SAR Test Report

Test Report No. 15038839S-A

Customer	**ACSL, Ltd.**
Description of EUT	**Falcon 3.0 GND**
Model Number of EUT	**E-000110-02**
FCC ID	**2A8JK-FIDES-LINK**
Test Regulation	**FCC 47CFR 2.1093**
Test Result	**Complied**
Issue Date	**December 18, 2023**
Remarks	-

Representative Test Engineer	**Approved By**
H. Naka	T. Imamura
Hiroshi Naka Engineer	Toyokazu Imamura Leader

CERTIFICATE 1266.03

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REVISION HISTORY

Original Test Report No.: 15038839S-A

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	15038839S-A	December 18 2023	-

Reference : Abbreviations (Including words undescribed in this report) (radio_r0v09s06_230726)

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
SDM	Space Division Multiplexing
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	ACSL, Ltd.
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Telephone Number	+81-3-6456-9300
Contact Person	Yasuki Ikeuchi

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	Falcon 3.0 GND
Model Number	E-000110-02
Serial Number	STC2000024-AT
Condition of sample	Engineering prototype (Not for sale: The sample is equivalent to mass-produced items.)
Receipt Date of sample	November 29, 2023 (*. No modification by the Lab.) (for antenna power measurement) December 1, 2023 (*. No modification by the Lab.) (for SAR measurement)
Test Date (SAR)	December 1, 2023

2.2 Product Description

General

Feature of EUT	Model number: E-000110-02 (referred to as the EUT in this report) is a Falcon 3.0 GND transmitter and installed into the specified host device.

Radio specification

Equipment type	Transceiver			
Frequency of operation	2412 MHz ~ 2467 MHz (*. Only 3 frequencies (2417, 2432, 2462 MHz) are used.)		Band width	10 MHz
Supported modulations	OFDM			
Typical and maximum transmit power	19 dBm (Maximum, Maximum tune-up tolerance limit) *.The measured output power (conducted) as SAR reference power refers to section 5 in this report. *. Maximum tune-up tolerance limit is conducted burst average power and is defined by a customer as duty cycle 100% (continuous transmitting).			
Antenna quantity	2 pcs. (*. One of the antennas is for receiving only.)			
Antenna ID	Antenna 1 (Tx/Rx)	Antenna 2 (Rx only)		
Antenna type	Omni antenna	Omni antenna		
Antenna connector type	PCB: MHF I (I-PEX 20279-001E), Antenna: soldered	PCB: MHF I (I-PEX 20279-001E), Antenna: soldered		
Antenna gain (max. gain)	2.6 dBi (*including cable loss)	2.6 dBi (*including cable loss)		

*. This report contains data provided by the customer which can impact the validity of results. UL Japan, Inc. is only responsible for the validity of results after the integration of the data provided by the customer.

*. The EUT do not use the special transmitting technique such as “beam-forming” and “time-space code diversity.”

Description of Host devcie

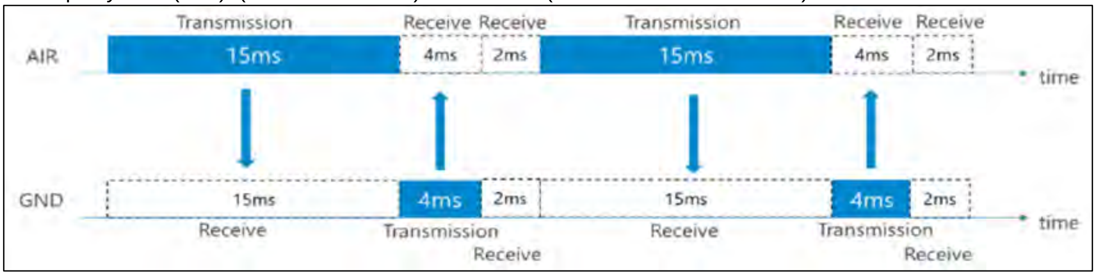
Manufacture	ACSL, Ltd.
Model number	L14 (Controller)
Condition of sample	Engineering prototype (Not for sale: The sample is equivalent to mass-produced items.)
Rating	DC 7.2 V (Li-ion rechargeable battery) *. The battery is built-in the host device, and the user can not remove the battery.
SAR Category 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.

SECTION 3: Maximum SAR value, test specification and procedures

3.1 Summary of Maximum SAR Value

Band	Highest Reported SAR [W/kg]					
	Partial-body (Flat phantom)		Head (SAM phantom)		Hands (Flat phantom)	
	SAR type: SAR (1g)		SAR type: SAR (1g)		SAR type: SAR (10g)	
	Standalone	Simultaneous Transmission	Standalone	Simultaneous Transmission	Standalone	Simultaneous Transmission
2.4 GHz	0.74 (*1) (Separation: 0 mm, Tx occupancy rate: 19.2 %)	N/A	N/A	N/A	N/A	N/A
Limit applied	Partial body/Head: 1.6 W/kg (SAR (1g)), Limbs (Hands): 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					

*1. This module is used as a pair of AIR module and GND module (GND module is this reported model) The AIR module and GND module have the same hardware. On the other hand, the firmware is different for the AIR module and GND module. Switching between TDD transmission and reception is performed under firmware control. The switching will be executed at the following timing. One cycle is 21ms, of which AIR transmits 15ms. GND transmits 4ms. There is a time period of 2ms when both AIR and GND become Receive. This time measures the channel condition.
Tx occupancy rate = (4 ms) / (15 ms + 4 ms +2 ms) * 100 = 19.0% (actual measurement is 19.2 %)



Conclusion

The SAR test values with touch setup condition, found for the device are below the maximum limit of 1.6 W/kg for SAR (1g) requirement (when 19 % Tx occupancy is applied).

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 (SAR 1g)**	**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 D04	Interim General RF Exposure Guidance	v01
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
KDB 941225 D07	SAR Evaluation Procedures for UMPC Mini-Tablet Devices. (Handheld device)	v01r02

*. The measurement uncertainty budget is suggested by IEC/IEEE 62209-1528:2020 and determined by SPEAG, DASY8 Manual for Module SAR. 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

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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 = $\frac{d}{dt}(\frac{dW}{dm}) = \frac{d}{dt}(\frac{dW}{\rho * dV})$
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.

				$f \le$ 3 GHz	3 GHz < $f \le$ 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 OFDM continuous transmitting modes. The frequency used in the SAR testing are shown as a following.

Tx frequency band		2.4 GHz band, 2412 MHz ~ 2467 MHz				
Maximum power [dBm]		19.0				
SAR test Condition	Frequency [MHz]	2417, 2432, 2462 (*. Only 3 frequencies are used.)				
	Modulation	OFDM				
Power setting	Power measurement	18 (*. This power is set for power measurement and is usually not user-settable.)				
	SAR	18 (*. This power is set for power measurement and is usually not user-settable.)				
Controlled software	Test name	Software name	Version	Date	Storage location / Remarks	
	Power measurement	Continuous Tx	1.0.0	2023-11-27	EUT memory. Setting via PC (Tera-Term_4.106)	
	SAR	Continuous Tx	1.0.0	2023-11-27	EUT memory. Setting via PC (Tera-Term_4.106)	

<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 D04(v01), 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) (Clause 5.1.1 Initial Test Position SAR Test Reduction Procedure)
DSSS and OFDM configurations are considered separately according to the required SAR procedures. SAR is measured in the initial test position using the 802.11 transmission mode configuration required by the DSSS procedure or initial test configuration and subsequent test configuration(s) according to the OFDM procedures. The initial test position procedure is described in the following:

a) When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other (remaining) test positions in that exposure configuration and 802.11 transmission mode combinations within the frequency band or aggregated band. SAR is also not required for that exposure configuration in the subsequent test configuration(s).
b) When the reported SAR of the initial test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position using subsequent highest extrapolated or estimated 1-g SAR conditions determined by area scans or next closest/smallest test separation distance and maximum RF coupling test positions based on manufacturer justification, on the highest maximum output power channel, until the reported SAR is ≤ 0.8 W/kg or all required test positions (left, right, touch, tilt or subsequent surfaces and edges) are tested.
c) For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested. Additional power measurements may be required for this step, which should be limited to those necessary for identifying the subsequent highest output power channels.

4.2 RF exposure conditions (Test exemption)

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

Setup	Explanation of EUT setup (*. Refer to Appendix 1 for test setup photographs.)	Antenna position	D [mm]
Top	The omni antenna and top surface of EUT was touched to the Flat phantom.	90 degrees	**0**
Back	The omni antenna and back surface of EUT was touched to the Flat phantom.	0 degree	**0**
Front	The front surface of EUT was touched to the Flat phantom.	0 degree	**≈ 35**
Right	The right surface of EUT was touched to the Flat phantom.	0/90 degree	**≈ 35**
Bottom	The bottom surface existed) of EUT was touched to the Flat phantom.	90 degrees	**≈ 129**
Left	The left surface of EUT was touched to the Flat phantom.	0/90 degree	**≈ 130**

*. **D:** Antenna separation distance. It is the distance from the antenna inside EUT to the outer surface of EUT which user may touch.
*. Details of "antenna separation distance" and "Size of EUT" are shown in Appendix 1-1.

<u>SAR test exemption consideration by KDB 447498 D04 (v01)</u>

							Judge of SAR test exemption ("Test "or "Exempt") / SAR based Threshold power					
							Antenna separation distance					
Tx band, Mode	Higher frequency [MHz]	Conducted		Antenna			0 (< 5) mm	0 (< 5) mm	35 mm	35 mm	129 (>50) mm	130 (>50) mm
		Max. ave. power		Gain	ERP		Top	Back	Front	Right	Bottom	Left
		[dBm]	[mW]	[dBi]	[dBm]	[mW]	SAR (1g)	SAR (1g)	SAR (1g)	SAR (1g)	SAR (1g)	SAR (1g)
2.4GHz, OFDM	2462	19	79	2.6	19.45	88	**Test /** 3 mW	**Test /** 3 mW	Exempt / 111 mW	Exempt / 111 mW	Exempt / > 200 mW	Exempt / > 200 mW

*. Antenna separation distance is rounded to the nearest integer numbers (in mm) before calculation.
*. The table shows the upper frequency which has the maximum power (as "Tune-up limit") in each operation band, in mode and on the single antenna transmission.
*. Antenna separation distance is rounded to the nearest integer numbers (in mm) before calculation.
*. (Calculating formula) ERP (dBm) = (max. conducted output power, dBm) + (antenna gain, dBi) – 2.15

<u><Conclusion for consideration for SAR test reduction></u>

1) Initially, all SAR tests were conservatively performed with test separation distance 0 mm.
2) "Top" and "Back" setup are applied SAR test, because of judge of SAR test exemption is "Test".

SAR-based thresholds (Pth (mW) shown below table of "Example Power Thresholds [mW]" are derived based on frequency, power, and separation distance of the RF source. The formula defines the thresholds in general for either available maximum time-averaged power or maximum time-averaged effective radiated power (ERP), whichever is greater. The SAR-based exemption is calculated by Formula (B.2) in below, applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power or effective radiated power (ERP), whichever is greater, of less than or equal to the threshold Pth (mW).
When 10-g extremity SAR applies, SAR test exemption may be considered by applying a factor of 2.5 to the SAR-based exemption thresholds.
*. This method shall only be used at separation distances from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive).

Table: Example Power Thresholds [mW] for SAR(1g) (Bold: listed in Table B.2 of KDB 447498 D04 (v01), Italic: Calculated)

Frequency [MHz] \ Distance [mm]	**5**	6	7	8	9	**10**	11	12	13	14	**15**	16	17	18	19	**20**	21	22	23	24	**25**	26	27	28	29	**30**	**35**	**40**	**45**	**50**
2402	3	4	5	7	9	10	12	15	17	20	22	25	28	32	35	39	42	46	50	55	59	64	68	73	78	84	112	144	180	220
2450	**3**	4	5	7	8	**10**	12	15	17	19	**22**	25	28	31	35	**38**	42	46	50	54	**59**	63	68	73	78	**83**	**111**	**143**	**179**	**219**
2462	3	4	5	7	8	10	12	14	17	19	22	25	28	31	35	38	42	46	50	54	58	63	68	73	78	83	111	143	179	219
2480	**3**	4	5	7	8	10	12	14	17	19	22	25	28	31	35	38	42	46	50	54	58	63	67	72	77	82	111	143	179	218
3600	**2**	3	4	5	6	**8**	10	11	13	16	**18**	20	23	26	29	**32**	35	38	42	45	**49**	53	57	62	66	**71**	**96**	**125**	**158**	**195**
5240	1	2	3	4	5	6	8	9	11	13	14	17	19	21	24	26	29	32	35	38	42	45	49	53	57	61	83	110	140	174
5320	1	2	3	4	5	6	8	9	11	12	14	16	19	21	23	26	29	32	35	38	41	45	48	52	56	60	83	109	139	173
5700	1	2	3	4	5	6	7	9	10	12	14	16	18	20	23	25	28	31	34	37	40	43	47	51	55	59	81	107	136	170
5800	**1**	2	3	4	5	**6**	7	9	10	12	**14**	16	18	20	22	**25**	28	30	33	36	**40**	43	47	50	54	**58**	**80**	**106**	**136**	**169**
5825	1	2	3	4	5	6	7	9	10	12	14	16	18	20	22	25	28	30	33	36	40	43	47	50	54	58	80	106	135	169
5885	1	2	3	4	5	6	7	8	10	12	14	16	18	20	22	25	27	30	33	36	39	43	46	50	54	58	80	105	135	168
6000	1	2	3	4	5	6	7	8	10	12	13	15	17	20	22	24	27	30	33	36	39	42	46	50	53	57	79	105	134	167

TABLE B.1—THRESHOLDS FOR SINGLE RF SOURCES SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION

RF Source Frequency			Minimum Distance			Threshold ERP
f_L MHz		f_H MHz	$\lambda_L / 2\pi$		$\lambda_H / 2\pi$	W
0.3	-	1.34	159 m	-	35.6 m	1,920 R^2
1.34	-	30	35.6 m	-	1.6 m	3,450 R^2/f^2
30	-	300	1.6 m	-	159 mm	3.83 R^2
300	-	1,500	159 mm	-	31.8 mm	0.0128 R^2f
1,500	-	100,000	31.8 mm	-	0.5 mm	19.2R^2

Subscripts L and H are low and high; λ is wavelength.
From §1.1307(b)(3)(i)(C), modified by adding Minimum Distance columns.

R is in meter, f is in MHz
Threshold ERP [W] = 19.2 × R^2 (~formula (A.1))
(Distance: over 40 cm)

Calculating formula:

$$P_{th}\ (\text{mW}) = ERP_{20\ cm}\ (\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \le f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \le f \le 6\ \text{GHz} \end{cases} \quad \text{(B.1)}$$

$$P_{th}\ (\text{mW}) = \begin{cases} ERP_{20\ cm}(d/20\ \text{cm})^x & d \le 20\ \text{cm} \\ ERP_{20\ cm} & 20\ \text{cm} < d \le 40\ \text{cm} \end{cases} \quad \text{(B.2)} \qquad x = -\log_{10}\left(\frac{60}{ERP_{20\ cm}\sqrt{f}}\right)$$

and f is in GHz, d is the separation distance (cm), and ERP_{20cm} is per Formula (B.1).

SECTION 5: Confirmation before testing

5.1 Test reference power measurement

Mode	Frequency		Power spec.		Duty cycle			Antenna power					Adjusted power setting?	Remarks
			Typical	Max.	duty cycle	duty factor	scaled factor	Set pwr.	Burst Ave.	Δ Max.	Tune-up factor	Time Ave.		
	[MHz]	CH	[dBm]	[dBm]	[%]	[dB]	[-]	[-]	[dBm]	[dB]	[-]	[dBm]	(*1)	
OFDM	2417	2	-	**19.0**	100	0.00	1.00	18	**17.82**	-1.18	1.31	17.82	Yes	-
	2432	5	-	**19.0**	100	0.00	1.00	18	**17.97**	-1.03	1.27	17.97	Yes	-
	2462	11	-	**19.0**	100	0.00	1.00	18	**18.76**	-0.24	1.06	18.76	Yes	-

*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 Max. (Deviation form max. 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: November 27, 2023 / Measured by: H. Naka/ Place: Preparation room of No. 7 shield room. (22 deg.C./ 42 %RH)
*. Uncertainty of antenna port conducted test; (±) 0.81 dB (Average power), (±) 0.27 % (duty cycle).

SECTION 6: Tissue simulating liquid

6.1 Liquid measurement

Frequency [MHz]	Liquid type	Liquid parameters													ΔSAR Coefficients (*a)			Date measured
		Liquid Temp. [deg.C.]	Liquid depth of phantom [mm]	Permittivity (εr) [-]					Conductivity [S/m]					Interpolated? ☐: No ☑: Yes	ΔSAR		ΔSAR correct Required?	
				Target value	Measured			Δend, >48hrs. (*1)	Target value	Measured			Δend, >48hrs. (*1)		1g [%]	10g [%]		
					Value	Δεr [%]	Limit [%]			Value	Δσ [%]	Limit [%]						
2450	Head	22.5	150	**39.2**	39.07	-0.3	10	begin	**1.80**	1.844	2.4	10	begin	☐	1.2	0.7	no	2023-12-01
2417	Head	22.5	150	**39.26**	39.13	-0.3	10	begin	**1.771**	1.817	2.6	10	begin	☐	1.3	0.7	no	2023-12-01, before SAR test.
2432				**39.23**	39.10	-0.3	10	begin	**1.784**	1.829	2.5	10	begin	☐	1.3	0.7	no	
2462				**39.19**	39.05	-0.3	10	begin	**1.813**	1.853	2.2	10	begin	☐	1.1	0.6	no	

*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.

*. The target values refers to clause 6.2 of this report.

*a. The coefficients in below are parameters defined in IEEE Std.1528-2013.
(Calculating formula,4 MHz~6 GHz): $\Delta SAR(1g)= C\varepsilon r \times \Delta\varepsilon r + C\sigma \times \Delta\sigma$, $C\varepsilon r=-7.854E-4\times f^3+9.402E-3\times f^2-2.742E-2\times f-0.2026$ / $C\sigma=9.804E-3\times f^3-8.661E-2\times f^2+2.981E-2\times f+0.7829$
$\Delta SAR(10g)= C\varepsilon r \times \Delta\varepsilon r + C\sigma \times \Delta\sigma$, $C\varepsilon r=3.456\times10^{-3}\times f^3-3.531\times10^{-2}\times f^2+7.675\times10^{-2}\times f-0.1860$ / $C\sigma=4.479\times10^{-3}\times f^3-1.586\times10^{-2}\times f^2-0.1972\times f+0.7717$
(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		Target Frequency	Head		Body	
(MHz)	ε_r	σ(S/m)	ε_r	σ(S/m)	(MHz)	ε_r	σ(S/m)	ε_r	σ(S/m)
1800~2000	40.0	1.40	53.3	1.52	3000	38.5	2.40	52.0	2.73
2450	39.2	1.80	52.7	1.95	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)			

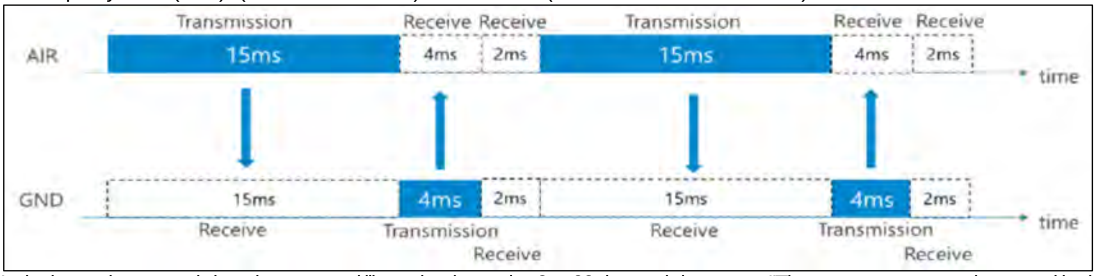
SECTION 7: Measurement results

7.1 Measurement results

7.1.1 SAR measurement results (2.4 GHz band)

Test setup					Mode & 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 (*c)
No.	Test position	Antenna position (degree) (*2)	Gap [mm]	Source power	Mode	[MHz] Mark with "*" is the initial CH.	CH	Duty cycle [%]	Duty scaled factor	Max. tune-up limit [dBm]	Measured conducted [dBm]	Power scaled (tune-up) factor	Measured SAR	ΔSAR [%]	ΔSAR corrected	Tx occupancy rate (*1)	Reported SAR (*b)	SAR type	Limit			
1	Top	90 deg.	0	Battery	OFDM	2417	2	100	1.00	19	17.82	1.31	2.96	+	n/a (*a)	19.2 %	**0.744**	1g	1.6	1-1	P1	-
2	Top	90 deg.	0	Battery	OFDM	2432	5	100	1.00	19	17.97	1.27	2.99	+	n/a (*a)	19.2 %	**0.729**	1g	1.6	-	P1	-
3	Top	90 deg.	0	Battery	OFDM	2462*	11	100	1.00	19	18.76	1.06	3.18	+	n/a (*a)	19.2 %	**0.647**	1g	1.6	-	P1	-
4	Back1	0 deg.	0	Battery	OFDM	2417	2	100	1.00	19	17.82	1.31	2.50	+	n/a (*a)	19.2 %	**0.629**	1g	1.6	-	P2	-
5	Back1	0 deg.	0	Battery	OFDM	2432	5	100	1.00	19	17.97	1.27	2.74	+	n/a (*a)	19.2 %	**0.668**	1g	1.6	-	P2	-
6	Back1	0 deg.	0	Battery	OFDM	2462*	11	100	1.00	19	18.76	1.06	2.56	+	n/a (*a)	19.2 %	**0.521**	1g	1.6	-	P2	-
7	Back2	0 deg.	0	Battery	OFDM	2432	11	100	1.00	19	17.97	1.27	2.60	+	n/a (*a)	19.2 %	**0.634**	1g	1.6	-	P3	-
8	Front	0 deg.	0	Battery	OFDM	2462*	11	100	1.00	19	18.76	1.06	0.082	+	n/a (*a)	19.2 %	**0.017**	1g	1.6	-	P4	-
9	Right	90 deg.	0	Battery	OFDM	2462*	11	100	1.00	19	18.76	1.06	0.103	+	n/a (*a)	19.2 %	**0.021**	1g	1.6	-	P5	-
10	Bottom	90 deg.	0	Battery	OFDM	2462*	11	100	1.00	19	18.76	1.06	n/a	+	n/a (*a)	19.2 %	**n/a**	1g	1.6	-	-	Exempt, See 4.2
11	Left	90 deg.	0	Battery	OFDM	2462*	11	100	1.00	19	18.76	1.06	n/a	+	n/a (*a)	19.2 %	**n/a**	1g	1.6	-	-	Exempt, See 4.2

*1. This module is used as a pair of AIR module and GND module (GND module is this reported model) The AIR module and GND module have the same hardware. On the other hand, the firmware is different for the AIR module and GND module. Switching between TDD transmission and reception is performed under firmware control. The switching will be executed at the following timing. One cycle is 21ms, of which AIR transmits 15ms. GND transmits 4ms. There is a time period of 2ms when both AIR and GND become Receive. This time measures the channel condition.
Tx occupancy rate = (4 ms) / (15 ms + 4 ms +2 ms) * 100 = 19.0% (actual measurement is 19.2 %)



*2. In the instruction manual, there is a note and illustration (spread at 0 or 90 degrees) that states, "The two antennas must be spread horizontally".
*. The highest Reported (scaled) SAR is marked with yellow marker (x.xxx), respectively.
*. Appx. Appendix; n/a: not applied; D: Antenna separation distance between antennas; Gap: It is separation distance between the device surface and the bottom outer surface of phantom.
*. During SAR test, the radiated power is always monitored by Spectrum Analyzer or/and MAIA.

*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) × (Tx occupancy rate (,when it applied))
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	(2417, 2432, 2462) MHz	2450 MHz	within ± 50 MHz of calibration frequency	7.15	± 12.0 %

7.2 Simultaneous transmission evaluation

Result: Simultaneous transmission did not exist.

*. The EUT do not have simultaneously transmitting.

7.3 SAR Measurement Variability (Repeated measurement requirement)

Result: "Largest to Smallest SAR Ratio" is smaller than KDB 865664 D01 requirement. (within 3rd repeated)

*. 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 (SAR(10g) is < 2 W/kg) ; steps 2) through 4) do not apply.
2) When the original highest measured SAR(1g) is ≥ 0.80 W/kg (SAR(10g) is ≥ 2 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 SAR (1g) is ≥ 1.45 W/kg (SAR (10g) is ≥ 3.63 W/kg).
4) Perform a third repeated measurement only if the original, first or second repeated measurement SAR (1g) is ≥1.5 W/kg (SAR (10g) is ≥3.75 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 (Antenna)				SAR Type	Unit	Original Highest	Original Judge	1st Repeated Meas.	1st Repeated Judge	1st Repeated Ratio	1st Repeated Judge	2nd Repeated Meas.	2nd Repeated Judge	2nd Repeated Ratio	2nd Repeated Judge	3rd Repeated Meas.	3rd Repeated Ratio	Original	1st Repeat	2nd Repeat	3rd Repeat
Top (90 deg.)	2.4	OFDM	2462	1g	W/kg	**3.18**	> 0.8	**3.11**	> 1.45	1.02	≤ 1.20	**3.19**	> 1.5	1.03	≤ 1.20	**3.20**	1.03	1-1 (P1)	No plot (P6)	No plot (P6)	No plot (P6)

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

7.4 Device holder perturbation verification (SAR)

Result: Pass (The influence of a device holder is small enough.)

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.

*. During SAR measurement the EUT was not placed on the device holder directly. The EUT was mounted in the device holder using Urethane form (low-permittivity and low-loss foam) to avoid changes of EUT performance by the holder material (Refer to Appendix 1-3, photographs of test setup). However, the "Device holder perturbation" was confirmed by the setup for which device holder was not used in highest SAR configuration.

EUT setup		Mode	Frequency [MHz]	Measured SAR [W/kg]			Device holder perturbation SAR Ratio	Remarks
Position	Antenna			SAR type	Device holder Exist	Device holder None		
Top	90 deg.	OFDM	2417	1g	**2.96**	**3.02**	**2.0 %**	*. It was smaller than 3.6 % of uncertainty of the "H: Device holder uncertainty", so influence of a device holder was judged to be no problem.
				SAR plot #	Plot 1-1	Plot 2-1		
				Setup photo	Photo. P1	Photo. P7		

*. Calculating formula: Device holder perturbation SAR Ratio (%) = {{((Measured SAR-none (W/kg)) / Measured SAR-exist (W/kg))} - 1}*100

7.5 Requirements on the Uncertainty Evaluation

7.5.1 SAR Uncertainty Evaluation

The highest measured SAR(1g) is over than 1.5 W/kg. Therefore, per KDB 865664 D01, the extended measurement uncertainty analysis described in IEEE 1528-2013 and IEC/IEEE 62209-1528 is applied. (See Appendix 3-3)

APPENDIX 2: Measurement data

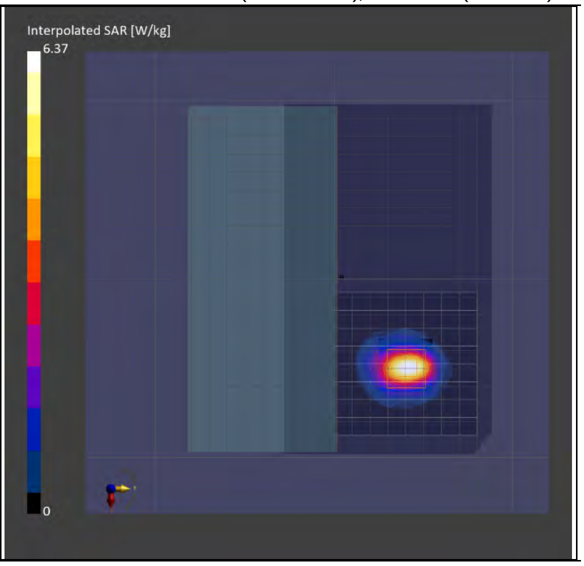
Appendix 2-1: Plot(s) of Worst Reported Value

Plot 1-1: Top & touch, OFDM, 2417 MHz

EUT: Falcon 3.0 GND ; Model: E-000110-02; Serial:STC2000024-AT / Model of Host device: L14 (Controller); Serial:STC2000024
Mode: OFDM (UID: 0 (CW)) ; Frequency: 2417 MHz ; Test Distance: 0 mm
TSL parameters used: Head(v6) ; f= 2417 MHz; Conductivity: 1.817 S/m; Permittivity: 39.13

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)@2417.000 MHz / - Software: 16.2.4.2524 (Measurement); 16.2.4.2524 (Evaluation)

Scan Setup			Measurement Results		
Setup items	Area Scan	Zoom Scan	Meas. Items	Area Scan	Zoom Scan
Grid Extents [mm]	80.0×80.0	30.0× 30.0 ×30.0	psSAR 1g [W/kg]	2.81	**2.96**
Grid Steps [mm]	10.0×10.0	5.0× 5.0 ×1.5	psSAR 10g [W/kg]	1.28	**1.31**
Sensor Surface [mm]	3.0	1.4	Power Drift [dB]	0.04	0.04
Graded Grid	N/A	Yes	Power Scaling	Disabled	Disabled
Grading Ratio	N/A	1.5	Scaling Factor [dB]	N/A	N/A
MAIA monitored	Y	Y	TSL Correction	No correction	No correction
Surface Detection	VMS + 6p	VMS + 6p	M2/M1 [%]	N/A	79.6
Scan Method	Measured	Measured	Dist 3dB Peak [mm]	N/A	9.0



Remarks: *. Date tested: 2023-12-01;Tested by: Hiroshi Naka; Tested place:No.7 shielded room; Ambient: (23~24) deg.C. / (60~75) %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: 231127_15038839_grd_acsl.d8sar- 12/1-7,d0&top,2417

APPENDIX 2: SAR Measurement data (cont'd)

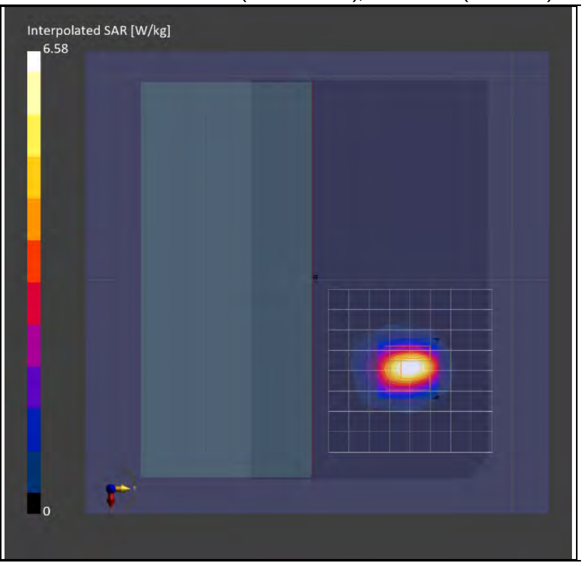
Appendix 2-2: SAR Plot for Device holder perturbation verification

Plot 2-1: No Device Holder; Top & touch, OFDM, 2417 MHz

EUT: Falcon 3.0 GND ; Model: E-000110-02; Serial:STC2000024-AT / Model of Host device: L14 (Controller); Serial:STC2000024
Mode: OFDM (UID: 0 (CW)) ; Frequency: 2417 MHz ; Test Distance: 0 mm
TSL parameters used: Head(v6) ; f= 2417 MHz; Conductivity: 1.817 S/m; Permittivity: 39.13

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)@2417.000 MHz / - Software: 16.2.4.2524 (Measurement); 16.2.4.2524 (Evaluation)

Scan Setup			Measurement Results		
Setup items	Area Scan	Zoom Scan	Meas. Items	Area Scan	Zoom Scan
Grid Extents [mm]	80.0×80.0	30.0× 30.0 ×30.0	psSAR 1g [W/kg]	2.95	**3.02**
Grid Steps [mm]	10.0×10.0	5.0× 5.0 ×1.5	psSAR 10g [W/kg]	1.33	**1.34**
Sensor Surface [mm]	3.0	1.4	Power Drift [dB]	-0.00	-0.02
Graded Grid	N/A	Yes	Power Scaling	Disabled	Disabled
Grading Ratio	N/A	1.5	Scaling Factor [dB]	N/A	N/A
MAIA monitored	Y	Y	TSL Correction	No correction	No correction
Surface Detection	VMS + 6p	VMS + 6p	M2/M1 [%]	N/A	78.3
Scan Method	Measured	Measured	Dist 3dB Peak [mm]	N/A	8.6



Remarks: *. Date tested: 2023-12-01;Tested by: Hiroshi Naka; Tested place:No.7 shielded room; Ambient: (22~23) deg.C. / (40~50) %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: 231127_15038839_grd_acsl.d8sar- 12/1-20,no-D/H,d0&top,2417

APPENDIX 3: Test instruments

Appendix 3-1: Equipment used

Test Name	LIMS ID	Description	Manufacturer	Model	Serial	Calibration Last Date	Calibration Interval (Month)
AT	160520	Attenuator	Weinschel - API Technologies Corp	4M-10	-	2022/12/12	12
AT	160899	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46185516	2022/12/09	12
AT	169910	Power Meter	Keysight Technologies Inc	8990B	MY51000448	2023/09/28	12
AT	169911	Power sensor	Keysight Technologies Inc	N1923A	MY57270004	2023/09/28	12
SAR	144886	Dielectric assessment kit soft	Schmid&Partner Engineering AG	DAK ver.3.0.6.14	9-0EE103A4	-	-
SAR	144944	Data Acquisition Electronics	Schmid&Partner Engineering AG	DAE4	626	2023/01/18	12
SAR	144986	Thermo-Hygrometer data logger	SATO KEIRYOKI	SK-L200THIIα/SK-LTHIIα-2	015246/08169	2023/08/04	12
SAR	144993	Ruler(300mm)	SHINWA	13134	-	2023/02/08	12
SAR	145086	Ruler(300mm)	SHINWA	13134	-	2023/02/08	12
SAR	145087	Ruler(100x50mm,L)	SHINWA	12101	-	2023/02/08	12
SAR	145090	Dipole Antenna	Schmid&Partner Engineering AG	D2450V2	822	2023/01/12	12
SAR	145106	Ruler(150mm,L)	SHINWA	12103	-	2023/02/08	12
SAR	145596	Device holder	Schmid&Partner Engineering AG	Mounting device for transmitter	-	2023/08/29	12
SAR	146112	Primepure Ethanol	Kanto Chemical Co., Inc.	14032-79	-	-	-
SAR	146176	Spectrum Analyzer	ADVANTEST	R3272	101100994	-	-
SAR	146185	DI water	MonotaRo	34557433	-	-	-
SAR	146235	Dosimetric E-Field Probe	Schmid&Partner Engineering AG	EX3DV4	3907	2023/01/16	12
SAR	146258	Network Analyzer	Keysight Technologies Inc	8753ES	US39171777	2023/10/05	12
SAR	150560	Measuring Tool, Ruler	SHINWA	14001	--	2023/02/08	12
SAR	191844	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	-	2023/08/03	12
SAR	201967	Digital thermomoter	HANNA	Checktemp-4	A01440226111	2023/08/04	12
SAR	201968	Digital thermomoter	HANNA	Checktemp-4	A01310946111	2023/08/04	12
SAR	207714	Head Tissue Simulating Liquid	Schmid&Partner Engineering AG	HBBL600-10000V6	SL AAH U16 BC	-	-
SAR	224020	DASY8 PC	Hewlett Packard	HP Z4 G4 Workstation	CZC1198G21	-	-
SAR	224023	Robot Controller	Schmid&Partner Engineering AG	CS9spe-TX2-60	F/22/0033789/C/001	-	-
SAR	224025	Measurement Server	Schmid&Partner Engineering AG	DASY8 Measurement Server	10042	2023/03/01	12
SAR	224026	Electro-Optical Converter	Schmid&Partner Engineering AG	EOC8-60	1027	-	-
SAR	224027	Light Beam Unit	Schmid&Partner Engineering AG	LIGHTBEAM-85	2069	-	-
SAR	224028	Modulation & Audio Interference Analyser	Schmid&Partner Engineering AG	MAIA	1582	-	-
SAR	224031	DASY8 Module SAR/APD soft	Schmid&Partner Engineering AG	ver.16.2.4.2524	9-2506F07D	-	-
SAR	224032	6-axis Robot	Schmid&Partner Engineering AG	TX2-60L spe	F/22/0033789/A/001	2023/08/29	12
SAR	224034	Flat Phantom	Schmid&Partner Engineering AG	ELI V8.0	2161	2023/08/21	12
SAR	225155	Mounting Platform	Schmid&Partner Engineering AG	MP8E-TX2-60L Basic	-	-	-
SAR	227155	SP2 Manual Control Pendant	Schmid&Partner Engineering AG	D21144507 C	22066839	-	-
SAR	230493	Dielectric assessment kit	Schmid&Partner Engineering AG	DAKS-3.5	1160	2022/12/14	12
SAR	230872	RF Power Source	Schmid&Partner Engineering AG	POWERSORCE1	4300	2022/12/16	12

*. The list above shows the equipment used when AT was measured on November 27, 2023 (See Section 5).
*. The list above shows the equipment used when SAR on December 1, 2023.

*. 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)

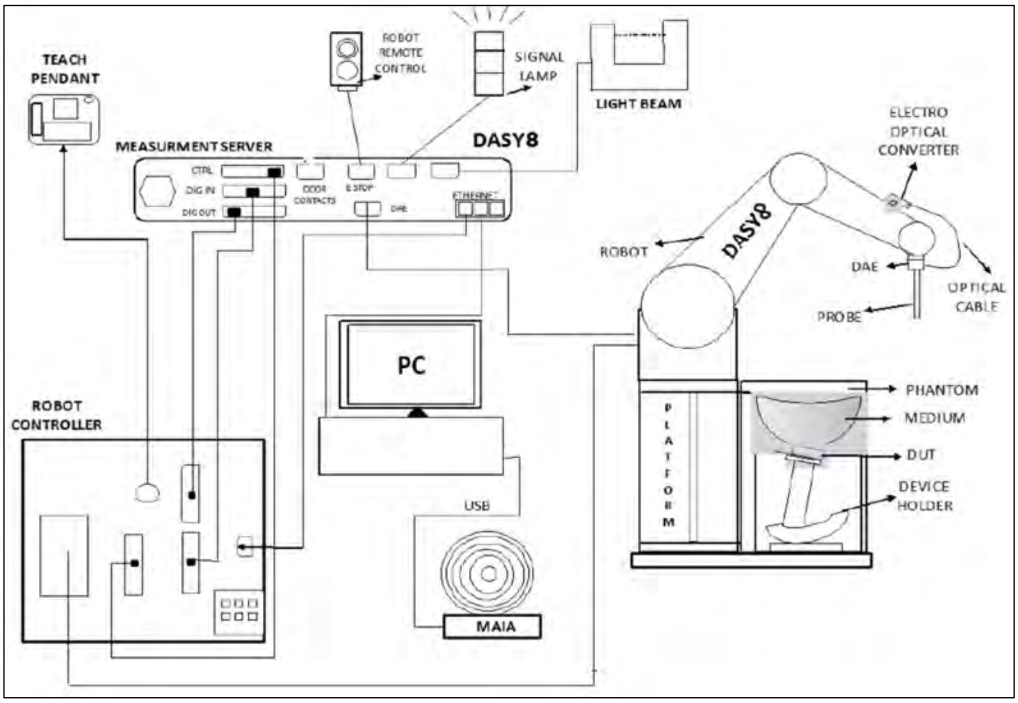
The expiration date of calibration is the end of the expired month.
As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chain of calibrations.
All equipment is calibrated with valid calibrations. Each measurement data is traceable 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.

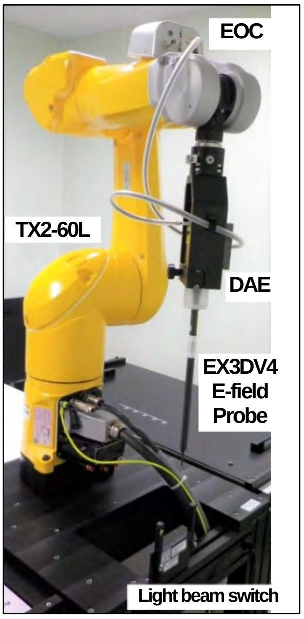


The DASY8 SAR/APD system for performing compliance tests consist of the following items:

- 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)

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

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

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)
	Corri	= 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-fieldprobes: $E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$

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																	
Liquid type: Head	F [MHz]	ΔSAR		SAR (1g) [W/kg] (*b)						SAR (10g) [W/kg] (*b)						Dev. Limit [%]
		1g [%]	10g [%]	Meas. (*a)	1W scaled	Target		Deviation		Meas. (*a)	1W scaled	Target		Deviation		
Date						Cal. (*c)	STD (*d)	Cal. [%]	STD [%]			Cal. (*c)	STD (*d)	Cal. [%]	STD [%]	
2023-12-01	2450	1.2	0.7	2.59	51.18	51.9	52.4	-1.4	-2.3	1.21	24.04	24.6	24	-2.3	0.2	≤10

*. F: Frequency, Meas.: Measured, Cal.: Calibration value, STD: Standard value, Dev.: Deviation, n/a: not applicable.
*a. The Measured SAR/APD value is obtained at 50 mW (17 dBm) for 2450 MHz, 5250 MHz, 5600 MHz and 5800 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 (10g)) (W/kg) = (Measured SAR(1g (10g)) (W/kg)) × (100 - (ΔSAR1g (10g) (%)) / 100
*c. The target value is a parameter defined in the calibration data sheet of D2450V2 (sn:822) dipole and D5GHzV2 (sn:1070) 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.

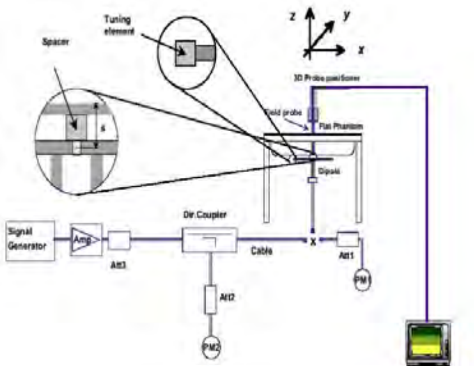
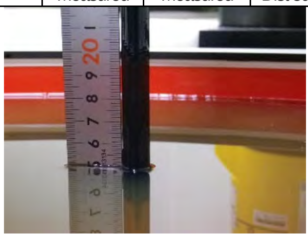


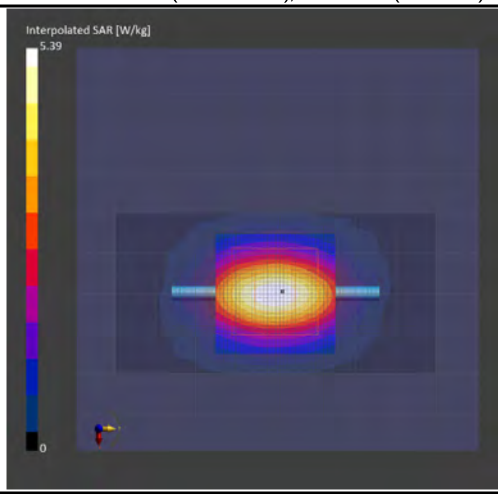
Figure. Test setup for the system performance check (example)

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

Dipole: D2450V2 - SN822 ; Mode: CW (0) ; Frequency: 2450 MHz ; Test Distance: 10 mm (dipole to liquid); Power: 17.0 dBm
TSL parameters used: Head(v6) ; f= 2450 MHz; Conductivity: 1.844 S/m; Permittivity: 39.07
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: 16.2.4.2524 (Measurement); 16.2.4.2524 (Evaluation)

Scan Setup			Measurement Results		
Setup Items	Area Scan	Zoom Scan	Meas. Items	Area Scan	Zoom Scan
Grid Extents [mm]	40.0×80.0	30.0× 30.0 ×30.0	psSAR1g [W/kg]	2.63	**2.59**
Grid Steps [mm]	10.0×10.0	5.0× 5.0 ×1.5	psSAR10g [W/kg]	1.22	**1.21**
Sensor Surface [mm]	3.0	1.4	Power Drift [dB]	0.02	-0.00
Graded Grid	N/A	Yes	Power Scaling	Disabled	Disabled
Grading Ratio	N/A	1.5	Scaling Factor [dB]	N/A	N/A
MAIA monitored	Y	Y	TSL Correction	No correction	No correction
Surface Detection	VMS + 6p	VMS + 6p	M2/M1 [%]	N/A	80.4
Scan Method	Measured	Measured	Dist 3dB Peak [mm]	N/A	9.0


150 mm (Liquid type: Head, 2023-12-01)



Remarks: *. Date tested:2023-12-01 ; Tested by: Hiroshi Naka; Tested place:No.7 shielded room; Ambient: (22) deg.C. / (60) %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: 231127_15038839_grd_acsl.d8sar- 1201a

Appendix 3-3: Measurement Uncertainty

Uncertainty of SAR measurement (2.4 GHz ~ 6 GHz) (*. liquid: head(v6), DAKS-3.5, Wi-Fi(BT)) (v11r04)							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	0.29	0.29	± 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	± 2.4 %	Rectangular	√3	1	1	± 1.4 %	± 1.4 %
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**	**± 12.1 %**	**± 12.0 %**
U	**(SAR: 2.4 GHz~6 GHz) Expanded Uncertainty**					**k=2**	**± 24.2 %**	**± 24.0 %**

*. 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 ∞.
*. Based on the results of section 7.3, the test setup uncertainty (Dxyz) is 1.3 % (coefficient of variation). Since this value is smaller than the above uncertainty item Dxyz (1.8 %), the above uncertainty is applied as is in this test case.

Uncertainty of SAR daily check (2.4 GHz ~ 6 GHz) (*. liquid: head(v6), DAKS-3.5, CW) (v11r04)							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 %	Normal	1	1	1	± 1.0 %	± 1.0 %
Δsys	Probe Positioning	± 0.5 %	Normal	1	0.29	0.29	± 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**	**± 10.5 %**	**± 10.4 %**
U	**(SAR daily check: 2.4 GHz~6 GHz) Expanded Uncertainty**					**k=2**	**± 21.0%**	**± 20.8 %**

*. 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 with 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-