

FCC SAR TEST REPORT

Test File No: F690501-RF-SAR000582

Equipment Under Test	Vacuum Cleaner
Model Name	A949KTMS
Variant Model	A9*****, A927KGMS, A929KVM, A939KBGS, VS9814CBWH, VS9813UWH, S99WETNWH, S94TNDPTNW
Applicant	LG Electronics USA, Inc.
Address of Applicant	111 Sylvan Avenue North Building Englewood Cliffs, NJ 07632
FCC ID	BEJ-LCWB001
Exposure Category	General Population/Uncontrolled Exposure
Standards	FCC 47 CFR Part 2 (2.1093) IEEE 1528 (2013)
Receipt No.	GPRI2504000622SR
Date of Receipt	2025-04-02
Date of SAR Test(s)	2025-06-02
Date of Issue	2025-06-10
Test Result	Refer to the Page 04

In the configuration tested, the EUT complied with the standards specified above.

This test report does not assure KOLAS accreditation.

Remarks:

- 1) The results of this test report are effective only to the items tested.
- 2) The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received.



Report prepared by /
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Revision history

Revision	Date of issue	Revisions	Revised By
-	June 10, 2025	Initial issue.	

Table of Contents

1	Testing Laboratory	4
2	Details of Applicant	4
3	Details of Manufacturer	4
4	Description of EUT(s)	4
5	The Highest Reported SAR Values	5
6	Test Methodology	5
7	Testing Environment	5
8	Specific Absorption Rate (SAR)	6
8.1	Introduction	6
8.2	SAR Definition	6
8.3	Test Standards and Limits	6
9	The SAR Measurement System	8
10	System Components	9
10.1	Probe	9
10.2	ELI Phantom	9
10.3	SAM Phantom	10
10.4	Device Holder	10
11	SAR Measurement Procedures	11
11.1	Normal SAR Measurement Procedure	11
12	SAR System Verification	13
13	Tissue Simulant Fluid for the Frequency Band	14
13.1	Simulating Mixture Characterization	14
14	Justification for Extended SAR Dipole Calibrations	15
15	Instruments List	15
16	FCC Power Measurement Procedures	16
17	Measured and Reported SAR	16
18	Maximum Output Power Specifications*	16
19	RF Conducted Power	17
20	DUT Antenna Locations*	18
21	SAR Test Exclusion Applied	19
22	SAR Data Summary	20
22.1	SAR measurement	20
23	SAR Measurement Variability	21
23.1	Measurement Variability	21
23.2	Measurement Uncertainty	21
24	Appendixes List	22
	-THE END-	22

1 Testing Laboratory

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2 Details of Applicant

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3 Details of Manufacturer

Applicant	LG Electronics Inc.
Address	84, Wanam-ro, Seongsan-gu, Changwon-si, Gyeongsangnam-do, 51554, Rep. of Korea

4 Description of EUT(s)

EUT Type	Vacuum Cleaner			
Model Name	A949KTMS			
Variant Model	A9*****, A927KGMS, A929KVM, A939KBGS, VS9814CBWH, VS9813UWH, S99WETNWH, S94TNDPTNW			
Basic & Variant Model Difference	Variable	Range of variable	Contents	Contents Detail
	1st *1	0 to 9	Tool Name	0 : A9 Original P9 motor 1 : A9 Original Nidec motor 2 : A9 KOMP 3 : A9KOMP+ 4: A9KP+
	2nd *1	0 to 9	Battery Type	0~3 : Entry Tier, Single battery 4~6 : Mid Tier, Dual battery 7~9 : High Tier, Dual battery
	3rd *1	K or Blank	Additional Compressor	K : With compressor Blank : Non compressor
	4th ~ 5th *1	A to Z	Exterior color	GM: Grey Matte SM : Silver Matte RM : Red Matte VM : Vintage-wine Matte BM : Black Matte PM : Pink Matte TM: Graphite Matte BG: Calming Beige
	6th *1	S, P, R or Blank	Additional Nozzle	S : Power punch (Sani-punch) P : Pet nozzle R : Replaceable filter Kit Blank: Non Secondary tool
	* Model VS9814CBWH is factory model name of A927KGMS * Model VS9813UWH is factory model name of A929KVM * Model S99WETNWH is factory model name of A939KBGS * Model S94TNDPTNW is factory model name of A949KTMS			
Software Version	V 1.0			
Hardware Version	V 1.0			
Serial Number	#1			
Antenna Information	Manufacturer		LG Electronics Inc.	
	Type		PCB Pattern Antenna	
	Antenna Gain (dBi)		1.50	
Mode of Operation	WLAN, BLE			
Tx Frequency Range	WLAN 2.4 GHz (2 412.0 MHz ~ 2 462.0 MHz) BLE (2 402.0 MHz ~ 2 480.0 MHz)			

5 The Highest Reported SAR Values

Band	Highest Reported SAR 10g (W/kg)
WLAN 2.4 GHz	1.700
Simultaneous SAR(TER) per KDB 690783 D01v01r03:	N/A

6 Test Methodology

ANSI/IEEE C95.1–1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz. It specifies the maximum exposure limit of 1.6 W/kg as averaged over any 1 gram of tissue for portable devices being used within 20 cm of the user in the uncontrolled environment.

Test tests documented in this report were performed in accordance with IEEE Standard 1528-2013 and the following published KDB procedures.

☒	KDB 865664 D01v01r04	SAR Measurement Requirements for 100 MHz to 6 GHz
☒	KDB 865664 D02v01r02	RF Exposure Compliance Reporting and Documentation Considerations
☐	KDB 447498 D01v06	Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies
☒	KDB 447498 D04v01	Interim General RF Exposure Guidance
☐	KDB 447498 D02v02r01	SAR Measurement Procedures for USB Dongle Transmitters
☒	KDB 248227 D01v02r02	SAR Guidance For IEEE 802.11 (Wi-Fi) Transmitters
☐	KDB 615223 D01v01r01	802.16e/WiMax SAR Measurement Guidance
☐	KDB 616217 D04v01r02	SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers
☐	KDB 643646 D01v01r03	SAR Test Considerations for Occupational PTT Radios
☐	KDB 648474 D03v01r04	Evaluation and Approval Considerations for Handsets with Specific Wireless Charging Battery Covers
☐	KDB 648474 D04v01r03	SAR Evaluation Considerations for Wireless Handsets
☐	KDB 680106 D01v03r01	RF Exposure Considerations for Low Power Consumer Wireless Power Transfer Applications
☐	KDB 941225 D01v03r01	3G SAR Measurement Procedures
☐	KDB 941225 D05v02r05	SAR Evaluation Considerations for LTE Devices
☐	KDB 941225 D06v02r01	SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities
☐	KDB 941225 D07v01r02	SAR Evaluation Procedures for UMPC Mini-Tablet Devices

7 Testing Environment

Ambient temperature	: 18°C ~ 25°C
Relative humidity	: 30% ~ 70%
Liquid temperature of during the test	: <± 2°C
Ambient noise & Reflection	: < 0.012 W/kg

8 Specific Absorption Rate (SAR)

8.1 Introduction

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

8.2 SAR Definition

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

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

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

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

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

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

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

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

8.3 Test Standards and Limits

According to FCC 47CFR §2.1093(d) The limits to be used for evaluation are based generally on criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate ("SAR") in Section 4.2 of "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz," ANSI/IEEE C95.3-2003, Copyright 2003 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017. These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (NCRP) in "Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields," NCRP Report No. 86, Section 17.4.5. Copyright NCRP, 1986, Bethesda, Maryland 20814. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards. The criteria to be used are specified in paragraphs (d)(1) and (d)(2) of this section and shall apply for portable devices transmitting in the frequency range

from 100 kHz to 6 GHz. Portable devices that transmit at frequencies above 6 GHz are to be evaluated in terms of the MPE limits specified in § 1.1310 of this chapter. Measurements and calculations to demonstrate compliance with MPE field strength or power density limits for devices operating above 6 GHz should be made at a minimum distance of 5 cm from the radiating source.

(1) Limits for Occupational/Controlled exposure: 0.4 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 8 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 20 W/kg, as averaged over an 10 grams of tissue (defined as a tissue volume in the shape of a cube). Occupational/Controlled limits apply when persons are exposed as a consequence of their employment provided these persons are fully aware of and exercise control over their exposure. Awareness of exposure can be accomplished by use of warning labels or by specific training or education through appropriate means, such as an RF safety program in a work environment.

(2) Limits for General Population/Uncontrolled exposure: 0.08 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 1.6 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 4 W/kg, as averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). General Population/Uncontrolled limits apply when the general public may be exposed, or when persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or do not exercise control over their exposure. Warning labels placed on consumer devices such as cellular telephones will not be sufficient reason to allow these devices to be evaluated subject to limits for occupational/controlled exposure in paragraph (d)(1) of this section.

Human Exposure	Uncontrolled Environment General Population	Controlled Environment Occupational
Partial Peak SAR (Partial)	1.60 mW/g	8.00 mW/g
Partial Average SAR (Whole Body)	0.08 mW/g	0.40 mW/g
Partial Peak SAR (Hands/Feet/Ankle/Wrist)	4.00 mW/g	20.00 mW/g

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

9 The SAR Measurement System

A block diagram of the SAR measurement System is given in Fig. 1. This SAR Measurement System uses a Computer-controlled 3-D stepper motor system (SPEAG DASY system). The model EX3DV4 field probe is used to determine the internal electric fields. The SAR can be obtained from the equation $SAR = \sigma (|E_i|^2) / \rho$ where σ and ρ are the conductivity and mass density of the tissue-simulant.

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

- A standard high precision 6-axis robot (Staubli TX family) with controller, teach pendant and software. An arm extension is for accommodating the data acquisition electronics (DAE).
- A dosimeter probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- 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.

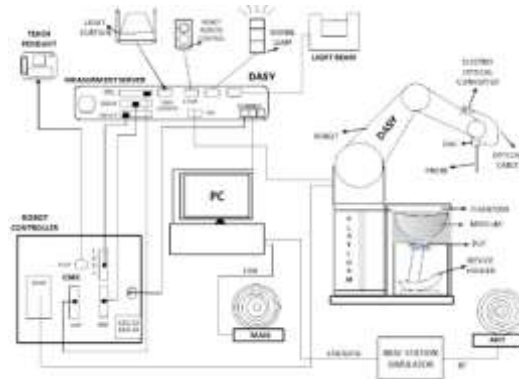


Fig a. The microwave circuit arrangement used for SAR system verification

- The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows.
- DASY software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Verification dipole kits allowing to validate the proper functioning of the system.

10 System Components

10.1 Probe

Construction	: Symmetrical design with triangular core. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	: Basic Broad Band Calibration in air Conversion Factors (CF) for HSL 835 and HSL1900. Additional CF-Calibration for other liquids and frequencies upon request.
Frequency	: 10 MHz to 6 GHz; Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	: ± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	: $10\mu\text{W/g}$ to $> 100\text{ mW/g}$; Linearity: ± 0.2 dB(noise: typically $< 1\mu\text{W/g}$)
Dimensions	: Overall length: 337 mm (Tip length: 20 mm) Tip diameter: 2.5 mm (Body diameter: 12 mm) Distance from probe tip to dipole centers: 1 mm
Application	: High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%



EX3DV4 E-Field Probe

NOTE:

1. The Probe parameters have been calibrated by the SPEAG. Please reference “APPENDIX C” for the Calibration Certification Report.

10.2 ELI Phantom

Construction	: Phantom for compliance testing of handheld and bodymounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.
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ELI V5.0 has the same shell geometry and is manufactured from the same material as ELI4, but has reinforced top structure



ELI Phantom

Shell Thickness	: 2.0 mm $\pm$ 0.1 mm
Dimensions	: Major axis : 600 mm Minor axis : 400 mm

10.3 SAM Phantom

- Construction : The SAM Phantom is constructed of a fiberglass shell integrated in a wooden table. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90 % of all users. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents the evaporation of the liquid. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot
- Shell Thickness : 2.0 mm $\pm$ 0.1 mm
- Filling Volume : Approx. 25 liters



SAM Phantom

10.4 Device Holder

- Construction: : In combination with the Twin SAM PhantomV4.0/V4.0C or Twin SAM, the Mounting Device (made from POM) enables the rotation of the mounted transmitter in spherical coordinates, whereby the rotation point is the ear opening. The devices can be easily and accurately positioned according to IEC, IEEE, CENELEC, FCC or other specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).



Device Holder

11 SAR Measurement Procedures

11.1 Normal SAR Measurement Procedure

Step 1: Power Reference Measurement

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

Step 2 and 3: Area Scan & Zoom Scan Procedures

The entire evaluation of the spatial peak values is performed within the Post-processing engine (SEMCAD). The system always gives the maximum values for the 1 g and 10 g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

1. The extraction of the measured data (grid and values) from the Zoom Scan.
2. The calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
3. The generation of a high-resolution mesh within the measured volume
4. The interpolation of all measured values from the measurement grid to the high-resolution grid
5. The extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
6. The calculation of the averaged SAR within masses of 1 g and 10 g.

Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1. SAR drift shall be kept within $\pm 5 \%$ and if it without $\pm 5 \%$, SAR retest according to measurement procedure step 1~4.

< Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v01r04 >

			≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5 mm $\pm$ 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2)$ mm $\pm$ 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location			$30^{\circ} \pm 1^{\circ}$	$20^{\circ} \pm 1^{\circ}$
Maximum area scan spatial resolution: Δx_{Area} , Δy_{Area}			≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
			When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	
Maximum zoom scan spatial resolution: Δx_{Zoom} , Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1 st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$ mm	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see IEEE Std 1528-2013 for details.				
* When zoom scan is required and the <u>reported</u> SAR from the <i>area scan based 1-g SAR estimation</i> procedures of KDB Publication 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

12 SAR System Verification

The microwave circuit arrangement for system verification is sketched in Fig 1. 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 $\pm 10\%$ from the target SAR values. These tests were done at 2450 MHz. The tests were conducted on the same days as the measurement of the DUT. The obtained results from the system accuracy verification are displayed in the table 1. (SAR values are normalized to 1W forward power delivered to the dipole). During the tests, the ambient temperature of the laboratory was in the range $(22 \pm 2)^\circ\text{C}$, the relative humidity was in the range $(55 \pm 5)\%$ R.H and the liquid depth above the ear reference points was $\geq 15\text{ cm} \pm 5\text{ mm}$ (frequency $\leq 3\text{ GHz}$) or $\geq 10\text{ cm} \pm 5\text{ mm}$ (frequency $> 3\text{ GHz}$) 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.

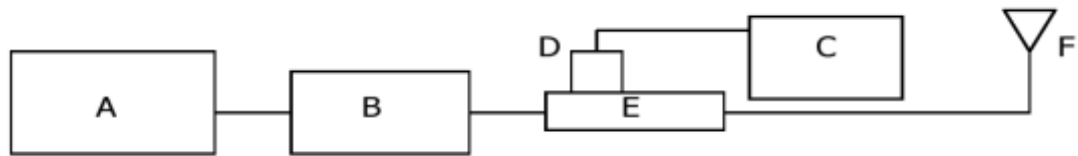


Fig 1. The microwave circuit arrangement used for SAR system verification

- A. Signal Generator
- B. RF Amplifier
- C. Power Meter
- D. Power Sensor
- E. Dual Directional Coupler
- F. Reference dipole Antenna

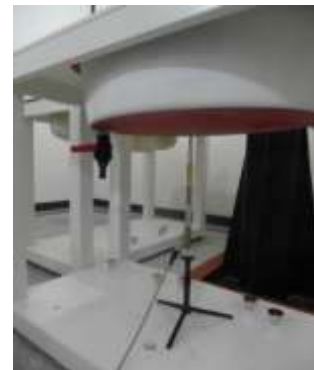


Photo of the dipole Antenna

Dipole Validation Kits		Probe S/N	Freq. (MHz)	Input Power (W)	Target SAR values (W/Kg)		1 W normalized Measured SAR (W/Kg)		Deviation (%)		Date	Temperature (°C)	
Model	S/N				1g SAR	10g SAR	1g SAR	10g SAR	1g SAR	10g SAR		Ambient	Liquid
D2450V2	892	7413	2450	0.10	52.60	24.70	51.20	23.60	-2.66	-4.45	2025-06-02	22.8	21.7

Table 1 Results system verification

13 Tissue Simulant Fluid for the Frequency Band

The dielectric properties for this simulant fluid were measured by using the Speag Model DAK-3.5 in conjunction with Keysight E5063A Network Analyzer by using a procedure.

Freq. (MHz)	Target Value		Measure Value		Deviation (%)		Date	Liquid Temperature (°C)
	Permittivity	Conductivity (S/m)	Permittivity	Conductivity (S/m)	Permittivity	Conductivity (S/m)		
2450*	39.20	1.80	38.666	1.821	-1.36	1.17	2025-06-02	21.7
2412.00	39.20	1.80	38.679	1.786	-1.33	-0.78		
2437.00	39.20	1.80	38.582	1.807	-1.58	0.39		
2462.00	39.20	1.80	38.611	1.820	-1.50	1.11		

Note: The data marked (*) in this table was Permittivity/Conductivity results of Verification

13.1 Simulating Mixture Characterization

The brain mixtures consist of a viscous gel using hydroxethylcellulose(HEC) gelling agent and saline solution. Preservation with a bactericide is added and visual inspection is made to make sure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation. The dielectric properties of the liquid material required to fill the phantom shell shall be target. For 3.4 to 10.0 GHz, the tests were done with using stimulating liquid made by SPEAG.

Frequency (MHz)	450	835	900	1800-2000	2450	2600
Tissue Type	Body					
Ingredient (% by weight)						
Water	38.91	40.29	40.29	55.24	45.0	45.0
Salt (NaCl)	3.79	1.38	1.38	0.31	0	0
Sugar	56.93	57.90	57.90	0	0	0
HEC	0.25	0.24	0.24	0	0	0
Bactericide	0.12	0.18	0.18	0	0	0
Triton X-100	0	0	0	0	0	0
DGBE	0	0	0	44.45	55.0	55.0
Tissue parameter target by IEEE 1528-2013						
Dielectric Constant	43.5	41.5	41.5	40.0	39.2	39.0
Conductivity (S/m)	0.87	0.90	0.97	1.40	1.80	1.96
Salt: 99+% Pure Sodium Chloride				Sucrose: 98+% Pure Sucrose		
Water: De-ionized, 16 M ⁺ resistivity				HEC: Hydroxyethyl Cellulose		
DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]						

14 Justification for Extended SAR Dipole Calibrations

Usage of SAR dipoles calibrated less than 3 years ago but more than 1 year ago were confirmed in maintaining return loss (< -20 dB, within 20 % of prior calibration) and impedance (within 5 ohm from prior calibration) requirements per extended calibrations in KDB publication 865664 D01V01r04: N/A.

15 Instruments List

Test Platform	SPEAG DASY System				
Manufacture	SPEAG				
Description	SAR Test System				
Software Reference	DASY52: 52.10.4(1527) / SEMCAD X: 14.6.14(7483)				
Equipment	Type	Serial Number	Cal Date	Cal Interval	Cal Due
Phantom	SAM Twin Phantom	1911	N/A	N/A	N/A
Probe	EX3DV4	7413	2024-10-16	Annual	2025-10-16
Data Acquisition Unit (DAE)	DAE4	1430	2025-03-19	Annual	2026-03-19
Dipole Validation Kits	D2450V2	892	2025-01-14	Biennial	2027-01-14
Calibration of Dielectric Parameter Probes	DAK-3.5	1228	2024-11-18	Annual	2025-11-18
Network Analyzer	E5063A	MY54706220	2025-01-08	Annual	2026-01-08
Power Meter	N1914A	MY56120017	2024-06-03	Annual	2025-06-03
Power Meter	N1914A	MY63210027	2024-07-05	Annual	2025-07-05
Power Sensor	N8481A	MY63190004	2024-07-05	Annual	2025-07-05
Power Sensor	N8481A	MY63190005	2024-07-05	Annual	2025-07-05
Power Sensor	N8481A	MY63190007	2024-07-05	Annual	2025-07-05
Signal Generator	E4421B	MY43350132	2025-02-12	Annual	2026-02-12
RF Amplifier	AMP2027ADB	10006	2025-01-09	Annual	2026-01-09
Dual Directional Coupler	772D	MY52180259	2025-05-24	Annual	2026-05-24
LP Filter	LA-30N	LF03	2025-03-04	Annual	2026-03-04
Attenuator	18N-03	18	2024-12-06	Annual	2025-12-06
Attenuator	18N-20	21	2024-11-27	Annual	2025-11-27
Hygro-Thermometer	TE-201	TE-201-2	2025-05-24	Annual	2026-05-24
Digital Thermometer	SDT25	23111500095	2025-01-09	Annual	2026-01-09
Signal Analyzer	FSQ	201057	2025-03-24	Annual	2026-03-24
DC Power Supply	HPM2020	022802107	2024-10-31	Annual	2025-10-31

16 FCC Power Measurement Procedures

The SAR measurement Software calculates a reference point at the start and end of the test to check for power drifts. If conducted power deviations of more than 5 % occurred, the tests were repeated.

17 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. Test highest reported SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r03.

18 Maximum Output Power Specifications*

This device operates using the following maximum output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D04v01

WLAN Maximum Power

Band	Maximum / Normal	Mode	Maximum Output Power (dBm)
WLAN 2.4 GHz	Maximum	802.11b	20.00
	Normal		17.00
	Maximum	802.11g	18.00
	Normal		15.00
	Maximum	802.11n HT20	17.00
	Normal		14.00

(Tolerance: -3.0 dB ~ +3.0 dB)

BLE Maximum Power

Band	Maximum / Normal	PHY	Maximum Output Power (dBm)
Bluetooth LE	Maximum	1M (37)	7.50
	Normal		4.50

(Tolerance: -3.0 dB ~ +3.0 dB)

- The data marked * in this report was provided by the customer and may affect the validity of the test results.

We are responsible for all the information of this test report except for the data(*) provided by the customer.

19 RF Conducted Power

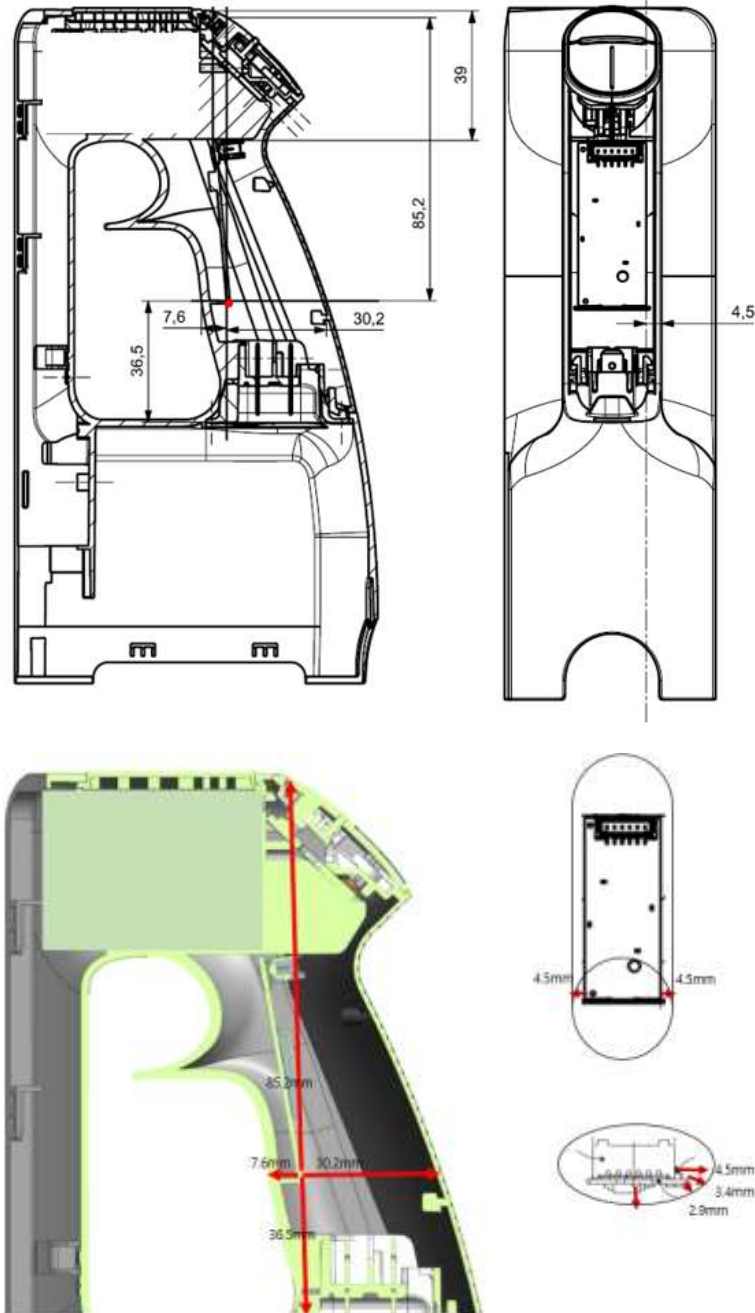
WLAN 2.4 GHz

Mode	Frequency (MHz)	Channel	Data Rate	Average Power (dBm)
802.11b	2412	1	1	19.65
	2437	6	1	19.81
	2462	11	1	19.91
802.11g	2412	1	6	Not Measured
	2437	6	6	
	2462	11	6	
802.11n HT20	2412	1	MCS0	
	2437	6	MCS0	
	2462	11	MCS0	

Note. Justification for test configurations for WLAN per KDB Publication 248227 D01 Wi-Fi SAR v02r02:

1. Power measurements were performed for the transmission mode configuration with the highest maximum output power specified for production units.
2. For transmission modes with the same maximum output power specification, powers were measured for the largest channel bandwidth, lowest order modulation and lowest data rate.
3. For transmission modes with identical maximum specified output power, channel bandwidth, modulation and data rates, power measurements were required for all identical configurations.
4. For each transmission mode configuration, powers were measured for the highest and lowest channels; and at the mid-band channel(s) when there were at least 3 channels supported. For channels were measured.

20 DUT Antenna Locations*



- The data marked * in this report was provided by the customer and may affect the validity of the test results.

We are responsible for all the information of this test report except for the data(*) provided by the customer.



21 SAR Test Exclusion Applied

Based on the maximum tune-up tolerance limit of WLAN and Bluetooth, and the antenna to use separation distance, Table “EXEMPT” SAR was not required and Table “Measure” SAR was required.

Frequency (MHz)	Output Power (dBm)	Separation distance (mm)						SAR Exemption					
		Front	Rear	Left edge	Right edge	Top	Bottom	Front	Rear	Left edge	Right edge	Top	Bottom
2460	20	30.2	7.6	4.5	4.5	85.2	36.5	EXEMPT	8.75 dBm Measure	8.75 dBm Measure	8.75 dBm Measure	EXEMPT	EXEMPT

Note

1. Maximum power is the source-based time-average power and represents the maximum RF output power among production units.
2. For distances < 5mm, a distance of 5mm is used to determine SAR exclusion and estimated SAR value.
3. Output power is the maximum rated power (including tune-up or manufacturing tolerances).
4. If the antenna separation distance is > 50mm then the value listed is the output power threshold, above which SAR measurement is required. For separation $\leq$ 50mm the value is the KDB 447498 D04v01 calculated value and must be less than 3 for SAR exemption.
5. Formulas round separation distance to nearest mm and power to nearest mW before calculating thresholds or exemption values.

22 SAR Data Summary

22.1 SAR measurement

WLAN 2.4 GHz Extremity SAR					Ambient Temperature (°C)		22.8				
					Liquid Temperature (°C)		21.7				
					Date		2025-06-02				
Position	Mod.	Data Rate	Freq (MHz)	Ch.	Space (mm)	Measure Power (dBm)	Measure 10 g SAR (W/kg)	Tune-Up Limit (dBm)	Power Scaling Factor	Duty Scaling Factor	Scaling 10 g SAR (W/kg)
Rear	802.11b	1 Mbps	2437.00	6	0	19.81	1.080	20.00	1.045	1.017	1.148
Right Edge	802.11b	1 Mbps	2437.00	6	0	19.81	0.636	20.00	1.045	1.017	0.676
Left Edge	802.11b	1 Mbps	2437.00	6	0	19.81	1.600	20.00	1.045	1.017	1.700

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in FCC KDB Publication 447498 D04v01.
2. Liquid tissue depth was at least 15 cm for all frequencies.
3. All modes of operation were investigated, and worst-case results are reported.
4. The EUT is tested 2nd hot-spot peak, if it is less than 2 dB below the highest peak.
5. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
6. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D04v01.
7. The EUT was powered using an external, regulated DC power supply set to 5.0 V during SAR testing. This configuration was used because the internal battery was unavailable for continuous transmission operation.

23 SAR Measurement Variability

23.1 Measurement Variability

Per FCC KDB Publication 865664 D01v01r04, SAR measurement variability was assessed for each frequency band, which was determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media were required for SAR measurements in a frequency band, the variability measurement procedures were applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. These additional measurements were repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device was returned to ambient conditions (normal room temperature) with the power supply before it was re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

The same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds. The repeated measurement results must be clearly identified in the SAR report.

SAR Measurement Variability was assessed using the following procedures for each frequency band:

1. When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.
2. A second repeated measurement was performed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg ($\sim 10\%$ from the 1-g SAR limit).
3. A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20 .
4. Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg

23.2 Measurement Uncertainty

The measured SAR was < 1.5 W/kg for all frequency bands. The equivalent ratio (1.5/1.6) should be applied to extremity and occupational exposure conditions. Therefore, per KDB Publication 865664 D01v01r04, the extended measurement uncertainty analysis per IEEE 1528-2013 was not required.



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Page : 22/22

24 Appendixes List

Appendix A	Appendix A Verification Plots
Appendix B	Appendix B Test Plots
Appendix C	Appendix C Photograph
Appendix D	Appendix D Probe, DAE and Dipole Calibration Certificates

-THE END-

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A4 (210mm x 297mm)