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SAR EVALUATION REPORT

FCC ID:	IPH-A4967
IC:	1792A-A4967
HVIN/PMN/Model(s):	AA4967
Device Type:	Portable Digital Transceiver
Report Issue Date:	July 25th, 2025

Garmin International, Inc.
1200 E. 151st Street,
Olathe, KS 66062, United States

Certification

FCC Equipment Class	Body SAR [W/kg]	Extremity SAR [W/kg]	10g Simultaneous Tx SAR [W/kg]
DTS	0.97	0.36	0.36
DSS	-	-	0.36
DXX	-	< 0.10	0.36
FCC Limit	1.6	4.0	4.0

ISED	Body SAR [W/kg]	Extremity SAR [W/kg]	10g Simultaneous Tx SAR [W/kg]
2.4 GHz WIFI	0.97	0.36	0.40
2.4 GHz Bluetooth LE	-	-	0.40
2.4 GHz ANT/ANT+	-	-	0.40
NFC	-	0.00	0.40
ISED Limit	1.6	4.0	4.0

The measurement evaluations presented in this report are based on the maximum performance of the tested device(s), which has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment / general population exposure federal limits in 47CFR § 1.1310 and Health Canada Safety Code 6 and has been tested in accordance with the measurement procedures specified within this report.

This document has been revised and replaces all previously issued versions of this document with the same Test Report S/N.

Steve Liu
President

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1. DUT Specifics

1.1. Device under Test

The device under test is a portable digital transceiver, incorporating the technologies listed in Table 1-1 below. The manufacturer has confirmed that the device is within operational tolerances expected for production units and has the same physical, mechanical, and thermal characteristics expected for production units. The serial number of the device used for each test is indicated alongside the results.

1.2. Maximum SAR per Mode

Table 1-1 Supported Technologies

Band/Mode	Frequency (MHz)
2.4 GHz WIFI	2412 - 2472 MHz
2.4 GHz Bluetooth LE	2402 - 2480 MHz
2.4 GHz ANT/ANT+	2402 - 2480 MHz
NFC	13.56 MHz

1.3. Maximum Time-Averaged Power From Manufacturer

The manufacturer has confirmed that this device follows the below target output power specifications and tolerances. SAR values were scaled to the maximum allowed power (including tolerance) to determine compliance per KDB Publication 447498 D04v01.

Table 1-2 2.4 GHz WIFI Target RF Output Power

2.4 GHz WIFI Target Power [dBm]						
Power Level	Channel Bandwidth [MHz]	Mode		802.11b (CDD + STBC)	802.11g (CDD + STBC)	802.11n (CDD +STBC, SDM)
		Channel	Freq. [MHz]	Antenna 2.4 GHz	Antenna 2.4 GHz	Antenna 2.4 GHz
Max	22 (802.11b)/ 20 (802.11g/n)	1	2412	16.5	13.0	14.0
		2	2417	16.5	14.0	15.0
		3	2422	16.5	15.5	15.0
		4	2427	16.5	15.5	15.0
		5	2432	16.5	15.5	15.0
		6	2437	16.5	15.5	15.0
		7	2442	16.5	15.5	15.0
		8	2447	16.5	15.5	15.0
		9	2452	16.5	15.5	15.0
		10	2457	16.5	14.0	15.0
		11	2462	16.5	12.0	11.5
		12	2467	10.5	10.0	8.5
		13	2472	9.0	8.0	7.0
Tolerance: +/- 2 dB						

Table 1-3 2.4 GHz Bluetooth LE Target RF Output Power

2.4 GHz Bluetooth LE Target Power [dBm]					
Power Level	Mode	Data Rate	Channel	Frequency [MHz]	Antenna 2.4 GHz
Max	BLE	1Mbps	37	2402	-1.0
			0	2404	2.5
			17	2440	2.5
			36	2478	-1.0
			39	2480	-1.0
		2Mbps	0	2404	2.5
			17	2440	2.5
			36	2478	-1.0
Tolerance: +/- 2 dB					

Table 1-4 2.4 GHz ANT/ANT+ Target RF Output Power

2.4 GHz ANT/ANT+ Target Power [dBm]			
Power Level	Mode	Frequency [MHz]	Antenna 2.4 GHz
Max	ANT/ANT+	2402	-1.0
		2404	2.5
		2440	2.5
		2478	2.5
		2480	-1.0
Tolerance: +/- 2 dB			

1.4. Surfaces Required for Testing

Antennas	Back	Front	Top	Bottom	Right	Left
Antenna 2.4 GHz	Yes	Yes	Yes	Yes	Yes	Yes
NFC Antenna	Yes	Yes	Yes	Yes	Yes	Yes

1.5. Test Guidance Applied

- IEEE 1528-2013 (FCC)
- IEC/IEEE 62209-1528:2020 (ISED)
- RSS-102 Issue 6 (ISED)
- RSS-102.SAR.MEAS (ISED)
- Health Canada Safety Code 6 (ISED)
- FCC KDB Publication 248227 D01v02r02 (SAR Considerations for 802.11 Devices) (FCC/ISED)
- FCC KDB Publication 447498 D04v01 (General SAR Guidance) (FCC/ISED)
- FCC KDB Publication 865664 D01v01r04, D02v01r02 (SAR Measurements up to 6 GHz) (FCC)

2. Bluetooth LE and ANT/ANT+ SAR Test Exemption Assessment

2.1. FCC SAR Test Exemption

Per FCC KDB 447498 D01 v06 Section 4.3.1, For 100 MHz to 6 GHz "1-g and 10-g SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when… *test separation distances* **≤ 50 mm**, the **1-g and 10-g *SAR*** *test exclusion "numeric thresholds"*:

$$\frac{MaxPower}{Distance} \cdot \sqrt{f_{GHz}} \leq 3.0 \qquad \text{(for 1-g SAR)}$$

$$\frac{MaxPower}{Distance} \cdot \sqrt{f_{GHz}} \leq 7.5 \qquad \text{(for 10-g SAR)}$$

Where: f_{GHz} = RF Channel frequency in GHz
$MaxPower$ = Power of channel, including tune-up tolerance, rounded to the nearest mW before calculation
$Distance$ = Min. Test Separation Distance in mm, rounded to the nearest mm before calculation

Per FCC KDB 447498 D01 v06 Section 4.3.1, "Power and distance are rounded to the nearest mW and mm before calculation." The result is rounded to one decimal place for comparison.

For Bluetooth LE, 2.5 dBm + 2 dB = 4.5 dBm = 3 mW

For ANT/ANT+, 2.5 dBm + 2 dB = 4.5 dBm = 3 mW

For distances ≤ 5mm, per FCC policy the value of 5 shall be used for the distance component of the equation.

$$\frac{MaxPower}{Distance} \cdot \sqrt{f_{GHz}} = \frac{3}{5} \cdot \sqrt{2.48} = 0.94$$

$0.94 \leq 3.0$ (for 1-g SAR)

$0.94 \leq 7.5$ (for 10-g SAR)

1-g and 10-g Bluetooth LE and ANT/ANT+ SAR is Exempt per FCC KDB 447498 D01 v06.

2.2. ISED SAR Test Exemption

Per RSS-102 Section 6.3, SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when… *test separation distances* **≤ 20 cm**, the **1-g *SAR*** *test exclusion "numeric thresholds"*:

Frequency (MHz)	≤ 5mm (mW)
2450	3

Note: For 10-g SAR, the exemption limits above are multiplied by a factor of 2.5

For Bluetooth LE, 2.5 dBm + 2 dB = 4.5 dBm = 3 mW

For ANT/ANT+, 2.5 dBm + 2 dB = 4.5 dBm = 3 mW

$3.0 \leq 3.0$ (for 1-g SAR)

$3.0 \leq 7.5$ (for 10-g SAR)

1-g and 10-g Bluetooth LE and ANT/ANT+ SAR is Exempt per RSS-102.

3. DUT Conducted Powers

3.1. WIFI Conducted Powers

Table 3-1

2.4 GHz WIFI Conducted Power [dBm]						
Power Level	Channel Bandwidth [MHz]	Mode		802.11b	802.11g	802.11n
		Ch.	Freq. [MHz]	Antenna 2.4 GHz	Antenna 2.4 GHz	Antenna 2.4 GHz
Max	22 (802.11b)/ 20 (802.11g/n)	1	2412	17.16	15.02	15.97
		6	2437	17.01	16.22	15.90
		11	2462	16.96	12.46	12.07

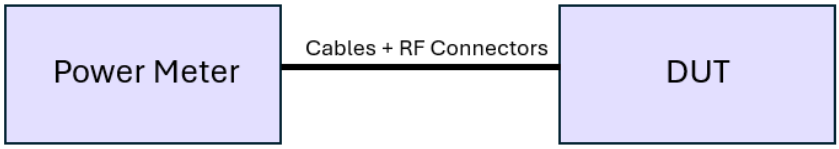

Figure 3-1 Power Measurement Setup

4. DUT SAR Test Results

4.1. WIFI SAR Data

Table 4-1

Exposure Condition	Band/Mode	Antenna	DUT SN	Power Drift [dB]	Maximum Duty Cycle [%]	Measured Duty Cycle [%]	Frequency [MHz]	Channel	Modulation/Configuration	Data Rate (Mbps)	Maximum Allowed Power [dBm]	Measured Conducted Power [dBm]	Separation Distance [mm]	Position	Measured 1g SAR [W/kg]	Reported 1g SAR [W/kg]	Measured 10g SAR [W/kg]	Reported 10g SAR [W/kg]	Test Plot
Body/Extremity	2.4 GHz WIFI	Antenna 2.4 GHz	47435	-0.03	100.0%	100.0%	2412	1	IEEE 802.11b - 22 MHz	1	18.5	17.16	0	Back	0.238	0.324	0.129	0.176	-
Body/Extremity	2.4 GHz WIFI	Antenna 2.4 GHz	47435	0.02	100.0%	100.0%	2412	1	IEEE 802.11b - 22 MHz	1	18.5	17.16	0	Front	0.334	0.455	0.170	0.231	-
Body/Extremity	2.4 GHz WIFI	Antenna 2.4 GHz	47435	-0.03	100.0%	100.0%	2412	1	IEEE 802.11b - 22 MHz	1	18.5	17.16	0	Top	0.105	0.143	0.055	0.075	-
Body/Extremity	2.4 GHz WIFI	Antenna 2.4 GHz	47435	-0.13	100.0%	100.0%	2412	1	IEEE 802.11b - 22 MHz	1	18.5	17.16	0	Left	0.545	0.742	0.207	0.282	-
Body/Extremity	2.4 GHz WIFI	Antenna 2.4 GHz	47435	-0.11	100.0%	100.0%	2437	6	IEEE 802.11b - 22 MHz	1	18.5	17.01	0	Left	0.528	0.744	0.198	0.279	-
Body/Extremity	2.4 GHz WIFI	Antenna 2.4 GHz	47435	-0.08	100.0%	100.0%	2462	11	IEEE 802.11b - 22 MHz	1	18.5	16.96	0	Left	0.683	0.974	0.255	0.364	1
Body/Extremity	2.4 GHz WIFI	Antenna 2.4 GHz	47435	-0.08	100.0%	100.0%	2412	1	IEEE 802.11b - 22 MHz	1	18.5	17.16	0	Bottom	0.113	0.154	0.055	0.075	-
Body/Extremity	2.4 GHz WIFI	Antenna 2.4 GHz	47435	-0.10	100.0%	100.0%	2412	1	IEEE 802.11b - 22 MHz	1	18.5	17.16	0	Right	0.046	0.063	0.023	0.031	-

4.2. NFC SAR Data

Table 4-2

Exposure Condition	Band/Mode	Antenna	DUT SN	Power Drift [dB]	Frequency [MHz]	Signal Type	Separation Distance [mm]	Position	Measured 10g SAR [W/kg]	Test Plot
Extremity	NFC	NFC Antenna	47435	0.02	13.56	A	0	Back	0.000	-
Extremity	NFC	NFC Antenna	47435	0.16	13.56	A	0	Front	0.000	-
Extremity	NFC	NFC Antenna	47435	0.17	13.56	A	0	Top	0.000	2
Extremity	NFC	NFC Antenna	47435	0.15	13.56	A	0	Bottom	0.000	-
Extremity	NFC	NFC Antenna	47435	0.01	13.56	A	0	Right	0.000	-
Extremity	NFC	NFC Antenna	47435	-0.15	13.56	A	0	Left	0.000	-

4.3. General SAR Testing Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2013 and FCC KDB Publication 447498 D04v01 for FCC.
2. The test data reported are the worst-case SAR values according to test procedures specified in IEC/IEEE 62209-1528 and RSS-102.SAR.MEAS for ISED.
3. Per IEC/IEEE 62209-1528, SAR testing was performed using probes calibrated for the modulation specific signal.
4. SAR evaluations were made in accordance with the latest version of RSS-102 Issue 6 and RSS-102.SAR.MEAS, then IEC/IEEE 62209-1528. FCC KDB Publications listed in RSS-102 can be used as supplementary procedures due to limitation of technology specific testing protocols in the international standards.
5. Liquid tissue depth was at least 15.0 cm for all frequencies.
6. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D04v01.
7. Batteries are fully charged at the beginning of the SAR measurements.
8. Per IEC/IEEE 62209-1528, the worst case configuration was additionally evaluated for all channels.
9. Since back/front/top/left surfaces of the device are intended for use on user's hand, extremity SAR is evaluated for these surfaces.

10. Since back/front/top/left surfaces of the device are in close proximity to the user's body, body SAR is also measured with these surfaces positioned against a flat phantom, representative of the operating conditions expected by users.
11. NFC was evaluated for extremity for all surfaces based on expected usage conditions.
12. Simultaneous transmission analysis is provided in Appendix E.

4.4. WLAN Notes:

1. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 2.4 GHz WIFI operations, the initial test configuration was selected according to the 802.11 transmission modes with the highest maximum allowed powers. SAR for other 802.11 modes was not required due to the maximum allowed powers and the highest reported SAR.
2. Per KDB Publication 248227 D01v02r02, channels 12 and 13 are not required for SAR testing when their maximum output power is not higher than channel 1, 6 and 11.
3. When the maximum reported 1g averaged SAR is ≤ 0.8 W/kg (2.0 W/kg for 10g evaluations), SAR testing on additional channels was not required. Otherwise, SAR for the next highest output power channel was required until the reported SAR result was ≤ 1.20 W/kg for 1g evaluations (3 W/kg for 10g evaluations) or all test channels were measured.
4. The device was configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools. The reported SAR was scaled to the 100% transmission duty factor to determine compliance. Procedures used to measure the duty factor are identical to that in the associated Part 15 test reports.

5. DUT SAR Measurement Variability Requirement

Per FCC KDB Publication 865664 D01v01r04, SAR measurement variability was not required since the measured SAR results for a frequency band were less than 0.8 W/kg for 1g SAR and 2.0 W/kg for 10g SAR.

6. General Introduction

Title 47 of the Code of Federal Regulations (CFR) pertains to United States Federal regulation for Telecommunications. The **Federal Communications Commission (FCC)** is the agency responsible for implementing and enforcing these regulations. The rules define a **radiofrequency device** as any device which in its operation is capable of emitting radiofrequency energy by radiation, conduction, or other means.

47CFR §2.1093(b) states, "A **portable device** is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that the RF source's radiating structure(s) **is/are within 20 centimeters of the body of the user**."

Also, 47CFR §2.1093(d)(6) states, that General population/uncontrolled exposure limits defined in §1.1310 "apply to portable devices intended for use by consumers or persons who are exposed as a consequence of their employment and may not be fully aware of the potential for exposure or cannot exercise control over their exposure."

47CFR §2.1093(d)(2) states that evaluation of compliance within FCC's SAR limits can be demonstrated by laboratory measurements. This test report serves this purpose.

7. Background on Radiofrequency (RF) Exposure Limits

7.1. Controlled Environment

Controlled environments are defined as locations where the RF field intensities have been adequately characterized by means of measurement or calculation and exposure is incurred by persons who are: aware of the potential for RF field exposure, cognizant of the intensity of the RF fields in their environment, aware of the potential health risks associated with RF field exposure and able to control their risk using mitigation strategies. 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.

7.2. Uncontrolled Environment

Uncontrolled environments are defined as locations where either insufficient assessment of RF fields have been conducted or where persons who are allowed access to these areas have not received proper RF field awareness/safety training and have no means to assess or, if required, to mitigate their exposure to RF fields. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed, or in which persons who may not be made fully aware of the potential for exposure, or cannot exercise control over their exposure. Members of the general public would fall under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

7.3. RF Exposure Limits for 100kHz – 6 GHz

Per FCC 47 CFR §1.1310 and Health Canada Safety Code 6, the SAR limits are applied for frequencies 100kHz ~ 6 GHz as shown below.

Table 7-1 Human Exposure to RF Radiation Limits in 47 CFR §1.1310 and Health Canada Safety Code 6- SAR Basic Restrictions

Environment	Condition	**SAR**	Averaging volume
Uncontrolled / General Population	Head, Neck Trunk	**1.6 W/kg**	1g cube
	Extremity	**4.0 W/kg**	10g cube
Controlled	Head/Trunk	**8 W/kg**	1g cube
	Extremity / Limbs	**20 W/kg**	10g cube

8. RF Safety Laboratory SAR Measurement System

8.1. SAR Measurement Hardware and Software

Peak spatially averaged SAR (psSAR) measurements are performed using a DASY8 robot system with cDASY8 module SAR software. The DASY8 is made by SPEAG in Switzerland and consists of a 6-axis robot, robot controller, computer, dosimetric probe, probe alignment light beam unit, and various SAR phantoms.

8.2. E-Field Probe

Manufacturer	Schmid & Partner Engineering AG
Model	EX3DV4
Description	Smallest isotropic electric (E-) field probe for high precision specific absorption rate (SAR) measurements
Frequency Range	10 MHz - 10.0 GHz
Dynamic Range	10 µW/g – >100 mW/g
Overall Length (mm)	337
Body Diameter (mm)	12
Tip Length (mm)	337
Tip Diameter (mm)	2.5
Probe Tip to Sensor X Calibration Point (mm)	1
Probe Tip to Sensor Y Calibration Point (mm)	1
Applications	High precision dosimetric measurements in any exposure scenario (e.g. very strong gradient fields); the only probe that enables compliance testing for frequencies up to 6 GHz with precision of better than 30%
Compatibility	DASY8 robot + cDASY8 module SAR software

8.3. Peak Spatially Averaged SAR (psSAR) Measurements

SAR Evaluations are performed using the following procedure compliant to FCC KDB Publication 865664 D01v01r04, IEEE 1528:2013 and IEC/IEEE 62209-1528:

1. The SAR distribution at the exposed side of the head or body was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the device-head and body interface, and the horizontal grid resolution was determined per FCC KDB Publication 865664 D01v01r04, IEEE 1528:2013 and IEC/IEEE 62209-1528.

2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.
3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01r04, IEEE 1528:2013 and IEC/IEEE 62209-1528. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):
   a. SAR values at the inner surface of the phantom are extrapolated from the measured values along the line away from the surface with spacing no greater than the area scan and zoomscan resolutions specified in FCC KDB Publication 865664 D01v01v04 section 2.7.1, IEEE 1528:2013 table 6, and IEC/IEEE 62209-1528 table 3 & table 4. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).
   b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the "Not a knot" condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.
   c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
   d. The zoom scan is confirmed to meet both of the following parameters if the result is > 0.1 W/kg. If the result does not meet the below parameters, it is re-measured with a finer resolution scan until the below parameters are met.
      (1) The smallest horizontal distance from the local SAR peaks to all points 3 dB below the SAR peak shall be larger than the horizontal grid steps in both x- and y-directions.
      (2) The ratio of the SAR at the second measured point (M2) to the SAR at the closest measured point (Ml) at the x-y location of the measured maximum SAR value shall be at least 30%
4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete to calculate the SAR drift. If the drift deviated by more than 5%, the SAR test and drift measurements were repeated.

8.4. Test Positions

8.4.1. Device Holder

The device holder is made out of low-loss POM material having the following dielectric parameters: relative permittivity ε = 3 and loss tangent δ = 0.02.

8.4.2. Body SAR Test

Since back/front/top/left surfaces of the device are in close proximity to the user's body, body SAR is measured with these surfaces positioned against a flat phantom, representative of the operating conditions expected by users.

8.4.3. Extremity Exposure Configurations

Devices that are designed or intended for use on extremities or mainly operated in extremity only exposure conditions; i.e., hands, wrists, feet and ankles, may require extremity SAR evaluation. When the device also operates in close proximity to the user's body, SAR compliance for the body is also required. The 1g body and 10g extremity SAR Exclusion Thresholds found in KDB Publication 447498 D04v01 should be applied to determine SAR test requirements.

8.5. RF Safety Laboratory SAR System Measurement Uncertainty

SAR Uncertainty for DUTs According to 62209-1528										
(Frequencies: 4 MHz - 3 GHz)										
Symbol	Input Quantity (Xi) (Source of Uncertainty)	62209-1528 Ref	Unc. (xi)	Prob. Dist. PDFi	Div(qi)	ci (1g)	ci (10g)	Std Unc (1g)	Std. Unc (10g)	vi
Measurement System Errors										
CF	Probe Calibration	8.4.1.1	13.3%	N (k=2)	2	1	1	6.65%	6.7%	∞
CFdrift	Probe Calibration Drift	8.4.1.2	1.7%	R	√3	1	1	1.0%	1.0%	∞
LIN	Probe Linearity and Detection Limit	8.4.1.3	4.7%	R	√3	1	1	2.7%	2.7%	∞
BBS	Broadband Signal	8.4.1.4	2.8%	R	√3	1	1	1.6%	1.6%	∞
ISO	Probe Isotropy	8.4.1.5	7.6%	R	√3	1	1	4.4%	4.4%	∞
DAE	Other probe and data acquisition errors	8.4.1.6	0.8%	N	1	1	1	0.8%	0.8%	∞
AMB	RF Ambient and Noise	8.4.1.7	1.8%	N	1	1	1	1.8%	1.8%	∞
Δxyz	Probe Positioning Errors	8.4.1.8	0.006 mm	N	1	0.14	0.14	0.1%	0.1%	
DAT	Data Processing Errors	8.4.1.9	1.2%	N	1	1	1	1.2%	1.2%	∞
Phantom and Device Errors										
LIQ(σ)	Measurement of Phantom Conductivity	8.4.2.1	2.5%	N	1	0.78	0.71	2.0%	1.8%	∞
LIQ(Tc)	Temperature Effects (Medium)	8.4.2.2	5.4%	R	√3	0.78	0.71	2.4%	2.2%	∞
EPS	Shell Permittivity	8.4.2.3	14.0%	R	√3	0	0	0.0%	0.0%	∞
DIS	Distance between the radiating element of the DUT and the phantom medium	8.4.2.4	2.0%	N	1	2	2	4.0%	4.0%	∞
Dxyz	Repeatability of Positioning the DUT or source against the phantom	8.4.2.5	1.0%	N	1	1	1	1.0%	1.0%	5
H	Device Holder Effects	8.4.2.6	3.6%	N	1	1	1	3.6%	3.6%	8
MOD	Effect of Operating mode on probe sensitivity	8.4.2.7	2.4%	R	√3	1	1	1.4%	1.4%	∞
RFdrift	Variation in SAR due to Drift in ouptput of DUT	8.4.2.9	2.5%	N	1	1	1	2.5%	2.5%	∞
VAL	Validation Antenna Uncertainty (Validation measurement only)	8.4.2.10	0.0%	N	1	1	1	0.0%	0.0%	∞
Pin	Uncertianty in Accepted Power (Validation Measurement only)	8.4.2.11	0.0%	N	1	1	1	0.0%	0.0%	∞
Correction to the SAR Results										
C(ε',σ)	Phantom Deviation from Target (ε',σ)	8.4.3.1	1.9%	N	1	1	0.84	1.9%	1.6%	∞
C(R)	SAR Scaling	8.4.3.2	0.0%	R	√3	1	1	0.0%	0.0%	∞
u(ΔS AR)							Combined Uncertainty	11.5%	11.3%	∞
U				Expanded Uncertainty and Effective Degrees of Freedom (k=2)				22.9%	22.7%	

9. Technology Specific Test Setup Requirements

9.1. Measured and Reported SAR

Per FCC KDB Publication 447498 D04v01, when SAR is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance. For simultaneous transmission, the measured aggregate SAR must be scaled according to the sum of the differences between the maximum tune-up tolerance and actual power used to test each transmitter. When SAR is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as *reported* SAR. The highest *reported* SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r03.

9.2. Procedures Used to Establish RF Signal for SAR

Devices under test are evaluated prior to testing, with a fully charged battery and were configured to operate at maximum output power. In order to verify that the device is tested throughout the SAR test at maximum output power, the SAR measurement system measures a “point SAR” at an arbitrary reference point at the start and end of the 1 gram and 10 gram SAR evaluation, to assess for any power drifts during the evaluation.

9.3. SAR Testing with 802.11 Transmitters

The normal network operating configurations of 802.11 transmitters are not suitable for SAR measurements. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure the results are consistent and reliable. See KDB Publication 248227 D01v02r02 for more details.

9.3.1. General Device Setup

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters.

A periodic duty factor is required for current generation SAR systems to measure SAR. When 802.11 frame gaps are accounted for in the transmission, a maximum transmission duty factor of 92 - 96% is typically achievable in most test mode configurations. A minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. The reported SAR is scaled to 100% duty factor to determine compliance at the maximum tune-up tolerance limit.

9.3.2. Initial Test Position Procedure

The test position with the highest extrapolated (peak) SAR is used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg, no additional testing for the remaining test positions is required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

9.3.3. 2.4 GHz SAR Test Requirements

SAR is measured for 2.4 GHz 802.11b DSSS using either the 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 position 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 802.11 g/n OFDM are additionally evaluated for SAR if the highest reported SAR for 802.11b, adjusted by the ratio of the OFDM to DSSS specified maximum output power, is > 1.2 W/kg. When SAR is required for OFDM modes in 2.4 GHz band, the Initial Test Configuration Procedures should be followed. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

When the reported SAR is ≤ 0.8 W/kg, no additional measurements on other test channels are required. Otherwise, SAR is evaluated using the subsequent highest average RF output channel until the reported SAR result is ≤ 1.2 W/kg or all channels are measured. When there are multiple untested channels having the same subsequent highest average RF output power, the channel with higher frequency from the lowest 802.11 mode is considered for SAR measurements (See Section 8.6.6). When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

10. Equipment List

Manufacturer	Model	Description	Serial Number	Calibration Date	Calibration Due	CBT
Amplifier Research	5S1G4	RF Broadband Amplifier (800 MHz - 4.2 GHz)	331258			✓
Anritsu	MA24118A	Microwave USB Power Sensor (10MHz - 18 GHz)	2123431	1/13/2025	1/13/2026	
Anritsu	MA24118A	Microwave USB Power Sensor (10MHz - 18 GHz)	2123500	1/13/2025	1/13/2026	
Anritsu	S820E	Vector Network Analyzer	2348026	11/30/2023	11/30/2025	
Control Company	4040	Ambient Thermometer	230581662	8/28/2023	8/28/2025	
Control Company	4352	Long Stem Liquid Thermometer	230662223	9/28/2023	9/28/2025	
Micro-Coax	UFB205A-0-0240-30x30	SMA M-F RF test Cable (DC - 18 GHz)	-			✓
Mini-Circuits	BW-N20W20+	20dB RF Fixed Attenuator (DC - 18 GHz)	-			✓
Mini-Circuits	BW-S3W2+	3dB RF Fixed Attenuator (DC - 18 GHz)	-			✓
Mini-Circuits	BW-S3W2+	3dB RF Fixed Attenuator (DC - 18 GHz)	-			✓
Mini-Circuits	CBL-6FT-SMNM+	Precision Test Cable SMA/N (DC - 18 GHz)	3318			✓
Mini-Circuits	NF-SF50+	RF Adapter N Male to SMA Female (DC - 18 GHz)	-			✓
Mini-Circuits	VLF-3000+	Coaxial Low Pass Filter (DC - 3 GHz)	-			✓
Mitutoyo	CD-4"AX	Digital Caliper	B23243217	9/28/2023	9/28/2025	
Narda	4226-20 (26733)	20 dB SMA Directional Coupler (0.5 - 18 GHz)	0201			✓
Rohde & Schwarz	SMCV100B	R&S SMCV100B Vector Signal Generator (VSG)	103882	12/21/2023	12/19/2025	
SPEAG	D2450V2	2450 MHz System Validation Dipole	1112	11/15/2024	11/15/2025	
SPEAG	CLA13	13 MHz System Validation Dipole	1041	10/11/2024	10/11/2025	
SPEAG	DAE4ip	Data Acquisition Electronics with Integ. Power	1839	9/4/2024	9/4/2025	
SPEAG	DAE4ip	Data Acquisition Electronics with Integ. Power	1862	1/16/2025	1/16/2026	
SPEAG	DAK-12	DAK-12 Dielectric Probe	1194	10/14/2024	10/14/2025	
SPEAG	DAK-3.5	DAK-3.5 Dielectric Probe	1349	9/2/2024	9/2/2025	
SPEAG	EX3DV4	SAR Measurement Probe	7836	9/12/2024	9/12/2025	
SPEAG	EX3DV4	SAR Measurement Probe	7859	5/5/2025	5/5/2026	
SPEAG	SE UMS 171 E	MAIA Modulation and Interference Analyzer	1814			
SPEAG	SE UMS 171 E	MAIA Modulation and Interference Analyzer	1817			
SPEAG	SE UMS 176 C	ANT Wideband Communication Antenna	1601			

✓Note: Components calibrated before testing. Prior to testing, the measurement paths containing a cable, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator, power sensor, or VNA) to determine the losses of the measurement path. The power meter offset was then adjusted to compensate for the measurement system losses. This level offset is stored within the power meter before measurements are made. This calibration verification procedure applies to the system verification and output power measurements. The calibrated reading is then taken directly from the power meter after compensation of the losses for all final power measurements.

11. Conclusion

The SAR evaluation indicates that the DUT is capable of compliance with the RF radiation exposure limits of the FCC and ISED, 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.