SAR Compliance Test Report

Date of Report	6/08/2020	**Client's Contact person:**	Gabriel Blard
Number of pages:	31	**Responsible Test engineer:**	Ilari Kinnunen
Testing laboratory:	**Verkotan Oy** Elektroniikkatie 17 90590 Oulu Finland	**Client:**	**Findster Technologies, S.A.** Rua Sá da Bandeira, nº 651 1º Direito 4000-437 Porto Portugal
Tested device	Findster Duo+		
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** **IEEE 1528 - 2013** IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Technique **RSS-102, Issue 5, 2015** 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:	06.08.2020 Miia Nurkkala Digitaalinen allekirjoittaja: Miia Nurkkala Päiväys: 2020.08.06 13:48:22 +03'00' **Laboratory Manager**		

TABLE OF CONTENTS

1. SUMMARY OF SAR TEST REPORT

1.1 Test Details

Equipment under Test (DUT):

Product:	Findster Duo+
Manufacturer:	Findster Technologies
HW Number:	Guardian: 03.06, Pet: 03.07
Serial Number:	Guardian: 04020306-04010000, Pet: 04320307-04010000
FCC ID Number:	Guardian: 2AHM8-FDT04GRDR2, Pet: 2AHM8-FDT04PETR2
IC ID:	Guardian: 26000-FDT04GRDR2, Pet: 26000-FDT04PETR2
DUT Number:	Guardian sample: 22174, Pet sample: 22175
Battery Type used in testing:	Integrated
Portable/ Mobile device	Portable
State of the Sample	Production sample

Testing information:

Testing performed:	29.7.2020 – 30.7.2020
Notes:	-
Document ID:	FCC SAR report ID4390b Findster Duo Plus 06082020
Temperature °C	22±2 / Controlled
Humidity RH%	30±20 / Controlled
Measurement performed by:	Ilari Kinnunen, Jesper Varis

1.2 Maximum Results

The maximum reported* SAR value for Body-worn 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 in RSS-102 for Body is SAR_{1g} 1.6 W/kg.

1.2.1 Standalone SAR

System	Highest Reported* SAR_{1g}(W/kg) in Body-Worn Condition	Result
LoRa	**0.62**	**PASS**

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

1.2.2 FCC Simultaneous Transmission SAR

Highest Simultaneous Transmission SAR	SAR_{1g}(W/kg) in Body-Worn Condition	Result
LoRa + Bluetooth LE	**0.65**	**PASS**

1.2.3 ISED Simultaneous Transmission SAR

Highest Simultaneous Transmission SAR	SAR_{1g}(W/kg) in Body-Worn Condition	Result
LoRa + Bluetooth LE	**0.8**	**PASS**

1.2.4 Maximum Drift

Maximum Drift During Measurements	-0.14dBm*

*Larger than 5% drifts included to scaling factors

1.2.5 Measurement Uncertainty

Expanded Uncertainty (k=2) 95 %	±23.4 %

2. DESCRIPTION OF THE DEVICE UNDER TEST (DUT)

The DUT is pet tracking system which allows real-time monitoring of the pets geo-location and activity. It has two modules, one for the guardian and one for the pet.

Device Category	Portable
Exposure Environment	General population, uncontrolled

2.1 Supported Frequency Bands and Operational Modes

TX Frequency bands	Modes of Operation	Transmitter Frequency Range
	LoRa	918 – 927.5 MHz
	Bluetooth LE	2400 – 2483.5 MHz

2.2 SAR test Exclusions

The device supports Bluetooth low energy technology at 2.4 GHz. The output power of Bluetooth is 0dBm and it qualifies for low power test exclusion according to FCC KDB Publications 447498D01 as standalone equipment.

According to RSS-102, issue 5, 2015, the SAR test exclusion power threshold for 2450MHz is 4mW at ≤5mm separation distance. The maximum EIRP of the Bluetooth transmitter is 1.82mW thus it is below the test exclusion threshold.

3. OUTPUT POWER

3.1 Maximum specified conducted output power

From a customer;

LoRa Bandwidth 125 kHz	Max Output Power [dBm]
Guardian Module	14
Pet Module	14

3.2 Tested conducted power

LoRa Bandwidth 125 kHz	Guardian Module	Pet Module
918 MHz	15.46	15.45
923 MHz	15.42	15.38
927.5MHz	15.38	15.37

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.

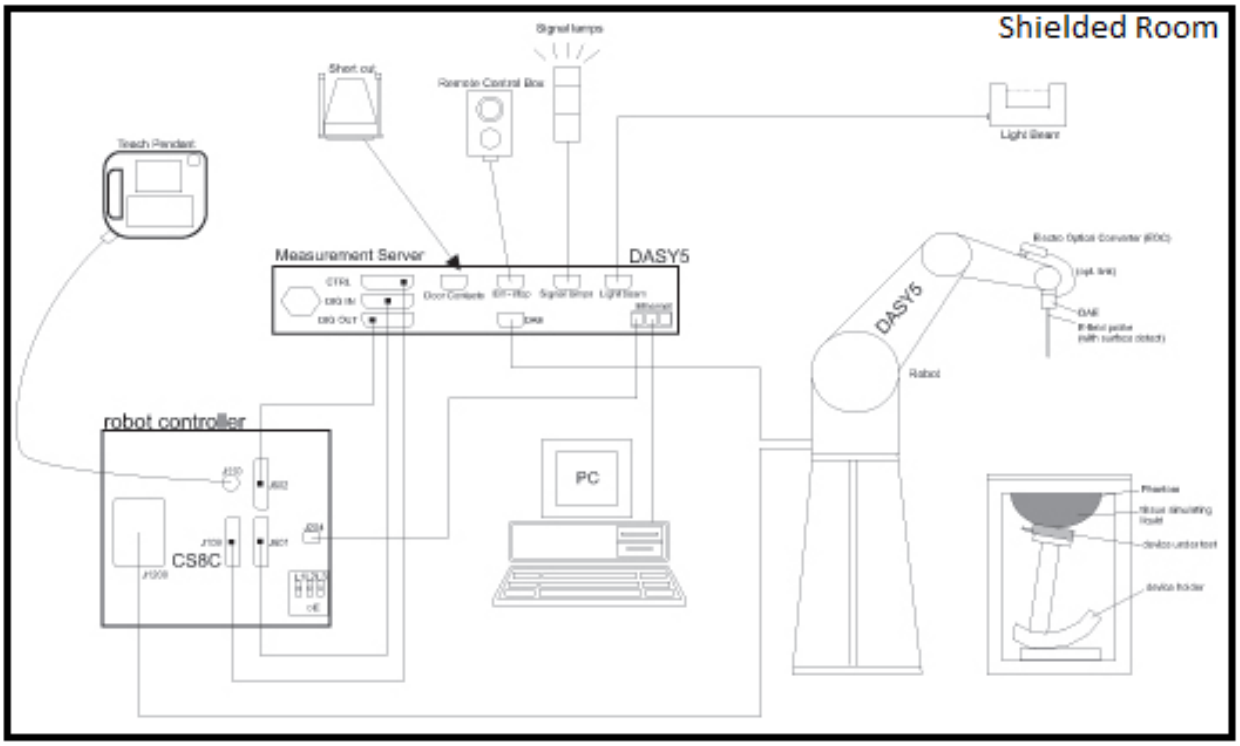


Figure 1 Schematic Laboratory Picture

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	04.2020
Probe	EX3DV4	7447	03.2020
Dipole	D835V2	448	03.2020
DASY5 Software	52.8.8.1258	-	NA
Signal generator	Agilent E4438C	MY42082527	NA
Amplifier	Ophir 5163F	1022	NA
Power Reflection Meter	NRT	835065/049	02.2020
Directional Power Sensor	NRT-Z44	835374/021	02.2020
Spectrum Analyzer	Agilent E445A	MY41000121	NA

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

4.2.1 ELI phantom

The phantom used in SAR tests was an ELI phantom, manufactured by SPEAG. ELI phantom is used for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. 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 in all frequencies used. 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, salt, emulsifiers

4.4 System Validation Status

Frequency [MHz]	Dipole Type / SN	Probe Type / SN	Calibrated Signal Type	DAE Unit / SN	Dielectric Constant ε	Conductivity , σ [S/m]	Validation Done
							Head tissue simulant
835	D835V2 - SN: 473	EX3DV4 - SN: 7447	CW/GMSK	DAE 4 / 756	40.96	0.89	04.2020

4.5 System Check

Date	Tissue Type	Tissue Temp. [°C]	Frequency [MHz]	Input Power	Measured SAR_{1g} [W/kg]	1 W Target SAR_{1g} [W/kg]	1 W Normalized SAR_{1g} [W/kg]	Deviation (%)	Plot #
29.7.2020	WB HEAD	22.06	835	250	2.38	9.38	9.52	1.49	1
30.7.2020	WB HEAD	22.14	835	250	2.49	9.38	9.96	6.18	2

4.5.1 Tissue Simulant Verification

				Target		Measured		Deviation	
Date	**Tissue Type**	**Tissue Temp [°C]**	**Frequency [MHz]**	**Dielectric Constant [ε]**	**Conductivity. σ [S/m]**	**Dielectric Constant [ε]**	**Conductivity σ [S/m]**	**ε (%)**	**σ (%)**
29.07.2020	WB Head	22	835	41.55	0.91	39.06	0.92	-6.0	1.6
29.07.2020	WB Head	22	918	41.48	0.98	38.83	0.96	-6.4	-2.4
29.07.2020	WB Head	22	923	41.47	0.98	38.82	0.96	-6.4	-2.4
29.07.2020	WB Head	22	927.5	41.46	0.98	38.81	0.96	-6.4	-2.5
30.07.2020	WB Head	22	835	41.55	0.91	39.07	0.94	-6.0	2.7
30.07.2020	WB Head	22	918	41.48	0.98	38.84	0.96	-6.3	-1.4
30.07.2020	WB Head	22	923	41.47	0.98	38.84	0.97	-6.4	-1.5
30.07.2020	WB Head	22	927.5	41.46	0.98	38.82	0.97	-6.4	-1.5

5. TEST PROCEDURE

Testing was carried out in accordance with FCC KDB Publications 447498 D01 and RSS-102.

According to the Notice-DRS001, the low, mid and high frequency channels for the configuration with the highest SAR value were tested.

The LoRa transmission was set on with software, using the maximum duty cycle.

5.1 Test Positions

5.1.1 Body-worn Configuration, 0mm separation distance

Guardian Module

The Guardian Module was placed below the ELI phantom with 0mm separation distance. All sides of the device were measured. Due to the shaping of the device there is some gap in the middle and side part of the device between the phantom and the device at the zero-separation distance, while one edge of the device is at zero separation. Photos of the test positions are presented in Appendix A.

Pet Module

The device was placed below the flat part of the ELI phantom with 0mm separation distance. The device was oriented in such way that the side (back) of the device against the dog's neck when in use, was oriented against the phantom. The side facing the opposite way of the dog (front) was also measured.

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 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.

5.3 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

Uncertainty Budget
IEEE 1528-2013

Error Description	Uncert. value	Prob. Dist.	Div.	(*ci*) 1g	(*ci*) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(*vi*) v_{eff}
Measurement System								
Probe Calibration	±6.0 %	N	1	1	1	±6.0 %	±6.0 %	∞
Axial Isotropy	±4.7 %	R		0.7	0.7	±1.9 %	±1.9 %	∞
Hemispherical Isotropy	±9.6 %	R	1.73	0.7	0.7	±3.9 %	±3.9 %	∞
Boundary Effects	±1.0 %	R	1.73	1	1	±0.6 %	±0.6 %	∞
Linearity	±4.7 %	R	1.73	1	1	±2.7 %	±2.7 %	∞
System Detection Limits	±1.0 %	R	1.73	1	1	±0.6 %	±0.6 %	∞
Modulation Response^m	±2.4 %	R	1.73	1	1	±1.4 %	±1.4 %	∞
Readout Electronics	±0.3 %	N	1	1	1	±0.3 %	±0.3 %	∞
Response Time	±0.8 %	R	1.73	1	1	±0.5 %	±0.5 %	∞
Integration Time	±2.6 %	R	1.73	1	1	±1.5 %	±1.5 %	∞
RF Ambient Noise	±3.0 %	R	1.73	1	1	±1.7 %	±1.7 %	∞
RF Ambient Reflections	±3.0 %	R	1.73	1	1	±1.7 %	±1.7 %	∞
Probe Positioner	±0.4 %	R	1.73	1	1	±0.2 %	±0.2 %	∞
Probe Positioning	±2.9 %	R	1.73	1	1	±1.7 %	±1.7 %	∞
Max. SAR Eval.	±2.0 %	R	1.73	1	1	±1.2 %	±1.2 %	∞
Test Sample Related								
Device Positioning	±2.9 %	N	1	1	1	±2.9 %	±2.9 %	145
Device Holder	±3.6 %	N	1	1	1	±3.6 %	±3.6 %	5
Power Drift	±5.0 %	R	1.73	1	1	±2.9 %	±2.9 %	∞
Power Scaling	±6 %	R	1.73	1	1	±3.5 %	± 3.5%	∞
Phantom and Setup								
Phantom Uncertainty	±6.1 %	R	1.73	1	1	±3.5 %	±3.5 %	∞
SAR correction	±1.9 %	R	1.73	1	0.84	±1.1 %	±0.9 %	∞
Liquid Conductivity (mea.)	±2.5 %	R	1.73	0.78	0.71	±1.1 %	±1.0 %	∞
Liquid Permittivity (mea.)	±2.5 %	R	1.73	0.26	0.26	±0.3 %	±0.4 %	∞
Temp. unc. - Conductivity	±3.4 %	R	1.73	0.78	0.71	±1.5 %	±1.4 %	∞
Temp. unc. - Permittivity	±0.4 %	R	1.73	0.23	0.26	±0.1 %	±0.1 %	∞
Combined Std. Uncertainty						±11.7 %	±11.6 %	361
Expanded STD Uncertainty						**±23.4 %**	**±23.3 %**	

7. TEST RESULTS

7.1 SAR Results for Body-worn Exposure Condition, 0 mm separation distance

7.1.1 Guardian module

Band	Freq [MHz]	Modulation / BW [kHz]	Test position	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Measured SAR_{1g} [W/kg]	Scaling Factor	Duty Cycle [%]	Reported SAR_{1g} [W/kg]	Plot #
LoRa	918	CSS / 125	Front	14	15.46	0.06	0.615	1.00	14.5	0.62	3
LoRa	918	CSS / 125	Back	14	15.46	0.08	0.478	1.00	14.5	0.48	
LoRa	918	CSS / 125	Top Left	14	15.46	-0.01	0.441	1.00	14.5	0.44	
LoRa	918	CSS / 125	Top Right	14	15.46	0	0.127	1.00	14.5	0.13	
LoRa	918	CSS / 125	Bottom Left	14	15.46	0.08	0.158	1.00	14.5	0.16	
LoRa	918	CSS / 125	Bottom Right	14	15.46	-0.06	0.0875	1.00	14.5	0.09	
LoRa	923	CSS / 125	Front	14	15.42	-0.14	0.533	1.00	14.5	0.53	
LoRa	927.5	CSS / 125	Front	14	15.38	-0.07	0.425	1.00	14.5	0.43	

7.1.2 Pet module

Band	Freq [MHz]	Modulation / BW [kHz]	Test position	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Measured SAR_{1g} [W/kg]	Scaling Factor	Duty Cycle [%]	Reported SAR_{1g} [W/kg]	Plot #
LoRa	918	CSS / 125	Back	14	15.45	-0.08	0.451	1.00	14.5	0.45	
LoRa	923	CSS / 125	Back	14	15.38	-0.04	0.338	1.00	14.5	0.34	
LoRa	927.5	CSS / 125	Back	14	15.37	-0.02	0.228	1.00	14.5	0.23	
LoRa	918	CSS / 125	Front	14	15.45	0.06	0.562	1.00	14.5	0.56	4

7.2 Calculated Bluetooth SAR Results

For simultaneous transmission evaluation the Bluetooth standalone SAR value is estimated according to the following equation:

FCC: [(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)]·[√f(GHz)/x] W/kg, where x = 7.5 for 1-g SAR.

ISED: (maximum power level including tune-up tolerance for transmitter A / maximum power level of exemption at the same frequency and distance) * 0.4W/kg

The maximum conducted output power of the Bluetooth LE is 0dBm = 1mW. EIRP is 1.82mW. The minimum separation distance between the user and/or bystander and the antenna according to the manufacturer is 7mm.

FCC: Bluetooth SAR_{1g}= (1mW/7mm)*(2.4835GHz)$^{1/2}$/7.5=0.03 W/kg

ISED: Bluetooth SAR_{1g}= (1.82mW/4mW) * 0.4W/kg =0.18W/kg

7.3 Simultaneous Transmission Analysis

FCC Simultaneous SAR:

	Reported SAR_{1g} [W/kg]
Maximum LoRa SAR	**0.62**
Maximum Bluetooth LE SAR	**0.03**
SAR Summation	**0.65**

ISED Simultaneous SAR:

	Reported SAR_{1g} [W/kg]
Maximum LoRa SAR	**0.62**
Maximum Bluetooth LE SAR	**0.18**
SAR Summation	**0.8**

7.4 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%.

Used zoom scan step sizes are compliant with IEC 62209-2/AMD1. The results can be seen in the table below.

Filename	Horizontal Grid Step [mm]	Minimum Distance [mm]	M2/M1 Ratio [%]	Result
Guardian LoRa Front Low	5.0	7.1	**32.9**	**PASS**
Guardian LoRa Back Low	5.0	11.2	47.6	**PASS**
Guardian LoRa Bottom Left Low	5.0	10	44.9	**PASS**
Guardian LoRa Front High	5.0	**7**	33.9	**PASS**
Guardian LoRa Front Mid	5.0	7.1	34.0	**PASS**
Guardian LoRa Top Left Low	5.0	**7**	35.0	**PASS**
Guardian LoRa Top Right Low	5.0	10	48.0	**PASS**
Pet LoRa Back High	5.0	11.2	46.5	**PASS**
Pet LoRa Back Low	5.0	11.1	47.3	**PASS**
Pet LoRa Back Mid	5.0	11.1	45.5	**PASS**
Pet LoRa Front Low	7.5	10.6	35.2	**PASS**

APPENDIX A: PHOTOS OF THE DUT

Size of the DUT: 42 x 42 x 18 mm

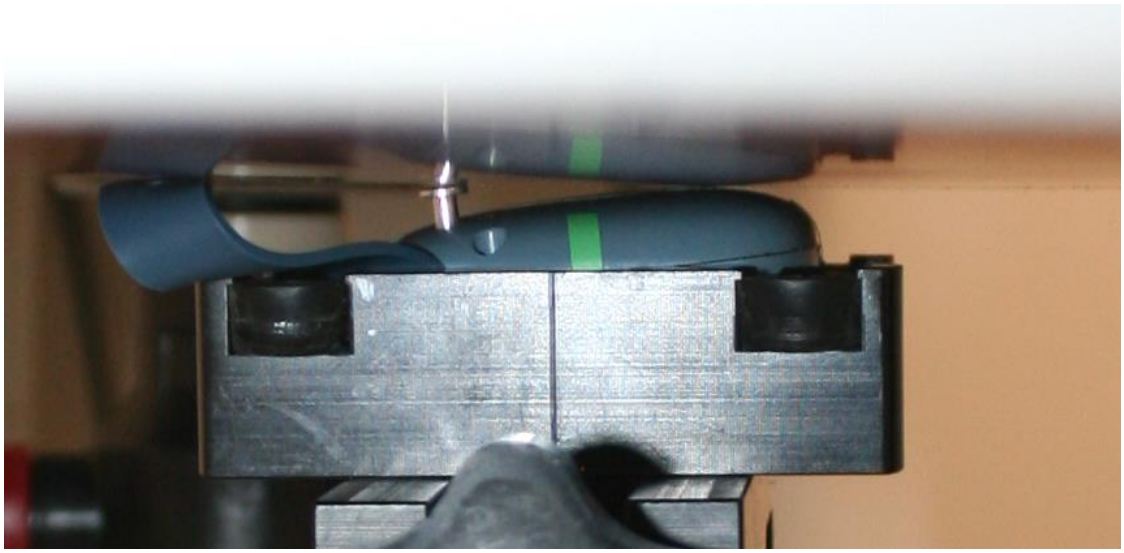
Guardian module: Front

Guardian module: Back

Pet module: Front

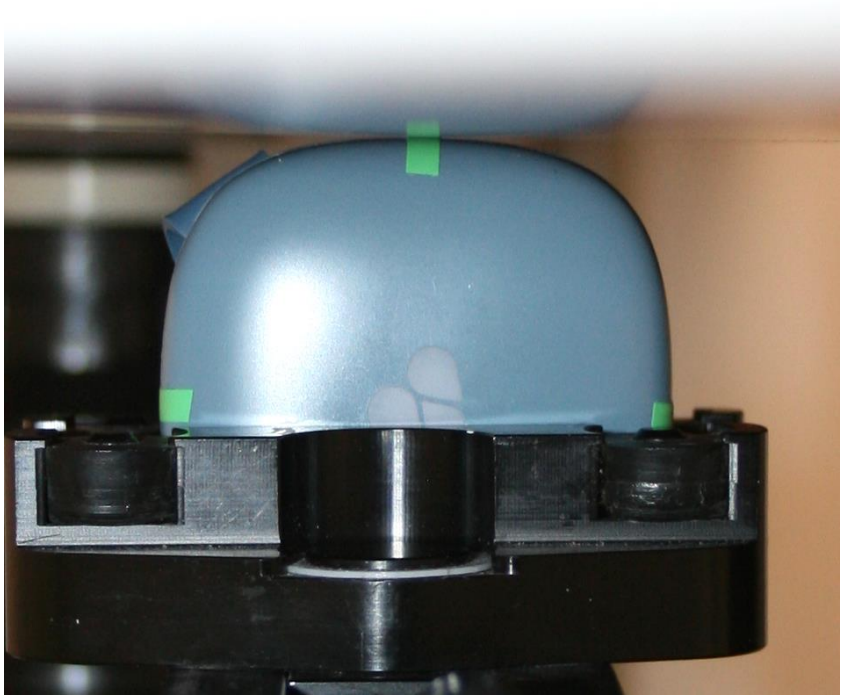
Pet module: Back

Guardian module: Front side of the device against the phantom, 0mm separation

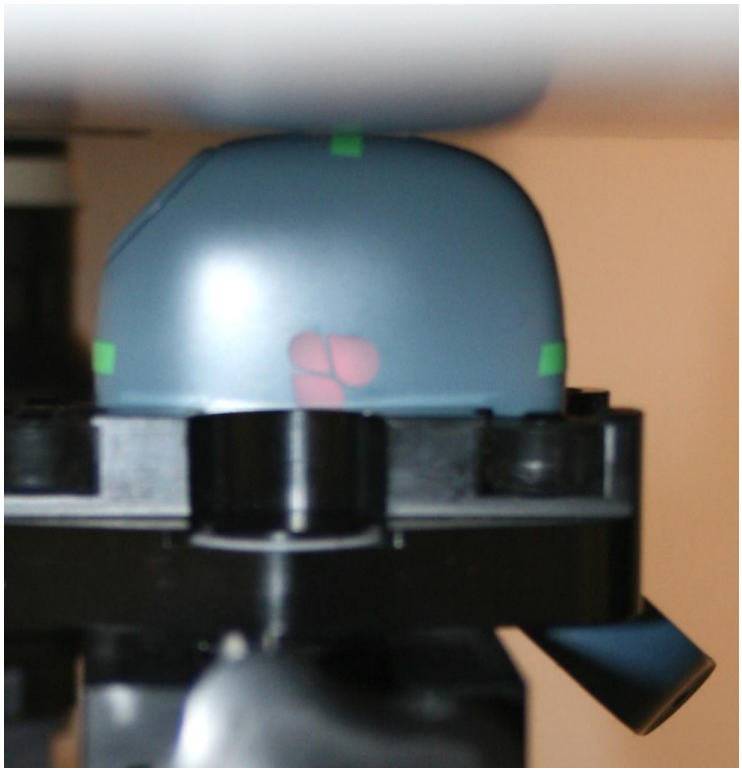


Guardian module: Back side of the device against the phantom, 0mm separation

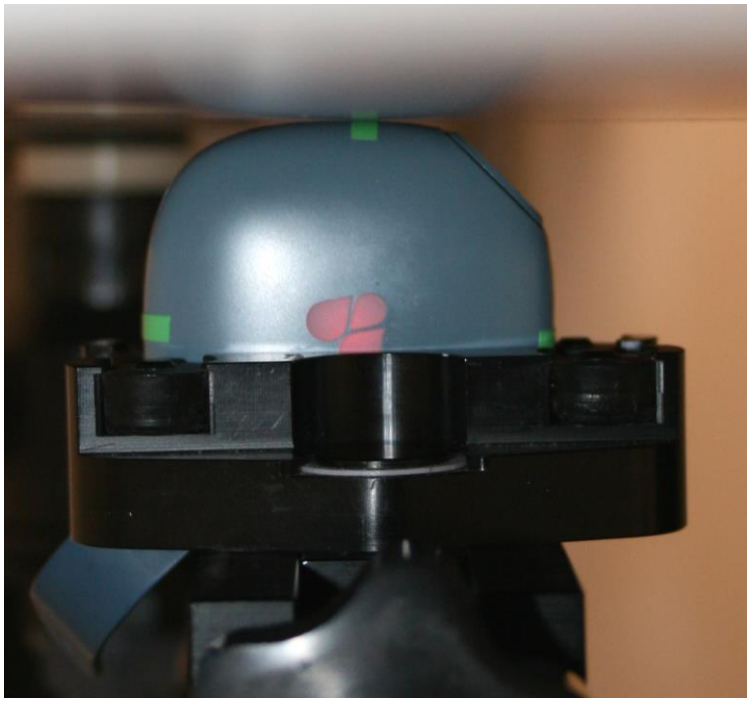
Guardian module: Top Left side of the device against the phantom, 0mm separation



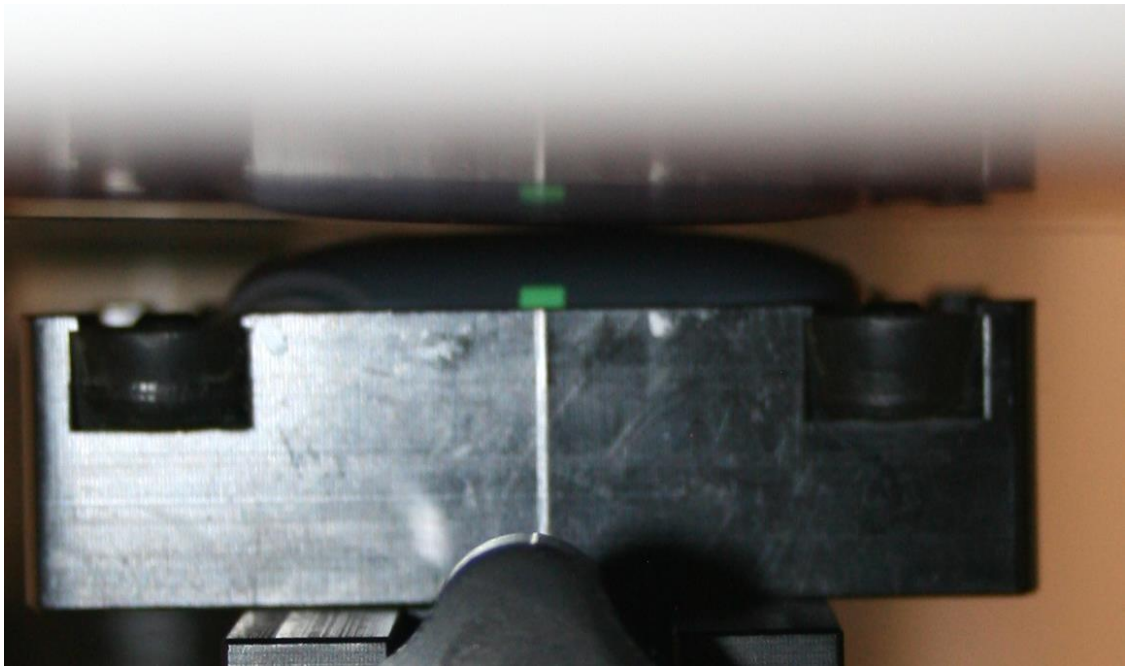
Guardian module: Top Right side of the device against the phantom, 0mm separation



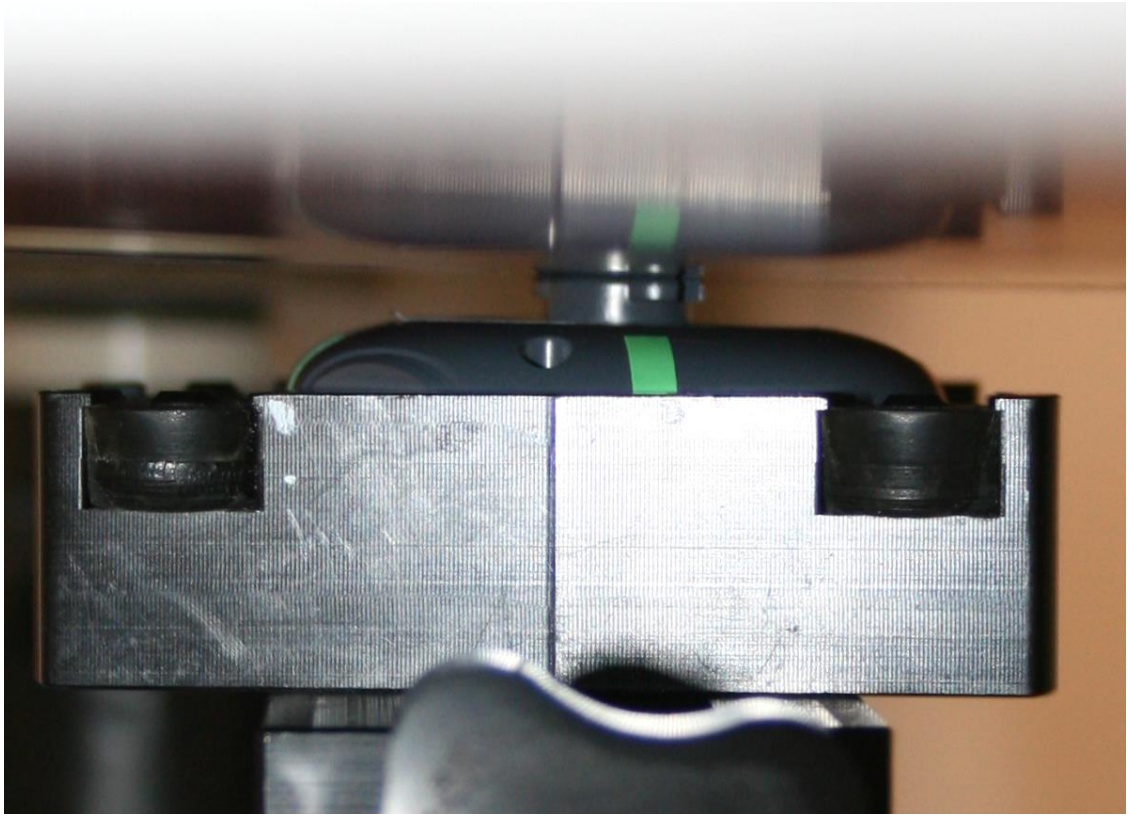
Guardian module: Bottom left side of the device against the phantom, 0mm separation



Guardian module: Bottom right side of the device against the phantom, 0mm separation



Pet module: Front side off the device against the phantom, 0mm separation



Pet module: Back side of the device against the phantom, 0mm separation

APPENDIX B: SYSTEM CHECK SCAN

Plot 1

Date/Time: 29.7.2020 9:45:36

Test Laboratory: Verkotan Oy

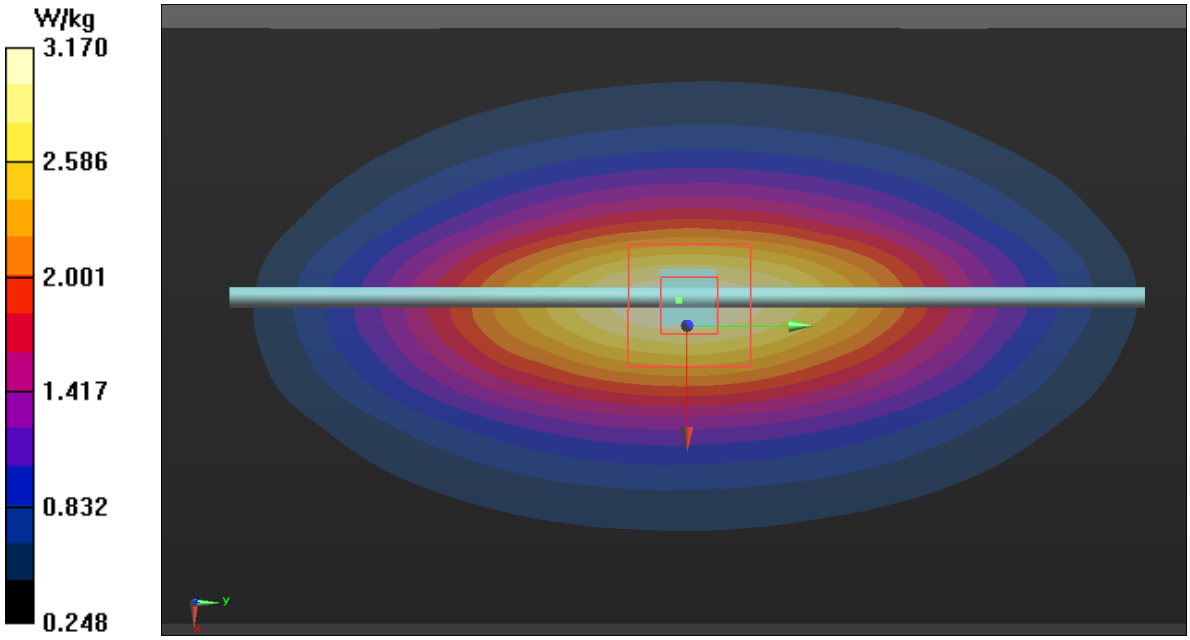
DUT: Dipole 835 MHz D835V2; Type: D835V2; Serial: D835V2 - SN:448

Communication System: UID 0, CW (0); Communication System Band: D835 (835.0 MHz); Frequency: 835 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 835 MHz; σ = 0.925 S/m; ε_r = 39.058; ρ = 1000 kg/m^3
Phantom section: Flat Section; Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(9.97, 9.97, 9.97); Calibrated: 25.3.2020;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0, -4.0
- Electronics: DAE4 Sn705; Calibrated: 24.4.2020
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/system check/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 61.35 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 3.64 W/kg
SAR(1 g) = 2.38 W/kg; SAR(10 g) = 1.54 W/kg (SAR corrected for target medium)
Maximum value of SAR (measured) = 3.17 W/kg
Configuration/system check/Area Scan (71x131x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 3.20 W/kg



Plot 2

Date/Time: 30.7.2020 8:50:45

Test Laboratory: Verkotan Oy

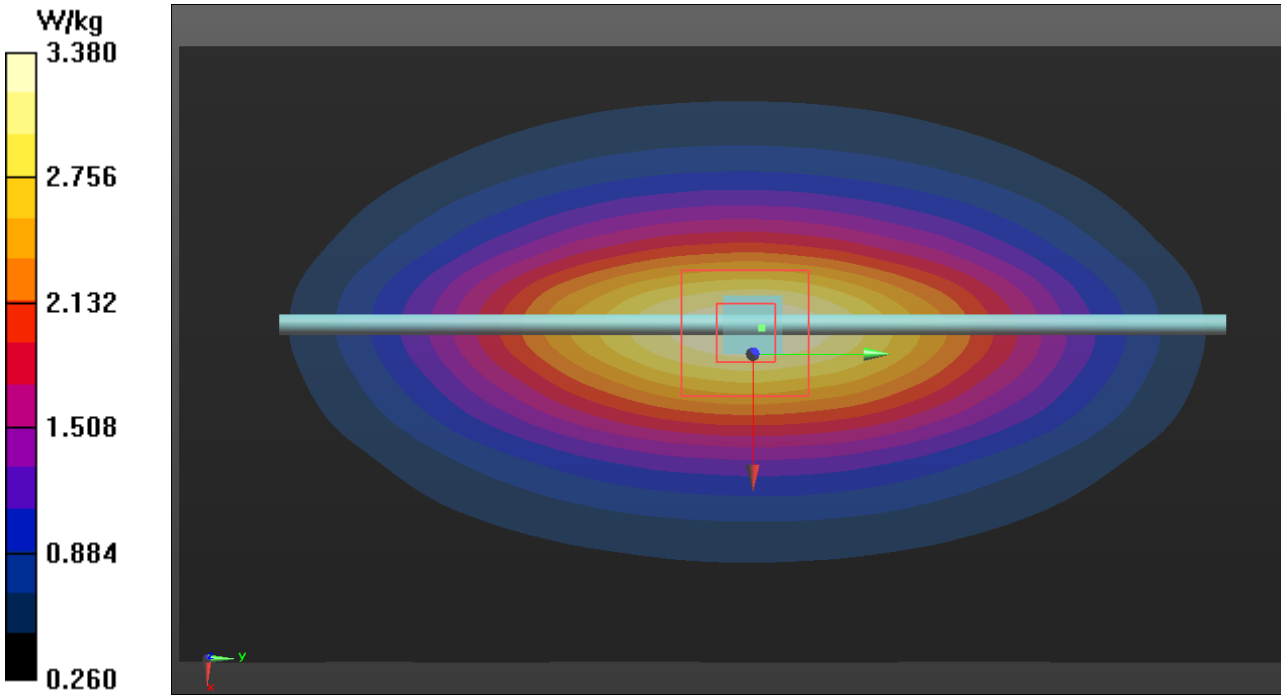
DUT: Dipole 835 MHz D835V2; Type: D835V2; Serial: D835V2 - SN:448

Communication System: UID 0, CW (0); Communication System Band: D835 (835.0 MHz); Frequency: 835 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 835 MHz; σ = 0.935 S/m; ε_r = 39.072; ρ = 1000 kg/m^3
Phantom section: Flat Section; Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(9.97, 9.97, 9.97); Calibrated: 25.3.2020;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0, -4.0
- Electronics: DAE4 Sn705; Calibrated: 24.4.2020
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/system check/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 61.47 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 3.83 W/kg
SAR(1 g) = 2.49 W/kg; SAR(10 g) = 1.61 W/kg (SAR corrected for target medium)
Maximum value of SAR (measured) = 3.38 W/kg
Configuration/system check/Area Scan (71x131x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 3.33 W/kg



APPENDIX C: MEASUREMENT SCANS

Plot 3

Date/Time: 29.7.2020 13:03:06

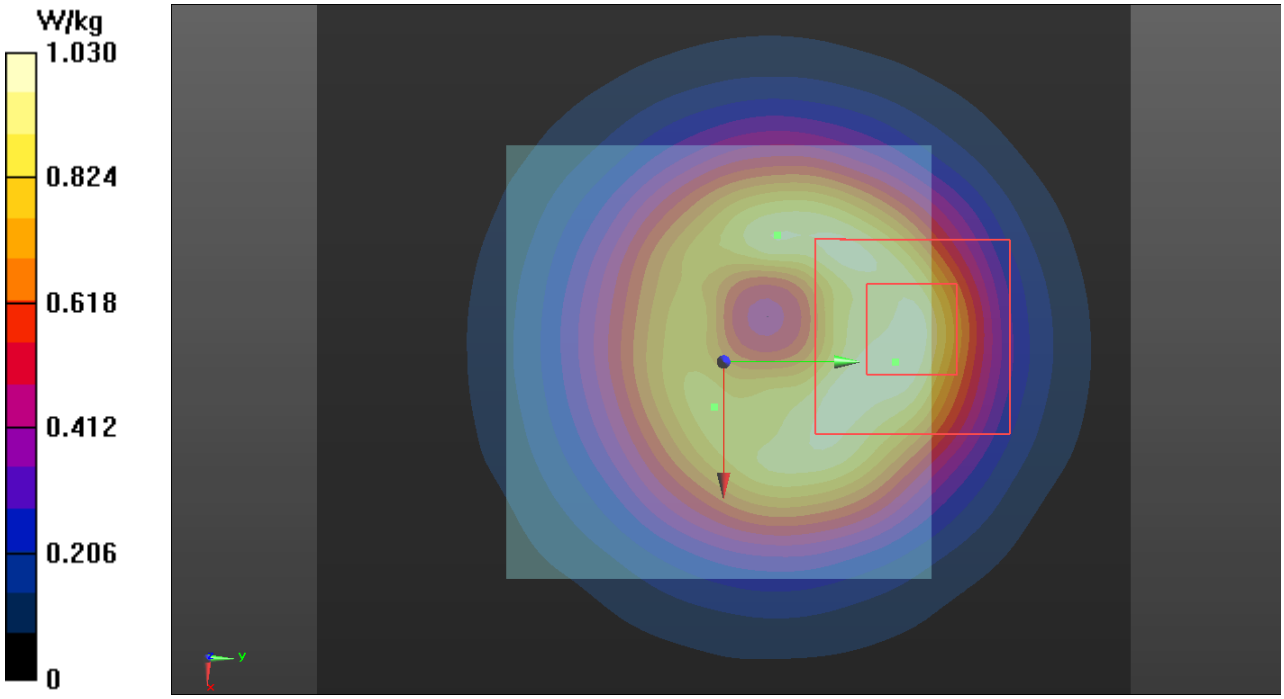
DUT: Findster Duo Plus

Communication System: UID 0, LoRA (0); Communication System Band: FCC; Frequency: 918 MHz;Communication System PAR: 8.386 dB; PMF:
Medium parameters used: f = 918 MHz; σ = 0.955 S/m; ε_r = 38.828; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(9.97, 9.97, 9.97); Calibrated: 25.3.2020;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 31.0
- Electronics: DAE4 Sn705; Calibrated: 24.4.2020
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Guardian LoRa Front Low/Area Scan (91x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.03 W/kg
Configuration/Guardian LoRa Front Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 21.97 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.87 W/kg
SAR(1 g) = 0.615 W/kg; SAR(10 g) = 0.268 W/kg (SAR corrected for target medium)
Maximum value of SAR (measured) = 1.26 W/kg



Plot 4

Date/Time: 29.7.2020 11:37:47

Test Laboratory: Verkotan Oy

DUT: Findster Duo Plus

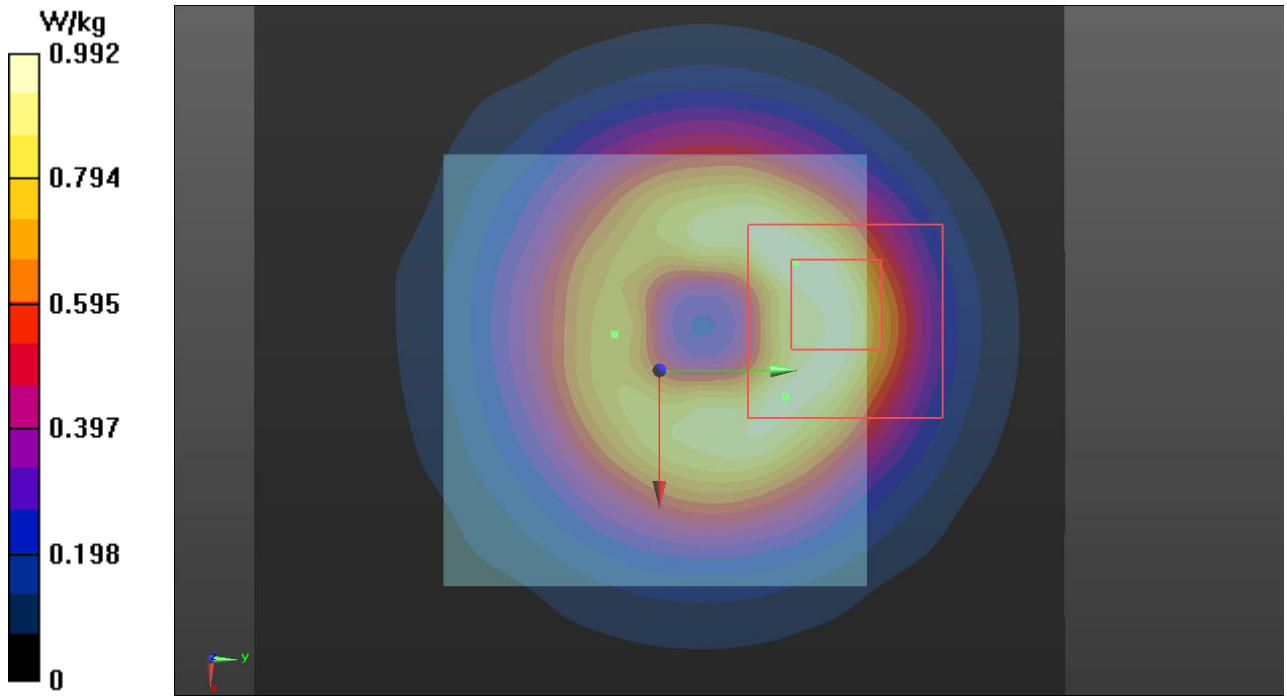
Communication System: UID 0, LoRA (0); Communication System Band: FCC; Frequency: 918 MHz;Communication System PAR: 8.386 dB; PMF:
Medium parameters used: f = 918 MHz; σ = 0.955 S/m; ε_r = 38.828; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(9.97, 9.97, 9.97); Calibrated: 25.3.2020;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 31.0
- Electronics: DAE4 Sn705; Calibrated: 24.4.2020
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Pet LoRa Front Low/Area Scan (91x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.992 W/kg
Configuration/Pet LoRa Front Low/Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 21.83 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 1.56 W/kg

SAR(1 g) = 0.562 W/kg; SAR(10 g) = 0.248 W/kg (SAR corrected for target medium)
Maximum value of SAR (measured) = 1.01 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: EX3-7447_Mar20**

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:7447

Calibration procedure(s): QA CAL-01.v9, QA CAL-14.v5, QA CAL-23.v5, QA CAL-25.v7
Calibration procedure for dosimetric E-field probes

Calibration date: March 25, 2020

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	03-Apr-19 (No. 217-02892/02893)	Apr-20
Power sensor NRP-Z91	SN: 103244	03-Apr-19 (No. 217-02892)	Apr-20
Power sensor NRP-Z91	SN: 103245	03-Apr-19 (No. 217-02893)	Apr-20
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-19 (No. 217-02894)	Apr-20
DAE4	SN: 660	27-Dec-19 (No. DAE4-660_Dec19)	Dec-20
Reference Probe ES3DV2	SN: 3013	31-Dec-19 (No. ES3-3013_Dec19)	Dec-20
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-18)	In house check: Jun-20
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-19)	In house check: Oct-20

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 27, 2020

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

Certificate No: EX3-7447_Mar20 Page 1 of 9

EX3DV4 – SN:7447 March 25, 2020

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]	0.41	0.42	0.42	± 10.1 %
DCP (mV)[B]	98.5	91.0	100.2	

Calibration Results for Modulation Response

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Max dev.	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	197.2	± 2.7 %	± 4.7 %
		Y	0.0	0.0	1.0		185.8		
		Z	0.0	0.0	1.0		172.3		

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.

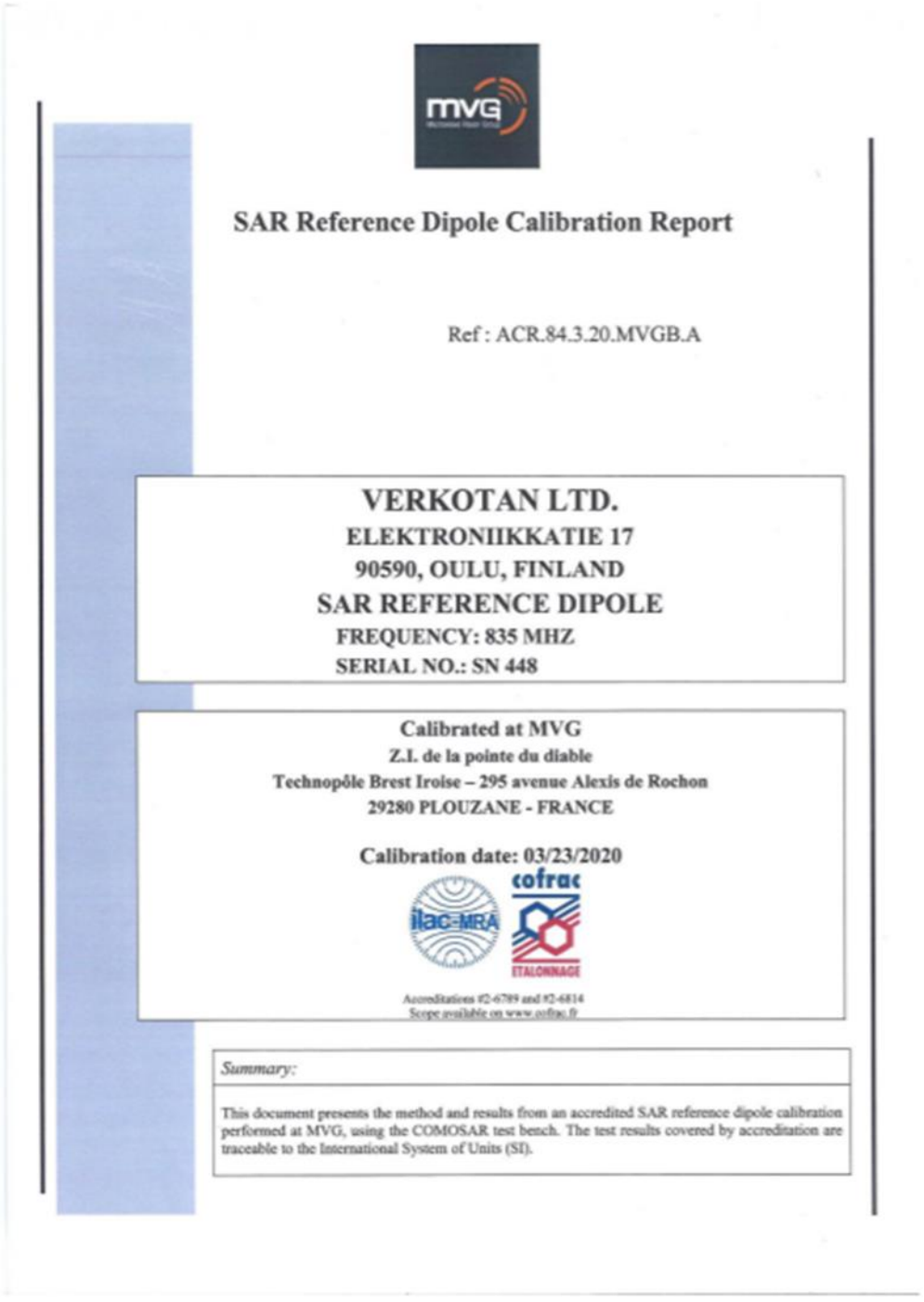
DASY/EASY - Parameters of Probe: EX3DV4 - SN:7447

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
750	41.9	0.89	10.38	10.38	10.38	0.52	0.88	± 12.0 %
900	41.5	0.97	9.97	9.97	9.97	0.31	1.05	± 12.0 %
1750	40.1	1.37	8.65	8.65	8.65	0.29	0.88	± 12.0 %
1950	40.0	1.40	8.29	8.29	8.29	0.23	0.98	± 12.0 %
2150	39.7	1.53	8.21	8.21	8.21	0.29	0.88	± 12.0 %
2300	39.5	1.67	8.05	8.05	8.05	0.30	1.00	± 12.0 %
2450	39.2	1.80	7.83	7.83	7.83	0.29	1.00	± 12.0 %
2600	39.0	1.96	7.64	7.64	7.64	0.19	1.20	± 12.0 %
3300	38.2	2.71	7.00	7.00	7.00	0.30	1.30	± 13.1 %
5250	35.9	4.71	5.18	5.18	5.18	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.56	4.56	4.56	0.40	1.80	± 13.1 %
5750	35.4	5.22	4.70	4.70	4.70	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



SAR Reference Dipole Calibration Report

Ref : ACR.84.3.20.MVGB.A

VERKOTAN LTD.
ELEKTRONIIKKATIE 17
90590, OULU, FINLAND
SAR REFERENCE DIPOLE
FREQUENCY: 835 MHZ
SERIAL NO.: SN 448

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

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

Summary:

This document presents the method and results from an accredited SAR reference dipole calibration performed 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.84.3.20.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

Page: 2/10

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 %	

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	9.38 (0.94)	6.22	5.94 (0.59)
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	