FCC SAR REPORT

Report No.:	JYTSZ-R14-2500004
Applicant:	Avenir Telecom
Address of Applicant:	208 Boulevard de Plombieres 13014 Marseille-FRANCE
Equipment Under Test (EUT)	
Product Name:	Laptop PC
Model No.:	L17-N41, L17-N41-82AZ, L17-N41-82QW, L17-N41-41QW, L17-N41-41AZ
Trade mark	Energizer®
FCC ID:	2AM4J-L17N41
Applicable standards:	FCC 47 CFR Part 2.1093
Date of Test:	05 Jan., 2025
Test Result:	Maximum Reported 1-g SAR (W/kg) Body: 1.391

Project by:	Jaily Lin ***Project Engineer***	***Date:***	*27 Mar., 2025*
Reviewed by:	Peter Zhang ***Senior Engineer***	***Date:***	*27 Mar., 2025*
Approved by:	Janet Wei ***Manager***	***Date:***	*27 Mar., 2025*

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in above the application standard version. Test results reported herein relate only to the item(s) tested.

2 Version

Version No.	Date	Description
00	*27 Mar., 2025*	*Original*
01	*08 Apr., 2025*	*Updated page 31*

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4 SAR Results Summary

The maximum results of Specific Absorption Rate (SAR) found during test as below:

<Highest Reported standalone SAR Summary>

Exposure Position	Frequency Band	Reported 1-g SAR (W/kg)	Equipment Class	Highest Reported 1-g SAR (W/kg)
Body (0 mm Gap)	WLAN 2.4GHz	1.391	DTS	1.391
	WLAN 5.2 GHz	1.275	NII	
	WLAN 5.8 GHz	1.233		
	Bluetooth	0.131	DSS	

Note:

1. The highest simultaneous transmission is scalar summation of Reported standalone SAR per FCC KDB 690783 D01 v01r03, and scalar SAR summation of all possible simultaneous transmission scenarios are < 1.6W/kg.
2. This device is compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-2005, and had been tested in accordance with the measurement methods and procedures specified in IEC/IEEE 62209-1528.

5 General Information

5.1 Client Information

Applicant:	Avenir Telecom
Address of Applicant:	208 Boulevard de Plombieres 13014 Marseille-FRANCE
Manufacturer:	Avenir Telecom
Address of Manufacturer:	208 Boulevard de Plombieres 13014 Marseille-FRANCE
Factory	Avenir Telecom
Address of Address	Room 1408, Building 1, Lot 1, Chang Yuan Jingji Yu Jing Feng, Nanshan District, 518073, Shenzhen, GuangDong Province, China

5.2 General Description of EUT

<table>
<tr><td>Product Name:</td><td colspan="4">Laptop PC</td></tr>
<tr><td>Model No.:</td><td colspan="4">L17-N41, L17-N41-82AZ, L17-N41-82QW, L17-N41-41QW, L17-N41-41AZ</td></tr>
<tr><td>Category of device</td><td colspan="4">Portable device</td></tr>
<tr><td rowspan="3">Operation Frequency:</td><td rowspan="2">Wi-Fi:</td><td>2412MHz~2462MHz</td><td colspan="2">5150MHz-5250MHz</td></tr>
<tr><td>5725MHz-5850MHz</td><td colspan="2"></td></tr>
<tr><td colspan="4">Bluetooth: 2402 MHz ~ 2480 MHz</td></tr>
<tr><td rowspan="2">Modulation technology:</td><td>Wi-Fi:</td><td>☒802.11b(DSSS)</td><td colspan="2">☒802.11a/g/n/ac (OFDM)</td></tr>
<tr><td>Bluetooth:</td><td>☒BDR(GFSK)</td><td>☒EDR(π/4-DQPSK, 8DPSK)</td><td>☒LE(GFSK)</td></tr>
<tr><td>Antenna Type:</td><td colspan="4">Internal Antenna</td></tr>
<tr><td>Antenna Gain:</td><td colspan="4">ANT 1 (AUX ANT) :
2.4G Wi-Fi: 1.90 dBi (declare by Applicant)
5.2G Wi-Fi: 0.92 dBi (declare by Applicant)
5.8G Wi-Fi: 2.54 dBi (declare by Applicant)
Bluetooth: 1.90 dBi (declare by Applicant)
ANT 2 (MAIN ANT) :
2.4G Wi-Fi: 1.90 dBi (declare by Applicant)
5.2G Wi-Fi: 2.43 dBi (declare by Applicant)
5.8G Wi-Fi: 2.02 dBi (declare by Applicant)
Bluetooth: 1.90 dBi (declare by Applicant)</td></tr>
<tr><td>Dimensions (L*W*H):</td><td colspan="4">401 mm (L)× 257 mm (W)× 12 mm (H)</td></tr>
<tr><td rowspan="2">Accessories information:</td><td colspan="3" rowspan="2">Adapter:
Model No.: AS2406A-1202000DM
Input: AC100-240V, 50/60Hz 0.8A
Output: DC 12.0V, 2.0A</td><td>Battery:
Rechargeable Li-ion Battery DC7.6V/5500mAh</td></tr>
<tr><td>Headset:
Support headset (shipped without)</td></tr>
<tr><td>Remark:</td><td colspan="4">Model No.: L17-N41, L17-N41-82AZ, L17-N41-82QW, L17-N41-41QW, L17-N41-41AZ were identical inside, the electrical circuit design, layout, components used and internal wiring, with only difference being L17-N41-82AZ, L17-N41-41AZ 15.6 laptop 8/256 French Keyboard, L17-N41-82QW, L17-N41-41QW 15.6 laptop 8/256 US Keyboard.</td></tr>
</table>

5.3 Maximum RF Output Power

ANT 1:

WLAN 2.4 GHz Band Average Power (dBm)				
Mode/Band	b	g	n (HT-20)	n (HT-40)
WLAN 2.4GHz	15.68	13.57	13.36	13.29

ANT 2:

WLAN 2.4 GHz Band Average Power (dBm)				
Mode/Band	b	g	n (HT-20)	n (HT-40)
WLAN 2.4GHz	16.45	14.33	14.13	13.81

ANT 1:

WLAN 5.2 GHz Band Average Power (dBm)						
Mode/Band	a	ac 20	ac 40	ac 80	n 20	n 40
WLAN 5.2GHz	14.79	14.33	14.29	13.60	14.32	14.32

ANT 2:

WLAN 5.2 GHz Band Average Power (dBm)						
Mode/Band	a	ac 20	ac 40	ac 80	n 20	n 40
WLAN 5.2GHz	15.20	14.69	14.65	14.03	14.71	14.71

ANT 1:

WLAN 5.8 GHz Band Average Power (dBm)						
Mode/Band	a	ac 20	ac 40	ac 80	n 20	n 40
WLAN 5.8GHz	14.55	14.69	14.30	13.75	15.17	14.32

ANT 2:

WLAN 5.8 GHz Band Average Power (dBm)						
Mode/Band	a	ac 20	ac 40	ac 80	n 20	n 40
WLAN 5.8GHz	15.16	14.72	13.93	12.93	14.71	14.19

ANT 1:

Bluetooth Average Power (dBm)				
Mode/Band	1 Mbps(GFSK)	2 Mbps(π/4DQPSK)	3 Mbps (8DPSK)	LE (BT 4.0)
Bluetooth	7.20	10.22	10.30	1.46

ANT 2:

Bluetooth Average Power (dBm)				
Mode/Band	1 Mbps(GFSK)	2 Mbps(π/4DQPSK)	3 Mbps (8DPSK)	LE (BT 4.0)
Bluetooth	7.78	9.61	10.18	0.72

5.4 Environment of Test Site

Temperature:	18°C ~25 °C
Humidity:	35%~75% RH
Atmospheric Pressure:	1010 mbar

5.5 Test Sample Plan

Sample Number	Used for Test Items
SZR012500008-3	SAR
Remark: *JianYan Testing Group Shenzhen Co., Ltd. is only responsible for the test project data of the above samples, and will keep the above samples for a month.*	

5.6 Test Location

JianYan Testing Group Shenzhen Co., Ltd.
No.101, Building 8, Innovation Wisdom Port, No.155 Hongtian Road, Huangpu Community, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, People's Republic of China.
Tel: +86-755-23118282, Fax: +86-755-23116366
Email: info-JYTee@lets.com, Website: http://jyt.lets.com

6 Introduction

6.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

6.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

$$SAR=\frac{d}{dt}\left(\frac{dU}{dm}\right)=\frac{d}{dt}\left(\frac{dU}{\rho dv}\right)$$

SAR is expressed in units of Watts per kilogram (W/kg)

SAR measurement can be either related to the temperature elevation in tissue by

$$SAR=C\left(\frac{\delta T}{\delta t}\right)$$

Where: C is the specific heat capacity, δT is the temperature rise and δt is the exposure duration, or related to the electrical field in the tissue by

$$SAR=\frac{\sigma\cdot E^2}{\rho}$$

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength. However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

7 RF Exposure Limits

7.1 Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

7.2 Controlled Environment

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

7.3 RF Exposure Limits

SAR Human Exposure Specified in ANSI/IEEE C95.1-1992 and Health Canada Safety Code 6

HUMAN EXPOSURE LIMITS		
	UNCONTROLLED ENVIRONMENT *General Population* (W/kg) or (mW/g)	CONTROLLED ENVIRONMENT *Occupational* (W/kg) or (mW/g)
SPATIAL PEAK SAR Brain	1.6	8.0
SPATIAL AVERAGE SAR Whole Body	0.08	0.4
SPATIAL PEAK SAR Hands, Feet, Ankles, Wrists	4.0	20

Note:

1. The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
2. The Spatial Average value of the SAR averaged over the whole body.
3. The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

8 SAR Measurement System

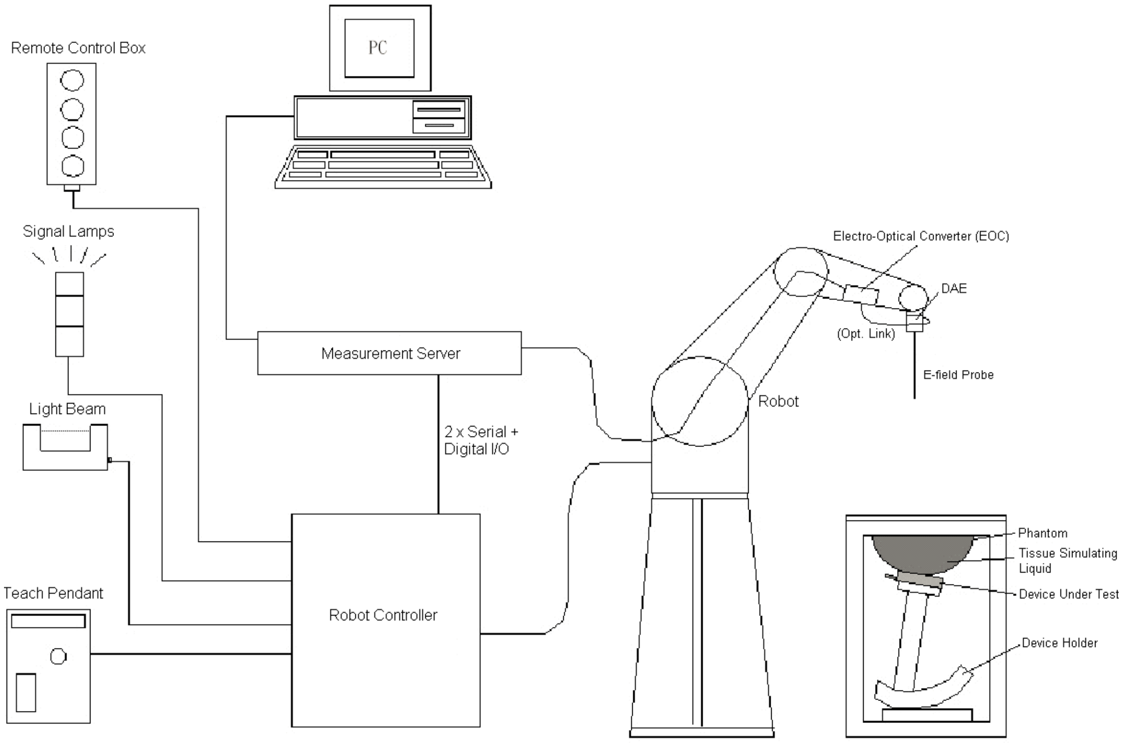


Fig. 8.1 SPEAG DASY System Configurations

The DASY system for performance compliance tests is illustrated above graphically. This system consists of the following items:

- A standard high precision 6-axis robot with controller, a teach pendant and software
- A data acquisition electronic (DAE) attached to the robot arm extension
- A dosimetric probe equipped with an optical surface detector system
- The electro-optical converter (EOC) performs the conversion between optical and electrical signals
- A measurement server performs the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the accuracy of the probe positioning
- A computer operating Windows XP
- DASY software
- Remove control with teach pendant and additional circuitry for robot safety such as warming lamps, etc.
- The SAM twin phantom
- A device holder
- Tissue simulating liquid
- Dipole for evaluating the proper functioning of the system

Component details are described in the following sub-sections.

8.1 E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG). The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

- **E-Field Probe Specification**
  <EX3DV4 Probe>

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency Directivity	10 MHz to 6 GHz; Linearity: ± 0.2 dB ± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (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: 330 mm (Tip: 20mm) Tip diameter: 2.5 mm (Body: 12mm) Typical distance from probe tip to dipole centers: 1 mm

Fig. 8.2 Photo of E-Field Probe

- **E-Field Probe Calibration**
  Each probe needs to be calibrated according to a dosimetric assessment procedure with accuracy better than ± 10%. The spherical isotropy shall be evaluated and within ± 0.25 dB. The sensitivity parameters (Norm X, Norm Y and Norm Z), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested. The calibration data can be referred to appendix E of this report.

8.2 Data Acquisition Electronics (DAE)

The Data acquisition electronics (DAE) consists 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 and 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 input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

Fig. 8.3 Photo of DAE

8.3 Robot

The SPEAG DASY system uses the high precision robots (DASY5: TX60L) type from St?ubli SA (France). For the 6-axis controller system, the robot controller version (DASY5: CS8c) from St?ubli is used. The St?ubli robot series have many features that are important for our application:

- High precision (repeatability 0.02 mm)
- High reliability (industrial design)
- Low maintenance costs (virtually maintenance free due to direct drive gears; nobelt drives)
- Jerk-free straight movements
- Low ELF interference (motor control fields shielded via the closed metallic construction shields)

Fig. 8.4 Photo of Robot

8.4 Measurement Server

The measurement server is based on a PC/104 CPU board with CPU (DASY 5: 400MHz, Intel Celeron), chip-disk (DASY5: 128 MB), RAM (DASY5: 128 MB). The necessary circuits for communication with the DAE electronic box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY I/O board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all the real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operations.

Fig. 8.5 Photo of Server for DASY5

8.5 Light Beam Unit

The light beam switch allows automatic "tooling" of the probe. During the process, the actual position of the probe tip with respect to the robot arm is measured, as well as the probe length and the horizontal probe offset. The software then corrects all movements, such that the robot coordinates are valid for the probe tip.

The repeatability of this process is better than0.1 mm. If a position has been taught with an aligned probe, the same position will be reached with another aligned probe within 0.1 mm, even if the other probe has different dimensions. During probe rotations, the probe tip will keep its actual position.

Fig. 8.6 Photo of Light Beam

8.6 Phantom

<SAM Twin Phantom>

Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm	 **Fig. 8.7 Photo of SAM Twin Phantom**
Filling Volume Dimensions	Approx. 25 liters Length: 1000mm; Width: 500mm; Height: adjustable feet	
Measurement Areas	Left Head, Right Head, Flat phantom	

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

<ELI4 Phantom >

The ELI4 phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30MHz to 6 GHz. ELI4 is fully compatible with the latest draft of the standard IEC 62209-2 and all known tissue simulating liquids.
ELI4 has been optimized regarding its performance and can be integrated into a SPEAG standard phantom table. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points
The phantom can be used with the following tissue simulating liquids:

- Water-sugar based liquids can be left permanently in the phantom. Always cover the liquid if the system is not in use; otherwise the parameters will change 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 phantom resistiveness

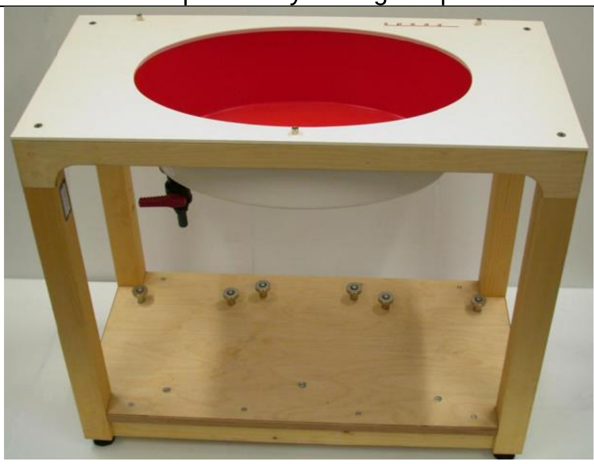


Fig.8.8 Photo of ELI4 Phantom

8.7 Device Holder

<Device Holder for SAM Twin Phantom>

The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5 mm distance, a positioning uncertainty of ± 0.5 mm would produce a SAR uncertainty of ± 20 %. Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions in which the devices must be measured are defined by the standards.
The DASY device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (ERP).
Thus the device needs no repositioning when changing the angles.
The DASY device holder is constructed of low-low POM material having the following dielectric parameters: relative permittivity ε = 3 and loss tangent δ = 0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

Fig. 8.9 Photo of Device Holder

8.8 Data storage and Evaluation

- **Data Storage**

The DASY software stores the assessed data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all the necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files. The post-processing software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verifications of the complete software setup even after the measurement and allows correction of erroneous parameter settings. For example, if a measurement has been performed with an incorrect crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be reevaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type (e.g., [V/m], [mW/g]). Some of these units are not available in certain situations or give meaningless results, e.g., a SAR-output in a non-lose media, will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

- **Data Evaluation**

The DASY post-processing software (SEMCAD) automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe Parameters:	- Sensitivity	$Norm_i$, a_{i0}, a_{i1}, a_{i2}
	- Conversion	$ConvF_i$
	- Diode compression point	dcp_i
Device Parameters:	- Frequency	f
	- Crest	cf
Media Parameters:	- Conductivity	σ
	- Density	ρ

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY components. In the direct measuring mode of the multi-meter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power.

The formula for each channel can be given as:

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

With V_i = compensated signal of channel i, (i = x, y, z)
U_i = input signal of channel i, (i = x, y, z)
cf = crest factor of exciting field (DASY parameter)
dcp^i = diode compression point (DASY parameter)

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

E- Field Probes: $$E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

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

With V_i = compensated signal of channel i, (i = x, y, z)
$Norm_i$ = senor sensitivity of channel i, (i = x, y, z), μV/ (V/m) ^{2}
ConvF = sensitivity enhancement in solution
a_{ij} = sensor sensitivity factors for H-field probes
f = carrier frequency (GHz)
E_i = electric field strength of channel i in V/m
Hi = magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian magnitude):

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

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

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$

With SAR = local specific absorption rate in mW/g
E_{tot} = total field strength in V/m
σ = conductivity in (mho/m) or (Siemens/m)
ρ = equipment tissue density in g/cm^3

Note that the density is set to 1, to account for actual head tissue density rather than the density of the tissue simulating liquid.

8.9 Test Equipment List

Manufacturer	Equipment Description	Model	Management Number	Cal. Information	
				Last Cal.	Due Date
SPEAG	2450MHz System Validation Kit	D2450V2	WXJ023-3	06.06.2022	06.05.2025
SPEAG	5GHz System Validation Kit	D5GHzV2	WXJ023-14	01.16.2024	01.15.2027
SPEAG	Data Acquisition Electronics	DAE4	WXJ021-1	03.26.2024	03.25.2025
SPEAG	Dosimetric E-Field Probe	EX3DV4	WXJ022	03.20.2024	03.19.2025
SPEAG	DASY 52 Measurement Software	DASY 52	Version 52.10.4.1527	N.C.R	N.C.R
SPEAG	DASY 52 File Conversion Software	SEMCAD X	Version 14.6.14 (7501)	N.C.R	N.C.R
SPEAG	Robot Controller	CS8Cspeag-TX60	WXG021-1	N.C.R	N.C.R
SPEAG	Phantom	Twin SAM Phantom	WXG021-4	N.C.R	N.C.R
SPEAG	Phantom	ELI V5.0	WXG021-5	N.C.R	N.C.R
SPEAG	Phone Positioner	N/A	WXG021-6	N.C.R	N.C.R
St?ubli	Robot	TX60Lspeag	WXG021-3	N.C.R	N.C.R
KEYSIGHT	Network Analyzer	E5071C	WXJ091	12.16.2024	12.15.2025
KEYSIGHT	EPM Series Power Meter	N1914A	WXJ075	06.11.2024	06.10.2025
KEYSIGHT	E-Series Power Sensor	E9300H	WXJ075-1	06.11.2024	06.10.2025
KEYSIGHT	E-Series Power Sensor	E9300H	WXJ075-2	06.11.2024	06.10.2025
KEYSIGHT	Signal Generator	N5173B	WXJ006-3	09.09.2024	09.08.2025
Huber Suhner	RF Cable	SUCOFLEX	WXG008-13	See Note 3	
Huber Suhner	RF Cable	SUCOFLEX	WXG008-14	See Note 3	
Huber Suhner	RF Cable	SUCOFLEX	WXG008-15	See Note 3	
Weinschel	Attenuator	23-3-34	WXG008-16	See Note 3	
Anritsu	Directional Coupler	MP654A	WXG008-17	See Note 3	
SPEAG	Dielectric Assessment Kit	3.5 Probe	WXG008-7	See Note 4	
SPEAG	DAK Measurement Software	DAK	Version: DAK 3.5	N.C.R	
TXC	Broadband Amplifier	BBA018000	WXG008-11	See Note 5	

Note:
1. The calibration certificate of DASY can be referred to appendix C of this report.
2. Referring to KDB 865664 D01v01r04, the dipole calibration interval can be extended to 3 years with justification. The dipoles are also not physically damaged, or repaired during the interval.
3. The Insertion Loss calibration of Dual Directional Coupler and Attenuator were characterized via the network analyzer and compensated during system check.
4. The dielectric probe kit was calibrated via the network analyzer, with the specified procedure (calibrated in pure water) and calibration kit (standard) short circuit, before the dielectric measurement. The specific procedure and calibration kit are provided by Speag.
5. In system check we need to monitor the level on the power meter, and adjust the power amplifier level to have precise power level to the dipole; the measured SAR will be normalized to 1 W input power according to the ratio of 1 W to the input power to the dipole. For system check, the calibration of the power amplifier is deemed not critically required for correct measurement; the power meter is critical and we do have calibration for it
6. Attenuator insertion loss is calibrated by the network Analyzer, which the calibration is valid, before system check.
7. N.C.R means No Calibration Requirement.

9 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For body SAR testing, the liquid height from the center of the flat phantom to liquid top surface is larger than 15 cm, which is shown in Fig. 9.1.

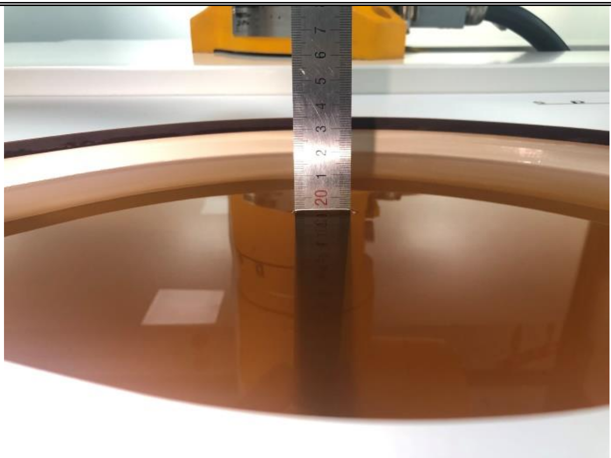


Fig. 9.4 Photo of Liquid Height for Body SAR (depth>15cm)

The relative permittivity and conductivity of the tissue material should be within ±5% of the values given in the table below recommended by the FCC OET 65 supplement C and RSS 102 Issue 5.

Target Frequency (MHz)	εr	σ(S/m)
150	52.3	0.76
300	45.3	0.87
450	43.5	0.87
835	41.5	0.90
900	41.5	0.97
915	41.5	0.98
1450	40.5	1.20
1610	40.3	1.29
1800-2000	40.0	1.40
2450	39.2	1.80
3000	38.5	2.40
5800	35.3	5.27

(εr = relative permittivity, σ = conductivity and ρ = 1000 kg/m^3)

The dielectric parameters of liquids were verified prior to the SAR evaluation using a Speag Dielectric Probe Kit and an Agilent Network Analyzer.
The following table shows the measuring results for simulating liquid.

Frequency (MHz)	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (εr)	Conductivity Target(σ)	Permittivity Target(εr)	Delta (σ)%	Delta (εr)%	Limit (%)	Date (mm/dd/yy)
2450	22.8	1.72	40.25	1.80	39.20	-4.39	2.67	±5	01/05/2025
5200	22.8	4.63	37.34	4.66	36.00	-0.60	3.73	±5	01/05/2025
5800	22.8	5.24	36.66	5.27	35.30	-0.49	3.84	±5	01/05/2025

10 SAR System Verification

Each DASY system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the DASY software, enable the user to conduct the system performance check and system validation. System validation kit includes a dipole, tripod holder to fix it underneath the flat phantom and a corresponding distance holder.

- **Purpose of System Performance check**
  The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected. It is recommended that the system performance check be performed prior to any usage of the system in order to guarantee reproducible results. The system performance check uses normal SAR measurements in a simplified setup with a well characterized source. This setup was selected to give a high sensitivity to all parameters that might fail or vary over time. The system check does not intend to replace the calibration of the components, but indicates situations where the system uncertainty is exceeded due to drift or failure.

- **System Setup**
  In the simplified setup for system evaluation, the EUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:

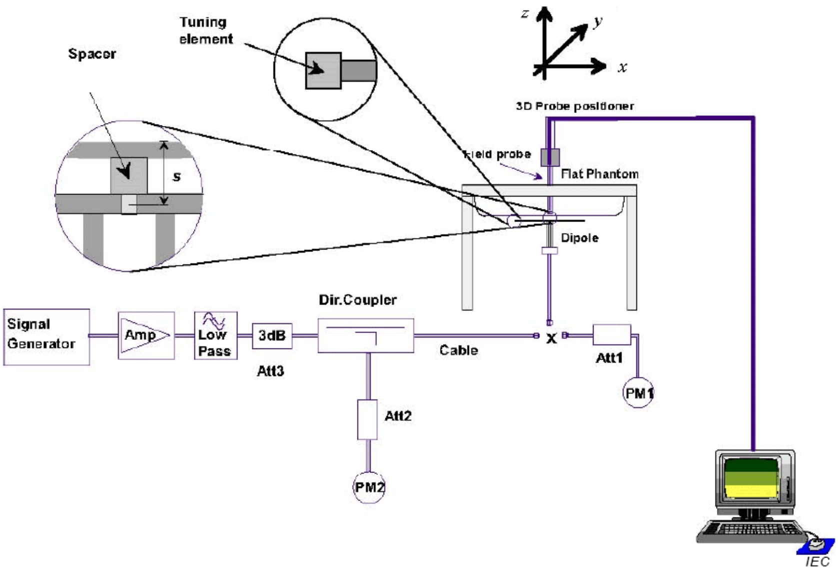


Fig.10.1 System Verification Setup Diagram

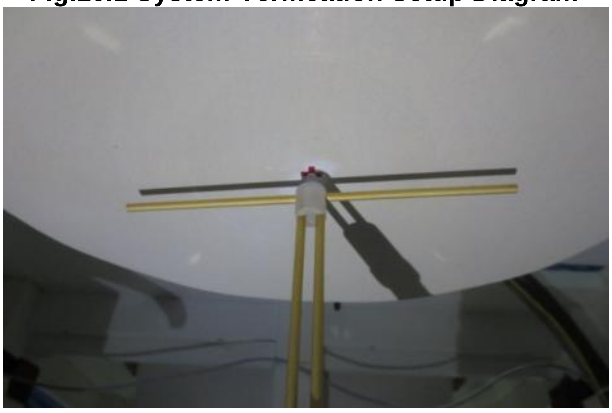


Fig.10.2 Photo of Dipole setup

- **System Verification Results**

  Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10%. The table as below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix C of this report.

Date (mm/dd/yy)	Frequency (MHz)	Power fed onto dipole (mW)	Measured 1g SAR (W/kg)	Normalized to 1W 1g SAR (W/kg)	1W Target 1g SAR (W/kg)	Deviation (%)
2450	40	2.080	52.00	53.4	-2.62	2450
5200	40	3.230	80.75	77.00	4.87	5200
5800	40	3.280	82.00	78.90	3.93	5800

11 EUT Testing Position

This EUT was tested in one positions. This is Back Side of the EUT with phantom 0 mm gap, as illustrated below, please refer to Appendix B for the test setup photos.

11.1 Body Configurations

- To position the device parallel to the phantom surface with either keypad up or down.
- To adjust the device parallel to the flat phantom.
- To adjust the distance between the device surface and the flat phantom to 0 mm or holster surface and the flat phantom to 0 mm.

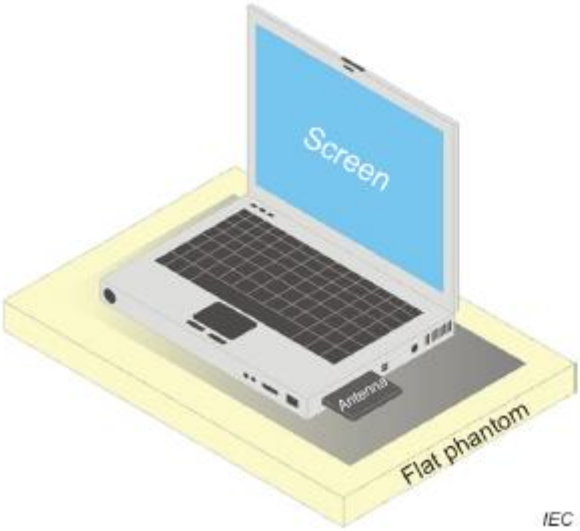


Fig.11.5 Illustration for Body Worn Position

12 Measurement Procedures

The measurement procedures are as below:

<Conducted power measurement>
- For WWAN power measurement, use base station simulator to configure EUT WWAN transition in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
- Read the WWAN RF power level from the base station simulator.
- For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band.
- Connect EUT RF port through RF cable to the power meter or spectrum analyzer, and measure WLAN/BT output power.

<Conducted power measurement>
- Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
- Place the EUT in positions as Appendix B demonstrates.
- Set scan area, grid size and other setting on the DASY software.
- Measure SAR results for the highest power channel on each testing position.
- Find out the largest SAR result on these testing positions of each band.
- Measure SAR results for other channels in worst SAR testing position if the Reported SAR or highest power channel is larger than 0.8 W/kg.

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

- Power reference measurement
- Area scan
- Zoom scan
- Power drift measurement

12.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a “cube” measurement. The measured volume must include the 1g and 10 g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:
- Extraction of the measured data (grid and values) from the Zoom Scan.
- Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters).
- Generation of a high-resolution mesh within the measured volume.
- Interpolation of all measured values form the measurement grid to the high-resolution grid
- Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
- Calculation of the averaged SAR within masses of 1g and 10g.

12.2 Power Reference Measurement

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

12.3 Area & Zoom Scan Procedures

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10g. Area scan and zoom scan resolution setting follows KDB 865664 D01v01r04 quoted below.

			≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location			30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}			≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
			When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	≤ 1.5·$\Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details. * When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

12.4 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD post-processor scan combine and subsequently superpose these measurement data to calculating the multiband SAR.

12.5 SAR Averaged Methods

In DASY, the interpolation and extrapolation are both based on the modified Quadratic Shepard's method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1g and 10g cubes, the extrapolation distance should not be larger than 5 mm.

12.6 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.

13 Conducted RF Output Power

13.1 WLAN 2.4 GHz Band Conducted Power

ANT 1 :

Average Power (dBm)					
Channel	Frequency (MHz)	802.11 b	802.11 g	802.11n (HT20)	802.11n (HT40)
CH 01	2412	**15.68**	13.57	13.36	13.29
CH 06	2437	14.98	12.78	12.70	13.03
CH 11	2462	14.86	12.59	12.67	12.99

ANT 2 :

Average Power (dBm)					
Channel	Frequency (MHz)	802.11 b	802.11 g	802.11n (HT20)	802.11n (HT40)
CH 01	2412	**16.45**	14.33	14.13	13.81
CH 06	2437	15.52	13.56	13.38	13.49
CH 11	2462	15.35	13.35	13.15	13.37

Note:

1. SAR test of WLAN 2.4GHz is performed.
2. Per KDB 248227 D01v02r02, choose the highest output power channel to test SAR and determine further SAR exclusion.
3. Per KDB 248227 D01v02r02, In the 2.4 GHz band, separate SAR procedures are applied to DSSS and OFDM configurations to simplify DSSS test requirements. SAR is not required for the following 2.4 GHz OFDM conditions:
   1) When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.
   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.
4. The output power of all data rate were pre-scan, just the worst case (the lowest data rate) of all mode were shown in report.
5. Per KDB 248227 D01V02r02 section 2.2, when the EUT in continuously transmitting mode, the actual duty cycle is 100%, so the duty cycle factor is 1.

13.2 WLAN 5.2GHz Band Conducted Power

ANT 1 :

Average Power (dBm)				
Channel	Frequency (MHz)	802.11 a	802.11 ac 20	802.11 n20
CH 36	5180	14.20	13.68	13.71
CH 40	5200	13.99	13.53	13.53
CH 48	5240	**14.79**	14.33	14.32

Average Power (dBm)			
Channel	Frequency (MHz)	802.11ac 40	802.11 n40
CH 38	5190	13.74	13.74
CH 46	5230	14.29	14.32

Average Power (dBm)		
Channel	Frequency (MHz)	802.11ac 80
CH 42	5210	13.60

ANT 2 :

Average Power (dBm)				
Channel	Frequency (MHz)	802.11 a	802.11 ac 20	802.11 n20
CH 36	5180	14.75	14.17	14.25
CH 40	5200	14.51	14.01	14.02
CH 48	5240	**15.20**	14.69	14.71

Average Power (dBm)			
Channel	Frequency (MHz)	802.11ac 40	802.11 n40
CH 38	5190	14.25	14.21
CH 46	5230	14.65	14.71

Average Power (dBm)		
Channel	Frequency (MHz)	802.11ac 80
CH 42	5210	14.03

Note:

1. SAR test of WLAN 5.2GHz is performed.
2. Per KDB 248227 D01v02r02, choose the highest output power channel to test SAR and determine further SAR exclusion.
3. The output power of all data rate were pre-scan, just the worst case (the lowest data rate) of all mode were shown in report.
4. Per KDB 248227 D01V02r02 section 2.2, when the EUT in continuously transmitting mode, the actual duty cycle is 100%, so the duty cycle factor is 1.

13.3 WLAN 5.8GHz Band Conducted Power

ANT 1:

Average Power (dBm)				
Channel	Frequency (MHz)	802.11 a	802.11 ac 20	802.11 n20
CH 149	5745	14.55	13.37	13.90
CH 157	5785	13.98	14.69	**15.17**
CH 165	5825	13.50	14.13	14.70

Average Power (dBm)			
Channel	Frequency (MHz)	802.11ac 40	802.11 n40
CH 151	5755	13.59	13.64
CH 159	5795	14.30	14.32

Average Power (dBm)		
Channel	Frequency (MHz)	802.11 ac80
CH 155	5775	13.75

ANT 2:

Average Power (dBm)				
Channel	Frequency (MHz)	802.11 a	802.11 ac 20	802.11 n20
CH 149	5745	13.90	13.37	13.44
CH 157	5785	**15.16**	14.72	14.71
CH 165	5825	14.37	13.85	13.86

Average Power (dBm)			
Channel	Frequency (MHz)	802.11ac 40	802.11 n40
CH 151	5755	13.22	13.50
CH 159	5795	13.93	14.19

Average Power (dBm)		
Channel	Frequency (MHz)	802.11 ac80
CH 155	5775	12.93

Note:

1. SAR test of WLAN 5.8GHz is performed.
2. Per KDB 248227 D01v02r02, choose the highest output power channel to test SAR and determine further SAR exclusion.
3. The output power of all data rate were pre-scan, just the worst case (the lowest data rate) of all mode were shown in report.
4. Per KDB 248227 D01V02r02 section 2.2, when the EUT in continuously transmitting mode, the actual duty cycle is 100%, so the duty cycle factor is 1.

13.4 Bluetooth Conducted Power

ANT 1:

Average Power (dBm)				
Channel	Frequency (MHz)	GFSK	π/4-DQPSK	8DPSK
CH 00	2402	6.47	8.89	9.01
CH 39	2441	6.96	9.80	10.08
CH 78	2480	7.20	10.22	**10.30**

Average Power (dBm)		
Channel	Frequency (MHz)	BLE
CH 00	2402	0.33
CH 20	2442	0.88
CH 39	2480	1.46

ANT 2:

Average Power (dBm)				
Channel	Frequency (MHz)	GFSK	π/4-DQPSK	8DPSK
CH 00	2402	6.22	8.11	9.27
CH 39	2441	7.32	9.09	9.86
CH 78	2480	7.78	9.61	**10.18**

Average Power (dBm)		
Channel	Frequency (MHz)	BLE
CH 00	2402	0.03
CH 20	2442	0.62
CH 39	2480	0.72

Note:
1. SAR test of Bluetooth is performed and the mode with highest average power is selected for SAR testing.
2. Per KDB 447498 D04v01 section 2.1.2: 1-mW Test Exemption, SAR test for BLE is not required.
3. The output power of all data rate were pre-scan, just the worst case of all mode were shown in report.
4. Per KDB 248227 D01V02r02 section 2.2, when the EUT in continuously transmitting mode, the actual duty cycle is 100%, so the duty cycle factor is 1.

14 Exposure Positions Consideration

14.1 EUT Antenna Locations

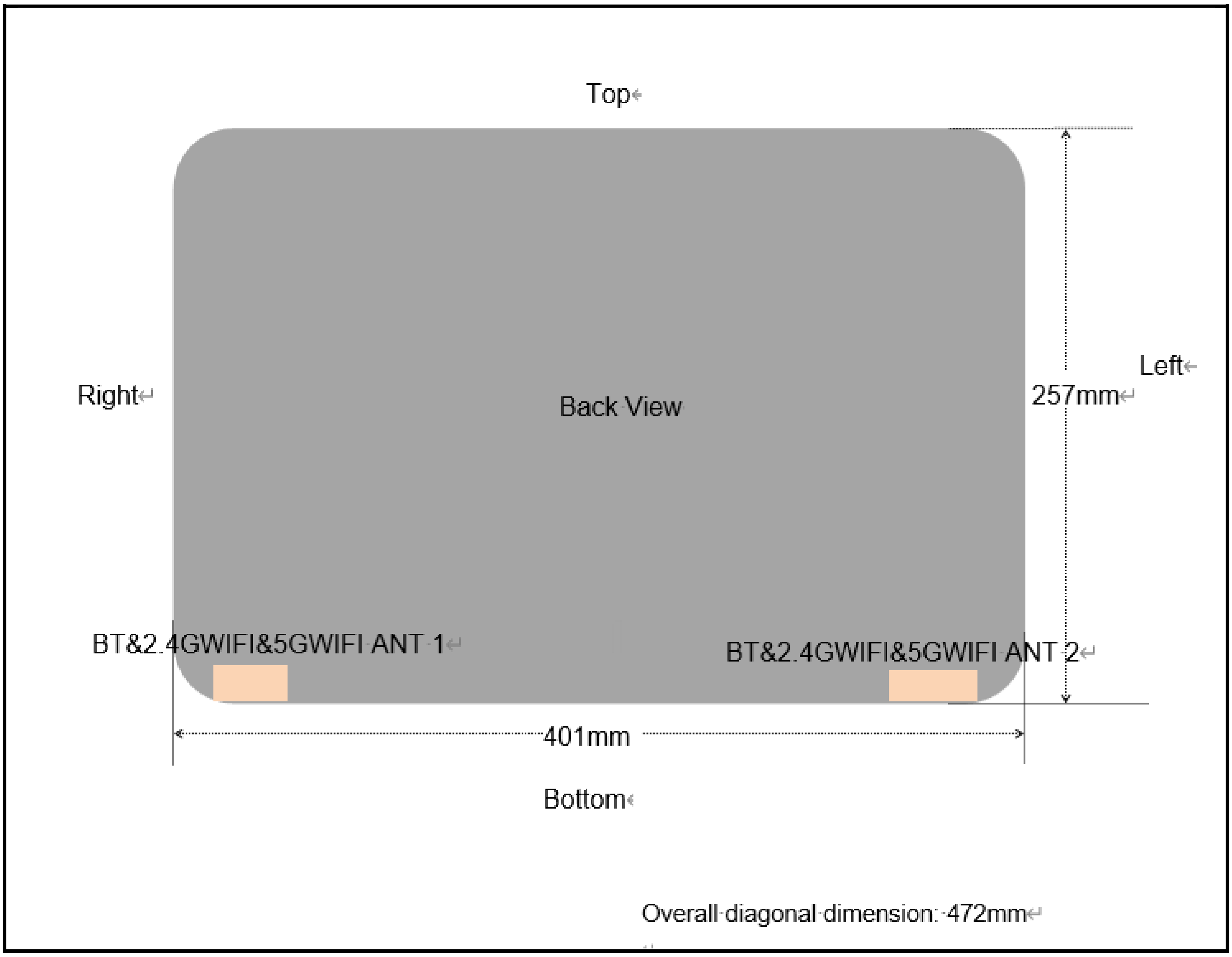


Fig.14.1 EUT Antenna Locations

Note: This antenna diagram is only used as a reference for the distance from the antenna to each edge. For the specific shape of the antenna, please refer to the physical photo.

14.2 Test Positions Consideration

Distance of Antennas to EUT edge/surface Test distance: 10mm						
Antennas	**Back**	**Front**	**Top Side**	**Bottom Side**	**Right Side**	**Left Side**
BT&2.4GWIFI&5GWIFI ANT 1	<25mm	<25mm	222mm	<25mm	347mm	26mm
BT&2.4GWIFI&5GWIFI ANT2	<25mm	<25mm	230mm	<25mm	26mm	347mm

15 SAR Test Results Summary

15.1 Standalone Body SAR

➢ WLAN 2.4GHz Body SAR

Plot No.	Band/Mode	ANT	Test Position	CH.	Freq. (MHz)	Ave. Power (dBm)	Power Drift (dB)	Tune-Up Limit (dBm)	Meas. SAR_{1g} (W/kg)	Scaling Factor	D.C Factor	Reported SAR_{1g} (W/kg)
	2.4GHz/802.11b	1	Back	1	2412	15.68	-0.02	16.0	0.880	1.076	1.000	0.947
	2.4GHz/802.11b	1	Back	6	2437	14.98	-0.02	16.0	0.911	1.265	1.000	1.152
	2.4GHz/802.11b	1	Back	11	2462	14.86	-0.07	16.0	0.599	1.300	1.000	0.779
1	2.4GHz/802.11b	2	Back	1	2412	16.45	-0.02	16.5	**1.200**	1.012	1.000	1.214
	2.4GHz/802.11b	2	Back	6	2437	15.52	-0.04	16.5	1.110	1.253	1.000	1.391
	2.4GHz/802.11b	2	Back	11	2462	15.35	-0.17	16.5	0.877	1.303	1.000	1.143
	2.4GHz/802.11b	**2**	**Back**	**1**	**2412**	**16.45**	**0.06**	**16.5**	**1.170**	**1.012**	**1.000**	**1.184**
ANSI / IEEE C95.1 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population						**1.6 W/kg (mW/g) Averaged over 1g**						

➢ WLAN 5.2GHz Body SAR

Plot No.	Band/Mode	ANT	Test Position	CH.	Freq. (MHz)	Ave. Power (dBm)	Power Drift (dB)	Tune-Up Limit (dBm)	Meas. SAR_{1g} (W/kg)	Scaling Factor	D.C Factor	Reported SAR_{1g} (W/kg)
2	5.2GHz/802.11a	1	Back	48	5240	14.79	0.05	15.0	1.030	1.050	1.000	1.082
	5.2GHz/802.11a	1	Back	36	5180	14.20	-0.01	15.0	0.982	1.202	1.000	1.180
	5.2GHz/802.11a	1	Back	40	5200	13.99	-0.08	15.0	1.010	1.262	1.000	1.275
	5.2GHz/802.11a	**1**	**Back**	**48**	**5240**	**14.79**	**0.03**	**15.0**	**1.010**	**1.050**	**1.000**	**1.061**
	5.2GHz/802.11a	2	Back	48	5240	15.20	-0.01	15.5	0.986	1.072	1.000	1.057
	5.2GHz/802.11a	2	Back	36	5180	14.75	-0.15	15.5	0.787	1.189	1.000	0.936
	5.2GHz/802.11a	2	Back	40	5200	14.51	-0.18	15.5	0.845	1.256	1.000	1.061
ANSI / IEEE C95.1 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population						**1.6 W/kg (mW/g) Averaged over 1g**						

➢ WLAN 5.8GHz Body SAR

Plot No.	Band/Mode	ANT	Test Position	CH.	Freq. (MHz)	Ave. Power (dBm)	Power Drift (dB)	Tune-Up Limit (dBm)	Meas. SAR_{1g} (W/kg)	Scaling Factor	D.C Factor	Reported SAR_{1g} (W/kg)
	5.8GHz/802.11n 20	1	Back	157	5785	15.17	0.06	15.5	0.625	1.079	1.000	0.674
	5.8GHz/802.11a	2	Back	157	5785	15.16	-0.20	15.5	0.794	1.081	1.000	0.858
3	5.8GHz/802.11a	2	Back	149	5745	13.90	-0.05	15.5	**0.853**	1.445	1.000	1.233
	5.8GHz/802.11a	2	Back	165	5825	14.37	0.05	15.5	0.659	1.297	1.000	0.855
	5.8GHz/802.11a	**2**	**Back**	**149**	**5745**	**13.90**	**0.11**	**15.5**	**0.837**	**1.445**	**1.000**	**1.209**
ANSI / IEEE C95.1 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population						**1.6 W/kg (mW/g) Averaged over 1g**						

➢ Bluetooth Body SAR

Plot No.	Band/Mode	ANT	Test Position	CH.	Freq. (MHz)	Ave. Power (dBm)	Power Drift (dB)	Tune-Up Limit (dBm)	Meas. SAR_{1g} (W/kg)	Scaling Factor	D.C Factor	Reported SAR_{1g} (W/kg)
4	BT/8DPSK	1	Back	78	2480	10.30	-0.02	10.5	**0.125**	1.047	1.000	0.131
	BT/8DPSK	2	Back	78	2480	10.18	0.02	10.5	0.038	1.076	1.000	0.041
ANSI / IEEE C95.1 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population						**1.6 W/kg (mW/g) Averaged over 1g**						

Note:

1. Per KDB 447498 D04v01, for each exposure position, if the highest output channel Reported SAR ≤0.8W/kg, other channels SAR testing is not necessary.
2. Additional WLAN SAR testing was performed for simultaneous transmission analysis.
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required when the measured

SAR is ≥0.8W/kg.

4. Per KDB 248227 D01v02r02, OFDM SAR is not required 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. Cuz the maximum output power specified for OFDM and DSSS are 25.12mW(14.0dBm) and 39.81mW(16.0dBm), the scaled SAR would be 0.882×(25.12/39.81)=0.0.557W/Kg ˂ 1.2 W/kg, therefore, SAR is not required for OFDM.
5. According to KDB 865664 D02v01r02, SAR plot is required for the highest measured SAR in each exposure configuration, wireless mode and frequency band combination.
6. Highlight part of test data means repeated test.

15.2 Repeated SAR measurement

Band/ Mode	Test Position	ANT	CH.	Freq. (MHz)	Measured SAR (W/kg)				
					Original	1st Repeated		2nd Repeated	
						Value	Ratio	Value	Ratio
2.4GHz/802.11b	Back	2	1	2412	1.20	1.17	1.03	/	/
5.2GHz/802.11a	Back	1	48	5240	1.03	1.01	1.02	/	/
5.8GHz/802.11a	Back	2	149	5745	0.853	0.837	1.02	/	/
ANSI / IEEE C95.1 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population					**1.6 W/kg (mW/g) Averaged over 1g**				

Note:

1. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg
2. Per KDB 865664 D01v01r04, if the ratio of *original* and *repeated* is ≤ 1.2and the measured SAR <1.45W/kg,only one repeated measurement is required.

15.3 DUT holder perturbation uncertainty evaluation

1. According to TCB workshop, Oct 2016:
   When the highest reported SAR of an antenna is > 1.2 W/kg, holder perturbation verification is required for each antenna, using the highest SAR configuration among all applicable frequency bands.
2. According to IEC/IEEE 62209-1528 section R.2.2, When it is unknown if a device holder perturbs the fields of a test device, the SAR uncertainty shall be assessed with a flat phantom (see Clause 5) by comparing the SAR with and without the device holder according to the following tests:

a) With device holder: 1 g or 10 g peak spatial-average SAR is measured with the handset fixed in the holder in a manner similar to the way it was held when tested for the head SAR position. The handset horizontal and vertical centerlines (see Clause 6) are aligned parallel to the bottom of the flat phantom and the device is in direct contact with the phantom. The test shall be performed with the antenna position and device operational configuration corresponding to that where the highest head SAR was previously measured for each frequency band.

b) Without device holder: 1 g or 10 g peak spatial-average SAR is measured with the handset placed on a low-loss foam block or support in the position identical to that tested with the device holder. The relative permittivity and loss tangent of the foam material shall be less than 1.2 and 10–5, respectively.

Test result:

Plot	Band/ Mode	ANT	Test Position	CH.	Freq. (MHz)	Test configuration	Measured SAR (W/kg) Averaged over 1g
1	2.4GHz/802.11b	2	Back	6	2437	With device holder	1.11
2	2.4GHz/802.11b	2	Back	6	2437	Without device holder	1.07

Note:

1. The plots of test result please check

The following equation is used to computed the SAR tolerance,

$$SAR_{\text{tolerance}}[\%] = 100 \times \left(\frac{SAR_{\text{w/ holder}} - SAR_{\text{w/o holder}}}{SAR_{\text{w/o holder}}} \right)$$

Therefore, the SAR $_{\text{tolerance}}$=100× [(1.11-1.07)/ 1.11] = 3.60%.

15.4 Multi-Band Simultaneous Transmission Considerations

This device does not contain transmitters that may operate simultaneously. Therefore simultaneous transmission analysis is not required.

15.5 Multi-Band Simultaneous Transmission Considerations

This device does not contain transmitters that may operate simultaneously. Therefore simultaneous transmission analysis is not required.

15.6 Measurement Uncertainty

Per KDB865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEC/IEEE 62209-1528 is not required in SAR reports submitted for equipment approval. The equivalent ratio (1.5/1.6) is applied to extremity and occupational exposure conditions.

15.7 Measurement Conclusion

The SAR evaluation indicates that the EUT complies with the RF radiation exposure limits of the FCC and Industry Canada, with respect to all parameters subject to this test. These measurements were taken to simulate the RF effects of RF exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The results and statements relate only to the item(s) tested. Please note that the absorption and distribution of electromagnetic energy in the body are very complex phenomena that depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because various factors may interact with one another to vary the specific biological outcome of an exposure to electromagnetic fields, any protection guide should consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables.

16 Reference

[1]. FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”

[2]. ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992

[3]. IEC/IEEE 62209-1528, “Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Part 1528: Human models, instrumentation, and procedures (Frequency range of 4 MHz to 10 GHz)”, October 2020

[4]. SPEAG DASY52 System Handbook

[5]. FCC KDB 248227 D01 v02r02, “SAR GUIDANCE FOR IEEE 802.11 (Wi-Fi) TRANSMITTERS”, October 2015

[6]. FCC KDB 447498 D04 v01, “RF EXPOSURE PROCEDURES AND EQUIPMENT AUTHORIZATION POLICIES FOR MOBILE AND PORTABLE DEVICES”, November 2021

[7]. FCC KDB 616217 D04 v01r02, “SAR EVALUATION CONSIDERATIONS FOR LAPTOP, NOTEBOOK, NETBOOK AND TABLET COMPUTERS”, October 2015

[8]. FCC KDB 941225 D06 v02r01, " SAR EVALUATION PROCEDURES FOR PORTABLE DEVICES WITH WIRELESS ROUTER CAPABILITIES", October 2015

[9]. FCC KDB 865664 D01 v01r04, “SAR MEASUREMENT REQUIREMENTS FOR 100 MHz TO 6 GHz”, August 2015

Appendix A: Plots of SAR System Check

Test Laboratory: JYTSZ Date: 1/5/2025

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: SN:910

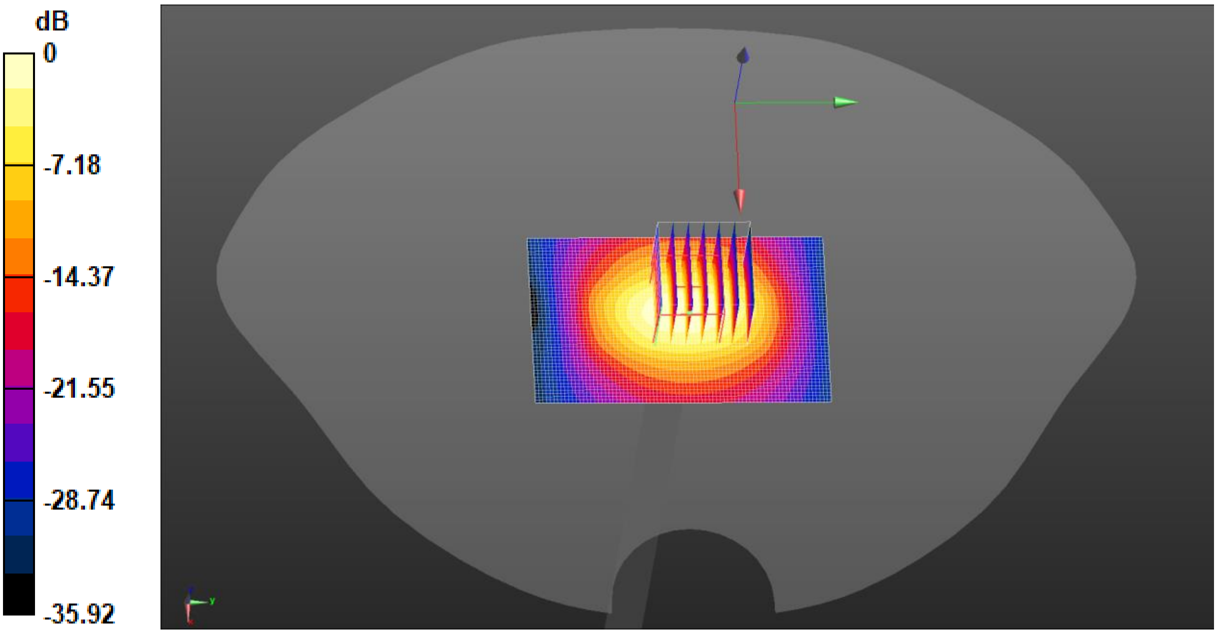
Communication System: UID 0, CW (0); Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.721 S/m; ε_r = 40.246; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(7.59, 7.59, 7.59) @ 2412 MHz; Calibrated: 3/20/2024
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1452; Calibrated: 3/26/2024
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

System Performance Check at Frequency2450 MHz Head Tissue/d=10mm, Pin=40 mW, dist=1.4mm (EX-Probe)/Area Scan (51x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 3.52 W/kg

System Performance Check at Frequency2450 MHz Head Tissue/d=10mm, Pin=40 mW, dist=1.4mm (EX-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 43.10 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 4.24 W/kg
SAR(1 g) = 2.08 W/kg; SAR(10 g) = 0.937 W/kg
Smallest distance from peaks to all points 3 dB below = 8.9 mm
Ratio of SAR at M2 to SAR at M1 = 48.6%
Maximum value of SAR (measured) = 3.31 W/kg



0 dB = 3.52 W/kg = 5.47 dBW/kg

Test Laboratory: JYTSZ Date: 1/5/2025

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: SN:1320

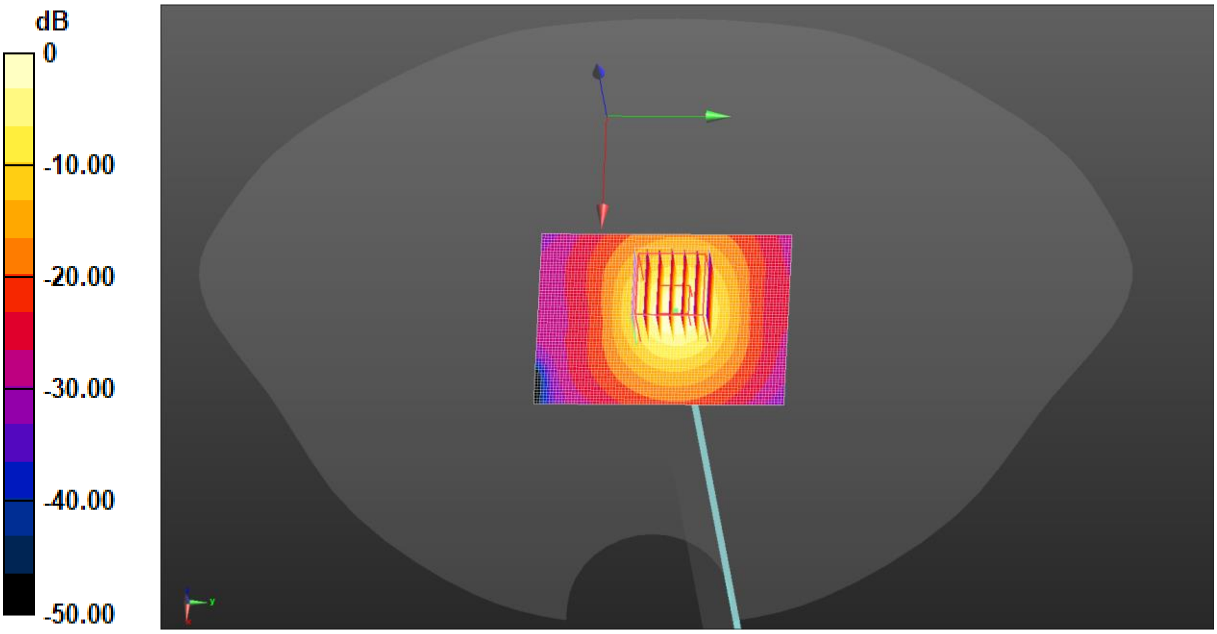
Communication System: UID 0, CW (0); Frequency: 5200 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5200 MHz; σ = 4.632 S/m; ε_r = 37.342; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(5.4, 5.4, 5.4) @ 5200 MHz; Calibrated: 3/20/2024
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1452; Calibrated: 3/26/2024
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

System Performance Check at Frequency5GHz Head Tissue/d=10mm, Pin=40 mW, dist=1.4mm (EX-Probe)/Area Scan (61x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 8.32 W/kg

System Performance Check at Frequency5GHz Head Tissue/d=10mm, Pin=40 mW, dist=1.4mm (EX-Probe)/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 39.34 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 12.3 W/kg
SAR(1 g) = 3.23 W/kg; SAR(10 g) = 0.941 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 56.2%
Maximum value of SAR (measured) = 8.07 W/kg



0 dB = 8.07 W/kg = 9.07 dBW/kg

Test Laboratory: JYTSZ Date: 1/5/2025

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: SN:1320

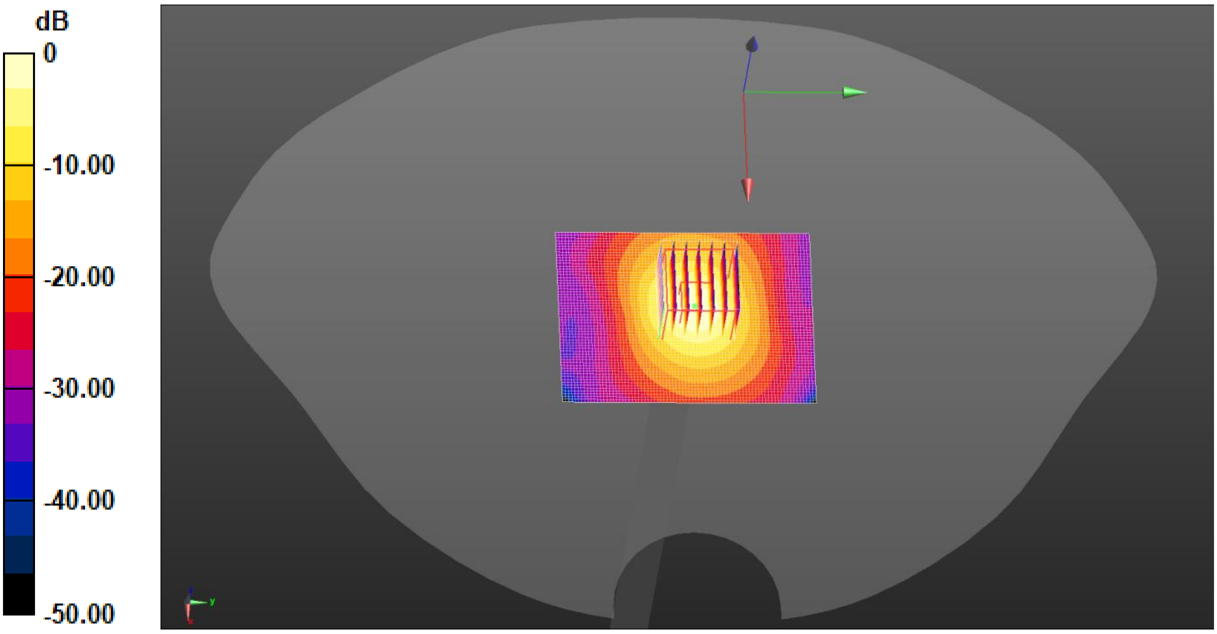
Communication System: UID 0, CW (0); Frequency: 5800 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5800 MHz; σ = 5.244 S/m; ε_r = 36.657; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(4.93, 4.93, 4.93) @ 5800 MHz; Calibrated: 3/20/2024
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1452; Calibrated: 3/26/2024
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

System Performance Check at Frequency5GHz Head Tissue/d=10mm, Pin=40 mW, dist=1.4mm (EX-Probe)/Area Scan (61x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 8.67 W/kg

System Performance Check at Frequency5GHz Head Tissue/d=10mm, Pin=40 mW, dist=1.4mm (EX-Probe)/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 39.91 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 14.2 W/kg
SAR(1 g) = 3.28 W/kg; SAR(10 g) = 0.930 W/kg
Smallest distance from peaks to all points 3 dB below = 7.4 mm
Ratio of SAR at M2 to SAR at M1 = 50.2%
Maximum value of SAR (measured) = 8.42 W/kg



0 dB = 8.42 W/kg = 9.25 dBW/kg

Appendix B: Plots of SAR Test Data

Test Laboratory: JYTSZ Date: 2025/1/5

DUT: Laptop PC; Type: L17-N41; Serial: SZR012500008-3

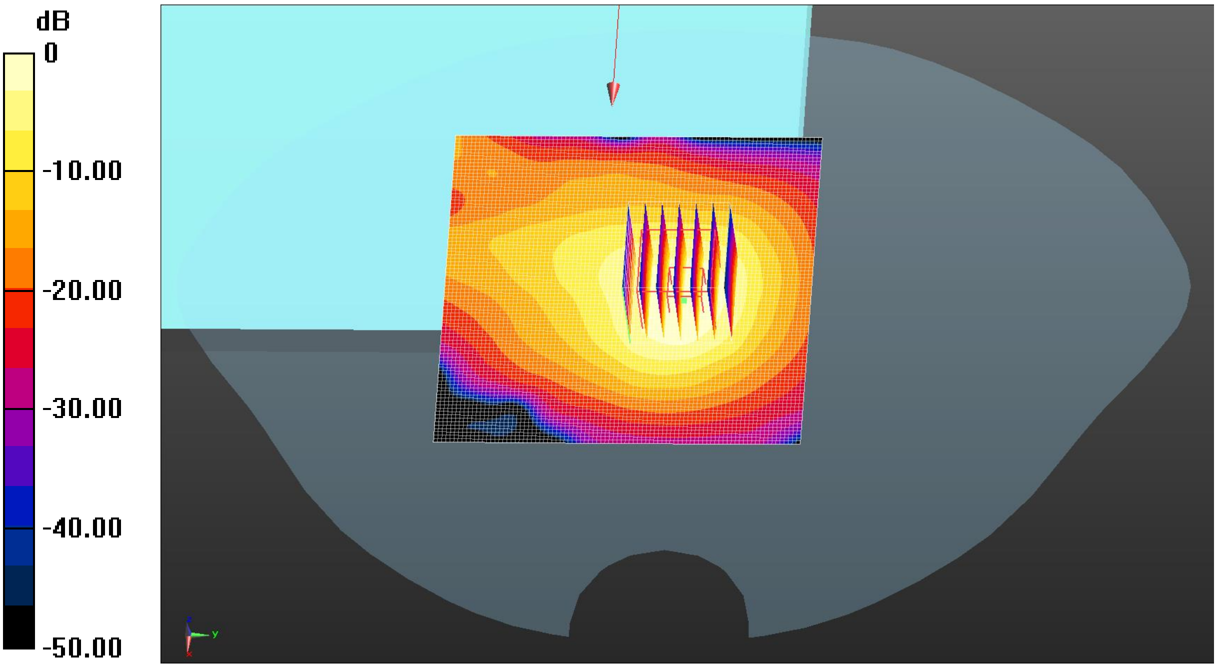
Communication System: UID 0, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps) (0); Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; σ = 1.688 S/m; ε_r = 40.314; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(7.59, 7.59, 7.59) @ 2412 MHz; Calibrated: 2024/3/20
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1452; Calibrated: 2024/3/26
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

2.4G WiFi Body Back/Low Channel/Area Scan (91x91x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 1.96 W/kg

2.4G WiFi Body Back/Low Channel/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 30.34 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 2.26 W/kg
SAR(1 g) = 1.2 W/kg; SAR(10 g) = 0.614 W/kg
Smallest distance from peaks to all points 3 dB below = 10.4 mm
Ratio of SAR at M2 to SAR at M1 = 54.2%
Maximum value of SAR (measured) = 1.86 W/kg



0 dB = 1.96 W/kg = 2.93 dBW/kg

Test Laboratory: JYTSZ Date: 2025/1/5

DUT: Laptop PC; Type: L17-N41; Serial: SZR012500008-3

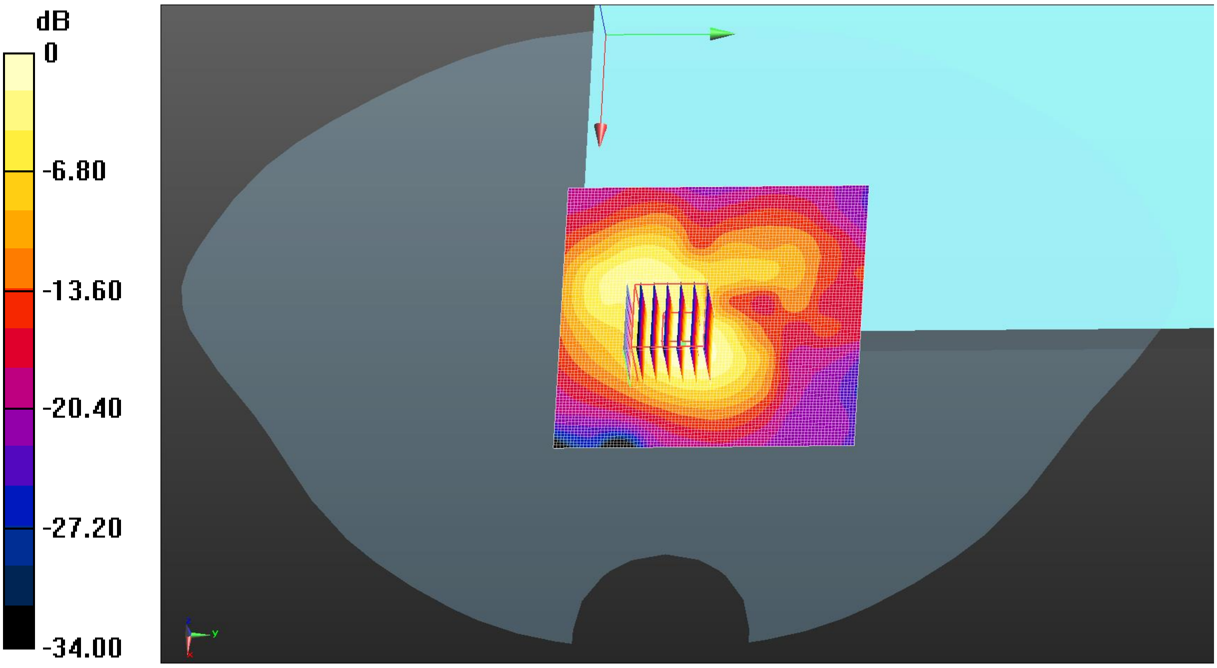
Communication System: UID 0, IEEE 802.11a WiFi 5GHz (0); Frequency: 5240 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5240 MHz; σ = 4.673 S/m; ε_r = 37.297; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(5.4, 5.4, 5.4) @ 5240 MHz; Calibrated: 2024/3/20
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1452; Calibrated: 2024/3/26
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

5.2G WIFI Body Back/High Channel/Area Scan (91x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 2.47 W/kg

5.2G WIFI Body Back/High Channel/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 25.44 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 3.50 W/kg
SAR(1 g) = 1.03 W/kg; SAR(10 g) = 0.345 W/kg
Smallest distance from peaks to all points 3 dB below = 8.9 mm
Ratio of SAR at M2 to SAR at M1 = 57.5%
Maximum value of SAR (measured) = 2.25 W/kg



0 dB = 2.25 W/kg = 3.52 dBW/kg

Test Laboratory: JYTSZ Date: 2025/1/5

DUT: Laptop PC; Type: L17-N41; Serial: SZR012500008-3

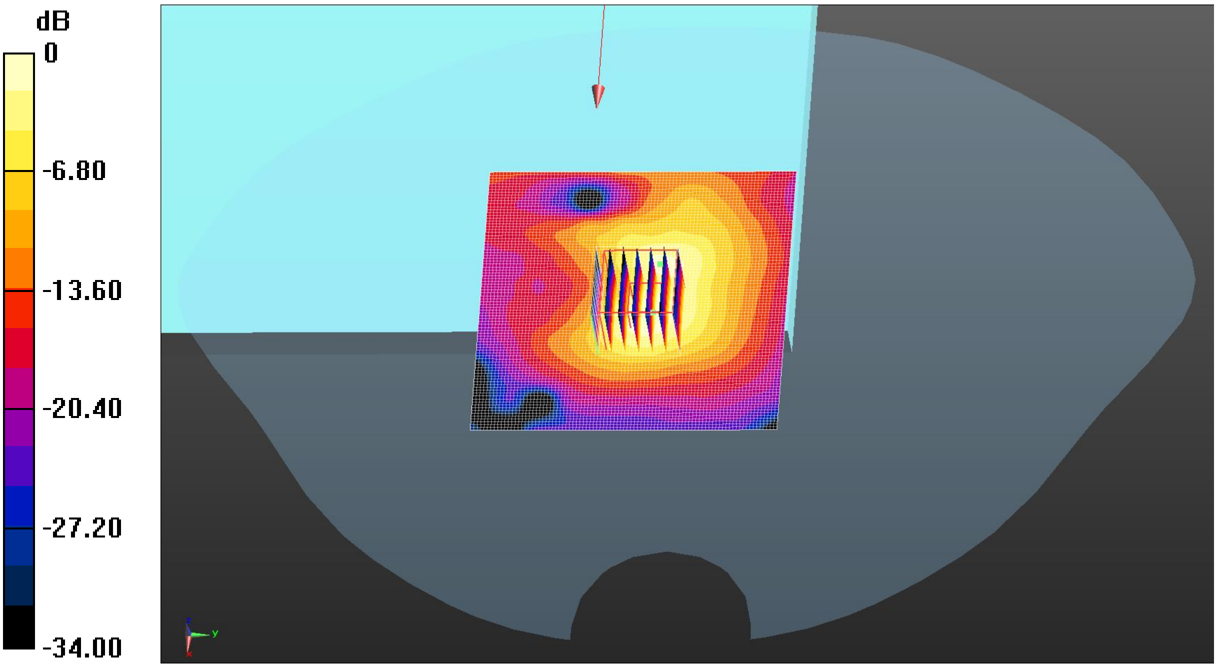
Communication System: UID 0, IEEE 802.11a WiFi 5GHz (0); Frequency: 5745 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5745 MHz; σ = 5.188 S/m; ε_r = 36.719; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(4.93, 4.93, 4.93) @ 5745 MHz; Calibrated: 2024/3/20
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1452; Calibrated: 2024/3/26
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

5.8G WiFi Body Back/Low Channel/Area Scan (91x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 2.10 W/kg

5.8G WiFi Body Back/Low Channel/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 13.51 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 3.34 W/kg
SAR(1 g) = 0.853 W/kg; SAR(10 g) = 0.269 W/kg
Smallest distance from peaks to all points 3 dB below = 7.9 mm
Ratio of SAR at M2 to SAR at M1 = 53.8%
Maximum value of SAR (measured) = 1.99 W/kg



0 dB = 1.99 W/kg = 2.99 dBW/kg

Test Laboratory: JYTSZ Date: 2025/1/5

DUT: Laptop PC; Type: L17-N41; Serial: SZR012500008-3

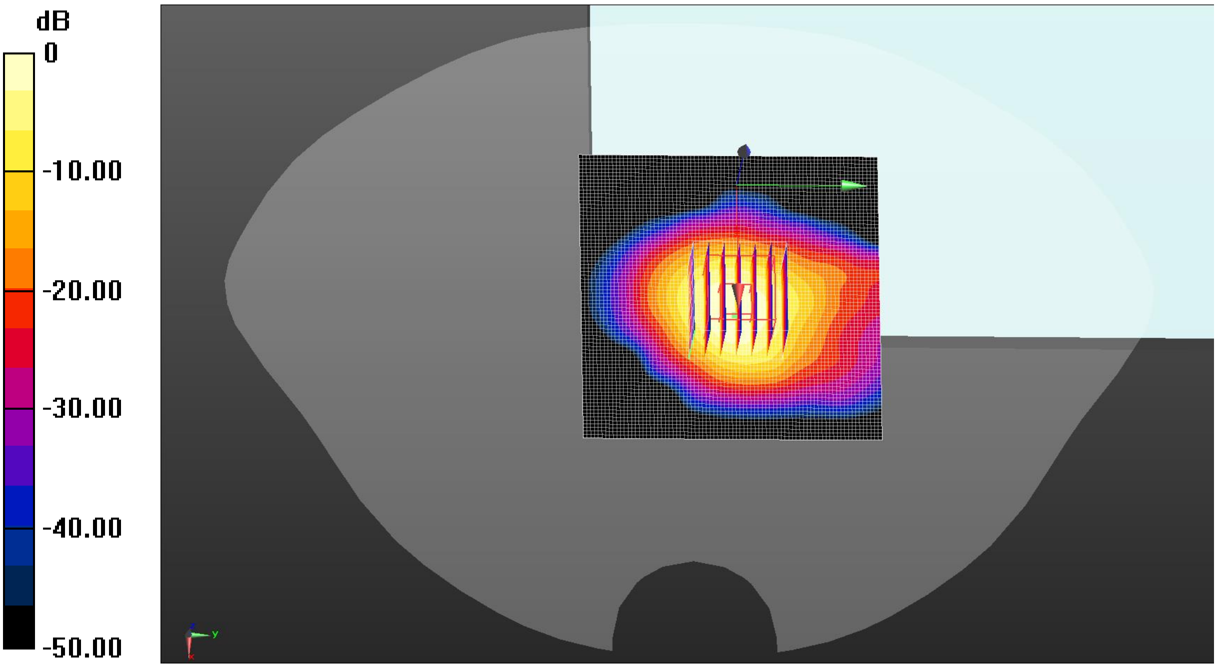
Communication System: UID 0, Bluetooth (0); Frequency: 2441 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2441 MHz; σ = 1.713 S/m; ε_r = 40.262; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(7.59, 7.59, 7.59) @ 2441 MHz; Calibrated: 2024/3/20
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1452; Calibrated: 2024/3/26
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

Bluetooth Body Back/Middle Channel/Area Scan (71x71x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.276 W/kg

Bluetooth Body Back/Middle Channel/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 11.52 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.484 W/kg
SAR(1 g) = 0.125 W/kg; SAR(10 g) = 0.048 W/kg
Smallest distance from peaks to all points 3 dB below = 8 mm
Ratio of SAR at M2 to SAR at M1 = 25.1%
Maximum value of SAR (measured) = 0.278 W/kg



0 dB = 0.276 W/kg = -5.59 dBW/kg

Test Laboratory: JYTSZ Date: 2025/1/5

DUT: Laptop PC; Type: L17-N41; Serial: SZR012500008-3

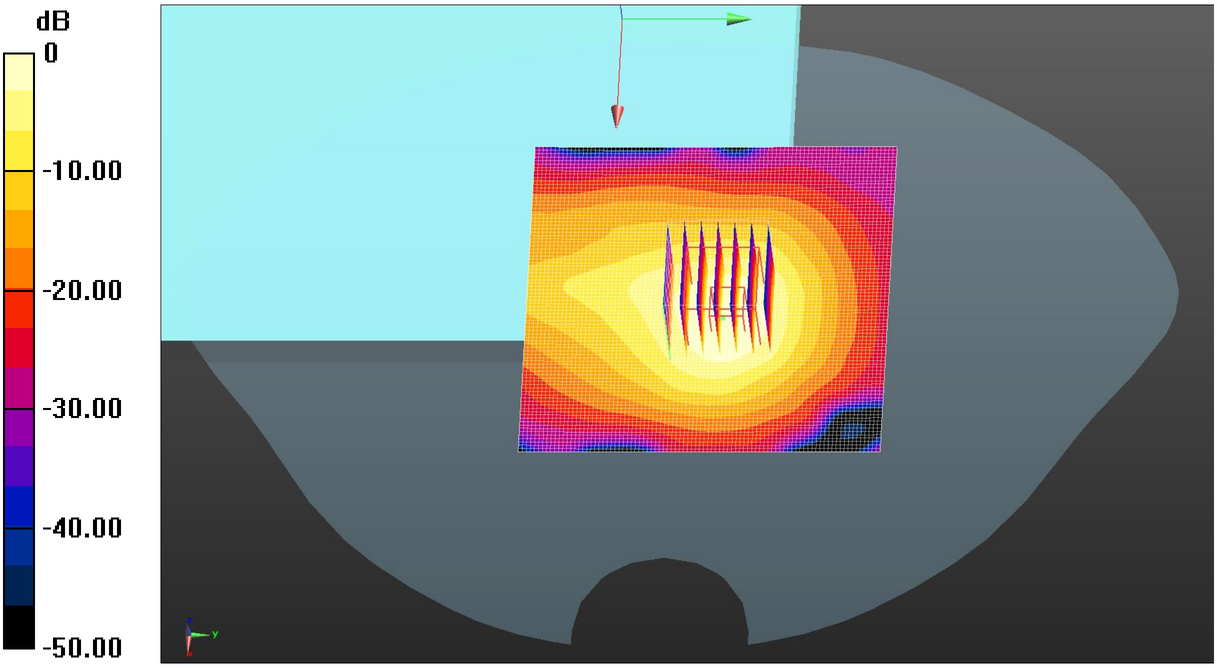
Communication System: UID 0, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps) (0); Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.71 S/m; ε_r = 40.27; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(7.59, 7.59, 7.59) @ 2437 MHz; Calibrated: 2024/3/20
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1452; Calibrated: 2024/3/26
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

2.4G WiFi Body Back/Middle Channel/Area Scan (91x91x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 1.69 W/kg

2.4G WiFi Body Back/Middle Channel/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 19.64 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 2.02 W/kg
SAR(1 g) = 1.07 W/kg; SAR(10 g) = 0.549 W/kg
Smallest distance from peaks to all points 3 dB below = 11.7 mm
Ratio of SAR at M2 to SAR at M1 = 54.4%
Maximum value of SAR (measured) = 1.62 W/kg



0 dB = 1.69 W/kg = 2.27 dBW/kg

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