

TEST REPORT

Applicant: Seeed Technology Co., Ltd.
Address: 9F, G3 Building, TCL International E City,
Zhongshanyuan Road, Nanshan District, Shenzhen,
Guangdong Province, P.R.C
Equipment Type: Wio tracker L1
Model Name: L1 Pro (refer to section 2.3)
Brand Name: **seeed studio**
FCC ID: Z4T-TRACKER-L1
Test Standard: FCC 47 CFR Part 2.1093
(refer to section 3.1)
Maximum SAR: Body(1g):0.80 W/kg
(refer to section 3.3)
Sample Arrival Date: Jun. 13, 2025
Test Date: Jun. 27, 2025 – Jul. 28, 2025
Date of Issue: Aug. 12, 2025

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

Tested by: Guo Guangwei**Checked by:** Xu Rui**Approved by:** Tolan Tu

(Testing Director)



Revision History

Version	Issue Date	Revisions Content
<u>Rev. 01</u>	<u>Aug. 12, 2025</u>	<u>Initial Issue</u>

TABLE OF CONTENTS

1	GENERAL INFORMATION	4
1.1	Test Laboratory	4
1.2	Test Location	4
1.3	Test Environment Condition.....	4
2	PRODUCT INFORMATION	5
2.1	Applicant Information	5
2.2	Manufacturer Information.....	5
2.3	General Description for Equipment under Test (EUT).....	5
2.4	Ancillary Equipment.....	7
2.5	Technical Information	8
3	SUMMARY OF TEST RESULT	9
3.1	Test Standards	9
3.2	Device Category and SAR Limit	10
3.3	Test Result Summary	11
3.4	Test Uncertainty	12
4	MEASUREMENT SYSTEM	13
4.1	Specific Absorption Rate (SAR) Definition	13
4.2	DASY SAR System	14
5	SYSTEM VERIFICATION	22
5.1	Purpose of System Check	22
5.2	System Check Setup	22
6	TEST POSITION CONFIGURATIONS	23
6.1	Body-worn Position Conditions	23
7	MEASUREMENT PROCEDURE	24

7.1	Measurement Process Diagram	24
7.2	SAR Scan General Requirement	25
7.3	Measurement Procedure	26
7.4	Area & Zoom Scan Procedure	26
7.5	Interim Procedures for WIFI 6E	26
8	CONDUCTED RF OUTPUT POWER	27
8.1	LoRa.....	27
8.2	Bluetooth	27
9	TEST RESULT	28
9.1	Bluetooth	29
9.2	LoRa.....	30
10	SAR Measurement Variability	31
11	SIMULTANEOUS TRANSMISSION.....	32
11.1	Simultaneous Transmission Mode Considerations	32
11.2	Sum SAR of Simultaneous Transmission	33
12	TEST EQUIPMENTS LIST	34
ANNEX A	SIMULATING LIQUID VERIFICATION RESULT	35
ANNEX B	SYSTEM CHECK RESULT	36
ANNEX C	TEST DATA.....	37
ANNEX D	EUT EXTERNAL PHOTOS.....	37
ANNEX E	SAR TEST SETUP PHOTOS	37
ANNEX F	CALIBRATION REPORT.....	37
ANNEX G	TUNE-UP PROCEDURE	37

1 GENERAL INFORMATION

1.1 Test Laboratory

Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	<input type="checkbox"/> Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China <input checked="" type="checkbox"/> 1/F, Building B, Ganghongji High-tech Intelligent Industrial Park, No. 1008, Songbai Road, Yangguang Community, Xili Sub-district, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196.

1.3 Test Environment Condition

Ambient Temperature	18°C to 25°C
Ambient Relative Humidity	30% to 70%

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Seeed Technology Co., Ltd.
Address	9F, G3 Building, TCL International E City, Zhongshanyuan Road, Nanshan District, Shenzhen, Guangdong Province, P.R.C

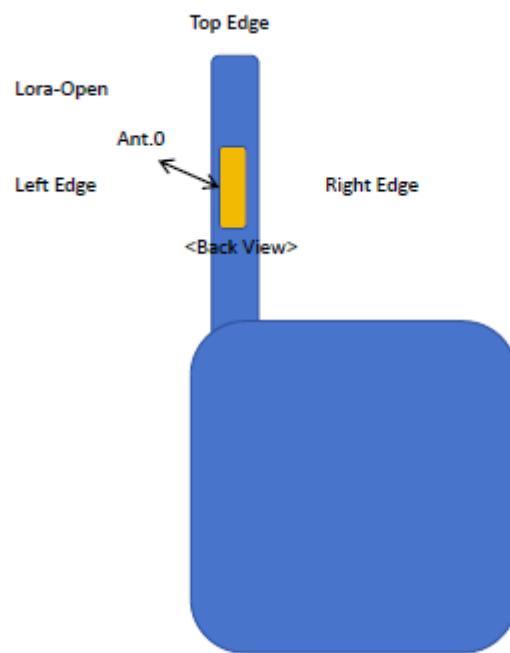
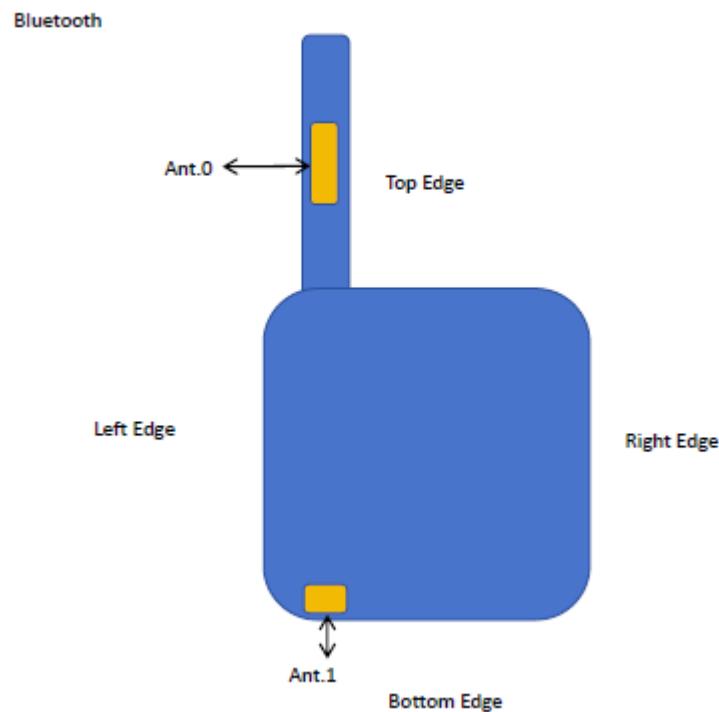
2.2 Manufacturer Information

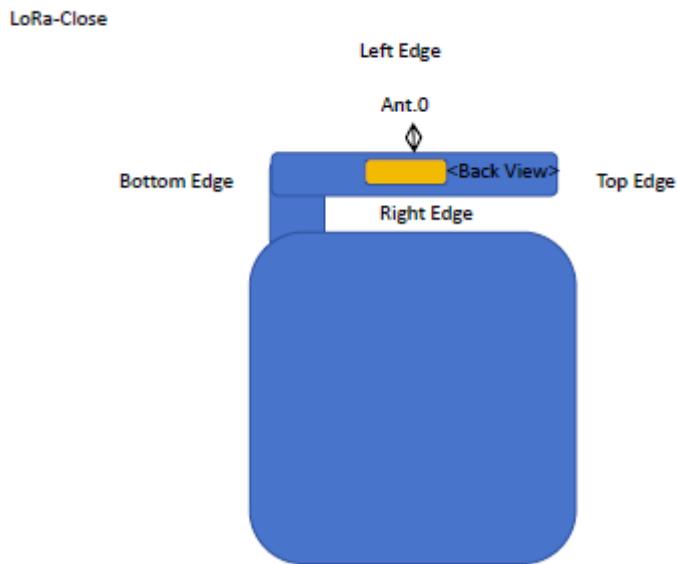
Manufacturer	Seeed Technology Co., Ltd.
Address	9F, G3 Building, TCL International E City, Zhongshanyuan Road, Nanshan District, Shenzhen, Guangdong Province, P.R.C

2.3 General Description for Equipment under Test (EUT)

EUT Name	Wio tracker L1
Model Name Under Test	L1 Pro
Series Model Name	L1, L1 Lite, L1 E-ink
Description of Model Name Differentiation	1. L1 Pro has plastic casing, battery and OLED 2. L1 has no plastic casing and no battery 3. L1 Lite has no plastic casing, no battery and no OLED 4. L1 E-ink has no plastic casing, no battery and no OLED, but comes with an E-ink screen as an accessory
Hardware Version	v1.3
Software Version	v1.0
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.3.1 Antenna Information:





Antenna	Support Bands
Ant.0	LoRa
Ant.1	Bluetooth

2.4 Ancillary Equipment

Ancillary Equipment 1	Battery	
	Brand Name	N/A
	Model No.	103450-2000MAH
	Serial No.	N/A
	Capacity	2000mAh
	Rated Voltage	3.7 V
	Limit Charge Voltage	4.2 V
	Ancillary Equipment 2	Antenna

2.5 Technical Information

Network and Wireless connectivity	Bluetooth (BLE), LoRa
-----------------------------------	-----------------------

The requirement for the following technical information of the EUT was tested in this report:

Operating Mode	Bluetooth; LoRa	
Frequency Range	Bluetooth	2400 ~ 2483.5 MHz
	LoRa Band L	865.0 ~ 868.0 MHz
	LoRa Band M	868.0 ~ 868.6 MHz
	LoRa Band N	868.7 ~ 869.2 MHz
Antenna Type	Bluetooth	Ceramic
	LoRa	External
Exposure Category	General Population/Uncontrolled exposure	
EUT Type	Portable Device	

3 SUMMARY OF TEST RESULT

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 2.1093	Radiofrequency radiation exposure evaluation: portable devices
2	ANSI/IEEE C95.1-1992	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
3	FCC KDB 447498 D04 v01	RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices
4	FCC KDB 865664 D01 v01r04	SAR Measurement 100 MHz to 6 GHz
5	FCC KDB 865664 D02 v01r02	RF Exposure Reporting

3.2 Device Category and SAR Limit

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

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

Table of Exposure Limits:

Body Position	SAR Value (W/Kg)	
	General Population/ Uncontrolled Exposure	Occupational/ Controlled Exposure
Whole-Body SAR (averaged over the entire body)	0.08	0.4
Partial-Body SAR (averaged over any 1 gram of tissue)	1.60	8.0
SAR for hands, wrists, feet and ankles (averaged over any 10 grams of tissue)	4.0	20.0

NOTE:

General Population/Uncontrolled Exposure: Locations where there is the exposure of individuals who have no knowledge or control of their exposure. 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.

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

3.3 Test Result Summary

3.3.1 Highest SAR

Equipment Class	Band	Maximum Scaled SAR (W/kg)	Maximum Report SAR (W/kg)
		Body	Body
		(0mm)	(0mm)
		1g SAR	1g SAR
LoRa	DTS	0.80	0.80
DTS	Bluetooth	0.06	
Limit (W/kg)		1.6	1.6
Verdict		PASS	

3.3.2 Highest Simultaneous Transmission SAR

Equipment Class	Maximum Scaled SAR
	(W/kg)
	Body 1g (0mm)
LoRa	0.86
DTS	0.86
Limit (W/Kg)	1.60
Verdict	Pass

Note: The simultaneous transmission SAR detail please refer to section 12.

3.4 Test Uncertainty

According to KDB 865664 D01, when the highest measured 1 g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis is not required in SAR reports submitted for equipment approval.

The maximum 1 g SAR for the EUT in this report is 0.800 W/kg, which is lower than 1.5 W/kg, so the extensive SAR measurement uncertainty analysis is not required in this report.

4 MEASUREMENT SYSTEM

4.1 Specific Absorption Rate (SAR) Definition

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

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

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

SAR is expressed in units of Watts per kilogram (W/kg) SAR measurement can be related to the electrical field in the tissue by

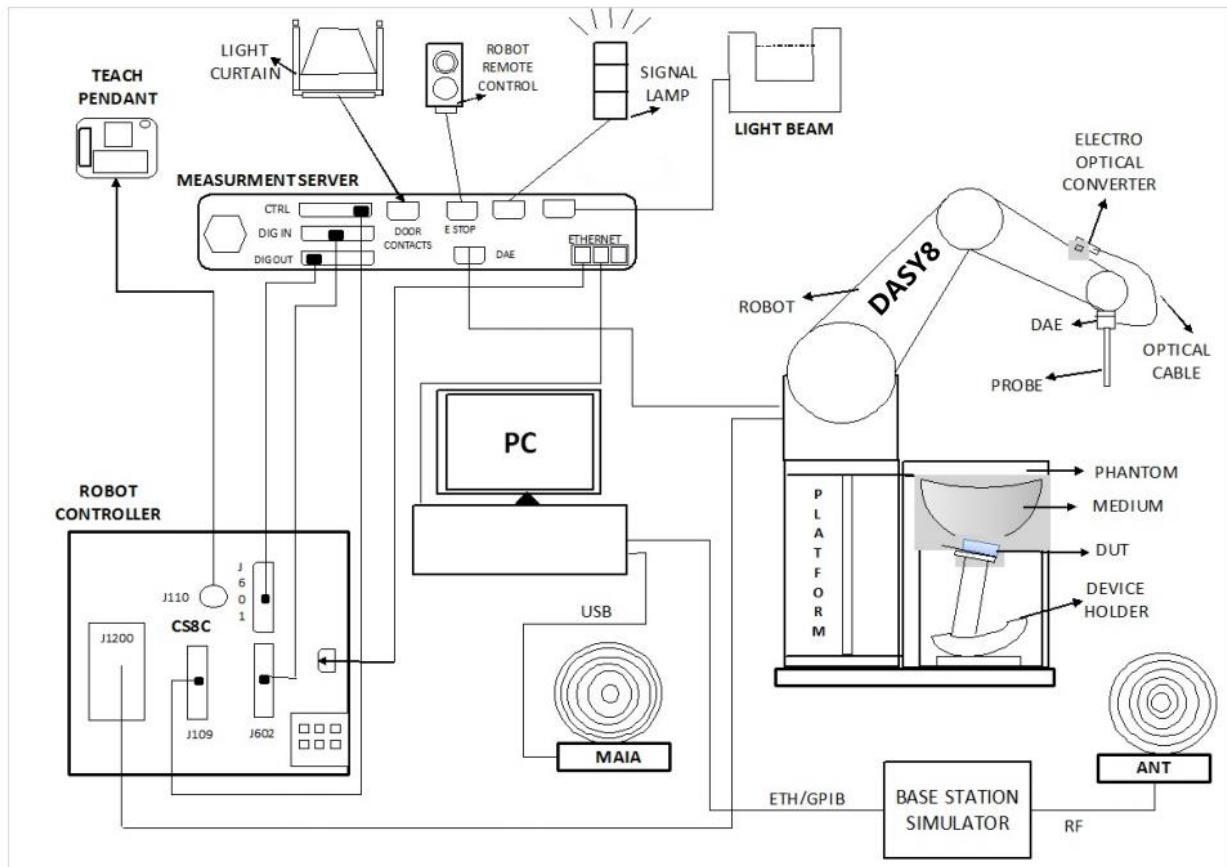
$$\mathbf{SAR} = \frac{\sigma E^2}{\rho}$$

Where: σ is the conductivity of the tissue,

ρ is the mass density of the tissue and E is the RMS electrical field strength.

4.2 DASY SAR System

4.2.1 DASY SAR System Diagram



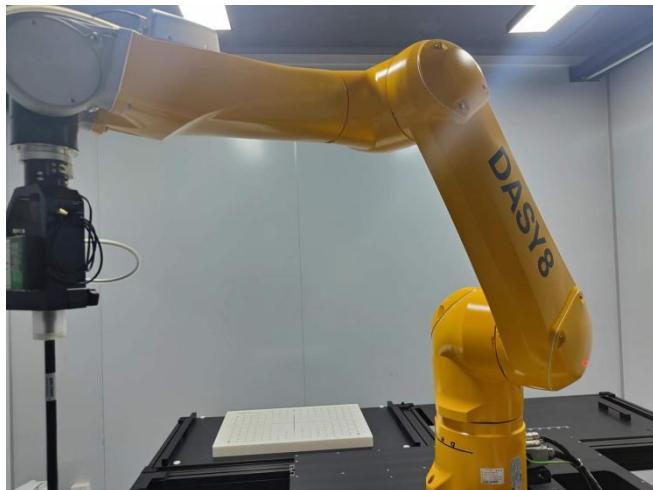
The DASY system for performing compliance tests consists of the following items:

1. A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
2. A dosimetric 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.
3. A data acquisition electronic (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.
4. A unit to operate the optical surface detector which is connected to the EOC.
5. The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY measurement server.
6. The DASY measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation.
7. DASY software and SEMCAD data evaluation software.
8. Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
9. The generic twin phantom enabling the testing of left-hand and right-hand usage.
10. The device holder for handheld mobile phones.
11. Tissue simulating liquid mixed according to the given recipes.

12. System validation dipoles allowing to validate the proper functioning of the system.

4.2.2 Robot

The Dasy SAR system uses the high precision robots. Symmetrical design with triangular core Built-in optical fiber for surface detection system For the 6-axis controller system, Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents). The robot series have many features that are important for our application:



- High precision
(repeatability ± 0.02 mm)
- High reliability
(industrial design)
- Low maintenance costs
(virtually maintenance free due to direct drive gears; no belt drives)
- Jerk-free straight movements
(brush less synchron motors; no stepper motors)
- Low ELF interference
(motor control _elds shielded via the closed metallic construction shields)

4.2.3 E-Field Probe

The probe is specially designed and calibrated for use in liquids with high permittivities for the measurements the Specific Dosimetric E-Field Probe EX3DV4 with following specifications is used.

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection system Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., glycoether)
Calibration	ISO/IEC 17025 calibration service available
Frequency	4 MHz to 10 GHz; Linearity: ± 0.2 dB
Directivity	± 0.2 dB in HSL (rotation around probe axis) ; ± 0.4 dB in HSL (rotation normal to probe axis)
Dynamic range	5 μ W/g to > 100 mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 337 mm (Tip: 9 mm) Tip diameter: 2.5 mm (Body: 10 mm) Distance from probe tip to dipole centers: 1.0 mm
Application	General dosimetry up to 3 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms (EX3DV4)



E-Field Probe Calibration Process

Probe calibration is realized, in compliance with IEC/IEEE 62209-1528 and IEEE 1528 std, with CALISAR, Antennessa proprietary calibration system. The calibration is performed with the IEC/IEEE 62209-1528 annexe technique using reference guide at the five frequencies.

4.2.4 Data Acquisition Electronics

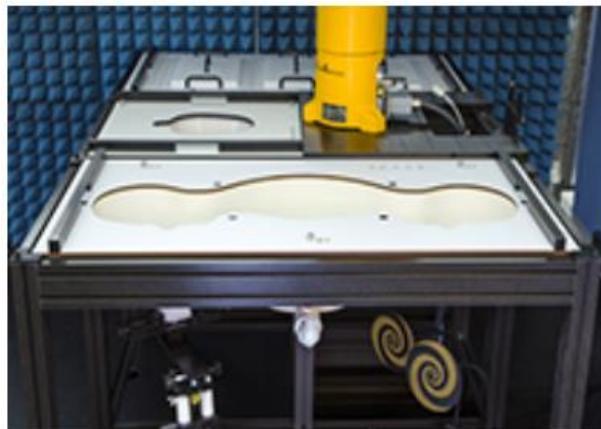
The data acquisition electronics (DAE) consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converte and a command decoder with a control logic unit. Transmission to the measurement server is accomplished through an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



- Input Impedance: 200MOhm
- The Inputs: Symmetrical and Floating
- Common Mode Rejection: Above 80dB

4.2.5 Phantoms

For the measurements the Specific Anthropomorphic Mannequin (SAM) defined by the IEEE SCC-34/SC2 group is used. The phantom is a polyurethane shell integrated in a wooden table. The thickness of the phantom amounts to 2mm +/- 0.2mm. It enables the dosimetric evaluation of left and right phone usage and includes an additional flat phantom part for the simplified performance check. The phantom set-up includes a cover, which prevents the evaporation of the liquid.



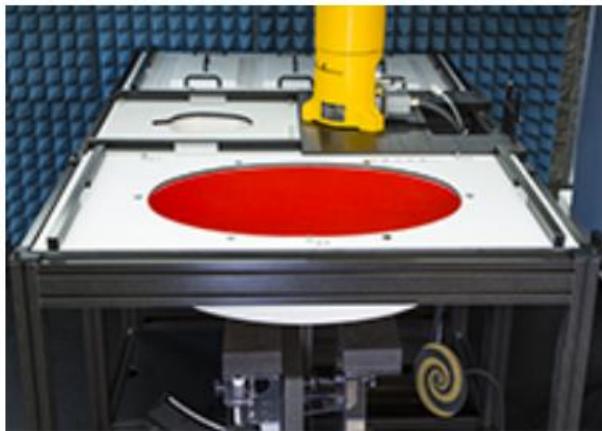
- Left hand
- Right hand
- Flat phantom

Photo of Phantom



Serial Number	Material	Length	Height
SAM	Vinylester, glass fiber reinforced	1000	500

Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of below 10 GHz. ELI4 is fully compatible with the latest draft of the standard IEC 62209 Part II and all known tissue simulating liquids. ELI4 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.



• Flat phantom

Photo of Phantom



Serial Number	Shell Thickness (mm)	Major ellipse axis (mm)	Minor axis (mm)
ELI V8.0	2.0 ± 0.2	600	400

4.2.6 Device Holder

The DASY device holder has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of 65°. 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. This device holder is used for standard mobile phones or PDA's only. If necessary an additional support of polystyrene material is used. Larger DUT's (e.g. notebooks) cannot be tested using this device holder. Instead a support of bigger polystyrene cubes and thin polystyrene plates is used to position the DUT in all relevant positions to find and measure spots with maximum SAR values.

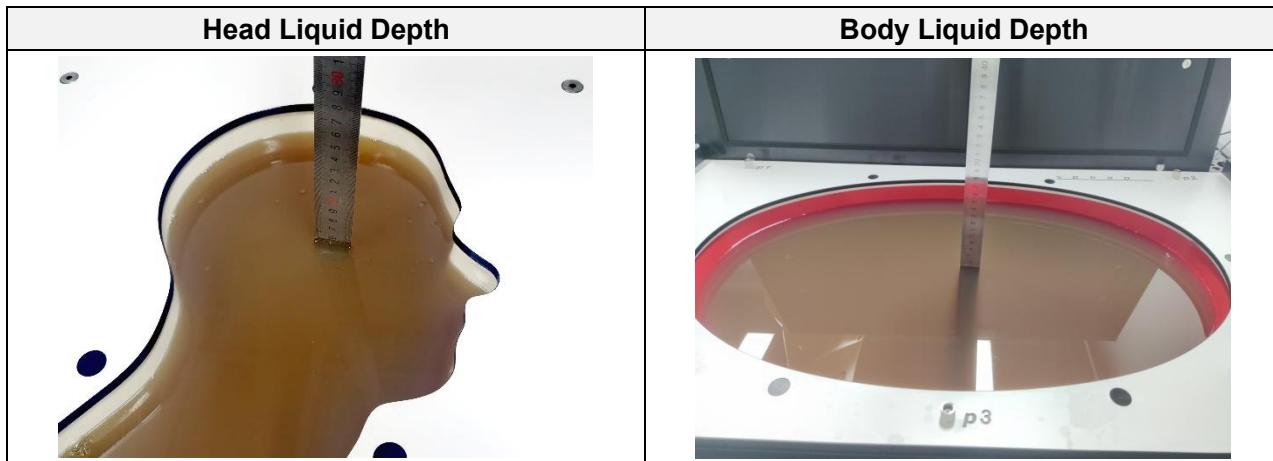
Therefore those devices are normally only tested at the flat part of the SAM.



The positioning system allows obtaining cheek and tilting position with a very good accuracy. Incompliance with CENELEC, the tilt angle uncertainty is lower than 1°.

4.2.7 Simulating Liquid

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15 cm. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm. The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5%.



The following table gives the recipes for tissue simulating liquid and the theoretical Conductivity/Permittivity.

The following table gives the recipes for tissue simulating liquid.

TSL	Manufacturer / Model	Freq Range (MHz)	Main Ingredients
Head WideBand	SPEAG HBBL600-10000V6	600-10000	Ethanediol, Sodium petroleum sulfonate, Hexylene Glycol / 2-Methyl-pentane-2,4-diol, Alkoxylated alcohol

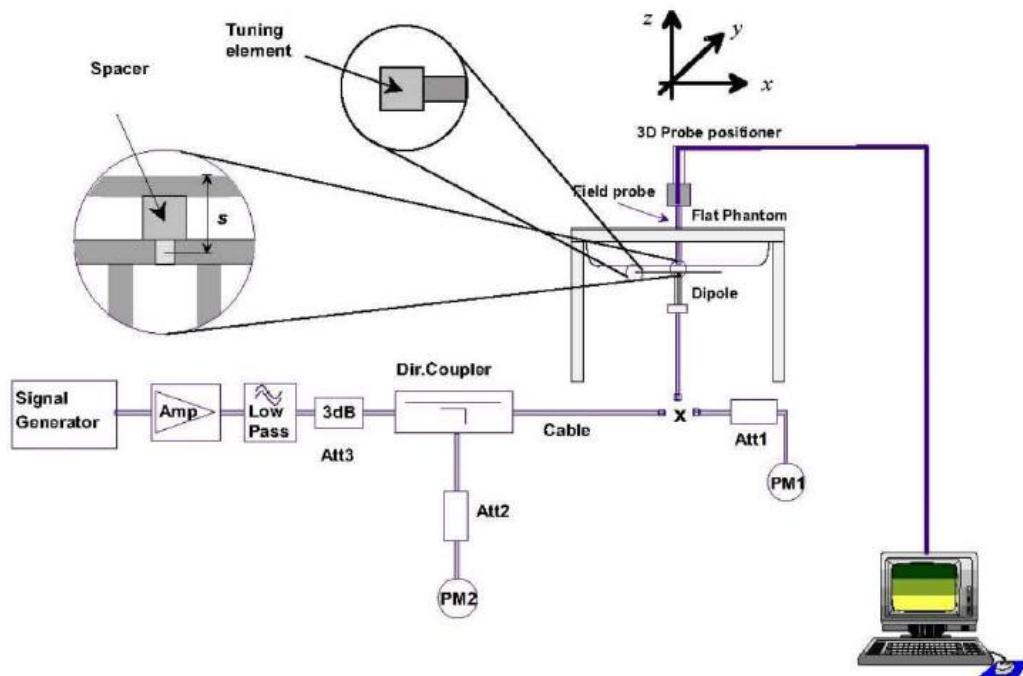
5 SYSTEM VERIFICATION

5.1 Purpose of System Check

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

5.2 System Check Setup

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



6 TEST POSITION CONFIGURATIONS

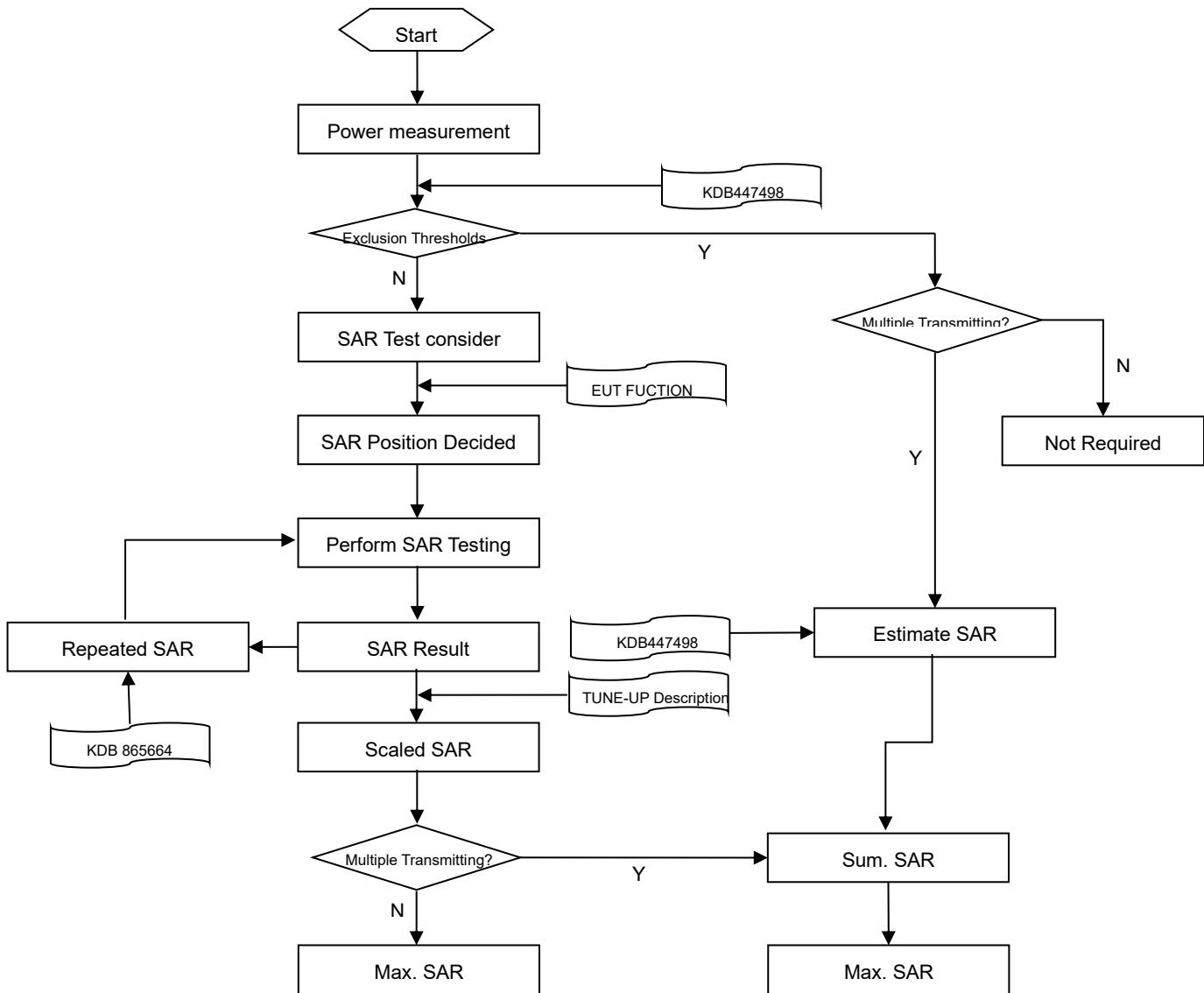
6.1 Body-worn Position Conditions

Devices that support transmission while used with body-worn accessories must be tested for SAR compliance related to each body-worn condition of use. SAR evaluation is required for body-worn accessories supplied with the device they are attached to.

The general informing principle is that the selected test configurations must conservatively capture the various body-worn accessory use conditions expected by users. For instance, devices that are designed to operate on the body of users using lanyards and straps, or without requiring additional body-worn accessories, must be tested for SAR compliance using a conservative minimum test separation distance not to exceed 5 mm for all use conditions required by the device.

7 MEASUREMENT PROCEDURE

7.1 Measurement Process Diagram



7.2 SAR Scan General Requirement

Probe boundary effect error compensation is required for measurements with the probe tip closer than half a probe tip diameter to the phantom surface. Both the probe tip diameter and sensor offset distance must satisfy measurement protocols; to ensure probe boundary effect errors are minimized and the higher fields closest to the phantom surface can be correctly measured and extrapolated to the phantom surface for computing 1 g SAR. Tolerances of the post-processing algorithms must be verified by the test laboratory for the scan resolutions used in the SAR measurements, according to the reference distribution functions specified in IEEE Std 1528-2013.

		≤3GHz	>3GHz	
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface		5±1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm	
Maximum probe angle from probe axis to phantom surface normal at the measurement location		$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$	
		≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3–4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm	
Maximum area scan spatial resolution: Δx Area , Δy Area			When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	
Maximum zoom scan spatial resolution: Δx Zoom , Δy Zoom		≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3–4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*	
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: Δz Zoom (n)		3–4 GHz: ≤ 4 mm	
			4–5 GHz: ≤ 3 mm	
			5–6 GHz: ≤ 2 mm	
	graded grid	≤ 5 mm	3–4 GHz: ≤ 3 mm	
			4–5 GHz: ≤ 2.5 mm	
			5–6 GHz: ≤ 2 mm	
Minimum zoom scan volume	x, y, z		$\leq 1.5 \cdot \Delta z$ Zoom (n-1)	
			3–4 GHz: ≥ 28 mm	
			4–5 GHz: ≥ 25 mm	
			5–6 GHz: ≥ 22 mm	

Note:

1. δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.
2. * When zoom scan is required and the reported SAR from the area scan based 1 g SAR estimation procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

7.3 Measurement Procedure

The following steps are used for each test position

- a. Establish a call with the maximum output power with a base station simulator. The connection between the mobile and the base station simulator is established via air interface
- b. Measurement of the local E-field value at a fixed location. This value serves as a reference value for calculating a possible power drift.
- c. Measurement of the SAR distribution with a grid of 8 to 16mm * 8 to 16 mm and a constant distance to the inner surface of the phantom. Since the sensors cannot directly measure at the inner phantom surface, the values between the sensors and the inner phantom surface are extrapolated. With these values the area of the maximum SAR is calculated by an interpolation scheme.
- d. Around this point, a cube of 30 * 30 * 30 mm or 32 * 32 * 32 mm is assessed by measuring 5 or 8 * 5 or 8 * 4 or 5 mm. With these data, the peak spatial-average SAR value can be calculated.

7.4 Area & Zoom Scan Procedure

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

When the 1 g SAR of the highest peak is within 2 dB of the SAR limit, additional zoom scans are required for other peaks within 2 dB of the highest peak that have not been included in any zoom scan to ensure there is no increase in SAR.

7.5 Interim Procedures for WIFI 6E

Interim procedures for FCC radio frequency (RF) exposure evaluations of U-NII 6-7 GHz band portable devices have been made available during the TCB workshop in April 2021. The procedure is summarized below:

- a. Evaluate SAR / APD with DASY6 Module SAR V16.0 or higher. The configurations to be tested are defined in the relevant Knowledge Database (KDB). The psSAR and absorbed psPD are reported.
- b. For the configuration with the highest SAR, evaluate the incident power density with DASY6 Module mmWave V2.4.2 or higher. The incident psPD must be adjusted per amount that the measurement uncertainty exceeds 30% before it is included in the test report.

8 CONDUCTED RF OUTPUT POWER

8.1 LoRa

Please refer the document “BL-SZ2560704-AP.pdf”.

8.2 Bluetooth

Please refer the document “BL-SZ2560704-AP.pdf”.

9 TEST RESULT

1. 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 WIFI 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 WIFI/Bluetooth: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
2. Absorbed power density (APD) using a 4cm² averaging area is reported based on SAR measurements.
3. Per KDB 447498 D04, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:
 - $\leq 0.8 \text{ W/kg}$ or 2.0 W/kg , for 1-g or 10-g respectively, when the transmission band is $\leq 100 \text{ MHz}$
 - $\leq 0.6 \text{ W/kg}$ or 1.5 W/kg , for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
 - $\leq 0.4 \text{ W/kg}$ or 1.0 W/kg , for 1-g or 10-g respectively, when the transmission band is $\geq 200 \text{ MHz}$
4. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is $\geq 0.8 \text{ W/kg}$

9.1 Bluetooth

Band	Antenna	Mode	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift(dB)	1 g Meas SAR(W/kg)	Meas. Power (dBm)	Max. tune-up power(dBm)	Scaling Factor	Duty cycle (%)	Duty cycle Factor	1g Scaled SAR (W/kg)	Meas. No.
Body															
Bluetooth	Ant.1	BLE-1M	Front Side	0	39	2480	0.05	0.038	1.90	2.00	1.023	62.78	1.593	0.062	2#
	Ant.1		Back Side	0	39	2480	-0.17	0.012	1.90	2.00	1.023	62.78	1.593	0.020	/
	Ant.1		Left Edge	0	39	2480	0.07	0.006	1.90	2.00	1.023	62.78	1.593	0.010	/
	Ant.1		Right Edge	0	39	2480	-0.10	0.014	1.90	2.00	1.023	62.78	1.593	0.023	/
	Ant.1		Top Edge	0	39	2480	-0.08	0.005	1.90	2.00	1.023	62.78	1.593	0.008	/
	Ant.1		Bottom Edge	0	39	2480	0.07	0.017	1.90	2.00	1.023	62.78	1.593	0.028	/
	Ant.1		Front Side	0	0	2402	0.15	0.028	1.27	2.00	1.183	62.78	1.593	0.053	/
	Ant.1		Front Side	0	19	2441	-0.06	0.031	1.78	2.00	1.052	62.78	1.593	0.052	/

9.2 LoRa

Band	Antenna	Mode	State	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift(dB)	1 g Meas SAR(W/kg)	Meas. Power (dBm)	Max. tune-up power(dBm)	Scaling Factor	Duty cycle (%)	Duty cycle Factor	1g Scaled SAR (W/kg)	Meas. No.
Body																
LoRa	Ant.0	DTS	Close	Front Side	0	3	907.8	0.14	0.622	19.62	20.00	1.091	100.00	1.000	0.679	/
	Ant.0	DTS		Back Side	0	3	907.8	-0.14	0.507	19.62	20.00	1.091	100.00	1.000	0.553	/
	Ant.0	DTS		Left Edge	0	3	907.8	0.19	0.463	19.62	20.00	1.091	100.00	1.000	0.505	/
	Ant.0	DTS		Top Edge	0	3	907.8	0.02	0.071	19.62	20.00	1.091	100.00	1.000	0.077	/
	Ant.0	DTS		Bottom Edge	0	3	907.8	0.14	0.005	19.62	20.00	1.091	100.00	1.000	0.005	/
	Ant.0	DTS		Front Side	0	0	903.0	0.02	0.710	19.48	20.00	1.127	100.00	1.000	0.800	1#
	Ant.0	DTS		Front Side	0	7	914.2	0.17	0.411	16.65	17.00	1.084	100.00	1.000	0.446	/
	Ant.0	DTS	Open	Front Side	0	3	907.8	0.08	0.322	19.62	20.00	1.091	100.00	1.000	0.351	/
	Ant.0	DTS		Back Side	0	3	907.8	0.12	0.363	19.62	20.00	1.091	100.00	1.000	0.396	/
	Ant.0	DTS		Left Edge	0	3	907.8	-0.13	0.454	19.62	20.00	1.091	100.00	1.000	0.495	/
	Ant.0	DTS		Right Edge	0	3	907.8	-0.10	0.332	19.62	20.00	1.091	100.00	1.000	0.362	/
	Ant.0	DTS		Top Edge	0	3	907.8	0.02	0.002	19.62	20.00	1.091	100.00	1.000	0.002	/
	Ant.0	DTS		Bottom Edge	0	3	907.8	0.16	0.003	19.62	20.00	1.091	100.00	1.000	0.003	/
	Ant.0	DTS		Left Edge	0	0	903.0	-0.12	0.488	19.48	20.00	1.127	100.00	1.000	0.550	/
	Ant.0	DTS		Left Edge	0	7	914.2	-0.01	0.295	16.65	17.00	1.084	100.00	1.000	0.320	/

10 SAR Measurement Variability

According to KDB 865664 D01, SAR measurement variability was assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. Alternatively, if the highest measured SAR for both head and body tissue-equivalent media are ≤ 1.45 W/kg and the ratio of these highest SAR values, i.e., largest divided by smallest value, is ≤ 1.10 , the highest SAR configuration for either head or body tissue-equivalent medium may be used to perform the repeated measurement. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR repeated measurement procedure:

1. When the highest measured SAR is < 0.80 W/kg, repeated measurement is not required.
2. When the highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
3. If the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 , or when the original or repeated measurement is ≥ 1.45 W/kg, perform a second repeated measurement.
4. If the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20 , and the original, first or second repeated measurement is ≥ 1.5 W/kg, perform a third repeated measurement.

11 SIMULTANEOUS TRANSMISSION

Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneous transmitting antenna. When the sum of SAR 1g of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit (SAR 1g 1.6 W/kg), the simultaneous transmission SAR is not required. When the sum of SAR 1g is greater than the SAR limit (SAR 1g 1.6 W/kg), SAR test exclusion is determined by the SAR to Peak Location Ratio (SPLSR).

According KDB 447498 D04, simultaneous transmission:

- a) SPLSR = $(\text{SAR1} + \text{SAR2})^{1.5} / R_i$ (min. separation distance, mm), and the peak separation distance is determined from the square root of $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$, where (x_1, y_1, z_1) and (x_2, y_2, z_2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
 SAR1 is the highest reported or estimated SAR for the first of a pair of simultaneous transmitting antennas, in a specific test operating mode and exposure condition.
 SAR2 is the highest reported or estimated SAR for the second of a pair of simultaneous transmitting antennas, in a specific test operating mode and exposure condition as the first.
- b) If SPLSR ≤ 0.04 , simultaneously transmission SAR measurement is not necessary.
- c) Simultaneously transmission SAR measurement, and the reported multi-band SAR $< 1.6\text{W/kg}$.

11.1 Simultaneous Transmission Mode Considerations

NO.	Simultaneous Tx Combination	Body
1	LoRa+Bluetooth	Yes

Note:

1. The maximum SAR summation is calculated based on the same configuration and test position.

11.2 Sum SAR of Simultaneous Transmission

Body Simultaneous Transmission SAR Evaluation for Lora Antenna with Bluetooth

Position	Stand alone SAR		SUM SAR LoRa+Bluetooth (1+2)
	1	2	
	LoRa.MAX	Bluetooth	
Front Side 0mm	0.800	0.062	0.862
Back Side 0mm	0.553	0.020	0.573
Left Edge 0mm	0.550	0.010	0.560
Right Edge 0mm	0.362	0.023	0.385
Top Edge 0mm	0.077	0.008	0.085
Bottom Edge 0mm	0.005	0.028	0.033

Note:

1: The highest Summed 10g SAR is 0.862 W/Kg < 1.6 W/kg, so Simultaneous Transmission SAR test is not required.

12 TEST EQUIPMENTS LIST

Description	Manufacturer	Model	Serial No./Version	Cal. Date	Cal. Due
PC	Dell	N/A	N/A	N/A	N/A
Test Software	Speag	DASY8	16.2.2.1588	N/A	N/A
835MHz Validation Dipole	Speag	D835V2	SN: 4d187	2024/05/08	2027/05/07
2450MHz Validation Dipole	Speag	D2450V2	SN: 952	2024/05/07	2027/05/06
Data Acquisition Electronics	Speag	DAE4	SN: 1710	2025/01/20	2026/01/19
E-Field Probe	Speag	EX3DV4	SN: 7664	2025/06/30	2026/06/29
Signal Generator	Keysight	N5173B	MY62150163	2024/08/12	2025/08/11
Power Meter	R&S	NRVD-B2	835843/014	2024/08/08	2025/08/07
Power Sensor	R&S	NRV-Z4	100381	2024/08/08	2025/08/07
Power Sensor	R&S	NRV-Z2	100211	2024/08/08	2025/08/07
Network Analyzer	Agilent	E5071C	MY46103472	2024/09/11	2025/09/10
Thermometer	Elitech	RC-4HC	EF7239002655	2024/10/31	2025/10/30
Thermometer	Elitech	RC-4HC	EF7216002974	2024/10/31	2025/10/30
Power Amplifier	Mini-Circuits	ZVA-183W-S+	932502132	N/A	N/A
Dielectric Probe Kit	Speag	DAK3.5	SN: 1312	N/A	N/A
Phantom	Speag	SAM	SN: 1859	N/A	N/A
Attenuator	COM-MW	ZA-S1-31	1305003187	N/A	N/A
Directional coupler	AA-MCS	AAMCS-UDC	000272	N/A	N/A

Note: For dipole antennas, BALUN has adopted 3 years as calibration intervals, and on annual basis, every measurement dipole has been evaluated and is in compliance with the following criteria:

1. There is no physical damage on the dipole;
2. System validation with specific dipole is within 10% of calibrated value;
3. Return-loss is within 20% of calibrated measurement.
4. Impedance (real or imaginary parts) is within 5 Ohms of calibrated measurement.

ANNEX A SIMULATING LIQUID VERIFICATION RESULT

The dielectric parameters of the liquids were verified prior to the SAR evaluation using a DAK3.5 Dielectric Probe Kit.

Date	Liquid Type	Fre. (MHz)	Temp. (°C)	Meas. Conductivity (σ) (S/m)	Meas. Permittivity (ϵ)	Target Conductivity (σ) (S/m)	Target Permittivity (ϵ)	Conductivity Tolerance (%)	Permittivity Tolerance (%)
2025.07.27	Head	835	21.2	0.91	42.60	0.90	41.50	1.11	2.65
2025.07.28	Head	2450	21.3	1.83	38.68	1.80	39.20	1.67	-1.33
Note: The tolerance limit of Conductivity and Permittivity is $\pm 5\%$.									

ANNEX B SYSTEM CHECK RESULT

Comparing to the original SAR value provided by SPEAG, the validation data should be within its specification of 10 %(for 1 g).

Date	Liquid Type	Freq. (MHz)	Power (mW)	Measured SAR (W/kg)	Normalized SAR (W/kg)	Dipole SAR (W/kg)	Tolerance (%)
2025.07.27	Head	835	100	0.968	9.68	9.74	-0.62
2025.07.28	Head	2450	100	5.290	52.90	52.60	0.57

Note: The tolerance limit of System validation $\pm 10\%$.

Please refer the document "BL-SZ2560704-ASC.pdf".

ANNEX C TEST DATA

Please refer the document "BL-SZ2560704-ATD.pdf".

ANNEX D EUT EXTERNAL PHOTOS

Please refer the document "BL-SZ2560704-AW.pdf".

ANNEX E SAR TEST SETUP PHOTOS

Please refer the document "BL-SZ2560704-AS.pdf".

ANNEX F CALIBRATION REPORT

Please refer the document "BL-SZ2560704-AC.pdf".

ANNEX G TUNE-UP PROCEDURE

Please refer the document "BL-SZ2560704-AT.pdf".

Statement

1. The laboratory guarantees the scientificity, accuracy and impartiality of the test, and is responsible for all the information in the report, except the information provided by the customer. The customer is responsible for the impact of the information provided on the validity of the results.
2. The report without China inspection body and laboratory Mandatory Approval (CMA) mark has no effect of proving to the society.
3. For the report with CNAS mark or A2LA mark, the items marked with "☆" are not within the accredited scope.
4. This report is invalid if it is altered, without the signature of the testing and approval personnel, or without the "inspection and testing dedicated stamp" or test report stamp.
5. The test data and results are only valid for the tested samples provided by the customer.
6. This report shall not be partially reproduced without the written permission of the laboratory.
7. Any objection shall be raised to the laboratory within 30 days after receiving the report.

--END OF REPORT--