

SAR Compliance Test Report

Date of Report	27/06/2016	Client's Contact person:	Latvasalo Tomi
Number of pages:	145	Responsible Test engineer:	Ilpo Joensuu
Testing laboratory:	Verkotan Oy Elektroniikkatie 17 90590 Oulu Finland	Client:	Bittium Wireless Ltd Tutkijantie 8 90590 Oulu Finland
Tested device	Bittium Tough Mobile (SD-42)		
Related reports:	FCC SAR Test Report No. SA150623C04		
Testing has been carried out in accordance with:	47CFR §2.1093 Radiofrequency Radiation Exposure Evaluation: Portable Devices FCC published RF exposure KDB procedures RSS-102, Issue 5 Evaluation Procedure for Mobile and Portable Radio Transmitters with Respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields IEEE 1528 - 2013 IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Technique		
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:
For the contents:

27.06.2016

Miia

Nurkkala

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Laboratory Manager

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1. SUMMARY OF SAR TEST REPORT

1.1 Test Details

Equipment under Test (EUT):

Product:	Tough Mobile
Manufacturer:	Bittium Wireless Ltd
Type:	SD-42
Serial Number:	356244060009325
FCC ID Number:	V27SD-42
IC ID Number:	NA
Hardware Version:	0502
DUT Number:	23143
Battery Type used in testing:	3700034
Portable/ Mobile device	Portable
State of the Sample	Prototype

Testing information:

Testing performed:	25.5 – 28.5.2016
Notes:	Maximum SAR test results of report no. SA150623C04 are re-tested in this report.
Document name:	FCC_SAR_Report_SD-42_07062016.docx
Temperature °C	22±2 / Controlled
Humidity RH%	40±20 / Controlled
Measurement performed by:	Ilpo Joensuu/ Kirsi Kyllönen

1.2 Maximum Results

The maximum reported* SAR values for Head Exposure Condition, Body-worn and Hotspot Mode configurations are reported 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 Head & Body is SAR_{1g} 1.6 W/kg,

Equipment Class	System	Highest Reported* SAR _{1g} (W/kg) in Head Exposure Condition	Highest Reported* SAR _{1g} (W/kg) in Body-Worn Condition	Highest Reported* SAR _{1g} (W/kg) in Hotspot Mode	Result
PCE	GSM850	0.22	0.42	0.42	PASS
	PCS1900	0.34	0.28	0.28	PASS
	WCDMA II	0.78	0.67	0.67	PASS
	WCDMA IV	0.49	0.62	0.62	PASS
	WCDMA V	0.21	0.37	0.37	PASS
	LTE 2	0.59	0.44	0.44	PASS
	LTE 4	0.46	0.44	0.44	PASS
	LTE 5	0.18	0.29	0.29	PASS
	LTE 7	0.75	1.27	1.27	PASS
	LTE 14	0.14	0.31	0.31	PASS
DTS	2.4 GHz WLAN	0.11	0.13	0.13	PASS

NIII	5.3 GHz WLAN	0.13	0.22	n/a	PASS
	5.6 GHz WLAN	0.24	0.12	n/a	PASS
	5.8 GHz WLAN	0.04	0.01	n/a	PASS

* Reported SAR Values are scaled to, or measured at, upper limit of power tuning tolerance.

1.2.1 Simultaneous Transmission SAR

Highest Simultaneous Transmission SAR	SAR _{1g} (W/kg) in Head Exposure Condition*	SAR _{1g} (W/kg) in Body-Worn Condition*	SAR _{1g} (W/kg) in Hotspot Mode*	Result
PCE(Low Band) + PCE(High Band) + DTS	**	1.22	1.22	PASS
PCE(Low Band) + PCE(High Band) + NIII	**	1.31	n/a	PASS
PCE (LTE 7) + DTS	**	1.40	1.40	PASS
PCE (LTE 7)+ NIII	**	1.49	n/a	PASS

* Reported SAR Values are scaled to, or measured at, upper limit of power tuning tolerance.

** Not evaluated in this test report. See section 2.

1.2.2 Maximum Drift

Maximum Drift During Measurements	≤ 0.22* dB
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*Larger drifts included to scaling factors

1.2.3 Measurement Uncertainty

Expanded Uncertainty (k=2) 95 %	±24.5 %
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2. DESCRIPTION OF THE DEVICE UNDER TEST (DUT)

Device Category	Portable
Exposure Environment	Uncontrolled

V27SD-41 (HW0402) is fully SAR tested in FCC SAR Test Report No. **SA150623C04**. V27SD-42 (HW0502) and V27SD-41 (HW0402) have identical HW on all supported US frequency bands. LTE bands 13 and 17 that are supported by V27SD-41 are disabled and replaced by LTE bands 28a/b in V27SD-42. The purpose of this report is to confirm that disabling of LTE bands 13 and 17 do not impact SAR values in other US frequency bands. Thus maximum SAR values presented chapter 1 of **SA150623C04** were SAR tested. Chapter 1 of **SA150623C04** is presented in appendix F.

SD-41 and SD-42 have different power tuning target for LTE band 14. LTE 14 was fully SAR tested for SD-42.

2.1 Supported Frequency Bands and Operational Modes

TX Frequency bands	Modes of Operation	Modulation Mode	Transmitter Frequency Range (MHz)
	GSM/GPRS/EDGE 850	GMSK/8PSK	824.2 - 848.8
	GSM/GPRS/EDGE 1900	GMSK/8PSK	1850.2 - 1909.8
	WCDMA/ HSUPA V	QPSK	826.4 - 846.6
	WCDMA/ HSUPA II	QPSK	1852.4 - 1907.6
	WCDMA/ HSUPA IV	QPSK	1712.4 - 1752.6
	LTE 2	QPSK/16QAM	1850.7 - 1909.3
	LTE 4	QPSK/16QAM	1710.7 - 1754.3
	LTE 5	QPSK/16QAM	824.7 - 848.3
	LTE 7	QPSK/16QAM	2502.5 - 2567.5
	LTE 14	QPSK/16QAM	790.5 - 795.5
	WLAN 2.4G	OFDM	2412 - 2462
	WLAN 5G	OFDM	5180-5825
	BT	GFSK	2402 - 2480

Bands Operating Outside USA GSM 900, GSM1800, WCDMA I/VI, LTE 1/8/3/7/20/28

Common features	
Number of SIM Cards:	2
Output Power and Batteries	The device output power was set to maximum power level for all tests. A fully charged battery was used for every test sequence.

GSM/GPRS/EGPRS	KDB 941225 D03 SAR Test Reduction Procedures for GSM/GPRS/EDGE
Device Class	B
GSM Multi Slot Class	12
EGPRS	33
Number of Slots Used in Testing	The number of Tx slots in GPRS tests was 4 at GSM850 MHz and PCS1900 MHz band. Selection was based on conducted power result comparison with all available uplink slot configurations.

WCDMA	KDB 941225 D01 SAR Measurement Procedures for 3G Devices
HSUPA	SAR tests for HSUPA mode have not been performed as no HSUPA Sub-test mode has an average power > 0.25 dB above the basic WCDMA 12.2 kbps RMC mode.
HSDPA	SAR tests for HSDPA mode have not been performed as no HSDPA Sub-test mode has an average power > 0.25 dB above the basic WCDMA 12.2 kbps RMC mode.

LTE	KDB 941225 D05 SAR for LTE Devices v02r02 DR07-41372							
Call Tester Settings	Anritsu MT8820C: Additional Spectrum Emission was set to 'NS_01' to disable A-MPR. p-Max on							
LTE MPR	MPR values as stipulated in Table 6.2.3_1 of 3GPP TS 36.101 (presented below) have been incorporated into the device; these MPR values are dependent on the modulation, Channel Bandwidth and Resource Block allocations as shown:							
	modulation	Channel Bandwidth / Transmission bandwidth (RB)					MPR (dB)	
		1.4MHz	3MHz	5MHz	10MHz	15MHz		20MHz
	QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
	16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
	16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
Bluetooth	KDB 447498 D01 General RF Exposure Guidance v05							
Testing	Since WLAN2450 and BT use same frequency and antenna, and WLAN2450 tuning power is higher, and they cannot transmit simultaneously, the WLAN2450 standalone SAR is conservative estimation of BT SAR. Thus BT SAR can be deemed to comply without further analysis or measurements.							

This EUT has 3 WWAN Antennas and 1 WLAN Antenna. The simultaneous transmission possibilities for this device are listed as below.

Antenna	Band	Remark
WWAN Ant-0	GSM850, WCDMA V, LTE 5, LTE 13, LTE 14, LTE 17	Low Band
WWAN Ant-1	GSM 1900, WCDMA II, WCDMA IV, LTE 2, LTE 4	High Band
WWAN Ant-2	LTE 7	LTE 7
WLAN / BT	WLAN (DTS), WLAN (NII), BT	WLAN

Simultaneous TX Combination	Capable Transmit Configurations	Head (Voice / VoIP)	Body-worn (Voice / VoIP)	Hotspot (Data)
1	WWAN [Low Band] (Voice / Data) + WLAN (Data)	Yes	Yes	Yes
2	WWAN [Low Band] (Voice / Data) + BT (Data)	No	Yes	No
3	WWAN [High Band] (Voice / Data) + WLAN (Data)	Yes	Yes	Yes
4	WWAN [High Band] (Voice / Data) + BT (Data)	No	Yes	No
5	WWAN [LTE 7] (Data) + WLAN (Data)	Yes	Yes	Yes
6	WWAN [LTE 7] (Data) + BT (Data)	No	Yes	No
7	WWAN [Low Band] (Voice / Data) + WWAN [High Band] (Voice / Data)	Yes	Yes	Yes
8	WWAN [Low Band] (Voice / Data) + WWAN [High Band] (Voice / Data) +	Yes	Yes	Yes

2.4G WLAN and 5G WLAN can not transmit simultaneously. Bluetooth and WLAN can not transmit simultaneously. Antenna locations, SAR testing required for hotspot mode based on locations and full simultaneous transmission analysis is presented in FCC SAR Test Report No. **SA150623C04**.

3. CONDUCTED POWERS

3.1 Tested conducted power

Tested conducted powers are presented in chapter 7 tables.

3.2 Maximum Conducted powers

GSM 850 Slot Configuration	Target	Tolerance [dB]
GSM (GMSK, 1Tx-slot)	33.0	+0.5/-1.0
GPRS (GMSK, 1Tx-slot)	33.0	+0.5/-1.0
GPRS (GMSK, 2Tx-slot)	30.5	+1.0/-1.0
GPRS (GMSK, 3Tx-slot)	28.5	+1.0/-1.0
GPRS (GMSK, 4Tx-slot)	27.5	+1.0/-1.0
EDGE (8PSK, 1Tx-slot)	27.5	+0.5/-1.0
EDGE (8PSK, 2Tx-slot)	24.5	+1.0/-1.0
EDGE (8PSK, 3Tx-slot)	22.7	+1.0/-1.0
EDGE (8PSK, 4Tx-slot)	21.5	+1.0/-1.0

GSM 1900 Slot Configuration	Target	Tolerance [dB]
GSM (GMSK, 1Tx-slot)	29.0	+0.5/-1.0
GPRS (GMSK, 1Tx-slot)	29.0	+0.5/-1.0
GPRS (GMSK, 2Tx-slot)	27.5	+1.0/-1.0
GPRS (GMSK, 3Tx-slot)	25.7	+1.0/-1.0
GPRS (GMSK, 4Tx-slot)	24.5	+1.0/-1.0
EDGE (8PSK, 1Tx-slot)	26.5	+0.5/-1.0
EDGE (8PSK, 2Tx-slot)	24.0	+1.0/-1.0
EDGE (8PSK, 3Tx-slot)	22.0	+1.0/-1.0
EDGE (8PSK, 4Tx-slot)	20.5	+1.0/-1.0

WCDMA II Mode	Target	Tolerance [dB]
RMC 12.2K	24.0	+0.5/-2.0
HSDPA Subtest-1	23.0	+0.5/-2.0
HSDPA Subtest-2	23.0	+0.5/-2.0
HSDPA Subtest-3	22.0	+1.0/-2.0
HSDPA Subtest-4	22.0	+1.0/-2.0
HSUPA Subtest-1	23.0	+1.0/-2.0
HSUPA Subtest-2	22.0	+1.0/-2.0
HSUPA Subtest-3	23.0	+1.0/-2.0
HSUPA Subtest-4	23.0	+1.0/-2.0
HSUPA Subtest-5	23.0	+1.0/-2.0

WCDMA IV Mode	Target	Tolerance [dB]
RMC 12.2K	24.0	+0.5/-2.0

HSDPA Subtest-1	23.0	+0.5/-2.0
HSDPA Subtest-2	23.0	+0.5/-2.0
HSDPA Subtest-3	22.0	+1.0/-2.0
HSDPA Subtest-4	22.0	+1.0/-2.0
HSUPA Subtest-1	23.0	+1.0/-2.0
HSUPA Subtest-2	22.0	+1.0/-2.0
HSUPA Subtest-3	23.0	+1.0/-2.0
HSUPA Subtest-4	23.0	+1.0/-2.0
HSUPA Subtest-5	23.0	+1.0/-2.0

WCDMA V Mode	Target	Tolerance [dB]
RMC 12.2K	24.0	+0.5/-2.0
HSDPA Subtest-1	23.0	+0.5/-2.0
HSDPA Subtest-2	23.0	+0.5/-2.0
HSDPA Subtest-3	22.0	+1.0/-2.0
HSDPA Subtest-4	22.0	+1.0/-2.0
HSUPA Subtest-1	23.0	+1.0/-2.0
HSUPA Subtest-2	22.0	+1.0/-2.0
HSUPA Subtest-3	23.0	+1.0/-2.0
HSUPA Subtest-4	23.0	+1.0/-2.0
HSUPA Subtest-5	23.0	+1.0/-2.0

Band	Target [dBm]	Tolerance [dB]
LTE1	23.0	+1.0/-1.0
LTE2	23.0	+1.0/-1.0
LTE3	23.0	+1.0/-1.0
LTE4	23.0	+1.0/-1.0
LTE5	23.0	+0.5/-1.0
LTE7	23.0	+0.5/-1.0
LTE8	24.0	+0.5/-1.0
LTE14	24.0	+0.5/-1.0
LTE20	23.0	+0.5/-1.0
LTE28	24.0	+0.5/-1.0

2.4 GHz	Target [dBm]	Tolerance [dB]
802.11b	19.0	+1.0/-1.0
802.11g	17.5	+1.0/-1.0
802.11n (2.4 GHz)	17.5	+1.0/-1.0
5.2 GHz	Target [dBm]	Tolerance [dB]
802.11a	16.5	+1.0/-1.0
802.11n (5 GHz)	16.5	+1.0/-1.0
802.11ac	14.0	+1.0/-1.0

5.3 GHz	Target [dBm]	Tolerance [dB]
802.11a	16.5	+1.0/-1.0
802.11n (5 GHz)	16.5	+1.0/-1.0
802.11ac	14.0	+1.0/-1.0
5.6 GHz	Target [dBm]	Tolerance [dB]
802.11a	16.5	+1.0/-1.0
802.11n (5 GHz)	16.5	+1.0/-1.0
802.11ac	14.5	+1.0/-1.0
5.8 GHz	Target [dBm]	Tolerance [dB]
802.11a	16.5	+1.0/-1.0
802.11n (5 GHz)	16.5	+1.0/-1.0
802.11ac	14.5	+1.0/-1.0

4. TEST EQUIPMENT

Dasy4 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 brain equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe to the location of maximum electromagnetic field.

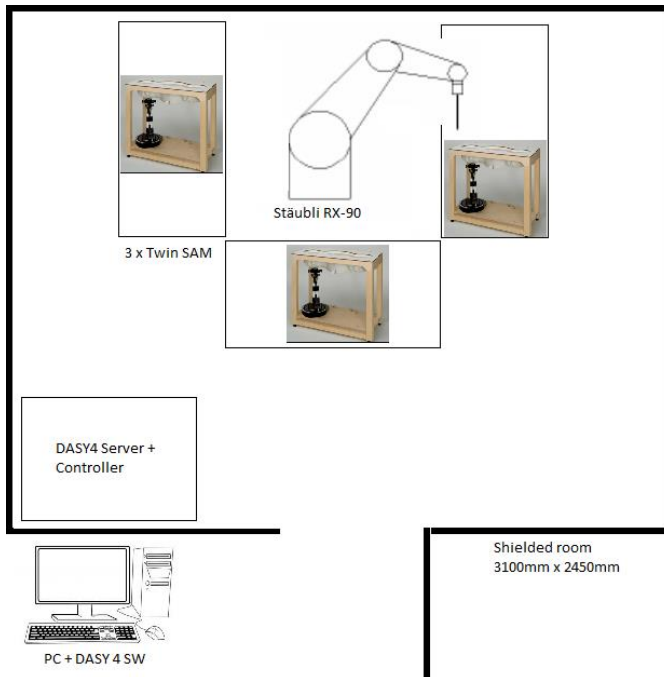


Figure 1 Schematic Laboratory Picture

4.1 Test Equipment List

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

Test Equipment	Model	Serial Number	Calibration Date	Calibration Expiry
DAE	DAE3	371	01/2016	01/2017
Probe	EX3DV4	3570	01/2016	01/2017
Dipole	D835V2	448	01/2016	01/2019
Dipole	D1900V2	511	01/2016	01/2019
Dipole	D2450V2	758	01/2016	01/2019
Dipole	D2600V2	1118	01/2016	01/2019
Dipole	D5GHZV2	1014	04/2016	04/2019
DASY Software	v4.7	na	na	na
Signal Generator	SMIQ06B	834968/023	na	na
Amplifier	AR 5S1G4	27573	na	na
Power Reflection Meter	R&S NRT	835065/049	12/2015	12/2016
Power Sensor	NRT Z-44	835374/021	01/2016	01/2017
Radio Communication	Anritsu MT8820C	6200883099	11/2015	11/2016

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 μ W/g to > 100 mW/g, Linearity: ± 0.2 dB
Dimensions	Overall length: 330 mm Tip length: 10 mm Body diameter: 12 mm Tip diameter: 2.5 mm Distance from probe tip to dipole centers: 1.0 mm
Application	General dosimetry up to 6 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms

4.2 Phantoms

The phantom used in SAR tests was the flat phantom section of the twin-headed "SAM Phantom", manufactured by SPEAG. The phantom conforms to the requirements of IEEE 1528 and FCC published RF Exposure KDB Procedures.

4.3 Tissue Simulants

Recommended values for the dielectric parameters of the tissue simulants are given in IEEE 1528 and FCC published RF Exposure KDB Procedures. The dielectric parameters of the used tissue simulants were within $\pm 5\%$ of the recommended values in all frequencies used. SAR testing was carried out within 24 hours of measuring the dielectric parameters. Depth of the tissue simulant was at least 15.0 cm from the inner surface of the flat phantom.

4.3.1 Recipes

Ingredient	Head (% by weight)				Body (% by weight)			
	650-935		1700-2000		2350-2700		5000-6000	
Deionised Water	51.5	69.25	54.5	70.25	56.0	70.2	50-65*	75.7
Tween 20	47.35	30.0	45.23	29.41	44.0	29.62	8-25 Emulsion	17 Etocas
Salt	1.15	0.75	0.27	0.34		0.18	0-1.5	
Oil							10-30	7.3

* Recipe is proprietary to SPEAG. The proportions of the constituents have not been disclosed

4.4 System Validation Status

Frequency [MHz]	Dipole Type / SN	Probe Type / SN	Calibrated Signal Type	DAE Unit / SN	Validation Done	
					Head tissue simulant	Body tissue simulant
835	D835V2 / 448	EX3DV4 / 3570	CW	DAE3 / 371	02/2016	02/2016
1800	D1800V2 / 249	EX3DV4 / 3570	CW	DAE3 / 371	02/2016	02/2016
1900	D1900V2 / 511	EX3DV4 / 3570	CW	DAE3 / 371	02/2016	02/2016
2450	D2450V2 / 758	EX3DV4 / 3570	CW	DAE3 / 371	02/2016	02/2016

2600	D2600V2 / 1118	EX3DV4 / 3570	CW	DAE3 / 371	02/2016	02/2016
5250	D5GHzV2 / 1014	EX3DV4 / 3570	CW	DAE3 / 371	05/2016	05/2016
5600	D5GHzV2 / 1014	EX3DV4 / 3570	CW	DAE3 / 371	05/2016	05/2016
5750	D5GHzV2 / 1014	EX3DV4 / 3570	CW	DAE3 / 371	05/2016	05/2016

4.5 System Check

Date	Tissue Type	Tissue Temp. [°C]	Frequency [MHz]	Input Power	Measured SAR _{1g} [W/kg]	1 W Target SAR _{1g} [W/kg]	1 W Normalized SAR _{1g} [W/kg]	Deviation _{1g} (%)	Plot #
25.5.2016	H900	22.2	835	250mW	2.47	9.27	9.88	6.6	1
25.5.2016	H1900	21.5	1800	250mW	9.86	39.3	39.44	0.4	3
26.5.2016	H1900	21.9	1900	250mW	9.68	38.9	38.72	-0.5	5
24.5.2016	H2450	22.4	2450	250mW	13.1	51.4	52.4	2.0	7
26.5.2016	H5000	22.5	5250	100mW	8.05	75.2	75.2	7.1	11
26.5.2016	H5000	22.5	5600	100mW	8.75	80.5	87.5	8.7	12
26.5.2016	H5000	22.5	5750	100mW	7.76	77.4	77.6	0.3	13
25.5.2016	M900	22.5	835	250mW	2.52	9.55	10.08	5.6	2
24.5.2016	M1900	22.3	1800	250mW	9.79	39.1	39.16	0.2	4
24.5.2016	M1900	22.3	1900	250mW	10.1	40.3	40.4	0.3	6
24.5.2016	M2450	21.7	2450	250mW	12.9	51.2	51.6	0.8	8
31.5.2016	M2450	22.5	2450	250mW	12.5	51.2	50.0	-2.3	9
25.5.2016	M2450	22.5	2600	250mW	13.8	53.5	55.2	3.2	10
27.5.2016	M5000	22.2	5250	100mW	7.87	71.9	78.7	9.5	14
27.5.2016	M5000	22.2	5600	100mW	8.03	75.7	80.3	6.1	15
27.5.2016	M5000	22.2	5750	100mW	6.77	72.9	67.7	-7.1	16

4.5.1 Tissue Simulant Verification

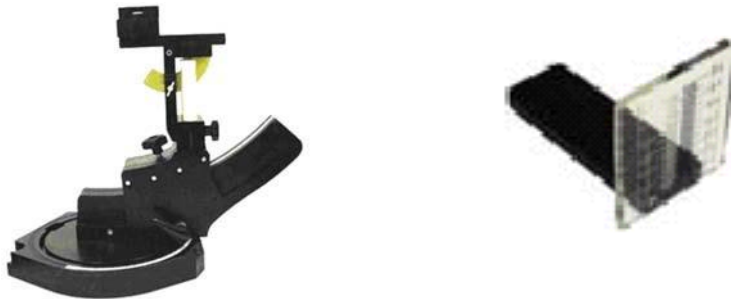
Date	Tissue Type	Tissue Temp. [°C]	Frequency [MHz]	Target		Measured		Deviation σ (%)	Deviation ϵ (%)
				Conductivity, σ [S/m]	Dielectric Constant ϵ	Conductivity, σ [S/m]	Dielectric Constant ϵ		
25.5.2016	H900	22	835	0.90	41.50	0.93	40.61	3.5	-1.2
25.5.2016	H1900	22	1800	1.4	40.0	1.41	39.2	1.2	-1.7
26.5.2016	H1900	22	1900	1.4	40.0	1.38	39.56	-1.5	-1.1
24.5.2016	H2450	22	2450	1.80	39.2	1.77	39.96	-1.9	1.9
26.5.2016	H5000	22	5250	4.71	35.9	4.80	36.20	1.9	0.8
26.5.2016	H5000	22	5600	5.07	35.5	5.17	35.66	1.9	0.5
26.5.2016	H5000	22	5750	5.22	35.4	5.33	35.45	2.0	0.1
25.5.2016	M900	22	835	0.97	55.2	1.01	53.89	3.9	-2.4
24.5.2016	M1900	22	1800	1.52	53.3	1.56	51.72	2.5	-3.0
24.5.2016	M1900	22	1900	1.52	53.3	1.56	52.51	2.5	-1.5
24.5.2016	M2450	22	2450	1.95	52.7	1.90	50.32	-2.6	-4.5
31.5.2016	M2450	22	2450	1.95	52.7	1.91	50.8	-2.0	-3.6
25.5.2016	M2450	22	2600	2.16	52.5	2.24	50.95	2.7	2.2
27.5.2016	M5000	22	5250	5.36	49.0	5.17	48.1	-3.5	-1.6
27.5.2016	M5000	22	5600	5.76	48.53	5.69	47.27	-1.4	-2.5
27.5.2016	M5000	22	5750	5.94	48.33	5.92	46.93	-0.3	-2.8

5. TEST PROCEDURE

In all operating bands the measurements were performed in the maximum test results found in report no. **SA150623C04**. The device output power was set to maximum power level for all tests. A fully charged battery was used for every test sequence.

5.1 Device Holder

The device was placed in the device holder that is supplied by SPEAG.



A custom made spacer on the right, was used to position the device within the SPEAG holder. The spacer positions the device so that the holder has minimal effect on the test results but still holds the device securely. The spacer was removed before the tests.

5.2 Test Positions

See Appendix A for photos of the test positions.

5.2.1 Against Head Configuration

Measurements were made in “cheek” and “tilt” positions on both the left hand and right hand sides of the phantom. The positions used in the measurements were according to IEEE 1528 “IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”.

5.2.2 Body-worn Configuration, 10 mm separation distance

The device was placed in the SPEAG holder using the spacer and placed below the flat phantom. The distance between the device and the phantom was kept at the defined separation distance using a separate flat spacer that was removed before the start of the measurements. The device was oriented with both sides facing the phantom to find the highest results.

5.2.3 Hotspot Mode Configuration, 10 mm separation distance

The device was placed in the SPEAG holder and, in sequence, the front face, rear face and each of the 4 edges was positioned 10 mm away from the flat phantom. The spacer was removed before the start of the measurements.

5.3 Scan Procedures

First, area scans were used for determination of the field distribution. Next, a zoom scan, a minimum of 5x5x7 points covering a volume of at least 30x30x30mm, was performed around the highest E-field value to determine the averaged SAR value. Power drift was determined by measuring the same point at the start of the area scan and again at the end of the zoom scan.

5.4 SAR Averaging Methods

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

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor o_set. Several measurements at different distances are necessary for the extrapolation.

The interpolation, extrapolation and maximum search routines within Dasy47 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).

6. MEASUREMENT UNCERTAINTY

Uncertainty Budget								
Error Description	Uncert. value	Prob. Dist.	Div.	(c _i) 1g	(c _i) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(v _i) v _{eff}
Measurement System								
Probe Calibration	±6.55 %	N	1	1	1	±6.55 %	±6.55 %	∞
Axial Isotropy	±4.7 %	R	$\sqrt{2}$	0.7	0.7	±1.9 %	±1.9 %	∞
Hemispherical Isotropy	±9.6 %	R	$\sqrt{2}$	0.7	0.7	±3.9 %	±3.9 %	∞
Boundary Effects	±2.0 %	R	$\sqrt{2}$	1	1	±1.2 %	±1.2 %	∞
Linearity	±4.7 %	R	$\sqrt{2}$	1	1	±2.7 %	±2.7 %	∞
System Detection Limits	±1.0 %	R	$\sqrt{2}$	1	1	±0.6 %	±0.6 %	∞
Modulation Response ^m	±2.4 %	R	$\sqrt{2}$	1	1	±1.4 %	±1.4 %	∞
Readout Electronics	±0.3 %	N	1	1	1	±0.3 %	±0.3 %	∞
Response Time	±0.8 %	R	$\sqrt{2}$	1	1	±0.5 %	±0.5 %	∞
Integration Time	±2.6 %	R	$\sqrt{2}$	1	1	±1.5 %	±1.5 %	∞
RF Ambient Noise	±3.0 %	R	$\sqrt{2}$	1	1	±1.7 %	±1.7 %	∞
RF Ambient Reflections	±3.0 %	R	$\sqrt{2}$	1	1	±1.7 %	±1.7 %	∞
Probe Positioner	±0.8 %	R	$\sqrt{2}$	1	1	±0.5 %	±0.5 %	∞
Probe Positioning	±6.7 %	R	$\sqrt{2}$	1	1	±3.9 %	±3.9 %	∞
Max. SAR Eval.	±4.0 %	R	$\sqrt{2}$	1	1	±2.3 %	±2.3 %	∞
Test Sample Related								
Device Positioning	±2.9 %	N	1	1	1	±2.9 %	±2.9 %	145
Device Holder	±3.6 %	N	1	1	1	±3.6 %	±3.6 %	5
Power Drift	±5.0 %	R	$\sqrt{2}$	1	1	±2.9 %	±2.9 %	∞
Power Scaling ^p	±0 %	R	$\sqrt{2}$	1	1	±0.0 %	±0.0 %	∞
Phantom and Setup								
Phantom Uncertainty	±6.6 %	R	$\sqrt{2}$	1	1	±3.8 %	±3.8 %	∞
SAR correction	±1.9 %	R	$\sqrt{2}$	1	0.84	±1.1 %	±0.9 %	∞
Liquid Conductivity (mea.) ^{DAK}	±2.5 %	R	$\sqrt{2}$	0.78	0.71	±1.1 %	±1.0 %	∞
Liquid Permittivity (mea.) ^{DAK}	±2.5 %	R	$\sqrt{2}$	0.26	0.26	±0.3 %	±0.4 %	∞
Temp. unc. - Conductivity ^{BB}	±3.4 %	R	$\sqrt{2}$	0.78	0.71	±1.5 %	±1.4 %	∞
Temp. unc. - Permittivity ^{BB}	±0.4 %	R	$\sqrt{2}$	0.23	0.26	±0.1 %	±0.1 %	∞
Combined Std. Uncertainty						±12.3 %	±12.2 %	748
Expanded STD Uncertainty						±24.6 %	±24.5 %	

7. TEST RESULTS

7.1 SAR Results for Head Exposure Condition

Band	Channel	TX Slot configuration	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	GPRS Duty Cycle	Measured SAR _{1g} [mW/g]	Scaling Factor	Reported SAR _{1g} [mW/g]	Plot #
GPRS 850	189	4	28.5	28.05	0.01	Right Cheek	1:22	0.195	1.11	0.22	17
GPRS 1900	810	4	25.5	25.37	0.20	Left Cheek	1:22	0.334	1.03	0.34	18

Band	Channel	Mode	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR _{1g} [mW/g]	Scaling Factor	Reported SAR _{1g} [mW/g]	Plot #
II	9538	RMC 12.2K	24.5	24.26	-0.06	Left Cheek	1:1	0.739	1.06	0.78	19
IV	1312	RMC 12.2K	24.5	24.38	-0.01	Left Cheek	1:1	0.473	1.03	0.49	20
V	4182	RMC 12.2K	24.5	24.23	0.19	Right Cheek	1:1	0.196	1.06	0.21	21

Band	Channel	Modulation / BW [MHz]	RB size	RB Offset	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR _{1g} [mW/g]	Scaling Factor	Reported SAR _{1g} [mW/g]	Plot #
LTE 2	18700	QPSK / 20	1	0	24	23.66	-0.11	Left Cheek	1	0.543	1.08	0.59	22
LTE 4	20175	QPSK / 20	1	0	24	23.01	-0.08	Left Cheek	1	0.369	1.26	0.46	23
LTE 5	20525	QPSK / 10	1	0	23.5	22.76	0.18	Right Cheek	1	0.153	1.19	0.18	24
LTE 7	21100	QPSK / 20	1	0	23.5	23.11	0.19	Left Cheek	1	0.688	1.09	0.75	25
LTE 14	23330	QPSK / 10	1	0	24.5	24.06	0.07	Right Cheek	1	0.138	1.11	0.15	26
LTE 14	23330	QPSK / 10	25	25	24.5	23.09	0.17	Right Cheek	1	0.102	1.38	0.14	
LTE 14	23330	QPSK / 10	1	0	24.5	24.06	0.05	Right Tilted	1	0.106	1.11	0.12	
LTE 14	23330	QPSK / 10	25	25	24.5	23.09	0.12	Right Tilted	1	0.0801	1.38	0.11	
LTE 14	23330	QPSK / 10	1	0	24.5	24.06	0.13	Left Cheek	1	0.125	1.11	0.14	
LTE 14	23330	QPSK / 10	25	25	24.5	23.09	0.05	Left Cheek	1	0.0883	1.38	0.12	
LTE 14	23330	QPSK / 10	1	0	24.5	24.06	0.06	Left Tilted	1	0.094	1.11	0.10	
LTE 14	23330	QPSK / 10	25	25	24.5	23.09	-0.04	Left Tilted	1	0.0657	1.38	0.09	

Band	Channel	Mode	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR _{1g} [mW/g]	Scaling Factor	Reported SAR _{1g} [mW/g]	Plot #
802.11b	6	-	20	19.51	0.20	Right Cheek	1:1	0.098	1.12	0.11	27
802.11ac	58	VHT80	15	14.35	0	Right Cheek	1:1	0.114	1.16	0.13	
802.11ac	122	VHT80	15.5	15.06	0	Right Cheek	1:1	0.22	1.11	0.24	28
802.11ac	155	VHT80	15.5	14.94	-0.13	Right Cheek	1:1	0.0391	1.14	0.04	

7.2 SAR Results for Body-Worn Configuration, 10 mm separation distance

Band	Channel	TX Slot configuration	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	GPRS Duty Cycle	Measured SAR _{1g} [mW/g]	Scaling Factor	Reported SAR _{1g} [mW/g]	Plot #
GPRS 850	189	4	28.5	28.05	-0.11	Rear Face	1:2.2	0.378	1.11	0.42	29
GPRS 1900	810	4	25.5	25.37	-0.01	Rear Face	1:2.2	0.27	1.03	0.28	30

Band	Channel	Mode	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR _{1g} [mW/g]	Scaling Factor	Reported SAR _{1g} [mW/g]	Plot #
II	9538	RMC 12.2K	24.5	24.26	-0.02	Rear Face	1:1	0.636	1.06	0.67	31
IV	1312	RMC 12.2K	24.5	24.38	0.08	Rear Face	1:1	0.599	1.03	0.62	32
V	4182	RMC 12.2K	24.5	24.23	0.01	Rear Face	1:1	0.35	1.06	0.37	33

Band	Channel	Modulation / BW [MHz]	RB size	RB Offset	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR _{1g} [mW/g]	Scaling Factor	Reported SAR _{1g} [mW/g]	Plot #
LTE 2	18700	QPSK / 20	1	0	24	23.66	-0.07	Rear Face	1	0.409	1.08	0.44	34
LTE 4	20175	QPSK / 20	1	0	24	23.01	-0.04	Rear Face	1	0.351	1.26	0.44	35
LTE 5	20525	QPSK / 10	1	0	23.5	22.76	-0.03	Rear Face	1	0.248	1.19	0.29	36
LTE 7	21350	QPSK / 20	1	0	23.5	23.11	0.08	Rear Face	1	1.16	1.09	1.27	37
LTE 14	23330	QPSK / 10	1	0	24.5	24.06	-0.04	Rear Face	1	0.28	1.11	0.31	38
LTE 14	23330	QPSK / 10	25	25	24.5	23.09	0	Rear Face	1	0.212	1.38	0.29	
LTE 14	23330	QPSK / 10	1	0	24.5	24.06	-0.01	Front Face	1	0.188	1.11	0.21	
LTE 14	23330	QPSK / 10	25	25	24.5	23.09	0.017	Front Face	1	0.14	1.38	0.19	

Band	Channel	Mode	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR _{1g} [mW/g]	Scaling Factor	Reported SAR _{1g} [mW/g]	Plot #
802.11b	6	-	20	19.51	-0.17	Rear Face	1:1	0.118	1.12	0.13	39
802.11ac	58	VHT80	15	14.35	-0.0976	Rear Face	1:1	0.191	1.16	0.22	40
802.11ac	122	VHT80	15.5	15.06	0.035	Rear Face	1:1	0.106	1.11	0.12	
802.11ac	155	VHT80	15.5	14.94	0.431	Rear Face	1:1	0.00737	1.26*	0.01	

*Drift considered in scaling factor

Repeated Measurements for the highest measured SAR results

Band	Channel	Modulation / BW [MHz]	RB size	RB Offset	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR _{1g} [mW/g]	Scaling Factor	Reported SAR _{1g} [mW/g]	Plot #
LTE 7	21350	QPSK / 20	1	0	23.5	23.11	0.222	Rear Face	1	1.14	1.09	1.25	41

7.3 SAR Results for Hotspot Mode Configuration, 10 mm separation distance

Band	Channel	TX Slot configuration	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	GPRS Duty Cycle	Measured SAR _{1g} [mW/g]	Scaling Factor	Reported SAR _{1g} [mW/g]	Plot #
GPRS 850	189	4	28.5	28.05	-0.11	Rear Face	1:2.2	0.378	1.11	0.42	
GPRS 1900	810	4	25.5	25.37	-0.01	Rear Face	1:2.2	0.27	1.03	0.28	

Band	Channel	Mode	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR _{1g} [mW/g]	Scaling Factor	Reported SAR _{1g} [mW/g]	Plot #
II	9538	RMC 12.2K	24.5	24.26	-0.02	Rear Face	1:1	0.636	1.06	0.67	
IV	1312	RMC 12.2K	24.5	24.38	0.08	Rear Face	1:1	0.599	1.03	0.62	
V	4182	RMC 12.2K	24.5	24.23	0.01	Rear Face	1:1	0.35	1.06	0.37	

Band	Channel	Modulation / BW [MHz]	RB size	RB Offset	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR _{1g} [mW/g]	Scaling Factor	Reported SAR _{1g} [mW/g]	Plot #
LTE 2	18700	QPSK / 20	1	0	24	23.66	-0.07	Rear Face	1	0.409	1.08	0.44	
LTE 4	20175	QPSK / 20	1	0	24	23.01	-0.04	Rear Face	1	0.351	1.26	0.44	
LTE 5	20525	QPSK / 10	1	0	23.5	22.76	-0.03	Rear Face	1	0.248	1.19	0.29	
LTE 7	21350	QPSK / 20	1	0	23.5	23.11	0.08	Rear Face	1	1.16	1.09	1.27	
LTE 14	23330	QPSK / 10	1	0	24.5	24.06	-0.04	Rear Face	1	0.28	1.11	0.31	
LTE 14	23330	QPSK / 10	25	0	24.5	23.09	0.00	Rear Face	1	0.212	1.38	0.29	
LTE 14	23330	QPSK / 10	1	0	24.5	24.06	-0.01	Front Face	1	0.188	1.11	0.21	
LTE 14	23330	QPSK / 10	25	0	24.5	23.09	0.017	Front Face	1	0.14	1.38	0.19	
LTE 14	23330	QPSK / 10	1	0	24.5	24.06	-0.02	Right Side	1	0.214	1.11	0.24	42
LTE 14	23330	QPSK / 10	25	25	24.5	23.09	0.05	Right Side	1	0.16	1.38	0.22	
LTE 14	23330	QPSK / 10	1	0	24.5	24.06	0.02	Bottom Side	1	0.113	1.11	0.13	43
LTE 14	23330	QPSK / 10	25	25	24.5	23.09	0.04	Bottom Side	1	0.0877	1.38	0.12	

Band	Channel	Mode	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR _{1g} [mW/g]	Scaling Factor	Reported SAR _{1g} [mW/g]	Plot #
802.11b	6	-	20	19.51	0.118	Right Side	1:1	0.139	1.12	0.16	44

7.4 SAR Results for simultaneous transmission

Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneous transmitting antenna. When the sum of SAR_{1g} of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit (SAR_{1g} 1.6 W/kg), the simultaneous transmission SAR is not required. When the sum of SAR_{1g} is greater than the SAR limit (SAR_{1g} 1.6 W/kg), SAR test exclusion is determined by the SPLSR.

Since only the maximum SAR test results of report no. SA150623C04 are re-tested in this report all the possible combinations of simultaneous transmission SAR values are not evaluated. For full simultaneous transmission analysis see report no. SA150623C04.

	Exposure Condition	Head				Body		Hotspot					
		Right Cheek	Right Tilt	Left Cheek	Left Tilt	Front Face	Rear Face	Front Face	Rear Face	Left Side	Right Side	Top Side	Bottom Side
PCE(LB)	GSM850	0.22	-	-	-	-	0.42	-	0.42	-	-	-	-
	WCDMA V	0.21	-	-	-	-	0.37	-	0.37	-	-	-	-
	LTE 5	0.18	-	-	-	-	0.29	-	0.33	-	-	-	-
	LTE 14	0.14	0.12	0.14	0.09	0.23	0.31	0.23	0.31	-	0.24	-	0.13
Maximun SAR		0.22	-	-	-	-	0.42	-	0.42	-	-	-	-
PCE(HB)	GSM1900	-	-	0.34	-	-	0.28	-	0.28	-	-	-	-
	WCDMA II	-	-	0.78	-	-	0.67	-	0.67	-	-	-	-
	WCDMA IV	-	-	0.49	-	-	0.62	-	0.62	-	-	-	-
	LTE 2	-	-	0.59	-	-	0.44	-	0.44	-	-	-	-
	LTE 4	-	-	0.46	-	-	0.44	-	0.44	-	-	-	-
Maximun SAR		-	-	0.78	-	-	0.67	-	0.67	-	-	-	-
DTS	WLAN 2.4GHz	0.11	-	-	-	-	0.13	-	0.13	-	0.16	-	-
SAR Summation		-	-	-	-	-	1.22	-	1.22	-	-	-	-
SPLSR Analysis		Σ SAR < 1.6, Analysis Not Required											

	Exposure Condition	Head				Body		Hotspot					
		Right Cheek	Right Tilt	Left Cheek	Left Tilt	Front Face	Rear Face	Front Face	Rear Face	Left Side	Right Side	Top Side	Bottom Side
PCE(LB)	GSM850	0.22	-	-	-	-	0.42	-	0.42	-	-	-	-
	WCDMA V	0.21	-	-	-	-	0.37	-	0.37	-	-	-	-
	LTE 5	0.18	-	-	-	-	0.29	-	0.33	-	-	-	-
	LTE 14	0.14	0.12	0.14	0.09	0.23	0.31	0.23	0.31	-	0.24	-	0.13
Maximun SAR		0.22					0.42		0.42				
PCE(HB)	GSM1900	-	-	0.34	-	-	0.28	-	0.28	-	-	-	-
	WCDMA II	-	-	0.78	-	-	0.67	-	0.67	-	-	-	-
	WCDMA IV	-	-	0.49	-	-	0.62	-	0.62	-	-	-	-
	LTE 2	-	-	0.59	-	-	0.44	-	0.44	-	-	-	-
	LTE 4	-	-	0.46	-	-	0.44	-	0.44	-	-	-	-
Maximun SAR		-	-	0.78	-	-	0.67	-	0.67	-	-	-	-
NIII	WLAN 5GHz	0.24	-	-	-	-	0.22	n/a	n/a	n/a	n/a	n/a	n/a
SAR Summation		-	-	-	-	-	1.31	-	-	-	-	-	-
SPLSR Analysis		Σ SAR < 1.6, Analysis Not Required											

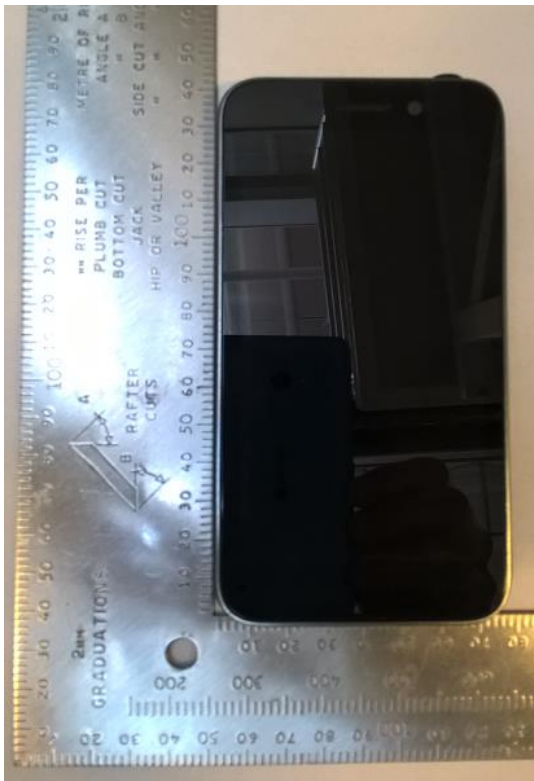
	Exposure Condition	Head				Body		Hotspot					
	Test Position	Right Cheek	Right Tilt	Left Cheek	Left Tilt	Front Face	Rear Face	Front Face	Rear Face	Left Side	Right Side	Top Side	Bottom Side
PCE	LTE 7	-	-	0.75	-	-	1.27	-	1.27	-	-	-	-
DTS	WLAN 2.4GHz	0.11	-	-	-	-	0.13	-	0.13	-	0.16	-	-
SAR Summation		-	-	-	-	-	1.40	-	1.40	-	-	-	-
SPLSR Analysis		Σ SAR < 1.6, Analysis Not Required											

	Exposure Condition	Head				Body		Hotspot					
	Test Position	Right Cheek	Right Tilt	Left Cheek	Left Tilt	Front Face	Rear Face	Front Face	Rear Face	Left Side	Right Side	Top Side	Bottom Side
PCE	LTE 7	-	-	0.75	-	-	1.27	-	1.27	-	-	-	-
NIII	WLAN 5GHz	0.24	-	-	-	-	0.22	n/a	n/a	n/a	n/a	n/a	n/a
SAR Summation		-	-	-	-	-	1.49	-	-	-	-	-	-
SPLSR Analysis		Σ SAR < 1.6, Analysis Not Required											

APPENDIX A: PHOTOS OF THE DUT

Dimension of the DUT are 75.5x141x13.5mm

Front of the DUT:



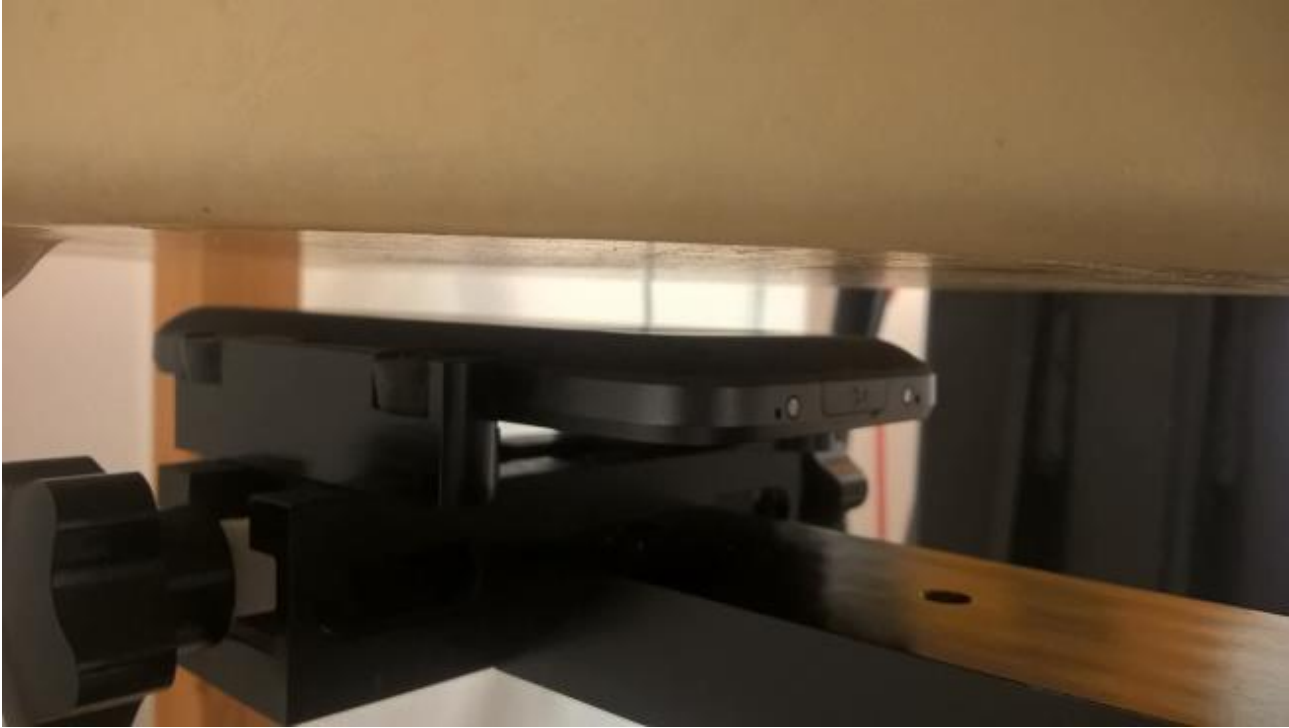
Back of the DUT:



Head Exposure Condition:



Body-Worn 10 mm Condition, Back:



Hot Spot 10 mm Condition, Right Side:



APPENDIX B: SYSTEM CHECK SCANS

Plot 1 Date/Time: 25.05.2016 18:47:40

Test Laboratory: Verkotan Oy

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:448
Program Name: System Performance Check at 835 MHz

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 835 \text{ MHz}$; $\sigma = 0.933 \text{ mho/m}$; $\epsilon_r = 40.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(8.08, 8.08, 8.08); Calibrated: 15.01.2016
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn371; Calibrated: 22.04.2016
- Phantom: SAM_3; Type: SAM Twin; Serial: TP-1289
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=15mm, Pin=250mW/Area Scan (61x111x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 2.66 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

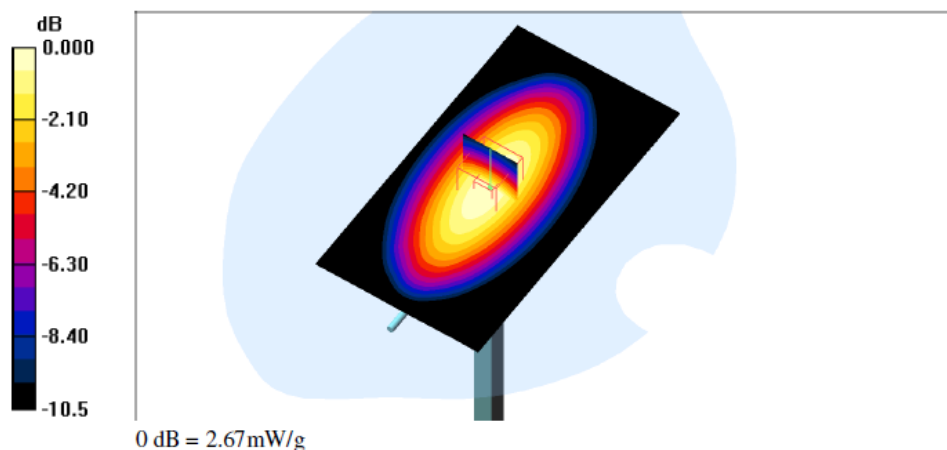
Reference Value = 53.9 V/m; Power Drift = -0.019 dB

Peak SAR (extrapolated) = 3.68 W/kg

SAR(1 g) = 2.47 mW/g; SAR(10 g) = 1.61 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 2.67 mW/g



Plot 2 Date/Time: 25.05.2016 13:11:32

Test Laboratory: Verkotan Oy

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:448
Program Name: System Performance Check at 835 MHz

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 835 \text{ MHz}$; $\sigma = 1.01 \text{ mho/m}$; $\epsilon_r = 53.9$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(8.17, 8.17, 8.17); Calibrated: 15.01.2016
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn371; Calibrated: 22.04.2016
- Phantom: SAM_2; Type: SAM Twin; Serial: TP-1142
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=15mm, Pin=250mW/Area Scan (61x111x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 2.71 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

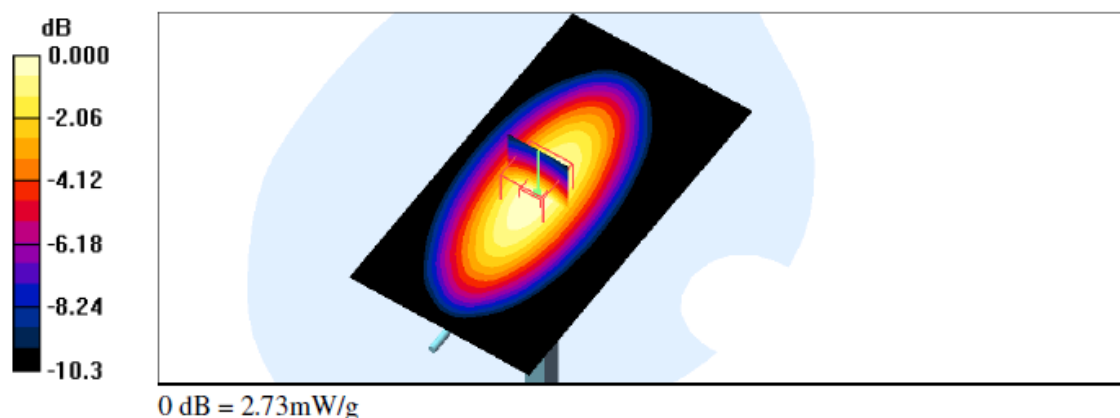
Reference Value = 52.1 V/m; Power Drift = 0.034 dB

Peak SAR (extrapolated) = 3.73 W/kg

SAR(1 g) = 2.52 mW/g; SAR(10 g) = 1.65 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 2.73 mW/g



Plot 3 Date/Time: 25.05.2016 23:58:41

Test Laboratory: Verkotan Oy

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:249
Program Name: System Performance Check at 1800 MHz

Communication System: CW; Frequency: 1800 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1800 \text{ MHz}$; $\sigma = 1.41 \text{ mho/m}$; $\epsilon_r = 39.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(7.19, 7.19, 7.19); Calibrated: 15.01.2016
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn371; Calibrated: 22.04.2016
- Phantom: SAM_1; Type: SAM Twin; Serial: TP-1128
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=15mm, Pin=250mW/Area Scan (71x71x1): Measurement grid: dx=10mm, dy=10mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 11.0 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

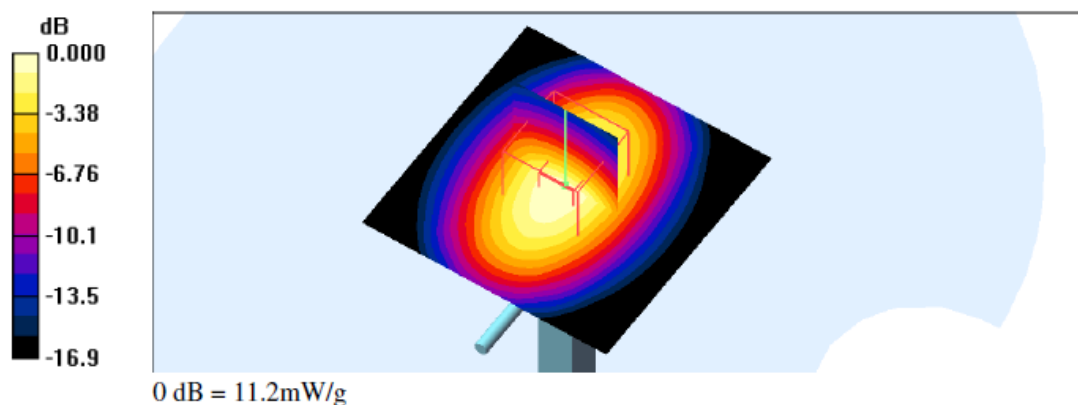
Reference Value = 87.2 V/m; Power Drift = 0.089 dB

Peak SAR (extrapolated) = 18.4 W/kg

SAR(1 g) = 9.86 mW/g; SAR(10 g) = 5.14 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 11.2 mW/g



Plot 4 Date/Time: 24.05.2016 02:50:32

Test Laboratory: Verkotan Oy

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:249
Program Name: System Performance Check at 1900 MHz

Communication System: CW; Frequency: 1800 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1800 \text{ MHz}$; $\sigma = 1.56 \text{ mho/m}$; $\epsilon_r = 51.7$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(6.96, 6.96, 6.96); Calibrated: 15.01.2016
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn371; Calibrated: 22.04.2016
- Phantom: SAM_2; Type: SAM Twin; Serial: TP-1142
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=15mm, Pin=250mW/Area Scan (71x71x1): Measurement grid: dx=10mm, dy=10mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 11.2 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

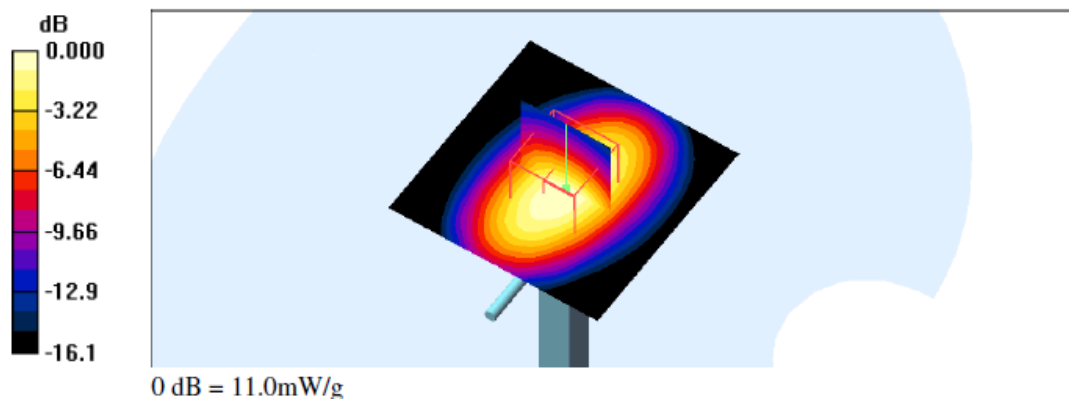
Reference Value = 81.3 V/m; Power Drift = 0.019 dB

Peak SAR (extrapolated) = 17.6 W/kg

SAR(1 g) = 9.79 mW/g; SAR(10 g) = 5.18 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 11.0 mW/g



Plot 5 Date/Time: 26.05.2016 01:48:00

Test Laboratory: Verkotan Oy

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:511
Program Name: System Performance Check at 1900 MHz

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1900$ MHz; $\sigma = 1.38$ mho/m; $\epsilon_r = 39.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(6.99, 6.99, 6.99); Calibrated: 15.01.2016
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn371; Calibrated: 22.04.2016
- Phantom: SAM_2; Type: SAM Twin; Serial: TP-1142
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=15mm, Pin=250mW/Area Scan (71x71x1): Measurement grid: dx=10mm, dy=10mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 11.0 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

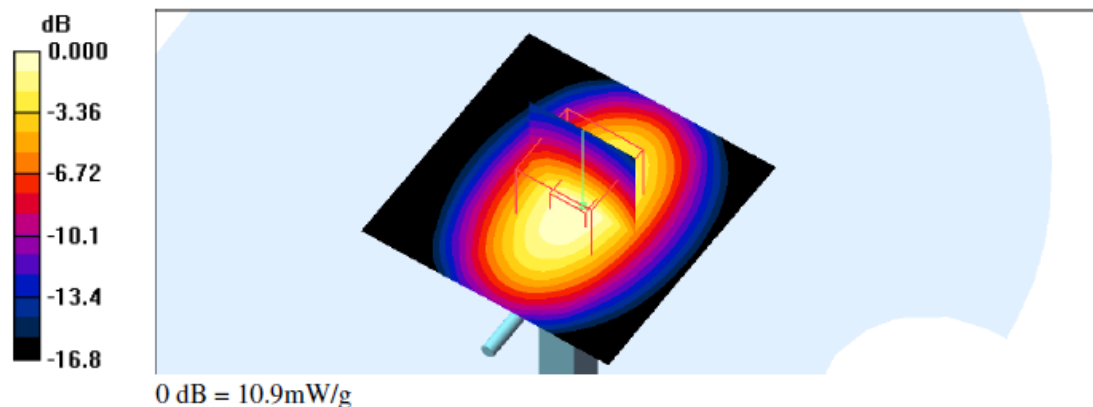
Reference Value = 85.9 V/m; Power Drift = -0.079 dB

Peak SAR (extrapolated) = 17.9 W/kg

SAR(1 g) = 9.68 mW/g; SAR(10 g) = 5.07 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 10.9 mW/g



Plot 6 Date/Time: 24.05.2016 02:32:54

Test Laboratory: Verkotan Oy

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:511
Program Name: System Performance Check at 1900 MHz

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1900 \text{ MHz}$; $\sigma = 1.56 \text{ mho/m}$; $\epsilon_r = 52.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(6.77, 6.77, 6.77); Calibrated: 15.01.2016
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn371; Calibrated: 22.04.2016
- Phantom: SAM_2; Type: SAM Twin; Serial: TP-1142
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 86.1 V/m; Power Drift = 0.036 dB

Peak SAR (extrapolated) = 18.5 W/kg

SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.24 mW/g

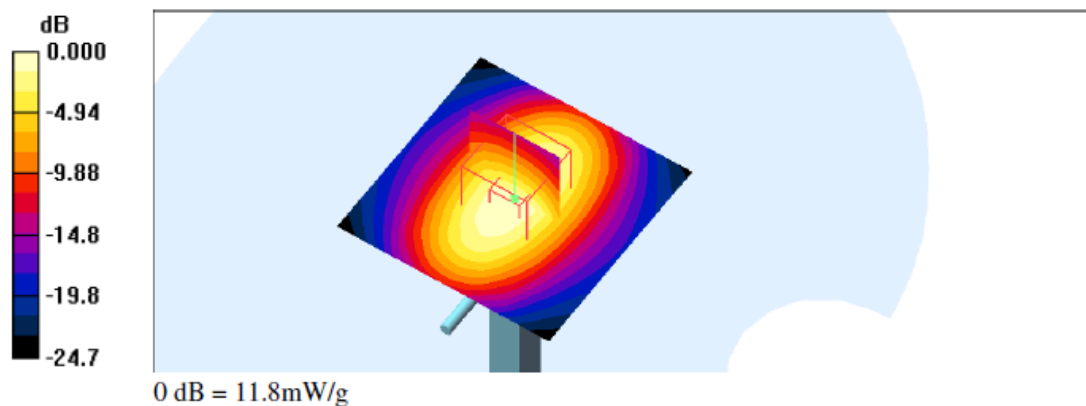
[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 11.4 mW/g

d=15mm, Pin=250mW/Area Scan (71x71x1): Measurement grid: dx=10mm, dy=10mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 11.8 mW/g



Plot 7 Date/Time: 24.05.2016 16:19:03

Test Laboratory: Verkotan Oy

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:758
Program Name: System Performance Check at 2450 MHz

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 2450 \text{ MHz}$; $\sigma = 1.77 \text{ mho/m}$; $\epsilon_r = 40$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(6.38, 6.38, 6.38); Calibrated: 15.01.2016
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn371; Calibrated: 22.04.2016
- Phantom: SAM_3; Type: SAM Twin; Serial: TP-1289
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=15mm, Pin=250mW/Area Scan (71x71x1): Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (interpolated) = 15.3 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

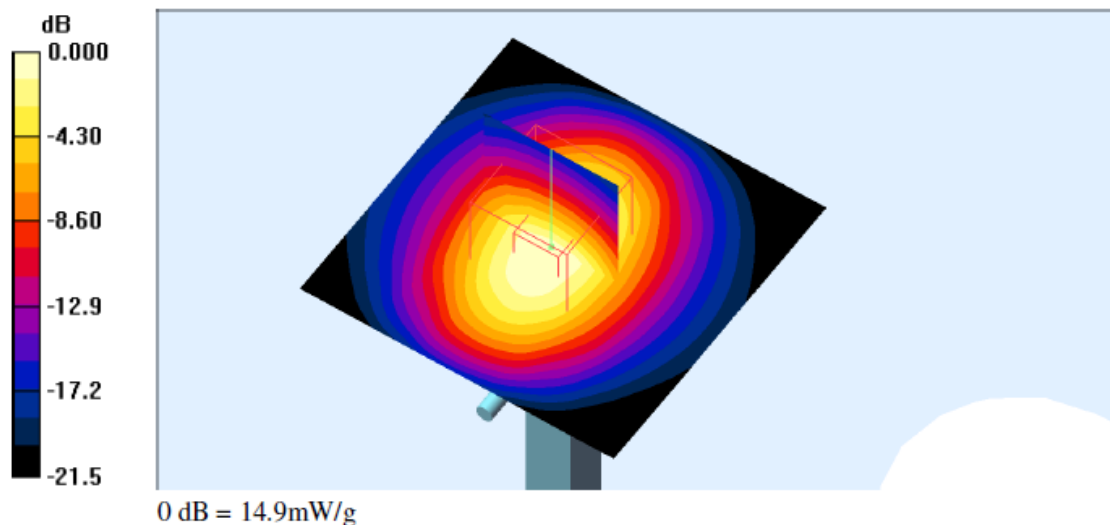
Reference Value = 90.1 V/m; Power Drift = 0.078 dB

Peak SAR (extrapolated) = 27.1 W/kg

SAR(1 g) = 13.1 mW/g; SAR(10 g) = 6.1 mW/g

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 14.9 mW/g



Plot 8 Date/Time: 24.05.2016 20:43:54

Test Laboratory: Verkotan Oy

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:758
Program Name: System Performance Check at 2450 MHz

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 2450$ MHz; $\sigma = 1.9$ mho/m; $\epsilon_r = 50.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(6.5, 6.5, 6.5); Calibrated: 15.01.2016
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn371; Calibrated: 22.04.2016
- Phantom: SAM_1; Type: SAM Twin; Serial: TP-1128
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=15mm, Pin=250mW/Area Scan (71x71x1): Measurement grid: dx=10mm, dy=10mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 15.2 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

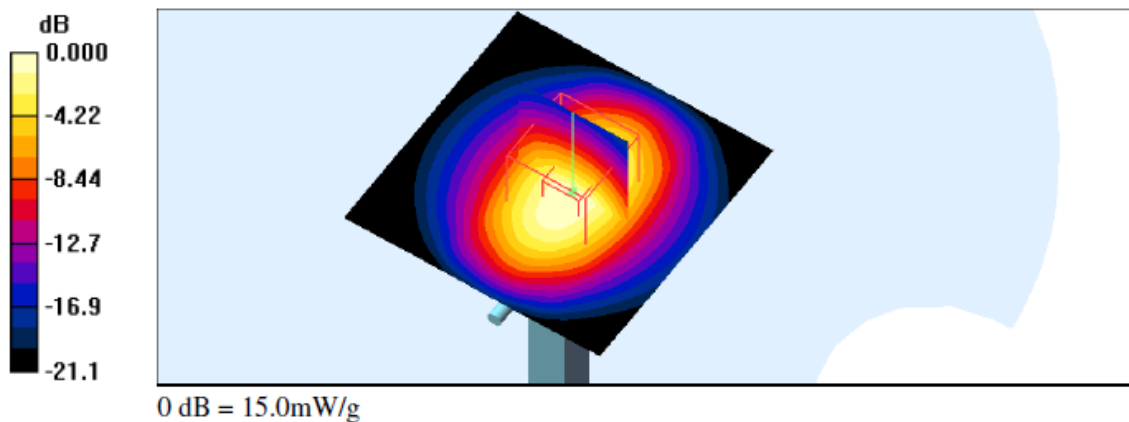
Reference Value = 83.1 V/m; Power Drift = -0.027 dB

Peak SAR (extrapolated) = 26.3 W/kg

SAR(1 g) = 12.9 mW/g; SAR(10 g) = 6 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 15.0 mW/g



Plot 9 Date/Time: 31.05.2016 13:24:52

Test Laboratory: Verkotan Oy

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:758
Program Name: System Performance Check at 2450 MHz

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 2450$ MHz; $\sigma = 1.91$ mho/m; $\epsilon_r = 50.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(6.5, 6.5, 6.5); Calibrated: 15.01.2016
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn371; Calibrated: 22.04.2016
- Phantom: SAM_1; Type: SAM Twin; Serial: TP-1128
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=250mW/Area Scan (81x81x1): Measurement grid: dx=12mm, dy=12mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (interpolated) = 14.8 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

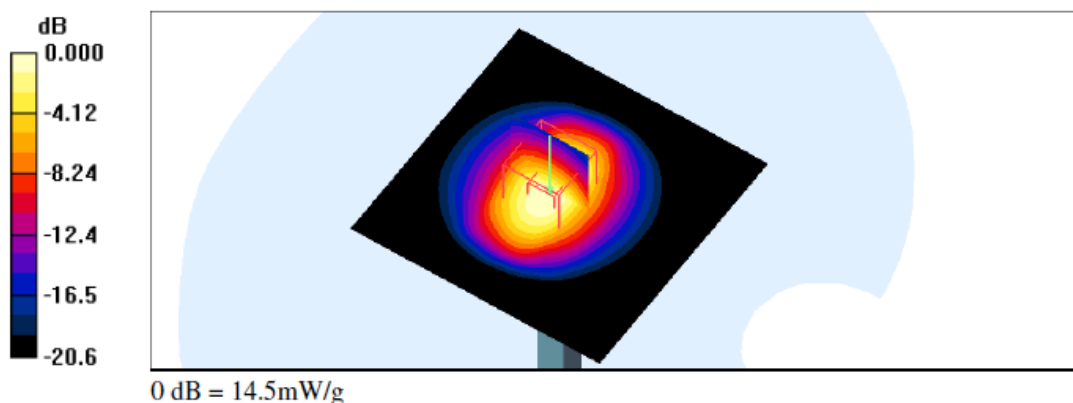
Reference Value = 83.0 V/m; Power Drift = 0.009 dB

Peak SAR (extrapolated) = 24.9 W/kg

SAR(1 g) = 12.5 mW/g; SAR(10 g) = 5.86 mW/g

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 14.5 mW/g



Plot 10 Date/Time: 25.05.2016 10:50:26

Test Laboratory: Verkotan Oy

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1118
Program Name: System Performance Check at 2600 MHz

Communication System: CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 2600$ MHz; $\sigma = 2.24$ mho/m; $\epsilon_r = 50.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(6.26, 6.26, 6.26); Calibrated: 15.01.2016
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn371; Calibrated: 22.04.2016
- Phantom: SAM_1; Type: SAM Twin; Serial: TP-1128
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=250mW/Area Scan (81x81x1): Measurement grid: dx=12mm, dy=12mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 16.3 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

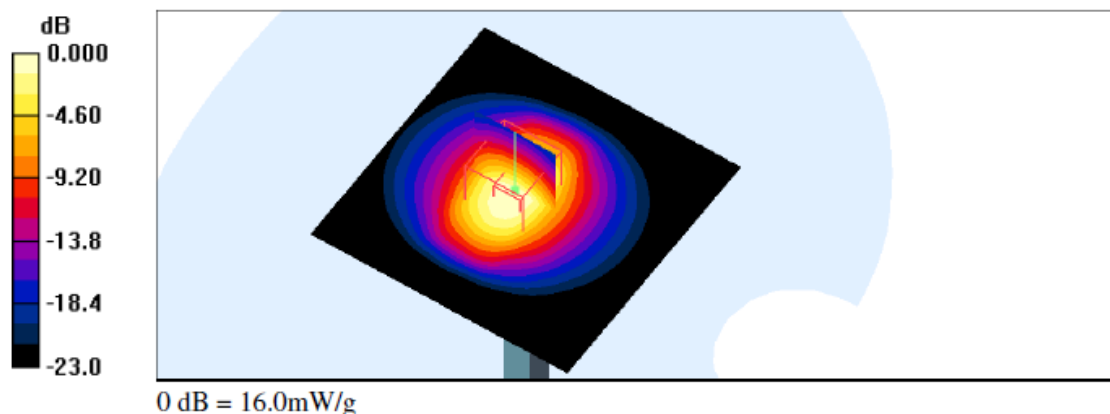
Reference Value = 77.8 V/m; Power Drift = 0.021 dB

Peak SAR (extrapolated) = 28.8 W/kg

SAR(1 g) = 13.8 mW/g; SAR(10 g) = 6.15 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 16.0 mW/g



Plot 11 Date/Time: 26.05.2016 10:13:43

Test Laboratory: Verkotan Oy

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN:1014
Program Name: System Performance Check at 5200-5800 MHz (Graded Grid)

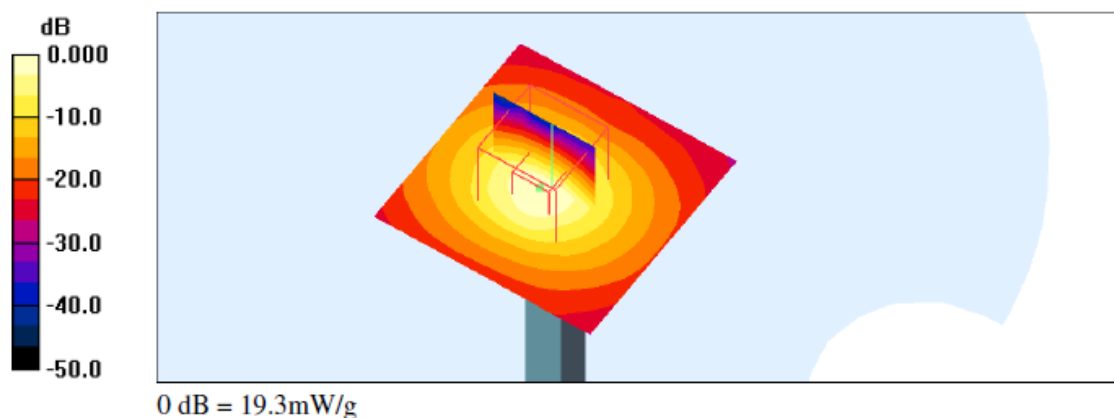
Communication System: CW; Frequency: 5250 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5250 \text{ MHz}$; $\sigma = 4.8 \text{ mho/m}$; $\epsilon_r = 36.2$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(4.3, 4.3, 4.3); Calibrated: 15.01.2016
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn371; Calibrated: 22.04.2016
- Phantom: SAM_3; Type: SAM Twin; Serial: TP-1289
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=100mW, f=5250 MHz/Area Scan (61x61x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 20.6 mW/g

d=10mm, Pin=100mW, f=5250 MHz/Zoom Scan (4x4x1.4mm, graded) (8x8x7)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 66.8 V/m; Power Drift = 0.177 dB
Peak SAR (extrapolated) = 34.3 W/kg
SAR(1 g) = 8.05 mW/g; SAR(10 g) = 2.24 mW/g
Maximum value of SAR (measured) = 19.3 mW/g



Plot 12 Date/Time: 26.05.2016 10:35:56

Test Laboratory: Verkotan Oy

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN:1014

Program Name: System Performance Check at 5200-5800 MHz (Graded Grid)

Communication System: CW; Frequency: 5600 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5600$ MHz; $\sigma = 5.17$ mho/m; $\epsilon_r = 35.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(3.7, 3.7, 3.7); Calibrated: 15.01.2016
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn371; Calibrated: 22.04.2016
- Phantom: SAM_3; Type: SAM Twin; Serial: TP-1289
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=100mW, f=5600 MHz/Area Scan (61x61x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 23.7 mW/g

d=10mm, Pin=100mW, f=5600 MHz/Zoom Scan (4x4x1.4mm, graded) (8x8x7)/Cube 0:

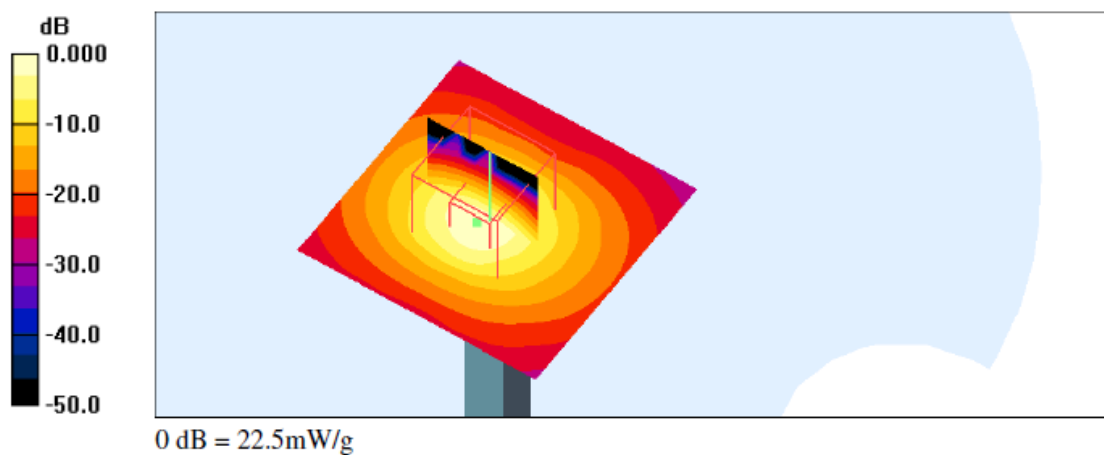
Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 71.4 V/m; Power Drift = -0.025 dB

Peak SAR (extrapolated) = 39.2 W/kg

SAR(1 g) = 8.75 mW/g; SAR(10 g) = 2.4 mW/g

Maximum value of SAR (measured) = 22.5 mW/g



Plot 13 Date/Time: 26.05.2016 11:04:10

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: D2450V2 - SN:1014
Program Name: System Performance Check at 5200-5800 MHz (Graded Grid)

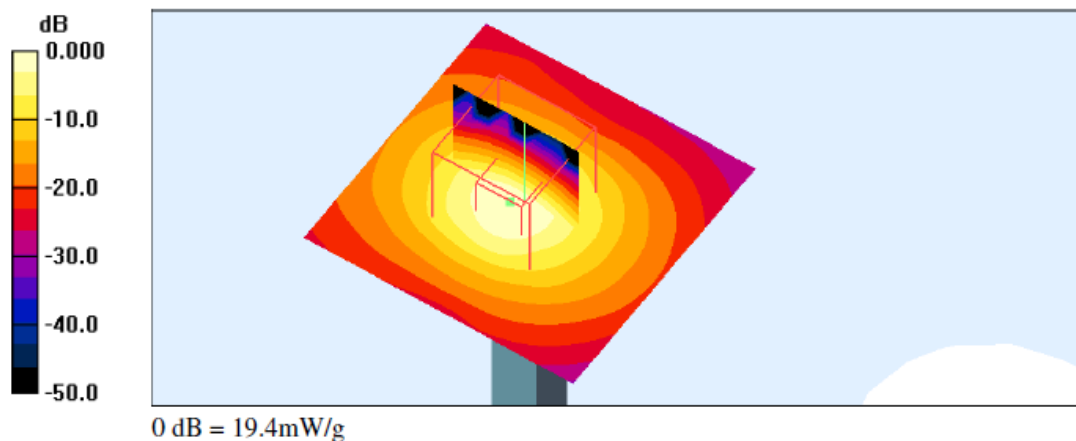
Communication System: CW; Frequency: 5750 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5750$ MHz; $\sigma = 5.33$ mho/m; $\epsilon_r = 35.5$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(4, 4, 4); Calibrated: 15.01.2016
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn371; Calibrated: 22.04.2016
- Phantom: SAM_3; Type: SAM Twin; Serial: TP-1289
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=100mW, f=5750 MHz/Area Scan (61x61x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 20.8 mW/g

d=10mm, Pin=100mW, f=5750 MHz/Zoom Scan (4x4x1.4mm, graded) (8x8x7)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 66.7 V/m; Power Drift = -0.030 dB
Peak SAR (extrapolated) = 36.1 W/kg
SAR(1 g) = 7.76 mW/g; SAR(10 g) = 2.13 mW/g
Maximum value of SAR (measured) = 19.4 mW/g



Plot 14

Date/Time: 27.05.2016 08:30:48

Test Laboratory: Verkotan Oy

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN:1014

Program Name: System Performance Check at 5200-5800 MHz (Graded Grid)

Communication System: CW; Frequency: 5250 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5250$ MHz; $\sigma = 5.17$ mho/m; $\epsilon_r = 48.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(3.78, 3.78, 3.78); Calibrated: 15.01.2016
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn371; Calibrated: 22.04.2016
- Phantom: SAM_2; Type: SAM Twin; Serial: TP-1142
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=100mW, f=5250 MHz/Area Scan (61x61x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 20.1 mW/g

d=10mm, Pin=100mW, f=5250 MHz/Zoom Scan (4x4x1.4mm, graded) (8x8x7)/Cube 0:

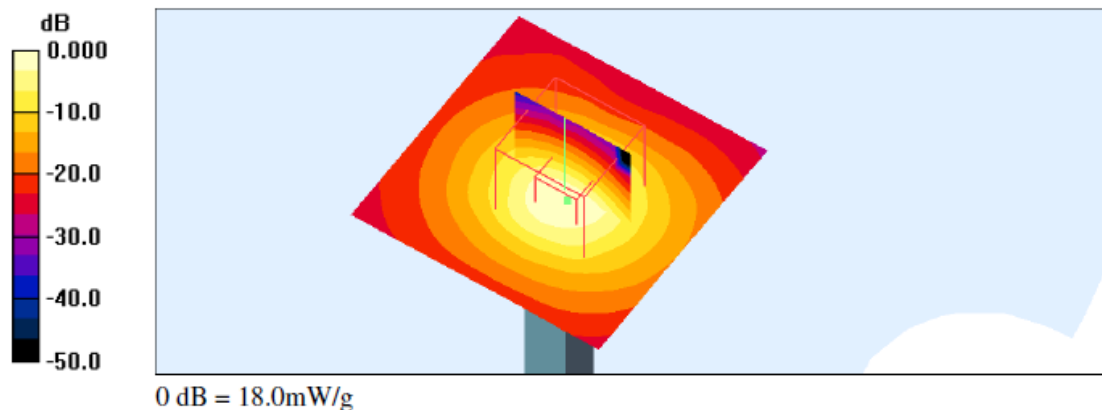
Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 62.1 V/m; Power Drift = -0.091 dB

Peak SAR (extrapolated) = 28.7 W/kg

SAR(1 g) = 7.87 mW/g; SAR(10 g) = 2.25 mW/g

Maximum value of SAR (measured) = 18.0 mW/g



Plot 15 Date/Time: 27.05.2016 08:53:04

Test Laboratory: Verkotan Oy

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN:1014
Program Name: System Performance Check at 5200-5800 MHz (Graded Grid)

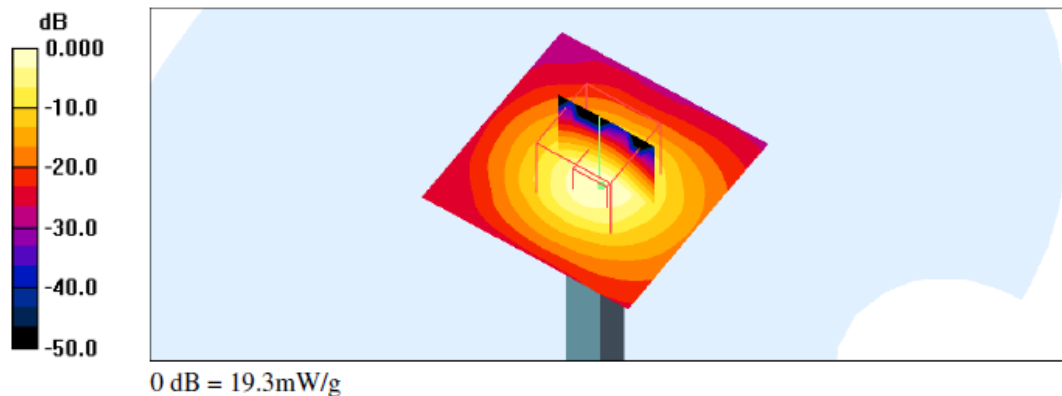
Communication System: CW; Frequency: 5600 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5600$ MHz; $\sigma = 5.69$ mho/m; $\epsilon_r = 47.3$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(3.25, 3.25, 3.25); Calibrated: 15.01.2016
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn371; Calibrated: 22.04.2016
- Phantom: SAM_2; Type: SAM Twin; Serial: TP-1142
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=100mW, f=5600 MHz/Area Scan (61x61x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 21.6 mW/g

d=10mm, Pin=100mW, f=5600 MHz/Zoom Scan (4x4x1.4mm, graded) (8x8x7)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 61.3 V/m; Power Drift = -0.191 dB
Peak SAR (extrapolated) = 32.4 W/kg
SAR(1 g) = 8.03 mW/g; SAR(10 g) = 2.27 mW/g
Maximum value of SAR (measured) = 19.3 mW/g



Plot 16 Date/Time: 27.05.2016 09:15:01

Test Laboratory: Verkotan Oy

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN:1014

Program Name: System Performance Check at 5200-5800 MHz (Graded Grid)

Communication System: CW; Frequency: 5750 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5750$ MHz; $\sigma = 5.92$ mho/m; $\epsilon_r = 46.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(3.48, 3.48, 3.48); Calibrated: 15.01.2016
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn371; Calibrated: 22.04.2016
- Phantom: SAM_2; Type: SAM Twin; Serial: TP-1142
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=100mW, f=5750 MHz/Area Scan (61x61x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 18.0 mW/g

d=10mm, Pin=100mW, f=5750 MHz/Zoom Scan (4x4x1.4mm, graded) (8x8x7)/Cube 0:

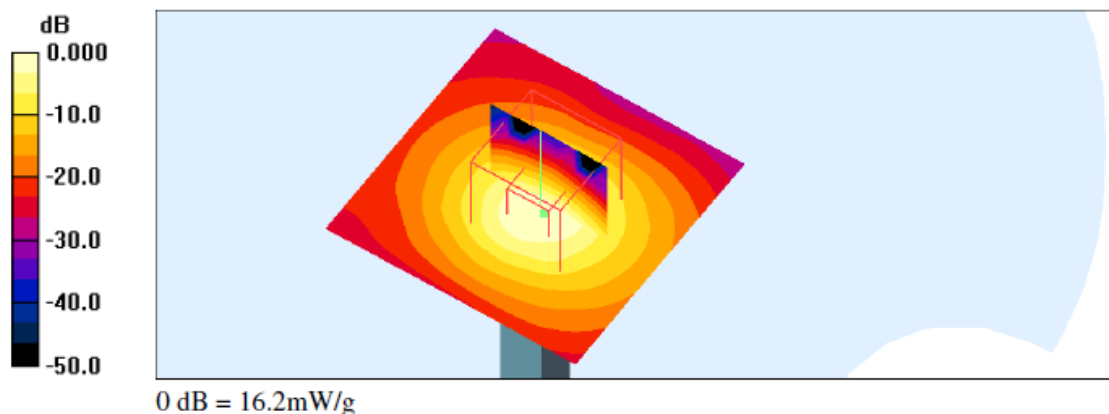
Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 56.4 V/m; Power Drift = -0.231 dB

Peak SAR (extrapolated) = 27.2 W/kg

SAR(1 g) = 6.77 mW/g; SAR(10 g) = 1.92 mW/g

Maximum value of SAR (measured) = 16.2 mW/g



APPENDIX C: MEASUREMENT SCAN

Plot 17

Date/Time: 25.05.2016 22:59:19

Test Laboratory: Verkotan Oy

DUT: Tough Mobile; Type: Smartphone; Serial: 356244060009320

Program Name: Compliance Testing: P1528 Protocol, Right-Hand Side

Communication System: 4 slots 850; Frequency: 836.4 MHz; Duty Cycle: 1:2.2

Medium parameters used (interpolated): $f = 836.4$ MHz; $\sigma = 0.933$ mho/m; $\epsilon_r = 40.6$; $\rho = 1000$ kg/m³

Phantom section: Right Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(8.08, 8.08, 8.08); Calibrated: 15.01.2016

- Sensor-Surface: 4mm (Mechanical Surface Detection)

- Electronics: DAE3 Sn371; Calibrated: 22.04.2016

- Phantom: SAM_3; Type: SAM Twin; Serial: TP-1289

- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Touch position - Middle/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.209 mW/g

Touch position - Middle/Zoom Scan (7x7x7) (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

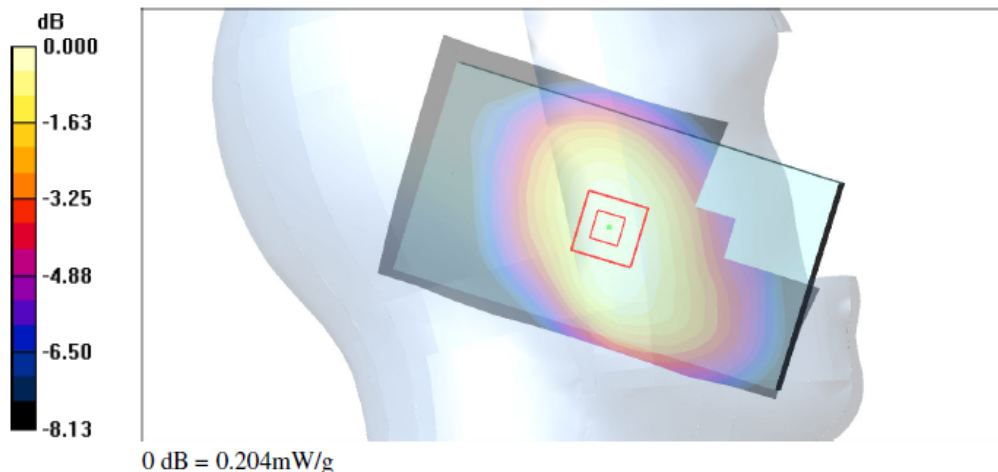
Reference Value = 5.76 V/m; Power Drift = 0.011 dB

Peak SAR (extrapolated) = 0.249 W/kg

SAR(1 g) = 0.195 mW/g; SAR(10 g) = 0.148 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.204 mW/g



Plot 18 Date/Time: 26.05.2016 03:33:46

Test Laboratory: Verkotan Oy

DUT: Tough Mobile; Type: Smartphone; Serial: 356244060009320
Program Name: Tough Mobile Head Exposure

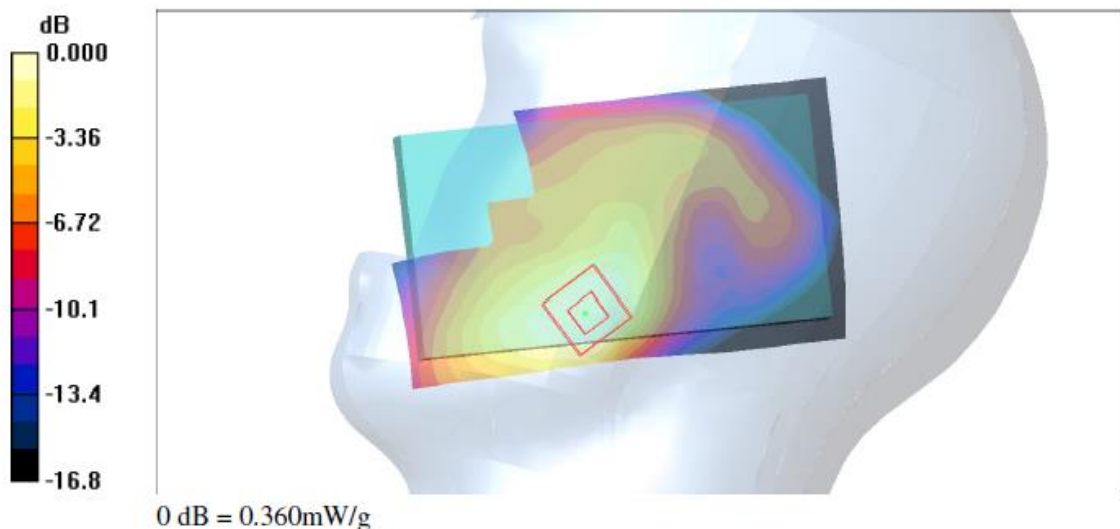
Communication System: 4slots 1900; Frequency: 1909.8 MHz; Duty Cycle: 1:2.2
Medium parameters used: $f = 1909.87$ MHz; $\sigma = 1.37$ mho/m; $\epsilon_r = 39.5$; $\rho = 1000$ kg/m³
Phantom section: Left Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(6.99, 6.99, 6.99); Calibrated: 15.01.2016
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn371; Calibrated: 22.04.2016
- Phantom: SAM_2; Type: SAM Twin; Serial: TP-1142
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Left Cheek/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.373 mW/g

Left Cheek/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 7.01 V/m; Power Drift = 0.202 dB
Peak SAR (extrapolated) = 0.505 W/kg
SAR(1 g) = 0.334 mW/g; SAR(10 g) = 0.211 mW/g
Maximum value of SAR (measured) = 0.360 mW/g



Plot 19 Date/Time: 26.05.2016 02:37:50

Test Laboratory: Verkotan Oy

DUT: Tough Mobile; Type: Smartphone; Serial: 356244060009320
Program Name: Tough Mobile Head Exposure

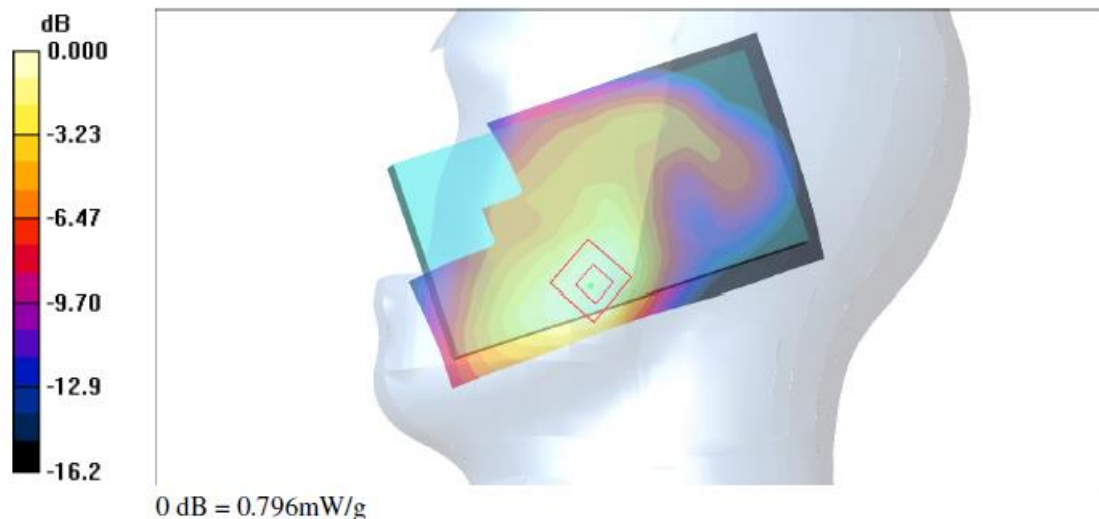
Communication System: WCDMA 1900; Frequency: 1907.6 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1907.68 \text{ MHz}$; $\sigma = 1.38 \text{ mho/m}$; $\epsilon_r = 39.5$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Left Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(6.99, 6.99, 6.99); Calibrated: 15.01.2016
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn371; Calibrated: 22.04.2016
- Phantom: SAM_2; Type: SAM Twin; Serial: TP-1142
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Left Cheek/Area Scan (61x101x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 0.818 mW/g

Left Cheek/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=7.5\text{mm}$, $dy=7.5\text{mm}$, $dz=5\text{mm}$
Reference Value = 10.7 V/m; Power Drift = -0.059 dB
Peak SAR (extrapolated) = 1.11 W/kg
 $\text{SAR}(1 \text{ g}) = 0.739 \text{ mW/g}$; $\text{SAR}(10 \text{ g}) = 0.468 \text{ mW/g}$
Maximum value of SAR (measured) = 0.796 mW/g



Plot 20 Date/Time: 26.05.2016 01:06:17

Test Laboratory: Verkotan Oy

DUT: Tough Mobile; Type: Smartphone; Serial: 356244060009320
Program Name: Tough Mobile Head Exposure

Communication System: WCDMA 1700; Frequency: 1712.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1712.4 \text{ MHz}$; $\sigma = 1.33 \text{ mho/m}$; $\epsilon_r = 39.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(7.19, 7.19, 7.19); Calibrated: 15.01.2016
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn371; Calibrated: 22.04.2016
- Phantom: SAM_1; Type: SAM Twin; Serial: TP-1128
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Left Cheek/Area Scan (61x101x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.529 mW/g

Left Cheek/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=7.5\text{mm}$, $dy=7.5\text{mm}$, $dz=5\text{mm}$

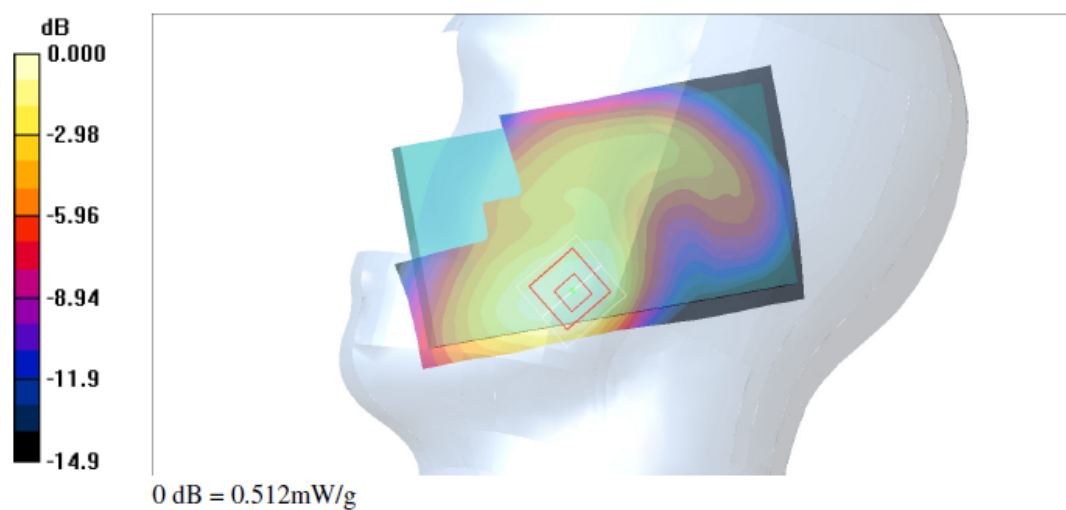
Reference Value = 9.94 V/m; Power Drift = -0.014 dB

Peak SAR (extrapolated) = 0.713 W/kg

SAR(1 g) = 0.473 mW/g; SAR(10 g) = 0.307 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.512 mW/g



Plot 21

Date/Time: 25.05.2016 23:25:00

DUT: Tough Mobile; Type: Smartphone; Serial: 356244060009320
Program Name: Compliance Testing: P1528 Protocol, Right-Hand Side

Communication System: WCDMA 850; Frequency: 836.4 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 836.4$ MHz; $\sigma = 0.933$ mho/m; $\epsilon_r = 40.6$; $\rho = 1000$ kg/m³
Phantom section: Right Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(8.08, 8.08, 8.08); Calibrated: 15.01.2016
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn371; Calibrated: 22.04.2016
- Phantom: SAM_3; Type: SAM Twin; Serial: TP-1289
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Touch position, right hand - Middle/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm

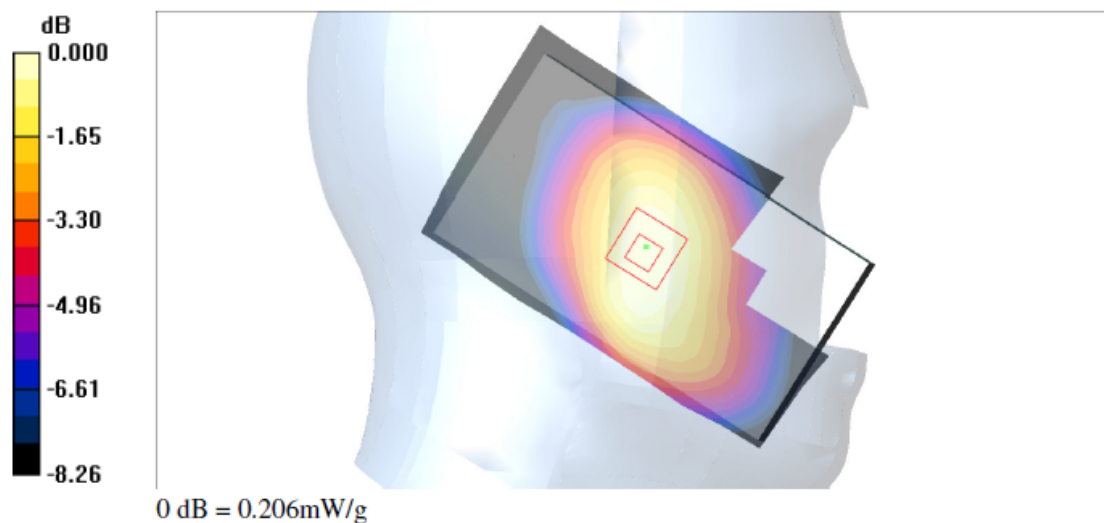
[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.208 mW/g

Touch position, right hand - Middle/Zoom Scan (7x7x7) (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 5.65 V/m; Power Drift = 0.190 dB
Peak SAR (extrapolated) = 0.248 W/kg
SAR(1 g) = 0.196 mW/g; SAR(10 g) = 0.148 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.206 mW/g



Plot 22 Date/Time: 26.05.2016 02:57:42

Test Laboratory: Verkotan Oy

DUT: Tough Mobile; Type: Smartphone; Serial: 356244060009320
Program Name: Tough Mobile Head Exposure

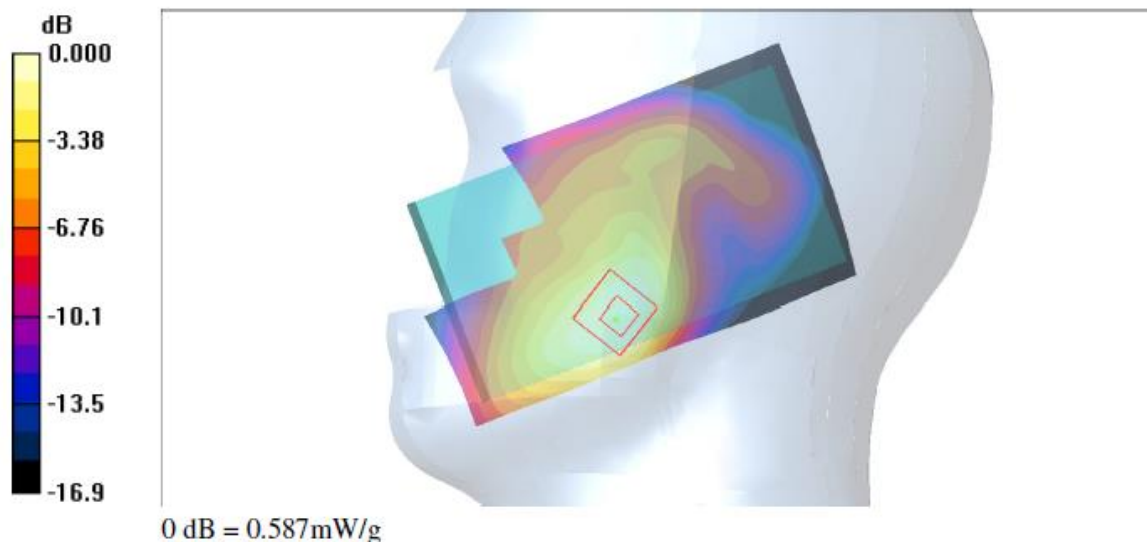
Communication System: LTE 2; Frequency: 1860 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1860.02$ MHz; $\sigma = 1.35$ mho/m; $\epsilon_r = 39.4$; $\rho = 1000$ kg/m³
Phantom section: Left Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(6.99, 6.99, 6.99); Calibrated: 15.01.2016
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn371; Calibrated: 22.04.2016
- Phantom: SAM_2; Type: SAM Twin; Serial: TP-1142
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Left Cheek/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.601 mW/g

Left Cheek/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 8.39 V/m; Power Drift = -0.110 dB
Peak SAR (extrapolated) = 0.815 W/kg
SAR(1 g) = 0.543 mW/g; SAR(10 g) = 0.346 mW/g
Maximum value of SAR (measured) = 0.587 mW/g



Plot 23

Date/Time: 26.05.2016 00:35:54

Test Laboratory: Verkotan Oy

DUT: Tough Mobile; Type: Smartphone; Serial: 356244060009320

Program Name: Tough Mobile Head Exposure

Communication System: LTE 4; Frequency: 1732.5 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1732.5$ MHz; $\sigma = 1.35$ mho/m; $\epsilon_r = 39.5$; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(7.19, 7.19, 7.19); Calibrated: 15.01.2016
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn371; Calibrated: 22.04.2016
- Phantom: SAM_1; Type: SAM Twin; Serial: TP-1128
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Left Cheek/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.406 mW/g

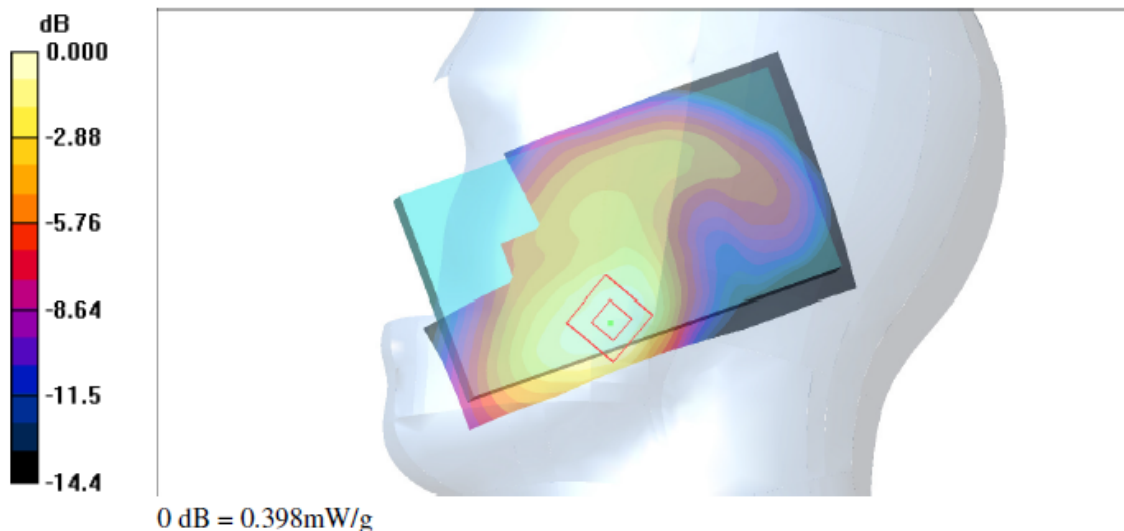
Left Cheek/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 8.55 V/m; Power Drift = -0.082 dB

Peak SAR (extrapolated) = 0.554 W/kg

SAR(1 g) = 0.369 mW/g; SAR(10 g) = 0.237 mW/g

Maximum value of SAR (measured) = 0.398 mW/g



Plot 24

Date/Time: 30.05.2016 00:59:58

Test Laboratory: Verkotan Oy

DUT: Tough Mobile; Type: Smartphone; Serial: 356244060009320
Program Name: Compliance Testing: P1528 Protocol, Right-Hand Side

Communication System: LTE 5; Frequency: 836.5 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 836.593$ MHz; $\sigma = 0.943$ mho/m; $\epsilon_r = 42.4$; $\rho = 1000$ kg/m³

Phantom section: Right Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(8.08, 8.08, 8.08); Calibrated: 15.01.2016
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn371; Calibrated: 22.04.2016
- Phantom: SAM_2; Type: SAM Twin; Serial: TP-1142
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Touch position, right hand - Middle/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.158 mW/g

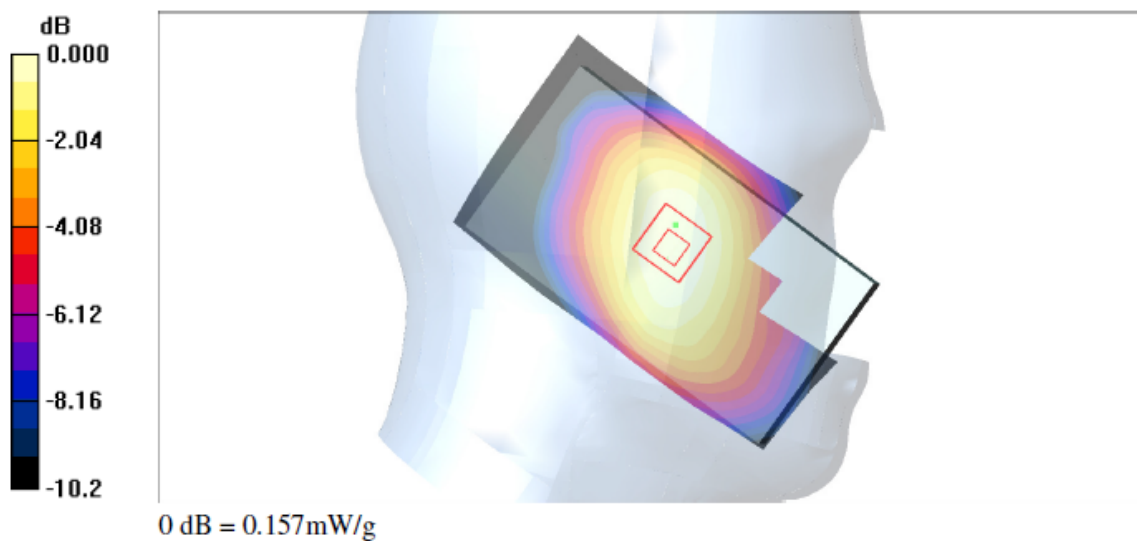
Touch position, right hand - Middle/Zoom Scan (7x7x7) (6x6x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 4.60 V/m; Power Drift = 0.173 dB

Peak SAR (extrapolated) = 0.181 W/kg

SAR(1 g) = 0.150 mW/g; SAR(10 g) = 0.118 mW/g

Maximum value of SAR (measured) = 0.157 mW/g



Plot 25 Date/Time: 24.05.2016 19:38:45

Test Laboratory: Verkotan Oy

DUT: Tough Mobile; Type: Smartphone; Serial: 356244060009320
Program Name: Tough Mobile Head Exposure

Communication System: LTE 7; Frequency: 2535 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2535.01$ MHz; $\sigma = 1.89$ mho/m; $\epsilon_r = 39.6$; $\rho = 1000$ kg/m³

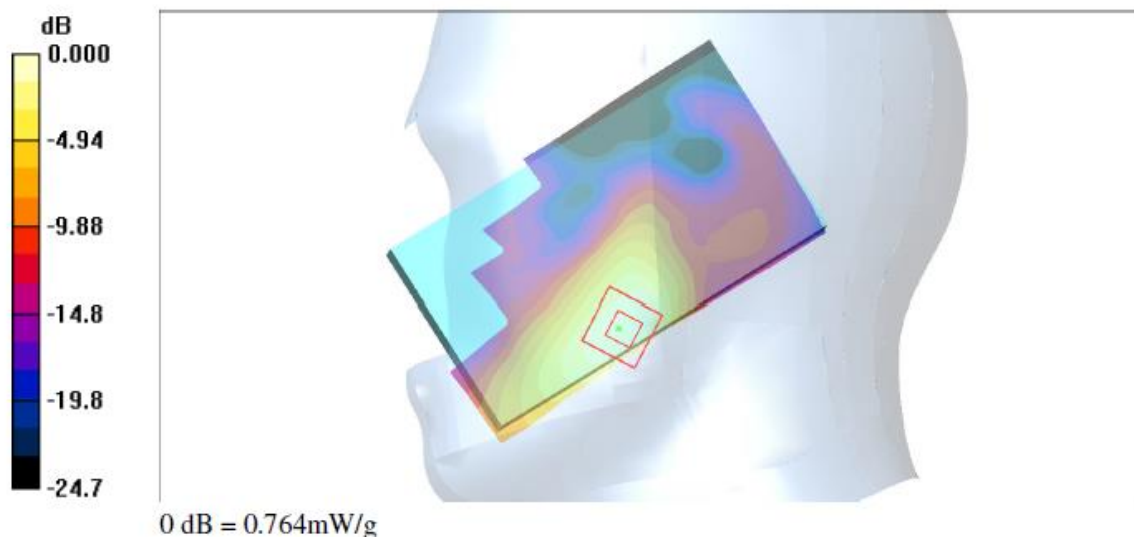
Phantom section: Left Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(6.19, 6.19, 6.19); Calibrated: 15.01.2016
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn371; Calibrated: 22.04.2016
- Phantom: SAM_3; Type: SAM Twin; Serial: TP-1289
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Left Cheek/Area Scan (71x121x1): Measurement grid: $dx=12$ mm, $dy=12$ mm
Maximum value of SAR (interpolated) = 0.768 mW/g

Left Cheek/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm
Reference Value = 4.49 V/m; Power Drift = 0.328 dB
Peak SAR (extrapolated) = 1.28 W/kg
SAR(1 g) = 0.688 mW/g; SAR(10 g) = 0.357 mW/g
Maximum value of SAR (measured) = 0.764 mW/g



Plot 26

Date/Time: 25.05.2016 21:45:20

Test Laboratory: Verkotan Oy

DUT: Tough Mobile; Type: Smartphone; Serial: 356244060009320
Program Name: Compliance Testing: P1528 Protocol, Right-Hand Side

Communication System: LTE 14; Frequency: 793 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 793 \text{ MHz}$; $\sigma = 0.902 \text{ mho/m}$; $\epsilon_r = 40.9$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(8.68, 8.68, 8.68); Calibrated: 15.01.2016
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn371; Calibrated: 22.04.2016
- Phantom: SAM_3; Type: SAM Twin; Serial: TP-1289
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Touch position, right hand - Middle 1 0/Area Scan (61x101x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (interpolated) = 0.145 mW/g

Touch position, right hand - Middle 1 0/Zoom Scan (7x7x7) (5x5x7)/Cube 0: Measurement grid: $dx=7.5\text{mm}$, $dy=7.5\text{mm}$, $dz=5\text{mm}$

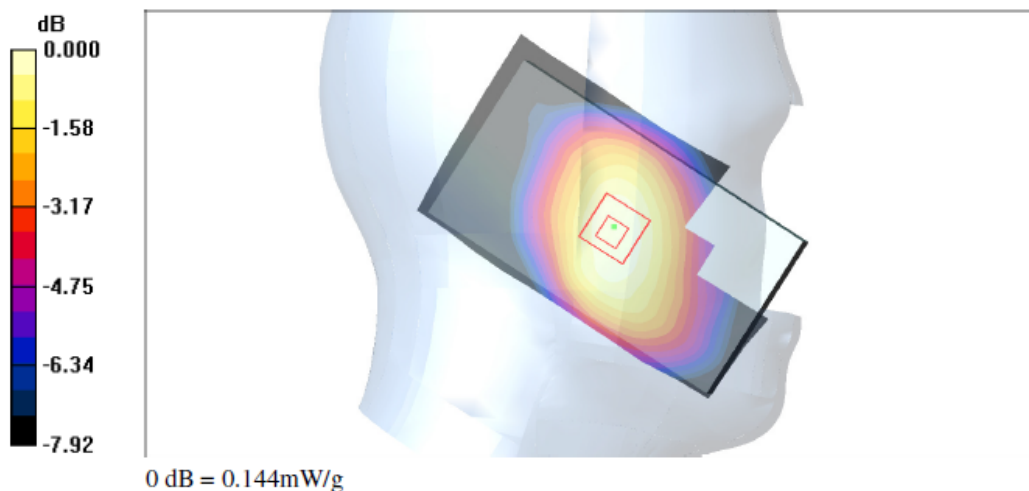
Reference Value = 4.60 V/m; Power Drift = 0.065 dB

Peak SAR (extrapolated) = 0.174 W/kg

SAR(1 g) = 0.138 mW/g; SAR(10 g) = 0.106 mW/g

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.144 mW/g



Plot 27

Date/Time: 25.05.2016 08:37:03

Test Laboratory: Verkotan Oy

DUT: Tough Mobile; Type: Smartphone; Serial: 356244060009320
Program Name: Head Exposure Condition

Communication System: WLAN; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.75$ mho/m; $\epsilon_r = 40$; $\rho = 1000$ kg/m³

Phantom section: Right Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(6.38, 6.38, 6.38); Calibrated: 15.01.2016
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn371; Calibrated: 22.04.2016
- Phantom: SAM_3; Type: SAM Twin; Serial: TP-1289
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Right Cheek Area Scan (71x121x1): Measurement grid: dx=12mm, dy=12mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.104 mW/g

Right Cheek Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

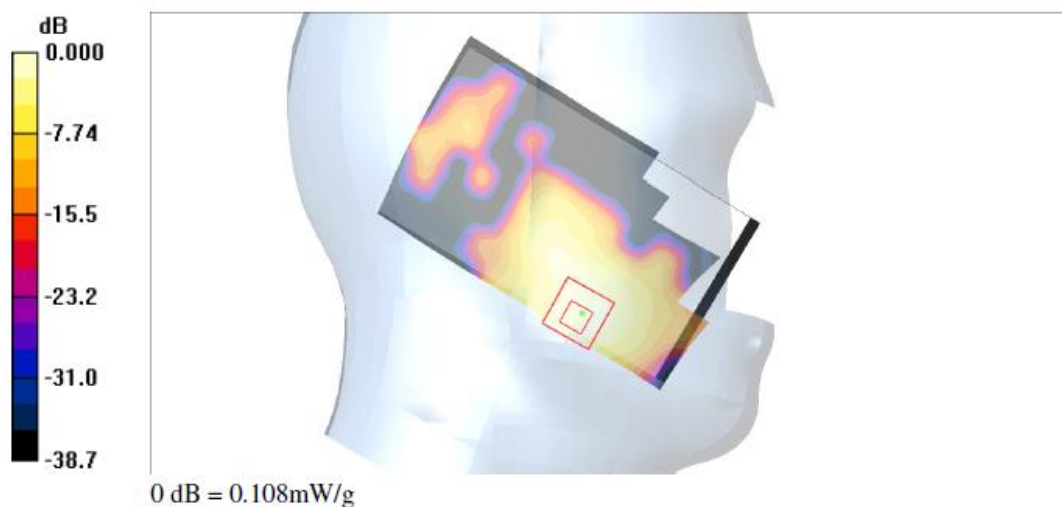
Reference Value = 2.31 V/m; Power Drift = 0.201 dB

Peak SAR (extrapolated) = 0.205 W/kg

SAR(1 g) = 0.098 mW/g; SAR(10 g) = 0.048 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.108 mW/g



Plot 28

Date/Time: 26.05.2016 12:40:34

Test Laboratory: Verkotan Oy

DUT: Tough Mobile; Type: Smartphone; Serial: 356244060009320
Program Name: Head Exposure Condition

Communication System: WLAN 5GHz; Frequency: 5610 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5610 \text{ MHz}$; $\sigma = 5.18 \text{ mho/m}$; $\epsilon_r = 35.7$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Right Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3570; ConvF(3.7, 3.7, 3.7); Calibrated: 15.01.2016
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn371; Calibrated: 22.04.2016
- Phantom: SAM_3; Type: SAM Twin; Serial: TP-1289
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Touch position 2/Area Scan (91x151x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$
Maximum value of SAR (interpolated) = 0.819 mW/g

Touch position 2/Zoom Scan (4x4x1.4mm, graded) (8x8x7)/Cube 0: Measurement grid:
 $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$
Reference Value = 0.000 V/m; Power Drift = 0.000 dB
Peak SAR (extrapolated) = 0.919 W/kg
 $\text{SAR}(1 \text{ g}) = 0.220 \text{ mW/g}$; $\text{SAR}(10 \text{ g}) = 0.057 \text{ mW/g}$
Maximum value of SAR (measured) = 0.589 mW/g

