Shenzhen CTA Testing Technology Co., Ltd.
Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District, Shenzhen, China

TEST REPORT

Report Reference No.......................:	**CTA24053101207**	
FCC ID .... :	**2BG5S-CLR903**	
Compiled by (position+printed name+signature)..:	File administrators Jinghua Xiao	Jinghua Xiao
Supervised by (position+printed name+signature)..:	Project Engineer Lushan Kong	Lushan Kong
Approved by (position+printed name+signature)..:	RF Manager Eric Wang	Eric Wang
Date of issue.......................................:	Jun. 18, 2024	
Testing Laboratory Name ....:	**Shenzhen CTA Testing Technology Co., Ltd.**	
Address...:	Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District, Shenzhen, China	
Applicant's name ....:	**Shanghai Yuge information technology Co., Ltd.**	
Address...:	Room 204-1, No. 6, Lane 88, Shengrong Road, China (Shanghai) pilot Free Trade Zone, China	
Test specification........................... :		
Standard ....:	**IEC 62209-2:2010; IEEE 1528:2013; FCC 47 CFR Part 2.1093; ANSI/IEEE C95.1:2005; Reference FCC KDB 447498; KDB 865664; KDB 941225; KDB 616217**	

Test item description..................... :	**4G LTE Wireless Communication Module**
Trade Mark ....:	N/A
Manufacturer.......................................:	Shanghai Yuge information technology Co., Ltd.
Model/Type reference.........................:	CLR903
Listed Models ....:	CLR901, CLR902, CLR905, CLR906, CLR907, CLR908, CLR909, CLR910, CLR801, CLR802, CLR803, CLR805, CLR806,CLR807, CLR808, CLR809, CLR920
Rating ....:	DC 5.0V From external circuit
Result..:	**PASS**

TEST REPORT

Equipment under Test	:	4G LTE Wireless Communication Module
Model /Type	:	CLR903
Listed Models	:	CLR901, CLR902, CLR905, CLR906, CLR907, CLR908, CLR909, CLR910, CLR801, CLR802, CLR803, CLR805, CLR806, CLR807, CLR808, CLR809, CLR920
Applicant	:	**Shanghai Yuge information technology Co., Ltd.**
Address	:	Room 204-1, No. 6, Lane 88, Shengrong Road, China (Shanghai) pilot Free Trade Zone, China
Manufacturer	:	**Shanghai Yuge information technology Co., Ltd.**
Address	:	Room 204-1, No. 6, Lane 88, Shengrong Road, China (Shanghai) pilot Free Trade Zone, China

Test Result:	**PASS**

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

※ ※ Revision History ※ ※

REV.	ISSUED DATE	DESCRIPTION
Rev.1.0	Jun. 18, 2024	Initial Test Report Release

Contents

1 Statement of Compliance

<Highest SAR Summary>

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-2005, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 The maximum results of Specific Absorption Rate (SAR) found during testing are as follows.

<Highest SAR Summary>

Frequency Band	Highest Reported 1g-SAR(W/Kg)	Simultaneous Reported SAR (W/Kg)
	Body (5mm)	
WCDMA band V	1.051	N/A
LTE Band 5	0.839	
LTE Band 7	0.547	
LTE Band 40A	0.606	
LTE Band 40B	0.668	
LTE Band 41/ LTE Band 38	0.714	
SAR Test Limit (W/Kg)	**1.60**	
Test Result	**PASS**	

Note: LTE Band 38 SAR was covered by LTE Band 41; according to April 2015 TCB workshop, SAR test for overlapping LTE bands can be reduced if a. the maximum output power, including tolerance, for the smaller band is ≤ the larger band to qualify for the SAR test exclusion. b. the channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band.

2 General Information

2.1 General Remarks

Date of receipt of test sample	:	May 31, 2024
Testing commenced on	:	June 11, 2024
Testing concluded on	:	June 13, 2024

2.2 Description of Equipment Under Test (EUT)

Product Name:	4G LTE Wireless Communication Module
Model/Type reference:	CLR903
Power supply:	DC 5.0V From external circuit
Testing sample ID:	CTA240531012-1# (Engineer sample) CTA240531012-2# (Normal sample)
Hardware version:	C36SM#01
Software version:	C36SM_HLT_A13M_OVERSEA_V1.0
Tx Frequency:	WCDMA: Band 5: TX: 826.40~846.60MHz LTE: FDD Band 5: TX: 824~849MHz FDD Band 7: TX: 2500~2570MHz TDD Band 38: TX: 2570~2620MHz TDD Band 40: TX: 2305~2315MHz&2350~2360MHz TDD Band 41: TX: 2496~2690MHz
Type of Modulation:	WCDMA: QPSK,16QAM LTE: QPSK,16QAM
Category of device:	Body close device
Remark: The above DUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.	

2.3 Device Category and SAR Limits

This device, because its radiating structure is allowed to be used within 20 centimeters of the body of the user. Limit for General Population/Uncontrolled exposure should be applied for this device, it is 1.6 W/kg as averaged over any 1 gram of tissue.

2.4 Applied Standard

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards:

- FCC 47 CFR Part 2 (2.1093:2013)
- ANSI/IEEE C95.1:2005

- IEEE Std 1528:2013
- KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- KDB 865664 D02 RF Exposure Reporting v01r02
- KDB 447498 D01 General RF Exposure Guidance v06
- KDB 941225 D01 3G SAR Procedures v03r01
- KDB 941225 D05 SAR for LTE Devicesv02r05
- KDB 616217 D04 SAR for laptop and tablets v01r02
- KDB 447498 D02 SAR Procedures for Dongle Xmtr v02r01

2.5 Test Facility

FCC-Registration No.: 517856 Designation Number: CN1318

Shenzhen CTA Testing Technology Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

A2LA-Lab Cert. No.: 6534.01

Shenzhen CTA Testing Technology Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

ISED#: 27890 CAB identifier: CN0127

Shenzhen CTA Testing Technology Co., Ltd. has been listed by Innovation, Science and Economic Development Canada to perform electromagnetic emission measurement.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010.

2.6 Environment of Test Site

Items	Required	Actual
Temperature (℃)	18-25	22~23
Humidity (%RH)	30-70	55~65

2.7 Test Configuration

The device was controlled by using a base station emulator. Communication between the device and the emulator was established by air link. The distance between the EUT and the 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 all tests. For WLAN SAR testing, WLAN engineering testing software installed on the EUT can provide continuous transmitting RF signal.

3 Specific Absorption Rate (SAR)

3.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/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.

3.2 SAR Definition

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

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

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

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

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

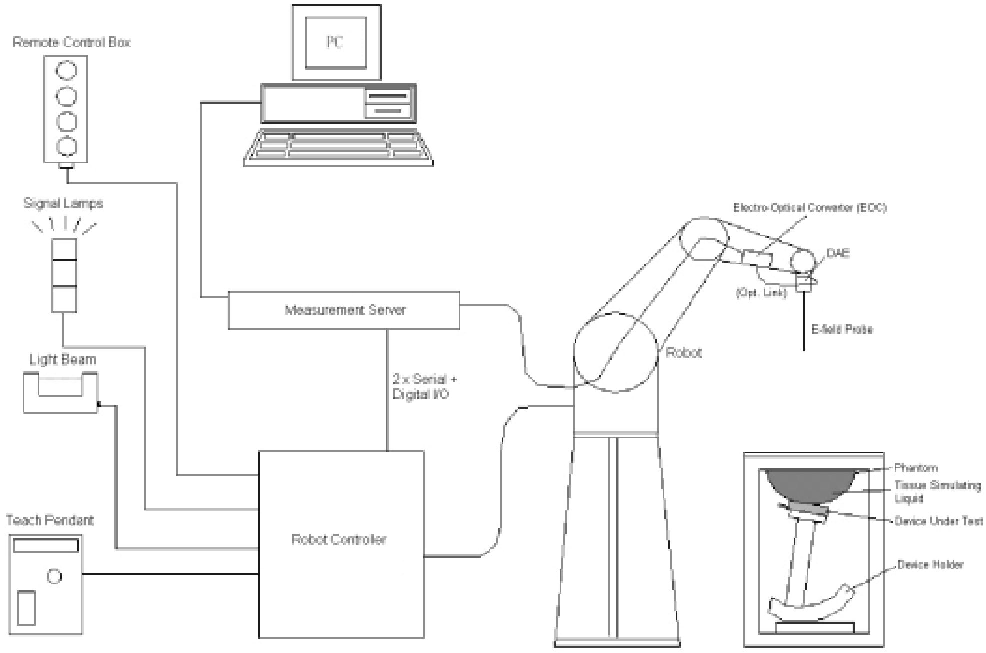
Where: C is the specific head capacity, δT is the temperature rise and δtisthe exposure duration, or related to the electrical field in the tissue by

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

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

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

4 SAR Measurement System



DASY System Configurations

The DASY system for performance compliance tests is illustrated above graphically. This system consists of the following items:

- A standard high precision 6-axis robot with controller, a teach pendant and software
- A data acquisition electronic (DAE) attached to the robot arm extension
- A dosimetric probe equipped with an optical surface detector system
- The electro-optical converter (EOC) performs the conversion between optical and electrical signals
- A measurement server performs the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the accuracy of the probe positioning
- A computer operating Windows XP
- DASY software
- Remove control with teach pendant and additional circuitry for robot safety such as warming lamps, etc.
- The SAM twin phantom
- A device holder
- Tissue simulating liquid
- Dipole for evaluating the proper functioning of the system

components are described in details in the following sub-sections.

4.1 E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG).The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

- **E-Field Probe Specification**

<EX3DV4 Probe>

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

- **E-Field Probe Calibration**

Each probe needs to be calibrated according to a dosimetric assessment procedure with accuracy better than ± 10%. The spherical isotropy shall be evaluated and within ± 0.25dB. The sensitivity parameters (NormX, NormY, and NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested. The calibration data can be referred to appendix C of this report.

4.2 Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock. The input impedance of the DAE is 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80dB.

Photo of DAE

4.3 Robot

The SPEAG DASY system uses the high precision robots (DASY5: TX60XL) type from Stäubli SA (France). For the 6-axis controllersystem, the robot controller version (DASY5: CS8c) from Stäubli is used. The Stäublirobot 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)

Photo of DASY5

4.4 Measurement Server

The measurement server is based on a PC/104 CPU board with CPU (DASY5: 400 MHz, Intel Celeron), chipdisk (DASY5: 128 MB), RAM (DASY5: 128 MB). The necessary circuits for communication with the DAE electronic box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY I/O board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all the real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operations.

Photo of Server for DASY5

4.5 Phantom

<SAM Twin Phantom>

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

Photo of SAM Phantom

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

<ELI4 Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%)
Filling Volume	Approx. 30 liters
Dimensions	Major ellipse axis: 600 mm Minor axis:400 mm

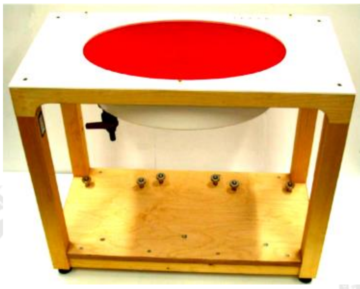


Photo of ELI4 Phantom

The ELI4 phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

4.6 Device Holder

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

The DASY device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (ERP).Thus the device needs no repositioning when changing the angles.

The DASY device holder is constructed of low-loss POM material having the following dielectric parameters: relative permittivity ε = 3 and loss tangent δ = 0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

Device Holder

4.7 Data Storage and Evaluation

➢ Data Storage

The DASY software stores the assessed data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all the necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files. The post-processing software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of erroneous parameter settings. For example, if a measurement has been performed with an incorrect crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be reevaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type (e.g., [V/m], [A/m], [W/kg]). Some of these units are not available in certain situations or give meaningless results, e.g., a SAR-output in a non-lose media, will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

➢ Data Evaluation

The DASY post-processing software (SEMCAD) automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software：

Probe parameters：	- Sensitivity	$Norm_i$, a_{i0}, a_{i1}, a_{i2}
	- Conversion factor	$ConvF_i$
	- Diode compression point	dcp_i
Device parameters：	- Frequency	f
	- Crest factor	cf
Media parameters：	- Conductivity	σ
	- Density	ρ

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY components. In the direct measuring mode of the multi-meter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.
The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power.
The formula for each channel can be given as：

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

with V_i= compensated signal of channel i, (i = x, y, z)
U_i = input signal of channel i, (i = x, y, z)
cf = crest factor of exciting field (DASY parameter)
dcp_i = diode compression point (DASY parameter)

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

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

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

with V_i = compensated signal of channel i,(i= x, y, z)
$Norm_i$= sensor sensitivity of channel i, (i= x, y, z), μV/(V/m)^2 for E-field Probes
ConvF= sensitivity enhancement in solution
a_{ij}= sensor sensitivity factors for H-field probes
f = carrier frequency [GHz]
E_i= electric field strength of channel iin V/m
H_i= magnetic field strength of channel iin A/m

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

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

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

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

with SAR = local specific absorption rate in W/kg
E_{tot}= total field strength in V/m
σ = conductivity in [mho/m] or [Siemens/m]
ρ = equivalent tissue density in g/cm^3

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

5 Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	835MHz System Validation Kit	D835V2	484	Aug. 25,2023	Aug. 24,2026
SPEAG	2300MHz System Validation Kit	D2300V2	1103	Feb. 16,2023	Feb. 15,2026
SPEAG	2600MHz System Validation Kit	D2600V2	1073	Feb. 17,2023	Feb. 16,2026
Rohde & Schwarz	UNIVERSAL RADIO COMMUNICATION TESTER	CMW500	1201.0002K50-104209-JC	Nov.05, 2023	Nov.04, 2024
SPEAG	Data Acquisition Electronics	DAE3	428	Aug.30,2023	Aug.29,2024
SPEAG	Dosimetric E-Field Probe	EX3DV4	7380	June 21,2023	June 20,2024
Agilent	ENA Series Network Analyzer	E5071C	MY46317418	Oct.25, 2023	Oct.24, 2024
SPEAG	DAK	DAK-3.5	1226	NCR	NCR
SPEAG	SAM Twin Phantom	QD000P40CD	1802	NCR	NCR
SPEAG	ELI Phantom	QDOVA004AA	2058	NCR	NCR
AR	Amplifier	ZHL-42W	QA1118004	NCR	NCR
Agilent	Power Meter	N1914A	MY50001102	Oct.25, 2023	Oct.24, 2024
Agilent	Power Sensor	N8481H	MY51240001	Oct.25, 2023	Oct.24, 2024
R&S	Spectrum Analyzer	N9020A	MY51170037	Oct.25, 2023	Oct.24, 2024
Agilent	Signal Generation	N5182A	MY48180656	Oct.25, 2023	Oct.24, 2024
Worken	Directional Coupler	0110A05601O-10	COM5BNW1A2	Oct.25, 2023	Oct.24, 2024

Note:

1. The calibration certificate of DASY can be referred to appendix C of this report.
2. The dipole calibration interval can be extended to 3 years with justification. The dipoles are also not physically damaged, or repaired during the interval.
3. The Insertion Loss calibration of Dual Directional Coupler and Attenuator were characterized via the network analyzer and compensated during system check.
4. The dielectric probe kit was calibrated via the network analyzer, with the specified procedure (calibrated in pure water) and calibration kit (standard) short circuit, before the dielectric measurement. The specific procedure and calibration kit are provided by Agilent.
5. In system check we need to monitor the level on the power meter, and adjust the power amplifier level to have precise power level to the dipole; the measured SAR will be normalized to 1W input power according to the ratio of 1W to the input power to the dipole. For system check, the calibration of the power amplifier is deemed not critically required for correct measurement; the power meter is critical and we do have calibration for it

6 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 6.1. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown as followed:

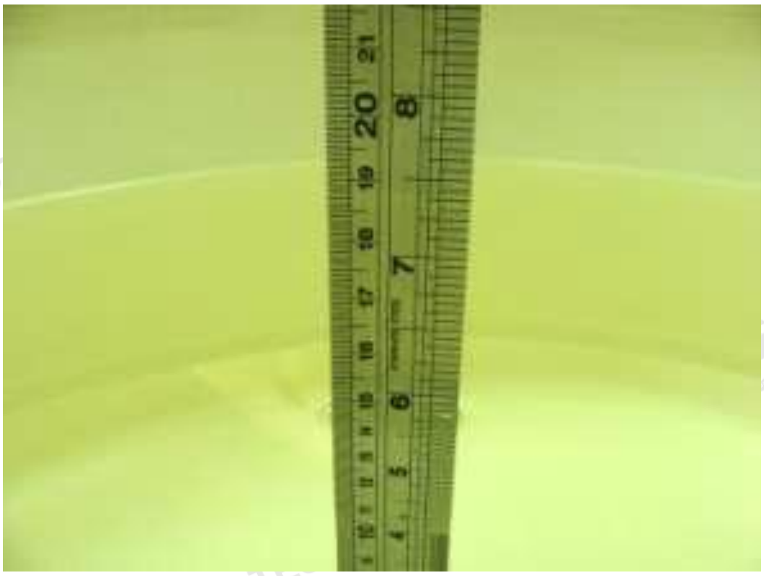


Photo of Liquid Height

The following table gives the recipes for tissue simulating liquid.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
For Head								
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
1800,1900,2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
2600	54.8	0	0	0.1	0	45.1	1.96	39.0
For Body								
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
1800,1900,2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0	0	31.4	1.95	52.7
2600	65.5	0	0	0	0	31.5	2.16	52.5

The following table shows the measuring results for simulating liquid.

Measured Frequency (MHz)	Target Tissue		Measured Tissue				Liquid Temp.	Test Data
	εr	σ	εr	Dev. (%)	σ	Dev. (%)		
835	41.5	0.90	42.251	1.81%	0.861	-4.38%	22.8	06/11/2024
2300	39.5	1.67	38.947	-1.40%	1.611	-3.51%	22.6	06/12/2024
2600	39.0	1.96	39.109	0.28%	1.881	-4.01%	22.5	06/13/2024

7 System Verification Procedures

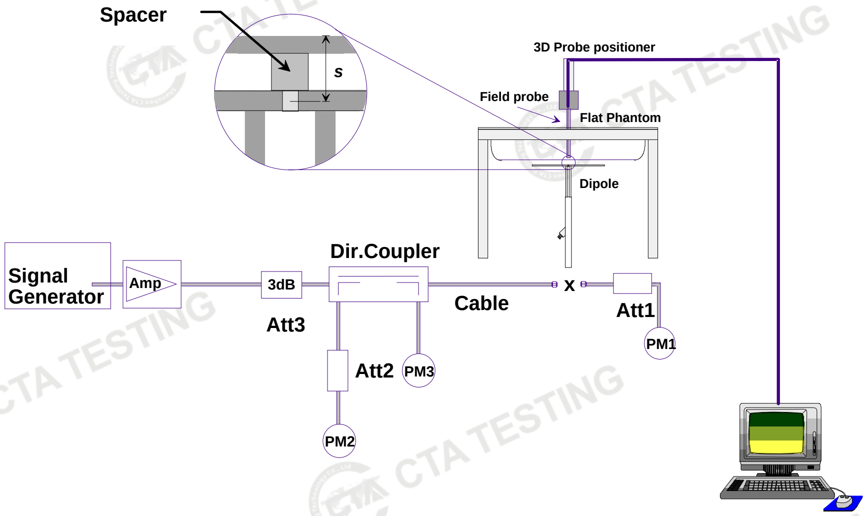
Each DASY system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the DASY software, enable the user to conduct the system performance check and system validation. System validation kit includes a dipole, tripod holder to fix it underneath the flat phantom and a corresponding distance holder.

➢ Purpose of System Performance check

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

➢ System Setup

In the simplified setup for system evaluation, the EUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:



System Setup for System Evaluation

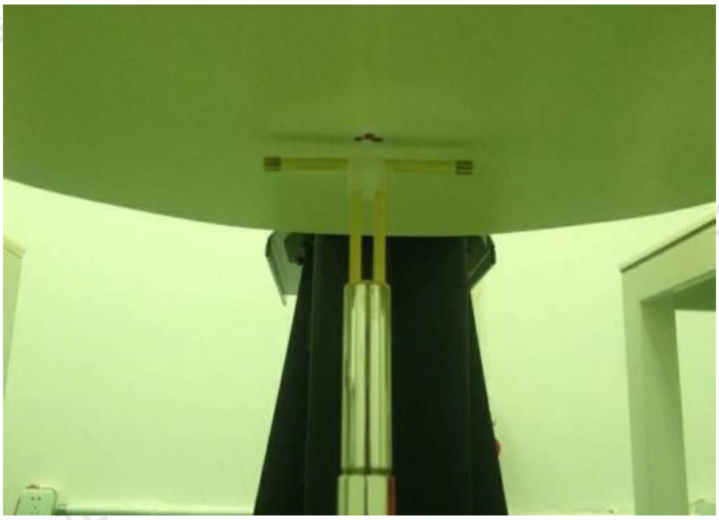


Photo of Dipole Setup

➢ Validation Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10%. The table below shows the target SAR and measured SAR after normalized to 1W input power. It indicates that the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

Date	Frequency (MHz)	Power fed onto reference dipole (mW)	Targeted SAR 1g (W/kg)	Measured SAR1g (W/kg)	Normalized SAR (W/kg)	Deviation (%)
06/11/2024	835	250	9.68	2.39	9.56	-1.34%
06/12/2024	2300	250	49.2	12.44	49.76	1.17%
06/13/2024	2600	250	56.8	13.68	54.72	-3.68%

8 EUT Testing Position

8.1 DONGLE TESTING PROCEDURES

Test all USB orientations [see figure below: (A) Horizontal-Up, (B) Horizontal-Down, (C) Vertical-Front, and (D) Vertical-Back] with a device-to-phantom separation distance of 5 mm or less, according to KDB Publication 447498 D01 requirements. These test orientations are intended for the exposure conditions found in typical laptop/notebook/netbook or tablet computers with either horizontal or vertical USB connector configurations at various locations in the keyboard section of the computer. Current generation portable host computers should be used to establish the required SAR measurement separation distance. The same test separation distance must be used to test all frequency bands and modes in each USB orientation. The typical Horizontal-Up USB connection (A), found in the majority of host computers, must be tested using an appropriate host computer. A host computer with either Vertical-Front (C) or Vertical Back (D) 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 (B) or the remaining Vertical USB orientation, a high-quality USB cable, 12 inches or less, may be used for testing these other orientations. It must be documented that the USB cable does not influence the radiating characteristics and output power of the transmitter.

(A) Horizontal-Up (B) Horizontal-Down (C) Vertical-Front (D) Vertical-Back

Note: These are USB connector orientations on laptop computers; USB dongles have the reverse configuration for plugging into the corresponding laptop computers.

Figure 1 – USB Connector Orientations Implemented on Laptop Computers

8.2 Test Distance for SAR Evaluation

In this case the EUT(Equipment under Test) is set 5mm away from the phantom, the test distance is 5mm.

9 Measurement Procedures

The measurement procedures are as follows:

(a) Use base station simulator (if applicable) or engineering software to transmit RF power continuously (continuous Tx) in the middle channel.
(b) Keep EUT to radiate maximum output power or 100% duty factor (if applicable)
(c) Measure output power through RF cable and power meter.
(d) Place the EUT in the positions as setup photos demonstrates.
(e) Set scan area, grid size and other setting on the DASY software.
(f) Measure SAR transmitting at the middle channel for all applicable exposure positions.
(g) Identify the exposure position and device configuration resulting the highest SAR
(h) Measure SAR at the lowest and highest channels attheworst exposure position and device configuration if applicable.

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

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

9.1 Spatial Peak SAR Evaluation

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

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

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

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

9.2 Power Reference Measurement

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

9.3 Area Scan Procedures

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB0 is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01 SAR measurement 100 MHz to 6 GHz.

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 mm ± 1 mm	$\frac{1}{2}\cdot\delta\cdot\ln(2)$ mm ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

9.4 Zoom Scan Procedures

Zoom scans are used assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube shoes base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01 SAR measurement 100 MHz to 6 GHz.

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	≤ $1.5\cdot\Delta z_{Zoom}(n-1)$ mm	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see IEEE Std 1528-2013 for details. * When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB Publication 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

9.5 Volume Scan Procedures

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 aggregateSAR, 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.

9.6 Power Drift Monitoring

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

10 TEST CONDITIONS AND RESULTS

10.1 Conducted Power Results

<WCDMA Conducted Power>

The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification. A summary of these settings are illustrated below:

HSDPA Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting:
   i. Set Gain Factors (β_c and β_d) and parameters were set according to each
   ii. Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
   iii. Set RMC 12.2Kbps + HSDPA mode.
   iv. Set Cell Power = -86 dBm
   v. Set HS-DSCH Configuration Type to FRC (H-set 1, QPSK)
   vi. Select HSDPA Uplink Parameters
   vii. Set Delta ACK, Delta NACK and Delta CQI = 8
   viii. Set Ack-Nack Repetition Factor to 3
   ix. Set CQI Feedback Cycle (k) to 4 ms
   x. Set CQI Repetition Factor to 2
   xi. Power Ctrl Mode = All Up bits
d. The transmitted maximum output power was recorded.

Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH

Sub-test	β_c	β_d	β_d *(SF)*	β_c/β_d	β_{HS} *(Note1, Note 2)*	CM (dB) *(Note 3)*	MPR (dB) *(Note 3)*
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 *(Note 4)*	15/15 *(Note 4)*	64	12/15 *(Note 4)*	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

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

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, Δ_{ACK} and Δ_{NACK} = 30/15 with $\beta_{hs} = 30/15 * \beta_c$, and Δ_{CQI} = 24/15 with $\beta_{hs} = 24/15 * \beta_c$.

Note 3: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 4: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 11/15 and β_d = 15/15.

Setup Configuration

HSUPA Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.

b. The RF path losses were compensated into the measurements.

c. A call was established between EUT and Base Station with following setting * :

  i. Call Configs = 5.2B, 5.9B, 5.10B, and 5.13.2B with QPSK

  ii. Set the Gain Factors (β_c and β_d) and parameters (AG Index) were set according to each specific sub-test in the following table, C11.1.3, quoted from the TS 34.121

  iii. Set Cell Power = -86 dBm

  iv. Set Channel Type = 12.2k + HSPA

  v. Set UE Target Power

  vi. Power Ctrl Mode= Alternating bits

  vii. Set and observe the E-TFCI

  viii. Confirm that E-TFCI is equal to the target E-TFCI of 75 for sub-test 1, and other subtest's E-TFCI

d. The transmitted maximum output power was recorded.

Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (Note 5) (Note 6)	β_{ed} (SF)	β_{ed} (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 6)	E-TFCI
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed}1: 47/15 β_{ed}2: 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 (Note 4)	15/15 (Note 4)	64	15/15 (Note 4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c .

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

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

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

Note 5: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.

Note 6: β_{ed} can not be set directly, it is set by Absolute Grant Value.

Setup Configuration

<WCDMA Conducted Power>

WCDMA	Band V (dBm)			
TX Channel	Tune-up limit (dBm)	4132	4183	4233
Frequency (MHz)		826.4	836.6	846.6
RMC 12.2Kbps	24.00	23.26	23.58	23.23
RMC AMR	24.00	23.28	23.10	23.00
HSDPA Subtest-1	23.00	21.92	22.53	22.07
HSDPA Subtest-2	22.00	21.85	21.81	21.45
HSDPA Subtest-3	22.00	21.09	20.81	20.91
HSDPA Subtest-4	21.00	20.79	20.46	20.22
HSUPA Subtest-1	23.00	22.28	22.51	22.07
HSUPA Subtest-2	22.00	20.79	21.33	20.88
HSUPA Subtest-3	22.00	21.16	20.75	21.60
HSUPA Subtest-4	21.00	20.24	20.74	19.73
HSUPA Subtest-5	21.00	19.80	19.71	20.43

General Note

1. Per KDB 941225 D01 v02, RMC 12.2kbps setting is used to evaluate SAR as primary mode. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode 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.
2. It is expected by the manufacturer that MPR for some HSDPA/HSUPA subtests may differ from the specification of 3GPP, according to the chipset implementation in this model. The implementation and expected deviation are detailed in tune-up procedure exhibit.

<LTE Conducted Power>

LTE Band 5							
BW (MHz)	Modulation	RB Size	RB Offset	Channel/Frequency(MHz)			Tune-up limit (dBm)
				20450	20525	20600	
				829	836.5	844	
10	QPSK	1	0	**23.85**	23.33	23.48	24.0
10	QPSK	1	25	23.17	23.72	23.26	
10	QPSK	1	49	23.51	23.64	23.06	
10	QPSK	25	0	22.18	**22.39**	22.09	23.0
10	QPSK	25	12	22.22	22.35	22.06	
10	QPSK	25	25	22.10	22.07	22.19	
10	QPSK	50	0	22.02	**22.34**	22.24	
10	16QAM	1	0	22.07	22.20	22.19	23.0
10	16QAM	1	25	22.24	22.05	22.18	
10	16QAM	1	49	**22.45**	22.20	22.31	
10	16QAM	25	0	21.46	21.33	21.44	22.0
10	16QAM	25	12	21.46	**21.52**	21.16	
10	16QAM	25	25	21.17	21.15	21.24	
10	16QAM	50	0	21.23	21.19	**21.30**	
BW (MHz)	Modulation	RB Size	RB Offset	Channel/Frequency(MHz)			Tune-up limit (dBm)
				20425	20525	20625	
				826.5	836.5	846.5	
5	QPSK	1	0	23.25	**23.73**	23.64	24.0
5	QPSK	1	12	23.66	23.59	23.72	
5	QPSK	1	24	23.57	23.52	23.56	
5	QPSK	12	0	22.14	22.14	22.14	23.0
5	QPSK	12	7	**22.44**	22.20	22.24	
5	QPSK	12	13	22.36	22.05	22.08	
5	QPSK	25	0	**22.38**	22.34	22.16	
5	16QAM	1	0	22.35	22.11	22.15	23.0
5	16QAM	1	12	22.34	22.34	22.41	
5	16QAM	1	24	22.02	**22.42**	22.22	
5	16QAM	12	0	21.44	21.22	21.31	22.0
5	16QAM	12	7	**21.47**	21.36	21.32	
5	16QAM	12	13	21.18	21.46	21.20	
5	16QAM	25	0	21.28	**21.55**	21.25	

BW (MHz)	Modulation	RB Size	RB Offset	Channel/Frequency(MHz)			Tune-up limit (dBm)
				20415	20525	20635	
				825.5	836.5	844	
3	QPSK	1	0	23.45	**23.89**	23.78	24.0
3	QPSK	1	8	23.71	23.87	23.16	
3	QPSK	1	14	23.64	23.13	**23.89**	
3	QPSK	8	0	22.28	22.36	22.23	23.0
3	QPSK	8	4	22.04	**22.40**	22.37	
3	QPSK	8	7	22.04	22.09	22.16	
3	QPSK	15	0	22.13	22.02	**22.24**	
3	16QAM	1	0	22.34	22.30	22.35	23.0
3	16QAM	1	8	22.27	22.12	22.24	
3	16QAM	1	14	**22.44**	22.37	22.10	
3	16QAM	8	0	21.49	21.15	**21.51**	22.0
3	16QAM	8	4	21.31	21.28	21.42	
3	16QAM	8	7	21.20	21.39	21.19	
3	16QAM	15	0	21.19	21.31	**21.45**	

BW (MHz)	Modulation	RB Size	RB Offset	Channel/Frequency(MHz)			Tune-up limit (dBm)
				20407	20525	20643	
				824.7	836.5	848.3	
1.4	QPSK	1	0	23.76	23.19	23.93	24.0
1.4	QPSK	1	3	23.07	23.53	**23.98**	
1.4	QPSK	1	5	23.71	23.82	23.28	
1.4	QPSK	3	0	22.39	22.14	22.35	23.0
1.4	QPSK	3	1	22.41	22.19	**22.44**	
1.4	QPSK	3	3	22.05	22.27	22.25	
1.4	QPSK	6	0	22.21	**22.45**	22.44	
1.4	16QAM	1	0	22.17	22.31	22.16	23.0
1.4	16QAM	1	3	22.01	**22.35**	22.19	
1.4	16QAM	1	5	22.07	22.28	22.07	
1.4	16QAM	3	0	21.39	21.51	21.50	22.0
1.4	16QAM	3	1	21.30	21.35	21.31	
1.4	16QAM	3	3	**21.54**	21.19	21.28	
1.4	16QAM	6	0	21.19	21.37	**21.53**	

LTE Band 7							
BW (MHz)	Modulation	RB Size	RB Offset	Channel/Frequency(MHz)			Tune-up limit (dBm)
				20850	21100	21350	
				2510	2535	2560	
20	QPSK	1	0	**23.84**	23.81	23.39	24.0
20	QPSK	1	49	23.61	23.37	23.66	
20	QPSK	1	99	23.08	23.55	23.42	
20	QPSK	50	0	22.22	22.36	22.35	23.0
20	QPSK	50	24	22.12	**22.37**	22.11	
20	QPSK	50	50	22.34	22.03	22.15	
20	QPSK	100	0	22.01	**22.34**	22.29	
20	16QAM	1	0	22.02	22.27	22.13	23.0
20	16QAM	1	49	22.13	22.24	22.32	
20	16QAM	1	99	22.29	22.03	**22.35**	
20	16QAM	50	0	21.44	21.51	21.20	22.0
20	16QAM	50	24	21.19	21.42	21.53	
20	16QAM	50	50	**21.55**	21.22	21.31	
20	16QAM	100	0	21.20	**21.33**	21.27	
BW (MHz)	Modulation	RB Size	RB Offset	Channel/Frequency(MHz)			Tune-up limit (dBm)
				20825	21100	21375	
				2507.5	2535	2562.5	
15	QPSK	1	0	23.74	23.32	23.33	24.0
15	QPSK	1	37	**23.94**	23.84	23.48	
15	QPSK	1	74	23.61	23.41	23.17	
15	QPSK	36	0	22.12	22.11	22.12	23.0
15	QPSK	36	20	22.17	22.18	**22.39**	
15	QPSK	36	39	22.30	22.22	22.04	
15	QPSK	75	0	**22.31**	22.04	22.24	
15	16QAM	1	0	22.26	22.27	22.22	23.0
15	16QAM	1	37	22.01	22.18	22.10	
15	16QAM	1	74	**22.42**	22.40	22.33	
15	16QAM	36	0	21.22	21.20	21.42	22.0
15	16QAM	36	20	21.34	21.16	21.46	
15	16QAM	36	39	21.15	21.36	**21.54**	
15	16QAM	75	0	21.34	**21.52**	21.33	

BW (MHz)	Modulation	RB Size	RB Offset	Channel/Frequency(MHz)			Tune-up limit (dBm)
				20800	21100	21400	
				2505	2535	2565	
10	QPSK	1	0	23.65	23.41	23.52	24.0
10	QPSK	1	25	**23.83**	23.33	23.32	
10	QPSK	1	49	23.29	23.36	23.49	
10	QPSK	25	0	22.17	22.17	22.29	23.0
10	QPSK	25	12	22.04	22.03	**22.43**	
10	QPSK	25	25	22.07	22.01	22.20	
10	QPSK	50	0	22.12	**22.36**	22.05	
10	16QAM	1	0	22.33	22.15	**22.40**	23.0
10	16QAM	1	25	22.20	22.33	22.26	
10	16QAM	1	49	22.29	22.16	22.30	
10	16QAM	25	0	**21.50**	**21.50**	21.45	22.0
10	16QAM	25	12	21.27	21.26	21.49	
10	16QAM	25	25	21.40	21.46	21.21	
10	16QAM	50	0	**21.42**	21.26	21.30	

BW (MHz)	Modulation	RB Size	RB Offset	Channel/Frequency(MHz)			Tune-up limit (dBm)
				20775	21100	21425	
				2502.5	2535	2567.5	
5	QPSK	1	0	23.30	**23.98**	23.04	24.0
5	QPSK	1	12	23.45	23.24	23.69	
5	QPSK	1	24	23.04	23.81	23.06	
5	QPSK	12	0	22.08	22.07	**22.40**	23.0
5	QPSK	12	7	22.06	22.05	22.06	
5	QPSK	12	13	22.08	22.25	22.02	
5	QPSK	25	0	22.15	**22.41**	22.01	
5	16QAM	1	0	**22.44**	22.01	22.23	23.0
5	16QAM	1	12	22.40	22.43	22.27	
5	16QAM	1	24	22.24	22.09	22.19	
5	16QAM	12	0	21.19	21.22	**21.50**	22.0
5	16QAM	12	7	21.49	21.25	21.18	
5	16QAM	12	13	21.30	21.46	21.36	
5	16QAM	25	0	**21.35**	21.28	21.17	

LTE Band 38							
BW (MHz)	Modulation	RB Size	RB Offset	Channel/Frequency(MHz)			Tune-up limit (dBm)
				37850	38000	38150	
				2580	2595	2610	
20	QPSK	1	0	23.79	23.84	23.13	24.0
20	QPSK	1	49	23.70	23.66	23.71	
20	QPSK	1	99	23.34	23.07	**23.88**	
20	QPSK	50	0	22.41	22.33	22.06	23.0
20	QPSK	50	24	22.18	22.11	22.27	
20	QPSK	50	50	22.36	**22.45**	22.37	
20	QPSK	100	0	**22.16**	22.04	22.10	
20	16QAM	1	0	22.33	22.21	22.02	23.0
20	16QAM	1	49	22.37	**22.45**	22.31	
20	16QAM	1	99	22.31	22.16	22.33	
20	16QAM	50	0	21.38	21.25	21.37	22.0
20	16QAM	50	24	21.15	21.16	21.26	
20	16QAM	50	50	**21.53**	21.29	21.28	
20	16QAM	100	0	**21.53**	21.48	21.25	
BW (MHz)	Modulation	RB Size	RB Offset	Channel/Frequency(MHz)			Tune-up limit (dBm)
				37825	38000	38175	
				2577.5	2595	2612.5	
15	QPSK	1	0	23.64	23.27	23.02	24.0
15	QPSK	1	37	23.54	**23.98**	23.32	
15	QPSK	1	74	23.21	23.15	23.16	
15	QPSK	36	0	22.07	22.05	22.08	23.0
15	QPSK	36	20	22.24	22.23	**22.41**	
15	QPSK	36	39	22.39	22.26	22.40	
15	QPSK	75	0	**22.44**	22.01	22.42	
15	16QAM	1	0	22.23	22.19	22.04	23.0
15	16QAM	1	37	22.27	22.23	22.16	
15	16QAM	1	74	**22.44**	22.15	22.14	
15	16QAM	36	0	21.43	21.25	**21.55**	22.0
15	16QAM	36	20	21.24	21.53	21.43	
15	16QAM	36	39	21.47	21.29	21.49	
15	16QAM	75	0	**21.53**	21.38	21.27	

BW (MHz)	Modulation	RB Size	RB Offset	Channel/Frequency(MHz)			Tune-up limit (dBm)
				37800	38000	38200	
				2575	2595	2615	
10	QPSK	1	0	23.56	23.19	23.10	24.0
10	QPSK	1	25	23.33	23.36	**23.87**	
10	QPSK	1	49	23.60	23.22	23.45	
10	QPSK	25	0	22.25	22.28	22.33	23.0
10	QPSK	25	12	22.03	**22.41**	22.16	
10	QPSK	25	25	22.04	22.23	22.30	
10	QPSK	50	0	**22.32**	22.12	22.21	
10	16QAM	1	0	22.26	22.38	22.14	23.0
10	16QAM	1	25	22.14	22.14	**22.45**	
10	16QAM	1	49	**22.45**	22.14	22.07	
10	16QAM	25	0	21.21	21.17	21.36	22.0
10	16QAM	25	12	21.26	**21.53**	21.20	
10	16QAM	25	25	21.48	21.28	21.15	
10	16QAM	50	0	21.27	21.20	**21.49**	

BW (MHz)	Modulation	RB Size	RB Offset	Channel/Frequency(MHz)			Tune-up limit (dBm)
				37775	38000	38225	
				2572.5	2595	2617.5	
5	QPSK	1	0	**23.92**	23.51	23.39	24.0
5	QPSK	1	12	23.09	23.22	23.85	
5	QPSK	1	24	23.03	23.71	23.64	
5	QPSK	12	0	22.01	**22.44**	22.11	23.0
5	QPSK	12	7	22.17	22.26	22.32	
5	QPSK	12	13	22.22	22.14	22.26	
5	QPSK	25	0	22.37	**22.44**	22.40	
5	16QAM	1	0	**22.41**	22.05	22.35	23.0
5	16QAM	1	12	22.09	22.37	22.36	
5	16QAM	1	24	22.18	22.21	22.18	
5	16QAM	12	0	21.22	21.39	21.34	22.0
5	16QAM	12	7	21.25	**21.42**	21.40	
5	16QAM	12	13	21.24	21.40	21.22	
5	16QAM	25	0	**21.46**	21.38	21.40	

LTE Band 40A 2305MHz~2315MHz					
BW (MHz)	Modulation	RB Size	RB Offset	Channel/Frequency(MHz)	Tune-up limit (dBm)
				38750	
				2310	
10	QPSK	1	0	23.25	24.0
10	QPSK	1	25	23.57	
10	QPSK	1	49	23.39	
10	QPSK	25	0	22.24	23.0
10	QPSK	25	12	22.21	
10	QPSK	25	25	22.22	
10	QPSK	50	0	22.12	
10	16QAM	1	0	22.25	23.0
10	16QAM	1	25	22.17	
10	16QAM	1	49	22.13	
10	16QAM	25	0	21.24	22.0
10	16QAM	25	12	21.31	
10	16QAM	25	25	21.53	
10	16QAM	50	0	**21.45**	

BW (MHz)	Modulation	RB Size	RB Offset	Channel/Frequency(MHz)			Tune-up limit (dBm)
				38725	38750	38775	
				2307.5	2310	2312.5	
5	QPSK	1	0	23.54	**23.91**	23.43	24.0
5	QPSK	1	12	23.36	23.48	23.77	
5	QPSK	1	24	23.41	23.38	23.60	
5	QPSK	12	0	**22.43**	22.34	22.16	23.0
5	QPSK	12	7	22.38	22.14	22.29	
5	QPSK	12	13	22.40	22.40	22.20	
5	QPSK	25	0	22.08	**22.41**	22.39	
5	16QAM	1	0	**22.40**	22.15	22.29	23.0
5	16QAM	1	12	22.10	22.39	**22.40**	
5	16QAM	1	24	22.06	22.34	22.05	
5	16QAM	12	0	21.20	21.22	21.36	22.0
5	16QAM	12	7	21.33	21.19	21.39	
5	16QAM	12	13	**21.53**	21.28	21.43	
5	16QAM	25	0	21.35	21.35	**21.53**	

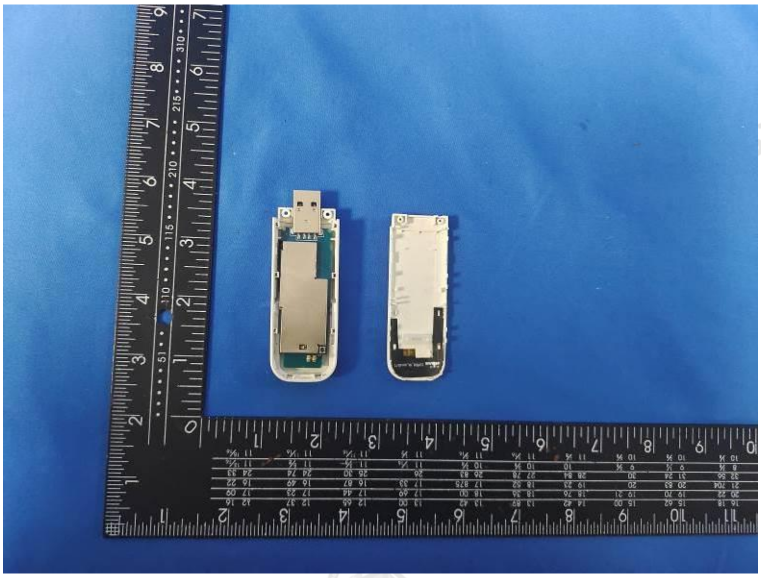
LTE Band 40B 2350MHz~2360MHz							
BW (MHz)	Modulation	RB Size	RB Offset	Channel/Frequency(MHz)			Tune-up limit (dBm)
				39200			
				2355			
10	QPSK	1	0	23.40			24.0
10	QPSK	1	25	23.32			
10	QPSK	1	49	23.47			
10	QPSK	25	0	22.27			23.0
10	QPSK	25	12	22.04			
10	QPSK	25	25	22.34			
10	QPSK	50	0	22.19			
10	16QAM	1	0	22.32			23.0
10	16QAM	1	25	22.27			
10	16QAM	1	49	22.32			
10	16QAM	25	0	21.37			22.0
10	16QAM	25	12	21.25			
10	16QAM	25	25	21.31			
10	16QAM	50	0	**21.49**			
BW (MHz)	Modulation	RB Size	RB Offset	Channel/Frequency(MHz)			Tune-up limit (dBm)
				39175	39200	39225	
				2352.5	2355	2357.5	
5	QPSK	1	0	**23.87**	23.18	23.07	24.0
5	QPSK	1	12	23.82	23.25	23.23	
5	QPSK	1	24	23.49	23.58	23.47	
5	QPSK	12	0	22.14	**22.41**	22.12	23.0
5	QPSK	12	7	22.40	22.38	22.25	
5	QPSK	12	13	22.12	22.06	22.08	
5	QPSK	25	0	22.07	22.16	**22.31**	
5	16QAM	1	0	22.36	22.18	22.44	23.0
5	16QAM	1	12	**22.45**	22.31	22.29	
5	16QAM	1	24	22.09	22.17	22.14	
5	16QAM	12	0	21.46	21.17	21.15	22.0
5	16QAM	12	7	21.28	21.25	**21.47**	
5	16QAM	12	13	21.40	21.18	21.31	
5	16QAM	25	0	21.19	**21.47**	21.25	

LTE Band 41									
BW (MHz)	Modulation	RB Size	RB Offset	Channel/Frequency(MHz)					Tune-up limit (dBm)
				39750	40185	40620	41055	41490	
				2506	2549.5	2593	2636.5	2680	
20	QPSK	1	0	23.41	23.64	23.94	23.71	23.65	24.0
20	QPSK	1	49	23.54	23.44	23.46	23.23	23.10	
20	QPSK	1	99	23.92	23.81	23.87	23.82	**23.95**	
20	QPSK	50	0	22.12	22.05	22.11	22.28	**22.45**	23.0
20	QPSK	50	24	22.18	22.31	**22.45**	22.32	22.35	
20	QPSK	50	50	22.20	22.20	22.21	22.21	22.38	
20	QPSK	100	0	**22.21**	22.08	22.11	22.07	22.13	
20	16QAM	1	0	22.25	22.21	**22.29**	22.17	22.12	23.0
20	16QAM	1	49	22.02	22.01	22.18	22.12	22.10	
20	16QAM	1	99	22.22	22.21	22.28	22.16	22.10	
20	16QAM	50	0	21.48	21.29	21.28	21.31	21.35	22.0
20	16QAM	50	24	21.37	21.29	21.33	21.26	21.29	
20	16QAM	50	50	21.47	21.41	**21.51**	21.36	21.38	
20	16QAM	100	0	**21.39**	21.27	21.26	21.25	21.34	
BW (MHz)	Modulation	RB Size	RB Offset	Channel/Frequency(MHz)					Tune-up limit (dBm)
				39725	40173	40620	41068	41515	
				2503.5	2548.5	2593	2637.8	2682.5	
15	QPSK	1	0	**23.79**	23.55	23.50	23.21	23.00	24.0
15	QPSK	1	37	23.74	23.52	23.43	23.30	23.34	
15	QPSK	1	74	23.59	23.29	23.07	23.34	23.64	
15	QPSK	36	0	22.08	22.19	22.33	22.29	22.41	23.0
15	QPSK	36	20	22.25	22.16	22.08	22.25	**22.42**	
15	QPSK	36	39	22.36	22.15	22.13	22.16	22.29	
15	QPSK	75	0	22.02	21.98	**22.11**	22.04	22.03	
15	16QAM	1	0	22.24	22.24	22.39	22.39	**22.41**	23.0
15	16QAM	1	37	22.06	22.12	22.36	22.16	22.02	
15	16QAM	1	74	22.19	22.17	22.30	22.16	22.17	
15	16QAM	36	0	21.45	21.45	**21.55**	21.31	21.22	22.0
15	16QAM	36	20	21.51	21.34	21.34	21.21	21.21	
15	16QAM	36	39	21.54	21.39	21.28	21.37	21.53	
15	16QAM	75	0	**21.54**	21.34	21.15	21.30	**21.54**	

BW (MHz)	Modulation	RB Size	RB Offset	Channel/Frequency(MHz)					Tune-up limit (dBm)
				39700	40160	40620	41080	41540	
				2501	2547	2593	2639	2685	
10	QPSK	1	0	23.01	23.29	23.71	23.45	23.25	24.0
10	QPSK	1	25	**23.80**	23.76	23.74	23.45	23.33	
10	QPSK	1	49	23.55	23.43	23.45	23.55	23.72	
10	QPSK	25	0	22.33	22.27	22.28	22.18	22.14	23.0
10	QPSK	25	12	22.37	22.37	**22.45**	22.31	22.19	
10	QPSK	25	25	22.07	22.21	22.38	22.27	22.34	
10	QPSK	50	0	22.08	22.09	22.16	22.21	**22.27**	
10	16QAM	1	0	**22.43**	22.35	22.29	22.08	22.07	23.0
10	16QAM	1	25	22.26	22.15	22.17	22.13	22.16	
10	16QAM	1	49	22.34	22.33	22.35	22.33	22.38	
10	16QAM	25	0	**21.49**	21.38	21.36	21.25	21.23	22.0
10	16QAM	25	12	21.46	21.40	21.41	21.30	21.32	
10	16QAM	25	25	21.42	21.33	21.44	21.34	21.39	
10	16QAM	50	0	**21.49**	21.30	21.15	21.23	21.35	

BW (MHz)	Modulation	RB Size	RB Offset	Channel/Frequency(MHz)					Tune-up limit (dBm)
				39675	40148	40620	41093	51565	
				2498.5	2545.8	2593	2640.3	2687.5	
5	QPSK	1	0	23.36	23.46	23.62	23.77	**23.97**	24.0
5	QPSK	1	12	23.60	23.21	23.02	23.19	23.43	
5	QPSK	1	24	23.00	23.23	23.61	23.70	23.80	
5	QPSK	12	0	22.11	22.00	22.07	22.10	22.30	23.0
5	QPSK	12	7	22.03	22.14	**22.42**	22.23	22.06	
5	QPSK	12	13	22.30	22.22	22.26	22.28	22.32	
5	QPSK	25	0	**22.36**	22.32	22.30	22.11	22.05	
5	16QAM	1	0	22.10	22.03	22.11	22.03	22.12	23.0
5	16QAM	1	12	22.16	22.17	22.19	22.20	**22.31**	
5	16QAM	1	24	22.01	22.01	22.20	22.13	22.13	
5	16QAM	12	0	21.39	21.29	21.22	21.25	**21.41**	22.0
5	16QAM	12	7	21.34	21.32	**21.41**	21.26	21.30	
5	16QAM	12	13	21.24	21.20	21.28	21.27	21.32	
5	16QAM	25	0	**21.50**	21.34	21.20	21.19	21.22	

10.2 Transmit Antennas



Antenna Distance to Edge

Distance of The Antenna to the EUT surface and edge					
Antennas	**Back**	**Front**	**Left**	**Right**	**Top**
WWAN Main	10mm	0mm	0mm	0mm	0mm

10.3 SAR Test Exclusion and Estimated SAR

SAR Test Exclusion Considerations

Per KDB 447498 D01v06, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR

- f(GHz) is the RF channel transmit frequency in GHz.
- Power and distance are rounded to the nearest mW and mm before calculation.
- The result is rounded to one decimal place for comparison.

Per KDB 447498 D01v06, at 100 MHz to 6 GHz and for test separation distances > 50 mm, the SAR test exclusion threshold is determined according to the following:

a) [Threshold at 50mm)+(test separation distance-50mm)*(f(MHz)/150)]mW, at 100MHz to 1500MHz
b) [Threshold at 50mm)+(test separation distance-50mm)*10]mW at > 1500MHz and ≤ 6GHz

Estimated SAR

Per KDB447498 requires when the standalone SAR test exclusion of section 4.3.1 is applied to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to the following to determine simultaneous transmission SAR test exclusion;

● (max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] • [√ f(GHz)/x] W/kg for test separation distances ≤ 50 mm;

where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.

● 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is > 50 mm

The below table, exemption limits for routine evaluation based on frequency and separation distance was according to SAR-based Exemption – §1.1307(b)(3)(i)(B).

	Standalone SAR Test Exclusion and Estimated SAR								
Wireless Interface	Frequency (MHz)	Configuration	Max. Power With tune-up dBm	Max. Power With tune-up mW	Distance (mm)	Calculation Result	SAR Exclusion Thresholds	Standalone SAR Exclusion	Estimated SAR (W/Kg)
WWAN	836.6	Back	24.0	251.189	10	23.0	3	No	N/A
		Front	24.0	251.189	5	45.9	3	No	N/A
		Left	24.0	251.189	5	45.9	3	No	N/A
		Right	24.0	251.189	5	45.9	3	No	N/A
		Top	24.0	251.189	5	45.9	3	No	N/A

Remark:

1. Maximum average power including tune-up tolerance;
2. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion
3. when the distance is < 50 mm exclusion threshold is "Ratio", when the distance is > 50 mm exclusion threshold is "mW".

10.4 SAR Test Results

General Note:

1 Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.

a) Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.

b) For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"

c) For WLAN/Bluetooth: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor

2 Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

- ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
- ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
- ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

3 Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.

<Body SAR>

SAR Values [WCDMA band V]

Plot No.	Mode	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR1g (W/kg)	Reported SAR1g (W/kg)
Measured / Reported SAR numbers-Body distance 5mm										
#1	RMC 12.2K	Front	4183	836.6	23.58	24.00	1.102	0.05	**0.905**	0.997
	RMC 12.2K	Back	4183	836.6	23.58	24.00	1.102	-0.04	0.756	0.833
	RMC 12.2K	Left	4183	836.6	23.58	24.00	1.102	-0.07	0.885	0.975
	RMC 12.2K	Right	4183	836.6	23.58	24.00	1.102	-0.05	0.836	0.921
	RMC 12.2K	Top	4183	836.6	23.58	24.00	1.102	0.06	0.901	0.992
	RMC 12.2K	Front	4132	826.4	23.26	24.00	1.186	-0.11	0.886	**1.051**
	RMC 12.2K	Left	4132	826.4	23.26	24.00	1.186	0.03	0.737	0.874
	RMC 12.2K	Right	4132	826.4	23.26	24.00	1.186	0.05	0.864	1.025
	RMC 12.2K	Top	4132	826.4	23.26	24.00	1.186	-0.10	0.810	0.960
	RMC 12.2K	Front	4233	846.6	23.23	24.00	1.194	0.03	0.857	1.023
	RMC 12.2K	Left	4233	846.6	23.23	24.00	1.194	-0.08	0.704	0.841
	RMC 12.2K	Right	4233	846.6	23.23	24.00	1.194	0.09	0.834	0.996
	RMC 12.2K	Top	4233	846.6	23.23	24.00	1.194	0.05	0.780	0.931

SAR Values [LTE Band 5]

Plot No.	Mode	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR1g (W/kg)	Reported SAR1g (W/kg)
Measured / Reported SAR numbers-Body distance 5mm										
#2	10MHz/1RB#0	Front	20450	829	23.85	24.00	1.035	-0.05	**0.735**	0.761
	10MHz/1RB#0	Back	20450	829	23.85	24.00	1.035	-0.06	0.577	0.597
	10MHz/1RB#0	Left	20450	829	23.85	24.00	1.035	-0.02	0.709	0.734
	10MHz/1RB#0	Right	20450	829	23.85	24.00	1.035	0.06	0.660	0.683
	10MHz/1RB#0	Top	20450	829	23.85	24.00	1.035	0.05	0.725	0.750
	10MHz/25RB#0	Front	20525	836.5	22.39	23.00	1.151	0.03	0.708	0.815
	10MHz/25RB#0	Back	20525	836.5	22.39	23.00	1.151	-0.09	0.548	0.631
	10MHz/25RB#0	Left	20525	836.5	22.39	23.00	1.151	-0.08	0.682	0.785
	10MHz/25RB#0	Right	20525	836.5	22.39	23.00	1.151	-0.02	0.631	0.726
	10MHz/25RB#0	Top	20450	836.5	22.39	23.00	1.151	0.08	0.702	0.808
	10MHz/25RB#12	Front	20450	829	22.22	23.00	1.197	0.05	0.701	**0.839**
	10MHz/25RB#12	Top	20450	829	22.22	23.00	1.197	-0.07	0.685	0.820
	10MHz/25RB#25	Front	20600	844	22.19	23.00	1.205	0.06	0.692	0.834
	10MHz/25RB#25	Top	20600	844	22.19	23.00	1.205	-0.11	0.681	0.821

SAR Values [LTE Band 7]

Plot No.	Mode	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR1g (W/kg)	Reported SAR1g (W/kg)
Measured / Reported SAR numbers-Body distance 5mm										
#3	20MHz/1RB#0	Front	20850	2510	23.84	24.00	1.038	-0.04	**0.489**	0.507
	20MHz/1RB#0	Back	20850	2510	23.84	24.00	1.038	0.07	0.329	0.341
	20MHz/1RB#0	Left	20850	2510	23.84	24.00	1.038	0.11	0.462	0.479
	20MHz/1RB#0	Right	20850	2510	23.84	24.00	1.038	-0.05	0.410	0.425
	20MHz/1RB#0	Top	21100	2510	23.84	24.00	1.038	0.03	0.476	0.494
	20MHz/50RB#24	Front	21100	2535	22.37	23.00	1.156	-0.10	0.473	**0.547**
	20MHz/50RB#24	Back	21100	2535	22.37	23.00	1.156	-0.09	0.316	0.365
	20MHz/50RB#24	Left	21100	2535	22.37	23.00	1.156	0.06	0.450	0.520
	20MHz/50RB#24	Right	21100	2535	22.37	23.00	1.156	-0.07	0.399	0.461
	20MHz/50RB#24	Top	21100	2535	22.37	23.00	1.156	0.01	0.465	0.538

SAR Values [LTE Band 40A]

Plot No.	Mode	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
Measured / Reported SAR numbers-Body 5mm										
#4	10MHz/1RB#25	Front	38750	2310	23.57	24.00	1.104	-0.11	**0.525**	0.580
	10MHz/1RB#25	Back	38750	2310	23.57	24.00	1.104	0.07	0.368	0.406
	10MHz/1RB#25	Left	38750	2310	23.57	24.00	1.104	0.02	0.503	0.555
	10MHz/1RB#25	Right	38750	2310	23.57	24.00	1.104	0.07	0.452	0.499
	10MHz/1RB#25	Top	38750	2310	23.57	24.00	1.104	-0.11	0.510	0.563
	10MHz/25RB#0	Front	38750	2310	22.24	23.00	1.191	-0.12	0.509	**0.606**
	10MHz/25RB#0	Back	38750	2310	22.24	23.00	1.191	0.05	0.353	0.421
	10MHz/25RB#0	Left	38750	2310	22.24	23.00	1.191	0.10	0.480	0.572
	10MHz/25RB#0	Right	38750	2310	22.24	23.00	1.191	0.08	0.438	0.522
	10MHz/25RB#0	Top	38750	2310	22.24	23.00	1.191	-0.05	0.497	0.592

SAR Values [LTE Band 40B]

Plot No.	Mode	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
Measured / Reported SAR numbers-Body 5mm										
#5	10MHz/1RB#49	Front	39200	2355	23.47	24.00	1.130	0.14	**0.591**	**0.668**
	10MHz/1RB#49	Back	39200	2355	23.47	24.00	1.130	0.03	0.432	0.488
	10MHz/1RB#49	Left	39200	2355	23.47	24.00	1.130	0.01	0.566	0.639
	10MHz/1RB#49	Right	39200	2355	23.47	24.00	1.130	0.00	0.520	0.587
	10MHz/1RB#49	Top	39200	2355	23.47	24.00	1.130	-0.11	0.585	0.661
	10MHz/25RB#25	Front	39200	2355	22.34	23.00	1.164	-0.08	0.573	0.667
	10MHz/25RB#25	Back	39200	2355	22.34	23.00	1.164	0.13	0.415	0.483
	10MHz/25RB#25	Left	39200	2355	22.34	23.00	1.164	-0.06	0.550	0.640
	10MHz/25RB#25	Right	39200	2355	22.34	23.00	1.164	0.10	0.498	0.580
	10MHz/25RB#25	Top	39200	2355	22.34	23.00	1.164	0.07	0.563	0.655

SAR Values [LTE Band 41]

Plot No.	Mode	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR1g (W/kg)	Reported SAR1g (W/kg)
Measured / Reported SAR numbers-Body distance 5mm										
#6	20MHz/1RB#99	Front	41490	2680	23.95	24.00	1.012	-0.05	**0.657**	0.665
	20MHz/1RB#99	Back	41490	2680	23.95	24.00	1.012	-0.09	0.504	0.510
	20MHz/1RB#99	Left	41490	2680	23.95	24.00	1.012	0.13	0.637	0.644
	20MHz/1RB#99	Right	41490	2680	23.95	24.00	1.012	-0.10	0.584	0.591
	20MHz/1RB#99	Top	41490	2680	23.95	24.00	1.012	0.05	0.650	0.658
	20MHz/50RB#24	Front	40620	2593	22.45	23.00	1.135	-0.10	0.629	**0.714**
	20MHz/50RB#24	Back	40620	2593	22.45	23.00	1.135	-0.07	0.472	0.536
	20MHz/50RB#24	Left	40620	2593	22.45	23.00	1.135	0.12	0.600	0.681
	20MHz/50RB#24	Right	40620	2593	22.45	23.00	1.135	0.13	0.559	0.634
	20MHz/50RB#24	Top	40620	2593	22.45	23.00	1.135	-0.05	0.620	0.704

10.5 SAR Measurement Variability

SAR measurement variability must be 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. The following procedures are applied to determine if repeated measurements are required.

1 Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.

2 When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.

3 Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥1.45 W/kg (~ 10% from the 1-g SAR limit).

4 Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

SAR Measurement Variability

Band	Mode	Test Position	Ch.	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio	Second Repeated SAR (W/kg)
WCDMA band V	RMC 12.2K	Front	4183	0.894	0.905	1.012	N/A
	RMC 12.2K	Left	4183	0.870	0.885	1.018	N/A
	RMC 12.2K	Right	4183	0.836	0.825	1.013	N/A
	RMC 12.2K	Top	4183	0.878	0.901	1.027	N/A
	RMC 12.2K	Front	4132	0.886	0.883	1.004	N/A
	RMC 12.2K	Right	4132	0.864	0.859	1.006	N/A
	RMC 12.2K	Top	4132	0.810	0.784	1.034	N/A
	RMC 12.2K	Front	4233	0.857	0.844	1.015	N/A
	RMC 12.2K	Right	4233	0.813	0.834	1.026	N/A

10.6 Simultaneous Transmission Analysis

Per FCC KD B447498 D01, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the transmitting antenna in a specific a physical test configuration is ≤1.6 W/Kg. When the sum is greater than the SAR limit, SAR test exclusion is determined by the SAR to peak location separation ratio.

$$\text{Ratio}=\frac{(\text{SAR}_1+\text{SAR}_2)^{1.5}}{(\text{peak location separation,mm})}<0.04$$

The following procedures adopted from “FCC SAR Considerations for Cell Phones with Multiple Transmitters” are applicable to handsets with built-in unlicensed transmitters such as 802.11 a/b/g/n and Bluetooth devices which may simultaneously transmit with the licensed transmitter.

Application Simultaneous Transmission information:

N/A

Evaluation of Simultaneous SAR

The device only one transmitter.

11 Measurement Uncertainty

NO	Source	Uncert. ai（%）	Prob. Dist.	Div. k	ci (1g)	ci (10g)	Stand.Uncert. ui (1g)	Stand.Uncert. ui (10g)	*Veff*
1	Repeat	0. 4	N	1	1	1	0. 4	0. 4	9
Instrument									
2	Probe calibration	7	N	2	1	1	3.5	3.5	∞
3	Axial isotropy	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	∞
4	Hemispherical isotropy	9.4	R	$\sqrt{3}$	0.7	0.7	3.9	3.9	∞
5	Boundary effect	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
6	Linearity	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
7	Detection limits	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
8	Readout electronics	0.3	N	1	1	1	0.3	0.3	∞
9	Response time	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
10	Integration time	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
11	Ambient noise	3.0	R	$\sqrt{3}$	1	1	1.7	1.7	∞
12	Ambient reflections	3.0	R	$\sqrt{3}$	1	1	1.7	1.7	∞
13	Probe positioner mech. restrictions	0.4	R	$\sqrt{3}$	1	1	0.2	0.2	∞
14	Probe positioning with respect to phantom shell	2.9	R	$\sqrt{3}$	1	1	1.7	1.7	∞
15	Max.SAR evaluation	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞

Test sample related									
16	Device positioning	3.8	N	1	1	1	3.8	3.8	99
17	Device holder	5.1	N	1	1	1	5.1	5.1	5
18	Drift of output power	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Phantom and set-up									
19	Phantom uncertainty	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞
20	Liquid conductivity (target)	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
21	Liquid conductivity (meas)	2.5	N	1	0.64	0.43	1.6	1.2	∞
22	Liquid Permittivity (target)	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.5	∞
23	Liquid Permittivity (meas)	2.5	N	1	0.6	0.49	1.5	1.2	∞
Combined standard			RSS	$U_C = \sqrt{\sum_{i=1}^{n} C_i^2 U_i^2}$			11.4%	11.3%	236
Expanded uncertainty(P=95%)		$U = k\,U_c$, k=2					**22.8%**	**22.6%**	

Appendix A. EUT Photos and Test Setup Photos

	
Front(5mm)	Back(5mm)
	
Left(5mm)	Right(5mm)
	
Top(5mm)	

Appendix B. Plots of SAR System Check

835MHz System Check

Date: 06/11/2024

DUT: Dipole 835 MHz; Type: D835V2; Serial: 484

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

Medium parameters used (interpolated): f = 835 MHz; σ = 0.861 S/m; ε_r = 42.251; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7380; ConvF(9.62, 9.62, 9.62) ; Calibrated: 6/21/2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn428; Calibrated: 08/30/2023
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 3.76 W/kg

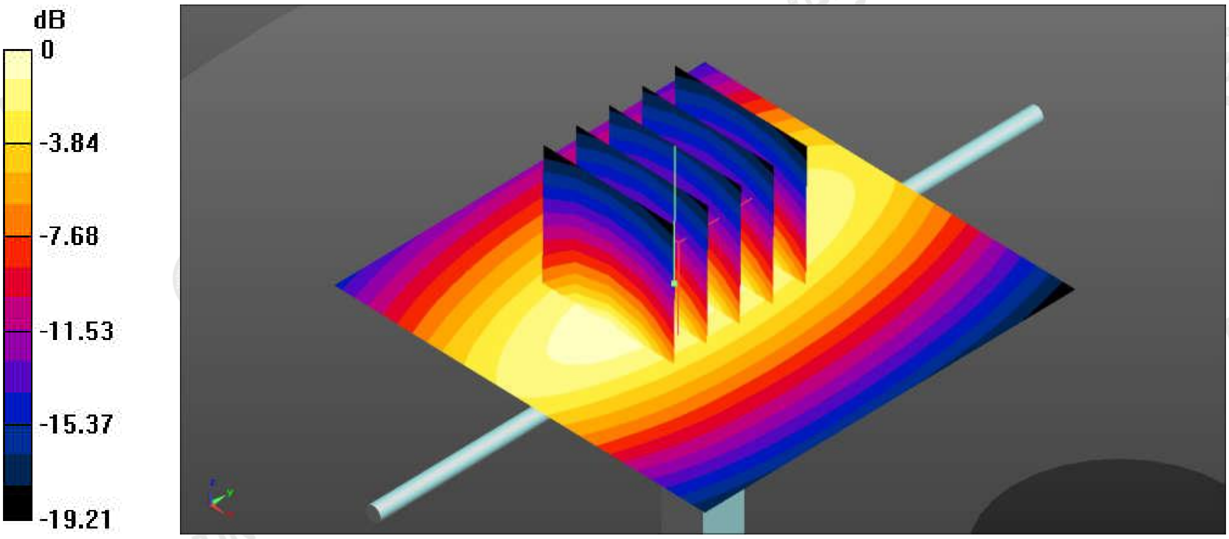
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 56.47 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 4.56 W/kg

SAR(1 g) = 2.39 W/kg; SAR(10 g) = 1.86 W/kg

Maximum value of SAR (measured) =3.70 W/kg



0 dB = 3.70 W/kg

System Performance Check 835MHz 250mW

2300MHz System Check Date: 06/12/2024

DUT: Dipole 2300 MHz; Type: D2300V2; Serial: 1130

Communication System: CW; Frequency: 2300 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 2300 MHz; σ = 1.611 S/m; εr = 38.947; ρ = 1000 kg/m3

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7380; ConvF(7.50, 7.50, 7.50) ; Calibrated: 6/21/2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn428; Calibrated: 08/30/2023
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Area Scan (71x71x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 19.5 W/kg

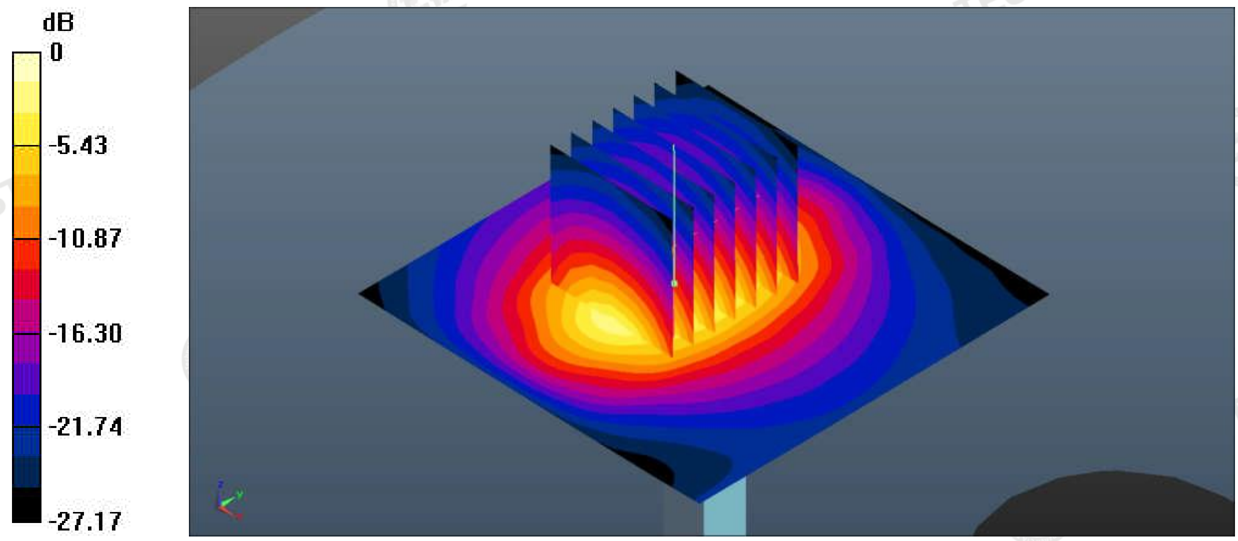
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 100.8 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 26.5 W/kg

SAR(1 g) = 12.44 W/kg; SAR(10 g) = 5.96 W/kg

Maximum value of SAR (measured) = 18.7 W/kg



0 dB = 18.7 W/kg

System Performance Check 2450MHz 250mW

2600MHz System Check

Date: 06/13/2024

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: 1073

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

Medium parameters used (interpolated): f = 2600 MHz; σ = 1.881 S/m; εr = 39.109; ρ = 1000 kg/m3

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7380; ConvF(7.35, 7.35, 7.35) ; Calibrated: 6/21/2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn428; Calibrated: 08/30/2023
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Area Scan (91x101x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 23.2 W/kg

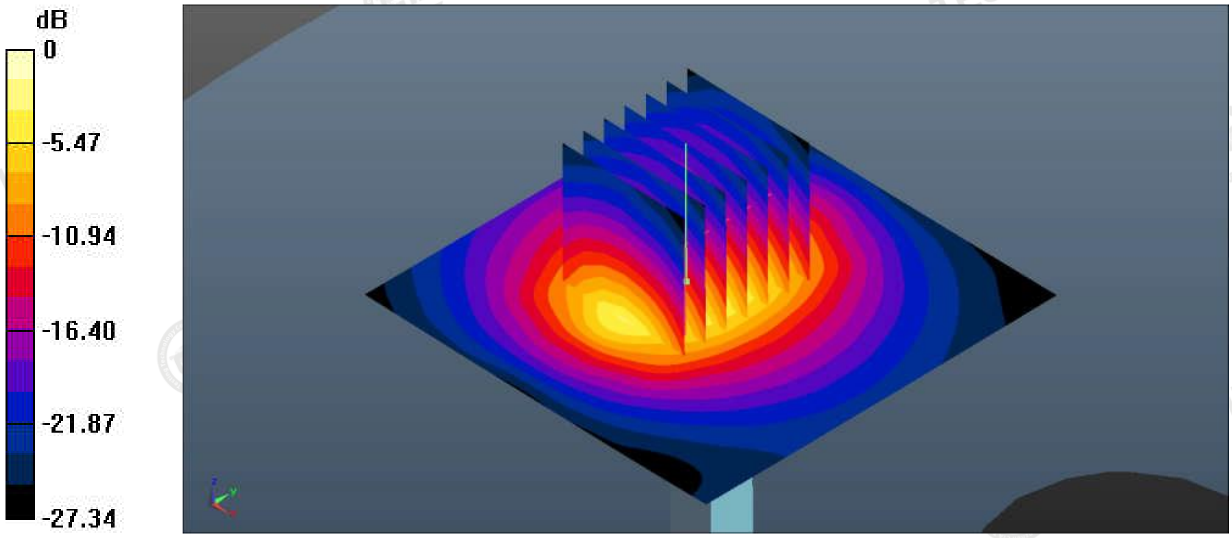
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.74 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 29.6 W/kg

SAR(1 g) = 13.68 W/kg; SAR(10 g) = 6.53 W/kg

Maximum value of SAR (measured) = 23.0 W/kg



0 dB = 23.0 W/kg

System Performance Check 2600MHz 250mW

Appendix C. Plots of SAR Test Data

#1

Date: 06/11/2024

WCDMA Band V_ RMC 12.2K_Front_5mm_Ch4183

Communication System: UID 0, Generic WCDMA (0); Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium parameters used: f = 836.6 MHz; σ = 0.901 S/m; ε_r = 40.765; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7380; ConvF(9.62, 9.62, 9.62) ; Calibrated: 6/21/2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn428; Calibrated: 08/30/2023
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Front /Area Scan (41x81x1): Interpolated grid: dx=1.500 mm, dy= 1.500 mm

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

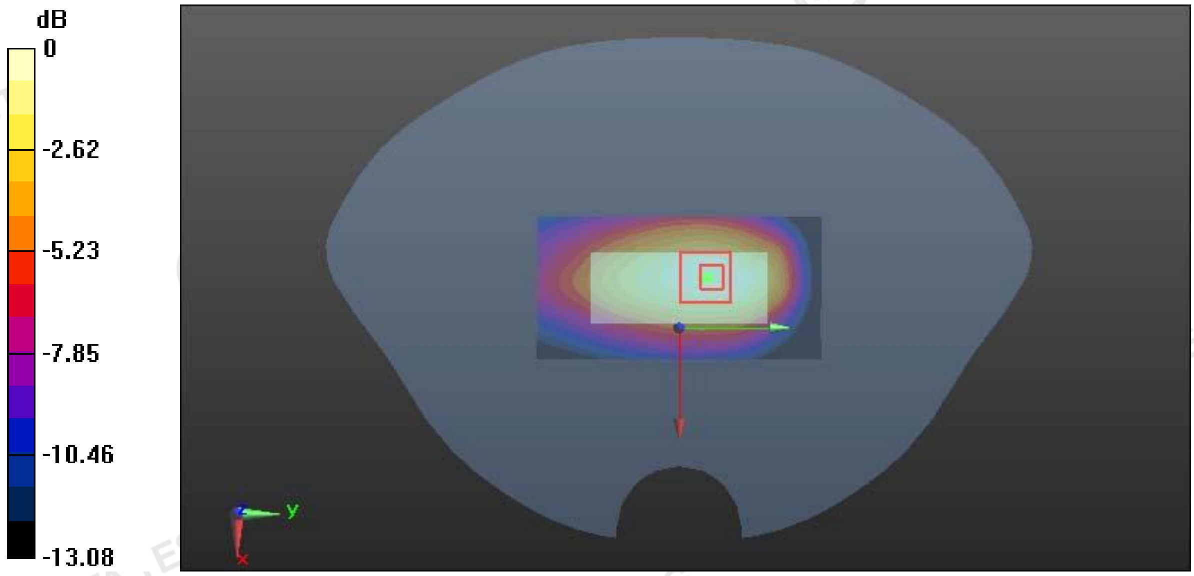
Front /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 28.56 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 1.54 W/Kg

SAR(1 g) = 0.905 W/Kg; SAR(10 g) = 0.525 W/Kg

Maximum value of SAR (measured) = 1.14 W/kg



0 dB = 1.14 W/kg

#2

Date: 06/11/2024

LTE Band 5_10MHz/1RB#0_Front_5mm_Ch20450

Communication System: UID 0, Generic LTE (0); Frequency: 829 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 829 MHz; σ = 0.901 S/m; ε_r = 40.871; ρ = 1000 kg/m^3
Phantom section: Flat Section

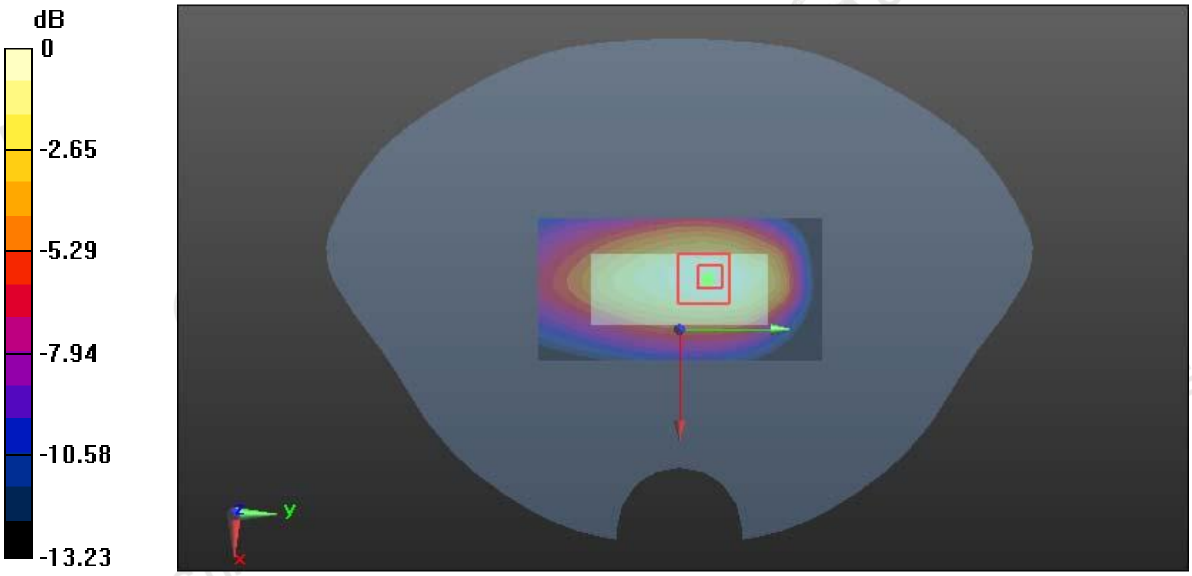
DASY5 Configuration:

- Probe: EX3DV4 - SN7380; ConvF(9.62, 9.62, 9.62) ; Calibrated: 6/21/2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn428; Calibrated: 08/30/2023
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Front /Area Scan (41x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.958 W/kg

Front /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.36 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 1.21 W/kg

SAR(1 g) = 0.735 W/kg; SAR(10 g) = 0.424 W/kg
Maximum value of SAR (measured) = 1.05 W/kg



0 dB = 1.05 W/kg

#3

Date: 06/13/2024

LTE Band 7_20MHz/1RB#0_Back_5mm_Ch20850

Communication System: UID 0, Generic LTE (0); Frequency 2510 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): f = 2510 MHz; σ = 1.981 S/m; εr = 38.779; ρ = 1000 kg/m3

Phantom section: Flat Section

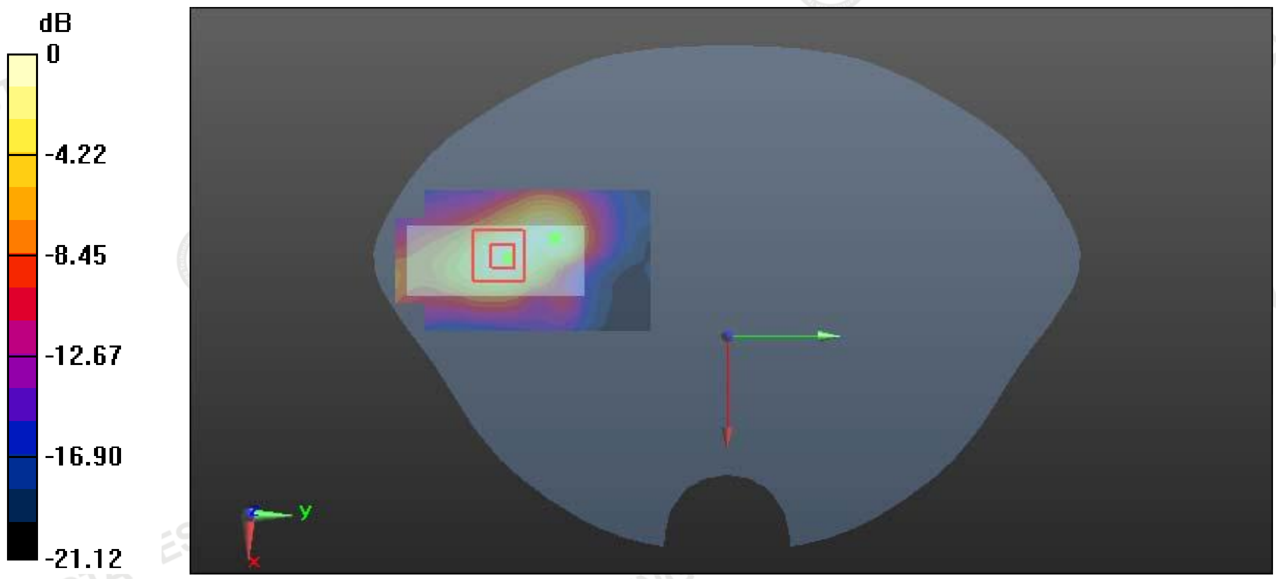
DASY5 Configuration:

- Probe: EX3DV4 - SN7380; ConvF(7.35, 7.35, 7.35) ; Calibrated: 6/21/2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn428; Calibrated: 08/30/2023
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Front /Area Scan (51x91x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.755 W/kg

Front /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.736 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 0.998 W/kg

SAR(1 g) = 0.489 W/kg; SAR(10 g) = 0.225 W/kg
Maximum value of SAR (measured) = 0.781 W/kg



0 dB = 0.781 W/kg

#4
Date: 06/12/2024

LTE Band 40A_10MHz/1RB#25_Front_5mm_Ch38750

Communication System: UID 0, Generic LTE (0); Frequency: 2310 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2310 MHz; σ = 1.405 S/m; ε_r = 39.627; ρ = 1000 kg/m^3
Phantom section: Flat Section

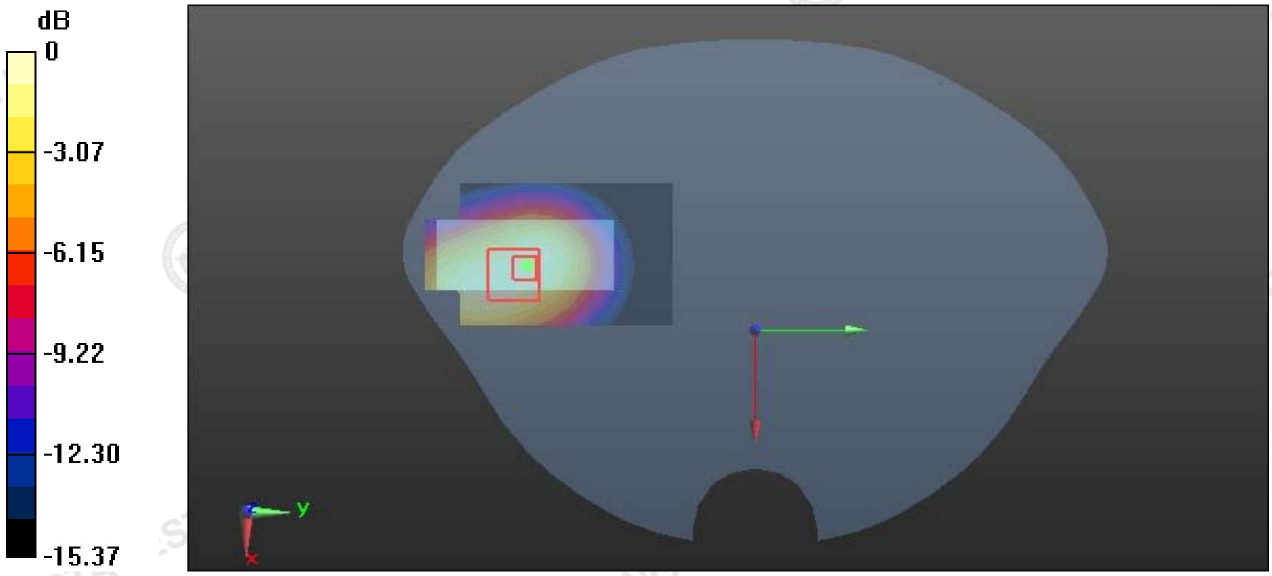
DASY5 Configuration:

- Probe: EX3DV4 - SN7380; ConvF(7.75, 7.75, 7.75) ; Calibrated: 6/21/2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn428; Calibrated: 08/30/2023
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Area Scan (41x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.826 W/Kg

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value =1.778 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 0.945 W/kg

SAR(1 g) = 0.525 W/Kg; SAR(10 g) = 0.323 W/Kg
Maximum value of SAR (measured) = 0.755 W/Kg



0 dB = 0.755 W/kg

#5

Date: 06/12/2024

LTE Band 40B_10MHz/1RB#49_Front_5mm_Ch39200

Communication System: UID 0, Generic LTE (0); Frequency: 2355 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2355 MHz; σ = 1.405 S/m; ε_r = 39.627; ρ = 1000 kg/m^3
Phantom section: Flat Section

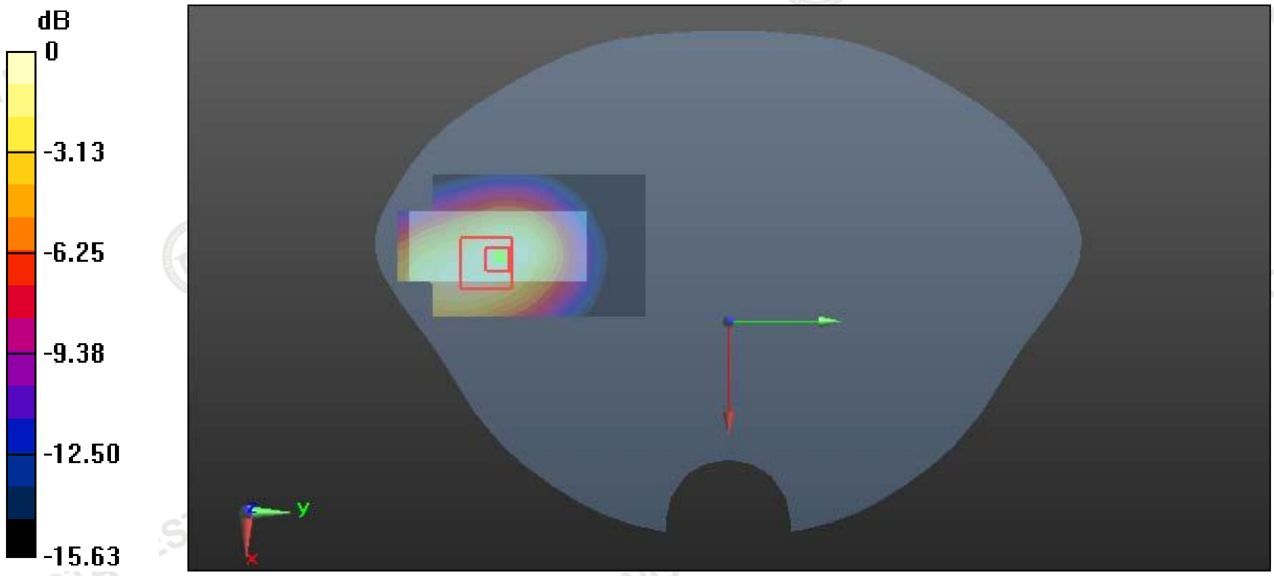
DASY5 Configuration:

- Probe: EX3DV4 - SN7380; ConvF(7.75, 7.75, 7.75) ; Calibrated: 6/21/2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn428; Calibrated: 08/30/2023
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Area Scan (41x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.936 W/Kg

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value =1.185 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 1.05 W/kg

SAR(1 g) = 0.591 W/Kg; SAR(10 g) = 0.367 W/Kg
Maximum value of SAR (measured) = 0.869 W/Kg



0 dB = 0.869 W/kg

#6
Date: 06/13/2024

LTE Band 41_20MHz/1RB#99_Front_5mm_Ch41490

Communication System: UID 0, Generic LTE (0); Frequency: 2680 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2680 MHz; σ = 2.005 S/m; εr = 39.225; ρ = 1000 kg/m3
Phantom section: Flat Section

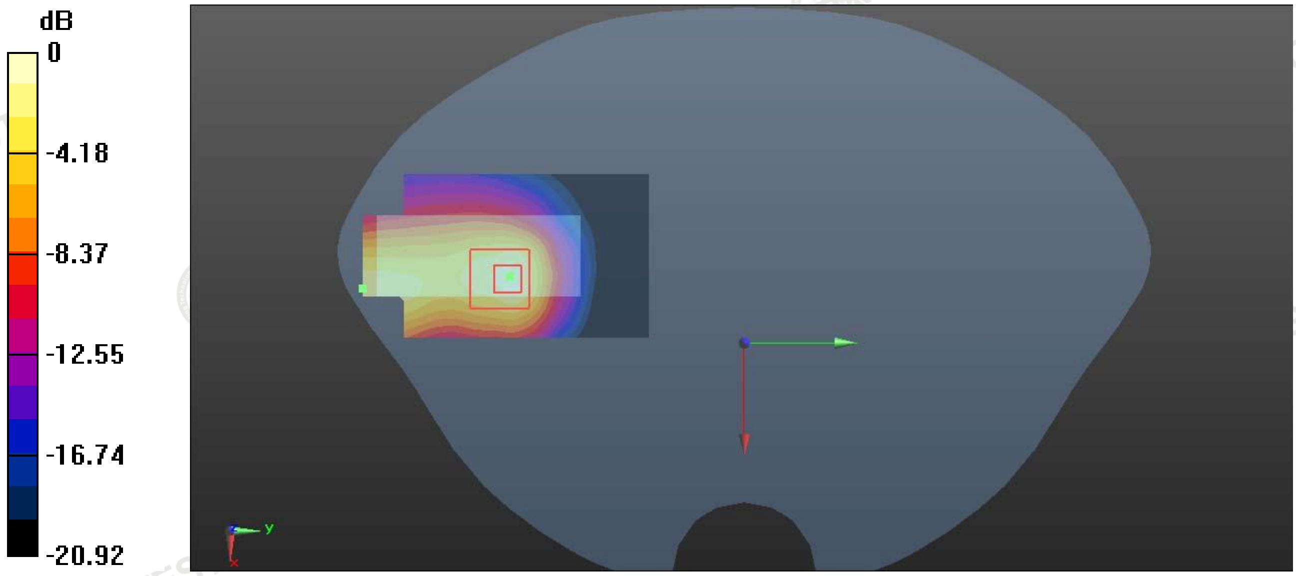
DASY5 Configuration:

- Probe: EX3DV4 - SN7380; ConvF(7.35, 7.35, 7.35) ; Calibrated: 6/21/2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn428; Calibrated: 08/30/2023
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Front /Area Scan (41x71x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 1.02 W/kg

Front /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.758 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 1.36 W/kg

SAR(1 g) = 0.657 W/Kg; SAR(10 g) = 0.369 W/Kg
Maximum value of SAR (measured) = 1.10 W/kg



0 dB = 1.10 W/kg

Appendix D. DASY System Calibration Certificate

In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

中国认可 国际互认 校准 CALIBRATION CNAS L0570

Client ruixiang Certificate No: J23Z60276

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN : 7380
Calibration Procedure(s)	FF-Z11-004-02 Calibration Procedures for Dosimetric E-field Probes
Calibration date:	June 21, 2023

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	12-Jun-23(CTTL, No.J23X05435)	Jun-24
Power sensor NRP-Z91	101547	12-Jun-23(CTTL, No.J23X05435)	Jun-24
Power sensor NRP-Z91	101548	12-Jun-23(CTTL, No.J23X05435)	Jun-24
Reference 10dBAttenuator	18N50W-10dB	19-Jan-23(CTTL, No.J23X00212)	Jan-25
Reference 20dBAttenuator	18N50W-20dB	19-Jan-23(CTTL, No.J23X00211)	Jan-25
Reference Probe EX3DV4	SN 7517	27-Jan-23(SPEAG, No.EX-7517_Jan23)	Jan-24
DAE4	SN 1555	25-Aug-22(SPEAG, No.DAE4-1555_Aug22)	Aug-23
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
SignalGenerator MG3700A	6201052605	12-Jun-23(CTTL, No.J23X05434)	Jun-24
Network Analyzer E5071C	MY46110673	10-Jan-23(CTTL, No.J23X00104)	Jan-24
Reference 10dBAttenuator	BT0520	11-May-23(CTTL, No.J23X04061)	May-25
Reference 20dBAttenuator	BT0267	11-May-23(CTTL, No.J23X04062)	May-25
OCP DAK-3.5	SN 1040	18-Jan-23(SPEAG, No.OCP-DAK3.5-1040_Jan23)	Jan-24

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	余宗英
Reviewed by:	Lin Hao	SAR Test Engineer	林浩
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: June 27, 2023

In Collaboration with
s p e a g
CALIBRATION LABORATORY

CAICT

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A,B,C,D	modulation dependent linearization parameters
Polarization Φ	Φ rotation around probe axis
Polarization θ	θ rotation around an axis that is in the plane normal to probe axis (at measurement center), i θ=0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

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

b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016

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

d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization θ=0 (f≤900MHz in TEM-cell; f>1800MHz: waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2-field uncertainty inside TSL (see below ConvF).
- *NORM(f)x,y,z = NORMx,y,z* frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics.
- *Ax,y,z; Bx,y,z; Cx,y,z;VRx,y,z:*A,B,C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f≤800MHz) and inside waveguide using analytical field distributions based on power measurements for f >800MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORMx,y,z* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from±50MHz to±100MHz.
- *Spherical isotropy (3D deviation from isotropy):* in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset:* The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle:* The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

TTL In Collaboration with s p e a g CALIBRATION LABORATORY

CAICT

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

DASY/EASY – Parameters of Probe: EX3DV4 – SN:7380

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm($\mu V/(V/m)^2$)[A]	0.44	0.35	0.41	±10.0%
DCP(mV)[B]	100.5	101.6	100.6	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	161.9	±2.2%
		Y	0.0	0.0	1.0		139.0	
		Z	0.0	0.0	1.0		149.3	

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%.

[A] The uncertainties of Norm X, Y, Z do not affect the E^2-field uncertainty inside TSL (see Page 4).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainly is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

In Collaboration with
s p e a g
CALIBRATION LABORATORY

CAICT

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

DASY/EASY – Parameters of Probe: EX3DV4 – SN:7380

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz][C]	Relative Permittivity[F]	Conductivity (S/m)[F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
750	41.9	0.89	10.02	10.02	10.02	0.17	1.27	±12.7%
835	41.5	0.90	9.62	9.62	9.62	0.18	1.30	±12.7%
1750	40.1	1.37	8.35	8.35	8.35	0.28	1.02	±12.7%
1900	40.0	1.40	8.05	8.05	8.05	0.24	1.11	±12.7%
2100	39.8	1.49	8.00	8.00	8.00	0.24	1.11	±12.7%
2300	39.5	1.67	7.75	7.75	7.75	0.65	0.67	±12.7%
2450	39.2	1.80	7.50	7.50	7.50	0.65	0.69	±12.7%
2600	39.0	1.96	7.35	7.35	7.35	0.47	0.85	±12.7%
3500	37.9	2.91	6.85	6.85	6.85	0.41	1.03	±13.9%
3700	37.7	3.12	6.69	6.69	6.69	0.43	1.03	±13.9%
3900	37.5	3.32	6.58	6.58	6.58	0.30	1.50	±13.9%
4100	37.2	3.53	6.62	6.62	6.62	0.35	1.25	±13.9%
4200	37.1	3.63	6.52	6.52	6.52	0.30	1.45	±13.9%
4400	36.9	3.84	6.44	6.44	6.44	0.30	1.50	±13.9%
4600	36.7	4.04	6.41	6.41	6.41	0.35	1.48	±13.9%
4800	36.4	4.25	6.36	6.36	6.36	0.35	1.50	±13.9%
4950	36.3	4.40	5.95	5.95	5.95	0.35	1.55	±13.9%
5250	35.9	4.71	5.45	5.45	5.45	0.40	1.55	±13.9%
5600	35.5	5.07	4.86	4.86	4.86	0.45	1.40	±13.9%
5750	35.4	5.22	4.96	4.96	4.96	0.45	1.40	±13.9%

[C] Frequency validity above 300 MHz of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequency up to 6 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

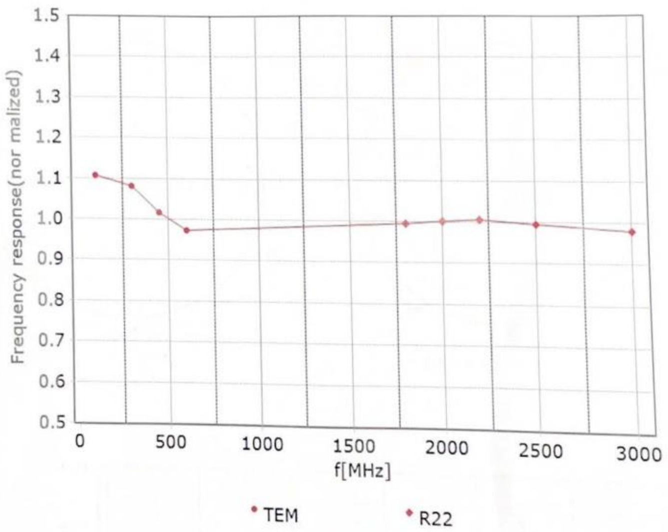
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

TTL In Collaboration with speag CALIBRATION LABORATORY

CAICT

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ±7.4% (k=2)

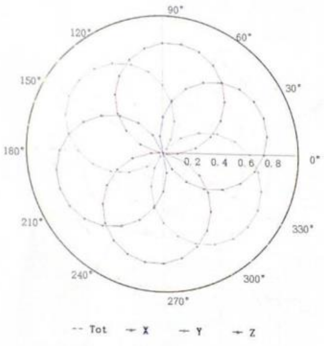
TTL In Collaboration with speag CALIBRATION LABORATORY

CAICT

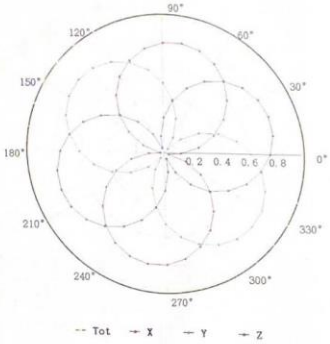
Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

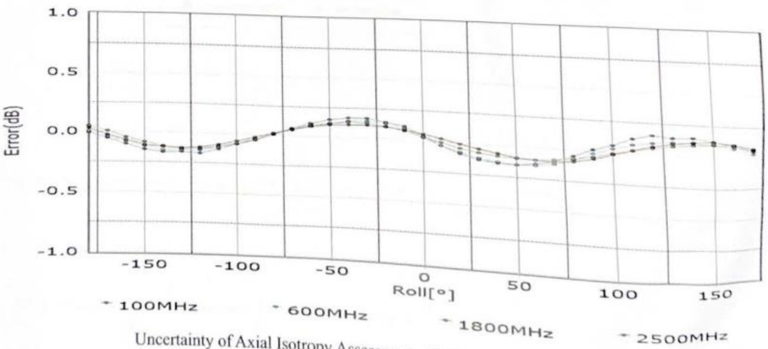
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM



f=1800 MHz, R22





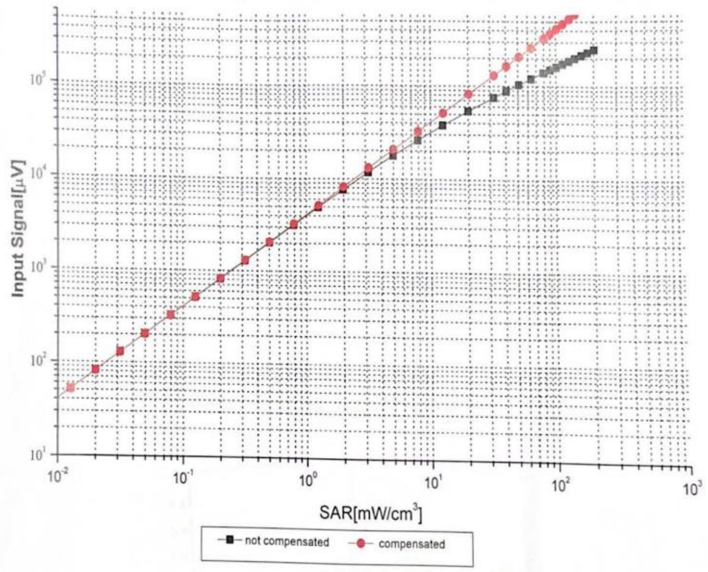
Uncertainty of Axial Isotropy Assessment: ±1.2% (k=2)

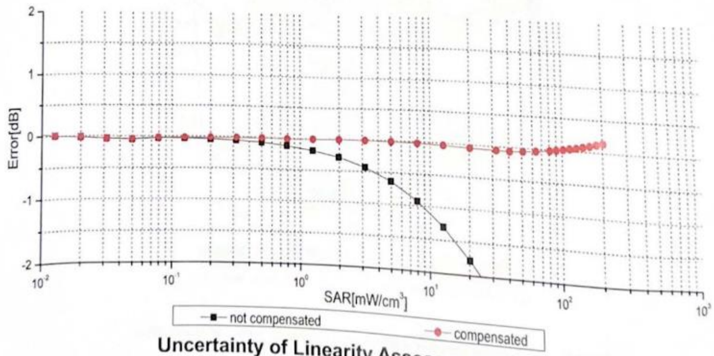
TTL In Collaboration with s p e a g CALIBRATION LABORATORY

CAICT

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

Dynamic Range f(SAR$_{head}$)
(TEM cell, f = 900 MHz)





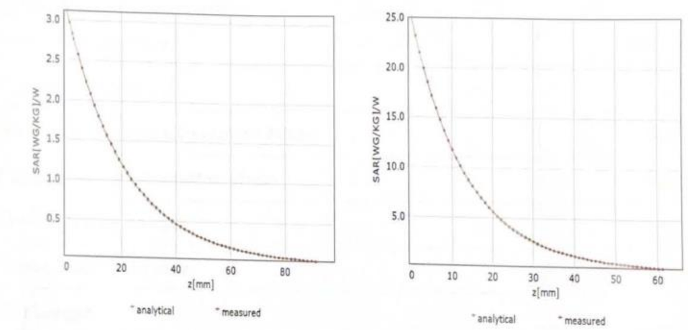
Uncertainty of Linearity Assessment: ±0.9% (*k*=2)

TTL In Collaboration with speag CALIBRATION LABORATORY CAICT

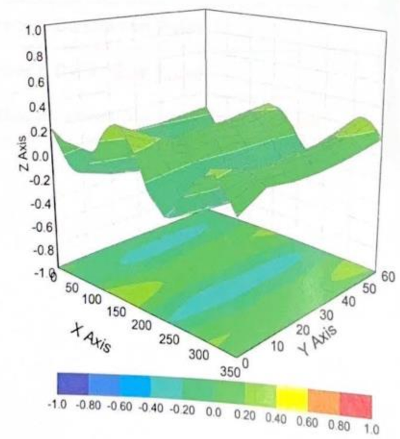
Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

Conversion Factor Assessment

f=750 MHz,WGLS R9(H_convF) f=1750 MHz,WGLS R22(H_convF)



Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: ±3.2% (k=2)

TTL In Collaboration with speag CALIBRATION LABORATORY

CAICT

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

DASY/EASY – Parameters of Probe: EX3DV4 – SN:7380

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	83.7
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	9mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	1.4mm

TTL In Collaboration with s p e a g CALIBRATION LABORATORY

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

ilac-MRA CNAS 中国认可 国际互认 校准 CALIBRATION CNAS L0570 CAICT

Client : CTA Certificate No: J23Z60391

CALIBRATION CERTIFICATE

Object	DAE3 - SN: 428
Calibration Procedure(s)	FF-Z11-002-01 Calibration Procedure for the Data Acquisition Electronics (DAEx)
Calibration date:	August 30, 2023

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Process Calibrator 753	1971018	12-Jun-23 (CTTL, No.J23X05436)	Jun-24

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

Issued: September 06, 2023

In Collaboration with
s p e a g
CALIBRATION LABORATORY

CAICT

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

Glossary:

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters:

- *DC Voltage Measurement*: Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The report provide only calibration results for DAE, it does not contain other performance test results.

In Collaboration with
s p e a g
CALIBRATION LABORATORY

CAICT

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.......+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	404.468 ± 0.15% (k=2)	404.804 ± 0.15% (k=2)	404.579 ± 0.15% (k=2)
Low Range	3.95934 ± 0.7% (k=2)	3.95437 ± 0.7% (k=2)	3.91875 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	258.5° ± 1 °

In Collaboration with
TTL speag
CALIBRATION LABORATORY
中国认可 国际互认 校准 CALIBRATION CNAS L0570
CAICT
Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

Client CTA Certificate No: J23Z60387

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 484
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	August 25, 2023

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	22-Sep-22 (CTTL, No.J22X09561)	Sep-23
Power sensor NRP8S	104291	22-Sep-22 (CTTL, No.J22X09561)	Sep-23
Reference Probe EX3DV4	SN 3617	31-Mar-23(CTTL-SPEAG,No.Z23-60161)	Mar-24
DAE4	SN 1556	11-Jan-23(CTTL-SPEAG,No.Z23-60034)	Jan-24
Secondary Standards	**ID #**	**Cal Date (Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	05-Jan-23 (CTTL, No. J23X00107)	Jan-24
NetworkAnalyzer E5071C	MY46110673	10-Jan-23 (CTTL, No. J23X00104)	Jan-24

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

Issued: September 1, 2023

TTL In Collaboration with s p e a g CALIBRATION LABORATORY

CAICT

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

Glossary:

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

Calibration is Performed According to the Following Standards:

a) 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%.

In Collaboration with
speag
CALIBRATION LABORATORY

CAICT

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

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	42.1 ± 6 %	0.90 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.42 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.68 W/kg ± 18.8 % (*k*=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.56 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.24 W/kg ± 18.7 % (*k*=2)**

In Collaboration with
s p e a g
CALIBRATION LABORATORY

CAICT

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.8Ω- 2.74jΩ
Return Loss	- 31.2dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.299 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

In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

DASY5 Validation Report for Head TSL Date: 2023-08-25

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 484

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

Medium parameters used: f = 835 MHz; σ = 0.904 S/m; ε_r = 42.11; ρ = 1000 kg/m^3

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(10.1, 10.1, 10.1) @ 835 MHz; Calibrated: 2023-03-31
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2023-01-11
- 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 = 57.93 V/m; Power Drift = -0.01 dB

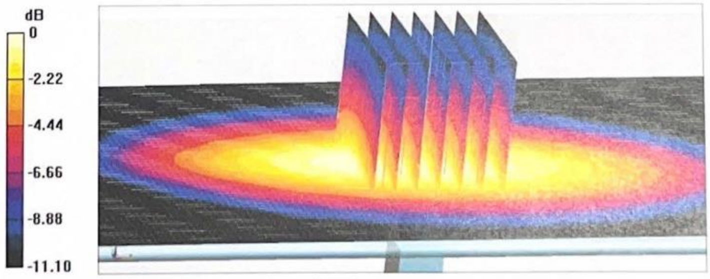
Peak SAR (extrapolated) = 3.92 W/kg

SAR(1 g) = 2.42 W/kg; SAR(10 g) = 1.56 W/kg

Smallest distance from peaks to all points 3 dB below = 16.3 mm

Ratio of SAR at M2 to SAR at M1 = 62.1%

Maximum value of SAR (measured) = 3.36 W/kg



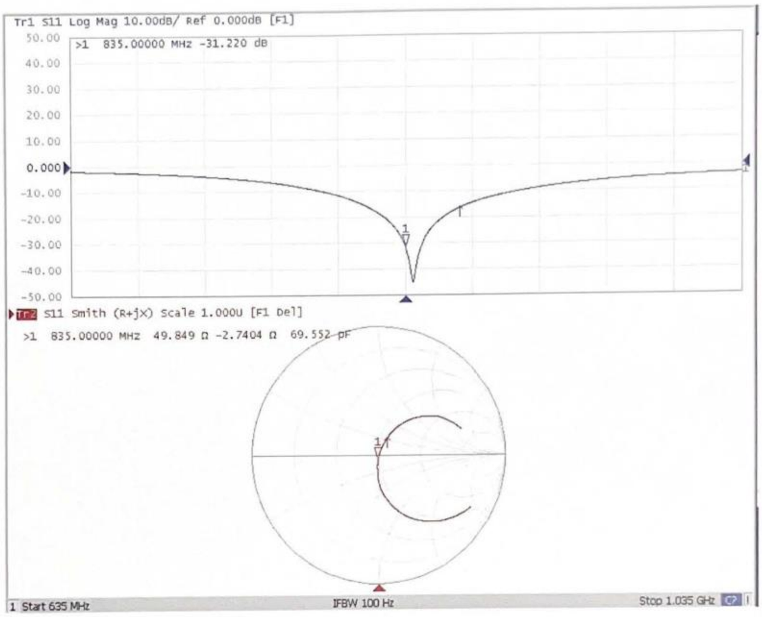
0 dB = 3.36 W/kg = 5.26 dBW/kg

TTL In Collaboration with s p e a g CALIBRATION LABORATORY

CAICT

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

Impedance Measurement Plot for Head TSL



In Collaboration with s p e a g
CALIBRATION LABORATORY
中国认可 国际互认 校准 CALIBRATION CNAS L0570
CAICT
Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

Client ATC Certificate No: Z23-60085

CALIBRATION CERTIFICATE

Object	D2300V2 - SN: 1103
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	February 16, 2023

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106276	10-May-22 (CTTL, No.J22X03103)	May-23
Power sensor NRP6A	101369	10-May-22 (CTTL, No.J22X03103)	May-23
Reference Probe EX3DV4	SN 7464	19-Jan-23 (CTTL-SPEAG,No.Z22-60565)	Jan-24
DAE4	SN 1556	11-Jan-23(CTTL-SPEAG,No.Z23-60034)	Jan-24
Secondary Standards	**ID #**	**Cal Date (Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49070393	17-May-23 (CTTL, No.J22X03157)	May-24
NetworkAnalyzer E5071C	MY46110673	10-Jan-23 (CTTL, No. J23X00104)	Jan-24

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

Issued: February 24, 2023