中认信通

CHINA CERTIFICATION ICT CO., LTD (DONGGUAN)

ACCREDITED
TESTING LABORATORY
CERTIFICATE # 6356.01

SAR TEST REPORT

Applicant: **F5CS LTD**

Address: 3500 S Dupont Hwy Suite 300 Dover DE 19901

FCC ID: **2AIKX-F202-8G**

Product Name: **TABLET PC**

Model Number: **F202_8G**

Multiple Models: **F203, F204, F301, F302, F303, F202_128G, FWIN232_N5, FWIN232_P2, FWIN232 PRO N4, FWIN232 PLUS, FWIN232 ELITE, FWIN232 PRO N5, FWIN232 PLUS N5 (Please refer to DOS for Model difference)**

Standard(s): **47 CFR Part 2(2.1093)**

The above equipment has been tested and found compliant with the requirement of the relative standards by China Certification ICT Co., Ltd (Dongguan)

Report Number: **CR230634889-SA**

Date Of Issue: **2023-10-08**

Reviewed By: **Karl Gong** Karl Gong

Title: SAR Engineer

Test Laboratory: **China Certification ICT Co., Ltd (Dongguan)**
No. 113, Pingkang Road, Dalang Town, Dongguan,
Guangdong, China
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SAR TEST RESULTS SUMMARY

Operation Frequency Bands	Highest Reported 1g SAR (W/kg)	Limits (W/kg)
	Body SAR (Gap 0mm)	
WLAN 2.4G	1.11	**1.6**
WLAN 5.2G	**1.45**	
WLAN 5.8G	1.26	
EUT Received Date:	2023/06/25	
Tested Date:	2023/10/07	
Tested Result:	Pass	

Test Facility

The Test site used by China Certification ICT Co., Ltd (Dongguan) to collect test data is located on the No. 113, Pingkang Road, Dalang Town, Dongguan, Guangdong, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 442868, the FCC Designation No. : CN1314.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0123.

Declarations

China Certification ICT Co., Ltd (Dongguan) is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with a triangle symbol "▲". Customer model name, addresses, names, trademarks etc. are not considered data.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	CR230634889E-SA	Original Report	2023-10-08

1. GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

Device Type:	Portable
Exposure Category:	Population / Uncontrolled
Antenna Type(s):	Internal Antenna
Body-Worn Accessories:	None
Proximity Sensor:	None
Carrier Aggregation:	None
Operation modes:	WLAN, Bluetooth
Frequency Band:	WLAN 2.4G : 2412 MHz-2462 MHz WLAN 5.2G : 5150 MHz-5250 MHz WLAN 5.8G:5725 MHz-5850MHz Bluetooth : 2402 MHz-2480 MHz
Conducted RF Power:	WLAN 2.4G: 16.79 dBm WLAN 5.2G: 14.33 dBm WLAN 5.8G:12.83 dBm Bluetooth(BDR/EDR) : 5.83 dBm BLE: 6.69 dBm
Dimensions (L*W*H):	160 mm (L) * 242 mm (W) * 9 mm (H)
Rated Input Voltage:	DC 3.8V from Rechargeable Battery
Serial Number:	2716-1
Normal Operation:	Body-Support

1.2 Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE 1528-2013, the following FCC Published RF exposure KDB procedures:

KDB 447498 D01 General RF Exposure Guidance v06
KDB 648474 D04 Handset SAR v01r03
KDB865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
KDB865664 D02 RF Exposure Reporting v01r02
KDB 248227 D01 802.11 Wi-Fi SAR v02r02
KDB 616217 D04 SAR for laptop and tablets v01r02

TCB Workshop April 2019: RF Exposure Procedures

1.3 SAR Limts

FCC Limit

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 1 g of tissue)	**1.60**	8.0
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).

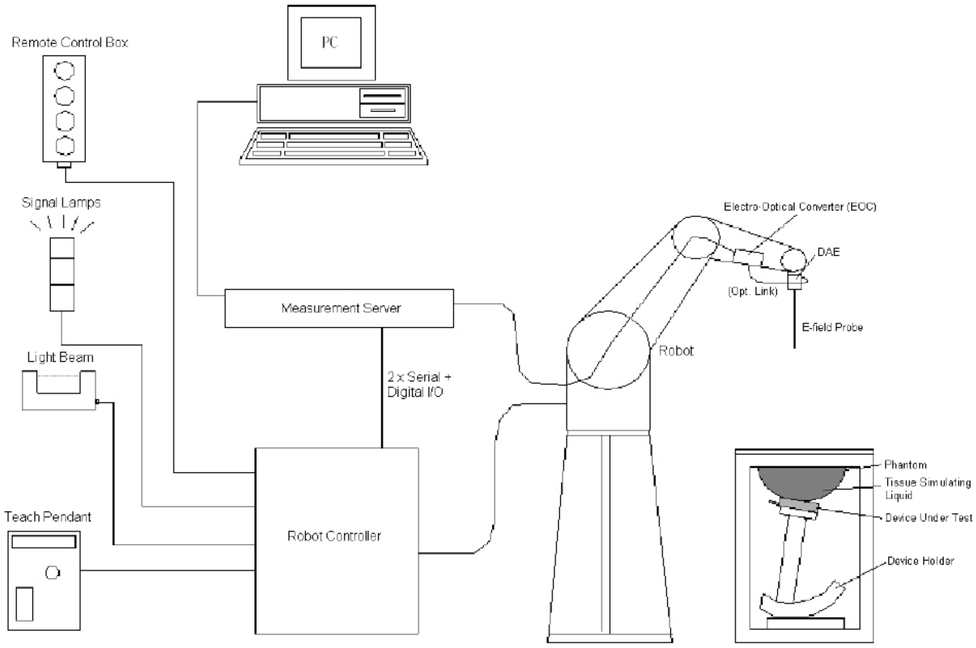
General Population/Uncontrolled environments Spatial Peak limit 1.6W/kg for 1g SAR applied to the EUT.

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

The measurement server performs all real-time data evaluation of field measurements and surface detection, controls robot movements and handles safety operation. 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 point out, and therefore only devices provided by SPEAG can be connected. 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 200MOhm; 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 µW/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 µW/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

Calibration Frequency Points for EX3DV4 E-Field Probes SN: 7522 Calibrated: 2023/5/29

Calibration Frequency Point(MHz)	Frequency Range(MHz)		Conversion Factor		
	From	To	X	Y	Z
750 Head	650	850	9.90	9.90	9.90
900 Head	850	1000	9.37	9.37	9.37
1750 Head	1650	1850	8.15	8.15	8.15
1900 Head	1850	2000	7.94	7.94	7.94
2300 Head	2200	2400	7.67	7.67	7.67
2450 Head	2400	2550	7.42	7.42	7.42
2600 Head	2550	2700	7.23	7.23	7.23
5200 Head	5090	5490	5.36	5.36	5.36
5500 Head	5490	5700	4.85	4.85	4.85
5750 Head	5700	5910	4.90	4.90	4.90

SAM Twin Phantom

The SAM twin phantom is a fiberglass shell phantom with 2mm shell thickness (except the ear region, where shell thickness increases to 6 mm). The phantom has three measurement areas:

_ Left Head
_ Right Head
_ Flat phantom

The phantom table for the DASY systems based on the robots have the size of 100 x 50 x 85 cm (L x W x H).
For easy dislocation these tables have fork lift cut outs at the bottom.
The bottom plate contains three pairs of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. Only one device holder is necessary if two phantoms are used (e.g., for different liquids)

A white cover is provided to cover the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. Free space scans of devices on top of this phantom cover are possible. Three reference marks are provided on the phantom counter. These reference marks are used to teach the absolute phantom position relative to the robot.

Robots

The DASY5 system uses the high precision industrial robot. The robot offers the same features important for our application:

- High precision (repeatability 0.02mm)
- High reliability (industrial design)
- Low maintenance costs (virtually maintenance free due to direct drive gears; no belt drives)
- Jerk-free straight movements (brushless synchrony motors; no stepper motors)
- Low ELF interference (motor control fields shielded via the closed metallic construction shields)

The above mentioned robots are controlled by the Staubli CS8c robot controllers. All information regarding the use and maintenance of the robot arm and the robot controller is contained on the CDs delivered along with the robot. Paper manuals are available upon request direct from Staubli.

SAR Scan Pricedures

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 1.4 mm. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

Step 2: 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.

Area Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 mm ± 1 mm	$\frac{1}{2}\cdot\delta\cdot\ln(2)$ mm ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

Step 3: Zoom Scan (Cube Scan Averaging)

The averaging zoom scan volume utilized in the DASY5 software is in the shape of a cube and the side dimension of a 1 g or 10 g mass is dependent on the density of the liquid representing the simulated tissue. A density of 1000 kg/m^3 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 5mm,with the side length of the 10g cube is 21.5mm.

Zoom Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	≤ 1.5·$\Delta z_{Zoom}(n-1)$ mm	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see IEEE Std 1528-2013 for details. * When zoom scan is required and the _reported_ SAR from the *area scan based 1-g SAR estimation* procedures of KDB Publication 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

Step 4: Power Drift Measurement

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

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 x7 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 liquid

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
750	*41,9*	*0,89*
835	41,5	0,90
900	41,5	0,97
1 450	40,5	1,20
1 500	*40,4*	*1,23*
1 640	*40,2*	*1,31*
1 750	*40,1*	*1,37*
1 800	40,0	1,40
1 900	40,0	1,40
2 000	40,0	1,40
2 100	*39,8*	*1,49*
2 300	*39,5*	*1,67*
2 450	39,2	1,80
2 600	*39,0*	*1,96*
3 000	38,5	2,40
3 500	*37,9*	*2,91*
4 000	*37,4*	*3,43*
4 500	*36,8*	*3,94*
5 000	*36,2*	*4,45*
5 200	*36,0*	*4,66*
5 400	*35,8*	*4,86*
5 600	*35,5*	*5,07*
5 800	*35,3*	*5,27*
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.

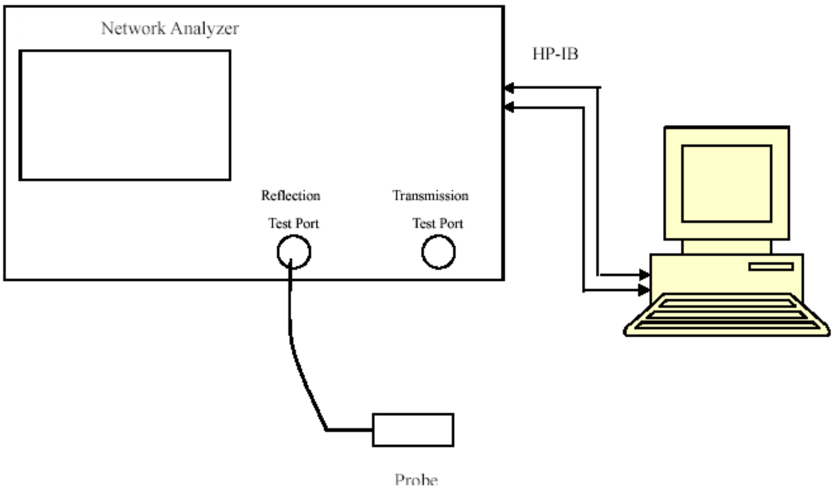
3. EQUIPMENT LIST AND CALIBRATION

3.1 Equipments List & Calibration Information

Equipment	Model	S/N	Calibration Date	Calibration Due Date
DASY5 Test Software	DASY52.8	N/A	NCR	NCR
DASY5 Measurement Server	DASY5 5.0.28	1123	NCR	NCR
Data Acquisition Electronics	DAE4	1354	2022/10/31	2023/10/30
E-Field Probe	EX3DV4	7522	2023/5/29	2024/5/28
Mounting Device	MD4HHTV5	BJPCTC0152	NCR	NCR
Twin SAM	Twin SAM V5.0	1470	NCR	NCR
Dipole, 2450 MHz	D2450V2	1102	2023/3/27	2026/3/26
Dipole,5GHz	D5GHzV2	1246	2022/11/1	2025/10/31
Simulated Tissue Liquid Head(500-9500 MHz)	HBBL600-10000V6	220420-2	Each Time	/
Network Analyzer	8753B	2828A00170	2022/10/24	2023/10/23
Dielectric assessment kit	1253	SM DAK 040 CA	NCR	NCR
MXG Vector Signal Generator	N5182B	MY51350144	2023/3/31	2024/3/30
Power Meter	EPM-441A/8484A	GB37481494	2023/3/31	2024/3/30
USB Wideband Power Sensor	U2021XA	MY54080015	2023/3/31	2024/3/30
Power Amplifier	ZVA-183-S+	5969001149	NCR	NCR
Directional Coupler	441493	520Z	NCR	NCR
Attenuator	20dB, 100W	LN749	NCR	NCR
Attenuator	6dB, 150W	2754	NCR	NCR
Spectrum Analyzer	FSV40	101943	2023/3/31	2024/3/30

4. SAR MEASUREMENT SYSTEM VERIFICATION

4.1 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)	$\Delta\varepsilon_r$	Δσ (S/m)	
2422	Simulated Tissue Liquid Head	40.285	1.831	39.26	1.78	2.61	2.87	±5
2437	Simulated Tissue Liquid Head	40.001	1.853	39.23	1.79	1.97	3.52	±5
2450	Simulated Tissue Liquid Head	39.754	1.872	39.20	1.80	1.41	4.00	±5
2452	Simulated Tissue Liquid Head	39.785	1.875	39.20	1.80	1.49	4.17	±5

**Liquid Verification above was performed on 2023/10/07.*

Frequency (MHz)	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		ε_r	σ (S/m)	ε_r	σ (S/m)	$\Delta\varepsilon_r$	Δσ (S/m)	
5190	Simulated Tissue Liquid Head	36.379	4.725	36.01	4.65	1.02	1.61	±5
5230	Simulated Tissue Liquid Head	36.336	4.784	35.97	4.69	1.02	2.00	±5
5250	Simulated Tissue Liquid Head	36.352	4.829	35.95	4.71	1.12	2.53	±5
5745	Simulated Tissue Liquid Head	36.301	5.339	35.36	5.22	2.66	2.28	±5
5750	Simulated Tissue Liquid Head	36.300	5.337	35.35	5.22	2.69	2.24	±5
5785	Simulated Tissue Liquid Head	36.543	5.356	35.32	5.26	3.46	1.83	±5
5825	Simulated Tissue Liquid Head	36.525	5.377	35.28	5.30	3.53	1.45	±5

**Liquid Verification above was performed on 2023/10/07.*

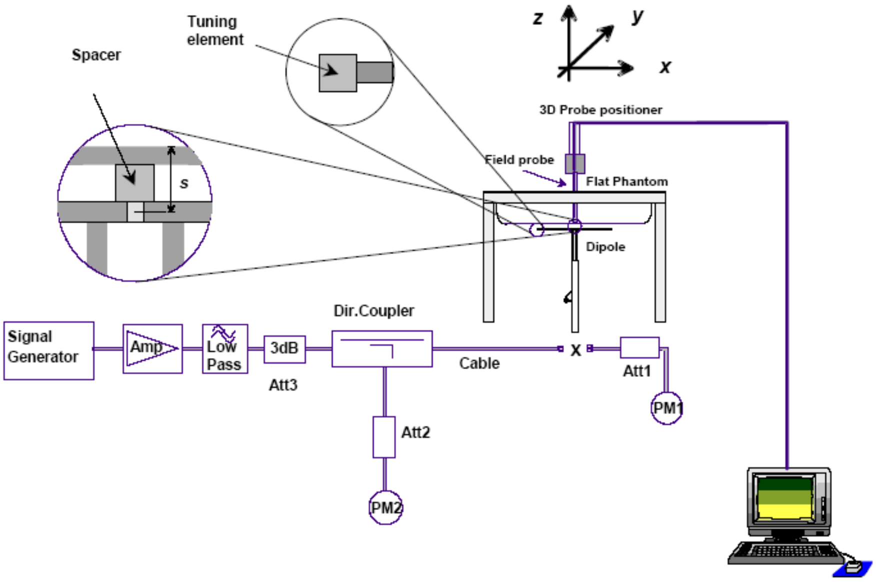
4.2 System Accuracy Verification

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

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

a) s = 15 mm ± 0,2 mm for 300 MHz ≤ f ≤ 1 000 MHz;
b) s = 10 mm ± 0,2 mm for 1 000 MHz < f ≤ 3 000 MHz;
c) s = 10 mm ± 0,2 mm for 3 000 MHz < f ≤ 6 000 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 (%)
2023/10/07	2450 MHz	Simulated Tissue Liquid Head	100	1g	5.31	53.1	50.9	4.32	±10
2023/10/07	5250 MHz	Simulated Tissue Liquid Head	100	1g	8.13	81.3	77.5	4.90	±10
2023/10/07	5750 MHz	Simulated Tissue Liquid Head	100	1g	8.23	82.3	78.4	4.97	±10

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

4.3 SAR SYSTEM VALIDATION DATA

System Performance 2450MHz

DUT: D2450V2; Type: 2450 MHz; Serial: 1102

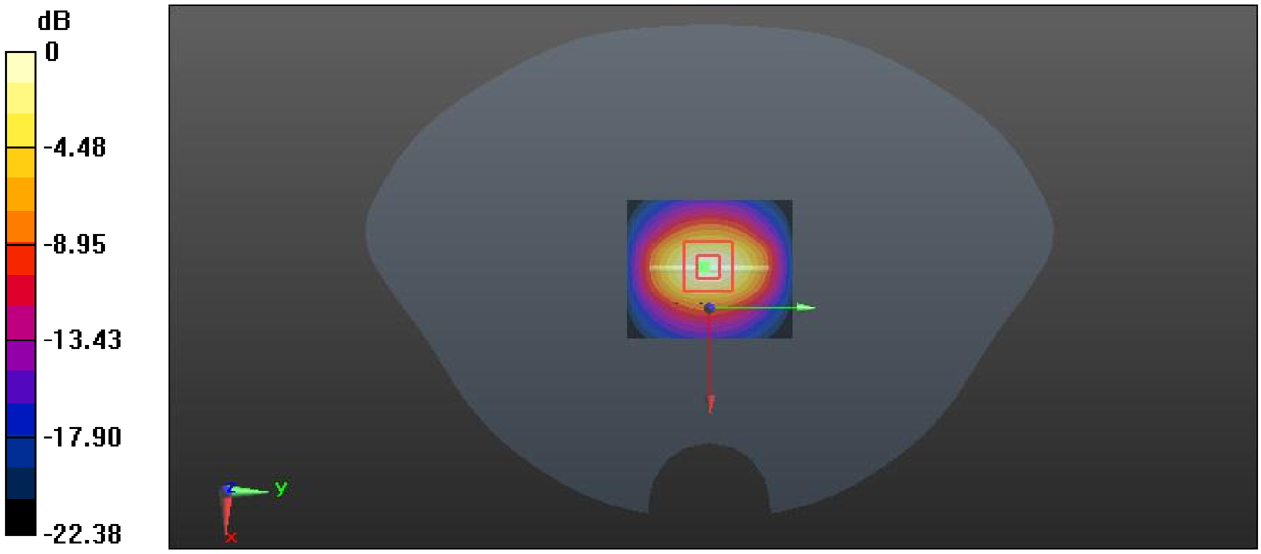
Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.872 S/m; ε_r = 39.754; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(7.42, 7.42, 7.42) @ 2450 MHz; Calibrated: 2023/5/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1354; Calibrated: 2022/10/31
- Phantom: Twin SAM; Type: Twin SAM V5.0; Serial: TP:1470
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Area Scan (7x10x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 8.29 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 45.35 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 9.89 W/kg
SAR(1 g) = 5.31 W/kg; SAR(10 g) = 2.28 W/kg
Maximum value of SAR (measured) = 8.08 W/kg



0 dB = 8.08 W/kg = 9.0 dBW/kg

System Performance 5250 MHz

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

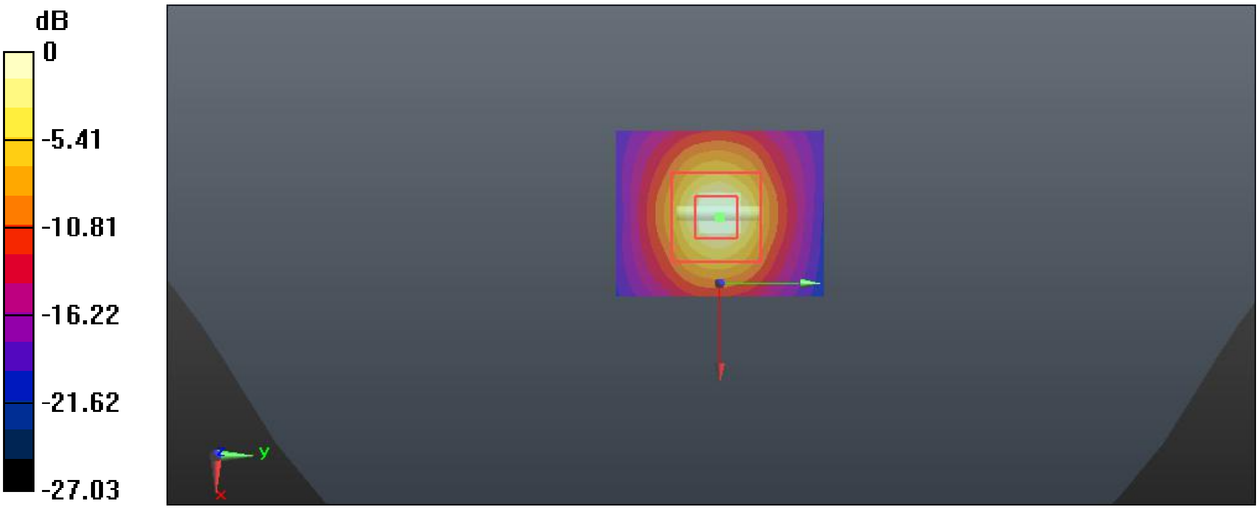
Communication System: CW; Frequency: 5250 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5250 MHz; σ = 4.829 S/m; ε_r = 36.352; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(5.36, 5.36, 5.36) @ 5250 MHz; Calibrated: 2023/5/29
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1354; Calibrated: 2022/10/31
- Phantom: Twin SAM; Type: Twin SAM V5.0; Serial: TP:1470
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Area Scan (8x8x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 17.7 W/kg

Zoom Scan (9x9x6)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 66.29 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 31.1 W/kg
SAR(1 g) = 8.13 W/kg; SAR(10 g) = 2.31 W/kg
Maximum value of SAR (measured) = 17.4 W/kg



0 dB = 17.4 W/kg = 12.41 dBW/kg

System Performance 5750 MHz

DUT: Dipole D5GHzV2; Type: 5750 MHz; Serial: SN:1246

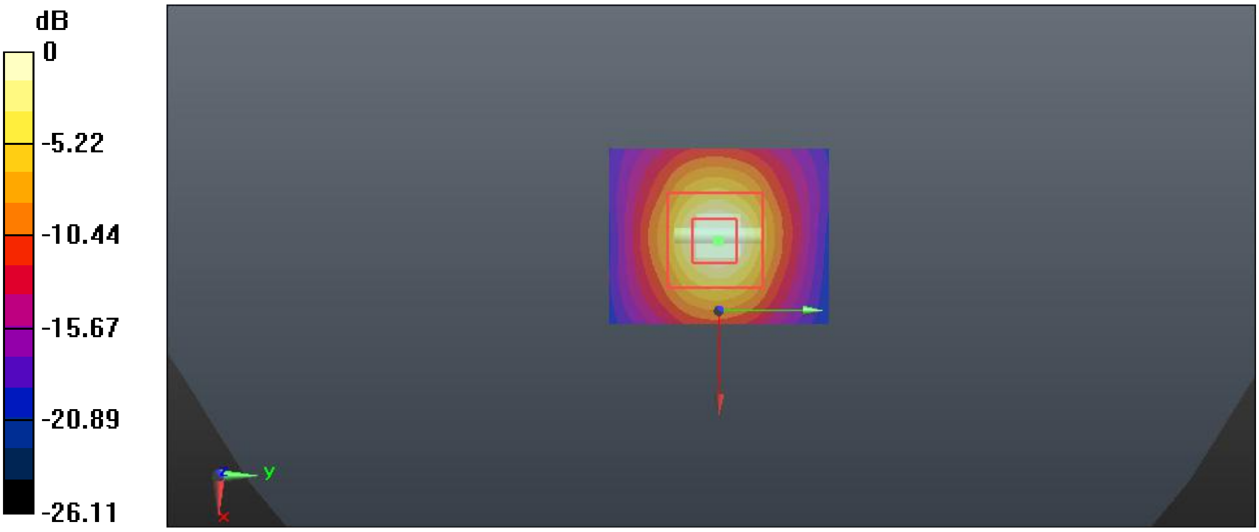
Communication System: CW; Frequency: 5750 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5750 MHz; σ = 5.337 S/m; ε_r = 36.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(5.36, 5.36, 5.36) @ 5750 MHz; Calibrated: 2023/5/29
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1354; Calibrated: 2022/10/31
- Phantom: Twin SAM; Type: Twin SAM V5.0; Serial: TP:1470
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Area Scan (8x8x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 18.5 W/kg

Zoom Scan (9x9x6)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 564.74 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 38.1 W/kg
SAR(1 g) = 8.23 W/kg; SAR(10 g) = 2.37 W/kg
Maximum value of SAR (measured) = 18.9 W/kg



0 dB = 18.9 W/kg = 12.75 dBW/kg

5. EUT TEST STRATEGY AND METHODOLOGY

5.1 Test positions for body Supported and other configurations

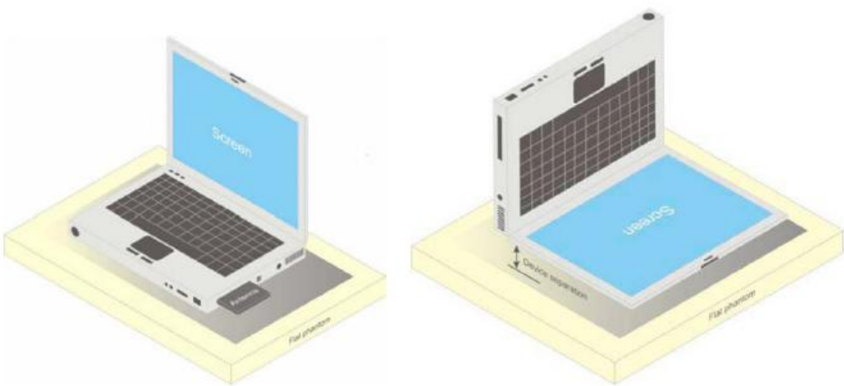
A typical example of a body supported device is a wireless enabled laptop device that amongother orientations may be supported on the thighs of a sitting user. To represent thisorientation, the device shall be positioned with its base against the flat phantom.Other orientations may be specified by the manufacturer in the user instructions. If theintended use is not specified, the device shall be tested directly against the flat phantom in allusable orientations

The screen portion of the device shall be in an open position at a 90° angle as seen in Figure7a (left side), or at an operating angle specified for intended use by the manufacturer in theoperating instructions. Where a body supported device has an integral screen required fornormal operation, then the screen-side will not need to be tested if it ordinarily remains 200mm from the body. Where a screen mounted antenna is present, this position shall berepeated with the screen against the flat phantom as shown in Figure 7a) (right side), if this isconsistent with the intended use.

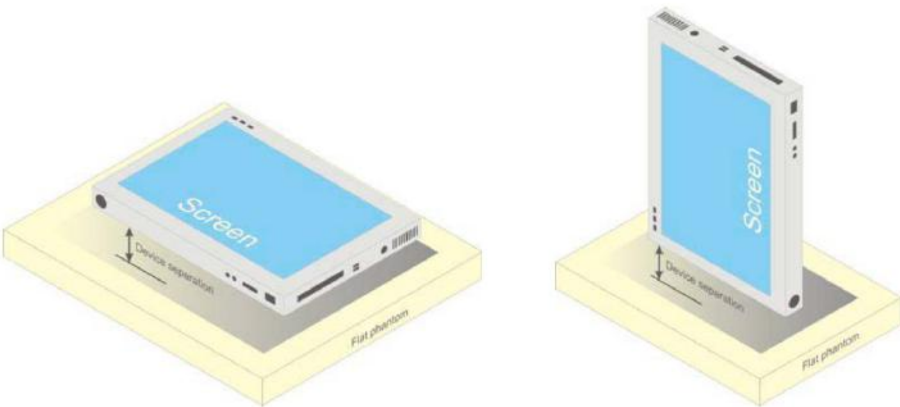
Other devices that fall into this category include tablet type portable computers and creditcard transaction authorisation terminals, point-of-sale and/or inventory terminals. Where thesedevices may be torso or limb-supported, the same principles for body-supported devices areapplied.The example in Figure 7b) shows a tablet form factor portable computer for which SAR shouldbe separately assessed with
d) each surface and
e) the separation distances
positioned against the flat phantom that correspond to the intended use as specified by themanufacturer. If the intended use is not specified in the user instructions, the device shall betested directly against the flat phantom in all usable orientations.

Some body-supported devices may allow testing with an external power supply (e.g. a.c.adapter) supplemental to the battery, but it shall be verified and documented in themeasurement report that SAR is still conservative.

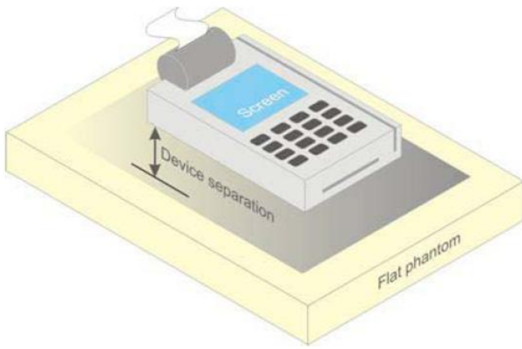
For devices that employ an external antenna with variable positions (e.g. swivel antenna), see 6.1.4.5 and Figure 6.



a) Portable computer with external antenna plug-in-radio-card (left side) or with internal antenna located in screen section (right side)



b) Tablet form factor portable computer



c) Wireless credit card transaction authorisation terminal

Figure 7 – Test positions for body supported devices

5.2 Test Distance for SAR Evaluation

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

5.3 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 Measured 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 Measured to calculate the averages.

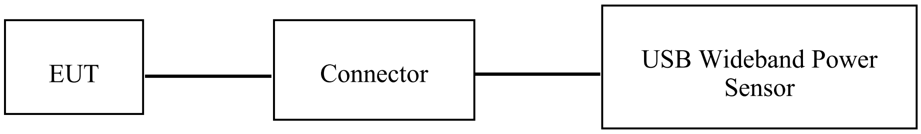
All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

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.

6. CONDUCTED OUTPUT POWER MEASUREMENT

6.1 Test Procedure

The RF output of the transmitter was connected to the input port of the USB Wideband Power Sensor through Connector.



WLAN/BT

6.2 Maximum Target Output Power

Max Target Power(dBm)			
Mode/Band	Channel		
	Low	Middle	High
WLAN 2.4G(802.11b)	14.5	14.5	14.5
WLAN 2.4G(802.11g)	13.5	15.0	14.0
WLAN 2.4G(802.11n ht20)	13.5	14.5	14.0
WLAN 2.4G(802.11n ht40)	16.0	17.0	17.0
WLAN 5.2G(802.11a)	11.0	11.0	11.5
WLAN 5.2G(802.11n ht20)	11.5	11.5	11.5
WLAN 5.2G(802.11n ht40)	12.0	/	14.5
WLAN 5.2G(802.11ac80)	/	11.5	/
WLAN 5.8G(802.11a)	11.0	10.5	10.0
WLAN 5.8G(802.11n ht20)	12.5	12.0	13.0
WLAN 5.8G(802.11n ht40)	10.2	/	10.2
WLAN 5.8G(802.11ac80)	/	8.5	/
Bluetooth BDR/EDR	6.0	6.0	6.0
BLE	7.0	7.0	7.0

6.3 Test Results:

WLAN 2.4G:

Mode	Channel frequency (MHz)	Data Rate	Duty Cycle [%]	RF Output Power (dBm)
802.11b	2412	1Mbps	100	14.50
	2437			13.16
	2462			13.18
802.11g	2412	6Mbps		13.13
	2437			14.55
	2462			13.63
802.11n HT20	2412	MCS0		13.06
	2437			14.42
	2462			13.58
802.11n HT40	2422	MCS0		15.69
	2437			16.79
	2452			16.75

Wi-Fi 5.2G:

Mode	Channel frequency (MHz)	Data Rate	Duty Cycle [%]	RF Output Power (dBm)
802.11a	5180	6Mbps	100	10.23
	5200			10.31
	5240			11.34
802.11n ht20	5180	MCS0		11.14
	5200			11.37
	5240			11.22
802.11n ht40	5190	MCS0		11.67
	5230			14.33
802.11ac80	5210	MCS0		12.90

Wi-Fi 5.8G:

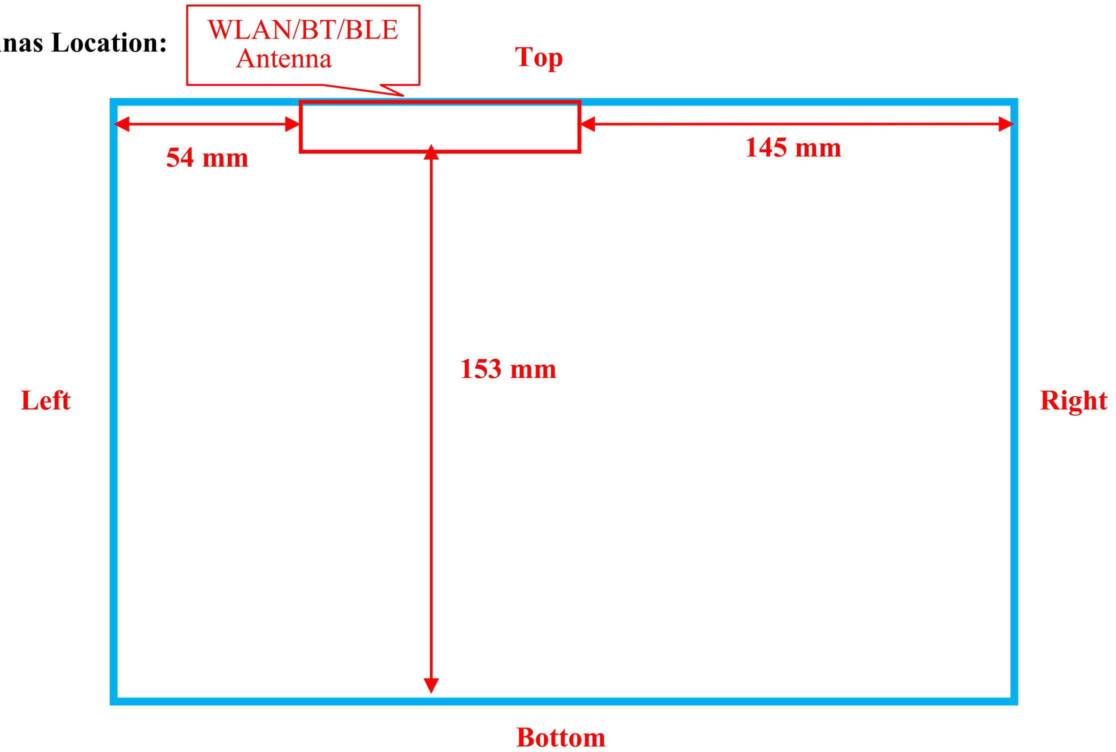
Mode	Channel frequency (MHz)	Data Rate	Duty Cycle [%]	RF Output Power (dBm)
802.11a	5745	6Mbps	100	10.71
	5785			10.21
	5825			9.72
802.11n ht20	5745	MCS0		12.37
	5785			11.79
	5825			12.83
802.11n ht40	5755	MCS0		10.01
	5795			9.83
802.11ac80	5775	MCS0		8.34

Bluetooth :

Mode	Channel frequency (MHz)	RF Output Power (dBm)
BDR(GFSK)	2402	5.27
	2441	5.83
	2480	5.26
EDR(π/4-DQPSK)	2402	4.44
	2441	4.91
	2480	4.35
EDR(8DPSK)	2402	4.51
	2441	5.08
	2480	4.30
BLE_1M	2402	6.37
	2440	6.69
	2480	6.08

7. Standalone SAR test exclusion considerations

Antennas Location:



EUT Front View

7.1 Antenna Distance To Edge

Antenna Distance To Edge(mm)						
Antenna	**Front**	**Bcck**	**Left**	**Right**	**Top**	**Bottom**
WLAN &BT Antenna	< 5	< 5	54	145	< 5	153

7.2 Standalone SAR test exclusion considerations

Mode	Frequency (MHz)	Output Power (dBm)	Output Power (mW)	Distance (mm)	Calculated value	Threshold (1-g)	SAR Test Exclusion
WLAN 2.4G	2472	17.0	50.12	0	15.8	3	No
WLAN 5.2G	5240	14.5	28.18	0	12.9	3	No
WLAN 5.8G	5825	13.0	19.95	0	9.6	3	No
Bluetooth	2480	7.0	5.01	0	1.6	3	YES

Note:*The bluetooth based peak power for calculation.*

NOTE:

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:

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤7.5 for 10-g extremity SAR, where

1. f(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.

7.3 SAR test exclusion for the EUT edge considerations Result

Antenna Distance To Edge(mm)						
Mode	**Front**	**Bcck**	**Left**	**Right**	**Top**	**Bottom**
Bluetooth	Exclusion*	Exclusion*	Exclusion*	Exclusion*	Exclusion*	Exclusion*
2.4G Wi-Fi	**Required**	**Required**	Exclusion	Exclusion	**Required**	Exclusion
5.2G Wi-Fi	**Required**	**Required**	Exclusion	Exclusion	**Required**	Exclusion
5.8G Wi-Fi	**Required**	**Required**	Exclusion	Exclusion	**Required**	Exclusion

Note:

Required： The distance to Edge is less than 25mm, testing is required.
Exclusion*： SAR test exclusion evaluation has been done above.
Exclusion： The distance to Edge is more than 25 mm, testing is not required.

8. SAR MEASUREMENT RESULTS

This page summarizes the results of the performed dosimetric evaluation.

8.1 SAR Test Data

Environmental Conditions

Temperature:	22.4~23.8℃
Relative Humidity:	41~52 %
ATM Pressure:	101.3 kPa
Test Date:	2023/10/07

Testing was performed by Carl Chen, Wei dong Lu, Ken Zong.

WLAN 2.4G:

EUT Position	Frequency (MHz)	Test Mode	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/kg)				
					Scaled Factor	Duty cycle Factor	Meas. SAR	Scaled SAR	Plot
Body Front (0mm)	2422	802.11n HT40	15.69	16.0	1.074	1.000	0.912	0.98	1#
	2437	802.11n HT40	16.79	17.0	1.050	1.000	1.050	1.11	2#
	2452	802.11n HT40	16.75	17.0	1.059	1.000	0.953	1.01	3#
Body Back (0mm)	2422	802.11n HT40	15.69	16.0	1.074	1.000	0.991	1.07	4#
	2437	802.11n HT40	16.79	17.0	1.050	1.000	1.050	1.11	5#
	2452	802.11n HT40	16.75	17.0	1.059	1.000	1.010	1.07	6#
Body Top (0mm)	2422	802.11n HT40	/	/	/	/	/	/	/
	2437	802.11n HT40	16.79	17.0	1.050	1.000	0.503	0.53	7#
	2452	802.11n HT40	/	/	/	/	/	/	/

Note:
1. When the 1-g SAR is≤ 0.8W/kg, 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.
3. KDB 248227 D01-SAR measurement is not required for 2.4 GHz OFDM(802.11g/n) when the highest reported SAR for DSSS(802.11b) is ≤ 1.2 W/kg, and the output power for DSSS is not less than that for OFDM.
4. For 802.11n-HT40 mode power is the largest among 802.11b/g/n-HT20/n-HT40, 802.11n-HT40 mode as initial test configuration is selected to test.

WLAN 5.2G:

EUT Position	Frequency (MHz)	Test Mode	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/kg)				
					Scaled Factor	Duty cycle Factor	Meas. SAR	Scaled SAR	Plot
Body Front (0mm)	5190	802.11n ht40	11.67	12.0	1.079	1.000	1.150	1.25	8#
	/	/	/	/	/	/	/	/	/
	5230	802.11n ht40	14.33	14.5	1.040	1.000	1.040	1.09	9#
Body Back (0mm)	5190	802.11n ht40	/	/	/	/	/	/	/
	/	/	/	/	/	/	/	/	/
	5230	802.11n ht40	14.33	14.5	1.040	1.000	0.563	0.59	10#
Body Top (0mm)	5190	802.11n ht40	11.67	12.0	1.079	1.000	1.340	1.45	11#
	/	/	/	/	/	/	/	/	/
	5230	802.11n ht40	14.33	14.5	1.040	1.000	1.140	1.19	12#

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.
3. For 802.11n ht40 mode power is the largest among 802.11a/n ht20/n ht40/ac80, 802.11n ht40 mode as initial test configuration is selected to test.

WLAN 5.8G:

EUT Position	Frequency (MHz)	Test Mode	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/kg)				
					Scaled Factor	Duty cycle Factor	Meas. SAR	Scaled SAR	Plot
Body Front (0mm)	5745	802.11n ht20	/	/	/	/	/	/	/
	5785	802.11n ht20	/	/	/	/	/	/	/
	5825	802.11n ht20	12.83	13.0	1.040	1.000	0.205	0.22	13#
Body Back (0mm)	5745	802.11n ht20	12.37	12.5	1.030	1.000	1.020	1.06	14#
	5785	802.11n ht20	11.79	12.0	1.050	1.000	1.080	1.14	15#
	5825	802.11n ht20	12.83	13.0	1.040	1.000	1.210	1.26	16#
Body Top (0mm)	5745	802.11n ht20	/	/	/	/	/	/	/
	5785	802.11n ht20	/	/	/	/	/	/	/
	5825	802.11n ht20	12.83	13.0	1.040	1.000	0.684	0.72	17#

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.

3. For 802.11n ht20 mode power is the largest among 802.11a/n ht20/n ht40/ac80, 802.11n ht20 mode as initial test configuration is selected to test.

9. 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 (~ 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

Body

SAR probe calibration point	Frequency Band	Freq.(MHz)	EUT Position	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio
				Original	Repeated	
2450 (2412-2462 MHz)	WLAN 2.4G	2437	Body Front	1.05	1.02	1.03
5250 (5150-5250MHz)	WLAN 5.2G	5190	Body Top	1.34	1.27	1.05
5750 (5700-5910MHz)	WLAN 5.8G	5825	Body Back	1.21	1.18	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.

10. SAR SIMULTANEOUS TRANSMISSION DESCRIPTION

Simultaneous Transmission:

Description of Simultaneous Transmit Capabilities		
Transmitter Combination	**Simultaneous?**	**Hotspot?**
WLAN + Bluetooth	×	×

11. SAR Plots

Plot 1#:

DUT: TABLET PC; Type: F202_8G; Serial: 2716-1

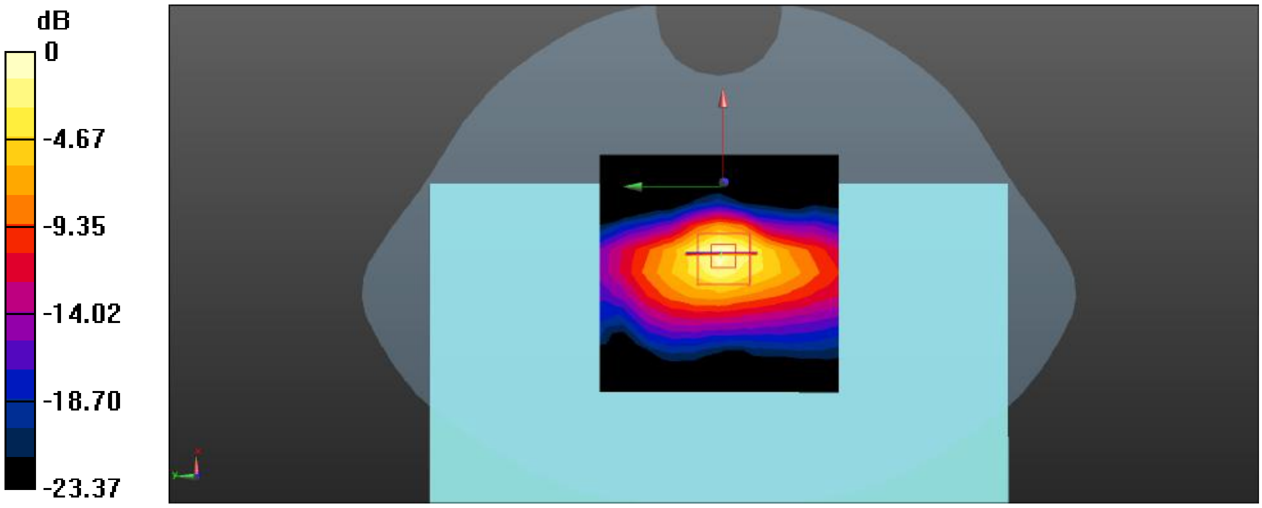
Communication System: UID 0, 2.4G WiFi (0); Frequency: 2422 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2422 MHz; σ = 1.831 S/m; ε_r = 40.285; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(7.42, 7.42, 7.42) @ 2422 MHz; Calibrated: 2023/5/29;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1354; Calibrated: 2022/10/31
- Phantom: Twin SAM; Type: Twin SAM V5.0; Serial: TP:1470
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Body Front/WLAN 802.11n HT40 Low/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 1.04 W/kg

Body Front/WLAN 802.11n HT40 Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 20.95 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 2.31 W/kg
SAR(1 g) = 0.912 W/kg; SAR(10 g) = 0.393 W/kg
Maximum value of SAR (measured) = 1.13 W/kg



0 dB = 1.13 W/kg = 0.54 dBW/kg

Test Plot 2#:

DUT: TABLET PC; Type: F202_8G; Serial: 2716-1

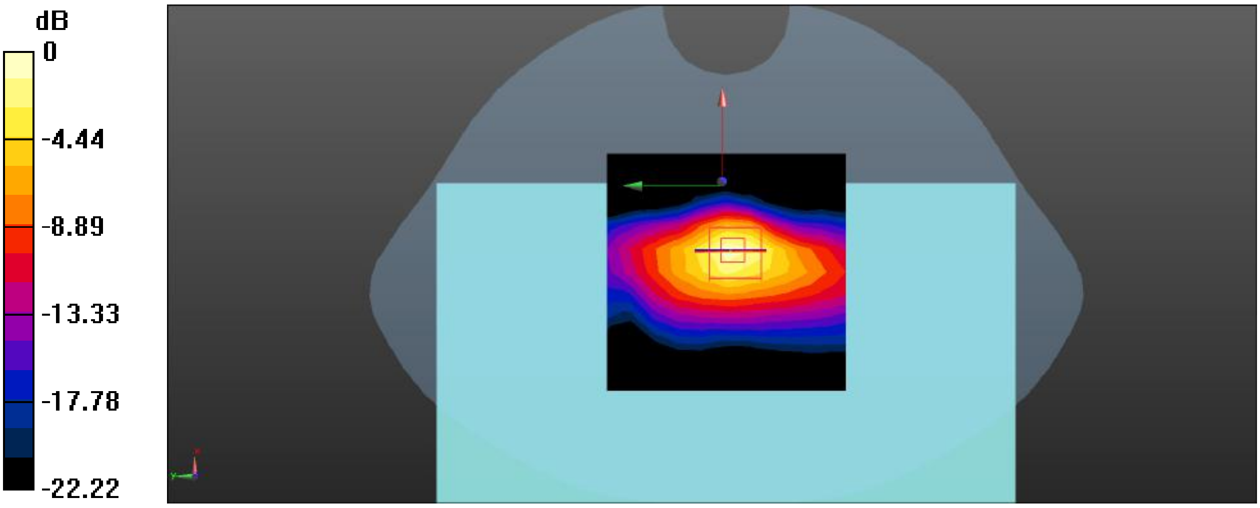
Communication System: UID 0, 2.4G WiFi (0); Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.853 S/m; ε_r = 40.001; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(7.42, 7.42, 7.42) @ 2437 MHz; Calibrated: 2023/5/29;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1354; Calibrated: 2022/10/31
- Phantom: Twin SAM; Type: Twin SAM V5.0; Serial: TP:1470
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Body Front/WLAN 802.11n HT40 Mid/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 1.24 W/kg

Body Front/WLAN 802.11n HT40 Mid/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 19.79 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 2.62 W/kg
SAR(1 g) = 1.05 W/kg; SAR(10 g) = 0.447 W/kg
Maximum value of SAR (measured) = 1.31 W/kg



0 dB = 1.31 W/kg = 1.19 dBW/kg

Test Plot 3#:

DUT: TABLET PC; Type: F202_8G; Serial: 2716-1

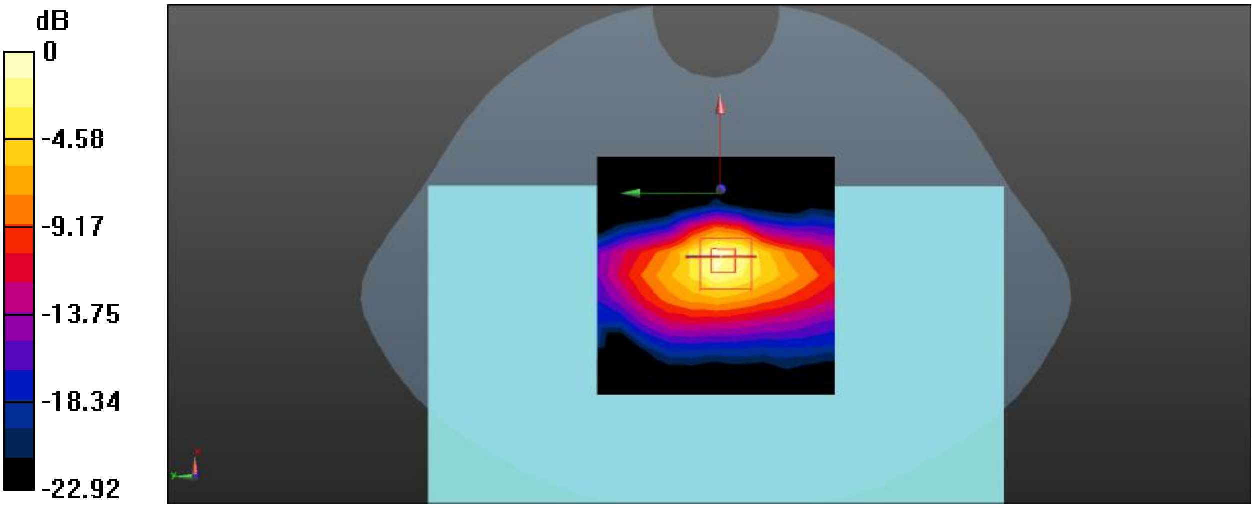
Communication System: UID 0, 2.4G WiFi (0); Frequency: 2452 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2452 MHz; σ = 1.875 S/m; ε_r = 39.785; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(7.42, 7.42, 7.42) @ 2452 MHz; Calibrated: 2023/5/29;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1354; Calibrated: 2022/10/31
- Phantom: Twin SAM; Type: Twin SAM V5.0; Serial: TP:1470
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Body Front/WLAN 802.11n HT40 High/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.919 W/kg

Body Front/WLAN 802.11n HT40 High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 20.91 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 2.38 W/kg
SAR(1 g) = 0.953 W/kg; SAR(10 g) = 0.399 W/kg
Maximum value of SAR (measured) = 1.14 W/kg



0 dB = 1.14 W/kg = 0.57 dBW/kg

Test Plot 4#:

DUT: TABLET PC; Type: F202_8G; Serial: 2716-1

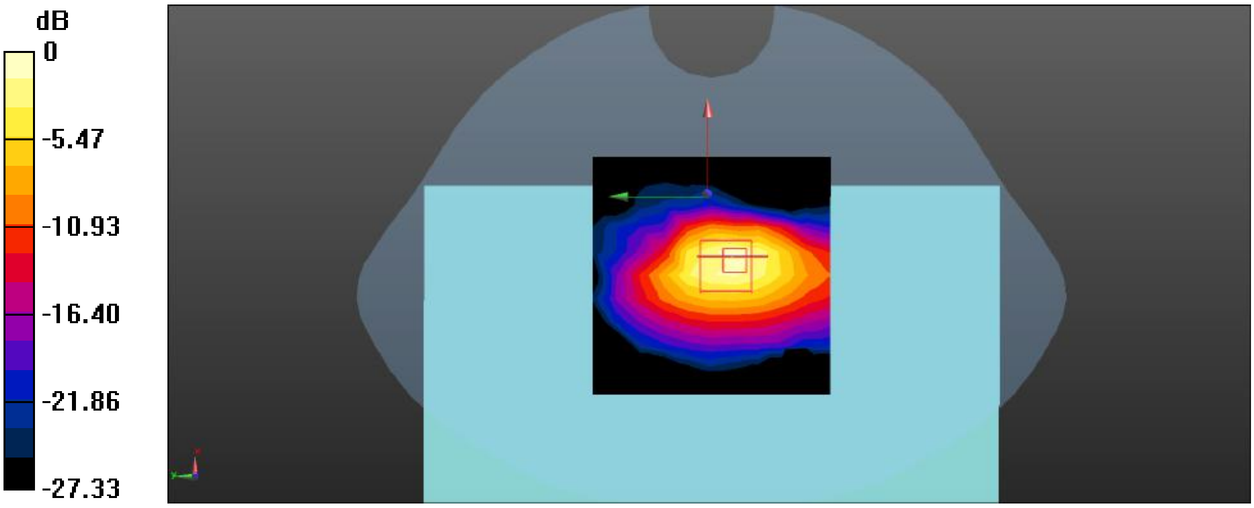
Communication System: UID 0, 2.4G WiFi (0); Frequency: 2422 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2422 MHz; σ = 1.831 S/m; ε_r = 40.285; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(7.42, 7.42, 7.42) @ 2422 MHz; Calibrated: 2023/5/29;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1354; Calibrated: 2022/10/31
- Phantom: Twin SAM; Type: Twin SAM V5.0; Serial: TP:1470
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Body Back/WLAN 802.11n HT40 Low/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 1.04 W/kg

Body Back/WLAN 802.11n HT40 Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 21.27 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 2.97 W/kg
SAR(1 g) = 0.991 W/kg; SAR(10 g) = 0.431 W/kg
Maximum value of SAR (measured) = 1.18 W/kg



0 dB = 1.18 W/kg = 0.73 dBW/kg

Test Plot 5#

DUT: TABLET PC; Type: F202_8G; Serial: 2716-1

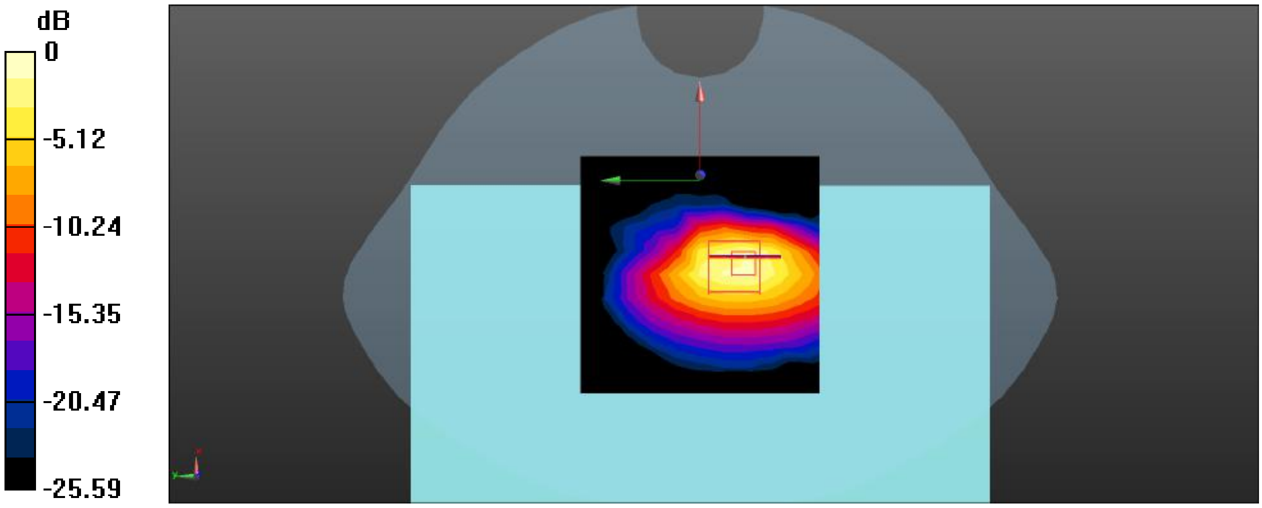
Communication System: UID 0, 2.4G WiFi (0); Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.853 S/m; ε_r = 40.001; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(7.42, 7.42, 7.42) @ 2437 MHz; Calibrated: 2023/5/29;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1354; Calibrated: 2022/10/31
- Phantom: Twin SAM; Type: Twin SAM V5.0; Serial: TP:1470
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Body Back/WLAN 802.11n HT40 Mid/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.958 W/kg

Body Back/WLAN 802.11n HT40 Mid/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 18.45 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 3.31 W/kg
SAR(1 g) = 1.05 W/kg; SAR(10 g) = 0.451 W/kg
Maximum value of SAR (measured) = 1.24 W/kg



0 dB = 1.24 W/kg = 0.94 dBW/kg

Test Plot 6#

DUT: TABLET PC; Type: F202_8G; Serial: 2716-1

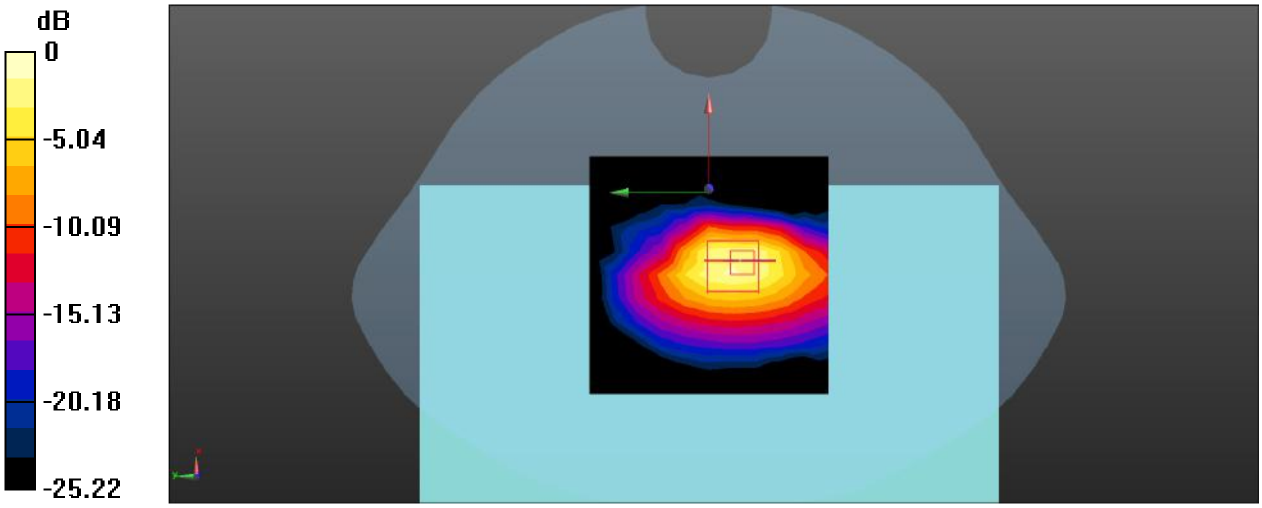
Communication System: UID 0, 2.4G WiFi (0); Frequency: 2452 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2452 MHz; σ = 1.875 S/m; ε_r = 39.785; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(7.42, 7.42, 7.42) @ 2452 MHz; Calibrated: 2023/5/29;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1354; Calibrated: 2022/10/31
- Phantom: Twin SAM; Type: Twin SAM V5.0; Serial: TP:1470
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Body Back/WLAN 802.11n HT40 High/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.911 W/kg

Body Back/WLAN 802.11n HT40 High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 19.81 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 3.12 W/kg
SAR(1 g) = 1.01 W/kg; SAR(10 g) = 0.434 W/kg
Maximum value of SAR (measured) = 1.28 W/kg



0 dB = 1.28 W/kg = 1.08 dBW/kg

Test Plot 7#

DUT: TABLET PC; Type: F202_8G; Serial: 2716-1

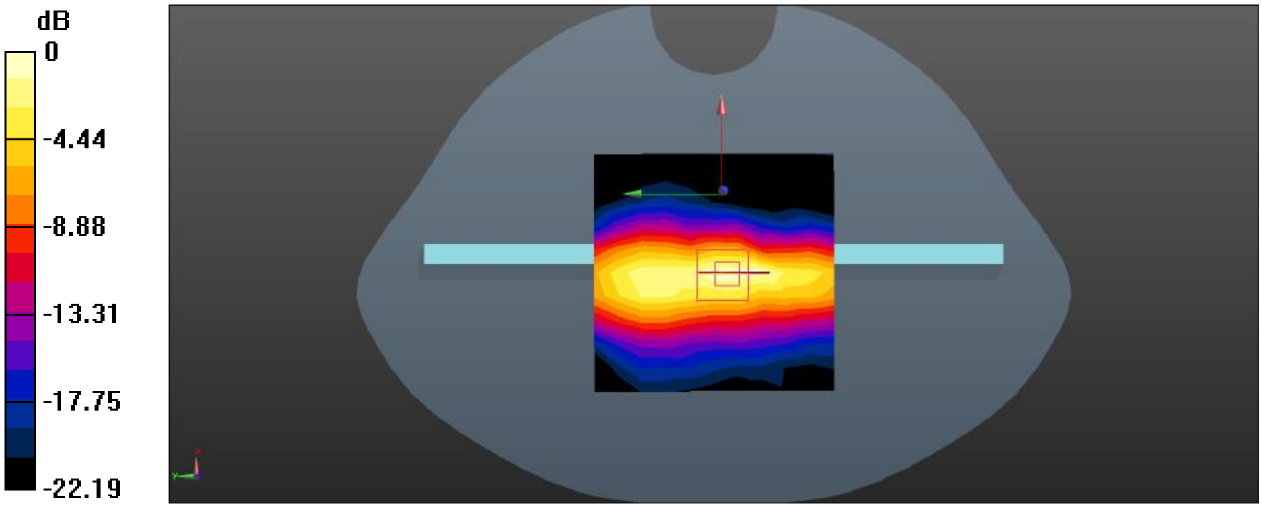
Communication System: UID 0, 2.4G WiFi (0); Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.853 S/m; ε_r = 40.001; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(7.42, 7.42, 7.42) @ 2437 MHz; Calibrated: 2023/5/29;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1354; Calibrated: 2022/10/31
- Phantom: Twin SAM; Type: Twin SAM V5.0; Serial: TP:1470
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Body Top/WLAN 802.11n HT40 Mid/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.565 W/kg

Body Top/WLAN 802.11n HT40 Mid/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 17.67 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 1.29 W/kg
SAR(1 g) = 0.503 W/kg; SAR(10 g) = 0.220 W/kg
Maximum value of SAR (measured) = 0.587 W/kg



0 dB = 0.587 W/kg = -2.31 dBW/kg

Test Plot 8#

DUT: TABLET PC; Type: F202_8G; Serial: 2716-1

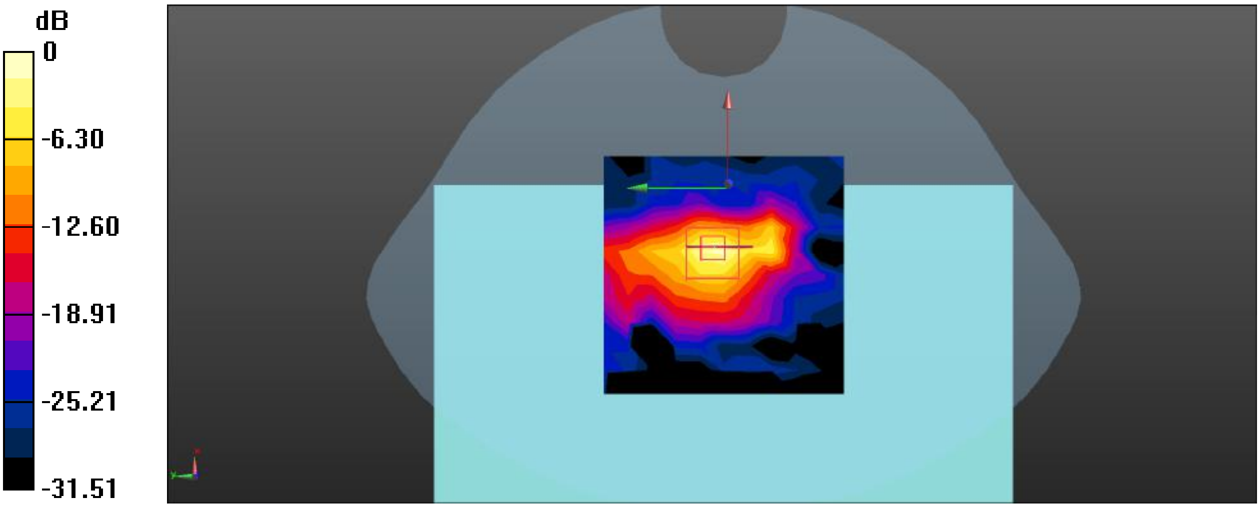
Communication System: UID 0, 5.2G WiFi (0); Frequency: 5190 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5190 MHz; σ = 4.725 S/m; ε_r = 36.379; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(5.36, 5.36, 5.36) @ 5190 MHz; Calibrated: 2023/5/29;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1354; Calibrated: 2022/10/31
- Phantom: Twin SAM; Type: Twin SAM V5.0; Serial: TP:1470
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Body Front/WLAN 5.2G 802.11n-HT40 Low/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 2.02 W/kg

Body Front/WLAN 5.2G 802.11n-HT40 Low/Zoom Scan (8x8x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 9.568 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 5.36 W/kg
SAR(1 g) = 1.15 W/kg; SAR(10 g) = 0.323 W/kg
Maximum value of SAR (measured) = 2.46 W/kg



0 dB = 2.46 W/kg = 3.91 dBW/kg

Test Plot 9#

DUT: TABLET PC; Type: F202_8G; Serial: 2716-1

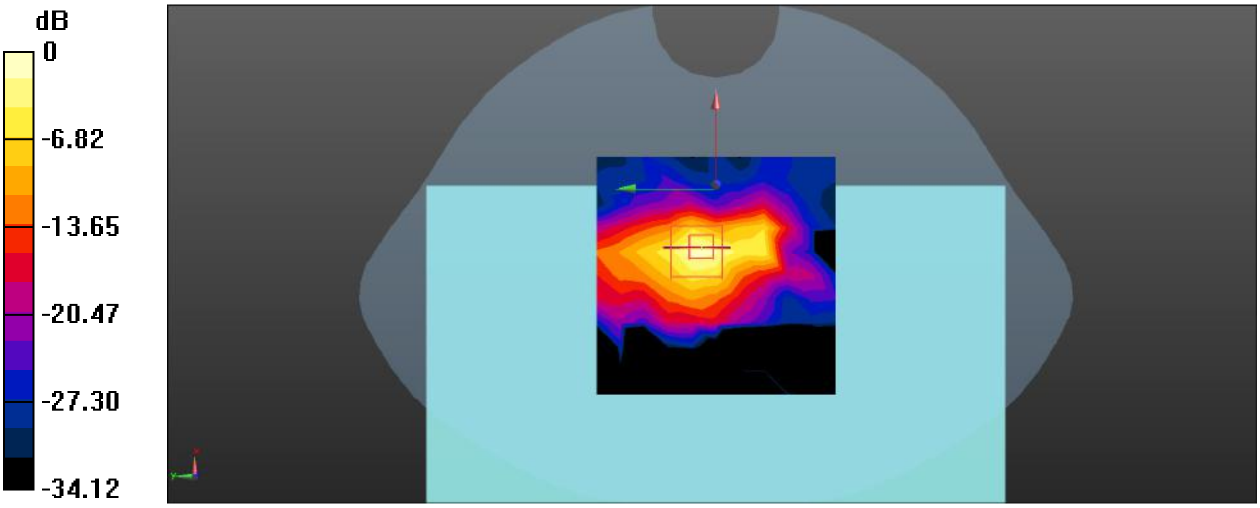
Communication System: UID 0, 5.2G WiFi (0); Frequency: 5230 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5230 MHz; σ = 4.784 S/m; ε_r = 36.336; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(5.36, 5.36, 5.36) @ 5230 MHz; Calibrated: 2023/5/29;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1354; Calibrated: 2022/10/31
- Phantom: Twin SAM; Type: Twin SAM V5.0; Serial: TP:1470
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Body Front/WLAN 5.2G 802.11n-HT40 High/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 1.63 W/kg

Body Front/WLAN 5.2G 802.11n-HT40 High/Zoom Scan (8x8x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 7.965 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 4.47 W/kg
SAR(1 g) = 1.04 W/kg; SAR(10 g) = 0.297 W/kg
Maximum value of SAR (measured) = 2.03 W/kg



0 dB = 2.03 W/kg = 3.06 dBW/kg

Test Plot 10#

DUT: TABLET PC; Type: F202_8G; Serial: 2716-1

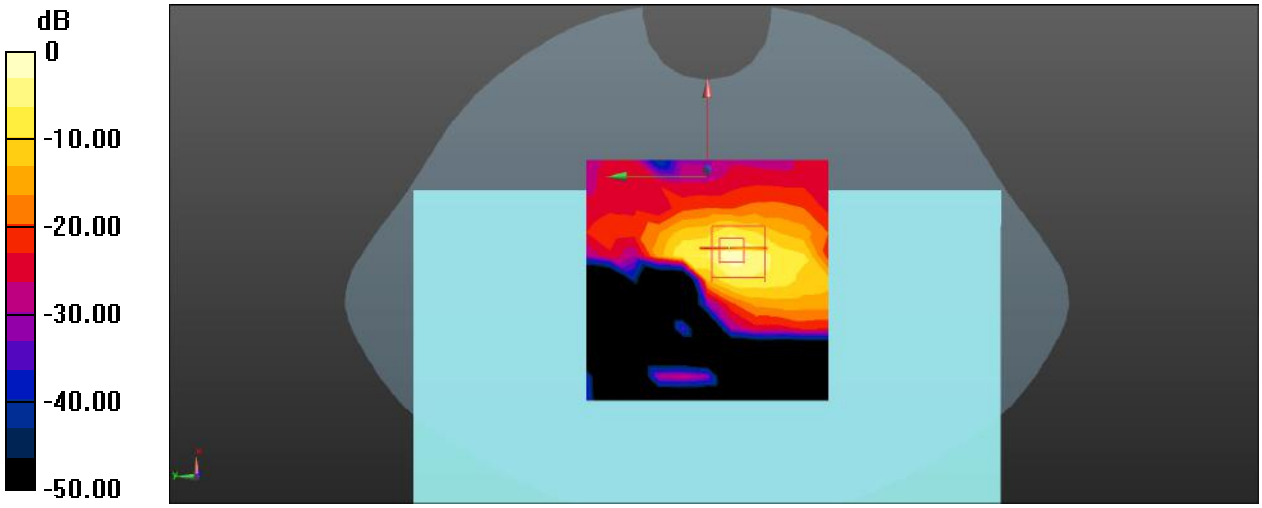
Communication System: UID 0, 5.2G WiFi (0); Frequency: 5230 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5230 MHz; σ = 4.784 S/m; ε_r = 36.336; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(5.36, 5.36, 5.36) @ 5230 MHz; Calibrated: 2023/5/29;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1354; Calibrated: 2022/10/31
- Phantom: Twin SAM; Type: Twin SAM V5.0; Serial: TP:1470
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Body Back/WLAN 5.2G 802.11n-HT40 High/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 1.29 W/kg

Body Back/WLAN 5.2G 802.11n-HT40 High/Zoom Scan (8x8x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 2.521 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 3.86 W/kg
SAR(1 g) = 0.563 W/kg; SAR(10 g) = 0.171 W/kg
Maximum value of SAR (measured) = 1.45 W/kg



0 dB = 1.45 W/kg = 1.61 dBW/kg

Plot 11#

DUT: TABLET PC; Type: F202_8G; Serial: 2716-1

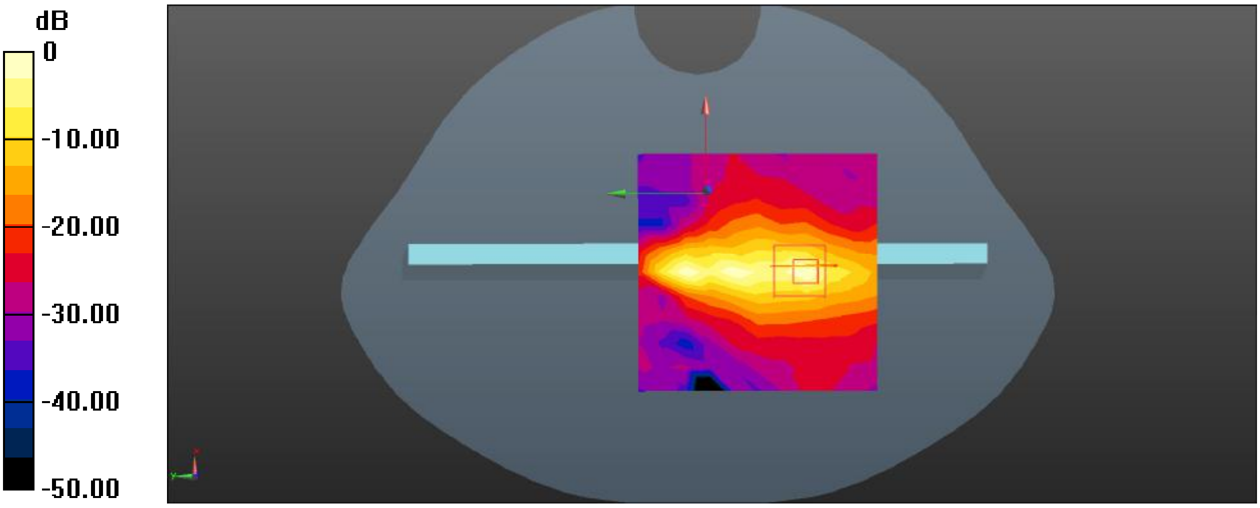
Communication System: UID 0, 5.2G WiFi (0); Frequency: 5190 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5190 MHz; σ = 4.725 S/m; ε_r = 36.379; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(5.36, 5.36, 5.36) @ 5190 MHz; Calibrated: 2023/5/29;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1354; Calibrated: 2022/10/31
- Phantom: Twin SAM; Type: Twin SAM V5.0; Serial: TP:1470
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Body Top/WLAN 5.2G 802.11n-HT40 Low/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 3.44 W/kg

Body Top/WLAN 5.2G 802.11n-HT40 Low/Zoom Scan (8x8x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 12.96 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 6.46 W/kg
SAR(1 g) = 1.34 W/kg; SAR(10 g) = 0.308 W/kg
Maximum value of SAR (measured) = 2.71 W/kg



0 dB = 2.71 W/kg = 4.33 dBW/kg

Plot 12#

DUT: TABLET PC; Type: F202_8G; Serial: 2716-1

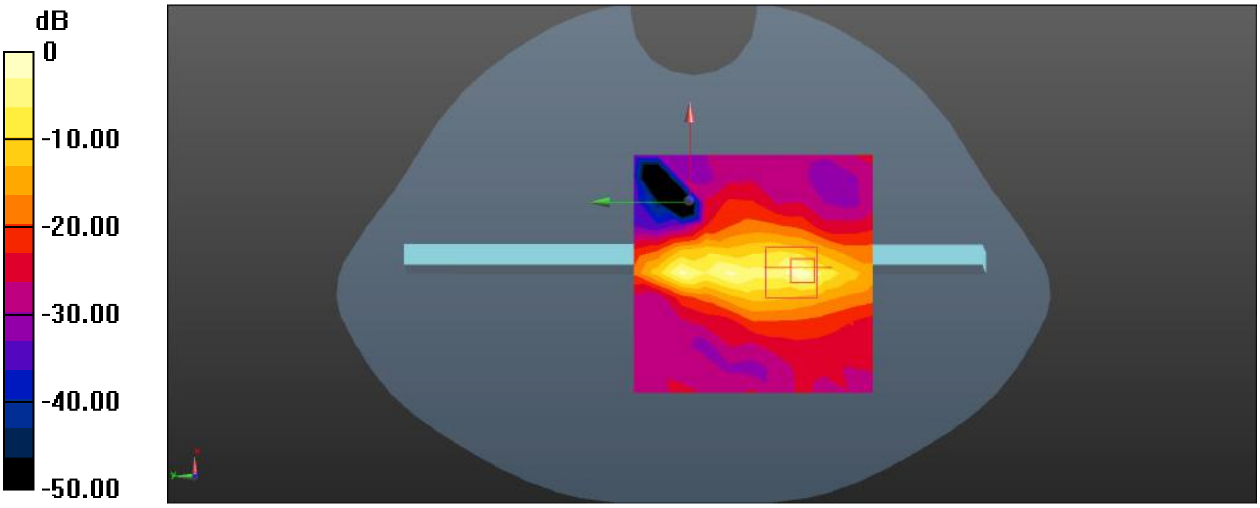
Communication System: UID 0, 5.2G WiFi (0); Frequency: 5230 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5230 MHz; σ = 4.784 S/m; ε_r = 36.336; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(5.36, 5.36, 5.36) @ 5230 MHz; Calibrated: 2023/5/29;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1354; Calibrated: 2022/10/31
- Phantom: Twin SAM; Type: Twin SAM V5.0; Serial: TP:1470
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Body Top/WLAN 5.2G 802.11n-HT40 High/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 2.94 W/kg

Body Top/WLAN 5.2G 802.11n-HT40 High/Zoom Scan (8x8x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 12.06 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 5.69 W/kg
SAR(1 g) = 1.14 W/kg; SAR(10 g) = 0.254 W/kg
Maximum value of SAR (measured) = 2.72 W/kg



0 dB = 2.72 W/kg = 4.35 dBW/kg

Test Plot 13#

DUT: TABLET PC; Type: F202_8G; Serial: 2716-1

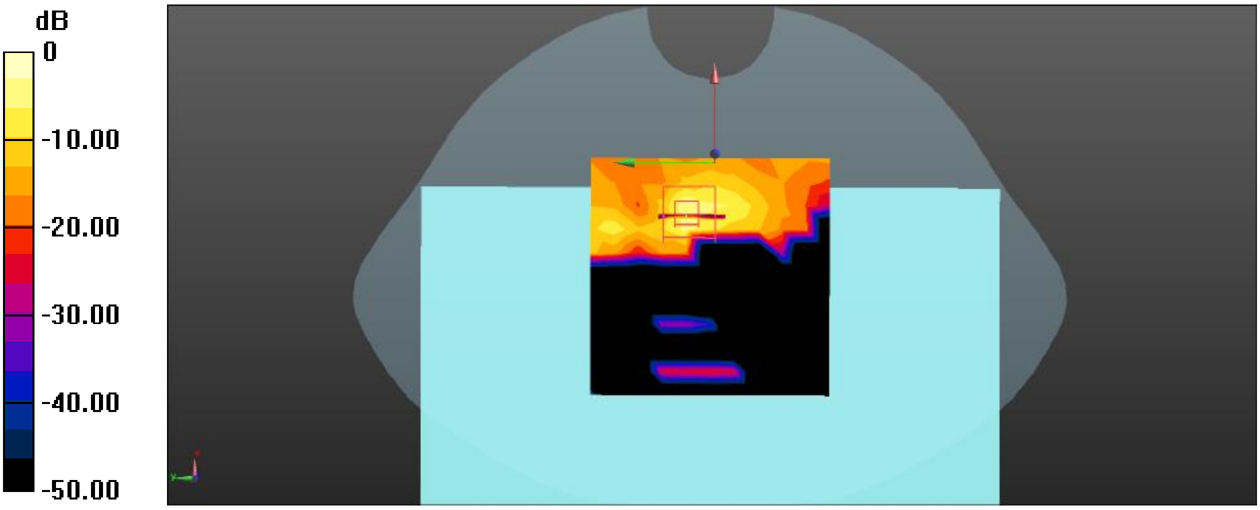
Communication System: UID 0, 5.8G Wi-Fi (0); Frequency: 5825 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5825 MHz; σ = 5.377 S/m; ε_r = 36.525; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(4.9, 4.9, 4.9) @ 5825 MHz; Calibrated: 2023/5/29;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1493; Calibrated: 2023/3/17
- Phantom: Twin SAM; Type: Twin SAM V5.0; Serial: TP:1470
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Body Back/WLAN 5.8G 802.11n-HT20 Mid/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.262 W/kg

Body Back/WLAN 5.8G 802.11n-HT20 Mid/Zoom Scan (8x8x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 0.3080 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.03 W/kg
SAR(1 g) = 0.205 W/kg; SAR(10 g) = 0.042 W/kg
Maximum value of SAR (measured) = 0.551 W/kg



0 dB = 0.551 W/kg = -2.59 dBW/kg

Test Plot 14#

DUT: TABLET PC; Type: F202_8G; Serial: 2716-1

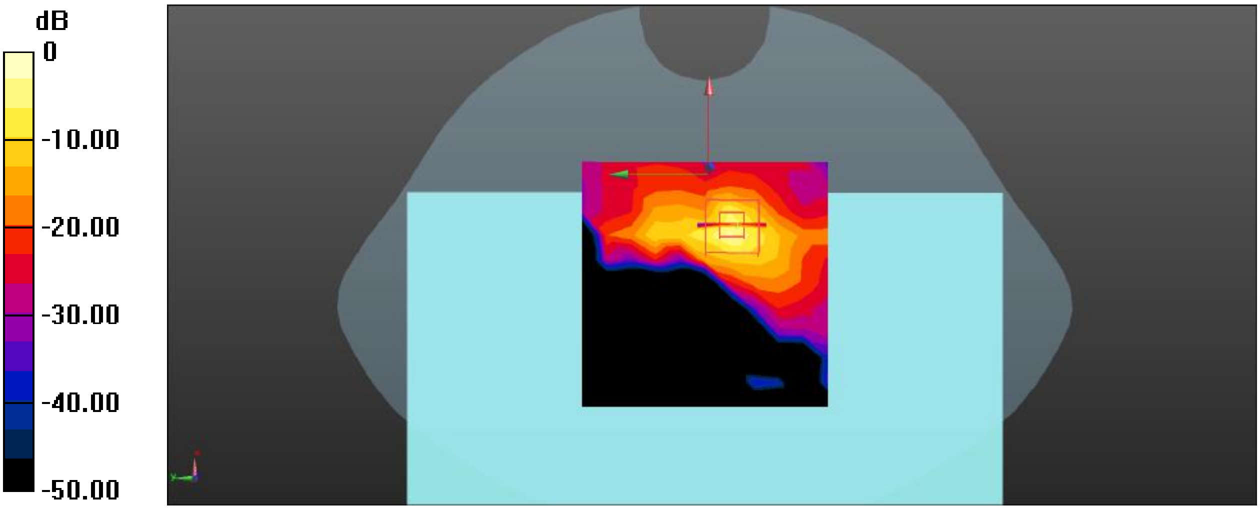
Communication System: UID 0, 5.8G Wi-Fi (0); Frequency: 5745 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5745 MHz; σ = 5.339 S/m; ε_r = 36.301; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(4.9, 4.9, 4.9) @ 5745 MHz; Calibrated: 2023/5/29;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1493; Calibrated: 2023/3/17
- Phantom: Twin SAM; Type: Twin SAM V5.0; Serial: TP:1470
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Body Front/WLAN 5.8G 802.11n-HT20 Low/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 1.50 W/kg

Body Front/WLAN 5.8G 802.11n-HT20 Low/Zoom Scan (8x8x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 6.62 W/kg
SAR(1 g) = 1.02 W/kg; SAR(10 g) = 0.200 W/kg
Maximum value of SAR (measured) = 2.64 W/kg



0 dB = 2.64 W/kg = 4.22 dBW/kg

Test Plot 15#

DUT: TABLET PC; Type: F202_8G; Serial: 2716-1

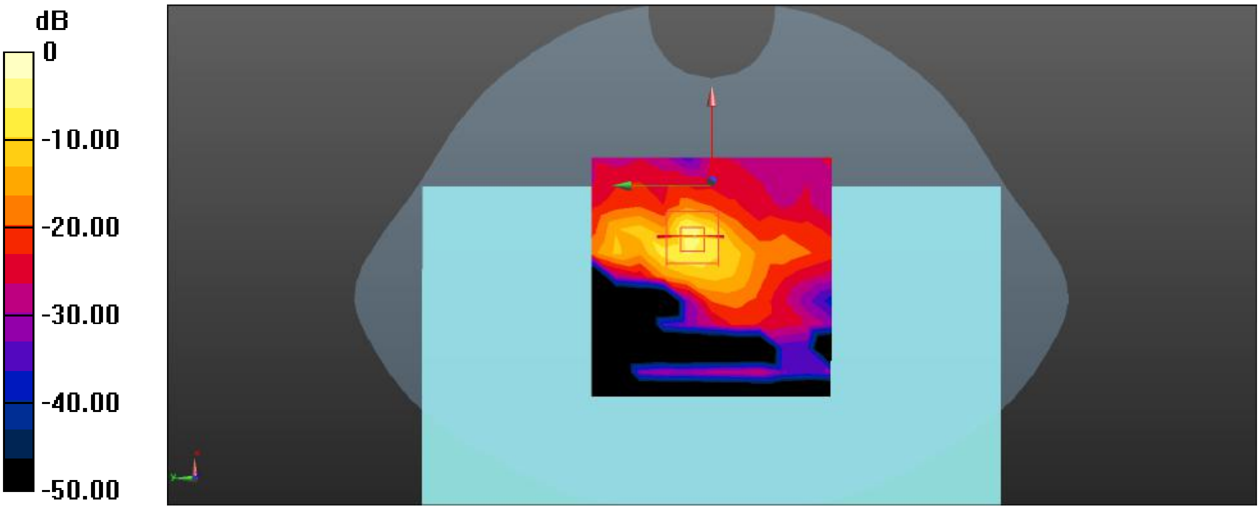
Communication System: UID 0, 5.8G Wi-Fi (0); Frequency: 5785 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5785 MHz; σ = 5.356 S/m; ε_r = 36.543; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(4.9, 4.9, 4.9) @ 5785 MHz; Calibrated: 2023/5/29;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1493; Calibrated: 2023/3/17
- Phantom: Twin SAM; Type: Twin SAM V5.0; Serial: TP:1470
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Body Front/WLAN 5.8G 802.11n-HT20 Mid/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 1.08 W/kg

Body Front/WLAN 5.8G 802.11n-HT20 Mid/Zoom Scan (8x8x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 4.017 V/m; Power Drift = 0.15 dB
Peak SAR (extrapolated) = 7.34 W/kg
SAR(1 g) = 1.08 W/kg; SAR(10 g) = 0.209 W/kg
Maximum value of SAR (measured) = 2.75 W/kg



0 dB = 2.75 W/kg = 4.39 dBW/kg

Plot 16#

DUT: TABLET PC; Type: F202_8G; Serial: 2716-1

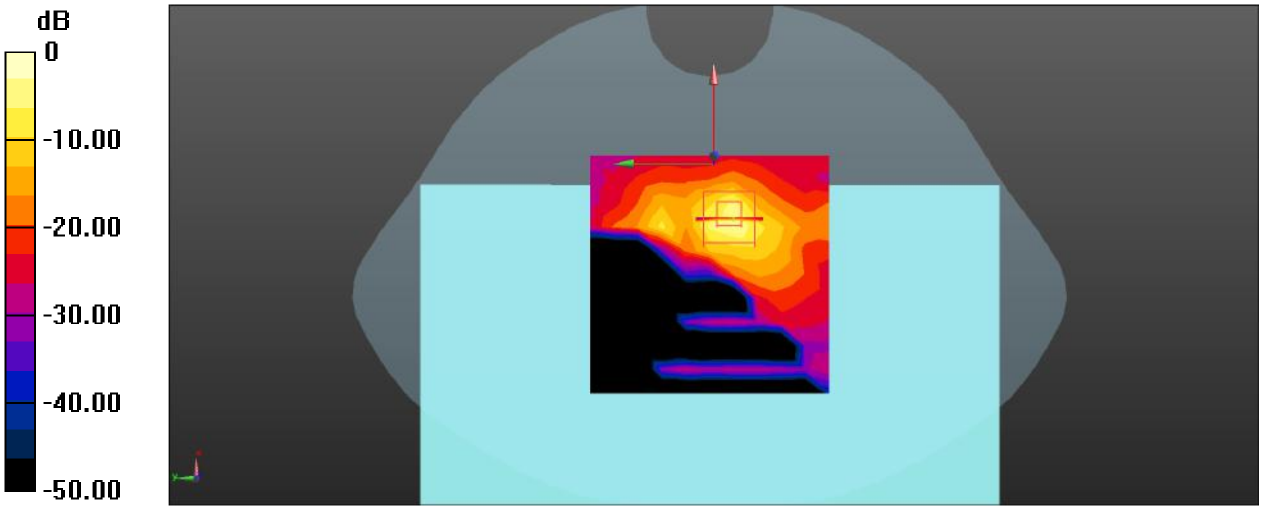
Communication System: UID 0, 5.8G Wi-Fi (0); Frequency: 5825 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5825 MHz; σ = 5.377 S/m; ε_r = 36.525; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(4.9, 4.9, 4.9) @ 5825 MHz; Calibrated: 2023/5/29;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1493; Calibrated: 2023/3/17
- Phantom: Twin SAM; Type: Twin SAM V5.0; Serial: TP:1470
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Body Front/WLAN 5.8G 802.11n-HT20 High/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 1.30 W/kg

Body Front/WLAN 5.8G 802.11n-HT20 High/Zoom Scan (8x8x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 0.09000 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 8.91 W/kg
SAR(1 g) = 1.21 W/kg; SAR(10 g) = 0.231 W/kg
Maximum value of SAR (measured) = 2.58 W/kg



0 dB = 2.58 W/kg = 4.12 dBW/kg

Plot 17#

DUT: TABLET PC; Type: F202_8G; Serial: 2716-1

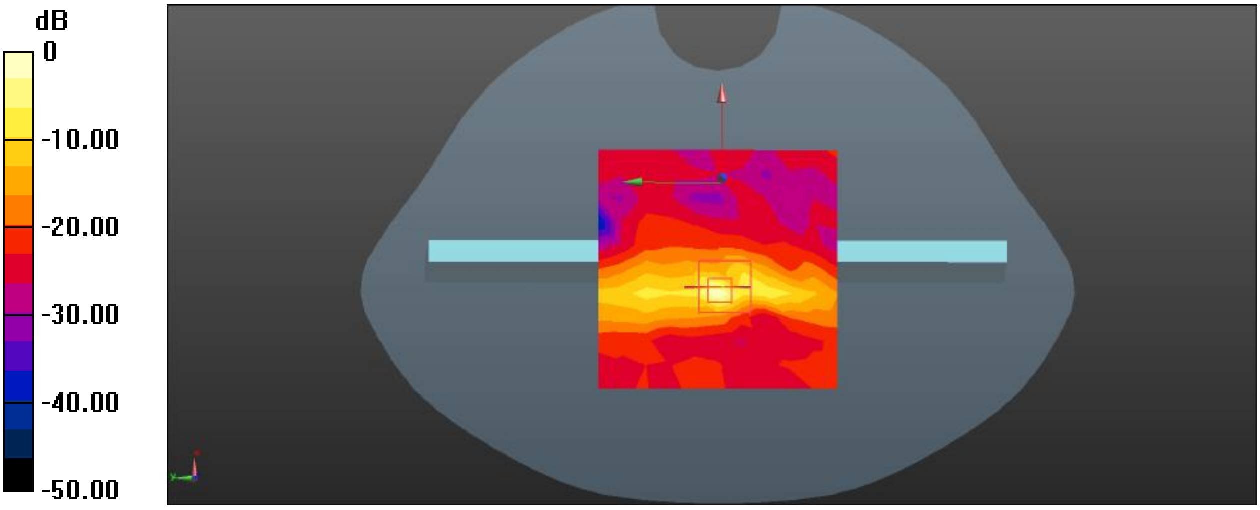
Communication System: UID 0, 5.8G Wi-Fi (0); Frequency: 5825 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5825 MHz; σ = 5.367 S/m; ε_r = 35.619; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(4.9, 4.9, 4.9) @ 5825 MHz; Calibrated: 2023/5/29;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1493; Calibrated: 2023/3/17
- Phantom: Twin SAM; Type: Twin SAM V5.0; Serial: TP:1470
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Body Top/WLAN 5.8G 802.11n-HT20 High/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 2.02 W/kg

Body Top/WLAN 5.8G 802.11n-HT20 High/Zoom Scan (8x8x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 2.776 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 6.14 W/kg
SAR(1 g) = 0.684 W/kg; SAR(10 g) = 0.121 W/kg
Maximum value of SAR (measured) = 1.96 W/kg



0 dB = 1.96 W/kg = 2.92 dBW/kg

APPENDIX A MEASUREMENT UNCERTAINTY

The uncertainty budget has been determined for the measurement system and is given in the following Table.

Measurement uncertainty evaluation for IEEE1528-2013 SAR test

Source of uncertainty	Tolerance/ uncertainty ± %	Probability distribution	Divisor	ci (1 g)	ci (10 g)	Standard uncertainty ± %, (1 g)	Standard uncertainty ± %, (10 g)
Measurement system							
Probe calibration	6.55	N	1	1	1	6.3	6.3
Axial Isotropy	4.7	R	√3	1	1	2.7	2.7
Hemispherical Isotropy	9.6	R	√3	0	0	0.0	0.0
Boundary effect	1.0	R	√3	1	1	0.6	0.6
Linearity	4.7	R	√3	1	1	2.7	2.7
Detection limits	1.0	R	√3	1	1	0.6	0.6
Readout electronics	0.3	N	1	1	1	0.3	0.3
Response time	0.0	R	√3	1	1	0.0	0.0
Integration time	0.0	R	√3	1	1	0.0	0.0
RF ambient conditions – noise	1.0	R	√3	1	1	0.6	0.6
RF ambient conditions– reflections	1.0	R	√3	1	1	0.6	0.6
Probe positioner mech. Restrictions	0.8	R	√3	1	1	0.5	0.5
Probe positioning with respect to phantom shell	6.7	R	√3	1	1	3.9	3.9
Post-processing	2.0	R	√3	1	1	1.2	1.2
Test sample related							
Test sample positioning	2.8	N	1	1	1	2.8	2.8
Device holder uncertainty	6.3	N	1	1	1	6.3	6.3
Drift of output power	5.0	R	√3	1	1	2.9	2.9
Phantom and set-up							
Phantom uncertainty (shape and thickness tolerances)	4.0	R	√3	1	1	2.3	2.3
Liquid conductivity target)	5.0	R	√3	0.64	0.43	1.8	1.2
Liquid conductivity meas.)	2.5	N	1	0.64	0.43	1.6	1.1
Liquid permittivity target)	5.0	R	√3	0.6	0.49	1.7	1.4
Liquid permittivity meas.)	2.5	N	1	0.6	0.49	1.5	1.2
Combined standard uncertainty		RSS				12.2	12.0
Expanded uncertainty 95 % confidence interval)						24.1	23.7

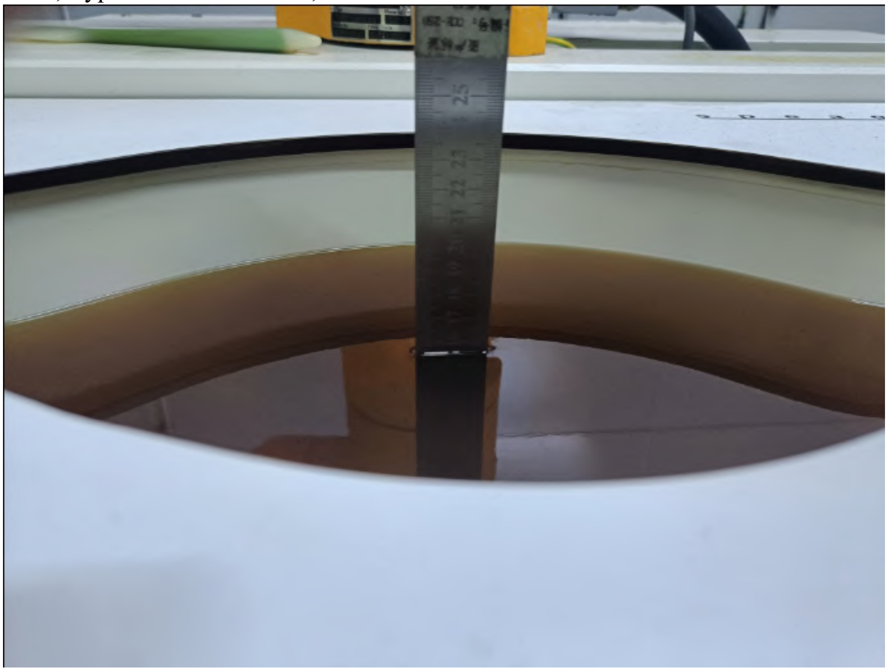
Measurement uncertainty evaluation for IEC62209-1 SAR test

Source of uncertainty	Tolerance/ uncertainty ± %	Probability distribution	Divisor	ci (1 g)	ci (10 g)	Standard uncertainty ± %, (1 g)	Standard uncertainty ± %, (10 g)
Measurement system							
Probe calibration	6.55	N	1	1	1	6.3	6.3
Axial Isotropy	4.7	R	√3	1	1	2.7	2.7
Hemispherical Isotropy	9.6	R	√3	0	0	0.0	0.0
Boundary effect	1.0	R	√3	1	1	0.6	0.6
Linearity	4.7	R	√3	1	1	2.7	2.7
Detection limits	1.0	R	√3	1	1	0.6	0.6
Readout electronics	0.3	N	1	1	1	0.3	0.3
Response time	0.0	R	√3	1	1	0.0	0.0
Integration time	0.0	R	√3	1	1	0.0	0.0
RF ambient conditions – noise	1.0	R	√3	1	1	0.6	0.6
Probe positioning with respect to phantom shell	6.7	R	√3	1	1	3.9	3.9
Probe positioner mech. Restrictions	0.8	R	√3	1	1	0.5	0.5
RF ambient conditions–reflections	1.0	R	√3	1	1	0.6	0.6
Post-processing	2.0	R	√3	1	1	1.2	1.2
Test sample related							
Test sample positioning	2.8	N	1	1	1	2.8	2.8
Device holder uncertainty	6.3	N	1	1	1	6.3	6.3
Drift of output power	5.0	R	√3	1	1	2.9	2.9
Phantom and set-up							
Phantom uncertainty (shape and thickness tolerances)	4.0	R	√3	1	1	2.3	2.3
Liquid conductivity target)	5.0	R	√3	0.64	0.43	1.8	1.2
Liquid conductivity meas.)	2.5	N	1	0.64	0.43	1.6	1.1
Liquid permittivity target)	5.0	R	√3	0.6	0.49	1.7	1.4
Liquid permittivity meas.)	2.5	N	1	0.6	0.49	1.5	1.2
Combined standard uncertainty		RSS				12.2	12.0
Expanded uncertainty 95 % confidence interval)						24.0	23.6

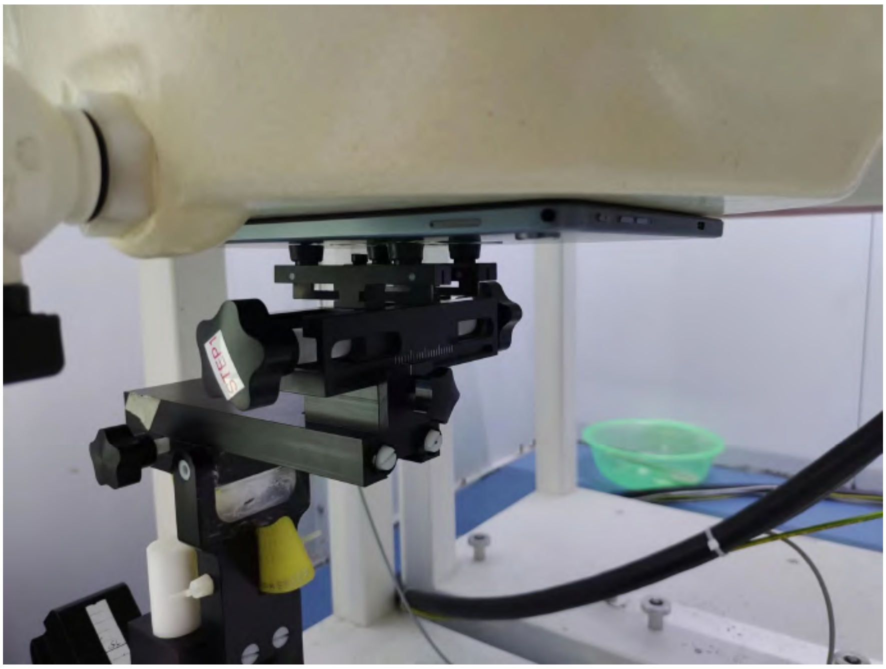
APPENDIX B EUT TEST POSITION PHOTOS

Liquid depth ≥ 15cm

Phantom: Twin SAM; Type: Twin SAM V5.0; Serial: TP:1470



Body Front Setup Photo(0 mm)



Body Back Setup Photo(0 mm)

Body Top Setup Photo(0 mm)

APPENDIX C CALIBRATION CERTIFICATES

In Collaboration with speag CALIBRATION LABORATORY

中国认可 国际互认 校准 CALIBRATION CNAS L0570 CAICT

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E-mail: emf@caict.ac.cn http://www.caict.ac.cn

Client CCICT Certificate No: J23Z60226

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN : 7522

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

Calibration date: May 29, 2023

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	14-Jun-22(CTTL, No.J22X04181)	Jun-23
Power sensor NRP-Z91	101547	14-Jun-22(CTTL, No.J22X04181)	Jun-23
Power sensor NRP-Z91	101548	14-Jun-22(CTTL, No.J22X04181)	Jun-23
Reference 10dBAttenuator	18N50W-10dB	19-Jan-23(CTTL, No.J23X00212)	Jan-25
Reference 20dBAttenuator	18N50W-20dB	19-Jan-23(CTTL, No.J23X00211)	Jan-25
OCP DAK-3.5	SN 1040	18-Jan-23(SPEAG, No.OCP-DAK3.5-1040_Jan23)	Jan-24
Reference Probe EX3DV4	SN 7517	27-Jan-23(SPEAG, No.EX-7517_Jan23)	Jan-24
DAE4	SN 1555	25-Aug-22(SPEAG, No.DAE4-1555_Aug22)	Aug-23
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
SignalGenerator MG3700A	6201052605	14-Jun-22(CTTL, No.J22X04182)	Jun-23
Network Analyzer E5071C	MY46110673	10-Jan-23(CTTL, No.J23X00104)	Jan-24
Reference 10dBAttenuator	BT0520	11-May-23(CTTL, No.J23X04061)	May-25
Reference 20dBAttenuator	BT0267	11-May-23(CTTL, No.J23X04062)	May-25

	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: June 04, 2023

Certificate No: J23Z60226 Page 1 of 9

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Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A,B,C,D	modulation dependent linearization parameters
Polarization Φ	Φ rotation around probe axis
Polarization θ	θ rotation around an axis that is in the plane normal to probe axis (at measurement center), i θ=0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

b) IEC 62209-1, "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

c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization θ=0 (f≤900MHz in TEM-cell; f>1800MHz: waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2-field uncertainty inside TSL (see below ConvF).
- *NORM(f)x,y,z = NORMx,y,z* frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics.
- *Ax,y,z; Bx,y,z; Cx,y,z;VRx,y,z:*A,B,C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f≤800MHz) and inside waveguide using analytical field distributions based on power measurements for f >800MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORMx,y,z* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from±50MHz to±100MHz.
- *Spherical isotropy (3D deviation from isotropy):* in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset:* The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle:* The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (*k*=2)
Norm(μV/(V/m)^2)[A]	0.44	0.45	0.53	±10.0%
DCP(mV)[B]	99.4	98.3	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	156.8	±2.8%
		Y	0.0	0.0	1.0		158.4	
		Z	0.0	0.0	1.0		176.2	

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

[A] The uncertainties of Norm X, Y, Z do not affect the E^2-field uncertainty inside TSL (see Page 4).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainly is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz][C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
750	41.9	0.89	9.90	9.90	9.90	0.11	1.85	±12.7%
900	41.5	0.97	9.37	9.37	9.37	0.15	1.74	±12.7%
1750	40.1	1.37	8.15	8.15	8.15	0.25	1.13	±12.7%
1900	40.0	1.40	7.94	7.94	7.94	0.23	1.09	±12.7%
2300	39.5	1.67	7.67	7.67	7.67	0.65	0.69	±12.7%
2450	39.2	1.80	7.42	7.42	7.42	0.65	0.69	±12.7%
2600	39.0	1.96	7.23	7.23	7.23	0.50	0.83	±12.7%
5250	35.9	4.71	5.36	5.36	5.36	0.45	1.47	±13.9%
5500	35.6	4.96	4.85	4.85	4.85	0.50	1.40	±13.9%
5750	35.4	5.22	4.90	4.90	4.90	0.45	1.50	±13.9%

[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 up to 6 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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

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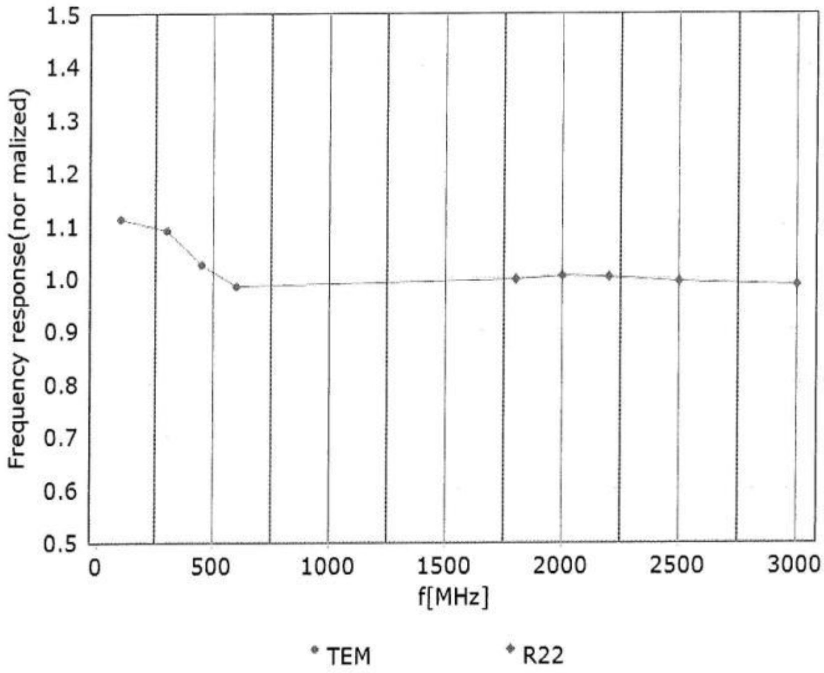
Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



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

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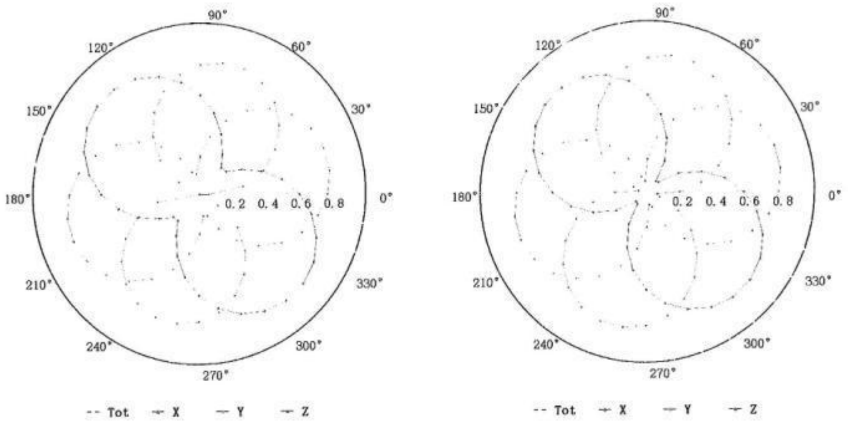
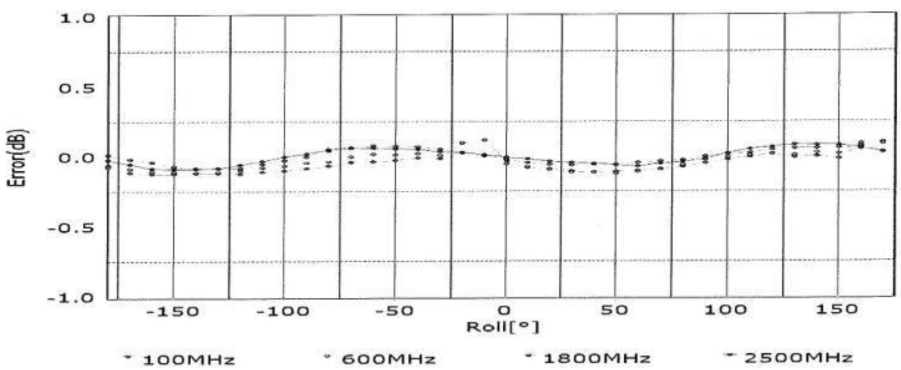
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM

f=1800 MHz, R22





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

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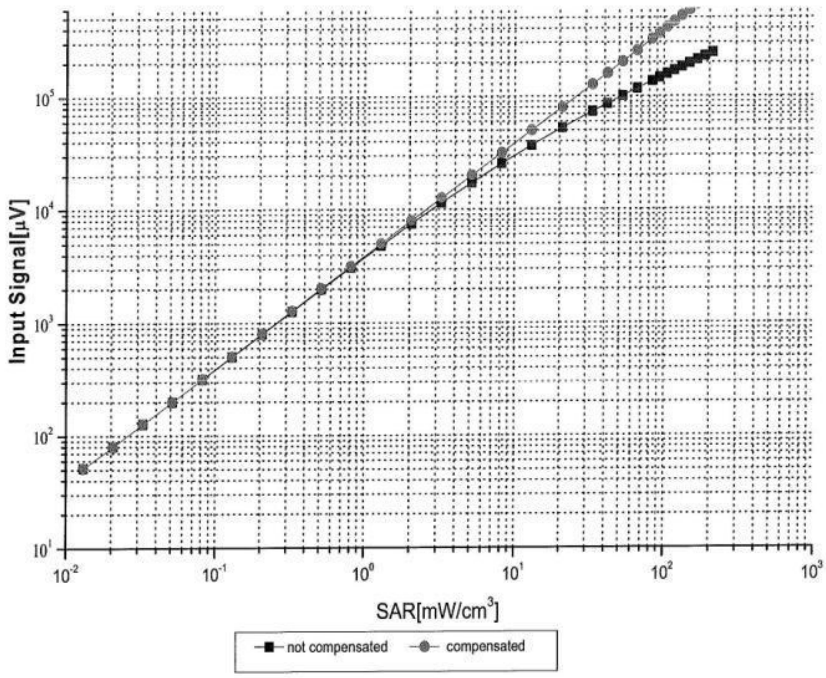
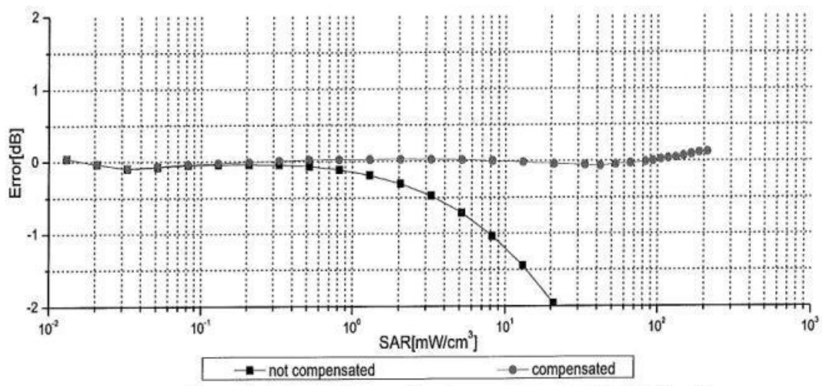
Dynamic Range f(SAR$_{head}$)
(TEM cell, f = 900 MHz)





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

Certificate No:J23Z60226 Page 7 of 9

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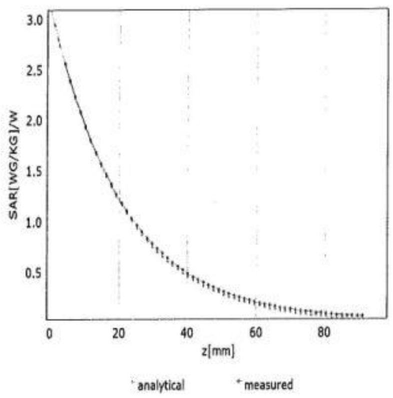
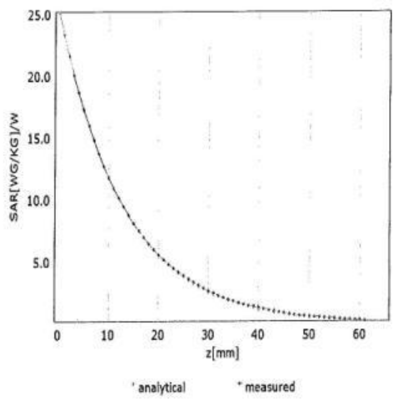
Conversion Factor Assessment

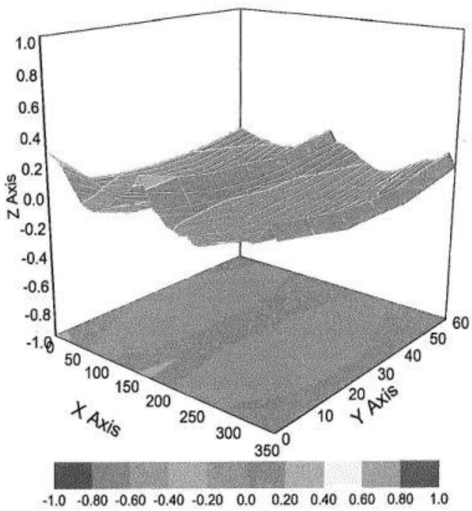
f=750 MHz,WGLS R9(H_convF)



f=1750 MHz,WGLS R22(H_convF)



Deviation from Isotropy in Liquid



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

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

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	31.1
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	9mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	1.4mm

APPENDIX D CALIBRATION CERTIFICATES

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

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

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

Accreditation No.: **SCS 0108**

Client **BACL**
Sunnyvale, USA

Certificate No. **D2450V2-1102_Mar23**

CALIBRATION CERTIFICATE

Object	D2450V2 - SN:1102
Calibration procedure(s)	QA CAL-05.v12 Calibration Procedure for SAR Validation Sources between 0.7-3 GHz
Calibration date:	March 27, 2023

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-22 (No. 217-03525/03524)	Apr-23
Power sensor NRP-Z91	SN: 103244	04-Apr-22 (No. 217-03524)	Apr-23
Power sensor NRP-Z91	SN: 103245	04-Apr-22 (No. 217-03525)	Apr-23
Reference 20 dB Attenuator	SN: BH9394 (20k)	04-Apr-22 (No. 217-03527)	Apr-23
Type-N mismatch combination	SN: 310982 / 06327	04-Apr-22 (No. 217-03528)	Apr-23
Reference Probe EX3DV4	SN: 7349	10-Jan-23 (No. EX3-7349_Jan23)	Jan-24
DAE4	SN: 601	19-Dec-22 (No. DAE4-601_Dec22)	Dec-23

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-22)	In house check: Oct-24
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-22)	In house check: Oct-24

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Sven Kühn	Technical Manager	

Issued: March 27, 2023

Certificate No: D2450V2-1102_Mar23 Page 1 of 6

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

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

Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

c) DASY 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 source is mounted in a touch configuration below the center marking of the flat phantom.
- *Return Loss:* This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. 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	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.0 ± 6 %	1.81 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	12.9 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**50.9 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.07 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.1 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.9 Ω + 4.8 jΩ
Return Loss	- 24.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.155 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

DASY5 Validation Report for Head TSL

Date: 27.03.2023

Test Laboratory: SPEAG, Zurich, Switzerland

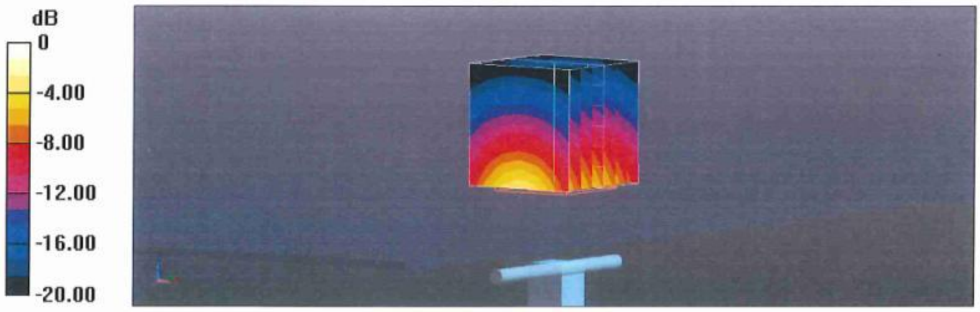
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:1102

Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.81 S/m; ε_r = 38; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.88, 7.88, 7.88) @ 2450 MHz; Calibrated: 10.01.2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 19.12.2022
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

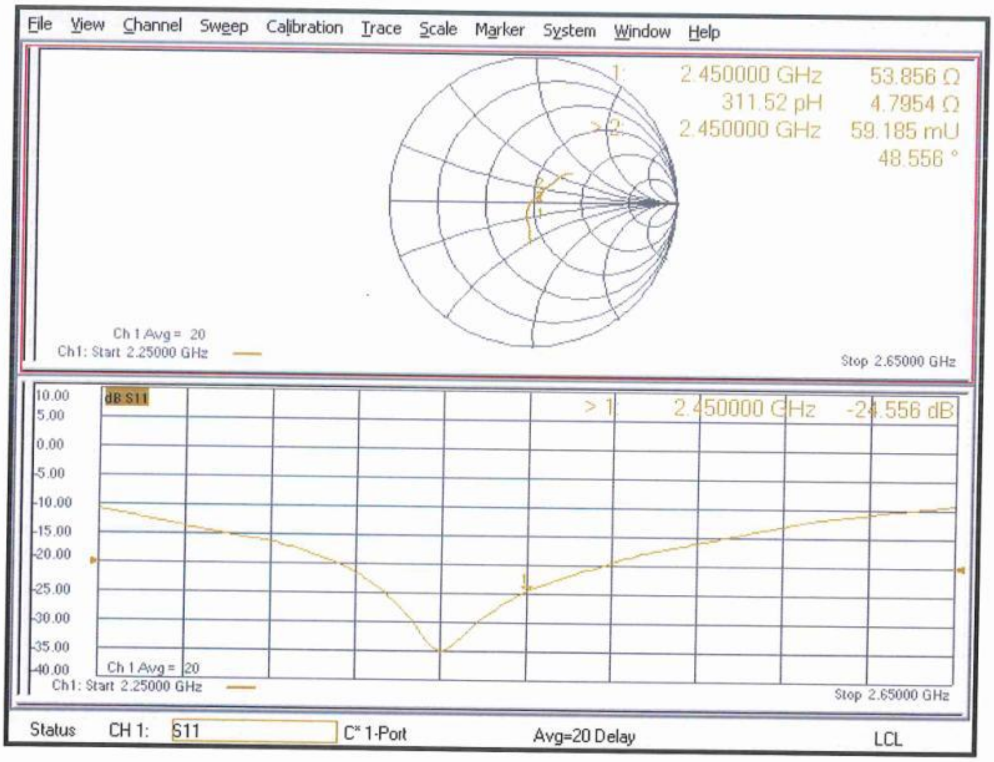
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 115.0 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 24.7 W/kg
SAR(1 g) = 12.9 W/kg; SAR(10 g) = 6.07 W/kg
Smallest distance from peaks to all points 3 dB below = 9 mm
Ratio of SAR at M2 to SAR at M1 = 51.9%
Maximum value of SAR (measured) = 20.7 W/kg



0 dB = 20.7 W/kg = 13.16 dBW/kg

Certificate No: D2450V2-1102_Mar23 Page 5 of 6

Impedance Measurement Plot for Head TSL



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Client **BACL** **Certificate No: Z22-60480**

CALIBRATION CERTIFICATE

Object	D5GHzV2 - SN: 1246
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	November 1, 2022

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106276	10-May-22 (CTTL, No.J22X03103)	May-23
Power sensor NRP6A	101369	10-May-22 (CTTL, No.J22X03103)	May-23
Reference Probe EX3DV4	SN 7464	26-Jan-22(SPEAG,No.EX3-7464_Jan22)	Jan-23
DAE4	SN 1556	12-Jan-22(CTTL-SPEAG,No.Z22-60007)	Jan-23
Secondary Standards	**ID #**	**Cal Date (Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	13-Jan-22 (CTTL, No. J22X00409)	Jan-23
Network Analyzer E5071C	MY46110673	14-Jan-22 (CTTL, No.J22X00406)	Jan-23

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

Issued: November 7, 2022

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Glossary:

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

Calibration is Performed According to the Following Standards:

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

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

Additional Documentation:

c) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

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Measurement Conditions

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

DASY Version	DASY52	52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5250 MHz ± 1 MHz 5600 MHz ± 1 MHz 5750 MHz ± 1 MHz	

Head TSL parameters at 5250MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 ℃	35.9	4.71 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) ℃	35.2 ± 6 %	4.68 mho/m ± 6 %
Head TSL temperature change during test	<1.0 ℃	----	----

SAR result with Head TSL at 5250MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.78 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**77.5 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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Head TSL parameters at 5600MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 ℃	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) ℃	34.6 ±6 %	5.05 mho/m ±6 %
Head TSL temperature change during test	<1.0 ℃	----	----

SAR result with Head TSL at 5600MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.11 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**80.7 W/kg ±24.4 % (*k*=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.30 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.8 W/kg ±24.2 % (*k*=2)**

Head TSL parameters at 5750MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 ℃	35.4	5.22 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) ℃	34.4 ±6 %	5.21 mho/m ±6 %
Head TSL temperature change during test	<1.0 ℃	----	----

SAR result with Head TSL at 5750MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.89 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**78.4 W/kg ±24.4 % (*k*=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.22 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 5250MHz

Impedance, transformed to feed point	49.1Ω- 3.09jΩ
Return Loss	- 29.8dB

Antenna Parameters with Head TSL at 5600MHz

Impedance, transformed to feed point	52.0Ω+ 4.16jΩ
Return Loss	- 26.9dB

Antenna Parameters with Head TSL at 5750MHz

Impedance, transformed to feed point	53.5Ω+ 2.47jΩ
Return Loss	- 27.6dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.097 ns

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

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

Additional EUT Data

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DASY5 Validation Report for Head TSL Date: 2022-11-01

Test Laboratory: CTTL, Beijing, China

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

Communication System: CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz

Medium parameters used: f = 5250 MHz; σ = 4.677 S/m; ε_r = 35.15; ρ = 1000 kg/m^3

Medium parameters used: f = 5600 MHz; σ = 5.047 S/m; ε_r = 34.56; ρ = 1000 kg/m^3

Medium parameters used: f = 5750 MHz; σ = 5.211 S/m; ε_r = 34.35; ρ = 1000 kg/m^3

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(5.43, 5.43, 5.43) @ 5250 MHz; ConvF(4.91, 4.91, 4.91) @ 5600 MHz; ConvF(4.85, 4.85, 4.85) @ 5750 MHz; Calibrated: 2022-01-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2022-01-12
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration /Pin=100mW, d=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.38 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 31.5 W/kg
SAR(1 g) = 7.78 W/kg; SAR(10 g) = 2.21 W/kg
Smallest distance from peaks to all points 3 dB below = 6.9 mm
Ratio of SAR at M2 to SAR at M1 = 64.9%
Maximum value of SAR (measured) = 17.9 W/kg

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 = 65.26 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 35.8 W/kg
SAR(1 g) = 8.11 W/kg; SAR(10 g) = 2.3 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 62.3%
Maximum value of SAR (measured) = 19.2 W/kg

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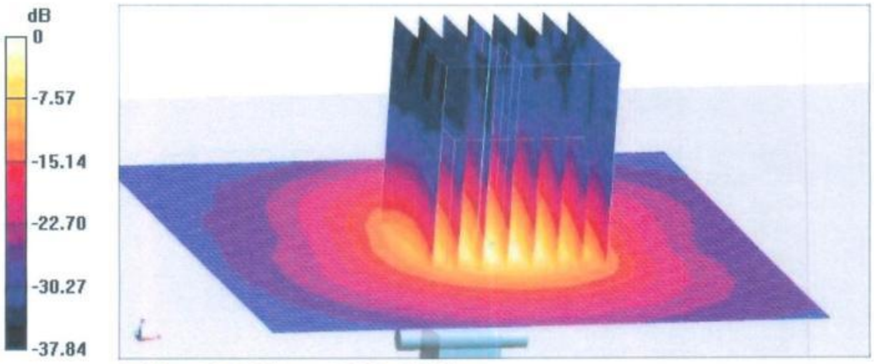
Dipole Calibration /Pin=100mW, d=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.56 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 36.7 W/kg
SAR(1 g) = 7.89 W/kg; SAR(10 g) = 2.22 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 60.9%
Maximum value of SAR (measured) = 19.0 W/kg



0 dB = 19.0 W/kg = 12.79 dBW/kg

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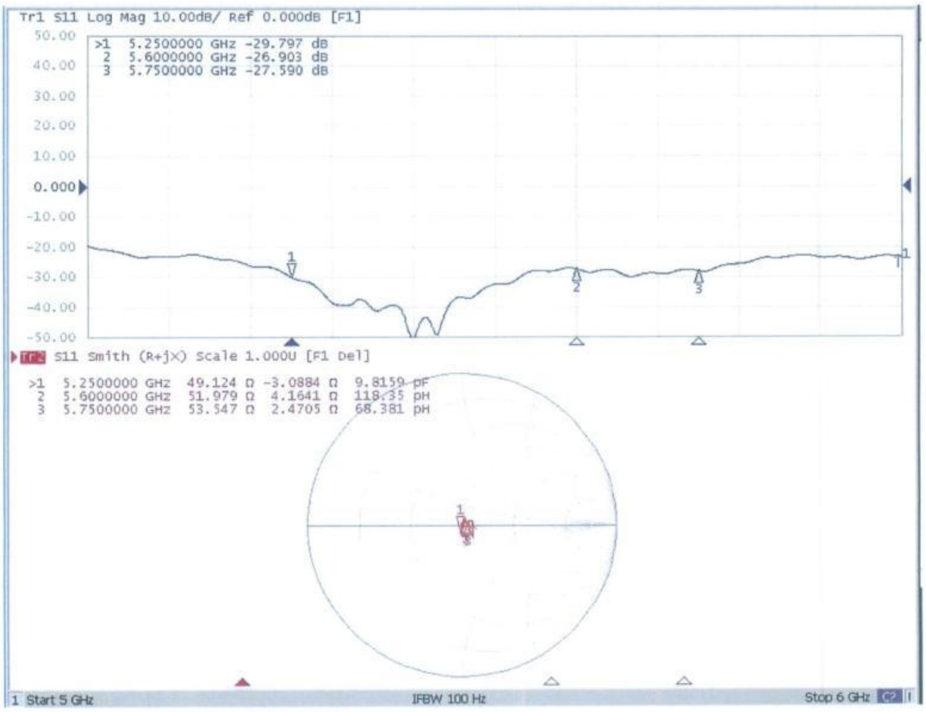
Impedance Measurement Plot for Head TSL



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