



TEST REPORT

APPLICANT : Reliance Communications LLC
PRODUCT NAME : Orbic Myra
MODEL NAME : R678L5
BRAND NAME : Orbic
FCC ID : 2ABGH-R678L5
STANDARD(S) : FCC 47 CFR Part 2(2.1093)
IEEE 1528-2013
RECEIPT DATE : 2020-10-22
TEST DATE : 2020-05-05 to 2021-05-23
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Changed History		
Version	Date	Reason for Change
1.0	2021-05-29	First edition



1. SAR Results Summary

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

<Highest Reported SAR Summary>

Frequency Band		Highest SAR Summary			
		Head (Gap 0mm)	Body-worn (Gap 10mm)	Hotspot (Gap 10mm)	Extremity (Gap 0mm)
		1g SAR (W/kg)			10g SAR (W/kg)
GSM	GSM850	0.246	0.120	0.120	N/A
	GSM1900	0.582	0.092	0.114	N/A
WCDMA	WCDMA Band II	0.309	0.164	0.195	N/A
	WCDMA Band IV	0.519	0.248	0.354	N/A
	WCDMA Band V	0.454	0.069	0.069	N/A
LTE	LTE Band 2	0.317	0.074	0.091	N/A
	LTE Band 5	0.390	0.055	0.055	N/A
	LTE Band 12	0.217	0.091	0.091	N/A
	LTE Band 13	0.275	0.165	0.165	N/A
	LTE Band 66/4	0.383	0.023	0.031	N/A
5G NR	n2(NSA)	0.545	0.204	0.246	N/A
	n5(NSA)	0.345	0.167	0.167	N/A
	n66(NSA)	0.329	0.089	0.099	N/A
	n77(NSA)	0.553	0.157	0.320	N/A
WLAN	2.4GHz WLAN	0.265	0.138	0.138	N/A
	5GHz WLAN	0.386	0.274	0.274	0.696
2.4GHz Band	Bluetooth (Estimated)	N/A	0.453	0.453	N/A

Max Scaled SAR _{1g} (W/Kg):	Head:	0.582 W/kg	Limit(W/kg): 1.6 W/kg
	Body-worn:	0.274 W/kg	
	Hotspot:	0.354 W/kg	
Max Scaled SAR _{10g} (W/Kg):	Extremity	0.696 W/kg	Limit(W/kg): 4.0 W/kg

Highest Simultaneous Transmission SAR _{1g} (W/Kg):	1.564 W/kg	Limit(W/kg): 1.6 W/kg
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Note:

1. This device is in compliance with Specific Absorption Rate (SAR) for general population or uncontrolled exposure limits (1.6W/kg as averaged over any 1 gram of tissue; specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992), and had been tested in accordance with



the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.

2. For FDD-LTE Band 4 is full covered by FDD-LTE Band 66, therefore only FDD-LTE Band 66 was tested.
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 Myra
IMEI:	357758890006424
Hardware Version:	V2.2
Software Version:	ORB678L5_v1.0.42_BVZ
Frequency Bands:	GSM 850: 824 MHz ~ 849 MHz GSM 1900: 1850 MHz ~ 1910 MHz 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 46: 5150 MHz ~ 5925 MHz(only RX) 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: 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 Mode:	GSM/GPRS: GMSK EDGE: 8PSK WCDMA: QPSK, 16QAM, 64QAM LTE: QPSK, 16QAM, 64QAM 5G NR: CP-OFDM/DFT-s-OFDM, PI/2 BPSK QPSK, 16QAM, 64QAM, 256QAM 802.11b: DSSS 802.11a/g/n-HT20/HT40/ac-VHT20/40/80: OFDM BR+EDR: GFSK(1Mbps), $\pi/4$ -DQPSK(2Mbps), 8-DPSK(3Mbps) Bluetooth LE: GFSK(1Mbps)	
Multi-slot Class:	GPRS: Multi-slot Class 12 EDGE: Multi-slot Class 12	
Operation Class:	Class B	
Carrier Aggregation:	CA Uplink & Downlink	
VoLTE Mode:	Supports	
Hotspot Mode:	Support (5G WLAN only for B1 & B4)	
WLAN MIMO:	Support	
Antenna Type:	WWAN: Fixed Internal Antenna WLAN: PIFA Antenna Bluetooth: PIFA Antenna	
Battery:	Manufacturer:	HUIZHOU DXDRAGON INC
	Model Name:	BLE-5001
	Capacity:	5000mAh
	Rated Voltage:	3.85V
SIM Cards Description:	SIM 1	GSM+ WCDMA+LTE+5G NR(EN-DC)

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



2.3. Environment of Test Site/Conditions

Normal Temperature (NT):	20-25 °C
Relative Humidity:	30-75 %
Air Pressure:	980-1020 hPa

Test Frequency:	GSM 850MHz/1900MHz WCDMA Band II/IV/V FDD-LTE Band 2/4/5/12/13/66 5G NR(NSA) N2/5/66/77 WLAN 2.4GHz WLAN 5GHz
Operation Mode:	Call established
Power Level:	GSM 850 MHz (Maximum output power(level 5)) GSM 1900MHz (Maximum output power(level 0)) WCDMA Band II/IV/V (All Up Bits) FDD-LTE Band 2/4/5/12/13/66 (Maximum output power) 5G NR(NSA) (Maximum output power) WLAN 2.4GHz WLAN 5GHz

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 Middle 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:

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

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

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

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

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

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

Where σ is the conductivity of the tissue, ρ is the mass density of the tissue and $|E|$ is the rmselectrical 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. The exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Limits for 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 47 CFR Part 2(2.1093)	Radio Frequency Radiation Exposure Evaluation: Portable Devices	No deviation
IEEE 1528-2013	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques	No deviation
KDB 447498 D01v06	General RF Exposure Guidance	No deviation
KDB 248227 D01v02r02	SAR Measurement Procedures for 802.11 Transmitters	No deviation
KDB 865664 D01v01r04	SAR Measurement 100 MHz to 6 GHz	No deviation
KDB 865664 D02v01r02	RF Exposure Reporting	No deviation
KDB 648474 D04v01r03	Handset SAR	No deviation
KDB 941225 D01v03r01	3G SAR MEAUREMENT PROCEDURES	No deviation
KDB 941225 D05v02r05	SAR Evaluation Consideration for LTE Devices	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

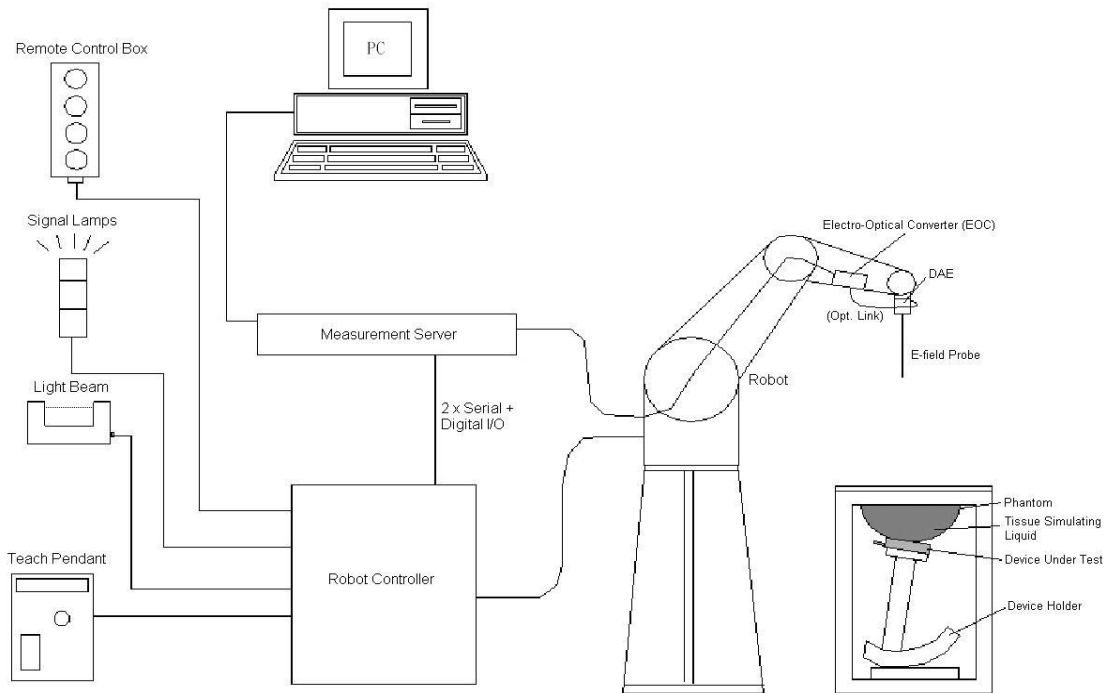


Fig 6.1 SPEAG DASY System Configurations

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 (ECO) 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.
- Some of the components are described in details 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

<ES3DV3 Probe>

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

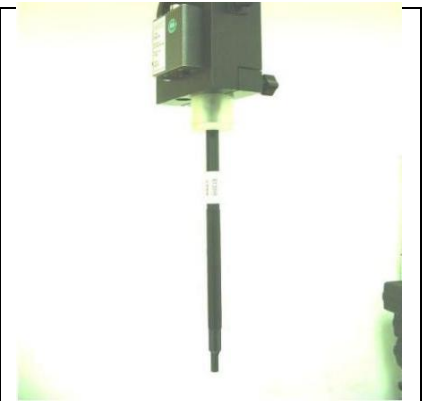


Fig 6.2 Photo of ES3DV3

<EX3DV4 Probe>

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	10 MHz to 6 GHz; Linearity: ± 0.2 dB
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 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 6.3 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 (NormX, NormY, and NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested. The calibration data can be referred to appendix C 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. 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 200M Ω ; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.



Fig 6.4 Photo of DAE

6.3. Robot

The SPEAG DASY system uses the high precision robots (DASY4: RX90BL; DASY5: TX90XL) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version (DASY4: CS7MB; DASY5: CS8c) from Stäubli is used. The Stäubli robot series have many features that are important for our application:

High precision (repeatability ± 0.035 mm)

High reliability (industrial design)

Jerk-free straight movements

Low ELF interference (the closed metallic construction shields against motor control fields)



Fig 6.5 Photo of DASY5

6.4. Measurement Server

The measurement server is based on a PC/104 CPU board with CPU (DASY4: 166 MHz, Intel Pentium; DASY5: 400 MHz, Intel Celeron), chip disk (DASY4: 32 MB; DASY5: 128 MB), RAM (DASY4: 64 MB, DASY5: 128 MB). The necessary circuits for communication with the DAE electronic box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY I/O board, which is directly connected to the PC/104 bus of the CPU board. The measurement server performs all the real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operations.



Fig 6.6 Photo of Server for DASY5

6.5. Light Beam Unit

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

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



Fig. 6.7 Photo of Light Beam

6.6. Phantom

<SAM Twin Phantom>

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



Fig. 6.8 Photo of SAM Phantom

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

6.7. Device Holder

<Device Holder for SAM Twin Phantom>

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

The DASY device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (EPR). 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 6.9 Device Holder

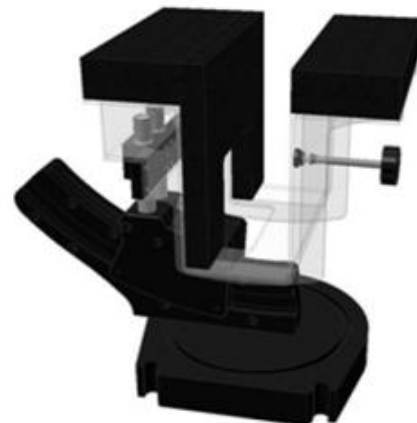


Fig 6.10 Laptop Extension Kit



6.8. Data Storage and Evaluation

➤ Data Storage

The DASY software stores the assessed data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all the necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files. The post-processing software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification 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], [A/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 factor	$ConvF_i$
	- Diode compression point	$dcpi$
Device parameters:	- Frequency	f
	- Crest factor	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:

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

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)
 dcp_i = diode compression point (DASY parameter)

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

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

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

With V_i = compensated signal of channel i , ($i = x, y, z$)
 Norm_i = sensor sensitivity of channel i , ($i = x, y, z$), $\mu\text{V}/(\text{V}/\text{m})^2$ for E-field
 Probes 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.

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

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 = equivalent tissue density in g/cm^3

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



6.9. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V3	1173	2018.06.21	2021.06.20
SPEAG	835MHz System Validation Kit	D835V2	4d227	2018.06.22	2021.06.21
SPEAG	1750MHz System Validation Kit	D1750V2	1160	2018.06.25	2021.06.24
SPEAG	1900MHz System Validation Kit	D1900V2	5d221	2018.06.22	2021.06.21
SPEAG	2450MHz System Validation Kit	D2450V2	805	2018.10.26	2021.10.25
SPEAG	2600MHz System Validation Kit	D2600V2	1139	2018.06.25	2021.06.24
SPEAG	3900MHz System Validation Kit	D3900V2	1046	2020.06.02	20231.6.01
SPEAG	5000MHz System Validation Kit	D5GHzV2	1176	2018.11.06	2021.11.05
SPEAG	Dosimetric E-Field Probe	EX3DV4	7608	2020.11.27	2021.11.26
SPEAG	Data Acquisition Electronics	DAE4	1643	2020.11.30	2021.11.29
SPEAG	Dielectric Assessment KIT	DAK-3.5	1279	2020.10.20	2021.10.19
SPEAG	SAM Twin Phantom 2	QD 000 P40 CB	TP-1464	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
R&S	Network Emulator	CMW500	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	2021.03.25	2022.03.24
Agilent	Power Sensor	N8482A	MY41090849	2020.10.20	2021.10.19
Agilent	Power Meter	E4416A	MY45102093	2020.10.20	2021.10.19
Anritsu	Power Sensor	MA2411B	N/A	2020.10.20	2021.10.19
Anritsu	Power Meter	NRVD	101066	2020.10.20	2021.10.19
Agilent	Dual Directional Coupler	778D	50422	NA	NA
MCL	Attenuation1	351-218-010	N/A	NA	NA
KTJ	Thermo meter	TA298	N/A	2021.01.15	2022.01.14
N/A	Tissue Simulating Liquids	600-6000MHz	N/A	24H	

Note:

1. The calibration certificate of DASY can be referred to appendix E of this report.
2. The Insertion Loss calibration of Dual Directional Coupler and Attenuator were characterized via the network analyzer and compensated during system check.
3. 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.

4. 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.
5. Attenuator insertion loss is calibrated by the network Analyzer, which the calibration is valid, before system check.
6. N.C.R means No Calibration Requirement.

7. Tissue Simulating Liquids

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15cm. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15cm. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15cm, which is shown in Fig. 7.1. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 7.2. The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5% are listed in below table.

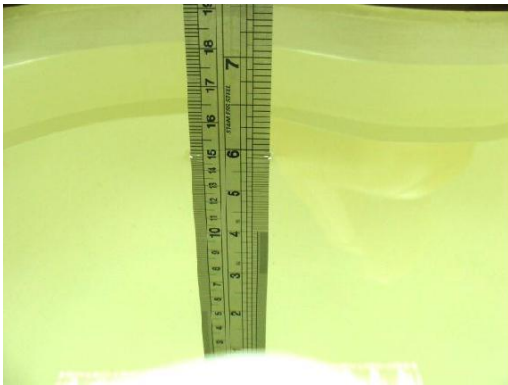


Fig 7.1 Photo of Liquid Height for Head SAR



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
Body								
750	51.7	47.2	0	0.9	0.1	0	0.96	55.5
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
1800, 1900, 2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0	0	31.4	1.95	52.7
2600	68.1	0	0	0.1	0	31.8	2.16	52.5

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%



Note: Please refer to the validation results for dielectric parameters of each frequency band. The dielectric properties of the tissue simulating liquids were verified prior to the SAR evaluation using a SPEAG Dielectric Assessment KIT and an Agilent Network Analyzer.

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	22.3	0.893	0.89	0.34	±5	2021.05.05
835	HSL	22.3	0.908	0.90	0.89	±5	2021.05.05
1750	HSL	22.1	1.410	1.37	2.92	±5	2021.05.19
1900	HSL	22.1	1.403	1.40	0.21	±5	2021.05.19
2450	HSL	22.4	1.768	1.80	-1.78	±5	2021.05.15
3900	HSL	22.3	3.312	3.33	-0.54	±5	2021.05.18
5250	HSL	22.1	4.812	4.71	2.17	±5	2021.05.21
5600	HSL	22.1	5.262	5.07	3.79	±5	2021.05.22
5750	HSL	22.1	5.368	5.22	2.84	±5	2021.05.23
Frequency (MHz)	Tissue Type	Liquid Temp.(°C)	Permittivity (ϵ_r)	Permittivity Target (ϵ_r)	Delta (ϵ_r) (%)	Limit (%)	Date
750	HSL	22.3	41.888	41.90	-0.03	±5	2021.05.05
835	HSL	22.3	41.726	41.50	0.54	±5	2021.05.05
1750	HSL	22.1	40.231	40.10	0.33	±5	2021.05.19
1900	HSL	22.1	40.343	40.00	0.86	±5	2021.05.19
2450	HSL	22.4	39.555	39.20	0.91	±5	2021.05.15
3900	HSL	22.3	37.862	37.50	0.97	±5	2021.05.18
5250	HSL	22.1	36.124	35.95	0.48	±5	2021.05.21
5600	HSL	22.1	36.168	35.50	1.88	±5	2021.05.22
5750	HSL	22.1	35.883	35.35	1.51	±5	2021.05.23

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.

8.1. 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.

8.2. System Setup

The output power on dipole port must be calibrated to 24 dBm (250 mW) before dipole is connected. In the simplified setup for system evaluation, the DUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave which 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 system check verifies that the system operates within its specifications. It is performed daily or before every SAR measurement. The system check uses normal SAR measurements in the flat section of the phantom with a matched dipole at a specified distance. The system verification setup is shown as below.



Fig 8.1 Photo of Dipole Setup

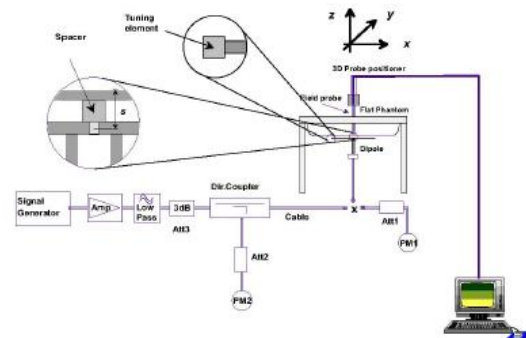


Fig 8.2 System Setup for System Evaluation



8.3. Validation Results

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

<Validation Setup>

Frequency (MHz)	Tissue Type	Input Power(mW)	Dipole S/N	Probe S/N	DAE S/N
750	HSL	250	D750V3-1173	7608	1643
835	HSL	250	D835V2-4d227	7608	1643
1750	HSL	250	D1750V2-1160	7608	1643
1900	HSL	250	D1900V2-5d221	7608	1643
2450	HSL	250	D2450V2-805	7608	1643
3900	HSL	100	D3900V2-1046	7608	1643
5250	HSL	100	D5GHzV2-1176-5250	7608	1643
5600	HSL	100	D5GHzV2-1176-5600	7608	1643
5750	HSL	100	D5GHzV2-1128-5750	7608	1643

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	Frequency (MHz)	Tissue Type	Input Power (mW)	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2021.05.05	750	HSL	250	2.09	8.26	8.36	1.21
2021.05.05	835	HSL	250	2.34	9.34	9.36	0.21
2021.05.19	1750	HSL	250	9.32	37.10	37.28	0.49
2021.05.19	1900	HSL	250	10.16	39.50	40.64	2.89
2021.05.15	2450	HSL	250	13.27	52.00	53.08	2.08
2021.05.18	3900	HSL	100	7.25	69.90	72.5	3.72
2021.05.21	5250	HSL	100	7.82	78.90	78.2	-0.89
2021.05.22	5600	HSL	100	8.29	80.90	82.9	2.47
2021.05.23	5750	HSL	100	8.11	80.00	81.1	1.37

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Measured 10g SAR (W/kg)	Targeted 10g SAR (W/kg)	Normalized 10g SAR (W/kg)	Deviation (%)
2021.05.05	750	HSL	250	1.41	5.45	5.64	3.49
2021.05.05	835	HSL	250	1.56	6.07	6.24	2.80
2021.05.19	1750	HSL	250	5.09	20.00	20.36	1.80
2021.05.19	1900	HSL	250	5.18	20.60	20.72	0.58
2021.05.15	2450	HSL	250	6.17	24.10	24.68	2.41
2021.05.18	3900	HSL	100	2.37	24.10	23.7	-1.66



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2021.05.21	5250	HSL	100	2.21	22.50	22.1	-1.78
2021.05.22	5600	HSL	100	2.31	23.10	23.1	0.00
2021.05.23	5750	HSL	100	2.19	22.60	21.9	-3.10

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 10 mm gap, as illustrated below, please refer to Appendix 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

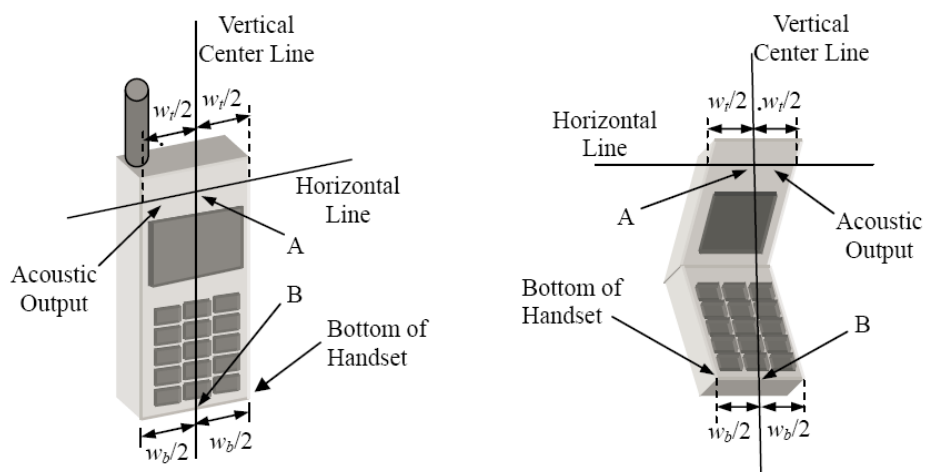


Fig. 9.2 Illustration for Handset Vertical and Horizontal Reference Lines

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)

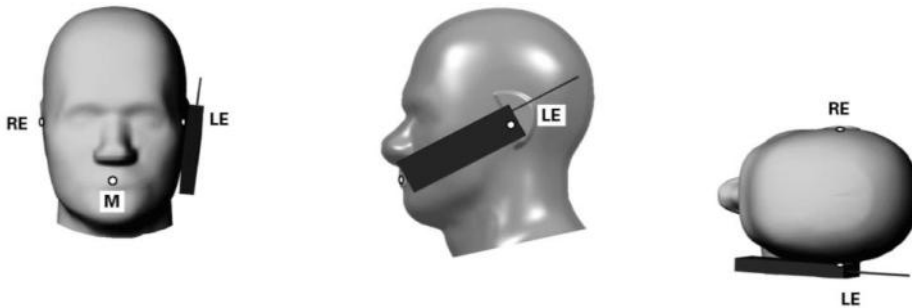


Fig 9.3 Illustration for Cheek Position

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).

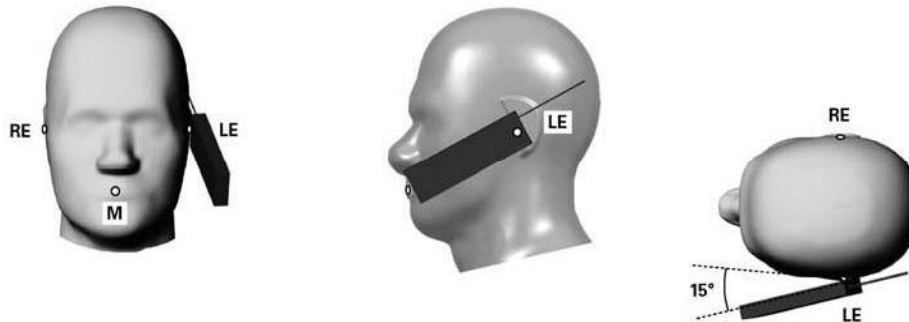


Fig 9.4 Illustration for Tilted Position

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-worn Configurations

The body-worn configurations shall be tested with the supplied accessories (belt-clips, holsters, etc.) attached to the device in normal use configuration.

For body-worn and other configurations a flat phantom shall be used which is comprised of material with electrical properties similar to the corresponding tissues.

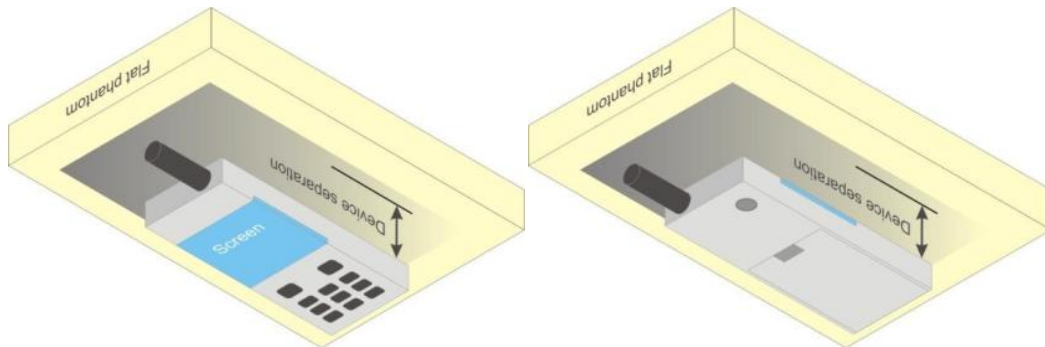


Fig 9.5 Illustration for Body Worn Position

9.6. Hotspot Mode Exposure Position Conditions

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

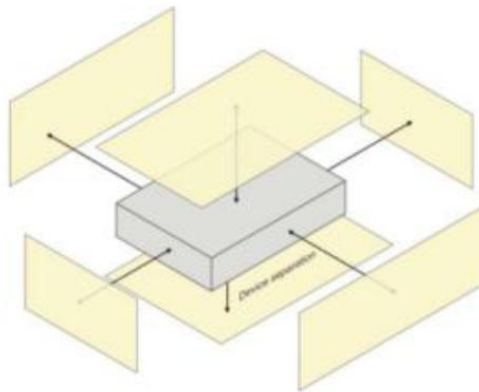


Fig 9.6 Illustration for Hotspot Position

10. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

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

<SAR measurement>

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

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

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

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 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.



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

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

10.2. Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

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 10mm² 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 founding the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE1528-2003.

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/m³ 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 DASYS, 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 1 g and 10 g cubes, the extrapolation distance should not be larger than 5 mm.

10.6. Power Drift Monitoring

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

11. SAR Test Procedure

11.1. General Scan Requirements

Probe boundary effect error compensation is required for measurements with the probe tip closer than half a probe tip diameter to the phantom surface. Both the probe tip diameter and sensor offset distance must satisfy measurement protocols; to ensure probe boundary effect errors are minimized and the higher fields closest to the phantom surface can be correctly measured and extrapolated to the phantom surface for computing 1-g SAR. Tolerances of the post-processing algorithms must be verified by the test laboratory for the scan resolutions used in the SAR measurements, according to the reference distribution functions specified in IEEE Std. 1528-2013.

		≤ 3 GHz	> 3 GHz	
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface		5 mm \pm 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2)$ mm \pm 0.5 mm	
Maximum probe angle from probe axis to phantom surface normal at the measurement location		$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$	
Maximum area scan spatial resolution: Δx_{Area} , Δy_{Area}		≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm	
		When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be \leq the corresponding x or y dimension of the test device with at least one measurement point on the test device.		
Maximum zoom scan spatial resolution: Δx_{Zoom} , Δy_{Zoom}		≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*	
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$	≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm	
	graded grid	$\Delta z_{Zoom}(1)$: between 1 st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$ mm	
Minimum zoom scan volume	x, y, z	≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm	
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see IEEE Std 1528-2013 for details. * When zoom scan is required and the <i>reported</i> SAR from the <i>area scan based 1-g SAR estimation</i> procedures of KDB Publication 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				



11.2. Test Procedure

The Following steps are used for each test position

1. Establish a call with the maximum output power with a base station simulator. The connection between the mobile and the base station simulator is established via air interface.
2. Measurement of the local E-field value at a fixed location. This value serves as a reference value for calculating a possible power drift.
3. Measurement of the SAR distribution with a grid of 8 to 16mm * 8 to 16 mm and a constant distance to the inner surface of the phantom. Since the sensors cannot directly measure at the inner phantom surface, the values between the sensors and the inner phantom surface are extrapolated. With these values the area of the maximum SAR is calculated by an interpolation scheme.
4. Around this point, a cube of 30 * 30 * 30 mm or 32 * 32 * 32 mm is assessed by measuring 5 or 8 * 5 or 8*4 or 5 mm. With these data, the peak spatial-average SAR value can be calculated.

11.3. Description of Interpolation/Extrapolation Scheme

The local SAR inside the phantom is measured using small dipole sensing elements inside a probe body. The probe tip must not be in contact with the phantom surface in order to minimize measurements errors, but the highest local SAR will occur at the surface of the phantom.

An extrapolation is using to determinate this highest local SAR values. The extrapolation is based on a fourth-order least-square polynomial fit of measured data. The local SAR value is then extrapolated from the liquid surface with a 1mm step.

The measurements have to be performed over a limited time (due to the duration of the battery) so the step of measurement is high. It could vary between 5 and 8 mm. To obtain an accurate assessment of the maximum SAR averaged over 10 grams and 1 gram requires a very fine resolution in the three dimensional scanned data array.

11.4. Wireless Router

Some battery-operated handsets have the capability to transmit and receive user through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06 v02r01 where SAR test considerations for handsets ($L \times W \geq 9 \text{ cm} \times 5 \text{ cm}$) are based on a composite test separation distance of 10 from the front, back and edges of the device containing transmitting antennas within 2.5cm of their edges,



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 due to the limitations of the SAR assessment probes. Therefore, SAR must be evaluated for each frequency transmission and mode separately and spatially summed with the WIFI transmitter according to FCC KDB Publication 447498 D01v06 publication procedures. The "Portable Hotspot" feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.



12. 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:				
1. 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				
2. 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_a	β_a (SF)	β_c/β_a	$\beta_{hs}^{(1)}$	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: $\Delta_{ACK}, \Delta_{NACK}$ 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 $\beta_c/\beta_a = 12/15, \beta_{hs}/\beta_c = 24/15$.
 Note 3: For subtest 2 the β_c/β_a 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 $\beta_a = 15/15$.

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	β_{ed1} : 47/15 β_{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, TF0) 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, TF0) 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	β_{ed1} : 30/15 β_{ed2} : 30/15	β_{ed3} : 24/15 β_{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

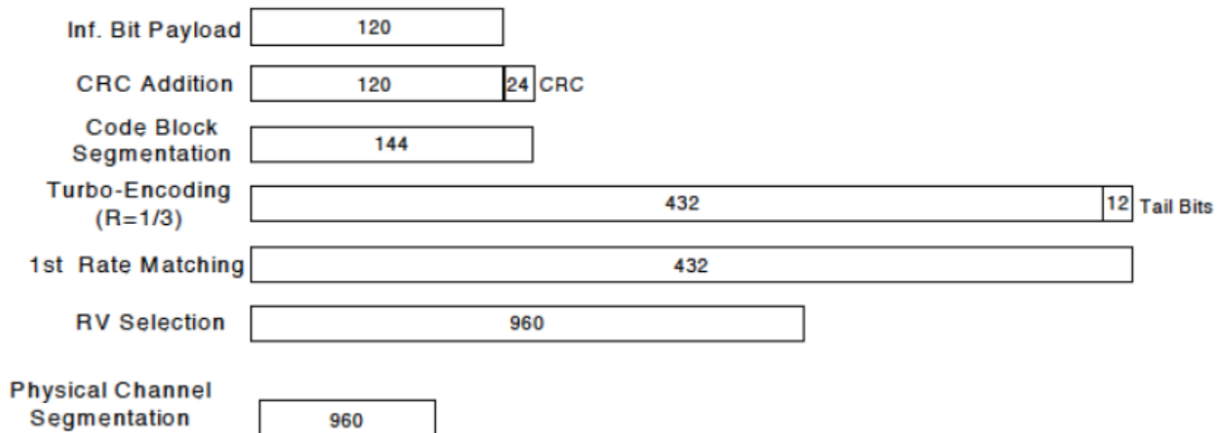
Parameter During Connection setup	Unit	Value
P-CPICH_Ec/Ior	dB	-10
P-CCPCH and SCH_Ec/Ior	dB	-12
PICH_Ec/Ior	dB	-15
HS-PDSCH	dB	off
HS-SCCH_1	dB	off
DPCH_Ec/Ior	dB	-5
OCNS_Ec/Ior	dB	-3.1

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)



<CDMA Mode>

1xEV-DO Rev. B

Call box setup procedure

1xEV-DO Release B

1> CMW 500 Signal Generator > 1xEV-DO Taskbar Enable

2> CMW 500 1xEV-DO Signaling Configuration Window >

3> 1xEV-DO Signaling On Window:

Under Access Network Control:

Band Class: BC0: US Cellular

RF Channel: 31

1xEV-DO Power: -70 dBm

4> 1xEV-DO Signaling Configuration Window

Under RF Frequency Band / Channel: Enter Ch. Frequency

- Under Carrier Configuration: RF Frequency
For Two Carriers: Low Channel (1013)

	<u>RF Channel</u>	<u>RF Channel Offset</u>
Carrier [0]	31	0
Carrier [1]	1013	982

- Under Carrier Configuration: RF Pilot
- | | <u>Carrier Sector</u> | <u>Active on AN</u> | <u>Assigned to AT</u> |
|-----------|-----------------------|---------------------|-----------------------|
| Pilot [0] | C0/S0 | ✓ | ✓ |
| | CA/S1 | ✓ | ✓ |

For Three Carriers: Low Channel (1013)

	<u>RF Channel</u>	<u>RF Channel Offset</u>
Carrier [0]	72	0
Carrier [1]	31	-41
Carrier [2]	1013	941

- Under Carrier Configuration: RF Pilot
- | | <u>Carrier Sector</u> | <u>Active on AN</u> | <u>Assigned to AT</u> |
|-----------|-----------------------|---------------------|-----------------------|
| Pilot [0] | C0/S0 | ✓ | ✓ |
| Pilot [1] | C1/S1 | ✓ | ✓ |
| Pilot [2] | C2/S2 | ✓ | ✓ |



<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	Channel bandwidth / Transmission bandwidth configuration [RB]						MPR	3GPP
	1.4	3.0	5	10	15	20	Target	MPR
	MHz	MHz	MHz	MHz	MHz	MHz	(dB)	(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	Channel 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	√	√	N/A	N/A
13	N/A	N/A	√	√	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 ½ 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 ½ 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 / 12 SAR test was covered by Band 25 / 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 ≤ 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 16QAM signal 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



DSSSSAR.

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.

13. Conducted Power List

Remark: The output power of GSM/WCDMA/LTE/5G NR(NSA) refers to the annex E of this report.

14. LTE Carrier Aggregation

14.1. 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_66B	66B	-	No
3	CA_66C	66C	-	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_2A-4A	2A	-	No
2	CA_2A-5A	2A	-	No
3	CA_2A-12A	2A	-	No
4	CA_2A-13A	2A	-	No
5	CA_2A-66A	2A	-	No
6	CA_4A-5A	4A	-	No
7	CA_4A-12A	4A	-	No
8	CA_4A-13A	4A	-	No
9	CA_5A-66A	66A	-	No
10	CA_13A-66A	66A	-	No

Note:

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

- a. 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.
- b. 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.
- c. 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.



14.2. 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-2A	2A-2A		3CC-1
2	CA_2A-4A	2A, 4A, 2A-4A		3CC-6
3	CA_2A-5A	2A		3CC-9
4	CA_2A-12A	-		No
5	CA_2A-13A	2A		3CC-12
6	CA_2A-66A	2A, 66A, 2A-66A		3CC-14
7	CA_4A-4A	4A-4A		3CC-17
8	CA_4A-5A	4A		3CC-17
9	CA_4A-13A	4A		3CC-18
10	CA_4A-66A	4A		No
11	CA_5A-5A	-		3CC-32
12	CA_5A-12A	-		3CC-21
13	CA_5A-66A	66A		3CC-24
14	CA_66B	66B		3CC-23
15	CA_66C	66C		3CC-24



3CC Downlink Carrier Aggregation				
No.	Combination	UL MIMO	Restriction	Completely Covered by Measurement Superset
1	CA_2A-2A-4A	2A-2A, 2A-4A		4CC-1
2	CA_2A-2A-5A	2A-2A		4CC-4
3	CA_2A-2A-12A	2A-2A		4CC-5
4	CA_2A-2A-13A	2A-2A		4CC-6
5	CA_2A-2A-66A	2A-2A, 2A-66A		4CC-9
6	CA_2A-4A-4A	2A-4A, 4A-4A		4CC-10
7	CA_2A-4A-5A	2A, 4A, 2A-4A		4CC-11
8	CA_2A-4A-12A	2A, 4A, 2A-4A		No
9	CA_2A-5A-66A	2A, 66A, 2A-66A		4CC-14
10	CA_2A-5B	2A		4CC-15
11	CA_2A-13A-46A	2A	46A RX only	No
12	CA_2A-13A-66A	2A, 66A, 2A-66A		4CC-18
13	CA_2A-46A-66A	2A, 66A, 2A-66A	46A RX only	No
14	CA_2A-66A-66A	2A-66A, 66A-66A		4CC-19
15	CA_2A-66B	2A, 66B, 2A-66B		4CC-8
16	CA_2A-66C	2A, 66C, 2A-66C		4CC-9
17	CA_4A-4A-5A	4A-4A		4CC-20
18	CA_4A-4A-13A	4A-4A		No
19	CA_4A-5B	4A		4CC-20
20	CA_4A-46A-46A	4A	46A RX only	No
21	CA_5A-5A-66A			4CC-23
22	CA_5A-66A-66A			4CC-21
23	CA_5A-66B			4CC-25
24	CA_5A-66C			4CC-25
25	CA_5B-66A			4CC-25
26	CA_13A-4A-2A	4A, 2A		No
27	CA_13A-46A-66A	66A	46A RX only	4CC-18
28	CA_13A-66A-66A	66A-66A		4CC-18
29	CA_13A-66B	66B		4CC-18
30	CA_13A-66C	66C		4CC-18
31	CA_66A-66A-66A	66A-66A		4CC-19
32	CA_66A-66C	66A-66C		No



4CC Downlink Carrier Aggregation				
No.	Combination	UL MIMO	Restriction	Completely Covered by Measurement Superset
1	CA_2A-2A-4A-4A	2A-2A	-	No
2	CA_2A-2A-4A-5A	2A-2A	-	No
3	CA_2A-2A-4A-12A	2A-2A	-	No
4	CA_2A-2A-5A-66A	2A-2A	-	No
5	CA_2A-2A-12A-66A	2A-2A	-	No
6	CA_2A-2A-13A-66A	2A-2A	-	No
7	CA_2A-2A-66A-66A	2A, 66A-66A	-	No
8	CA_2A-2A-66B	66B, 2A-2A	-	No
9	CA_2A-2A-66C	66C, 2A-2A	-	No
10	CA_2A-4A-4A-5A	4A-4A	-	No
11	CA_2A-4A-5B	2A, 4A, 2A-4A	-	No
12	CA_2A-5A-66A-66A	66A-66A	-	No
13	CA_2A-5A-66B	2A, 66B	-	No
14	CA_2A-5A-66C	2A, 66C	-	No
15	CA_2A-5B-66A	2A, 66A, 2A-66A	-	No
16	CA_2A-13A-66A-66A	66A-66A	-	No
17	CA_2A-13A-66B	2A, 66B	-	No
18	CA_2A-13A-66C	2A, 66C	-	No
19	CA_2A-66A-66A-66A	66A-66A	-	No
20	CA_4A-4A-5B	4A-4A	-	No
21	CA_5A-5A-66A-66A	66A-66A	-	No
22	CA_5A-5A-66B	66B	-	No
23	CA_5A-5A-66C	66C	-	No
24	CA_5B-66B	66B	-	No
25	CA_5B-66C	66C	-	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.

15. 5G NR EN-DC Consideration

➤ General Guidance

1. 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.
2. 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.
3. According to October 2020 TCB Workshop publication, EN-DC SAR assessment should follow:
 - a. 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.
 - b. 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.
 - c. 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.
 - d. 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	12A-N2	12A	N2	15	20
FDD	2A-12A-N2	2A/12A	N2	15	20
FDD	12A-66A-N2	12A/66A	N2	15	20
FDD	13A-66A-N2	13A/66A	N2	15	20
FDD	46A-66A-N5	12A/66A/66A	N5	15	20
FDD	2A-46D-N5	46A/66A	N5	15	20
FDD	12A-N66	2A/46D	N66	15	20
FDD	13A-46A-N66	12A	N66	15	20
FDD	5A-46A-N66	13A/46A	N66	15	20
FDD	2A-12A-N66	5A/46A	N66	15	20
FDD	12A-66A-N66	2A/12A	N66	15	20
FDD	2A-46A-N66	12A/66A	N66	15	20
TDD	13A-N77	2A/46A	N77	30	100

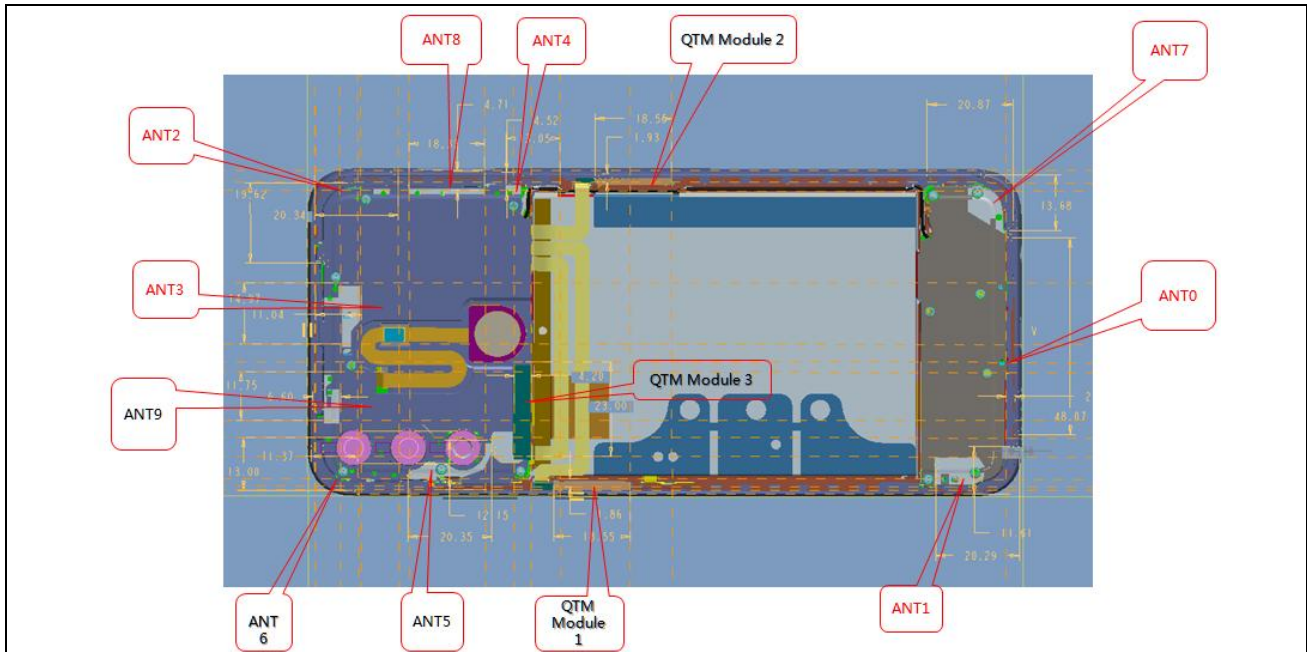


TDD	5A-N77	2A/12A/12A	N77	30	100
FDD	12A-66A-66A-N2	13A	N2	15	20
FDD	2A-12A-12A-N66	5A	N66	15	20

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
12A-N2	12	10	25.0	18.5	N2	20	22.5
2A-12A-N2	12	10	25.0	18.5	N2	20	22.5
12A-66A-N2	12	10	25.0	19.0	N2	20	22.5
13A-66A-N2	13	10	25.0	22.5	N2	20	22.5
46A-66A-N5	66	20	22.0	23.0	N5	20	23.0
2A-46D-N5	2	20	22.5	19.5	N5	20	23.0
12A-N66	12	10	25.0	21.5	N66	20	23.5
13A-46A-N66	13	10	25.0	23.5	N66	20	23.5
5A-46A-N66	5	10	25.0	23.0	N66	20	23.5
2A-12A-N66	2	20	22.5	19.5	N66	20	23.5
12A-66A-N66	12	10	25.0	18.5	N66	20	23.5
2A-46A-N66	2	20	22.5	23.0	N66	20	23.5
13A-N77	13	10	25.0	23.5	N77	100	23.5
5A-N77	5	10	25.0	23.5	N77	100	23.5
12A-66A-66A-N2	12	10	25.0	18.5	N2	20	22.5
2A-12A-12A-N66	12	10	25.0	18.5	N66	20	23.5

16. Hotspot Mode Evaluation Procedure

➤ EUT Antenna Location



Antenna supports TX bands:

- ANT 0: GSM 850, UMTS Band V, LTE Band 5/12/13, 5G N5;
- ANT 2: GSM 850, UMTS Band V, LTE Band 5/12/13, 5G N5;
- ANT 3: GSM1900,WCDMA Band 2/4, LTE Band 2/4/66, 5G N77;
- ANT 5: WLAN 2.4GHz CH0, WLAN 5GHz CH0, Bluetooth;
- ANT 6: WLAN 5GHz CH1;
- ANT 8: 5G N2/66;
- ANT 9: WLAN 2.4GHz CH1;

Antenna supports RX bands:

- ANT 0: GSM 850, UMTS Band V, LTE Band 5/12/13, 5G N5;
- ANT 1: LTE Band 2/4/66, 5G N2/77/66;
- ANT 2: GSM 850, UMTS Band V, LTE Band 5/12/13, 5G N5;
- ANT 3: LTE Band 2/4/66, 5G N2/66/77;
- ANT 4: 5G N77;
- ANT 5: WLAN 2.4GHz CH0, WLAN 5GHz CH0, Bluetooth, LTE Band 46;
- ANT 6: GPS L1/L5; WLAN 5GHz CH1, LTE Band 46;
- ANT 7: LTE Band 2/4/66, 5G N2/66/77;
- ANT 8: GSM1900,WCDMA Band 2/4, LTE Band 2/4/66, 5G N2/66;
- ANT 9: WLAN 2.4GHz CH1;



➤ **EUT Antenna Distance**

Antenna Location	Front	Back	Left	Right	Top	Bottom
ANT 0 Antenna	<5mm	<5mm	<25mm	<5mm	166mm	<5mm
ANT 1 Antenna	<5mm	<5mm	<25mm	<5mm	139mm	<5mm
ANT 2 Antenna	<5mm	<5mm	<5mm	>25mm	<5mm	150mm
ANT 3 Antenna	<5mm	<5mm	>25mm	>25mm	<5mm	157mm
ANT 4 Antenna	<5mm	<5mm	<5mm	<25mm	45mm	118mm
ANT 5 Antenna	<5mm	<5mm	>25mm	<5mm	<25mm	117mm
ANT 6 Antenna	<5mm	<5mm	<25mm	<5mm	<5mm	157mm
ANT 7 Antenna	<5mm	<5mm	<5mm	>25mm	144mm	<5mm
ANT 8 Antenna	<5mm	<5mm	<5mm	>25mm	<25mm	>25mm
ANT 9 Antenna	<5mm	<5mm	>25mm	<25mm	<5mm	167mm

➤ **Hotspot Evaluation**

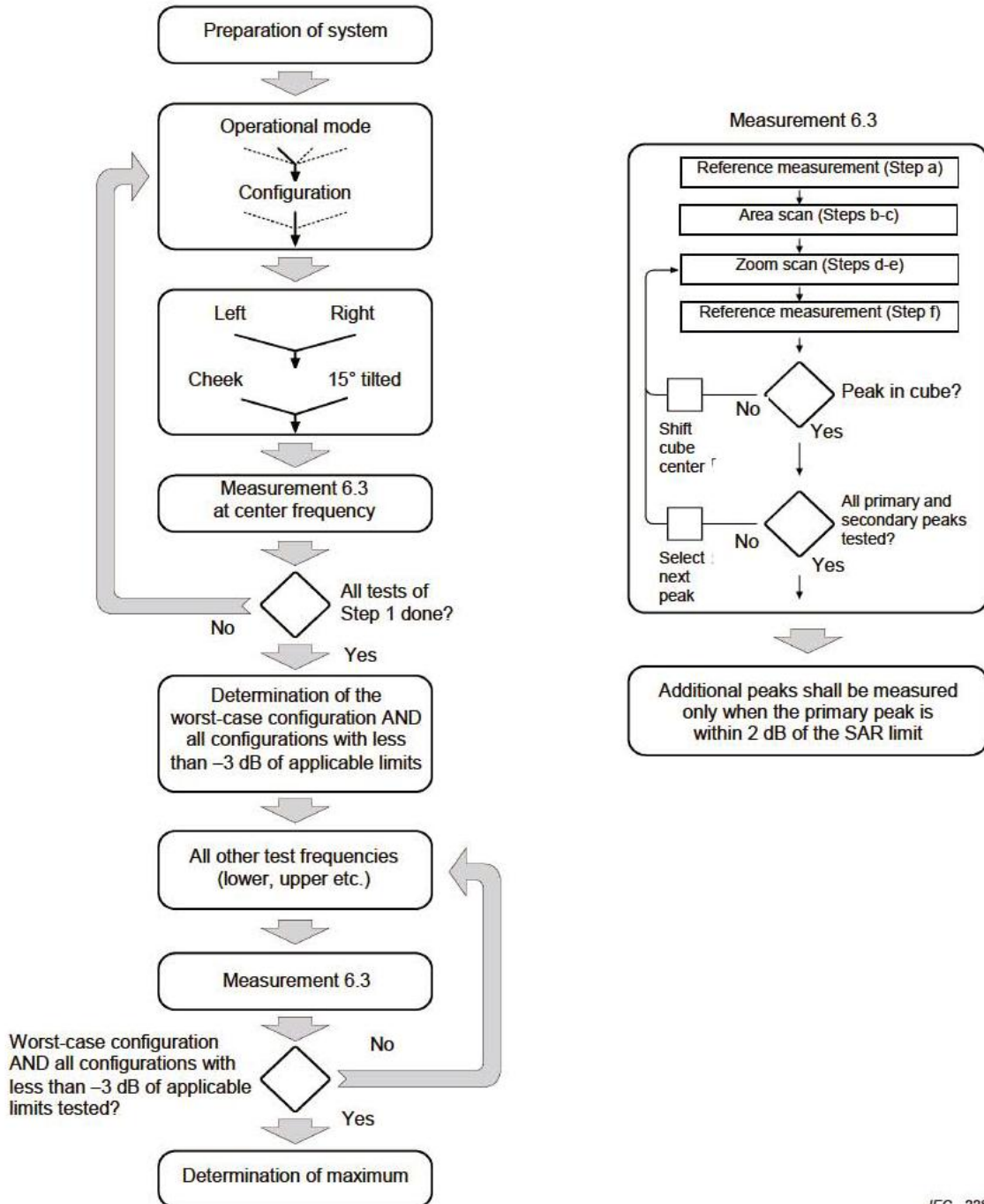
Assessment		Hotspot side for SAR Test distance: 10mm				
Antennas	Front	Back	Left	Right	Top	Bottom
ANT 0	Yes	Yes	Yes	Yes	No	Yes
ANT 1	No	No	No	No	No	No
ANT 2	Yes	Yes	Yes	Yes	Yes	No
ANT 3	Yes	Yes	No	No	Yes	No
ANT 4	Yes	Yes	Yes	Yes	No	No
ANT 5	Yes	Yes	No	Yes	Yes	No
ANT 6	No	No	No	No	No	No
ANT 7	Yes	Yes	Yes	Yes	No	Yes
ANT 8	Yes	Yes	Yes	Yes	Yes	No
ANT 9	Yes	Yes	No	Yes	Yes	No

Note :

1. The SAR evaluation procedures for Portable Devices with Wireless Router function is according to KDB 941225 D06 Hotspot SAR v02r01.
2. Head/Body-worn/Hotspot mode SAR assessments are required.
3. Referring to KDB 941225 D06, when the overall device length and width are $\geq 9\text{cm} \times 5\text{cm}$, the test distance is 10 mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.
4. For WWAN antennas, all of the surfaces or edges will be tested except the bottom side though they are greater than 25mm between the antennas and surfaces or edges in this report.

17. Block Diagram of the Tests to be Performed

17.1. Head



IEC 228/05

17.2. Body

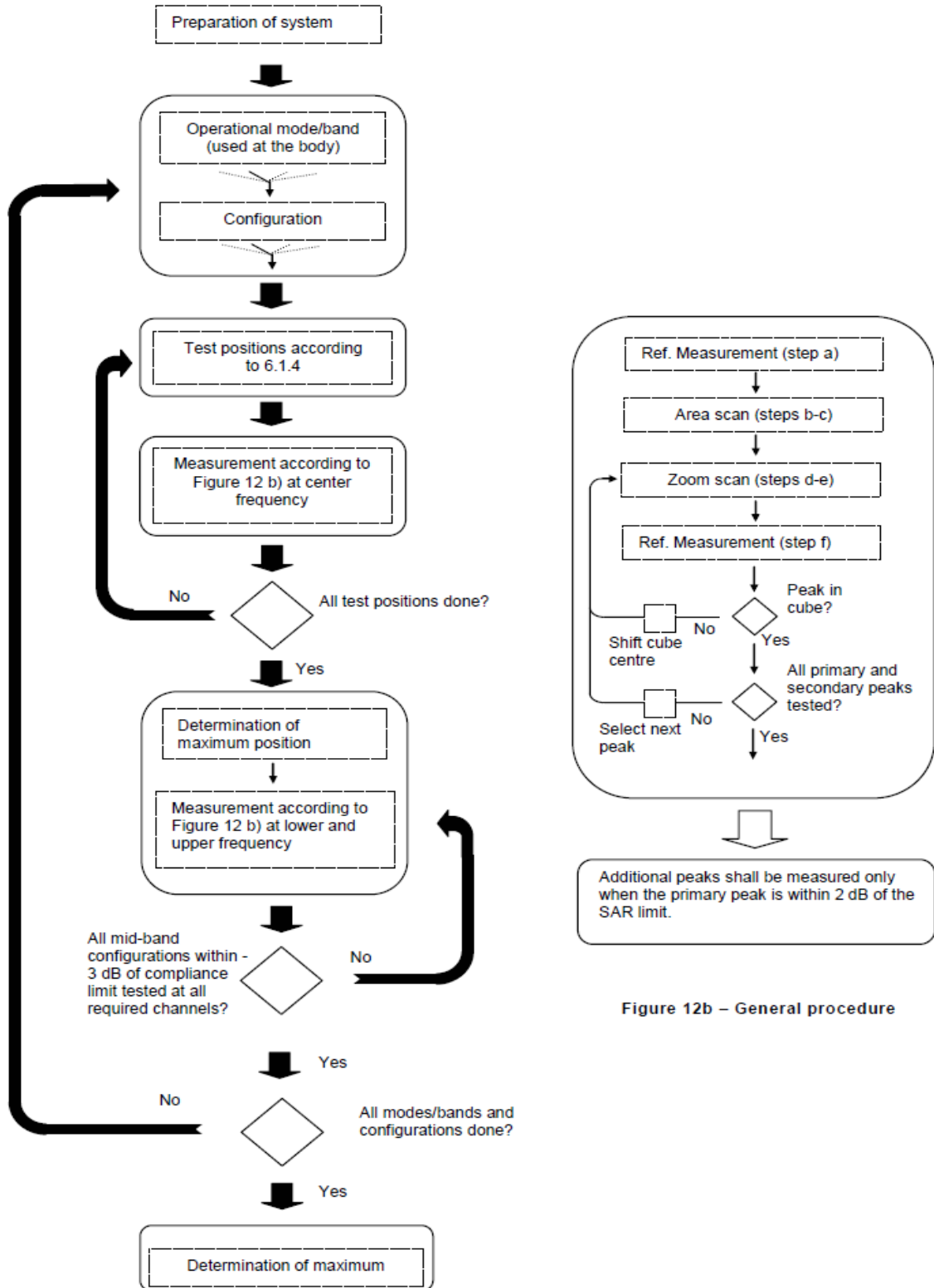


Figure 12b – General procedure



18. Test Results List

18.1. Test Guidance

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
 - a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
 - b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)".
 - c. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor.
 - d. For WLAN/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 KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥ 0.8 W/kg.
4. 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.
5. Per KDB648474 D04v01r03, for smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm, when hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg, however, when power reduction applies to hotspot mode the measured SAR must be scaled to the maximum output power, including tolerance, allowed for tablet modes to compare with the 1.2 W/kg SAR test reduction threshold.
6. 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.

7. The EUT respectively defined the top and bottom antenna maximum power in the software. The top and bottom antenna will switch automatically according to the receiver signal strength and maximum transmission power level.
8. For CA intra-band uplink, SAR measurement was performed at the worst condition of standalone carrier, and it was performed separately for CA inter-band uplink according to the TCB workshop publication in October 2018.
9. The 5G NR (NSA) SAR measurement procedure should be followed the TCB workshop publication in October 2020:
 - a. 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.
 - b. 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.
 - c. 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.
 - d. When the algebraic sum of the 1-g SAR values is > 1.6 W/kg, SPLSR analysis procedure should be applied.



18.2. Head SAR Data

➤ GSM 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 2								
	GPRS 850(4 TX slots)	Right Cheek	251	26.56	27.00	1.107	0.209	0.231
1#	GPRS 850(4 TX slots)	Right Tilt	251	26.56	27.00	1.107	0.222	0.246
	GPRS 850(4 TX slots)	Left Cheek	251	26.56	27.00	1.107	0.187	0.207
	GPRS 850(4 TX slots)	Left Tilt	251	26.56	27.00	1.107	0.111	0.123
Ant 0								
	GPRS 850(4 TX slots)	Right Cheek	251	30.42	31.00	1.143	0.049	0.056
	GPRS 850(4 TX slots)	Right Tilt	251	30.42	31.00	1.143	0.020	0.023
	GPRS 850(4 TX slots)	Left Cheek	251	30.42	31.00	1.143	0.052	0.059
	GPRS 850(4 TX slots)	Left Tilt	251	30.42	31.00	1.143	0.028	0.032
Ant 3								
	GPRS 1900(4 TX slots)	Right Cheek	661	25.48	26.00	1.127	0.396	0.446
2#	GPRS 1900(4 TX slots)	Right Tilt	661	25.48	26.00	1.127	0.516	0.582
	GPRS 1900(4 TX slots)	Left Cheek	661	25.48	26.00	1.127	0.384	0.433
	GPRS 1900(4 TX slots)	Left Tilt	661	25.48	26.00	1.127	0.508	0.573



➤ **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								
	Band II/RMC 12.2Kbps	Right Cheek	9400	22.52	23.00	1.117	0.208	0.232
3#	Band II/RMC 12.2Kbps	Right Tilt	9400	22.52	23.00	1.117	0.277	0.309
	Band II/RMC 12.2Kbps	Left Cheek	9400	22.52	23.00	1.117	0.183	0.204
	Band II/RMC 12.2Kbps	Left Tilt	9400	22.52	23.00	1.117	0.257	0.287
Ant 3								
	Band IV/RMC 12.2Kbps	Right Cheek	1413	22.82	23.50	1.169	0.349	0.408
4#	Band IV/RMC 12.2Kbps	Right Tilt	1413	22.82	23.50	1.169	0.444	0.519
	Band IV/RMC 12.2Kbps	Left Cheek	1413	22.82	23.50	1.169	0.316	0.370
	Band IV/RMC 12.2Kbps	Left Tilt	1413	22.82	23.50	1.169	0.436	0.510
Ant 2								
5#	Band V/RMC 12.2Kbps	Right Cheek	4233	21.15	22.00	1.216	0.373	0.454
	Band V/RMC 12.2Kbps	Right Tilt	4233	21.15	22.00	1.216	0.215	0.261
	Band V/RMC 12.2Kbps	Left Cheek	4233	21.15	22.00	1.216	0.106	0.129
	Band V/RMC 12.2Kbps	Left Tilt	4233	21.15	22.00	1.216	0.032	0.039
Ant 0								
	Band V/RMC 12.2Kbps	Right Cheek	4233	23.85	24.50	1.161	0.006	0.007
	Band V/RMC 12.2Kbps	Right Tilt	4233	23.85	24.50	1.161	0.007	0.008
	Band V/RMC 12.2Kbps	Left Cheek	4233	23.85	24.50	1.161	0.008	0.009
	Band V/RMC 12.2Kbps	Left Tilt	4233	23.85	24.50	1.161	0.003	0.003



➤ 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								
	LTE Band 2/1RB#0 20M	Right Cheek	18900	21.76	22.50	1.186	0.202	0.240
6#	LTE Band 2/1RB#0 20M	Right Tilt	18900	21.76	22.50	1.186	0.267	0.317
	LTE Band 2/1RB#0 20M	Left Cheek	18900	21.76	22.50	1.186	0.211	0.250
	LTE Band 2/1RB#0 20M	Left Tilt	18900	21.76	22.50	1.186	0.230	0.273
Ant 2								
	LTE Band 2/50RB#0 20M	Right Cheek	18900	20.69	21.50	1.205	0.184	0.222
	LTE Band 2/50RB#0 20M	Right Tilt	18900	20.69	21.50	1.205	0.236	0.284
	LTE Band 2/50RB#0 20M	Left Cheek	18900	20.69	21.50	1.205	0.193	0.233
	LTE Band 2/50RB#0 20M	Left Tilt	18900	20.69	21.50	1.205	0.200	0.241
Ant 2								
7#	LTE Band 5/1RB#0 10M	Right Cheek	20525	24.47	25.00	1.130	0.345	0.390
	LTE Band 5/1RB#0 10M	Right Tilt	20525	24.47	25.00	1.130	0.333	0.376
	LTE Band 5/1RB#0 10M	Left Cheek	20525	24.47	25.00	1.130	0.220	0.249
	LTE Band 5/1RB#0 10M	Left Tilt	20525	24.47	25.00	1.130	0.140	0.158
Ant 0								
	LTE Band 5/25RB#0 10M	Right Cheek	20525	23.32	24.00	1.169	0.286	0.334
	LTE Band 5/25RB#0 10M	Right Tilt	20525	23.32	24.00	1.169	0.235	0.275
	LTE Band 5/25RB#0 10M	Left Cheek	20525	23.32	24.00	1.169	0.164	0.192
	LTE Band 5/25RB#0 10M	Left Tilt	20525	23.32	24.00	1.169	0.104	0.122
Ant 0								
	LTE Band 5/1RB#0 10M	Right Cheek	20525	22.69	23.50	1.205	0.024	0.029
	LTE Band 5/1RB#0 10M	Right Tilt	20525	22.69	23.50	1.205	0.015	0.018
	LTE Band 5/1RB#0 10M	Left Cheek	20525	22.69	23.50	1.205	0.027	0.033
	LTE Band 5/1RB#0 10M	Left Tilt	20525	22.69	23.50	1.205	0.016	0.019
Ant 0								
	LTE Band 5/25RB#0 10M	Right Cheek	20525	21.54	22.50	1.247	0.019	0.024
	LTE Band 5/25RB#0 10M	Right Tilt	20525	21.54	22.50	1.247	0.014	0.017
	LTE Band 5/25RB#0 10M	Left Cheek	20525	21.54	22.50	1.247	0.022	0.027
	LTE Band 5/25RB#0 10M	Left Tilt	20525	21.54	22.50	1.247	0.014	0.017
	LTE Band 5B/1RB#0 10M	Right Cheek	20525	24.27	25.00	1.183	0.266	0.315



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 2								
8#	LTE Band 12/1RB#0 10M	Right Cheek	23060	24.42	25.00	1.143	0.190	0.217
	LTE Band 12/1RB#0 10M	Right Tilt	23060	24.42	25.00	1.143	0.115	0.131
	LTE Band 12/1RB#0 10M	Left Cheek	23060	24.42	25.00	1.143	0.086	0.098
	LTE Band 12/1RB#0 10M	Left Tilt	23060	24.42	25.00	1.143	0.069	0.079
Ant 0								
	LTE Band 12/25RB#0 10M	Right Cheek	23060	23.47	24.00	1.130	0.111	0.125
	LTE Band 12/25RB#0 10M	Right Tilt	23060	23.47	24.00	1.130	0.102	0.115
	LTE Band 12/25RB#0 10M	Left Cheek	23060	23.47	24.00	1.130	0.062	0.070
	LTE Band 12/25RB#0 10M	Left Tilt	23060	23.47	24.00	1.130	0.051	0.058
Ant 0								
	LTE Band 12/1RB#0 10M	Right Cheek	23060	23.93	24.50	1.140	0.031	0.035
	LTE Band 12/1RB#0 10M	Right Tilt	23060	23.93	24.50	1.140	0.014	0.016
	LTE Band 12/1RB#0 10M	Left Cheek	23060	23.93	24.50	1.140	0.060	0.068
	LTE Band 12/1RB#0 10M	Left Tilt	23060	23.93	24.50	1.140	0.015	0.017
Ant 2								
	LTE Band 12/25RB#0 10M	Right Cheek	23060	22.92	23.50	1.143	0.024	0.027
	LTE Band 12/25RB#0 10M	Right Tilt	23060	22.92	23.50	1.143	0.011	0.013
	LTE Band 12/25RB#0 10M	Left Cheek	23060	22.92	23.50	1.143	0.049	0.056
	LTE Band 12/25RB#0 10M	Left Tilt	23060	22.92	23.50	1.143	0.012	0.014
Ant 2								
	LTE Band 13/1RB#25 10M	Right Cheek	23230	24.20	25.00	1.202	0.126	0.151
9#	LTE Band 13/1RB#25 10M	Right Tilt	23230	24.20	25.00	1.202	0.229	0.275
	LTE Band 13/1RB#25 10M	Left Cheek	23230	24.20	25.00	1.202	0.072	0.087
	LTE Band 13/1RB#25 10M	Left Tilt	23230	24.20	25.00	1.202	0.091	0.109
Ant 0								
	LTE Band 13/25RB#25 10M	Right Cheek	23230	23.17	24.00	1.211	0.110	0.133
	LTE Band 13/25RB#25 10M	Right Tilt	23230	23.17	24.00	1.211	0.143	0.173
	LTE Band 13/25RB#25 10M	Left Cheek	23230	23.17	24.00	1.211	0.064	0.077
	LTE Band 13/25RB#25 10M	Left Tilt	23230	23.17	24.00	1.211	0.086	0.104
Ant 0								
	LTE Band 13/1RB#25 10M	Right Cheek	23230	23.99	24.50	1.125	0.051	0.057
	LTE Band 13/1RB#25 10M	Right Tilt	23230	23.99	24.50	1.125	0.032	0.036
	LTE Band 13/1RB#25 10M	Left Cheek	23230	23.99	24.50	1.125	0.048	0.054
	LTE Band 13/1RB#25 10M	Left Tilt	23230	23.99	24.50	1.125	0.049	0.055



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)
	LTE Band 13/25RB#25 10M	Right Cheek	23230	22.75	23.50	1.189	0.050	0.059
	LTE Band 13/25RB#25 10M	Right Tilt	23230	22.75	23.50	1.189	0.028	0.033
	LTE Band 13/25RB#25 10M	Left Cheek	23230	22.75	23.50	1.189	0.040	0.048
	LTE Band 13/25RB#25 10M	Left Tilt	23230	22.75	23.50	1.189	0.045	0.053
Ant 3								
	LTE Band 66/1RB#0 20M	Right Cheek	132322	21.61	22.00	1.094	0.266	0.291
10#	LTE Band 66/1RB#0 20M	Right Tilt	132322	21.61	22.00	1.094	0.350	0.383
	LTE Band 66/1RB#0 20M	Left Cheek	132322	21.61	22.00	1.094	0.259	0.283
	LTE Band 66/1RB#0 20M	Left Tilt	132322	21.61	22.00	1.094	0.314	0.344
	LTE Band 66/50RB#0 10M	Right Cheek	132322	20.72	21.00	1.067	0.212	0.226
	LTE Band 66/50RB#0 10M	Right Tilt	132322	20.72	21.00	1.067	0.316	0.337
	LTE Band 66/50RB#0 10M	Left Cheek	132322	20.72	21.00	1.067	0.200	0.213
	LTE Band 66/50RB#0 10M	Left Tilt	132322	20.72	21.00	1.067	0.286	0.305
	LTE Band 66C/1RB#0 20M	Right Tilt	132072	19.78	20.00	1.052	0.237	0.249



➤ 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								
11#	NR N2/1RB#1 20M	Right Cheek	376000	21.99	22.55	1.138	0.479	0.545
	NR N2/1RB#1 20M	Right Tilt	376000	21.99	22.55	1.138	0.067	0.076
	NR N2/1RB#1 20M	Left Cheek	376000	21.99	22.55	1.138	0.237	0.270
	NR N2/1RB#1 20M	Left Tilt	376000	21.99	22.55	1.138	0.036	0.041
Ant 2								
	NR N2/50RB#1 20M	Right Cheek	376000	21.69	22.00	1.074	0.423	0.454
	NR N2/50RB#1 20M	Right Tilt	376000	21.69	22.00	1.074	0.054	0.058
	NR N2/50RB#1 20M	Left Cheek	376000	21.69	22.00	1.074	0.200	0.215
	NR N2/50RB#1 20M	Left Tilt	376000	21.69	22.00	1.074	0.024	0.026
Ant 0								
12#	NR N5/1RB#1 20M	Right Cheek	167800	20.77	21.50	1.183	0.292	0.345
	NR N5/1RB#1 20M	Right Tilt	167800	20.77	21.50	1.183	0.160	0.189
	NR N5/1RB#1 20M	Left Cheek	167800	20.77	21.50	1.183	0.122	0.144
	NR N5/1RB#1 20M	Left Tilt	167800	20.77	21.50	1.183	0.116	0.137
Ant 0								
	NR N5/50RB#25 20M	Right Cheek	167800	20.13	20.50	1.089	0.255	0.278
	NR N5/50RB#25 20M	Right Tilt	167800	20.13	20.50	1.089	0.142	0.155
	NR N5/50RB#25 20M	Left Cheek	167800	20.13	20.50	1.089	0.111	0.121
	NR N5/50RB#25 20M	Left Tilt	167800	20.13	20.50	1.089	0.096	0.105
Ant 0								
	NR N5/1RB#1 20M	Right Cheek	167800	20.77	21.50	1.183	0.028	0.033
	NR N5/1RB#1 20M	Right Tilt	167800	20.77	21.50	1.183	0.014	0.017
	NR N5/1RB#1 20M	Left Cheek	167800	20.77	21.50	1.183	0.024	0.028
	NR N5/1RB#1 20M	Left Tilt	167800	20.77	21.50	1.183	0.015	0.018
Ant 0								
	NR N5/50RB#25 20M	Right Cheek	167800	20.13	20.50	1.089	0.021	0.023
	NR N5/50RB#25 20M	Right Tilt	167800	20.13	20.50	1.089	0.007	0.008
	NR N5/50RB#25 20M	Left Cheek	167800	20.13	20.50	1.089	0.017	0.019
	NR N5/50RB#25 20M	Left Tilt	167800	20.13	20.50	1.089	0.008	0.009



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								
13#	NR N66/1RB#1 20M	Right Cheek	349000	22.91	23.50	1.146	0.287	0.329
	NR N66/1RB#1 20M	Right Tilt	349000	22.91	23.50	1.146	0.048	0.055
	NR N66/1RB#1 20M	Left Cheek	349000	22.91	23.50	1.146	0.147	0.168
	NR N66/1RB#1 20M	Left Tilt	349000	22.91	23.50	1.146	0.026	0.030
Ant 3								
	NR N66/36RB#1 20M	Right Cheek	349000	22.68	23.00	1.076	0.158	0.170
	NR N66/36RB#1 20M	Right Tilt	349000	22.68	23.00	1.076	0.031	0.033
	NR N66/36RB#1 20M	Left Cheek	349000	22.68	23.00	1.076	0.100	0.108
	NR N66/36RB#1 20M	Left Tilt	349000	22.68	23.00	1.076	0.020	0.022
Ant 3								
	NR N77/1RB#1 100M	Right Cheek	654800	23.24	23.50	1.062	0.423	0.449
14#	NR N77/1RB#1 100M	Right Tilt	654800	23.24	23.50	1.062	0.521	0.553
	NR N77/1RB#1 100M	Left Cheek	654800	23.24	23.50	1.062	0.444	0.471
	NR N77/1RB#1 100M	Left Tilt	654800	23.24	23.50	1.062	0.465	0.494
Ant 3								
	NR N77/135RB#1 100M	Right Cheek	654800	22.65	23.00	1.084	0.382	0.414
	NR N77/135RB#1 100M	Right Tilt	654800	22.65	23.00	1.084	0.491	0.532
	NR N77/135RB#1 100M	Left Cheek	654800	22.65	23.00	1.084	0.400	0.434
	NR N77/135RB#1 100M	Left Tilt	654800	22.65	23.00	1.084	0.433	0.469

➤ **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 (CH0)								
	WLAN2.4GHz/802.11b	Right Cheek	11	16.21	17.00	1.199	0.121	0.145
	WLAN2.4GHz/802.11b	Right Tilt	11	16.21	17.00	1.199	0.072	0.086
15#	WLAN2.4GHz/802.11b	Left Cheek	11	16.21	17.00	1.199	0.221	0.265
	WLAN2.4GHz/802.11b	Left Tilt	11	16.21	17.00	1.199	0.100	0.120
Ant 9 (CH1)								
	WLAN2.4GHz/802.11b	Right Cheek	1	17.47	18.00	1.130	0.066	0.075
	WLAN2.4GHz/802.11b	Right Tilt	1	17.47	18.00	1.130	0.077	0.087
	WLAN2.4GHz/802.11b	Left Cheek	1	17.47	18.00	1.130	0.111	0.125
	WLAN2.4GHz/802.11b	Left Tilt	1	17.47	18.00	1.130	0.137	0.155



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 (CH0)								
	WLAN5.2GHz/802.11n40	Right Cheek	48	8.27	9.00	1.183	0.098	0.118
	WLAN5.2GHz/802.11n40	Right Tilt	48	8.27	9.00	1.183	0.116	0.140
	WLAN5.2GHz/802.11n40	Left Cheek	48	8.27	9.00	1.183	0.173	0.209
	WLAN5.2GHz/802.11n40	Left Tilt	48	8.27	9.00	1.183	0.123	0.148
Ant 6 (CH1)								
	WLAN5.2GHz/802.11a	Right Cheek	44	14.80	15.50	1.175	0.115	0.138
	WLAN5.2GHz/802.11a	Right Tilt	44	14.80	15.50	1.175	0.124	0.149
	WLAN5.2GHz/802.11a	Left Cheek	44	14.80	15.50	1.175	0.246	0.295
16#	WLAN5.2GHz/802.11a	Left Tilt	44	14.80	15.50	1.175	0.322	0.386
Ant 5 (CH0)								
	WLAN5.3GHz/802.11a	Right Cheek	60	8.26	9.00	1.186	0.096	0.116
	WLAN5.3GHz/802.11a	Right Tilt	60	8.26	9.00	1.186	0.093	0.112
	WLAN5.3GHz/802.11a	Left Cheek	60	8.26	9.00	1.186	0.165	0.200
	WLAN5.3GHz/802.11a	Left Tilt	60	8.26	9.00	1.186	0.120	0.145
Ant 6 (CH1)								
	WLAN5.3GHz/802.11a	Right Cheek	52	14.62	15.00	1.091	0.121	0.135
	WLAN5.3GHz/802.11a	Right Tilt	52	14.62	15.00	1.091	0.169	0.188
	WLAN5.3GHz/802.11a	Left Cheek	52	14.62	15.00	1.091	0.198	0.220
17#	WLAN5.3GHz/802.11a	Left Tilt	52	14.62	15.00	1.091	0.339	0.377
Ant 5 (CH0)								
	WLAN5.5GHz/802.11a	Right Cheek	144	8.27	9.00	1.183	0.123	0.148
	WLAN5.5GHz/802.11a	Right Tilt	144	8.27	9.00	1.183	0.111	0.134
	WLAN5.5GHz/802.11a	Left Cheek	144	8.27	9.00	1.183	0.141	0.170
	WLAN5.5GHz/802.11a	Left Tilt	144	8.27	9.00	1.183	0.130	0.157
Ant 6 (CH1)								
	WLAN5.5GHz/802.11a	Right Cheek	100	13.91	14.50	1.146	0.105	0.123
	WLAN5.5GHz/802.11a	Right Tilt	100	13.91	14.50	1.146	0.142	0.166
	WLAN5.5GHz/802.11a	Left Cheek	100	13.91	14.50	1.146	0.181	0.211
18#	WLAN5.5GHz/802.11a	Left Tilt	100	13.91	14.50	1.146	0.317	0.370
Ant 5 (CH0)								
	WLAN5.8GHz/802.11a	Right Cheek	165	8.28	9.00	1.180	0.041	0.049
	WLAN5.8GHz/802.11a	Right Tilt	165	8.28	9.00	1.180	0.035	0.042
	WLAN5.8GHz/802.11a	Left Cheek	165	8.28	9.00	1.180	0.097	0.117
	WLAN5.8GHz/802.11a	Left Tilt	165	8.28	9.00	1.180	0.048	0.058



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 6 (CH1)								
	WLAN5.8GHz/802.11a	Right Cheek	149	13.47	14.00	1.130	0.100	0.115
	WLAN5.8GHz/802.11a	Right Tilt	149	13.47	14.00	1.130	0.121	0.139
	WLAN5.8GHz/802.11a	Left Cheek	149	13.47	14.00	1.130	0.171	0.197
19#	WLAN5.8GHz/802.11a	Left Tilt	149	13.47	14.00	1.130	0.197	0.227

Note:

1. Per KDB 447498 D01v06, for each exposure position, if the highest output power channel Reported SAR \leq 0.8W/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 0.8W/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 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 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 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 and 1.02 for 5G WLAN.



18.3. Body SAR Data

➤ **GSM 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 2								
	GPRS 850(4 TX slots)	Front Side	251	26.56	27.00	1.107	0.091	0.101
20#	GPRS 850(4 TX slots)	Back Side	251	26.56	27.00	1.107	0.108	0.120
	GPRS 850(4 TX slots)	Left Side	251	26.56	27.00	1.107	0.062	0.069
	GPRS 850(4 TX slots)	Right Side	251	26.56	27.00	1.107	0.022	0.024
	GPRS 850(4 TX slots)	Top Side	251	26.56	27.00	1.107	0.094	0.104
Ant 0								
	GPRS 850(4 TX slots)	Front Side	251	30.42	31.00	1.143	0.061	0.070
	GPRS 850(4 TX slots)	Back Side	251	30.42	31.00	1.143	0.075	0.086
	GPRS 850(4 TX slots)	Left Side	251	30.42	31.00	1.143	0.055	0.063
	GPRS 850(4 TX slots)	Right Side	251	30.42	31.00	1.143	0.031	0.035
	GPRS 850(4 TX slots)	Bottom Side	251	30.42	31.00	1.143	0.070	0.080
Ant 3								
	GPRS 1900(4 TX slots)	Front Side	661	25.48	26.00	1.127	0.040	0.045
21#	GPRS 1900(4 TX slots)	Back Side	661	25.48	26.00	1.127	0.082	0.092
	GPRS 1900(4 TX slots)	Left Side	661	25.48	26.00	1.127	0.020	0.022
	GPRS 1900(4 TX slots)	Right Side	661	25.48	26.00	1.127	0.004	0.004
22#	GPRS 1900(4 TX slots)	Top Side	661	25.48	26.00	1.127	0.101	0.114



➤ **WCDMA 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								
	Band II/RMC 12.2Kbps	Front Side	9400	22.52	23.00	1.117	0.072	0.080
23#	Band II/RMC 12.2Kbps	Back Side	9400	22.52	23.00	1.117	0.147	0.164
	Band II/RMC 12.2Kbps	Left Side	9400	22.52	23.00	1.117	0.035	0.039
	Band II/RMC 12.2Kbps	Right Side	9400	22.52	23.00	1.117	0.011	0.012
24#	Band II/RMC 12.2Kbps	Top Side	9400	22.52	23.00	1.117	0.175	0.195
Ant 3								
	Band IV/RMC 12.2Kbps	Front Side	1413	22.82	23.50	1.169	0.118	0.138
25#	Band IV/RMC 12.2Kbps	Back Side	1413	22.82	23.50	1.169	0.212	0.248
	Band IV/RMC 12.2Kbps	Left Side	1413	22.82	23.50	1.169	0.041	0.048
	Band IV/RMC 12.2Kbps	Right Side	1413	22.82	23.50	1.169	0.015	0.018
26#	Band IV/RMC 12.2Kbps	Top Side	1413	22.82	23.50	1.169	0.303	0.354
Ant 2								
	Band V/RMC 12.2Kbps	Front Side	4233	21.15	22.00	1.216	0.024	0.029
27#	Band V/RMC 12.2Kbps	Back Side	4233	21.15	22.00	1.216	0.057	0.069
	Band V/RMC 12.2Kbps	Left Side	4233	21.15	22.00	1.216	0.048	0.058
	Band V/RMC 12.2Kbps	Right Side	4233	21.15	22.00	1.216	0.018	0.022
	Band V/RMC 12.2Kbps	Top Side	4233	21.15	22.00	1.216	0.050	0.061
Ant 0								
	Band V/RMC 12.2Kbps	Front Side	4233	23.85	24.50	1.161	0.020	0.023
	Band V/RMC 12.2Kbps	Back Side	4233	23.85	24.50	1.161	0.026	0.030
	Band V/RMC 12.2Kbps	Left Side	4233	23.85	24.50	1.161	0.011	0.013
	Band V/RMC 12.2Kbps	Right Side	4233	23.85	24.50	1.161	0.010	0.012
	Band V/RMC 12.2Kbps	Bottom Side	4233	23.85	24.50	1.161	0.020	0.023



➤ 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								
	LTE Band 2/1RB#0 20M	Front Side	18900	21.76	22.50	1.186	0.030	0.035
28#	LTE Band 2/1RB#0 20M	Back Side	18900	21.76	22.50	1.186	0.062	0.074
	LTE Band 2/1RB#0 20M	Left Side	18900	21.76	22.50	1.186	0.007	0.008
	LTE Band 2/1RB#0 20M	Right Side	18900	21.76	22.50	1.186	0.006	0.007
29#	LTE Band 2/1RB#0 20M	Top Side	18900	21.76	22.50	1.186	0.077	0.091
Ant 2								
	LTE Band 2/50RB#0 20M	Front Side	18900	20.69	21.50	1.205	0.022	0.027
	LTE Band 2/50RB#0 20M	Back Side	18900	20.69	21.50	1.205	0.048	0.058
	LTE Band 2/50RB#0 20M	Left Side	18900	20.69	21.50	1.205	0.005	0.006
	LTE Band 2/50RB#0 20M	Right Side	18900	20.69	21.50	1.205	0.002	0.002
	LTE Band 2/50RB#0 20M	Top Side	18900	20.69	21.50	1.205	0.059	0.071
Ant 2								
	LTE Band 5/1RB#0 10M	Front Side	20525	24.47	25.00	1.130	0.034	0.038
30#	LTE Band 5/1RB#0 10M	Back Side	20525	24.47	25.00	1.130	0.049	0.055
	LTE Band 5/1RB#0 10M	Left Side	20525	24.47	25.00	1.130	0.036	0.041
	LTE Band 5/1RB#0 10M	Right Side	20525	24.47	25.00	1.130	0.016	0.018
	LTE Band 5/1RB#0 10M	Top Side	20525	24.47	25.00	1.130	0.039	0.044
Ant 0								
	LTE Band 5/25RB#0 10M	Front Side	20525	23.32	24.00	1.169	0.030	0.035
	LTE Band 5/25RB#0 10M	Back Side	20525	23.32	24.00	1.169	0.041	0.048
	LTE Band 5/25RB#0 10M	Left Side	20525	23.32	24.00	1.169	0.033	0.039
	LTE Band 5/25RB#0 10M	Right Side	20525	23.32	24.00	1.169	0.013	0.015
	LTE Band 5/25RB#0 10M	Top Side	20525	23.32	24.00	1.169	0.034	0.040
Ant 0								
	LTE Band 5/1RB#0 10M	Front Side	20525	22.69	23.50	1.205	0.030	0.036
	LTE Band 5/1RB#0 10M	Back Side	20525	22.69	23.50	1.205	0.037	0.044
	LTE Band 5/1RB#0 10M	Left Side	20525	22.69	23.50	1.205	0.023	0.028
	LTE Band 5/1RB#0 10M	Right Side	20525	22.69	23.50	1.205	0.017	0.020
	LTE Band 5/1RB#0 10M	Bottom Side	20525	22.69	23.50	1.205	0.027	0.033
Ant 0								
	LTE Band 5/25RB#0 10M	Front Side	20525	21.54	22.50	1.247	0.025	0.031
	LTE Band 5/25RB#0 10M	Back Side	20525	21.54	22.50	1.247	0.030	0.037
	LTE Band 5/25RB#0 10M	Left Side	20525	21.54	22.50	1.247	0.017	0.021
	LTE Band 5/25RB#0 10M	Right Side	20525	21.54	22.50	1.247	0.010	0.012



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)
	LTE Band 5/25RB#0 10M	Bottom Side	20525	21.54	22.50	1.247	0.020	0.025
Ant 2								
31#	LTE Band 5B/1RB#0 10M	Back Side	20525	24.27	25.00	1.183	0.027	0.032
Ant 2								
	LTE Band 12/1RB#0 10M	Front Side	23060	24.42	25.00	1.143	0.046	0.053
32#	LTE Band 12/1RB#0 10M	Back Side	23060	24.42	25.00	1.143	0.079	0.091
	LTE Band 12/1RB#0 10M	Left Side	23060	24.42	25.00	1.143	0.057	0.065
	LTE Band 12/1RB#0 10M	Right Side	23060	24.42	25.00	1.143	0.010	0.011
	LTE Band 12/1RB#0 10M	Top Side	23060	24.42	25.00	1.143	0.031	0.035
Ant 0								
	LTE Band 12/25RB#0 10M	Front Side	23060	23.47	24.00	1.130	0.020	0.023
	LTE Band 12/25RB#0 10M	Back Side	23060	23.47	24.00	1.130	0.042	0.047
	LTE Band 12/25RB#0 10M	Left Side	23060	23.47	24.00	1.130	0.034	0.038
	LTE Band 12/25RB#0 10M	Right Side	23060	23.47	24.00	1.130	0.009	0.010
	LTE Band 12/25RB#0 10M	Top Side	23060	23.47	24.00	1.130	0.026	0.029
Ant 0								
	LTE Band 12/1RB#0 10M	Front Side	23060	23.93	24.50	1.140	0.044	0.050
	LTE Band 12/1RB#0 10M	Back Side	23060	23.93	24.50	1.140	0.059	0.067
	LTE Band 12/1RB#0 10M	Left Side	23060	23.93	24.50	1.140	0.033	0.038
	LTE Band 12/1RB#0 10M	Right Side	23060	23.93	24.50	1.140	0.040	0.046
	LTE Band 12/1RB#0 10M	Bottom Side	23060	23.93	24.50	1.140	0.045	0.051
Ant 0								
	LTE Band 12/25RB#0 10M	Front Side	23060	22.92	23.50	1.143	0.034	0.039
	LTE Band 12/25RB#0 10M	Back Side	23060	22.92	23.50	1.143	0.040	0.046
	LTE Band 12/25RB#0 10M	Left Side	23060	22.92	23.50	1.143	0.026	0.030
	LTE Band 12/25RB#0 10M	Right Side	23060	22.92	23.50	1.143	0.031	0.035
	LTE Band 12/25RB#0 10M	Bottom Side	23060	22.92	23.50	1.143	0.035	0.040
Ant 2								
	LTE Band 13/1RB#25 10M	Front Side	23230	24.20	25.00	1.202	0.078	0.094
33#	LTE Band 13/1RB#25 10M	Back Side	23230	24.20	25.00	1.202	0.137	0.165
	LTE Band 13/1RB#25 10M	Left Side	23230	24.20	25.00	1.202	0.072	0.087
	LTE Band 13/1RB#25 10M	Right Side	23230	24.20	25.00	1.202	0.019	0.023
	LTE Band 13/1RB#25 10M	Top Side	23230	24.20	25.00	1.202	0.064	0.077



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)
	LTE Band 13/25RB#25 10M	Front Side	23230	23.17	24.00	1.211	0.055	0.067
	LTE Band 13/25RB#25 10M	Back Side	23230	23.17	24.00	1.211	0.091	0.110
	LTE Band 13/25RB#25 10M	Left Side	23230	23.17	24.00	1.211	0.062	0.075
	LTE Band 13/25RB#25 10M	Right Side	23230	23.17	24.00	1.211	0.011	0.013
	LTE Band 13/25RB#25 10M	Top Side	23230	23.17	24.00	1.211	0.052	0.063
Ant 0								
	LTE Band 13/1RB#0 10M	Front Side	23230	23.99	24.50	1.125	0.022	0.025
	LTE Band 13/1RB#0 10M	Back Side	23230	23.99	24.50	1.125	0.036	0.041
	LTE Band 13/1RB#0 10M	Left Side	23230	23.99	24.50	1.125	0.020	0.022
	LTE Band 13/1RB#0 10M	Right Side	23230	23.99	24.50	1.125	0.018	0.020
	LTE Band 13/1RB#0 10M	Bottom Side	23230	23.99	24.50	1.125	0.028	0.031
	LTE Band 13/25RB#25 10M	Front Side	23230	22.75	23.50	1.189	0.020	0.024
	LTE Band 13/25RB#25 10M	Back Side	23230	22.75	23.50	1.189	0.031	0.037
	LTE Band 13/25RB#25 10M	Left Side	23230	22.75	23.50	1.189	0.018	0.021
	LTE Band 13/25RB#25 10M	Right Side	23230	22.75	23.50	1.189	0.014	0.017
	LTE Band 13/25RB#25 10M	Bottom Side	23230	22.75	23.50	1.189	0.023	0.027
Ant 3								
	LTE Band 66/1RB#0 20M	Front Side	132322	21.61	22.00	1.094	0.011	0.012
34#	LTE Band 66/1RB#0 20M	Back Side	132322	21.61	22.00	1.094	0.021	0.023
	LTE Band 66/1RB#0 20M	Left Side	132322	21.61	22.00	1.094	0.005	0.005
	LTE Band 66/1RB#0 20M	Right Side	132322	21.61	22.00	1.094	0.004	0.004
35#	LTE Band 66/1RB#0 20M	Top Side	132322	21.61	22.00	1.094	0.028	0.031
	LTE Band 66/1RB#0 20M	Front Side	132322	20.72	21.00	1.067	0.009	0.010
	LTE Band 66/1RB#0 20M	Back Side	132322	20.72	21.00	1.067	0.018	0.019
	LTE Band 66/1RB#0 20M	Left Side	132322	20.72	21.00	1.067	0.004	0.004
	LTE Band 66/1RB#0 20M	Right Side	132322	20.72	21.00	1.067	0.003	0.003
	LTE Band 66/1RB#0 20M	Top Side	132322	20.72	21.00	1.067	0.025	0.026
36#	LTE Band 66C/1RB#0 20M	Top Side	132072	19.78	20.00	1.052	0.022	0.023



➤ 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								
	NR N2/1RB#1 20M	Front Side	376000	21.99	22.50	1.125	0.058	0.065
37#	NR N2/1RB#1 20M	Back Side	376000	21.99	22.50	1.125	0.181	0.204
38#	NR N2/1RB#1 20M	Left Side	376000	21.99	22.50	1.125	0.219	0.246
	NR N2/1RB#1 20M	Right Side	376000	21.99	22.50	1.125	0.004	0.004
	NR N2/1RB#1 20M	Top Side	376000	21.99	22.50	1.125	0.008	0.009
Ant 2								
	NR N2/50RB#1 20M	Front Side	376000	21.69	22.00	1.074	0.046	0.049
	NR N2/50RB#1 20M	Back Side	376000	21.69	22.00	1.074	0.173	0.186
	NR N2/50RB#1 20M	Left Side	376000	21.69	22.00	1.074	0.190	0.204
	NR N2/50RB#1 20M	Right Side	376000	21.69	22.00	1.074	0.003	0.003
	NR N2/50RB#1 20M	Top Side	376000	21.69	22.00	1.074	0.007	0.008
Ant 2								
	NR N5/1RB#1 20M	Front Side	167800	22.50	23.00	1.122	0.098	0.110
39#	NR N5/1RB#1 20M	Back Side	167800	22.50	23.00	1.122	0.149	0.167
	NR N5/1RB#1 20M	Left Side	167800	22.50	23.00	1.122	0.058	0.065
	NR N5/1RB#1 20M	Right Side	167800	22.50	23.00	1.122	0.011	0.012
	NR N5/1RB#1 20M	Top Side	167800	22.50	23.00	1.122	0.110	0.123
Ant 0								
	NR N5/50RB#25 20M	Front Side	167800	22.35	22.50	1.035	0.083	0.086
	NR N5/50RB#25 20M	Back Side	167800	22.35	22.50	1.035	0.126	0.130
	NR N5/50RB#25 20M	Left Side	167800	22.35	22.50	1.035	0.044	0.046
	NR N5/50RB#25 20M	Right Side	167800	22.35	22.50	1.035	0.010	0.010
	NR N5/50RB#25 20M	Top Side	167800	22.35	22.50	1.035	0.103	0.107
Ant 0								
	NR N5/1RB#1 20M	Front Side	167800	22.50	23.00	1.122	0.069	0.077
	NR N5/1RB#1 20M	Back Side	167800	22.50	23.00	1.122	0.138	0.155
	NR N5/1RB#1 20M	Left Side	167800	22.50	23.00	1.122	0.010	0.011
	NR N5/1RB#1 20M	Right Side	167800	22.50	23.00	1.122	0.034	0.038
	NR N5/1RB#1 20M	Bottom Side	167800	22.50	23.00	1.122	0.078	0.088



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)
	NR N5/50RB#25 20M	Front Side	167800	22.35	22.50	1.035	0.060	0.062
	NR N5/50RB#25 20M	Back Side	167800	22.35	22.50	1.035	0.129	0.134
	NR N5/50RB#25 20M	Left Side	167800	22.35	22.50	1.035	0.009	0.009
	NR N5/50RB#25 20M	Right Side	167800	22.35	22.50	1.035	0.025	0.026
	NR N5/50RB#25 20M	Bottom Side	167800	22.35	22.50	1.035	0.064	0.066
Ant 8								
	NR N66/1RB#1 20M	Front Side	349000	22.91	23.50	1.146	0.032	0.036
40#	NR N66/1RB#1 20M	Back Side	349000	22.91	23.50	1.146	0.078	0.089
41#	NR N66/1RB#1 20M	Left Side	349000	22.91	23.50	1.146	0.086	0.099
	NR N66/1RB#1 20M	Right Side	349000	22.91	23.50	1.146	0.026	0.030
	NR N66/1RB#1 20M	Top Side	349000	22.91	23.50	1.146	0.006	0.006
	NR N66/36RB#1 20M	Front Side	349000	22.68	23.00	1.076	0.022	0.024
	NR N66/36RB#1 20M	Back Side	349000	22.68	23.00	1.076	0.065	0.070
	NR N66/36RB#1 20M	Left Side	349000	22.68	23.00	1.076	0.060	0.065
	NR N66/36RB#1 20M	Right Side	349000	22.68	23.00	1.076	0.020	0.022
	NR N66/36RB#1 20M	Top Side	349000	22.68	23.00	1.076	0.005	0.005
Ant 3								
	NR N77/1RB#1 100M	Front Side	654800	23.24	23.50	1.062	0.069	0.073
42#	NR N77/1RB#1 100M	Back Side	654800	23.24	23.50	1.062	0.148	0.157
	NR N77/1RB#1 100M	Left Side	654800	23.24	23.50	1.062	0.040	0.042
	NR N77/1RB#1 100M	Right Side	654800	23.24	23.50	1.062	0.100	0.106
43#	NR N77/1RB#1 100M	Top Side	654800	23.24	23.50	1.062	0.301	0.320
	NR N77/135RB#1 100M	Front Side	654800	22.65	23.00	1.084	0.057	0.062
	NR N77/135RB#1 100M	Back Side	654800	22.65	23.00	1.084	0.126	0.137
	NR N77/135RB#1 100M	Left Side	654800	22.65	23.00	1.084	0.033	0.036
	NR N77/135RB#1 100M	Right Side	654800	22.65	23.00	1.084	0.067	0.073
	NR N77/135RB#1 100M	Top Side	654800	22.65	23.00	1.084	0.246	0.267



➤ **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(CH 0)								
	WLAN2.4GHz/802.11b	Front Side	11	16.21	17.00	1.199	0.041	0.049
	WLAN2.4GHz/802.11b	Back Side	11	16.21	17.00	1.199	0.112	0.134
	WLAN2.4GHz/802.11b	Left Side	11	16.21	17.00	1.199	0.009	0.011
	WLAN2.4GHz/802.11b	Right Side	11	16.21	17.00	1.199	0.061	0.073
	WLAN2.4GHz/802.11b	Top Side	11	16.21	17.00	1.199	0.020	0.024
Ant 9(CH 1)								
	WLAN2.4GHz/802.11b	Front Side	1	17.47	18.00	1.130	0.024	0.027
44#	WLAN2.4GHz/802.11b	Back Side	1	17.47	18.00	1.130	0.122	0.138
	WLAN2.4GHz/802.11b	Left Side	1	17.47	18.00	1.130	0.020	0.023
	WLAN2.4GHz/802.11b	Right Side	1	17.47	18.00	1.130	0.044	0.049
	WLAN2.4GHz/802.11b	Top Side	1	17.47	18.00	1.130	0.060	0.067
Ant 5(CH 0)								
	WLAN5.2GHz/802.11a	Front Side	48	8.27	9.00	1.183	0.089	0.107
	WLAN5.2GHz/802.11a	Back Side	48	8.27	9.00	1.183	0.191	0.230
	WLAN5.2GHz/802.11a	Right Side	48	8.27	9.00	1.183	0.161	0.194
	WLAN5.2GHz/802.11a	Top Side	48	8.27	9.00	1.183	0.097	0.117
Ant 6(CH 1)								
	WLAN5.2GHz/802.11a	Front Side	44	14.80	15.50	1.175	0.090	0.108
45#	WLAN5.2GHz/802.11a	Back Side	44	14.80	15.50	1.175	0.136	0.163
	WLAN5.2GHz/802.11a	Right Side	44	14.80	15.50	1.175	0.125	0.150
46#	WLAN5.2GHz/802.11a	Top Side	44	14.80	15.50	1.175	0.222	0.266
Ant 5(CH 0)								
	WLAN5.3GHz/802.11a	Front Side	60	8.26	9.00	1.186	0.080	0.097
	WLAN5.3GHz/802.11a	Back Side	60	8.26	9.00	1.186	0.132	0.160
Ant 6(CH 1)								
	WLAN5.3GHz/802.11a	Front Side	52	14.62	15.00	1.091	0.096	0.107
47#	WLAN5.3GHz/802.11a	Back Side	52	14.62	15.00	1.091	0.154	0.171
Ant 5(CH 0)								
	WLAN5.5GHz/802.11a	Front Side	144	8.27	9.00	1.183	0.066	0.080
	WLAN5.5GHz/802.11a	Back Side	144	8.27	9.00	1.183	0.110	0.133
Ant 6(CH 1)								
	WLAN5.5GHz/802.11a	Front Side	100	13.91	14.50	1.146	0.118	0.138
48#	WLAN5.5GHz/802.11a	Back Side	100	13.91	14.50	1.146	0.196	0.229



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(CH 0)								
	WLAN5.8GHz/802.11a	Front Side	165	8.28	9.00	1.180	0.015	0.018
	WLAN5.8GHz/802.11a	Back Side	165	8.28	9.00	1.180	0.019	0.023
	WLAN5.8GHz/802.11a	Right Side	165	8.28	9.00	1.180	0.009	0.011
	WLAN5.8GHz/802.11a	Top Side	165	8.28	9.00	1.180	0.015	0.018
Ant 6(CH 1)								
	WLAN5.8GHz/802.11a	Front Side	149	13.47	14.00	1.130	0.211	0.243
49#	WLAN5.8GHz/802.11a	Back Side	149	13.47	14.00	1.130	0.238	0.274
	WLAN5.8GHz/802.11a	Right Side	149	13.47	14.00	1.130	0.028	0.032
	WLAN5.8GHz/802.11a	Top Side	149	13.47	14.00	1.130	0.162	0.187

Note:

The WLAN Reported 1g SAR (W/kg) has been calculated together with the duty cycle scaling factor 1.0 for 2.4G WLAN and 1.02 for 5GHz WLAN.

➤ **Bluetooth Body SAR**

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

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

Channel	Frequency (GHz)	Max. Tune-up Power (dBm)	Max. Power(mW)	Test Distance (mm)	Result	Exclusion Thresholds for 1-g SAR
CH 78	2.48	12.5	17.78	10	2.8	3.0

Mode	Max. Tune-up Power (dBm)	Exposure Position	Body
		Test Distance (mm)	10
Bluetooth	12.5	Estimated SAR (W/kg)	0.373

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)
	Bluetooth/1Mbps	Front Side	78	11.91	12.50	1.146	0.373	0.453
	Bluetooth/1Mbps	Back Side	78	11.91	12.50	1.146	0.373	0.453
	Bluetooth/1Mbps	Right Side	78	11.91	12.50	1.146	0.373	0.453
	Bluetooth/1Mbps	Top Side	78	11.91	12.50	1.146	0.373	0.453

Note: The duty cycle factor of 1.06 should be used to calculating the reported SAR.



18.4. 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 (~ 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 .



18.5. Extremity SAR Assessment

Guidance:

1. According to KDB 648747 D04v01r03 The UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna located at ≤ 25 mm from that surface or edge, in direct contact with a flat phantom, for 10-g extremity SAR according to the body-equivalent tissue dielectric parameters in KDB Publication 865664 D01 to address interactive hand use exposure conditions.
2. When hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg.
3. According to the user manual, the EUT diagonal size is greater than 16cm, therefore the 0mm extremity SAR of WLAN 5GHz is required. There are two types of antennas in this device, only the worst antenna was tested the extremity SAR in this report.
4. Test results as below:

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 5 (CH0)								
	WLAN5.3GHz/802.11a	Front Side	60	8.26	9.00	1.186	0.198	0.239
	WLAN5.3GHz/802.11a	Back Side	60	8.26	9.00	1.186	0.310	0.375
Ant 6 (CH1)								
	WLAN5.3GHz/802.11a	Front Side	52	14.62	15.00	1.091	0.233	0.259
50#	WLAN5.3GHz/802.11a	Back Side	52	14.62	15.00	1.091	0.382	0.425
Ant 5 (CH0)								
	WLAN5.5GHz/802.11a	Front Side	144	8.27	9.00	1.183	0.098	0.118
	WLAN5.5GHz/802.11a	Back Side	144	8.27	9.00	1.183	0.274	0.331
Ant 6 (CH1)								
	WLAN5.5GHz/802.11a	Front Side	100	13.91	14.50	1.146	0.268	0.313
51#	WLAN5.5GHz/802.11a	Back Side	100	13.91	14.50	1.146	0.596	0.696



19. Simultaneous Transmission Evaluation

19.1. Simultaneous Transmission Consideration

No.	Simultaneous Transmission Consideration	Head	Body-Worn	Hotspot
1	WWAN(2G/3G/4G)+WLAN 2.4GHz(Ant 6/Ant 9)	Yes	Yes	Yes
2	WWAN(2G/3G/4G)+WLAN 5.2GHz/5.8GHz(Ant 5/Ant 6)	Yes	Yes	Yes
3	WWAN(2G/3G/4G)+WLAN 5.3GHz/5.5GHz(Ant 5/Ant 6)	Yes	Yes	No
4	WWAN 5G NR(FR1)+WLAN 2.4GHz(Ant 5/Ant 9)	Yes	Yes	Yes
5	WWAN 5G NR(FR1)+WLAN 5.2GHz/5.8GHz(Ant 5/Ant 6)	Yes	Yes	Yes
6	WWAN 5G NR(FR1)+WLAN 5.3GHz/5.5GHz(Ant 5/Ant 6)	Yes	Yes	No
7	WWAN(2G/3G/4G)+Bluetooth(Ant 5)	Yes	Yes	Yes
8	WWAN 5G NR(FR1)+Bluetooth(Ant 5)	Yes	Yes	Yes
9	WLAN 2.4GHz(Ant 3)+Bluetooth(Ant 5)	Yes	Yes	No
10	WLAN 5.2GHz/5.8GHz(Ant 6)+Bluetooth(Ant 5)	Yes	Yes	No
11	WLAN 5.3GHz/5.5GHz(Ant 6)+Bluetooth(Ant 5)	Yes	Yes	No
12	WWAN(2G/3G/4G)+WLAN 2.4GHz(MIMO)	Yes	Yes	Yes
13	WWAN(2G/3G/4G)+WLAN 5GHz(MIMO)	Yes	Yes	Yes
14	WWAN 5G NR(FR1)+WLAN 2.4GHz(MIMO)	Yes	Yes	Yes
15	WWAN 5G NR(FR1)+WLAN 5GHz(MIMO)	Yes	Yes	Yes

Note:

- When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of the WWAN and WLAN transmitters. The "Portable Hotspot" feature on the handset was NOT activated, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal.
- The hotspot SAR result may overlap with the body-worn accessory SAR requirements, per KDB 941225 D06, the more conservative configurations can be considered, thus excluding some unnecessary body-worn accessory SAR tests.
- Simultaneous Transmission SAR evaluation is not required for BT and WLAN, because the software mechanism have been incorporated to guarantee that the WLAN and Bluetooth transmitters would not simultaneously operate.
- Per KDB 447498D01v06, simultaneous transmission SAR evaluation procedures is as followed:
 Step 1: If sum of 1 g SAR < 1.6 W/kg, Simultaneous SAR measurement is not required.
 Step 2: If sum of 1 g SAR > 1.6 W/kg, ratio of SAR to peak separation distance for pair of transmitters calculated.
 Step 3: If the ratio of SAR to peak separation distance is ≤ 0.04 , Simultaneous SAR measurement is not required.
 Step 4: If the ratio of SAR to peak separation distance is > 0.04, Simultaneous SAR measurement



is required and simultaneous transmission SAR value is calculated.

(The ratio is determined by: $(SAR1 + SAR2) \wedge 1.5/Ri \leq 0.04$,

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

5. 2.4G&5G MIMO SAR were combined standalone SAR of CH0 and CH1.
6. When it supports transmit simultaneously at WWAN+WLAN MIMO mode, the co-location SAR of WWAN+WLAN (standalone SAR) would not be recorded in this report.
7. For LTE inter-band CA uplink & EN-DC analysis, the maximum reported SAR of the antenna 0 or antenna 2 for low frequency bands and antenna 3 for high frequency bands would be calculating separately.



19.2. Simultaneous Transmission Analysis

➤ Head Data for LTE Inter-band CA Uplink Combination

Carrier Component	Exposure Position	Standalone 1g SAR (W/kg)		Summed 1g SAR (W/kg)
		PCC	SCC	
CA_2A-4A	Right Cheek	0.240	0.329	0.569
	Right Tilt	0.317	0.055	0.372
	Left Cheek	0.250	0.168	0.418
	Left Tilt	0.273	0.030	0.303
CA_2A-5A	Right Cheek	0.240	0.390	0.630
	Right Tilt	0.317	0.376	0.693
	Left Cheek	0.250	0.249	0.499
	Left Tilt	0.273	0.158	0.431
CA_2A-12A	Right Cheek	0.240	0.217	0.457
	Right Tilt	0.317	0.131	0.448
	Left Cheek	0.250	0.098	0.348
	Left Tilt	0.273	0.079	0.352
CA_2A-13A	Right Cheek	0.240	0.151	0.391
	Right Tilt	0.317	0.275	0.592
	Left Cheek	0.250	0.087	0.337
	Left Tilt	0.273	0.109	0.382
CA_2A-66A	Right Cheek	0.240	0.329	0.569
	Right Tilt	0.317	0.055	0.372
	Left Cheek	0.250	0.168	0.418
	Left Tilt	0.273	0.030	0.303
CA_4A-5A	Right Cheek	0.329	0.390	0.719
	Right Tilt	0.055	0.376	0.431
	Left Cheek	0.168	0.249	0.417
	Left Tilt	0.030	0.158	0.188
CA_4A-13A	Right Cheek	0.329	0.151	0.480
	Right Tilt	0.055	0.275	0.330
	Left Cheek	0.168	0.087	0.255
	Left Tilt	0.030	0.109	0.139
CA_5A-66A	Right Cheek	0.390	0.329	0.719
	Right Tilt	0.376	0.055	0.431
	Left Cheek	0.249	0.168	0.417
	Left Tilt	0.158	0.030	0.188



Carrier Component	Exposure Position	Standalone 1g SAR (W/kg)		Summed 1g SAR (W/kg)
		PCC	SCC	
CA_13A-66A	Right Cheek	0.151	0.329	0.480
	Right Tilt	0.275	0.055	0.330
	Left Cheek	0.087	0.168	0.255
	Left Tilt	0.109	0.030	0.139

➤ **Head Data for EN-DC Combination**

EN-DC Combination	Exposure Position	Standalone 1g SAR (W/kg)			EN-DC Summed 1g SAR (W/kg)
		LTE Carrier		5G NR	
12A-N2	Right Cheek	0.240	/	0.545	0.785
	Right Tilt	0.317	/	0.076	0.393
	Left Cheek	0.250	/	0.270	0.520
	Left Tilt	0.273	/	0.041	0.314
2A-12A-N2	Right Cheek	0.240	0.217	0.545	1.002
	Right Tilt	0.317	0.131	0.076	0.524
	Left Cheek	0.250	0.098	0.270	0.618
	Left Tilt	0.273	0.079	0.041	0.393
12A-66A-N2	Right Cheek	0.217	0.291	0.545	1.053
	Right Tilt	0.131	0.383	0.076	0.590
	Left Cheek	0.098	0.283	0.270	0.651
	Left Tilt	0.079	0.344	0.041	0.464
13A-66A-N2	Right Cheek	0.151	0.291	0.545	0.987
	Right Tilt	0.275	0.383	0.076	0.734
	Left Cheek	0.087	0.283	0.270	0.640
	Left Tilt	0.109	0.344	0.041	0.494
46A-66A-N5	Right Cheek	/	0.291	0.345	0.636
	Right Tilt	/	0.383	0.189	0.572
	Left Cheek	/	0.283	0.144	0.427
	Left Tilt	/	0.344	0.137	0.481
2A-46D-N5	Right Cheek	0.240	/	0.345	0.585
	Right Tilt	0.317	/	0.189	0.506
	Left Cheek	0.250	/	0.144	0.394
	Left Tilt	0.273	/	0.137	0.410
12A-N66	Right Cheek	0.217	/	0.329	0.546
	Right Tilt	0.131	/	0.055	0.186
	Left Cheek	0.098	/	0.168	0.266
	Left Tilt	0.079	/	0.030	0.109
13A-46A-N66	Right Cheek	0.151	/	0.329	0.480
	Right Tilt	0.275	/	0.055	0.330



	Left Cheek	0.087	/	0.168	0.255
	Left Tilt	0.109	/	0.030	0.139
5A-46A-N66	Right Cheek	0.390	/	0.329	0.719
	Right Tilt	0.376	/	0.055	0.431
	Left Cheek	0.249	/	0.168	0.417
	Left Tilt	0.158	/	0.030	0.188
2A-12A-N66	Right Cheek	0.240	0.217	0.329	0.786
	Right Tilt	0.317	0.131	0.055	0.503
	Left Cheek	0.250	0.098	0.168	0.516
	Left Tilt	0.273	0.079	0.030	0.382
12A-66A-N66	Right Cheek	0.217	0.291	0.329	0.837
	Right Tilt	0.131	0.383	0.055	0.569
	Left Cheek	0.098	0.283	0.168	0.549
	Left Tilt	0.079	0.344	0.030	0.453
2A-46A-N66	Right Cheek	0.240	/	0.329	0.569
	Right Tilt	0.317	/	0.055	0.372
	Left Cheek	0.250	/	0.168	0.418
	Left Tilt	0.273	/	0.030	0.303
13A-N77	Right Cheek	0.151	/	0.449	0.600
	Right Tilt	0.275	/	0.553	0.828
	Left Cheek	0.087	/	0.471	0.558
	Left Tilt	0.109	/	0.494	0.603
5A-N77	Right Cheek	0.390	/	0.449	0.839
	Right Tilt	0.376	/	0.553	0.929
	Left Cheek	0.249	/	0.471	0.720
	Left Tilt	0.158	/	0.494	0.652

EN-DC Combination	Exposure Position	Standalone 1g SAR (W/kg)				EN-DC Summed 1g SAR (W/kg)
		LTE Carrier			5G NR	
12A-66A-66A-N2	Right Cheek	0.217	0.291	0.291	0.545	1.344
	Right Tilt	0.131	0.383	0.383	0.076	0.973
	Left Cheek	0.098	0.283	0.283	0.270	0.934
	Left Tilt	0.079	0.344	0.344	0.041	0.808
2A-12A-12A-N66	Right Cheek	0.240	0.217	0.217	0.329	1.003
	Right Tilt	0.317	0.131	0.131	0.055	0.634
	Left Cheek	0.250	0.098	0.098	0.168	0.614
	Left Tilt	0.273	0.079	0.079	0.030	0.461



➤ **Head Data for WLAN MIMO for 2.4GHz & 5GHz**

Exposure Position	1	2	3	4	1+2 Summed 1g SAR (W/kg)	3+4 Summed 1g SAR (W/kg)
	2.4GHz WLAN CH 0	2.4GHz WLAN CH 1	5GHz WLAN CH 0	5GHz WLAN CH 1		
	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)		
Right Cheek	0.145	0.075	0.148	0.138	0.220	0.286
Right Tilt	0.086	0.087	0.140	0.188	0.173	0.328
Left Cheek	0.265	0.125	0.209	0.295	0.390	0.504
Left Tilt	0.120	0.155	0.157	0.386	0.275	0.543

➤ **Head Simultaneous Transmission for WWAN(2/3/4G)+WLAN MIMO**

WWAN Band	Exposure Position	1	2	3	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)
		WWAN	2.4GHz WLAN	5GHz WLAN		
		1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)		
GSM 850	Right Cheek	0.231	0.220	0.286	0.451	0.517
	Right Tilt	0.246	0.173	0.328	0.419	0.574
	Left Cheek	0.207	0.390	0.504	0.597	0.711
	Left Tilt	0.123	0.275	0.543	0.398	0.666
GSM 1900	Right Cheek	0.446	0.220	0.286	0.666	0.732
	Right Tilt	0.582	0.173	0.328	0.755	0.910
	Left Cheek	0.433	0.390	0.504	0.823	0.937
	Left Tilt	0.573	0.275	0.543	0.848	1.116
WCDMA II	Right Cheek	0.232	0.220	0.286	0.452	0.518
	Right Tilt	0.309	0.173	0.328	0.482	0.637
	Left Cheek	0.204	0.390	0.504	0.594	0.708
	Left Tilt	0.287	0.275	0.543	0.562	0.830
WCDMA IV	Right Cheek	0.408	0.220	0.286	0.628	0.694
	Right Tilt	0.519	0.173	0.328	0.692	0.847
	Left Cheek	0.370	0.390	0.504	0.760	0.874
	Left Tilt	0.510	0.275	0.543	0.785	1.053
WCDMA V	Right Cheek	0.454	0.220	0.286	0.674	0.740
	Right Tilt	0.261	0.173	0.328	0.434	0.589
	Left Cheek	0.129	0.390	0.504	0.519	0.633
	Left Tilt	0.039	0.275	0.543	0.314	0.582
LTE Band 2	Right Cheek	0.240	0.220	0.286	0.460	0.526
	Right Tilt	0.317	0.173	0.328	0.490	0.645
	Left Cheek	0.250	0.390	0.504	0.640	0.754
	Left Tilt	0.273	0.275	0.543	0.548	0.816
LTE Band 5	Right Cheek	0.390	0.220	0.286	0.610	0.676



	Right Tilt	0.376	0.173	0.328	0.549	0.704
	Left Cheek	0.249	0.390	0.504	0.639	0.753
	Left Tilt	0.158	0.275	0.543	0.433	0.701
LTE Band 12	Right Cheek	0.217	0.220	0.286	0.437	0.503
	Right Tilt	0.131	0.173	0.328	0.304	0.459
	Left Cheek	0.098	0.390	0.504	0.488	0.602
	Left Tilt	0.079	0.275	0.543	0.354	0.622
LTE Band 13	Right Cheek	0.151	0.220	0.286	0.371	0.437
	Right Tilt	0.275	0.173	0.328	0.448	0.603
	Left Cheek	0.087	0.390	0.504	0.477	0.591
	Left Tilt	0.109	0.275	0.543	0.384	0.652
LTE Band 66/4	Right Cheek	0.291	0.220	0.286	0.511	0.577
	Right Tilt	0.383	0.173	0.328	0.556	0.711
	Left Cheek	0.283	0.390	0.504	0.673	0.787
	Left Tilt	0.344	0.275	0.543	0.619	0.887

➤ **Head Simultaneous Transmission for WWAN(EN-DC)+WLAN MIMO**

WWAN Band	Exposure Position	1	2	3	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)
		WWAN	2.4GHz WLAN	5GHz WLAN		
		1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)		
12A-N2	Right Cheek	0.785	0.220	0.286	1.005	1.071
	Right Tilt	0.393	0.173	0.328	0.566	0.721
	Left Cheek	0.520	0.390	0.504	0.910	1.024
	Left Tilt	0.314	0.275	0.543	0.589	0.857
2A-12A-N2	Right Cheek	1.002	0.220	0.286	1.222	1.288
	Right Tilt	0.524	0.173	0.328	0.697	0.852
	Left Cheek	0.618	0.390	0.504	1.008	1.122
	Left Tilt	0.393	0.275	0.543	0.668	0.936
12A-66A-N2	Right Cheek	1.053	0.220	0.286	1.273	1.339
	Right Tilt	0.590	0.173	0.328	0.763	0.918
	Left Cheek	0.651	0.390	0.504	1.041	1.155
	Left Tilt	0.464	0.275	0.543	0.739	1.007
13A-66A-N2	Right Cheek	0.987	0.220	0.286	1.207	1.273
	Right Tilt	0.734	0.173	0.328	0.907	1.062
	Left Cheek	0.640	0.390	0.504	1.030	1.144
	Left Tilt	0.494	0.275	0.543	0.769	1.037
46A-66A-N5	Right Cheek	0.636	0.220	0.286	0.856	0.922
	Right Tilt	0.572	0.173	0.328	0.745	0.900
	Left Cheek	0.427	0.390	0.504	0.817	0.931
	Left Tilt	0.481	0.275	0.543	0.756	1.024



2A-46D-N5	Right Cheek	0.585	0.220	0.286	0.805	0.871
	Right Tilt	0.506	0.173	0.328	0.679	0.834
	Left Cheek	0.394	0.390	0.504	0.784	0.898
	Left Tilt	0.410	0.275	0.543	0.685	0.953
12A-N66	Right Cheek	0.546	0.220	0.286	0.766	0.832
	Right Tilt	0.186	0.173	0.328	0.359	0.514
	Left Cheek	0.266	0.390	0.504	0.656	0.770
	Left Tilt	0.109	0.275	0.543	0.384	0.652
13A-46A-N66	Right Cheek	0.480	0.220	0.286	0.700	0.766
	Right Tilt	0.330	0.173	0.328	0.503	0.658
	Left Cheek	0.255	0.390	0.504	0.645	0.759
	Left Tilt	0.139	0.275	0.543	0.414	0.682
5A-46A-N66	Right Cheek	0.719	0.220	0.286	0.939	1.005
	Right Tilt	0.431	0.173	0.328	0.604	0.759
	Left Cheek	0.417	0.390	0.504	0.807	0.921
	Left Tilt	0.188	0.275	0.543	0.463	0.731
2A-12A-N66	Right Cheek	0.786	0.220	0.286	1.006	1.072
	Right Tilt	0.503	0.173	0.328	0.676	0.831
	Left Cheek	0.516	0.390	0.504	0.906	1.020
	Left Tilt	0.382	0.275	0.543	0.657	0.925
12A-66A-N66	Right Cheek	0.837	0.220	0.286	1.057	1.123
	Right Tilt	0.569	0.173	0.328	0.742	0.897
	Left Cheek	0.549	0.390	0.504	0.939	1.053
	Left Tilt	0.453	0.275	0.543	0.728	0.996
2A-46A-N66	Right Cheek	0.569	0.220	0.286	0.789	0.855
	Right Tilt	0.372	0.173	0.328	0.545	0.700
	Left Cheek	0.418	0.390	0.504	0.808	0.922
	Left Tilt	0.303	0.275	0.543	0.578	0.846
13A-N77	Right Cheek	0.600	0.220	0.286	0.820	0.886
	Right Tilt	0.828	0.173	0.328	1.001	1.156
	Left Cheek	0.558	0.390	0.504	0.948	1.062
	Left Tilt	0.603	0.275	0.543	0.878	1.146
5A-N77	Right Cheek	0.839	0.220	0.286	1.059	1.125
	Right Tilt	0.929	0.173	0.328	1.102	1.257
	Left Cheek	0.720	0.390	0.504	1.110	1.224
	Left Tilt	0.652	0.275	0.543	0.927	1.195
12A-66A-66A-N2	Right Cheek	1.344	0.220	0.286	1.564	1.630
	Right Tilt	0.973	0.173	0.328	1.146	1.301
	Left Cheek	0.934	0.390	0.504	1.324	1.438
	Left Tilt	0.808	0.275	0.543	1.083	1.351
2A-12A-12A-N66	Right Cheek	1.003	0.220	0.286	1.223	1.289



	Right Tilt	0.634	0.173	0.328	0.807	0.962
	Left Cheek	0.614	0.390	0.504	1.004	1.118
	Left Tilt	0.461	0.275	0.543	0.736	1.004

➤ **Body Data for WLAN MIMO**

Exposure Position	1	2	3	4	1+2 Summed 1g SAR (W/kg)	3+4 Summed 1g SAR (W/kg)
	2.4GHz WLAN CH 0	2.4GHz WLAN CH 1	5GHz WLAN CH 0	5GHz WLAN CH 1		
	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)		
Front Side	0.049	0.027	0.107	0.243	0.076	0.350
Back Side	0.134	0.138	0.230	0.274	0.272	0.504
Left Side	0.011	0.023	0.000	0.000	0.034	0.000
Right Side	0.073	0.049	0.194	0.150	0.122	0.344
Top Side	0.024	0.067	0.117	0.266	0.091	0.383
Bottom Side	0.000	0.000	0.000	0.000	0.000	0.000

➤ **Body Data for LTE Inter-band CA Uplink**

Carrier Component	Exposure Position	Standalone 1g SAR (W/kg)		Summed 1g SAR (W/kg)
		PCC	SCC	
CA_2A-4A	Front	0.035	0.036	0.071
	Back	0.074	0.089	0.163
	Left side	0.008	0.099	0.107
	Right side	0.007	0.030	0.037
	Top side	0.091	0.006	0.097
	Bottom side	0.000	0.000	0.000
CA_2A-5A	Front	0.035	0.038	0.073
	Back	0.074	0.055	0.129
	Left side	0.008	0.041	0.049
	Right side	0.007	0.020	0.027
	Top side	0.091	0.044	0.135
	Bottom side	0.000	0.033	0.033
CA_2A-12A	Front	0.035	0.053	0.088
	Back	0.074	0.091	0.165
	Left side	0.008	0.065	0.073
	Right side	0.007	0.046	0.053
	Top side	0.091	0.035	0.126
	Bottom side	0.000	0.051	0.051
CA_2A-13A	Front	0.035	0.094	0.129



	Back	0.074	0.165	0.239
	Left side	0.008	0.087	0.095
	Right side	0.007	0.023	0.030
	Top side	0.091	0.077	0.168
	Bottom side	0.000	0.031	0.031
CA_2A-66A	Front	0.035	0.036	0.071
	Back	0.074	0.089	0.163
	Left side	0.008	0.099	0.107
	Right side	0.007	0.030	0.037
	Top side	0.091	0.006	0.097
	Bottom side	0.000	0.000	0.000
CA_4A-5A	Front	0.036	0.038	0.074
	Back	0.089	0.055	0.144
	Left side	0.099	0.041	0.140
	Right side	0.030	0.020	0.050
	Top side	0.006	0.044	0.050
	Bottom side	0.000	0.033	0.033
CA_4A-13A	Front	0.036	0.094	0.130
	Back	0.089	0.165	0.254
	Left side	0.099	0.087	0.186
	Right side	0.030	0.023	0.053
	Top side	0.006	0.077	0.083
	Bottom side	0.000	0.031	0.031
CA_5A-66A	Front	0.038	0.036	0.074
	Back	0.055	0.089	0.144
	Left side	0.041	0.099	0.140
	Right side	0.020	0.030	0.050
	Top side	0.044	0.006	0.050
	Bottom side	0.033	0.000	0.033
CA_13A-66A	Front	0.094	0.036	0.130
	Back	0.165	0.089	0.254
	Left side	0.087	0.099	0.186
	Right side	0.023	0.030	0.053
	Top side	0.077	0.006	0.083
	Bottom side	0.031	0.000	0.031



➤ **Body Data for EN-DC Combination**

EN-DC Combination	Exposure Position	Standalone 1g SAR (W/kg)		EN-DC Summed 1g SAR (W/kg)
		LTE Carrier	5G NR	
12A-N2	Front	0.035	/	0.100
	Back	0.074	/	0.278
	Left side	0.008	/	0.254
	Right side	0.007	/	0.011
	Top side	0.091	/	0.100
	Bottom side	0.000	/	0.000
2A-12A-N2	Front	0.035	0.053	0.153
	Back	0.074	0.091	0.369
	Left side	0.008	0.065	0.319
	Right side	0.007	0.046	0.057
	Top side	0.091	0.035	0.135
	Bottom side	0.000	0.051	0.051
12A-66A-N2	Front	0.053	0.012	0.130
	Back	0.091	0.023	0.318
	Left side	0.065	0.005	0.316
	Right side	0.046	0.004	0.054
	Top side	0.035	0.031	0.075
	Bottom side	0.051	0.000	0.051
13A-66A-N2	Front	0.094	0.012	0.171
	Back	0.165	0.023	0.392
	Left side	0.087	0.005	0.338
	Right side	0.023	0.004	0.031
	Top side	0.077	0.031	0.117
	Bottom side	0.031	0.000	0.031
46A-66A-N5	Front	/	0.012	0.122
	Back	/	0.023	0.190
	Left side	/	0.005	0.070
	Right side	/	0.004	0.042
	Top side	/	0.031	0.154
	Bottom side	/	0.000	0.088
2A-46D-N5	Front	0.035	/	0.145
	Back	0.074	/	0.241
	Left side	0.008	/	0.073
	Right side	0.007	/	0.045
	Top side	0.091	/	0.214



	Bottom side	0.000		0.036	0.036
12A-N66	Front	0.053	0.012	0.089	0.154
	Back	0.091	0.023	0.099	0.213
	Left side	0.065	0.005	0.030	0.100
	Right side	0.046	0.004	0.006	0.056
	Top side	0.035	0.031	0.000	0.066
	Bottom side	0.051	0.000	0.036	0.087
13A-46A-N66	Front	0.094	/	0.089	0.183
	Back	0.165	/	0.099	0.264
	Left side	0.087	/	0.030	0.117
	Right side	0.023	/	0.006	0.029
	Top side	0.077	/	0.000	0.077
	Bottom side	0.031	/	0.036	0.067
5A-46A-N66	Front	0.038	/	0.089	0.127
	Back	0.055	/	0.099	0.154
	Left side	0.041	/	0.030	0.071
	Right side	0.020	/	0.006	0.026
	Top side	0.044	/	0.000	0.044
	Bottom side	0.033	/	0.036	0.069
2A-12A-N66	Front	0.035	0.053	0.089	0.177
	Back	0.074	0.091	0.099	0.264
	Left side	0.008	0.065	0.030	0.103
	Right side	0.007	0.046	0.006	0.059
	Top side	0.091	0.035	0.000	0.126
	Bottom side	0.000	0.051	0.036	0.087
12A-66A-N66	Front	0.053	0.012	0.089	0.154
	Back	0.091	0.023	0.099	0.213
	Left side	0.065	0.005	0.030	0.100
	Right side	0.046	0.004	0.006	0.056
	Top side	0.035	0.031	0.000	0.066
	Bottom side	0.051	0.000	0.036	0.087
2A-46A-N66	Front	0.035	/	0.089	0.124
	Back	0.074	/	0.099	0.173
	Left side	0.008	/	0.030	0.038
	Right side	0.007	/	0.006	0.013
	Top side	0.091	/	0.000	0.091
	Bottom side	0.000	/	0.036	0.036
13A-N77	Front	0.094	/	0.073	0.167



	Back	0.165	/	0.157	0.322
	Left side	0.087	/	0.042	0.129
	Right side	0.023	/	0.106	0.129
	Top side	0.077	/	0.320	0.397
	Bottom side	0.031	/	0.000	0.031
5A-N77	Front	0.038	/	0.073	0.111
	Back	0.055	/	0.157	0.212
	Left side	0.041	/	0.042	0.083
	Right side	0.020	/	0.106	0.126
	Top side	0.044	/	0.320	0.364
	Bottom side	0.033	/	0.000	0.033

EN-DC Combination	Exposure Position	Standalone 1g SAR (W/kg)				EN-DC Summed 1g SAR (W/kg)
		LTE Carrier		5G NR		
12A-66A-66A-N2	Front	0.053	0.012	0.012	0.035	0.112
	Back	0.091	0.023	0.023	0.074	0.211
	Left side	0.065	0.005	0.005	0.008	0.083
	Right side	0.046	0.004	0.004	0.007	0.061
	Top side	0.035	0.031	0.031	0.091	0.188
	Bottom side	0.051	0.000	0.000	0.000	0.051
2A-12A-12A-N66	Front	0.035	0.053	0.053	0.036	0.177
	Back	0.074	0.091	0.091	0.089	0.345
	Left side	0.008	0.065	0.065	0.099	0.237
	Right side	0.007	0.046	0.046	0.030	0.129
	Top side	0.091	0.035	0.035	0.006	0.167
	Bottom side	0.000	0.051	0.051	0.000	0.102



➤ **Body Simultaneous Transmission for WWAN(2/3/4G)+WLAN MIMO**

WWAN Band	Exposure Position	1	2	3	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)
		WWAN	2.4GHz WLAN	5GHz WLAN		
		1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)		
GSM 850	Front Side	0.101	0.076	0.350	0.177	0.451
	Back Side	0.120	0.272	0.504	0.392	0.624
	Left Side	0.069	0.034	0.000	0.103	0.069
	Right Side	0.035	0.122	0.344	0.157	0.379
	Top Side	0.104	0.091	0.383	0.195	0.487
	Bottom Side	0.080	0.000	0.000	0.080	0.080
GSM 1900	Front Side	0.045	0.076	0.350	0.121	0.395
	Back Side	0.092	0.272	0.504	0.364	0.596
	Left Side	0.022	0.034	0.000	0.056	0.022
	Right Side	0.004	0.122	0.344	0.126	0.348
	Top Side	0.114	0.091	0.383	0.205	0.497
	Bottom Side	0.000	0.000	0.000	0.000	0.000
WCDMA II	Front Side	0.080	0.076	0.350	0.156	0.430
	Back Side	0.164	0.272	0.504	0.436	0.668
	Left Side	0.039	0.034	0.000	0.073	0.039
	Right Side	0.012	0.122	0.344	0.134	0.356
	Top Side	0.195	0.091	0.383	0.286	0.578
	Bottom Side	0.000	0.000	0.000	0.000	0.000
WCDMA IV	Front Side	0.138	0.076	0.350	0.214	0.488
	Back Side	0.248	0.272	0.504	0.520	0.752
	Left Side	0.048	0.034	0.000	0.082	0.048
	Right Side	0.018	0.122	0.344	0.140	0.362
	Top Side	0.354	0.091	0.383	0.445	0.737
	Bottom Side	0.000	0.000	0.000	0.000	0.000
WCDMA V	Front Side	0.029	0.076	0.350	0.105	0.379
	Back Side	0.069	0.272	0.504	0.341	0.573
	Left Side	0.058	0.034	0.000	0.092	0.058
	Right Side	0.022	0.122	0.344	0.144	0.366
	Top Side	0.061	0.091	0.383	0.152	0.444
	Bottom Side	0.023	0.000	0.000	0.023	0.023
LTE Band 2	Front Side	0.035	0.076	0.350	0.111	0.385
	Back Side	0.074	0.272	0.504	0.346	0.578
	Left Side	0.008	0.034	0.000	0.042	0.008



	Right Side	0.007	0.122	0.344	0.129	0.351
	Top Side	0.091	0.091	0.383	0.182	0.474
	Bottom Side	0.000	0.000	0.000	0.000	0.000
LTE Band 5	Front Side	0.038	0.076	0.350	0.114	0.388
	Back Side	0.055	0.272	0.504	0.327	0.559
	Left Side	0.041	0.034	0.000	0.075	0.041
	Right Side	0.020	0.122	0.344	0.142	0.364
	Top Side	0.044	0.091	0.383	0.135	0.427
	Bottom Side	0.033	0.000	0.000	0.033	0.033
LTE Band 12	Front Side	0.053	0.076	0.350	0.129	0.403
	Back Side	0.091	0.272	0.504	0.363	0.595
	Left Side	0.065	0.034	0.000	0.099	0.065
	Right Side	0.046	0.122	0.344	0.168	0.390
	Top Side	0.035	0.091	0.383	0.126	0.418
	Bottom Side	0.051	0.000	0.000	0.051	0.051
LTE Band 13	Front Side	0.094	0.076	0.350	0.170	0.444
	Back Side	0.165	0.272	0.504	0.437	0.669
	Left Side	0.087	0.034	0.000	0.121	0.087
	Right Side	0.023	0.122	0.344	0.145	0.367
	Top Side	0.077	0.091	0.383	0.168	0.460
	Bottom Side	0.031	0.000	0.000	0.031	0.031
LTE Band 66	Front Side	0.012	0.076	0.350	0.088	0.362
	Back Side	0.023	0.272	0.504	0.295	0.527
	Left Side	0.005	0.034	0.000	0.039	0.005
	Right Side	0.004	0.122	0.344	0.126	0.348
	Top Side	0.031	0.091	0.383	0.122	0.414
	Bottom Side	0.000	0.000	0.000	0.000	0.000



➤ **Body Simultaneous Transmission for WWAN(EN-DC)+WLAN MIMO**

WWAN Band	Exposure Position	1	2	3	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)
		WWAN	2.4GHz WLAN	5GHz WLAN		
		1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)		
12A-N2	Front Side	0.100	0.076	0.350	0.176	0.450
	Back Side	0.278	0.272	0.504	0.550	0.782
	Left Side	0.254	0.034	0.000	0.288	0.254
	Right Side	0.011	0.122	0.344	0.133	0.355
	Top Side	0.100	0.091	0.383	0.191	0.483
	Bottom Side	0.000	0.000	0.000	0.000	0.000
2A-12A-N2	Front Side	0.153	0.076	0.350	0.229	0.503
	Back Side	0.369	0.272	0.504	0.641	0.873
	Left Side	0.319	0.034	0.000	0.353	0.319
	Right Side	0.057	0.122	0.344	0.179	0.401
	Top Side	0.135	0.091	0.383	0.226	0.518
	Bottom Side	0.051	0.000	0.000	0.051	0.051
12A-66A-N2	Front Side	0.130	0.076	0.350	0.206	0.480
	Back Side	0.318	0.272	0.504	0.590	0.822
	Left Side	0.316	0.034	0.000	0.350	0.316
	Right Side	0.054	0.122	0.344	0.176	0.398
	Top Side	0.075	0.091	0.383	0.166	0.458
	Bottom Side	0.051	0.000	0.000	0.051	0.051
13A-66A-N2	Front Side	0.171	0.076	0.350	0.247	0.521
	Back Side	0.392	0.272	0.504	0.664	0.896
	Left Side	0.338	0.034	0.000	0.372	0.338
	Right Side	0.031	0.122	0.344	0.153	0.375
	Top Side	0.117	0.091	0.383	0.208	0.500
	Bottom Side	0.031	0.000	0.000	0.031	0.031
46A-66A-N5	Front Side	0.122	0.076	0.350	0.198	0.472
	Back Side	0.190	0.272	0.504	0.462	0.694
	Left Side	0.070	0.034	0.000	0.104	0.070
	Right Side	0.042	0.122	0.344	0.164	0.386
	Top Side	0.154	0.091	0.383	0.245	0.537
	Bottom Side	0.088	0.000	0.000	0.088	0.088
2A-46D-N5	Front Side	0.145	0.076	0.350	0.221	0.495
	Back Side	0.241	0.272	0.504	0.513	0.745
	Left Side	0.073	0.034	0.000	0.107	0.073



	Right Side	0.045	0.122	0.344	0.167	0.389
	Top Side	0.214	0.091	0.383	0.305	0.597
	Bottom Side	0.036	0.000	0.000	0.036	0.036
12A-N66	Front Side	0.154	0.076	0.350	0.230	0.504
	Back Side	0.213	0.272	0.504	0.485	0.717
	Left Side	0.100	0.034	0.000	0.134	0.100
	Right Side	0.056	0.122	0.344	0.178	0.400
	Top Side	0.066	0.091	0.383	0.157	0.449
	Bottom Side	0.087	0.000	0.000	0.087	0.087
	13A-46A-N66	Front Side	0.183	0.076	0.350	0.259
Back Side		0.264	0.272	0.504	0.536	0.768
Left Side		0.117	0.034	0.000	0.151	0.117
Right Side		0.029	0.122	0.344	0.151	0.373
Top Side		0.077	0.091	0.383	0.168	0.460
Bottom Side		0.067	0.000	0.000	0.067	0.067
5A-46A-N66	Front Side	0.127	0.076	0.350	0.203	0.477
	Back Side	0.154	0.272	0.504	0.426	0.658
	Left Side	0.071	0.034	0.000	0.105	0.071
	Right Side	0.026	0.122	0.344	0.148	0.370
	Top Side	0.044	0.091	0.383	0.135	0.427
	Bottom Side	0.069	0.000	0.000	0.069	0.069
2A-12A-N66	Front Side	0.177	0.076	0.350	0.253	0.527
	Back Side	0.264	0.272	0.504	0.536	0.768
	Left Side	0.103	0.034	0.000	0.137	0.103
	Right Side	0.059	0.122	0.344	0.181	0.403
	Top Side	0.126	0.091	0.383	0.217	0.509
	Bottom Side	0.087	0.000	0.000	0.087	0.087
12A-66A-N66	Front Side	0.154	0.076	0.350	0.230	0.504
	Back Side	0.213	0.272	0.504	0.485	0.717
	Left Side	0.100	0.034	0.000	0.134	0.100
	Right Side	0.056	0.122	0.344	0.178	0.400
	Top Side	0.066	0.091	0.383	0.157	0.449
	Bottom Side	0.087	0.000	0.000	0.087	0.087
2A-46A-N66	Front Side	0.124	0.076	0.350	0.200	0.474
	Back Side	0.173	0.272	0.504	0.445	0.677
	Left Side	0.038	0.034	0.000	0.072	0.038
	Right Side	0.013	0.122	0.344	0.135	0.357
	Top Side	0.091	0.091	0.383	0.182	0.474



	Bottom Side	0.036	0.000	0.000	0.036	0.036
13A-N77	Front Side	0.167	0.076	0.350	0.243	0.517
	Back Side	0.322	0.272	0.504	0.594	0.826
	Left Side	0.129	0.034	0.000	0.163	0.129
	Right Side	0.129	0.122	0.344	0.251	0.473
	Top Side	0.397	0.091	0.383	0.488	0.780
	Bottom Side	0.031	0.000	0.000	0.031	0.031
5A-N77	Front Side	0.111	0.076	0.350	0.187	0.461
	Back Side	0.212	0.272	0.504	0.484	0.716
	Left Side	0.083	0.034	0.000	0.117	0.083
	Right Side	0.126	0.122	0.344	0.248	0.470
	Top Side	0.364	0.091	0.383	0.455	0.747
	Bottom Side	0.033	0.000	0.000	0.033	0.033
12A-66A-66A-N 2	Front Side	0.112	0.076	0.350	0.188	0.462
	Back Side	0.211	0.272	0.504	0.483	0.715
	Left Side	0.083	0.034	0.000	0.117	0.083
	Right Side	0.061	0.122	0.344	0.183	0.405
	Top Side	0.188	0.091	0.383	0.279	0.571
	Bottom Side	0.051	0.000	0.000	0.051	0.051
2A-12A-12A-N6 6	Front Side	0.177	0.076	0.350	0.253	0.527
	Back Side	0.345	0.272	0.504	0.617	0.849
	Left Side	0.237	0.034	0.000	0.271	0.237
	Right Side	0.129	0.122	0.344	0.251	0.473
	Top Side	0.167	0.091	0.383	0.258	0.550
	Bottom Side	0.102	0.000	0.000	0.102	0.102



➤ **Body Simultaneous Transmission for WWAN(2/3/4G)+WLAN+Bluetooth**

WWAN Band	Exposure Position	1	2	3	4	1+2+4 Summed 1g SAR (W/kg)	1+3+4 Summed 1g SAR (W/kg)
		WWAN	2.4GHz (Ant 9)	5GHz (Ant 6)	Bluetooth Estimated		
		1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)		
GSM 850	Front Side	0.101	0.027	0.243	0.453	0.581	0.797
	Back Side	0.120	0.138	0.274	0.453	0.711	0.847
	Left Side	0.069	0.023	0.000	0.453	0.545	0.522
	Right Side	0.035	0.049	0.150	0.453	0.537	0.638
	Top Side	0.104	0.067	0.266	0.453	0.624	0.823
	Bottom Side	0.080	0.000	0.000	0.000	0.080	0.080
GSM 1900	Front Side	0.045	0.027	0.243	0.453	0.525	0.741
	Back Side	0.092	0.138	0.274	0.453	0.683	0.819
	Left Side	0.022	0.023	0.000	0.453	0.498	0.475
	Right Side	0.004	0.049	0.150	0.453	0.506	0.607
	Top Side	0.114	0.067	0.266	0.453	0.634	0.833
	Bottom Side	0.000	0.000	0.000	0.000	0.000	0.000
WCDMA II	Front Side	0.080	0.027	0.243	0.453	0.560	0.776
	Back Side	0.164	0.138	0.274	0.453	0.755	0.891
	Left Side	0.039	0.023	0.000	0.453	0.515	0.492
	Right Side	0.012	0.049	0.150	0.453	0.514	0.615
	Top Side	0.195	0.067	0.266	0.453	0.715	0.914
	Bottom Side	0.000	0.000	0.000	0.000	0.000	0.000
WCDMA IV	Front Side	0.138	0.027	0.243	0.453	0.618	0.834
	Back Side	0.248	0.138	0.274	0.453	0.839	0.975
	Left Side	0.048	0.023	0.000	0.453	0.524	0.501
	Right Side	0.018	0.049	0.150	0.453	0.520	0.621
	Top Side	0.354	0.067	0.266	0.453	0.874	1.073
	Bottom Side	0.000	0.000	0.000	0.000	0.000	0.000
WCDMA V	Front Side	0.029	0.027	0.243	0.453	0.509	0.725
	Back Side	0.069	0.138	0.274	0.453	0.660	0.796
	Left Side	0.058	0.023	0.000	0.453	0.534	0.511
	Right Side	0.022	0.049	0.150	0.453	0.524	0.625
	Top Side	0.061	0.067	0.266	0.453	0.581	0.780
	Bottom Side	0.023	0.000	0.000	0.000	0.023	0.023
LTE Band 2	Front Side	0.035	0.027	0.243	0.453	0.515	0.731
	Back Side	0.074	0.138	0.274	0.453	0.665	0.801
	Left Side	0.008	0.023	0.000	0.453	0.484	0.461



	Right Side	0.007	0.049	0.150	0.453	0.509	0.610
	Top Side	0.091	0.067	0.266	0.453	0.611	0.810
	Bottom Side	0.000	0.000	0.000	0.000	0.000	0.000
LTE Band 5	Front Side	0.038	0.027	0.243	0.453	0.518	0.734
	Back Side	0.055	0.138	0.274	0.453	0.646	0.782
	Left Side	0.041	0.023	0.000	0.453	0.517	0.494
	Right Side	0.020	0.049	0.150	0.453	0.522	0.623
	Top Side	0.044	0.067	0.266	0.453	0.564	0.763
	Bottom Side	0.033	0.000	0.000	0.000	0.033	0.033
LTE Band 12	Front Side	0.053	0.027	0.243	0.453	0.533	0.749
	Back Side	0.091	0.138	0.274	0.453	0.682	0.818
	Left Side	0.065	0.023	0.000	0.453	0.541	0.518
	Right Side	0.046	0.049	0.150	0.453	0.548	0.649
	Top Side	0.035	0.067	0.266	0.453	0.555	0.754
	Bottom Side	0.051	0.000	0.000	0.000	0.051	0.051
LTE Band 13	Front Side	0.094	0.027	0.243	0.453	0.574	0.790
	Back Side	0.165	0.138	0.274	0.453	0.756	0.892
	Left Side	0.087	0.023	0.000	0.453	0.563	0.540
	Right Side	0.023	0.049	0.150	0.453	0.525	0.626
	Top Side	0.077	0.067	0.266	0.453	0.597	0.796
	Bottom Side	0.031	0.000	0.000	0.000	0.031	0.031
LTE Band 66	Front Side	0.012	0.027	0.243	0.453	0.492	0.708
	Back Side	0.023	0.138	0.274	0.453	0.614	0.750
	Left Side	0.005	0.023	0.000	0.453	0.481	0.458
	Right Side	0.004	0.049	0.150	0.453	0.506	0.607
	Top Side	0.031	0.067	0.266	0.453	0.551	0.750
	Bottom Side	0.000	0.000	0.000	0.000	0.000	0.000



➤ **Body Simultaneous Transmission for WWAN(EN-DC)+WLAN+Bluetooth**

WWAN Band	Exposure Position	1	2	3	4	1+2+4 Summed 1g SAR (W/kg)	1+3+4 Summed 1g SAR (W/kg)
		WWAN	2.4GHz (Ant 9)	5GHz (Ant 6)	Bluetooth Estimated		
		1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)		
12A-N2	Front Side	0.100	0.027	0.243	0.453	0.580	0.796
	Back Side	0.278	0.138	0.274	0.453	0.869	1.005
	Left Side	0.254	0.023	0.000	0.453	0.730	0.707
	Right Side	0.011	0.049	0.150	0.453	0.513	0.614
	Top Side	0.100	0.067	0.266	0.453	0.620	0.819
	Bottom Side	0.000	0.000	0.000	0.000	0.000	0.000
2A-12A-N2	Front Side	0.153	0.027	0.243	0.453	0.633	0.849
	Back Side	0.369	0.138	0.274	0.453	0.960	1.096
	Left Side	0.319	0.023	0.000	0.453	0.795	0.772
	Right Side	0.057	0.049	0.150	0.453	0.559	0.660
	Top Side	0.135	0.067	0.266	0.453	0.655	0.854
	Bottom Side	0.051	0.000	0.000	0.000	0.051	0.051
12A-66A-N2	Front Side	0.130	0.027	0.243	0.453	0.610	0.826
	Back Side	0.318	0.138	0.274	0.453	0.909	1.045
	Left Side	0.316	0.023	0.000	0.453	0.792	0.769
	Right Side	0.054	0.049	0.150	0.453	0.556	0.657
	Top Side	0.075	0.067	0.266	0.453	0.595	0.794
	Bottom Side	0.051	0.000	0.000	0.000	0.051	0.051
13A-66A-N2	Front Side	0.171	0.027	0.243	0.453	0.651	0.867
	Back Side	0.392	0.138	0.274	0.453	0.983	1.119
	Left Side	0.338	0.023	0.000	0.453	0.814	0.791
	Right Side	0.031	0.049	0.150	0.453	0.533	0.634
	Top Side	0.117	0.067	0.266	0.453	0.637	0.836
	Bottom Side	0.031	0.000	0.000	0.000	0.031	0.031
46A-66A-N5	Front Side	0.122	0.027	0.243	0.453	0.602	0.818
	Back Side	0.190	0.138	0.274	0.453	0.781	0.917
	Left Side	0.070	0.023	0.000	0.453	0.546	0.523
	Right Side	0.042	0.049	0.150	0.453	0.544	0.645
	Top Side	0.154	0.067	0.266	0.453	0.674	0.873
	Bottom Side	0.088	0.000	0.000	0.000	0.088	0.088
2A-46D-N5	Front Side	0.145	0.027	0.243	0.453	0.625	0.841
	Back Side	0.241	0.138	0.274	0.453	0.832	0.968
	Left Side	0.073	0.023	0.000	0.453	0.549	0.526



	Right Side	0.045	0.049	0.150	0.453	0.547	0.648
	Top Side	0.214	0.067	0.266	0.453	0.734	0.933
	Bottom Side	0.036	0.000	0.000	0.000	0.036	0.036
12A-N66	Front Side	0.154	0.027	0.243	0.453	0.634	0.850
	Back Side	0.213	0.138	0.274	0.453	0.804	0.940
	Left Side	0.100	0.023	0.000	0.453	0.576	0.553
	Right Side	0.056	0.049	0.150	0.453	0.558	0.659
	Top Side	0.066	0.067	0.266	0.453	0.586	0.785
	Bottom Side	0.087	0.000	0.000	0.000	0.087	0.087
	13A-46A-N66	Front Side	0.183	0.027	0.243	0.453	0.663
Back Side		0.264	0.138	0.274	0.453	0.855	0.991
Left Side		0.117	0.023	0.000	0.453	0.593	0.570
Right Side		0.029	0.049	0.150	0.453	0.531	0.632
Top Side		0.077	0.067	0.266	0.453	0.597	0.796
Bottom Side		0.067	0.000	0.000	0.000	0.067	0.067
5A-46A-N66	Front Side	0.127	0.027	0.243	0.453	0.607	0.823
	Back Side	0.154	0.138	0.274	0.453	0.745	0.881
	Left Side	0.071	0.023	0.000	0.453	0.547	0.524
	Right Side	0.026	0.049	0.150	0.453	0.528	0.629
	Top Side	0.044	0.067	0.266	0.453	0.564	0.763
	Bottom Side	0.069	0.000	0.000	0.000	0.069	0.069
2A-12A-N66	Front Side	0.177	0.027	0.243	0.453	0.657	0.873
	Back Side	0.264	0.138	0.274	0.453	0.855	0.991
	Left Side	0.103	0.023	0.000	0.453	0.579	0.556
	Right Side	0.059	0.049	0.150	0.453	0.561	0.662
	Top Side	0.126	0.067	0.266	0.453	0.646	0.845
	Bottom Side	0.087	0.000	0.000	0.000	0.087	0.087
12A-66A-N66	Front Side	0.154	0.027	0.243	0.453	0.634	0.850
	Back Side	0.213	0.138	0.274	0.453	0.804	0.940
	Left Side	0.100	0.023	0.000	0.453	0.576	0.553
	Right Side	0.056	0.049	0.150	0.453	0.558	0.659
	Top Side	0.066	0.067	0.266	0.453	0.586	0.785
	Bottom Side	0.087	0.000	0.000	0.000	0.087	0.087
2A-46A-N66	Front Side	0.124	0.027	0.243	0.453	0.604	0.820
	Back Side	0.173	0.138	0.274	0.453	0.764	0.900
	Left Side	0.038	0.023	0.000	0.453	0.514	0.491
	Right Side	0.013	0.049	0.150	0.453	0.515	0.616
	Top Side	0.091	0.067	0.266	0.453	0.611	0.810



	Bottom Side	0.036	0.000	0.000	0.000	0.036	0.036
13A-N77	Front Side	0.167	0.027	0.243	0.453	0.647	0.863
	Back Side	0.322	0.138	0.274	0.453	0.913	1.049
	Left Side	0.129	0.023	0.000	0.453	0.605	0.582
	Right Side	0.129	0.049	0.150	0.453	0.631	0.732
	Top Side	0.397	0.067	0.266	0.453	0.917	1.116
	Bottom Side	0.031	0.000	0.000	0.000	0.031	0.031
5A-N77	Front Side	0.111	0.027	0.243	0.453	0.591	0.807
	Back Side	0.212	0.138	0.274	0.453	0.803	0.939
	Left Side	0.083	0.023	0.000	0.453	0.559	0.536
	Right Side	0.126	0.049	0.150	0.453	0.628	0.729
	Top Side	0.364	0.067	0.266	0.453	0.884	1.083
	Bottom Side	0.033	0.000	0.000	0.000	0.033	0.033
12A-66A-66A-N2	Front Side	0.100	0.027	0.243	0.453	0.580	0.796
	Back Side	0.278	0.138	0.274	0.453	0.869	1.005
	Left Side	0.254	0.023	0.000	0.453	0.730	0.707
	Right Side	0.011	0.049	0.150	0.453	0.513	0.614
	Top Side	0.100	0.067	0.266	0.453	0.620	0.819
	Bottom Side	0.000	0.000	0.000	0.000	0.000	0.000
2A-12A-12A-N66	Front Side	0.153	0.027	0.243	0.453	0.633	0.849
	Back Side	0.369	0.138	0.274	0.453	0.960	1.096
	Left Side	0.319	0.023	0.000	0.453	0.795	0.772
	Right Side	0.057	0.049	0.150	0.453	0.559	0.660
	Top Side	0.135	0.067	0.266	0.453	0.655	0.854
	Bottom Side	0.051	0.000	0.000	0.000	0.051	0.051



19.3. 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+Bluetooth mode may not be required for the SAR measurement of Bluetooth has been exempted.

➤ **SPLSR Analysis Results**

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 12	Right Cheek	0.190	0.00611	-0.332	-0.173	797.2	0.31	0.00	Not required
LTE Band 66		0.266	0.00672	-0.317	-0.173				
LTE Band 66		0.266	0.00672	-0.317	-0.173				
5G NR N2		0.479	0.049	-0.315	-0.176				
5.5GHz CH0		0.123	-0.00454	-0.287	-0.166				
5.2GHz CH1		0.115	-0.00962	-0.288	-0.168				

Remark:

The plots of SPLSR please refer to the annex D.

20. Uncertainty Assessment

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 table below.

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

Standard Uncertainty for Assumed Distribution

(a) standard uncertainty is determined as the product of the multiplying factor and the estimated range of variations in the measured quantity

(b) k is the coverage factor

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 DASY uncertainty Budget is shown in the following tables.

Error Description	Uncertainty Value (±%)	Probability	Divisor	(Ci) 1g	(Ci) 10g	Standard Uncertainty (1g) (±%)	Standard Uncertainty (10g) (±%)
Measurement System							
Probe Calibration	6.0	N	1	1	1	6.0	6.0
Axial Isotropy	4.7	R	1.732	0.7	0.7	1.9	1.9
Hemispherical Isotropy	9.6	R	1.732	0.7	0.7	3.9	3.9
Boundary Effects	1.0	R	1.732	1	1	0.6	0.6
Linearity	4.7	R	1.732	1	1	2.7	2.7
System Detection Limits	1.0	R	1.732	1	1	0.6	0.6
Modulation Response	3.2	R	1.732	1	1	1.8	1.8
Readout Electronics	0.3	N	1	1	1	0.3	0.3
Response Time	0.0	R	1.732	1	1	0.0	0.0
Integration Time	2.6	R	1.732	1	1	1.5	1.5
RF Ambient Noise	3.0	R	1.732	1	1	1.7	1.7
RF Ambient Reflections	3.0	R	1.732	1	1	1.7	1.7
Probe Positioner	0.4	R	1.732	1	1	0.2	0.2
Probe Positioning	2.9	R	1.732	1	1	1.7	1.7
Max. SAR Eval.	2.0	R	1.732	1	1	1.2	1.2
Test Sample Related							
Device Positioning	3.0	N	1	1	1	3.0	3.0
Device Holder	3.6	N	1	1	1	0.089	0.089
Power Drift	5.0	R	1.732	1	1	2.9	2.9
Power Scaling	0.0	R	1.732	1	1	0.0	0.0
Phantom and Setup							
Phantom Uncertainty	6.1	R	1.732	1	1	3.5	3.5
SAR correction	0.0	R	1.732	1	0.84	0.0	0.0
Liquid Conductivity Repeatability	0.2	N	1	0.78	0.71	0.1	0.1
Liquid Conductivity (target)	5.0	R	1.732	0.78	0.71	2.3	2.0
Liquid Conductivity (mea.)	2.5	R	1.732	0.78	0.71	1.1	1.0
Temp. unc. - Conductivity	3.4	R	1.732	0.78	0.71	1.5	1.4
Liquid Permittivity Repeatability	0.15	N	1	0.23	0.26	0.0	0.0
Liquid Permittivity (target)	5.0	R	1.732	0.23	0.26	0.7	0.8
Liquid Permittivity (mea.)	2.5	R	1.732	0.23	0.26	0.3	0.4
Temp. unc. - Permittivity	0.83	R	1.732	0.23	0.26	0.1	0.1
Combined Std. Uncertainty						11.4%	11.4%
Coverage Factor for 95 %						K=2	K=2
Expanded STD Uncertainty						22.9%	22.7%



Error Description	Uncertainty Value (±%)	Probability	Divisor	(Ci) 1g	(Ci) 10g	Standard Uncertainty (1g) (±%)	Standard Uncertainty (10g) (±%)
Measurement System							
Probe Calibration	6.55	N	1	1	1	6.0	6.0
Axial Isotropy	4.7	R	1.732	0.7	0.7	1.9	1.9
Hemispherical Isotropy	9.6	R	1.732	0.7	0.7	3.9	3.9
Boundary Effects	2.0	R	1.732	1	1	1.2	1.2
Linearity	4.7	R	1.732	1	1	2.7	2.7
System Detection Limits	1.0	R	1.732	1	1	0.6	0.6
Modulation Response	3.2	R	1.732	1	1	1.8	1.8
Readout Electronics	0.3	N	1	1	1	0.3	0.3
Response Time	0.0	R	1.732	1	1	0.0	0.0
Integration Time	2.6	R	1.732	1	1	1.5	1.5
RF Ambient Noise	3.0	R	1.732	1	1	1.7	1.7
RF Ambient Reflections	3.0	R	1.732	1	1	1.7	1.7
Probe Positioner	0.4	R	1.732	1	1	0.2	0.2
Probe Positioning	6.7	R	1.732	1	1	3.9	3.9
Max. SAR Eval.	4.0	R	1.732	1	1	2.3	2.3
Test Sample Related							
Device Positioning	3.0	N	1	1	1	3.0	3.0
Device Holder	3.6	N	1	1	1	0.089	0.089
Power Drift	5.0	R	1.732	1	1	2.9	2.9
Power Scaling	0.0	R	1.732	1	1	0.0	0.0
Phantom and Setup							
Phantom Uncertainty	6.1	R	1.732	1	1	3.8	3.8
SAR correction	0.0	R	1.732	1	0.84	0.0	0.0
Liquid Conductivity Repeatability	0.2	N	1	0.78	0.71	0.1	0.1
Liquid Conductivity (target)	5.0	R	1.732	0.78	0.71	2.3	2.0
Liquid Conductivity (mea.)	2.5	R	1.732	0.78	0.71	1.1	1.0
Temp. unc. - Conductivity	3.4	R	1.732	0.78	0.71	1.5	1.4
Liquid Permittivity Repeatability	0.15	N	1	0.23	0.26	0.0	0.0
Liquid Permittivity (target)	5.0	R	1.732	0.23	0.26	0.7	0.8
Liquid Permittivity (mea.)	2.5	R	1.732	0.23	0.26	0.3	0.4
Temp. unc. - Permittivity	0.83	R	1.732	0.23	0.26	0.1	0.1
Combined Std. Uncertainty						12.5%	12.5%
Coverage Factor for 95 %						K=2	K=2
Expanded STD Uncertainty						25.1 %	25.1%



Annex A General Information

1. Identification of the Responsible Testing Laboratory

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

2. Identification of the Responsible Testing Location

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

3. Facilities and Accreditations

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

Note:

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

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