FCC SAR Test Report

Report No.	:	**PSU-NQN2208230109SA02**
Applicant	:	**HMD Global Oy**
Address	:	**Bertel Jungin aukio 9,02600 Espoo,Finland**
Manufacturer	:	**HMD Global Oy**
Address	:	**Bertel Jungin aukio 9,02600 Espoo,Finland**
Product	:	**Tablet PC**
FCC ID	:	**2AJOTTA-1495**
Brand	:	**NOKIA**
Model No.	:	**TA-1495**
Standards	:	**FCC 47 CFR Part 2 (2.1093) / IEEE C95.1:1992 / IEEE 1528:2013 KDB 865664 D01 v01r04 / KDB 865664 D02 v01r02 / KDB 248227 D01 v02r02 KDB 447498 D04 v01 / KDB 616217 D04 v01r02 / KDB 941225 D01 v03r01 KDB 941225 D05 v02r05 / KDB 941225 D05A v01r02 / KDB 941225 D06 v02r01**
Sample Received Date	:	**Aug. 03, 2022**
Date of Testing	:	**Aug. 15, 2022 ~ Aug. 28, 2022**
FCC Designation No.	:	**CN1325** **FCC Site Registration No. : 434559**
Issued By	:	**Huarui 7layers High Technology (Suzhou) Co., Ltd.**
Address	:	**Tower N, Innovation Center, 88 Zuyi Road, High-tech District, Suzhou City, Anhui Province China**

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

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Peibo Sun/ Manager

Table of Contents

Release Control Record

Report No.	Reason for Change	Date Issued
PSU-NQN2208230109SA02	Initial release	Sep. 17, 2022

1. Summary of Maximum SAR Value

Equipment Class	Mode	Highest Reported Body SAR_{1g} (W/kg)
PCB	GSM850	1.15
	GSM1900	0.95
	WCDMA V	1.17
	LTE 5	1.01
	LTE 7	0.99
	LTE 41 / 38	0.99
DTS	2.4G WLAN	0.99
NII	5.2G WLAN	N/A
	5.3G WLAN	1.19
	5.6G WLAN	1.18
	5.8G WLAN	1.17
DSS	Bluetooth	0.20
Highest Simultaneous Transmission SAR		1.59

Note:

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

2. Description of Equipment Under Test

EUT Type	Tablet PC
FCC ID	2AJOTTA-1495
Brand Name	NOKIA
Model Name	TA-1495
HW Version	EM_U1630_V1.2 L20
SW Version	V0.492_B01
Tx Frequency Bands (Unit: MHz)	GSM850 : 824.2 ~ 848.8 GSM1900 : 1850.2 ~ 1909.8 WCDMA Band V : 826.4 ~ 846.6 LTE Band 5 : 824.7 ~ 848.3 LTE Band 7 : 2502.5 ~ 2567.5 LTE Band 38 : 2572.5 ~ 2617.5 LTE Band 41 : 2498.5 ~ 2687.5 WLAN : 2412 ~ 2462, 5180 ~ 5240, 5260 ~ 5320, 5500 ~ 5720, 5745 ~ 5825 Bluetooth : 2402 ~ 2480
Uplink Modulations	GSM & GPRS & EDGE : GMSK, 8PSK WCDMA : BPSK, QPSK LTE : QPSK, 16QAM, 64QAM 802.11b : DSSS 802.11a/g/n/ac : OFDM Bluetooth : GFSK, π/4-DQPSK, 8-DPSK, LE
Maximum Tune-up Conducted Power (Unit: dBm)	Please refer to section 4.5.1of this report.
Antenna Type	PIFA Antenna
EUT Stage	Identical Prototype

Note:

1. The above EUT information is declared by manufacturer and for more detailed features description please refers to the manufacturer's specifications or User's Manual.
2. This device supports both LTE B38 and B41.Since the supported frequency span for LTE B38 falls completely within the LTE B41, they have the same target power, and share the same transmission path, therefore SAR was only assessed for LTE B41.
3. For WWAN and WLAN, when the p-sensor is detect close to the body sate, power reduction will be activated to limit the maximum power. Proximity sensor triggering distances please refer to section 4.1 in this report.

3. SAR Measurement System

3.1 Definition of Specific Absorption Rate (SAR)

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

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

SAR is expressed in units of Watts per kilogram (W/kg)
SAR measurement can be related to the electrical field in the tissue by

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

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

3.2 SPEAG DASY System

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

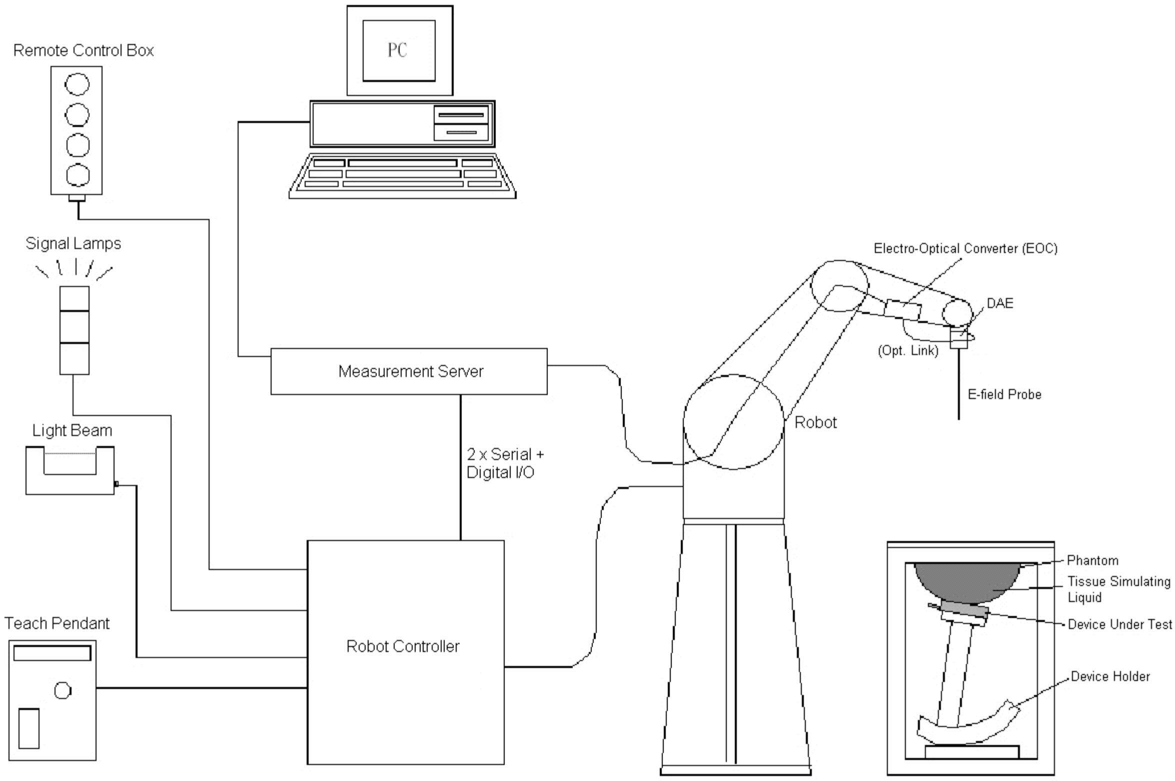


Fig-3.1 DASY System Setup

3.2.1 Robot

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

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

Fig-3.2 DASY6

3.2.2 Probes

The SAR measurement is conducted with the dosimetric probe. The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency.

Model	EX3DV4
Construction	Symmetrical design with triangular core. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE).
Frequency	10 MHz to 6 GHz Linearity: ± 0.2 dB
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 µW/g to 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 µW/g)
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm

Model	ES3DV3
Construction	Symmetrical design with triangular core. Interleaved sensors. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE).
Frequency	10 MHz to 4 GHz Linearity: ± 0.2 dB
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.3 dB in tissue material (rotation normal to probe axis)
Dynamic Range	5 µW/g to 100 mW/g Linearity: ± 0.2 dB
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 3.9 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm

3.2.3 Data Acquisition Electronics (DAE)

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

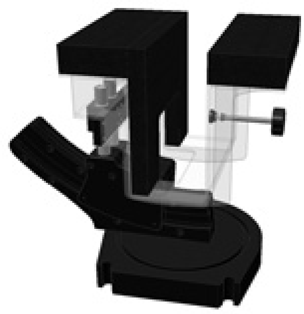
3.2.4 Phantoms

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

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

3.2.5 Device Holder

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

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

3.2.6 System Validation Dipoles

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

3.2.7 Tissue Simulating Liquids

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

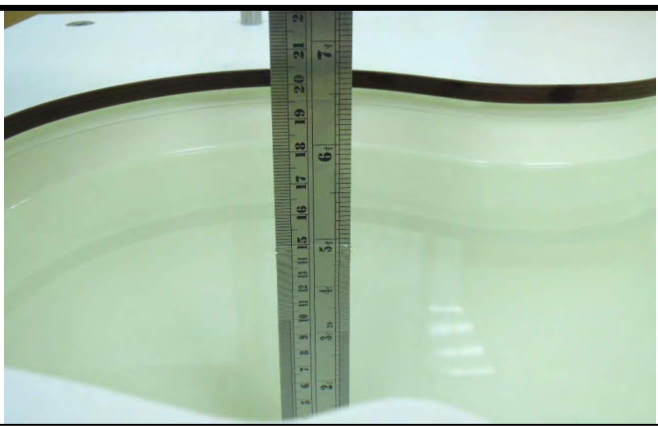


Photo of Liquid Height for Head Position

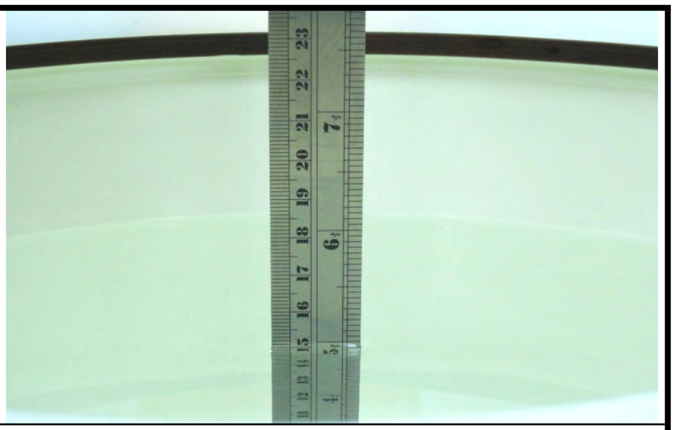


Photo of Liquid Height for Body Position

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

Table-3.1 Targets of Tissue Simulating Liquid

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

The following table gives the recipes for tissue simulating liquids.

Table-3.2 Recipes of Tissue Simulating Liquid

Tissue Type	Bactericide	DGBE	HEC	NaCl	Sucrose	Triton X-100	Water	Diethylene Glycol Mono-hexylether
H750	0.2	-	0.2	1.5	56.0	-	42.1	-
H835	0.2	-	0.2	1.5	57.0	-	41.1	-
H900	0.2	-	0.2	1.4	58.0	-	40.2	-
H1450	-	43.3	-	0.6	-	-	56.1	-
H1640	-	45.8	-	0.5	-	-	53.7	-
H1750	-	47.0	-	0.4	-	-	52.6	-
H1800	-	44.5	-	0.3	-	-	55.2	-
H1900	-	44.5	-	0.2	-	-	55.3	-
H2000	-	44.5	-	0.1	-	-	55.4	-
H2300	-	44.9	-	0.1	-	-	55.0	-
H2450	-	45.0	-	0.1	-	-	54.9	-
H2600	-	45.1	-	0.1	-	-	54.8	-
H3500	-	8.0	-	0.2	-	20.0	71.8	-
H5G	-	-	-	-	-	17.2	65.5	17.3

3.3 SAR System Verification

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

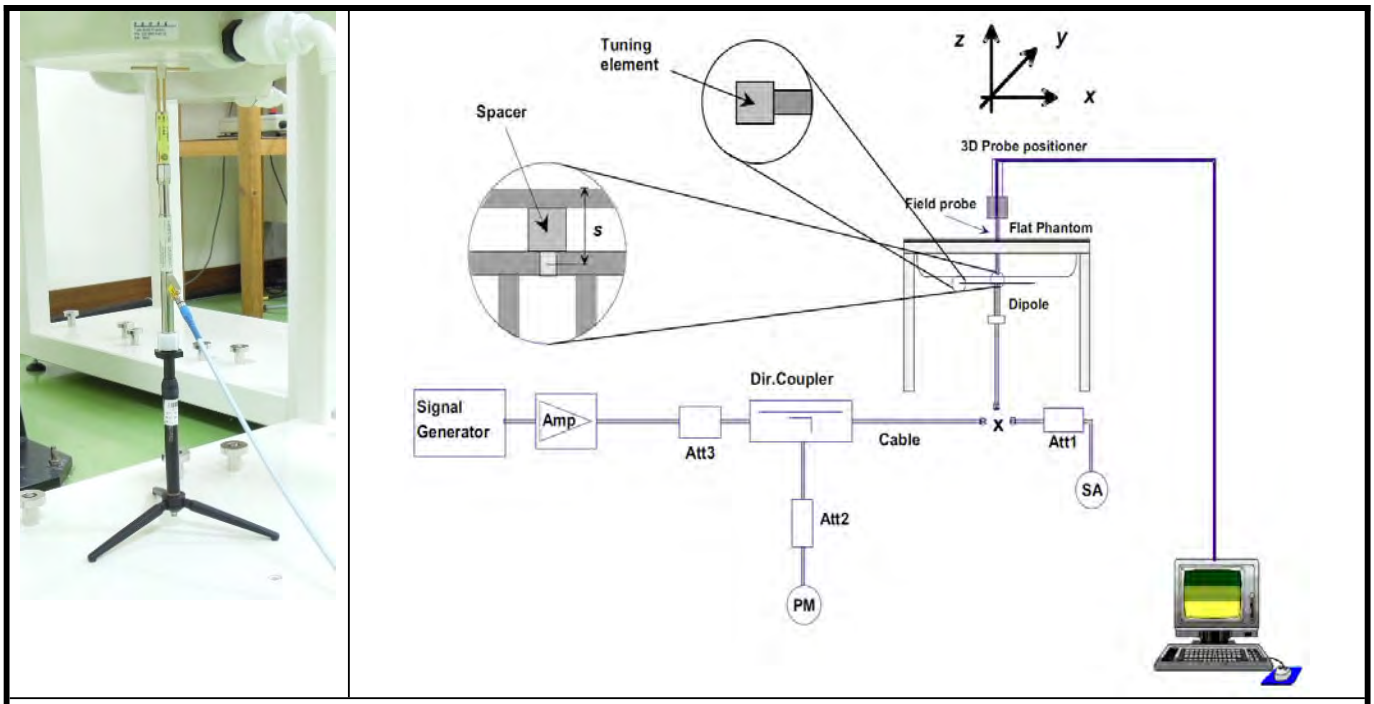


Fig-3.4 System Verification Setup

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

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

3.4 SAR Measurement Procedure

According to the SAR test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:
(a) Power reference measurement
(b) Area scan
(c) Zoom scan
(d) Power drift measurement

The SAR measurement procedures for each of test conditions are as follows:
(a) Make EUT to transmit maximum output power
(b) Measure conducted output power through RF cable
(c) Place the EUT in the specific position of phantom
(d) Perform SAR testing steps on the DASY system
(e) Record the SAR value

3.4.1 Area & Zoom Scan Procedure

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

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

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

3.4.2 Volume Scan Procedure

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

3.4.3 Power Drift Monitoring

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

3.4.4 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

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

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

3.4.5 SAR Averaged Methods

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

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

4. SAR Measurement Evaluation

4.1 EUT Configuration and Setting

<Connections between EUT and System Simulator>

For WWAN SAR testing, the EUT was linked and controlled by base station emulator (CMW 500 is used for GSM/WCDMA/CDMA/LTE). Communication between the EUT and the emulator was established by air link. The distance between the EUT and the communicating antenna of the emulator is larger than 50 cm and the output power radiated from the emulator antenna is at least 30 dB smaller than the output power of EUT. The EUT was set from the emulator to radiate maximum output power during SAR testing.

< Proximity Sensor Triggering Distances >

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

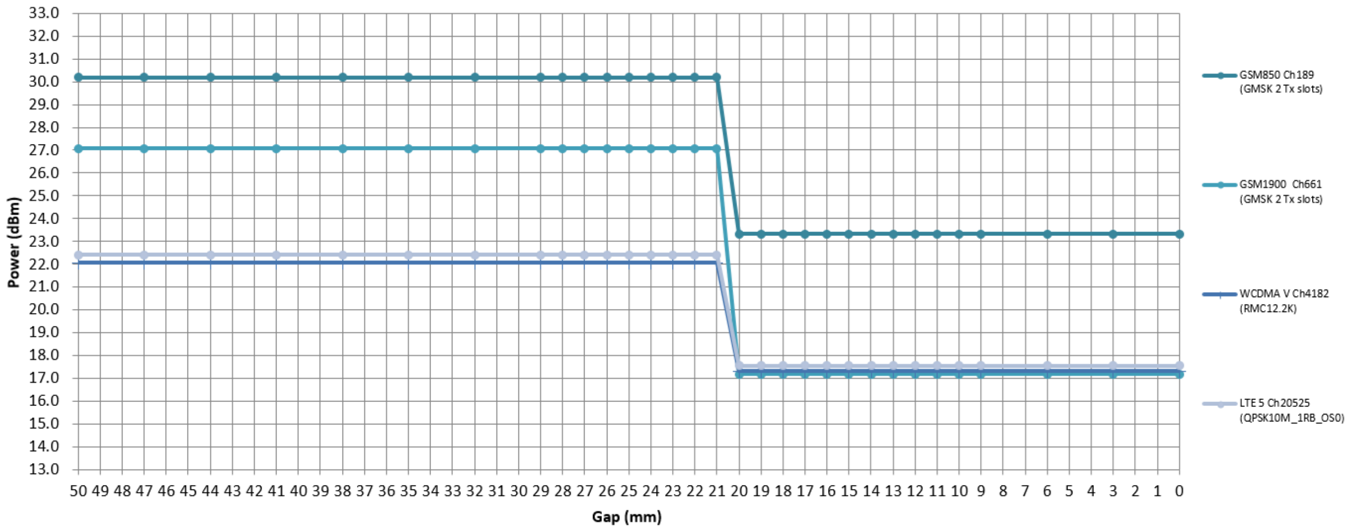
In the preliminary triggering distance testing, the tissue-equivalent medium for different frequency bands were used for verification; no other frequency bands tissue-equivalent medium was found to result in shortest triggering than that for 5700MHz, and the tissue-equivalent medium for 5700MHz was used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

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

Main-LM Antenna

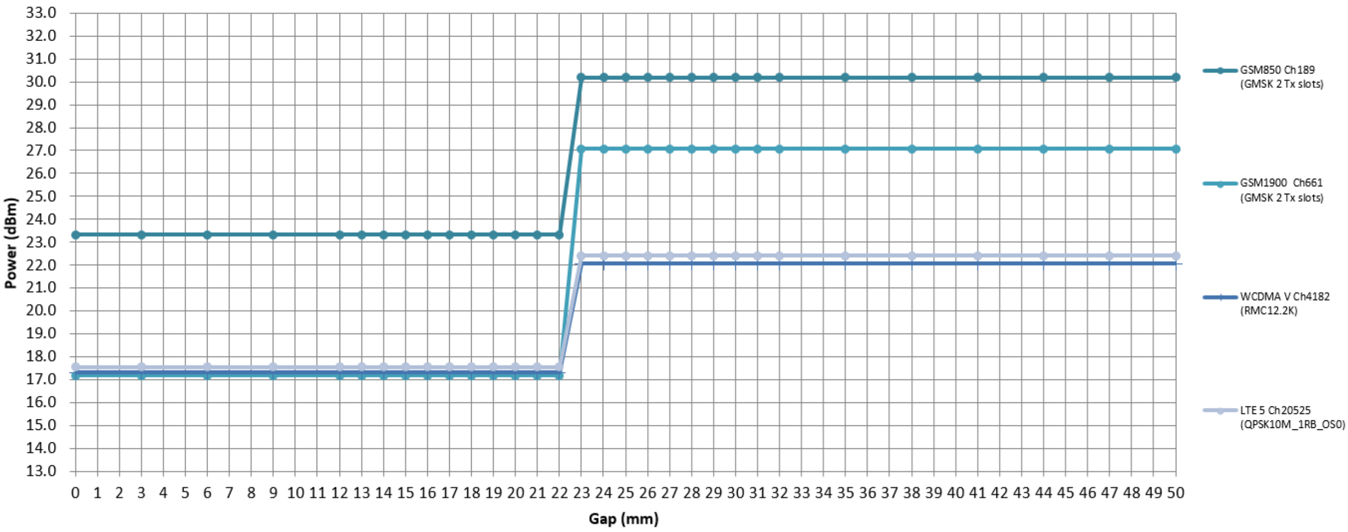
Output Power Verification in dBm for EUT Rear Face (moving toward phantom)											
Distance (mm)	16	17	18	19	20	21	22	23	24	25	26
GSM850 Ch189 (GPRS 2Txslots)	23.34	23.34	23.34	23.34	23.34	30.18	30.18	30.18	30.18	30.18	30.18
GSM1900 Ch661 (GPRS 2Txslots)	17.20	17.20	17.20	17.20	17.20	27.08	27.08	27.08	27.08	27.08	27.08
WCDMA V Ch4182 (RMC12.2K)	17.32	17.32	17.32	17.32	17.32	22.07	22.07	22.07	22.07	22.07	22.07
LTE 5 Ch20525 (QPSK10M_1RB_OS0)	17.57	17.57	17.57	17.57	17.57	22.41	22.41	22.41	22.41	22.41	22.41

Rear Face
(moving toward phantom)



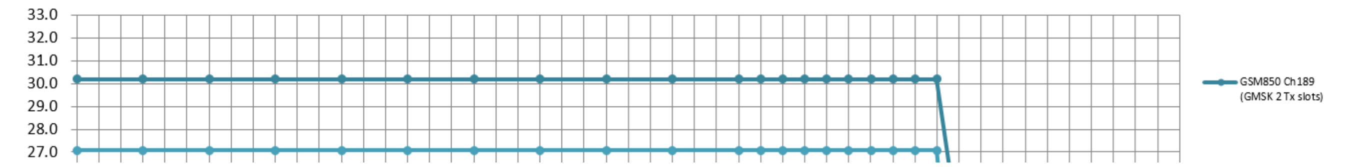
Output Power Verification in dBm for EUT Rear Face (moving away phantom)											
Distance (mm)	18	19	20	21	22	23	24	25	26	27	28
GSM850 Ch189 (GPRS 2Txslots)	23.34	23.34	23.34	23.34	23.34	30.18	30.18	30.18	30.18	30.18	30.18
GSM1900 Ch661 (GPRS 2Txslots)	17.20	17.20	17.20	17.20	17.20	27.08	27.08	27.08	27.08	27.08	27.08
WCDMA V Ch4182 (RMC12.2K)	17.32	17.32	17.32	17.32	17.32	22.07	22.07	22.07	22.07	22.07	22.07
LTE 5 Ch20525 (QPSK10M_1RB_OS0)	17.57	17.57	17.57	17.57	17.57	22.41	22.41	22.41	22.41	22.41	22.41

Rear Face
(moving away phantom)

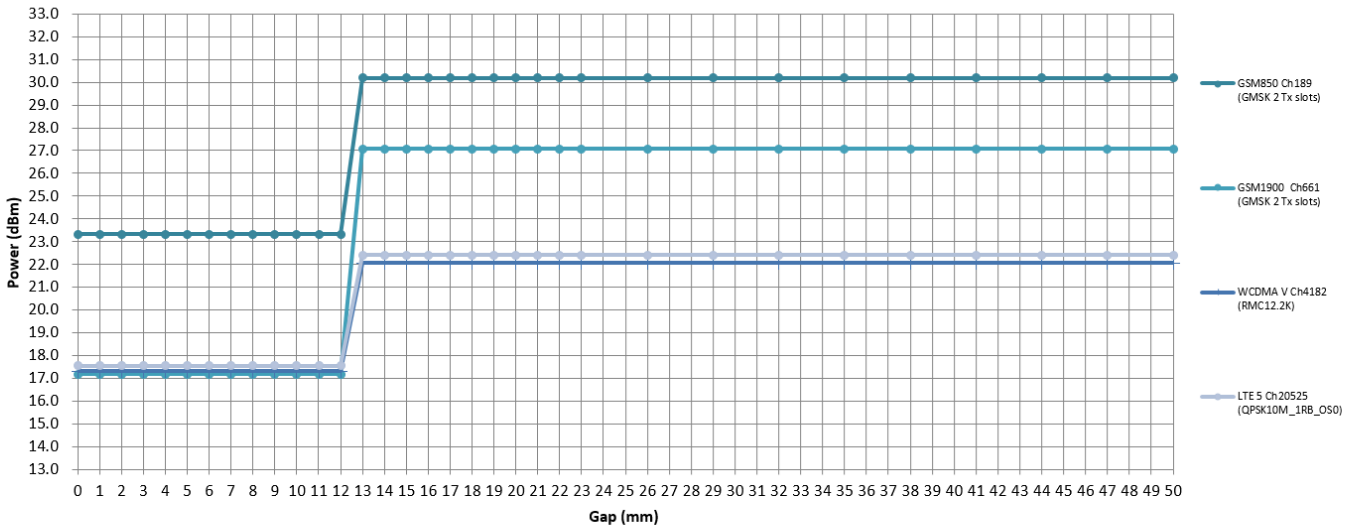


Output Power Verification in dBm for EUT Right Side (moving toward phantom)											
Distance (mm)	6	7	8	9	10	11	12	13	14	15	16
GSM850 Ch189 (GPRS 2Txslots)	23.34	23.34	23.34	23.34	23.34	30.18	30.18	30.18	30.18	30.18	30.18
GSM1900 Ch661 (GPRS 2Txslots)	17.20	17.20	17.20	17.20	17.20	27.08	27.08	27.08	27.08	27.08	27.08
WCDMA V Ch4182 (RMC12.2K)	17.32	17.32	17.32	17.32	17.32	22.07	22.07	22.07	22.07	22.07	22.07
LTE 5 Ch20525 (QPSK10M_1RB_OS0)	17.57	17.57	17.57	17.57	17.57	22.41	22.41	22.41	22.41	22.41	22.41

Right Side
(moving toward phantom)



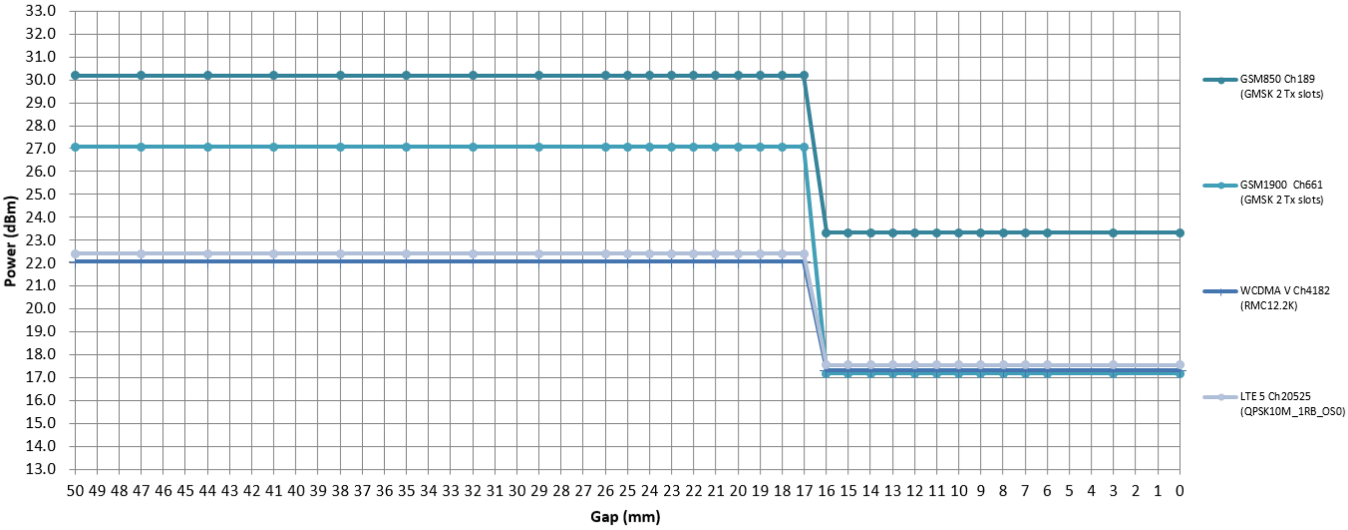
Right Side
(moving away phantom)



Output Power Verification in dBm for EUT Right Side (moving away phantom)											
Distance (mm)	8	9	10	11	12	13	14	15	16	17	18
GSM850 Ch189 (GPRS 2Txslots)	23.34	23.34	23.34	23.34	23.34	30.18	30.18	30.18	30.18	30.18	30.18
GSM1900 Ch661 (GPRS 2Txslots)	17.20	17.20	17.20	17.20	17.20	27.08	27.08	27.08	27.08	27.08	27.08
WCDMA V Ch4182 (RMC12.2K)	17.32	17.32	17.32	17.32	17.32	22.07	22.07	22.07	22.07	22.07	22.07
LTE 5 Ch20525 (QPSK10M_1RB_OS0)	17.57	17.57	17.57	17.57	17.57	22.41	22.41	22.41	22.41	22.41	22.41

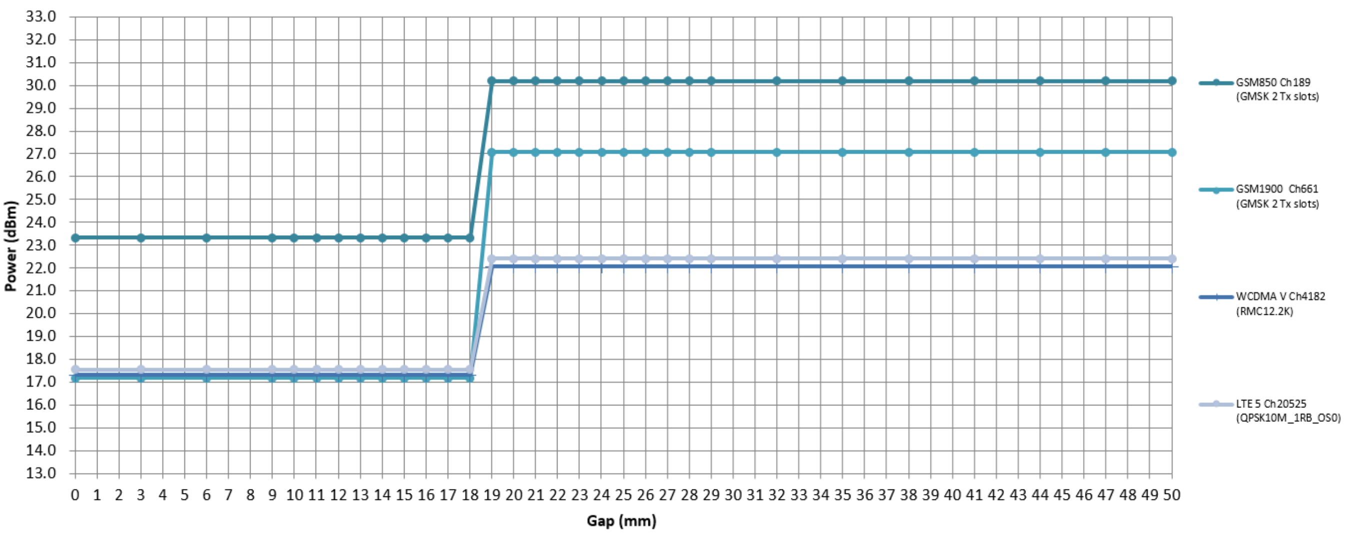
Output Power Verification in dBm for EUT Top Side (moving toward phantom)											
Distance (mm)	12	13	14	15	16	17	18	19	20	21	22
GSM850 Ch189 (GPRS 2Txslots)	23.34	23.34	23.34	23.34	23.34	30.18	30.18	30.18	30.18	30.18	30.18
GSM1900 Ch661 (GPRS 2Txslots)	17.20	17.20	17.20	17.20	17.20	27.08	27.08	27.08	27.08	27.08	27.08
WCDMA V Ch4182 (RMC12.2K)	17.32	17.32	17.32	17.32	17.32	22.07	22.07	22.07	22.07	22.07	22.07
LTE 5 Ch20525 (QPSK10M_1RB_OS0)	17.57	17.57	17.57	17.57	17.57	22.41	22.41	22.41	22.41	22.41	22.41

Top Side
(moving toward phantom)



Output Power Verification in dBm for EUT Top Side (moving away phantom)											
Distance (mm)	14	15	16	17	18	19	20	21	22	23	24
GSM850 Ch189 (GPRS 2Txslots)	23.34	23.34	23.34	23.34	23.34	30.18	30.18	30.18	30.18	30.18	30.18
GSM1900 Ch661 (GPRS 2Txslots)	17.20	17.20	17.20	17.20	17.20	27.08	27.08	27.08	27.08	27.08	27.08
WCDMA V Ch4182 (RMC12.2K)	17.32	17.32	17.32	17.32	17.32	22.07	22.07	22.07	22.07	22.07	22.07
LTE 5 Ch20525 (QPSK10M_1RB_OS0)	17.57	17.57	17.57	17.57	17.57	22.41	22.41	22.41	22.41	22.41	22.41

Top Side
(moving away phantom)

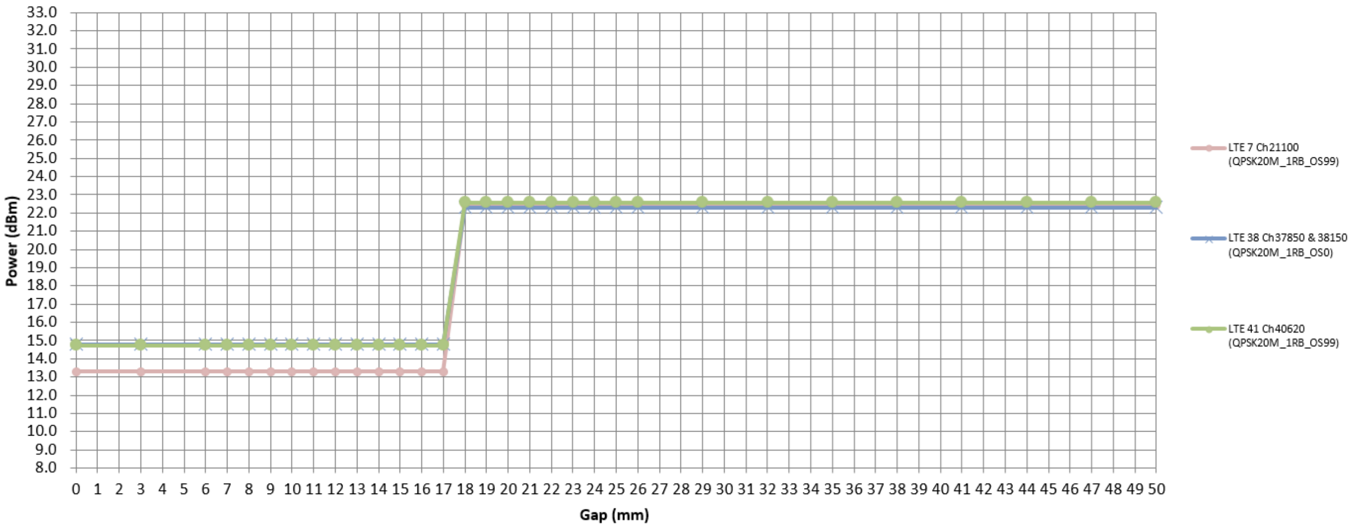


Main-H Antenna

Output Power Verification in dBm for EUT Rear Face (moving toward phantom)											
Distance (mm)	11	12	13	14	15	16	17	18	19	20	21
LTE 7 Ch20850 (QPSK20M_1RB_OS99)	13.30	13.30	13.30	13.30	13.30	22.43	22.43	22.43	22.43	22.43	22.43
LTE 38 Ch37850 & 38150 (QPSK20M_1RB_OS0)	14.80	14.80	14.80	14.80	14.80	22.30	22.30	22.30	22.30	22.30	22.30
LTE 41 Ch40620 (QPSK20M_1RB_OS99)	14.73	14.73	14.73	14.73	14.73	22.57	22.57	22.57	22.57	22.57	22.57

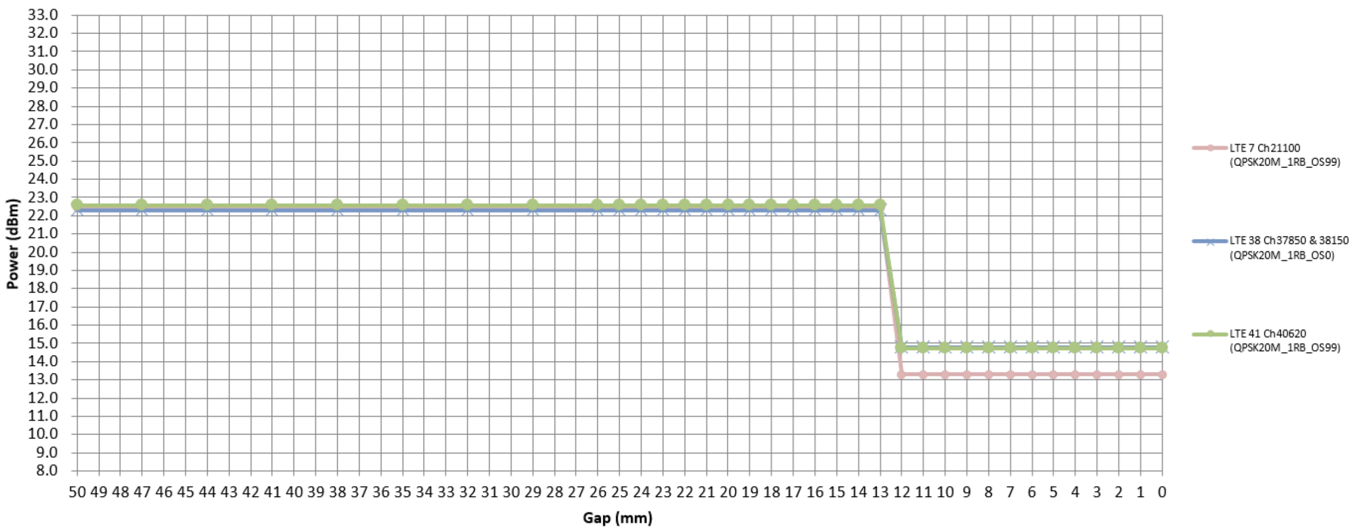
Output Power Verification in dBm for EUT Rear Face (moving away phantom)											
Distance (mm)	13	14	15	16	17	18	19	20	21	22	23
LTE 7 Ch20850 (QPSK20M_1RB_OS99)	13.30	13.30	13.30	13.30	13.30	22.43	22.43	22.43	22.43	22.43	22.43
LTE 38 Ch37850 & 38150 (QPSK20M_1RB_OS0)	14.80	14.80	14.80	14.80	14.80	22.30	22.30	22.30	22.30	22.30	22.30
LTE 41 Ch40620 (QPSK20M_1RB_OS99)	14.73	14.73	14.73	14.73	14.73	22.57	22.57	22.57	22.57	22.57	22.57

Rear Face
(moving away phantom)

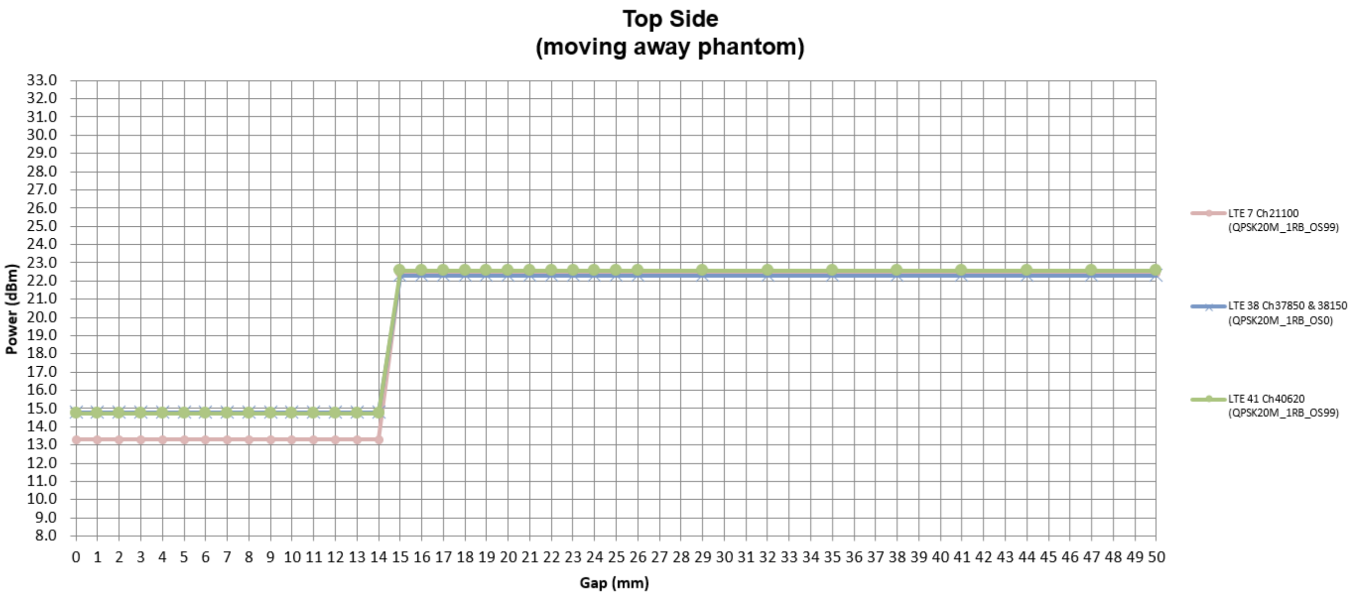


Output Power Verification in dBm for EUT Top Side (moving toward phantom)											
Distance (mm)	8	9	10	11	12	13	14	15	16	17	18
LTE 7 Ch20850 (QPSK20M_1RB_OS99)	13.30	13.30	13.30	13.30	13.30	22.43	22.43	22.43	22.43	22.43	22.43
LTE 38 Ch37850 & 38150 (QPSK20M_1RB_OS0)	14.80	14.80	14.80	14.80	14.80	22.30	22.30	22.30	22.30	22.30	22.30
LTE 41 Ch40620 (QPSK20M_1RB_OS99)	14.73	14.73	14.73	14.73	14.73	22.57	22.57	22.57	22.57	22.57	22.57

Top Side
(moving toward phantom)

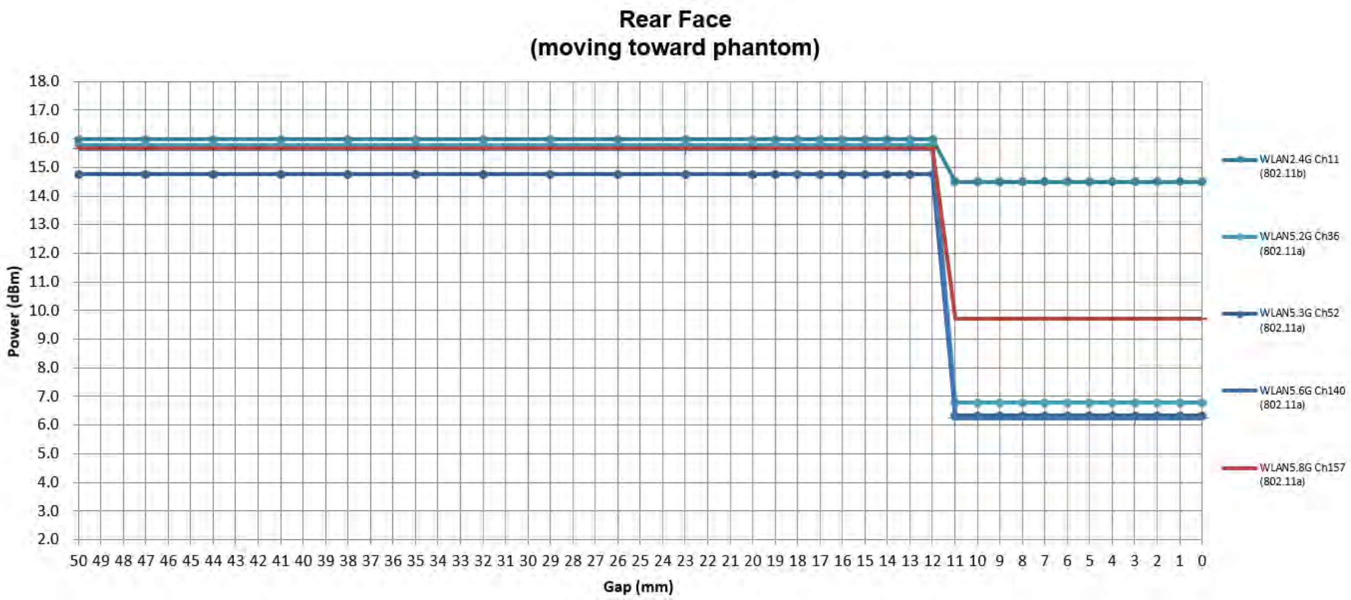


Output Power Verification in dBm for EUT Top Side (moving away phantom)											
Distance (mm)	10	11	12	13	14	15	16	17	18	19	20
LTE 7 Ch20850 (QPSK20M_1RB_OS99)	13.30	13.30	13.30	13.30	13.30	22.43	22.43	22.43	22.43	22.43	22.43
LTE 38 Ch37850 & 38150 (QPSK20M_1RB_OS0)	14.80	14.80	14.80	14.80	14.80	22.30	22.30	22.30	22.30	22.30	22.30
LTE 41 Ch40620 (QPSK20M_1RB_OS99)	14.73	14.73	14.73	14.73	14.73	22.57	22.57	22.57	22.57	22.57	22.57



WLAN Antenna

Output Power Verification in dBm for EUT Rear Face (moving toward phantom)											
Distance (mm)	7	8	9	10	11	12	13	14	15	16	17
WLAN2.4G Ch11 (802.11b)	14.50	14.50	14.50	14.50	14.50	15.97	15.97	15.97	15.97	15.97	15.97
WLAN5.2G Ch36 (802.11a)	6.79	6.79	6.79	6.79	6.79	15.78	15.78	15.78	15.78	15.78	15.78
WLAN5.3G Ch52 (802.11a)	6.33	6.33	6.33	6.33	6.33	14.76	14.76	14.76	14.76	14.76	14.76
WLAN5.6G Ch140 (802.11a)	6.25	6.25	6.25	6.25	6.25	15.65	15.65	15.65	15.65	15.65	15.65
WLAN5.8G Ch157 (802.11a)	9.70	9.70	9.70	9.70	9.70	15.66	15.66	15.66	15.66	15.66	15.66



Output Power Verification in dBm for EUT Rear Face (moving away phantom)											
Distance (mm)	9	10	11	12	13	14	16	17	18	19	20
WLAN2.4G Ch11 (802.11b)	14.50	14.50	14.50	14.50	14.50	15.97	15.97	15.97	15.97	15.97	15.97
WLAN5.2G Ch36 (802.11a)	6.79	6.79	6.79	6.79	6.79	15.78	15.78	15.78	15.78	15.78	15.78
WLAN5.3G Ch52 (802.11a)	6.33	6.33	6.33	6.33	6.33	14.76	14.76	14.76	14.76	14.76	14.76
WLAN5.6G Ch140 (802.11a)	6.25	6.25	6.25	6.25	6.25	15.65	15.65	15.65	15.65	15.65	15.65
WLAN5.8G Ch157 (802.11a)	9.70	9.70	9.70	9.70	9.70	15.66	15.66	15.66	15.66	15.66	15.66

Output Power Verification in dBm for EUT Top Side (moving toward phantom)											
Distance (mm)	7	8	9	10	11	12	13	14	15	16	17
WLAN2.4G Ch11 (802.11b)	14.50	14.50	14.50	14.50	14.50	15.97	15.97	15.97	15.97	15.97	15.97
WLAN5.2G Ch36 (802.11a)	6.79	6.79	6.79	6.79	6.79	15.78	15.78	15.78	15.78	15.78	15.78
WLAN5.3G Ch52 (802.11a)	6.33	6.33	6.33	6.33	6.33	14.76	14.76	14.76	14.76	14.76	14.76
WLAN5.6G Ch140 (802.11a)	6.25	6.25	6.25	6.25	6.25	15.65	15.65	15.65	15.65	15.65	15.65
WLAN5.8G Ch157 (802.11a)	9.70	9.70	9.70	9.70	9.70	15.66	15.66	15.66	15.66	15.66	15.66

Output Power Verification in dBm for EUT Top Side (moving away phantom)											
Distance (mm)	9	10	11	12	13	14	16	17	18	19	20
WLAN2.4G Ch11 (802.11b)	14.50	14.50	14.50	14.50	14.50	15.97	15.97	15.97	15.97	15.97	15.97
WLAN5.2G Ch36 (802.11a)	6.79	6.79	6.79	6.79	6.79	15.78	15.78	15.78	15.78	15.78	15.78
WLAN5.3G Ch52 (802.11a)	6.33	6.33	6.33	6.33	6.33	14.76	14.76	14.76	14.76	14.76	14.76
WLAN5.6G Ch140 (802.11a)	6.25	6.25	6.25	6.25	6.25	15.65	15.65	15.65	15.65	15.65	15.65
WLAN5.8G Ch157 (802.11a)	9.70	9.70	9.70	9.70	9.70	15.66	15.66	15.66	15.66	15.66	15.66

Proximity Sensor Coverage (KDB 616217 D04 §6.3)

Since the proximity sensor is collocated with antenna in one component, the procedure for proximity sensor coverage is not required.

Proximity Sensor Tilt Angle Influences(KDB 616217 D04 §6.4)

The proximity sensor tilt angle influence was determined per KDB 616217 for applicable edge. Summary for proximity sensor tilt angle influence is shown in below.

Main-LM Antenna

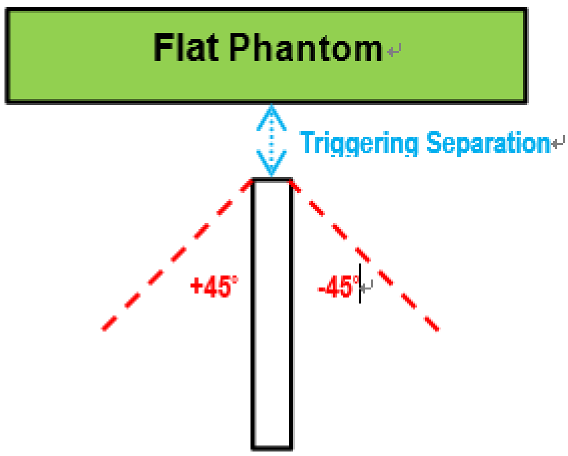
Orientation	Separation Distance (mm)	Tilt Angle										
		-45°	-40°	-30°	-20°	-10°	0°	10°	20°	30°	40°	45°
Right Side	10	On	On	On	On	On	On	On	On	On	On	On
Top Side	16	On	On	On	On	On	On	On	On	On	On	On

Main-H Antenna

Orientation	Separation Distance (mm)	Tilt Angle										
		-45°	-40°	-30°	-20°	-10°	0°	10°	20°	30°	40°	45°
Top Side	12	On	On	On	On	On	On	On	On	On	On	On

WLAN Antenna

Orientation	Separation Distance (mm)	Tilt Angle										
		-45°	-40°	-30°	-20°	-10°	0°	10°	20°	30°	40°	45°
Top Side	11	On	On	On	On	On	On	On	On	On	On	On



Summary for Proximity Sensor Triggering Test

According to the procedures noticed in KDB 616217 D04,

The Main-LM Antenna for proximity sensor triggering distance is 20 mm for EUT Rear Face, 10mm for Right Side and 16 mm for Top Side. The separation distance of 10mm / 16 mm determined by the smallest triggering distance on Right Side / Top Side is used to access the tilt angle influence and the sensor does not release during ±45 degree. Therefore, the smallest separation distance for tilt angle influence is 10mm for the Right Side and 16 mm for the Top Side. The conservation triggering distances based on the separation distance for the sensor trigger / not triggered as EUT with power reduction at 0 mm, and EUT without power reduction at 19 mm for EUT Rear Face, 9mm for Right Side and 15 mm for Top Side were used to test SAR.

The Main-H Antenna for proximity sensor triggering distance is 15 mm for EUT Rear Face and 12 mm for Top Side. The separation distance of 12 mm determined by the smallest triggering distance on Top Side is used to access the tilt angle influence and the sensor does not release during ±45 degree. Therefore, the smallest separation distance for tilt angle influence is 12 mm for the Top Side. The conservation triggering distances based on the separation distance for the sensor trigger / not triggered as EUT with power reduction at 0 mm, and EUT without power reduction at 14 mm for EUT Rear Face and 11 mm for Top Side were used to test SAR.

The WLAN Antenna for proximity sensor triggering distance is 11 mm for EUT Rear Face and Top Side. The separation distance of 11mm determined by the smallest triggering distance on Top Side is used to access the tilt angle influence and the sensor does not release during ±45 degree. Therefore, the smallest separation distance for tilt angle influence is 11mm for the Top Side. The conservation triggering distances based on the separation distance for the sensor trigger / not triggered as EUT with power reduction at 0 mm, and EUT without power reduction at 10 mm for EUT Rear Face and Top Side were used to test SAR.

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

Main-LM Antenna Proximity Sensor Trigger Distance (mm)			
Position	Rear Face	Right Side	Top Side
Minimum	20	10	16

Main-H Antenna Proximity Sensor Trigger Distance (mm)		
Position	Rear Face	Top Side
Minimum	15	12

WLAN Antenna Proximity Sensor Trigger Distance (mm)		
Position	Rear Face	Top Side
Minimum	11	11

<Considerations Related to GSM / GPRS / EDGE for Setup and Testing>

The maximum multi-slot capability supported by this device is as below.

1. This EUT is class B device
2. This EUT supports GPRS multi-slot class 12 (max. uplink: 4, max. downlink: 4, total timeslots: 5)
3. This EUT supports EDGE multi-slot class 12 (max. uplink: 4, max. downlink: 4, total timeslots: 5)

For GSM850 frequency band, the power control level is set to 5 for GSM mode and GPRS (GMSK: CS1), and set to 8 for EDGE (GMSK: MCS1, 8PSK: MCS9). For GSM1900 frequency band, the power control level is set to 0 for GSM mode and GPRS (GMSK: CS1), and set to 2 for EDGE (GMSK: MCS1, 8PSK: MCS9).

SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested.

The frame-averaged power is linearly proportion to the slot number configured and it is linearly scaled the maximum burst-averaged power based on time slots. The calculated method is shown as below:

Frame-averaged power = 10 x log (Burst-averaged power mW x Slot used / 8)

<Considerations Related to WCDMA for Setup and Testing>

WCDMA Handsets Head SAR

SAR for next to the ear head exposure is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”. The 3G SAR test reduction procedure is applied to AMR configurations with 12.2 kbps RMC as the primary mode.

WCDMA Handsets Body-worn SAR

SAR for body-worn configurations is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”. The 3G SAR test reduction procedure is applied to other spreading codes and multiple $DPDCH_n$ configurations supported by the handset with 12.2 kbps RMC as the primary mode.

Handsets with Release 5 HSDPA

The 3G SAR test reduction procedure is applied to HSDPA body-worn configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSDPA using the HSDPA body SAR procedures in the “Release 5 HSDPA Data Devices”, for the highest reported SAR body-worn exposure configuration in 12.2 kbps RMC. Handsets with both HSDPA and HSUPA are tested according to Release 6 HSPA test procedures.

Handsets with Release 6 HSUPA

The 3G SAR test reduction procedure is applied to HSPA (HSUPA/HSDPA with RMC) body-worn configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSPA using the HSPA body SAR procedures in the “Release 6 HSPA Data Devices”, for the highest reported body-worn exposure SAR configuration in 12.2 kbps RMC. When VOIP is applicable for next to the ear head exposure in HSPA, the 3G SAR test reduction procedure is applied to HSPA with 12.2 kbps RMC as the primary mode; otherwise, the same HSPA configuration used for body-worn measurements is tested for next to the ear head exposure.

Release 5 HSDPA Data Devices

The 3G SAR test reduction procedure is applied to body SAR with 12.2 kbps RMC as the primary mode. Otherwise, body SAR for HSDPA is measured using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, for the highest reported SAR configuration in 12.2 kbps RMC without HSDPA. HSDPA is configured according to the applicable UE category of a test device. The number of HS-DSCH / HS-PDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4 ms and a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors (β_c, β_d), and HS-DPCCH power offset parameters (Δ_{ACK}, Δ_{NACK}, Δ_{CQI}) are set according to values indicated in below. The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the H-set.

Sub-test	β_c	β_d	β_d (SF)	β_c / β_d	β_{hs} (1)	CM (dB)(2)	MPR
1	2 / 15	15 / 15	64	2 / 15	4 / 15	0.0	0
2	12 / 15 (3)	15 / 15 (3)	64	12 / 15 (3)	24 / 15	1.0	0
3	15 / 15	8 / 15	64	15 / 8	30 / 15	1.5	0.5
4	15 / 15	4 / 15	64	15 / 4	30 / 15	1.5	0.5

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 $\beta_c / \beta_d = 12 / 15$, $\beta_{hs} / \beta_c = 24 / 15$.
Note 3: For subtest 2 the β_c / β_d ratio of 12 / 15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 11 / 15$ and $\beta_d = 15 / 15$.

Release 6 HSUPA Data Devices

The 3G SAR test reduction procedure is applied to body SAR with 12.2 kbps RMC as the primary mode. Otherwise, body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 and power control algorithm 2, according to the highest reported body SAR configuration in 12.2 kbps RMC without HSPA. When VOIP applies to head exposure, the 3G SAR test reduction procedure is applied with 12.2 kbps RMC as the primary mode. Otherwise, the same HSPA configuration used for body SAR measurements are applied to head exposure testing. Due to inner loop power control requirements in HSPA, a communication test set is required for output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and E-DCH configurations for HSPA are configured according to the β values indicated in below.

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 ⇔ $A_{hs} = \beta_{hs} / \beta_c$ = 30 / 15 ⇔ β_{hs} = 30 / 15 * β_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+ SAR Guidance

The 3G SAR test reduction procedure is applied to HSPA+ (uplink) with 12.2 kbps RMC as the primary mode. Otherwise, when SAR is required for Rel. 6 HSPA, SAR is required for Rel. 7 HSPA+. Power is measured for HSPA+ that supports uplink 16QAM according to configurations in Table C.11.1.4 of 3GPP TS 34.121-1 to determine SAR test reduction.

DC-HSDPA SAR Guidance

The 3G SAR test reduction procedure is applied to DC-HSDPA with 12.2 kbps RMC as the primary mode. Otherwise, when SAR is required for Rel. 5 HSDPA, SAR is required for Rel. 8 DC-HSDPA. Power is measured for DC-HSDPA according to the H-Set 12, FRC configuration in Table C.8.1.12 of 3GPP TS 34.121-1 to determine SAR test reduction. A primary and a secondary serving HS-DSCH Cell are required to perform the power measurement and for the results to be acceptable.

<Considerations Related to LTE for Setup and Testing>

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

EUT Supported LTE Band and Channel Bandwidth						
LTE Band	**BW 1.4 MHz**	**BW 3 MHz**	**BW 5 MHz**	**BW 10 MHz**	**BW 15 MHz**	**BW 20 MHz**
5	**V**	**V**	**V**	**V**		
7			**V**	**V**	**V**	**V**
38			**V**	**V**	**V**	**V**
41			**V**	**V**	**V**	**V**

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

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

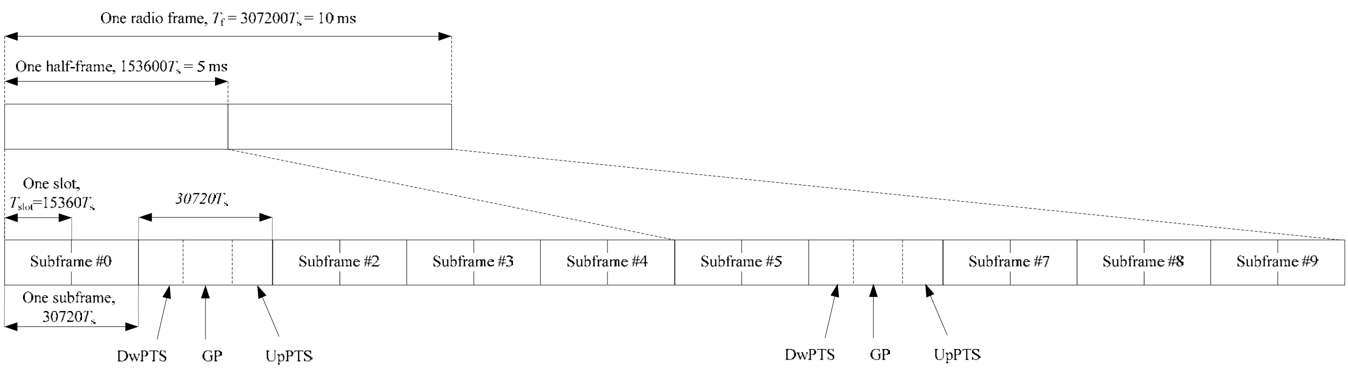
Note: MPR is according to the standard and implemented in the circuit (mandatory).

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

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

TDD-LTE Setup Configurations

According to KDB 941225 D05, SAR testing for TDD-LTE device must be tested using a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by the defined 3GPP TDD-LTE configurations. The TDD-LTE of this device supports frame structure type 2 defined in 3GPP TS 36.211 section 4.2, and the frame structure configuration can be referred to below.



3GPP TS 36.211 Figure 4.2-1: Frame Structure Type 2

<table>
<tr><th rowspan="3">Special Subframe Configuration</th><th colspan="3">Normal Cyclic Prefix in Downlink</th><th colspan="3">Extended Cyclic Prefix in Downlink</th></tr>
<tr><th rowspan="2">DwPTS</th><th colspan="2">UpPTS</th><th rowspan="2">DwPTS</th><th colspan="2">UpPTS</th></tr>
<tr><th>Normal Cyclic Prefix in Uplink</th><th>Extended Cyclic Prefix in Uplink</th><th>Normal Cyclic Prefix in Uplink</th><th>Extended Cyclic Prefix in Uplink</th></tr>
<tr><td>0</td><td>6592·Ts</td><td rowspan="5">2192·Ts</td><td rowspan="5">2560·Ts</td><td>7680·Ts</td><td rowspan="4">2192·Ts</td><td rowspan="4">2560·Ts</td></tr>
<tr><td>1</td><td>19760·Ts</td><td>20480·Ts</td></tr>
<tr><td>2</td><td>21952·Ts</td><td>23040·Ts</td></tr>
<tr><td>3</td><td>24144·Ts</td><td>25600·Ts</td></tr>
<tr><td>4</td><td>26336·Ts</td><td>7680·Ts</td><td rowspan="4">4384·Ts</td><td rowspan="4">5120·Ts</td></tr>
<tr><td>5</td><td>6592·Ts</td><td rowspan="5">4384·Ts</td><td rowspan="5">5120·Ts</td><td>20480·Ts</td></tr>
<tr><td>6</td><td>19760·Ts</td><td>23040·Ts</td></tr>
<tr><td>7</td><td>21952·Ts</td><td>12800·Ts</td></tr>
<tr><td>8</td><td>24144·Ts</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>9</td><td>13168·Ts</td><td>-</td><td>-</td><td>-</td></tr>
</table>

3GPP TS 36.211 Table 4.2-1: Configuration of Special Subframe

Uplink-Downlink Configuration	Downlink-to-Uplink Switch-Point Periodicity	Subframe Number									
		0	1	2	3	4	5	6	7	8	9
0	5 ms	D	S	U	U	U	D	S	U	U	U
1	5 ms	D	S	U	U	D	D	S	U	U	D
2	5 ms	D	S	U	D	D	D	S	U	D	D
3	10 ms	D	S	U	U	U	D	D	D	D	D
4	10 ms	D	S	U	U	D	D	D	D	D	D
5	10 ms	D	S	U	D	D	D	D	D	D	D
6	5 ms	D	S	U	U	U	D	S	U	U	D

3GPP TS 36.211 Table 4.2-2: Uplink-Downlink Configurations

The variety of different TD-LTE uplink-downlink configurations allows a network operator to allocate the network's capacity between uplink and downlink traffic to meet the needs of the network. The uplink duty cycle of these seven configurations can readily be computed and shown in below.

UL-DL Configuration	0	1	2	3	4	5	6
Highest Duty-Cycle	63.33%	43.33%	23.33%	31.67%	21.67%	11.67%	53.33%

Considering the highest transmission duty cycle, TDD-LTE was tested using Uplink-Downlink Configuration 0 with 6 uplink subframe and 2 special subframe. The special subframe was set to special subframe configuration 7 using extended cyclic prefix uplink. Therefore, SAR testing for TDD-LTE was performed at the maximum output power with highest transmission duty cycle of 63.33%.

LTE Downlink Carrier Aggregation (CA) Setup Configurations

LTE Carrier Aggregation (CA) was defined in 3GPP release 10 and higher. The LTE device in CA mode has one Primary Component Carrier (PCC) and one or more Secondary Component Carriers (SCC). PCC acts as the anchor carrier and can optionally cross-schedule data transmission on SCC. The RRC connection is only handled by one cell, the PCC for downlink and uplink communications. After making a data connection to the PCC, the LTE device adds the SCC on the downlink only. All uplink communications and acknowledgements remain identical to release 8 specifications on the PCC. The combinations of downlink carrier aggregation supported by this device are listed in below.

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.

EUT Supported Combinations of Downlink Carrier Aggregation			
2CC Downlink Carrier Aggregation			
CA_5A-5A	CA_5A-7A	CA_7A-7A	CA_41A-41A
CA_5B	CA_7C	CA_41C	

Power Confirmation for SAR Testing for LTE Uplink CA

The conducted power for uplink CA active was measured on the highest reported SAR configuration for each exposure condition with both two carrier components was set to largest channel bandwidth.

EUT Supported Combinations of Uplink Carrier Aggregation
Intra-Band 2CC Uplink CA Operating Bands
CA_41C

SAR Measurements for Intra-Band Contiguous CA

The SAR testing was performed with the single carrier (uplink CA is inactive) for all test positions for each exposure condition. The LTE uplink CA active was verified with maximum output power on the highest SAR configuration of single carrier for each exposure condition. For intra-band contiguous CA, the SCC channel was set to closest available contiguous channel.

<Considerations Related to WLAN for Setup and Testing>

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

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

Initial Test Configuration

An initial test configuration is determined for OFDM transmission modes in 2.4 GHz and 5 GHz bands according to the channel bandwidth, modulation and data rate combination(s) with the highest maximum output power specified for production units in each standalone and aggregated frequency band. When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration, for each frequency band.

Subsequent Test Configuration

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

SAR Test Configuration and Channel Selection

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

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

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

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

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

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

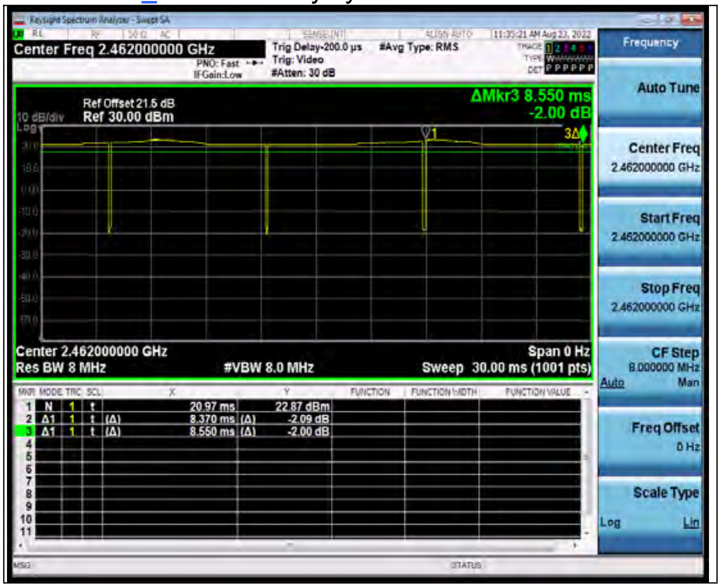
2) When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the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

<Considerations Related to Bluetooth for Setup and Testing>

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

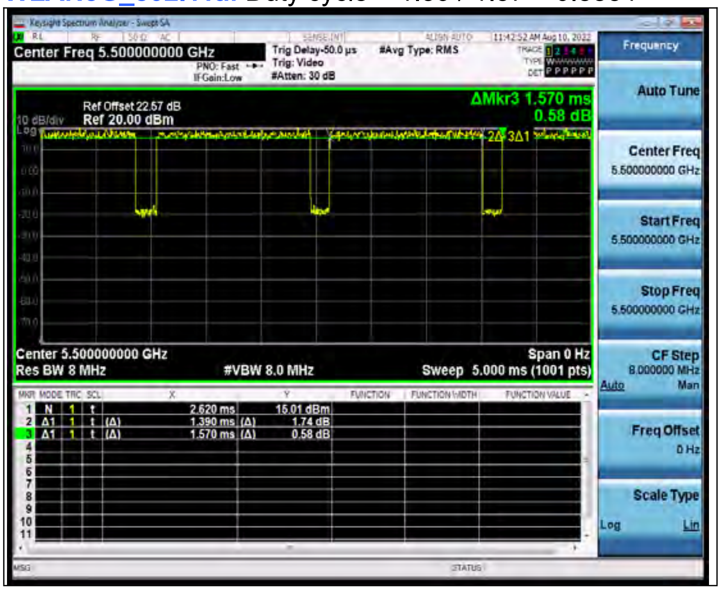
<WLAN2.4G Duty Cycle of Test Signal>

WLAN2.4G_802.11b: Duty cycle = 8.37 / 8.55 = 0.9789



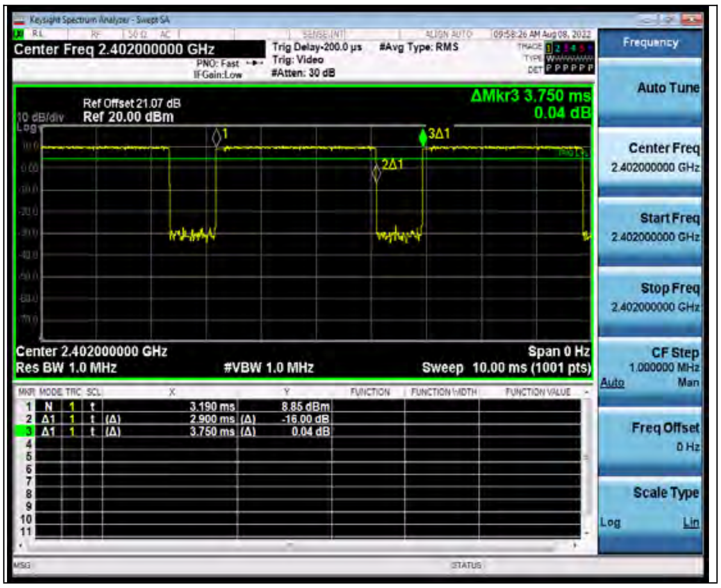
<WLAN5G Duty Cycle of Test Signal>

WLAN5G_802.11a: Duty cycle = 1.39 / 1.57 = 0.8854



<BT Duty Cycle of Test Signal>

BT_8DPSK: Duty cycle = 2.90 / 3.75 = 0.7733



4.2 EUT Testing Position

4.2.1 Body Exposure Conditions

For full-size tablet, according to KDB 616217 D04, SAR evaluation is required for back surface and edges of the devices. The back surface and edges of the tablet are tested with the tablet touching the phantom. Exposures from antennas through the front surface of the display section of a tablet are generally limited to the user's hands. Exposures to hands for typical consumer transmitters used in tablets are not expected to exceed the extremity SAR limit; therefore, SAR evaluation for the front surface of tablet display screens are generally not necessary. When voice mode is supported on a tablet and it is limited to speaker mode or headset operations only, additional SAR testing for this type of voice use is not required.

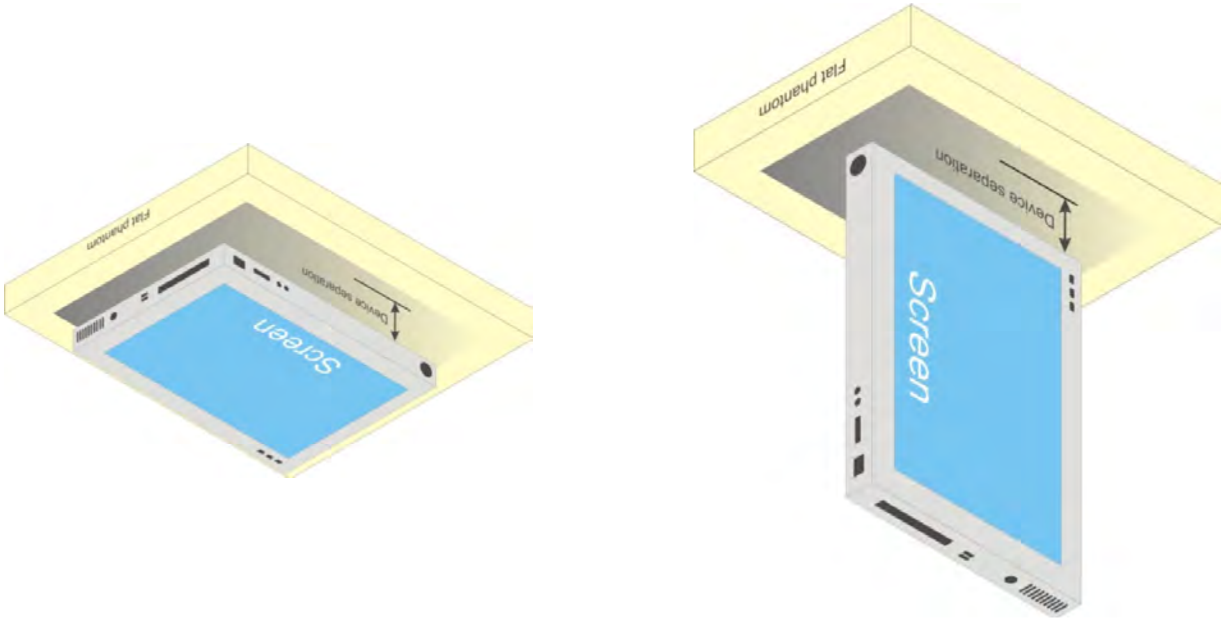


Fig-4.1 Illustration for Tablet Setup

4.2.2 SAR Test Exclusion Evaluations

According to KDB 447498 D04 Appendix B, the SAR test exclusion condition is based on source-based time-averaged maximum conducted output power, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions. The SAR exclusion threshold is determined by the following.

$$P_{th}\,(\text{mW}) = \begin{cases} ERP_{20\,\text{cm}}(d/20\,\text{cm})^{x} & d \le 20\,\text{cm} \\ ERP_{20\,\text{cm}} & 20\,\text{cm} < d \le 40\,\text{cm} \end{cases}$$

where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\,\text{cm}}\sqrt{f}}\right)$$

Exposure Position	Wireless Interface	GPRS 850 2Tx	GPRS 1900 2Tx	WCDMA Band V	LTE Band 5
Exposure Position	Calculated Frequency	848MHz	1909MHz	846MHz	848MHz
Exposure Position	Maximum power (dBm)	25	22	23.00	24
Exposure Position	Maximum rated power(mW)	316.0	158.0	200.0	251.0
Rear Face	Separation distance(mm)	0.0			
Rear Face	exclusion threshold	9.0	3.0	9.0	9.0
Rear Face	Testing required?	**Yes**	**Yes**	**Yes**	**Yes**
Top Side	Separation distance(mm)	5.0			
Top Side	exclusion threshold	9.0	3.0	9.0	9.0
Top Side	Testing required?	**Yes**	**Yes**	**Yes**	**Yes**
Right Side	Separation distance(mm)	5.0			
Right Side	exclusion threshold	9.0	3.0	9.0	9.0
Right Side	Testing required?	**Yes**	**Yes**	**Yes**	**Yes**
Bottom Side	Separation distance(mm)	149.0			
Bottom Side	exclusion threshold	1138.0	1776.0	1135.0	1138.0
Bottom Side	Testing required?	**No**	**No**	**No**	**No**
Left Side	Separation distance(mm)	205.0			
Left Side	exclusion threshold	1792.0	3203.0	1788.0	1792.0
Left Side	Testing required?	**No**	**No**	**No**	**No**

Exposure Position	Wireless Interface	LTE Band 7	LTE Band 38	LTE Band 41
	Calculated Frequency	2567MHz	2617MHz	2687MHz
	Maximum power (dBm)	24	24	24
	Maximum rated power(mW)	251.0	251.0	251.0
Rear Face	Separation distance(mm)	0.0		
	exclusion threshold	3.0	3.0	3.0
	Testing required?	**Yes**	**Yes**	**Yes**
Top Side	Separation distance(mm)	5.0		
	exclusion threshold	3.0	3.0	3.0
	Testing required?	**Yes**	**Yes**	**Yes**
Right Side	Separation distance(mm)	93.0		
	exclusion threshold	708.0	705.0	702.0
	Testing required?	**No**	**No**	**No**
Bottom Side	Separation distance(mm)	149.0		
	exclusion threshold	1743.0	1741.0	1738.0
	Testing required?	**No**	**No**	**No**
Left Side	Separation distance(mm)	130.0		
	exclusion threshold	1343.0	1340.0	1337.0
	Testing required?	**No**	**No**	**No**

Exposure Position	Wireless Interface	BT	BLE	WLAN2.4G	WLAN5G
Exposure Position	Calculated Frequency	2480MHz	2480MHz	2462MHz	5825MHz
	Maximum power (dBm)	7	4	17	16
	Maximum rated power(mW)	5.0	3.0	50.0	50.0
Rear Face	Separation distance(mm)	0.0			
	exclusion threshold	3.0	3.0	3.0	1.0
	Testing required?	**Yes**	**No**	**Yes**	**Yes**
Top Side	Separation distance(mm)	5.0			
	exclusion threshold	3.0	3.0	3.0	1.0
	Testing required?	**Yes**	**No**	**Yes**	**Yes**
Right Side	Separation distance(mm)	173.0			
	exclusion threshold	2321.0	2321.0	2322.0	2260.0
	Testing required?	**No**	**No**	**No**	**No**
Bottom Side	Separation distance(mm)	149.0			
	exclusion threshold	1747.0	1747.0	1747.0	1654.0
	Testing required?	**No**	**No**	**No**	**No**
Left Side	Separation distance(mm)	38.0			
	exclusion threshold	129.0	129.0	130.0	95.0
	Testing required?	**No**	**No**	**No**	**No**

4.2.3 Simultaneous Transmission Possibilities

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

Simultaneous TX Combination	Capable Transmit Configurations	Body Exposure Condition
1	WWAN + WLAN2.4G	Yes
2	WWAN + WLAN5G	Yes
3	WWAN + BT	Yes
4	WLAN2.4G + BT	Yes
5	WLAN5G + BT	Yes
6	WWAN + WLAN2.4G + BT	Yes
7	WWAN + WLAN5G + BT	Yes

4.3 Tissue Verification

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

Test Date	Tissue Type	Frequency (MHz)	Liquid Temp. (℃)	Measured Conductivity (σ)	Measured Permittivity (ε_r)	Target Conductivity (σ)	Target Permittivity (ε_r)	Conductivity Deviation (%)	Permittivity Deviation (%)
Aug. 15, 2022	Head	835	22.2	0.936	43.156	0.90	41.50	4.00	3.99
Aug. 18, 2022	Head	1900	22.3	1.409	40.214	1.40	40.00	0.64	0.53
Aug. 25, 2022	Head	2450	22.6	1.807	39.291	1.80	39.20	0.39	0.23
Aug. 17, 2022	Head	2600	22.7	1.922	39.074	1.96	39.00	-1.94	0.19
Aug. 26, 2022	Head	5250	22.6	4.629	36.244	4.71	35.90	-1.72	0.96
Aug. 27, 2022	Head	5600	22.4	5.018	35.687	5.07	35.50	-1.03	0.53
Aug. 28, 2022	Head	5750	22.4	5.139	35.394	5.27	35.40	-2.49	-0.02

Note:

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

4.4 System Verification

The measuring result for system verification is tabulated as below.

Test Date	Mode	Frequency (MHz)	1W Target SAR-1g (W/kg)	Measured SAR-1g (W/kg)	Normalized to 1W SAR-1g (W/kg)	Deviation (%)	Dipole S/N	Probe S/N	DAE S/N
Aug. 15, 2022	Head	835	9.60	2.50	10.00	4.17	4d265	3985	755
Aug. 18, 2022	Head	1900	39.70	9.72	38.88	-2.07	5d159	3985	755
Aug. 25, 2022	Head	2450	52.80	12.30	49.20	-6.82	1048	3985	755
Aug. 17, 2022	Head	2600	55.80	14.70	58.80	5.38	1110	3985	755
Aug. 26, 2022	Head	5250	76.90	7.70	77.00	0.13	1315	3985	755
Aug. 27, 2022	Head	5600	81.90	8.35	83.50	1.95	1315	3985	755
Aug. 28, 2022	Head	5750	76.10	7.24	72.40	-4.86	1315	3985	755

Note:

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

4.5 Maximum Output Power

4.5.1 Maximum Conducted Power

The maximum conducted average power (Unit: dBm) including tune-up tolerance please refer to Appendix D.

4.5.2 Measured Conducted Power Result

The measured conducted power result (Unit: dBm) please refer to Appendix D.

4.6 SAR Testing Results

4.6.1 SAR Test Reduction Considerations

<KDB 447498 D04, General RF Exposure Guidance>

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

(1) ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz

(2) ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz

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

<KDB 941225 D01, 3G SAR Measurement Procedures>

The mode tested for SAR is referred to as the primary mode. The equivalent modes considered for SAR test reduction are denoted as secondary modes. Both primary and secondary modes must be in the same frequency band. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ 1/4 dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode.

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

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

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

(2) QPSK with 100% RB allocation

SAR is not required when the highest maximum output power for 100% RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.

(3) Higher order modulations

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

1.45 W/kg.

(4) Other channel bandwidth

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

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

(1) For handsets operating next to ear, hotspot mode or mini-tablet configurations, the initial test position procedures were applied. The test position with the highest extrapolated peak SAR will be used as the initial test position. When the reported SAR of initial test position is <= 0.4 W/kg, SAR testing for remaining test positions is not required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is <= 0.8 W/kg or all test positions are measured.

(2) For WLAN 2.4 GHz, the highest measured maximum output power channel for DSSS was selected for SAR measurement. When the reported SAR is <= 0.8 W/kg, no further SAR testing is required. Otherwise, SAR is evaluated at the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel. For OFDM modes (802.11g/n), SAR is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and it is <= 1.2 W/kg.

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

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

4.6.2 SAR Results for Body Exposure Condition (Separation Distance is 0 cm Gap)

<GSM / WCDMA>

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Ch.	Power Reduction	Max. Tune-up Power (dBm)	Measured Conducted Power (dBm)	Power Drift (dB)	Measured SAR-1g (W/kg)	Tune-up Scaling Factor	Scaled SAR-1g (W/kg)
1	GSM850	GPRS 2Tx slot	Rear Face	0	189	Reduced Power	25	23.44	0.12	0.801	1.43	**1.15**
	GSM850	GPRS 2Tx slot	Right Side	0	189	Reduced Power	25	23.44	-0.16	0.752	1.43	1.08
	GSM850	GPRS 2Tx slot	Top Side	0	189	Reduced Power	25	23.44	0.09	0.256	1.43	0.37
	GSM850	GPRS 2Tx slot	Rear Face	1.9	189	Full Power	32	30.18	0.11	0.186	1.52	0.28
	GSM850	GPRS 2Tx slot	Right Side	0.9	189	Full Power	32	30.18	-0.13	0.472	1.52	0.72
	GSM850	GPRS 2Tx slot	Top Side	1.5	189	Full Power	32	30.18	0.04	0.078	1.52	0.12
	GSM850	GPRS 2Tx slot	Rear Face	0	128	Reduced Power	25	23.26	0.06	0.758	1.49	1.13
	GSM850	GPRS 2Tx slot	Rear Face	0	251	Reduced Power	25	23.34	-0.15	0.727	1.47	1.07
	GSM850	GPRS 2Tx slot	Right Side	0	128	Reduced Power	25	23.26	-0.09	0.762	1.49	1.14
	GSM850	GPRS 2Tx slot	Right Side	0	251	Reduced Power	25	23.34	0.16	0.735	1.47	1.08
2	GSM1900	GPRS 2Tx slot	Rear Face	0	661	Reduced Power	19	17.31	-0.18	0.647	1.48	**0.95**
	GSM1900	GPRS 2Tx slot	Right Side	0	661	Reduced Power	19	17.31	-0.06	0.131	1.48	0.19
	GSM1900	GPRS 2Tx slot	Top Side	0	661	Reduced Power	19	17.31	0.05	0.332	1.48	0.49
	GSM1900	GPRS 2Tx slot	Rear Face	1.9	661	Full Power	29	27.08	0.02	0.326	1.56	0.51
	GSM1900	GPRS 2Tx slot	Right Side	0.9	661	Full Power	29	27.08	-0.13	0.318	1.56	0.49
	GSM1900	GPRS 2Tx slot	Top Side	1.5	661	Full Power	29	27.08	-0.17	0.347	1.56	0.54
	GSM1900	GPRS 2Tx slot	Rear Face	0	512	Reduced Power	19	17.2	0.11	0.606	1.51	0.92
	GSM1900	GPRS 2Tx slot	Rear Face	0	810	Reduced Power	19	17.03	-0.07	0.558	1.57	0.88
	WCDMA V	RMC12.2K	Rear Face	0	4182	Reduced Power	18.5	17.32	0.06	0.619	1.31	0.81
	WCDMA V	RMC12.2K	Right Side	0	4182	Reduced Power	18.5	17.32	-0.07	0.434	1.31	0.57
	WCDMA V	RMC12.2K	Top Side	0	4182	Reduced Power	18.5	17.32	0.03	0.397	1.31	0.52
	WCDMA V	RMC12.2K	Rear Face	1.9	4182	Full Power	23	22.07	0.12	0.172	1.24	0.21
	WCDMA V	RMC12.2K	Right Side	0.9	4182	Full Power	23	22.07	-0.05	0.399	1.24	0.49
	WCDMA V	RMC12.2K	Top Side	1.5	4182	Full Power	23	22.07	0.01	0.088	1.24	0.11
3	WCDMA V	RMC12.2K	Rear Face	0	4132	Reduced Power	18.5	17.28	0.09	0.882	1.32	**1.17**
	WCDMA V	RMC12.2K	Rear Face	0	4233	Reduced Power	18.5	17.19	-0.11	0.667	1.35	0.90

<LTE>

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Ch.	Power Reduction	RB	offset	Duty Cycle %	Max. Tune-up Power (dBm)	Measured Conducted Power (dBm)	Power Drift (dB)	Measured SAR-1g (W/kg)	Duty Cycle Scaling Factor	Tune-up Scaling Factor	Scaled SAR-1g (W/kg)
	LTE 5	QPSK10M	Rear Face	0	20525	Reduced Power	1	0	-	19	17.57	0.06	0.696	-	1.39	0.97
	LTE 5	QPSK10M	Right Side	0	20525	Reduced Power	1	0	-	19	17.57	0.04	0.502	-	1.39	0.70
	LTE 5	QPSK10M	Top Side	0	20525	Reduced Power	1	0	-	19	17.57	0.03	0.363	-	1.39	0.50
	LTE 5	QPSK10M	Rear Face	1.9	20525	Full Power	1	0	-	24	22.41	0.15	0.239	-	1.44	0.34
	LTE 5	QPSK10M	Right Side	0.9	20525	Full Power	1	0	-	24	22.41	-0.02	0.454	-	1.44	0.65
	LTE 5	QPSK10M	Top Side	1.5	20525	Full Power	1	0	-	24	22.41	-0.11	0.097	-	1.44	0.14
4	LTE 5	QPSK10M	Rear Face	0	20450	Reduced Power	1	0	-	19	17.41	0.01	0.701	-	1.44	**1.01**
	LTE 5	QPSK10M	Rear Face	0	20600	Reduced Power	1	0	-	19	17.5	0.02	0.692	-	1.41	0.98
	LTE 5	QPSK10M	Rear Face	0	20525	Reduced Power	25	12	-	18	16.73	-0.11	0.511	-	1.34	0.68
	LTE 5	QPSK10M	Right Side	0	20525	Reduced Power	25	12	-	18	16.73	0.16	0.424	-	1.34	0.57
	LTE 5	QPSK10M	Top Side	0	20525	Reduced Power	25	12	-	18	16.73	0.05	0.362	-	1.34	0.48
	LTE 5	QPSK10M	Rear Face	1.9	20525	Full Power	25	12	-	23	21.34	0.04	0.164	-	1.47	0.24
	LTE 5	QPSK10M	Right Side	0.9	20525	Full Power	25	12	-	23	21.34	0.07	0.154	-	1.47	0.23
	LTE 5	QPSK10M	Top Side	1.5	20525	Full Power	25	12	-	23	21.34	-0.11	0.127	-	1.47	0.19
	LTE 5	QPSK10M	Rear Face	0	20525	Reduced Power	50	0	-	18	16.63	0.15	0.576	-	1.37	0.79
5	LTE 7	QPSK20M	Rear Face	0	21100	Reduced Power	1	0	-	13.5	13.3	-0.05	0.950	-	1.05	**0.99**
	LTE 7	QPSK20M	Top Side	0	21100	Reduced Power	1	0	-	13.5	13.3	-0.12	0.319	-	1.05	0.33
	LTE 7	QPSK20M	Rear Face	1.4	21100	Full Power	1	0	-	24	22.43	0.15	0.650	-	1.44	0.93
	LTE 7	QPSK20M	Top Side	1.1	21100	Full Power	1	0	-	24	22.43	0.13	0.519	-	1.44	0.75
	LTE 7	QPSK20M	Rear Face	0	20850	Reduced Power	1	0	-	13.5	13.19	0.11	0.849	-	1.07	0.91
	LTE 7	QPSK20M	Rear Face	0	21350	Reduced Power	1	0	-	13.5	13.19	0.06	0.903	-	1.07	0.97
	LTE 7	QPSK20M	Rear Face	1.4	20850	Full Power	1	0	-	24	22.19	0.05	0.546	-	1.52	0.83
	LTE 7	QPSK20M	Rear Face	1.4	21350	Full Power	1	0	-	24	22.41	-0.12	0.577	-	1.44	0.83
	LTE 7	QPSK20M	Rear Face	0	21100	Reduced Power	50	0	-	12.5	12.34	-0.06	0.714	-	1.04	0.74
	LTE 7	QPSK20M	Top Side	0	21100	Reduced Power	50	0	-	12.5	12.34	0.03	0.284	-	1.04	0.29

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Ch.	Power Reduction	RB	offset	Duty Cycle %	Max. Tune-up Power (dBm)	Measured Conducted Power (dBm)	Power Drift (dB)	Measured SAR-1g (W/kg)	Duty Cycle Scaling Factor	Tune-up Scaling Factor	Scaled SAR-1g (W/kg)
	LTE 7	QPSK20M	Rear Face	1.4	21100	Full Power	50	0	-	23	21.3	0.07	0.504	-	1.48	0.75
	LTE 7	QPSK20M	Top Side	1.1	21100	Full Power	50	0	-	23	21.3	-0.15	0.415	-	1.48	0.61
	LTE 7	QPSK20M	Rear Face	1.4	21100	Full Power	100	0	-	23	21.15	0.17	0.508	-	1.53	0.78
	LTE 7	QPSK20M	Rear Face	0	21100	Reduced Power	100	0	-	12.5	12.18	0.12	0.867	-	1.08	0.93
	LTE 41	QPSK20M	Rear Face	0	40620	Reduced Power	1	99	62.9	15	14.73	0.11	0.570	1.01	1.06	0.61
	LTE 41	QPSK20M	Top Side	0	40620	Reduced Power	1	99	62.9	15	14.73	0.13	0.147	1.01	1.06	0.16
	LTE 41	QPSK20M	Rear Face	1.4	40620	Full Power	1	99	62.9	24	22.57	0.03	0.350	1.01	1.39	0.49
	LTE 41	QPSK20M	Top Side	1.1	40620	Full Power	1	99	62.9	24	22.57	-0.13	0.306	1.01	1.39	0.43
	LTE 41	QPSK20M	Rear Face	0	39750	Reduced Power	1	99	62.9	15	14.53	0.02	0.691	1.01	1.11	0.77
	LTE 41	QPSK20M	Rear Face	0	40185	Reduced Power	1	99	62.9	15	14.65	0.12	0.910	1.01	1.08	0.99
	LTE 41	QPSK20M	Rear Face	0	41055	Reduced Power	1	99	62.9	15	14.66	0.05	0.866	1.01	1.08	0.94
6	LTE 41	QPSK20M	Rear Face	0	41490	Reduced Power	1	99	62.9	15	14.67	0	0.916	1.01	1.08	**0.99**
	LTE 41	QPSK20M	Rear Face	0	40620	Reduced Power	50	0	62.9	14	13.75	0.02	0.479	1.01	1.06	0.51
	LTE 41	QPSK20M	Top Side	0	40620	Reduced Power	50	0	62.9	14	13.75	0.16	0.178	1.01	1.06	0.19
	LTE 41	QPSK20M	Rear Face	1.4	40620	Full Power	50	0	62.9	23	21.58	0.05	0.221	1.01	1.39	0.31
	LTE 41	QPSK20M	Top Side	1.1	40620	Full Power	50	0	62.9	23	21.58	0.09	0.147	1.01	1.39	0.21
	LTE 41	QPSK20M	Rear Face	0	40620	Reduced Power	100	0	62.9	15	13.67	0.05	0.389	1.01	1.36	0.53
	UL CA_41C	QPSK20M	Rear Face	0	PCC: 41490 SCC: 41292	Reduced Power	PCC: 1 SCC: 0	PCC: 99 SCC: 0	62.9	15	14.41	0.1	0.829	1.01	1.15	0.96

<WLAN / BT >

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Ch.	Power Reduction	Duty Cycle %	Max. Tune-up Power (dBm)	Measured Conducted Power (dBm)	Power Drift (dB)	Measured SAR-1g (W/kg)	Duty Cycle Scaling Factor	Tune-up Scaling Factor	Scaled SAR-1g (W/kg)
7	WLAN2.4G	802.11b	Rear Face	0	11	Reduced Power	97.89	15	14.5	0.13	0.864	1.02	1.12	**0.99**
	WLAN2.4G	802.11b	Top Side	0	11	Reduced Power	97.89	15	14.5	0.02	0.678	1.02	1.12	0.78
	WLAN2.4G	802.11b	Rear Face	1	11	Full Power	97.89	17	15.97	0.11	0.249	1.02	1.27	0.32
	WLAN2.4G	802.11b	Rear Face	1.4	11	Full Power	97.89	17	15.97	0.09	0.106	1.02	1.27	0.14
	WLAN2.4G	802.11b	Top Side	1	11	Full Power	97.89	17	15.97	0.07	0.311	1.02	1.27	0.40
	WLAN2.4G	802.11b	Top Side	1.5	11	Full Power	97.89	17	15.97	0.1	0.147	1.02	1.27	0.19
	WLAN2.4G	802.11b	Rear Face	0	1	Reduced Power	97.89	15	14.4	-0.12	0.837	1.02	1.15	0.98
	WLAN5G	802.11a	Rear Face	0	52	Reduced Power	88.54	7	6.33	0.05	0.482	1.13	1.17	0.64
	WLAN5G	802.11a	Top Side	0	52	Reduced Power	88.54	7	6.33	0.11	0.704	1.13	1.17	0.93
	WLAN5G	802.11a	Rear Face	1	52	Full Power	88.54	16	14.76	0.03	0.334	1.13	1.33	0.50
	WLAN5G	802.11a	Rear Face	1.4	52	Full Power	88.54	16	14.76	0.08	0.143	1.13	1.33	0.21
8	WLAN5G	802.11a	Top Side	1	52	Full Power	88.54	16	14.76	-0.08	0.789	1.13	1.33	**1.19**
	WLAN5G	802.11a	Top Side	1.5	52	Full Power	88.54	16	14.76	0.03	0.366	1.13	1.33	0.55
	WLAN5G	802.11a	Top Side	0	60	Reduced Power	88.54	7	6.3	0.02	0.734	1.13	1.17	0.97
	WLAN5G	802.11a	Top Side	1	60	Full Power	88.54	16	14.29	0.08	0.705	1.13	1.48	1.18
	WLAN5G	802.11a	Rear Face	0	140	Reduced Power	88.54	7	6.25	-0.07	0.350	1.13	1.19	0.47
	WLAN5G	802.11a	Top Side	0	140	Reduced Power	88.54	7	6.25	0.03	0.493	1.13	1.19	0.66
	WLAN5G	802.11a	Rear Face	1	140	Full Power	88.54	16	15.65	0.18	0.414	1.13	1.08	0.51
	WLAN5G	802.11a	Rear Face	1.4	140	Full Power	88.54	16	15.65	0.05	0.227	1.13	1.08	0.28
	WLAN5G	802.11a	Top Side	1	140	Full Power	88.54	16	15.65	0.12	0.733	1.13	1.08	0.90
	WLAN5G	802.11a	Top Side	1.5	140	Full Power	88.54	16	15.65	0.17	0.389	1.13	1.08	0.48
9	WLAN5G	802.11a	Top Side	1	100	Full Power	88.54	16	15.38	-0.07	0.906	1.13	1.15	**1.18**
	WLAN5G	802.11a	Rear Face	0	157	Reduced Power	88.54	10	9.7	0.03	0.587	1.13	1.07	0.71
	WLAN5G	802.11a	Top Side	0	157	Reduced Power	88.54	10	9.7	0.15	0.826	1.13	1.07	1.00
	WLAN5G	802.11a	Rear Face	1	157	Full Power	88.54	16	15.66	-0.09	0.405	1.13	1.08	0.49
	WLAN5G	802.11a	Rear Face	1.4	157	Full Power	88.54	16	15.66	0.11	0.254	1.13	1.08	0.31
	WLAN5G	802.11a	Top Side	1	157	Full Power	88.54	16	15.66	0.11	0.434	1.13	1.08	0.53
	WLAN5G	802.11a	Top Side	1.5	157	Full Power	88.54	16	15.66	0.03	0.276	1.13	1.08	0.34
10	WLAN5G	802.11a	Top Side	0	149	Reduced Power	88.54	10	9.42	-0.09	0.910	1.13	1.14	**1.17**
11	BT	8DPSK	Rear Face	0	0	Full Power	77.33	7	6.51	0.05	0.137	1.29	1.12	**0.20**
	BT	8DPSK	Rear Face	1.4	0	Full Power	77.33	7	6.51	0.09	0.078	1.29	1.12	0.11
	BT	8DPSK	Top Side	0	0	Full Power	77.33	7	6.51	0.11	0.051	1.29	1.12	0.07

4.6.3 SAR Measurement Variability

According to KDB 865664 D01, SAR measurement variability was assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. Alternatively, if the highest measured SAR for both head and body tissue-equivalent media are ≤ 1.45 W/kg and the ratio of these highest SAR values, i.e., largest divided by smallest value, is ≤ 1.10, the highest SAR configuration for either head or body tissue-equivalent medium may be used to perform the repeated measurement. 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.

SAR repeated measurement procedure:

1. When the highest measured SAR is < 0.80 W/kg, repeated measurement is not required.
2. When the highest measured SAR is >= 0.80 W/kg, repeat that measurement once.
3. 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, perform a second repeated measurement.
4. If the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20, and the original, first or second repeated measurement is >= 1.5 W/kg, perform a third repeated measurement.

Band	Test Position	Ch.	Original Measured SAR-1g (W/kg)	1st Repeated SAR-1g (W/kg)	L/S Ratio	2nd Repeated SAR-1g (W/kg)	L/S Ratio	3rd Repeated SAR-1g (W/kg)	L/S Ratio
WCDMA V	Rear Face	4132	0.882	0.869	1.01	N/A	N/A	N/A	N/A
LTE 7	Rear Face	21100	1.010	0.998	1.01	N/A	N/A	N/A	N/A
WLAN2.4G	Rear Face	11	1.030	0.994	1.04	N/A	N/A	N/A	N/A
WLAN5G	Top Side	100	0.906	0.888	1.02	N/A	N/A	N/A	N/A
WLAN5G	Top Side	149	0.910	0.902	1.01	N/A	N/A	N/A	N/A

4.6.4 Simultaneous Multi-band Transmission Evaluation

<SAR Summation Analysis>

Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneous transmitting antenna. When the sum of SAR_{1g} of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit (SAR_{1g} 1.6 W/kg), the simultaneous transmission SAR is not required. When the sum of SAR_{1g} is greater than the SAR limit (SAR_{1g} 1.6 W/kg), SAR test exclusion is determined by the SPLSR.

WWAN Band	Exposure Position	1	2	3	4	1+2+4 Summed 1g SAR (W/kg)	1+3+4 Summed 1g SAR (W/kg)
		WWAN	2.4GHz WLAN	5GHz WLAN	Bluetooth		
		1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)		
GSM850	Rear Face at 0mm	1.147	0.990	0.710	0.198	**2.34**	**2.06**
	Right side at 0mm	1.138				**1.14**	**1.14**
	Top side at 0mm	0.367	0.777	1.000	0.074	**1.22**	**1.44**
	Rear Face at 19mm	0.283	0.137	0.310	0.113	**0.53**	**0.71**
	Right side at 9mm	0.718				**0.72**	**0.72**
	Top side at 15mm	0.118	0.190	0.550	0.074	**0.38**	**0.74**
GSM1900	Rear Face at 0mm	0.955	0.990	0.710	0.198	**2.14**	**1.86**
	Right side at 0mm	0.193				**0.19**	**0.19**
	Top side at 0mm	0.490	0.777	1.000	0.074	**1.34**	**1.56**
	Rear Face at 19mm	0.507	0.137	0.310	0.113	**0.76**	**0.93**
	Right side at 9mm	0.495				**0.49**	**0.49**
	Top side at 15mm	0.540	0.190	0.550	0.074	**0.80**	**1.16**
WCDMA V	Rear Face at 0mm	1.168	0.990	0.710	0.198	**2.36**	**2.08**
	Right side at 0mm	0.569				**0.57**	**0.57**
	Top side at 0mm	0.521	0.777	1.000	0.074	**1.37**	**1.59**
	Rear Face at 19mm	0.213	0.137	0.310	0.113	**0.46**	**0.64**
	Right side at 9mm	0.494				**0.49**	**0.49**
	Top side at 15mm	0.109	0.190	0.550	0.074	**0.37**	**0.73**
LTE 5	Rear Face at 0mm	1.011	0.990	0.710	0.198	**2.20**	**1.92**
	Right side at 0mm	0.698				**0.70**	**0.70**
	Top side at 0mm	0.505	0.777	1.000	0.074	**1.36**	**1.58**
	Rear Face at 19mm	0.345	0.137	0.310	0.113	**0.59**	**0.77**
	Right side at 9mm	0.655				**0.65**	**0.65**
	Top side at 15mm	0.186	0.190	0.550	0.074	**0.45**	**0.81**
LTE 7	Rear Face at 0mm	0.995	0.990	0.710	0.198	**2.18**	**1.90**
	Top side at 0mm	0.334	0.777	1.000	0.074	**1.18**	**1.41**
	Rear Face at 14mm	1.026	0.137	0.310	0.113	**1.28**	**1.45**
	Top side at 11mm	0.745	0.403	1.186	0.074	**1.22**	**2.00**

WWAN Band	Exposure Position	1 WWAN 1g SAR (W/kg)	2 2.4GHz WLAN 1g SAR (W/kg)	3 5GHz WLAN 1g SAR (W/kg)	4 Bluetooth 1g SAR (W/kg)	1+2+4 Summed 1g SAR (W/kg)	1+3+4 Summed 1g SAR (W/kg)
LTE 41 / 38	Rear Face at 0mm	0.995	0.990	0.710	0.198	**2.18**	**1.90**
	Top side at 0mm	0.190	0.777	1.000	0.074	**1.04**	**1.26**
	Rear Face at 14mm	0.490	0.137	0.310	0.113	**0.74**	**0.91**
	Top side at 11mm	0.428	0.403	1.186	0.074	**0.90**	**1.69**

Note：Summed 1+2+4 covers Summed 1+2 / 1+4 / 2+4, Summed 1+3+4 covers Summed 1+3 / 1+4 / 3+4.

<SAR to Peak Location Separation Ratio Analysis>

The simultaneous transmitting antennas in each operating mode and exposure condition combination are considered one pair at a time to determine the SPLSR. When SAR is measured for both antennas in the pair, the peak location separation distance is computed by the following formula.

$$\text{Peak Location Separation Distance} = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$$

Where (x_1, y_1, z_1) and (x_2, y_2, z_2) are the coordinates of the extrapolated peak SAR locations in the area or zoom scans.

When standalone test exclusion applies, SAR is estimated; the peak location is assumed to be at the feed-point or geometric center of the antenna. Due to curvatures on the SAM phantom, when SAR is estimated for one of the antennas in an antenna pair, the measured peak SAR location will be translated onto the test device to determine the peak location separation for the antenna pair.

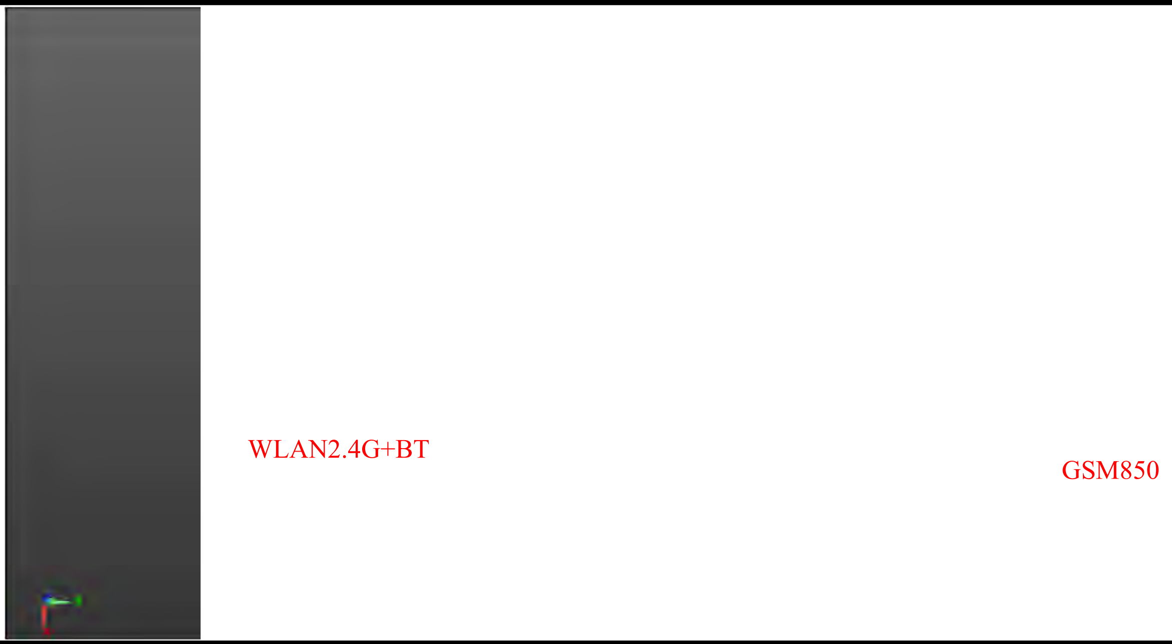
The SPLSR is determined by the following formula.

$$\text{SPLSR} = \frac{(\text{SAR}_1 + \text{SAR}_2)^{1.5}}{R_i}$$

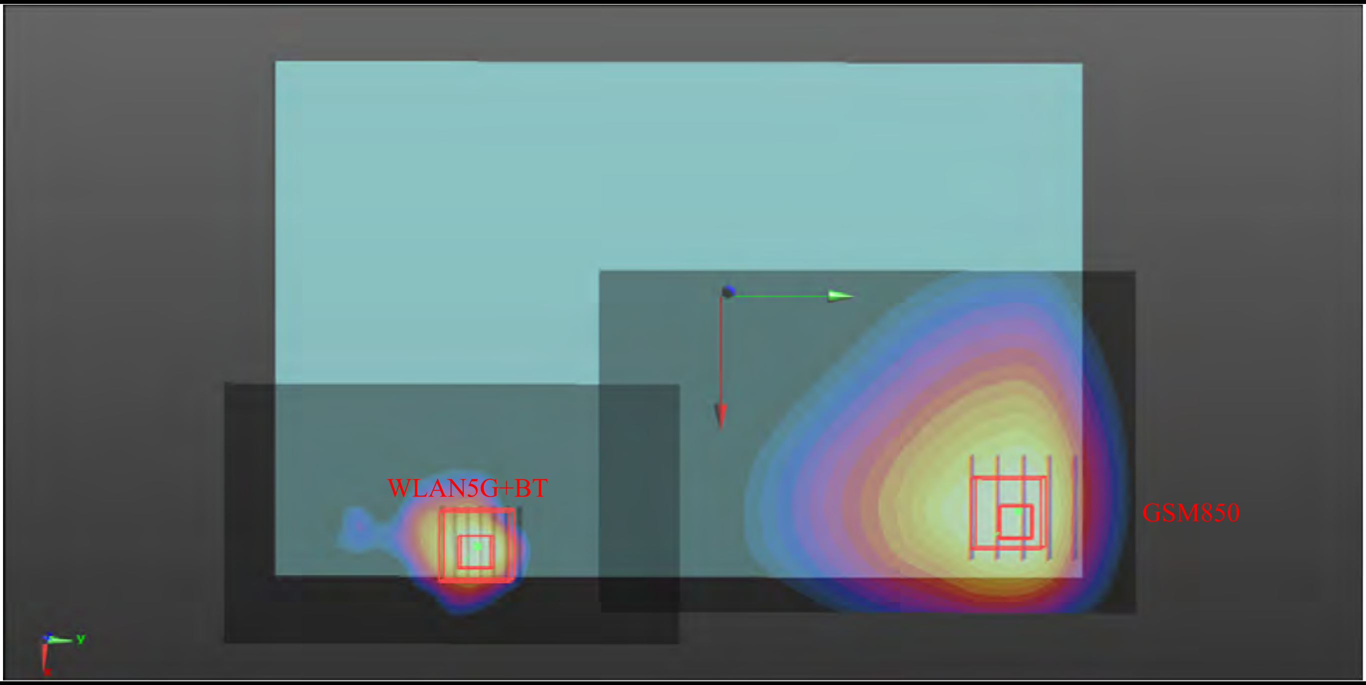
Where SAR_1 and SAR_2 are the highest reported or estimated SAR for each antenna in the pair, and R_i is the separation distance between the peak SAR locations for the antenna pair in mm.

When the SPLSR is <= 0.04, the simultaneous transmission SAR is not required. Otherwise, the enlarged zoom scan and volume scan post-processing procedures will be performed.

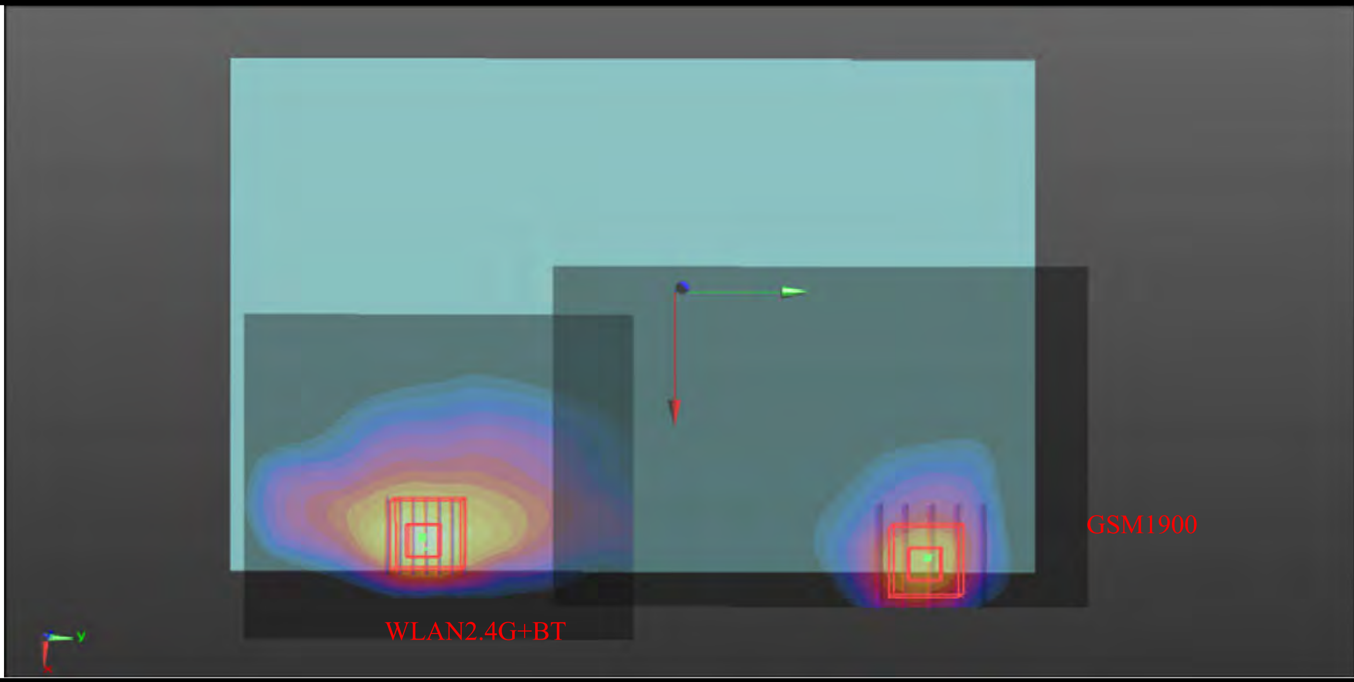
Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (m) X	SAR peak location (m) Y	SAR peak location (m) Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
GSM850	Rear Face	1.15	0	0.0665	0.096	-0.173	151.9	2.34	0.02	Not required
WLAN2.4G+BT		1.19	0	0.078	-0.0555	-0.172				



Band	Position	SAR (W/kg)	Gap	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			(mm)	X	Y	Z				
GSM850	Rear Face	1.15	0	0.0665	0.096	-0.173	152.9	2.16	0.02	Not required
WLAN5G+BT		1.01	0	0.0786	-0.0564	-0.175				

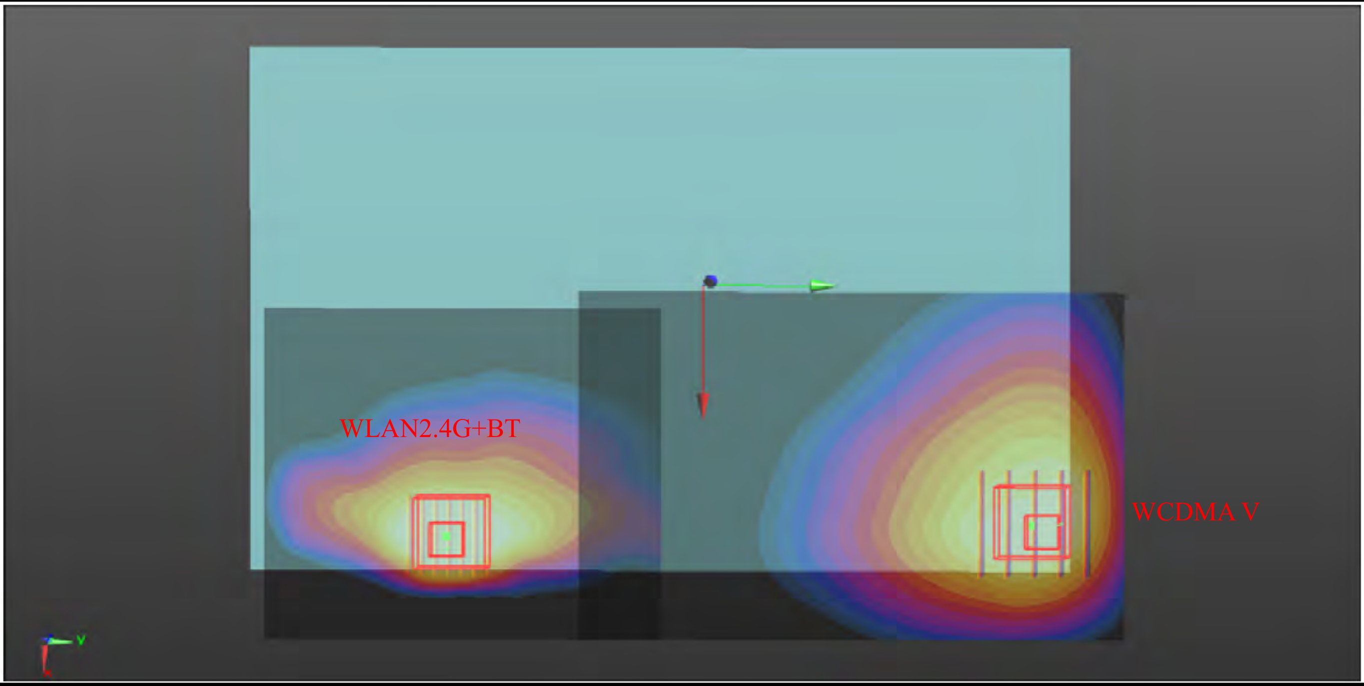


Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				X	Y	Z				
GSM1900	Rear Face	0.95	0	0.075	0.0905	-0.173	146.0	2.14	0.02	Not required
WLAN2.4G+BT		1.19	0	0.078	-0.0555	-0.172				

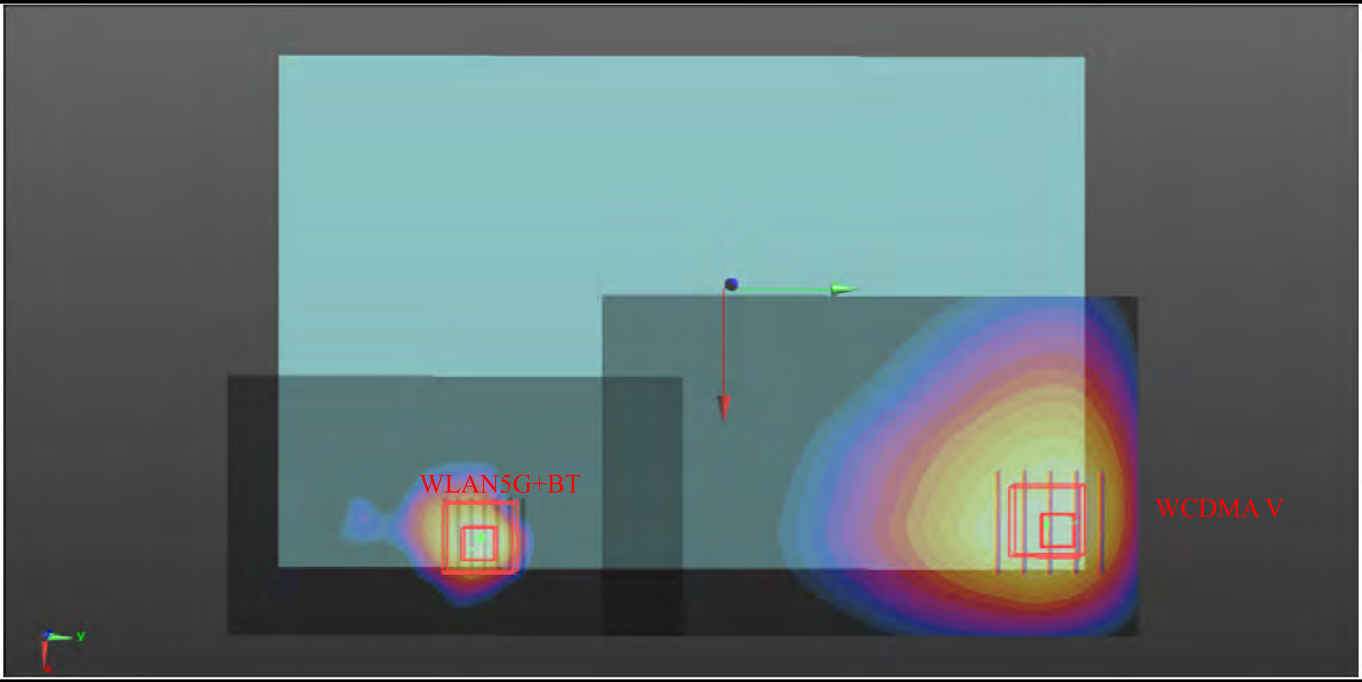


Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
GSM1900	Rear Face	0.95	0	0.075	0.0905	-0.173	147.0	1.96	0.02	Not required
WLAN5G+BT		1.01	0	0.0786	-0.0564	-0.175				

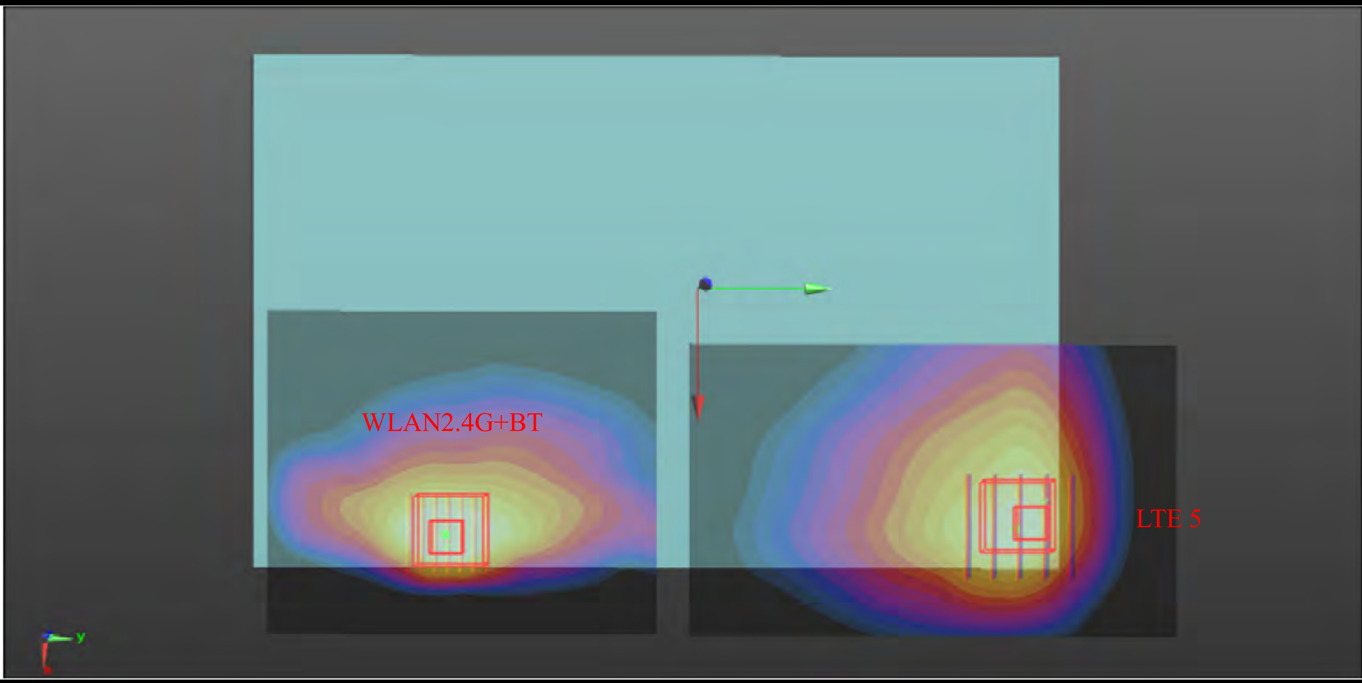
Band	Position	SAR (W/kg)	Gap	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			(mm)	X	Y	Z				
WCDMA V	Rear Face	0.81	0	0.0655	0.12	-0.172	175.9	2.00	0.02	Not required
WLAN2.4G+BT		1.19	0	0.078	-0.0555	-0.172				



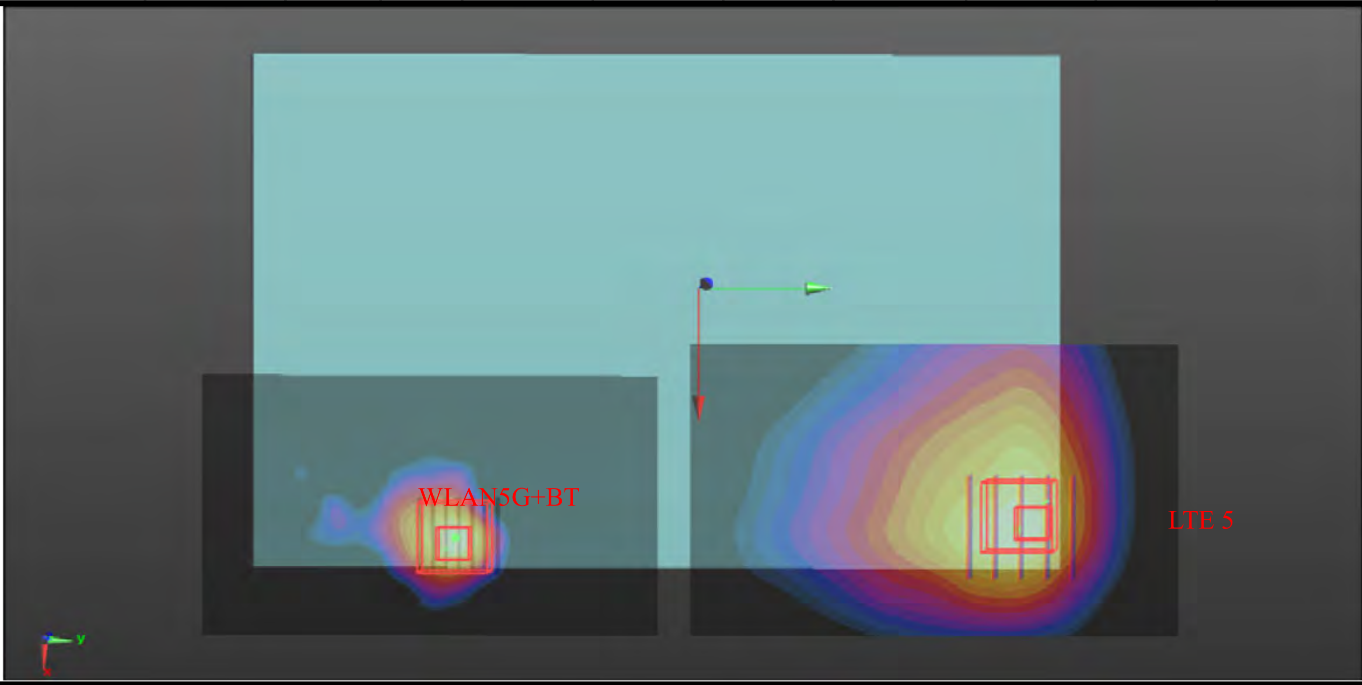
<table>
<tr><th rowspan="2">Band</th><th rowspan="2">Position</th><th rowspan="2">SAR (W/kg)</th><th>Gap</th><th colspan="3">SAR peak location (m)</th><th rowspan="2">3D distance (mm)</th><th rowspan="2">Summed SAR (W/kg)</th><th rowspan="2">SPLSR Results</th><th rowspan="2">Simultaneous SAR</th></tr>
<tr><th>(mm)</th><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>WCDMA V</td><td rowspan="2">Rear Face</td><td>0.81</td><td>0</td><td>0.0655</td><td>0.12</td><td>-0.172</td><td rowspan="2">176.9</td><td rowspan="2">1.82</td><td rowspan="2">0.01</td><td rowspan="2">Not required</td></tr>
<tr><td>WLAN5G+BT</td><td>1.01</td><td>0</td><td>0.0786</td><td>-0.0564</td><td>-0.175</td></tr>
</table>



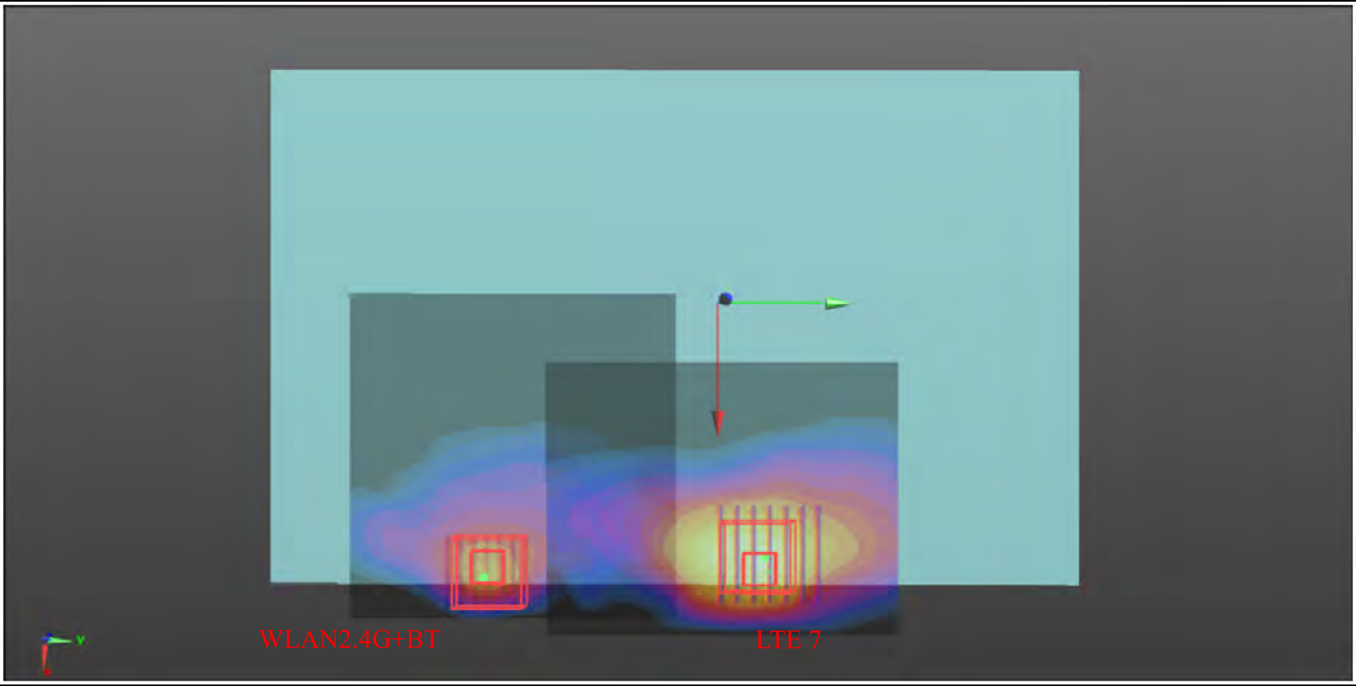
Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				X	Y	Z				
LTE 5	Rear Face	1.01	0	0.059	0.119	-0.175	175.6	2.20	0.02	Not required
WLAN2.4G+BT		1.19	0	0.078	-0.0555	-0.172				



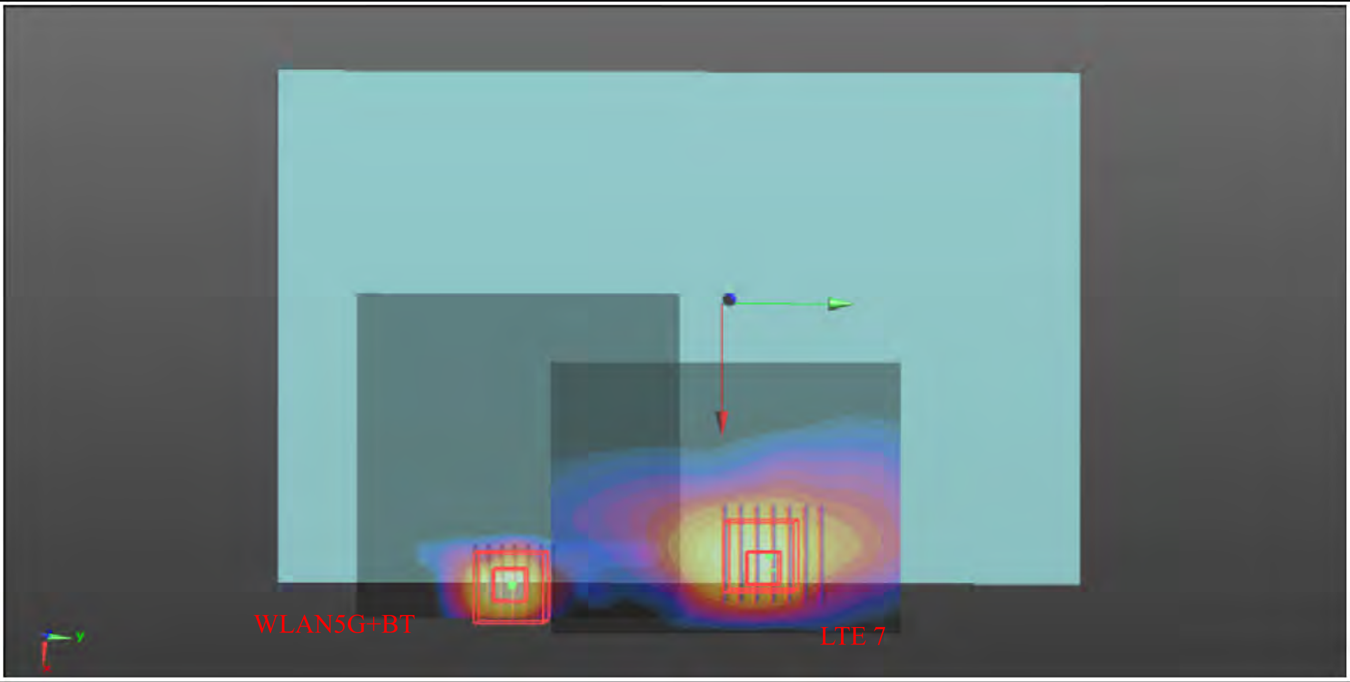
Band	Position	SAR (W/kg)	Gap	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			(mm)	X	Y	Z				
LTE 5	Rear Face	1.01	0	0.059	0.119	-0.175	176.5	2.02	0.02	Not required
WLAN5G+BT		1.01	0	0.0786	-0.0564	-0.175				



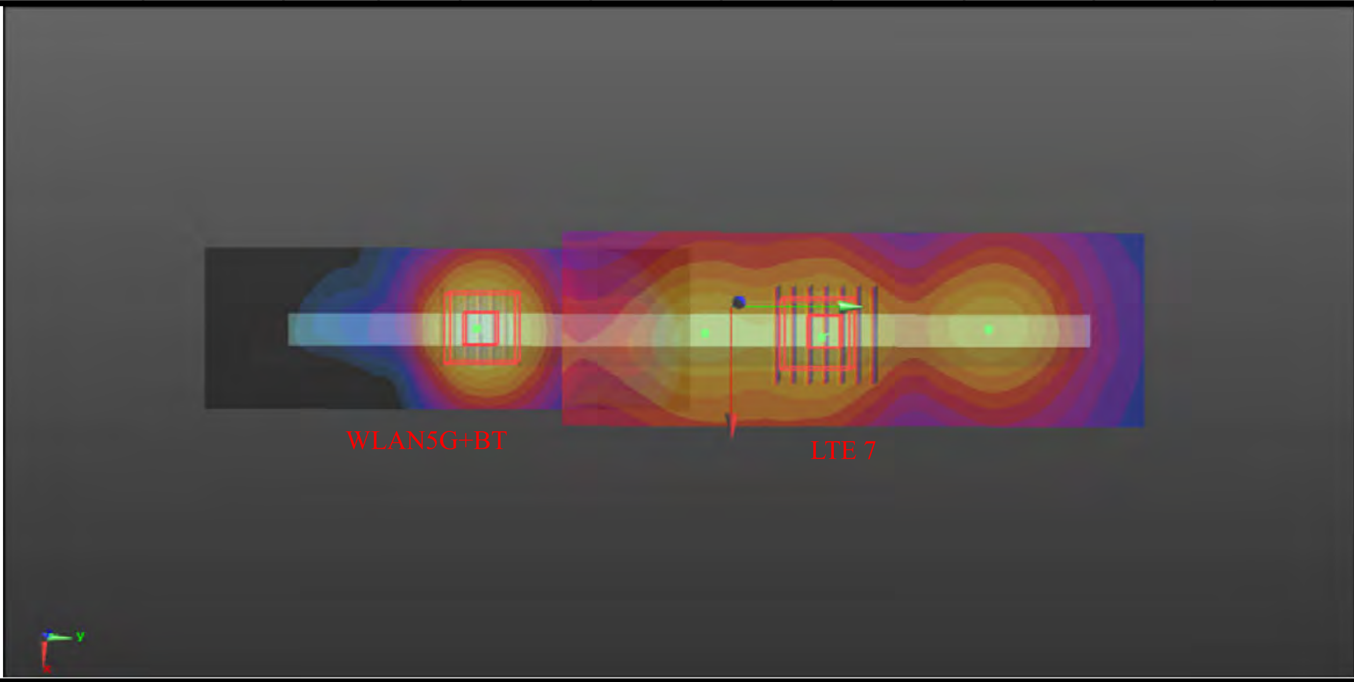
Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				X	Y	Z				
LTE 7	Rear Face	0.99	0	0.0684	0.0156	-0.173	71.8	2.18	0.04	Not required
WLAN2.4G+BT		1.19	0	0.078	-0.0555	-0.172				



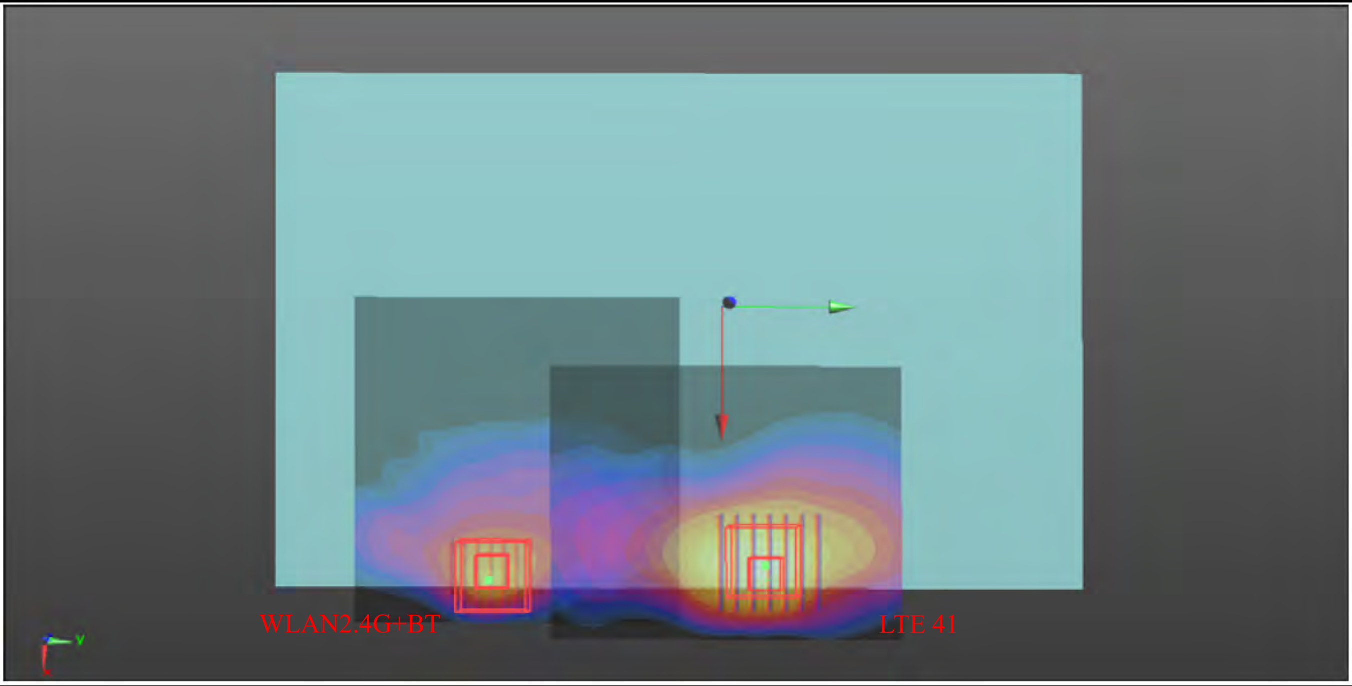
Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
LTE 7	Rear Face	1.15	0	0.0684	0.0156	-0.173	72.7	2.16	0.04	Not required
WLAN5G+BT		1.01	0	0.0786	-0.0564	-0.175				



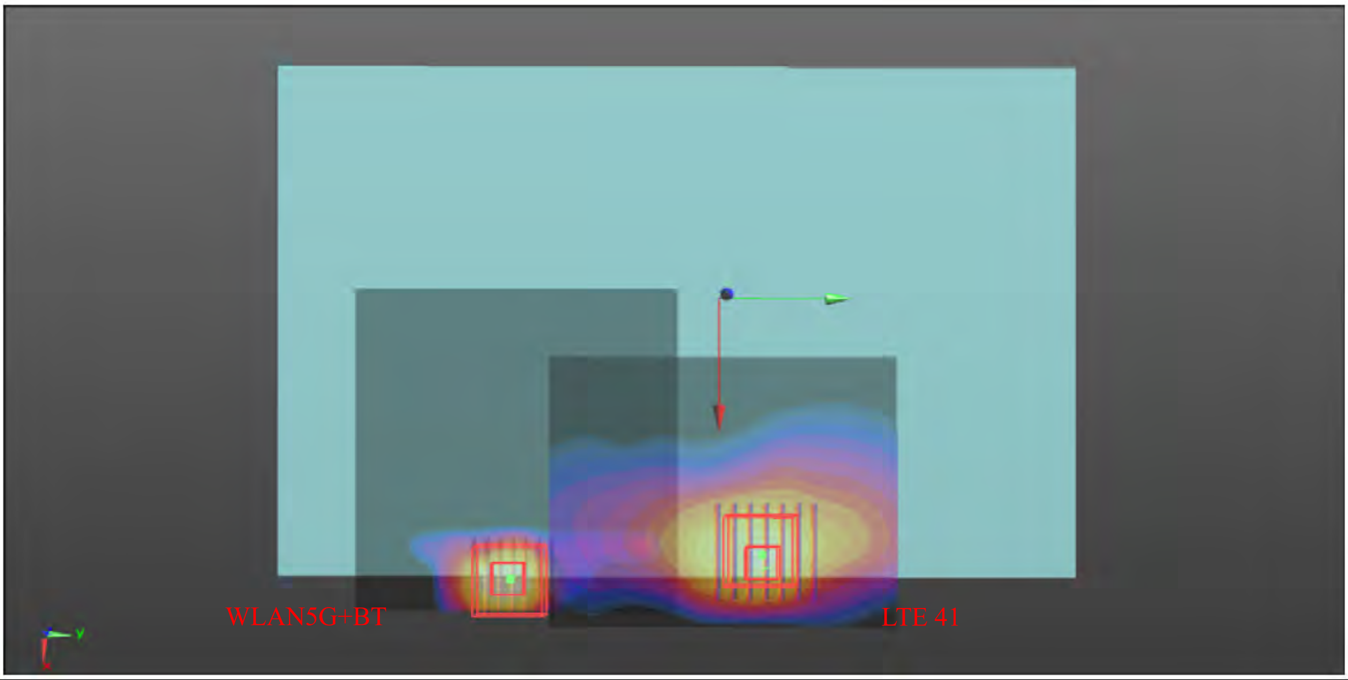
Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				X	Y	Z				
LTE 7	Top Side	0.75	11	0.0024	0.0404	-0.173	106.4	2.00	0.03	Not required
WLAN5G+BT		1.26	11	0.002	-0.066	-0.175				



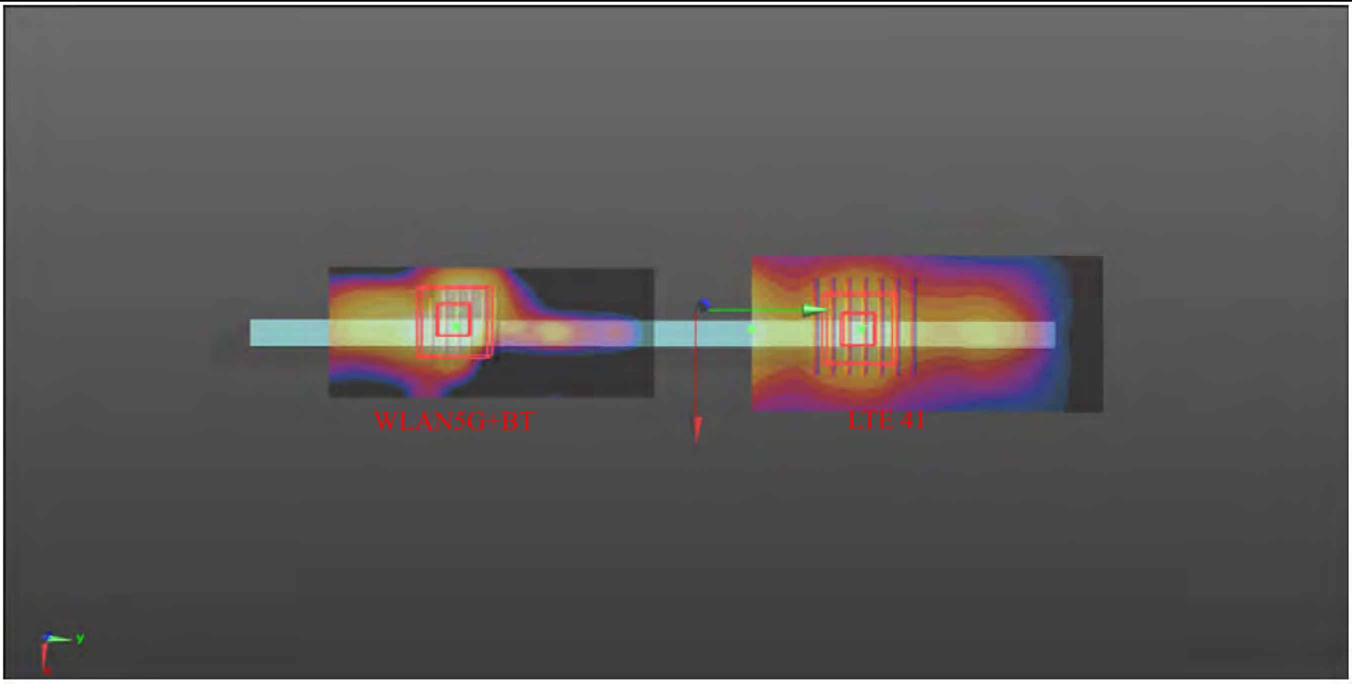
Band	Position	SAR (W/kg)	Gap	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			(mm)	X	Y	Z				
LTE 41	Rear Face	0.99	0	0.0785	0.0205	-0.175	76.1	2.18	0.04	Not required
WLAN2.4G+BT		1.19	0	0.078	-0.0555	-0.172				



Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
LTE 41	Rear Face	1.15	0	0.0785	0.0205	-0.175	76.9	2.16	0.04	Not required
WLAN5G+BT		1.01	0	0.0786	-0.0564	-0.175				



Band	Position	SAR (W/kg)	Gap	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
			(mm)	X	Y	Z				
LTE 41	Top side	0.43	11	8.74E-11	0.0428	-0.173	108.8	1.69	0.02	Not required
WLAN5G+BT		1.26	11	0.002	-0.066	-0.175				



Test Engineer : Chang Gao, and Zixiao Xia

5. Calibration of Test Equipment

Equipment	Manufacturer	Model	SN	Cal. Date	Cal. Interval
System Validation Dipole	SPEAG	D835V2	4d265	Oct. 18, 2021	1 Year
System Validation Dipole	SPEAG	D1900V2	5d159	Sep. 16, 2021	1 Year
System Validation Dipole	SPEAG	D2450V2	1048	Oct. 21, 2021	1 Year
System Validation Dipole	SPEAG	D2600V2	1110	Sep. 16, 2021	1 Year
System Validation Dipole	SPEAG	D5GHzV2	1315	Oct. 22, 2021	1 Year
Data Acquisition Electronics	SPEAG	DAE4	755	Apr. 27, 2022	1 Year
Dosimetric E-Field Probe	SPEAG	EX3DV4	3985	May. 16, 2022	1 Year
Magnetic Field Probe	SPEAG	DAKS-3.5	1119	Feb.28,2022	1 Year
Vector network analyzer	SPEAG	DAKS_VNA R140	0121219	Feb.28,2022	1 Year
Wideband Radio Communication Tester	Rohde&Schwarz	CMW 500	169210	Jun. 22, 2022	1 Year
Power Meter	Rohde&Schwarz	NRX	102380	Feb.15,2022	1 Year
Power Sensor	Rohde&Schwarz	NRP6A	102942	Feb.15,2022	1 Year
Power Sensor	Rohde&Schwarz	NRP6A	102943	Feb.15,2022	1 Year
ESG Analog Signal Generator	Rohde&Schwarz	SMB100A03	182185	Feb.16,2022	1 Year
Coupler	Woken	0110A056020-10	COM27RW1 A3	May.11,2022	1 Year
Temp.&Humi.Recorder	ANYMETER	JR912	SZ01	Jun.19,2022	1 Year

6. Measurement Uncertainty

DASY6 Uncertainty Budget According to IEC 62209-2/2010 (30 MHz - 6 GHz range)								
Error Description	**Uncertainty Value (±%)**	**Probability**	**Divisor**	**(Ci) 1g**	**(Ci) 10g**	**Standard Uncertainty (1g) (±%)**	**Standard Uncertainty (10g) (±%)**	**(Vi) Veff**
Measurement System								
Probe Calibration	6.65	N	1	1	1	6.7	6.7	∞
Axial Isotropy	4.7	R	1.732	0.7	0.7	1.9	1.9	∞
Hemispherical Isotropy	9.6	R	1.732	0.7	0.7	3.9	3.9	∞
Boundary Effects	2.0	R	1.732	1	1	1.2	1.2	∞
Linearity	4.7	R	1.732	1	1	2.7	2.7	∞
System Detection Limits	1.0	R	1.732	1	1	0.6	0.6	∞
Modulation Response	3.2	R	1.732	1	1	1.8	1.8	∞
Readout Electronics	0.3	N	1	1	1	0.3	0.3	∞
Response Time	0.0	R	1.732	1	1	0.0	0.0	∞
Integration Time	2.6	R	1.732	1	1	1.5	1.5	∞
RF Ambient Noise	3.0	R	1.732	1	1	1.7	1.7	∞
RF Ambient Reflections	3.0	R	1.732	1	1	1.7	1.7	∞
Probe Positioner	0.4	R	1.732	1	1	0.2	0.2	∞
Probe Positioning	6.7	R	1.732	1	1	3.9	3.9	∞
Max. SAR Eval.	4.0	R	1.732	1	1	2.3	2.3	∞
Test Sample Related								
Device Positioning	4.3	N	1	1	1	4.3	4.3	35
Device Holder	4.9	N	1	1	1	4.9	4.9	12
Power Drift	5.0	R	1.732	1	1	2.9	2.9	∞
Power Scaling	0.0	R	1.732	1	1	0.0	0.0	∞
Phantom and Setup								
Phantom Uncertainty	6.6	R	1.732	1	1	3.8	3.8	∞
SAR correction	0.0	R	1.732	1	0.84	0.0	0.0	∞
Liquid Conductivity Repeatability	0.16	N	1	0.78	0.71	0.1	0.1	5
Liquid Conductivity (target)	10.0	R	1.732	0.78	0.71	4.5	4.1	∞
Liquid Conductivity (mea.)	2.5	R	1.732	0.78	0.71	1.1	1.0	∞
Temp. unc. - Conductivity	3.64	R	1.732	0.78	0.71	1.6	1.5	∞
Liquid Permittivity Repeatability	0.08	N	1	0.23	0.26	0.0	0.0	5
Liquid Permittivity (target)	10.0	R	1.732	0.23	0.26	1.3	1.5	∞
Liquid Permittivity (mea.)	2.5	R	1.732	0.23	0.26	0.3	0.4	∞
Temp. unc. - Permittivity	1.78	R	1.732	0.23	0.26	0.2	0.3	∞
Combined Std. Uncertainty						14.0%	13.9%	624
Coverage Factor for 95 %						K=2	K=2	
Expanded STD Uncertainty						28.0%	27.7%	

Uncertainty budget for frequency range 30 MHz to 6 GHz

7. Information on the Testing Laboratories

We, Huarui 7layers High Technology (Suzhou) Co., Ltd., were founded in 2020 to provide our best service in EMC, Radio, Telecom and Safety consultation.

If you have any comments, please feel free to contact us at the following:

Add: Tower N, Innovation Center, 88 Zuyi Road, High-tech District, Suzhou City, Anhui Province
Tel: +86 (0557) 368 1008

The road map of all our labs can be found in our web site also
Web: http://www.7Layers.com

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Appendix A. SAR Plots of System Verification

The plots for system verification with largest deviation for each SAR system combination are shown as follows.

Test Laboratory: ritt 7 Layers SAR/HAC Testing Lab Date: 08/15/2022

System Check_HSL835_220815

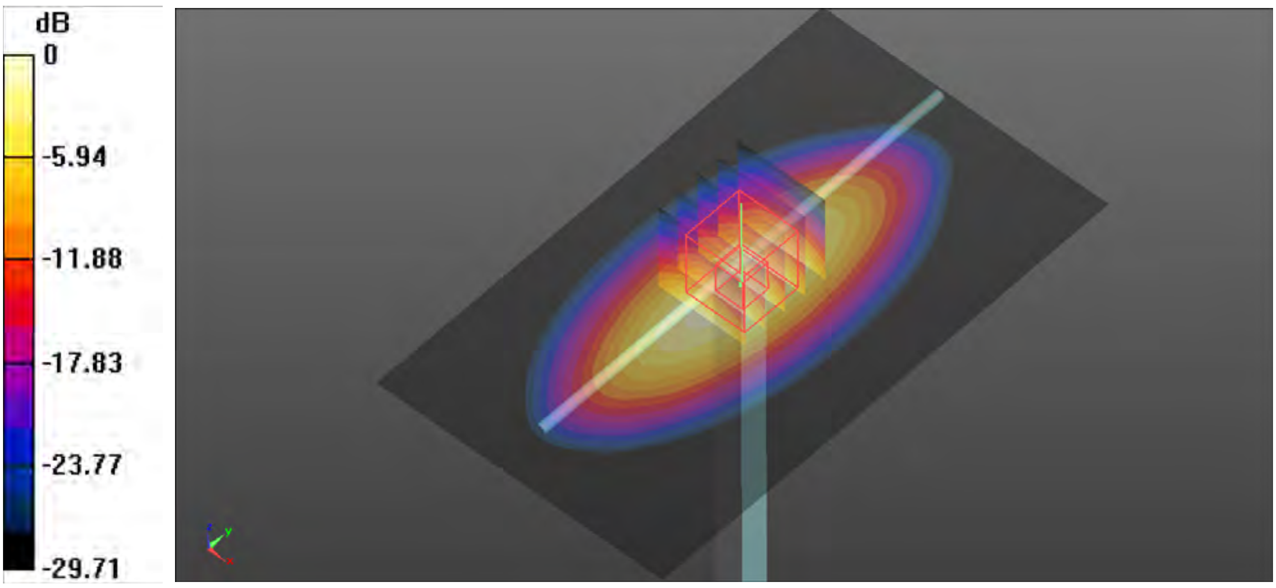
DUT: Dipole 835 MHz; Type: D835V2

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: HSL835_0815 Medium parameters used: f = 835 MHz; σ = 0.936 S/m; ε_r = 43.156; ρ = 1000 kg/m^3
Ambient Temperature：23.4℃; Liquid Temperature：22.2℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3985; ConvF(9.85, 9.85, 9.85) @ 835 MHz; Calibrated: 05/16/2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 04/27/2022
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2128
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=250mW/Area Scan (61x201x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 3.45 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 49.71 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 4.00 W/kg
SAR(1 g) = 2.5 W/kg; SAR(10 g) = 1.62 W/kg
Maximum value of SAR (measured) = 3.43 W/kg



0 dB = 3.43 W/kg

System Check_HSL1900_220818

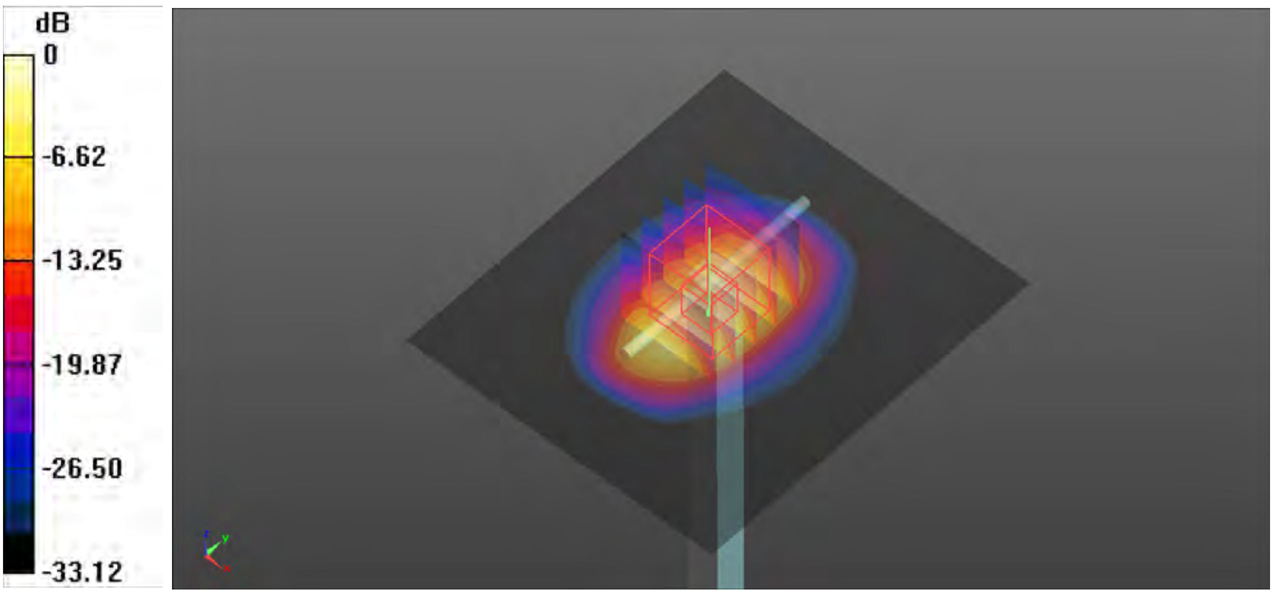
DUT: Dipole:1900MHz;Type:D1900V2

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: HSL1900_0818 Medium parameters used: f = 1900 MHz; σ = 1.409 S/m; ε_r = 40.214; ρ = 1000 kg/m^3
Ambient Temperature：23.5℃; Liquid Temperature：22.3℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3985; ConvF(8.14, 8.14, 8.14) @ 1900 MHz; Calibrated: 05/16/2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 04/27/2022
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2128
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=250mW/Area Scan (61x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 16.2 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 94.25 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 17.9 W/kg
SAR(1 g) = 9.72 W/kg; SAR(10 g) = 5.05 W/kg
Maximum value of SAR (measured) = 15.1 W/kg



0 dB = 15.1 W/kg

Test Laboratory: ritt 7 Layers SAR/HAC Testing Lab Date: 08/25/2022

System Check_HSL2450_220825

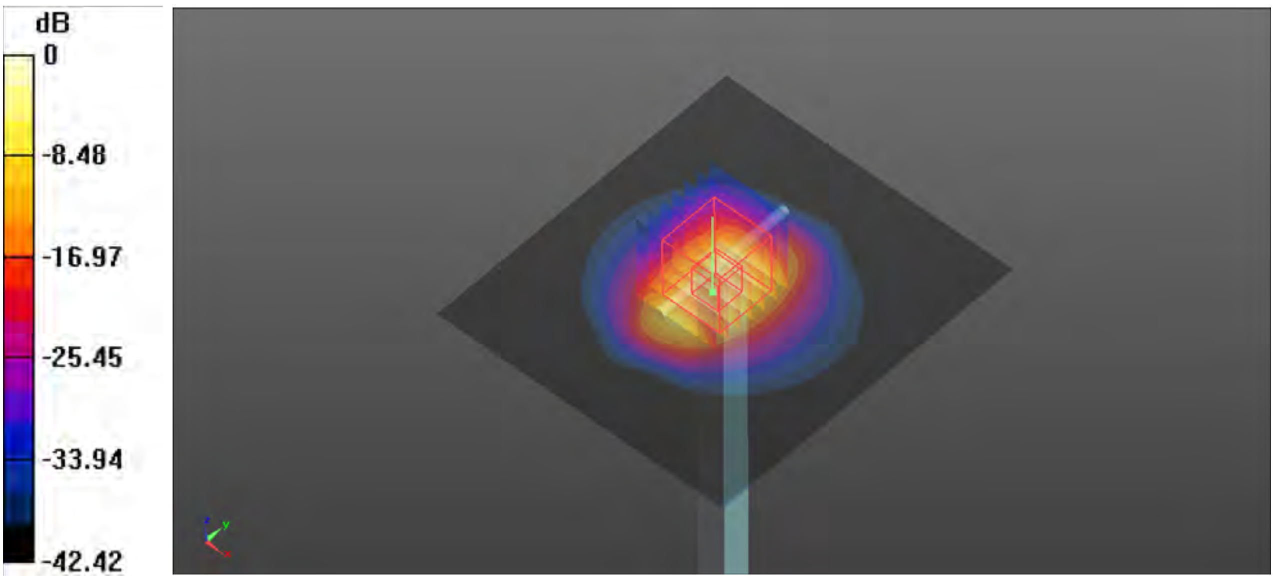
DUT: Dipole 2450 MHz; Type: D2450V2

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: HSL2450_0825 Medium parameters used: f = 2450 MHz; σ = 1.807 S/m; ε_r = 39.291; ρ = 1000 kg/m^3
Ambient Temperature：23.2℃; Liquid Temperature：22.6℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3985; ConvF(7.68, 7.68, 7.68) @ 2450 MHz; Calibrated: 05/16/2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 04/27/2022
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2128
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=250mW/Area Scan (71x121x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 21.2 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 71.11 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 25.4 W/kg
SAR(1 g) = 12.3 W/kg; SAR(10 g) = 5.73 W/kg
Maximum value of SAR (measured) = 20.6 W/kg



0 dB = 20.6 W/kg

Test Laboratory: ritt 7 Layers SAR/HAC Testing Lab Date: 08/17/2022

System Check_HSL2600_220817

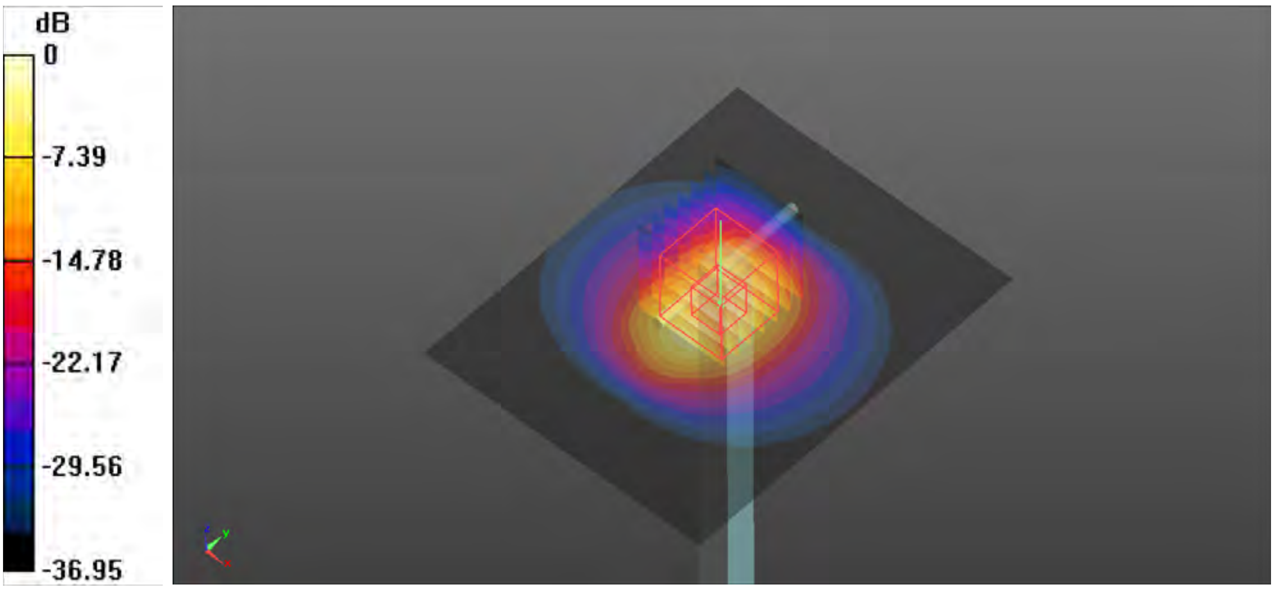
DUT: Dipole:2600 MHz;Type:D2600V2

Communication System: CW; Frequency: 2600 MHz;Duty Cycle: 1:1
Medium: HSL2600_0817 Medium parameters used: f = 2600 MHz; σ = 1.922 S/m; ε_r = 39.074; ρ = 1000 kg/m^3
Ambient Temperature：23.2℃; Liquid Temperature：22.7℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3985; ConvF(7.47, 7.47, 7.47) @ 2600 MHz; Calibrated: 05/16/2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 04/27/2022
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2128
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=250mW/Area Scan (81x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 24.4 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 106.2 V/m; Power Drift = 0.18 dB
Peak SAR (extrapolated) = 31.3 W/kg
SAR(1 g) = 14.7 W/kg; SAR(10 g) = 6.62 W/kg
Maximum value of SAR (measured) = 25.1 W/kg



0 dB = 25.1 W/kg

System Check_HSL5250_220826

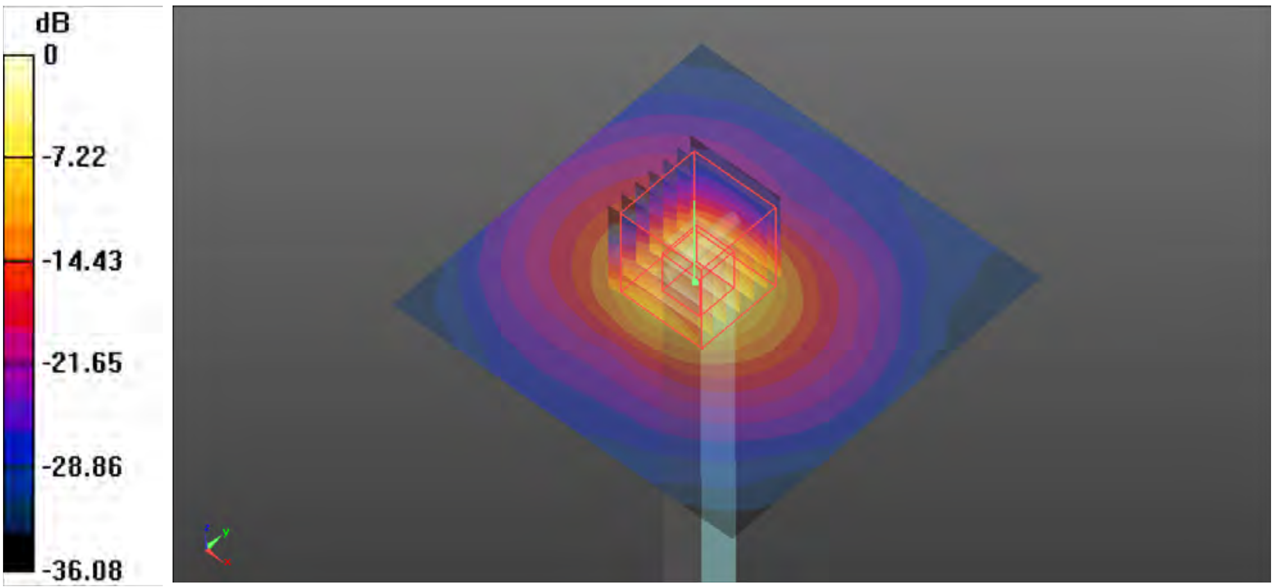
DUT: Dipole D5GHzV2; Type: D5GHzV2

Communication System: CW; Frequency: 5250 MHz;Duty Cycle: 1:1
Medium: HSL5G_0826 Medium parameters used: f = 5250 MHz; σ = 4.629 S/m; ε_r = 36.244; ρ = 1000 kg/m^3
Ambient Temperature：23.4℃; Liquid Temperature：22.6℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3985; ConvF(5.52, 5.52, 5.52) @ 5250 MHz; Calibrated: 05/16/2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 04/27/2022
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2128
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=100mW/Area Scan (91x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 18.9 W/kg

Pin=100mW/Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 26.59 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 32.9 W/kg
SAR(1 g) = 7.7 W/kg; SAR(10 g) = 2.18 W/kg
Maximum value of SAR (measured) = 18.8 W/kg



0 dB = 18.8 W/kg

System Check_HSL5600_220827

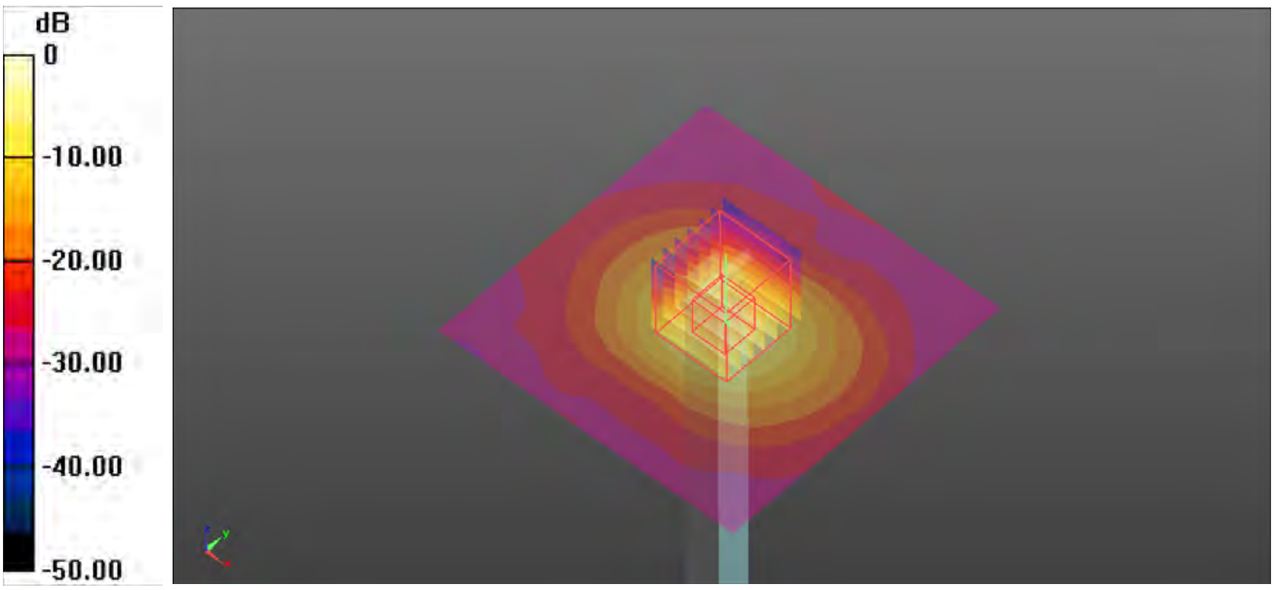
DUT: Dipole D5GHzV2; Type: D5GHzV2

Communication System: CW; Frequency: 5600 MHz;Duty Cycle: 1:1
Medium: HSL5G_0827 Medium parameters used: f = 5600 MHz; σ = 5.018 S/m; ε_r = 35.687; ρ = 1000 kg/m^3
Ambient Temperature：23.2℃; Liquid Temperature：22.4℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3985; ConvF(4.97, 4.97, 4.97) @ 5600 MHz; Calibrated: 05/16/2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 04/27/2022
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2128
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=100mW/Area Scan (91x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 20.8 W/kg

Pin=100mW/Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 29.21 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 37.6 W/kg
SAR(1 g) = 8.35 W/kg; SAR(10 g) = 2.34 W/kg
Maximum value of SAR (measured) = 20.4 W/kg



0 dB = 20.4 W/kg

Test Laboratory: ritt 7 Layers SAR/HAC Testing Lab Date: 08/28/2022

System Check_HSL5750_220828

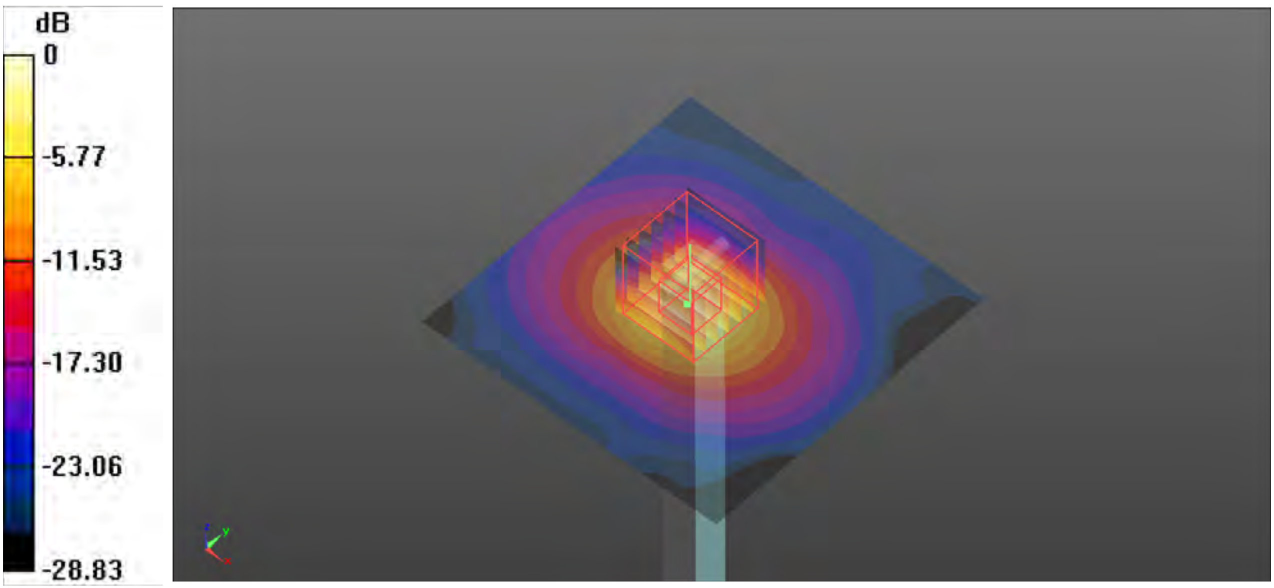
DUT: Dipole D5GHzV2; Type: D5GHzV2

Communication System: CW; Frequency: 5750 MHz;Duty Cycle: 1:1
Medium: HSL5G_0828 Medium parameters used: f = 5750 MHz; σ = 5.139 S/m; ε_r = 35.394; ρ = 1000 kg/m^3
Ambient Temperature：23.6℃; Liquid Temperature：22.4℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3985; ConvF(5.02, 5.02, 5.02) @ 5750 MHz; Calibrated: 05/16/2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 04/27/2022
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2128
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=100mW/Area Scan (61x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 18.6 W/kg

Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 38.15 V/m; Power Drift = 0.18 dB
Peak SAR (extrapolated) = 33.3 W/kg
SAR(1 g) = 7.24 W/kg; SAR(10 g) = 2.04 W/kg
Maximum value of SAR (measured) = 19.6 W/kg



0 dB = 19.6 W/kg

Appendix B. SAR Plots of SAR Measurement

The SAR plots for highest measured SAR in each exposure configuration, wireless mode and frequency band combination, and measured SAR > 1.5 W/kg are shown as follows.

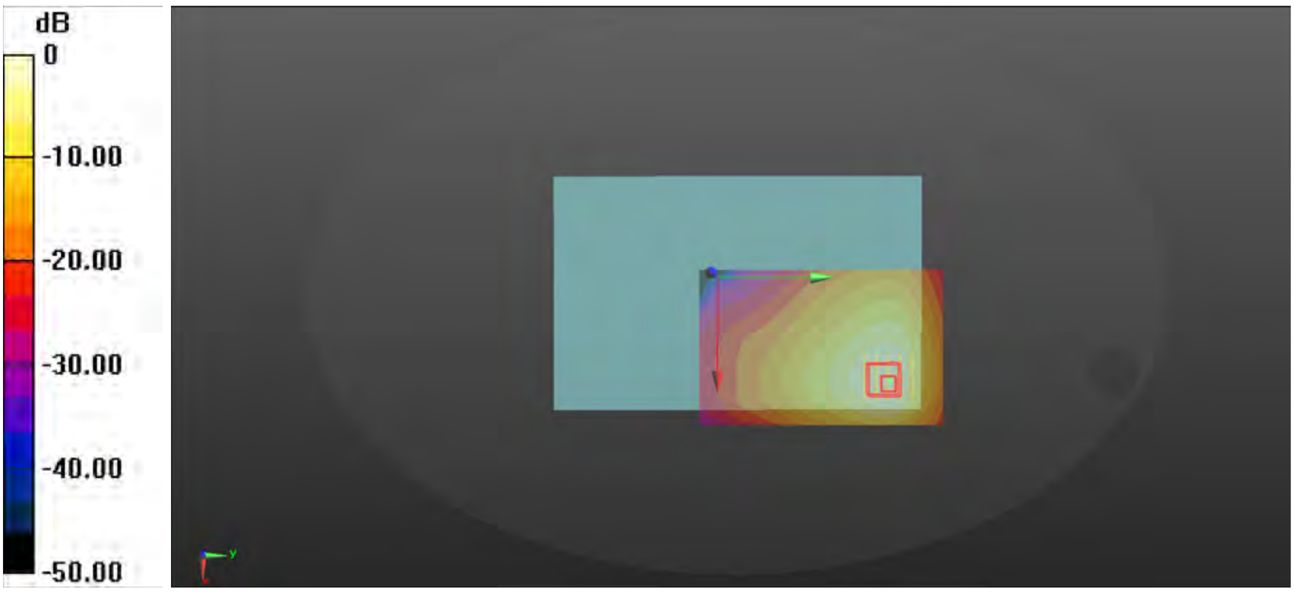
P01 GSM850_GPRS 2TX slot_Rear Face_0cm_Ch189

Communication System: GPRS 2Tx slot; Frequency: 836.4 MHz;Duty Cycle: 1:4.15
Medium: HSL835_0815 Medium parameters used: f = 836.4 MHz; σ = 0.937 S/m; ε_r = 43.144; ρ = 1000 kg/m^3
Ambient Temperature：23.4℃; Liquid Temperature：22.2℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3985; ConvF(9.85, 9.85, 9.85) @ 836.4 MHz; Calibrated: 05/16/2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 04/27/2022
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2128
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

- **Area Scan (71x111x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.14 W/kg

- **Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 1.076 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 1.80 W/kg
SAR(1 g) = 0.801 W/kg; SAR(10 g) = 0.516 W/kg
Maximum value of SAR (measured) = 0.928 W/kg



0 dB = 0.928 W/kg

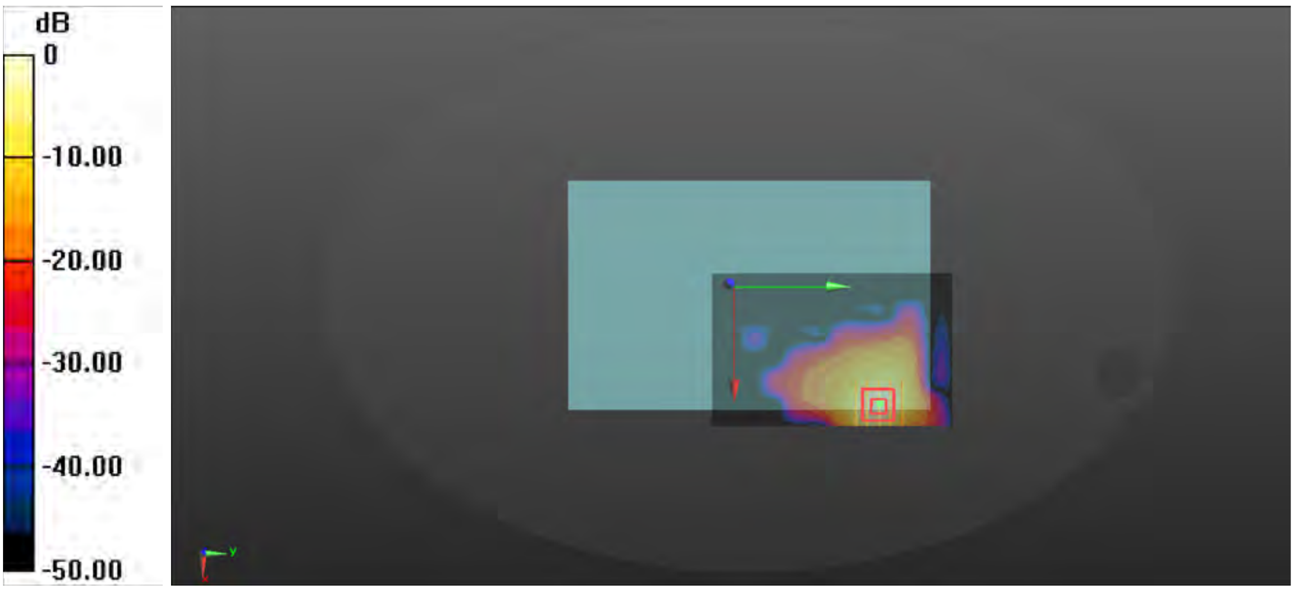
P02 GSM1900_GPRS 2TX slot_Rear Face_0cm_Ch661

Communication System: GPRS 2Tx slot; Frequency: 1880 MHz;Duty Cycle: 1:4.15
Medium: HSL1900_0818 Medium parameters used: f = 1880 MHz; σ = 1.397 S/m; ε_r = 40.23; ρ = 1000 kg/m^3
Ambient Temperature：23.5℃; Liquid Temperature：22.3℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3985; ConvF(8.14, 8.14, 8.14) @ 1880 MHz; Calibrated: 05/16/2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 04/27/2022
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2128
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

- **Area Scan (71x111x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.846 W/kg

- **Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 1.49 W/kg
SAR(1 g) = 0.647 W/kg; SAR(10 g) = 0.278 W/kg
Maximum value of SAR (measured) = 0.742 W/kg



0 dB = 0.742 W/kg

Test Laboratory: ritt 7 Layers SAR/HAC Testing Lab   Date: 08/15/2022

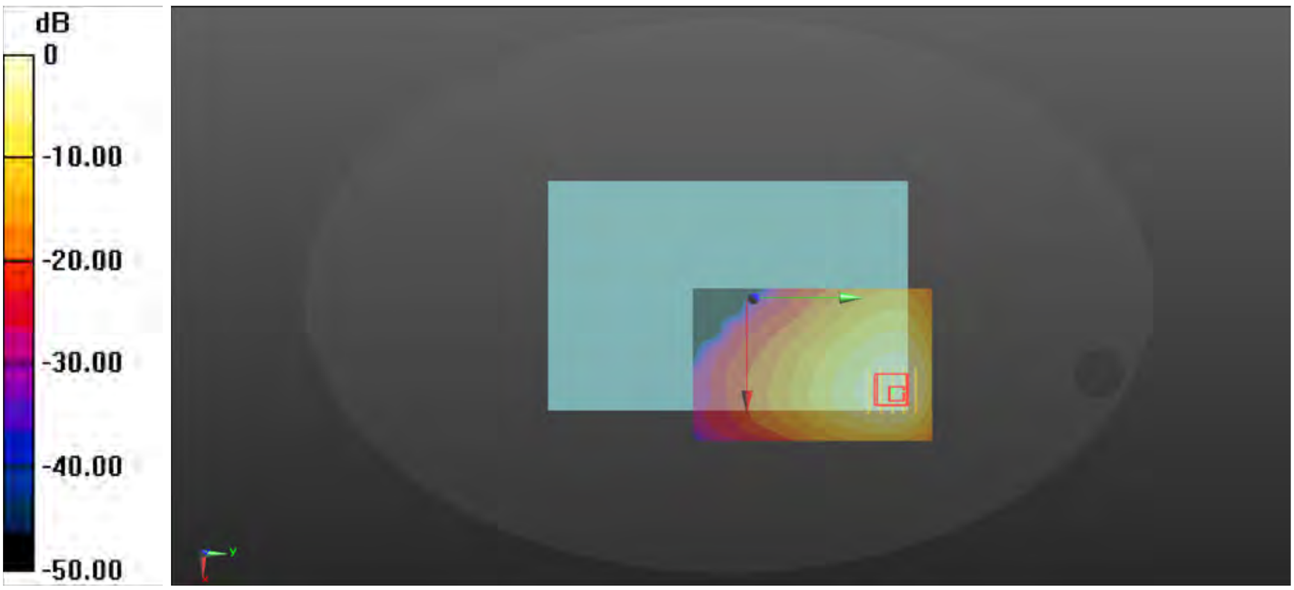
P03 WCDMA V_RMC 12.2K_Rear Face_0cm_Ch4132

Communication System: WCDMA; Frequency: 836.4 MHz;Duty Cycle: 1:1
Medium: HSL835_0815 Medium parameters used: f = 836.4 MHz; σ = 0.937 S/m; ε_r = 43.144; ρ = 1000 kg/m^3
Ambient Temperature：23.4℃; Liquid Temperature：22.2℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3985; ConvF(9.85, 9.85, 9.85) @ 836.4 MHz; Calibrated: 05/16/2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 04/27/2022
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2128
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

-Area Scan (71x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.984 W/kg

-Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 1.77 W/kg
SAR(1 g) = 0.882 W/kg; SAR(10 g) = 0.507 W/kg
Maximum value of SAR (measured) = 0.926 W/kg



0 dB = 0.926 W/kg

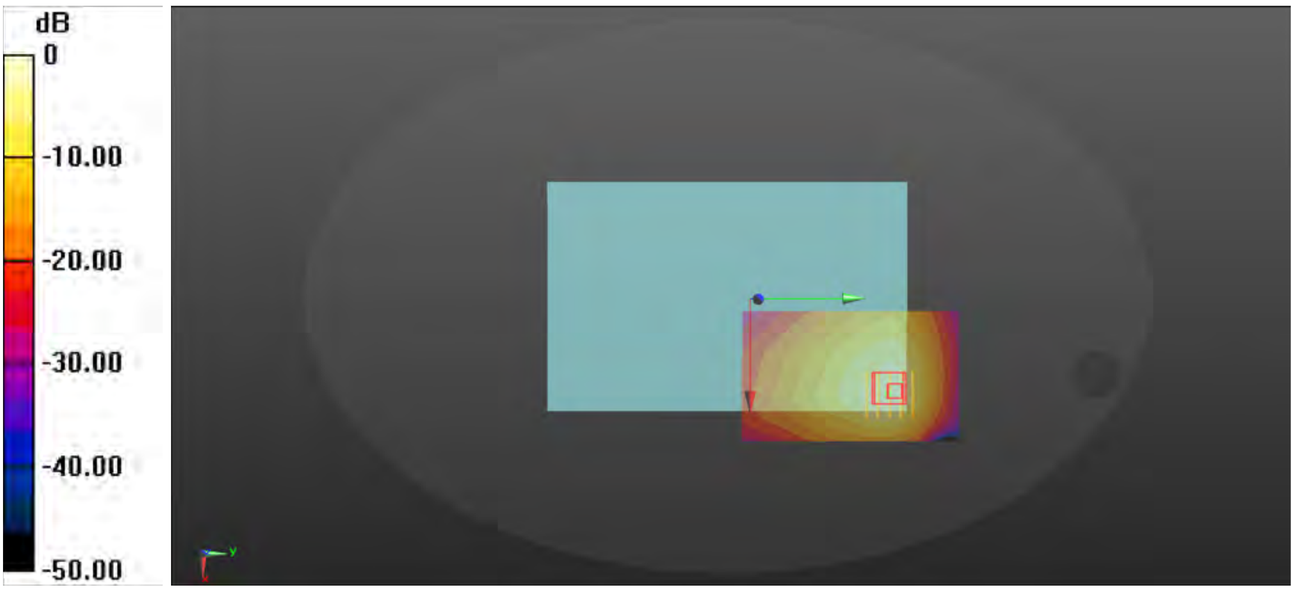
P04 LTE B5_QPSK20M_Rear Face_0cm_Ch20450_1RB_OS0

Communication System: LTE; Frequency: 829 MHz;Duty Cycle: 1:1
Medium: HSL835_0815 Medium parameters used: f = 829 MHz; σ = 0.934 S/m; ε_r = 43.205; ρ = 1000 kg/m^3
Ambient Temperature：23.4℃; Liquid Temperature：22.2℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3985; ConvF(9.85, 9.85, 9.85) @ 829 MHz; Calibrated: 05/16/2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 04/27/2022
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2128
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

-Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.31 W/kg

-Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0.4600 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.74 W/kg
SAR(1 g) = 0.701 W/kg; SAR(10 g) = 0.393 W/kg
Maximum value of SAR (measured) = 1.28 W/kg



0 dB = 1.28 W/kg

Test Laboratory: ritt 7 Layers SAR/HAC Testing Lab   Date: 08/17/2022

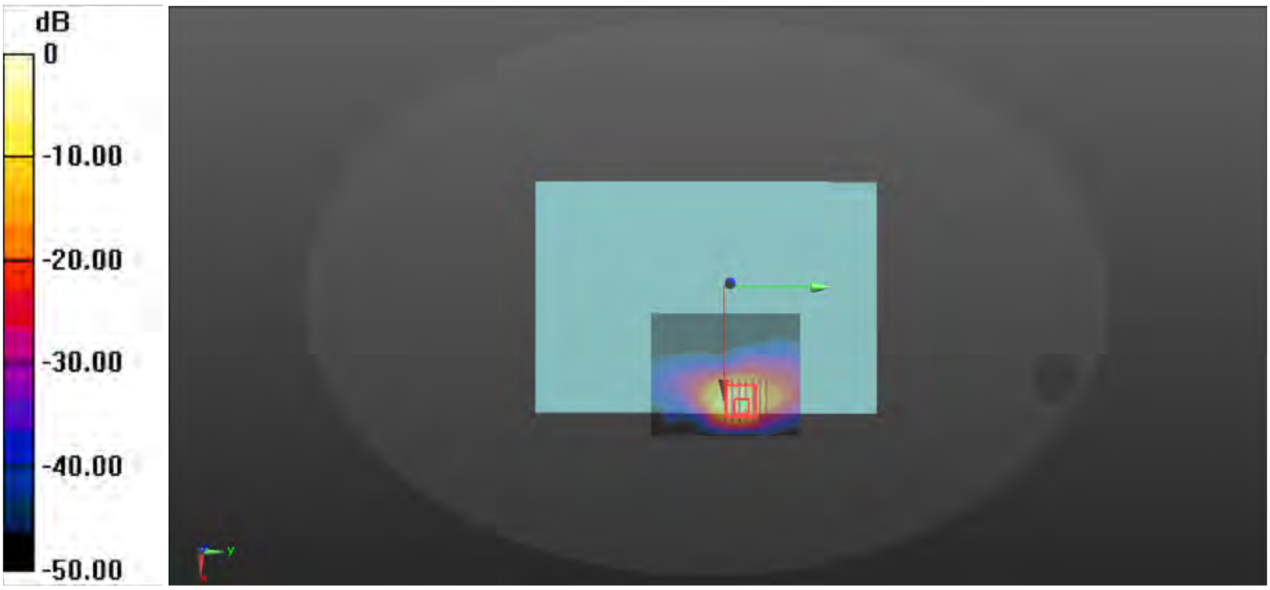
P05 LTE B7_QPSK20M_Rear Face_0cm_Ch21100_1RB_OS0

Communication System: LTE; Frequency: 2535 MHz;Duty Cycle: 1:1
Medium: HSL2600_0817 Medium parameters used: f = 2535 MHz; $\sigma = 1.871$ S/m; $\varepsilon_r = 39.154$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.2℃; Liquid Temperature：22.7℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3985; ConvF(7.47, 7.47, 7.47) @ 2535 MHz; Calibrated: 05/16/2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 04/27/2022
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2128
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

- **Area Scan (81x111x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 1.43 W/kg

- **Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 3.20 W/kg
SAR(1 g) = 0.95 W/kg; SAR(10 g) = 0.420 W/kg
Maximum value of SAR (measured) = 1.13 W/kg



0 dB = 1.13 W/kg

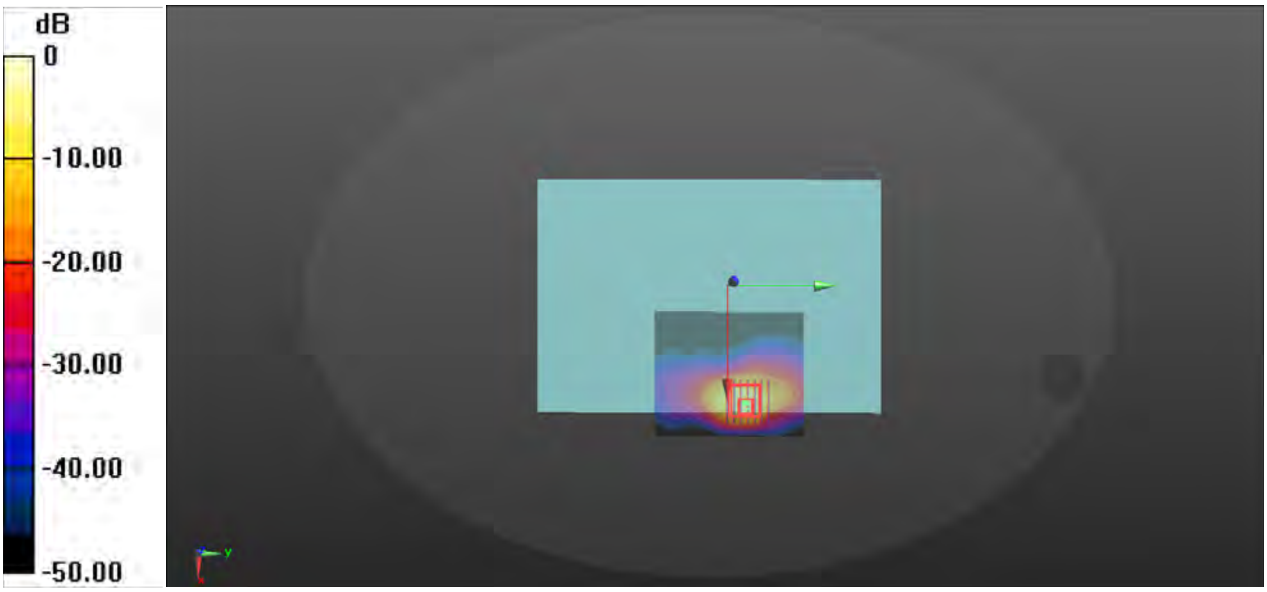
P06 LTE B41_QPSK20M_Rear Face_0cm_Ch41490_1RB_OS99

Communication System: LTE; Frequency: 2680 MHz;Duty Cycle: 1:1.59
Medium: HSL2600_0817 Medium parameters used: f = 2680 MHz; σ = 1.987 S/m; ε_r = 38.953; ρ = 1000 kg/m^3
Ambient Temperature：23.2℃; Liquid Temperature：22.7℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3985; ConvF(7.47, 7.47, 7.47) @ 2680 MHz; Calibrated: 05/16/2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 04/27/2022
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2128
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

- **Area Scan (61x121x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.31 W/kg

- **Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.53 W/kg
SAR(1 g) = 0.916 W/kg; SAR(10 g) = 0.379 W/kg
Maximum value of SAR (measured) = 2.31 W/kg



0 dB = 2.31 W/kg

Test Laboratory: ritt 7 Layers SAR/HAC Testing Lab   Date: 08/25/2022

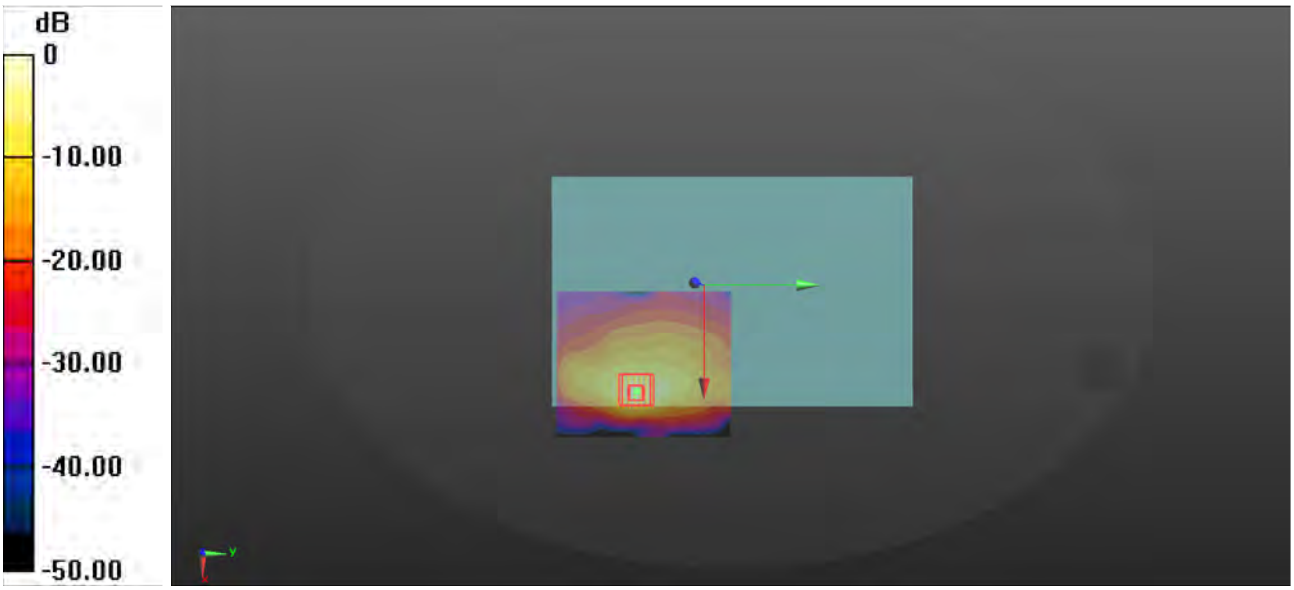
P07 WLAN2.4G_802.11b_Rear Face_0cm_Ch11

Communication System: 802.11b; Frequency: 2462 MHz;Duty Cycle: 1:1.02
Medium: HSL2450_0825 Medium parameters used: f = 2462 MHz; σ = 1.816 S/m; ε_r = 39.282; ρ = 1000 kg/m^3
Ambient Temperature：23.2℃; Liquid Temperature：22.6℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3985; ConvF(7.68, 7.68, 7.68) @ 2462 MHz; Calibrated: 05/16/2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 04/27/2022
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2128
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

- **Area Scan (101x121x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 2.34 W/kg

- **Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 0.7590 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 3.86 W/kg
SAR(1 g) = 0.864 W/kg; SAR(10 g) = 0.473 W/kg
Maximum value of SAR (measured) = 2.53 W/kg



0 dB = 2.53 W/kg

Test Laboratory: ritt 7 Layers SAR/HAC Testing Lab Date: 08/26/2022

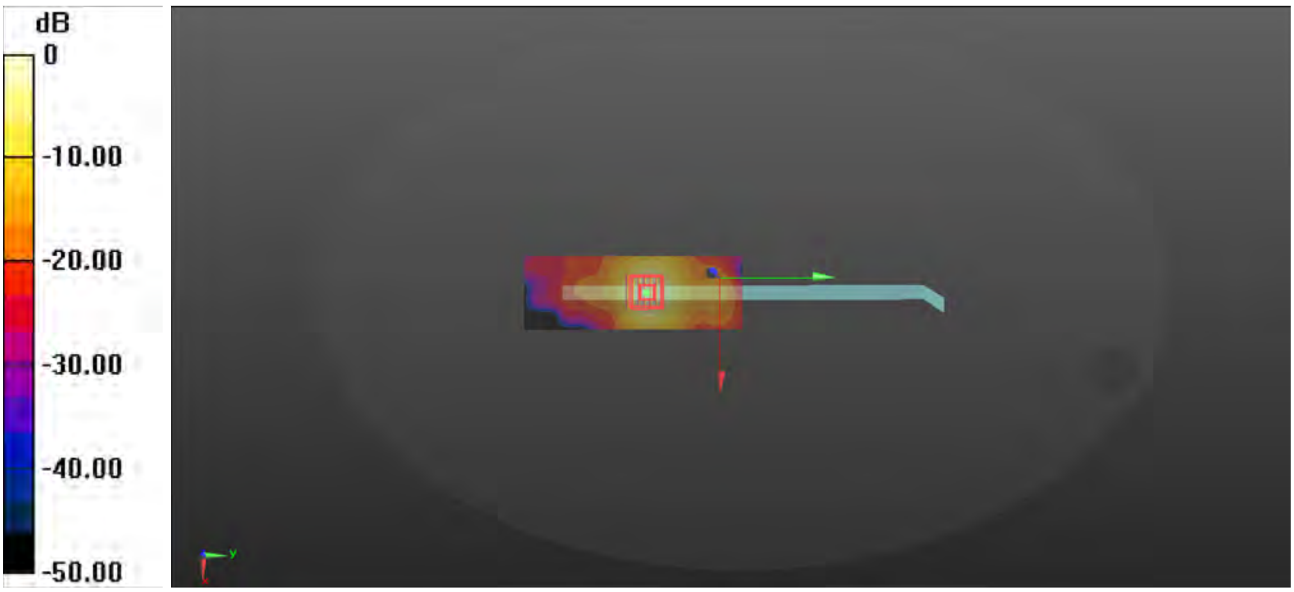
P08 WLAN5G_802.11a_Top Side_1cm_Ch52

Communication System: 802.11a; Frequency: 5260 MHz;Duty Cycle: 1:1.13
Medium: HSL5G_0826 Medium parameters used: f = 5260 MHz; σ = 4.637 S/m; ε_r = 36.258; ρ = 1000 kg/m^3
Ambient Temperature：23.4℃; Liquid Temperature：22.6℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3985; ConvF(5.52, 5.52, 5.52) @ 5260 MHz; Calibrated: 05/16/2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 04/27/2022
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2128
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

-Area Scan (51x151x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.91 W/kg

-Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 0.9320 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 2.84 W/kg
SAR(1 g) = 0.789 W/kg; SAR(10 g) = 0.278 W/kg
Maximum value of SAR (measured) = 1.87 W/kg



0 dB = 1.87 W/kg

Test Laboratory: ritt 7 Layers SAR/HAC Testing Lab   Date: 08/27/2022

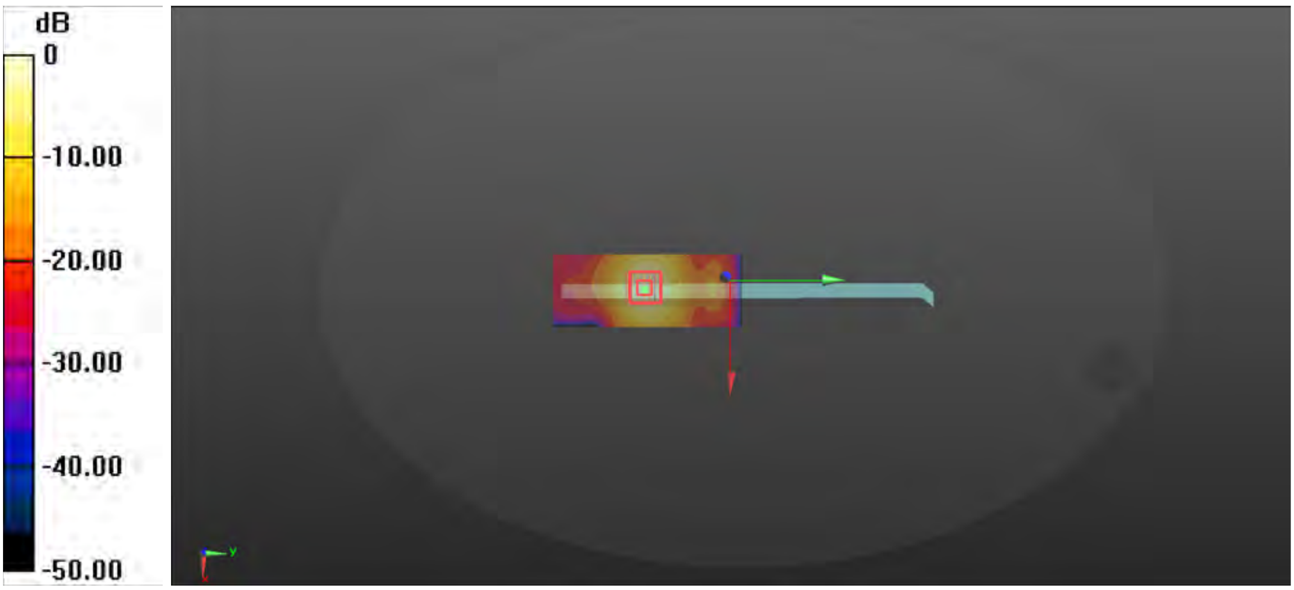
P09 WLAN5G_802.11a_Top Side_1cm_Ch100

Communication System: 802.11a; Frequency: 5500 MHz;Duty Cycle: 1:1.13
Medium: HSL5G_0827 Medium parameters used: f = 5500 MHz; σ = 4.885 S/m; ε_r = 35.758; ρ = 1000 kg/m^3
Ambient Temperature：23.2℃; Liquid Temperature：22.4℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3985; ConvF(4.97, 4.97, 4.97) @ 5500 MHz; Calibrated: 05/16/2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 04/27/2022
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2128
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

-Area Scan (51x131x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 2.06 W/kg

-Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 0 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 3.18 W/kg
SAR(1 g) = 0.906 W/kg; SAR(10 g) = 0.317 W/kg
Maximum value of SAR (measured) = 2.07 W/kg



0 dB = 2.07 W/kg

Test Laboratory: ritt 7 Layers SAR/HAC Testing Lab Date: 08/26/2022

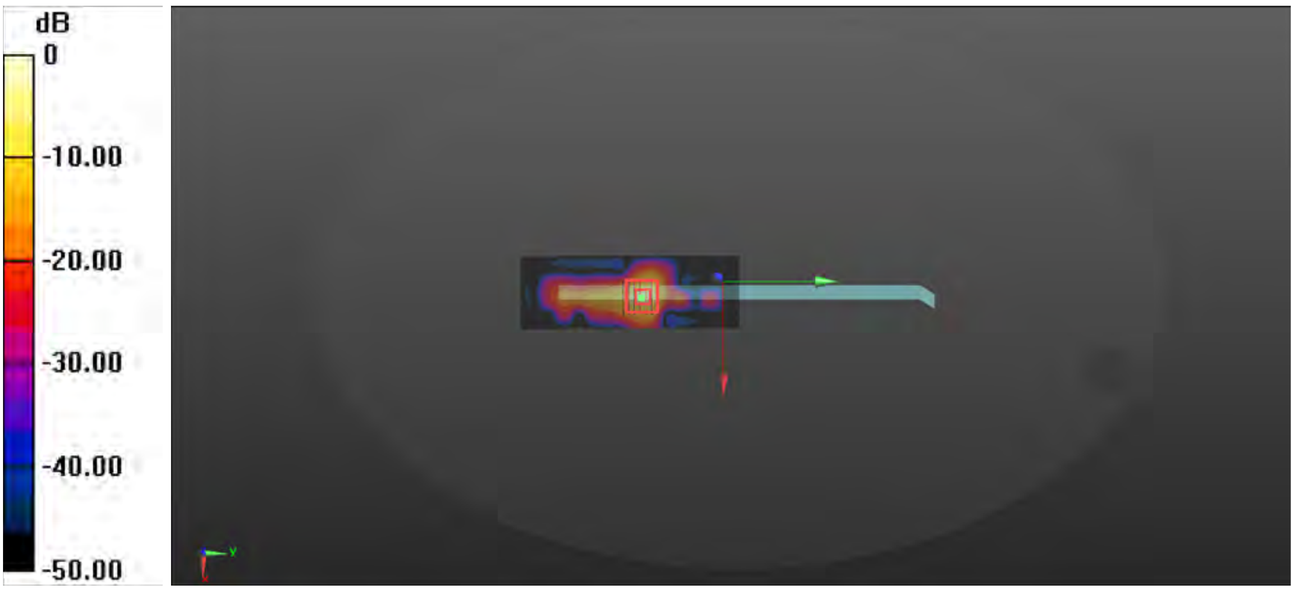
P10 WLAN5G_802.11a_Top Side_0cm_Ch149

Communication System: 802.11a; Frequency: 5745 MHz;Duty Cycle: 1:1.13
Medium: HSL5G_0826 Medium parameters used: f = 5745 MHz; σ = 5.133 S/m; ε_r = 35.418; ρ = 1000 kg/m^3
Ambient Temperature：23.6℃; Liquid Temperature：22.4℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3985; ConvF(5.02, 5.02, 5.02) @ 5745 MHz; Calibrated: 05/16/2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 04/27/2022
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2128
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

- **Area Scan (51x151x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 2.80 W/kg

- **Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 0 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 5.74 W/kg
SAR(1 g) = 0.91 W/kg; SAR(10 g) = 0.205 W/kg
Maximum value of SAR (measured) = 3.21 W/kg



0 dB = 3.21 W/kg

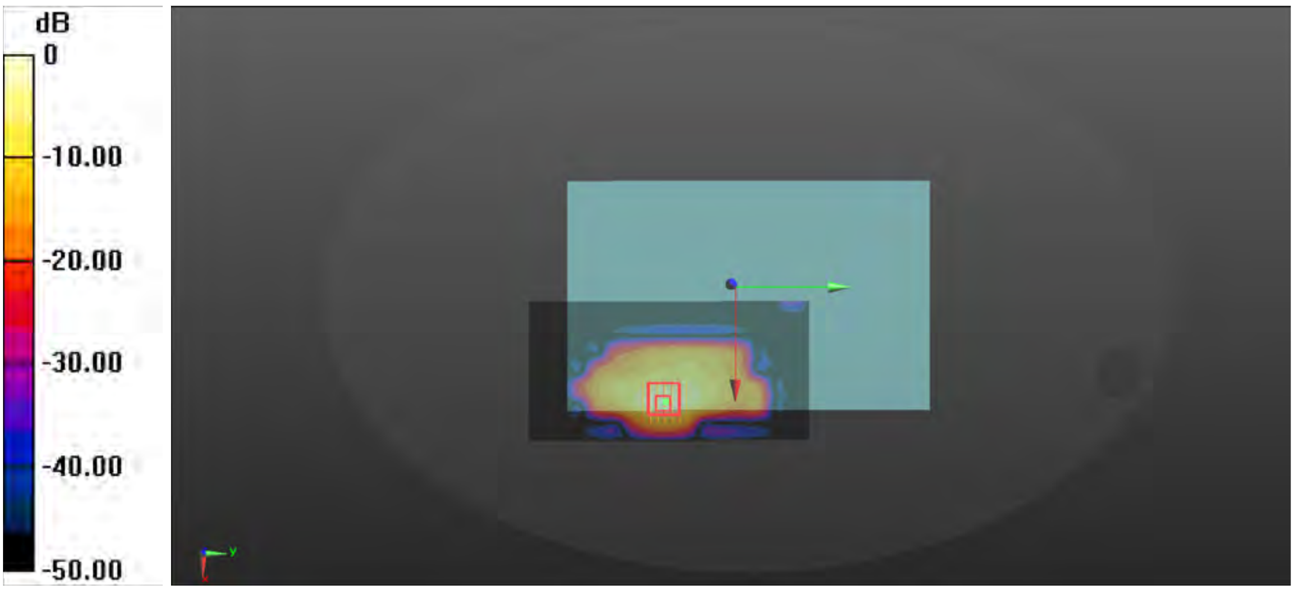
P11 BT_8DPSK_Rear Face_0cm_Ch0

Communication System: BT; Frequency: 2402 MHz;Duty Cycle: 1:1.29
Medium: HSL2450_0825 Medium parameters used: f = 2402 MHz; σ = 1.771 S/m; ε_r = 39.38; ρ = 1000 kg/m^3
Ambient Temperature：23.2℃; Liquid Temperature：22.6℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3985; ConvF(7.68, 7.68, 7.68) @ 2402 MHz; Calibrated: 05/16/2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 04/27/2022
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2128
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

- **Area Scan (81x161x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.476 W/kg

- **Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.624 W/kg
SAR(1 g) = 0.137 W/kg; SAR(10 g) = 0.082 W/kg
Maximum value of SAR (measured) = 0.389 W/kg



0 dB = 0.389 W/kg

Appendix C. Calibration Certificate for Probe and Dipole

The SPEAG calibration certificates are shown as follows.

In Collaboration with
s p e a g
CALIBRATION LABORATORY

中国认可
国际互认
校准
CALIBRATION
CNAS L0570

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, Chi
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Client **7layers** **Certificate No: Z21-60421**

CALIBRATION CERTIFICATE

Object: D835V2 - SN: 4d265

Calibration Procedure(s): FF-Z11-003-01
Calibration Procedures for dipole validation kits

Calibration date: October 18, 2021

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	24-Sep-21 (CTTL, No.J21X08326)	Sep-22
Power sensor NRP8S	104291	24-Sep-21 (CTTL, No.J21X08326)	Sep-22
Reference Probe EX3DV4	SN 7517	03-Feb-21(CTTL-SPEAG,No.Z21-60001)	Feb-22
DAE4	SN 1556	15-Jan-21(SPEAG,No.DAE4-1556_Jan21)	Jan-22
Secondary Standards	**ID #**	**Cal Date (Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	01-Feb-21 (CTTL, No.J21X00593)	Jan-22
NetworkAnalyzer E5071C	MY46110673	14-Jan-21 (CTTL, No.J21X00232)	Jan-22

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	[signature]
Reviewed by:	Lin Hao	SAR Test Engineer	[signature]
Approved by:	Qi Dianyuan	SAR Project Leader	[signature]

Issued: October 24, 2021

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORMx,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor k=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

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Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.9 ± 6 %	0.89 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.60 W/kg ± 18.8 % (*k*=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.55 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.25 W/kg ± 18.7 % (*k*=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.9Ω- 2.16jΩ
Return Loss	- 32.6dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.304 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

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DASY5 Validation Report for Head TSL Date: 10.18.2021

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d265

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: f = 835 MHz; σ = 0.886 S/m; ε_r = 40.9; ρ = 1000 kg/m^3

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7517; ConvF(9.81, 9.81, 9.81) @ 835 MHz; Calibrated: 2021-02-03
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2021-01-15
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 59.24 V/m; Power Drift = -0.01 dB

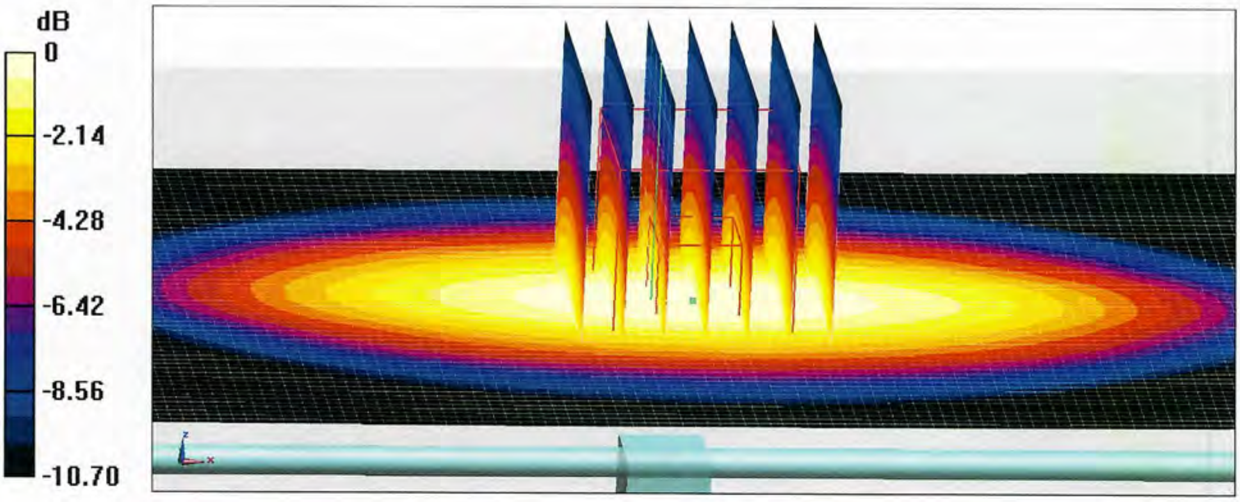
Peak SAR (extrapolated) = 3.66 W/kg

SAR(1 g) = 2.38 W/kg; SAR(10 g) = 1.55 W/kg

Smallest distance from peaks to all points 3 dB below = 19.2 mm

Ratio of SAR at M2 to SAR at M1 = 64.7%

Maximum value of SAR (measured) = 3.21 W/kg



0 dB = 3.21 W/kg = 5.07 dBW/kg

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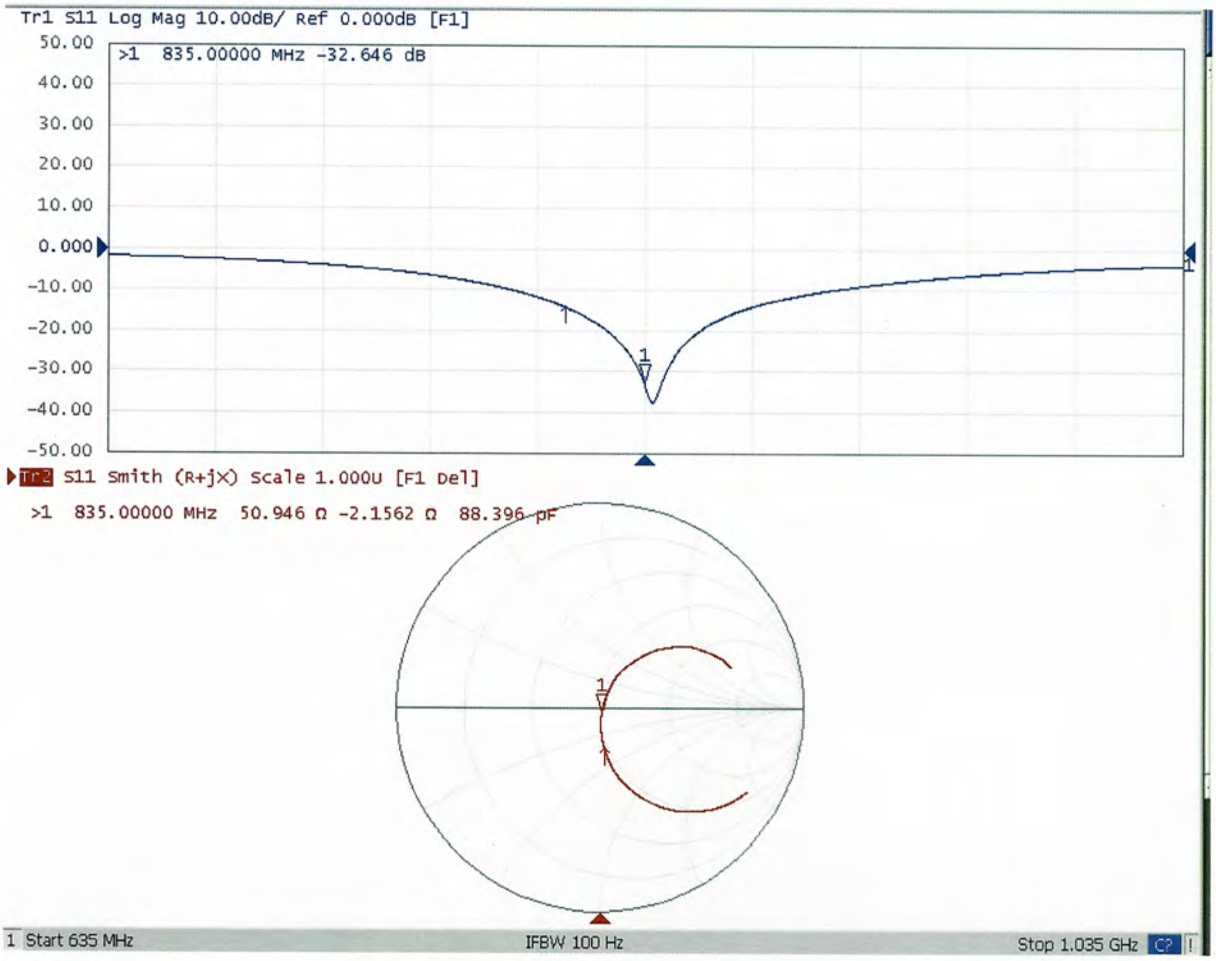
Impedance Measurement Plot for Head TSL



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Client **B.V.ADT** **Certificate No: Z21-60336**

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d159
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	September 16, 2021

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3)°C and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	23-Sep-20 (CTTL, No.J20X08336)	Sep-21
Power sensor NRP8S	104291	23-Sep-20 (CTTL, No.J20X08336)	Sep-21
Reference Probe EX3DV4	SN 7517	03-Feb-21(CTTL-SPEAG,No.Z21-60001)	Feb-22
DAE4	SN 1556	15-Jan-21(SPEAG,No.DAE4-1556_Jan21)	Jan-22
Secondary Standards	**ID #**	**Cal Date (Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	01-Feb-21 (CTTL, No.J21X00593)	Jan-22
NetworkAnalyzer E5071C	MY46110673	14-Jan-21 (CTTL, No.J21X00232)	Jan-22

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: September 21, 2021

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lossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORMx,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016

c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010

d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor k=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

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Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.2 ± 6 %	1.42 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.97 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**39.7 W/kg ± 18.8 % (*k*=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.08 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**20.3 W/kg ± 18.7 % (*k*=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.2Ω+ 7.76jΩ
Return Loss	- 21.4dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.106 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

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DASY5 Validation Report for Head TSL Date: 09.16.2021

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d159

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: f = 1900 MHz; σ = 1.416 S/m; ε_r = 40.23; ρ = 1000 kg/m^3

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7517; ConvF(7.81, 7.81, 7.81) @ 1900 MHz; Calibrated: 2021-02-03
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2021-01-15
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 99.85 V/m; Power Drift = 0.00 dB

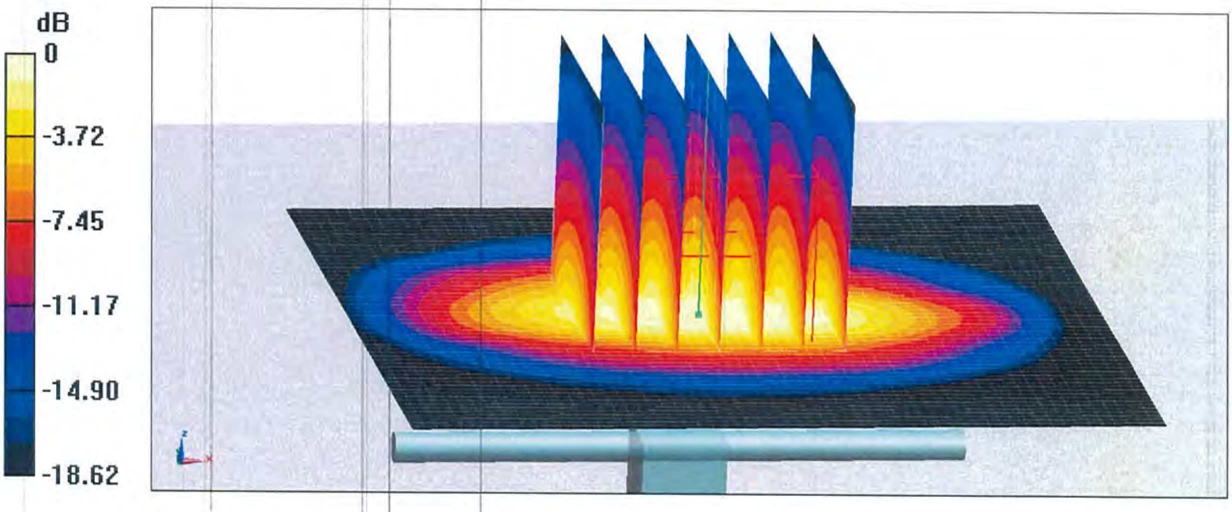
Peak SAR (extrapolated) = 19.4 W/kg

SAR(1 g) = 9.97 W/kg; SAR(10 g) = 5.08 W/kg

Smallest distance from peaks to all points 3 dB below = 10 mm

Ratio of SAR at M2 to SAR at M1 = 51.3%

Maximum value of SAR (measured) = 15.9 W/kg



0 dB = 15.9 W/kg = 12.01 dBW/kg

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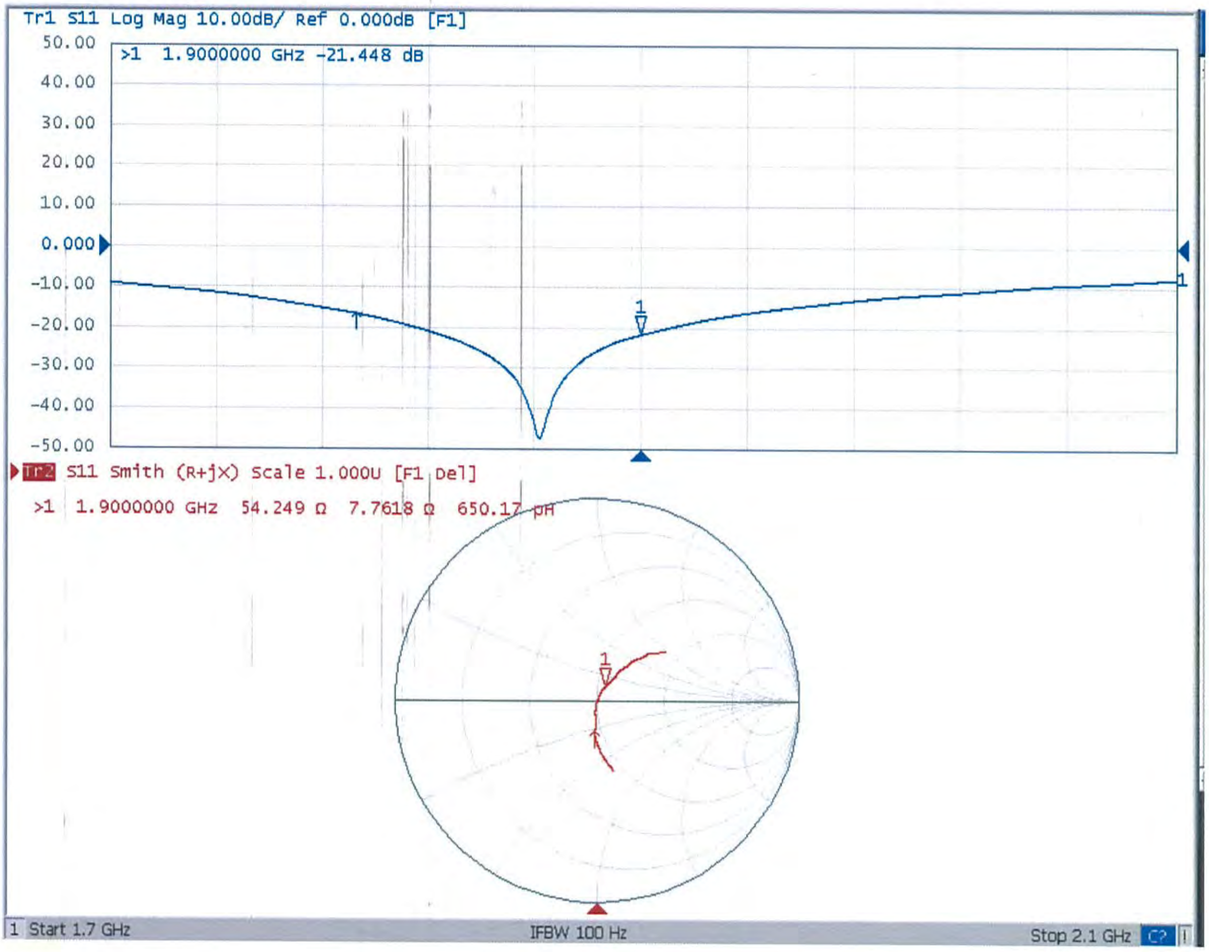
Impedance Measurement Plot for Head TSL



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Client **7layers** **Certificate No: Z21-60425**

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 1048
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	October 21, 2021

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	24-Sep-21 (CTTL, No.J21X08326)	Sep-22
Power sensor NRP8S	104291	24-Sep-21 (CTTL, No.J21X08326)	Sep-22
Reference Probe EX3DV4	SN 7517	03-Feb-21(CTTL-SPEAG,No.Z21-60001)	Feb-22
DAE4	SN 1556	15-Jan-21(SPEAG,No.DAE4-1556_Jan21)	Jan-22
Secondary Standards	**ID #**	**Cal Date (Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	01-Feb-21 (CTTL, No.J21X00593)	Jan-22
NetworkAnalyzer E5071C	MY46110673	14-Jan-21 (CTTL, No.J21X00232)	Jan-22

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: October 27, 2021

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORMx,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor k=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

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Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.5 ± 6 %	1.81 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.2 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.8 W/kg ± 18.8 % (*k*=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.05 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.2 W/kg ± 18.7 % (*k*=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.6Ω+ 8.39jΩ
Return Loss	- 21.6dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.057 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

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DASY5 Validation Report for Head TSL Date: 10.21.2021

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 1048

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2450 MHz; σ = 1.809 S/m; ε_r = 39.51; ρ = 1000 kg/m^3

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7517; ConvF(7.34, 7.34, 7.34) @ 2450 MHz; Calibrated: 2021-02-03
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2021-01-15
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 108.6 V/m; Power Drift = -0.02 dB

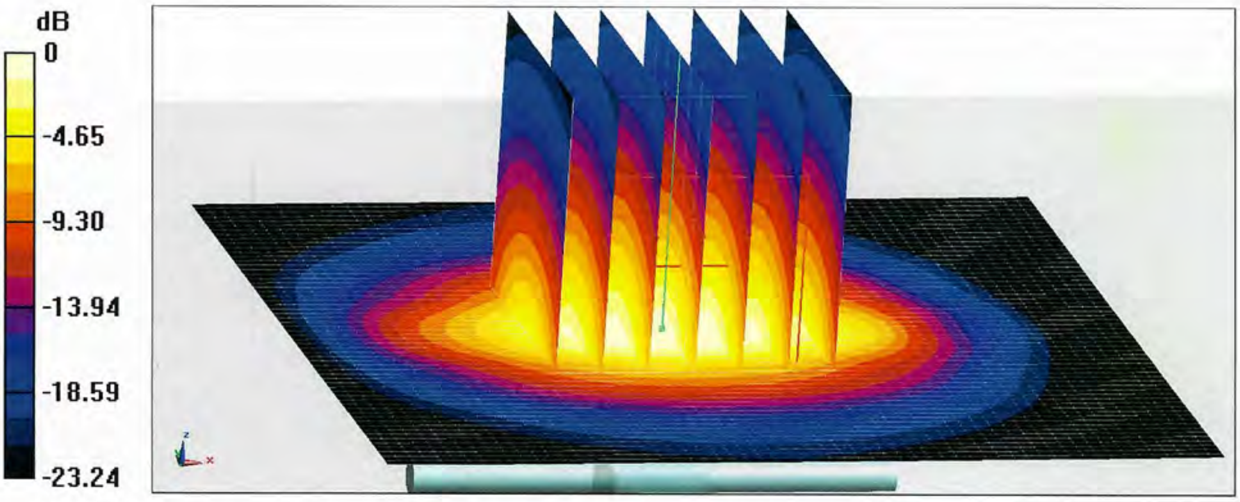
Peak SAR (extrapolated) = 28.0 W/kg

SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.05 W/kg

Smallest distance from peaks to all points 3 dB below = 9 mm

Ratio of SAR at M2 to SAR at M1 = 47.1%

Maximum value of SAR (measured) = 22.5 W/kg



0 dB = 22.5 W/kg = 13.52 dBW/kg

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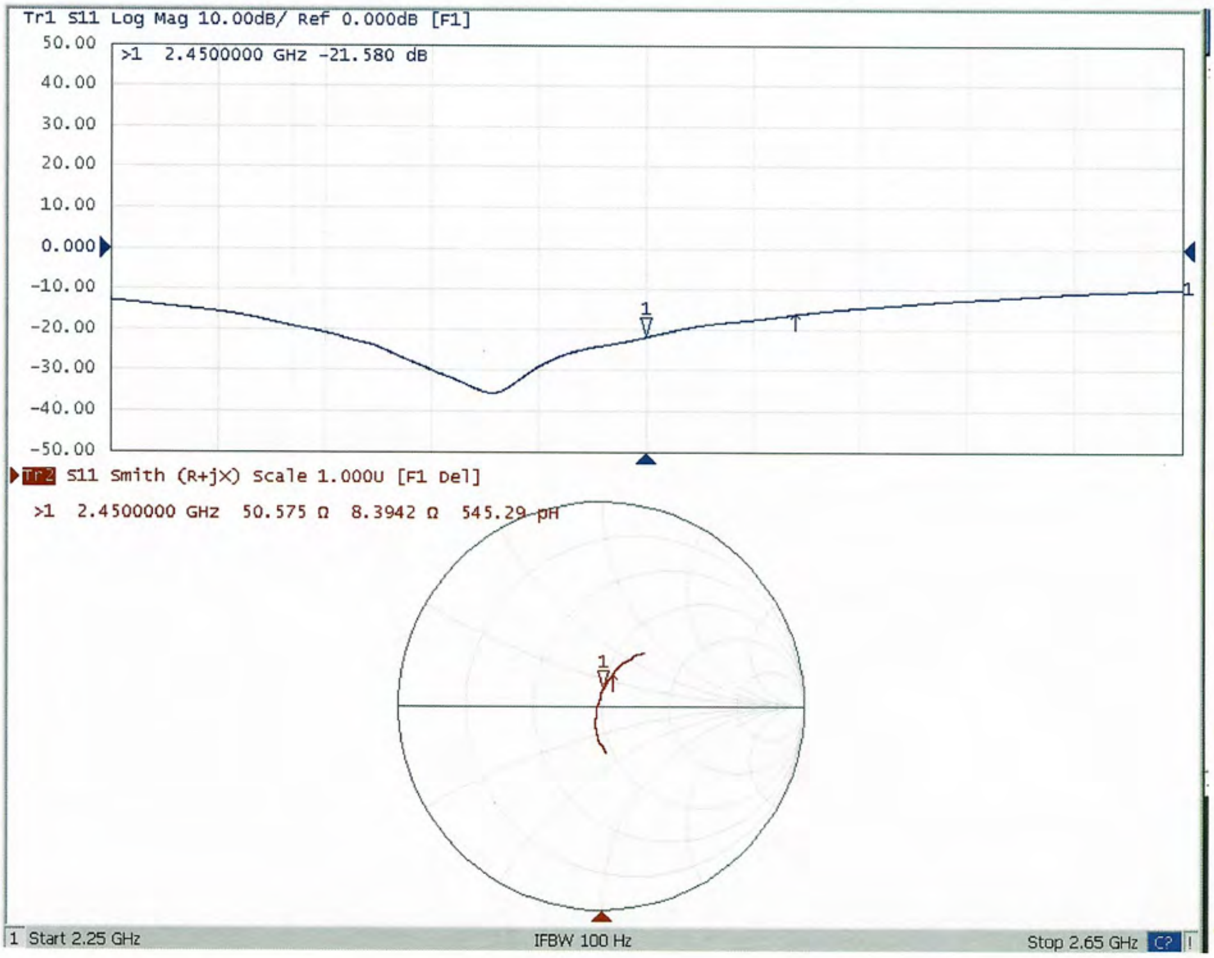
Impedance Measurement Plot for Head TSL



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Client B.V.ADT Certificate No: Z21-60339

CALIBRATION CERTIFICATE

Object: D2600V2 - SN: 1110

Calibration Procedure(s): FF-Z11-003-01
Calibration Procedures for dipole validation kits

Calibration date: September 16, 2021

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	23-Sep-20 (CTTL, No.J20X08336)	Sep-21
Power sensor NRP8S	104291	23-Sep-20 (CTTL, No.J20X08336)	Sep-21
Reference Probe EX3DV4	SN 7517	03-Feb-21(CTTL-SPEAG,No.Z21-60001)	Feb-22
DAE4	SN 1556	15-Jan-21(SPEAG,No.DAE4-1556_Jan21)	Jan-22
Secondary Standards	**ID #**	**Cal Date (Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	01-Feb-21 (CTTL, No.J21X00593)	Jan-22
Network Analyzer E5071C	MY46110673	14-Jan-21 (CTTL, No.J21X00232)	Jan-22

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: September 21, 2021

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORMx,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor k=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

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Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2600 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.0 ± 6 %	1.95 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.9 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**55.8 W/kg ± 18.8 % (*k*=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.13 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.6 W/kg ± 18.7 % (*k*=2)**

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Appendix(Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.1Ω- 5.12jΩ
Return Loss	- 25.7dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.058 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

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DASY5 Validation Report for Head TSL Date: 09.16.2021

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1110

Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2600 MHz; σ = 1.949 S/m; ε_r = 39.04; ρ = 1000 kg/m^3

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7517; ConvF(7.1, 7.1, 7.1) @ 2600 MHz; Calibrated: 2021-02-03
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2021-01-15
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 105.3 V/m; Power Drift = 0.01 dB

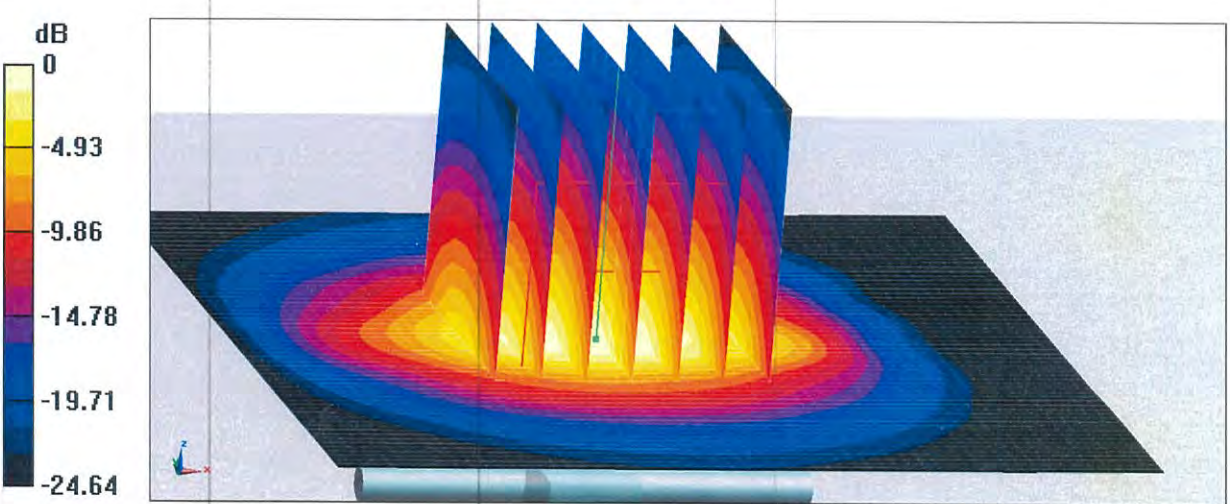
Peak SAR (extrapolated) = 30.6 W/kg

SAR(1 g) = 13.9 W/kg; SAR(10 g) = 6.13 W/kg

Smallest distance from peaks to all points 3 dB below = 9 mm

Ratio of SAR at M2 to SAR at M1 = 45.2%

Maximum value of SAR (measured) = 24.1 W/kg



0 dB = 24.1 W/kg = 13.82 dBW/kg

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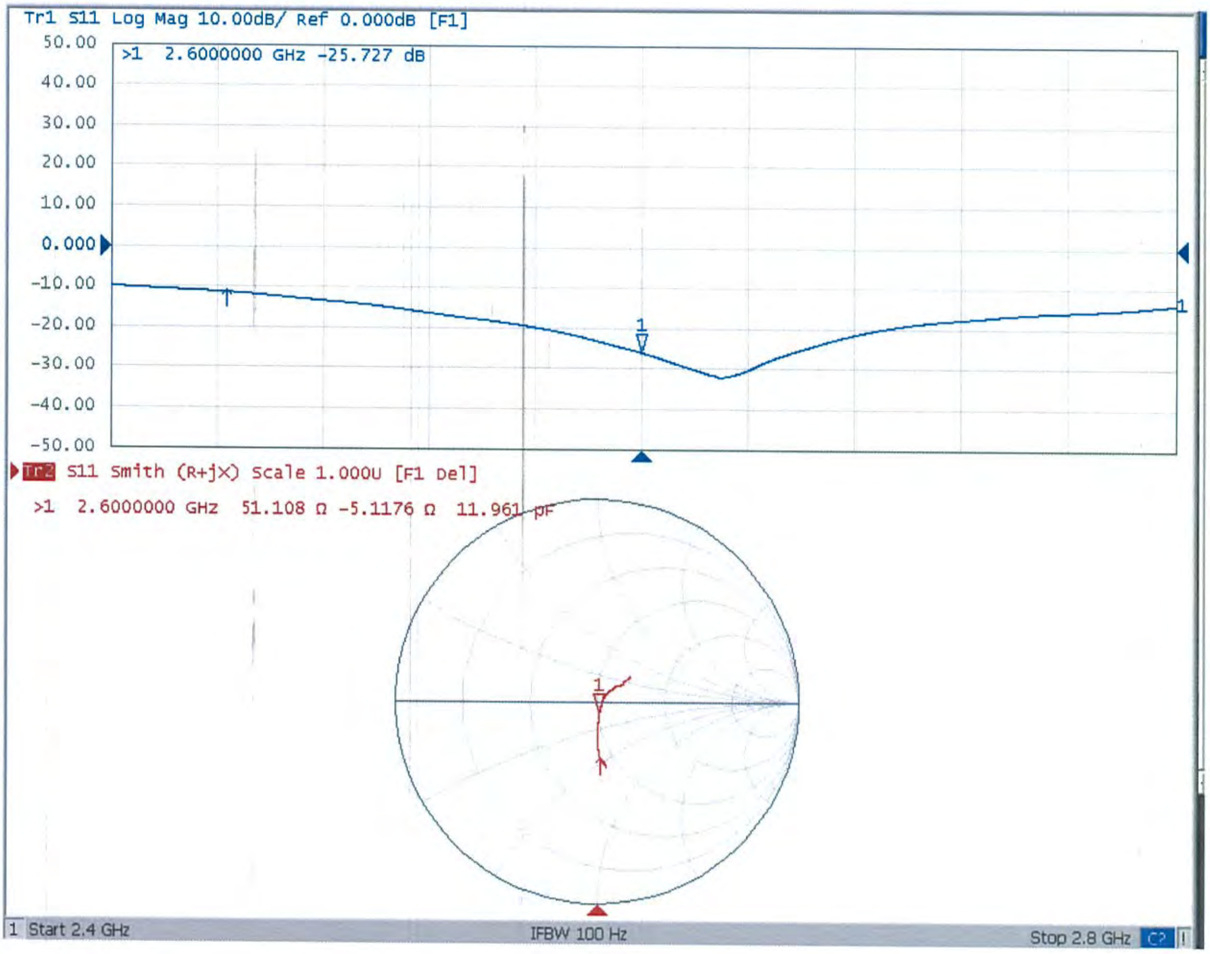
Impedance Measurement Plot for Head TSL



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CNAS L0570

Client **7layers** **Certificate No: Z21-60431**

CALIBRATION CERTIFICATE

Object	D5GHzV2 - SN: 1315
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	October 22, 2021

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	24-Sep-21 (CTTL, No.J21X08326)	Sep-22
Power sensor NRP8S	104291	24-Sep-21 (CTTL, No.J21X08326)	Sep-22
ReferenceProbe EX3DV4	SN 7517	03-Feb-21(CTTL-SPEAG,No.Z21-60001)	Feb-22
DAE4	SN 1556	15-Jan-21(SPEAG,No.DAE4-1556_Jan21)	Jan-22
Secondary Standards	**ID #**	**Cal Date (Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	01-Feb-21 (CTTL, No.J21X00593)	Jan-22
NetworkAnalyzerE5071C	MY46110673	14-Jan-21 (CTTL, No.J21X00232)	Jan-22

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
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