REPORT No.: SZ23100340S01

TEST REPORT

APPLICANT	:	Sonim Technologies, Inc..
PRODUCT NAME	:	Mobile Hotspot
MODEL NAME	:	H500V
BRAND NAME	:	Sonim
FCC ID	:	WYPH500V
STANDARD(S)	:	FCC 47 CFR Part 2(2.1093) IEEE 1528-2013
RECEIPT DATE	:	2023-11-27
TEST DATE	:	2023-12-08 to 2024-02-01
ISSUE DATE	:	2024-04-16

Edited by : Xie Yiyun

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DIRECTORY

Changed History		
Version	**Date**	**Reason for Change**
1.0	2024-04-16	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 Body (Gap 10mm) 1g SAR (W/kg)
WCDMA	WCDMA Band II	0.770
	WCDMA Band IV	0.654
	WCDMA Band V	0.533
LTE	LTE Band 2	0.768
	LTE Band 5	0.682
	LTE Band 7	0.584
	LTE Band 12/17	0.605
	LTE Band 13	0.584
	LTE Band 48	0.990
	LTE Band 66/4	0.626
5G NR	n2	0.603
	n5	0.727
	n48	0.995
	n66	0.543
	n77	1.036
	n78	1.014
WLAN	2.4GHz WLAN	0.500
	5GHz WLAN	0.562

Highest Simultaneous Transmission SAR_{1g} (W/Kg):	1.316 W/kg	Limit(W/kg): 1.6 W/kg

Note:

1. This device is in compliance with Specific Absorption Rate (SAR) for general population or uncontrolled exposure limits (1.6W/kg as averaged over any 1 gram of tissue; specified in FCC 47 CFR part 1 (1.1310) and IEEE C95.1-1991), 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 4/17 is full covered by FDD-LTE Band 66/12, therefore only FDD-LTE Band 66/12 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% confidence intervals.

2. Technical Information

Note: Provide by applicant.

2.1. Applicant and Manufacturer Information

Applicant:	Sonim Technologies, Inc.
Applicant Address:	4445 Eastgate Mall, Suite 200, San Diego, CA 92121, USA
Manufacturer:	Sonim Technologies, Inc.
Manufacturer Address:	4445 Eastgate Mall, Suite 200, San Diego, CA 92121, USA

2.2. Equipment under Test (EUT) Description

Product Name:	Mobile Hotspot
EUT IMEI:	351966690000085 351966690000416
Hardware Version:	V1.0
Software Version:	H50.0-01-5.4.0-15.08.00
Frequency Bands:	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 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 46(RX): 5150 MHz ~ 5925 MHz LTE Band 48: 3550 MHz ~ 3700 MHz LTE Band 66: 1710 MHz ~ 1780 MHz 5G NR n2: 1850 MHz ~ 1910 MHz 5G NR n5: 824 MHz ~ 849 MHz 5G NR n48: 3550 MHz ~ 3700 MHz 5G NR n66: 1710 MHz ~ 1780 MHz 5G NR n77: 3450 MHz ~ 3550 MHz; 3700 MHz ~ 3980 MHz 5G NR n78: 3450 MHz ~ 3550 MHz; 3700 MHz ~ 3800 MHz WLAN 2.4GHz: 2412 MHz ~ 2472 MHz WLAN 5.2GHz: 5180 MHz ~ 5240 MHz WLAN 5.8GHz: 5745 MHz ~ 5825 MHz

Modulation Mode:	WCDMA: QPSK, 16QAM LTE: QPSK, 16QAM, 64QAM, 256QAM 5G NR: DFT-s-OFDM/CP-OFDM, PI/2 BPSK QPSK, 16QAM, 64QAM, 256QAM 802.11b: DSSS 802.11a/g/n-HT20/HT40/ac-VHT20/40/80: OFDM 802.11ax-HEW20/40/80: OFDMA
Operation Class:	Class B
Carrier Aggregation:	Uplink & Downlink
Hotspot Mode:	Support
WLAN MIMO:	Support
Antenna Type:	WWAN: PIFA Antenna WLAN: PIFA Antenna
SIM Cards Description:	WCDMA+LTE+5G NR

Note:

1. This report was updated based on the original report (Report No. : SZ23100334S01, Model: H500B, FCC ID: WYPH500B), both of them are different from the LTE and NR frequency bands that were deleted through hardware and software, and the millimeter wave module was added, the WCDMA and WiFi specifications remain unchanged, as below:

	Original	**New**
Model	H500B	H500V
FCC ID	WYPH500B	WYPH500V
HW Version	V1.0	V1.0
SW Version	H50.0-01-5.4.0-11.08.00	H50.0-01-5.4.0-15.08.00
WCDMA Bands	B2/4/5	B2/4/5
LTE Bands	B2/4/5/7/12/13/14/17/25/26/29(RX)/30/38/41/42/43/46(Rx)/48/66/71	B2/4/5/7/12/13/17/46(Rx)/48/66
5G FR1 Bands	n2/n5/n7/n12/n13/n14/n25/n26/n29(RX)/n30/n38/n41/n48/n66/n71/n77/n78	n2/n5/n48/n66/n77/n78
5G FR2 Bands	N/A	n260/n261
WIFI	2.4G WiFi, 5G WiFi B1/B4	2.4G WiFi, 5G WiFi B1/B4

Therefore, the changes do not affect the standalone transmission test results in this report, and the test results are still referred to the original test results, and the SAR data related to LTE & 5G NR CA /EN-DC/ simultaneous transmission configuration will be retested and the test results will be recorded in this the report, and mmwave will perform power density tests and the test results will be recorded in the report of SZ23100340S02. The other test results in this report still refer to the test results in the original test report.

2. 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 %

Test Frequency:	WCDMA Band II/IV/V FDD-LTE Band 2/4/5/7/12/13/17/66 TDD-LTE 48 5G NR n2/5/48/66/77/78 WLAN 2.4GHz WLAN 5GHz
Operation Mode:	Call established
Power Level:	WCDMA Band II/IV/V (All Up Bits) FDD-LTE Band 2/4/5/7/12/13/17/66 (Maximum output power) TDD-LTE Band 48 (Maximum output power) 5G NR n2/5/48/66/77/78 (Maximum output power) WLAN 2.4GHz/WLAN 5GHz Refers to Annex E in this report

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:

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

SAR is expressed in units of Watts per kilogram (W/kg).
SAR measurement can be either related to the temperature elevation in tissue by,

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

Where C is the specific head capacity, $\delta\mathrm{T}$ is the temperature rise and $\delta\mathrm{t}$ the exposure duration, or related to the electrical field in the tissue by

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

Where σ is the conductivity of the tissue, ρ is the mass density of the tissue and $|\mathrm{E}|$ is the rmselectrical field strength.

However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

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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.

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.

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.

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: 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

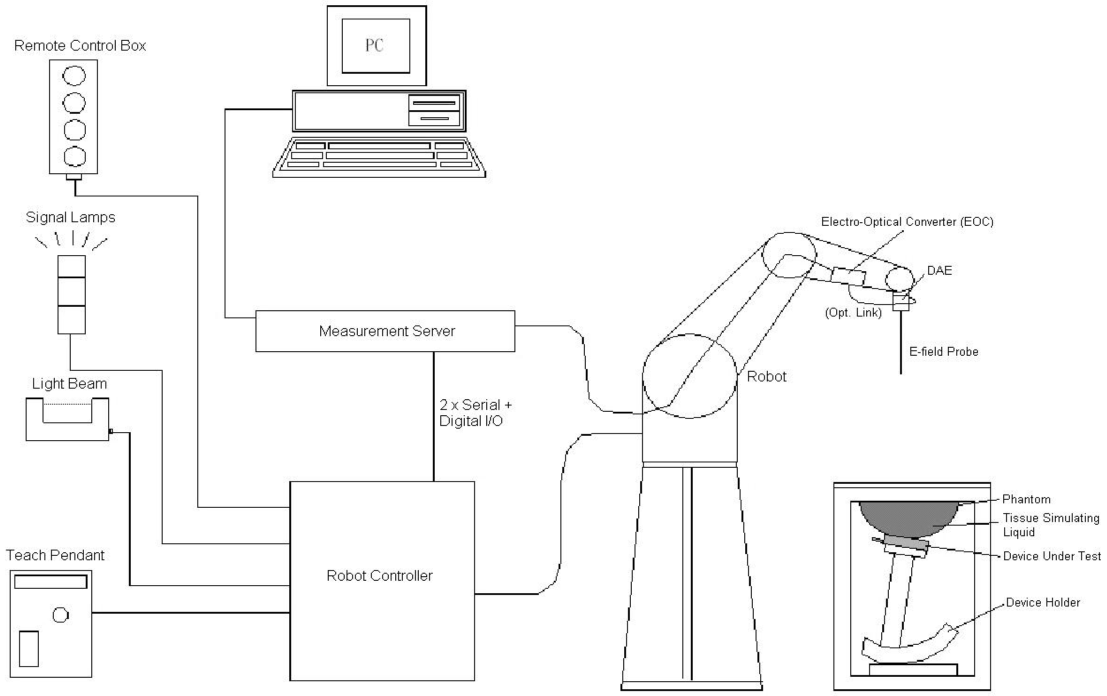

Fig 6.1 SPEAG DASY System Configurations

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.
- Remove control with teach pendant and additional circuitry for robot safety such as warming lamps, etc.
- The SAM twin phantom.
- A device holder.
- Tissue simulating liquid.
- Dipole for evaluating the proper functioning of the system.

➢ 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 μW/g to 100 mW/g; Linearity: ± 0.2 dB	
Dimensions	Overall length: 330 mm (Tip: 16 mm) Tip diameter: 6.8 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.7 mm	**Fig 6.2 Photo of ES3DV3**

<EX3DV4 Probe>

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz to 6 GHz; Linearity: ± 0.2 dB	
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)	
Dynamic Range	10 μW/g to 100 mW/g; Linearity: ± 0.2 dB	
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	**Fig 6.3 Photo of EX3DV4**

➢ **E-Field Probe Calibration**

Each probe needs to be calibrated according to a dosimetric assessment procedure with accuracy better than ± 10%. The spherical isotropy shall be evaluated and within ± 0.25 dB. The sensitivity parameters (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. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock. The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

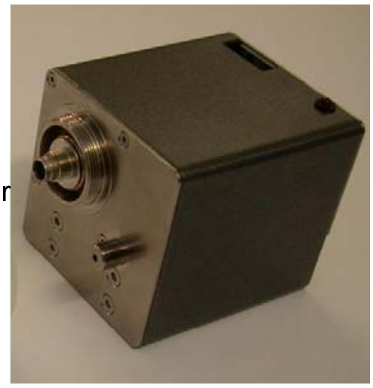

Fig 6.4 Photo of DAE

6.3. Robot

The SPEAG DASY system uses the high precision robots (DASY6: TX60XL) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version (DASY6: CS8c) from Stäubliis used. The Stäublirobot series have many features that are important for our application:

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

Fig. 6.5 Photo of Robot

6.4. Measurement Server

The measurement server is based on a PC/104 CPU board with CPU (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	 **Fig. 6.8 Photo of SAM Phantom**
Filling Volume Dimensions	Approx. 25 liters Length: 1000 mm; Width: 500 mm; Height: adjustable feet	
Measurement Areas	Left Head, Right Head, Flat phantom	

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

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 $\varepsilon = 3$ 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

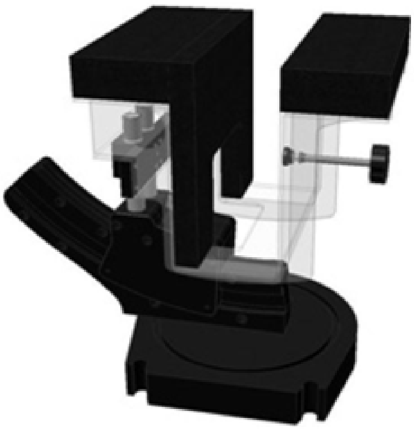

Fig 6.10 Laptop Extension Kit

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 Vi = compensated signal of channel i, (i = x, y, z)
Ui = input signal of channel i, (i = x, y, z)
cf = crest factor of exciting field (DASY parameter)
dcpi = diode compression point (DASY parameter)

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

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

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

With V_i = compensated signal of channel i, (i = x, y, z)
$Norm_i$ = sensor sensitivity of channel i, (i = x, y, z), μV/(V/m)^2 forE-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):

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

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

$$\mathrm{SAR} = \mathrm{E}_{\mathrm{tot}}^{2} \times \frac{\sigma}{\rho \times 1000}$$

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.

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6.9. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial No./ SW Version	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V3	1223	2022.08.22	2025.08.21
SPEAG	900MHz System Validation Kit	D900V2	1d064	2021.12.17	2024.12.16
SPEAG	1800MHz System Validation Kit	D1800V2	2d158	2021.12.17	2024.12.16
SPEAG	2000MHz System Validation Kit	D2000V2	1050	2021.12.18	2024.12.17
SPEAG	2450MHz System Validation Kit	D2450V2	805	2021.12.17	2024.12.16
SPEAG	2600MHz System Validation Kit	D2600V2	1198	2022.08.17	2025.08.16
SPEAG	3500MHz System Validation Kit	D3500V2	1104	2023.06.03	2026.06.02
SPEAG	3700MHz System Validation Kit	D3700V2	1076	2023.06.03	2026.06.02
SPEAG	3900MHz System Validation Kit	D3900V2	1046	2023.06.02	2026.06.01
SPEAG	5000MHz System Validation Kit	D5GHzV2	1176	2021.12.19	2024.12.18
SPEAG	DOSIMETRIC ASSESSMENT SYSTEM Software	DASY52	52.10.4.1527	NCR	NCR
SPEAG	Dosimetric E-Field Probe	EX3DV4	7608	2023.03.15	2024.03.14
SPEAG	Data Acquisition Electronics	DAE4	1643	2023.02.22	2024.02.21
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	2023.02.09	2024.02.08
Anritsu	Network Emulator	MT8820C	6201274521	2023.02.09	2024.02.08
Anritsu	Network Emulator	MT8821C	6261830572	2023.02.09	2024.02.08
Anritsu	Network Emulator	MT8000A	6262148249	2023.06.27	2024.06.24
Agilent	Network Analyzer	E5071B	MY42404762	2023.02.09	2024.02.08
SPEAG	Dielectric Assessment KIT	DAK-3.5	1279	2023.08.03	2024.08.02
mini-circuits	Amplifier	ZHL-42W+	608501717	NCR	NCR
mini-circuits	Amplifier	ZVE-8G+	754401735	NCR	NCR
Agilent	Signal Generator	N5182B	MY53050509	2023.09.19	2024.09.18
R&S	Power Senor	NRP8S	103215	2023.02.09	2024.02.08
Agilent	Power Meter	E4416A	MY45102093	2023.09.19	2024.09.18
R&S	Power Sensor	NRP8S	103240	2023.02.09	2024.02.08
Anritsu	Power Meter	E4418B	GB43318055	2023.06.21	2024.06.20
Agilent	Dual Directional Coupler	778D	50422	NA	NA
MCL	Attenuation	351-218-010	N/A	NA	NA

R&S	Spectrum Analyzer	N9030A	MY54170556	2023.10.07	2024.10.06
KTJ	Thermo meter	TA298	N/A	2023.11.22	2024.11.21
SPEAG	Tissue Simulating Liquids	HBBL600-10000V6		24H	

Note:

1. The calibration certificate of DASY can be referred to appendix G 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 of1W 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.

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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.Thenominaldielectricvaluesofthe 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 (εr)
Head								
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
1800,1900,2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
2600	54.8	0	0	0.1	0	45.1	1.96	39.0
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.(℃)	Conductivity (σ)	Conductivity Target (σ)	Delta (σ) (%)	Limit (%)	Date
750	HSL	22.1	0.881	0.89	-1.01	±5	2023.12.20
750	HSL	22.4	0.887	0.89	-0.34	±5	2024.01.20
900	HSL	22.1	0.956	0.97	-1.44	±5	2023.12.17
900	HSL	22.3	0.943	0.97	-2.78	±5	2024.01.02
900	HSL	22.3	0.945	0.97	-2.58	±5	2024.01.26
1800	HSL	22.2	1.349	1.40	-3.64	±5	2023.12.13
1800	HSL	22.3	1.344	1.40	-4.00	±5	2023.12.23
1800	HSL	22.3	1.385	1.40	-1.07	±5	2024.01.09
1800	HSL	22.3	1.359	1.40	-3.43	±5	2024.01.22
1800	HSL	22.3	1.352	1.40	-3.43	±5	2024.02.01
2000	HSL	22.3	1.424	1.40	1.71	±5	2023.12.08
2000	HSL	22.3	1.404	1.40	0.29	±5	2024.01.21
2450	HSL	22.3	1.763	1.80	-2.06	±5	2023.12.26
2600	HSL	22.1	2.024	1.96	3.27	±5	2023.12.09
2600	HSL	22.3	1.944	1.96	-0.82	±5	2024.02.01
3500	HSL	22.3	3.050	2.91	4.81	±5	2023.12.19
3500	HSL	22.2	2.942	2.91	1.10	±5	2023.12.27
3500	HSL	22.3	2.869	2.91	-1.41	±5	2024.01.24
3500	HSL	22.3	2.889	2.91	1.10	±5	2024.01.29
3700	HSL	22.2	3.116	3.05	2.16	±5	2023.12.15
3700	HSL	22.3	2.932	3.05	-3.87	±5	2023.12.21
3700	HSL	22.3	3.005	3.05	-2.23	±5	2024.01.28
3900	HSL	22.2	3.242	3.15	2.92	±5	2023.12.24
3900	HSL	22.2	3.143	3.15	-0.22	±5	2024.01.06
3900	HSL	22.2	3.332	3.15	2.92	±5	2024.01.30
5250	HSL	22.3	4.719	4.71	0.19	±5	2023.12.28
5750	HSL	22.4	5.116	5.22	-1.99	±5	2024.01.04
Frequency (MHz)	Tissue Type	Liquid Temp.(℃)	Permittivity (εr)	Permittivity Target (εr)	Delta (εr) (%)	Limit (%)	Date
750	HSL	22.1	40.783	41.90	-2.67	±5	2023.12.20

750	HSL	22.4	42.243	41.90	0.82	±5	2024.01.20
900	HSL	22.1	41.286	41.50	-0.52	±5	2023.12.17
900	HSL	22.3	41.428	41.50	-0.17	±5	2024.01.02
900	HSL	22.3	40.297	41.50	-2.90	±5	2024.01.26
1800	HSL	22.2	38.667	40.00	-3.33	±5	2023.12.13
1800	HSL	22.3	38.294	40.00	-4.27	±5	2023.12.23
1800	HSL	22.3	40.272	40.00	0.68	±5	2024.01.09
1800	HSL	22.3	38.551	40.00	-3.65	±5	2024.01.22
1800	HSL	22.3	38.541	40.00	-3.65	±5	2024.02.01
2000	HSL	22.3	39.203	40.00	-1.99	±5	2023.12.08
2000	HSL	22.3	39.183	40.00	-2.04	±5	2024.01.21
2450	HSL	22.3	37.814	39.20	-3.54	±5	2023.12.26
2600	HSL	22.1	37.827	39.00	-3.01	±5	2023.12.09
2600	HSL	22.3	38.539	39.00	-1.18	±5	2024.02.01
3500	HSL	22.3	38.102	37.90	0.53	±5	2023.12.19
3500	HSL	22.2	36.861	37.90	-2.74	±5	2023.12.27
3500	HSL	22.3	37.283	37.90	-1.63	±5	2024.01.24
3500	HSL	22.3	37.296	37.90	-2.74	±5	2024.01.29
3700	HSL	22.2	38.152	37.70	1.20	±5	2023.12.15
3700	HSL	22.3	38.138	37.70	1.16	±5	2023.12.21
3700	HSL	22.3	36.754	37.70	-2.29	±5	2024.01.28
3900	HSL	22.2	37.560	37.50	0.16	±5	2023.12.24
3900	HSL	22.2	37.476	37.50	-0.06	±5	2024.01.06
3900	HSL	22.2	37.566	37.50	0.16	±5	2024.01.30
5250	HSL	22.3	35.183	35.95	-2.13	±5	2023.12.28
5750	HSL	22.4	36.659	35.35	3.70	±5	2024.01.04

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. SAR System Performance Check

➢ **Purpose of System Performance Check**

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

➢ **System Setup**

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

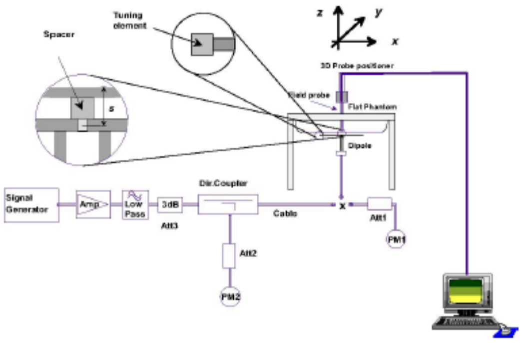

Fig 8.2 System Setup for System Evaluation

- **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	D750V3-1223	7608	1643
900	HSL	250	D900V2-1d064	7608	1643
1800	HSL	250	D1800V2-2d158	7608	1643
2000	HSL	250	D2000V2-1050	7608	1643
2450	HSL	250	D2450V2-805	7608	1643
2600	HSL	250	D2600V2-1198	7608	1643
3500	HSL	100	D3500V2-1104	7608	1643
3700	HSL	100	D3700V2-1076	7608	1643
3900	HSL	100	D3900V2-1176	7608	1643
5250	HSL	100	D5GHzV2-1176-5250	7608	1643
5750	HSL	100	D5GHzV2-1176-5750	7608	1643

<System Validation>

Frequency (MHz)	Tissue Type	Conductivity (σ)	Permittivity (εr)	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
6500	HSL	6.07	34.46	PASS	PASS	PASS

Frequency (MHz)	Tissue Type	Conductivity (σ)	Permittivity (εr)	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
6500	HSL	6.07	34.46	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 (%)
2023.12.20	750	HSL	250	2.16	8.54	8.64	1.17
2024.01.20	750	HSL	250	2.21	8.54	8.84	3.51
2023.12.17	900	HSL	250	2.87	11.20	11.48	2.50
2024.01.02	900	HSL	250	2.91	11.20	11.64	3.93
2024.01.26	900	HSL	250	2.86	11.20	11.44	2.14
2023.12.13	1800	HSL	250	10.27	39.20	41.08	4.80
2023.12.23	1800	HSL	250	10.19	39.20	40.76	3.98
2024.01.09	1800	HSL	250	10.24	39.20	40.96	4.49
2024.01.22	1800	HSL	250	10.26	39.20	40.88	4.29
2024.02.01	1800	HSL	250	10.22	39.20	40.88	4.29
2023.12.08	2000	HSL	250	10.07	41.60	40.28	-3.17
2024.01.21	2000	HSL	250	10.28	41.60	41.12	-1.15
2023.12.26	2450	HSL	250	13.36	52.30	53.44	2.18
2023.12.09	2600	HSL	250	14.87	57.00	59.48	4.35
2024.02.01	2600	HSL	250	14.72	57.00	58.88	3.30
2023.12.19	3500	HSL	100	7.25	67.20	72.5	7.89
2023.12.27	3500	HSL	100	7.05	67.20	70.5	4.91
2024.01.24	3500	HSL	100	6.97	67.20	69.7	3.72

2024.01.29	3500	HSL	100	7.07	67.20	70.7	4.91
2023.12.15	3700	HSL	100	7.12	67.50	71.2	5.48
2023.12.21	3700	HSL	100	7.25	67.50	72.5	7.41
2024.01.28	3700	HSL	100	7.25	67.50	71.1	5.33
2023.12.24	3900	HSL	100	7.24	69.90	72.4	3.58
2024.01.06	3900	HSL	100	7.21	69.90	72.1	3.15
2024.01.30	3900	HSL	100	7.24	69.90	72.4	3.58
2023.12.28	5250	HSL	100	8.29	76.70	82.9	8.08
2024.01.04	5750	HSL	100	8.44	78.70	84.4	7.24

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Measured 10g SAR (W/kg)	Targeted 10g SAR (W/kg)	Normalized 10g SAR (W/kg)	Deviation (%)
2023.12.20	750	HSL	250	1.42	5.57	5.68	1.97
2024.01.20	750	HSL	250	1.41	5.57	5.64	1.26
2023.12.17	900	HSL	250	1.79	7.19	7.16	-0.42
2024.01.02	900	HSL	250	1.82	7.19	7.28	1.25
2024.01.26	900	HSL	250	1.85	7.19	7.4	2.92
2023.12.13	1800	HSL	250	5.32	20.10	21.28	5.87
2023.12.23	1800	HSL	250	5.26	20.10	21.04	4.68
2024.01.09	1800	HSL	250	5.33	20.10	21.32	6.07
2024.01.22	1800	HSL	250	5.21	20.10	21.16	5.27
2024.02.01	1800	HSL	250	5.29	20.10	21.16	5.27
2023.12.08	2000	HSL	250	5.15	20.70	20.6	-0.48
2024.01.21	2000	HSL	250	5.31	20.70	21.24	2.61
2023.12.26	2450	HSL	250	6.05	23.90	24.2	1.26
2023.12.09	2600	HSL	250	6.52	25.70	26.08	1.48
2024.02.01	2600	HSL	250	6.69	25.70	26.76	4.12
2023.12.19	3500	HSL	100	2.58	25.10	25.8	-4.59
2023.12.27	3500	HSL	100	2.68	25.10	26.8	2.79
2024.01.24	3500	HSL	100	2.65	25.10	26.5	5.58
2024.01.29	3500	HSL	100	2.68	25.10	26.8	2.79
2023.12.15	3700	HSL	100	2.37	24.20	23.7	3.32
2023.12.21	3700	HSL	100	2.61	24.20	26.1	7.85
2024.01.28	3700	HSL	100	2.59	24.20	25.3	4.55
2023.12.24	3900	HSL	100	2.49	24.10	24.9	3.32
2024.01.06	3900	HSL	100	2.32	24.10	23.2	1.26
2024.01.30	3900	HSL	100	2.52	24.10	25.2	4.56
2023.12.28	5250	HSL	100	2.36	22.10	23.6	7.85

2024.01.04	5750	HSL	100	2.41	22.50	24.1	7.11

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 Front/Back/Left/Right/Top/Bottom of the EUT with phantom 10 mm gap, as illustrated below, please refer to Appendix B for the test setup photos.

9.1. 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.

9.2. 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.

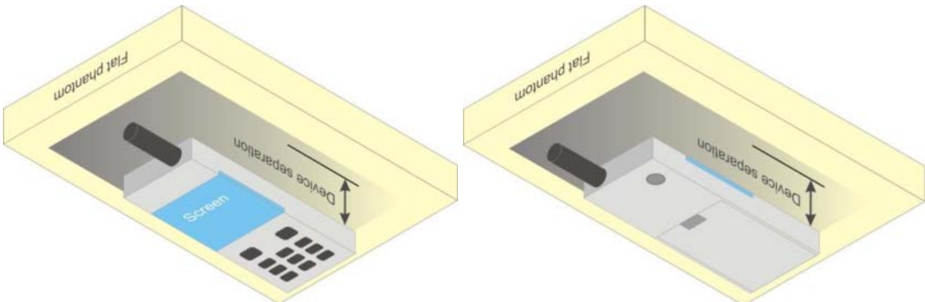

Fig 9.1 Illustration for Body Worn Position

9.3. 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).

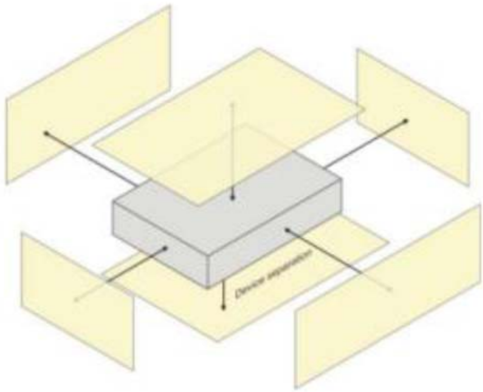

Fig 9.2 Illustration for Hotspot Position

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 form the measurement grid to the high-resolution grid.
(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface.
(f)Calculation of the averaged SAR within masses of 1g and 10g.

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 a10mm² 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 DASY, the interpolation and extrapolation are both based on the modified Quadratic Sheppard's method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 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 DASY 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.

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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.

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

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 to16 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 x W ≥ 9 cm x 5 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 form general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

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

12. SAR Test Configuration

<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 ≤ ¼ 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 ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / 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 ¼ 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.

<u>HSDPA Setup Configuration</u>

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{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: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 8 ⇔ $A_{hs} = \beta_{hs}/\beta_c = 30/15$ ⇔ $\beta_{hs} = 30/15 * \beta_c$

Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15.

Note 3: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 11/15 and β_d = 15/15.

HSUPA Setup Configuration

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{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 Δ_{CQI} = 8 $\Leftrightarrow$ $A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$.
Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.
Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 14/15 and β_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 (Note3)	β_d	β_{HS} (Note1)	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_{ed}1: 30/15 β_{ed}2: 30/15	β_{ed}3: 24/15 β_{ed}4: 24/15	3.5	2.5	14	105	105

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{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 β_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.

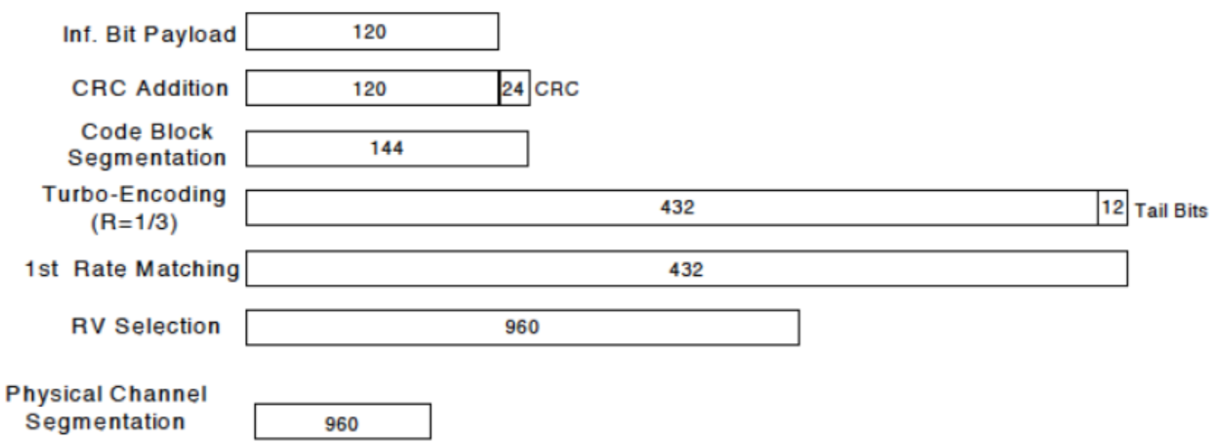

Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

<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)

	RF Channel	RF Channel Offset
Carrier [0]	31	0
Carrier [1]	1013	982

➢ Under Carrier Configuration: RF Pilot

	Carrier Sector	Active on AN	Assigned to AT
Pilot [0]	C0/S0	✓	✓
	CA/S1	✓	✓

For Three Carriers: Low Channel (1013)

	RF Channel	RF Channel Offset
Carrier [0]	72	0
Carrier [1]	31	-41
Carrier [2]	1013	941

➢ Under Carrier Configuration: RF Pilot

	Carrier Sector	Active on AN	Assigned to AT
Pilot [0]	C0/S0	✓	✓
Pilot [1]	C1/S1	✓	✓
Pilot [2]	C2/S2	✓	✓

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<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 Target (dB)	3GPP MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz		
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 0.5dBmeasurement tolerance

LTE Bands

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

Note:

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

power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.

5. Per KDB 941225 D05v02r05, 16QAM/64QAM output power for each RB allocation configuration is > not 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 16QAMsignal modulation are correct. Identify if Maximum Power Reduction (MPR) is optional or mandatory, i.e. built-in by design: only mandatory MPR may be considered during SAR testing, when the maximum output power is permanently limited by the MPR implemented within the UE; and only for the applicable RB (resource block) configurations specified in LTE standards: b) A-MPR (additional MPR) must be disabled.
10. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
    a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
    b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
    c. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
    d. For WLAN/Bluetooth: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling

factor * Tune-up scaling factor

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

11. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
12. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/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 GHz802.11g/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 band width 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 sametransmitter and antenna(s) are used for U-NII-1 and U-NII-2A bands, additional SAR test reduction Vapplies. When band gap channels between U-NII-2C band and 5.8 GHz U-NII-3 or §15.247 bandare supported, the highest maximum output power transmission mode configuration and maximumoutput power channel across the bands must be used to determine SAR test reduction, accordingto the initial test configuration and subsequent test configuration requirements. In applying theinitial test configuration and subsequent test configuration procedures, the 802.11 transmissionconfiguration with the highest specified maximum output power and the channel within a testconfiguration with the highest measured maximum output power should be clearly distinguished toapply the procedures.

13. Conducted Power List

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

14. Carrier Aggregation

14.1. LTE Uplink Carrier Aggregation

➢ **Carrier Aggregation Configuration**

<Intra-band>

2CC Uplink Carrier Aggregation for Intra-band				
No.	Combination	MIMO	Restriction	Completely Covered by Measurement Superset
1	CA_48C	-	-	No
2	CA_66B	-	-	No
3	CA_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 Intra-band				
No.	Combination	MIMO	Restriction	Completely Covered by Measurement Superset
1	CA_2A-4A	-	-	No
2	CA_2A-5A	-	-	No
3	CA_2A-13A	-	-	No
4	CA_2A-66A	-	-	No
5	CA_4A-5A	-	-	No

6	CA_4A-13A	-	-	No
7	CA_5A-66A	-	-	No
8	CA_13A-66A	-	-	No

Note:

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

1. If the signal uplink 1-g SAR values for each band are both less than 0.8 W/kg and the algebraic summation of the 1-g SAR values are less than 1.45 W/kg no additional measurements need to be performed.
2. If one or the signal uplink1-g SAR values is greater than 0.8 W/kg, instead of algebraically summing the 1-g SAR values, sum up the SAR distributions, similar to the enlarged zoom scan (volume scan) procedures found in FCC KDB Publication 865664 D01. And PAG is required for this case.
3. If the algebraic sum of the 1-g SAR values is > 1.45 W/kg additional measurements may have to be made. Submit a KDB inquiry for additional guidance. And PAG is required for this case.

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	MIMO	Restriction	Completely Covered by Measurement Superset
1	CA_13A-48A	-	-	3CC-1
2	CA_13A-66A	-	-	3CC-3
3	CA_2A-13A	-	-	3CC-6
4	CA_2A-2A	-	-	3CC-8
5	CA_2A-48A	-	-	3CC-12
6	CA_2A-4A	-	-	3CC-14
7	CA_2A-5A	-	-	3CC-17
8	CA_2A-66A	-	-	3CC-19
9	CA_48A-66A	-	-	3CC-22
10	CA_48C	-	-	3CC-25
11	CA_4A-13A	-	-	No
12	CA_4A-48A	-	-	No
13	CA_4A-4A	-	-	3CC-28

14	CA_4A-5A	-	-	No
15	CA_5A-48A	-	-	3CC-30
16	CA_5A-66A	-	-	3CC-32
17	CA_66A-66A	-	-	3CC-35
18	CA_66B	-	-	No
19	CA_66C	-	-	No

3CC Downlink Carrier Aggregation				
NO.	Combination	MIMO	Restriction	Completely Covered by Measurement Superset
1	CA_13A-48A-66A	-	-	No
2	CA_13A-48C	-	-	4CC-3
3	CA_13A-66A-66A	-	-	No
4	CA_13A-66B	-	-	No
5	CA_13A-66C	-	-	No
6	CA_2A-13A-48A	-	-	No
7	CA_2A-13A-66A	-	-	4CC-6
8	CA_2A-2A-13A	-	-	4CC-9
9	CA_2A-2A-4A	-	-	4CC-10
10	CA_2A-2A-5A	-	-	4CC-12
11	CA_2A-2A-66A	-	-	4CC-13
12	CA_2A-48A-66A	-	-	No
13	CA_2A-48C	-	-	4CC-16
14	CA_2A-4A-13A	-	-	No
15	CA_2A-4A-4A	-	-	4CC-18
16	CA_2A-4A-5A	-	-	No
17	CA_2A-5A-48A	-	-	No
18	CA_2A-5A-66A	-	-	4CC-20
19	CA_2A-66A-66A	-	-	4CC-23
20	CA_2A-66B	-	-	No
21	CA_2A-66C	-	-	No
22	CA_48A-66A-66A	-	-	No
23	CA_48A-66B	-	-	No
24	CA_48A-66C	-	-	No
25	CA_48C-66A	-	-	4CC-24
26	CA_48D	-	-	4CC-27
27	CA_4A-48C	-	-	No
28	CA_4A-4A-13A	-	-	No

29	CA_4A-4A-5A	-	-	No
30	CA_5A-48A-66A	-	-	No
31	CA_5A-48C	-	-	4CC-30
32	CA_5A-66A-66A	-	-	No
33	CA_5A-66B	-	-	No
34	CA_5A-66C	-	-	No
35	CA_66A-66A-66A	-	-	No

4CC Downlink Carrier Aggregation				
NO.	Combination	MIMO	Restriction	Completely Covered by Measurement Superset
1	CA_13A-48A-66B	-	-	No
2	CA_13A-48A-66C	-	-	No
3	CA_13A-48C-66A	-	-	No
4	CA_13A-48D	-	-	5CC-1
5	CA_2A-13A-48C	-	-	No
6	CA_2A-13A-66A-66A	-	-	No
7	CA_2A-13A-66B	-	-	No
8	CA_2A-13A-66C	-	-	No
9	CA_2A-2A-13A-66A	-	-	5CC-4
10	CA_2A-2A-4A-4A	-	-	No
11	CA_2A-2A-4A-5A	-	-	No
12	CA_2A-2A-5A-66A	-	-	5CC-5
13	CA_2A-2A-66A-66A	-	-	No
14	CA_2A-2A-66B	-	-	No
15	CA_2A-2A-66C	-	-	No
16	CA_2A-48C-66A	-	-	No
17	CA_2A-48D	-	-	5CC-8
18	CA_2A-4A-4A-5A	-	-	No
19	CA_2A-5A-48C	-	-	No
20	CA_2A-5A-66A-66A	-	-	No
21	CA_2A-5A-66B	-	-	No
22	CA_2A-5A-66C	-	-	No
23	CA_2A-66A-66A-66A	-	-	No
24	CA_48C-66A-66A	-	-	No
25	CA_48C-66B	-	-	No
26	CA_48C-66C	-	-	No
27	CA_48D-66A	-	-	No

28	CA_48E	-	-	5CC-11
29	CA_4A-48D	-	-	No
30	CA_5A-48C-66A	-	-	No
31	CA_5A-48D	-	-	No

5CC Downlink Carrier Aggregation				
NO.	Combination	MIMO	Restriction	Completely Covered by Measurement Superset
1	CA_13A-48D-66A	-	-	No
2	CA_13A-48E	-	-	No
3	CA_2A-13A-48D	-	-	No
4	CA_2A-2A-13A-66A-66A	-	-	No
5	CA_2A-2A-5A-66A-66A	-	-	No
6	CA_2A-2A-5A-66B	-	-	No
7	CA_2A-2A-5A-66C	-	-	No
8	CA_2A-48D-66A	-	-	No
9	CA_2A-48E	-	-	No
10	CA_2A-5A-48D	-	-	No
11	CA_48E-66A	-	-	No
12	CA_4A-48E	-	-	No
13	CA_5A-48D-66A	-	-	No

➢ **LTE Downlink Carrier Aggregation Conducted Power**

1. According to KDB941225 D05A v01r02, Uplink maximum output power measurement with downlink carrier aggregation active should be measured, using the highest output channel measured without downlink carrier aggregation, to confirm that uplink maximum output power with downlink carrier aggregation active remains within the specified tune-up tolerance limits and not more than ¼ dB higher than the maximum output measured without downlink carrier aggregation active.
2. Uplink maximum output power with downlink carrier aggregation active does not show more than ¼ dB higher than the maximum output power without downlink carrier aggregation active, therefore SAR evaluation with downlink carrier aggregation active can be excluded.
3. For power measurement were control and acknowledge data is sent on uplink channels that operate identical to specifications when downlink carrier aggregation is inactive.
4. Selected highest measured power when downlink carrier aggregation is inactive for conducted power comparison with downlink carrier aggregation is active, to confirm that when downlink carrier aggregation is active uplink maximum output power remains within the specified tune-up

tolerance limits and not more than ¼ dB higher than the maximum output power measured when downlink carrier aggregation inactive.

5. For non-contiguous intra-band CA, the SCC selected to provide maximum separation from the PCC and must remain fully within the downlink transmission band.
6. For Intra-band, contiguous CA, the downlink channels selected to perform the uplink power measurement must satisfy
7. 3GPP channel spacing (5.4.1A of 3GPP TS 36.521 or equivalent) and channel bandwidth (5.4.2A) requirements.

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

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

14.3. 5G NR Carrier Aggregation

➢ **Downlink 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	MIMO	Restriction	Completely Covered by Measurement Superset
1	CA_n2(2A)	-	-	No
2	CA_n2A-n48A	-	-	No
3	CA_n2A-n5A	-	-	No
4	CA_n2A-n66A	-	-	No
5	CA_n2A-n77A	-	-	No
6	CA_n48(2A)	-	-	No
7	CA_n48A-n66A	-	-	No
8	CA_n48B	-	-	No
9	CA_n48C	-	-	No
10	CA_n5(2A)	-	-	No
11	CA_n5A-n48A	-	-	No
12	CA_n5A-n66A	-	-	No
13	CA_n5A-n77A	-	-	No
14	CA_n5B	-	-	No
15	CA_n66(2A)	-	-	No
16	CA_n66A-n77A	-	-	No

17	CA_n66B	-	-	No
18	CA_n77C	-	-	No

Note:

1. 3GPP channel spacing (5.4.1A of 3GPP TS 38.521 or equivalent) and channel bandwidth (5.3.2A) requirements.

For NR operating bands with 100 kHz channel raster:

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

For NR operating bands with 15 kHz channel raster:

$$\text{Nominal channel spacing} = \left\lfloor \frac{BW_{Channel(1)} + BW_{Channel(2)} - 2\left|GB_{Channel(1)} - GB_{Channel(2)}\right|}{0.015 * 2^{n+1}} \right\rfloor 0.015 * 2^{n} \text{ [MHz]}$$

2. 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)/SA 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.

➢ **<ENDC UL>**

<5G NR Anchor Combination>

5G-NR	EN-DC Combination	4G UL	5G-NR UL	SCS (kHz)	Maximum Bandwidth (MHz)
FDD	DC_5A_n2A	5A	n2	15	20
FDD	DC_13A_n2A	13A	n2	15	20
FDD	DC_66A_n2A	66A	n2	15	20
FDD	DC_2A_n5A	2A	n5	15	20
FDD	DC_48A_n5A	48A	n5	15	20
FDD	DC_66A_n5A	66A	n5	15	20
FDD	DC_2A_n66A	2A	n66	15	30
FDD	DC_5A_n66A	5A	n66	15	30
FDD	DC_13A_n66A	13A	n66	15	30
FDD	DC_48A_n66A	48A	n66	15	30
TDD	DC_2A_n77A	2A	n77	30	100
TDD	DC_5A_n77A	5A	n77	30	100
TDD	DC_13A_n77A	13A	n77	30	100
TDD	DC_66A_n77A	66A	n77	30	100

<Maximum Power for EN-DC>

EN-DC Configuration	LTE Signal Carrier				5G NR			
	Band	BW (MHz)	Maximum Power (dBm)		Band	BW (MHz)	Maximum Power (dBm)	
			Standalone	EN-DC Active			Standalone	EN-DC Active
DC_5A_n2A	5A	10	24.0	21.0	n2	20	23.5	22.5
DC_13A_n2A	13A	10	24.0	22.0	n2	20	23.5	22.5
DC_66A_n2A	66A	20	24.0	23.0	n2	20	/	21.0
DC_2A_n5A	2A	20	24.0	23.0	n5	20	23.0	19.5
DC_48A_n5A	48A	20	/	13.0	n5	20	23.0	19.5
DC_66A_n5A	66A	20	24.0	23.0	n5	20	23.0	19.5
DC_2A_n66A	2A	20	24.0	23.0	n66	30	/	21.5
DC_5A_n66A	5A	10	24.0	21.0	n66	30	23.0	22.0
DC_13A_n66A	13A	10	24.0	22.0	n66	30	23.0	22.0
DC_48A_n66A	48A	20	21.0	16.0	n66	30	23.0	22.0
DC_2A_n77A	2A	20	24.0	23.0	n77	100	18.0	12.5
DC_5A_n77A	5A	10	24.0	21.0	n77	100	/	19.0
DC_13A_n77A	13A	10	24.0	22.0	n77	100	/	19.0
DC_66A_n77A	66A	20	24.0	23.0	n77	100	18.0	12.5

- **ENDC DL**

<5G NR Anchor Combination>

5G-NR	EN-DC Combination	4G DL MIMO	5G-NR DL MIMO
FDD	DC_13A_n2A	-	-
FDD+TDD	DC_13A_n2A-n77A	-	-
FDD	DC_13A_n66A	-	-
FDD+TDD	DC_13A_n66A-n77A	-	-
TDD	DC_13A_n77A	-	-
TDD	DC_13A_n77C	-	-
FDD	DC_13A-48A_n2A	-	-
FDD	DC_13A-48A_n66A	-	-
FDD	DC_13A-48D_n2A	-	-
FDD	DC_13A-48D_n66A	-	-
FDD	DC_13A-48E_n2A	-	-
FDD	DC_13A-48E_n66A	-	-
FDD	DC_13A-66A_n2A	-	-
FDD	DC_13A-66A_n66A	-	-
TDD	DC_13A-66A_n77A	-	-

FDD	DC_13A-66A-66A_n2A	-	-
FDD	DC_13A-66A-66A_n66A	-	-
TDD	DC_13A-66A-66A_n77A	-	-
FDD	DC_2A_n5A	-	-
FDD+TDD	DC_2A_n5A-n77A	-	-
FDD	DC_2A_n66A	-	-
FDD+TDD	DC_2A_n66A-n77A	-	-
TDD	DC_2A_n77A	-	-
TDD	DC_2A_n77C	-	-
FDD	DC_2A-13A_n2A	-	-
FDD	DC_2A-13A_n66A	-	-
TDD	DC_2A-13A_n77A	-	-
FDD	DC_2A-2A_n5A	-	-
FDD+TDD	DC_2A-2A_n5A-n77A	-	-
FDD	DC_2A-2A_n66A	-	-
FDD+TDD	DC_2A-2A_n66A-n77A	-	-
TDD	DC_2A-2A_n77A	-	-
TDD	DC_2A-2A_n77C	-	-
FDD	DC_2A-2A-13A_n66A	-	-
TDD	DC_2A-2A-13A_n77A	-	-
FDD	DC_2A-2A-5A_n66A	-	-
TDD	DC_2A-2A-5A_n77A	-	-
FDD	DC_2A-2A-66A_n5A	-	-
FDD	DC_2A-2A-66A_n66A	-	-
FDD+TDD	DC_2A-2A-66A_n77A	-	-
FDD	DC_2A-2A-66A-66A_n5A	-	-
FDD	DC_2A-2A-66A-66A_n66A	-	-
TDD	DC_2A-2A-66A-66A_n77A	-	-
FDD	DC_2A-48A_n5A	-	-
FDD	DC_2A-48A_n66A	-	-
FDD	DC_2A-48C_n5A	-	-
FDD	DC_2A-48C_n66A	-	-
FDD	DC_2A-48D_n5A	-	-
FDD	DC_2A-48D_n66A	-	-
FDD	DC_2A-48E_n5A	-	-
FDD	DC_2A-48E_n66A	-	-
FDD	DC_2A-5A_n2A	-	-
FDD	DC_2A-5A_n66A	-	-
TDD	DC_2A-5A_n77A	-	-
FDD	DC_2A-66A_n2A	-	-
FDD	DC_2A-66A_n5A	-	-
FDD	DC_2A-66A_n66A	-	-
TDD	DC_2A-66A_n77A	-	-

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FDD	DC_2A-66A-66A_n2A	-	-
FDD	DC_2A-66A-66A_n5A	-	-
FDD	DC_2A-66A-66A_n66A	-	-
TDD	DC_2A-66A-66A_n77A	-	-
FDD	DC_48A_n5A	-	-
FDD	DC_48A-66A_n2A	-	-
FDD	DC_48A-66A_n5A	-	-
FDD	DC_48C_n5A	-	-
FDD	DC_48C-66A_n2A	-	-
FDD	DC_48C-66A_n5A	-	-
FDD	DC_48D_n5A	-	-
FDD	DC_48D-66A_n2A	-	-
FDD	DC_48D-66A_n5A	-	-
FDD	DC_48E_n5A	-	-
FDD	DC_48E-66A_n2A	-	-
FDD	DC_48E-66A_n5A	-	-
FDD	DC_5A_n2A	-	-
FDD+TDD	DC_5A_n2A-n77A	-	-
FDD	DC_5A_n66A	-	-
FDD+TDD	DC_5A_n66A-n77A	-	-
TDD	DC_5A_n77A	-	-
TDD	DC_5A_n77C	-	-
FDD	DC_5A-66A_n2A	-	-
FDD	DC_5A-66A_n66A	-	-
TDD	DC_5A-66A_n77A	-	-
FDD	DC_5A-66A-66A_n2A	-	-
FDD	DC_5A-66A-66A_n66A	-	-
TDD	DC_5A-66A-66A_n77A	-	-
FDD	DC_66A_n2A	-	-
TDD	DC_66A_n2A-n77A	-	-
FDD	DC_66A_n5A	-	-
FDD+TDD	DC_66A_n5A-n77A	-	-
TDD	DC_66A_n77A	-	-
TDD	DC_66A_n77C	-	-
FDD	DC_66A-66A_n2A	-	-
FDD+TDD	DC_66A-66A_n2A-n77A	-	-
FDD	DC_66A-66A_n5A	-	-
FDD+TDD	DC_66A-66A_n5A-n77A	-	-
TDD	DC_66A-66A_n77A	-	-
TDD	DC_66A-66A_n77C	-	-
FDD	DC_66A-66A-66A_n2A	-	-
FDD	DC_66A-66A-66A_n5A	-	-
TDD	DC_66A-66A-66A_n77A	-	-

16. EUT Antenna Location

➢ **EUT Antenna Location**

The location of antenna was recorded in annex B
ANT 0: TX/RX: WCDMA Band II/IV; LTE Band 2/4/7/46(RX)/66; 5G NR n2/66 (for SA/NSA) PRX(MIMO):LTE Band 48; 5G NR n48/77/78 (for SA) ANT 1: TX1/RX: LTE Band 2 (for CA)/4/66 (for CA_2A-4A/CA_2A-66A); 5G NR n2/66 (for NSA) DRX: WCDMA Band II/IV; LTE Band 2/4/66; 5G NR n2/66 PRX (MIMO): LTE band 46; DRX (MIMO): LTE Band 7/48; 5G NR n48/77/78 ANT 2: TX/RX: LTE Band 48; 5G NR n48/77/78 (for SA/NSA) PRX (MIMO): LTE Band 2/4/7/66; 5G NR n2/66; DRX: LTE Band 46 ANT 3: TX1/RX: LTE Band 48(for NSA B48+NR LB), 5G NR n48/77/78 (for NSA) DRX: WCDMA Band I; LTE Band 7/48; 5G NR n48/77/78 DRX (MIMO): LTE Band 2/4/66/38/46; 5G NR n2/66 ANT 4: TRX: WCDMA Band V; LTE Band 5/12/13/17; 5G NR n5 (for SA/NSA) ANT 5: DRX: WCDMA Band V; LTE Band 5/12/13/117; 5G NR n5 WIFI_1: WLAN 2.4GHz/5GHz WIFI_2: WLAN 2.4GHz/5GHz GPS: GPS L1+5

➢ **EUT Antenna Distance**

Antenna Location	Front	Back	Left	Right	Top	Bottom
ANT 0	＜5mm	＜5mm	＞25mm	＜25mm	＜5mm	＞25mm
ANT 1	＜5mm	＜5mm	＞25mm	＜25mm	＞25mm	＜5mm
ANT 2	＜5mm	＜5mm	＞25mm	＜5mm	＞25mm	＜25mm
ANT 3	＜5mm	＜5mm	＜5mm	＞25mm	＞25mm	＜25mm
ANT 4	＜5mm	＜5mm	＜5mm	＞25mm	＜25mm	＞25mm
WIFI_1	＜5mm	＜5mm	＞25mm	＜5mm	＞25mm	＜25mm
WIFI_2	＜5mm	＜5mm	＜25mm	＞25mm	＜5mm	＞25mm

➢ **Hotspot Evaluation**

Assessment	Hotspot Side for SAR Test Distance: 10mm					
Antennas	Front	Back	Left	Right	Top	Bottom
ANT 0	Yes	Yes	No	Yes	Yes	No
ANT 1	Yes	Yes	No	Yes	No	Yes
ANT 2	Yes	Yes	No	Yes	No	Yes
ANT 3	Yes	Yes	Yes	No	No	Yes
ANT 4	Yes	Yes	Yes	No	Yes	No
WIFI_1	Yes	Yes	No	Yes	No	Yes
WIFI_2	Yes	Yes	Yes	No	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 ≥ 9cm*5cm, the test distance is 10 mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.

17. Block Diagram of the Tests to be Performed

17.1. Body

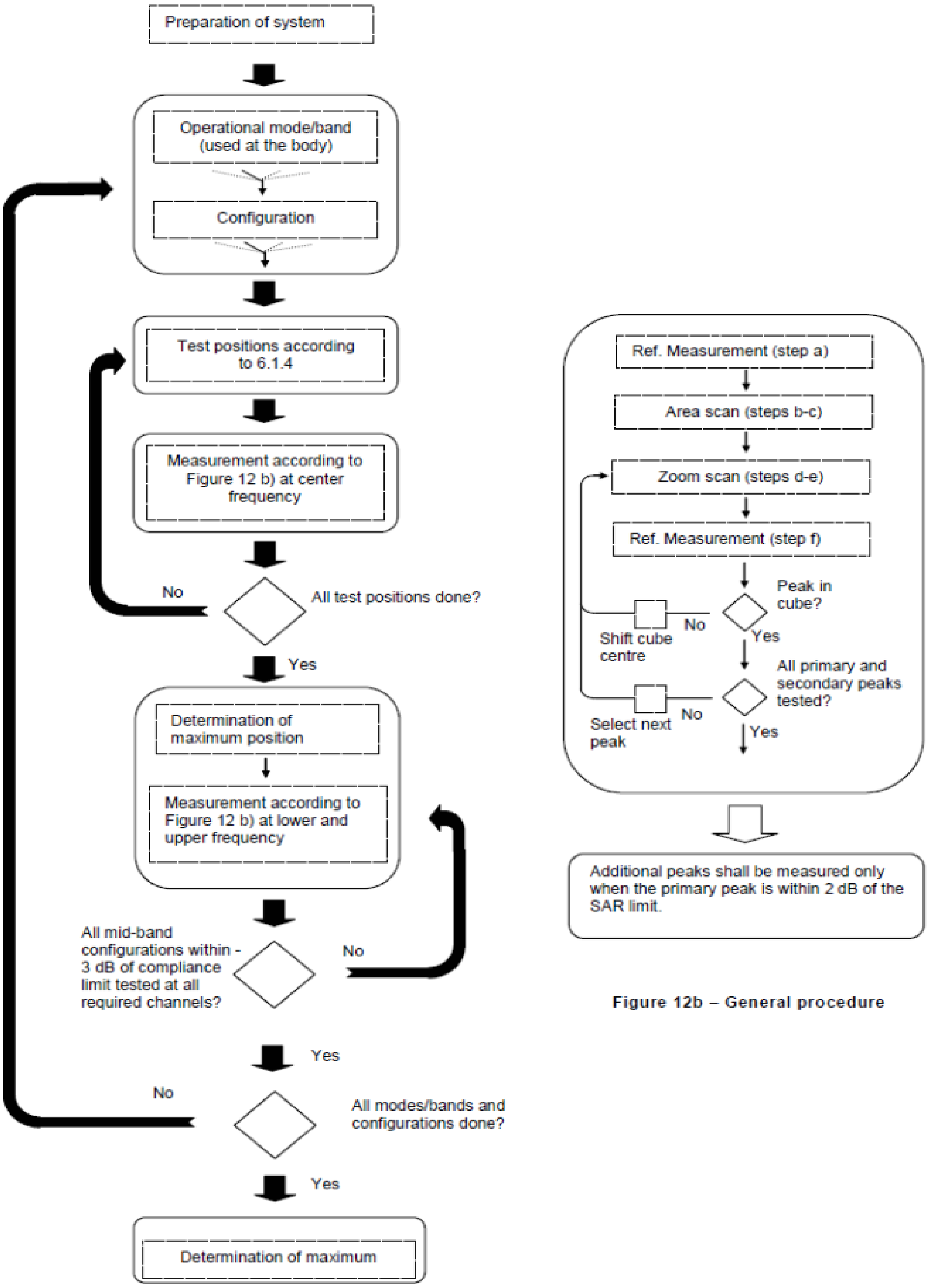


Figure 12b – General procedure

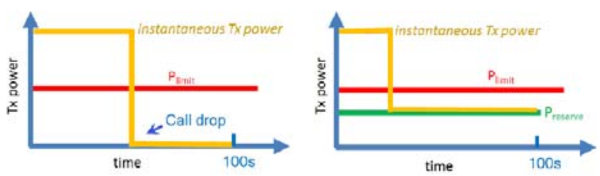
18. Smart Transmit Algorithm

FCC SAR limit is defined based on time average RF exposure. Qualcomm® Smart Transmit algorithm developed by Qualcomm, when running in a wireless device, will ensure the wireless device is in compliance with IN limit of SAR averaged over a defined time window, denoted as SAR_time_window, at all times. The Smart Transmit algorithm will not only ensure the wireless device to comply with RF exposure requirement, but also will improve the user experience and network performance.

For a given wireless device, once the SAR of the wireless device is characterized at a transmit power level via SAR measurement, SAR at a different power level for the characterized configuration(s) can be scaled by the change in the corresponding power level. Therefore, for a characterized device, SAR compliance can be achieved through transmit power control and management.

The basic concept of the Smart Transmit algorithm by Qualcomm is that if time-averaged transmit power approaches the P_{limit}, then the modem needs to limit instantaneous transmit power to make sure that the time-averaged transmit power does not exceed the P_{limit} in any SAR_time_window (i.e., the time-averaged SAR complies with the CE SAR limit in any SAR_time_window). The wireless device can instantaneously transmit at high transmit powers and exceed the P_{limit} for a short duration before limiting the power to maintain the time-averaged transmit power under the P_{limit}.

The Smart Transmit algorithm can be configured to manage the instantaneous transmit power (Tx power) to keep the time-averaged power to not exceed P_{limit}. To avoid dropping the radio link, Smart Transmit algorithm starts the power limiting enforcement earlier in time to back off the Tx power to a reserve level (denoted as Preserve) so that wireless device can maintain the radio link at a minimum reserve power level for as long as needed and at the same time ensure that the time-averaged Tx power over any SAR_time_window is less than P_{limit} at all times (see Figure 1-1(b)). At all times, Smart Transmit meets the below equation:



(a) (b)

$$time\ avg.Tx\ power = \frac{1}{T}\int_{t}^{t+T} inst.Tx\ power(t)\,dt \le P_{limit}$$

Figure 1-1 Smart Transmit Operation: (a) Transmit at high power when needed and permitted; (b) Transmit with reserve power to support continuous transmission at a minimum power level (Preserve) where, *time avg. Tx power* is the power averaged between *t* and *t+T* time period; *T* is *SAR_time_window*; *inst. Tx power (t)* is the instantaneous transmit power at *t* time instant; P_{limit} is the predefined time averaged power limit.

19. Proximity Sensor Considerations

19.1. Proximity Sensor Triggering Distances

➢ **P-sensor Triggering Distance Testing**

The EUT should be moved further away from and toward the flat phantom that fill with the tissue simulating liquid to determine the proximity sensor triggering distances. Conducted power is monitored qualitatively to identify the general triggering characteristics and recorded quantitatively, versus spacing, as required by the procedures.

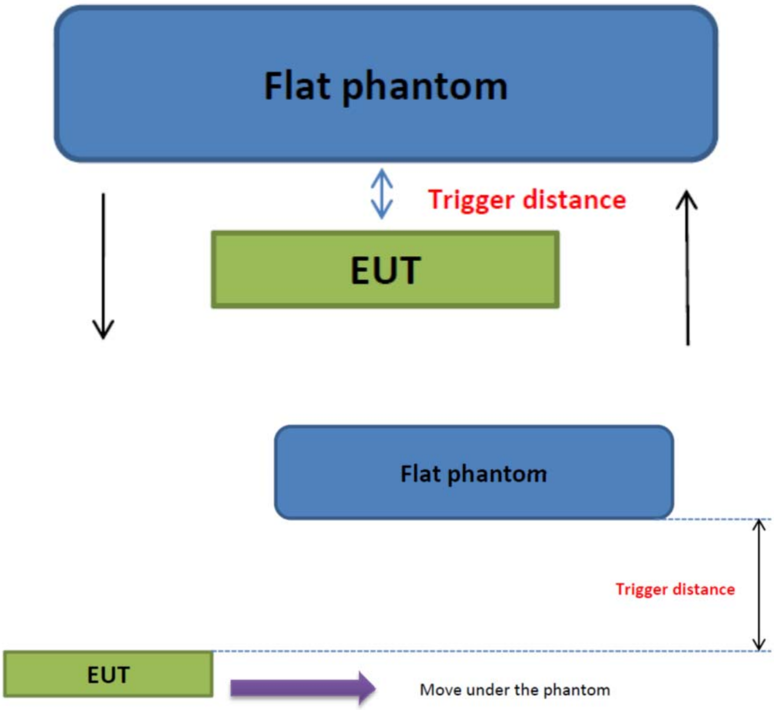


Fig.19.1 Illustration for proximity sensor trigger

➢ **P-sensor Triggering Distance**

<WWAN>

Proximity Sensor Trigger Distance (mm)						
Exposure Position	Front Side	Back Side	Left Side	Right Side	Top Side	Bottom Side
Minimum	15	15	15	15	15	15

<WLAN>

Proximity Sensor Trigger Distance (mm)						
Exposure Position	Front Side	Back Side	Left Side	Right Side	Top Side	Bottom Side
Minimum	15	15	15	10	15	15

19.2. Proximity Sensor Coverage

Proximity sensors are not normally designed to cover the entire back surface or edges of a MIFI. The sensing regions are usually limited to areas near the sensor element. If a sensor is spatially offset from the antenna(s), it is necessary to verify sensor triggering for conditions where the antenna is next to the user but the sensor is laterally further away to ensure sensor coverage is sufficient for reducing the power to maintain compliance. For P-sensor coverage testing, the device is moved and “along the direction of maximum antenna and sensor offset”. Illustrating in the internal photo exhibit, although the sensor spatially offset, there is no trigger condition where the antenna is next to the user, the sensor is laterally further away, therefore proximity sensor coverage testing is not required. This procedure is not required since the antenna, sensor and peak SAR location is overlapped with the sensor.

20. Test Results List

20.1. 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 ≥0.8W/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. 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.
8. The CA intra-band uplink and 5G NR 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.
9. The LTE Band 2/4/66 and 5G NR n2/66 in antenna 1 are TX only when CA or ENDC is in use and do not support independent transmission.
10. The LTE Band 48 and 5G NR N48/77/78 in antenna 3 is TX only in the ENDC state and does not support independent transmission.
11. The frequency bands corresponding to DSI grades and their power states are as follows:

<table>
<tr><th rowspan="2">DSI</th><th rowspan="2">Antenna</th><th rowspan="2">Frequency Bands</th><th colspan="2">Power Reduction</th><th rowspan="2">Transmit Type</th></tr>
<tr><th>WWAN</th><th>WLAN</th></tr>
<tr><td>0</td><td>All</td><td>All</td><td>Full Power</td><td>Full Power</td><td rowspan="5">Standalone Transmission</td></tr>
<tr><td>1</td><td>ANT 4</td><td>WCDMA/LTE/NR LB</td><td>Yes</td><td>No</td></tr>
<tr><td>2</td><td>ANT 3</td><td>5G 48/77/78 NSA</td><td>Yes</td><td>No</td></tr>
<tr><td>3</td><td>WIFI_2</td><td>wifi_2</td><td>No</td><td>Yes</td></tr>
<tr><td>4</td><td>ANT 1</td><td>LTE/NR NSA MHB</td><td>Yes</td><td>No</td></tr>
</table>

5	WIFI _1	wifi_1	No	Yes	
6	ANT 2	LTE/NR UHB	Yes	No	
7	ANT 0	WCDMA/LTE/NR MHB	Yes	No	
8	ANT 1 + WIFI 1	LTE/NR NSA MHB	Yes	Yes	Simultaneous Transmission
9	ANT 2 + WIFI 1	LTE/NR UHB	Yes	Yes	
10	ANT 0 + WIFI 2	WCDMA/LTE/NR MHB	Yes	Yes	
11	ANT 4 + WIFI 2	WCDMA/LTE/NR LB	Yes	Yes	
12	ANT 4 + ANT 3	WCDMA/LTE/NR LB & NR NSA	Yes	Yes	
13	ANT 1 + WIFI 1 + ANT 2	LTE/NR UHB & NSA MB	Yes	Yes	
14	Ant 4 + ANT 3 + WIFI 2	WCDMA/LTE/NR LB & NR UHB	Yes	Yes	
15	ANT 4 + ANT 3 + ANT 1 + ANT 2 + ANT 0 + WIFI 1 + WIFI 2	All	Yes	Yes	

12. When this device is close to human body the sensor will be active automatically and the reduced power level 1&2 of WWAN applied.
13. The reduced power level 2 of WWAN will be applied to CA / EN-DC / simultaneous transmission.
14. The Power level condition applied should be follow:

Transmission Condition	Wireless System	Antenna	Body
Standalone	WWAN	ANT 0	Full Power
		ANT 2	Reduced Power Level 1
		ANT 4	Full Power
	WLAN	WIFI 1	Full Power
		WIFI 2	Full Power
		MIMO	Full Power

Transmission Condition	Wireless System	Antenna	Body
CA /EN-DC/ Simultaneous	WWAN	ANT 0	Reduced Power Level 2
		ANT 1	Reduced Power Level 2
		ANT 2	Reduced Power Level 2
		ANT 3	Reduced Power Level 2

		ANT 4	Reduced Power Level 2
	WLAN	WIFI 1	Full Power
		WIFI 2	Full Power
		MIMO	Full Power

20.2. Body SAR Data

➢ **WCDMA Body SAR**

Plot No.	Band/Mode	Test Position	CH.	Ave. Power (dBm)	Tune-up Limit (dBm)	Tune-up Scaling Factor	Meas. SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
Sensor off/Full Power (ANT 0)								
	Band II/RMC 12.2Kbps	Front Side	9400	23.11	24.00	1.227	0.211	0.259
	Band II/RMC 12.2Kbps	Back Side	9400	23.11	24.00	1.227	0.543	0.666
	Band II/RMC 12.2Kbps	Right Side	9400	23.11	24.00	1.227	0.179	0.220
	Band II/RMC 12.2Kbps	Top Side	9400	23.11	24.00	1.227	0.608	0.746
	Band II/RMC 12.2Kbps	Top Side	9262	23.04	24.00	1.247	0.595	0.742
1#	Band II/RMC 12.2Kbps	Top Side	9538	23.05	24.00	1.245	0.619	0.770
Sensor off/Full Power (ANT 0)								
	Band IV/RMC 12.2Kbps	Front Side	1413	23.12	24.00	1.225	0.213	0.261
	Band IV/RMC 12.2Kbps	Back Side	1413	23.12	24.00	1.225	0.360	0.441
	Band IV/RMC 12.2Kbps	Right Side	1413	23.12	24.00	1.225	0.229	0.280
2#	Band IV/RMC 12.2Kbps	Top Side	1413	23.12	24.00	1.225	0.534	0.654
	Band IV/RMC 12.2Kbps	Top Side	1312	23.06	24.00	1.242	0.497	0.617
	Band IV/RMC 12.2Kbps	Top Side	1513	23.03	24.00	1.250	0.505	0.631
Sensor off/Full Power (ANT 4)								
	Band V/RMC 12.2Kbps	Front Side	4182	23.07	24.00	1.239	0.422	0.523
	Band V/RMC 12.2Kbps	Back Side	4182	23.07	24.00	1.239	0.150	0.186
	Band V/RMC 12.2Kbps	Left Side	4182	23.07	24.00	1.239	0.249	0.308
	Band V/RMC 12.2Kbps	Top Side	4182	23.07	24.00	1.239	0.356	0.441
	Band V/RMC 12.2Kbps	Front Side	4132	23.01	24.00	1.256	0.413	0.519
3#	Band V/RMC 12.2Kbps	Front Side	4233	23.04	24.00	1.247	0.427	0.533
Sensor on/Reduced Power Level 2 for Simultaneous transmission (ANT 4)								
	Band V/RMC 12.2Kbps	Front Side	4182	21.37	22.00	1.156	0.266	0.308
	Band V/RMC 12.2Kbps	Back Side	4182	21.37	22.00	1.156	0.238	0.275
	Band V/RMC 12.2Kbps	Left Side	4182	21.37	22.00	1.156	0.186	0.215
	Band V/RMC 12.2Kbps	Top Side	4182	21.37	22.00	1.156	0.134	0.155

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	Band V/RMC 12.2Kbps	Front Side	4132	21.31	22.00	1.172	0.323	0.379
	Band V/RMC 12.2Kbps	Front Side	4233	21.34	22.00	1.164	0.224	0.261

➢ **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)
Sensor off/Full Power (ANT 0)								
	LTE Band 2/1RB#0 20M	Front Side	18900	22.81	24.00	1.315	0.302	0.397
	LTE Band 2/1RB#0 20M	Back Side	18900	22.81	24.00	1.315	0.538	0.708
	LTE Band 2/1RB#0 20M	Right Side	18900	22.81	24.00	1.315	0.182	0.239
4#	LTE Band 2/1RB#0 20M	Top Side	18900	22.81	24.00	1.315	0.584	0.768
	LTE Band 2/1RB#0 20M	Top Side	18700	22.77	24.00	1.327	0.553	0.734
	LTE Band 2/1RB#0 20M	Top Side	19100	22.74	24.00	1.337	0.509	0.680
	LTE Band 2/50RB#0 20M	Front Side	18900	21.90	23.00	1.288	0.390	0.502
	LTE Band 2/50RB#0 20M	Back Side	18900	21.90	23.00	1.288	0.271	0.349
	LTE Band 2/50RB#0 20M	Right Side	18900	21.90	23.00	1.288	0.159	0.205
	LTE Band 2/50RB#0 20M	Top Side	18900	21.90	23.00	1.288	0.496	0.639
	LTE Band 2/50RB#0 20M	Top Side	18700	21.86	23.00	1.300	0.516	0.670
	LTE Band 2/50RB#0 20M	Top Side	19100	21.84	23.00	1.306	0.410	0.536
Sensor on/Reduced Power Level 2 for CA & EN-DC & Simultaneous transmission (ANT 0)								
	LTE Band 2/1RB#0 20M	Front Side	18900	21.80	23.00	1.318	0.252	0.332
	LTE Band 2/1RB#0 20M	Back Side	18900	21.80	23.00	1.318	0.337	0.444
	LTE Band 2/1RB#0 20M	Right Side	18900	21.80	23.00	1.318	0.149	0.196
	LTE Band 2/1RB#0 20M	Top Side	18900	21.80	23.00	1.318	0.450	0.593
	LTE Band 2/1RB#0 20M	Top Side	18700	21.77	23.00	1.327	0.385	0.511
	LTE Band 2/1RB#0 20M	Top Side	19100	21.74	23.00	1.337	0.374	0.500
	LTE Band 2/50RB#0 20M	Front Side	18900	20.90	22.00	1.288	0.182	0.234
	LTE Band 2/50RB#0 20M	Back Side	18900	20.90	22.00	1.288	0.271	0.349
	LTE Band 2/50RB#0 20M	Right Side	18900	20.90	22.00	1.288	0.122	0.157
	LTE Band 2/50RB#0 20M	Top Side	18900	20.90	22.00	1.288	0.280	0.361
	LTE Band 2/50RB#0 20M	Top Side	18700	20.86	22.00	1.300	0.291	0.378
	LTE Band 2/50RB#0 20M	Top Side	19100	20.84	22.00	1.306	0.289	0.377
Sensor off/Full Power (ANT 4)								
5#	LTE Band 5/1RB#0 10M	Front Side	20525	23.09	24.00	1.233	0.553	0.682
	LTE Band 5/1RB#0 10M	Back Side	20525	23.09	24.00	1.233	0.477	0.589
	LTE Band 5/1RB#0 10M	Left Side	20525	23.09	24.00	1.233	0.287	0.354
	LTE Band 5/1RB#0 10M	Top Side	20525	23.09	24.00	1.233	0.275	0.339
	LTE Band 5/1RB#0 10M	Front Side	20450	23.04	24.00	1.247	0.526	0.656

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	LTE Band 5/1RB#0 10M	Front Side	20600	23.03	24.00	1.250	0.536	0.670
	LTE Band 5/25RB#0 10M	Front Side	20525	22.10	23.00	1.230	0.487	0.599
	LTE Band 5/25RB#0 10M	Back Side	20525	22.10	23.00	1.230	0.393	0.483
	LTE Band 5/25RB#0 10M	Left Side	20525	22.10	23.00	1.230	0.253	0.311
	LTE Band 5/25RB#0 10M	Top Side	20525	22.10	23.00	1.230	0.242	0.298
	LTE Band 5/25RB#0 10M	Front Side	20450	22.04	23.00	1.247	0.507	0.633
	LTE Band 5/25RB#0 10M	Front Side	20600	22.00	23.00	1.259	0.472	0.594
Sensor on/Reduced Power Level 2 for CA & EN-DC & Simultaneous transmission (ANT 4)								
	LTE Band 5/1RB#0 10M	Front Side	20525	20.07	21.00	1.239	0.222	0.275
	LTE Band 5/1RB#0 10M	Back Side	20525	20.07	21.00	1.239	0.192	0.238
	LTE Band 5/1RB#0 10M	Left Side	20525	20.07	21.00	1.239	0.115	0.143
	LTE Band 5/1RB#0 10M	Top Side	20525	20.07	21.00	1.239	0.111	0.137
	LTE Band 5/1RB#0 10M	Front Side	20450	20.02	21.00	1.253	0.211	0.265
	LTE Band 5/1RB#0 10M	Front Side	20600	20.10	21.00	1.230	0.215	0.265
	LTE Band 5/25RB#0 10M	Front Side	20525	19.08	20.00	1.236	0.196	0.242
	LTE Band 5/25RB#0 10M	Back Side	20525	19.08	20.00	1.236	0.158	0.195
	LTE Band 5/25RB#0 10M	Left Side	20525	19.08	20.00	1.236	0.101	0.125
	LTE Band 5/25RB#0 10M	Top Side	20525	19.08	20.00	1.236	0.097	0.120
	LTE Band 5/25RB#0 10M	Front Side	20450	19.02	20.00	1.253	0.204	0.255
	LTE Band 5/25RB#0 10M	Front Side	20600	18.98	20.00	1.265	0.190	0.240
Sensor off/Full Power (ANT 0)								
	LTE Band 7/1RB#0 20M	Front Side	21100	23.09	24.00	1.233	0.213	0.263
	LTE Band 7/1RB#0 20M	Back Side	21100	23.09	24.00	1.233	0.341	0.420
	LTE Band 7/1RB#0 20M	Right Side	21100	23.09	24.00	1.233	0.220	0.271
	LTE Band 7/1RB#0 20M	Top Side	21100	23.09	24.00	1.233	0.472	0.582
6#	LTE Band 7/1RB#0 20M	Top Side	20850	23.00	24.00	1.259	0.464	0.584
	LTE Band 7/1RB#0 20M	Top Side	21350	23.03	24.00	1.250	0.445	0.556
	LTE Band 7/50RB#0 20M	Front Side	21100	22.23	23.00	1.194	0.162	0.193
	LTE Band 7/50RB#0 20M	Back Side	21100	22.23	23.00	1.194	0.251	0.300
	LTE Band 7/50RB#0 20M	Right Side	21100	22.23	23.00	1.194	0.177	0.211
	LTE Band 7/50RB#0 20M	Top Side	21100	22.23	23.00	1.194	0.307	0.367
	LTE Band 7/50RB#0 20M	Top Side	20850	22.08	23.00	1.236	0.303	0.374
	LTE Band 7/50RB#0 20M	Top Side	21350	22.14	23.00	1.219	0.353	0.430
Sensor off/Full Power (ANT 4)								
7#	LTE Band 12/1RB#0 10M	Front Side	23095	22.96	24.00	1.271	0.476	0.605
	LTE Band 12/1RB#0 10M	Back Side	23095	22.96	24.00	1.271	0.296	0.376
	LTE Band 12/1RB#0 10M	Left Side	23095	22.96	24.00	1.271	0.307	0.391
	LTE Band 12/1RB#0 10M	Top Side	23095	22.96	24.00	1.271	0.042	0.053

	LTE Band 12/1RB#0 10M	Front Side	23060	22.87	24.00	1.297	0.377	0.490
	LTE Band 12/1RB#0 10M	Front Side	23130	22.90	24.00	1.288	0.420	0.541
	LTE Band 12/25RB#0 10M	Front Side	23095	21.97	23.00	1.268	0.320	0.406
	LTE Band 12/25RB#0 10M	Back Side	23095	21.97	23.00	1.268	0.317	0.402
	LTE Band 12/25RB#0 10M	Left Side	23095	21.97	23.00	1.268	0.164	0.208
	LTE Band 12/25RB#0 10M	Top Side	23095	21.97	23.00	1.268	0.151	0.191
	LTE Band 12/25RB#0 10M	Front Side	23060	21.90	23.00	1.288	0.304	0.391
	LTE Band 12/25RB#0 10M	Front Side	23130	21.88	23.00	1.294	0.331	0.429
Sensor on/Reduced Power Level 2 for Simultaneous transmission (ANT 4)								
	LTE Band 12/1RB#0 10M	Front Side	23095	20.94	22.00	1.276	0.243	0.310
	LTE Band 12/1RB#0 10M	Back Side	23095	20.94	22.00	1.276	0.229	0.292
	LTE Band 12/1RB#0 10M	Left Side	23095	20.94	22.00	1.276	0.131	0.167
	LTE Band 12/1RB#0 10M	Top Side	23095	20.94	22.00	1.276	0.115	0.147
	LTE Band 12/1RB#0 10M	Front Side	23060	20.85	22.00	1.303	0.249	0.324
	LTE Band 12/1RB#0 10M	Front Side	23130	20.88	22.00	1.294	0.238	0.308
	LTE Band 12/25RB#0 10M	Front Side	23095	19.95	21.00	1.274	0.194	0.248
	LTE Band 12/25RB#0 10M	Back Side	23095	19.95	21.00	1.274	0.183	0.233
	LTE Band 12/25RB#0 10M	Left Side	23095	19.95	21.00	1.274	0.105	0.133
	LTE Band 12/25RB#0 10M	Top Side	23095	19.95	21.00	1.274	0.092	0.117
	LTE Band 12/25RB#0 10M	Front Side	23060	19.88	21.00	1.294	0.199	0.258
	LTE Band 12/25RB#0 10M	Front Side	23130	19.86	21.00	1.300	0.190	0.248
Sensor off/Full Power (ANT 4)								
8#	LTE Band 13/1RB#0 10M	Front Side	23230	23.11	24.00	1.227	0.476	0.584
	LTE Band 13/1RB#0 10M	Back Side	23230	23.11	24.00	1.227	0.366	0.450
	LTE Band 13/1RB#0 10M	Left Side	23230	23.11	24.00	1.227	0.228	0.280
	LTE Band 13/1RB#0 10M	Top Side	23230	23.11	24.00	1.227	0.279	0.343
	LTE Band 13/25RB#0 10M	Front Side	23230	22.26	23.00	1.186	0.376	0.445
	LTE Band 13/25RB#0 10M	Back Side	23230	22.26	23.00	1.186	0.298	0.353
	LTE Band 13/25RB#0 10M	Left Side	23230	22.26	23.00	1.186	0.185	0.220
	LTE Band 13/25RB#0 10M	Top Side	23230	22.26	23.00	1.186	0.218	0.259
Sensor on/Reduced Power Level 2 for CA & EN-DC & Simultaneous transmission (ANT 4)								
	LTE Band 13/1RB#0 10M	Front Side	23230	21.08	22.00	1.236	0.186	0.230
	LTE Band 13/1RB#0 10M	Back Side	23230	21.08	22.00	1.236	0.148	0.183
	LTE Band 13/1RB#0 10M	Left Side	23230	21.08	22.00	1.236	0.098	0.121
	LTE Band 13/1RB#0 10M	Top Side	23230	21.08	22.00	1.236	0.066	0.082
	LTE Band 13/25RB#0 10M	Front Side	23230	20.23	21.00	1.194	0.160	0.191
	LTE Band 13/25RB#0 10M	Back Side	23230	20.23	21.00	1.194	0.134	0.159
	LTE Band 13/25RB#0 10M	Left Side	23230	20.23	21.00	1.194	0.088	0.106

	LTE Band 13/25RB#0 10M	Top Side	23230	20.23	21.00	1.194	0.060	0.071
Sensor on/Reduced Power Level 1 (ANT 2)								
	LTE Band 48/1RB#0 20M	Front Side	55990	20.23	21.00	1.194	0.255	0.306
	LTE Band 48/1RB#0 20M	Back Side	55990	20.23	21.00	1.194	0.363	0.436
	LTE Band 48/1RB#0 20M	Right Side	55990	20.23	21.00	1.194	0.760	0.913
	LTE Band 48/1RB#0 20M	Bottom Side	55990	20.23	21.00	1.194	0.116	0.139
	LTE Band 48/1RB#0 20M	Right Side	55340	20.17	21.00	1.211	0.710	0.865
	LTE Band 48/1RB#0 20M	Right Side	55830	20.20	21.00	1.202	0.751	0.908
	LTE Band 48/1RB#0 20M	Right Side	56150	20.18	21.00	1.208	0.758	0.921
9#	LTE Band 48/1RB#0 20M	Right Side	56640	20.10	21.00	1.230	0.800	0.990
	LTE Band 48/50RB#0 20M	Front Side	55990	19.30	20.00	1.175	0.174	0.206
	LTE Band 48/50RB#0 20M	Back Side	55990	19.30	20.00	1.175	0.336	0.397
	LTE Band 48/50RB#0 20M	Right Side	55990	19.30	20.00	1.175	0.680	0.804
	LTE Band 48/50RB#0 20M	Bottom Side	55990	19.30	20.00	1.175	0.074	0.088
	LTE Band 48/50RB#0 20M	Right Side	55340	19.27	20.00	1.183	0.655	0.780
	LTE Band 48/50RB#0 20M	Right Side	55830	19.18	20.00	1.208	0.685	0.832
	LTE Band 48/50RB#0 20M	Right Side	56150	19.13	20.00	1.222	0.689	0.847
	LTE Band 48/50RB#0 20M	Right Side	56640	19.03	20.00	1.250	0.722	0.908
	LTE Band 48C/1RB#0 20M+20M	Right Side	56642	18.31	19.00	1.172	0.770	0.908
	LTE Band 48/100RB#0 20M	Right Side	55990	18.74	20.00	1.337	0.592	0.796
Sensor on/Reduced Power Level 2 for EN-DC & Simultaneous transmission (ANT 2)								
	LTE Band 48/1RB#0 20M	Front Side	55990	15.20	16.00	1.202	0.064	0.077
	LTE Band 48/1RB#0 20M	Back Side	55990	15.20	16.00	1.202	0.087	0.105
	LTE Band 48/1RB#0 20M	Right Side	55990	15.20	16.00	1.202	0.231	0.279
	LTE Band 48/1RB#0 20M	Bottom Side	55990	15.20	16.00	1.202	0.074	0.090
	LTE Band 48/1RB#0 20M	Right Side	55340	15.14	16.00	1.219	0.227	0.278
	LTE Band 48/1RB#0 20M	Right Side	55830	15.17	16.00	1.211	0.236	0.287
	LTE Band 48/1RB#0 20M	Right Side	56150	15.15	16.00	1.216	0.241	0.295
	LTE Band 48/1RB#0 20M	Right Side	56640	15.07	16.00	1.239	0.245	0.305
	LTE Band 48/50RB#0 20M	Front Side	55990	14.27	15.00	1.183	0.053	0.063
	LTE Band 48/50RB#0 20M	Back Side	55990	14.27	15.00	1.183	0.110	0.131
	LTE Band 48/50RB#0 20M	Right Side	55990	14.27	15.00	1.183	0.217	0.258
	LTE Band 48/50RB#0 20M	Bottom Side	55990	14.27	15.00	1.183	0.064	0.076
	LTE Band 48/50RB#0 20M	Right Side	55340	14.24	15.00	1.191	0.144	0.173
	LTE Band 48/50RB#0 20M	Right Side	55830	14.15	15.00	1.216	0.195	0.239
	LTE Band 48/50RB#0 20M	Right Side	56150	14.10	15.00	1.230	0.156	0.193
	LTE Band 48/50RB#0 20M	Right Side	56640	14.00	15.00	1.259	0.222	0.281

	LTE Band 48C/1RB#0 20M+20M	Right Side	56642	13.27	14.00	1.183	0.224	0.267
Sensor on/Reduced Power Level 2 for EN-DC (ANT 3)								
	LTE Band 48/1RB#0 20M	Front Side	55990	13.23	14.00	1.194	0.058	0.070
	LTE Band 48/1RB#0 20M	Back Side	55990	13.23	14.00	1.194	0.121	0.145
	LTE Band 48/1RB#0 20M	Left Side	55990	13.23	14.00	1.194	0.136	0.163
	LTE Band 48/1RB#0 20M	Bottom Side	55990	13.23	14.00	1.194	0.052	0.062
	LTE Band 48/1RB#0 20M	Left Side	55340	13.17	14.00	1.211	0.153	0.186
	LTE Band 48/1RB#0 20M	Left Side	55830	13.20	14.00	1.202	0.127	0.154
	LTE Band 48/1RB#0 20M	Left Side	56150	13.18	14.00	1.208	0.114	0.139
	LTE Band 48/1RB#0 20M	Left Side	56640	13.10	14.00	1.230	0.132	0.163
	LTE Band 48/50RB#0 20M	Front Side	55990	12.30	13.00	1.175	0.052	0.061
	LTE Band 48/50RB#0 20M	Back Side	55990	12.30	13.00	1.175	0.108	0.127
	LTE Band 48/50RB#0 20M	Left Side	55990	12.30	13.00	1.175	0.121	0.143
	LTE Band 48/50RB#0 20M	Bottom Side	55990	12.30	13.00	1.175	0.046	0.055
	LTE Band 48/50RB#0 20M	Left Side	55340	12.27	13.00	1.183	0.136	0.162
	LTE Band 48/50RB#0 20M	Left Side	55830	12.18	13.00	1.208	0.113	0.137
	LTE Band 48/50RB#0 20M	Left Side	56150	12.13	13.00	1.222	0.101	0.125
	LTE Band 48/50RB#0 20M	Left Side	56640	12.03	13.00	1.250	0.117	0.148
Sensor off/Full Power (ANT 0)								
	LTE Band 66/1RB#0 20M	Front Side	132322	22.98	24.00	1.265	0.229	0.290
	LTE Band 66/1RB#0 20M	Back Side	132322	22.98	24.00	1.265	0.280	0.354
	LTE Band 66/1RB#0 20M	Right Side	132322	22.98	24.00	1.265	0.249	0.315
	LTE Band 66/1RB#0 20M	Top Side	132322	22.98	24.00	1.265	0.437	0.552
	LTE Band 66/1RB#0 20M	Top Side	132072	22.87	24.00	1.297	0.380	0.493
10#	LTE Band 66/1RB#0 20M	Top Side	132572	22.90	24.00	1.288	0.486	0.626
	LTE Band 66/50RB#0 20M	Front Side	132322	21.99	23.00	1.262	0.214	0.270
	LTE Band 66/50RB#0 20M	Back Side	132322	21.99	23.00	1.262	0.249	0.314
	LTE Band 66/50RB#0 20M	Right Side	132322	21.99	23.00	1.262	0.195	0.246
	LTE Band 66/50RB#0 20M	Top Side	132322	21.99	23.00	1.262	0.455	0.574
	LTE Band 66/50RB#0 20M	Top Side	132072	21.95	23.00	1.274	0.403	0.513
	LTE Band 66/50RB#0 20M	Top Side	132572	21.87	23.00	1.297	0.442	0.573
	LTE Band 66B/1RB#0 10M+10M	Top Side	132523	22.20	23.00	1.202	0.434	0.522
	LTE Band 66C/1RB#0 20M+20M	Top Side	132374	22.27	23.00	1.183	0.451	0.534
Sensor on/Reduced Power Level 2 for CA & EN-DC & Simultaneous transmission (ANT 0)								
	LTE Band 66/1RB#0 20M	Front Side	132322	21.96	23.00	1.271	0.115	0.146

	LTE Band 66/1RB#0 20M	Back Side	132322	21.96	23.00	1.271	0.317	0.403
	LTE Band 66/1RB#0 20M	Right Side	132322	21.96	23.00	1.271	0.203	0.258
	LTE Band 66/1RB#0 20M	Top Side	132322	21.96	23.00	1.271	0.388	0.493
	LTE Band 66/1RB#0 20M	Top Side	132072	21.85	23.00	1.303	0.379	0.494
	LTE Band 66/1RB#0 20M	Top Side	132572	21.88	23.00	1.294	0.410	0.531
	LTE Band 66/50RB#0 20M	Front Side	132322	20.97	22.00	1.268	0.231	0.293
	LTE Band 66/50RB#0 20M	Back Side	132322	20.97	22.00	1.268	0.025	0.032
	LTE Band 66/50RB#0 20M	Right Side	132322	20.97	22.00	1.268	0.182	0.231
	LTE Band 66/50RB#0 20M	Top Side	132322	20.97	22.00	1.268	0.353	0.447
	LTE Band 66/50RB#0 20M	Top Side	132072	20.93	22.00	1.279	0.362	0.463
	LTE Band 66/50RB#0 20M	Top Side	132572	20.85	22.00	1.303	0.344	0.448
	LTE Band 66B/1RB#0 10M+10M	Top Side	132523	21.18	22.00	1.208	0.329	0.397
	LTE Band 66C/1RB#0 20M+20M	Top Side	132374	21.04	22.00	1.247	0.351	0.438
Sensor on/Reduced Power Level 2 for CA (ANT 1)								
	LTE Band 66/1RB#0 20M	Front Side	132322	20.96	22.00	1.271	0.274	0.348
	LTE Band 66/1RB#0 20M	Back Side	132322	20.96	22.00	1.271	0.204	0.260
	LTE Band 66/1RB#0 20M	Right Side	132322	20.96	22.00	1.271	0.116	0.148
	LTE Band 66/1RB#0 20M	Bottom Side	132322	20.96	22.00	1.271	0.221	0.280
	LTE Band 66/1RB#0 20M	Front Side	132072	20.85	22.00	1.303	0.264	0.344
	LTE Band 66/1RB#0 20M	Front Side	132572	20.88	22.00	1.294	0.259	0.335
	LTE Band 66/50RB#0 20M	Front Side	132322	19.97	21.00	1.268	0.230	0.292
	LTE Band 66/50RB#0 20M	Back Side	132322	19.97	21.00	1.268	0.161	0.204
	LTE Band 66/50RB#0 20M	Right Side	132322	19.97	21.00	1.268	0.102	0.130
	LTE Band 66/50RB#0 20M	Bottom Side	132322	19.97	21.00	1.268	0.189	0.240
	LTE Band 66/50RB#0 20M	Front Side	132072	19.93	21.00	1.279	0.221	0.283
	LTE Band 66/50RB#0 20M	Front Side	132572	19.85	21.00	1.303	0.249	0.324

➢ 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)
Sensor off/Full Power (ANT 0)								
	5G NR n2/1RB#1 20M	Front Side	376000	23.57	24.50	1.239	0.335	0.415
	5G NR n2/1RB#1 20M	Back Side	376000	23.57	24.50	1.239	0.390	0.483
	5G NR n2/1RB#1 20M	Right Side	376000	23.57	24.50	1.239	0.195	0.242
11#	5G NR n2/1RB#1 20M	Top Side	376000	23.57	24.50	1.239	0.487	0.603
	5G NR n2/1RB#1 20M	Top Side	372000	23.47	24.50	1.268	0.470	0.596

	5G NR n2/1RB#1 20M	Top Side	380000	23.09	24.50	1.384	0.342	0.473
	5G NR n2/50RB#1 20M	Front Side	376000	22.57	23.50	1.239	0.325	0.403
	5G NR n2/50RB#1 20M	Back Side	376000	22.57	23.50	1.239	0.353	0.437
	5G NR n2/50RB#1 20M	Right Side	376000	22.57	23.50	1.239	0.205	0.254
	5G NR n2/50RB#1 20M	Top Side	376000	22.57	23.50	1.239	0.365	0.452
	5G NR n2/50RB#1 20M	Top Side	372000	22.33	23.50	1.309	0.352	0.461
	5G NR n2/50RB#1 20M	Top Side	380000	22.16	23.50	1.361	0.357	0.486
Sensor on/Reduced Power Level 2 for EN-DC & Simultaneous transmission (ANT 0)								
	5G NR n2/1RB#1 20M	Front Side	376000	22.55	23.50	1.245	0.256	0.319
	5G NR n2/1RB#1 20M	Back Side	376000	22.55	23.50	1.245	0.343	0.427
	5G NR n2/1RB#1 20M	Right Side	376000	22.55	23.50	1.245	0.162	0.202
	5G NR n2/1RB#1 20M	Top Side	376000	22.55	23.50	1.245	0.406	0.505
	5G NR n2/1RB#1 20M	Top Side	372000	22.45	23.50	1.274	0.312	0.397
	5G NR n2/1RB#1 20M	Top Side	380000	22.07	23.50	1.390	0.340	0.473
	5G NR n2/50RB#1 20M	Front Side	376000	21.55	22.50	1.245	0.179	0.223
	5G NR n2/50RB#1 20M	Back Side	376000	21.55	22.50	1.245	0.307	0.382
	5G NR n2/50RB#1 20M	Right Side	376000	21.55	22.50	1.245	0.111	0.138
	5G NR n2/50RB#1 20M	Top Side	376000	21.55	22.50	1.245	0.324	0.403
	5G NR n2/50RB#1 20M	Top Side	372000	21.31	22.50	1.315	0.268	0.352
	5G NR n2/50RB#1 20M	Top Side	380000	21.14	22.50	1.368	0.334	0.457
Sensor on/Reduced Power Level 2 for EN-DC (ANT 1)								
	5G NR n2/1RB#1 20M	Front Side	376000	21.05	22.00	1.245	0.239	0.297
	5G NR n2/1RB#1 20M	Back Side	376000	21.05	22.00	1.245	0.216	0.269
	5G NR n2/1RB#1 20M	Right Side	376000	21.05	22.00	1.245	0.097	0.121
	5G NR n2/1RB#1 20M	Bottom Side	376000	21.05	22.00	1.245	0.151	0.188
	5G NR n2/1RB#1 20M	Front Side	372000	20.95	22.00	1.274	0.133	0.170
	5G NR n2/1RB#1 20M	Front Side	380000	20.97	22.00	1.268	0.159	0.201
	5G NR n2/50RB#1 20M	Front Side	376000	20.05	21.00	1.245	0.211	0.263
	5G NR n2/50RB#1 20M	Back Side	376000	20.05	21.00	1.245	0.094	0.118
	5G NR n2/50RB#1 20M	Right Side	376000	20.05	21.00	1.245	0.075	0.093
	5G NR n2/50RB#1 20M	Bottom Side	376000	20.05	21.00	1.245	0.098	0.122
	5G NR n2/50RB#1 20M	Front Side	372000	19.81	21.00	1.315	0.109	0.144
	5G NR n2/50RB#1 20M	Front Side	380000	19.84	21.00	1.306	0.157	0.205
Sensor off/Full Power (ANT 4)								
	5G NR n5/1RB#1 20M	Front Side	167300	22.69	23.50	1.205	0.531	0.640
	5G NR n5/1RB#1 20M	Back Side	167300	22.69	23.50	1.205	0.364	0.439
	5G NR n5/1RB#1 20M	Left Side	167300	22.69	23.50	1.205	0.259	0.312
	5G NR n5/1RB#1 20M	Bottom Side	167300	22.69	23.50	1.205	0.177	0.213

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	5G NR n5/1RB#1 20M	Front Side	166800	22.56	23.50	1.242	0.490	0.608
12#	5G NR n5/1RB#1 20M	Front Side	167800	22.61	23.50	1.227	0.592	0.727
	5G NR n5/50RB#1 20M	Front Side	167300	21.94	22.50	1.138	0.373	0.424
	5G NR n5/50RB#1 20M	Back Side	167300	21.94	22.50	1.138	0.233	0.265
	5G NR n5/50RB#1 20M	Left Side	167300	21.94	22.50	1.138	0.104	0.118
	5G NR n5/50RB#1 20M	Top Side	167300	21.94	22.50	1.138	0.069	0.078
	5G NR n5/50RB#1 20M	Front Side	166800	21.91	22.50	1.146	0.352	0.403
	5G NR n5/50RB#1 20M	Front Side	167800	21.90	22.50	1.148	0.275	0.316
Sensor on/Reduced Power Level 2 for EN-DC & Simultaneous transmission (ANT 4)								
	5G NR n5/1RB#1 20M	Front Side	167300	19.17	20.00	1.211	0.109	0.132
	5G NR n5/1RB#1 20M	Back Side	167300	19.17	20.00	1.211	0.052	0.063
	5G NR n5/1RB#1 20M	Left Side	167300	19.17	20.00	1.211	0.069	0.084
	5G NR n5/1RB#1 20M	Bottom Side	167300	19.17	20.00	1.211	0.064	0.077
	5G NR n5/1RB#1 20M	Front Side	166800	19.04	20.00	1.247	0.073	0.091
	5G NR n5/1RB#1 20M	Front Side	167800	19.09	20.00	1.233	0.077	0.095
	5G NR n5/50RB#1 20M	Front Side	167300	18.42	19.00	1.143	0.087	0.100
	5G NR n5/50RB#1 20M	Back Side	167300	18.42	19.00	1.143	0.042	0.048
	5G NR n5/50RB#1 20M	Left Side	167300	18.42	19.00	1.143	0.055	0.063
	5G NR n5/50RB#1 20M	Top Side	167300	18.42	19.00	1.143	0.051	0.059
	5G NR n5/50RB#1 20M	Front Side	166800	18.39	19.00	1.151	0.058	0.067
	5G NR n5/50RB#1 20M	Front Side	167800	18.38	19.00	1.153	0.062	0.071
Sensor on/Reduced Power Level 1 (ANT 2)								
	5G NR n48/1RB#1 40M	Front Side	641666	19.29	20.00	1.178	0.284	0.334
	5G NR n48/1RB#1 40M	Back Side	641666	19.29	20.00	1.178	0.465	0.548
	5G NR n48/1RB#1 40M	Right Side	641666	19.29	20.00	1.178	0.801	0.943
	5G NR n48/1RB#1 40M	Bottom Side	641666	19.29	20.00	1.178	0.199	0.234
13#	5G NR n48/1RB#1 40M	Right Side	638000	19.28	20.00	1.180	0.843	0.995
	5G NR n48/1RB#1 40M	Right Side	639834	19.14	20.00	1.219	0.810	0.987
	5G NR n48/1RB#1 40M	Right Side	643500	19.17	20.00	1.211	0.765	0.926
	5G NR n48/1RB#1 40M	Right Side	645332	19.18	20.00	1.208	0.774	0.935
	5G NR n48/50RB#25 40M	Front Side	638000	18.92	20.00	1.282	0.242	0.310
	5G NR n48/50RB#25 40M	Back Side	638000	18.92	20.00	1.282	0.360	0.462
	5G NR n48/50RB#25 40M	Right Side	638000	18.92	20.00	1.282	0.738	0.946
	5G NR n48/50RB#25 40M	Bottom Side	638000	18.92	20.00	1.282	0.175	0.224
	5G NR n48/50RB#25 40M	Right Side	639834	18.85	20.00	1.303	0.720	0.938
	5G NR n48/50RB#25 40M	Right Side	641666	18.84	20.00	1.306	0.725	0.947
	5G NR n48/50RB#25 40M	Right Side	643500	18.76	20.00	1.330	0.671	0.892
	5G NR n48/50RB#25 40M	Right Side	645332	18.64	20.00	1.368	0.680	0.929

	5G NR n48/100RB#0 40M	Right Side	641666	18.43	20.00	1.435	0.556	0.798
Sensor on/Reduced Power Level 2 for Simultaneous transmission (ANT 2)								
	5G NR n48/1RB#1 40M	Front Side	641666	12.95	14.00	1.274	0.074	0.094
	5G NR n48/1RB#1 40M	Back Side	641666	12.95	14.00	1.274	0.178	0.227
	5G NR n48/1RB#1 40M	Right Side	641666	12.95	14.00	1.274	0.207	0.264
	5G NR n48/1RB#1 40M	Bottom Side	641666	12.95	14.00	1.274	0.072	0.092
	5G NR n48/1RB#1 40M	Right Side	638000	12.91	14.00	1.285	0.171	0.220
	5G NR n48/1RB#1 40M	Right Side	639834	12.82	14.00	1.312	0.187	0.245
	5G NR n48/1RB#1 40M	Right Side	643500	12.84	14.00	1.306	0.174	0.227
	5G NR n48/1RB#1 40M	Right Side	645332	12.63	14.00	1.371	0.169	0.231
	5G NR n48/50RB#1 40M	Front Side	641666	12.81	14.00	1.315	0.068	0.090
	5G NR n48/50RB#1 40M	Back Side	641666	12.81	14.00	1.315	0.164	0.215
	5G NR n48/50RB#1 40M	Right Side	641666	12.81	14.00	1.315	0.190	0.251
	5G NR n48/50RB#1 40M	Bottom Side	641666	12.81	14.00	1.315	0.066	0.087
	5G NR n48/50RB#1 40M	Right Side	638000	12.79	14.00	1.321	0.157	0.208
	5G NR n48/50RB#1 40M	Right Side	639834	12.80	14.00	1.318	0.172	0.227
	5G NR n48/50RB#1 40M	Right Side	643500	12.73	14.00	1.340	0.160	0.214
	5G NR n48/50RB#1 40M	Right Side	645332	12.61	14.00	1.377	0.155	0.214
Sensor off/Full Power (ANT 0)								
	5G NR n66/1RB#1 30M	Front Side	349000	23.01	24.00	1.256	0.221	0.278
	5G NR n66/1RB#1 30M	Back Side	349000	23.01	24.00	1.256	0.240	0.301
	5G NR n66/1RB#1 30M	Right Side	349000	23.01	24.00	1.256	0.257	0.323
	5G NR n66/1RB#1 30M	Top Side	349000	23.01	24.00	1.256	0.393	0.494
	5G NR n66/1RB#1 30M	Top Side	345000	22.95	24.00	1.274	0.381	0.485
14#	5G NR n66/1RB#1 30M	Top Side	353000	22.99	24.00	1.262	0.430	0.543
	5G NR n66/80RB#1 30M	Front Side	349000	22.92	24.00	1.282	0.235	0.301
	5G NR n66/80RB#1 30M	Back Side	349000	22.92	24.00	1.282	0.346	0.444
	5G NR n66/80RB#1 30M	Right Side	349000	22.92	24.00	1.282	0.142	0.182
	5G NR n66/80RB#1 30M	Top Side	349000	22.92	24.00	1.282	0.328	0.421
	5G NR n66/80RB#1 30M	Back Side	345000	22.76	24.00	1.330	0.342	0.455
	5G NR n66/80RB#1 30M	Back Side	353000	22.89	24.00	1.291	0.349	0.451
Sensor on/Reduced Power Level 2 for EN-DC & Simultaneous transmission (ANT 0)								
	5G NR n66/1RB#1 30M	Front Side	349000	21.99	23.00	1.262	0.229	0.289
	5G NR n66/1RB#1 30M	Back Side	349000	21.99	23.00	1.262	0.236	0.298
	5G NR n66/1RB#1 30M	Right Side	349000	21.99	23.00	1.262	0.138	0.174
	5G NR n66/1RB#1 30M	Top Side	349000	21.99	23.00	1.262	0.256	0.323
	5G NR n66/1RB#1 30M	Top Side	345000	21.93	23.00	1.279	0.232	0.297
	5G NR n66/1RB#1 30M	Top Side	353000	21.97	23.00	1.268	0.333	0.422

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	5G NR n66/80RB#1 30M	Front Side	349000	21.90	23.00	1.288	0.213	0.275
	5G NR n66/80RB#1 30M	Back Side	349000	21.90	23.00	1.288	0.220	0.283
	5G NR n66/80RB#1 30M	Right Side	349000	21.90	23.00	1.288	0.129	0.166
	5G NR n66/80RB#1 30M	Top Side	349000	21.90	23.00	1.288	0.239	0.307
	5G NR n66/80RB#1 30M	Top Side	345000	21.74	23.00	1.337	0.216	0.289
	5G NR n66/80RB#1 30M	Top Side	353000	21.87	23.00	1.297	0.310	0.403
Sensor on/Reduced Power Level 2 for EN-DC & Simultaneous transmission (ANT 1)								
	5G NR n66/1RB#1 30M	Front Side	349000	21.49	22.50	1.262	0.219	0.276
	5G NR n66/1RB#1 30M	Back Side	349000	21.49	22.50	1.262	0.088	0.111
	5G NR n66/1RB#1 30M	Right Side	349000	21.49	22.50	1.262	0.070	0.088
	5G NR n66/1RB#1 30M	Bottom Side	349000	21.49	22.50	1.262	0.115	0.146
	5G NR n66/1RB#1 30M	Front Side	345000	21.43	22.50	1.279	0.121	0.155
	5G NR n66/1RB#1 30M	Front Side	353000	21.47	22.50	1.268	0.132	0.168
	5G NR n66/80RB#1 30M	Front Side	349000	21.40	22.50	1.288	0.141	0.182
	5G NR n66/80RB#1 30M	Back Side	349000	21.40	22.50	1.288	0.059	0.076
	5G NR n66/80RB#1 30M	Right Side	349000	21.40	22.50	1.288	0.055	0.071
	5G NR n66/80RB#1 30M	Bottom Side	349000	21.40	22.50	1.288	0.082	0.106
	5G NR n66/80RB#1 30M	Front Side	345000	21.24	22.50	1.337	0.066	0.089
	5G NR n66/80RB#1 30M	Front Side	353000	21.37	22.50	1.297	0.074	0.096
Sensor on/Reduced Power Level 1 (ANT 2) (HPUE)								
	5G NR n77/1RB#1 100M	Front Side	633334	17.80	18.50	1.175	0.163	0.192
	5G NR n77/1RB#1 100M	Back Side	633334	17.80	18.50	1.175	0.482	0.566
	5G NR n77/1RB#1 100M	Right Side	633334	17.80	18.50	1.175	0.799	0.939
	5G NR n77/1RB#1 100M	Bottom Side	633334	17.80	18.50	1.175	0.092	0.108
	5G NR n77/135RB#1 100M	Front Side	633334	17.49	18.00	1.125	0.169	0.190
	5G NR n77/135RB#1 100M	Back Side	633334	17.49	18.00	1.125	0.459	0.516
	5G NR n77/135RB#1 100M	Right Side	633334	17.49	18.00	1.125	0.771	0.867
	5G NR n77/135RB#1 100M	Bottom Side	633334	17.49	18.00	1.125	0.095	0.107
	5G NR n77/270RB#0 100M	Right Side	633334	17.11	18.00	1.227	0.550	0.675
Sensor on/Reduced Power Level 2 for EN-DC & Simultaneous transmission (ANT 2) (HPUE)								
	5G NR n77/1RB#1 100M	Front Side	633334	11.78	12.50	1.180	0.075	0.089
	5G NR n77/1RB#1 100M	Back Side	633334	11.78	12.50	1.180	0.094	0.111
	5G NR n77/1RB#1 100M	Right Side	633334	11.78	12.50	1.180	0.242	0.286
	5G NR n77/1RB#1 100M	Bottom Side	633334	11.78	12.50	1.180	0.049	0.058
	5G NR n77/135RB#1 100M	Front Side	633334	11.47	12.00	1.130	0.071	0.080
	5G NR n77/135RB#1 100M	Back Side	633334	11.47	12.00	1.130	0.088	0.100

	5G NR n77/135RB#1 100M	Right Side	633334	11.47	12.00	1.130	0.227	0.257
	5G NR n77/135RB#1 100M	Bottom Side	633334	11.47	12.00	1.130	0.046	0.052
Sensor on/Reduced Power Level 2 for EN-DC (ANT 3) (HPUE)								
	5G NR n77/1RB#1 100M	Front Side	633334	18.80	19.50	1.175	0.206	0.242
	5G NR n77/1RB#1 100M	Back Side	633334	18.80	19.50	1.175	0.262	0.308
	5G NR n77/1RB#1 100M	Left Side	633334	18.80	19.50	1.175	0.814	0.956
	5G NR n77/1RB#1 100M	Bottom Side	633334	18.80	19.50	1.175	0.091	0.107
	5G NR n77/135RB#1 100M	Front Side	633334	18.49	19.00	1.125	0.069	0.078
	5G NR n77/135RB#1 100M	Back Side	633334	18.49	19.00	1.125	0.158	0.177
	5G NR n77/135RB#1 100M	Left Side	633334	18.49	19.00	1.125	0.660	0.743
	5G NR n77/135RB#1 100M	Bottom Side	633334	18.49	19.00	1.125	0.097	0.109
	5G NR n77/270RB#0 100M	Left Side	633334	17.41	19.00	1.442	0.515	0.743
Sensor on/Reduced Power Level 1 (ANT 2)								
	5G NR n77/1RB#1 100M	Front Side	633334	17.69	18.50	1.205	0.225	0.271
	5G NR n77/1RB#1 100M	Back Side	633334	17.69	18.50	1.205	0.412	0.496
	5G NR n77/1RB#1 100M	Right Side	633334	17.69	18.50	1.205	0.773	0.931
	5G NR n77/1RB#1 100M	Bottom Side	633334	17.69	18.50	1.205	0.119	0.143
	5G NR n77/135RB#1 100M	Front Side	633334	16.94	18.00	1.276	0.248	0.316
	5G NR n77/135RB#1 100M	Back Side	633334	16.94	18.00	1.276	0.325	0.415
	5G NR n77/135RB#1 100M	Right Side	633334	16.94	18.00	1.276	0.596	0.761
	5G NR n77/135RB#1 100M	Bottom Side	633334	16.94	18.00	1.276	0.103	0.131
	5G NR n77/270RB#0 100M	Right Side	633334	16.88	18.00	1.294	0.535	0.692
Sensor on/Reduced Power Level 2 for EN-DC & Simultaneous transmission (ANT 2)								
	5G NR n77/1RB#1 100M	Front Side	633334	11.57	12.50	1.239	0.056	0.069
	5G NR n77/1RB#1 100M	Back Side	633334	11.57	12.50	1.239	0.148	0.183
	5G NR n77/1RB#1 100M	Right Side	633334	11.57	12.50	1.239	0.153	0.190
	5G NR n77/1RB#1 100M	Bottom Side	633334	11.57	12.50	1.239	0.053	0.066
	5G NR n77/135RB#1 100M	Front Side	633334	10.92	12.00	1.282	0.052	0.066
	5G NR n77/135RB#1 100M	Back Side	633334	10.92	12.00	1.282	0.137	0.175
	5G NR n77/135RB#1 100M	Right Side	633334	10.92	12.00	1.282	0.141	0.181
	5G NR n77/135RB#1 100M	Bottom Side	633334	10.92	12.00	1.282	0.049	0.063
Sensor on/Reduced Power Level 2 for EN-DC (ANT 3)								
	5G NR n77/1RB#1 100M	Front Side	633334	18.80	19.50	1.175	0.093	0.110
	5G NR n77/1RB#1 100M	Back Side	633334	18.80	19.50	1.175	0.229	0.269
	5G NR n77/1RB#1 100M	Left Side	633334	18.80	19.50	1.175	0.781	0.918
	5G NR n77/1RB#1 100M	Bottom Side	633334	18.80	19.50	1.175	0.103	0.121
	5G NR n77/135RB#1 100M	Front Side	633334	18.49	19.00	1.125	0.065	0.073

	5G NR n77/135RB#1 100M	Back Side	633334	18.49	19.00	1.125	0.140	0.158
	5G NR n77/135RB#1 100M	Left Side	633334	18.49	19.00	1.125	0.725	0.815
	5G NR n77/135RB#1 100M	Bottom Side	633334	18.49	19.00	1.125	0.106	0.120
	5G NR n77/270RB#0 100M	Left Side	633334	17.11	19.00	1.545	0.612	0.946
Sensor on/Reduced Power Level 1 (ANT 2) (HPUE)								
	5G NR n77/1RB#1 100M	Front Side	656000	17.76	18.50	1.186	0.254	0.302
	5G NR n77/1RB#1 100M	Back Side	656000	17.76	18.50	1.186	0.408	0.484
	5G NR n77/1RB#1 100M	Right Side	656000	17.76	18.50	1.186	0.774	0.918
	5G NR n77/1RB#1 100M	Bottom Side	656000	17.76	18.50	1.186	0.096	0.114
	5G NR n77/1RB#1 100M	Right Side	650000	17.60	18.50	1.230	0.772	0.950
	5G NR n77/1RB#1 100M	Right Side	653000	17.65	18.50	1.216	0.742	0.902
	5G NR n77/1RB#1 100M	Right Side	659000	17.68	18.50	1.208	0.789	0.953
	5G NR n77/1RB#1 100M	Right Side	662000	17.67	18.50	1.211	0.771	0.933
	5G NR n77/135RB#1 100M	Front Side	656000	16.61	17.50	1.227	0.215	0.263
	5G NR n77/135RB#1 100M	Back Side	656000	16.61	17.50	1.227	0.359	0.440
	5G NR n77/135RB#1 100M	Right Side	656000	16.61	17.50	1.227	0.783	0.962
	5G NR n77/135RB#1 100M	Bottom Side	656000	16.61	17.50	1.227	0.112	0.137
	5G NR n77/135RB#1 100M	Right Side	650000	16.52	17.50	1.253	0.753	0.943
	5G NR n77/135RB#1 100M	Right Side	653000	16.54	17.50	1.247	0.745	0.930
	5G NR n77/135RB#1 100M	Right Side	659000	16.58	17.50	1.236	0.741	0.916
	5G NR n77/135RB#1 100M	Right Side	662000	16.55	17.50	1.245	0.791	0.984
	5G NR n77/270RB#0 100M	Right Side	656000	16.37	17.50	1.297	0.612	0.794
Sensor on/Reduced Power Level 2 for EN-DC & Simultaneous transmission (ANT 2) (HPUE)								
	5G NR n77/1RB#1 100M	Front Side	656000	10.76	11.50	1.186	0.083	0.098
	5G NR n77/1RB#1 100M	Back Side	656000	10.76	11.50	1.186	0.061	0.072
	5G NR n77/1RB#1 100M	Right Side	656000	10.76	11.50	1.186	0.094	0.111
	5G NR n77/1RB#1 100M	Bottom Side	656000	10.76	11.50	1.186	0.075	0.089
	5G NR n77/1RB#1 100M	Right Side	650000	9.95	11.50	1.429	0.207	0.296
	5G NR n77/1RB#1 100M	Right Side	653000	9.60	11.50	1.549	0.186	0.288
	5G NR n77/1RB#1 100M	Right Side	659000	9.98	11.50	1.419	0.192	0.272
	5G NR n77/1RB#1 100M	Right Side	662000	10.17	11.50	1.358	0.199	0.270
	5G NR n77/135RB#1 100M	Front Side	656000	9.61	10.50	1.227	0.079	0.097
	5G NR n77/135RB#1 100M	Back Side	656000	9.61	10.50	1.227	0.058	0.071
	5G NR n77/135RB#1 100M	Right Side	656000	9.61	10.50	1.227	0.089	0.110
	5G NR n77/135RB#1 100M	Bottom Side	656000	9.61	10.50	1.227	0.071	0.087
	5G NR n77/135RB#1 100M	Right Side	650000	9.62	10.50	1.225	0.210	0.257

	5G NR n77/135RB#1 100M	Right Side	653000	9.49	10.50	1.262	0.177	0.223
	5G NR n77/135RB#1 100M	Right Side	659000	9.53	10.50	1.250	0.182	0.228
	5G NR n77/135RB#1 100M	Right Side	662000	9.58	10.50	1.236	0.189	0.234
Sensor on/Reduced Power Level 2 for EN-DC (ANT 3) (HPUE)								
	5G NR n77/1RB#1 100M	Front Side	656000	17.20	18.00	1.202	0.121	0.145
	5G NR n77/1RB#1 100M	Back Side	656000	17.20	18.00	1.202	0.329	0.396
	5G NR n77/1RB#1 100M	Left Side	656000	17.20	18.00	1.202	0.768	0.923
	5G NR n77/1RB#1 100M	Bottom Side	656000	17.20	18.00	1.202	0.109	0.131
	5G NR n77/1RB#1 100M	Left Side	650000	17.02	18.00	1.253	0.739	0.926
	5G NR n77/1RB#1 100M	Left Side	653000	17.13	18.00	1.222	0.660	0.806
	5G NR n77/1RB#1 100M	Left Side	659000	17.18	18.00	1.208	0.797	0.962
15#	5G NR n77/1RB#1 100M	Left Side	662000	16.97	18.00	1.268	0.817	1.036
	5G NR n77/135RB#1 100M	Front Side	656000	16.61	17.50	1.227	0.117	0.144
	5G NR n77/135RB#1 100M	Back Side	656000	16.61	17.50	1.227	0.264	0.324
	5G NR n77/135RB#1 100M	Left Side	656000	16.61	17.50	1.227	0.814	0.999
	5G NR n77/135RB#1 100M	Bottom Side	656000	16.61	17.50	1.227	0.154	0.189
	5G NR n77/135RB#1 100M	Left Side	650000	16.52	17.50	1.253	0.682	0.854
	5G NR n77/135RB#1 100M	Left Side	653000	16.54	17.50	1.247	0.766	0.956
	5G NR n77/135RB#1 100M	Left Side	659000	16.58	17.50	1.236	0.712	0.880
	5G NR n77/135RB#1 100M	Left Side	662000	16.55	17.50	1.245	0.806	1.004
	5G NR n77/270RB#0 100M	Left Side	656000	16.47	17.50	1.268	0.613	0.777
Sensor on/Reduced Power Level 1 (ANT 2)								
	5G NR n77/1RB#1 100M	Front Side	656000	17.70	18.50	1.202	0.248	0.298
	5G NR n77/1RB#1 100M	Back Side	656000	17.70	18.50	1.202	0.545	0.655
	5G NR n77/1RB#1 100M	Right Side	656000	17.70	18.50	1.202	0.744	0.894
	5G NR n77/1RB#1 100M	Bottom Side	656000	17.70	18.50	1.202	0.257	0.309
	5G NR n77/1RB#1 100M	Right Side	650000	17.52	18.50	1.253	0.768	0.963
	5G NR n77/1RB#1 100M	Right Side	653000	17.63	18.50	1.222	0.782	0.956
	5G NR n77/1RB#1 100M	Right Side	659000	17.55	18.50	1.245	0.737	0.917
	5G NR n77/1RB#1 100M	Right Side	662000	17.52	18.50	1.253	0.809	1.014
	5G NR n77/135RB#1 100M	Front Side	656000	17.36	18.00	1.159	0.212	0.246
	5G NR n77/135RB#1 100M	Back Side	656000	17.36	18.00	1.159	0.425	0.493
	5G NR n77/135RB#1 100M	Right Side	656000	17.36	18.00	1.159	0.619	0.717
	5G NR n77/135RB#1 100M	Bottom Side	656000	17.36	18.00	1.159	0.078	0.090
	5G NR n77/135RB#1 100M	Right Side	650000	17.12	18.00	1.225	0.712	0.872
	5G NR n77/135RB#1 100M	Right Side	653000	16.91	18.00	1.285	0.676	0.869
	5G NR n77/135RB#1 100M	Right Side	659000	17.07	18.00	1.239	0.697	0.863

	5G NR n77/135RB#1 100M	Right Side	662000	17.27	18.00	1.183	0.707	0.837
	5G NR n77/270RB#0 100M	Right Side	656000	17.30	18.00	1.175	0.575	0.676
Sensor on/Reduced Power Level 2 for EN-DC & Simultaneous transmission (ANT 2)								
	5G NR n77/1RB#1 100M	Front Side	656000	10.70	11.50	1.202	0.071	0.085
	5G NR n77/1RB#1 100M	Back Side	656000	10.70	11.50	1.202	0.066	0.079
	5G NR n77/1RB#1 100M	Right Side	656000	10.70	11.50	1.202	0.182	0.219
	5G NR n77/1RB#1 100M	Bottom Side	656000	10.70	11.50	1.202	0.050	0.060
	5G NR n77/1RB#1 100M	Right Side	650000	10.02	11.50	1.406	0.121	0.170
	5G NR n77/1RB#1 100M	Right Side	653000	10.52	11.50	1.253	0.124	0.155
	5G NR n77/1RB#1 100M	Right Side	659000	10.33	11.50	1.309	0.164	0.215
	5G NR n77/1RB#1 100M	Right Side	662000	10.42	11.50	1.282	0.108	0.138
	5G NR n77/135RB#1 100M	Front Side	656000	10.36	11.00	1.159	0.067	0.078
	5G NR n77/135RB#1 100M	Back Side	656000	10.36	11.00	1.159	0.063	0.073
	5G NR n77/135RB#1 100M	Right Side	656000	10.36	11.00	1.159	0.173	0.200
	5G NR n77/135RB#1 100M	Bottom Side	656000	10.36	11.00	1.159	0.048	0.055
	5G NR n77/135RB#1 100M	Right Side	650000	10.12	11.00	1.225	0.115	0.141
	5G NR n77/135RB#1 100M	Right Side	653000	10.19	11.00	1.205	0.118	0.142
	5G NR n77/135RB#1 100M	Right Side	659000	10.07	11.00	1.239	0.156	0.193
	5G NR n77/135RB#1 100M	Right Side	662000	10.27	11.00	1.183	0.103	0.121
Sensor on/Reduced Power Level 2 for EN-DC (ANT 3)								
	5G NR n77/1RB#1 100M	Front Side	656000	17.20	18.00	1.202	0.134	0.161
	5G NR n77/1RB#1 100M	Back Side	656000	17.20	18.00	1.202	0.291	0.350
	5G NR n77/1RB#1 100M	Left Side	656000	17.20	18.00	1.202	0.670	0.805
	5G NR n77/1RB#1 100M	Bottom Side	656000	17.20	18.00	1.202	0.107	0.128
	5G NR n77/1RB#1 100M	Left Side	650000	17.02	18.00	1.253	0.662	0.830
	5G NR n77/1RB#1 100M	Left Side	653000	17.13	18.00	1.222	0.600	0.733
	5G NR n77/1RB#1 100M	Left Side	659000	17.05	18.00	1.245	0.602	0.750
	5G NR n77/1RB#1 100M	Left Side	662000	17.02	18.00	1.253	0.689	0.863
	5G NR n77/135RB#1 100M	Front Side	656000	16.86	17.50	1.159	0.103	0.119
	5G NR n77/135RB#1 100M	Back Side	656000	16.86	17.50	1.159	0.329	0.381
	5G NR n77/135RB#1 100M	Left Side	656000	16.86	17.50	1.159	0.626	0.726
	5G NR n77/135RB#1 100M	Bottom Side	656000	16.86	17.50	1.159	0.083	0.096
	5G NR n77/135RB#1 100M	Left Side	650000	16.62	17.50	1.225	0.646	0.791
	5G NR n77/135RB#1 100M	Left Side	653000	16.41	17.50	1.285	0.648	0.833
	5G NR n77/135RB#1 100M	Left Side	659000	16.57	17.50	1.239	0.607	0.752
	5G NR n77/135RB#1 100M	Left Side	662000	16.77	17.50	1.183	0.817	0.967
	5G NR n77/270RB#0 100M	Left Side	656000	16.80	17.50	1.175	0.571	0.671
Sensor on/Reduced Power Level 1 (ANT 2)								

(HPUE)								
	5G NR n78/1RB#1 100M	Front Side	633334	20.06	21.00	1.242	0.145	0.180
	5G NR n78/1RB#1 100M	Back Side	633334	20.06	21.00	1.242	0.358	0.444
	5G NR n78/1RB#1 100M	Right Side	633334	20.06	21.00	1.242	0.816	1.013
	5G NR n78/1RB#1 100M	Bottom Side	633334	20.06	21.00	1.242	0.076	0.095
	5G NR n78/135RB#67 100M	Front Side	633334	19.62	20.00	1.091	0.131	0.143
	5G NR n78/135RB#67 100M	Back Side	633334	19.62	20.00	1.091	0.320	0.349
	5G NR n78/135RB#67 100M	Right Side	633334	19.62	20.00	1.091	0.796	0.869
	5G NR n78/135RB#67 100M	Bottom Side	633334	19.62	20.00	1.091	0.074	0.081
	5G NR n78/270RB#0 100M	Right Side	633334	18.55	20.00	1.396	0.529	0.739
Sensor on/Reduced Power Level 2 for Simultaneous transmission (ANT 2) (HPUE)								
	5G NR n78/1RB#1 100M	Front Side	633334	11.06	12.00	1.242	0.065	0.081
	5G NR n78/1RB#1 100M	Back Side	633334	11.06	12.00	1.242	0.150	0.186
	5G NR n78/1RB#1 100M	Right Side	633334	11.06	12.00	1.242	0.217	0.269
	5G NR n78/1RB#1 100M	Bottom Side	633334	11.06	12.00	1.242	0.054	0.067
	5G NR n78/135RB#67 100M	Front Side	633334	10.66	11.50	1.213	0.058	0.070
	5G NR n78/135RB#67 100M	Back Side	633334	10.66	11.50	1.213	0.134	0.162
	5G NR n78/135RB#67 100M	Right Side	633334	10.66	11.50	1.213	0.193	0.234
	5G NR n78/135RB#67 100M	Bottom Side	633334	10.66	11.50	1.213	0.048	0.058
Sensor on/Reduced Power Level 1 (ANT 2)								
	5G NR n78/1RB#1 100M	Front Side	633334	20.17	21.00	1.211	0.142	0.172
	5G NR n78/1RB#1 100M	Back Side	633334	20.17	21.00	1.211	0.328	0.397
16#	5G NR n78/1RB#1 100M	Right Side	633334	20.17	21.00	1.211	0.838	1.014
	5G NR n78/1RB#1 100M	Bottom Side	633334	20.17	21.00	1.211	0.081	0.098
	5G NR n78/135RB#67 100M	Front Side	633334	19.61	20.00	1.094	0.146	0.160
	5G NR n78/135RB#67 100M	Back Side	633334	19.61	20.00	1.094	0.315	0.344
	5G NR n78/135RB#67 100M	Right Side	633334	19.61	20.00	1.094	0.769	0.841
	5G NR n78/135RB#67 100M	Bottom Side	633334	19.61	20.00	1.094	0.081	0.089
	5G NR n78/270RB#0 100M	Right Side	633334	19.11	20.00	1.227	0.538	0.660
Sensor on/Reduced Power Level 2 for Simultaneous transmission (ANT 2)								
	5G NR n78/1RB#1 100M	Front Side	633334	11.12	12.00	1.225	0.057	0.070
	5G NR n78/1RB#1 100M	Back Side	633334	11.12	12.00	1.225	0.142	0.174
	5G NR n78/1RB#1 100M	Right Side	633334	11.12	12.00	1.225	0.200	0.245
	5G NR n78/1RB#1 100M	Bottom Side	633334	11.12	12.00	1.225	0.065	0.080
	5G NR n78/135RB#67 100M	Front Side	633334	10.61	11.50	1.227	0.052	0.064
	5G NR n78/135RB#67 100M	Back Side	633334	10.61	11.50	1.227	0.131	0.160
	5G NR n78/135RB#67 100M	Right Side	633334	10.61	11.50	1.227	0.184	0.226

	5G NR n78/135RB#67 100M	Bottom Side	633334	10.61	11.50	1.227	0.060	0.073
Sensor on/Reduced Power Level 1 (ANT 2) (HPUE)								
	5G NR n78/1RB#1 100M	Front Side	650000	19.90	20.50	1.148	0.148	0.170
	5G NR n78/1RB#1 100M	Back Side	650000	19.90	20.50	1.148	0.264	0.304
	5G NR n78/1RB#1 100M	Right Side	650000	19.90	20.50	1.148	0.856	0.983
	5G NR n78/1RB#1 100M	Bottom Side	650000	19.90	20.50	1.148	0.247	0.284
	5G NR n78/135RB#67 100M	Front Side	650000	19.21	20.00	1.199	0.119	0.142
	5G NR n78/135RB#67 100M	Back Side	650000	19.21	20.00	1.199	0.209	0.250
	5G NR n78/135RB#67 100M	Right Side	650000	19.21	20.00	1.199	0.744	0.892
	5G NR n78/135RB#67 100M	Bottom Side	650000	19.21	20.00	1.199	0.237	0.284
	5G NR n78/270RB#0 100M	Right Side	650000	18.17	20.00	1.524	0.566	0.863
Sensor on/Reduced Power Level 2 for Simultaneous transmission (ANT 2) (HPUE)								
	5G NR n78/1RB#1 100M	Front Side	650000	10.90	12.00	1.288	0.069	0.089
	5G NR n78/1RB#1 100M	Back Side	650000	10.90	12.00	1.288	0.125	0.161
	5G NR n78/1RB#1 100M	Right Side	650000	10.90	12.00	1.288	0.226	0.291
	5G NR n78/1RB#1 100M	Bottom Side	650000	10.90	12.00	1.288	0.070	0.090
	5G NR n78/135RB#67 100M	Front Side	650000	10.21	11.00	1.199	0.062	0.075
	5G NR n78/135RB#67 100M	Back Side	650000	10.21	11.00	1.199	0.113	0.135
	5G NR n78/135RB#67 100M	Right Side	650000	10.21	11.00	1.199	0.227	0.272
	5G NR n78/135RB#67 100M	Bottom Side	650000	10.21	11.00	1.199	0.063	0.076
Sensor on/Reduced Power Level 1 (ANT 2)								
	5G NR n78/1RB#1 100M	Front Side	650000	19.80	20.50	1.175	0.174	0.205
	5G NR n78/1RB#1 100M	Back Side	650000	19.80	20.50	1.175	0.325	0.382
	5G NR n78/1RB#1 100M	Right Side	650000	19.80	20.50	1.175	0.856	1.006
	5G NR n78/1RB#1 100M	Bottom Side	650000	19.80	20.50	1.175	0.200	0.235
	5G NR n78/135RB#1 100M	Front Side	650000	19.20	20.00	1.202	0.179	0.215
	5G NR n78/135RB#1 100M	Back Side	650000	19.20	20.00	1.202	0.295	0.355
	5G NR n78/135RB#1 100M	Right Side	650000	19.20	20.00	1.202	0.754	0.907
	5G NR n78/135RB#1 100M	Bottom Side	650000	19.20	20.00	1.202	0.178	0.214
	5G NR n78/270RB#0 100M	Right Side	650000	17.15	18.00	1.216	0.560	0.681
Sensor on/Reduced Power Level 2 for Simultaneous transmission (ANT 2)								
	5G NR n78/1RB#1 100M	Front Side	650000	10.90	12.00	1.288	0.065	0.084
	5G NR n78/1RB#1 100M	Back Side	650000	10.90	12.00	1.288	0.153	0.197
	5G NR n78/1RB#1 100M	Right Side	650000	10.90	12.00	1.288	0.221	0.285
	5G NR n78/1RB#1 100M	Bottom Side	650000	10.90	12.00	1.288	0.071	0.091
	5G NR n78/135RB#1 100M	Front Side	650000	10.19	11.00	1.205	0.057	0.069

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	5G NR n78/135RB#1 100M	Back Side	650000	10.19	11.00	1.205	0.135	0.162
	5G NR n78/135RB#1 100M	Right Side	650000	10.19	11.00	1.205	0.194	0.234
	5G NR n78/135RB#1 100M	Bottom Side	650000	10.19	11.00	1.205	0.062	0.075

➢ **WLAN 2.4GHz/5GHz 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)
Sensor off/Full Power (WIFI 1)								
	WLAN2.4GHz/802.11b	Front Side	1	17.42	18.50	1.282	0.200	0.259
	WLAN2.4GHz/802.11b	Back Side	1	17.42	18.50	1.282	0.269	0.348
	WLAN2.4GHz/802.11b	Right Side	1	17.42	18.50	1.282	0.281	0.363
	WLAN2.4GHz/802.11b	Bottom Side	1	17.42	18.50	1.282	0.156	0.202
	WLAN2.4GHz/802.11b	Right Side	7	17.36	18.50	1.300	0.146	0.190
	WLAN2.4GHz/802.11b	Right Side	13	15.86	16.50	1.159	0.226	0.263
Sensor off/Full Power (WIFI 2)								
17#	WLAN2.4GHz/802.11b	Front Side	1	17.76	18.50	1.186	0.418	0.500
	WLAN2.4GHz/802.11b	Back Side	1	17.76	18.50	1.186	0.149	0.178
	WLAN2.4GHz/802.11b	Left Side	1	17.76	18.50	1.186	0.029	0.035
	WLAN2.4GHz/802.11b	Top Side	1	17.76	18.50	1.186	0.193	0.231
	WLAN2.4GHz/802.11b	Front Side	7	17.52	18.00	1.117	0.104	0.117
	WLAN2.4GHz/802.11b	Front Side	13	15.46	16.00	1.132	0.121	0.138
Sensor off/Full Power (MIMO)								
	WLAN2.4GHz/802.11n20	Front Side	7	18.06	19.00	1.242	0.081	0.101
	WLAN2.4GHz/802.11n20	Back Side	7	18.06	19.00	1.242	0.055	0.068
	WLAN2.4GHz/802.11n20	Left Side	7	18.06	19.00	1.242	0.058	0.072
	WLAN2.4GHz/802.11n20	Right Side	7	18.06	19.00	1.242	0.116	0.144
	WLAN2.4GHz/802.11n20	Top Side	7	18.06	19.00	1.242	0.049	0.061
	WLAN2.4GHz/802.11n20	Bottom Side	7	18.06	19.00	1.242	0.051	0.064
	WLAN2.4GHz/802.11n20	Right Side	1	17.35	18.00	1.161	0.110	0.128
	WLAN2.4GHz/802.11n20	Right Side	13	11.90	13.00	1.288	0.182	0.236
Sensor off/Full Power (WIFI 1)								
	WLAN5.2GHz/802.11a	Front Side	44	15.63	16.50	1.222	0.131	0.160
	WLAN5.2GHz/802.11a	Back Side	44	15.63	16.50	1.222	0.100	0.122
18#	WLAN5.2GHz/802.11a	Right Side	44	15.63	16.50	1.222	0.460	0.562
	WLAN5.2GHz/802.11a	Bottom Side	44	15.63	16.50	1.222	0.244	0.298
	WLAN5.2GHz/802.11a	Right Side	36	15.62	16.50	1.225	0.449	0.550
	WLAN5.2GHz/802.11a	Right Side	48	15.30	16.00	1.175	0.418	0.491
Sensor off/Full Power (WIFI 2)								

	WLAN5.2GHz/802.11a	Front Side	36	15.93	16.50	1.140	0.072	0.082
	WLAN5.2GHz/802.11a	Back Side	36	15.93	16.50	1.140	0.068	0.078
	WLAN5.2GHz/802.11a	Left Side	36	15.93	16.50	1.140	0.066	0.075
	WLAN5.2GHz/802.11a	Top Side	36	15.93	16.50	1.140	0.118	0.135
	WLAN5.2GHz/802.11a	Top Side	44	15.79	16.50	1.178	0.108	0.128
	WLAN5.2GHz/802.11a	Top Side	48	15.53	16.00	1.114	0.103	0.115
Sensor off/Full Power (MIMO)								
	WLAN5.2GHz/802.11n20	Front Side	44	18.03	18.50	1.114	0.110	0.123
	WLAN5.2GHz/802.11n20	Back Side	44	18.03	18.50	1.114	0.080	0.089
	WLAN5.2GHz/802.11n20	Left Side	44	18.03	18.50	1.114	0.075	0.084
	WLAN5.2GHz/802.11n20	Right Side	44	18.03	18.50	1.114	0.276	0.307
	WLAN5.2GHz/802.11n20	Top Side	44	18.03	18.50	1.114	0.181	0.202
	WLAN5.2GHz/802.11n20	Bottom Side	44	18.03	18.50	1.114	0.195	0.217
	WLAN5.2GHz/802.11n20	Right Side	36	18.02	18.50	1.117	0.267	0.298
	WLAN5.2GHz/802.11n20	Right Side	48	17.72	18.50	1.197	0.301	0.360
Sensor off/Full Power (WIFI 1)								
	WLAN5.8GHz/802.11a	Front Side	149	15.16	16.00	1.213	0.137	0.166
	WLAN5.8GHz/802.11a	Back Side	149	15.16	16.00	1.213	0.249	0.302
	WLAN5.8GHz/802.11a	Right Side	149	15.16	16.00	1.213	0.390	0.473
	WLAN5.8GHz/802.11a	Bottom Side	149	15.16	16.00	1.213	0.206	0.249
	WLAN5.8GHz/802.11a	Right Side	157	15.00	15.50	1.122	0.456	0.512
	WLAN5.8GHz/802.11a	Right Side	165	15.05	15.50	1.109	0.428	0.474
Sensor off/Full Power (WIFI 2)								
	WLAN5.8GHz/802.11a	Front Side	157	15.60	16.50	1.230	0.140	0.172
	WLAN5.8GHz/802.11a	Back Side	157	15.60	16.50	1.230	0.139	0.171
	WLAN5.8GHz/802.11a	Left Side	157	15.60	16.50	1.230	0.036	0.044
	WLAN5.8GHz/802.11a	Top Side	157	15.60	16.50	1.230	0.181	0.223
	WLAN5.8GHz/802.11a	Top Side	149	15.39	16.00	1.151	0.177	0.204
	WLAN5.8GHz/802.11a	Top Side	165	15.52	16.50	1.253	0.167	0.209
Sensor off/Full Power (MIMO)								
	WLAN5.8GHz/802.11n40	Front Side	151	18.23	19.00	1.194	0.215	0.257
	WLAN5.8GHz/802.11n40	Back Side	151	18.23	19.00	1.194	0.176	0.210
	WLAN5.8GHz/802.11n40	Left Side	151	18.23	19.00	1.194	0.076	0.091
	WLAN5.8GHz/802.11n40	Right Side	151	18.23	19.00	1.194	0.421	0.503
	WLAN5.8GHz/802.11n40	Top Side	151	18.23	19.00	1.194	0.188	0.224
	WLAN5.8GHz/802.11n40	Bottom Side	151	18.23	19.00	1.194	0.193	0.231
19#	WLAN5.8GHz/802.11n40	Right Side	159	18.07	19.00	1.239	0.454	0.562

Note:

1. Per KDB 447498 D01v06, for each exposure position, if the highest output power channel Reported SAR ≤ 0.8W/kg, other channels SAR testing is not necessary.
2. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required when the measured SAR is ≥ 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 ≤ 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 ≤ 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 ≤ 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. For TDD-LTE, the reported SAR should be scaled with the duty cycle scaling factor 1.006.
8. The WLAN 2.4GHz 802.11 b reported 1g SAR (W/kg) should be scaled with the duty cycle scaling factor 1.008/1.003(WIFI 1 CH 7)/1.004(WIFI 1 CH 13), WLAN 2.4GHz 802.11n20 with 1.003 and WLAN 5GHz with 1.000.

20.3. Repeated SAR Assessment

➢ **General Note**

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.

➢ **Test Results**

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)
Sensor on/Reduced Power Level 1 (ANT 2)								
OR.	LTE Band 48/1RB#0 20M	Right Side	56640	20.10	21.00	1.230	0.800	0.990
1st	LTE Band 48/1RB#0 20M	Right Side	56640	20.10	21.00	1.230	0.783	0.969
Sensor on/Reduced Power Level 1 (ANT 2)								
OR.	5G NR n48/1RB#1 40M	Right Side	638000	19.28	20.00	1.180	0.843	0.995
1st	5G NR n48/1RB#1 40M	Right Side	638000	19.28	20.00	1.180	0.813	0.960
Sensor on/Reduced Power Level 1 (ANT 2)								
OR.	5G NR n77/1RB#1 100M	Right Side	662000	17.52	18.50	1.253	0.809	1.014
1st	5G NR n77/1RB#1 100M	Right Side	662000	17.52	18.50	1.253	0.785	0.984
Sensor on/Reduced Power Level 2 for EN-DC (ANT 3) (HPUE)								
OR.	5G NR n77/1RB#1 100M	Left Side	633334	18.80	19.50	1.175	0.814	0.956
1st	5G NR n77/1RB#1 100M	Left Side	633334	18.80	19.50	1.175	0.793	0.932
Sensor on/Reduced Power Level 2 for EN-DC (ANT 3) (HPUE)								
OR.	5G NR n77/1RB#1 100M	Left Side	662000	16.97	18.00	1.268	0.817	1.036
1st	5G NR n77/1RB#1 100M	Left Side	662000	16.97	18.00	1.268	0.801	1.015

Sensor on/Reduced Power Level 2 for EN-DC (ANT 3)								
OR.	5G NR n77/135RB#1 100M	Left Side	662000	16.77	17.50	1.183	0.817	0.967
1st	5G NR n77/135RB#1 100M	Left Side	662000	16.77	17.50	1.183	0.792	0.937
Sensor on/Reduced Power Level 1 (ANT 2) (HPUE)								
OR.	5G NR n78/1RB#1 100M	Right Side	633334	18.06	19.00	1.242	0.816	1.013
1st	5G NR n78/1RB#1 100M	Right Side	633334	18.06	19.00	1.242	0.807	1.002
Sensor on/Reduced Power Level 1 (ANT 2)								
OR.	5G NR n78/1RB#1 100M	Right Side	633334	18.17	19.00	1.211	0.838	1.014
1st	5G NR n78/1RB#1 100M	Right Side	633334	18.17	19.00	1.211	0.782	0.947
Sensor on/Reduced Power Level 1 (ANT 2) (HPUE)								
OR.	5G NR n78/1RB#1 100M	Right Side	650000	17.90	18.50	1.148	0.856	0.983
1st	5G NR n78/1RB#1 100M	Right Side	650000	17.90	18.50	1.148	0.834	0.958
Sensor on/Reduced Power Level 1 (ANT 2)								
OR.	5G NR n78/1RB#1 100M	Right Side	650000	17.80	18.50	1.175	0.856	1.006
1st	5G NR n78/1RB#1 100M	Right Side	650000	17.80	18.50	1.175	0.827	0.972

21. Simultaneous Transmission Evaluation

21.1. Simultaneous Transmission Consideration

No.	Simultaneous Transmission Consideration	Body
1	WWAN(3G/4G/5G SA)+WLAN 2.4GHz/5GHz (SISO/MIMO)	Yes
2	WWAN(3G/4G/5G SA)+WLAN 2.4GHz (SISO/MIMO)+WLAN 5GHz (SISO/MIMO)	Yes
3	WWAN(5G FR1 NSA)+WLAN 2.4GHz/5GHz (SISO/MIMO)	Yes
4	WWAN(5G FR1 NSA)+WLAN 2.4GHz (SISO/MIMO)+WLAN 5GHz (SISO/MIMO)	Yes
5	WWAN(5G FR2 NSA)+WLAN 2.4GHz/5GHz (SISO/MIMO)	Yes
6	WWAN(5G FR2 NSA)+WLAN 2.4GHz (SISO/MIMO)+WLAN 5GHz (SISO/MIMO)	Yes

Note:

1. 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.
2. 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.
3. Per KDB 447498D01v06, simultaneous transmission SAR evaluation procedures is as followed:
   Step 1: If sum of 1 g SAR < 1.6 W/kg, Simultaneous SAR measurement is not required.
   Step 2: If sum of 1 g SAR > 1.6 W/kg, ratio of SAR to peak separation distance for pair of transmitters calculated.
   Step 3: If the ratio of SAR to peak separation distance is ≤ 0.04, Simultaneous SAR measurement is not required.
   Step 4: If the ratio of SAR to peak separation distance is > 0.04, Simultaneous SAR measurement is required and simultaneous transmission SAR value is calculated.
   (The ratio is determined by: $(SAR1 + SAR2)^{1.5}/Ri \le 0.04$,
   Ri is the separation distance between the peak SAR locations for the antenna pair in mm.

21.2. Simultaneous Transmission Analysis

The EUT supports simultaneous transmission of multiple radios. RF exposure compliance in simultaneous transmission scenarios is evaluated in this section.

It must be noted here that Qualcomm Smart Transmit time-averaging algorithm was applied to only WWAN, where the time-averaged power level is controlled so that RF exposure is ≤ SAR_design_target for sub-6 WWAN. Since there is total design-related uncertainty arising from

TxAGC and device-to-device variation, the worst-case RF exposure should be determined by accounting for this uncertainty in the corresponding design target, thus, with 1dB of device uncertainty for sub-6 WWAN. Therefore, the worst-case RF exposure for this EUT is:

Worst-case Time-averaged RF Exposure for WWAN

Title	WWAN Wireless System
	Sub-6G
Maximum time-averaged power level	Plimit
Maximum time-averaged exposure	SAR_design_target=0.8W/kg (1g SAR)
Maximum Design-related uncertainty	1.0 dB
Worst-case time-averaged RF exposure	Reported SAR =1.0W/kg (1g)

Note:

The highest SAR value obtained from UL FCC SAR Test Report. For scenarios where (P_{limit} + 1.0dB uncertainty) ≥ P_{max} (maximum RF tune-up output power), time-averaged SAR exposure from Smart Transmit enabled EUT (at P_{limi}t) cannot exceed reported SAR corresponding to P_{max}.

RF exposure compliance with WWAN+WLAN simultaneous transmission scenarios is demonstrated for various radio configurations using below equation:

Total norm. RF exposure = norm. RF exposure from Smart Transmit enabled WWAN (norm. SAR from 4G + norm. SAR from 5G sub-6G) + norm. SAR from WLAN ≤ 1.0 normalized limit (1)

Smart Transmit algorithm in WWAN adds directly the time-averaged RF exposure from 4G and time-averaged RF exposure from 5G sub-6G, i.e.,

norm. RF exposure from Smart Transmit enabled WWAN: (normalized SAR exposure from 4G) + (normalized PD exposure from 5G sub-6G) ≤ 1.0 normalized limit (2)

In other words, Smart Transmit algorithm controls the total RF exposure from both 4G radio and 5G sub-6G NR to not exceed CE limit. Smart transmit algorithm assumes hotspots are collocated (i.e., ignoring spatial distribution of hotspots) and directly adds normalized RF exposures from 4G and from 5G sub-6G, i.e.,

If A = max normalized time-averaged SAR exposure from 4G,
B = max normalized time-averaged SAR exposure from 5G sub-6G,

Then, equation (2) can be re-written as below because Smart Transmit assumes 4G hotspots are collocated with 5G sub-6G hotspot:

Smart Transmit enabled WWAN: x(t) * A + (1-x(t)) * B ≤ 1.0 normalized limit (3)

Here, "x(t)*A" represents percentage of normalized time-averaged RF exposure from 4G, and x(t) ranges between [0,1]; "(1-x(t))*B" is remaining percentage of RF exposure contribution from 5G sub-6G. Smart Transmit controls 'x' in real time such that the sum of these exposures never exceeds 1.0 normalized limit.

Note that mathematically:

$(t) * A$ + (1−(t))$*B$ ≤ $max(A,B)$≤ 1.0 $normalized\ limit$ for x(t) ∈ [0,1] (4)

Therefore, if below equations (5a) and (5b) are proven:

A +$norm.SAR\ from\ WLAN$≤ 1.0 $norm.limit$ (5a),

B +$norm.SAR\ from\ WLAN$ ≤ 1.0 $norm.limit$ (5b),

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

[$(t) * A$ + (1−(t))$*B$] +$norm.SAR\ from\ WLAN$ ≤ 1.0 $norm.limit$ (5c)

Which is the same as equation (1), to demonstrate compliance for simultaneous transmission.

Additionally, it should be noted that in the absence of 5G sub-6G, Smart Transmit limits the maximum RF exposure contributed from 4G to 100% normalized exposure (i.e., x=1.0 in equation 3). Therefore:

Smart Transmit enabled WWAN: A=max (normalized SAR exposure from 4G) ≤ 1.0 normalized limit (6a)

Smart Transmit enabled WWAN: B=max (normalized SAR exposure from 5G sub-6G) ≤ 1.0 normalized limit (6b)

The compliance for simultaneous transmission scenarios of WWAN (4G/5G sub-6G) radio enabled with Smart Transmit and WLAN without Smart Transmit is re-evaluated for all transmission scenarios supported by this EUT.

As described in equation (7), simultaneous transmission analysis for WWAN + WLAN is performed in two parts:

4G WWAN + WLAN (i.e., Eq. (7a) with compliance demonstration in the main report

5G sub-6G WWAN + WLAN (i.e., Eq. (7b) with compliance demonstration in the main report

By combining above a. and b., the CE requirement expressed in Eq. (1), re-written below, is met:

Step 1: Total Exposure Ratio (TER) = LTE + WLAN + BT < 1
Step 2: Total Exposure Ratio (TER) = 5G NR + WLAN + BT <1

21.3. Simultaneous Transmission Exposure Evaluation

Remark: The simultaneous transmission data was recorded in annex F.

22. Uncertainty Assessment

According to KDB 865664 D01 SAR measurement 100 MHz to 6GHz, when the highest measured 1-g SAR is less than 1.5 W/kg and 10-g extremity SAR less than 3.75 W/kg, the expanded SAR measurement uncertainty must be less than 30% with a confidence interval of k=2. When these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE 1528-2013 is not required in the SAR report and submitted for equipment approval. For this device, both the 1-g SAR is less than 1.5 W/kg. Therefore the measurement uncertainty table is not required in this report.

23. Measurement Conclusion

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

Annex A General Information

1. Identification of the Responsible Testing Laboratory

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

2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Address:	FL.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,G) will be submitted separately.

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