SAR TEST REPORT

Project No.	:	JB-Z0791-B
Client	:	Sony Corporation
Address	:	1-7-1 Konan Minato-ku Tokyo, 108-0075 Japan
Type of Equipment	:	Wireless Microphone
Model No.	:	ECM-W2BT(R)
FCC ID	:	AK8ECM-W2BTR
Regulation Applied	:	FCC 47 CFR 2.1093

SAR Limits :

Exposure Characteristics	Spatial Peak SAR (Head and Trunk) averaged over any 1 g of tissue
General Public Exposure	1.6 W/kg

The Highest Reported SAR :

RF Exposure Conditions	Equipment Class	Note(s)
	DSS/DTS	
	Bluetooth	
Body-Worn	0.242 W/kg	

Test Result : **Complied**

Sample Receipt	:	September 17, 2020	
Testing	:	September 18, 2020	(for conducted power measurements)
		November 13, 2020	(for SAR measurements)
Reported	:	February 5, 2021	

Reported by :

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Format No.: NV1-1-01 Version 5.0

REVISION HISTORY

Project No.	Revision	Page	Description	Issued date
JB-Z0791	Original	-	-	December 14, 2020
JB-Z0791-A	1	1,4	Corrected the FCC ID.	January 19, 2021
JB-Z0791-B	2	28,29	Updated the reported SAR according to the specification change of the maximum duty cycle of the DUT specified by the client.	February 5, 2021

DISCLAIMER

This report includes the information provided by the customer as below;

- Cover page : Client and product related information
- Clause 1.1 : Description of Device Under Test (DUT)
- Clause 1.2 : Antenna Placement
- Clause 1.3 : Simultaneous Transmission Conditions
- Clause 1.4 : Nominal and Maximum Possible Power (Maximum Tune-up Tolerance Limit)

* The laboratory is not responsible for results affected by the above information.

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1. General Information

1.1. Description of Device Under Test (DUT)

DUT Description

	DUT
Type of Equipment	Wireless Microphone
Model No.	ECM-W2BT(R)
FCC-ID	AK8ECM-W2BTR
Test Sample Condition	☐ Prototype ☒ Pre-production ☐ Mass-production
	* Not for sale: The sample is equivalent to mass-production items. * No modification by the test lab.
Serial No.	4
Rating	Li-ion Battery DC 3.7 V ☒ Not user accessible.
Head/Body-Worn Accessories (supplied with the device)	n/a
Device Dimension (W x H x D)	See Appendix D
Device Category	Portable
Exposure Category	General population/ Uncontrolled environment

Wireless Technologies

Wireless Technologies	Frequency Bands	Operating Mode
Bluetooth	2.4 GHz	Version 5.0 (BR/EDR)

Radio Specification

Antenna Type	Monopole Antenna
Antenna Gain	- 0.42 dBi

1.2. Antenna Placement

Antenna	Minimum Distance from Edges or Sides of DUT (mm)						
	Front	Back	Back-Tilt	Left	Right	Top	Bottom
Bluetooth	*1	*1	*1	*1	*1	*1	*1

*1 Please refer to Appendix D.

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1.3. Nominal and Maximum Possible Power (Maximum Tune-up Tolerance Limit)

Wireless Technologies	Mode	Frequency Band (MHz)		Channel	Data Rate	Full Power (Burst Averaged)	Ant. Gain (dBi)	Equivalent Isotropically Radiated Power (dBm)
		Lower	Higher			Max. Tune-up Limit (dBm)		
Bluetooth	BR	2402	2480	All	-	10.0	- 0.42	9.58
	EDR	2402	2480	All	-	10.0	- 0.42	9.58

1.4. RF Exposure Conditions

Wireless Technologies	RF Exposure Conditions	User-to-DUT Distance (mm)	Test Position	DUT-to-Ant. Distance (mm)	SAR Required	Note(s)
Bluetooth	Body-Worn	0	Front	*1	Yes	
			Back	*1	Yes	
			Back-Tilt	*1	Yes	
			Left	*1	Yes	
			Right	*1	Yes	
			Top	*1	Yes	
			Bottom	*1	Yes	

Note(s):
*1 Please refer to Appendix D.

1.5. RF Exposure Limits

Human Exposure	General Population/ Uncontrolled Exposure	Occupational/ Controlled Exposure
Spatial Peak SAR (Head and Trunk) averaged over any 1 g of tissue	**1.6 W/kg***	8 W/kg
Spatial Average SAR (Whole Body) averaged over the whole body	0.08 W/kg	0.4 W/kg
Spatial Peak SAR (Extremities: Hands/Wrists/Feet/Ankles) averaged over any 10 g of tissue	4 W/kg	20 W/kg

* The limit(s) applied in this report.

1.6. SAR Test Exclusion

SAR test exclusion is applied according to KDB 447498 D01.

The 1-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where:

* f(GHz) is the RF channel transmit frequency in GHz
* Power and distance are rounded to the nearest mW and mm before calculation
* The result is rounded to one decimal place for comparison
* When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

Body-Worn SAR (1-g SAR) Test Exclusion as per KDB 447498 D01

Freq. Band	Freq. (MHz)	Test Position	User-to-Host Distance (mm)	Host-to-Ant Distance (mm)	User-to-Ant Distance (mm)	Min. Test Sep. Distance (mm)	Max. Possible Power			Exclusion Threshold	SAR Required (> 3.0)
							(dBm)	(mW)	rounded (mW)		
Bluetooth	2450	Front	*1	*1	*1	*1	10.0	10.0	10	*1	Yes
	2450	Back	*1	*1	*1	*1	10.0	10.0	10	*1	No
	2450	Back-Tilt	*1	*1	*1	*1	10.0	10.0	10	*1	No
	2450	Left	*1	*1	*1	*1	10.0	10.0	10	*1	Yes
	2450	Right	*1	*1	*1	*1	10.0	10.0	10	*1	Yes
	2450	Top	*1	*1	*1	*1	10.0	10.0	10	*1	Yes
	2450	Bottom	*1	*1	*1	*1	10.0	10.0	10	*1	No

1.7. Test Specification, Methods and Procedures

Test Specification

☒	FCC 47 CFR 2.1093		Radiofrequency radiation exposure evaluation: portable devices

Test Methods

☒	IEEE Std 1528-2013		IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
☐	KDB 248227 D01	v02r02	SAR Guidance for IEEE 802.11 (Wi-Fi) Transmitters
☒	KDB 447498 D01	v06	Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies
☐	KDB 447498 D02	v02r01	SAR Measurement Procedures for USB Dongle Transmitters
☐	KDB 615223 D01	v01r01	802.16e/WiMax SAR Measurement Guidance
☐	KDB 616217 D04	v01r02	SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers
☐	KDB 643646 D01	v01r03	SAR Test Reduction Considerations for Occupational PTT Radios
☐	KDB 648474 D03	v01r04	Evaluation and Approval Considerations for Handsets with Specific Wireless Charging Battery Covers
☐	KDB 648474 D04	v01r03	SAR Evaluation Considerations for Wireless Handsets
☒	KDB 865664 D01	v01r04	SAR Measurement Requirements for 100 MHz to 6 GHz
☐	KDB 941225 D01	v03r01	3G SAR Measurement Procedures
☐	KDB 941225 D05	v02r05	SAR Evaluation Considerations for LTE Devices
☐	KDB 941225 D06	v02r01	SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities
☐	KDB 941225 D07	v01r02	SAR Evaluation Procedures for UMPC Mini-Tablet Devices

Test Procedures

The SAR tests were performed according to the procedures of
Sony Global Manufacturing & Operations Corporation EMC/RF Test Laboratory,
the Document No. NV3-2 and NV3-16, available upon request.

☒ No deviation from the procedures
☐ Deviation from the procedures
☐ ______________________________

References

[1] ICNIRP. Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz). Health Physics 74(4): 494-522, 1998.
[2] American National Standards Institute (ANSI), "Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz," ANSI/IEEE C95.1-1992.
[3] Health Canada, "Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3 kHz to 300 GHz," Safety Code 6 (2009).
[4] European Council Recommendation 1999/519/EC of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz) (Official Journal L 199 of 30 July 1999).
[5] REDCA Technical Guidance Note 20 (TGN 20), SAR Testing and Assessment Guidance, Version 5.0, July 2017.
[6] Australian Communications and Media Authority (ACMA),Radiocommunications (Electromagnetic Radiation - Human Exposure) Standard 2014.
[7] TCB Workshop April 2019; RF Exposure Procedures (Tissue Simulating Liquids)
[8] Schmid & Partner Engineering AG (SPEAG), DASY52 System Handbook, April 2014.
[9] Schmid & Partner Engineering AG (SPEAG), Safety Data Sheet, Doc No 772-SLAAx0yy-J, June 14, 2013.
[10] Schmid & Partner Engineering AG (SPEAG), Safety Data Sheet, Doc No 772-SLAAx1yy-I, October 18, 2013.
[11] Schmid & Partner Engineering AG (SPEAG), Safety Data Sheet, Doc No 772-SLAAx6yy-H, September 26, 2013.
[12] Schmid & Partner Engineering AG (SPEAG), Material Safety Data Sheet, Doc No 772-SLAAH502A-D, August 9, 2013.
[13] Schmid & Partner Engineering AG (SPEAG), Material Safety Data Sheet, Doc No 772-SLAAx4yy-J, August 9, 2013.
[14] Schmid & Partner Engineering AG (SPEAG), Material Safety Data Sheet, Doc No 772-SLAAHxU16B-C, June 9, 2015.

1.8. Test Facilities and Accreditation

Test Facilities

Test Facility Name	: Sony Global Manufacturing & Operations Corporation EMC/RF Test Laboratory, Main Lab.
Address	: 8-4 Shiomi Kisarazu-shi Chiba-ken, 292-0834, Japan
Shielded Room Used	: ☒ 4th Site Shielded Room 2 ☐ 4th Site Shielded Room 3

A2LA Accreditation

Certificate No.	: 3203.01
Expiration	: October 31, 2021

2. Test Set-up

2.1. Test Equipment and Measurement Software Lists

Table 2-1 Test Equipment List

Used	Control No.	Equipment Description	Model No.	Serial No.	Manufacturer	Cal. Int.	Last Cal.	Note(s)
☒	W0128	Robot	TX60 L	F14/5VR2B1/A/01	Staubli	N/A	N/A *1	
☐	W0124	Robot	RX60B L	F04/5Z71A1/A/03	Staubli	N/A	N/A *1	
☒	WA0002	E-Field Probe	EX3DV4	3921	SPEAG	1Y	20.10.21	
☐	WA0052	E-Field Probe	EX3DV4	7452	SPEAG	1Y	20.03.13	
☐	W0095	Data Acquisition Electronics	DAE4	482	SPEAG	1Y	20.09.10	
☒	W0096	Data Acquisition Electronics	DAE4	610	SPEAG	1Y	20.01.10	
☐	W0081	Twin SAM Phantom	Twin SAM	TP-1441	SPEAG	N/A	N/A *1	
☐	W0082	Twin SAM Phantom	Twin SAM	TP-1325	SPEAG	N/A	N/A *1	
☐	W0126	Twin SAM Phantom	Twin SAM	TP-1851	SPEAG	N/A	N/A *1	
☐	W0127	Twin SAM Phantom	Twin SAM	TP-1852	SPEAG	N/A	N/A *1	
☒	W0119	ELI Phantom	ELI V5.0	1259	SPEAG	N/A	N/A *1	
☒	WA0026	System Validation Dipole	D2450V2	936	SPEAG	1Y	20.06.12	
☐	WA0028	System Validation Dipole	D5GHzV2	1183	SPEAG	1Y	20.06.17	
☒	W0121	Vector Reflectometer	DAKS_VNA R140	0111013	Copper Mountain Technologies	1Y	20.06.20	
☒	WA0029	Dielectric Probe	DAKS-3.5	1034	SPEAG	1Y	20.07.15	
☒	M0913	Signal Generator	SMR40	100360	Rohde&Schwarz	1Y	20.10.03	
☒	W0122	Power Amp	CGA020M602-2633R	B40550	R&K	N/A	N/A *1	
☒	W0104	Power Sensor	U2021XA	MY54040006	Agilent	1Y	20.10.03	
☒	W0105	Power Sensor	U2021XA	MY54080005	Agilent	1Y	20.10.03	
☒	W0120	Directional Coupler	4226-20	-	narda	1Y	20.10.03	
☒	W0117	Attenuator	8493B 3 dB	MY39260857	Agilent	1Y	20.10.03	
☒	W0118	Attenuator	AT-110 10 dB	932968	Hirose	1Y	20.10.03	
☒	W0148	Attenuator	AT-103 3 dB	980711	Hirose	1Y	20.10.03	
☐	WC0022	RF Cable	SUCOFLEX 106	503094/6	HUBER+SUHNER	1Y	20.10.03	
☒	WC0017	RF Cable	SUCOFLEX 104	253269/4	HUBER+SUHNER	1Y	20.10.03	
☒	WC0024	RF Cable	SUCOFLEX 126E	MY1150/26E	HUBER+SUHNER	1Y	20.10.03	
☒	WC0025	RF Cable	SUCOFLEX 104	MY37246/4	HUBER+SUHNER	1Y	20.10.03	
☒	WC0021	RF Cable	SUCOFLEX 106	503095/6	HUBER+SUHNER	1Y	20.10.03	
☐	M5061	Thermometer	0560 6220	39515471/801	testo	1Y	20.04.17	
☐	M5152	Thermometer	608-H2	41475965	testo	1Y	20.11.05	
☒	M5292	Thermometer	608-H2	41476142	testo	1Y	20.10.02	
☐	W0112	Water Thermometer	735-1	02736130	testo	1Y	20.09.08	
☒	W0113	Water Thermometer	735-1	02788580	testo	1Y	20.07.13	
☐	W0116	Water Thermometer	735-1	02788596	testo	1Y	20.08.06	

Note(s):
* The calibration is valid until the end of the expiration month.
*1 In-house verification is conducted periodically.

Table 2-2 Measurement Software List

Used	Control No.	Software Description	Model No.	Ver.	Manufacturer
☐	SW-0401	SAR measurement software	DASY52	52.10.4.1527	SPEAG
☐	SW-0402	SAR post-processing software	SEMCAD X	14.6.14.7483	SPEAG
☒	SW-0403	Dielectric measurement software	DAK	2.6.0.5	SPEAG
☒	SW-0404	SAR measurement software	DASY52	52.10.4.1527	SPEAG
☒	SW-0405	SAR post-processing software	SEMCAD X	14.6.14.7483	SPEAG
☐	SW-0406	SAR measurement spreadsheet	-	1.00	Main Lab.
☒	SW-0314	Power measurement software	N1918A	R03.09.00	Agilent

2.2. Measurement System Description

The DASY5 system for performing compliance tests consists of the following items:

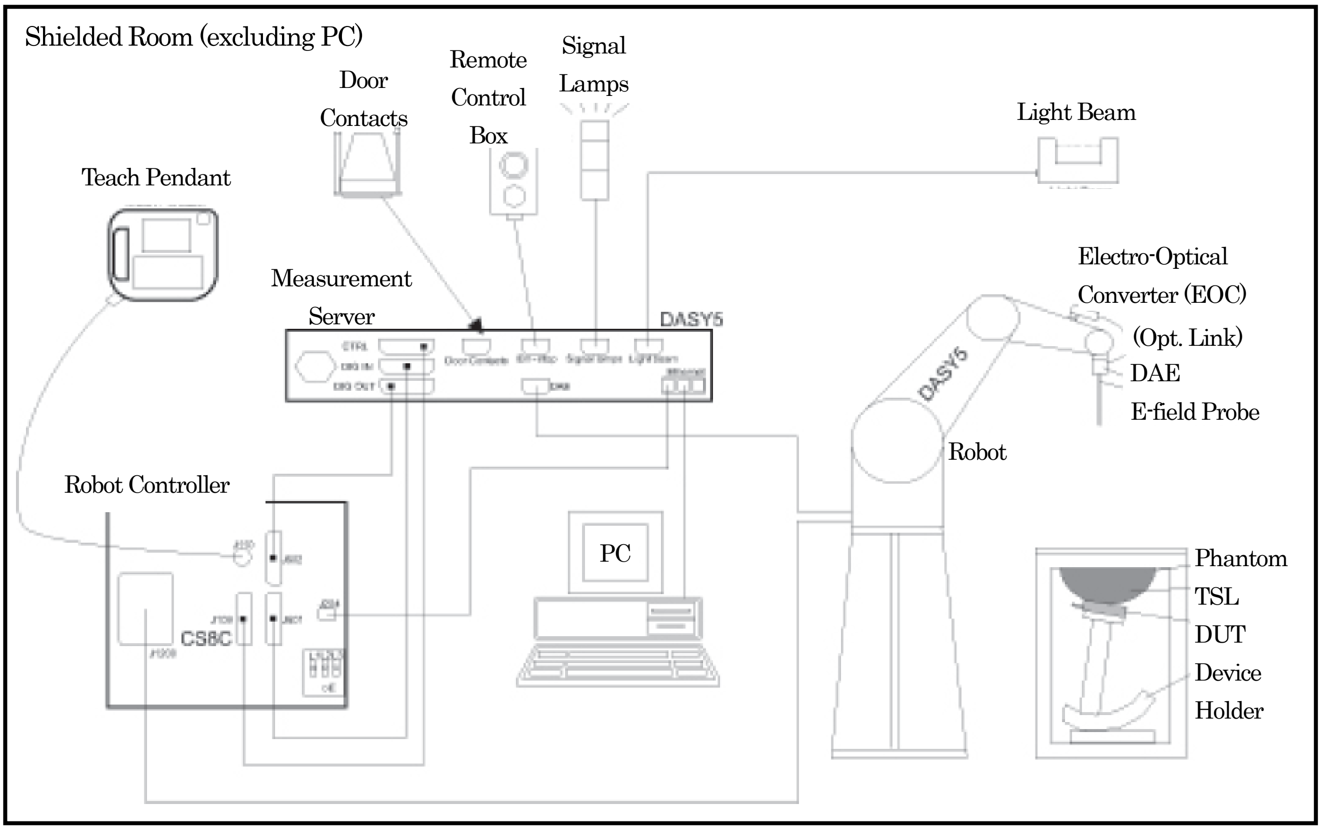


Figure 2-1 Measurement System Description

- A standard high precision 6-axis robot (Staubli TX/RX family) 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. 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 Win7 professional operating system and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantoms (the Twin SAM and/or ELI phantoms) enabling the testing of handheld (left-hand and right-hand) and/or body-mounted usage.
- The device holders for handheld mobile phones and/or larger devices (e.g., laptops, cameras, etc.).
- Tissue simulating liquid (TSL) mixed according to the given recipes.
- System Validation Dipole Kits allowing to validate the proper functioning of the system.

2.3. Measurement System Main Components

Robot (Positioner)

	Shielded Room 2	Shielded Room 3
Manufacturer	Staubli SA	
Model No.	TX60L	RX60BL
Number of Axis	6	
Reach at Wrist	920 mm	865 mm
Repeatability	+/- 0.03 mm	+/- 0.033 mm
Nominal Load Capacity	2 kg	1.5 kg
Maximum Load Capacity	5 kg	2.5 kg
Control Unit	CS8c	CS7m
Weight	52.2 kg	45 kg

E-Field Probe

Manufacturer	Schmid & Partner Engineering AG (SPEAG)
Model No.	EX3DV4
Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 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 to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 µW/g)
Dimensions	Overall length: 337 mm (Tip length: 20 mm) Tip diameter: 2.5 mm (Body diameter: 12 mm) Typical distance from probe tip to dipole centers: 1 mm

Data Acquisition Electronics (DAE)

Manufacturer	Schmid & Partner Engineering AG (SPEAG)
Model No.	DAE4
Construction	Signal amplifier, multiplexer, A/D converter, and control logic Serial optical link for communication with DASY4/5 embedded system (fully remote controlled) Two-step probe touch detector for mechanical surface detection and emergency robot stop
Measurement Range	-100 to +300 mV (16 bit resolution and two range settings: 4 mV, 400 mV)
Input Offset Voltage	< 5 µV (with auto zero)
Input Resistance	200 MΩ
Input Bias Current	< 50 fA
Battery Power	> 10 hours of operation (with two 9.6 V NiMH accus)
Dimensions (L x W x H)	60 x 60 x 68 mm

DASY5 Measurement Server

Manufacturer	Schmid & Partner Engineering AG (SPEAG)
Model No.	DASY5 Measurement Server
CPU	Intel ULV Celeron 400 MHz
Chip-Disk	128 MB
RAM	128 MB
Construction	16 Bit A/D converter for surface detection system Vacuum Fluorescent Display
I/O Interface	Robot Interface / Serial link to DAE (with watchdog supervision) / Door contact port / Emergency stop port (to connect the remote control) / Signal lamps port / Light beam port / Three Ethernet connection ports (for PC, Control Unit, and future applications) / Two USB 2.0 ports (for installation and advanced troubleshooting by SPEAG) / Two serial links (for future applications) / Expansion port (for future applications)
Dimensions (L x W x H)	440 x 241 x 89 mm

Phantoms (Twin SAM Phantom)

Manufacturer	Schmid & Partner Engineering AG (SPEAG)
Model No.	Twin SAM
Description	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot. Twin SAM V5.0 has the same shell geometry and is manufactured from the same material as Twin SAM V4.0, but has reinforced top structure.
Material	Vinylester, glass fiber reinforced (VE-GF)
Liquid Compatibility	Compatible with all SPEAG tissue simulating liquids (incl. DGBE type)
Shell Thickness	2 ± 0.2 mm (6 ± 0.2 mm at ear point)
Dimensions	Length: 1000 mm Width: 500 mm Height: adjustable feet
Filling Volume	Approx. 25 liters
Wooden Support	SPEAG standard phantom table

Phantoms (ELI Phantom)

Manufacturer	Schmid & Partner Engineering AG (SPEAG)
Model No.	ELI V5.0
Description	Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles. ELI V5.0 has the same shell geometry and is manufactured from the same material as ELI4, but has reinforced top structure.
Material	Vinylester, glass fiber reinforced (VE-GF)
Liquid Compatibility	Compatible with all SPEAG tissue simulating liquids (incl. DGBE type)
Shell Thickness	2.0 ± 0.2 mm (bottom plate)
Dimensions	Major axis: 600 mm Minor axis: 400 mm
Filling Volume	Approx. 30 liters
Wooden Support	SPEAG standard phantom table

Device Holder (Mounting Device for Hand-Held Transmitters)

Manufacturer	Schmid & Partner Engineering AG (SPEAG)
Model No.	MD4HHTV5
Description	In combination with the Twin SAM 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).
Material	Polyoxymethylene (POM)

Device Holder (Mounting Device Adaptor for Ultra Wide Transmitters)

Manufacturer	Schmid & Partner Engineering AG (SPEAG)
Model No.	MDA4WTV5
Description	An 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 140mm.
Material	Polyoxymethylene (POM)

Device Holder (Mounting Device Adaptor for Laptops)

Manufacturer	Schmid & Partner Engineering AG (SPEAG)
Model No.	MDA4LAP
Description	A simple but effective and easy-to-use extension for the Mounting Device; facilitates testing of larger devices according to IEC 62209-2 (e.g., laptops, cameras, etc.); lightweight and fits easily on the upper part of the Mounting Device in place of the phone positioner. The extension is fully compatible with the Twin SAM, ELI Phantoms.
Material	Polyoxymethylene (POM), PET-G, Foam

System Validation Dipole Kits

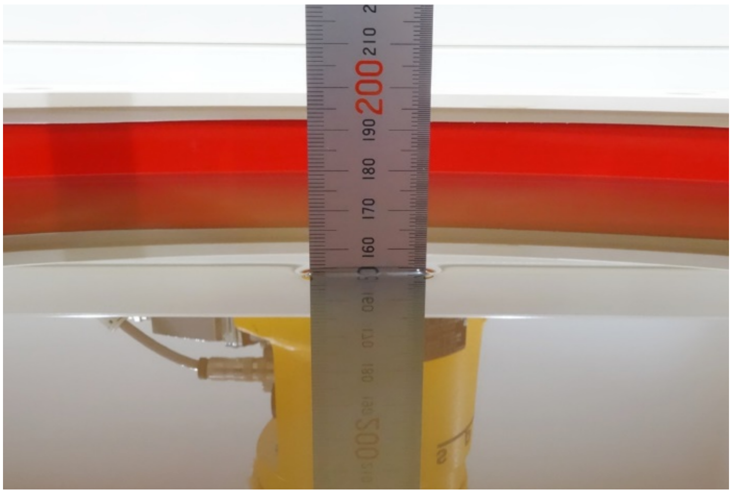
Manufacturer	Schmid & Partner Engineering AG (SPEAG)		
Model No.	D-Series		
Construction	Symmetrical dipole with l/4 balun Enables measurement of feedpoint impedance with NWA Matched for use near flat phantoms filled with tissue simulating solutions		
Frequency	2450, 5100 to 5800 MHz		
Return Loss	> 20 dB at specified validation position		
Power Capability	> 100 W (f < 1 GHz); > 40 W (f > 1 GHz)		
Accessories	Distance holder, tripod adaptor, tripod		
Dimensions	Product	Dipole length	Overall height
	D2450V2	52.0 mm	290.0 mm
	D5GHzV2	20.6 mm	300.0 mm

2.4. Tissue Simulating Liquids

Recipes for tissue simulating liquids manufactured by SPEAG

Ingredients (% by weight)	Frequency (MHz)					
	1900 to 3800		3500 to 5800		600 to 6000	
Used	☐	☐	☐	☐	☒	☐
Tissue Simulating Liquids	HBBL 1900-3800 V3	MBBL 1900-3800 V3	HBBL 3500-5800 V5	MBBL 3500-5800 V5	HBBL 600-6000 V6	MBBL 600-6000 V6
Tissue Type	Head	Body	Head	Body	Head	Body
H_2O	50 – 73 %		50 – 65 %	60 – 80 %	–	
Non-ionic detergents	25 – 50 %		–	–	–	
NaCl	0 – 2 %		0 – 1.5 %	0 – 1.5 %	–	
Preventol-D7	0.05 – 0.1 %		–	–	–	
Ethanediol	–		–	–	1.0 – 4.9 %	
Sodium Petroleum Sulfonate	–		–	–	< 2.9 %	
Hexylene Glycol	–		–	–	< 2.9 %	
Alkoxylated Alcohol	–		–	–	< 2.0 %	
Mineral Oil	–		10 – 30 %	–	< 20 %	
Emulsifiers	–		8 – 25 %	20 – 40 %	–	

For the SAR measurement, the phantom must be filled with tissue simulating liquid to a depth of at least 15 cm.



HBBL600-6000 V6

Figure 2-2 Photos: Liquid Depth (at the center of the flat phantom)

2.5. SAR Measurement

Step 1: Power Reference Measurement
Before an area scan and after the zoom scan, single point SAR measurements are performed at defined locations to estimate the SAR measurement drift due to device output power variations.

Step 2: Area Scan
An area scan is performed according to the requirements in Table 2-3.

Step 3: Zoom Scan
A zoom scan is performed according to the requirements in Table 2-3.

Step 4: Power Drift Measurement
Before an area scan and after the zoom scan, single point SAR measurements are performed at defined locations to estimate the SAR measurement drift due to device output power variations.

Table 2-3 Area Scan and Zoom Scan Parameters

<table>
<tr><th colspan="3" rowspan="2"></th><th colspan="2">DUT Transmit Frequency being Tested</th></tr>
<tr><th>≤ 3 GHz</th><th>> 3 GHz</th></tr>
<tr><td colspan="3">Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 ± 1 mm</td><td>½ δ ln(2) ± 0.5 mm</td></tr>
<tr><td colspan="3">Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30° ± 1°</td><td>20° ± 1°</td></tr>
<tr><td colspan="3" rowspan="2">Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}</td><td>≤ 2 GHz: ≤ 15 mm
2 – 3 GHz: ≤ 12 mm</td><td>3 – 4 GHz: ≤ 12 mm
4 – 6 GHz: ≤ 10 mm</td></tr>
<tr><td colspan="2">When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}</td><td>≤ 2 GHz: ≤ 8 mm
2 – 3 GHz: ≤ 5 mm</td><td>3 – 4 GHz: ≤ 5 mm
4 – 6 GHz: ≤ 4 mm</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>≤ 5 mm</td><td>3 – 4 GHz: ≤ 4 mm
4 – 5 GHz: ≤ 3 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>≤ 4 mm</td><td>3 – 4 GHz: ≤ 3 mm
4 – 5 GHz: ≤ 2.5 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">≤ 1.5 $\cdot \Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>≥ 30 mm</td><td>3 – 4 GHz: ≥ 28 mm
4 – 5 GHz: ≥ 25 mm
5 – 6 GHz: ≥ 22 mm</td></tr>
<tr><td colspan="5">Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium.</td></tr>
</table>

2.6. Measurement Uncertainty

☒ Table 2-4 DASY5 Uncertainty Budget for SAR Tests

According to IEEE Std 1528-2013 (0.3GHz to 3GHz range)								
Input quantity	Uncertainty of Xi			Ci		Ciu(Xi)		Vi Veff
	Xi	Prob. Dist.	Div.	1g [-]	10g [-]	1g	10g	
Measurement System								
Probe Calibration (k=1)	±6.0%	N	1.00	1.00	1.00	±6.0%	±6.0%	∞
Axial Isotropy	±4.7%	R	1.73	0.70	0.70	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.7%	R	1.73	0.70	0.70	±3.9%	±3.9%	∞
Boundary Effects	±1.0%	R	1.73	1.00	1.00	±0.6%	±0.6%	∞
Linearity	±4.7%	R	1.73	1.00	1.00	±2.7%	±2.7%	∞
System Detection Limits	±0.3%	R	1.73	1.00	1.00	±0.1%	±0.1%	∞
Modulation Response	±2.4%	R	1.73	1.00	1.00	±1.4%	±1.4%	∞
Readout Electronics	±0.3%	N	1.00	1.00	1.00	±0.3%	±0.3%	∞
Response Time	±0.8%	R	1.73	1.00	1.00	±0.5%	±0.5%	∞
Integration Time	±2.6%	R	1.73	1.00	1.00	±1.5%	±1.5%	∞
RF Ambient Noise	±0.2%	R	1.73	1.00	1.00	±0.1%	±0.1%	∞
RF Ambient Reflections	±0.0%	R	1.73	1.00	1.00	±0.0%	±0.0%	∞
Probe Positioner	±0.4%	R	1.73	1.00	1.00	±0.2%	±0.2%	∞
Probe Positioning	±2.9%	R	1.73	1.00	1.00	±1.7%	±1.7%	∞
Max. SAR Eval.	±2.0%	R	1.73	1.00	1.00	±1.2%	±1.2%	∞
Test Sample Related								
Device Positioning	±1.8%	N	1.00	1.00	1.00	±1.8%	±1.8%	14
Device Holder	±3.6%	N	1.00	1.00	1.00	±3.6%	±3.6%	5
Power Drift	±5.0%	R	1.73	1.00	1.00	±2.9%	±2.9%	∞
Power Scaling	±0.0%	R	1.73	1.00	1.00	±0.0%	±0.0%	∞
Phantom and Setup								
Phantom Uncertainty	±7.2%	R	1.73	1.00	1.00	±4.2%	±4.2%	∞
SAR Correction	±1.9%	R	1.73	1.00	0.84	±1.1%	±0.9%	∞
Liquid Conductivity (mea.)	±2.5%	R	1.73	0.78	0.71	±1.1%	±1.0%	∞
Liquid Permittivity (mea.)	±2.5%	R	1.73	0.23	0.26	±0.3%	±0.4%	∞
Temp. Unc. - Conductivity	±3.4%	R	1.73	0.78	0.71	±1.5%	±1.4%	∞
Temp. Unc. - Permittivity	±0.4%	R	1.73	0.23	0.26	±0.1%	±0.1%	∞
Combined Standard Uncertainty						±10.9%	±10.8%	405
Expanded Uncertainty (95% conf. interval)			k=2			±21.7%	±21.6%	

☒ Table 2-5 DASY5 Uncertainty Budget for SAR Tests

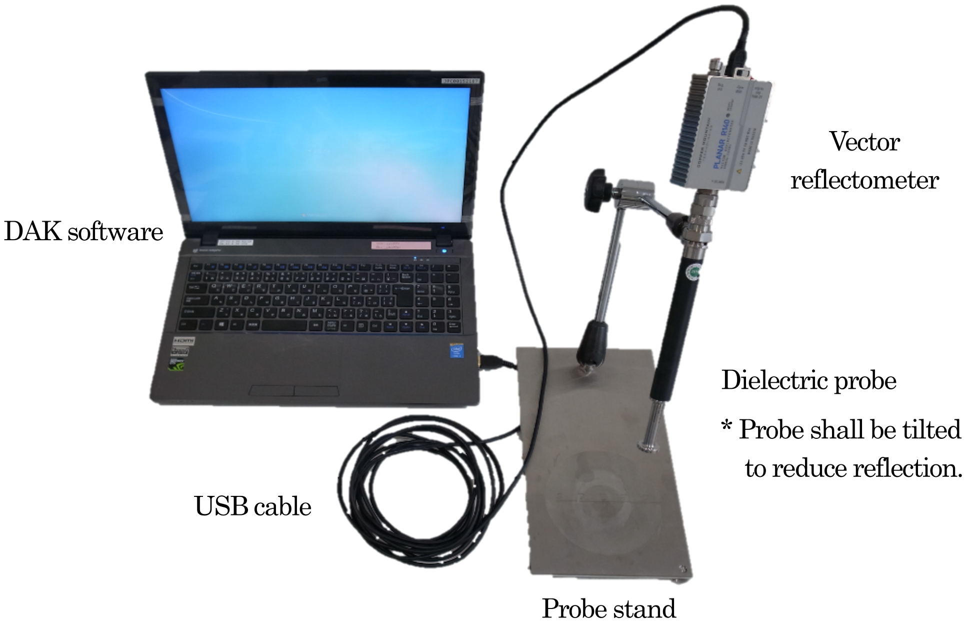
According to IEEE Std 1528-2013 (3GHz to 6GHz range)								
Input quantity	Uncertainty of Xi			Ci		Ciu(Xi)		Vi Veff
	Xi	Prob. Dist.	Div.	1g [-]	10g [-]	1g	10g	
Measurement System								
Probe Calibration (k=1)	±6.55%	N	1.00	1.00	1.00	±6.6%	±6.6%	∞
Axial Isotropy	±4.7%	R	1.73	0.70	0.70	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.7%	R	1.73	0.70	0.70	±3.9%	±3.9%	∞
Boundary Effects	±2.0%	R	1.73	1.00	1.00	±1.2%	±1.2%	∞
Linearity	±4.7%	R	1.73	1.00	1.00	±2.7%	±2.7%	∞
System Detection Limits	±0.3%	R	1.73	1.00	1.00	±0.1%	±0.1%	∞
Modulation Response	±2.4%	R	1.73	1.00	1.00	±1.4%	±1.4%	∞
Readout Electronics	±0.3%	N	1.00	1.00	1.00	±0.3%	±0.3%	∞
Response Time	±0.8%	R	1.73	1.00	1.00	±0.5%	±0.5%	∞
Integration Time	±2.6%	R	1.73	1.00	1.00	±1.5%	±1.5%	∞
RF Ambient Noise	±0.2%	R	1.73	1.00	1.00	±0.1%	±0.1%	∞
RF Ambient Reflections	±0.0%	R	1.73	1.00	1.00	±0.0%	±0.0%	∞
Probe Positioner	±0.8%	R	1.73	1.00	1.00	±0.5%	±0.5%	∞
Probe Positioning	±6.7%	R	1.73	1.00	1.00	±3.9%	±3.9%	∞
Max. SAR Eval.	±4.0%	R	1.73	1.00	1.00	±2.3%	±2.3%	∞
Test Sample Related								
Device Positioning	±1.8%	N	1.00	1.00	1.00	±1.8%	±1.8%	14
Device Holder	±3.6%	N	1.00	1.00	1.00	±3.6%	±3.6%	5
Power Drift	±5.0%	R	1.73	1.00	1.00	±2.9%	±2.9%	∞
Power Scaling	±0.0%	R	1.73	1.00	1.00	±0.0%	±0.0%	∞
Phantom and Setup								
Phantom Uncertainty	±7.6%	R	1.73	1.00	1.00	±4.4%	±4.4%	∞
SAR Correction	±1.9%	R	1.73	1.00	0.84	±1.1%	±0.9%	∞
Liquid Conductivity (mea.)	±2.5%	R	1.73	0.78	0.71	±1.1%	±1.0%	∞
Liquid Permittivity (mea.)	±2.5%	R	1.73	0.23	0.26	±0.3%	±0.4%	∞
Temp. Unc. - Conductivity	±3.4%	R	1.73	0.78	0.71	±1.5%	±1.4%	∞
Temp. Unc. - Permittivity	±0.4%	R	1.73	0.23	0.26	±0.1%	±0.1%	∞
Combined Standard Uncertainty						±12.0%	±12.0%	605
Expanded Uncertainty (95% conf. interval)			k=2			±24.0%	±23.9%	

☒ Table 2-6 DASY5 Uncertainty Budget for SAR System Check

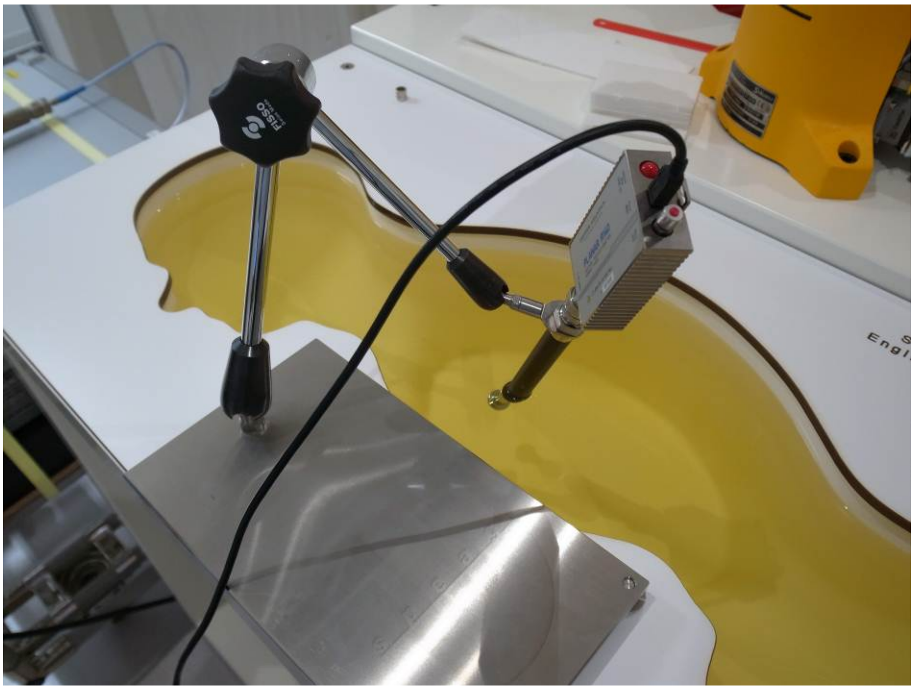
According to IEEE Std 1528-2013 (0.3GHz to 6GHz range)								
Input quantity	Uncertainty of Xi			Ci		Ciu(Xi)		Vi Veff
	Xi	Prob. Dist.	Div.	1g [-]	10g [-]	1g	10g	
Measurement System								
Probe Calibration (k=1)	±6.55%	N	1.00	1.00	1.00	±6.6%	±6.6%	∞
Axial Isotropy	±4.7%	R	1.73	0.70	0.70	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.7%	R	1.73	0.70	0.70	±3.9%	±3.9%	∞
Boundary Effects	±2.0%	R	1.73	1.00	1.00	±1.2%	±1.2%	∞
Linearity	±4.7%	R	1.73	1.00	1.00	±2.7%	±2.7%	∞
System Detection Limits	±0.3%	R	1.73	1.00	1.00	±0.1%	±0.1%	∞
Modulation Response	±0.0%	R	1.73	1.00	1.00	±0.0%	±0.0%	∞
Readout Electronics	±0.3%	N	1.00	1.00	1.00	±0.3%	±0.3%	∞
Response Time	±0.0%	R	1.73	1.00	1.00	±0.0%	±0.0%	∞
Integration Time	±0.0%	R	1.73	1.00	1.00	±0.0%	±0.0%	∞
RF Ambient Noise	±1.0%	R	1.73	1.00	1.00	±0.6%	±0.6%	∞
RF Ambient Reflections	±1.0%	R	1.73	1.00	1.00	±0.6%	±0.6%	∞
Probe Positioner	±0.8%	R	1.73	1.00	1.00	±0.5%	±0.5%	∞
Probe Positioning	±6.7%	R	1.73	1.00	1.00	±3.9%	±3.9%	∞
Max. SAR Eval.	±4.0%	R	1.73	1.00	1.00	±2.3%	±2.3%	∞
Dipole Related								
Deviation of exp. Dipole	±5.5%	R	1.73	1.00	1.00	±3.2%	±3.2%	∞
Dipole Axis to Liquid Dist.	±2.0%	R	1.73	1.00	1.00	±1.2%	±1.2%	∞
Inoput Power & SAR Drift	±3.4%	R	1.73	1.00	1.00	±2.0%	±2.0%	∞
Phantom and Setup								
Phantom Uncertainty	±7.6%	R	1.73	1.00	1.00	±4.4%	±4.4%	∞
SAR Correction	±1.9%	R	1.73	1.00	0.84	±1.1%	±0.9%	∞
Liquid Conductivity (mea.)	±2.5%	N	1.00	0.78	0.71	±2.0%	±1.8%	∞
Liquid Permittivity (mea.)	±2.5%	N	1.00	0.23	0.26	±0.6%	±0.7%	∞
Temp. Unc. - Conductivity	±3.4%	R	1.73	0.78	0.71	±1.5%	±1.4%	∞
Temp. Unc. - Permittivity	±0.4%	R	1.73	0.23	0.26	±0.1%	±0.1%	∞
Combined Standard Uncertainty						±11.6%	±11.5%	
Expanded Uncertainty (95% conf. interval)			k=2			±23.1%	±23.0%	

2.7. Dielectric Parameter Measurement of Tissue Simulating Liquids

The dielectric properties of the tissue simulating liquids used were verified within 24 hours before the SAR measurement.



(a) Dielectric Parameter Measurement System



(b) Example Photo: Dielectric Parameter Measurement

Figure 2-3 Dielectric Parameter Measurement Set-up

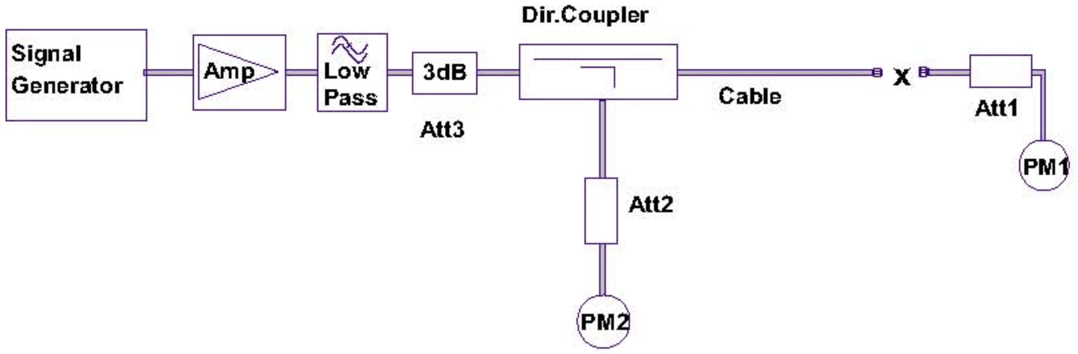
*1 Target values are linearly interpolated between the values defined in KDB 865664 D01, when necessary.
*2 The deviation of measured values from target values must be within +/-5 %.

4th Site Shielded Room 2

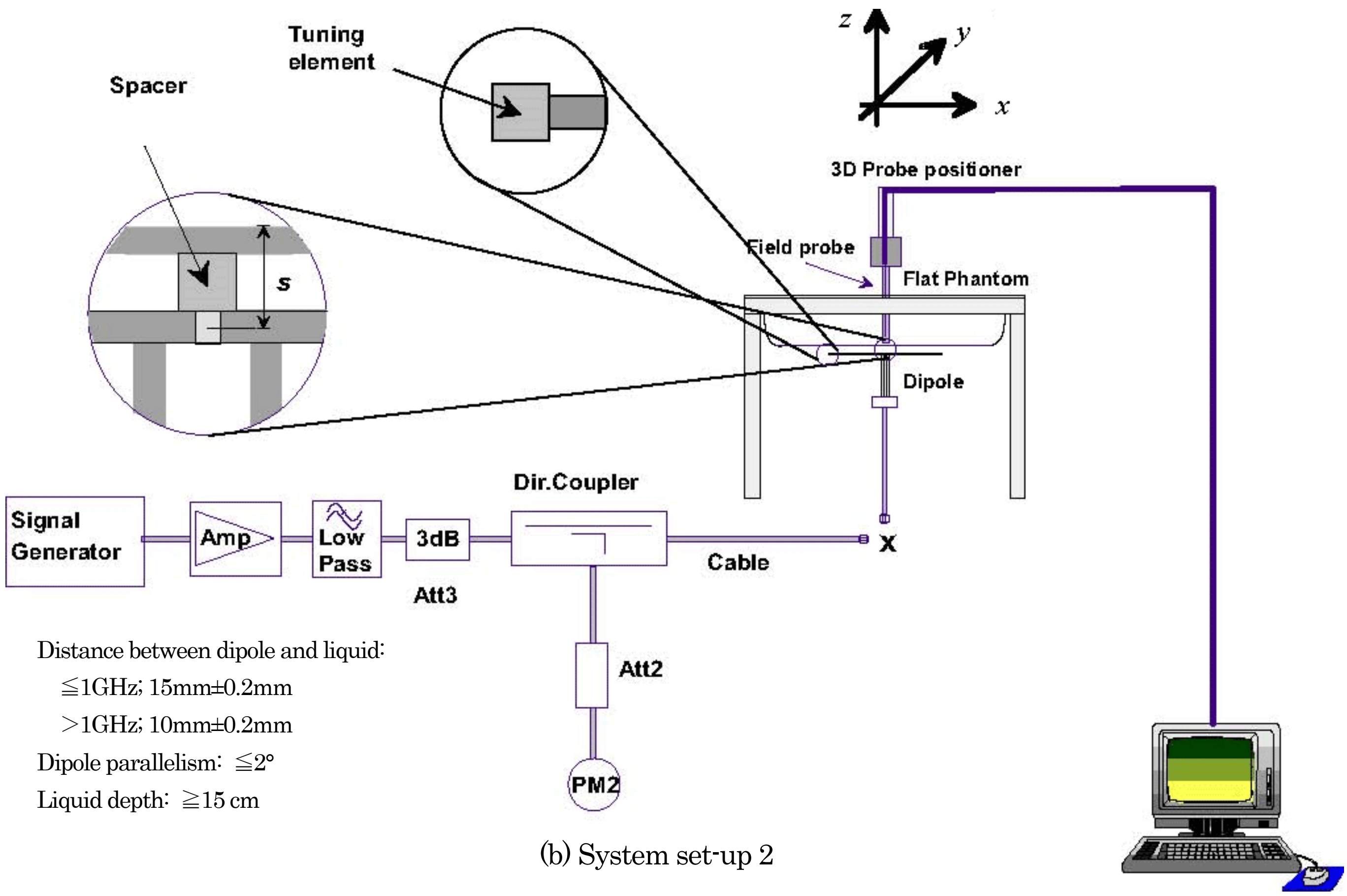
TSL	Freq. (MHz)	Param.	Target *1	Meas.	Dev. (%) *2	Date	Amb. Temp. (deg. C)	Rel. Hum. (%RH)	Liquid Temp. (deg. C)	Note(s)
HBBL 600-6000V6	2402	ε_r	39.29	39.38	0.23	2020/11/13	21.2	42.2	20.2	
		σ (S/m)	1.76	1.83	3.98					
	2441	ε_r	39.22	39.32	0.25					
		σ (S/m)	1.79	1.86	3.91					
	2480	ε_r	39.16	39.25	0.23					
		σ (S/m)	1.83	1.90	3.83					

2.8. System Check Measurement

The system check was performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium.

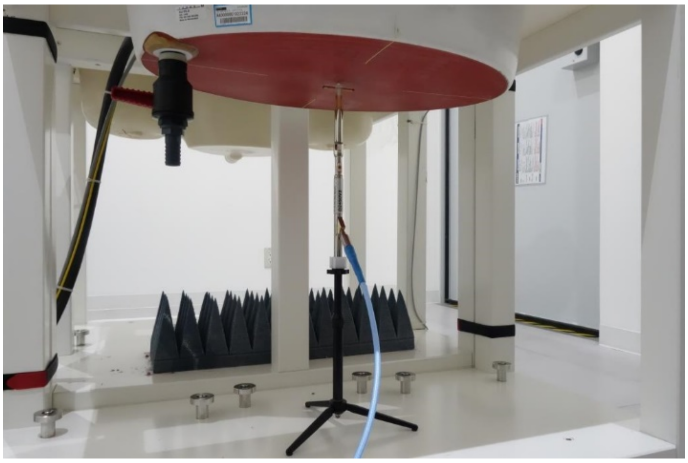


(a) System set-up 1



(b) System set-up 2

Figure 2-4 System Check Measurement Set-up



(c) Photo: System Validation Dipole Placement

Figure 2-4 System Check Measurement Set-up (continued)

*1 The normalized values (1 W) were calculated by normalizing the measured values to 1-W forward input power.
*2 The target values (1 W) are defined in IEEE Std 1528 and/or the calibration certificate of system validation dipoles used.
*3 The deviation of normalized values from target values must be within +/-10 %.

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System Validation Dipole	Freq. (MHz)	Param.	250 mW-Meas. (W/kg)	1 W-Norm. (W/kg) *1	1 W-Target (W/kg) *2	Dev. (%) *3	Date	Amb. Temp. (deg. C)	Rel. Hum. (%RH)	Liquid Temp. (deg. C)	Note(s)
D2450V2	2450	1-g SAR	14.10	56.40	52.10	8.25	2020/11/13	21.6	42.0	20.2	
		10-g SAR	6.55	26.20	24.00	9.17					

3. Conducted Power Measurements

□<The Initial Test Configuration Procedures for Wi-Fi>

According to KDB 248227 D01,

the initial test configuration is determined by the 802.11 configuration with the highest maximum output power specified for production units, including tune-up tolerance, in each standalone and aggregated frequency band.

When multiple channel bandwidth configurations in a frequency band have the same specified maximum output power, the initial test configuration is determined by applying the following steps sequentially.

1) The largest channel bandwidth configuration is selected among the multiple configurations in a frequency band with the same specified maximum output power.
2) If multiple configurations have the same specified maximum output power and largest channel bandwidth, the lowest order modulation among the largest channel bandwidth configurations is selected.
3) If multiple configurations have the same specified maximum output power, largest channel bandwidth and lowest order modulation, the lowest data rate configuration among these configurations is selected.
4) When multiple transmission modes (802.11a/g/n/ac) have the same specified maximum output power, largest channel bandwidth, lowest order modulation and lowest data rate, the lowest order 802.11 mode is selected; i.e., 802.11a is chosen over 802.11n then 802.11ac or 802.11g is chosen over 802.11n.

3.1. Conducted Power Measurement Results

Bluetooth

Date	:	2020/09/18	Measured by	:	M. Kouga
Amb. Temp.	:	24.7 deg. C	Rel. hum.	:	74.4 %RH

Bluetooth BR

Ch.	Freq. (MHz)	Packet Type	Meas. Frame Averaged Power (dBm)	Meas. Burst Averaged Power (dBm) *1	Max. Poss. Power (dBm)	Within 2 dB of Max. Poss. Power	SAR Tested	Note(s)
0	2402	DH5	**6.14**	9.49	10.0	Yes	Yes	Worst Ch
39	2441	DH5	5.99	9.35	10.0	Yes	Yes	
78	2480	DH5	5.44	8.80	10.0	Yes	Yes	

*1 Used for confirmation that the DUT's output power is within +0/-2 dB of the maximum tune-up tolerance limits (max. poss. power), since the maximum tune-up tolerance limits are defined as burst averaged values.

4. SAR Measurements

☒<SAR Correction/Scaling>

According to KDB 447498 D01, KDB 248227 D01, and/or KDB 865664 D01,
the maximum SAR values are determined by taking account of the following correction or scaling factors.

The maximum 1-g SAR and/or 10-g SAR values (reported SAR) are calculated by applying the ΔSAR positive correction for deviations of the tissue-equivalent liquid and the power scaling for the maximum duty factor and maximum possible power levels (maximum tune-up tolerance limit) to each measured 1-g SAR and/or 10-g SAR value:

Reported SAR (W/kg) = Measured SAR (W/kg) * ΔSAR positive correction factor * Duty cycle scaling factor * Tune-up scaling factor

where;

ΔSAR positive correction factor = (100 - ΔSAR[*1]) / 100

Duty cycle scaling factor = Max. possible duty cycle / Measured duty cycle used for the SAR measurement

Tune-up scaling factor = Max. possible power (mW) / Measured power used for the SAR measurement (mW)

*1 $\Delta SAR (\%) = c_\varepsilon * \Delta\varepsilon_r + c_\sigma * \Delta\sigma$

<For 1-g SAR>

$c_\varepsilon = -7.854 * 10^{-4} f^3 + 9.402 * 10^{-3} f^2 - 2.742 * 10^{-2} f - 0.2026$

$c_\sigma = 9.804 * 10^{-3} f^3 - 8.661 * 10^{-2} f^2 + 2.981 * 10^{-2} f + 0.7829$

<For 10-g SAR>

$c_\varepsilon = 3.456 * 10^{-3} f^3 - 3.531 * 10^{-2} f^2 + 7.675 * 10^{-2} f - 0.1860$

$c_\sigma = 4.479 * 10^{-3} f^3 - 1.586 * 10^{-2} f^2 - 0.1972 f + 0.7717$

where;

- c_ε coefficient representing the sensitivity of SAR to permittivity
- $\Delta\varepsilon_r$ percent change in permittivity
- c_σ coefficient representing the sensitivity of SAR to conductivity
- $\Delta\sigma$ percent change in conductivity
- f frequency in GHz

A negative ΔSAR would translate to a lower measured SAR value than what would be measured if using dielectric properties equal to the target values.

A positive ΔSAR would translate to a higher measured SAR value than what would be measured if using dielectric properties equal to the target values.

SAR correction shall not be made when the ΔSAR has a positive sign to provide a conservative SAR value.

The SAR is only corrected when ΔSAR has a negative sign.

☐<SAR Test Reduction for Wi-Fi>

SAR test reduction for Wi-Fi is applied according to KDB 248227 D01.

For 2.4 GHz 802.11g/n OFDM configurations

SAR is not required for the following 2.4 GHz OFDM conditions.

1) When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.
2) When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg or 3 W/kg (1-g or 10-g respectively).

For U-NII-1 (W52) and U-NII-2A (W53) Bands

When the same transmitter and antenna(s) are used for U-NII-1 and U-NII-2A bands, additional SAR test reduction applies.

1) When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg or 3 W/kg (1-g or 10-g respectively), SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition); otherwise, each band is tested independently for SAR.
2) When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg or 3 W/kg (1-g or 10-g respectively), SAR is not required for the band with lower maximum output power in that test configuration; otherwise, each band is tested independently for SAR.

4.1. SAR Measurement Results

<Body-Worn SAR>

Bluetooth

Date : 2020/11/13 Measured by : S. Fukushima
Amb. Temp. : 23.3 deg. C Rel. hum. : 40.8 %RH

Mode	Ch.	Freq. (MHz)	Position	Dis. (mm)	Max. Poss. Power (dBm)	Meas. Power (dBm)	Max. Duty Cycle (%)	Meas. Duty Cycle (%)	Meas. 1-g SAR (W/kg)	Reported 1-g SAR (W/kg)	Liquid Temp. (deg. C)	Plot No.
Step 1: Worst Position Check												
DH5	0	2402	Front	0	10.00	9.49	50.00	46.17	0.068	0.083	20.5	
			Left		10.00	9.49	50.00	46.17	0.061	0.074	20.6	
			Right		10.00	9.49	50.00	46.17	0.068	0.083	20.6	
			Top		10.00	9.49	50.00	46.17	0.199	**0.242**	20.6	1
Step 2: Worst Channel Check (for Step 1)												
DH5	39	2441	Top	0	10.00	9.35	50.00	46.17	0.176	0.221	20.7	
	78	2480			10.00	8.80	50.00	46.17	0.100	0.143	20.7	

*1 The burst averaged power values are used for power scaling since the maximum tune-up tolerance limits are defined as burst averaged values.

*2 Reported SAR (W/kg) = Measured SAR (W/kg) * Duty cycle scaling factor * Tune-up scaling factor

where;

Duty cycle scaling factor = Max. possible duty cycle (%) / Measured duty cycle used for the SAR measurement (%)

Tune-up scaling factor = Max. possible power (mW) (* equal to 100% duty cycle) / Measured power used for the SAR measurement (mW)

5. Test Verifications and Procedure

This DUT can be attached to other products recommended by the client (hereinafter referred to as the "Recommended Models") and used with them.
The Recommended Models also use a certified module and have been granted its own equipment authorization through the original certification or Class II permissive change.
Since the DUT and each of the Recommended Models can transmit simultaneously, the SAR was measured with the DUT attached to a representative of the Recommended Models and it was verified that the measured SAR values were within the SAR limits.
All measurements in this section are just for verification, therefore they are just for reference only.

5.1. Verification procedure

The verification was performed according to the following procedure.
Please refer to Appendix D for more details on test positions.

1) Among the Recommended Models, models with higher SAR values of their original certification or Class II permissive change were chosen as representative by the client for this verification.
2) Considering simultaneous transmission, the test position was selected so both the DUT and a representative of the Recommended Models placed as close to the phantom as possible.
3) SAR of the DUT and of the representative of the Recommended Models were measured separately.
4) Simultaneous transmission SAR evaluation was determined according to KDB 447498 D01, Evaluation by summation of Reported SAR values. All measurements in this section are just for verification, therefore they are just for reference only.

SAR Measurement Results (For Reference Only)

Representative of Recomended Model No.	RF Exposure Conditions	Test Position	Highest Reported 1g-SAR (W/kg)				Σ 1-g SAR (W/kg)
			DUT (ECM-W2BT(R))	Recomended Model			
			(1) Bluetooth	(2) Wi-Fi 2.4 GHz	(3) Wi-Fi 5 GHz	(4) Bluetooth	(1)+(2)+(3)+(4)
1DR024 *1	Body-Worn	Front	0.015	0.844	-	-	0.859
1VY001		Front-Right	0.105	0.537	-	-	0.642
1VY002		Front-Tilt (Jack)	0.145	-	-	0.019	0.164
		Front-Tilt (Grip)	0.045	-	0.348	-	0.393

*1 The Recommended Models 1DR011 and 1DR024 were compared in terms of their original SAR values of Class II permissive change, and 1DR024, which has a higher SAR value, was verified as a representative.

Appendix A. Plots of SAR Measurement

Please see the following page(s).

Plot No. 1

Date: 2020/11/13

Test Laboratory: Sony Global Manufacturing & Operations Corporation EMC/RF Test Laboratory Main Lab. 4th Site Shielded Room 2

Bluetooth (0ch)_Body-Worn_Top_0mm

DUT: ECM-W2BT(R)

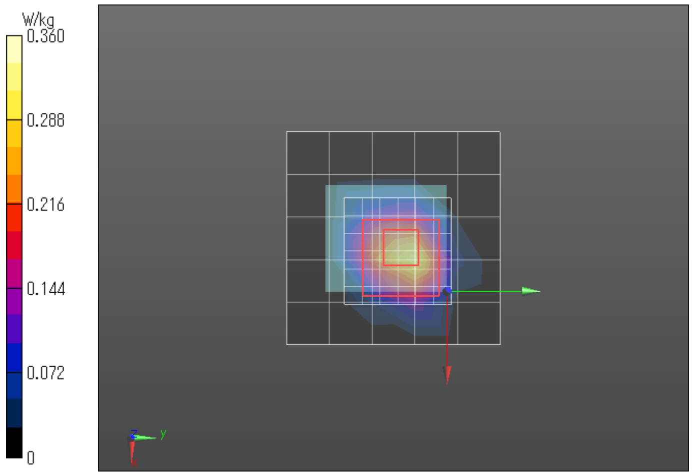
Communication System: UID 0, Bluetooth (0);
Communication System Band: Bluetooth; Frequency: 2402 MHz;
Medium parameters used: f = 2402 MHz; σ = 1.826 S/m; ε_r = 39.378; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3921; ConvF(7.82, 7.82, 7.82) @ 2402 MHz; Calibrated: 2020/10/21
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn610; Calibrated: 2020/01/10
- Phantom: ELI v5.0 (20deg probe tilt); Type: QDOVA002AA; Serial: TP:1259
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Configuration/Bluetooth (0ch)_Body-Worn_Top_0mm/
Area Scan (6x6x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 0.309 W/kg

Configuration/Bluetooth(0ch)_Body-Worn_Top_0mm/
Zoom Scan (7x7x5)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.48 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.525 W/kg
SAR(1 g) = 0.199 W/kg; SAR(10 g) = 0.084 W/kg (SAR corrected for target medium)
Maximum value of SAR (measured) = 0.360 W/kg



Appendix B. Plots of System Check

Please see the following page(s).

Date: 2020/11/13

Test Laboratory: Sony Global Manufacturing & Operations Corporation EMC/RF Test Laboratory Main Lab. 4th Site Shielded Room 2

Validation_D2450_HSL

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 936

Communication System: UID 0, CW (0); Frequency: 2450 MHz

Medium parameters used: f = 2450 MHz; σ = 1.868 S/m; ε_r = 39.3; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3921; ConvF(7.82, 7.82, 7.82) @ 2450 MHz; Calibrated: 2020/10/21
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn610; Calibrated: 2020/01/10
- Phantom: ELI v5.0 (20deg probe tilt); Type: QDOVA002AA; Serial: TP:1259
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

System Performance Check at Frequencies above 2 GHz/Validation D2450 HSL/
Area Scan (8x8x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 19.8 W/kg

System Performance Check at Frequencies above 2 GHz/Validation D2450 HSL/
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 117.0 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 29.3 W/kg

SAR(1 g) = 14.1 W/kg; SAR(10 g) = 6.55 W/kg (SAR corrected for target medium)

Maximum value of SAR (measured) = 23.6 W/kg