



## TEST REPORT

### For SAR

Report No..... : CHTW25040090



Project No ..... : SHT2504043201W

FCC ID ..... : **2AC8UA2547**

Applicant's name..... : Anhui Huami Information Technology Co., Ltd.

Address..... : 7/F, Building B2, Huami Global Innovation Center, No. 900, Wangjiang West Road, High-tech Zone, 518000 Hefei City, PEOPLE'S REPUBLIC OF CHINA

Product Name ..... : Smart Watch

Trade Mark..... : -

Model No..... : A2547

Listed Model(s) ..... : -

Standard ..... : FCC 47 CFR Part2.1093  
IEEE Std C95.1: 1999 Edition  
IEEE Std 1528: 2013

Date of receipt of test sample..... : 2025/4/25

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Date of issue..... : 2025/5/7

Result..... : **PASS**

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## 1. Statement of Compliance

Maximum Reported SAR (W/kg @1g)				
Type	Test setting	WIFI	BT	Simultaneous TX
Head	Dist.= 10mm	0.427	0.091	0.518

Maximum Reported SAR (W/kg @10g)				
Type	Test setting	WIFI	BT	Simultaneous TX
Extremity	Dist.= 0mm	0.631	0.165	0.796

Note:

1. This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg@1g) and (4 W/kg@10g) specified in FCC 47 CFR part 2 (2.1093) and IEEE Std C95.1,
2. This device had been tested in accordance with the measurement methods and procedures specified in IEEE 1528 and FCC KDB publications.

## **2 . Test Standards and Report version**

### **2.1. Test Standards**

The tests were performed according to following standards:

[FCC 47 Part 2.1093](#): Radiofrequency radiation exposure evaluation: portable devices.

[IEEE Std C95.1, 1999 Edition](#): IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz

[IEEE Std 1528™-2013](#): IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.

FCC published RF exposure KDB procedures:

[865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04](#): SAR Measurement Requirements for 100 MHz to 6 GHz

[865664 D02 RF Exposure Reporting v01r02](#): RF Exposure Compliance Reporting and Documentation Considerations

[447498 D04 Interim General RF Exposure Guidance v01](#): Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies

[248227 D01 802.11 Wi-Fi SAR v02r02](#): SAR Measurement Procedures for 802.11 a/b/g Transmitters

[TCB workshop](#) April, 2019; Page 19, Tissue Simulating Liquids (TSL)

### **2.2. Report version**

Revision No.	Date of issue	Description
N/A	2025-05-07	Original

### 3. Summary

#### 3.1. Client Information

Applicant:	Anhui Huami Information Technology Co., Ltd.
Address:	7/F, Building B2, Huami Global Innovation Center, No. 900, Wangjiang West Road, High-tech Zone, 518000 Hefei City, PEOPLE'S REPUBLIC OF CHINA
Manufacturer:	Anhui Huami Information Technology Co., Ltd.
Address:	7/F, Building B2, Huami Global Innovation Center, No. 900, Wangjiang West Road, High-tech Zone, 518000 Hefei City, PEOPLE'S REPUBLIC OF CHINA

#### 3.2. Product Description

Main unit	
Product Name:	Smart Watch
Trade Mark:	-
Model No.:	A2547
Listed Model(s):	-
Power supply:	DC 3.91V from Battery
Hardware version:	V1.0
Software version:	3.2.0.2
Device Dimension:	Length x Width x Thickness (mm): 49 x 49 x 13
Device Category:	Portable
Product stage:	Production unit
RF Exposure Environment:	General Population/Uncontrolled
HTW test sample No.:	YPHT25040432001

Note:

The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power.

#### 3.3. RF Specification Description<sup>#1</sup>

Wi-Fi 2.4G				
Support type:	<input checked="" type="checkbox"/> 802.11b	<input checked="" type="checkbox"/> 802.11g	<input checked="" type="checkbox"/> 802.11n	<input type="checkbox"/> 802.11ax
Support bandwidth:	<input checked="" type="checkbox"/> 20MHz	<input type="checkbox"/> 40MHz		
Bluetooth				
Support type:	<input checked="" type="checkbox"/> BR	<input checked="" type="checkbox"/> EDR	<input checked="" type="checkbox"/> BLE-1Mbps	<input checked="" type="checkbox"/> BLE-2Mbps

Note:

○ : means that this feature is supported; : means that this feature is not supported

○ #1: Please refer to RF report for detailed technical specifications

### 3.4. Testing Laboratory Information

Laboratory Name	Shenzhen Huatongwei International Inspection Co., Ltd.	
Laboratory Location	Building 7, Baiwang Idea Factory, No.1051, Songbai Road, Yangguang Community, Xili Subdistrict, Nanshan District, Shenzhen, Guangdong, China	
Connect information:	Tel: 400-963-0755 E-mail: <a href="mailto:cs@szhtw.com.cn">cs@szhtw.com.cn</a> <a href="http://www.szhtw.com.cn">http://www.szhtw.com.cn</a>	
Qualifications	Type	Accreditation Number
	FCC Registration Number	762235
	FCC Designation Number	CN1181

### 3.5. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Ambient temperature	18 °C to 25 °C
Ambient humidity	30%RH to 70%RH
Air Pressure	950-1050mbar

#### 4. Equipments Used during the Test

Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Cal. date (YY-MM-DD)	Due date (YY-MM-DD)
●	Data Acquisition Electronics DAEx	SPEAG	HTWE0313-05	DAE4	1549	2025/04/21	2026/04/20
●	E-field Probe	SPEAG	HTWE0313-06	EX3DV4	7494	2024/06/07	2025/06/06
●	Phantoms	SPEAG	HTWE0313-12	ELI V8.0	2078	N/A	N/A
●	Head TSL	-	-	HBBL600-10000	-	N/A	N/A
●	Temperature & humidity	MIAO XIN	HTWE0319	TH20R-EX	-	2025/03/18	2026/03/17
Tissue-equivalent liquids Validation							
●	Dielectric Assessment Kit	SPEAG	HTWE0315-02	DAK-3.5	1267	N/A	N/A
●	Network analyzer	Keysight	HTWE0331	E5071C	MY46733048	2024/08/27	2025/08/26
●	Thermometer	LKM	HTWE0317	DTM3000	3693	2025/03/18	2026/03/17
System Validation							
●	System Validation Dipole	SPEAG	HTWE0314-07	D2450V2	1009	2023/12/06	2026/12/05
●	Signal Generator	R&S	HTWE0276	SMB100A	114360	2025/03/13	2026/03/12
●	Power Viewer for Windows	R&S	N/A	N/A	N/A	N/A	N/A
●	Power sensor	R&S	HTWE0278	NRP18A	101010	2025/03/14	2026/03/13
●	Power sensor	R&S	HTWE0389	NRP18A	101386	2025/03/14	2026/03/13
●	Power Amplifier	BONN	HTWE0336	BLWA 0160-2M	1811887	2024/11/08	2025/11/07
●	Dual Directional Coupler	Mini-Circuits	HTWE0335	ZHDC-10-62-S+	F975001814	2024/11/08	2025/11/07
●	Attenuator	Mini-Circuits	HTWE0333	VAT-3W2+	1819	2024/11/08	2025/11/07
●	Attenuator	Mini-Circuits	HTWE0334	VAT-10W2+	1741	2024/11/08	2025/11/07

Note:

1. The Probe, Dipole and DAE calibration reference to the Appendix E and F.
2. Referring to KDB865664 D01, the dipole calibration interval can be extended to 3 years with justification. The dipole are also not physically damaged or repaired during the interval.

## **5. Measurement Uncertainty**

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be  $\leq 30\%$ , for a confidence interval of  $k = 2$ . If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528 is not required in SAR reports submitted for equipment approval.

Therefore, the measurement uncertainty is not required.

## 6. SAR Measurement System Configuration

### 6.1. SAR Measurement Set-up

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

A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).

A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.

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.

A unit to operate the optical surface detector which is connected to the EOC.

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.

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.

DASY5 software and SEMCAD data evaluation software.

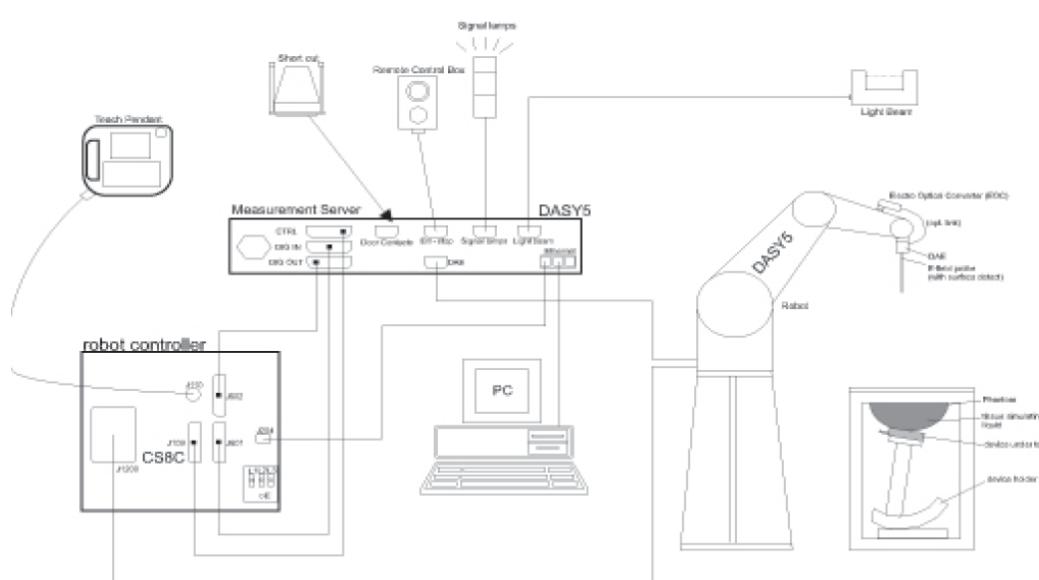
Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.

The generic twin phantom enabling the testing of left-hand and right-hand usage.

The device holder for handheld Mobile Phones.

Tissue simulating liquid mixed according to the given recipes.

System validation dipoles allowing to validate the proper functioning of the system.



## 6.2. 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.

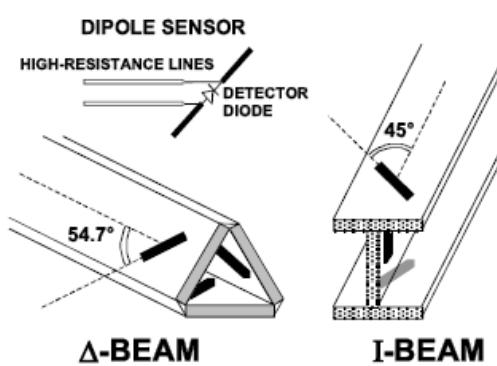
### ● Probe Specification

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available.
Frequency	4 MHz to 10 GHz; Linearity: $\pm 0.2$ dB (30 MHz to 6 GHz)
Directivity	$\pm 0.3$ dB in HSL (rotation around probe axis) $\pm 0.5$ dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 $\mu$ W/g to > 100 W/kg; Linearity: $\pm 0.2$ dB
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Distance from probe tip to dipole centers: 1.0 mm
Application	General dosimetry up to 6 GHz Dosimetry in strong gradient fields Compliance tests of Mobile Phones
Compatibility	DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI

### ♦ Isotropic E-Field Probe

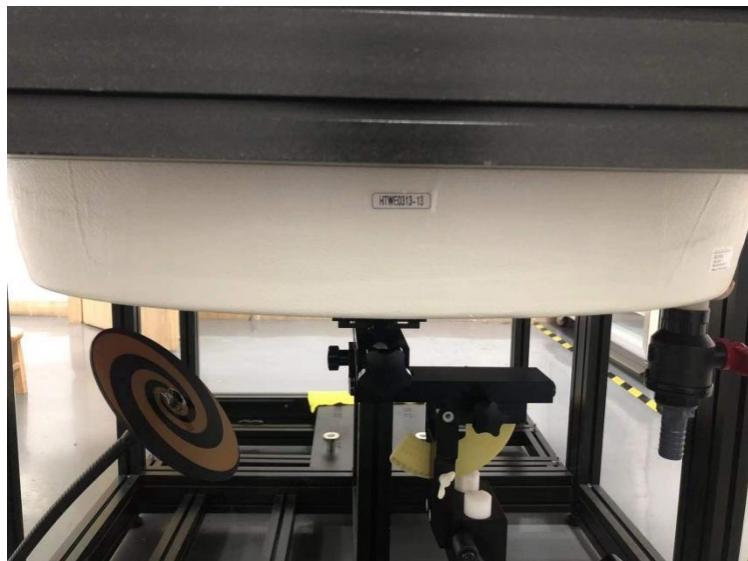
The isotropic E-Field probe has been fully calibrated and assessed for isotropicity, and boundary effect within a controlled environment. Depending on the frequency for which the probe is calibrated the method utilized for calibration will change.

The E-Field probe utilizes a triangular sensor arrangement as detailed in the diagram below:



### 6.3. Phantoms

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 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.



ELI4 Phantom

### 6.4. Device Holder

The device was placed in the device holder (illustrated below) that is supplied by SPEAG as an integral part of the DASY system.

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



Device holder supplied by SPEAG

## 7. SAR Test Procedure

### 7.1. Scanning Procedure

#### Step 1: 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. Measure the local SAR at a test point within 8 mm of the phantom inner surface that is closest to the DUT. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

#### Step 2: Area Scan

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 locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) 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 Resolutions per FCC KDB Publication 865664 D01v04

	$\leq 3$ GHz	$> 3$ GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	$5 \text{ mm} \pm 1 \text{ mm}$	$\frac{1}{2} \cdot \delta \cdot \ln(2) \text{ mm} \pm 0.5 \text{ mm}$
Maximum probe angle from probe axis to phantom surface normal at the measurement location	$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$
	$\leq 2 \text{ GHz: } \leq 15 \text{ mm}$ $2 - 3 \text{ GHz: } \leq 12 \text{ mm}$	$3 - 4 \text{ GHz: } \leq 12 \text{ mm}$ $4 - 6 \text{ GHz: } \leq 10 \text{ mm}$
Maximum area scan spatial resolution: $\Delta x_{\text{Area}}, \Delta y_{\text{Area}}$	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 $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

**Step 3: Zoom Scan**

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1g and 10g of simulated tissue. The Zoom Scan measures points (refer to table below) within a cube whose 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 g and 10 g and displays these values next to the job's label.

**Zoom Scan Resolutions per FCC KDB Publication 865664 D01v04**

Maximum zoom scan spatial resolution: $\Delta x_{Zoom}$ , $\Delta y_{Zoom}$		$\leq 2$ GHz: $\leq 8$ mm $2 - 3$ GHz: $\leq 5$ mm*	$3 - 4$ GHz: $\leq 5$ mm* $4 - 6$ GHz: $\leq 4$ mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$	$\leq 5$ mm	$3 - 4$ GHz: $\leq 4$ mm $4 - 5$ GHz: $\leq 3$ mm $5 - 6$ GHz: $\leq 2$ mm
	graded grid	$\leq 4$ mm	$3 - 4$ GHz: $\leq 3$ mm $4 - 5$ GHz: $\leq 2.5$ mm $5 - 6$ GHz: $\leq 2$ mm
Minimum zoom scan volume	$x, y, z$	$\geq 30$ mm	$3 - 4$ GHz: $\geq 28$ mm $4 - 5$ GHz: $\geq 25$ mm $5 - 6$ GHz: $\geq 22$ mm
	Note: $\delta$ 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 <u>reported</u> SAR from the <i>area scan based 1-g SAR estimation</i> procedures of KDB Publication 447498 is $\leq 1.4$ W/kg, $\leq 8$ mm, $\leq 7$ mm and $\leq 5$ 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.			

**Step 4: Power drift measurement**

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1. The SAR drift shall be kept within  $\pm 5$  %.

## 7.2. Data Storage and Evaluation

### 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], [°C], [W/kg], [mW/cm<sup>2</sup>], [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.

### Data Evaluation

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:	Dcp <i>i</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 DASY5 components. In the direct measuring mode of the multimeter 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:

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

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

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

cf: crest factor of exciting field (DASY parameter)

dcpi: diode compression point (DASY parameter)

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

$$E - \text{fieldprobes} : E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

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

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

Normi: sensor sensitivity of channel (i = x, y, z),  
[mV/(V/m)<sup>2</sup>] for E-field Probes

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):

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

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

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1'000}$$

SAR: local specific absorption rate in W/kg

Etot: total field strength in V/m

$\sigma$ : conductivity in [mho/m] or [Siemens/m]

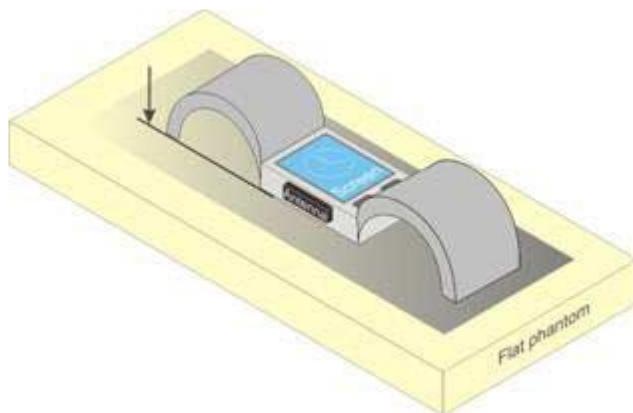
$\rho$ : equivalent tissue density in g/cm<sup>3</sup>

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.

## **8. Position of the wireless device in relation to the phantom**

### **8.1. Head and Extremity**

Transmitters that are built-in within a wrist watch or similar wrist-worn devices typically operate in speaker mode for voice communication, with the device worn on the wrist and positioned next to the mouth. Next to the mouth exposure requires 1-g SAR and the wrist-worn condition requires 10-g extremity SAR. The 10-g extremity and 1-g SAR test exclusions may be applied to the wrist and face exposure conditions. When SAR evaluation is required, next to the mouth use is evaluated with the front of the device positioned at 10 mm from a flat phantom filled with head tissue-equivalent medium. The wrist bands should be strapped together to represent normal use conditions. SAR for wrist exposure is evaluated with the back of the device positioned in direct contact against a flat phantom filled with body tissue-equivalent medium. The wrist bands should be unstrapped and touching the phantom.



## 9. Dielectric Property Measurements & System Check

### 9.1. Tissue Dielectric Parameters

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within  $\pm 2^\circ\text{C}$  of the temperature when the tissue parameters are characterized.

The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3-4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.

The dielectric constant ( $\epsilon_r$ ) and conductivity ( $\sigma$ ) of typical tissue-equivalent media recipes are expected to be within  $\pm 5\%$  of the required target values; but for SAR measurement systems that have implemented the SAR error compensation algorithms documented in IEEE Std 1528, to automatically compensate the measured SAR results for deviations between the measured and required tissue dielectric parameters, the tolerance for  $\epsilon_r$  and  $\sigma$  may be relaxed to  $\pm 10\%$ . This is limited to frequencies  $\leq 3$  GHz.

#### Tissue Dielectric Parameters

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

Tissue dielectric parameters for Head and Body				
Target Frequency (MHz)	Head		Body	
	$\epsilon_r$	$\sigma$ (S/m)	$\epsilon_r$	$\sigma$ (S/m)
2450	39.2	1.80	52.7	1.95

#### Measurement Results:

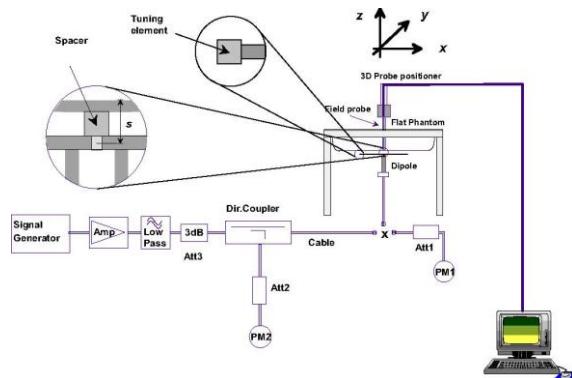
Dielectric performance of Head tissue simulating liquid									
Frequency (MHz)	$\epsilon_r$		$\sigma$ (S/m)		Delta ( $\epsilon_r$ )	Delta ( $\sigma$ )	Limit	Temp (°C)	Date
	Target	Measured	Target	Measured					
2450	39.20	41.06	1.800	1.865	4.73%	3.61%	$\pm 5\%$	22.8	2025/4/28

## 9.2. System Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are re-measured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

### System Performance Check Measurement Conditions:

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness:  $2.0 \pm 0.2$  mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be  $\geq 15.0$  cm for SAR measurements  $\leq 3$  GHz and  $\geq 10.0$  cm for measurements  $> 3$  GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.  
For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube was chosen for the cube.
- The results are normalized to 1 W input power.



System Performance Check Setup

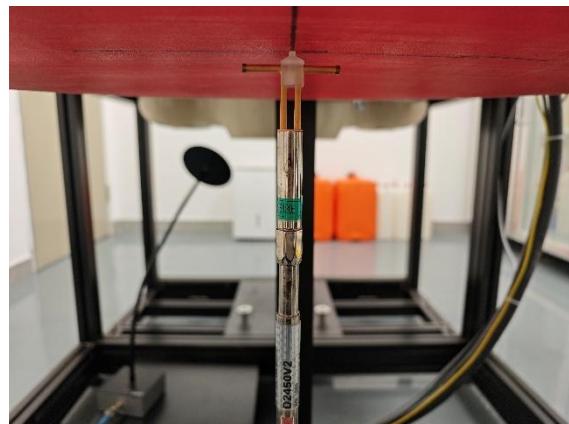


Photo of Dipole Setup

**Measurement Results:**

Head											
Frequency (MHz)	1g SAR			10g SAR			Delta (1g)	Delta (10g)	Limit	Temp (°C)	Date
	Target 1W	Normalize to 1W	Measured 250mW	Target 1W	Normalize to 1W	Measured 250mW					
2450	53.40	53.60	13.40	24.70	25.92	6.48	0.37%	4.94%	±10%	23.4	2025/4/28

**Note:**

*The 1-g and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within ±10% of the manufacturer calibrated dipole SAR target.*

### Plots of System Performance Check

Test Laboratory: Huatongwei International Inspection Co., Ltd., SAR Lab Date: 4/28/2025

#### System Performance Check-Head 2450MHz

Communication System: UID 0, CW (0); Frequency: 2450 MHz; Duty Cycle: 1:1  
 Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.865$  S/m;  $\epsilon_r = 41.055$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section  
 Ambient Temperature: 23.4°C; Liquid Temperature: 22.8°C

DASY Configuration:

- Probe: EX3DV4 - SN7494; ConvF(8.13, 8.13, 8.13) @ 2450 MHz; Calibrated: 6/7/2024
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/21/2025
- Phantom: ELI V8.0 ; Type: QD OVA 004 AA ; Serial: 2078
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

**Head/d=10mm, Pin=250mW/Area Scan (5x7x1):** Measurement grid: dx=12mm, dy=12mm  
 Maximum value of SAR (measured) = 17.2 W/kg

**Head/d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.43 V/m; Power Drift = -0.18 dB

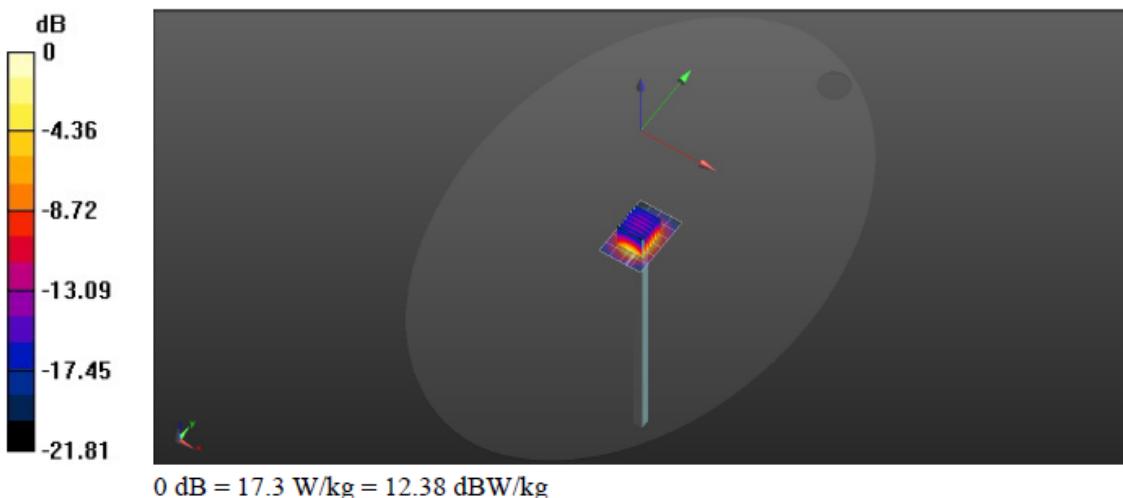
Peak SAR (extrapolated) = 26.2 W/kg

SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.48 W/kg

Smallest distance from peaks to all points 3 dB below = 10.2 mm

Ratio of SAR at M2 to SAR at M1 = 52.3%

Maximum value of SAR (measured) = 17.3 W/kg



## 10. SAR Exposure Limits

SAR assessments have been made in line with the requirements of FCC 47 CFR § 2.1093.

Type Exposure	Limit (W/kg)	
	General Population/ Uncontrolled Exposure Environment	Occupational/ Controlled Exposure Environment
Spatial Average SAR (whole body)	0.08	0.4
Spatial Peak SAR (1g cube tissue for head and trunk)	1.6	8.0
Spatial Peak SAR (10g for limb)	4.0	20.0

*Note:*

1. *Population/Uncontrolled Environments:* are defined as locations where there is the exposure of individual who have no knowledge or control of their exposure.
2. *Occupational/Controlled Environments:* are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure (i.e. as a result of employment or occupation).

## **11. Conducted Power Measurement Results and Tune-up**

Please refer to appendix report

*Note:*

### ***Wi-Fi***

*For 2.4GHz Wi-Fi SAR testing, highest average RF output power channel for the lowest data rate for 802.11b were for SAR evaluation.*

*The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures.*

*SAR testing is not required for OFDM mode(s) when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg.*

## **12. Measured and Reported SAR Results**

### **Measurement Results:**

Please refer to appendix report

### **Measurement data plots:**

Please refer to appendix D

Note:

#### **SAR Test Reduction criteria are as follows:**

- Reported SAR(W/kg) for WWAN = Measured SAR \*Tune-up Scaling Factor
- Reported SAR(W/kg) for Wi-Fi and Bluetooth = Measured SAR \* Tune-up scaling factor \* Duty Cycle scaling factor
- Duty Cycle scaling factor = 1 / Duty cycle (%)

#### **KDB 447498 D04 Interim General RF Exposure Guidance v01:**

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:

- $\leq 0.8 \text{ W/kg}$  or  $2.0 \text{ W/kg}$ , for 1-g or 10-g respectively, when the transmission band is  $\leq 100 \text{ MHz}$
- $\leq 0.6 \text{ W/kg}$  or  $1.5 \text{ W/kg}$ , for 1-g or 10-g respectively, when the transmission band is between  $100 \text{ MHz}$  and  $200 \text{ MHz}$
- $\leq 0.4 \text{ W/kg}$  or  $1.0 \text{ W/kg}$ , for 1-g or 10-g respectively, when the transmission band is  $\geq 200 \text{ MHz}$

#### **KDB 248227 D01 SAR meas for 802.11:**

When 802.11 frame gaps are accounted for in the transmission, a maximum transmission duty factor of 92 - 96% is typically achievable in most test mode configurations. A minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit. SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS procedure is applied to reduce the number of SAR tests; these are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

The multiple test positions require SAR measurements in head, hotspot mode or UMPC mini-tablet configurations may be reduced according to the highest reported SAR determined using the initial test position(s) by applying the DSSS or OFDM SAR measurement procedures in the required wireless mode test configuration(s). The initial test position(s) is measured using the highest measured maximum output power channel in the required wireless mode test configuration(s). When the reported SAR for the initial test position is:

- $\leq 0.4 \text{ W/kg}$ , further SAR measurement is not required for the other test positions in that exposure configuration and wireless mode combination within the frequency band or aggregated band. DSSS and OFDM configurations are considered separately according to the required SAR procedures.
- $> 0.4 \text{ W/kg}$ , SAR is repeated using the same wireless mode test configuration tested in the initial test position to measure the subsequent next closest/smallest test separation distance and maximum coupling test position, on the highest maximum output power channel, until the reported SAR is  $\leq 0.8 \text{ W/kg}$  or all required test positions are tested.
  - For subsequent test positions with equivalent test separation distance or when exposure is dominated by coupling conditions, the position for maximum coupling condition should be tested.
  - When it is unclear, all equivalent conditions must be tested.
- For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is  $> 0.8 \text{ W/kg}$ , measure the SAR for these positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is  $\leq 1.2 \text{ W/kg}$  or all required test channels are considered.
  - The additional power measurements required for this step should be limited to those necessary for

*identifying subsequent highest output power channels to apply the test reduction.*

- *When the specified maximum output power is the same for both UNII 1 and UNII 2A, begin SAR measurements in UNII 2A with the channel with the highest measured output power. If the reported SAR for UNII 2A is  $\leq 1.2$  W/kg, SAR is not required for UNII 1; otherwise treat the remaining bands separately and test them independently for SAR.*
- *When the specified maximum output power is different between UNII 1 and UNII 2A, begin SAR with the band that has the higher specified maximum output. If the highest reported SAR for the band with the highest specified power is  $\leq 1.2$  W/kg, testing for the band with the lower specified output power is not required; otherwise test the remaining bands independently for SAR.*

*To determine the initial test position, Area Scans were performed to determine the position with the Maximum Value of SAR (measured). The position that produced the highest Maximum Value of SAR is considered the worst case position; thus used as the initial test position.*

### **13. Simultaneous Transmission analysis**

No.	Simultaneous Transmission Configurations	Head	Extremity	Note
1	WLAN + Bluetooth	Yes	Yes	

General note:

The reported SAR summation is calculated based on the same configuration and test position.

#### **Simultaneous Transmission data:**

Please refer to appendix report

**--- End of Report ---**

Project No.	SHT2504043201W		
Test sample No.	YPHT25040432001	Model No.	A2547
Start test date	2025/4/28	Finish date	2025/4/28
Temperature	23.4°C	Humidity	55.60%
Test Engineer	Jiaxing Si	Auditor	<i>Xiaodong Zhao</i>

Appendix clause	Test Item	Result
A	Conducted Power Measurement Results	PASS
B	SAR Measurement Results	PASS
C	Simultaneous Transmission analysis	PASS

## Appendix A:Conducted Power Measurement Results-WIFI/Bluetooth

WIFI 2.4G					
Mode	Channel	Frequency (MHz)	Conducted Power (dBm)	Tune-up limit (dBm)	Duty Cycle (%)
802.11b	1	2412	16.50	18.00	93.58
	6	2437	16.49	17.99	98.93
	11	2462	15.93	17.43	98.92
802.11g	1	2412	15.67	17.17	98.93
	6	2437	15.46	16.96	98.93
	11	2462	15.04	16.54	98.93
802.11n (HT20)	1	2412	15.59	17.09	93.11
	6	2437	15.42	16.92	93.17
	11	2462	14.85	16.35	93.17

Bluetooth						
Mode		Channel	Frequency (MHz)	Conducted Power (dBm)	Tune-up limit (dBm)	Duty Cycle (%)
EDR	GFSK	0	2402	10.66	12.16	100.00
		39	2441	10.46	11.96	100.00
		78	2480	10.47	11.97	100.00
	$\pi/4$ QPSK	0	2402	9.50	11.00	100.00
		39	2441	9.20	10.70	100.00
		78	2480	9.09	10.59	100.00
	8DPSK	0	2402	9.44	10.94	100.00
		39	2441	9.19	10.69	100.00
		78	2480	9.26	10.76	100.00
BLE 1M	GFSK	0	2402	7.62	9.12	64.45
		19	2440	7.47	8.97	64.39
		39	2480	7.35	8.85	64.39
BLE 2M	GFSK	0	2402	7.52	9.02	34.74
		19	2440	7.28	8.78	34.80
		39	2480	7.19	8.69	34.80

## Appendix B:SAR Measurement Results-Head

WIFI 2.4G												
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune-up limit (dBm)	Tune-up scaling factor	Duty Cycle	Duty Cycle Scaling Factor	Power Drift(dB)	Measured SAR(1g)	Report SAR(1g)	Plot No.
		CH	MHz							(W/kg)	(W/kg)	
802.11b	Front	1	2412	16.50	18.00	1.413	93.58%	1.069	0.08	0.283	0.427	1
		6	2437	16.49	17.99	1.413	98.93%	1.011	-0.05	0.244	0.348	-
		11	2462	15.93	17.43	1.413	98.92%	1.011	-0.12	0.276	0.394	-

Bluetooth												
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune-up limit (dBm)	Tune-up scaling factor	Duty Cycle	Duty Cycle Scaling Factor	Power Drift(dB)	Measured SAR(1g)	Report SAR(1g)	Plot No.
		CH	MHz							(W/kg)	(W/kg)	
EDR GFSK	Front	0	2402	10.66	12.16	1.413	100.00%	1.000	-0.02	0.064	0.091	2
		39	2441	10.46	11.96	1.413	100.00%	1.000	-0.07	0.056	0.079	-
		78	2480	10.47	11.97	1.413	100.00%	1.000	-0.09	0.060	0.085	-
BLE 1M GFSK	Front	0	2402	7.62	9.12	1.413	64.45%	1.552	-0.01	0.015	0.033	-
		19	2440	7.47	8.97	1.413	64.39%	1.553	-0.08	0.014	0.031	-
		39	2480	7.35	8.85	1.413	64.39%	1.553	-0.13	0.010	0.022	-

## Appendix B:SAR Measurement Results-Extremity

WIFI 2.4G												
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune-up limit (dBm)	Tune-up scaling factor	Duty Cycle	Duty Cycle Scaling Factor	Power Drift(dB)	Measured SAR(10g) (W/kg)	Report SAR(10g) (W/kg)	Plot No.
		CH	MHz									
802.11b	Rear	1	2412	16.50	18.00	1.413	93.58%	1.069	-0.01	0.418	0.631	3
		6	2437	16.49	17.99	1.413	98.93%	1.011	-0.03	0.406	0.580	-
		11	2462	15.93	17.43	1.413	98.92%	1.011	-0.17	0.399	0.570	-

Bluetooth												
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune-up limit (dBm)	Tune-up scaling factor	Duty Cycle	Duty Cycle Scaling Factor	Power Drift(dB)	Measured SAR(10g) (W/kg)	Report SAR(10g) (W/kg)	Plot No.
		CH	MHz									
EDR GFSK	Rear	0	2402	10.66	12.16	1.413	100.00%	1.000	-0.08	0.117	0.165	4
		39	2441	10.46	11.96	1.413	100.00%	1.000	-0.15	0.111	0.157	-
		78	2480	10.47	11.97	1.413	100.00%	1.000	-0.09	0.107	0.151	-
BLE 1M GFSK	Rear	0	2402	7.62	9.12	1.413	64.45%	1.552	-0.05	0.033	0.071	-
		19	2440	7.47	8.97	1.413	64.39%	1.553	-0.03	0.024	0.053	-
		39	2480	7.35	8.85	1.413	64.39%	1.553	0.01	0.027	0.059	-

**Appendix C: Simultaneous Transmission analysis**

<b>WLAN+ Bluetooth(Head)</b>				
WLAN Band	Exposure Position	Max SAR (W/kg)		Summed SAR (W/kg)
		WLAN	BT	
WIFI 2.4G	Front	0.427	0.091	0.518

<b>WLAN+ Bluetooth(Extremity)</b>				
WLAN Band	Exposure Position	Max SAR (W/kg)		Summed SAR (W/kg)
		WLAN	BT	
WIFI 2.4G	Rear	0.631	0.165	0.796

**WIFI 2.4G Head**

Communication System: UID 0, Generic WIFI (0); Frequency: 2412 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2412 \text{ MHz}$ ;  $\sigma = 1.837 \text{ S/m}$ ;  $\epsilon_r = 41.11$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Ambient Temperature: 23.4°C; Liquid Temperature: 22.8°C

DASY Configuration:

- Probe: EX3DV4 - SN7494; ConvF(8.13, 8.13, 8.13) @ 2412 MHz; Calibrated: 6/7/2024
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/21/2025
- Phantom: ELI V8.0 ; Type: QD OVA 004 AA ; Serial: 2078
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

**Front 10mm/CH1/Area Scan (6x6x1):** Measurement grid:  $dx=12\text{mm}$ ,  $dy=12\text{mm}$ 

Maximum value of SAR (measured) = 0.403 W/kg

**Front 10mm/CH1/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$ 

Reference Value = 15.18 V/m; Power Drift = 0.08 dB

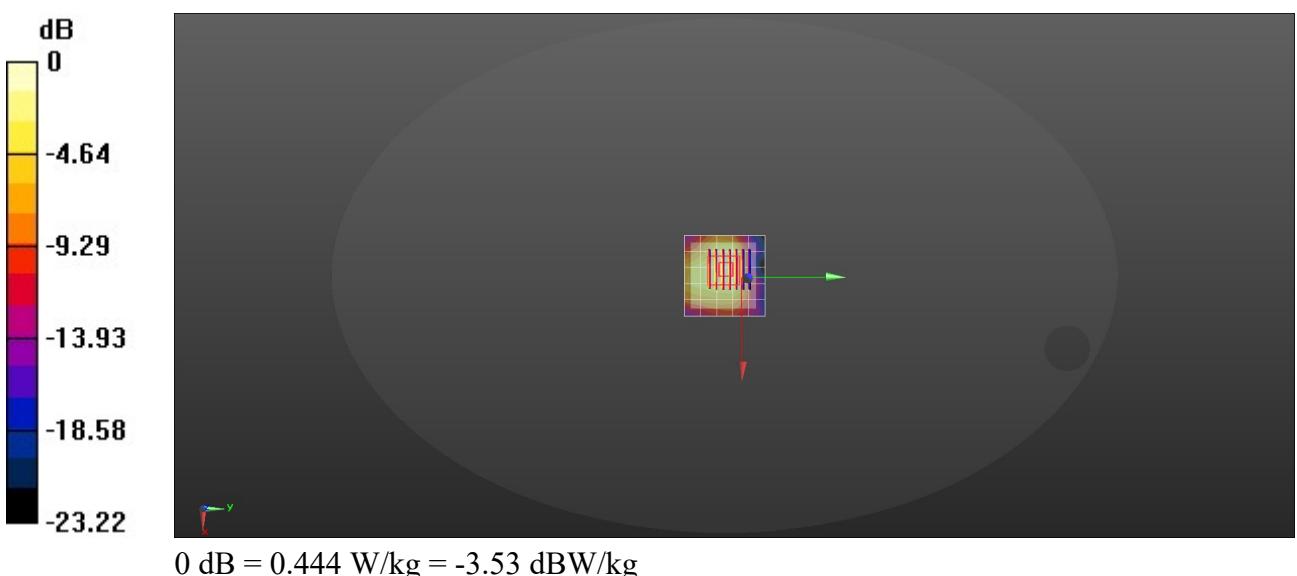
Peak SAR (extrapolated) = 0.552 W/kg

**SAR(1 g) = 0.283 W/kg; SAR(10 g) = 0.145 W/kg**

Smallest distance from peaks to all points 3 dB below = 9.8 mm

Ratio of SAR at M2 to SAR at M1 = 52.1%

Maximum value of SAR (measured) = 0.444 W/kg



## Bluetooth Head

Communication System: UID 0, Generic BT (0); Frequency: 2402 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2402$  MHz;  $\sigma = 1.83$  S/m;  $\epsilon_r = 41.126$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Ambient Temperature: 23.4°C; Liquid Temperature: 22.8°C

DASY Configuration:

- Probe: EX3DV4 - SN7494; ConvF(8.13, 8.13, 8.13) @ 2402 MHz; Calibrated: 6/7/2024
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/21/2025
- Phantom: ELI V8.0 ; Type: QD OVA 004 AA ; Serial: 2078
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

**Front 10mm/CH0/Area Scan (6x6x1):** Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.0979 W/kg

**Front 10mm/CH0/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.285 V/m; Power Drift = -0.02 dB

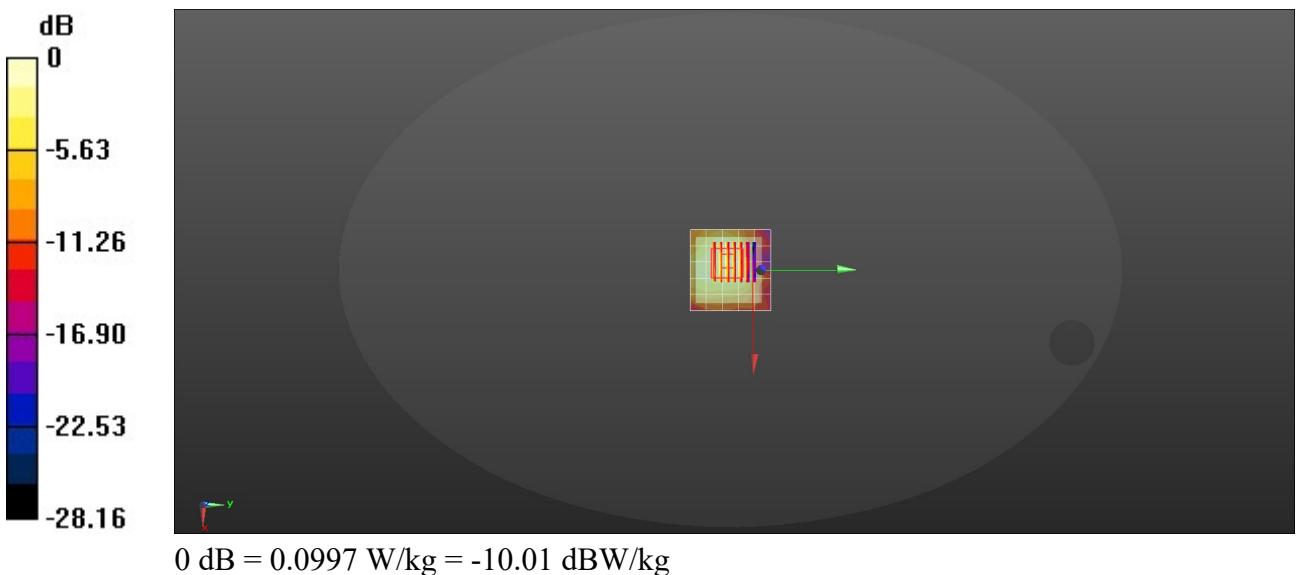
Peak SAR (extrapolated) = 0.129 W/kg

**SAR(1 g) = 0.064 W/kg; SAR(10 g) = 0.033 W/kg**

Smallest distance from peaks to all points 3 dB below = 8.9 mm

Ratio of SAR at M2 to SAR at M1 = 49.9%

Maximum value of SAR (measured) = 0.0997 W/kg



## WIFI 2.4G Extremity

Communication System: UID 0, Generic WIFI (0); Frequency: 2412 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2412 \text{ MHz}$ ;  $\sigma = 1.837 \text{ S/m}$ ;  $\epsilon_r = 41.11$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient Temperature: 23.4°C; Liquid Temperature: 22.8°C

DASY Configuration:

- Probe: EX3DV4 - SN7494; ConvF(8.13, 8.13, 8.13) @ 2412 MHz; Calibrated: 6/7/2024
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/21/2025
- Phantom: ELI V8.0 ; Type: QD OVA 004 AA ; Serial: 2078
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

**Rear 0mm/CH1/Area Scan (6x6x1):** Measurement grid:  $dx=12\text{mm}$ ,  $dy=12\text{mm}$

Maximum value of SAR (measured) = 1.38 W/kg

**Rear 0mm/CH1/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 22.98 V/m; Power Drift = -0.01 dB

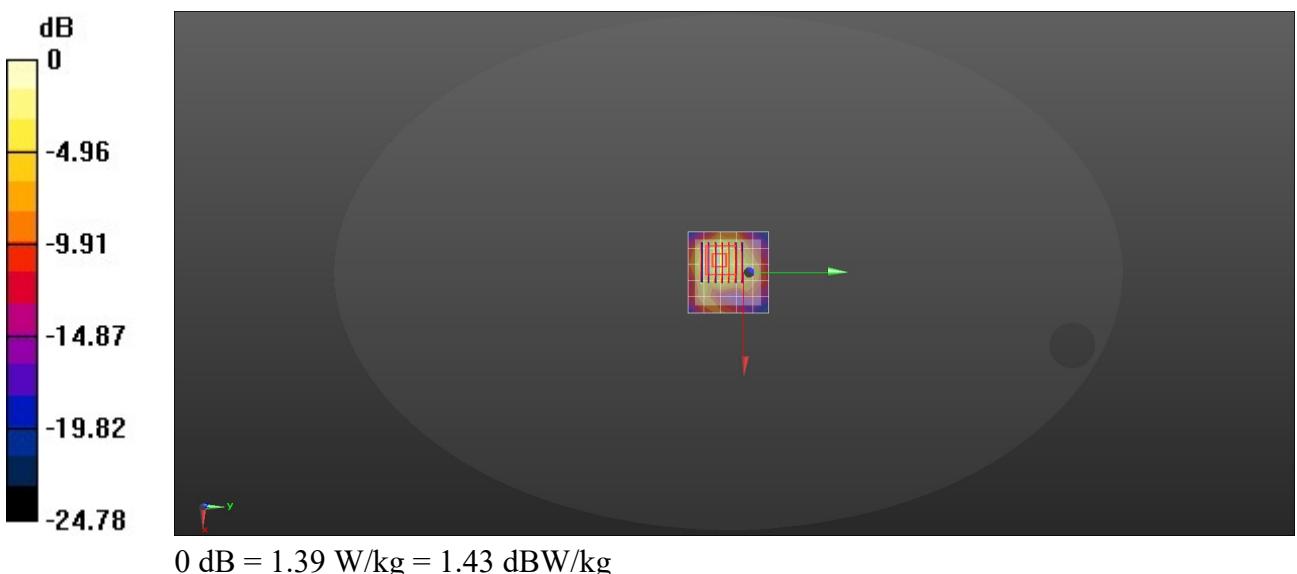
Peak SAR (extrapolated) = 1.70 W/kg

**SAR(1 g) = 0.911 W/kg; SAR(10 g) = 0.418 W/kg**

Smallest distance from peaks to all points 3 dB below = 10.6 mm

Ratio of SAR at M2 to SAR at M1 = 56.7%

Maximum value of SAR (measured) = 1.39 W/kg



## Bluetooth Extremity

Communication System: UID 0, Generic BT (0); Frequency: 2402 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2402$  MHz;  $\sigma = 1.83$  S/m;  $\epsilon_r = 41.126$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Ambient Temperature: 23.4°C; Liquid Temperature: 22.8°C

DASY Configuration:

- Probe: EX3DV4 - SN7494; ConvF(8.13, 8.13, 8.13) @ 2402 MHz; Calibrated: 6/7/2024
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/21/2025
- Phantom: ELI V8.0 ; Type: QD OVA 004 AA ; Serial: 2078
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

**Rear 0mm/CH0/Area Scan (6x6x1):** Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.414 W/kg

**Rear 0mm/CH0/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 12.60 V/m; Power Drift = -0.08 dB

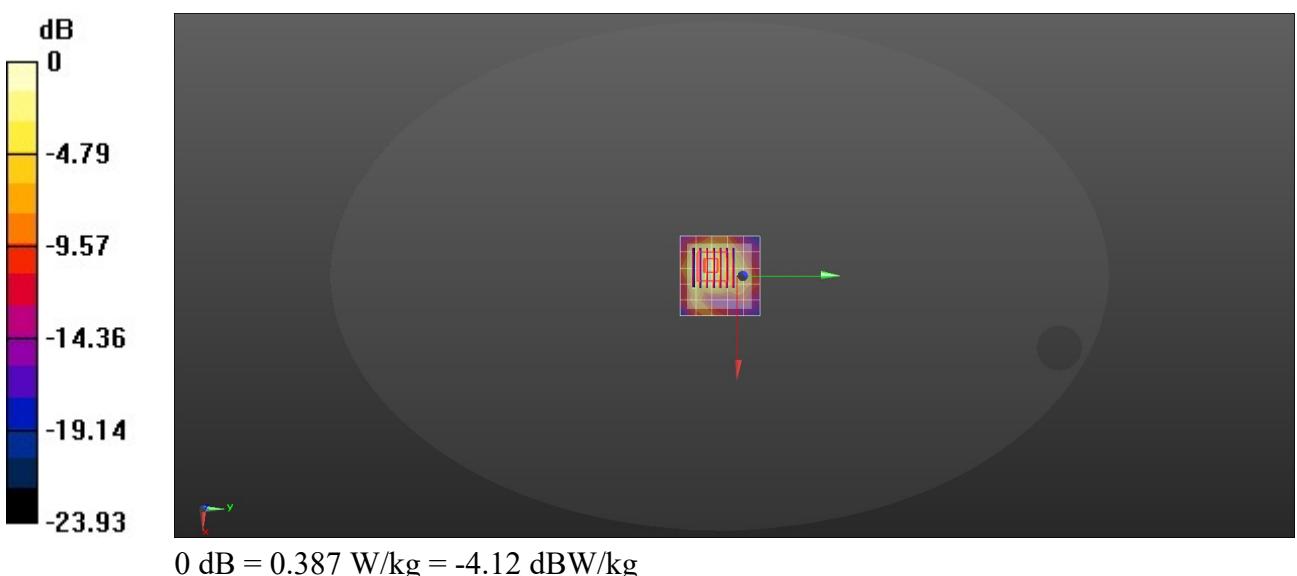
Peak SAR (extrapolated) = 0.485 W/kg

**SAR(1 g) = 0.256 W/kg; SAR(10 g) = 0.117 W/kg**

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

Ratio of SAR at M2 to SAR at M1 = 55.7%

Maximum value of SAR (measured) = 0.387 W/kg



## 1.1. DAE4 Calibration Certificate



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>



Client : HTW

Certificate No: 25J02Z000261

### CALIBRATION CERTIFICATE

Object DAE4 - SN: 1549

Calibration Procedure(s) FF-Z11-002-01  
 Calibration Procedure for the Data Acquisition Electronics (DAEEx)

Calibration date: April 21, 2025

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( $22\pm3$ )°C 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	11-Jun-24 (CTTL, No.24J02X005147)	Jun-25

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

Issued: April 23, 2025

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



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

**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.





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

#### DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB =  $6.1\mu\text{V}$ , full range =  $-100\dots+300\text{ mV}$

Low Range: 1LSB =  $61\text{nV}$ , full range =  $-1\dots+3\text{mV}$

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

Calibration Factors	X	Y	Z
High Range	$406.362 \pm 0.15\% \text{ (k=2)}$	$406.035 \pm 0.15\% \text{ (k=2)}$	$406.194 \pm 0.15\% \text{ (k=2)}$
Low Range	$3.98339 \pm 0.7\% \text{ (k=2)}$	$3.99051 \pm 0.7\% \text{ (k=2)}$	$3.99188 \pm 0.7\% \text{ (k=2)}$

#### Connector Angle

Connector Angle to be used in DASY system	$18.5^\circ \pm 1^\circ$
---	--------------------------

## 1.2. Probe Calibration Certificate

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<b>Client</b> <b>HTW</b> <b>Certificate No:</b> <b>24J02Z000321</b>																																	
<b>CALIBRATION CERTIFICATE</b>																																	
Object	EX3DV4 - SN : 7494																																
Calibration Procedure(s)	FF-Z11-004-02 Calibration Procedures for Dosimetric E-field Probes																																
Calibration date:	June 07, 2024																																
<p>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.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)°C and humidity&lt;70%.</p> <p>Calibration Equipment used (M&amp;TE critical for calibration)</p>																																	
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**Glossary:**

TSL	tissue simulating liquid
NORM <sub>x,y,z</sub>	sensitivity in free space
ConvF	sensitivity in TSL / NORM <sub>x,y,z</sub>
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A,B,C,D	modulation dependent linearization parameters
Polarization $\Phi$	$\Phi$ rotation around probe axis
Polarization $\theta$	$\theta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i $\theta=0$ 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:**

- 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
- IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- 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
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

**Methods Applied and Interpretation of Parameters:**

- $NORM_{x,y,z}$ : Assessed for E-field polarization  $\theta=0$  ( $f \leq 900$ MHz in TEM-cell;  $f > 1800$ MHz: waveguide).  $NORM_{x,y,z}$  are only intermediate values, i.e., the uncertainties of  $NORM_{x,y,z}$  does not effect the  $E^2$ -field uncertainty inside TSL (see below ConvF).
- $NORM(f)x,y,z = NORM_{x,y,z} * frequency\_response$  (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  $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to  $NORM_{x,y,z} * ConvF$  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  $\pm 50$ MHz to  $\pm 100$ MHz.
- 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  $NORM_x$  (no uncertainty required).



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## DASY/EASY – Parameters of Probe: EX3DV4 – SN:7494

### Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm( $\mu$ V/(V/m) <sup>2</sup> ) <sup>A</sup>	0.40	0.47	0.41	$\pm$ 10.0%
DCP(mV) <sup>B</sup>	99.9	100.2	100.1	

### Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB/ $\mu$ V	C	D dB	VR mV	Unc <sup>E</sup> (k=2)
0	CW	X	0.0	0.0	1.0	0.00	156.2	$\pm$ 2.0%
		Y	0.0	0.0	1.0		169.5	
		Z	0.0	0.0	1.0		158.4	

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%.

<sup>A</sup> The uncertainties of Norm X, Y, Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Page 4).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>E</sup> Uncertainty 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:7494

### Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz] <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha <sup>G</sup>	Depth <sup>G</sup> (mm)	Unct. (k=2)
750	41.9	0.89	10.74	10.74	10.74	0.19	1.20	±12.7%
835	41.5	0.90	10.38	10.38	10.38	0.14	1.39	±12.7%
1750	40.1	1.37	8.94	8.94	8.94	0.25	1.02	±12.7%
1900	40.0	1.40	8.60	8.60	8.60	0.28	0.99	±12.7%
2100	39.8	1.49	8.55	8.55	8.55	0.20	1.16	±12.7%
2300	39.5	1.67	8.37	8.37	8.37	0.61	0.66	±12.7%
2450	39.2	1.80	8.13	8.13	8.13	0.54	0.71	±12.7%
2600	39.0	1.96	7.93	7.93	7.93	0.57	0.68	±12.7%
5250	35.9	4.71	5.70	5.70	5.70	0.45	1.40	±13.9%
5600	35.5	5.07	5.04	5.04	5.04	0.45	1.40	±13.9%
5750	35.4	5.22	5.19	5.19	5.19	0.45	1.40	±13.9%

<sup>C</sup> 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.

<sup>F</sup> At frequency up to 6 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> 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.

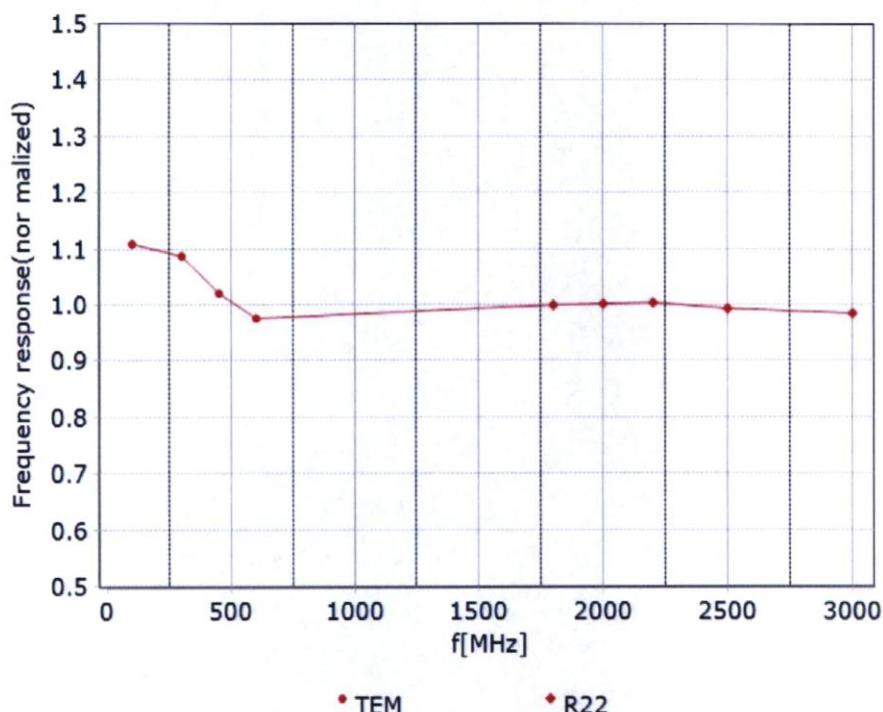


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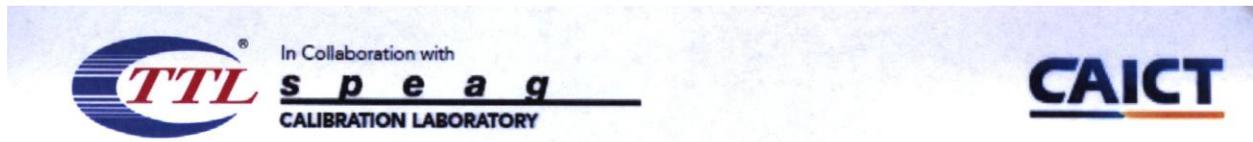


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## Frequency Response of E-Field (TEM-Cell: ifi110 EXX, Waveguide: R22)



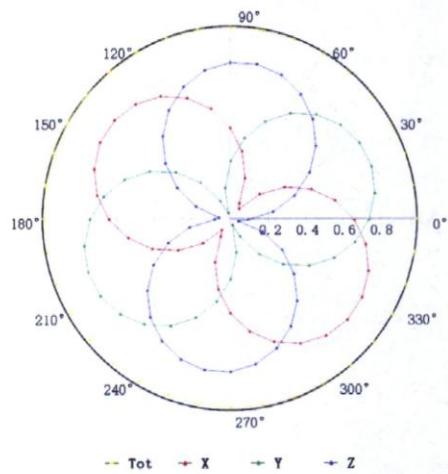
Uncertainty of Frequency Response of E-field:  $\pm 7.4\% (k=2)$



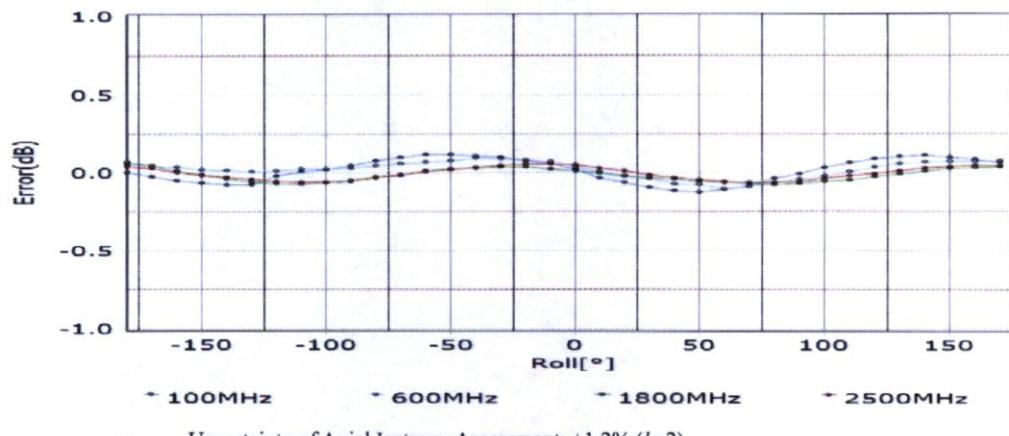
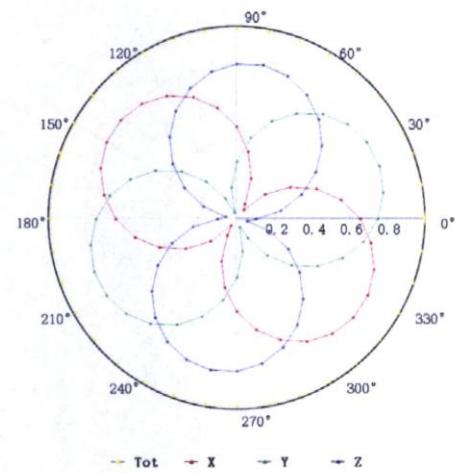
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### Receiving Pattern ( $\Phi$ ), $\theta=0^\circ$

**f=600 MHz, TEM**



**f=1800 MHz, R22**



Uncertainty of Axial Isotropy Assessment:  $\pm 1.2\% (k=2)$