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DEKRA

ilac-MRA

A2LA ACCREDITED Cert. # 3235.01

Test report No:
2640203R.715

FCC TEST REPORT

Product	Notebook PC
Model and /or type reference	S5652M / K5652M / V5652M
Trademark	ASUS
FCC ID	TX2-RTL8852B
Applicant´s name / address	Realtek Semiconductor Corp. No. 2, Innovation Road II, Hsinchu Science Park, Hsinchu 300, Taiwan
Test method requested, standard	47 CFR FCC Part 2 (Section 2.1093) IEEE Std 1528-2013 ANSI C95.1-2019
Verdict Summary	IN COMPLIANCE
Documented by (name / position & signature)	Tim Cao / Project Manager
Approved by (name / position & signature)	Frank He / Technical Manager
Date of issue	2026-07-01
Report Version	V1.0
Report template No	Template_FCC SAR-RF-V1.0

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COMPETENCES AND GUARANTEES

DEKRA is a testing laboratory competent to carry out the tests described in this report.
In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated in the report and it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

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The results presented in this Test Report apply only to the particular item under test established in this document.

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GENERAL CONDITIONS

Test Location	No. 99, Hongye Road, Suzhou Industrial Park Suzhou, 215006, P.R. China
Test Facility	A2LA (Certificate No. 3235.01) CNAS (Certificate No. L5313) FCC - Designation Number: CN1199 Test Firm Registration Number: 566524 ISED - CAB identifier: CN0040 IC#: 4075B
Date (receive sample)	Apr. 05, 2026
Date (start test)	Apr. 10, 2026
Date (finish test)	Apr. 30, 2026

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or Competent Authorities.
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5. The measurement result is considered in conformance with the requirement if it is within the prescribed limit, it is not necessary to account the uncertainty associated with the measurement result.

DOCUMENT HISTORY

Report No.	Version	Description	Issued Date
2640203R.715	V1.0	Initial issue of report.	2026-07-01

STATEMENT OF COMPLIANCE

The maximum results of Specific Absorption Rate (SAR) found during testing for Notebook PC, are as follows.

Frequency Band	Maximum Reported SAR 1g (W/kg)
	Body SAR (0mm)
Bluetooth	0.17
WLAN 2.4G	0.36
WLAN 5.2G	0.55
WLAN 5.3G	0.55
WLAN 5.6G	0.87
WLAN 5.8G	**1.04**
Sum SAR	Maximum Simultaneous Transmission SAR 1g (W/kg)
	1.21
SAR Limited(W/kg)	1.60

USED EQUIPMENT

SAR Test / TR6

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Stäubli Robot TX60L	Stäubli	TX60L	F10/5C90A1/A/01	N/A	N/A
Controller	Stäubli	SP1	S-0034	N/A	N/A
Dipole Validation Kits	Speag	D2450V2	839	2025.03.18	2028.03.17
Dipole Validation Kits	Speag	D5GHzV2	1078	2025.03.14	2028.03.13
ELI Phantom	Speag	ELI	N/A	N/A	N/A
Device Holder	Speag	SD 000 H01 HA	N/A	N/A	N/A
Data Acquisition Electronic	Speag	DAE4	1854	2026.03.23	2027.03.22
E-Field Probe	Speag	EX3DV4	7761	2026.04.08	2027.04.07
SAR Software	Speag	DASY6	V5.2 Build 162	N/A	N/A
Power Amplifier	MVE	MPC1018.50	C30002D	2026.03.26	2027.03.25
Dual Directional Coupler	woken	0110A05A82Z-20	CMLC66W1A1	2026.03.24	2027.03.23
Tissue fluid test probe	SPEAG	DAK 3.5	1308	N/A	N/A
Vector Network	Agilent	E5071C	MY46108153	2025.07.25	2026.07.24
Signal Generator	R&S	SMBV100A	263697	2025.05.22	2026.05.21
Signal Generator	R&S	SMBV100A	263697	2026.04.26	2027.04.25
PSG Analog Signal Generator	Agilent	E8257D	MY44321116	2025.12.07	2026.12.06
Power Meter	Keysight	N1912A	MY60300004	2026.03.21	2027.03.20
Temperature/Humidity Meter	Rites	RTS-1909	N/A	2026.02.05	2027.02.04
Temperature/Humidity Meter	Rites	RTS-1909	N/A	2026.02.05	2027.02.04

SAR Test / TR6

Instrument	Manufacturer	Model No.	Serial No.	Firmware Version	Software Version
SAR Software	Speag	DASY6	V5.2 Build 162	N/A	V16.2.4.2448
Power Amplifier	MVE	MPC1018.50	C30002D	A.14.03	N/A
Vector Network	Agilent	E5071C	MY46103316	A.11.31	N/A
Signal Generator	R&S	SMBV100A	263697	V4.15.125.49	N/A
Power Meter	Keysight	N1912A	MY60300004	A2.06.01	N/A

UNCERTAINTY

Uncertainties have been calculated according to the DEKRA internal document. The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95% .

Uncertainty for System Validation 4MHz – 300 MHz								
Error Description	Unc. ±%	Prob. Dist.	Div.	(ci) 1g	(ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(vi) veff
Measurement System								
Probe Calibration	±13.3%	N	2	1	1	±6.65%	±6.65%	∞
Axial Isotropy	±0.5%	R	$\sqrt{3}$	0.7	0.7	±0.2%	±0.2%	∞
Hemispherical Isotropy	±9.6%	R	$\sqrt{3}$	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Linearity	±0.6%	R	$\sqrt{3}$	1	1	±0.4%	±0.4%	∞
Modulation	±2.4%	R	$\sqrt{3}$	1	1	±1.4%	±1.4%	∞
System 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 Noise	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
RF Ambient Reflections	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Probe Positioner	±0.8%	R	$\sqrt{3}$	1	1	±0.5%	±0.5%	∞
Probe Positioning	±2.0%	R	$\sqrt{3}$	1	1	±1.2%	±1.2%	∞
Max. SAR Eval.	±2.0%	R	$\sqrt{3}$	1	1	±1.2%	±1.2%	∞
Dipole Related								
Deviation from exp. dipole	±5.5%	R	$\sqrt{3}$	0	0	±0.0%	±0.0%	∞
Dipole axis to liquid distance	±2.0%	R	$\sqrt{3}$	1	1	±1.2%	±1.2%	∞
Dipole input power and SAR drift	±3.4%	R	$\sqrt{3}$	1	1	±2.0%	±2.0%	∞
Device Holder	±3.6%	N	1	1	1	±3.6%	±3.6%	5
Device Positioning	±2.9%	N	1	1	1	±2.9%	±2.9%	145
Phantom and Setup								
Phantom Uncertainty	±4.0%	R	$\sqrt{3}$	1	1	±2.3%	±2.3%	∞
SAR correction for deviations in conductivity and permittivity(target)	±5%	R	$\sqrt{3}$	1	0.84	±2.9%	±2.4%	∞
Liquid Conductivity (meas.)	±2.5%	N	1	0.78	0.71	±2.0%	±1.8%	∞
Liquid Permittivity (meas.)	±2.5%	N	1	0.26	0.26	±0.6%	±0.7%	∞
Liquid conductivity - temperature uncertainty	±1.7%	R	$\sqrt{3}$	0.78	0.71	±0.8%	±0.7%	
Liquid permittivity - temperature uncertainty	±0.3%	R	$\sqrt{3}$	0.23	0.26	±0.0%	±0.0%	
Combined Std. Uncertainty						±10.6%	±10.4%	
Expanded Std. Uncertainty						±21.2%	±20.9%	

DASY6 SAR Uncertainty								
Measurement uncertainty for 300 MHz to 3 GHz averaged over 1 gram / 10 gram.								
Error Description	Uncert. value	Prob. Dist.	Div.	(ci) 1g	(ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(vi) veff
Measurement System								
Probe Calibration	±5.5%	N	1	1	1	±5.5%	±5.5%	∞
Axial Isotropy	±4.7%	R	$\sqrt{3}$	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.6%	R	$\sqrt{3}$	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Linearity	±4.7%	R	$\sqrt{3}$	1	1	±2.7%	±2.7%	∞
System 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	±0.8%	R	$\sqrt{3}$	1	1	±0.5%	±0.5%	∞
Integration Time	±2.6%	R	$\sqrt{3}$	1	1	±1.5%	±1.5%	∞
RF Ambient Noise	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
RF Ambient Reflections	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Probe Positioner	±0.4%	R	$\sqrt{3}$	1	1	±0.2%	±0.2%	∞
Probe Positioning	±2.9%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Max. SAR Eval.	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Test Sample Related								
Device Positioning	±2.9%	N	1	1	1	±2.9%	±2.9%	145
Device Holder	±3.6%	N	1	1	1	±3.6%	±3.6%	5
Power Drift	±5.0%	R	$\sqrt{3}$	1	1	±2.9%	±2.9%	∞
Phantom and Setup								
Phantom Uncertainty	±4.0%	R	$\sqrt{3}$	1	1	±2.3%	±2.3%	∞
Liquid Conductivity (meas.)	±2.5%	N	1	0.78	0.71	±2.0%	±1.8%	∞
Liquid Permittivity (meas.)	±2.5%	N	1	0.26	0.26	±0.6%	±0.7%	∞
Combined Std. Uncertainty						±10.6%	±10.5%	361
Expanded STD Uncertainty						±21.2%	±21.1%	

DASY6 SAR Uncertainty

Measurement uncertainty for 3 GHz to 6 GHz averaged over 1 gram / 10 gram.

Error Description	Uncert. value	Prob. Dist.	Div.	(ci) 1g	(ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(vi) veff
Measurement System								
Probe Calibration	±6.65%	N	1	1	1	±6.65%	±6.65%	∞
Axial Isotropy	±4.7%	R	$\sqrt{3}$	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.6%	R	$\sqrt{3}$	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±2.0%	R	$\sqrt{3}$	1	1	±1.2%	±1.2%	∞
Linearity	±4.7%	R	$\sqrt{3}$	1	1	±2.7%	±2.7%	∞
System 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	±0.8%	R	$\sqrt{3}$	1	1	±0.5%	±0.5%	∞
Integration Time	±2.6%	R	$\sqrt{3}$	1	1	±1.5%	±1.5%	∞
RF Ambient Noise	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
RF Ambient Reflections	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Probe Positioner	±0.8%	R	$\sqrt{3}$	1	1	±0.5%	±0.5%	∞
Probe Positioning	±6.7%	R	$\sqrt{3}$	1	1	±3.9%	±3.9%	∞
Max. SAR Eval.	±4.0%	R	$\sqrt{3}$	1	1	±2.3%	±2.3%	∞
Test Sample Related								
Device Positioning	±2.9%	N	1	1	1	±2.9%	±2.9%	145
Device Holder	±3.6%	N	1	1	1	±3.6%	±3.6%	5
Power Drift	±5.0%	R	$\sqrt{3}$	1	1	±2.9%	±2.9%	∞
Phantom and Setup								
Phantom Uncertainty	±4.0%	R	$\sqrt{3}$	1	1	±2.3%	±2.3%	∞
Liquid Conductivity (meas.)	±2.5%	N	1	0.78	0.71	±2.0%	±1.8%	∞
Liquid Permittivity (meas.)	±2.5%	N	1	0.26	0.26	±0.6%	±0.7%	∞
Combined Std. Uncertainty						±12.0%	±12.0%	784
Expanded STD Uncertainty						±24.0%	±23.9%	

1 GENERAL INFORMATION

Product Name ....:	Notebook PC
Trademark ....:	ASUS
Model Name ....:	S5652M / K5652M / V5652M
FCC ID..:	TX2-RTL8852B
Hardware Version..........................:	V1
Software Version ....:	S5652MA305
Model difference ....:	Exclusively for marketing purposes.
Power Supply ....:	AC: 230 Vac
Manufacturer ....:	ASUSTK COMPUTER INC.
Manufacturer address ....:	1F. No.15, Lide Rd., Beitou Dist., Taipei City 112, Taiwan
Factory..:	Nanchang Huaqin Electronic Technology Co., Ltd.
Factory address.............................:	No.2999, Tianxiang Avenue, High-tech Development Zone, Nanchang City
Wireless Module ....:	RTL8852B
Wireless specification ....:	Wi-Fi
Wireless specification ....:	802.11b / g / n / ax
Operating frequency range(s) ....:	2412~2472MHz
Type of Modulation ....:	DSSS / OFDM / OFDMA
Wireless specification ....:	802.11a / n / ac / ax
Operating frequency range(s) ....:	U-NII-1: 5180 MHz to 5240 MHz
	U-NII-2A: 5260 MHz to 5320 MHz
	U-NII-2C: 5500 MHz to 5720 MHz
	U-NII-3: 5745 MHz to 5825 MHz
	U-NII-4: 5835 MHz to 5885 MHz
Modulation technology................:	OFDM / OFDMA
Wireless specifiction ....:	Bluetooth (BR/EDR)
Operating frequency range(s) ....:	2402~2480MHz
Data Rate ....:	GFSK 1Mbps, Pi/4 DQPSK 2Mbps, 8DPSK 3Mbps
Wireless specification	Bluetooth (LE)
Operating frequency range(s)	2402~2480MHz
Wireless specification	LE 1Mbps, LE 2Mbps

Remark:

1. As above information is provided and confirmed by the applicant. DEKRA is not liable to the accuracy, suitability, reliability or/and integrity of the information.
2. The modulation and bandwidth are similar for 802.11n, 802.11ac, 802.11ax therefore the manufacturer will control the power for 802.11 n mode is same as the 802.11ac/ax mode or more lower than it and investigated worst case to representative mode in test report.
3. The S5652M is tested as the main model, and its data also represents the K5652M and V5652M.

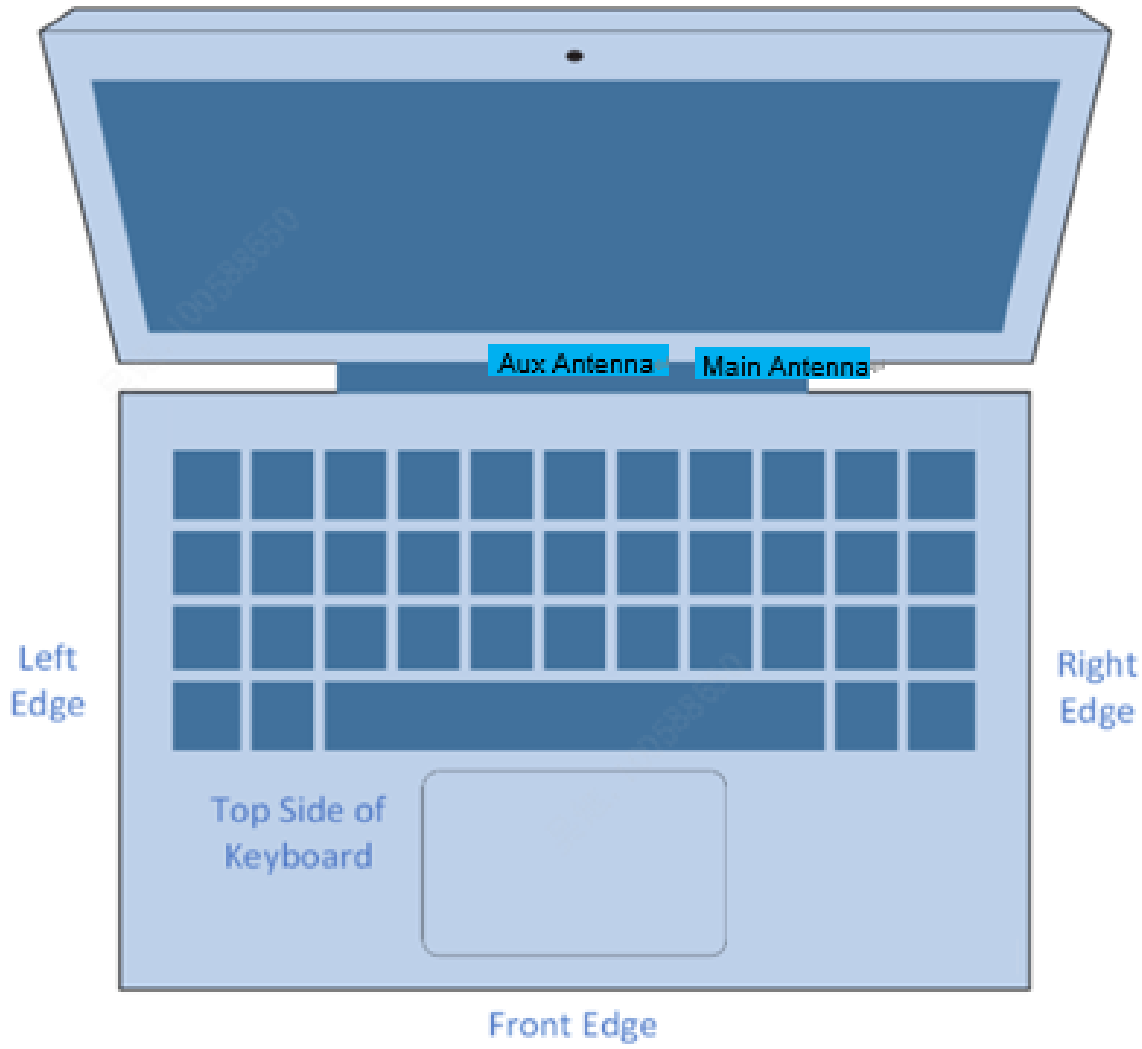
Antenna Information:

Antenna Port	Antenna Manufacturer	Antenna Type	2400-2483.5 MHz	5150-5250 MHz	5250-5350 MHz	5470-5725 MHz	5725-5850 MHz	5850-5895 MHz
MAIN	INPAQ (WA-P-LELE-04-104)	PIFA	1.28	2.32	0.96	1.87	1.05	1.55
AUX			1.85	1.50	2.11	2.15	1.55	2.15
MAIN	AWAN (AYP6Y-200155)	PIFA	2.00	2.37	2.67	1.94	2.67	2.55
AUX			1.86	2.03	2.11	2.87	2.39	2.44

Note: The report gain usage details are as follows:

1. Output Power test: The maximum equivalent isotropic radiated power (EIRP) is calculated separately for the two antennas.
2. Radiated spurious emission test: Each antenna was tested separately, and only the worst data was included in the report.
3. OFDMA: The product supports OFDMA Full RU and Partial RU for 802.11ax devices. The worst-case mode of the module occurs in Full RU, so verifying using only the full resource unit (Full RU) is sufficient to demonstrate the compliance of 802.11ax OFDMA.

1.1 DUT Antenna Locations



Measuring Surface	Antenna	Separation Distance (antenna-to-Surface)
Bottom Side	Main	7.4mm，with Rubber 10.1mm
	Aux	7.4mm，with Rubber 10.1mm
Front Edge	Main	240mm
	Aux	240mm
Left Edge	Main	255.5mm
	Aux	195mm
Right Edge	Main	100mm
	Aux	165mm
Top side of Keyboard	Main	NA
	Aux	NA

1.2 Power reduction specification

This device uses a single fixed level of power reduction through static table look-up for SAR compliance and it is triggered by a single event or operation

1) A fixed level power reduction is applied for some frequency bands when hotspot mode becomes active. When the hotspot is disabled, the power value will be recovered.
2) A fixed level power reduction is applied for some frequency bands when simultaneously transmitting with the other antennas in certain simultaneous transmission conditions. The standalone SAR compliance still uses the standalone SAR results tested at the maximum output power level without any power reduction
3) A fixed level power reduction is applied for some frequency bands when handset operate “held to the ear” condition, the power reduction triggered by audio receiver detection. The audio receiver detection is used to determine head or body scenario.
4) The proximity sensor is used to indicate when the device is held close to a user’s body exposure condition. It utilizes the proximity sensor to reduce the output power in specific wireless and operating modes of main antenna to ensure SAR compliance(Refer to section 5.4 for detailed proximity Sensor information and validation data per KDB 616217).

The following tables summarize the key power reduction information. The detailed full power which is the Max. power the state can use and reduced tune-up specifications and conducted power measurement results are provided in Section 8 of this report.

Band	Antenna	Tune up Power (dBm)
Bluetooth	AUX	12.50
Wi-Fi 2.4G	AUX	15.00
	MAIN	15.00
	AUX+MAIN	18.00
Wi-Fi 5.2G	AUX	13.50
	MAIN	13.50
	AUX+MAIN	16.50
Wi-Fi 5.3G	AUX	13.50
	MAIN	13.50
	AUX+MAIN	16.50
Wi-Fi 5.6G	AUX	13.50
	MAIN	13.50
	AUX+MAIN	16.50
Wi-Fi 5.8G	AUX	13.50
	MAIN	13.50
	AUX+MAIN	16.50

1.3 Test Specification

Identity	Document Title
FCC 47CFR §2.1093	Radio frequency Radiation Exposure Evaluation: Portable Devices
ANSI/IEEE C95.1-2019	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.
IEEE 1528-2013	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
EN 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) (IEC/IEEE 62209-1528)
KDB 941225 D05	SAR for LTE Devices v02r05
KDB 941225 D05A	LTE Rel.10 KDB Inquiry Sheet v01r02
KDB 941225 D06	Hotspot Mode SAR v02r01
KDB 248227 D01	SAR Guidance for IEEE 802 11 Wi-Fi SAR v02r02
KDB 648474 D04	Handset SAR v01r03
KDB447498 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 690783 D01	SAR Listings on Grants v01r03
KDB 616217 D04	SAR for laptop and tablets v01r02

1.4 RF exposure limits

This device belongs to portable device category because its radiating structure is allowed to be used within 20 centimetres of the body of the user.

Limit for General Population/Uncontrolled exposure should be applied for this device; it is 1.6 W/kg as averaged over any 1 gram of tissue.

SAR Exposure Limit		
	General Population / Uncontrolled Exposure [1] (W/kg)	Occupational / Controlled Exposure [2] (W/kg)
Spatial Peak SAR [3] (head or Body)	1.60	8.00
Spatial Peak SAR [4] (Whole Body)	0.08	0.40
Spatial Peak SAR [5] (Hands / Feet / Ankle / Wrist)	4.00	20.00
Power Density Exposure Limit (1,500 - 100,000 MHz)		
	General Population / Uncontrolled Exposure (mW/cm^2) [6]	Occupational / Controlled Exposure (mW/cm^2)
Power Density (S)	1.0	5.0

Notes:
1. **General Population / Uncontrolled Environments** are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.
2. **Occupational / 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).
3. 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.
4. The Spatial Average value of the SAR averaged over the whole body.
5. 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.
6. 1 mW/cm^2 = 10 W/m^2,

2 SAR MEASUREMENTS SYSTEM CONFIGURATION

SAR Definition

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.

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 (p).The equation description is as below:

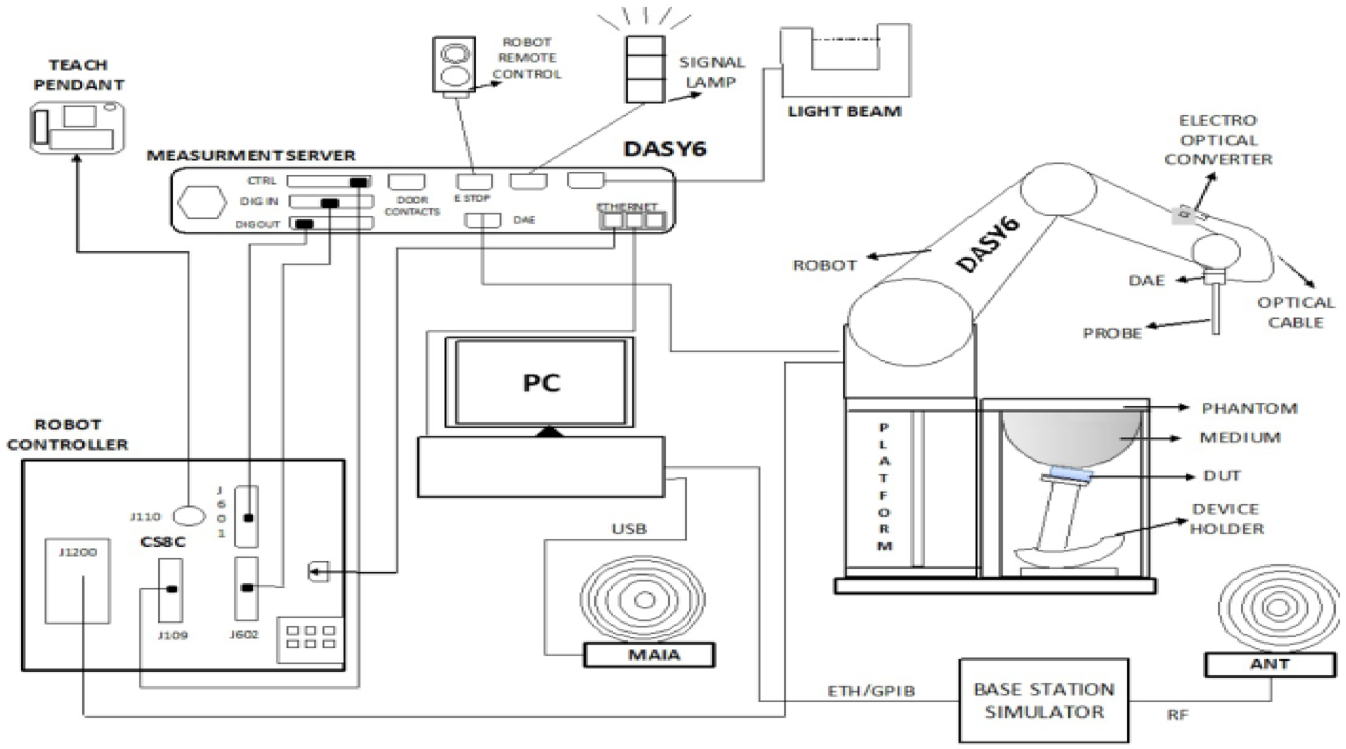
$$\mathrm{SAR} = \frac{d}{dt}\left(\frac{dW}{dm}\right) = \frac{d}{dt}\left(\frac{dW}{\rho dv}\right)$$

SAR measurement can be related to the electrical field in the tissue by

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

Where:
σ= conductivity of the tissue (S/m)
p= mass density of the tissue (kg/m3)
E = RMS electric field strength (V/m)
SAR is expressed in units of Watts per kilogram (W/kg).

2.1 DASY6 SAR System Description



The DASY6 system for performing compliance tests consists of the following items:
1. A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
2. A data acquisition electronics (DAE) which performs the signal amplification, 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.
3. 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.
4. The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
5. A computer running Windows 11 and the DASY6 software.
6. Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
7. The phantom, the device holder and other accessories according to the targeted measurement.

2.2 Applications

Predefined procedures and evaluations for automated compliance testing with all worldwide standards, e.g., IEC/IEEE 62209-1528 others.

2.3 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 measures points and step size follow as below. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution. The measure settings are referred in IEEE Std 1528-2013.

<table>
<tr><th colspan="3"></th><th>≤3GHz</th><th>>3GHz</th></tr>
<tr><td colspan="3">Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5±1 mm</td><td>½·δ·ln(2)±0.5 mm</td></tr>
<tr><td colspan="3">Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30°±1°</td><td>20°±1°</td></tr>
<tr><td colspan="3" rowspan="2">Maximum area scan spatial resolution: Δx Area , Δy Area</td><td>≤ 2 GHz: ≤ 15 mm
2 – 3 GHz: ≤ 12 mm</td><td>3–4 GHz: ≤ 12 mm
4 – 6 GHz: ≤ 10 mm</td></tr>
<tr><td colspan="2">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.</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx Zoom , Δy Zoom</td><td>≤ 2 GHz: ≤ 8 mm
2 –3 GHz: ≤ 5 mm*</td><td>3–4 GHz: ≤ 5 mm*
4 – 6 GHz: ≤ 4 mm*</td></tr>
<tr><td rowspan="7">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2" rowspan="3">uniform grid: Δz Zoom (n)</td><td rowspan="3">≤ 5 mm</td><td>3–4 GHz: ≤ 4 mm</td></tr>
<tr><td>4–5 GHz: ≤ 3 mm</td></tr>
<tr><td>5–6 GHz: ≤ 2 mm</td></tr>
<tr><td rowspan="4">graded grid</td><td rowspan="3">Δz Zoom (1): between 1st two points closest to phantom surface</td><td rowspan="3">≤ 4 mm</td><td>3–4 GHz: ≤ 3 mm</td></tr>
<tr><td>4–5 GHz: ≤ 2.5 mm</td></tr>
<tr><td>5–6 GHz: ≤ 2 mm</td></tr>
<tr><td>Δz Zoom (n>1): between subsequent points</td><td colspan="2">≤ 1.5·Δz Zoom (n-1)</td></tr>
<tr><td rowspan="3">Minimum zoom scan volume</td><td colspan="2" rowspan="3">x, y, z</td><td rowspan="3">≥30 mm</td><td>3–4 GHz: ≥ 28 mm</td></tr>
<tr><td>4–5 GHz: ≥ 25 mm</td></tr>
<tr><td>5–6 GHz: ≥ 22 mm</td></tr>
</table>

Note:

1. δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.
2. * 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 3GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

2.4 Uncertainty of Inter-/Extrapolation and Averaging

To evaluate the uncertainty of the interpolation, extrapolation and averaged SAR calculation algorithms of the Postprocessor, DASY6 allows the generation of measurement grids which are artificially predefined by analytically based test functions. Therefore, the grids of area scans and zoom scans can be filled with uncertainty test data, according to the SAR benchmark functions of IEC/IEEE 62209-1528.The three analytical functions shown in equations as below are used to describe the possible range of the expected SAR distributions for the tested handsets. The field gradients are covered by the spatially flat distribution f1, the spatially steep distribution f3 and f2 accounts for H-field cancellation on the phantom/tissue surface.

$$f_1(x,y,z) = Ae^{-\frac{z}{2a}}\cos^2\left(\frac{\pi}{2}\frac{\sqrt{x'^2+y'^2}}{5a}\right)$$

$$f_2(x,y,z) = Ae^{-\frac{z}{a}}\frac{a^2}{a^2+x'^2}\left(3-e^{-\frac{2z}{a}}\right)\cos^2\left(\frac{\pi}{2}\frac{y'}{3a}\right)$$

$$f_3(x,y,z) = A\frac{a^2}{\frac{a^2}{4}+x'^2+y'^2}\left(e^{-\frac{2z}{a}}+\frac{a^2}{2(a+2z)^2}\right)$$

2.5 DASY6 E-Field Probe

The SAR measurement is conducted with the diametric probe manufactured by SPEAG. The probe is specially designed and calibrated for use in liquid with high permittivity. The diametric probe has special calibration in liquid at different frequency.
SPEAG conducts the probe calibration in compliance with international and national standards (e.g. IEC/IEEE 62209-1528, etc.) under ISO 17025. The calibration data are in Appendix D**.**

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	4 MHz to 10 GHz Linearity: ± 0.2 dB (30 MHz to 10 GHz)
Directivity	±0.1 dB in TSL (rotation around probe axis) ±0.3 dB in TSL (rotation normal to probe axis)
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
Calibration	ISO/IEC 17025 calibration service available

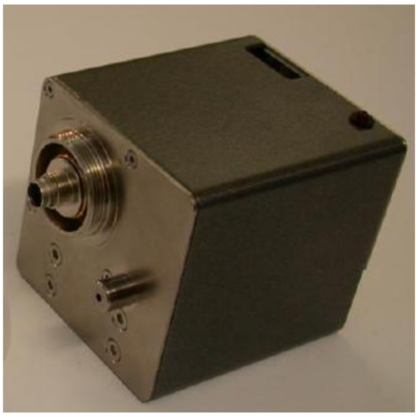
EX3DV4 E-Field Probe

Probe setup on robot

2.6 Boundary Detection Unit and Probe Mounting Device

The DASY probes use a precise connector and an additional holder for the probe, consisting of a plastic tube and a flexible silicon ring to center the probe. The connector at the DAE is flexibly mounted and held in the default position with magnets and springs. Two switching systems in the connector mount detect frontal and lateral probe collisions and trigger the necessary software response.

2.7 DATA Acquisition Electronics (DAE) and Measurement Server



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 DAE4 is 200M Ohm; the inputs are symmetrical and floating. Common mode rejection is above 80dB.

The DASY6 measurement server is based on a PC/104 CPU board with a 400MHz intel ULV Celeron, 128MB chipdisk and 128MB RAM. The necessary circuits for communication with the DAE 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

2.8 Robot

The DASY6 system uses the high precision robots TX60 XL type out of the newer series from Stäubli SA (France). For the 6-axis controller DASY6 system, the CS8C robot controller version from Stäubli is used. The XL robot series have many features that are important for our application:

- High precision (repeatability 0.02 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)
- 6-axis controller

2.9 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 than 0.1 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.

2.10 Device Holder

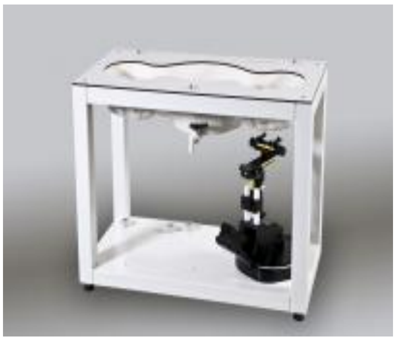
The DASY6 device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (EPR).
Thus the device needs no repositioning when changing the angles.
The DASY6 device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity εr =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.

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.

The DASY6 device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity εr =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.

2.11 SAM Phantom

SAM Twin Phantom

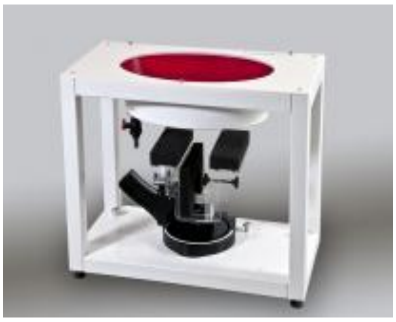


The SAM twin phantom is a fiberglass shell phantom with 2mm shell thickness (except the ear region where shell thickness increases to 6mm). It has three measurement areas:

- 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.

ELI Phantom



The SAM phantom is a fiberglass shell phantom with 2mm shell thickness. It has one measurement areas:

- ELI phantom

The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

3 TISSUE SIMULATING LIQUID

3.1 The composition of the tissue simulating liquid

Simulate 10MHz~10000MHz liquid, manufactured by SPEAG

Table F.1 – Suggested recipes for achieving target dielectric properties, 30 MHz to 900 MHz

Frequency (MHz)	30	50		144		450		835	900	
Recipe source number	3	3	2	2	3	2	4	2	2	4
Ingredients (% by weight)										
De-ionized water	48,30	48,30	53,53	55,12	48,30	48,53	56	50,36	50,31	56
Tween 20			44,70	43,31		49,51		48,39	48,34	
Oxidized mineral oil							44			44
Diethylenglycol monohexylether										
Triton X-100										
Diacetin	50,00	50,00			50,00					
DGBE										
NaCl	1,60	1,60	1,77	1,57	1,60	1,96		1,25	1,35	
Additives and salt	0,10	0,10			0,10					
Measured temperature dependence										
Temp. (°C)			21	21		21	20	21	21	20
$\varepsilon_{\text{liquid temp. unc.}}$ (%)	0,8	0,1			0,1	0,1		0,04	0,04	
$\sigma_{\text{liquid temp. unc.}}$ (%)	2,8	2,8			2,6	4,2		1,6	1,6	

Table F.2 – Suggested recipes for achieving target dielectric properties, 1 800 MHz to 10 000 MHz

Frequency (MHz)	1 800		2 450	4 000	5 000	5 200	5 800	6 000	8 000	10 000
Recipe source number	2	4	4	4	4	1	1	4	5	5
Ingredients (% by weight)										
De-ionized water	54,23	56	56	56	56	65,53	65,53	56	67,8	66,0
Tween	45,27								31,1	33,0
Oxidized mineral oil		44	44	44	44			44		
Diethylenglycol monohexylether						17,24	17,24			
Triton X-100						17,24	17,24			
Diacetin										
DGBE										
NaCl	0,50									
Additives and salt										
Measured temperature dependence										
Temp. (°C)	21	20	20	20	20	22	22	20	20	20
$\varepsilon_{\text{liquid temp. unc.}}$ (%)	0,4					1,7	1,8			
$\sigma_{\text{liquid temp. unc.}}$ (%)	2,3					2,7	2,6			

NOTE 1 Multiple columns under a single frequency indicate optional recipes.

NOTE 2 Recipe source numbers: 1 verified by different labs, 2 Reference [59], 3 developed by IT'IS Foundation, 4 developed by IT'IS Foundation, 5 Reference [60].

NOTE 3 The values of $\varepsilon_{\text{liquid temp. unc.}}$ and $\sigma_{\text{liquid temp. unc.}}$ are liquid temperature uncertainties described in O.9.6, based on measurements of the applicable liquid recipes given above. These are not part of the original publications but have been subsequently developed by the project team.

NOTE 4 The recipes at 8 000 MHz and 10 000 MHz are sufficiently broadband that they cover the frequency range of 6 000 MHz to 10 000 MHz within a tolerance of ±10 % for permittivity and conductivity.

3.2 Measurement for Tissue Simulate Liquid

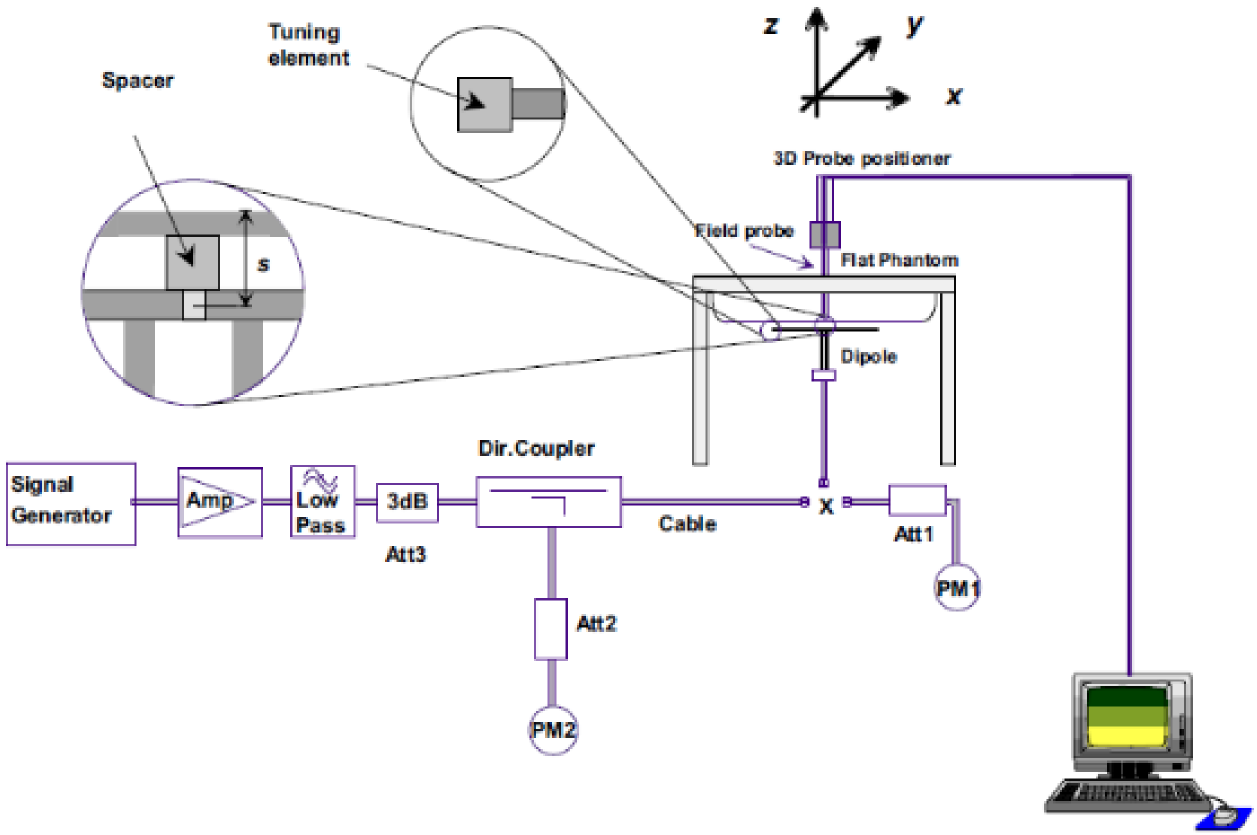
The dielectric properties for this Tissue Simulate Liquids were measured by using the Agilent E5071C Network Analyzer (600 KHz-10000 MHz). The Conductivity (σ) and Permittivity (ρ) are listed in bellow table. For the SAR measurement given in this report. The temperature variation of the Tissue Simulate Liquids was 22 ± 2 °C.

Measured Frequency (MHz)	Target Tissue (±5%)		Measured Tissue		Liquid Temp.(℃)	Measured Date
	ε_r	σ(S/m)	ε_r	σ(S/m)		
2450	39.2 (37.24~41.16)	1.80 (1.71~1.89)	40.82	1.89	22.50	2026.04.13
5250	35.9 (34.11~37.70)	4.71 (4.47~4.95)	35.89	4.77	22.50	2026.04.15
5600	35.5 (33.73~37.28)	5.07 (4.82~5.32)	35.23	5.20	22.50	2026.04.17
5750	35.4 (33.63~37.17)	5.22 (4.96~5.48)	34.95	5.37	22.50	2025.04.19

Tissue Verification								
CH	Frequency (MHz)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)
0	2402	1.85	40.93	1.76	39.29	4.94	4.15	±5
39	2441	1.88	40.84	1.79	39.22	4.97	4.18	±5
78	2480	1.92	40.75	1.83	39.15	4.64	3.95	±5
1	2412	1.86	40.92	1.77	39.27	4.86	4.12	±5
6	2437	1.88	40.86	1.79	39.22	4.92	4.23	±5
11	2462	1.90	40.79	1.81	39.18	4.92	4.06	±5
42	5210	4.73	36.02	4.67	35.99	1.33	0.06	±5
58	5290	4.83	35.83	4.75	35.91	1.75	-0.19	±5
106	5530	5.11	35.40	5.00	35.59	2.16	-0.56	±5
122	5610	5.21	35.22	5.08	35.49	2.56	-0.79	±5
155	5775	5.40	34.89	5.25	35.33	2.90	-1.16	±5

4 SYSTEM CHECK

The microwave circuit arrangement for system Check is sketched in F-12. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within +/- 10% from the target SAR values. The tests were conducted on the same days as the measurement of the EUT. The obtained results from the system accuracy verification are displayed in the following table (A power level of 250Mw (below 3GHz) or 100Mw (3-6GHz) was input to the dipole antenna). During the tests, the ambient temperature of the laboratory was in the range 22±2°C, the relative humidity was in the range 60% and the liquid depth above the ear reference points was above 15±0.5 cm in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.



F-1. The microwave circuit arrangement used for SAR system check

4.1 Justification for Extended Dipole Calibrations

1) Referring to KDB865664 D01 requirements for dipole calibration, instead of the typical annual calibration recommended by measurement standards, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements. Each measured dipole is expected to evaluate with the following criteria at least on annual interval in Appendix C.

a) There is no physical damage on the dipole;
b) System check with specific dipole is within 10% of calibrated value;
c) Return-loss is within 10% of calibrated measurement;
d) Impedance is within 5Ω from the previous measurement.

1) Network analyser probe calibration against air, distilled water and a shorting block performed before measuring liquid parameters.

4.2 Measurement for System Check

Validation Kit	Measured SAR 250mW		Measured SAR 1W		Normalized to 1W Target (±10%)		Liquid Temp.(℃)	Measured Date
	1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)		
D2450V2	13.60	6.35	54.40	25.40	52.80 (47.52~58.08)	24.60 (22.14~27.06)	22.50	2026.04.13

Validation Kit	Measured SAR 100mW		Measured SAR 1W		Normalized to 1W Target (±10%)		Liquid Temp.(℃)	Measured Date
	1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)		
D5GHzV2 5.25GHz	7.45	2.14	74.50	21.40	77.60 (69.84~85.36)	21.60 (19.44~23.76)	22.50	2026.04.15
D5GHzV2 5.6GHz	8.65	2.47	86.50	24.70	81.30 (73.17~89.43)	22.60 (20.34~24.86)	22.50	2026.04.17
D5GHzV2 5.75GHz	7.81	2.23	78.10	22.30	77.40 (69.66~85.14)	21.30 (19.17~23.43)	22.50	2025.04.19

5 TEST CONFIGURATION

SAR Test Reduction Procedure

According to KDB 941225D01, in the following procedures, the mode tested for SAR is referred to as the primary mode. The equivalent modes considered for SAR test reduction are denoted as secondary modes. Both primary and secondary modes must be in the same frequency band. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode. This is referred to as the 3G SAR test reduction procedure in the following SAR test guidance, where the primary mode is identified in the applicable wireless mode test procedures and the secondary mode is wireless mode being considered for SAR test reduction by that procedure. When the 3G SAR test reduction procedure is not satisfied, it is identified as “otherwise” in the applicable procedures; SAR measurement is required for the secondary mode.

Wi-Fi Test Configuration

DSSS and OFDM configurations are considered separately according to the required SAR procedures. SAR is measured in the initial test position using the 802.11 transmission mode configuration required by the DSSS procedure or initial test configuration and subsequent test configuration(s) according to the OFDM procedures. The initial test position procedure is described in the following:

1）. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other (remaining) test positions in that exposure configuration and 802.11 transmission mode combinations within the frequency band or aggregated band. SAR is also not required for that exposure configuration in the subsequent test configuration(s).
2）. When the reported SAR of the initial test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position using subsequent highest extrapolated or estimated 1-g SAR conditions determined by area scans or next closest/smallest test separation distance and maximum RF coupling test positions based on manufacturer justification, on the highest maximum output power channel, until the reported SAR is ≤ 0.8 W/kg or all required test positions (left, right, touch, tilt or subsequent surfaces and edges) are tested.
3）. For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested. a) Additional power measurements may be required for this step, which should be limited to those necessary for identifying the subsequent highest output power channels.

Initial Test Configuration Procedures

An initial test configuration is determined for OFDM transmission modes according to the channel bandwidth, modulation and data rate combination(s) with the highest maximum output power specified for production units in each standalone and aggregated frequency band. SAR is measured using the highest measured maximum output power channel. For configurations with the same specified or measured maximum output power, additional transmission mode and test channel selection procedures are required. SAR test reduction for subsequent highest output test channels is determined according to *reported* SAR of the initial test configuration.
For next to the ear, hotspot mode and UMC mini-tablet exposure configurations where multiple test positions are required, the initial test position procedure is applied to minimize the number of test positions required for SAR measurement using the initial test configuration transmission mode. For fixed exposure conditions that do not have multiple SAR test positions, SAR is measured in the transmission mode determined by the initial test configuration.

When the *reported* SAR of the initial test configuration is > 0.8 W/kg, SAR measurement is required for subsequent next highest measured output power channel(s) in the initial test configuration until *reported* SAR is ≤ 1.2 W/kg or all required channels are tested.

Subsequent Test Configuration Procedures

SAR measurement requirements for the remaining 802.11 transmission mode configurations that have not been tested in the initial test configuration are determined separately for each standalone and aggregated frequency band, in each exposure condition, according to the maximum output power specified for production units. The initial test position procedure is applied to next to the ear, UMPC mini-tablet and hotspot mode configurations. When the same maximum output power is specified for multiple transmission modes, additional power measurements may be required to determine if SAR measurements are required for subsequent highest output power channels in a subsequent test configuration. The subsequent test configuration and SAR measurement procedures are described in the following.

1）. When SAR test exclusion provisions of KDB Publication 447498 are applicable and SAR measurement is not required for the initial test configuration, SAR is also not required for the next highest maximum output power transmission mode subsequent test configuration(s) in that frequency band or aggregated band and exposure configuration.

2）. When the highest *reported* SAR for the initial test configuration (when applicable, include subsequent highest output channels), according to the initial test position or fixed exposure position requirements, is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for that subsequent test configuration.

3）. The number of channels in the initial test configuration and subsequent test configuration can be different due to differences in channel bandwidth. When SAR measurement is required for a subsequent test configuration and the channel bandwidth is smaller than that in the initial test configuration, all channels in the subsequent test configuration that overlap with the larger bandwidth channel tested in the initial test configuration should be used to determine the highest maximum output power channel. This step requires additional power measurement to identify the highest maximum output power channel in the subsequent test configuration to determine SAR test reduction.
   a) SAR should first be measured for the channel with highest measured output power in the subsequent test configuration.
   b) SAR for subsequent highest measured maximum output power channels in the subsequent test configuration is required only when the *reported* SAR of the preceding higher maximum output power channel(s) in the subsequent test configuration is > 1.2 W/kg or until all required channels are tested. i) For channels with the same measured maximum output power, SAR should be measured using the channel closest to the center frequency of the larger channel bandwidth channel in the initial test configuration.

4）. SAR measurements for the remaining highest specified maximum output power OFDM transmission mode configurations that have not been tested in the initial test configuration (highest maximum output) or subsequent test configuration(s) (subsequent next highest maximum output power) is determined by recursively applying the subsequent test configuration procedures in this section to the remaining configurations according to the following:
   a) replace “subsequent test configuration” with “next subsequent test configuration” (i.e., subsequent next highest specified maximum output power configuration)
   b) replace “initial test configuration” with “all tested higher output power configurations”

2.4 GHz WiFi SAR Procedures

Separate SAR procedures are applied to DSSS and OFDM configurations in the 2.4 GHz band to simplify DSSS test requirements. For 802.11b DSSS SAR measurements, DSSS SAR procedure applies to fixed exposure test position and initial test position procedure applies to multiple exposure test positions. When SAR measurement is required for an OFDM configuration, the initial test configuration, subsequent test configuration and initial test position procedures are applied. The SAR test exclusion requirements for 802.11g/n OFDM configurations are described in following.

- **802.11b DSSS SAR Test Requirements**

SAR is measured for 2.4 GHz 802.11b DSSS using either a fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:

1）. When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.

2）. When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

- **2.4 GHz 802.11g/n OFDM&OFDMA SAR Test Exclusion Requirements**

When SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations, the measurement and test reduction procedures for OFDM are applied (section 5.3, including sub-sections). 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.

- **SAR Test Requirements for OFDM&OFDMA configurations**

When SAR measurement is required for 802.11 g/n OFDM configurations, each standalone and frequency aggregated band is considered separately for SAR test reduction. In applying the initial test configuration and subsequent test configuration procedures, the 802.11 transmission configuration with the highest specified maximum output power and the channel within a test configuration with the highest measured maximum output power should be clearly distinguished to apply the procedures.

5 GHz WiFi SAR Procedures

- **U-NII-1 and U-NII-2A Bands**
  For devices that operate in only one of the U-NII-1 and U-NII-2A bands, the normally required SAR procedures for OFDM configurations are applied. For devices that operate in both U-NII bands using the same transmitter and antenna(s), SAR test reduction is determined according to the following：

1) When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition); otherwise, both bands are tested independently for SAR.
2) When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration; otherwise, both bands are tested independently for SAR.
3) The two U-NII bands may be aggregated to support a 160 MHz channel on channel number 50. Without additional testing, the maximum output power for this is limited to the lower of the maximum output power certified for the two bands. When SAR measurement is required for at least one of the bands and the highest reported SAR adjusted by the ratio of specified maximum output power of aggregated to standalone band is > 1.2 W/kg, SAR is required for the 160 MHz channel. This procedure does not apply to an aggregated band with maximum output higher than the standalone band(s); the aggregated band must be tested independently for SAR. SAR is not required when the 160 MHz channel is operating at a reduced maximum power and also qualifies for SAR test exclusion.

- **U-NII-2C and U-NII-3 Bands**
  The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. when Terminal Doppler Weather Radar (TDWR) restriction applies, all channels that operate at 5.60 – 5.65 GHz must be included to apply the SAR test reduction and measurement procedures.

  When the same transmitter and antenna(s) are used for U-NII-2C band and U-NII-3 band or 5.8 GHz band of §15.247, the bands may be aggregated to enable additional channels with 20, 40 or 80 MHz bandwidth to span across the band gap, as illustrated in Appendix B. The maximum output power for the additional band gap channels is limited to the lower of those certified for the bands. Unless band gap channels are permanently disabled, they must be considered for SAR testing. The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. To maintain SAR measurement accuracy and to facilitate test reduction, the channels in U-NII-2C band above 5.65 GHz may be grouped with the 5.8 GHz channels in U-NII-3 or §15.247 band to enable two SAR probe calibration frequency points to cover the bands, including the band gap channels. When band gap channels are supported and the bands are not aggregated for SAR testing, band gap channels must be considered independently in each band according to the normally required OFDM SAR measurement and probe calibration frequency points requirements.

- **OFDM&OFDMA Transmission Mode SAR Test Configuration and Channel Selection Requirements**
  The initial test configuration for 5 GHz OFDM transmission modes is determined by the 802.11 configuration with the highest maximum output power specified for production units, including tune-up tolerance, in each standalone and aggregated frequency band. SAR for the initial test configuration is measured using the highest maximum output power channel determined by the default power measurement procedures. When multiple configurations in a frequency band have the same specified maximum output power, the initial test configuration is determined according to the following steps applied sequentially.
  1) The largest channel bandwidth configuration is selected among the multiple configurations with the same specified maximum output power.
  2) If multiple configurations have the same specified maximum output power and largest channel bandwidth, the lowest order modulation among the largest channel bandwidth configurations is selected.
  3) If multiple configurations have the same specified maximum output power, largest channel bandwidth and lowest order modulation, the lowest data rate configuration among these configurations is selected.
  4) When multiple transmission modes (802.11a/g/n/ac) have the same specified maximum output power, largest channel bandwidth, lowest order modulation and lowest data rate, the lowest order 802.11 mode is selected; i.e., 802.11a is chosen over 802.11n then 802.11ac or 802.11g is chosen over 802.11n. After an initial test configuration is determined, if multiple test channels have the same measured maximum output power, the channel chosen for SAR measurement is determined according to the following. These channel selection procedures apply to both the initial test configuration and subsequent test configuration(s), with respect to the default power measurement procedures or additional power measurements required for further SAR test reduction. The same procedures also apply to subsequent highest output power channel(s) selection.
     a) The channel closest to mid-band frequency is selected for SAR measurement.
     b) For channels with equal separation from mid-band frequency; for example, high and low channels or two mid-band channels, the higher frequency (number) channel is selected for SAR measurement.

- **SAR Test Requirements for OFDM&OFDMA configurations**

When SAR measurement is required for 802.11 a/n/ac OFDM configurations, each standalone and frequency aggregated band is considered separately for SAR test reduction. When the same transmitter and antenna(s) are used for U-NII-1 and U-NII-2A bands, additional SAR test reduction applies. When band gap channels between U-NII-2C band and 5.8 GHz U-NII-3 or §15.247 band are supported, the highest maximum output power transmission mode configuration and maximum output power channel across the bands must be used to determine SAR test reduction, according to the initial test configuration and subsequent test configuration requirements. In applying the initial test configuration and subsequent test configuration procedures, the 802.11 transmission configuration with the highest specified maximum output power and the channel within a test configuration with the highest measured maximum output power should be clearly distinguished to apply the procedures.

6 DESCRIPTION OF TEST POSITION

A typical example of a device used next to the body is a wireless enabled laptop or a tablet device containing a peripheral plug-in radio transmitter that can be supported on the user's body. Other devices that fall into this category include tablets of equivalent sizes or larger than a netbook computer (> 20 cm diagonal display), credit card transaction authorization terminals, and point-of-sale and/or inventory terminals. The example in Figure) shows a tablet form factor portable computer for which SAR should be separately assessed with each surface and edge containing an antenna positioned against the flat phantom in accordance with the conditions of Figure. Some tablets might limit display orientations so that the edges with antennas are not used next to the user; therefore, such edges might not need testing.

To assess these types of use conditions, the following applies.

a) The DUT shall be positioned with its base (bottom surface) and applicable edges against the flat phantom. The orientations and other use positions can be host device specific. Therefore, these should be determined according to the transmitter and antenna locations on the host device.

b) For antennas incorporated in the display screen of a laptop, notebook or netbook computers, tests shall be performed with the display screen open at a 90° angle as seen in Figure, or at a more conservative angle allowing the antennas to be closer to the phantom for assessing the user exposure conditions.

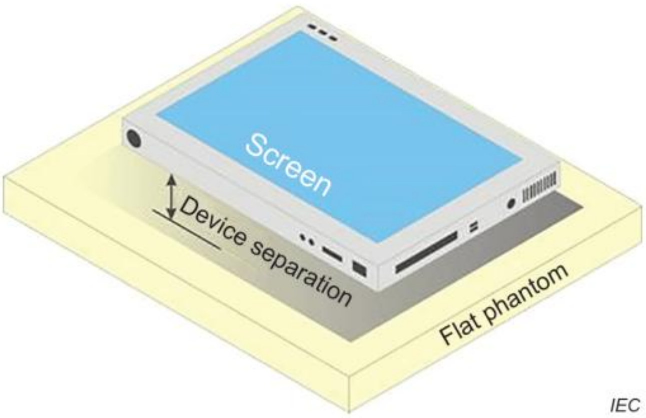
c) Display screen that should be open during normal operation generally do not need to be tested, provided the antenna(s) on the screen is sufficiently far away from the user's body according to the maximum output power of the antenna.

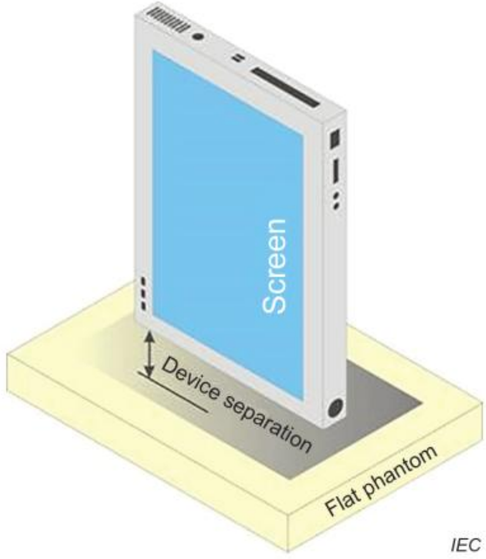
d) Where a screen mounted antenna is present, the SAR measurement for bystander exposure shall be performed with the screen positioned parallel to the flat phantom as shown in Figure.

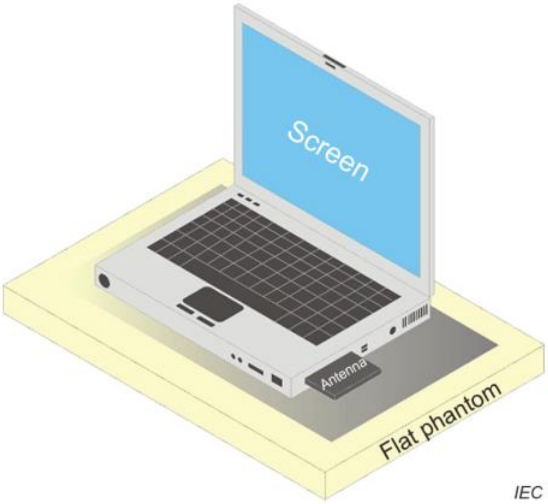
e) Body-supported devices with an external power supply (e.g. AC adapter) supplemental to the battery shall be tested with and without the external power supply attached.

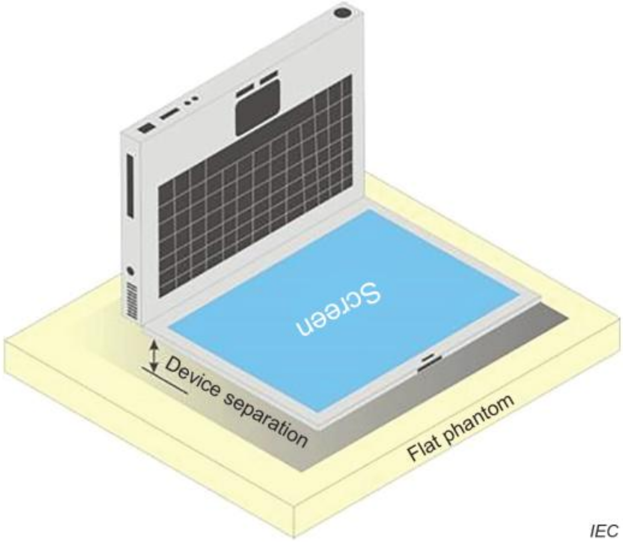
f) For devices that employ an external antenna with variable positions, the procedures for swivel and detachable antenna should be used; see Figure.

Note 1: RF transmitters that can operate in different hosts might require additional consideration.
Note 2: A separation distance of 2,5 cm is considered to be conservative for covering a wide range of expected bystander exposure conditions.


Screen
Device separation
Flat phantom
IEC


Screen
Device separation
Flat phantom
IEC


Screen
Antenna
Flat phantom
IEC

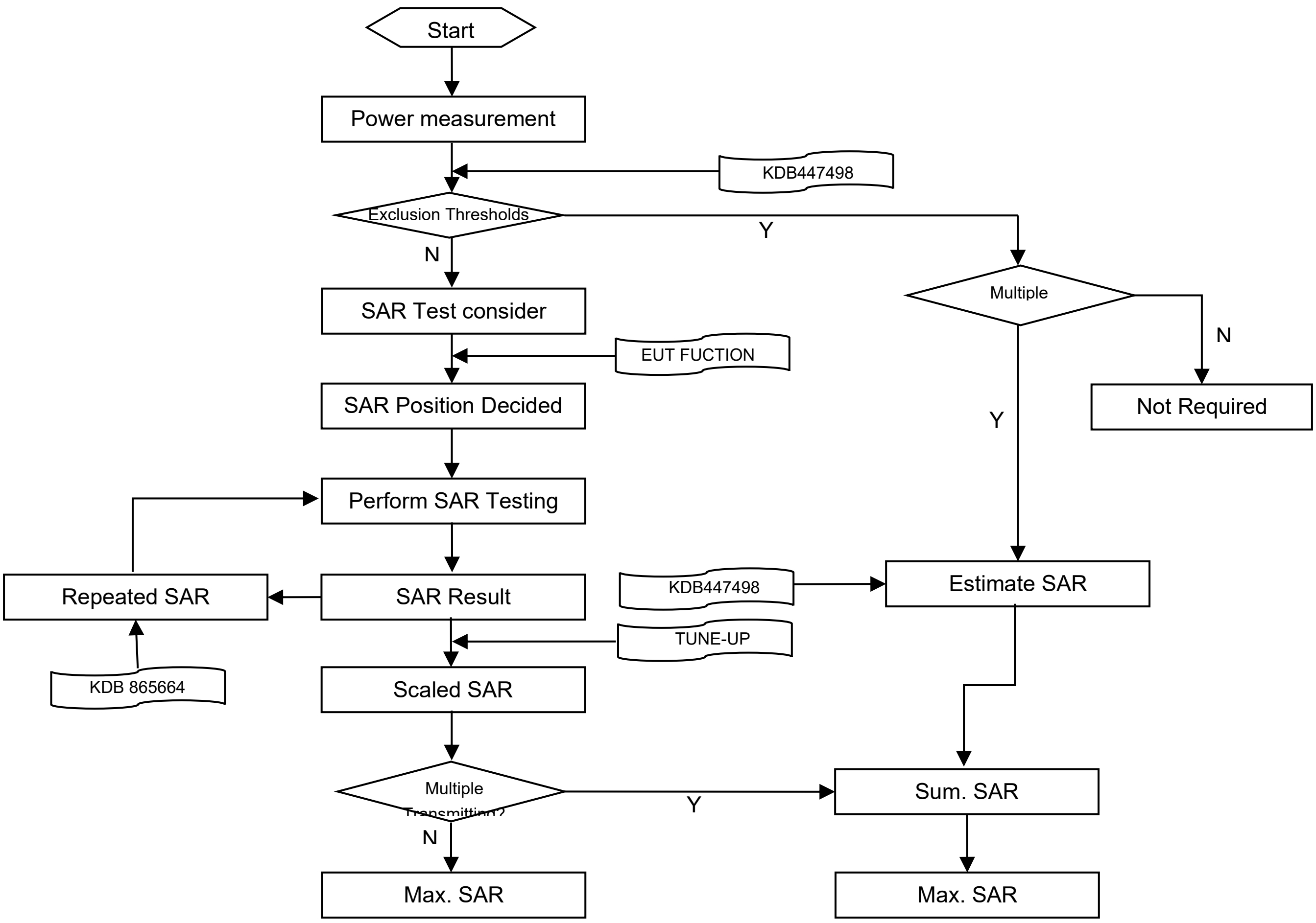

Screen
Device separation
Flat phantom
IEC

6.1 Product Specific 10g Exposure Consideration

According with FCC KDB 648474 D04, for smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that support voice calls next to the ear, unless it is confirmed otherwise through KDB inquiries, the following phablet procedures should be applied to evaluate SAR compliance for each applicable wireless modems and frequency band. Devices marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance;

The UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna located at ≤ 25 mm from that surface or edge, in direct contact with a flat phantom, for 10-g extremity SAR according to the body-equivalent tissue dielectric parameters in KDB 865664 to address interactive hand use exposure conditions. The UMPC mini-tablet 1-g SAR at 5 mm is not required. When hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg.

6.2 Measurement Process Diagram



7 TEST RESULT

7.1 Measurement of RF Conducted Power

	Mode	Channel	Frequency (MHz)	Average Power (dBm)			Tune up (dB)	
				MAIN	AUX	MAIN+AUX	MAIN/AUX	MAIN+AUX
2.4GHz WLAN	**802.11b 1Mbps**	1	2412	14.62	14.56	17.60	15.00	18.00
		6	2437	14.75	14.60	17.69	15.00	18.00
		11	**2462**	14.72	14.85	**17.80**	15.00	18.00
	802.11g 6Mbps	1	2412	14.33	14.11	17.23	15.00	17.90
		6	2437	14.26	14.37	17.33	15.00	17.90
		11	2462	14.16	14.13	17.16	15.00	17.90
	802.11ac-VHT20 MCS0	1	2412	14.26	14.12	17.20	15.00	17.90
		6	2437	14.16	14.16	17.17	15.00	17.90
		11	2462	14.36	14.23	17.31	15.00	17.90
	802.11ac-VHT40 MCS0	3	2422	14.17	14.30	17.25	15.00	17.90
		6	2437	14.12	14.16	17.15	15.00	17.90
		9	2452	14.18	14.17	17.19	15.00	17.90
	802.11ax-HE20 MCS0	1	2412	14.21	14.17	17.20	15.00	17.90
		6	2437	14.36	14.33	17.36	15.00	17.90
		11	2462	14.23	14.30	17.28	15.00	17.90
	802.11ax-HE40 MCS0	3	2422	14.17	14.17	17.18	15.00	17.90
		6	2437	14.32	14.14	17.24	15.00	17.90
		9	2452	14.27	14.30	17.30	15.00	17.90

	Mode	Channel	Frequency (MHz)	Average Power (dBm)			Tune up (dB)	
				MAIN	AUX	MAIN+AUX	MAIN/AUX	MAIN+AUX
5GHz WLAN	802.11a 6Mbps	36	5180	11.37	11.38	14.39	12.50	15.50
		40	5200	11.44	11.35	14.41	12.50	15.50
		48	5240	11.34	11.40	14.38	12.50	15.50
		52	5260	13.18	13.29	16.25	13.50	16.50
		56	5280	13.08	13.11	16.11	13.50	16.50
		64	5320	13.26	13.28	16.28	13.50	16.50
		100	5500	13.32	13.31	16.33	13.50	16.50
		116	5580	13.07	13.31	16.20	13.50	16.50
		140	5700	13.27	13.10	16.20	13.50	16.50
		149	5745	13.10	13.38	16.25	13.50	16.50
		157	5785	13.11	13.17	16.15	13.50	16.50
		165	5825	13.09	13.24	16.18	13.50	16.50
		169	5845	13.07	13.06	16.08	13.50	16.50
		173	5865	13.09	13.07	16.09	13.50	16.50
		177	5885	13.05	13.11	16.09	13.50	16.50
	802.11ac-VHT20 MCS0	36	5180	11.36	11.40	14.39	12.50	15.50
		40	5200	11.31	11.47	14.40	12.50	15.50
		48	5240	11.49	11.30	14.41	12.50	15.50
		52	5260	13.27	13.13	16.21	13.50	16.50
		56	5280	13.18	13.06	16.13	13.50	16.50
		64	5320	13.28	13.18	16.24	13.50	16.50
		100	5500	13.11	13.10	16.12	13.50	16.50
		116	5580	13.04	13.29	16.18	13.50	16.50
		140	5700	13.03	13.15	16.10	13.50	16.50
		149	5745	13.23	13.12	16.19	13.50	16.50
		157	5785	13.05	13.26	16.17	13.50	16.50
		165	5825	13.19	13.13	16.17	13.50	16.50
		169	5845	13.02	13.11	16.08	13.50	16.50
		173	5865	13.06	13.08	16.08	13.50	16.50
		177	5885	13.06	13.06	16.07	13.50	16.50
	802.11ac-VHT40 MCS0	38	5190	13.24	13.19	16.23	13.50	16.50
		46	5230	13.12	13.18	16.16	13.50	16.50
		54	5270	13.07	13.24	16.17	13.50	16.50
		62	5310	13.04	13.21	16.14	13.50	16.50
		102	5510	13.21	13.12	16.18	13.50	16.50
		118	5590	13.16	13.07	16.13	13.50	16.50
		134	5670	13.15	13.33	16.25	13.50	16.50
		151	5755	13.28	13.16	16.23	13.50	16.50
		159	5795	13.32	13.38	16.36	13.50	16.50
		167	5835	13.01	13.10	16.07	13.50	16.50
		175	5875	13.08	13.06	16.08	13.50	16.50
		42	5210	13.31	13.22	16.28	13.50	16.40

	802.11ac-VHT80 MCS0	58	5290	13.32	13.22	16.28	13.50	16.40
		106	5530	13.15	13.15	16.16	13.50	16.40
		122	5610	13.27	13.30	16.30	13.50	16.40
		155	5775	13.29	13.31	16.31	13.50	16.40
		171	5855	13.04	13.10	16.08	13.50	16.40
	802.11ax-HE20 MCS0	36	5180	11.39	11.41	14.41	12.50	15.50
		40	5200	11.37	11.51	14.45	12.50	15.50
		48	5240	11.57	11.30	14.45	12.50	15.50
		52	5260	13.20	13.21	16.22	13.50	16.50
		56	5280	13.21	13.35	16.29	13.50	16.50
		64	5320	13.13	13.25	16.20	13.50	16.50
		100	5500	13.12	13.12	16.13	13.50	16.50
		116	5580	13.08	13.15	16.13	13.50	16.50
		140	5700	13.23	13.30	16.28	13.50	16.50
		149	5745	13.12	13.30	16.22	13.50	16.50
		157	5785	13.17	13.11	16.15	13.50	16.50
		165	5825	13.15	13.32	16.25	13.50	16.50
		169	5845	13.09	13.12	16.12	13.50	16.50
		173	5865	13.07	13.09	16.09	13.50	16.50
		177	5885	13.05	13.06	16.07	13.50	16.50
	802.11ax-HE40 MCS0	38	5190	13.31	13.30	16.32	13.50	16.50
		46	5230	13.20	13.30	16.26	13.50	16.50
		54	5270	13.14	13.06	16.11	13.50	16.50
		62	5310	13.08	13.28	16.19	13.50	16.50
		102	5510	13.12	13.19	16.17	13.50	16.50
		118	5590	13.08	13.24	16.17	13.50	16.50
		134	5670	13.37	13.10	16.25	13.50	16.50
		151	5755	13.30	13.33	16.33	13.50	16.50
		159	5795	13.21	13.31	16.27	13.50	16.50
		167	5835	13.01	13.14	16.09	13.50	16.50
		175	5875	13.08	13.10	16.10	13.50	16.50
	802.11ax-HE80 MCS0	**42**	**5210**	13.41	13.47	**16.45**	13.50	16.50
		58	**5290**	13.44	13.36	**16.41**	13.50	16.50
		106	5530	13.41	13.29	16.36	13.50	16.50
		122	**5610**	13.45	13.37	**16.42**	13.50	16.50
		155	**5775**	13.47	13.41	**16.45**	13.50	16.50
		171	5855	13.27	13.31	16.30	13.50	16.50

	Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune up (dB)
Bluetooth	DH5	0	2402	11.92	12.50
		39	2441	**12.16**	**12.50**
		78	2480	11.73	12.50
	2DH5	0	2402	9.22	12.50
		39	2441	9.34	12.50
		78	2480	9.36	12.50
	3DH5	0	2402	9.13	12.50
		39	2441	9.47	12.50
		78	2480	9.45	12.50
	BLE 1M	0	2402	11.81	12.50
		19	2440	11.87	12.50
		39	2480	11.68	12.50
	BLE 2M	1	2404	12.04	12.50
		19	2440	11.70	12.50
		38	2478	11.85	12.50

7.2 Measurement of SAR Test Results

Test position	Test mode	Test ch./Freq.	Duty Cycle factor	SAR (W/kg) 1-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 1-g(W/kg)
Body SAR Test data (Separate 0mm) INPAQ Antenna									
Top Side of Keyboard	DH5	39/2441	1.00	0.000	0.00	12.16	12.50	1.081	0.000
Front Side	DH5	39/2441	1.00	0.065	0.08	12.16	12.50	1.081	0.070
Left Edge	DH5	39/2441	1.00	0.000	0.00	12.16	12.50	1.081	0.000
Right Edge	DH5	39/2441	1.00	0.019	0.09	12.16	12.50	1.081	0.021
Top Side	DH5	39/2441	1.00	0.000	0.00	12.16	12.50	1.081	0.000
Bottom Side	DH5	39/2441	1.00	**0.158**	**0.01**	12.16	12.50	1.081	**0.171**
Bottom Side	DH5	0/2402	1.00	0.137	0.04	11.92	12.50	1.143	0.157
Bottom Side	DH5	78/2480	1.00	0.124	0.07	11.73	12.50	1.194	0.148
Body SAR Test data (Separate 0mm) AWAN Antenna									
Bottom Side	DH5	39/2441	1.00	0.144	0.01	12.16	12.50	1.081	0.156

Test position	Test mode	Test ch./Freq.	Duty Cycle factor	SAR (W/kg) 1-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 1-g(W/kg)
Body SAR Test data(Separate 0mm) INPAQ Antenna MIMO									
Top Side of Keyboard	802.11b	11/2462	1.31	0.000	0.00	17.80	18.00	1.047	0.000
Front Side	802.11b	11/2462	1.31	0.072	-0.09	17.80	18.00	1.047	0.099
Left Edge	802.11b	11/2462	1.31	0.000	0.00	17.80	18.00	1.047	0.000
Right Edge	802.11b	11/2462	1.31	0.033	0.04	17.80	18.00	1.047	0.045
Top Side	802.11b	11/2462	1.31	0.000	0.00	17.80	18.00	1.047	0.000
Bottom Side	802.11b	11/2462	1.31	**0.263**	**0.01**	17.80	18.00	1.047	**0.361**
Bottom Side	802.11b	1/2412	1.31	0.236	0.07	17.60	18.00	1.096	0.339
Bottom Side	802.11b	6/2437	1.31	0.251	-0.02	17.69	18.00	1.074	0.353
Body SAR Test data(Separate 0mm) AWAN Antenna MIMO									
Bottom Side	802.11b	11/2462	1.31	0.241	0.03	17.80	18.00	1.047	0.331

Test position	Test mode	Test ch./Freq.	Duty Cycle factor	SAR (W/kg) 1-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 1-g(W/kg)
Body SAR Test data(Separate 0mm) INPAQ Antenna MIMO									
Top Side of Keyboard	802.11ax80	42/5210	1.00	0.000	0.00	16.45	16.50	1.012	0.000
Front Side	802.11ax80	42/5210	1.00	0.396	0.03	16.45	16.50	1.012	0.401
Left Edge	802.11ax80	42/5210	1.00	0.000	0.00	16.45	16.50	1.012	0.000
Right Edge	802.11ax80	42/5210	1.00	0.104	0.09	16.45	16.50	1.012	0.105
Top Side	802.11ax80	42/5210	1.00	0.000	0.00	16.45	16.50	1.012	0.000
Bottom Side	802.11ax80	42/5210	1.00	**0.541**	**0.05**	16.45	16.50	1.012	**0.547**
Body SAR Test data(Separate 0mm) AWAN Antenna MIMO									
Bottom Side	802.11ax80	42/5210	1.00	0.494	0.04	16.45	16.50	1.012	0.500

Test position	Test mode	Test ch./Freq.	Duty Cycle factor	SAR (W/kg) 1-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 1-g(W/kg)
Body SAR Test data(Separate 0mm) INPAQ Antenna MIMO									
Top Side of Keyboard	802.11ax80	58/5290	1.00	0.000	0.00	16.41	16.50	1.021	0.000
Front Side	802.11ax80	58/5290	1.00	0.380	0.11	16.41	16.50	1.021	0.388
Left Edge	802.11ax80	58/5290	1.00	0.000	0.00	16.41	16.50	1.021	0.000
Right Edge	802.11ax80	58/5290	1.00	0.093	0.09	16.41	16.50	1.021	0.095
Top Side	802.11ax80	58/5290	1.00	0.000	0.00	16.41	16.50	1.021	0.000
Bottom Side	802.11ax80	58/5290	1.00	**0.541**	**0.03**	16.41	16.50	1.021	**0.552**
Body SAR Test data(Separate 0mm) AWAN Antenna MIMO									
Bottom Side	802.11ax80	58/5290	1.00	0.481	0.01	16.41	16.50	1.021	0.491

Test position	Test mode	Test ch./Freq.	Duty Cycle factor	SAR (W/kg) 1-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 1-g(W/kg)
Body SAR Test data(Separate 0mm) INPAQ Antenna MIMO									
Top Side of Keyboard	802.11ax80	122/5610	1.00	0.000	0.00	16.42	16.50	1.019	0.000
Front Side	802.11ax80	122/5610	1.00	0.584	0.09	16.42	16.50	1.019	0.595
Left Edge	802.11ax80	122/5610	1.00	0.000	0.00	16.42	16.50	1.019	0.000
Right Edge	802.11ax80	122/5610	1.00	0.179	0.07	16.42	16.50	1.019	0.182
Top Side	802.11ax80	122/5610	1.00	0.000	0.00	16.42	16.50	1.019	0.000
Bottom Side	802.11ax80	122/5610	1.00	**0.854**	**0.02**	16.42	16.50	1.019	**0.870**
Bottom Side	802.11ax80	106/5530	1.00	0.813	0.04	16.36	16.50	1.033	0.840
Body SAR Test data(Separate 0mm) AWAN Antenna MIMO									
Bottom Side	802.11ax80	122/5610	1.00	0.819	0.04	16.42	16.50	1.019	0.834
Bottom Side	802.11ax80	106/5530	1.00	0.756	-0.03	16.36	16.50	1.033	0.781

Test position	Test mode	Test ch./Freq.	Duty Cycle factor	SAR (W/kg) 1-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 1-g(W/kg)
Body SAR Test data(Separate 0mm) INPAQ Antenna MIMO									
Top Side of Keyboard	802.11ax80	155/5775	1.00	0.000	0.00	16.45	16.50	1.012	0.000
Front Side	802.11ax80	155/5775	1.00	0.671	0.02	16.45	16.50	1.012	0.679
Left Edge	802.11ax80	155/5775	1.00	0.000	0.00	16.45	16.50	1.012	0.000
Right Edge	802.11ax80	155/5775	1.00	0.204	0.04	16.45	16.50	1.012	0.206
Top Side	802.11ax80	155/5775	1.00	0.000	0.00	16.45	16.50	1.012	0.000
Bottom Side	802.11ax80	155/5775	1.00	**1.030**	**0.07**	16.45	16.50	1.012	**1.042**
Bottom Side	802.11ax80	171/5885	1.00	0.866	0.04	16.30	16.50	1.047	0.907
Body SAR Test data(Separate 0mm) AWAN Antenna MIMO									
Bottom Side	802.11ax80	155/5775	1.00	0.894	-0.07	16.45	16.50	1.012	0.904

SAR Test Note:

1. The Wi-Fi duty cycle is 85~100%, Wi-Fi SAR scaling need further consideration and the theoretical duty cycle is 100%, therefore the actual duty cycle will be scaled up to the theoretical value of Wi-Fi reported SAR calculation.
2. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

SAR Measurement Variability

Band	Mode	Test Position	Ch.	Freq. (MHz)	Antenna	Original 10g SAR (W/kg)	First 10g SAR (W/kg)	First Ratio (%)
WLAN 5.6G	802.11ax80	Bottom Side	122	5610	MIMO	0.854	0.833	-2.5
WLAN 5.8G	802.11ax80	Bottom Side	155	5775	MIMO	1.030	0.974	-5.7
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--

Note:
According to KDB 865664 D01v01r04, 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. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium.
The following procedures are applied to determine if repeated measurements are required:

1. The original highest measured Reported SAR 10-g ≥ 2.0 W/kg repeated that measurement once.
2. Perform a second repeated measurement the ratio of the largest to the smallest SAR for the original and first repeated measurements is <3.0 W/kg, or when the original or repeated measurement ≥ 3.63 W/kg (~10% from the 10-g SAR limit).

7.3 Multiple Transmitter Evaluation

Simultaneous SAR SAR test evaluation

• **Simultaneous TX Combination**	Body SAR
Wi-Fi 2.4G + Bluetooth	Y
Wi-Fi 5G + Bluetooth	Y

Simultaneous Transmission SAR Summation Scenario

Body SAR (0mm)					
Exposure Position (0mm)	1	2	3	1+3	2+3
	2.4GHz WLAN	5GHz WLAN	Bluetooth	Scaled SAR	
	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)
Body SAR	0.36	1.04	0.17	0.53	1.21

8 SAR VALIDATION DATA

Date: 4/13/2026

System Check Head 2450MHz

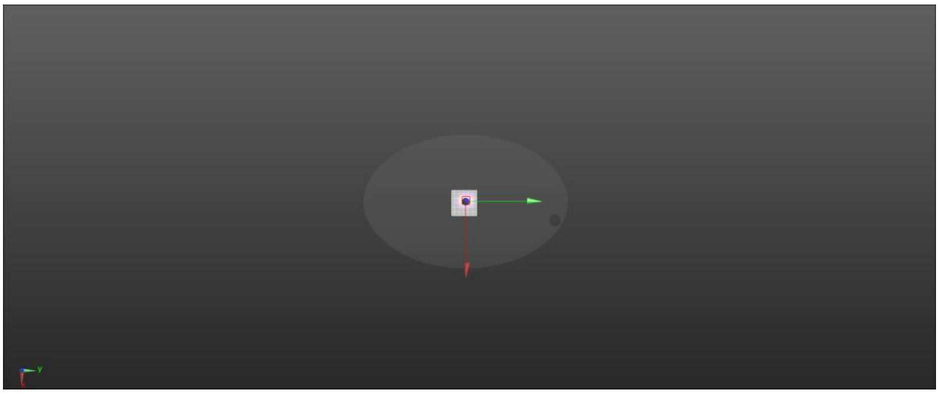
Communication System: UID 0, CW; Communication System Band: D2450MHz; Duty Cycle: 1:1; Frequency: 2450 MHz; Medium parameters used: f = 2450 MHz; σ = 1.888 S/m; ε_r = 40.816; ρ = 1000 kg/m^3

Ambient temperature (℃): 22.5, Liquid temperature (℃): 22.0

DASY5 Configuration:

- Probe: EX3DV4 - SN7761; ConvF(7.3, 7.3, 7.3); Calibrated: 4/8/2026
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4ip Sn1854; Calibrated: 3/23/2026
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2106
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Area Scan (61x61x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 23.3 W/kg
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 87.99 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 28.2 W/kg
SAR(1 g) = 13.6 W/kg; SAR(10 g) = 6.35 W/kg
Smallest distance from peaks to all points 3 dB below = 9 mm
Ratio of SAR at M2 to SAR at M1 = 48.5%
Maximum value of SAR (measured) = 22.9 W/kg



Date: 4/15/2026

System Check Head 5250MHz

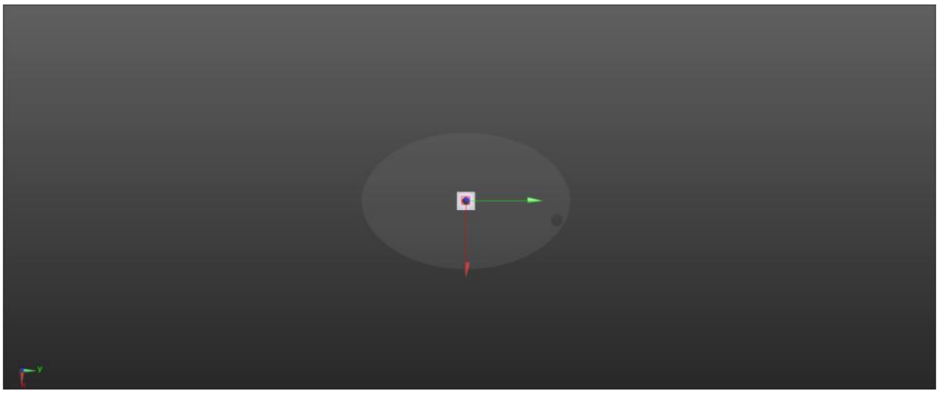
Communication System: UID 0, CW (0); Communication System Band: 5250MHz; Duty Cycle: 1:1; Frequency: 5250 MHz; Medium parameters used: f = 5250 MHz; σ = 4.771 S/m; ε_r = 35.891; ρ = 1000 kg/m^3

Ambient temperature (℃): 22.5, Liquid temperature (℃): 22.0

DASY5 Configuration:

- Probe: EX3DV4 - SN7761; ConvF(5.25, 5.25, 5.25); Calibrated: 4/8/2026
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4ip Sn1854; Calibrated: 3/23/2026
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2106
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Area Scan (51x51x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 19.1 W/kg
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 42.84 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 28.7 W/kg
SAR(1 g) = 7.45 W/kg; SAR(10 g) = 2.14 W/kg
Smallest distance from peaks to all points 3 dB below = 7.4 mm
Ratio of SAR at M2 to SAR at M1 = 66.3%
Maximum value of SAR (measured) = 18.7 W/kg



Date: 4/17/2026

System Check Head 5600MHz

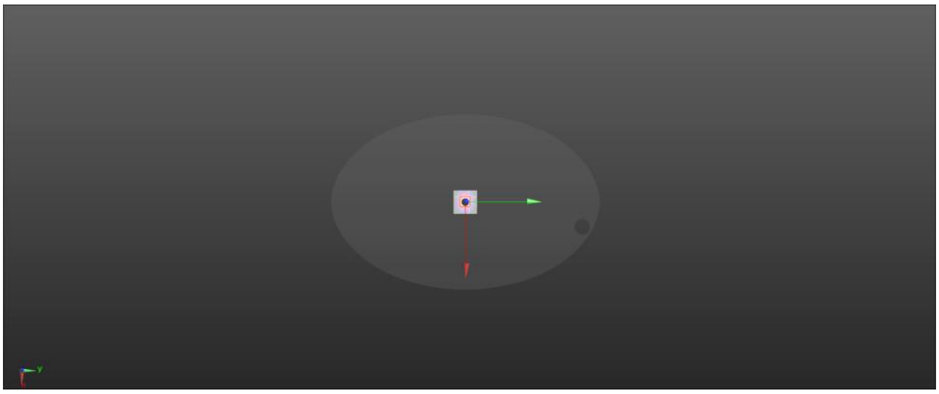
Communication System: UID 0, CW (0); Communication System Band: D5600MHz; Duty Cycle: 1:1; Frequency: 5600 MHz; Medium parameters used: f = 5600 MHz; σ = 5.2 S/m; ε_r = 35.234; ρ = 1000 kg/m^3

Ambient temperature (℃): 22.5, Liquid temperature (℃): 22.0

DASY5 Configuration:

- Probe: EX3DV4 - SN7761; ConvF(4.65, 4.65, 4.65); Calibrated: 4/8/2026
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4ip Sn1854; Calibrated: 3/23/2026
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2106
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Area Scan (51x51x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 22.8 W/kg
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 43.36 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 35.4 W/kg
SAR(1 g) = 8.65 W/kg; SAR(10 g) = 2.47 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 64.1%
Maximum value of SAR (measured) = 22.3 W/kg



Date: 4/19/2026

System Check Head 5750MHz

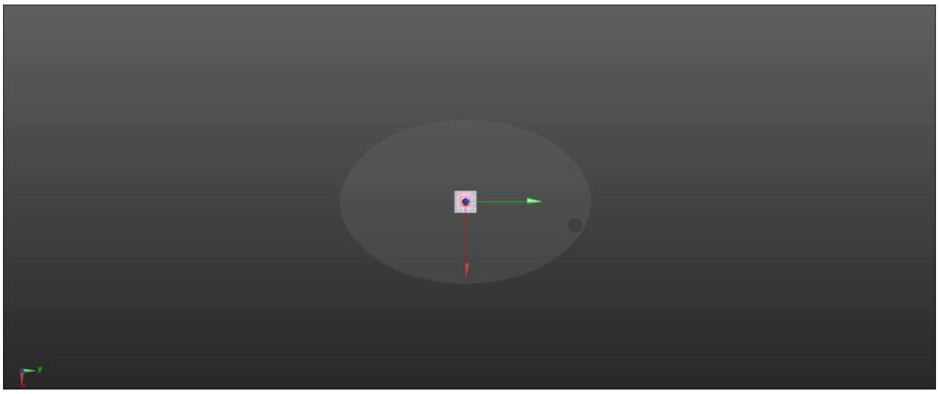
Communication System: UID 0, CW (0); Communication System Band: D5750MHz; Duty Cycle: 1:1; Frequency: 5750 MHz; Medium parameters used: f = 5750 MHz; σ = 5.368 S/m; ε_r = 34.951; ρ = 1000 kg/m^3

Ambient temperature (℃): 22.5, Liquid temperature (℃): 22.0

DASY5 Configuration:

- Probe: EX3DV4 - SN7761; ConvF(4.79, 4.79, 4.79); Calibrated: 4/8/2026
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4ip Sn1854; Calibrated: 3/23/2026
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2106
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Area Scan (51x51x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 20.7 W/kg
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 40.24 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 33.2 W/kg
SAR(1 g) = 7.81 W/kg; SAR(10 g) = 2.23 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 62.7%
Maximum value of SAR (measured) = 20.2 W/kg



9 SAR TEST DATA

Date: 4/13/2026

Bluetooth DH5-Bottom-CH39-2441MHz

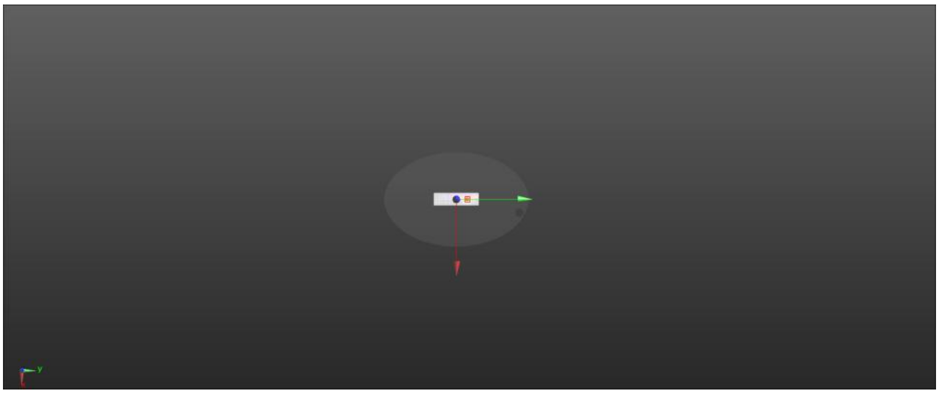
Communication System: UID 0, Bluetooth (0); Communication System Band: BDR+EDR; Duty Cycle: 1:1; Frequency: 2441 MHz; Medium parameters used: f = 2441 MHz; σ = 1.879 S/m; ε_r = 40.842; ρ = 1000 kg/m^3

Ambient temperature (℃): 22.5, Liquid temperature (℃): 22.0

DASY5 Configuration:

- Probe: EX3DV4 - SN7761; ConvF(7.3, 7.3, 7.3); Calibrated: 4/8/2026
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4ip Sn1854; Calibrated: 3/23/2026
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2106
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Area Scan (41x151x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.282 W/kg
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.669 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.390 W/kg
SAR(1 g) = 0.158 W/kg; SAR(10 g) = 0.066 W/kg
Smallest distance from peaks to all points 3 dB below = 8.9 mm
Ratio of SAR at M2 to SAR at M1 = 41.2%
Maximum value of SAR (measured) = 0.292 W/kg



Date: 4/13/2026

WLAN 2.4G 802.11b-Bottom-CH11-2462MHz

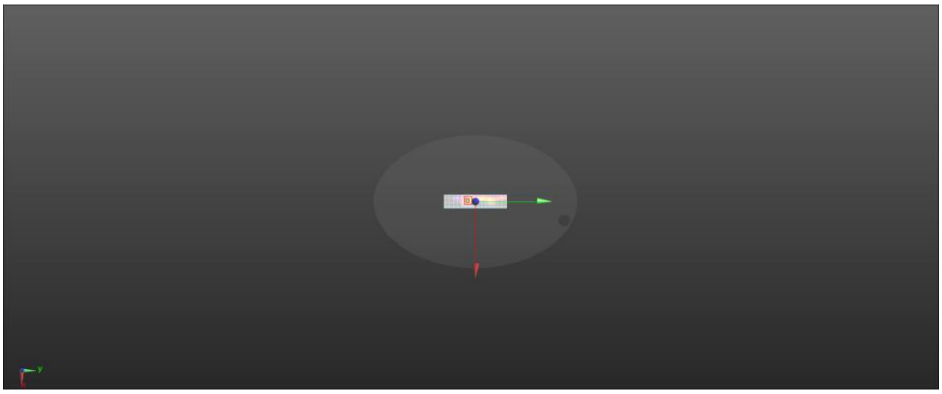
Communication System: UID 0, WIFI 2.4G (0); Communication System Band: 802.11b(20M); Duty Cycle: 1:1;
Frequency: 2462 MHz; Medium parameters used: f = 2462 MHz; σ = 1.899 S/m; ε_r = 40.788; ρ = 1000 kg/m^3

Ambient temperature (℃): 22.5, Liquid temperature (℃): 22.0

DASY5 Configuration:

- Probe: EX3DV4 - SN7761; ConvF(7.3, 7.3, 7.3); Calibrated: 4/8/2026
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4ip Sn1854; Calibrated: 3/23/2026
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2106
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Area Scan (31x151x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.438 W/kg
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.261 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.612 W/kg
SAR(1 g) = 0.263 W/kg; SAR(10 g) = 0.118 W/kg
Smallest distance from peaks to all points 3 dB below = 8.1 mm
Ratio of SAR at M2 to SAR at M1 = 44.3%
Maximum value of SAR (measured) = 0.465 W/kg



Date: 4/15/2026

WLAN 5G 802.11ax80-Bottom-CH42-5210MHz

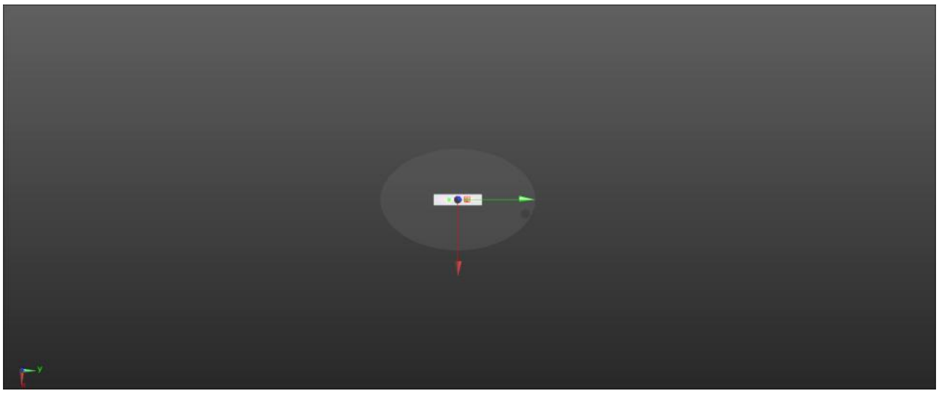
Communication System: UID 0, WIFI 5G (0); Communication System Band: 802.11ax(80M); Duty Cycle: 1:1;
Frequency: 5210 MHz; Medium parameters used: f = 5210 MHz; σ = 4.732 S/m; ε_r = 36.016; ρ = 1000 kg/m^3

Ambient temperature (℃): 22.5, Liquid temperature (℃): 22.0

DASY5 Configuration:

- Probe: EX3DV4 - SN7761; ConvF(5.25, 5.25, 5.25); Calibrated: 4/8/2026
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4ip Sn1854; Calibrated: 3/23/2026
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2106
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Area Scan (41x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.39 W/kg
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 6.207 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 2.00 W/kg
SAR(1 g) = 0.541 W/kg; SAR(10 g) = 0.176 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 65.8%
Maximum value of SAR (measured) = 1.28 W/kg



Date: 4/15/2026

WLAN 5G 802.11ax80-Bottom-CH58-5290MHz

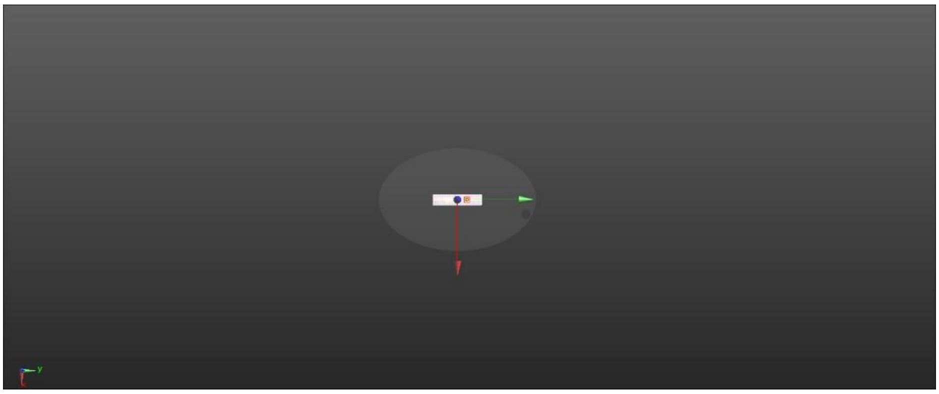
Communication System: UID 0, WIFI 5G (0); Communication System Band: 802.11ax(80M); Duty Cycle: 1:1; Frequency: 5290 MHz; Medium parameters used: f = 5290 MHz; σ = 4.833 S/m; ε_r = 35.83; ρ = 1000 kg/m^3

Ambient temperature (℃): 22.5, Liquid temperature (℃): 22.0

DASY5 Configuration:

- Probe: EX3DV4 - SN7761; ConvF(5.25, 5.25, 5.25); Calibrated: 4/8/2026
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4ip Sn1854; Calibrated: 3/23/2026
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2106
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Area Scan (41x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.29 W/kg
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 6.868 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 1.98 W/kg
SAR(1 g) = 0.541 W/kg; SAR(10 g) = 0.180 W/kg
Smallest distance from peaks to all points 3 dB below = 7.6 mm
Ratio of SAR at M2 to SAR at M1 = 65.1%
Maximum value of SAR (measured) = 1.23 W/kg



Date: 4/17/2026

WLAN 5G 802.11ax80-Bottom-CH122-5610MHz

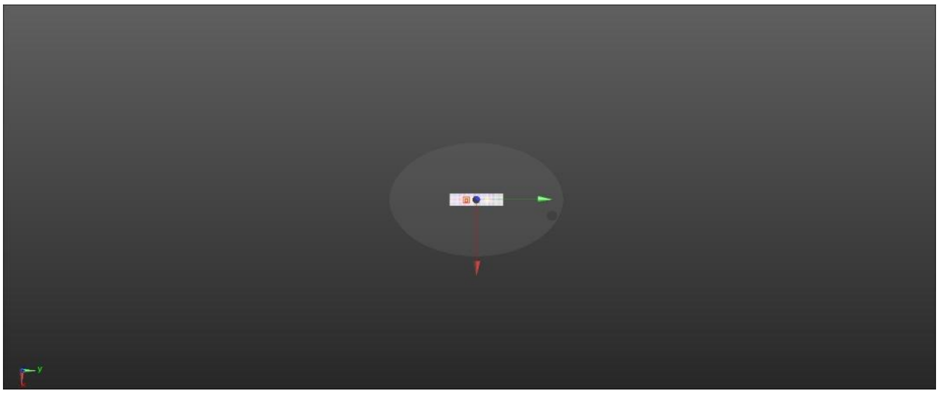
Communication System: UID 0, WIFI 5G (0); Communication System Band: 802.11ax(80M); Duty Cycle: 1:1;
Frequency: 5610 MHz; Medium parameters used: f = 5610 MHz; σ = 5.21 S/m; ε_r = 35.224; ρ = 1000 kg/m^3

Ambient temperature (℃): 22.5, Liquid temperature (℃): 22.0

DASY5 Configuration:

- Probe: EX3DV4 - SN7761; ConvF(4.65, 4.65, 4.65); Calibrated: 4/8/2026
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4ip Sn1854; Calibrated: 3/23/2026
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2106
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Area Scan (41x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.69 W/kg
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 3.247 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 3.51 W/kg
SAR(1 g) = 0.854 W/kg; SAR(10 g) = 0.224 W/kg
Smallest distance from peaks to all points 3 dB below = 5.6 mm
Ratio of SAR at M2 to SAR at M1 = 61.3%
Maximum value of SAR (measured) = 1.87 W/kg



Date: 4/19/2026

WLAN 5G 802.11ax80-Bottom-CH155-5775MHz

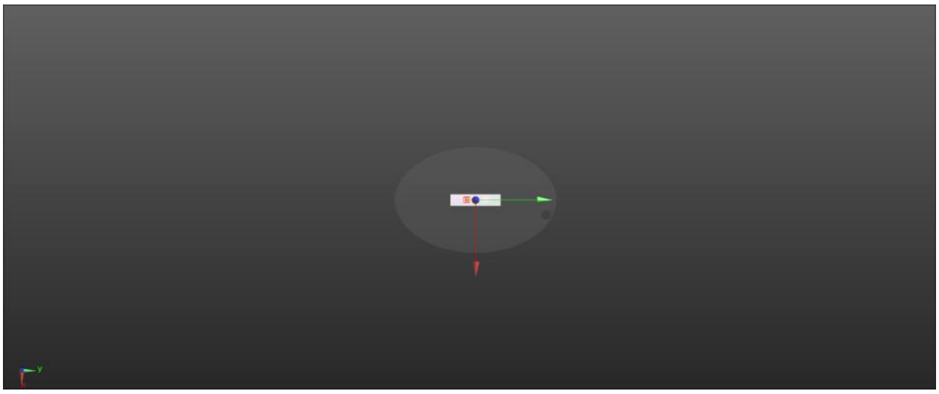
Communication System: UID 0, WIFI 5G (0); Communication System Band: 802.11ax(80M); Duty Cycle: 1:1;
Frequency: 5775 MHz; Medium parameters used: f = 5775 MHz; σ = 5.402 S/m; ε_r = 34.888; ρ = 1000 kg/m^3

Ambient temperature (℃): 22.5, Liquid temperature (℃): 22.0

DASY5 Configuration:

- Probe: EX3DV4 - SN7761; ConvF(4.79, 4.79, 4.79); Calibrated: 4/8/2026
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4ip Sn1854; Calibrated: 3/23/2026
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2106
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Area Scan (41x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 2.67 W/kg
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 2.078 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 4.87 W/kg
SAR(1 g) = 1.03 W/kg; SAR(10 g) = 0.308 W/kg
Smallest distance from peaks to all points 3 dB below = 6.8 mm
Ratio of SAR at M2 to SAR at M1 = 59.3%
Maximum value of SAR (measured) = 2.69 W/kg



10 CALIBRATION CERTIFICATE

Note: The detailed calibration certificate can refer to Appendix.

11 TEST SETUP PHOTO

Note: The Test Setup Photo please see appendix.

The End