SAR TEST REPORT

The following samples were submitted and identified on behalf of the client as:

Equipment Under Test of Host	Notebook Computer
Marketing Name of Host	Aspire M3, Aspire M3 series, Aspire M3-581T, Aspire M3-581TG
Brand Name of Host	Acer
Model No. of Host	MA50
Equipment Under Test of Module	PCIE 802.11a/b/g/n 2.4GHz/5GHz + USB BT 4.0 card
Model No. of Module	AR5B22
Company Name	Qualcomm Atheros Inc
Company Address	1700 Technology Drive, San Jose, CA 95110
Standards	FCC OET 65 supplement C, IEEE /ANSI C95.1 , C95.3, IEEE 1528
FCC ID	PPD-AR5B22
Date of Receipt	Sep. 19, 2012
Date of Test(s)	Sep. 19, 2012 ~ Sep. 25, 2012
Date of Issue	Nov. 15, 2012

In the configuration tested, the EUT complied with the standards specified above.

Remarks:

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS Taiwan Electronic & Communication Laboratory or testing done by SGS Taiwan Electronic & Communication Laboratory in connection with distribution or use of the product described in this report must be approved by SGS Taiwan Electronic & Communication Laboratory in writing.

Signed for on the behalf of SGS

Engineer	**Supervisor**
Chris Tsung	Kelly Tsai
Chris Tsung	**Kelly Tsai**
Date : Nov. 15, 2012	**Date :** Nov. 15, 2012

Version

Report Number	Revision	Date	Memo
EN/2012/A0001	00	2012/10/19	Initial creation of test report.
EN/2012/A0001	01	2012/10/23	1st modification
EN/2012/A0001	02	2012/10/31	2nd modification
EN/2012/A0001	03	2012/11/06	3rd modification
EN/2012/A0001	04	2012/11/15	4th modification

This test report contains a reference to the previous version test report that it replaces.

Contents

1. General Information

1.1 Testing Laboratory

SGS Taiwan Ltd. Electronics & Communication Laboratory	
134, Wu Kung Road, Wuku industrial zone	
Taipei county, Taiwan, R.O.C.	
Telephone	+886-2-2299-3279
Fax	+886-2-2298-0488
Internet	http://www.tw.sgs.com/

1.2 Details of Applicant

Company Name	Qualcomm Atheros Inc
Company Address	1700 Technology Drive, San Jose, CA 95110
Contact Person	Stanley Lin
Telephone	886-2-87516385 # 1633
E-mail	slin@qca.qualcomm.com

1.3 Description of EUT

EUT Name of Host	Notebook Computer	
Marketing Name of Host	Aspire M3, Aspire M3 series, Aspire M3-581T, Aspire M3-581TG	
Brand Name of Host	Acer	
Model No. of Host	MA50	
EUT Name of Module	PCIE 802.11a/b/g/n 2.4GHz/5GHz + USB BT 4.0 card	
Model No. of Module	AR5B22	
FCC ID	PPD-AR5B22	
Mode of Operation	☒WLAN802.11 a/b/g/n (☒20M ☒40M) band	
Duty Cycle	WLAN802.11 a/b/g/n(20M/40M)	1

TX Frequency Range (MHz)	WLAN802.11 b/g/n(20M)		2412	—	2462
	WLAN802.11 n (40M)		2422	—	2452
	WLAN802.11 a 5.2G		5180	—	5320
	WLAN802.11 n (20M) 5.2G		5180	—	5320
	WLAN802.11 n (40M) 5.2G		5190	—	5310
	WLAN802.11 a 5.5G		5500	—	5700
	WLAN802.11 n (20M) 5.5G		5500	—	5700
	WLAN802.11 n (40M) 5.5G		5510	—	5670
	WLAN802.11 a 5.8G		5745	—	5825
	WLAN802.11 n (20M) 5.8G		5745	—	5825
	WLAN802.11 n (40M) 5.8G		5755	—	5795
Channel Number (ARFCN) Max. SAR Measured(1 g) (Unit: W/Kg)	WLAN802.11 b/g/n(20M)		1	—	11
	WLAN802.11 n (40M)		3	—	9
	WLAN802.11 a 5.2G		36	—	64
	WLAN802.11 n (20M) 5.2G		36	—	64
	WLAN802.11 n (40M) 5.2G		38	—	62
	WLAN802.11 a 5.5G		100	—	140
	WLAN802.11 n (20M) 5.5G		100	—	140
	WLAN802.11 n (40M) 5.5G		102	—	134
	WLAN802.11 a 5.8G		149	—	165
	WLAN802.11 n (20M) 5.8G		149	—	165
	WLAN802.11 n (40M) 5.8G		151	—	159
	MIMO antenna	WLAN 802.11 b	1.13	☒Laptop 1 Channel	

#. WLAN802.11 a/b/g/n (20M/40M) conducted power table (MIMO antenna: combined power of port 0 & 1)

(When the maximum transmitter and antenna output power are ≦ 60/f(GHz) (mW) SAR evaluation is typically not required for FCC or TCB approval)

802.11b		Average Power Output(dBm)				
CH	Frequency (MHz)	Data Rate				
		1		2	5.5	11
		ch1	cho+ch1	cho+ch1	cho+ch1	cho+ch1
1	2412	16.4	19.27	19.06	18.97	18.92
6	2437	16.9	19.8	19.81	19.81	19.8
11	2462	16.5	19.52	19.62	19.72	19.66

802.11g		Average Power Output (dBm)								
CH	Frequency (MHz)	Data Rate								
		6		9	12	18	24	36	48	54
		ch1	cho+ch1							
1	2412	12.63	15.65	—	—	—	—	—	—	—
6	2437	16.66	19.63	—	—	—	—	—	—	—
11	2462	12.51	15.36	—	—	—	—	—	—	—

802.11n(20M)		Average Power Output (dBm)							
CH	Frequency (MHz)	Data Rate							
		6.5	13	19.5	26	39	52	58.5	65
		cho+ch1							
1	2412	15.84	—	—	—	—	—	—	—
6	2437	19.58	—	—	—	—	—	—	—
11	2462	16.35	—	—	—	—	—	—	—

802.11n(40M)		Average Power Output (dBm)							
CH	Frequency (MHz)	Data Rate							
		13.5 cho+ch1	27	40.5	54	81	108	121.5	135
3	2422	12.29	—	—	—	—	—	—	—
6	2437	16.85	—	—	—	—	—	—	—
9	2452	13.87	—	—	—	—	—	—	—

802.11a 5.2G/5.5G/5.8G		Average Power Output(dBm)								
CH	Frequency (MHz)	Data Rate								
		6		9	12	18	24	36	48	54
		ch1	ch0+ch1	ch0+ch1	ch0+ch1	ch0+ch1	ch0+ch1	ch0+ch1	ch0+ch1	ch0+ch1
36	5180	11.42	14.37	14.35	14.2	14.21	14.21	14.17	14.11	14.3
40	5200	11.46	14.39	—	—	—	—	—	—	—
44	5220	11.12	14.1	—	—	—	—	—	—	—
48	5240	11.49	14.39	14.36	14.34	14.3	14.34	14.31	14.24	14.25
52	5260	16.37	19.43	19.4	19.39	19.41	19.37	19.4	19.37	19.39
56	5280	13.43	16.42	—	—	—	—	—	—	—
60	5300	13.2	16.24	—	—	—	—	—	—	—
64	5320	13.86	16.87	16.84	16.76	16.71	16.73	16.86	16.84	16.86
100	5500	12.74	15.66	—	—	—	—	—	—	—
104	5520	13.32	16.34	16.25	16.17	16.3	16.27	15.98	16.18	16.2
108	5540	13.4	16.41	—	—	—	—	—	—	—
112	5560	13.9	16.78	—	—	—	—	—	—	—
116	5580	14.58	17.49	17.22	17.43	17.18	17.1	17.04	16.92	16.97
132	5660	13.69	16.66	—	—	—	—	—	—	—
136	5680	13.44	16.48	16.37	16.44	16.42	16.41	16.32	16.29	16.15
140	5700	10.37	13.31	—	—	—	—	—	—	—
149	5745	12	15.03	14.88	14.86	15.02	15.02	14.88	14.87	14.86
153	5765	12.29	15.27	—	—	—	—	—	—	—
157	5785	12.23	15.24	15.23	15.2	15.18	15.21	15.13	15.09	15.04
161	5805	12.18	15.17	—	—	—	—	—	—	—
165	5825	12.16	15.22	15.13	15.07	15.03	15.09	15.11	15.13	15.12

802.11n(20M) 5.2G/5.5G/5.8G		Average Power Output (dBm)							
CH	Frequency (MHz)	Data Rate							
		6.5	13	19.5	26	39	52	58.5	65
		ch0+ch1	ch0+ch1	ch0+ch1	ch0+ch1	ch0+ch1	ch0+ch1	ch0+ch1	ch0+ch1
36	5180	14.2	14.15	14.08	14.14	14.14	14.11	13.93	14.07
48	5240	13.96	13.77	13.73	13.68	13.68	13.48	13.6	13.44
52	5260	17.69	17.67	17.67	17.55	17.55	17.48	17.45	17.34
64	5320	16.71	16.67	16.62	16.6	16.6	16.76	16.65	16.54
100	5500	15.27	15.12	15.12	15.13	15.13	14.85	14.91	14.8
116	5580	18.52	18.34	18.35	18.27	18.27	18.21	18.22	18.24
140	5700	15.27	15.23	15.17	15.17	15.17	14.8	14.84	14.87
149	5745	16.1	16.08	16	15.95	15.95	15.86	15.62	15.61
157	5805	16.42	16.39	16.38	16.37	16.37	16.29	16.26	16.05

802.11n(40M) 5.2G/5.5G/5.8G		Average Power Output (dBm)							
CH	Frequency (MHz)	Data Rate							
		13.5	27	40.5	54	81	108	121.5	135
		ch0+ch1	ch0+ch1	ch0+ch1	ch0+ch1	ch0+ch1	ch0+ch1	ch0+ch1	ch0+ch1
38	5190	12.46	12.34	12.25	12.18	12.08	11.76	11.77	11.72
46	5230	16.36	16.15	16.09	15.92	15.88	15.75	15.69	15.61
54	5270	17.93	17.73	17.61	17.62	17.53	17.43	17.53	17.25
62	5310	12.53	12.4	12.35	12.16	12.2	12.09	12.01	12.05
102	5510	11.63	11.52	11.45	11.37	11.23	11.15	10.98	10.92
118	5590	17.85	17.8	17.79	17.64	17.47	17.45	17.37	17.33
134	5670	15.04	14.87	14.79	14.78	14.61	14.48	14.33	14.37
151	5755	17.2	17.05	16.96	16.91	16.82	16.71	16.51	16.3
159	5795	17.17	17.09	17.04	16.97	16.82	16.7	16.62	16.58

1.4 Test Environment

Ambient Temperature: 22±2° C
Tissue Simulating Liquid: 22±2° C

1.5 Operation Description

Use chipset specific software to control the EUT, and makes it transmit in maximum power. Measurements are performed respectively on the lowest, middle and highest channels of the operating band(s).
The EUT is set to maximum power level during all tests, and at the beginning of each test the battery is fully charged.

We will test it with 1 configuration:

Configuration 1: Laptop mode. (WLAN antenna to body distance is 5.7mm)

According to KDB 248227 the 1-g SAR for the highest output channel is less than 0.8 W/kg, where the transmission band corresponding to all channels is ≤ 200 MHz, testing for the other channels is not required.

According to KDB 248227 the 1-g SAR for the highest output channel is less than 0.4 W/kg, where the transmission band corresponding to all channels is ≤ 200 MHz, testing for the other channels is not required.

Due to the maximum average output power of lowest data rate is higher than the other data rates, thus only lowest data rate to do SAR testing.

When the maximum transmitter and antenna output power are ≦ 60/f(GHz) (mW) SAR evaluation is typically not required for FCC or TCB approval

1.6 The SAR Measurement System

A block diagram of the SAR measurement System is given in Fig. a. This SAR Measurement System uses a Computer-controlled 3-D stepper motor system (SPEAG DASY 5 professional system). A Model EX3DV4 field probe is used to determine the internal electric fields. The SAR can be obtained from the equation SAR= σ ($|Ei|^2$)/ ρ where σ and ρ are the conductivity and mass density of the tissue-simulant.

The DASY5 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Staubli RX family) with controller, teach pendant and software. An arm extension is for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage intissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.

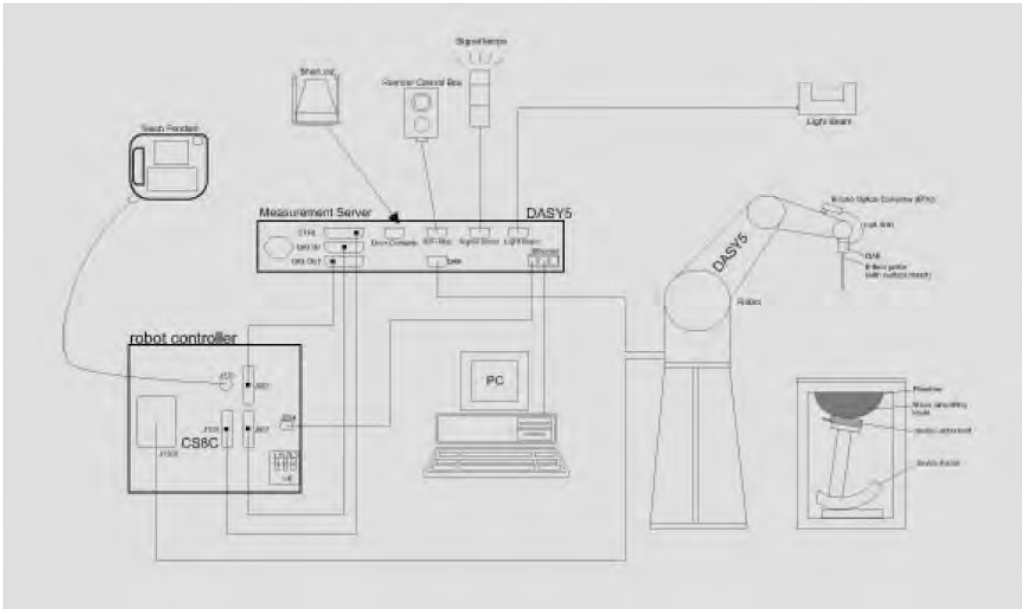


Fig. a The block diagram of SAR system

- The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 2000 or Windows XP.
- DASY5 software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing to validate the proper functioning of the system.

1.7 System Components

EX3DV4 E-Field Probe

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	Basic Broad Band Calibration in air Conversion Factors (CF) for HSL 2450/5200/5500/5800 MHz Additional CF for other liquids and frequencies upon request
Frequency	10 MHz to > 6 GHz, Linearity: ± 0.6 dB (30 MHz to 4 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: ± 0.6 dB (noise: typically < 1 µW/g)
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.

SAM PHANTOM V4.0C

Construction	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-200X, CENELEC 50361 and IEC 62209. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot.	
Shell Thickness	2 ± 0.2 mm	
Filling Volume	Approx. 25 liters	
Dimensions	Height: 810 mm; Length: 1000 mm; Width: 500 mm	

DEVICE HOLDER

Construction	The device holder (Supporter) for Notebook is made by POM (polyoxymethylene resin) , which is non-metal and non-conductive. The height can be adjusted to fit varies kind of notebooks.	 Device Holder

1.8 SAR System Verification

The microwave circuit arrangement for system verification is sketched in Fig. b. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within +/- 5% from the target SAR values. These tests were done at 2450/5200/5500/5800 MHz. The tests were conducted on the same days as the measurement of the DUT. The obtained results from the system accuracy verification are displayed in the table 1 (SAR values are normalized to 1W forward power delivered to the dipole). During the tests, the ambient temperature of the laboratory was 21.7°C, the relative humidity was 62% and the liquid depth above the ear reference points was above 15 cm in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.

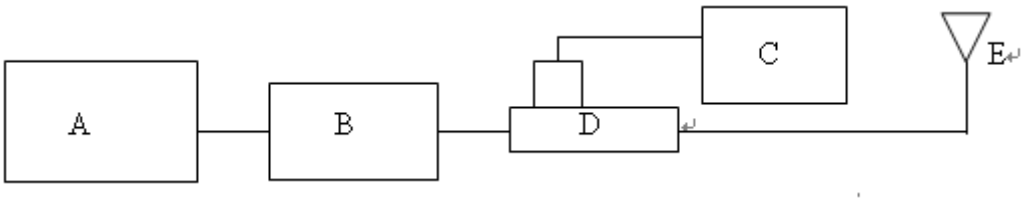


Fig. b The block diagram of system verification

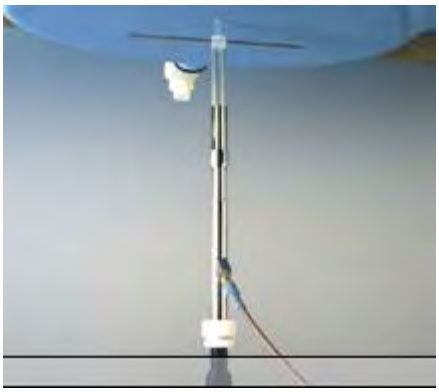
A. Generator

B. Amplifier

C. Power sensor

D. Dual directional coupling

E. Reference dipole antenna



Photograph of the dipole Antenna

Validation Kit	S/N	Frequency (MHz)	Target SAR (1g) (Pin=250mW) (mW/g)	Measured SAR (1g)(mW/g)	Measured Date
D2450V2	727	2450	12.7	12.5	Sep. 20, 2012
D5GHzV2	1104	5200	7.41	7.56	Sep. 19, 2012
D5GHzV2	1104	5200	7.41	7.55	Sep. 20, 2012
D5GHzV2	1104	5500	7.89	7.91	Sep. 21, 2012
D5GHzV2	1104	5500	7.89	7.85	Sep. 23, 2012
D5GHzV2	1104	5800	7.32	7.27	Sep. 25, 2012

Table 1. Results of system validation

1.9 Tissue Simulant Fluid for the Frequency Band

The dielectric properties for this body-simulant fluid were measured by using the Agilent Model 85070E Dielectric Probe (rates frequency band 200 MHz to 20 GHz) in conjunction with Network Analyzer.

All dielectric parameters of tissue simulates were measured within 24 hours of SAR measurements. The depth of the tissue simulant in the flat section of the phantom was 15cm±5mm during all tests. (Fig. 2)

Frequency (MHz)	Dielectric Parameters		Recommended Limits	Measured	Measurement date
2450	ε_r	Verification	49.78-55.02	54.045	Sep. 20, 2012
		Test CH 1_WLAN		54.106	
		Test CH 6_WLAN		54.046	
		Test CH 11_WLAN		54.033	
	σ (S/m)	Verification	1.88-2.08	1.963	
		Test CH 1_WLAN		1.902	
		Test CH 6_WLAN		1.944	
		Test CH 11_WLAN		1.98	
	Simulated Tissue Temp.(℃)		20-24	21.7	
5200	ε_r	Verification	45.41-50.19	48.522	Sep. 19, 2012
		Test CH 36_WLAN		48.664	
		Test CH 48_WLAN		48.343	
		Test CH 52_WLAN		48.196	
		Test CH 64_WLAN		47.747	
	σ (S/m)	Verification	5.14-5.68	5.337	
		Test CH 36_WLAN		5.284	
		Test CH 48_WLAN		5.351	
		Test CH 52_WLAN		5.408	
		Test CH 64_WLAN		5.496	
	Simulated Tissue Temp.(℃)		20-24	21.7	

5200	ε_r	Verification	45.41-50.19	48.322	Sep. 20, 2012
		Test CH 38_WLAN		48.353	
		Test CH 46_WLAN		48.265	
		Test CH 54_WLAN		48.16	
		Test CH 62_WLAN		48.077	
	σ (S/m)	Verification	5.14-5.68	5.299	
		Test CH 38_WLAN		5.286	
		Test CH 46_WLAN		5.366	
		Test CH 54_WLAN		5.437	
		Test CH 62_WLAN		5.505	
	Simulated Tissue Temp.(℃)		20-24	21.7	
5500	ε_r	Verification	44.94-49.67	47.205	Sep. 21, 2012
		Test CH 100_WLAN		47.205	
		Test CH 104_WLAN		47.183	
		Test CH 116_WLAN		47.112	
		Test CH 136_WLAN		46.833	
		Test CH 140_WLAN		46.798	
	σ (S/m)	Verification	5.49-6.07	5.75	
		Test CH 100_WLAN		5.75	
		Test CH 104_WLAN		5.78	
		Test CH 116_WLAN		5.862	
		Test CH 136_WLAN		6.035	
		Test CH 140_WLAN		6.027	
	Simulated Tissue Temp.(℃)		20-24	21.7	

5500	ε_r	Verification	44.94-49.67	47.595	Sep. 23, 2012
		Test CH 102_WLAN		47.584	
		Test CH 118_WLAN		47.434	
		Test CH 134_WLAN		46.983	
	σ (S/m)	Verification	5.49-6.07	5.757	
		Test CH 102_WLAN		5.771	
		Test CH 118_WLAN		5.906	
		Test CH 134_WLAN		6.015	
	Simulated Tissue Temp.(℃)		20-24	21.7	
5800	ε_r	Verification	44.46-49.14	46.45	Sep. 25, 2012
		Test CH 149_WLAN		46.652	
		Test CH 151_WLAN		46.681	
		Test CH 157_WLAN		46.545	
		Test CH 159_WLAN		46.482	
		Test CH 165_WLAN		46.334	
	σ (S/m)	Verification	5.89-6.51	6.19	
		Test CH 149_WLAN		6.107	
		Test CH 151_WLAN		6.125	
		Test CH 157_WLAN		6.174	
		Test CH 159_WLAN		6.184	
		Test CH 165_WLAN		6.212	
	Simulated Tissue Temp.(℃)		20-24	21.7	

Table 2. Dielectric Parameters of Tissue Simulant Fluid

The composition of the Body tissue simulating liquid:

Frequency (MHz)	Mode	Ingredients						Total amount
		DGMBE	Water	Salt	Preventol D-7	Cellulose	Sugar	
2450M	Body	301.7ml	698.3ml	—	—	—	—	1.0L(Kg)

Simulating Liquids for 5 GHz, Manufactured by SPEAG:

Ingredients	Water	Esters, Emulsifiers, Inhibitors	Sodium and Salt
(% by weight)	60-80	20-40	0-1.5

Table 3. Recipes for tissue simulating liquid

1.10 Evaluation Procedures

The entire evaluation of the spatial peak values is performed within the Post-processing engine (SEMCAD). The system always gives the maximum values for the 1 g and 10 g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

1. The extraction of the measured data (grid and values) from the Zoom Scan.
2. The calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
3. The generation of a high-resolution mesh within the measured volume
4. The interpolation of all measured values from the measurement grid to the high-resolution grid
5. The extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
6. The calculation of the averaged SAR within masses of 1g and 10g.

The probe is calibrated at the center of the dipole sensors that is located 1 to 2.7mm away from the probe tip. During measurements, the probe stops shortly above the phantom surface, depending on the probe and the surface detecting system. Both distances are included as parameters in the probe configuration file. The software always knows exactly how far away the measured point is from the surface. As the probe cannot directly measure at the surface, the values between the deepest measured point and the surface must be extrapolated. The angle between the probe axis and the surface normal line is less than 30 degree.

In the Area Scan, the gradient of the interpolation function is evaluated to find all the extreme of the SAR distribution. The uncertainty on the locations of the extreme is less than 1/20 of the grid size. Only local maximum within –2 dB of the global maximum are searched and passed for the Cube Scan measurement. In the Cube Scan, the interpolation function is used to extrapolate the Peak SAR from the lowest measurement points to the inner phantom surface (the extrapolation distance). The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5mm.

The maximum search is automatically performed after each area scan measurement. It

is based on splines in two or three dimensions. The procedure can find the maximum for most SAR distributions even with relatively large grid spacing. After the area scanning measurement, the probe is automatically moved to a position at the interpolated maximum. The following scan can directly use this position for reference, e.g., for a finer resolution grid or the cube evaluations. The 1g and 10g peak evaluations are only available for the predefined cube 7x7x7 scans. The routines are verified and optimized for the grid dimensions used in these cube measurements.

The measured volume of 30x30x30mm contains about 30g of tissue.

The first procedure is an extrapolation (incl. Boundary correction) to get the points between the lowest measured plane and the surface. The next step uses 3D interpolation to get all points within the measured volume. In the last step, a 1g cube is placed numerically into the volume and its averaged SAR is calculated. This cube is the moved around until the highest averaged SAR is found. If the highest SAR is found at the edge of the measured volume, the system will issue a warning: higher SAR values might be found outside of the measured volume. In that case the cube measurement can be repeated, using the new interpolated maximum as the center.

1.11 Test Standards and Limits

According to FCC 47CFR §2.1093(d) The limits to be used for evaluation are based generally on criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (“SAR”) in Section 4.2 of “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz,” ANSI/IEEE C95.1–1992, Copyright 1992 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017. These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (NCRP) in “Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields,” NCRP Report No. 86, Section 17.4.5. Copyright NCRP, 1986, Bethesda, Maryland 20814. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards. The criteria to be used are specified in paragraphs (d)(1) and (d)(2) of this section and shall apply for portable devices transmitting in the frequency range from 100 kHz to 6 GHz. Portable devices that transmit at frequencies above 6 GHz are to be evaluated in terms of the MPE limits specified in § 1.1310 of this chapter. Measurements and calculations to demonstrate compliance with MPE field strength or power density limits for devices operating above 6 GHz should be made at a minimum distance of 5 cm from the radiating source.

(1) Limits for Occupational/Controlled exposure: 0.4 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 8 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 20 W/kg, as averaged over an 10 grams of tissue (defined as a tissue volume in the shape of a cube).

(2) Occupational/Controlled limits apply when persons are exposed as a consequence of their employment provided these persons are fully aware of and exercise control over their exposure. Awareness of exposure can be accomplished by use of warning labels or by specific training or education through appropriate means, such as an RF safety program in a work environment.

(3) Limits for General Population/Uncontrolled exposure: 0.08 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 1.6 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are

the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 4 W/kg, as averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). General Population/Uncontrolled limits apply when the general public may be exposed, or when persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or do not exercise control over their exposure. Warning labels placed on consumer devices such as cellular telephones will not be sufficient reason to allow these devices to be evaluated subject to limits for occupational/controlled exposure in paragraph (d)(1) of this section.(Table 4.)

Human Exposure	Uncontrolled Environment General Population	Controlled Environment Occupational
Spatial Peak SAR (Brain)	1.60 m W/g	8.00 m W/g
Spatial Average SAR (Whole Body)	0.08 m W/g	0.40 m W/g
Spatial Peak SAR (Hands/Feet/Ankle/Wrist)	4.00 m W/g	20.00 m W/g

Table 4. RF exposure limits

Notes:

1. Uncontrolled environments are defined as locations where there is potential exposure of individuals who have no knowledge or control of their potential exposure.
2. Controlled environments are defined as locations where there is potential exposure of individuals who have knowledge of their potential exposure and can exercise control over their exposure.

2. Summary of Results

WLAN802.11 b

Band	EUT Position	Antenna	Test Configuration	Averaged SAR over 1g (W/kg)			SAR Limit 1g (W/kg)
				CH 1	CH 6	CH 11	
				2412 MHz	2437 MHz	2462 MHz	
WLAN 802.11 b	Body Worn	MIMO	Laptop mode	1.13	1.11	0.942	1.6

Test distance is 0mm.

Using KDB248227-SAR is not required for 802.11 g/HT20 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels.

According to KDB447498 the 1-g SAR for the highest output channel is less than 0.8 W/kg, where the transmission band corresponding to all channels is ≤ 100 MHz, testing for the other channels is not required.

WLAN802.11 a / n (20M) 5.2G

Band	EUT Position	Antenna	Test Configuration	Averaged SAR over 1g (W/kg)				SAR Limit 1g (W/kg)
				CH 36	CH 48	CH 52	CH 64	
				5180 MHz	5240 MHz	5260 MHz	5320 MHz	
WLAN a 5.2G	Body Worn	MIMO	Laptop mode	0.467	0.503	1.08	0.568	1.6
WLAN n (20M) 5.2G	Body Worn	MIMO	Laptop mode	0.457	0.519	0.944	0.581	1.6

WLAN802.11 n (40M) 5.2G

Band	EUT Position	Antenna	Test Configuration	Averaged SAR over 1g (W/kg)				SAR Limit 1g (W/kg)
				CH 38	CH 46	CH 54	CH 62	
				5190 MHz	5230 MHz	5270 MHz	5310 MHz	
WLAN n (40M) 5.2G	Body Worn	MIMO	Laptop mode	0.316	0.859	0.382	0.389	1.6

WLAN802.11 a 5.5G

Band	EUT Position	Antenna	Test Configuration	Averaged SAR over 1g (W/kg)			SAR Limit 1g (W/kg)
				CH 104	CH 116	CH 136	
				5520 MHz	5580 MHz	5680 MHz	
WLAN a 5.5G	Body Worn	MIMO	Laptop mode	0.562	1.07	0.758	1.6

WLAN802.11 n (20M) 5.5G

Band	EUT Position	Antenna	Test Configuration	Averaged SAR over 1g (W/kg)			SAR Limit 1g (W/kg)
				CH 100	CH 116	CH 140	
				5500 MHz	5580 MHz	5700 MHz	
WLAN n(20M) 5.5G	Body Worn	MIMO	Laptop mode	0.788	1.06	0.746	1.6

WLAN802.11 n (40M) 5.5G

Band	EUT Position	Antenna	Test Configuration	Averaged SAR over 1g (W/kg)			SAR Limit 1g (W/kg)
				CH 102	CH 118	CH 134	
				5510 MHz	5590 MHz	5670 MHz	
WLAN n (40M) 5.5G	Body Worn	MIMO	Laptop mode	0.271	0.949	0.857	1.6

WLAN802.11 a / n (20M) 5.8G

Band	EUT Position	Antenna	Test Configuration	Averaged SAR over 1g (W/kg)			SAR Limit 1g (W/kg)
				CH 149	CH 157	CH 165	
				5745 MHz	5785 MHz	5825 MHz	
WLAN a 5.8G	Body Worn	MIMO	Laptop mode	0.672	0.974	0.809	1.6
WLAN n (20M) 5.8G	Body Worn	MIMO	Laptop mode	0.757	0.861	0.689	1.6

WLAN802.11 n (40M) 5.8G

Band	EUT Position	Antenna	Test Configuration	Averaged SAR over 1g (W/kg)		SAR Limit 1g (W/kg)
				CH 151	CH 159	
				5755 MHz	5795 MHz	
WLAN n (40M) 5.8G	Body Worn	MIMO	Laptop mode	0.911	0.804	1.6

According to KDB447498 the 1-g SAR for the highest output channel is less than 0.4 W/kg, where the transmission band corresponding to all channels is ≤ 200 MHz, testing for the other channels is not required.

3. Instruments List

Manufacturer	Device	Type	Serial number	Date of last calibration	Date of next calibration
Schmid & Partner Engineering AG	Dosimetric E-Field Probe	EX3DV4	3848	Jun.04.2012	Jun.04.2012
Schmid & Partner Engineering AG	2450/5200/5500/5800 MHz System Validation Dipole	D2450V2	727	Apr.25,2012	Apr.24,2013
		D5GHzV2	1104	Apr.18,2012	Apr.17,2013
Schmid & Partner Engineering AG	Data acquisition Electronics	DAE4	1336	Jun.05.2012	Jun.04.2013
Schmid & Partner Engineering AG	Software	DASY 52 V52.8	N/A	Calibration not required	Calibration not required
Schmid & Partner Engineering AG	Phantom	SAM	N/A	Calibration not required	Calibration not required
HP	Network Analyzer	8753D	3410A05547	Mar.15.2012	Mar.14.2013
Agilent	Dielectric Probe Kit	85070E	MY44300677	Calibration not required	Calibration not required
Agilent	Dual-directional coupler	772D	MY46151242	Jul.05,2012	Jul.04,2013
Agilent	RF Signal Generator	N5181A	MY50141235	Jan.06.2012	Jan.06.2013
Agilent	Power meter	E4417A	MY51410006	Oct.24.2011	Oct.23.2013

4. Measurements

Date: 2012/9/20

Laptop mode_WLAN802.11b_CH1

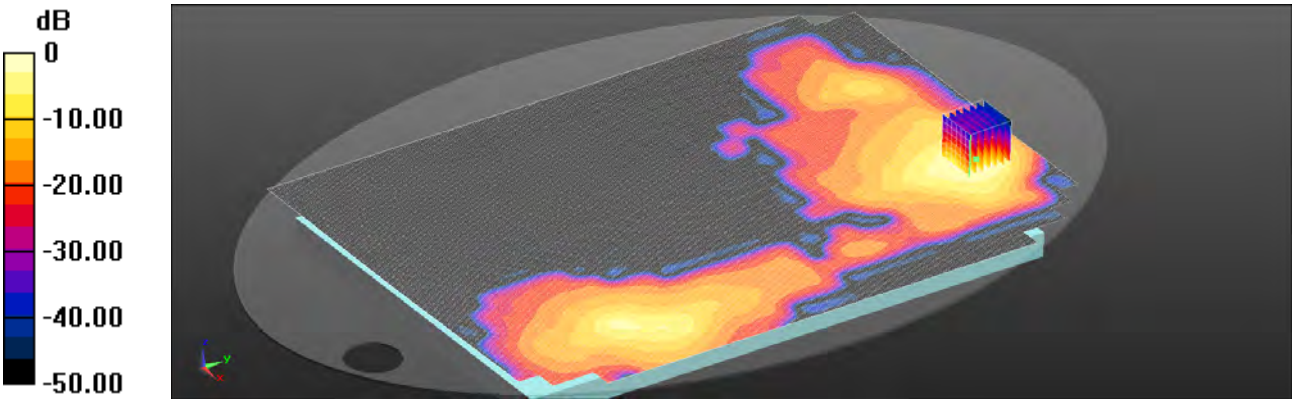
Communication System: WLAN 2.45G (FCC); Frequency: 2412 MHz
Medium parameters used: f = 2412 MHz; σ = 1.902 mho/m; ε_r = 54.106; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(6.95, 6.95, 6.95); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

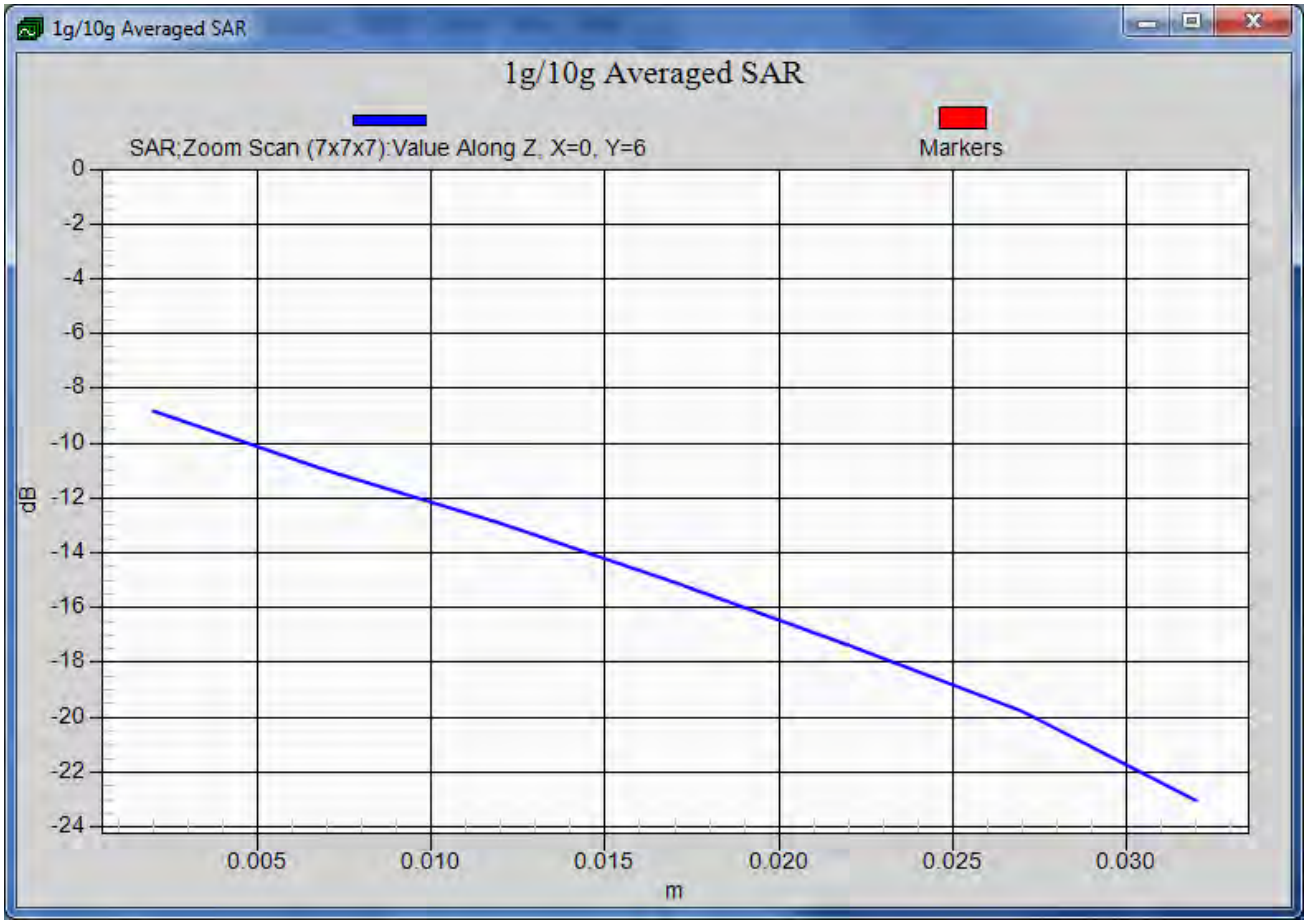
Configuration/Lap-held/Area Scan (201x281x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.78 mW/g

Configuration/Lap-held/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 2.385 mW/g

SAR(1 g) = 1.13 mW/g; SAR(10 g) = 0.557 mW/g
Maximum value of SAR (measured) = 1.71 mW/g



0 dB = 1.78 mW/g = 5.01 dB mW/g



Date: 2012/9/20

Laptop mode_WLAN802.11b_CH6

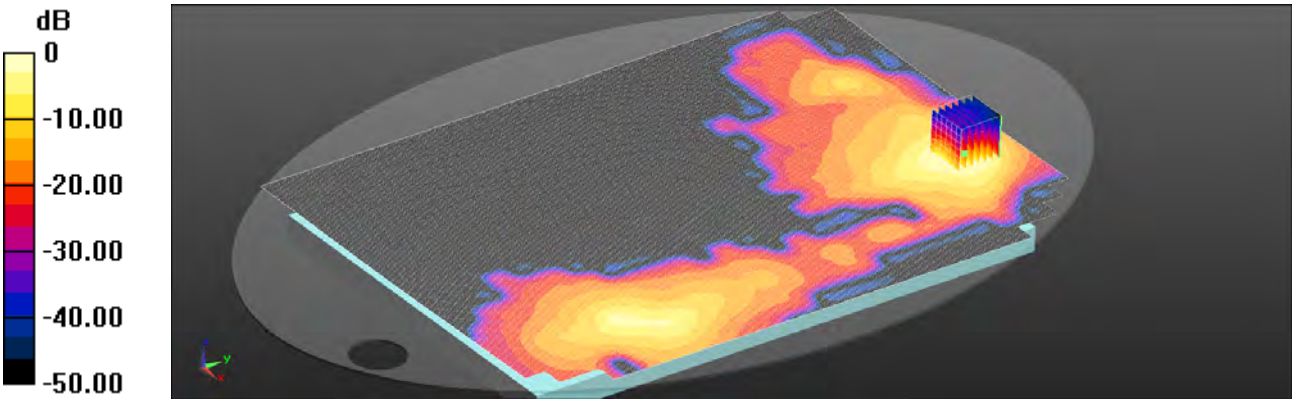
Communication System: WLAN 2.45G (FCC); Frequency: 2437 MHz
Medium parameters used: f = 2437 MHz; σ = 1.944 mho/m; ε_r = 54.046; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(6.95, 6.95, 6.95); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (201x281x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.89 mW/g

Configuration/Lap-held/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 2.351 mW/g

SAR(1 g) = 1.11 mW/g; SAR(10 g) = 0.545 mW/g
Maximum value of SAR (measured) = 1.69 mW/g



0 dB = 1.89 mW/g = 5.53 dB mW/g

Date: 2012/9/20

Laptop mode_WLAN802.11b_CH11

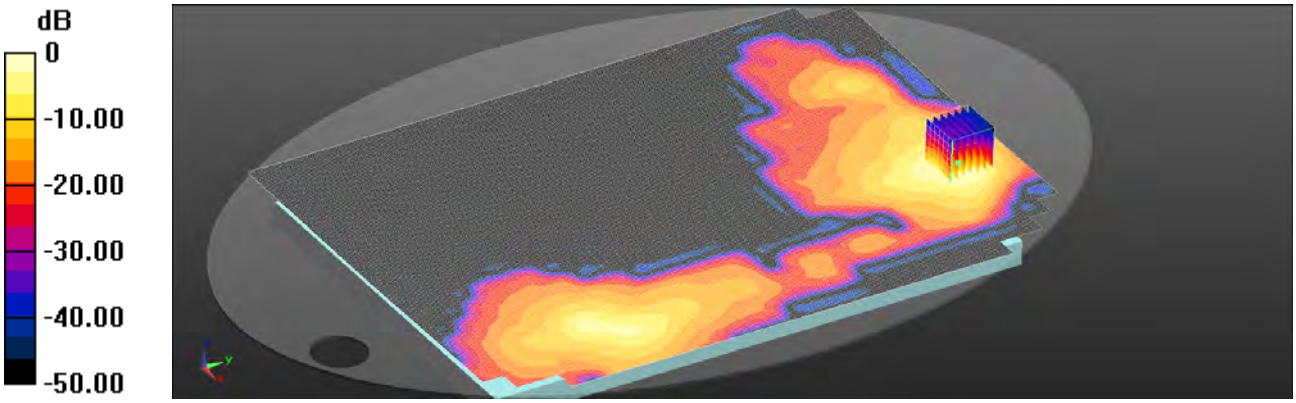
Communication System: WLAN 2.45G (FCC); Frequency: 2462 MHz
Medium parameters used: f = 2462 MHz; σ = 1.98 mho/m; ε_r = 54.033; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(6.95, 6.95, 6.95); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (201x281x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.52 mW/g

Configuration/Lap-held/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 2.013 mW/g

SAR(1 g) = 0.942 mW/g; SAR(10 g) = 0.460 mW/g
Maximum value of SAR (measured) = 1.45 mW/g



0 dB = 1.52 mW/g = 3.62 dB mW/g

Date: 2012/9/19

Laptop mode_WLAN802.11a 5.2G_CH36

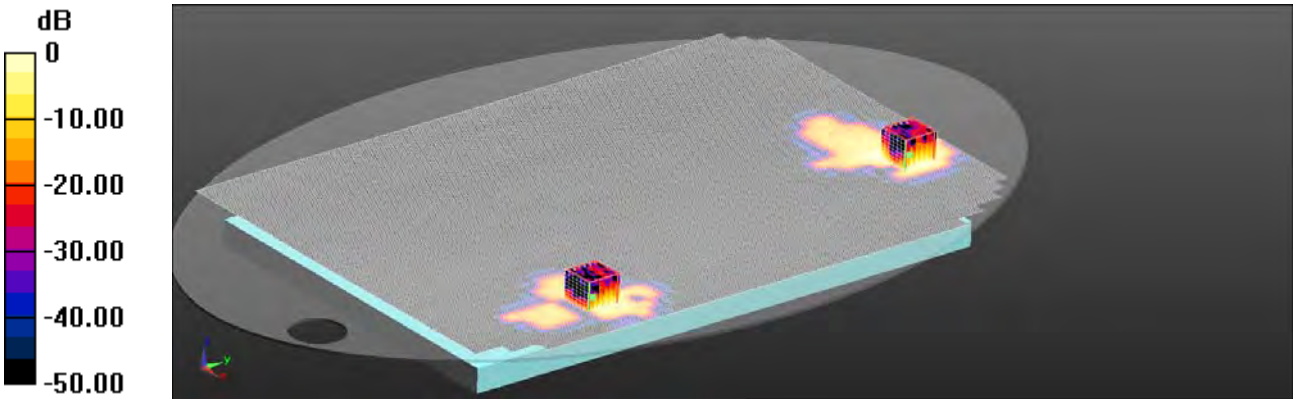
Communication System: WLAN 5G (FCC); Frequency: 5180 MHz
Medium parameters used: f = 5180 MHz; σ = 5.284 mho/m; ε_r = 48.664; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(4.4, 4.4, 4.4); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.942 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.719 mW/g
SAR(1 g) = 0.467 mW/g; SAR(10 g) = 0.149 mW/g
Maximum value of SAR (measured) = 0.886 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.381 mW/g
SAR(1 g) = 0.399 mW/g; SAR(10 g) = 0.115 mW/g
Maximum value of SAR (measured) = 0.799 mW/g



0 dB = 0.942 mW/g = -0.52 dB mW/g

Date: 2012/9/19

Laptop mode_WLAN802.11a 5.2G_CH48

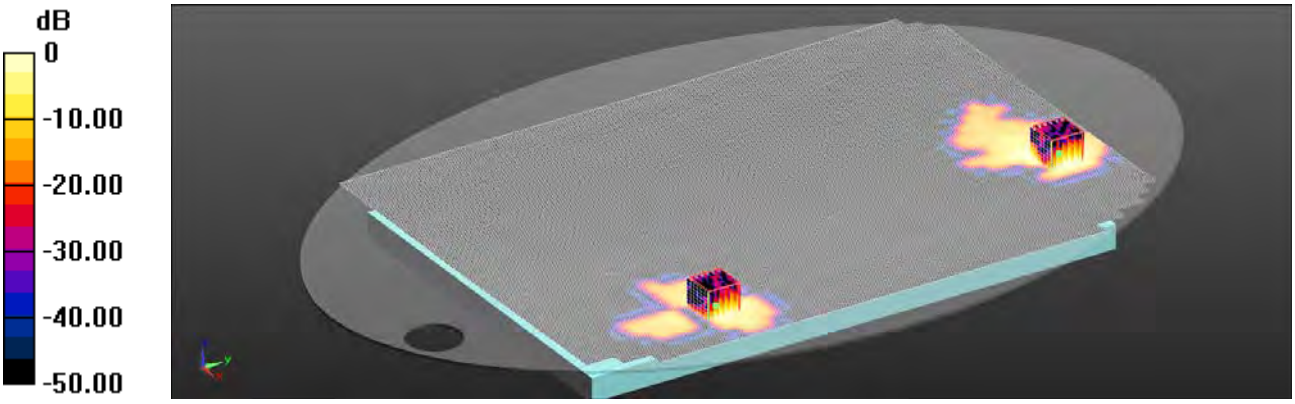
Communication System: WLAN 5G (FCC); Frequency: 5240 MHz
Medium parameters used: f = 5240 MHz; σ = 5.351 mho/m; ε_r = 48.343; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(4.4, 4.4, 4.4); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.01 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.840 mW/g
SAR(1 g) = 0.503 mW/g; SAR(10 g) = 0.161 mW/g
Maximum value of SAR (measured) = 0.981 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.617 mW/g
SAR(1 g) = 0.462 mW/g; SAR(10 g) = 0.131 mW/g
Maximum value of SAR (measured) = 0.942 mW/g



0 dB = 1.01 mW/g = 0.09 dB mW/g

Date: 2012/9/19

Laptop mode_WLAN802.11a 5.2G_CH52

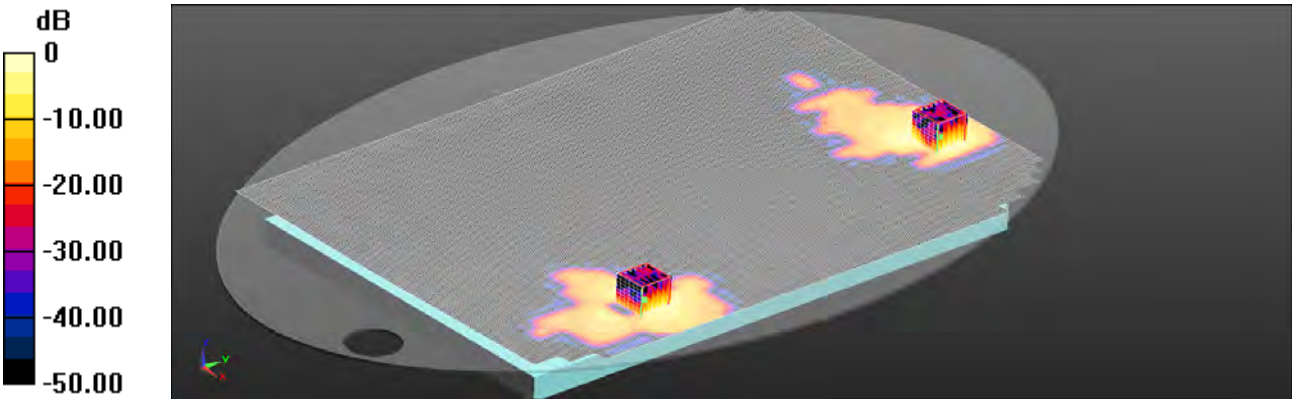
Communication System: WLAN 5G (FCC); Frequency: 5260 MHz
Medium parameters used: f = 5260 MHz; σ = 5.408 mho/m; ε_r = 48.196; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(4.17, 4.17, 4.17); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.38 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.729 mW/g
SAR(1 g) = 1.08 mW/g; SAR(10 g) = 0.315 mW/g
Maximum value of SAR (measured) = 2.17 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.406 mW/g
SAR(1 g) = 0.910 mW/g; SAR(10 g) = 0.296 mW/g
Maximum value of SAR (measured) = 1.76 mW/g



0 dB = 2.38 mW/g = 7.52 dB mW/g

Date: 2012/9/19

Laptop mode_WLAN802.11a 5.2G_CH64

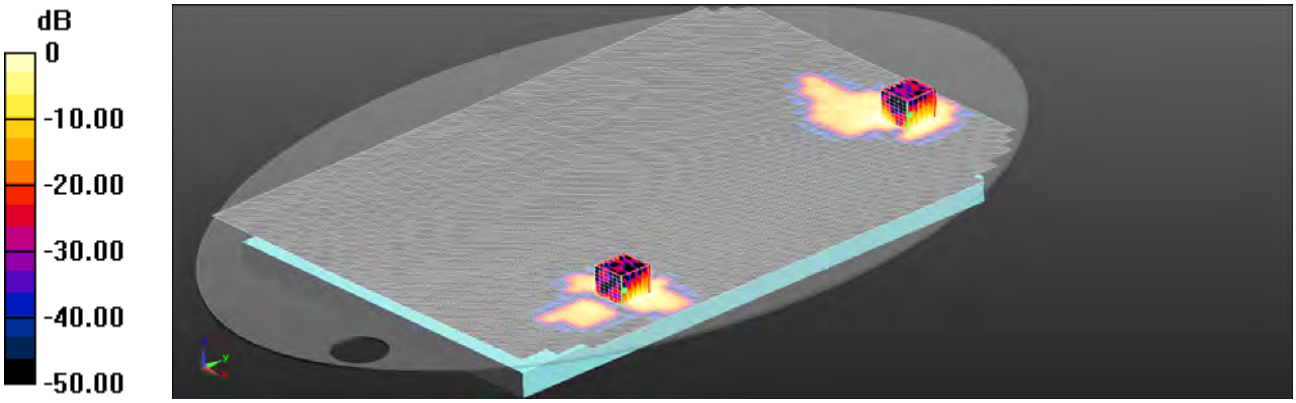
Communication System: WLAN 5G (FCC); Frequency: 5320 MHz
Medium parameters used: f = 5320 MHz; σ = 5.496 mho/m; ε_r = 47.747; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(4.17, 4.17, 4.17); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.15 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.729 mW/g
SAR(1 g) = 0.484 mW/g; SAR(10 g) = 0.133 mW/g
Maximum value of SAR (measured) = 0.988 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 2.141 mW/g
SAR(1 g) = 0.568 mW/g; SAR(10 g) = 0.184 mW/g
Maximum value of SAR (measured) = 1.09 mW/g



0 dB = 1.15 mW/g = 1.21 dB mW/g

Date: 2012/9/19

Laptop mode_WLAN802.11n(20M) 5.2G_CH36

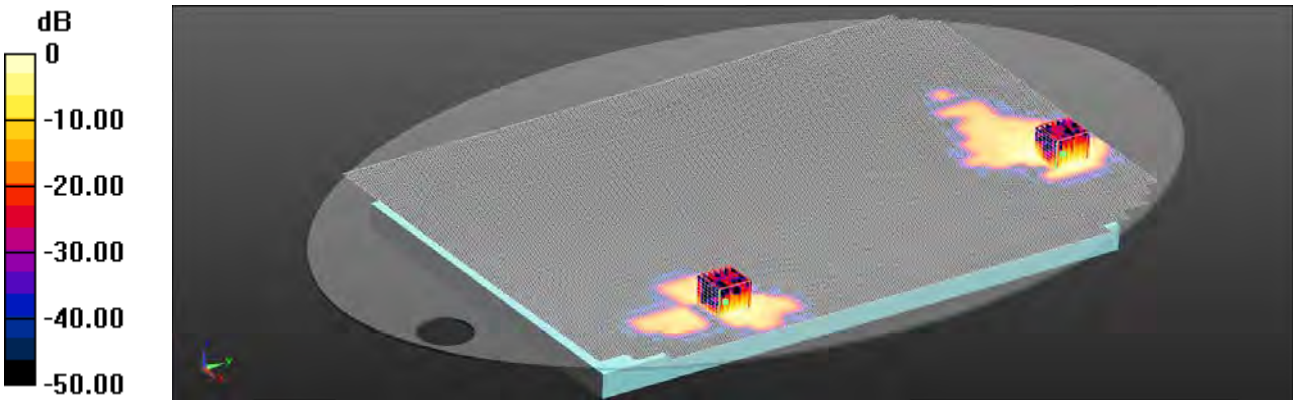
Communication System: WLAN 5G (FCC); Frequency: 5180 MHz
Medium parameters used: f = 5180 MHz; σ = 5.284 mho/m; ε_r = 48.664; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(4.4, 4.4, 4.4); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.911 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.649 mW/g
SAR(1 g) = 0.457 mW/g; SAR(10 g) = 0.147 mW/g
Maximum value of SAR (measured) = 0.878 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.344 mW/g
SAR(1 g) = 0.397 mW/g; SAR(10 g) = 0.113 mW/g
Maximum value of SAR (measured) = 0.799 mW/g



0 dB = 0.911 mW/g = -0.81 dB mW/g

Date: 2012/9/19

Laptop mode_WLAN802.11n(20M) 5.2G_CH48

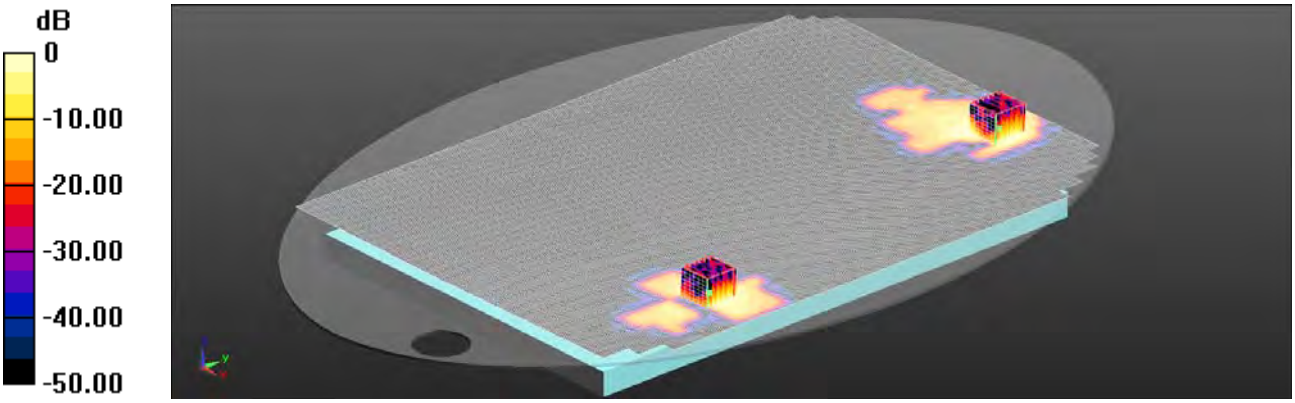
Communication System: WLAN 5G (FCC); Frequency: 5240 MHz
Medium parameters used: f = 5240 MHz; σ = 5.351 mho/m; ε_r = 48.343; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(4.4, 4.4, 4.4); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.11 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.557 mW/g
SAR(1 g) = 0.454 mW/g; SAR(10 g) = 0.131 mW/g
Maximum value of SAR (measured) = 0.921 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.947 mW/g
SAR(1 g) = 0.519 mW/g; SAR(10 g) = 0.169 mW/g
Maximum value of SAR (measured) = 0.998 mW/g



0 dB = 1.11 mW/g = 0.87 dB mW/g

Date: 2012/9/19

Laptop mode_WLAN802.11n(20M) 5.2G_CH52

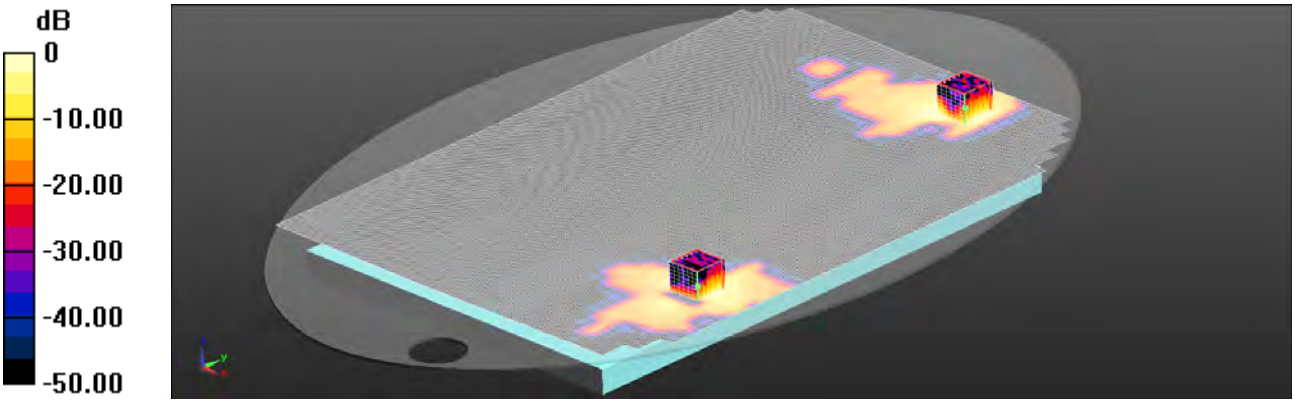
Communication System: WLAN 5G (FCC); Frequency: 5260 MHz
Medium parameters used: f = 5260 MHz; σ = 5.408 mho/m; ε_r = 48.196; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(4.17, 4.17, 4.17); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.07 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.252 mW/g
SAR(1 g) = 0.944 mW/g; SAR(10 g) = 0.267 mW/g
Maximum value of SAR (measured) = 1.90 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 2.959 mW/g
SAR(1 g) = 0.807 mW/g; SAR(10 g) = 0.264 mW/g
Maximum value of SAR (measured) = 1.57 mW/g



0 dB = 2.07 mW/g = 6.32 dB mW/g

Date: 2012/9/19

Laptop mode_WLAN802.11n(20M) 5.2G_CH64

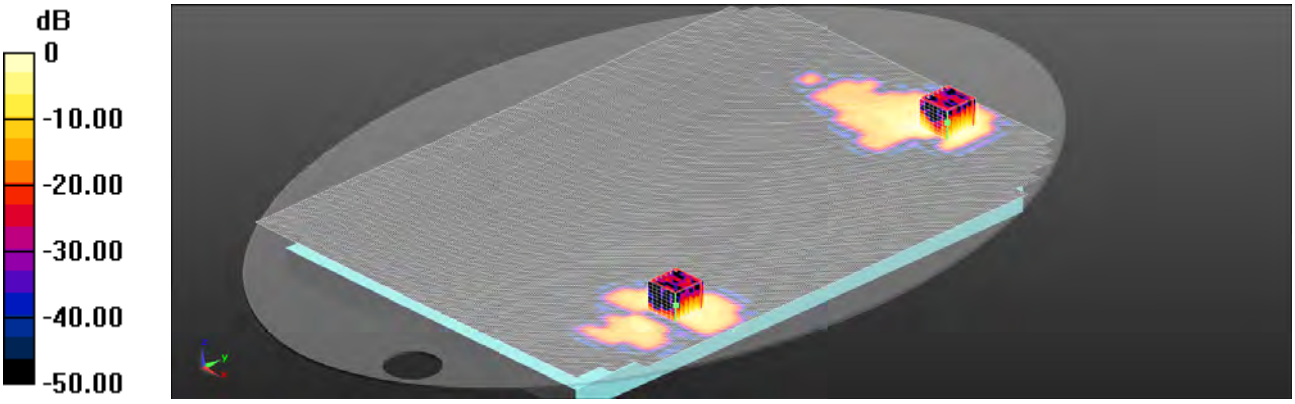
Communication System: WLAN 5G (FCC); Frequency: 5320 MHz
Medium parameters used: f = 5320 MHz; σ = 5.496 mho/m; ε_r = 47.747; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(4.17, 4.17, 4.17); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.18 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.770 mW/g
SAR(1 g) = 0.493 mW/g; SAR(10 g) = 0.138 mW/g
Maximum value of SAR (measured) = 1.02 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 2.149 mW/g
SAR(1 g) = 0.581 mW/g; SAR(10 g) = 0.191 mW/g
Maximum value of SAR (measured) = 1.11 mW/g



0 dB = 1.18 mW/g = 1.45 dB mW/g

Date: 2012/9/20

Laptop mode_WLAN802.11n(40M) 5.2G_CH38

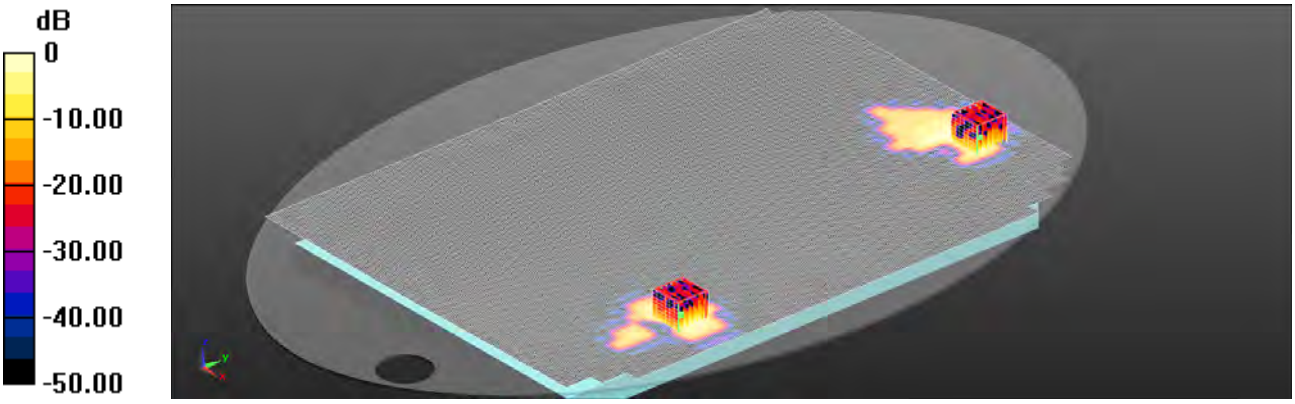
Communication System: WLAN 5G (FCC); Frequency: 5190 MHz
Medium parameters used: f = 5190 MHz; σ = 5.286 mho/m; ε_r = 48.353; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(4.4, 4.4, 4.4); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.753 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.033 mW/g
SAR(1 g) = 0.304 mW/g; SAR(10 g) = 0.092 mW/g
Maximum value of SAR (measured) = 0.622 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.154 mW/g
SAR(1 g) = 0.316 mW/g; SAR(10 g) = 0.090 mW/g
Maximum value of SAR (measured) = 0.621 mW/g



0 dB = 0.753 mW/g = -2.47 dB mW/g

Date: 2012/9/20

Laptop mode_WLAN802.11n(40M) 5.2G_CH46

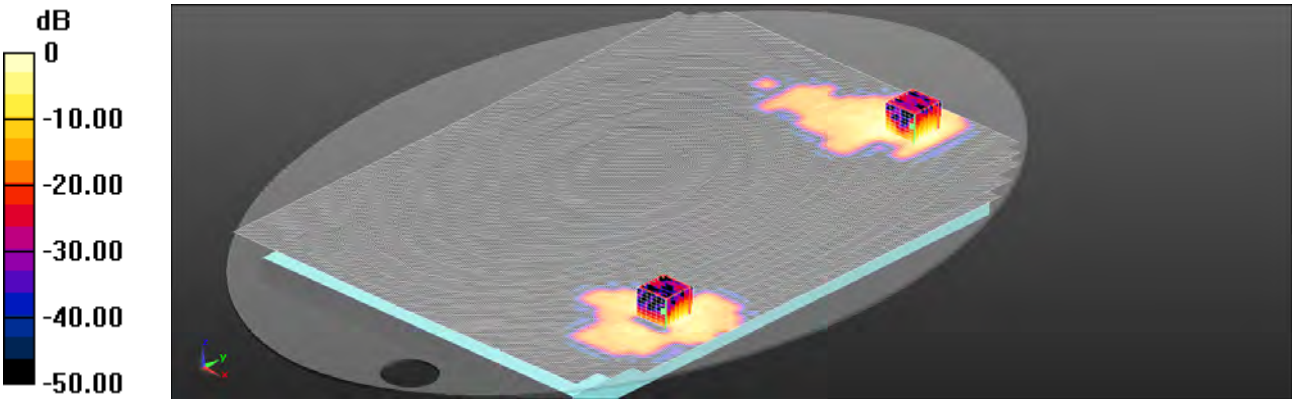
Communication System: WLAN 5G (FCC); Frequency: 5230 MHz
Medium parameters used: f = 5230 MHz; σ = 5.366 mho/m; ε_r = 48.265; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(4.4, 4.4, 4.4); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.90 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.002 mW/g
SAR(1 g) = 0.859 mW/g; SAR(10 g) = 0.244 mW/g
Maximum value of SAR (measured) = 1.69 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 2.864 mW/g
SAR(1 g) = 0.786 mW/g; SAR(10 g) = 0.257 mW/g
Maximum value of SAR (measured) = 1.50 mW/g



0 dB = 1.90 mW/g = 5.59 dB mW/g

Date: 2012/9/20

Laptop mode_WLAN802.11n(40M) 5.2G_CH54

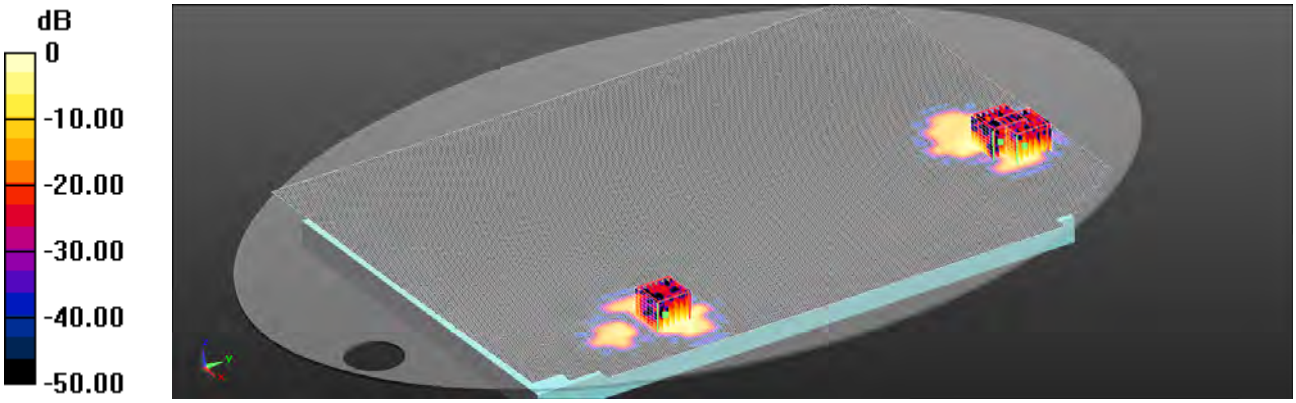
Communication System: WLAN 5G (FCC); Frequency: 5270 MHz
Medium parameters used: f = 5270 MHz; σ = 5.437 mho/m; ε_r = 48.16; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.863 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.386 mW/g
SAR(1 g) = 0.382 mW/g; SAR(10 g) = 0.106 mW/g
Maximum value of SAR (measured) = 0.783 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.139 mW/g
SAR(1 g) = 0.326 mW/g; SAR(10 g) = 0.091 mW/g
Maximum value of SAR (measured) = 0.643 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 2: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.269 mW/g
SAR(1 g) = 0.337 mW/g; SAR(10 g) = 0.100 mW/g
Maximum value of SAR (measured) = 0.672 mW/g



0 dB = 0.863 mW/g = -1.28 dB mW/g

Date: 2012/9/20

Laptop mode_WLAN802.11n(40M) 5.2G_CH62

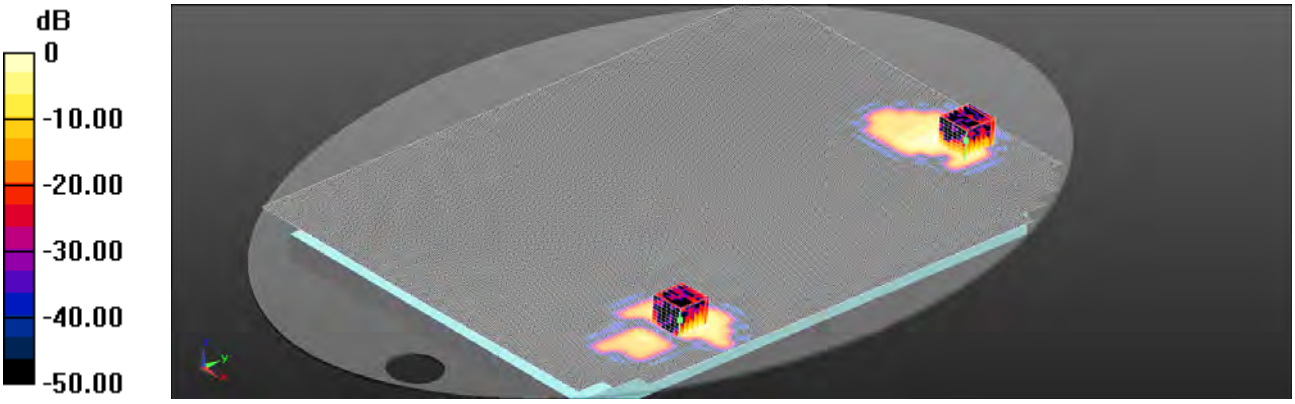
Communication System: WLAN 5G (FCC); Frequency: 5310 MHz
Medium parameters used: f = 5310 MHz; σ = 5.505 mho/m; ε_r = 48.077; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(4.17, 4.17, 4.17); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.962 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.759 mW/g
SAR(1 g) = 0.389 mW/g; SAR(10 g) = 0.106 mW/g
Maximum value of SAR (measured) = 0.825 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.412 mW/g
SAR(1 g) = 0.367 mW/g; SAR(10 g) = 0.101 mW/g
Maximum value of SAR (measured) = 0.715 mW/g



0 dB = 0.962 mW/g = -0.34 dB mW/g

Date: 2012/9/21

Laptop mode_WLAN802.11a 5.5G_CH104

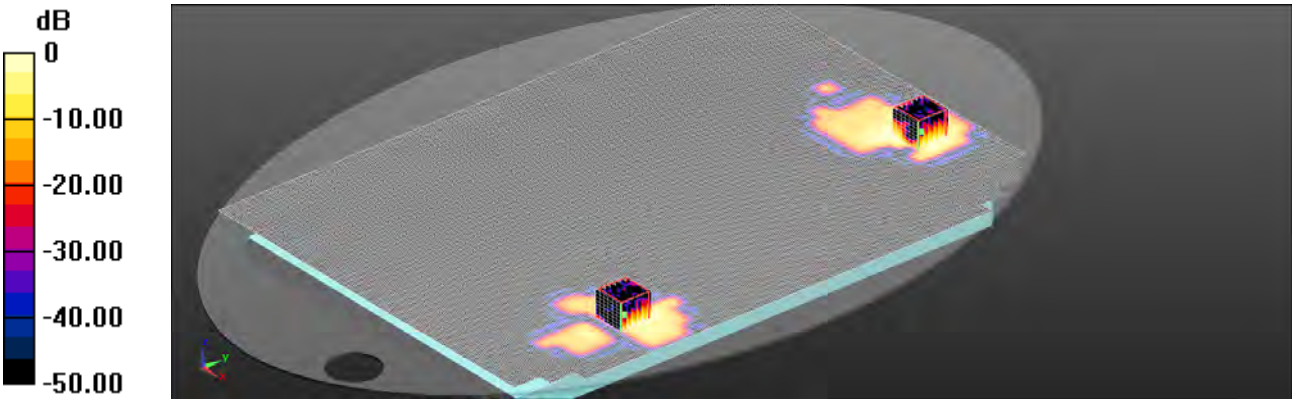
Communication System: WLAN 5G (FCC); Frequency: 5520 MHz
Medium parameters used: f = 5520 MHz; σ = 5.78 mho/m; ε_r = 47.183; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(3.88, 3.88, 3.88); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.44 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 2.897 mW/g
SAR(1 g) = 0.562 mW/g; SAR(10 g) = 0.151 mW/g
Maximum value of SAR (measured) = 1.20 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 2.162 mW/g
SAR(1 g) = 0.560 mW/g; SAR(10 g) = 0.179 mW/g
Maximum value of SAR (measured) = 1.11 mW/g



0 dB = 1.44 mW/g = 3.19 dB mW/g

Date: 2012/9/21

Laptop mode_WLAN802.11a 5.5G_CH116

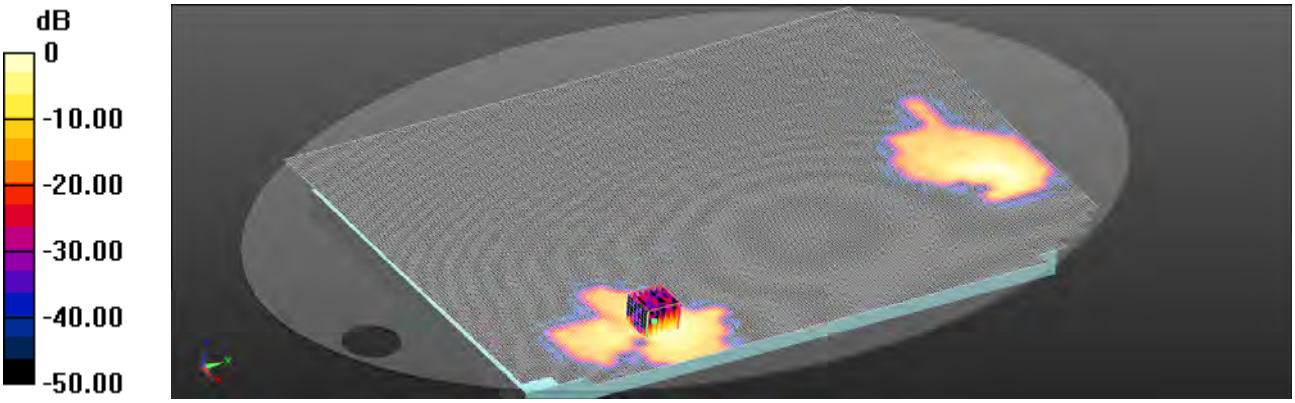
Communication System: WLAN 5G (FCC); Frequency: 5580 MHz
Medium parameters used: f = 5580 MHz; σ = 5.862 mho/m; ε_r = 47.112; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(3.88, 3.88, 3.88); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.58 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 4.166 mW/g

SAR(1 g) = 1.07 mW/g; SAR(10 g) = 0.302 mW/g
Maximum value of SAR (measured) = 2.19 mW/g



0 dB = 2.58 mW/g = 8.24 dB mW/g

Date: 2012/9/21

Laptop mode_WLAN802.11a 5.5G_CH136

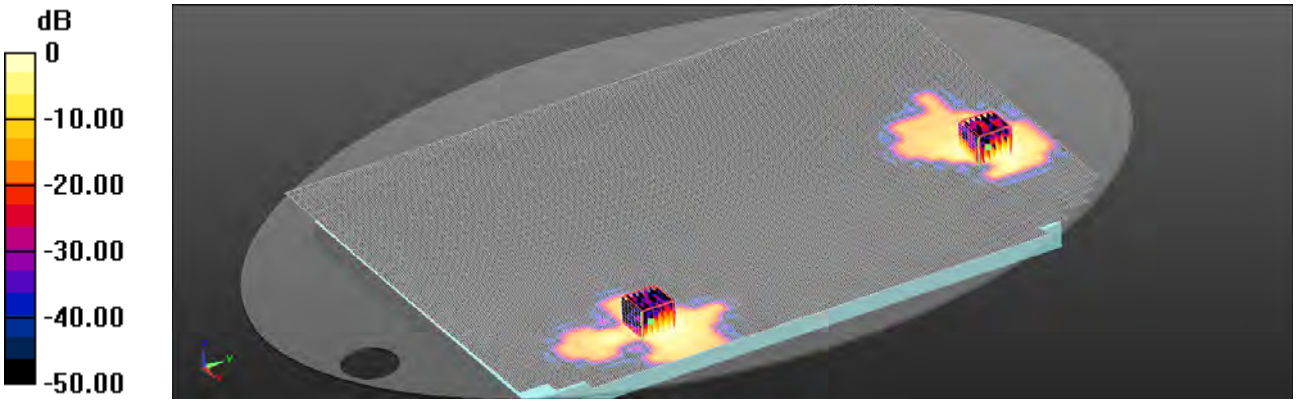
Communication System: WLAN 5G (FCC); Frequency: 5680 MHz
Medium parameters used: f = 5680 MHz; σ = 6.035 mho/m; ε_r = 46.833; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(3.88, 3.88, 3.88); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.75 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.020 mW/g
SAR(1 g) = 0.758 mW/g; SAR(10 g) = 0.200 mW/g
Maximum value of SAR (measured) = 1.59 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 2.471 mW/g
SAR(1 g) = 0.615 mW/g; SAR(10 g) = 0.201 mW/g
Maximum value of SAR (measured) = 1.25 mW/g



0 dB = 1.75 mW/g = 4.86 dB mW/g

Date: 2012/9/21

Laptop mode_WLAN802.11n(20M) 5.5G_CH100

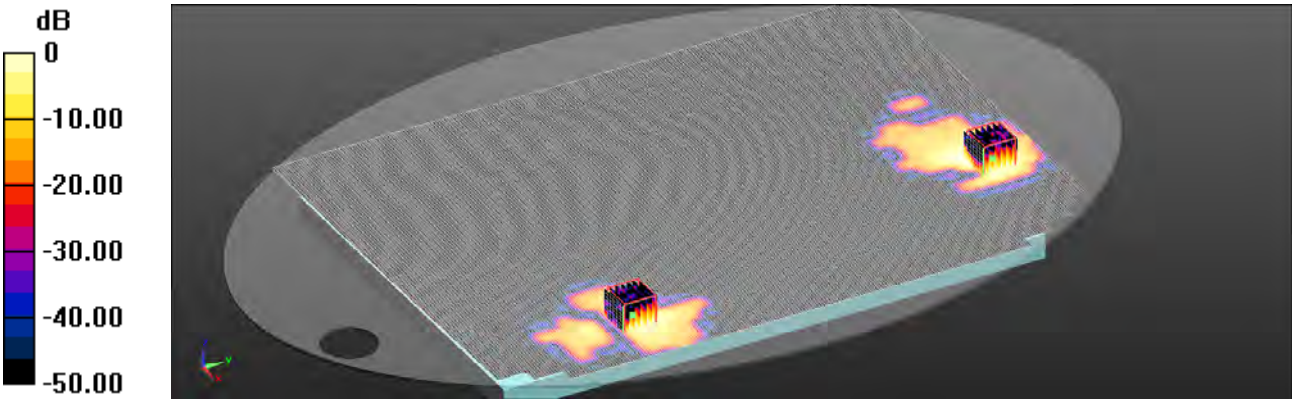
Communication System: WLAN 5G (FCC); Frequency: 5500 MHz
Medium parameters used: f = 5500 MHz; σ = 5.75 mho/m; ε_r = 47.205; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(3.88, 3.88, 3.88); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.61 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 2.735 mW/g
SAR(1 g) = 0.712 mW/g; SAR(10 g) = 0.190 mW/g
Maximum value of SAR (measured) = 1.48 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.104 mW/g
SAR(1 g) = 0.788 mW/g; SAR(10 g) = 0.249 mW/g
Maximum value of SAR (measured) = 1.55 mW/g



0 dB = 1.61 mW/g = 4.16 dB mW/g

Date: 2012/9/21

Laptop mode_WLAN802.11n(20M) 5.5G_CH116

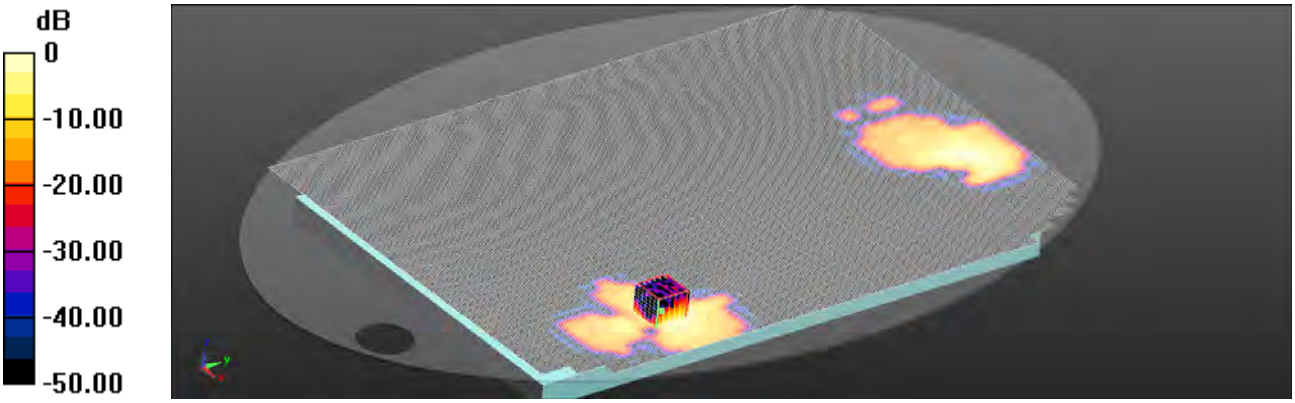
Communication System: WLAN 5G (FCC); Frequency: 5580 MHz
Medium parameters used: f = 5580 MHz; σ = 5.862 mho/m; ε_r = 47.112; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(3.88, 3.88, 3.88); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.28 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 4.093 mW/g

SAR(1 g) = 1.06 mW/g; SAR(10 g) = 0.296 mW/g
Maximum value of SAR (measured) = 2.20 mW/g



0 dB = 2.28 mW/g = 7.15 dB mW/g

Date: 2012/9/21

Laptop mode_WLAN802.11n(20M) 5.5G_CH140

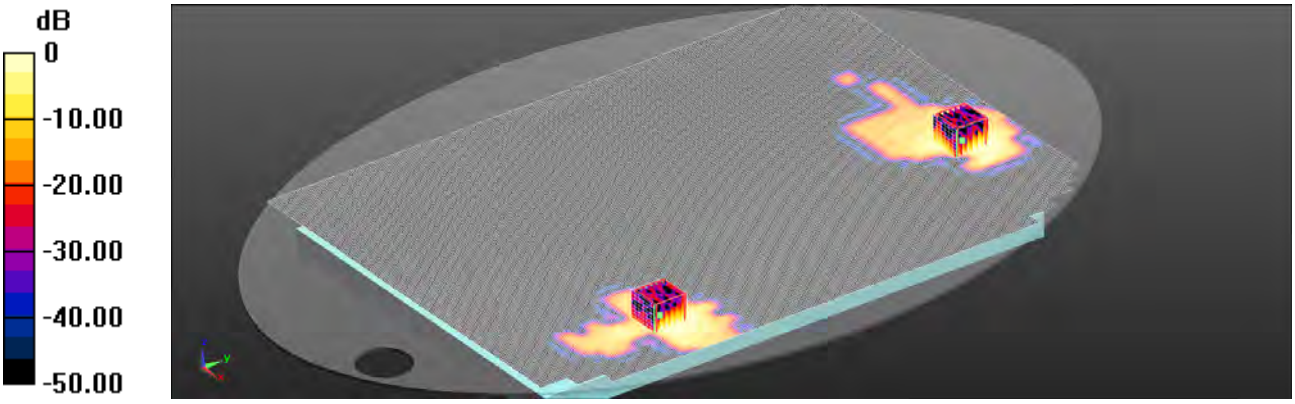
Communication System: WLAN 5G (FCC); Frequency: 5700 MHz
Medium parameters used: f = 5700 MHz; σ = 6.027 mho/m; ε_r = 46.798; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(3.88, 3.88, 3.88); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.58 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 2.905 mW/g
SAR(1 g) = 0.746 mW/g; SAR(10 g) = 0.200 mW/g
Maximum value of SAR (measured) = 1.54 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 2.732 mW/g
SAR(1 g) = 0.698 mW/g; SAR(10 g) = 0.226 mW/g
Maximum value of SAR (measured) = 1.44 mW/g



0 dB = 1.58 mW/g = 3.97 dB mW/g

Date: 2012/9/23

Laptop mode_WLAN802.11n(40M) 5.5G_CH102

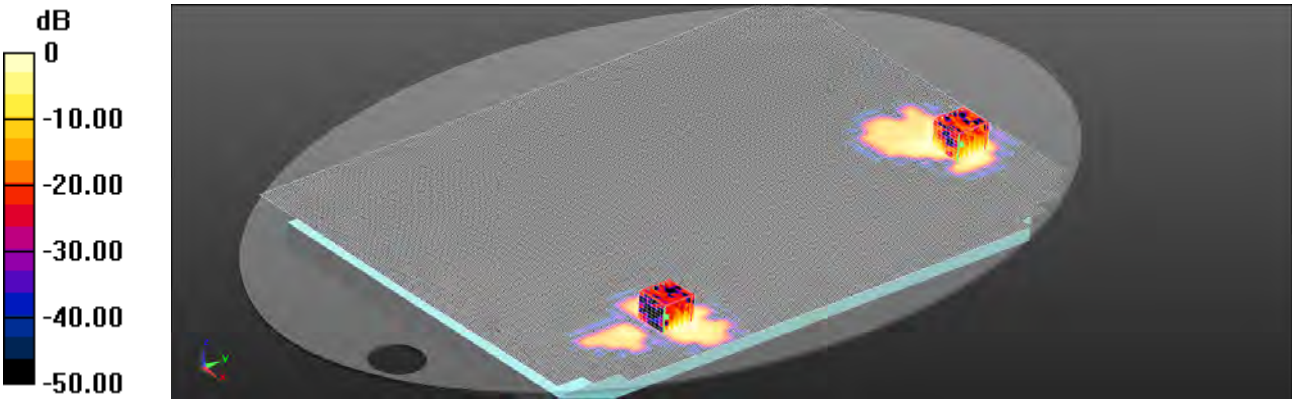
Communication System: WLAN 5G (FCC); Frequency: 5510 MHz
Medium parameters used: f = 5510 MHz; σ = 5.771 mho/m; ε_r = 47.584; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(3.88, 3.88, 3.88); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.659 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.050 mW/g
SAR(1 g) = 0.271 mW/g; SAR(10 g) = 0.072 mW/g
Maximum value of SAR (measured) = 0.590 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 0.878 mW/g
SAR(1 g) = 0.241 mW/g; SAR(10 g) = 0.076 mW/g
Maximum value of SAR (measured) = 0.484 mW/g



0 dB = 0.659 mW/g = -3.63 dB mW/g

Date: 2012/9/23

Laptop mode_WLAN802.11n(40M) 5.5G_CH118

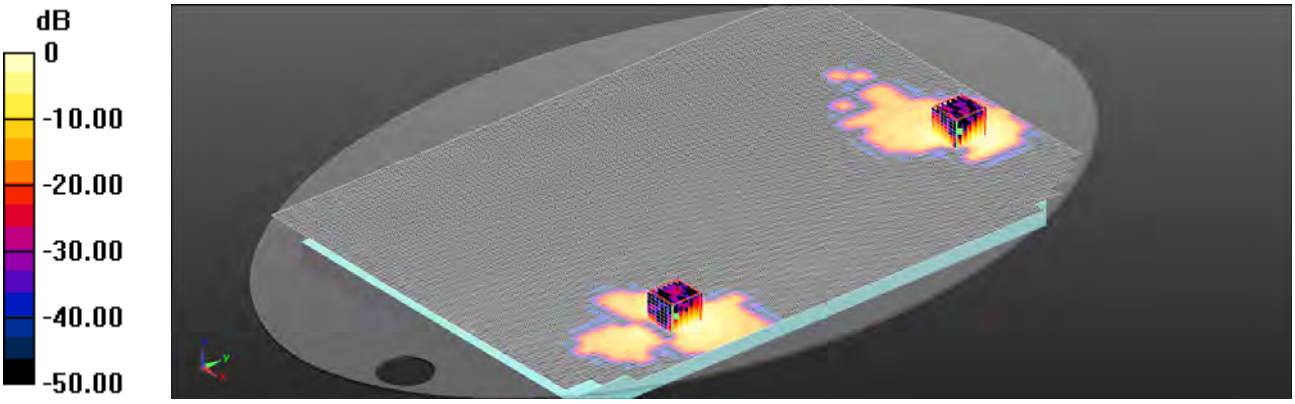
Communication System: WLAN 5G (FCC); Frequency: 5590 MHz
Medium parameters used: f = 5590 MHz; σ = 5.906 mho/m; ε_r = 47.434; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(3.88, 3.88, 3.88); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.13 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.613 mW/g
SAR(1 g) = 0.949 mW/g; SAR(10 g) = 0.262 mW/g
Maximum value of SAR (measured) = 2.00 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.206 mW/g
SAR(1 g) = 0.809 mW/g; SAR(10 g) = 0.278 mW/g
Maximum value of SAR (measured) = 1.59 mW/g



0 dB = 2.13 mW/g = 6.55 dB mW/g

Date: 2012/9/23

Laptop mode_WLAN802.11n(40M) 5.5G_CH134

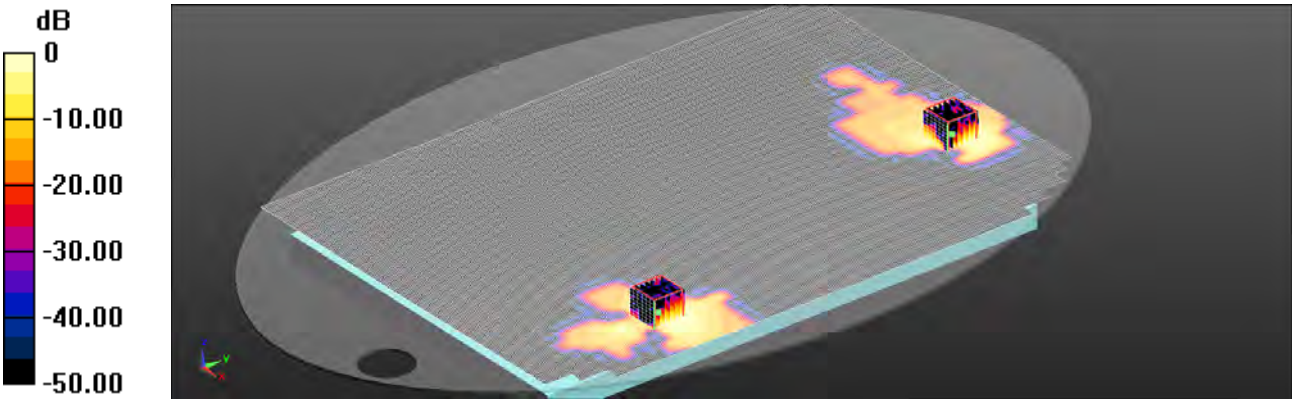
Communication System: WLAN 5G (FCC); Frequency: 5670 MHz
Medium parameters used: f = 5670 MHz; σ = 6.015 mho/m; ε_r = 46.983; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(3.88, 3.88, 3.88); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.99 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.196 mW/g
SAR(1 g) = 0.857 mW/g; SAR(10 g) = 0.226 mW/g
Maximum value of SAR (measured) = 1.85 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 2.693 mW/g
SAR(1 g) = 0.653 mW/g; SAR(10 g) = 0.214 mW/g
Maximum value of SAR (measured) = 1.33 mW/g



0 dB = 1.99 mW/g = 5.97 dB mW/g

Date: 2012/9/25

Laptop mode_WLAN802.11a 5.8G_CH149

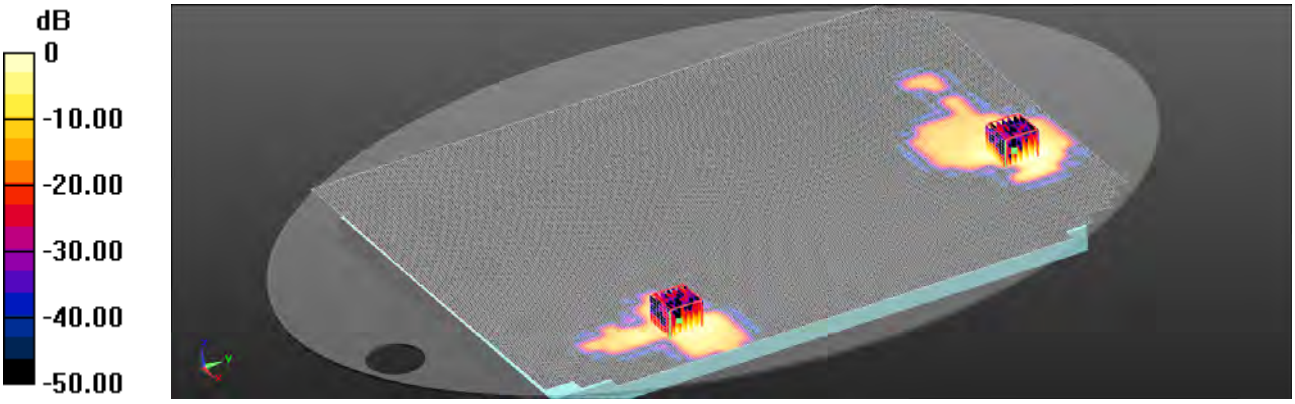
Communication System: WLAN 5G (FCC); Frequency: 5745 MHz
Medium parameters used: f = 5745 MHz; σ = 6.107 mho/m; ε_r = 46.652; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(3.87, 3.87, 3.87); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.32 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 2.683 mW/g
SAR(1 g) = 0.672 mW/g; SAR(10 g) = 0.219 mW/g
Maximum value of SAR (measured) = 1.37 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 2.156 mW/g
SAR(1 g) = 0.548 mW/g; SAR(10 g) = 0.143 mW/g
Maximum value of SAR (measured) = 1.16 mW/g



0 dB = 1.32 mW/g = 2.40 dB mW/g

Date: 2012/9/25

Laptop mode_WLAN802.11a 5.8G_CH157

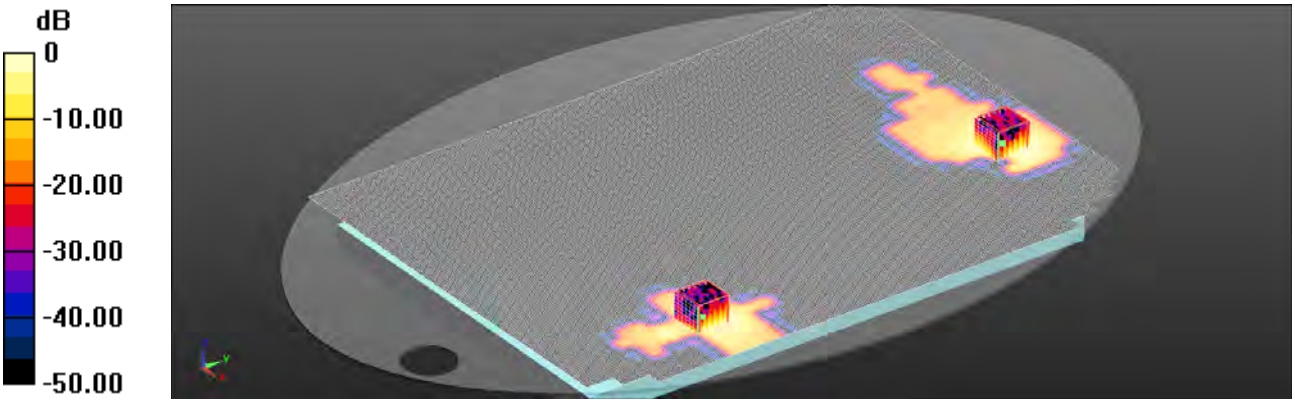
Communication System: WLAN 5G (FCC); Frequency: 5785 MHz
Medium parameters used: f = 5785 MHz; σ = 6.174 mho/m; ε_r = 46.545; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(3.87, 3.87, 3.87); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.91 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.828 mW/g
SAR(1 g) = 0.974 mW/g; SAR(10 g) = 0.314 mW/g
Maximum value of SAR (measured) = 1.97 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 2.845 mW/g
SAR(1 g) = 0.710 mW/g; SAR(10 g) = 0.183 mW/g
Maximum value of SAR (measured) = 1.51 mW/g



0 dB = 1.91 mW/g = 5.64 dB mW/g

Date: 2012/9/25

Laptop mode_WLAN802.11a 5.8G_CH165

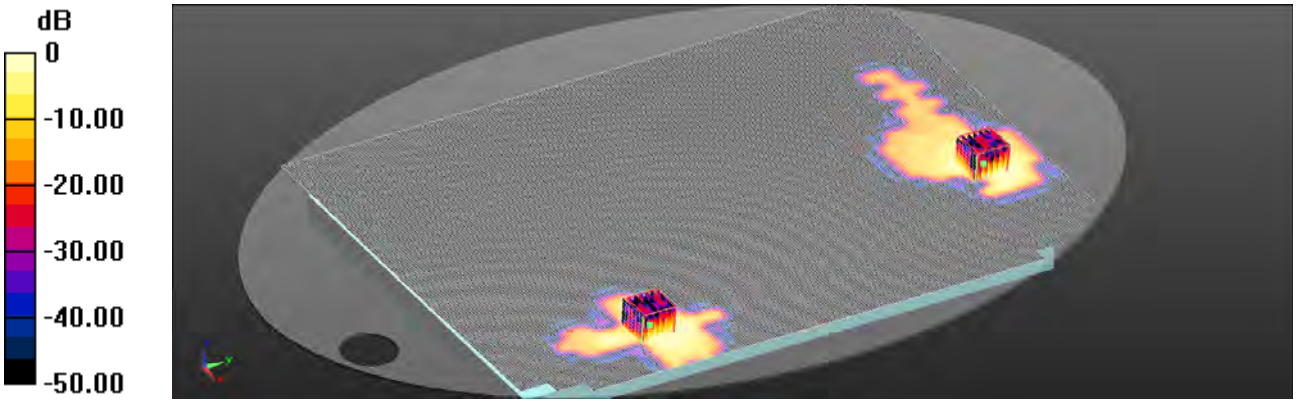
Communication System: WLAN 5G (FCC); Frequency: 5825 MHz
Medium parameters used: f = 5825 MHz; σ = 6.212 mho/m; ε_r = 46.334; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(3.87, 3.87, 3.87); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.60 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 2.861 mW/g
SAR(1 g) = 0.709 mW/g; SAR(10 g) = 0.186 mW/g
Maximum value of SAR (measured) = 1.52 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.295 mW/g
SAR(1 g) = 0.809 mW/g; SAR(10 g) = 0.260 mW/g
Maximum value of SAR (measured) = 1.67 mW/g



0 dB = 1.60 mW/g = 4.08 dB mW/g

Date: 2012/9/25

Laptop mode_WLAN802.11n(20M) 5.8G_CH149

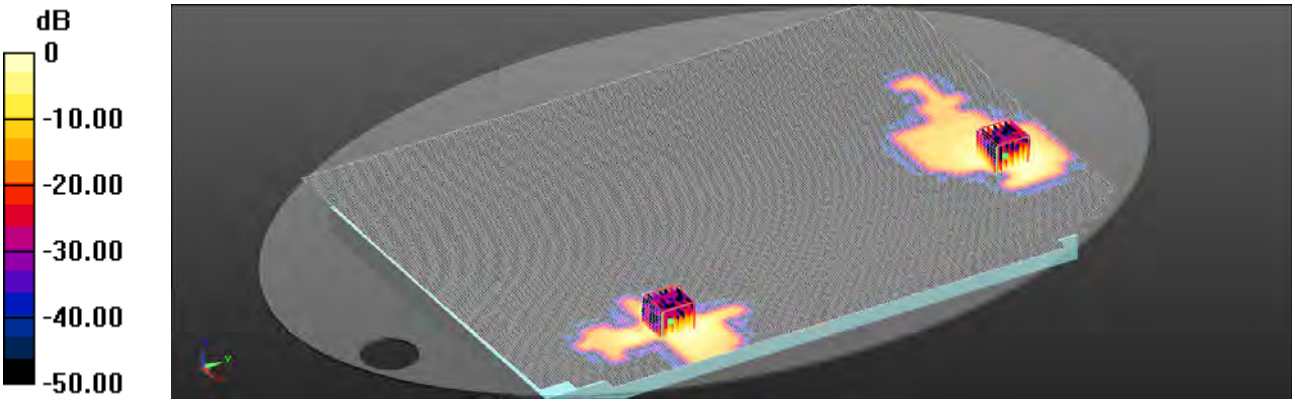
Communication System: WLAN 5G (FCC); Frequency: 5745 MHz
Medium parameters used: f = 5745 MHz; σ = 6.107 mho/m; ε_r = 46.652; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(3.87, 3.87, 3.87); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.57 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 2.663 mW/g
SAR(1 g) = 0.677 mW/g; SAR(10 g) = 0.180 mW/g
Maximum value of SAR (measured) = 1.43 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 2.997 mW/g
SAR(1 g) = 0.757 mW/g; SAR(10 g) = 0.249 mW/g
Maximum value of SAR (measured) = 1.55 mW/g



0 dB = 1.57 mW/g = 3.93 dB mW/g

Date: 2012/9/25

Laptop mode_WLAN802.11n(20M) 5.8G_CH157

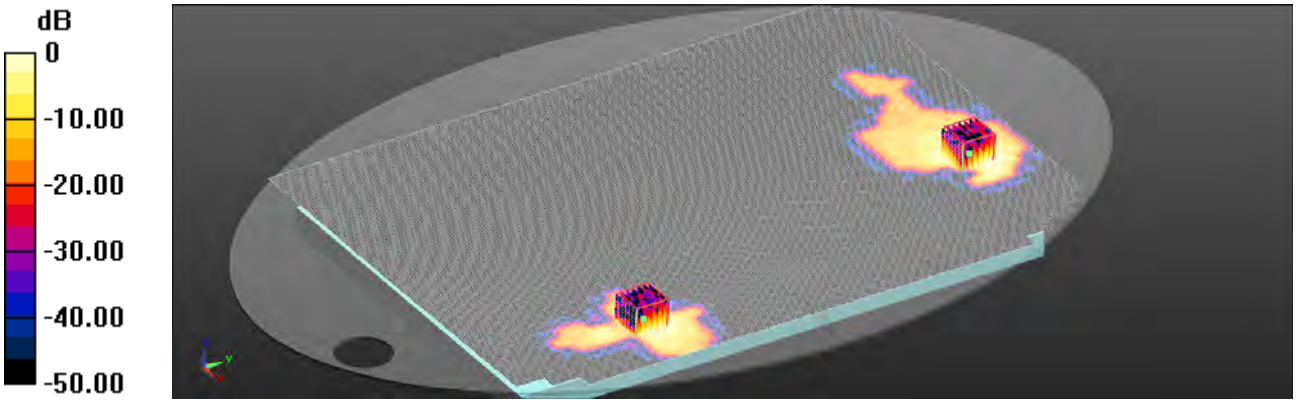
Communication System: WLAN 5G (FCC); Frequency: 5785 MHz
Medium parameters used: f = 5785 MHz; σ = 6.174 mho/m; ε_r = 46.545; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(3.87, 3.87, 3.87); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.66 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.490 mW/g
SAR(1 g) = 0.861 mW/g; SAR(10 g) = 0.281 mW/g
Maximum value of SAR (measured) = 1.75 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 2.428 mW/g
SAR(1 g) = 0.595 mW/g; SAR(10 g) = 0.160 mW/g
Maximum value of SAR (measured) = 1.25 mW/g



0 dB = 1.66 mW/g = 4.40 dB mW/g

Date: 2012/9/25

Laptop mode_WLAN802.11n(20M) 5.8G_CH165

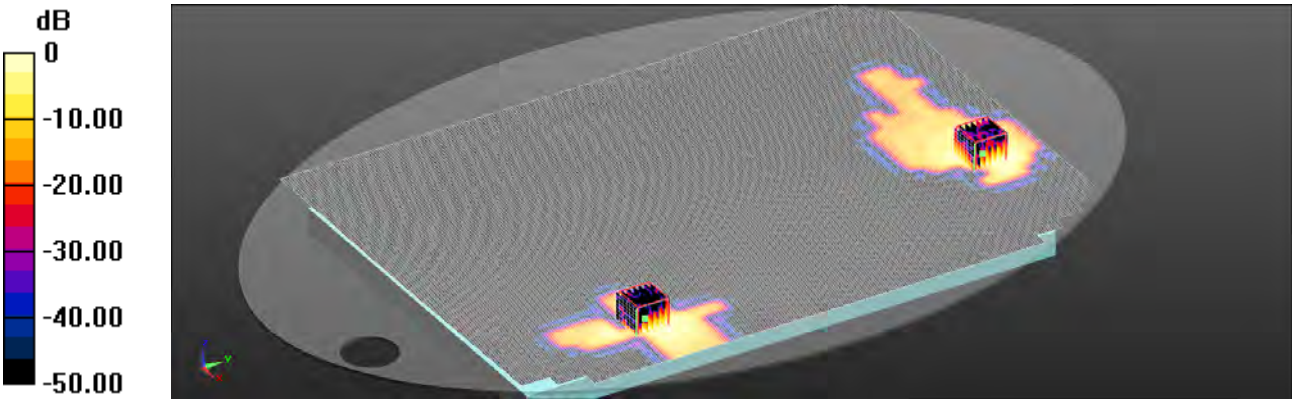
Communication System: WLAN 5G (FCC); Frequency: 5825 MHz
Medium parameters used: f = 5825 MHz; σ = 6.212 mho/m; ε_r = 46.334; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(3.87, 3.87, 3.87); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.37 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 2.713 mW/g
SAR(1 g) = 0.689 mW/g; SAR(10 g) = 0.223 mW/g
Maximum value of SAR (measured) = 1.37 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 5.487 mW/g
SAR(1 g) = 0.552 mW/g; SAR(10 g) = 0.138 mW/g
Maximum value of SAR (measured) = 1.19 mW/g



0 dB = 1.37 mW/g = 2.71 dB mW/g

Date: 2012/9/25

Laptop mode_WLAN802.11n(40M) 5.8G_CH151

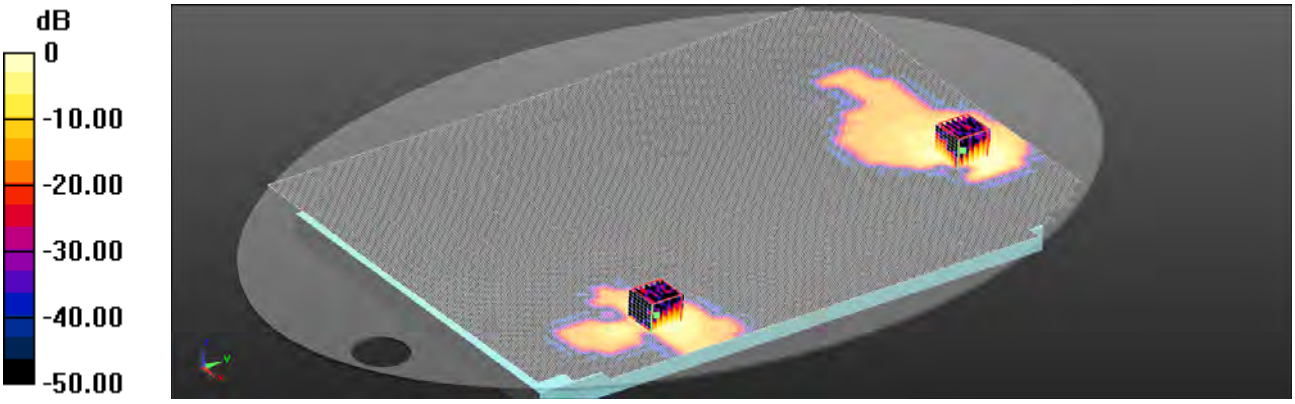
Communication System: WLAN 5G (FCC); Frequency: 5755 MHz
Medium parameters used: f = 5755 MHz; σ = 6.125 mho/m; ε_r = 46.681; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(3.87, 3.87, 3.87); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.81 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.566 mW/g
SAR(1 g) = 0.911 mW/g; SAR(10 g) = 0.300 mW/g
Maximum value of SAR (measured) = 1.87 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 2.337 mW/g
SAR(1 g) = 0.607 mW/g; SAR(10 g) = 0.159 mW/g
Maximum value of SAR (measured) = 1.29 mW/g



0 dB = 1.81 mW/g = 5.15 dB mW/g

Date: 2012/9/25

Laptop mode_WLAN802.11n(40M) 5.8G_CH159

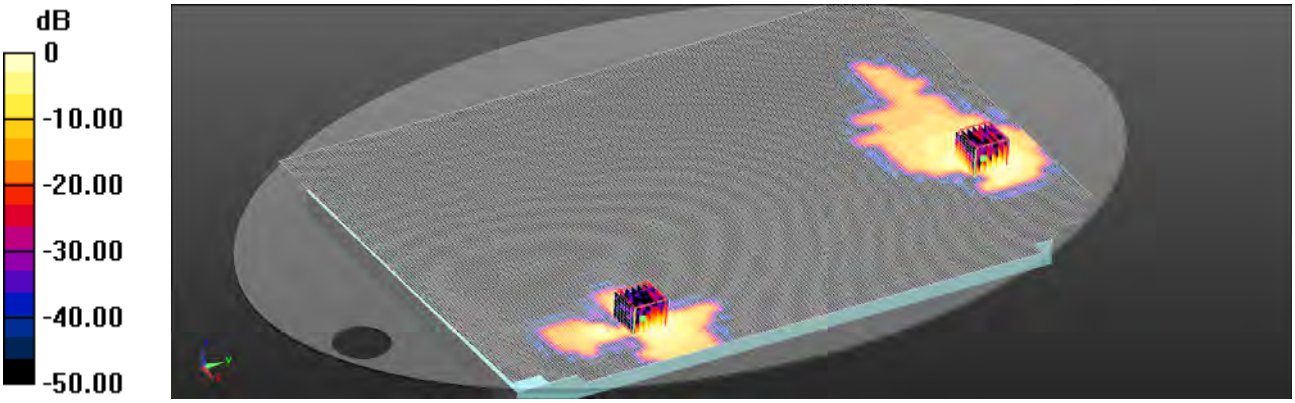
Communication System: WLAN 5G (FCC); Frequency: 5795 MHz
Medium parameters used: f = 5795 MHz; σ = 6.184 mho/m; ε_r = 46.482; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(3.87, 3.87, 3.87); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Configuration/Lap-held/Area Scan (301x421x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.56 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.119 mW/g
SAR(1 g) = 0.804 mW/g; SAR(10 g) = 0.268 mW/g
Maximum value of SAR (measured) = 1.62 mW/g

Configuration/Lap-held/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 2.015 mW/g
SAR(1 g) = 0.534 mW/g; SAR(10 g) = 0.141 mW/g
Maximum value of SAR (measured) = 1.17 mW/g



0 dB = 1.56 mW/g = 3.89 dB mW/g

5. SAR System Performance Verification

Date: 2012/9/20

Dipole 2450 MHz (Body)

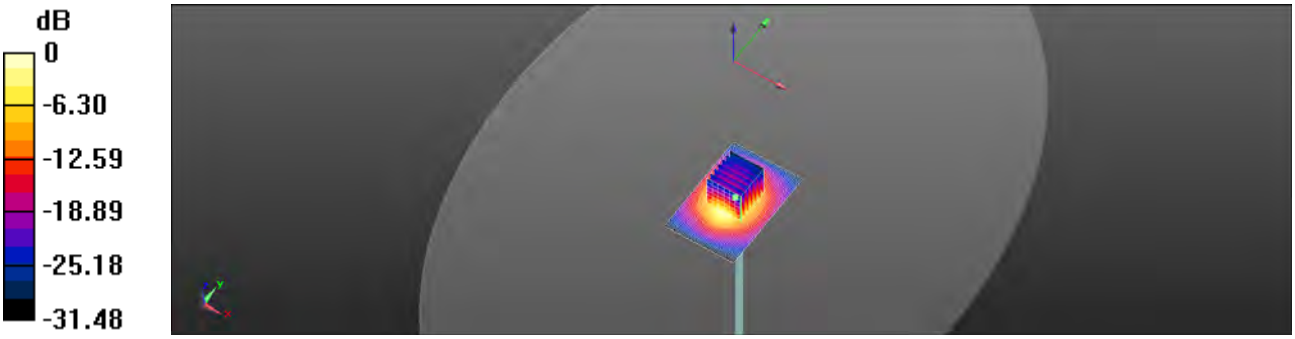
Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.963 mho/m; ε_r = 54.045; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(6.95, 6.95, 6.95); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Verification/Pin=250mW, d=10mm/Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 19.9 mW/g

Verification/Pin=250mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 97.839 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 26.544 mW/g

SAR(1 g) = 12.5 mW/g; SAR(10 g) = 5.75 mW/g
Maximum value of SAR (measured) = 19.2 mW/g



0 dB = 19.9 mW/g = 25.99 dB mW/g

Date: 2012/9/19

Dipole 5.2 GHz (Body)

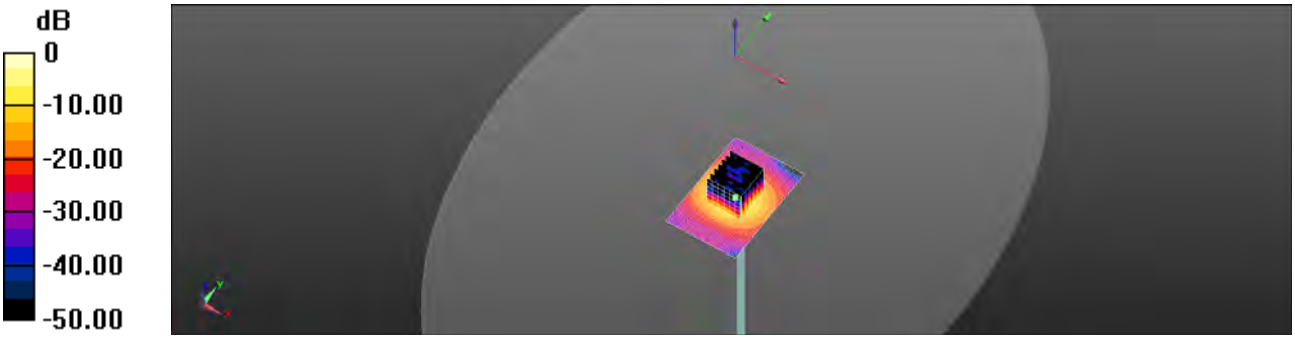
Communication System: CW; Frequency: 5200 MHz
Medium parameters used: f = 5200 MHz; σ = 5.337 mho/m; ε_r = 48.522; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(4.4, 4.4, 4.4); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Verification/Pin=100mW, d=10mm/Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 15.8 mW/g

Verification/Pin=100mW, d=10mm/Zoom Scan (7x7x9)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 59.167 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 31.857 mW/g

SAR(1 g) = 7.56 mW/g; SAR(10 g) = 2.10 mW/g
Maximum value of SAR (measured) = 15.9 mW/g



0 dB = 15.8 mW/g = 23.96 dB mW/g

Date: 2012/9/20

Dipole 5.2 GHz (Body)

Communication System: CW; Frequency: 5200 MHz
Medium parameters used: f = 5200 MHz; σ = 5.299 mho/m; ε_r = 48.322; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

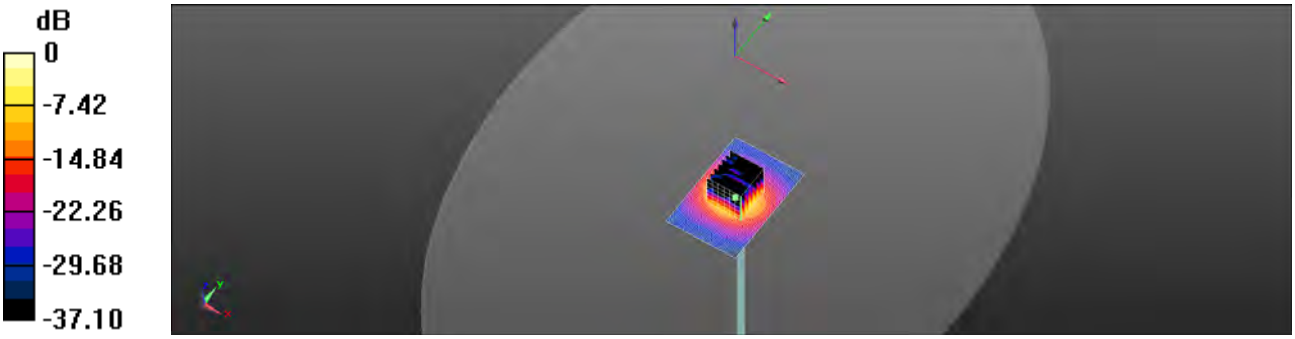
- Probe: EX3DV4 - SN3848; ConvF(4.4, 4.4, 4.4); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Verification/Pin=100mW, d=10mm/Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 15.7 mW/g

Verification/Pin=100mW, d=10mm/Zoom Scan (7x7x9)/Cube 0:

Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 60.091 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 31.356 mW/g

SAR(1 g) = 7.55 mW/g; SAR(10 g) = 2.09 mW/g
Maximum value of SAR (measured) = 15.7 mW/g



0 dB = 15.7 mW/g = 23.93 dB mW/g

Date: 2012/9/21

Dipole 5.5 GHz (Body)

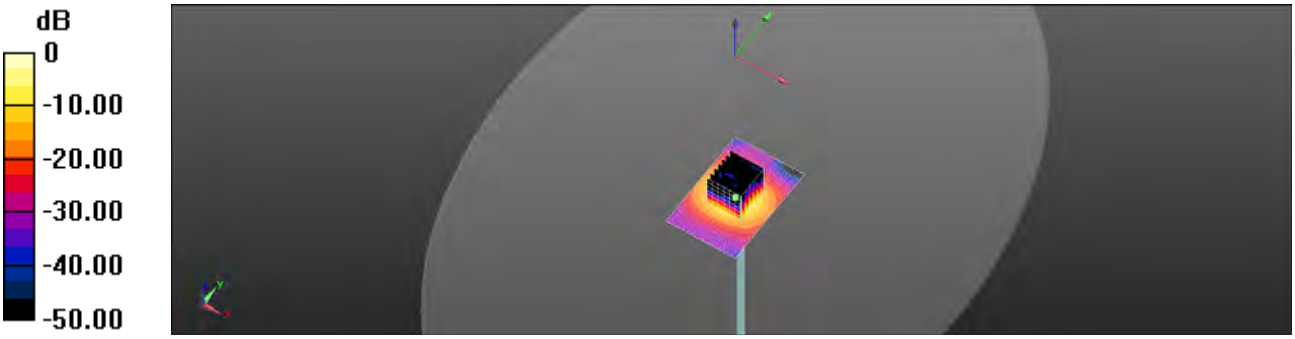
Communication System: CW; Frequency: 5500 MHz
Medium parameters used: f = 5500 MHz; σ = 5.75 mho/m; ε_r = 47.205; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(3.88, 3.88, 3.88); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Verification/Pin=100mW, d=10mm/Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 16.6 mW/g

Verification/Pin=100mW, d=10mm/Zoom Scan (7x7x9)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 59.443 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 36.376 mW/g

SAR(1 g) = 7.91 mW/g; SAR(10 g) = 2.16 mW/g
Maximum value of SAR (measured) = 16.6 mW/g



0 dB = 16.6 mW/g = 24.42 dB mW/g

Date: 2012/9/23

Dipole 5.5 GHz (Body)

Communication System: CW; Frequency: 5500 MHz
Medium parameters used: f = 5500 MHz; σ = 5.757 mho/m; ε_r = 47.595; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(3.88, 3.88, 3.88); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

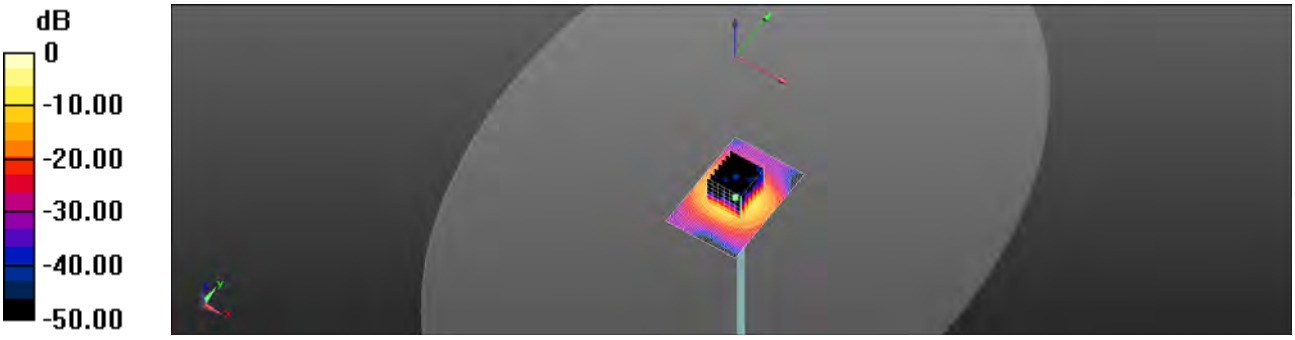
Verification/Pin=100mW, d=10mm 2/Area Scan (41x61x1):

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 16.6 mW/g

Verification/Pin=100mW, d=10mm 2/Zoom Scan (7x7x9)/Cube 0:

Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 58.992 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 35.800 mW/g

SAR(1 g) = 7.85 mW/g; SAR(10 g) = 2.14 mW/g
Maximum value of SAR (measured) = 16.4 mW/g



0 dB = 16.6 mW/g = 24.39 dB mW/g

Date: 2012/9/25

Dipole 5.8 GHz (Body)

Communication System: CW; Frequency: 5800 MHz
Medium parameters used: f = 5800 MHz; σ = 6.19 mho/m; ε_r = 46.45; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3848; ConvF(3.87, 3.87, 3.87); Calibrated: 2012/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2012/6/5
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1141
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

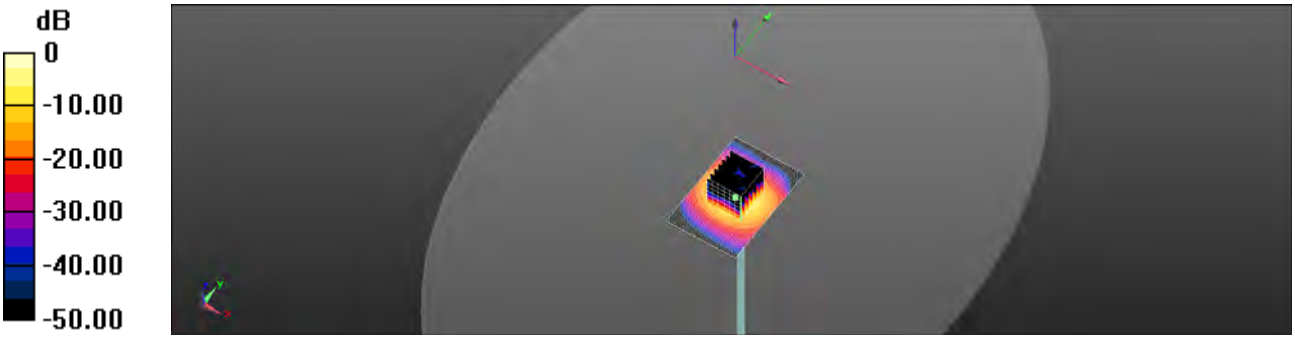
Verification/Pin=100mW, d=10mm 3/Area Scan (41x61x1):

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 15.4 mW/g

Verification/Pin=100mW, d=10mm 3/Zoom Scan (7x7x9)/Cube 0:

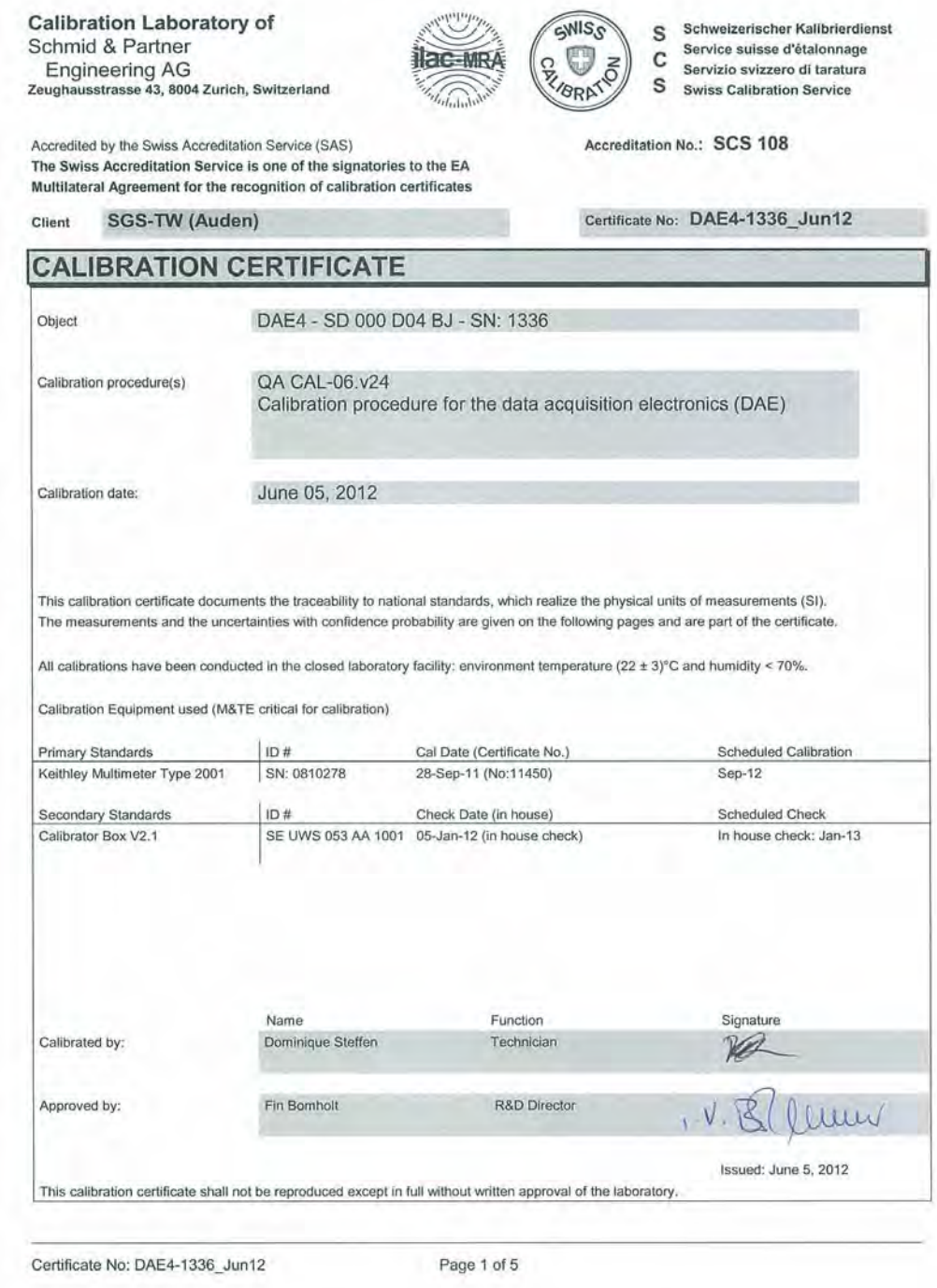
Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 56.323 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 34.539 mW/g

SAR(1 g) = 7.27 mW/g; SAR(10 g) = 1.98 mW/g
Maximum value of SAR (measured) = 15.4 mW/g



0 dB = 15.4 mW/g = 23.77 dB mW/g

6. DAE & Probe Calibration Certificate



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Accreditation No.: SCS 108

Client: SGS-TW (Auden)

Certificate No: DAE4-1336_Jun12

CALIBRATION CERTIFICATE

Object: DAE4 - SD 000 D04 BJ - SN: 1336

Calibration procedure(s): QA CAL-06.v24
Calibration procedure for the data acquisition electronics (DAE)

Calibration date: June 05, 2012

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
Keithley Multimeter Type 2001	SN: 0810278	28-Sep-11 (No:11450)	Sep-12
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Calibrator Box V2.1	SE UWS 053 AA 1001	05-Jan-12 (in house check)	In house check: Jan-13

	Name	Function	Signature
Calibrated by:	Dominique Steffen	Technician	
Approved by:	Fin Bomholt	R&D Director	

Issued: June 5, 2012

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Certificate No: DAE4-1336_Jun12 Page 1 of 5

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Accreditation No.: SCS 108

Glossary

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
  - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
  - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
  - *Input Offset Measurement*: Output voltage and statistical results over a large number of zero voltage measurements.
  - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - *Input resistance:* Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
  - *Power consumption:* Typical value for information. Supply currents in various operating modes.

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range:	1LSB =	6.1μV ,	full range =	-100...+300 mV
Low Range:	1LSB =	61nV ,	full range =	-1.....+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	403.371 ± 0.1% (k=2)	403.127 ± 0.1% (k=2)	403.194 ± 0.1% (k=2)
Low Range	3.96695 ± 0.7% (k=2)	3.96890 ± 0.7% (k=2)	3.99405 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	122.5 ° ± 1 °

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Appendix

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	199994.11	-3.29	-0.00
Channel X	+ Input	20001.83	0.90	0.00
Channel X	- Input	-19999.76	0.45	-0.00
Channel Y	+ Input	199997.52	0.39	0.00
Channel Y	+ Input	19998.61	-2.15	-0.01
Channel Y	- Input	-20001.36	-1.00	0.00
Channel Z	+ Input	199993.95	-3.37	-0.00
Channel Z	+ Input	19998.98	-1.78	-0.01
Channel Z	- Input	-20001.47	-0.97	0.00

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	2002.07	0.90	0.04
Channel X	+ Input	202.26	0.62	0.31
Channel X	- Input	-197.79	0.45	-0.23
Channel Y	+ Input	2001.57	0.59	0.03
Channel Y	+ Input	201.46	-0.01	-0.01
Channel Y	- Input	-198.80	-0.34	0.17
Channel Z	+ Input	2001.54	0.51	0.03
Channel Z	+ Input	200.53	-1.00	-0.50
Channel Z	- Input	-199.57	-1.21	0.61

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	5.99	4.73
	- 200	-3.24	-5.13
Channel Y	200	4.30	4.27
	- 200	-5.85	-5.85
Channel Z	200	8.94	9.05
	- 200	-12.06	-12.09

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	6.36	-0.99
Channel Y	200	9.20	-	7.23
Channel Z	200	8.41	6.54	-

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4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	15917	15922
Channel Y	15876	15535
Channel Z	15842	16395

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	1.30	-0.23	2.19	0.37
Channel Y	-0.29	-1.58	1.23	0.56
Channel Z	-2.08	-3.18	-0.96	0.49

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	-0.01	-8	-9

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Accreditation No.: SCS 108

Client SGS-TW (Auden) **Certificate No: EX3-3848_Jun12**

CALIBRATION CERTIFICATE

Object EX3DV4 - SN:3848

Calibration procedure(s) QA CAL-01.v8, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes

Calibration date: June 4, 2012

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 E4419B	GB41293874	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Reference 30 dB Attenuator	SN: S5129 (30b)	27-Mar-12 (No. 217-01532)	Apr-13
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 660	10-Jan-12 (No. DAE4-660_Jan12)	Jan-13
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

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

Issued: June 5, 2012

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Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe EX3DV4

SN:3848

Manufactured: October 25, 2011
Calibrated: June 4, 2012

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3848

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.35	0.40	0.45	± 10.1 %
DCP (mV)[B]	105.4	102.1	99.4	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
0	CW	0.00	X	0.00	0.00	1.00	177.0	±3.5 %
			Y	0.00	0.00	1.00	188.5	
			Z	0.00	0.00	1.00	199.4	

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 NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[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.

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t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
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DASY/EASY - Parameters of Probe: EX3DV4 - SN:3848

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	Depth (mm)	Unct. (k=2)
750	41.9	0.89	9.19	9.19	9.19	0.38	0.93	± 12.0 %
835	41.5	0.90	8.90	8.90	8.90	0.35	1.03	± 12.0 %
900	41.5	0.97	8.73	8.73	8.73	0.28	1.15	± 12.0 %
1750	40.1	1.37	7.82	7.82	7.82	0.80	0.55	± 12.0 %
1900	40.0	1.40	7.55	7.55	7.55	0.29	0.88	± 12.0 %
2000	40.0	1.40	7.54	7.54	7.54	0.41	0.74	± 12.0 %
2300	39.5	1.67	7.15	7.15	7.15	0.35	0.75	± 12.0 %
2450	39.2	1.80	6.78	6.78	6.78	0.53	0.66	± 12.0 %
2600	39.0	1.96	6.62	6.62	6.62	0.29	0.99	± 12.0 %
5200	36.0	4.66	5.24	5.24	5.24	0.30	1.80	± 13.1 %
5300	35.9	4.76	4.99	4.99	4.99	0.32	1.80	± 13.1 %
5600	35.5	5.07	4.85	4.85	4.85	0.30	1.80	± 13.1 %
5800	35.3	5.27	4.65	4.65	4.65	0.40	1.80	± 13.1 %

[C] Frequency validity 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.
[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.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3848

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	9.24	9.24	9.24	0.34	0.99	± 12.0 %
835	55.2	0.97	9.11	9.11	9.11	0.54	0.76	± 12.0 %
900	55.0	1.05	8.99	8.99	8.99	0.29	1.13	± 12.0 %
1750	53.4	1.49	7.48	7.48	7.48	0.38	0.88	± 12.0 %
1900	53.3	1.52	7.28	7.28	7.28	0.39	0.83	± 12.0 %
2000	53.3	1.52	7.42	7.42	7.42	0.28	1.01	± 12.0 %
2300	52.9	1.81	7.10	7.10	7.10	0.46	0.74	± 12.0 %
2450	52.7	1.95	6.95	6.95	6.95	0.80	0.50	± 12.0 %
2600	52.5	2.16	6.74	6.74	6.74	0.80	0.54	± 12.0 %
5200	49.0	5.30	4.40	4.40	4.40	0.50	1.90	± 13.1 %
5300	48.9	5.42	4.17	4.17	4.17	0.50	1.90	± 13.1 %
5600	48.5	5.77	3.88	3.88	3.88	0.50	1.90	± 13.1 %
5800	48.2	6.00	3.87	3.87	3.87	0.60	1.90	± 13.1 %

[C] Frequency validity 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.
[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.

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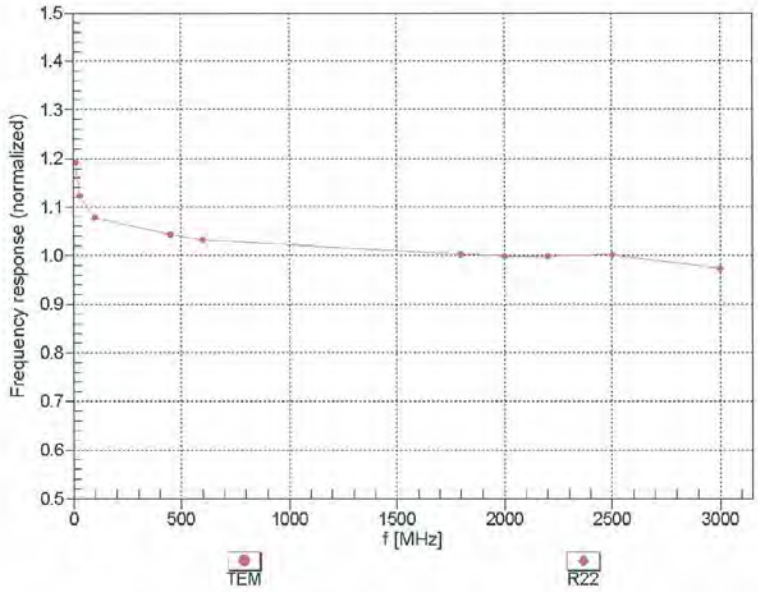
EX3DV4– SN:3848 June 4, 2012

Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

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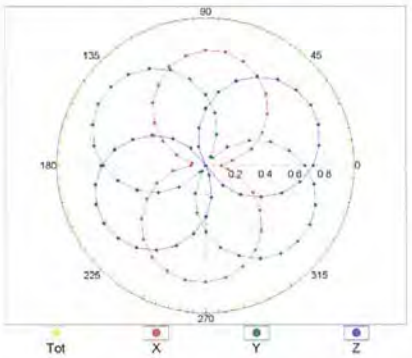
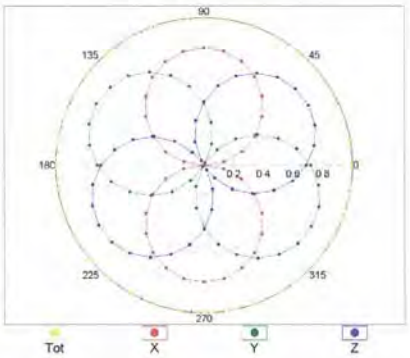
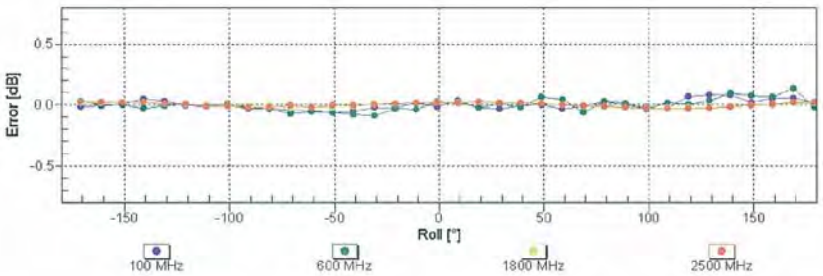
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22





Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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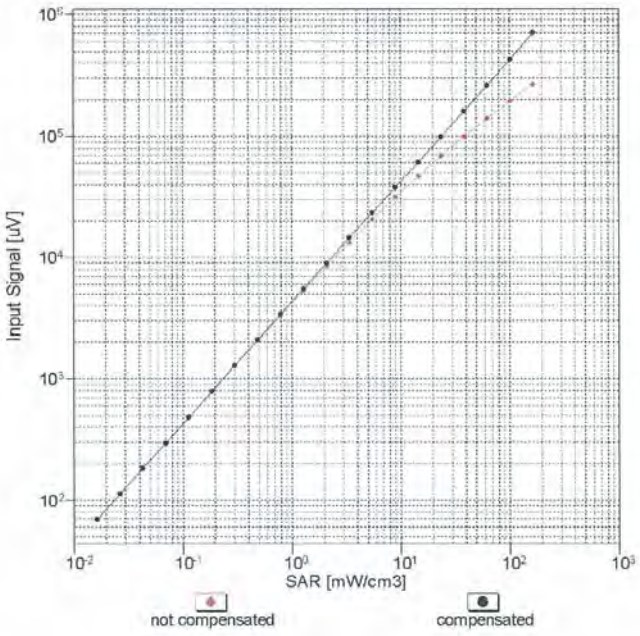
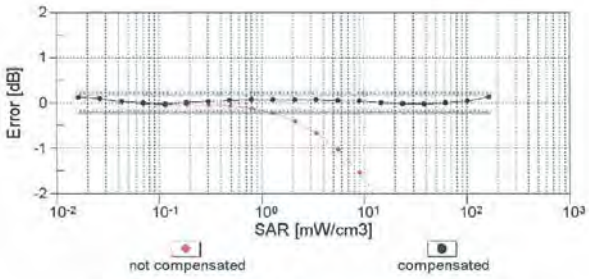
Dynamic Range f(SAR$_{head}$)
(TEM cell , f = 900 MHz)



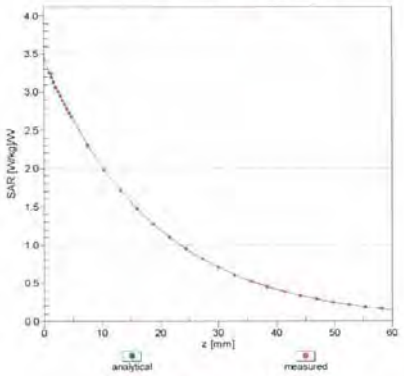


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

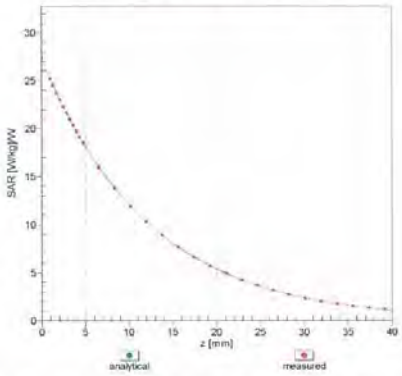
EX3DV4– SN:3848 June 4, 2012

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

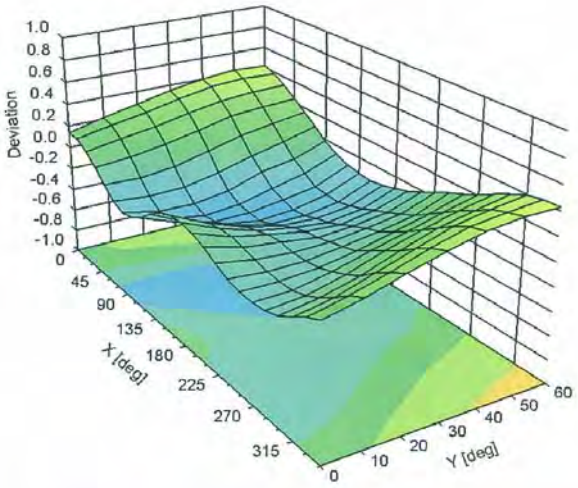


f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

Certificate No: EX3-3848_Jun12 Page 10 of 11

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3848

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	59
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

7. Uncertainty Budget

Measurement Uncertainty evaluation template for DUT SAR test
IEEE 1528

A	c	D	e		f	g	h=c * f / e	i=c * g / e	k
Source of Uncertainty	Tolerance/ Uncertaint	Probabilit y	Div	Div Value	ci (1g)	ci (10g)	Standard uncertainty	Standard uncertainty	vi, or Veff
Measurement system									
Probe calibration	6.55%	N	1	1	1	1	6.55%	6.55%	∞
Isotropy , Axial	3.50%	R	√3	1.732	1	1	2.02%	2.02%	∞
Isotropy, Hemispherical	9.60%	R	√3	1.732	1	1	5.54%	5.54%	∞
Boundary Effect	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Linearity	4.70%	R	√3	1.732	1	1	2.71%	2.71%	∞
Detection Limits	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Readout Electronics	0.30%	N	1	1	1	1	0.30%	0.30%	∞
Response time	0.80%	R	√3	1.732	1	1	0.46%	0.46%	∞
Integration Time	2.60%	R	√3	1.732	1	1	1.50%	1.50%	∞
Measurement drift (class A	1.75%	R	√3	1.732	1	1	1.01%	1.01%	∞
RF ambient condition - noise	3.00%	R	√3	1.732	1	1	1.73%	1.73%	∞
RF ambient conditions -	3.00%	R	√3	1.732	1	1	1.73%	1.73%	∞
Probe positioner Mechanical	0.40%	R	√3	1.732	1	1	0.23%	0.23%	∞
Probe Positioning with respect to	2.90%	R	√3	1.732	1	1	1.67%	1.67%	∞
Post-processing	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Max SAR Eval	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Test Sample related									
Test sample positioning	2.90%	N	1	1	1	1	2.90%	2.90%	M-1
Device Holder Uncertainty	3.60%	N	1	1	1	1	3.60%	3.60%	M-1
Drift of output power	5.00%	R	√3	1.732	1	1	2.89%	2.89%	∞
Phantom and Setup									
Phantom Uncertainty	4.00%	R	√3	1.732	1	1	2.31%	2.31%	∞
Liquid conductivity(meas.) Max at 5200 band	4.31%	N	1	1	0.64	0.43	2.76%	1.85%	M
Liquid permitivity(meas.) Max at 5500 band	3.72%	N	1	1	0.6	0.49	2.23%	1.82%	M
Combined standard uncertainty		RSS					12.10%	11.86%	
Expant uncertainty (95% confidence							24.20%	23.72%	

8. Phantom Description

Schmid & Partner Engineering AG

s p e a g

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

Certificate of Conformity / First Article Inspection

Item	SAM Twin Phantom V4.0
Type No	QD 000 P40 C
Series No	TP-1150 and higher
Manufacturer	SPEAG Zeughausstrasse 43 CH-8004 Zürich Switzerland

Tests
The series production process used allows the limitation to test of first articles.
Complete tests were made on the pre-series Type No. QD 000 P40 AA, Serial No. TP-1001 and on the series first article Type No. QD 000 P40 BA, Serial No. TP-1005. Certain parameters have been retested using further series items (called samples) or are tested at each item.

Test	Requirement	Details	Units tested
Dimensions	Compliant with the geometry according to the CAD model	IT'IS CAD File (*)	First article, Samples
Material thickness of shell	Compliant with the requirements according to the standards	2mm +/- 0.2mm in flat and specific areas of head section	First article, Samples, TP-1314 ff.
Material thickness at ERP	Compliant with the requirements according to the standards	6mm +/- 0.2mm at ERP	First article, All items
Material parameters	Dielectric parameters for required frequencies	300 MHz – 6 GHz: Relative permittivity < 5, Loss tangent < 0.05	Material samples
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards if handled and cleaned according to the instructions. Observe technical Note for material compatibility.	DEGMBE based simulating liquids	Pre-series, First article, Material samples
Sagging	Compliant with the requirements according to the standards. Sagging of the flat section when filled with tissue simulating liquid.	< 1% typical < 0.8% if filled with 155mm of HSL900 and without CUT below	Prototypes, Sample testing

Standards
[1] CENELEC EN 50361
[2] IEEE Std 1528-2003
[3] IEC 62209 Part I
[4] FCC OET Bulletin 65, Supplement C, Edition 01-01
(*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of the other documents.

Conformity
Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of SAR measurements specified in standards [1] to [4].

Date 07.07.2005

Signature / Stamp

s p e a g
Schmid & Partner Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

Doc No MT-QD 000 P40 C-F Page 1 (1)

9. System Validation from Original Equipment Supplier

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client SGS-TW (Auden)

Certificate No: D2450V2-727_Apr12

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 727
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	April 25, 2012

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 EPM-442A	GB37480704	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.2 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

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

Issued: April 25, 2012

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

Certificate No: D2450V2-727_Apr12 Page 1 of 8

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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%.

Measurement Conditions

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

DASY Version	DASY5	V52.8.1
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.6 ± 6 %	1.81 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	12.8 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**51.2 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.95 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**23.8 mW /g ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.4 ± 6 %	1.98 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.7 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**50.4 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.92 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**23.6 mW / g ± 16.5 % (k=2)**

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.6 Ω + 2.8 jΩ
Return Loss	- 27.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	51.3 Ω + 3.9 jΩ
Return Loss	- 27.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.149 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	January 09, 2003

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DASY5 Validation Report for Head TSL

Date: 25.04.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 727

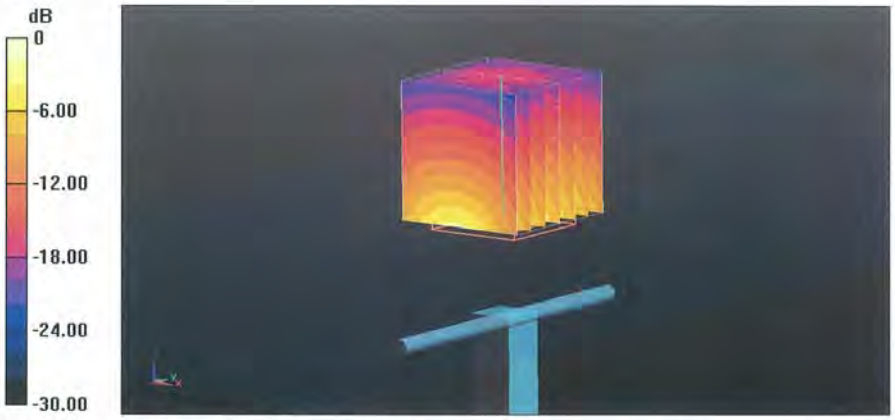
Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.81 mho/m; ε_r = 39.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.45, 4.45, 4.45); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 98.712 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 26.388 mW/g
SAR(1 g) = 12.8 mW/g; SAR(10 g) = 5.95 mW/g
Maximum value of SAR (measured) = 16.4 mW/g



0 dB = 16.4 mW/g = 24.30 dB mW/g

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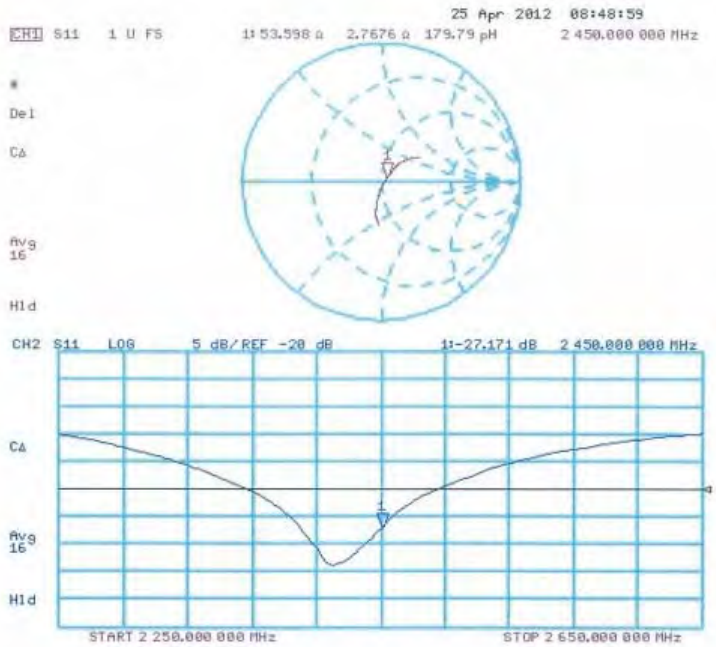
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL

Date: 25.04.2012

Test Laboratory: SPEAG, Zurich, Switzerland

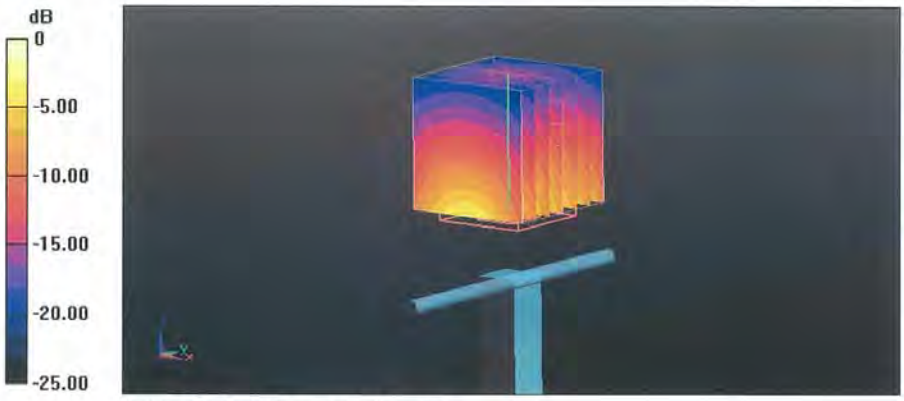
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 727

Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.98 mho/m; ε_r = 52.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.26, 4.26, 4.26); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.136 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 25.811 mW/g
SAR(1 g) = 12.7 mW/g; SAR(10 g) = 5.92 mW/g
Maximum value of SAR (measured) = 16.7 mW/g



0 dB = 16.7 mW/g = 24.45 dB mW/g

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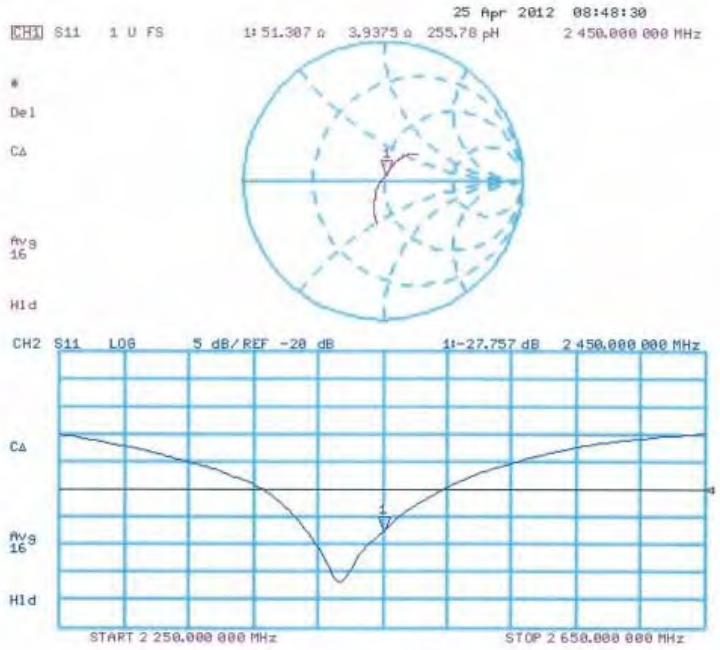
Impedance Measurement Plot for Body TSL



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Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: **SCS 108**

Client **SGS-TW (Auden)**

Certificate No: **D5GHzV2-1104_Apr12**

CALIBRATION CERTIFICATE

Object	D5GHzV2 - SN: 1104
Calibration procedure(s)	QA CAL-22.v1 Calibration procedure for dipole validation kits between 3-6 GHz
Calibration date:	April 18, 2012

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 EPM-442A	GB37480704	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.2 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe EX3DV4	SN: 3503	30-Dec-11 (No. EX3-3503_Dec11)	Dec-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	Israe El-Naouq
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 18, 2012

Calibration Laboratory of
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Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEC 62209-2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures"; Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", March 2010

b) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

c) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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%.

Measurement Conditions

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

DASY Version	DASY5	V52.8.1
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz ± 1 MHz 5500 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.0 ± 6 %	4.52 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.22 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**81.7 mW /g ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.35 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**23.3 mW /g ± 19.5 % (k=2)**

Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.6 ± 6 %	4.80 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.54 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**84.8 mW / g ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.43 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**24.1 mW / g ± 19.5 % (k=2)**

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.1 ± 6 %	5.11 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.08 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**80.1 mW / g ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.29 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**22.7 mW / g ± 19.5 % (k=2)**

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Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.8 ± 6 %	5.41 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.41 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**73.8 mW / g ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.07 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**20.6 mW / g ± 19.5 % (k=2)**

Body TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.6	5.65 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.3 ± 6 %	5.78 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.89 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**78.5 mW / g ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.18 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**21.7 mW / g ± 19.5 % (k=2)**

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Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.8 ± 6 %	6.20 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.32 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**72.9 mW / g ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.02 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**20.1 mW / g ± 19.5 % (k=2)**

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Appendix

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	52.8 Ω - 8.7 jΩ
Return Loss	- 21.0 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	52.4 Ω - 5.4 jΩ
Return Loss	- 24.8 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	56.5 Ω - 0.3 jΩ
Return Loss	- 24.3 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	53.5 Ω - 6.6 jΩ
Return Loss	- 22.9 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	53.2 Ω - 2.6 jΩ
Return Loss	- 27.9 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	56.8 Ω + 1.9 jΩ
Return Loss	- 23.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.209 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	September 24, 2010

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DASY5 Validation Report for Head TSL

Date: 17.04.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1104

Communication System: CW; Frequency: 5200 MHz, Frequency: 5500 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 4.52 mho/m; ε_r = 35; ρ = 1000 kg/m^3 , Medium parameters used: f = 5500 MHz; σ = 4.8 mho/m; ε_r = 34.6; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 5.11 mho/m; ε_r = 34.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.41, 5.41, 5.41); Calibrated: 30.12.2011, ConvF(4.91, 4.91, 4.91); Calibrated: 30.12.2011, ConvF(4.81, 4.81, 4.81); Calibrated: 30.12.2011;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.351 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 30.800 mW/g
SAR(1 g) = 8.22 mW/g; SAR(10 g) = 2.35 mW/g
Maximum value of SAR (measured) = 19.1 mW/g

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.317 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 33.950 mW/g
SAR(1 g) = 8.54 mW/g; SAR(10 g) = 2.43 mW/g
Maximum value of SAR (measured) = 20.1 mW/g

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 61.898 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 34.138 mW/g
SAR(1 g) = 8.08 mW/g; SAR(10 g) = 2.29 mW/g
Maximum value of SAR (measured) = 19.7 mW/g

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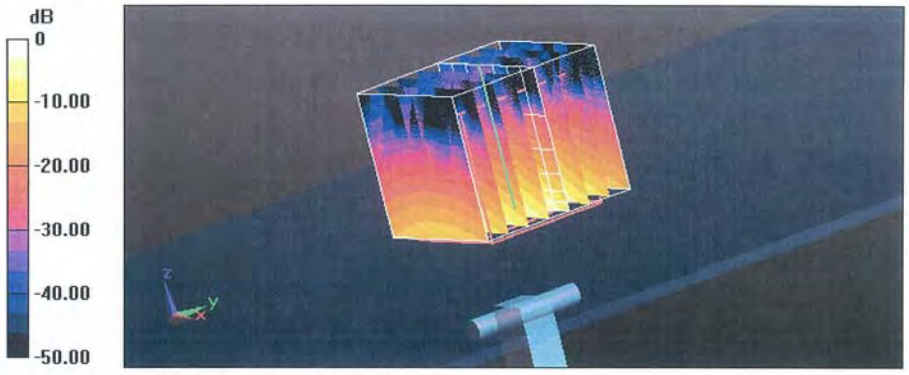

0 dB = 19.7 mW/g = 25.89 dB mW/g

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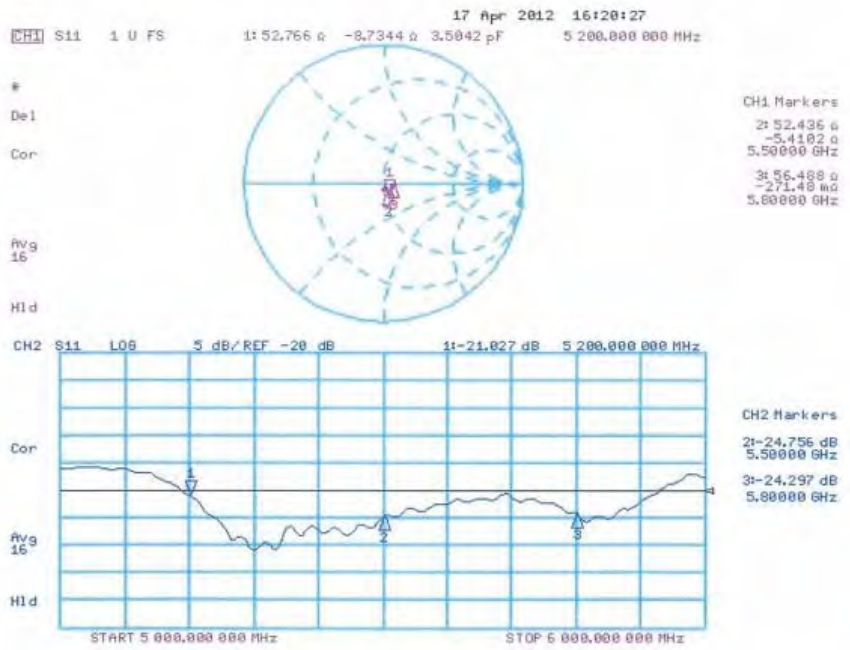
Impedance Measurement Plot for Head TSL



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t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
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DASY5 Validation Report for Body TSL

Date: 18.04.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1104

Communication System: CW; Frequency: 5200 MHz, Frequency: 5500 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 5.41 mho/m; ε_r = 47.8; ρ = 1000 kg/m^3 , Medium parameters used: f = 5500 MHz; σ = 5.78 mho/m; ε_r = 47.3; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 6.2 mho/m; ε_r = 46.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.91, 4.91, 4.91); Calibrated: 30.12.2011, ConvF(4.43, 4.43, 4.43); Calibrated: 30.12.2011, ConvF(4.38, 4.38, 4.38); Calibrated: 30.12.2011;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.557 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 29.375 mW/g
SAR(1 g) = 7.41 mW/g; SAR(10 g) = 2.07 mW/g
Maximum value of SAR (measured) = 16.9 mW/g

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.550 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 34.062 mW/g
SAR(1 g) = 7.89 mW/g; SAR(10 g) = 2.18 mW/g
Maximum value of SAR (measured) = 18.9 mW/g

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 54.767 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 34.448 mW/g
SAR(1 g) = 7.32 mW/g; SAR(10 g) = 2.02 mW/g
Maximum value of SAR (measured) = 18.0 mW/g

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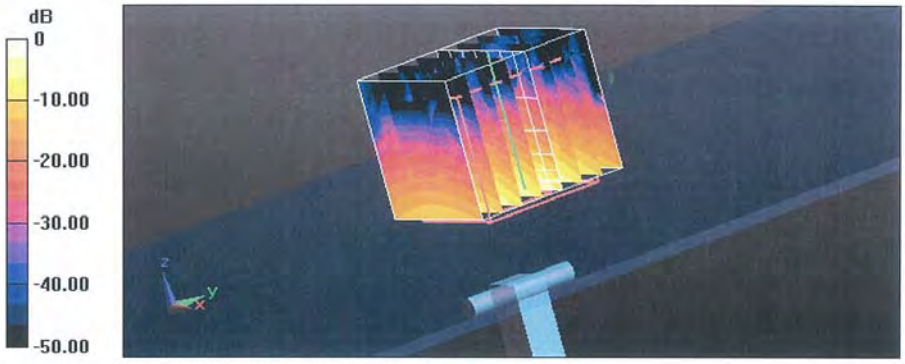

0 dB = 18.0 mW/g = 25.11 dB mW/g

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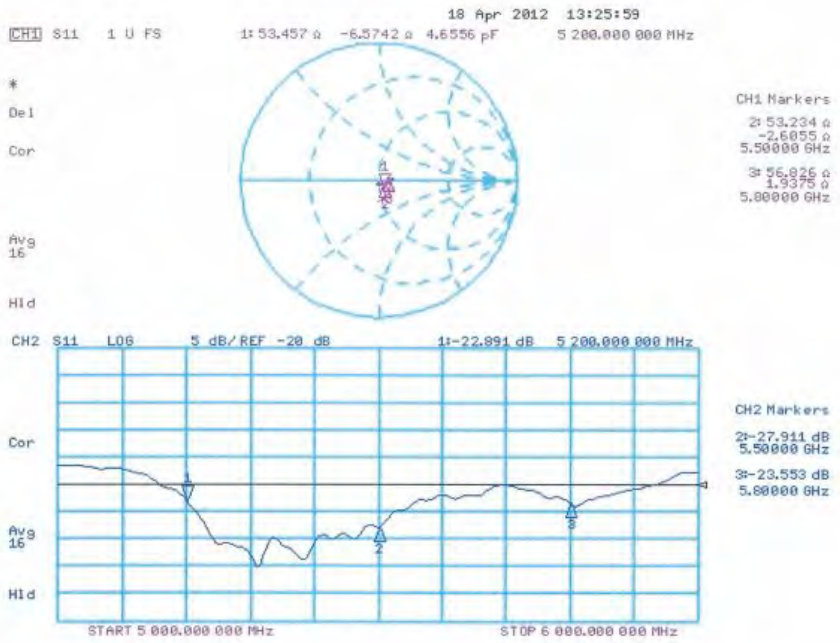
Impedance Measurement Plot for Body TSL



End of 1st part of report

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