SAR Compliance Test Report

Date of Report	4/01/2023	**Client's Contact person:**	Rauno Nikkilä
Number of pages:	47	**Responsible Test engineer:**	Kalle Orava
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Tested device	HH83, Model 837-1A		
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** 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 5** Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus		
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: 04.01.2023

For the contents:

Miia Nurkkala

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Laboratory Manager

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1. SUMMARY OF SAR TEST REPORT

1.1 Test Details

Device under Test (DUT):

Product:	Nordic ID HH83 Barcode
Manufacturer:	Nordic ID
SN Number:	K223202594 (SAR sample), K223202597 (conducted sample)
FCC/ISED ID Number:	FCC ID: SCC8371A, IC: 5137A-8371A
Model:	837-1A
DUT Number:	21546 (SAR sample), 21545 (conducted sample)
Battery Type used in testing:	Lithium-ion battery PA_UL-LNB46.R001
Portable/ Mobile device	Portable
State of the Sample	Production sample

Testing information:

Testing Performed:	17.10.2022 - 19.10.2022, 14.12.2022 – 21.12.2022
Notes:	-
Document ID:	FCC_SAR report_HH83_ID5950_29122022
Temperature °C	22±2 / Controlled
Humidity RH%	20±20 / Controlled
Measurement performed by:	Kalle Orava, Jesper Varis
FCC Test Firm Designation number	FI0005
ISED Company Number	22218

1.2 Maximum Results

The maximum reported* SAR value for body worn and head 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) for body worn and head SAR_{1g} is 1.6 W/kg.

1.2.1 Standalone SAR Results

System	Equipment Class	Highest Reported* SAR_{1g}(W/kg) in Body-Worn Configuration, 0mm separation distance	Highest Reported* SAR_{1g}(W/kg) in Head Exposure Configuration	Result
WLAN 2.4GHz	**NII**	**0.68**	**0.19**	**PASS**
WLAN 5GHz	**NII**	**1.14**	**0.24**	**PASS**
Bluetooth	**DSS**	**0.08**	**0.03**	**PASS**

* Reported SAR Values are scaled to maximum theoretical output power.

1.2.2 Maximum Drift

Maximum Drift During Measurements	0.78 dB*

*Drifts >5% have been considered in the scaling factor

1.2.3 Measurement Uncertainty

0.3-3GHz

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

3-6GHz

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

2. DESCRIPTION OF THE DEVICE UNDER TEST (DUT)

The device is a data collector which uses barcode reading. Device can transmit via WLAN or Bluetooth.

Device Category	Portable
Exposure Environment	Uncontrolled

2.1 Supported Frequency Bands and Operational Modes

	Modes of Operation	**Transmitter Frequency Range (MHz)**
TX Frequency bands	2.4GHz WLAN	2412-2484
	5GHz WLAN	5180-5825
	Bluetooth, BLE	2402-2480

3. OUTPUT POWER

3.1.1 Maximum Output Power 2.4 GHz

From a Customer, maximum defined output power:

Mode	Frequency [MHz]	Max Output Power [dBm] GRANT XMR201911SC600WF	Max Output Power [dBm] Test Report R1910A0590-R1&R2
WLAN 2.4GHz b	2412 - 2462	16.33	16.37
WLAN 2.4GHz g	2412 - 2462	16.33	15.23
WLAN 2.4GHz n	2412 - 2462	16.33	14.39
Bluetooth	2402-2480	11.46	11.46

For the Grant of the equipment the following WLAN power indexes were used. The same indexes were used in SAR testing and considered as the maximum specified output power for test reduction purposes. SAR results are scaled to the maximum power values of the grant of the equipment.

Single Antenna Power Index			
Packet Type	**CH1**	**CH6**	**CH11**
802.11b	16	16	16
802.11g	16	16	16
802.11n HT20	15	15	15
Packet Type	**CH3**	**CH6**	**CH9**
802.11n HT40	14	14	14

3.1.2 Maximum Output Power 5GHz

Mode	Frequency [MHz]	Max Output Power [dBm] GRANT XMR201911SC600WF	Max Output Power [dBm] Test Report R1910A0590-R3
WLAN 5GHz a	5180 – 5240	13.80	13.32
WLAN 5GHz a	5260 – 5320	13.80	13.13
WLAN 5GHz a	5500 – 5700	13.42	13.08
WLAN 5GHz a	5745 - 5825	12.55	12.39
WLAN 5GHz n HT20	5180 – 5240	13.80	13.50
WLAN 5GHz n HT20	5260 – 5320	13.80	13.35
WLAN 5GHz n HT20	5500 – 5700	13.42	13.05
WLAN 5GHz n HT20	5745 - 5825	12.55	12.27
WLAN 5GHz n HT40	5190 – 5230	13.80	13.21
WLAN 5GHz n HT40	5270 – 5310	13.80	13.24
WLAN 5GHz n HT40	5510 – 5670	13.42	13.21
WLAN 5GHz n HT40	5755 - 5795	12.55	12.36
WLAN 5GHz ac HT20	5180 – 5240	13.80	13.24
WLAN 5GHz ac HT20	5260 – 5320	13.80	13.17
WLAN 5GHz ac HT20	5500 – 5700	13.42	13.33
WLAN 5GHz ac HT20	5745 - 5825	12.55	12.46
WLAN 5GHz ac HT40	5190 – 5230	13.80	13.16

WLAN 5GHz ac HT40	5270 – 5310	13.80	13.12
WLAN 5GHz ac HT40	5510 – 5670	13.42	13.32
WLAN 5GHz ac HT40	5755 - 5795	12.55	12.25
WLAN 5GHz ac HT80	5210	13.80	12.67
WLAN 5GHz ac HT80	5290	13.80	13.00
WLAN 5GHz ac HT80	5530	13.42	12.93
WLAN 5GHz ac HT80	5775	12.55	12.05

For the Grant of the equipment the following WLAN power indexes were used. The same indexes were used in SAR testing and considered as the maximum specified output power for test reduction purposes. SAR results are scaled to the maximum power values of the grant of the equipment.

	Single Antenna Power Index											
Packet Type	CH36	CH44	CH48	CH52	CH60	CH64	CH100	CH116	CH140	CH149	CH157	CH165
802.11a	13	13	13	13	13	13	13	13	13	13	13	13
802.11n HT20	13	13	13	13	13	13	13	13	13	13	13	13
802.11ac VHT20	13	13	13	13	13	13	13	13	13	13	13	13
Packet Type	CH38	CH46	CH54	CH62	CH102	CH110	CH134	CH151	CH159	/	/	/
802.11n HT40	13	13	13	13	13	13	13	13	13	/	/	/
802.11ac VHT40	13	13	13	13	13	13	13	13	13	/	/	/
Packet Type	CH42	CH58	CH106	CH155	/	/	/	/	/	/	/	/
802.11ac VHT80	12	12	12	12	/	/	/	/	/	/	/	/

3.2 Tested conducted power

Measured conducted output power at transmitting antenna connector.

2.4GHz WLAN:

Standard	Transmission mode	Data rate [Mbps]	Output power [dBm]		
			CH 1 2412 MHz	CH 6 2437 MHz	CH 11 2462 MHz
802.11b	DSSS	1	15.85	15.76	16.15

Bluetooth:

Standard	Output power [dBm]		
	CH 0 2402 MHz	CH 39 2441 MHz	CH 78 2480 MHz
BT	11.18	11.45	10.76

5GHz WLAN:

Standard	Channel	Frequency [MHz]	Transmission mode	Data rate [Mbps]	Output power [dBm]
802.11n HT40	54	5270	OFDM	13.5 (MCS0)	13.54
802.11n HT40	62	5310			13.26
802.11n HT40	102	5510			12.34
802.11n HT40	110	5550			12.24
802.11n HT40	118	5590			12.08
802.11n HT40	126	5630			11.94
802.11n HT40	134	5670			11.87
802.11n HT40	142	5710			11.85
802.11n HT40	151	5755			11.81
802.11n HT40	159	5795			11.68

4. TEST EQUIPMENT

Dasy52 near field scanning systems, manufactured by SPEAG were 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.

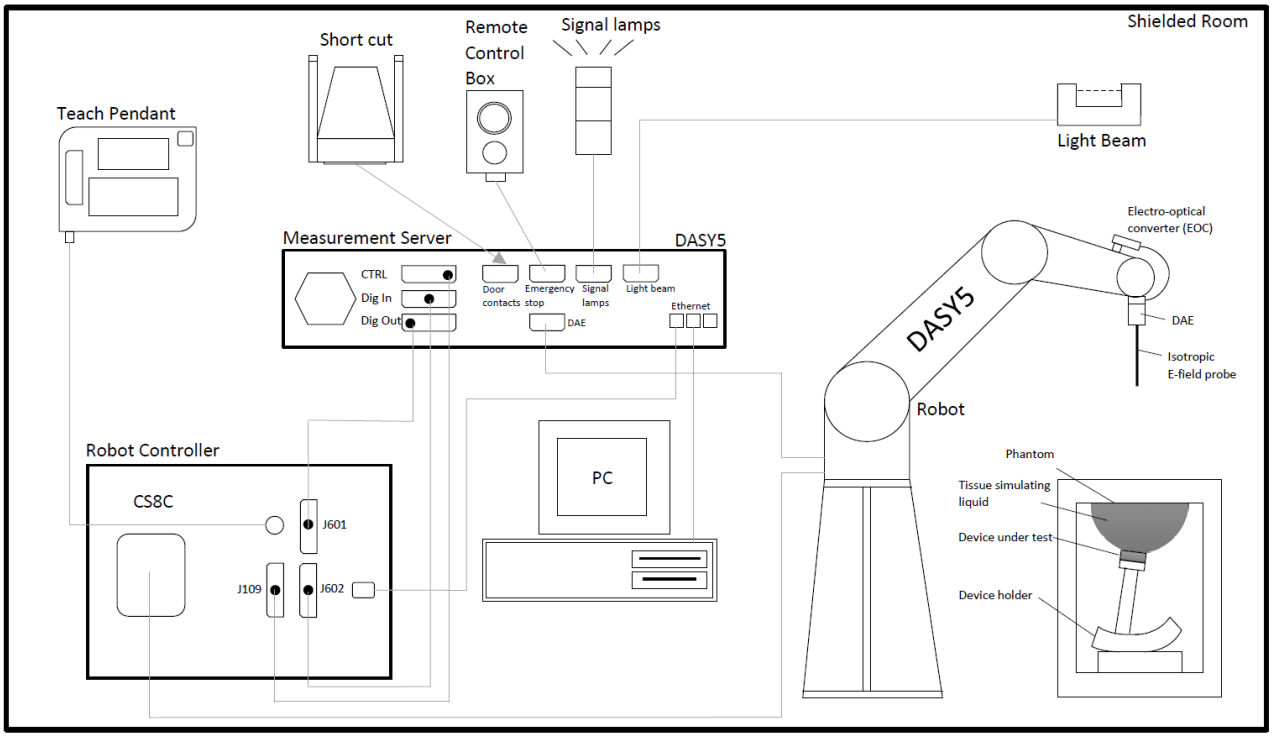


Figure 1 Schematic Laboratory Picture

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	705	04.2022
Probe	EX3DV4	7447	02.2022
Dipole	D2450V2	729	06.2022
Dipole	D5GHZV2	1014	03.2020
DASY5 Software	52.8.8.1258	-	NA
Signal generator	MG3710A	6261911026	02.2022
Signal generator	MG3710E	6262028676	NA
Amplifier	10S1G4A	320421	NA
Amplifier	Ophir 5163F	1022	NA
Amplifier	5GHz	NA	NA
Power Sensor	Anritsu MA24105A	2102058	11.2022
Power Sensor	NRP-Z11	100265	12.2021

Dipole calibration period supporting data:

		Measured on 09/2021			Calibrated		
Dipole and serial number	**Frequency [MHz]**	**Return loss [dB]**	**Impedance [Ω]**		**Return loss [dB]**	**Impedance [Ω]**	
D5GHzV2 - SN: 1014	5250	-26.5	53.2	-3.7	-25.81	52.5	-4.4
D5GHzV2 - SN: 1014	5600	-25.3	46.2	-3.7	-21.7	49	-8.1
D5GHzV2 - SN: 1014	5750	-22.5	45.9	5.9	-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 Tip diameter: 2.5 mm Distance from probe tip to dipole centers: 1.0 mm
Application	General dosimetry up to 6 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms

4.2 Phantoms

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.

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 frequencies under 3GHz and ±5% at frequencies above 3GHz. 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.

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

4.4 System Validation Status

Frequency [MHz]	Dipole Type / SN	Probe Type / SN	Calibrated Signal Type	DAE Unit / SN	Dielectric Constant [ε] Head tissue simulant	Conductivity σ [S/m] Head tissue simulant	Validation Done
							Head tissue simulant
2450	D2450V2 - SN: 729	EX3DV4 - SN: 7447	CW	DAE 4 / 1332	37.82	1.79	03/2022
5250	D5GHzV2 - SN: 1014	EX3DV4 - SN: 7447	CW	DAE 4 / 1332	35.42	4.64	03/2022
5600	D5GHzV2 - SN: 1014	EX3DV4 - SN: 7447	CW	DAE 4 / 1332	34.77	5.03	03/2022
5750	D5GHzV2 - SN: 1014	EX3DV4 - SN: 7447	CW	DAE 4 / 1332	34.5	5.2	03/2022

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 1g [%]	Plot #
17.10.2022	WB Head	21	2450	250	13.1	52.3	52.4	0.19	1
18.10.2022	WB Head	21	5250	100	7.05	77.65	70.5	-9.21	2
18.10.2022	WB Head	21	5600	100	8.34	83.31	83.4	0.11	3
18.08.2022	WB Head	21	5750	100	8.2	75.18	82	9.07	4
23.11.2022	WB Head	21	2450	250	12.1	52.3	48.4	-7.46	5
14.12.2022	WB Head	22	2450	250	12.3	52.3	49.2	-5.93	6
19.12.2022	WB Head	22	2450	250	11.9	52.3	47.6	-9.0	7
19.12.2022	WB Head	22	5250	250	7.17	77.65	71.7	-7.7	8
19.12.2022	WB Head	22	5600	250	8.75	83.31	87.5	5.0	9
20.12.2022	WB Head	22	5750	250	7.54	75.18	75.4	0.3	10

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 [%]**
17.10.2022	WB Head	21.9	2412.0	39.27	1.77	39.85	1.77	1.5	0.4
17.10.2022	WB Head	21.9	2437.0	39.22	1.79	39.8	1.79	1.5	0.2
17.10.2022	WB Head	21.9	2450.0	39.2	1.8	39.78	1.8	1.5	0.1
17.10.2022	WB Head	21.9	2462.0	39.18	1.81	39.76	1.81	1.5	0.0
18.10.2022	WB Head	21.9	5250.0	35.95	4.71	35.45	4.52	-1.4	-4.1
18.10.2022	WB Head	21.9	5270.0	35.93	4.73	35.4	4.54	-1.5	-4.1
18.10.2022	WB Head	21.9	5310.0	35.89	4.77	35.33	4.58	-1.6	-3.9
18.10.2022	WB Head	21.9	5510.0	35.63	4.98	34.97	4.8	-1.9	-3.5
18.10.2022	WB Head	21.9	5600.0	35.5	5.07	34.82	4.9	-1.9	-3.3
18.10.2022	WB Head	21.9	5630.0	35.47	5.1	34.76	4.94	-2.0	-3.1
18.10.2022	WB Head	21.9	5710.0	35.39	5.18	34.63	5.03	-2.2	-2.8
18.10.2022	WB Head	21.9	5750.0	35.35	5.22	34.55	5.08	-2.3	-2.7
18.10.2022	WB Head	21.9	5755.0	35.34	5.22	34.54	5.09	-2.3	-2.6
18.10.2022	WB Head	21.9	5795.0	35.3	5.26	34.47	5.13	-2.4	-2.5
23.11.2022	WB Head	22	2402.0	39.28	1.76	42.44	1.69	8.0	-3.7
23.11.2022	WB Head	22	2441.0	39.22	1.79	42.37	1.72	8.1	-4.0
23.11.2022	WB Head	22	2450.0	39.2	1.8	42.35	1.73	8.0	-4.1
23.11.2022	WB Head	22	2480.0	39.16	1.83	42.32	1.75	8.1	-4.7
14.12.2022	WB Head	22	2402	39.29	1.76	41.54	1.81	5.7	3.2
14.12.2022	WB Head	22	2412	39.27	1.77	41.53	1.82	5.8	3.1
14.12.2022	WB Head	22	2437	39.22	1.79	41.48	1.84	5.8	2.9
14.12.2022	WB Head	22	2441	39.22	1.79	41.48	1.84	5.8	2.8
14.12.2022	WB Head	22	2450	39.2	1.8	41.46	1.85	5.8	2.8
14.12.2022	WB Head	22	2462	39.18	1.81	41.44	1.86	5.8	2.6
14.12.2022	WB Head	22	2480	39.16	1.83	41.42	1.87	5.8	2.3
16.12.2022	WB Head	22	2402	39.28	1.76	40.48	1.77	3.0	0.9
16.12.2022	WB Head	22	2412	39.27	1.77	40.46	1.78	3.0	0.9
16.12.2022	WB Head	22	2437	39.22	1.79	40.42	1.8	3.0	0.7
16.12.2022	WB Head	22	2441	39.22	1.79	40.41	1.8	3.0	0.7
16.12.2022	WB Head	22	2450	39.2	1.8	40.39	1.81	3.0	0.6
16.12.2022	WB Head	22	2462	39.18	1.81	40.38	1.82	3.0	0.4
16.12.2022	WB Head	22	2480	39.16	1.83	40.35	1.83	3.0	-0.0
19.12.2022	WB Head	22	2402	39.28	1.76	40.53	1.74	3.2	-1.2
19.12.2022	WB Head	22	2412	39.27	1.77	40.51	1.74	3.2	-1.2
19.12.2022	WB Head	22	2437	39.22	1.79	40.47	1.76	3.2	-1.4
19.12.2022	WB Head	22	2441	39.22	1.79	40.47	1.77	3.2	-1.4
19.12.2022	WB Head	22	2450	39.2	1.8	40.46	1.77	3.2	-1.5
19.12.2022	WB Head	22	2462	39.18	1.81	40.44	1.78	3.2	-1.7
19.12.2022	WB Head	22	2480	39.16	1.83	40.42	1.79	3.2	-2.0
19.12.2022	WB Head	22	5250	35.95	4.71	36.89	4.58	2.6	-2.9
19.12.2022	WB Head	22	5270	35.93	4.73	36.84	4.6	2.5	-2.8
19.12.2022	WB Head	22	5310	35.89	4.77	36.78	4.65	2.5	-2.6
19.12.2022	WB Head	22	5510	35.63	4.98	36.42	4.87	2.2	-2.2
19.12.2022	WB Head	22	5600	35.5	5.07	36.25	4.98	2.1	-1.8
19.12.2022	WB Head	22	5630	35.47	5.1	36.2	5.01	2.1	-1.8
19.12.2022	WB Head	22	5710	35.39	5.18	36.06	5.1	1.9	-1.5
20.12.2022	WB Head	22	5750	35.35	5.22	35.93	5.2	1.7	-0.3
20.12.2022	WB Head	22	5755	35.34	5.23	35.93	5.21	1.7	-0.3
20.12.2022	WB Head	22	5795	35.3	5.26	35.86	5.26	1.6	-0.2

5. TEST PROCEDURE

Testing was carried out in accordance with FCC KDB Publications 447498 D04, 248227 D01 and Industry Canada RSS-102.

For WLAN and Bluetooth transmission, a control software was used to set the DUT to transmit at maximum power and maximum duty cycle.

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 1Mbps.

Photos of the test positions are presented in Appendix A.

5.1 Scan Procedures

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

5.2 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%
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	±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%
Δ_{sys}	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%
$LIQ(T_\sigma)$	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 (±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						±11.0%	±10.9%
U	**Expanded Uncertainty**						±22.1%	±21.9%

Table 6.9.1: Worst-Case uncertainty budget for DASY6 assessed according to IEC/IEEE 62209-1528 [4]. The budget is valid for the frequency range 300MHz - 3GHz and represents a worst-case analysis. For specific tests and configurations, the uncertainty could be considerable smaller. All listed error components have v_{eff} equal to ∞.

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%

Table 6.9.2: Worst-Case uncertainty budget for DASY6 assessed according to IEC/IEEE 62209-1528 [4]. The budget is valid for the frequency range 3GHz - 6GHz and represents a worst-case analysis. For specific tests and configurations, the uncertainty could be considerable smaller. All listed error components have v_{eff} equal to ∞.

7. TEST RESULTS

7.1 SAR Results for body worn Configuration

WLAN 2.4GHz, 0mm separation distance:

Mode	Freq [MHz]	Channel	Data Rate	Test position	Maximum Power [dBm]	Conducted Power [dBm]	Measured SAR1g [W/kg]	Power Drift [dB]*	Scaling Factor	Duty Cycle	Reported SAR1g [W/kg]	Plot #
802.11b	2462	11	MCS 0, 1 mbps	front 0mm	16.33	16.15	0.19	0.53	1.18	1:1	0.23	
802.11b	2462	11	MCS 0, 1 mbps	back 0mm	16.33	16.15	0.07	0.60	1.20	1:1	0.08	
802.11b	2462	11	MCS 0, 1 mbps	left 0mm	16.33	16.15	0.54	-0.23	1.10	1:1	0.59	
802.11b	2412	1	MCS 0, 1 mbps	left 0mm	16.33	15.85	0.29	-0.12	1.12	1:1	0.33	
802.11b	2437	6	MCS 0, 1 mbps	left 0mm	16.33	15.76	0.59	-0.04	1.14	1:1	0.68	11

*Larger than 5% drifts included to scaling factors

Bluetooth, 0mm separation distance

Mode	Packet type	Freq [MHz]	Channel	Test position	Maximum Power [dBm]	Conducted Power [dBm]	Measured SAR1g [W/kg]	Power Drift [dB]	Scaling Factor	Duty Cycle	Reported SAR1g [W/kg]	Plot #
Bluetooth	DH5	2441	39	front 0mm	11.46	11.45	0.03	-0.14	1.00	1:1	0.03	
Bluetooth	DH5	2441	39	back 0mm	11.46	11.45	0.0000022	0.0*	1.00	1:1	0.0000022	
Bluetooth	DH5	2441	39	left 0mm	11.46	11.45	0.08	-0.21	1.00	1:1	0.08	12
Bluetooth	DH5	2402	0	left 0mm	11.46	11.18	0.04	0.09	1.07	1:1	0.04	
Bluetooth	DH5	2480	78	left 0mm	11.46	10.76	0.04	0.03	1.17	1:1	0.05	

*Due to low e-field generated by DUT at the location of drift measurement, the measurements are not applicable

WLAN 5GHz, 0mm separation distance:

Mode	Freq [MHz]	Channel	Data Rate	Test position	Maximum Power [dBm]	Conducted Power [dBm]	Measured SAR1g [W/kg]	Power Drift [dB]*	Scaling Factor	Duty Cycle	Reported SAR1g [W/kg]	Plot #
802.11n HT40	5270	54	40 MHz MCS 0, 13.5Mbps	front 0mm	13.80	13.54	0.27	-0.02	1.06	1:1	0.29	
802.11n HT40	5270	54	40 MHz MCS 0, 13.5Mbps	back 0mm	13.80	13.54	0.18	0.25	1.13	1:1	0.21	
802.11n HT40	5270	54	40 MHz MCS 0, 13.5Mbps	left 0mm	13.80	13.54	0.92	-0.10	1.06	1:1	0.97	
802.11n HT40	5270	54	40 MHz MCS 0, 13.5Mbps	left 0mm, repeat	13.80	13.54	1.01	0.28	1.13	1:1	1.14	13
802.11n HT40	5310	62	40 MHz MCS 0, 13.5Mbps	left 0mm	13.80	13.26	0.90	0.31	1.22	1:1	1.09	
802.11n HT40	5310	62	40 MHz MCS 0, 13.5Mbps	left 0mm, repeat	13.80	13.26	0.90	-0.01	1.13	1:1	1.02	
802.11n HT40	5510	102	40 MHz MCS 0, 13.5Mbps	front 0mm	13.42	12.34	0.14	0.24	1.36	1:1	0.19	
802.11n HT40	5510	102	40 MHz MCS 0, 13.5Mbps	back 0mm	13.42	12.34	0.09	-0.06	1.28	1:1	0.11	
802.11n HT40	5510	102	40 MHz MCS 0, 13.5Mbps	left 0mm	13.42	12.34	0.47	0.31	1.38	1:1	0.65	14
802.11n HT40	5630	126	40 MHz MCS 0, 13.5Mbps	left 0mm	13.42	11.94	0.33	0.42	1.55	1:1	0.51	
802.11n HT40	5710	142	40 MHz MCS 0, 13.5Mbps	left 0mm	12.55	11.85	0.30	0.44	1.30	1:1	0.39	
802.11n HT40	5755	151	40 MHz MCS 0, 13.5Mbps	front 0mm	12.55	11.81	0.09	-0.24	1.25	1:1	0.11	
802.11n HT40	5755	151	40 MHz MCS 0, 13.5Mbps	back 0mm	12.55	11.81	0.04	-0.10	1.19	1:1	0.05	
802.11n HT40	5755	151	40 MHz MCS 0, 13.5Mbps	left 0mm	12.55	11.81	0.30	0.22	1.25	1:1	0.38	
802.11n HT40	5795	159	40 MHz MCS 0, 13.5Mbps	left 0mm	12.55	11.68	0.31	0.22	1.29	1:1	0.39	15

*Larger than 5% drifts included to scaling factors

7.2 SAR Results for Head Exposure Configuration

WLAN 2.4 GHz:

Mode	Freq [MHz]	Channel	Data Rate	Test position	Maximum Power [dBm]	Conducted Power [dBm]	Measured SAR1g [W/kg]	Power Drift [dB]*	Scaling Factor	Duty Cycle	Reported SAR1g [W/kg]	Plot #
802.11b	2462	11	MCS 0, 1 mbps	Left Cheek	16.33	16.15	0.04	-0.25	1.10	1:1	0.05	
802.11b	2462	11	MCS 0, 1 mbps	Left Tilt	16.33	16.15	0.05	0.26	1.11	1:1	0.06	
802.11b	2462	11	MCS 0, 1 mbps	Right Cheek	16.33	16.15	0.14	0.2	1.04	1:1	0.15	
802.11b	2462	11	MCS 0, 1 mbps	Right Tilt	16.33	16.15	0.09	0.22	1.10	1:1	0.10	
802.11b	2412	1	MCS 0, 1 mbps	Right Cheek	16.33	15.85	0.15	0.14	1.12	1:1	0.17	
802.11b	2437	6	MCS 0, 1 mbps	Right Cheek	16.33	15.76	0.16	0.26	1.21	1:1	0.19	16

*Larger than 5% drifts included to scaling factors

Bluetooth:

Mode	Packet type	Freq [MHz]	Channel	Test position	Maximum Power [dBm]	Conducted Power [dBm]	Measured SAR1g [W/kg]	Power Drift [dB]*	Scaling Factor	Duty Cycle	Reported SAR1g [W/kg]	Plot #
Bluetooth	DH5	2441	39	Left Cheek	11.46	11.45	0.007	0.37	1.09	1:1	0.007	
Bluetooth	DH5	2441	39	Left Tilt	11.46	11.45	0.008	-0.15	1.00	1:1	0.008	
Bluetooth	DH5	2441	39	Right Cheek	11.46	11.45	0.024	0.47	1.12	1:1	0.026	17
Bluetooth	DH5	2441	39	Right Tilt	11.46	11.45	0.017	0.13	1.00	1:1	0.017	
Bluetooth	DH5	2402	0	Right Cheek	11.46	11.18	0.022	0.46	1.19	1:1	0.026	
Bluetooth	DH5	2480	78	Right Cheek	11.46	10.76	0.01	0.78	1.41	1:1	0.018	

*Larger than 5% drifts included to scaling factors

WLAN 5GHz:

Mode	Freq [MHz]	Channel	Data Rate	Test position	Maximum Power [dBm]	Conducted Power [dBm]	Measured SAR1g [W/kg]	Power Drift [dB]*	Scaling Factor	Duty Cycle	Reported SAR1g [W/kg]	Plot #
802.11n HT40	5270	54	40 MHz MCS 0, 13.5Mbps	Left Cheek	13.802	13.54	0.112	-0.11	1.06	1:1	0.12	
802.11n HT40	5270	54	40 MHz MCS 0, 13.5Mbps	Left Tilt	13.802	13.54	0.06	0.21	1.06	1:1	0.06	
802.11n HT40	5270	54	40 MHz MCS 0, 13.5Mbps	Right Cheek	13.802	13.54	0.21	0.13	1.06	1:1	0.22	
802.11n HT40	5270	54	40 MHz MCS 0, 13.5Mbps	Right Tilt	13.802	13.54	0.11	-0.28	1.13	1:1	0.13	
802.11n HT40	5310	62	40 MHz MCS 0, 13.5Mbps	Right Cheek	13.802	13.26	0.21	0.12	1.13	1:1	0.24	18
802.11n HT40	5510	102	40 MHz MCS 0, 13.5Mbps	Left Cheek	13.424	12.34	0.0447	0.32	1.38	1:1	0.06	
802.11n HT40	5510	102	40 MHz MCS 0, 13.5Mbps	Left Tilt	13.424	12.34	0.04	-0.16	1.28	1:1	0.05	
802.11n HT40	5510	102	40 MHz MCS 0, 13.5Mbps	Right Cheek	13.424	12.34	0.10	0.18	1.28	1:1	0.13	19
802.11n HT40	5510	102	40 MHz MCS 0, 13.5Mbps	Right Tilt	13.424	12.34	0.0578	0.12	1.28	1:1	0.07	
802.11n HT40	5630	126	40 MHz MCS 0, 13.5Mbps	Right Cheek	13.424	11.94	0.0633	-0.37	1.53	1:1	0.10	
802.11n HT40	5710	142	40 MHz MCS 0, 13.5Mbps	Right Cheek	12.553	11.85	0.06	0.21	1.18	1:1	0.07	
802.11n HT40	5755	151	40 MHz MCS 0, 13.5Mbps	Left Cheek	12.553	11.810	0.04	0.58	1.36	1:1	0.05	
802.11n HT40	5755	151	40 MHz MCS 0, 13.5Mbps	Left Tilt	12.553	11.810	0.03	0.11	1.19	1:1	0.04	
802.11n HT40	5755	151	40 MHz MCS 0, 13.5Mbps	Right Cheek	12.553	11.810	0.05	0.02	1.19	1:1	0.06	
802.11n HT40	5755	151	40 MHz MCS 0, 13.5Mbps	Right Tilt	12.553	11.810	0.03	-0.10	1.19	1:1	0.04	
802.11n HT40	5795	159	40 MHz MCS 0, 13.5Mbps	Right Cheek	12.553	11.680	0.06	0.03	1.22	1:1	0.07	20

*Larger than 5% drifts included to scaling factors

APPENDIX B: SYSTEM CHECK SCAN

Plot 1

Date/Time: 17.10.2022 12.08.24

Test Laboratory: Verkotan Oy

DUT: D2450V2 - SN729; Type: D2450V2; Serial: SN729

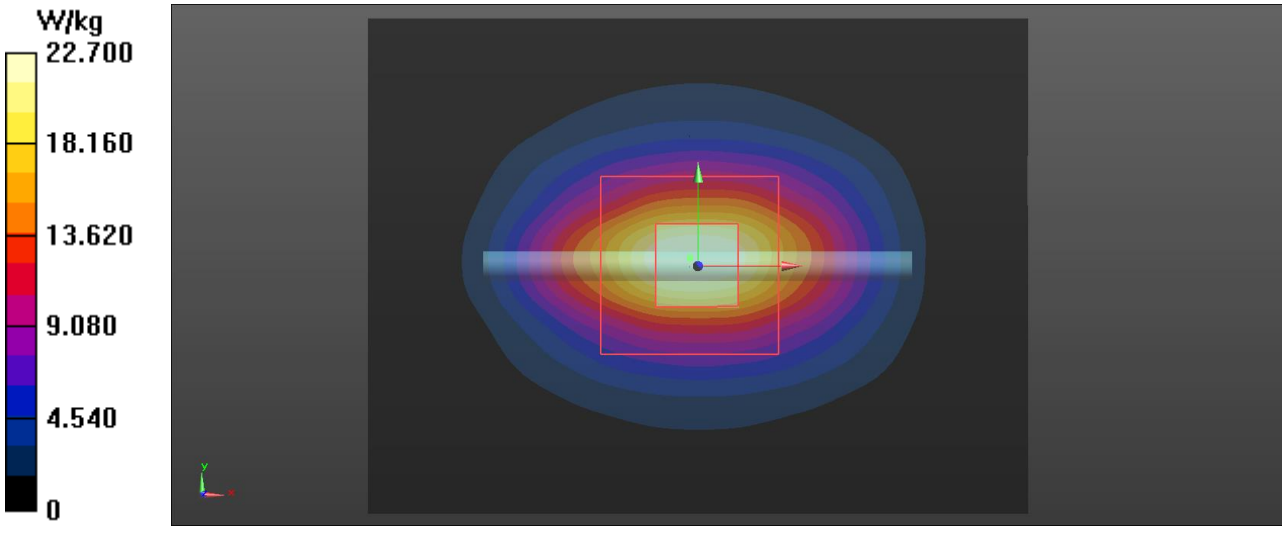
Communication System: UID 0, CW (0); Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz;Communication System PAR: 0 dB;
Medium parameters used (interpolated): f = 2450 MHz; σ = 1.802 S/m; ε_r = 39.779; ρ = 1000 kg/m^3
Phantom section: Center Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(7.77, 7.77, 7.77) @ 2450 MHz; Calibrated: 28.02.2022
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0, -4.0
  - Electronics: DAE4 Sn705; Calibrated: 12.04.2022
  - 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/system check 2450MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 90.80 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 28.0 W/kg
SAR(1 g) = 13.1 W/kg; SAR(10 g) = 6.09 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 = 47.5%
Maximum value of SAR (measured) = 22.0 W/kg

WLAN 2.4GHz/system check 2450MHz/Area Scan (61x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 22.7 W/kg



Plot 2

Date/Time: 18.10.2022 11.19.41

Test Laboratory: Verkotan Oy

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

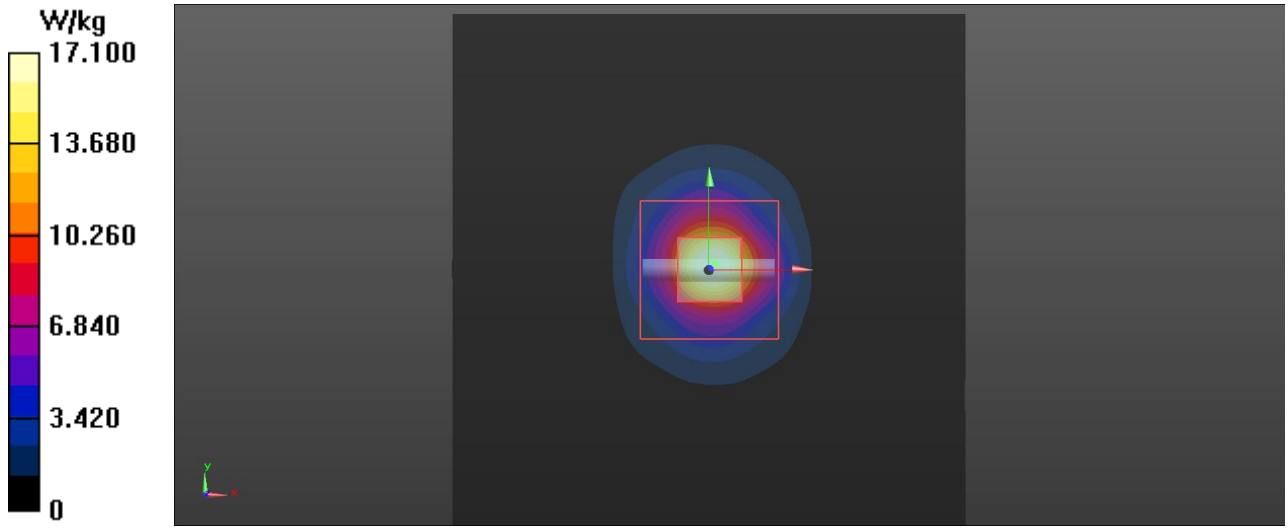
Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5250 MHz;Communication System PAR: 0 dB;
Medium parameters used (interpolated): f = 5250 MHz; σ = 4.515 S/m; ε_r = 35.448; ρ = 1000 kg/m^3
Phantom section: Center Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(5.2, 5.2, 5.2) @ 5250 MHz; Calibrated: 28.02.2022
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 25.0
  - Electronics: DAE4 Sn705; Calibrated: 12.04.2022
  - 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 5250MHz 2/Area Scan (81x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 17.6 W/kg

Configuration/system check 5250MHz 2/Zoom Scan (7x7x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 44.05 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 26.4 W/kg
SAR(1 g) = 7.05 W/kg; SAR(10 g) = 2.05 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 = 66.2%
Maximum value of SAR (measured) = 17.1 W/kg



Plot 3

Date/Time: 18.10.2022 11.51.38

Test Laboratory: Verkotan Oy

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

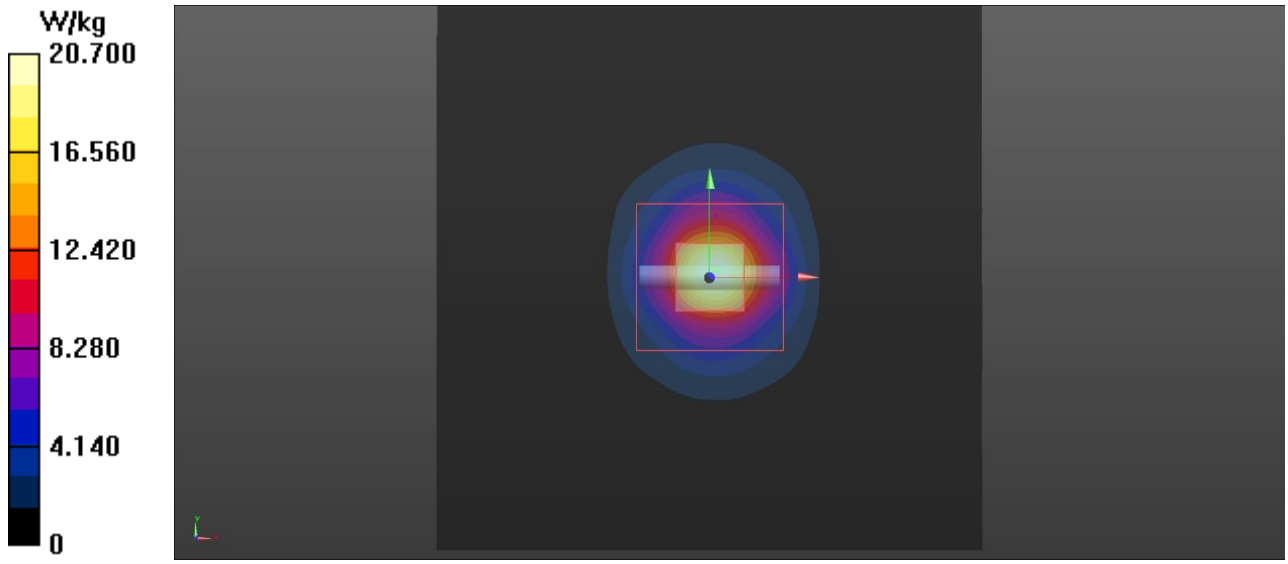
Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5600 MHz;Communication System PAR: 0 dB;
Medium parameters used: f = 5600 MHz; σ = 4.903 S/m; ε_r = 34.816; ρ = 1000 kg/m^3
Phantom section: Center Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(4.5, 4.5, 4.5) @ 5600 MHz; Calibrated: 28.02.2022
  - 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 Sn705; Calibrated: 12.04.2022
  - 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 5600MHz/Zoom Scan (7x7x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 45.24 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 34.9 W/kg
SAR(1 g) = 8.34 W/kg; SAR(10 g) = 2.39 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) = 21.1 W/kg

Configuration/system check 5600MHz/Area Scan (81x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 20.7 W/kg



Date/Time: 18.10.2022 12.15.03

Test Laboratory: Verkotan Oy

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

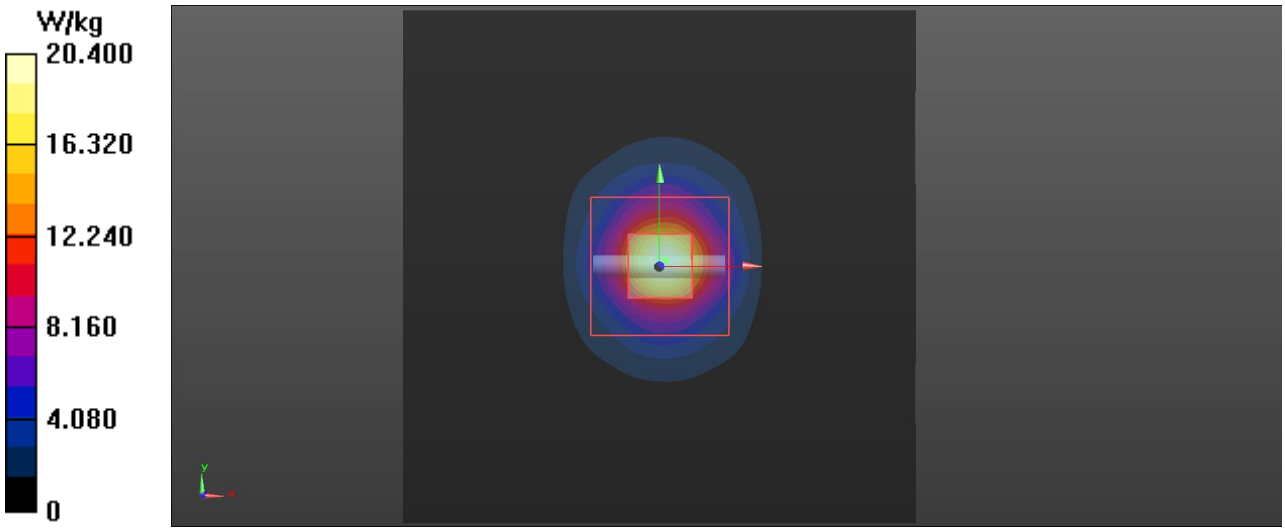
Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5750 MHz;Communication System PAR: 0 dB;
Medium parameters used: f = 5750 MHz; σ = 5.081 S/m; ε_r = 34.554; ρ = 1000 kg/m^3
Phantom section: Center Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(4.6, 4.6, 4.6) @ 5750 MHz; Calibrated: 28.02.2022
  - 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 Sn705; Calibrated: 12.04.2022
  - 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 5750MHz/Zoom Scan (7x7x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 43.11 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 35.6 W/kg
SAR(1 g) = 8.2 W/kg; SAR(10 g) = 2.34 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 = 61.3%
Maximum value of SAR (measured) = 20.8 W/kg

Configuration/system check 5750MHz/Area Scan (81x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 20.4 W/kg



Plot 5

Date/Time: 23.11.22 14:24:47

Test Laboratory: Verkotan Oy

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

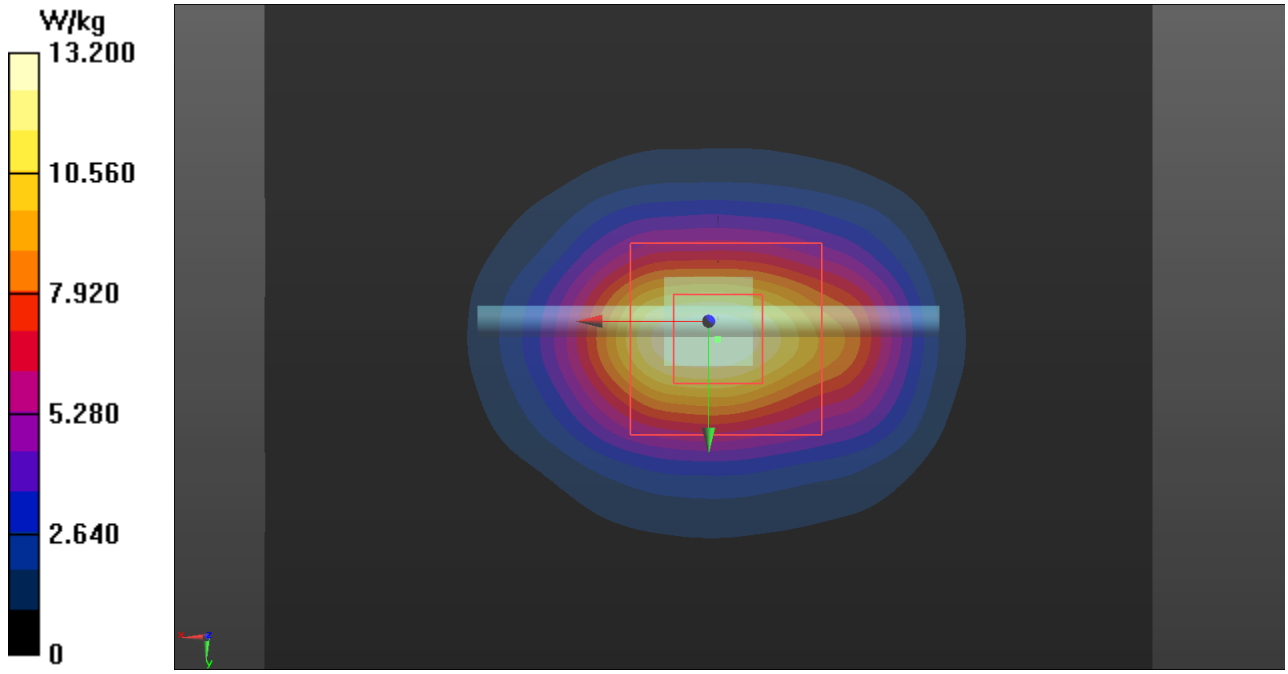
Communication System: UID 0, CW (0); Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz;
Communication System PAR: 0 dB;
Medium parameters used (interpolated): f = 2450 MHz; σ = 1.726 S/m; ε_r = 42.355; ρ = 1000 kg/m^3
Phantom section: Center Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN3852; ConvF(7.48, 7.48, 7.48) @ 2450 MHz; Calibrated: 27.10.22
  - Sensor-Surface: 4mm (Mechanical Surface Detection), z = -4.0, 31.0
  - Electronics: DAE4 Sn710; Calibrated: 19.10.22
  - 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, 23.11.2022/Area Scan (101x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 13.2 W/kg

Configuration/System check, 23.11.2022/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 87.32 V/m; Power Drift = -0.14 dB
Peak SAR (extrapolated) = 23.2 W/kg
SAR(1 g) = 12.1 W/kg; SAR(10 g) = 5.74 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 = 52.6%
Maximum value of SAR (measured) = 13.3 W/kg



Date/Time: 14.12.22 15:17:49

Test Laboratory: Verkotan Oy

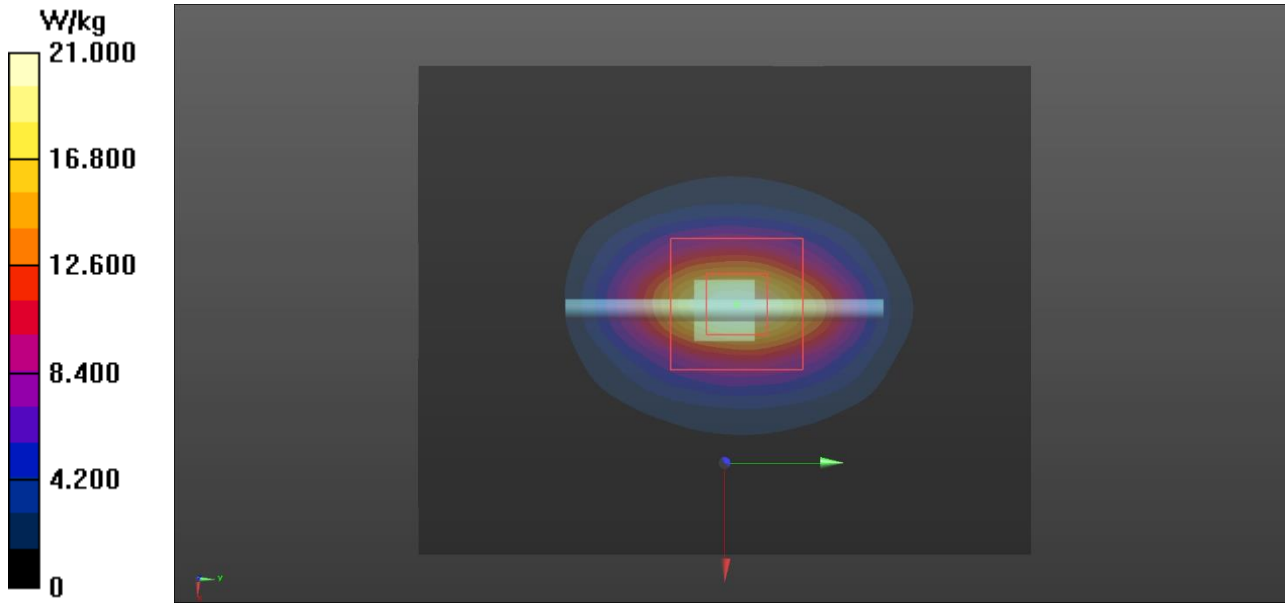
DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN:729

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 = 1.85 S/m; ε_r = 41.459; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(7.77, 7.77, 7.77) @ 2450 MHz; Calibrated: 28.2.22
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), Sensor-Surface: 4mm (Mechanical Surface Detection), z = -4.0, 31.0
  - Electronics: DAE4 Sn705; Calibrated: 12.4.22
  - Phantom: SAR1_Phantom 2_Twin-SAM; Type: QD 000 P40 CC;
  - DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Configuration/System check, 14.12.2022/Area Scan (81x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 21.0 W/kg
Configuration/System check, 14.12.2022/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 87.70 V/m; Power Drift = -0.16 dB
Peak SAR (extrapolated) = 24.9 W/kg
SAR(1 g) = 12.3 W/kg; SAR(10 g) = 5.8 W/kg (SAR corrected for target medium)
Maximum value of SAR (measured) = 14.0 W/kg



Date/Time: 19.12.2022 8.04.25

Test Laboratory: Verkotan Oy

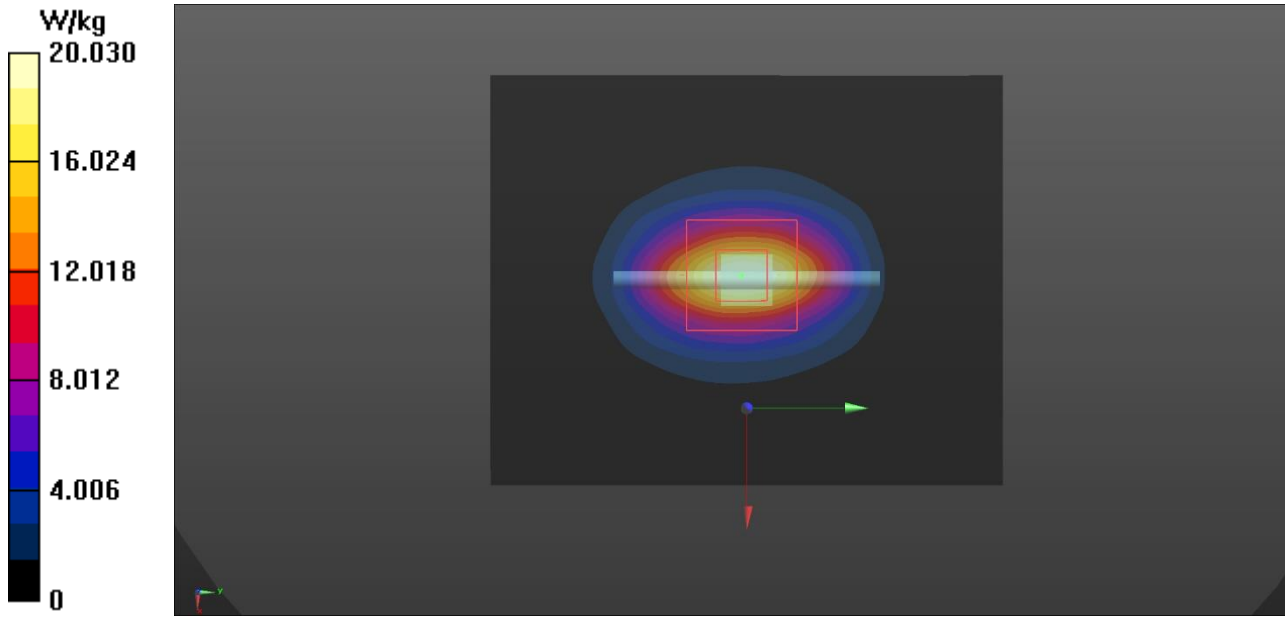
DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN:729

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 = 1.773 S/m; ε_r = 40.457; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(7.77, 7.77, 7.77) @ 2450 MHz; Calibrated: 28.02.2022
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), Sensor-Surface: 4mm (Mechanical Surface Detection), z = -4.0, 31.0
  - Electronics: DAE4 Sn705; Calibrated: 12.04.2022
  - Phantom: SAR1_Phantom 2_Twin-SAM; Type: QD 000 P40 CC;
  - DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Configuration/System check, 19.12.2022/Area Scan (81x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 20.0 W/kg
Configuration/System check, 19.12.2022/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 87.99 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 23.9 W/kg
SAR(1 g) = 11.9 W/kg; SAR(10 g) = 5.6 W/kg (SAR corrected for target medium)
Maximum value of SAR (measured) = 13.4 W/kg



Date/Time: 19.12.22 12:13:52

Test Laboratory: Verkotan Oy

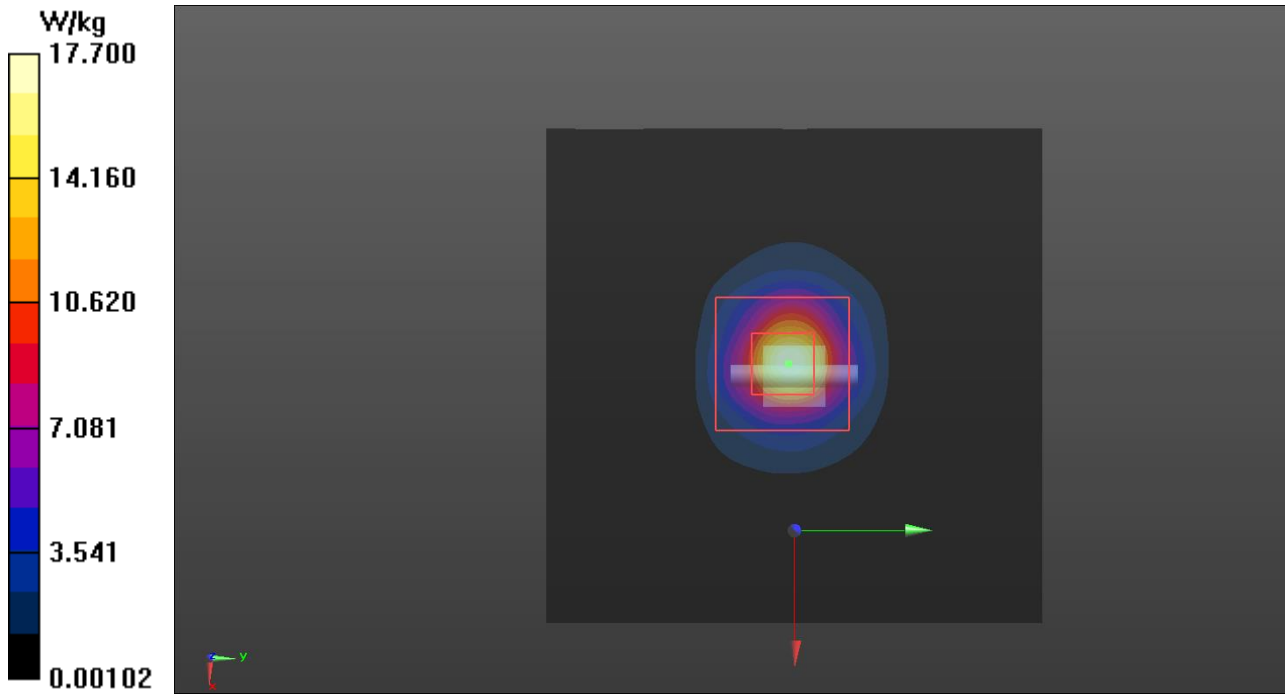
DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1014

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 = 4.575 S/m; ε_r = 36.886; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(5.2, 5.2, 5.2) @ 5250 MHz; Calibrated: 28.2.22
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 25.0, -4.0
  - Electronics: DAE4 Sn705; Calibrated: 12.4.22
  - Phantom: SAR1_Phantom 2_Twin-SAM; Type: QD 000 P40 CC;
  - DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Configuration/system check 5250MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 40.59 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 27.8 W/kg
SAR(1 g) = 7.17 W/kg; SAR(10 g) = 2.06 W/kg (SAR corrected for target medium)
Maximum value of SAR (measured) = 17.7 W/kg
Configuration/system check 5250MHz/Area Scan (81x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 18.0 W/kg



Plot 9

Date/Time: 19.12.22 13:13:33

Test Laboratory: Verkotan Oy

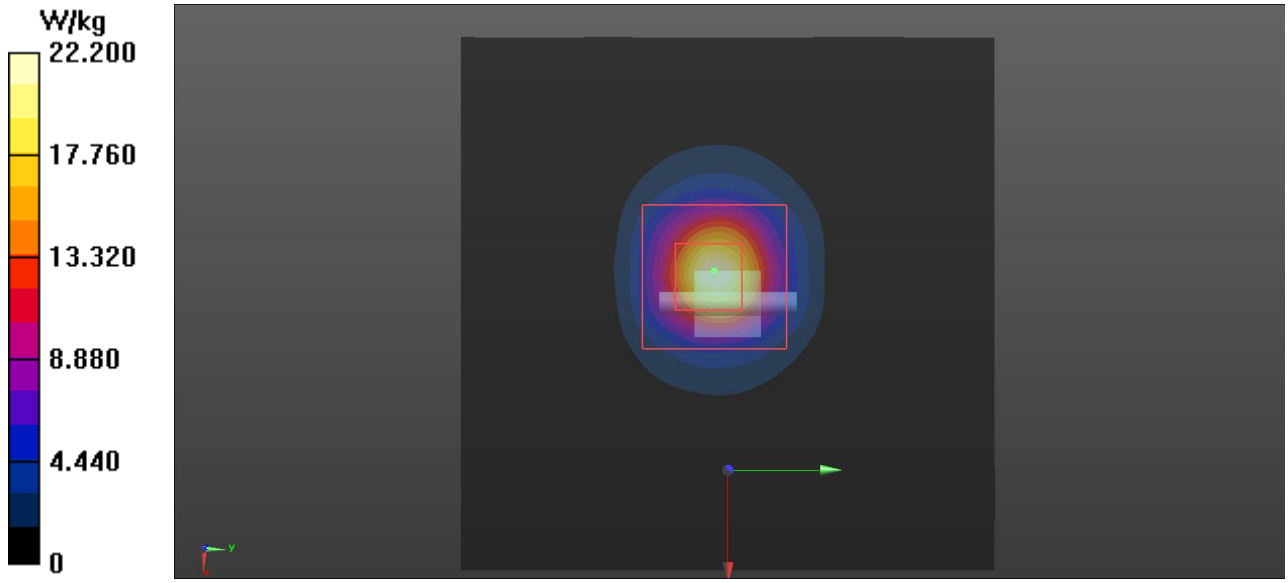
DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1014

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 = 4.977 S/m; ε_r = 36.254; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(4.5, 4.5, 4.5) @ 5600 MHz; Calibrated: 28.2.22
  - 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 Sn705; Calibrated: 12.4.22
  - Phantom: SAR1_Phantom 2_Twin-SAM; Type: QD 000 P40 CC;
  - DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Configuration/system check 5600MHz 2 2/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 39.64 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 38.0 W/kg
SAR(1 g) = 8.75 W/kg; SAR(10 g) = 2.45 W/kg (SAR corrected for target medium)
Maximum value of SAR (measured) = 22.2 W/kg
Configuration/system check 5600MHz 2 2/Area Scan (81x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 12.6 W/kg



Plot 10

Date/Time: 20.12.22 14:50:07

Test Laboratory: Verkotan Oy

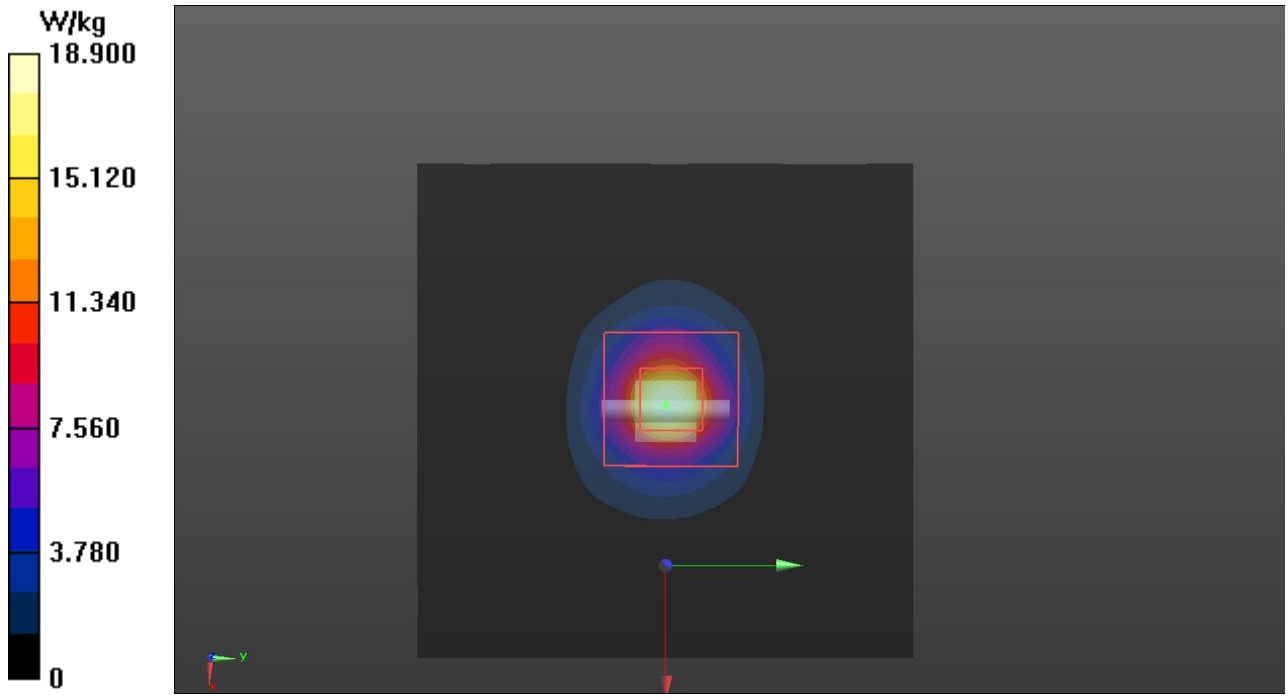
DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1014

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5750 MHz;
Communication System PAR: 0 dB;
Medium parameters used: f = 5750 MHz; σ = 5.202 S/m; ε_r = 35.934; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(4.6, 4.6, 4.6) @ 5750 MHz; Calibrated: 28.2.22
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 25.0, -4.0
  - Electronics: DAE4 Sn705; Calibrated: 12.4.22
  - Phantom: Twin-SAM V4.0 (20deg probe tilt); Type: QD 000 P40 CC;
  - DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Configuration/system check 5750MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 38.80 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 33.0 W/kg
SAR(1 g) = 7.54 W/kg; SAR(10 g) = 2.14 W/kg (SAR corrected for target medium)
Maximum value of SAR (measured) = 18.9 W/kg
Configuration/system check 5750MHz/Area Scan (81x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 20.5 W/kg



APPENDIX C: MEASUREMENT SCAN

Plot 11

Date/Time: 17.10.2022 15.52.23

Test Laboratory: Verkotan Oy

DUT: NordicID, HH83;

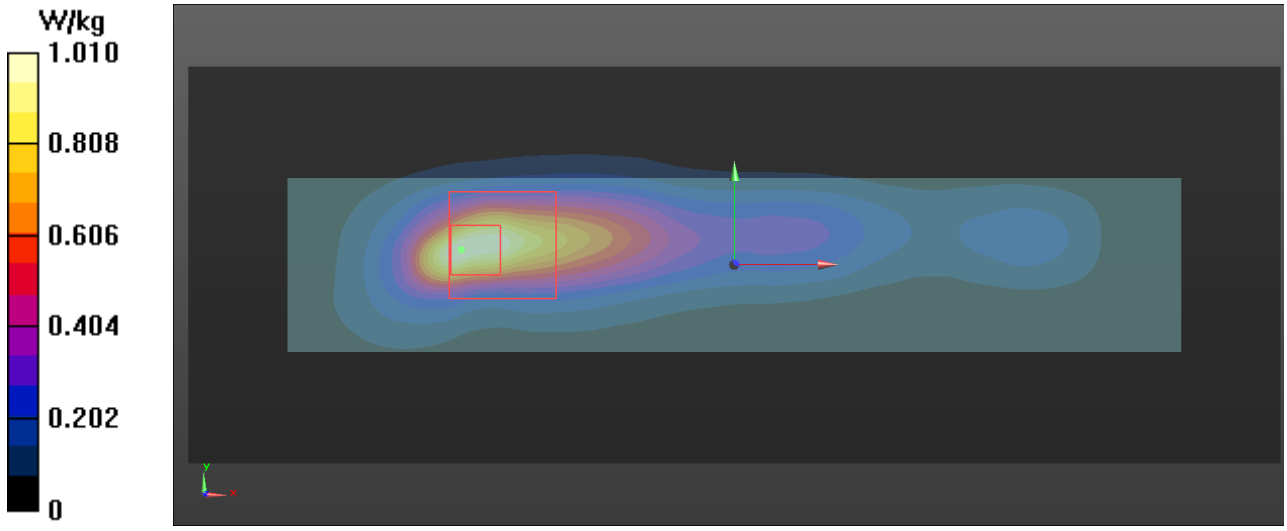
Communication System: UID 0, WLAN 2.4 (0); Communication System Band: WLAN2.4GHz; Frequency: 2437 MHz;
Communication System PAR: 0 dB;
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.792 S/m; ε_r = 39.802; ρ = 1000 kg/m^3
Phantom section: Center Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(7.77, 7.77, 7.77) @ 2437 MHz; Calibrated: 28.02.2022
  - 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 Sn705; Calibrated: 12.04.2022
  - Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx;
  - DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

WLAN/WLAN 2.4GHz, CH6, Left 0mm/Zoom Scan (8x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.19 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 1.37 W/kg
SAR(1 g) = 0.593 W/kg; SAR(10 g) = 0.260 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 7 mm
Ratio of SAR at M2 to SAR at M1 = 45.1%
Maximum value of SAR (measured) = 1.05 W/kg

WLAN/WLAN 2.4GHz, CH6, Left 0mm/Area Scan (81x221x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.01 W/kg



Plot 12

Date/Time: 24.11.22 14:34:39

Test Laboratory: Verkotan Oy

DUT: NordicID, HH83;

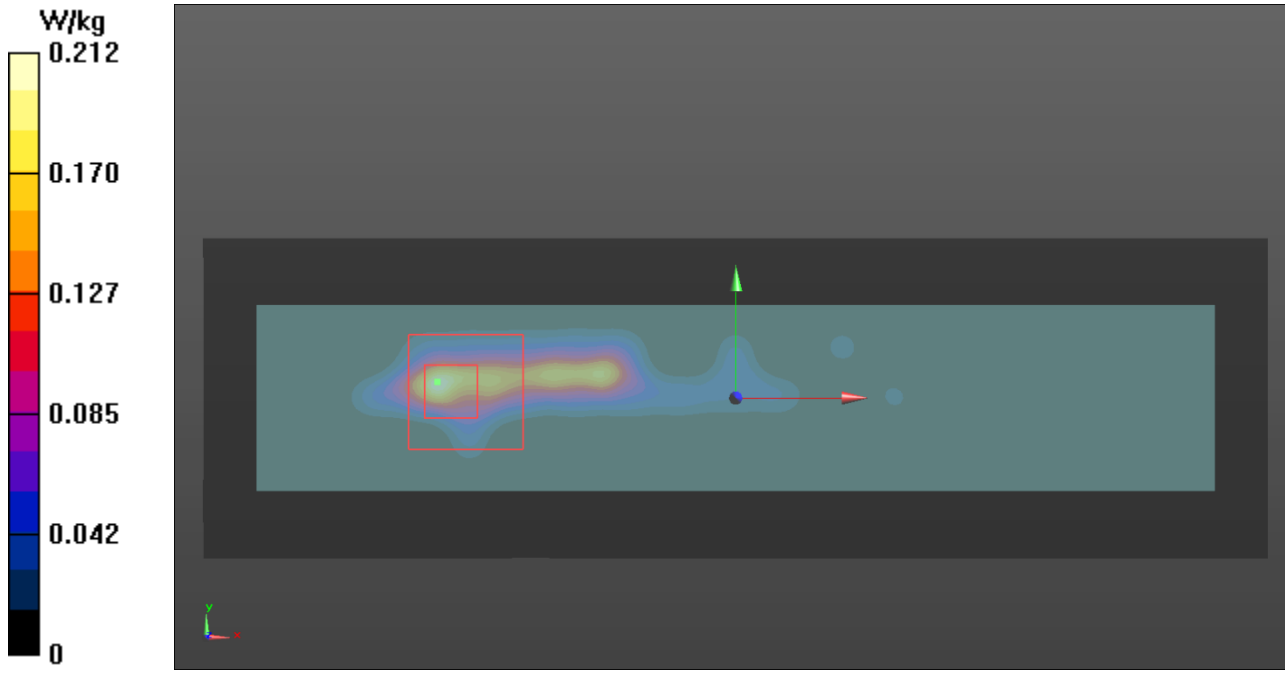
Communication System: UID 0, Bluetooth (0); Communication System Band: Bluetooth; Frequency: 2441 MHz;
Communication System PAR: 4.771 dB;
Medium parameters used (interpolated): f = 2441 MHz; σ = 1.72 S/m; ε_r = 42.374; ρ = 1000 kg/m^3
Phantom section: Center Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN3852; ConvF(7.48, 7.48, 7.48) @ 2441 MHz; Calibrated: 27.10.22
  - Sensor-Surface: 4mm (Mechanical Surface Detection), Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 31.0
  - Electronics: DAE4 Sn710; Calibrated: 19.10.22
  - Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx;
  - DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Configuration/Bluetooth, CH39, left 0mm/Area Scan (61x201x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.212 W/kg

Configuration/Bluetooth, CH39, left 0mm/Zoom Scan (8x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.132 V/m; Power Drift = -0.21 dB
Peak SAR (extrapolated) = 0.166 W/kg
SAR(1 g) = 0.077 W/kg; SAR(10 g) = 0.031 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 5.8 mm
Ratio of SAR at M2 to SAR at M1 = 47.4%
Maximum value of SAR (measured) = 0.125 W/kg



Plot 13

Date/Time: 19.10.2022 10.17.29

Test Laboratory: Verkotan Oy

DUT: NordicID, HH83;

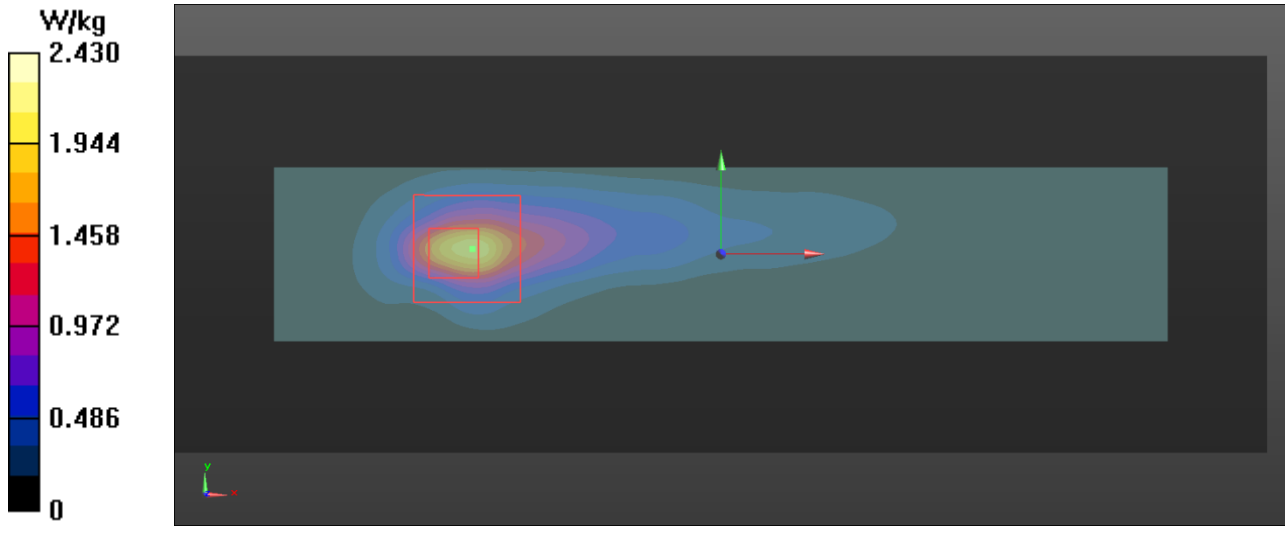
Communication System: UID 0, WLAN5GHz (0); Communication System Band: 5GHz; Frequency: 5270 MHz;
Communication System PAR: 0 dB;
Medium parameters used: f = 5270 MHz; σ = 4.536 S/m; ε_r = 35.404; ρ = 1000 kg/m^3
Phantom section: Center Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(5.2, 5.2, 5.2) @ 5270 MHz; Calibrated: 28.02.2022
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 25.0
  - Electronics: DAE4 Sn705; Calibrated: 12.04.2022
  - 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, CH54, Left 0mm/Area Scan (81x221x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 2.07 W/kg

WLAN 5GHz/WLAN 5GHz, CH54, Left 0mm/Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 6.141 V/m; Power Drift = 0.28 dB
Peak SAR (extrapolated) = 3.92 W/kg
SAR(1 g) = 1.01 W/kg; SAR(10 g) = 0.314 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 6.1 mm
Ratio of SAR at M2 to SAR at M1 = 66.2%
Maximum value of SAR (measured) = 2.43 W/kg



Plot 14

Date/Time: 19.10.2022 10.56.03

Test Laboratory: Verkotan Oy

DUT: NordicID, HH83;

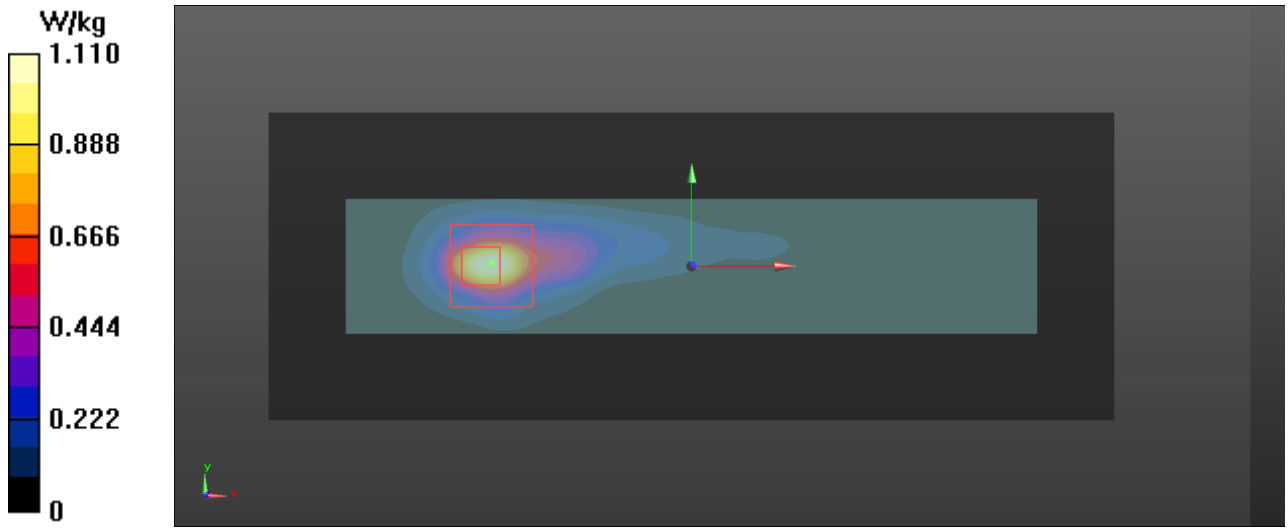
Communication System: UID 0, WLAN5GHz (0); Communication System Band: 5GHz; Frequency: 5510 MHz;
Communication System PAR: 0 dB;
Medium parameters used: f = 5510 MHz; σ = 4.8 S/m; ε_r = 34.968; ρ = 1000 kg/m^3
Phantom section: Center Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(4.5, 4.5, 4.5) @ 5510 MHz; Calibrated: 28.02.2022
  - 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 Sn705; Calibrated: 12.04.2022
  - 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, CH102, Left 0mm/Zoom Scan (9x9x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 3.188 V/m; Power Drift = 0.31 dB
Peak SAR (extrapolated) = 1.87 W/kg
SAR(1 g) = 0.473 W/kg; SAR(10 g) = 0.142 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 5.4 mm
Ratio of SAR at M2 to SAR at M1 = 65.9%
Maximum value of SAR (measured) = 1.12 W/kg

WLAN 5GHz/WLAN 5GHz, CH102, Left 0mm/Area Scan (81x221x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.11 W/kg



Date/Time: 19.10.2022 13.17.26

Test Laboratory: Verkotan Oy

DUT: NordicID, HH83;

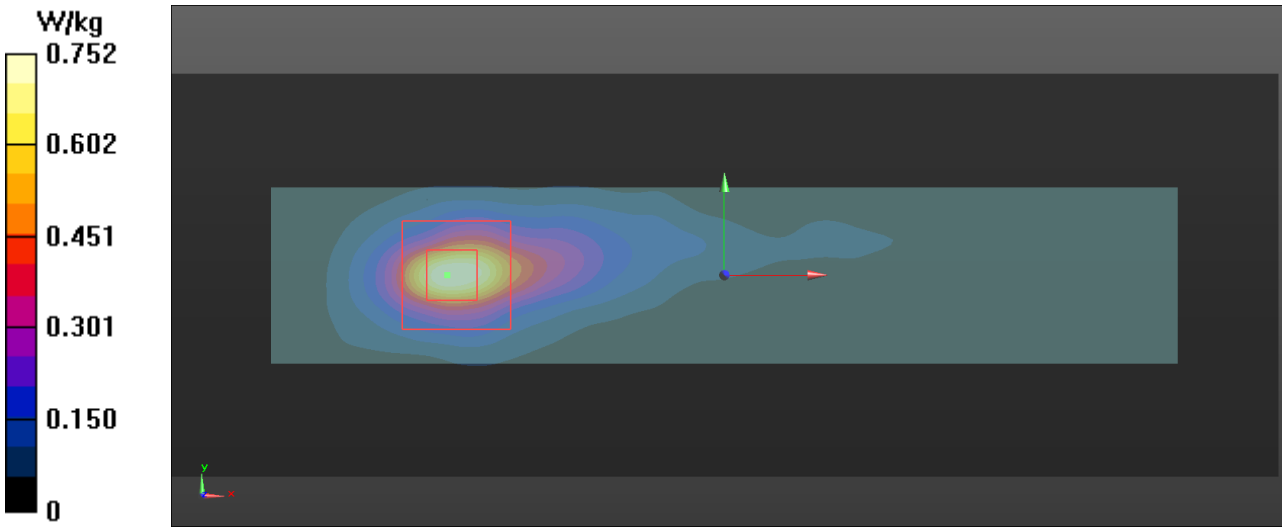
Communication System: UID 0, WLAN5GHz (0); Communication System Band: 5GHz; Frequency: 5795 MHz;
Communication System PAR: 0 dB;
Medium parameters used (interpolated): f = 5795 MHz; σ = 5.132 S/m; ε_r = 34.472; ρ = 1000 kg/m^3
Phantom section: Center Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(4.6, 4.6, 4.6) @ 5795 MHz; Calibrated: 28.02.2022
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 25.0
  - Electronics: DAE4 Sn705; Calibrated: 12.04.2022
  - 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, CH159, Left 0mm/Area Scan (81x221x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.765 W/kg

WLAN 5GHz/WLAN 5GHz, CH159, Left 0mm/Zoom Scan (9x9x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 2.286 V/m; Power Drift = 0.22 dB
Peak SAR (extrapolated) = 1.31 W/kg
SAR(1 g) = 0.307 W/kg; SAR(10 g) = 0.097 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 = 60.4%
Maximum value of SAR (measured) = 0.752 W/kg



Plot 16

Date/Time: 19.12.22 10:23:39

Test Laboratory: Verkotan Oy

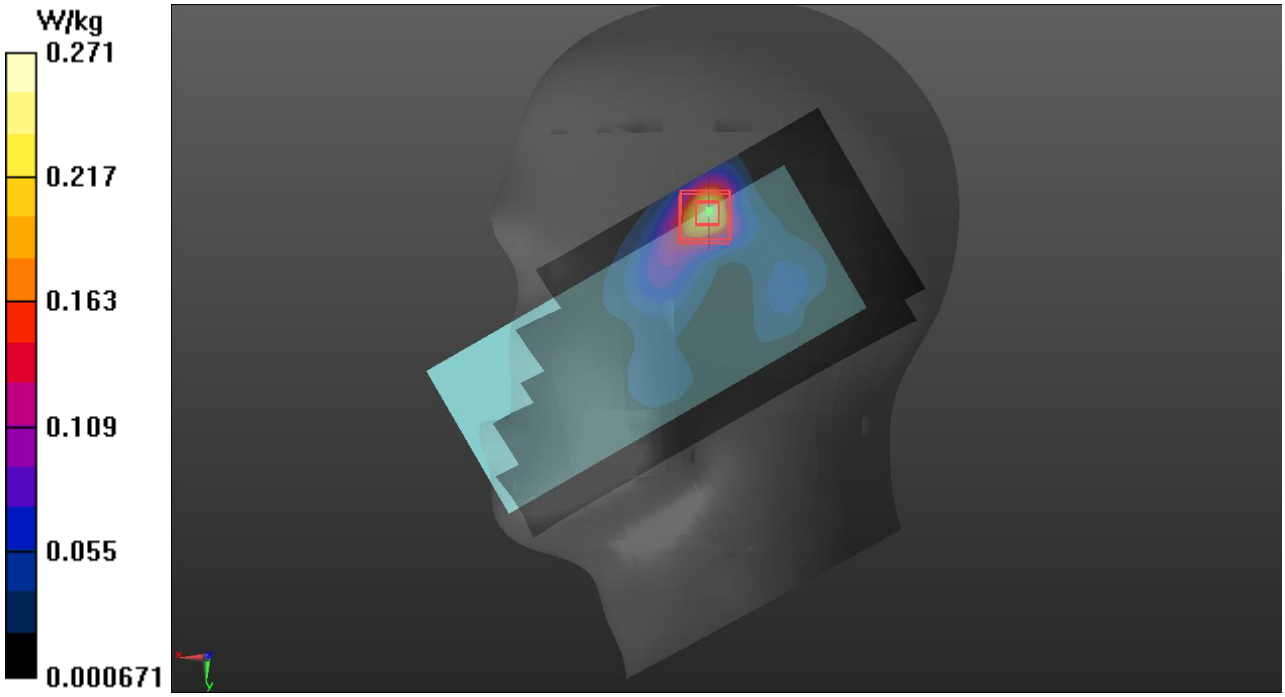
DUT: NordicID, HH83;

Communication System: UID 0, WLAN 2.4 (0); Communication System Band: WLAN2.4GHz; Frequency: 2437 MHz;
Communication System PAR: 0 dB;
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.763 S/m; ε_r = 40.472; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(7.77, 7.77, 7.77) @ 2437 MHz; Calibrated: 28.2.22
  - 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 Sn705; Calibrated: 12.4.22
  - Phantom: SAR1_Phantom 2_Twin-SAM; Type: QD 000 P40 CC;
  - DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Configuration/WLAN 2.4GHz 802.11b CH 6 Right Cheek 2 2/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.095 V/m; Power Drift = 0.26 dB
Peak SAR (extrapolated) = 0.344 W/kg
SAR(1 g) = 0.160 W/kg; SAR(10 g) = 0.074 W/kg (SAR corrected for target medium)
Maximum value of SAR (measured) = 0.271 W/kg
Configuration/WLAN 2.4GHz 802.11b CH 6 Right Cheek 2 2/Area Scan (101x221x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.275 W/kg



Plot 17

Date/Time: 15.12.22 09:52:25

Test Laboratory: Verkotan Oy

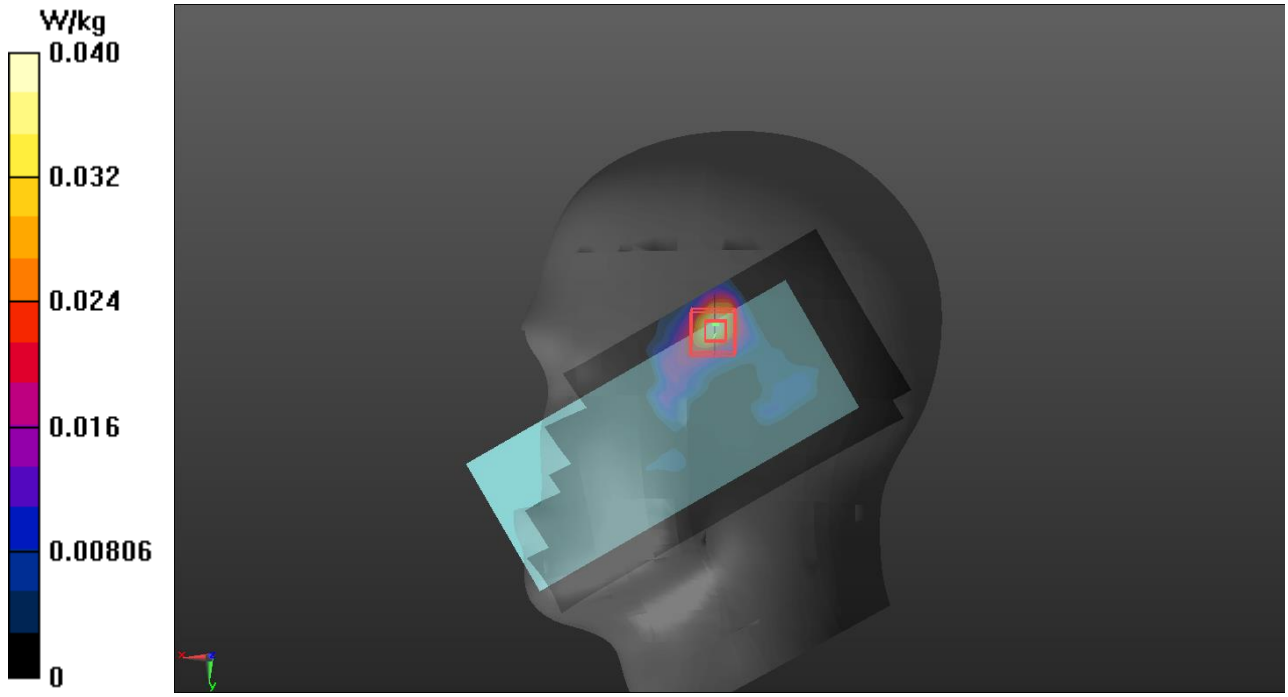
DUT: NordicID, HH83;

Communication System: UID 0, Bluetooth (0); Communication System Band: Bluetooth; Frequency: 2441 MHz;
Communication System PAR: 4.771 dB;
Medium parameters used (interpolated): f = 2441 MHz; σ = 1.843 S/m; ε_r = 41.475; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(7.77, 7.77, 7.77) @ 2441 MHz; Calibrated: 28.2.22
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 31.0
  - Electronics: DAE4 Sn705; Calibrated: 12.4.22
  - Phantom: SAR1_Phantom 2_Twin-SAM; Type: QD 000 P40 CC;
  - DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Configuration 3/Bluetooth, CH7, Right Cheek/Area Scan (101x221x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.0403 W/kg
Configuration 3/Bluetooth, CH7, Right Cheek/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.146 V/m; Power Drift = 0.47 dB
Peak SAR (extrapolated) = 0.0530 W/kg
SAR(1 g) = 0.024 W/kg; SAR(10 g) = 0.011 W/kg (SAR corrected for target medium)
Maximum value of SAR (measured) = 0.0401 W/kg



Plot 18

Date/Time: 20.12.22 10:04:48

Test Laboratory: Verkotan Oy

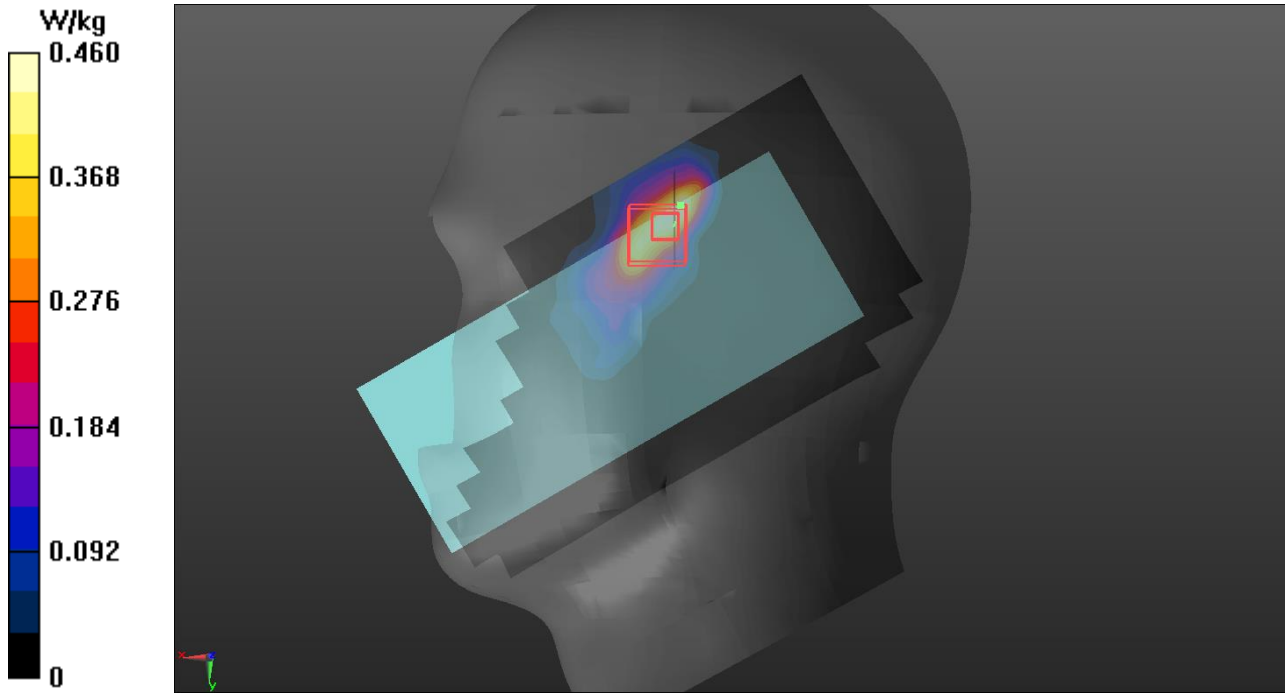
DUT: NordicID, HH83;

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 = 4.648 S/m; ε_r = 36.776; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(5.2, 5.2, 5.2) @ 5310 MHz; Calibrated: 28.2.22
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), z = 15.0, -4.0
  - Electronics: DAE4 Sn705; Calibrated: 12.4.22
  - Phantom: Twin-SAM V4.0 (20deg probe tilt); Type: QD 000 P40 CC;
  - DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Configuration 2/WLAN 5GHz 802.11n CH62, Right Cheek/Zoom Scan (10x10x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 6.187 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 0.707 W/kg
SAR(1 g) = 0.211 W/kg; SAR(10 g) = 0.082 W/kg (SAR corrected for target medium)
Maximum value of SAR (measured) = 0.460 W/kg
Configuration 2/WLAN 5GHz 802.11n CH62, Right Cheek/Area Scan (111x241x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.473 W/kg



Plot 19

Date/Time: 20.12.22 13:03:31

Test Laboratory: Verkotan Oy

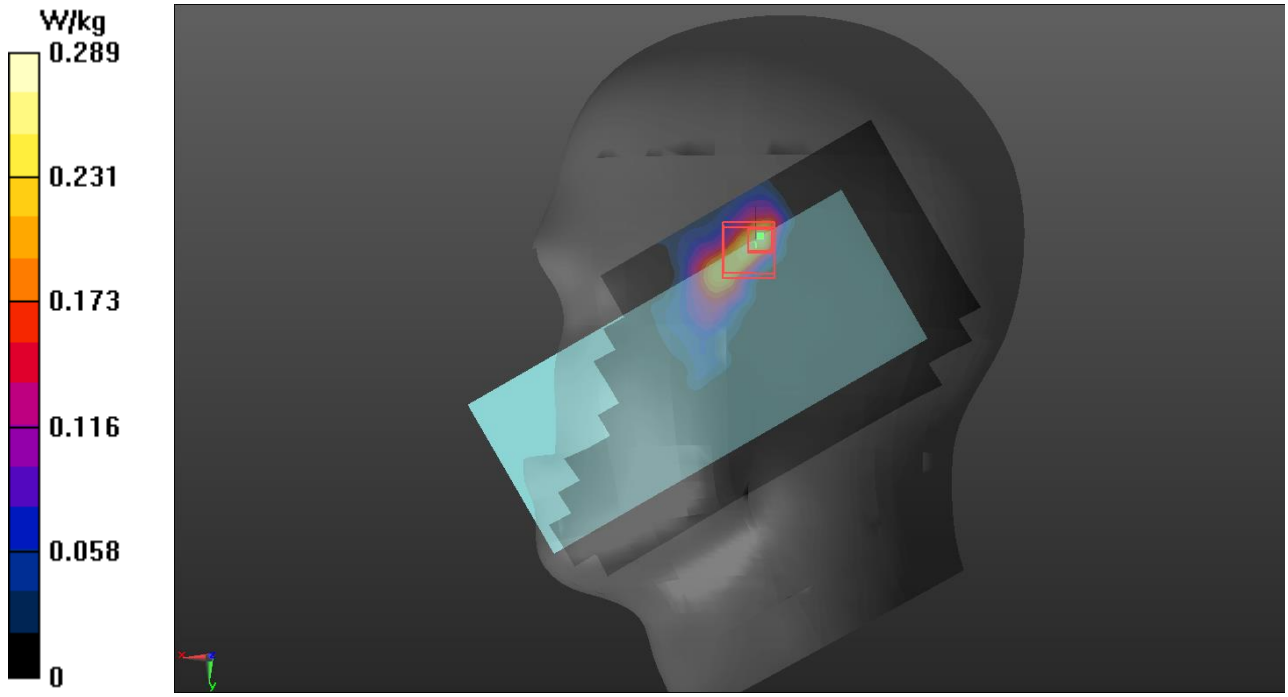
DUT: NordicID, HH83;

Communication System: UID 0, WLAN5GHz (0); Communication System Band: 5GHz; Frequency: 5510 MHz;
Communication System PAR: 0 dB;
Medium parameters used: f = 5510 MHz; σ = 4.867 S/m; ε_r = 36.418; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(4.5, 4.5, 4.5) @ 5510 MHz; Calibrated: 28.2.22
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 15.0
  - Electronics: DAE4 Sn705; Calibrated: 12.4.22
  - Phantom: Twin-SAM V4.0 (20deg probe tilt); Type: QD 000 P40 CC;
  - DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Configuration 2/WLAN 5GHz 802.11n CH102, Right Cheek 2/Area Scan (111x241x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.289 W/kg
Configuration 2/WLAN 5GHz 802.11n CH102, Right Cheek 2/Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 4.446 V/m; Power Drift = 0.18 dB
Peak SAR (extrapolated) = 0.403 W/kg
SAR(1 g) = 0.101 W/kg; SAR(10 g) = 0.033 W/kg (SAR corrected for target medium)
Maximum value of SAR (measured) = 0.262 W/kg



Plot 20

Date/Time: 21.12.22 13:46:00

Test Laboratory: Verkotan Oy

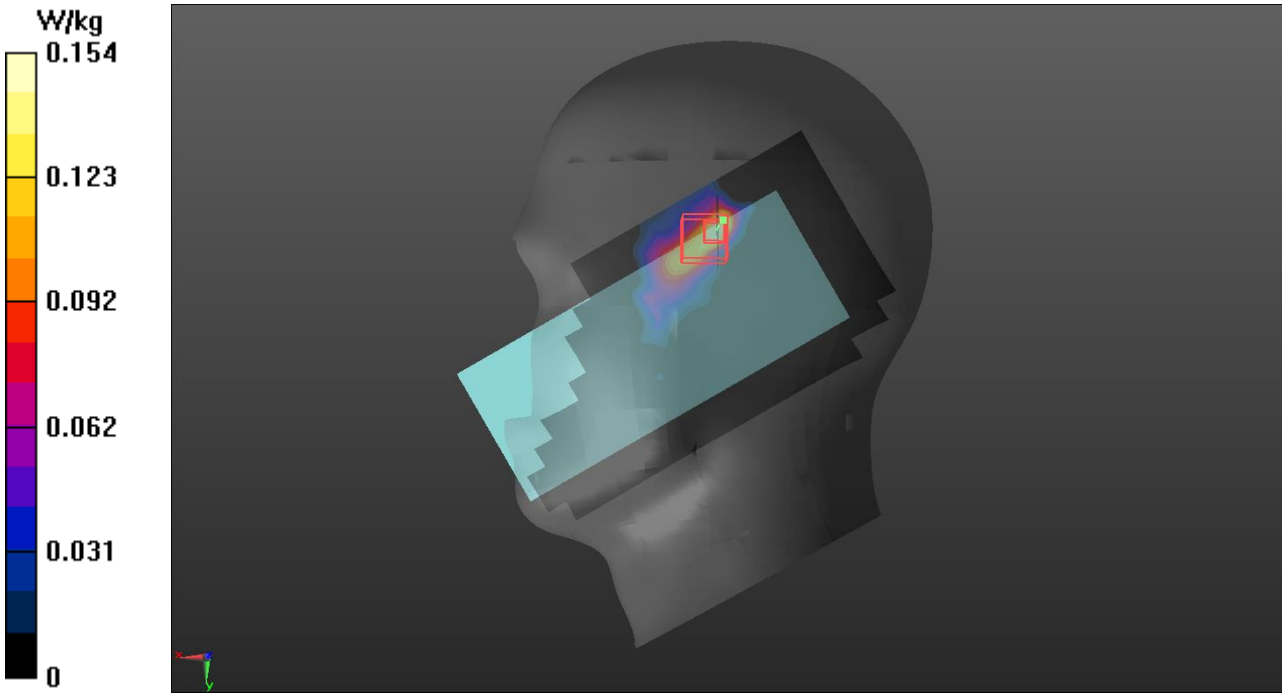
DUT: NordicID, HH83;

Communication System: UID 0, WLAN5GHz (0); Communication System Band: 5GHz; Frequency: 5795 MHz;
Communication System PAR: 0 dB;
Medium parameters used (interpolated): f = 5795 MHz; σ = 5.256 S/m; ε_r = 35.858; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(4.6, 4.6, 4.6) @ 5795 MHz; Calibrated: 28.2.22
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), z = 15.0, -4.0
  - Electronics: DAE4 Sn705; Calibrated: 12.4.22
  - Phantom: Twin-SAM V4.0 (20deg probe tilt); Type: QD 000 P40 CC;
  - DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Configuration/WLAN 5GHz 802.11n CH159, Right Cheek 2 2 2 2/Zoom Scan (10x10x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 3.360 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.242 W/kg
SAR(1 g) = 0.056 W/kg; SAR(10 g) = 0.019 W/kg (SAR corrected for target medium)
Maximum value of SAR (measured) = 0.154 W/kg
Configuration/WLAN 5GHz 802.11n CH159, Right Cheek 2 2 2 2/Area Scan (111x241x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.162 W/kg



APPENDIX D: RELEVANT PAGES FROM PROBE CALIBRATION

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: EX3-7447_Feb22**

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:7447

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: February 28, 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	09-Apr-21 (No. 217-03291/03292)	Apr-22
Power sensor NRP-Z91	SN: 103244	09-Apr-21 (No. 217-03291)	Apr-22
Power sensor NRP-Z91	SN: 103245	09-Apr-21 (No. 217-03292)	Apr-22
Reference 20 dB Attenuator	SN: CC2552 (20x)	09-Apr-21 (No. 217-03343)	Apr-22
DAE4	SN: 660	13-Oct-21 (No. DAE4-660_Oct21)	Oct-22
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-20)	In house check: Jun-22
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-20)	In house check: Jun-22
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-22

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

Issued: March 1, 2022

DASY/EASY - 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]	0.40	0.43	0.44	± 10.1 %
DCP (mV)[B]	93.5	95.0	96.2	

Calibration Results for Modulation Response

UID	Communication System Name		A dB	B dB$\sqrt{\mu V}$	C	D dB	VR mV	Max dev.	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	155.9	±2.5 %	± 4.7 %
		Y	0.0	0.0	1.0		167.3		
		Z	0.0	0.0	1.0		159.8		

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] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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
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

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	