



FCC SAR Test Report

Report No. : PSU-QSU2503120111SA01

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Manufacturer : TCL Communication Ltd.

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Product : TCL LINKPORT IK511

FCC ID : 2ACCJSCD005

Brand : TCL

Model No. : IK511U

Standards : FCC 47 CFR Part 2 (2.1093) / IEEE C95.1:1992 / IEEE 1528:2013
KDB 865664 D01 v01r04 / KDB 865664 D02 v01r02 / KDB 447498 D02 v02r01
KDB 447498 D01 v06 / KDB 616217 D04 v01r02 / KDB 941225 D05 v02r05

Date of Testing : Mar. 15, 2025 ~ Mar. 16, 2025

Issued By : Huarui 7layers High Technology (Suzhou) Co., Ltd.

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FCC Designation No. : CN1325 FCC Site Registration No. : 434559

CERTIFICATION: The above equipment has 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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1. Summary of Maximum SAR Value

Equipment Class	Mode	Highest Reported Body SAR _{1g} (0.5 cm Gap) (W/kg)
PCB	LTE Band 7	1.02
	LTE Band 12	0.71
	LTE Band 13	1.09
	LTE Band 25 / 2	0.91
	LTE Band 26 / 5	0.96
	LTE Band 38	0.66
	LTE Band 66 / 4	0.85
	LTE Band 71	0.59
	NR Band n25	0.34
	NR Band n66	0.36
	NR Band n71	0.62

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	TCL LINKPORT IK511
FCC ID	2ACCJSCD005
IMEI	004400152020002
Brand Name	TCL
Model Name	IK511U
HW Version	V3.0
SW Version	IK511U_ZZ_01.00_01
Tx Frequency Bands (Unit: MHz)	LTE Band 2 : 1850.7 ~ 1909.3 LTE Band 4 : 1710.7 ~ 1754.3 LTE Band 5 : 824.7 ~ 848.3 LTE Band 7 : 2502.5 ~ 2567.5 LTE Band 12 : 699.7 ~ 715.3 LTE Band 13 : 779.5 ~ 784.5 LTE Band 25 : 1850.7 ~ 1914.3 LTE Band 26 : 814.7 ~ 848.3 LTE Band 38 : 2572.5 ~ 2617.5 LTE Band 66 : 1710.7 ~ 1779.3 LTE Band 71 : 665.5 ~ 695.5 NR Band n25 : 1852.5~ 1912.5 NR Band n66 : 1712.5~ 1777.5 NR Band n71 : 665.5 ~ 695.5
Uplink Modulations	LTE : QPSK, 16QAM, 64QAM NR : Pi/2 BPSK (DFT-s-OFDM), QPSK (DFT-s-OFDM, CP-OFDM), 16QAM (DFT-s-OFDM, CP-OFDM), 64QAM (DFT-s-OFDM, CP-OFDM), 256QAM (DFT-s-OFDM, CP-OFDM)
Subcarrier Spacing	15 kHz (FDD) / 30 kHz (TDD)
Maximum Tune-up Conducted Power (Unit: dBm)	Please refer to section 4.5.1 of this report.
Antenna Type	Fixed Internal Antenna
EUT Stage	Production Unit

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 Band 2/4/5 and LTE Band 25/66/26. Since the supported frequency span for LTE Band 2/4/5 falls completely within the LTE Band 25/66/26, they have the same target power, and share the same transmission path, therefore SAR was only assessed for LTE Band 25/66/26.
3. For WWAN Antenna, when the SAR sensor is detected close to the body state, power reduction will be activated to limit the maximum power. Proximity sensor triggering distances please refer to section 4.1 of this report.
4. According to the difference statement provided by the manufacturer, the 2nd source components were replaced based on the original product. These changes will not affect the RF parameters, and the worst case of the original report has been verified. (Original report number: W7L-P24070005SA01, FCC ID: 2ACCJSCD005; issued by: BV 7LAYERS COMMUNICATIONS TECHNOLOGY (SHENZHEN) CO. LTD.).



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:

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

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

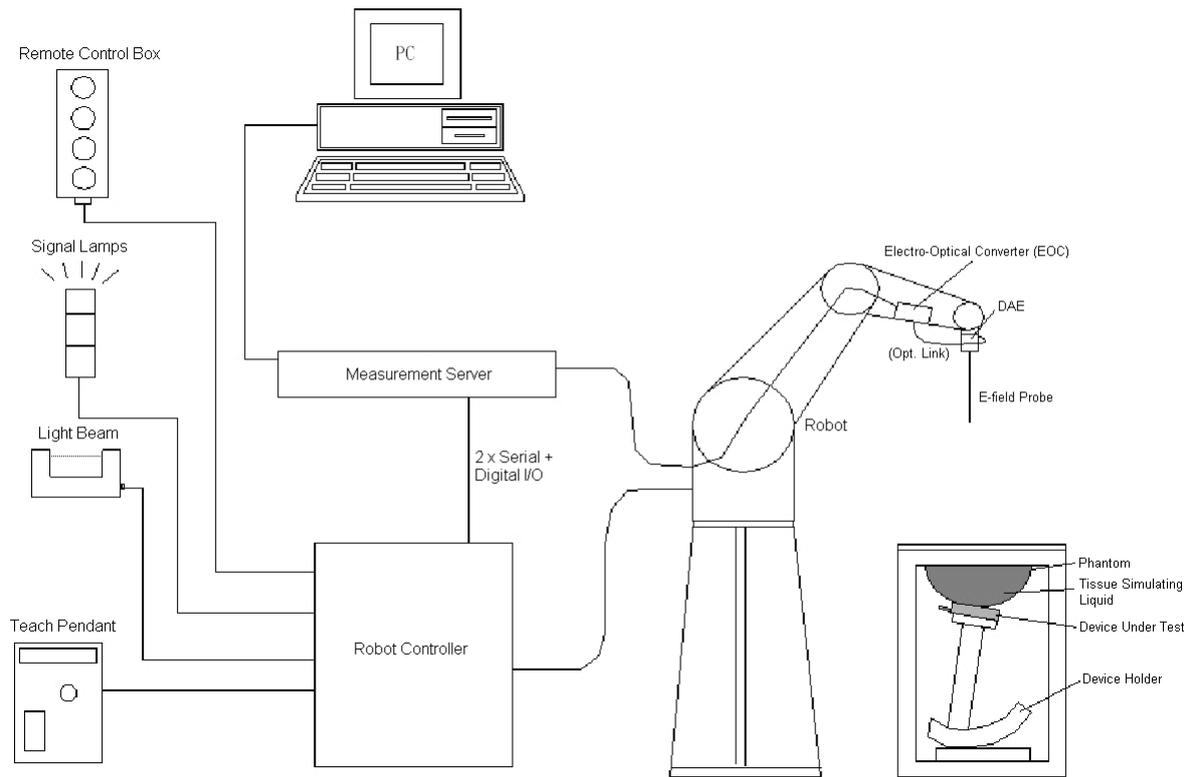
SAR measurement can be related to the electrical field in the tissue by

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

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the 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 from 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 (DASY6: 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 μ W/g to 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 μ W/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 μ W/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	$< 5\mu$ V (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	

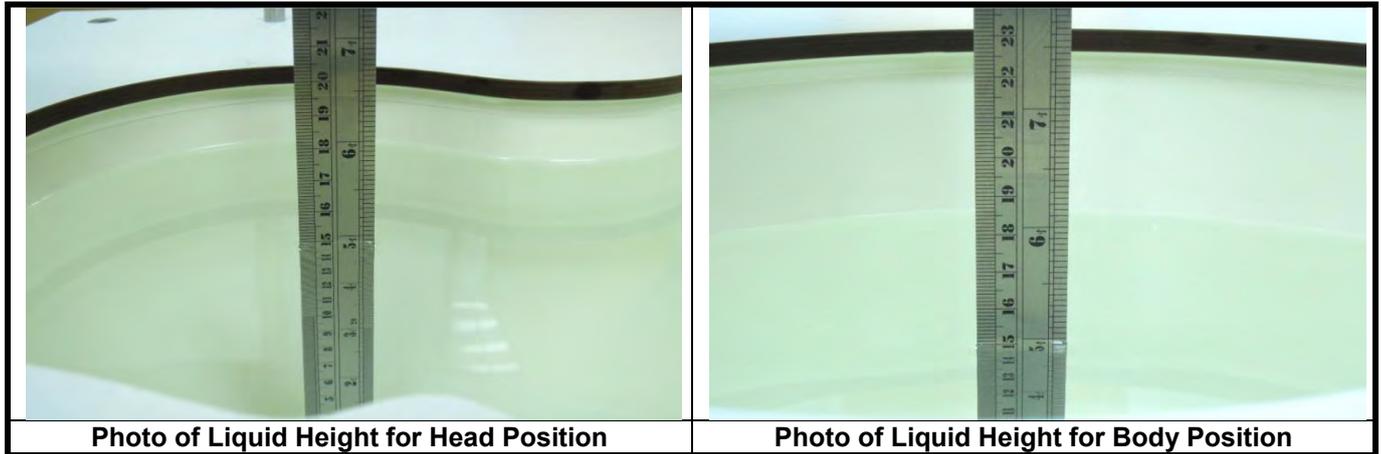
Model	Laptop Extensions Kit	
Construction	Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices according to IEC 62209-2 (e.g., laptops, cameras, etc.). It is lightweight and fits easily on the upper part of the Mounting Device in place of the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

3.2.6 System Validation Dipoles

Model	D-Serial	
Construction	Symmetrical dipole with 1/4 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.



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 $\pm 5\%$	Target Conductivity	Range of $\pm 5\%$
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	-	28.0	-	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.

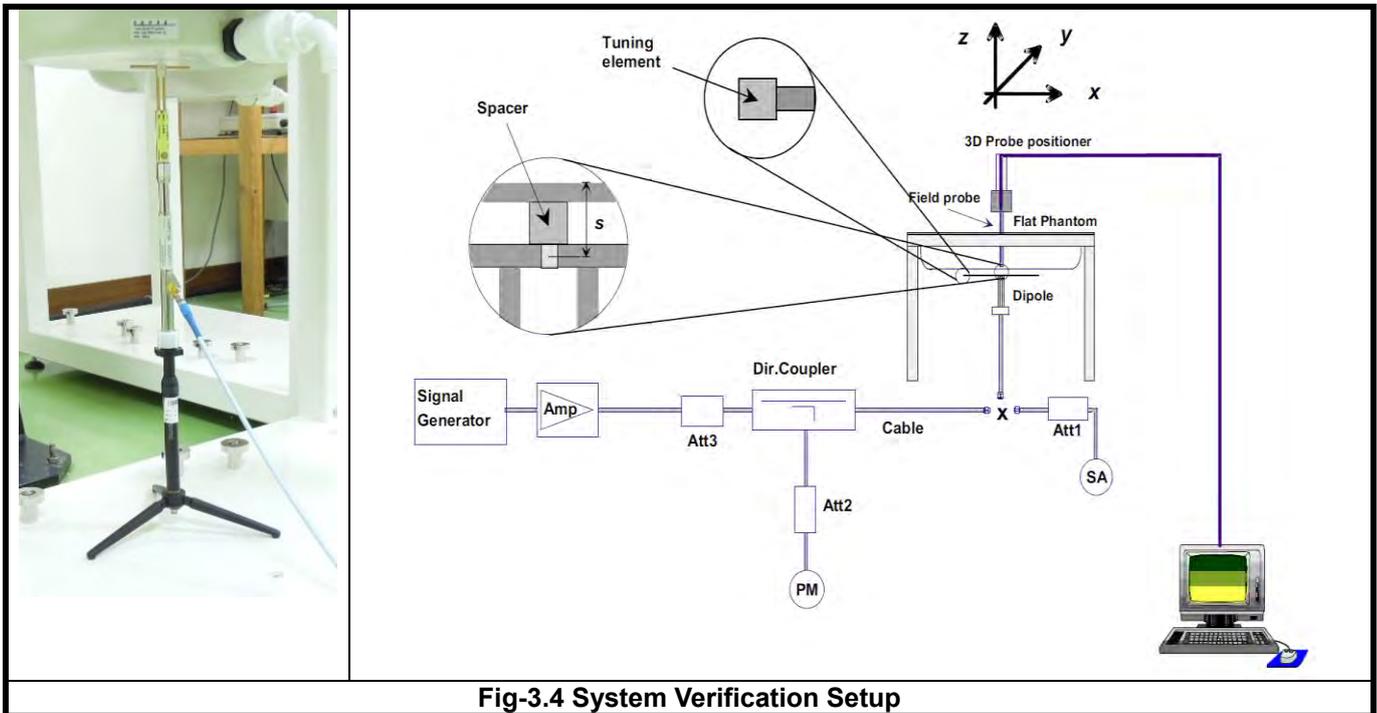


Fig-3.4 System Verification Setup

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 ($\Delta x, \Delta y$)	<= 15 mm	<= 12 mm	<= 12 mm	<= 10 mm	<= 10 mm
Zoom Scan ($\Delta x, \Delta y$)	<= 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 $\Delta x / \Delta y$ (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 from the measurement grid to the high-resolution grid
- (e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
- (f) Calculation of the averaged SAR within masses of 1g and 10g

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

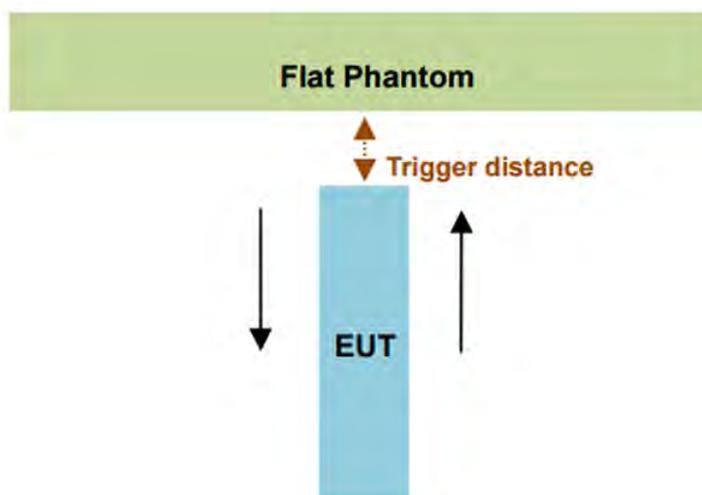
<Connections between EUT and System Simulator>

For WWAN SAR testing, the EUT was linked and controlled by base station emulator (Anritsu MT8820C is used for 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. For NR SAR testing, due to test setup limitations, SAR testing for NR was performed using Factory Test Mode software to establish the connection.

<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.

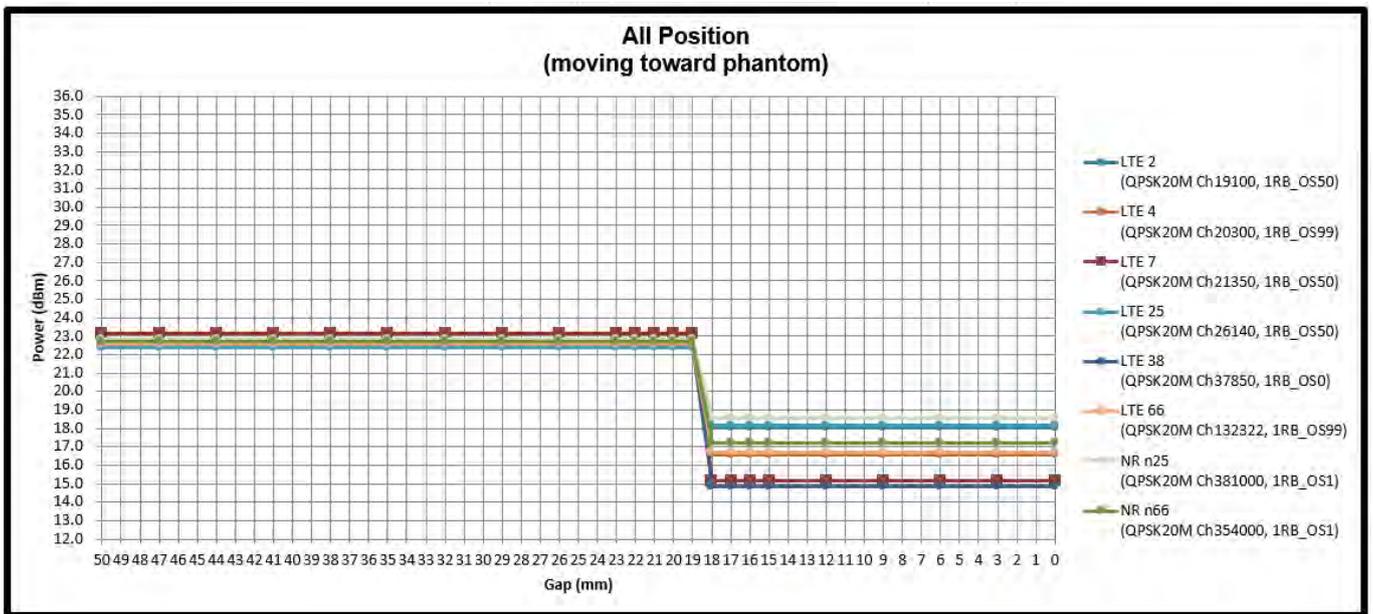


Summary for power verification per distance was tabulated in the below table.



**Output Power Verification in dBm for EUT All Position
(moving toward phantom)**

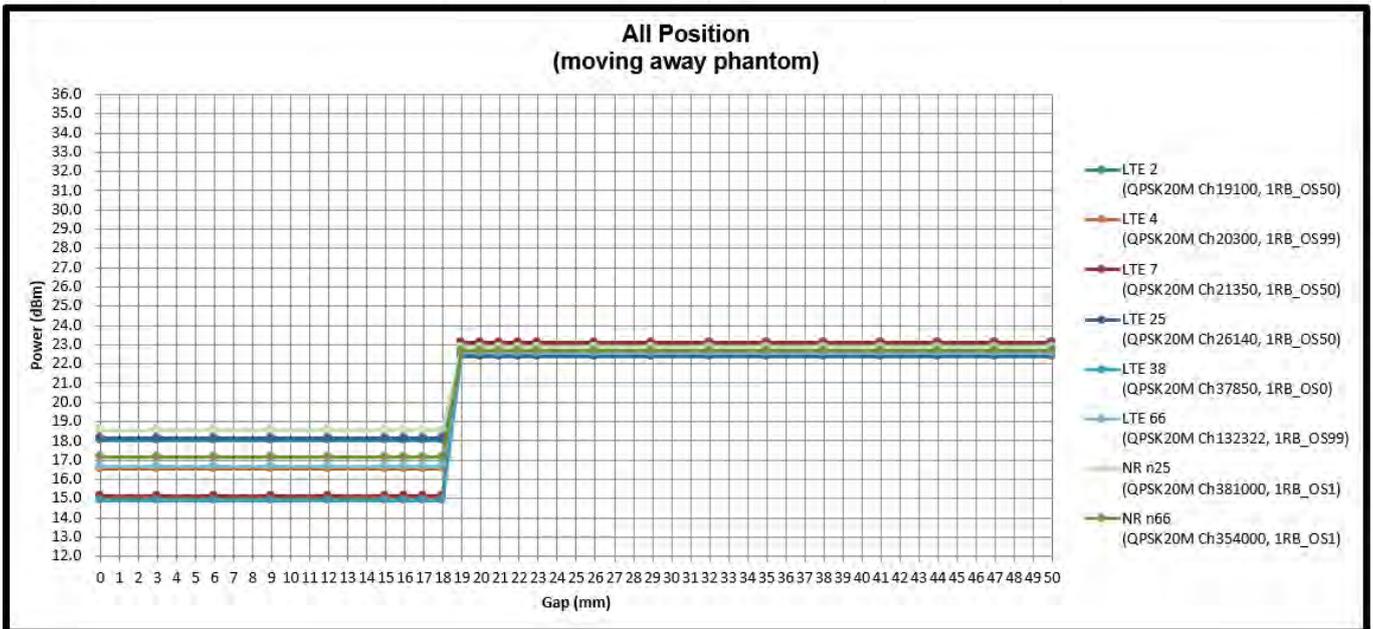
Distance (mm)	0~14	15	16	17	18	19	20	21	22	23	24~50
LTE 2 (QPSK20M Ch19100, 1RB_OS50)	18.05	18.05	18.05	18.05	18.05	22.39	22.39	22.39	22.39	22.39	22.39
LTE 4 (QPSK20M Ch20300, 1RB_OS99)	16.55	16.55	16.55	16.55	16.55	22.49	22.49	22.49	22.49	22.49	22.49
LTE 7 (QPSK20M Ch21350, 1RB_OS50)	15.14	15.14	15.14	15.14	15.14	23.13	23.13	23.13	23.13	23.13	23.13
LTE 25 (QPSK20M Ch26140, 1RB_OS50)	18.15	18.15	18.15	18.15	18.15	22.41	22.41	22.41	22.41	22.41	22.41
LTE 38 (QPSK20M Ch37850, 1RB_OS0)	14.87	14.87	14.87	14.87	14.87	22.63	22.63	22.63	22.63	22.63	22.63
LTE 66 (QPSK20M Ch132322, 1RB_OS99)	16.69	16.69	16.69	16.69	16.69	22.56	22.56	22.56	22.56	22.56	22.56
NR n25 (QPSK20M Ch381000, 1RB_OS1)	18.58	18.58	18.58	18.58	18.58	22.84	22.84	22.84	22.84	22.84	22.84
NR n66 (QPSK20M Ch354000, 1RB_OS1)	17.18	17.18	17.18	17.18	17.18	22.68	22.68	22.68	22.68	22.68	22.68





Output Power Verification in dBm for EUT All Position (moving away phantom)

Distance (mm)	0~14	15	16	17	18	19	20	21	22	23	24~50
LTE 2 (QPSK20M Ch19100, 1RB_OS50)	18.05	18.05	18.05	18.05	18.05	22.39	22.39	22.39	22.39	22.39	22.39
LTE 4 (QPSK20M Ch20300, 1RB_OS99)	16.55	16.55	16.55	16.55	16.55	22.49	22.49	22.49	22.49	22.49	22.49
LTE 7 (QPSK20M Ch21350, 1RB_OS50)	15.14	15.14	15.14	15.14	15.14	23.13	23.13	23.13	23.13	23.13	23.13
LTE 25 (QPSK20M Ch26140, 1RB_OS50)	18.15	18.15	18.15	18.15	18.15	22.41	22.41	22.41	22.41	22.41	22.41
LTE 38 (QPSK20M Ch37850, 1RB_OS0)	14.87	14.87	14.87	14.87	14.87	22.63	22.63	22.63	22.63	22.63	22.63
LTE 66 (QPSK20M Ch132322, 1RB_OS99)	16.69	16.69	16.69	16.69	16.69	22.56	22.56	22.56	22.56	22.56	22.56
NR n25 (QPSK20M Ch381000, 1RB_OS1)	18.58	18.58	18.58	18.58	18.58	22.84	22.84	22.84	22.84	22.84	22.84
NR n66 (QPSK20M Ch354000, 1RB_OS1)	17.18	17.18	17.18	17.18	17.18	22.68	22.68	22.68	22.68	22.68	22.68



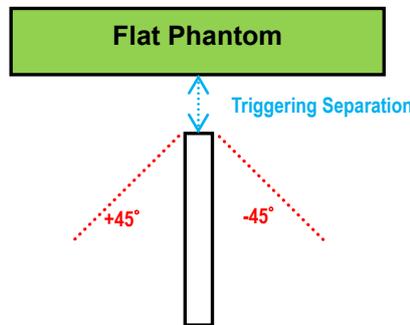
Proximity Sensor Coverage

In KDB 616217 section 6.3, if a sensor is spatially offset from the antenna(s), it is necessary to verify sensor triggering for conditions where the antenna is next to the user but the sensor is laterally further away to ensure sensor coverage is sufficient for reducing the power to maintain compliance. For p-sensor coverage testing, the device is moved and “along the direction of maximum antenna and sensor offset”.

However, this device uses a capacitive proximity sensor that is same metallic component as the transmitting antenna to facilitate triggering in any condition the user may use the device in proximity of the antenna in the device. Therefore, no further sensor coverage assessments were required.

Proximity Sensor Tilt Angle Influences

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.



Orientation	Separation Distance (mm)	Tilt Angle										
		-45°	-40°	-30°	-20°	-10°	0°	10°	20°	30°	40°	45°
Vertical-Front	18	On	On	On	On	On	On	On	On	On	On	On
Vertical-Back	18	On	On	On	On	On	On	On	On	On	On	On
Vertical-Top	18	On	On	On	On	On	On	On	On	On	On	On

Summary for Proximity Sensor Triggering Distance

The detailed trigger distance is as follows:

Test position	Vertical-Front	Vertical-Back	Horizontal-Up	Horizontal-Down	Vertical-Top
Distance	18mm	18mm	18mm	18mm	18mm

Note:

1. 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.
2. For verification of compliance of power reduction scheme, additional SAR testing with EUT transmitting at full RF power at a conservative trigger distance -1mm was performed.



<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 QPSK, 16QAM and 64QAM modulation. The results please refer to section 4.5 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
2	V	V	V	V	V	V
4	V	V	V	V	V	V
5	V	V	V	V		
7			V	V	V	V
12	V	V	V	V		
13			V	V		
25	V	V	V	V	V	V
26	V	V	V	V	V	
38			V	V	V	V
66	V	V	V	V	V	V
71			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.

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3

Modulation	Channel bandwidth / Transmission bandwidth (N_{RB})						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3
256 QAM	≥ 1						≤ 5

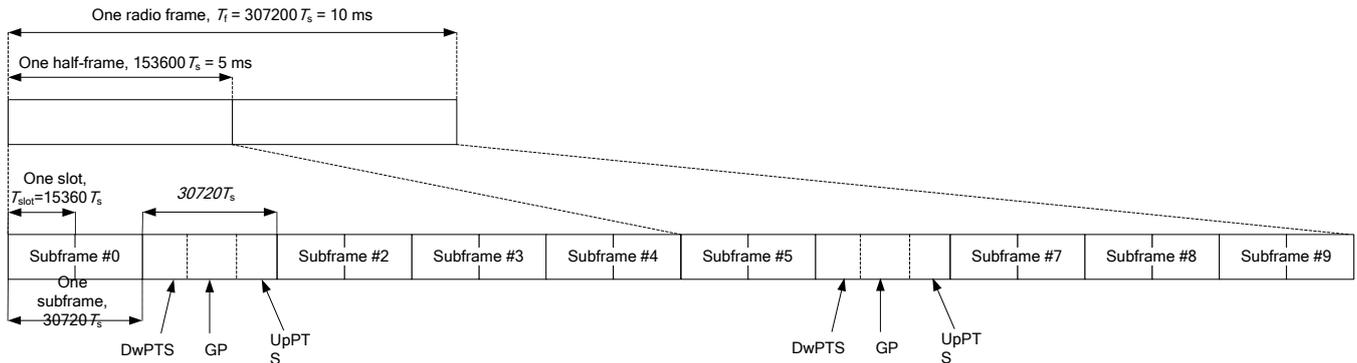
Note: MPR is according to the standard and implemented in the circuit (mandatory).

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

Special Subframe Configuration	Normal Cyclic Prefix in Downlink			Extended Cyclic Prefix in Downlink		
	DwPTS	UpPTS		DwPTS	UpPTS	
		Normal Cyclic Prefix in Uplink	Extended Cyclic Prefix in Uplink		Normal Cyclic Prefix in Uplink	Extended Cyclic Prefix in Uplink
0	6592 · Ts	2192 · Ts	2560 · Ts	7680 · Ts	2192 · Ts	2560 · Ts
1	19760 · Ts			20480 · Ts		
2	21952 · Ts			23040 · Ts		
3	24144 · Ts			25600 · Ts		
4	26336 · Ts			7680 · Ts		
5	6592 · Ts	4384 · Ts	5120 · Ts	20480 · Ts	4384 · Ts	5120 · Ts
6	19760 · Ts			23040 · Ts		
7	21952 · Ts			12800 · Ts		
8	24144 · Ts			-		
9	13168 · Ts	-	-	-	-	-

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%.



<Considerations Related to 5G NR for Setup and Testing>

1. 5G NR supports SA mode. The details are as follows

Mode	Band	Duplex	SCS(KHz)	BW(M)
SA	5G NR n25	FDD	15	5, 10, 15, 20
	5G NR n66	FDD	15	5, 10, 15, 20
	5G NR n71	FDD	15	5, 10, 15, 20

2. 5G NR supports both normal mode and Redcap mode. Since the output power of normal mode is equal to or greater than that of Redcap mode, only the normal mode needs to be tested for SAR.
3. For 5G NR test procedure was following step similar FCC KDB 941225 D05:
 - (1) For DFT-OFDM and CP-OFDM output power measurement reduction, according to 38.101 maximum power reduction for power class 3, the CP-OFDM mode will not higher than DFT-OFDM mode, therefore, similar FCC KB 941225 D05 procedure for other modulation output power for each RB allocation configuration is > not ½ dB higher than the same configuration in DFT-QPSK and the reported SAR for the DFT-QPSK configuration is ≤ 1.45 W/kg, CP-OFDM testing is not required.
 - (2) For DFT-OFDM and CP-OFDM output power measurement reduction, according to 38.101 maximum power reduction for power class 3, for 16QAM/64QAM/256QAM and smaller bandwidth output power will spot check largest channel bandwidth worst RB configuration to ensure the 16QAM/64QAM/256QAM and smaller bandwidth output power will not ½ dB higher than the same configuration in the largest supported bandwidth.
 - (3) SAR testing start with the largest channel bandwidth and measure SAR for QPSK with 1RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offset at the upper edge, middle and lower edge of each required test channel.
 - (4) 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
 - (5) 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% RB and 1RB allocations and the highest reported SAR for 1RB 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.
 - (6) Pi/2 BPSK/16QAM/64QAM/256QAM output powers according to 3GPP MPR will not ½ dB higher than the same configuration in QPSK, also reported SAR for the QPSK configuration is less than 1.45 W/kg, Pi/2 BPSK/16QAM/64QAM/256QAM SAR testing are not required.



- (7) Smaller bandwidth output power for each RB allocation configuration for this device will not. ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg, smaller bandwidth SAR testing is not required for this device.

Table 6.2.2.3-1: Maximum power reduction (MPR) for power class 3

Modulation		MPR (dB)		
		Edge RB allocations	Outer RB allocations	Inner RB allocations
DFT-s-OFDM	Pi/2 BPSK	≤ 3.5 ¹	≤ 1.2 ¹	≤ 0.2 ¹
		≤ 0.5 ²		0 ²
	QPSK	≤ 1		0
	16 QAM	≤ 2		≤ 1
	64 QAM	≤ 2.5		
	256 QAM	≤ 4.5		
CP-OFDM	QPSK	≤ 3		≤ 1.5
	16 QAM	≤ 3		≤ 2
	64 QAM	≤ 3.5		
	256 QAM	≤ 6.5		
NOTE 1: Applicable for UE operating in TDD mode with Pi/2 BPSK modulation and UE indicates support for UE capability <i>powerBoosting-pi2BPSK</i> and if the IE <i>powerBoostPi2BPSK</i> is set to 1 and 40 % or less slots in radio frame are used for UL transmission for bands n40, n41, n77, n78 and n79. The reference power of 0dB MPR is 26dBm.				
NOTE 2: Applicable for UE operating in FDD mode, or in TDD mode in bands other than n40, n41, n77, n78 and n79 and if the IE <i>powerBoostPi2BPSK</i> is set to 0 and if more than 40% of slots in radio frame are used for UL transmission for bands n40, n41, n77, n78 and n79.				

- 4. Due to test setup limitations, SAR testing for NR was performed using Factory Test Mode software to establish the connection.

4.2 EUT Testing Position

4.2.1 Body Exposure Conditions

<Simple Dongle Procedures>

For USB dongle transmitter, according to KDB 447498 D02, SAR evaluation is required for all USB orientations illustrated as below with a device-to-phantom separation distance of 5 mm or less. The typical Horizontal-Up USB connection, found in the majority of host computers, must be tested using an appropriate host computer. A host computer with either Vertical-Front or Vertical-Back USB connection should be used to test one of the vertical USB orientations. If a suitable host computer is not available for testing the Horizontal-Down or the remaining Vertical USB orientation, a high quality USB cable, 12 inches or less, may be used for testing these other orientations.

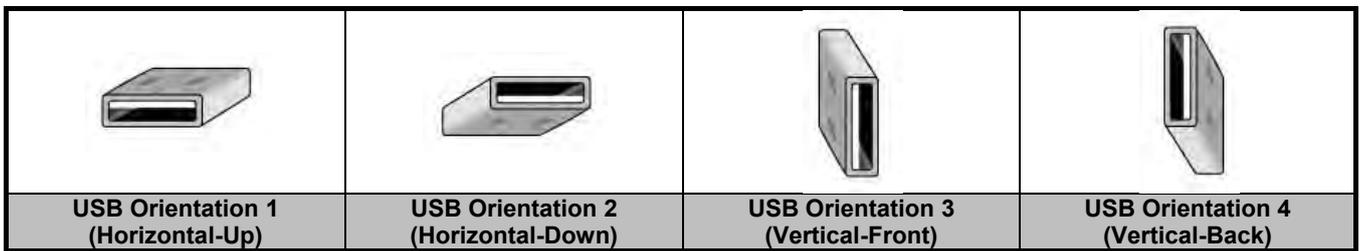


Fig-4.1 Illustration for USB Connector Orientations



4.3 Tissue Verification

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

Test Date	Tissue Type	Frequency (MHz)	Liquid Temp. (°C)	Measured Conductivity (σ)	Measured Permittivity (ϵ_r)	Target Conductivity (σ)	Target Permittivity (ϵ_r)	Conductivity Deviation (%)	Permittivity Deviation (%)
Mar. 15, 2025	HSL	750	22.6	0.905	42.784	0.89	41.90	1.69	2.11
Mar. 15, 2025	HSL	835	22.5	0.916	40.654	0.90	41.50	1.78	-2.04
Mar. 16, 2025	HSL	1750	22.3	1.353	39.781	1.37	40.10	-1.24	-0.80
Mar. 15, 2025	HSL	1900	22.4	1.373	40.283	1.40	40.00	-1.93	0.71
Mar. 16, 2025	HSL	2600	22.3	1.953	39.065	1.96	39.00	-0.36	0.17

Note:

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

4.4 System Verification

The measuring result for system verification is tabulated as below.

<1g SAR>

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
Mar. 15, 2025	HSL	750	8.49	2.110	8.44	1.30	1067	3873	755
Mar. 15, 2025	HSL	835	9.57	2.530	10.12	6.17	4d139	3873	755
Mar. 16, 2025	HSL	1750	36.30	8.980	35.92	-6.34	1071	3873	755
Mar. 15, 2025	HSL	1900	39.80	9.800	39.20	-4.92	5d159	3873	755
Mar. 16, 2025	HSL	2600	55.90	13.600	54.40	-3.40	1110	3873	755

<10g SAR>

Test Date	Mode	Frequency (MHz)	1W Target SAR-10g (W/kg)	Measured SAR-10g (W/kg)	Normalized to 1W SAR-10g (W/kg)	Deviation (%)	Dipole S/N	Probe S/N	DAE S/N
Mar. 15, 2025	HSL	750	5.59	1.440	5.76	3.04	1067	3873	755
Mar. 15, 2025	HSL	835	6.31	1.690	6.76	7.13	4d139	3873	755
Mar. 16, 2025	HSL	1750	19.50	4.940	19.76	1.33	1071	3873	755
Mar. 15, 2025	HSL	1900	20.90	5.290	21.16	1.24	5d159	3873	755
Mar. 16, 2025	HSL	2600	25.40	6.380	25.52	0.47	1110	3873	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 measuring conducted average power (Unit: dBm) please refer to Appendix D.

4.6 SAR Testing Results

4.6.1 SAR Test Reduction Considerations

<KDB 447498 D01, 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 $\leq 1/4$ 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 941225 D05, SAR Evaluation Considerations for 5G NR Devices>

- (1) For DFT-OFDM and CP-OFDM output power measurement reduction, according to 38.101 maximum power reduction for power class 3, the CP-OFDM mode will not higher than DFT-OFDM mode, therefore, similar FCC KB 941225 D05 procedure for other modulation output power for each RB allocation configuration is > not 1/2 dB higher than the same configuration in DFT-QPSK and the reported SAR for the DFT-QPSK configuration is ≤ 1.45 W/kg, CP-OFDM testing is not required.
- (2) For DFT-OFDM and CP-OFDM output power measurement reduction, according to 38.101 maximum power reduction for power class 3, for 16QAM/64QAM/256QAM and smaller bandwidth output power will spot check largest channel bandwidth worst RB configuration to ensure the 16QAM/64QAM/256QAM and smaller bandwidth output power will not 1/2 dB higher than the same configuration in the largest supported bandwidth.
- (3) SAR testing start with the largest channel bandwidth and measure SAR for QPSK with 1RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offset at the upper edge, middle and lower edge of each required test channel.
- (4) 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
- (5) 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% RB and 1RB allocations and the highest reported SAR for 1RB 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.
- (6) Pi/2 BPSK/16QAM/64QAM/256QAM output powers according to 3GPP MPR will not 1/2 dB higher than the same configuration in QPSK, also reported SAR for the QPSK configuration is less than 1.45 W/kg, Pi/2 BPSK/16QAM/64QAM/256QAM SAR testing are not required.
- (7) Smaller bandwidth output power for each RB allocation configuration for this device will not. 1/2 dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg, smaller bandwidth SAR testing is not required for this device.



4.6.2 SAR Results for Body Exposure Condition (Separation Distance is 0.5 cm Gap)

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Ch.	Power Reduction	RB#	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)
P01	LTE Band 7	QPSK20M	Vertical-Top	0.5cm	21350	Reduce	1	50	-	16.00	15.14	0.16	0.840	-	1.219	1.02
P02	LTE Band 12	QPSK10M	Horizontal-Up	0.5cm	23095	Full	1	24	-	24.00	22.67	-0.01	0.522	-	1.358	0.71
P03	LTE Band 13	QPSK10M	Horizontal-Up	0.5cm	23230	Full	1	0	-	24.00	23.38	-0.15	0.942	-	1.153	1.09
P04	LTE Band 25/2	QPSK20M	Horizontal-Up	0.5cm	26140	Reduce	1	50	-	19.00	18.15	-0.06	0.745	-	1.216	0.91
P05	LTE Band 26/5	QPSK15M	Horizontal-Up	0.5cm	26765	Full	1	0	-	24.00	23.02	0.14	0.764	-	1.253	0.96
P06	LTE Band 38	QPSK20M	Vertical-Top	0.5cm	37850	Reduce	1	0	62.9	16.00	14.87	0.11	0.503	1.006	1.297	0.66
P07	LTE Band 66/4	QPSK20M	Horizontal-Up	0.5cm	132322	Reduce	1	99	-	18.00	16.69	0.05	0.628	-	1.352	0.85
P08	LTE Band 71	QPSK20M	Horizontal-Up	0.5cm	133222	Full	1	0	-	24.00	22.62	-0.07	0.426	-	1.374	0.59
P09	FR1 n25	DFT-QPSK20M	Horizontal-Up	0.5cm	381000	Reduce	1	1	-	19.00	18.58	-0.13	0.310	-	1.102	0.34
P10	FR1 n66	DFT-QPSK20M	Horizontal-Up	1.7cm	354000	Full	1	1	-	24.00	22.68	0.03	0.267	-	1.355	0.36
P11	FR1 n71	DFT-QPSK20M	Horizontal-Up	0.5cm	134600	Full	50	28	-	24.00	23.34	-0.04	0.528	-	1.164	0.62



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	Separation Distance (cm)	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
LTE 7	Horizontal-Up	0.5cm	21350	0.840	0.822	1.022	N/A	N/A	N/A	N/A
LTE 13	Horizontal-Up	0.5cm	23230	0.942	0.923	1.021	N/A	N/A	N/A	N/A

Test Engineer : Renjie Liu, and Zixiao Xia



5. Calibration of Test Equipment

Equipment	Manufacturer	Model	SN	Cal. Data	Due Data
System Validation Dipole	SPEAG	D750V3	1067	Jul. 17, 2024	Jul. 16, 2025
System Validation Dipole	SPEAG	D835V2	4d139	Jul. 16, 2024	Jul. 15, 2025
System Validation Dipole	SPEAG	D1750V2	1071	Jun. 17, 2024	Jun. 16, 2025
System Validation Dipole	SPEAG	D1900V2	5d159	Jun. 15, 2024	Jun. 14, 2025
System Validation Dipole	SPEAG	D2600V2	1110	Jun. 17, 2024	Jun. 16, 2025
Dosimetric E-Field Probe	SPEAG	EX3DV4	3873	Sep. 29, 2024	Sep. 28, 2025
Data Acquisition Electronics	SPEAG	DAE4	755	Jul. 05, 2024	Jul. 04, 2025
Dielectric Probe Kit	SPEAG	DAK-3.5	1076	Aug. 20, 2024	Aug. 19, 2025
Radio Communication Analyzer	Rohde&Schwarz	CMW500	166205	Aug. 01, 2024	Jul. 31, 2025
ENA Series Network Analyzer	Agilent	E5071C	MY46214638	Apr. 28, 2024	Apr. 27, 2025
ESG Analog Signal Generator	Rohde&Schwarz	SMB100B	102507	Mar. 28, 2024	Mar. 27, 2025
Power Meter	Agilent	N1914A	MY52180044	Jan. 16, 2025	Jan. 15, 2026
Power Sensor	Agilent	E9304A H18	MY52050011	Jan. 16, 2025	Jan. 15, 2026
Power Meter	Rohde&Schwarz	NRX	102380	Mar. 28, 2024	Mar. 27, 2025
Power Sensor	Rohde&Schwarz	NRP6A	102942	Mar. 20, 2024	Mar. 19, 2025
Temp. & Humi. Recorder	HUATO	A2000TH	HE20107712	Apr. 29, 2024	Apr. 28, 2025
Electronic Thermometer	YONGFA	YF-160A	120100323	Apr. 29, 2024	Apr. 28, 2025
Coupler	Woken	0110A056020-10	COM27RW1A3	May. 20, 2024	May. 19, 2025



6. Measurement Uncertainty

DASY Uncertainty Budget According to IEEE 1528-2013 and IEC 62209-1/2016 (0.3 - 3 GHz range)								
Error Description	Uncertainty Value (±%)	Probability	Divisor	(Ci) 1g	(Ci) 10g	Standard Uncertainty (1g) (±%)	Standard Uncertainty (10g) (±%)	(Vi) Veff
Measurement System								
Probe Calibration	6.05	N	1	1	1	6.1	6.1	∞
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	4.0	N	1	1	1	4.0	4.0	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	0.14	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	2.61	R	1.732	0.78	0.71	1.2	1.1	∞
Liquid Permittivity Repeatability	0.03	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						13.6%	13.5%	578
Coverage Factor for 95 %						K=2	K=2	
Expanded STD Uncertainty						27.2%	26.9%	

Uncertainty budget for frequency range 30 MHz to 3 GHz



7. Information on the Testing Laboratories

We, Huarui Saiwei (Suzhou) Technology 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](tel:+86(0557)3681008)

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.

System Check_HSL750_250315

DUT: Dipole:750 MHz;Type:D750V3

Communication System: CW; Frequency: 750 MHz;Duty Cycle: 1:1

Medium: HSL750_0315 Medium parameters used: $f = 750$ MHz; $\sigma = 0.905$ S/m; $\epsilon_r = 42.784$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.5°C; Liquid Temperature : 22.6°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3873; ConvF(9.87, 9.87, 9.87) @ 750 MHz; Calibrated: 2024/9/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 2024/7/5
- Phantom: SAM with CRP V5.0; Type: QD000P40CB; Serial: TP:1502
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

Pin=250mW/Area Scan (51x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 2.56 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 55.52 V/m; Power Drift = -0.08 dB

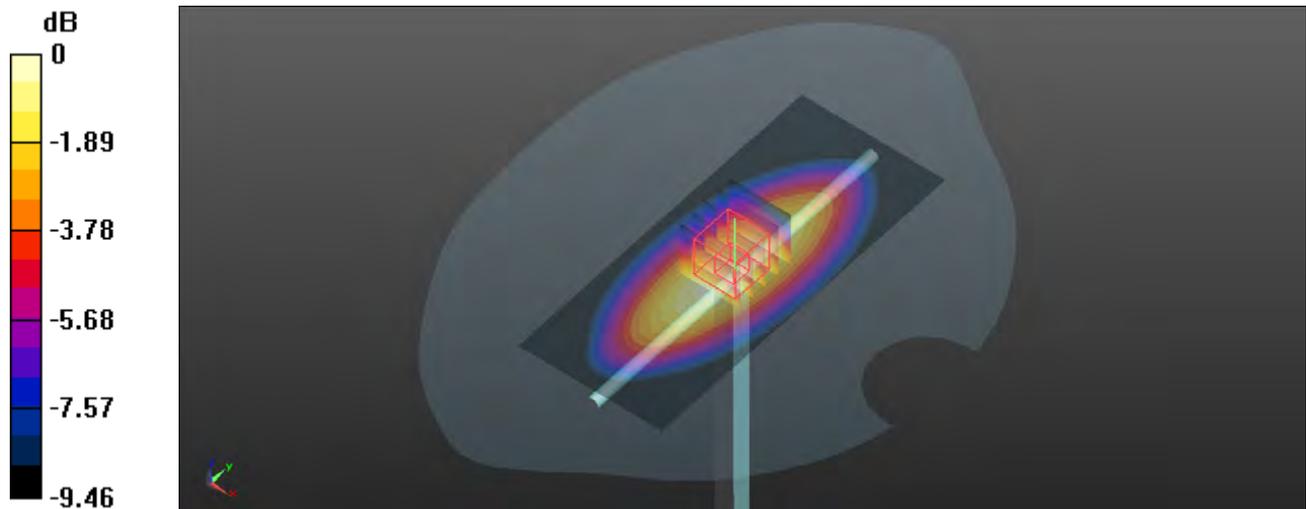
Peak SAR (extrapolated) = 2.89 W/kg

SAR(1 g) = 2.11 W/kg; SAR(10 g) = 1.44 W/kg

Smallest distance from peaks to all points 3 dB below = 19.5 mm

Ratio of SAR at M2 to SAR at M1 = 72.1%

Maximum value of SAR (measured) = 2.58 W/kg



0 dB = 2.58 W/kg

System Check_HSL835_250315

DUT: Dipole:835 MHz;Type:D835V2

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1

Medium: HSL835_0315 Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.916 \text{ S/m}$; $\epsilon_r = 40.654$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 23.5°C ; Liquid Temperature : 22.5°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3873; ConvF(9.47, 9.47, 9.47) @ 835 MHz; Calibrated: 2024/9/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 2024/7/5
- Phantom: SAM with CRP V5.0; Type: QD000P40CB; Serial: TP:1502
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

Pin=250mW/Area Scan (61x111x1): Interpolated grid: $dx=1.500 \text{ mm}$, $dy=1.500 \text{ mm}$
 Maximum value of SAR (interpolated) = 3.11 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 60.51 V/m ; Power Drift = -0.00 dB

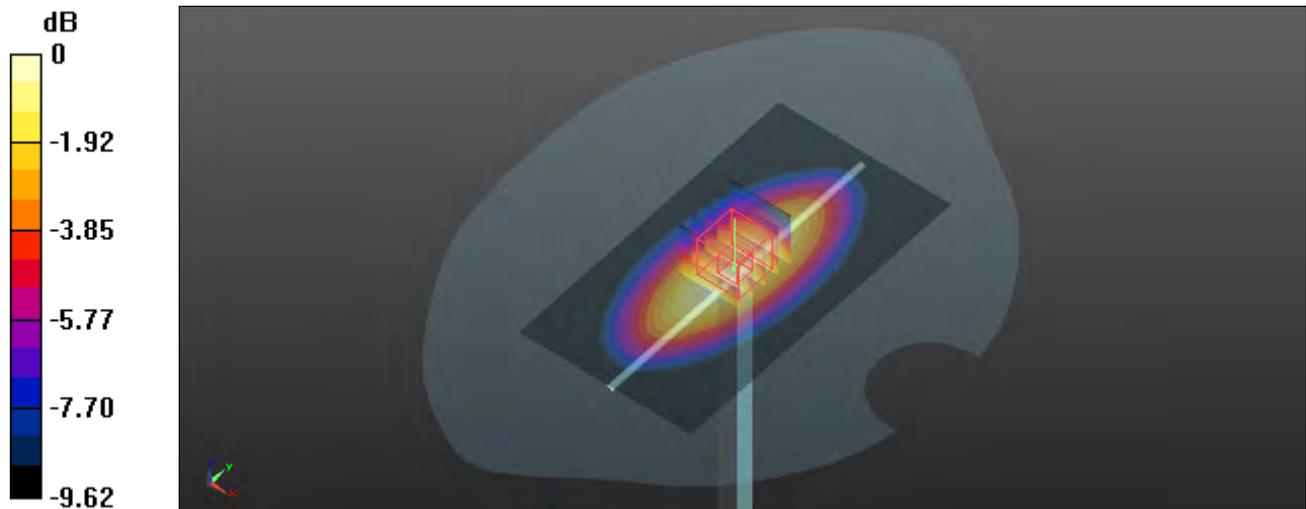
Peak SAR (extrapolated) = 3.49 W/kg

SAR(1 g) = 2.53 W/kg ; SAR(10 g) = 1.69 W/kg

Smallest distance from peaks to all points 3 dB below = 17.9 mm

Ratio of SAR at M2 to SAR at M1 = 71.5%

Maximum value of SAR (measured) = 3.11 W/kg



0 dB = 3.11 W/kg

System Check_HSL1750_250316

DUT: Dipole:1750 MHz;Type:D1750V2

Communication System: CW; Frequency: 1750 MHz;Duty Cycle: 1:1

Medium: HSL1750_0316 Medium parameters used: $f = 1750$ MHz; $\sigma = 1.353$ S/m; $\epsilon_r = 39.781$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.4°C; Liquid Temperature : 22.3°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3873; ConvF(8.31, 8.31, 8.31) @ 1750 MHz; Calibrated: 2024/9/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 2024/7/5
- Phantom: SAM with CRP V5.0; Type: QD000P40CB; Serial: TP:1502
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

Pin=250mW/Area Scan (71x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 13.3 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 103.0 V/m; Power Drift = -0.11 dB

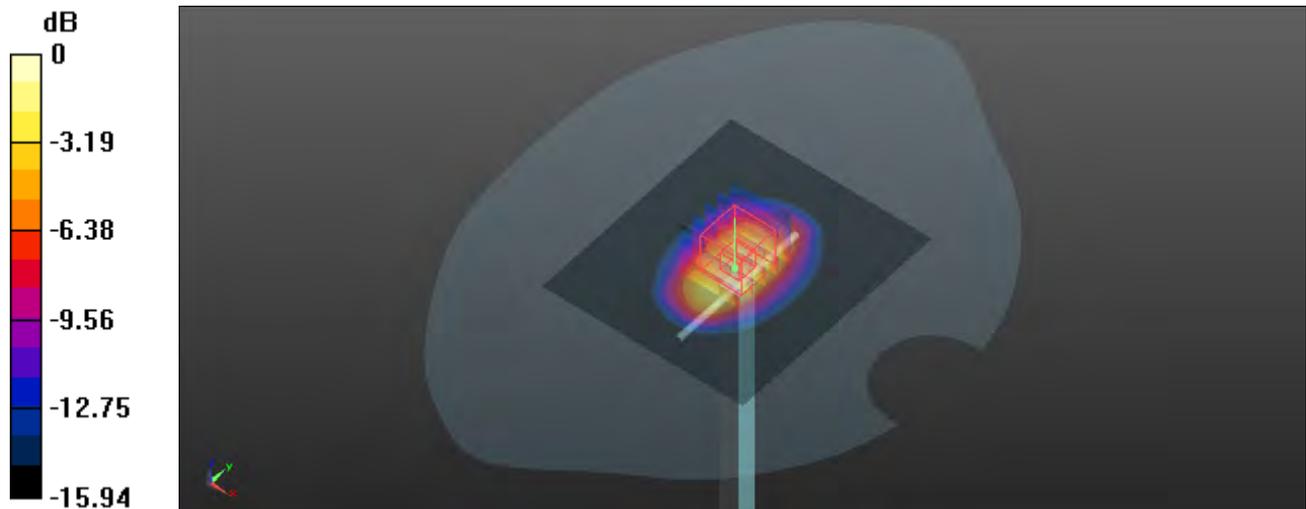
Peak SAR (extrapolated) = 15.3 W/kg

SAR(1 g) = 8.98 W/kg; SAR(10 g) = 4.94 W/kg

Smallest distance from peaks to all points 3 dB below = 11.2 mm

Ratio of SAR at M2 to SAR at M1 = 58.6%

Maximum value of SAR (measured) = 13.3 W/kg



0 dB = 13.3 W/kg

System Check_HSL1900_250315

DUT: Dipole:1900MHz;Type:D1900V2

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1

Medium: HSL1900_0315 Medium parameters used: $f = 1900$ MHz; $\sigma = 1.373$ S/m; $\epsilon_r = 40.283$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.5°C; Liquid Temperature : 22.4°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3873; ConvF(7.97, 7.97, 7.97) @ 1900 MHz; Calibrated: 2024/9/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 2024/7/5
- Phantom: SAM with CRP V5.0; Type: QD000P40CB; Serial: TP:1502
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

Pin=250mW/Area Scan (61x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 14.6 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 102.7 V/m; Power Drift = -0.03 dB

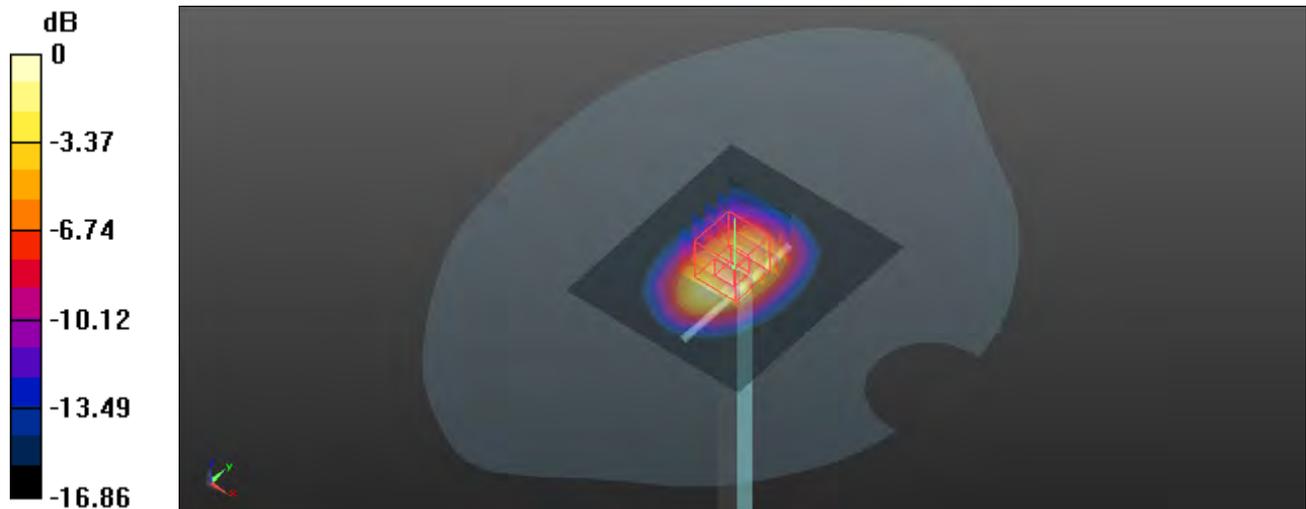
Peak SAR (extrapolated) = 16.6 W/kg

SAR(1 g) = 9.8 W/kg; SAR(10 g) = 5.29 W/kg

Smallest distance from peaks to all points 3 dB below = 11.2 mm

Ratio of SAR at M2 to SAR at M1 = 58.8%

Maximum value of SAR (measured) = 13.6 W/kg



0 dB = 13.6 W/kg

System Check_HSL2600_250316

DUT: Dipole:2600 MHz;Type:D2600V2

Communication System: CW; Frequency: 2600 MHz;Duty Cycle: 1:1

Medium: HSL2600_0316 Medium parameters used: $f = 2600$ MHz; $\sigma = 1.953$ S/m; $\epsilon_r = 39.065$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.5°C; Liquid Temperature : 22.3°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3873; ConvF(7.31, 7.31, 7.31) @ 2600 MHz; Calibrated: 2024/9/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 2024/7/5
- Phantom: SAM with CRP V5.0; Type: QD000P40CB; Serial: TP:1502
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

Pin=250mW/Area Scan (71x91x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 21.7 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 111.2 V/m; Power Drift = -0.14 dB

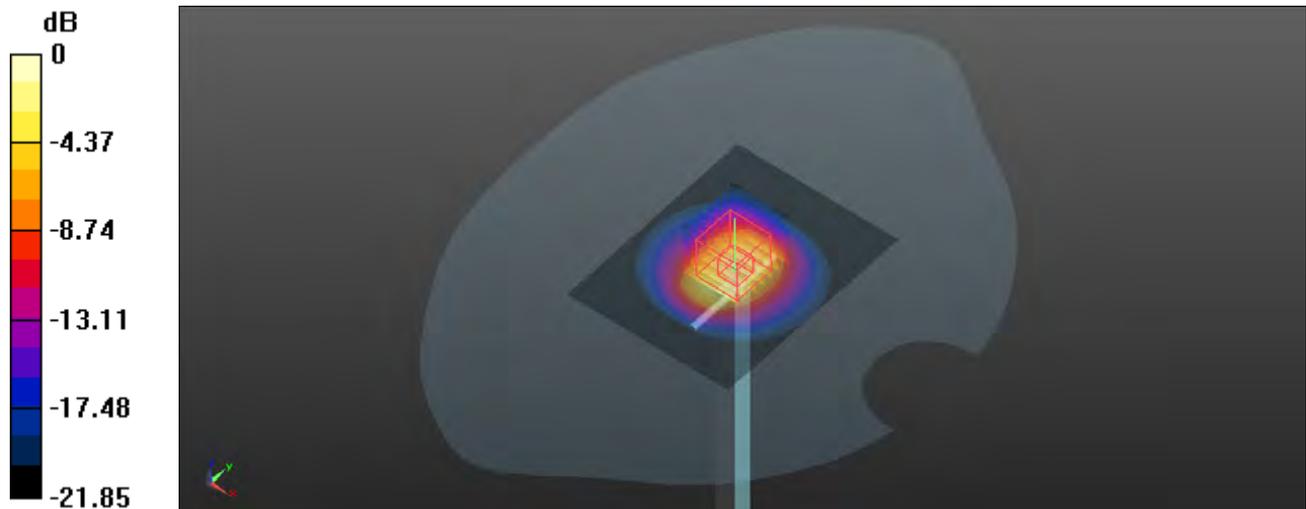
Peak SAR (extrapolated) = 26.6 W/kg

SAR(1 g) = 13.6 W/kg; SAR(10 g) = 6.38 W/kg

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

Ratio of SAR at M2 to SAR at M1 = 51.7%

Maximum value of SAR (measured) = 20.5 W/kg



0 dB = 20.5 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_LTE Band 7_QPSK20M_Vertical-Top_0.5cm_Ch21350_1RB_OS50

Communication System: LTE_FDD; Frequency: 2560 MHz; Duty Cycle: 1:1

Medium: HSL2600_0316 Medium parameters used: $f = 2560$ MHz; $\sigma = 1.919$ S/m; $\epsilon_r = 39.151$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.5°C; Liquid Temperature : 22.3°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3873; ConvF(7.31, 7.31, 7.31) @ 2560 MHz; Calibrated: 2024/9/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 2024/7/5
- Phantom: SAM with CRP V5.0; Type: QD000P40CB; Serial: TP:1502
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

- **Area Scan (41x61x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 1.64 W/kg

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

Reference Value = 25.75 V/m; Power Drift = 0.16 dB

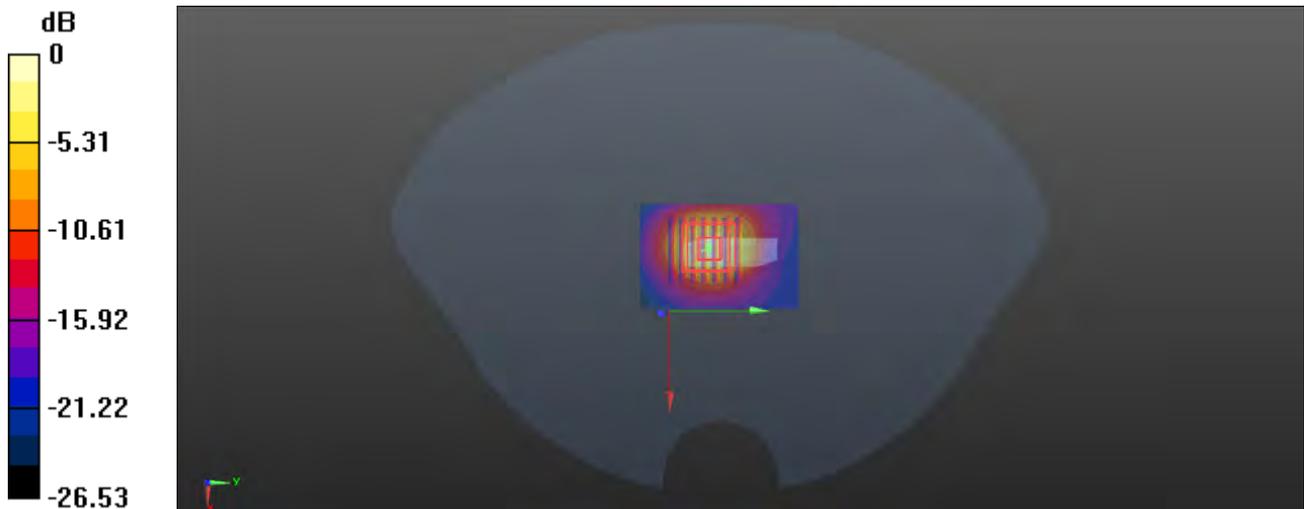
Peak SAR (extrapolated) = 1.99 W/kg

SAR(1 g) = 0.840 W/kg; SAR(10 g) = 0.338 W/kg

Smallest distance from peaks to all points 3 dB below = 7.6 mm

Ratio of SAR at M2 to SAR at M1 = 43.5%

Maximum value of SAR (measured) = 1.54 W/kg



0 dB = 1.54 W/kg

P02_LTE Band 12_QPSK10M_Horizontal-Up_0.5cm_Ch23095_1RB_OS24

Communication System: LTE_FDD; Frequency: 707.5 MHz; Duty Cycle: 1:1

Medium: HSL750_0315 Medium parameters used: $f = 707.5$ MHz; $\sigma = 0.891$ S/m; $\epsilon_r = 42.963$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.5°C; Liquid Temperature : 22.6°C

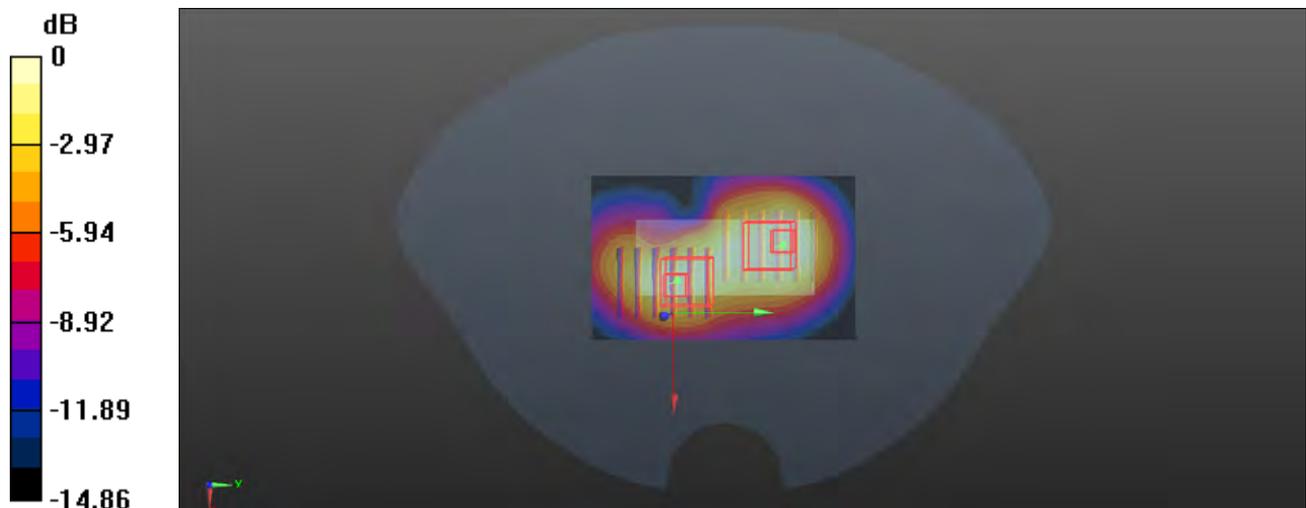
DASY5 Configuration:

- Probe: EX3DV4 - SN3873; ConvF(9.87, 9.87, 9.87) @ 707.5 MHz; Calibrated: 2024/9/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 2024/7/5
- Phantom: SAM with CRP V5.0; Type: QD000P40CB; Serial: TP:1502
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

- **Area Scan (51x81x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.888 W/kg

- **Zoom Scan (5x6x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 25.59 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.06 W/kg
SAR(1 g) = 0.522 W/kg; SAR(10 g) = 0.304 W/kg
Smallest distance from peaks to all points 3 dB below = 11.6 mm
Ratio of SAR at M2 to SAR at M1 = 53.5%
Maximum value of SAR (measured) = 0.799 W/kg

- **Zoom Scan (5x6x7)/Cube 1:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 25.59 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.818 W/kg
SAR(1 g) = 0.441 W/kg; SAR(10 g) = 0.266 W/kg
Smallest distance from peaks to all points 3 dB below = 10.7 mm
Ratio of SAR at M2 to SAR at M1 = 54.5%
Maximum value of SAR (measured) = 0.663 W/kg



0 dB = 0.663 W/kg

P03_LTE Band 13_QPSK10M_Horizontal-Up_0.5cm_Ch23230_1RB_OS0

Communication System: LTE_FDD; Frequency: 782 MHz; Duty Cycle: 1:1

Medium: HSL750_0315 Medium parameters used: $f = 782 \text{ MHz}$; $\sigma = 0.915 \text{ S/m}$; $\epsilon_r = 42.678$; $\rho = 1000 \text{ kg/m}^3$

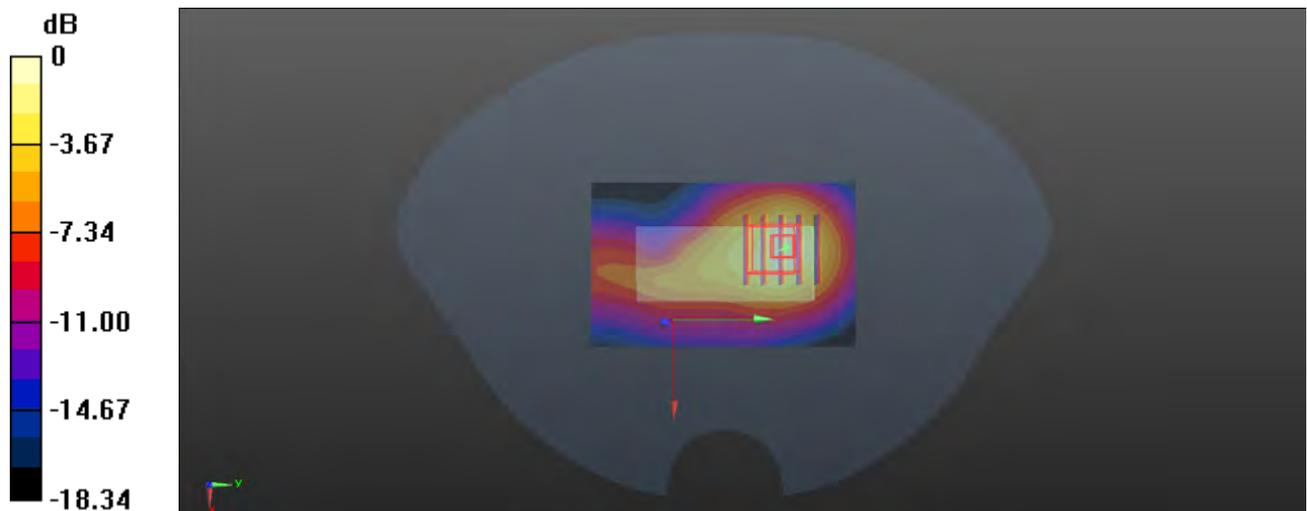
Ambient Temperature : 23.5°C ; Liquid Temperature : 22.6°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3873; ConvF(9.87, 9.87, 9.87) @ 782 MHz; Calibrated: 2024/9/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 2024/7/5
- Phantom: SAM with CRP V5.0; Type: QD000P40CB; Serial: TP:1502
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

- **Area Scan (51x81x1):** Interpolated grid: $dx=1.500 \text{ mm}$, $dy=1.500 \text{ mm}$
Maximum value of SAR (interpolated) = 1.65 W/kg

- **Zoom Scan (5x5x7)/Cube 0:** Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$
Reference Value = 30.88 V/m ; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 1.99 W/kg
SAR(1 g) = 0.942 W/kg ; SAR(10 g) = 0.517 W/kg
Smallest distance from peaks to all points 3 dB below = 10.2 mm
Ratio of SAR at M2 to SAR at M1 = 49%
Maximum value of SAR (measured) = 1.58 W/kg



0 dB = 1.58 W/kg

P04_LTE Band 25_QPSK20M_Horizontal-Up_0.5cm_Ch26140_1RB_OS50

Communication System: LTE_FDD; Frequency: 1860 MHz; Duty Cycle: 1:1

Medium: HSL1900_0315 Medium parameters used: $f = 1860$ MHz; $\sigma = 1.356$ S/m; $\epsilon_r = 40.299$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.5°C; Liquid Temperature : 22.4°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3873; ConvF(7.97, 7.97, 7.97) @ 1860 MHz; Calibrated: 2024/9/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 2024/7/5
- Phantom: SAM with CRP V5.0; Type: QD000P40CB; Serial: TP:1502
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

- **Area Scan (51x81x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.25 W/kg

- **Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 25.58 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 1.56 W/kg

SAR(1 g) = 0.745 W/kg; SAR(10 g) = 0.381 W/kg

Smallest distance from peaks to all points 3 dB below = 10.1 mm

Ratio of SAR at M2 to SAR at M1 = 49.4%

Maximum value of SAR (measured) = 1.23 W/kg

- **Zoom Scan (5x5x7)/Cube 1:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 25.58 V/m; Power Drift = -0.06 dB

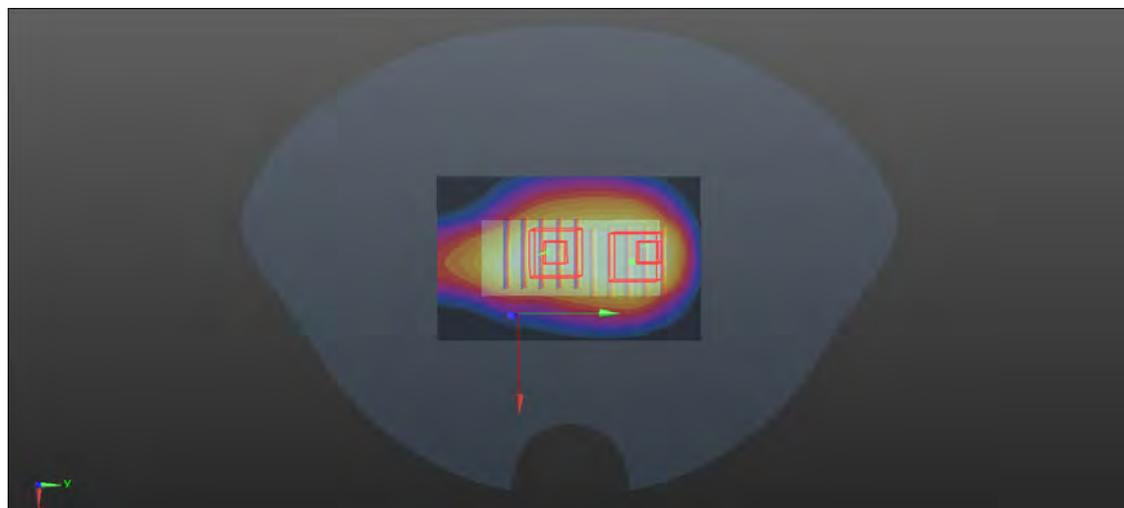
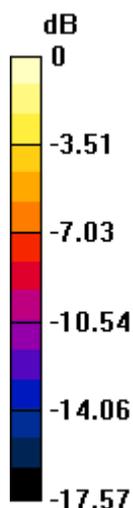
Peak SAR (extrapolated) = 1.05 W/kg

SAR(1 g) = 0.632 W/kg; SAR(10 g) = 0.388 W/kg

Smallest distance from peaks to all points 3 dB below = 13.7 mm

Ratio of SAR at M2 to SAR at M1 = 60.8%

Maximum value of SAR (measured) = 0.895 W/kg



0 dB = 0.895 W/kg

P05_LTE Band 26_QPSK15M_Horizontal-Up_0.5cm_Ch26765_1RB_OS0

Communication System: LTE_FDD; Frequency: 821.5 MHz; Duty Cycle: 1:1

Medium: HSL835_0315 Medium parameters used: $f = 821.5$ MHz; $\sigma = 0.911$ S/m; $\epsilon_r = 40.712$; $\rho = 1000$ kg/m³

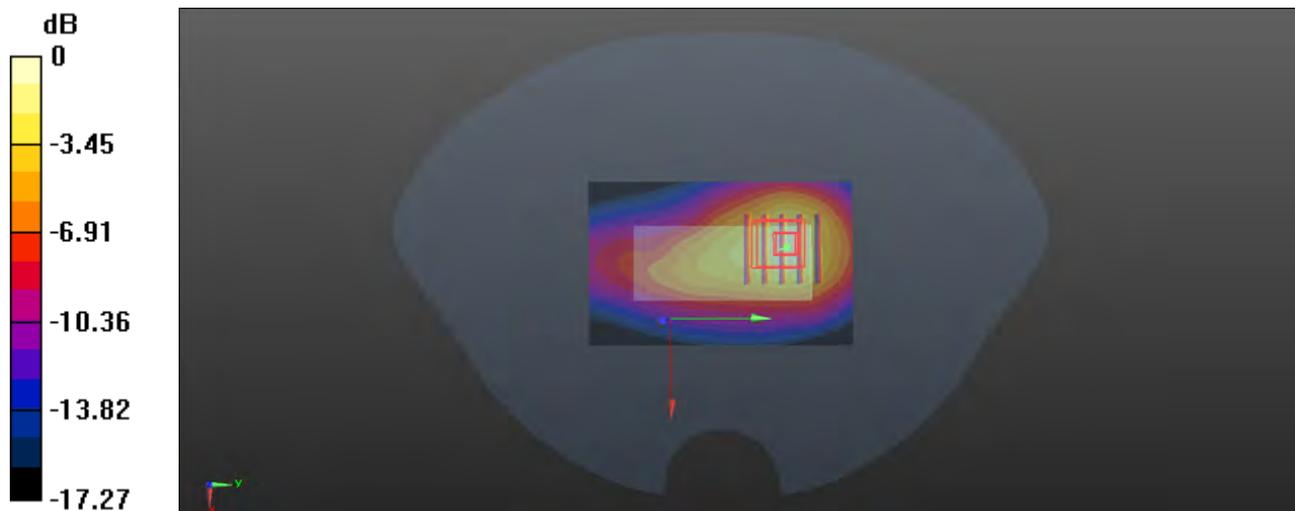
Ambient Temperature : 23.5°C; Liquid Temperature : 22.5°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3873; ConvF(9.47, 9.47, 9.47) @ 821.5 MHz; Calibrated: 2024/9/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 2024/7/5
- Phantom: SAM with CRP V5.0; Type: QD000P40CB; Serial: TP:1502
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

- **Area Scan (51x81x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.18 W/kg

- **Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.01 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 1.52 W/kg
SAR(1 g) = 0.764 W/kg; SAR(10 g) = 0.421 W/kg
Smallest distance from peaks to all points 3 dB below = 13.6 mm
Ratio of SAR at M2 to SAR at M1 = 52.4%
Maximum value of SAR (measured) = 1.22 W/kg



0 dB = 1.22 W/kg

P06_LTE Band 38_QPSK20M_Vertical-Top_0.5cm_Ch37850_1RB_OS0

Communication System: LTE_TDD; Frequency: 2580 MHz; Duty Cycle: 1:1.59

Medium: HSL2600_0316 Medium parameters used: $f = 2580$ MHz; $\sigma = 1.935$ S/m; $\epsilon_r = 39.117$; $\rho = 1000$ kg/m³

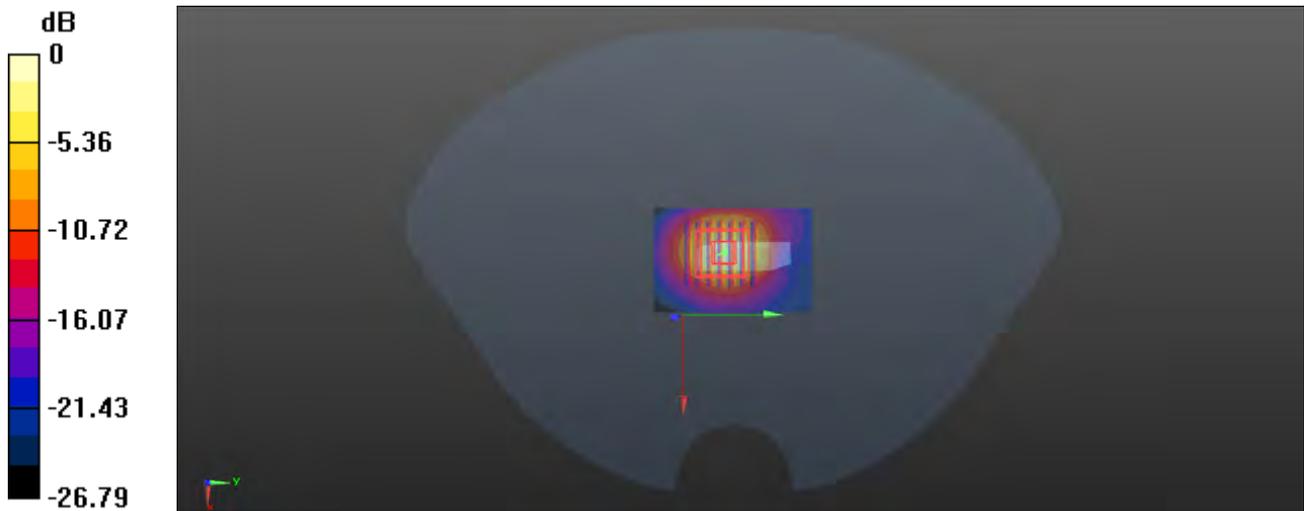
Ambient Temperature : 23.5°C; Liquid Temperature : 22.3°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3873; ConvF(7.31, 7.31, 7.31) @ 2580 MHz; Calibrated: 2024/9/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 2024/7/5
- Phantom: SAM with CRP V5.0; Type: QD000P40CB; Serial: TP:1502
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

- Area Scan (41x61x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
 Maximum value of SAR (interpolated) = 0.989 W/kg

- Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
 Reference Value = 20.03 V/m; Power Drift = 0.11 dB
 Peak SAR (extrapolated) = 1.19 W/kg
SAR(1 g) = 0.503 W/kg; SAR(10 g) = 0.202 W/kg
 Smallest distance from peaks to all points 3 dB below = 7.6 mm
 Ratio of SAR at M2 to SAR at M1 = 43.8%
 Maximum value of SAR (measured) = 0.928 W/kg



0 dB = 0.928 W/kg

P07_LTE Band 66_QPSK20M_Horizontal-Up_0.5cm_Ch132322_1RB_OS99

Communication System: LTE_FDD; Frequency: 1745 MHz; Duty Cycle: 1:1

Medium: HSL1750_0316 Medium parameters used: $f = 1745$ MHz; $\sigma = 1.35$ S/m; $\epsilon_r = 39.793$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.4°C; Liquid Temperature : 22.3°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3873; ConvF(8.31, 8.31, 8.31) @ 1745 MHz; Calibrated: 2024/9/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 2024/7/5
- Phantom: SAM with CRP V5.0; Type: QD000P40CB; Serial: TP:1502
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

- **Area Scan (51x81x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.04 W/kg

- **Zoom Scan (6x7x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 25.05 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 1.28 W/kg

SAR(1 g) = 0.628 W/kg; SAR(10 g) = 0.386 W/kg

Smallest distance from peaks to all points 3 dB below = 5.8 mm

Ratio of SAR at M2 to SAR at M1 = 54.4%

Maximum value of SAR (measured) = 0.899 W/kg

- **Zoom Scan (6x7x7)/Cube 1:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 25.05 V/m; Power Drift = 0.05 dB

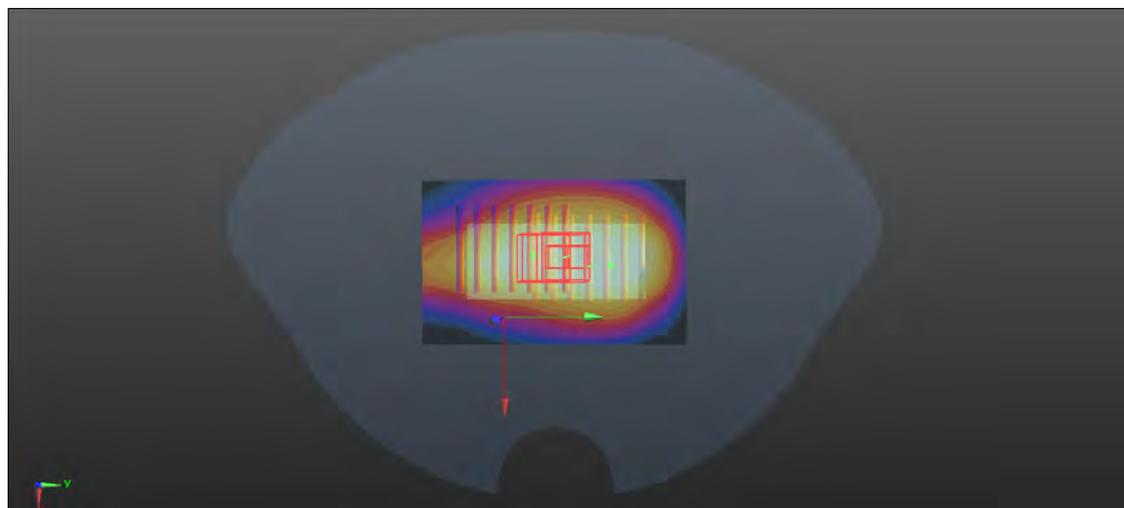
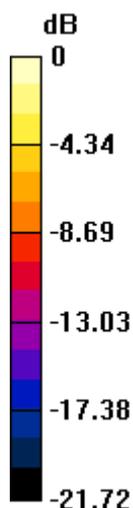
Peak SAR (extrapolated) = 0.967 W/kg

SAR(1 g) = 0.610 W/kg; SAR(10 g) = 0.375 W/kg

Smallest distance from peaks to all points 3 dB below = 16 mm

Ratio of SAR at M2 to SAR at M1 = 64.3%

Maximum value of SAR (measured) = 0.846 W/kg



0 dB = 0.846 W/kg

P08_LTE Band 71_QPSK20M_Horizontal-Up_0.5cm_Ch133222_1RB_OS0

Communication System: LTE_FDD; Frequency: 673 MHz; Duty Cycle: 1:1

Medium: HSL750_0315 Medium parameters used: $f = 673$ MHz; $\sigma = 0.881$ S/m; $\epsilon_r = 43.105$; $\rho = 1000$ kg/m³

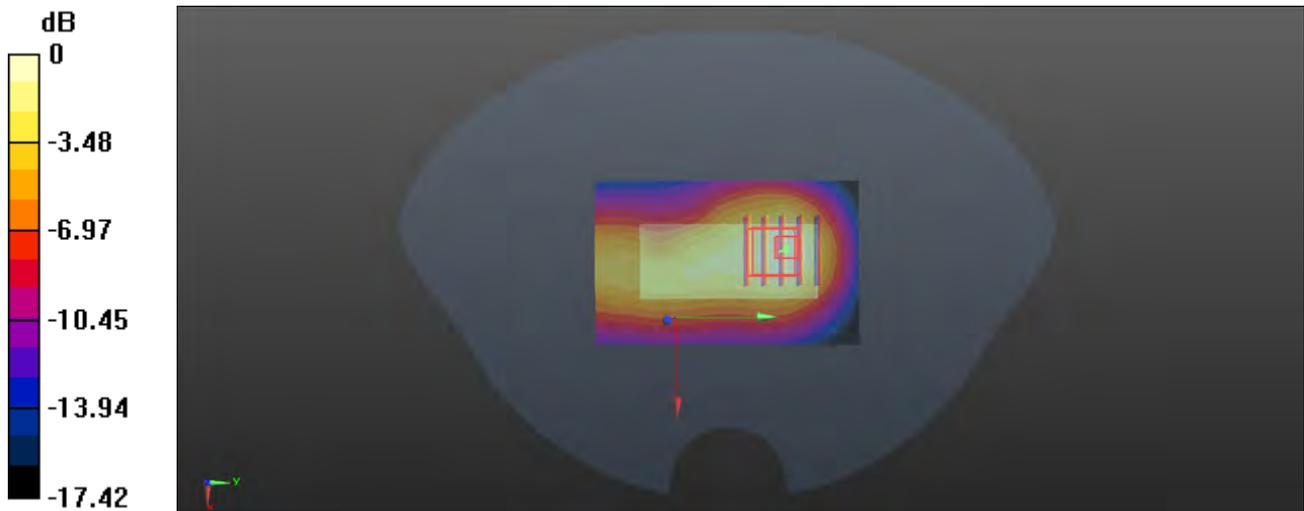
Ambient Temperature : 23.5°C; Liquid Temperature : 22.6°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3873; ConvF(9.87, 9.87, 9.87) @ 673 MHz; Calibrated: 2024/9/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 2024/7/5
- Phantom: SAM with CRP V5.0; Type: QD000P40CB; Serial: TP:1502
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

- **Area Scan (51x81x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
 Maximum value of SAR (interpolated) = 0.743 W/kg

- **Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
 Reference Value = 22.50 V/m; Power Drift = -0.07 dB
 Peak SAR (extrapolated) = 0.881 W/kg
SAR(1 g) = 0.426 W/kg; SAR(10 g) = 0.247 W/kg
 Smallest distance from peaks to all points 3 dB below = 11.5 mm
 Ratio of SAR at M2 to SAR at M1 = 53.2%
 Maximum value of SAR (measured) = 0.654 W/kg



0 dB = 0.654 W/kg

P09_FR1 n25_DFT-QPSK20M_Horizontal-Up_0.5cm_Ch381000_1RB_OS1

Communication System: NR; Frequency: 1905 MHz; Duty Cycle: 1:1

Medium: HSL1900_0315 Medium parameters used: $f = 1905 \text{ MHz}$; $\sigma = 1.377 \text{ S/m}$; $\epsilon_r = 40.272$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 23.5°C; Liquid Temperature : 22.4°C

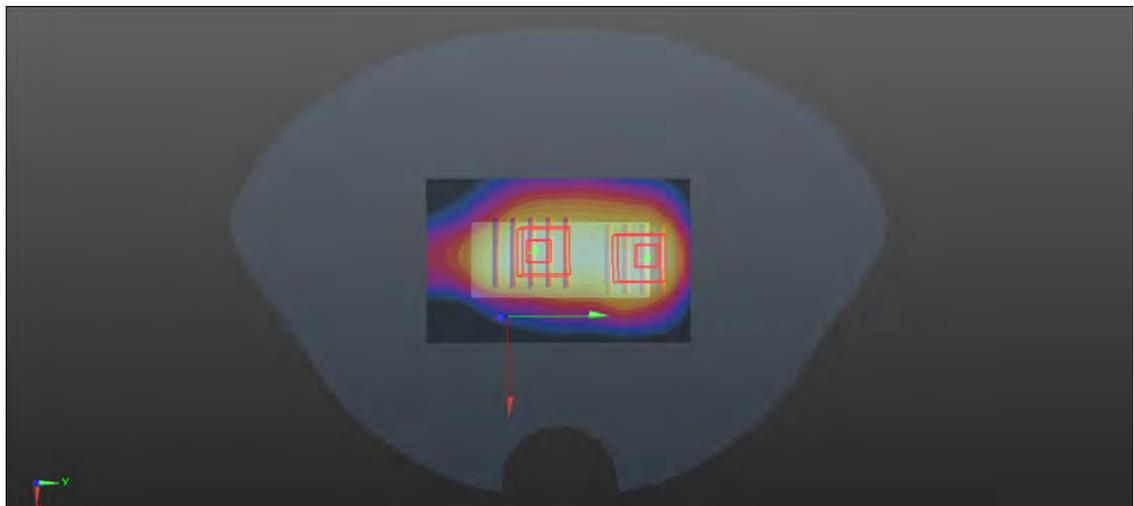
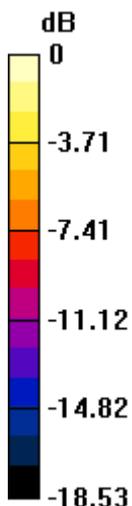
DASY5 Configuration:

- Probe: EX3DV4 - SN3873; ConvF(7.97, 7.97, 7.97) @ 1905 MHz; Calibrated: 2024/9/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 2024/7/5
- Phantom: SAM with CRP V5.0; Type: QD000P40CB; Serial: TP:1502
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

- **Area Scan (51x81x1):** Interpolated grid: $dx=1.500 \text{ mm}$, $dy=1.500 \text{ mm}$
 Maximum value of SAR (interpolated) = 0.515 W/kg

- **Zoom Scan (5x5x7)/Cube 0:** Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$
 Reference Value = 15.55 V/m; Power Drift = -0.13 dB
 Peak SAR (extrapolated) = 0.641 W/kg
SAR(1 g) = 0.310 W/kg; SAR(10 g) = 0.151 W/kg
 Smallest distance from peaks to all points 3 dB below = 10.1 mm
 Ratio of SAR at M2 to SAR at M1 = 50.1%
 Maximum value of SAR (measured) = 0.527 W/kg

- **Zoom Scan (5x5x7)/Cube 1:** Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$
 Reference Value = 15.55 V/m; Power Drift = -0.13 dB
 Peak SAR (extrapolated) = 0.413 W/kg
SAR(1 g) = 0.248 W/kg; SAR(10 g) = 0.145 W/kg
 Smallest distance from peaks to all points 3 dB below = 13.2 mm
 Ratio of SAR at M2 to SAR at M1 = 61.2%
 Maximum value of SAR (measured) = 0.357 W/kg



0 dB = 0.357 W/kg

P10_FR1 n66_DFT-QPSK20M_Horizontal-Up_1.7cm_Ch354000_1RB_OS0

Communication System: NR; Frequency: 1770 MHz; Duty Cycle: 1:1

Medium: HSL1750_0316 Medium parameters used: $f = 1770$ MHz; $\sigma = 1.365$ S/m; $\epsilon_r = 39.724$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.4°C; Liquid Temperature : 22.2°C

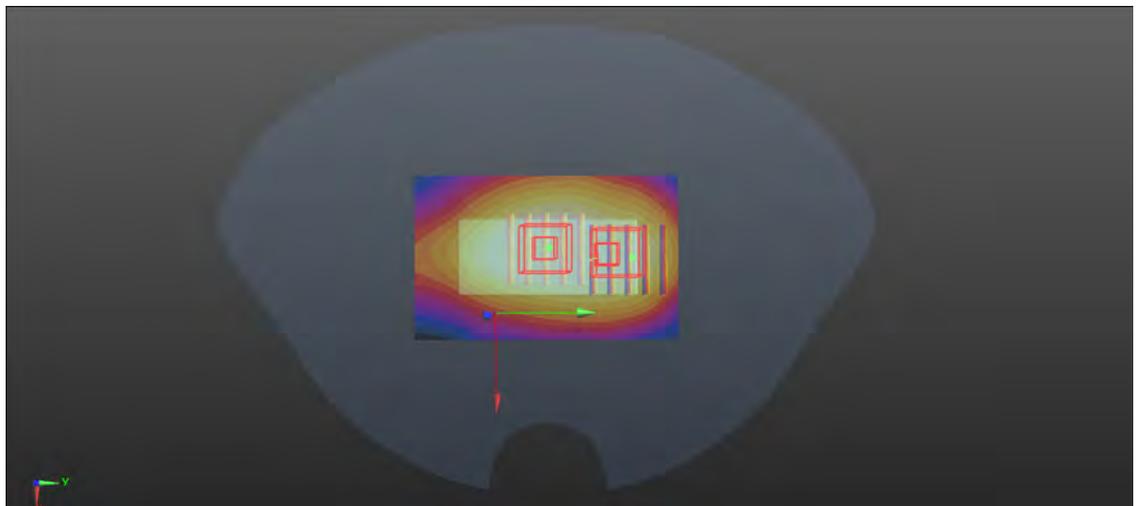
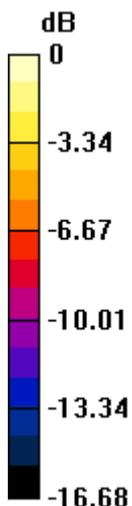
DASY5 Configuration:

- Probe: EX3DV4 - SN3873; ConvF(8.31, 8.31, 8.31) @ 1770 MHz; Calibrated: 2024/9/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 2024/7/5
- Phantom: SAM with CRP V5.0; Type: QD000P40CB; Serial: TP:1502
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

- **Area Scan (51x81x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.480 W/kg

- **Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.27 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.561 W/kg
SAR(1 g) = 0.267 W/kg; SAR(10 g) = 0.185 W/kg
Smallest distance from peaks to all points 3 dB below = 17.9 mm
Ratio of SAR at M2 to SAR at M1 = 63.8%
Maximum value of SAR (measured) = 0.226 W/kg

- **Zoom Scan (5x5x7)/Cube 1:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.27 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.436 W/kg
SAR(1 g) = 0.204 W/kg; SAR(10 g) = 0.133 W/kg
Smallest distance from peaks to all points 3 dB below = 26 mm
Ratio of SAR at M2 to SAR at M1 = 58%
Maximum value of SAR (measured) = 0.316 W/kg



0 dB = 0.316 W/kg

P11_FR1 n71_DFT-QPSK20M_Horizontal-Up_0.5cm_Ch134600_50RB_OS28

Communication System: NR; Frequency: 673 MHz; Duty Cycle: 1:1

Medium: HSL750_0315 Medium parameters used: $f = 673 \text{ MHz}$; $\sigma = 0.881 \text{ S/m}$; $\epsilon_r = 43.105$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 23.5°C ; Liquid Temperature : 22.6°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3873; ConvF(9.87, 9.87, 9.87) @ 673 MHz; Calibrated: 2024/9/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn755; Calibrated: 2024/7/5
- Phantom: SAM with CRP V5.0; Type: QD000P40CB; Serial: TP:1502
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

- Area Scan (51x81x1): Interpolated grid: $dx=1.500 \text{ mm}$, $dy=1.500 \text{ mm}$

Maximum value of SAR (interpolated) = 0.911 W/kg

- Zoom Scan (6x6x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 26.23 V/m ; Power Drift = -0.04 dB

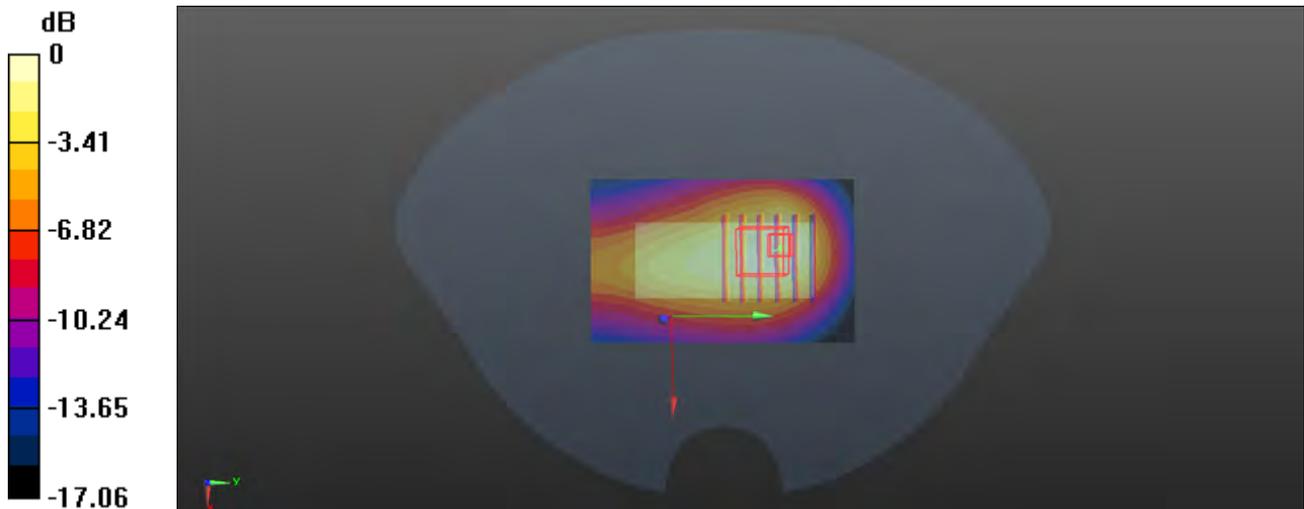
Peak SAR (extrapolated) = 1.03 W/kg

SAR(1 g) = 0.528 W/kg ; SAR(10 g) = 0.324 W/kg

Smallest distance from peaks to all points 3 dB below = 11.3 mm

Ratio of SAR at M2 to SAR at M1 = 55.1%

Maximum value of SAR (measured) = 0.789 W/kg



0 dB = 0.789 W/kg



Appendix C. Calibration Certificate for Probe and Dipole

The SPEAG calibration certificates are shown as follows.

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Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

Client: B.V.ADT

Certificate No: 24J02Z000323

CALIBRATION CERTIFICATE

Object D750V3 - SN: 1067

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

Calibration date: June 17, 2024

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	106276	17-May-24 (CTTL, No. J24X04107)	May-25
Power sensor NRP6A	101369	17-May-24 (CTTL, No. J24X04107)	May-25
Reference Probe EX3DV4	SN 7307	28-May-24(SPEAG, No. EX-7307_May24)	May-25
DAE4	SN 1556	03-Jan-24(CTTL-SPEAG, No.24J02Z80002)	Jan-25
Secondary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	25-Dec-23 (CTTL, No. J23X13426)	Dec-24
NetworkAnalyzer E5071C	MY46110673	25-Dec-23 (CTTL, No. J23X13425)	Dec-24
OCP DAK-3.5(weighted)	1040	22-Jan-24(SPEAG, No.OCP-DAK3.5-1040_Jan24)	Jan-25

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

Issued: June 22, 2024

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM _{x,y,z}
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- a) IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020
- b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- c) 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	750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.7 ± 6 %	0.87 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.09 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.49 W/kg ± 18.8 % (k=2)
SAR averaged over 10 cm³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.59 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	54.8Ω+ 2.71jΩ
Return Loss	- 25.6dB

General Antenna Parameters and Design

Electrical Delay (one direction)	0.945 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point 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 feed-point may be damaged.

Additional EUT Data

Manufactured by	SPEAG
-----------------	-------

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DASY5 Validation Report for Head TSL

Date: 2024-06-17

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1067

Communication System: UID 0, CW; Frequency: 750 MHz

Medium parameters used: $f = 750$ MHz; $\sigma = 0.871$ S/m; $\epsilon_r = 41.65$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN7307; ConvF(9.25, 9.17, 10.18) @ 750 MHz; Calibrated: 2024-05-28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2024-01-03
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

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

Reference Value = 56.28 V/m; Power Drift = -0.01 dB

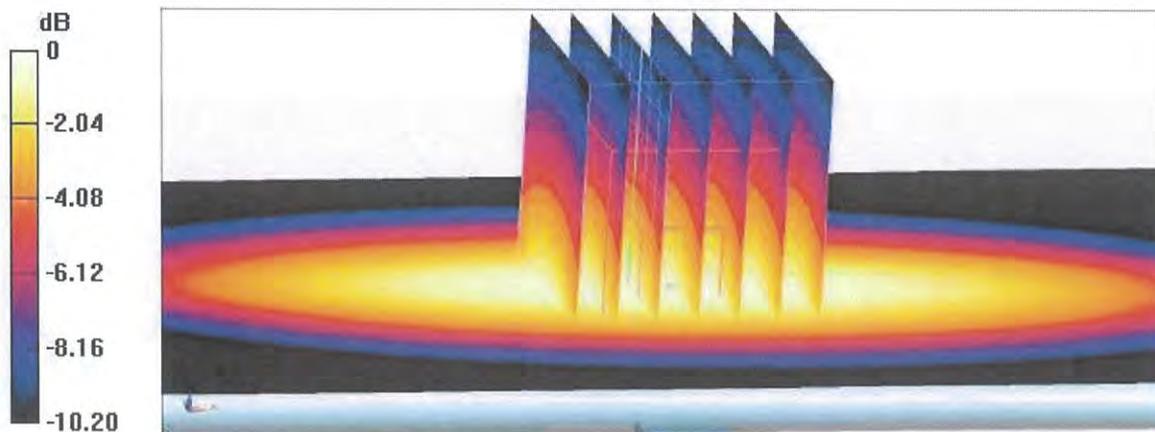
Peak SAR (extrapolated) = 2.99 W/kg

SAR(1 g) = 2.09 W/kg; SAR(10 g) = 1.38 W/kg

Smallest distance from peaks to all points 3 dB below = 18.6 mm

Ratio of SAR at M2 to SAR at M1 = 69.1%

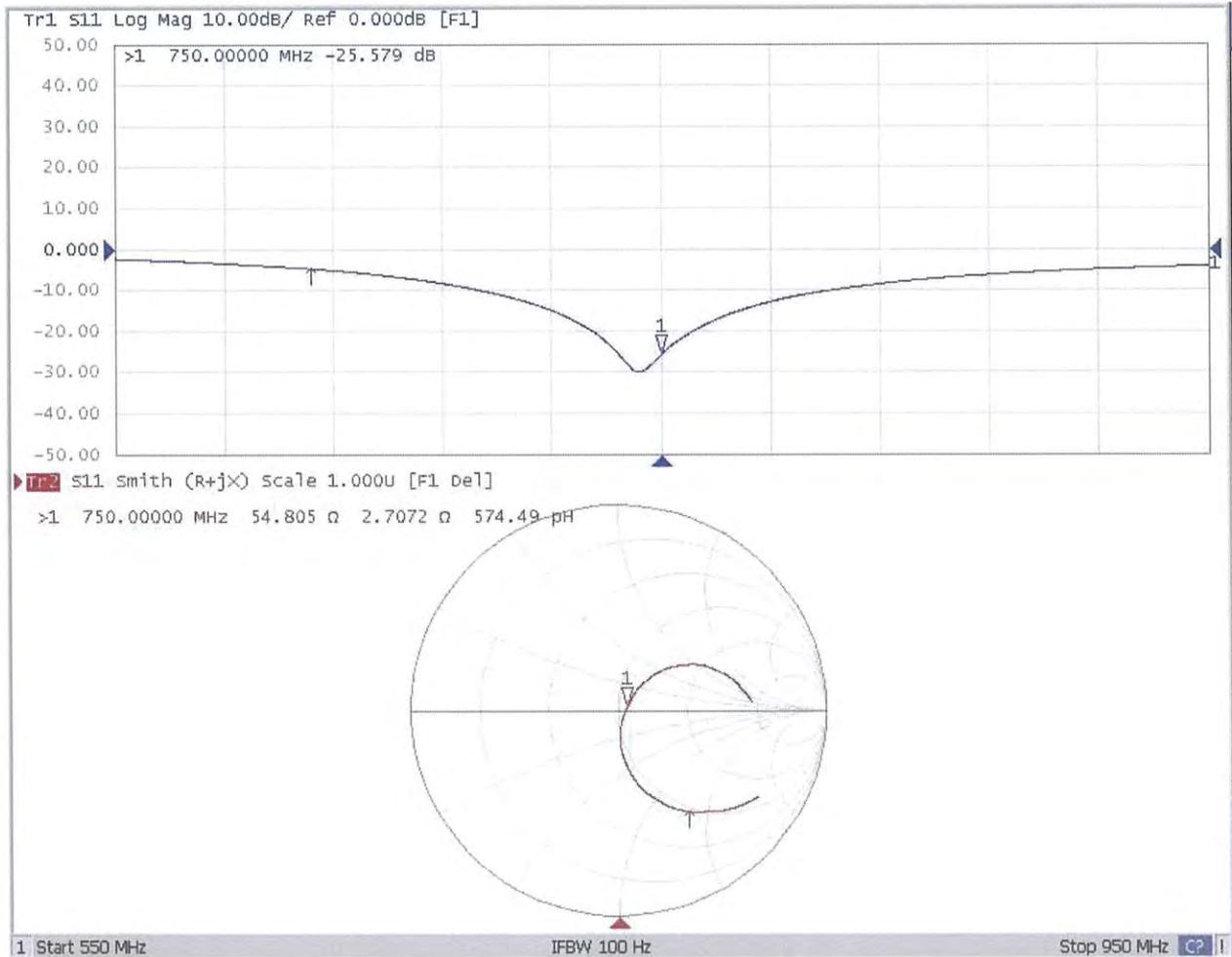
Maximum value of SAR (measured) = 2.72 W/kg



0 dB = 2.72 W/kg = 4.35 dBW/kg

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Impedance Measurement Plot for Head TSL



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Client

B.V.ADT

Certificate No: **24J02Z000324**

CALIBRATION CERTIFICATE

Object: **D835V2 - SN: 4d139**

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

Calibration date: **June 16, 2024**

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	106276	17-May-24 (CTTL, No. J24X04107)	May-25
Power sensor NRP6A	101369	17-May-24 (CTTL, No. J24X04107)	May-25
Reference Probe EX3DV4	SN 7307	28-May-24(SPEAG, No. EX-7307_May24)	May-25
DAE4	SN 1556	03-Jan-24(CTTL-SPEAG, No.24J02Z80002)	Jan-25
Secondary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	25-Dec-23 (CTTL, No. J23X13426)	Dec-24
NetworkAnalyzer E5071C	MY46110673	25-Dec-23 (CTTL, No. J23X13425)	Dec-24
OCP DAK-3.5(weighted)	1040	22-Jan-24(SPEAG, No.OCP-DAK3.5-1040_Jan24)	Jan-25

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

Issued: June 22, 2024

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM _{x,y,z}
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- a) IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020
- b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- c) DAS4/5 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	41.0 ± 6 %	0.88 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.36 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.57 W/kg ± 18.8 % (k=2)
SAR averaged over 10 cm³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.56 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.31 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	49.3Ω- 2.76jΩ
Return Loss	- 30.8dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.298 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point 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 feed-point may be damaged.

Additional EUT Data

Manufactured by	SPEAG
-----------------	-------

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DASY5 Validation Report for Head TSL

Date: 2024-06-16

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d139

Communication System: UID 0, CW; Frequency: 835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.88 \text{ S/m}$; $\epsilon_r = 40.97$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN7307; ConvF(9.48, 9.4, 10) @ 835 MHz; Calibrated: 2024-05-28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2024-01-03
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

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

Reference Value = 59.29 V/m; Power Drift = -0.02 dB

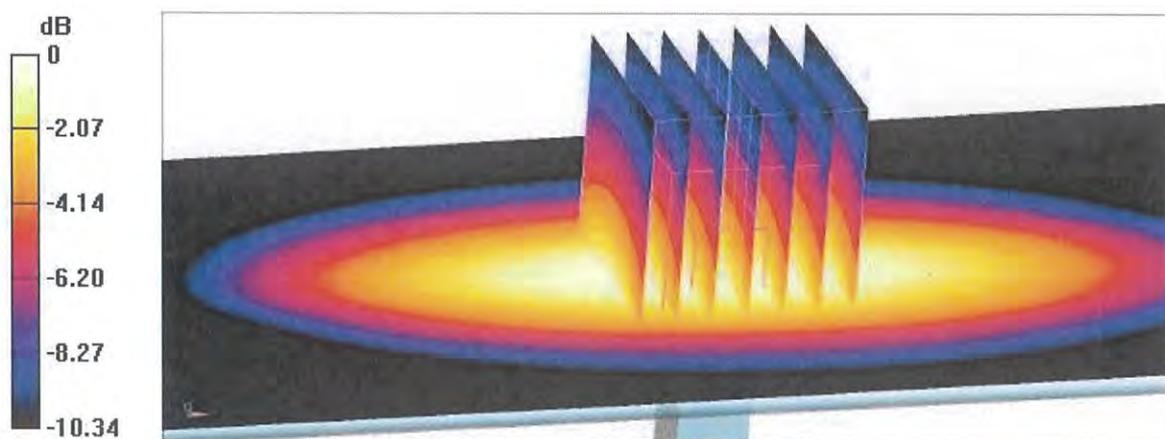
Peak SAR (extrapolated) = 3.39 W/kg

SAR(1 g) = 2.36 W/kg; SAR(10 g) = 1.56 W/kg

Smallest distance from peaks to all points 3 dB below = 16.6 mm

Ratio of SAR at M2 to SAR at M1 = 69.5%

Maximum value of SAR (measured) = 3.09 W/kg

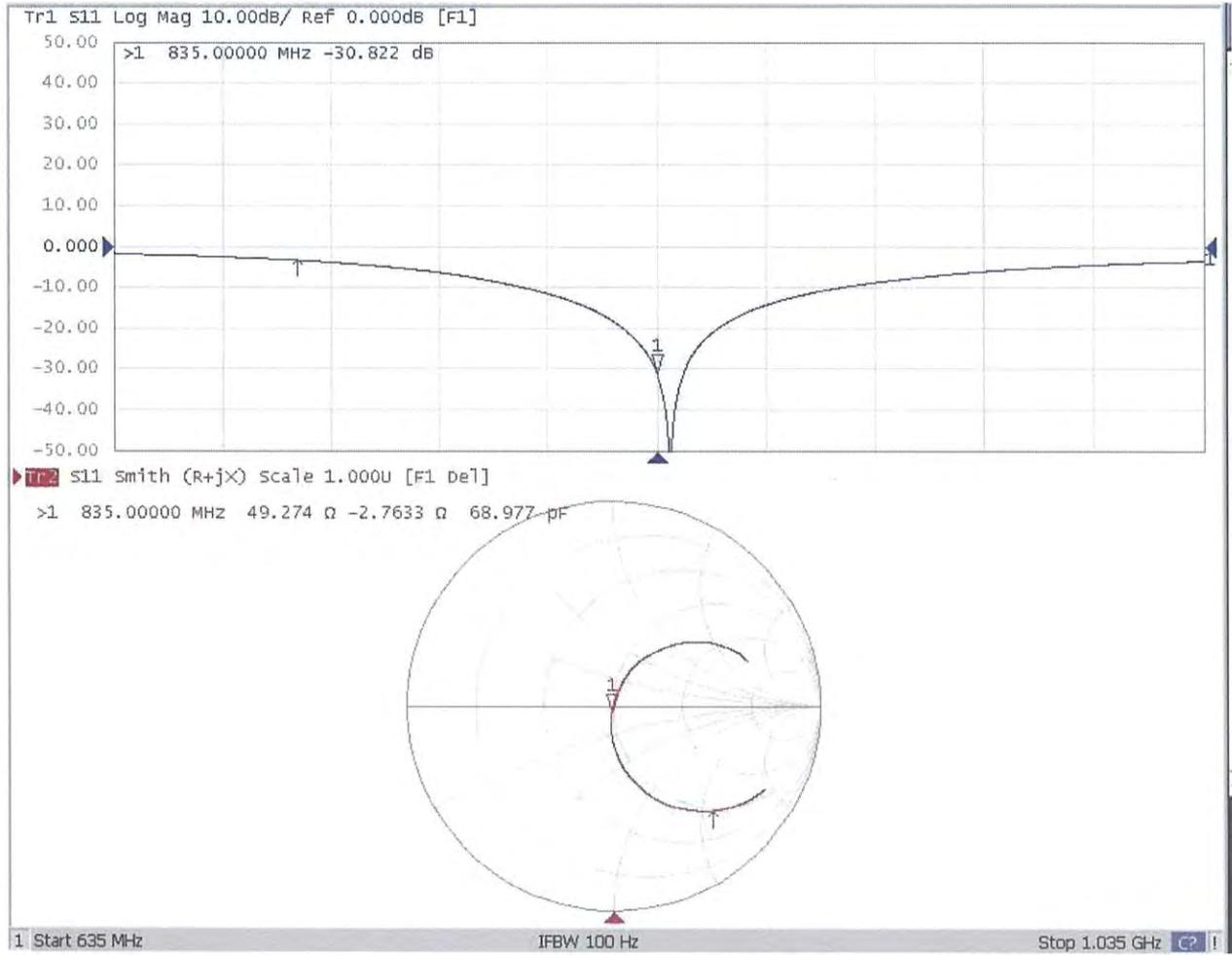


0 dB = 3.09 W/kg = 4.90 dBW/kg



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Impedance Measurement Plot for Head TSL



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Client **B.V.ADT**

Certificate No: **24J02Z000326**

CALIBRATION CERTIFICATE

Object **D1750V2 - SN: 1071**

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

Calibration date: **June 17, 2024**

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	106276	17-May-24 (CTTL, No. J24X04107)	May-25
Power sensor NRP6A	101369	17-May-24 (CTTL, No. J24X04107)	May-25
Reference Probe EX3DV4	SN 7307	28-May-24(SPEAG, No. EX-7307_May24)	May-25
DAE4	SN 1556	03-Jan-24(CTTL-SPEAG, No.24J02Z80002)	Jan-25
Secondary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	25-Dec-23 (CTTL, No. J23X13426)	Dec-24
NetworkAnalyzer E5071C	MY46110673	25-Dec-23 (CTTL, No. J23X13425)	Dec-24
OCP DAK-3.5(weighted)	1040	22-Jan-24(SPEAG, No.OCP-DAK3.5-1040_Jan24)	Jan-25

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

Issued: June 22, 2024

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM _{x,y,z}
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- a) IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020
- b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- c) 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	52.10.4
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	1750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.7 ± 6 %	1.40 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.17 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	36.3 W/kg ± 18.8 % (k=2)
SAR averaged over 10 cm³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	4.92 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	19.5 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	47.8Ω- 0.77jΩ
Return Loss	- 32.3dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.126 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point 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 feed-point may be damaged.

Additional EUT Data

Manufactured by	SPEAG
-----------------	-------

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DASY5 Validation Report for Head TSL

Date: 2024-06-17

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1071

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.401$ S/m; $\epsilon_r = 40.73$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN7307; ConvF(7.9, 7.9, 8.54) @ 1750 MHz; Calibrated: 2024-05-28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2024-01-03
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

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

Reference Value = 95.64 V/m; Power Drift = -0.01 dB

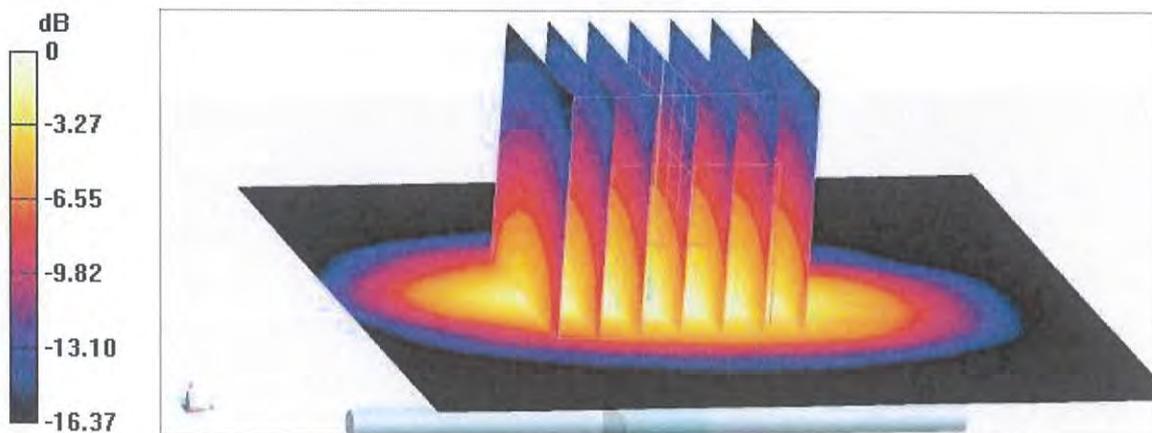
Peak SAR (extrapolated) = 16.3 W/kg

SAR(1 g) = 9.17 W/kg; SAR(10 g) = 4.92 W/kg

Smallest distance from peaks to all points 3 dB below = 9.5 mm

Ratio of SAR at M2 to SAR at M1 = 56.9%

Maximum value of SAR (measured) = 13.9 W/kg

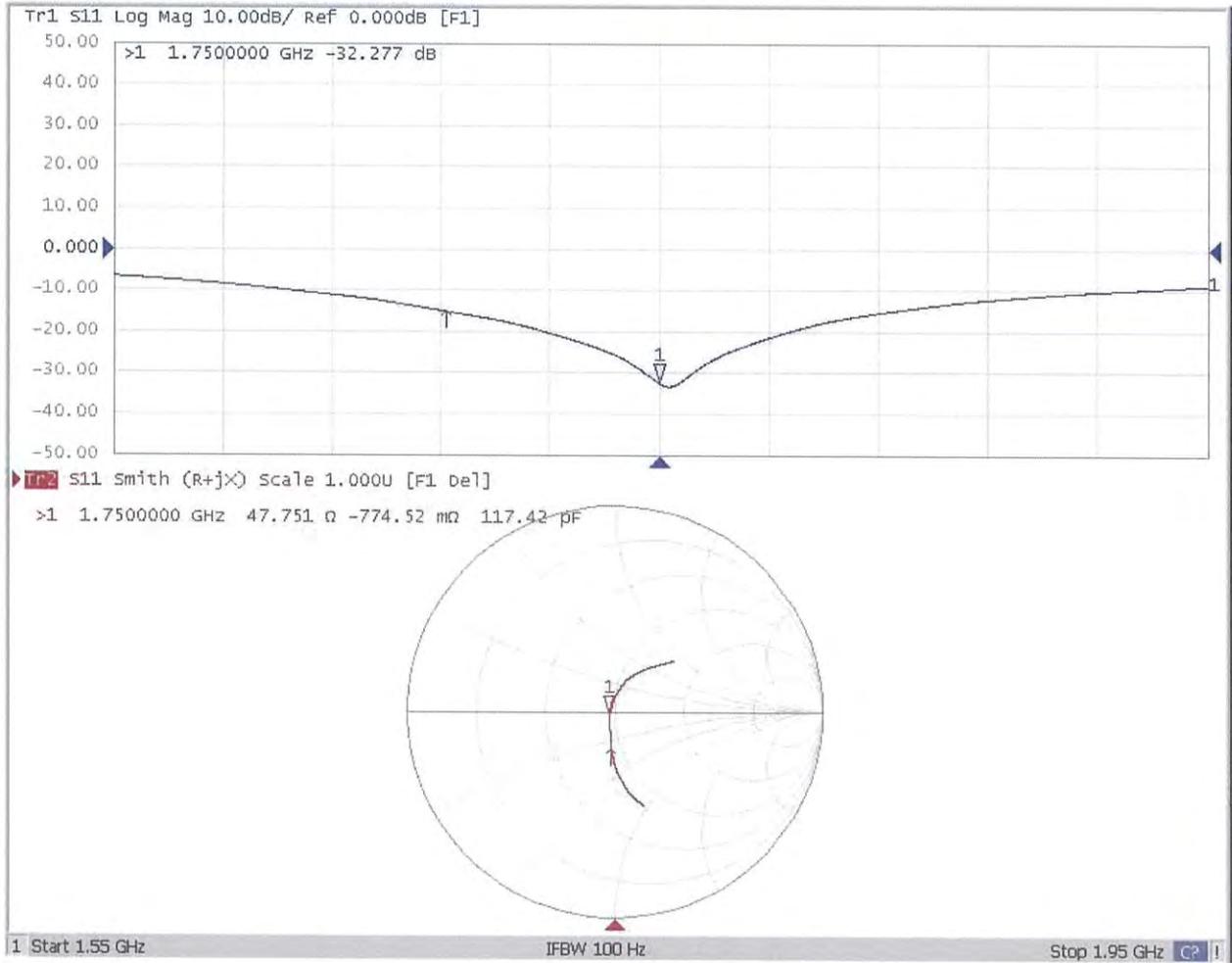


0 dB = 13.9 W/kg = 11.43 dBW/kg



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Impedance Measurement Plot for Head TSL



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Client: B.V.ADT

Certificate No: 24J02Z000327

CALIBRATION CERTIFICATE

Object D1900V2 - SN: 5d159

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

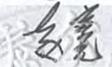
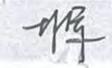
Calibration date: June 15, 2024

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	106276	17-May-24 (CTTL, No. J24X04107)	May-25
Power sensor NRP6A	101369	17-May-24 (CTTL, No. J24X04107)	May-25
Reference Probe EX3DV4	SN 7307	28-May-24(SPEAG, No. EX-7307_May24)	May-25
DAE4	SN 1556	03-Jan-24(CTTL-SPEAG, No.24J02Z80002)	Jan-25
Secondary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	25-Dec-23 (CTTL, No. J23X13426)	Dec-24
NetworkAnalyzer E5071C	MY46110673	25-Dec-23 (CTTL, No. J23X13425)	Dec-24
OCP DAK-3.5(weighted)	1040	22-Jan-24(SPEAG, No.OCP-DAK3.5-1040_Jan24)	Jan-25

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

Issued: June 22, 2024

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM _{x,y,z}
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- a) IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020
- b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- c) 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	52.10.4
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	41.2 ± 6 %	1.41 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.92 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	39.8 W/kg ± 18.8 % (k=2)
SAR averaged over 10 cm³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.21 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	20.9 W/kg ± 18.7 % (k=2)