SAR Compliance Test Report

Date of Report:	14/02/2025	**Client's Contact person:**	Pascal Scafidi
Number of pages:	40		
		Responsible Test engineer:	Jesper Varis
Testing laboratory:	**Verkotan Oy** Elektroniikkatie 17 90590 Oulu Finland	**Client:**	**STMicroelectronics (Rousses) SAS** 190 Avenue Celestin Coq 13790 Rousset France

Tested device:	**STM32WBA5MMG**
Related reports:	-
Testing has been carried out in accordance with:	**47CFR §2.1093** Radiofrequency Radiation Exposure Evaluation: Portable Devices **FCC published RF exposure KDB procedures** **IEC/IEEE 62209-1528, 2020** Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices **RSS-102, Issue 6, 2023** Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
Documentation:	The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory
Test Results:	**The EUT complies with the requirements in respect of all parameters subject to the test.** The test results relate only to devices specified in this document

Date and signatures:

14.02.2025

Laboratory Manager

Miia Nurkkala

TABLE OF CONTENTS

1. SUMMARY OF SAR TEST REPORT 3
1.1 TEST DETAILS 3
1.2 MAXIMUM RESULTS 4
1.2.1 Standalone SAR 4
1.2.2 Maximum Drift 4
1.2.3 Measurement Uncertainty 4
2. DESCRIPTION OF THE DEVICE UNDER TEST (DUT) 5
2.1 SUPPORTED FREQUENCY BANDS AND OPERATIONAL MODES 6
3. OUTPUT POWER 7
3.1 MAXIMUM SPECIFIED CONDUCTED OUTPUT POWER 7
3.2 TESTED CONDUCTED POWER 7
4. TEST EQUIPMENT 8
4.1 TEST EQUIPMENT LIST 9
4.1.1 Isotropic E-field Probe Type EX3DV4 10
4.2 PHANTOMS 10
4.3 TISSUE SIMULANTS 10
4.4 SYSTEM VALIDATION STATUS 11
4.5 SYSTEM CHECK 11
4.5.1 Tissue Simulant Verification 11
5. TEST PROCEDURE 12
5.1 TEST POSITIONS 13
5.1.1 Body-worn Configuration, 5mm separation distance 13
5.2 SCAN PROCEDURES 14
5.3 SAR AVERAGING METHODS 14
6. MEASUREMENT UNCERTAINTY 15
7. TEST RESULTS 16
7.1 SAR RESULTS FOR BODY EXPOSURE CONDITION WITH 5MM SEPARATION 16
7.2 RF ENERGY COUPLING ENHANCEMENT 17
7.3 IEC/IEEE 62209-1528:2020, ZOOM SCAN EVALUATION 18
APPENDIX A: PHOTOS OF THE DUT 19
APPENDIX B: SYSTEM CHECK SCAN 25
APPENDIX C: MEASUREMENT SCANS 27
APPENDIX D: RELEVANT PAGES FROM PROBE & DAE CALIBRATION REPORTS 29
APPENDIX E: RELEVANT PAGES FROM DIPOLE CALIBRATION REPORTS 37

1. SUMMARY OF SAR TEST REPORT

1.1 Test Details

Device under Test (DUT):

Product:	Bluetooth Low Energy and IEEE 802.15.4 radio module
Manufacturer:	STMICROELECTRONICS
Model:	STM32WBA5MMG
FCC ID Number:	YCP-32WBA5MMG01
ISED ID Number:	8976A-32WBA5MMG01
DUT Number:	20169, 20170
Battery Type used in testing:	No battery, USB powered
State of the Sample:	Production sample

Testing information:

Testing performed:	20.01.2025 – 22.01.2025
Notes:	-
Document history & changes:	Initial version
Document ID:	FCC ISED_SAR report_STM32WBA5MMG ID6901b_28012025.docx
Temperature °C	22±2 / Controlled
Humidity RH%	30±20 / Controlled
Measurement performed by:	Jesper Varis
FCC Test Firm Designation Number:	FI0005
ISED Company Number:	22218

1.2 Maximum Results

The maximum reported* SAR values for Body-worn for transmitting systems are shown in a table below. The device conforms to the requirements of the standards when the maximum reported SAR value is less than or equal to the limit. The SAR limit specified in FCC 47 CFR part 2 (2.1093) and Health Canada's RF exposure guideline, Safety Code 6 for Head/Body SAR_{1g} is 1.6 W/kg.

1.2.1 Standalone SAR

System	Highest Reported* SAR_{1g}[W/kg] in Body-Worn Exposure Condition, 5mm separation distance	Result
BLE	**0.044**	**PASS**
802.15.4	**0.0016**	**PASS**

* Reported SAR Values are scaled to upper limit of power tuning tolerance.

1.2.2 Maximum Drift

Maximum Drift During Measurements	-1.80 dB*

*Larger than 5% drifts included to scaling factors

1.2.3 Measurement Uncertainty

DASY5 System, SAR 1g: 300 MHz – 3 GHz:

Expanded Uncertainty (k=2) 95 %	±22.6 %

2. DESCRIPTION OF THE DEVICE UNDER TEST (DUT)

The DUT is a radio module supporting Bluetooth Low Energy and IEEE 802.15.4 standard based Thread, Matter and Zigbee with integrated antenna.

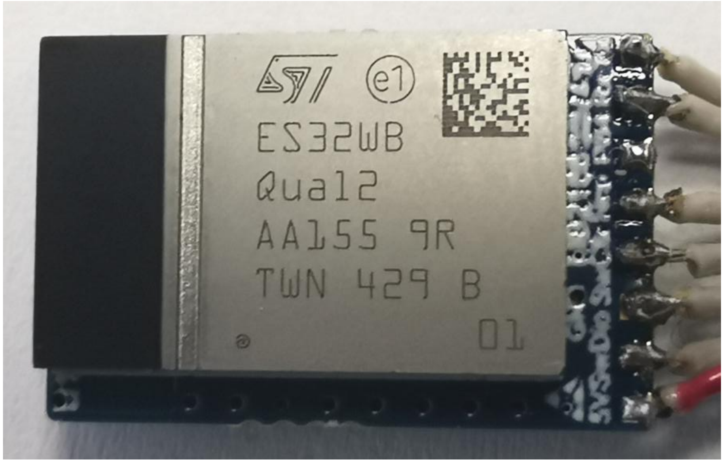


Figure 1. Overview of the DUT

Device Category	Portable
Exposure Environment	General population uncontrolled

2.1 Supported Frequency Bands and Operational Modes

TX Frequency bands	Modes of Operation	Transmitter Frequency Range [MHz]
	Bluetooth	2402 – 2480
	802.15.4	2400 - 2480

3. OUTPUT POWER

3.1 Maximum specified conducted output power

From the customer, including tune-up tolerances;

Bluetooth	Max Output Power [dBm]
Bluetooth LE	10

802.15.4	Max Output Power [dBm]
802.15.4	10

3.2 Tested conducted power

Measured conducted output power at transmitting antenna connector;

Bluetooth:

Standard	Output power [dBm]			
	CH 37 2402 MHz	CH 17 2440 MHz	CH 18 2442 MHz	CH 39 2480 MHz
BLE	9.87	9.59	9.58	9.05

Standard	Output power [dBm]			
	CH 11 2405 MHz	CH 18 2440 MHz	CH 19 2445 MHz	CH 26 2480 MHz
802.15.4	9.80	9.53	9.49	9.01

4. TEST EQUIPMENT

Dasy near field scanning system, manufactured by SPEAG was used for SAR testing. The test system consists of high precision robotics system (Staubli), robot controller, computer, near-field probe, probe alignment sensor, and a phantom containing the tissue equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe to the location of maximum electromagnetic field.

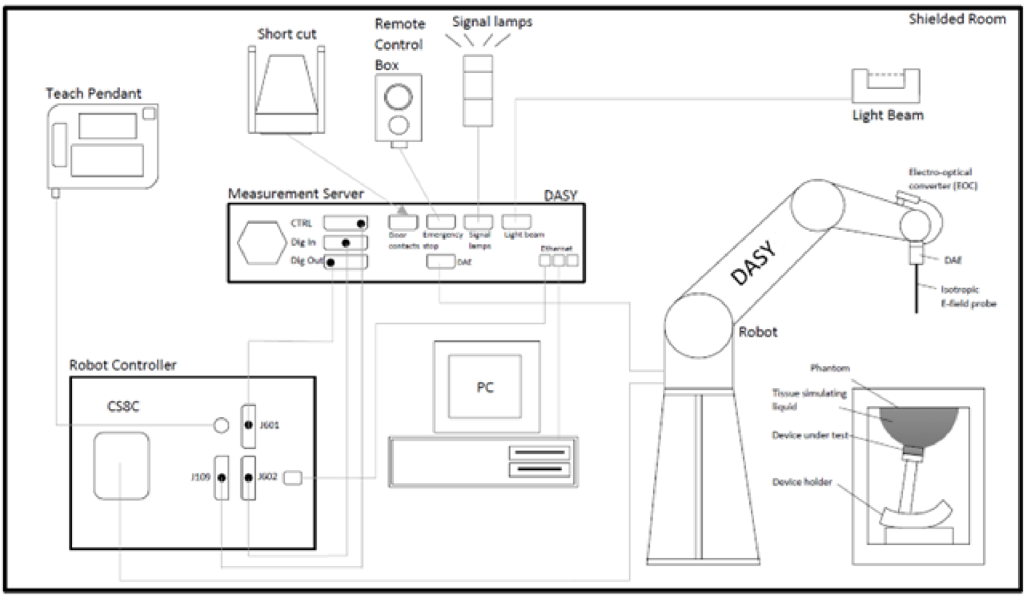


Figure 2 Schematic Laboratory Picture

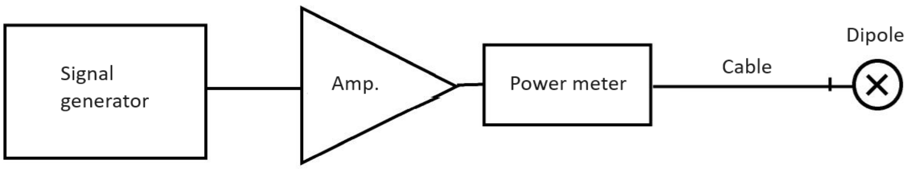


Figure 3. Signal source setup for system check

4.1 Test Equipment List

Test Equipment	Model	Serial Number	Calibration Date	Interval [years]
Amplifier, 800-4200MHz, 50W	5163F	1022	NA	NA
DAE4, converter	DAE4	1332	02/2024	1
DASY5 Software	52.8.8.1258	-	NA	NA
Inline Peak Power Sensor	MA24105A	2102058	11/2024	1
Isotropic DOS probe	EX3DV4	7447	02/2024	1
Network Analyzer	E5071B	MY42301191	03/2024	1
Power Sensor	NRP8S	1419.0006K02-108509-Zh	03/2024	2
System validation dipole	D2450V2	758	12/2024	3
Vector Signal Generator	MG3710A	6201502519	NA	1

Main used test system components are listed above. For full equipment list and calibration intervals, please contact the testing laboratory.

4.1.1 Isotropic E-field Probe Type EX3DV4

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	Calibration certificate in Appendix D
Frequency	4 MHz to 10 GHz (dosimetry) Linearity: ± 0.2 dB (30 MHz to 10 GHz)
Directivity (typical)	±0.1 dB in TSL (rotation around probe axis) ±0.3 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 µW/g – >100 mW/g Linearity: ±0.2 dB (noise: typically <1 µW/g)
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 2.5 mm (body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	General dosimetry up to 6 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms

4.2 Phantoms

Modular flat phantom:

The Triple Modular Phantom consists of three identical modules that can be installed and removed separately without emptying the liquid. It is used for compliance testing of small wireless devices in body-worn configurations. The phantom conforms to the requirements of IEC/IEEE 62209-1528 and FCC published RF Exposure KDB Procedures.

4.3 Tissue Simulants

Recommended values for the dielectric parameters of the tissue simulants are given in IEC/IEEE 62209-1528 and FCC published RF Exposure KDB Procedures. The dielectric parameters of the used tissue simulants were within ±10% of the recommended values at frequencies under 3GHz and ±5% at frequencies above 3GHz. A liquid compensation algorithm was used in DASY with which measured peak average SAR values were corrected for the deviation of used liquid. Depth of the tissue simulant was at least 15.0 cm from the inner surface of the flat phantom.

Tissue simulant liquid Ingredients
Deionized Water, tween, salt

4.4 System Validation Status

Frequency [MHz]	Dipole Type / SN	Probe Type / SN	Calibrated Signal Type	DAE Unit / SN	Dielectric Constant [ε']	Conductivity σ [S/m]	Date
2450	D2450V2 - 729	EX3DV4 - SN: 7447	CW	DAE 4 / 1332	36.41	1.67	03/2024

4.5 System Check

Date	Tissue Type	Tissue Temp. [°C]	Frequency [MHz]	Input Power [mW]	Measured SAR_{1g} [W/kg]	1 W Target SAR_{1g} [W/kg]	1 W Normalized SAR_{1g} [W/kg]	Deviation [%]	Plot #
20.01.2025	WB Head	22	2450	250	13.1	53.53	52.4	-2.11	1
21.01.2025	WB Head	22	2450	250	13.6	53.53	54.4	1.63	2

4.5.1 Tissue Simulant Verification

				Measured		Target		Deviation	
Date	Tissue Type	Tissue Temp [°C]	Frequency [MHz]	Dielectric Constant [ε]	Conductivity σ [S/m]	Dielectric Constant [ε] Target	Conductivity σ [S/m] Target	ε [%]	σ [%]
20.01.2025	WB Head	22	2402	37.56	1.73	39.28	1.76	-4.4	-1.4
20.01.2025	WB Head	22	2440	37.49	1.76	39.22	1.79	-4.4	-1.9
20.01.2025	WB Head	22	2450	37.48	1.76	39.2	1.8	-4.4	-2.0
20.01.2025	WB Head	22	2480	37.42	1.78	39.16	1.83	-4.4	-2.7
21.01.2025	WB Head	22	2405	39.45	1.78	39.28	1.76	0.4	1.0
21.01.2025	WB Head	22	2440	39.39	1.8	39.22	1.79	0.5	0.4
21.01.2025	WB Head	22	2450	39.37	1.81	39.2	1.8	0.4	0.3
21.01.2025	WB Head	22	2480	39.3	1.83	39.16	1.83	0.4	-0.3

5. TEST PROCEDURE

Testing was carried out in accordance with FCC KDB Publications 447498 D01 General RF Exposure Guidance v06 and Industry Canada RSS-102, Issue 6.

Test configurations for SAR testing were selected based on conducted power measurements. Low, mid and high frequency channels for the configuration with the highest SAR value were tested as per ISED notice 2016-DRS001.

Control software was used to set the DUT to transmit at maximum power and maximum duty cycle.

BLE was tested using 1Mbit/s data rate and 89.2% duty cycle. IEEE 802.15.4 was tested using 8.8% duty cycle.

5.1 Test Positions

5.1.1 Body-worn Configuration, 5mm separation distance

Body SAR was tested from all six sides of the DUT.

Five sides of the module (front, back, left, right and top) were tested using 5mm separation distance. The device was on the top of the Rohacell and lifted towards the phantom until the distance between the phantom and the device was 5mm. The distance between the device and the phantom was kept at 5mm using a separate flat spacer that was removed before the start of the measurements.

Due to the power cables of the module at the bottom side, the bottom of the DUT was lifted towards the phantom to 0mm, thus the distance between the module and the phantom was ≤5mm.

Photos of the test positions are presented in appendix A

5.2 Scan Procedures

First, area scans were used for determination of the field distribution. Next, a zoom scan was performed around the highest E-field value to determine the averaged SAR value. Drift was determined by measuring the same point at the start of the area scan and again at the end of the zoom scan.

5.3 SAR Averaging Methods

The maximum SAR value was averaged over a cube of tissue using interpolation and extrapolation.

The interpolation, extrapolation and maximum search routines within Dasy are all based on the modified Quadratic Shepard's method (Robert J. Renka," Multivariate Interpolation of Large Sets of Scattered Data", University of North Texas ACM Transactions on Mathematical Software, vol. 14, no. 2, June 1988, pp. 139-148).
The interpolation scheme combines a least-square fitted function method with a weighted average method. A trivariate 3-D / bivariate 2-D quadratic function is computed for each measurement point and fitted to neighboring points by a least-square method. For the zoom scan, inverse distance weighting is incorporated to fit distant points more accurately. The interpolating function is finally calculated as a weighted average of the quadratics.

In the zoom scan, the interpolation function is used to extrapolate the Peak SAR from the deepest measurement points to the inner surface of the phantom.

6. MEASUREMENT UNCERTAINTY

Uncertainty Budget
According to IEC/IEEE 62209-1528
(Frequency band: 300MHz–3GHz range)

Symbol	Error Description	Uncert. value	Prob. Dist.	Div.	(c_i) (1g)	(c_i) (10g)	Std. Unc. (1g)	Std. Unc. (10g)
Measurement System Errors								
CF	Probe Calibration	±13.3%	N	√2	1	1	±6.7%	±6.7%
CF_{drift}	Probe Calibration Drift	±1.7%	R	√3	1	1	±1.0%	±1.0%
LIN	Probe Linearity	±4.7%	R	√3	1	1	±2.7%	±2.7%
BBS	Broadband Signal	±2.8%	R	√3	1	1	±1.6%	±1.6%
ISO	Probe Isotropy	±7.6%	R	3	1	1	±4.4%	±4.4%
DAE	Other Probe+Electronic	±0.8%	N	1	1	1	±0.8%	±0.8%
AMB	RF Ambient	±1.8%	N	1	1	1	±1.8%	±1.8%
Δ_{sys}	Probe Positioning	±0.006mm	N	1	0.14	0.14	±0.10%	±0.10%
DAT	Data Processing	±1.2%	N	1	1	1	±1.2%	±1.2%
Phantom and Device Errors								
LIQ(σ)	Conductivity (meas.)[DAK]	±2.5%	N	√1	0.78	0.71	±2.0%	±1.8%
LIQ(T_σ)	Conductivity (temp.)[BB]	±3.3%	R	√3	0.78	0.71	±1.5%	±1.4%
EPS	Phantom Permittivity	±14.0%	R	3	0	0	±0%	±0%
DIS	Distance DUT – TSL	±2.0%	N	1	2	2	±4.0%	±4.0%
D_{xyz}	Device Positioning	±1.0%	N	1	1	1	±1.0%	±1.0%
H	Device Holder	±3.6%	N	√1	1	1	±3.6%	±3.6%
MOD	DUT Modulation[m]	±2.4%	R	√3	1	1	±1.4%	±1.4%
TAS	Time-average SAR	±1.7%	R	3	1	1	±1.0%	±1.0%
RF_{drift}	DUT drift	±2.5%	N	1	1	1	±2.5%	±2.5%
VAL	Val Antenna Unc.[val]	±0.0%	N	1	1	1	±0.0%	±0.0%
RF_{in}	Unc. Input Power[val]	±0.0%	N	1	1	1	±0.0%	±0.0%
Correction to the SAR results								
C(ε, σ)	Deviation to Target	±1.9%	N	√1	1	0.84	±1.9%	±1.6%
C(R)	SAR scaling[p]	±0.0%	R	3	1	1	±0.0%	±0.0%
u(ΔSAR)	Combined Uncertainty						±11.3%	±11.2%
U	**Expanded Uncertainty**						±22.6%	±22.5%

7. TEST RESULTS

7.1 SAR Results for Body Exposure Condition with 5mm separation

Bluetooth:

Mode	Data Rate [Mbps]	Channel	Frequency [MHz]	Maximum Power [dBm]	Conducted Power [dBm]	Test Position	Measured SAR_{1g} [W/kg]	Power Drift [dB]	Duty Cycle [%]	Scaling Factor	Reported SAR_{1g} [W/kg]	Plot #
BLE	1	37	2402	10	9.87	Front 5mm	0.0423	-0.05	89.2	1.03	0.044	3
BLE	1	37	2402	10	9.87	Back 5mm	0.0407	0.03	89.2	1.03	0.042	
BLE	1	37	2402	10	9.87	Left 5mm	0.0137	0.59*	89.2	1.18	0.016	
BLE	1	37	2402	10	9.87	Right 5mm	0.0077	0.52*	89.2	1.16	0.009	
BLE	1	37	2402	10	9.87	Top 5mm	0.0118	0.28*	89.2	1.10	0.013	
BLE	1	37	2402	10	9.87	Bottom 0mm****	0.0012	0.15	89.2	1.03	0.001	
BLE	1	17	2440	10	9.59	Front 5mm	0.0212	-0.04	89.2	1.10	0.023	
BLE	1	39	2480	10	9.05	Front 5mm	0.0104	-0.21	89.2	1.24	0.013	

*Larger than 5% drifts included to scaling factors
****Bottom side has longer separation distance than 5mm measured from the antenna to the edge of the module, thus it has been measured with 0mm separation distance

802.15.4:

Mode	Channel	Frequency [MHz]	Maximum Power [dBm]	Conducted Power [dBm]	Test Position	Measured SAR_{1g} [W/kg]	Power Drift [dB]	Duty Cycle [%]	Scaling Factor	Reported SAR_{1g} [W/kg]	Plot #
802.15.4	11	2405	10	9.80	Front 5mm	0.00129	-0.33*	8.8	1.13	0.0015	
802.15.4	11	2405	10	9.80	Back 5mm	0.00149	0.01	8.8	1.05	0.0016	4
802.15.4	11	2405	10	9.80	Left 5mm	0.00144	0***	8.8	1.05	0.0015	
802.15.4	11	2405	10	9.80	Right 5mm	0.00017**	0***	8.8	1.05	0.0002**	
802.15.4	11	2405	10	9.80	Top 5mm	0.000009**	0***	8.8	1.05	0.00001**	
802.15.4	11	2405	10	9.80	Bottom 0mm****	0.0000002	0	8.8	1.05	0.0000002	
802.15.4	18	2440	10	9.53	Back 5mm	0.00074	0.52*	8.8	1.26	0.0009	
802.15.4	26	2480	10	9.01	Back 5mm	0.00003	-1.8*	8.8	1.90	0.00006	

*Larger than 5% drifts included to scaling factors
**Due to low e-field generated by DUT, measurement system reported only area scan
***Due to low e-field generated by DUT at the location of drift measurement, the measurements are not applicable
****Bottom side has longer separation distance than 5mm measured from the antenna to the edge of the module, thus it has been measured with 0mm separation distance

7.2 RF Energy Coupling Enhancement

Additional measurements were conducted at the highest reported SAR configuration to consider RF Energy Coupling Enhancement at increased separation distance. Following procedure was used for the testing:

- For the highest reported SAR configuration, the probe was positioned at the peak SAR location of the zoom scan, at a distance half of the probe tip diameter, rounded to the nearest mm from the phantom surface.
- DUT was positioned at direct contact with the phantom and then moved away in 5mm increments, until the measured SAR is < 50 % of that measured in direct contact with the phantom. Three single-point SAR repeated measurements were done at each separation distance as there were no variation higher than 15% between the measurements.
- Since the highest measured single-point SAR among all positions is less than 25% from that measured with the device positioned at 5mm separation distance from the phantom, no further measurements were required.

Mode	Data Rate [Mbps]	Channel	Frequency [MHz]	Maximum Power [dBm]	Conducted Power [dBm]	Test Position	Single-point SAR [W/kg]	Scaling Factor	Reported Single-point SAR [W/kg]	Variation [%]
BLE	1	37	2402	10	9.87	Front 0mm	0.4381	1.03	0.4514	0.87
BLE	1	37	2402	10	9.87	Front 0mm	0.4343	1.03	0.4475	
BLE	1	37	2402	10	9.87	Front 0mm	0.4347	1.03	0.4479	
BLE	1	37	2402	10	9.87	Front 5mm	0.1127	1.03	0.1161	0.44
BLE	1	37	2402	10	9.87	Front 5mm	0.1130	1.03	0.1164	
BLE	1	37	2402	10	9.87	Front 5mm	0.1125	1.03	0.1159	
BLE	1	37	2402	10	9.87	Front 10mm	0.0168	1.03	0.0173	9.70
BLE	1	37	2402	10	9.87	Front 10mm	0.0164	1.03	0.0169	
BLE	1	37	2402	10	9.87	Front 10mm	0.0182	1.03	0.0187	

Mode	Channel	Frequency [MHz]	Maximum Power [dBm]	Conducted Power [dBm]	Test Position	Single-point SAR [W/kg]	Scaling Factor	Reported Single-point SAR [W/kg]	Variation [%]
802.15.4	11	2405	10	9.80	Back 0mm	0.0651	1.05	0.0681	0.81
802.15.4	11	2405	10	9.80	Back 0mm	0.0655	1.05	0.0685	
802.15.4	11	2405	10	9.80	Back 0mm	0.0656	1.05	0.0687	
802.15.4	11	2405	10	9.80	Back 5mm	0.0080	1.05	0.0084	7.35
802.15.4	11	2405	10	9.80	Back 5mm	0.0082	1.05	0.0085	
802.15.4	11	2405	10	9.80	Back 5mm	0.0076	1.05	0.0079	
802.15.4	11	2405	10	9.80	Back 10mm	0.0002	1.05	0.0002	9.74
802.15.4	11	2405	10	9.80	Back 10mm	0.0002	1.05	0.0002	
802.15.4	11	2405	10	9.80	Back 10mm	0.0002	1.05	0.0002	

7.3 IEC/IEEE 62209-1528:2020, Zoom Scan Evaluation

According to IEC/IEEE 62209-1528:2020, subclause 7.4.2 d.4), the zoom scan complies if the peak spatial-average SAR is below 0.1 W/kg, or if the following criteria is met:

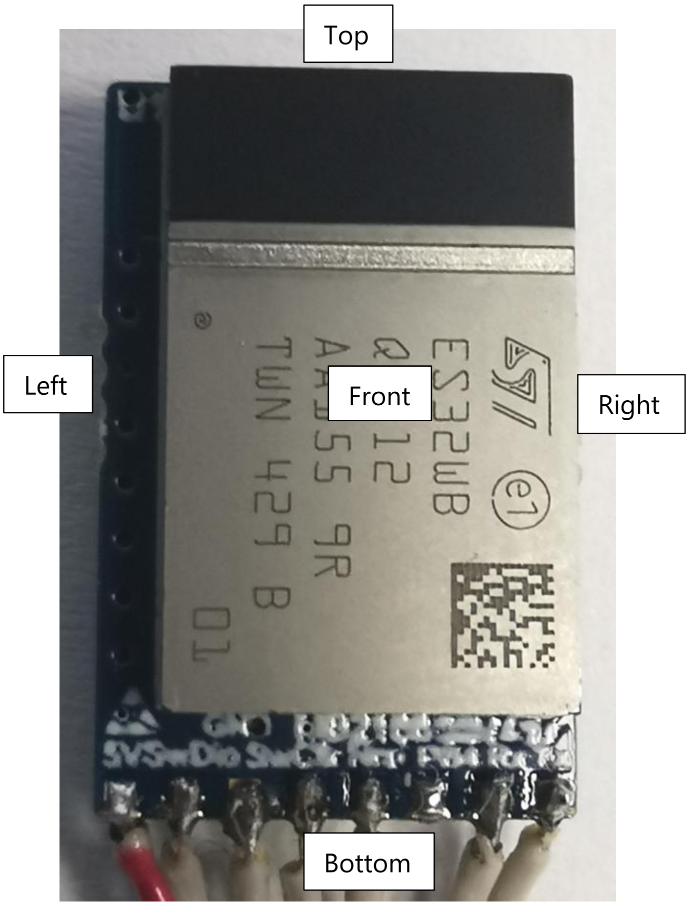
1. The smallest horizontal distance from the local SAR peaks to all points 3 dB below the SAR peak is larger than the horizontal grid step.

2. Ratio of SAR at the second measured point (M2) to the SAR at the closest measured point (M1) at the x-y location of the measured maximum is at least 30%.

Zoom scan compliance according to IEC/IEEE 62209-1528:2020 is automatically verified by DASY software and all zoom scans in this test report do pass the criteria. The horizontal distance and Ratio between measurement points M2 and M1 of the highest SAR results are available in Appendix C.

APPENDIX A: PHOTOS OF THE DUT

Size of the DUT is: 8 x 13 x 3 mm



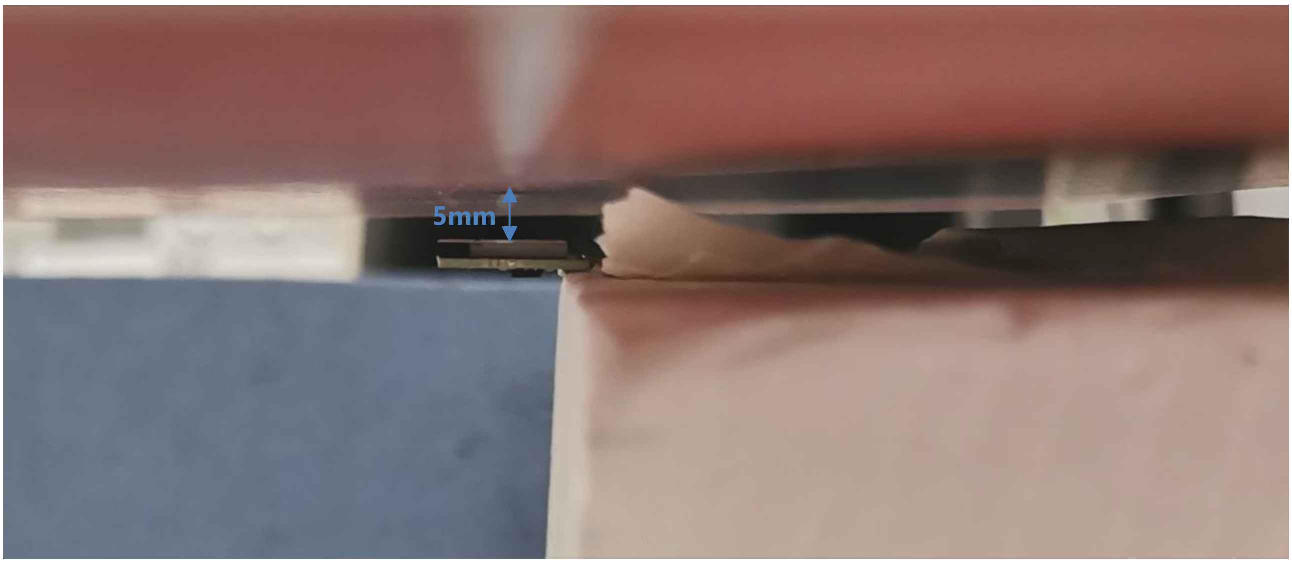


Figure 4 Front side of the DUT against the phantom, 5mm separation distance

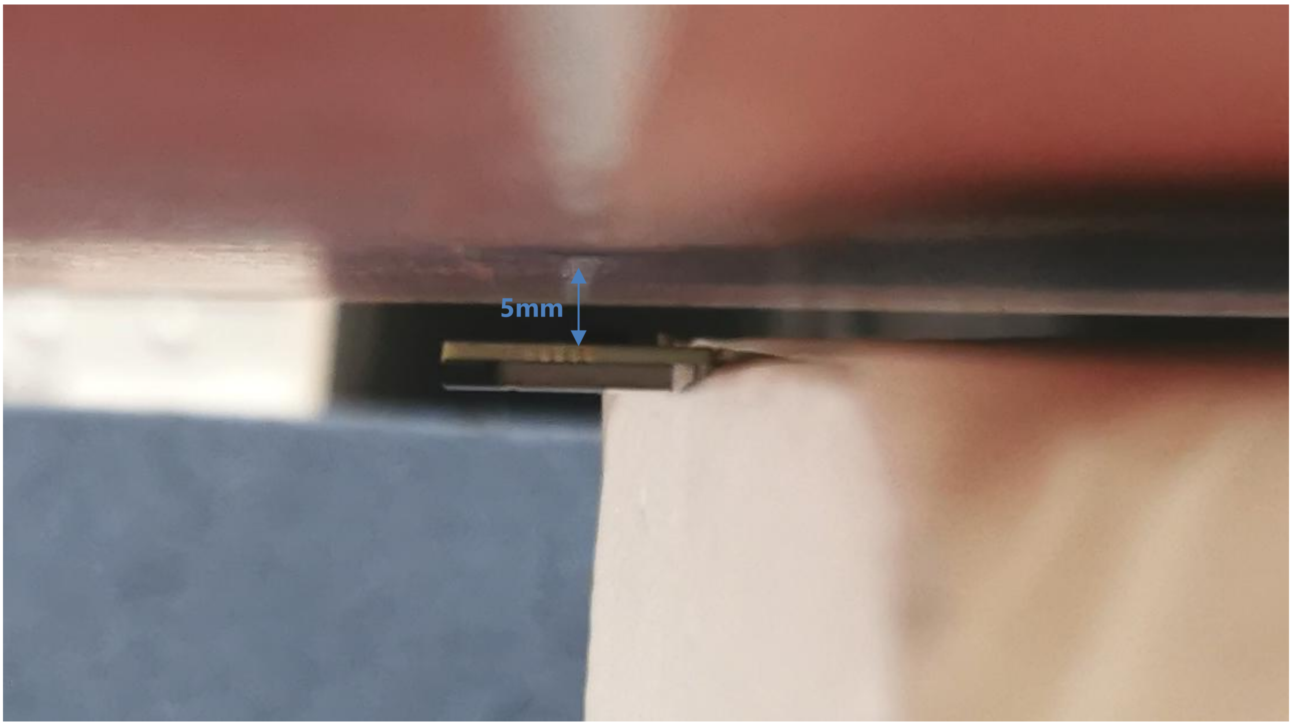


Figure 5 Back side of the DUT against the phantom, 5mm separation distance

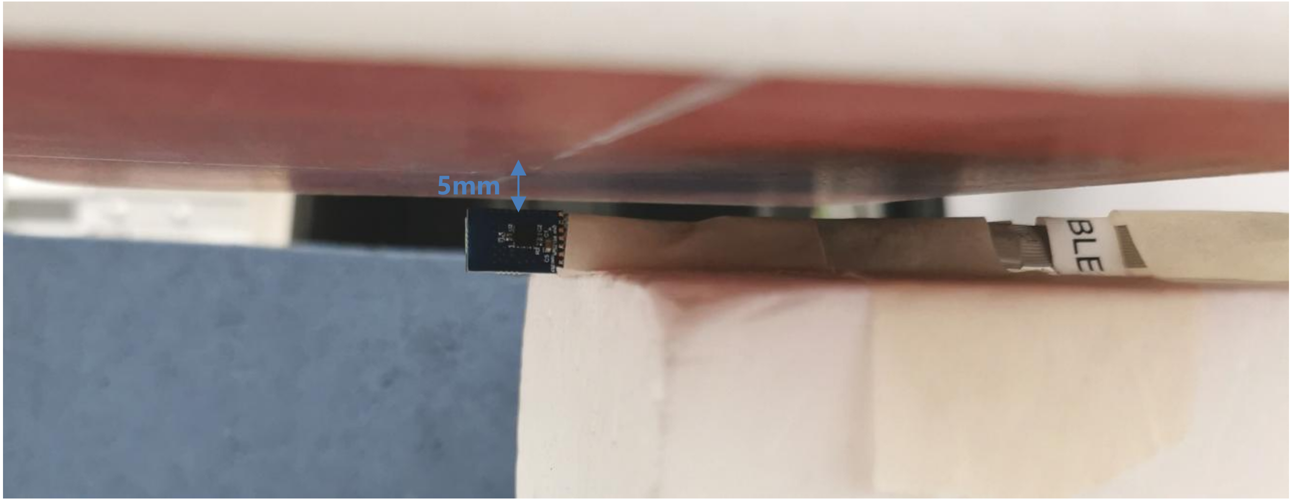


Figure 6 Left side of the DUT against the phantom, 5mm separation distance

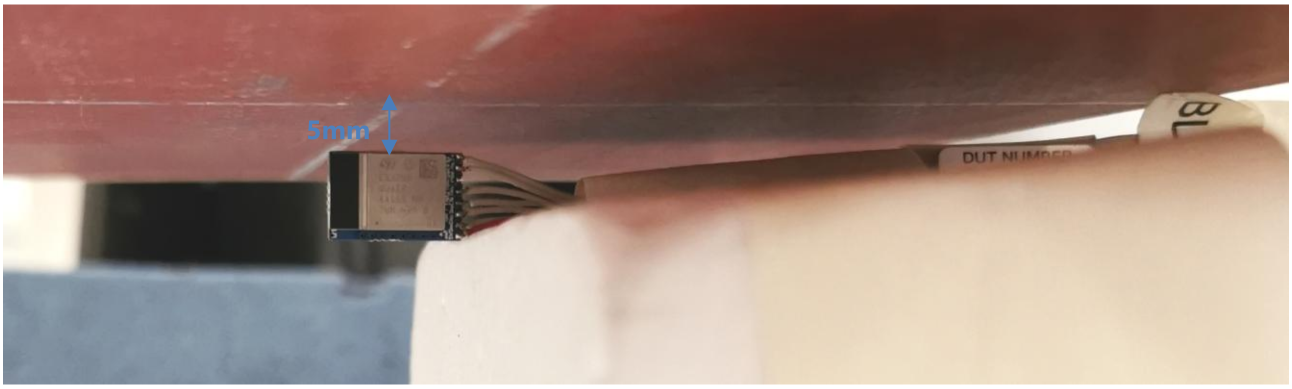


Figure 7 Right side of the DUT against the phantom, 5mm separation distance

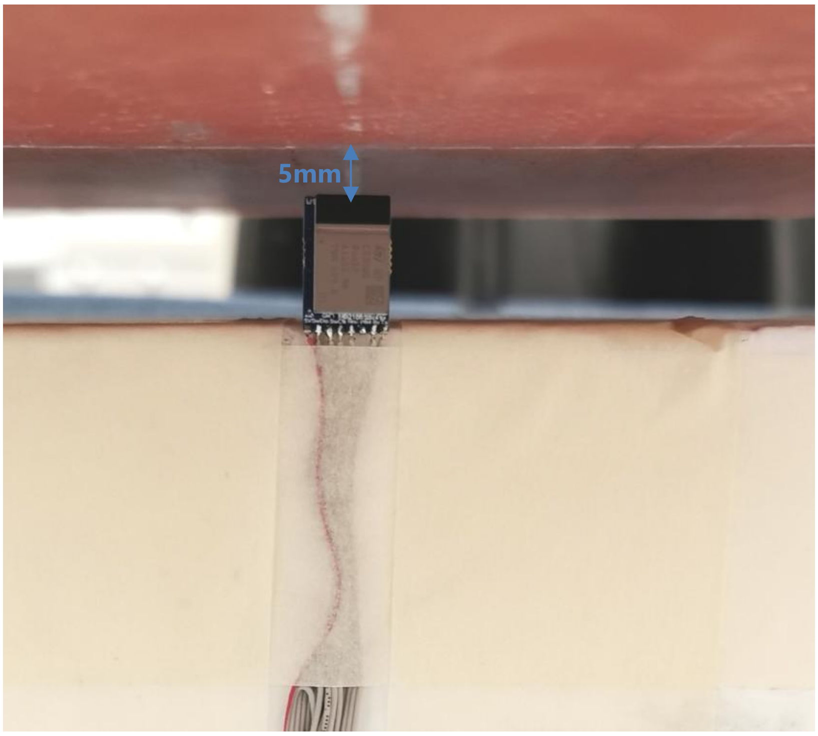


Figure 8 Top side of the DUT against the phantom, 5mm separation distance

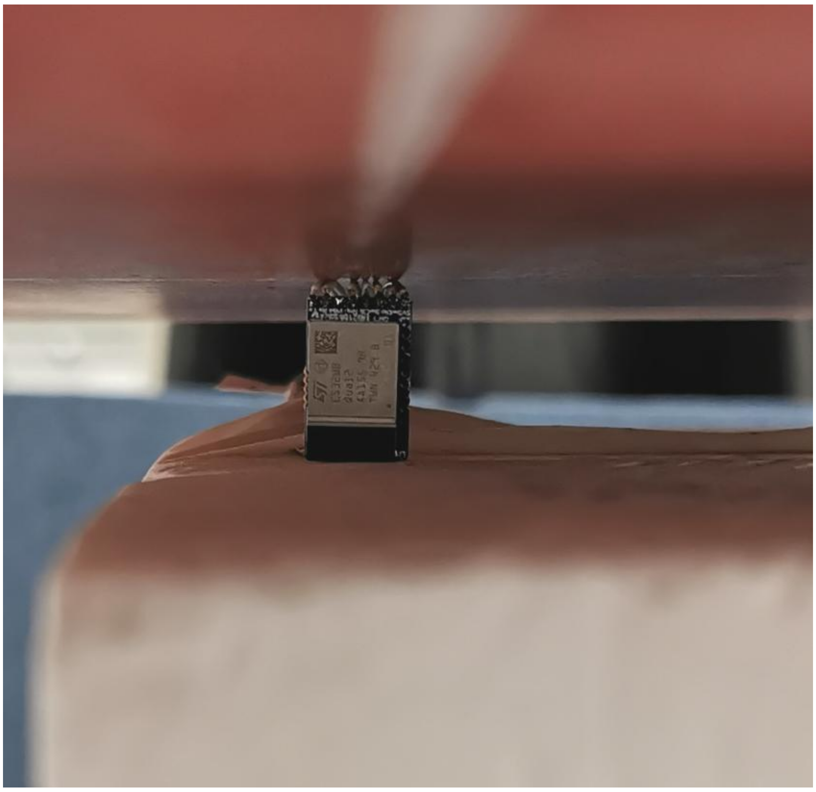


Figure 9 Bottom side of the DUT against the phantom, 0mm separation distance

Figure 10 Front test position, RF Energy Coupling Enhancement, 0mm separation distance

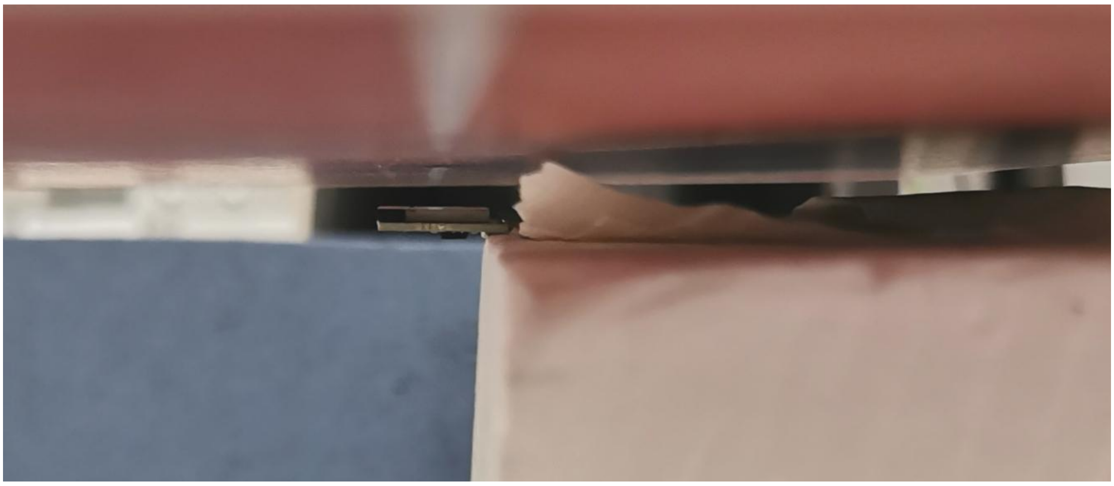


Figure 11 Front test position, RF Energy Coupling Enhancement, 5mm separation distance

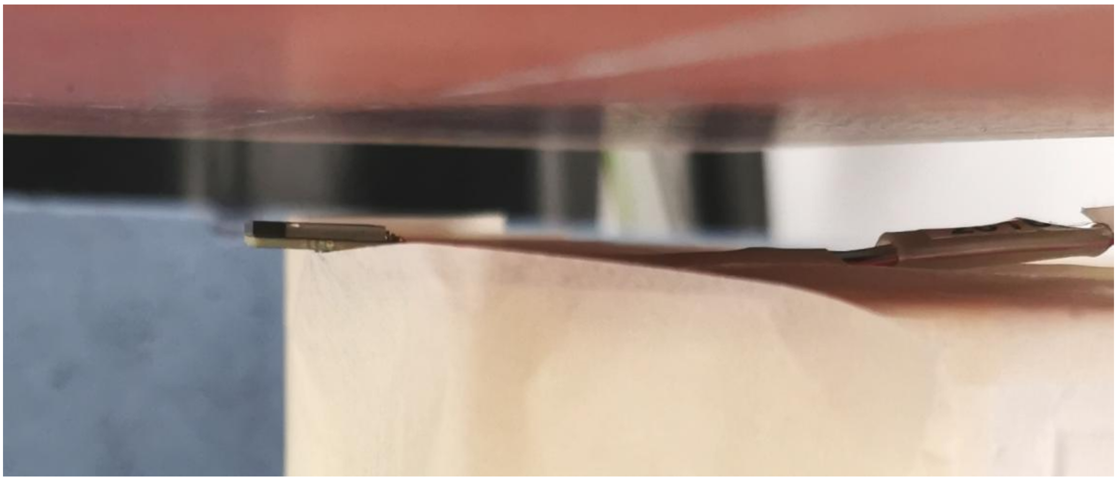


Figure 12 Front test position, RF Energy Coupling Enhancement, 10mm separation distance

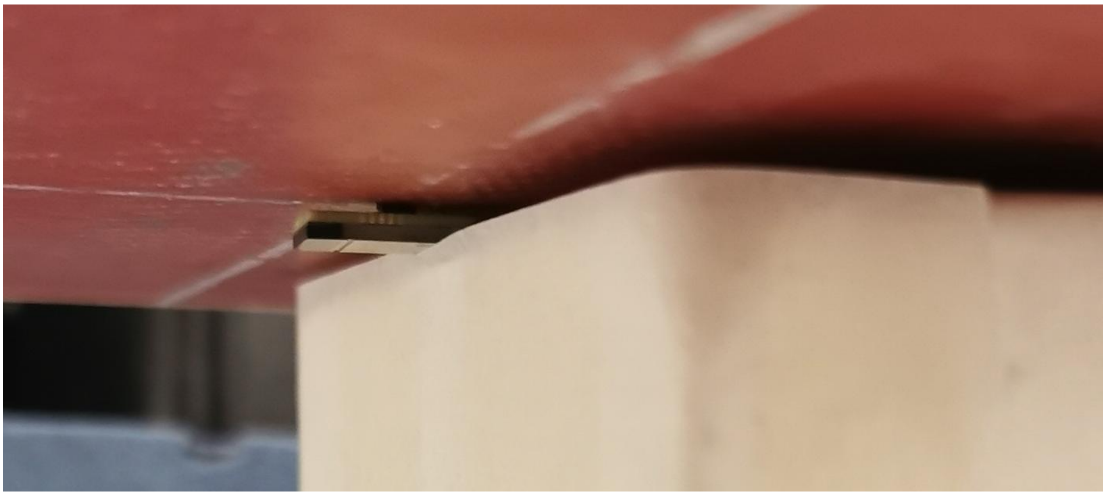


Figure 13 Back test position, RF Energy Enhancement, 0mm separation distance

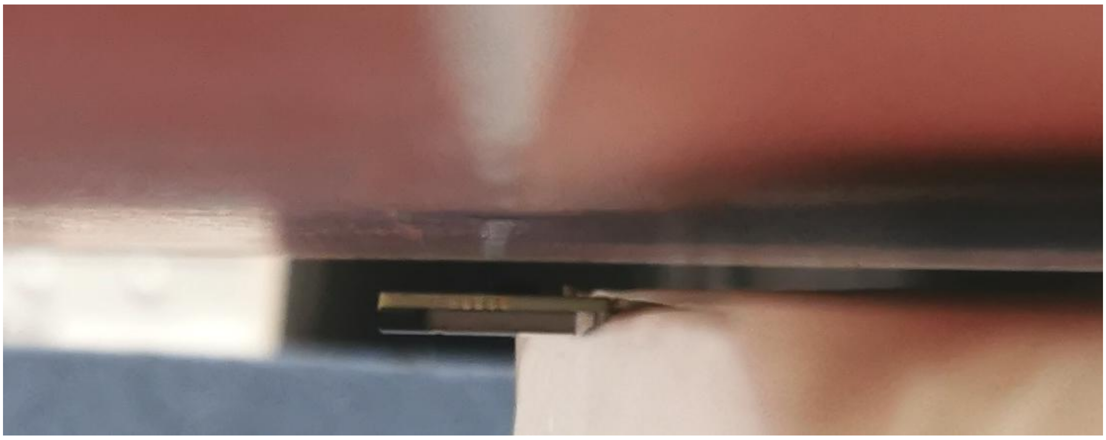


Figure 14 Back test position, RF Energy Enhancement, 5mm separation distance

Figure 15 Back test position, RF Energy Enhancement, 10mm separation distance

APPENDIX B: SYSTEM CHECK SCAN

Plot 1

Date/Time: 20.1.25 14:43:13

Test Laboratory: Verkotan Oy

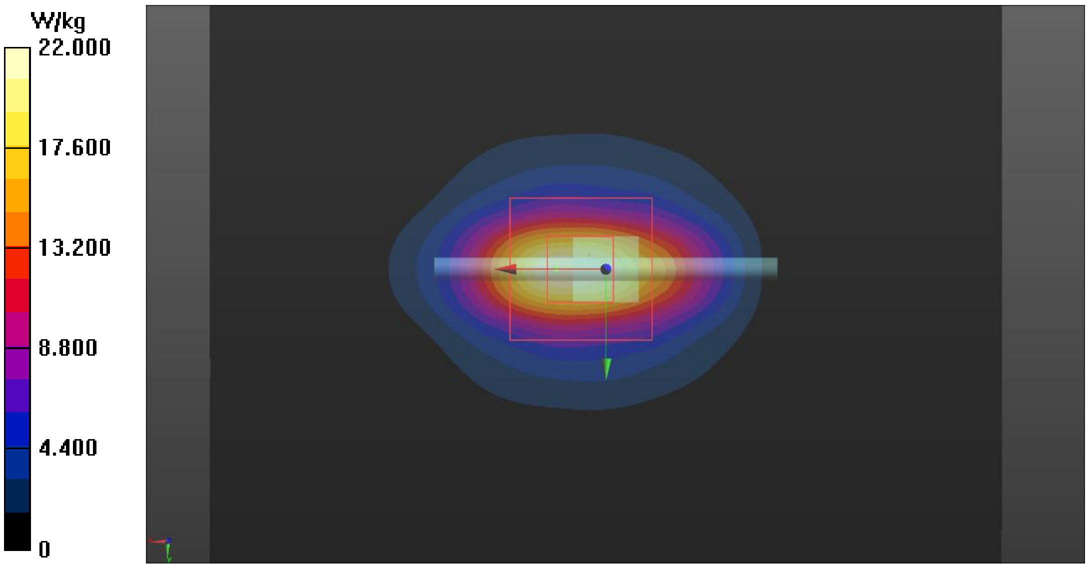
DUT: D2450V2 - SN758

Communication System: UID 0, CW (0); Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz;
Communication System PAR: 0 dB;
Medium parameters used (interpolated): f = 2450 MHz; σ = 1.764 S/m; ε_r = 37.476; ρ = 1000 kg/m^3
Phantom section: Center Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(7.59, 7.49, 7.65) @ 2450 MHz; Calibrated: 23.2.24
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 31.0
  - Electronics: DAE4 Sn1332; Calibrated: 14.2.24
  - Phantom: SAR1_Phantom 1_triple flat right; Type: QD 000 P51 Cx;
  - DASY52 52.10.2(1495); SEMCAD X 14.6.14(7483)

Configuration/system check 2450MHz/Area Scan (81x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 22.0 W/kg
Configuration/system check 2450MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 107.2 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 26.7 W/kg
SAR(1 g) = 13.1 W/kg; SAR(10 g) = 6.07 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 8.9 mm
Ratio of SAR at M2 to SAR at M1 = 49.2%
Maximum value of SAR (measured) = 21.8 W/kg



Plot 2

Date/Time: 21.1.25 14:42:32

Test Laboratory: Verkotan Oy

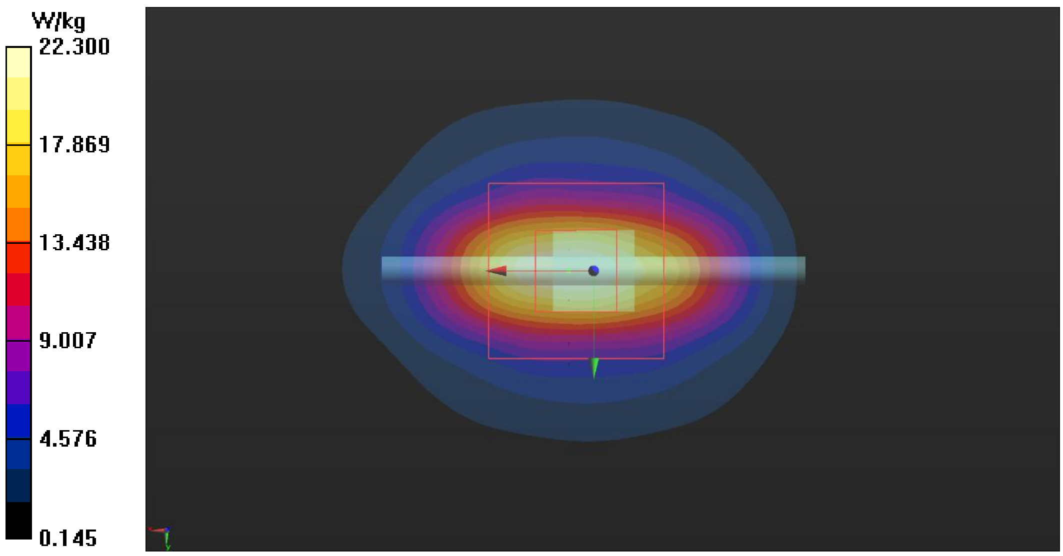
DUT: D2450V2 - SN758

Communication System: UID 0, CW (0); Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz;
Communication System PAR: 0 dB;
Medium parameters used (interpolated): f = 2450 MHz; σ = 1.805 S/m; ε_r = 39.369; ρ = 1000 kg/m^3
Phantom section: Center Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(7.59, 7.49, 7.65) @ 2450 MHz; Calibrated: 23.2.24
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), z = 31.0, -4.0
  - Electronics: DAE4 Sn1332; Calibrated: 14.2.24
  - Phantom: SAR1_Phantom 1_triple flat right; Type: QD 000 P51 Cx;
  - DASY52 52.10.2(1495); SEMCAD X 14.6.14(7483)

Configuration/system check 2450MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 109.4 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 27.4 W/kg
SAR(1 g) = 13.6 W/kg; SAR(10 g) = 6.32 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 9 mm
Ratio of SAR at M2 to SAR at M1 = 49.8%
Maximum value of SAR (measured) = 22.3 W/kg
Configuration/system check 2450MHz/Area Scan (81x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 22.2 W/kg



APPENDIX C: MEASUREMENT SCANS

Plot 3

Date/Time: 21.1.25 08:55:37

Test Laboratory: Verkotan Oy

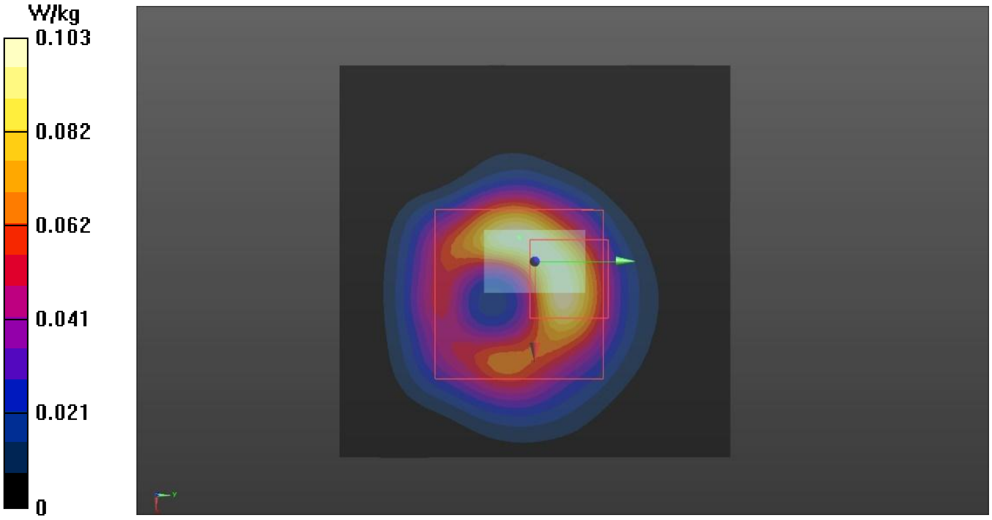
DUT: STM32WBA5MMG

Communication System: UID 0, Bluetooth (0); Communication System Band: Bluetooth; Frequency: 2402 MHz;
Communication System PAR: 0.506 dB;
Medium parameters used (interpolated): f = 2402 MHz; σ = 1.733 S/m; ε_r = 37.555; ρ = 1000 kg/m^3
Phantom section: Center Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(7.59, 7.49, 7.65) @ 2402 MHz; Calibrated: 23.2.24
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0, -4.0
  - Electronics: DAE4 Sn1332; Calibrated: 14.2.24
  - Phantom: SAR1_Phantom 1_triple flat right; Type: QD 000 P51 Cx;
  - DASY52 52.10.2(1495); SEMCAD X 14.6.14(7483)

Configuration/BLE, 1Mbps, CH37, Front, 5mm/Zoom Scan (8x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.402 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 0.143 W/kg
SAR(1 g) = 0.042 W/kg; SAR(10 g) = 0.018 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 3 mm
Ratio of SAR at M2 to SAR at M1 = 25.7%
Maximum value of SAR (measured) = 0.103 W/kg
Configuration/BLE, 1Mbps, CH37, Front, 5mm/Area Scan (51x51x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.101 W/kg



Plot 4

Date/Time: 21.1.25 15:56:03

Test Laboratory: Verkotan Oy

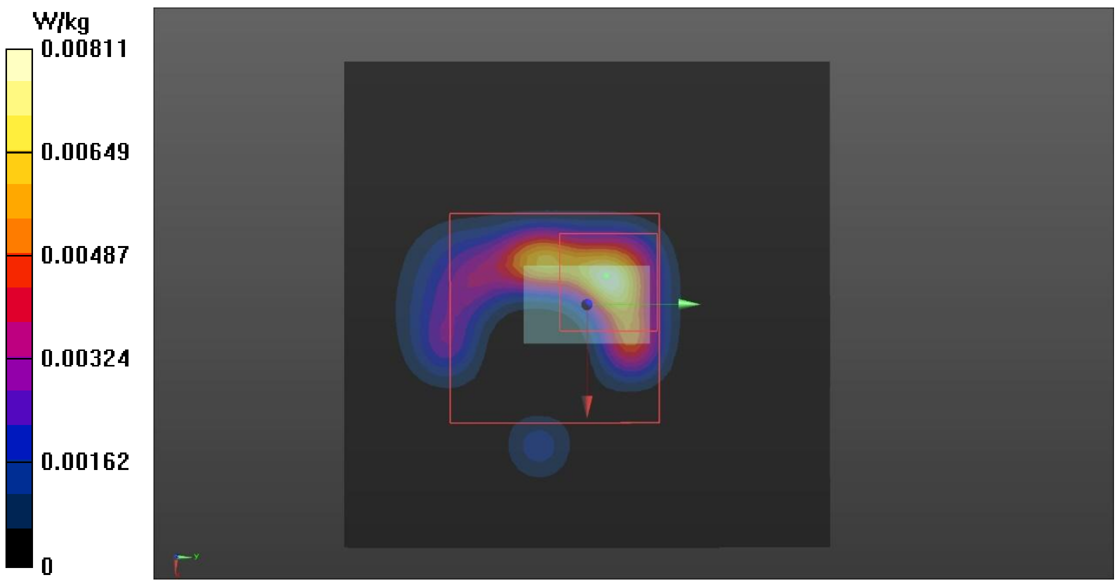
DUT: STM32WBA5MMG

Communication System: UID 0, 802.15.4 (0); Communication System Band: 802.15.4; Frequency: 2405 MHz;
Communication System PAR: 10.555 dB;
Medium parameters used (interpolated): f = 2405 MHz; σ = 1.778 S/m; ε_r = 39.45; ρ = 1000 kg/m^3
Phantom section: Center Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(7.59, 7.49, 7.65) @ 2405 MHz; Calibrated: 23.2.24
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 31.0
  - Electronics: DAE4 Sn1332; Calibrated: 14.2.24
  - Phantom: SAR1_Phantom 1_triple flat right; Type: QD 000 P51 Cx;
  - DASY52 52.10.2(1495); SEMCAD X 14.6.14(7483)

Configuration/802.15.4, CH11, Back, 5mm/Area Scan (51x51x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.00811 W/kg
Configuration/802.15.4, CH11, Back, 5mm/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.791 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.0130 W/kg
SAR(1 g) = 0.00149 W/kg; SAR(10 g) = 0.000368 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid
Ratio of SAR at M2 to SAR at M1 = 35.4%
Maximum value of SAR (measured) = 0.00688 W/kg



APPENDIX D: RELEVANT PAGES FROM PROBE & DAE CALIBRATION REPORTS

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

ilac-MRA

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S 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: **Verkotan**
Oulu, Finland

Certificate No.: **EX-7447_Feb24**

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:7447

Calibration procedure(s): QA CAL-01.v10, QA CAL-12.v10, QA CAL-14.v7, QA CAL-23.v6, QA CAL-25.v8
Calibration procedure for dosimetric E-field probes

Calibration date: February 23, 2024

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 NRP2	SN: 104778	30-Mar-23 (No. 217-03804/03805)	Mar-24
Power sensor NRP-Z91	SN: 103244	30-Mar-23 (No. 217-03804)	Mar-24
OCP DAK-3.5 (weighted)	SN: 1249	05-Oct-23 (OCP-DAK3.5-1249_Oct23)	Oct-24
OCP DAK-12	SN: 1016	05-Oct-23 (OCP-DAK12-1016_Oct23)	Oct-24
Reference 20 dB Attenuator	SN: CC2552 (20x)	30-Mar-23 (No. 217-03809)	Mar-24
DAE4	SN: 660	16-Mar-23 (No. DAE4-660_Mar23)	Mar-24
Reference Probe EX3DV4	SN: 7349	03-Nov-23 (No. EX3-7349_Nov23)	Nov-24

Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-22)	In house check: Jun-24
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-22)	In house check: Jun-24
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-22)	In house check: Jun-24
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-22)	In house check: Jun-24
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-22)	In house check: Oct-24

	Name	Function	Signature
Calibrated by	Aidonia Georgiadou	Laboratory Technician	[signature]
Approved by	Sven Kühn	Technical Manager	[signature]

Issued: February 23, 2024

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

Certificate No: EX-7447_Feb24 Page 1 of 9

Parameters of Probe: EX3DV4 - SN:7447

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc ($k = 2$)
Norm ($\mu V/(V/m)^2$) [A]	0.42	0.42	0.43	±10.1%
DCP (mV) [B]	93.9	92.0	99.2	±4.7%

Calibration Results for Modulation Response

UID	Communication System Name		A dB	B $dB\sqrt{\mu V}$	C	D dB	VR mV	Max dev.	Max Unc[E] $k = 2$
0	CW	X	0.00	0.00	1.00	0.00	132.1	±2.0%	±4.7%
		Y	0.00	0.00	1.00		134.8		
		Z	0.00	0.00	1.00		127.6		

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 Page 5).
[B] Linearization parameter uncertainty for maximum specified field strength.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

Parameters of Probe: EX3DV4 - SN:7447

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle	40.2°
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.

Parameters of Probe: EX3DV4 - SN:7447

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz)[C]	Relative Permittivity[F]	Conductivity[F] (S/m)	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unc ($k = 2$)
13	55.0	0.75	17.59	17.59	17.59	0.00	1.25	±13.3%
750	41.9	0.89	9.63	9.05	9.58	0.34	1.27	±11.0%
900	41.5	0.97	8.89	9.05	8.92	0.34	1.27	±11.0%
1750	40.1	1.37	8.35	8.14	8.40	0.25	1.27	±11.0%
1950	40.0	1.40	7.96	7.80	8.03	0.27	1.27	±11.0%
2150	39.7	1.53	7.80	7.68	7.86	0.29	1.27	±11.0%
2300	39.5	1.67	7.75	7.61	7.75	0.29	1.27	±11.0%
2450	39.2	1.80	7.59	7.49	7.65	0.29	1.27	±11.0%
2600	39.0	1.96	7.53	7.40	7.55	0.28	1.27	±11.0%
5250	35.9	4.71	5.27	5.32	5.36	0.35	1.62	±13.1%
5600	35.5	5.07	4.42	4.45	4.52	0.35	1.75	±13.1%
5750	35.4	5.22	4.62	4.68	4.75	0.34	1.83	±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] The probes are calibrated using tissue simulating liquids (TSL) that deviate for ε and σ by less than ±5% from the target values (typically better than ±3%) and are valid for TSL with deviations of up to ±10% if SAR correction is applied.

[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.

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
C 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 **Verkotan**
Oulu, Finland

Certificate No: **DAE4-1332_Feb24**

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BM - SN: 1332
Calibration procedure(s)	QA CAL-06.v30 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	February 14, 2024

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
Keithley Multimeter Type 2001	SN: 0810278	29-Aug-23 (No:37421)	Aug-24
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Auto DAE Calibration Unit	SE UWS 053 AA 1001	23-Jan-24 (in house check)	In house check: Jan-25
Calibrator Box V2.1	SE UMS 006 AA 1002	23-Jan-24 (in house check)	In house check: Jan-25

	Name	Function	Signature
Calibrated by:	Eric Hainfeld	Laboratory Technician	
Approved by:	Sven Kühn	Technical Manager	i.V.

Issued: February 14, 2024

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

Certificate No: DAE4-1332_Feb24 Page 1 of 5

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1µV , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.......+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	404.342 ± 0.02% (k=2)	403.743 ± 0.02% (k=2)	403.941 ± 0.02% (k=2)
Low Range	4.00099 ± 1.50% (k=2)	3.97401 ± 1.50% (k=2)	3.96186 ± 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	64.5 ° ± 1 °

Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

High Range		Reading (µV)	Difference (µV)	Error (%)
Channel X	+ Input	200009.12	-5.72	-0.00
Channel X	+ Input	19986.74	0.57	0.00
Channel X	- Input	-20024.85	1.35	-0.01
Channel Y	+ Input	200013.32	-4.96	-0.00
Channel Y	+ Input	19986.18	-0.34	-0.00
Channel Y	- Input	-20027.73	-1.83	0.01
Channel Z	+ Input	200013.38	-2.21	-0.00
Channel Z	+ Input	19984.89	-1.79	-0.01
Channel Z	- Input	-20027.29	-1.36	0.01

Low Range		Reading (µV)	Difference (µV)	Error (%)
Channel X	+ Input	1980.86	-0.34	-0.02
Channel X	+ Input	180.48	-0.78	-0.43
Channel X	- Input	-219.83	-1.02	0.47
Channel Y	+ Input	1981.60	0.22	0.01
Channel Y	+ Input	180.04	-1.40	-0.77
Channel Y	- Input	-219.96	-1.48	0.68
Channel Z	+ Input	1981.81	0.25	0.01
Channel Z	+ Input	180.53	-1.06	-0.58
Channel Z	- Input	-219.72	-1.42	0.65

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (µV)	Low Range Average Reading (µV)
Channel X	200	-16.56	-18.30
	- 200	19.67	17.87
Channel Y	200	-22.95	-22.90
	- 200	21.58	21.18
Channel Z	200	-9.94	-10.17
	- 200	8.87	8.99

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (µV)	Channel Y (µV)	Channel Z (µV)
Channel X	200	-	-0.53	-3.33
Channel Y	200	7.46	-	1.63
Channel Z	200	10.18	4.30	-

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	15931	15993
Channel Y	16084	16421
Channel Z	16003	15942

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	0.61	-0.43	1.52	0.37
Channel Y	-0.51	-2.12	2.02	0.55
Channel Z	-0.40	-1.25	0.88	0.46

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	-0.01	-8	-9

APPENDIX E: RELEVANT PAGES FROM DIPOLE CALIBRATION REPORTS

SAR Reference Dipole Calibration Report

Ref : ACR.348.11.24.BES.A

VERKOTAN LTD.
ELEKTRONIIKKATIE 17
90590, OULU, FINLAND
SAR REFERENCE DIPOLE
FREQUENCY: 2450 MHZ
SERIAL NO.: D2450V2 SN:758

Calibrated at MVG
Z.I. de la pointe du diable
Technopôle Brest Iroise – 295 avenue Alexis de Rochon
29280 PLOUZANE - FRANCE

Calibration date: 12/11/24

Accreditations #2-6789 and #2-6814
Scope available on www.cofrac.fr

Summary:

This document presents the method and results from an accredited SAR reference dipole calibration performed in MVG using the COMOSAR test bench. All calibration results are traceable to national metrology institutions.

Page: 1/8

	Name	*Function*	*Date*	*Signature*
Prepared by :	Pedro Ruiz	Technical Manager	12/16/2024	
Checked & approved by:	Pedro Ruiz	Technical Manager	12/16/2024	
Authorized by:	Geraldine Toutain	Quality Manager	12/20/2024	

DocuSigned by:
Géraldine TOUTAIN
A1C9AC91CB5441A

	Customer Name
Distribution :	Verkotan Ltd.

Issue	*Name*	*Date*	*Modifications*
A	Pedro Ruiz	12/16/2024	Initial release

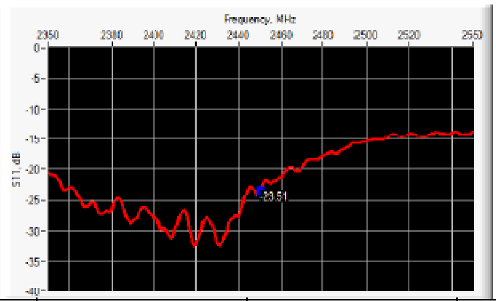
6 CALIBRATION RESULTS

6.1 MECHANICAL DIMENSIONS

L mm		h mm		d mm	
Measured	Required	Measured	Required	Measured	Required
-	51.50 +/- 2%	-	30.40 +/- 2%	-	3.60 +/- 2%

6.2 S11 PARAMETER

6.2.1 S11 parameter in Head Liquid



Frequency (MHz)	S11 parameter (dB)	Requirement (dB)	Impedance
2450	-23.51	-20	44.1Ω - 2.2jΩ

6.3 SAR

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards state that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. Per the standards, the dipole shall be positioned below the bottom of the phantom, with the dipole length centered and parallel to the longest dimension of the flat phantom, with the top surface of the dipole at the described distance from the bottom surface of the phantom by using a prescribed spacer.

6.3.1 SAR with Head Liquid

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards state that the system validation measurements should produce the SAR values shown below (for phantom thickness of 2 mm), within the uncertainty for the system validation. All SAR values are normalized to 1 W forward power. In bracket, the measured SAR is given with the used input power.

Software	OPENSAR V5
Phantom	SN 13/09 SAM68
Probe	SN 36/23 EPGO431
Liquid	Head Liquid Values: eps' : 41.6 sigma : 1.81

Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=5mm/dy=5mm/dz=5mm
Frequency	2450 MHz
Input power	20 dBm
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-70 %

Frequency	1g SAR (W/kg)			10g SAR (W/kg)		
	Measured	Measured normalized to 1W	Target normalized to 1W	Measured	Measured normalized to 1W	Target normalized to 1W
2450 MHz	5.35	53.53	52.40	2.59	25.86	24.00