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.......................: CTA24112101001

FCC ID. ....: 2BMKZ-SOL-A01

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....................................:	Dec. 02, 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 ....:	**Duoping Technologies HK Limited**
Address...:	Unit 1003, 10/F., Tower 2, Silvercord, 30 Canton Road, Tsim Sha Tsui, Kowloon HongKong China
Test specification.......................... :	
Standard ....:	**FCC 47CFR §2.1093; ANSI/IEEE C95.1-1992; IEEE 1528-2013; KDB 248227 D01; KDB 447498 D01; KDB 865664 D01; KDB 865664 D02; KDB 690783 D01**

Test item description..................... :	**INAIR Pod**
Trade Mark...:	N/A
Manufacturer.....................................:	Duoping Technologies HK Limited
Model/Type reference.......................:	Sol-A01
Listed Models ....:	N/A
Rating ....:	DC 3.85V From Battery and DC 9V From external circuit
Result..:	**PASS**

TEST REPORT

Equipment under Test	:	INAIR Pod
Model /Type	:	Sol-A01
Listed Models	:	N/A
Applicant	:	**Duoping Technologies HK Limited**
Address	:	Unit 1003, 10/F., Tower 2, Silvercord, 30 Canton Road, Tsim Sha Tsui, Kowloon HongKong China
Manufacturer	:	**Duoping Technologies HK Limited**
Address	:	Unit 1003, 10/F., Tower 2, Silvercord, 30 Canton Road, Tsim Sha Tsui, Kowloon HongKong 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	Dec. 02, 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)	Highest Reported 1g-SAR(W/Kg)	Simultaneous Reported SAR (W/Kg)
	Body (0mm) ANT A	Body (0mm) ANT B	
WLAN2.4G	0.573	0.587	1.160
BT	0.219	/	
WLAN5.2G	0.556	0.540	
WLAN5.8G	0.597	0.524	
SAR Test Limit (W/Kg)	1.60		
Test Result	PASS		

2 General Information

2.1 General Remarks

Date of receipt of test sample	:	Nov. 29, 2024
Testing commenced on	:	Nov. 29, 2024
Testing concluded on	:	Dec. 02, 2024

2.2 Description of Equipment Under Test (EUT)

Product Name:	INAIR Pod
Model/Type reference:	Sol-A01
Power supply:	DC 3.85V From Battery and DC 9V From external circuit
Testing sample ID:	CTA241121010-1# (Engineer sample) CTA241121010-2# (Normal sample)
Hardware version:	N/A
Software version:	N/A
Bluetooth BLE	
Supported type:	Bluetooth low Energy
Modulation:	GFSK
Operation frequency:	2402MHz to 2480MHz
Channel number:	40
Channel separation:	2 MHz
Bluetooth	
Supported Type:	Bluetooth BR/EDR
Modulation:	GFSK, π/4DQPSK, 8DPSK
Operation frequency:	2402MHz~2480MHz
Channel number:	79
Channel separation:	1MHz
WIFI2.4G	
Supported type:	802.11b/802.11g/802.11n(H20)/ 802.11n(H40)/802.11ax(H20)/ 802.11ax(H40)
Modulation:	802.11b: DSSS 802.11g/802.11n(H20)/ 802.11n(H40): OFDM 802.11g/802.11ax(H20)/ 802.11ax(H40): OFDM
Operation frequency:	802.11b/802.11g/802.11n(H20)/ 802.11n(H40)/802.11ax(H20)/ 802.11ax(H40): 2412MHz~2462MHz
Channel number:	802.11b/802.11g/802.11n(H20)/ 802.11ax(H20): 11

	802.11n(H40) 802.11ax(H40):7			
Channel separation:	5MHz			
WIFI5G				
Supported type:	20MHz system	40MHz system	80MHz system	160MHz system
	802.11a 802.11n 802.11ac/ax	802.11n 802.11 ac/ax	802.11 ac/ax	N/A
Operation frequency:	5180MHz-5240MHz 5745MHz-5825MHz	5190MHz-5230MHz 5755MHz-5795MHz	5210MHz 5775MHz	N/A
Modulation:	OFDM	OFDM	OFDM	N/A
Channel number:	9	4	2	N/A
Channel separation:	20MHz	40MHz	80MHz	N/A
Category of device:	Portable 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 belongs to portable device category 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 47CFR §2.1093	Radiofrequency Radiation Exposure Evaluation: Portable Devices
ANSI/IEEE C95.1-1992	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.
IEEE 1528-2013	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
KDB 248227 D01	SAR Guidance for IEEE 802 11 Wi-Fi SAR v02r02
KDB 447498 D01	General RF Exposure Guidance v06
KDB 865664 D01	SAR Measurement 100 MHz to 6 GHz v01r04
KDB 865664 D02	RF Exposure Reporting v01r02
KDB 690783 D01	SAR Listings on Grants v01r03

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:

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

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

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

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

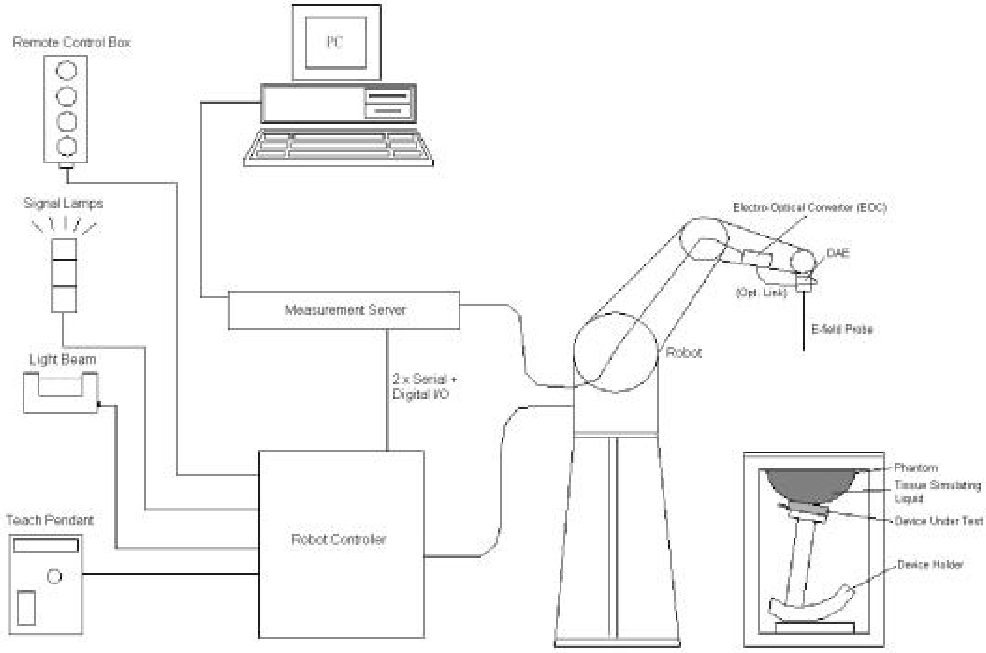
Where: C is the specific head capacity, δT is the temperature rise and δtisthe exposure duration, or related to the electrical field in the tissue by

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

Where:σ is the conductivity of the tissue, ρ is the mass density of the tissue and 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 controller system, the robot controller version (DASY5: CS8c) from Stäubli is used. The Stäubli robot series have many features that are important for our application:

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

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

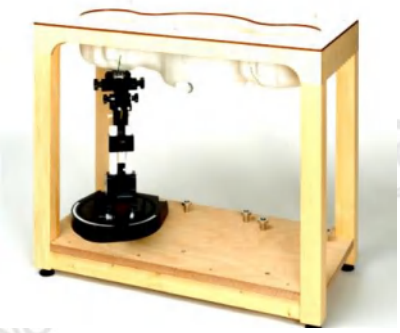


Photo of SAM Phantom

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：

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

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： $$\mathbf{E_i} = \sqrt{\frac{\mathbf{V_i}}{\mathbf{Norm_i \cdot ConvF}}}$$

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

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)：

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

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

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

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	2450MHz System Validation Kit	D2450V2	745	Aug. 28,2023	Aug. 27,2026
SPEAG	5GHz System Validation Kit	D5GHzV2	1160	Oct. 02,2024	Oct. 01,2027
Rohde & Schwarz	UNIVERSAL RADIO COMMUNICATION TESTER	CMW500	1201.0002K50-104209-JC	Aug.25, 2024	Aug.24, 2025
SPEAG	Data Acquisition Electronics	DAE4	387	Sep.02,2024	Sep.01,2025
SPEAG	Dosimetric E-Field Probe	EX3DV4	7396	May.06,2024	May.05,2025
Agilent	ENA Series Network Analyzer	E5071C	MY46317418	Aug.25, 2024	Aug.24, 2025
SPEAG	DAK	DAK-3.5	1226	Aug.25, 2024	Aug.24, 2025
SPEAG	SAM Twin Phantom	QD000P40CD	1802	NA1	NA1
SPEAG	ELI Phantom	QDOVA004AA	2058	NA1	NA1
AR	Amplifier	ZHL-42W	QA1118004	Aug.25, 2024	Aug.24, 2025
Agilent	Power Meter	N1914A	MY50001102	Aug.25, 2024	Aug.24, 2025
Agilent	Power Sensor	N8481H	MY51240001	Aug.25, 2024	Aug.24, 2025
R&S	Spectrum Analyzer	N9020A	MY51170037	Aug.25, 2024	Aug.24, 2025
Agilent	Signal Generation	N5182A	MY48180656	Aug.25, 2024	Aug.24, 2025
Worken	Directional Coupler	0110A05601O-10	COM5BNW1A2	Aug.25, 2024	Aug.24, 2025

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. “1” : NA as this is not measurement equipment.

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:

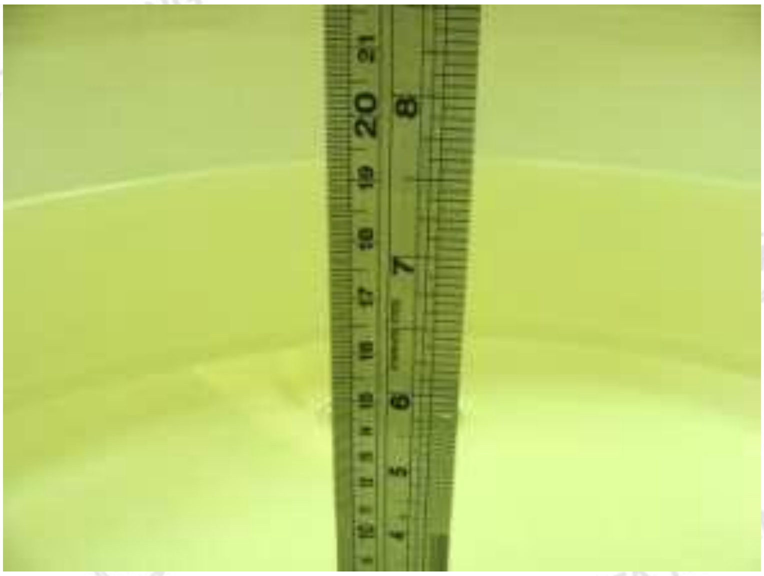


Photo of Liquid Height

The following table gives the recipes for tissue simulating liquid.

Ingredients (% by weight)	Frequency (MHz)				
	450	700-900	1750-2000	2300-2500	2500-2700
Water	38.56	40.30	55.24	55.00	54.92
Salt (NaCl)	3.95	1.38	0.31	0.2	0.23
Sucrose	56.32	57.90	0	0	0
HEC	0.98	0.24	0	0	0
Bactericide	0.19	0.18	0	0	0
Tween	0	0	44.45	44.80	44.85

Salt: 99+% Pure Sodium Chloride

Sucrose: 98+% Pure Sucrose

Water: De-ionized, 16 MΩ+ resistivity

HEC: Hydroxyethyl Cellulose

Tween: Polyoxyethylene (20) sorbitan monolaurate

HSL5GHz is composed of the following ingredients：

Water：50-65%

Mineral oil：10-30%

Emulsifiers：8-25%

Sodium salt：0-1.5%

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. (%)		
2450	39.2	1.80	39.658	1.17%	1.778	-1.22%	22.7	11/29/2024
5250	36.0	4.66	35.895	-0.29%	4.754	2.02%	23.2	12/02/2024
5750	35.3	5.27	34.586	-2.02%	5.325	1.04%	23.2	12/02/2024

7 System Verification Procedures

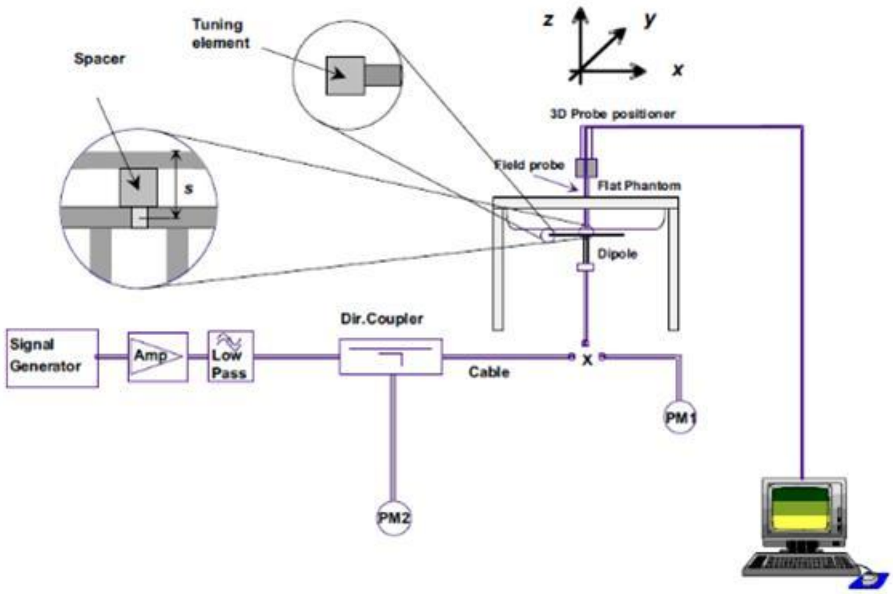
Each DASY system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the DASY software, enable the user to conduct the system performance check and system validation. System validation kit includes a dipole, tripod holder to fix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

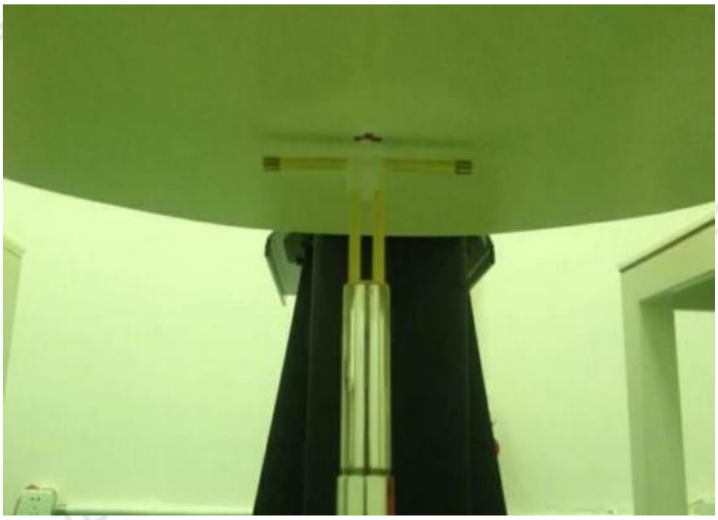


Photo of Dipole Setup

➢ 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 B 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 (%)
11/29/2024	2450	125	52.7	6.66	53.28	1.10%
12/02/2024	5250	100	80.7	7.54	75.4	-6.57%
12/02/2024	5750	100	82.0	7.71	77.1	-5.98%

8 EUT Testing Position

8.1 Body-Supported Device Configurations

According to KDB 616217 section 4.3, SAR should be separately assessed with each surface and separation distance positioned against the flat phantom that correspond to the intended use as specified by the manufacturer. The antennas in tablets are typically located near the back (bottom) surface and/or along the edges of the devices; therefore, SAR evaluation is required for these configurations. Exposures from antennas through the front (top) surface of the display section of a full-size tablet, away from the edges, are generally limited to the user's hands. Exposures to hands for typical consumer transmitters used in tablets are not expected to exceed the extremity SAR limit; therefore, SAR evaluation for the front surface of tablet display screens are generally not necessary, except for tablets that are designed to require continuous operations with the hand(s) next to the antenna(s).

- To position the device parallel to the phantom surface with either keypad up or down.
- To adjust the device parallel to the flat phantom.
- To adjust the distance between the device surface and the flat phantom to 0 mm.
- When each surface is measurement, the SAR Test Exclusion Threshold in KDB 447498 should be applied.

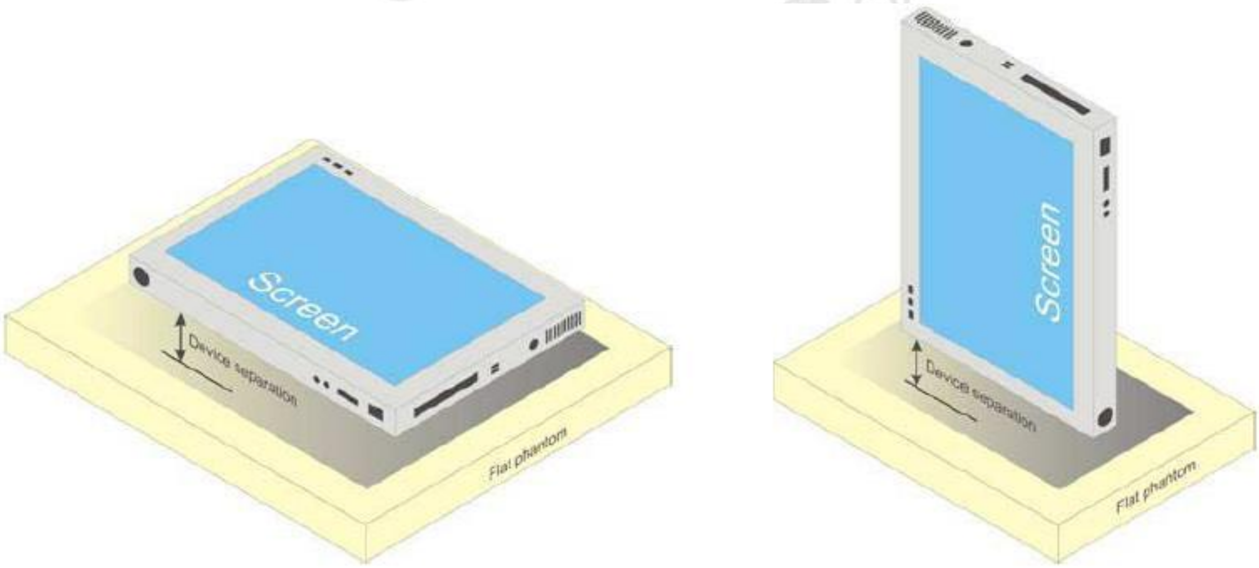


Fig.81 Illustration for Body Position

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	½·δ·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

<WLAN 2.4GHz Conducted Power>

Test Mode	Antenna	Frequency (MHz)	Output Power (dBm)	Tune-up limit (dBm)
802.11b	SISO ANT A	2412	16.132	17.00
		2437	15.282	16.00
		2462	16.122	17.00
	SISO ANT B	2412	18.237	19.00
		2437	17.068	18.00
		2462	18.767	19.00
802.11g	SISO ANT A	2412	18.426	19.00
		2437	17.638	18.00
		2462	18.182	19.00
	SISO ANT B	2412	20.665	21.00
		2437	19.433	20.00
		2462	20.349	21.00
802.11n20	SISO ANT A	2412	17.460	18.00
		2437	16.561	17.00
		2462	17.199	18.00
	SISO ANT B	2412	19.649	20.00
		2437	18.542	19.00
		2462	19.226	20.00
	MIMO A+B	2412	21.701	/
		2437	20.674	/
		2462	21.340	/
802.11n40	SISO ANT A	2422	16.795	17.00
		2437	16.629	17.00
		2452	16.852	17.00
	SISO ANT B	2422	18.238	19.00

		2437	18.916	19.00
		2452	18.015	19.00
	MIMO A+B	2422	20.586	/
		2437	20.932	/
		2452	20.483	/
802.11ax20	SISO ANT A	2412	18.514	19.00
		2437	17.736	18.00
		2462	18.337	19.00
	SISO ANT B	2412	20.143	21.00
		2437	19.888	20.00
		2462	20.752	21.00
	MIMO A+B	2412	22.415	/
		2437	21.954	/
		2462	22.721	/
802.11ax40	SISO ANT A	2422	18.084	19.00
		2437	17.889	18.00
		2452	18.176	19.00
	SISO ANT B	2422	20.996	21.00
		2437	19.724	20.00
		2452	20.692	21.00
	MIMO A+B	2422	22.790	/
		2437	21.913	/
		2452	22.624	/

Mode	Antenna	Duty Cycle (%)	Correction Factor (dB)
802.11b	SISO ANT A	87.75	0.57
	SISO ANT B	91.78	0.37
802.11g	SISO ANT A	95.19	0.21
	SISO ANT B	95.20	0.21
802.11n20	SISO ANT A	95.06	0.22
	SISO ANT B	95.06	0.22
	MIMO A+B	98.07	0.08
802.11n40	SISO ANT A	95.01	0.22

	SISO ANT B	95.01	0.22
	MIMO A+B	98.02	0.09
802.11ax20	SISO ANT A	94.81	0.23
	SISO ANT B	99.76	0.01
	MIMO A+B	100.00	0
802.11ax40	SISO ANT A	94.98	0.22
	SISO ANT B	99.80	0.01
	MIMO A+B	100.00	0

<WLAN 5.2GHz Conducted Power>

Test Mode	Antenna	Frequency (MHz)	Output power (dBm)	Duty cycle factor (dB)	Total power (dBm)	Tune-up limit (dBm)
802.11a	SISO ANT A	5180	17.617	0.198	17.815	18.00
		5200	17.608	0.198	17.806	18.00
		5240	17.377	0.198	17.575	18.00
	SISO ANT B	5180	16.791	0.202	16.993	17.50
		5200	16.632	0.202	16.834	17.00
		5240	16.478	0.202	16.680	17.00
802.11n20	SISO ANT A	5180	16.453	0.204	16.657	17.00
		5200	16.375	0.204	16.579	17.00
		5240	16.285	0.204	16.489	17.00
	SISO ANT B	5180	15.423	0.204	15.627	16.00
		5200	15.286	0.204	15.490	16.00
		5240	15.313	0.204	15.517	16.00
	MIMO A+B	5180	18.979	0.069	19.048	/
		5200	18.875	0.069	18.944	/
		5240	18.836	0.069	18.905	/
802.11n40	SISO ANT A	5190	17.301	0.205	17.506	18.00
		5230	17.223	0.205	17.428	18.00
	SISO ANT B	5190	16.229	0.206	16.435	17.00
		5230	16.168	0.206	16.374	17.00
	MIMO A+B	5190	19.808	0.07	19.878	/
		5230	19.738	0.07	19.808	/
802.11ac20	SISO ANT A	5180	16.377	0.203	16.580	17.00
		5200	16.394	0.203	16.597	17.00
		5240	16.323	0.203	16.526	17.00
	SISO ANT B	5180	15.464	0.204	15.668	16.00
		5200	15.363	0.204	15.567	16.00
		5240	15.304	0.204	15.508	16.00
	MIMO A+B	5180	18.955	0.069	19.024	/
		5200	18.919	0.069	18.988	/
		5240	18.854	0.069	18.923	/
802.11ac40	SISO ANT A	5190	17.077	0.207	17.284	18.00
		5230	16.985	0.207	17.192	18.00
	SISO ANT B	5190	16.263	0.209	16.472	17.00

		5230	16.149	0.209	16.358	17.00
	MIMO A+B	5190	19.699	0.073	19.772	/
		5230	19.597	0.073	19.670	/
802.11ac80	SISO ANT A	5210	17.035	0.205	17.240	18.00
	SISO ANT B	5210	16.174	0.205	16.379	17.00
	MIMO A+B	5210	19.636	0.07	19.706	/
802.11ax20	SISO ANT A	5180	17.895	0.006	17.901	18.00
		5200	17.804	0.006	17.810	18.00
		5240	17.632	0.006	17.638	18.00
	SISO ANT B	5180	16.106	0.004	16.110	17.00
		5200	15.956	0.004	15.960	16.00
		5240	15.700	0.004	15.704	16.00
	MIMO A+B	5180	20.102	0	20.102	/
		5200	19.988	0	19.988	/
		5240	19.783	0	19.783	/
802.11ax40	SISO ANT A	5190	17.931	0.006	17.937	18.50
		5230	17.765	0.006	17.771	18.00
	SISO ANT B	5190	16.352	0.006	16.358	17.00
		5230	16.095	0.006	16.101	17.00
	MIMO A+B	5190	20.223	0	20.223	/
		5230	20.020	0	20.020	/
802.11ax80	SISO ANT A	5210	17.753	0.004	17.757	18.00
	SISO ANT B	5210	16.052	0.004	16.056	17.00
	MIMO A+B	5210	19.996	0	19.996	/

Test Mode	Antenna	Duty Cycle (%)	Factor (dB)
802.11a	SISO ANT A	95.55	0.198
	SISO ANT B	95.46	0.202
802.11n20	SISO ANT A	95.42	0.204
	SISO ANT B	95.42	0.204
	MIMO A+B	98.43	0.069
802.11n40	SISO ANT A	95.38	0.205
	SISO ANT B	95.38	0.206
	MIMO A+B	98.39	0.070
802.11ac20	SISO ANT A	95.42	0.203

	SISO ANT B	95.42	0.204
	MIMO A+B	98.43	0.069
802.11ac40	SISO ANT A	95.34	0.207
	SISO ANT B	95.29	0.209
	MIMO A+B	98.33	0.073
802.11ax80	SISO ANT A	95.39	0.205
	SISO ANT B	95.39	0.205
	MIMO A+B	98.40	0.070
802.11ax20	SISO ANT A	99.85	0.006
	SISO ANT B	99.90	0.004
	MIMO A+B	100	0
802.11ax40	SISO ANT A	99.85	0.006
	SISO ANT B	99.86	0.006
	MIMO A+B	100	0
802.11ax80	SISO ANT A	99.90	0.004
	SISO ANT B	99.90	0.004
	MIMO A+B	100	0

<WLAN 5.8GHz Conducted Power>

Test Mode	Antenna	Frequency (MHz)	Output power (dBm)	Duty cycle factor (dB)	Total power (dBm)	Tune-up limit (dBm)
802.11a	SISO ANT A	5745	17.480	0.202	17.682	18.50
		5785	17.419	0.202	17.621	18.00
		5825	17.446	0.202	17.648	18.00
	SISO ANT B	5745	15.098	0.202	15.300	16.00
		5785	15.948	0.202	16.150	17.00
		5825	15.978	0.202	16.180	17.00
802.11n20	SISO ANT A	5745	16.774	0.006	16.780	17.00
		5785	16.988	0.006	16.994	17.00
		5825	16.888	0.006	16.894	17.00
	SISO ANT B	5745	14.697	0.006	14.703	15.00
		5785	15.382	0.006	15.388	16.00
		5825	15.513	0.006	15.519	16.00
	MIMO A+B	5745	18.869	0	18.869	/
		5785	19.269	0	19.269	/
		5825	19.265	0	19.265	/
802.11n40	SISO ANT A	5755	17.147	0.206	17.353	18.00
		5795	17.070	0.206	17.276	18.00
	SISO ANT B	5755	15.306	0.208	15.514	16.00
		5795	15.754	0.208	15.962	16.00
	MIMO A+B	5755	19.334	0.071	19.405	/
		5795	19.472	0.071	19.543	/
802.11ac20	SISO ANT A	5745	17.238	0.006	17.244	18.00
		5785	17.330	0.006	17.336	18.00
		5825	17.236	0.006	17.242	18.00
	SISO ANT B	5745	15.003	0.006	15.009	16.00
		5785	15.789	0.006	15.795	16.00
		5825	15.972	0.006	15.978	16.00
	MIMO A+B	5745	19.273	0.006	19.279	/
		5785	19.638	0.006	19.644	/
		5825	19.660	0.006	19.666	/
802.11ac40	SISO ANT A	5755	17.112	0.207	17.319	18.00
		5795	17.014	0.207	17.221	18.00

	SISO ANT B	5755	15.294	0.207	15.501	16.00
		5795	15.661	0.207	15.868	16.00
	MIMO A+B	5755	19.308	0.072	19.380	/
		5795	19.400	0.072	19.472	/
802.11ac80	SISO ANT A	5775	16.854	0.203	17.057	18.00
	SISO ANT B	5775	15.250	0.203	15.453	16.00
	MIMO A+B	5775	19.136	0.068	19.204	/
802.11ax20	SISO ANT A	5745	16.731	0.006	16.737	17.00
		5785	17.554	0.006	17.560	18.00
		5825	17.394	0.006	17.400	18.00
	SISO ANT B	5745	16.098	0.006	16.104	17.00
		5785	16.676	0.006	16.682	17.50
		5825	16.529	0.006	16.535	17.00
	MIMO A+B	5745	19.436	0	19.436	/
		5785	20.147	0	20.147	/
		5825	19.993	0	19.993	/
802.11ax40	SISO ANT A	5755	17.593	0.007	17.600	18.00
		5795	17.489	0.007	17.496	18.00
	SISO ANT B	5755	16.145	0.006	16.151	17.00
		5795	16.436	0.006	16.442	17.00
	MIMO A+B	5755	19.939	0	19.939	/
		5795	20.005	0	20.005	/
802.11ax80	SISO ANT A	5775	17.482	0.006	17.488	18.00
	SISO ANT B	5775	15.970	0.006	15.976	16.00
	MIMO A+B	5775	19.802	0	19.802	/

Test Mode	Antenna	Duty Cycle (%)	Factor (dB)
802.11a	SISO ANT A	95.46	0.202
	SISO ANT B	95.46	0.202
802.11n20	SISO ANT A	99.86	0.006
	SISO ANT B	99.86	0.006
	MIMO A+B	100	0
802.11n40	SISO ANT A	95.38	0.206
	SISO ANT B	95.33	0.208
	MIMO A+B	98.37	0.071

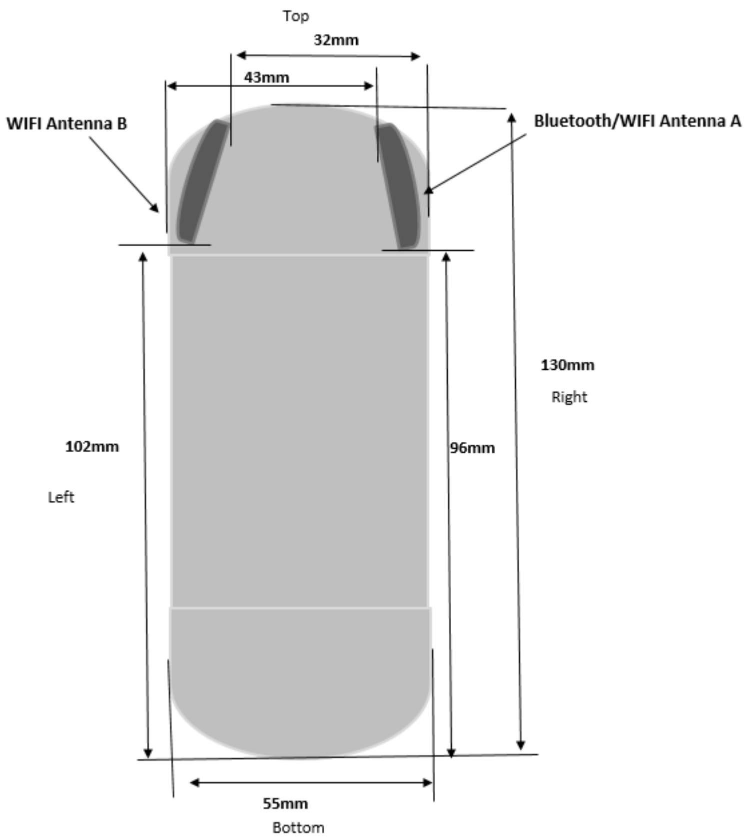
802.11ac20	SISO ANT A	99.85	0.006
	SISO ANT B	99.85	0.006
	MIMO A+B	100	0
802.11ac40	SISO ANT A	95.34	0.207
	SISO ANT B	95.34	0.207
	MIMO A+B	98.35	0.072
802.11ax80	SISO ANT A	95.44	0.203
	SISO ANT B	95.44	0.203
	MIMO A+B	98.45	0.068
802.11ax20	SISO ANT A	99.86	0.006
	SISO ANT B	99.85	0.006
	MIMO A+B	100	0
802.11ax40	SISO ANT A	99.85	0.007
	SISO ANT B	99.85	0.006
	MIMO A+B	100	0
802.11ax80	SISO ANT A	99.86	0.006
	SISO ANT B	99.86	0.006
	MIMO A+B	100	0

< Bluetooth Conducted Power>

Test Mode	Test Frequency (MHz)	Output Power (dBm)	Tune-up limit (dBm)
GFSK	2402	0.364	1.00
	2440	0.662	1.00
	2480	-0.963	0.00

Modulation	Packet	Test Frequency (MHz)	Output Power (dBm)	Tune-up limit (dBm)
GFSK	1-DH1	2402	11.824	12.00
		2441	11.332	12.00
		2480	11.876	12.00
π/4-DQPSK	2-DH1	2402	12.021	13.00
		2441	11.629	12.00
		2480	12.116	13.00
8-DPSK	3-DH1	2402	12.372	13.00
		2441	11.927	12.00
		2480	12.627	13.00

10.2 Transmit Antennas(Front View)



Distance of The Antenna to the EUT surface and edge						
Antennas	**Front**	**Back**	**Top Side**	**Bottom Side**	**Left Side**	**Right Side**
BT&WLAN Ant A	<5mm	<5mm	<5mm	96mm	43mm	<5mm
WLAN Ant B	<5mm	<5mm	<5mm	102mm	<5mm	32mm

10.3 SAR Test Exclusion and Estimated SAR

Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and Product specific 10g SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Test Exclusion Threshold condition is satisfied. These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.

SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≤ 50 mm

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	*SAR Test Exclusion Threshold* (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	
MHz	30	35	40	45	50	mm
150	232	271	310	349	387	*SAR Test Exclusion Threshold* (mW)
300	164	192	219	246	274	
450	134	157	179	201	224	
835	98	115	131	148	164	
900	95	111	126	142	158	
1500	73	86	98	110	122	
1900	65	76	87	98	109	
2450	57	67	77	86	96	
3600	47	55	63	71	79	
5200	39	46	53	59	66	
5400	39	45	52	58	65	
5800	37	44	50	56	62	

When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

The test exclusions are applicable only when the minimum test separation distance is > 50 mm and for transmission frequencies between 100 MHz and 6 GHz.

SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and > 50 mm

MHz	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	mm
100	474	481	487	494	501	507	514	521	527	534	541	547	554	561	567	
150	387	397	407	417	427	437	447	457	467	477	487	497	507	517	527	
300	274	294	314	334	354	374	394	414	434	454	474	494	514	534	554	
450	224	254	284	314	344	374	404	434	464	494	524	554	584	614	644	
835	164	220	275	331	387	442	498	554	609	665	721	776	832	888	943	
900	158	218	278	338	398	458	518	578	638	698	758	818	878	938	998	
1500	122	222	322	422	522	622	722	822	922	1022	1122	1222	1322	1422	1522	mW
1900	109	209	309	409	509	609	709	809	909	1009	1109	1209	1309	1409	1509	
2450	96	196	296	396	496	596	696	796	896	996	1096	1196	1296	1396	1496	
3600	79	179	279	379	479	579	679	779	879	979	1079	1179	1279	1379	1479	
5200	66	166	266	366	466	566	666	766	866	966	1066	1166	1266	1366	1466	
5400	65	165	265	365	465	565	665	765	865	965	1065	1165	1265	1365	1465	
5800	62	162	262	362	462	562	662	762	862	962	1062	1162	1262	1362	1462	

According to the table above, Standalone SAR exclusion calculation for this device are as below:

ANT	Freq. Band	Frequency (MHz)	Position	Test Separation (mm)	Max Power (dBm)	Max Power (mW)	Exclusion Threshold (mW)	Exclusion (Yes/No)
ANT A	BT	2480	Front	5	13.00	19.95	10	No
		2480	Back	5	13.00	19.95	10	No
		2480	Left edge	43	13.00	19.95	82.4	Yes
		2480	Right edge	5	13.00	19.95	10	No
		2480	Top edge	5	13.00	19.95	10	No
		2480	Bottom edge	96	13.00	19.95	556	Yes
	Wi-Fi 2.4G	2412	Front	5	17.00	50.12	10	No
		2412	Back	5	17.00	50.12	10	No
		2412	Left edge	43	17.00	50.12	82.4	Yes
		2412	Right edge	5	17.00	50.12	10	No
		2412	Top edge	5	17.00	50.12	10	No
		2412	Bottom edge	96	17.00	50.12	556	Yes
	Wi-Fi 5.2G	5190	Front	5	18.50	70.79	7	No
		5190	Back	5	18.50	70.79	7	No

		5190	Left edge	43	18.50	70.79	56.6	No
		5190	Right edge	5	18.50	70.79	7	No
		5190	Top edge	5	18.50	70.79	7	No
		5190	Bottom edge	96	18.50	70.79	526	Yes
	Wi-Fi 5.8G	5745	Front	5	18.50	70.79	6	No
		5745	Back	5	18.50	70.79	6	No
		5745	Left edge	43	18.50	70.79	53.6	No
		5745	Right edge	5	18.50	70.79	6	No
		5745	Top edge	5	18.50	70.79	6	No
		5745	Bottom edge	96	18.50	70.79	522	Yes

ANT	Freq. Band	Frequency (MHz)	Position	Test Separation (mm)	Max Power (dBm)	Max Power (mW)	Exclusion Threshold (mW)	Exclusion (Yes/No)
ANT B	Wi-Fi 2.4G	2462	Front	5	19.00	79.43	10	No
		2462	Back	5	19.00	79.43	10	No
		2462	Left edge	5	19.00	79.43	10	No
		2462	Right edge	32	19.00	79.43	61	No
		2462	Top edge	5	19.00	79.43	10	No
		2462	Bottom edge	102	19.00	79.43	616	Yes
	Wi-Fi 5.2G	5180	Front	5	17.50	56.23	7	No
		5180	Back	5	17.50	56.23	7	No
		5180	Left edge	5	17.50	56.23	7	No
		5180	Right edge	32	17.50	56.23	41.8	No
		5180	Top edge	5	17.50	56.23	7	No
		5180	Bottom edge	102	17.50	56.23	586	Yes
	Wi-Fi 5.8G	5745	Front	5	17.50	56.23	6	No
		5745	Back	5	17.50	56.23	6	No
		5745	Left edge	5	17.50	56.23	6	No
		5745	Right edge	32	17.50	56.23	39.8	No
		5745	Top edge	5	17.50	56.23	6	No
		5745	Bottom edge	102	17.50	56.23	582	Yes

From what is shown in the table above, we can draw the conclusion that:

EUT Sides for SAR Testing								
ANT A	Mode	Exposure Condition	Front	Back	Left	Right	Top	Bottom
	BT	Body	Yes	Yes	No	Yes	Yes	No
	WIFI 2.4G	Body	Yes	Yes	No	Yes	Yes	No
	WIFI 5.2G	Body	Yes	Yes	Yes	Yes	Yes	No
	WIFI 5.8G	Body	Yes	Yes	Yes	Yes	Yes	No

EUT Sides for SAR Testing								
ANT B	Mode	Exposure Condition	Front	Back	Left	Right	Top	Bottom

	WIFI 2.4G	Body	Yes	Yes	Yes	Yes	Yes	No
	WIFI 5.2G	Body	Yes	Yes	Yes	Yes	Yes	No
	WIFI 5.8G	Body	Yes	Yes	Yes	Yes	Yes	No

EUT Sides for SAR Testing.

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 [WIFI 2.4G] ANT A

Plot No.	Mode	Test Position	Ch.	Freq. (MHz)	Duty Cycle	Conducted 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 distance 0mm											
	802.11b	Front	1	2412	1.140	16.132	17.00	1.221	-0.09	0.365	0.508
#1	802.11b	Back	1	2412	1.140	16.132	17.00	1.221	0.14	**0.412**	**0.573**
	802.11b	Right edge	1	2412	1.140	16.132	17.00	1.221	0.05	0.299	0.416
	802.11b	Top edge	1	2412	1.140	16.132	17.00	1.221	-0.11	0.342	0.476

SAR Values [WIFI 2.4G] ANT B

Plot No.	Mode	Test Position	Ch.	Freq. (MHz)	Duty Cycle	Conducted 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 distance 0mm											
	802.11b	Front	11	2462	1.090	18.767	19.00	1.055	0.11	0.465	0.535
#2	802.11b	Back	11	2462	1.090	18.767	19.00	1.055	-0.14	**0.511**	**0.587**
	802.11b	Left edge	11	2462	1.090	18.767	19.00	1.055	-0.02	0.400	0.460
	802.11b	Right edge	11	2462	1.090	18.767	19.00	1.055	-0.09	0.345	0.397
	802.11b	Top edge	11	2462	1.090	18.767	19.00	1.055	-0.17	0.425	0.489

Remark:

1) The maximum Scaled SAR value is marked in bold.

2) When the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR test for the other 802.11 modes are not required.

SAR Values [WIFI 5.2G] ANT A

Plot No.	Mode	Test Position	Ch.	Freq. (MHz)	Duty Cycle	Conducted 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 distance 0mm											
	802.11ax40	Front	38	5190	1.002	17.937	18.50	1.138	0.02	0.435	0.496
#3	802.11ax40	Back	38	5190	1.002	17.937	18.50	1.138	-0.17	**0.488**	**0.556**
	802.11ax40	Left edge	38	5190	1.002	17.937	18.50	1.138	0.15	0.321	0.366
	802.11ax40	Right edge	38	5190	1.002	17.937	18.50	1.138	-0.19	0.379	0.432
	802.11ax40	Top edge	38	5190	1.002	17.937	18.50	1.138	0.03	0.400	0.456

SAR Values [WIFI 5.2G] ANT B

Plot No.	Mode	Test Position	Ch.	Freq. (MHz)	Duty Cycle	Conducted 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 distance 0mm											
	802.11a	Front	36	5180	1.048	16.993	17.50	1.124	-0.11	0.412	0.485
#4	802.11a	Back	36	5180	1.048	16.993	17.50	1.124	-0.18	**0.459**	**0.540**
	802.11a	Left edge	36	5180	1.048	16.993	17.50	1.124	0.07	0.366	0.431
	802.11a	Right edge	36	5180	1.048	16.993	17.50	1.124	-0.13	0.302	0.356
	802.11a	Top edge	36	5180	1.048	16.993	17.50	1.124	0.06	0.387	0.456

Remark:

1) The maximum Scaled SAR value is marked in bold.

2) When multiple transmission modes (802.11a/g/n/ac) have the same specified maximum output power, largest channel bandwidth, lowest order modulation and lowest data rate, the lowest order 802.11 mode is selected; i.e., 802.11a is chosen over 802.11n then 802.11ac or 802.11g is chosen over 802.11n.

SAR Values [WIFI 5.8G] ANT A

Plot No.	Mode	Test Position	Ch.	Freq. (MHz)	Duty Cycle	Conducted 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 distance 0mm											
	802.11a	Front	149	5745	1.048	17.682	18.50	1.207	0.00	0.440	0.556
#5	802.11a	Back	149	5745	1.048	17.682	18.50	1.207	-0.14	**0.472**	**0.597**
	802.11a	Left edge	149	5745	1.048	17.682	18.50	1.207	0.15	0.394	0.498
	802.11a	Right edge	149	5745	1.048	17.682	18.50	1.207	0.04	0.336	0.425
	802.11a	Top edge	149	5745	1.048	17.682	18.50	1.207	-0.16	0.421	0.532

SAR Values [WIFI 5.8G] ANT B

Plot No.	Mode	Test Position	Ch.	Freq. (MHz)	Duty Cycle	Conducted 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 distance 0mm											
	802.11ax20	Front	157	5785	1.002	16.682	17.50	1.207	0.15	0.387	0.468
#6	802.11ax20	Back	157	5785	1.002	16.682	17.50	1.207	-0.16	**0.433**	**0.524**
	802.11ax20	Left edge	157	5785	1.002	16.682	17.50	1.207	0.02	0.332	0.401
	802.11ax20	Right edge	157	5785	1.002	16.682	17.50	1.207	-0.13	0.274	0.331
	802.11ax20	Top edge	157	5785	1.002	16.682	17.50	1.207	0.05	0.352	0.426

Remark:

1) The maximum Scaled SAR value is marked in bold.

2) When multiple transmission modes (802.11a/g/n/ac) have the same specified maximum output power, largest channel bandwidth, lowest order modulation and lowest data rate, the lowest order 802.11 mode is selected; i.e., 802.11a is chosen over 802.11n then 802.11ac or 802.11g is chosen

over 802.11n.

SAR Values [Bluetooth] ANT A

Plot No.	Mode	Test Position	Ch.	Freq. (MHz)	Conducted 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 distance 0mm										
	8-DPSK	Front	78	2480	12.627	13.00	1.090	0.01	0.178	0.194
#7	8-DPSK	Back	78	2480	12.627	13.00	1.090	-0.15	**0.201**	**0.219**
	8-DPSK	Right edge	78	2480	12.627	13.00	1.090	0.19	0.133	0.145
	8-DPSK	Top edge	78	2480	12.627	13.00	1.090	0.02	0.147	0.160

Remark:

1) The maximum Scaled SAR value is marked in bold.

11 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.

$$\text{Ratio}=\frac{(SAR_1+SAR_2)^{1.5}}{(\text{peak location separation,mm})}<0.04$$

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:

No.	Simultaneous Transmission Configurations	Body
1	2.4GHz WLAN A+2.4GHz WLAN B	Yes
2	5.2GHz WLAN A+5.2GHz WLAN B	Yes
3	5.8GHz WLAN A+5.8GHz WLAN B	Yes
4	Bluetooth ANT A+2.4GHz WLAN B	Yes
5	Bluetooth ANT A+5.2GHz WLAN B	Yes
6	Bluetooth ANT A+5.8GHz WLAN B	Yes

Note: WIFI 2.4G and WIFI 5G it cannot transmit simultaneously.

Evaluation of Simultaneous SAR

Exposure Position	1 MAX. WLAN2.4G ANT A Reported SAR SAR1g (W/kg)	2 MAX. WLAN2.4G ANT B Reported SAR SAR1g (W/kg)	3 MAX. WLAN5.2G ANT A Reported SAR SAR1g (W/kg)	4 MAX. WLAN5.2G ANT B Reported SAR SAR1g (W/kg)	5 MAX. WLAN5.8G ANT A Reported SAR SAR1g (W/kg)	6 MAX. WLAN5.8G ANT B Reported SAR SAR1g (W/kg)	7 MAX. BT ANT A Reported SAR SAR1g (W/kg)	1+2 Summed 1g SAR (W/kg)	3+4 Summed 1g SAR (W/kg)	5+6 Summed 1g SAR (W/kg)	2+7 Summed 1g SAR (W/kg)	4+7 Summed 1g SAR (W/kg)	6+7 Summed 1g SAR (W/kg)	SPLSR
Front	0.508	0.535	0.496	0.485	0.556	0.468	0.194	1.043	0.981	1.024	0.729	0.679	0.662	
Back	0.573	0.587	0.556	0.540	0.597	0.524	0.219	**1.160**	1.096	1.121	0.806	0.759	0.743	N/A
Left edge	/	0.460	0.366	0.431	0.498	0.401	/	0.460	0.797	0.899	0.460	0.431	0.401	N/A
Right edge	0.416	0.397	0.432	0.356	0.425	0.331	0.145	0.813	0.788	0.756	0.542	0.501	0.476	N/A
Top edge	0.476	0.489	0.456	0.456	0.532	0.426	0.160	0.965	0.912	0.958	0.649	0.616	0.586	N/A
Bottom edge	/	/	/	/	/	/	/	/	/	/	/	/	/	N/A

MAX. ΣSAR_{1g} =**1.160**W/kg<1.6 W/kg, so the Simultaneous transmission SAR with volume scan are not required.

12 Measurement Uncertainty

When the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. to KDB 865664D01.

Appendix A. EUT Photos and Test Setup Photos

Front side(0mm)

Back side(0mm)


Left side(0mm)

Right edge(0mm)

Top edge(0mm)

Appendix B. Plots of SAR System Check

2450MHz System Check Date: 11/29/2024

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 745
Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.778 S/m; εr = 39.658; ρ = 1000 kg/m3
Phantom section: Flat Section

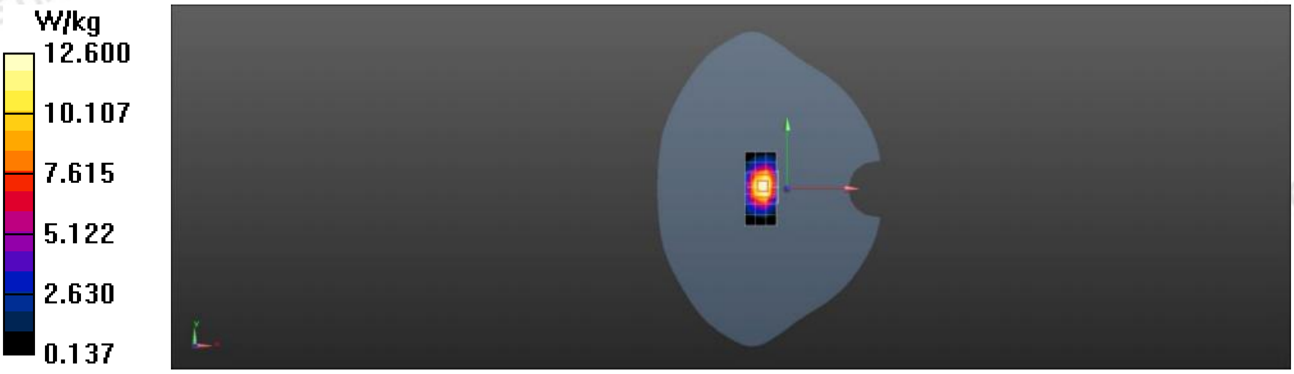
DASY5 Configuration:

- Probe: EX3DV4 - SN7396; ConvF(7.57, 7.57, 7.57); Calibrated: May. 06, 2024
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 09/02/2024
- 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 (4x8x1): Measurement grid: dx=12 mm, dy=12 mm
Maximum value of SAR (Measurement) = 11.5 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 99.25 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 20.4 W/kg

SAR(1 g) = 6.66 W/kg; SAR(10 g) = 3.33 W/kg
Maximum value of SAR (measured) = 12.6 W/kg



System Performance Check 2450MHz 125mW

5250MHz System Check

Date: 12/02/2024

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: 1160

Communication System: CW; Frequency: 5250 MHz;Duty Cycle: 1:1

Medium parameters used: f = 5250 MHz; σ =4.754 S/m; εr = 35.895; ρ = 1000 kg/m3

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7396; ConvF(5.33, 5.33, 5.33); Calibrated: May. 06, 2024
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 09/02/2024
- 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 (5x5x1): Measurement grid: dx=10 mm, dy=10 mm

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

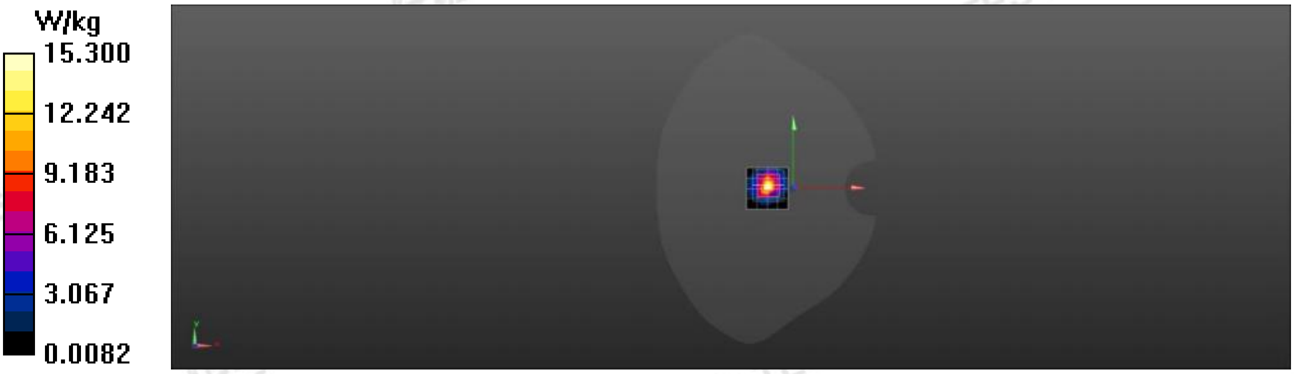
Zoom Scan (7x7x12): Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 67.30 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) =21.4 W/kg

SAR(1 g) = 7.54 W/kg; SAR(10 g) = 2.24 W/kg

Maximum value of SAR (measured) = 15.3 W/kg



System Performance Check 5250MHz 100mW

5750MHz System Check

Date: 12/02/2024

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: 1160

Communication System: CW; Frequency: 5750 MHz;Duty Cycle: 1:1

Medium parameters used: f = 5750 MHz; σ =5.325 S/m; εr = 34.586; ρ = 1000 kg/m3

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7396; ConvF(4.92, 4.92, 4.92); Calibrated: May. 06, 2024
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 09/02/2024
- 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 (5x5x1): Measurement grid: dx=10 mm, dy=10 mm

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

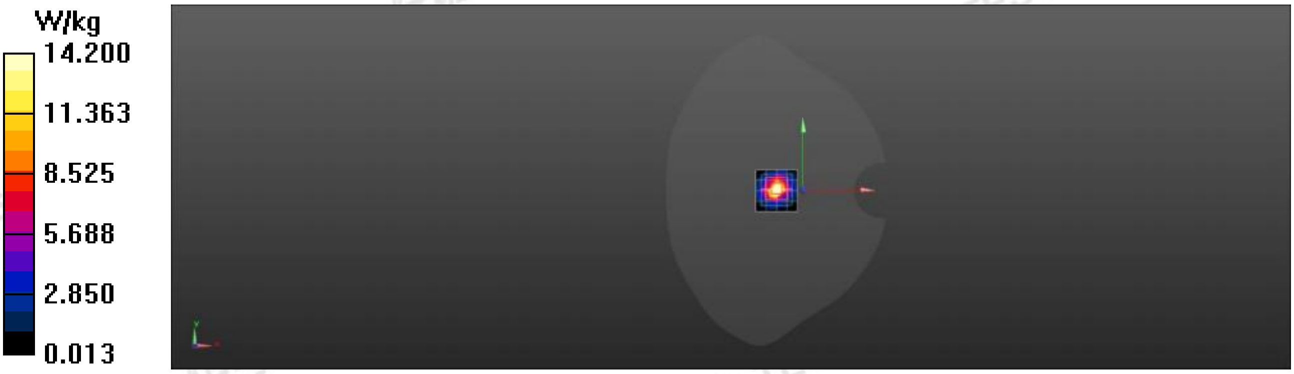
Zoom Scan (7x7x12): Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 70.00 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) =20.6 W/kg

SAR(1 g) = 7.71 W/kg; SAR(10 g) = 2.45 W/kg

Maximum value of SAR (measured) = 14.2 W/kg



System Performance Check 5750MHz 100mW

Appendix C. Plots of SAR Test Data

#1

Date: 11/29/2024

WIFI2.4G_802.11b_Back_0mm_Ch01_ANT A

Communication System: UID 0, Generic WIFI (0); Frequency: 2412 MHz;Duty Cycle: 1:1.140
Medium parameters used: f = 2412 MHz; σ = 1.884 S/m; εr =37.444; ρ = 1000 kg/m^3
Phantom section: Flat Section

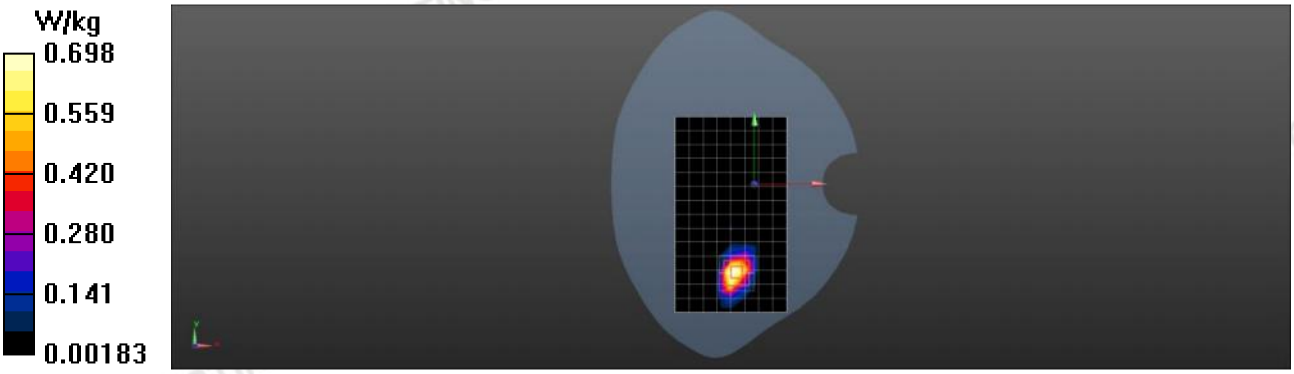
DASY5 Configuration:

- Probe: EX3DV4 - SN7396; ConvF(7.57, 7.57, 7.57); Calibrated: May. 06, 2024
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 09/02/2024
- 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 (9x15x1): Measurement grid: dx=12 mm, dy=12 mm
Maximum value of SAR (Measurement) = 0.668 W/kg

Front /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.344 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 1.04 W/kg

SAR(1 g) = 0.412 W/kg; SAR(10 g) = 0.255 W/kg
Maximum value of SAR (measured) =0.698 W/kg



#2

Date: 11/29/2024

WIFI2.4G_802.11b_Back_0mm_Ch11_ANT B

Communication System: UID 0, Generic WIFI (0); Frequency: 2462 MHz;Duty Cycle: 1:1.090

Medium parameters used: f = 2462 MHz; σ = 1.811 S/m; εr =38.874; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7396; ConvF(7.57, 7.57, 7.57); Calibrated: May. 06, 2024
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 09/02/2024
- 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 (9x15x1): Measurement grid: dx=12 mm, dy=12 mm

Maximum value of SAR (Measurement) = 0.704 W/kg

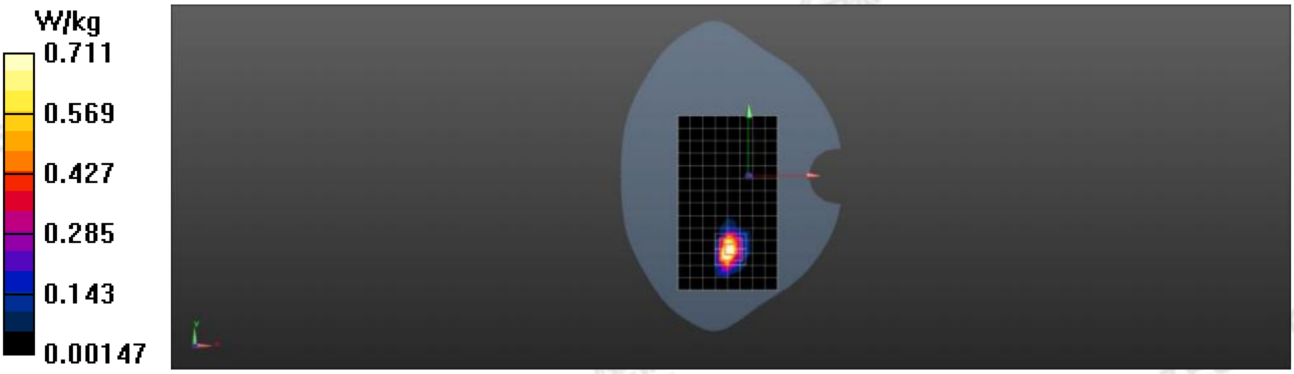
Front /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 1.168 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 1.22 W/kg

SAR(1 g) = 0.511 W/kg; SAR(10 g) = 0.318 W/kg

Maximum value of SAR (measured) =0.711 W/kg



#3

Date: 12/02/2024

WIFI5.2G_802.11ax40_Back_0mm_Ch38_ANT A

Communication System: UID 0, Generic WIFI (0); Frequency: 5190 MHz;Duty Cycle: 1:1.002

Medium parameters used: f = 5190 MHz; σ = 4.574 S/m; εr =36.985; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7396; ConvF(5.33, 5.33, 5.33); Calibrated: May. 06, 2024
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 09/02/2024
- 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 (11x16x1): Measurement grid: dx=10 mm, dy=10 mm

Maximum value of SAR (Measurement) = 1.03 W/kg

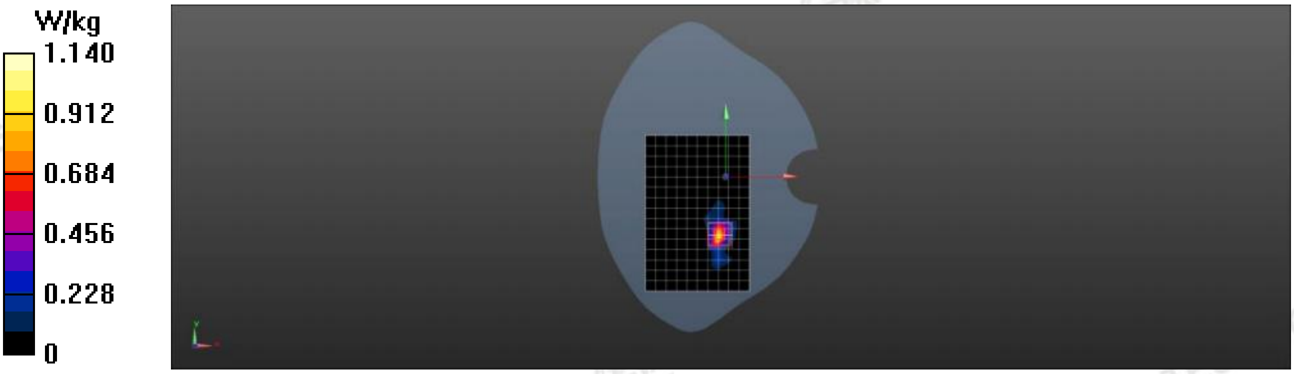
Front /Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.627 V/m; Power Drift = -0.17 dB

Peak SAR (extrapolated) = 1.88 W/kg

SAR(1 g) = 0.488 W/kg; SAR(10 g) = 0.297 W/kg

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



#4

Date: 12/02/2024

WIFI5.2G_802.11a_Back_0mm_Ch36_ANT B

Communication System: UID 0, Generic WIFI (0); Frequency: 5180 MHz;Duty Cycle: 1:1.048

Medium parameters used: f = 5180 MHz; σ = 4.489 S/m; εr =37.114; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7396; ConvF(5.33, 5.33, 5.33); Calibrated: May. 06, 2024
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 09/02/2024
- 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 (11x16x1): Measurement grid: dx=10 mm, dy=10 mm

Maximum value of SAR (Measurement) = 1.12 W/kg

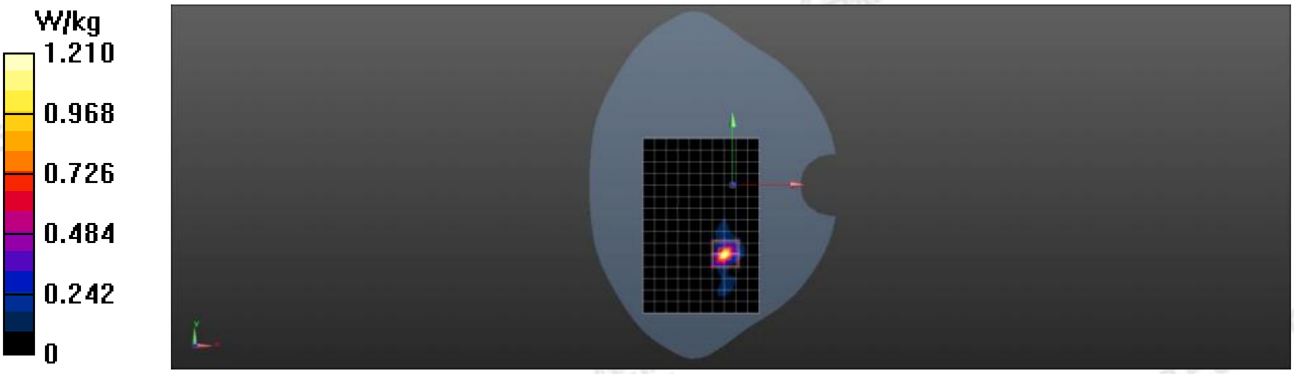
Front /Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 0.8200 V/m; Power Drift =-0.18 dB

Peak SAR (extrapolated) = 2.14 W/kg

SAR(1 g) = 0.459 W/kg; SAR(10 g) = 0.311 W/kg

Maximum value of SAR (measured) =1.21 W/kg



#5

Date: 12/02/2024

WIFI5.8G_802.11a_Back_0mm_Ch149_ANT A

Communication System: UID 0, Generic WIFI (0); Frequency: 5745 MHz;Duty Cycle: 1:1.048

Medium parameters used: f = 5745 MHz; σ = 5.396 S/m; εr =34.415; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7396; ConvF(4.92,4.92, 4.92); Calibrated: May. 06, 2024
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 09/02/2024
- 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 (9x16x1): Measurement grid: dx=10 mm, dy=10 mm

Maximum value of SAR (Measurement) = 0.631 W/kg

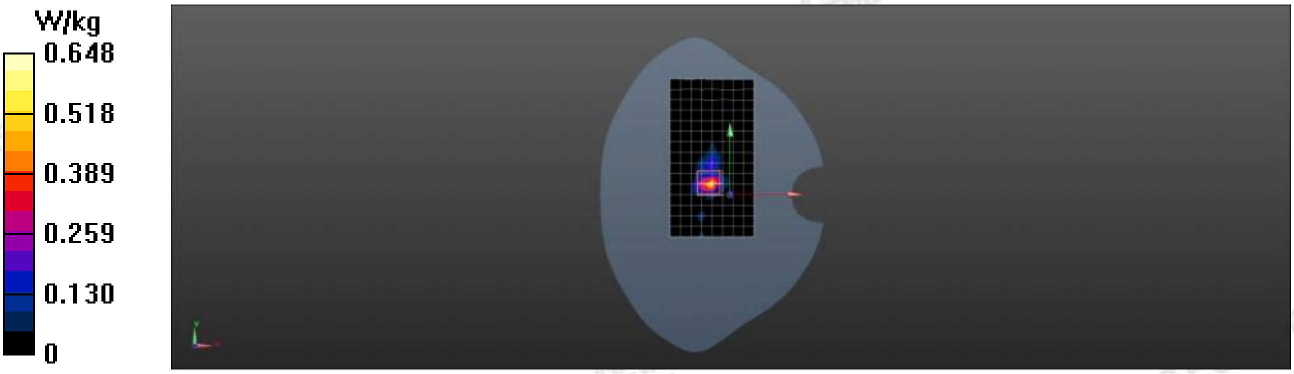
Front /Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value =2.849 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 13.9 W/kg

SAR(1 g) = 0.472 W/kg; SAR(10 g) = 0.174 W/kg

Maximum value of SAR (measured) =0.648 W/kg



#6

Date: 12/02/2024

WIFI5.8G_802.11ax20_Back_0mm_Ch157_ANT B

Communication System: UID 0, Generic WIFI (0); Frequency: 5785 MHz;Duty Cycle: 1:1.002

Medium parameters used: f = 5785 MHz; σ = 5.145 S/m; εr =36.664; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7396; ConvF(4.92,4.92, 4.92); Calibrated: May. 06, 2024
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 09/02/2024
- 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 (9x16x1): Measurement grid: dx=10 mm, dy=10 mm

Maximum value of SAR (Measurement) = 0.581 W/kg

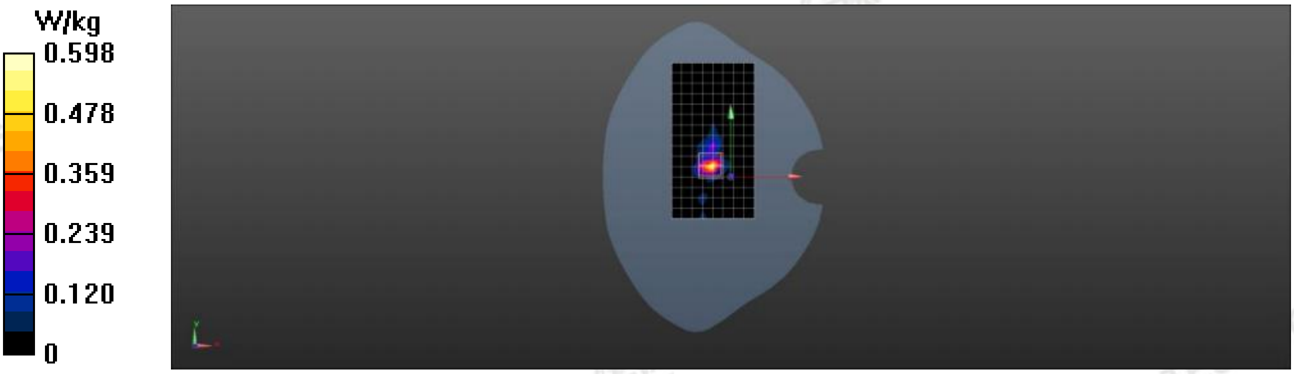
Front /Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value =2.849 V/m; Power Drift = -0.16 dB

Peak SAR (extrapolated) = 1.07 W/kg

SAR(1 g) = 0.433 W/kg; SAR(10 g) = 0.241 W/kg

Maximum value of SAR (measured) =0.598 W/kg



#7

Date: 11/29/2024

Bluetooth_8-DPSK_Back_0mm_Ch78_ANT A

Communication System: UID 0, Generic WIFI (0); Frequency: 2480 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2480 MHz; σ = 1.854 S/m; εr =37.715; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7396; ConvF(7.57, 7.57, 7.57); Calibrated: May. 06, 2024
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 09/02/2024
- 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 (9x15x1): Measurement grid: dx=12 mm, dy=12 mm

Maximum value of SAR (Measurement) = 0.94 W/kg

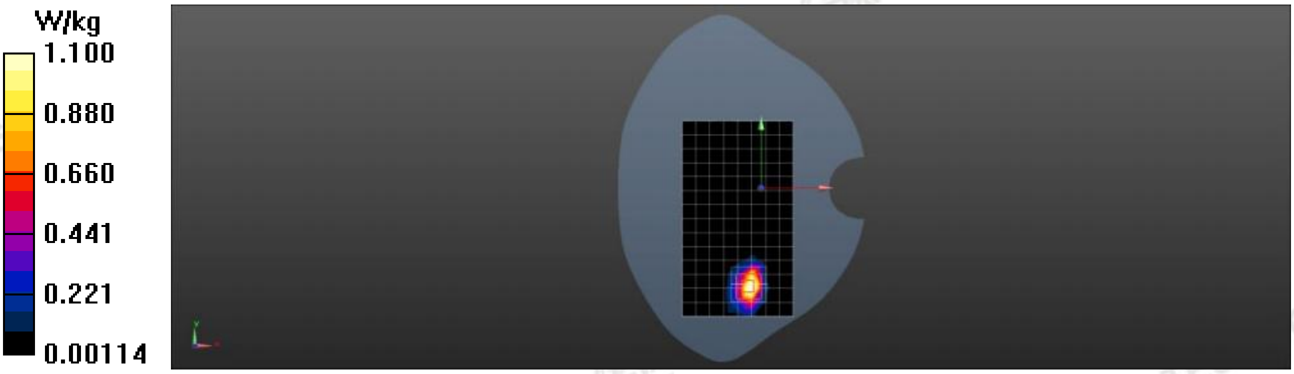
Front /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.8950 V/m; Power Drift = -0.15 dB

Peak SAR (extrapolated) = 1.87 W/kg

SAR(1 g) = 0.201 W/kg; SAR(10 g) = 0.118 W/kg

Maximum value of SAR (measured) =1.10 W/kg



Appendix D. DASY System Calibration Certificate

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

Client Anbotek (Auden) Certificate No: Z24-98671

CALIBRATION CERTIFICATE

Object EX3DV4 - SN:7396

Calibration Procedure(s) FF-Z12-006-08
Calibration Procedures for Dosimetric E-field Probes

Calibration date: May 06 , 2024

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

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)℃ 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	20-Jun-23 (CTTL, No.J23 X07447)	Jun-23
Power sensor NRP-Z91	101547	20-Jun-23 (CTTL, No.J23 X07447)	Jun-23
Power sensor NRP-Z91	101548	20-Jun-23 (CTTL, No.J23 X07447)	Jun-23
Reference10dBAttenuator	18N50W-10dB	13-Mar-24(CTTL,No.J24X01547)	Mar-24
Reference20dBAttenuator	18N50W-20dB	13-Mar-24(CTTL, No.J24X01548)	Mar-24
Reference Probe EX3DV4	SN 7433	26-Sep-23(SPEAG,No.EX3-7433_Sep22)	Sep-23
DAE4	SN 549	13-Dec-23(SPEAG, No.DAE4-549_Dec22)	Dec -23
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGeneratorMG3700A	6201052605	27-Jun-23 (CTTL, No.J23X04776)	Jun-23
Network Analyzer E5071C	MY46110673	13-Jan-24 (CTTL, No.J24X00285)	Jan -24

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

Issued: May06 , 2024

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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, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005

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).

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Probe EX3DV4

SN: 7396

Calibrated: May 06, 2024

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 7396

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm(μV/(V/m)^2)[A]	0.54	0.53	0.50	±10.0%
DCP(mV)[B]	97.8	104.5	102.5	

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	199.9	±2.4%
		Y	0.0	0.0	1.0		203.3	
		Z	0.0	0.0	1.0		195.0	

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 5 and Page 6).
[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.

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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 7396

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	9.82	9.82	9.82	0.30	0.85	±12.1%
835	41.5	0.90	9.71	9.71	9.71	0.15	1.36	±12.1%
900	41.5	0.97	9.87	9.87	9.87	0.16	1.37	±12.1%
1750	40.1	1.37	8.61	8.61	8.61	0.25	1.04	±12.1%
1900	40.0	1.40	8.13	8.13	8.13	0.24	1.01	±12.1%
2100	39.8	1.49	8.14	8.14	8.14	0.24	1.04	±12.1%
2300	39.5	1.67	7.85	7.85	7.85	0.40	0.75	±12.1%
2450	39.2	1.80	7.57	7.57	7.57	0.50	0.75	±12.1%
2600	39.0	1.96	7.38	7.38	7.38	0.64	0.68	±12.1%
5250	35.9	4.71	5.33	5.33	5.33	0.45	1.30	±13.3%
5600	35.5	5.07	4.89	4.89	4.89	0.45	1.35	±13.3%
5750	35.4	5.22	4.92	4.92	4.92	0.45	1.45	±13.3%

[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 below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ±5%. 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.

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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 7396

Calibration Parameter Determined in Body 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	55.5	0.96	10.09	10.09	10.09	0.30	0.90	±12.1%
835	55.2	0.97	9.88	9.88	9.88	0.19	1.32	±12.1%
900	55.0	1.05	9.82	9.82	9.82	0.23	1.15	±12.1%
1750	53.4	1.49	8.24	8.24	8.24	0.24	1.06	±12.1%
1900	53.3	1.52	7.97	7.97	7.97	0.19	1.24	±12.1%
2100	53.2	1.62	8.18	8.18	8.18	0.19	1.39	±12.1%
2300	52.9	1.81	7.88	7.88	7.88	0.55	0.80	±12.1%
2450	52.7	1.95	7.53	7.53	7.53	0.46	0.89	±12.1%
2600	52.5	2.16	7.38	7.38	7.38	0.52	0.80	±12.1%
5250	48.9	5.36	4.93	4.93	4.93	0.45	1.80	±13.3%
5600	48.5	5.77	4.19	4.19	4.19	0.48	1.90	±13.3%
5750	48.3	5.94	4.52	4.52	4.52	0.48	1.95	±13.3%

[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 below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ±5%. 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.

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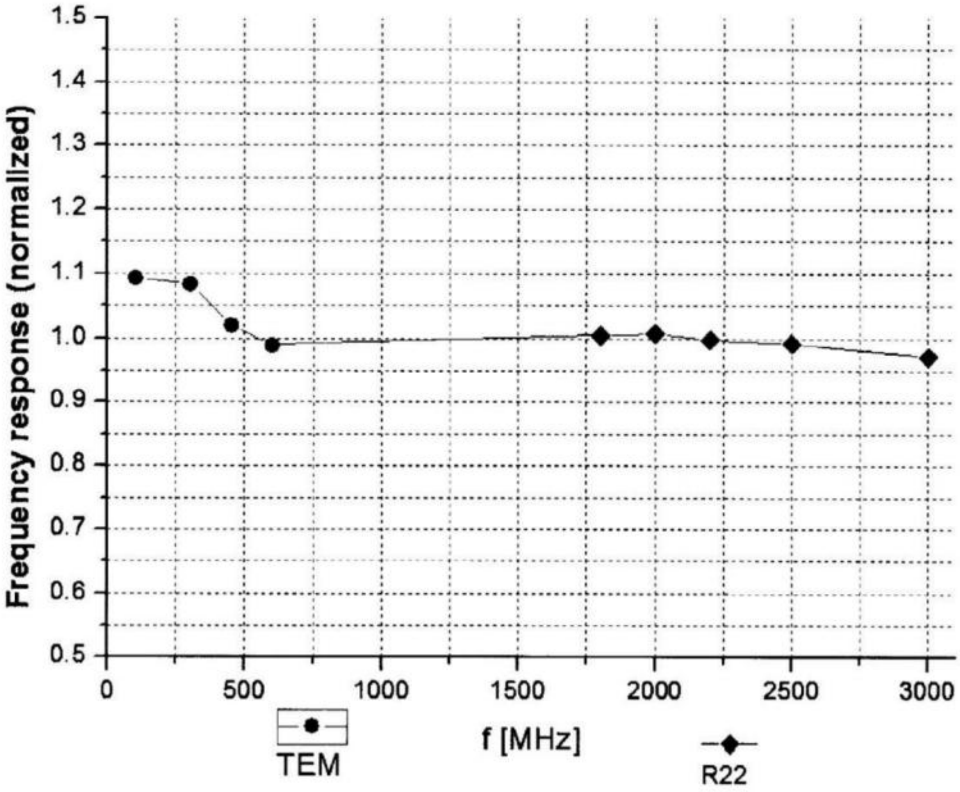
Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



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

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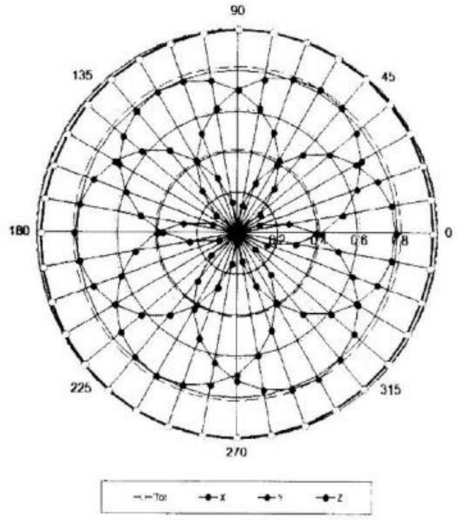
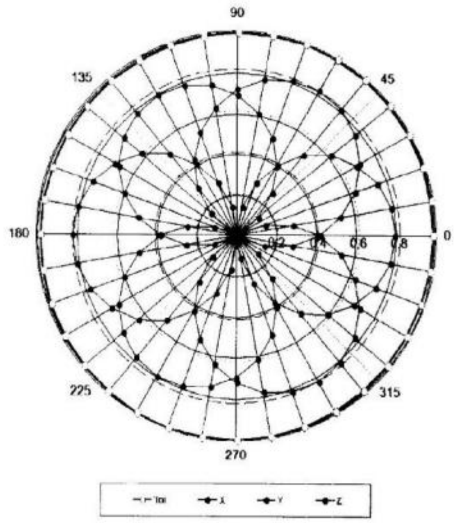
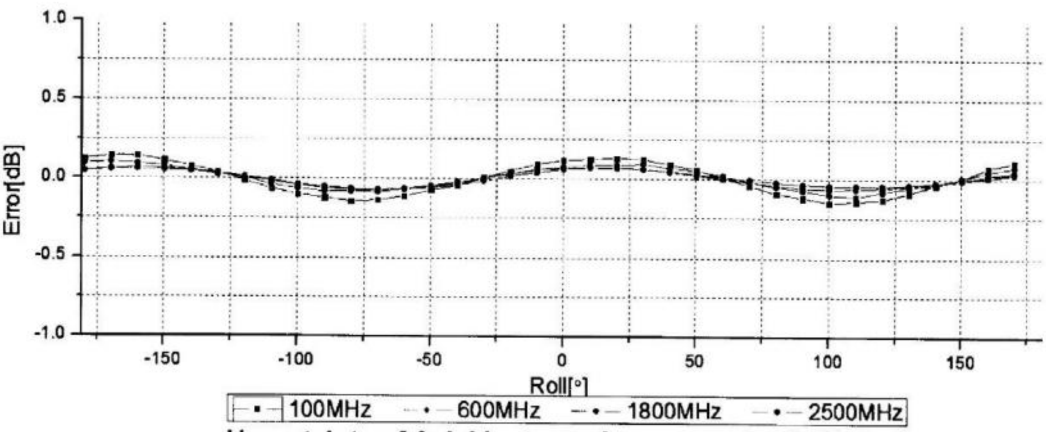
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM



f=1800 MHz, R22





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

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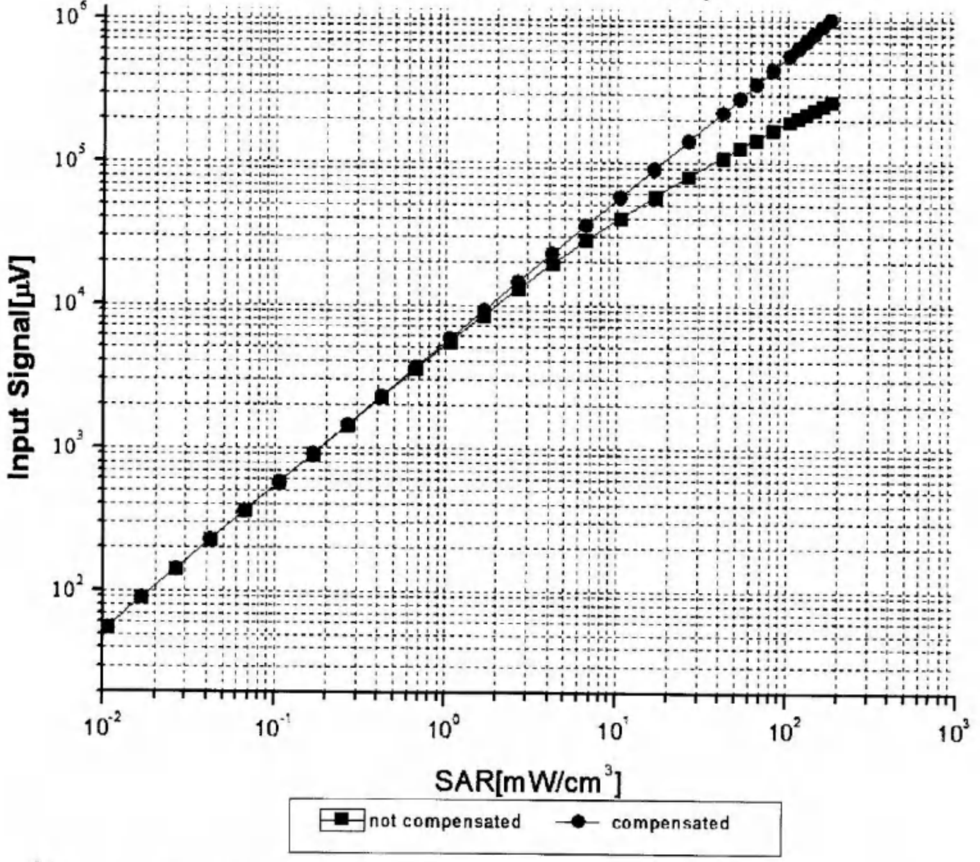
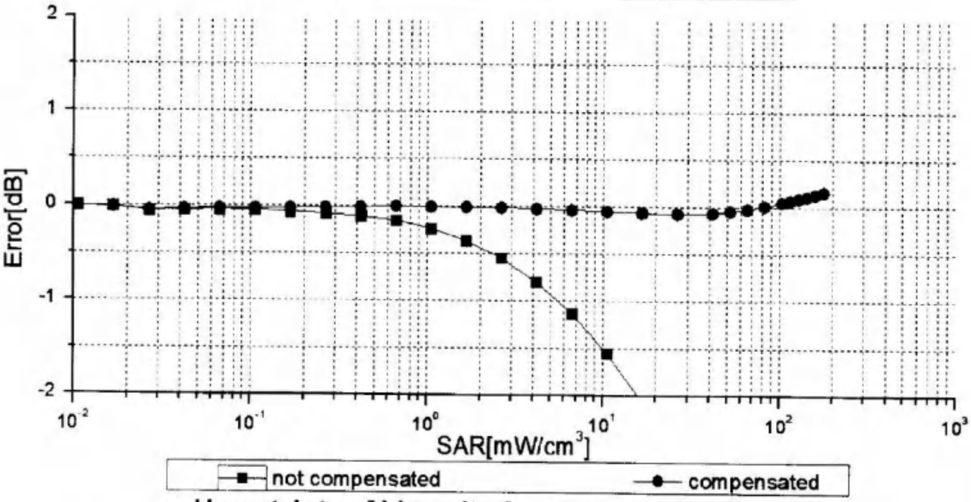
Dynamic Range f(SAR_{head})
(TEM cell, f = 900 MHz)





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

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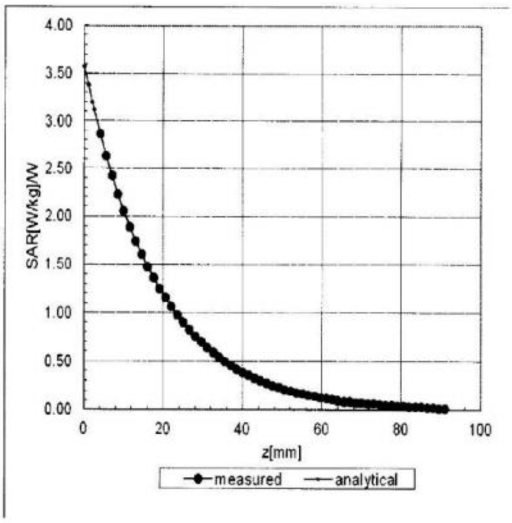
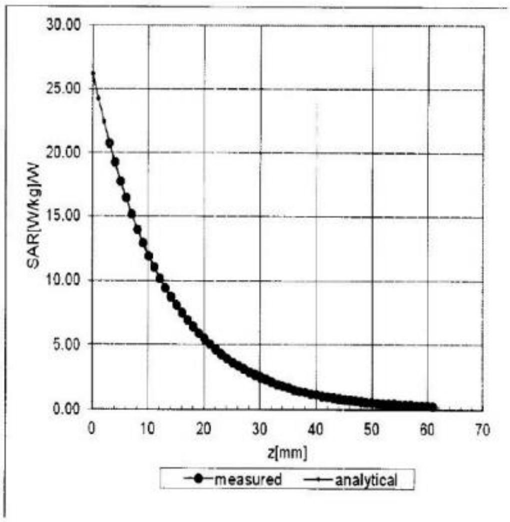
Conversion Factor Assessment

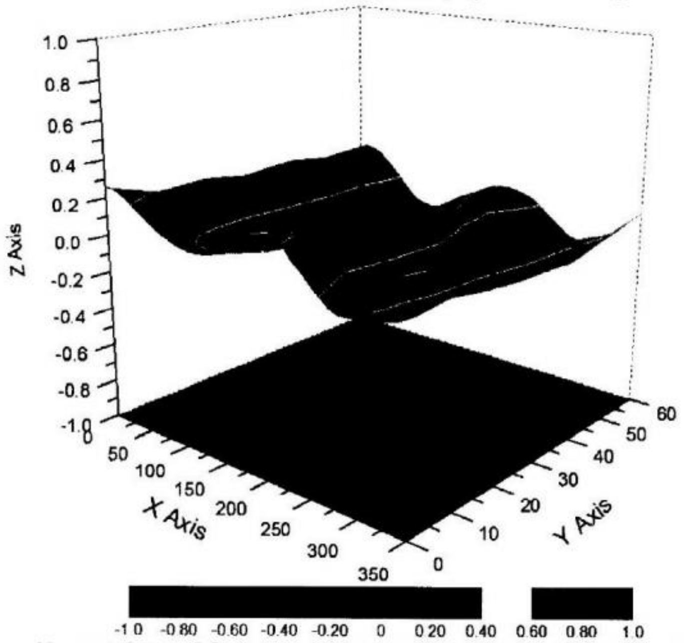
f=900 MHz, WGLS R9(H_convF)



f=1750 MHz, WGLS R22(H_convF)



Deviation from Isotropy in Liquid



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

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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 7396

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	156.9
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

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Accreditation No.: SCS 0108

Client Anbotek (Auden)

Certificate No: DAE4-387_Sep02

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BM - SN: 387
Calibration procedure(s)	QA CAL-06.v29 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	September 02, 2024

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	15-Aug-24 (No:22092)	Aug-24
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Auto DAE Calibration Unit	SE UWS 053 AA 1001	05-Jan-24 (in house check)	In house check: Jan-24
Calibrator Box V2.1	SE UMS 006 AA 1002	05-Jan-24 (in house check)	In house check: Jan-24

	Name	Function	Signature
Calibrated by:	Dominique Steffen	Laboratory Technician	
Approved by:	Sven Kühn	Deputy Manager	i.V.

Issued: September 02, 2024

Calibration Laboratory of
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Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: **SCS 0108**

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 following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
  - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
  - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
  - *Input Offset Measurement*: Output voltage and statistical results over a large number of zero voltage measurements.
  - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - *Input resistance:* Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
  - *Power consumption:* Typical value for information. Supply currents in various operating modes.

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	404.489 ± 0.02% (k=2)	404.852 ± 0.02% (k=2)	404.862 ± 0.02% (k=2)
Low Range	3.97827 ± 1.50% (k=2)	3.95875 ± 1.50% (k=2)	3.97982 ± 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	53.0 ° ± 1 °

Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	200032.85	-3.31	-0.00
Channel X	+ Input	20007.64	1.88	0.01
Channel X	- Input	-20003.48	1.18	-0.01
Channel Y	+ Input	200034.23	-1.43	-0.00
Channel Y	+ Input	20006.60	0.91	0.00
Channel Y	- Input	-20004.04	0.72	-0.00
Channel Z	+ Input	200035.38	-0.83	-0.00
Channel Z	+ Input	20003.69	-2.11	-0.01
Channel Z	- Input	-20006.38	-1.59	0.01

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	2001.63	0.08	0.00
Channel X	+ Input	202.29	0.70	0.35
Channel X	- Input	-197.90	0.60	-0.30
Channel Y	+ Input	2001.33	-0.07	-0.00
Channel Y	+ Input	200.86	-0.60	-0.30
Channel Y	- Input	-199.87	-1.23	0.62
Channel Z	+ Input	2001.61	0.27	0.01
Channel Z	+ Input	200.60	-0.70	-0.35
Channel Z	- Input	-199.51	-0.85	0.43

2. Common mode sensitivity

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

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	13.50	11.56
	- 200	-8.64	-11.18
Channel Y	200	-0.81	-1.28
	- 200	1.05	0.09
Channel Z	200	7.17	6.91
	- 200	-9.46	-9.01

3. Channel separation

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

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	-1.70	0.33
Channel Y	200	10.70	-	-0.38
Channel Z	200	7.11	7.89	-

4. AD-Converter Values with inputs shorted

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

	High Range (LSB)	Low Range (LSB)
Channel X	15969	17466
Channel Y	15661	16162
Channel Z	15990	16190

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	0.73	-2.58	3.29	0.62
Channel Y	0.41	-0.49	1.23	0.40
Channel Z	-0.80	-1.88	0.30	0.42

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	−0.01	-8	-9

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Client CTA Certificate No: J23Z60389

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 745
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	August 28, 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)°C and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	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

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Glossary:

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

Calibration is Performed According to the Following Standards:

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

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

Additional Documentation:

c) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

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Measurement Conditions

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

DASY Version	DASY52	52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.0 ± 6 %	1.84 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.3 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.7 W/kg ± 18.8 % (*k*=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.16 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.5 W/kg ± 18.7 % (*k*=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.2Ω+ 5.40jΩ
Return Loss	- 23.7dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.077 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

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DASY5 Validation Report for Head TSL Date: 2023-08-28

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 745

Communication System: UID 0, CW; Frequency: 2450 MHz

Medium parameters used: f = 2450 MHz; σ = 1.835 S/m; ε_r = 39.03; ρ = 1000 kg/m^3

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(7.68, 7.68, 7.68) @ 2450 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 = 101.5 V/m; Power Drift = -0.05 dB

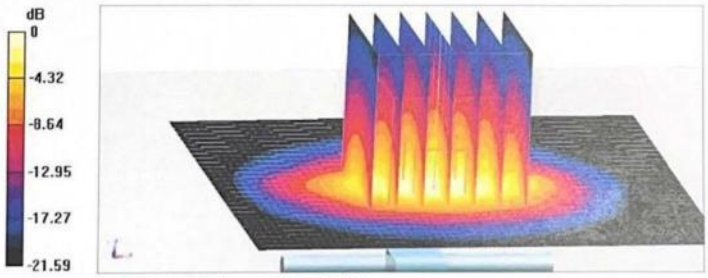
Peak SAR (extrapolated) = 27.7 W/kg

SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.16 W/kg

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

Ratio of SAR at M2 to SAR at M1 = 48.5%

Maximum value of SAR (measured) = 22.4 W/kg



0 dB = 22.4 W/kg = 13.50 dBW/kg

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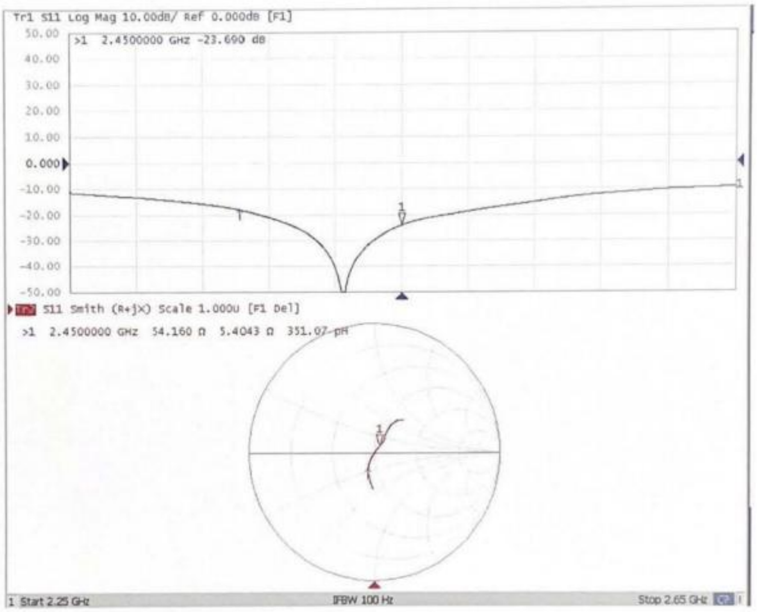
Impedance Measurement Plot for Head TSL



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Accreditation No.: **SCS 0108**

Client **Anbotek (Auden)**

Certificate No: **D5GHzV2-1160_Oct11**

CALIBRATION CERTIFICATE

Object: D5GHzV2 - SN: 1160

Calibration procedure(s): QA CAL-22.v2
Calibration procedure for dipole validation kits between 3-6 GHz

Calibration date: October 02,2024

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	07-Oct-17 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-20 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-20 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	01-Apr-21 (No. 217-02131)	Mar-16
Type-N mismatch combination	SN: 5047.2 / 06327	01-Apr-21 (No. 217-02134)	Mar-16
Reference Probe EX3DV4	SN: 3503	30-Dec-20 (No. EX3-3503_Dec14)	Dec-15
DAE4	SN: 601	17-Aug-21 (No. DAE4-601_Aug15)	Aug-16

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100972	18-Jun-21 (in house check Jun-15)	In house check: Jun-18
Network Analyzer HP 8753E	US37390585 S4206	15-Oct-20 (in house check Oct-14)	In house check: Oct-15

	Name	Function	Signature
Calibrated by:	Leif Klysner	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: October 6, 2021

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Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

a) 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 62209-2, "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
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) 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%.

Measurement Conditions

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

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz ± 1 MHz 5300 MHz ± 1 MHz 5600 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.4 ± 6 %	4.57 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.06 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**80.7 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.31 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.1 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.2 ± 6 %	4.68 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5300 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.26 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**82.7 W / kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.39 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.9 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.7 ± 6 %	5.03 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.69 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**87.0 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.47 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.7 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.3 ± 6 %	5.26 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.20 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**82.0 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.31 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.1 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.9 ± 6 %	5.35 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.81 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**77.8 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.18 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.7 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.42 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.7 ± 6 %	5.49 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5300 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.88 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**78.4 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.20 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.9 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.7 ± 6 %	5.99 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.20 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**81.5 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.30 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**22.8 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.4 ± 6 %	6.27 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.88 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**78.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.20 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.8 W/kg ± 19.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	48.1 Ω - 8.5 jΩ
Return Loss	- 21.0 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	50.2 Ω - 5.2 jΩ
Return Loss	- 25.7 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	54.8 Ω - 2.5 jΩ
Return Loss	- 25.7 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	53.0 Ω - 3.0 jΩ
Return Loss	- 27.7 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	48.6 Ω - 6.8 jΩ
Return Loss	- 23.0 dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	49.0 Ω - 4.2 jΩ
Return Loss	- 27.1 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	56.2 Ω - 0.7 jΩ
Return Loss	- 24.6 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	55.9 Ω - 1.7 jΩ
Return Loss	- 24.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.199 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	June 06, 2013

DASY5 Validation Report for Head TSL

Date: 24.09.2021

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1160

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 4.57 S/m; ε_r = 36.4; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 4.68 S/m; ε_r = 36.2; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 5.03 S/m; ε_r = 35.7; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 5.26 S/m; ε_r = 35.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

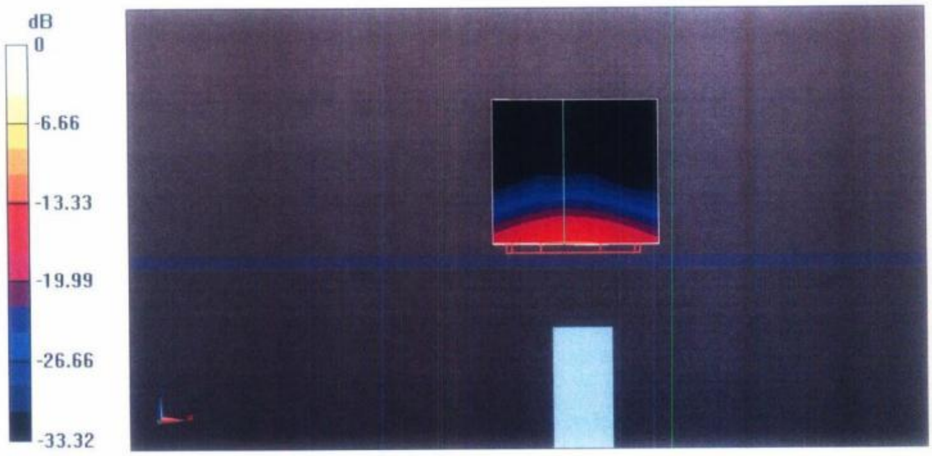
- Probe: EX3DV4 - SN3503; ConvF(5.51, 5.51, 5.51); Calibrated: 30.12.2021, ConvF(5.21, 5.21, 5.21); Calibrated: 30.12.2021, ConvF(4.92, 4.92, 4.92); Calibrated: 30.12.2021, ConvF(4.9, 4.9, 4.9); Calibrated: 30.12.2021,
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 17.08.2021
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.41 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 29.3 W/kg
SAR(1 g) = 8.06 W/kg; SAR(10 g) = 2.31 W/kg
Maximum value of SAR (measured) = 18.7 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.31 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 31.1 W/kg
SAR(1 g) = 8.26 W/kg; SAR(10 g) = 2.39 W/kg
Maximum value of SAR (measured) = 19.4 W/kg

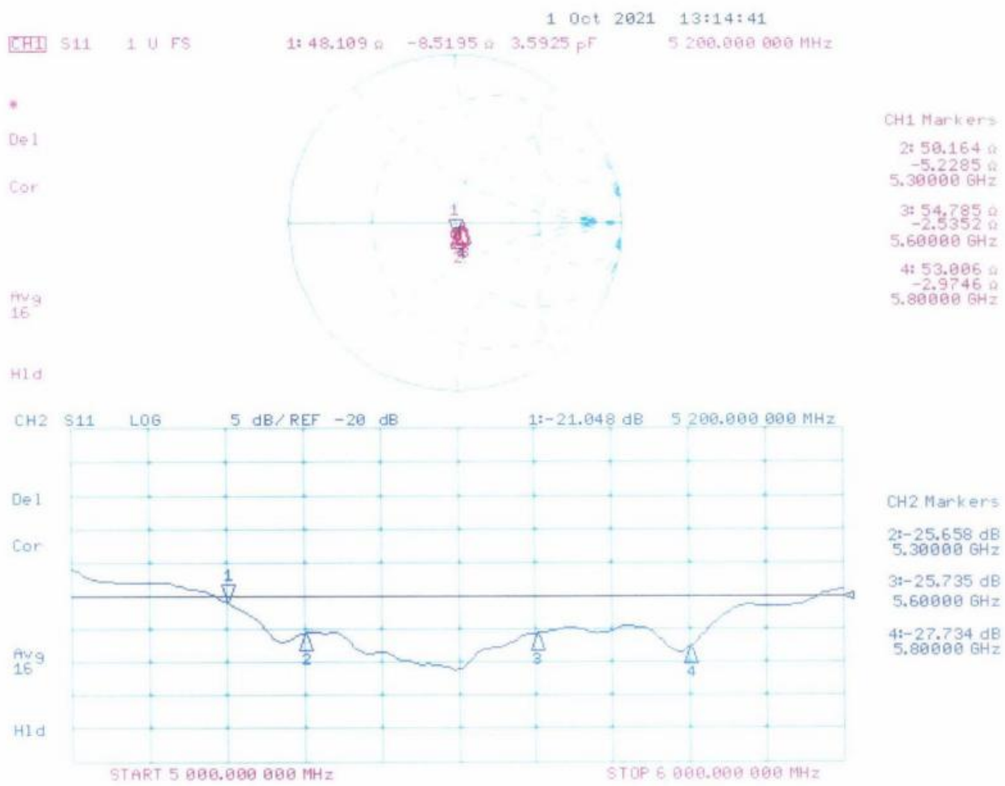
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.34 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 34.7 W/kg
SAR(1 g) = 8.69 W/kg; SAR(10 g) = 2.47 W/kg
Maximum value of SAR (measured) = 21.0 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 62.41 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 34.5 W/kg
SAR(1 g) = 8.2 W/kg; SAR(10 g) = 2.31 W/kg
Maximum value of SAR (measured) = 20.5 W/kg



0 dB = 18.7 W/kg = 12.72 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 05.10.2021

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1160

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 5.35 S/m; ε_r = 47.9; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 5.49 S/m; ε_r = 47.7; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 5.99 S/m; ε_r = 46.7; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 6.27 S/m; ε_r = 46.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

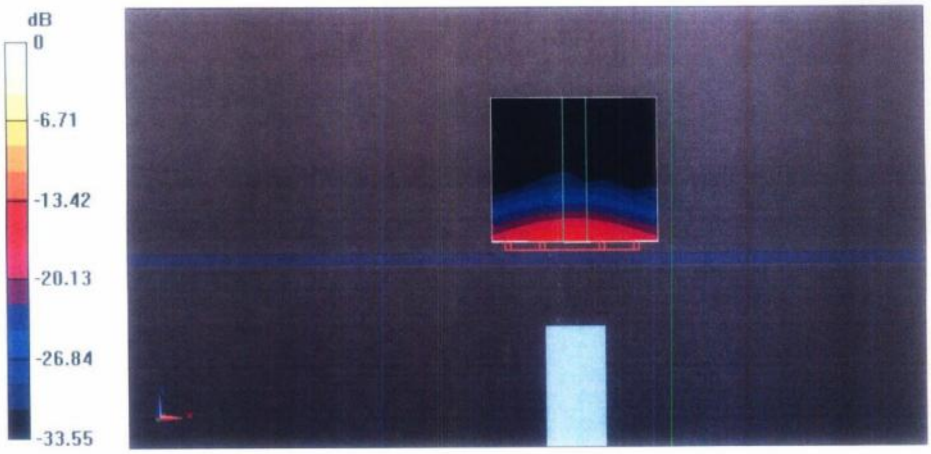
- Probe: EX3DV4 - SN3503; ConvF(4.95, 4.95, 4.95); Calibrated: 30.12.2021, ConvF(4.78, 4.78, 4.78); Calibrated: 30.12.2021; ConvF(4.35, 4.35, 4.35); Calibrated: 30.12.2021, ConvF(4.32, 4.32, 4.32); Calibrated: 30.12.2021;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 17.08.2021
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 67.32 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 30.4 W/kg
SAR(1 g) = 7.81 W/kg; SAR(10 g) = 2.18 W/kg
Maximum value of SAR (measured) = 18.2 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 67.22 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 31.6 W/kg
SAR(1 g) = 7.88 W/kg; SAR(10 g) = 2.2 W/kg
Maximum value of SAR (measured) = 18.8 W/kg

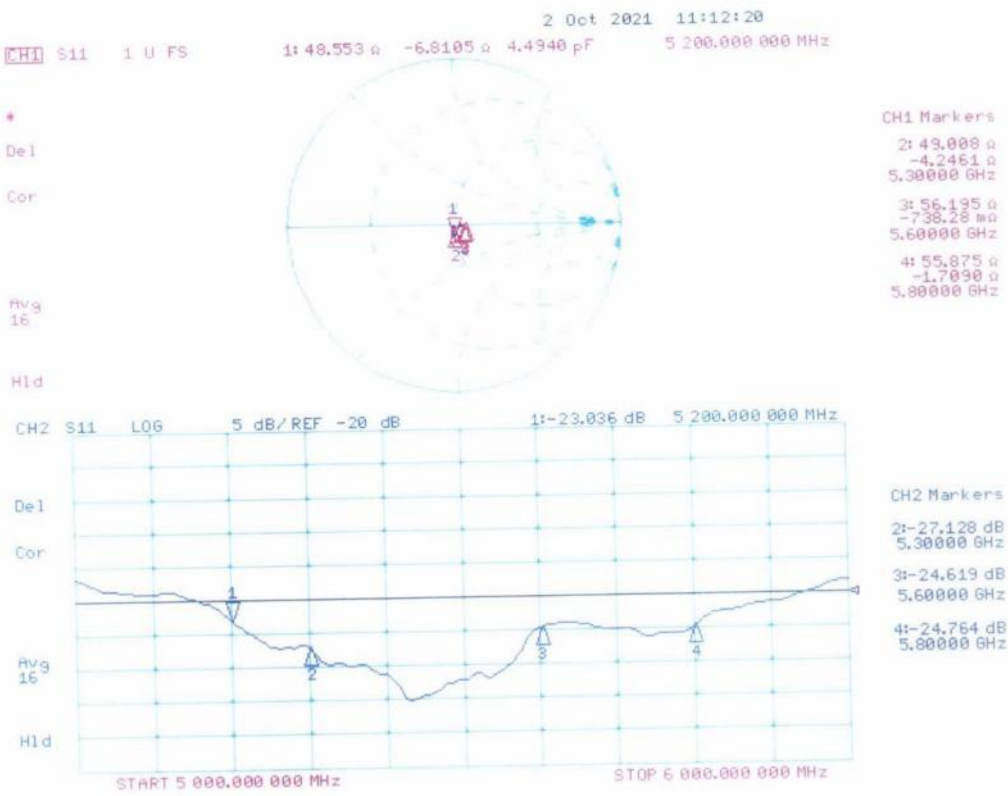
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 67.36 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 36.6 W/kg
SAR(1 g) = 8.2 W/kg; SAR(10 g) = 2.3 W/kg
Maximum value of SAR (measured) = 20.2 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.22 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 37.1 W/kg
SAR(1 g) = 7.88 W/kg; SAR(10 g) = 2.2 W/kg
Maximum value of SAR (measured) = 19.7 W/kg



0 dB = 18.2 W/kg = 12.60 dBW/kg

Impedance Measurement Plot for Body TSL



Referring to KDB 865664D01V01r03, if dipoles are verified in return loss (<-20dB, within 20% of prior calibration) and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

D2450V2, SN. 745				
	2450 Head			
Date of. Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)
2023-08-28	-23.7		54.2	
2024-08-27	-23.68	-0.08	54.1	-0.1

The return loss is <-20dB, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration.

Therefore the verification result should support extended calibration.

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