SAR TEST REPORT

Test Report No.: 13692048S-A-R2

Applicant : **CASIO COMPUTER CO., LTD.**
Type of Equipment : **Motion Sensor**
Model No. : **CMT-S20R-AS**
FCC ID : **BBQCMTS20RAS**
Test Standard : **FCC 47CFR §2.1093**
Test Result : **Complied** (Refer to Section 3)

RF Exposure Condition	Highest Reported SAR Value			Remarks			Output power (average)	
	Type	Tune-up value	Limit	Band	Frequency	Mode	Measured	Maximum
Partial-body	SAR (1g)	**0.11 W/kg**	**1.6**	DTS	2480 MHz	BT LE (1Mbps)	8.97 dBm	10 dBm

*. **Highest reported SAR (1g) across all exposure conditions on this EUT is "0.11 W/kg (partial-body)".**

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by any agency of the Federal Government.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. The information provided from the customer for this report is identified in SECTION 1.
10. This report (-R2) is a revised version of 13692048S-A-R1. 13692048S-A-R1 report is replaced with this report.

Date of test: August 12, 2021

Test engineer: Hiroshi Naka (Engineer)

Approved by: Toyokazu Imamura (Leader)

☒ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
☐ There is no testing item of "Non-accreditation".

CERTIFICATE 1266.03

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

REVISION HISTORY

Revision	Test report No.	Date	Page revised	Contents
Original	13692048S-A	August 23, 2021	-	-
-R1	13692048S-A-R1	September 13, 2021	1,4,11,14~16	Changed “type of equipment” to “Motion Sensor” from “RUNNING Sensor”.
-R2	13692048S-A-R2	September 28, 2021	19	Corrected calibration date of SPB-02 to “2021/4/21” from “2021/4/14”. Corrected calibration date of SEPP-02 to “2021/4/14” from “2021/4/21”.

*. By issue of new revision report, the report of an old revision becomes invalid.

Reference : Abbreviations (Including words undescribed in this report) (radio_r0v03_200214)

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
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
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
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
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
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
MRA	Mutual Recognition Arrangement
N/A	Not Applicable
NIST	National Institute of Standards and Technology
NS	No signal detect.
NSA	Normalized Site Attenuation
NVLAP	National Voluntary Laboratory Accreditation Program
OBW	Occupied Band Width
OFDM	Orthogonal Frequency Division Multiplexing
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
Rx	Receiving
SA, S/A	Spectrum Analyzer
SAR	Specific Absorption Rate
SG	Signal Generator
SVSWR	Site-Voltage Standing Wave Ratio
TR	Test Receiver
Tx	Transmitting
VBW	Video BandWidth
Vert.	Vertical
WLAN	Wireless LAN

CONTENTS PAGE

Contents of appendixes

SECTION 1: Customer information

Company Name	CASIO COMPUTER CO., LTD.
Address	2-1, Sakaecho 3-chome, Hamura-shi Tokyo 205-8555, Japan
Telephone Number	+81-42-579-7375
Contact Person	Daisuke Uematsu

The information provided from the customer is as follows;
- Applicant, 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 of Equipment	Motion Sensor
Model Number	CMT-S20R-AS
Serial Number	CS1-033
Condition of EUT	Production prototype (*. Not for sale: This sample is equivalent to mass-produced items.)
Receipt Date of Sample	August 17, 2020 (*. Sample for power measurement.) *. No modification by the test Lab. August 10, 2021 (*. Sample for SAR test.) *. No modification by the test Lab. *. After power measurement, the EUT was returned to a customer to assemble for SAR test sample.
Rating	DC 3.8 V (Built-in type rechargeable Li-ion battery), DC 5 V (USB bus-power)
Country of Mass-production	Philippines
Category Identified	Portable device (*. Since EUT may contact and/or very close to a human body during Wi-Fi or Bluetooth operation, the partial-body SAR (1g) shall be observed.)
Feature of EUT	Model: CMT-S20R-AS (referred to as the EUT in this report) is a Motion Sensor.
SAR Accessory	Belt clip (*. The belt clip which the body integrate type can't be removed)

2.2 Product Description

Equipment type :	Transceiver						
Communication type :	Bluetooth 5.0 (Low energy)						
Frequency of operation :	2402 MHz ~ 2480 MHz	Type of modulation :	GFSK	Channel spacing :	2 MHz	Bandwidth :	79 MHz
Typical and maximum transmit power :	Typical power: 8 dBm, Maximum tune-up tolerance limit (maximum) power: 10 dBm *. The measured output power (conducted) as SAR reference power refers to section 5 in this report.						

Quantity of antenna :	1 piece	Antenna type :	Multiband Antenna	Antenna connector type :	Soldered on the PCB
Antenna gain (peak) :	0.79 dBi				

***.** Maximum tune-up tolerance limit is conducted burst average power and is defined by a customer as Duty cycle 100% (continuous transmitting).

SECTION 3: Test specification, procedures and results

3.1 Test specification

FCC47CFR §2.1093: Radiofrequency radiation exposure evaluation: portable devices.

*. The US Federal Communications Commission has released the report and order "Guidelines for Evaluating the Environmental Effects of RF Radiation", ET Docket No. 93-62 in August 1996. The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g for an uncontrolled environment and 8.0 mW/g for an occupational/controlled environment as recommended by the ANSI/IEEE standard C95.1-1992. The device should be evaluated at maximum output power (radiated from the antenna) under "worst-case" conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling in accordance with the following measurement procedures.

The tests documented in this report were performed in accordance with FCC 47 CFR Parts 2, IEEE Std.1528-2013 (latest), the following FCC Published RF exposure KDB procedures, and TCB workshop updates.

KDB 447498 D01 (v06):	General RF exposure guidance
KDB 865664 D01 (v01r04):	SAR measurement 100MHz to 6GHz
IEEE Std. 1528-2013:	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.

3.2 Exposure limit

Environments of exposure limit	Whole-Body (averaged over the entire body)	Partial-Body (averaged over any 1g of tissue)	Hands, Wrists, Feet and Ankles (averaged over any 10g of tissue)
(A) Limits for Occupational / Controlled Exposure (W/kg)	0.4	8.0	20.0
(B) Limits for General population / /Uncontrolled Exposure (W/kg)	0.08	1.6	4.0

*. Occupational/Controlled Environments: are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure, (i.e. as a result of employment or occupation).

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

The limit applied in this test report is;

General population / uncontrolled exposure, Partial-Body (averaged over any 1g of tissue) limit: 1.6 W/kg (body touch)

3.3 Addition, deviation and exclusion to the test procedure

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

3.4 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)

Used?	Place	Width × Depth × Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance	Used?	Place	Width × Depth × Height (m)	Size of reference ground plane (m) / horizontal conducting plane
☐	No.1 Semi-anechoic chamber	20.6 × 11.3 × 7.65	20.6 × 11.3	10 m	☐	No.4 Shielded room	4.4 × 4.7 × 2.7	4.4 × 4.7
☐	No.2 Semi-anechoic chamber	20.6 × 11.3 × 7.65	20.6 × 11.3	10 m	☐	No.5 Shielded room	7.8 × 6.4 × 2.7	7.8 × 6.4
☐	No.3 Semi-anechoic chamber	12.7 × 7.7 × 5.35	12.7 × 7.7	5 m	☐	No.6 Shielded room	7.8 × 6.4 × 2.7	7.8 × 6.4
☐	No.4 Semi-anechoic chamber	8.1 × 5.1 × 3.55	8.1 × 5.1	-	☒	**No.7 Shielded room**	2.76 × 3.76 × 2.4	2.76 × 3.76
☐	No.1 Shielded room	6.8 × 4.1 × 2.7	6.8 × 4.1	-	☐	No.8 Shielded room	3.45 × 5.5 × 2.4	3.45 × 5.5
☐	No.2 Shielded room	6.8 × 4.1 × 2.7	6.8 × 4.1	-	☐	No.1 Measurement room	2.55 × 4.1 × 2.5	2.55 × 4.1
☐	No.3 Shielded room	6.3 × 4.7 × 2.7	6.3 × 4.7	-				

3.5 Procedures and Results

Test Procedure	SAR measurement: KDB 447498 D01, KDB 865664 D01, IEC Std. 1528		
Category	FCC 47CFR §2.1093 (Portable device)	**SAR type**	Partial-Body

Mode / Band (Operation frequency)	**Bluetooth Low energy** ((2402-2480) MHz)		
Results (Reported SAR(1g))	**Complied**	**SAR (1g) Limit**	**1.6 W/kg**
Reported SAR(1g) value	**0.114 W/kg** (*. Refer to Section 6)	**Measured SAR value**	0.090 W/kg
Mode, frequency	BT LE, 1 Mbps, 2480 MHz	**Duty cycle [%]**	100 (duty scaled factor: 1.00)
Output burst average power	8.97 dBm (maximum power: 10 dBm, tune-up factor: 1.27)		

Note: UL Japan's SAR Work Procedures No.13-EM-W0429 and 13-EM-W0430. No addition, deviation nor exclusion has been made from standards

*. (Calculating formula) Corrected SAR to max.power (Reported SAR) (W/kg) = (Measured SAR (W/kg)) × (Duty scaled factor) × (Tune-up factor)
where; Tune-up factor [-] = 1 / (10 ^ ("Δmax (max.power - burst average power), dB" / 10)), Duty scaled factor [-] = 100(%) / (duty cycle, %)

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg for partial body) specified in FCC 47 CFR part 2 (2.1093) and had been tested in accordance with the measurement methods and procedures specified in FCC KDB publications and IEEE 1528-2013.

3.6 SAR measurement procedure

3.6.1 Normal SAR measurement procedure

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. The SAR test reference power measurement and the SAR test were proceeded with the lowest data rate (which has the higher time-based average power typically) on each operation mode. Therefore, the average output power was measured on the lower, middle (or near middle), upper and specified channels with the lowest data rate of each operation mode. The power of other data rate was also measured to confirm the time-base average power and when if it's required. The power measurement result is shown in Section 6.

*. The EUT transmission power was verified that it was within 2dB lower than the maximum tune-up tolerance limit when it was set the rated power. (Clause 4.1, KDB447498 D01 (v06))

Step 2: Power reference measurement

Measurement of the E-field at a fixed location above the central position of flat phantom (or/and furthermore an interpolated peak SAR location of area scan in step 2) was used as a reference value for assessing the power drop.

Step 3: Area Scan (Area scan parameters: KDB 865664 D01 (v01r04).)

The SAR distribution at the exposed side of head or body position was measured at a distance of each device from the inner surface of the shell. The area covered the entire dimension of the antenna of EUT and suitable horizontal grid spacing of EUT. Based on these data, the area of the maximum absorption was determined by splines interpolation.

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
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
	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.	

Step 4: Zoom Scan and post-processing (Zoom scan parameters: KDB 865664 D01 (v01r04).)

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 volume of 30 mm (X) × 30 mm (Y) × 30 mm (Z) (or more) was assessed by measuring 7×7×7 points (or more), ≤ 3GHz.

A volume of 28 mm (X) × 28 mm (Y) × 24mm (Z) (or more) was assessed by measuring 8×8×7 points (or more) (by “Ratio step” method (*1)), > 3 GHz.

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 ≤ 3 GHz	3 GHz < f ≤ 6 GHz
1	Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
2	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
3		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
4			$\Delta z_{Zoom}(n>1)$: between subsequent points	≤ 1.5 ·$\Delta z_{Zoom}(n-1)$ mm	
5	Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm
	* The asterisk table-footnote is per KDB Pub. 865664 D01 v01r04. NOTE For uniformity purposes the integer frequency increments of rows 1 to 3 and 5 apply, rather than the corresponding variable and fixed parameters given in IEC 62209-1:2016 and IEC 62209-2:2010/AMD1:2019.				

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 procedure, and with the same settings. The Power Drift Measurement gives the field 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. The measurement procedure is the same as Step 2. It was checked that the power drift is within ±5% in the evaluation procedure of SAR testing. The verification of power drift during the SAR test is that DASY system calculates the power drift by measuring the e-filed at the same location at beginning and the end of the scan measurement for each test position. The result is shown in SAR plot data of APPENDIX 2.

*. DASY system calculation Power drift value[dB] =20log(Ea)/(Eb) (where, Before SAR testing: Eb[V/m] / After SAR testing: Ea[V/m])
Limit of power drift[W] = ±5%; Power drift limit (X) [dB] = 10log(P_drift)=10log(1.05/1) = 10log(1.05)-10log(1) = 0.21dB
from E-filed relations with power; S=E×H=E^2/η=P/(4×π×r^2) (η: Space impedance) → P=(E^2×4×π×r^2)/η
Therefore, The correlation of power and the E-filed
Power drift limit (X) dB=10log(P_drift) = 10log(E_drift)^2=20log(E_drift)
From the above mentioned, **the calculated power drift of DASY system must be the less than (±) 0.21dB.**

Step 6: Z-Scan

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation the extrapolated distance should not be larger than the step size in Z-direction.

*. The all SAR tests were conservatively performed with test separation distance 0 mm. The phantom bottom thickness is approx. 2mm. Typical distance from probe tip to dipole centers is 1mm. The distance between the SAR probe tip to the surface of test device which is touched the bottom surface of the phantom is approx. 3 mm for 2.4GHz band and 2.4 mm for 5GHz band.

*1. “Ratio step” method parameters used; the first measurement point: “1.4mm” from the phantom surface, the initial z grid separation: “1.4mm”, subsequent graded grid ratio: “1.4”. These parameters comply with the requirement of KDB 865664 D01and recommended by Schmid & Partner Engineering AG (DASY5 manual).

SECTION 4: Operation of EUT during testing

4.1 Operating modes for SAR testing

*. This EUT has Bluetooth Low energy continuous transmitting mode. The frequency used in the SAR testing are shown as a following.

Operation mode		Bluetooth Low energy
Maximum power [dBm]		10
SAR tested condition	Frequency [MHz]	2402, 2440, 2480 (operation band: 2402 ~ 2480)
	Data rate [Mbps]	1
	Power setting	8 dBm (*. 8 dBm for power measurement)

	Test name	Software name	Version	Date	Storage location
Controlled software	Power measurement	CMT-S20R-AS INSPECTOR (*1)	Ver1.2.2	2020/09/29	EUT's memory (firmware), operated by Tera-Term Ver.4.87 (host PC).
	SAR test	CMT-S20R-AS INSPECTOR (*1)	Ver1.2.2	2020/09/29	EUT's memory (firmware), operated by Tera-Term Ver.4.93 (host PC).

*1. This software was used for both power measurement and SAR test. It set Tx parameters which includes; "channel", "data rate (used: 1 Mbps)", "power (used 8 dBm (maximum power setting))""data pattern (used: PRBS9)" via serial communication cable by Tera-Term software on connected host PC.

4.2 RF exposure conditions

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 Tested /Reduced	SAR type
Left	A left side surface of an EUT is touched to the Flat phantom.	3.646	Tested	Body-touch
Right	A right side surface of an EUT is touched to the Flat phantom.	3.646	Tested	
Back (Clip)	A back surface (clip side) of an EUT is touched to the Flat phantom.	≈6	Tested	
Front	A front surface of an EUT is touched to the Flat phantom.	6.558	Tested	
Bottom (SW)	A bottom surface (switch side) of an EUT is touched to the Flat phantom.	6.754	Tested	
Top (USB)	A top surface (USB connector side) of an EUT is touched to the Flat phantom.	7.581	Tested	

*. **D:** Antenna separation distance. It is the distance from the antenna inside EUT to the outer surface of EUT which an operator may touch.
*. Size of EUT: 39.9 mm (width) × 62.1 mm (height) × 18.2 mm (depth).

4.3 SAR test exclusion considerations accordance to KDB 447498 D01

The following is based on KDB447498D01;

Step 1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max.power of channel, including tune-up tolerance, mW) / (min.test separation distance, mm)] × [$\sqrt{f(GHz)}$] ≤ 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] / [$\sqrt{f(GHz)}$] …… 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) At 1500 MHz to 6 GHz and for test separation distances > 50 mm, the SAR test exclusion threshold is determined according to 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 ≤50mm from the user.						
					Calculated threshold value						
					Setup	Left	Right	Back (Clip)	Front	Bottom (SW)	Top (USB)
			[dBm]	[mW]	D[mm]	< 5	< 5	6	7	7	8
2.4GHz	BT LE	2480	10	10	Judge	3.1,Test	3.1,Test	2.6 (< 3), Reduce	2.2 (< 3), Reduce	2.2 (< 3), Reduce	2.0 (< 3), Reduce

*. D: Antenna separation distance, Max.: Maximum,.
Notes: 1. Power and distance are rounded to the nearest mW and mm before calculation.

<Conclusion for consideration for SAR test reduction>

1) **Since the EUT is small size device, SAR test was applied to all surfaces of EUT even if the SAR test exclusion judge was "test can be reduced".**
2) The all SAR tests were conservatively performed with test separation distance 0mm.

By the determined test setup shown above, the SAR test was applied in the following procedures.

Step 1	Worst SAR search by using a highest measurement output power channel. Add SAR test for all required test channels (including lower/middle/upper), when if it is required.

*. During SAR test, the radiated power is always monitored by Spectrum Analyzer.

SECTION 5: Confirmation before testing

5.1 SAR reference power measurement (antenna terminal conducted average power of EUT)

*. Antenna gain (peak): 0.79 dBi (2.4GHz band)

Mode	Frequency		Data rate	Power Setting (software)	Duty cycle	Duty factor	Duty scaled factor	Measurement Result				Power correction				Power tuning applied?	Remarks (Reference test report number)
								Time average power		Burst power		Power		Δ from max.	Tune-up factor		
												Typical	Max.				
	[MHz]	CH	[Mbps]	[-]	[%]	[dB]	[-]	[dBm]	[mW]	[dBm]	[mW]	[dBm]	[dBm]	[dB]	[-]		
BT-LE	2402	0	1	P8 (8 dBm)	100	0	1.00	8.51	7.10	**8.51**	7.10	8.0	**10.0**	-1.49	1.41	none (default)	13692047S-A
	2440	19	1	P8 (8 dBm)	100	0	1.00	8.89	7.74	**8.89**	7.74	8.0	**10.0**	-1.11	1.29	none (default)	13692047S-A
	2480	39	1	P8 (8 dBm)	100	0	1.00	8.97	7.89	**8.97**	7.89	8.0	**10.0**	-1.03	1.27	none (default)	13692047S-A

*. [ ]: SAR test was applied.

*. The SAR test powers by setting power were not more than 2dB lower than maximum tune-up power (KDB 447498 D01 (v06) requirement).

*. CH: Channel; Max: Maximum; n/a: not applied

*. Calculating formula: Burst power (dBm) = (P/M Reading, dBm)+(Cable loss, dB)+(Attenuator, dB)+(duty factor, dB)
Time average power (dBm) = (P/M Reading, dBm)+(Cable loss, dB)+(Attenuator, dB)
Duty cycle: (duty cycle, %) = (Tx on time, ms) / (1 cycle time, ms) × 100, where 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, %)
ΔMax. (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))

*. The above power was measure and reported by UL Japan, Shonan EMC Lab. The reference test report number is 13692047S-A, UL Japan published.
Date measured: March 29, 2021 / Measured by: Toshinori Yamada/ Place: No. 5 shield room. (23 deg.C./ 46 %RH)

*. Uncertainty of antenna port conducted test (Average power); 0.89 dB.

SECTION 6: SAR Measurement results

6.1 Tissue simulating liquid measurement

6.1.1 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

6.1.2 Liquid measurement (Liquid verification)

Frequency [MHz]	Liquid type	Liquid parameters (*a)														ΔSAR Coefficients(*b)		Correction required?	Date measured
		Liquid Temp. [deg.C.]	Liquid depth of phantom [mm]	Permittivity (εr) [-]						Conductivity [S/m]						ΔSAR			
				Target value	Measured				Δend, >48hrs [%] (*1)	Target value	Measured				Δend, >48hrs [%] (*1)	(1g) [%]	(10g) [%]		
					Value	Δεr [%]	Interpolated	Limit [%]			Value	Δσ [%]	Interpolated	Limit [%]					
2402	Head	22.5	150	***39.29***	39.82	1.4	☑	10	*begin*	***1.757***	1.811	3.1	☑	10	*begin*	1.2	0.6	not required.	August 12, 2021
2440				***39.22***	39.75	1.4	☑	10	*begin*	***1.791***	1.842	2.9	☑	10	*begin*	1.1	0.5	not required.	
2480				***39.16***	39.69	1.4	☑	10	*begin*	***1.833***	1.873	2.2	☑	10	*begin*	0.7	0.3	not required.	

*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

*a. The target values of (2000, 2450, 3000, 5800) MHz are parameters defined in Appendix A of KDB 865664 D01. 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: ΔSAR(1g)= Cεr ×Δεr + Cσ ×Δσ, Cεr=-7.854E-4×f^3+9.402E-3×f^2-2.742E-2×f-0.2026 / Cσ =9.804E-3×f^3-8.661E-2×f^2+2.981E-2×f+0.7829
Calculating formula: ΔSAR(10g)= Cεr ×Δεr + Cσ ×Δσ, Cεr=3.456×10^{-3}×f^3-3.531×10^{-2}×f^2+7.675×10^{-2}×f-0.1860 / Cσ =4.479×10^{-3}×f^3-1.586×10^{-2}×f^2-0.1972×f+0.7717
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

*. 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	(2402, 2440, 2480) MHz	2450 MHz	within ± 5 0MHz of calibration frequency	7.35	± 12.0 %

6.2 SAR results

Test setup			Mode and Frequency (*2)			Duty cycle		Power correction			SAR results [W/kg] (Max.value of multi-peak)				SAR type	SAR Limit [W/kg]	SAR plot # in Appx. 2-2	Setup photo # in Appx. 1-3	Remarks
Test position	Gap [mm]	Source power (*1):	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	ΔSAR [%]	ΔSAR corrected	**Scaled (*b)**					
Back (Clip)	0	ext.DC3.7V	BT LE (1Mbps)*	2480*	39	100	1.00	10	8.97	1.27	0.090	Positive	n/a (*a)	**0.114**	1g	1.6	1-1	P1	Higher
Back (Clip)	0	ext.DC3.7V	BT LE (1Mbps)*	2440	19	100	1.00	10	8.89	1.29	0.070	Positive	n/a (*a)	**0.090**	1g	1.6	1-2	P1	-
Back (Clip)	0	ext.DC3.7V	BT LE (1Mbps)*	2412	0	100	1.00	10	8.51	1.41	0.038	Positive	n/a (*a)	**0.054**	1g	1.6	1-3	P1	-
Front	0	ext.DC3.7V	BT LE (1Mbps)*	2480*	39	100	1.00	10	8.97	1.27	0.040	Positive	n/a (*a)	**0.051**	1g	1.6	1-4	P2	-
Top (USB)	0	ext.DC3.7V	BT LE (1Mbps)*	2480*	39	100	1.00	10	8.97	1.27	0.033	Positive	n/a (*a)	**0.042**	1g	1.6	1-5	P3	-
Bottom (SW)	0	ext.DC3.7V	BT LE (1Mbps)*	2480*	39	100	1.00	10	8.97	1.27	0.014	Positive	n/a (*a)	**0.018**	1g	1.6	1-6	P4	-
Left	0	ext.DC3.7V	BT LE (1Mbps)*	2480*	39	100	1.00	10	8.97	1.27	0.029	Positive	n/a (*a)	**0.037**	1g	1.6	1-7	P5	-
Right	0	ext.DC3.7V	BT LE (1Mbps)*	2480*	39	100	1.00	10	8.97	1.27	0.068	Positive	n/a (*a)	**0.086**	1g	1.6	1-8	P6	-

Notes: *. The higher scaled (reported) SAR in each operation band is marked (shaded yellow marker).
*. Appx. Appendix, Max.: maximum.; n/a: not applied. Gap: It is the separation distance between the EUT surface and the bottom outer surface of phantom.

*1. "ext.DC3.7V": During SAR test, the EUT was operated with external DC 3.7V supplied from DC power supply and connected a serial cable which connected to host PC.

*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: Scaled SAR (W/kg) = (Measured SAR (W/kg)) × (Duty scaled factor) × (Power scaled factor)
where, Duty scaled factor [-] = 100(%) / (duty cycle, %), Power scaled factor [-] = 10 ^ (((Max.tune-up limit, dBm) - (Measured conducted, dBm)) / 10)

***. SAR test reduction considerations**

(KDB 447498 D01, 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 or 2.0 W/kg, for 1g or 10g respectively, when the transmission band is ≤ 100 MHz
(2) ≤ 0.6 W/kg or 1.5 W/kg, for 1g or 10g respectively, when the transmission band is between 100 MHz and 200 MHz
(3) ≤ 0.4 W/kg or 1.0 W/kg, for 1g or 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. The scaling factor for the duty factor is defined as (100% / (transmission duty cycle (%))).

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. The scaling factor for the tune-up power is defined as "(maximum tune-up limit (mW)) / (measured conducted power (mW))".

*. The reported SAR (scaled SAR) would be calculated by "(measured SAR) × (duty cycle scaling factor) × (tune-up power scaling factor)".

6.3 Simultaneous transmission (Co-location) evaluation according to KDB447498 D01

Result: This EUT does not support simultaneous transmission.

6.4 SAR Measurement Variability (Repeated measurement requirement)

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

In accordance with published RF Exposure KDB procedure 865664 D01 (v01r04) 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.

6.5 Device holder perturbation verification

Result: Since all the reported (scaled) SAR are less than 1.2 W/kg (SAR(1g)), the additional "device holder perturbation verification" measurement is 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.

APPENDIX 2: SAR Measurement data

Appendix 2-1: Worst Reported SAR(1g) Plot

Plot 1-1: Back (Clip) & touch / BT LE (1Mbps) / 2480 MHz

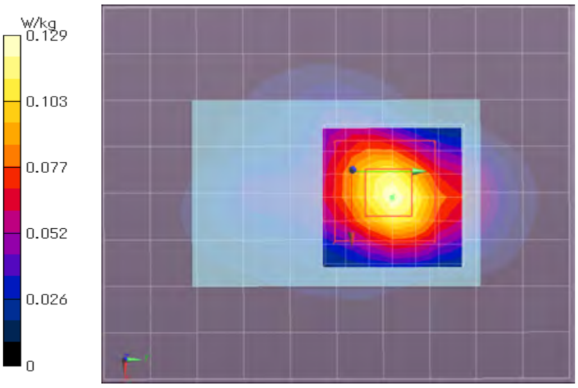
EUT: Motion Sensor; Type: CMT-S20R-AS; Serial: CS1-033

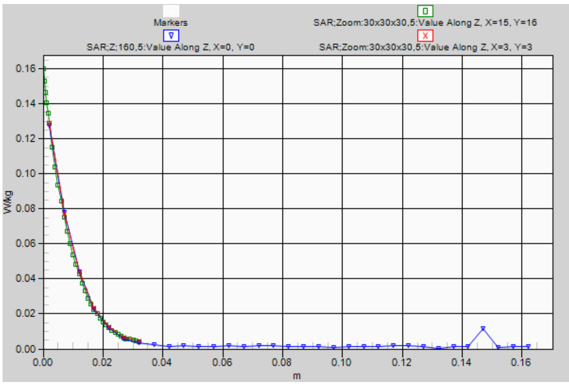
Mode: BT LE(1Mbps, fixed frequency) (UID: 0, Wi-fi_2.4GHz (0), Frame Length in ms: 0; PAR: 0; PMF: 1); **Frequency: 2480 MHz; Crest Factor: 1.0**
Medium: HSL5GHz(v6.2108); Medium parameters used: f = 2480 MHz; σ = 1.873 S/m; ε_r = 39.69; ρ = 1000 kg/m^3
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration: -Electronics: DAE4 Sn626; Calibrated: 2020/11/17 / -Phantom: ELI v4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
-DASY52 52.10.3(1513); SEMCAD X 14.6.13(7474) / -Probe: EX3DV4 - SN3907; ConvF(7.35, 7.35, 7.35) @ 2480 MHz; Calibrated: 2021/04/21
-Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0, 161.0

touch/24h2;2480,Back(clip)&d0,ble(1m)/
Area:80x100,10 (9x11x1): Measurement grid: dx=10mm, dy=10mm; Maximum value of SAR (measured) = 0.122 W/kg
Area:80x100,10 (81x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm; Maximum value of SAR (interpolated) = 0.123 W/kg
Z;160,5 (1x1x33): Measurement grid: dx=20mm, dy=20mm, dz=5mm; Maximum value of SAR (measured) = 0.128 W/kg

Zoom:30x30x30,5 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm;
Reference Value = 8.426 V/m; Power Drift = 0.00 dB; Maximum value of SAR (measured) = 0.129 W/kg; Peak SAR (extrapolated) = 0.160 W/kg
SAR(1 g) = 0.090 W/kg; SAR(10 g) = 0.042 W/kg (*.Smallest distance from peaks to all points 3 dB below = 10.2 mm; Ratio of SAR at M2 to SAR at M1 = 59.7%)





Remarks: *. Date tested: 2021/8/12; Tested by: Hiroshi Naka; Tested place:No.7 shielded room,
*. liquid depth: 150 mm; Position: distance of EUT to phantom: 0 mm (2 mm to liquid); ambient: (22~24) deg.C. / (60~70) %RH,
*. liquid temperature: 22.4(start)/22.4(end)/22.5(in check) deg.C.; *.White cubic: zoom scan area, Red cubic: big=SAR(10g)/small=SAR(1g)

Appendix 2: SAR measurement data (cont'd)

Appendix 2-2: Other SAR(1g) Plots

Plot 1-2: Back (Clip) & touch / BT LE (1Mbps) / 2440 MHz

EUT: Motion Sensor; Type: CMT-S20R-AS; Serial: CS1-033

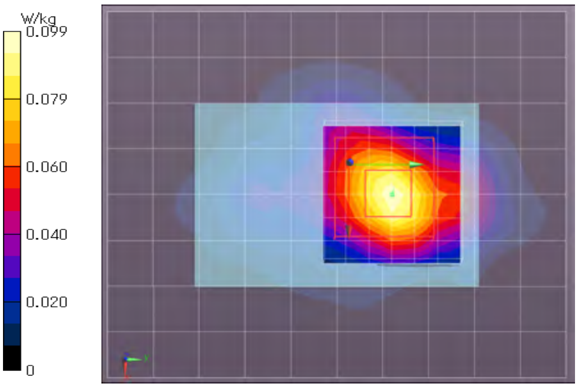
Mode: BT LE(1Mbps, fixed frequency) (UID: 0, Wi-fi_2.4GHz (0), Frame Length in ms: 0; PAR: 0; PMF: 1); **Frequency: 2440 MHz; Crest Factor: 1.0**
Medium: HSL5GHz(v6.2108); Medium parameters used: f = 2440 MHz; σ = 1.842 S/m; ε_r = 39.76; ρ = 1000 kg/m^3
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration: -Electronics: DAE4 Sn626; Calibrated: 2020/11/17 / -Phantom: ELI v4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
-DASY52 52.10.3(1513); SEMCAD X 14.6.13(7474) / -Probe: EX3DV4 - SN3907; ConvF(7.35, 7.35, 7.35) @ 2440 MHz; Calibrated: 2021/04/21
-Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0

touch/24h1;2440,Back(clip)&d0,ble(1m)/
Area:80x100,10 (9x11x1): Measurement grid: dx=10mm, dy=10mm; Maximum value of SAR (measured) = 0.0944 W/kg
Area:80x100,10 (81x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm; Maximum value of SAR (interpolated) = 0.0953 W/kg

Zoom:30x30x30,5 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm;
Reference Value = 7.450 V/m; Power Drift = 0.04 dB; Maximum value of SAR (measured) = 0.0993 W/kg; Peak SAR (extrapolated) = 0.121 W/kg

SAR(1 g) = 0.070 W/kg; SAR(10 g) = 0.033 W/kg (*.Ratio of SAR at M2 to SAR at M1 = 62%)



Remarks: *. Date tested: 2021/8/12; Tested by: Hiroshi Naka; Tested place:No.7 shielded room,
*. liquid depth: 150 mm; Position: distance of EUT to phantom: 0 mm (2 mm to liquid); ambient: (22~24) deg.C. / (60~70) %RH,
*. liquid temperature: 22.5(start)/22.4(end)/22.5(in check) deg.C.; *.White cubic: zoom scan area, Red cubic: big=SAR(10g)/small=SAR(1g)

Plot 1-3: Back (Clip) & touch / BT LE (1Mbps) / 2402 MHz

EUT: Motion Sensor; Type: CMT-S20R-AS; Serial: CS1-033

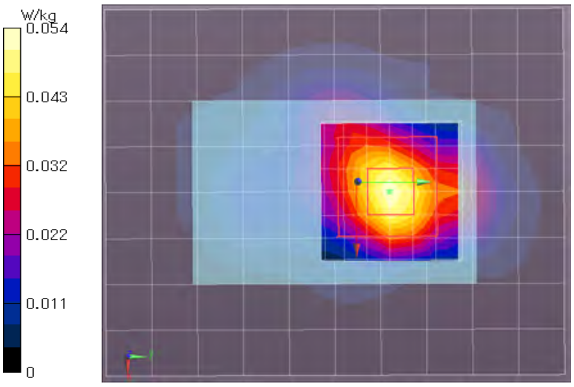
Mode: BT LE(1Mbps, fixed frequency) (UID: 0, Wi-fi_2.4GHz (0), Frame Length in ms: 0; PAR: 0; PMF: 1); **Frequency: 2402 MHz; Crest Factor: 1.0**
Medium: HSL5GHz(v6.2108); Medium parameters used (interpolated): f = 2402 MHz; σ = 1.811 S/m; ε_r = 39.82; ρ = 1000 kg/m^3
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration: -Electronics: DAE4 Sn626; Calibrated: 2020/11/17 / -Phantom: ELI v4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
-DASY52 52.10.3(1513); SEMCAD X 14.6.13(7474) / -Probe: EX3DV4 - SN3907; ConvF(7.35, 7.35, 7.35) @ 2402 MHz; Calibrated: 2021/04/21
-Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0

touch/24h3;2402,Back(clip)&d0,ble(1m)/
Area:80x100,10 (9x11x1): Measurement grid: dx=10mm, dy=10mm; Maximum value of SAR (measured) = 0.0527 W/kg
Area:80x100,10 (81x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm; Maximum value of SAR (interpolated) = 0.0536 W/kg

Zoom:30x30x30,5 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm;
Reference Value = 5.590 V/m; Power Drift = -0.01 dB; Maximum value of SAR (measured) = 0.0540 W/kg; Peak SAR (extrapolated) = 0.0660 W/kg

SAR(1 g) = 0.038 W/kg; SAR(10 g) = 0.018 W/kg (*.Ratio of SAR at M2 to SAR at M1 = 64.5%)



Remarks: *. Date tested: 2021/8/12; Tested by: Hiroshi Naka; Tested place:No.7 shielded room,
*. liquid depth: 150 mm; Position: distance of EUT to phantom: 0 mm (2 mm to liquid); ambient: (22~24) deg.C. / (60~70) %RH,
*. liquid temperature: 22.4(start)/22.4(end)/22.5(in check) deg.C.; *.White cubic: zoom scan area, Red cubic: big=SAR(10g)/small=SAR(1g)

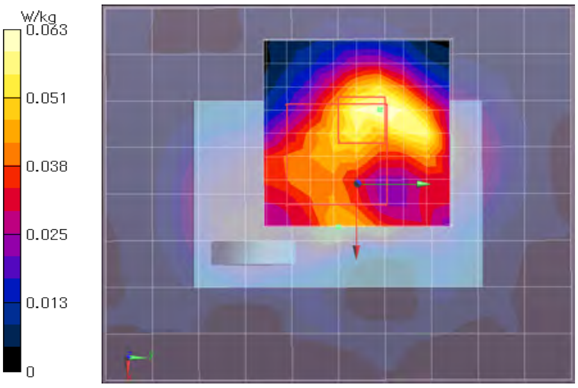
Appendix 2: SAR measurement data / Appendix 2-2: Other SAR(1g) Plots (cont'd)

Plot 1-4: Front & touch / BT LE (1Mbps) / 2480 MHz
EUT: Motion Sensor; Type: CMT-S20R-AS; Serial: CS1-033
Mode: BT LE(1Mbps, fixed frequency) (UID: 0, Wi-fi_2.4GHz (0), Frame Length in ms: 0; PAR: 0; PMF: 1)**; Frequency: 2480 MHz; Crest Factor: 1.0**
Medium: HSL5GHz(v6.2108); Medium parameters used: f = 2480 MHz; σ = 1.873 S/m; ε_r = 39.69; ρ = 1000 kg/m^3
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration: -Electronics: DAE4 Sn626; Calibrated: 2020/11/17 / -Phantom: ELI v4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
-DASY52 52.10.3(1513); SEMCAD X 14.6.13(7474) / -Probe: EX3DV4 - SN3907; ConvF(7.35, 7.35, 7.35) @ 2480 MHz; Calibrated: 2021/04/21
-Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0

touch/24h4;2480,Front&d0,ble(1m)/
Area:80x100,10 (9x11x1): Measurement grid: dx=10mm, dy=10mm; Maximum value of SAR (measured) = 0.0639 W/kg
Area:80x100,10 (81x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm; Maximum value of SAR (interpolated) = 0.0679 W/kg

Zoom:30x30x30,5 (9x9x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm;
Reference Value = 5.879 V/m; Power Drift = 0.05 dB; Maximum value of SAR (measured) = 0.0633 W/kg; Peak SAR (extrapolated) = 0.0860 W/kg
SAR(1 g) = 0.040 W/kg; SAR(10 g) = 0.020 W/kg (*.Ratio of SAR at M2 to SAR at M1 = 42.7%)



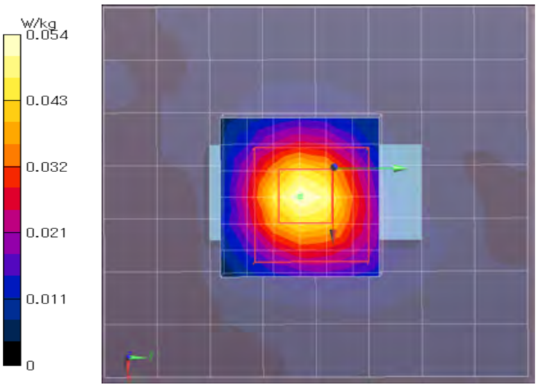
Remarks: *. Date tested: 2021/8/12; Tested by: Hiroshi Naka; Tested place:No.7 shielded room,
*. liquid depth: 150 mm; Position: distance of EUT to phantom: 0 mm (2 mm to liquid); ambient: (22~24) deg.C. / (60~70) %RH,
*. liquid temperature: 22.4(start)/22.5(end)/22.5(in check) deg.C.; *.White cubic: zoom scan area, Red cubic: big=SAR(10g)/small=SAR(1g)

Plot 1-5: Top (USB) & touch / BT LE (1Mbps) / 2480 MHz
EUT: Motion Sensor; Type: CMT-S20R-AS; Serial: CS1-033
Mode: BT LE(1Mbps, fixed frequency) (UID: 0, Wi-fi_2.4GHz (0), Frame Length in ms: 0; PAR: 0; PMF: 1)**; Frequency: 2480 MHz; Crest Factor: 1.0**
Medium: HSL5GHz(v6.2108); Medium parameters used: f = 2480 MHz; σ = 1.873 S/m; ε_r = 39.69; ρ = 1000 kg/m^3
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration: -Electronics: DAE4 Sn626; Calibrated: 2020/11/17 / -Phantom: ELI v4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
-DASY52 52.10.3(1513); SEMCAD X 14.6.13(7474) / -Probe: EX3DV4 - SN3907; ConvF(7.35, 7.35, 7.35) @ 2480 MHz; Calibrated: 2021/04/21
-Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0

touch/24h5;2480,Top&d0,ble(1m)/
Area:70x80,10 (8x9x1): Measurement grid: dx=10mm, dy=10mm; Maximum value of SAR (measured) = 0.0473 W/kg
Area:70x80,10 (71x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm; Maximum value of SAR (interpolated) = 0.0555 W/kg

Zoom:30x30x30,5 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm;
Reference Value = 5.518 V/m; Power Drift = 0.09 dB; Maximum value of SAR (measured) = 0.0537 W/kg; Peak SAR (extrapolated) = 0.0760 W/kg
SAR(1 g) = 0.033 W/kg; SAR(10 g) = 0.014 W/kg (*.Ratio of SAR at M2 to SAR at M1 = 41.5%)



Remarks: *. Date tested: 2021/8/12; Tested by: Hiroshi Naka; Tested place:No.7 shielded room,
*. liquid depth: 150 mm; Position: distance of EUT to phantom: 0 mm (2 mm to liquid); ambient: (22~24) deg.C. / (60~70) %RH,
*. liquid temperature: 22.5(start)/22.5(end)/22.5(in check) deg.C.; *.White cubic: zoom scan area, Red cubic: big=SAR(10g)/small=SAR(1g)

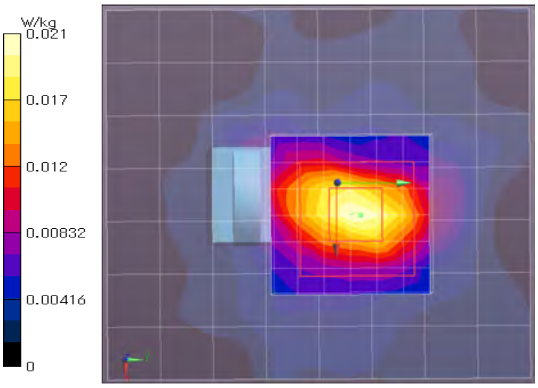
Appendix 2: SAR measurement data / Appendix 2-2: Other SAR(1g) Plots (cont'd)

Plot 1-6: Bottom (SW) & touch / BT LE (1Mbps) / 2480 MHz
EUT: Motion Sensor; Type: CMT-S20R-AS; Serial: CS1-033
Mode: BT LE(1Mbps, fixed frequency) (UID: 0, Wi-fi_2.4GHz (0), Frame Length in ms: 0; PAR: 0; PMF: 1); **Frequency: 2480 MHz; Crest Factor: 1.0**
Medium: HSL5GHz(v6.2108); Medium parameters used: f = 2480 MHz; σ = 1.873 S/m; ε_r = 39.69; ρ = 1000 kg/m^3
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration: -Electronics: DAE4 Sn626; Calibrated: 2020/11/17 / -Phantom: ELI v4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
-DASY52 52.10.3(1513); SEMCAD X 14.6.13(7474) / -Probe: EX3DV4 - SN3907; ConvF(7.35, 7.35, 7.35) @ 2480 MHz; Calibrated: 2021/04/21
-Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0

touch/24h8;2480,Bottom(sw)&d0,ble(1m)/
Area:70x80,10 (8x9x1): Measurement grid: dx=10mm, dy=10mm; Maximum value of SAR (measured) = 0.0196 W/kg
Area:70x80,10 (71x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm; Maximum value of SAR (interpolated) = 0.0201 W/kg

Zoom:30x30x30,5 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm;
Reference Value = 3.421 V/m; Power Drift = 0.03 dB; Maximum value of SAR (measured) = 0.0208 W/kg; Peak SAR (extrapolated) = 0.0290 W/kg
SAR(1 g) = 0.014 W/kg; SAR(10 g) = 0.00618 W/kg (*.Ratio of SAR at M2 to SAR at M1 = 46.8%;)



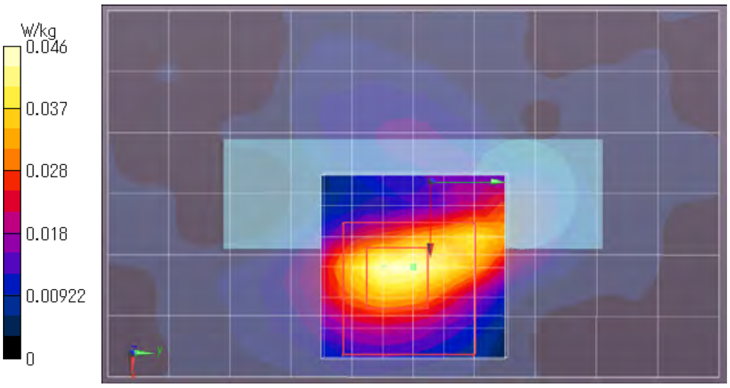
Remarks: *. Date tested: 2021/8/12; Tested by: Hiroshi Naka; Tested place:No.7 shielded room,
*. liquid depth: 150 mm; Position: distance of EUT to phantom: 0 mm (2 mm to liquid); ambient: (22~24) deg.C. / (60~70) %RH,
*. liquid temperature: 22.6(start)/22.5(end)/22.5(in check) deg.C.; *.White cubic: zoom scan area, Red cubic: big=SAR(10g)/small=SAR(1g)

Plot 1-7: Left & touch / BT LE (1Mbps) / 2480 MHz
EUT: Motion Sensor; Type: CMT-S20R-AS; Serial: CS1-033
Mode: BT LE(1Mbps, fixed frequency) (UID: 0, Wi-fi_2.4GHz (0), Frame Length in ms: 0; PAR: 0; PMF: 1); **Frequency: 2480 MHz; Crest Factor: 1.0**
Medium: HSL5GHz(v6.2108); Medium parameters used: f = 2480 MHz; σ = 1.873 S/m; ε_r = 39.69; ρ = 1000 kg/m^3
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration: -Electronics: DAE4 Sn626; Calibrated: 2020/11/17 / -Phantom: ELI v4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
-DASY52 52.10.3(1513); SEMCAD X 14.6.13(7474) / -Probe: EX3DV4 - SN3907; ConvF(7.35, 7.35, 7.35) @ 2480 MHz; Calibrated: 2021/04/21
-Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0

touch/24h9;2480,Side(ant)&d0,ble(1m)/
Area:60x100,10 (7x11x1): Measurement grid: dx=10mm, dy=10mm; Maximum value of SAR (measured) = 0.0436 W/kg
Area:60x100,10 (61x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm; Maximum value of SAR (interpolated) = 0.0445 W/kg

Zoom:30x30x30,5 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm;
Reference Value = 5.033 V/m; Power Drift = 0.04 dB; Maximum value of SAR (measured) = 0.0461 W/kg; Peak SAR (extrapolated) = 0.0670 W/kg
SAR(1 g) = 0.029 W/kg; SAR(10 g) = 0.012 W/kg (*.Ratio of SAR at M2 to SAR at M1 = 43.2%)



Remarks: *. Date tested: 2021/8/12; Tested by: Hiroshi Naka; Tested place:No.7 shielded room,
*. liquid depth: 150 mm; Position: distance of EUT to phantom: 0 mm (2 mm to liquid); ambient: (22~24) deg.C. / (60~70) %RH,
*. liquid temperature: 22.5(start)/22.5(end)/22.5(in check) deg.C.; *.White cubic: zoom scan area, Red cubic: big=SAR(10g)/small=SAR(1g)

Appendix 2: SAR measurement data / Appendix 2-2: Other SAR(1g) Plots (cont'd)

Plot 1-8: Right & touch / BT LE (1Mbps) / 2480 MHz

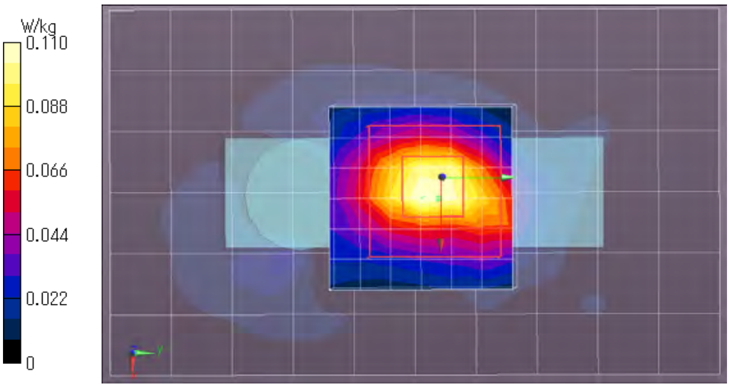
EUT: Motion Sensor; Type: CMT-S20R-AS; Serial: CS1-033

Mode: BT LE(1Mbps, fixed frequency) (UID: 0, Wi-fi_2.4GHz (0), Frame Length in ms: 0; PAR: 0; PMF: 1); **Frequency: 2480 MHz; Crest Factor: 1.0**
Medium: HSL5GHz(v6.2108); Medium parameters used: f = 2480 MHz; σ = 1.873 S/m; ε_r = 39.69; ρ = 1000 kg/m^3
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration: -Electronics: DAE4 Sn626; Calibrated: 2020/11/17 / -Phantom: ELI v4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
-DASY52 52.10.3(1513); SEMCAD X 14.6.13(7474) / -Probe: EX3DV4 - SN3907; ConvF(7.35, 7.35, 7.35) @ 2480 MHz; Calibrated: 2021/04/21
-Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0

touch/24h10;2480,Side)&d0,ble(1m)/
Area:60x100,10 (7x11x1): Measurement grid: dx=10mm, dy=10mm; Maximum value of SAR (measured) = 0.110 W/kg
Area:60x100,10 (61x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm; Maximum value of SAR (interpolated) = 0.147 W/kg

Zoom:30x30x30,5 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm;
Reference Value = 7.860 V/m; Power Drift = 0.10 dB; Maximum value of SAR (measured) = 0.110 W/kg; Peak SAR (extrapolated) = 0.176 W/kg
SAR(1 g) = 0.068 W/kg; SAR(10 g) = 0.028 W/kg (*.Smallest distance from peaks to all points 3 dB below = 7.3 mm; Ratio of SAR at M2 to SAR at M1 = 40.3%)



Remarks: *. Date tested: 2021/8/12; Tested by: Hiroshi Naka; Tested place:No.7 shielded room,
*. liquid depth: 150 mm; Position: distance of EUT to phantom: 0 mm (2 mm to liquid); ambient: (22~24) deg.C. / (60~70) %RH,
*. liquid temperature: 22.5(start)/22.5(end)/22.5(in check) deg.C.; *.White cubic: zoom scan area, Red cubic: big=SAR(10g)/small=SAR(1g)

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)
SAR	COTS-SSAR-02	144885	DASY52 software	Schmid&Partner Engineering AG	DASY5 PRO	Ver.52.10.3.1513	-	-
SAR	COTS-SSEP-02	144886	Dielectric assessment software	Schmid&Partner Engineering AG	DAK	Ver.DAK1.10.317.11	-	-
SAR	KAT10-P1	144882	Attenuator	Weinschel - API Technologies Corp	24-10-34	BY5927	2020/12/11	12
SAR	KCPL-07	146100	Directional Coupler	Pulsar Microwave Corp.	CCS30-B26	621	-	-
SAR	KDAE-01	144944	Data Acquisition Electronics	Schmid&Partner Engineering AG	DAE4	626	2020/11/17	12
SAR	KIU-08	145059	Power sensor	Rohde & Schwarz	NRV-Z4	100372	2020/09/15	12
SAR	KIU-09	145099	Power sensor	Rohde & Schwarz	NRV-Z4	100371	2020/09/15	12
SAR	KOS-14	144986	Thermo-Hygrometer data logger	SATO KEIRYOKI	SK-L200THIIα/SK-LTHIIα-2	015246/08169	2020/10/01	12
SAR	KPA-12	145359	RF Power Amplifier	Milmega	AS2560-50	1018582	-	-
SAR	KPFL-01	145560	Flat Phantom	Schmid&Partner Engineering AG	Oval flat phantom ELI 4.0	1059	2020/08/19	12
SAR	KPM-05	144988	Power meter	Keysight Technologies Inc	E4417A	GB41290718	2021/04/09	12
SAR	KPM-06	144989	Power Meter	Rohde & Schwarz	NRVD	101599	2020/09/15	12
SAR	KPSS-01	144990	Power sensor	Keysight Technologies Inc	E9327A	US40440544	2021/04/09	12
SAR	KRU-04	145086	Ruler(300mm)	SHINWA	13134	-	2021/02/10	12
SAR	KRU-05	145087	Ruler(100x50mm,L)	SHINWA	12101	-	2021/02/10	12
SAR	KSDA-01	145090	Dipole Antenna	Schmid&Partner Engineering AG	D2450V2	822	2020/11/10	12
SAR	KSDH-01	145596	Device holder	Schmid&Partner Engineering AG	Mounting device for transmitter	-	2020/09/03	12
SAR	KSG-08	145109	Signal Generator	Rohde & Schwarz	SMT06	100763	2020/09/14	12
SAR	SALC-01	146112	Primepure Ethanol	Kanto Chemical Co., Inc.	14032-79	-	-	-
SAR	SAT20-SARP1	160521	Attenuator	Weinschel - API Technologies Corp	4M-20	-	2020/12/11	12
SAR	SCC-SAR2	145405	Coaxial Cable	Huber+Suhner	SF104A/11PC3542/11N451/4M	MY699/4A	2020/12/11	12
SAR	SEPP-02	145500	Dielectric probe	Schmid&Partner Engineering AG	DAK3.5	1129	2021/04/14	12
SAR	SOS-26	191844	Humidity Indicator	CUSTOM. Inc	CTH-201	-	2021/08/02	12
SAR	SOS-SAR2	201967	Digital thermomoter	HANNA	Checktemp-4	A01440226111	2020/10/02	12
SAR	SOS-SAR3	201968	Digital thermomoter	HANNA	Checktemp-4	A01310946111	2020/10/02	12
SAR	SPB-02	146235	Dosimetric E-Field Probe	Schmid&Partner Engineering AG	EX3DV4	3907	2021/04/21	12
SAR	SRU-06	150560	Measuring Tool, Ruler	SHINWA	14001	--	2021/02/10	12
SAR	SSA-04	146176	Spectrum Analyzer	ADVANTEST	R3272	101100994	-	-
SAR	SSAR-02	146177	SAR measurement system	Schmid&Partner Engineering AG	DASY5	1324	-	-
SAR	SSLHV6-01	207714	Head Tissue Simulating Liquid	Schmid&Partner Engineering AG	HBBL600-10000V6	SL AAH U16 BC	-	-
SAR	SSNA-01	146258	Network Analyzer	Keysight Technologies Inc	8753ES	US39171777	2020/11/09	12
SAR	SSRBT-02	145621	SAR robot	Schmid&Partner Engineering AG	TX60 Lspeag	F12/5L2QA1/A/01	2020/09/03	12
SAR	SWTR-03	146185	DI water	MonotaRo	34557433	-	-	-

*. AT (antenna terminal conducted power measurement) was measured March 29, 2021. Equipment used for AT refers to test report number: 13692047S-A.

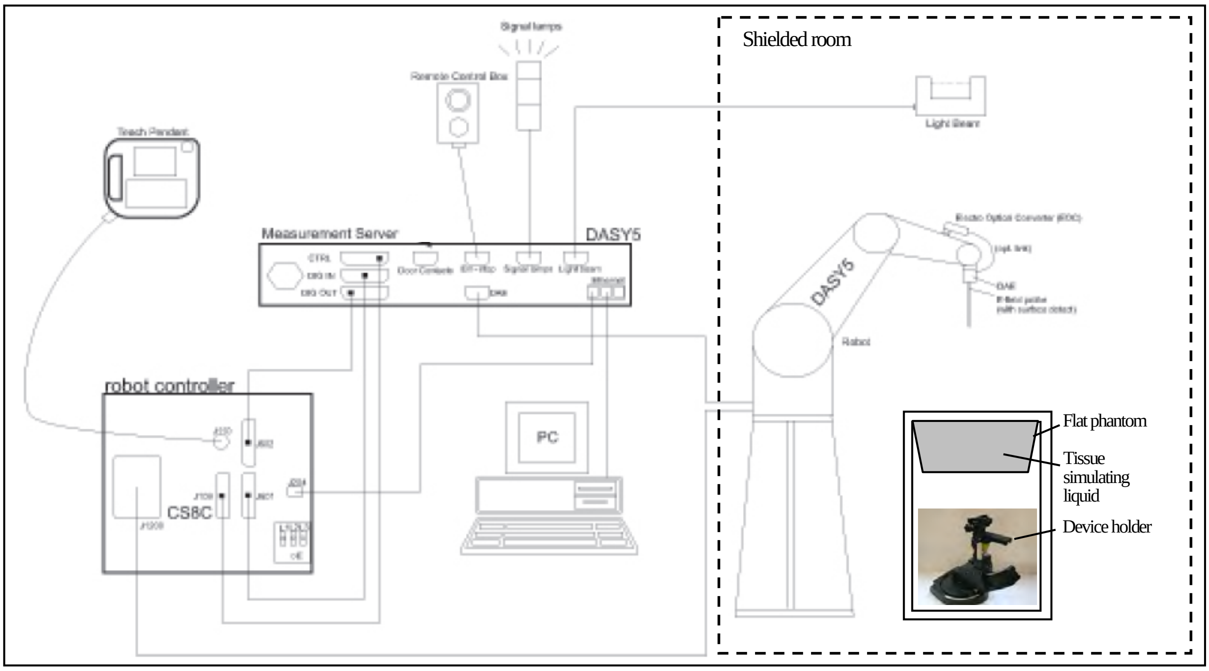
*. Local ID: SALC-01, the parameters of primepure Ethanol (as reference liquid) used for the simulated tissue parameter confirmation was defined the NPL Report MAT23 (http://www.npl.co.uk/content/conpublication/4295)

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: Configuration and peripherals

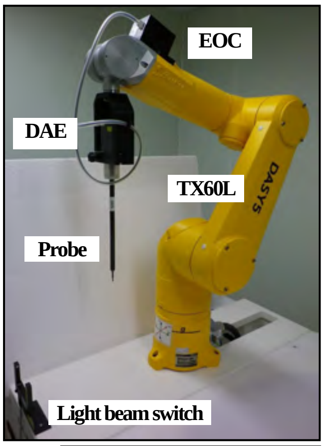
These measurements were performed with the automated near-field scanning system DASY5 from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision robot), which positions the probes with a positional repeatability of better than ± 0.02 mm. Special E- and H-field probes have been 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 DASY5 system for performing compliance tests consist of the following items:

1	A standard high precision 6-axis robot (Stäubli TX/RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
2	An isotropic field probe optimized and calibrated for the targeted measurement.
3	A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
4	The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
5	The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
6	The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
7	A computer running Win7 professional operating system and the DASY5 software.
8	R Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
9	The phantom.
10	The device holder for EUT. (low-loss dielectric palette) (*. when it was used.)
11	Tissue simulating liquid mixed according to the given recipes.
12	Validation dipole kits allowing to validate the proper functioning of the system.

Appendix 3-3: Test system specification

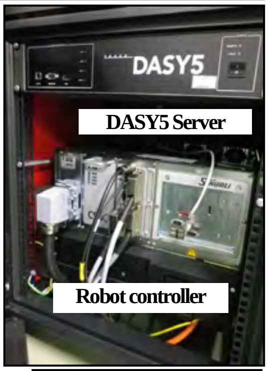


TX60 Lsepag robot/CS8Csepag-TX60 robot controller

- •Number of Axes : 6 •Repeatability : ±0.02 mm
- •Manufacture : Stäubli Unimation Corp.

DASY5 Measurement server

- •Features : The DASY5 measurement server is based on a PC/104 CPU board with a 400MHz intel ULV Celeron, 128MB chip-disk and 128MB RAM. The necessary circuits for communication with the DAE4 electronics box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY5 I/O board, which is directly connected to the PC/104 bus of the CPU board.
- •Calibration : No calibration required.
- •Manufacture : Schmid & Partner Engineering AG



Data Acquisition Electronic (DAE)

- •Features : Signal amplifier, multiplexer, A/D converter and control logic. Serial optical link for communication with DASY5 embedded system (fully remote controlled). 2 step probe touch detector for mechanical surface detection and emergency robot stop (not in -R version)
- •Measurement Range : 1 µV to > 200 mV (16bit resolution and 2 range settings: 4 mV, 400 mV)
- •Input Offset voltage : < 1 µV (with auto zero)
- •Input Resistance : 200 MΩ
- •Battery Power : > 10 hrs. of operation (with two 9 V battery)
- •Manufacture : Schmid & Partner Engineering AG

Electro-Optical Converter (EOC61)

- •Manufacture : Schmid & Partner Engineering AG

Light Beam Switch (LB5/80)

- •Manufacture : Schmid & Partner Engineering AG

SAR measurement software

- •Item : Dosimetric Assessment System DASY5
- •Software version : Refer to Appendix 3-1 (Equipment used)
- •Manufacture : Schmid & Partner Engineering AG

E-Field Probe

- •Model : EX3DV4 (serial number: 3907)
- •Construction : Symmetrical design with triangular core. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE).
- •Frequency : 10MHz to 6GHz, Linearity: ±0.2 dB (30MHz to 6GHz)
- •Conversion Factors (CF) : Head: (2.45, 5.25, 5.6, 5.8) GHz
  : Body: (2.45, 5.25, 5.6, 5.75) GHz
- •Directivity : ±0.3 dB in HSL (rotation around probe axis)
  ±0.5 dB in tissue material (rotation normal to probe axis)
- •Dynamic Range : 10µW/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

Phantom

- •Model Number : **ELI 4.0 oval flat phantom**
- •Shell Material : Fiberglass •Shell Thickness : Bottom plate: 2 ±0.2 mm
- •Dimensions : Bottom elliptical: 600×400 mm, Depth: 190 mm (Volume: Approx. 30 liters)
- •Manufacture : Schmid & Partner Engineering AG

Device Holder

☒ Urethane foam

☒ KSDH-01: In combination with the ELI4, 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

☐ SSDH-02: 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

Data storage and evaluation (postprocessing)

The DASY5 software stores the measured voltage acquired by the Data Acquisition Electronics (DAE) as raw data together with all the necessary software parameters for the data evaluation (probe calibration data, liquid parameters and communication system parameters) in measurement files with the extension ".da5x". The postprocessing software evaluates the data every time the data is visualized or exported.
The fields and SAR are calculated from the measured voltage (probe voltage acquired by the DAE) and the following parameters:

Probe parameters:	- Sensitivity	*normi, ai0, ai1, ai2*
	- Conversion Factor	*convFi*
	- Diode Compression Point	*dcpi*
	- Probe Modulation Response Factors	*ai, bi, ci, d*
Device parameters:	- Frequency	*f*
	- Crest factor	*cf*
Media parameters:	- Conductivity	σ
	- Relative Permittivity	ρ

This parameters are stored in the DASY5 V52 measurement file.
These parameters must be correctly set in the DASY5 V52 software setup. They are available as configuration file and can be imported into the measurement file. The values displayed in the multimeter window are assessed using the parameters of the actual system setup. In the scan visualization and export modes, the parameters stored in the measurement file are used.
The measured voltage is not proportional to the exciting. It must be first linearized.

Approximated Probe Response Linearization using Crest Factor;
This linearization method is enabled when a custom defined communication system is measured. The compensation applied is a function of the measured voltage, the detector diode compression point and the crest factor of the measured signal.

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

with	V_i	= linearized voltage of channel i in µV	(i = x,y,z)
	U_i	= measured voltage of channel i in µV	(i = x,y,z)
	cf	= crest factor of exciting field	(DASY parameter)
	dcp_i	= diode compression point of channel i in µV	(Probe parameter, i = x,y,z)

The resulting linearized voltage is only approximated because the probe is not calibrated to this specific signal.

Field and SAR Calculation
The primary field data for each channel are calculated using the linearized voltage:

$$\text{E} - \text{fieldprobes :} \qquad E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

with	V_i	= linearized voltage of channel i in µV	(i = x,y,z)
	$Norm_i$	= sensor sensitivity of channel i in µV/(V/m)2 for E-field Probes	(i = x,y,z)
	ConvF	= sensitivity enhancement in solution	
	E_i	= 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 primary field data are used to calculate the derived field units.

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1'000}$$

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

Appendix 3-4: Simulated tissue composition and parameter confirmation

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) (*1)				
Manufacture	Schmid & Partner Engineering AG	Note: *1. speag_920-SLAAxyy-E_1.12.15CL (Maintenance of tissue simulating liquid)			

*. The dielectric parameters were checked prior to assessment using the DAK3.5 dielectric probe kit.

Date measured	Frequency [MHz]	Liquid type	Ambient/		Liquid temp. [deg.C.]	Liquid depth of phantom [mm]	Liquid parameters (*a)										ΔSAR (*b)	
							Permittivity (εr) [-]					Conductivity [S/m]					1g [%]	10g [%]
							Target	Measured			Δend, >48hrs	Target	Measured			Δend, >48hrs		
			[deg.C.]	[%RH]				Meas.	Δεr[%]	Limit			Meas.	Δσ[%]	Limit			
August 12, 2021	2450	Head	23	52	22.5	150	***39.20***	39.74	1.4	10%	-	***1.800***	1.850	2.8	10%	-	1.0	0.5

*. Calculating formula: Δend(>48 hrs) (%) = {(dielectric properties, end of test series) / (dielectric properties, beginning of test series) -1} × 100

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

Standard										*Interpolated & Extrapolated*									
f (MHz)	Head Tissue		Body Tissue		f (MHz)	Head Tissue		Body Tissue		f (MHz)	Head Tissue		Body Tissue		f (MHz)	Head Tissue		Body Tissue	
	εr	σ [S/m]	εr	σ [S/m]		εr	σ [S/m]	εr	σ [S/m]		εr	σ [S/m]	εr	σ [S/m]		εr	σ [S/m]	εr	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**										

*b. The coefficients are parameters defined in IEEE Std. 1528-2013.

$\Delta SAR(1g) = C\varepsilon r \times \Delta\varepsilon r + C\sigma \times \Delta\sigma$, $C\varepsilon r = -7.854E\text{-}4 \times f^3 + 9.402E\text{-}3 \times f^2 - 2.742E\text{-}2 \times f - 0.2026$ / $C\sigma = 9.804E\text{-}3 \times f^3 - 8.661E\text{-}2 \times f^2 + 2.981E\text{-}2 \times f + 0.7829$

$\Delta SAR(10g) = C\varepsilon r \times \Delta\varepsilon r + C\sigma \times \Delta\sigma$, $C\varepsilon r = 3.456 \times 10^{-3} \times f^3 - 3.531 \times 10^{-2} \times f^2 + 7.675 \times 10^{-2} \times f - 0.1860$ / $C\sigma = 4.479 \times 10^{-3} \times f^3 - 1.586 \times 10^{-2} \times f^2 - 0.1972 \times f + 0.7717$

Appendix 3-5: Daily 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.

Date	Frequency [MHz]	ΔSAR			Daily check results (*. Meas.: Measured, Cal.: Calibration value, STD: Standard value)																	
					SAR (1g) [W/kg] (*d)									SAR (10g) [W/kg] (*d)								
		Liquid Type	1g [%]	10g [%]	Meas. (*c)	ΔSAR-correct	1W scaled	Target		Deviation		Limit [%]	Pass ?	Meas. (*c)	ΔSAR-correct	1W scaled	Target		Deviation		Limit [%]	Pass ?
								Cal. (*e)	STD (*f)	Cal. [%]	STD [%]						Cal. (*e)	STD (*f)	Cal. [%]	STD [%]		
August 12, 2021	2450	Head	1.0	0.5	13.3	13.17	52.6	53.6	52.4	-1.7	0.5	10	Pass	6.19	6.16	24.64	24.9	24	-1.0	2.7	10	Pass

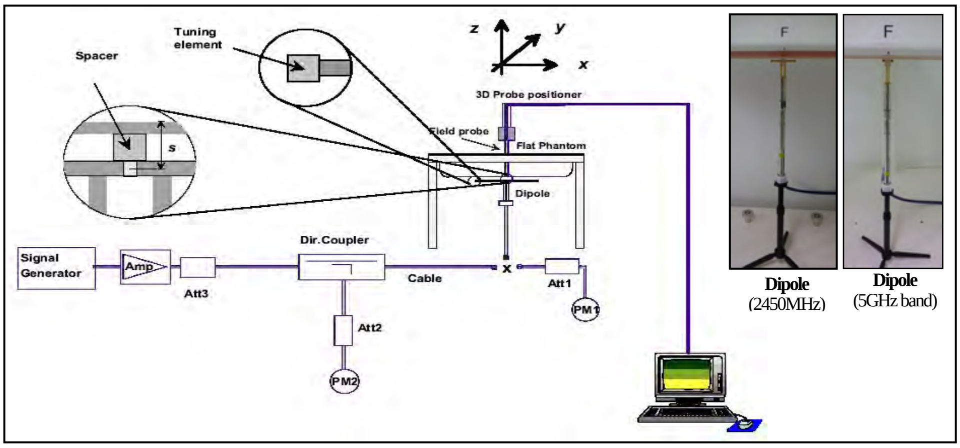
*. Calculating formula: ΔSAR corrected SAR (1g,10g) (W/kg) = (Measured SAR(1g,10g) (W/kg)) × (100 - (ΔSAR(%)) / 100

*c. The "Meas. (Measured)" SAR value is obtained at 250 mW for 2450MHz, 100 mW for (5250, 5600, 5800) MHz

*d. 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.

*e. The target value is a parameter defined in the calibration data sheet of D2450V2 (sn:822) dipole calibrated by Schmid & Partner Engineering AG (Certification No. D2450V2-822_Nov20, the data sheet was filed in this report).

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

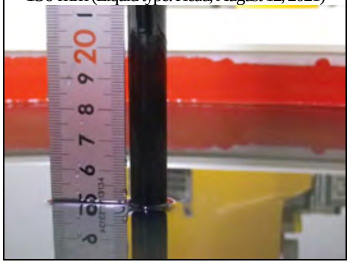


Test setup for the system performance check

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
Telephone: +81 463 50 6400 / Facsimile: +81 463 50 6401

Appendix 3-6: Daily check measurement data

Photographs of Liquid depth
150 mm (Liquid type: Head, August 12, 2021)

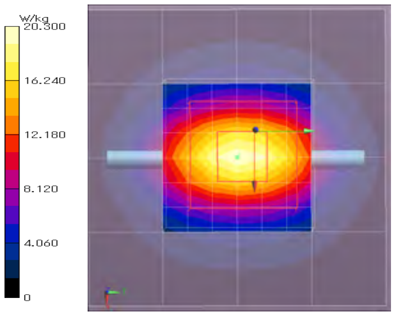


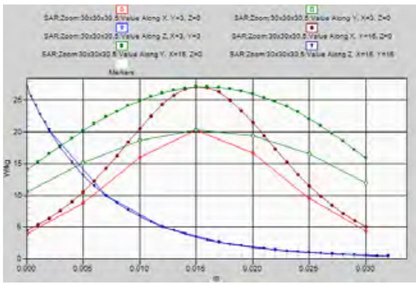
EUT: D2450V2 - SN822; Type: D2450V2; Serial: SN822; Forward conducted power: 250 mW
Communication System: CW (UID 0, Frame Length in ms: 0; Communication System PAR: 0; PMF: 1); **Frequency: 2450 MHz; Crest Factor: 1.0**
Medium: HSL5GHz(v6.2108); Medium parameters used: f = 2450 MHz; σ = 1.85 S/m; ε_r = 39.74; ρ = 1000 kg/m^3
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

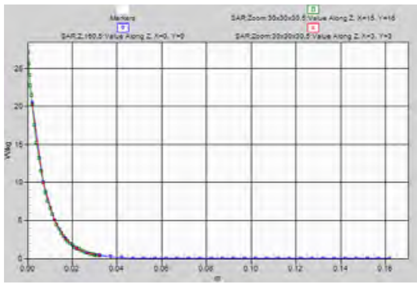
DASY Configuration: -Electronics: DAE4 Sn626; Calibrated: 2020/11/17 / -Phantom: ELI v4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
-DASY52 52.10.3(1513); SEMCAD X 14.6.13(7474) / -Probe: EX3DV4 - SN3907; ConvF(7.35, 7.35, 7.35) @ 2450 MHz; Calibrated: 2021/04/21
-Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0, 161.0

Area:60x60,15 (5x5x1): Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (measured) = 20.1 W/kg
Area:60x60,15 (41x41x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm; Maximum value of SAR (interpolated) = 20.1 W/kg
Z;160,5 (1x1x33): Measurement grid: dx=20mm, dy=20mm, dz=5mm; Maximum value of SAR (measured) = 20.5 W/kg

Zoom:30x30x30,5 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm;
Reference Value = 106.6 V/m; Power Drift = 0.07 dB; Maximum value of SAR (measured) = 20.3 W/kg; Peak SAR (extrapolated) = 27.1 W/kg
SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.19 W/kg (*.Smallest distance from peaks to all points 3 dB below = 9 mm; Ratio of SAR at M2 to SAR at M1 = 49.2%)







Remarks: *. Date tested: 2021/8/12; Tested by: Hiroshi Naka; Tested place:No.7 shielded room,
*. liquid depth: 150 mm; Position: distance of dipole to phantom: 8mm (10mm to liquid); ambient: 23 deg.C. / 60~70) %RH,
*. liquid temperature: 22.5(start)/22.5(end)/22.5(in check) deg.C.; *.White cubic: zoom scan area, Red cubic: big=SAR(10g)/small=SAR(1g)

Appendix 3-7: Uncertainty Assessment (SAR measurement/Daily check)

*. Although this standard determines only the limit value of uncertainty, there is no applicable rule of uncertainty in this. Therefore, the following results are derived depending on whether or not laboratory uncertainty is applied.

Uncertainty of SAR measurement (2.4GHz~6GHz) (*.v6h,ε&σ: 10%, DAK3.5, Tx: ≈100% duty cycle) (v09r02)	1g SAR	10g SAR
Combined measurement uncertainty of the measurement system (k=1)	± 13.2 %	± 13.1 %
Expanded uncertainty (k=2)	± 26.4 %	± 26.2 %

	Error Description (2.4-6GHz)	Uncertainty Value	Probability distribution	Divisor	ci (1g)	ci (10g)	ui (1g)	ui (10g)	Vi, veff
A	**Measurement System** (DASY5)						(std. uncertainty)	(std. uncertainty)	
1	Probe Calibration Error	±7.0 %	Normal	1	1	1	±7.0 %	±7.0 %	∞
2	Axial isotropy Error	±4.7 %	Rectangular	√3	0.71	0.71	±1.9 %	±1.9 %	∞
3	Hemispherical isotropy Error	±9.6 %	Rectangular	√3	0.71	0.71	±3.9 %	±3.9 %	∞
4	Linearity Error	±4.7 %	Rectangular	√3	1	1	±2.7 %	±2.7 %	∞
5	Probe modulation response (v09)	±5.5 %	Rectangular	√3	1	1	±3.2 %	±3.2 %	∞
6	Sensitivity Error (detection limit)	±1.0 %	Rectangular	√3	1	1	±0.6 %	±0.6 %	∞
7	Boundary effects Error	±4.3%	Rectangular	√3	1	1	±2.5 %	±2.5 %	∞
8	Readout Electronics Error(DAE)	±0.3 %	Rectangular	√3	1	1	±0.3 %	±0.3 %	∞
9	Response Time Error	±0.8 %	Normal	1	1	1	±0.5 %	±0.5 %	∞
10	Integration Time Error (≈100% duty cycle)	±0 %	Rectangular	√3	1	1	0 %	0 %	∞
11	RF ambient conditions-noise (v09)	±1.0 %	Rectangular	√3	1	1	±0.6 %	±0.6 %	∞
12	RF ambient conditions-reflections	±3.0 %	Rectangular	√3	1	1	±1.7 %	±1.7 %	∞
13	Probe positioner mechanical tolerance	±3.3 %	Rectangular	√3	1	1	±1.9 %	±1.9 %	∞
14	Probe Positioning with respect to phantom shell	±6.7 %	Rectangular	√3	1	1	±3.9 %	±3.9 %	∞
15	Max. SAR evaluation (Post-processing)	±4.0 %	Rectangular	√3	1	1	±2.3 %	±2.3 %	∞
B	**Test Sample Related**								
16	Device Holder or Positioner Tolerance (v09)	±3.2 %	Normal	1	1	1	±3.2 %	±3.2 %	5
17	Test Sample Positioning Error (v09)	±2.1 %	Normal	1	1	1	±2.1 %	±2.1 %	10
18	Power scaling	±0 %	Rectangular	√3	1	1	±0 %	±0 %	∞
19	Drift of output power (measured, <0.2dB)	±5.0 %	Rectangular	√3	1	1	±2.9 %	±2.9 %	∞
C	**Phantom and Setup**								
20	Phantom uncertainty (shape, thickness tolerances)	±7.5 %	Rectangular	√3	1	1	±4.3 %	±4.3 %	∞
21	Algorithm for correcting SAR (e',σ: 10%)	±1.9 %	Normal	1	1	0.84	±1.9 %	±1.6 %	∞
22	Measurement Liquid Conductivity Error (DAK3.5)	±3.0 %	Normal	1	0.78	0.71	±2.3 %	±2.1 %	7
23	Measurement Liquid Permittivity Error (DAK3.5)	±3.1 %	Normal	1	0.23	0.26	±0.7 %	±0.8 %	7
24	Liquid Conductivity-temp.uncertainty (≤2deg.C.v6h)	±3.0 %	Rectangular	√3	0.78	0.71	±1.4 %	±1.2 %	∞
25	Liquid Permittivity-temp.uncertainty (≤2deg.C.v6h)	±1.0 %	Rectangular	√3	0.23	0.26	±0.1 %	±0.2 %	∞
	Combined Standard Uncertainty (v09r02)						**± 13.2** %	**± 13.1** %	945
	Expanded Uncertainty (k=2) (v09r02)						**± 26.4 %**	**± 26.2 %**	

*. This measurement uncertainty budget is suggested by IEEE Std.1528(2013) and determined by Schmid & Partner Engineering AG (DASY5 Uncertainty Budget). Per KDB 865664 D01 (v01r04) SAR Measurement 100 MHz to 6 GHz, Section 2.8.1., when the highest measured SAR(1g) within a frequency band is < 1.5W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std.1528 (2013) is not required in SAR reports submitted for equipment approval.

Uncertainty of daily check (2.4~6GHz) (*.v6h,ε&σ tolerance: 10%, DAK3.5, CW) (v09r02)	1g SAR	10g SAR
Combined measurement uncertainty of the measurement system (k=1)	± 10.8 %	± 10.7 %
Expanded uncertainty (k=2)	± 21.6 %	± 21.4 %

	Error Description (2.4-6GHz)	Uncertainty Value	Probability distribution	Divisor	ci (1g)	ci (10g)	ui (1g)	ui (10g)	Vi, veff
A	**Measurement System** (DASY5)						(std. uncertainty)	(std. uncertainty)	
1	Probe Calibration Error	±7.0 %	Normal	1	1	1	±7.0 %	±7.0 %	∞
2	Axial isotropy error	±4.7 %	Rectangular	√3	0.71	0.71	±1.9 %	±1.9 %	∞
3	Hemispherical isotropy error	±9.6 %	Rectangular	√3	0	0	0 %	0 %	∞
4	Probe linearity	±4.7 %	Rectangular	√3	1	1	±2.7 %	±2.7 %	∞
5	Probe modulation response (CW)	±0.0 %	Rectangular	√3	1	1	0 %	0 %	∞
6	System detection limit	±1.0 %	Rectangular	√3	1	1	±0.6 %	±0.6 %	∞
7	Boundary effects	±4.3 %	Rectangular	√3	1	1	±2.5 %	±2.5 %	∞
8	System readout electronics (DAE)	±0.3 %	Normal	1	1	1	±0.3 %	±0.3 %	∞
9	Response Time Error (<5ms/100ms wait)	±0.0 %	Rectangular	√3	1	1	0 %	0 %	∞
10	Integration Time Error (CW)	±0.0 %	Rectangular	√3	1	1	0 %	0 %	∞
11	RF ambient conditions-noise	±3.0 %	Rectangular	√3	1	1	±1.7 %	±1.7 %	∞
12	RF ambient conditions-reflections	±3.0 %	Rectangular	√3	1	1	±1.7 %	±1.7 %	∞
13	Probe positioner mechanical tolerance	±3.3 %	Rectangular	√3	1	1	±1.9 %	±1.9 %	∞
14	Probe positioning with respect to phantom shell	±6.7 %	Rectangular	√3	1	1	±3.9 %	±3.9 %	∞
15	Max. SAR evaluation (Post-processing)	±4.0 %	Rectangular	√3	1	1	±2.3 %	±2.3 %	∞
B	**Test Sample Related**								
16	Deviation of the experimental source	±1.9 %	Normal	1	1	1	±1.9 %	±1.9 %	∞
17	Dipole to liquid distance (10mm±0.2mm,<2deg.)	±2.0 %	Rectangular	√3	1	1	±1.2 %	±1.2 %	∞
18	Drift of output power (measured, <0.1dB)	±2.3 %	Rectangular	√3	1	1	±1.3 %	±1.3 %	∞
C	**Phantom and Setup**								
19	Phantom uncertainty	±2.0 %	Rectangular	√3	1	1	±1.2 %	±1.2%	∞
20	Algorithm for correcting SAR (e',σ: 10%)	±1.9 %	Normal	1	1	0.84	±1.9 %	±1.6 %	∞
21	Liquid conductivity (meas.) (DAK3.5)	±3.0 %	Normal	1	0.78	0.71	±2.3 %	±2.1 %	∞
22	Liquid permittivity (meas.) (DAK3.5)	±3.1 %	Normal	1	0.23	0.26	±0.7 %	±0.8 %	∞
23	Liquid Conductivity-temp.uncertainty (≤2deg.C.v6h)	±3.0 %	Rectangular	√3	0.78	0.71	±1.4 %	±1.2 %	∞
24	Liquid Permittivity-temp.uncertainty (≤2deg.C.v6h)	±1.0 %	Rectangular	√3	0.23	0.26	±0.1 %	±0.2 %	∞
	Combined Standard Uncertainty (v09r02)						**±10.8** %	**±10.7** %	
	Expanded Uncertainty (k=2) (v09r02)						**±21.6** %	**±21.4** %	

*. This measurement uncertainty budget is suggested by IEEE Std. 1528(2013) and determined by Schmid & Partner Engineering AG (DASY5 Uncertainty Budget).

*. Table of uncertainties are listed for ISO/IEC 17025.

Appendix 3-8: Calibration certificate: E-Field Probe (EX3DV4)

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **UL Japan (RCC)**

Certificate No: **EX3-3907_Apr21**

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3907
Calibration procedure(s)	QA CAL-01.v9, QA CAL-14.v6, QA CAL-23.v5, QA CAL-25.v7 Calibration procedure for dosimetric E-field probes
Calibration date:	April 21, 2021

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	09-Apr-21 (No. 217-03291/03292)	Apr-22
Power sensor NRP-Z91	SN: 103244	09-Apr-21 (No. 217-03291)	Apr-22
Power sensor NRP-Z91	SN: 103245	09-Apr-21 (No. 217-03292)	Apr-22
Reference 20 dB Attenuator	SN: CC2552 (20x)	09-Apr-21 (No. 217-03343)	Apr-22
DAE4	SN: 660	23-Dec-20 (No. DAE4-660_Dec20)	Dec-21
Reference Probe ES3DV2	SN: 3013	30-Dec-20 (No. ES3-3013_Dec20)	Dec-21
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-20)	In house check: Jun-22
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-21

	Name	Function	Signature
Calibrated by:	Jeffrey Katzman	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 24, 2021

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

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

Appendix 3-8: Calibration certificate: E-Field Probe (EX3DV4) (cont'd)

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, ", "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Appendix 3-8: Calibration certificate: E-Field Probe (EX3DV4) (cont'd)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3907

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.45	0.58	0.54	± 10.1 %
DCP (mV)[B]	102.7	97.5	99.0	

Calibration Results for Modulation Response

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Max dev.	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	134.6	± 3.5 %	± 4.7 %
		Y	0.0	0.0	1.0		129.4		
		Z	0.0	0.0	1.0		129.5		

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of Norm X,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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

Appendix 3-8: Calibration certificate: E-Field Probe (EX3DV4) (cont'd)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3907

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-143.3
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

Note: Measurement distance from surface can be increased to 3-4 mm for an *Area Scan* job.

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

Appendix 3-8: Calibration certificate: E-Field Probe (EX3DV4) (cont'd)

EX3DV4– SN:3907

April 21, 2021

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3907

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
2450	39.2	1.80	7.35	7.35	7.35	0.41	0.90	± 12.0 %
5250	35.9	4.71	5.14	5.14	5.14	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.56	4.56	4.56	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.60	4.60	4.60	0.40	1.80	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Validity of ConvF assessed at 6 MHz is 4-9 MHz, and ConvF assessed at 13 MHz is 9-19 MHz. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

Appendix 3-8: Calibration certificate: E-Field Probe (EX3DV4) (cont'd)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3907

Calibration Parameter Determined in Body Tissue Simulating Media

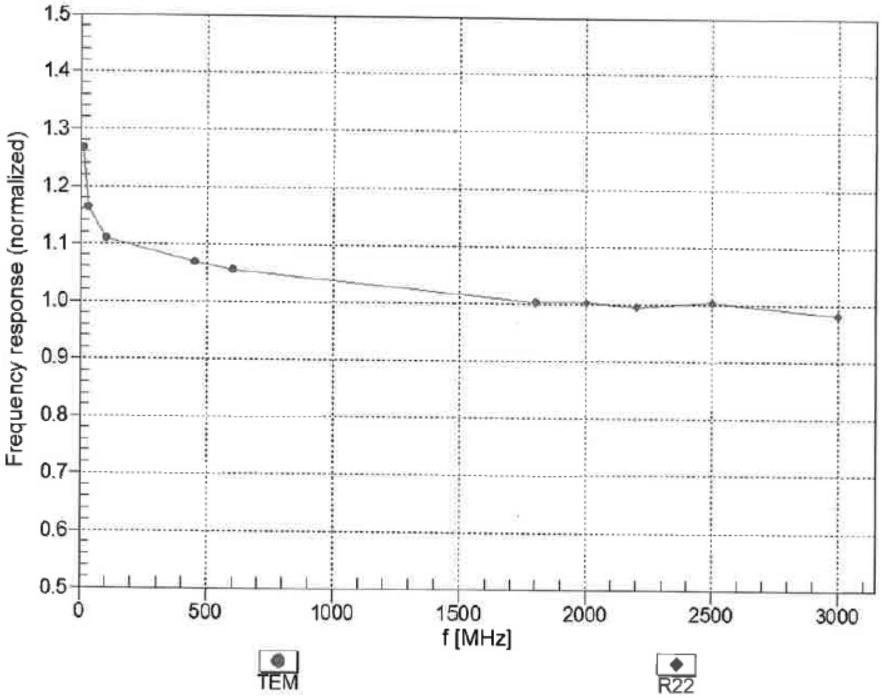
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
2450	52.7	1.95	7.44	7.44	7.44	0.36	0.95	± 12.0 %
5250	48.9	5.36	4.49	4.49	4.49	0.50	1.90	± 13.1 %
5600	48.5	5.77	3.96	3.96	3.96	0.50	1.90	± 13.1 %
5750	48.3	5.94	4.07	4.07	4.07	0.50	1.90	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Validity of ConvF assessed at 6 MHz is 4-9 MHz, and ConvF assessed at 13 MHz is 9-19 MHz. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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

Appendix 3-8: Calibration certificate: E-Field Probe (EX3DV4) (cont'd)

Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

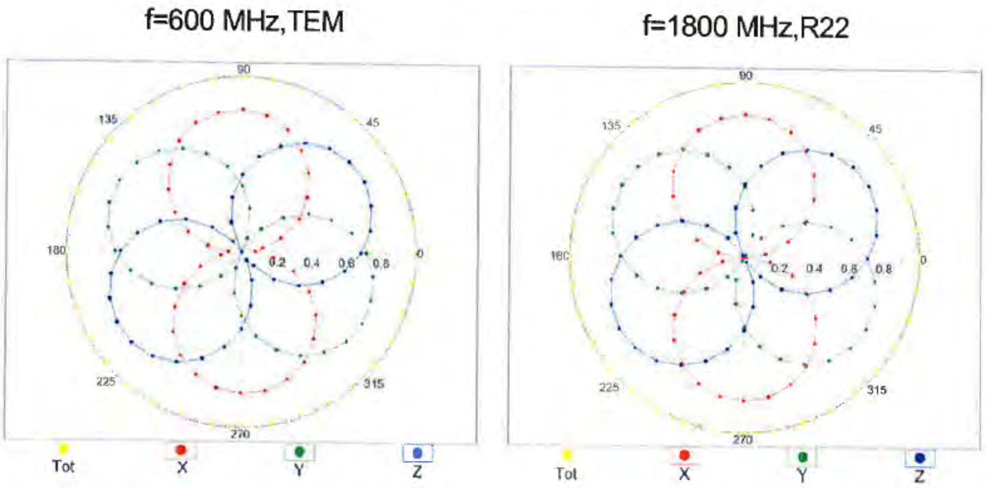
UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
Telephone: +81 463 50 6400 / Facsimile: +81 463 50 6401

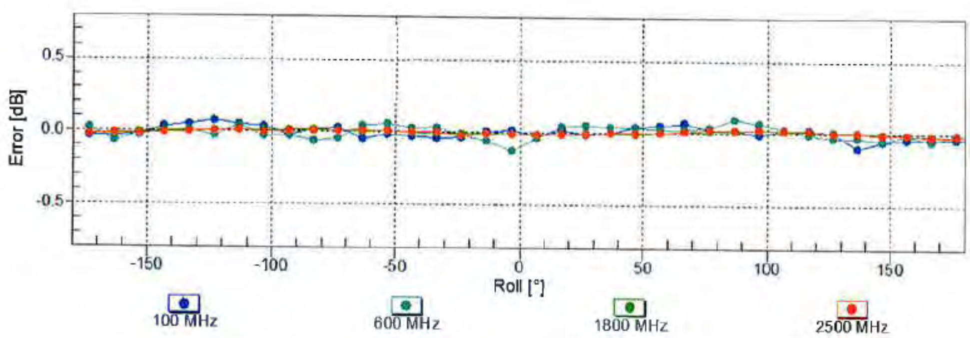
Appendix 3-8: Calibration certificate: E-Field Probe (EX3DV4) (cont'd)

EX3DV4– SN:3907

April 21, 2021

Receiving Pattern (ϕ), $\vartheta = 0°$





Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

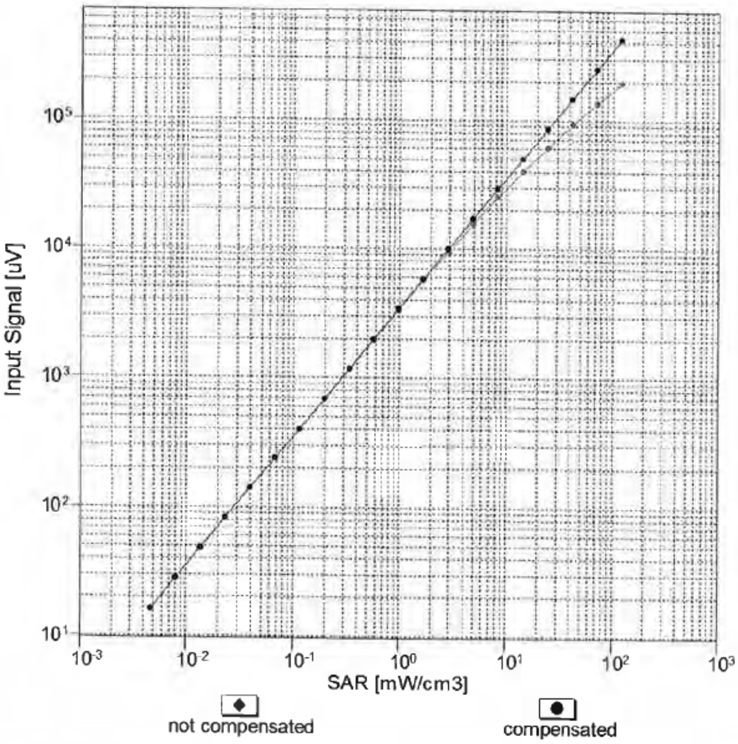
Appendix 3-8: Calibration certificate: E-Field Probe (EX3DV4) (cont'd)

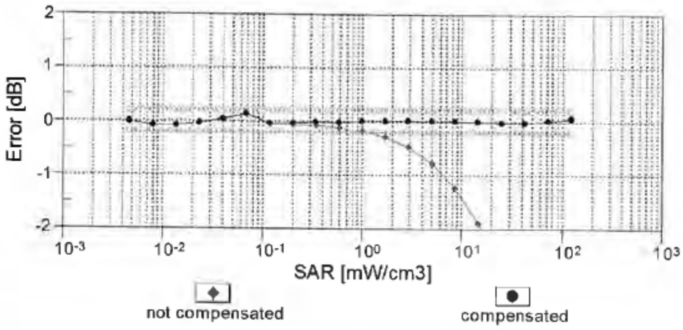
EX3DV4– SN:3907

April 21, 2021

Dynamic Range f(SAR$_{head}$)

(TEM cell , f$_{eval}$= 1900 MHz)





Uncertainty of Linearity Assessment: ± 0.6% (k=2)

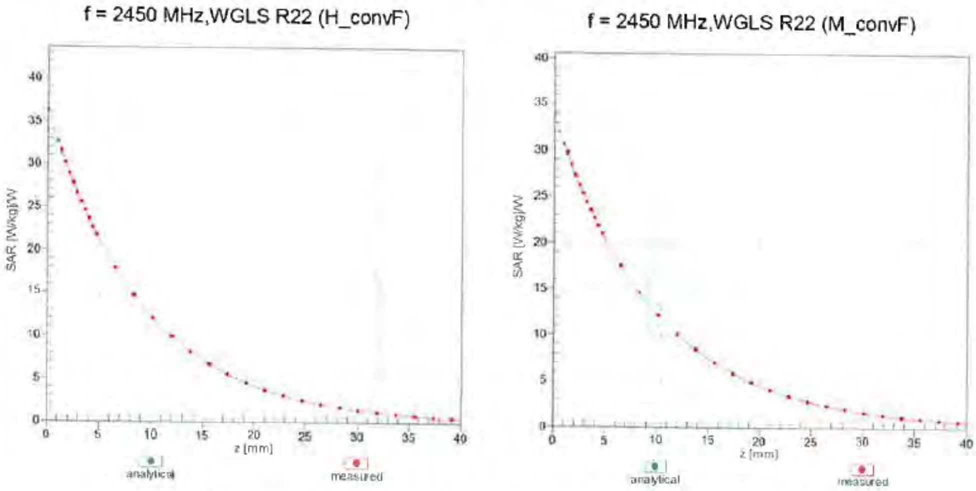
UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
Telephone: +81 463 50 6400 / Facsimile: +81 463 50 6401

Appendix 3-8: Calibration certificate: E-Field Probe (EX3DV4) (cont'd)

EX3DV4– SN:3907

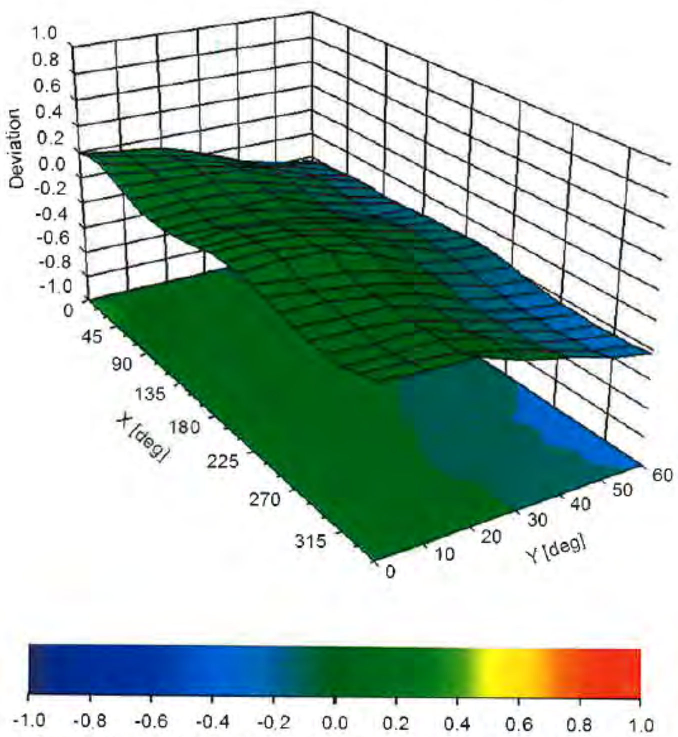
April 21, 2021

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

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

Appendix 3-9: Calibration certificate: Dipole (D2450V2)

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **UL Japan (RCC)**

Certificate No: **D2450V2-822_Nov20**

CALIBRATION CERTIFICATE

Object: D2450V2 - SN:822

Calibration procedure(s): QA CAL-05.v11
Calibration Procedure for SAR Validation Sources between 0.7-3 GHz

Calibration date: November 10, 2020

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	01-Apr-20 (No. 217-03100/03101)	Apr-21
Power sensor NRP-Z91	SN: 103244	01-Apr-20 (No. 217-03100)	Apr-21
Power sensor NRP-Z91	SN: 103245	01-Apr-20 (No. 217-03101)	Apr-21
Reference 20 dB Attenuator	SN: BH9394 (20k)	31-Mar-20 (No. 217-03106)	Apr-21
Type-N mismatch combination	SN: 310982 / 06327	31-Mar-20 (No. 217-03104)	Apr-21
Reference Probe EX3DV4	SN: 7405	29-Jun-20 (No. EX3-7405_Jun20)	Jun-21
DAE4	SN: 601	02-Nov-20 (No. DAE4-601_Nov20)	Nov-21

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-21

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	M.Weber
Approved by:	Katja Pokovic	Technical Manager	

Issued: November 11, 2020

Appendix 3-9: Calibration certificate: Dipole (D2450V2) (cont'd)

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

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

Appendix 3-9: Calibration certificate: Dipole (D2450V2) (cont'd)

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.1 ± 6 %	1.86 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.7 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**53.6 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.30 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.9 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.8 ± 6 %	2.03 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.3 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**52.0 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.16 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**24.3 W/kg ± 16.5 % (k=2)**

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

Appendix 3-9: Calibration certificate: Dipole (D2450V2) (cont'd)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.3 Ω + 5.5 jΩ
Return Loss	- 24.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.5 Ω + 6.7 jΩ
Return Loss	- 23.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.160 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

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

Appendix 3-9: Calibration certificate: Dipole (D2450V2) (cont'd)

DASY5 Validation Report for Head TSL

Date: 10.11.2020

Test Laboratory: SPEAG, Zurich, Switzerland

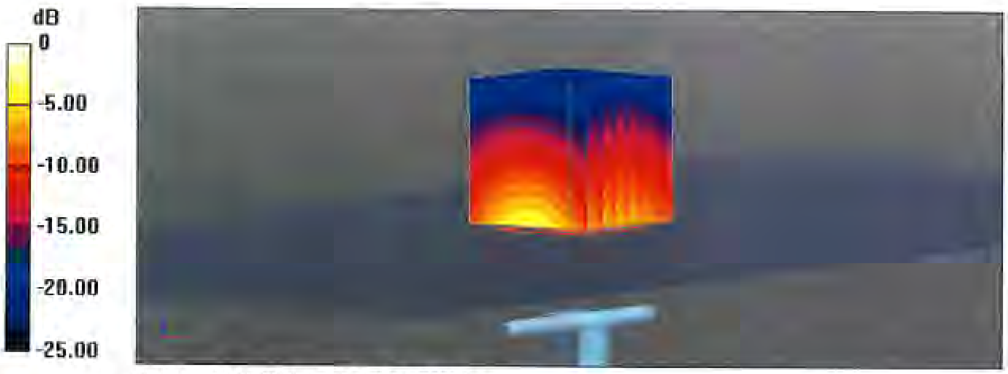
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:822

Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.86 S/m; ε_r = 38.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7405; ConvF(7.81, 7.81, 7.81) @ 2450 MHz; Calibrated: 29.06.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.11.2020
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

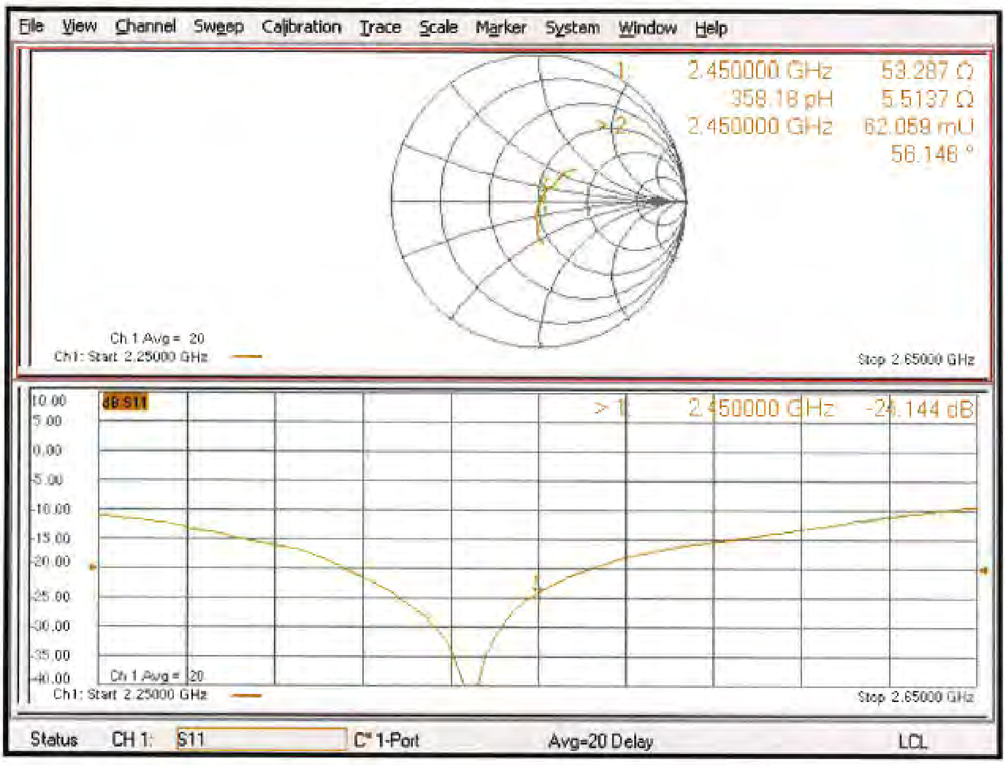
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 116.9 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 28.4 W/kg
SAR(1 g) = 13.7 W/kg; SAR(10 g) = 6.3 W/kg
Smallest distance from peaks to all points 3 dB below = 9 mm
Ratio of SAR at M2 to SAR at M1 = 48.4%
Maximum value of SAR (measured) = 23.1 W/kg



0 dB = 23.1 W/kg = 13.64 dBW/kg

Appendix 3-9: Calibration certificate: Dipole (D2450V2) (cont'd)

Impedance Measurement Plot for Head TSL



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

Appendix 3-9: Calibration certificate: Dipole (D2450V2) (cont'd)

DASY5 Validation Report for Body TSL

Date: 10.11.2020

Test Laboratory: SPEAG, Zurich, Switzerland

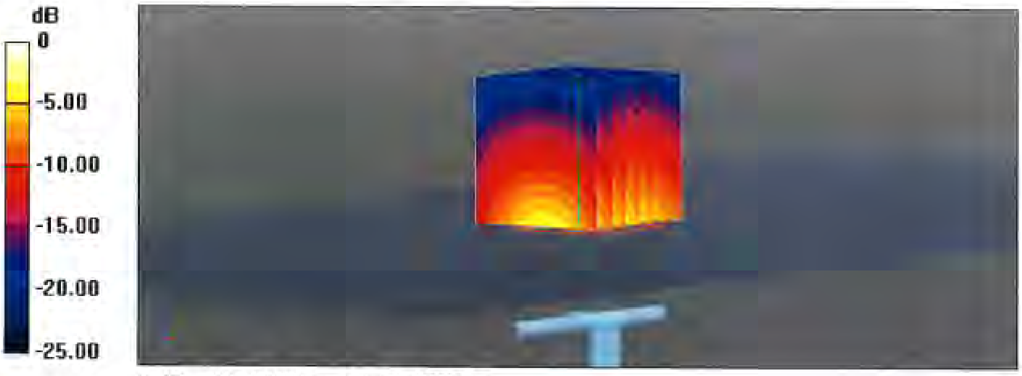
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:822

Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.03 S/m; ε_r = 51.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7405; ConvF(7.75, 7.75, 7.75) @ 2450 MHz; Calibrated: 29.06.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.11.2020
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 108.1 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 27.4 W/kg
SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.16 W/kg
Smallest distance from peaks to all points 3 dB below = 8.2 mm
Ratio of SAR at M2 to SAR at M1 = 50%
Maximum value of SAR (measured) = 21.6 W/kg

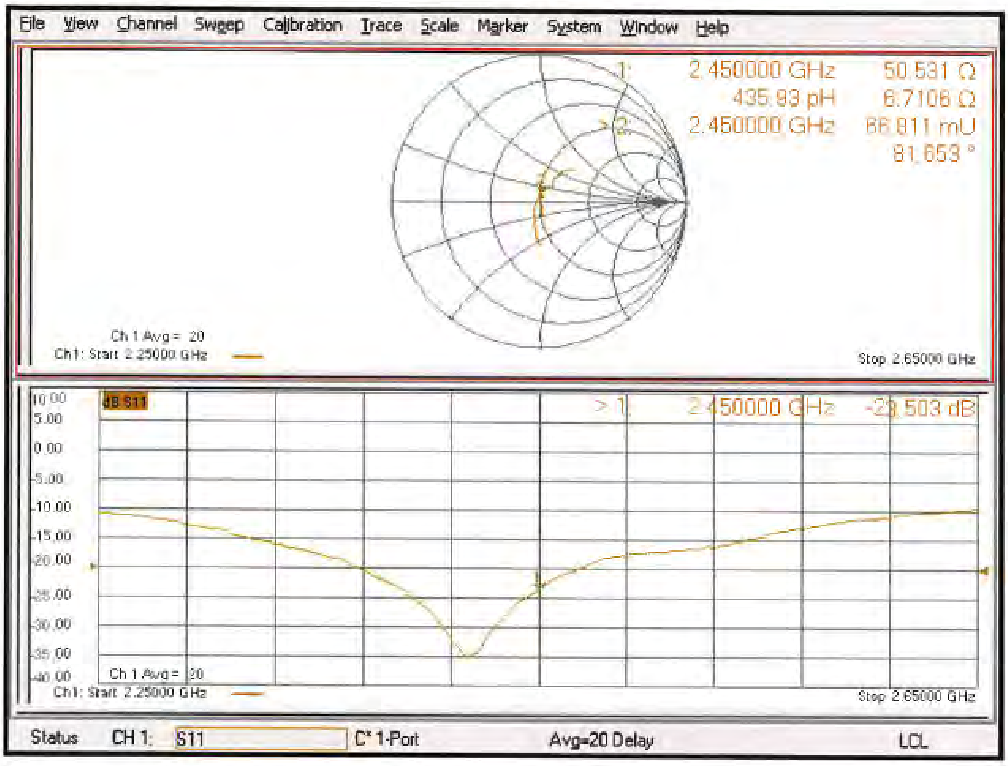


0 dB = 21.6 W/kg = 13.34 dBW/kg

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

Appendix 3-9: Calibration certificate: Dipole (D2450V2) (cont'd)

Impedance Measurement Plot for Body TSL



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