/1RB#1 20M	Right Tilt	167300	23.53	24.00	1.114	0.375	0.418
	NR n5/1RB#1 20M	Left Cheek	167300	23.53	24.00	1.114	0.329	0.367
	NR n5/1RB#1 20M	Left Tilt	167300	23.53	24.00	1.114	0.300	0.335
	NR n5/50RB#1 20M	Right Cheek	167300	22.66	23.00	1.081	0.312	0.337
	NR n5/50RB#1 20M	Right Tilt	167300	22.66	23.00	1.081	0.204	0.221
	NR n5/50RB#1 20M	Left Cheek	167300	22.66	23.00	1.081	0.258	0.279
	NR n5/50RB#1 20M	Left Tilt	167300	22.66	23.00	1.081	0.266	0.288
Ant. 2 for EN-DC (Reduced Power Level 4)								
	NR n5/1RB#1 20M	Right Cheek	167300	20.83	21.50	1.167	0.026	0.030
	NR n5/1RB#1 20M	Right Tilt	167300	20.83	21.50	1.167	0.014	0.016
	NR n5/1RB#1 20M	Left Cheek	167300	20.83	21.50	1.167	0.018	0.021
	NR n5/1RB#1 20M	Left Tilt	167300	20.83	21.50	1.167	0.012	0.014
	NR n5/50RB#1 20M	Right Cheek	167300	19.96	20.50	1.132	0.017	0.019
	NR n5/50RB#1 20M	Right Tilt	167300	19.96	20.50	1.132	0.010	0.011
	NR n5/50RB#1 20M	Left Cheek	167300	19.96	20.50	1.132	0.012	0.014
	NR n5/50RB#1 20M	Left Tilt	167300	19.96	20.50	1.132	0.009	0.010
Ant 3 (Reduced Power Level 1)								
12#	NR n66/1RB#1 20M	Right Cheek	349000	20.38	21.00	1.153	0.935	1.078
	NR n66/1RB#1 20M	Right Tilt	349000	20.38	21.00	1.153	0.678	0.782
	NR n66/1RB#1 20M	Left Cheek	349000	20.38	21.00	1.153	0.543	0.626
	NR n66/1RB#1 20M	Left Tilt	349000	20.38	21.00	1.153	0.279	0.321
	NR n66/1RB#1 20M	Right Cheek	344000	20.20	21.00	1.202	0.829	0.997
	NR n66/1RB#1 20M	Right Cheek	354000	20.28	21.00	1.180	0.877	1.035
	NR n66/1RB#1 20M	Right Cheek	349000	19.58	20.50	1.236	0.527	0.651
	NR n66/50RB#1 20M	Right Cheek	349000	19.74	20.50	1.191	0.802	0.956
	NR n66/50RB#1 20M	Right Tilt	349000	19.74	20.50	1.191	0.524	0.624
	NR n66/50RB#1 20M	Left Cheek	349000	19.74	20.50	1.191	0.530	0.632
	NR n66/50RB#1 20M	Left Tilt	349000	19.74	20.50	1.191	0.206	0.245
	NR n66/50RB#1 20M	Right Cheek	344000	19.71	20.50	1.199	0.726	0.871
	NR n66/50RB#1 20M	Right Cheek	354000	19.70	20.50	1.202	0.741	0.891
Ant. 4 for EN-DC (Reduced Power Level 4)								
	NR n66/1RB#1 20M	Right Cheek	349000	13.46	14.00	1.132	0.147	0.166



	NR n66/1RB#1 20M	Right Tilt	349000	13.46	14.00	1.132	0.112	0.127
	NR n66/1RB#1 20M	Left Cheek	349000	13.46	14.00	1.132	0.191	0.216
	NR n66/1RB#1 20M	Left Tilt	349000	13.46	14.00	1.132	0.127	0.144
	NR n66/50RB#1 20M	Right Cheek	349000	12.82	13.50	1.169	0.134	0.157
	NR n66/50RB#1 20M	Right Tilt	349000	12.82	13.50	1.169	0.090	0.105
	NR n66/50RB#1 20M	Left Cheek	349000	12.82	13.50	1.169	0.140	0.164
	NR n66/50RB#1 20M	Left Tilt	349000	12.82	13.50	1.169	0.092	0.108
Ant. 7 for EN-DC (Reduced Power Level 4)								
13#	NR n77/1RB#1 100M	Right Cheek	656000	17.58	18.00	1.102	0.013	0.015
	NR n77/1RB#1 100M	Right Tilt	656000	17.58	18.00	1.102	0.008	0.009
	NR n77/1RB#1 100M	Left Cheek	656000	17.58	18.00	1.102	0.010	0.011
	NR n77/1RB#1 100M	Left Tilt	656000	17.58	18.00	1.102	0.006	0.007
	NR n77/135RB#1 100M	Right Cheek	656000	16.36	17.00	1.159	0.011	0.013
	NR n77/135RB#1 100M	Right Tilt	656000	16.36	17.00	1.159	0.008	0.009
	NR n77/135RB#1 100M	Left Cheek	656000	16.36	17.00	1.159	0.008	0.009
	NR n77/135RB#1 100M	Left Tilt	656000	16.36	17.00	1.159	0.008	0.010

➤ WLAN Head SAR

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)
Ant 5 (Reduced Power Level 1)								
	WLAN2.4GHz/802.11b	Right Cheek	1	16.01	16.50	1.119	0.281	0.314
	WLAN2.4GHz/802.11b	Right Tilt	1	16.01	16.50	1.119	0.091	0.101
	WLAN2.4GHz/802.11b	Left Cheek	1	16.01	16.50	1.119	0.435	0.487
	WLAN2.4GHz/802.11b	Left Tilt	1	16.01	16.50	1.119	0.137	0.153
Ant 5 for MIMO Simultaneous Transmission (Reduced Power Level 5)								
	WLAN2.4GHz/802.11b	Right Cheek	6	9.30	10.00	1.175	0.028	0.033
	WLAN2.4GHz/802.11b	Right Tilt	6	9.30	10.00	1.175	0.134	0.157
	WLAN2.4GHz/802.11b	Left Cheek	6	9.30	10.00	1.175	0.134	0.157
	WLAN2.4GHz/802.11b	Left Tilt	6	9.30	10.00	1.175	0.042	0.049
Ant 6 (Reduced Power Level 1)								
	WLAN2.4GHz/802.11b	Right Cheek	6	14.67	15.00	1.079	0.320	0.345
	WLAN2.4GHz/802.11b	Right Tilt	6	14.67	15.00	1.079	0.180	0.194
14#	WLAN2.4GHz/802.11b	Left Cheek	6	14.67	15.00	1.079	0.444	0.479
	WLAN2.4GHz/802.11b	Left Tilt	6	14.67	15.00	1.079	0.198	0.214
Ant 6 for MIMO Simultaneous Transmission (Reduced Power Level 5)								



	WLAN2.4GHz/802.11b	Right Cheek	6	10.96	11.50	1.132	0.136	0.154
	WLAN2.4GHz/802.11b	Right Tilt	6	10.96	11.50	1.132	0.077	0.087
	WLAN2.4GHz/802.11b	Left Cheek	6	10.96	11.50	1.132	0.189	0.214
	WLAN2.4GHz/802.11b	Left Tilt	6	10.96	11.50	1.132	0.084	0.095
Ant 5 (Reduced Power Level 1)								
	WLAN5.2GHz/802.11n40	Right Cheek	38	13.24	13.50	1.062	0.409	0.449
	WLAN5.2GHz/802.11n40	Right Tilt	38	13.24	13.50	1.062	0.250	0.274
15#	WLAN5.2GHz/802.11n40	Left Cheek	38	13.24	13.50	1.062	0.501	0.550
	WLAN5.2GHz/802.11n40	Left Tilt	38	13.24	13.50	1.062	0.301	0.330
Ant 5 for MIMO Simultaneous Transmission (Reduced Power Level 5)								
	WLAN5.2GHz/802.11n40	Right Cheek	38	8.46	9.00	1.132	0.041	0.048
	WLAN5.2GHz/802.11n40	Right Tilt	38	8.46	9.00	1.132	0.025	0.029
	WLAN5.2GHz/802.11n40	Left Cheek	38	8.46	9.00	1.132	0.050	0.059
	WLAN5.2GHz/802.11n40	Left Tilt	38	8.46	9.00	1.132	0.083	0.097
Ant 6 (Reduced Power Level 1)								
	WLAN5.2GHz/802.11n40	Right Cheek	38	13.18	13.50	1.076	0.292	0.325
	WLAN5.2GHz/802.11n40	Right Tilt	38	13.18	13.50	1.076	0.267	0.297
	WLAN5.2GHz/802.11n40	Left Cheek	38	13.18	13.50	1.076	0.481	0.535
	WLAN5.2GHz/802.11n40	Left Tilt	38	13.18	13.50	1.076	0.455	0.507
Ant 6 for MIMO Simultaneous Transmission (Reduced Power Level 5)								
	WLAN5.2GHz/802.11n40	Right Cheek	38	5.28	5.50	1.052	0.026	0.028
	WLAN5.2GHz/802.11n40	Right Tilt	38	5.28	5.50	1.052	0.024	0.026
	WLAN5.2GHz/802.11n40	Left Cheek	38	5.28	5.50	1.052	0.026	0.028
	WLAN5.2GHz/802.11n40	Left Tilt	38	5.28	5.50	1.052	0.057	0.062
Ant 5 (Reduced Power Level 1)								
	WLAN5.3GHz/802.11n40	Right Cheek	62	12.63	13.00	1.089	0.385	0.433
	WLAN5.3GHz/802.11n40	Right Tilt	62	12.63	13.00	1.089	0.271	0.305
16#	WLAN5.3GHz/802.11n40	Left Cheek	62	12.63	13.00	1.089	0.479	0.539
	WLAN5.3GHz/802.11n40	Left Tilt	62	12.63	13.00	1.089	0.352	0.396
Ant 5 for MIMO Simultaneous Transmission (Reduced Power Level 5)								
	WLAN5.3GHz/802.11n40	Right Cheek	62	6.70	7.00	1.072	0.082	0.091
	WLAN5.3GHz/802.11n40	Right Tilt	62	6.70	7.00	1.072	0.058	0.064
	WLAN5.3GHz/802.11n40	Left Cheek	62	6.70	7.00	1.072	0.102	0.113
	WLAN5.3GHz/802.11n40	Left Tilt	62	6.70	7.00	1.072	0.075	0.083
Ant 6 (Reduced Power Level 1)								
	WLAN5.3GHz/802.11n40	Right Cheek	62	12.84	13.50	1.164	0.401	0.483
	WLAN5.3GHz/802.11n40	Right Tilt	62	12.84	13.50	1.164	0.354	0.427
	WLAN5.3GHz/802.11n40	Left Cheek	62	12.84	13.50	1.164	0.450	0.542



	WLAN5.3GHz/802.11n40	Left Tilt	62	12.84	13.50	1.164	0.426	0.513
Ant 6 for MIMO Simultaneous Transmission (Reduced Power Level 5)								
	WLAN5.3GHz/802.11n40	Right Cheek	62	3.97	4.50	1.130	0.051	0.060
	WLAN5.3GHz/802.11n40	Right Tilt	62	3.97	4.50	1.130	0.045	0.053
	WLAN5.3GHz/802.11n40	Left Cheek	62	3.97	4.50	1.130	0.058	0.067
	WLAN5.3GHz/802.11n40	Left Tilt	62	3.97	4.50	1.130	0.044	0.051
Ant 5 (Reduced Power Level 1)								
	WLAN5.5GHz/802.11n40	Right Cheek	102	12.76	13.00	1.057	0.336	0.368
	WLAN5.5GHz/802.11n40	Right Tilt	102	12.76	13.00	1.057	0.164	0.180
17#	WLAN5.5GHz/802.11n40	Left Cheek	102	12.76	13.00	1.057	0.432	0.472
	WLAN5.5GHz/802.11n40	Left Tilt	102	12.76	13.00	1.057	0.313	0.343
Ant 5 for MIMO Simultaneous Transmission (Reduced Power Level 5)								
	WLAN5.5GHz/802.11n40	Right Cheek	102	5.28	5.50	1.052	0.075	0.082
	WLAN5.5GHz/802.11n40	Right Tilt	102	5.28	5.50	1.052	0.037	0.040
	WLAN5.5GHz/802.11n40	Left Cheek	102	5.28	5.50	1.052	0.097	0.105
	WLAN5.5GHz/802.11n40	Left Tilt	102	5.28	5.50	1.052	0.070	0.076
Ant 6 (Reduced Power Level 1)								
	WLAN5.5GHz/802.11ac80	Right Cheek	106	12.67	13.00	1.079	0.308	0.344
	WLAN5.5GHz/802.11ac80	Right Tilt	106	12.67	13.00	1.079	0.346	0.386
	WLAN5.5GHz/802.11ac80	Left Cheek	106	12.67	13.00	1.079	0.473	0.528
	WLAN5.5GHz/802.11ac80	Left Tilt	106	12.67	13.00	1.079	0.391	0.436
Ant 6 for MIMO Simultaneous Transmission (Reduced Power Level 5)								
	WLAN5.5GHz/802.11n40	Right Cheek	102	5.12	5.50	1.091	0.021	0.023
	WLAN5.5GHz/802.11n40	Right Tilt	102	5.12	5.50	1.091	0.023	0.026
	WLAN5.5GHz/802.11n40	Left Cheek	102	5.12	5.50	1.091	0.035	0.039
	WLAN5.5GHz/802.11n40	Left Tilt	102	5.12	5.50	1.091	0.026	0.030
Ant 5 (Reduced Power Level 1)								
	WLAN5.8GHz/802.11n20	Right Cheek	165	165	12.16	12.50	1.081	0.481
	WLAN5.8GHz/802.11n20	Right Tilt	165	165	12.16	12.50	1.081	0.297
	WLAN5.8GHz/802.11n20	Left Cheek	165	165	12.16	12.50	1.081	0.511
	WLAN5.8GHz/802.11n20	Left Tilt	165	165	12.16	12.50	1.081	0.455
Ant 5 for MIMO Simultaneous Transmission (Reduced Power Level 5)								
	WLAN5.8GHz/802.11n20	Right Cheek	165	5.47	6.00	1.130	0.032	0.037
	WLAN5.8GHz/802.11n20	Right Tilt	165	5.47	6.00	1.130	0.020	0.023
	WLAN5.8GHz/802.11n20	Left Cheek	165	5.47	6.00	1.130	0.048	0.055
	WLAN5.8GHz/802.11n20	Left Tilt	165	5.47	6.00	1.130	0.030	0.035
Ant 6								



	WLAN5.8GHz/802.11n40	Right Cheek	159	12.44	13.00	1.138	0.357	0.420
	WLAN5.8GHz/802.11n40	Right Tilt	159	12.44	13.00	1.138	0.381	0.448
18#	WLAN5.8GHz/802.11n40	Left Cheek	159	12.44	13.00	1.138	0.447	0.526
	WLAN5.8GHz/802.11n40	Left Tilt	159	12.44	13.00	1.138	0.393	0.462
Ant 6 for MIMO Simultaneous Transmission (Reduced Power Level 5)								
	WLAN5.8GHz/802.11n40	Right Cheek	159	5.27	5.50	1.054	0.045	0.048
	WLAN5.8GHz/802.11n40	Right Tilt	159	5.27	5.50	1.054	0.047	0.051
	WLAN5.8GHz/802.11n40	Left Cheek	159	5.27	5.50	1.054	0.068	0.073
	WLAN5.8GHz/802.11n40	Left Tilt	159	5.27	5.50	1.054	0.049	0.052

Note:

1. Per KDB 447498 D01v06, for each exposure position, if the highest output power channel Reported SAR $\leq 0.8\text{W/kg}$, other channels SAR testing is not necessary.
2. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required when the measured SAR is $\geq 0.8\text{W/kg}$.
3. Per KDB 941225 D05v02r05, 100% RB allocation SAR measurement is not required when the highest reported SAR for 1 RB and 50% RB allocation are $\leq 0.8\text{ W/kg}$.
4. Per KDB 248227 D01v02r02, for 802.11b DSSS , when the reported SAR of the highest measured maximum output power channel for the exposure configuration is $\leq 0.8\text{ W/kg}$, no further SAR testing is required in that exposure configuration.
5. Per KDB 248227 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 $\leq 1.2\text{ W/kg}$.
6. According to KDB 865664 D02v01r02, SAR plot is required for the highest measured SAR in each exposure configuration, wireless mode and frequency band combination.
7. The WLAN Reported 1g SAR (W/kg) has been calculated together with the duty cycle scaling factor 1.0 for 2.4G WLAN(Ant.5/Ant.6) and 1.034 for 5.2G WLAN(Ant.5/Ant.6), 5.3G WLAN(Ant.5/Ant.6), 5.5G WLAN(Ant.5/Ant.6), 5.8G WLAN(Ant.6), 1.018 for 5.8G WLAN(Ant.5) .



16.3 Body SAR Data

➤ WCDMA Body SAR

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)
Ant. 3 (Reduced Power Level 2)								
	Band II/RMC 12.2Kbps	Bottom Face	9400	12.65	13.00	1.084	0.687	0.745
	Band II/RMC 12.2Kbps	Edge 1	9400	12.65	13.00	1.084	0.057	0.061
	Band II/RMC 12.2Kbps	Edge 4	9400	12.65	13.00	1.084	0.627	0.680
	Band II/RMC 12.2Kbps	Bottom Face	9262	12.57	13.00	1.104	0.634	0.700
19#	Band II/RMC 12.2Kbps	Bottom Face	9538	12.52	13.00	1.117	0.956	1.068
Ant. 3 (Reduced Power Level 2)								
	Band IV/RMC 12.2Kbps	Bottom Face	1413	13.29	14.00	1.178	0.718	0.846
	Band IV/RMC 12.2Kbps	Edge 1	1413	13.29	14.00	1.178	0.046	0.054
	Band IV/RMC 12.2Kbps	Edge 4	1413	13.29	14.00	1.178	0.622	0.732
	Band IV/RMC 12.2Kbps	Bottom Face	1312	13.07	14.00	1.239	0.674	0.835
20#	Band IV/RMC 12.2Kbps	Bottom Face	1513	13.18	14.00	1.208	0.899	1.086
Ant. 0 (Reduced Power Level 2)								
	Band V/RMC 12.2Kbps	Bottom Face	4182	16.32	17.00	1.169	0.635	0.743
	Band V/RMC 12.2Kbps	Edge 1	4182	16.32	17.00	1.169	0.351	0.410
	Band V/RMC 12.2Kbps	Edge 4	4182	16.32	17.00	1.169	0.503	0.588
	Band V/RMC 12.2Kbps	Bottom Face	4132	16.26	17.00	1.186	0.604	0.716
21#	Band V/RMC 12.2Kbps	Bottom Face	4233	16.17	17.00	1.211	0.643	0.778



➤ **LTE QPSK Body SAR**

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)
Ant 3 (Reduced Power Level 2)								
	LTE Band 2/1RB#0 20M	Bottom Face	18900	15.51	16.00	1.119	0.820	0.918
	LTE Band 2/1RB#0 20M	Edge 1	18900	15.51	16.00	1.119	0.079	0.089
	LTE Band 2/1RB#0 20M	Edge 4	18900	15.51	16.00	1.119	0.768	0.860
	LTE Band 2/1RB#0 20M	Bottom Face	18700	15.17	16.00	1.211	0.804	0.973
22#	LTE Band 2/1RB#0 20M	Bottom Face	19100	15.41	16.00	1.146	0.988	1.132
	LTE Band 2/1RB#0 20M	Edge 4	18700	15.27	16.00	1.183	0.750	0.887
	LTE Band 2/1RB#0 20M	Edge 4	19100	15.41	16.00	1.146	0.865	0.991
	LTE Band 2/100RB#0 20M	Bottom Face	18900	13.97	15.00	1.268	0.711	0.901
	LTE Band 2/50RB#0 20M	Bottom Face	18900	14.21	15.00	1.199	0.681	0.817
	LTE Band 2/50RB#0 20M	Edge 1	18900	14.21	15.00	1.199	0.063	0.075
	LTE Band 2/50RB#0 20M	Edge 4	18900	14.21	15.00	1.199	0.623	0.747
Ant. 3 for CA (Reduced Power Level 3)								
	LTE Band 2/1RB#0 20M	Bottom Face	18900	11.21	12.00	1.199	0.362	0.434
	LTE Band 2/1RB#0 20M	Edge 1	18900	11.21	12.00	1.199	0.035	0.042
	LTE Band 2/1RB#0 20M	Edge 4	18900	11.21	12.00	1.199	0.339	0.407
	LTE Band 2/50RB#0 20M	Bottom Face	18900	9.91	11.00	1.285	0.301	0.386
	LTE Band 2/50RB#0 20M	Edge 1	18900	9.91	11.00	1.285	0.028	0.036
	LTE Band 2/50RB#0 20M	Edge 4	18900	9.91	11.00	1.285	0.275	0.353
Ant. 4 for EN-DC (Reduced Power Level 4)								
	LTE Band 2/1RB#0 20M	Bottom Face	18900	11.08	11.50	1.102	0.452	0.498
	LTE Band 2/1RB#0 20M	Edge 1	18900	11.08	11.50	1.102	0.142	0.156
	LTE Band 2/1RB#0 20M	Edge 4	18900	11.08	11.50	1.102	0.069	0.076
	LTE Band 2/50RB#0 20M	Bottom Face	18900	9.90	10.50	1.148	0.419	0.481
	LTE Band 2/50RB#0 20M	Edge 1	18900	9.90	10.50	1.148	0.142	0.163
	LTE Band 2/50RB#0 20M	Edge 4	18900	9.90	10.50	1.148	0.069	0.079
Ant 0 (Reduced Power Level 2)								
	LTE Band 5/1RB#0 10M	Bottom Face	20525	18.16	19.00	1.213	0.705	0.855
	LTE Band 5/1RB#0 10M	Edge 1	20525	18.16	19.00	1.213	0.290	0.352
	LTE Band 5/1RB#0 10M	Edge 4	20525	18.16	19.00	1.213	0.506	0.614
	LTE Band 5/1RB#0 10M	Bottom Face	20450	18.09	19.00	1.233	0.641	0.790
23#	LTE Band 5/1RB#0 10M	Bottom Face	20600	18.12	19.00	1.225	0.724	0.887



	LTE Band 5/50RB#0 10M	Bottom Face	20525	16.83	18.00	1.309	0.549	0.719
	LTE Band 5/25RB#0 10M	Bottom Face	20525	17.09	18.00	1.233	0.574	0.708
	LTE Band 5/25RB#0 10M	Edge 1	20525	17.09	18.00	1.233	0.241	0.297
	LTE Band 5/25RB#0 10M	Edge 4	20525	17.09	18.00	1.233	0.416	0.513
	LTE Band 5B/1RB#0 10M	Bottom Face	20600	18.73	19.00	1.064	0.712	0.758
Ant. 0 for CA (Reduced Power Level 3)								
	LTE Band 5/1RB#0 10M	Bottom Face	20525	14.06	14.50	1.107	0.406	0.449
	LTE Band 5/1RB#0 10M	Edge 1	20525	14.06	14.50	1.107	0.167	0.185
	LTE Band 5/1RB#0 10M	Edge 4	20525	14.06	14.50	1.107	0.291	0.323
	LTE Band 5/25RB#0 10M	Bottom Face	20525	12.99	13.50	1.125	0.331	0.372
	LTE Band 5/25RB#0 10M	Edge 1	20525	12.99	13.50	1.125	0.139	0.156
	LTE Band 5/25RB#0 10M	Edge 4	20525	12.99	13.50	1.125	0.240	0.269
Ant. 2 for EN-DC (Reduced Power Level 4)								
	LTE Band 5/1RB#0 10M	Bottom Face	20525	24.15	24.50	1.084	0.318	0.345
	LTE Band 5/1RB#0 10M	Edge 3	20525	24.15	24.50	1.084	0.268	0.290
	LTE Band 5/1RB#0 10M	Edge 4	20525	24.15	24.50	1.084	0.158	0.171
	LTE Band 5/25RB#0 10M	Bottom Face	20525	23.06	23.50	1.107	0.296	0.328
	LTE Band 5/25RB#0 10M	Edge 3	20525	23.06	23.50	1.107	0.210	0.232
	LTE Band 5/25RB#0 10M	Edge 4	20525	23.06	23.50	1.107	0.150	0.166
Ant 0 (Reduced Power Level 2)								
	LTE Band 12/1RB#0 10M	Bottom Face	23095	24.08	24.50	1.102	0.510	0.562
	LTE Band 12/1RB#0 10M	Edge 1	23095	24.08	24.50	1.102	0.012	0.013
24#	LTE Band 12/1RB#0 10M	Edge 4	23095	24.08	24.50	1.102	0.627	0.691
	LTE Band 12/25RB#0 10M	Bottom Face	23095	22.91	23.50	1.146	0.453	0.519
	LTE Band 12/25RB#0 10M	Edge 1	23095	22.91	23.50	1.146	0.010	0.011
	LTE Band 12/25RB#0 10M	Edge 4	23095	22.91	23.50	1.146	0.534	0.612
Ant 0 (Reduced Power Level 2)								
	LTE Band 13/1RB#0 10M	Bottom Face	23230	24.11	24.50	1.094	0.503	0.550
	LTE Band 13/1RB#0 10M	Edge 1	23230	24.11	24.50	1.094	0.012	0.013
25#	LTE Band 13/1RB#0 10M	Edge 4	23230	24.11	24.50	1.094	0.531	0.581
	LTE Band 13/25RB#0 10M	Bottom Face	23230	23.08	23.50	1.102	0.440	0.485
	LTE Band 13/25RB#0 10M	Edge 1	23230	23.08	23.50	1.102	0.014	0.015



	LTE Band 13/25RB#0 10M	Edge 4	23230	23.08	23.50	1.102	0.439	0.484
Ant. 0 for CA (Reduced Power Level 3)								
	LTE Band 13/1RB#0 10M	Bottom Face	23230	18.61	19.00	1.094	0.337	0.369
	LTE Band 13/1RB#0 10M	Edge 1	23230	18.61	19.00	1.094	0.008	0.009
	LTE Band 13/1RB#0 10M	Edge 4	23230	18.61	19.00	1.094	0.356	0.389
	LTE Band 13/25RB#0 10M	Bottom Face	23230	17.58	18.00	1.102	0.295	0.325
	LTE Band 13/25RB#0 10M	Edge 1	23230	17.58	18.00	1.102	0.009	0.010
	LTE Band 13/25RB#0 10M	Edge 4	23230	17.58	18.00	1.102	0.293	0.323
Ant. 2 for EN-DC (Reduced Power Level 4)								
	LTE Band 13/1RB#0 10M	Bottom Face	23230	22.53	23.00	1.114	0.498	0.555
	LTE Band 13/1RB#0 10M	Edge 3	23230	22.53	23.00	1.114	0.365	0.407
	LTE Band 13/1RB#0 10M	Edge 4	23230	22.53	23.00	1.114	0.023	0.026
	LTE Band 13/25RB#0 10M	Bottom Face	23230	21.50	22.00	1.122	0.387	0.434
	LTE Band 13/25RB#0 10M	Edge 3	23230	21.50	22.00	1.122	0.293	0.329
	LTE Band 13/25RB#0 10M	Edge 4	23230	21.50	22.00	1.122	0.023	0.026
Ant. 7 (Reduced Power Level 2)								
	LTE Band 48/1RB#0 20M	Bottom Face	55990	14.34	15.00	1.164	0.785	0.914
	LTE Band 48/1RB#0 20M	Edge 2	55990	14.34	15.00	1.164	0.208	0.242
	LTE Band 48/1RB#0 20M	Edge 3	55990	14.34	15.00	1.164	0.276	0.321
	LTE Band 48/1RB#0 20M	Bottom Face	55340	14.24	15.00	1.191	0.768	0.915
	LTE Band 48/1RB#0 20M	Bottom Face	55830	14.20	15.00	1.202	0.788	0.947
	LTE Band 48/1RB#0 20M	Bottom Face	56150	14.27	15.00	1.183	0.789	0.933
26#	LTE Band 48/1RB#0 20M	Bottom Face	56640	14.24	15.00	1.191	0.916	1.091
	LTE Band 48/50RB#0 20M	Bottom Face	55990	13.24	14.00	1.191	0.673	0.802
	LTE Band 48/50RB#0 20M	Edge 2	55990	13.24	14.00	1.191	0.182	0.217
	LTE Band 48/50RB#0 20M	Edge 3	55990	13.24	14.00	1.191	0.224	0.267
	LTE Band 48/50RB#0 20M	Bottom Face	55340	13.13	14.00	1.222	0.700	0.855
	LTE Band 48/50RB#0 20M	Bottom Face	55830	13.14	14.00	1.219	0.666	0.812
	LTE Band 48/50RB#0 20M	Bottom Face	56150	13.19	14.00	1.205	0.668	0.805
	LTE Band 48/50RB#0 20M	Bottom Face	56640	13.12	14.00	1.225	0.783	0.959
	LTE Band 48/100RB#0 20M	Bottom Face	55990	13.05	14.00	1.245	0.625	0.778
	LTE Band 48C/1RB#0 20M	Bottom Face	56640	13.55	14.00	1.109	0.815	0.904
	LTE Band 48E/1RB#0 20M	Bottom Face	56640	13.41	14.00	1.146	0.804	0.921



Ant. 7 for CA (Reduced Power Level 3)								
	LTE Band 48/1RB#0 20M	Bottom Face	55990	10.24	11.00	1.191	0.387	0.460
	LTE Band 48/1RB#0 20M	Edge 2	55990	10.24	11.00	1.191	0.102	0.122
	LTE Band 48/1RB#0 20M	Edge 3	55990	10.24	11.00	1.191	0.136	0.162
Ant. 7 for EN-DC (Reduced Power Level 4)								
	LTE Band 48/50RB#0 20M	Bottom Face	55990	9.14	10.00	1.219	0.331	0.404
	LTE Band 48/50RB#0 20M	Edge 2	55990	9.14	10.00	1.219	0.090	0.109
	LTE Band 48/50RB#0 20M	Edge 3	55990	9.14	10.00	1.219	0.110	0.134
Ant. 3 (Reduced Power Level 2)								
	LTE Band 66/1RB#0 20M	Bottom Face	132322	14.69	15.00	1.074	0.697	0.749
	LTE Band 66/1RB#0 20M	Edge 1	132322	14.69	15.00	1.074	0.059	0.063
	LTE Band 66/1RB#0 20M	Edge 4	132322	14.69	15.00	1.074	0.855	0.918
27#	LTE Band 66/1RB#0 20M	Edge 4	132072	14.61	15.00	1.094	0.933	1.021
	LTE Band 66/1RB#0 20M	Edge 4	132572	14.55	15.00	1.109	0.796	0.883
	LTE Band 66/100RB#0 20M	Edge 4	132072	13.41	14.00	1.146	0.684	0.784
Ant. 3 for CA (Reduced Power Level 3)								
	LTE Band 66/50RB#0 20M	Bottom Face	132322	13.66	14.00	1.081	0.623	0.674
	LTE Band 66/50RB#0 20M	Edge 1	132322	13.66	14.00	1.081	0.048	0.052
	LTE Band 66/50RB#0 20M	Edge 4	132322	13.66	14.00	1.081	0.672	0.727
Ant. 4 for EN-DC/EN-DC Simultaneous Transmission								
	LTE Band 66/1RB#0 20M	Bottom Face	132322	11.05	11.50	1.109	0.473	0.525



	LTE Band 66/1RB#0 20M	Edge 1	132322	11.05	11.50	1.109	0.169	0.187
	LTE Band 66/1RB#0 20M	Edge 4	132572	11.05	11.50	1.109	0.047	0.052
	LTE Band 66/50RB#0 20M	Bottom Face	132322	10.11	10.50	1.094	0.462	0.505
	LTE Band 66/50RB#0 20M	Edge 1	132322	10.11	10.50	1.094	0.140	0.153
	LTE Band 66/50RB#0 20M	Edge 4	132322	10.11	10.50	1.094	0.042	0.046

➤ **5G NR DFT-s-QPSK Body SAR**

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)
Ant 3 (Reduced Power Level 2)								
	NR n2/1RB#1 20M	Bottom Face	376000	14.52	15.00	1.117	0.718	0.802
	NR n2/1RB#1 20M	Edge 1	376000	14.52	15.00	1.117	0.053	0.060
	NR n2/1RB#1 20M	Edge 4	376000	14.52	15.00	1.117	0.542	0.605
	NR n2/1RB#1 20M	Bottom Face	372000	14.45	15.00	1.135	0.616	0.699
28#	NR n2/1RB#1 20M	Bottom Face	380000	14.48	15.00	1.127	1.020	1.150
	NR n2/100RB#1 20M	Bottom Face	376000	13.66	14.50	1.213	0.625	0.758
	NR n2/50RB#1 20M	Bottom Face	376000	13.95	14.50	1.135	0.406	0.461
	NR n2/50RB#1 20M	Edge 1	376000	13.95	14.50	1.135	0.034	0.039
	NR n2/50RB#1 20M	Edge 4	376000	13.95	14.50	1.135	0.386	0.438
Ant. 4 for EN-DC (Reduced Power Level 4)								
	NR n2/1RB#1 20M	Bottom Face	376000	11.82	12.50	1.169	0.465	0.544
	NR n2/1RB#1 20M	Edge 1	376000	11.82	12.50	1.169	0.140	0.164
	NR n2/1RB#1 20M	Edge 4	376000	11.82	12.50	1.169	0.055	0.064
	NR n2/50RB#1 20M	Bottom Face	376000	11.25	12.00	1.189	0.271	0.322
	NR n2/50RB#1 20M	Edge 1	376000	11.25	12.00	1.189	0.095	0.112
	NR n2/50RB#1 20M	Edge 4	376000	11.25	12.00	1.189	0.036	0.042
Ant 0 (Reduced Power Level 2)								
29#	NR n5/1RB#1 20M	Bottom Face	167300	23.53	24.00	1.114	1.040	1.159
	NR n5/1RB#1 20M	Edge 1	167300	23.53	24.00	1.114	1.020	1.137
	NR n5/1RB#1 20M	Edge 4	167300	23.53	24.00	1.114	0.920	1.025
	NR n5/1RB#1 20M	Bottom Face	166800	23.40	24.00	1.148	0.872	1.001
	NR n5/1RB#1 20M	Bottom Face	167800	23.44	24.00	1.138	0.909	1.034
	NR n5/1RB#1 20M	Edge 1	166800	23.40	24.00	1.148	0.810	0.930
	NR n5/1RB#1 20M	Edge 1	167800	23.44	24.00	1.138	0.795	0.904



	NR n5/50RB#1 20M	Bottom Face	167300	22.66	23.00	1.081	0.960	1.038
	NR n5/50RB#1 20M	Edge 1	167300	22.66	23.00	1.081	0.849	0.918
	NR n5/50RB#1 20M	Edge 4	167300	22.66	23.00	1.081	0.789	0.853
	NR n5/50RB#1 20M	Bottom Face	167300	22.57	23.00	1.104	0.954	1.053
	NR n5/50RB#1 20M	Bottom Face	167300	22.60	23.00	1.096	0.838	0.919
	NR n5/50RB#1 20M	Edge 1	167300	22.57	23.00	1.104	0.801	0.884
	NR n5/50RB#1 20M	Edge 1	167300	22.60	23.00	1.096	0.791	0.867
	NR n5/100RB#1 20M	Bottom Face	167300	22.40	23.00	1.148	0.722	0.829
Ant. 2 for EN-DC (Reduced Power Level 4)								
	NR n5/1RB#1 20M	Bottom Face	167300	20.83	21.50	1.167	0.298	0.348
	NR n5/1RB#1 20M	Edge 3	167300	20.83	21.50	1.167	0.292	0.341
	NR n5/1RB#1 20M	Edge 4	167300	20.83	21.50	1.167	0.136	0.159
	NR n5/50RB#1 20M	Bottom Face	167300	19.96	20.50	1.132	0.184	0.209
	NR n5/50RB#1 20M	Edge 3	167300	19.96	20.50	1.132	0.177	0.201
	NR n5/50RB#1 20M	Edge 4	167300	19.96	20.50	1.132	0.085	0.096
Ant 3 (Reduced Power Level 2)								
	NR n66/1RB#1 20M	Bottom Face	349000	14.82	15.50	1.169	0.869	1.016
	NR n66/1RB#1 20M	Edge 1	349000	14.82	15.50	1.169	0.055	0.064
	NR n66/1RB#1 20M	Edge 4	349000	14.82	15.50	1.169	0.842	0.985
	NR n66/1RB#1 20M	Bottom Face	344000	14.64	15.50	1.219	0.772	0.941
30#	NR n66/1RB#1 20M	Bottom Face	354000	14.79	15.50	1.178	0.987	1.162
	NR n66/100RB#1 20M	Bottom Face	349000	14.02	15.00	1.253	0.428	0.536
	NR n66/50RB#1 20M	Bottom Face	349000	14.18	15.00	1.208	0.527	0.637
	NR n66/50RB#1 20M	Edge 1	349000	14.18	15.00	1.208	0.049	0.060
	NR n66/50RB#1 20M	Edge 4	349000	14.18	15.00	1.208	0.454	0.548
Ant. 4 for EN-DC (Reduced Power Level 4)								
	NR n66/1RB#1 20M	Bottom Face	349000	13.67	14.00	1.079	0.545	0.588
	NR n66/1RB#1 20M	Edge 1	349000	13.67	14.00	1.079	0.180	0.194
	NR n66/1RB#1 20M	Edge 4	349000	13.67	14.00	1.079	0.058	0.062
	NR n66/50RB#1 20M	Bottom Face	349000	12.82	13.50	1.169	0.279	0.326
	NR n66/50RB#1 20M	Edge 1	349000	12.82	13.50	1.169	0.095	0.111
	NR n66/50RB#1 20M	Edge 4	349000	12.82	13.50	1.169	0.062	0.072
Ant. 7 for EN-DC (Reduced Power Level 4)								
31#	NR n77/1RB#1 100M	Bottom Face	656000	17.58	18.00	1.102	0.462	0.509
	NR n77/1RB#1 100M	Edge 2	656000	17.58	18.00	1.102	0.163	0.180



	NR n77/1RB#1 100M	Edge 3	656000	17.58	18.00	1.102	0.132	0.145
	NR n77/135RB#1 100M	Bottom Face	656000	16.36	17.00	1.159	0.399	0.462
	NR n77/135RB#1 100M	Edge 2	656000	16.36	17.00	1.159	0.163	0.189
	NR n77/135RB#1 100M	Edge 3	656000	16.36	17.00	1.159	0.104	0.121

➤ WLAN Body SAR

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)
Ant 5 (Reduced Power Level 2)								
	WLAN2.4GHz/802.11b	Bottom Face	1	13.54	14.00	1.112	0.660	0.734
	WLAN2.4GHz/802.11b	Edge 1	1	13.54	14.00	1.112	0.056	0.062
	WLAN2.4GHz/802.11b	Edge 2	1	13.54	14.00	1.112	0.246	0.273
	WLAN2.4GHz/802.11b	Bottom Face	6	12.19	13.00	1.205	0.828	0.998
	WLAN2.4GHz/802.11b	Bottom Face	11	11.70	12.50	1.202	0.750	0.902
Ant 5 for MIMO Simultaneous Transmission (Reduced Power Level 5)								
	WLAN2.4GHz/802.11b	Bottom Face	6	9.30	10.00	1.175	0.341	0.401
	WLAN2.4GHz/802.11b	Edge 1	6	9.30	10.00	1.175	0.026	0.031
	WLAN2.4GHz/802.11b	Edge 2	6	9.30	10.00	1.175	0.112	0.132
Ant 6 (Reduced Power Level 2)								
32#	WLAN2.4GHz/802.11b	Bottom Face	6	14.74	15.50	1.191	0.958	1.141
	WLAN2.4GHz/802.11b	Edge 1	6	14.74	15.50	1.191	0.187	0.223
	WLAN2.4GHz/802.11b	Edge 2	6	14.74	15.50	1.191	0.446	0.531
	WLAN2.4GHz/802.11b	Bottom Face	1	14.44	15.00	1.138	0.945	1.075
	WLAN2.4GHz/802.11b	Bottom Face	11	14.04	14.50	1.112	0.941	1.046
Ant 6 for MIMO Simultaneous Transmission (Reduced Power Level 5)								
	WLAN2.4GHz/802.11b	Bottom Face	6	10.96	11.50	1.132	0.280	0.317
	WLAN2.4GHz/802.11b	Edge 1	6	10.96	11.50	1.132	0.055	0.062
	WLAN2.4GHz/802.11b	Edge 4	6	10.96	11.50	1.132	0.130	0.147
Ant 5 (Reduced Power Level 2)								
	WLAN5.2GHz/802.11n40	Bottom Face	38	7.88	8.50	1.153	0.584	0.697
	WLAN5.2GHz/802.11n40	Edge 1	38	7.88	8.50	1.153	0.175	0.209
	WLAN5.2GHz/802.11n40	Edge 2	38	7.88	8.50	1.153	0.744	0.887
	WLAN5.2GHz/802.11n40	Edge 2	46	6.87	7.50	1.156	0.721	0.862
Ant 5 for MIMO Simultaneous Transmission (Reduced Power Level 5)								
	WLAN5.2GHz/802.11n40	Bottom Face	38	8.46	9.00	1.132	0.398	0.466
	WLAN5.2GHz/802.11n40	Edge 1	38	8.46	9.00	1.132	0.094	0.110
	WLAN5.2GHz/802.11n40	Edge 2	38	8.46	9.00	1.132	0.313	0.366



Ant 6 (Reduced Power Level 2)								
33#	WLAN5.2GHz/802.11n40	Bottom Face	38	8.57	9.00	1.104	0.922	1.053
	WLAN5.2GHz/802.11n40	Edge 1	38	8.57	9.00	1.104	0.529	0.604
	WLAN5.2GHz/802.11n40	Edge 2	38	8.57	9.00	1.104	0.153	0.175
	WLAN5.2GHz/802.11n40	Bottom Face	46	6.88	7.50	1.153	0.840	1.002
Ant 6 for MIMO Simultaneous Transmission (Reduced Power Level 5)								
	WLAN5.2GHz/802.11n40	Bottom Face	38	5.28	5.50	1.052	0.316	0.344
	WLAN5.2GHz/802.11n40	Edge 1	38	5.28	5.50	1.052	0.181	0.197
	WLAN5.2GHz/802.11n40	Edge 2	38	5.28	5.50	1.052	0.052	0.057
Ant 5 (Reduced Power Level 2)								
	WLAN5.3GHz/802.11n40	Bottom Face	62	8.39	9.00	1.151	0.490	0.583
	WLAN5.3GHz/802.11n40	Edge 1	62	8.39	9.00	1.151	0.261	0.311
	WLAN5.3GHz/802.11n40	Edge 2	62	8.39	9.00	1.151	0.794	0.945
	WLAN5.3GHz/802.11n40	Edge 2	54	6.89	7.50	1.151	0.726	0.864
Ant 5 for MIMO Simultaneous Transmission (Reduced Power Level 5)								
	WLAN5.3GHz/802.11n40	Bottom Face	62	6.70	7.00	1.072	0.307	0.340
	WLAN5.3GHz/802.11n40	Edge 1	62	6.70	7.00	1.072	0.136	0.151
	WLAN5.3GHz/802.11n40	Edge 2	62	6.70	7.00	1.072	0.413	0.458
Ant 6 (Reduced Power Level 2)								
	WLAN5.3GHz/802.11n40	Bottom Face	62	8.55	9.00	1.109	0.807	0.926
	WLAN5.3GHz/802.11n40	Edge 1	62	8.55	9.00	1.109	0.452	0.518
	WLAN5.3GHz/802.11n40	Edge 2	62	8.55	9.00	1.109	0.151	0.173
34#	WLAN5.3GHz/802.11n40	Bottom Face	54	7.04	7.50	1.112	0.850	0.977
Ant 6 for MIMO Simultaneous Transmission (Reduced Power Level 5)								
	WLAN5.3GHz/802.11n40	Bottom Face	62	3.97	4.50	1.130	0.289	0.338
	WLAN5.3GHz/802.11n40	Edge 1	62	3.97	4.50	1.130	0.150	0.175
	WLAN5.3GHz/802.11n40	Edge 2	62	3.97	4.50	1.130	0.050	0.058
Ant 5 (Reduced Power Level 2)								
	WLAN5.5GHz/802.11n40	Bottom Face	102	6.99	7.50	1.125	0.354	0.412
	WLAN5.5GHz/802.11n40	Edge 1	102	6.99	7.50	1.125	0.156	0.181
	WLAN5.5GHz/802.11n40	Edge 2	102	6.99	7.50	1.125	0.766	0.891
	WLAN5.5GHz/802.11n40	Edge 2	126	5.47	6.00	1.130	0.977	1.141
35#	WLAN5.5GHz/802.11n40	Edge 2	142	4.13	4.50	1.089	1.020	1.148
Ant 5 for MIMO Simultaneous Transmission (Reduced Power Level 5)								
	WLAN5.5GHz/802.11n40	Bottom Face	102	5.28	5.50	1.052	0.168	0.183
	WLAN5.5GHz/802.11n40	Edge 1	102	5.28	5.50	1.052	0.074	0.080
	WLAN5.5GHz/802.11n40	Edge 2	102	5.28	5.50	1.052	0.363	0.395
Ant 6 (Reduced Power Level 2)								



	WLAN5.5GHz/802.11n40	Bottom Face	102	7.07	7.50	1.104	0.854	0.975
	WLAN5.5GHz/802.11n40	Edge 1	102	7.07	7.50	1.104	0.464	0.530
	WLAN5.5GHz/802.11n40	Edge 2	102	7.07	7.50	1.104	0.131	0.150
	WLAN5.5GHz/802.11n40	Bottom Face	126	5.67	6.00	1.079	0.584	0.652
	WLAN5.5GHz/802.11n40	Bottom Face	142	4.36	5.00	1.159	0.552	0.661
Ant 6 for MIMO Simultaneous Transmission (Reduced Power Level 5)								
	WLAN5.5GHz/802.11n40	Bottom Face	102	5.12	5.50	1.091	0.340	0.384
	WLAN5.5GHz/802.11n40	Edge 1	102	5.12	5.50	1.091	0.185	0.209
	WLAN5.5GHz/802.11n40	Edge 2	102	5.12	5.50	1.091	0.052	0.059
Ant 5 (Reduced Power Level 2)								
	WLAN5.8GHz/802.11n20	Bottom Face	165	5.67	6.00	1.079	0.367	0.403
	WLAN5.8GHz/802.11n20	Edge 1	165	5.67	6.00	1.079	0.110	0.121
	WLAN5.8GHz/802.11n20	Edge 2	165	5.67	6.00	1.079	0.847	0.930
	WLAN5.8GHz/802.11n20	Edge 2	149	4.91	5.50	1.146	0.762	0.889
	WLAN5.8GHz/802.11n20	Edge 2	157	4.21	4.50	1.069	0.831	0.904
Ant 5 for MIMO Simultaneous Transmission (Reduced Power Level 5)								
	WLAN5.8GHz/802.11n20	Bottom Face	165	5.47	6.00	1.130	0.189	0.217
	WLAN5.8GHz/802.11n20	Edge 1	165	5.47	6.00	1.130	0.057	0.066
	WLAN5.8GHz/802.11n20	Edge 2	165	5.47	6.00	1.130	0.437	0.503
Ant 6 (Reduced Power Level 2)								
	WLAN5.8GHz/802.11n40	Bottom Face	159	5.51	6.00	1.119	0.887	1.006
	WLAN5.8GHz/802.11n40	Edge 1	159	5.51	6.00	1.119	0.672	0.762
	WLAN5.8GHz/802.11n40	Edge 2	159	5.51	6.00	1.119	0.111	0.126
35#	WLAN5.8GHz/802.11n40	Bottom Face	151	5.11	6.00	1.227	0.858	1.067
Ant 6 for MIMO Simultaneous Transmission (Reduced Power Level 5)								
	WLAN5.8GHz/802.11n40	Bottom Face	159	5.27	5.50	1.054	0.330	0.352
	WLAN5.8GHz/802.11n40	Edge 1	159	5.27	5.50	1.054	0.250	0.267
	WLAN5.8GHz/802.11n40	Edge 2	159	5.27	5.50	1.054	0.041	0.044

Note:

1. Per KDB 447498 D01v06, for each exposure position, if the highest output channel Reported SAR $\leq 0.8\text{W/kg}$, other channels SAR testing is not necessary.
2. Additional WLAN SAR testing was performed for simultaneous transmission analysis.
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required when the measured SAR is $\geq 0.8\text{W/kg}$.
4. 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 $\leq 1.2\text{W/kg}$.
5. According to KDB 865664 D02v01r02, SAR plot is required for the highest measured SAR in



each exposure configuration, wireless mode and frequency band combination.

6. The WLAN Reported 1g SAR (W/kg) has been calculated together with the duty cycle scaling factor 1.0 for 2.4G WLAN(Ant.5/Ant.6) and 1.034 for 5.2G WLAN(Ant.5/Ant.6), 5.3G WLAN(Ant.5/Ant.6), 5.5G WLAN(Ant.5/Ant.6), 5.8G WLAN(Ant.6), 1.018 for 5.8G WLAN(Ant.5) .

➤ **Bluetooth Body SAR**

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)
Ant 5 (Full Power)								
36#	Bluetooth/1Mbps	Bottom Face	78	6.08	7.50	1.387	0.137	0.206
	Bluetooth/1Mbps	Edge 1	78	6.08	7.50	1.387	0.097	0.146
	Bluetooth/1Mbps	Edge 2	78	6.08	7.50	1.387	0.080	0.120

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. The duty cycle of Bluetooth is 76.80%, Therefore the duty cycle scaling factor 1.085 should be used to calculating the reported SAR.

16.4 Repeated SAR Assessment

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

1. Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg;
2. When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
3. Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg ($\sim 10\%$ from the 1-g SAR limit).
4. Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20 .

➤ Repeated SAR

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)
OR	LTE Band 2/1RB#0 20M	Right Cheek	18900	18.88	19.50	1.153	0.986	1.137
1 st	LTE Band 2/1RB#0 20M	Right Cheek	18900	18.88	19.50	1.153	0.936	1.080
OR	LTE Band 5/1RB#0 10M	Right Cheek	20525	20.26	21.00	1.186	0.959	1.137
1 st	LTE Band 5/1RB#0 10M	Right Cheek	20525	20.26	21.00	1.186	0.934	1.108
OR	LTE Band 12/1RB#0 10M	Right Cheek	23130	24.00	24.50	1.122	1.020	1.144
1 st	LTE Band 12/1RB#0 10M	Right Cheek	23130	24.00	24.50	1.122	0.976	1.095
OR	LTE Band 13/1RB#0 10M	Right Cheek	23230	24.11	24.50	1.094	1.020	1.116
1 st	LTE Band 13/1RB#0 10M	Right Cheek	23230	24.11	24.50	1.094	1.018	1.114
OR	LTE Band 66/1RB#0 20M	Right Cheek	132322	20.32	21.00	1.169	1.010	1.181
1 st	LTE Band 66/1RB#0 20M	Right Cheek	132322	20.32	21.00	1.169	0.937	1.096
OR	Band II/RMC 12.2Kbps	Bottom Face	9538	12.52	13.00	1.117	0.956	1.068



1 st	Band II/RMC 12.2Kbps	Bottom Face	9538	12.52	13.00	1.117	0.952	1.063
OR	Band IV/RMC 12.2Kbps	Bottom Face	1513	13.18	14.00	1.208	0.899	1.086
1 st	Band IV/RMC 12.2Kbps	Bottom Face	1513	13.18	14.00	1.208	0.895	1.081
OR	LTE Band 2/1RB#0 20M	Bottom Face	19100	15.41	16.00	1.146	0.988	1.132
1 st	LTE Band 2/1RB#0 20M	Bottom Face	19100	15.41	16.00	1.146	0.975	1.117
OR	LTE Band 48/1RB#0 20M	Bottom Face	56640	14.24	15.00	1.191	0.916	1.091
1 st	LTE Band 48/1RB#0 20M	Bottom Face	56640	14.24	15.00	1.191	0.911	1.085
OR	LTE Band 66/1RB#0 20M	Edge 4	132072	14.61	15.00	1.094	0.933	1.021
1 st	LTE Band 66/1RB#0 20M	Edge 4	132072	14.61	15.00	1.094	0.931	1.018
OR	NR n2/1RB#1 20M	Bottom Face	380000	14.48	15.00	1.127	1.020	1.150
1 st	NR n2/1RB#1 20M	Bottom Face	380000	14.48	15.00	1.127	0.980	1.105
OR	NR n5/1RB#1 20M	Bottom Face	167300	23.53	24.00	1.114	1.040	1.159
1 st	NR n5/1RB#1 20M	Bottom Face	167300	23.53	24.00	1.114	0.972	1.083
OR	NR n66/1RB#1 20M	Bottom Face	354000	14.79	15.50	1.178	0.987	1.162
1 st	NR n66/1RB#1 20M	Bottom Face	354000	14.79	15.50	1.178	0.925	1.089
OR	WLAN2.4GHz/802.11b	Bottom Face	6	14.74	15.50	1.191	0.958	1.141
1 st	WLAN2.4GHz/802.11b	Bottom Face	6	14.74	15.50	1.191	0.955	1.138
OR	WLAN5.2GHz/802.11n40	Bottom Face	38	8.57	9.00	1.104	0.922	1.053
1 st	WLAN5.2GHz/802.11n40	Bottom Face	38	8.57	9.00	1.104	0.920	1.050
OR	WLAN5.3GHz/802.11n40	Bottom Face	54	7.04	7.50	1.112	0.850	0.977
1 st	WLAN5.3GHz/802.11n40	Bottom Face	54	7.04	7.50	1.112	0.845	0.971
OR	WLAN5.5GHz/802.11n40	Edge 2	142	4.13	4.50	1.089	1.020	1.148
1 st	WLAN5.5GHz/802.11n40	Edge 2	142	4.13	4.50	1.089	1.012	1.139
OR	WLAN5.8GHz/802.11n40	Bottom Face	151	5.11	6.00	1.227	0.858	1.067
1 st	WLAN5.8GHz/802.11n40	Bottom Face	151	5.11	6.00	1.227	0.857	1.066

17 Simultaneous Transmission Analysis

17.1 Simultaneous Transmission Consideration for WWAN

No.	Simultaneous Transmission Consideration	Head	Body
1	WWAN(2G/3G/4G)+WLAN 2.4GHz(SISO)	Yes	Yes
2	WWAN(2G/3G/4G)+WLAN 5GHz(SISO)	Yes	Yes
3	WWAN(2G/3G/4G)+WLAN 2.4GHz(MIMO)	Yes	Yes
4	WWAN(2G/3G/4G)+WLAN 5GHz(MIMO)	Yes	Yes
5	WWAN(SA/NSA)+WLAN 2.4GHz(SISO)	Yes	Yes
6	WWAN(SA/NSA)+WLAN 5GHz(SISO)	Yes	Yes
7	WWAN(SA/NSA)+WLAN 2.4GHz(MIMO)	Yes	Yes
8	WWAN(SA/NSA)+WLAN 5GHz(MIMO)	Yes	Yes
9	WWAN(2G/3G/4G)+Bluetooth	No	Yes
10	WWAN(SA/NSA)+Bluetooth	No	Yes
11	WWAN(2G/3G/4G)+WLAN 2.4GHz(Ant 6)+BT(Ant 5)	No	Yes
12	WWAN(SA/NSA)+WLAN 2.4GHz(Ant 6)+BT(Ant 5)	No	Yes
13	WWAN(2G/3G/4G)+WLAN 5GHz(Ant 6)+BT(Ant 5)	No	Yes
14	WWAN(SA/NSA)+WLAN 5GHz(Ant 6)+BT(Ant 5)	No	Yes

Note:

- Simultaneous Transmission SAR evaluation is not required for BT and Wi-Fi of antenna 5, because the software mechanism have been incorporated to guarantee that the WLAN and Bluetooth transmitters would not simultaneously operate at the same time.
- 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: $(SAR_1 + SAR_2) \wedge 1.5/R_i \leq 0.04$,
 R_i is the separation distance between the peak SAR locations for the antenna pair in mm.
- The standalone SAR of EN-DC and simultaneous transmission SAR of GSM/WCDMA/LTE/5G NR (SA/NSA) refers to the annex F of this report.

17.2 SPLSR Assessment and Analysis

➤ General Guidance

1. Per KDB 447498, When standalone SAR is measured, the peak location is determined by the x, y, z coordinates of the extrapolated and interpolated results reported by the zoom scan measurement, or area scan measurement when area scan based 1-g SAR estimation is applicable.
2. When standalone SAR is measured for both antennas in the pair, the peak location separation distance is computed by the square root of $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$, where (x_1, y_1, z_1) and (x_2, y_2, z_2) are the coordinates in the area scans or extrapolated peak SAR locations in the zoom scans, as appropriate.
3. The ratio is determined by $(SAR_1 + SAR_2)/1.5/R_i$, rounded to two decimal digits, and must be ≤ 0.04 for all antenna pairs in the configuration to qualify for 1-g SAR test exclusion.
4. SPLSR analysis for EN-DC+WLAN/Bluetooth mode may not be recorded in this report for the large distance between the WWAN and WLAN/Bluetooth antenna.
5. For SPLSR analysis, only the worst frequency band of WCDMA, LTE and 5G NR (Sub-6G) would be recorded in this report.

➤ Results of SPLSR Analysis

<WWAN+WLAN SISO>

Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR(W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
WCDMA Band IV	Bottom	0.899	0.032	0.015	-0.205	104.3	1.73	0.02	Not required
WLAN 2.4GHz Ant 5	Face	0.828	-0.0708	0.0324	-0.205				
Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR(W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
WCDMA Band IV	Bottom	0.899	0.032	0.015	-0.205	129.0	1.86	0.02	Not required
WLAN 2.4GHz Ant 6	Face	0.958	-0.0912	0.0532	-0.205				
Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR(W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
LTE Band 2	Bottom	0.988	0.032	0.0135	-0.205	104.5	1.82	0.02	Not required
WLAN 2.4GHz Ant 5	Face	0.828	-0.0708	0.0324	-0.205				



Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR(W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
LTE Band 2	Bottom	0.988	0.032	0.0135	-0.205	129.4	1.95	0.02	Not required
WLAN 2.4GHz Ant 6	Face	0.958	-0.0912	0.0532	-0.205				
Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR(W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
n66	Bottom	0.987	-0.027	0.065	-0.205	54.6	1.82	0.04	Not required
WLAN 2.4GHz Ant 5	Face	0.828	-0.0708	0.0324	-0.205				
Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR(W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
n66	Bottom	0.987	-0.027	0.065	-0.205	65.3	1.95	0.04	Not required
WLAN 2.4GHz Ant 6	Face	0.958	-0.0912	0.0532	-0.205				
Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
WCDMA Band IV	Bottom	0.899	0.032	0.015	-0.205	101.0	1.48	0.02	Not required
WLAN 5.2GHz Ant 5	Face	0.584	-0.067	0.035	-0.205				
Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
WCDMA Band IV	Bottom	0.899	0.032	0.015	-0.205	126.3	1.76	0.02	Not required
WLAN 5.8GHz Ant 6	Face	0.858	-0.084	0.065	-0.205				
Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
LTE Band 2	Bottom	0.988	0.032	0.0135	-0.205	101.3	1.57	0.02	Not required
WLAN 5.2GHz Ant 5	Face	0.584	-0.067	0.035	-0.205				
Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
LTE Band 2	Bottom	0.988	0.032	0.0135	-0.205	126.9	1.85	0.02	Not required
WLAN 5.8GHz Ant 6	Face	0.858	-0.084	0.065	-0.205				



Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
n66	Bottom	0.987	-0.027	0.065	-0.205	50.0	1.57	0.04	Not required
WLAN 5.2GHz Ant 5	Face	0.584	-0.067	0.035	-0.205				
Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
n66	Bottom	0.987	-0.027	0.065	-0.205	57.0	1.85	0.04	Not required
WLAN 5.8GHz Ant 6	Face	0.858	-0.084	0.065	-0.205				

Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
WCDMA Band IV	Bottom	0.899	0.032	0.015	-0.205	285.9	1.43	0.01	Not required
WLAN 2.4GHz Ant 6		0.398	-0.0912	0.0532	-0.205				
Bluetooth Ant 5	Face	0.137	-0.0684	0.0168	-0.205				

Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
LTE Band 2	Bottom	0.988	0.032	0.0135	-0.205	286.2	1.52	0.01	Not required
WLAN 2.4GHz Ant 6		0.398	-0.0912	0.0532	-0.205				
Bluetooth Ant 5	Face	0.137	-0.0684	0.0168	-0.205				

Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
n66	Bottom	0.987	-0.027	0.065	-0.205	244.2	1.52	0.01	Not required
WLAN 2.4GHz Ant 6		0.398	-0.0912	0.0532	-0.205				
Bluetooth Ant 5	Face	0.137	-0.0684	0.0168	-0.205				

Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
WCDMA Band IV	Bottom	0.899	0.032	0.015	-0.205	283.7	1.38	0.01	Not required
WLAN 5.5GHz Ant 6		0.340	-0.084	0.065	-0.205				
Bluetooth Ant 5	Face	0.137	-0.0684	0.0168	-0.205				



Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
LTE Band 2	Bottom Face	0.988	0.032	0.0135	-0.205	284.1	1.47	0.01	Not required
WLAN 5.5GHz Ant 6		0.340	-0.084	0.065	-0.205				
Bluetooth Ant 5		0.137	-0.0684	0.0168	-0.205				
Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
n66	Bottom Face	0.987	-0.027	0.065	-0.205	240.9	1.46	0.01	Not required
WLAN 5.5GHz Ant 6		0.340	-0.084	0.065	-0.205				
Bluetooth Ant 5		0.137	-0.0684	0.0168	-0.205				

<WWAN+WLAN MIMO>

Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
WCDMA Band IV	Bottom Face	0.899	0.032	0.015	-0.205	290.9	1.58	0.01	Not required
WLAN 2.4GHz Ant 5		0.280	-0.0708	0.0324	-0.205				
WLAN 2.4GHz Ant 6		0.398	-0.0912	0.0532	-0.205				
Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
LTE Band 2	Bottom Face	0.988	0.032	0.0135	-0.205	291.3	1.67	0.01	Not required
WLAN 2.4GHz Ant 5		0.280	-0.0708	0.0324	-0.205				
WLAN 2.4GHz Ant 6		0.398	-0.0912	0.0532	-0.205				
Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
n66	Bottom Face	0.987	-0.027	0.065	-0.205	246.3	1.67	0.01	Not required
WLAN 2.4GHz Ant 5		0.280	-0.0708	0.0324	-0.205				
WLAN 2.4GHz Ant 6		0.398	-0.0912	0.0532	-0.205				
Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
WCDMA Band IV	Bottom	0.899	0.032	0.015	-0.205	287.6	1.64	0.01	Not required



WLAN 5.2GHz Ant 5	Face	0.398	-0.067	0.035	-0.205				
WLAN 5.5GHz Ant 6		0.340	-0.084	0.065	-0.205				

Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
LTE Band 2	Bottom Face	0.988	0.032	0.0135	-0.205	288.1	1.73	0.01	Not required
WLAN 5.2GHz Ant 5		0.398	-0.067	0.035	-0.205				
WLAN 5.5GHz Ant 6		0.340	-0.084	0.065	-0.205				

Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
n66	Bottom Face	0.987	-0.027	0.065	-0.205	242.1	1.73	0.01	Not required
WLAN 5.2GHz Ant 5		0.398	-0.067	0.035	-0.205				
WLAN 5.5GHz Ant 6		0.340	-0.084	0.065	-0.205				

Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
LTE Band 2	Bottom Face	0.362	0.032	0.0135	-0.205	464.3	1.45	0.00	Not required
LTE Band 5		0.405	0.0185	0.057	-0.205				
WLAN 2.4GHz Ant 5		0.280	-0.0708	0.0324	-0.205				
WLAN 2.4GHz Ant 6		0.398	-0.0912	0.0532	-0.205				

Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
LTE Band 2	Bottom Face	0.362	0.032	0.0135	-0.205	464.5	1.51	0.00	Not required
LTE Band 5		0.405	0.0185	0.057	-0.205				
WLAN 5.2GHz Ant 5		0.398	-0.067	0.035	-0.205				
WLAN 5.5GHz Ant 6		0.340	-0.084	0.065	-0.205				



Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
LTE Band 2	Bottom	0.452	-0.029	0.057	-0.205	447.3	1.68	0.00	Not required
5G NR n66		0.545	-0.0275	0.0505	-0.205				
WLAN 2.4GHz Ant 5	Face	0.280	-0.0708	0.0324	-0.205				
WLAN 2.4GHz Ant 6		0.398	-0.0912	0.0532	-0.205				
Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
LTE Band 13	Bottom	0.498	-0.0015	-0.0555	-0.205	490.1	1.72	0.00	Not required
5G NR n66		0.545	-0.0275	0.0505	-0.205				
WLAN 2.4GHz Ant 5	Face	0.280	-0.0708	0.0324	-0.205				
WLAN 2.4GHz Ant 6		0.398	-0.0912	0.0532	-0.205				
Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
LTE Band 13	Bottom	0.498	-0.0015	-0.0555	-0.205	478.2	1.64	0.00	Not required
5G NR n77		0.462	-0.0676	-0.0488	-0.205				
WLAN 2.4GHz Ant 5	Face	0.280	-0.0708	0.0324	-0.205				
WLAN 2.4GHz Ant 6		0.398	-0.0912	0.0532	-0.205				
Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
LTE Band 66	Bottom	0.473	-0.0275	0.0555	-0.205	457.5	1.61	0.00	Not required
5G NR n77		0.462	-0.0676	-0.0488	-0.205				
WLAN 2.4GHz Ant 5	Face	0.280	-0.0708	0.0324	-0.205				
WLAN 2.4GHz Ant 6		0.398	-0.0912	0.0532	-0.205				
Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
LTE Band 2	Bottom	0.452	-0.029	0.057	-0.205	446.3	1.74	0.01	Not required
5G NR n66		0.545	-0.0275	0.0505	-0.205				
WLAN 5.2GHz Ant 5	Face	0.398	-0.067	0.035	-0.205				
WLAN 5.5GHz Ant 6		0.340	-0.084	0.065	-0.205				
Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
LTE Band 13	Bottom	0.498	-0.0015	-0.0555	-0.205	491.8	1.78	0.00	Not required



5G NR n66	Face	0.545	-0.0275	0.0505	-0.205				
WLAN 5.2GHz Ant 5		0.398	-0.067	0.035	-0.205				
WLAN 5.5GHz Ant 6		0.340	-0.084	0.065	-0.205				
Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
LTE Band 13	Bottom	0.498	-0.0015	-0.0555	-0.205	476.0	1.70	0.00	Not required
5G NR n77		0.462	-0.0676	-0.0488	-0.205				
WLAN 5.2GHz Ant 5	Face	0.398	-0.067	0.035	-0.205				
WLAN 5.5GHz Ant 6		0.340	-0.084	0.065	-0.205				
Band	Position	SAR (W/kg)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			X	Y	Z				
LTE Band 66	Bottom	0.473	-0.0275	0.0555	-0.205	452.4	1.67	0.00	Not required
5G NR n77		0.462	-0.0676	-0.0488	-0.205				
WLAN 5.2GHz Ant 5	Face	0.398	-0.067	0.035	-0.205				
WLAN 5.5GHz Ant 6		0.340	-0.084	0.065	-0.205				

17.3 Simultaneous Transmission Consideration for mmWave

➤ Simultaneous Transmission Consideration

No.	Simultaneous Transmission Consideration	Support
1	WWAN (LTE)+5G FR2+WLAN 2.4GHz/5GHz (SISO/MIMO)	Yes

Note:

The mmWave and WLAN MIMO and Bluetooth cannot transmit simultaneously at the same time according to the user manual.

➤ Simultaneous Transmission Analysis

RF exposure compliance with WWAN +WLAN simultaneous transmission scenarios, 5G NR and LTE are managed and controlled by Qualcomm Smart Transmit.

Smart Transmit algorithm in WWAN adds directly the time-averaged RF exposure from LTE and time-averaged RF exposure from 5G FR1, i.e.,

Smart Transmit current implementation assumes hotspots from 5G NR and LTE are coll0cated.

Therefore for a total of 1 exposure margin, if LTE uses x , then the exposure margin left for 5G NR is capped to $(1-x)$. The compliance equation for LTE + 5G NR is

$$\text{Smart Transmit enabled WWAN: } x * A + (1-x) * B \leq 1.0 \text{ normalized limit (1)}$$

Here, " $x*A$ " represents percentage of normalized time-averaged RF exposure from LTE, and x ranges between $[0,1]$; " $(1-x)*B$ " is remaining percentage of RF exposure contribution from 5G NR (i.e., SAR exposure for 5G NR FR1 and PD exposure for 5G NR FR2). Smart Transmit controls ' x ' in real time such that the sum of these exposures never exceeds 1.0 normalized limit.

Note that mathematically:

$$x * A + (1-x) * B \leq x * (A,B) + (1-x) * B \max(A,B) \leq \max(A,B) \text{ normalized limit}$$

$$x * A + (1-x) * B \leq 1.0 \text{ for } x \in [0,1] \text{ (2)}$$

Therefore, if below equations and are proven:

$$A + \text{norm.SAR from WLAN} \leq 1.0 \text{ norm.limit,}$$

$$B + \text{norm.SAR from WLAN} \leq 1.0 \text{ norm.limit},$$

Then, based on equation (4), below condition is also proved:

$$[x * A + (1-x)*B] + \text{norm.SAR from WLAN} \leq 1.0 \text{ norm.limit}$$

➤ Total Exposure Radio Analysis

The fields generated by the antennas can be correlated or uncorrelated. At different frequencies, fields are always uncorrelated, and the aggregate power density contributions can be summed according to spatially averaged values of corresponding sources at any point in space, r , to determine the total exposure ratio (TER). Assuming I sources, the TER at each point in space is equal to

$$\text{TER}^{\text{uncorr}}(r) = \sum_{i=1}^I \text{ER}_i = \sum_{i=1}^I \frac{S_{\text{av},i}(r, f_i)}{S_{\text{lim}}(f_i)}$$

Where $S_{\text{av},i}$ is the power density for the source I operating at a frequency f_i and S_{lim} is the power density limit as specified by the relevant standard.

Exposure from transmitters operating above and below 6GHz, where 6GHz denotes the transmission frequency where the basic restrictions change from being defined in terms of SAR to being defined in terms of power density, therefore uncorrelated and the TER is determined as

$$\text{TER}^{\text{uncorr}}(r) = \sum_{i=1}^I \text{ER}_i = \sum_{i=1}^I \frac{S_{\text{av},i}(r, f_i)}{S_{\text{lim}}(f_i)}$$

According to the FCC guidance in TCBC workshop and IEC TR 63170, the total exposure ratio calculated by taking ratio of maximum reported SAR divided by SAR limit and adding it to maximum measured power density by its limit. Numerical sum of the ratios should be less or equal to 1. Therefore the simultaneous transmission should be follows:

$$\text{TER} = \sum_{n=1}^N \frac{\text{SAR}_n}{\text{SAR}_{n,\text{limit}}} + \sum_{n=1}^N \frac{S_{m,\text{avg}}}{S_{m,\text{limit}}} < 1$$



➤ Total Exposure Ratio

<WLAN MIMO Summary>

Exposure Position	Maximum Reported SAR (W/kg)				Summation (W/kg)	
	1	2	3	4	1+2	3+4
	WLAN 2.4GHz ch1	WLAN 2.4GHz ch2	WLAN 5GHz ch1	WLAN 5GHz ch2	WLAN 2.4GHz	WLAN 5GHz
Bottom Face	0.401	0.317	0.466	0.384	0.718	0.85
Edge 1	0.03	0.062	0.151	0.209	0.092	0.36
Edge 2	0.132	0.0	0.503	0.0	0.132	0.503
Edge 3	0.0	0.0	0.0	0.0	0.0	0.0
Edge 4	0.0	0.147	0.0	0.059	0.147	0.059

<mmW + WLAN MIMO >

Exposure Position	Maximum Reported SAR (W/kg)		Power Density	Total Exposure Ratio SAR/1.6+PD/10	
	1	2	3	1+3	2+
	WLAN 2.4GHz	WLAN 5GHz	n260	Summation	Summation
Bottom Face	0.718	0.85	N/A	N/A	N/A
Edge 1	0.092	0.36	N/A	N/A	N/A
Edge 2	0.132	0.503	2.71	0.354	0.585
Edge 3	0.0	0.0	N/A	N/A	N/A
Edge 4	0.147	0.059	2.62	0.354	0.299

Exposure Position	Maximum Reported SAR (W/kg)		Power Density	Total Exposure Ratio SAR/1.6+PD/10	
	1	2	3	1+3	2+
	WLAN 2.4GHz	WLAN 5GHz	n261	Summation	Summation
Bottom Face	0.718	0.85	N/A	N/A	N/A
Edge 1	0.092	0.36	N/A	N/A	N/A
Edge 2	0.132	0.503	3.56	0.439	0.67
Edge 3	0.0	0.0	N/A	N/A	N/A
Edge 4	0.147	0.059	5.39	0.631	0.576



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Note:

1. The test position of edge 2 and edge 4 mean the side of right and left recorded in PD report I21Z61643-SEM01.
2. The highest psPD of 5G mmW at 0mm recorded in above table are from the PD report I21Z61643-SEM01.

18 Measurement Uncertainty

The component of uncertainty may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainty 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 %. The SATIMO uncertainty Budget is shown in the following tables.

18.1 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	E.6.2	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
Probe positioning with respect to Phantom Shell	E.6.3	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
Extrapolation, interpolation and integration Algorithms 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	$\sqrt{3}$	$\frac{0.6}{4}$	0.43	1.69	1.13	∞
Liquid conductivity - measurement uncertainty	E.3.3	2.5	N	1	$\frac{0.6}{4}$	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	$\sqrt{3}$	$\frac{0.7}{8}$	0.41			∞
Liquid permittivity -temperature uncertainty	E.3.4		R	$\sqrt{3}$	$\frac{0.2}{3}$	0.26			∞
Combined Standard Uncertainty			RSS				11.55	12.07	
Expanded Uncertainty (95% Confidence interval)			K=2				± 23.20	± 24.17	



18.2 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 Algorithms 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	



19 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.
Laboratory Address:	FL.1-3, 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.
Address:	FL.1-3, 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,F) will be submitted separately.

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