

TEST REPORT

Applicant Name : SEUIC Technologies Co., Ltd.
Address : NO.15 Xinghuo Road, Nanjing New & High Technology
Industry Development Zone Nanjing, 210061 China
Report Number : CR21100112-20B
FCC ID: 2AC68AUTOIDQ9

Test Standard (s)

FCC Part 2.1093

Sample Description

Product Type: Portable Data Collection Terminal
Model No.: AUTOID Q9
Date Received: 2021/11/10
Date of Test: 2021/11/28
Report Date: 2021/11/30

Test Result:	Pass*
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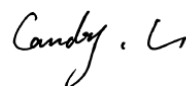
* In the configuration tested, the EUT complied with the standards above.

Prepared and Checked By:



Lance Li
EMC Engineer

Approved By:



Candy Li
EMC Engineer

Note: This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "★".

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Shenzhen Accurate Technology Co., Ltd.

1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China
Tel: +86 755-26503290 Fax: +86 755-26503396 Web: www.atc-lab.com

Attestation of Test Results			
EUT Information	EUT Description	Portable Data Collection Terminal	
	Tested Model	AUTOID Q9	
	FCC ID	2AC68AUTOIDQ9	
	Serial Number	CR21100112-SA-S2	
MODE		Max. SAR Level(s) Reported(W/kg)	Limit (W/kg)
5.2G Wi-Fi	1g Head SAR	0.17	1.6
	1g Body SAR	1.42	
5.3G Wi-Fi	1g Head SAR	0.14	
	1g Body SAR	1.26	
5.8G Wi-Fi	1g Head SAR	0.16	
	1g Body SAR	0.7	
Applicable Standards	FCC 47 CFR part 2.1093 Radiofrequency radiation exposure evaluation: portable devices		
	RF Exposure Procedures: TCB Workshop April 2019		
	IEEE1528:2013 IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques		
	IEC 62209-1:2016 Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Part 1: Devices used next to the ear (Frequency range of 300 MHz to 6 GHz)		
	KDB procedures KDB 447498 D01 General RF Exposure Guidance v06 KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04 KDB 865664 D02 RF Exposure Reporting v01r02 KDB 248227 D01 802 11 Wi-Fi SAR v02r02		
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 IEEE 1528-2013 and RF exposure KDB procedures.			
The results and statements contained in this report pertain only to the device(s) evaluated.			

Note: The test data of 2G/3G/4G, 2.4G Wi-Fi, bluetooth and simultaneous transmission considerations please refer to report: CR21100112-20A, which issued by China Certification ICT Co., Ltd (Dongguan) on 2021-12-23.

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	CR21100112-20B	Original Report	2021-11-30

EUT DESCRIPTION

This report has been prepared on behalf of **SEUIC Technologies Co., Ltd.** and their product **Portable Data Collection Terminal**, Model: **AUTOID Q9**, FCC ID: **2AC68AUTOIDQ9** or the EUT (Equipment under Test) as referred to in the rest of this report.

Technical Specification

Device Type:	Portable
Exposure Category:	Population / Uncontrolled
Antenna Type(s):	Internal Antenna
Body-Worn Accessories:	None
Operation Mode :	GSM,GPRS/EDGE Data, WCDMA(Rel99,HSUPA,HSDPA,DC-HSDPA,HSPA+),FDD-LTE,TDD-LTE, WLAN and Bluetooth
Frequency Band:	Wi-Fi 5.2G: 5150-5250 MHz Wi-Fi 5.3G: 5250-5350 MHz Wi-Fi 5.8G: 5725-5850 MHz
Conducted RF Power:	Wi-Fi 5.2G: 14.21 dBm; Wi-Fi 5.3G: 10.31 dBm; Wi-Fi 5.8G: 9.76 dBm
Power Source:	3.85 VDC Rechargeable Battery
Normal Operation:	Head and Body Worn

Note: The test data of 2G/3G/4G, 2.4G Wi-Fi, bluetooth please refer to report: CR21100112-20A, which issued by China Certification ICT Co., Ltd (Dongguan) on 2021-12-23.

REFERENCE, STANDARDS, AND GUIDELINES

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 Limit(1g Tissue)**

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)	1.60	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

CE Limit(10g Tissue)

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) & 2 W/kg (CE) applied to the EUT.

FACILITIES

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.

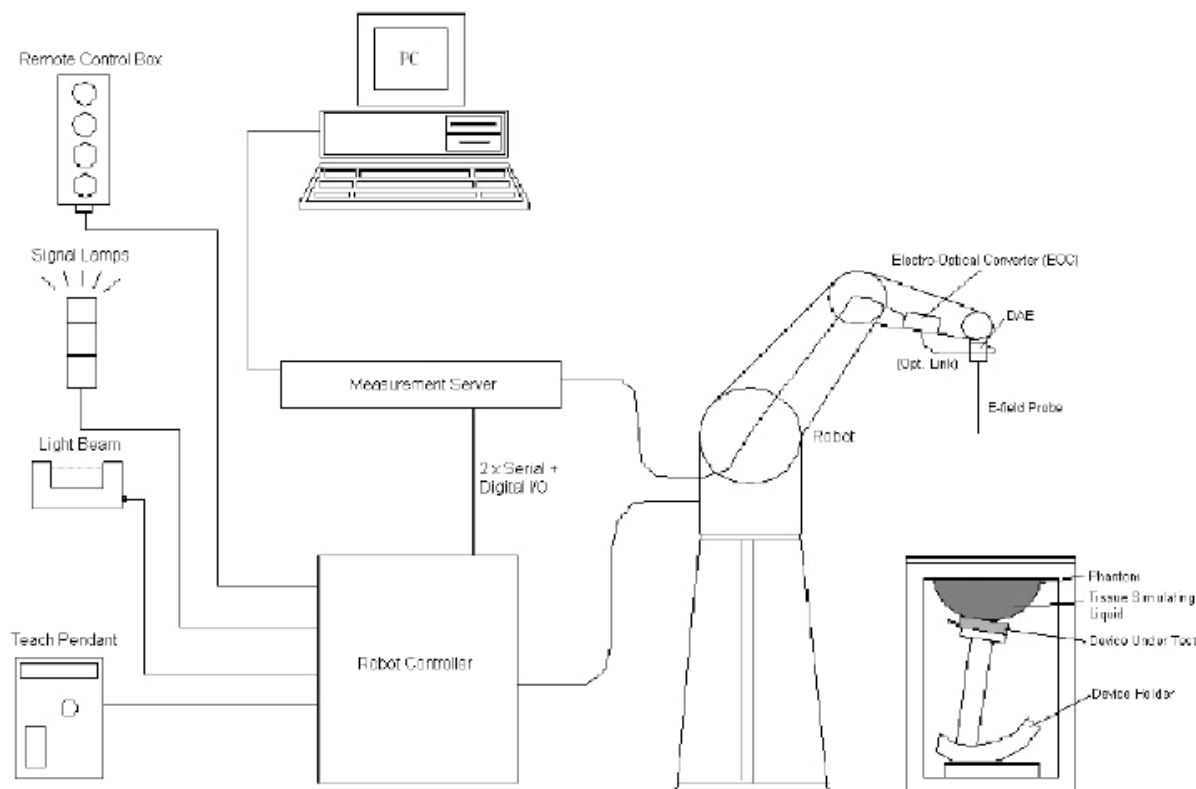
DESCRIPTION OF TEST SYSTEM

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 DASY6 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 200MΩ; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

EX3DV4 E-Field Probes

Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in TSL (rotation around probe axis) ± 0.5 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 μ W/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 μ W/g)
Dimensions	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
Application	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%.
Compatibility	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: 7329 Calibrated: 2020/11/30

Calibration Frequency Point(MHz)	Frequency Range(MHz)		Conversion Factor		
	From	To	X	Y	Z
750 Head	650	850	10.13	10.13	10.13
900 Head	850	1000	9.79	9.79	9.79
1450 Head	1350	1550	8.66	8.66	8.66
1750 Head	1650	1850	8.41	8.41	8.41
1900 Head	1850	2000	8.14	8.14	8.14
2100 Head	2000	2200	8.15	8.15	8.15
2300 Head	2200	2400	7.80	7.80	7.80
2450 Head	2400	2550	7.44	7.44	7.44
2600 Head	2550	2700	7.29	7.29	7.29
5200 Head	5090	5250	5.55	5.55	5.55
5300 Head	5250	5410	5.28	5.28	5.28
5600 Head	5490	5700	4.76	4.76	4.76
5800 Head	5700	5910	4.72	4.72	4.72

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/m³ 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 62209-1:2016

Recommended Tissue Dielectric Parameters for Head

Table A.3 – Dielectric properties of the head tissue-equivalent liquid

Frequency MHz	Relative permittivity ϵ_r	Conductivity (σ) S/m
300	45,3	0,87
450	43,5	0,87
<i>750</i>	<i>41,9</i>	<i>0,89</i>
835	41,5	0,90
900	41,5	0,97
1 450	40,5	1,20
<i>1 500</i>	<i>40,4</i>	<i>1,23</i>
<i>1 640</i>	<i>40,2</i>	<i>1,31</i>
<i>1 750</i>	<i>40,1</i>	<i>1,37</i>
1 800	40,0	1,40
1 900	40,0	1,40
2 000	40,0	1,40
<i>2 100</i>	<i>39,8</i>	<i>1,49</i>
<i>2 300</i>	<i>39,5</i>	<i>1,67</i>
2 450	39,2	1,80
<i>2 600</i>	<i>39,0</i>	<i>1,96</i>
3 000	38,5	2,40
<i>3 500</i>	<i>37,9</i>	<i>2,91</i>
<i>4 000</i>	<i>37,4</i>	<i>3,43</i>
<i>4 500</i>	<i>36,8</i>	<i>3,94</i>
<i>5 000</i>	<i>36,2</i>	<i>4,45</i>
<i>5 200</i>	<i>36,0</i>	<i>4,66</i>
<i>5 400</i>	<i>35,8</i>	<i>4,86</i>
<i>5 600</i>	<i>35,5</i>	<i>5,07</i>
<i>5 800</i>	<i>35,3</i>	<i>5,27</i>
6 000	35,1	5,48

NOTE For convenience, permittivity and conductivity values at those frequencies which are not part of the original data provided by Drossos et al. [33] or the extension to 5 800 MHz are provided (i.e. the values shown *in italics*). These values were linearly interpolated between the values in this table that are immediately above and below these values, except the values at 6 000 MHz that were linearly extrapolated from the values at 3 000 MHz and 5 800 MHz.

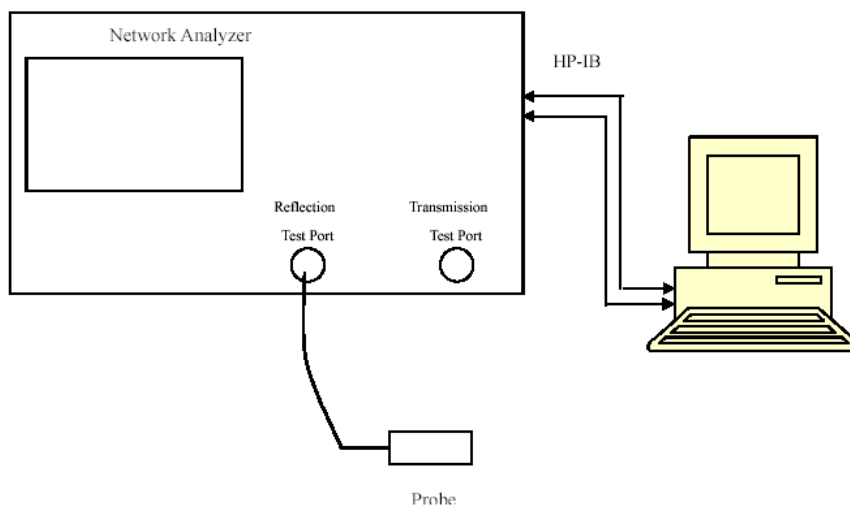
EQUIPMENT LIST AND CALIBRATION

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	7329	2020/11/30	2021/11/29
Mounting Device	MD4HHTV5	SD 000 H01 KA	NCR	NCR
SAM Twin Phantom	SAM-Twin V5.0	1744	NCR	NCR
Dipole,5GHz	D5GHzV2	1246	2019/11/19	2022/11/18
Simulated Tissue Liquid Head(500-9500MHz)	HBBL600-10000V6	180622-2	Each Time	/
Network Analyzer	8753D	3410A08288	2021/7/07	2022/7/06
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	2021/7/31	2022/7/30
Power Amplifier	CBA 1G-070	T44328	2020/12/24	2021/12/23
Linear Power Amplifier	AS0860-40/45	1060913	2020/12/24	2021/12/23
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 (%)
		ϵ_r	σ (S/m)	ϵ_r	σ (S/m)	$\Delta\epsilon_r$	$\Delta\sigma$ (S/m)	
5180	Simulated Tissue Liquid Head	36.103	4.601	36.02	4.64	0.23	-0.84	± 10
5200	Simulated Tissue Liquid Head	36.061	4.626	36	4.66	0.17	-0.73	± 10
5240	Simulated Tissue Liquid Head	36.047	4.676	35.96	4.7	0.24	-0.51	± 10
5250	Simulated Tissue Liquid Head	36.025	4.705	35.95	4.71	0.21	-0.11	± 10
5260	Simulated Tissue Liquid Head	35.995	4.732	35.94	4.72	0.15	0.25	± 10
5280	Simulated Tissue Liquid Head	35.94	4.748	35.92	4.74	0.06	0.17	± 10
5300	Simulated Tissue Liquid Head	35.903	4.813	35.9	4.76	0.01	1.11	± 10
5320	Simulated Tissue Liquid Head	35.844	4.821	35.88	4.78	-0.1	0.86	± 10
5745	Simulated Tissue Liquid Head	35.352	5.217	35.36	5.22	-0.02	-0.06	± 10
5785	Simulated Tissue Liquid Head	35.347	5.242	35.32	5.26	0.08	-0.34	± 10
5800	Simulated Tissue Liquid Head	35.341	5.314	35.3	5.27	0.12	0.83	± 10
5825	Simulated Tissue Liquid Head	35.218	5.335	35.28	5.3	-0.18	0.66	± 10

*Liquid Verification above was performed on 2021/11/28.

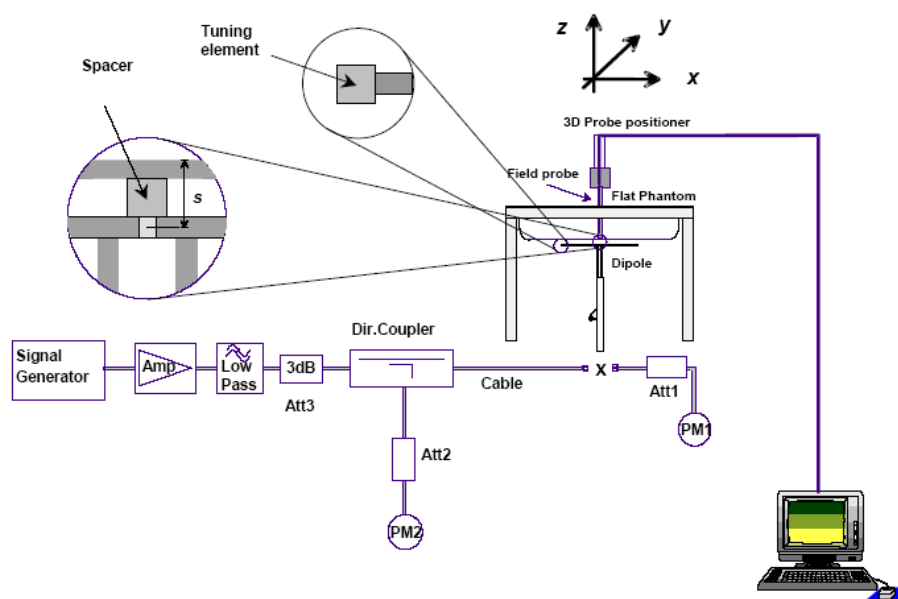
System Accuracy Verification

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	Liquid Type	Input Power (mW)	Measured SAR (W/kg)		Normalized to 1W (W/kg)	Target Value (W/kg)	Delta (%)	Tolerance (%)
2021/11/28	5250 MHz	Head	100	1g	7.72	77.2	75.0	2.93	± 10
2021/11/28	5300 MHz	Head	100	1g	7.64	76.4	77.2	-1.04	± 10
2021/11/28	5800 MHz	Head	100	1g	7.85	78.5	77.9	0.77	± 10

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

SAR SYSTEM VALIDATION DATA

System Performance 5250MHz

DUT: D5GHzV2; Type: 5250MHz; Serial: 1246

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

Medium parameters used: $f = 5250$ MHz; $\sigma = 4.705$ S/m; $\epsilon_r = 36.025$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(5.55, 5.55, 5.55) @ 5250 MHz; Calibrated: 2021/11/30
- Sensor-Surface: 1.4mm (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)

Area Scan (41x61x1): Interpolated grid: $dx=1.000$ mm, $dy=1.000$ mm

Maximum value of SAR (interpolated) = 19.9 W/kg

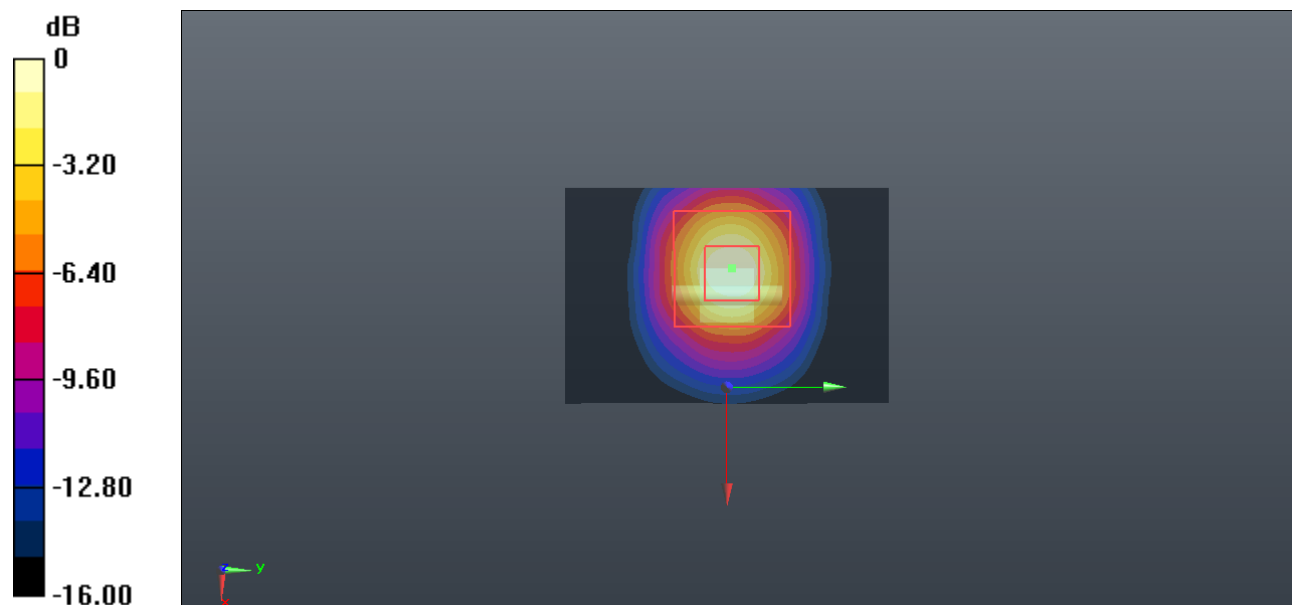
Zoom Scan (7x7x6)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=2$ mm

Reference Value = 39.10 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 28.2 W/kg

SAR(1 g) = 7.72 W/kg; SAR(10 g) = 2.28 W/kg

Maximum value of SAR (measured) = 18.1 W/kg



0 dB = 18.1 W/kg = 12.58 dBW/kg

System Performance 5300MHz**DUT: D5GHzV2; Type: 5300MHz; Serial: 1246**

Communication System: CW; Frequency: 5300 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5300$ MHz; $\sigma = 4.813$ S/m; $\epsilon_r = 35.903$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(5.28, 5.28, 5.28) @ 5300 MHz; Calibrated: 2021/11/30
- Sensor-Surface: 1.4mm (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)

Area Scan (41x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 19.3 W/kg

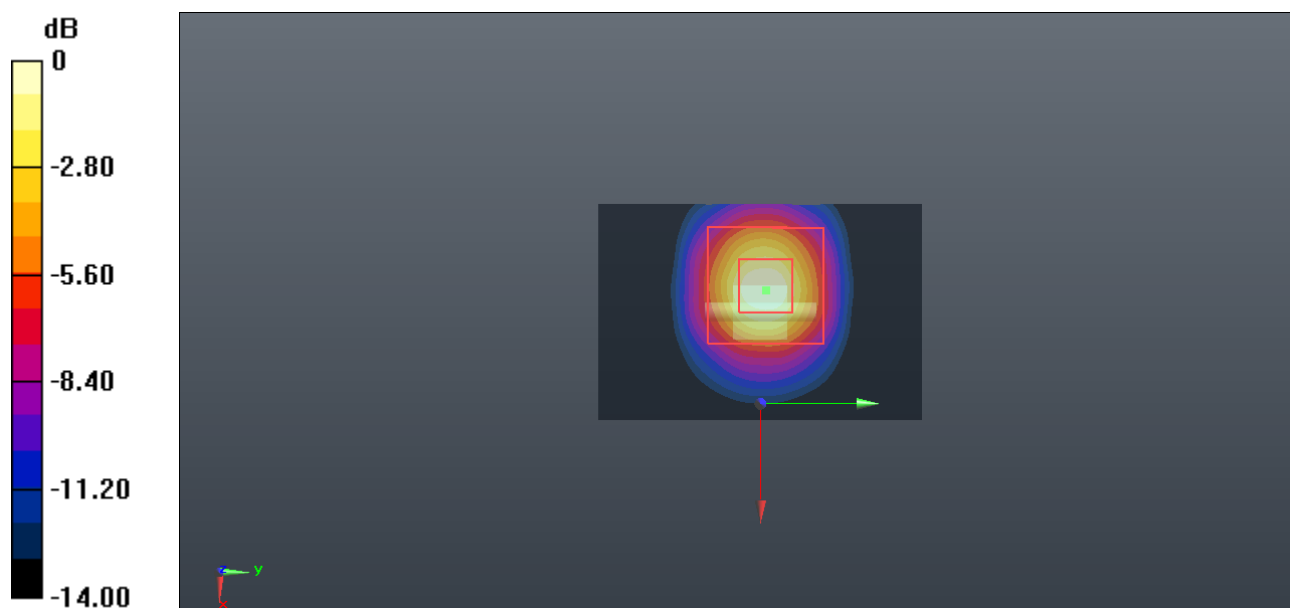
Zoom Scan (7x7x6)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm

Reference Value = 39.51 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 28.8 W/kg

SAR(1 g) = 7.64 W/kg; SAR(10 g) = 2.19 W/kg

Maximum value of SAR (measured) = 18.4 W/kg



0 dB = 18.4 W/kg = 12.65 dBW/kg

System Performance 5800MHz**DUT: D5GHzV2; Type: 5800MHz; Serial: 1246**

Communication System: CW; Frequency: 5800 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5800$ MHz; $\sigma = 5.314$ S/m; $\epsilon_r = 35.341$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(4.72, 4.72, 4.72) @ 5800 MHz; Calibrated: 2021/11/30
- Sensor-Surface: 1.4mm (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)

Area Scan (41x61x1): Interpolated grid: $dx=1.000$ mm, $dy=1.000$ mm

Maximum value of SAR (interpolated) = 21.0 W/kg

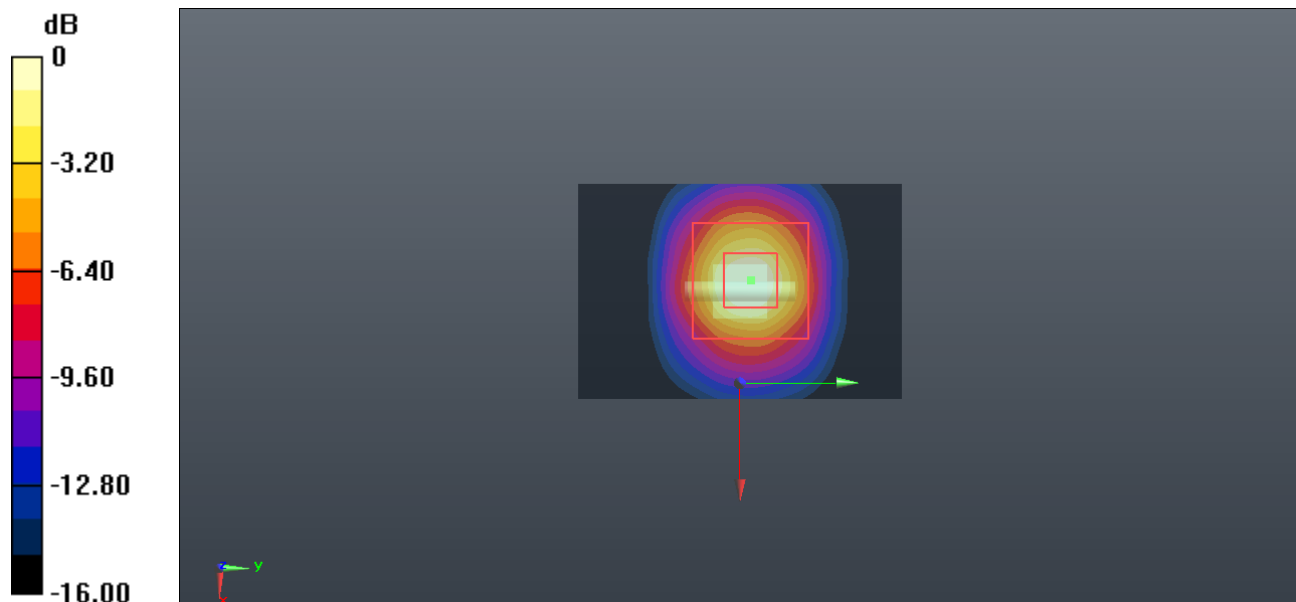
Zoom Scan (7x7x6)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=2$ mm

Reference Value = 39.09 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 33.4 W/kg

SAR(1 g) = 7.85 W/kg; SAR(10 g) = 2.29 W/kg

Maximum value of SAR (measured) = 19.6 W/kg



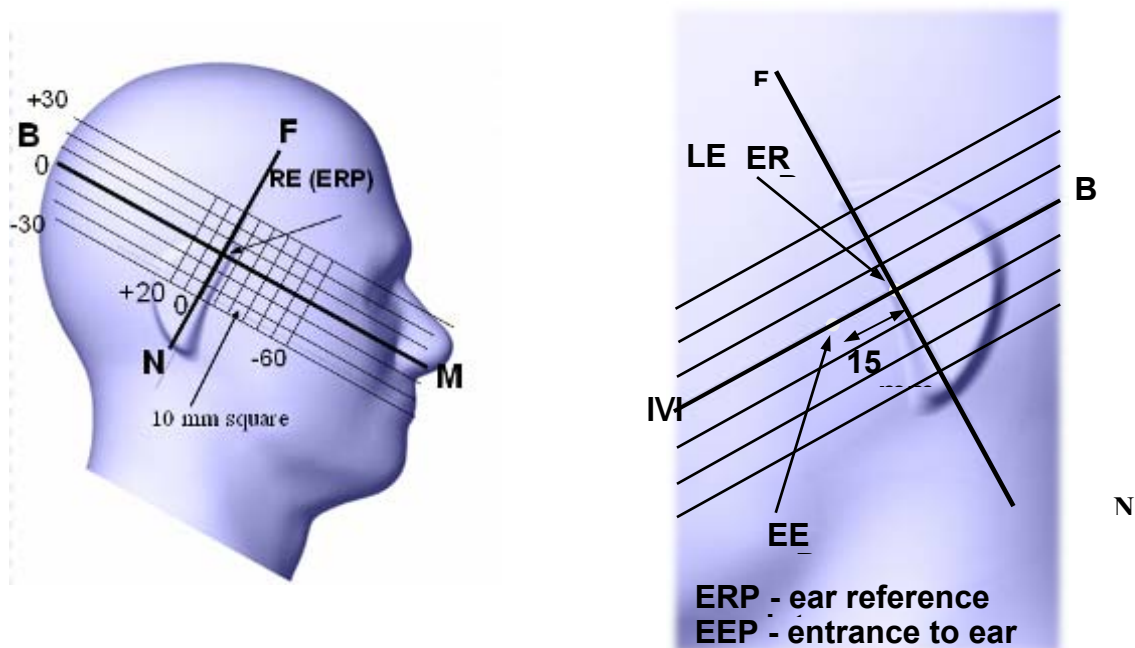
0 dB = 19.6 W/kg = 12.92 dBW/kg

EUT TEST STRATEGY AND METHODOLOGY

Test Positions for Device Operating Next to a Person's Ear

This category includes most wireless handsets with fixed, retractable or internal antennas located toward the top half of the device, with or without a foldout, sliding or similar keypad cover. The handset should have its earpiece located within the upper ¼ of the device, either along the centerline or off-centered, as perceived by its users. This type of handset should be positioned in a normal operating position with the “test device reference point” located along the “vertical centerline” on the front of the device aligned to the “ear reference point”. The “test device reference point” should be located at the same level as the center of the earpiece region. The “vertical centerline” should bisect the front surface of the handset at its top and bottom edges. A “ear reference point” is located on the outer surface of the head phantom on each ear spacer. It is located 1.5 cm above the center of the ear canal entrance in the “phantom reference plane” defined by the three lines joining the center of each “ear reference point” (left and right) and the tip of the mouth.

A handset should be initially positioned with the earpiece region pressed against the ear spacer of a head phantom. For the SCC-34/SC-2 head phantom, the device should be positioned parallel to the “N-F” line defined along the base of the ear spacer that contains the “ear reference point”. For interim head phantoms, the device should be positioned parallel to the cheek for maximum RF energy coupling. The “test device reference point” is aligned to the “ear reference point” on the head phantom and the “vertical centerline” is aligned to the “phantom reference plane”. This is called the “initial ear position”. While maintaining these three alignments, the body of the handset is gradually adjusted to each of the following positions for evaluating SAR:



Cheek/Touch Position

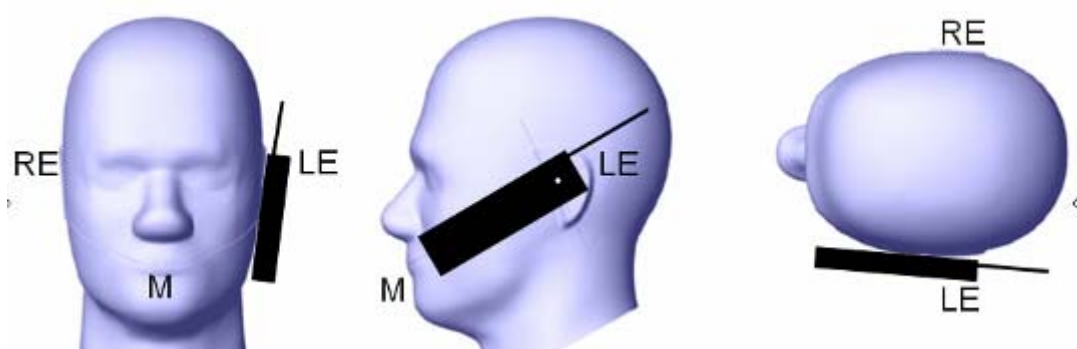
The device is brought toward the mouth of the head phantom by pivoting against the “ear reference point” or along the “N-F” line for the SCC-34/SC-2 head phantom.

This test position is established:

When any point on the display, keypad or mouthpiece portions of the handset is in contact with the phantom.
(or) When any portion of a foldout, sliding or similar keypad cover opened to its intended self-adjusting normal use position is in contact with the cheek or mouth of the phantom.

For existing head phantoms – when the handset loses contact with the phantom at the pivoting point, rotation should continue until the device touches the cheek of the phantom or breaks its last contact from the ear spacer.

Cheek /Touch Position



Ear/Tilt Position

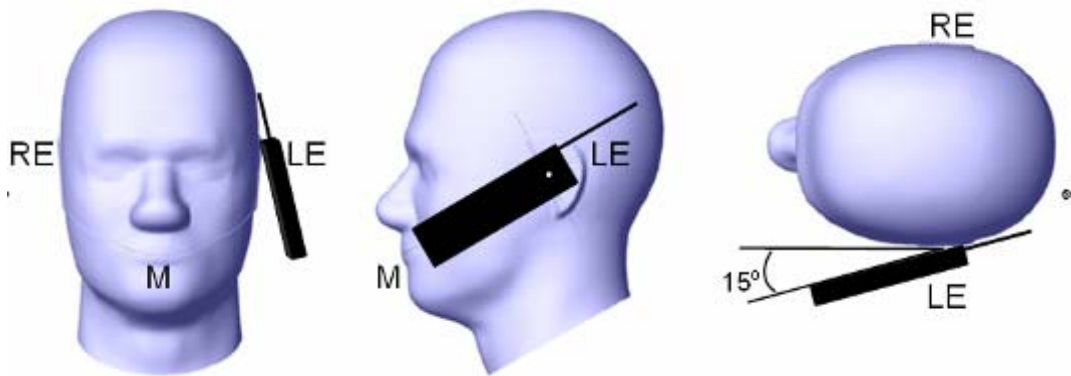
With the handset aligned in the “Cheek/Touch Position”:

1) If the earpiece of the handset is not in full contact with the phantom’s ear spacer (in the “Cheek/Touch position”) and the peak SAR location for the “Cheek/Touch” position is located at the ear spacer region or corresponds to the earpiece region of the handset, the device should be returned to the “initial ear position” by rotating it away from the mouth until the earpiece is in full contact with the ear spacer.

2) (otherwise) The handset should be moved (translated) away from the cheek perpendicular to the line passes through both “ear reference points” (note: one of these ear reference points may not physically exist on a split head model) for approximate 2-3 cm. While it is in this position, the device handset is tilted away from the mouth with respect to the “test device reference point” until the inside angle between the vertical centerline on the front surface of the phone and the horizontal line passing through the ear reference point is by 15° to 80°. After the tilt, it is then moved (translated) back toward the head perpendicular to the line passes through both “ear reference points” until the device touches the phantom or the ear spacer. If the antenna touches the head first, the positioning process should be repeated with a tilt angle less than 15° so that the device and its antenna would touch the phantom simultaneously. This test position may require a device holder or positioner to achieve the translation and tilting with acceptable positioning repeatability.

If a device is also designed to transmit with its keypad cover closed for operating in the head position, such positions should also be considered in the SAR evaluation. The device should be tested on the left and right side of the head phantom in the “Cheek/Touch” and “Ear/Tilt” positions. When applicable, each configuration should be tested with the antenna in its fully extended and fully retracted positions. These test configurations should be tested at the high, middle and low frequency channels of each operating mode; for example, AMPS, CDMA, and TDMA. If the SAR measured at the middle channel for each test configuration (left, right, Cheek/Touch, Tilt/Ear, extended and retracted) is at least 2.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s). If the transmission band of the test device is less than 10 MHz, testing at the high and low frequency channels is optional.

Ear /Tilt 15° Position



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.

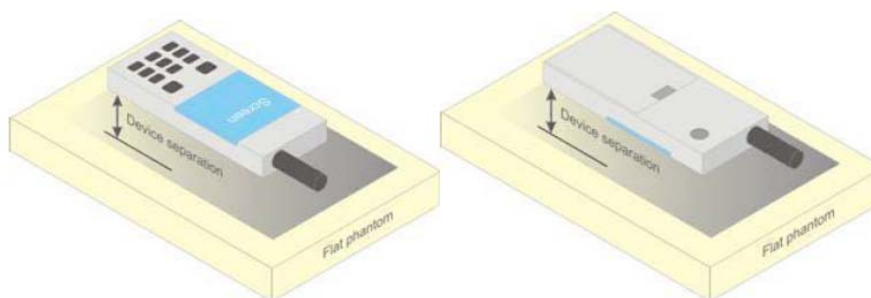


Figure 5 – Test positions for body-worn devices

Test Distance for SAR Evaluation

In this case the DUT(Device Under Test) is set directly against 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.

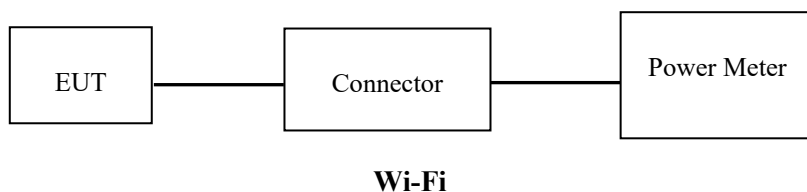
CONDUCTED OUTPUT POWER MEASUREMENT

Provision Applicable

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

Test Procedure

The RF output of the transmitter was connected to the input port of the Power Meter through Connector.



Maximum Target Output Power

Max Target Power(dBm)			
Mode/Band	Channel		
	Low	Middle	High
Wi-Fi 5.2G (802.11a)	14.3	14.3	14.3
Wi-Fi 5.2G (802.11n ht20)	14.2	14.2	14.2
Wi-Fi 5.2G (802.11n ht40)	14.1	/	14.1
Wi-Fi 5.2G (802.11ac ht80)	/	14.3	/
Wi-Fi 5.3G (802.11a)	10.4	10.4	10.4
Wi-Fi 5.3G (802.11n ht20)	10.4	10.4	10.4
Wi-Fi 5.3G (802.11n ht40)	10.4	/	10.4
Wi-Fi 5.2G (802.11ac ht80)	/	10.4	/
Wi-Fi 5.8G (802.11a)	9.9	9.9	9.9
Wi-Fi 5.8G (802.11n ht20)	9.7	9.7	9.7
Wi-Fi 5.8G (802.11n ht40)	9.6	/	9.6
Wi-Fi 5.8G (802.11ac ht80)	/	9.9	/

Test Results:**Wi-Fi 5.2G:**

Mode	Channel frequency (MHz)	Data Rate	Max Average Output Power(dBm)
802.11a	5180	6Mbps	14.12
	5200		14
	5240		14.21
802.11n20	5180	MCS0	14.08
	5200		14.01
	5240		13.9
802.11n40	5190	MCS0	13.96
	5230		13.95
802.11ac80	5210	MCS0	14.18

Wi-Fi 5.3G:

Mode	Channel frequency (MHz)	Data Rate	Max Average Output Power(dBm)
802.11a	5260	6Mbps	10.31
	5280		10.03
	5320		10.11
802.11n20	5260	MCS0	10.28
	5280		10.16
	5320		10.3
802.11n40	5270	MCS0	10.24
	5310		10.05
802.11ac80	5290	MCS0	10.26

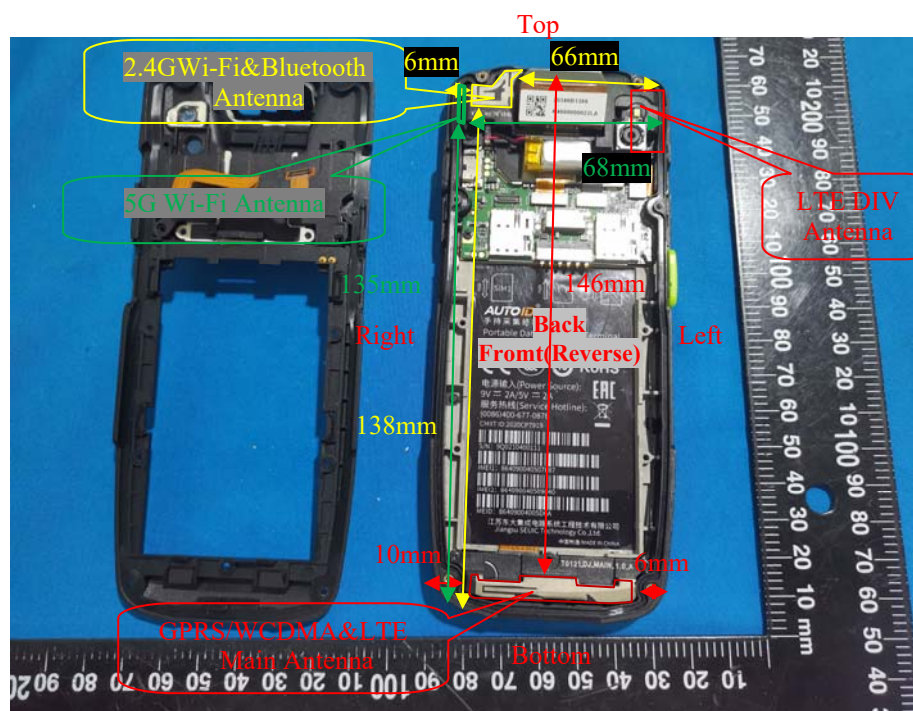
Wi-Fi 5.8G:

Mode	Channel frequency (MHz)	Data Rate	Max Average Output Power(dBm)
802.11a	5745	6Mbps	9.48
	5785		9.41
	5825		9.76
802.11n20	5745	MCS0	9.5
	5785		9.56
	5825		9.24
802.11n40	5755	MCS0	9.43
	5795		9.53
802.11ac80	5775	MCS0	9.75

Note: The test data of 2G/3G/4G, 2.4G Wi-Fi, bluetooth please refer to report: CR21100112-20A, which issued by China Certification ICT Co., Ltd (Dongguan) on 2021-11-30.

Standalone SAR test exclusion considerations

Antennas Location:



Note: The LTE DIV antenna can not transmit, and is receiving only.

Antenna Distance To Edge

Antenna Distance To Edge(mm)					
Antenna	Back	Left	Right	Top	Bottom
WWAN(GPRS/WCDMA/LTE)	< 5	6	10	146	< 5
2.4G Wi-Fi&Bluetooth Antenna	< 5	66	6	< 5	138
5G Wi-Fi Antenna	< 5	68	< 5	< 5	135

Standalone SAR test exclusion considerations:

Mode	Frequency (MHz)	Pavg (dBm)	Pavg (mW)	Test Exclusion Distance (mm)
WLAN 5.2G	5240	14.3	26.9	20.6
WLAN 5.3G	5320	10.4	11.0	8.5
WLAN 5.8G	5825	9.9	9.8	8.0

SAR test exclusion for the EUT edge considerations Result

Mode	Back	Left	Right	Top	Bottom
WLAN 5.2G	Required	Exclusion	Required	Required	Exclusion
WLAN 5.3G	Required	Exclusion	Required	Required	Exclusion
WLAN 5.8G	Required	Exclusion	Required	Required	Exclusion

Note:

Required: The distance is less than **Test Exclusion Distance**, the SAR test is required.

Exclusion: The distance is large than **Test Exclusion Distance**, SAR test is not required.

SAR test exclusion for the EUT edge considerations detail:**Distance < 50mm (To Edges)**

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$$\left[\frac{\text{max. power of channel, including tune-up tolerance, mW}}{\text{min. test separation distance, mm}} \right] \cdot$$

$$\left[\sqrt{f(\text{GHz})} \right] \leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR, where}$$

1. $f(\text{GHz})$ is the RF channel transmit frequency in GHz.

2. Power and distance are rounded to the nearest mW and mm before calculation.

3. The result is rounded to one decimal place for comparison.

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

5. The Time based average Power is used for calculation

Distance > 50mm (To Edges)

At 100 MHz to 6 GHz and for *test separation distances* > 50 mm, the SAR test exclusion threshold is determined according to the following:

a)
$$\left[\text{Power allowed at numeric threshold for 50 mm in step 1} + (\text{test separation distance} - 50 \text{ mm}) \cdot \left(\frac{f(\text{MHz})}{150} \right) \right]$$

mW, at 100 MHz to 1500 MHz

b)
$$\left[\text{Power allowed at numeric threshold for 50 mm in step 1} + (\text{test separation distance} - 50 \text{ mm}) \cdot 10 \right] \text{ mW at } > 1500 \text{ MHz and } \leq 6 \text{ GHz.}$$

SAR MEASUREMENT RESULTS

This page summarizes the results of the performed dosimetric evaluation.

SAR Test Data

Environmental Conditions

Temperature:	22.1-23.7 °C
Relative Humidity:	45-59%
ATM Pressure:	101.8 kPa
Test Date:	2021/11/28

Testing was performed by Seven Liang, Jacky Yang, Fake ou.

Wi-Fi 5.2G:

EUT Position	Frequency (MHz)	Test Mode	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/kg), Limit=1.6W/kg			
					Scaled Factor	Meas. SAR	Scaled SAR	Plot
Head Left Cheek	5180	802.11a	/	/	/	/	/	/
	5200	802.11a	14	14.3	1.072	0.155	0.17	1#
	5240	802.11a	/	/	/	/	/	/
Head Left Tilt	5180	802.11a	/	/	/	/	/	/
	5200	802.11a	14	14.3	1.072	0.11	0.12	2#
	5240	802.11a	/	/	/	/	/	/
Head Right Cheek	5180	802.11a	/	/	/	/	/	/
	5200	802.11a	14	14.3	1.072	0.156	0.17	3#
	5240	802.11a	/	/	/	/	/	/
Head Right Tilt	5180	802.11a	/	/	/	/	/	/
	5200	802.11a	14	14.3	1.072	0.075	0.08	4#
	5240	802.11a	/	/	/	/	/	/
Body Back (0mm)	5180	802.11a	/	/	/	/	/	/
	5200	802.11a	14	14.3	1.072	0.315	0.34	5#
	5240	802.11a	/	/	/	/	/	/
Body Right (0mm)	5180	802.11a	14.12	14.3	1.042	1.08	1.13	6#
	5200	802.11a	14	14.3	1.072	1.3	1.39	7#
	5240	802.11a	14.21	14.3	1.021	1.39	1.42	8#
Body Top (0mm)	5180	802.11a	/	/	/	/	/	/
	5200	802.11a	14	14.3	1.072	0.181	0.19	9#
	5240	802.11a	/	/	/	/	/	/

Wi-Fi 5.3G:

EUT Position	Frequency (MHz)	Test Mode	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/kg), Limit=1.6W/kg			
					Scaled Factor	Meas. SAR	Scaled SAR	Plot
Head Left Cheek	5260	802.11a	/	/	/	/	/	/
	5280	802.11a	10.03	10.4	1.089	0.129	0.14	10#
	5320	802.11a	/	/	/	/	/	/
Head Left Tilt	5260	802.11a	/	/	/	/	/	/
	5280	802.11a	10.03	10.4	1.089	0.091	0.1	11#
	5320	802.11a	/	/	/	/	/	/
Head Right Cheek	5260	802.11a	/	/	/	/	/	/
	5280	802.11a	10.03	10.4	1.089	0.112	0.12	12#
	5320	802.11a	/	/	/	/	/	/
Head Right Tilt	5260	802.11a	/	/	/	/	/	/
	5280	802.11a	10.03	10.4	1.089	0.089	0.1	13#
	5320	802.11a	/	/	/	/	/	/
Body Back (0mm)	5260	802.11a	/	/	/	/	/	/
	5280	802.11a	10.03	10.4	1.089	0.195	0.21	14#
	5320	802.11a	/	/	/	/	/	/
Body Right (0mm)	5260	802.11a	10.31	10.4	1.021	0.901	0.92	15#
	5280	802.11a	10.03	10.4	1.089	1.08	1.18	16#
	5320	802.11a	10.11	10.4	1.069	1.18	1.26	17#
Body Top (0mm)	5260	802.11a	/	/	/	/	/	/
	5280	802.11a	10.03	10.4	1.089	0.123	0.13	18#
	5320	802.11a	/	/	/	/	/	/

Wi-Fi 5.8G:

EUT Position	Frequency (MHz)	Test Mode	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/kg), Limit=1.6W/kg			
					Scaled Factor	Meas. SAR	Scaled SAR	Plot
Head Left Cheek	5745	802.11a	/	/	/	/	/	/
	5785	802.11a	9.41	9.9	1.119	0.125	0.14	19#
	5825	802.11a	/	/	/	/	/	/
Head Left Tilt	5745	802.11a	/	/	/	/	/	/
	5785	802.11a	9.41	9.9	1.119	0.147	0.16	20#
	5825	802.11a	/	/	/	/	/	/
Head Right Cheek	5745	802.11a	/	/	/	/	/	/
	5785	802.11a	9.41	9.9	1.119	0.124	0.14	21#
	5825	802.11a	/	/	/	/	/	/
Head Right Tilt	5745	802.11a	/	/	/	/	/	/
	5785	802.11a	9.41	9.9	1.119	0.136	0.15	22#
	5825	802.11a	/	/	/	/	/	/
Body Back (0mm)	5745	802.11a	/	/	/	/	/	/
	5785	802.11a	9.41	9.9	1.119	0.181	0.2	23#
	5825	802.11a	/	/	/	/	/	/
Body Right (0mm)	5745	802.11a	/	/	/	/	/	/
	5785	802.11a	9.41	9.9	1.119	0.624	0.7	24#
	5825	802.11a	/	/	/	/	/	/
Body Top (0mm)	5745	802.11a	/	/	/	/	/	/
	5785	802.11a	9.41	9.9	1.119	0.259	0.29	25#
	5825	802.11a	/	/	/	/	/	/

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 units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance.

SAR Measurement Variability

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 ≥ 0.80 W/kg, repeat that measurement once.
- 3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg ($\sim 10\%$ from the 1-g SAR limit).
- 4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20 .

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.

The Highest Measured SAR Configuration in Each Frequency Band

Head

SAR probe calibration point	Frequency Band	Freq.(MHz)	EUT Position	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio
				Original	Repeated	
/	/	/	/	/	/	/

Body

SAR probe calibration point	Frequency Band	Freq.(MHz)	EUT Position	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio
				Original	Repeated	
5200MHz (5090-5250MHz)	Wi-Fi 5.2G	5240	Body Right	1.39	1.36	1.02
5300MHz (5250-5410MHz)	Wi-Fi 5.3G	5320	Body Right	1.18	1.15	1.03

Note:

1. Second Repeated Measurement is not required since the ratio of the largest to smallest SAR for the original and first repeated measurement is not > 1.20 .
2. The measured SAR results **do not** have to be scaled to the maximum tune-up tolerance to determine if repeated measurements are required.
3. SAR measurement variability must be assessed for each frequency band, which is determined by the **SAR probe calibration point and tissue-equivalent medium** used for the device measurements..

SAR SIMULTANEOUS TRANSMISSION DESCRIPTION

Simultaneous Transmission:

Description of Simultaneous Transmit Capabilities		
Transmitter Combination	Simultaneous?	Hotspot?
WWAN(GSM/WCDMA/LTE) + Bluetooth	√	×
WWAN(GSM/WCDMA/LTE) + WLAN	√	√
WLAN + Bluetooth	×	×

Note: Simultaneous and Hotspot SAR test exclusion considerations please refer to report: CR21100112-20A, which issued by China Certification ICT Co., Ltd (Dongguan) on 2021-12-23.

SAR Plots

Please Refer to the Attachment.

APPENDIX A MEASUREMENT UNCERTAINTY

KDB 865664 D01 SAR measurement 100MHz to 6GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 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 1528-2013 is not required in SAR reports submitted for equipment approval. For this device, the highest measured 1-g SAR is less 1.5W/kg. Therefore, the measurement uncertainty table is not required in this report

APPENDIX B EUT TEST POSITION PHOTOS

Please Refer to the Attachment.

APPENDIX C PROBE CALIBRATION CERTIFICATES

Please Refer to the Attachment.

APPENDIX D DIPOLE CALIBRATION CERTIFICATES

Please Refer to the Attachment.

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

Plot 1#: 5.2G Wi-Fi Mode A_Mid_Head Left Cheek**DUT: Portable Data Collection Terminal; Type: AUTOID Q9; Serial: CR21100112-SA-S2**

Communication System: 5.2G Wi-Fi; Frequency: 5200 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5200$ MHz; $\sigma = 4.626$ S/m; $\epsilon_r = 36.061$; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(5.55, 5.55, 5.55) @ 5200 MHz; Calibrated: 2020/11/30
- Sensor-Surface: 1.4mm (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)

Area Scan (101x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.331 W/kg

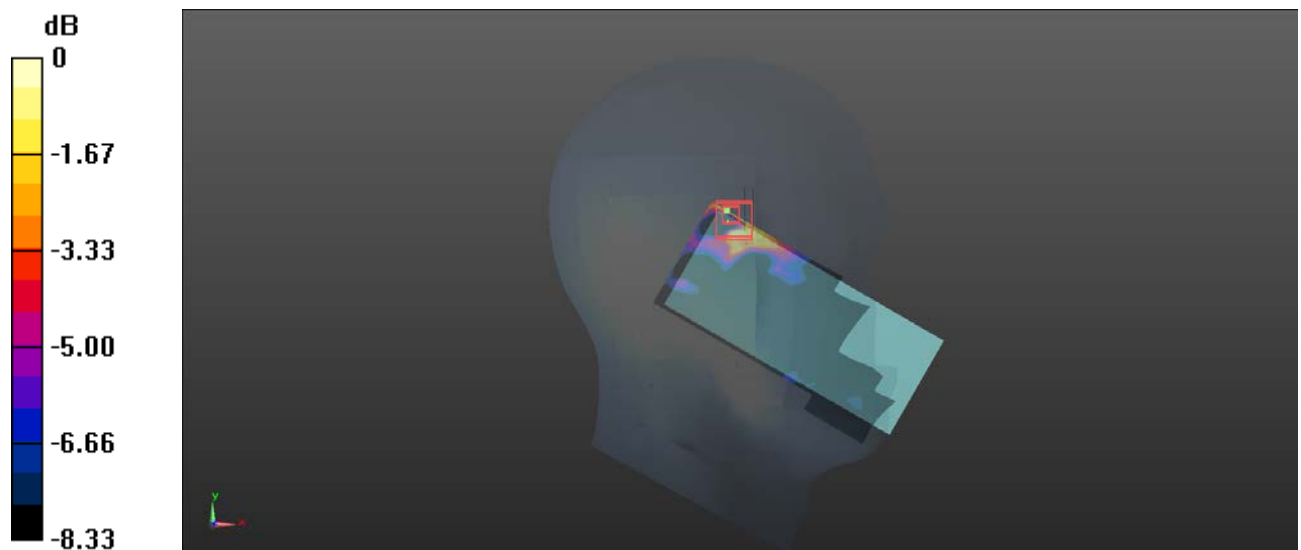
Zoom Scan (7x7x16)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm

Reference Value = 3.092 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 0.545 W/kg

SAR(1 g) = 0.155 W/kg; SAR(10 g) = 0.078 W/kg

Maximum value of SAR (measured) = 0.323 W/kg



0 dB = 0.323 W/kg = -4.91 dBW/kg

Plot 2#: 5.2G Wi-Fi Mode A_Mid_Head Left Tilt**DUT: Portable Data Collection Terminal; Type: AUTOID Q9; Serial: CR21100112-SA-S2**

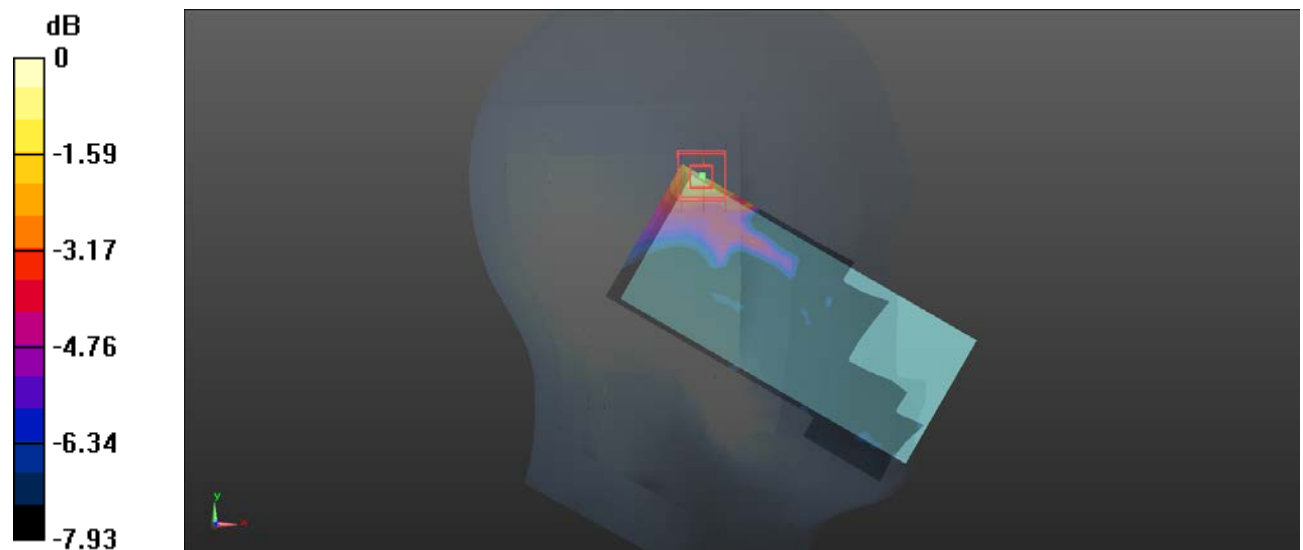
Communication System: 5.2G Wi-Fi; Frequency: 5200 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5200 \text{ MHz}$; $\sigma = 4.626 \text{ S/m}$; $\epsilon_r = 36.061$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(5.55, 5.55, 5.55) @ 5200 MHz; Calibrated: 2020/11/30
- Sensor-Surface: 1.4mm (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)

Area Scan (101x181x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$ Maximum value of SAR (interpolated) = 0.211 W/kg **Zoom Scan (7x7x16)/Cube 0:** Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=2\text{mm}$ Reference Value = 2.984 V/m ; Power Drift = 0.10 dB Peak SAR (extrapolated) = 0.334 W/kg **SAR(1 g) = 0.110 W/kg ; SAR(10 g) = 0.066 W/kg** Maximum value of SAR (measured) = 0.215 W/kg  $0 \text{ dB} = 0.215 \text{ W/kg} = -6.68 \text{ dBW/kg}$

Plot 3#: 5.2G Wi-Fi Mode A_Mid_Head Right Cheek**DUT: Portable Data Collection Terminal; Type: AUTOID Q9; Serial: CR21100112-SA-S2**

Communication System: 5.2G WiF; Frequency: 5200 MHz;Duty Cycle: 1:1

Medium parameters used: $f = 5200$ MHz; $\sigma = 4.626$ S/m; $\epsilon_r = 36.061$; $\rho = 1000$ kg/m³

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(5.55, 5.55, 5.55) @ 5200 MHz; Calibrated: 2020/11/30
- Sensor-Surface: 1.4mm (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)

Area Scan (101x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.160 W/kg

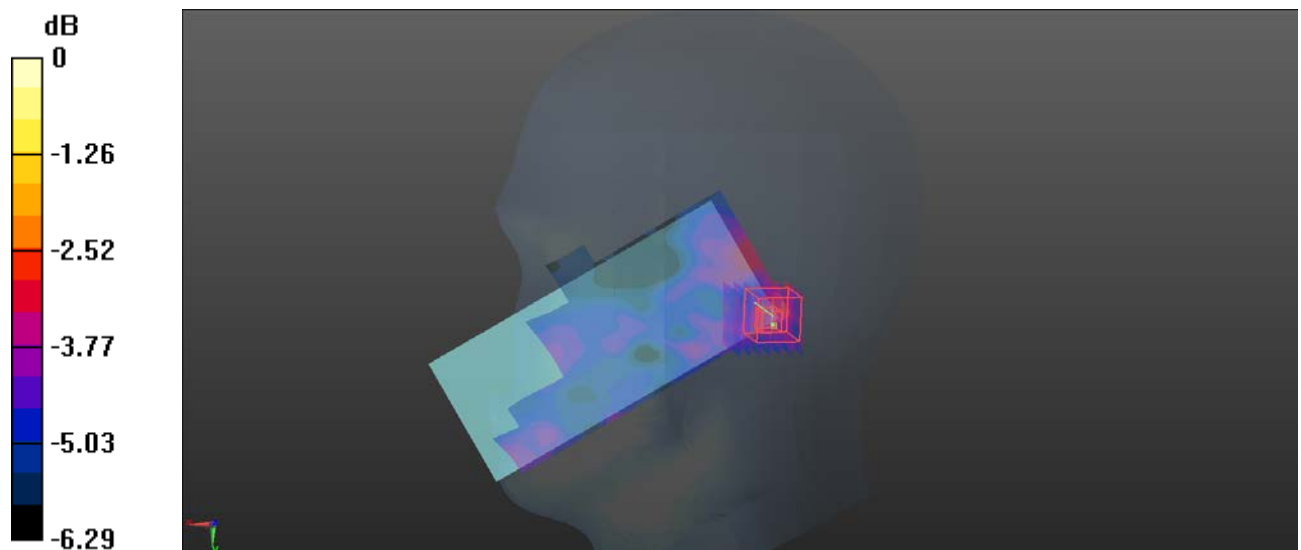
Zoom Scan (7x7x16)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm

Reference Value = 3.283 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 0.371 W/kg

SAR(1 g) = 0.156 W/kg; SAR(10 g) = 0.090 W/kg

Maximum value of SAR (measured) = 0.174 W/kg



0 dB = 0.174 W/kg = -7.59 dBW/kg

Plot 4#: 5.2G Wi-Fi Mode A_Mid_Head Right Tilt**DUT: Portable Data Collection Terminal; Type: AUTOID Q9; Serial: CR21100112-SA-S2**

Communication System: 5.2G Wi-Fi; Frequency: 5200 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5200$ MHz; $\sigma = 4.626$ S/m; $\epsilon_r = 36.061$; $\rho = 1000$ kg/m³

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(5.55, 5.55, 5.55) @ 5200 MHz; Calibrated: 2020/11/30
- Sensor-Surface: 1.4mm (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)

Area Scan (101x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.0640 W/kg

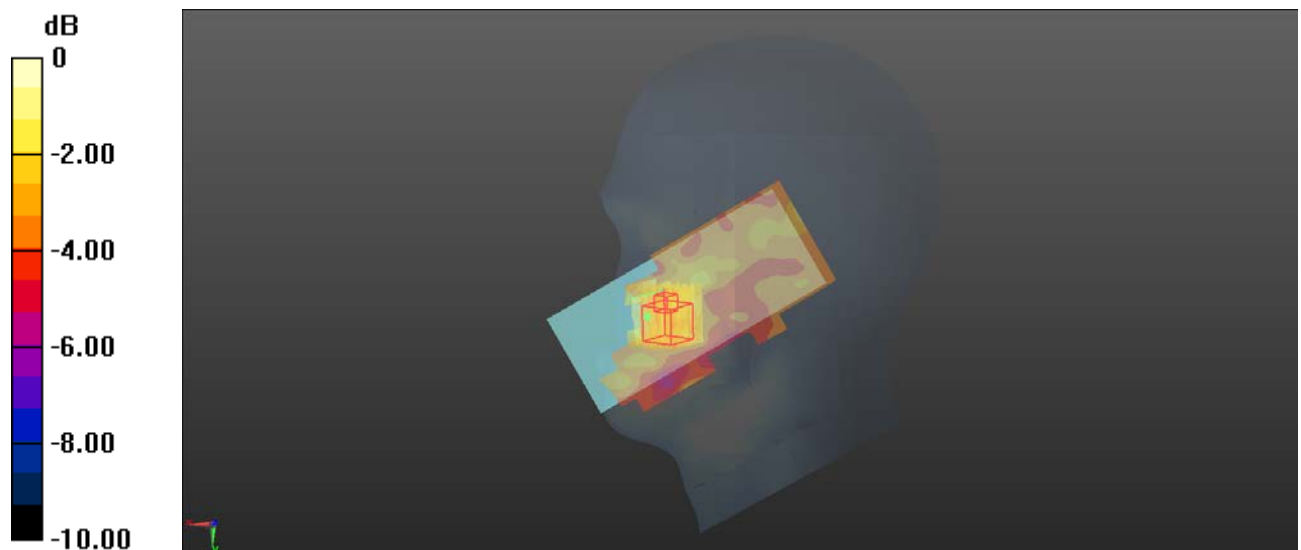
Zoom Scan (7x8x16)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm

Reference Value = 3.222 V/m; Power Drift = 0.15 dB

Peak SAR (extrapolated) = 0.106 W/kg

SAR(1 g) = 0.075 W/kg; SAR(10 g) = 0.066 W/kg

Maximum value of SAR (measured) = 0.102 W/kg



0 dB = 0.102 W/kg = -9.91 dBW/kg

Plot 5#: 5.2G Wi-Fi Mode A_Mid_Body Back**DUT: Portable Data Collection Terminal; Type: AUTOID Q9; Serial: CR21100112-SA-S2**

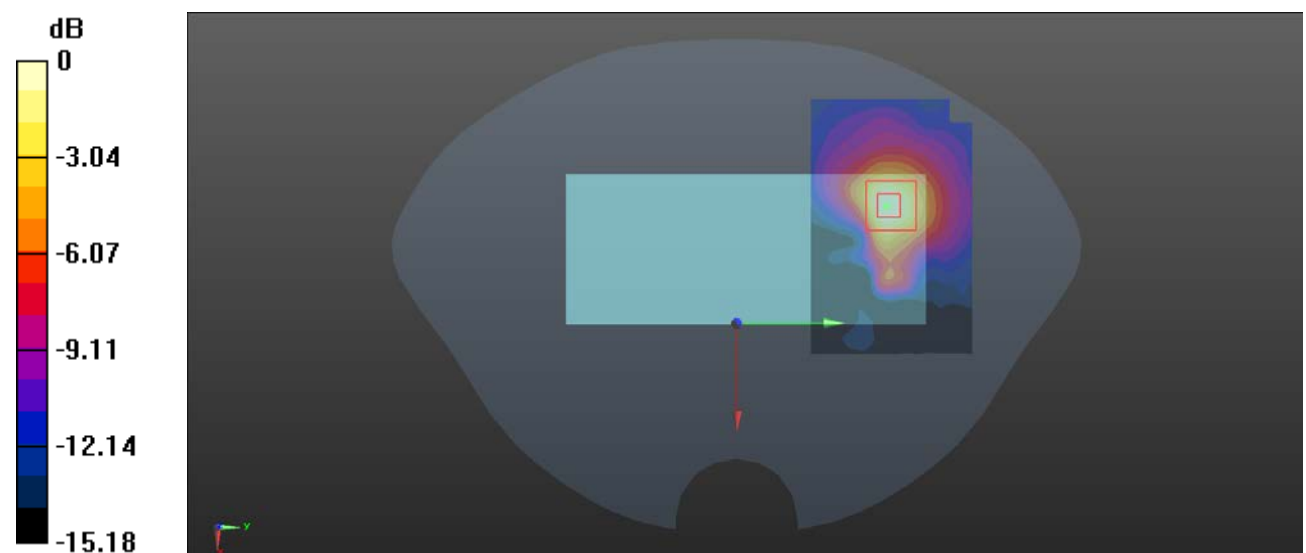
Communication System:.2G WiFi; Frequency: 5200 MHz;Duty Cycle: 1:1

Medium parameters used: $f = 5200 \text{ MHz}$; $\sigma = 4.626 \text{ S/m}$; $\epsilon_r = 36.061$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(5.55, 5.55, 5.55) @ 5200 MHz; Calibrated: 2020/11/30
- Sensor-Surface: 1.4mm (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)

Area Scan (111x71x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$ Maximum value of SAR (interpolated) = 0.727 W/kg **Zoom Scan (7x7x16)/Cube 0:** Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=2\text{mm}$ Reference Value = 2.387 V/m ; Power Drift = 0.14 dB Peak SAR (extrapolated) = 1.13 W/kg **SAR(1 g) = 0.315 W/kg ; SAR(10 g) = 0.131 W/kg** Maximum value of SAR (measured) = 0.696 W/kg 0 dB = 0.696 W/kg = -1.57 dBW/kg

Plot 6#: 5.2G Wi-Fi Mode A Low Body Right**DUT: Portable Data Collection Terminal; Type: AUTOID Q9; Serial: CR21100112-SA-S2**

Communication System: 5.2G Wi-Fi; Frequency: 5180 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5180$ MHz; $\sigma = 4.601$ S/m; $\epsilon_r = 36.103$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(5.55, 5.55, 5.55) @ 5180 MHz; Calibrated: 2020/11/30
- Sensor-Surface: 1.4mm (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)

Area Scan (51x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 2.95 W/kg

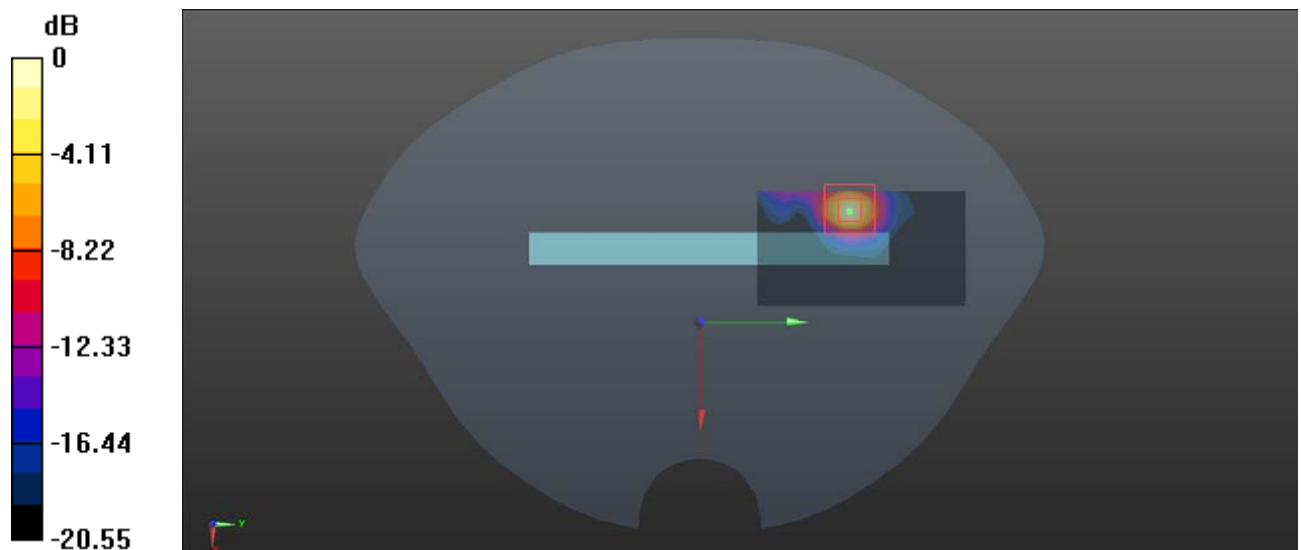
Zoom Scan (7x7x16)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm

Reference Value = 2.599 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 5.53 W/kg

SAR(1 g) = 1.08 W/kg; SAR(10 g) = 0.255 W/kg

Maximum value of SAR (measured) = 3.11 W/kg



0 dB = 3.11 W/kg = 4.93 dBW/kg

Plot 7#: 5.2G Wi-Fi Mode A_Mid_Body Right**DUT: Portable Data Collection Terminal; Type: AUTOID Q9; Serial: CR21100112-SA-S2**

Communication System: 5.2G Wi-Fi; Frequency: 5200 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5200$ MHz; $\sigma = 4.626$ S/m; $\epsilon_r = 36.061$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(5.55, 5.55, 5.55) @ 5200 MHz; Calibrated: 2020/11/30
- Sensor-Surface: 1.4mm (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)

Area Scan (51x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 3.31 W/kg

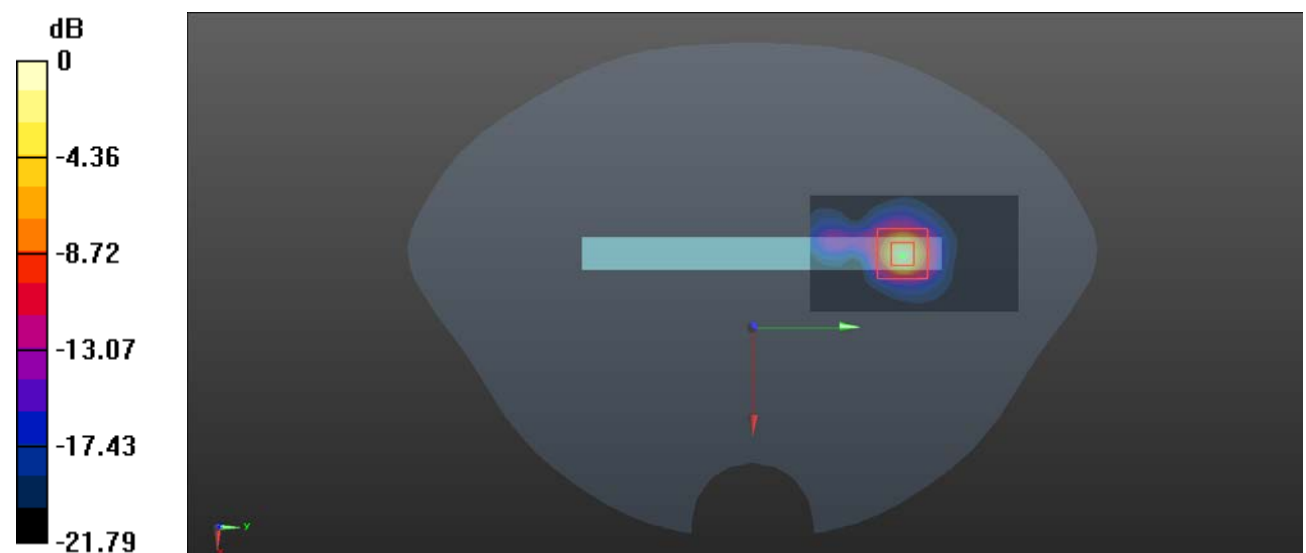
Zoom Scan (7x7x16)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm

Reference Value = 2.996 V/m; Power Drift = -0.15 dB

Peak SAR (extrapolated) = 6.63 W/kg

SAR(1 g) = 1.3 W/kg; SAR(10 g) = 0.292 W/kg

Maximum value of SAR (measured) = 3.86 W/kg



0 dB = 3.86 W/kg = 5.87 dBW/kg

Plot 8#: 5.2G Wi-Fi Mode A High Body Right**DUT: Portable Data Collection Terminal; Type: AUTOID Q9; Serial: CR21100112-SA-S2**

Communication System: 5.2G Wi-Fi; Frequency: 5240 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5240$ MHz; $\sigma = 4.676$ S/m; $\epsilon_r = 36.047$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(5.55, 5.55, 5.55) @ 5240 MHz; Calibrated: 2020/11/30
- Sensor-Surface: 1.4mm (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)

Area Scan (51x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 4.04 W/kg

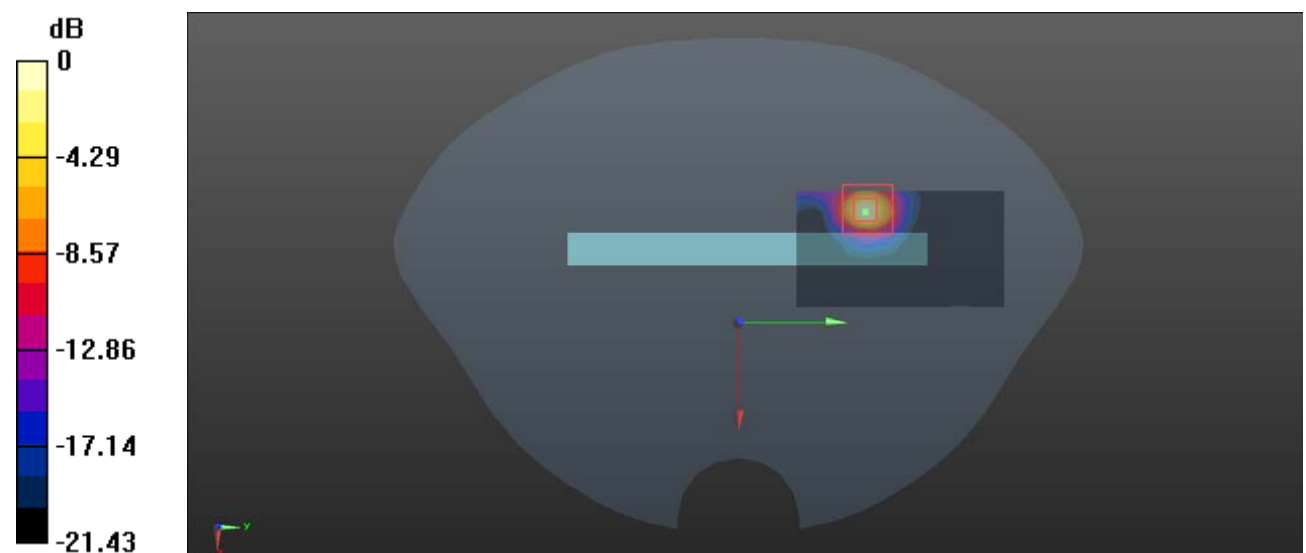
Zoom Scan (7x7x16)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm

Reference Value = 2.847 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 7.32 W/kg

SAR(1 g) = 1.39 W/kg; SAR(10 g) = 0.317 W/kg

Maximum value of SAR (measured) = 4.08 W/kg



0 dB = 4.08 W/kg = 6.11 dBW/kg

Plot 9#: 5.2G Wi-Fi Mode A_Mid_Body Top**DUT: Portable Data Collection Terminal; Type: AUTOID Q9; Serial: CR21100112-SA-S2**

Communication System: 5.2G Wi-Fi; Frequency: 5200 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5200$ MHz; $\sigma = 4.626$ S/m; $\epsilon_r = 36.061$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(5.55, 5.55, 5.55) @ 5200 MHz; Calibrated: 2020/11/30
- Sensor-Surface: 1.4mm (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)

Area Scan (41x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.373 W/kg

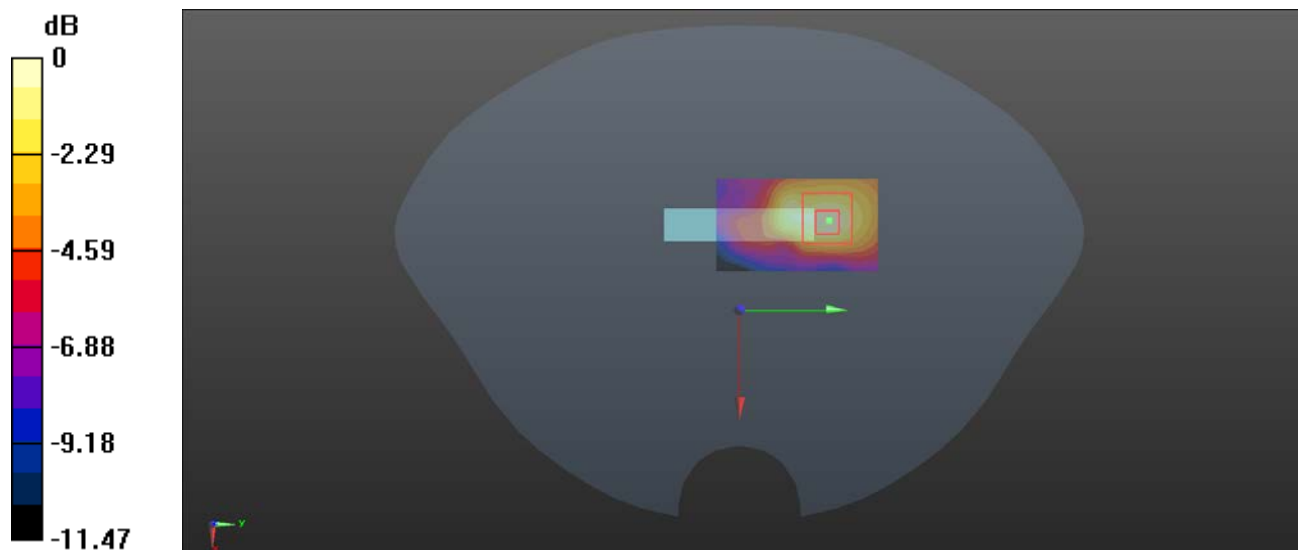
Zoom Scan (7x7x16)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm

Reference Value = 2.637 V/m; Power Drift = 0.15 dB

Peak SAR (extrapolated) = 0.626 W/kg

SAR(1 g) = 0.181 W/kg; SAR(10 g) = 0.094 W/kg

Maximum value of SAR (measured) = 0.372 W/kg



0 dB = 0.372 W/kg = -4.29 dBW/kg

Plot 10#: 5.3G WiFi Mode A_Mid_Head Left Cheek**DUT: Portable Data Collection Terminal; Type: AUTOID Q9; Serial: CR21100112-SA-S2**

Communication System: 5.3G WiFi; Frequency: 5280 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5280$ MHz; $\sigma = 4.748$ S/m; $\epsilon_r = 35.94$; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(5.28, 5.28, 5.28) @ 5280 MHz; Calibrated: 2020/11/30
- Sensor-Surface: 1.4mm (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)

Area Scan (101x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.262 W/kg

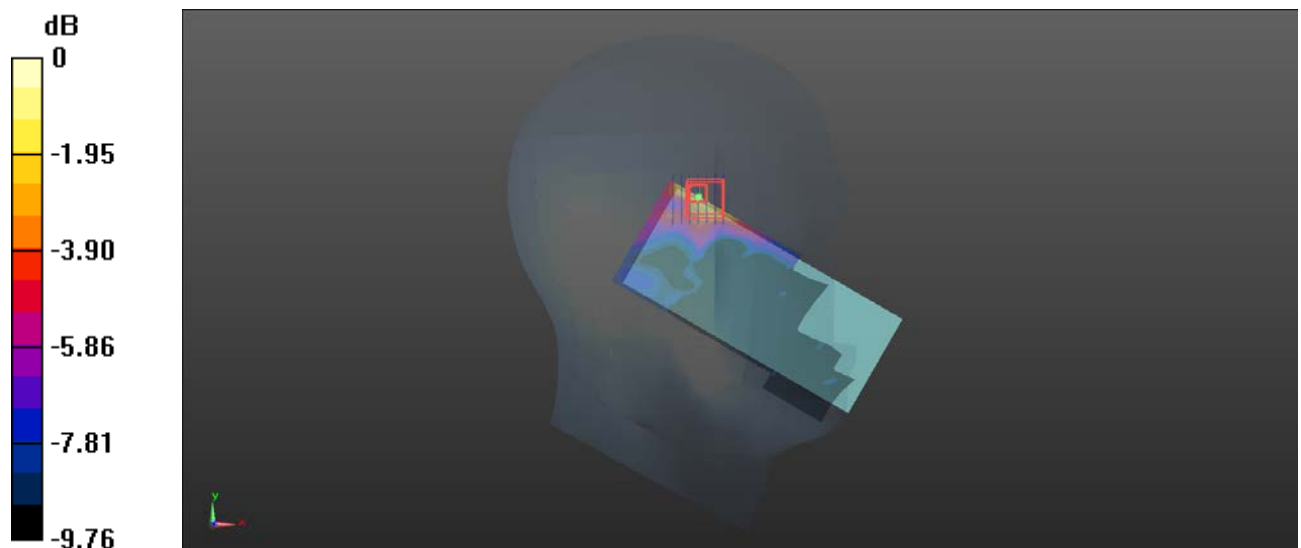
Zoom Scan (7x7x16)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm

Reference Value = 3.185 V/m; Power Drift = 0.13 dB

Peak SAR (extrapolated) = 0.395 W/kg

SAR(1 g) = 0.129 W/kg; SAR(10 g) = 0.069 W/kg

Maximum value of SAR (measured) = 0.261 W/kg



0 dB = 0.261 W/kg = -5.83 dBW/kg

Plot 11#: 5.3G WiFi Mode A_Mid_Head Left Tilt**DUT: Portable Data Collection Terminal; Type: AUTOID Q9; Serial: CR21100112-SA-S2**

Communication System: 5.3G WiFi; Frequency: 5280 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5280$ MHz; $\sigma = 4.748$ S/m; $\epsilon_r = 35.94$; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(5.28, 5.28, 5.28) @ 5280 MHz; Calibrated: 2020/11/30
- Sensor-Surface: 1.4mm (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)

Area Scan (101x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.223 W/kg

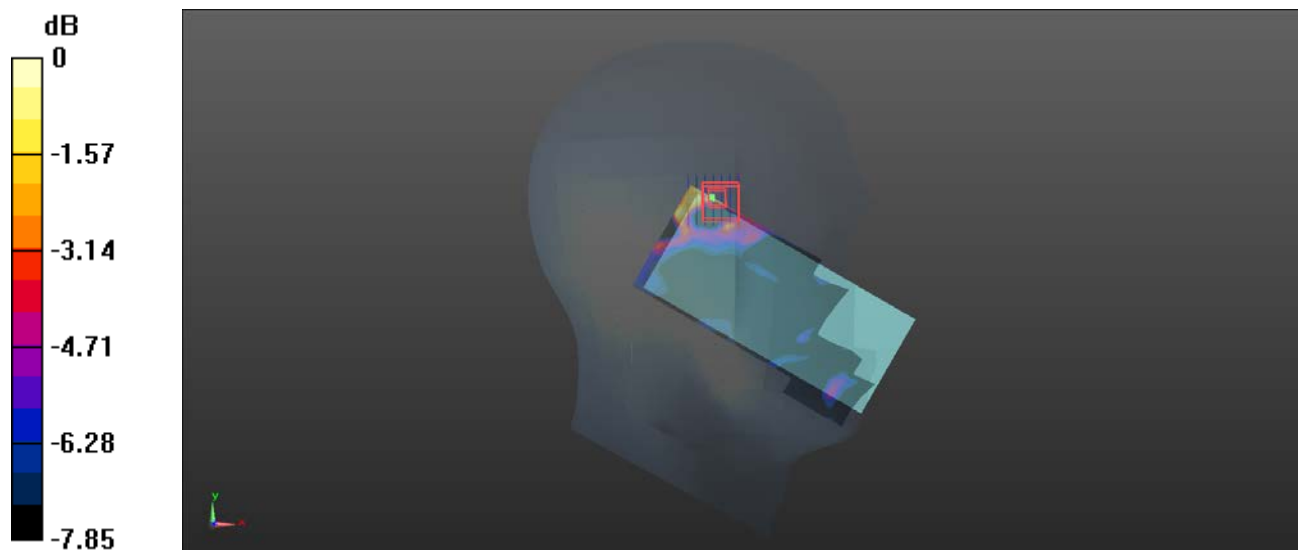
Zoom Scan (7x7x16)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm

Reference Value = 3.451 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.645 W/kg

SAR(1 g) = 0.091 W/kg; SAR(10 g) = 0.057 W/kg

Maximum value of SAR (measured) = 0.182 W/kg



0 dB = 0.182 W/kg = -7.40 dBW/kg

Plot 12#: 5.3G WiFi Mode A_Mid_Head Right Cheek**DUT: Portable Data Collection Terminal; Type: AUTOID Q9; Serial: CR21100112-SA-S2**

Communication System: 5.3G WiFi; Frequency: 5280 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5280$ MHz; $\sigma = 4.748$ S/m; $\epsilon_r = 35.94$; $\rho = 1000$ kg/m³

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(5.28, 5.28, 5.28) @ 5280 MHz; Calibrated: 2020/11/30
- Sensor-Surface: 1.4mm (Fix Surface)
- 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)

Area Scan (101x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.114 W/kg

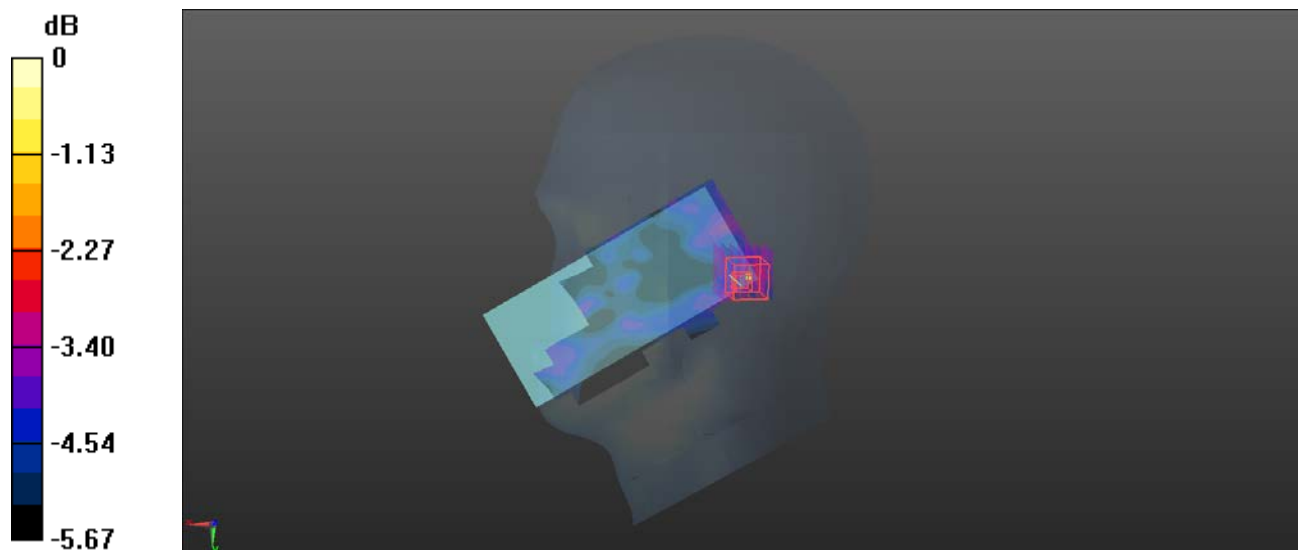
Zoom Scan (7x7x16)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm

Reference Value = 4.023 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 0.298 W/kg

SAR(1 g) = 0.112 W/kg; SAR(10 g) = 0.083 W/kg

Maximum value of SAR (measured) = 0.181 W/kg



0 dB = 0.181 W/kg = -7.42 dBW/kg

Plot 13#: 5.3G WiFi Mode A_Mid_Head Right Tilt**DUT: Portable Data Collection Terminal; Type: AUTOID Q9; Serial: CR21100112-SA-S2**

Communication System: 5.3G WiFi; Frequency: 5280 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5280$ MHz; $\sigma = 4.748$ S/m; $\epsilon_r = 35.94$; $\rho = 1000$ kg/m³

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(5.28, 5.28, 5.28) @ 5280 MHz; Calibrated: 2020/11/30
- Sensor-Surface: 1.4mm (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)

Area Scan (101x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.140 W/kg

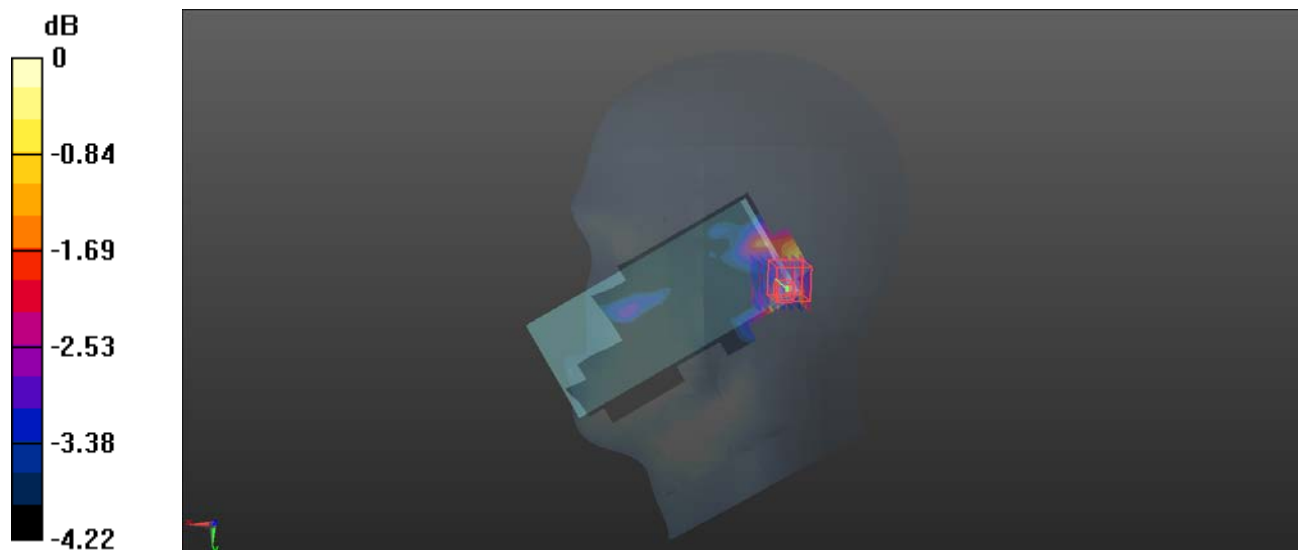
Zoom Scan (7x7x16)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm

Reference Value = 3.945 V/m; Power Drift = 0.19 dB

Peak SAR (extrapolated) = 0.167 W/kg

SAR(1 g) = 0.089 W/kg; SAR(10 g) = 0.072 W/kg

Maximum value of SAR (measured) = 0.129 W/kg



0 dB = 0.129 W/kg = -8.89 dBW/kg

Plot 14#: 5.3G WiFi Mode A_Mid_Body Back**DUT: Portable Data Collection Terminal; Type: AUTOID Q9; Serial: CR21100112-SA-S2**

Communication System:, 5.3G WiFi; Frequency: 5280 MHz;Duty Cycle: 1:1

Medium parameters used: $f = 5280 \text{ MHz}$; $\sigma = 4.748 \text{ S/m}$; $\epsilon_r = 35.94$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(5.28, 5.28, 5.28) @ 5280 MHz; Calibrated: 2020/11/30
- Sensor-Surface: 1.4mm (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)

Area Scan (101x191x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$ Maximum value of SAR (interpolated) = 0.404 W/kg **Zoom Scan (7x7x11)/Cube 0:** Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=3\text{mm}$ Reference Value = 2.919 V/m ; Power Drift = 0.13 dB Peak SAR (extrapolated) = 0.648 W/kg **SAR(1 g) = 0.195 W/kg ; SAR(10 g) = 0.093 W/kg** Maximum value of SAR (measured) = 0.407 W/kg 0 dB = 0.407 W/kg = -3.90 dBW/kg

Plot 15#: 5.3G WiFi Mode A Low Body Right**DUT: Portable Data Collection Terminal; Type: AUTOID Q9; Serial: CR21100112-SA-S2**

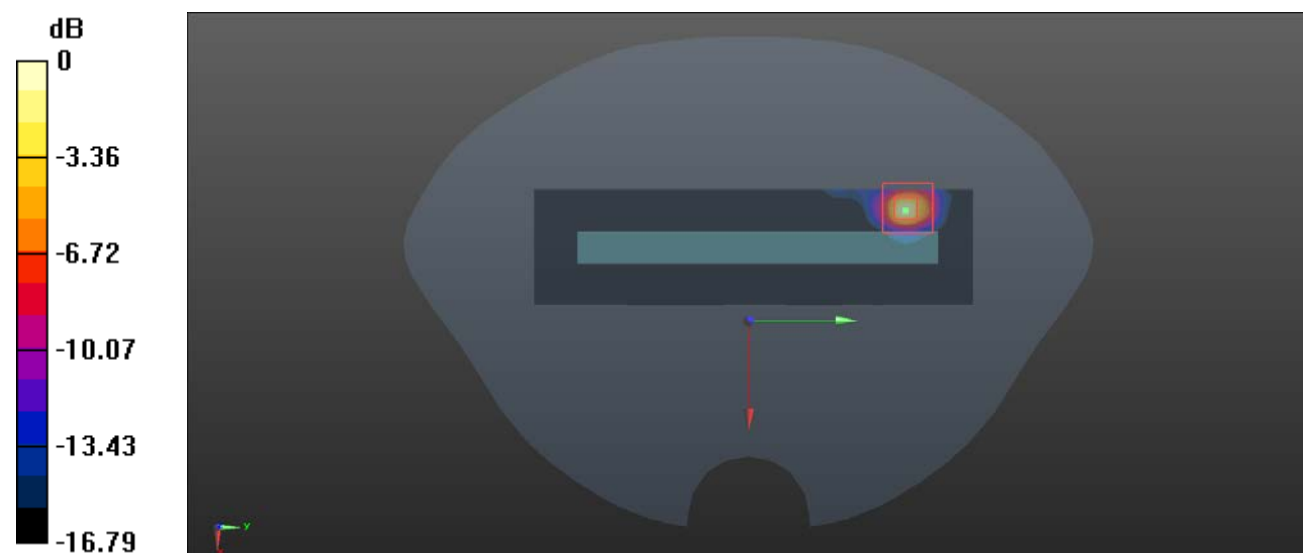
Communication System: 5.3G WiFi; Frequency: 5260 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5260 \text{ MHz}$; $\sigma = 4.732 \text{ S/m}$; $\epsilon_r = 35.995$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(5.28, 5.28, 5.28) @ 5260 MHz; Calibrated: 2020/11/30
- Sensor-Surface: 1.4mm (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)

Area Scan (51x191x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$ Maximum value of SAR (interpolated) = 0.258 W/kg **Zoom Scan (7x7x16)/Cube 0:** Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=2\text{mm}$ Reference Value = 2.648 V/m ; Power Drift = 0.11 dB Peak SAR (extrapolated) = 4.56 W/kg **SAR(1 g) = 0.901 W/kg ; SAR(10 g) = 0.202 W/kg** Maximum value of SAR (measured) = 2.58 W/kg 0 dB = 2.58 W/kg = 4.12 dBW/kg

Plot 16#: 5.3G WiFi Mode A_Mid_Body Right**DUT: Portable Data Collection Terminal; Type: AUTOID Q9; Serial: CR21100112-SA-S2**

Communication System: 5.3G WiFi; Frequency: 5280 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5280$ MHz; $\sigma = 4.748$ S/m; $\epsilon_r = 35.94$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(5.28, 5.28, 5.28) @ 5280 MHz; Calibrated: 2020/11/30
- Sensor-Surface: 1.4mm (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)

Area Scan (51x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 2.47 W/kg

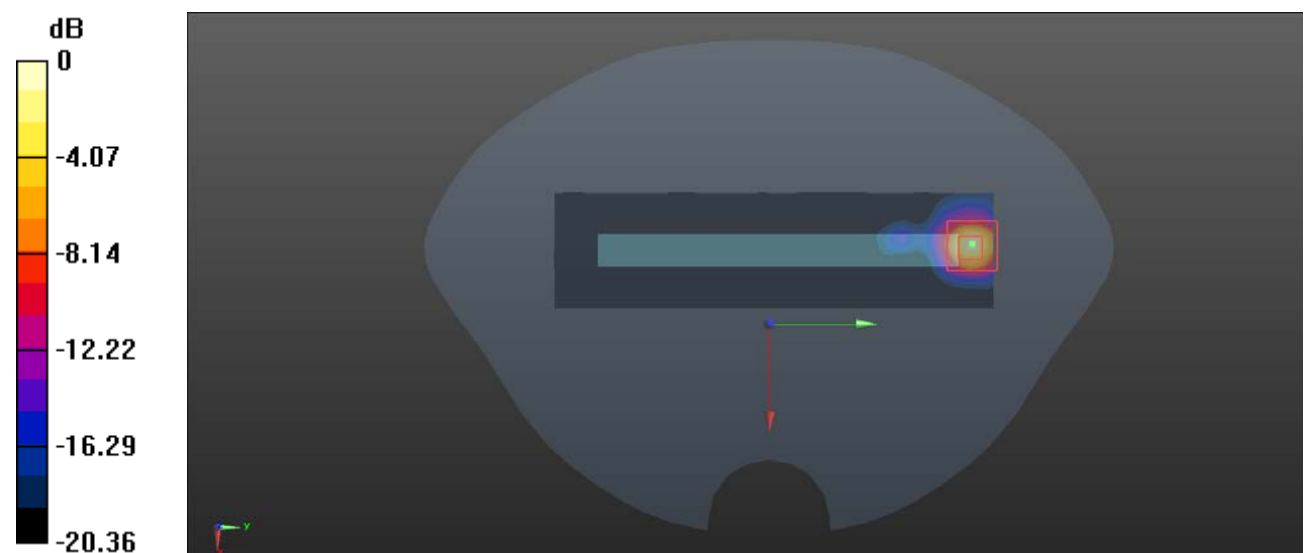
Zoom Scan (7x7x16)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm

Reference Value = 2.504 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 5.93 W/kg

SAR(1 g) = 1.08 W/kg; SAR(10 g) = 0.251 W/kg

Maximum value of SAR (measured) = 2.93 W/kg



0 dB = 2.93 W/kg = 4.67 dBW/kg

Plot 17#: 5.3G WiFi Mode A High Body Right**DUT: Portable Data Collection Terminal; Type: AUTOID Q9; Serial: CR21100112-SA-S2**

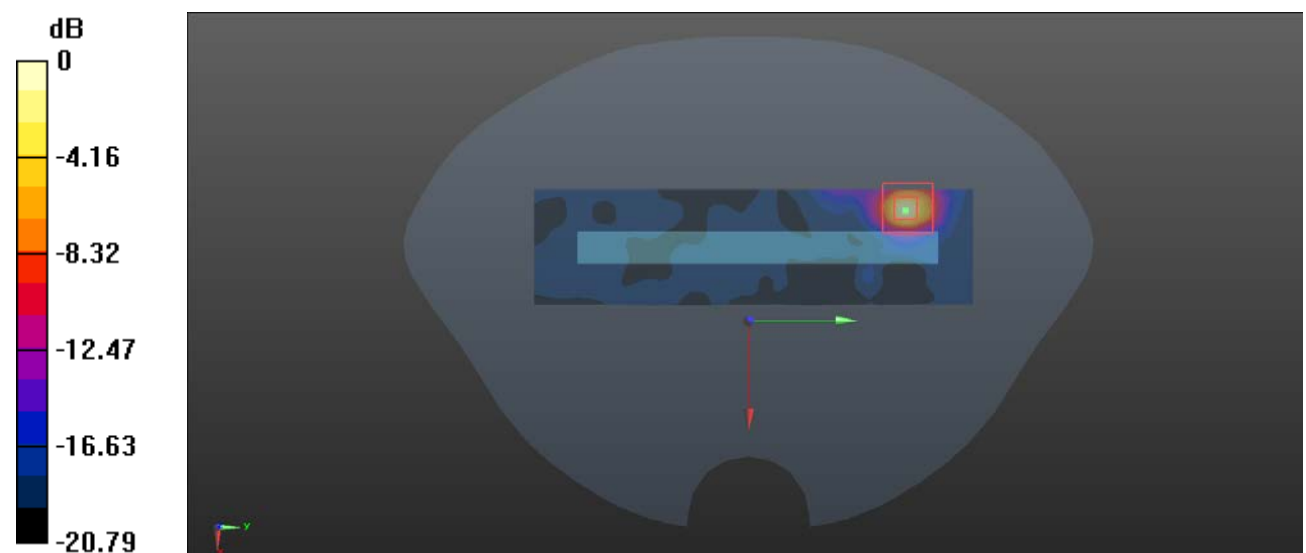
Communication System: 5.3G WiFi; Frequency: 5320 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5320 \text{ MHz}$; $\sigma = 4.821 \text{ S/m}$; $\epsilon_r = 35.844$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(5.28, 5.28, 5.28) @ 5320 MHz; Calibrated: 2020/11/30
- Sensor-Surface: 1.4mm (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)

Area Scan (51x191x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$ Maximum value of SAR (interpolated) = 3.46 W/kg **Zoom Scan (7x7x16)/Cube 0:** Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=2\text{mm}$ Reference Value = 2.491 V/m ; Power Drift = 0.11 dB Peak SAR (extrapolated) = 6.63 W/kg **SAR(1 g) = 1.18 W/kg ; SAR(10 g) = 0.283 W/kg** Maximum value of SAR (measured) = 3.61 W/kg 0 dB = 3.61 W/kg = 5.58 dBW/kg

Plot 18#: 5.3G WiFi Mode A_Mid_Body Top**DUT: Portable Data Collection Terminal; Type: AUTOID Q9; Serial: CR21100112-SA-S2**

Communication System: 5.3G WiFi; Frequency: 5280 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5280$ MHz; $\sigma = 4.748$ S/m; $\epsilon_r = 35.94$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(5.28, 5.28, 5.28) @ 5280 MHz; Calibrated: 2020/11/30
- Sensor-Surface: 1.4mm (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)

Area Scan (41x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.221 W/kg

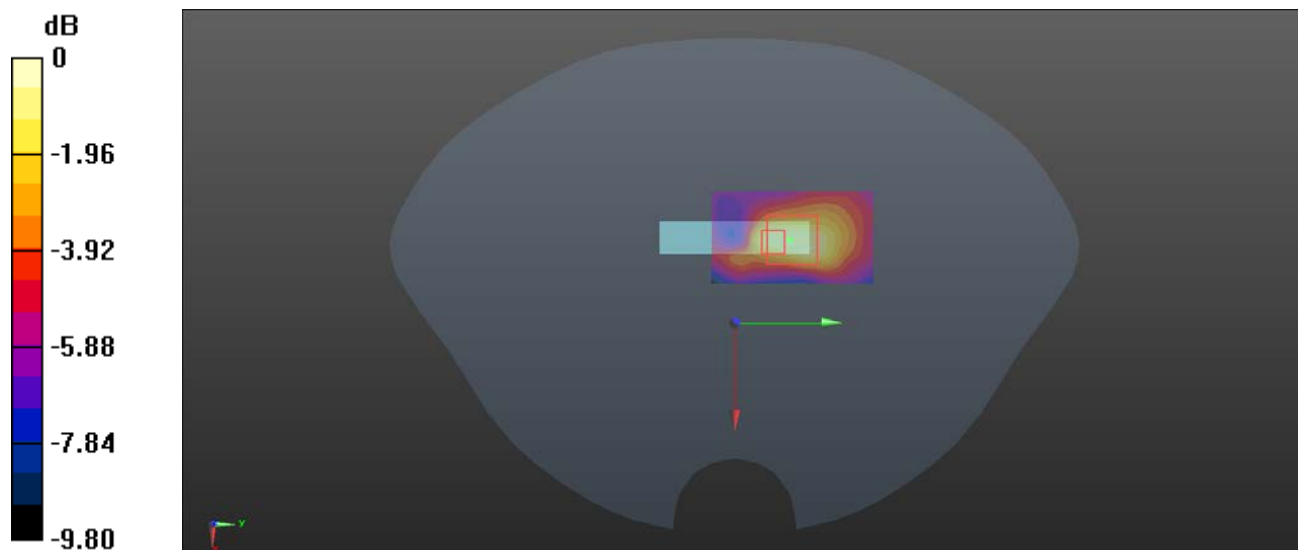
Zoom Scan (7x7x16)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm

Reference Value = 3.004 V/m; Power Drift = 0.17 dB

Peak SAR (extrapolated) = 0.470 W/kg

SAR(1 g) = 0.123 W/kg; SAR(10 g) = 0.068 W/kg

Maximum value of SAR (measured) = 0.254 W/kg



0 dB = 0.254 W/kg = -5.95 dBW/kg

Plot 19#: 5.8G WiFi Mode A_Mid_Head Left Cheek**DUT: Portable Data Collection Terminal; Type: AUTOID Q9; Serial: CR21100112-SA-S2**

Communication System: 5.8G Wi-Fi; Frequency: 5785 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5785$ MHz; $\sigma = 5.242$ S/m; $\epsilon_r = 35.347$; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(4.72, 4.72, 4.72) @ 5785 MHz; Calibrated: 2020/11/30
- Sensor-Surface: 1.4mm (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)

Area Scan (101x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.240 W/kg

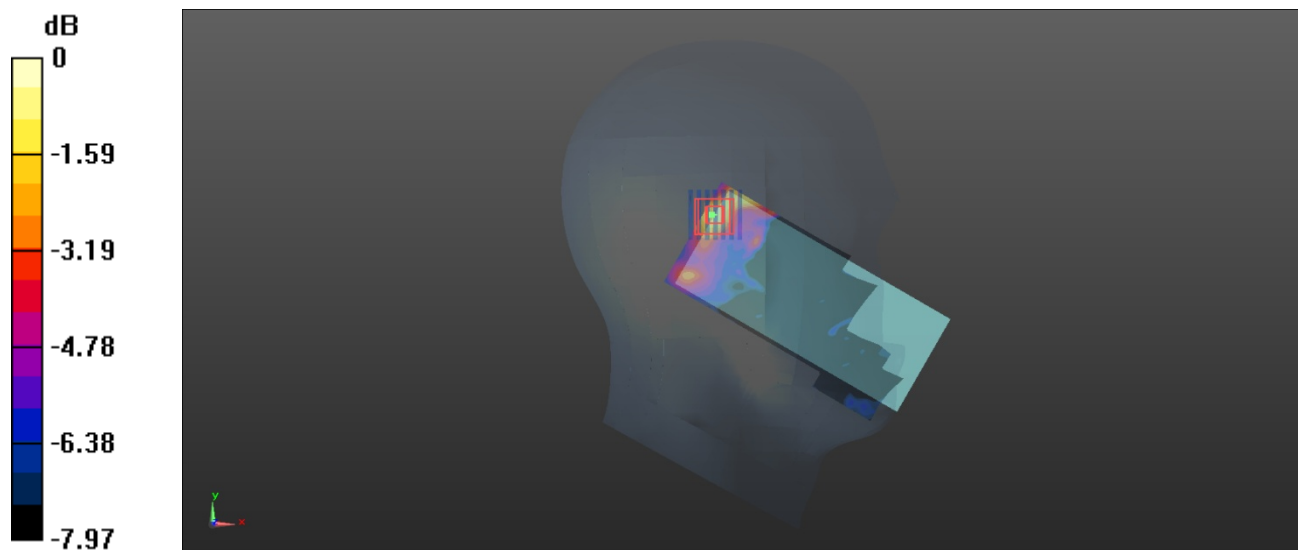
Zoom Scan (7x7x16)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm

Reference Value = 4.219 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 0.437 W/kg

SAR(1 g) = 0.125 W/kg; SAR(10 g) = 0.076 W/kg

Maximum value of SAR (measured) = 0.265 W/kg



0 dB = 0.265 W/kg = -5.77 dBW/kg

Plot 20#: 5.8G WiFi Mode A_Mid_Head Left Tilt**DUT: Portable Data Collection Terminal; Type: AUTOID Q9; Serial: CR21100112-SA-S2**

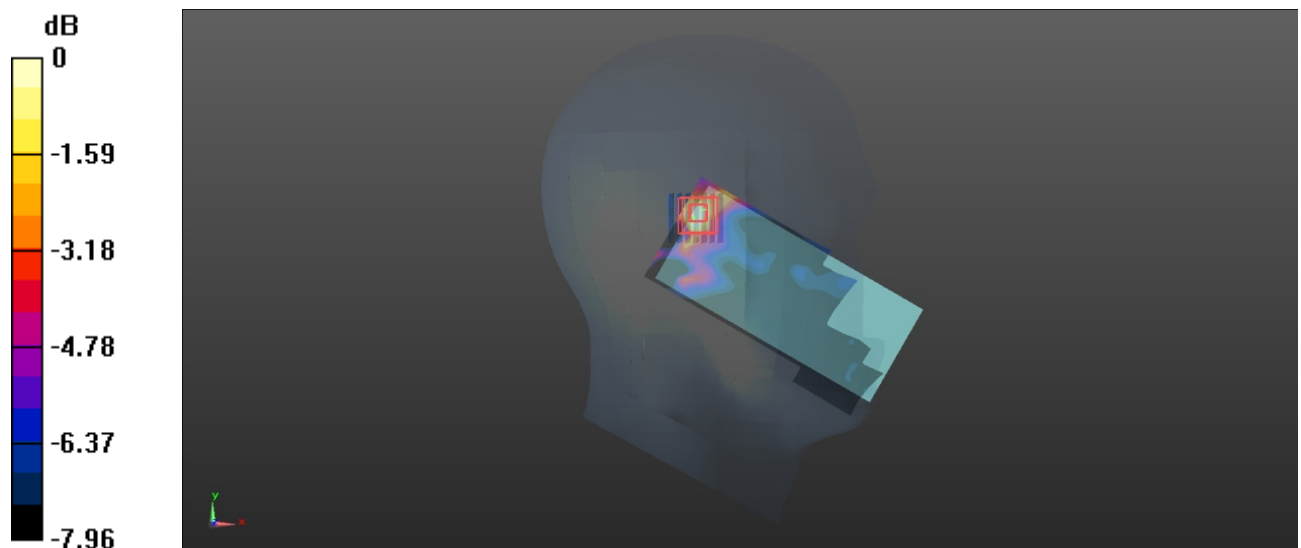
Communication System: 5.8G Wi-Fi; Frequency: 5785 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5785 \text{ MHz}$; $\sigma = 5.242 \text{ S/m}$; $\epsilon_r = 35.347$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(4.72, 4.72, 4.72) @ 5785 MHz; Calibrated: 2020/11/30
- Sensor-Surface: 1.4mm (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)

Area Scan (101x201x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$ Maximum value of SAR (interpolated) = 0.324 W/kg **Zoom Scan (7x7x16)/Cube 0:** Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=2\text{mm}$ Reference Value = 4.371 V/m ; Power Drift = 0.12 dB Peak SAR (extrapolated) = 0.561 W/kg **SAR(1 g) = 0.147 W/kg ; SAR(10 g) = 0.085 W/kg** Maximum value of SAR (measured) = 0.284 W/kg 0 dB = 0.284 W/kg = -5.47 dBW/kg

Plot 21#: 5.8G WiFi Mode A_Mid_Head Right Cheek**DUT: Portable Data Collection Terminal; Type: AUTOID Q9; Serial: CR21100112-SA-S2**

Communication System:, 5.8G Wi-Fi; Frequency: 5785 MHz;Duty Cycle: 1:1

Medium parameters used: $f = 5785$ MHz; $\sigma = 5.242$ S/m; $\epsilon_r = 35.347$; $\rho = 1000$ kg/m³

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(4.72, 4.72, 4.72) @ 5785 MHz; Calibrated: 2020/11/30
- Sensor-Surface: 1.4mm (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)

Area Scan (101x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.198 W/kg

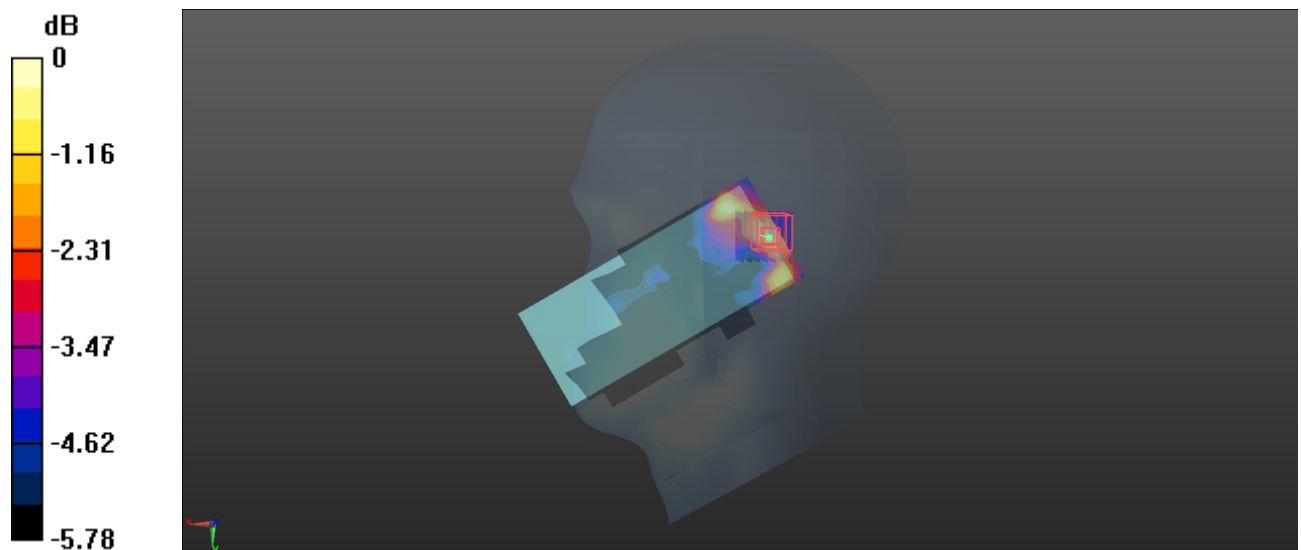
Zoom Scan (7x7x16)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm

Reference Value = 4.531 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 0.352 W/kg

SAR(1 g) = 0.124 W/kg; SAR(10 g) = 0.088 W/kg

Maximum value of SAR (measured) = 0.210 W/kg



0 dB = 0.210 W/kg = -6.78 dBW/kg

Plot 22#: 5.8G WiFi Mode A_Mid_Head Right Tilt**DUT: Portable Data Collection Terminal; Type: AUTOID Q9; Serial: CR21100112-SA-S2**

Communication System: 5.8G Wi-Fi; Frequency: 5785 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5785$ MHz; $\sigma = 5.242$ S/m; $\epsilon_r = 35.347$; $\rho = 1000$ kg/m³

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(4.72, 4.72, 4.72) @ 5785 MHz; Calibrated: 2020/11/30
- Sensor-Surface: 1.4mm (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)

Area Scan (101x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.287 W/kg

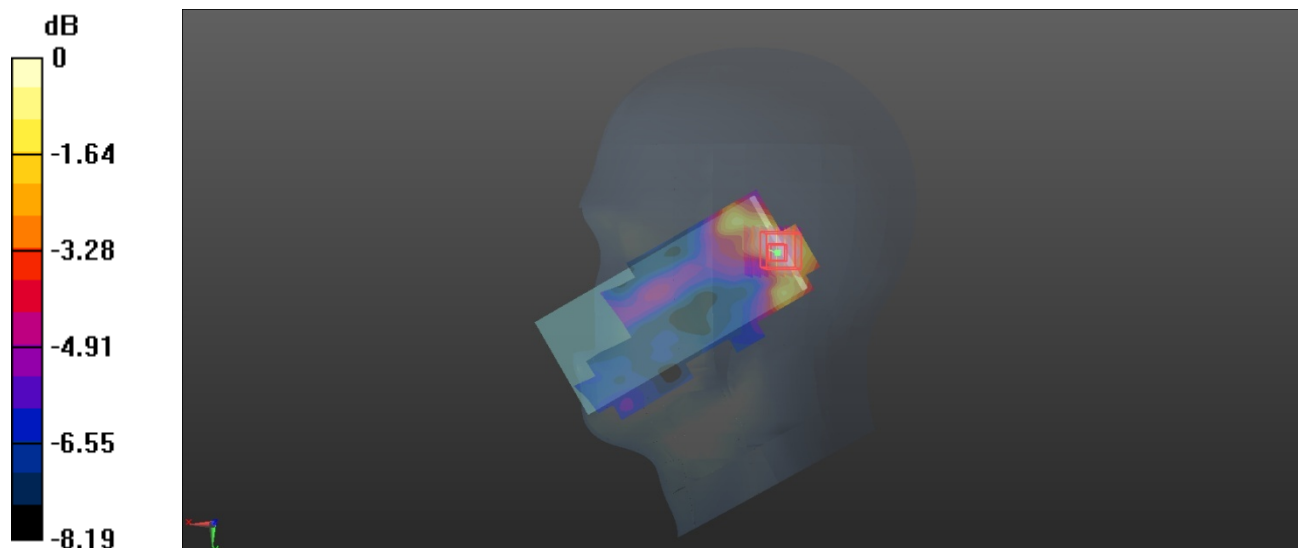
Zoom Scan (7x7x16)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm

Reference Value = 5.319 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 0.391 W/kg

SAR(1 g) = 0.136 W/kg; SAR(10 g) = 0.093 W/kg

Maximum value of SAR (measured) = 0.237 W/kg



0 dB = 0.237 W/kg = -6.25 dBW/kg

Plot 23#: 5.8G WiFi Mode A_Mid_Body Back**DUT: Portable Data Collection Terminal; Type: AUTOID Q9; Serial: CR21100112-SA-S2**

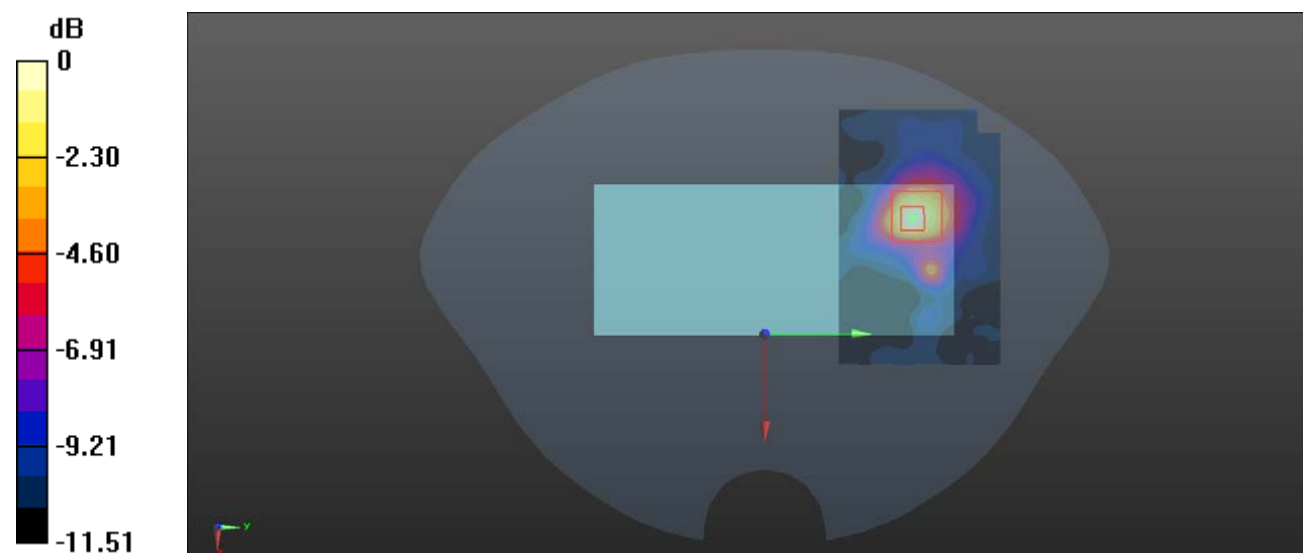
Communication System: 5.8G Wi-Fi; Frequency: 5785 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5785 \text{ MHz}$; $\sigma = 5.242 \text{ S/m}$; $\epsilon_r = 35.347$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(4.72, 4.72, 4.72) @ 5785 MHz; Calibrated: 2020/11/30
- Sensor-Surface: 1.4mm (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)

Area Scan (111x71x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$ Maximum value of SAR (interpolated) = 0.413 W/kg **Zoom Scan (7x7x16)/Cube 0:** Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=2\text{mm}$ Reference Value = 2.582 V/m ; Power Drift = 0.04 dB Peak SAR (extrapolated) = 0.774 W/kg **SAR(1 g) = 0.181 W/kg ; SAR(10 g) = 0.086 W/kg** Maximum value of SAR (measured) = 0.416 W/kg 0 dB = 0.416 W/kg = -3.81 dBW/kg

Plot 24#: 5.8G WiFi Mode A_Mid_Body Right**DUT: Portable Data Collection Terminal; Type: AUTOID Q9; Serial: CR21100112-SA-S2**

Communication System: 5.8G Wi-Fi; Frequency: 5785 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5785$ MHz; $\sigma = 5.242$ S/m; $\epsilon_r = 35.347$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(4.72, 4.72, 4.72) @ 5785 MHz; Calibrated: 2020/11/30
- Sensor-Surface: 1.4mm (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)

Area Scan (51x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 1.47 W/kg

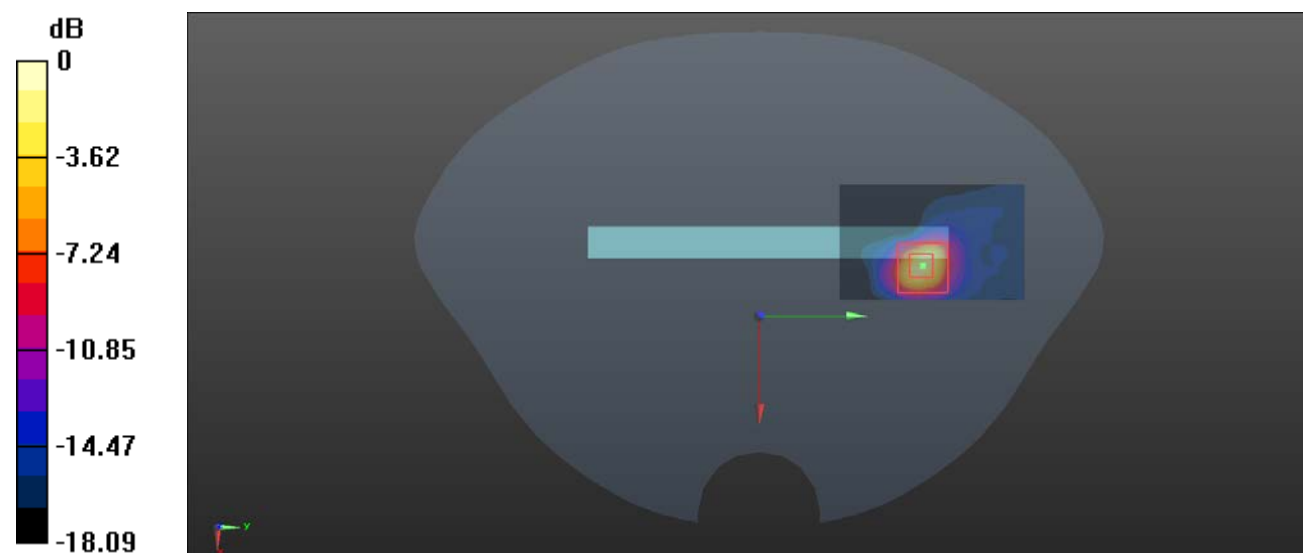
Zoom Scan (7x7x16)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm

Reference Value = 2.734 V/m; Power Drift = 0.15 dB

Peak SAR (extrapolated) = 3.52 W/kg

SAR(1 g) = 0.624 W/kg; SAR(10 g) = 0.172 W/kg

Maximum value of SAR (measured) = 1.83 W/kg



0 dB = 1.83 W/kg = 2.62 dBW/kg

Plot 25#: 5.8G WiFi Mode A_Mid_Body Top**DUT: Portable Data Collection Terminal; Type: AUTOID Q9; Serial: CR21100112-SA-S2**

Communication System: 5.8G Wi-Fi; Frequency: 5785 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5785$ MHz; $\sigma = 5.242$ S/m; $\epsilon_r = 35.347$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(4.72, 4.72, 4.72) @ 5785 MHz; Calibrated: 2020/11/30
- Sensor-Surface: 1.4mm (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)

Area Scan (41x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.649 W/kg

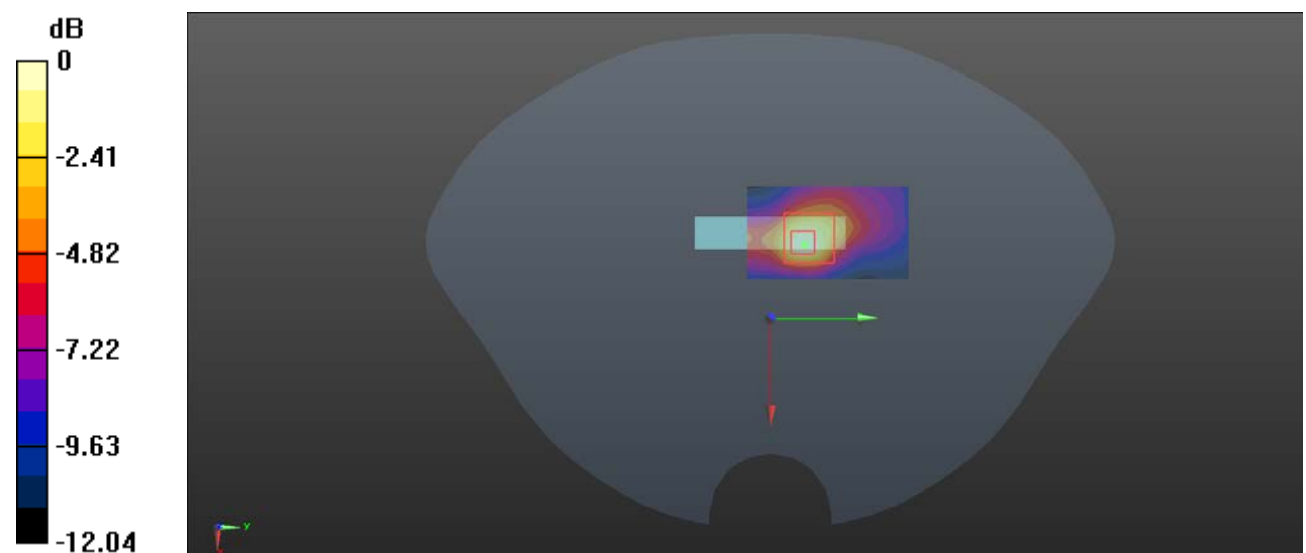
Zoom Scan (7x7x16)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm

Reference Value = 3.908 V/m; Power Drift = -0.15 dB

Peak SAR (extrapolated) = 1.16 W/kg

SAR(1 g) = 0.259 W/kg; SAR(10 g) = 0.116 W/kg

Maximum value of SAR (measured) = 0.595 W/kg

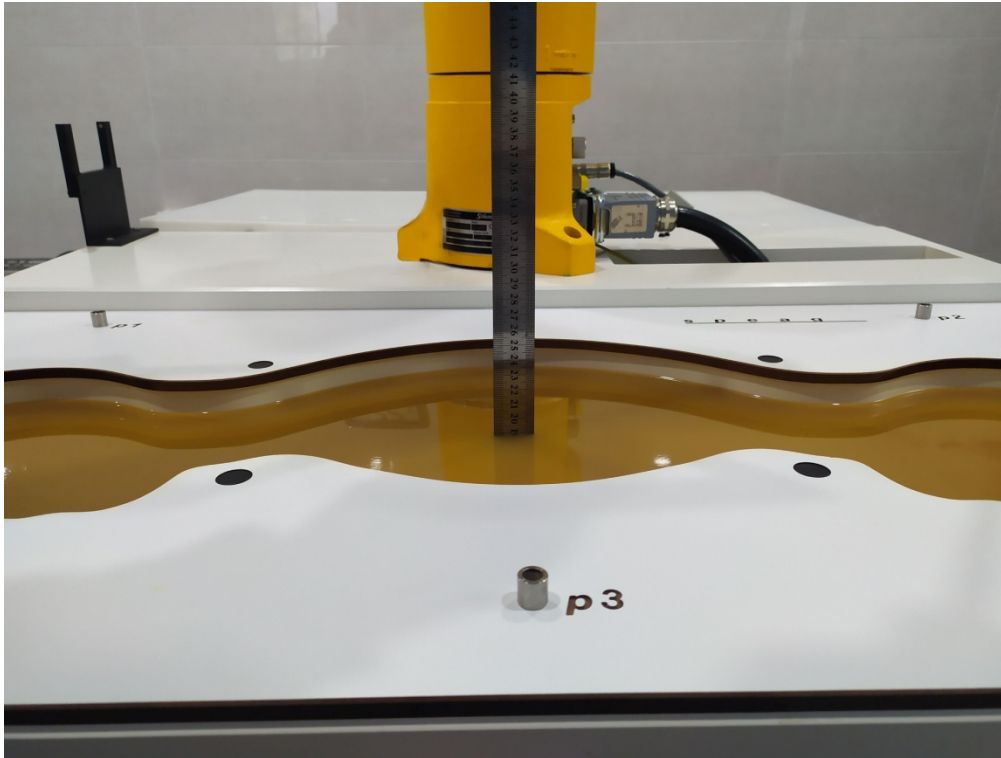


0 dB = 0.595 W/kg = -2.25 dBW/kg

APPENDIX B EUT TEST POSITION PHOTOS

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

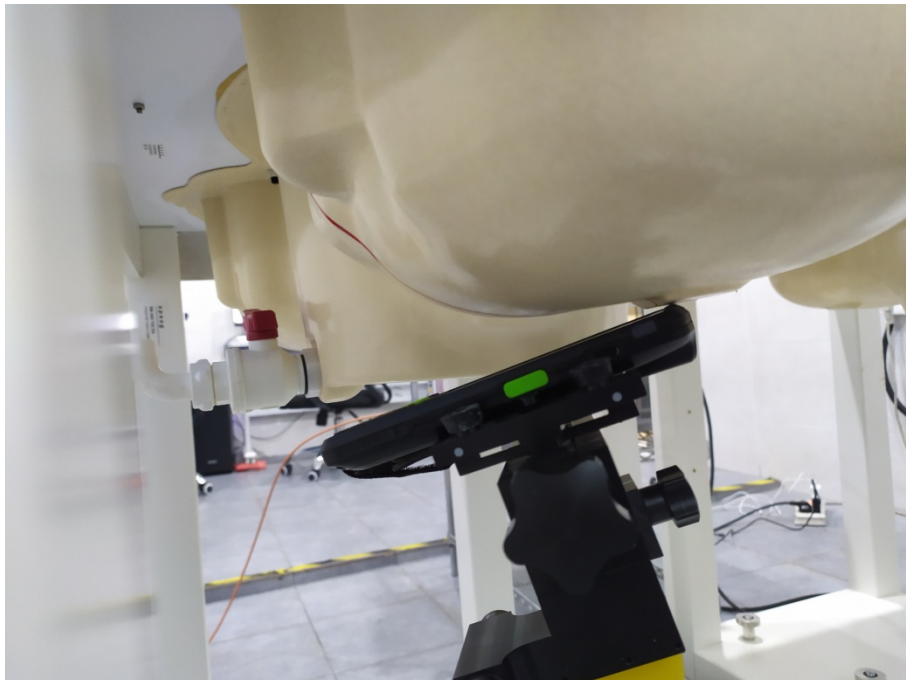
Phantom Type: Twin SAM Phantom ; Type: QD000 P40 CD; Serial: TP:1744



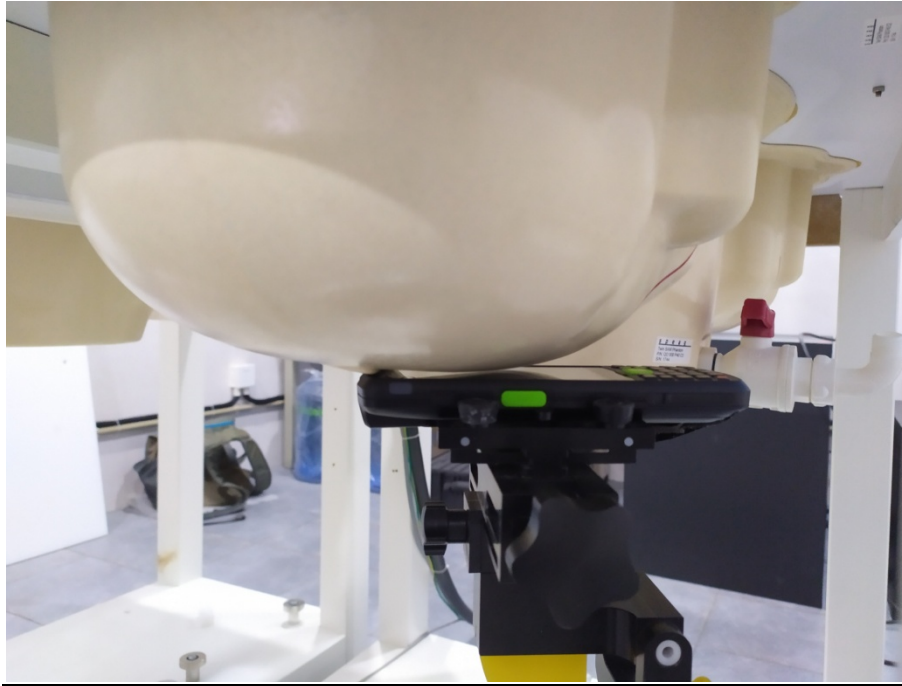
Head Left Cheek Setup Photo



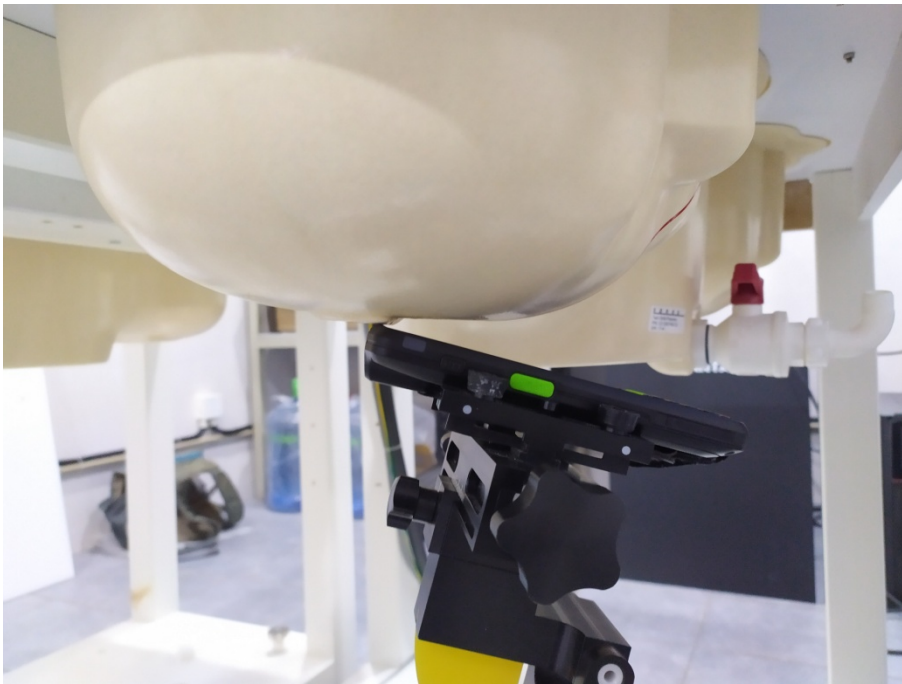
Head Left Tilt Setup Photo



Head Right Cheek Setup Photo



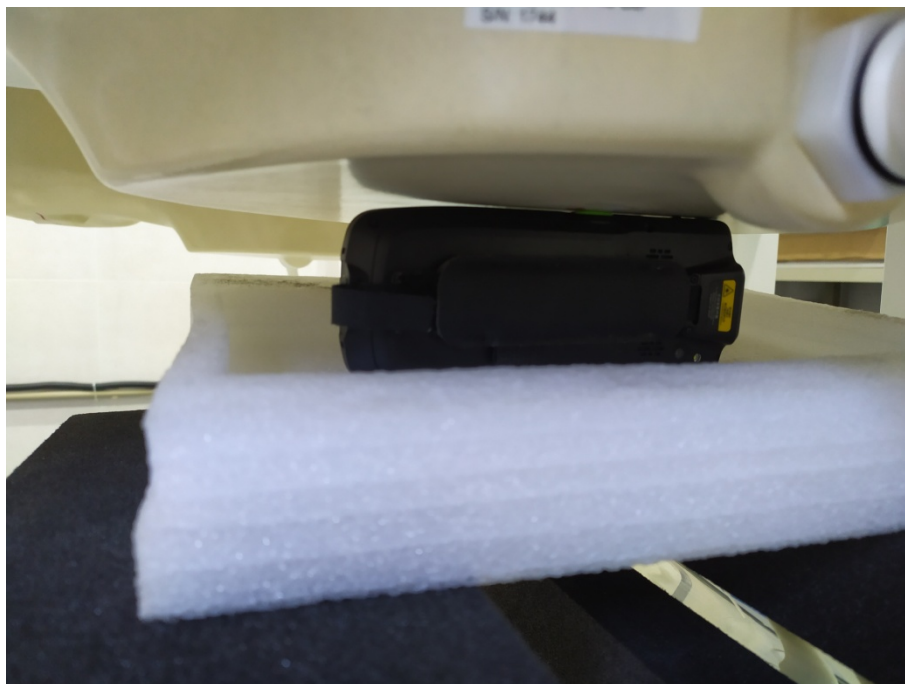
Head Right Tilt Setup Photo



Body Back Setup Photo (0mm)



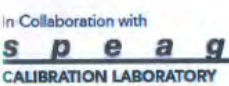
Body Right Setup Photo (0mm)



Body Top Setup Photo (0mm)



APPENDIX C PROBE CALIBRATION CERTIFICATES



In Collaboration with
TTL SPEAG
 CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
 Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
 E-mail: ctlt@chinattl.com [Http://www.chinattl.cn](http://www.chinattl.cn)

中国认可
国际互认
校准
CALIBRATION
CNAS L0570

Client **BACL** Certificate No: **Z20-60456**

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN : 7329**

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

Calibration date: **November 30, 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&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 1556	4-Feb-20(SPEAG, No.DAE4-1556_Feb20)	Feb-21

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	10-Feb-20(CTTL, No.J20X00515)	Feb-21

	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: December 02, 2020

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

Certificate No: Z20-60456

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In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan 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>

Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A,B,C,D	modulation dependent linearization parameters
Polarization Φ	Φ rotation around probe axis
Polarization θ	θ rotation around an axis that is in the plane normal to probe axis (at measurement center), i $\theta=0$ 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 $\theta=0$ ($f \leq 900\text{MHz}$ in TEM-cell; $f > 1800\text{MHz}$: 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), $x, y, z = \text{NORM}_{x,y,z} \cdot \text{frequency_response}$ (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_{x,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.
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; VR_{x,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 $f \leq 800\text{MHz}$) and inside waveguide using analytical field distributions based on power measurements for $f > 800\text{MHz}$. 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_{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 $\pm 50\text{MHz}$ to $\pm 100\text{MHz}$.
- 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).

Certificate No: Z20-60456

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DASY/EASY – Parameters of Probe: EX3DV4 – SN:7329

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm($\mu\text{V}/(\text{V/m})^2$) ^A	0.49	0.40	0.47	±10.0%
DCP(mV) ^B	98.8	100.7	99.1	

Modulation Calibration Parameters

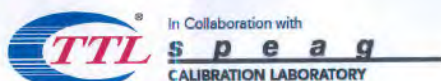
UID	Communication System Name		A dB	B dB- μV	C	D dB	VR mV	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	164.1	±2.2%
		Y	0.0	0.0	1.0		146.1	
		Z	0.0	0.0	1.0		164.7	

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

^A The uncertainties of Norm X, Y, Z do not affect the E²-field uncertainty inside TSL (see Page 4).

^B Numerical linearization parameter: uncertainty not required.

^E 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:7329

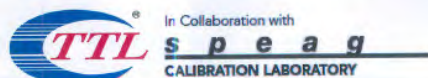
Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz] ^c	Relative Permittivity ^f	Conductivity (S/m) ^f	ConvF X	ConvF Y	ConvF Z	Alpha ^g	Depth ^g (mm)	Unct. (k=2)
750	41.9	0.89	10.13	10.13	10.13	0.40	0.80	±12.1%
900	41.5	0.97	9.79	9.79	9.79	0.16	1.32	±12.1%
1450	40.5	1.20	8.66	8.66	8.66	0.20	0.95	±12.1%
1750	40.1	1.37	8.41	8.41	8.41	0.21	1.09	±12.1%
1900	40.0	1.40	8.14	8.14	8.14	0.24	1.06	±12.1%
2100	39.8	1.49	8.15	8.15	8.15	0.21	1.16	±12.1%
2300	39.5	1.67	7.80	7.80	7.80	0.50	0.73	±12.1%
2450	39.2	1.80	7.44	7.44	7.44	0.34	1.02	±12.1%
2600	39.0	1.96	7.29	7.29	7.29	0.38	0.92	±12.1%
5200	36.0	4.66	5.55	5.55	5.55	0.50	1.25	±13.3%
5300	35.9	4.76	5.28	5.28	5.28	0.50	1.25	±13.3%
5600	35.5	5.07	4.76	4.76	4.76	0.60	1.17	±13.3%
5800	35.3	5.27	4.72	4.72	4.72	0.55	1.35	±13.3%

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

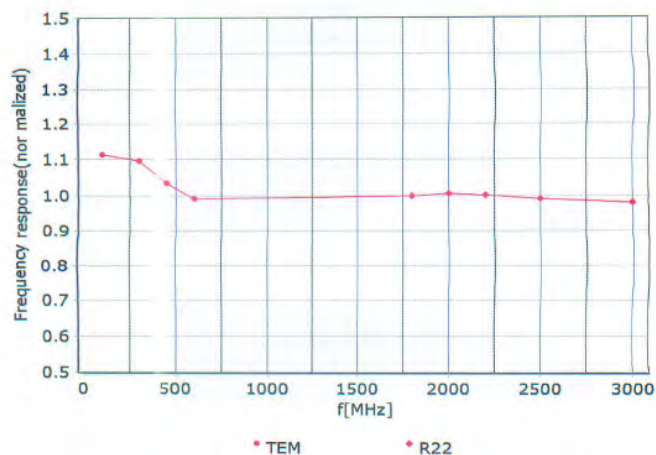
^f At frequency below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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

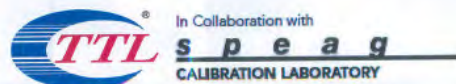


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Frequency Response of E-Field (TEM-Cell: ifi110 EXX, Waveguide: R22)



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

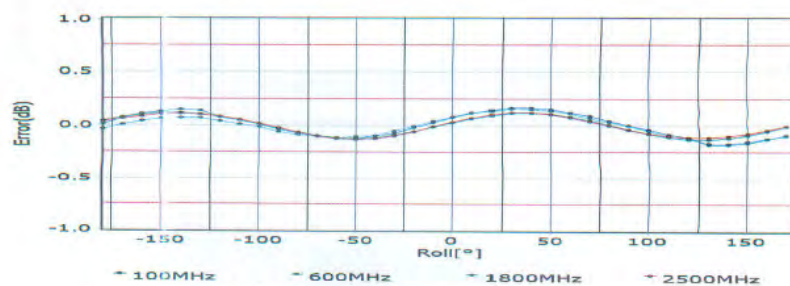
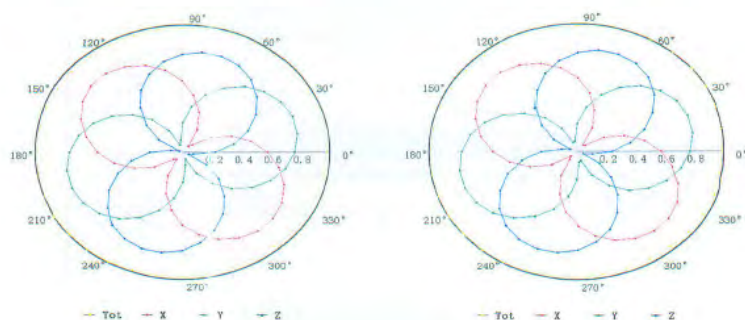


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Receiving Pattern (Φ), $\theta=0^\circ$

f=600 MHz, TEM

f=1800 MHz, R22



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

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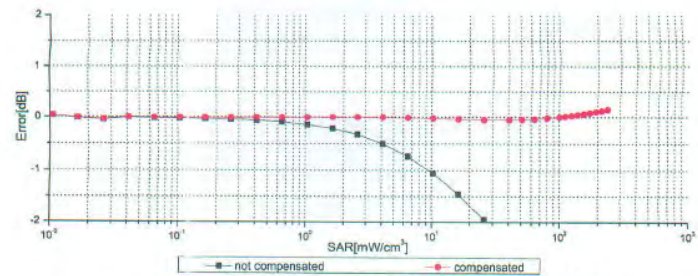
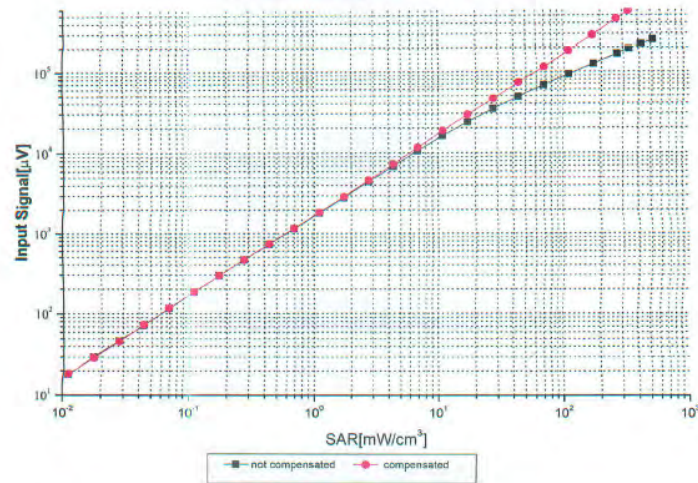
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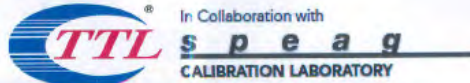
Dynamic Range f(SAR_{head}) (TEM cell, f = 900 MHz)



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

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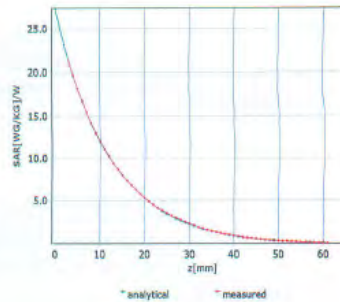
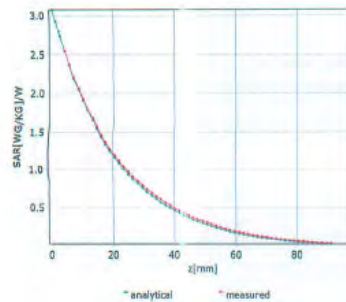


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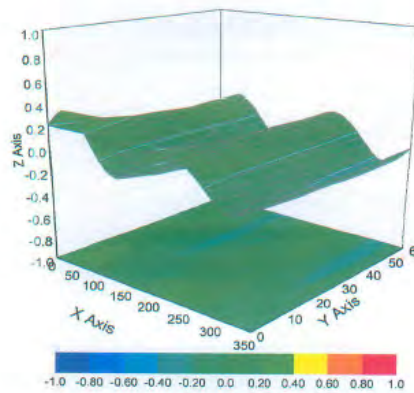
Conversion Factor Assessment

f=750 MHz,WGLS R9(H_convF)

f=1750 MHz,WGLS R22(H_convF)



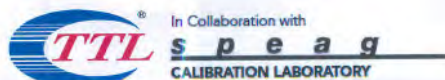
Deviation from Isotropy in Liquid



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

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DASY/EASY – Parameters of Probe: EX3DV4 – SN:7329

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	65.6
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	10mm
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



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CNAS L0570

Client

BACL

Certificate No: Z19-60434

CALIBRATION CERTIFICATE

Object D5GHzV2 - SN: 1246

Calibration Procedure(s) FF-Z11-003-01
Calibration Procedures for dipole validation kits

Calibration date: November 19, 2019

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	106276	11-Apr-19 (CTTL, No.J19X02605)	Apr-20
Power sensor NRP6A	101369	11-Apr-19 (CTTL, No.J19X02605)	Apr-20
ReferenceProbe EX3DV4	SN 3617	31-Jan-19(SPEAG,No.EX3-3617_Jan19)	Jan-20
DAE4	SN 1555	22-Aug-19(CTTL-SPEAG,No.Z19-60295)	Aug-20
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	23-Jan-19 (CTTL, No.J19X00336)	Jan-20
NetworkAnalyzerE5071C	MY46110673	24-Jan-19 (CTTL, No.J19X00547)	Jan-20

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

Issued: November 23, 2019

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 _{x,y,z}
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%.

Measurement Conditions

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

DASY Version	DASY52	V52.10.3
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz $\pm$ 1 MHz 5300 MHz $\pm$ 1 MHz 5600 MHz $\pm$ 1 MHz 5800 MHz $\pm$ 1 MHz	

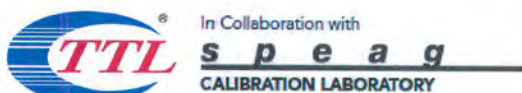
Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	36.1 $\pm$ 6 %	4.62 mho/m $\pm$ 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL at 5250 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.50 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	75.0 W/kg $\pm$ 24.4 % (k=2)
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.13 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	21.3 W/kg $\pm$ 24.2 % (k=2)



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Head TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.5 ± 6 %	4.80 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL at 5300 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.74 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	77.2 W/kg ± 24.4 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.20 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	21.9 W/kg ± 24.2 % (k=2)

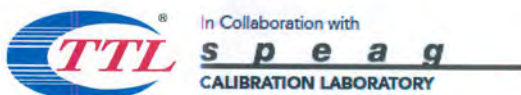
Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.0 ± 6 %	5.02 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.00 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	79.8 W/kg ± 24.4 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.7 W/kg ± 24.2 % (k=2)



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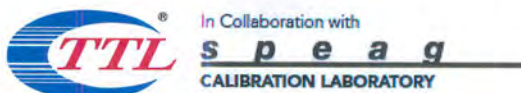
Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.7 ± 6 %	5.18 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.82 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	77.9 W/kg ± 24.4 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.21 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.0 W/kg ± 24.2 % (k=2)



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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	55.5Ω - 1.09jΩ
Return Loss	- 25.5dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	52.0Ω + 0.71jΩ
Return Loss	- 33.5dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	48.7Ω + 3.41jΩ
Return Loss	- 28.7dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	49.4Ω + 5.06jΩ
Return Loss	- 25.8dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.074 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: 11.19.2019

Test Laboratory: CTTT, Beijing, China

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1246

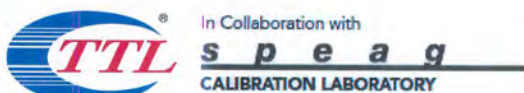
Communication System: CW; Frequency: 5200 MHz, Frequency: 5300 MHz,
Frequency: 5600 MHz, Frequency: 5800 MHz,
Medium parameters used: $f = 5200$ MHz; $\sigma = 4.623$ S/m; $\epsilon_r = 36.13$; $\rho = 1000$
kg/m³, Medium parameters used: $f = 5300$ MHz; $\sigma = 4.804$ S/m; $\epsilon_r = 35.47$; $\rho =$
1000 kg/m³, Medium parameters used: $f = 5600$ MHz; $\sigma = 5.022$ S/m; $\epsilon_r = 35.01$; $\rho =$
1000 kg/m³, Medium parameters used: $f = 5800$ MHz; $\sigma = 5.179$ S/m; $\epsilon_r = 34.74$;
 $\rho = 1000$ kg/m³,
Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(5.5, 5.5, 5.5) @ 5200 MHz; ConvF(5.25, 5.25, 5.25) @ 5300 MHz; ConvF(5.06, 5.06, 5.06) @ 5600 MHz; ConvF(5.04, 5.04, 5.04) @ 5800 MHz; Calibrated: 1/31/2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1555; Calibrated: 8/22/2019
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

Dipole Calibration /Pin=100mW, d=10mm, f=5200 MHz/Zoom Scan,
dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 53.81 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 31.8 W/kg
SAR(1 g) = 7.5 W/kg; SAR(10 g) = 2.13 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 64.5%
Maximum value of SAR (measured) = 17.9 W/kg

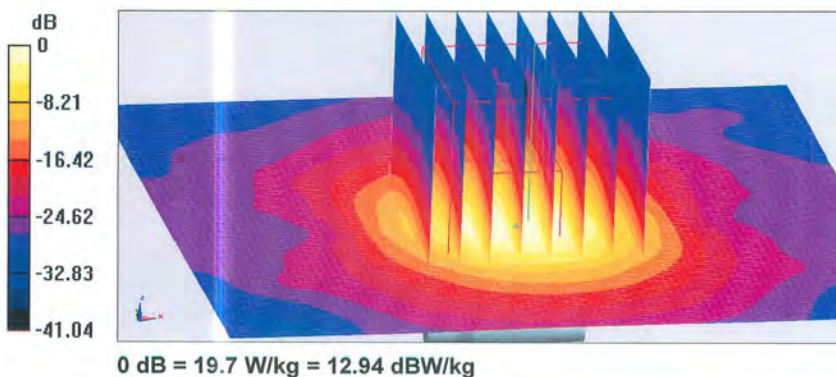
Dipole Calibration /Pin=100mW, d=10mm, f=5300 MHz/Zoom Scan,
dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 54.56 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 33.4 W/kg
SAR(1 g) = 7.74 W/kg; SAR(10 g) = 2.2 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 64.1%
Maximum value of SAR (measured) = 18.4 W/kg



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Dipole Calibration /Pin=100mW, d=10mm, f=5600 MHz/Zoom Scan,
dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
 Reference Value = 59.82 V/m; Power Drift = 0.04 dB
 Peak SAR (extrapolated) = 36.5 W/kg
SAR(1 g) = 8 W/kg; SAR(10 g) = 2.28 W/kg
 Smallest distance from peaks to all points 3 dB below = 7.4 mm
 Ratio of SAR at M2 to SAR at M1 = 60.4%
 Maximum value of SAR (measured) = 20.0 W/kg

Dipole Calibration /Pin=100mW, d=10mm, f=5800 MHz/Zoom Scan,
dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
 Reference Value = 61.13 V/m; Power Drift = -0.01 dB
 Peak SAR (extrapolated) = 37.3 W/kg
SAR(1 g) = 7.82 W/kg; SAR(10 g) = 2.21 W/kg
 Smallest distance from peaks to all points 3 dB below = 7.6 mm
 Ratio of SAR at M2 to SAR at SAR at M1 = 59.3%
 Maximum value of SAR (measured) = 19.7 W/kg





In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan 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

Impedance Measurement Plot for Head TSL

