SAR Compliance Test Report

Date of Report	5/02/2025	**Client's Contact person:**	Pasi Lassila
Number of pages:	50	**Responsible Test engineer:**	Ilari Kinnunen
Testing laboratory:	**Verkotan Oy** Elektroniikkatie 17 90590 Oulu Finland	**Client:**	**Optomed Oy** Yrttipellontie 1 90230 Oulu Finland
Tested device	Optomed Lumo Camera		
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** **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:	05.02.2025 Miia Nurkkala **Laboratory Manager**		

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1. SUMMARY OF SAR TEST REPORT

1.1 Test Details

Equipment under Test (DUT):

Product:	Handheld fundus camera
Manufacturer:	Optomed
Model:	Optomed Lumo Camera
Serial Number:	Camera_B2_03, Camera_B2_04
FCC ID Number:	AYNCINDY2MWM1
ISED ID Number:	32500-CINDY2MWM1
DUT Number:	21442, 21443
Battery Type used in testing:	Li-ion battery
State of the Sample	Production sample

Testing information:

Testing performed:	30.11.2022 – 13.12.2022
Notes:	This report replaces FCC SAR report Cindy 2.0 ID7157 24102024
Document ID:	FCC SAR report Optomed Lumo Camera ID7157 05022025.docx
Document history & changes:	Initial version
Temperature °C	22±2 / Controlled
Humidity RH%	30±20 / Controlled
FCC Test Firm Designation Number	FI0005
ISED Company Number:	22218
Measurement performed by:	Ilari Kinnunen

1.2 RSS-102 version update to Issue 6, 2023

Results of the report *FCC SAR report Cindy 2.0 ID4632b 23122022* that were tested according to RSS-102 Issue 5 2015, Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) have been evaluated in this test report against the RSS-102 Issue 6 2023, Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) and have been found to be compliant.

The changes made to the standard RSS-102, Issue 6 from RSS-102, Issue 5 do not have affect on the compliance of tested results in the report *FCC SAR report Cindy 2.0 ID4632b 23122022*. The SAR testing was conducted for WLAN technology, thus the changes in 2.4 GHz exemption limits have no affect on results. Testing was done at separation distance of 10mm or less, thus compliant with RSS-102, Issue 6, 2023.

The *FCC SAR report Optomed Lumo Camera ID7157 31102024* complies with the RSS-102 Issue 6 2023, Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands).

This compliance statement relates only to the DUT tested and identified in the revised report *FCC SAR report Optomed Lumo Camera ID7157 31102024*.

1.3 Maximum Results

The maximum reported* SAR values for Body-worn condition and Extremity-configuration 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 Body SAR_{1g} is 1.6 W/kg and Extremity SAR_{10g} is 4.0 W/kg.

1.3.1 Standalone SAR

System	Highest Reported* SAR_{1g}(W/kg) in Body-worn Condition, 0mm Separation Distance	Highest Reported* SAR_{10g}(W/kg) in Extremity Condition, 0mm Separation Distance	Result
WLAN 2.4GHz	**0.46**	**0.22**	**PASS**
WLAN 5GHz	**0.31**	**0.10**	**PASS**

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

1.3.2 Maximum Drift

Maximum Drift During Measurements	0.93dB

*Larger than 5% drifts included to scaling factors

1.3.3 Measurement Uncertainty

Uncertainty 300MHz-3GHz

Expanded Uncertainty (k=2) 95 %	±22.1 %

Uncertainty 3GHz-6GHz

Expanded Uncertainty (k=2) 95 %	±24.0 %

2. DESCRIPTION OF THE DEVICE UNDER TEST (DUT)

The DUT is a handheld fundus camera that supports 2.4GHz and 5GHz WLAN. Module also supports Bluetooth but it is disabled.

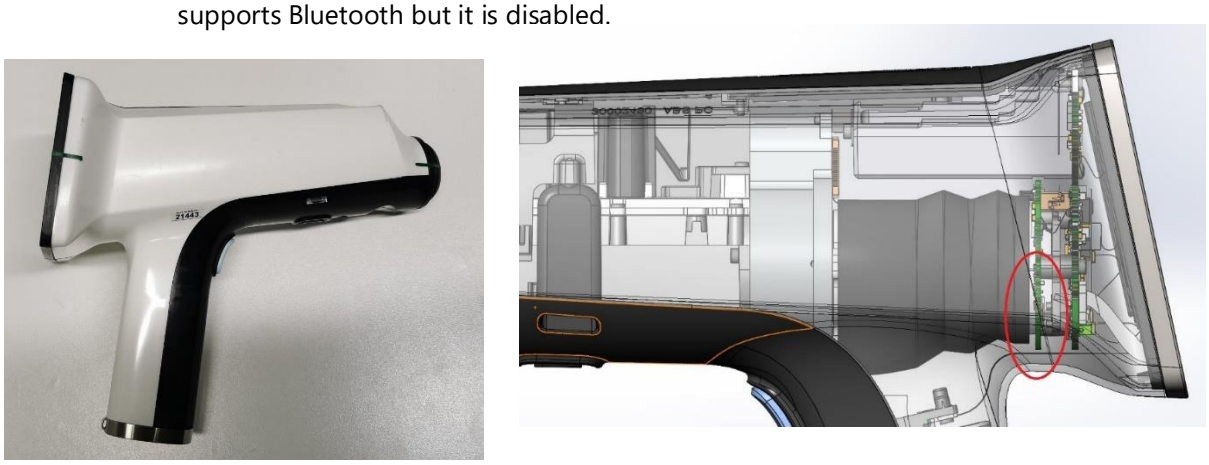


Figure 1 DUT and WLAN antenna location

Device Category	Portable
Exposure Environment	General population

2.1 Supported Frequency Bands and Operational Modes

TX Frequency bands	Modes of Operation	Transmitter Frequency Range (MHz)
	2.4GHz WLAN	2412 – 2462
	5GHz WLAN	5180 – 5825

3. OUTPUT POWER

3.1 Maximum Specified Conducted Output Power

According to "Preliminary Specification Number: SP-HY1MW-N; W-LAN+Bluetooth Combo Module Data Sheet, Cypress Chipset for 802.11a/b/g/n/ac + Bluetooth 5.0, Tentative P/N : LBEE5HY1MW-TEMP", section 11 electrical characteristics.

WLAN 2.4GHz	Max Output Power [dBm]
802.11b	19.5
802.11g	18.5
802.11n	16.5

WLAN 5GHz	Max Output Power [dBm]
802.11a	17.0
802.11n (HT 40MHz)	17.0
802.11ac (VHT 80MHz)	14.0

3.2 Tested conducted power

Murata country code of the module was disabled for the conducted output power measurements to increase power. Use of country code restricts output power.

WLAN 2.4GHz:

Standard	Data Rate [Mbps]	Bandwidth [MHz]	Frequency [MHz]	Channel	Maximum Specified Conducted Power [dBm]	Measured Conducted Power [dBm]
802.11b	1	20	2412	1	19.5	17.98
802.11b	1	20	2437	6	19.5	17.78
802.11b	1	20	2462	11	19.5	18.09

WLAN 5GHz:

Standard	Data Rate [Mbps]	Bandwidth [MHz]	Frequency [MHz]	Channel	Maximum Specified Conducted Power [dBm]	Measured Conducted Power [dBm]
802.11n	MCS0	40	5270	54	17.0	15.99
802.11n	MCS0	40	5310	62	17.0	15.81
802.11n	MCS0	40	5510	102	17.0	16.52
802.11n	MCS0	40	5550	110	17.0	16.64
802.11n	MCS0	40	5630	126	17.0	16.67
802.11n	MCS0	40	5670	134	17.0	16.58
802.11n	MCS0	40	5710	142	17.0	16.57
802.11n	MCS0	40	5755	151	17.0	15.98
802.11n	MCS0	40	5795	159	17.0	15.89

4. TEST EQUIPMENT

Dasy52 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.

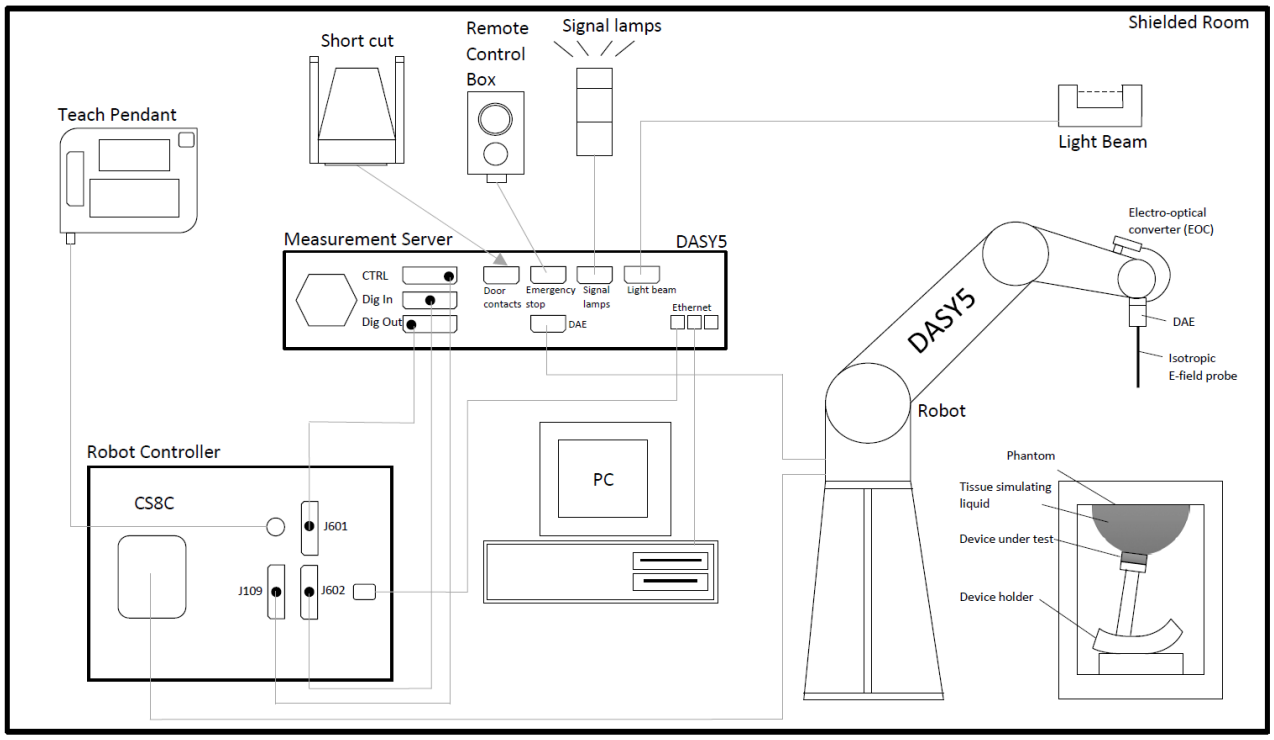


Figure 2 Schematic Laboratory Picture

4.1 Test Equipment List

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

Test Equipment	Model	Serial Number	Calibration Date
DAE	DAE4	710	10.2022
Probe	EX3DV4	3852	10.2022
Dipole	D2450V2	729	10.2022
Dipole	D5GHzV2	1014	03.2020
DASY5 Software	52.8.8.1258	-	NA
Signal Generator	Anritsu MG3710A	6261911026	02.2022
Amplifier	AR 10S1G4A	320421	NA
Power meter	NRP-Z11	100265	12.2021
Inline Peak Power Sensor	Anritsu MA24105A	2102058	11.2022

Dipole calibration period supporting data:

		Measured on 10/2022			Calibrated		
Dipole and serial number	Frequency (MHz)	Return loss (dB)	Impedance (Ω)		Return loss (dB)	Impedance (Ω)	
D5GHzV2 - SN: 1014	5250	-26.7	49.9	-4.6	-25.81	52.5	-4.4
D5GHzV2 - SN: 1014	5600	-24.0	48.0	-5.8	-21.7	49	-8.1
D5GHzV2 - SN: 1014	5750	-22.6	43.1	-0.5	-27.71	46.1	1.4

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	10 MHz to >6 GHz (dosimetry); Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 µW/g to > 100 mW/g, Linearity: ± 0.2 dB
Dimensions	Overall length: 330 mm Tip length: 10 mm Body diameter: 12 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 IEEE 1528 and FCC published RF Exposure KDB Procedures. The shell thickness of the bottom plate is 2±0.2mm. The dimensions are 308x192x182mm and filling volume is 9.2 liters giving a filling height of 155mm.

4.3 Tissue Simulants

Recommended values for the dielectric parameters of the tissue simulants are given in IEEE 1528 and FCC published RF Exposure KDB Procedures. The dielectric parameters of the used tissue simulants were within ±10% of the recommended values at 2.4GHz and ±5% at 5GHz frequency area. A liquid compensation algorithm was used in DASY5 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 consists of:

Head 600 – 6000 MHz tissue simulant liquid Ingredients
Deionized Water, oil, salt, emulsifiers

4.4 System Validation Status

Frequency [MHz]	Dipole Type / SN	Probe Type / SN	Calibrated Signal Type	Validation Signal Type	DAE Unit / SN	Dielectric Constant ε	Conductivity, σ [S/m]	Validation Done Head tissue simulant
2450	D2450V2 / 758	EX3DV4 / 3852	CW	CW/DSSS	DAE 4 / 710	40.46	1.75	11.2022
5250	D5GHzV2 / 1014	EX3DV4 / 3852	CW	CW	DAE 4 / 710	37.44	4.66	11.2022
5600	D5GHzV2 / 1014	EX3DV4 / 3852	CW	CW/OFDM	DAE 4 / 710	36.79	5.07	11.2022
5750	D5GHzV2 / 1014	EX3DV4 / 3852	CW	CW	DAE 4 / 710	36.62	5.19	11.2022

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 #
30.11.2022	WB Head	22	2450	250	12.1	52.3	48.4	-7.5	1
01.12.2022	WB Head	22	2450	250	12.1	52.3	48.4	-7.5	2
05.12.2022	WB Head	22	2450	250	12.1	52.3	48.4	-7.5	3
07.12.2022	WB Head	22	5250	100	7.11	77.65	71.1	-8.4	4
08.12.2022	WB Head	22	5250	100	7.26	77.65	72.6	-6.5	5
08.12.2022	WB Head	22	5750	100	7.16	75.18	71.6	-4.8	6
09.12.2022	WB Head	22	5750	100	7.27	75.18	72.7	-3.3	7
12.12.2022	WB Head	22	5600	100	7.6	83.31	76.0	-8.8	8
13.12.2022	WB Head	22	5600	100	7.71	83.31	77.1	-7.5	9

4.5.1 Tissue Simulant Verification

				Target		Measured		Deviation	
Date	**Tissue Type**	**Tissue Temp [°C]**	**Frequency [MHz]**	**Dielectric Constant [ε] Target**	**Conductivity σ [S/m] Target**	**Dielectric Constant [ε]**	**Conductivity σ [S/m]**	**ε (%)**	**σ (%)**
30.11.2022	WB Head	22	2412	39.27	1.77	41.53	1.67	5.8	-5.6
30.11.2022	WB Head	22	2437	39.22	1.79	41.48	1.68	5.8	-5.9
30.11.2022	WB Head	22	2442	39.21	1.79	41.48	1.69	5.8	-5.9
30.11.2022	WB Head	22	2450	39.2	1.8	41.47	1.69	5.8	-6.0
30.11.2022	WB Head	22	2462	39.18	1.81	41.45	1.7	5.8	-6.2
30.11.2022	WB Head	22	2472	39.17	1.82	41.43	1.71	5.8	-6.4
01.12.2022	WB Head	22	2412	39.27	1.77	41.22	1.71	5.0	-3.4
01.12.2022	WB Head	22	2437	39.22	1.79	41.19	1.72	5.0	-3.6
01.12.2022	WB Head	22	2442	39.21	1.79	41.17	1.73	5.0	-3.7
01.12.2022	WB Head	22	2450	39.2	1.8	41.16	1.73	5.0	-3.7
01.12.2022	WB Head	22	2462	39.18	1.81	41.15	1.74	5.0	-4.0
01.12.2022	WB Head	22	2472	39.17	1.82	41.14	1.75	5.0	-4.1
05.12.2022	WB Head	22	2412	39.27	1.77	41.13	1.69	4.8	-4.6
05.12.2022	WB Head	22	2437	39.22	1.79	41.09	1.7	4.8	-4.8
05.12.2022	WB Head	22	2442	39.21	1.79	41.08	1.71	4.8	-4.8
05.12.2022	WB Head	22	2450	39.2	1.8	41.07	1.71	4.8	-5.0
05.12.2022	WB Head	22	2462	39.18	1.81	41.05	1.72	4.8	-5.2
05.12.2022	WB Head	22	2472	39.17	1.82	41.04	1.73	4.8	-5.4
07.12.2022	WB Head	22	5190	36.0	4.64	36.58	4.45	1.6	-4.2
07.12.2022	WB Head	22	5250	35.93	4.71	36.48	4.51	1.5	-4.1
07.12.2022	WB Head	22	5270	35.91	4.73	36.44	4.54	1.5	-4.0
07.12.2022	WB Head	22	5310	35.86	4.77	36.38	4.58	1.4	-3.9
08.12.2022	WB Head	22	5190	36.0	4.64	36.36	4.46	1.0	-4.1
08.12.2022	WB Head	22	5250	35.93	4.71	36.26	4.52	0.9	-4.0
08.12.2022	WB Head	22	5270	35.91	4.73	36.21	4.54	0.9	-3.9
08.12.2022	WB Head	22	5310	35.86	4.77	36.16	4.59	0.8	-3.8
08.12.2022	WB Head	22	5750	35.36	5.22	35.38	5.08	0.1	-2.6
08.12.2022	WB Head	22	5755	35.35	5.22	35.37	5.09	0.0	-2.6
08.12.2022	WB Head	22	5795	35.31	5.26	35.31	5.13	0.0	-2.5
09.12.2022	WB Head	22	5750	35.36	5.22	35.19	5.14	-0.5	-1.5
09.12.2022	WB Head	22	5755	35.35	5.22	35.18	5.15	-0.5	-1.5
09.12.2022	WB Head	22	5795	35.31	5.26	35.1	5.19	-0.6	-1.4
12.12.2022	WB Head	22	5510	35.63	4.97	35.25	4.79	-1.1	-3.7
12.12.2022	WB Head	22	5600	35.53	5.06	35.09	4.89	-1.2	-3.4
12.12.2022	WB Head	22	5630	35.49	5.1	35.03	4.93	-1.3	-3.3
12.12.2022	WB Head	22	5710	35.4	5.18	34.9	5.02	-1.4	-3.0
13.12.2022	WB Head	22	5510	35.6	4.97	34.9	4.73	-2.0	-4.9
13.12.2022	WB Head	22	5600	35.5	5.07	34.7	4.83	-2.2	-4.6
13.12.2022	WB Head	22	5630	35.5	5.10	34.7	4.87	-2.2	-4.4
13.12.2022	WB Head	22	5710	35.4	5.18	34.6	4.96	-2.4	-4.3

5. TEST PROCEDURE

Testing was carried out in accordance with FCC KDB Publications 447498 D04 Interim General RF Exposure Guidance v01, 248227 D01 and RSS-102, Issue 6.

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

The WLAN transmission modes for testing were selected according to power, largest channel bandwidth configuration, lowest order modulation and lowest data rate. 2.4GHz WLAN was tested with 802.11b standard with data rate of 1Mbit/s and 5GHz WLAN was tested with 802.11n (HT 40MHz) standard and MCS0 data rate.

5.1.1 Extremity Configuration and Body-worn Configuration, 0mm separation distance

The device was placed on the device holder and lifted towards the phantom until the distance between the phantom and the device was 0mm.
The device was tested with 0mm separation from 6 sides of the DUT (Front, left, right, top, bottom and camera side) against Extremity SAR and Body SAR limits. Due to the irregular shape of the DUT, there are only a few contact points between the phantom and the DUT on each side. The DUT was positioned so that the contact points with phantom provide the worst-case separation distance to the antenna.

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 Dasy52 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

DASY5 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	±12.0%	N	√2	1	1	±6.0%	±6.0%
CFdrift	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	±3.0%	R	√3	1	1	±1.7%	±1.7%
ISO	Probe Isotropy	±7.6%	R	3	1	1	±4.4%	±4.4%
DAE	Data Acquisition	±0.3%	N	1	1	1	±0.3%	±0.3%
AMB	RF Ambient	±1.8%	N	1	1	1	±1.8%	±1.8%
Δsys	Probe Positioning	±3.9%	N	1	0.14	0.14	±0.5%	±0.5%
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%
Dxyz	Device Positioning (±0.5mm)	±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	±2.6%	R	3	1	1	±1.5%	±1.5%
RFdrift	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%
RF_{in}	Unc. Input Power^{val}	±0.0%	N	1	1	1	±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%	R	3	1	1	±0%	±0%
u(ΔSAR)	Combined Uncertainty						±11.0%	±10.9%
U	**Expanded Uncertainty**						±22.1%	±21.9%

DASY5 Uncertainty Budget According to IEC/IEEE 62209-1528 (Frequency band: 3GHz - 6GHz 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	±14.0%	N	√2	1	1	±7.0%	±7.0%
CF*drift*	Probe Calibration Drift	±1.7%	N	√3	1	1	±1.0%	±1.0%
LIN	Probe Linearity	±4.7%	R	√3	1	1	±2.7%	±2.7%
BBS	Broadband Signal	±2.6%	R	√3	1	1	±1.5%	±1.5%
ISO	Probe Isotropy	±7.6%	R	3	1	1	±4.4%	±4.4%
DAE	Data Acquisition	±0.3%	N	1	1	1	±0.3%	±0.3%
AMB	RF Ambient	±1.8%	N	1	1	1	±1.8%	±1.8%
Δ*sys*	Probe Positioning	±3.9%	N	1	0.33	0.33	±1.3%	±1.3%
DAT	Data Processing	±2.3%	N	1	1	1	±2.3%	±2.3%
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}	±3.4%	R	√3	0.78	0.71	±1.5%	±1.4%
EPS	Phantom Permittivity	±14.0%	R	3	0.25	0.25	±2.0%	±2.0%
DIS	Distance DUT - TSL	±2.0%	N	1	2	2	±4.0%	±4.0%
D*xyz*	Device Positioning (±0.5mm)	±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	±2.6%	R	3	1	1	±1.5%	±1.5%
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%
RF_{in}	Unc. Input Power^{val}	±0.0%	N	1	1	1	±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%	R	3	1	1	±0%	±0%
u(ΔSAR)	Combined Uncertainty						±12.0%	±11.9%
U	**Expanded Uncertainty**						±24.0%	±23.8%

7. TEST RESULTS

7.1 SAR Results for Body-Worn Condition with 0mm separation

2.4GHz WLAN:

Standard	Data Rate [Mbps]	Bandwidth [MHz]	Frequency [MHz]	Channel	Maximum Power [dBm]	Conducted Power [dBm]	Test position	Measured SAR1g [W/kg]	Power Drift* [dB]	Scaling Factor	Duty Cycle	Reported SAR1g [W/kg]	Plot #
802.11b	1	20	2462	11	19.50	18.09	Front	0.051	0.00	1.38	1:1	0.07	
802.11b	1	20	2462	11	19.50	18.09	Left	0.306	0.33	1.49	1:1	0.46	10
802.11b	1	20	2462	11	19.50	18.09	Right	0.044	N/A**	1.38	1:1	0.06	
802.11b	1	20	2462	11	19.50	18.09	Top	0.082	0.48	1.55	1:1	0.13	
802.11b	1	20	2462	11	19.50	18.09	Bottom	0.081	-0.08	1.38	1:1	0.11	
802.11b	1	20	2462	11	19.50	18.09	Camera	0.020	N/A**	1.38	1:1	0.03	
802.11b	1	20	2412	1	19.50	17.98	Left	0.213	0.49	1.59	1:1	0.34	
802.11b	1	20	2437	6	19.50	17.78	Left	0.204	0.35	1.61	1:1	0.33	

*Larger than 5% drifts included to scaling factors
**Due to low E-field generated by DUT at the location of the drift measurement, the measurements are not applicable

5GHz WLAN:

Standard	Data Rate [Mbps]	Bandwidth [MHz]	Frequency [MHz]	Channel	Maximum Power [dBm]	Conducted Power [dBm]	Test position	Measured SAR1g [W/kg]	Power Drift* [dB]	Scaling Factor	Duty Cycle	Reported SAR1g [W/kg]	Plot #
802.11n	MCS0	40	5270	54	17.00	15.99	Front	0.092	N/A**	1.26	1:1	0.12	
802.11n	MCS0	40	5270	54	17.00	15.99	Left	0.054	0.30	1.35	1:1	0.07	
802.11n	MCS0	40	5270	54	17.00	15.99	Right	0.052	-0.33	1.36	1:1	0.07	
802.11n	MCS0	40	5270	54	17.00	15.99	Top	0.031	N/A**	1.26	1:1	0.04	
802.11n	MCS0	40	5270	54	17.00	15.99	Bottom	0.093	0.46	1.40	1:1	0.13	
802.11n	MCS0	40	5270	54	17.00	15.99	Camera	0.0001	N/A**	1.26	1:1	0.0002	
802.11n	MCS0	40	5310	62	17.00	15.81	Bottom	0.122	N/A**	1.32	1:1	0.16	11

*Larger than 5% drifts included to scaling factors
**Due to low E-field generated by DUT at the location of the drift measurement, the measurements are not applicable

Standard	Data Rate [Mbps]	Bandwidth [MHz]	Frequency [MHz]	Channel	Maximum Power [dBm]	Conducted Power [dBm]	Test position	Measured SAR1g [W/kg]	Power Drift* [dB]	Scaling Factor	Duty Cycle	Reported SAR1g [W/kg]	Plot #
802.11n	MCS0	40	5630	126	17.00	16.67	Front	0.239	0.85	1.31	1:1	0.31	12
802.11n	MCS0	40	5630	126	17.00	16.67	Left	0.052	0.45	1.20	1:1	0.06	
802.11n	MCS0	40	5630	126	17.00	16.67	Right	0.031	0.02	1.08	1:1	0.03	
802.11n	MCS0	40	5630	126	17.00	16.67	Top	0.007	-0.42	1.19	1:1	0.01	
802.11n	MCS0	40	5630	126	17.00	16.67	Bottom	0.180	0.74	1.28	1:1	0.23	
802.11n	MCS0	40	5630	126	17.00	16.67	Camera	0.001***	N/A**	1.08	1:1	0.001***	
802.11n	MCS0	40	5510	102	17.00	16.52	Front	0.194	0.33	1.21	1:1	0.23	
802.11n	MCS0	40	5710	142	17.00	16.57	Front	0.184	0.93	1.37	1:1	0.25	

*Larger than 5% drifts included to scaling factors
**Due to low E-field generated by DUT at the location of the drift measurement, the measurements are not applicable
***Due to low E-field generated by DUT zoom scan value was not obtained, area scan value is reported instead.

Standard	Data Rate [Mbps]	Bandwidth [MHz]	Frequency [MHz]	Channel	Maximum Power [dBm]	Conducted Power [dBm]	Test position	Measured SAR1g [W/kg]	Power Drift* [dB]	Scaling Factor	Duty Cycle	Reported SAR1g [W/kg]	Plot #
802.11n	MCS0	40	5755	151	17.00	15.98	Front	0.175	0.92	1.56	1:1	0.27	13
802.11n	MCS0	40	5755	151	17.00	15.98	Left	0.057	0.46	1.41	1:1	0.08	
802.11n	MCS0	40	5755	151	17.00	15.98	Right	0.020	-0.31	1.36	1:1	0.03	
802.11n	MCS0	40	5755	151	17.00	15.98	Top	0.00003	-0.57	1.44	1:1	0.0001	
802.11n	MCS0	40	5755	151	17.00	15.98	Bottom	0.151	N/A**	1.26	1:1	0.19	
802.11n	MCS0	40	5755	151	17.00	15.98	Camera	0.0002	N/A**	1.26	1:1	0.0003	
802.11n	MCS0	40	5795	159	17.00	15.89	Front	0.166	-0.90	1.59	1:1	0.26	

*Larger than 5% drifts included to scaling factors
**Due to low E-field generated by DUT at the location of the drift measurement, the measurements are not applicable

7.2 SAR Results for Extremity Exposure with 0mm separation

2.4GHz WLAN:

Standard	Data Rate [Mbps]	Bandwidth [MHz]	Frequency [MHz]	Channel	Maximum Power [dBm]	Conducted Power [dBm]	Test position	Measured SAR10g [W/kg]	Power Drift* [dB]	Scaling Factor	Duty Cycle	Reported SAR10g [W/kg]	Plot #
802.11b	1	20	2462	11	19.50	18.09	Front	0.026	0.00	1.38	1:1	0.04	
802.11b	1	20	2462	11	19.50	18.09	Left	0.148	0.33	1.49	1:1	0.22	10
802.11b	1	20	2462	11	19.50	18.09	Right	0.017	N/A**	1.38	1:1	0.02	
802.11b	1	20	2462	11	19.50	18.09	Top	0.036	0.48	1.55	1:1	0.06	
802.11b	1	20	2462	11	19.50	18.09	Bottom	0.043	-0.08	1.38	1:1	0.06	
802.11b	1	20	2462	11	19.50	18.09	Camera	0.008	N/A**	1.38	1:1	0.01	
802.11b	1	20	2412	1	19.50	17.98	Left	0.103	0.49	1.59	1:1	0.16	
802.11b	1	20	2437	6	19.50	17.78	Left	0.099	0.35	1.61	1:1	0.16	

*Larger than 5% drifts included to scaling factors
**Due to low E-field generated by DUT at the location of the drift measurement, the measurements are not applicable

5GHz WLAN:

Standard	Data Rate [Mbps]	Bandwidth [MHz]	Frequency [MHz]	Channel	Maximum Power [dBm]	Conducted Power [dBm]	Test position	Measured SAR10g [W/kg]	Power Drift* [dB]	Scaling Factor	Duty Cycle	Reported SAR10g [W/kg]	Plot #
802.11n	MCS0	40	5270	54	17.00	15.99	Front	0.029	N/A**	1.26	1:1	0.04	
802.11n	MCS0	40	5270	54	17.00	15.99	Left	0.022	0.30	1.35	1:1	0.03	
802.11n	MCS0	40	5270	54	17.00	15.99	Right	0.022	-0.33	1.36	1:1	0.03	
802.11n	MCS0	40	5270	54	17.00	15.99	Top	0.005	N/A**	1.26	1:1	0.01	
802.11n	MCS0	40	5270	54	17.00	15.99	Bottom	0.033	0.46	1.40	1:1	0.05	
802.11n	MCS0	40	5270	54	17.00	15.99	Camera	0.00001	N/A**	1.26	1:1	0.00002	
802.11n	MCS0	40	5310	62	17.00	15.81	Bottom	0.045	N/A**	1.32	1:1	0.06	11

*Larger than 5% drifts included to scaling factors
**Due to low E-field generated by DUT at the location of the drift measurement, the measurements are not applicable

tandard	Data Rate [Mbps]	Bandwidth [MHz]	Frequency [MHz]	Channel	Maximum Power [dBm]	Conducted Power [dBm]	Test position	Measured SAR10g [W/kg]	Power Drift* [dB]	Scaling Factor	Duty Cycle	Reported SAR10g [W/kg]	Plot #
802.11n	MCS0	40	5630	126	17.00	16.67	Front	0.076	0.85	1.31	1:1	0.10	12
802.11n	MCS0	40	5630	126	17.00	16.67	Left	0.022	0.45	1.20	1:1	0.03	
802.11n	MCS0	40	5630	126	17.00	16.67	Right	0.012	0.02	1.08	1:1	0.01	
802.11n	MCS0	40	5630	126	17.00	16.67	Top	0.001	-0.42	1.19	1:1	0.001	
802.11n	MCS0	40	5630	126	17.00	16.67	Bottom	0.066	0.74	1.28	1:1	0.08	
802.11n	MCS0	40	5630	126	17.00	16.67	Camera	0.000112***	N/A**	1.08	1:1	0.0001***	
802.11n	MCS0	40	5510	102	17.00	16.52	Front	0.061	0.33	1.21	1:1	0.07	
802.11n	MCS0	40	5710	142	17.00	16.57	Front	0.057	0.93	1.37	1:1	0.08	

*Larger than 5% drifts included to scaling factors
**Due to low E-field generated by DUT at the location of the drift measurement, the measurements are not applicable
***Due to low E-field generated by DUT zoom scan value was not obtained, area scan value is reported instead.

Standard	Data Rate [Mbps]	Bandwidth [MHz]	Frequency [MHz]	Channel	Maximum Power [dBm]	Conducted Power [dBm]	Test position	Measured SAR10g [W/kg]	Power Drift* [dB]	Scaling Factor	Duty Cycle	Reported SAR10g [W/kg]	Plot #
802.11n	MCS0	40	5755	151	17.00	15.98	Front	0.052	0.92	1.56	1:1	0.08	13
802.11n	MCS0	40	5755	151	17.00	15.98	Left	0.023	0.46	1.41	1:1	0.03	
802.11n	MCS0	40	5755	151	17.00	15.98	Right	0.004	-0.31	1.36	1:1	0.01	
802.11n	MCS0	40	5755	151	17.00	15.98	Top	0.000003	-0.57	1.44	1:1	0.00001	
802.11n	MCS0	40	5755	151	17.00	15.98	Bottom	0.052	N/A**	1.26	1:1	0.07	
802.11n	MCS0	40	5755	151	17.00	15.98	Camera	0.00002	N/A**	1.26	1:1	0.00003	
802.11n	MCS0	40	5795	159	17.00	15.89	Front	0.050	-0.90	1.59	1:1	0.08	

*Larger than 5% drifts included to scaling factors
**Due to low E-field generated by DUT at the location of the drift measurement, the measurements are not applicable

7.3 IEC 62209-2 AMD1:2019

According to IEC 62209-2 AMD1:2019, 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 62209-2 AMD1:2019 is automatically verified by DASY5 software and all zoom scans in this test report do pass the criteria. The smallest horizontal distance and Ratio between measurement points M2 and M1 of the highest SAR results is available in Appendix C.

APPENDIX A: PHOTOS OF THE DUT

Size of the DUT is: 220 x 184 x 141 mm.

Figure 3 Front side of the device against the phantom with 0mm separation

Figure 4 Left side of the device against the phantom with 0mm separation

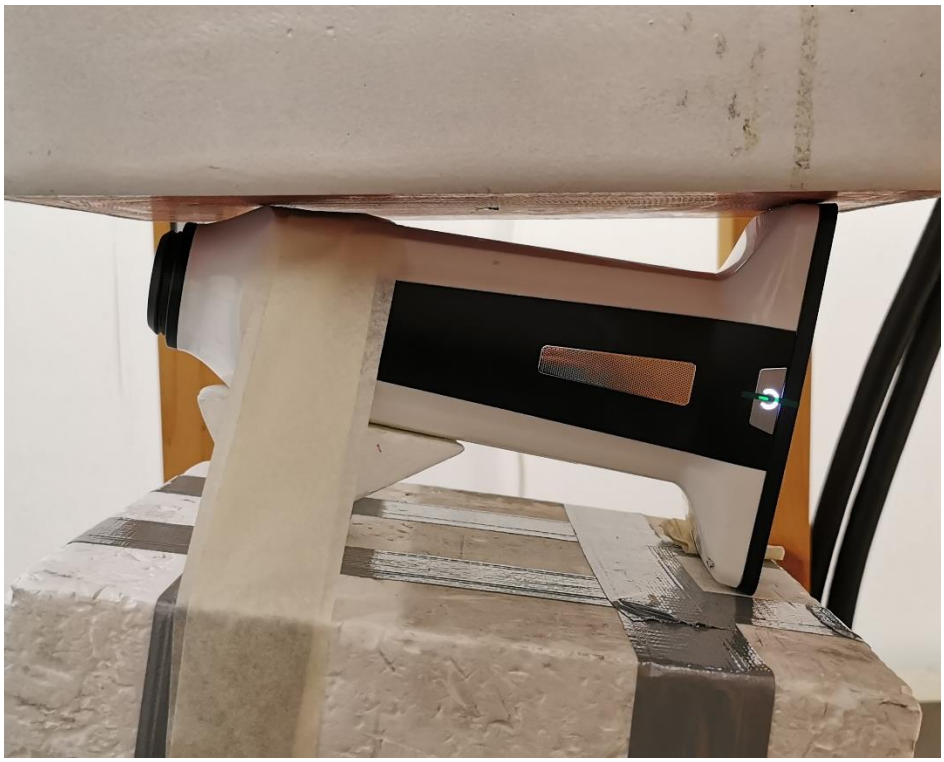


Figure 5 Right side of the device against the phantom with 0mm separation

Figure 6 Top side of the device against the phantom with 0mm separation

Figure 7 Bottom side of the device against the phantom with 0mm separation

Figure 8 Camera side of the device against the phantom with 0mm separation

APPENDIX B: SYSTEM CHECK SCAN

Plot 1

Date/Time: 30.11.2022 15.09.44

Test Laboratory: Verkotan Oy

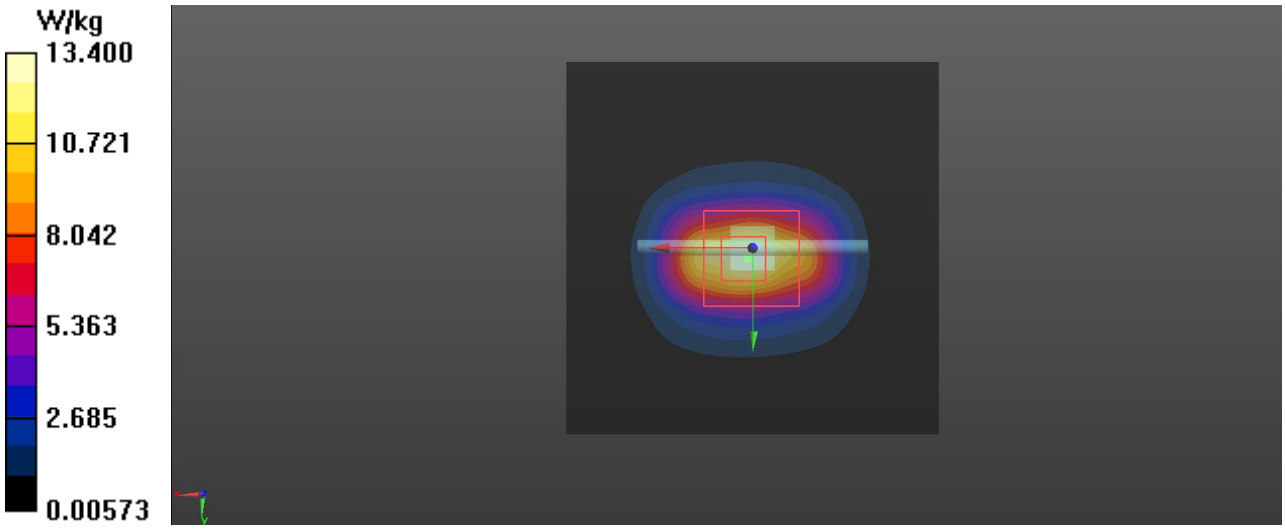
DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN:729

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 = 1.693 S/m; ε_r = 41.467; ρ = 1000 kg/m^3
Phantom section: Center Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN3852; ConvF(7.48, 7.48, 7.48) @ 2450 MHz; Calibrated: 27.10.2022
  - Sensor-Surface: 4mm (Mechanical Surface Detection), z = 31.0, -4.0
  - Electronics: DAE4 Sn710; Calibrated: 19.10.2022
  - Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx;
  - DASY52 52.10.4(1527); 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 = 87.63 V/m; Power Drift = -0.17 dB
Peak SAR (extrapolated) = 22.9 W/kg
SAR(1 g) = 12.1 W/kg; SAR(10 g) = 5.67 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 10 mm
Ratio of SAR at M2 to SAR at M1 = 52.5%
Maximum value of SAR (measured) = 13.2 W/kg
Configuration/System check 2450MHz/Area Scan (71x71x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 13.4 W/kg



Plot 2

Date/Time: 01.12.2022 14.55.34

Test Laboratory: Verkotan Oy

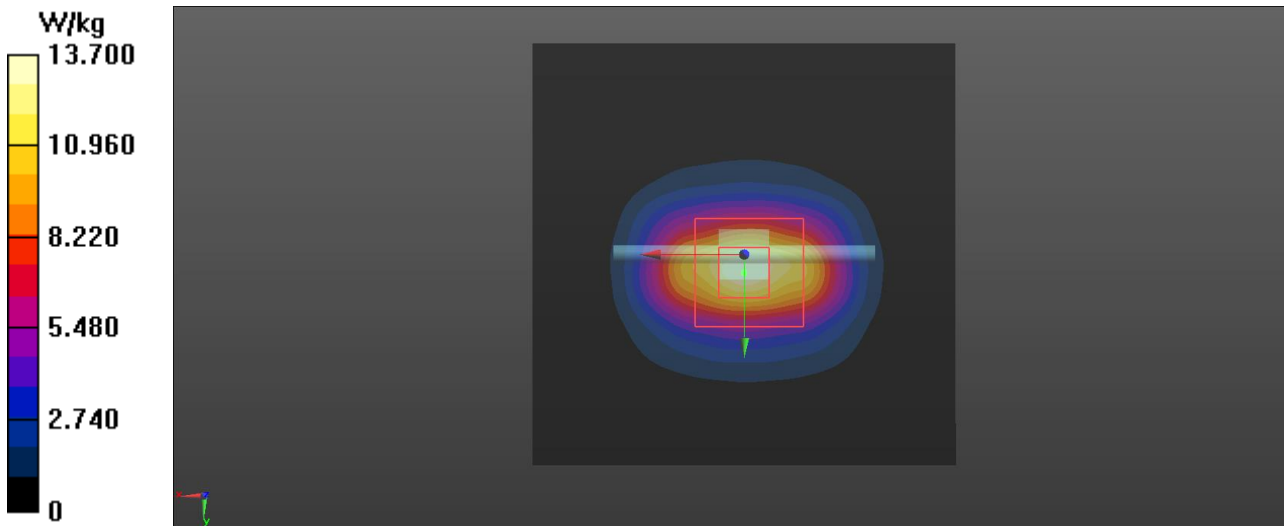
DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN: 729

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 = 1.733 S/m; ε_r = 41.161; ρ = 1000 kg/m^3
Phantom section: Center Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN3852; ConvF(7.48, 7.48, 7.48) @ 2450 MHz; Calibrated: 27.10.2022
  - Sensor-Surface: 4mm (Mechanical Surface Detection), z = 31.0, -4.0
  - Electronics: DAE4 Sn710; Calibrated: 19.10.2022
  - Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx;
  - DASY52 52.10.4(1527); 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 = 87.13 V/m; Power Drift = -0.20 dB
Peak SAR (extrapolated) = 23.3 W/kg
SAR(1 g) = 12.1 W/kg; SAR(10 g) = 5.8 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 10 mm
Ratio of SAR at M2 to SAR at M1 = 52.4%
Maximum value of SAR (measured) = 13.4 W/kg
Configuration/System check 2450MHz/Area Scan (71x71x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 13.7 W/kg



Plot 3

Date/Time: 05.12.2022 8.48.49

Test Laboratory: Verkotan Oy

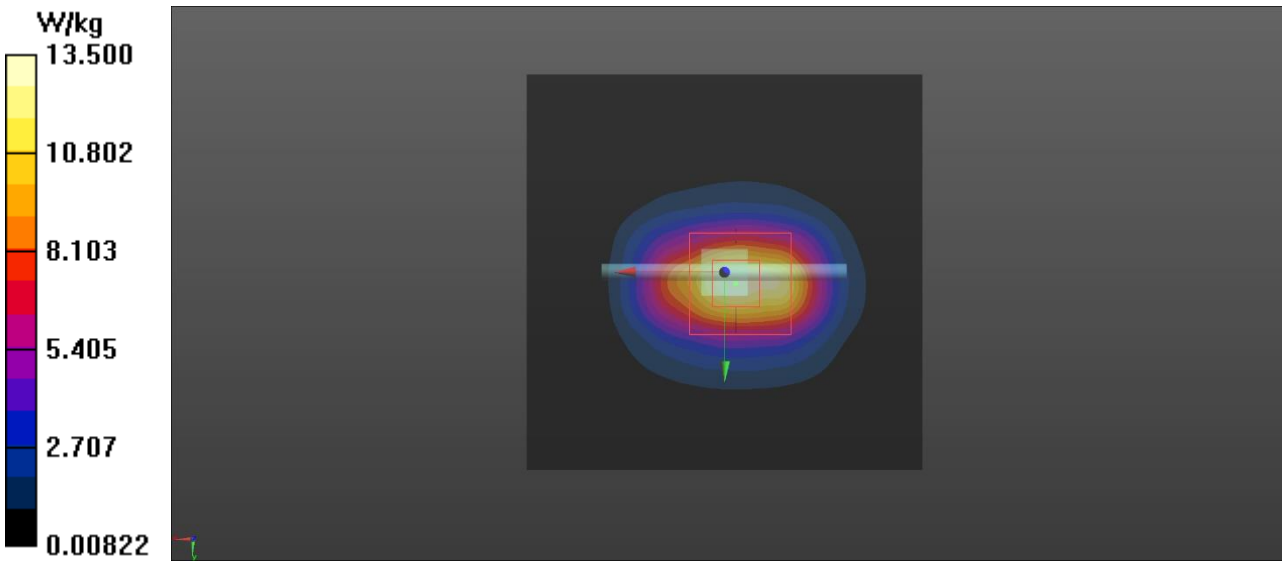
DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN: 729

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 = 1.711 S/m; ε_r = 41.067; ρ = 1000 kg/m^3
Phantom section: Center Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN3852; ConvF(7.48, 7.48, 7.48) @ 2450 MHz; Calibrated: 27.10.2022
  - Sensor-Surface: 4mm (Mechanical Surface Detection), z = 31.0, -4.0
  - Electronics: DAE4 Sn710; Calibrated: 19.10.2022
  - Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx;
  - DASY52 52.10.4(1527); 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 = 85.78 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 23.2 W/kg
SAR(1 g) = 12.1 W/kg; SAR(10 g) = 5.72 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 10 mm
Ratio of SAR at M2 to SAR at M1 = 52.4%
Maximum value of SAR (measured) = 13.3 W/kg
Configuration/System check 2450MHz/Area Scan (71x71x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 13.5 W/kg



Plot 4

Date/Time: 07.12.2022 9.38.33

Test Laboratory: Verkotan Oy

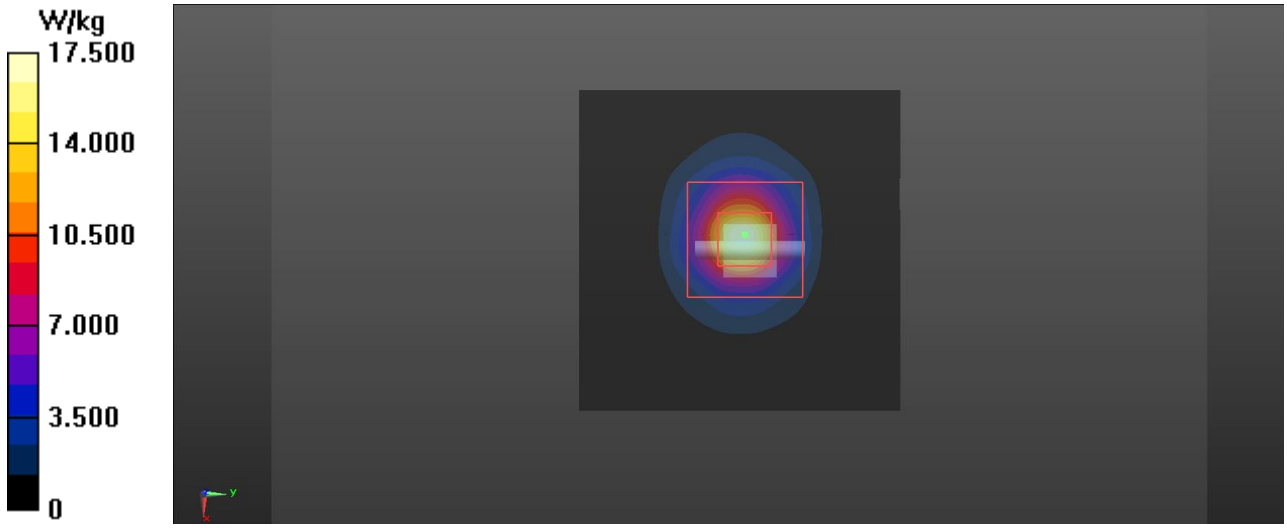
DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1014

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5250 MHz;
Communication System PAR: 0 dB;
Medium parameters used (interpolated): f = 5250 MHz; σ = 4.514 S/m; ε_r = 36.475; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN3852; ConvF(4.9, 4.9, 4.9) @ 5250 MHz; Calibrated: 27.10.2022
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 25.0
  - Electronics: DAE4 Sn710; Calibrated: 19.10.2022
  - Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx;
  - DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

System check 5250/Area Scan (61x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 17.4 W/kg
System check 5250/Zoom Scan (9x9x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.62 V/m; Power Drift = 0.31 dB
Peak SAR (extrapolated) = 27.4 W/kg
SAR(1 g) = 7.11 W/kg; SAR(10 g) = 2.04 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 6.8 mm
Ratio of SAR at M2 to SAR at M1 = 67.1%
Maximum value of SAR (measured) = 17.5 W/kg



Plot 5

Date/Time: 08.12.2022 8.54.21

Test Laboratory: Verkotan Oy

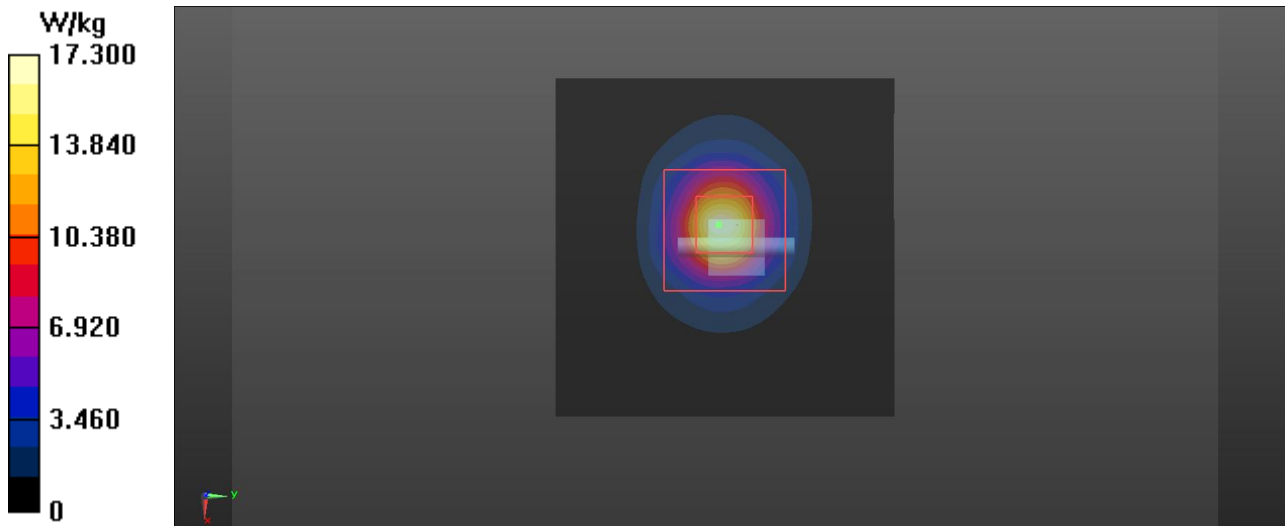
DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1014

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5250 MHz;
Communication System PAR: 0 dB;
Medium parameters used (interpolated): f = 5250 MHz; σ = 4.518 S/m; ε_r = 36.256; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN3852; ConvF(4.9, 4.9, 4.9) @ 5250 MHz; Calibrated: 27.10.2022
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 25.0, -4.0
  - Electronics: DAE4 Sn710; Calibrated: 19.10.2022
  - Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx;
  - DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

System check 5250/Zoom Scan (9x9x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 61.99 V/m; Power Drift = 0.31 dB
Peak SAR (extrapolated) = 28.7 W/kg
SAR(1 g) = 7.26 W/kg; SAR(10 g) = 2.09 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 6.4 mm
Ratio of SAR at M2 to SAR at M1 = 66.6%
Maximum value of SAR (measured) = 18.1 W/kg
System check 5250/Area Scan (61x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 17.3 W/kg



Plot 6

Date/Time: 08.12.2022 14.21.05

Test Laboratory: Verkotan Oy

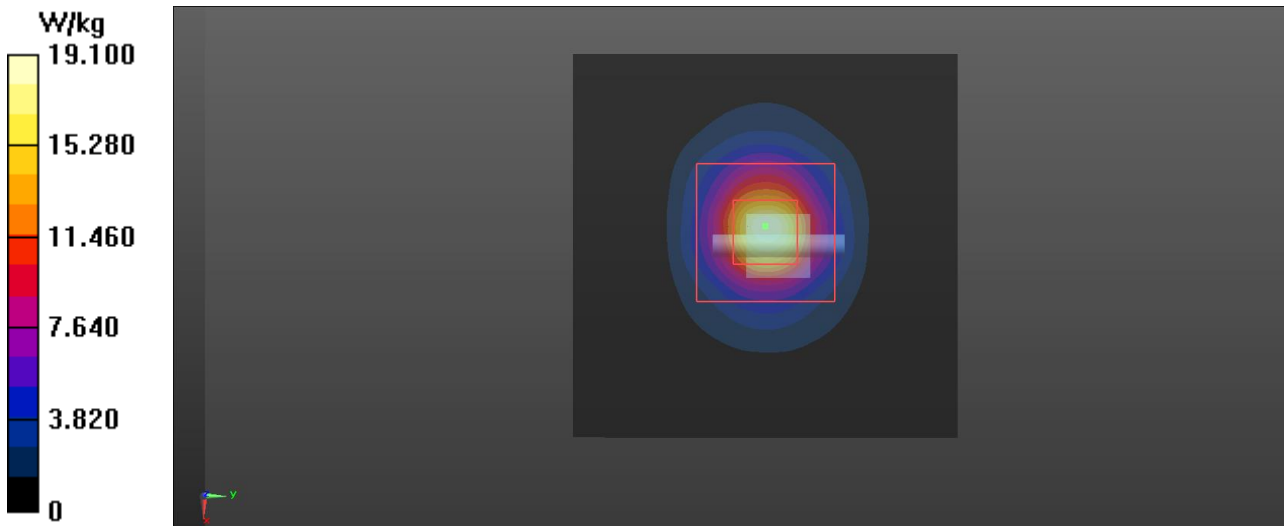
DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1014

Communication System: UID 0, WLAN5GHz (0); Communication System Band: 5GHz; Frequency: 5750 MHz;
Communication System PAR: 0 dB;
Medium parameters used: f = 5750 MHz; σ = 5.082 S/m; ε_r = 35.382; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN3852; ConvF(4.65, 4.65, 4.65) @ 5750 MHz; Calibrated: 27.10.2022
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 25.0, -4.0
  - Electronics: DAE4 Sn710; Calibrated: 19.10.2022
  - Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx;
  - DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

System check 5750/Zoom Scan (9x9x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.43 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 33.4 W/kg
SAR(1 g) = 7.16 W/kg; SAR(10 g) = 2.03 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 6.9 mm
Ratio of SAR at M2 to SAR at M1 = 61.7%
Maximum value of SAR (measured) = 19.1 W/kg
System check 5750/Area Scan (61x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 19.1 W/kg



Plot 7

Date/Time: 09.12.2022 14.43.12

Test Laboratory: Verkotan Oy

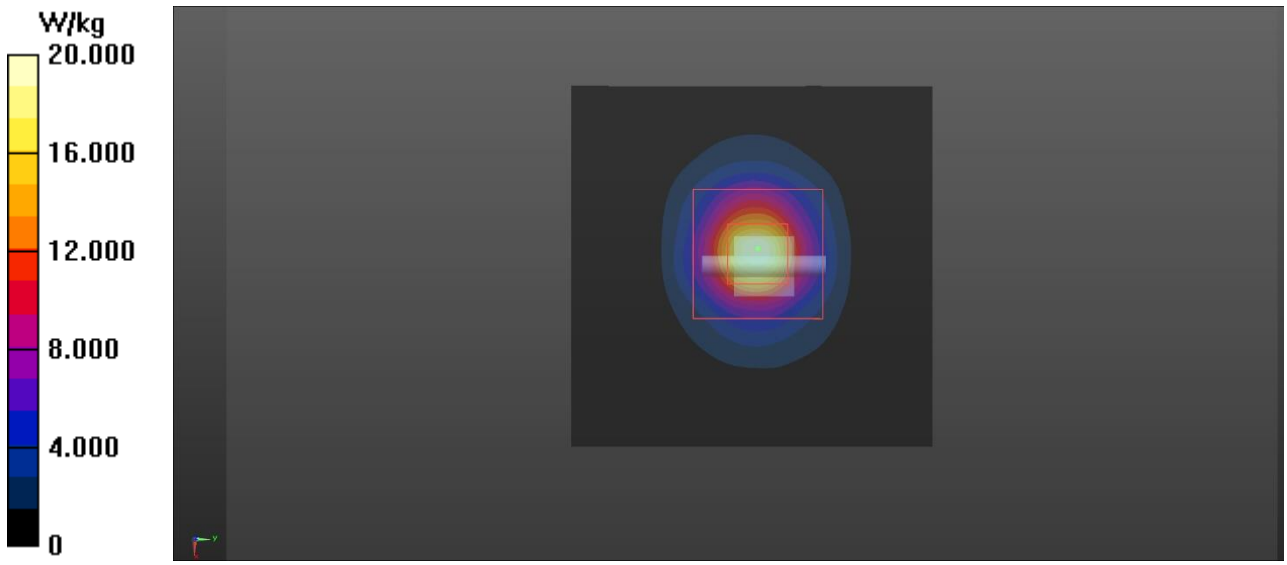
DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1014

Communication System: UID 0, WLAN5GHz (0); Communication System Band: 5GHz; Frequency: 5750 MHz;
Communication System PAR: 0 dB;
Medium parameters used: f = 5750 MHz; σ = 5.141 S/m; ε_r = 35.194; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN3852; ConvF(4.65, 4.65, 4.65) @ 5750 MHz; Calibrated: 27.10.2022
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 25.0, -4.0
  - Electronics: DAE4 Sn710; Calibrated: 19.10.2022
  - Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx;
  - DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

System check 5750/Zoom Scan (9x9x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 69.66 V/m; Power Drift = -0.54 dB
Peak SAR (extrapolated) = 32.8 W/kg
SAR(1 g) = 7.27 W/kg; SAR(10 g) = 2.07 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 7.1 mm
Ratio of SAR at M2 to SAR at M1 = 62.2%
Maximum value of SAR (measured) = 19.0 W/kg
System check 5750/Area Scan (61x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 20.0 W/kg



Plot 8

Date/Time: 12.12.2022 10.51.13

Test Laboratory: Verkotan Oy

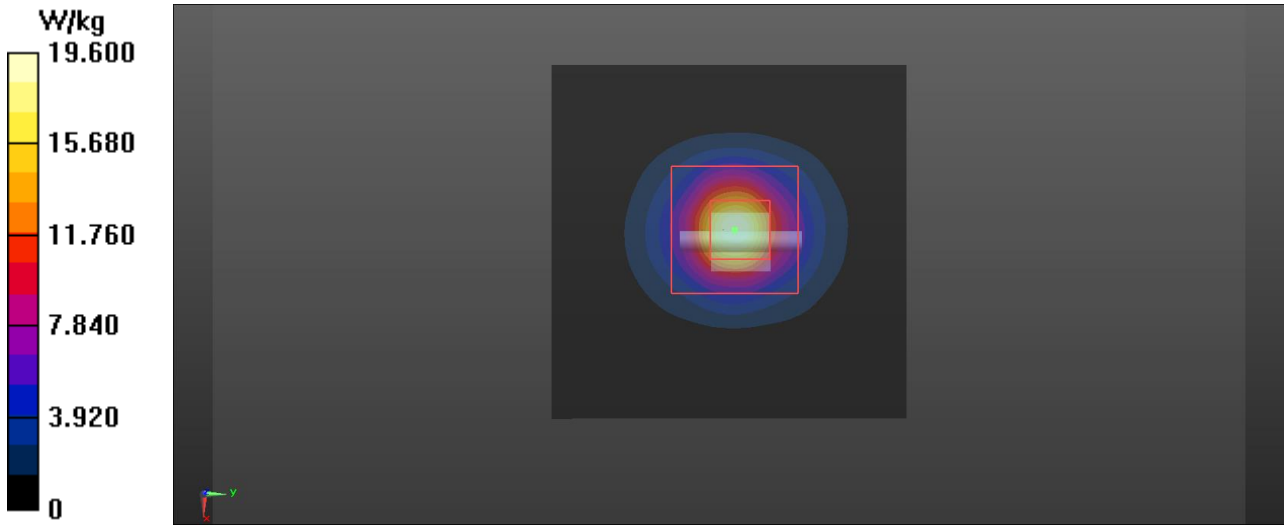
DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1014

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5600 MHz;
Communication System PAR: 0 dB;
Medium parameters used: f = 5600 MHz; σ = 4.891 S/m; ε_r = 35.088; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN3852; ConvF(4.61, 4.61, 4.61) @ 5600 MHz; Calibrated: 27.10.2022
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 25.0, -4.0
  - Electronics: DAE4 Sn710; Calibrated: 19.10.2022
  - Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx;
  - DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

System check 5600/Zoom Scan (7x7x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 69.42 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 33.0 W/kg
SAR(1 g) = 7.6 W/kg; SAR(10 g) = 2.2 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 6.5 mm
Ratio of SAR at M2 to SAR at M1 = 63.2%
Maximum value of SAR (measured) = 19.2 W/kg
System check 5600/Area Scan (61x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 19.6 W/kg



Plot 9

Date/Time: 13.12.2022 11.12.33

Test Laboratory: Verkotan Oy

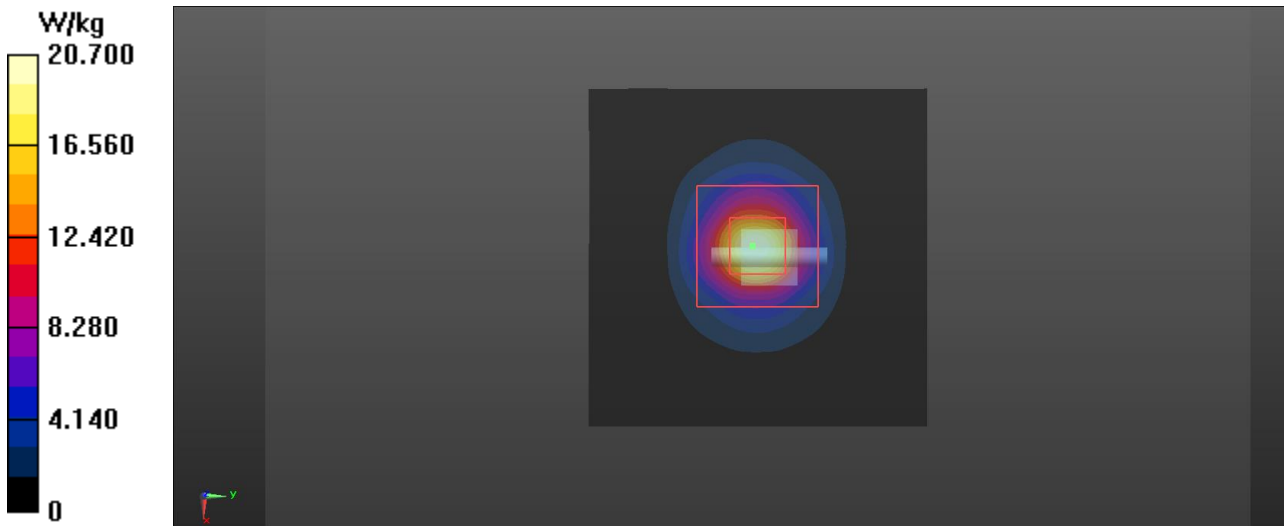
DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1014

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5600 MHz;
Communication System PAR: 0 dB;
Medium parameters used: f = 5600 MHz; σ = 4.831 S/m; ε_r = 34.742; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN3852; ConvF(4.61, 4.61, 4.61) @ 5600 MHz; Calibrated: 27.10.2022
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 25.0, -4.0
  - Electronics: DAE4 Sn710; Calibrated: 19.10.2022
  - Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx;
  - DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

System check 5600/Zoom Scan (9x9x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 71.42 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 33.5 W/kg
SAR(1 g) = 7.71 W/kg; SAR(10 g) = 2.22 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 6.4 mm
Ratio of SAR at M2 to SAR at M1 = 63.4%
Maximum value of SAR (measured) = 20.1 W/kg
System check 5600/Area Scan (61x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 20.7 W/kg



APPENDIX C: MEASUREMENT SCANS

Plot 10

Date/Time: 01.12.2022 13.53.26

Test Laboratory: Verkotan Oy

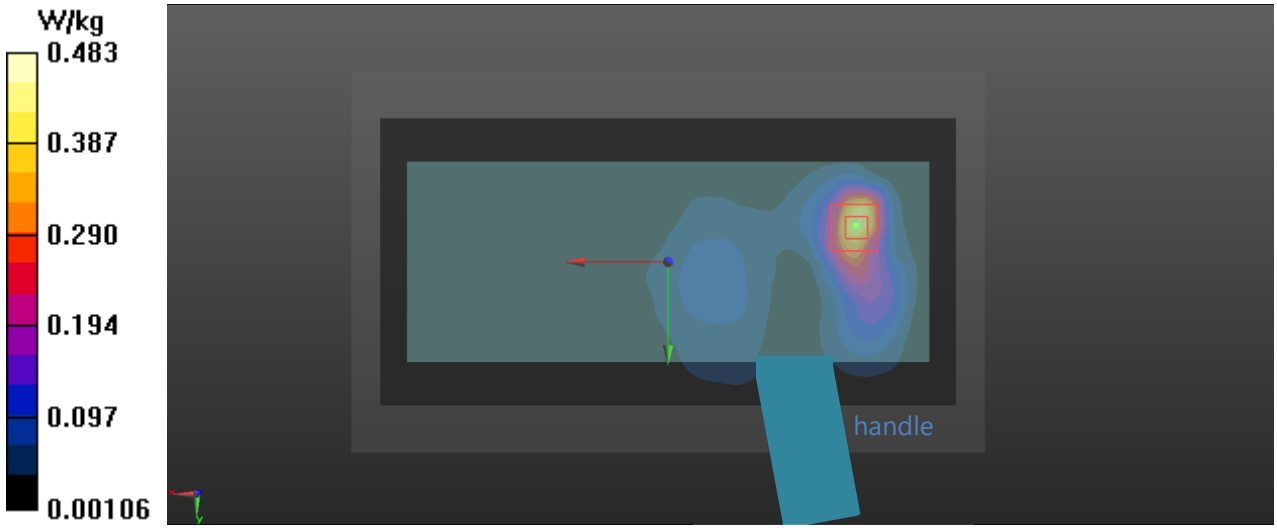
DUT: Optomed Lumo Camera

Communication System: UID 0, WLAN 2.4 (0); Communication System Band: WLAN2.4GHz; Frequency: 2462 MHz;
Communication System PAR: 0 dB;
Medium parameters used: f = 2462 MHz; σ = 1.701 S/m; ε_r = 41.451; ρ = 1000 kg/m^3
Phantom section: Center Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN3852; ConvF(7.48, 7.48, 7.48) @ 2462 MHz; Calibrated: 27.10.2022
  - 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 Sn710; Calibrated: 19.10.2022
  - Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx;
  - DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

WLAN 2.4GHz, Left, CH11/Area Scan (221x111x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.423 W/kg
WLAN 2.4GHz, Left, CH11/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.35 V/m; Power Drift = 0.33 dB
Peak SAR (extrapolated) = 0.571 W/kg
SAR(1 g) = 0.306 W/kg; SAR(10 g) = 0.148 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 9.8 mm
Ratio of SAR at M2 to SAR at M1 = 49.5%
Maximum value of SAR (measured) = 0.483 W/kg



Plot 11

Date/Time: 08.12.2022 13.11.36

Test Laboratory: Verkotan Oy

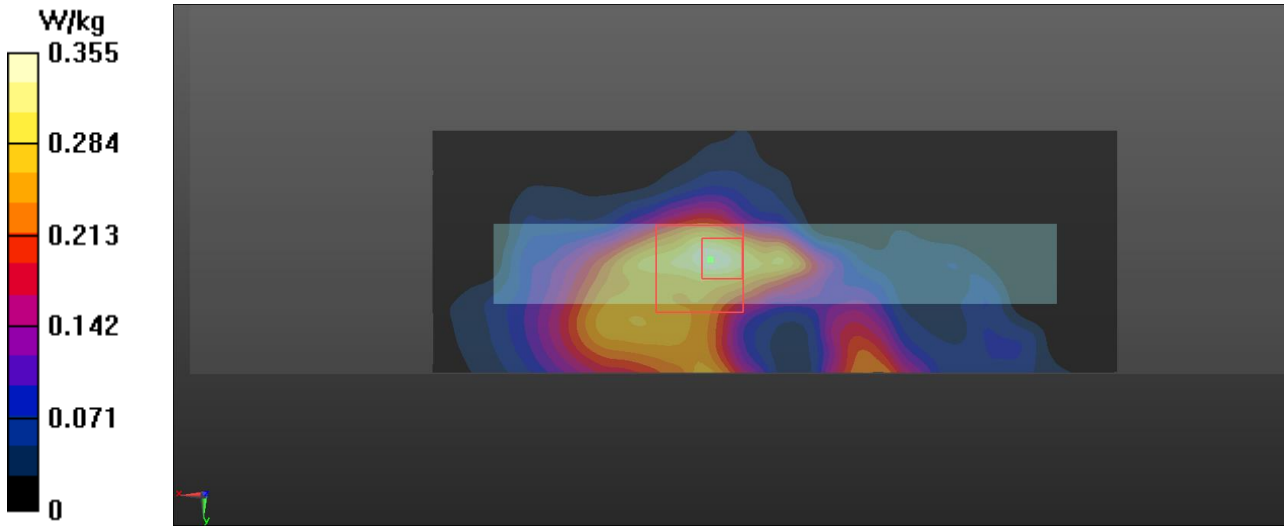
DUT: Optomed Lumo Camera

Communication System: UID 0, WLAN5GHz (0); Communication System Band: 5GHz; Frequency: 5310 MHz;
Communication System PAR: 0 dB;
Medium parameters used: f = 5310 MHz; σ = 4.589 S/m; ε_r = 36.161; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN3852; ConvF(4.9, 4.9, 4.9) @ 5310 MHz; Calibrated: 27.10.2022
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), z = 25.0, -4.0
  - Electronics: DAE4 Sn710; Calibrated: 19.10.2022
  - Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx;
  - DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

WLAN 5GHz, Bottom, CH62/Zoom Scan (12x12x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 4.631 V/m; Power Drift = 1.23 dB
Peak SAR (extrapolated) = 0.600 W/kg
SAR(1 g) = 0.122 W/kg; SAR(10 g) = 0.045 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 7.4 mm
Ratio of SAR at M2 to SAR at M1 = 67.9%
Maximum value of SAR (measured) = 0.299 W/kg
WLAN 5GHz, Bottom, CH62/Area Scan (171x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.355 W/kg



Plot 12

Date/Time: 13.12.2022 8.15.55

Test Laboratory: Verkotan Oy

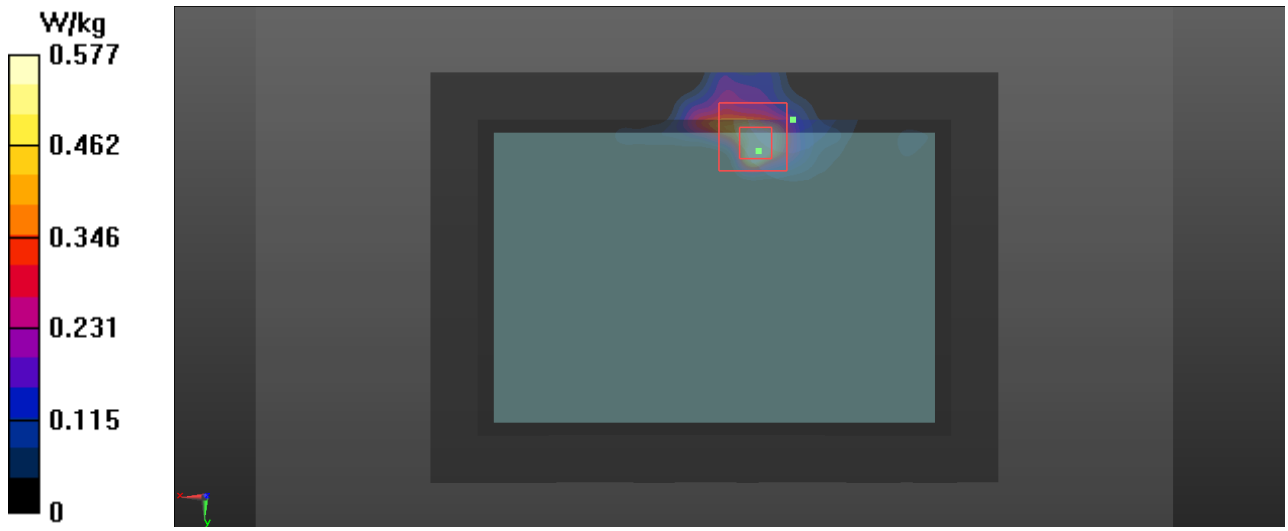
DUT: Optomed Lumo Camera

Communication System: UID 0, WLAN5GHz (0); Communication System Band: 5GHz; Frequency: 5630 MHz;
Communication System PAR: 0 dB;
Medium parameters used: f = 5630 MHz; σ = 4.928 S/m; ε_r = 35.031; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN3852; ConvF(4.61, 4.61, 4.61) @ 5630 MHz; Calibrated: 27.10.2022
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 25.0
  - Electronics: DAE4 Sn710; Calibrated: 19.10.2022
  - Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx;
  - DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

WLAN 5GHz/WLAN 5GHz, Front, CH126/Area Scan (181x131x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.784 W/kg
WLAN 5GHz/WLAN 5GHz, Front, CH126/Zoom Scan (9x9x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 3.919 V/m; Power Drift = 0.85 dB
Peak SAR (extrapolated) = 0.960 W/kg
SAR(1 g) = 0.239 W/kg; SAR(10 g) = 0.076 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 65%
Maximum value of SAR (measured) = 0.577 W/kg



Plot 13

Date/Time: 08.12.2022 15.47.34

Test Laboratory: Verkotan Oy

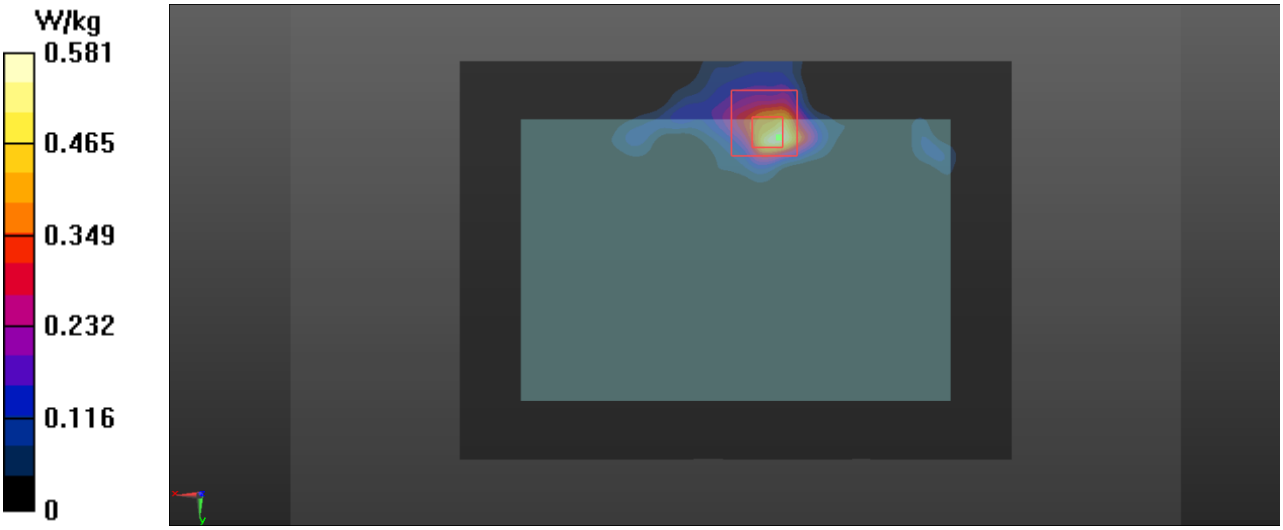
DUT: Optomed Lumo Camera

Communication System: UID 0, WLAN5GHz (0); Communication System Band: 5GHz; Frequency: 5755 MHz;
Communication System PAR: 0 dB;
Medium parameters used (interpolated): f = 5755 MHz; σ = 5.088 S/m; ε_r = 35.367; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN3852; ConvF(4.65, 4.65, 4.65) @ 5755 MHz; Calibrated: 27.10.2022
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), z = 25.0, -4.0
  - Electronics: DAE4 Sn710; Calibrated: 19.10.2022
  - Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx;
  - DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

WLAN 5GHz, Front, CH151 2/Zoom Scan (9x9x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 5.568 V/m; Power Drift = 0.92 dB
Peak SAR (extrapolated) = 0.712 W/kg
SAR(1 g) = 0.175 W/kg; SAR(10 g) = 0.052 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 6.6 mm
Ratio of SAR at M2 to SAR at M1 = 62.7%
Maximum value of SAR (measured) = 0.459 W/kg
WLAN 5GHz, Front, CH151 2/Area Scan (181x131x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.581 W/kg



APPENDIX D: RELEVANT PAGES FROM PROBE CALIBRATION REPORTS

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
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	Certificate No	EX-3852_Oct22

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3852
Calibration procedure(s)	QA CAL-01.v9, QA CAL-12.v9, QA CAL-14.v6, QA CAL-23.v5, QA CAL-25.v7 Calibration procedure for dosimetric E-field probes
Calibration date	October 27, 2022

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	04-Apr-22 (No. 217-03525/03524)	Apr-23
Power sensor NRP-Z91	SN: 103244	04-Apr-22 (No. 217-03524)	Apr-23
OCP DAK-3.5 (weighted)	SN: 1249	20-Oct-22 (OCP-DAK3.5-1249_Oct22)	Oct-23
OCP DAK-12	SN: 1016	20-Oct-22 (OCP-DAK12-1016_Oct22)	Oct-23
Reference 20 dB Attenuator	SN: CC2552 (20x)	04-Apr-22 (No. 217-03527)	Apr-23
DAE4	SN: 660	10-Oct-22 (No. DAE4-660_Oct22)	Oct-23
Reference Probe ES3DV2	SN: 3013	27-Dec-21 (No. ES3-3013_Dec21)	Dec-22

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	Michael Weber	Laboratory Technician	
Approved by	Sven Kühn	Technical Manager	

Issued: October 27, 2022

Parameters of Probe: EX3DV4 - SN:3852

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc ($k = 2$)
Norm (μV/(V/m)^2) [A]	0.41	0.39	0.46	±10.1%
DCP (mV) [B]	99.8	98.2	99.9	±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	147.5	±2.5%	±4.7%
		Y	0.00	0.00	1.00		138.0		
		Z	0.00	0.00	1.00		137.1		

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:3852

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle	126.7°
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:3852

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 ($k = 2$)
6	55.0	0.75	15.18	15.18	15.18	0.00	1.00	±13.3%
30	55.0	0.75	13.34	13.34	13.34	0.00	1.00	±13.3%
64	54.2	0.75	11.88	11.88	11.88	0.00	1.00	±13.3%
128	52.8	0.76	11.57	11.57	11.57	0.00	1.00	±13.3%
220	49.0	0.81	10.92	10.92	10.92	0.00	1.00	±13.3%
450	43.5	0.87	10.20	10.20	10.20	0.16	1.30	±13.3%
900	41.5	0.97	8.82	8.82	8.82	0.44	0.94	±12.0%
1300	40.8	1.14	8.54	8.54	8.54	0.27	1.22	±12.0%
1450	40.5	1.20	8.63	8.63	8.63	0.39	0.80	±12.0%
1640	40.2	1.31	8.33	8.33	8.33	0.34	0.90	±12.0%
1810	40.0	1.40	7.90	7.90	7.90	0.38	0.90	±12.0%
1900	40.0	1.40	7.72	7.72	7.72	0.36	0.90	±12.0%
2450	39.2	1.80	7.48	7.48	7.48	0.41	0.90	±12.0%
3300	38.2	2.71	6.85	6.85	6.85	0.30	1.30	±13.1%
3500	37.9	2.91	6.83	6.83	6.83	0.30	1.35	±13.1%
3700	37.7	3.12	6.65	6.65	6.65	0.30	1.35	±13.1%
3900	37.5	3.32	6.38	6.38	6.38	0.40	1.60	±13.1%
4100	37.2	3.53	6.19	6.19	6.19	0.40	1.60	±13.1%
5250	35.9	4.71	4.90	4.90	4.90	0.40	1.80	±13.1%
5600	35.5	5.07	4.61	4.61	4.61	0.40	1.80	±13.1%
5750	35.4	5.22	4.65	4.65	4.65	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 E: RELEVANT PAGES FROM DIPOLE CALIBRATION REPORTS

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
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** Certificate No: **D2450V2-729_Jul22**

CALIBRATION CERTIFICATE

Object	D2450V2 - SN:729
Calibration procedure(s)	QA CAL-05.v11 Calibration Procedure for SAR Validation Sources between 0.7-3 GHz
Calibration date:	July 15, 2022

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	04-Apr-22 (No. 217-03525/03524)	Apr-23
Power sensor NRP-Z91	SN: 103244	04-Apr-22 (No. 217-03524)	Apr-23
Power sensor NRP-Z91	SN: 103245	04-Apr-22 (No. 217-03525)	Apr-23
Reference 20 dB Attenuator	SN: BH9394 (20k)	04-Apr-22 (No. 217-03527)	Apr-23
Type-N mismatch combination	SN: 310982 / 06327	04-Apr-22 (No. 217-03528)	Apr-23
Reference Probe EX3DV4	SN: 7349	31-Dec-21 (No. EX3-7349_Dec21)	Dec-22
DAE4	SN: 601	02-May-22 (No. DAE4-601_May22)	May-23

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: MY41093315	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-22

	Name	Function	Signature
Calibrated by:	Aidonia Georgiadou	Laboratory Technician	
Approved by:	Niels Kuster	Quality Manager	

Issued: July 19, 2022

Measurement Conditions

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

DASY Version	DASY52	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	37.9 ± 6 %	1.85 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	13.4 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.3 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.21 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.5 W/kg ± 16.5 % (k=2)**

SAR Reference Dipole Calibration Report

Ref : ACR.84.7.20.MVGB.A

VERKOTAN LTD.
ELEKTRONIIKKATIE 17
90590, OULU, FINLAND
SAR REFERENCE DIPOLE
FREQUENCY: 5000 MHZ
SERIAL NO.: SN 1014

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

Calibration date: 03/23/2020

ilac-MRA cofrac ETALONNAGE

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

0.0Summary:

This document presents the method and results from an accredited SAR reference dipole calibration performed at MVG, using the COMOSAR test bench. The test results covered by accreditation are traceable to the International System of Units (SI).

SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.84.7.20.MVGB.A

	Name	Function	Date	Signature
Prepared by :	Jérôme LUC	Technical Manager	3/24/2020	
Checked by :	Jérôme LUC	Technical Manager	3/24/2020	
Approved by :	Yann Toutain	Laboratory Director	3/24/2020	

	Customer Name
Distribution :	Verkotan Ltd.

Issue	Name	Date	Modifications
A	Jérôme LUC	3/24/2020	Initial release

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3000	41.5 ±1 %.		25.0 ±1 %.		3.6 ±1 %.	
3500	37.0±1 %.		26.4 ±1 %.		3.6 ±1 %.	
3700	34.7±1 %.		26.4 ±1 %.		3.6 ±1 %.	
5000-6000	20.6±1 %.	-	40.3 ±1 %.	-	d1 - 3.6 ±1 %. d2 – 2.1 ±1 %.	-

7 VALIDATION MEASUREMENT

The IEEE Std. 1528, FCC KDBs and CEI/IEC 62209 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.

7.1 MEASUREMENT CONDITION

Software	OPENSAR V5
Phantom	SN 13/09 SAM68
Probe	SN 41/18 EPGO333
Liquid	Head Liquid Values 5250 MHz: eps' :35.64 sigma : 4.67 Head Liquid Values 5600 MHz: eps' :36.66 sigma : 5.17 Head Liquid Values 5750 MHz: eps' :35.31 sigma : 5.21
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=4mm/dy=4m/dz=2mm
Frequency	5250 MHz 5600 MHz 5750 MHz
Input power	20 dBm
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-80 %

7.2 HEAD LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ε_r')		Conductivity (σ) S/m	
	required	measured	required	measured
300	45.3 ±10 %		0.87 ±10 %	
450	43.5 ±10 %		0.87 ±10 %	
750	41.9 ±10 %		0.89 ±10 %	
835	41.5 ±10 %		0.90 ±10 %	
900	41.5 ±10 %		0.97 ±10 %	
1450	40.5 ±10 %		1.20 ±10 %	
1500	40.4 ±10 %		1.23 ±10 %	
1640	40.2 ±10 %		1.31 ±10 %	
1750	40.1 ±10 %		1.37 ±10 %	
1800	40.0 ±10 %		1.40 ±10 %	

3000	41.5 ±1 %.		25.0 ±1 %.		3.6 ±1 %.	
3500	37.0±1 %.		26.4 ±1 %.		3.6 ±1 %.	
3700	34.7±1 %.		26.4 ±1 %.		3.6 ±1 %.	
5000-6000	20.6±1 %.	-	40.3 ±1 %.	-	d1 - 3.6 ±1 %. d2 – 2.1 ±1 %.	-

7 VALIDATION MEASUREMENT

The IEEE Std. 1528, FCC KDBs and CEI/IEC 62209 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.

7.1 MEASUREMENT CONDITION

Software	OPENSAR V5
Phantom	SN 13/09 SAM68
Probe	SN 41/18 EPGO333
Liquid	Head Liquid Values 5250 MHz: eps' :35.64 sigma : 4.67 Head Liquid Values 5600 MHz: eps' :36.66 sigma : 5.17 Head Liquid Values 5750 MHz: eps' :35.31 sigma : 5.21
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=4mm/dy=4m/dz=2mm
Frequency	5250 MHz 5600 MHz 5750 MHz
Input power	20 dBm
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-80 %

7.2 HEAD LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ε_r')		Conductivity (σ) S/m	
	required	measured	required	measured
300	45.3 ±10 %		0.87 ±10 %	
450	43.5 ±10 %		0.87 ±10 %	
750	41.9 ±10 %		0.89 ±10 %	
835	41.5 ±10 %		0.90 ±10 %	
900	41.5 ±10 %		0.97 ±10 %	
1450	40.5 ±10 %		1.20 ±10 %	
1500	40.4 ±10 %		1.23 ±10 %	
1640	40.2 ±10 %		1.31 ±10 %	
1750	40.1 ±10 %		1.37 ±10 %	
1800	40.0 ±10 %		1.40 ±10 %	

1900	40.0 ±10 %		1.40 ±10 %	
1950	40.0 ±10 %		1.40 ±10 %	
2000	40.0 ±10 %		1.40 ±10 %	
2100	39.8 ±10 %		1.49 ±10 %	
2300	39.5 ±10 %		1.67 ±10 %	
2450	39.2 ±10 %		1.80 ±10 %	
2600	39.0 ±10 %		1.96 ±10 %	
3000	38.5 ±10 %		2.40 ±10 %	
3500	37.9 ±10 %		2.91 ±10 %	
5000	36.2 ±10 %		4.45 ±10 %	
5100	36.1 ±10 %		4.56 ±10 %	
5200	36.0 ±10 %		4.66 ±10 %	
5300	35.9 ±10 %		4.76 ±10 %	
5400	35.8 ±10 %		4.86 ±10 %	
5500	35.6 ±10 %		4.97 ±10 %	
5600	35.5 ±10 %	36.66	5.07 ±10 %	5.17
5700	35.4 ±10 %		5.17 ±10 %	
5800	35.3 ±10 %		5.27 ±10 %	
5900	35.2 ±10 %		5.38 ±10 %	
6000	35.1 ±10 %		5.48 ±10 %	

7.3 MEASUREMENT RESULT

The IEEE Std. 1528 and CEI/IEC 62209 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.

Frequency MHz	1 g SAR (W/kg/W)		10 g SAR (W/kg/W)	
	required	measured	required	measured
300	2.85		1.94	
450	4.58		3.06	
750	8.49		5.55	
835	9.56		6.22	
900	10.9		6.99	
1450	29		16	
1500	30.5		16.8	
1640	34.2		18.4	
1750	36.4		19.3	
1800	38.4		20.1	

1900	39.7		20.5	
1950	40.5		20.9	
2000	41.1		21.1	
2100	43.6		21.9	
2300	48.7		23.3	
2450	52.4		24	
2600	55.3		24.6	
3000	63.8		25.7	
3500	67.1		25	
5200	76.5		21.6	
5250	-	77.65 (7.77)	-	22.22 (2.22)
5500	83.3		23.4	
5600	-	83.31 (8.33)	-	24.02 (2.40)
5750	-	75.18 (7.52)	-	21.96 (2.20)
5800	78.0		21.9	