

# SAR TEST REPORT

For

## FCC: VTech Telecommunications Ltd

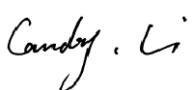
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**FCC ID: EW780-1962-01**

**IC: 1135B-80196201**

<b>Report Type:</b> Original Report		<b>Product Type:</b> Baby Monitor	
<b>Report Number:</b>		SZ1211008-51393E-SA	
<b>Report Date:</b>		2021-11-10	
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Attestation of Test Results			
EUT Information	EUT Description	Baby Monitor	
	Tested Model	VM5255 PU	
	Multiple Model	VM5255-2 PU, VM5255-ab PU, VM5263 PU, VM5263-2 PU, VM5263-ab PU, VM5463 PU, VM5463-2 PU, VM5463-ab PU, LM918-2W PU, VM5254 PU (a=any alphanumeric character or blank is presenting number of baby unit; b = any alphanumeric character or blank is presenting color of enclosure.)	
	HVIN	35-201795PU	
	FCC ID	EW780-1962-01	
	IC	1135B-80196201	
	Serial Number	SZ1211008-51393E-SA-S_LRL	
	Test Date	2021/11/06	
	MODE		Max. SAR Level(s) Reported(W/kg)
2.4 GHz SRD	Face up	0.01	1.6
	10g Limb	0.25	4.0
Applicable Standards	FCC 47 CFR part 2.1093 Radiofrequency radiation exposure evaluation: portable devices		
	RSS-102 Issue 5 Amendment 1 February 2021 Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands).		
	IEC/IEEE62209-1528:2020 Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-worn wireless communication devices - Human models, instrumentation and procedures (Frequency range of 4 MHz to 10 GHz)		
	KDB procedures KDB 447498 D01 General RF Exposure Guidance v06. KDB 648474 D04 Handset SAR v01r03. KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04 KDB 865664 D02 RF Exposure Reporting v01r02		
Note: This wireless device has been shown to be capable of compliance for localized specific absorption rate (SAR) for General Population/Uncontrolled Exposure limits specified in FCC 47 CFR part 2.1093 and has been tested in accordance with the measurement procedures specified in IEC/IEEE62209-1528:2020 and RF exposure KDB procedures. The results and statements contained in this report pertain only to the device(s) evaluated.			

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## DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	SZ1211008-51393E-SA	Original Report	2021-11-10

## EUT DESCRIPTION

This report has been prepared on behalf of **VTech Telecommunications Ltd** and their product Baby Monitor, Model: VM5255 PU, FCC ID: **EW780-1962-01**; IC: **1135B-80196201** or the EUT (Equipment under Test) as referred to in the rest of this report.

*Notes: Series models differ from main models only by name and color; Model **VM5255 PU** was selected for fully testing, the detailed information can be referred to the attached declaration which was stated and guaranteed by the applicant.*

*\*All measurement and test data in this report was gathered from production sample serial number: SZ1211008-51393E-SA-S\_LRL (Assigned by ATC). The EUT supplied by the applicant was received on 2021-10-08.*

### Technical Specification

<b>Device Type:</b>	Portable
<b>Exposure Category:</b>	Population / Uncontrolled
<b>Antenna Type(s):</b>	External Antenna
<b>Accessories:</b>	None
<b>Operation Mode:</b>	SRD 2.4G
<b>Frequency Band:</b>	2.4GHz Band: 2405~2475MHz
<b>Peak RF Power:</b>	SRD 2.4G: 17.41 dBm
<b>Power Source:</b>	Rechargeable Battery
<b>Normal Operation:</b>	Handheld

## REFERENCE, STANDARDS, AND GUIDELINES

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### FCC:

The Report and Order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g as recommended by the ANSI/IEEE standard C95.1-1992 [6] for an uncontrolled environment (Paragraph 65). According to the Supplement C of OET Bulletin 65 "Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 29, 2001 by the FCC, the device should be evaluated at maximum output power (radiated from the antenna) under "worst-case" conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

This report describes the methodology and results of experiments performed on wireless data terminal. The objective was to determine if there is RF radiation and if radiation is found, what is the extent of radiation with respect to safety limits. SAR (Specific Absorption Rate) is the measure of RF exposure determined by the amount of RF energy absorbed by human body (or its parts) – to determine how the RF energy couples to the body or head which is a primary health concern for body worn devices. The limit below which the exposure to RF is considered safe by regulatory bodies in North America is 1.6 mW/g average over 1 gram of tissue mass.

### CE:

The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 2 mW/g as recommended by EN62209-1 for an uncontrolled environment. According to the Standard, the device should be evaluated at maximum output power (radiated from the antenna) under "worst-case" conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

This report describes the methodology and results of experiments performed on wireless data terminal. The objective was to determine if there is RF radiation and if radiation is found, what is the extent of radiation with respect to safety limits. SAR (Specific Absorption Rate) is the measure of RF exposure determined by the amount of RF energy absorbed by human body (or its parts) – to determine how the RF energy couples to the body or head which is a primary health concern for body worn devices. The limit below which the exposure to RF is considered safe by regulatory bodies in Europe is 2 mW/g average over 10 gram of tissue mass.

The test configurations were laid out on a specially designed test fixture to ensure the reproducibility of measurements. Each configuration was scanned for SAR. Analysis of each scan was carried out to characterize the above effects in the device.

**SAR Limits****FCC&IC Limit**

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 1 g of tissue)	<b>1.60</b>	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

**CE Limit**

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 10 g of tissue)	2.0	10
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

Population/Uncontrolled Environments are defined as locations where there is the exposure of individual who have no knowledge or control of their exposure.

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).

General Population/Uncontrolled environments Spatial Peak limit 1.6W/kg (FCC&IC) & 2 W/kg (CE) applied to the EUT.

## FACILITIES

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The test site used by Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 708358, the FCC Designation No.: CN1189. Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 4297.01 .

Listed by Innovation, Science and Economic Development Canada (ISED), the Registration Number is 5077A.

The test site has been registered with ISED Canada under ISED Canada Registration Number CN0016.

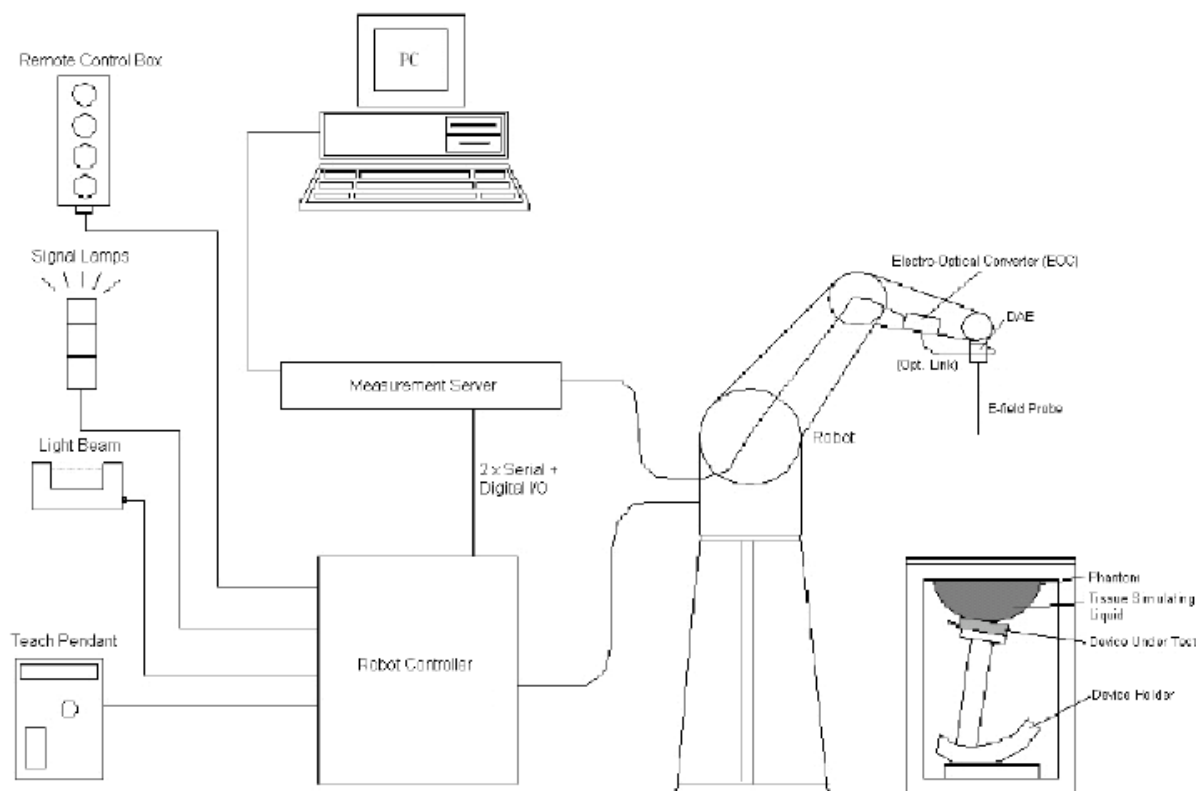
## DESCRIPTION OF TEST SYSTEM

These measurements were performed with the automated near-field scanning system DASY5 from Schmid & Partner Engineering AG (SPEAG) which is the Fifth generation of the system shown in the figure hereinafter:



### DASY5 System Description

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



- A standard high precision 6-axis robot (Staubli TX=RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal application, 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.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running Win7 professional operating system and the DASY52 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

### **DASY5 Measurement Server**

The DASY5 measurement server is based on a PC/104 CPU board with a 400 MHz Intel ULV Celeron, 128 MB chip-disk and 128 MB RAM. The necessary circuits for communication with the DAE4 (or DAE3) electronics box, as well as the 16-bit AD converter system for optical detection and digital I/O interface are contained on the DASY5 I/O board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all real-time data evaluations of field measurements and surface detection, controls robot movements, and handles safety operations. The PC operating system cannot interfere with these time-critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program- controlled robot movements. Furthermore, the measurement server is equipped with an expansion port, which is reserved for future applications. Please note that this expansion port does not have a standardized pinout, and therefore only devices provided by SPEAG can be connected. Connection of devices from any other supplier could seriously damage the measurement server.

### **Data Acquisition Electronics**

The data acquisition electronics (DAE4) consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder with a control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information, as well as an optical uplink for commands and the clock.

The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.

The input impedance of both the DAE4 as well as of the DAE3 box is 200M $\Omega$ ; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

**EX3DV4 E-Field Probes**

<b>Frequency</b>	10 MHz to > 6 GHz Linearity: $\pm 0.2$ dB (30 MHz to 6 GHz)
<b>Directivity</b>	$\pm 0.3$ dB in TSL (rotation around probe axis) $\pm 0.5$ dB in TSL (rotation normal to probe axis)
<b>Dynamic Range</b>	10 $\mu$ W/g to > 100 mW/g Linearity: $\pm 0.2$ dB (noise: typically < 1 $\mu$ W/g)
<b>Dimensions</b>	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
<b>Application</b>	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields); the only probe that enables compliance testing for frequencies up to 6 GHz with precision of better 30%.
<b>Compatibility</b>	DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI

**SAM Twin Phantom**

The SAM Twin Phantom (shown in front of DASY5) is a fiberglass shell phantom with shell thickness 2 mm, except in the ear region where the thickness is increased to 6 mm..

When the phantom is mounted inside allocated slot of the DASY5 platform, phantom reference points can be taught directly in the DASY5 V5.2 software. When the DASY5 platform is used to mount the

Phantom, some of the phantom teaching points cannot be reached by the robot in DASY5 V5.2. A special tool called P1a-P2aX-Former is provided to transform two of the three points, P1 and P2, to reachable locations. To use these new teaching points, a revised phantom configuration file is required.

In addition to our standard broadband liquids, the phantom can be used with the following tissue simulating liquids:

Sugar-water-based liquids can be left permanently in the phantom.

Always cover the liquid when the system is not in use to prevent changes in liquid parameters due to water evaporation.

DGBE-based liquids should be used with care. As DGBE is a softener for most plastics, the liquid should be taken out of the phantom, and the phantom should be dried when the system is not in use (desirable at least once a week).

Do not use other organic solvents without previously testing the solvent resistivity of the phantom. Approximately 25 liters of liquid is required to fill the SAM Twin phantom.



**Calibration Frequency Points for EX3DV4 E-Field Probes SN: 7522 Calibrated: 2021/04/19**

Calibration Frequency Point(MHz)	Frequency Range(MHz)		Conversion Factor		
	From	To	X	Y	Z
750 Head	650	850	9.93	9.93	9.93
900 Head	850	1000	9.39	9.39	9.39
1750 Head	1650	1850	8.16	8.16	8.16
1900 Head	1850	2000	7.94	7.94	7.94
2300 Head	2200	2400	7.61	7.61	7.61
2450 Head	2400	2550	7.25	7.25	7.25
2600 Head	2550	2700	7.05	7.05	7.05

**Area Scans**

Area scans are defined prior to the measurement process being executed with a user defined variable spacing between each measurement point (integral) allowing low uncertainty measurements to be conducted. Scans defined for FCC applications utilize a 15mm 2 step integral, with 1.5mm interpolation used to locate the peak SAR area used for zoom scan assessments.

Where the system identifies multiple SAR peaks (which are within 25% of peak value) the system will provide the user with the option of assessing each peak location individually for zoom scan averaging.

**Zoom Scan (Cube Scan Averaging)**

The averaging zoom scan volume utilized in the DASY5 software is in the shape of a cube and the side dimension of a 1 g or 10 g mass is dependent on the density of the liquid representing the simulated tissue. A density of 1000 kg/m<sup>3</sup> is used to represent the head and body tissue density and not the phantom liquid density, in order to be consistent with the definition of the liquid dielectric properties, i.e. the side length of the 1g cube is 10mm, with the side length of the 10g cube is 21.5mm.

When the cube intersects with the surface of the phantom, it is oriented so that 3 vertices touch the surface of the shell or the center of a face is tangent to the surface. The face of the cube closest to the surface is modified in order to conform to the tangent surface.

The zoom scan integer steps can be user defined so as to reduce uncertainty, but normal practice for typical test applications (including FCC) utilize a physical step of 7 x 7 x 7 (5mmx5mmx5mm) providing a volume of 30 mm in the X & Y & Z axis.

## Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEC/IEEE62209-1528:2020

### Recommended Tissue Dielectric Parameters for Head and Body

**Table 2 – Dielectric properties of the tissue-equivalent medium**

Frequency MHz	Real part of the complex relative permittivity, $\epsilon'_r$	Conductivity, $\sigma$ S/m	Penetration depth (E-field), $\delta$ mm
4	55,0	0,75	293,0
13	55,0	0,75	165,5
30	55,0	0,75	112,8
150	52,3	0,76	62,0
300	45,3	0,87	46,1
450	43,5	0,87	43,0
750	41,9	0,89	39,8
835	41,5	0,90	39,0
900	41,5	0,97	36,2
1 450	40,5	1,20	28,6
1 800	40,0	1,40	24,3
1 900	40,0	1,40	24,3
1 950	40,0	1,40	24,3
2 000	40,0	1,40	24,3
2 100	39,8	1,49	22,8
2 450	39,2	1,80	18,7
2 600	39,0	1,96	17,2
3 000	38,5	2,40	14,0
3 500	37,9	2,91	11,4
4 000	37,4	3,43	10,0
4 500	36,8	3,94	9,7

Frequency MHz	Real part of the complex relative permittivity, $\varepsilon'_r$	Conductivity, $\sigma$ S/m	Penetration depth (E-field), $\delta$ mm
5 000	36,2	4,45	1,5
5 200	36,0	4,66	8,4
5 400	35,8	4,86	8,1
5 600	35,5	5,07	7,5
5 800	35,3	5,27	7,3
6 000	35,1	5,48	7,0
6 500	34,5	6,07	6,7
7 000	33,9	6,65	6,4
7 500	33,3	7,24	6,1
8 000	32,7	7,84	5,9
8 500	32,1	8,46	5,3
9 000	31,6	9,08	4,8
9 500	31,0	9,71	4,4
10 000	30,4	10,40	4,0

NOTE For convenience, permittivity and conductivity values are linearly interpolated for frequencies that are not a part of the original data from Drossos et al. [2]. They are shown in italics in Table 2. The italicized values are linearly interpolated (below 5800 MHz) or extrapolated (above 5800 MHz) from the non-italicized values that are immediately above and below these values.

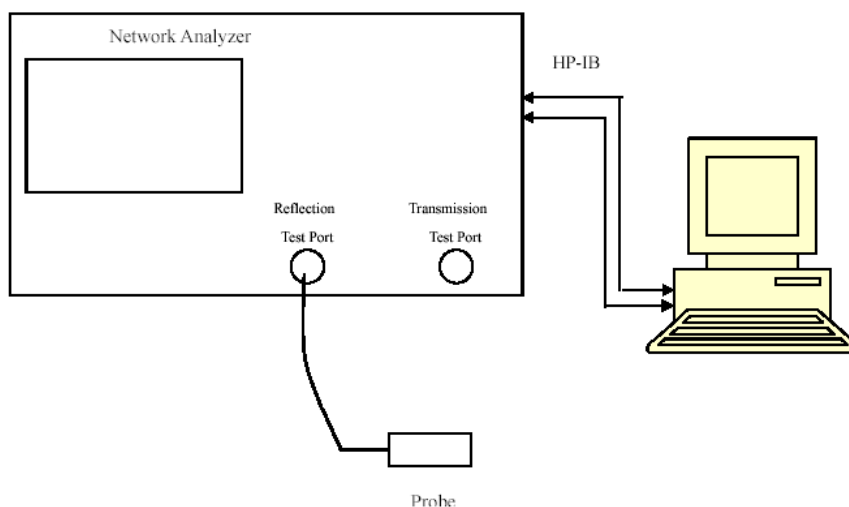
## EQUIPMENT LIST AND CALIBRATION

### Equipments List & Calibration Information

Equipment	Model	S/N	Calibration Date	Calibration Due Date
DASY5 Test Software	DASY52 52.10.4	N/A	NCR	NCR
DASY5 Measurement Server	DASY5 6.0.31	N/A	NCR	NCR
Data Acquisition Electronics	DAE4	1354	2021/9/1	2022/8/31
E-Field Probe	EX3DV4	7522	2021/4/19	2022/4/18
Mounting Device	MD4HHTV5	SD 000 H01 KA	NCR	NCR
SAM Twin Phantom	SAM-Twin V5.0	1744	NCR	NCR
Dipole,2450MHz	D2450V2	751	2020/10/13	2023/10/12
Simulated Tissue Liquid Head(500-9500MHz)	HBBL600-10000V6	180622-2	Each Time	/
Network Analyzer	8753D	3410A08288	2021/7/06	2022/7/05
Dielectric Assessment Kit	DAK-3.5	1248	NCR	NCR
Signal Generator	SMB100A	108362	2020/12/24	2021/12/23
USB wideband power sensor	U2021XA	MY52350001	2021/7/06	2022/7/05
Pre-Amplifier	PAM-0118	135	2021/01/04	2022/01/03
Directional Coupler	4223-20	3.113.277	2020/12/25	2021/12/24
6dB Attenuator	8493B 6dB Attenuator	2708A 04769	2020/12/25	2021/12/24

## SAR MEASUREMENT SYSTEM VERIFICATION

### Liquid Verification



Liquid Verification Setup Block Diagram

### Liquid Verification Results

Frequency (MHz)	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		$\epsilon_r$	$\sigma$ (S/m)	$\epsilon_r$	$\sigma$ (S/m)	$\Delta\epsilon_r$	$\Delta\sigma$	
2405	Tissue Liquid Head	40.047	1.742	39.29	1.76	1.93	-1.02	$\pm 5$
2439	Tissue Liquid Head	39.926	1.771	39.22	1.79	1.80	-1.06	$\pm 5$
2450	Tissue Liquid Head	39.903	1.786	39.20	1.80	1.79	-0.78	$\pm 5$
2475	Tissue Liquid Head	39.887	1.814	39.17	1.83	1.83	-0.87	$\pm 5$

\*Liquid Verification above was performed on 2021/11/06.

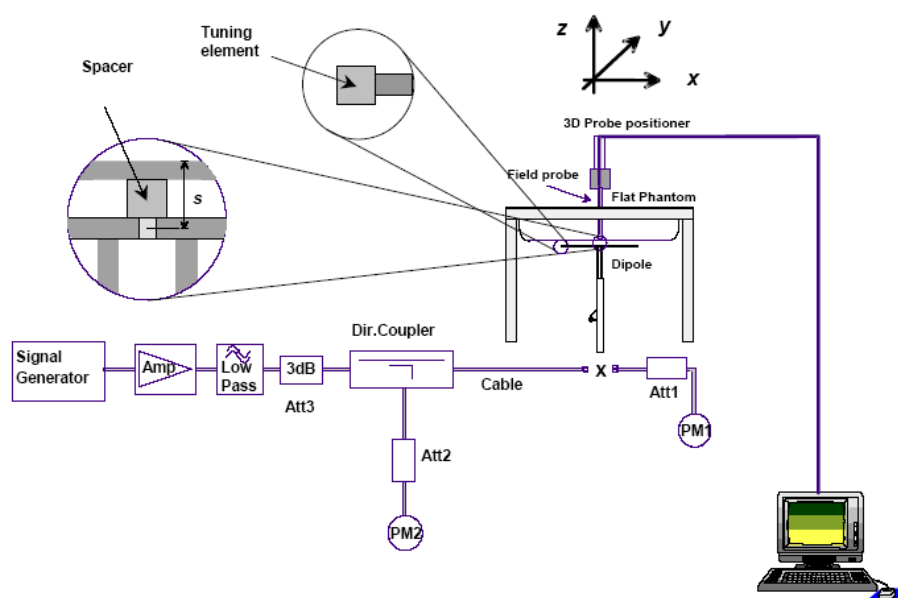
## System Accuracy Verification

Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of  $\pm 10\%$ . The validation results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

The spacing distances in the **System Verification Setup Block Diagram** is given by the following:

- $s = 15 \text{ mm} \pm 0,2 \text{ mm}$  for  $300 \text{ MHz} \leq f \leq 1\,000 \text{ MHz}$ ;
- $s = 10 \text{ mm} \pm 0,2 \text{ mm}$  for  $1\,000 \text{ MHz} < f \leq 3\,000 \text{ MHz}$ ;
- $s = 10 \text{ mm} \pm 0,2 \text{ mm}$  for  $3\,000 \text{ MHz} < f \leq 6\,000 \text{ MHz}$ .

## System Verification Setup Block Diagram



## System Accuracy Check Results

Date	Frequency Band (MHz)	Liquid Type	Input Power (mW)	Measured SAR (W/kg)		Normalized to 1W (W/kg)	Target Value (W/Kg)	Delta (%)	Tolerance (%)
2021/11/06	2450	Head	100	1g	5.07	50.7	53.0	-4.340	$\pm 10$

Date	Frequency Band (MHz)	Liquid Type	Input Power (mW)	Measured SAR (W/kg)		Normalized to 1W (W/kg)	Target Value (W/Kg)	Delta (%)	Tolerance (%)
2021/11/06	2450	Head	100	10g	2.41	24.1	24.4	-1.23	$\pm 10$

\*The SAR values above are normalized to 1 Watt forward power.

## SAR SYSTEM VALIDATION DATA

### System Performance 2450MHz

**DUT: D2450V2; Type: 2450 MHz; Serial: 751**

Communication System: UID 0, CW (0); Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.786$  S/m;  $\epsilon_r = 39.903$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(7.25, 7.25, 7.25) @ 2450 MHz;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1354; Calibrated: 2021/9/1
- Phantom: Head model; Type: QD000P40CC; Serial: TP:1744
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

**System Performance Check at 2450MHz/d=10mm, Pin=100mw 2/Area Scan (101x111x1):** Interpolated grid:

dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 5.85 W/kg

**System Performance Check at 2450MHz/d=10mm, Pin=100mw 2/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:

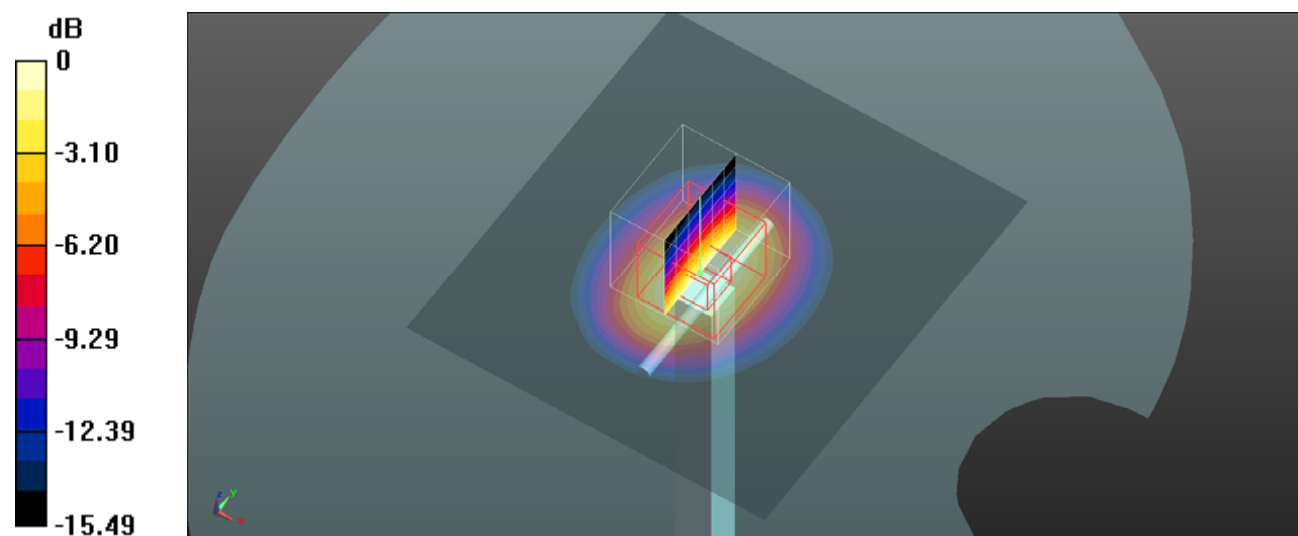
dx=5mm, dy=5mm, dz=5mm

Reference Value = 59.34 V/m; Power Drift = -0.13 dB

Peak SAR (extrapolated) = 9.20 W/kg

**SAR(1 g) = 5.07 W/kg; SAR(10 g) = 2.41 W/kg**

Maximum value of SAR (measured) = 6.02 W/kg



0 dB = 6.02 W/kg = 7.80 dBW/kg

## EUT TEST STRATEGY AND METHODOLOGY

### Test positions for body-worn and other configurations

Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations. Devices with a headset output should be tested with a headset connected to the device. When multiple accessories that do not contain metallic components are supplied with the device, the device may be tested with only the accessory that dictates the closest spacing to the body. When multiple accessories that contain metallic components are supplied with the device, the device must be tested with each accessory that contains a unique metallic component. If multiple accessories share an identical metallic component (e.g., the same metallic belt-clip used with different holsters with no other metallic components), only the accessory that dictates the closest spacing to the body must be tested.

Body-worn accessories may not always be supplied or available as options for some devices that are intended to be authorized for body-worn use. A separation distance of 1.5 cm between the back of the device and a flat phantom is recommended for testing body-worn SAR compliance under such circumstances. Other separation distances may be used, but they should not exceed 2.5 cm. In these cases, the device may use body-worn accessories that provide a separation distance greater than that tested for the device provided however that the accessory contains no metallic components.

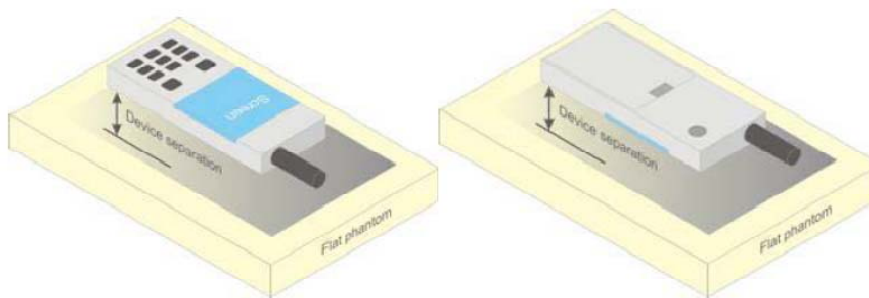


Figure 5 – Test positions for body-worn devices

### Test Distance for SAR Evaluation

For this case the EUT(Equipment Under Test) is set 0mm away from the phantom, the test distance is 0mm.

## SAR Evaluation Procedure

The evaluation was performed with the following procedure:

Step 1: Measurement of the SAR value at a fixed location above the ear point or central position was used as a reference value for assessing the power drop. The SAR at this point is measured at the start of the test and then again at the end of the testing.

Step 2: The SAR distribution at the exposed side of the head was measured at a distance of 4 mm from the inner surface of the shell. The area covered the entire dimension of the head or radiating structures of the EUT, the horizontal grid spacing was 15 mm x 15 mm, and the SAR distribution was determined by integrated grid of 1.5mm x 1.5mm. Based on these data, the area of the maximum absorption was determined by spline interpolation. The first Area Scan covers the entire dimension of the EUT to ensure that the hotspot was correctly identified.

Step 3: Around this point, a volume of 30 mm x 30 mm x 30 mm was assessed by measuring 7x 7 x 7 points. On the basis of this data set, the spatial peak SAR value was evaluated under the following procedure:

- 1) The data at the surface were extrapolated, since the center of the dipoles is 1.2 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.3 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.

- 2) The maximum interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed by the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three one dimensional splines with the "Not a knot"-condition (in x, y and z-directions). The volume was integrated with the trapezoidal-algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the averages.

All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

Step 4: Re-measurement of the SAR value at the same location as in Step 1. If the value changed by more than 5%, the evaluation was repeated.

## PEAK TRAVSMIT POWER MEASUREMENT

### Provision Applicable

The measured peak output power should be greater and within 5% than EMI measurement.

### Maximum Target Output Power

Max Target Output Power(dBm)			
Mode/Band	Channel		
	Low	Middle	High
SRD 2.4G	18.0	18.0	18.0

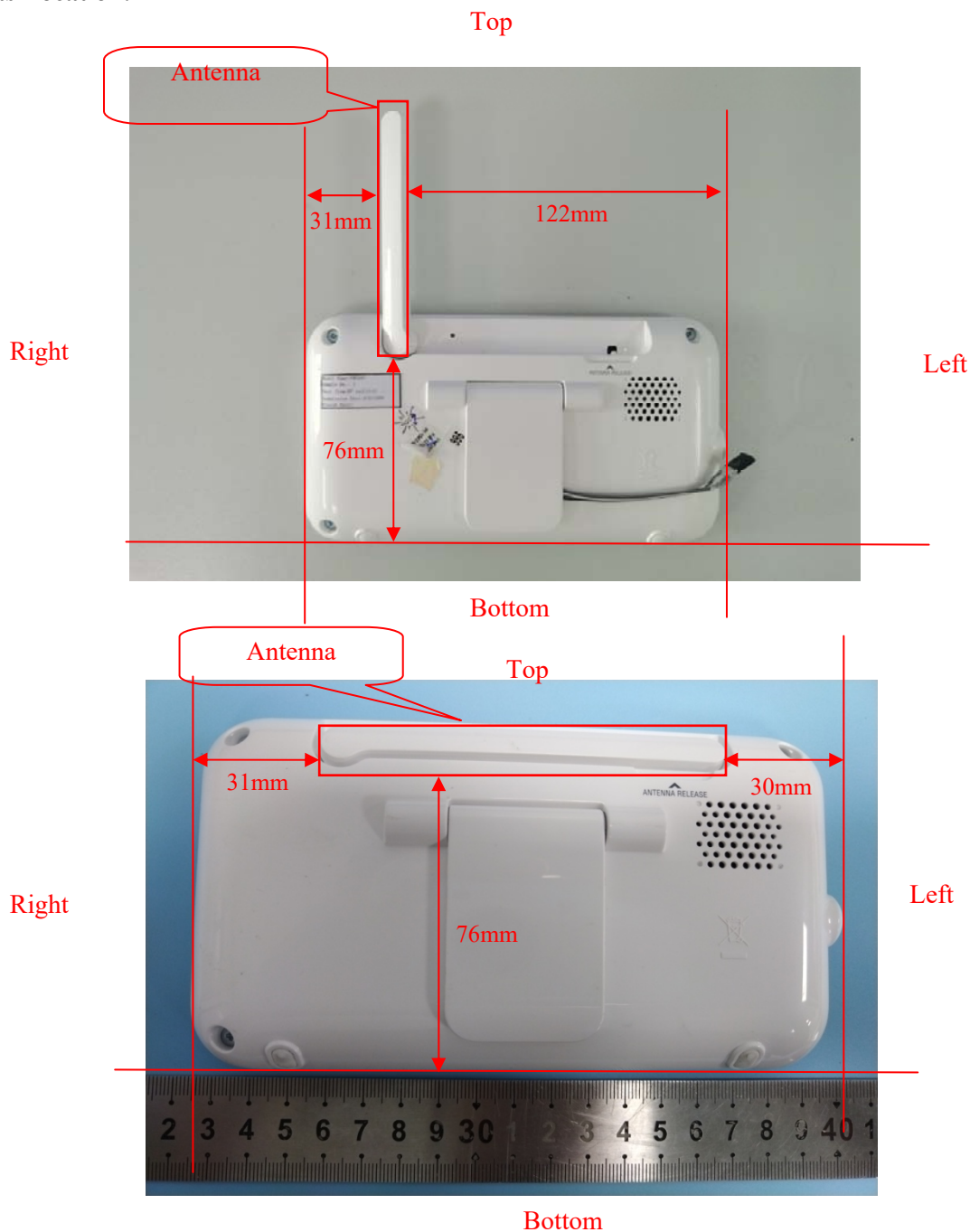
### Test Results:

#### SRD 2.4G:

Frequency Band	Channel	Frequency (MHz)	Peak Power (dBm)
SRD 2.4G	Low	2405	17.12
	Middle	2439	<b>17.41</b>
	High	2475	17.32

## Antennas Location

### Antennas Location:



### Antenna Distance To Edge

Antenna Distance To Edge(mm)					
Antenna	Back	Left	Right	Bottom	Top
SRD 2.4G (open)	<5	122	31	76	/
SRD 2.4G (closed)	<5	30	31	76	<5

Note: The antenna at the top do not consider open condition.

**Standalone SAR test exclusion for the EUT Edge considerations (RSS-102 issue 5)**

Frequency (MHz)	Exemption Limits (mW)	
	At separation distance of 15 mm	At separation distance of 20 mm
2450	37.5	75

Antenna	Frequency (MHz)	Peak P <sub>avg</sub> (dBm)	Peak P <sub>avg</sub> (mW)	Test Exclusion Distance(mm)
SRD 2.4G	2475	18	63.1	18.4

Note:

1. Antenna Gain is 0 dBi
2. For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 2.5. If the Exemption Limits of the device is between two distances located in Table 1, linear interpolation shall be applied for the applicable exemption separation distance.

Note:

1. When the operating frequency of the device is between two frequencies located in Appendix A of Per RSS-102 issue 5, linear interpolation shall be applied for the applicable separation distance.
2. When the Test Exclusion Distance is farther than 50mm and less than 200mm, testing for each edge is required.

Test exclusion result					
Antenna	Back	Left	Right	Bottom	Top
SRD 2.4G (open)	<b>Required</b>	Exclusion	Exclusion	Exclusion	/
SRD 2.4G (closed)	<b>Required</b>	Exclusion	Exclusion	Exclusion	<b>Required</b>

**Note 1:**

**Required:** The distance to Edge is less than **Test Exclusion Distance**, test is required.

**Exclusion:** The distance to Edge is more than **Test Exclusion Distance**, test is not required.

**Note 2:**

Because the standard of IC is more strict than that of FCC required, So we use the standard of IC to evaluate

## SAR MEASUREMENT RESULTS

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This page summarizes the results of the performed dosimetric evaluation.

### SAR Test Data

#### Environmental Conditions

Temperature:	22.6-23.4℃
Relative Humidity:	50-58 %
ATM Pressure:	101.3 kPa
Test Date:	2021/11/06

*Testing was performed by Seven Liang.*

**SRD 2.4G Mode:**

Antenna	EUT Position	Frequency (MHz)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg), Limited=1.6 W/kg				
					Scaled Factor	Meas.	Scaled SAR	Correct SAR	Plot
SRD 2.4G (closed)	Face Up (25mm)	2405	/	/	/	/	/	/	/
		2439	17.41	18.0	1.146	<0.001	0.01	0.01	/
		2475	/	/	/	/	/	/	/
SRD 2.4G (open)	Face Up (25mm)	2405	/	/	/	/	/	/	/
		2439	17.41	18.0	1.146	<0.001	0.01	0.01	/
		2475	/	/	/	/	/	/	/

Antenna	EUT Position	Frequency (MHz)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	10g SAR (W/Kg), Limited=4.0 W/kg				
					Scaled Factor	Meas.	Scaled SAR	Correct SAR	Plot
Open	Handheld Back (0mm)	2405	/	/	/	/	/	/	/
		2439	17.41	18.0	1.146	0.106	0.12	0.12	1#
		2475	/	/	/	/	/	/	/
Antenna	EUT Position	Frequency (MHz)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	10g SAR (W/Kg), Limited=4.0 W/kg				
					Scaled Factor	Meas.	Scaled SAR	Correct SAR	Plot
Closed	Handheld Back (0mm)	2405	/	/	/	/	/	/	/
		2439	17.41	18.0	1.146	0.122	0.14	0.14	2#
		2475	/	/	/	/	/	/	/
	Handheld Top (0mm)	2405	/	/	/	/	/	/	/
		2439	17.41	18.0	1.146	0.222	0.25	0.25	3#
		2475	/	/	/	/	/	/	/

**Note:**

1. When the SAR value is less than half of the limit, testing for other channels are optional.
2. When SAR or MPE is not measured at the maximum power level allowed for production to the individual channels tested to determine compliance.
3. According to **Notice 2012-DRS0529**, if the correction  $\Delta$ SAR has a negative sign, **the measured SAR result should be corrected**, and has a positive sign, the measured SAR result shall not be corrected.
4. For modes that peak SAR is too low to evaluate, a SAR value 0.01 W/kg is considered as their Scaled SAR.

**Corrected SAR Evaluation**

62209-2 © IEC:2010

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**Annex F**  
(normative)**SAR correction for deviations of complex permittivity from targets****F.2 SAR correction formula**

From [13] and [14], a linear relationship was found between the percent change in SAR (denoted  $\Delta SAR$ ) and the percent change in the permittivity and conductivity from the target values in Table 1 (denoted  $\Delta \epsilon_r$  and  $\Delta \sigma$ , respectively). This linear relationship agrees with the results of Kuster and Balzano [48] and Bit-Babik et al. [2]. The relationship is given by:

$$\Delta SAR = c_\epsilon \Delta \epsilon_r + c_\sigma \Delta \sigma \quad (F.1)$$

where

$c_\epsilon = \partial(\Delta SAR)/\partial(\Delta \epsilon)$  is the coefficients representing the sensitivity of SAR to permittivity where SAR is normalized to output power;

$c_\sigma = \partial(\Delta SAR)/\partial(\Delta \sigma)$  is the coefficients representing the sensitivity of SAR to conductivity, where SAR is normalized to output power.

The values of  $c_\epsilon$  and  $c_\sigma$  have a simple relationship with frequency that can be described using polynomial equations. For the 1 g averaged SAR  $c_\epsilon$  and  $c_\sigma$  are given by

$$c_\epsilon = -7,854 \times 10^{-4} f^3 + 9,402 \times 10^{-3} f^2 - 2,742 \times 10^{-2} f - 0,202 \ 6 \quad (F.2)$$

$$c_\sigma = 9,804 \times 10^{-3} f^3 - 8,661 \times 10^{-2} f^2 + 2,981 \times 10^{-2} f + 0,782 \ 9 \quad (F.3)$$

where

$f$  is the frequency in GHz.

For the 10 g averaged SAR, the variables  $c_\epsilon$  and  $c_\sigma$  are given by:

$$c_\epsilon = 3,456 \times 10^{-3} f^3 - 3,531 \times 10^{-2} f^2 + 7,675 \times 10^{-2} f - 0,186 \ 0 \quad (F.4)$$

$$c_\sigma = 4,479 \times 10^{-3} f^3 - 1,586 \times 10^{-2} f^2 - 0,197 \ 2 f + 0,771 \ 7 \quad (F.5)$$

Calibrate Date	Liquid Type	Frequency (MHz)	$C_{\varepsilon}$	$\Delta\varepsilon_r$	$C_{\delta}$	$\Delta\delta$	$\Delta\text{SAR } 1\text{g}$
2021/11/06	Head	2405	-0.225	1.93	0.490	-1.02	-0.934
		2439	-0.225	1.8	0.483	-1.06	-0.917
		2450	-0.225	1.79	0.480	-0.78	-0.777
		2475	-0.225	1.83	0.475	-0.87	-0.825

Calibrate Date	Liquid Type	Frequency (MHz)	$C_{\varepsilon}$	$\Delta\varepsilon_r$	$C_{\delta}$	$\Delta\delta$	$\Delta\text{SAR } 10\text{g}$
2021/11/06	Head	2405	-0.158	1.93	0.268	-1.02	-0.578
		2439	-0.159	1.8	0.261	-1.06	-0.563
		2450	-0.159	1.79	0.259	-0.78	-0.487
		2475	-0.160	1.83	0.254	-0.87	-0.514

**Note:**

1. Scaled SAR = Correct SAR\*(1- $\Delta\text{SAR}\%$ )

2. According to **Notice 2012-DRS0529**, if the correction  $\Delta\text{SAR}$  has a negative sign, **the measured SAR result should be corrected**, and has a positive sign, the measured SAR result shall not be corrected.

## SAR Plots

### SAT Test Plots:

#### Plot 1#

**DUT: Baby Monitor; Type: VM5255 PU; Serial: SZ1211008-51393E-SA-S\_LRL**

Communication System: UID 0, 2.4G DTS (0); Frequency: 2439 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated):  $f = 2439$  MHz;  $\sigma = 1.771$  S/m;  $\epsilon_r = 39.926$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

#### DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(7.25, 7.25, 7.25) @ 2439 MHz;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1354; Calibrated: 2021/9/1
- Phantom: Head model; Type: QD000P40CC; Serial: TP:1744
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

**Handheld Back/ SDR 2.4G Mid/Area Scan (101x141x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.236 W/kg

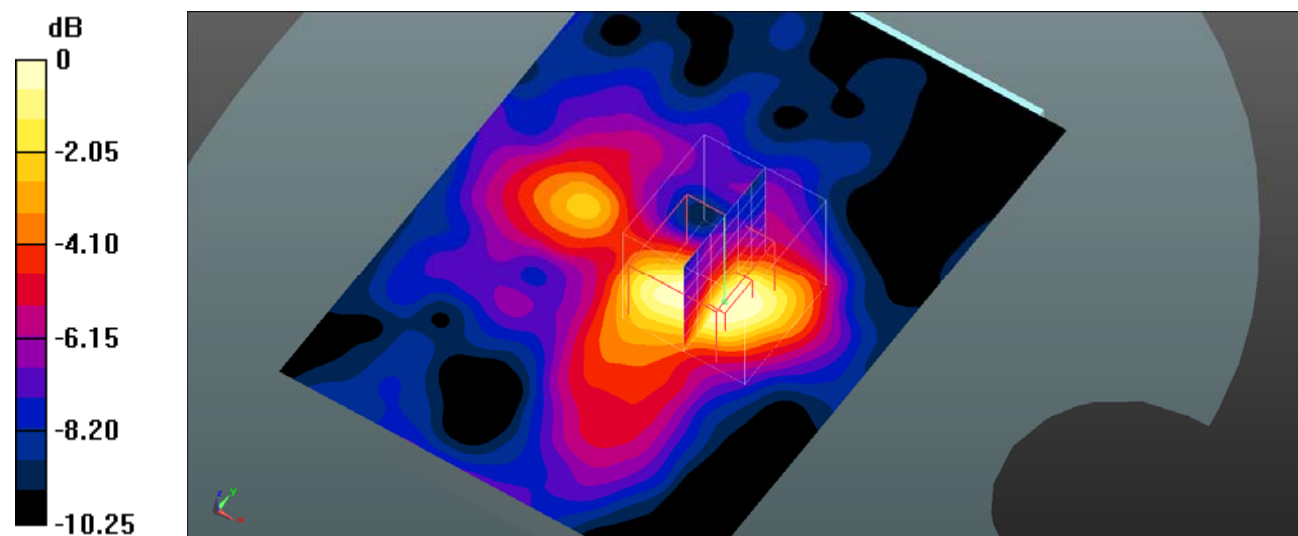
**Handheld Back/ SDR 2.4G Mid/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 6.313 V/m; Power Drift = -0.20 dB

Peak SAR (extrapolated) = 0.291 W/kg

**SAR(1 g) = 0.187 W/kg; SAR(10 g) = 0.106 W/kg**

Maximum value of SAR (measured) = 0.214 W/kg



0 dB = 0.214 W/kg = -6.70 dBW/kg

**Plot 2#****DUT: Baby Monitor; Type: VM5255 PU; Serial: SZ1211008-51393E-SA-S\_LRL**

Communication System: UID 0, 2.4G DTS (0); Frequency: 2439 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated):  $f = 2439$  MHz;  $\sigma = 1.771$  S/m;  $\epsilon_r = 39.926$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(7.25, 7.25, 7.25) @ 2439 MHz;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1354; Calibrated: 2021/9/1
- Phantom: Head model; Type: QD000P40CC; Serial: TP:1744
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

**Handheld Back/ SDR 2.4G Mid/Area Scan (101x141x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.297 W/kg

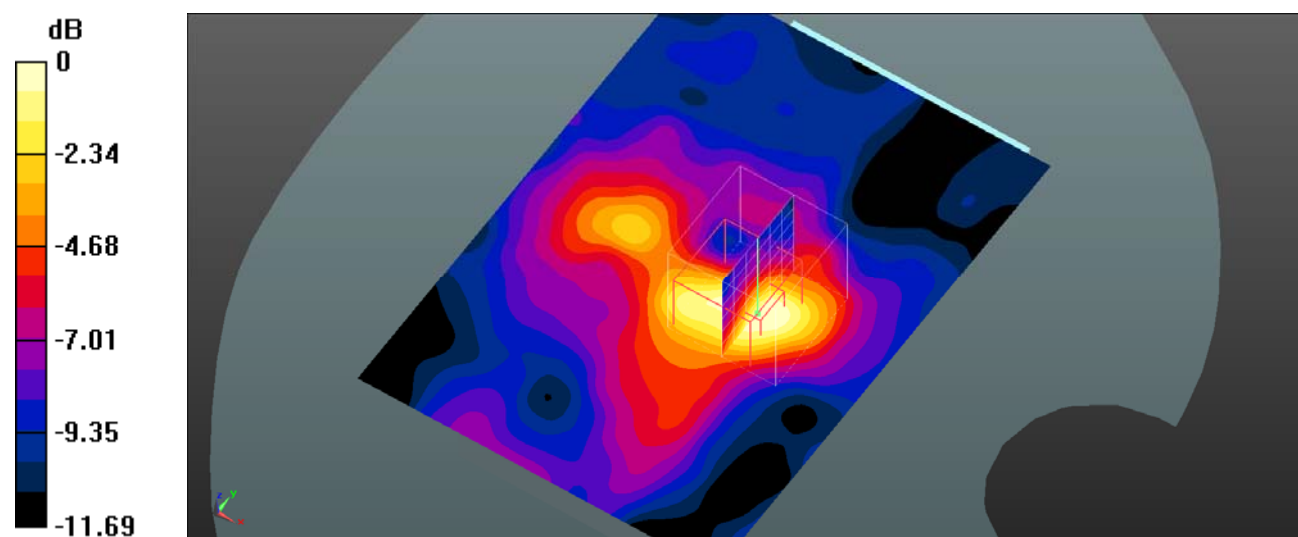
**Handheld Back/ SDR 2.4G Mid/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.512 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 0.368 W/kg

**SAR(1 g) = 0.225 W/kg; SAR(10 g) = 0.122 W/kg**

Maximum value of SAR (measured) = 0.267 W/kg



**Plot 3#****DUT: Baby Monitor; Type: VM5255 PU; Serial: SZ1211008-51393E-SA-S\_LRL**

Communication System: UID 0, 2.4G DTS (0); Frequency: 2439 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated):  $f = 2439$  MHz;  $\sigma = 1.771$  S/m;  $\epsilon_r = 39.926$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(7.25, 7.25, 7.25) @ 2439 MHz;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1354; Calibrated: 2021/9/1
- Phantom: Head model; Type: QD000P40CC; Serial: TP:1744
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

**Handheld Top/ SDR 2.4G Mid/Area Scan (101x141x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.657 W/kg

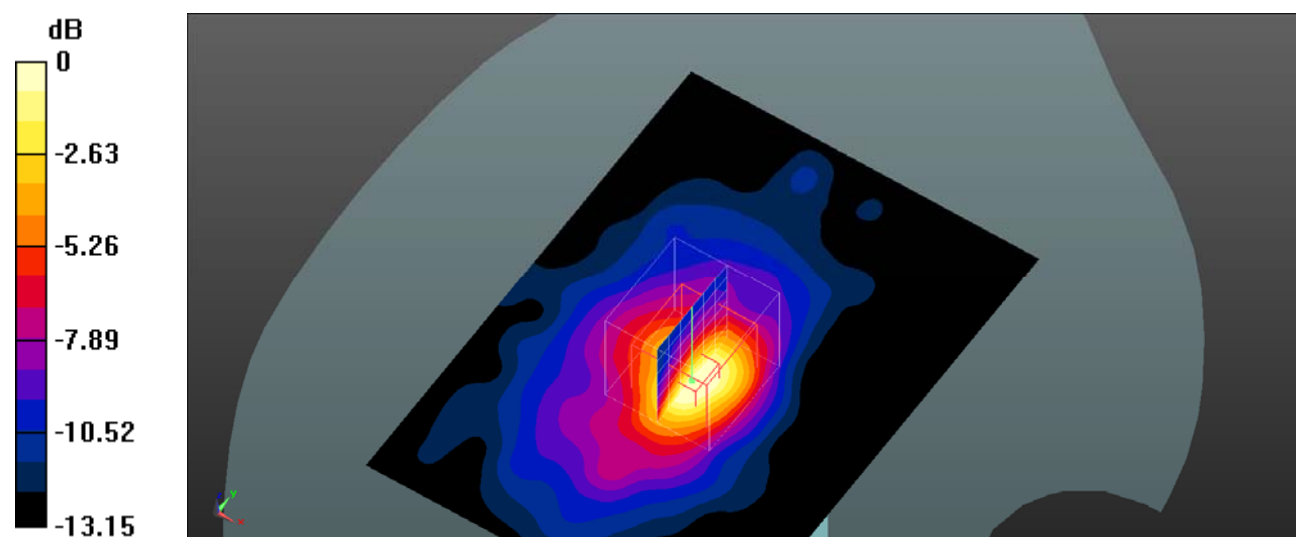
**Handheld Top/ SDR 2.4G Mid/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 15.91 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 0.909 W/kg

**SAR(1 g) = 0.470 W/kg; SAR(10 g) = 0.222 W/kg**

Maximum value of SAR (measured) = 0.557 W/kg



## SAR Measurement Variability

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In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz v01. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results

- 1) Repeated measurement is not required when the original highest measured SAR is  $< 0.80$  W/kg; steps 2) through 4) do not apply.
- 2) When the original highest measured SAR is  $\geq 0.80$  W/kg, repeat that measurement once.
- 3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is  $> 1.20$  or when the original or repeated measurement is  $\geq 1.45$  W/kg ( $\sim 10\%$  from the 1-g SAR limit).
- 4) Perform a third repeated measurement only if the original, first or second repeated measurement is  $\geq 1.5$  W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is  $> 1.20$ .

*Note: The same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.*

## APPENDIX A MEASUREMENT UNCERTAINTY

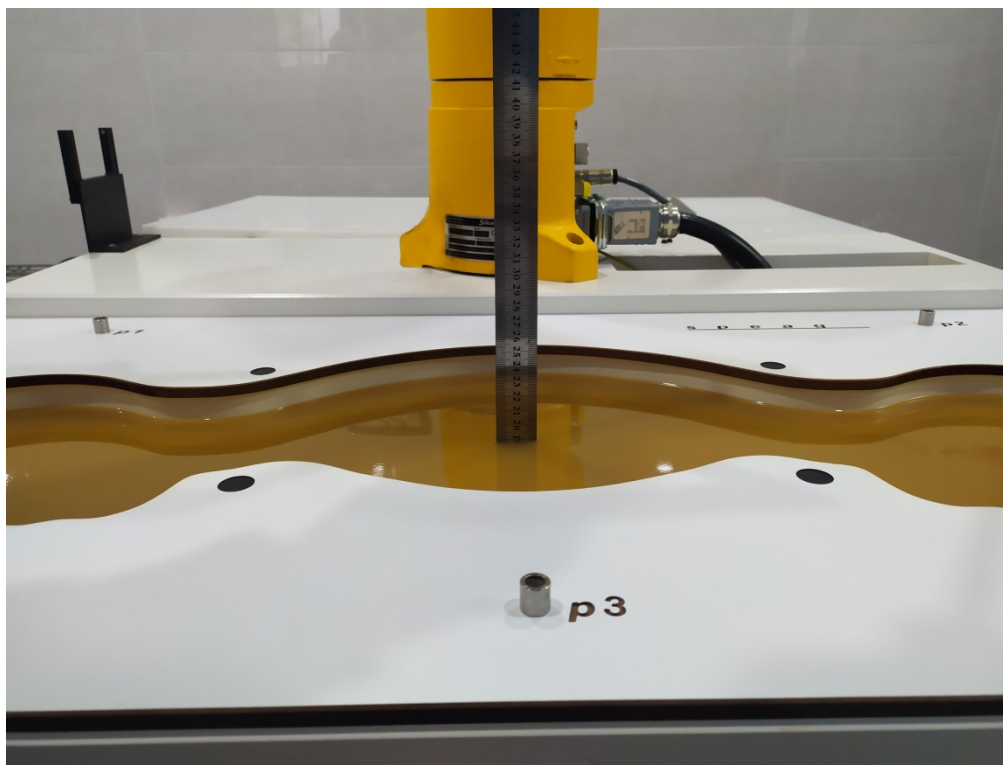
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KDB 865664 D01 SAR measurement 100MHz to 6GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be  $\leq 30\%$ , for a confidence interval of  $k = 2$ . If these conditions are met, extensive SAR measurement uncertainty analysis described in **IEC/IEEE62209-1528:2020** is not required in SAR reports submitted for equipment approval. For this device, the highest measured 1-g SAR is less 1.5W/kg and highest measured 10-g SAR is less 3.75W/kg. Therefore, the measurement uncertainty table is not required in this report

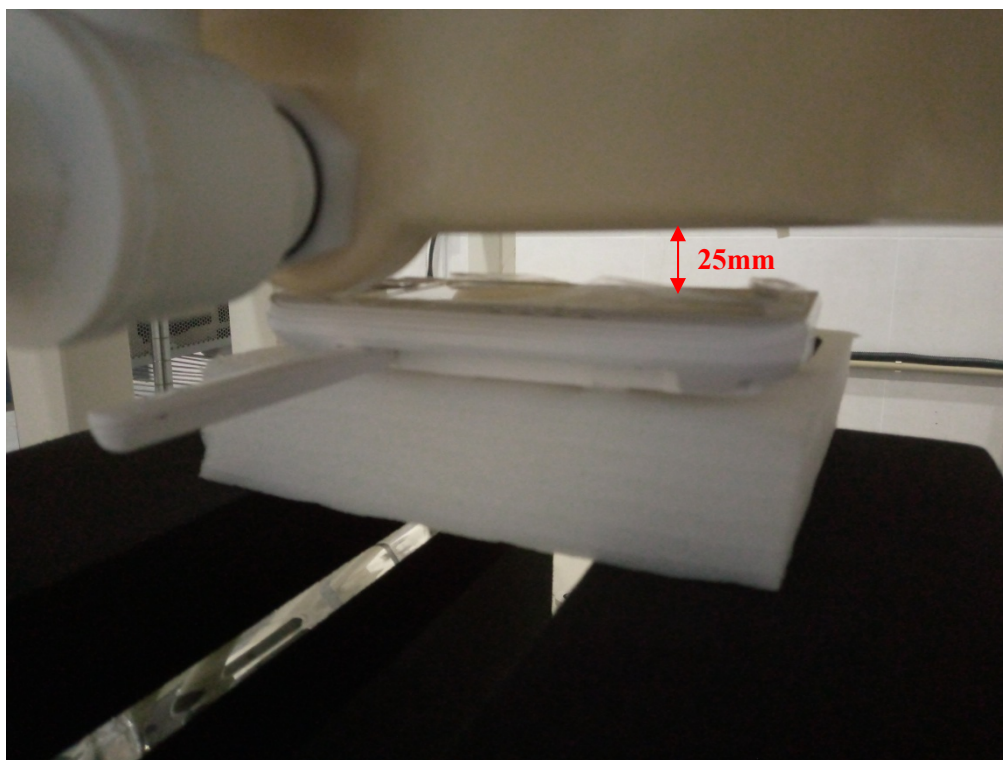
## APPENDIX B EUT TEST POSITION PHOTOS

**Liquid depth  $\geq 15\text{cm}$**

Phantom Type: Twin SAM Phantom ; Type: QD000 P40 CD; Serial: TP:1744



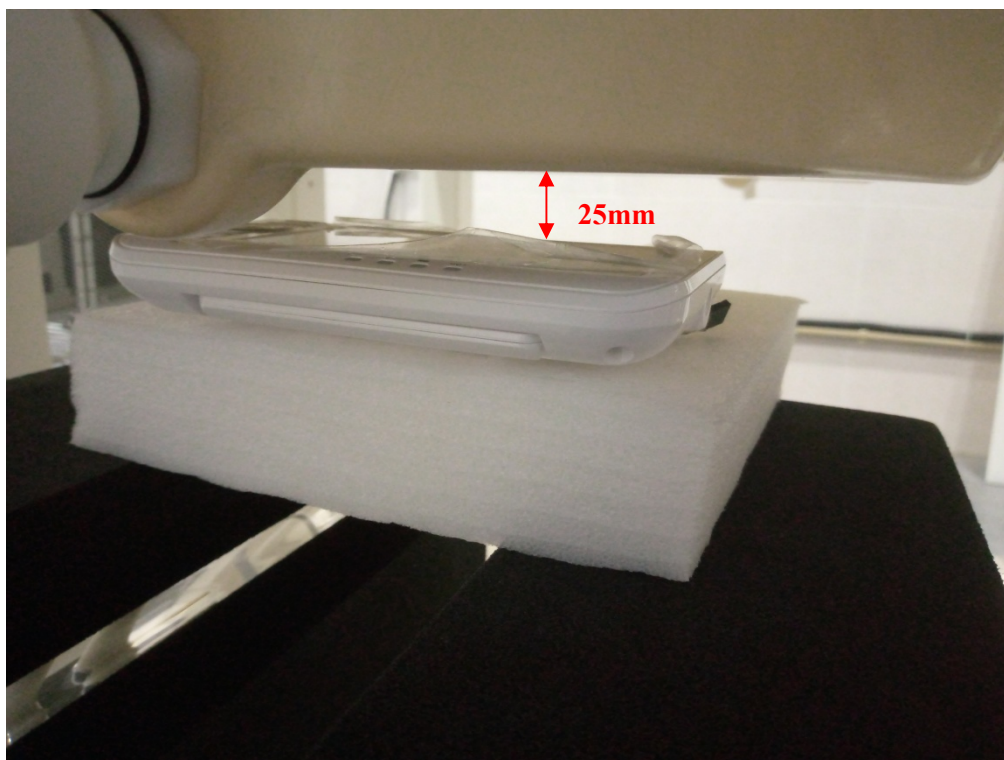
**Open ANT-Face up (25mm)**



**Open ANT-Handheld Back (0mm)**



**Closed ANT-Face up (25mm)**



**Closed ANT-Handheld Back (0mm)**



**Closed ANT-Handheld Top (0mm)**



## APPENDIX C PROBE CALIBRATION CERTIFICATES


In Collaboration with

In Collaboration with



中国认可  
国际互认  
校准  
CALIBRATION  
CNAS L0570

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China  
 Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504  
 E-mail: cttl@chinattl.com Http://www.chinattl.cn

Client **BACL** Certificate No: **Z21-60079**

### CALIBRATION CERTIFICATE

Object **EX3DV4 - SN : 7522**

Calibration Procedure(s) **FF-Z11-004-02**  
 Calibration Procedures for Dosimetric E-field Probes

Calibration date: **April 19, 2021**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	16-Jun-20(CTTL, No.J20X04344)	Jun-21
Power sensor NRP-Z91	101547	16-Jun-20(CTTL, No.J20X04344)	Jun-21
Power sensor NRP-Z91	101548	16-Jun-20(CTTL, No.J20X04344)	Jun-21
Reference 10dBAttenuator	18N50W-10dB	10-Feb-20(CTTL, No.J20X00525)	Feb-22
Reference 20dBAttenuator	18N50W-20dB	10-Feb-20(CTTL, No.J20X00526)	Feb-22
Reference Probe EX3DV4	SN 7307	29-May-20(SPEAG, No.EX3-7307_May20)	May-21
DAE4	SN 1555	25-Aug-20(SPEAG, No.DAE4-1555_Aug20)	Aug-21
Reference Probe EX3DV4	SN 3617	27-Jan-21(SPEAG, No.EX3-3617_Jan21)	Jan-22
DAE4	SN 1556	15-Jan-21(SPEAG, No.DAE4-1556_Jan21)	Jan-22
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGenerator MG3700A	6201052605	23-Jun-20(CTTL, No.J20X04343)	Jun-21
Network Analyzer E5071C	MY46110673	21-Jan-21(CTTL, No.J20X00515)	Jan-22

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

Issued: April 21, 2021

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

Certificate No: Z21-60079

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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), $\theta=0$ 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:**

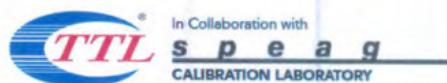
- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) 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<sub>x,y,z</sub>: Assessed for E-field polarization  $\theta=0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not effect the  $E^2$ -field uncertainty inside TSL (see below ConvF).
- NORM( $f$ )<sub>x,y,z</sub> = NORM<sub>x,y,z</sub> \* 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.
- DCP<sub>x,y,z</sub>: 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.
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; VR<sub>x,y,z</sub>; 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 valued are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM<sub>x,y,z</sub> \* 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<sub>x</sub> (no uncertainty required).

Certificate No: Z21-60079

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## DASY/EASY – Parameters of Probe: EX3DV4 – SN:7522

### Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc ( $k=2$ )
Norm( $\mu V/(V/m)^2$ ) <sup>A</sup>	0.43	0.44	0.53	$\pm 10.0\%$
DCP(mV) <sup>B</sup>	98.6	99.2	99.3	

### 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	167.8	$\pm 2.5\%$
		Y	0.0	0.0	1.0		170.2	
		Z	0.0	0.0	1.0		187.9	

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  $E^2$ -field uncertainty inside TSL (see Page 4 and Page 5).

<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:7522

### 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	9.93	9.93	9.93	0.40	0.75	±12.1%
900	41.5	0.97	9.39	9.39	9.39	0.12	1.95	±12.1%
1750	40.1	1.37	8.16	8.16	8.16	0.21	1.20	±12.1%
1900	40.0	1.40	7.94	7.94	7.94	0.25	1.10	±12.1%
2300	39.5	1.67	7.61	7.61	7.61	0.53	0.72	±12.1%
2450	39.2	1.80	7.25	7.25	7.25	0.34	1.00	±12.1%
2600	39.0	1.96	7.05	7.05	7.05	0.37	0.94	±12.1%

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

**DASY/EASY – Parameters of Probe: EX3DV4 – SN:7522****Calibration Parameter Determined in Body 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	55.5	0.96	9.87	9.87	9.87	0.40	0.78	±12.1%
900	55.0	1.05	9.31	9.31	9.31	0.16	1.65	±12.1%
1750	53.4	1.49	7.83	7.83	7.83	0.26	1.14	±12.1%
1900	53.3	1.52	7.66	7.66	7.66	0.19	1.29	±12.1%
2300	52.9	1.81	7.45	7.45	7.45	0.70	0.72	±12.1%
2450	52.7	1.95	7.29	7.29	7.29	0.70	0.71	±12.1%
2600	52.5	2.16	7.01	7.01	7.01	0.65	0.72	±12.1%

<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.

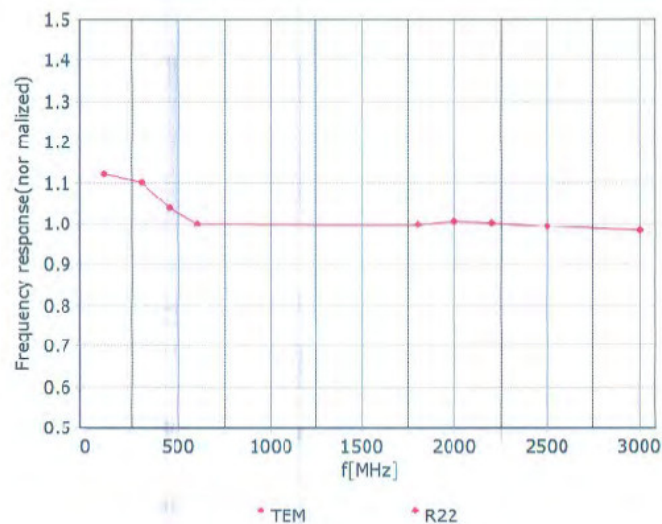
<sup>F</sup> At frequency below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ±5%. 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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### Frequency Response of E-Field (TEM-Cell: ifi110 EXX, Waveguide: R22)



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

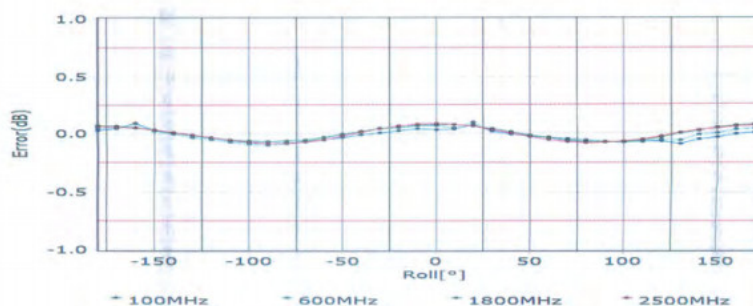
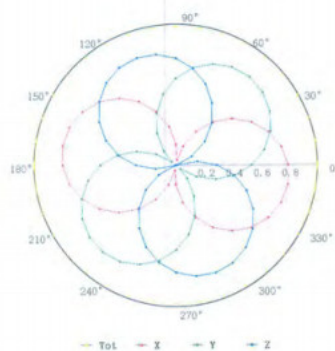
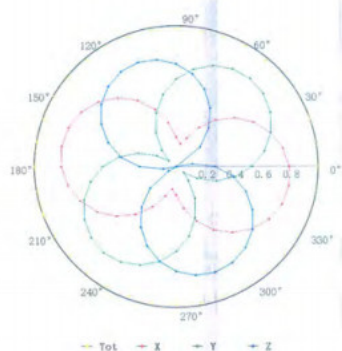


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### Receiving Pattern ( $\Phi$ ), $\theta=0^\circ$

f=600 MHz, TEM

f=1800 MHz, R22



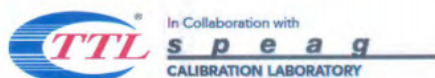
100MHz 600MHz 1800MHz 2500MHz

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

➤ **Dynamic Range f(SAR<sub>head</sub>)**

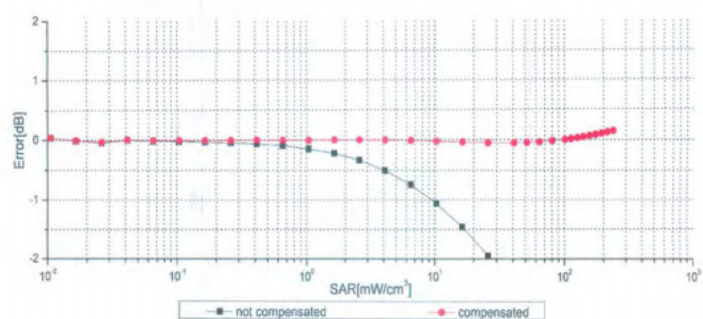
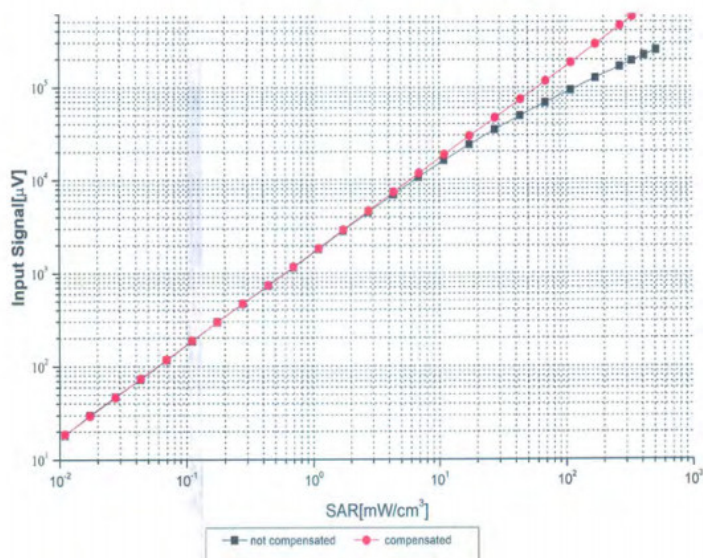
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### Dynamic Range f(SAR<sub>head</sub>) (TEM cell, f = 900 MHz)



Uncertainty of Linearity Assessment:  $\pm 0.9\%$  ( $k=2$ )

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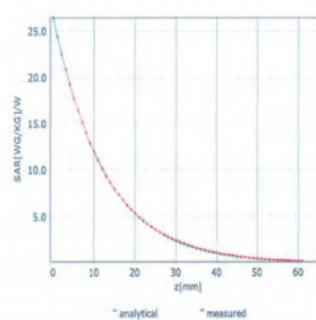
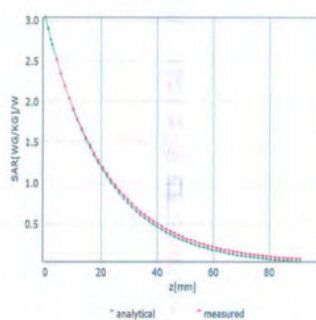
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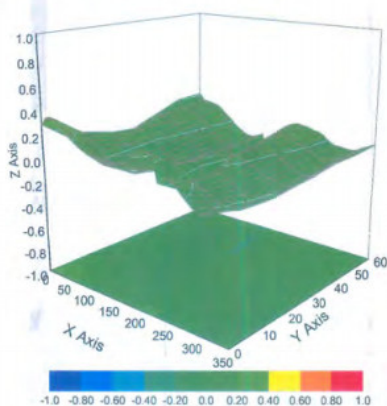
### Conversion Factor Assessment

f=750 MHz,WGLS R9(H\_convF)

f=1750 MHz,WGLS R22(H\_convF)



### Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment:  $\pm 3.2\%$  ( $k=2$ )

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## DASY/EASY – Parameters of Probe: EX3DV4 – SN:7522

### Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	32.2
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	9mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	1.4mm

## APPENDIX D DIPOLE CALIBRATION CERTIFICATES

Client **BACL**Certificate No: **Z20-60412**

### CALIBRATION CERTIFICATE

Object **D2450V2 - SN: 751**Calibration Procedure(s) **FF-Z11-003-01**  
Calibration Procedures for dipole validation kitsCalibration date: **October 13, 2020**

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&amp;TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106276	12-May-20 (CTTL, No.J20X02965)	May-21
Power sensor NRP6A	101369	12-May-20 (CTTL, No.J20X02965)	May-21
ReferenceProbe EX3DV4	SN 3617	30-Jan-20(SPEAG,No.EX3-3617_Jan20)	Jan-21
DAE4	SN 771	10-Feb-20(CTTL-SPEAG,No.Z20-60017)	Feb-21
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	25-Feb-20 (CTTL, No.J20X00516)	Feb-21
NetworkAnalyzer E5071C	MY48110673	10-Feb-20 (CTTL, No.J20X00515)	Feb-21

	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: October 22, 2020

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

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**Glossary:**

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

**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 assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

**Additional Documentation:**

- DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

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

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



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### Measurement Conditions

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

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz $\pm$ 1 MHz	

### Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	39.0 $\pm$ 6 %	1.81 mho/m $\pm$ 6 %
Head TSL temperature change during test	<1.0 °C	----	----

### SAR result with Head TSL

SAR averaged over 1 $\text{cm}^3$ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.3 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	53.0 W/kg $\pm$ 18.8 % ( $k=2$ )
SAR averaged over 10 $\text{cm}^3$ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.12 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.4 W/kg $\pm$ 18.7 % ( $k=2$ )



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Phantom	Triple Flat Phantom 5.1C	
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SAR measured	250 mW input power	6.12 W/kg
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#### Appendix (Additional assessments outside the scope of CNAS L0570)

##### Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.6Ω+ 4.0j Ω
Return Loss	- 25.7dB

##### General Antenna Parameters and Design

Electrical Delay (one direction)	1.022 ns
----------------------------------	----------

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

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

##### Additional EUT Data

Manufactured by	SPEAG
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#### DASY5 Validation Report for Head TSL

Date: 10.13.2020

Test Laboratory: CTTL, Beijing, China

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 751**

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.809$  S/m;  $\epsilon_r = 39.02$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(7.65, 7.65, 7.65) @ 2450 MHz; Calibrated: 2020-01-30
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2020-02-10
- Phantom: MFP\_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

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

Reference Value = 107.1 V/m; Power Drift = -0.04 dB

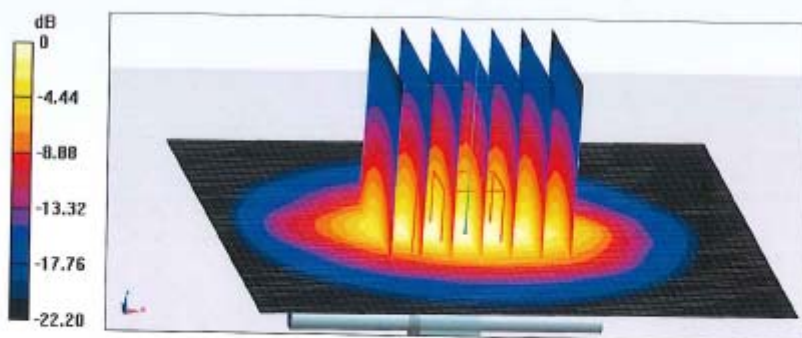
Peak SAR (extrapolated) = 28.1 W/kg

SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.12 W/kg

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

Ratio of SAR at M2 to SAR at M1 = 47.6%

Maximum value of SAR (measured) = 22.7 W/kg



0 dB = 22.7 W/kg = 13.56 dBW/kg

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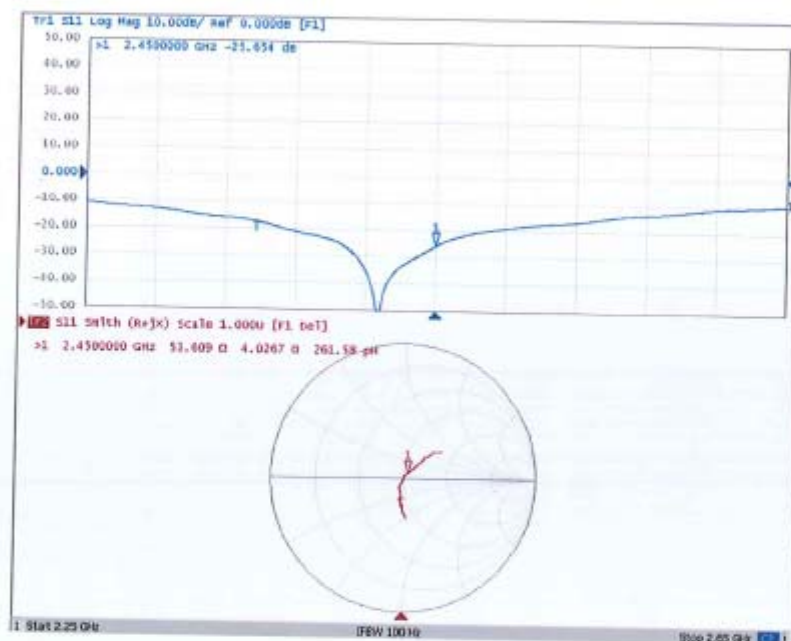
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### Impedance Measurement Plot for Head TSL



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