SAR Compliance Test Report

Date of Report	24/01/2022	**Client's Contact person:**	Imad Hjije
Number of pages:	78	**Responsible Test engineer:**	Kirsi Kyllönen
Testing laboratory:	**Verkotan Oy** Elektroniikkatie 17 90590 Oulu Finland	**Client:**	**Harman Becker Automotive Systems GmbH** Becker-Göring-Straße 16 76307 Karlsbad Germany
Tested device	Hardware for Enhanced Remote-, Mobility- & Emergency Services 1.5 LTE NAFTA		
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**		
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:	24.01.2022 Miia Nurkkala Digitaalinen allekirjoittaja: Miia Nurkkala Päiväys: 2022.01.24 16:21:09 +02'00' **Laboratory Manager**		

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1. SUMMARY OF SAR TEST REPORT

1.1 Test Details

Equipment under Test (DUT):

Product:	Hermes 1.5
Manufacturer:	Harman Becker Automotive Systems GmbH
Model:	Hermes 1.5, LTE NAFTA
Modules:	ME919Bs-567a, BT/WLAN CWM-03
Antennas:	Kathrein A1569050902 antenna, Mercedes-Benz A2229056207 Shark Fin antenna, WLAN PCB antenna
Serial Number:	M178L30LS005469
FCC ID Number:	T8GHERMES
DUT Number:	21788
Battery Type used in testing:	12V external power source
State of the Sample	Production sample

Testing information:

Testing performed:	17.11.2021 - 23.11.2021
Notes:	-
Document ID:	FCC SAR report_HERMES 1.5_ ID5252 _27122021.docx
Document history:	Initial version
Temperature °C	22±2 / Controlled
Humidity RH%	30±20 / Controlled
Measurement performed by:	Ilari Kinnunen, Kirsi Kyllönen
FCC Test Firm Designation Number	FI00005

1.2 Maximum Results

The maximum reported* SAR values 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) for Body-worn SAR_{1g} is 1.6 W/kg.

1.2.1 Standalone SAR

System	Highest Reported* SAR_{1g}(W/kg) in Body-Worn Condition, 35mm	Result
GPRS 850	**0.20**	**PASS**
GPRS 1900	**0.05**	**PASS**
WCDMA 2	**0.04**	**PASS**
WCDMA 4	**0.09**	**PASS**
WCDMA 5	**0.09**	**PASS**
LTE 2	**0.05**	**PASS**
LTE 4	**0.08**	**PASS**
LTE 5	**0.10**	**PASS**
LTE 12	**0.24**	**PASS**
LTE 13	**0.13**	**PASS**

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

1.2.2 Maximum Drift

Maximum Drift During Measurements	0.97dB

*Larger than 5% drifts included to scaling factors

1.2.3 Measurement Uncertainty

0.3 – 3 GHz:

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

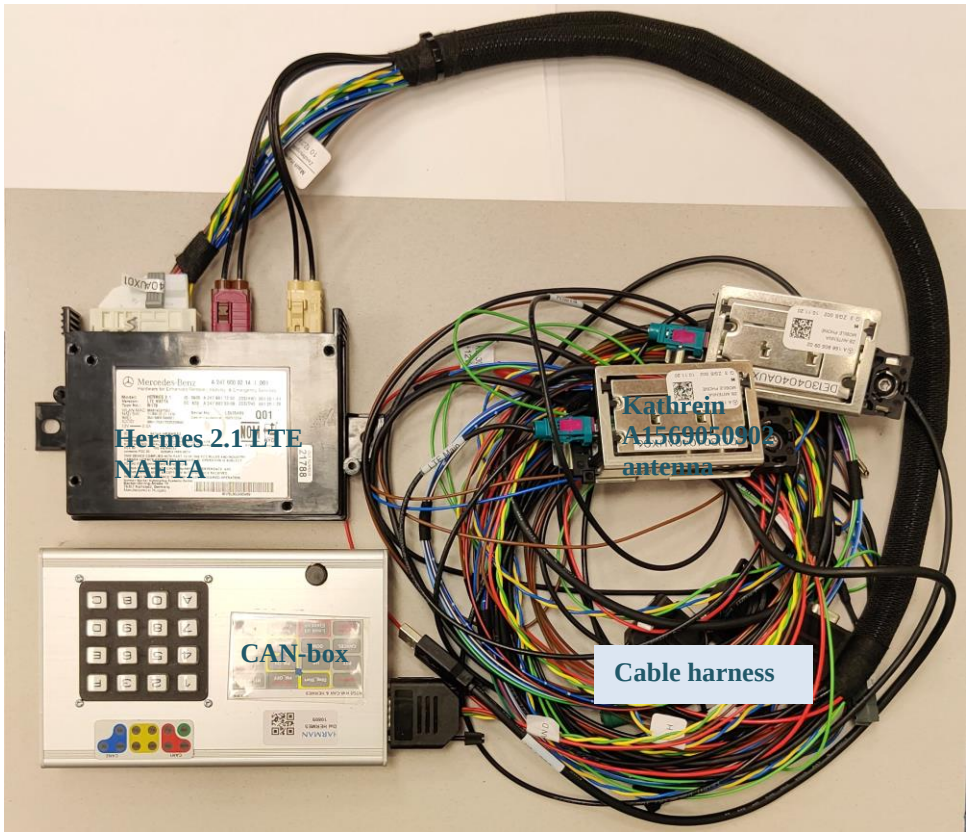
2. DESCRIPTION OF THE DEVICE UNDER TEST (DUT)

Device is Hardware for Enhanced Remote-, Mobility- & Emergency Services system for vehicles.

The HERMES 1.5 LTE NAFTA box has WLAN PCB antenna and GSM/UMTS/LTE connectivity either via Kathrein A1569050902 antenna or Mercedes-Benz A2229056207 Shark Fin antenna.

HERMES 1.5 LTE NAFTA has the same cellular module, same size and same cellular antennas as HERMES 2.1 LTE NAFTA thus the cellular SAR results tested with HERMES 2.1 LTE NAFTA are used for HERMES 1.5 NAFTA in this report.

The system consists of CAN-box, RF-Interface Hermes 1.5 LTE NAFTA, cable harness and external antenna either back of the vehicle, Kathrein A1569050902 antenna, or roof top shark fin Mercedes-Benz A2229056207 antenna for cellular transmission. The system is powered by external power source. The set-up for Hermes 1.5 LTE NAFTA is similar as for Hermes 2.1 LTE NAFTA below.



Device Category	Portable
Exposure Environment	General population uncontrolled

2.1 Supported Frequency Bands and Operational Modes

	Modes of Operation	Modulation Mode	Transmitter Frequency Range (MHz)
TX Frequency bands	GSM/GPRS 850	GMSK/8PSK	824 – 849
	GSM/GPRS 1900	GMSK/8PSK	1850 – 1910
	WCDMA 2	QPSK	1850 – 1910
	WCDMA 4	QPSK	1710 – 1755
	WCDMA 5	QPSK	824 – 849
	LTE 2	QPSK/16QAM	1850 – 1910
	LTE 4	QPSK/16QAM	1710 – 1755
	LTE 5	QPSK/16QAM	824 – 849
	LTE 12	QPSK/16QAM	698 – 716
	LTE 13	QPSK/16QAM	777 – 787
	WLAN 2.4	QPSK/16QAM	2412 – 2462
	WLAN 5	OFDM/DSSS	5735 – 5815
	Bluetooth	GFSK	2402-2480

2.2 Test Exclusions

The roof top shark fin antenna may be installed to a metallic car roof. Because the RF radiation towards the passengers is blocked by the metal roof, this use case is not considered in the SAR evaluation.

2.2.1 Test exclusion for WLAN antenna based on antenna location

The WLAN PCB antenna for HERMES 1.5 LTE NAFTA is located on the front side of the vehicle so that the shortest distance between the antenna and the passenger is 95.4mm (Figure 2). The maximum output powers for WLAN 2.4GHz 17 dBm and for WLAN 5GHz 14 dBm.

FCC SAR test exclusion threshold is calculated according to 447498 D04 Interim General RF Exposure Guidance, equations B.2 and B.1:

$$Pth\ (mW) = \begin{cases} ERP_{20\ cm}\ (d\ /\ 20cm)^{x} & d \le 20cm \\ ERP_{20\ cm} & 20cm < d \le 40cm \end{cases} \quad \text{(Equation 1)}$$

where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\ cm}\sqrt{f}}\right) \quad \text{(Equation 2)}$$

and f is in GHz, d is the separation distance (cm), and ERP20cm is per Equation 3 (B.1) below.

$$Pth\ (mW) = ERP20cm\ (mW) = \begin{cases} 2040f & 0.3 \le f < 1.5GHz \\ 3060 & 1.5GHz \le f \le 6GHz \end{cases} \quad \text{(Equation 3)}$$

Separation distances from 0.5 cm to 40 cm									
Test Position	**Operation mode**	**Frequency [GHz] (high channel)**	**Max time avg power (including tune-up tolerance)**	**Max Power [mW]**	**Antenna Gain [dBi]**	**Max ERP Power [mW]**	**Antenna to edge distance [mm]**	**Threshold [mW]**	**SAR test required (power > threshold)**
Back	WLAN 2.4	2.462	17	50	1.8	46	95	742	**No**
Back	WLAN 5	5.835	14	25	6.6	70	95	645	**No**

Based on calculated test exclusion threshold, WLAN 2.4GHz and WLAN 5GHz are below the test exclusion threshold.

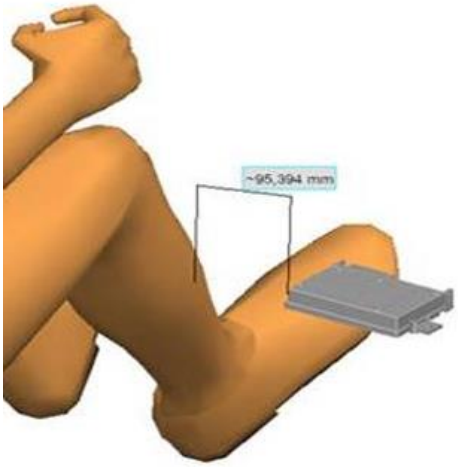


Figure 1 The minimum distance between the passenger and WLAN antenna in Hermes 1.5 LTE NAFTA.

2.2.2 Test exclusion for Bluetooth based on output power

WLAN and BT use the same frequency and antenna and since WLAN 2.4GHz tuning power is higher and they cannot transmit simultaneously, the WLAN 2.4GHz standalone SAR is conservative estimation of BT SAR. Thus, BT SAR can be deemed to comply without further analysis or measurements.

WLAN and Cellular can transmit simultaneously, but they are not co-located.

3. OUTPUT POWER

3.1 Maximum specified conducted output power

Maximum specified conducted output power, including tune-up tolerance.
From the customer;

GSM 850 Slot Configuration	Maximum Conducted Power [dBm]]
GSM (GMSK, 1Tx-slot)	35
GPRS (GMSK, 1Tx-slot)	35
GPRS (GMSK, 2Tx-slot)	35
GPRS (GMSK, 3Tx-slot)	33
EDGE (8PSK, 1Tx-slot)	30

GSM 1900 Slot Configuration	Maximum Conducted Power [dBm]
GSM (GMSK, 1Tx-slot)	32
GPRS (GMSK, 1Tx-slot)	32
GPRS (GMSK, 2Tx-slot)	32
GPRS (GMSK, 3Tx-slot)	30
EDGE (8PSK, 1Tx-slot)	29

WCDMA Slot Configuration	Maximum Conducted Power [dBm]
WCDMA 2	25
WCDMA 4	25
WCDMA 5	25

LTE Slot Configuration	Maximum Conducted Power [dBm]
LTE 2	25
LTE 4	25
LTE 5	25
LTE 12	25
LTE 13	25

WLAN Standard	Maximum Conducted Power [dBm]
802.11b	17
802.11g	17
802.11n	17

WLAN Standard	Maximum Conducted Power [dBm]
802.11n	14
802.11a	14
802.11ac	14

3.2 Tested conducted power

The tested conducted cellular output powers are from HERMES 2.1 LTE NAFTA sample.

GSM:

Slot Configuration Info	GSM 850 CH128 824.2 MHz	GSM 850 CH 190 836.6 MHz	GSM 850 CH 251 848.8 MHz	GSM 1900 CH512 1850.2 MHz	GSM 1900 CH661 1880.0 MHz	GSM 1900 CH810 1909.8 MHz
GPRS (GMSK, 1Tx-slot)	31.73	31.8	31.74	28.08	28.09	27.87
GPRS (GMSK, 2Tx-slot)	29.45	29.59	29.54	25.83	25.91	25.72
GPRS (GMSK, 3Tx-slot)	28.33	28.54	28.49	24.73	24.73	24.53
GPRS (GMSK, 4Tx-slot)	26.16	26.41	26.38	22.66	22.7	22.51
EDGE (8PSK, 1Tx-slot)	26.16	26.37	26.4	24.47	24.49	24.35
EDGE (8PSK, 2Tx-slot)	23.83	23.97	23.99	22.62	22.58	22.46
EDGE (8PSK, 3Tx-slot)	22.74	22.9	22.87	21.34	21.39	21.36
EDGE (8PSK, 4Tx-slot)	21.03	21.21	21.19	19.08	19.22	19.09

Time averaged power:

Slot Configuration	GSM 850 CH 128 824.2 MHz	GSM 850 CH 190 836.6 MHz	GSM 850 CH 251 848.8MHz	GSM 1900 CH 512 1850.2 MHz	GSM 1900 CH 661 1880.0 MHz	GSM 1900 CH 810 1909.8 MHz
GPRS 1-slot	22.73	22.8	22.74	19.08	19.09	18.87
GPRS 2-slot	23.45	23.59	23.54	19.83	19.91	19.72
GPRS 3-slot	**24.07**	**24.28**	**24.23**	**20.47**	**20.47**	**20.27**
GPRS 4-slot	23.16	23.41	23.38	19.66	19.7	19.51
EDGE 1-slot	17.16	17.37	17.4	15.47	15.49	15.35
EDGE 2-slot	17.83	17.97	17.99	16.62	16.58	16.46
EDGE 3-slot	18.48	18.64	18.61	17.08	17.13	17.1
EDGE 4-slot	18.03	18.21	18.19	16.08	16.22	16.09

The number of TX slots was 3 for GPRS 850 and GPRS 1900 SAR testing. The selection is based on above time averaged conducted power result comparison with all available uplink slot configurations. Use of these TX slots resulted in the highest time averaged power.

WCDMA:

ModeReference Channel	WCDMA 2			WCDMA 4			WCDMA 5		
	CH 9262 1852.4 MHz	CH 9400 1880.0 MHz	CH 9538 1907.6 MHz	CH 1312 1712.4 MHz	CH 1413 1732.6 MHz	CH 1513 1752.6 MHz	CH 4132 826.4 MHz	CH 4183 836.6 MHz	CH 4233 846.6 MHz
RMC 12.2K	22.49	22.44	22.38	22.56	22.46	22.39	23.2	23.03	23.11
HSDPA Subtest-1	22.47	22.42	22.37	22.48	22.43	22.38	23.14	22.97	23.08
HSDPA Subtest-2	22.51	22.46	22.36	22.52	22.46	22.35	23.14	23.0	23.08
HSDPA Subtest-3	22.0	21.94	21.78	22.02	21.93	21.93	22.55	22.41	22.55
HSDPA Subtest-4	21.99	21.93	21.78	22.01	21.94	21.93	22.53	22.42	22.55
HSUPA Subtest-1	22.43	22.36	22.31	22.48	22.41	22.37	23.12	22.98	23.05
HSUPA Subtest-2	22.44	22.36	22.28	22.51	22.41	22.36	23.13	22.96	23.06
HSUPA Subtest-3	21.92	21.87	21.84	21.99	21.94	21.84	22.55	22.4	22.49
HSUPA Subtest-4	22.3	22.3	22.18	22.48	22.41	22.33	23.09	22.99	23.08
HSUPA Subtest-5	22.36	22.27	22.2	22.49	22.37	22.33	23.12	22.96	23.04

LTE:

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			CH 18607 1850.7 MHz	CH 18900 1880.0 MHz	CH 19193 1909.3 MHz	3GPP MPR [dB]	CH 18607 1850.7 MHz	CH 18900 1880.0 MHz	CH 19193 1909.3 MHz	3GPP MPR [dB]
2 / 1.4M	1	0	21.69	22.2	21.62	0	20.78	21.35	20.65	1
	1	2	21.77	22.22	21.68	0	20.81	21.37	20.71	1
	1	5	21.65	22.09	21.47	0	20.68	21.23	20.58	1
	3	0	21.73	22.28	21.67	0	20.76	21.35	20.72	1
	3	1	21.76	22.21	21.68	0	20.74	21.36	20.72	1
	3	3	21.71	22.3	21.55	0	20.71	21.24	20.65	1
	6	0	20.65	21.24	20.58	1	19.82	20.34	19.66	2

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			CH 18615 1851.5 MHz	CH 18900 1880.0 MHz	CH 19185 1918.5 MHz	3GPP MPR [dB]	CH 18615 1851.5 MHz	CH 18900 1880.0 MHz	CH 19185 1918.5 MHz	3GPP MPR [dB]
2 / 3M	1	0	21.64	22.14	21.63	0	20.68	21.25	20.77	1
	1	7	21.8	22.32	21.69	0	20.86	21.41	20.78	1
	1	14	21.4	21.93	21.34	0	20.43	20.99	20.46	1
	8	0	20.67	21.19	20.71	1	19.78	20.23	19.78	2
	8	3	20.71	21.15	20.66	1	19.79	20.18	19.72	2
	8	7	20.57	21.04	20.52	1	19.69	20.12	19.61	2
	15	0	20.64	21.14	20.61	1	19.76	20.24	19.63	2

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			CH 18625 1852.5 MHz	CH 18900 1880.0 MHz	CH 19175 1907.5 MHz	3GPP MPR [dB]	CH 18625 1852.5 MHz	CH 18900 1880.0 MHz	CH 19175 1907.5 MHz	3GPP MPR [dB]
2 / 5M	1	0	21.89	22.4	21.98	0	21.01	21.54	21.11	1
	1	12	21.88	22.47	21.93	0	21.0	21.55	21.02	1
	1	24	21.54	22.11	21.51	0	20.57	21.14	20.53	1
	12	0	20.78	21.31	20.89	1	19.9	20.3	19.95	2
	12	6	20.73	21.26	20.87	1	19.79	20.3	19.94	2
	12	13	20.51	21.06	20.57	1	19.51	20.17	19.62	2
	25	0	20.62	21.19	20.75	1	19.64	20.22	19.8	2

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			CH 18650 1855 MHz	CH 18900 1880.0	CH 19150 1905 MHz	3GPP MPR [dB]	CH 18650 1855 MHz	CH 18900 1880.0 MHz	CH 19150 1905 MHz	3GPP MPR [dB]
2 / 10M	1	0	21.78	22.42	22.18	0	21.06	21.52	21.27	1
	1	24	21.87	22.34	21.92	0	21.03	21.39	21.08	1
	1	49	21.49	22.16	21.58	0	20.6	21.18	20.67	1
	25	0	20.73	21.29	21.02	1	19.7	20.28	20.0	2
	25	12	20.75	21.21	20.98	1	19.72	20.21	20.03	2
	25	25	20.5	21.0	20.7	1	19.49	20.01	19.75	2
	50	0	20.65	21.25	20.92	1	19.63	20.26	19.97	2

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			CH 18675 1857.5 MHz	CH 18900 1880.0	CH 19125 1902.5 MHz	3GPP MPR [dB]	CH 18675 1857.5 MHz	CH 18900 1880.0 MHz	CH 19125 1902.5 MHz	3GPP MPR [dB]
2 / 15M	1	0	21.75	22.28	21.98	0	20.86	21.43	21.23	1
	1	37	21.66	22.4	22.08	0	20.91	21.4	21.14	1
	1	74	21.39	21.8	21.37	0	20.54	20.76	20.54	1
	36	0	20.8	21.43	20.94	1	19.81	20.39	19.92	2
	36	19	20.66	21.35	21.09	1	19.68	20.31	20.11	2
	36	39	20.32	21.03	20.74	1	19.34	20.01	19.77	2
	75	0	20.58	21.22	21.03	1	19.62	20.18	19.98	2

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			CH 18700 1860.0 MHz	CH 18900 1880.0	CH 19100 1900.0 MHz	3GPP MPR [dB]	CH 18700 1860.0 MHz	CH 18900 1880.0	CH 19100 1900.0 MHz	3GPP MPR [dB]
2 / 20M	1	0	21.74	22.13	21.8	0	20.99	21.41	20.98	1
	1	50	21.77	22.48	22.26	0	20.83	21.57	21.29	1
	1	99	21.57	21.62	21.32	0	20.84	20.64	20.35	1
	50	0	20.71	21.24	20.88	1	19.72	20.2	19.83	2
	50	25	20.42	21.41	21.08	1	19.43	20.34	20.07	2
	50	50	20.37	20.87	20.85	1	19.29	19.82	19.8	2
	100	0	20.6	21.07	20.87	1	19.62	20.01	19.86	2

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			CH 19957 1710.7 MHz	CH 20175 1732.5 MHz	CH 20393 1754.3 MHz	3GPP MPR [dB]	CH 19957 1710.7 MHz	CH 20175 1732.5 MHz	CH 20393 1754.3 MHz	3GPP MPR [dB]
4 / 1.4M	1	0	21.6	21.95	21.87	0	20.76	21.19	21.04	1
	1	2	21.64	22.02	21.92	0	20.79	21.22	21.16	1
	1	5	21.51	21.96	21.83	0	20.69	21.2	21.1	1
	3	0	21.6	21.98	21.9	0	20.73	21.18	21.12	1
	3	1	21.63	22.01	21.93	0	20.81	21.14	21.1	1
	3	3	21.55	22.03	21.91	0	20.72	21.22	21.1	1
	6	0	20.53	20.94	20.91	1	20.5	20.92	20.86	2

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			CH 19965 1711.5 MHz	CH 20175 1732.5 MHz	CH 20385 1753.5 MHz	3GPP MPR [dB]	CH 19965 1711.5 MHz	CH 20175 1732.5 MHz	CH 20385 1753.5 MHz	3GPP MPR [dB]
4 / 3M	1	0	21.54	21.78	21.9	0	20.76	20.96	21.19	1
	1	7	21.69	22.14	22.0	0	20.96	21.37	21.14	1
	1	14	21.33	21.83	21.72	0	20.55	20.99	20.86	1
	8	0	20.6	20.82	20.94	1	20.53	20.76	20.82	2
	8	3	20.61	20.92	20.84	1	20.52	20.85	20.78	2
	8	7	20.48	20.91	20.74	1	20.4	20.85	20.66	2
	15	0	20.56	20.92	20.77	1	20.47	20.85	20.71	2

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			CH 19975 1711.5 MHz	CH 20175 1732.5 MHz	CH 20375 1753.5 MHz	3GPP MPR [dB]	CH 19975 1711.5 MHz	CH 20175 1732.5 MHz	CH 20375 1753.5 MHz	3GPP MPR [dB]
4 / 5M	1	0	21.47	21.75	22.08	0	20.68	20.89	21.22	1
	1	12	21.74	22.24	22.09	0	20.96	21.45	21.25	1
	1	24	20.94	21.58	21.35	0	20.04	20.74	20.53	1
	12	0	20.71	20.85	21.03	1	20.66	20.82	20.99	2
	12	6	20.68	21.0	20.96	1	20.61	20.96	20.92	2
	12	13	20.32	20.91	20.73	1	20.21	20.85	20.67	2
	25	0	20.51	20.93	20.85	1	20.44	20.86	20.78	2

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			CH 20000 1715.0 MHz	CH 20175 1732.5 MHz	CH 20350 1750.0 MHz	3GPP MPR [dB]	CH 20000 1715.0 MHz	CH 20175 1732.5 MHz	CH 20350 1750.0 MHz	3GPP MPR [dB]
4 / 10M	1	0	21.52	21.69	22.12	0	20.72	20.8	21.22	1
	1	24	21.61	22.14	22.29	0	20.71	21.14	21.59	1
	1	49	21.07	21.67	21.43	0	20.22	20.79	20.7	1
	25	0	20.61	20.87	21.15	1	20.48	20.75	21.08	2
	25	12	20.33	20.94	21.13	1	20.26	20.81	21.05	2
	25	25	20.26	21.0	20.91	1	20.17	20.86	20.86	2
	50	0	20.43	20.96	20.97	1	20.36	20.83	20.89	2

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			CH 20025 1717.0 MHz	CH 20175 1732.5 MHz	CH 20325 1747.5 MHz	3GPP MPR [dB]	CH 20025 1717.0 MHz	CH 20175 1732.5 MHz	CH 20325 1747.5 MHz	3GPP MPR [dB]
4 / 15M	1	0	21.61	21.79	22.31	0	20.84	20.94	21.32	1
	1	37	21.59	22.14	22.36	0	20.69	21.3	21.59	1
	1	74	21.31	21.72	21.53	0	20.43	20.83	20.74	1
	36	0	20.54	20.84	21.29	1	20.45	20.76	21.21	2
	36	19	20.45	20.96	21.18	1	20.35	20.87	21.1	2
	36	39	20.49	20.98	20.97	1	20.4	20.9	20.88	2
	75	0	20.51	20.97	21.28	1	20.42	20.89	21.19	2

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			CH 20050 1720.0 MHz	CH 20175 1732.5 MHz	CH 20300 1745.0 MHz	3GPP MPR [dB]	CH 20050 1720.0 MHz	CH 20175 1732.5 MHz	CH 20300 1745.0 MHz	3GPP MPR [dB]
4 / 20M	1	0	21.6	21.73	22.15	0	20.76	20.88	21.33	1
	1	50	21.61	22.17	22.35	0	20.75	21.38	21.5	1
	1	99	21.25	21.77	21.46	0	20.47	20.93	20.57	1
	50	0	20.54	20.83	21.24	1	20.45	20.75	21.17	2
	50	25	20.56	21.04	21.31	1	20.47	20.96	21.23	2
	50	50	20.53	20.96	20.94	1	20.44	20.88	20.87	2
	100	0	20.61	20.93	21.17	1	20.5	20.84	21.07	2

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			CH 20407 824.7 MHz	CH 20525 836.5 MHz	CH 20643 848.3 MHz	3GPP MPR [dB]	CH 20407 824.7 MHz	CH 20525 836.5 MHz	CH 20643 848.3 MHz	3GPP MPR [dB]
5 / 1.4M	1	0	22.22	22.13	22.57	0	21.32	21.35	21.59	1
	1	2	22.37	22.25	22.59	0	21.44	21.32	21.68	1
	1	5	22.27	22.14	22.25	0	21.28	21.22	21.27	1
	3	0	22.32	22.21	22.63	0	21.33	21.27	21.55	1
	3	1	22.37	22.22	22.54	0	21.38	21.26	21.57	1
	3	3	22.33	22.23	22.37	0	21.29	21.31	21.32	1
	6	0	21.7	21.73	21.81	1	20.71	20.74	20.83	2

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			CH 20415 825.5 MHz	CH 20525 836.5 MHz	CH 20635 847.5 MHz	3GPP MPR [dB]	CH 20415 825.5 MHz	CH 20525 836.5 MHz	CH 20635 847.5 MHz	3GPP MPR [dB]
5 / 3M	1	0	22.08	22.05	22.65	0	21.2	21.06	21.72	1
	1	7	22.51	22.35	22.74	0	21.54	21.53	21.79	1
	1	14	22.24	22.0	22.05	0	21.28	21.08	21.04	1
	8	0	21.71	21.58	22.12	1	20.67	20.59	21.1	2
	8	3	21.86	21.6	22.13	1	20.84	20.61	21.11	2
	8	7	21.81	21.68	21.85	1	20.77	20.64	20.84	2
	15	0	21.79	21.71	22.01	1	20.76	20.67	20.99	2

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			CH 20425 826.5 MHz	CH 20525 836.5 MHz	CH 20625 846.5 MHz	3GPP MPR [dB]	CH 20425 826.5 MHz	CH 20525 836.5 MHz	CH 20625 846.5 MHz	3GPP MPR [dB]
5 / 5M	1	0	22.56	22.48	23.13	0	21.61	21.62	22.21	1
	1	12	22.66	22.41	22.95	0	21.66	21.51	22.05	1
	1	24	22.95	22.51	22.54	0	21.98	21.67	21.68	1
	12	0	21.81	21.62	22.22	1	20.79	20.62	21.2	2
	12	6	22.02	21.63	22.21	1	21.0	20.65	21.18	2
	12	13	21.96	21.58	21.91	1	20.89	20.61	20.83	2
	25	0	21.82	21.59	22.07	1	20.74	20.6	21.01	2

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			CH 20450 829.0 MHz	CH 20525 836.5 MHz	CH 20600 844 MHz	3GPP MPR [dB]	CH 20450 829.0 MHz	CH 20525 836.5 MHz	CH 20600 844 MHz	3GPP MPR [dB]
5 / 10M	1	0	22.24	22.37	22.45	0	21.31	21.49	21.52	1
	1	24	22.73	22.19	22.87	0	21.76	21.32	22.05	1
	1	49	22.18	22.64	22.27	0	21.32	21.73	21.4	1
	25	0	21.78	21.56	22.0	1	20.73	20.55	20.91	2
	25	12	21.98	21.54	22.08	1	20.94	20.54	21.08	2
	25	25	21.69	21.5	21.91	1	20.63	20.45	20.81	2
	50	0	21.7	21.69	21.84	1	20.64	20.62	20.74	2

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			CH 23017 699.7 MHz	CH 23095 707.5 MHz	CH 23173 715.3 MHz	3GPP MPR [dB]	CH 23017 699.7 MHz	CH 23095 707.5 MHz	CH 23173 715.3 MHz	3GPP MPR [dB]
12 / 1.4M	1	0	21.84	21.98	22.3	0	21.05	21.2	21.57	1
	1	2	21.97	22.07	22.37	0	21.22	21.24	21.58	1
	1	5	21.81	22.13	21.97	0	21.06	21.36	21.21	1
	3	0	21.94	22.01	22.38	0	21.16	21.17	21.56	1
	3	1	21.95	22.05	22.36	0	21.14	21.19	21.53	1
	3	3	21.89	22.18	22.18	0	21.07	21.35	21.41	1
	6	0	21.52	21.75	21.84	1	20.82	21.09	21.24	2

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			CH 23025 700.5 MHz	CH 23095 707.5 MHz	CH 23165 714.5 MHz	3GPP MPR [dB]	CH 23025 700.5 MHz	CH 23095 707.5 MHz	CH 23165 714.5 MHz	3GPP MPR [dB]
12 / 3M	1	0	21.73	21.8	22.16	0	20.82	21.02	21.38	1
	1	7	21.98	22.19	22.46	0	21.21	21.49	21.64	1
	1	14	21.66	22.21	21.87	0	20.87	21.4	21.0	1
	8	0	21.46	21.58	21.9	1	20.77	20.9	21.23	2
	8	3	21.49	21.71	22.02	1	20.82	21.07	21.38	2
	8	7	21.42	21.87	21.82	1	20.76	21.24	21.19	2
	15	0	21.43	21.75	21.91	1	20.73	21.04	21.26	2

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			CH 23035 701.5 MHz	CH 23095 707.5 MHz	CH 23155 713.5 MHz	3GPP MPR [dB]	CH 23035 701.5 MHz	CH 23095 707.5 MHz	CH 23155 713.5 MHz	3GPP MPR [dB]
12 / 5M	1	0	22.64	22.51	23.29	0	21.77	21.82	22.44	1
	1	12	22.08	22.23	22.6	0	21.24	21.42	21.57	1
	1	24	22.1	22.88	22.46	0	21.32	22.22	21.74	1
	12	0	21.42	21.58	22.02	1	20.73	20.89	21.35	2
	12	6	21.45	21.76	21.99	1	20.78	21.1	21.38	2
	12	13	21.18	21.89	21.78	1	20.51	21.17	21.17	2
	25	0	21.31	21.72	21.88	1	20.61	21.06	21.25	2

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			CH 23060 704.0 MHz	CH 23095 707.5 MHz	CH 23130 711.0 MHz	3GPP MPR [dB]	CH 23060 704.0 MHz	CH 23095 707.5 MHz	CH 23130 711.0 MHz	3GPP MPR [dB]
12 / 10M	1	0	22.51	22.37	22.54	0	21.65	21.61	21.83	1
	1	24	21.86	22.17	22.71	0	21.16	21.35	21.91	1
	1	49	22.62	22.87	22.5	0	21.84	21.99	21.78	1
	25	0	21.27	21.29	21.81	1	20.6	20.69	21.14	2
	25	12	21.4	21.74	22.0	1	20.76	21.07	21.37	2
	25	25	21.25	21.77	21.74	1	20.68	21.13	21.09	2
	50	0	21.26	21.49	21.79	1	20.69	20.87	21.11	2

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			CH 23205 779.5 MHz	CH 23230 782.0 MHz	CH 23255 784.5 MHz	3GPP MPR [dB]	CH 23205 779.5 MHz	CH 23230 782.0 MHz	CH 23255 784.5 MHz	3GPP MPR [dB]
13 / 5M	1	0	22.53	22.89	22.81	0	21.59	21.97	21.82	1
	1	12	22.6	22.5	22.52	0	21.63	21.53	21.64	1
	1	24	22.74	22.61	22.78	0	21.74	21.63	21.83	1
	12	0	21.78	21.95	21.89	1	20.84	20.93	20.96	2
	12	6	21.92	22.07	21.91	1	20.98	21.07	20.95	2
	12	13	21.82	21.75	21.82	1	20.82	20.82	20.78	2
	25	0	21.78	21.78	21.76	1	20.81	20.82	20.82	2

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			NA	CH 23230 782.0 MHz	NA	3GPP MPR [dB]	NA	CH 23230 782.0 MHz	NA	3GPP MPR [dB]
13 / 10M	1	0	22.55	22.55	22.55	0	21.68	21.68	21.68	1
	1	24	22.6	22.6	22.6	0	21.69	21.69	21.69	1
	1	49	22.71	22.71	22.71	0	21.73	21.73	21.73	1
	25	0	21.8	21.8	21.8	1	20.76	20.76	20.76	2
	25	12	21.92	21.92	21.92	1	20.9	20.9	20.9	2
	25	25	21.61	21.61	21.61	1	20.61	20.61	20.61	2
	50	0	21.39	21.39	21.39	1	20.42	20.42	20.42	2

4. TEST EQUIPMENT

Dasy52 near field scanning system, manufactured by SPEAG was used for SAR testing. The test system consists of high precision robotics system (Staubli), robot controller, computer, near-field probe, probe alignment sensor, and a phantom containing the tissue equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe to the location of maximum electromagnetic field.

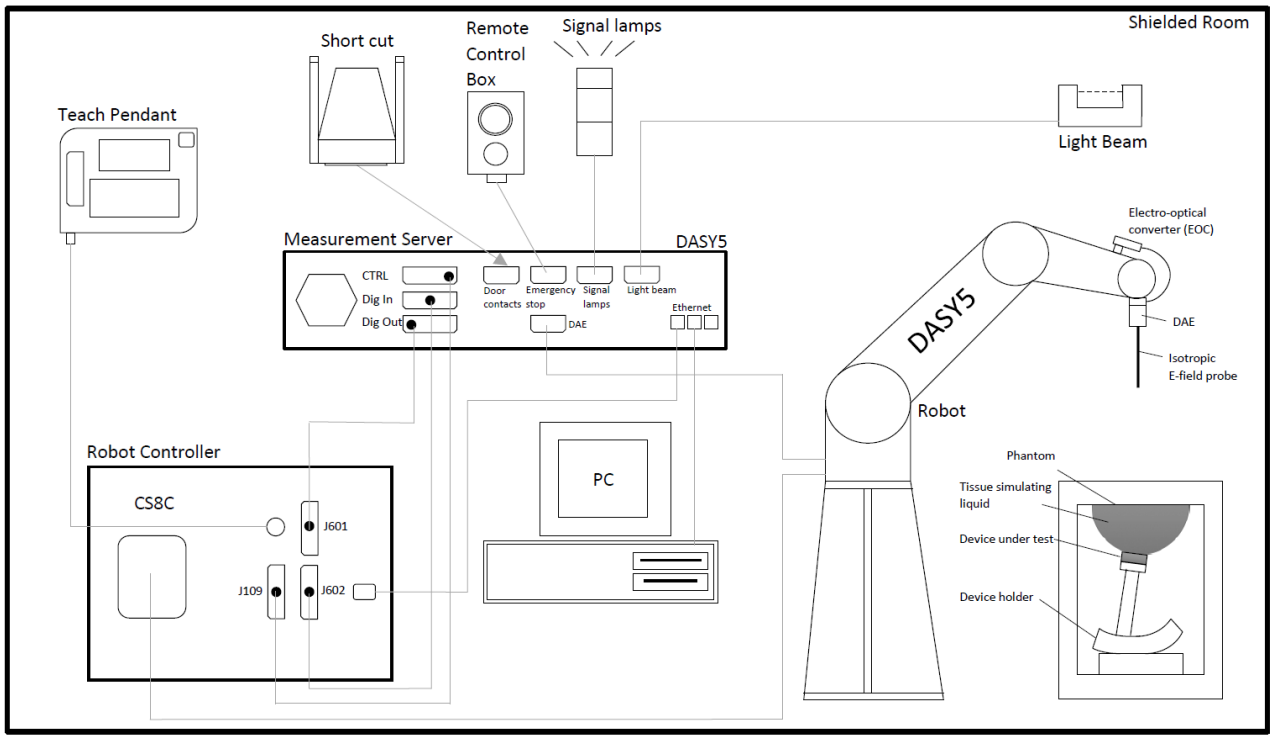


Figure 2 Schematic Laboratory Picture

4.1 Test Equipment List

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

Test Equipment	Model	Serial Number	Calibration Date
DAE	DAE4	705	04.2021
Probe	EX3DV4	7447	03.2021
Dipole	D750V3	454	12.2018
Dipole	D835V2	448	03.2020
Dipole	D1800V2	2d075	12.2020
Dipole	D1900V2	511	03.2020
DASY5 Software	52.8.8.1258	-	NA
Signal Generator	Agilent E4438C	MY42082527	NA
Amplifier	Bonn Elektronik BLMA 0842-10	1912417	NA
Power Sensor	R&S NRP-Z81	100792	06.2021
Radio Communication Tester	Anritsu MT8820C	6200930942	12.2020
Radio Communication Tester	Anritsu MT8820C	6200951734	11.2020
Inline peak power sensor	Anritsu MA24105A	2102058	08.2021

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)	
42/17 DIP 0G750-454	750	-25.7	54.5	-3	-27.76	52.5	-3.3
D835V2-SN:448	835	-25.2	49.2	-5.4	-29.93	52.2	-2.3
D1900V2-SN:511	1900	-25.4	49.4	5.3	-21.37	52.9	8

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

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. ELI is fully compatible with the 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 below 3GHz and ±5% of the recommended values in above 5GHz frequencies. 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	ε tissue simulant	σ [S/m] tissue simulant	Validation Done
750	D750V3 / 454	EX3DV4 / 7447	CW/FDD	DAE 4 / 710	42.55	0.92	04.2021
835	DIP 0G835 / 473	EX3DV4 / 7447	CW/GMSK	DAE 4 / 710	42.32	0.95	04.2021
1800	D1800V2 / 2D075	EX3DV4 / 7447	CW/GMSK	DAE 4 / 710	37.87	1.32	04.2021
1900	D1900V2 / 5D004	EX3DV4 / 7447	CW/FDD	DAE 4 / 710	37.37	1.36	04.2021

4.5 System Check

Date	Tissue Type	Tissue Temp. [°C]	Frequency [MHz]	Input Power [mW]	Measured SAR_{1g} [W/kg]	1 W Target SAR_{1g} [W/kg]	1 W Normalized SAR_{1g} [W/kg]	Deviation (%)	Plot #
17.11.2021	WB Head	22	835	250	2.44	9.38	9.76	4.1	1
18.11.2021	WB Head	22	750	250	2.03	8.52	8.12	-4.7	2
19.11.2021	WB Head	22	1900	250	9.47	37.1	37.88	2.1	3
22.11.2021	WB Head	22	1800	250	9.16	39.44	36.64	-7.1	4
23.11.2021	WB Head	22	1900	250	9.41	37.1	37.64	1.5	5

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 (%)
17.11.2021	WB Head	22	824	41.59	0.91	42.02	0.97	1.0	6.7
17.11.2021	WB Head	22	826	41.59	0.91	42.01	0.97	1.0	6.7
17.11.2021	WB Head	22	829	41.58	0.91	42.01	0.97	1.1	6.7
17.11.2021	WB Head	22	835	41.55	0.91	41.99	0.97	1.0	6.6
17.11.2021	WB Head	22	836	41.55	0.91	41.98	0.97	1.0	6.7
17.11.2021	WB Head	22	836.5	41.55	0.91	41.99	0.97	1.1	6.7
17.11.2021	WB Head	22	837	41.55	0.91	42.0	0.97	1.1	6.7
17.11.2021	WB Head	22	844	41.52	0.91	41.97	0.97	1.1	6.7
17.11.2021	WB Head	22	847	41.51	0.92	41.95	0.98	1.1	6.6
17.11.2021	WB Head	22	849	41.5	0.92	41.97	0.98	1.1	6.6
18.11.2021	WB Head	22	704	42.18	0.89	41.88	0.93	-0.7	4.2
18.11.2021	WB Head	22	707.5	42.16	0.89	41.87	0.93	-0.7	4.3
18.11.2021	WB Head	22	711	42.14	0.89	41.86	0.93	-0.7	4.3
18.11.2021	WB Head	22	750	41.94	0.89	41.72	0.94	-0.5	5.5
18.11.2021	WB Head	22	779.5	41.79	0.9	41.62	0.95	-0.4	6.4
18.11.2021	WB Head	22	782	41.78	0.9	41.6	0.95	-0.4	6.5
18.11.2021	WB Head	22	784.5	41.76	0.9	41.61	0.96	-0.4	6.6
18.11.2021	WB Head	22	824	41.59	0.91	41.48	0.97	-0.3	6.9
18.11.2021	WB Head	22	829	41.58	0.91	41.48	0.97	-0.2	6.9
18.11.2021	WB Head	22	835	41.55	0.91	41.45	0.97	-0.2	6.8
18.11.2021	WB Head	22	836.5	41.55	0.91	41.45	0.97	-0.2	6.9
18.11.2021	WB Head	22	837	41.55	0.91	41.45	0.97	-0.2	6.9
18.11.2021	WB Head	22	844	41.52	0.91	41.43	0.98	-0.2	6.7
18.11.2021	WB Head	22	849	41.5	0.92	41.41	0.98	-0.2	6.7
19.11.2021	WB Head	22	1850	40	1.4	39.42	1.44	-1.4	3.1
19.11.2021	WB Head	22	1852	40	1.4	39.42	1.44	-1.5	3.1
19.11.2021	WB Head	22	1860	40	1.4	39.41	1.45	-1.5	3.3
19.11.2021	WB Head	22	1880	40	1.4	39.37	1.46	-1.6	4.1
19.11.2021	WB Head	22	1900	40	1.4	39.35	1.47	-1.6	5.1
19.11.2021	WB Head	22	1908	40	1.4	39.34	1.47	-1.6	5.3
19.11.2021	WB Head	22	1910	40	1.4	39.33	1.48	-1.7	5.4
22.11.2021	WB Head	22	1713	40.14	1.35	38.88	1.34	-3.1	-0.8
22.11.2021	WB Head	22	1720	40.13	1.35	38.87	1.34	-3.1	-0.9
22.11.2021	WB Head	22	1732.5	40.11	1.36	38.85	1.35	-3.1	-0.8
22.11.2021	WB Head	22	1733	40.11	1.36	38.85	1.35	-3.1	-0.8
22.11.2021	WB Head	22	1745	40.09	1.37	38.83	1.36	-3.1	-0.8
22.11.2021	WB Head	22	1753	40.07	1.37	38.82	1.36	-3.1	-0.8
22.11.2021	WB Head	22	1800	40	1.4	38.73	1.39	-3.2	-0.8
22.11.2021	WB Head	22	1850	40	1.4	38.64	1.42	-3.4	1.2
22.11.2021	WB Head	22	1880	40	1.4	38.6	1.43	-3.5	2.4
22.11.2021	WB Head	22	1900	40	1.4	38.57	1.45	-3.6	3.3
22.11.2021	WB Head	22	1910	40	1.4	38.55	1.45	-3.6	3.8
23.11.2021	WB Head	22	1900	40	1.4	40.13	1.46	0.3	4.1
23.11.2021	WB Head	22	1907.6	40	1.4	40.12	1.46	0.3	4.5
23.11.2021	WB Head	22	1909.8	40	1.4	40.11	1.46	0.3	4.5
23.11.2021	WB Head	22	1950	40	1.4	40.06	1.49	0.2	6.3

5. TEST PROCEDURE

Testing was carried out in accordance with FCC KDB Publication 447498 D04 Interim General RF Exposure Guidance v01. KDB 941225 D05 was used to select LTE test modes for testing.

For the cellular technologies, the device was set to transmit using maximum power with a communication tester.

5.1 Device Holder

The device was placed in the device holder (illustrated below) that is supplied by SPEAG as an integral part of the Dasy system.

Device holder supplied by SPEAG

5.2 Test Positions

5.2.1 Body-worn Exposure Condition, 190 mm separation distance with Kathrein A1569050902 antenna

The Kathrein A1569050902 antenna was placed in the SPEAG holder and placed below the flat phantom with 190 mm separation between the antenna and the phantom. According to the manufacturer, the shortest distance between the passenger inside the vehicle and the Kathrein A1569050902 antenna is 190.5mm.
The device was oriented with back side of the device facing the phantom as in real life.
Photos of the test positions are presented in appendix A.

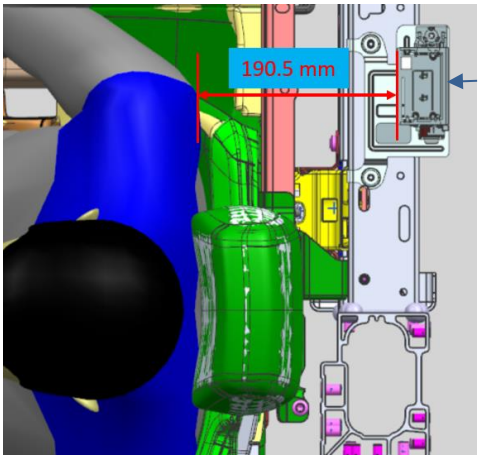


Figure 3 The minimum distance between the passenger and Kathrein A1569050902 antenna.

5.2.2 Body-worn Exposure Condition, 35 mm separation distance with Mercedes-Benz A2229056207 Shark Fin antenna

Mercedes-Benz A2229056207 Shark Fin antenna was placed in the SPEAG holder and placed below the flat phantom with 35 mm separation between the antenna and the phantom. According to the manufacturer, the shortest distance with glass roof between the passenger inside the vehicle and the antenna is 49mm.
The device was oriented with the bottom side of the device facing the phantom as in real life. Photos of the test positions are presented in appendix A.

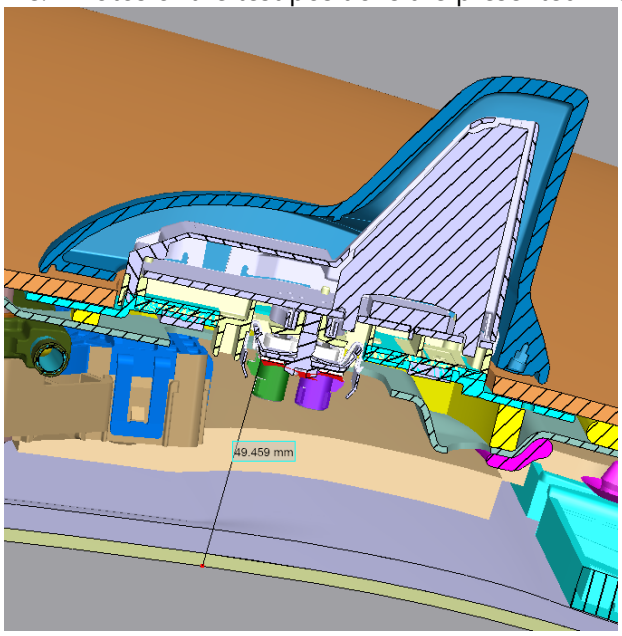


Figure 4 The minimum distance between the passenger and the Mercedes-Benz A2229056207 Shark Fin antenna

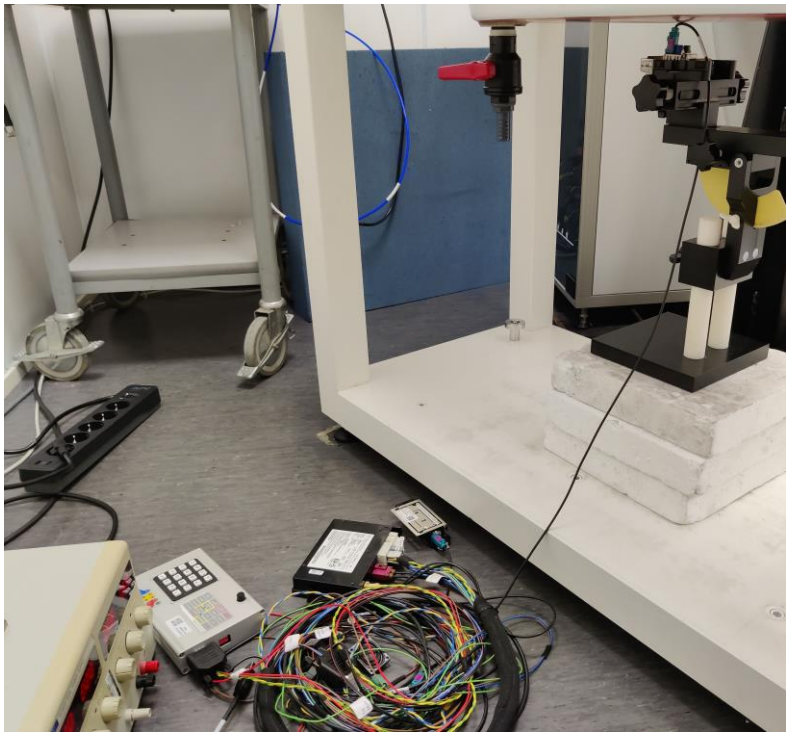


Figure 5 The test set up with A2229056207 Shark Fin antenna

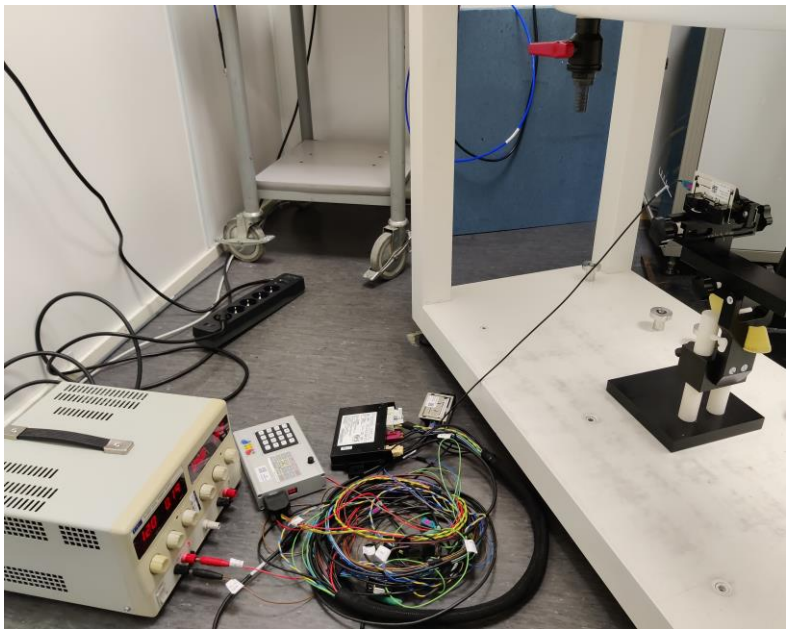


Figure 6 The test set up with Kathrein A1569050902 antenna

5.3 Scan Procedures

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

5.4 SAR Averaging Methods

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

The interpolation, extrapolation and maximum search routines within Dasy52 are all based on the modified Quadratic Shepard's method (Robert J. Renka," Multivariate Interpolation of Large Sets of Scattered Data", University of North Texas ACM Transactions on Mathematical Software, vol. 14, no. 2, June 1988, pp. 139-148).
The interpolation scheme combines a least-square fitted function method with a weighted average method. A trivariate 3-D / bivariate 2-D quadratic function is computed for each measurement point and fitted to neighboring points by a least-square method. For the zoom scan, inverse distance weighting is incorporated to fit distant points more accurately. The interpolating function is finally calculated as a weighted average of the quadratics.
In the zoom scan, the interpolation function is used to extrapolate the Peak SAR from the deepest measurement points to the inner surface of the phantom.

6. MEASUREMENT UNCERTAINTY

DASY5 Uncertainty Budget According to IEC/IEEE 62209-1528 (Frequency band: 300MHz - 3GHz range)								
Symbol	Error Description	Uncert. value	Prob. Dist.	Div.	(c_i) 1g	(c_i) 10g	Std. Unc. (1g)	Std. Unc. (10g)
Measurement System Errors								
CF	Probe Calibration	±12.0%	N	√2	1	1	±6.0%	±6.0%
CFdrift	Probe Calibration Drift	±1.7%	R	√3	1	1	±1.0%	±1.0%
LIN	Probe Linearity	±4.7%	R	√3	1	1	±2.7%	±2.7%
BBS	Broadband Signal	±3.0%	R	√3	1	1	±1.7%	±1.7%
ISO	Probe Isotropy	±7.6%	R	3	1	1	±4.4%	±4.4%
DAE	Data Acquisition	±0.3%	N	1	1	1	±0.3%	±0.3%
AMB	RF Ambient	±1.8%	N	1	1	1	±1.8%	±1.8%
Δsys	Probe Positioning	±3.9%	N	1	0.14	0.14	±0.5%	±0.5%
DAT	Data Processing	±1.2%	N	1	1	1	±1.2%	±1.2%
Phantom and Device Errors								
LIQ(σ)	Conductivity (meas.)^{DAK}	±2.5%	N	√1	0.78	0.71	±2.0%	±1.8%
LIQ(T_σ)	Conductivity (temp.)^{BB}	±3.3%	R	√3	0.78	0.71	±1.5%	±1.4%
EPS	Phantom Permittivity	±14.0%	R	3	0	0	±0%	±0%
DIS	Distance DUT - TSL	±2.0%	N	1	2	2	±4.0%	±4.0%
Dxyz	Device Positioning (±0.5mm)	±1.0%	N	1	1	1	±1.0%	±1.0%
H	Device Holder	±3.6%	N	√1	1	1	±3.6%	±3.6%
MOD	DUT Modulation^{m}	±2.4%	R	√3	1	1	±1.4%	±1.4%
TAS	Time-average SAR	±2.6%	R	3	1	1	±1.5%	±1.5%
RFdrift	DUT drift	±2.5%	N	1	1	1	±2.5%	±2.5%
VAL	Val Antenna Unc.^{val}	±0.0%	N	1	1	1	±0%	±0%
RF_{in}	Unc. Input Power^{val}	±0.0%	N	1	1	1	±0%	±0%
Correction to the SAR results								
C(ε, σ)	Deviation to Target	±1.9%	N	√1	1	0.84	±1.9%	±1.6%
C(R)	SAR scaling^{p}	±0%	R	3	1	1	±0%	±0%
u(ΔSAR)	Combined Uncertainty						±11.0%	±10.9%
U	**Expanded Uncertainty**						±22.1%	±21.9%

7. TEST RESULTS

7.1 Body-worn Exposure Condition, 35 mm separation distance with Mercedes-Benz A2229056207 Shark Fin antenna

Band	Channel	TX slot	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift* [dB]	Test Position	Duty Cycle	Measured SAR1g [W/kg]	Scaling Factor	Reported SAR1g [W/kg]	Plot #
GPRS 850	190	3	33	28.54	0.12	Bottom	3:8	0.071	2.79	0.20	6
GPRS 850	128	3	33	28.33	0.04	Bottom	3:8	0.063	2.93	0.18	
GPRS 850	251	3	33	28.49	0.05	Bottom	3:8	0.062	2.82	0.18	

*Larger than 5% drifts included to scaling factors

Band	Channel	TX slot	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift* [dB]	Test Position	Duty Cycle	Measured SAR1g [W/kg]	Scaling Factor	Reported SAR1g [W/kg]	Plot #
GPRS 1900	661	3	30	24.73	0.25	Bottom	3:8	0.015	3.56	0.05	7
GPRS 1900	512	3	30	24.73	0.29	Bottom	3:8	0.012	3.60	0.04	
GPRS 1900	810	3	30	24.53	0.48	Bottom	3:8	0.005	3.94	0.02	

*Larger than 5% drifts included to scaling factors

Band	Channel	Mode	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR1g [W/kg]	Scaling Factor	Reported SAR1g [W/kg]	Plot #
WCDMA 2	9400	RMC 12.2K	25	22.44	-0.06	Back	1:1	0.023	1.80	0.042	8
WCDMA 2	9262	RMC 12.2K	25	22.49	0.05	Back	1:1	0.019	1.78	0.034	
WCDMA 2	9538	RMC 12.2K	25	22.38	-0.11	Back	1:1	0.007	1.83	0.013	

Band	Channel	Mode	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift* [dB]	Test Position	Duty Cycle	Measured SAR1g [W/kg]	Scaling Factor	Reported SAR1g [W/kg]	Plot #
WCDMA 4	1413	RMC 12.2K	25	22.46	0.05	Back	1:1	0.033	1.79	0.059	
WCDMA 4	1312	RMC 12.2K	25	22.56	0.21	Back	1:1	0.019	1.75	0.033	
WCDMA 4	1513	RMC 12.2K	25	22.39	0.07	Back	1:1	0.051	1.82	0.093	9

*Larger than 5% drifts included to scaling factors

Band	Channel	Mode	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR1g [W/kg]	Scaling Factor	Reported SAR1g [W/kg]	Plot #
WCDMA 5	4183	RMC 12.2K	25	23.03	0.01	Back	1:1	0.057	1.57	0.090	
WCDMA 5	4132	RMC 12.2K	25	23.2	0.07	Back	1:1	0.062	1.51	0.094	10
WCDMA 5	4233	RMC 12.2K	25	23.11	0.01	Back	1:1	0.057	1.55	0.088	

Band	Channel	Modulation / BW [MHz]	RB Size	RB Offset	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift* [dB]	Test Position	Duty Cycle	Measured SAR1g [W/kg]	Scaling Factor	Reported SAR1g [W/kg]	Plot #
LTE 2	18900	QPSK / 20	1	50	25	22.48	0.08	Back	1:1	0.029	1.79	0.052	11
LTE 2	18900	QPSK / 20	50	25	25	21.41	0.25	Back	1:1	0.023	2.29	0.052	
LTE 2	18700	QPSK / 20	1	50	25	21.77	0.27	Back	1:1	0.019	2.24	0.042	
LTE 2	19100	QPSK / 20	1	50	25	22.26	0.01	Back	1:1	0.023	1.88	0.044	

*Larger than 5% drifts included to scaling factors

Band	Channel	Modulation / BW [MHz]	RB Size	RB Offset	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR1g [W/kg]	Scaling Factor	Reported SAR1g [W/kg]	Plot #
LTE 4	20300	QPSK / 20	1	50	25	22.35	-0.11	Back	1:1	0.045	1.84	0.082	12
LTE 4	20300	QPSK / 20	50	25	25	21.31	0.04	Back	1:1	0.033	2.34	0.077	
LTE 4	20050	QPSK / 20	1	50	25	21.61	0.23	Back	1:1	0.022	2.30	0.049	
LTE 4	20175	QPSK / 20	1	50	25	22.17	0.12	Back	1:1	0.031	1.92	0.060	

*Larger than 5% drifts included to scaling factors

Band	Channel	Modulation / BW [MHz]	RB Size	RB Offset	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR1g [W/kg]	Scaling Factor	Reported SAR1g [W/kg]	Plot #
LTE 5	20600	QPSK / 10	1	24	25	22.87	0.03	Back	1:1	0.046	1.63	0.075	
LTE 5	20600	QPSK / 10	25	12	25	22.08	-0.06	Back	1:1	0.038	1.96	0.075	
LTE 5	20450	QPSK / 10	1	24	25	22.73	-0.15	Back	1:1	0.060	1.69	0.102	13
LTE 5	20525	QPSK / 10	1	49	25	22.64	0.13	Back	1:1	0.052	1.72	0.090	

Band	Channel	Modulation / BW [MHz]	RB Size	RB Offset	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift* [dB]	Test Position	Duty Cycle	Measured SAR1g [W/kg]	Scaling Factor	Reported SAR1g [W/kg]	Plot #
LTE 12	23095	QPSK / 10	1	49	25	22.87	-0.05	Back	1:1	0.099	1.63	0.16	
LTE 12	23095	QPSK / 10	25	25	25	21.77	0.01	Back	1:1	0.100	2.10	0.21	
LTE 12	23060	QPSK / 10	1	49	25	22.62	-0.07	Back	1:1	0.141	1.73	0.24	14
LTE 12	23130	QPSK / 10	1	24	25	22.71	-0.01	Back	1:1	0.103	1.69	0.18	

Band	Channel	Modulation / BW [MHz]	RB Size	RB Offset	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR1g [W/kg]	Scaling Factor	Reported SAR1g [W/kg]	Plot #
LTE 13	23230	QPSK / 10	1	49	25	22.71	0.21	Back	1:1	0.071	1.69	0.12	
LTE 13	23230	QPSK / 10	25	12	25	21.92	-0.05	Back	1:1	0.065	2.03	0.13	
LTE 13	23205	QPSK / 5	1	24	25	22.74	0.03	Back	1:1	0.080	1.68	0.13	15
LTE 13	23255	QPSK / 5	1	0	25	22.81	0.06	Back	1:1	0.077	1.66	0.13	

7.2 Body-worn Exposure Condition, 190mm Separation Distance with Kathrein A1569050902 antenna

Band	Channel	TX slot	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift* [dB]	Test Position	Duty Cycle	Measured SAR1g [W/kg]	Scaling Factor	Reported SAR1g [W/kg]	Plot #
GPRS 850	190	3	33	28.54	0.24	Bottom	3:8	0.0045	2.95	0.013	
GPRS 850	128	3	33	28.33	0.12	Bottom	3:8	0.0044	2.93	0.013	
GPRS 850	251	3	33	28.49	0.32	Bottom	3:8	0.0073	3.04	0.022	16

*Larger than 5% drifts included to scaling factors

Band	Channel	TX slot	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift* [dB]	Test Position	Duty Cycle	Measured SAR1g [W/kg]	Scaling Factor	Reported SAR1g [W/kg]	Plot #
GPRS 1900	661	3	30	24.73	0.46	Bottom	3:8	0.0023	3.74	0.009	17
GPRS 1900	512	3	30	24.73	0.18	Bottom	3:8	0.0003	3.37	0.001	
GPRS 1900	810	3	30	24.53	-0.97	Bottom	3:8	0.0021	3.52	0.007	

*Larger than 5% drifts included to scaling factors

Band	Channel	Mode	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR1g [W/kg]	Scaling Factor	Reported SAR1g [W/kg]	Plot #
WCDMA 2	9400	RMC 12.2K	25	22.44	0.05	Back	1:1	0.0042	1.80	0.007	18
WCDMA 2	9262	RMC 12.2K	25	22.49	0.84	Back	1:1	0.0024	1.78	0.004	
WCDMA 2	9538	RMC 12.2K	25	22.38	0.21	Back	1:1	0.0034	1.83	0.006	

*Larger than 5% drifts included to scaling factors

Band	Channel	Mode	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift* [dB]	Test Position	Duty Cycle	Measured SAR1g [W/kg]	Scaling Factor	Reported SAR1g [W/kg]	Plot #
WCDMA 4	1413	RMC 12.2K	25	22.46	0.62	Back	1:1	0.0025	1.79	0.005	
WCDMA 4	1312	RMC 12.2K	25	22.56	-0.19	Back	1:1	0.0005	1.75	0.001	
WCDMA 4	1513	RMC 12.2K	25	22.39	0.91	Back	1:1	0.0027	1.82	0.005	19

*Larger than 5% drifts included to scaling factors

Band	Channel	Mode	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR1g [W/kg]	Scaling Factor	Reported SAR1g [W/kg]	Plot #
WCDMA 5	4183	RMC 12.2K	25	23.03	0.14	Back	1:1	0.0037	1.57	0.006	
WCDMA 5	4132	RMC 12.2K	25	23.2	0.97	Back	1:1	0.0037	1.51	0.006	
WCDMA 5	4233	RMC 12.2K	25	23.11	0.28	Back	1:1	0.0057	1.55	0.009	20

*Larger than 5% drifts included to scaling factors

Band	Channel	Modulation / BW [MHz]	RB Size	RB Offset	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift* [dB]	Test Position	Duty Cycle	Measured SAR1g [W/kg]	Scaling Factor	Reported SAR1g [W/kg]	Plot #
LTE 2	18900	QPSK / 20	1	50	25	22.48	0.59	Back	1:1	0.0024	2.05	0.005	
LTE 2	18900	QPSK / 20	50	25	25	21.41	-0.68	Back	1:1	0.0027	2.67	0.007	21
LTE 2	18700	QPSK / 20	1	50	25	21.77	0.08	Back	1:1	0.0013	2.10	0.003	
LTE 2	19100	QPSK / 20	1	50	25	22.26	0.22	Back	1:1	0.0033	1.98	0.006	

*Larger than 5% drifts included to scaling factors

Band	Channel	Modulation / BW [MHz]	RB Size	RB Offset	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR1g [W/kg]	Scaling Factor	Reported SAR1g [W/kg]	Plot #
LTE 4	20300	QPSK / 20	1	50	25	22.35	0.7	Back	1:1	0.0029	2.16	0.006	22
LTE 4	20300	QPSK / 20	50	25	25	21.31	-0.22	Back	1:1	0.0021	2.46	0.005	
LTE 4	20050	QPSK / 20	1	50	25	21.61	N/A**	Back	1:1	0.0002	2.18	0.000	
LTE 4	20175	QPSK / 20	1	50	25	22.17	-0.77	Back	1:1	0.0023	2.29	0.005	

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

Band	Channel	Modulation / BW [MHz]	RB Size	RB Offset	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR1g [W/kg]	Scaling Factor	Reported SAR1g [W/kg]	Plot #
LTE 5	20600	QPSK / 10	1	24	25	22.87	0.24	Back	1:1	0.0054	1.73	0.009	
LTE 5	20600	QPSK / 10	25	12	25	22.08	-0.02	Back	1:1	0.0043	1.96	0.009	
LTE 5	20450	QPSK / 10	1	24	25	22.73	-0.29	Back	1:1	0.0038	1.80	0.007	
LTE 5	20525	QPSK / 10	1	49	25	22.64	0.03	Back	1:1	0.0055	1.72	0.009	23

*Larger than 5% drifts included to scaling factors

Band	Channel	Modulation / BW [MHz]	RB Size	RB Offset	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift* [dB]	Test Position	Duty Cycle	Measured SAR1g [W/kg]	Scaling Factor	Reported SAR1g [W/kg]	Plot #
LTE 12	23095	QPSK / 10	1	49	25	22.87	-0.54	Back	1:1	0.00019	1.85	0.0003	24
LTE 12	23095	QPSK / 10	25	25	25	21.77	N/A**	Back	1:1	0.00002	2.10	0.0000	
LTE 12	23060	QPSK / 10	1	49	25	22.62	N/A**	Back	1:1	0.00005	1.73	0.0001	
LTE 12	23130	QPSK / 10	1	24	25	22.71	N/A**	Back	1:1	0.000004	1.69	0.0000	

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

Band	Channel	Modulation / BW [MHz]	RB Size	RB Offset	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR1g [W/kg]	Scaling Factor	Reported SAR1g [W/kg]	Plot #
LTE 13	23230	QPSK / 10	1	49	25	22.71	0.71	Back	1:1	0.0008	2.00	0.002	
LTE 13	23230	QPSK / 10	25	12	25	21.92	-0.16	Back	1:1	0.0009	2.03	0.002	
LTE 13	23205	QPSK / 5	1	24	25	22.74	0.69	Back	1:1	0.0014	1.97	0.003	
LTE 13	23255	QPSK / 5	1	0	25	22.81	-0.05	Back	1:1	0.0016	1.66	0.003	25

*Larger than 5% drifts included to scaling factors

APPENDIX A: PHOTOS OF THE DUT

Size of the DUT: 128mm × 86mm × 25mm.

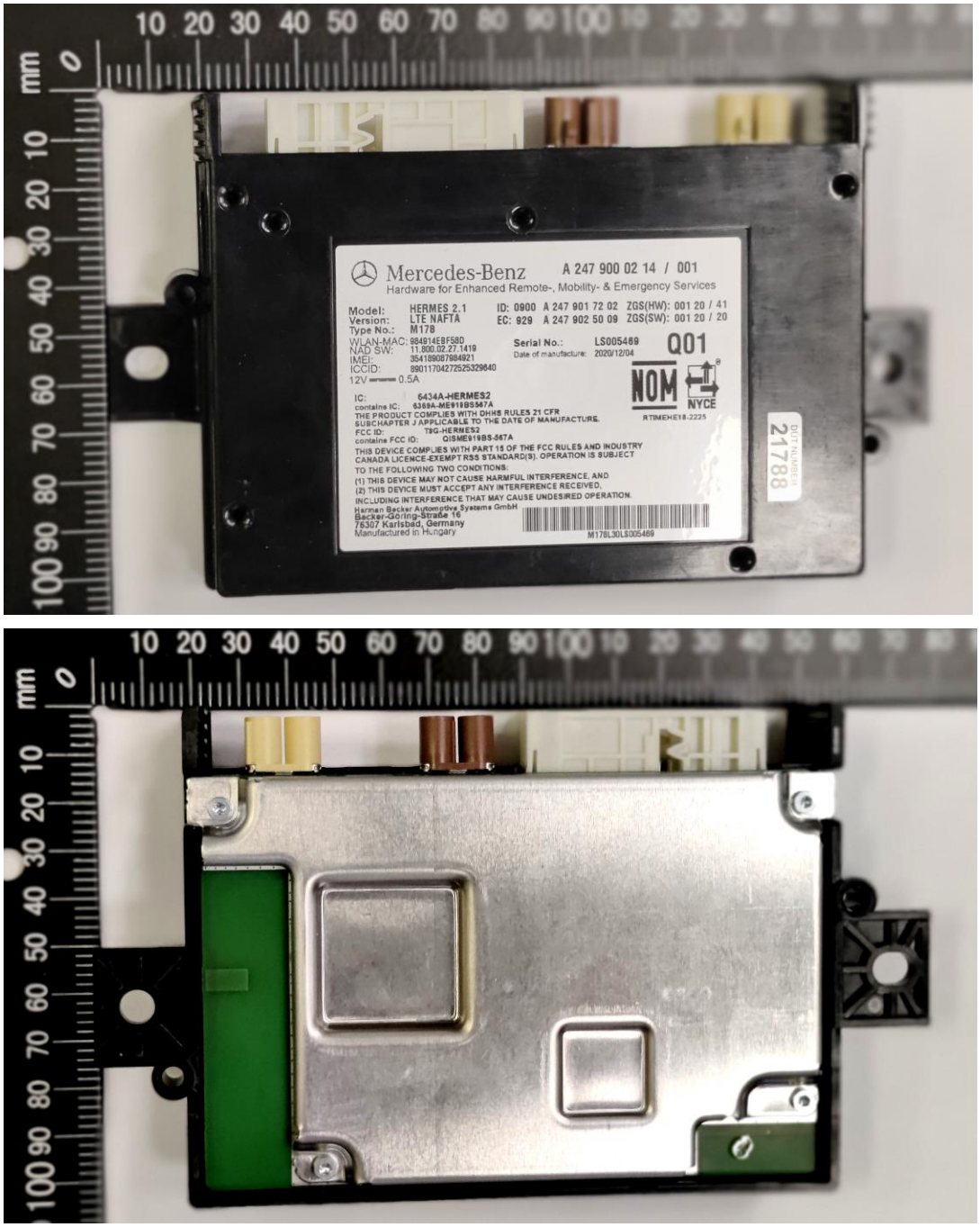


Figure A1 Hermes 2.1 LTE NAFTA

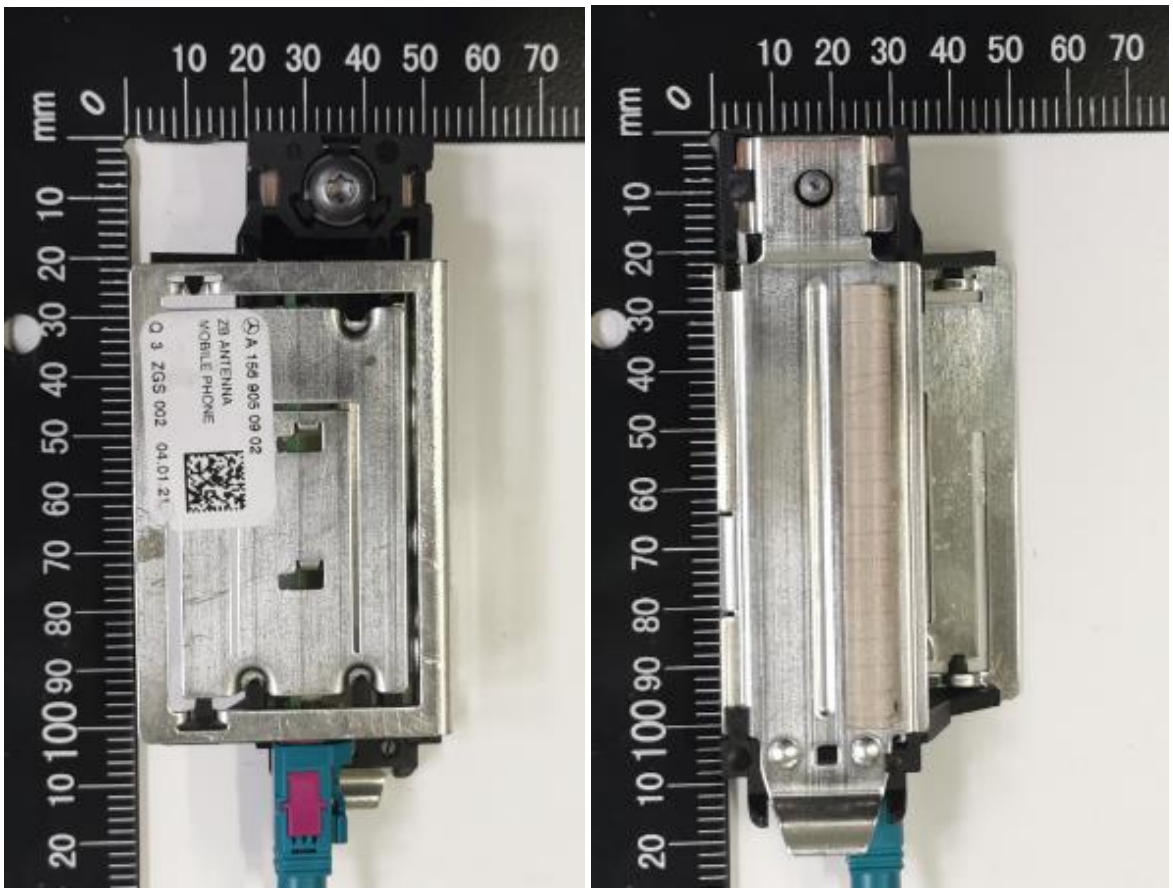


Figure A2 Kathrein A1569050902 antenna

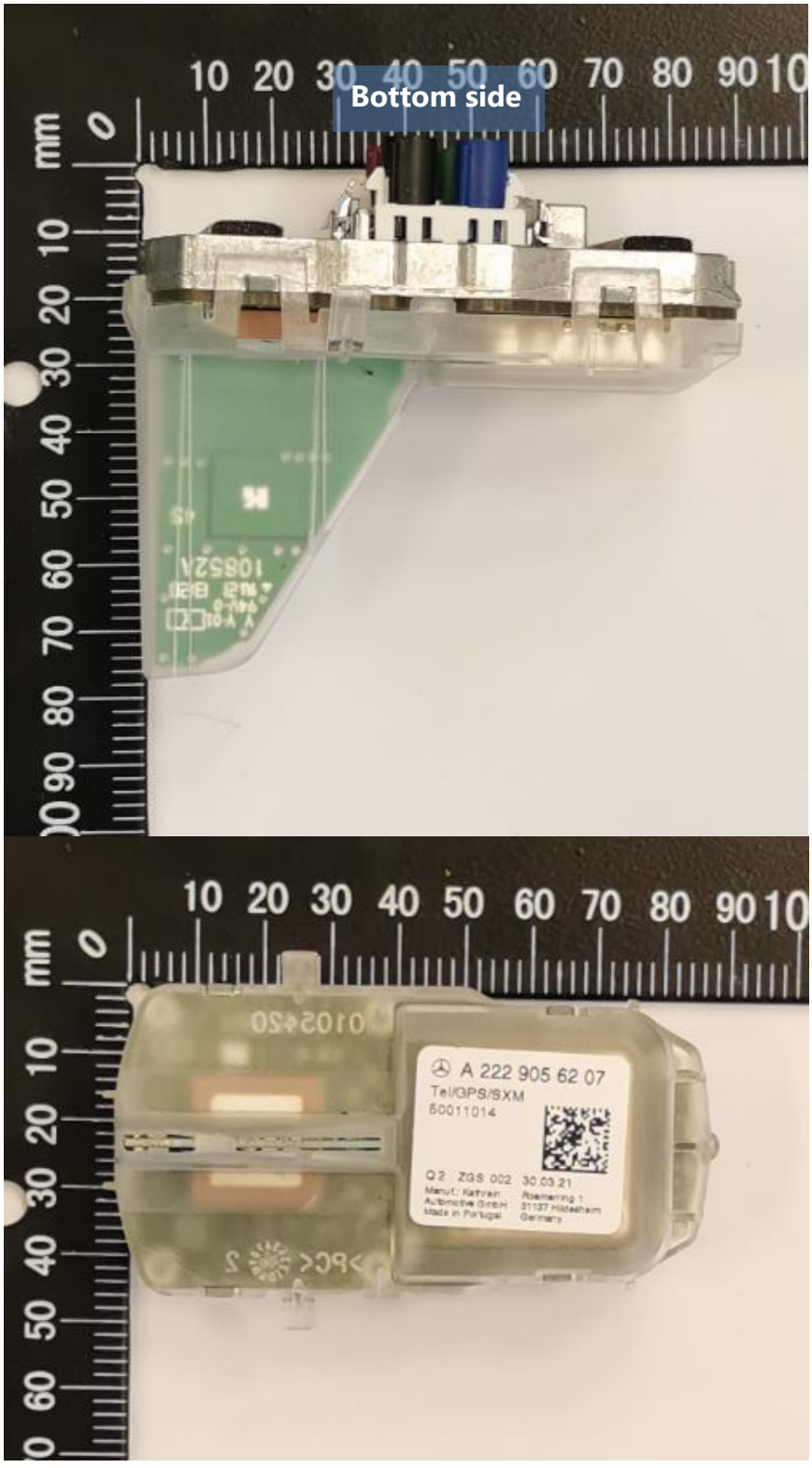


Figure A3 Mercedes-Benz A2229056207 Shark Fin antenna

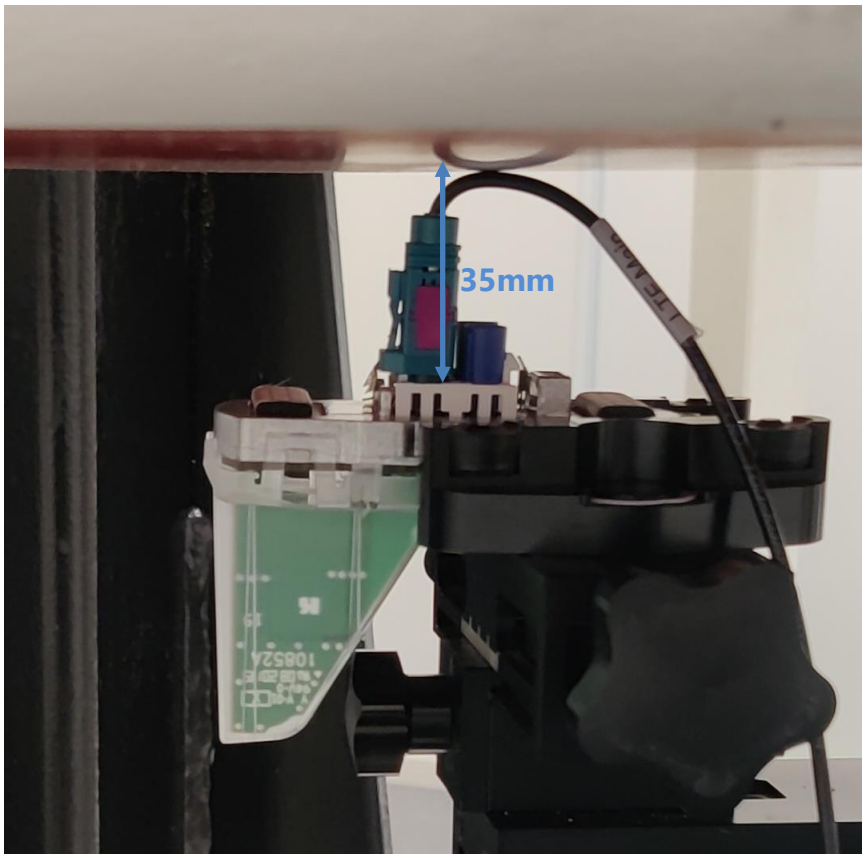


Figure A4 Shark Fin antenna, Bottom test position, 35mm separation distance

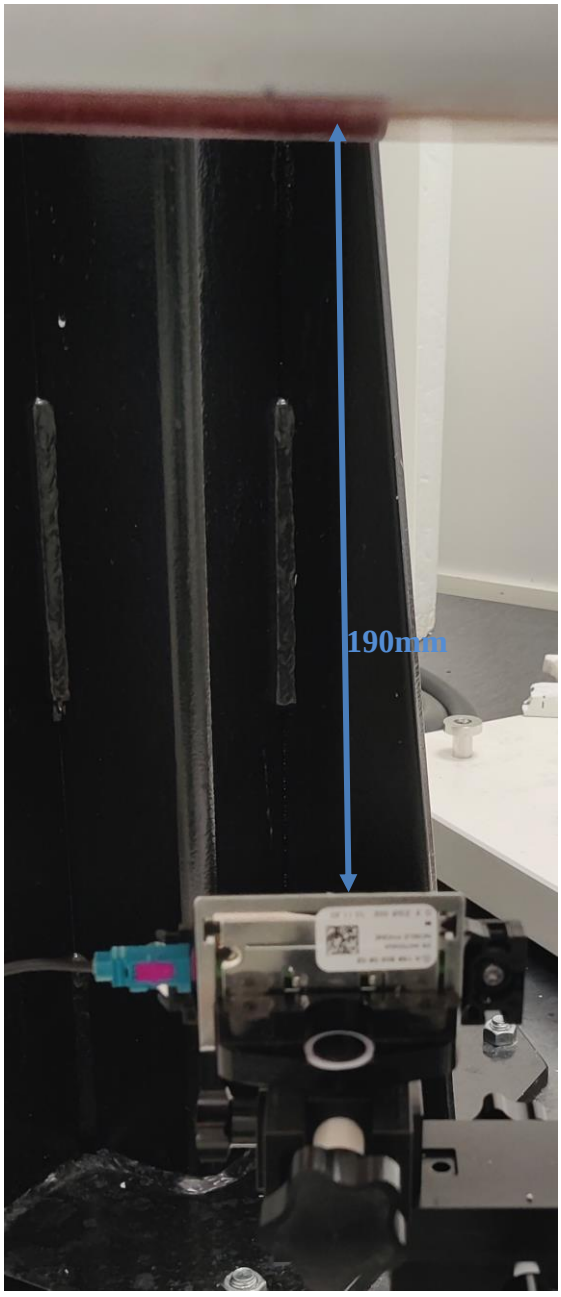


Figure A5 Kathrein A1569050902 antenna, Back test position, 190mm separation distance

APPENDIX B: SYSTEM CHECK SCAN

Plot 1

Date/Time: 17/11/2021 12.58.45

Test Laboratory: Verkotan Oy

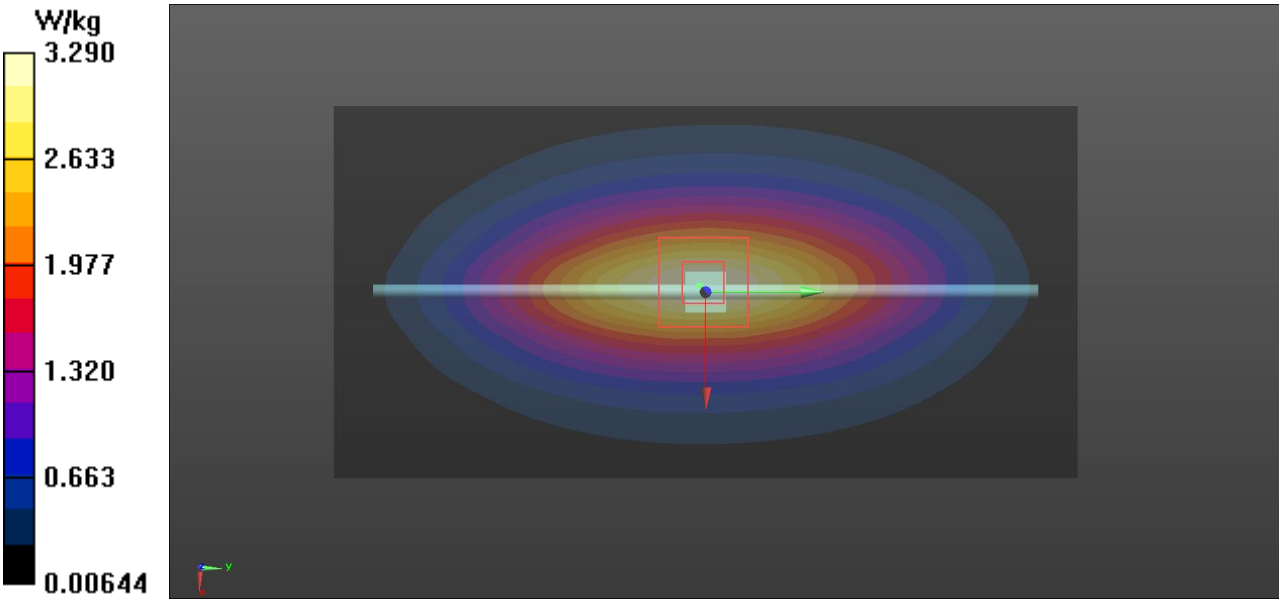
DUT: Dipole 835 MHz D835V2; Type: D835V2; Serial: D835V2 - SN:448

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 = 0.971 S/m; ε_r = 41.99; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(9.98, 9.98, 9.98) @ 835 MHz; Calibrated: 22/03/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0, -4.0
- Electronics: DAE4 Sn705; Calibrated: 26/04/2021
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA;
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Configuration/System_Check_835Mhz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.03 V/m; Power Drift = -0.16 dB Peak SAR (extrapolated) = 3.70 W/kg
SAR(1 g) = 2.44 W/kg; SAR(10 g) = 1.6 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 18 mm
Ratio of SAR at M2 to SAR at M1 = 66.3%
Maximum value of SAR (measured) = 3.29 W/kg
Configuration/System_Check_835Mhz/Area Scan (61x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 3.29 W/kg



Plot 2

Date/Time: 18/11/2021 10.13.02

Test Laboratory: Verkotan Oy

DUT: Dipole 750 MHz D750V3; Type: D750V3; Serial: D750V3 - SN:454

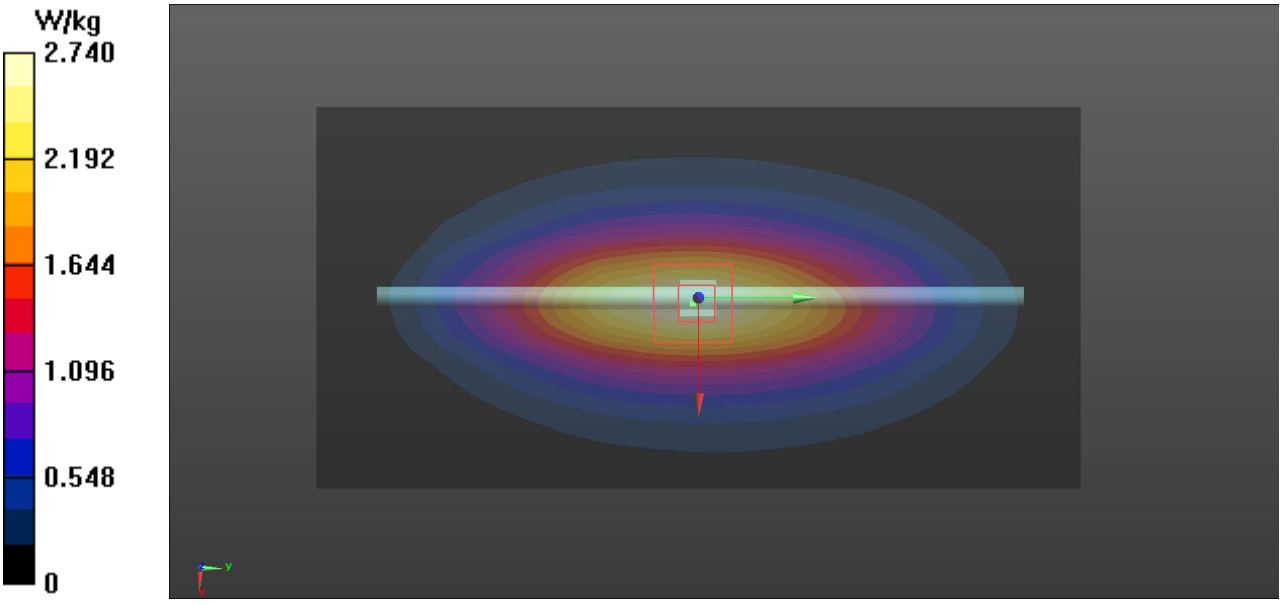
Communication System: UID 0, CW (0); Communication System Band: D750 (750.0 MHz); Frequency: 750 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 750 MHz; σ = 0.943 S/m; ε_r = 41.718; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(10.51, 10.51, 10.51) @ 750 MHz; Calibrated: 22/03/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0, -4.0
- Electronics: DAE4 Sn705; Calibrated: 26/04/2021
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA;
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Configuration/System_Check_750Mhz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 50.02 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 3.25 W/kg
SAR(1 g) = 2.03 W/kg; SAR(10 g) = 1.34 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 21.2 mm
Ratio of SAR at M2 to SAR at M1 = 65.1%
Maximum value of SAR (measured) = 2.87 W/kg

Configuration/System_Check_750Mhz/Area Scan (71x141x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 2.74 W/kg



Plot 3

Date/Time: 19/11/2021 10.41.40

Test Laboratory: Verkotan Oy

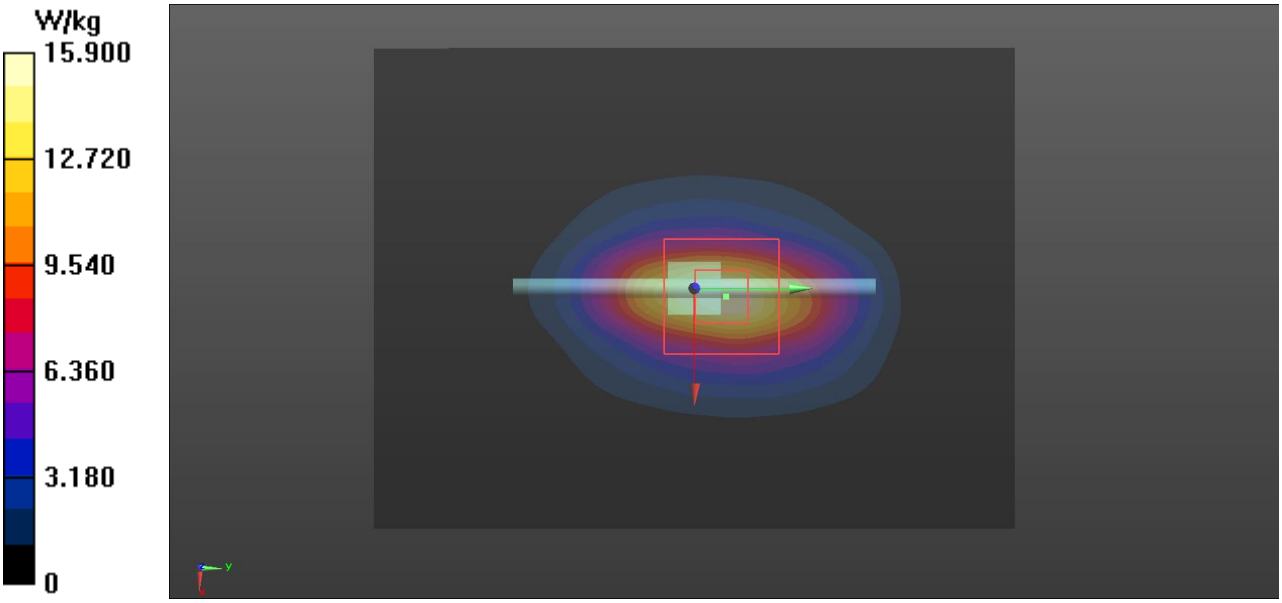
DUT: Dipole 1900 MHz D1900V2; Type: D1900V2; Serial: D1900V2 - SN:511

Communication System: UID 0, CW (0); Communication System Band: D1900 (1900.0 MHz); Frequency: 1900 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 1900 MHz; σ = 1.472 S/m; ε_r = 39.346; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(8.33, 8.33, 8.33) @ 1900 MHz; Calibrated: 22/03/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0, -4.0
- Electronics: DAE4 Sn705; Calibrated: 26/04/2021
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA;
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Configuration/System_Check_1900Mhz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 85.07 V/m; Power Drift = -0.09 dB Peak SAR (extrapolated) = 18.4 W/kg
SAR(1 g) = 9.47 W/kg; SAR(10 g) = 4.94 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 10.5 mm
Ratio of SAR at M2 to SAR at M1 = 53.3% Maximum value of SAR (measured) = 15.4 W/kg
Configuration/System_Check_1900Mhz/Area Scan (61x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 15.9 W/kg



Plot 4

Date/Time: 22/11/2021 10.19.36

Test Laboratory: Verkotan Oy

DUT: Dipole 1800 MHz D1800V2; Type: D1800V2; Serial: D1800V2 - SN:2d075

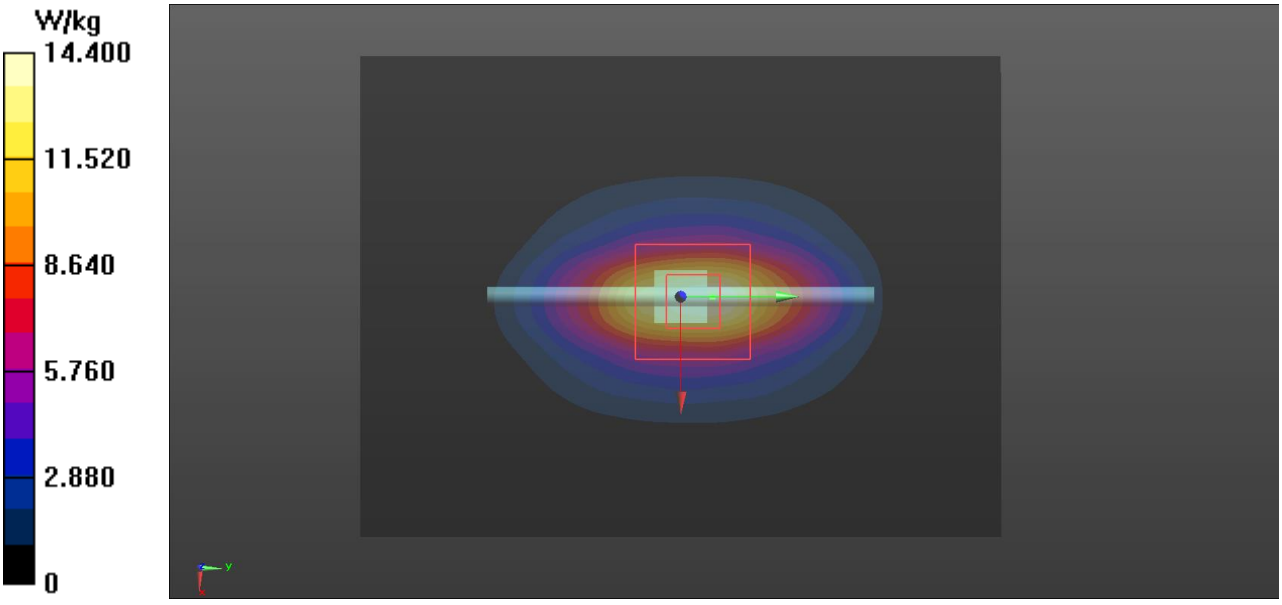
Communication System: UID 0, CW (0); Communication System Band: D1800 (1800.0 MHz); Frequency: 1800 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 1800 MHz; σ = 1.388 S/m; ε_r = 38.729; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(8.52, 8.52, 8.52) @ 1800 MHz; Calibrated: 22/03/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0, -4.0
- Electronics: DAE4 Sn705; Calibrated: 26/04/2021
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA;
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Configuration/System_Check_1800Mhz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 85.79 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 16.8 W/kg
SAR(1 g) = 9.16 W/kg; SAR(10 g) = 4.81 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 = 54.8%
Maximum value of SAR (measured) = 13.9 W/kg

Configuration/System_Check_1800Mhz/Area Scan (61x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 14.4 W/kg



Plot 5

Date/Time: 23/11/2021 11.22.15

Test Laboratory: Verkotan Oy

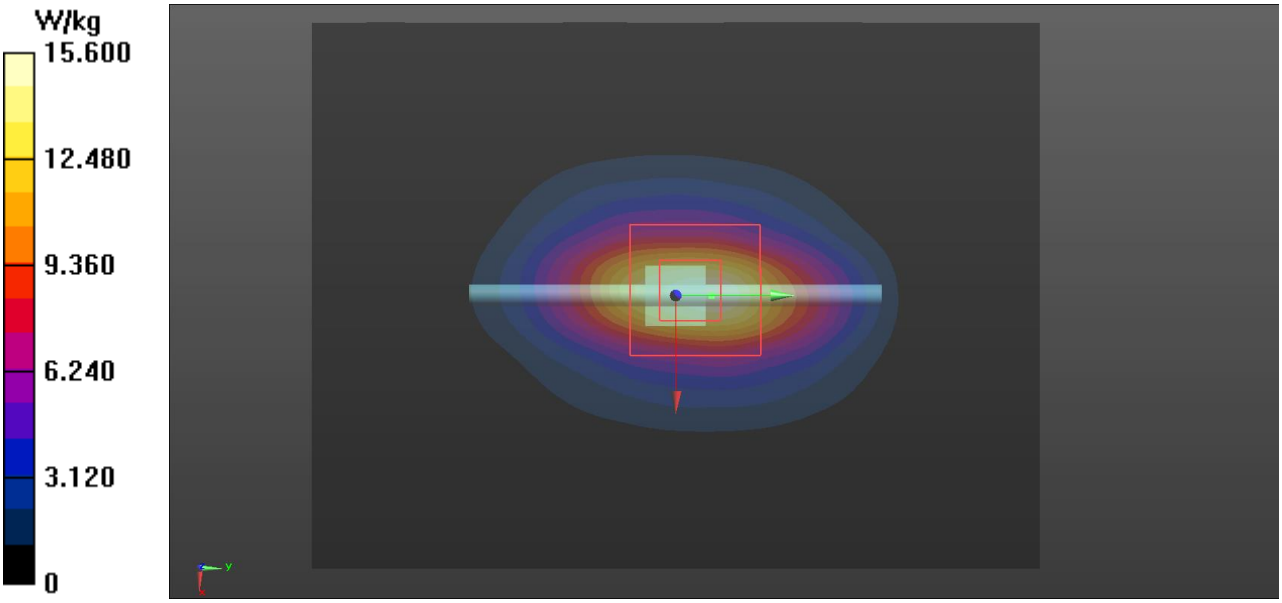
DUT: Dipole 1900 MHz D1900V2; Type: D1900V2; Serial: D1900V2 - SN:511

Communication System: UID 0, CW (0); Communication System Band: D1900 (1900.0 MHz); Frequency: 1900 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 1900 MHz; σ = 1.458 S/m; ε_r = 40.125; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(8.33, 8.33, 8.33) @ 1900 MHz; Calibrated: 22/03/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0, -4.0
- Electronics: DAE4 Sn705; Calibrated: 26/04/2021
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA;
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Configuration/System_Check_1900Mhz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 86.28 V/m; Power Drift = -0.08 dB Peak SAR (extrapolated) = 17.9 W/kg
SAR(1 g) = 9.41 W/kg; SAR(10 g) = 4.9 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 9.1 mm
Ratio of SAR at M2 to SAR at M1 = 53.9% Maximum value of SAR (measured) = 14.7 W/kg
Configuration/System_Check_1900Mhz/Area Scan (61x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 15.6 W/kg



APPENDIX C: MEASUREMENT SCANS

Plot 6

Date/Time: 18.11.2021 12:56:06

Test Laboratory: Verkotan Oy

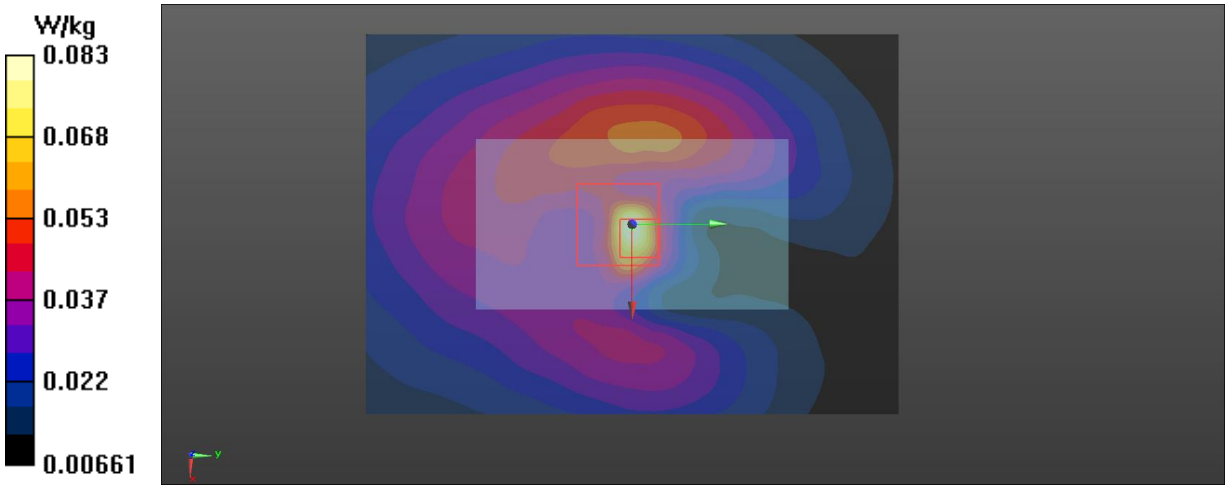
DUT: Hermes 2.1 LTE NAFTA with Mercedes-Benz A2229056207 Shark Fin antenna

Communication System: UID 0, GPRS850 3 Slot (0); Communication System Band: GPRS 850; Frequency: 836.6 MHz;Communication System PAR: 4.265 dB; PMF:
Medium parameters used: f = 837 MHz; σ = 0.974 S/m; ε_r = 41.448; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(9.98, 9.98, 9.98) @ 836.6 MHz; Calibrated: 22.3.2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 31.0
- Electronics: DAE4 Sn705; Calibrated: 26.4.2021
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA;
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Harman Shark Fin GPRS 850, 3slots/Area Scan (101x141x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.0831 W/kg
Harman Shark Fin GPRS 850, 3slots/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.991 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 0.394 W/kg
SAR(1 g) = 0.071 W/kg; SAR(10 g) = 0.030 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 3.6 mm
Ratio of SAR at M2 to SAR at M1 = 22.4%
Maximum value of SAR (measured) = 0.203 W/kg



Plot 7

Date/Time: 22.11.2021 15:05:25

Test Laboratory: Verkotan Oy

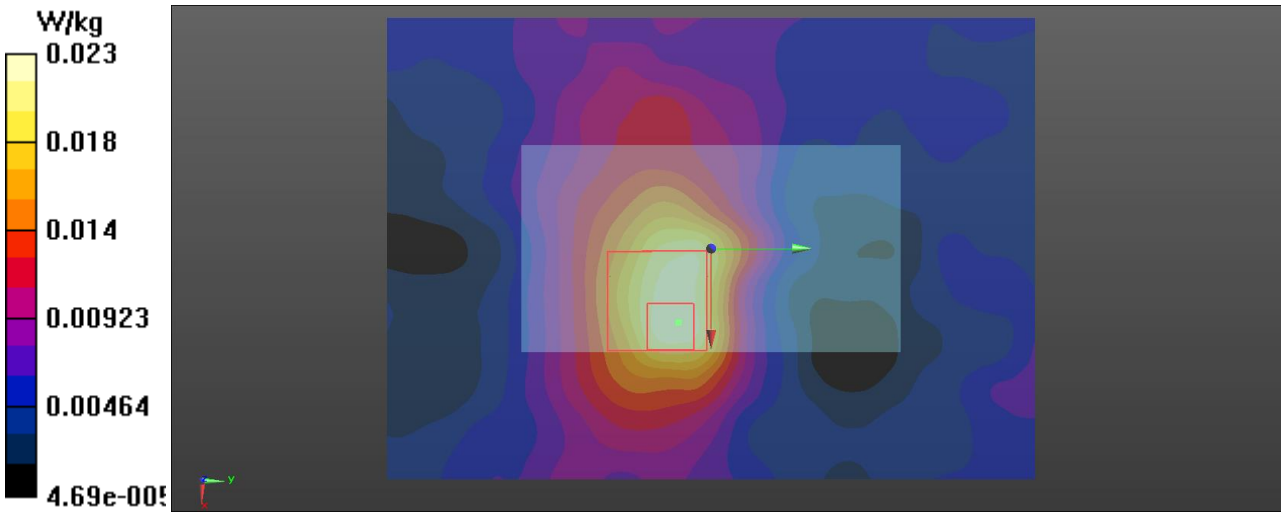
DUT: Hermes 2.1 LTE NAFTA with Mercedes-Benz A2229056207 Shark Fin antenna

Communication System: UID 0, GPRS 3 Slots (0); Communication System Band: GPRS 1900 3slots; Frequency: 1880 MHz;Communication System PAR: 4.265 dB; PMF:
Medium parameters used: f = 1880 MHz; σ = 1.434 S/m; ε_r = 38.599; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(8.33, 8.33, 8.33) @ 1880 MHz; Calibrated: 22.3.2021
- 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: 26.4.2021
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA;
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Harman Shark fin GPRS 1900/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.343 V/m; Power Drift = 0.25 dB
Peak SAR (extrapolated) = 0.0320 W/kg
SAR(1 g) = 0.015 W/kg; SAR(10 g) = 0.00898 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid
Ratio of SAR at M2 to SAR at M1 = 49.4% Maximum value of SAR (measured) = 0.0230 W/kg
Harman Shark fin GPRS 1900/Area Scan (101x141x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.0229 W/kg



Plot 8

Date/Time: 22/11/2021 16.28.13

Test Laboratory: Verkotan Oy

DUT: Hermes 2.1 LTE NAFTA with Mercedes-Benz A2229056207 Shark Fin antenna

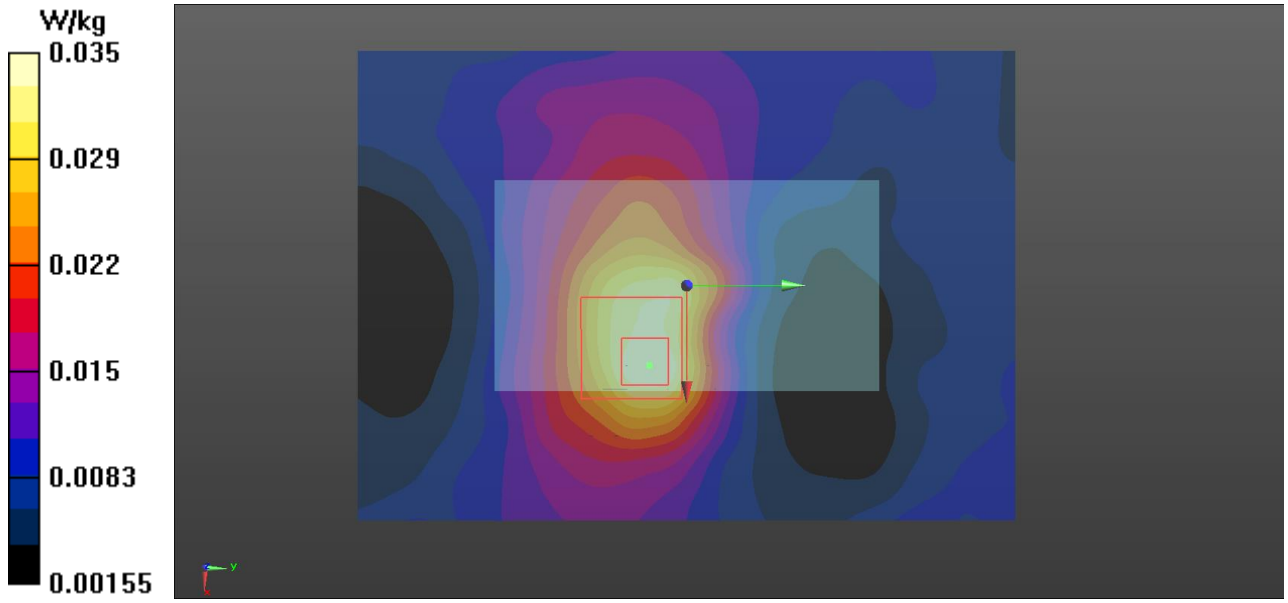
Communication System: UID 0, WCDMA (0); Communication System Band: Band 2; Frequency: 1880 MHz;Communication System PAR: 0 dB; PMF: 1.12202e-005
Medium parameters used: f = 1880 MHz; σ = 1.434 S/m; ε_r = 38.599; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(8.33, 8.33, 8.33) @ 1880 MHz; Calibrated: 22/03/2021
- 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: 26/04/2021
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA;
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Harman Shark fin WCDMA 2/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.327 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 0.0500 W/kg
SAR(1 g) = 0.023 W/kg; SAR(10 g) = 0.014 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid
Ratio of SAR at M2 to SAR at M1 = 38.5%
Maximum value of SAR (measured) = 0.0376 W/kg

Harman Shark fin WCDMA 2/Area Scan (101x141x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.0353 W/kg



Plot 9

Date/Time: 22/11/2021 13.46.48

Test Laboratory: Verkotan Oy

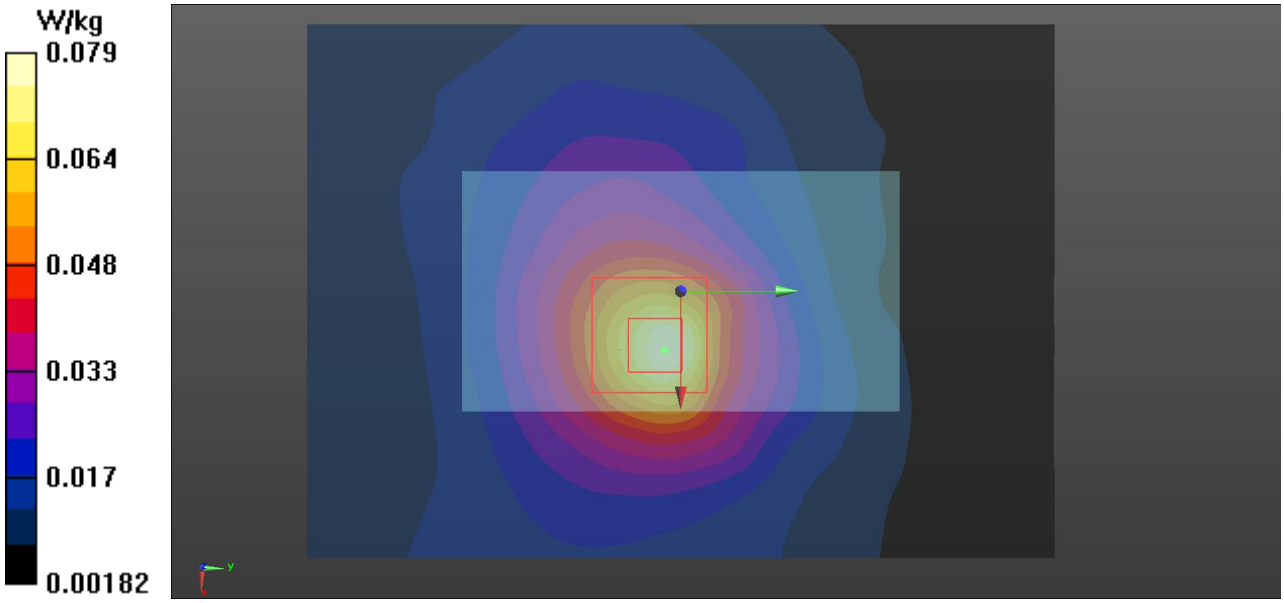
DUT: Hermes 2.1 LTE NAFTA with Mercedes-Benz A2229056207 Shark Fin antenna

Communication System: UID 0, WCDMA (0); Communication System Band: Band 4; Frequency: 1752.6 MHz;Communication System PAR: 0 dB; PMF: 1.12202e-005
Medium parameters used (interpolated): f = 1752.6 MHz; σ = 1.361 S/m; ε_r = 38.822; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(8.52, 8.52, 8.52) @ 1752.6 MHz; Calibrated: 22/03/2021
- 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: 26/04/2021
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA;
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Harman Shark fin WCDMA 4 mid /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.721 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 0.144 W/kg
SAR(1 g) = 0.051 W/kg; SAR(10 g) = 0.028 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 8 mm
Ratio of SAR at M2 to SAR at M1 = 34%
Maximum value of SAR (measured) = 0.105 W/kg
Harman Shark fin WCDMA 4 mid /Area Scan (101x141x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.0795 W/kg



Plot 10

Date/Time: 18/11/2021 11.49.41

Test Laboratory: Verkotan Oy

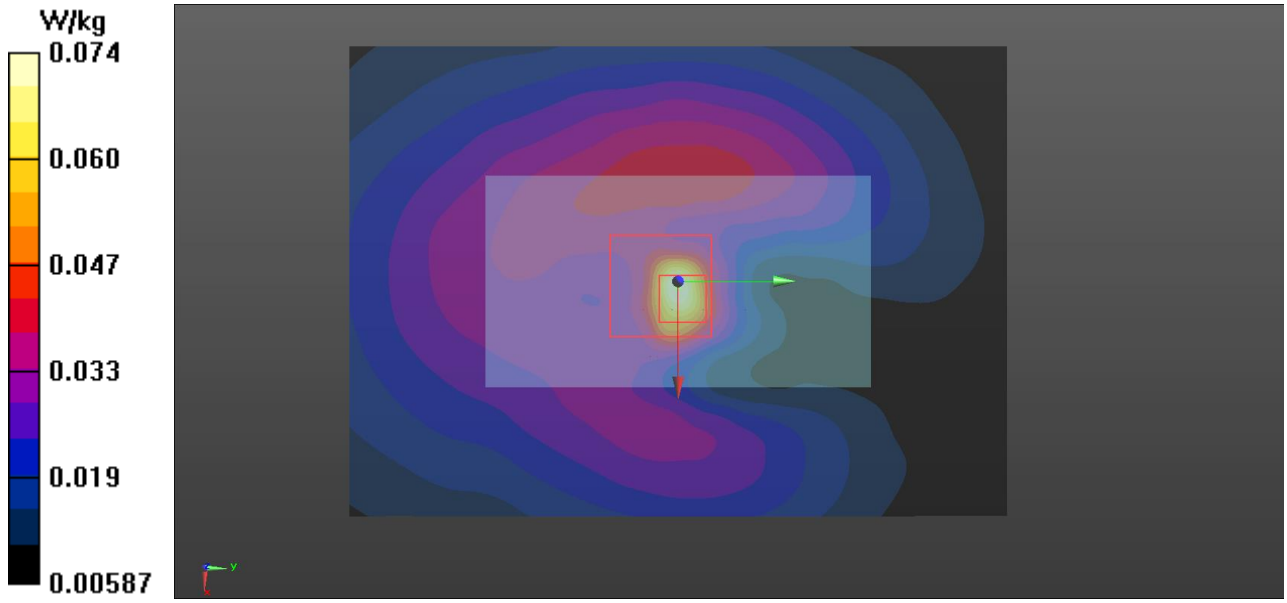
DUT: Hermes 2.1 LTE NAFTA with Mercedes-Benz A2229056207 Shark Fin antenna

Communication System: UID 0, WCDMA (0); Communication System Band: Band 5; Frequency: 826.4 MHz;Communication System PAR: 0 dB; PMF: 1.12202e-005
Medium parameters used (interpolated): f = 826.4 MHz; σ = 0.97 S/m; ε_r = 41.492; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(9.98, 9.98, 9.98) @ 826.4 MHz; Calibrated: 22/03/2021
- 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: 26/04/2021
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA;
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Harman Shark fin WCDMA 5/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.492 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 0.348 W/kg
SAR(1 g) = 0.062 W/kg; SAR(10 g) = 0.025 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 3.6 mm
Ratio of SAR at M2 to SAR at M1 = 22.6%
Maximum value of SAR (measured) = 0.173 W/kg
Harman Shark fin WCDMA 5/Area Scan (101x141x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.0738 W/kg



Plot 11

Date/Time: 19/11/2021 17.08.08

Test Laboratory: Verkotan Oy

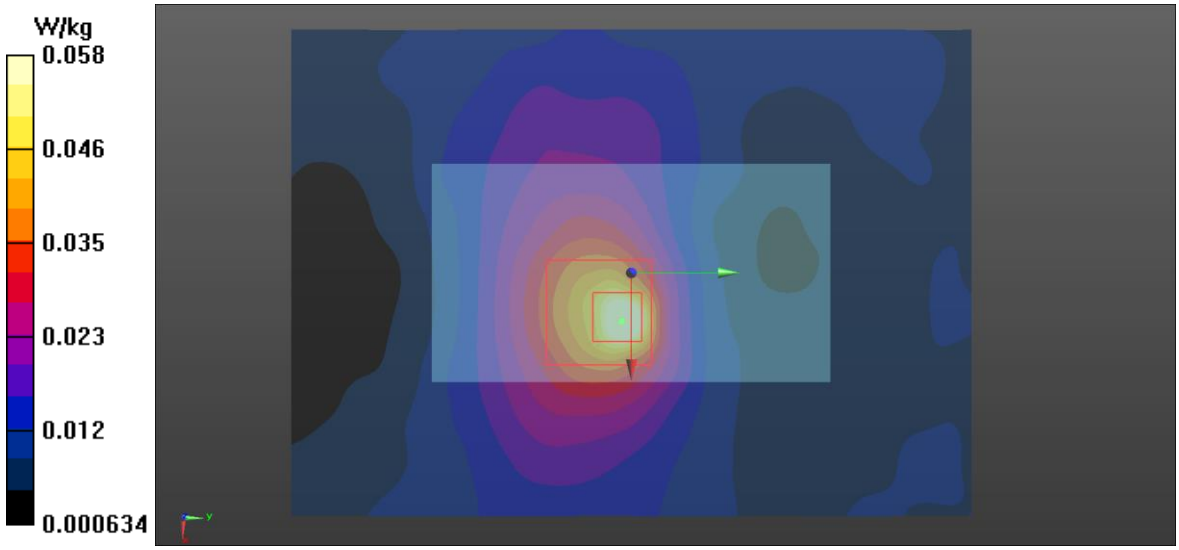
DUT: Hermes 2.1 LTE NAFTA with Mercedes-Benz A2229056207 Shark Fin antenna

Communication System: UID 0, Generic LTE (0); Communication System Band: Band 2, E-UTRA/FDD (1850.0 - 1910.0 MHz); Frequency: 1880 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 1880 MHz; σ = 1.458 S/m; ε_r = 39.375; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(8.33, 8.33, 8.33) @ 1880 MHz; Calibrated: 22/03/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 31.0
- Electronics: DAE4 Sn705; Calibrated: 26/04/2021
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA;
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Shark fin LTE 2, BW20, RB1, Offset 50 /Area Scan (101x141x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.0656 W/kg
Shark finL TE 2, BW20, RB1, Offset 50 /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.258 V/m; Power Drift = 0.08 dB Peak SAR (extrapolated) = 0.0820 W/kg
SAR(1 g) = 0.029 W/kg; SAR(10 g) = 0.017 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid
Ratio of SAR at M2 to SAR at M1 = 30.6% Maximum value of SAR (measured) = 0.0575 W/kg



Plot 12

Date/Time: 22/11/2021 11.18.39

Test Laboratory: Verkotan Oy

DUT: Hermes 2.1 LTE NAFTA with Mercedes-Benz A2229056207 Shark Fin antenna

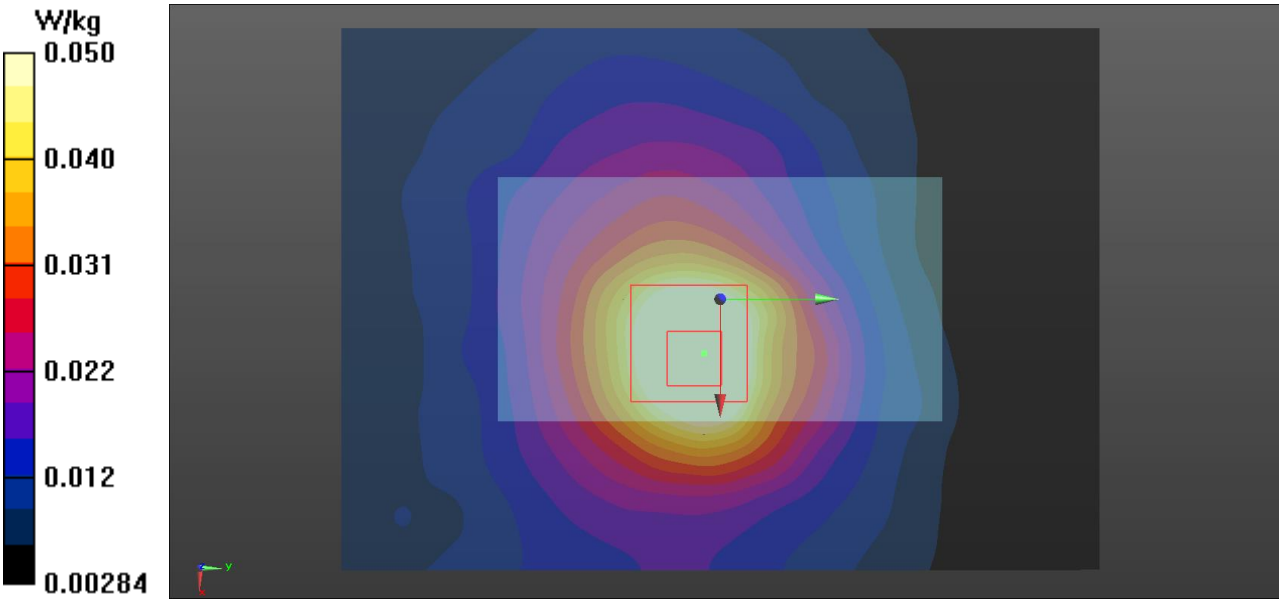
Communication System: UID 0, Generic LTE (0); Communication System Band: Band 4, E-UTRA/FDD (1710.0 - 1755.0 MHz); Frequency: 1745 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used (interpolated): f = 1745 MHz; σ = 1.357 S/m; ε_r = 38.83; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(8.52, 8.52, 8.52) @ 1745 MHz; Calibrated: 22/03/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0, -4.0
- Electronics: DAE4 Sn705; Calibrated: 26/04/2021
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA;
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Harman Shark fin LTE 4, BW20, RB1, Offset 50/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.377 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 0.114 W/kg
SAR(1 g) = 0.045 W/kg; SAR(10 g) = 0.025 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid
Ratio of SAR at M2 to SAR at M1 = 38.8%
Maximum value of SAR (measured) = 0.0851 W/kg

Harman Shark fin LTE 4, BW20, RB1, Offset 50/Area Scan (101x141x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.0683 W/kg



Plot 13

Date/Time: 18/11/2021 14.55.04

Test Laboratory: Verkotan Oy

DUT: Hermes 2.1 LTE NAFTA with Mercedes-Benz A2229056207 Shark Fin antenna

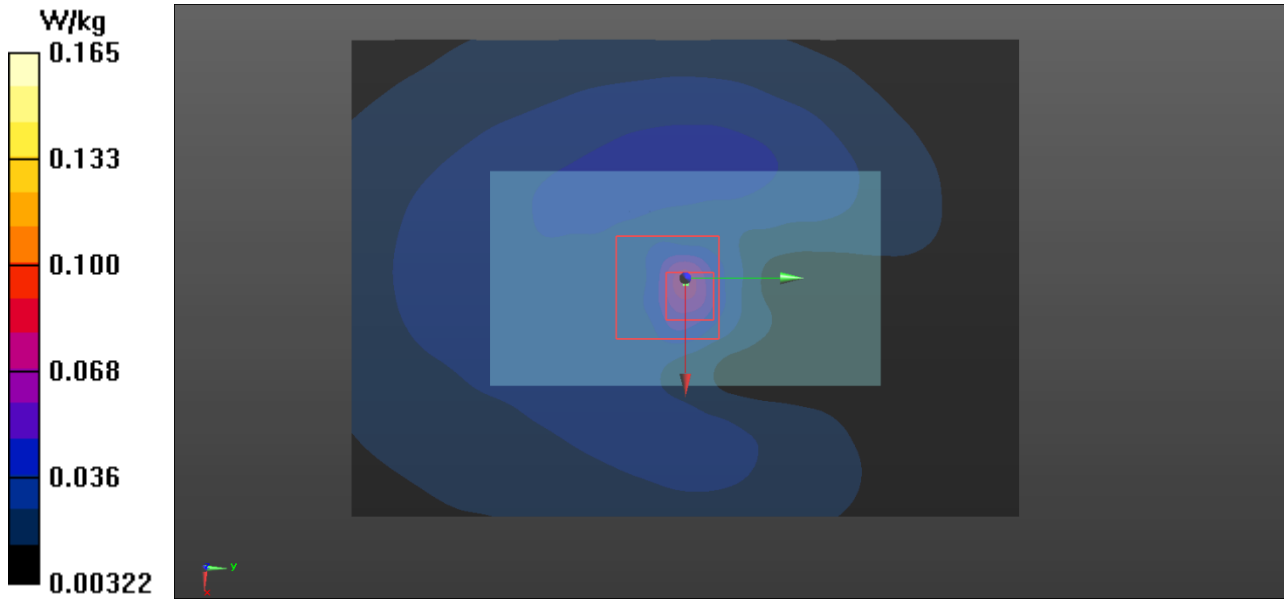
Communication System: UID 0, Generic LTE (0); Communication System Band: Band 5, E-UTRA/FDD (824.0 - 849.0 MHz); Frequency: 829 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 829 MHz; σ = 0.971 S/m; ε_r = 41.479; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(9.98, 9.98, 9.98) @ 829 MHz; Calibrated: 22/03/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 31.0
- Electronics: DAE4 Sn705; Calibrated: 26/04/2021
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA;
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Harman Shark fin LTE5, BW10, RB 1, offset 24 /Area Scan (101x141x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.0743 W/kg

Harman Shark fin LTE5, BW10, RB 1, offset 24 /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.550 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 0.313 W/kg
SAR(1 g) = 0.060 W/kg; SAR(10 g) = 0.025 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 3.6 mm
Ratio of SAR at M2 to SAR at M1 = 24.2%
Maximum value of SAR (measured) = 0.165 W/kg



Plot 14

Date/Time: 18/11/2021 16.39.48

Test Laboratory: Verkotan Oy

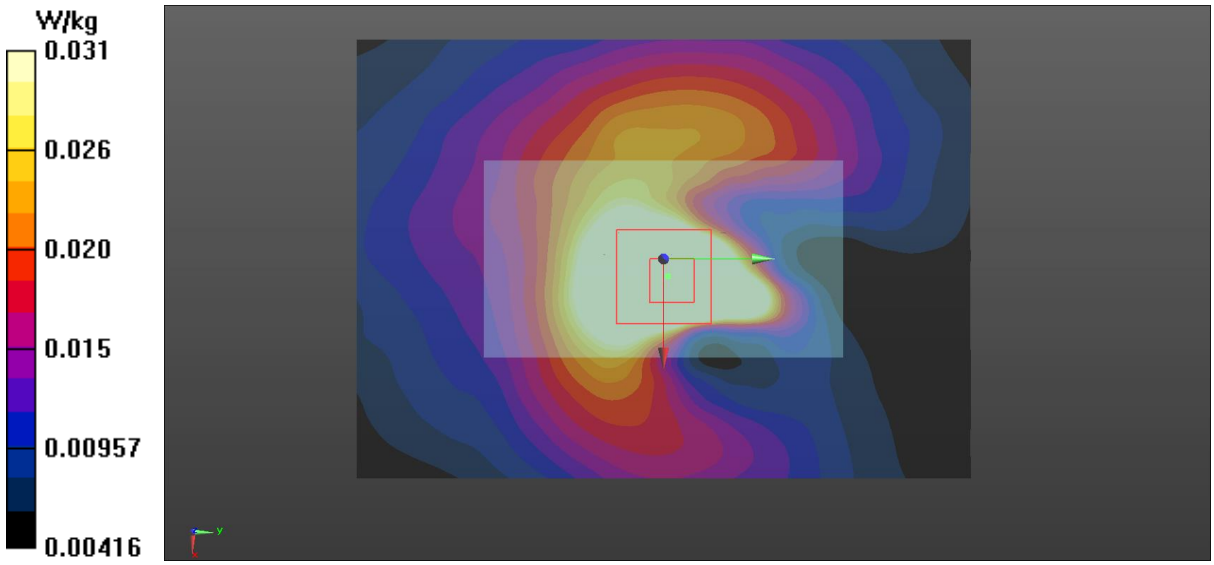
DUT: Hermes 2.1 LTE NAFTA with Mercedes-Benz A2229056207 Shark Fin antenna

Communication System: UID 0, Generic LTE (0); Communication System Band: Band 12, E-UTRA/FDD (698.0 - 716.0 MHz); Frequency: 704 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 704 MHz; σ = 0.927 S/m; ε_r = 41.877; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(10.51, 10.51, 10.51) @ 704 MHz; Calibrated: 22/03/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 31.0
- Electronics: DAE4 Sn705; Calibrated: 26/04/2021
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA;
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Harman Shark fin LTE12, BW10, RB 1, offset 49 low/Area Scan (101x141x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.217 W/kg
Harman Shark fin LTE12, BW10, RB 1, offset 49 low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.425 V/m; Power Drift = -0.07 dB Peak SAR (extrapolated) = 0.808 W/kg
SAR(1 g) = 0.141 W/kg; SAR(10 g) = 0.047 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 3 mm
Ratio of SAR at M2 to SAR at M1 = 18.9% Maximum value of SAR (measured) = 0.464 W/kg



Plot 15

Date/Time: 18/11/2021 19.17.04

Test Laboratory: Verkotan Oy

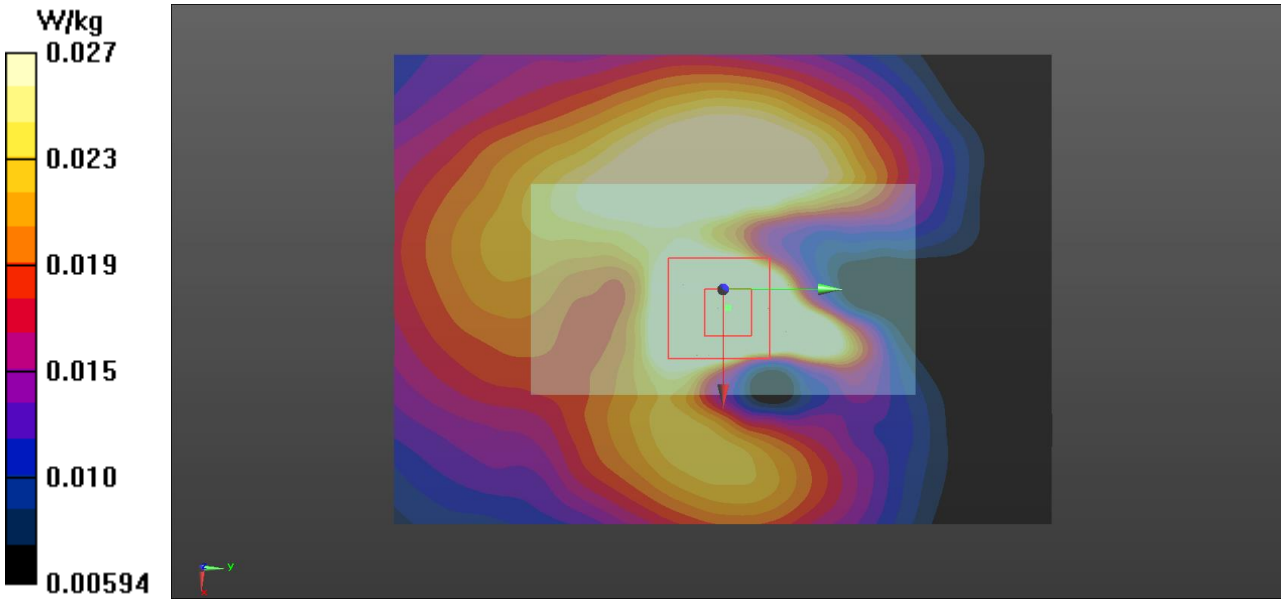
DUT: Hermes 2.1 LTE NAFTA with Mercedes-Benz A2229056207 Shark Fin antenna

Communication System: UID 0, Generic LTE (0); Communication System Band: Band 13, E-UTRA/FDD (777.0 - 787.0 MHz); Frequency: 779.5 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used (interpolated): f = 779.5 MHz; σ = 0.953 S/m; ε_r = 41.619; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(10.51, 10.51, 10.51) @ 779.5 MHz; Calibrated: 22/03/2021
- 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: 26/04/2021
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA;
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Harman Shark fin LTE13, BW5, RB 1, offset 24/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.643 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.392 W/kg
SAR(1 g) = 0.080 W/kg; SAR(10 g) = 0.029 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 3.1 mm
Ratio of SAR at M2 to SAR at M1 = 22.7%
Maximum value of SAR (measured) = 0.238 W/kg
Harman Shark fin LTE13, BW5, RB 1, offset 24/Area Scan (101x141x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.114 W/kg



Plot 16

Date/Time: 17/11/2021 17.22.25

Test Laboratory: Verkotan Oy

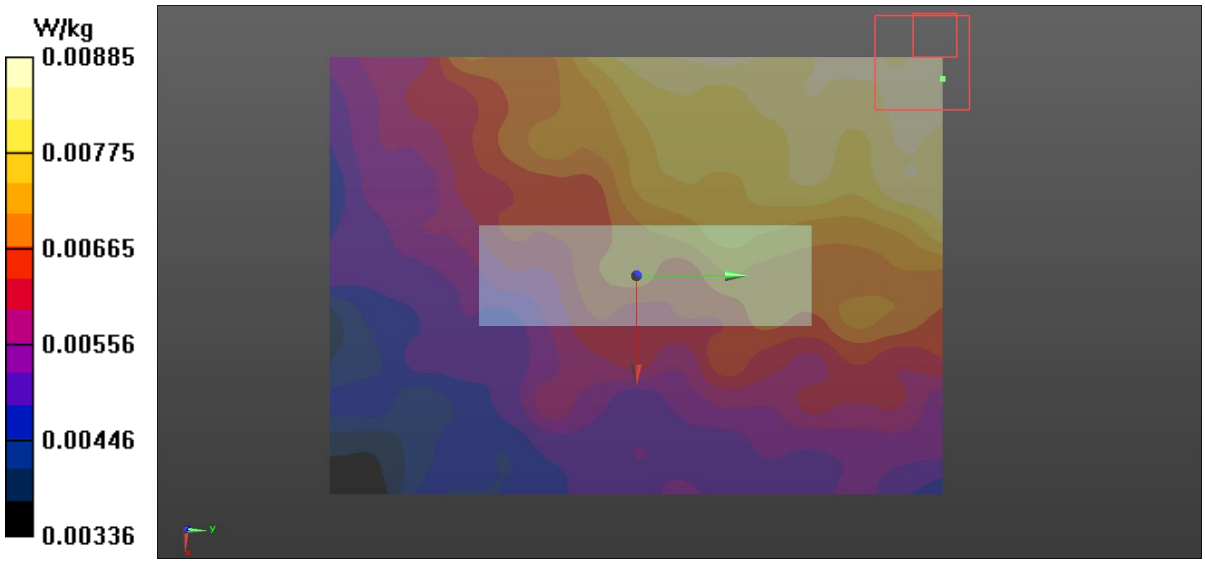
DUT: Hermes 2.1 LTE NAFTA with Kathrein A1569050902 antenna

Communication System: UID 0, GPRS850 3 Slot (0); Communication System Band: GPRS 850; Frequency: 848.8 MHz;Communication System PAR: 4.265 dB; PMF:
Medium parameters used: f = 849 MHz; σ = 0.976 S/m; ε_r = 41.966; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(9.98, 9.98, 9.98) @ 848.8 MHz; Calibrated: 22/03/2021
- 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: 26/04/2021
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA;
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Harman Kathrein GPRS 850, 3slots /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.525 V/m; Power Drift = 0.32 dB
Peak SAR (extrapolated) = 0.0100 W/kg
SAR(1 g) = 0.00733 W/kg; SAR(10 g) = 0.00551 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid
Ratio of SAR at M2 to SAR at M1 = 75.1% Maximum value of SAR (measured) = 0.00921 W/kg
Harman Kathrein GPRS 850, 3slots /Area Scan (101x141x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.00885 W/kg



Plot 17

Date/Time: 19/11/2021 12.54.35

Test Laboratory: Verkotan Oy

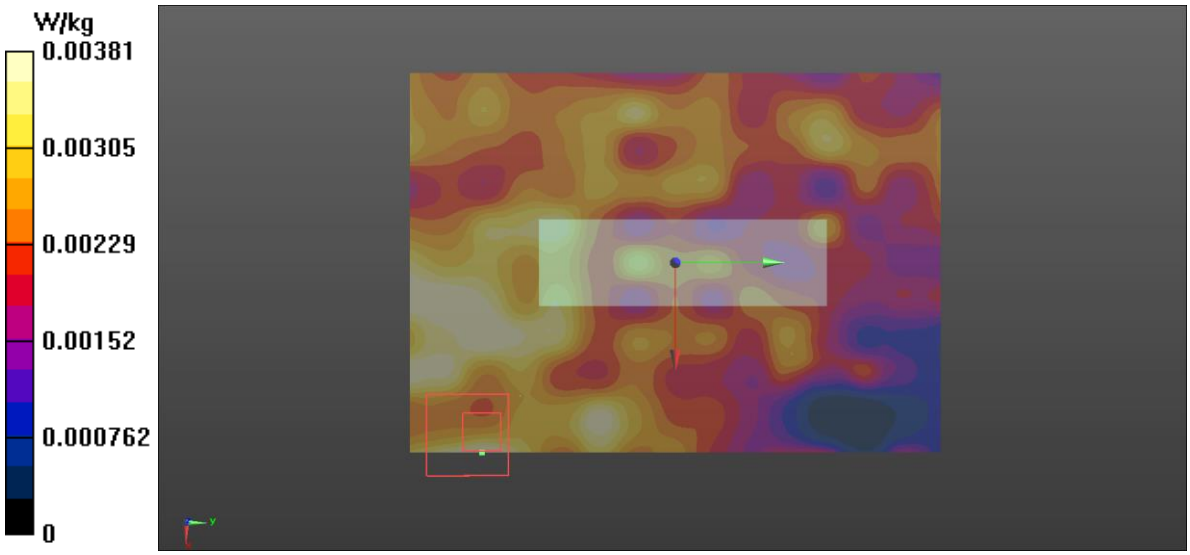
DUT: Hermes 2.1 LTE NAFTA with Kathrein A1569050902 antenna

Communication System: UID 0, GPRS 3 Slots (0); Communication System Band: GPRS 1900 3slots; Frequency: 1880 MHz;Communication System PAR: 4.265 dB; PMF:
Medium parameters used: f = 1880 MHz; σ = 1.458 S/m; ε_r = 39.375; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(8.33, 8.33, 8.33) @ 1880 MHz; Calibrated: 22/03/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 31.0
- Electronics: DAE4 Sn705; Calibrated: 26/04/2021
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA;
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Harman Kathrein GPRS 1900, 3 slots/Area Scan (101x141x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.00416 W/kg
Harman Kathrein GPRS 1900, 3 slots/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.319 V/m; Power Drift = 0.46 dB Peak SAR (extrapolated) = 0.00494 W/kg
SAR(1 g) = 0.0023 W/kg; SAR(10 g) = 0.00115 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid
Ratio of SAR at M2 to SAR at M1 = 46.3%
Maximum value of SAR (measured) = 0.00381 W/kg



Plot 18

Date/Time: 19/11/2021 11.33.44

Test Laboratory: Verkotan Oy

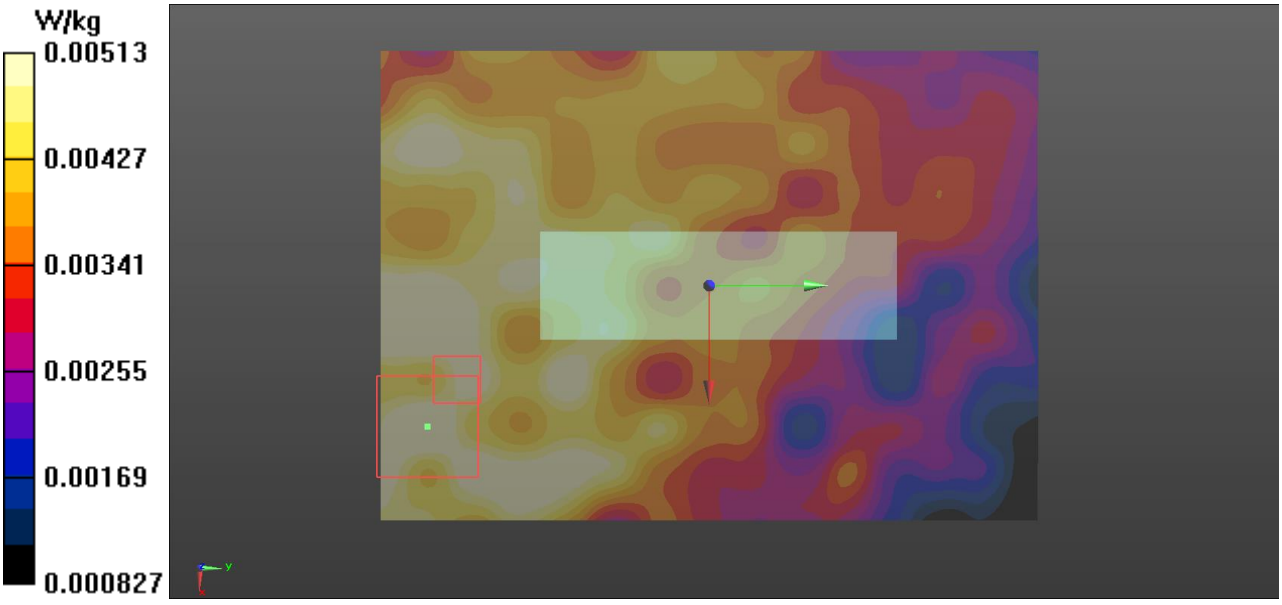
DUT: Hermes 2.1 LTE NAFTA with Kathrein A1569050902 antenna

Communication System: UID 0, WCDMA (0); Communication System Band: Band 2; Frequency: 1880 MHz;Communication System PAR: 0 dB; PMF: 1.12202e-005
Medium parameters used: f = 1880 MHz; σ = 1.458 S/m; ε_r = 39.375; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(8.33, 8.33, 8.33) @ 1880 MHz; Calibrated: 22/03/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 31.0
- Electronics: DAE4 Sn705; Calibrated: 26/04/2021
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA;
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Harman Kathrein WCDMA 2/Area Scan (101x141x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.00589 W/kg
Harman Kathrein WCDMA 2/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.555 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 0.00691 W/kg
SAR(1 g) = 0.00415 W/kg; SAR(10 g) = 0.00215 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid
Ratio of SAR at M2 to SAR at M1 = 55.1%
Maximum value of SAR (measured) = 0.00576 W/kg



Plot 19

Date/Time: 22/11/2021 18.33.05

Test Laboratory: Verkotan Oy

DUT: Hermes 2.1 LTE NAFTA with Kathrein A1569050902 antenna

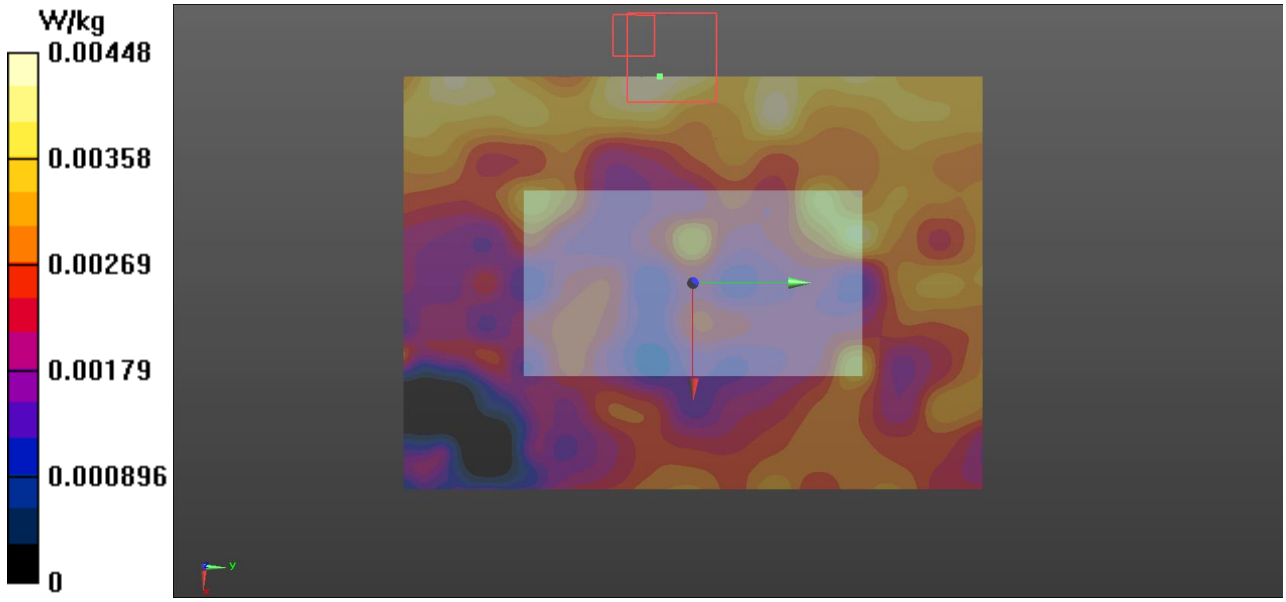
Communication System: UID 0, WCDMA (0); Communication System Band: Band 4; Frequency: 1752.6 MHz;Communication System PAR: 0 dB; PMF: 1.12202e-005
Medium parameters used (interpolated): f = 1752.6 MHz; σ = 1.361 S/m; ε_r = 38.822; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(8.52, 8.52, 8.52) @ 1752.6 MHz; Calibrated: 22/03/2021
- 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: 26/04/2021
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA;
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Configuration/FCC Harman Kathrein WCDMA 4 high/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.318 V/m; Power Drift = 0.91 dB
Peak SAR (extrapolated) = 0.00613 W/kg
SAR(1 g) = 0.0027 W/kg; SAR(10 g) = 0.00169 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid
Ratio of SAR at M2 to SAR at M1 = 43.6%
Maximum value of SAR (measured) = 0.00428 W/kg

Configuration/FCC Harman Kathrein WCDMA 4 high/Area Scan (101x141x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.00448 W/kg



Plot 20

Date/Time: 17/11/2021 16.06.43

Test Laboratory: Verkotan Oy

DUT: Hermes 2.1 LTE NAFTA with Kathrein A1569050902 antenna

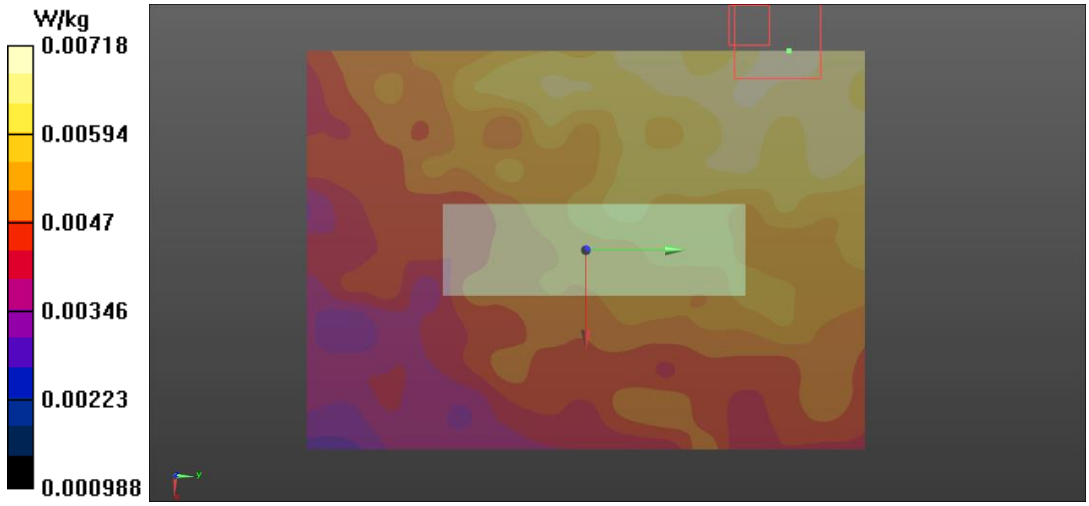
Communication System: UID 0, WCDMA (0); Communication System Band: Band 5; Frequency: 846.6 MHz;Communication System PAR: 0 dB; PMF: 1.12202e-005
Medium parameters used: f = 847 MHz; σ = 0.976 S/m; ε_r = 41.947; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(9.98, 9.98, 9.98) @ 846.6 MHz; Calibrated: 22/03/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 31.0
- Electronics: DAE4 Sn705; Calibrated: 26/04/2021
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA;
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Harman Kathrein WCDMA 5 /Area Scan (101x141x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.00742 W/kg

Harman Kathrein WCDMA 5 /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 2.379 V/m; Power Drift = 0.28 dB
Peak SAR (extrapolated) = 0.00847 W/kg
SAR(1 g) = 0.00568 W/kg; SAR(10 g) = 0.00423 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid
Ratio of SAR at M2 to SAR at M1 = 65.9%
Maximum value of SAR (measured) = 0.00718 W/kg



Plot 21

Date/Time: 19/11/2021 15.06.59

Test Laboratory: Verkotan Oy

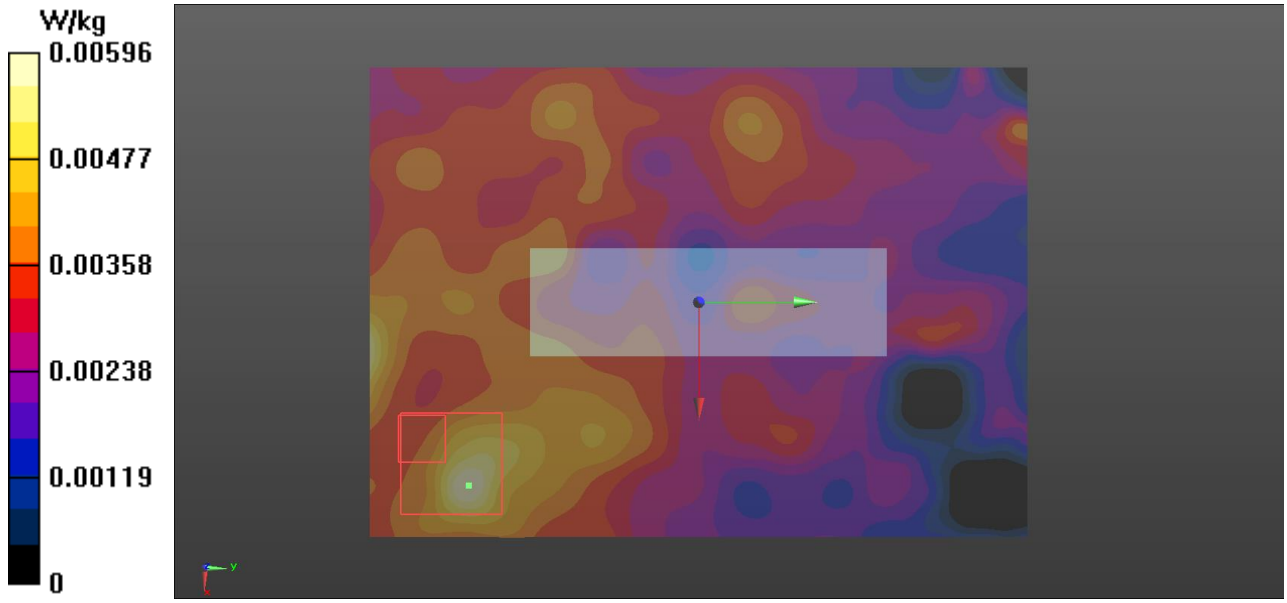
DUT: Hermes 2.1 LTE NAFTA with Kathrein A1569050902 antenna

Communication System: UID 0, Generic LTE (0); Communication System Band: Band 2, E-UTRA/FDD (1850.0 - 1910.0 MHz); Frequency: 1880 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 1880 MHz; σ = 1.458 S/m; ε_r = 39.375; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(8.33, 8.33, 8.33) @ 1880 MHz; Calibrated: 22/03/2021
- 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: 26/04/2021
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA;
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Harman Kathrein LTE 2, BW20, RB50, Offset 25/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.624 V/m; Power Drift = -0.68 dB
Peak SAR (extrapolated) = 0.00846 W/kg
SAR(1 g) = 0.00271 W/kg; SAR(10 g) = 0.00175 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid
Ratio of SAR at M2 to SAR at M1 = 69.9%
Maximum value of SAR (measured) = 0.00426 W/kg
Harman Kathrein LTE 2, BW20, RB50, Offset 25/Area Scan (101x141x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.00596 W/kg



Plot 22

Date/Time: 22/11/2021 18.49.17

Test Laboratory: Verkotan Oy

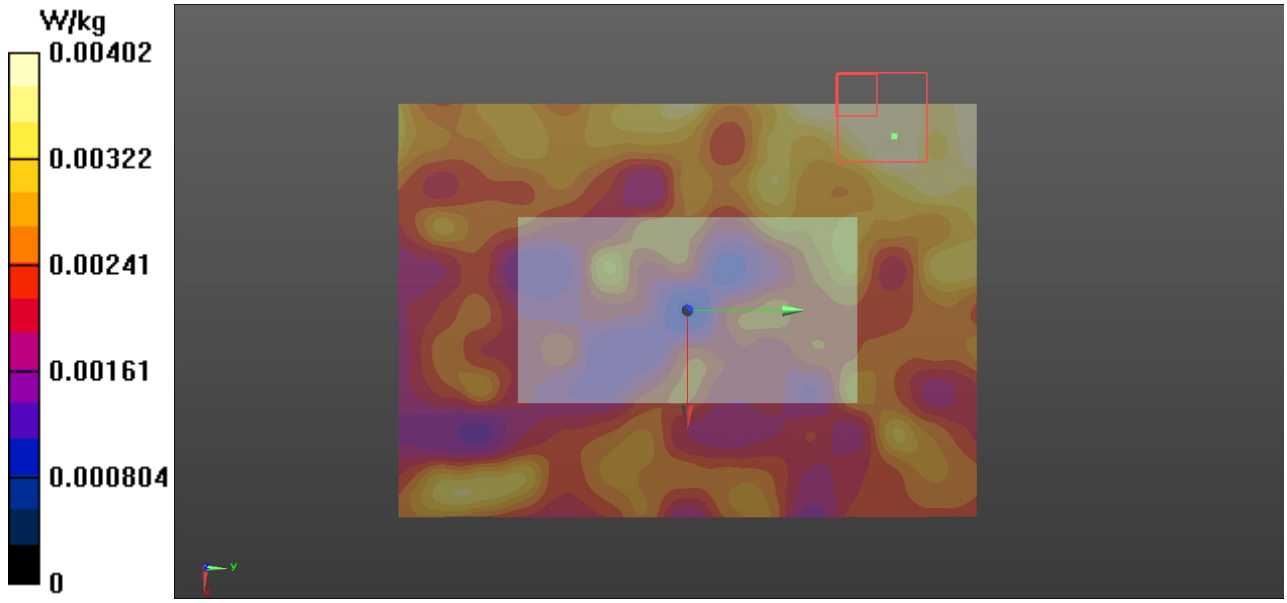
DUT: Hermes 2.1 LTE NAFTA with Kathrein A1569050902 antenna

Communication System: UID 0, Generic LTE (0); Communication System Band: Band 4, E-UTRA/FDD (1710.0 - 1755.0 MHz); Frequency: 1745 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used (interpolated): f = 1745 MHz; σ = 1.357 S/m; ε_r = 38.83; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(8.52, 8.52, 8.52) @ 1745 MHz; Calibrated: 22/03/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 31.0
- Electronics: DAE4 Sn705; Calibrated: 26/04/2021
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA;
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Harman Kathrein LTE 4, BW20, RB1, Offset 50/Area Scan (101x141x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.00464 W/kg
Harman Kathrein LTE 4, BW20, RB1, Offset 50/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.182 V/m; Power Drift = 0.70 dB
Peak SAR (extrapolated) = 0.00522 W/kg
SAR(1 g) = 0.00291 W/kg; SAR(10 g) = 0.0014 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid
Ratio of SAR at M2 to SAR at M1 = 48.8%
Maximum value of SAR (measured) = 0.00402 W/kg



Plot 23

Date/Time: 17/11/2021 18.58.59

Test Laboratory: Verkotan Oy

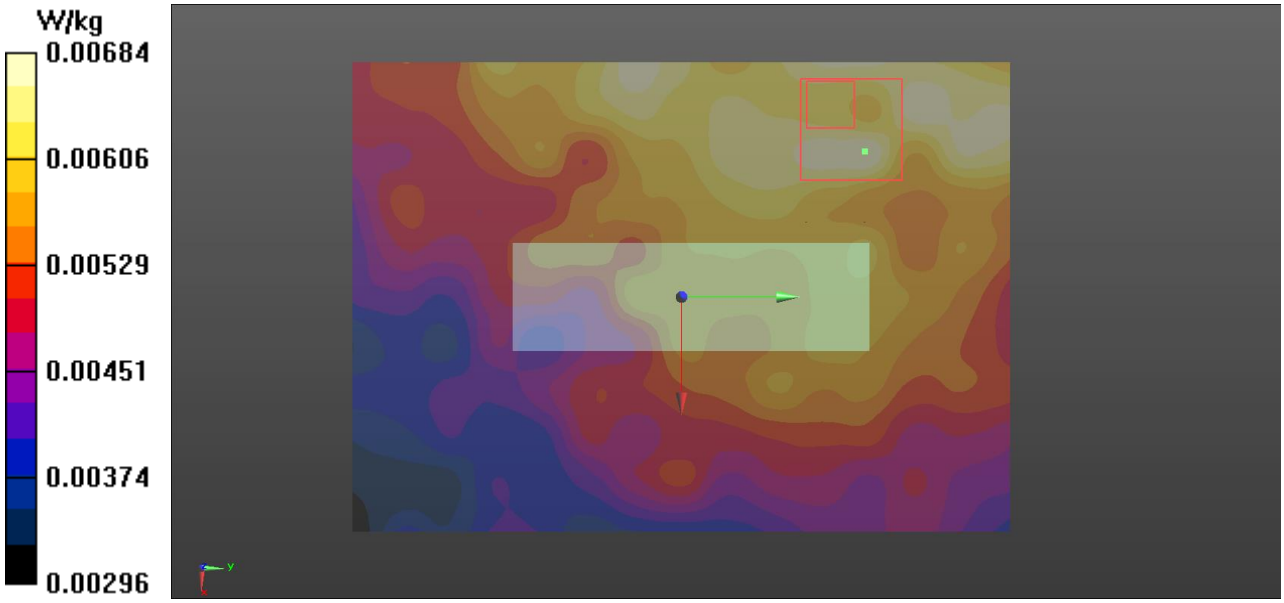
DUT: Hermes 2.1 LTE NAFTA with Kathrein A1569050902 antenna

Communication System: UID 0, Generic LTE (0); Communication System Band: Band 5, E-UTRA/FDD (824.0 - 849.0 MHz); Frequency: 836.5 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used (interpolated): f = 836.5 MHz; σ = 0.972 S/m; ε_r = 41.99; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(9.98, 9.98, 9.98) @ 836.5 MHz; Calibrated: 22/03/2021
- 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: 26/04/2021
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA;
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Harman Kathrein LTE5, BW10, RB 1, offset 49 mid/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.323 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.00753 W/kg
SAR(1 g) = 0.00546 W/kg; SAR(10 g) = 0.00411 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid
Ratio of SAR at M2 to SAR at M1 = 77.6%
Maximum value of SAR (measured) = 0.00679 W/kg
Harman Kathrein LTE5, BW10, RB 1, offset 49 mid/Area Scan (101x141x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.00684 W/kg



Plot 24

Date/Time: 18/11/2021 21.32.28

Test Laboratory: Verkotan Oy

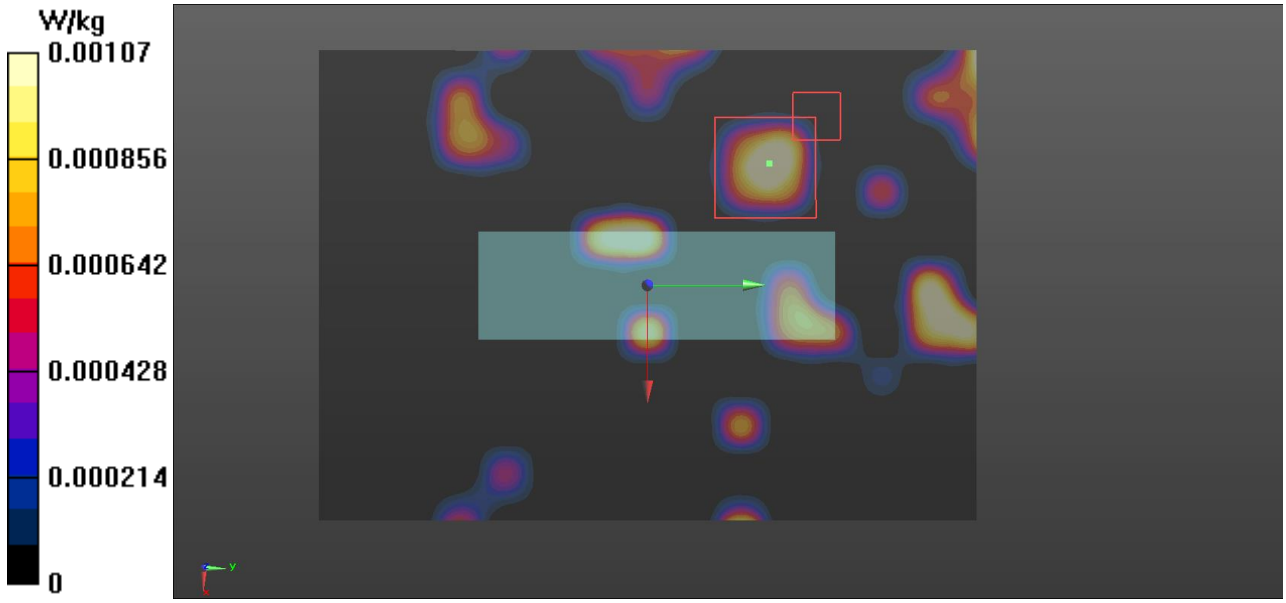
DUT: Hermes 2.1 LTE NAFTA with Kathrein A1569050902 antenna

Communication System: UID 0, Generic LTE (0); Communication System Band: Band 12, E-UTRA/FDD (698.0 - 716.0 MHz); Frequency: 707.5 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used (interpolated): f = 707.5 MHz; σ = 0.928 S/m; ε_r = 41.867; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(10.51, 10.51, 10.51) @ 707.5 MHz; Calibrated: 22/03/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 31.0
- Electronics: DAE4 Sn705; Calibrated: 26/04/2021
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA;
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Harman Kathrein LTE12, BW10, RB 1, offset 49 mid/Area Scan (101x141x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.00135 W/kg
Harman Kathrein LTE12, BW10, RB 1, offset 49 mid/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0.8000 V/m; Power Drift = -0.54 dB
Peak SAR (extrapolated) = 0.00107 W/kg
SAR(1 g) = 0.000186 W/kg; SAR(10 g) = 5.53e-005 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid
Ratio of SAR at M2 to SAR at M1 = 48.2%
Maximum value of SAR (measured) = 0.00107 W/kg



Plot 25

Date/Time: 18/11/2021 20.05.01

Test Laboratory: Verkotan Oy

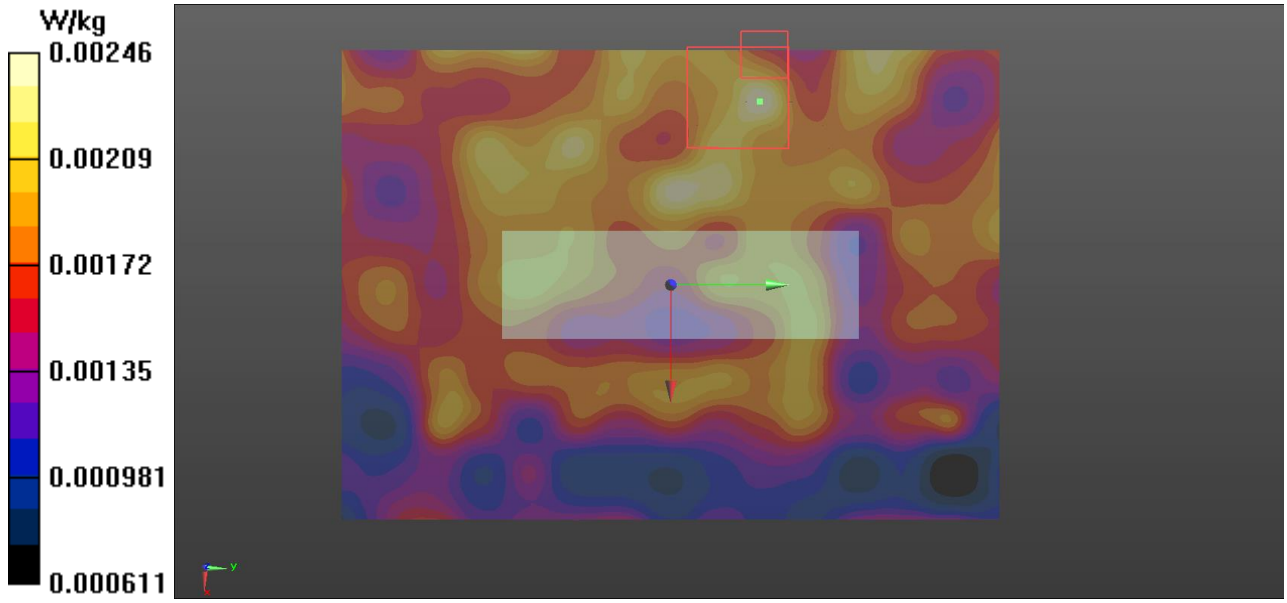
DUT: Hermes 2.1 LTE NAFTA with Kathrein A1569050902 antenna

Communication System: UID 0, Generic LTE (0); Communication System Band: Band 13, E-UTRA/FDD (777.0 - 787.0 MHz); Frequency: 784.5 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used (interpolated): f = 784.5 MHz; σ = 0.955 S/m; ε_r = 41.609; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(10.51, 10.51, 10.51) @ 784.5 MHz; Calibrated: 22/03/2021
- 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: 26/04/2021
- Phantom: SAR1_Phantom1_ELI; Type: QD OVA 002 AA;
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Harman Katherine LTE13, BW5, RB 1, offset 0 2/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.334 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 0.00383 W/kg
SAR(1 g) = 0.00161 W/kg; SAR(10 g) = 0.000953 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid
Ratio of SAR at M2 to SAR at M1 = 64.3%
Maximum value of SAR (measured) = 0.00229 W/kg
Harman Katherine LTE13, BW5, RB 1, offset 0 2/Area Scan (101x141x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.00246 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
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_Mar21**

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: March 22, 2021

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	01-Apr-20 (No. 217-03100/03101)	Apr-21
Power sensor NRP-Z91	SN: 103244	01-Apr-20 (No. 217-03100)	Apr-21
Power sensor NRP-Z91	SN: 103245	01-Apr-20 (No. 217-03101)	Apr-21
Reference 20 dB Attenuator	SN: CC2552 (20x)	31-Mar-20 (No. 217-03106)	Apr-21
DAE4	SN: 660	23-Dec-20 (No. DAE4-660_Dec20)	Dec-21
Reference Probe ES3DV2	SN: 3013	30-Dec-20 (No. ES3-3013_Dec20)	Dec-21
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-20)	In house check: Jun-22
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-21

	Name	Function	Signature
Calibrated by:	MIchael Weber	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 23, 2021

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]	94.4	91.5	100.1	

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	140.4	± 3.3 %	± 4.7 %
		Y	0.0	0.0	1.0		148.8		
		Z	0.0	0.0	1.0		145.0		

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.

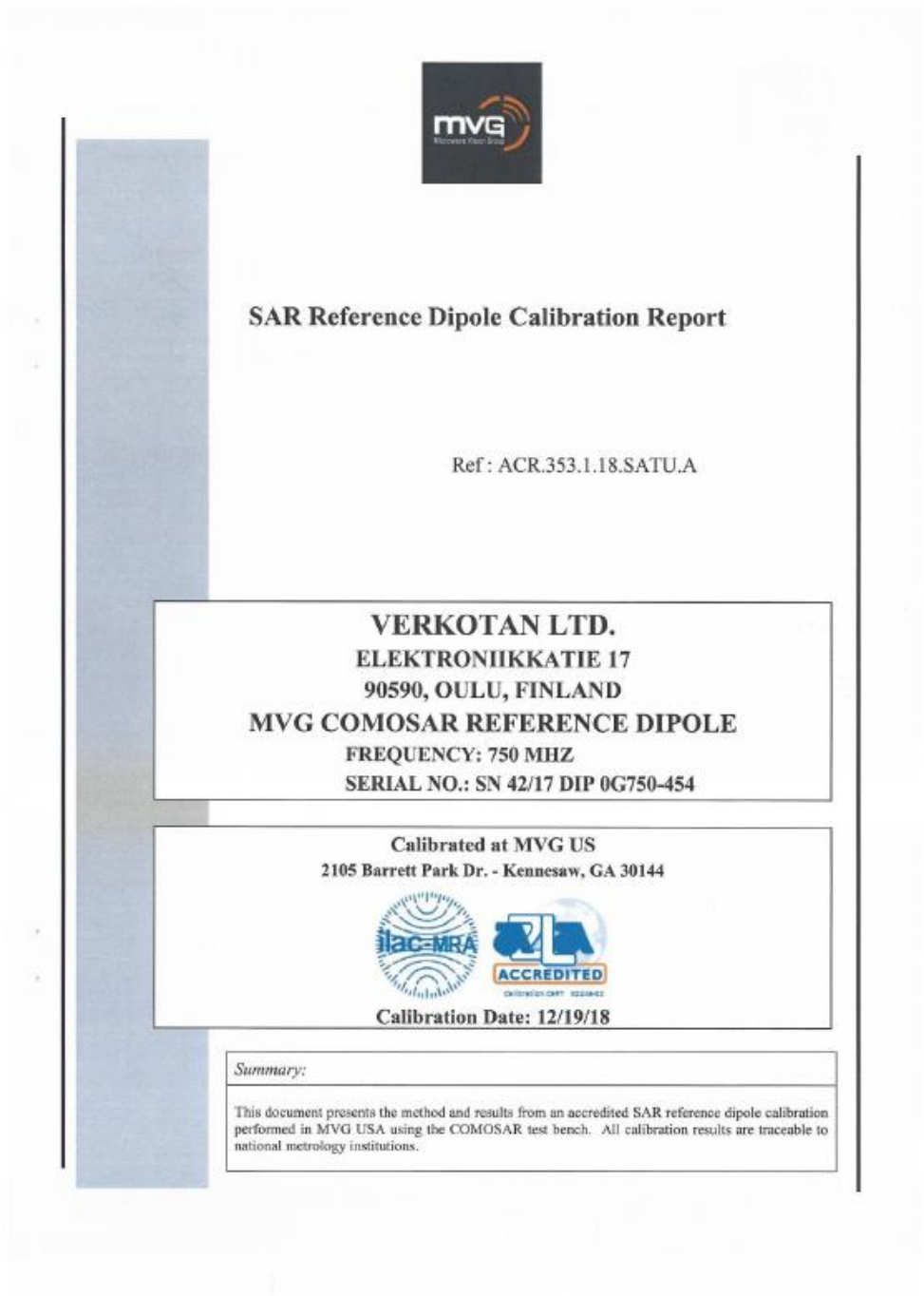
DASY/EASY - Parameters of Probe: EX3DV4 - SN:7447

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)
13	55.0	0.75	14.92	14.92	14.92	0.00	1.00	± 13.3 %
750	41.9	0.89	10.51	10.51	10.51	0.48	0.80	± 12.0 %
900	41.5	0.97	9.98	9.98	9.98	0.37	0.98	± 12.0 %
1750	40.1	1.37	8.52	8.52	8.52	0.36	0.86	± 12.0 %
1950	40.0	1.40	8.33	8.33	8.33	0.30	0.86	± 12.0 %
2150	39.7	1.53	8.22	8.22	8.22	0.31	0.86	± 12.0 %
2300	39.5	1.67	8.10	8.10	8.10	0.34	0.90	± 12.0 %
2450	39.2	1.80	7.85	7.85	7.85	0.31	0.90	± 12.0 %
2600	39.0	1.96	7.69	7.69	7.69	0.27	0.90	± 12.0 %
3300	38.2	2.71	7.00	7.00	7.00	0.30	1.30	± 13.1 %
5250	35.9	4.71	5.25	5.25	5.25	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.53	4.53	4.53	0.40	1.80	± 13.1 %
5750	35.4	5.22	4.63	4.63	4.63	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.353.1.18.SATU.A

VERKOTAN LTD.
ELEKTRONIIKKATIE 17
90590, OULU, FINLAND
MVG COMOSAR REFERENCE DIPOLE
FREQUENCY: 750 MHZ
SERIAL NO.: SN 42/17 DIP 0G750-454

Calibrated at MVG US
2105 Barrett Park Dr. - Kennesaw, GA 30144

Calibration Date: 12/19/18

Summary:

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

1800	40.0 ±5 %		1.40 ±5 %	
1900	40.0 ±5 %		1.40 ±5 %	
1950	40.0 ±5 %		1.40 ±5 %	
2000	40.0 ±5 %		1.40 ±5 %	
2100	39.8 ±5 %		1.49 ±5 %	
2300	39.5 ±5 %		1.67 ±5 %	
2450	39.2 ±5 %		1.80 ±5 %	
2600	39.0 ±5 %		1.96 ±5 %	
3000	38.5 ±5 %		2.40 ±5 %	
3500	37.9 ±5 %		2.91 ±5 %	

7.2 SAR MEASUREMENT RESULT WITH HEAD LIQUID

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.

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values: eps' : 40.0 sigma : 0.93
Distance between dipole center and liquid	15.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoom Scan Resolution	dx=8mm/dy=8mm/dz=5mm
Frequency	750 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

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	8.52 (0.85)	5.55	5.62 (0.56)
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	

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

ilac-MRA cofrac ETALONNAGE

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).

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	

SAR Reference Dipole Calibration Report

Ref : ACR.352.4.20.MVGB.A

VERKOTAN LTD.
ELEKTRONIIKKATIE 17
90590, OULU, FINLAND
SAR REFERENCE DIPOLE
FREQUENCY: 1800 MHZ
SERIAL NO.: SN 2D075

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

Calibration date: 12/17/20

ilac-MRA cofrac ETALONNAGE

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

Summary:

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

Page: 1/11

7.1 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 %	43.7	1.40 ±10 %	1.34
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 %	
3300	38.2 ±10 %		2.71 ±10 %	
3500	37.9 ±10 %		2.91 ±10 %	
3700	37.7 ±10 %		3.12 ±10 %	
3900	37.5 ±10 %		3.32 ±10 %	
4200	37.1 ±10 %		3.63 ±10 %	
4600	36.7 ±10 %		4.04 ±10 %	
4900	36.3 ±10 %		4.35 ±10 %	

7.2 SAR MEASUREMENT RESULT WITH HEAD LIQUID

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.

Software	OPENSAR V5
Phantom	SN 13/09 SAM68
Probe	SN 41/18 EPGO333
Liquid	Head Liquid Values: eps' : 43.7 sigma : 1.34
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=8mm/dy=8mm/dz=5mm
Frequency	1800 MHz
Input power	20 dBm
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-70 %

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	39.44 (3.94)	20.1	20.87 (2.09)
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	
3300	-		-	
3500	67.1		25	
3700	67.4		24.2	
3900	-		-	
4200	-		-	
4600	-		-	
4900	-		-	

SAR Reference Dipole Calibration Report

Ref : ACR.84.5.20.MVGB.A

VERKOTAN LTD.
ELEKTRONIIKKATIE 17
90590, OULU, FINLAND
SAR REFERENCE DIPOLE
FREQUENCY: 1900 MHZ
SERIAL NO.: SN 511

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

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).

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 %.	

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: eps' : 38.5 sigma : 1.45
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=8mm/dy=8mm/dz=5mm
Frequency	1900 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 %	38.5	1.40 ±10 %	1.45
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 %	

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	37.10 (3.71)	20.5	19.14 (1.91)
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	

