SAR TEST REPORT

for

Mettler Toledo (Changzhou) Measurement Technology Co., Ltd

RF Module

Model No.: MT-UHF-RFID01

Brand: Mettler-Toledo

FCC ID: 2ALAI24MT107

IC: 25883-MT24104

The MAX SAR(1g)	
Body SAR	1.082W/Kg

Test distance: 0mm

Prepared for : Mettler Toledo (Changzhou) Measurement Technology Co., Ltd
No.111 Taihu West Road Changzhou City, Jiangsu Province, China.

Prepared By : Audix Technology (Shenzhen) Co., Ltd.
No. 6, Kefeng Road, Science & Technology Park,
Nanshan District, Shenzhen, Guangdong, China

Tel: (0755) 26639496
Fax: (0755) 26632877

Report Number : ACS-SF24007
Date of Test : Aug.01, 2024
Date of Report : Sep.18, 2024

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SAR TEST REPORT

Applicant	:	Mettler Toledo (Changzhou) Measurement Technology Co., Ltd
Manufacturer	:	Mettler Toledo (Changzhou) Measurement Technology Co., Ltd
Product	:	RF Module
Model No.	:	MT-UHF-RFID01
Brand	:	Mettler-Toledo
Test Voltage	:	DC 5V

Measurement Standard Used:

- FCC 47 CFR Part 2 (2.1093)
- IEEE C95.1-1999
- IEC/IEEE 62209-1528: 2020
- IEC62209-1:2016
- IEC62209-2:2010
- FCC OET Bulletin 65 Supplement C (Edition 01-01)
- RSS-102, Issue 6: 2023
- FCC KDB 447498 D01 v06
- FCC KDB 865664 D01/D02

The device described above is tested by Audix Technology (Shenzhen) Co., Ltd. to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The test results are contained in this test report and Audix Technology (Shenzhen) Co., Ltd. is assumed full responsibility for the accuracy and completeness of test. This report contains data that are not covered by the NVLAP accreditation. Also, this report shows that the EUT is technically compliant with the FCC and RSS-102 test requirement.

This report applies to single evaluation of one sample of above mentioned product. And shall not be reproduced in part without written approval of Audix Technology (Shenzhen) Co., Ltd..

Date of Test : Aug.01, 2024 Report of date: Sep.18, 2024

Prepared by : Jasmine Ning
Jasmine Ning / Assistant

Reviewed by : Thomas Chen
Thomas Chen / Assistant Manager

AUDIX® 信華科技（深圳）有限公司
Audix Technology (Shenzhen) Co., Ltd.
EMC 部門報告專用章
Stamp only for EMC Dept. Report
Signature:

Approved & Authorized Signer :
Sunny Lu / Manager

REPORT REVISION HISTORY

Edition No.	Revision	Issue Date	Report No.
Original	Initial issue of report	Sep.18, 2024	ACS-SF24007

1. GENERAL INFORMATION

1.1.Description of Equipment Under Test

Applicant	Mettler Toledo (Changzhou) Measurement Technology Co., Ltd
Applicant Address	No.111 Taihu West Road Changzhou City, Jiangsu Province, China.
Manufacturer	Mettler Toledo (Changzhou) Measurement Technology Co., Ltd
Manufacturer Address	No.111 Taihu West Road Changzhou City, Jiangsu Province, China.
Product	RF Module
Model No.	MT-UHF-RFID01
Brand	Mettler-Toledo
FCC ID	2ALAI24MT107
IC	25883-MT24104
HVIN	MT-UHF-RFID01
Sample Type	Prototype production
Date of Receipt	Jul.25, 2024
Date of Test	Aug.01, 2024

1.2.Feature of Equipment Under Test

Product Feature & Specification		
Product	RF Module	
Model No.	MT-UHF-RFID01	
Power Source	☐ Commercial Power	AC V, Hz A
	☒ External Power Source	DC 5V
	☐ Li-ion Battery	DC V, mAh
	☐ UM battery	DC V
900 MHz		
Frequency Range	902.75MHz, 916.25MHz, 927.25MHz	
Antenna System		
Ant 1 Antenna Type: Dielectric Ceramics Peak Gain: 3dBi	Ant 2 Antenna Type: Flex Peak Gain: -26.3dBi	

2. GENERAL DESCRIPTION

2.1.Product Description For EUT

[None]

2.2.Applied Standards

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

- FCC 47 CFR Part 2 (2.1093)
- IEEE C95.1-1999
- IEC/IEEE 62209-1528: 2020
- IEC62209-1:2016
- IEC62209-2:2010
- FCC OET Bulletin 65 Supplement C (Edition 01-01)
- RSS-102, Issue 6: 2023
- FCC KDB 865664 D01/D02

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.Test Conditions

2.4.1. Ambient Condition

Ambient Temperature	20 to 24 ℃
Humidity	< 60 %

2.4.2. Test Configuration

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 30dB smaller than the output power of EUT. The EUT was set from the emulator to radiate maximum output power during all tests.

2.5.Exposure Positions Consideration

Sides for SAR tests						
Band	Body					
	Back	Front	Top	Bottom	Left	Right
900 MHz	√	√	√	×	√	√

Note: The bottom of the EUT is connected with a wire, so the bottom test cannot be carried out.

2.6.Standalone SAR Test Exclusion Considerations

Standalone 1-g head or body SAR evaluation by measurement or numerical simulation is not required when the corresponding SAR Exclusion Threshold condition, listed below, is satisfied. The 1-g SAR test exclusion threshold for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

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

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

According to the KDB447498 appendix A, the SAR test exclusion threshold for 2450MHz at 5mm test separation distances is 3mW, 5.8GHz is 1mW

Table B.2—Example Power Thresholds (mW)

	Distance (mm)										
Frequency (MHz)		5	10	15	20	25	30	35	40	45	50
	300	39	65	88	110	129	148	166	184	201	217
	450	22	44	67	89	112	135	158	180	203	226
	835	9	25	44	66	90	116	145	175	207	240
	1900	3	12	26	44	66	92	122	157	195	236
	2450	3	10	22	38	59	83	111	143	179	219
	3600	2	8	18	32	49	71	96	125	158	195
	5800	1	6	14	25	40	58	80	106	136	169

2.7.Block Diagram of connection between EUT and simulators

EUT

(EUT: RF Module)

2.8.Test Equipments

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date	Calibration Body
1.	DASY5 SAR Test System	Speag	TX60 L speag	F09/5B1H1/01	NCR	NCR	N/A
2.	ENA SERIES NETWORK ANALYZER	Agilent	E5071C	MY46316760	2023.09.15	2024.09.14	CCIC
3.	Power Meter	Anritsu	ML2487A	6K00003262	2024.06.19	2025.06.18	CCIC
4.	Power Sensor	Anritsu	MA2491A	032516	2024.06.19	2025.06.18	CCIC
5.	Signal Generator	Rohde&Schwarz	SMB100A	181375	2024.03.16	2025.03.15	CCIC
6.	Amplifier	Milmega	ZHL-42W	C620601316	NCR	NCR	N/A
7.	Dipole Validation Kits	Speag	D900V2	1d088	2023.05.23	2026.05.22	CCTL
8.	Attenuator	N/A	1527	001	2023.09.15	2024.09.14	CCIC
9.	Date Acquisition Electronics	Speag	DAE4	899	2024.06.06	2025.06.05	CCTL
10.	E-Field Probe	Speag	EX3DV4	3809	2023.09.18	2024.09.17	CCTL
11.	Test Software	Schmid&Partner Englinnering AG	DASY5	52.8.7.1137	NCR	NCR	NCR

Note1: Calibration Method

a): Calibration conducted by the National Institute of Information and Communications Technology～NICT～ or a designated calibration agency under Article 102-18 paragraph (1)～ TELEC Engeneering Center, Intertek Japan K.K., Keysight Technologies, Inc～.

b): Correction conducted pursuant to the provisions of Article 135 or Article 144 of the Measurement Law (Law No. 51 of 1992)～Japan Calibration Service Syste～

c): Calibration conducted in foreign countries, which shall be equivalent to the calibration conducted by the NICT or a designated calibration agency under Article 102-18 paragraph (1)～ TELEC Engeneering Center, Intertek Japan K.K., Keysight Technologies, Inc～.

d): Calibration conducted by using other equipment that listed above from a) to c)

Note2: CCIC (Shenzhen) Metrology & Testing Service Co.,Ltd

Addr : ShengHui Hongxing Chuangzhi Square, Tongren Road, TianliaoCommunity, Yutang Street, Guangming District, Shenzhen

2.9.Laboratory Environment

Temperature	Min:20℃,Max.25℃
Relative humidity	Min. = 45%, Max. = 70%
Note: Ambient noise is checked and found very low and in compliance with requirement of standards.	

2.10.Measurement Uncertainty

Test Item	Uncertainty
Uncertainty for SAR test	1g: ±21.2
	10g: ±20.7
Uncertainty for test site temperature and humidity	±0.6℃

Source	Type	Uncertainly Value (%)	Probability Distribution	K	C1(1g)	C1(10g)	Standard uncertainty uI(%)1g	Standard uncertainty uI(%)10g	Degree of freedom Veff or Vi
Measurement system repetivity	A	0.5	N	1		1	0.5	0.5	9
Probe calibration	B	5.9	N	1	1	1	5.9	5.9	∞
Isotropy	B	4.7	R	√3	1	1	2.7	2.7	∞
Linearity	B	4.7	R	√3	1	1	2.7	2.7	∞
Probe modulation response	B	0	R	√3	1	1	0	0	∞
Detection limits	B	1.0	R	√3	1	1	0.6	0.6	∞
Boundary effect	B	1.9	R	√3	1	1	1.1	1.1	∞
Readout electronics	B	1.0	N	1	1	1	1.0	1.0	∞
Response time	B	0	R	√3	1	1	0	0	∞
Integration time	B	4.32	R	√3	1	1	2.5	2.5	∞
RF ambient conditions – noise	B	0	R	√3	1	1	0	0	∞
RF ambient conditions – reflections	B	3	R	√3	1	1	1.73	1.73	∞
Probe positioner mech. restrictions	B	0.4	R	√3	1	1	0.2	0.2	∞
Probe positioning with respect to phantom shell	B	2.9	R	√3	1	1	1.7	1.7	∞
Post-processing	B	0	R	√3	1	1	0	0	∞
Test sample related									
Device holder uncertainty	A	2.94	N	1	1	1	2.94	2.94	M-1
Test sample positioning	A	4.1	N	1	1	1	4.1	4.1	M-1
Power scaling	B	5.0	R	√3	1	1	2.9	2.9	∞
Drift of output power (measured SAR drift)	B	5.0	R	√3	1	1	2.9	2.9	∞
Phantom and set-up									
Phantom uncertainty (shape and thickness tolerances)	B	4.0	R	√3	1	1	2.3	2.1	∞
Algorithm for correcting SAR for deviations in permittivity and conductivity	B	1.9	N	1	1	0,84	1,9	1,6	∞
Liquid conductivity (meas.)	A	0.55	N	1	0.78	0.71	0.24	0.21	M-1
Liquid permittivity (meas.)	A	0.19	N	1	0.23	0.26	0.09	0.06	M
Liquid permittivity – temperature uncertainty	A	5.0	R	√3	0,78	0,71	1.4	1.1	∞
Liquid conductivity – temperature uncertainty	A	5.0	R	√3	0.23	0,26	1.2	0.8	∞
Combined standard uncertainty	$u_c' = \sqrt{\sum_{i=1}^{23} c_i^2 u_i^2}$						10.57	10.32	
Expanded uncertainty (95 % conf. interval)	$u_e = 2u_c$		N	K=2			21.14	20.64	

3. SAR MEASUREMENTS SYSTEM

3.1.SAR Measurement Set-up

DASY5 system for performing compliance tests consists of the following items:

(1) A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
(2) A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage It issue simulating liquid. The probe is equipped with an optical surface detector system.
(3) A data acquisition electronic (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
(4) A unit to operate the optical surface detector which is connected to the EOC.
(5) The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY5 measurement server.
(6) The DASY5 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows 2003.
(7) DASY5 software and SEMCAD data evaluation software.
(8) Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
(9) The generic twin phantom enabling the testing of left-hand and right-hand usage.
(10) The device holder for handheld mobile phones.
(11) Tissue simulating liquid mixed according to the given recipes.
(12) System validation dipoles allowing to validate the proper functioning of the system.

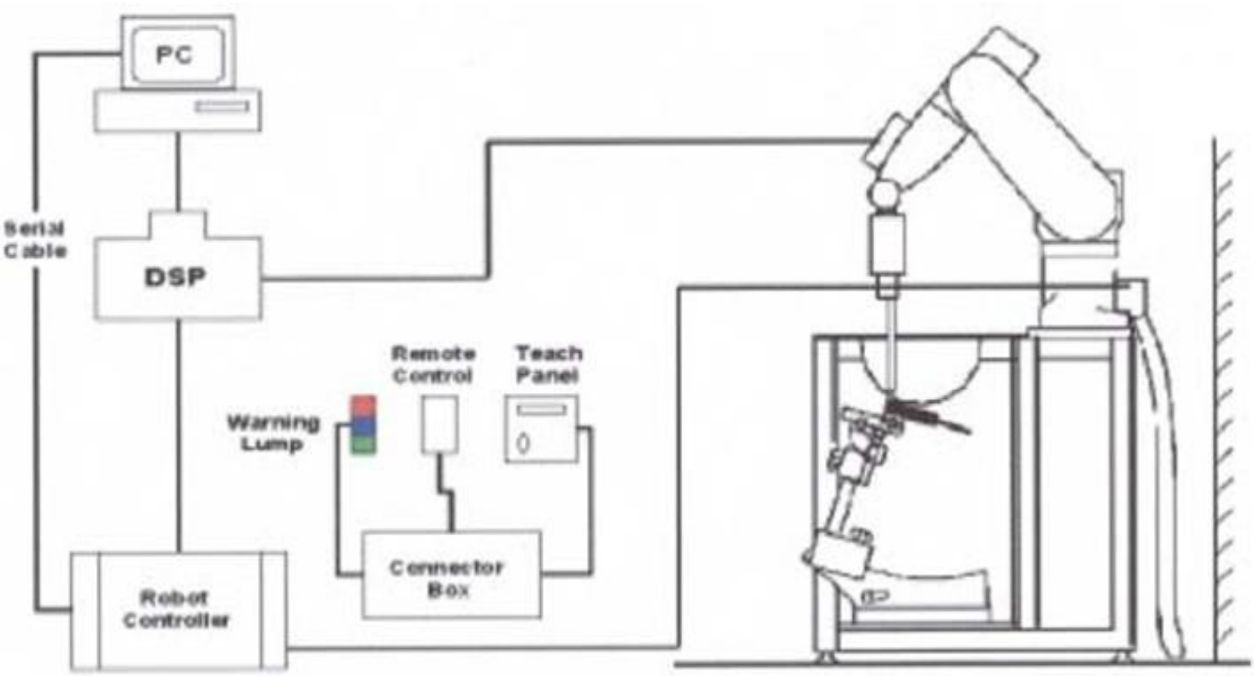


Figure 4.1 SAR Lab Test Measurement Set-up

3.2.ELI Phantom

Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid.
Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.

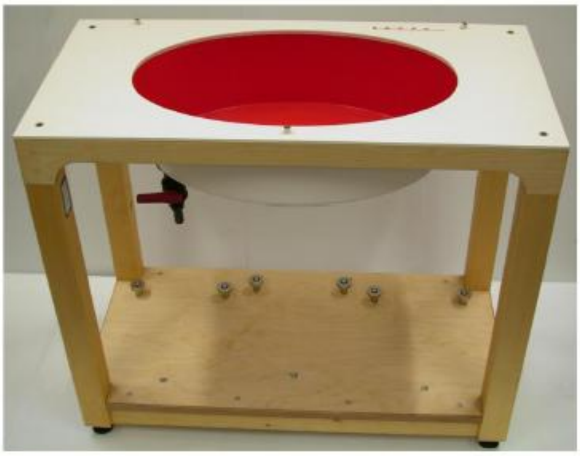


Figure 4.2 Top View of Twin Phantom

Material	Vinylester, glass fiber reinforced (VE-GF)
Liquid Compatibility	Compatible with all SPEAG tissue simulating liquids (incl. DGBE type)
Shell Thickness	2.0 ± 0.2 mm (bottom plate)
Dimensions	Major axis: 600 mm Minor axis: 400 mm
Filling Volume	approx. 30 liters
Wooden Support	SPEAG standard phantom table

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.
The phantom can be used with the following tissue simulating liquids:

*Water-sugar based liquid
*Glycol based liquids

3.3.Device Holder for SAM Twin Phantom

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

The DASY5 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 centers for both scales is the ear reference point (EPR).

Thus the device needs no repositioning when changing the angles.

The DASY5 device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity ε_r=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.

Figure 4.3 Device Holder

3.4.DASY5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

Figure 4.4 EX3DV4 E-field Probe

4.4.1. EX3DV4 Probe Specification

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available
Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 µW/g to > 100 mW/g Linearity: ± 0.2dB (noise: typically < 1 µW/g)
Dimensions	Overall length: PRS-T2 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.

3.5.E-field Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than ±10%. The spherical isotropy was evaluated and found to be better than ± 0.25dB. The sensitivity parameters (Norm X, Norm Y, Norm Z), the diode compression parameter (DCP) and the conversion factor (Conv F) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies bellow 1 GHz, and in a wave guide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in a dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

$$SAR = C\frac{\Delta T}{\Delta t}$$

Where: Δt = Exposure time (30 seconds),
C = Heat capacity of tissue (brain or muscle),
ΔT = Temperature increase due to RF exposure.
Or

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

Where:
σ = Simulated tissue conductivity,
ρ = Tissue density (kg/m3).

3.6.Scanning procedure

The DASY5 installation includes predefined files with recommended procedures for measurements and validation. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

The ”reference“ and ”drift“ measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the EUT’s output power and should vary max. ± 5 %.

The ”surface check“ measurement tests the optical surface detection system of the DASY5 system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above ± 0.1mm). To prevent wrong results tests are only executed when the liquid is free of air bubbles.

The difference between the optical surface detection and the actual surface depends on the Probe and is specified with each probe. (It does not depend on the surface reflectivity or the probe angle to the surface within ± 30°.)

Area Scan
The Area Scan is used as a fast scan in two dimensions to find the area of high field values before running a detailed measurement around the hot spot. Before starting the area scan a grid spacing of 15 mm x 15 mm is set. During the scan the distance of the probe to the phantom remains unchanged.

After finishing area scan, the field maxima within a range of 2 dB will be ascertained.
Zoom Scan
Zoom Scans are used to estimate the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default Zoom Scan is done by 7x7x7 points within a cube whose base is centered around the maxima found in the preceding area scan.

Spatial Peak Detection
The procedure for spatial peak SAR evaluation has been implemented and can determine values of masses of 1g and 10g, as well as for user-specific masses. The DASY5 system allows evaluations that combine measured data and robot positions, such as:
· maximum search
· extrapolation
· boundary correction
· peak search for averaged SAR

During a maximum search, global and local maxima searches are automatically performed in 2-D after each Area Scan measurement with at least 6 measurement points. It is based on the evaluation of the local SAR gradient calculated by the Quadratic Shepard’s method. The algorithm will find the global maximum and all local maxima within -2 dB of the global maxima for all SAR distributions.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation. Extrapolation routines require at least 10 measurement points in 3-D space. They are used in the Zoom Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Sheppard's method for extrapolation. For a grid using 7x7x7 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1g and 10g cubes.

A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube 7x7x7 scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 5mm steps.

4. DATA STORAGE AND EVALUATION

4.1.Data Storage

The DASY5 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension ".DA4". The 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 incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [℃], [mW/g], [mW/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

4.2.Data Evaluation by SEMCAD

The SEMCAD software 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 Normi, ai0, ai1, ai2
- Conversion factor ConvFi
- Diode compression point Dcpi

Device parameters: - Frequency
- Crest factor cf

Media parameters: - Conductivity
- Density

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 DASY5 components. In the direct measuring mode of the millimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used. The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics.
If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot cf / dcp_i$$

With V_i = compensated signal of channel i (i = x, y, z)

U_i = input signal of channel i (i = x, y, z)

cf = crest factor of exciting field (DASY parameter)

dcp_i = diode compression point (DASY parameter)

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

E-field probes: Ei = (Vi / Normi · ConvF)1/2

H-field probes: Hi = (Vi)1/2 · (ai0 + ai1 f + ai2f2) / f

With Vi = compensated signal of channel i (i = x, y, z)

Normi = sensor sensitivity of channel i (i = x, y, z)

ConvF = sensitivity enhancement in solution

aij = sensor sensitivity factors for H-field probes

f = carrier frequency [GHz]

Ei = electric field strength of channel i in V/m

Hi = magnetic field strength of channel i in A/m

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

Etot = (Ex2+ EY2+ Ez2)1/2

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

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

with

SAR = local specific absorption rate in mW/g

Etot = total field strength in V/m

= conductivity in [mho/m] or [Siemens/m]

= equivalent tissue density in g/cm3

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid. The power flow density is calculated assuming the excitation field to be a free space field.

Ppwe = Etot2 / 3770 or Ppwe = Htot2 · 37.7

with Ppwe = equivalent power density of a plane wave in mW/cm2

Etot = total electric field strength in V/m

Htot = total magnetic field strength in A/m

5. SYSTEM CHECK

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulates were measured every day using the dielectric probe kit and the network analyzer. A system check measurement was made following the determination of the dielectric parameters of the simulates, using the dipole validation kit. A power level of 250 mW was supplied to the dipole antenna, which was placed under the flat section of the twin SAM phantom. The system check results (dielectric parameters and SAR values) are given in the ANNEX A.

System check results have to be equal or near the values determined during dipole calibration with the relevant liquids and test system (±10 %).

System check is performed regularly on all frequency bands where tests are performed with the DASY5 system.

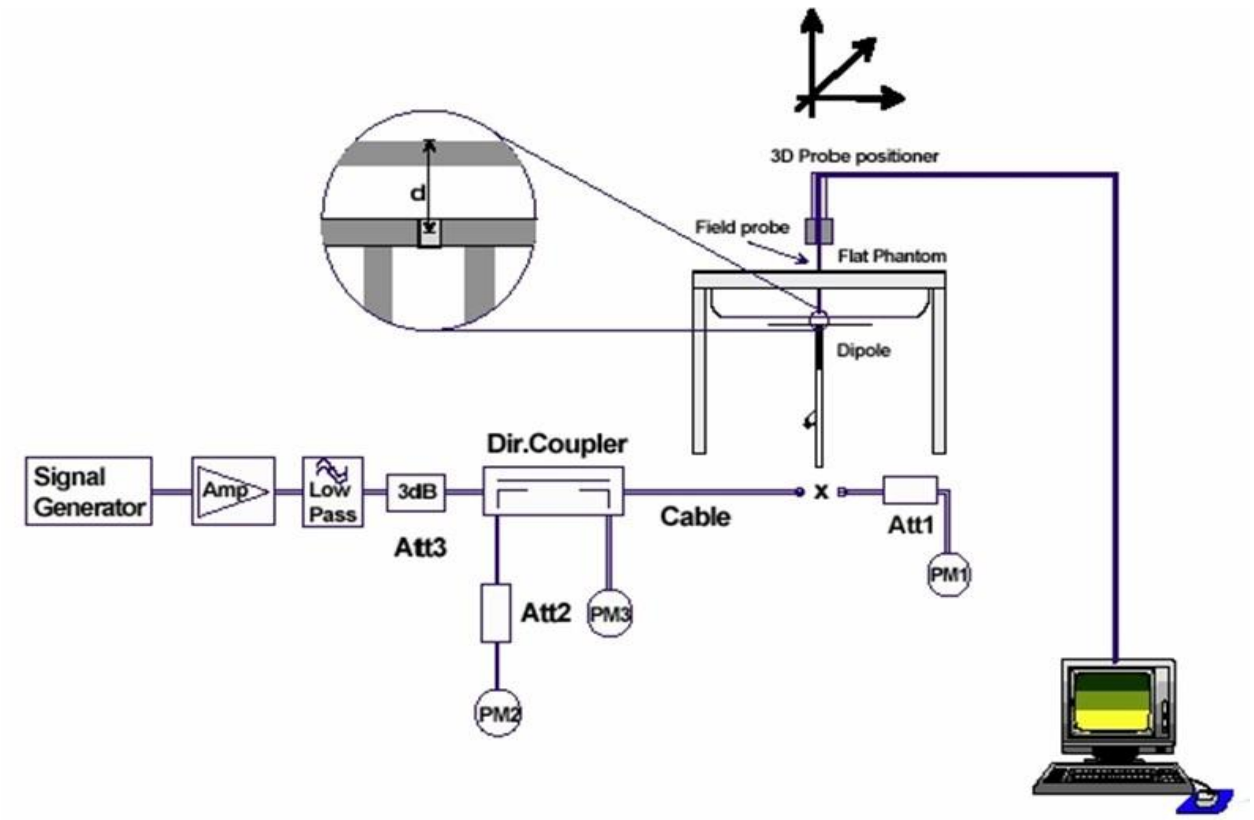


Figure 6.1: System Check Set-up

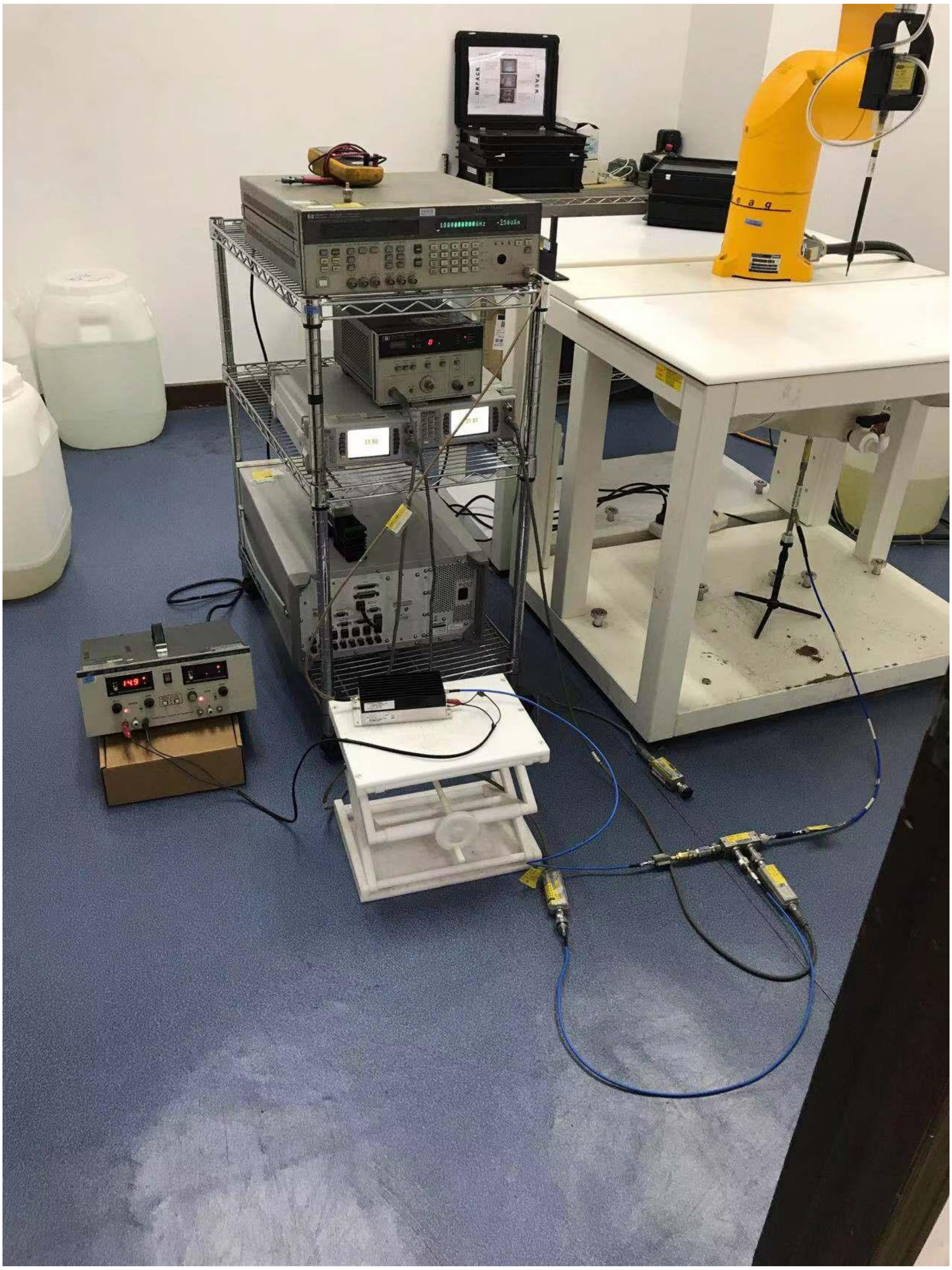


Figure 6.3: photos of system

6. TEST RESULTS

6.1.Output power

Frequency	Power
916.25MHz	25.95
915.25MHz	25.81
902.75MHz	25.79
927.25MHz	25.75

6.2.System Check & Tissue simulating liquid

Frequency	Description	SAR		Dielectric Parameters (±10% for window)		Temp
		1g	10g	εr	σ(s/m)	℃
900MHz	Recommended value	2.67 2.16804-3.17196	1.73 1.40649-2.05351	41.5 37.35-45.65	0.97 0.873-1.067	/
	Measurement value 2024-08-01	2.63	1.71	40.75	0.95	22.05

Test Laboratory: Audix SAR Lab Date: 01/08/2024

CW 900

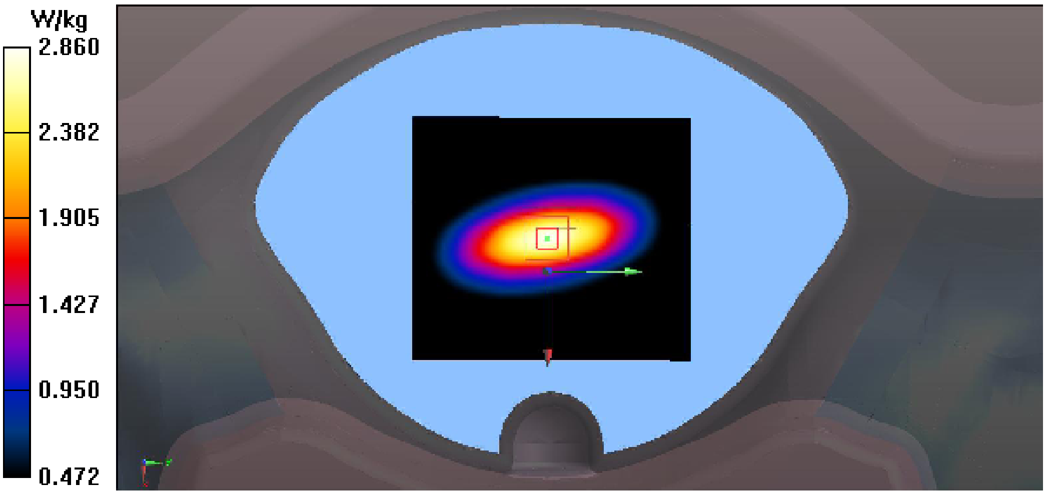
DUT: Dipole 900 MHz D900V2; Type: D900V2; Serial: D900V2 - SN:1d088

Communication System: UID 0, CW (0); Communication System Band: D900 (900.0 MHz);
Frequency: 900 MHz;Communication System PAR: 0 dB
Medium parameters used: f = 900 MHz; $\sigma = 0.95$ S/m; $\varepsilon_r = 40.75$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
DASY5 Configuration:

- Probe: EX3DV4 - SN3809; ConvF(9.05, 8.28, 7.89); Calibrated: 18/12/2023;
- Modulation Compensation:
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn899; Calibrated: 06/06/2024
- Phantom: SAM1; Type: SAM; Serial: TP-1543
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Configuration/CW 900MHz/Area Scan (61x71x1): Interpolated grid: dx=2.000 mm, dy=2.000 mm
Maximum value of SAR (interpolated) = 2.83 W/kg

Configuration/CW 900MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.86 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.79 W/kg
SAR(1 g) = 2.63 W/kg; SAR(10 g) = 1.71 W/kg
Maximum value of SAR (measured) = 2.86 W/kg



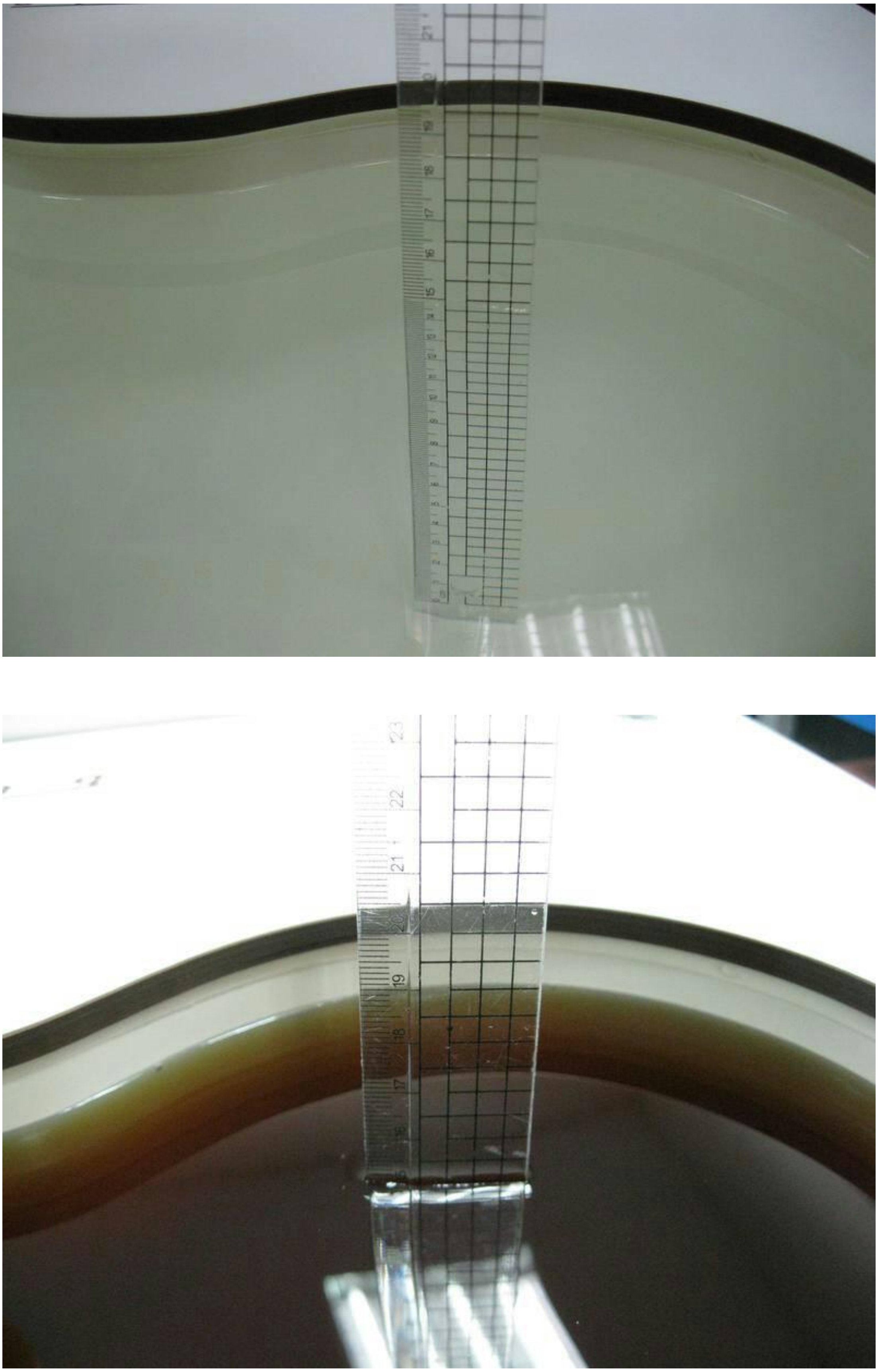


Figure 4.4: Liquid depth in the Flat Phantom

6.3.Test Results

Test Mode: 916.25MHz

Ant 1:

Distance	**Test Position (gain：3dbi)**	**1g**	**10g**	**Duty cycle**	**Conducted (dBm)**	**Tune up (dBm)**	**Factor**	**SAR(W/kg) 1g**	**SAR(W/kg) 10g**
0mm	Back	0.498	0.291	1	25.95	26	1.010881	0.503	0.294
0mm	Front	1.07	0.525	1	25.95	26	1.010881	1.082	0.531
0mm	Top	1.05	0.491	1	25.95	26	1.010881	1.061	0.496
0mm	Right	0.78	0.377	1	25.95	26	1.010881	0.788	0.381
0mm	Left	0.669	0.317	1	25.95	26	1.010881	0.676	0.32
Conclusion: PASS									
Note: Factor= Tune up AV Power(W)/Measured Power(W) Scaled SAR-1= Measured SAR*Factor Scaled-Final= Scaled SAR-1*(1/Duty Cycle)									

Ant 2:

Distance	**Test Position (gain：-27dbi)**	**1g**	**10g**	**Duty cycle**	**Conducted (dBm)**	**Tune up (dBm)**	**Factor**	**SAR(W/kg) 1g**	**SAR(W/kg) 10g**
0mm	Back	0.114	0.041	1	25.95	26	1.010881	0.115	0.041
0mm	Front	0.517	0.162	1	25.95	26	1.010881	0.523	0.164
0mm	Top	0.0024	0.000391	1	25.95	26	1.010881	0.002	0
0mm	Right	0.103	0.033	1	25.95	26	1.010881	0.104	0.033
0mm	Left	0.113	0.035	1	25.95	26	1.010881	0.114	0.035
Conclusion: PASS									
Note: Factor= Tune up AV Power(W)/Measured Power(W) Scaled SAR-1= Measured SAR*Factor Scaled-Final= Scaled SAR-1*(1/Duty Cycle)									

Test Mode: 902.75MHz

Ant 1:

Distance	**Test Position (gain：3dbi)**	**1g**	**10g**	**Duty cycle**	**Conducted (dBm)**	**Tune up (dBm)**	**Factor**	**SAR(W/kg) 1g**	**SAR(W/kg) 10g**
0mm	Front	1.02	0.528	1	25.79	26	1.049301	1.07	0.554
Conclusion: PASS									
Note: Factor= Tune up AV Power(W)/Measured Power(W) Scaled SAR-1= Measured SAR*Factor Scaled-Final= Scaled SAR-1*(1/Duty Cycle)									

Ant 2:

Distance	**Test Position (gain：-27dbi)**	**1g**	**10g**	**Duty cycle**	**Conducted (dBm)**	**Tune up (dBm)**	**Factor**	**SAR(W/kg) 1g**	**SAR(W/kg) 10g**
0mm	Front	0.388	0.127	1	25.79	26	1.049301	0.407	0.133
Conclusion: PASS									
Note: Factor= Tune up AV Power(W)/Measured Power(W) Scaled SAR-1= Measured SAR*Factor Scaled-Final= Scaled SAR-1*(1/Duty Cycle)									

Test Mode: 927.25MHz

Ant 1:

Distance	**Test Position (gain：3dbi)**	**1g**	**10g**	**Duty cycle**	**Conducted (dBm)**	**Tune up (dBm)**	**Factor**	**SAR(W/kg) 1g**	**SAR(W/kg) 10g**
0mm	Front	0.98	0.519	1	25.75	26	1.060474	1.039	0.55
Conclusion: PASS									
Note: Factor= Tune up AV Power(W)/Measured Power(W) Scaled SAR-1= Measured SAR*Factor Scaled-Final= Scaled SAR-1*(1/Duty Cycle)									

Ant 2:

Distance	**Test Position (gain：-27dbi)**	**1g**	**10g**	**Duty cycle**	**Conducted (dBm)**	**Tune up (dBm)**	**Factor**	**SAR(W/kg) 1g**	**SAR(W/kg) 10g**
0mm	Front	0.446	0.135	1	25.95	26	1.011579	0.451	0.137
Conclusion: PASS									
Note: Factor= Tune up AV Power(W)/Measured Power(W) Scaled SAR-1= Measured SAR*Factor Scaled-Final= Scaled SAR-1*(1/Duty Cycle)									

APPENDIX A

Graph Results
(900MHz)

Ant 1:

Test Laboratory: Audix SAR Lab Date: 01/08/2024

902.75MHz Front

DUT: RF Module M/N:MT-UHF-RFID01

Communication System: UID 0, specil frequency (0); Communication System Band: 927.25; Frequency: 902.75 MHz;Communication System PAR: 0 dB

Medium parameters used: f = 902.75 MHz; σ = 0.911 S/m; ε_r = 39.73; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3748; ConvF(8.82, 8.82, 8.82); Calibrated: 19/01/2023;
- Modulation Compensation:
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn899; Calibrated: 06/06/2024
- Phantom: SAM 1; Type: SAM; Serial: TP-1543
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Configuration/902.75MHz Front/Area Scan (61x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 2.66 W/kg

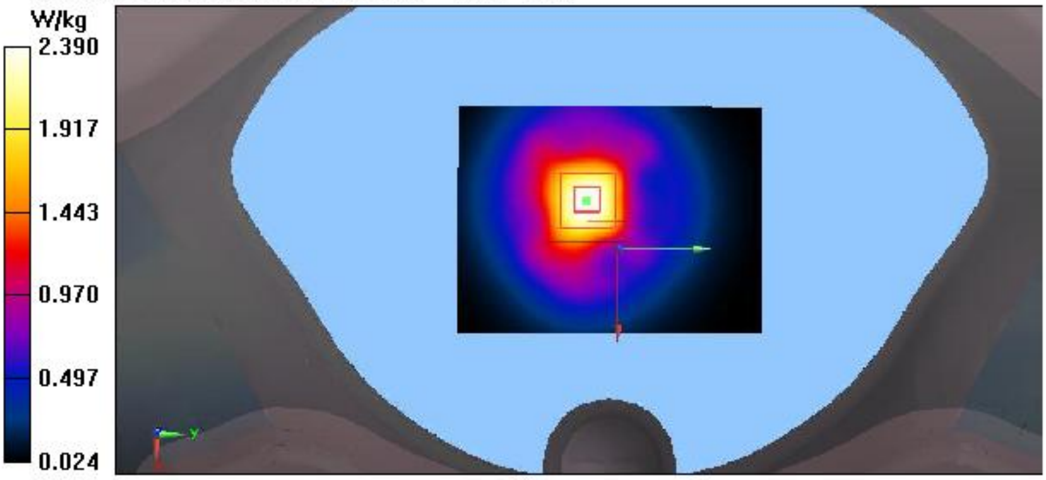
Configuration/902.75MHz Front/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 48.64 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 6.03 W/kg

SAR(1 g) = 1.02 W/kg; SAR(10 g) = 0.528 W/kg

Maximum value of SAR (measured) = 2.39 W/kg



Test Laboratory: Audix SAR Lab Date: 01/08/2024

916.25MHz Front

DUT: RF Module M/N:MT-UHF-RFID01

Communication System: UID 0, specil frequency (0); Communication System Band: 916.25; Frequency: 916.25 MHz;Communication System PAR: 0 dB

Medium parameters used: f = 916.25 MHz; σ = 0.983 S/m; ε_r = 39.78; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3809; ConvF(9.05, 8.28, 7.89); Calibrated: 18/12/2023;
- Modulation Compensation:
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn899; Calibrated: 06/06/2024
- Phantom: SAM 1; Type: SAM; Serial: TP-1543
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Configuration/CH0(916.25MHz Front)/Area Scan (61x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.13 W/kg

Configuration/CH0(916.25MHz Front)/Zoom Scan (5x5x7)/Cube 0:

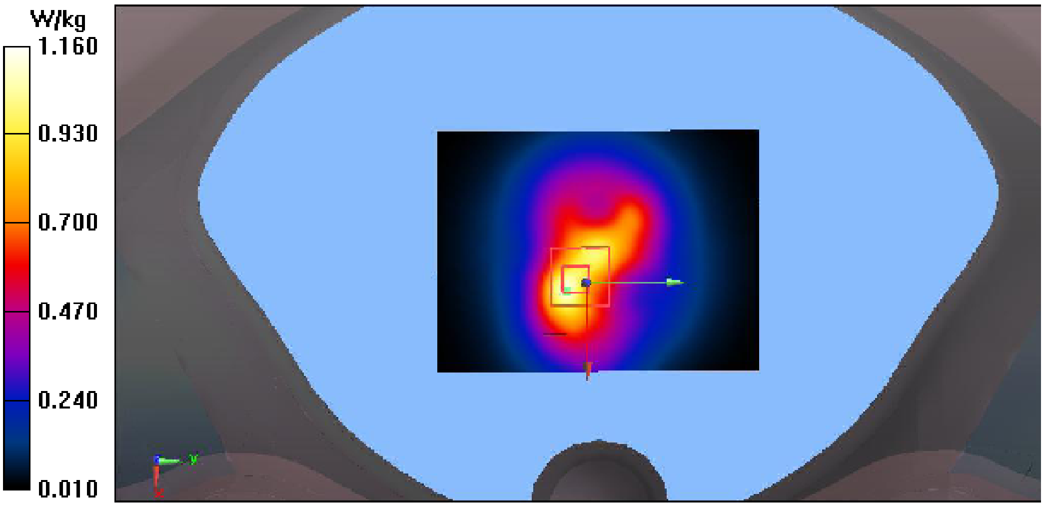
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 31.86 V/m; Power Drift = -0.15 dB

Peak SAR (extrapolated) = 3.22 W/kg

SAR(1 g) = 1.07 W/kg; SAR(10 g) = 0.525 W/kg

Maximum value of SAR (measured) = 1.16 W/kg



Test Laboratory: Audix SAR Lab Date: 01/08/2024

927.25MHz Front

DUT: RF Module M/N:MT-UHF-RFID01

Communication System: UID 0, specil frequency (0); Communication System Band: 927.25; Frequency: 927.25 MHz;Communication System PAR: 0 dB

Medium parameters used: f = 927.25 MHz; σ = 0.983 S/m; ε_r = 39.78; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3748; ConvF(8.82, 8.82, 8.82); Calibrated: 19/01/2023;
- Modulation Compensation:
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn899; Calibrated: 06/06/2024
- Phantom: SAM 1; Type: SAM; Serial: TP-1543
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Configuration/927.25MHz Front/Area Scan (61x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.87 W/kg

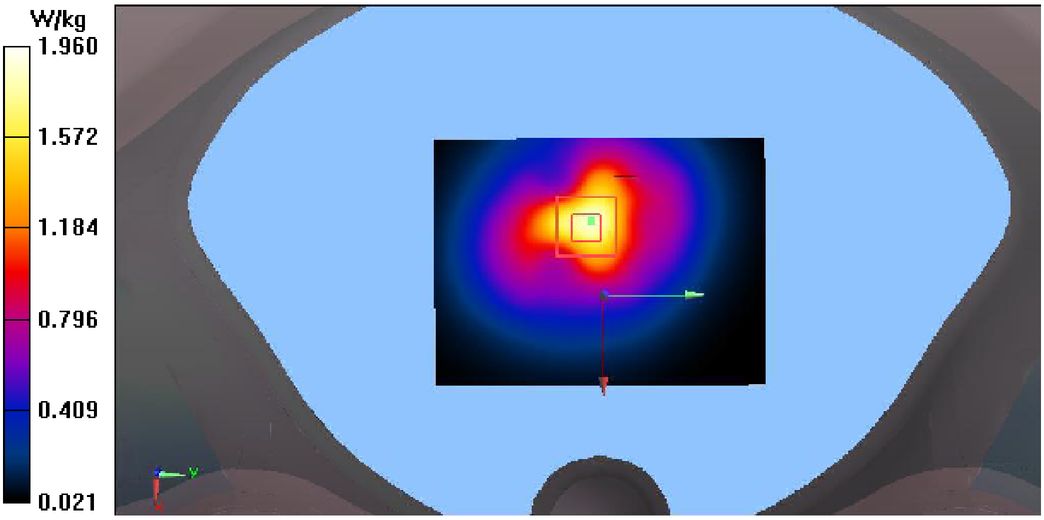
Configuration/927.25MHz Front/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 40.20 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 3.73 W/kg

SAR(1 g) = 0.98 W/kg; SAR(10 g) = 0.519 W/kg

Maximum value of SAR (measured) = 1.96 W/kg



Ant 2:

Test Laboratory: Audix SAR Lab Date: 01/08/2024

902.75MHz Front

DUT: RF Module M/N:MT-UHF-RFID01

Communication System: UID 0, specil frequency (0); Communication System Band: 927.25; Frequency: 902.75 MHz;Communication System PAR: 0 dB

Medium parameters used: f = 902.75 MHz; σ = 0.911 S/m; ε_r = 39.73; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3748; ConvF(8.82, 8.82, 8.82); Calibrated: 19/01/2023;
- Modulation Compensation:
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn899; Calibrated: 06/06/2024
- Phantom: SAM 1; Type: SAM; Serial: TP-1543
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Configuration/902.75MHz Front/Area Scan (61x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.556 W/kg

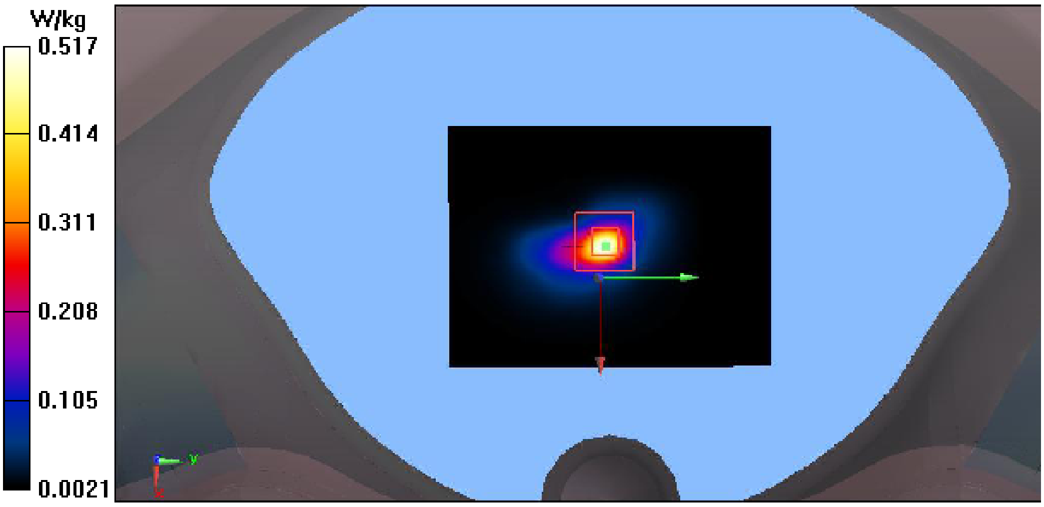
Configuration/902.75MHz Front/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 23.50 V/m; Power Drift = 0.17 dB

Peak SAR (extrapolated) = 1.12 W/kg

SAR(1 g) = 0.388 W/kg; SAR(10 g) = 0.127 W/kg

Maximum value of SAR (measured) = 0.517 W/kg



Test Laboratory: Audix SAR Lab   Date: 01/08/2024

927.25MHz Front

DUT: RF Module M/N:MT-UHF-RFID01

Communication System: UID 0, specil frequency (0); Communication System Band: 927.25; Frequency: 927.25 MHz;Communication System PAR: 0 dB

Medium parameters used: f = 927.25 MHz; $\sigma = 0.983$ S/m; $\varepsilon_r = 39.78$; $\rho = 1000$ kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3748; ConvF(8.82, 8.82, 8.82); Calibrated: 19/01/2023;
- Modulation Compensation:
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn899; Calibrated: 06/06/2024
- Phantom: SAM 1; Type: SAM; Serial: TP-1543
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Configuration/927.25MHz Front/Area Scan (61x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.456 W/kg

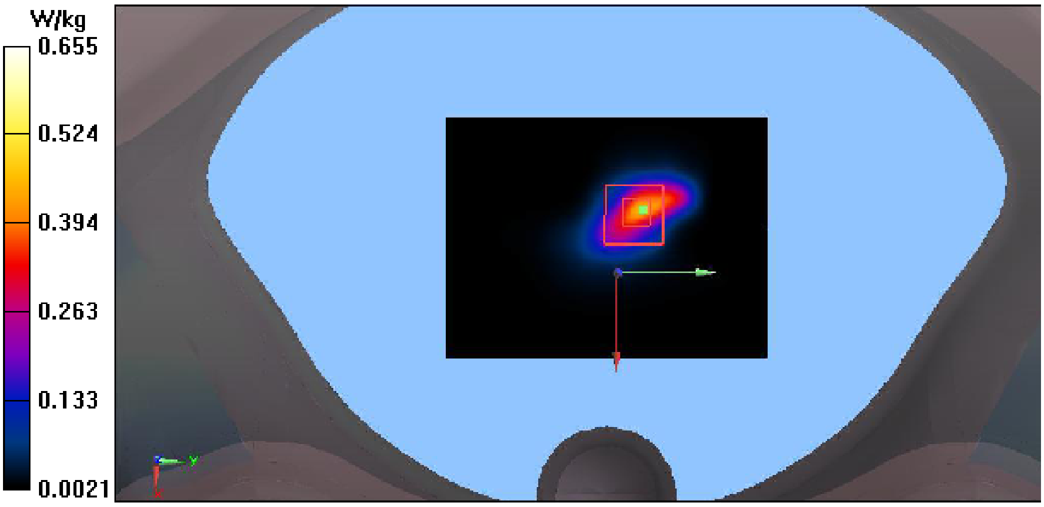
Configuration/927.25MHz Front/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 16.16 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 1.32 W/kg

SAR(1 g) = 0.446 W/kg; SAR(10 g) = 0.135 W/kg

Maximum value of SAR (measured) = 0.655 W/kg



Test Laboratory: Audix SAR Lab Date: 01/08/2024

916.25MHz Front

DUT: RF Module M/N:MT-UHF-RFID01

Communication System: UID 0, specil frequency (0); Communication System Band: 916.25; Frequency: 916.25 MHz;Communication System PAR: 0 dB

Medium parameters used (interpolated): f = 916.25 MHz; σ = 0.963 S/m; ε_r = 40.46; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3748; ConvF(8.82, 8.82, 8.82); Calibrated: 19/01/2023;
- Modulation Compensation:
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn899; Calibrated: 06/06/2024
- Phantom: SAM 1; Type: SAM; Serial: TP-1543
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Configuration/916.25MHz Front/Area Scan (61x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.545 W/kg

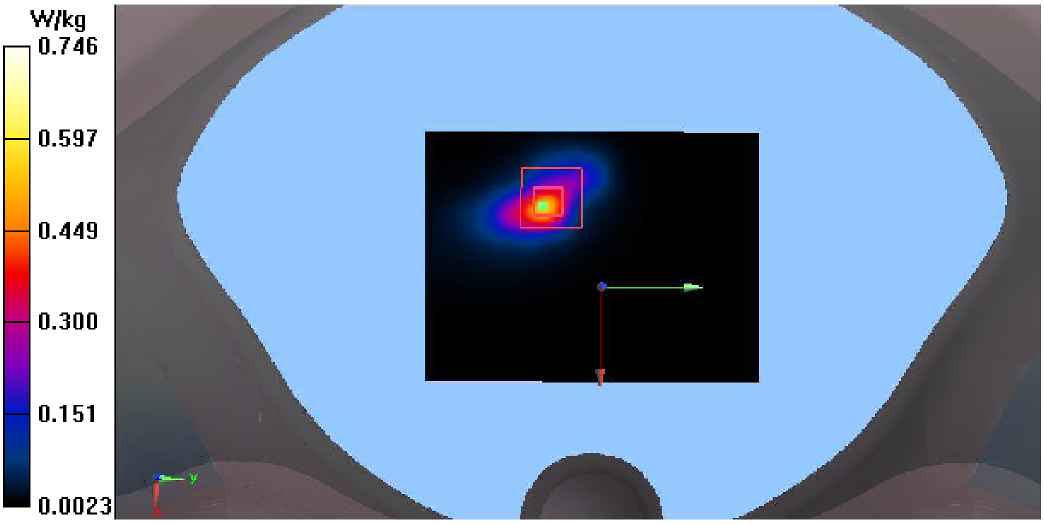
Configuration/916.25MHz Front/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 3.358 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 1.52 W/kg

SAR(1 g) = 0.517 W/kg; SAR(10 g) = 0.162 W/kg

Maximum value of SAR (measured) = 0.746 W/kg



APPENDIX B

DASY Calibration Certificate

TTL In Collaboration with speag CALIBRATION LABORATORY

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

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

Client audix Certificate No: J23Z60241

CALIBRATION CERTIFICATE

Object	D900V2 - SN: 1d088
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	May 23, 2023

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

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

Calibration Equipment used (M&TE critical for calibration)

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

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

Issued: May 30, 2023

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CAICT

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

Glossary:

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

Calibration is Performed According to the Following Standards:

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

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

Additional Documentation:

c) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

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TTL CAICT

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

Measurement Conditions

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

DASY Version	DASY52	52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.97 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.6 ± 6 %	0.95 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.67 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**10.8 W/kg ± 18.8 % (*k*=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.73 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.99 W/kg ± 18.7 % (*k*=2)**

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

Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.2Ω- 7.76jΩ
Return Loss	- 21.8dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.313 ns

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

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

Additional EUT Data

Manufactured by	SPEAG

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speag
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CAICT

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

DASY5 Validation Report for Head TSL Date: 2023-05-23

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN: 1d088

Communication System: UID 0, CW; Frequency: 900 MHz; Duty Cycle: 1:1

Medium parameters used: f = 900 MHz; σ = 0.948 S/m; ε_r = 40.57; ρ = 1000 kg/m^3

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(9.68, 9.68, 9.68) @ 900 MHz; Calibrated: 2023-03-31
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2023-01-11
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

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

Reference Value = 57.60 V/m; Power Drift = -0.04 dB

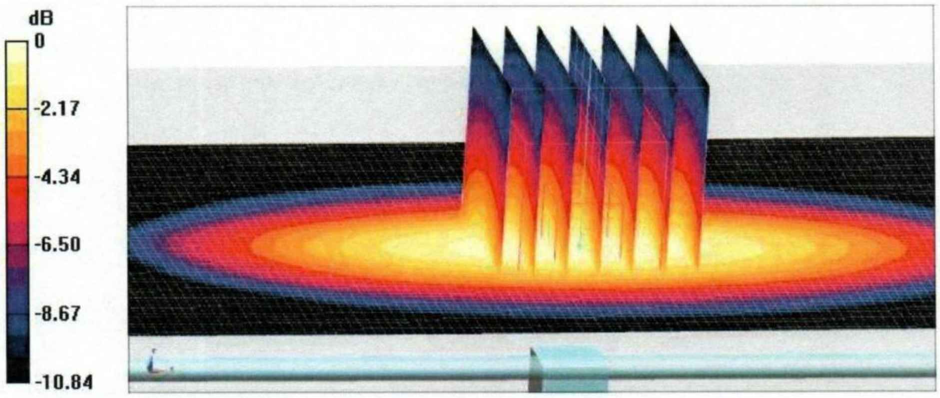
Peak SAR (extrapolated) = 4.24 W/kg

SAR(1 g) = 2.67 W/kg; SAR(10 g) = 1.73 W/kg

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

Ratio of SAR at M2 to SAR at M1 = 63.5%

Maximum value of SAR (measured) = 3.66 W/kg



0 dB = 3.66 W/kg = 5.63 dBW/kg

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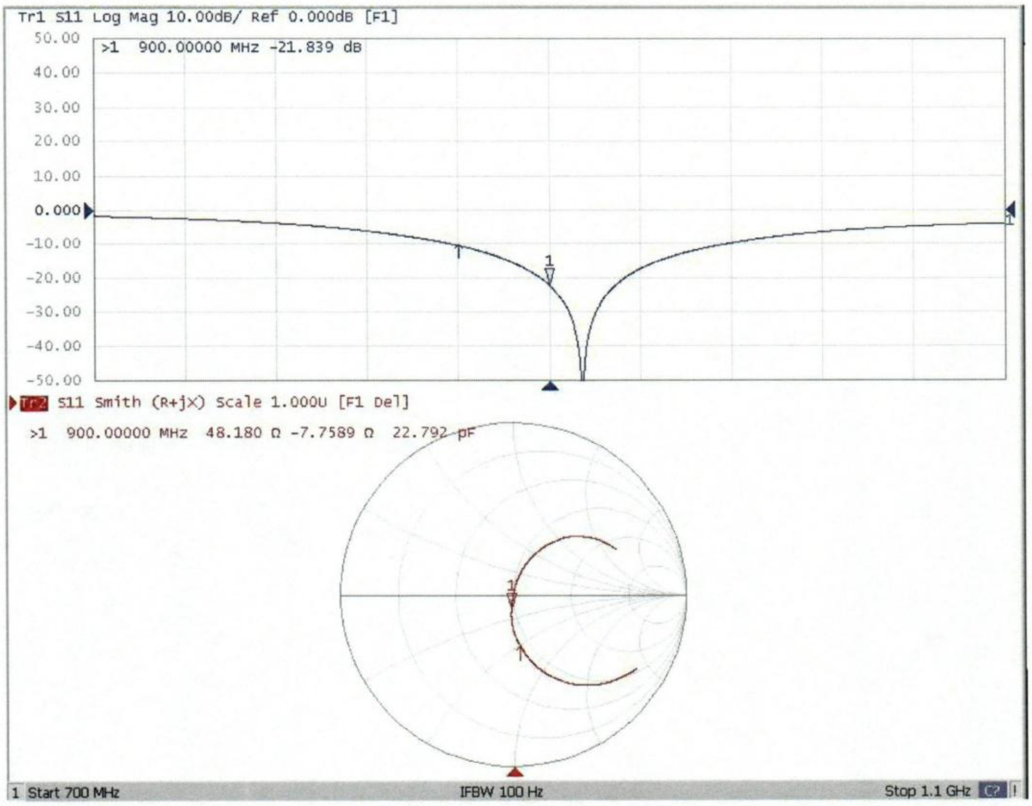
Impedance Measurement Plot for Head TSL



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Client : **Audix**

Certificate No: 24J02Z000275

CALIBRATION CERTIFICATE

Object	DAE4 - SN: 899
Calibration Procedure(s)	FF-Z11-002-01 Calibration Procedure for the Data Acquisition Electronics (DAEx)
Calibration date:	June 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
Process Calibrator 753	1971018	12-Jun-23 (CTTL, No.J23X05436)	Jun-24

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

Issued: June 09, 2024

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Glossary:

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

Methods Applied and Interpretation of Parameters:

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

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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	402.479 ± 0.15% (k=2)	403.066 ± 0.15% (k=2)	403.057 ± 0.15% (k=2)
Low Range	3.97823 ± 0.7% (k=2)	3.97596 ± 0.7% (k=2)	3.98225 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	350.5° ± 1 °

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **BTL**
Guangdong

Certificate No. **EX-3809_Dec23**

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3809

Calibration procedure(s): QA CAL-01.v10, QA CAL-12.v10, QA CAL-14.v7, QA CAL-23.v6, QA CAL-25.v8
Calibration procedure for dosimetric E-field probes

Calibration date: December 18, 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 (Certificate No.)	Scheduled Calibration
Power meter NRP2	SN: 104778	30-Mar-23 (No. 217-03804/03805)	Mar-24
Power sensor NRP-Z91	SN: 103244	30-Mar-23 (No. 217-03804)	Mar-24
OCP DAK-3.5 (weighted)	SN: 1249	05-Oct-23 (OCP-DAK3.5-1249_Oct23)	Oct-24
OCP DAK-12	SN: 1016	05-Oct-23 (OCP-DAK12-1016_Oct23)	Oct-24
Reference 20 dB Attenuator	SN: CC2552 (20x)	30-Mar-23 (No. 217-03809)	Mar-24
DAE4	SN: 660	16-Mar-23 (No. DAE4-660_Mar23)	Mar-24
Reference Probe ES3DV2	SN: 3013	06-Jan-23 (No. ES3-3013_Jan23)	Jan-24

Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-22)	In house check: Jun-24
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-22)	In house check: Jun-24
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-22)	In house check: Jun-24
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-22)	In house check: Jun-24
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-22)	In house check: Oct-24

	Name	Function	Signature
Calibrated by	Joanna Lleshaj	Laboratory Technician	
Approved by	Sven Kühn	Technical Manager	

Issued: December 18, 2023

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