



SAR TEST REPORT

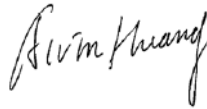
For

Shanghai Ratta Smart Technology Co.,Ltd.

Room 301, Building No.1, 168 Jixin Road, Minhang, Shanghai 201104 China

FCC ID: 2AQZ9-A6X

IC: 24370-A6X

Report Type: Original Report		Product Type: SuperNote	
Report Number:	RSH200825050-20B		
Report Date:	2020-10-24		
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Attestation of Test Results			
EUT Information	EUT Description	SuperNote	
	Tested Model	A6 X	
	FCC ID	2AQZ9-A6X	
	IC	24370-A6X	
	Serial Number	RSH200825050-SA-S1	
	Test Date	2020/09/14	
MODE	Max. SAR Level(s) Reported(W/kg)	Limit (W/kg)	
WLAN 2.4G	1g Body SAR	0.94	1.6
WLAN 5.2G	1g Body SAR	1.28	
WLAN 5.8G	1g Body SAR	1.32	
Bluetooth	1g Body SAR	0.08	

Applicable Standards	FCC 47 CFR part 2.1093 Radiofrequency radiation exposure evaluation: portable devices
	IEEE1528:2013 IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
	RSS-102 Issue 5 March 2015 Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands).
	IEC 62209-1:2016 Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Part 1: Devices used next to the ear (Frequency range of 300 MHz to 6 GHz)
	KDB procedures KDB 447498 D01 General RF Exposure Guidance v06 KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04 KDB 865664 D02 RF Exposure Reporting v01r02 KDB 248227 D01 802.11 Wi-Fi SAR v02r02 KDB 616217 D04 SAR for laptop and tablets v01r02 KDB 941225 D07 UMPC Mini Tablet v01r02
Note: This wireless device has been shown to be capable of compliance for localized specific absorption rate (SAR) for General Population/Uncontrolled Exposure limits specified in FCC 47 CFR part 2.1093 and has been tested in accordance with the measurement procedures specified in IEEE 1528-2013 and RF exposure KDB procedures. The results and statements contained in this report pertain only to the device(s) evaluated.	

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	RSH200825050-20B	Original Report	2020-10-24

EUT DESCRIPTION

This report has been prepared on behalf of **Shanghai Ratta Smart Technology Co.,Ltd.** and their product SuperNote , Model: **A6 X**, FCC ID: **2AQZ9-A6X**; IC: **24370-A6X** or the EUT (Equipment under Test) as referred to in the rest of this report.

**All measurement and test data in this report was gathered from production sample serial number: RSH200825050-SA-S1(Assigned by BACL, Shenzhen).The EUT supplied by the applicant was received on 2020-09-07.*

Technical Specification

Device Type:	Portable
Exposure Category:	Population / Uncontrolled
Antenna Type(s):	Internal Antenna
Proximity sensor for SAR reduction:	None
Face-Head Accessories:	None
Operation Mode :	WLAN, Bluetooth
Frequency Band:	WLAN (2.4G): 2412-2462 MHz WLAN (5.2G): 5180-5240 MHz WLAN (5.8G): 5745-5825 MHz Bluetooth: 2402 -2480 MHz
Conducted RF Power:	WLAN (2.4G): 11.01 dBm WLAN (5.2G): 19.46 dBm WLAN (5.8G): 18.22 dBm Bluetooth(BDR/EDR): 5.83 dBm Bluetooth LE: 2.62 dBm(1M), 2.97 dBm (2M)
Power Source:	Rechargeable Battery
Normal Operation:	Body Supported

REFERENCE, STANDARDS, AND GUIDELINES

FCC:

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

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

CE:

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

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

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

SAR Limits

FCC&IC Limit(1g Tissue)

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

CE Limit(1g Tissue)

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

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

Occupational/Controlled Environments are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure (i.e. as a result of employment or occupation).

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

FACILITIES

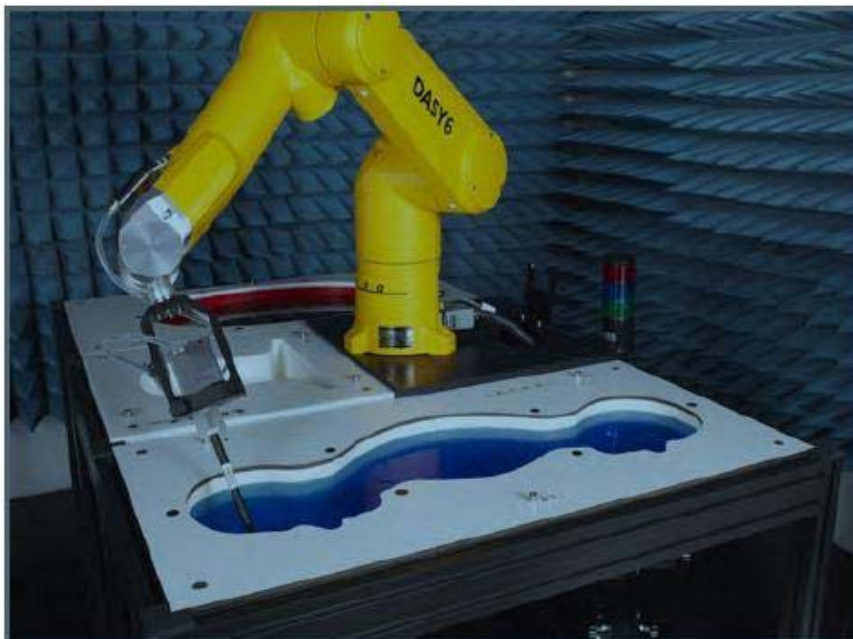
The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect data is located at 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 342867, the FCC Designation No.: CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

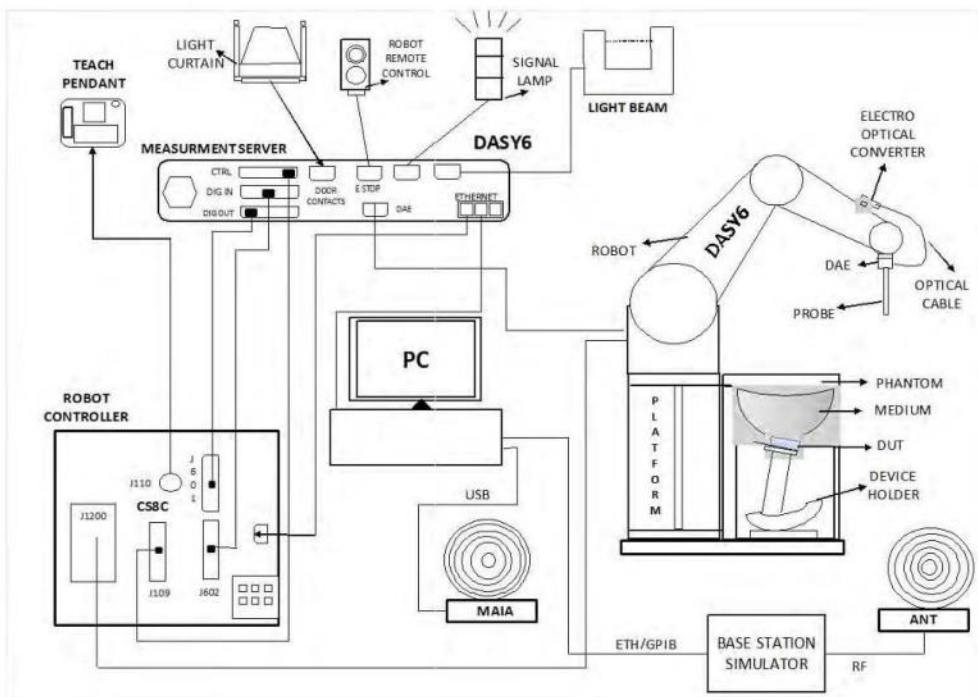
DESCRIPTION OF TEST SYSTEM

These measurements were performed with the automated near-field scanning system DASY6 from Schmid & Partner Engineering AG (SPEAG) which is the Fifth generation of the system shown in the figure hereinafter:



DASY6 System Description

The DASY6 system for performing compliance tests consists of the following items:



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

DASY6 Measurement Server

The DASY6 measurement server is based on a PC/104 CPU board with a 400 MHz Intel ULV Celeron, 128 MB chip-disk and 128 MB RAM. The necessary circuits for communication with the DAE4 (or DAE3) electronics box, as well as the 16-bit AD converter system for optical detection and digital I/O interface are contained on the DASY6 I/O board, which is directly connected to the PC/104 bus of the CPU board.



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

Data Acquisition Electronics

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

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

The input impedance of both the DAE4 as well as of the DAE3 box is 200M Ω ; 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

SAM Twin Phantom

The SAM Twin Phantom (shown in front of DASY6) is a fiberglass shell phantom with shell thickness 2 mm, except in the ear region where the thickness is increased to 6 mm. The phantom has three measurement areas: 1) Left Head, 2) Right Head, and 3) Flat Section. For larger devices, the use of the ELI-Phantom (shown behind DASY6) is required. For devices such as glasses with a wireless link, the Face Down Phantom is the most suitable (between the SAM Twin and ELI phantoms).

When the phantom is mounted inside allocated slot of the DASY6 platform, phantom reference points can be taught directly in the DASY5 V5.2 software. When the DASY6 platform is used to mount the

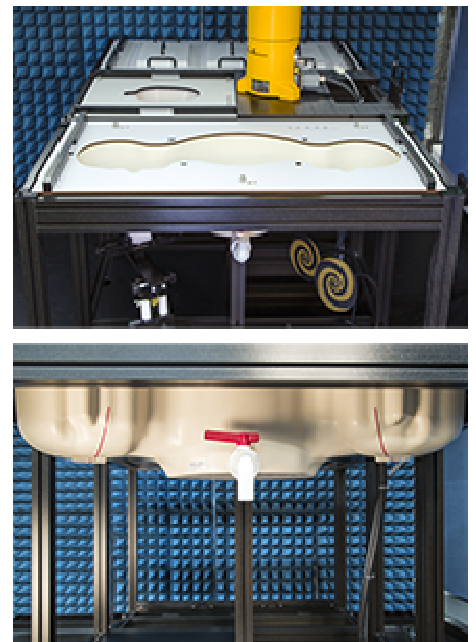
Phantom, some of the phantom teaching points cannot be reached by the robot in DASY5 V5.2. A special tool called P1a-P2aX-Former is provided to transform two of the three points, P1 and P2, to reachable locations. To use these new teaching points, a revised phantom configuration file is required.

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

Sugar-water-based liquids can be left permanently in the phantom. Always cover the liquid when the system is not in use to prevent changes in liquid parameters due to water evaporation.

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

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



ELI Phantom

The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30MHz to 6 GHz. ELI is fully compatible with the latest draft of the standard IEC 62209-2 and the use of all known tissue simulating liquids. ELI has been optimized for performance and can be integrated into a SPEAG standard phantom table. A cover is provided to prevent evaporation of water and changes in liquid parameters. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points.

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

- Sugar-water-based liquids can be left permanently in the phantom. Always cover the liquid when the system is not in use to prevent changes in liquid parameters due to water evaporation.
- DGBE-based liquids should be used with care. As DGBE is a softener for most plastics, the liquid should be taken out of the phantom, and the phantom should be dried when the system is not in use (desirable at least once a week).
- Do not use other organic solvents without previously testing the solvent resistivity of the phantom.

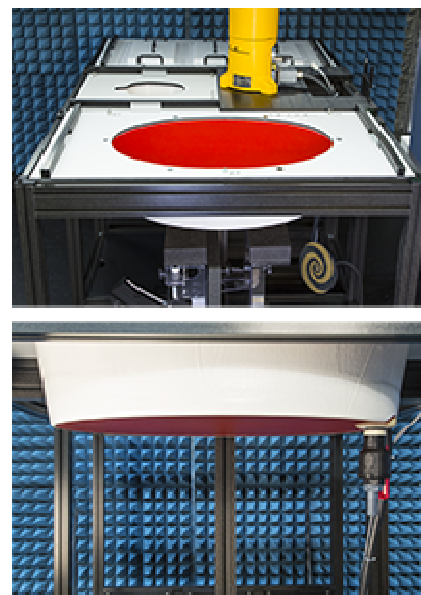
Approximately 25 liters of liquid is required to fill the ELI phantom.

Robots

The DASY6 system uses the high-precision industrial robots TX60L, TX90XL, and RX160L from Staubli SA (France). The TX robot family - the successor of the well-known RX robot family - continues to offer the features important for DASY6 applications:

- High precision (repeatability 0.04mm)
- 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 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 provided



Calibration Frequency Points for EX3DV4 E-Field Probes SN: 7522 Calibrated: 2020/04/01

Calibration Frequency Point(MHz)	Frequency Range(MHz)		Conversion Factor		
	From	To	X	Y	Z
750 Head	650	850	9.92	9.92	9.92
900 Head	850	1000	9.4	9.4	9.4
1750 Head	1650	1850	8.21	8.21	8.21
1900 Head	1850	2000	7.95	7.95	7.95
2300 Head	2200	2400	7.53	7.53	7.53
2450 Head	2400	2550	7.15	7.15	7.15
2600 Head	2550	2700	7.04	7.04	7.04
5200 Head	5090	5250	5.2	5.2	5.2
5300 Head	5250	5410	4.96	4.96	4.96
5600 Head	5490	5700	4.55	4.55	4.55
5800 Head	5700	5910	4.65	4.65	4.65

Area Scans

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

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

Zoom Scan (Cube Scan Averaging)

The averaging zoom scan volume utilized in the DASY5 software is in the shape of a cube and the side dimension of a 1 g or 10 g mass is dependent on the density of the liquid representing the simulated tissue. A density of 1000 kg/m³ is used to represent the head and body tissue density and not the phantom liquid density, in order to be consistent with the definition of the liquid dielectric properties, i.e. the side length of the 1g cube is 10mm, with the side length of the 10g cube is 21.5mm.

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

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

Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEC 62209-1:2016

Recommended Tissue Dielectric properties 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
<i>750</i>	<i>41,9</i>	<i>0,89</i>
835	41,5	0,90
900	41,5	0,97
1 450	40,5	1,20
<i>1 500</i>	<i>40,4</i>	<i>1,23</i>
<i>1 640</i>	<i>40,2</i>	<i>1,31</i>
<i>1 750</i>	<i>40,1</i>	<i>1,37</i>
1 800	40,0	1,40
1 900	40,0	1,40
2 000	40,0	1,40
<i>2 100</i>	<i>39,8</i>	<i>1,49</i>
<i>2 300</i>	<i>39,5</i>	<i>1,67</i>
2 450	39,2	1,80
<i>2 600</i>	<i>39,0</i>	<i>1,96</i>
3 000	38,5	2,40
<i>3 500</i>	<i>37,9</i>	<i>2,91</i>
<i>4 000</i>	<i>37,4</i>	<i>3,43</i>
<i>4 500</i>	<i>36,8</i>	<i>3,94</i>
<i>5 000</i>	<i>36,2</i>	<i>4,45</i>
<i>5 200</i>	<i>36,0</i>	<i>4,66</i>
<i>5 400</i>	<i>35,8</i>	<i>4,86</i>
<i>5 600</i>	<i>35,5</i>	<i>5,07</i>
<i>5 800</i>	<i>35,3</i>	<i>5,27</i>
6 000	35,1	5,48

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

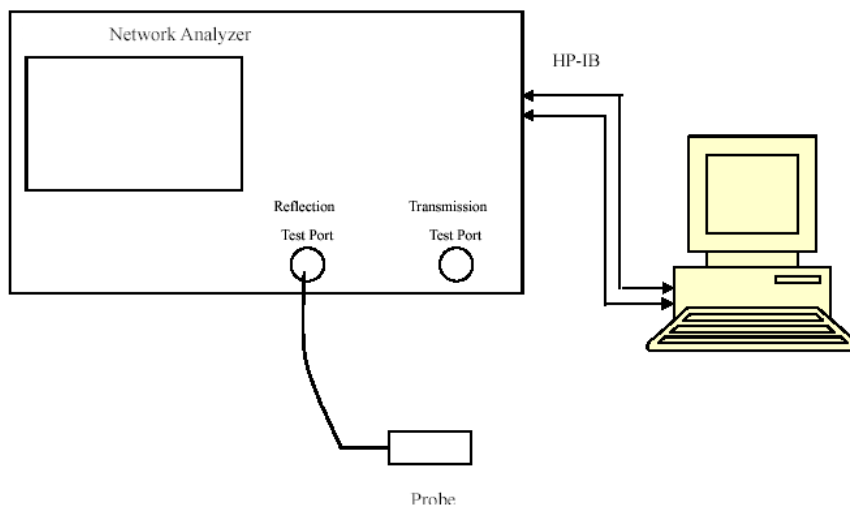
EQUIPMENT LIST AND CALIBRATION

Equipments List & Calibration Information

Equipment	Model	S/N	Calibration Date	Calibration Due Date
DASY5 Test Software	DASY52 52.10.2	N/A	NCR	NCR
DASY6 Measurement Server	DASY6 6.0.31	N/A	NCR	NCR
Data Acquisition Electronics	DAE4	1562	2020/03/03	2021/03/02
E-Field Probe	EX3DV4	7522	2020/04/01	2021/03/31
Mounting Device	MD4HHTV5	SD 000 H01 KA	NCR	NCR
SAM Twin Phantom	SAM-Twin V8.0	1962	NCR	NCR
Dipole, 2450MHz	D2450V2	751	2017/10/12	2020/10/12
Dipole, 5GHz	D5GHzV2	1301	2020/1/10	2023/1/9
Tissue Liquid Head	HBBL600-10000V6	180622-2	Each Time	
Network Analyzer	8753D	3410A08288	2020/7/31	2021/7/30
Dielectric Assessment Kit	DAK-3.5	1248	NCR	NCR
MXG Analog Signal Generator	N5181A	MY48180408	2020/7/31	2021/7/30
USB wideband power sensor	U2021XA	MY54250003	2020/7/31	2021/7/30
Power Amplifier	5S1G4	71377	NCR	NCR
Amplifier	ZVE-8G+	558401902	NCR	NCR
Directional Coupler	Oct-42	3307	NCR	NCR
Attenuator	6dB	773-6	NCR	NCR

SAR MEASUREMENT SYSTEM VERIFICATION

Liquid Verification



Liquid Verification Setup Block Diagram

Liquid Verification Results

Frequency (MHz)	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		ϵ_r	σ (S/m)	ϵ_r	σ (S/m)	$\Delta\epsilon_r$	$\Delta\sigma$	
2402	Head	40.359	1.725	39.30	1.76	2.69	-1.99	±5
2412	Head	40.253	1.738	39.28	1.77	2.48	-1.81	±5
2437	Head	40.011	1.766	39.23	1.79	1.99	-1.34	±5
2441	Head	40.162	1.794	39.22	1.79	2.4	0.22	±5
2450	Head	40.151	1.797	39.20	1.80	2.43	-0.17	±5
2462	Head	40.578	1.812	39.18	1.81	3.57	0.11	±5
2480	Head	40.396	1.826	39.16	1.83	3.16	-0.22	±5

*Liquid Verification above was performed on 2020/09/14.

Frequency (MHz)	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		ϵ_r	σ (S/m)	ϵ_r	σ (S/m)	$\Delta\epsilon_r$	$\Delta\sigma$	
5180	Head	36.861	4.484	36.02	4.64	2.33	-3.36	±5
5200	Head	36.552	4.569	36.00	4.66	1.53	-1.95	±5
5240	Head	36.648	4.602	35.96	4.70	1.91	-2.09	±5
5250	Head	36.796	4.608	35.95	4.71	2.35	-2.17	±5

*Liquid Verification above was performed on 2020/09/14.

Frequency (MHz)	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		ϵ_r	σ (S/m)	ϵ_r	σ (S/m)	$\Delta\epsilon_r$	$\Delta\sigma$	
5745	Head	35.663	5.068	35.28	5.22	1.09	-2.91	± 5
5785	Head	35.525	5.165	35.22	5.26	0.87	-1.81	± 5
5800	Head	35.291	5.183	35.30	5.27	-0.03	-1.65	± 5
5825	Head	35.442	5.235	35.28	5.30	0.46	-1.23	± 5

*Liquid Verification above was performed on 2020/09/14.

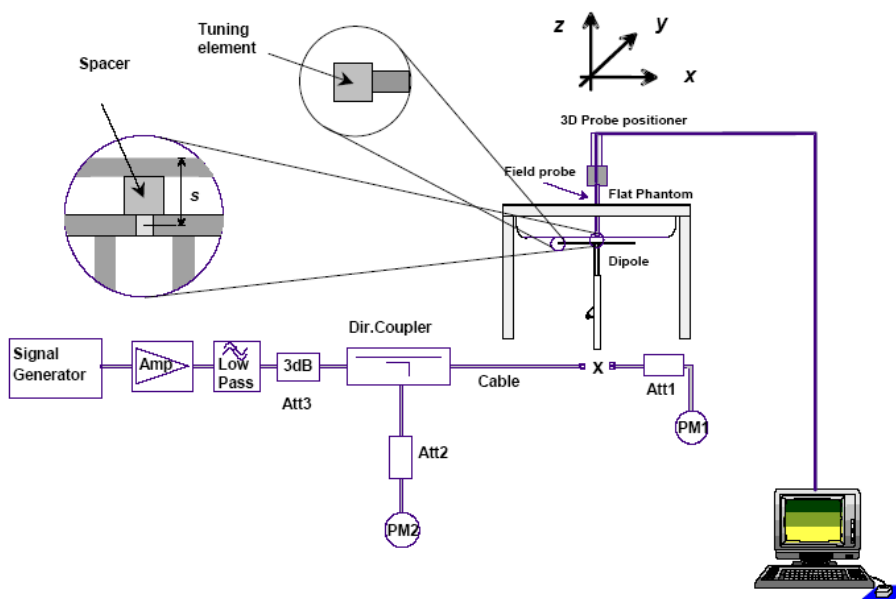
System Accuracy Verification

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

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

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

System Verification Setup Block Diagram



System Accuracy Check Results

Date	Frequency Band (MHz)	Liquid Type	Input Power (mW)	Measured SAR (W/kg)	Normalized to 1W (W/kg)	Target Value (W/Kg)	Delta (%)	Tolerance (%)
2020/09/14	2450	Head	100	1g 5.39	53.9	52.5	2.667	± 10
2020/09/14	5250	Head	250	1g 20.5	82.0	80.7	1.611	± 10
2020/09/14	5800	Head	250	1g 20.4	81.6	80.2	1.746	± 10

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

SAR SYSTEM VALIDATION DATA

System Performance 2450 MHz Head

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

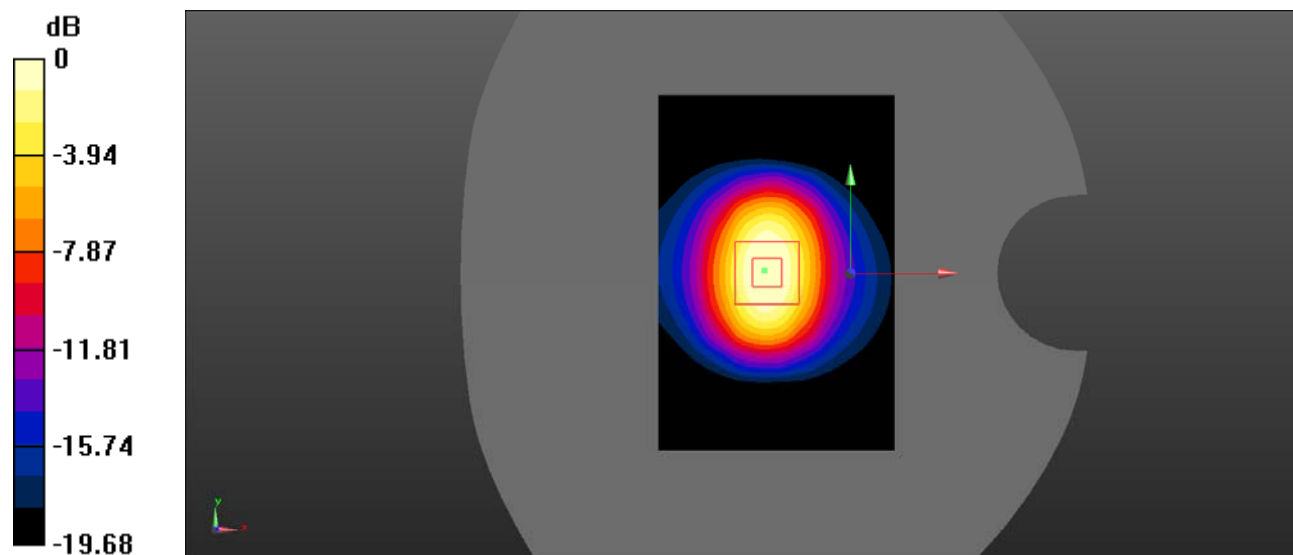
Communication System: UID 0, CW (0); Frequency: 2450 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 2450 \text{ MHz}$; $\sigma = 1.797 \text{ S/m}$; $\epsilon_r = 40.151$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(7.15, 7.15, 7.15) @ 2450 MHz;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1562; Calibrated: 3/3/2020
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Head 2450MHz Pin=100mW/Area Scan (81x121x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$
 Maximum value of SAR (interpolated) = 6.17 W/kg

Head 2450MHz Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$
 Reference Value = 50.59 V/m; Power Drift = -0.01 dB
 Peak SAR (extrapolated) = 10.9 W/kg
SAR(1 g) = 5.39 W/kg; SAR(10 g) = 2.58 W/kg
 Maximum value of SAR (measured) = 6.13 W/kg



0 dB = 6.13 W/kg = 7.87 dBW/kg

System Performance 5250 MHz Head

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: 1301

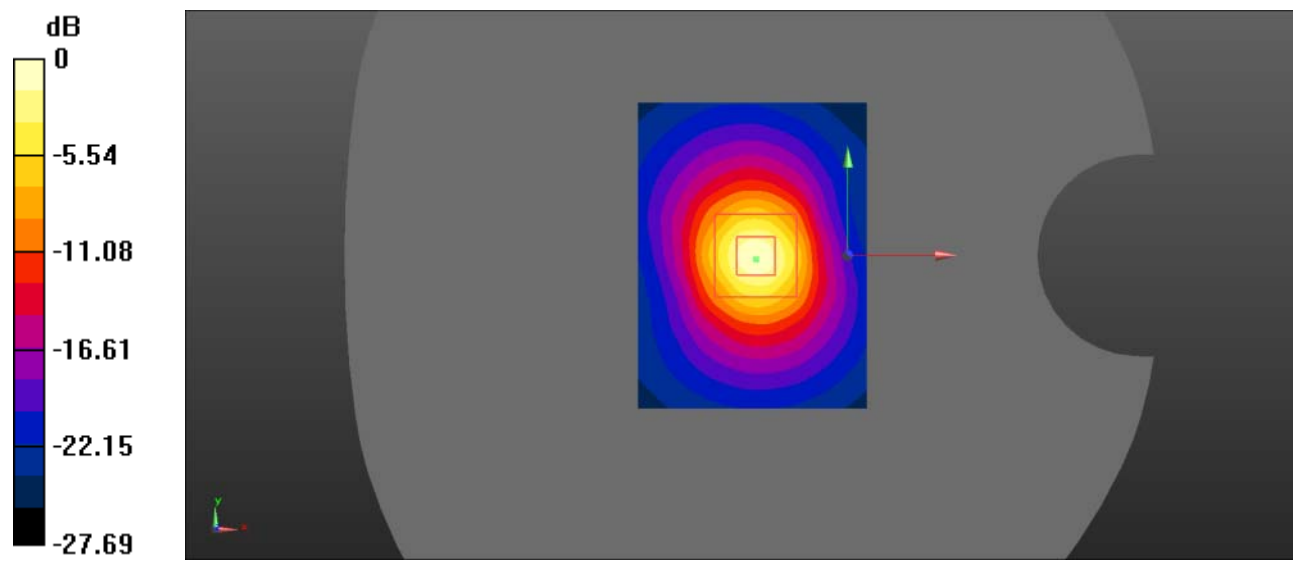
Communication System: UID 0, CW (0); Frequency: 5250 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 5250 \text{ MHz}$; $\sigma = 4.608 \text{ S/m}$; $\epsilon_r = 36.796$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 – SN7522; ConvF(5.2, 5.2, 5.2) @ 5250 MHz;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1562; Calibrated: 3/3/2020
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Head 5250MHz Pin=250mW/Area Scan (61x61x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$
 Maximum value of SAR (interpolated) = 51.7 W/kg

Head 5250MHz Pin=250mW/Zoom Scan (8x8x15)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=4\text{mm}$
 Reference Value = 75.64 V/m; Power Drift = -0.02 dB
 Peak SAR (extrapolated) = 77.8 W/kg
SAR(1 g) = 20.5 W/kg; SAR(10 g) = 5.68 W/kg
 Maximum value of SAR (measured) = 47.7 W/kg



0 dB = 47.7 W/kg = 16.79 dBW/kg

System Performance 5800 MHz Head

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: 1301

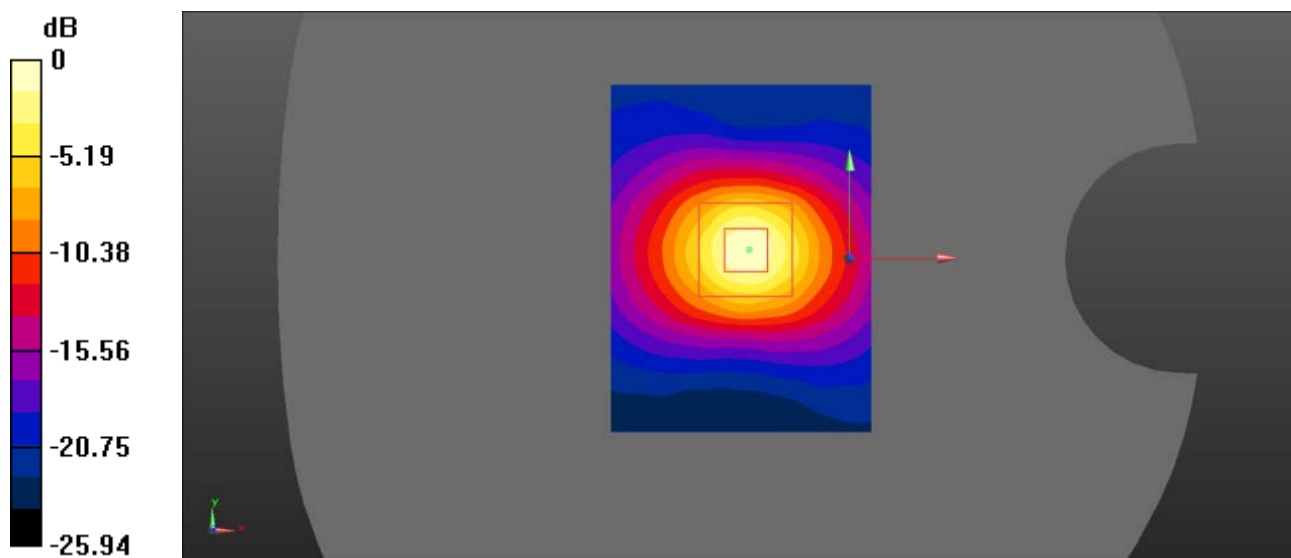
Communication System: UID 0, CW (0); Frequency: 5800 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 5800 \text{ MHz}$; $\sigma = 5.183 \text{ S/m}$; $\epsilon_r = 35.291$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(4.65, 4.65, 4.65) @ 5800 MHz;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1562; Calibrated: 3/3/2020
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Head 5800MHz Pin=250mW/Area Scan (61x61x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$
 Maximum value of SAR (interpolated) = 50.9 W/kg

Head 5800MHz Pin=250mW/Zoom Scan (8x8x15)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=4\text{mm}$
 Reference Value = 75.16 V/m; Power Drift = -0.01 dB
 Peak SAR (extrapolated) = 77.2 W/kg
SAR(1 g) = 20.4 W/kg; SAR(10 g) = 5.63 W/kg
 Maximum value of SAR (measured) = 47.1 W/kg



0 dB = 47.1 W/kg = 16.73 dBW/kg

EUT TEST STRATEGY AND METHODOLOGY

Test positions for body-worn and other configurations

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

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

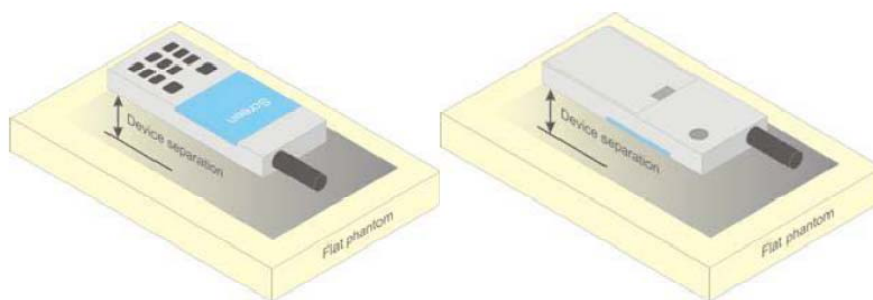


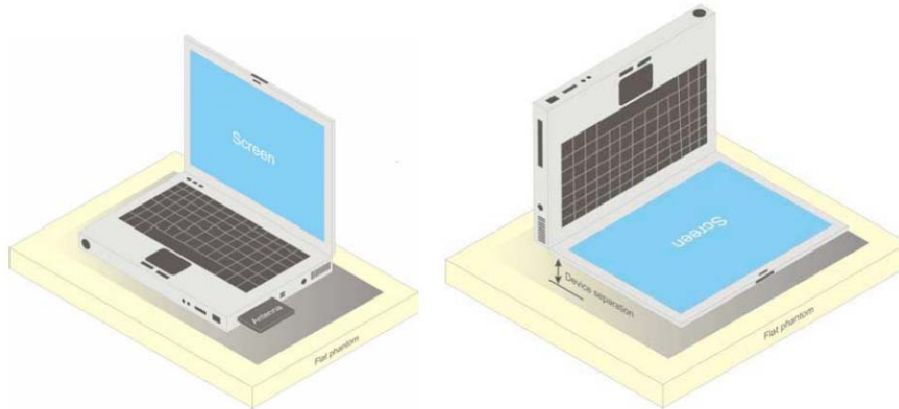
Figure 5 – Test positions for body-worn devices

Test positions for Body-supported device

A typical example of a body supported device is a wireless enabled laptop device that among other orientations may be supported on the thighs of a sitting user. To represent this orientation, 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 the intended use is not specified, the device shall be tested directly against the flat phantom in all usable orientations.

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

Other devices that fall into this category include tablet type portable computers and credit card transaction authorisation terminals, point-of-sale and/or inventory terminals. Where these devices may be torso or limb-supported, the same principles for body-supported devices are applied.



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

Test Distance for SAR Evaluation

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

SAR Evaluation Procedure

The evaluation was performed with the following procedure:

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

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

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

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

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

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

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

CONDUCTED OUTPUT POWER MEASUREMENT

Provision Applicable

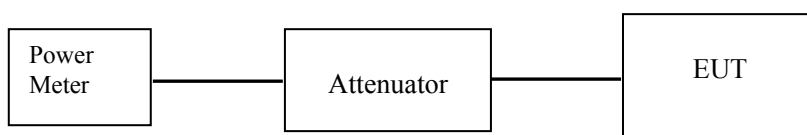
The measured peak output power should be greater and within 5% than EMI measurement.

EUT Exercise Software

The maximum peak conducted output power may be measured using a broadband peak RF power meter.

The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast-responding diode detector.

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.



Maximum Target Output Power

Max Target Power(dBm)			
Mode/Band	Channel		
	Low	Middle	High
WLAN 2.4G	11.3	11.3	11.3
WLAN 5.2G	19.8	19.8	19.8
WLAN 5.8G	18.6	18.6	18.6
Bluetooth BDR/EDR	6.0	6.0	6.0
Bluetooth BLE(1M)	3.0	3.0	3.0
Bluetooth BLE(2M)	3.3	3.3	3.3

Test Results:**WLAN 2.4G:**

Mode	Channel frequency (MHz)	Data Rate	RF Output Power(dBm)
802.11b	2412	1Mbps	10.97
	2437		11.01
	2462		10.78
802.11g	2412	6Mbps	10.07
	2437		10.34
	2462		10.51
802.11n HT20	2412	MCS0	9.24
	2437		9.70
	2462		10.18

WLAN 5.2G:

Mode	Channel frequency (MHz)	Data Rate	RF Output Power(dBm)
802.11a	5180	1Mbps	19.46
	5200		19.30
	5240		18.97
802.11n20	5180	6Mbps	18.93
	5200		18.98
	5240		18.73
802.11n40	5190	MCS0	19.02
	5230		19.06
802.11ac20	5180	MCS0	19.00
	5200		18.91
	5240		18.71
802.11ac40	5190	MCS0	19.20
	5230		19.24
802.11ac80	5210	MCS0	19.20

WLAN 5.8G:

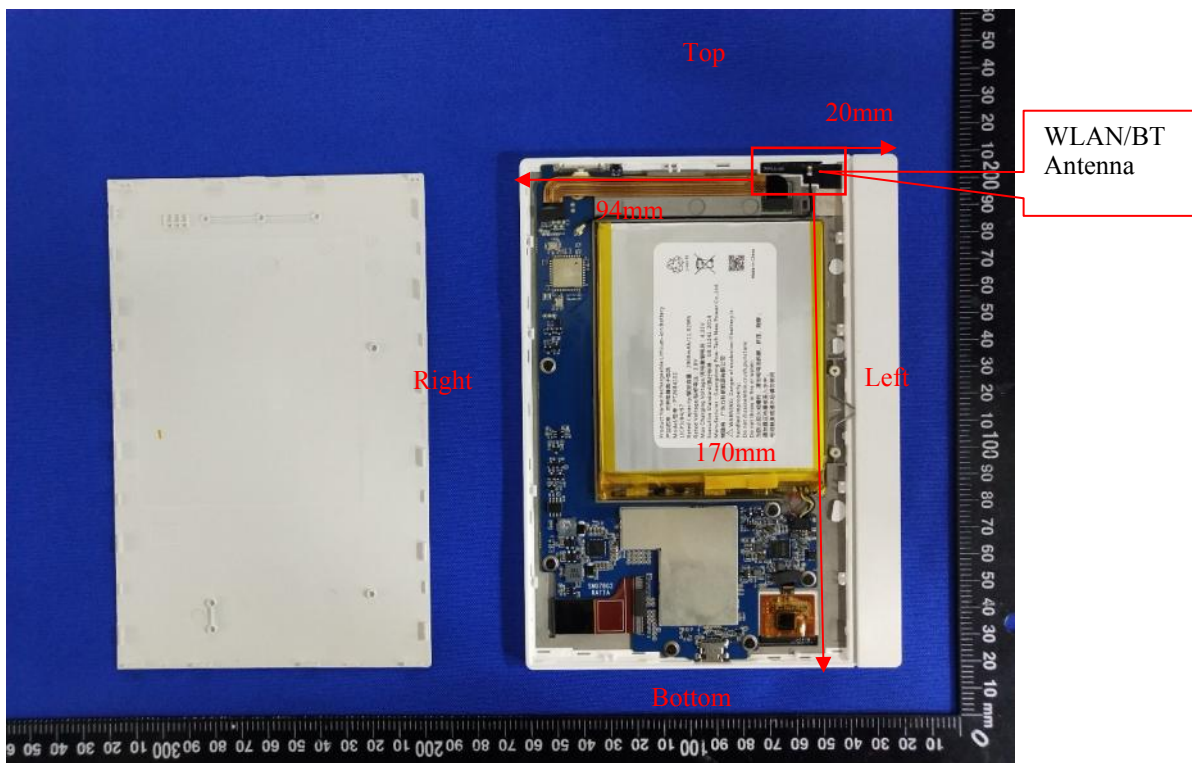
Mode	Channel frequency (MHz)	Data Rate	RF Output Power(dBm)
802.11a	5745	1Mbps	18.22
	5785		17.85
	5825		17.81
802.11n20	5745	6Mbps	17.90
	5785		17.21
	5825		16.45
802.11n40	5755	MCS0	17.85
	5795		18.00
802.11ac20	5745	MCS0	17.80
	5785		17.24
	5825		16.78
802.11ac40	5755	MCS0	18.20
	5795		17.49
802.11ac80	5775	MCS0	17.67

Bluetooth:

Mode	Channel frequency (MHz)	RF Output Power (dBm)
BDR(GFSK)	2402	5.83
	2441	5.70
	2480	5.81
EDR($\pi/4$ -DQPSK)	2402	4.50
	2441	4.27
	2480	4.09
EDR(8-DPSK)	2402	4.84
	2441	4.67
	2480	4.33
Bluetooth LE(1M)	2402	2.62
	2440	2.34
	2480	1.42
Bluetooth LE(2M)	2402	2.97
	2440	2.40
	2480	0.85

Standalone SAR test exclusion considerations

Antennas Location:



Antenna Distance To Edge

Antenna Distance To Edge(mm)					
Antenna	Back	Left	Right	Top	Bottom
Antenna (Wi-Fi & BT)	<5	20	94	<5	170

Output power level shall be the higher of the maximum conducted or equivalent isotropically radiated power (e.i.r.p.) source-based, time-averaged output power. For controlled use devices where the 8 W/kg for 1 gram of tissue applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 5. For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 2.5. If the operating frequency of the device is between two frequencies located in Table 1, linear interpolation shall be applied for the applicable separation distance. For test separation distance less than 5 mm, the exemption limits for a separation distance of 5 mm can be applied to determine if a routine evaluation is required.

Table 1: SAR evaluation – Exemption limits for routine evaluation based on frequency and separation distance^{4,5}

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of 30 mm	At separation distance of 35 mm	At separation distance of 40 mm	At separation distance of 45 mm	At separation distance of ≥50 mm
≤300	223 mW	254 mW	284 mW	315 mW	345 mW
450	141 mW	159 mW	177 mW	195 mW	213 mW
835	80 mW	92 mW	105 mW	117 mW	130 mW
1900	99 mW	153 mW	225 mW	316 mW	431 mW
2450	83 mW	123 mW	173 mW	235 mW	309 mW
3500	86 mW	124 mW	170 mW	225 mW	290 mW
5800	56 mW	71 mW	85 mW	97 mW	106 mW

Position	Distance (mm)	Mode	Frequency (MHz)	Max P _{avg} (dBm) ⁺ Gain(dBi)	Max P _{avg} (mW)	Test exclusion Threshold (mW)	SAR Test Exclusion
Back/Top	0	WLAN 2.4G	2462	11.86	15.346	3.98	No
		WLAN 5.2G	5240	19.8	95.499	1.24	No
		WLAN 5.8G	5785	18.6	72.444	1	No
		Bluetooth BDR/EDR	2480	6.56	4.529	3.94	No
Left	20	WLAN 2.4G	2462	11.86	15.346	30.02	Yes
		WLAN 5.2G	5240	19.8	95.499	28.22	No
		WLAN 5.8G	5785	18.6	72.444	26.84	No
		Bluetooth BDR/EDR	2480	6.56	4.529	30.06	Yes
Right	94	WLAN 2.4G	2462	11.86	15.346	308.78	Yes
		WLAN 5.2G	5240	19.8	95.499	150.8	
		WLAN 5.8G	5785	18.6	72.444	107.2	
		Bluetooth BDR/EDR	2480	6.56	4.529	308.46	
Bottom	170	WLAN 2.4G	2462	11.86	15.346	308.78	Yes
		WLAN 5.2G	5240	19.8	95.499	150.8	
		WLAN 5.8G	5785	18.6	72.444	107.2	
		Bluetooth BDR/EDR	2480	6.56	4.529	308.46	

SAR MEASUREMENT RESULTS

This page summarizes the results of the performed dosimetric evaluation.

SAR Test Data

Environmental Conditions

Temperature:	22.1-23.5 °C
Relative Humidity:	48-52%
ATM Pressure:	101.3 kPa
Test Date:	2020/09/14

Testing was performed by Seven Liang, Ricardo Lan.

WLAN 2.4G:

EUT Position	Frequency (MHz)	Test Mode	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/kg)				
					Scaled Factor	Meas. SAR	Scaled SAR	Correct SAR	Plot
Body Back (0mm)	2412	802.11b	10.97	11.3	1.079	0.599	0.65	0.65	1#
	2437	802.11b	11.01	11.3	1.069	0.75	0.80	0.80	2#
	2462	802.11b	10.78	11.3	1.127	0.837	0.94	0.94	3#
Body Top (0mm)	2412	802.11b	/	/	/	/	/	/	/
	2437	802.11b	11.01	11.3	1.069	0.037	0.04	0.04	4#
	2462	802.11b	/	/	/	/	/	/	/
Body Left (0mm)	2412	802.11b	/	/	/	/	/	/	/
	2437	802.11b	11.01	11.3	1.069	0.111	0.12	0.12	5#
	2462	802.11b	/	/	/	/	/	/	/

WLAN 5.2G:

EUT Position	Frequency (MHz)	Test Mode	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/kg)				
					Scaled Factor	Meas. SAR	Scaled SAR	Correct SAR	Plot
Body Back (0mm)	5180	802.11a	19.46	19.8	1.081	1.04	1.12	1.12	6#
	5200	802.11a	19.30	19.8	1.122	1.06	1.19	1.19	7#
	5240	802.11a	18.97	19.8	1.211	1.04	1.26	1.26	8#
Body Top (0mm)	5180	802.11a	19.46	19.8	1.081	1.1	1.19	1.19	9#
	5200	802.11a	19.30	19.8	1.122	0.99	1.11	1.11	10#
	5240	802.11a	18.97	19.8	1.211	1.09	1.32	1.32	11#
Body Left (0mm)	5180	802.11a	/	/	/	/	/	/	/
	5200	802.11a	19.30	19.8	1.122	0.126	0.14	0.14	12#
	5240	802.11a	/	/	/	/	/	/	/

WLAN 5.8G:

EUT Position	Frequency (MHz)	Test Mode	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/kg)				
					Scaled Factor	Meas. SAR	Scaled SAR	Correct SAR	Plot
Body Back (0mm)	5745	802.11a	18.22	18.6	1.091	1.01	1.10	1.10	13#
	5785	802.11a	17.85	18.6	1.189	1.08	1.28	1.28	14#
	5825	802.11a	17.81	18.6	1.199	0.955	1.15	1.15	15#
Body Top (0mm)	5745	802.11a	18.22	18.6	1.091	0.785	0.86	0.86	16#
	5785	802.11a	17.85	18.6	1.189	0.807	0.96	0.96	17#
	5825	802.11a	17.81	18.6	1.199	0.677	0.81	0.81	18#
Body Left (0mm)	5745	802.11a	/	/	/	/	/	/	/
	5785	802.11a	17.85	18.6	1.189	0.168	0.20	0.20	19#
	5825	802.11a	/	/	/	/	/	/	/

Note:

1. When the 1-g SAR is ≤ 0.8 W/Kg, testing for other channels are optional.
2. When the highest *reported* SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, OFDM SAR is not required.
3. 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.

Bluetooth:

EUT Position	Frequency (MHz)	Test Mode	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/kg)				
					Scaled Factor	Meas. SAR	Scaled SAR	Correct SAR	Plot
Body Back (0mm)	2402	GFSK	5.83	6.0	1.040	0.060	0.06	0.06	20#
	2441	GFSK	5.70	6.0	1.072	0.075	0.08	0.08	21#
	2480	GFSK	5.81	6.0	1.045	0.070	0.07	0.07	22#
Body Top (0mm)	2402	GFSK	/	/	/	/	/	/	/
	2441	GFSK	5.70	6.0	1.072	<0.01	0.01	0.01	/
	2480	GFSK	/	/	/	/	/	/	/

Corrected SAR Evaluation

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

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

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

where

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

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

The values of c_ϵ and c_σ have a simple relationship with frequency that can be described using polynomial equations. For the 1 g averaged SAR c_ϵ and c_σ are given by

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

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

where

f is the frequency in GHz.

For the 10 g averaged SAR, the variables c_ϵ and c_σ are given by:

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

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

Calibrate Date	Liquid Type	Frequency (MHz)	C_{ε}	$\Delta\varepsilon_r$	C_{δ}	Δ_{δ}	ΔSAR
2020/09/14	Head	2402	-0.225	2.69	0.491	-1.99	-1.582
		2412	-0.225	2.48	0.489	-1.81	-1.443
		2437	-0.225	1.99	0.483	-1.34	-1.095
		2441	-0.225	2.4	0.482	0.22	-0.434
		2450	-0.225	2.43	0.480	-0.17	-0.628
		2462	-0.225	3.57	0.478	0.11	-0.751
		2482	-0.225	3.16	0.473	-0.22	-0.815
		5180	-0.202	2.33	-0.024	-3.36	-0.39
		5200	-0.201	1.53	-0.026	-1.95	-0.257
		5240	-0.201	1.91	-0.028	-2.09	-0.325
		5250	-0.201	2.35	-0.029	-2.17	-0.409
		5745	-0.199	1.09	-0.045	-2.91	-0.086
		5785	-0.199	0.87	-0.045	-1.81	-0.092
		5800	-0.199	-0.03	-0.045	-1.65	0.08
		5825	-0.199	0.46	-0.044	-1.23	-0.037

SAR Measurement Variability

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

- 1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
- 2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
- 3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 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 MHz (2400-2550MHz)	WLAN 2.4G	2462	Body Back	0.837	0.831	1.0
5250 MHz (5090-5250 MHz)	WLAN 5.2G	5200	Body Back	1.06	1.06	1.0
5250 MHz (5090-5250 MHz)	WLAN 5.2G	5240	Body Top	1.1	1.12	0.98
5800 MHz (5700-5910 MHz)	WLAN 5.8G	5785	Body Back	1.08	1.01	1.06
5800 MHz (5700-5910 MHz)	WLAN 5.8G	5785	Body Top	0.807	0.801	1.0

Note:

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

SAR SIMULTANEOUS TRANSMISSION DESCRIPTION

Simultaneous Transmission:

Description of Simultaneous Transmit Capabilities	
Transmitter Combination	Simultaneous?
Wi-Fi+ Bluetooth	×

Note: WLAN and Bluetooth transmit with a same antenna

SAR Plots

Plot 1#

DUT: SuperNote; Type: A6 X; Serial: RSH200825050-SA-S1

Communication System: UID 0, 2.4G DTS (0); Frequency: 2412 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 2412 \text{ MHz}$; $\sigma = 1.738 \text{ S/m}$; $\epsilon_r = 40.253$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(7.15, 7.15, 7.15) @ 2412 MHz;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1562; Calibrated: 3/3/2020
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Body Back/WLAN 802.11b Low/Area Scan (101x101x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$

Maximum value of SAR (interpolated) = 0.735 W/kg

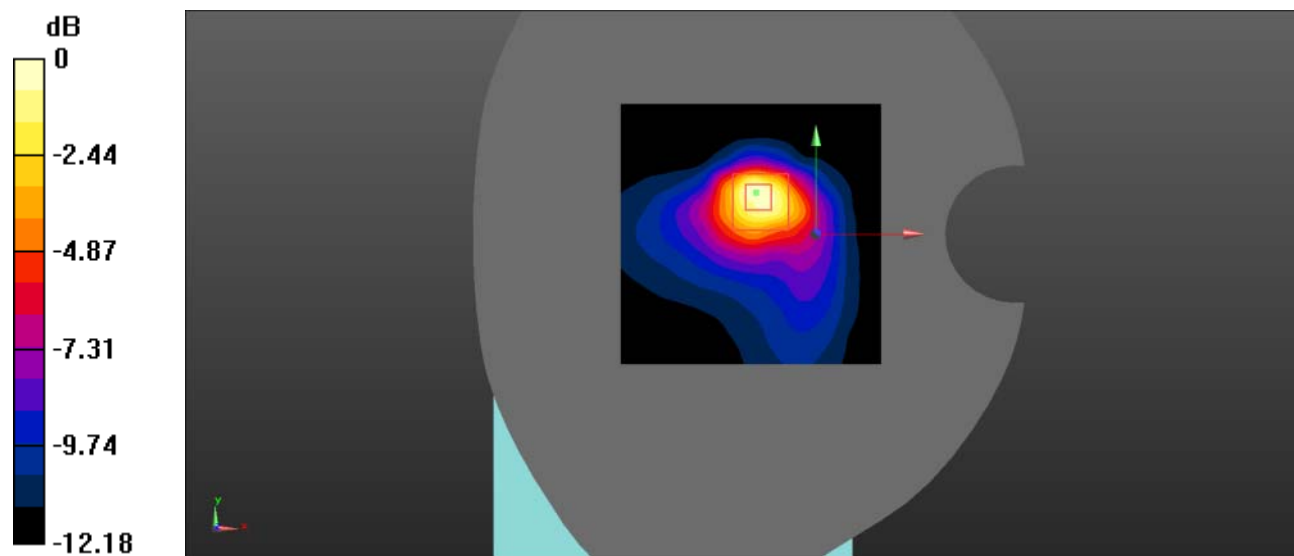
Body Back/WLAN 802.11b Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 12.04 V/m ; Power Drift = 0.15 dB

Peak SAR (extrapolated) = 1.47 W/kg

SAR(1 g) = 0.599 W/kg ; SAR(10 g) = 0.259 W/kg

Maximum value of SAR (measured) = 0.679 W/kg



0 dB = $0.679 \text{ W/kg} = -1.68 \text{ dBW/kg}$

Plot 2#

DUT: SuperNote; Type: A6 X; Serial: RSH200825050-SA-S1

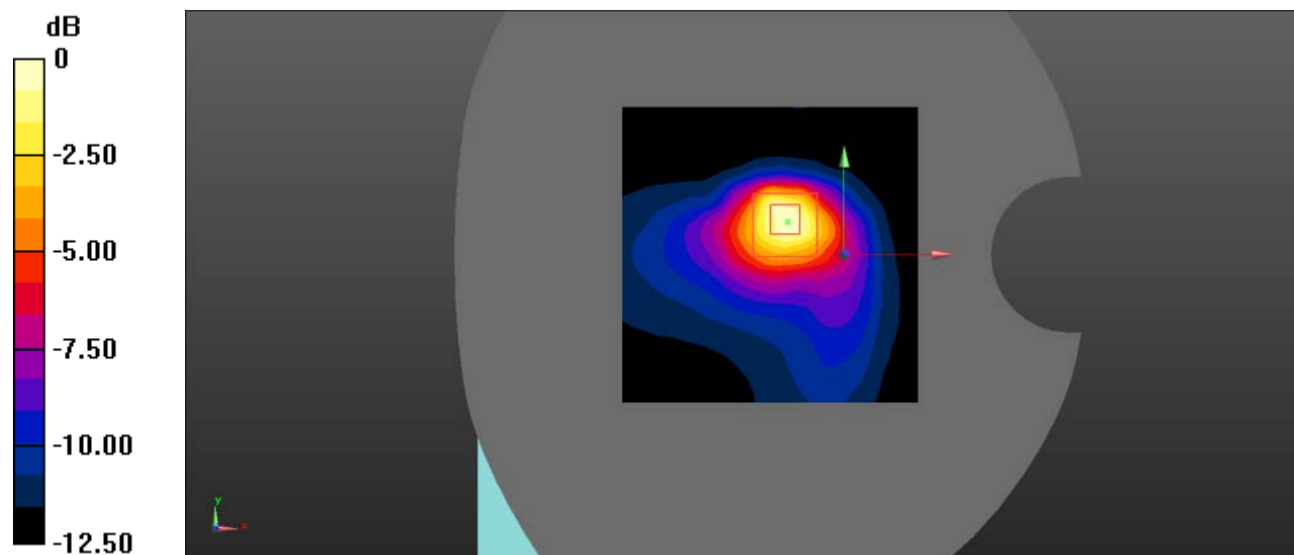
Communication System: UID 0, 2.4G DTS (0); Frequency: 2437 MHz; Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 2437 \text{ MHz}$; $\sigma = 1.766 \text{ S/m}$; $\epsilon_r = 40.011$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(7.15, 7.15, 7.15) @ 2437 MHz;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1562; Calibrated: 3/3/2020
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Body Back/WLAN 802.11b Mid/Area Scan (101x101x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$
 Maximum value of SAR (interpolated) = 0.863 W/kg

Body Back/WLAN 802.11b Mid/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$
 Reference Value = 14.35 V/m; Power Drift = 0.04 dB
 Peak SAR (extrapolated) = 1.90 W/kg
SAR(1 g) = 0.750 W/kg; SAR(10 g) = 0.322 W/kg
 Maximum value of SAR (measured) = 0.859 W/kg



$0 \text{ dB} = 0.859 \text{ W/kg} = -0.66 \text{ dBW/kg}$

Plot 3#

DUT: SuperNote; Type: A6 X; Serial: RSH200825050-SA-S1

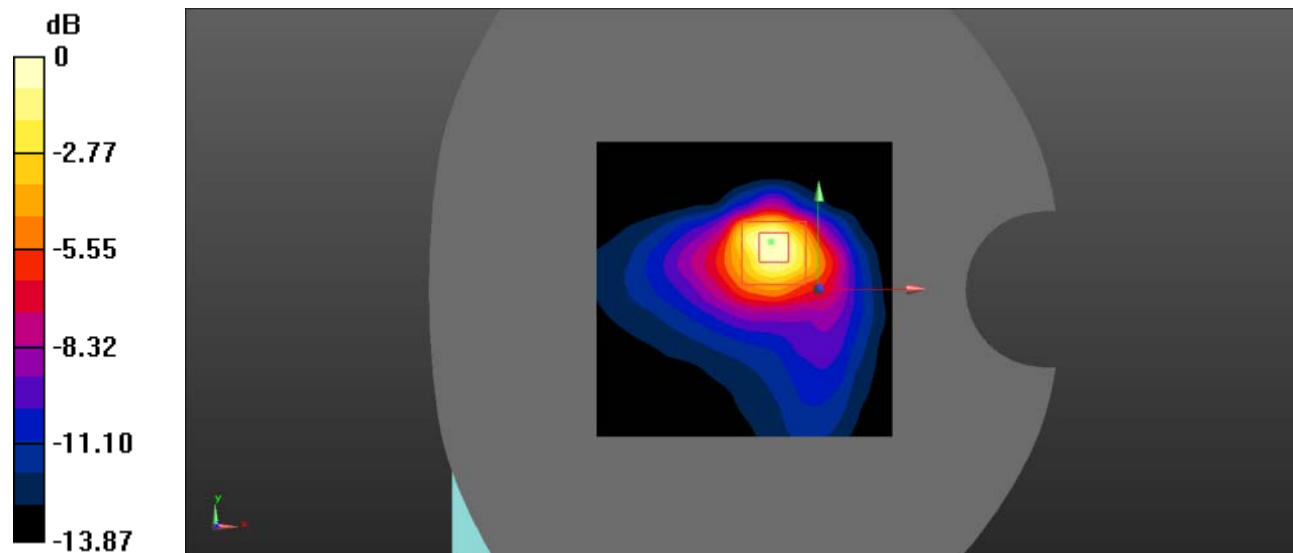
Communication System: UID 0, 2.4G DTS (0); Frequency: 2462 MHz; Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 2462 \text{ MHz}$; $\sigma = 1.812 \text{ S/m}$; $\epsilon_r = 40.578$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(7.15, 7.15, 7.15) @ 2462 MHz;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1562; Calibrated: 3/3/2020
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Body Back/WLAN 802.11b High/Area Scan (101x101x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$
 Maximum value of SAR (interpolated) = 1.03 W/kg

Body Back/WLAN 802.11b High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$
 Reference Value = 12.42 V/m; Power Drift = 0.05 dB
 Peak SAR (extrapolated) = 2.10 W/kg
SAR(1 g) = 0.837 W/kg; SAR(10 g) = 0.352 W/kg
 Maximum value of SAR (measured) = 0.962 W/kg



0 dB = 0.962 W/kg = -0.17 dBW/kg

Plot 4#

DUT: SuperNote; Type: A6 X; Serial: RSH200825050-SA-S1

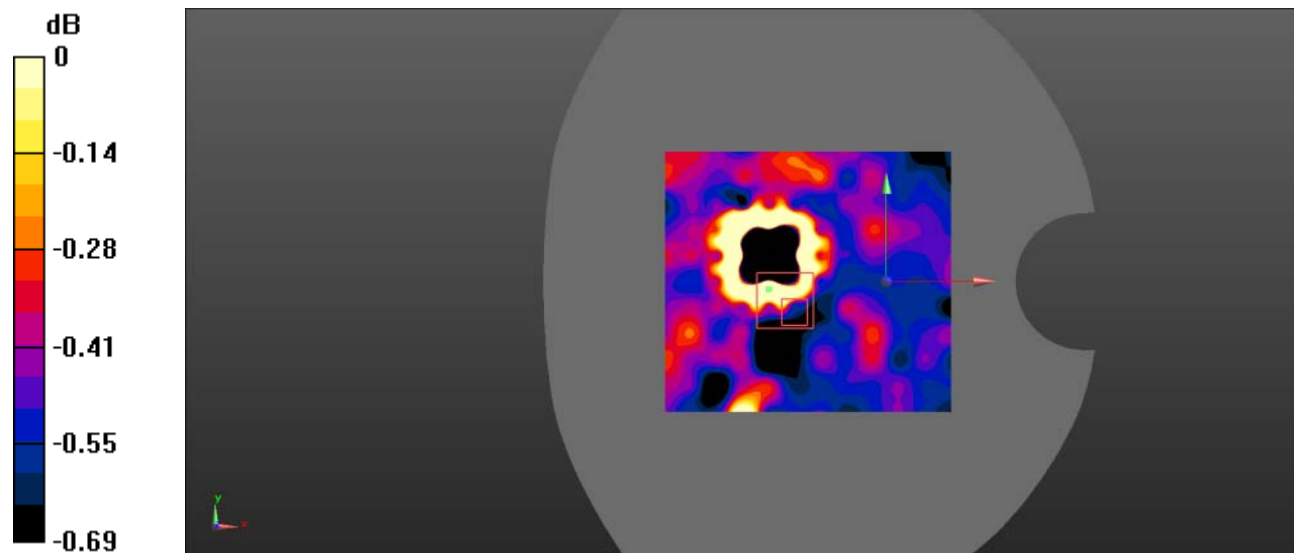
Communication System: UID 0, 2.4G DTS (0); Frequency: 2437MHz;Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 2437 \text{ MHz}$; $\sigma = 1.766 \text{ S/m}$; $\epsilon_r = 40.011$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(7.15, 7.15, 7.15) @ 2442 MHz;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1562; Calibrated: 3/3/2020
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Body Top/WLAN 802.11b Mid/Area Scan (111x101x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$
 Maximum value of SAR (interpolated) = 0.0562 W/kg

Body Top/WLAN 802.11b Mid/Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$
 Reference Value = 4.168 V/m; Power Drift = 0.08 dB
 Peak SAR (extrapolated) = 0.0420 W/kg
SAR(1 g) = 0.037 W/kg; SAR(10 g) = 0.037 W/kg
 Maximum value of SAR (measured) = 0.0397 W/kg



0 dB = 0.0397 W/kg = -14.01 dBW/kg

Plot 5#

DUT: SuperNote; Type: A6 X; Serial: RSH200825050-SA-S1

Communication System: UID 0, 2.4G DTS (0); Frequency: 2437MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 2437 \text{ MHz}$; $\sigma = 1.766 \text{ S/m}$; $\epsilon_r = 40.011$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(7.15, 7.15, 7.15) @ 2442 MHz;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1562; Calibrated: 3/3/2020
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Body Left/WLAN 802.11b Mid/Area Scan (101x101x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$

Maximum value of SAR (interpolated) = 0.115 W/kg

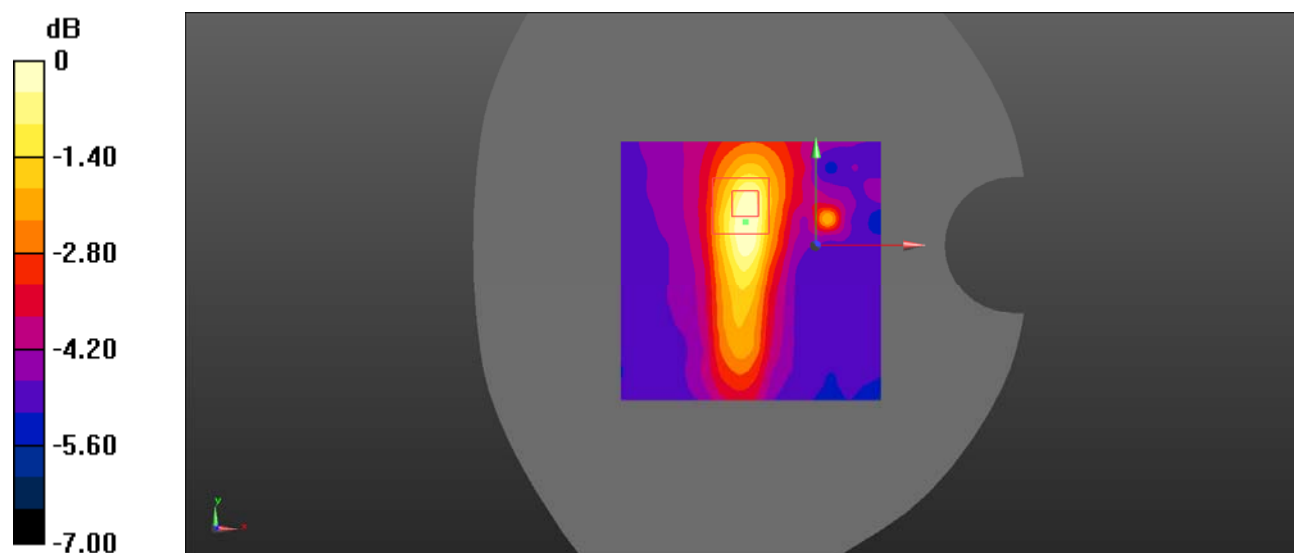
Body Left/WLAN 802.11b Mid/Zoom Scan (7x8x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 7.891 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 0.487 W/kg

SAR(1 g) = 0.111 W/kg; SAR(10 g) = 0.033 W/kg

Maximum value of SAR (measured) = 0.113 W/kg



0 dB = 0.113 W/kg = -9.47 dBW/kg

Plot 6#

DUT: SuperNote; Type: A6 X; Serial: RSH200825050-SA-S1

Communication System: UID 0, 5.2G WiFi (0); Frequency: 5180 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 5180 \text{ MHz}$; $\sigma = 4.484 \text{ S/m}$; $\epsilon_r = 36.861$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(5.2, 5.2, 5.2) @ 5180 MHz;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1562; Calibrated: 3/3/2020
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Body Back/WLAN 5.2G 802.11a Low/Area Scan (101x101x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$

Maximum value of SAR (interpolated) = 2.10 W/kg

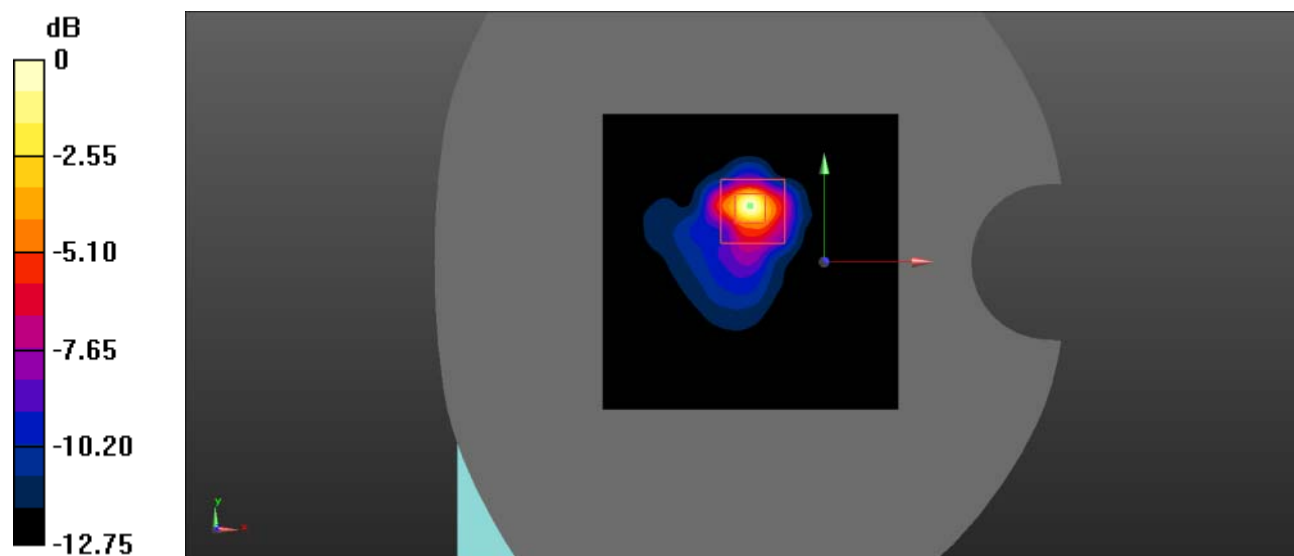
Body Back/WLAN 5.2G 802.11a Low/Zoom Scan (8x8x12)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2\text{mm}$

Reference Value = 7.414 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 4.00 W/kg

SAR(1 g) = 1.04 W/kg; SAR(10 g) = 0.329 W/kg

Maximum value of SAR (measured) = 2.05 W/kg



$0 \text{ dB} = 2.05 \text{ W/kg} = 3.12 \text{ dBW/kg}$

Plot 7#

DUT: SuperNote; Type: A6 X; Serial: RSH200825050-SA-S1

Communication System: UID 0, 5.2G WiFi (0); Frequency: 5200 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5200 \text{ MHz}$; $\sigma = 4.569 \text{ S/m}$; $\epsilon_r = 36.552$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(5.2, 5.2, 5.2) @ 5200 MHz;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1562; Calibrated: 3/3/2020
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Body Back/WLAN 5.2G 802.11a Mid 40/Area Scan (101x101x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$
 Maximum value of SAR (interpolated) = 1.94 W/kg

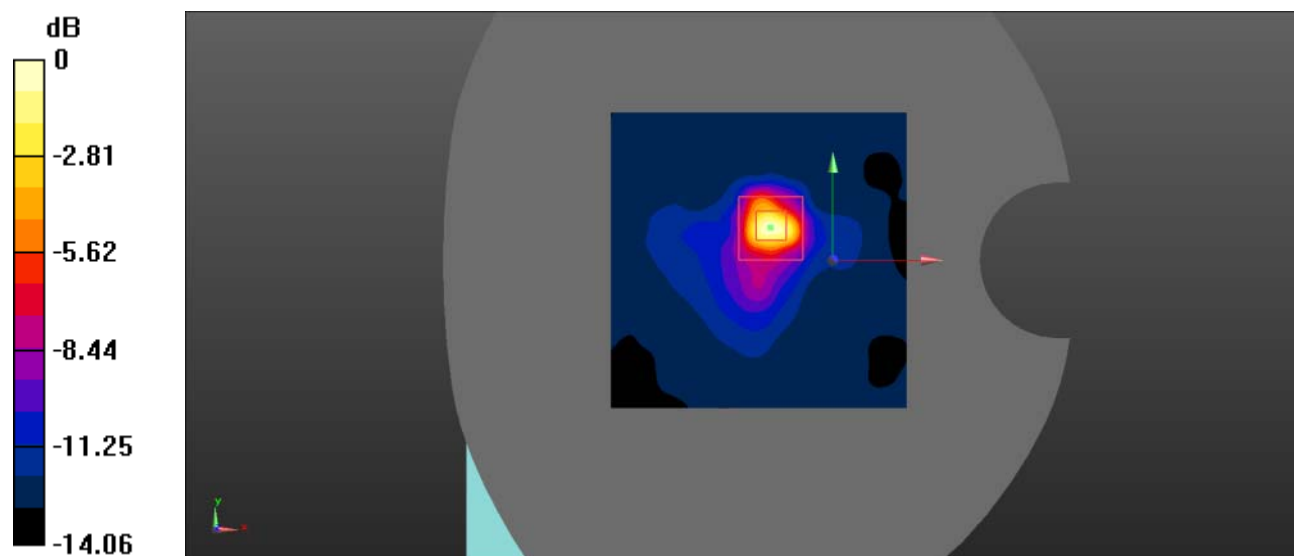
Body Back/WLAN 5.2G 802.11a Mid 40/Zoom Scan (9x9x12)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2\text{mm}$

Reference Value = 7.853 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 4.18 W/kg

SAR(1 g) = 1.06 W/kg; SAR(10 g) = 0.335 W/kg

Maximum value of SAR (measured) = 2.12 W/kg



0 dB = 2.12 W/kg = 3.26 dBW/kg

Plot 8#

DUT: SuperNote; Type: A6 X; Serial: RSH200825050-SA-S1

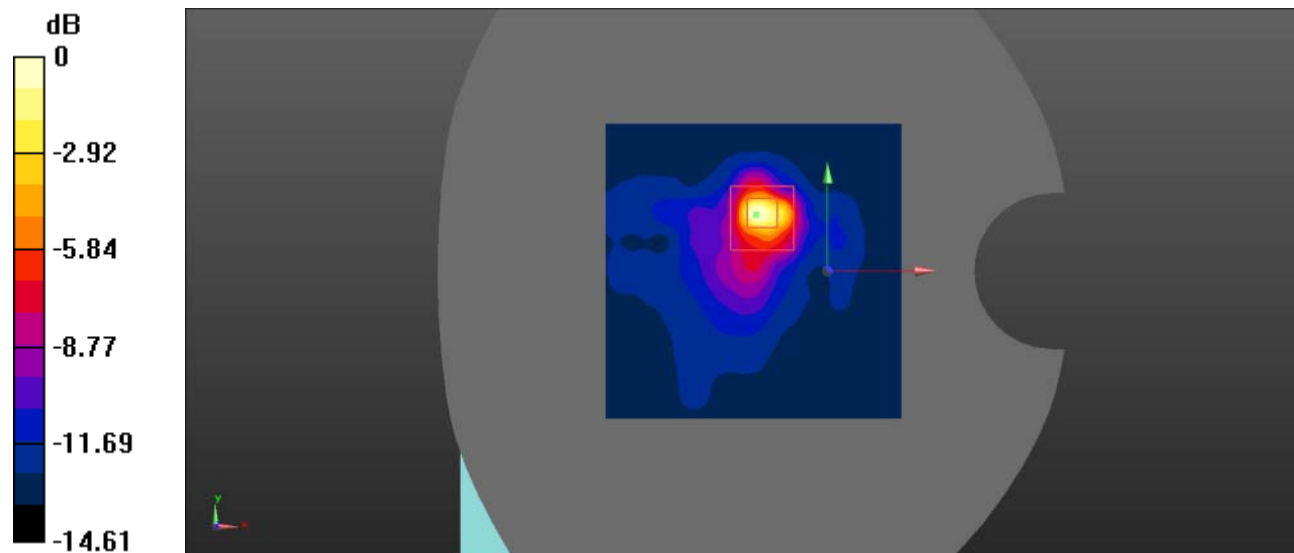
Communication System: UID 0, 5.2G WiFi (0); Frequency: 5240 MHz;Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 5240 \text{ MHz}$; $\sigma = 4.602 \text{ S/m}$; $\epsilon_r = 36.648$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(5.2, 5.2, 5.2) @ 5240 MHz;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1562; Calibrated: 3/3/2020
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Body Back/WLAN 5.2G 802.11a High/Area Scan (101x101x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$
 Maximum value of SAR (interpolated) = 2.14 W/kg

Body Back/WLAN 5.2G 802.11a High/Zoom Scan (9x9x12)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2\text{mm}$
 Reference Value = 7.744 V/m; Power Drift = 0.03 dB
 Peak SAR (extrapolated) = 4.01 W/kg
SAR(1 g) = 1.04 W/kg; SAR(10 g) = 0.336 W/kg
 Maximum value of SAR (measured) = 2.07 W/kg



0 dB = 2.07 W/kg = 3.16 dBW/kg

Plot 9#

DUT: SuperNote; Type: A6 X; Serial: RSH200825050-SA-S1

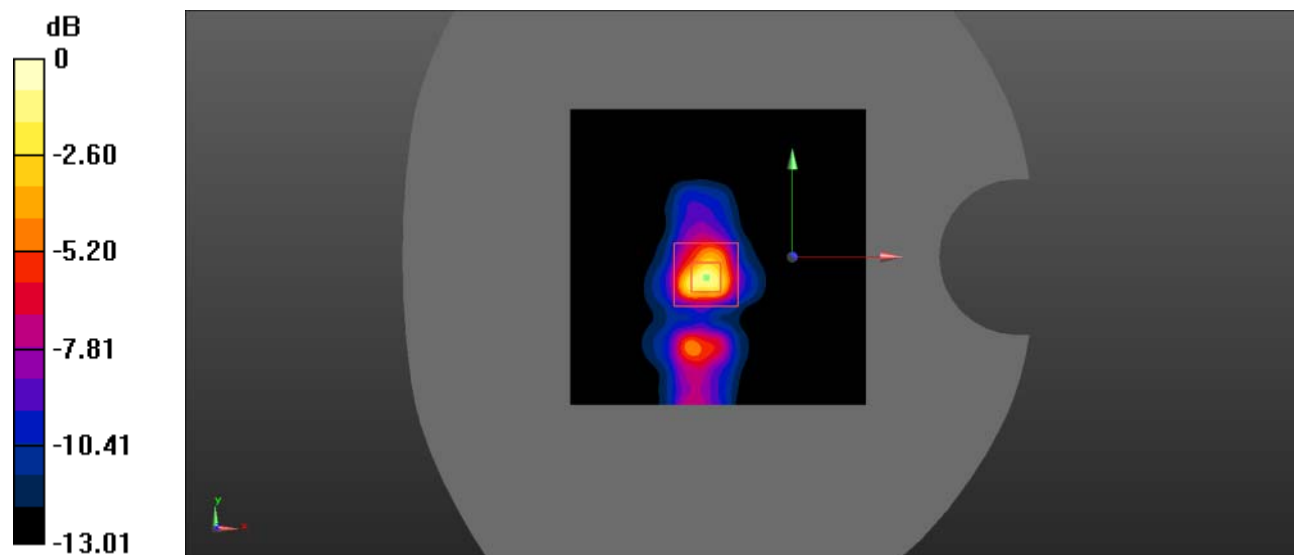
Communication System: UID 0, 5.2G WiFi (0); Frequency: 5180 MHz;Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 5180 \text{ MHz}$; $\sigma = 4.484 \text{ S/m}$; $\epsilon_r = 36.861$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(5.2, 5.2, 5.2) @ 5180 MHz;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1562; Calibrated: 3/3/2020
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Body Top/WLAN 5.2G 802.11a Low/Area Scan (101x101x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$
 Maximum value of SAR (interpolated) = 1.75 W/kg

Body Top/WLAN 5.2G 802.11a Low/Zoom Scan (9x9x12)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2\text{mm}$
 Reference Value = 11.41 V/m; Power Drift = -0.04 dB
 Peak SAR (extrapolated) = 4.27 W/kg
SAR(1 g) = 1.1 W/kg; SAR(10 g) = 0.343 W/kg
 Maximum value of SAR (measured) = 2.11 W/kg



$0 \text{ dB} = 2.11 \text{ W/kg} = 3.24 \text{ dBW/kg}$

Plot 10#

DUT: SuperNote; Type: A6 X; Serial: RSH200825050-SA-S1

Communication System: UID 0, 5.2G WiFi (0); Frequency: 5200 MHz;Duty Cycle: 1:1

Medium parameters used: $f = 5200 \text{ MHz}$; $\sigma = 4.569 \text{ S/m}$; $\epsilon_r = 36.552$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(5.2, 5.2, 5.2) @ 5200 MHz;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1562; Calibrated: 3/3/2020
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Body Top/WLAN 5.2G 802.11a Mid/Area Scan (101x101x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$

Maximum value of SAR (interpolated) = 1.71 W/kg

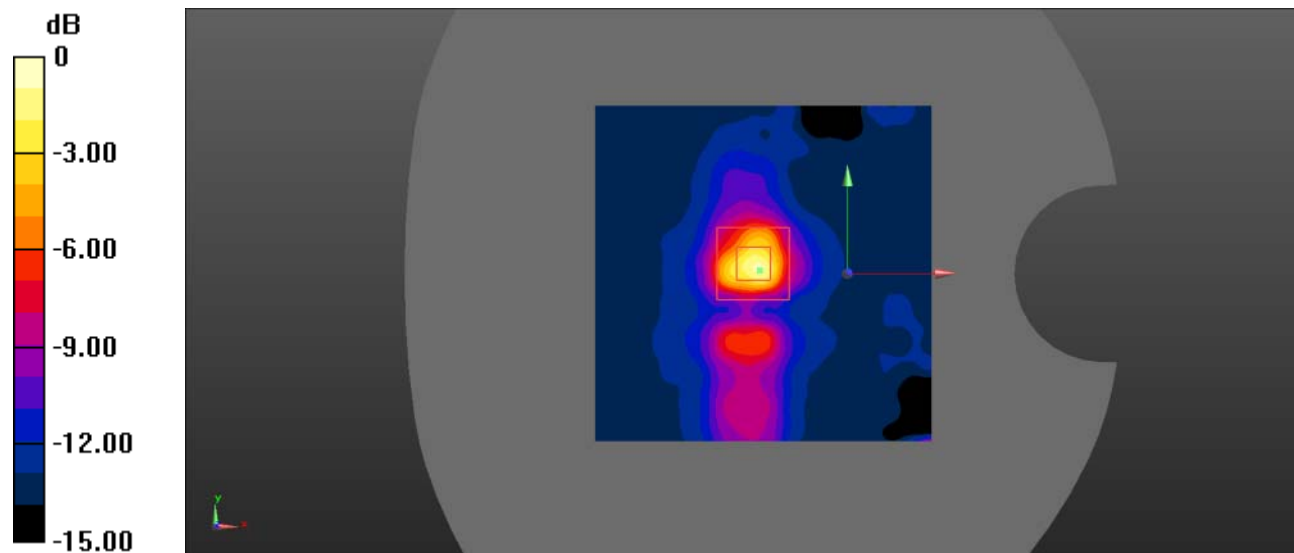
Body Top/WLAN 5.2G 802.11a Mid/Zoom Scan (9x9x12)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2\text{mm}$

Reference Value = 15.31 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.82 W/kg

SAR(1 g) = 0.999 W/kg; SAR(10 g) = 0.324 W/kg

Maximum value of SAR (measured) = 2.04 W/kg



0 dB = 2.04 W/kg = 3.10 dBW/kg

Plot 11#

DUT: SuperNote; Type: A6 X; Serial: RSH200825050-SA-S1

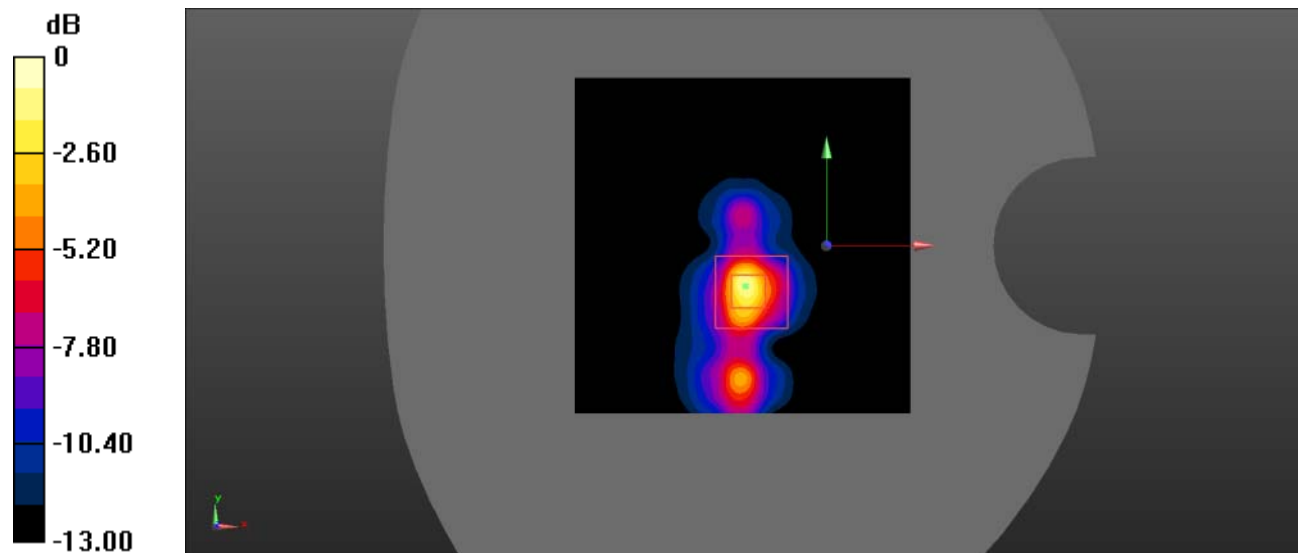
Communication System: UID 0, 5.2G WiFi (0); Frequency: 5240 MHz;Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 5240 \text{ MHz}$; $\sigma = 4.602 \text{ S/m}$; $\epsilon_r = 36.648$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(5.2, 5.2, 5.2) @ 5240 MHz;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1562; Calibrated: 3/3/2020
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Body Top/WLAN 5.2G 802.11a High/Area Scan (101x101x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$
 Maximum value of SAR (interpolated) = 1.81 W/kg

Body Top/WLAN 5.2G 802.11a High/Zoom Scan (9x9x12)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2\text{mm}$
 Reference Value = 7.282 V/m; Power Drift = 0.15 dB
 Peak SAR (extrapolated) = 4.25 W/kg
SAR(1 g) = 1.09 W/kg; SAR(10 g) = 0.342 W/kg
 Maximum value of SAR (measured) = 2.15 W/kg



0 dB = 2.15 W/kg = 3.32 dBW/kg

Plot 12#

DUT: SuperNote; Type: A6 X; Serial: RSH200825050-SA-S1

Communication System: UID 0, 5.2G WiFi (0); Frequency: 5200 MHz;Duty Cycle: 1:1

Medium parameters used: $f = 5200 \text{ MHz}$; $\sigma = 4.569 \text{ S/m}$; $\epsilon_r = 36.552$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(5.2, 5.2, 5.2) @ 5200 MHz;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1562; Calibrated: 3/3/2020
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Body Left/WLAN 5.2G 802.11a Mid 2/Area Scan (81x111x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$

Maximum value of SAR (interpolated) = 0.147 W/kg

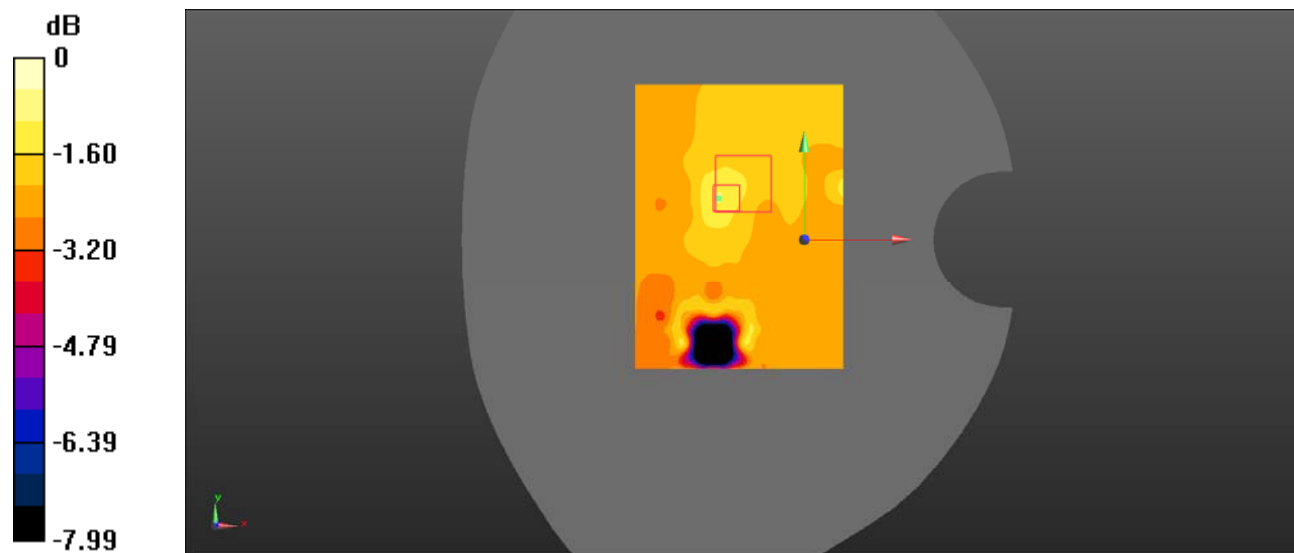
Body Left/WLAN 5.2G 802.11a Mid 2/Zoom Scan (10x10x12)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2\text{mm}$

Reference Value = 5.346 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.206 W/kg

SAR(1 g) = 0.126 W/kg; SAR(10 g) = 0.115 W/kg

Maximum value of SAR (measured) = 0.187 W/kg



0 dB = 0.187 W/kg = -7.28 dBW/kg

Plot 13#

DUT: SuperNote; Type: A6 X; Serial: RSH200825050-SA-S1

Communication System: UID 0, 5.8G Wi-Fi (0); Frequency: 5745 MHz; Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 5745 \text{ MHz}$; $\sigma = 5.068 \text{ S/m}$; $\epsilon_r = 35.663$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(4.65, 4.65, 4.65) @ 5745 MHz;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1562; Calibrated: 3/3/2020
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Body Back/WLAN 5.8G 802.11a Low 40/Area Scan (101x101x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$
 Maximum value of SAR (interpolated) = 1.57 W/kg

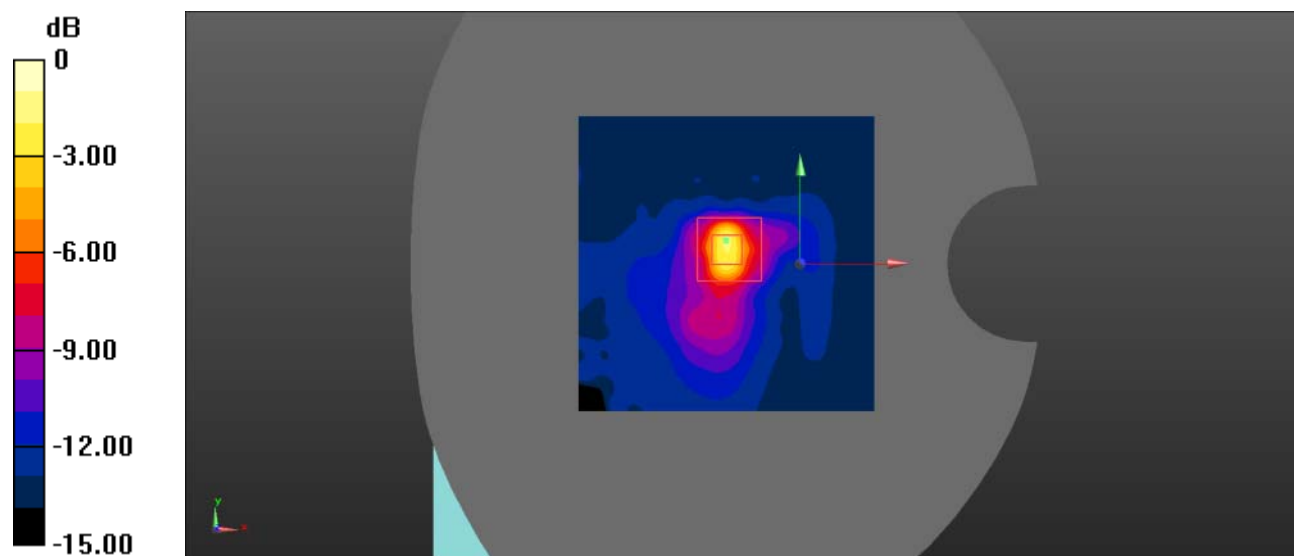
Body Back/WLAN 5.8G 802.11a Low 40/Zoom Scan (9x9x12)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2\text{mm}$

Reference Value = 13.30 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 4.00 W/kg

SAR(1 g) = 1.01 W/kg; SAR(10 g) = 0.234 W/kg

Maximum value of SAR (measured) = 2.33 W/kg



$0 \text{ dB} = 2.33 \text{ W/kg} = 3.67 \text{ dBW/kg}$

Plot 14#

DUT: SuperNote; Type: A6 X; Serial: RSH200825050-SA-S1

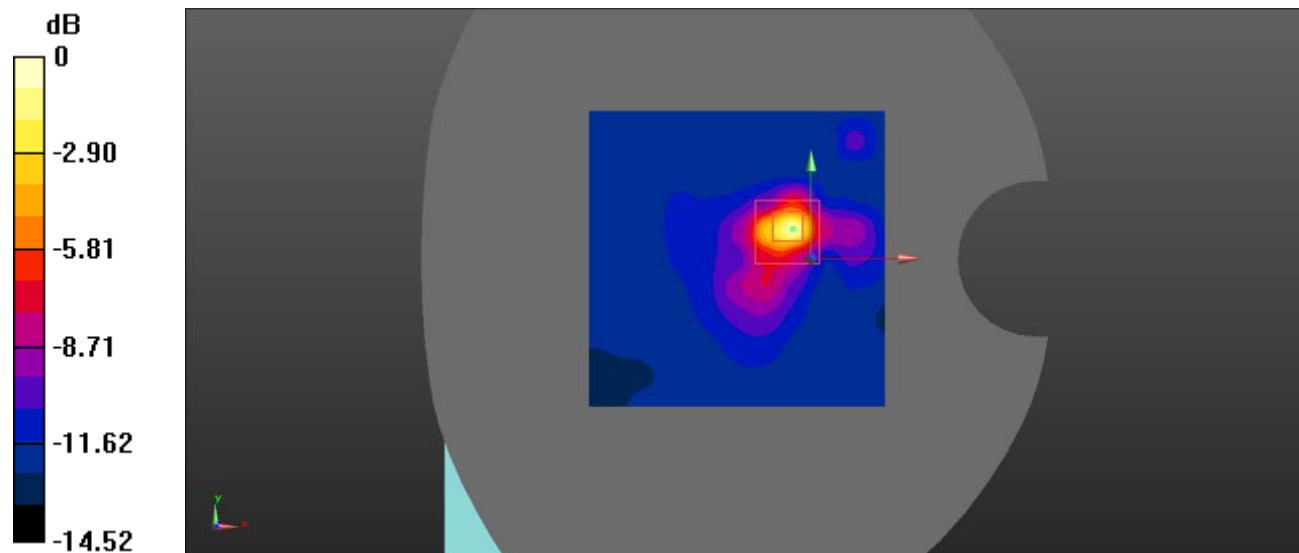
Communication System: UID 0, 5.8G Wi-Fi (0); Frequency: 5785 MHz; Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 5785 \text{ MHz}$; $\sigma = 5.165 \text{ S/m}$; $\epsilon_r = 35.525$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(4.65, 4.65, 4.65) @ 5785 MHz;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1562; Calibrated: 3/3/2020
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Body Back/WLAN 5.8G 802.11a Mid/Area Scan (101x101x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$
 Maximum value of SAR (interpolated) = 2.07 W/kg

Body Back/WLAN 5.8G 802.11a Mid/Zoom Scan (8x8x12)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2\text{mm}$
 Reference Value = 6.199 V/m; Power Drift = 0.03 dB
 Peak SAR (extrapolated) = 4.95 W/kg
SAR(1 g) = 1.08 W/kg; SAR(10 g) = 0.364 W/kg
 Maximum value of SAR (measured) = 2.34 W/kg



0 dB = 2.34 W/kg = 3.69 dBW/kg

Plot 15#

DUT: SuperNote; Type: A6 X; Serial: RSH200825050-SA-S1

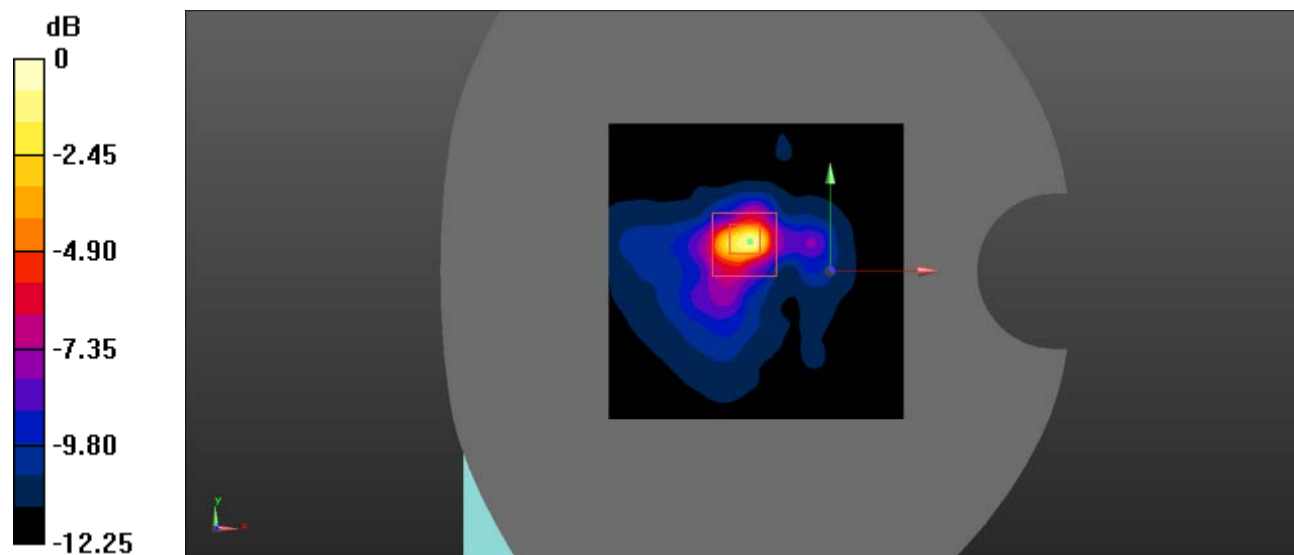
Communication System: UID 0, 5.8G Wi-Fi (0); Frequency: 5825 MHz;Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 5825 \text{ MHz}$; $\sigma = 5.235 \text{ S/m}$; $\epsilon_r = 35.442$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(4.65, 4.65, 4.65) @ 5825 MHz;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1562; Calibrated: 3/3/2020
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Body Back/WLAN 5.8G 802.11a High/Area Scan (101x101x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$
 Maximum value of SAR (interpolated) = 1.77 W/kg

Body Back/WLAN 5.8G 802.11a High/Zoom Scan (8x8x12)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2\text{mm}$
 Reference Value = 7.138 V/m; Power Drift = 0.05 dB
 Peak SAR (extrapolated) = 4.31 W/kg
SAR(1 g) = 0.955 W/kg; SAR(10 g) = 0.339 W/kg
 Maximum value of SAR (measured) = 2.02 W/kg



0 dB = 2.02 W/kg = 3.05 dBW/kg

Plot 16#

DUT: SuperNote; Type: A6 X; Serial: RSH200825050-SA-S1

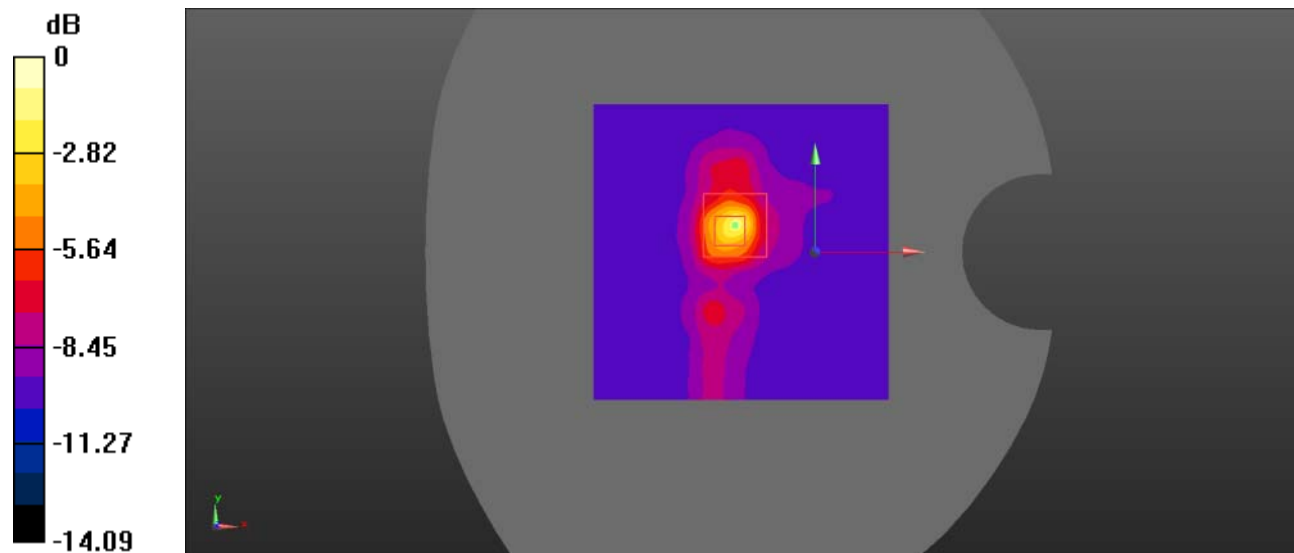
Communication System: UID 0, 5.8G Wi-Fi (0); Frequency: 5745 MHz; Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 5745 \text{ MHz}$; $\sigma = 5.068 \text{ S/m}$; $\epsilon_r = 35.663$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(4.65, 4.65, 4.65) @ 5745 MHz;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1562; Calibrated: 3/3/2020
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Body Top/WLAN 5.8G 802.11a Low/Area Scan (101x101x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$
 Maximum value of SAR (interpolated) = 1.17 W/kg

Body Top/WLAN 5.8G 802.11a Low/Zoom Scan (8x8x12)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2\text{mm}$
 Reference Value = 8.631 V/m; Power Drift = -0.06 dB
 Peak SAR (extrapolated) = 3.60 W/kg
SAR(1 g) = 0.785 W/kg; SAR(10 g) = 0.305 W/kg
 Maximum value of SAR (measured) = 1.66 W/kg



0 dB = 1.66 W/kg = 2.20 dBW/kg

Plot 17#

DUT: SuperNote; Type: A6 X; Serial: RSH200825050-SA-S1

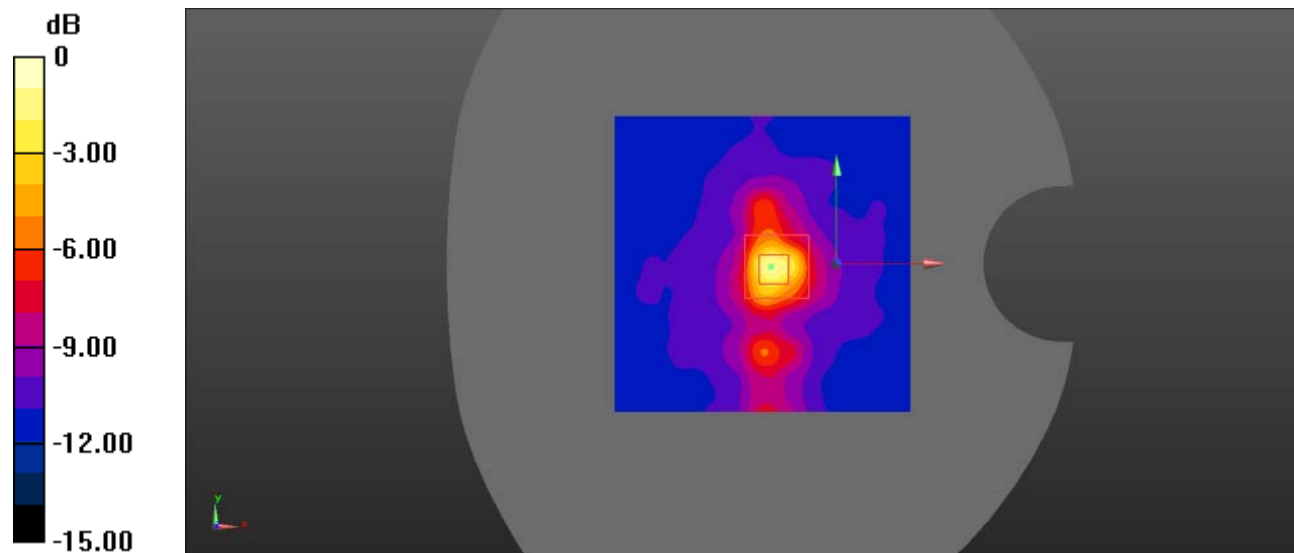
Communication System: UID 0, 5.8G Wi-Fi (0); Frequency: 5785 MHz; Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 5785 \text{ MHz}$; $\sigma = 5.165 \text{ S/m}$; $\epsilon_r = 35.525$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(4.65, 4.65, 4.65) @ 5785 MHz;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1562; Calibrated: 3/3/2020
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Body Top/WLAN 5.8G 802.11a Mid/Area Scan (101x101x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$
 Maximum value of SAR (interpolated) = 1.33 W/kg

Body Top/WLAN 5.8G 802.11a Mid/Zoom Scan (8x8x12)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2\text{mm}$
 Reference Value = 12.00 V/m; Power Drift = -0.30 dB
 Peak SAR (extrapolated) = 3.20 W/kg
SAR(1 g) = 0.807 W/kg; SAR(10 g) = 0.303 W/kg
 Maximum value of SAR (measured) = 1.63 W/kg



0 dB = 1.63 W/kg = 2.12 dBW/kg

Plot 18#

DUT: SuperNote; Type: A6 X; Serial: RSH200825050-SA-S1

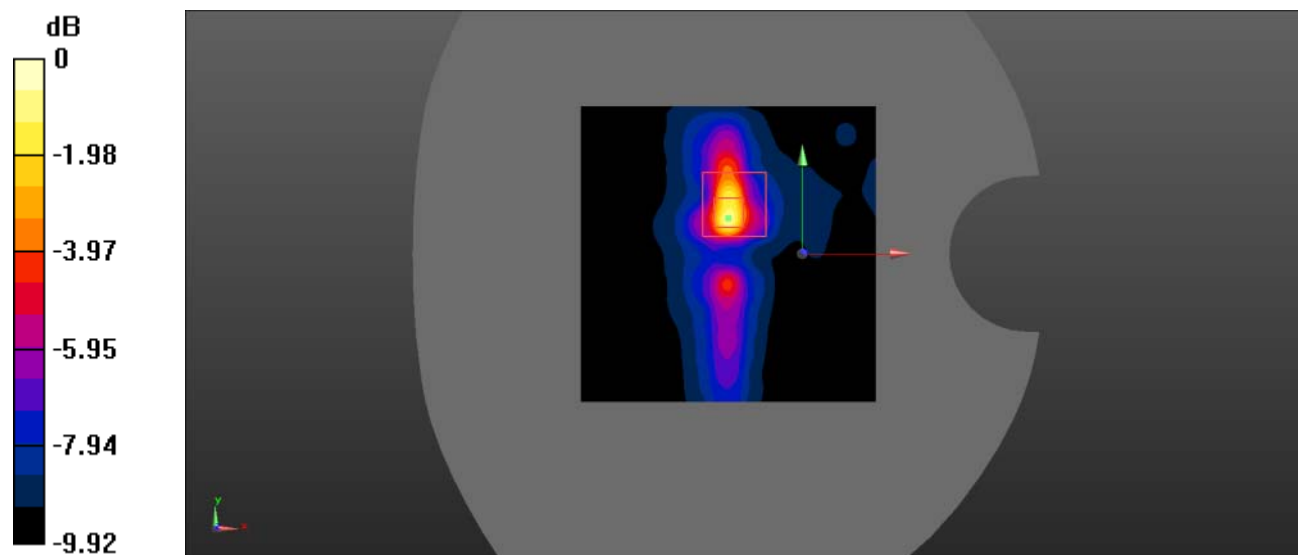
Communication System: UID 0, 5.8G Wi-Fi (0); Frequency: 5825 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 5825 \text{ MHz}$; $\sigma = 5.235 \text{ S/m}$; $\epsilon_r = 35.442$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(4.65, 4.65, 4.65) @ 5825 MHz;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1562; Calibrated: 3/3/2020
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Body Top/WLAN 5.8G 802.11a High/Area Scan (101x101x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$
Maximum value of SAR (interpolated) = 1.08 W/kg

Body Top/WLAN 5.8G 802.11a High/Zoom Scan (9x9x12)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2\text{mm}$
Reference Value = 6.359 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.40 W/kg
SAR(1 g) = 0.677 W/kg; SAR(10 g) = 0.267 W/kg
Maximum value of SAR (measured) = 1.27 W/kg



0 dB = 1.27 W/kg = 1.04 dBW/kg

Plot 19#

DUT: SuperNote; Type: A6 X; Serial: RSH200825050-SA-S1

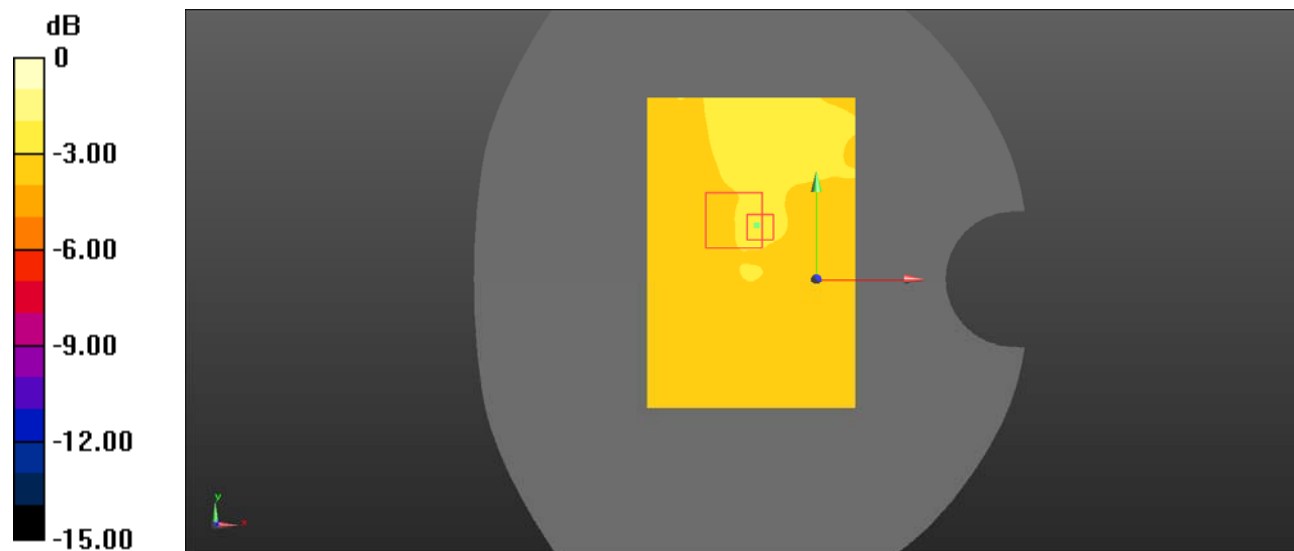
Communication System: UID 0, 5.8G Wi-Fi (0); Frequency: 5785 MHz;Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 5785 \text{ MHz}$; $\sigma = 5.165 \text{ S/m}$; $\epsilon_r = 35.525$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(4.65, 4.65, 4.65) @ 5785 MHz;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1562; Calibrated: 3/3/2020
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Body Left/WLAN 5.8G 802.11a Mid/Area Scan (81x121x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$
 Maximum value of SAR (interpolated) = 0.177 W/kg

Body Left/WLAN 5.8G 802.11a Mid/Zoom Scan (10x9x12)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2\text{mm}$
 Reference Value = 5.582 V/m ; Power Drift = 0.08 dB
 Peak SAR (extrapolated) = 0.297 W/kg
SAR(1 g) = 0.168 W/kg ; SAR(10 g) = 0.152 W/kg
 Maximum value of SAR (measured) = 0.285 W/kg



0 dB = $0.285 \text{ W/kg} = -5.45 \text{ dBW/kg}$

Plot 20#

DUT: SuperNote; Type: A6 X; Serial: RSH200825050-SA-S1

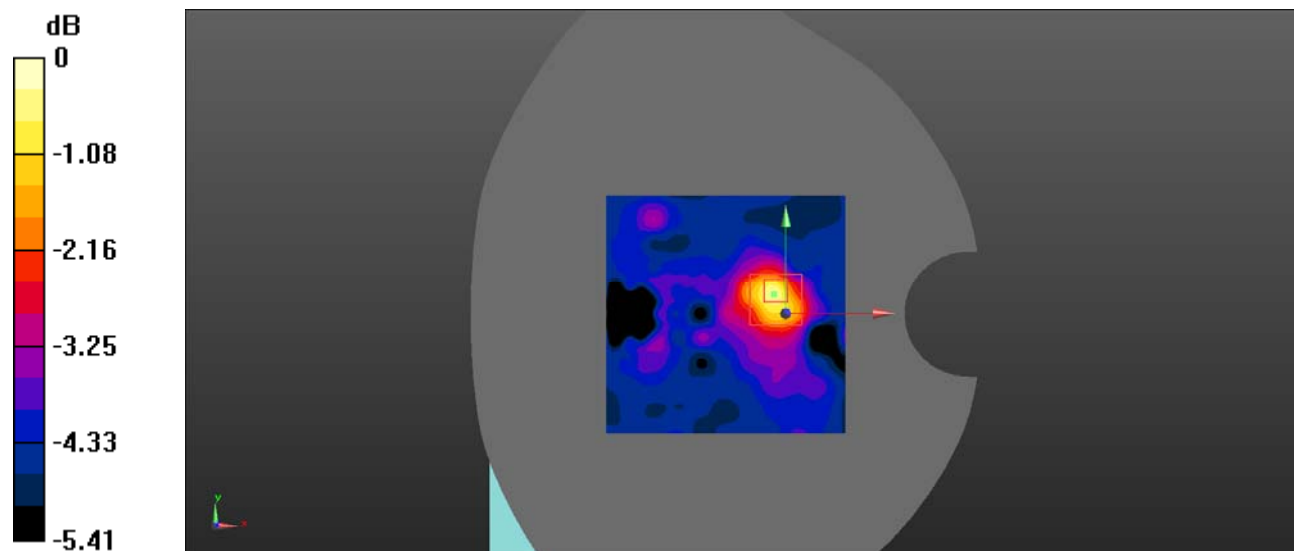
Communication System: UID 0, Bluetooth(GFSK) (0); Frequency: 2402 MHz;Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 2402$ MHz; $\sigma = 1.725$ S/m; $\epsilon_r = 40.359$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(7.15, 7.15, 7.15) @ 2402 MHz;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1562; Calibrated: 3/3/2020
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Body Back/BT Low/Area Scan (101x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
 Maximum value of SAR (interpolated) = 0.0623 W/kg

Body Back/BT Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
 Reference Value = 4.116 V/m; Power Drift = 0.05 dB
 Peak SAR (extrapolated) = 0.111 W/kg
SAR(1 g) = 0.060 W/kg; SAR(10 g) = 0.034 W/kg
 Maximum value of SAR (measured) = 0.0671 W/kg



0 dB = 0.0671 W/kg = -11.73 dBW/kg

Plot 21#

DUT: SuperNote; Type: A6 X; Serial: RSH200825050-SA-S1

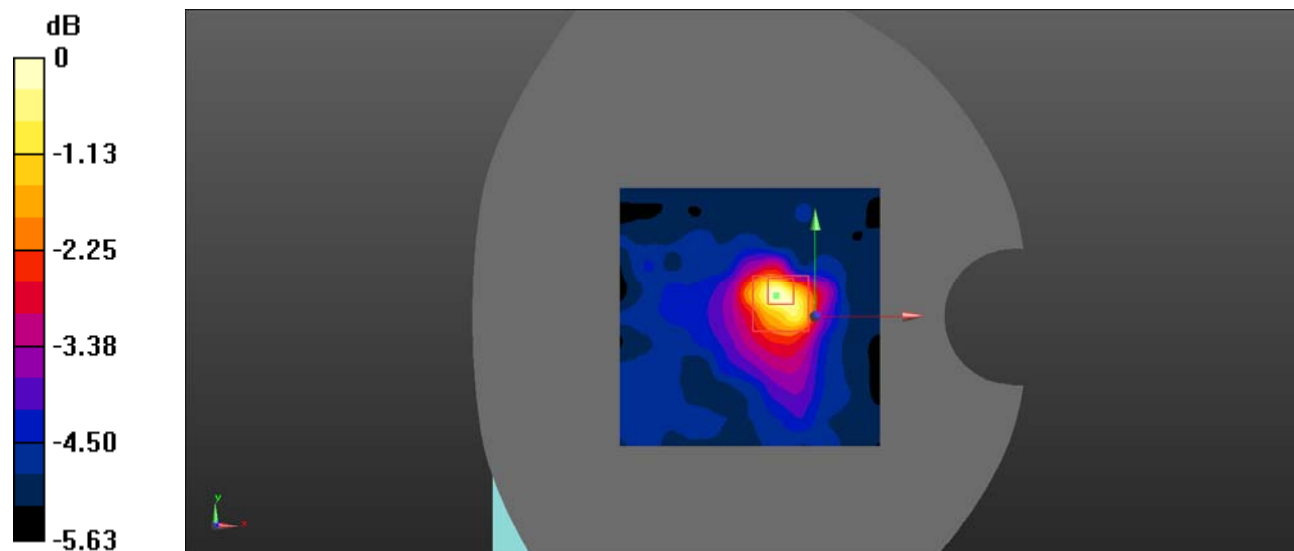
Communication System: UID 0, Bluetooth(GFSK) (0); Frequency: 2441 MHz;Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 2441$ MHz; $\sigma = 1.794$ S/m; $\epsilon_r = 40.162$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(7.15, 7.15, 7.15) @ 2441 MHz;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1562; Calibrated: 3/3/2020
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Body Back/BT Mid/Area Scan (101x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
 Maximum value of SAR (interpolated) = 0.0818 W/kg

Body Back/BT Mid/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
 Reference Value = 4.914 V/m; Power Drift = 0.09 dB
 Peak SAR (extrapolated) = 0.192 W/kg
SAR(1 g) = 0.075 W/kg; SAR(10 g) = 0.045 W/kg
 Maximum value of SAR (measured) = 0.0800 W/kg



0 dB = 0.0800 W/kg = -10.97 dBW/kg

Plot 22#

DUT: SuperNote; Type: A6 X; Serial: RSH200825050-SA-S1

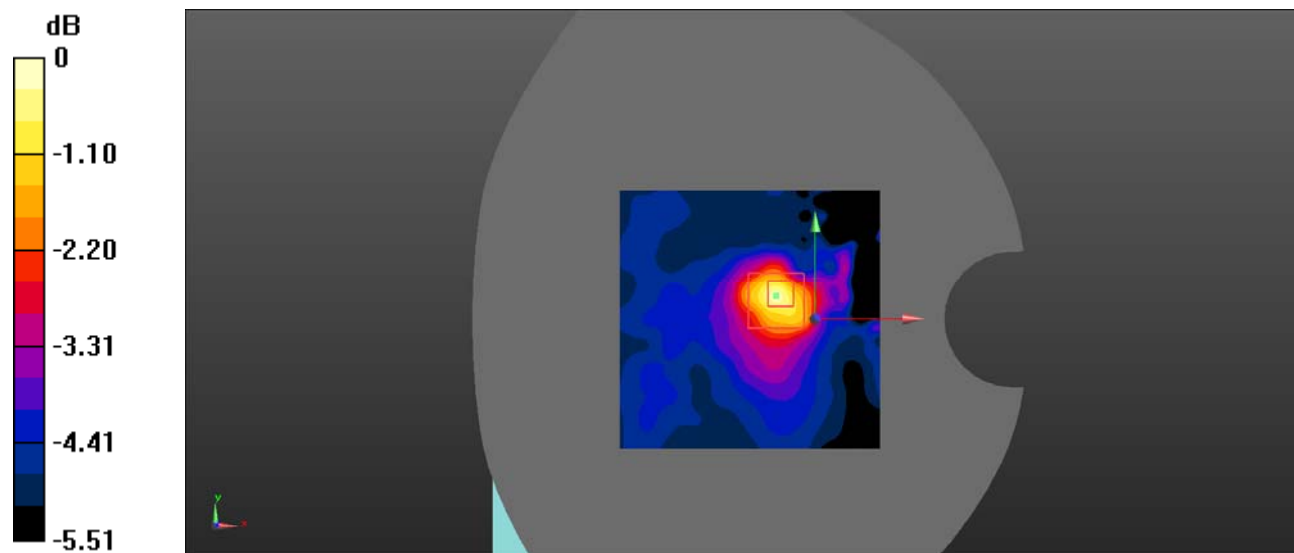
Communication System: UID 0, Bluetooth(GFSK) (0); Frequency: 2480 MHz;Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 2480 \text{ MHz}$; $\sigma = 1.826 \text{ S/m}$; $\epsilon_r = 40.396$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7522; ConvF(7.15, 7.15, 7.15) @ 2480 MHz;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1562; Calibrated: 3/3/2020
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Body Back/BT High/Area Scan (101x101x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$
 Maximum value of SAR (interpolated) = 0.0741 W/kg

Body Back/BT High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$
 Reference Value = 4.563 V/m; Power Drift = 0.01 dB
 Peak SAR (extrapolated) = 0.134 W/kg
SAR(1 g) = 0.070 W/kg; SAR(10 g) = 0.044 W/kg
 Maximum value of SAR (measured) = 0.0784 W/kg



$0 \text{ dB} = 0.0784 \text{ W/kg} = -11.06 \text{ dBW/kg}$

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	6.6	6.6
Axial Isotropy	4.7	R	$\sqrt{3}$	1	1	2.7	2.7
Hemispherical Isotropy	9.6	R	$\sqrt{3}$	0	0	0.0	0.0
Boundary effect	1.0	R	$\sqrt{3}$	1	1	0.6	0.6
Linearity	4.7	R	$\sqrt{3}$	1	1	2.7	2.7
Detection limits	1.0	R	$\sqrt{3}$	1	1	0.6	0.6
Readout electronics	0.3	N	1	1	1	0.3	0.3
Response time	0.0	R	$\sqrt{3}$	1	1	0.0	0.0
Integration time	0.0	R	$\sqrt{3}$	1	1	0.0	0.0
RF ambient conditions – noise	1.0	R	$\sqrt{3}$	1	1	0.6	0.6
RF ambient conditions–reflections	1.0	R	$\sqrt{3}$	1	1	0.6	0.6
Probe positioner mech. Restrictions	0.8	R	$\sqrt{3}$	1	1	0.5	0.5
Probe positioning with respect to phantom shell	6.7	R	$\sqrt{3}$	1	1	3.9	3.9
Post-processing	2.0	R	$\sqrt{3}$	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	$\sqrt{3}$	1	1	2.9	2.9
Phantom and set-up							
Phantom uncertainty (shape and thickness tolerances)	4.0	R	$\sqrt{3}$	1	1	2.3	2.3
Liquid conductivity target)	5.0	R	$\sqrt{3}$	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	$\sqrt{3}$	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)						24.3	23.9

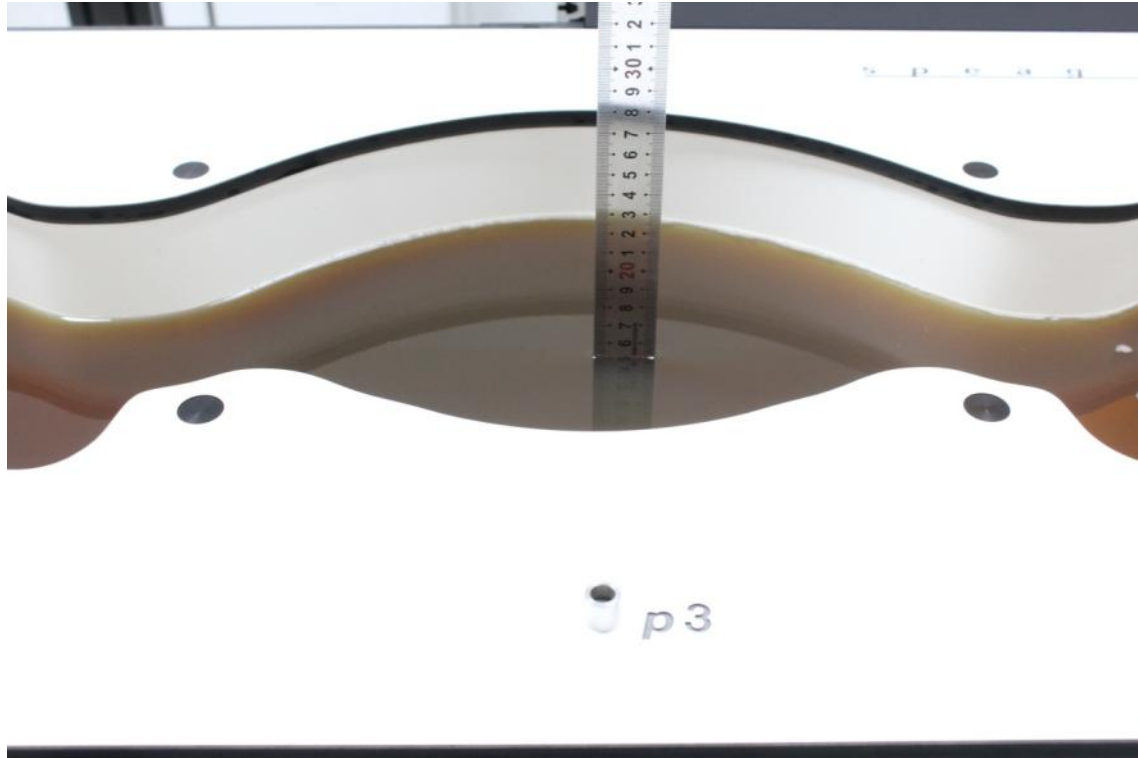
Measurement uncertainty evaluation for IEC62209-2 SAR test

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	6.6	6.6
Axial Isotropy	4.7	R	√3	1	1	2.7	2.7
Hemispherical Isotropy	9.6	R	√3	0	0	0.0	0.0
Linearity	4.7	R	√3	1	1	2.7	2.7
Modulation Response	0.0	R	√3	1	1	0.0	0.0
Detection limits	1.0	R	√3	1	1	0.6	0.6
Boundary effect	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							
Device holder Uncertainty	6.3	N	1	1	1	6.3	6.3
Test sample positioning	2.8	N	1	1	1	2.8	2.8
Power scaling	4.5	R	√3	1	1	2.6	2.6
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
Algorithm for correcting SAR for deviations in permittivity and conductivity	1.9	N	1	1	0.84	1.1	0.9
Liquid conductivity (meas.)	2.5	N	1	0.64	0.43	1.6	1.1
Liquid permittivity (meas.)	2.5	N	1	0.6	0.49	1.5	1.2
Temp. unc. - Conductivity	1.7	R	√3	0.78	0.71	0.8	0.7
Temp. unc. - Permittivity	0.3	R	√3	0.23	0.26	0.0	0.0
Combined standard uncertainty		RSS				12.2	12.1
Expanded uncertainty 95 % confidence interval)						24.5	24.2

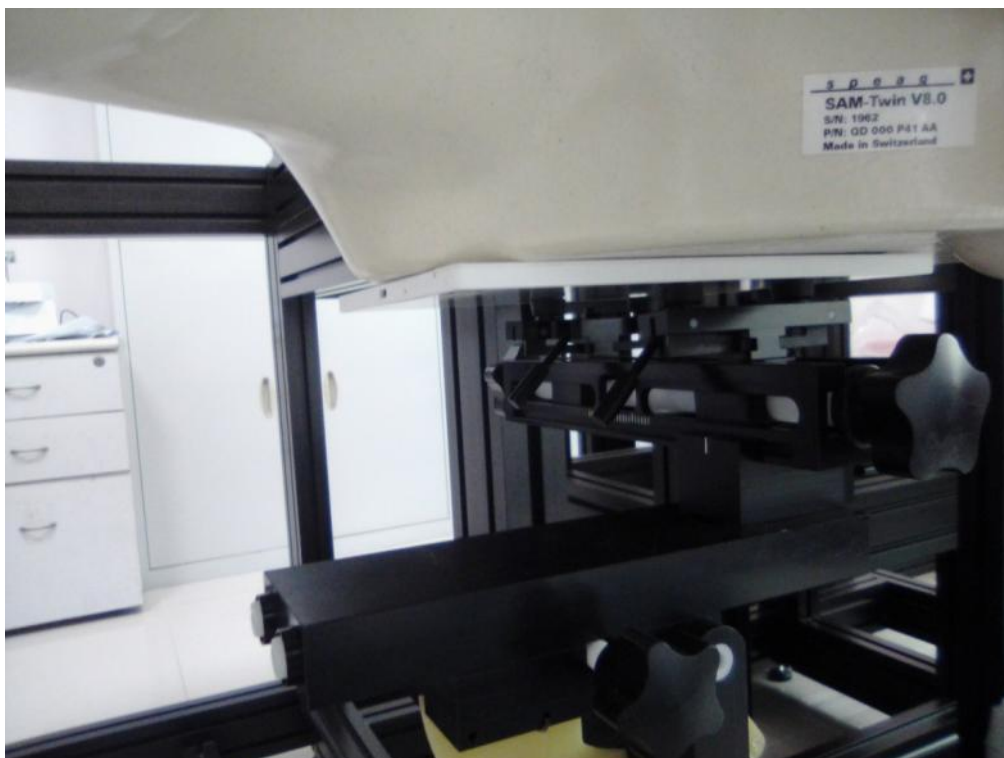
APPENDIX B EUT TEST POSITION PHOTOS

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

Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962



Body Back (0mm) Setup Photo



Body Top (0mm)Setup Photo



Body Left (0mm)Setup Photo



APPENDIX C PROBE CALIBRATION CERTIFICATES



In Collaboration with
s p e a g
CALIBRATION LABORATORY



中国认可
国际互认
校准
CALIBRATION
CNAS L0570

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

Client **BACL**

Certificate No: **Z20-60085**

CALIBRATION CERTIFICATE			
Object	EX3DV4 - SN : 7522		
Calibration Procedure(s)	FF-Z11-004-01 Calibration Procedures for Dosimetric E-field Probes		
Calibration date:	April 01, 2020		
<p>This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)°C and humidity<70%.</p> <p>Calibration Equipment used (M&TE critical for calibration)</p>			
Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	18-Jun-19(CTTL, No.J19X05125)	Jun-20
Power sensor NRP-Z91	101547	18-Jun-19(CTTL, No.J19X05125)	Jun-20
Power sensor NRP-Z91	101548	18-Jun-19(CTTL, No.J19X05125)	Jun-20
Reference 10dBAttenuator	18N50W-10dB	10-Feb-20(CTTL, No.J20X00525)	Feb-22
Reference 20dBAttenuator	18N50W-20dB	10-Feb-20(CTTL, No.J20X00526)	Feb-22
Reference Probe EX3DV4	SN 7307	24-May-19(SPEAG, No.EX3-7307_May19/2)	May-20
DAE4	SN 1525	26-Aug-19(SPEAG, No.DAE4-1525_Aug19)	Aug-20
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGenerator MG3700A	6201052605	18-Jun-19(CTTL, No.J19X05127)	Jun-20
Network Analyzer E5071C	MY46110673	10-Feb-20(CTTL, No.J20X00515)	Feb-21
Calibrated by:	Name	Function	Signature
	Yu Zongying	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	
Issued: April 03, 2020			
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Glossary:

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

Calibration is Performed According to the Following Standards:

- 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:

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



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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.43	0.44	0.51	$\pm 10.0\%$
DCP(mV) ^B	99.1	99.3	102.4	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	149.8	$\pm 2.7\%$
		Y	0.0	0.0	1.0		153.0	
		Z	0.0	0.0	1.0		174.8	

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

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

^B Numerical linearization parameter: uncertainty not required.

^E Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.



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DASY/EASY – Parameters of Probe: EX3DV4 – SN: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	9.92	9.92	9.92	0.40	0.75	±12.1%
900	41.5	0.97	9.40	9.40	9.40	0.13	1.95	±12.1%
1750	40.1	1.37	8.21	8.21	8.21	0.22	1.08	±12.1%
1900	40.0	1.40	7.95	7.95	7.95	0.21	1.22	±12.1%
2300	39.5	1.67	7.53	7.53	7.53	0.44	0.81	±12.1%
2450	39.2	1.80	7.15	7.15	7.15	0.48	0.79	±12.1%
2600	39.0	1.96	7.04	7.04	7.04	0.59	0.72	±12.1%
5200	36.0	4.66	5.20	5.20	5.20	0.45	1.75	±13.3%
5300	35.9	4.76	4.96	4.96	4.96	0.45	1.75	±13.3%
5600	35.5	5.07	4.55	4.55	4.55	0.45	1.60	±13.3%
5800	35.3	5.27	4.65	4.65	4.65	0.45	1.65	±13.3%

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

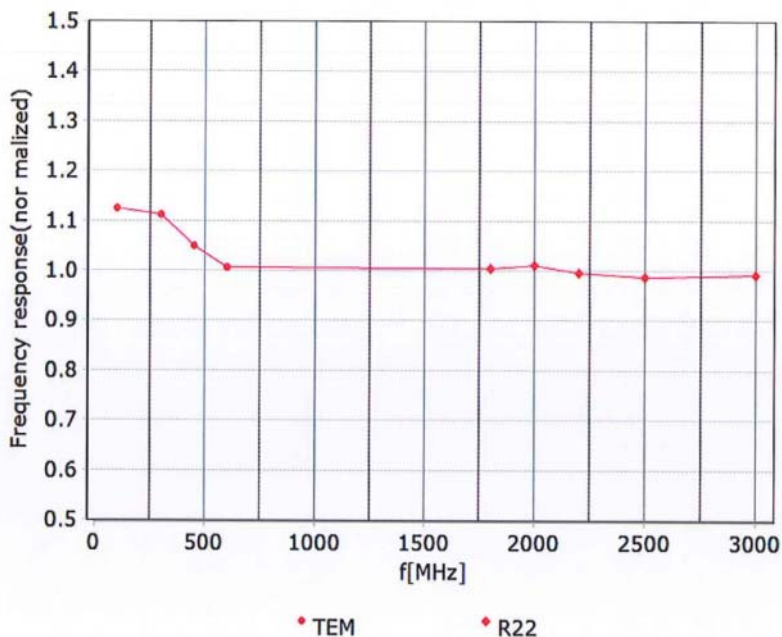
^F At frequency below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty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

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



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



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

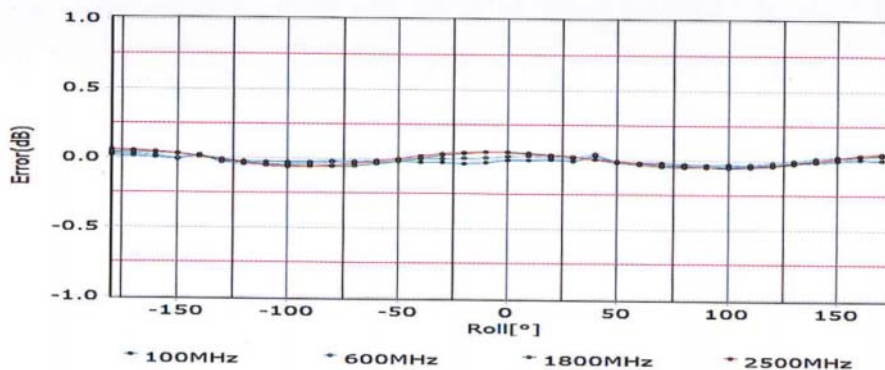
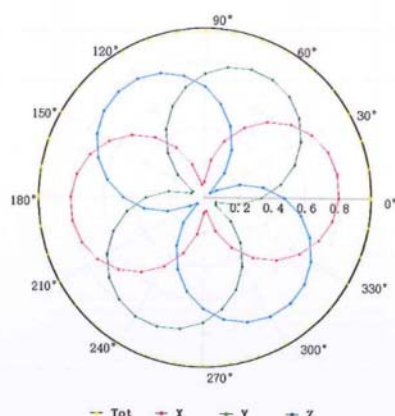
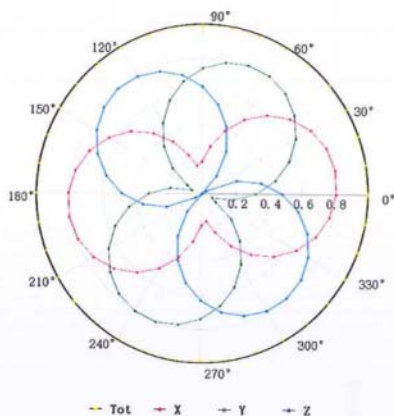


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Receiving Pattern (Φ), $\theta=0^\circ$

f=600 MHz, TEM

f=1800 MHz, R22

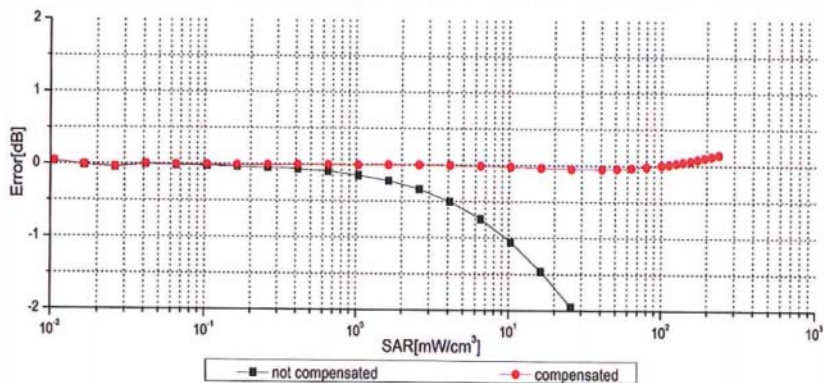
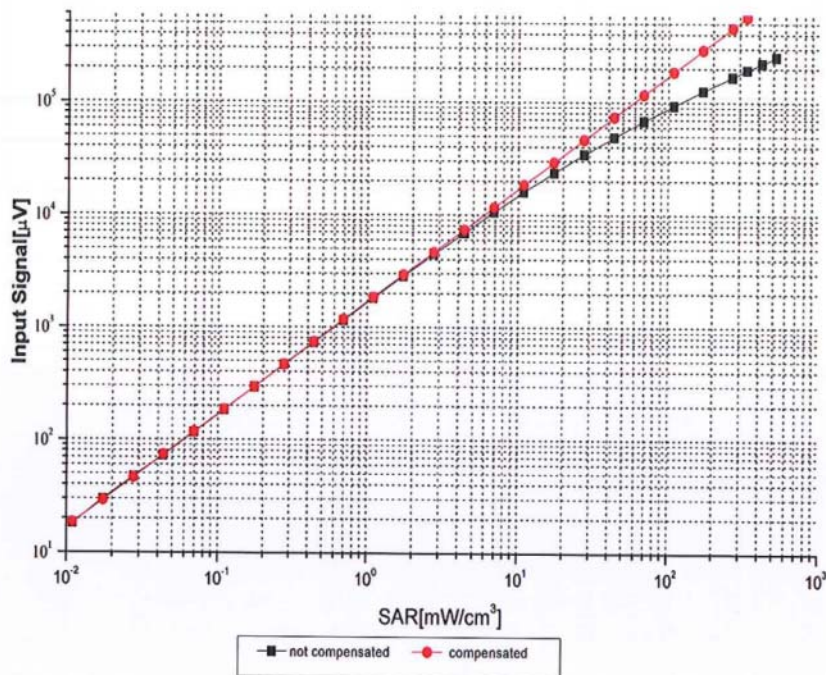


Uncertainty of Axial Isotropy Assessment: $\pm 1.2\%$ ($k=2$)



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



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

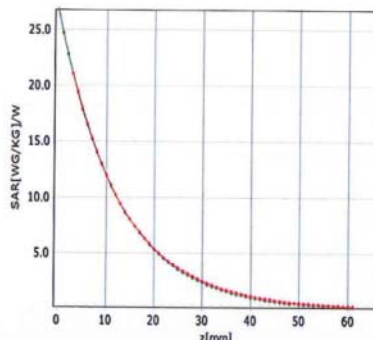
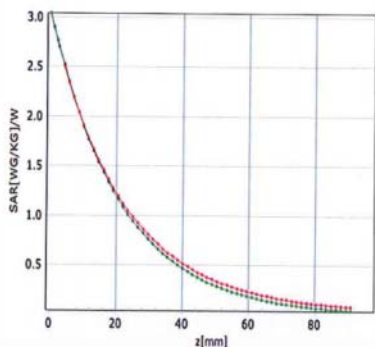


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Conversion Factor Assessment

f=750 MHz,WGLS R9(H_convF)

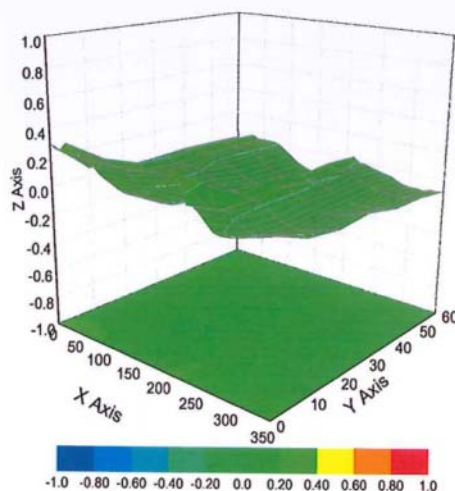
f=1750 MHz,WGLS R22(H_convF)



* analytical * measured

* analytical * measured

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 (°)	31.2
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	10mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	1.4mm

APPENDIX D DIPOLE CALIBRATION CERTIFICATES



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CNAS L0570

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Client

BACL

Certificate No: **Z17-97192**

CALIBRATION CERTIFICATE

Object **D2450V2 - SN: 751**

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

Calibration date: **October 12, 2017**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRVD	102196	02-Mar-17 (CTTL, No.J17X01254)	Mar-18
Power sensor NRV-Z5	100596	02-Mar-17 (CTTL, No.J17X01254)	Mar-18
Reference Probe EX3DV4	SN 3846	13-Jan-17(CTTL-SPEAG,No.Z16-97251)	Jan-18
DAE4	SN 1331	19-Jan-17(CTTL-SPEAG,No.Z17-97015)	Jan-18
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	13-Jan-17 (CTTL, No.J17X00286)	Jan-18
Network Analyzer E5071C	MY46110673	13-Jan-17 (CTTL, No.J17X00285)	Jan-18

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

Issued: October 15, 2017

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Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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



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Measurement Conditions

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

DASY Version	DASY52	52.10.0.1446
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 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	39.1 ± 6 %	1.82 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.2 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	52.5 mW /g ± 18.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.16 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	24.6 mW /g ± 18.7 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.3 ± 6 %	1.96 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	---	---

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.9 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	51.7 mW /g ± 18.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	6.05 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	24.2 mW /g ± 18.7 % (k=2)



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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.5Ω+ 4.65jΩ
Return Loss	- 24.1dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	51.5Ω+ 6.76jΩ
Return Loss	- 23.3dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.265 ns
----------------------------------	----------

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

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

Additional EUT Data

Manufactured by	SPEAG
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DASY5 Validation Report for Head TSL

Date: 10.12.2017

Test Laboratory: CTTL, Beijing, China

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

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

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.819$ S/m; $\epsilon_r = 39.06$; $\rho = 1000$ kg/m³

Phantom section: Left Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3846; ConvF(7.22,7.22,7.22); Calibrated: 1/13/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 1/19/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

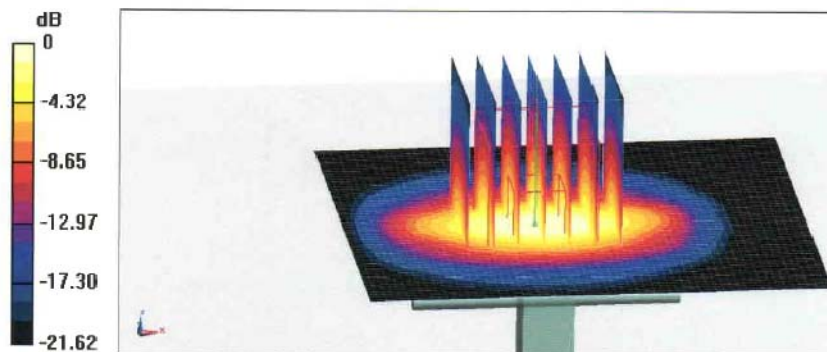
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 103.5 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 26.9 W/kg

SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.16 W/kg

Maximum value of SAR (measured) = 21.6 W/kg



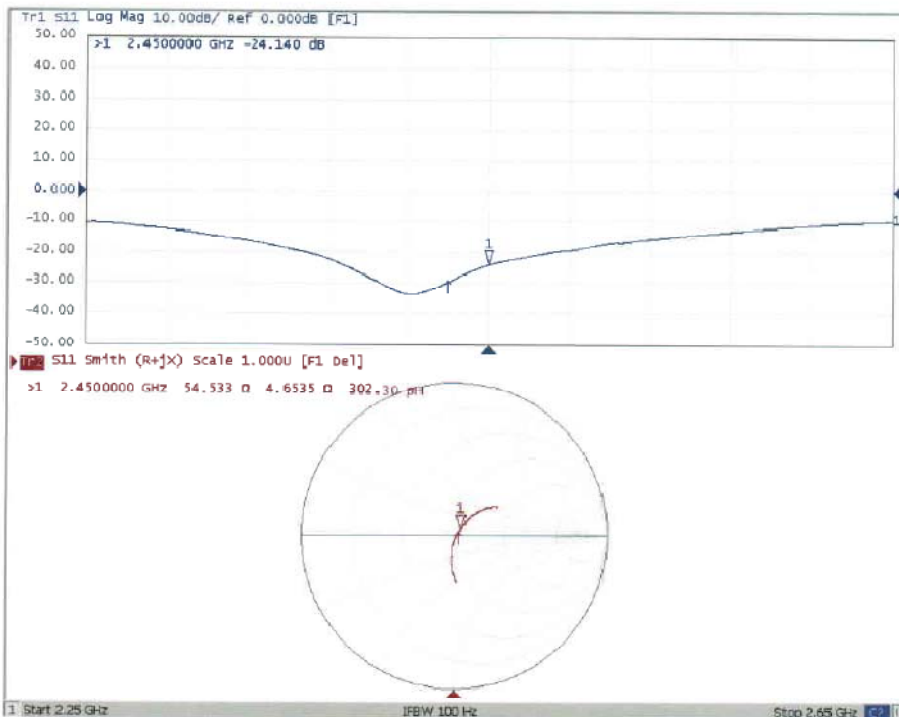
0 dB = 21.6 W/kg = 13.34 dBW/kg



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Impedance Measurement Plot for Head TSL





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DASY5 Validation Report for Body TSL

Date: 10.12.2017

Test Laboratory: CTTL, Beijing, China

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

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

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.957$ S/m; $\epsilon_r = 53.32$; $\rho = 1000$ kg/m³

Phantom section: Center Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3846; ConvF(7.31,7.31,7.31); Calibrated: 1/13/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 1/19/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

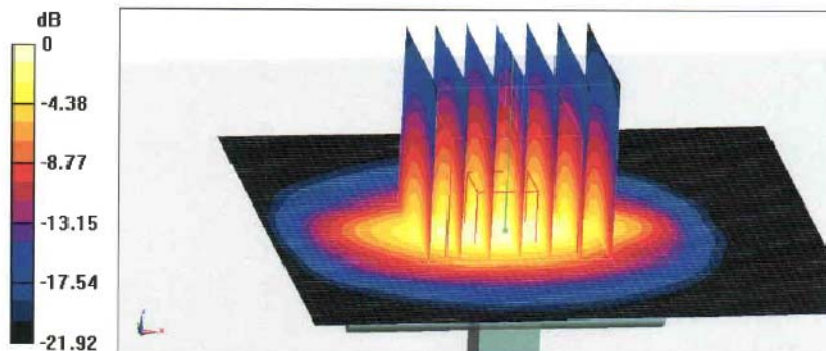
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 98.93 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 25.9 W/kg

SAR(1 g) = 12.9 W/kg; SAR(10 g) = 6.05 W/kg

Maximum value of SAR (measured) = 20.9 W/kg



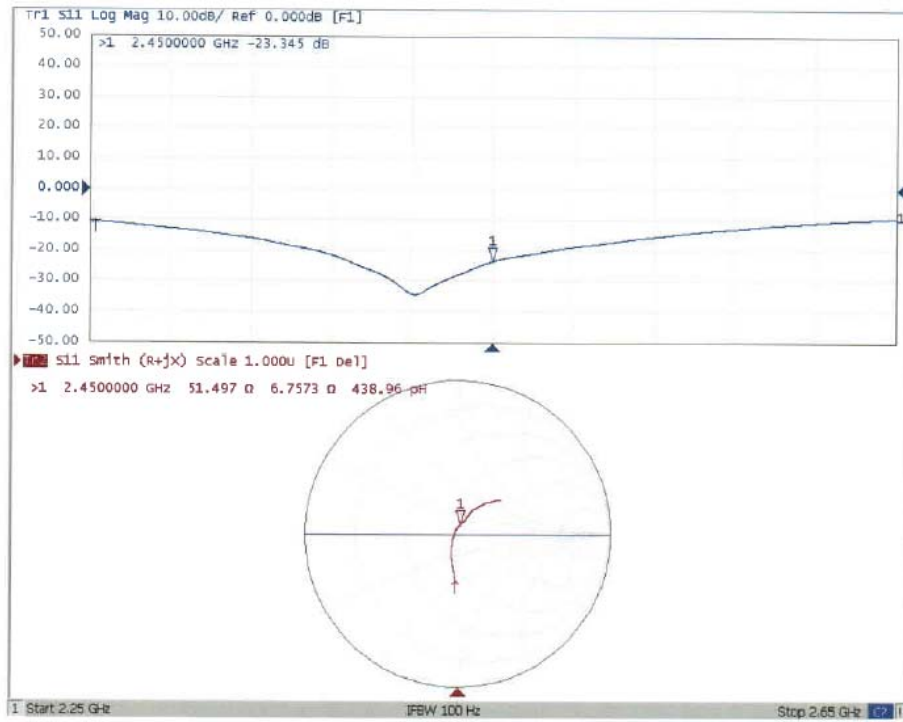
0 dB = 20.9 W/kg = 13.20 dBW/kg



In Collaboration with
s p e a g
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Impedance Measurement Plot for Body TSL



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



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **BACL USA**

Certificate No: **D5GHzV2-1301_Jan20**

CALIBRATION CERTIFICATE

Object **D5GHzV2 - SN:1301**

Calibration procedure(s) **QA CAL-22.v4
Calibration Procedure for SAR Validation Sources between 3-6 GHz**

Calibration date: **January 10, 2020**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	03-Apr-19 (No. 217-02892/02893)	Apr-20
Power sensor NRP-Z91	SN: 103244	03-Apr-19 (No. 217-02892)	Apr-20
Power sensor NRP-Z91	SN: 103245	03-Apr-19 (No. 217-02893)	Apr-20
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-19 (No. 217-02894)	Apr-20
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-19 (No. 217-02895)	Apr-20
Reference Probe EX3DV4	SN: 3503	31-Dec-19 (No. EX3-3503_Dec19)	Dec-20
DAE4	SN: 601	27-Dec-19 (No. DAE4-601_Dec19)	Dec-20

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Feb-19)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E9358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-20

Calibrated by: **Michael Weber** (Name) / **Laboratory Technician** (Function) / *M. Weber* (Signature)

Approved by: **Katja Pokovic** (Name) / **Technical Manager** (Function) / *[Signature]*

Issued: January 14, 2020

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

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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) 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"

Additional Documentation:

- e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.3
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5250 MHz ± 1 MHz 5600 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.71 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.8 ± 6 %	4.48 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5250 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.13 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	80.7 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.0 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.3 ± 6 %	4.83 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.59 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	85.1 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.44 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.1 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.0 ± 6 %	5.03 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.10 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	80.2 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.29 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.6 W/kg ± 19.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5250 MHz

Impedance, transformed to feed point	47.8 Ω - 3.1 jΩ
Return Loss	- 28.2 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	51.9 Ω + 1.9 jΩ
Return Loss	- 31.4 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	51.2 Ω + 3.1 jΩ
Return Loss	- 29.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.192 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
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DASY5 Validation Report for Head TSL

Date: 10.01.2020

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1301

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz

Medium parameters used: $f = 5250$ MHz; $\sigma = 4.48$ S/m; $\epsilon_r = 34.8$; $\rho = 1000$ kg/m³,Medium parameters used: $f = 5600$ MHz; $\sigma = 4.83$ S/m; $\epsilon_r = 34.3$; $\rho = 1000$ kg/m³,Medium parameters used: $f = 5800$ MHz; $\sigma = 5.03$ S/m; $\epsilon_r = 34$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.45, 5.45, 5.45) @ 5250 MHz, ConvF(5, 5, 5) @ 5600 MHz, ConvF(5.01, 5.01, 5.01) @ 5800 MHz; Calibrated: 31.12.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.12.2019
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.3(1513); SEMCAD X 14.6.13(7474)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan,**dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 77.91 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 28.2 W/kg

SAR(1 g) = 8.13 W/kg; SAR(10 g) = 2.33 W/kg

Smallest distance from peaks to all points 3 dB below = 7.2 mm

Ratio of SAR at M2 to SAR at M1 = 70.1%

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

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan,**dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 78.16 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 32.2 W/kg

SAR(1 g) = 8.59 W/kg; SAR(10 g) = 2.44 W/kg

Smallest distance from peaks to all points 3 dB below = 7.2 mm

Ratio of SAR at M2 to SAR at M1 = 67.4%

Maximum value of SAR (measured) = 19.8 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan,**dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 75.29 V/m; Power Drift = 0.04 dB

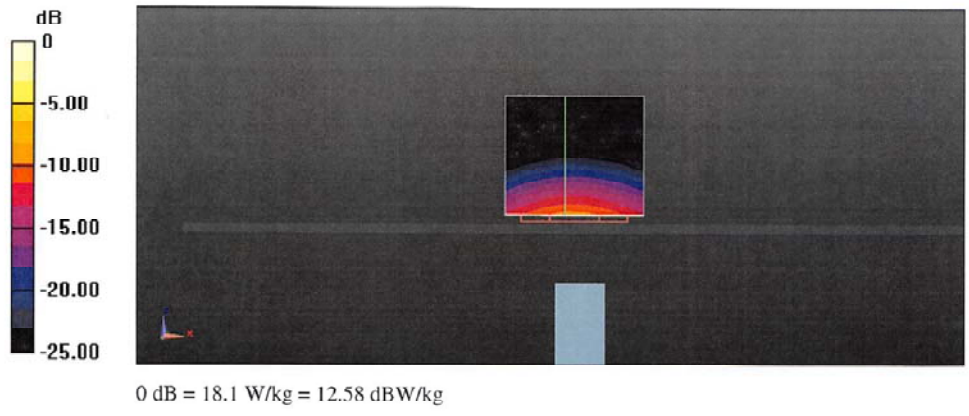
Peak SAR (extrapolated) = 32.5 W/kg

SAR(1 g) = 8.1 W/kg; SAR(10 g) = 2.29 W/kg

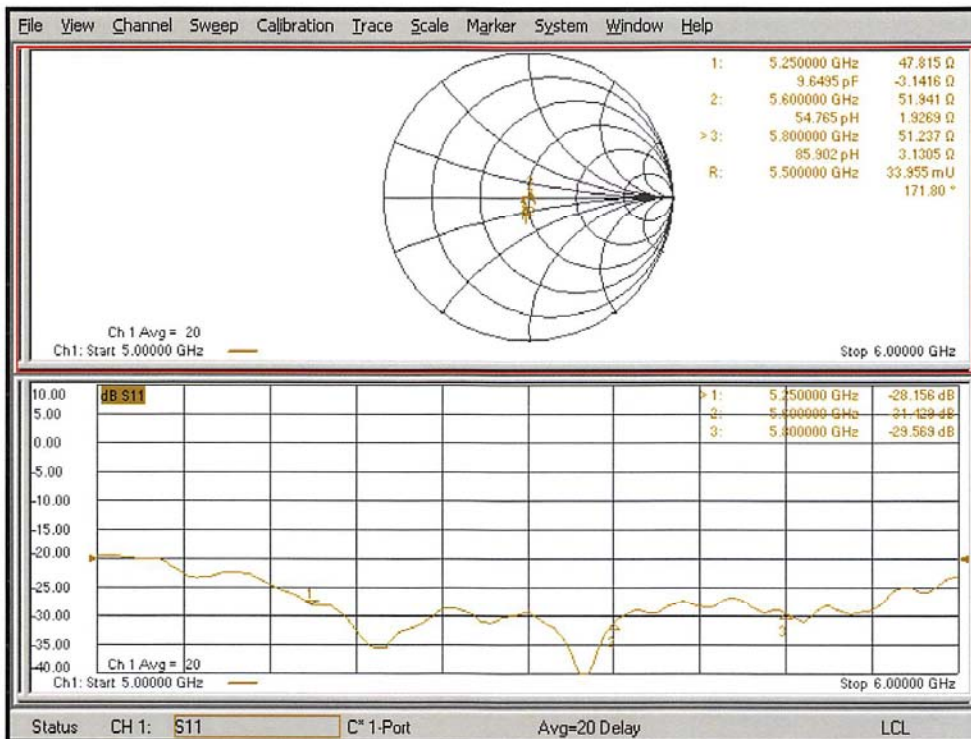
Smallest distance from peaks to all points 3 dB below = 7.4 mm

Ratio of SAR at M2 to SAR at M1 = 65.1%

Maximum value of SAR (measured) = 19.4 W/kg



Impedance Measurement Plot for Head TSL



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