ISED SAR TEST REPORT

IC	:	**3147A-LWB5PLUS**
Equipment	:	**Sterling-LWB5+ WiFi 5 + Bluetooth 5.2 USB Adapter**
Brand Name	:	**Ezurio**
Model Name	:	**Sterling LWB5+**
Applicant	:	**Ezurio LLC W66N220 Commerce Court, Cedarburg, WI 53012 United States Of America**
Manufacturer	:	**Ezurio LLC W66N220 Commerce Court, Cedarburg, WI 53012 United States Of America**
Standard	:	**ISED RSS-102 Issue 6**

The product was received on Jul 10, 2021 and testing was started from Jul 17, 2021 and completed on Aug 09, 2021. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample provide by manufacturer and the test data has been evaluated in accordance with the test procedures given in RSS-102 Issue 5 and has been pass the ISED requirement.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Approved by: Cona Huang / Deputy Manager

Testing Laboratory
1190

Sporton International Inc. EMC & Wireless Communications Laboratory

No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan

Table of Contents

History of this test report

Report No.	Version	Description	Issued Date
CA160207-01	01	Initial issue of report	Apr. 17, 2026

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for Ezurio LLC, Sterling-LWB5+ WiFi 5 + Bluetooth 5.2 USB Adapter, Sterling LWB5+, are as follows.

Frequency Band		Highest SAR Summary
		Body (Separation 5mm)
		1g SAR (W/kg)
WLAN	2.4GHz WLAN	0.90
	5GHz WLAN	1.13
2.4GHz Band	Bluetooth	0.03
Date of Testing:		2021/7/17 ~ 2021/8/9

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190). The ISED Assigned Code is 4086B. This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg for Partial-Body 1g SAR) specified in RSS-102 Issue 6, and had been tested in accordance with the measurement methods and procedures specified in IEC/IEEE 62209-1528:2020

Reviewed by: Jason Wang
Report Producer: Carlie Tsai

2. Guidance Applied

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards, the below KDB and IEC/IEEE standard may not including in the TAF code without accreditation.

- RSS-102 Issue 6
- RSS-102.SAR.MEAS issue 2
- IEC/IEEE 62209-1528:2020
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 447498 D02 SAR Procedures for Dongle Xmtr v02r01
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02

3. Equipment Under Test (EUT) Information

3.1 General Information

Product Feature & Specification	
Equipment Name	Sterling-LWB5+ WiFi 5 + Bluetooth 5.2 USB Adapter
Brand Name	Ezurio
Model Name	Sterling LWB5+
IC	3147A-LWB5PLUS
Wireless Technology and Frequency Range	WLAN 2.4 GHz Band: 2400 MHz ~ 2483.5 MHz WLAN 5.2 GHz Band: 5150 MHz ~ 5250 MHz WLAN 5.3 GHz Band: 5250 MHz ~ 5350 MHz WLAN 5.6 GHz Band: 5470 MHz ~ 5725 MHz WLAN 5.8 GHz Band: 5725 MHz ~ 5850 MHz Bluetooth: 2400 MHz ~ 2483.5 MHz
Mode	WLAN: 802.11a/b/g/n/ac HT20/HT40/VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE
HW Version	R4.0
EUT Stage	Identical Prototype

4. RF Exposure Limits

4.1 Uncontrolled Environment

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

4.2 Controlled Environment

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. The 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.

Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

1. Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

5. Specific Absorption Rate (SAR)

5.1 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.

5.2 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:

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

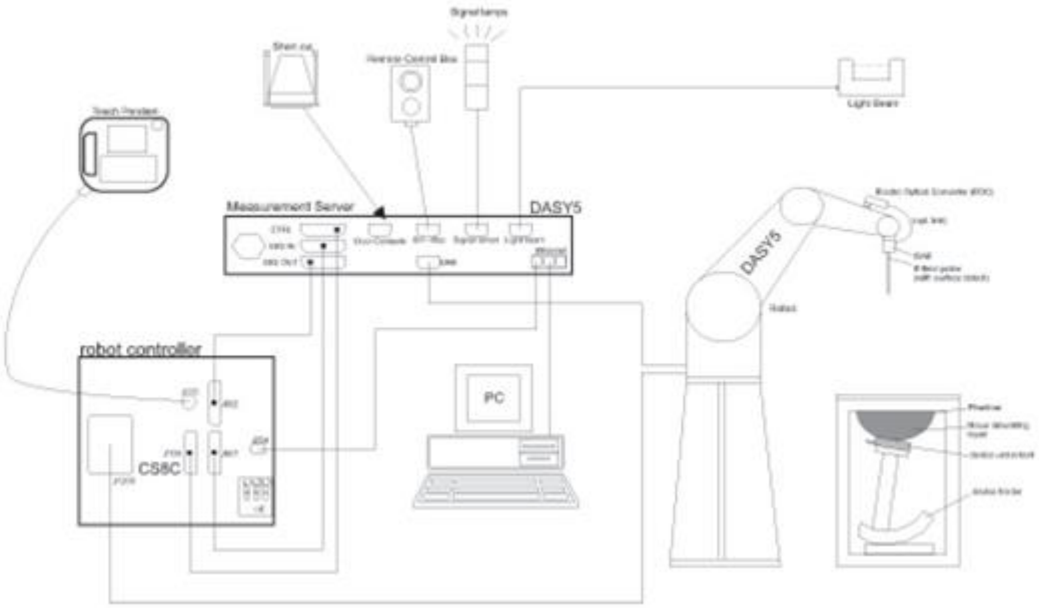
SAR is expressed in units of Watts per kilogram (W/kg)

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

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

6. System Description and Setup

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



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal 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.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

6.1 Test Site Location

The SAR measurement facilities used to collect data are within both Sporton Lab list below test site location are accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190 and 3786). The ISED Assigned Code is 4086B and 4086H.

Test Site	EMC & Wireless Communications Laboratory		Wensan Laboratory		
Test Site Location	4086B No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan		4086H No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan		
Test Site No.	SAR01-HY	SAR03-HY	SAR08-HY	SAR09-HY	SAR15-HY
	SAR04-HY	SAR05-HY	SAR11-HY	SAR12-HY	
	SAR06-HY	SAR10-HY	SAR13-HY	SAR14-HY	

6.2 E-Field Probe

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

<ES3DV3 Probe>

Construction	Symmetric design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz – 4 GHz; Linearity: ±0.2 dB (30 MHz – 4 GHz)	
Directivity	±0.2 dB in TSL (rotation around probe axis) ±0.3 dB in TSL (rotation normal to probe axis)	
Dynamic Range	5 μW/g – >100 mW/g; Linearity: ±0.2 dB	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 3.9 mm (body: 12 mm) Distance from probe tip to dipole centers: 3.0 mm	

<EX3DV4 Probe>

Construction	Symmetric design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz – >6 GHz Linearity: ±0.2 dB (30 MHz – 6 GHz)	
Directivity	±0.3 dB in TSL (rotation around probe axis) ±0.5 dB in TSL (rotation normal to probe axis)	
Dynamic Range	10 μW/g – >100 mW/g Linearity: ±0.2 dB (noise: typically <1 μW/g)	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 2.5 mm (body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	

6.3 Data Acquisition Electronics (DAE)

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

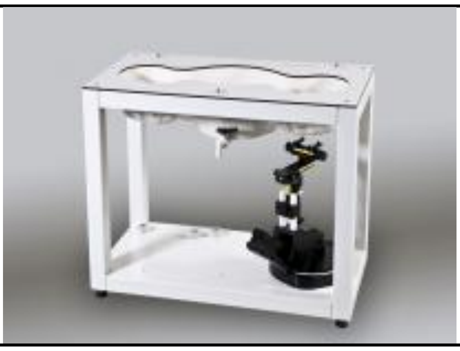
The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

Fig 5.1 Photo of DAE

6.4 Phantom

<SAM Twin Phantom>

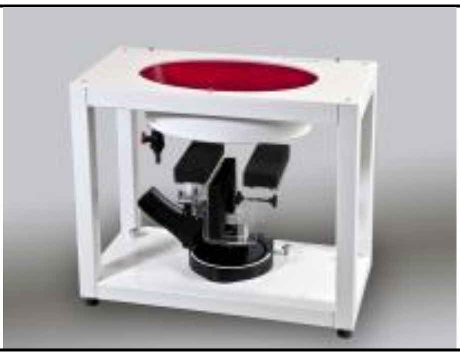
Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm
Filling Volume	Approx. 25 liters
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet
Measurement Areas	Left Hand, Right Hand, Flat Phantom



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>

Shell Thickness	2 ± 0.2 mm (sagging: <1%)
Filling Volume	Approx. 30 liters
Dimensions	Major ellipse axis: 600 mm Minor axis: 400 mm



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.

6.5 Device Holder

<Mounting Device for Hand-Held Transmitter>

In combination with the Twin SAM V5.0/V5.0c or ELI phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). And upgrade kit to Mounting Device to enable easy mounting of wider devices like big smart-phones, e-books, small tablets, etc. It holds devices with width up to 140 mm.

Mounting Device for Hand-Held Transmitters

Mounting Device Adaptor for Wide-Phones

<Mounting Device for Laptops and other Body-Worn Transmitters>

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.

Mounting Device for Laptops

7. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

(a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
(b) Read the WWAN RF power level from the base station simulator.
(c) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band
(d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

<SAR measurement>

(a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
(b) Place the EUT in the positions as Appendix D demonstrates.
(c) Set scan area, grid size and other setting on the DASY software.
(d) Measure SAR results for the highest power channel on each testing position.
(e) Find out the largest SAR result on these testing positions of each band
(f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

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

(a) Power reference measurement
(b) Area scan
(c) Zoom scan
(d) Power drift measurement

7.1 Spatial Peak SAR Evaluation

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

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

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

(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

7.2 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. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

7.3 Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB0 is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Parameter	DUT transmit frequency being tested	
	$f \leq$ 3 GHz	3 GHz < $f \leq$ 10 GHz
Maximum distance between the measured points (geometric centre of the sensors) and the inner phantom surface (z_{M1} in Figure 20 in mm)	5 ± 1	δ ln(2)/2 ± 0,5 [a]
Maximum spacing between adjacent measured points in mm (see O.8.3.1)[b]	20, or half of the corresponding zoom scan length, whichever is smaller	60/f, or half of the corresponding zoom scan length, whichever is smaller
Maximum angle between the probe axis and the phantom surface normal (α in Figure 20)[c]	5° (flat phantom only) 30° (other phantoms)	5° (flat phantom only) 20° (other phantoms)
Tolerance in the probe angle	1°	1°

[a] δ is the penetration depth for a plane-wave incident normally on a planar half-space.

[b] See Clause O.8 on how Δx and Δy may be selected for individual area scan requirements.

[c] The probe angle relative to the phantom surface normal is restricted due to the degradation in the measurement accuracy in fields with steep spatial gradients. The measurement accuracy decreases with increasing probe angle and increasing frequency. This is the reason for the tighter probe angle restriction at frequencies above 3 GHz.

7.4 Zoom Scan

Zoom scans are used assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube shoes base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

Parameter	DUT transmit frequency being tested	
	$f \le 3$ GHz	3 GHz < $f \le 10$ GHz
Maximum distance between the closest measured points and the phantom surface (z_{M1} in Figure 20 and Table 3, in mm)	5	$\delta \ln(2)/2$ [a]
Maximum angle between the probe axis and the phantom surface normal (α in Figure 20)	5° (flat phantom only) 30° (other phantoms)	5° (flat phantom only) 20° (other phantoms)
Maximum spacing between measured points in the x- and y-directions (Δx and Δy, in mm)	8	$24/f$ [b]
For uniform grids: Maximum spacing between measured points in the direction normal to the phantom shell (Δz_1 in Figure 20, in mm)	5	$10/(f-1)$
For graded grids: Maximum spacing between the two closest measured points in the direction normal to the phantom shell (Δz_1 in Figure 20, in mm)	4	$12/f$
For graded grids: Maximum incremental increase in the spacing between measured points in the direction normal to the phantom shell ($R_z = \Delta z_2/\Delta z_1$ in Figure 20)	1,5	1,5
Minimum edge length of the zoom scan volume in the x- and y-directions (L_z in O.8.3.2, in mm)	30	22
Minimum edge length of the zoom scan volume in the direction normal to the phantom shell (L_h in O.8.3.2 in mm)	30	22
Tolerance in the probe angle	1°	1°

a δ is the penetration depth for a plane-wave incident normally on a planar half-space.

b This is the maximum spacing allowed, which might not work for all circumstances.

7.5 Volume Scan Procedures

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

7.6 Power Drift Monitoring

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

8. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	2450MHz System Validation Kit(2)	D2450V2	736	Aug. 31, 2018	Aug. 28, 2021
SPEAG	5GHz System Validation Kit(2)	D5GHzV2	1128	Dec. 16, 2019	Dec. 14, 2021
SPEAG	Data Acquisition Electronics	DAE4	699	Feb. 16, 2021	Feb. 15, 2022
SPEAG	Data Acquisition Electronics	DAE4	917	Dec. 22, 2020	Dec. 21, 2021
SPEAG	Data Acquisition Electronics	DAE4	1311	Aug. 25, 2020	Aug. 24, 2021
SPEAG	Dosimetric E-Field Probe	EX3DV4	3898	Jun. 24, 2021	Jun. 23, 2022
SPEAG	Dosimetric E-Field Probe	EX3DV4	3925	Apr. 23, 2021	Apr. 22, 2022
SPEAG	Dosimetric E-Field Probe	EX3DV4	3976	Jan. 27, 2021	Jan. 26, 2022
RCPTWN	Thermometer	HTC-1	TM685-1	Nov. 10, 2020	Nov. 09, 2021
RCPTWN	Thermometer	HTC-1	TM560-2	Nov. 10, 2020	Nov. 09, 2021
R&S	BT Base Station	CBT	100815	Feb. 19, 2021	Feb. 18, 2022
SPEAG	Device Holder	N/A	N/A	N/A	N/A
Anritsu	Signal Generator	MG3710A	6201502524	Nov. 11, 2020	Nov. 10, 2021
Keysight	ENA Network Analyzer	E5071C	MY46104758	Sep. 03, 2020	Sep. 02, 2021
SPEAG	Dielectric Probe Kit	DAK-3.5	1126	Sep. 16, 2020	Sep. 15, 2021
LINE SEIKI	Digital Thermometer	DTM3000-spezial	2942	Nov. 06, 2020	Nov. 05, 2021
Anritsu	Power Meter	ML2495A	1419002	Aug. 19, 2020	Aug. 18, 2021
Anritsu	Power Sensor	MA2411B	1911176	Aug. 18, 2020	Aug. 17, 2021
Anritsu	Power Meter	ML2495A	1804003	Oct. 21, 2020	Oct. 20, 2021
Anritsu	Power Sensor	MA2411B	1726150	Oct. 21, 2020	Oct. 20, 2021
Agilent	Spectrum Analyzer	E4408B	MY44211028	Aug. 27, 2020	Aug. 26, 2021
Anritsu	Spectrum Analyzer	N9010A	MY53470118	Jan. 15, 2021	Jan. 14, 2022
Mini-Circuits	Power Amplifier	ZVE-8G+	6418	Oct. 21, 2020	Oct. 20, 2021
Mini-Circuits	Power Amplifier	ZVE-8G+	479102029	Aug. 26, 2020	Aug. 25, 2021
ATM	Dual Directional Coupler	C122H-10	P610410z-02	Note 1	
Woken	Attenuator 1	WK0602-XX	N/A	Note 1	
PE	Attenuator 2	PE7005-10	N/A	Note 1	
PE	Attenuator 3	PE7005- 3	N/A	Note 1	

General Note:

1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.
2. The dipole calibration interval can be extended to 3 years with justification according to KDB 865664 D01. The dipoles are also not physically damaged, or repaired during the interval. The justification data in appendix C can be found which the return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration for each dipole.

9. System Verification

9.1 Tissue Verification

The tissue dielectric parameters of tissue-equivalent media used for SAR measurements must be characterized within a temperature range of 18℃ to 25℃, measured with calibrated instruments and apparatuses, such as network analyzers and temperature probes. The temperature of the tissue-equivalent medium during SAR measurement must also be within 18℃ to 25℃ and within ± 2℃ of the temperature when the tissue parameters are characterized. The tissue dielectric measurement system must be calibrated before use. The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements.
The liquid tissue depth was at least 15cm in the phantom for all SAR testing

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
2450	22.3	1.838	39.064	1.80	39.20	2.11	-0.35	±5	2021/7/17
2450	22.5	1.779	38.563	1.80	39.20	-1.17	-1.63	±5	2021/7/30
5250	22.5	4.643	35.784	4.71	35.95	-1.42	-0.46	±5	2021/8/8
5600	22.5	5.071	35.626	5.07	35.50	0.02	0.35	±5	2021/8/9
5750	22.5	5.138	35.157	5.22	35.35	-1.57	-0.55	±5	2021/8/9

<Tissue Dielectric Parameter Check for Low / Middle / High Frequencies>

General Note:

The tissue measure results for low / middle / high frequencies list below, the results were used in the Dasy SAR system to perform interpolation to determine the dielectric parameters on the SAR test device. The SAR test plots may slightly difference between the tables below due to the digit rounding in the software calculated.

CH	Frequency (MHz)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
1	2412	1.795	39.222	1.766	39.268	1.40	-0.20	±5	Jul. 17, 2021
3	2422	1.807	39.175	1.775	39.250	1.51	-0.06	±5	Jul. 17, 2021
6	2437	1.824	39.120	1.788	39.223	1.89	-0.21	±5	Jul. 17, 2021
9	2452	1.840	39.056	1.802	39.197	2.22	-0.37	±5	Jul. 17, 2021
11	2462	1.851	39.014	1.813	39.184	2.29	-0.47	±5	Jul. 17, 2021
0	2402	1.725	38.770	1.757	39.285	-1.97	-1.35	±5	Jul. 30, 2021
19	2440	1.773	38.650	1.800	39.200	-1.50	-1.40	±5	Jul. 30, 2021
39	2480	1.821	38.474	1.800	39.200	1.17	-1.85	±5	Jul. 30, 2021
39	2480	1.821	38.474	1.800	39.200	1.17	-1.85	±5	Jul. 30, 2021
36	5180	4.531	35.887	4.639	36.023	-2.34	-0.31	±5	Aug. 08, 2021
38	5190	4.547	35.873	4.650	36.012	-2.22	-0.35	±5	Aug. 08, 2021
40	5200	4.575	35.867	4.660	36.000	-1.83	-0.37	±5	Aug. 08, 2021
42	5210	4.602	35.858	4.670	35.990	-1.45	-0.39	±5	Aug. 08, 2021
44	5220	4.616	35.841	4.680	35.980	-1.37	-0.44	±5	Aug. 08, 2021
46	5230	4.597	35.819	4.690	35.970	-1.99	-0.50	±5	Aug. 08, 2021
48	5240	4.632	35.801	4.700	35.960	-1.44	-0.55	±5	Aug. 08, 2021
50	5250	4.643	35.784	4.710	35.950	-1.43	-0.60	±5	Aug. 08, 2021
52	5260	4.665	35.785	4.720	35.940	-1.17	-0.32	±5	Aug. 08, 2021
54	5270	4.643	35.773	4.730	35.930	-1.84	-0.35	±5	Aug. 08, 2021
56	5280	4.661	35.749	4.740	35.920	-1.67	-0.42	±5	Aug. 08, 2021
58	5290	4.694	35.731	4.750	35.910	-1.19	-0.47	±5	Aug. 08, 2021
60	5300	4.671	35.723	4.760	35.900	-1.87	-0.49	±5	Aug. 08, 2021
62	5310	4.704	35.717	4.770	35.887	-1.39	-0.51	±5	Aug. 08, 2021
64	5320	4.678	35.709	4.781	35.873	-2.14	-0.53	±5	Aug. 08, 2021
100	5500	4.966	35.772	4.967	35.633	-0.09	0.48	±5	Aug. 09, 2021
102	5510	4.976	35.755	4.977	35.620	-0.08	0.43	±5	Aug. 09, 2021

104	5520	4.987	35.740	4.987	35.607	-0.07	0.39	±5	Aug. 09, 2021
106	5530	4.997	35.723	4.998	35.593	-0.07	0.34	±5	Aug. 09, 2021
108	5540	5.007	35.706	5.008	35.580	-0.06	0.30	±5	Aug. 09, 2021
110	5550	5.018	35.687	5.018	35.567	-0.05	0.25	±5	Aug. 09, 2021
112	5560	5.028	35.671	5.029	35.553	-0.03	0.20	±5	Aug. 09, 2021
114	5570	5.040	35.657	5.040	35.540	-0.01	0.44	±5	Aug. 09, 2021
116	5580	5.050	35.645	5.049	35.527	0.00	0.41	±5	Aug. 09, 2021
120	5600	5.071	35.626	5.070	35.500	0.03	0.36	±5	Aug. 09, 2021
122	5610	5.081	35.617	5.080	35.490	0.03	0.33	±5	Aug. 09, 2021
124	5620	5.091	35.607	5.090	35.480	0.02	0.30	±5	Aug. 09, 2021
126	5630	5.101	35.595	5.100	35.470	0.02	0.27	±5	Aug. 09, 2021
128	5640	5.110	35.585	5.110	35.460	0.01	0.24	±5	Aug. 09, 2021
132	5660	5.131	35.565	5.130	35.440	0.02	0.47	±5	Aug. 09, 2021
134	5670	5.141	35.555	5.140	35.430	0.02	0.44	±5	Aug. 09, 2021
136	5680	5.151	35.546	5.150	35.420	0.02	0.41	±5	Aug. 09, 2021
138	5690	5.161	35.536	5.160	35.410	0.02	0.38	±5	Aug. 09, 2021
140	5700	5.171	35.527	5.170	35.400	0.02	0.36	±5	Aug. 09, 2021
142	5710	5.181	35.517	5.180	35.390	0.01	0.33	±5	Aug. 09, 2021
144	5720	5.191	35.508	5.190	35.380	0.01	0.31	±5	Aug. 09, 2021
149	5745	5.131	35.166	5.215	35.355	-1.70	-0.66	±5	Aug. 09, 2021
151	5755	5.144	35.149	5.225	35.345	-1.65	-0.43	±5	Aug. 09, 2021
153	5765	5.158	35.134	5.235	35.335	-1.56	-0.47	±5	Aug. 09, 2021
155	5775	5.170	35.131	5.245	35.325	-1.53	-0.48	±5	Aug. 09, 2021
157	5785	5.177	35.130	5.255	35.315	-1.58	-0.48	±5	Aug. 09, 2021
159	5795	5.184	35.115	5.265	35.305	-1.64	-0.52	±5	Aug. 09, 2021
161	5805	5.194	35.094	5.275	35.295	-1.63	-0.58	±5	Aug. 09, 2021
165	5825	5.218	35.065	5.296	35.275	-1.55	-0.67	±5	Aug. 09, 2021

Table of Low/Middle/High Channel for Liquid Validation

9.2 System Performance Check Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

Test Side	Date	Frequency (MHz)	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
SAR05	2021/7/17	2450	50	D2450V2-736	EX3DV4 - SN3976	DAE4 Sn699	2.67	52.70	53.4	1.33
SAR05	2021/7/30	2450	250	D2450V2-736	EX3DV4 - SN3898	DAE4 Sn1311	14.00	52.70	56	6.26
SAR05	2021/8/8	5250	100	D5GHzV2-1128-5250	EX3DV4 - SN3898	DAE4 Sn917	7.91	80.00	79.1	-1.13
SAR05	2021/8/9	5600	100	D5GHzV2-1128-5600	EX3DV4 - SN3925	DAE4 Sn1311	7.84	82.40	78.4	-4.85
SAR05	2021/8/9	5750	100	D5GHzV2-1128-5750	EX3DV4 - SN3925	DAE4 Sn1311	7.27	79.10	72.7	-8.09

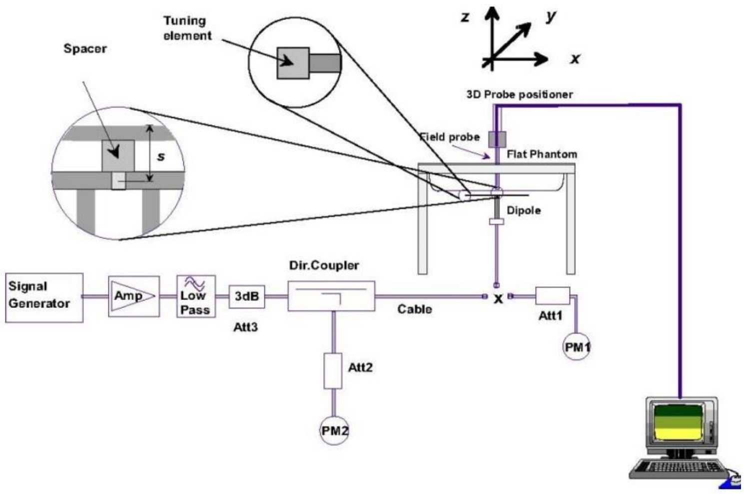


Fig 8.3.1 System Performance Check Setup

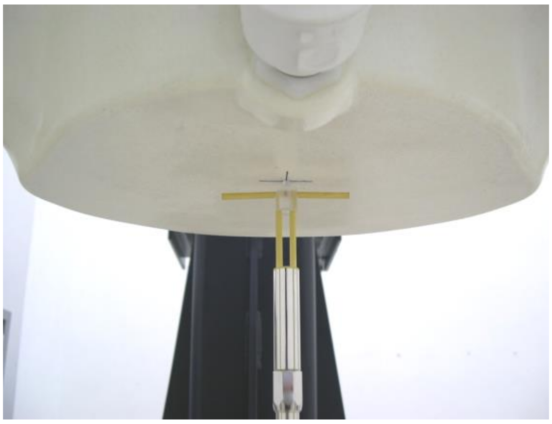
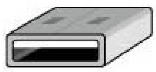
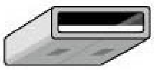
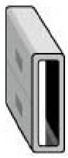
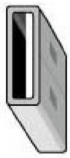


Fig 8.3.2 Setup Photo

10. RF Exposure Positions

10.1 SAR Testing for USB Dongle

Test all USB orientations [see figure below: (A) Horizontal-Up, (B) Horizontal-Down, (C) Vertical-Front, and (D) Vertical-Back] with a device-to-phantom separation distance of 5 mm or less, according to KDB Publication 447498 D02 requirements. These test orientations are intended for the exposure conditions found in typical laptop/notebook/netbook or tablet computers with either horizontal or vertical USB connector configurations at various locations in the keyboard section of the computer. Current generation portable host computers should be used to establish the required SAR measurement separation distance. The same test separation distance must be used to test all frequency bands and modes in each USB orientation. The typical Horizontal-Up USB connection (A), found in the majority of host computers, must be tested using an appropriate host computer. A host computer with either Vertical-Front (C) or Vertical Back (D) USB connection should be used to test one of the vertical USB orientations. If a suitable host computer is not available for testing the Horizontal-Down (B) or the remaining Vertical USB orientation, a high quality USB cable, 12 inches or less, may be used for testing these other orientations. It must be documented that the USB cable does not influence the radiating characteristics and output power of the transmitter.

			
Configuration 1 (Horizontal Up)	Configuration 2 (Horizontal Down)	Configuration 3 (Vertical Front)	Configuration 4 (Vertical Back)

11. WiFi/Bluetooth Output Power (Unit: dBm)

General Note:

1. The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures. For “Not required”, SAR Test reduction was applied from KDB 248227 guidance, Sec. 2.1, b), 1) when the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration, for each frequency band or when MIMO mode was not performed, due to for each antenna, transmit power in SISO operation is larger than (or equal to) the power in MIMO operation, RF exposure compliance of MIMO mode can be deduced from the compliance simultaneous transmission of antennas operating in SISO mode. Additional output power measurements were not necessary.
2. Per KDB 248227 D01v02r02, SAR test reduction is determined according to 802.11 transmission mode configurations and certain exposure conditions with multiple test positions. In the 2.4 GHz band, separate SAR procedures are applied to DSSS and OFDM configurations to simplify DSSS test requirements. For OFDM, in both 2.4 and 5 GHz bands, an initial test configuration must be determined for each standalone and aggregated frequency band, according to the transmission mode configuration with the highest maximum output power specified for production units to perform SAR measurements. If the same highest maximum output power applies to different combinations of channel bandwidths, modulations and data rates, additional procedures are applied to determine which test configurations require SAR measurement. When applicable, an initial test position may be applied to reduce the number of SAR measurements required for next to the ear, UMPC mini-tablet or hotspot mode configurations with multiple test positions.
3. For 2.4 GHz 802.11b DSSS, either the initial test position procedure for multiple exposure test positions or the DSSS procedure for fixed exposure position is applied; these are mutually exclusive. For 2.4 GHz and 5 GHz OFDM configurations, the initial test configuration is applied to measure SAR using either the initial test position procedure for multiple exposure test position configurations or the initial test configuration procedures for fixed exposure test conditions. Based on the reported SAR of the measured configurations and maximum output power of the transmission mode configurations that are not included in the initial test configuration, the subsequent test configuration and initial test position procedures are applied to determine if SAR measurements are required for the remaining OFDM transmission configurations. In general, the number of test channels that require SAR measurement is minimized based on maximum output power measured for the test sample(s).
4. For OFDM transmission configurations in the 2.4 GHz and 5 GHz bands, When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel for each frequency band.
5. 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.18 The initial test position procedure is described in the following:
   a. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and 802.11 transmission mode combinations within the frequency band or aggregated band.
   b. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.
   c. For all positions/configurations, 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.

<2.4GHz WLAN>

2.4GHz WLAN				Ant 1		
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	1	2412	16.38	16.50	100.00
		6	2437	17.62	18.00	
		11	2462	15.41	16.00	
	802.11g 6Mbps	1	2412	12.67	13.00	99.65
		6	2437	18.33	18.50	
		11	2462	13.54	14.00	
	802.11n-HT20 MCS0	1	2412	11.68	12.00	99.63
		6	2437	18.21	18.50	
		11	2462	12.06	12.50	
	802.11n-HT40 MCS0	3	2422	9.11	9.50	98.66
		6	2437	11.39	11.50	
		9	2452	9.78	10.00	

<5GHz WLAN>

5GHz WLAN				Ant 1		
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN	802.11a 6Mbps	36	5180	14.48	14.50	99.86
		40	5200	16.31	16.50	
		44	5220	16.28	16.50	
		48	5240	17.28	17.50	
	802.11n-HT20 MCS0	36	5180	13.65	14.00	99.93
		40	5200	16.04	16.50	
		44	5220	15.96	16.00	
		48	5240	17.05	17.50	
	802.11n-HT40 MCS0	38	5190	11.03	11.50	99.86
		46	5230	17.68	18.00	
	802.11ac-VHT20 MCS0	36	5180	13.71	14.00	99.84
		40	5200	16.11	16.50	
		44	5220	16.09	16.50	
		48	5240	17.12	17.50	
	802.11ac-VHT40 MCS0	38	5190	11.06	11.50	98.36
		46	5230	17.76	18.00	
	802.11ac-VHT80 MCS0	42	5210	10.06	10.50	95.73

5GHz WLAN				Ant 1		
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN	802.11a 6Mbps	52	5260	17.81	18.00	99.86
		56	5280	17.76	18.00	
		60	5300	18.23	18.50	
		64	5320	15.42	15.50	
	802.11n-HT20 MCS0	52	5260	17.68	18.00	99.93
		56	5280	17.59	18.00	
		60	5300	18.21	18.50	
		64	5320	14.36	14.50	
	802.11n-HT40 MCS0	54	5270	18.05	18.50	98.86
		62	5310	13.54	14.00	
	802.11ac-VHT20 MCS0	52	5260	17.81	18.00	99.84
		56	5280	17.72	18.00	
		60	5300	18.34	18.50	
		64	5320	14.45	14.50	
	802.11ac-VHT40 MCS0	54	5270	18.18	18.50	98.36
		62	5310	13.61	14.00	
	802.11ac-VHT80 MCS0	58	5290	12.46	12.50	95.73

5GHz WLAN				Ant 1		
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN	802.11a 6Mbps	100	5500	13.34	13.50	99.86
		116	5580	17.38	17.50	
		124	5620	16.98	17.00	
		132	5660	17.16	17.50	
		144	5720	17.93	18.00	
	802.11n-HT20 MCS0	100	5500	11.15	11.50	99.93
		116	5580	17.53	18.00	
		124	5620	17.51	18.00	
		132	5660	17.71	18.00	
		144	5720	17.86	18.00	
	802.11n-HT40 MCS0	102	5510	8.94	9.50	98.86
		110	5550	17.12	17.50	
		126	5630	17.11	17.50	
		134	5670	13.72	14.00	
		142	5710	17.80	18.00	
	802.11ac-VHT20 MCS0	100	5500	11.29	11.50	99.84
		116	5580	17.68	18.00	
		124	5620	17.63	18.00	
		132	5660	17.84	18.00	
		144	5720	17.89	18.00	
	802.11ac-VHT40 MCS0	102	5510	9.02	9.50	98.36
		118	5590	17.24	17.50	
		126	5630	17.22	17.50	
		134	5670	13.85	14.00	
		142	5710	17.89	18.00	
	802.11ac-VHT80 MCS0	106	5530	10.34	10.50	95.73
		122	5610	14.68	15.00	
		138	5690	17.85	17.90	

5GHz WLAN				Ant 1		
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN	802.11a 6Mbps	149	5745	17.39	17.50	99.86
		157	5785	17.29	17.50	
		165	5825	17.18	17.50	
	802.11n-HT20 MCS0	149	5745	17.21	17.50	99.93
		157	5785	17.19	17.50	
		165	5825	17.07	17.50	
	802.11n-HT40 MCS0	151	5755	16.71	17.00	98.86
		159	5795	17.37	17.50	
	802.11ac-VHT20 MCS0	149	5745	17.32	17.50	99.84
		157	5785	17.25	17.50	
		165	5825	17.13	17.50	
	802.11ac-VHT40 MCS0	151	5755	16.89	17.00	98.36
		159	5795	17.48	17.50	
	802.11ac-VHT80 MCS0	155	5775	14.14	14.50	95.73

<2.4GHz Bluetooth>

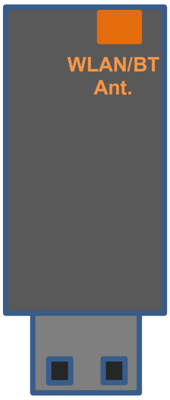
Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Limit
			1Mbps	
BR / EDR	CH 00	2402	7.33	8.00
	CH 39	2441	6.67	8.00
	CH 78	2480	6.32	7.00
Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Limit
			2Mbps	
BR / EDR	CH 00	2402	4.92	6.50
	CH 39	2441	3.85	5.50
	CH 78	2480	2.56	4.00
Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Limit
			3Mbps	
BR / EDR	CH 00	2402	4.91	6.50
	CH 39	2441	3.83	5.50
	CH 78	2480	2.55	4.00

Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Limit
			GFSK	
LE	CH 00	2402	8.22	9.00
	CH 19	2440	7.77	9.00
	CH 39	2480	7.02	8.50

General Note:

1. For 2.4GHz Bluetooth SAR testing was selected 1Mbps due to its highest average power and duty cycle is 63.72% considered in SAR testing, and the duty cycle would be scaled to theoretical 83.3% in reported SAR calculation.

12. Antenna Location



Front View

13. SAR Test Results

General Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
   c. For WLAN/Bluetooth: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
2. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
3. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.

WLAN Note:

1. Per KDB 248227 D01v02r02, for 2.4GHz 802.11g/n SAR testing is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.
2. Per KDB 248227 D01v02r02, WLAN5.2GHz SAR testing is not required when the WLAN5.3GHz band highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for WLAN5.2GHz band.
3. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.
4. For all positions / configurations, 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.
5. During SAR testing the WLAN transmission was verified using a spectrum analyzer.

13.1 Body SAR

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN2.4GHz	802.11b 1Mbps	Horizontal Up	5mm	6	2437	17.62	18.00	1.091	100	1.000	-0.09	0.614	0.670
01	WLAN2.4GHz	802.11b 1Mbps	Horizontal Down	5mm	6	2437	17.62	18.00	1.091	100	1.000	0.03	0.827	0.903
	WLAN2.4GHz	802.11b 1Mbps	Horizontal Down	5mm	1	2412	16.38	16.50	1.028	100	1.000	0.08	0.577	0.593
	WLAN2.4GHz	802.11b 1Mbps	Horizontal Down	5mm	11	2462	15.41	16.00	1.146	100	1.000	-0.01	0.458	0.525
	WLAN2.4GHz	802.11b 1Mbps	Vertical Front	5mm	6	2437	17.62	18.00	1.091	100	1.000	0.09	0.199	0.217
	WLAN2.4GHz	802.11b 1Mbps	Vertical Back	5mm	6	2437	17.62	18.00	1.091	100	1.000	0.08	0.379	0.414
	WLAN2.4GHz	802.11b 1Mbps	Tip Mode	5mm	6	2437	17.62	18.00	1.091	100	1.000	0.06	0.110	0.120
02	WLAN5GHz	802.11n-HT40 MCS0	Horizontal Up	5mm	54	5270	18.05	18.50	1.109	98.86	1.012	-0.06	0.910	1.021
	WLAN5GHz	802.11n-HT40 MCS0	Horizontal Up	5mm	62	5310	13.54	14.00	1.112	98.86	1.012	-0.13	0.422	0.475
	WLAN5GHz	802.11a 6Mbps	Horizontal Up	5mm	60	5300	18.23	18.50	1.064	99.86	1.001	0.18	0.877	0.934
	WLAN5GHz	802.11n-HT40 MCS0	Horizontal Down	5mm	54	5270	18.05	18.50	1.109	98.86	1.012	-0.12	0.421	0.473
	WLAN5GHz	802.11n-HT40 MCS0	Vertical Front	5mm	54	5270	18.05	18.50	1.109	98.86	1.012	0.16	0.712	0.799
	WLAN5GHz	802.11n-HT40 MCS0	Vertical Back	5mm	54	5270	18.05	18.50	1.109	98.86	1.012	0.12	0.316	0.355
	WLAN5GHz	802.11n-HT40 MCS0	Tip Mode	5mm	54	5270	18.05	18.50	1.109	98.86	1.012	0.01	0.685	0.769
	WLAN5GHz	802.11n-HT40 MCS0	Horizontal Up	5mm	142	5710	17.80	18.00	1.047	98.86	1.012	-0.13	0.732	0.776
	WLAN5GHz	802.11n-HT40 MCS0	Horizontal Down	5mm	142	5710	17.80	18.00	1.047	98.86	1.012	0.01	0.655	0.694
	WLAN5GHz	802.11n-HT40 MCS0	Vertical Front	5mm	142	5710	17.80	18.00	1.047	98.86	1.012	0.14	0.855	0.906
	WLAN5GHz	802.11n-HT40 MCS0	Vertical Front	5mm	102	5510	8.94	9.50	1.138	98.86	1.012	0.12	0.112	0.129
	WLAN5GHz	802.11n-HT40 MCS0	Vertical Front	5mm	110	5550	17.12	17.50	1.091	98.86	1.012	-0.11	0.572	0.632
	WLAN5GHz	802.11n-HT40 MCS0	Vertical Front	5mm	126	5630	17.11	17.50	1.094	98.86	1.012	0.06	0.544	0.602
	WLAN5GHz	802.11n-HT40 MCS0	Vertical Front	5mm	134	5670	13.72	14.00	1.067	98.86	1.012	-0.18	0.248	0.268
	WLAN5GHz	802.11a 6Mbps	Vertical Front	5mm	144	5720	17.93	18.00	1.016	99.86	1.001	0.01	0.799	0.813
	WLAN5GHz	802.11n-HT40 MCS0	Vertical Back	5mm	142	5710	17.80	18.00	1.047	98.86	1.012	0.16	0.574	0.608
03	WLAN5GHz	802.11n-HT40 MCS0	Tip Mode	5mm	142	5710	17.80	18.00	1.047	98.86	1.012	-0.12	1.070	1.134
	WLAN5GHz	802.11n-HT40 MCS0	Tip Mode	5mm	102	5510	8.94	9.50	1.138	98.86	1.012	-0.12	0.222	0.256
	WLAN5GHz	802.11n-HT40 MCS0	Tip Mode	5mm	110	5550	17.12	17.50	1.091	98.86	1.012	0.01	0.642	0.709
	WLAN5GHz	802.11n-HT40 MCS0	Tip Mode	5mm	126	5630	17.11	17.50	1.094	98.86	1.012	0.07	0.534	0.591
	WLAN5GHz	802.11n-HT40 MCS0	Tip Mode	5mm	134	5670	13.72	14.00	1.067	98.86	1.012	0.08	0.482	0.520
	WLAN5GHz	802.11a 6Mbps	Tip Mode	5mm	144	5720	17.93	18.00	1.016	99.86	1.001	0.12	0.988	1.005
	WLAN5GHz	802.11n-HT40 MCS0	Horizontal Up	5mm	159	5795	17.37	17.50	1.030	98.36	1.017	-0.14	0.822	0.861
	WLAN5GHz	802.11n-HT40 MCS0	Horizontal Up	5mm	151	5755	16.71	17.00	1.069	98.36	1.017	0.03	0.721	0.784
	WLAN5GHz	802.11a 6Mbps	Horizontal Up	5mm	149	5745	17.39	17.50	1.026	99.86	1.001	0.12	0.801	0.822
	WLAN5GHz	802.11n-HT40 MCS0	Horizontal Down	5mm	159	5795	17.37	17.50	1.030	98.36	1.017	0.08	0.795	0.833
	WLAN5GHz	802.11n-HT40 MCS0	Horizontal Down	5mm	151	5755	16.71	17.00	1.069	98.36	1.017	0.07	0.755	0.821
	WLAN5GHz	802.11a 6Mbps	Horizontal Down	5mm	149	5745	17.39	17.50	1.026	99.86	1.001	-0.12	0.788	0.809
	WLAN5GHz	802.11n-HT40 MCS0	Vertical Front	5mm	159	5795	17.37	17.50	1.030	98.36	1.017	0.01	0.625	0.655
	WLAN5GHz	802.11n-HT40 MCS0	Vertical Back	5mm	159	5795	17.37	17.50	1.030	98.36	1.017	0	0.554	0.581
04	WLAN5GHz	802.11n-HT40 MCS0	Tip Mode	5mm	159	5795	17.37	17.50	1.030	98.36	1.017	-0.14	1.040	1.090
	WLAN5GHz	802.11n-HT40 MCS0	Tip Mode	5mm	151	5755	16.71	17.00	1.069	98.36	1.017	0.13	0.892	0.970
	WLAN5GHz	802.11a 6Mbps	Tip Mode	5mm	149	5745	17.39	17.50	1.026	99.86	1.001	0.14	0.942	0.967

<Bluetooth SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
05	Bluetooth	LE	Horizontal Up	5mm	00	2402	8.22	9.00	1.197	63.72	1.307	0.01	0.018	0.028
	Bluetooth	LE	Horizontal Up	5mm	19	2440	7.77	9.00	1.327	63.72	1.307	0.09	0.010	0.017
	Bluetooth	LE	Horizontal Up	5mm	39	2480	7.02	9.00	1.578	63.72	1.307	0.12	0.011	0.023
	Bluetooth	LE	Horizontal Down	5mm	00	2402	8.22	9.00	1.197	63.72	1.307	-0.13	0.017	0.027
	Bluetooth	LE	Vertical Front	5mm	00	2402	8.22	9.00	1.197	63.72	1.307	0.07	0.003	0.005
	Bluetooth	LE	Vertical Back	5mm	00	2402	8.22	9.00	1.197	63.72	1.307	0.01	0.005	0.008
	Bluetooth	LE	Tip Mode	5mm	00	2402	8.22	9.00	1.197	63.72	1.307	-0.18	0.008	0.013

13.2 Repeated SAR Measurement

No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	WLAN2.4GHz	802.11b 1Mbps	Horizontal Down	5mm	6	2437	17.62	18.00	1.091	100	1.000	0.03	0.827	-	0.903
2nd	WLAN2.4GHz	802.11b 1Mbps	Horizontal Down	5mm	6	2437	17.62	18.00	1.091	100	1.000	0.05	0.811	1.02	0.885
1st	WLAN5GHz	802.11n-HT40 MCS0	Horizontal Up	5mm	54	5270	18.05	18.50	1.109	98.86	1.012	-0.06	0.910	-	1.021
2nd	WLAN5GHz	802.11n-HT40 MCS0	Horizontal Up	5mm	54	5270	18.05	18.50	1.109	98.86	1.012	-0.13	0.882	1.03	0.990
1st	WLAN5GHz	802.11n-HT40 MCS0	Tip Mode	5mm	142	5710	17.80	18.00	1.047	98.86	1.012	-0.12	1.070	-	1.134
2nd	WLAN5GHz	802.11n-HT40 MCS0	Tip Mode	5mm	142	5710	17.80	18.00	1.047	98.86	1.012	0.14	0.988	1.08	1.047
1st	WLAN5GHz	802.11n-HT40 MCS0	Tip Mode	5mm	159	5795	17.37	17.50	1.030	98.36	1.017	-0.14	1.040	-	1.090
2nd	WLAN5GHz	802.11n-HT40 MCS0	Tip Mode	5mm	159	5795	17.37	17.50	1.030	98.36	1.017	0.15	0.922	1.13	0.966

General Note:

1. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
2. Per KDB 865664 D01v01r04, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR <1.45W/kg, only one repeated measurement is required.
3. The ratio is the difference in percentage between original and repeated *measured SAR*.
4. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

Test Engineer： Henry Chou, Jay Jian, Jimmy Lu and Carter Jhuang

14. Uncertainty Assessment

Declaration of Conformity:
The test results with all measurement uncertainty excluded is presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

The component of uncertainly may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainly by the statistical analysis of a series of observations is termed a Type An evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. This includes calculating the standard deviation of the mean of a series of independent observations; using the method of least squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; or carrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience, and knowledge of the behavior and properties of relevant materials and instruments, manufacture's specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in table below.

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor[(a)]	1/k[(b)]	$1/\sqrt{3}$	$1/\sqrt{6}$	$1/\sqrt{2}$

(a) standard uncertainty is determined as the product of the multiplying factor and the estimated range of variations in the measured quantity

(b) κ is the coverage factor

Standard Uncertainty for Assumed Distribution

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual "root-sum-squares" (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The DASY uncertainty Budget is shown in the following tables.

The judgment of conformity in the report is based on the measurement results excluding the measurement uncertainty.

Error Description	Uncertainty Value (±%)	Probability	Divisor	(Ci) 1g	(Ci) 10g	Standard Uncertainty (1g) (±%)	Standard Uncertainty (10g) (±%)
Measurement System							
Probe Calibration	7.0	N	1	1	1	7.0	7.0
Axial Isotropy	4.7	R	1.732	0.7	0.7	1.9	1.9
Hemispherical Isotropy	9.6	R	1.732	0.7	0.7	3.9	3.9
Linearity	4.7	R	1.732	1	1	2.7	2.7
Modulation Response	3.2	R	1.732	1	1	1.8	1.8
System Detection Limits	1.0	R	1.732	1	1	0.6	0.6
Boundary Effects	2.0	R	1.732	1	1	1.2	1.2
Readout Electronics	0.3	N	1	1	1	0.3	0.3
Response Time	0.0	R	1.732	1	1	0.0	0.0
Integration Time	2.6	R	1.732	1	1	1.5	1.5
RF Ambient Noise	3.0	R	1.732	1	1	1.7	1.7
RF Ambient Reflections	3.0	R	1.732	1	1	1.7	1.7
Probe Positioner	0.4	R	1.732	1	1	0.2	0.2
Probe Positioning	6.7	R	1.732	1	1	3.9	3.9
Post-processing	4.0	R	1.732	1	1	2.3	2.3
Test Sample Related							
Device Holder	3.6	N	1	1	1	3.6	3.6
Test sample Positioning	3.0	N	1	1	1	3.0	3.0
Power Scaling	0.0	R	1.732	1	1	0.0	0.0
Power Drift	5.0	R	1.732	1	1	2.9	2.9
Phantom and Setup							
Phantom Uncertainty	7.6	R	1.732	1	1	4.4	4.4
SAR correction	0.0	R	1.732	1	0.84	0.0	0.0
Liquid Conductivity Repeatability	0.2	N	1	0.78	0.71	0.1	0.1
Liquid Conductivity (target)	5.0	R	1.732	0.78	0.71	2.3	2.0
Liquid Conductivity (mea.)	2.5	R	1.732	0.78	0.71	1.1	1.0
Temp. unc. - Conductivity	3.4	R	1.732	0.78	0.71	1.5	1.4
Liquid Permittivity Repeatability	0.15	N	1	0.23	0.26	0.0	0.0
Liquid Permittivity (target)	5.0	R	1.732	0.23	0.26	0.7	0.8
Liquid Permittivity (mea.)	2.5	R	1.732	0.23	0.26	0.3	0.4
Temp. unc. - Permittivity	0.83	R	1.732	0.23	0.26	0.1	0.1
Combined Std. Uncertainty						**12.9%**	**12.8%**
Coverage Factor for 95 %						**K=2**	**K=2**
Expanded STD Uncertainty						**25.9%**	**25.5%**

Uncertainty Budget of DASY for frequency range 30 MHz to 6 GHz according to IEC-IEEE 62209-1528

15. References

[1] ISED RSS-102 Issue 3, "Radio Frequency Exposure Compliance of Radio communication Apparatus (All Frequency Bands)", Dec 2023

[2] IEC/IEEE 62209-1528:2020, "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)", Oct. 2020

[3] SPEAG DASY System Handbook

[4] FCC KDB 248227 D01 v02r02, "SAR Guidance for IEEE 802.11 (WiFi) Transmitters", Oct 2015.

[5] FCC KDB 447498 D01 v06, "Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies", Oct 2015

[6] FCC KDB 447498 D02 v02r01, "SAR Measurement Procedures for USB Dongle Transmitters", Oct 2015.

[7] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.

[8] FCC KDB 865664 D02 v01r02, "RF Exposure Compliance Reporting and Documentation Considerations" Oct 2015.