SAR Test Report

Test Report No. 14560222S-A-R1

Customer	**OM Digital Solutions Corporation**
Description of EUT	**Wireless LAN/Bluetooth Module**
Model Number of EUT	**S080WIFI-PCA** (*. Installed into the specified platform: Digital Camera)
FCC ID	**YSKW80**
Test Regulation	**FCC 47CFR 2.1093**
Test Result	**Complied**
Issue Date	**May 31, 2023**
Remarks	-

Representative Test Engineer	**Approved By**
Hiroshi Naka Engineer	Toyokazu Imamura Leader

CERTIFICATE 1266.03

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REVISION HISTORY

Original Test Report No.: 14560222S-A

This report is a revised version of 14560222S-A. 14560222S-A is replaced with this report.

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	14560222S-A	April 12, 2023	-
-R1	14560222S-A-R1	May 31, 2023	(p5, 2.2) Corrected mistake. Antenna type: Invert F (was) -> Invert L (new). (p11, 4.2) Corrected mistake. Size of EUT: 28 mm (width) × 32 mm (height) × 2.8 mm (thickness) (was) -> 10 mm (width) × 29.5 mm (height) × 2.8 mm (thickness) (p25, Appendix 3-2-3) Corrected mistake. Conductivity: 1.862 S/m (was) -> 1.863 S/m (new)

Reference : Abbreviations (Including words undescribed in this report) (radio_r0v09s05_230303)

A2LA	The American Association for Laboratory Accreditation
AC	Alternating Current
AFH	Adaptive Frequency Hopping
AM	Amplitude Modulation
Amp, AMP	Amplifier
ANSI	American National Standards Institute
Ant, ANT	Antenna
AP	Access Point
APD	Absorbed Power Density
ASK	Amplitude Shift Keying
Atten., ATT	Attenuator
AV	Average
BPSK	Binary Phase-Shift Keying
BR	Bluetooth Basic Rate
BT	Bluetooth
BT LE	Bluetooth Low Energy
BW	BandWidth
Cal Int	Calibration Interval
CCK	Complementary Code Keying
CDD	Cyclic Delay Diversity
CFR	Code of Federal Regulations
Ch., CH	Channel
CISPR	Comite International Special des Perturbations Radioelectriques
CW	Continuous Wave
DBPSK	Differential BPSK
DC	Direct Current
D-factor	Distance factor
DFS	Dynamic Frequency Selection
DQPSK	Differential QPSK
DSSS	Direct Sequence Spread Spectrum
DUT	Device Under Test
EDR	Enhanced Data Rate
EIRP, e.i.r.p.	Equivalent Isotropically Radiated Power
EMC	ElectroMagnetic Compatibility
EMI	ElectroMagnetic Interference
EN	European Norm
ERP, e.r.p.	Effective Radiated Power
ETSI	European Telecommunications Standards Institute
EU	European Union
EUT	Equipment Under Test
Fac.	Factor
FCC	Federal Communications Commission
FHSS	Frequency Hopping Spread Spectrum
FM	Frequency Modulation
Freq.	Frequency
FSK	Frequency Shift Keying
GFSK	Gaussian Frequency-Shift Keying
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HE	High Efficiency (e.g. IEEE 802.11ax20HE)
HT	High Throughput (e.g. IEEE 802.11n20HT)
Hori.	Horizontal
ICES	Interference-Causing Equipment Standard
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IF	Intermediate Frequency
ILAC	International Laboratory Accreditation Conference
IPD	Incident Power Density
ISED	Innovation, Science and Economic Development Canada
ISO	International Organization for Standardization
JAB	Japan Accreditation Board
LAN	Local Area Network
LIMS	Laboratory Information Management System
MCS	Modulation and Coding Scheme
MIMO	Multiple Input Multiple Output (Radio)
MRA	Mutual Recognition Arrangement
MU-MIMO	Multi-User Multiple Input Multiple Output (Radio)
N/A	Not Applicable, Not Applied
NII	National Information Infrastructure (Radio)
NIST	National Institute of Standards and Technology
NR	New Radio
NS	No signal detect.
NSA	Normalized Site Attenuation
OBW	Occupied Band Width
OFDM	Orthogonal Frequency Division Multiplexing
PD	Power Density
P/M	Power meter
PCB	Printed Circuit Board
PER	Packet Error Rate
PHY	Physical Layer
PK	Peak
PN	Pseudo random Noise
PRBS	Pseudo-Random Bit Sequence
PSD	Power Spectral Density
QAM	Quadrature Amplitude Modulation
QP	Quasi-Peak
QPSK	Quadrature Phase Shift Keying
RBW	Resolution Band Width
RDS	Radio Data System
RE	Radio Equipment
RF	Radio Frequency
RMS	Root Mean Square
RSS	Radio Standards Specifications
RU	Resource Unit
Rx	Receiving
SA, S/A	Spectrum Analyzer
SAR	Specific Absorption Rate
SISO	Single Input Single Output (Radio)
SG	Signal Generator
SPLSR	SAR to Peak Location Separation Ratio
SVSWR	Site-Voltage Standing Wave Ratio
TSL	Tissue Simulation Liquid
T/R	Test Receiver
Tx	Transmitting
U-NII	Unlicensed National Information Infrastructure (Radio)
VBW	Video BandWidth
Vert.	Vertical
VHT	Very High Throughput (e.g. IEEE 802.11ac20VHT)
WLAN	Wireless LAN
Wi-Fi, WiFi	Wireless LAN, trademarked by Wi-Fi Alliance

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Contents of appendixes

SECTION 1: Customer information

Company Name	OM Digital Solutions Corporation
Address	49-3, Takakura-machi, Hachioji-shi, Tokyo 192-0033, Japan
Telephone Number	+81-42-642-2457
Contact Person	Koji Sakatani

The information provided from the customer is as follows;
- Customer name, Company name, Type of Equipment, Model No., FCC ID on the cover and other relevant pages.
- SECTION 1: Customer information
- SECTION 2: Equipment under test (EUT)
- SECTION 4: Operation of EUT during testing
- Appendix 1: The part of Antenna location information, Description of EUT and Support Equipment

* The laboratory is exempted from liability of any test results affected from the above information in SECTION 2, SECTION 4 and Appendix 1.

SECTION 2: Equipment under test (EUT)

2.1 Identification of EUT

Type	Wireless LAN/Bluetooth Module
Model Number	S080WIFI-PCA
Serial Number	IM032-SAR
Rating	DC 3.35 V~ DC 4.2 V (*. supplied form the platform.)
Condition of sample	Engineering prototype (Not for sale: The sample is equivalent to mass-produced items.)
Receipt Date of sample	January 19, 2023 (for power measurement) (*. No modification by the Lab.) March 22, 2023 (for SAR test) (*. No modification by the Lab.)
Test Date (SAR)	March 27, 2023

2.2 Product Description

General

Feature of EUT	Model: S080WIFI-PCA (referred to as the EUT in this report) is a Wireless LAN/Bluetooth Module.

Radio specification

Equipment type	Transceiver				
Frequency of operation (*1)	Bluetooth: 2402 MHz ~ 2480 MHz (BT LE) WLAN 2.4 GHz Band: 2412 MHz ~ 2462 MHz			WLAN 5.2 GHz Band (U-NII-1): 5180 MHz ~ 5240 MHz WLAN 5.3 GHz Band (U-NII-2A): 5260 MHz ~ 5320 MHz WLAN 5.6 GHz Band (U-NII-2C): 5500 MHz ~ 5700 MHz WLAN 5.8 GHz Band (U-NII-3): 5745 MHz ~ 5825 MHz	
Supported modulations (*1)	Bluetooth: (FHSS) GFSK WLAN 2.4 GHz) 11b: (DSSS) DBPSK/DQPSK/CCK WLAN 2.4 GHz) 11g/n: (OFDM) BPSK/QPSK/16QAM/64QAM WLAN 5 GHz band) 11a/n/ac: (OFDM) BPSK/QPSK/16QAM/64QAM, 11ac: 256QAM				
Typical and maximum transmit power (*1)	*. The specification of typical and maximum transmit power (which may occur) of S080WIFI-PCA refer to remarks in below "Table of original typical power and maximum transmit power (S080WIFI-PCA alone)". **However, when the S080WIFI-PCA module is installed in the specified host platform: IM032, WLAN 5 GHz band is not supported by the host platform's firmware. Refer to in below "Table of typical power and maximum transmit power (When the S080WIFI-PCA module is mounted on the host platform: IM032)".** The measured output power (conducted) as SAR reference power refers to section 5 in this report.				
Antenna quantity	1 pc.	Antenna type	Inverted L	Antenna connector type	Not applicable (printed)
Antenna gain (max. gain) (*. including cable loss)			-2.9 dBi (2.4 GHz band), 1.3 dBi (5 GHz band)		

***1. <u>WLAN 5 GHz band was not supported in this host platform: IM032 by the firmware. Therefore, the SAR test of WLAN 5 GHz band was reduced.</u>**

Description of Host Platform

Manufacture	OM Digital Solutions Corporation
Product name	Digital Camera
Model number	IM032
Condition of sample	Engineering prototype (Not for sale: The sample is equivalent to mass-produced items.)
Rating	DC 3.6 V (Li-ion Battery, Refer to Appendix 1-2) (*. The SAR test was performed in battery operation.)
SAR Category Identified	Portable device (*. Since EUT may contact to a localized human body during wireless operation, the partial-body SAR (1g) shall be observed.)
Exposure Category	General Population/Uncontrolled Exposure:
SAR Accessory	None. There are no accessories that would affect SAR test.

***. Table of Typical power and Maximum power (= Maximum tune-up tolerance limit power)**

[Table of typical and maximum transmit power (When the S080WIFI-PCA module is mounted on the host platform: IM032)]

Mode	Data rate, Index	Output power (Typical and maximum) [dBm] (*. The measured output power (conducted) refers to section 5 in this report.)														
		2.4 GHz			WLAN 5.2 GHz (*1)			WLAN 5.3 GHz (*1)			WLAN 5.6 GHz (*1)			WLAN 5.8 GHz (*1)		
		F [MHz]	Typical	Max.	F [MHz]	Typical	Max.	F [MHz]	Typical	Max.	F [MHz]	Typical	Max.	F [MHz]	Typical	Max.
BT-LE	1 Mbps	2402 ~2480	N/A	**7.5**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11b	1~11 Mbps	2412 ~2462	10	**12.5**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11g	6~54 Mbps	2412 ~2462	10	**12.5**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11a	6~54 Mbps	N/A	N/A	N/A	5180 ~5240	Not supported		5260 ~5320	Not supported		5500~5580, 5660~5700	Not supported		5745 ~5825	Not supported	
11n20	MCS0~7	2412 ~2462	10	**12.5**	5180 ~5240	Not supported		5260 ~5320	Not supported		5500~5580, 5660~5700	Not supported		5745 ~5825	Not supported	
11ac20	MCS0~8	N/A	N/A	N/A	5180 ~5240	Not supported		5260 ~5320	Not supported		5500~5580, 5660~5700	Not supported		5745 ~5825	Not supported	
11n40	MCS0~7	N/A	N/A	N/A	5190, 5230	Not supported		5270, 5310	Not supported		5510, 5550, 5670	Not supported		5755, 5795	Not supported	
11ac40	MCS0~9	N/A	N/A	N/A	5190, 5230	Not supported		5270, 5310	Not supported		5510, 5550, 5670	Not supported		5755, 5795	Not supported	
11ac80	MCS0~9	N/A	N/A	N/A	5210	Not supported		5290	Not supported		5530	Not supported		5775	Not supported	

***1. WLAN 5 GHz band was not supported in this host platform: IM032 by the firmware. Therefore, the SAR test of WLAN 5 GHz band was reduced.**

[Table of original typical and maximum transmit power for S080WIFI-PCA alone] (Reference purpose)

Mode	Data rate, Index	Output power (Typical and maximum) [dBm]														
		2.4 GHz			WLAN 5.2 GHz			WLAN 5.3 GHz			WLAN 5.6 GHz			WLAN 5.8 GHz		
		F [MHz]	Typical	Max.	F [MHz]	Typical	Max.	F [MHz]	Typical	Max.	F [MHz]	Typical	Max.	F [MHz]	Typical	Max.
BT-LE	1 Mbps	2402 ~2480	N/A	**7.5**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11b	1~11 Mbps	2412 ~2462	10	**12.5**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11g	6~54 Mbps	2412 ~2462	10	**12.5**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11a	6~54 Mbps	N/A	N/A	N/A	5180 ~5240	8	**10**	5260 ~5320	8	**10**	5500~5580, 5660~5700	7	**9**	5745 ~5825	7	**9**
11n20	MCS0~7	2412 ~2462	10	**12.5**	5180 ~5240	8	**10**	5260 ~5320	8	**10**	5500~5580, 5660~5700	7	**9**	5745 ~5825	7	**9**
11ac20	MCS0~8	N/A	N/A	N/A	5180 ~5240	8	**10**	5260 ~5320	8	**10**	5500~5580, 5660~5700	7	**9**	5745 ~5825	7	**9**
11n40	MCS0~7	N/A	N/A	N/A	5190, 5230	8	**10**	5270, 5310	8	**10**	5510, 5550, 5670	7	**9**	5755, 5795	7	**9**
11ac40	MCS0~9	N/A	N/A	N/A	5190, 5230	8	**10**	5270, 5310	8	**10**	5510, 5550, 5670	7	**9**	5755, 5795	7	**9**
11ac80	MCS0~9	N/A	N/A	N/A	5210	8	**10**	5290	8	**10**	5530	7	**9**	5775	7	**9**

*. F: Frequency; Max.: maximum; N/A: Not applicable; (mode) 11b: IEEE 802.11b, 11g: IEEE 802.11g, 11a: IEEE 802.11a, 11n20: IEEE 802.11n(20HT), 11n40: IEEE 802.11n(40HT), 11ac20: IEEE 802.11ac(20VHT), 11ac40: IEEE 802.11n(40VHT), 11ac80: IEEE 802.11ac(80VHT)
*. The EUT do not use the special transmitting technique such as "beam-forming" and "time-space code diversity."
***.** Maximum tune-up tolerance limit is conducted burst average power and is defined by a customer as Duty cycle 100% (continuous transmitting).
*. Wi-Fi and Bluetooth were not transmitted simultaneously. Therefore, simultaneously transmitted SAR was not considered.

SECTION 3: Maximum SAR value, test specification and procedures

3.1 Summary of Maximum SAR Value

Mode / Band	Highest Reported SAR [W/kg]					
	Partial body (Separation 0 mm, Flat phantom)		Head (Separation 0 mm, SAM phantom)		Limbs (Separation 0 mm, Flat phantom)	
	SAR type: SAR (1g)		SAR type: SAR (1g)		SAR type: SAR (10g)	
	Standalone	Simultaneous Transmission	Standalone	Simultaneous Transmission	Standalone	Simultaneous Transmission
WLAN 2.4 GHz	0.73	N/A	N/A	N/A	N/A	N/A
Bluetooth	0.19	N/A	N/A	N/A	N/A	N/A

Limit applied	Partial bod y/Head: 1.6 W/kg (SAR (1g)), Limbs: 4 W/kg (SAR (10g)), for general population/uncontrolled exposure is specified in FCC 47 CFR 2.1093.
Test Procedure	Refer to Section 3.2 in this report. In addition; UL Japan's SAR measurement work procedures No. ULID-003599 (13-EM-W0430). UL Japan's SAR measurement equipment calibration and inspection work procedures No. ULID-003598 (13-EM-W0429).
Category	Portable device (The devices being used within 20 cm between user and EUT.)

Conclusion

The SAR test values found for the device are separately below the maximum limit of 1.6 W/kg.

Test outline: Where the EUT is built into this platform, it was verified whether multi-platform conditions can be suited in according with section 2) of 5.2.2 in KDB447498 D01 (v06).

Consideration of the test results:	**The highest reported SAR (1g) of this platform was kept; ≤ 0.8 W/kg.** **Since highest reported SAR (1g) on this EUT's platform obtained in accordance with KDB447498 D01 (v06) was kept under 0.8 W/kg, this EUT was approved to operate multi-platform.**

***. Informative (Reference purpose only) - List of maximum SAR values for different platforms tested in the past**

The following shows a highest reported SAR value of the different host platforms in the past test. The SAR test results are not described in this report.
In the past, the EUT had installed into the following host platforms #1~#5 and measured highest reported SAR (1g) with smaller than 0.8 W/kg. (per KDB 447498 D01 (v06); multi-platform operation requirement).

Highest Reported SAR(1g)	SAR type	Platform No.	Platform Type	Platform Model No.	Band	Frequency [MHz]	Mode	Max power [dBm]	Version of KDB 447498	Version of KDB 248227 D01	Version of KDB 865664 D01	Date SAR tested	Report No. (*Refer to latest version)
0.59 W/kg	Body-worn	1	Digital Voice Recorder	DS-9500	WLAN 2.4 GHz	2412	11g	12.5	D01 (v06)	(v02r02)	(v01r04)	January, 2018	11834856S-A
0.54 W/kg					WLAN 5 GHz	5700	11a	9					
0.17 W/kg	Body-worn	2	Digital Camera	IM010	WLAN 2.4 GHz	2412	11g	12.5	D01 (v06)	(v02r02)	(v01r04)	August, 2018	12261909S-A
0.37 W/kg					WLAN 5 GHz	5700	11a	9					
0.29 W/kg	Body-worn	3	Digital Camera	IM019	WLAN 2.4 GHz	2412	11n20	12.5	D01 (v06)	(v02r02)	(v01r04)	September, 2019	12983402S-A
0.28 W/kg					WLAN 5 GHz	5700	11a	9					
0.36 W/kg	Body-worn	4	Digital Camera	IM021	WLAN 2.4 GHz	2412	11b	12.5	D01 (v06)	(v02r02)	(v01r04)	February, 2020	13065779S-A
N/A					WLAN 5 GHz	*. Not supported							
0.23 W/kg	Body-worn	5	Digital Camera	IM027	WLAN 2.4 GHz	2412	11n20	12.5	D01 (v06)	(v02r02)	(v01r04)	June, 2021	12983402S-A
0.31 W/kg					WLAN 5 GHz	5700	11a	9					
Criteria	Partial body (head & body): 1.6 W/kg (SAR (1g)) for general population/uncontrolled exposure is specified in FCC 47 CFR 2.1093).												

*. All SAR evaluation and reports publishing was done by Shonan EMC Lab. UL Japan.

3.2 RF Exposure limit

SAR Exposure Limit (100 kHz ~ 6 GHz)		
	General Population / Uncontrolled Exposure (*1) [W/kg]	Occupational / Controlled Exposure (*2) [W/kg]
Spatial Peak SAR (*3) (Whole Body)	0.08	0.4
Spatial Peak SAR (*4) (Partial-Body, Head or Body)	1.6	8
Spatial Peak SAR (*5) (Hands / Feet / Ankle / Wrist)	4	20

*. For the purpose of this Regulation, FCC has adopted the SAR and RF exposure limits established in FCC 47 CFR 1.1310: Radiofrequency radiation exposure limits.

*1. General Population / Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

*2. Occupational / 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).

*3. The Spatial Average value of the SAR averaged over the whole body.

*4. The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time

*5. The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time

The limit applied to this device which tested in this report is;

Limit of Spatial Peak SAR (Partial-Body)	**1.6 W/kg**	**General population / uncontrolled exposure**

3.3 Test specification

Standard	Description	Version
47 CFR 2.1093	(Limit) Radiofrequency radiation exposure evaluation: portable devices	-
ANSI/IEEE C95.1	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 KHz to 300 GHz	1992
IEEE Std. 1528	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.	2013
KDB 248227 D01	SAR Guidance for IEEE 802.11 (Wi-Fi) transmitters	v02r02
KDB 447498 D01	Interim General RF Exposure Guidance	v06
KDB 447498 D03	OET Bulletin 65, Supplement C Cross-Reference	v01
KDB 865664 D01	SAR measurement 100 MHz to 6 GHz	v01r04
KDB 865664 D02	RF exposure compliance reporting and documentation considerations	v01r02
KDB 388624 D02	Pre-approval guidance list-APPENDIX OVER6G	v18r03

*. The measurement uncertainty budget is suggested by IEC/IEEE 62209-1528:2020 and determined by SPEAG, DASY8 Manual for Module SAR/mmWave. Refer to Appendix3-3 for more details.

In addition to the above, the following information was used:

TCB workshop, 2016-10	RF Exposure Procedure, DUT Holder Perturbations; When the highest reported SAR of an antenna is > 1.2 W/kg, holder perturbation verification is required for each antenna, using the highest SAR configuration among all applicable frequency bands.
TCB workshop, 2018-04	Expedited Area Scans. (including mother scans)
TCB workshop, 2019-04	RF Exposure Procedure, 802.11ax SAR Testing
TCB workshop, 2019-10	RF Exposure Procedure, Tissue Simulating Liquids (TSL) -FCC has permitted the use of single head tissue simulating liquid specified in IEC 62209 for all SAR tests. -If FCC parameters are used, 5 % tolerance. If IEC parameters, 10 %.

3.4 Addition, deviation and exclusion to the test procedure

No addition, exclusion nor deviation has been made from the test procedure.

3.5 Test Location

UL Japan, Inc., Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN
Telephone number: +81 463 50 6400 / Facsimile number: +81 463 50 6401

*. A2LA Certificate Number: 1266.03 (FCC Test Firm Registration Number: 626366, ISED Lab Company Number: 2973D / CAB identifier: JP0001)

Place	Width × Depth × Height (m)	Size of reference ground plane (m) / horizontal conducting plane
No.7 Shielded room	2.76 × 3.76 × 2.4	2.76 × 3.76

3.6 SAR measurement procedure

3.6.1 SAR Definition

SAR is defined as 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 shown in right.	$SAR = \frac{d}{dt}\left(\frac{dW}{dm}\right) = \frac{d}{dt}\left(\frac{dW}{\rho * dV}\right)$
SAR measurement can be related to the electrical field in the tissue by the equation in right. SAR is expressed in units of Watts per kilogram (W/kg). Where : σ = conductivity of the tissue (S/m), ρ = mass density of the tissue (kg/m^3), E = RMS electric field strength in tissue (V/m)	$SAR = \frac{\sigma \lvert E \rvert^2}{\rho}$

3.6.2 Full SAR measurement procedure

The SAR measurement procedures are as follows: (1) The EUT is installed engineering testing software that provides continuous transmitting signal; (2) Measure output power through RF cable and power meter; (3) Set scan area, grid size and other setting on the DASY software; (4) Find out the largest SAR result on these testing positions of each band; (5) Measure SAR results for other channels in worst SAR testing position if the 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:
Step 1) Power measurement -.> SAR: Step 2) Power reference measurement -> Step 3) Area scan -> Step 4) Zoom scan -> Step 5) Power drift measurement

Step 1: Confirmation before SAR testing

Before SAR test, the RF wiring for the sample had been switched to the antenna conducted power measurement line from the antenna line and the average power was measured. This SAR reference power measurement was proceeded with the lowest data rate (which may have the higher time-based average power typically) on each operation mode and on the lower, middle (or near middle), upper and specified channels. The power measurement result is shown in Section 5.

*. The EUT transmission power used SAR test was verified that it was not more than 2 dB lower than the maximum tune-up tolerance limit. (KDB447498 D01 (v06))

Step 2: Power reference measurement

Measured psSAR value at a peak location of Fast Area Scan was used as a reference value for assessing the power drop.

Step 3: Area Scan

(Scan parameters: KDB 865664 D01, IEC/IEEE 62209-1528 (> 6GHz))

Area Scans are used to determine the peak location of the measured field before doing a finer measurement around the hotspot. Peak location can be found accurately even on coarse grids using the advanced interpolation routines implemented in DASY8. Area Scans measure a two dimensional volume covering the full device under test area. DASY8 uses Fast Averaged SAR algorithm to compute the 1 g and 10 g of simulated tissue from the Area Scan. DASY8 can either manually or automatically generates Area Scan grid settings based on device dimensions. In automatically case, the scan extent is defined by the device dimensions plus additional 15mm on each side. In manually, the scan covered the entire dimension of the antenna of EUT.

Step 4: Zoom Scan and post-processing

(Scan parameters: KDB 865664 D01, IEC/IEEE 62209-1528 (> 6GHz))

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures points (refer to table below) within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure.

*. A minimum volume of 30 mm (x) × 30 mm (y) × 30 mm (z) was assessed by "Ratio step" method (*1), for 2.4 GHz band. (Step XY: 5 mm)
*. A minimum volume of 24 mm (x) × 24 mm (y) × 24 mm (z) was assessed by "Ratio step" method (*1), for 5 GHz band (Step XY: 4 mm).
*. A minimum volume of 24 mm (x) × 24 mm (y) × 24 mm (z) was assessed by "Ratio step" method (*1), for 6 GHz band (Step XY: 3.4 mm).

When the SAR of the highest peak is within 2 dB of the SAR limit, additional zoom scans are proceeded 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. If the zoom scan measured as defined above complies with both of the following criteria. or if the peak spatial-average SAR is below 0.1 W/kg, no additional measurements are needed.

*. The smallest horizontal distance from the local SAR peaks to all points 3 dB below the SAR peak shall be larger than the horizontal grid steps in both x and y directions and recorded.
*. The ratio of the SAR at the second measured point to the SAR at the closest measured point at the x-y location of the measured maximum SAR value shall be at least 30 % and recorded.

			$f \leq 3$ GHz	3 GHz < $f \leq 10$ GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5 mm ± 1 mm	1/2 × δ × ln(2) mm ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location			5 ° ± 1 °(flat phantom only) 30 ° ± 1 °(other phantom)	5 ° ± 1 °(flat phantom only) 30 ° ± 1 °(other phantom)
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}			≤ 2 GHz : ≤ 15 mm, 2~3 GHz : ≤ 12 mm	3~4 GHz : ≤ 12 mm, 4~6 GHz : ≤ 10 mm > 6 GHz : ≤ 60/f mm, or half of the corresponding zoom scan length, whichever is smaller.
			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_{Area}, Δy_{Area}			≤ 2 GHz : ≤ 8 mm, 2~3 GHz : ≤ 5 mm (*1)	3~4 GHz : ≤ 5 mm (*1), 4~6 GHz : ≤ 4 mm (*1) > 6 GHz : ≤ 24/f mm
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3~4 GHz : ≤ 4 mm, 4~5 GHz : ≤ 3 mm, 5~6 GHz : ≤ 2 mm > 6 GHz : ≤ 10/(f-1) mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3~4 GHz : ≤ 3 mm, 4~5 GHz : ≤ 2.5 mm, 5~6 GHz : ≤ 2 mm > 6 GHz : ≤ 12/f mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	≤ 1.5 × Δz_{zoom} (n-1) mm	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3~4 GHz : ≥ 28 mm, 4~ 5 GHz : ≥ 25 mm, 5~6 GHz : ≥ 22 mm > 6 GHz : ≥ 22 mm

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see IEEE Std 1528-2013 (≤ 6 GHz) and IEC/IEEE 62209-1528 (≤ 10 GHz) for details.
*1. When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB Publication 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz. (KDB 865664 D01)
*. The scan parameters of > 6GHz is defined IEC/IEEE 62209-1528.

Step 5: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same project. The Power Drift Measurement gives the SAR difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. It was checked that the power drift was within ± 5% (0.21 dB) in single SAR project run. The verification of power drift during the SAR test shown in SAR plot data of APPENDIX 2.

*. The most of SAR tests were conservatively performed with test separation distance 0 mm. The phantom bottom thickness is approx. 2mm. Therefore, the distance between the SAR probe tip to the surface of test device which is touched the bottom surface of the phantom is approx. 2.4 mm. Typical distance from probe tip to probe's dipole centers is 1mm.

*1. "Ratio step" method parameters used; the first measurement point: "1.4 mm" from the phantom surface, the initial z grid separation: "1.5 mm", subsequent graded grid ratio: "1.5" for 2.4 GHz band and the initial z grid separation: "1.4 mm", subsequent graded grid ratio: "1.4" for above 5 GHz. These parameters comply with the requirement of KDB 865664 D01and recommended by Schmid & Partner Engineering AG (DASY8 manual).

SECTION 4: Operation of EUT during testing

4.1 Operating modes for testing

The EUT has Bluetooth (BT LE) and IEEE 802.11b, 11g, 11a, 11n(20HT), 11n(40HT), 11ac(20VHT), 11ac(40VHT) and 11ac(80VHT) continuous transmitting modes. The frequency and the modulation used in the SAR testing are shown as a following.

Operation mode	BT LE	11b	11g (*1)	11n20 (*1)	11a	11n20	11ac20	11n40	11ac40	11ac80	11a	11n20	11ac20	11n40	11ac40	11ac80
band	Bluetooth	WLAN 2.4 GHz			WLAN 5.2 GHz (*4)						WLAN 5.3 GHz					
Tx band [MHz]	2402~2480	2412~2462			5180~5240			5190, 5230		5210	5260~5320			5270, 5310		5290
Bandwidth [MHz]	2	20	20	20	20	20	20	40	40	80	20	20	20	40	40	80
Max.power [dBm]	7.5	12.5	12.5	12.5	10	10	10	10	10	10	10	10	10	10	10	10
Modulation	FHSS	DSSS	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM
Data rate [Mbps], Index (*3)	1	1	6	MCS0	6	MCS0	MCS0	MCS0	MCS0	MCS0	6	MCS0	MCS0	MCS0	MCS0	MCS0
Frequency tested [MHz]	2440 (*2)	2412, 2437, 2462	2412, 2437, 2462	2412, 2437, 2462	*. WLAN 5 GHz band is not supported in this platform.						*. WLAN 5 GHz band is not supported in this platform.					

Operation mode	11a	11n20	11ac20	11n40	11ac40	11ac80	11a	11n20	11ac20	11n40	11ac40	11ac80
band	WLAN 5.6 GHz						WLAN 5.8 GHz					
Tx band [MHz]	5500~5580, 5660~5700			5510,5550,5670		5530	5745~5825			5755, 5795		5775
Bandwidth [MHz]	20	20	20	40	40	80	20	20	20	40	40	80
Max.power [dBm]	9	9	9	9	9	9	9	9	9	9	9	9
Modulation	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM
Data rate [Mbps], Index (*7)	6	MCS0	MCS0	MCS0	MCS0	MCS0	6	MCS0	MCS0	MCS0	MCS0	MCS0
Frequency tested [MHz]	*. WLAN 5 GHz band is not supported in this platform.						*. WLAN 5 GHz band is not supported in this platform.					

	Test name	Software name	Version	Date	Storage location / Remarks
Controlled software	Power measurement	Wireless Test	1.00.1	2023/01/19	Driven by connected PC (Refer to Appendix 1-2)
		Wireless Test of camera	S0080	2023/01/19	Memory of digital camera. (jig)
	SAR	Wireless Test 1.1	1.01	2023/03/22	Driven by connected PC (Refer to Appendix 1-2)
		Wireless Test 1.1 of camera	D4605	2023/03/22	Memory of digital camera. (host platform)

*. n/a: SAR test was not applied.
*1. SAR test can be exempted in accordance with the following “SAR test reduction consideration”.
(KDB 248227 D01) Since reported SAR (1g) of DSSS mode which had highest output power was enough small, SAR test was only applied DSSS mode.
*2. SAR test applies to a middle channel which has maximum measured output power of BT LE mode.
*3. (KDB 248227 D01) Initial SAR test was applied to the operation mode which has higher bandwidth with the highest tune-up power and lowest data rate (lowest modulation).

<u>*. OFDM Transmission Mode SAR Test Configuration and Channel Selection Requirements</u>

(KDB 248227 D01, SAR Guidance for Wi-Fi Transmitters) The initial test configuration for 2.4 GHz and 5 GHz OFDM transmission modes 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. SAR for the initial test configuration is measured using the highest maximum output power channel determined by the default power measurement procedures.
When multiple channel bandwidth configurations in a frequency band 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.

<u>*. SAR test reduction considerations</u>

(KDB 447498 D01(v06), General RF Exposure Guidance) Testing of other required channels within the operating mode of a frequency band is not required when the reported 1g or 10g SAR for the mid-band or highest output power channel is:
(1) ≤ 0.8 W/kg for 1g , or 2.0 W/kg for 10g respectively, when the transmission band is ≤ 100 MHz
(2) ≤ 0.6 W/kg for 1g, or 1.5 W/kg for 10g respectively, when the transmission band is between 100 MHz and 200 MHz
(3) ≤ 0.4 W/kg for 1g, or 1.0 W/kg for 10g respectively, when the transmission band is ≥ 200 MHz
The SAR has been measured with highest transmission duty factor supported by the test mode tool for WLAN and/or Bluetooth. When the transmission duty factor could not be 100%, the reported SAR will be scaled to 100% transmission duty factor to determine compliance. When SAR is not measured at the maximum power level allowed for production unit, the measured SAR will be scaled to the maximum tune-up tolerance limit to determine compliance.

(KDB 248227 D01, SAR Guidance for Wi-Fi Transmitters) When the reported SAR of the initial test configuration is > 0.8 W/kg, SAR measurement is required for subsequent next highest measured output power channel(s) in the initial test configuration until reported SAR is ≤ 1.2 W/kg or all required channels are tested.

For 2.4GHz band, the highest measured maximum output power channel of DSSS was selected for SAR measurement, When the reported SAR is ≤ 0.8 W/kg, no further SAR test is required in this exposure configuration. Otherwise, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel. For OFDM modes (802.11g/n), SAR 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.

4.2 RF exposure conditions (Test exemption)

Antenna separation distances in each test setup plan are shown as follows.

Setup plan	Explanation of SAR test setup plan (*. Refer to Appendix 1 for test setup photographs which had been tested.)	D [mm]	SAR type
Front-right	A right portion of grip on a digital camera is touched to the Flat phantom.	**≈ 5**	Body touch
Front	A front surface of digital camera is touched to the Flat phantom.	**5.3**	
Right	A right surface of digital camera is touched to the Flat phantom.	**11.2**	
Top	A top surface of digital camera is touched to the Flat phantom.	**16.8**	
Rear	A rear surface of digital camera (LCD side) is touched to the Flat phantom.	**29.3**	
Bottom	A bottom surface of digital camera is touched to the Flat phantom.	**34.7**	
Left	A left surface of digital camera is touched to the Flat phantom.	**94.2**	

*. D: Antenna separation distance. It is the distance from the antenna to the outer surface of platform which an operator may touch.
*. Size of EUT (model: S080WIFI-PCA): 10 mm (width) × 29.5 mm (height) × 2.8 mm (thickness)
*. Size of platform (digital camera): 114.4 mm (width) × 65.8 mm (height) × 34.6 mm (depth)
*. Refer to Appendix 1 for the antenna location and the test setup photographs which had been tested.

SAR test exemption consideration by KDB 447498 D01 (v06)

Step 1) For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:
[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] × [√f (GHz)] ≤ 3.0 (for SAR(1g)), 7.5 (for SAR(10g))······formula (1)
If power is calculated from the upper formula (1);
[SAR(1g) test exclusion thresholds, mW] = 3 × [test separation distance, mm] / [√f (GHz)]······formula (2)

1. The upper frequency of the frequency band was used in order to calculate standalone SAR test exclusion considerations.
2. Power and distance are rounded to the nearest mW and mm before calculation
3. The result is rounded to one decimal place for comparison
4. The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

When the calculated threshold value by a numerical formula above-mentioned in the following table is 3.0 or less, SAR test can be excluded.

Step 2) For 1500 MHz to 6 GHz and test separation distances > 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:
[test exclusion thresholds, mW] = [(Power allowed at numeric threshold for 50mm in formula (1))] + [(test separation distance, mm) - (50mm)] × 10·········formula (3)

1. The upper frequency of the frequency band was used in order to calculate standalone SAR test exclusion considerations.
2. Power and distance are rounded to the nearest mW and mm before calculation

When output power is less than the calculated threshold value by a numerical formula above-mentioned in the following table, SAR test is excluded.

[SAR exclusion calculations for step 1) antenna ≤50mm from the user, and for step 2) antenna > 50mm from the user.]

Band	Tx mode	Upper Frequency [MHz]	Max. output power conducted		Step 1) SAR exclusion calculations for antenna ≤ 50 mm from the user. (Calculated threshold value, > 3.0 : Test, ≤ 3.0 : Reduce)							Step 2) > 50 mm from the user
					Calculated threshold value							
					Setup	Front-right	Front	Right	Top	Rear	Bottom	Left
			[dBm]	[mW]	D	≈ 5 mm	5 mm	11 mm	17 mm	29 mm	35 mm	94 mm
2.4 GHz	BT LE	2480	7.5	**6**	Judge	1.9, Reduce	1.9, Reduce	< 1.9, Reduce	< 1.9, Reduce	< 1.9, Reduce	< 1.9, Reduce	536 mW, Reduce
	11b, g, n20	2462	12.5	**18**	Judge	**5.6, Test**	**5.6, Test**	2.6, Reduce	1.7, Reduce	< 1.7, Reduce	< 1.7, Reduce	536 mW, Reduce

Notes: 1. Power and distance are rounded to the nearest mW and mm before calculation.

<Conclusion for consideration for SAR test reduction>

1) All SAR tests were conservatively performed with test separation distance 0 mm.
2) For WLAN operation; “Front-right” and “Front” setup which were near antenna section, were applied the SAR test because the output power was higher than calculated threshold power. The other setups were also SAR tested to confirm SAR level (if final SAR measurement was applicable), because the host platform is similar to small device.
3) For Bluetooth operation, the SAR test was applied with the worst SAR condition of WLAN mode.

SECTION 5: Confirmation before testing

5.1 Test reference power measurement

Mode	Frequency [MHz]	CH	Data rate, Index [Mbps]	Power spec. Typical [dBm]	Power spec. Max. [dBm]	Duty cycle: duty cycle [%]	Duty cycle: duty factor [dB]	Duty cycle: scaled factor [-]	Antenna power: Set pwr. [-]	Antenna power: Burst Ave. [dBm]	Antenna power: Δ Max. [dB]	Antenna power: Tune-up factor [-]	Antenna power: Time Ave. [dBm]	Adjusted power setting? (*1)	Remarks
BT LE	2402	0	1	n/a	**7.5**	64.0	1.94	1.56	fix	**5.80**	-1.70	1.48	3.86	No	-
	2440	19	1	n/a	**7.5**	64.0	1.94	1.56	fix	**5.94**	-1.56	1.43	4.00	No	-
	2480	39	1	n/a	**7.5**	64.0	1.94	1.56	fix	**5.69**	-1.81	1.52	3.75	No	-
11b	2412	1	1	10.0	**12.5**	99.0	0.04	1.01	11	11.11	-1.39	1.38	11.07	Yes	-
	2437	6	1	10.0	**12.5**	99.0	0.04	1.01	11	11.22	-1.28	1.34	11.18	Yes	-
	2462	11	1	10.0	**12.5**	99.0	0.04	1.01	11	10.92	-1.58	1.44	10.88	Yes	-
11g	2412	1	6	10.0	**12.5**	93.8	0.28	1.07	10	10.52	-1.98	1.58	10.24	No	-
	2437	6	6	10.0	**12.5**	93.8	0.28	1.07	10	11.02	-1.48	1.41	10.74	No	-
	2462	11	6	10.0	**12.5**	93.8	0.28	1.07	10	10.54	-1.96	1.57	10.26	No	-
11n 20HT	2412	1	MCS0	10.0	**12.5**	93.2	0.31	1.07	11	11.69	-0.81	1.21	11.38	Yes	-
	2437	6	MCS0	10.0	**12.5**	93.2	0.31	1.07	11	11.77	-0.73	1.18	11.46	Yes	-
	2462	11	MCS0	10.0	**12.5**	93.2	0.31	1.07	11	11.66	-0.84	1.21	11.35	Yes	-
11a	5180	36	6	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5200	40	6	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5220	44	6	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5240	48	6	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5260	52	6	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5280	56	6	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5300	60	6	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5320	64	6	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5500	100	6	7.0	9.0	-	-	-	-	-	-	-	-	-	
	5580	116	6	7.0	9.0	-	-	-	-	-	-	-	-	-	
	5700	140	6	7.0	9.0	-	-	-	-	-	-	-	-	-	
	5745	149	6	7.0	9.0	-	-	-	-	-	-	-	-	-	
	5785	157	6	7.0	9.0	-	-	-	-	-	-	-	-	-	
	5825	165	6	7.0	9.0	-	-	-	-	-	-	-	-	-	
11n 20HT	5180	36	MCS0	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5200	40	MCS0	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5220	44	MCS0	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5240	48	MCS0	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5260	52	MCS0	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5280	56	MCS0	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5300	60	MCS0	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5320	64	MCS0	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5500	100	MCS0	7.0	9.0	-	-	-	-	-	-	-	-	-	
	5580	116	MCS0	7.0	9.0	-	-	-	-	-	-	-	-	-	
	5700	140	MCS0	7.0	9.0	-	-	-	-	-	-	-	-	-	
	5745	149	MCS0	7.0	9.0	-	-	-	-	-	-	-	-	-	
	5785	157	MCS0	7.0	9.0	-	-	-	-	-	-	-	-	-	
	5825	165	MCS0	7.0	9.0	-	-	-	-	-	-	-	-	-	
11ac 20VHT	5180	36	MCS0	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5200	40	MCS0	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5220	44	MCS0	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5240	48	MCS0	8.0	10.0	-	-	-	-	-	-	-	-	-	*. WLAN 5 GHz band is not supported with this platform.
	5260	52	MCS0	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5280	56	MCS0	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5300	60	MCS0	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5320	64	MCS0	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5500	100	MCS0	7.0	9.0	-	-	-	-	-	-	-	-	-	
	5580	116	MCS0	7.0	9.0	-	-	-	-	-	-	-	-	-	
	5700	140	MCS0	7.0	9.0	-	-	-	-	-	-	-	-	-	
	5745	149	MCS0	7.0	9.0	-	-	-	-	-	-	-	-	-	
	5785	157	MCS0	7.0	9.0	-	-	-	-	-	-	-	-	-	
	5825	165	MCS0	7.0	9.0	-	-	-	-	-	-	-	-	-	
11n 40HT	5190	38	MCS0	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5230	46	MCS0	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5270	54	MCS0	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5310	62	MCS0	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5510	102	MCS0	7.0	9.0	-	-	-	-	-	-	-	-	-	
	5550	110	MCS0	7.0	9.0	-	-	-	-	-	-	-	-	-	
	5670	134	MCS0	7.0	9.0	-	-	-	-	-	-	-	-	-	
	5755	151	MCS0	7.0	9.0	-	-	-	-	-	-	-	-	-	
	5795	159	MCS0	7.0	9.0	-	-	-	-	-	-	-	-	-	
11ac 40VHT	5190	38	MCS0	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5230	46	MCS0	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5270	54	MCS0	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5310	62	MCS0	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5510	102	MCS0	7.0	9.0	-	-	-	-	-	-	-	-	-	
	5550	110	MCS0	7.0	9.0	-	-	-	-	-	-	-	-	-	
	5670	134	MCS0	7.0	9.0	-	-	-	-	-	-	-	-	-	
	5755	151	MCS0	7.0	9.0	-	-	-	-	-	-	-	-	-	
	5795	159	MCS0	7.0	9.0	-	-	-	-	-	-	-	-	-	
11ac 80VHT	5210	42	MCS0	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5290	58	MCS0	8.0	10.0	-	-	-	-	-	-	-	-	-	
	5530	106	MCS0	7.0	9.0	-	-	-	-	-	-	-	-	-	
	5775	155	MCS0	7.0	9.0	-	-	-	-	-	-	-	-	-	

*. (shaded): SAR test was applied.

*1. "Yes": The power setting was adjusted so that measured average power was not more than 2 dB lower than the maximum tune-up tolerance limit.

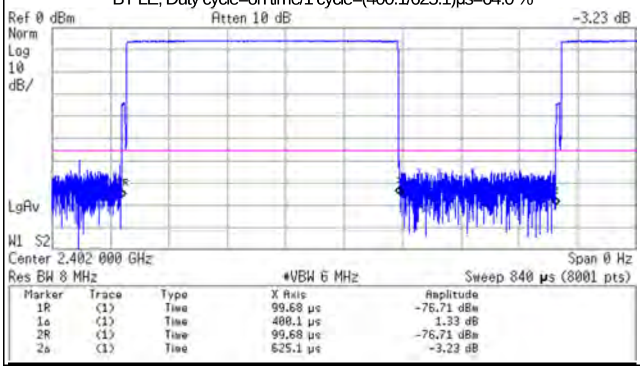
*. CH: Channel; Power spec.: Power specification; Max.: Maximum; Set pwr.: Setting power by tested software; Burst Ave.: Measured burst average power; Time Ave.: Measured time-based average power; n/a: Not applied, Not applicable.

*. (Calculating formula) Time average power (dBm) = (P/M Reading, dBm)+(Cable loss, dB)+(Attenuator, dB)
Burst power (dBm) = (P/M Reading, dBm)+(Cable loss, dB)+(Attenuator, dB)+(duty factor, dB)
Duty cycle: (duty cycle, %) = (Tx on time) / (1 cycle time) × 100, Duty factor (dBm) = 10 × log (100/(duty cycle, %))
Duty cycle scaled factor: Duty cycle correction factor for obtained SAR value, Duty scaled factor [-] = 100(%) / (duty cycle, %)
Δ from max. (Deviation form maximum power, dB) = (Burst power measured (average, dBm)) - (Max.tune-up limit power (average, dBm))
Tune-up factor: Power tune-up factor for obtained SAR value, Tune-up factor [-] = 1 / (10 ^ ("Deviation from max., dB" / 10))

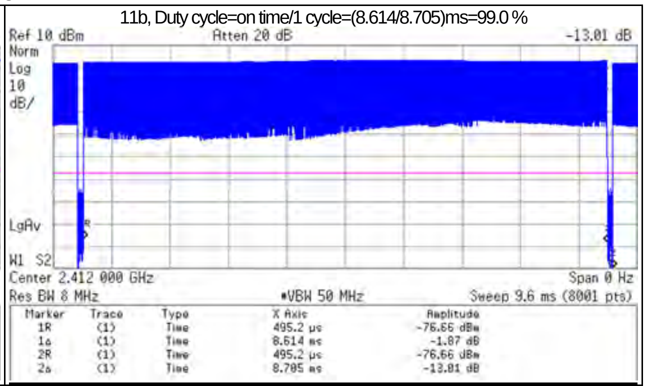
*. Date measured: January 17, 2023 / Measured by: H. Naka/ Place: Preparation room of No. 7 shield room. (20 deg.C./ 40 %RH)

*. Uncertainty of antenna port conducted test; (±) 1.1 dB (Average power), (±) 0.27 % (duty cycle).

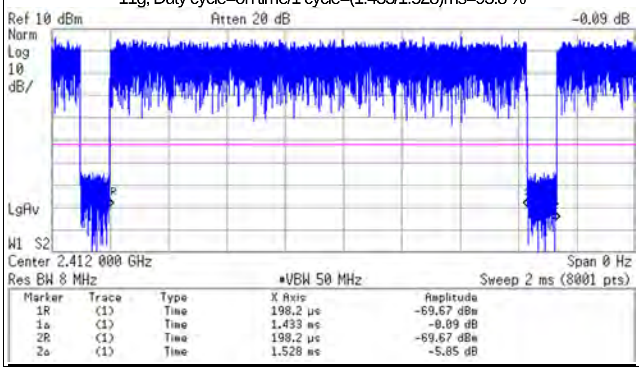
*. Chart of the worst duty cycle for each operation mode in right and in follows.



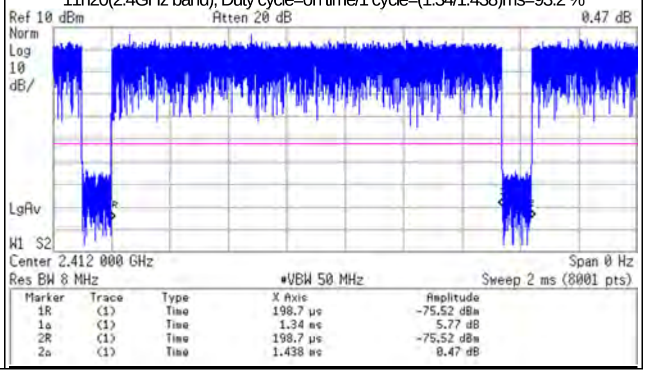
BT LE, Duty cycle=on time/1 cycle=(400.1/625.1)µs=64.0 %



11b, Duty cycle=on time/1 cycle=(8.614/8.705)ms=99.0 %



11g, Duty cycle=on time/1 cycle=(1.433/1.528)ms=93.8 %



11n20(2.4GHz band), Duty cycle=on time/1 cycle=(1.34/1.438)ms=93.2 %

SECTION 6: Tissue simulating liquid

6.1 Liquid measurement

Frequency [MHz]	Mode BW [MHz]	Liquid type	Liquid parameters (*a)												ΔSAR Coefficients (*b)			Date measured
			Liquid Temp. [deg.C.]	Liquid depth of phantom [mm]	Permittivity (εr) [-]				Conductivity [S/m]				Inter-polated ? ☐: No ☑: Yes	Δend, >48hrs. [%] (*1)	ΔSAR		ΔSAR Corrected?	
					Target value	Measured			Target value	Measured					1g [%]	10g [%]		
						Value	Δεr [%]	Limit [%]		Value	Δσ [%]	Limit [%]						
2450	-	Head	22.5	150	***39.2***	39.79	1.5	10	***1.80***	1.863	3.5	10	☐	begin	1.3	0.7	no (positive sign)	March 27, 2023
2412	20				***39.27***	39.84	1.5	10	***1.766***	1.831	3.7	10	☐	begin	1.5	0.7	no (positive sign)	
2437	20				***39.22***	39.80	1.5	10	***1.788***	1.853	3.6	10	☐	begin	1.4	0.7	no (positive sign)	
2440	BT				***39.22***	39.80	1.5	10	***1.791***	1.855	3.6	10	☐	begin	1.4	0.7	no (positive sign)	
2462	20				***39.18***	39.77	1.5	10	***1.813***	1.871	3.2	10	☐	begin	1.2	0.6	no (positive sign)	

*1. "begin": SAR test has ended within 24 hours from the liquid parameter measurement, "< 48 hrs.": Since SAR test has ended within 48 hours (2 days) from the liquid parameter measurement and a change in the liquid temperature was within 1 degree, liquid parameters measured on first day were used on next day continuously, "value (%)": Since the SAR test series took longer than 48 hours, the liquid parameters were measured on every 48 hours period and on the date which was end of test series. Since the difference of liquid parameters between the beginning and next measurement was smaller than 5%, the liquid parameters measured in beginning were used until end of each test series.
Calculating formula: "Δend(>48 hrs.) (%)"" = {(dielectric properties, end of test series) / (dielectric properties, beginning of test series) -1} × 100

*. The dielectric parameters were checked prior to assessment using the DAKS-3.5 dielectric probe.

*a. The target values of (2000, 2450, 3000, 5800) MHz are parameters defined in Appendix A of KDB 865664 D01 (refer to clause 6.2). For other frequencies, the target nominal dielectric values shall be obtained by linear interpolation between the higher and lower tabulated figures. Above 5800MHz were obtained using linear extrapolation.

*b. The coefficients in below are parameters defined in IEEE Std.1528-2013.
(Calculating formula,4 MHz~6 GHz): $\Delta SAR(1g) = C\varepsilon r \times \Delta\varepsilon r + C\sigma \times \Delta\sigma$, $C\varepsilon r = -7.854E{-}4 \times f^3 + 9.402E{-}3 \times f^2 - 2.742E{-}2 \times f - 0.2026$ / $C\sigma = 9.804E{-}3 \times f^3 - 8.661E{-}2 \times f^2 + 2.981E{-}2 \times f + 0.7829$
$\Delta SAR(10g) = C\varepsilon r \times \Delta\varepsilon r + C\sigma \times \Delta\sigma$, $C\varepsilon r = 3.456 \times 10^{-3} \times f^3 - 3.531 \times 10^{-2} \times f^2 + 7.675 \times 10^{-2} \times f - 0.1860$ / $C\sigma = 4.479 \times 10^{-3} \times f^3 - 1.586 \times 10^{-2} \times f^2 - 0.1972 \times f + 0.7717$
(Calculating formula): ΔSAR corrected SAR (W/kg) = (Measured SAR (W/kg)) × (100 - (ΔSAR(%)) / 100
Since the calculated ΔSAR values of the tested liquid had shown positive correction, the measured SAR was not converted by ΔSAR correction conservatively.

6.2 Target of tissue simulating liquid

Nominal dielectric values of the tissue simulating liquids in the phantom are listed in the following table. (Appendix A, KDB 865664 v01r04)

Target Frequency	Head		Body	
(MHz)	ε_r	σ(S/m)	ε_r	σ(S/m)
1800~2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95

Target Frequency	Head		Body	
(MHz)	ε_r	σ(S/m)	ε_r	σ(S/m)
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

*. For other frequencies, the target nominal dielectric values shall be obtained by linear interpolation between the higher and lower tabulated figures. Above 5800MHz were obtained using linear extrapolation.

6.3 Simulated tissue composition

Liquid type	Head	Control No.	SSLHV6-01	Model No. / Product No.	HBBL600-10000V6 / SL AAH U16 BC
Ingredient: Mixture [%]	Water: >77, Ethanediol: <5.2, Sodium petroleum sulfonate:<2.9, Hexylene Glycol: <2.9, alkoxylated alcohol (>C_{16}):<2.0				
Tolerance specification	± 10%				
Temperature gradients [% / deg.C]	permittivity: -0.19 / conductivity: -0.57 (at 2.6 GHz), permittivity: +0.31 / conductivity: -1.43 (at 5.5 GHz) (*)				
Manufacture	Schmid & Partner Engineering AG	Note: *. speag_920-SLAAxyy-E_1.12.15CL (Maintenance of tissue simulating liquid)			

SECTION 7: Measurement results

7.1 Measurement results

7.1.1 SAR measurement results

Test setup		Mode and Frequency			Duty cycle		Power correction			SAR results [W/kg] (Max.value of multi-peak)						SAR plot # in Appx. 2	Setup photo # in Appx. 1-3	Memo
Test position	Gap [mm]	Mode (D/R) Mark with "*" is the initial mode & frequency.	[MHz]	CH	Duty [%]	Duty scaled factor	Max. tune-up limit [dBm]	Measured conducted [dBm]	Power scaled (tune-up) factor	Measured SAR	ΔSAR [%]	ΔSAR corrected	Reported SAR (*b)	SAR type	Limit			
Front-right	0	11b (1Mbps)*	2412	1	99.0	1.01	12.5	11.11	1.38	0.470	+1.5	n/a (*a)	**0.655**	1g	1.6	-	P1	-
Front-right	0	11b (1Mbps)*	2437*	6	99.0	1.01	12.5	11.22	1.34	0.453	+1.4	n/a (*a)	**0.613**	1g	1.6	-	P1	-
Front-right	0	11b (1Mbps)*	2462	11	99.0	1.01	12.5	10.92	1.44	0.482	+1.2	n/a (*a)	**0.701**	1g	1.6	-	P1	-
Front-right	0	11g (6Mbps)	2412	1	93.8	1.07	12.5	10.52	1.58	0.361	+1.5	n/a (*a)	**0.610**	1g	1.6	-	P1	-
Front-right	0	11g (6Mbps)	2437	6	93.8	1.07	12.5	11.02	1.41	0.426	+1.4	n/a (*a)	**0.643**	1g	1.6	-	P1	-
Front-right	0	11g (6Mbps)	2462	11	93.8	1.07	12.5	10.54	1.57	0.406	+1.2	n/a (*a)	**0.682**	1g	1.6	-	P1	-
Front-right	0	11n20 (MCS0)	2412	1	93.2	1.07	12.5	11.69	1.21	0.475	+1.5	n/a (*a)	**0.615**	1g	1.6	-	P1	-
Front-right	0	11n20 (MCS0)	2437	6	93.2	1.07	12.5	11.77	1.18	0.483	+1.4	n/a (*a)	**0.610**	1g	1.6	-	P1	-
Front-right	0	11n20 (MCS0)	2462	11	93.2	1.07	12.5	11.66	1.21	0.564	+1.2	n/a (*a)	**0.730**	1g	1.6	1	P1	-
Front-right	0	BT LE (1Mbps)*	2440	19	64	1.56	7.5	5.94	1.43	0.085	+1.4	n/a (*a)	**0.190**	1g	1.6	-	P1	-
Front	0	11b (1Mbps)*	2437*	6	99	1.01	12.5	11.22	1.34	0.296	+1.4	n/a (*a)	**0.401**	1g	1.6	-	P2	-
Right	0	11b (1Mbps)*	2437*	6	99	1.01	12.5	11.22	1.34	0.066	+1.4	n/a (*a)	**0.089**	1g	1.6	-	P3	-
Top	0	11b (1Mbps)*	2437*	6	99	1.01	12.5	11.22	1.34	n/a (*1)	+1.4	n/a (*a)	n/a (*1)	1g	1.6	-	P4	-
Rear	0	11b (1Mbps)*	2437*	6	99	1.01	12.5	11.22	1.34	n/a (*1)	+1.4	n/a (*a)	n/a (*1)	1g	1.6	-	P5	-
Bottom	0	11b (1Mbps)*	2437*	6	99	1.01	12.5	11.22	1.34	n/a (*1)	+1.4	n/a (*a)	n/a (*1)	1g	1.6	-	P6	-
Left	0	11b (1Mbps)*	2437*	6	99	1.01	12.5	11.22	1.34	n/a (*1)	+1.4	n/a (*a)	n/a (*1)	1g	1.6	-	P7	-

*1. Zoom scan was not performed, because the measured interpolated maximum SAR value of area scan was very small.
*. The highest Reported (scaled) SAR is marked with yellow marker (x.xxx), respectively.
*. Appx. Appendix; n/a: not applied; Gap: It is separation distance between the device surface and the bottom outer surface of phantom.
*. Before SAR test, the battery of EUT was full charged.
*. During SAR test, the radiated power is always monitored by Spectrum Analyzer.

*a. Since the calculated ΔSAR values of the tested liquid had shown positive correction, the measured SAR was not converted by ΔSAR correction.
Calculating formula: ΔSAR corrected SAR (W/kg) = (Measured SAR (W/kg)) × (100 - (ΔSAR(%)) / 100
*b. Calculating formula: Reported (Scaled) SAR (W/kg) = (Measured SAR (W/kg)) × (Duty scaled factor) × (Power scaled factor)
where, Duty scaled factor [-] = 100(%) / (measured duty cycle, %), Power scaled factor [-] = 10 ^ (((Max.tune-up limit power, dBm) - (Measured conducted power, dBm)) / 10)
*. Calibration frequency of the SAR measurement probe (and used conversion factors for each frequency.)
The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

Liquid	SAR test frequency	Probe calibration frequency	Validity	Conversion factor	Uncertainty
Head	(2412, 2437, 2440, 2462) MHz	2450 MHz	within ± 5 0MHz of calibration frequency	7.15	± 12.0 %

7.2 Simultaneous transmission evaluation

Result: Simultaneous transmission did not exist.

*. The EUT has single antenna and WLAN and Bluetooth are not transmitted simultaneously.

7.3 SAR Measurement Variability (Repeated measurement requirement)

Result: Since all the measured SAR were less than 0.8 W/kg (SAR(1g)), the repeated measurement was not required.

*. In accordance with published RF Exposure KDB 865664 D01: SAR measurement 100 MHz to 6 GHz. 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.

1) Repeated measurement is not required when the original highest measured SAR(1g) is < 0.80 W/kg; steps 2) through 4) do not apply.
2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
3) Perform a second repeated measurement only 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 (~ 10% from the 1-g SAR limit).
4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

EUT setup	Band [GHz]	Mode	Frequency [MHz]	SAR Measurement Variability Result												SAR plot # in Appendix 2 (Setup photo# in Appendix 1-3)		
Position				Type	Unit	Original		1st Repeated				2nd Repeated				Original	1st Repeated	2nd Repeated
						Highest	Judge	Measured	Judge	Ratio	Judge	Measured	Judge	Ratio	Judge			
Front-right	WLAN 2.4 GHz	11n20	2462	SAR1g	W/kg	**0.564**	< 0.8	**n/a**	-	-	-	**n/a**	-	-	-	1 (P1)	-	-

*. Calculating formula: "Ratio": Largest to Smallest SAR Ratio (%) = (Largest SAR (W/kg)) / Smallest SAR (W/kg)

7.4 Device holder perturbation verification (SAR)

Result: Since all the reported (scaled) SAR were less than 1.2 W/kg (SAR(1g)), the additional "device holder perturbation verification" measurement was not considered.

When the highest reported SAR of an antenna is > 1.2 W/kg, holder perturbation verification (by Urethane form alone) is required by using the highest SAR configuration among all applicable frequency bands.

7.5 Requirements on the Uncertainty Evaluation

7.5.1 SAR Uncertainty Evaluation

Decision Rule ☑ Uncertainty is not included.
☐ Uncertainty is included.

*. The highest measured SAR(1g) is less than 1.5 W/kg and the highest measured SAR(10g) is less than 3.75 W/kg. Therefore, per KDB 865664 D01, the extended measurement uncertainty analysis described in IEEE 1528-2013 and IEC/IEEE 62209-1528 is not required.

APPENDIX 2: Measurement data

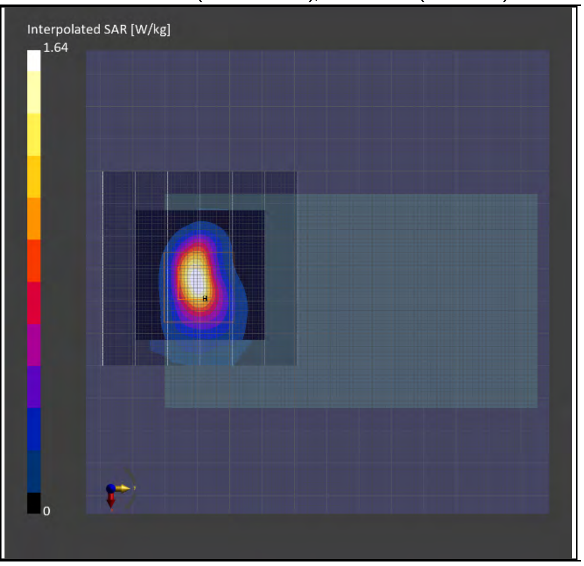
Appendix 2-1: Plot(s) of Worst Reported Value

Plot 1: Front-right & touch, 11n(20HT)(MCS0), 2462 MHz

EUT: Wireless LAN/Bluetooth Module; Model: S080WIFI-PCA+IM032(Digital Camera); Serial:IM032-SAR (PP2-001: Digital Camera)
Mode: 11n20(MCS0, OFDM) (UID: 0 (CW)); Frequency: 2462 MHz; Test Distance: 0 mm
TSL parameters used: Head(v6) ; f= 2462 MHz; Conductivity: 1.871 S/m; Permittivity: 39.77

DASY8 Configuration: - Electronics: DAE4 - SN626 (Calibrated:2023-01-18) / - Phantom: ELI V8.0 (20deg probe tilt) ; Serial: 2161 ; Phantom section: Flat
- Probe: EX3DV4 - SN3907(Calibrated: 2023-01-16); ConvF: (7.15, 7.15, 7.15)@2462 MHz / - Software: 16.2.2.1588 (Measurement); 16.2.2.1588 (Evaluation)

Scan Setup			Measurement Results		
	Area Scan	Zoom Scan		Area Scan	Zoom Scan
Grid Extents [mm]	60.0×60.0	30.0× 30.0 ×30.0	psSAR 1g [W/kg]	0.559	**0.564**
Grid Steps [mm]	10.0×10.0	5.0× 5.0 ×1.5	psSAR 10g [W/kg]	0.221	**0.205**
Sensor Surface [mm]	3.0	1.4	Power Drift [dB] (begin)	-0.01 (0.52 W/kg)	0.05 (0.51 W/kg)
Graded Grid	n/a	Yes	Power Scaling	Disabled	Disabled
Grading Ratio	n/a	1.5	Scaling Factor [dB]	N/A	N/A
MAIA	Y (Confirmed by MAIA)	Y (Confirmed by MAIA)	TSL Correction	No correction	No correction
Surface Detection	VMS + 6p	VMS + 6p	M2/M1 [%]	N/A	71.6
Scan Method	Measured	Measured	Dist 3dB Peak [mm]	N/A	5.9



Remarks: *. Date tested: 2023-03-27;Tested by: Hiroshi Naka; Tested place:No.7 shielded room; Ambient: (23~24) deg.C. / (60~80) %RH; Liquid depth: 150 mm;
*. Liquid temperature: 22.5 deg.C. ± 0.5 deg.C. (22.5 deg.C., in check); *. Red cubic: big=SAR(10g) / small=SAR(1g)
*. Project file name-Measurement Group: 230327_sar_14560222.d8sar- 3/27-9,front-R,2462,n20(m0)

APPENDIX 3: Test instruments

Appendix 3-1: Equipment used

Test Name	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Calibration Last Date	Calibration Interval (Month)
AT	KAT10-S3	144893	Attenuator	Keysight Technologies Inc	8490D 010	50924	2022/12/12	12
AT	KSA-08	145089	Spectrum Analyzer	Keysight Technologies Inc	E4446A	MY46180525	2022/11/01	12
AT	SCC-G14	145175	Coaxial Cable	Suhner	SUCOFLEX 102	31600/2	2022/12/01	12
AT	SOS-26	191844	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	-	2022/08/06	12
AT	SPM-13	169910	Power Meter	Keysight Technologies Inc	8990B	MY51000448	2022/11/08	12
AT	SPSS-06	169911	Power sensor	Keysight Technologies Inc	N1923A	MY57270004	2022/11/08	12

*. AT (antenna terminal conducted power measurement) was measured January 19, 2023. (Refer to Section 5 in this report.)

Test Name	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Calibration Last Date	Calibration Interval (Month)
SAR	COTS-SAR-03	224031	DASY8 Module SAR/APD	Schmid&Partner Engineering AG	DASY8 module SAR V16.2.2.1588	9-2506F07D	-	-
SAR	COTS-SSEP-02	144886	Dielectric assessment kit	Schmid&Partner Engineering AG	DAK v3.0.6.4	9-0EE103A4	-	-
SAR	KDAE-01	144944	Data Acquisition Electronics	Schmid&Partner Engineering AG	DAE4	626	2023/01/18	12
SAR	KOS-14	144986	Thermo-Hygrometer data logger	SATO KEIRYOKI	SK-L200THIIα/SK-LTHIIα-2	015246/08169	2022/08/06	12
SAR	KRU-04	145086	Ruler(300mm)	SHINWA	13134	-	2023/02/08	12
SAR	KRU-05	145087	Ruler(100x50mm,L)	SHINWA	12101	-	2023/02/08	12
SAR	KSDA-01	145090	Dipole Antenna	Schmid&Partner Engineering AG	D2450V2	822	2023/01/12	12
SAR	KSDH-01	145596	Device holder	Schmid&Partner Engineering AG	Mounting device for transmitter	-	2022/09/09	12
SAR	SALC-01	146112	Primepure Ethanol	Kanto Chemical Co., Inc.	14032-79	-	-	-
SAR	SEPP-03	230493	Dielectric assessment kit	Schmid&Partner Engineering AG	DAKS-3.5	1160	2022/12/14	12
SAR	SOS-26	191844	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	-	2022/08/06	12
SAR	SOS-SAR2	201967	Digital thermomoter	HANNA	Checktemp-4	A01440226111	2022/08/06	12
SAR	SOS-SAR3	201968	Digital thermomoter	HANNA	Checktemp-4	A01310946111	2022/08/06	12
SAR	SPA-SAR1	230872	RF Power Source	Schmid&Partner Engineering AG	POWERSORCE1	4300	2022/12/16	12
SAR	SPB-02	146235	Dosimetric E-Field Probe	Schmid&Partner Engineering AG	EX3DV4	3907	2023/01/16	12
SAR	SPC-SAR4	224020	DASY8 PC	Hewlett Packard	HP Z4 G4 Workstation	CZC1198G21	-	-
SAR	SPFL-02	224034	Flat Phantom	Schmid&Partner Engineering AG	ELI V8.0	2161	2022/10/20	12
SAR	SRU-06	150560	Measuring Tool, Ruler	SHINWA	14001	–	2023/02/08	12
SAR	SSA-04	146176	Spectrum Analyzer	ADVANTEST	R3272	101100994	-	-
SAR	SSEOC-03	224026	Electro-Optical Converter	Schmid&Partner Engineering AG	EOC8-60	1027	-	-
SAR	SSLB-03	224027	Light Beam Unit	Schmid&Partner Engineering AG	LIGHTBEAM-85	2069	-	-
SAR	SSLHV6-01	207714	Head Tissue Simulating Liquid	Schmid&Partner Engineering AG	HBBL600-10000V6	SL AAH U16 BC	-	-
SAR	SSMAIA-01	224028	Modulation & Audio Interference Analyser	Schmid&Partner Engineering AG	MAIA	1582	-	-
SAR	SSMP-03	225155	Mounting Platform	Schmid&Partner Engineering AG	MP8E-TX2-60L Basic	-	-	-
SAR	SSMS-03	224025	Measurement Server	Schmid&Partner Engineering AG	DASY8 Measurement Server	10042	2023/03/01	12
SAR	SSNA-01	146258	Network Analyzer	Keysight Technologies Inc	8753ES	US39171777	2022/10/03	12
SAR	SSRBT-03	224032	6-axis Robot	Schmid&Partner Engineering AG	TX2-60L spe	F/22/0033789/A/001	2022/10/28	12
SAR	SSRC-03	224023	Robot Controller	Schmid&Partner Engineering AG	CS9spe-TX2-60	F/22/0033789/C/001	-	-
SAR	SWTR-03	146185	DI water	MonotaRo	34557433	-	-	-

*. Local ID: SALC-01, the parameters of primepure Ethanol (as reference liquid) used for the simulated tissue parameter confirmation was defined the NPL Report MAT23 (http://www.npl.co.uk/content/conpublication/4295)

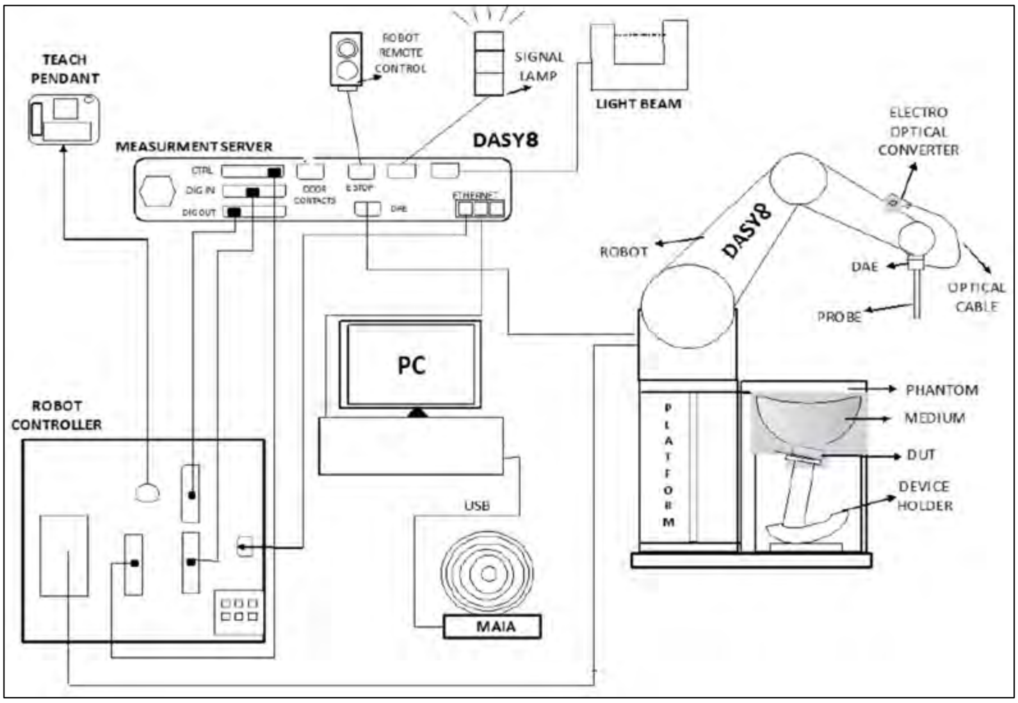
The expiration date of calibration is the end of the expired month.
As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chain of calibrations.
All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.
*. Hyphens for Last Calibration Date and Cal Int (month) are instruments that Calibration is not required (e.g. software), or instruments checked in advance before use.

[Test Item] SAR: Specific Absorption Rate, AT: Antenna terminal conducted power

Appendix 3-2: Measurement System

Appendix 3-2-1: SAR Measurement System

These measurements were performed with the automated near-field scanning system DASY8 from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision robot), which positions the probes with a positional repeatability of better than ± 0.03 mm. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines to the data acquisition unit. The SAR measurements were conducted with the dosimetry probes EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

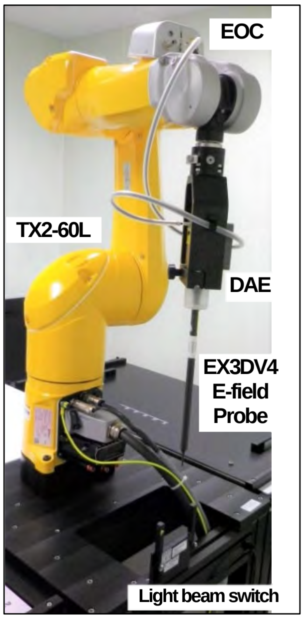


The DASY8 SAR/APD system for performing compliance tests consist of the following items:

- 6-axis robotic arm (Stäubli TX2-60L) for positioning the probe
- Mounting Platform for keeping the phantoms at a fixed location relative to the robot
- Measurement Server for handling all time-critical tasks, such as measurement data acquisition and supervision of safety features
- EOC (Electrical to Optical Converter) for converting the optical signal from the DAE to electrical before being transmitted to the measurement server
- LB (Light-Beam unit) for probe alignment (measurement of the exact probe length and eccentricity)
- SAR probe (EX3DV4 probes) for measuring the E-field distribution in the phantom. The SAR distribution and the psSAR (peak spatial averaged SAR) are derived from the E-field measurement.
- SAR phantom that represents a physical model with an equivalent human anatomy. A Specific Anthropomorphic Mannequin (SAM) head is usually used for handheld devices, and a Flat phantom is used for body-worn devices.
- TSL (Tissue Simulating Liquid) representing the dielectric properties of used tissue, e.g. Head Simulating Liquid, HSL.
- DAE (Data Acquisition Electronics) for reading the probe voltages and transmitting it to the DASY8 PC.
- Device Holder for positioning the DUT beneath the phantom.
- MAIA (Modulation and Interference Analyzer) for confirming the accuracy of the probe linearization parameters
- Operator PC for running the DASY8 software to define/execute the measurements
- System validation kits for system check/validation purposes.

Platforms

The platform is a multi-phantom support structure made of a wood and epoxy composite (ε = 3.3 and loss tangent δ < 0.07). It is a strong and rigid structure transparent to electric and magnetic fields (nonmetallic components).



TX2-60L robot, CS9 robot controller

•Number of Axes : 6 •Repeatability : ± 0.03 mm •Manufacture : Stäubli

DASY8 Measurement server

The DASY8 Measurement Server handles all time critical tasks such as acquisition of measurement data, detection of phantom surface, control of robot movements, supervision of safety features.
•Manufacture : Schmid & Partner Engineering AG

Data Acquisition Electronic (DAE)

The DAE is used to acquire the probe sensor voltages and transfer them to the DASY8 Measurement Server, and to report mechanical surface detection and probe collisions. The 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 with a control logic unit. Transmission to the DASY8 Measurement Server is accomplished through an optical downlink for data and status information and an optical uplink for commands and the clock. The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts used for mechanical surface detection and probe collision detection.
•Measurement Range : 1 μV to > 200 mV (2 range settings: 4 mV (low), 400 mV (high))
•Input Offset voltage : < 1 μV (with auto zero) •Input Resistance : 200 MΩ
•Battery operation : > 10 hrs. (with two rechargeable 9 V battery)
•Manufacture : Schmid & Partner Engineering AG

Electro-Optical Converter (EOC8-TX2-60L)

The Electrical to Optical Converter (EOC8) supports as data exchange between the DAE and the measurement server (optical connector) and data acquisition based on Ethernet protocol.
•Manufacture : Schmid & Partner Engineering AG

Light Beam Switch

The light beam unit allows automatic "tooling" of the probe. During the process, the actual position of the probe tip with respect to the robot arm, as well as the probe length and the horizontal probe offset, are measured. The software then corrects all movements within the measurement jobs, such that the robot coordinates are valid for the probe tip. The repeatability of this process is better than 0.1 mm. If a position has been taught with an aligned probe, the same position will be reached with another aligned probe within 0.1mm, even if the other probe has different dimensions. During probe rotations, the probe tip will keep its actual position.
•Manufacture : Schmid & Partner Engineering AG

SAR measurement software

•Software version : Refer to Appendix 3-1 (Equipment used) •Manufacture : Schmid & Partner Engineering AG

E-Field Probe

•Model : EX3DV4 •Frequency : 4 MHz to 10 GHz, Linearity: ±0.2 dB (30 MHz to 10 GHz)
•Construction : Symmetrical design with triangular core, Built-in shielding against static charges, PEEK enclosure material (resistant to organic solvents, e.g., DGBE).
•CF : Refer to calibration data of Appendix. (CF: Conversion Factors)
•Directivity : ± 0.1 dB in TSL (rotation around probe axis) / ± 0.3 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)
•Dimension : Overall length: 330 mm (Tip: 20 mm) / Tip diameter: 2.5 mm (Body: 12 mm)
Typical distance from probe tip to dipole centers: 1mm
•Application : High precision dosimetric measurement in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6GHz with precision of better 30%.
•Manufacture : Schmid & Partner Engineering AG

ELI Phantom

The ELI phantom is used for compliance testing of handheld and body-mounted wireless devices in the frequency range of 4 MHz to 10 GHz. ELI is fully compatible with the IEC/IEEE 62209-1528 standard and all known tissue simulating liquids.
ELI V8.0 phantom shell has optimized pretension in the bottom surface during production, such that the phantom is more robust and with reduced sagging.
•Model Number : ELI V8.0 flat phantom •Shell Material : Vinyl ester, fiberglass reinforced (VE-GF)
•Shell Thickness : 2.0 ± 0.2 mm (bottom plate) •Dimensions : 600 mm × 400 mm (oval) (volume: Approx. 30 liters)
•Manufacture : Schmid & Partner Engineering AG

Device Holder, Laptop holder, support material

Accurate device positioning is crucial for accurate and repeatable measurements. The positions in which the devices must be measured are defined by the standards. The device holder is designed to cope with the different positions given in the standard. It has two scales for device rotation (with respect to the body axis) and device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles. The DASY device holder is constructed of low-loss POM material having the following dielectric parameters: relative permittivity ε=3 and loss tangent δ=0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

☒ Device holder: In combination with the ELI phantom, the Mounting Device enables the rotation of the mounted transmitter device in spherical coordinates. Transmitter devices can be easily and accurately positioned. The low-loss dielectric urethane foam was used for the mounting section of device holder.
•Material : Polyoxymethylene (POM) •Manufacture: Schmid & Partner Engineering AG

☐ Laptop holder: A simple but effective and easy-to-use extension for the Mounting Device; facilitates testing of larger devices (e.g., laptops, cameras, etc.) according to IEC 62209-2.
•Material : Polyoxymethylene (POM), PET-G, Foam •Manufacture: Schmid & Partner Engineering AG

☒ Support form: Urethane foam

Data storage and evaluation (post processing)

The uplink signal transmitted by the DUT is measured inside the TSL by the probe, which is accurately positioned at a precisely known distance and with a normal orientation with respect to the phantom surface. The dipole / loop sensors at the probe tips pick up the signal and generate a voltage, which is measured by the voltmeter inside the DAE. The DAE returns digital values, which are converted to an optical signal and transmitted via the EOC to the measurement server. The data is finally transferred to the DASY8 software for further post processing. In addition, the DASY8 software periodically requests a measurement with short-circuited inputs from the DAE to compensate the amplifier offset and drift. This procedure is called DAE zeroing.
The operator has access to the following low level measurement settings:

- the integration time is the voltage acquisition time at each measurement point. It is typically 0.5 s.
- the zeroing period indicates how often the DAE zeroing is performed.

In parallel, the MAIA measures the characteristics of the uplink signal via the air interface and sends this information to the DASY8 software, which compares them to the communication system defined by the operator. A warning is issued if any difference is detected.

The measurement data is now acquired and can be post processed to compute the psSAR1g /8g /10g.
The measured voltages are not directly proportional to SAR and must be linearized. The formulas below are based on [1] (*1).
The measured voltage is first linearized using the (a, b, c, d) set of parameters specific to the communication system and sensor:

$$V_{compi} = U_i + U_i^2 \cdot \frac{10^{\frac{d}{10}}}{d_{cp_i}}$$

with	*Vcompi*	= compensated voltage of channel i (μV)	(i = x,y,z)
	Ui	= input voltage of channel i (μV)	(i = x,y,z)
	d	= PMR factor d (dB)	(Probe parameter)
	dcpi	= diode compression point of channel i (μV)	(Probe parameter, i = x,y,z)

$$V_{compi_{dB\sqrt{\mu V}}} = 10 \cdot \log_{10}(V_{compi})$$

$$corr_i = a_i \cdot e^{-(\frac{b_i - 10\log_{10}(V_{compi})}{c_i})^2}$$

with	*corri*	= correction factor of channel i (dB)	(i = x,y,z)
	$Vcompi_{dB\sqrt{\mu V}}$	= compensated voltage of channel i ($dB\sqrt{\mu V}$)	(i = x,y,z)
	ai	= PMR factor a of channel *i* (dB)	(Probe parameter, i = x,y,z)
	bi	= PMR factor b of channel *i* ($dB\sqrt{\mu V}$)	(Probe parameter, i = x,y,z)
	ci	= PMR factor c of channel *i* (-)	(Probe parameter, i = x,y,z)

The voltage $Vi_{dB\sqrt{\mu V}}$ is the linearized voltage in $dB\sqrt{\mu V}$):

$$V_{i_{dB\sqrt{\mu V}}} = V_{compi_{dB\sqrt{\mu V}}} - corr_i$$

with	$Vi_{dB\sqrt{\mu V}}$	= linearized voltage of channel i ($dB\sqrt{\mu V}$)	(i = x,y,z)
	$Vcompi_{dB\sqrt{\mu V}}$	= compensated voltage of channel i ($dB\sqrt{\mu V}$)	(i = x,y,z)
	Corr*i*	= PMR factor a of channel *i* (dB)	(i = x,y,z)

Finally, the linearized voltage is converted in μV :

$$V_i = 10^{\frac{V_{i_{dB\sqrt{\mu V}}}}{10}}$$

with	*Vi*	= linearized voltage of channel i (μV)	(i = x,y,z)
	$Vcompi_{dB\sqrt{\mu V}}$	= linearized voltage of channel i ($dB\sqrt{\mu V}$)	(i = x,y,z)

The Field data for each channel are calculated using the linearized voltage:

E-filedprobes: $$E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

with	*Vi*	= linearized voltage of channel i in μV	(i = x,y,z)
	Normi	= sensor sensitivity of channel i in μV/(V/m)2 for E-field Probes	(i = x,y,z)
	ConvF	= sensitivity enhancement in solution	
	Ei	= electric field strength of channel i in V/m	(i = x,y,z)

The RMS value of the field components gives the total field strength (Hermitian magnitude) :

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

The E-field data value is used to calculate SAR :

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$

with	SAR	= local specific absorption rate in mW/g
	Etot	= total field strength in V/m
	σ	= conductivity in [Ω/m] or [S/m]
	ρ	= equivalent tissue density in g/cm3

Note: The resulting linearized voltage is only approximated because the probe UID is used 0 (CW) for the test signal in this test report.

(*1) [1] Jagadish Nadakuduti, Sven Kuehn, Marcel Fehr, Mark Douglas Katja Pokovic and Niels Kuster, "The Effect of Diode Response of electromagnetic Field Probes for the Measurements of Complex Signals." IEEE Transactions on Electromagnetic Compatibility, vol. 54, pp. 1195–1204, Dec. 2012.

Appendix 3-2-2: SAR system check results

*. Prior to the SAR assessment of EUT, the Daily check was performed to test whether the SAR system was operating within its target of ±10%. The Daily check results are in the table below.

Daily check results (*. Abbreviations: F: Frequency, Meas.: Measured, Cal.: Calibration value, STD: Standard value, Dev.: Deviation)

Liquid type: Head / Date	F [MHz]	ΔSAR 1g [%]	ΔSAR 10g [%]	SAR (1g) [W/kg] (*b) Meas. (*a)	SAR (1g) 1W scaled	SAR (1g) Target Cal. (*c)	SAR (1g) Target STD (*d)	SAR (1g) Deviation Cal. [%]	SAR (1g) Deviation STD [%]	SAR (10g) [W/kg] (*b) Meas. (*a)	SAR (10g) 1W scaled	SAR (10g) Target Cal. (*c)	SAR (10g) Target STD (*d)	SAR (10g) Deviation Cal. [%]	SAR (10g) Deviation STD [%]	Dev. Limit [%]
March 27, 2023	2450	1.3	0.7	2.64	52.12	51.9	52.4	0.4	-0.5	1.23	24.42	24.6	24	-0.7	1.8	≤10

*a. The Measured SAR/APD value is obtained at 50 mW (17 dBm) for 2450 MHz

*b. The measured SAR value of Daily check was compensated for tissue dielectric deviations (ΔSAR) and scaled to 1W of output power in order to compare with the manufacture's calibration target value which was normalized.
ΔSAR corrected SAR (1g) (W/kg) = (Measured SAR(1g) (W/kg)) × (100 - (ΔSAR1g(%)) / 100
ΔSAR corrected SAR (10g) (W/kg) = (Measured SAR(10g) (W/kg)) × (100 - (ΔSAR10g(%)) / 100

*c. The target value is a parameter defined in the calibration data sheet of D2450V2 (sn:822) dipole calibrated by Schmid & Partner Engineering AG, the data sheet was filed in this report when there were used.

*d. The target value (normalized to 1W) is defined in IEEE Std.1528.

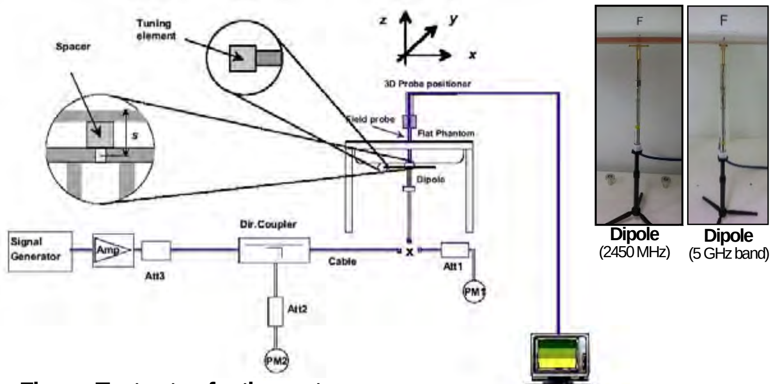
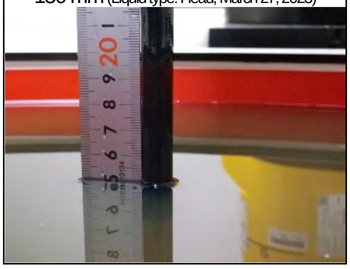


Figure. Test setup for the system performance check (example)

Appendix 3-2-3: SAR system check measurement data

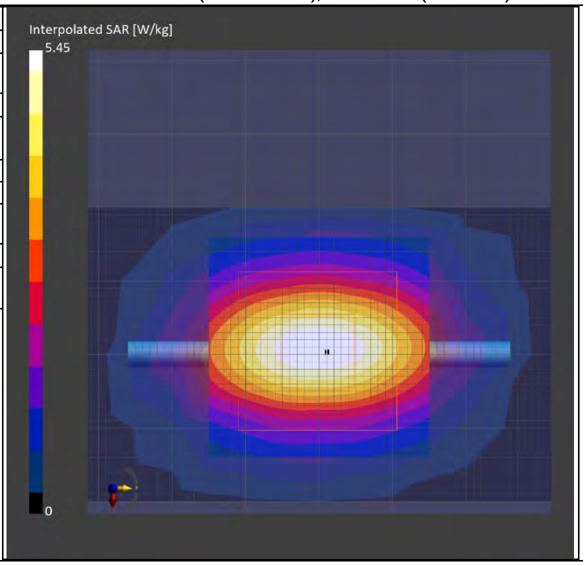
Photographs of Liquid depth
150 mm (Liquid type: Head, March 27, 2023)



EUT: Dipole(2.4GHz) ; Model: D2450V2 ; Serial: 822; Input power: 17 dBm (50 mW)
Mode: CW (UID: 0 (CW)) ; Frequency: 2450 MHz ; Test Distance: 10 mm (dipole to liquid)
TSL parameters used: Head(v6) ; f= 2450 MHz; Conductivity: 1.863 S/m; Permittivity: 39.79

DASY8 Configuration: - Electronics: DAE4 - SN626 (Calibrated:2023-01-18) / - Phantom: ELI V8.0 (20deg probe tilt) ; Serial: 2161 ; Phantom section: Flat
- Probe: EX3DV4 - SN3907(Calibrated: 2023-01-16); ConvF: (7.15, 7.15, 7.15)@2450 MHz / - Software: 16.2.2.1588 (Measurement); 16.2.2.1588 (Evaluation)

Scan Setup	Area Scan	Zoom Scan	Measurement Results	Area Scan	Zoom Scan
Grid Extents [mm]	40.0×80.0	30.0× 30.0 ×30.0	psSAR 1g [W/kg]	2.67	**2.64**
Grid Steps [mm]	10.0×10.0	5.0× 5.0 ×1.5	psSAR 10g [W/kg]	1.24	**1.23**
Sensor Surface [mm]	3.0	1.4	Power Drift [dB] (begin)	0.02 (2.42 W/kg)	0.01 (2.43 W/kg)
Graded Grid	n/a	Yes	Power Scaling	Disabled	Disabled
Grading Ratio	n/a	1.5	Scaling Factor [dB]	N/A	N/A
MAIA	Y (Confirmed by MAIA)	Y (Confirmed by MAIA)	TSL Correction	No correction	No correction
Surface Detection	VMS + 6p	VMS + 6p	M2/M1 [%]	N/A	80.7
Scan Method	Measured	Measured	Dist 3dB Peak [mm]	N/A	9.0



Remarks: *. Date tested: 2023-03-27;Tested by: Hiroshi Naka; Tested place:No.7 shielded room; Ambient: 23 deg.C. / 70 %RH; Liquid depth: 150 mm;
*. Liquid temperature: 22.5 deg.C. ± 0.5 deg.C. (22.5 deg.C., in check); *. Red cubic: big=SAR(10g) / small=SAR(1g)
*. Project file name-Measurement Group: 230327_sar_14560222.d8sar- 3/27,dly-h2450,p17

Appendix 3-3: Measurement Uncertainty

Uncertainty of SAR measurement (2.4 GHz ~ 6 GHz) (*. liquid: head(v6), DAKS-3.5, Wi-Fi(BT)) (v11r03)								1g SAR	10g SAR
Symbol	Error Description	Uncertainty (Unc.)	Probability distribution	Divisor	ci (1g)	ci (10g)		ui (1g) (Std. Unc.)	ui (10g) (Std. Unc.)
Measurement System (DASY8)									
CF	Probe Calibration (EX3DV4)	± 13.1 %	Normal	2	1	1		± 6.55 %	± 6.55 %
CFdrift	Probe Calibration Drift	± 1.7 %	Rectangular	√3	1	1		± 1.0 %	± 1.0 %
LIN	Probe Linearity	± 4.7 %	Rectangular	√3	1	1		± 2.7 %	± 2.7 %
BBS	Broadband Signal	± 2.6 %	Rectangular	√3	1	1		± 1.5 %	± 1.5 %
ISO1	Probe Isotropy	± 7.6 %	Rectangular	√3	1	1		± 4.4 %	± 4.4 %
DAE	Data Acquisition	± 1.2 %	Normal	1	1	1		± 1.2 %	± 1.2 %
AMB	RF Ambient (noise&refrection) (< 12μW/g)	± 1.0 %	Normal	1	1	1		± 1.0 %	± 1.0 %
Δsys	Probe Positioning	± 0.5 %	Normal	1	0.33	0.33		± 0.2 %	± 0.2 %
DAT	Data Processing	± 2.3 %	Normal	1	1	1		± 2.3 %	± 2.3 %
Phantom and Device Error									
LIQ(σ)	Conductivity (measured) (DAKS-3.5)	± 5.0 %	Normal	2	0.78	0.71		± 2.0 %	± 1.8 %
LIQ(Tσ)	Conductivity (temperature) (≤ 2 deg.C.)	± 2.4 %	Rectangular	√3	0.78	0.71		± 1.1 %	± 1.0 %
EPS	Phantom Permittivity (liquid to antenna: ≥ 5 mm)	± 14.0 %	Rectangular	√3	0.25	0.25		± 2.0 %	± 2.0 %
DIS	Distance EUT-TSL	± 2.7 %	Normal	1	2	2		± 5.4 %	± 5.4 %
Dxyz	Test Sample positioning	± 1.8 %	Normal	1	1	1		± 5.0 %	± 5.0 %
H	Device holder uncertainty	± 3.6 %	Normal	1	1	1		± 3.6 %	± 3.6 %
MOD	EUT Modulation	± 3.2 %	Normal	1	1	1		± 3.2 %	± 3.2 %
TAS	Time-average SAR	± 0.0 %	Rectangular	√3	1	1		± 0.0 %	± 0.0 %
RFdrift	Drift of output power (measured, < 0.2 dB)	± 4.7 %	Normal	2	1	1		± 2.4 %	± 2.4 %
Correction to the SAR results									
C(e,σ)	Deviation to Target (e',σ: ≤ 10 %, IEC head)	± 1.9 %	Normal	1	1	0.84		± 1.9 %	± 1.6 %
C(R)	SAR Scaling	± 0 %	Rectangular	√3	1	1		± 0.0 %	± 0.0 %
u(ΔSAR)	**(SAR: 2.4 GHz~6 GHz) Combined Standard Uncertainty**						**RSS**	**± 12.4 %**	**± 12.3 %**
U	**(SAR: 2.4 GHz~6 GHz) Expanded Uncertainty**						**k=2**	**± 24.8 %**	**± 24.6 %**

*. This uncertainty budget is suggested by IEC/IEEE 62209-1528:2020 and determined by SPEAG, DASY8 Module SAR Manual, 2022-08 (Chapter 6.3, DASY8 Uncertainty Budget for Hand-held/Body-worn Devices, Frequency band: 300 MHz - 3 GHz range and 3 GHz – 6 GHz range). All listed error components have veff equal to ∞.

Uncertainty of SAR daily check (2.4 GHz ~ 6 GHz) (*. liquid: head(v6), DAKS-3.5, CW) (v11r03)								1g SAR	10g SAR
Symbol	Error Description	Uncertainty (Unc.)	Probability distribution	Divisor	ci (1g)	ci (10g)		ui (1g) (Std. Unc.)	ui (10g) (Std. Unc.)
Measurement System (DASY8)									
CF	Probe Calibration (EX3DV4)	± 13.1 %	Normal	2	1	1		± 6.55 %	± 6.55 %
CFdrift	Probe Calibration Drift	± 1.7 %	Rectangular	√3	1	1		± 1.0 %	± 1.0 %
LIN	Probe Linearity	± 4.7 %	Rectangular	√3	1	1		± 2.7 %	± 2.7 %
ISO2	Probe Isotropy	± 4.7 %	Rectangular	√3	1	1		± 2.7 %	± 2.7 %
DAE	Data Acquisition	± 1.2 %	Normal	1	1	1		± 1.2 %	± 1.2 %
AMB	RF Ambient (noise&refrection) (<12uW/g)	± 1.0 %	Rectangular	√3	1	1		± 0.6 %	± 0.6 %
Δsys	Probe Positioning	± 0.5 %	Normal	1	0.33	0.33		± 0.2 %	± 0.2 %
DAT	Data Processing	± 2.3 %	Normal	1	1	1		± 2.3 %	± 2.3 %
Phantom and Device Error									
LIQ(σ)	Conductivity (measured) (DAKS-3.5)	± 5.0 %	Normal	2	0.78	0.71		± 2.0 %	± 1.8 %
LIQ(Tσ)	Conductivity (temperature) (≤ 2 deg.C.)	± 2.4 %	Rectangular	√3	0.78	0.71		± 1.1 %	± 1.0 %
EPS	Phantom Permittivity (liquid to antenna: ≥ 5 mm)	± 14.0 %	Rectangular	√3	0.25	0.25		± 2.0 %	± 2.0 %
VAL	Validation antenna uncertainty	± 5.5 %	Rectangular	√3	1	1		± 3.2 %	± 3.2 %
Pin	Uncertainty in accepted power	± 2.5 %	Normal	2	1	1		± 1.3 %	± 1.3 %
DIS	Distance EUT-TSL	± 2.0 %	Normal	1	2	2		± 4.0 %	± 4.0 %
Dxyz	Test Sample positioning	± 1.0 %	Normal	1	1	1		± 1.0 %	± 1.0 %
RFdrift	Drift of output power (measured, < 0.1 dB)	± 2.3 %	Rectangular	√3	1	1		± 1.3 %	± 1.3 %
Correction to the SAR results									
C(e,σ)	Deviation to Target (e',σ: ≤ 10 %. IEC head)	± 1.9 %	Normal	1	1	0.84		± 1.9 %	± 1.6 %
u(ΔSAR)	**(SAR daily check: 2.4 GHz~6 GHz) Combined Standard Uncertainty**						**RSS**	**± 10.4 %**	**± 10.3 %**
U	**(SAR daily check: 2.4 GHz~6 GHz) Expanded Uncertainty**						**k=2**	**± 20.8 %**	**± 20.6 %**

*. This uncertainty budget is suggested by IEC/IEEE 62209-1528:2020 and determined by SPEAG, DASY8 Module SAR Manual, 2022-08 (Chapter 6.2, DASY8 Uncertainty Budget for System Verification, Frequency band: 300 MHz - 6 GHz range). All listed error components have veff equal to ∞.

*. Table of uncertainties are listed for ISO/IEC 17025.
*. Although this standard determines only the limit value of uncertainty, there is no applicable rule of uncertainty in this. Therefore, the results are derived depending on whether or not laboratory uncertainty is applied.

Appendix 3-4: Calibration certificates

Local ID	LIMS ID	Description	Type/Model	Serial Number	Manufacture	Calibration Certificate	Note
SPB-02	146235	Dosimetric E-Field Probe	EX3DV4	3907	SPEAG		-
KSDA-01	145090	Dipole Antenna (2.45 GHz)	D2450V2	822	SPEAG		*1

*1: As stated on page 2 of the certificate, the calibration was performed in accordance to the latest standard IEC/IEEE 62209-1528. Therefore, the reported SAR values are valid for any system that complies with IEC/IEEE 62209-1528 including all new versions of DASY such as DASY6 and DASY8.

-End of report-