TEST REPORT

TEST REPORT
FROM
RFI GLOBAL SERVICES LTD

Test of: Intel Centrino Advanced-N 6230, 802.11ABGN + BT Half Minicard

To: OET Bulletin 65 Supplement C: (2001-01)
RSS-102 Issue 4 March 2010

Test Report Serial No:
RFI/SAR/RP81199JD01A V4.0

Version 4.0 supersedes all previous versions

This Test Report Is Issued Under The Authority Of Chris Guy, Head of Global Approvals:	 (APPROVED SIGNATORY)
Checked By: Richelieu Quoi	 (APPROVED SIGNATORY)
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1. Customer Information

Company Name:	Samsung Electronics Co., Ltd.
Address:	416, Maetan 3-Dong Yeongtong-Gu, Suwon-City Gyeonggi-Do 443-742 South Korea

2. Equipment Under Test (EUT)

2.1. Identification of Equipment Under Test (EUT)

Description:	Intel Centrino Advanced-N 6230, 802.11ABGN + BT Half Minicard
Brand Name:	Intel
Model Name or Number:	62230ANHMW
Serial Number:	None Stated
IMEI Number:	Not Applicable
FCC ID Number:	A3L62230ANH
IC ID Number:	649E-62230ANH
Date of Receipt:	18 March 2011

2.2. Description of EUT

The Equipment Under Test is an Intel Centrino Advanced-N 6230, 802.11ABGN + BT Half Minicard test in a SAMSUNG Notebook PC, Model: NP900X3A.

2.3. Modifications Incorporated in the EUT

There were no modifications incorporated in the EUT.

2.4. Additional Information Related to Testing

Equipment Category	WiFi802.11a/b/g/n		
Type of Unit	Portable Transceiver		
Intended Operating Environment:	Within WiFi Coverage		
Transmitter Maximum Output Power Characteristics:	WiFi802.11b/g/n	EUT setup in test mode to allow the EUT to transmit at a maximum power of up to 16.5 dBm.	
	WiFi802.11a	EUT setup in test mode to allow the EUT to transmit at a maximum power of up to 16.5 dBm.	
Transmitter Frequency Range:	WiFi802.11b/g/n	(2412 to 2462) MHz	
	WiFi802.11a	(5180 to 5825) MHz	
Transmitter Frequency Allocation of EUT When Under Test:	**Channel Number**	**Channel Description**	**Frequency (MHz)**
	1	Low	2412
	6	Middle	2437
	11	High	2462
	149	Low	5745
	36	Low	5180
	52	Low	5260
	116	Middle	5580
	157	Middle	5785
	165	High	5825
Modulation(s):	CCK (WiFi): 0 Hz		
Modulation Scheme (Crest Factor):	CCK (WiFi): 1		
Antenna Type:	Internal		
Antenna Length:	Unknown		
Number of Antenna Positions:	2		
Power Supply Requirement:	None Stated		
Battery Type(s):	Li-Ion		

3. Test Specification, Methods and Procedures

3.1. Test Specification

Reference:	OET Bulletin 65 Supplement C: (2001-01)
Title:	Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.
Purpose of Test:	To determine whether the equipment met the basic restrictions as defined in OET Bulletin 65 Supplement C: (2001-01) using the SAR averaging method as described in the test specification above.
Reference:	RSS-102 Issue 4 March 2010
Title:	Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
Purpose of Test:	To determine whether the equipment met the basic restrictions as defined in RSS-102 Issue 4 March 2010 using the SAR averaging method as described in the test specification above.

3.2. Methods and Procedures Reference Documentation

The methods and procedures used were as detailed in:

Federal Communications Commission, “Evaluating compliance with FCC Guidelines for human exposure to radio frequency electromagnetic fields”, OET Bulletin 65 Supplement C, FCC, Washington, D.C, 20554, 2001.

Thomas Schmid, Oliver Egger and Neils Kuster, “Automated E-field scanning system for dosimetric assessments”, IEEE Transaction on microwave theory and techniques,
Vol. 44, pp. 105-113, January 1996.

Neils Kuster, Ralph Kastle and Thomas Schmid, “Dosimetric evaluation of mobile communications equipment with know precision”, IEICE Transactions of communications, Vol. E80-B, No.5, pp. 645-652, May 1997.

KDB 616227 D03 SAR Supplement consideration for Notebook/Netbook /Laptop and Tablet

KDB 248227 D01 SAR measurement procedures for 802.11a/b/g transmitters

3.3. Definition of Measurement Equipment

The measurement equipment used complied with the requirements of the standards referenced in the methods & procedures section above. Appendix 1 contains a list of the test equipment used.

4. Deviations from the Test Specification

Test was performed as per "KDB 616227 D03 SAR Supplement consideration for Notebook/Netbook/Laptop and Tablet, KDB 248227 D01 SAR measurement procedures for 802.11a/b/g transmitters, according to the body-worn procedures in IEEE Std 1528-2003 and OET Bulletin 65 Supplement C 01-01.

As per the FCC Public Notice DA 02-1438 by the SCC-34/SC-2 and KDB publication 447498 D01 v04, for SAR measurement performed on the middle channel with levels < 50% of the SAR limit and corresponding channel < 100 MHz, SAR evaluation on the low and high channels are not required and therefore not evaluated.

Testing on 802.11n (20 MHz & 40 MHz Channel Bandwidth) Antenna A/B 2.4 GHz and 5 GHz bands were not performed as each antenna output is 13.5 dBm which is less than 802.11b/g/a modes.

Testing on WLAN 802.11a was performed on channel 157 only, as per ''KDB 248227 D01'', ''802.11a is tested for UNII operations on channels 36 in the 5.15-5.25 GHz band; channels 52 in the 5.25-5.35 GHz band and channels 116 in the 5.470-5.725 GHz band; and channels 157 instead of UNII channels''.

SAR Test on WLAN802.11a on Back of Display of EUT was not required, as the SAR level measured on WLAN802.11a on Base of EUT was found not to be the most conservative position compare to WLAN 802.11b/g on the same configurations.

5. Operation and Configuration of the EUT during Testing

5.1. Operating Modes

The EUT was tested in the following operating mode(s) unless otherwise stated:

- WiFi802.11 a/b/g Data allocated test mode using manufacturer customized software ‘’Diagnostic and Regulatory Testing Utility (DRTU)’’. The software was setup in to allow the EUT to transmit at a maximum power of up to 16.5dBm per channel.
- SAR measurements at the back of the display of the EUT were close to the noise floor and found not to be the most conservative position. Therefore this evaluation was not performed on 802.11a mode.
- The SAR measurements for MiMO 802.11n at 2.4 GHz and 5.8 GHz was not evaluated as each antenna had an output power of 13.5 dBm per antenna which individually was less than 50% of the output power measured for 802.11b/g/a modes.

5.2. Configuration and Peripherals

The EUT was tested in the following configuration(s) unless otherwise stated:

- Standalone battery powered.
- The Base of the EUT was tested in Body configuration with 0mm separation distance to flat section of the OVAL phantom. The applied configurations for body-worn orientations are closest to the user with the most conservative exposure condition.
- The Back of Display of EUT was tested with 25mm separation distance to flat section of the OVAL phantom.

Body Configuration

a) The EUT was placed in a normal operating position where the centre of EUT was aligned with the centre reference point on the flat section of the 'SAM' phantom.

b) With the EUT touching the phantom at an imaginary centre line. The EUT was aligned with a marked plane (X and Y axis) consisting of two lines.

c) For the touch-safe position the EUT was gradually moved towards the flat section of the 'SAM' phantom until any point of the EUT touched the phantom.

d) For position(s) greater then 0mm separation the EUT was positioned as per the touch-safe position, and then the vertical height was decreased/adjusted as required.

e) SAR measurements were evaluated at maximum power and the unit was operated for an appropriate period prior to the evaluation in order to minimise the drift.

f) The device was keyed to operate continuously in the transmit mode for the duration of the test.

g) The location of the maximum spatial SAR distribution (hot spot) was determined relative to the EUT and its antenna.

h) The EUT was transmitting at full power throughout the duration of the test powered by a fully charged battery.

6. Summary of Test Results

Test Name	Specification Reference	Result
Specific Absorption Rate-Wi-Fi 802.11b/g/n Body Configuration 1g	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-Wi-Fi 802.11a Body Configuration 1g	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied

6.1. Location of Tests

All the measurements described in this report were performed at the premises of
RFI Global Services Ltd, Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire, RG23 8BG United Kingdom

7. Measurements, Examinations and Derived Results

7.1. General Comments

This section contains test results only.

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to section 8 for details of measurement uncertainties.

7.2. Test Results

7.2.1.Specific Absorption Rate - Wi-Fi 802.11b/g Body Configuration 1g
Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.072

Environmental Conditions:

Temperature Variation in Lab (°C):	23.0 to 23.0
Temperature Variation in Liquid (°C):	22.0 to 22.0

Results:

EUT Position	Phantom Configuration	Channel Number	Level (W/kg)	Limit (W/kg)	Margin (W/kg)	Note(s)	Result
Base of EUT Facing Phantom (Antenna A)	Flat (OVAL 3mm)	6	0.072	1.600	1.528	1, 3	Complied
Base of EUT Facing Phantom (Antenna B)	Flat (OVAL 3mm)	6	0.025	1.600	1.575	1, 3	Complied
Base of EUT Facing Phantom (Antenna A)	Flat (OVAL 3mm)	6	0.068	1.600	1.532	2, 3	Complied
Base of EUT Facing Phantom (Antenna B)	Flat (OVAL 3mm)	6	0.019	1.600	1.581	2, 3	Complied

Specific Absorption Rate - Wi-Fi 802.11b/g Body Configuration 1g (Continued)							
EUT Position	**Phantom Configuration**	**Channel Number**	**Level (W/kg)**	**Limit (W/kg)**	**Margin (W/kg)**	**Note(s)**	**Result**
Back of Display of EUT Bystander Facing Phantom (Antenna A)	Flat (OVAL 3mm)	6	0.001	1.600	1.599	1, 4	Complied
Back of Display of EUT Bystander Facing Phantom (Antenna B)	Flat (OVAL 3mm)	6	0.003	1.600	1.597	1, 4	Complied
Back of Display of EUT Bystander Facing Phantom (Antenna A)	Flat (OVAL 3mm)	6	0.001	1.600	1.599	2, 4	Complied
Back of Display of EUT Bystander Facing Phantom (Antenna B)	Flat (OVAL 3mm)	6	0.001	1.600	1.599	2, 4	Complied

Note(s):

1. WLAN 802.11b at 1Mbps
2. WLAN 802.11g at 6Mbps
3. SAR measurements were performed with the Base of EUT at a separation distance of 0mm from the ‘’OVAL phantom flat section.
4. SAR measurements were performed with the Back of the Display of the EUT at a separation distance of 25mm from the ‘’OVAL phantom flat section.

* SAR measurements at the back of the display of the EUT were close to the noise floor and found not to be the most conservative position. Therefore this evaluation was not performed on 802.11a mode.

*The SAR measurements for MiMO 802.11n at 2.4 GHz and 5.8 GHz was not evaluated as each antenna had an output power of 13.5 dBm per antenna which individually was less than 50% of the output power measured for 802.11b/g/a modes.

7.2.2.Specific Absorption Rate - Wi-Fi 802.11a Body Configuration 1g
Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.021
Environmental Conditions:	
Temperature Variation in Lab (°C):	23.0 to 23.0
Temperature Variation in Liquid (°C):	22.0 to 22.0

Results:

EUT Position	Phantom Configuration	Channel Number	Level (W/kg)	Limit (W/kg)	Margin (W/kg)	Note(s)	Result
Base of EUT Facing Phantom (Antenna A)	Flat (OVAL 3mm)	157	0.018	1.600	1.582	1, 2	Complied
Base of EUT Facing Phantom (Antenna B)	Flat (OVAL 3mm)	157	0.021	1.600	1.585	1, 2	Complied
Base of EUT Facing Phantom (Antenna A)	Flat (OVAL 3mm)	36	0.014	1.600		1, 2	Complied
Base of EUT Facing Phantom (Antenna B)	Flat (OVAL 3mm)	36	0.0065	1.600		1, 2	Complied
Base of EUT Facing Phantom (Antenna A)	Flat (OVAL 3mm)	52	0.020	1.600		1, 2	Complied
Base of EUT Facing Phantom (Antenna B)	Flat (OVAL 3mm)	52	0.011	1.600		1, 2	Complied
Base of EUT Facing Phantom (Antenna A)	Flat (OVAL 3mm)	116	0.015	1.600		1, 2	Complied
Base of EUT Facing Phantom (Antenna B)	Flat (OVAL 3mm)	116	0.012	1.600		1, 2	Complied

Note(s):

1. WLAN 802.11a at 6 Mbps
2. SAR measurements were performed with the EUT at a separation distance of 25mm from the ‘’OVAL phantom flat section.

* SAR measurements at the back of the display of the EUT were close to the noise floor and found not to be the most conservative position. Therefore this evaluation was not performed on 802.11a mode.

*The SAR measurements for MiMO 802.11n at 2.4 GHz and 5.8 GHz was not evaluated as each antenna had an output power of 13.5 dBm per antenna which individually was less than 50% of the output power measured for 802.11b/g/a modes.

7.2.3. Conducted Average Power Measurement

Channel Number	Frequency (MHZ)	Tx Average Power Antenna 'A' (dBm)	Tx Average Power Antenna 'B' (dBm)	Note
1	2.412	16.5	16.5	2.4GHz 802.11b (1Mbps)
6	**2.437**	**16.5**	**16.5**	
11	2.462	16.5	16.5	
1	2.412	16.4	16.4	2.4GHz 802.11b (11Mbps)
6	2.437	16.5	16.5	
11	2.462	16.5	16.5	
1	2.412	16.5	16.5	2.4GHz 802.11g (6Mbps)
6	**2.437**	**16.5**	**16.5**	
11	2.462	16.5	16.5	
1	2.412	16.4	16.4	2.4GHz 802.11g (54Mbps)
6	2.437	16.5	16.5	
11	2.462	16.5	16.5	
1	2.412	13.5	13.5	2.4GHz 802.11n (HT0)
6	2.437	13.5	13.5	
11	2.462	13.5	13.5	
1	2.412	13.5	13.5	2.4GHz 802.11n (HT7)
6	2.437	13.5	13.5	
11	2.462	13.5	13.5	
1	2422	13.5	13.5	2.4GHz 802.11n (HT0)
4	2437	13.5	13.5	
9	2462	13.5	13.5	
1	2422	13.5	13.5	2.4GHz 802.11n (HT7)
4	2437	13.5	13.5	
9	2462	13.5	13.5	

Conducted Average Power Measurement (Continued)

Channel Number	Frequency (MHZ)	Tx Average Power Antenna 'A' (dBm)	Tx Average Power Antenna 'B' (dBm)	Note
149	5745	13.3	13.5	5.2GHz 802.11n (HT0) 20 MHz
157	5785	13.3	13.5	
165	5825	13.5	13.5	
149	5745	13.4	13.5	5.2GHz 802.11n (HT7) 20 MHz
157	5785	13.4	13.5	
165	5825	13.1	13.5	
149	5745	13.2	13.5	5.2GHz 802.11n (HT0) 40 MHz
157	5785	13.4	13.5	
165	5825	13.5	13.5	
149	5745	13.8	13.5	5.2GHz 802.11n (HT7) 40 MHz
157	5785	13.8	13.5	
165	5825	13.5	13.5	
149	5745	16.5	16.5	5.2GHz 802.11a (6Mbps) 20 MHz
157	**5785**	**16.4**	**16.5**	
165	5825	16.3	16.5	
149	5745	16.4	16.5	5.2GHz 802.11a (54Mbps) 20 MHz
157	5785	16.4	16.5	
165	5825	16.3	16.5	

Conducted Average Power Measurement (Continued)

Channel Number	Frequency (MHZ)	Tx Average Power Antenna 'A' (dBm)	Tx Average Power Antenna 'B' (dBm)	Note
36	**5180**	**16.5**	**16.5**	5.2GHz 802.11a (6Mbps) 20 MHz
40	5200	16.4	16.5	
44	5220	16.4	16.5	
48	5240	16.4	16.5	
52	**5260**	**16.5**	**16.5**	
56	5280	16.5	16.5	
60	5300	16.3	16.5	
64	5320	16.4	16.5	
100	5500	15.1	16.5	
104	5520	14.8	15.0	
108	5540	16.5	16.5	
112	5560	16.5	16.5	
116	**5580**	**16.8**	**16.8**	
120	5600	16.6	16.5	
124	5620	16.7	16.6	
128	5640	16.7	16.5	
132	5660	16.5	16.5	
136	5680	16.5	16.5	
140	5700	16.5	16.5	

Conducted Average Power Measurement (Continued)

Channel Number	Frequency (MHZ)	Tx Average Power Antenna 'A' (dBm)	Tx Average Power Antenna 'B' (dBm)	Note
36	5180	16.5	16.5	5.2GHz 802.11a (54Mbps) 20 MHz
40	5200	16.5	16.5	
44	5220	16.4	16.4	
48	5240	16.4	16.4	
52	5260	16.4	16.4	
56	5280	16.4	16.4	
60	5300	16.4	16.4	
64	5320	16.4	16.4	
100	5500	16.4	16.4	
104	5520	16.2	16.2	
108	5540	16.1	16.1	
112	5560	16.1	16.1	
116	5580	16.2	16.1	
120	5600	16.4	16.1	
124	5620	16.5	16.5	
128	5640	16.6	16.6	
132	5660	16.4	16.4	
136	5680	16.6	16.6	
140	5700	16.6	16.6	

8. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently, the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor, such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Test Name	Confidence Level	Calculated Uncertainty
Specific Absorption Rate-WLAN 802.11 b/g/n Body Configuration 1g	95%	19.34%
Specific Absorption Rate-WLAN 802.11a Body Configuration 1g	95%	20.14%

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty, the published guidance of the appropriate accreditation body is followed.

8.1. Specific Absorption Rate- WLAN 802.11b/g/n Body Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	$c_{i\ (10g)}$	Standard Uncertainty		$\square_i$ or $\square_{eff}$
							+ u (%)	- u (%)	
B	Probe calibration	11.000	11.000	normal (k=2)	2.0000	1.0000	5.500	5.500	11.000
B	Axial Isotropy	0.500	0.500	normal (k=2)	2.0000	1.0000	0.250	0.250	0.500
B	Hemispherical Isotropy	2.600	2.600	normal (k=2)	2.0000	1.0000	1.300	1.300	2.600
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	0.500
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	0.769
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	0.600
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	0.200
B	Readout Electronics	0.320	0.320	normal (k=2)	2.0000	1.0000	0.160	0.160	0.320
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	0.000
B	Integration Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	0.000
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	3.000
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	4.000
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	2.850
B	Extrapolation and integration/ Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	5.080
A	Test Sample Positioning	2.570	2.570	normal (k=1)	1.0000	1.0000	2.570	2.570	2.570
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	0.154
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	4.000
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	5.000
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	5.000
A	Liquid Conductivity (measured value)	4.900	4.900	normal (k=1)	1.0000	0.6400	3.136	3.136	4.900

B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	5.000
A	Liquid Permittivity (measured value)	4.920	4.920	normal (k=1)	1.0000	0.6000	2.952	2.952	4.920
	Combined standard uncertainty			t-distribution			9.87	9.87	
	Expanded uncertainty			k = 1.96			19.34	19.34	

8.2. Specific Absorption Rate- WLAN 802.11a Body Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	$c_{i\ (10g)}$	Standard Uncertainty		$\square_i$ or $\square_{eff}$
							+ u (%)	- u (%)	
B	Probe calibration	13.100	13.100	normal (k=2)	2.0000	1.0000	6.550	6.550	□
B	Axial Isotropy	0.500	0.500	normal (k=2)	2.0000	1.0000	0.250	0.250	□
B	Hemispherical Isotropy	2.600	2.600	normal (k=2)	2.0000	1.0000	1.300	1.300	□
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	□
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	□
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	□
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	□
B	Readout Electronics	0.320	0.320	normal (k=2)	2.0000	1.0000	0.160	0.160	□
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	□
B	Integration Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	□
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	□
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	□
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	□
B	Extrapolation and integration/ Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	□
A	Test Sample Positioning	2.540	2.540	normal (k=1)	1.0000	1.0000	2.540	2.540	□□
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	□□
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	□
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	□
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	□
A	Liquid Conductivity (measured value)	4.690	4.690	normal (k=1)	1.0000	0.6400	3.002	3.002	□

B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	
A	Liquid Permittivity (measured value)	3.830	3.830	normal (k=1)	1.0000	0.6000	2.298	2.298	
	Combined standard uncertainty			t-distribution			10.28	10.28	>400
	Expanded uncertainty			k = 1.96			20.14	20.14	>400

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
A034	Narda 20W Termination	Narda	374BNM	8706	Calibrated as part of system	-
A1097	SMA Directional Coupler	MiDISCO	MDC6223-30	None	Calibrated as part of system	-
A1137	3dB Attenuator	Narda	779	04690	Calibrated as part of system	-
A1174	Dielectric Probe Kit	Agilent Technologies	85070C	Us99360072	Calibrated before use	-
A1328	Handset Positioner	Schmid & Partner Engineering AG	Modification	SD 000 H01 DA	-	-
A1182	Handset Positioner	Schmid & Partner Engineering AG	V3.0	None	-	-
A1234	Data Acquisition Electronics	Schmid & Partner Engineering AG	DAE3	450	09 Feb 2011	12
A1238	SAM Phantom	Schmid & Partner Engineering AG	SAM b	001	Calibrated before use	-
A1322	2450 MHz Dipole Kit	Schmid & Partner Engineering AG	D2450V2	725	08 Feb 2011	24
A1377	5GHz Dipole Kit	Schmid & Partner Engineering AG	D5GHzV2	1016	10 Feb 2011	24
A1378	Probe	Schmid & Partner Engineering AG	EX3 DV3	3508	15 Feb 2011	12
A1497	Amplifier	Mini-Circuits	zhl-42w (sma)	e020105	Calibrated as part of system	-
A1566	SAM Phantom	Schmid & Partner Engineering AG	SAM a	002	Calibrated before use	-
A1990	Digital Camera	Samsung	E515	A23WC90 8A05431K	-	-
A215	20 dB Attenuator	Narda	766-20	9402	Calibrated as part of system	-
A1531	Antenna	AARONIA AG	7025	02458	-	-
C1042	Network Analyzer Cable	Agilent	8120-4779	349	-	-

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
C1145	Cable	Rosenberger MICRO-COAX	FA147A F003003030	41843-1	Calibrated as part of system	-
C1146	Cable	Rosenberger MICRO-COAX	FA147A F030003030	41752-1	Calibrated as part of system	-
G0528	Robot Power Supply	Schmid & Partner Engineering AG	DASY4	None	Calibrated before use	-
G087	PSU	Thurlby Thandar	CPX200	100701	Calibrated before use	-
M1015	Network Analyser	Agilent Technologies	8753ES	US39172406	27 Sept 2010	12
M1047	Robot Arm	Staubli	RX908 L	F00/SD8 9A1/A/01	Calibrated before use	-
M1159	Signal Generator	Agilent Technologies	E8241A	US42110332	Internal Checked 15 Dec 2010	4
M1071	Spectrum Analyzer	Agilent	HP8590E	3647U00514	(Monitoring use only)	-
M1071	Spectrum Analyzer	Agilent	HP8590E	3647U00514	(Monitoring use only)	-
M1044	Diode Power Sensor	Rohde & Schwarz	NRV-Z1	893350/019	26 May 2010	12
M265	Diode Power Sensor	Rohde & Schwarz	NRV-Z1	893350/017	26 May 2010	12
M263	Dual Channel Power Meter	Rohde & Schwarz	NRVD	826558/004	27 May 2010	12
S256	SAR Lab	RFI	Site 56	N/A	Calibrated before use	-

A.1.1. Calibration Certificates

This section contains the calibration certificates and data for the Probe(s) and Dipole(s) used, which are not included in the total number of pages for this report.

Asset: A1322 - Checked by [redacted]
21/02/2011

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
C 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 RFI

Certificate No: D2450V2-725_Feb11

CALIBRATION CERTIFICATE

Object: D2450V2 - SN: 725

Calibration procedure(s): QA CAL-05.v8
Calibration procedure for dipole validation kits

Calibration date: February 08, 2011

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	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Dimce Iliev	Laboratory Technician	D. Iliev
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 8, 2011

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

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.

Measurement Conditions

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

DASY Version	DASY5	V52.6
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
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	39.1 ± 6 %	1.73 mho/m ± 6 %
Head TSL temperature during test	(21.0 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.0 mW / g
SAR normalized	normalized to 1W	52.0 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**52.9 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.13 mW / g
SAR normalized	normalized to 1W	24.5 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**24.7 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	52.2 ± 6 %	1.94 mho/m ± 6 %
Body TSL temperature during test	(21.0 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.0 mW / g
SAR normalized	normalized to 1W	52.0 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**51.9 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.04 mW / g
SAR normalized	normalized to 1W	24.2 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**24.1 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	45.6 Ω + 7.9 jΩ
Return Loss	- 20.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.5 Ω + 9.7 jΩ
Return Loss	- 20.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.152 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.
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	October 16, 2002

DASY5 Validation Report for Head TSL

Date/Time: 07.02.2011 14:34:55

Test Laboratory: SPEAG, Zurich, Switzerland

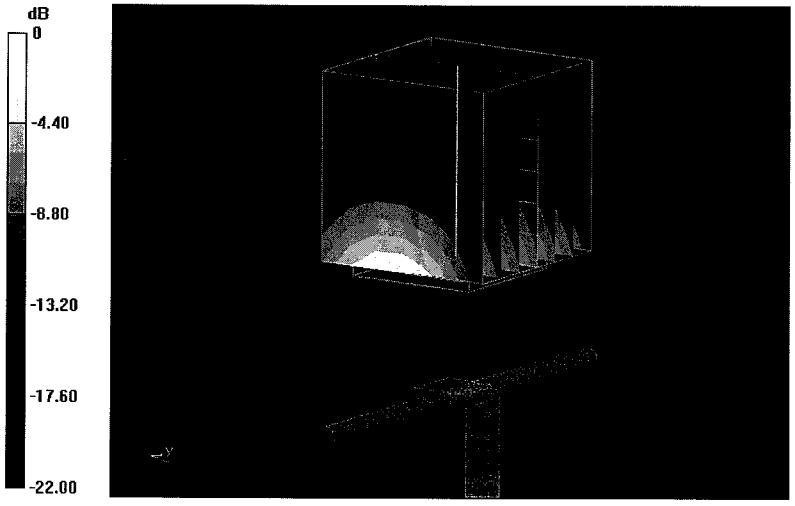
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:725

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL U12 BB
Medium parameters used: f = 2450 MHz; σ = 1.74 mho/m; ε_r = 39.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

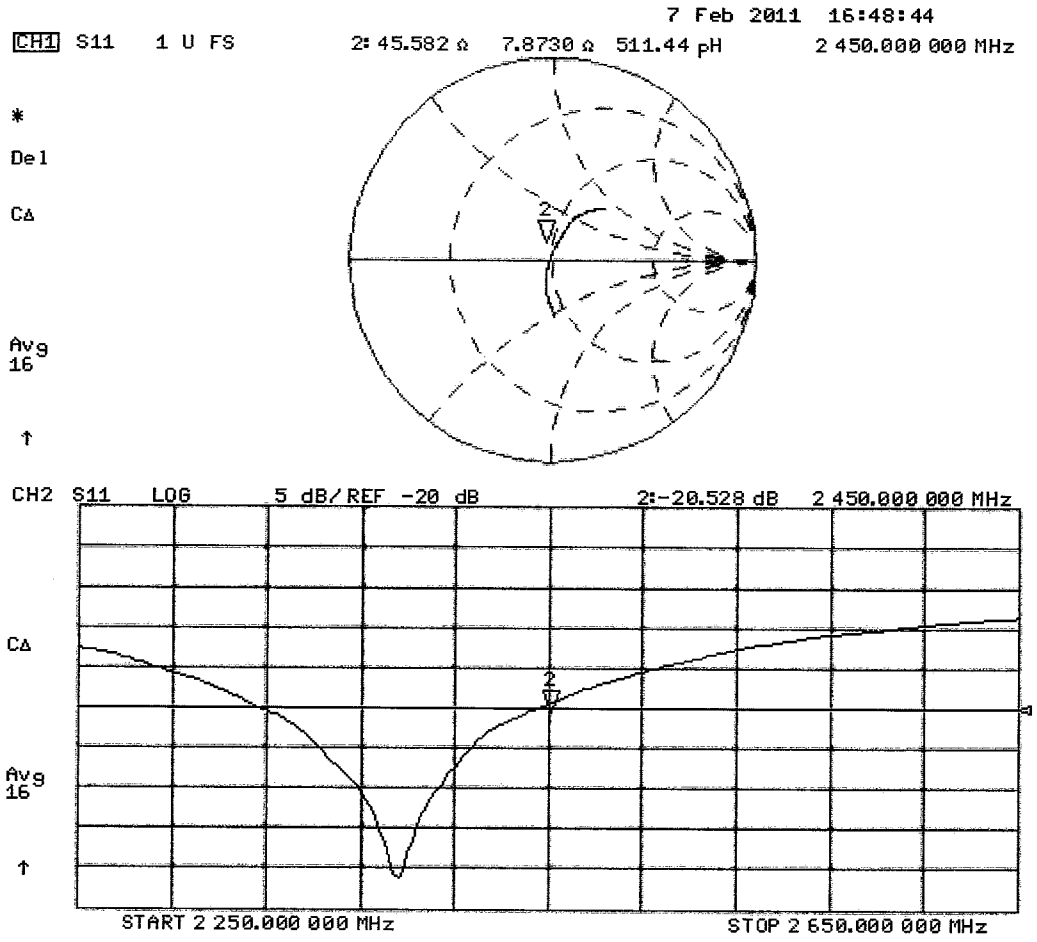
- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 101.3 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 26.701 W/kg
SAR(1 g) = 13 mW/g; SAR(10 g) = 6.13 mW/g
Maximum value of SAR (measured) = 16.608 mW/g



0 dB = 16.610mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date/Time: 08.02.2011 12:48:13

Test Laboratory: SPEAG, Zurich, Switzerland

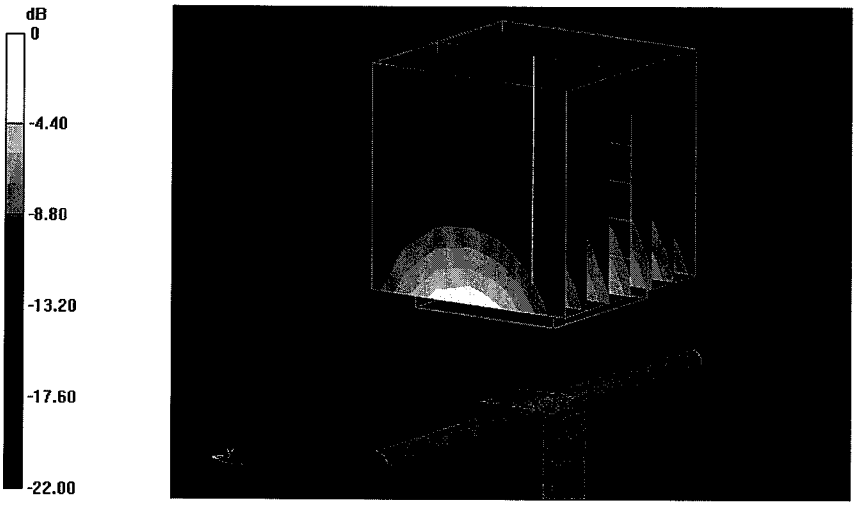
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:725

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: MSL U12 BB
Medium parameters used: f = 2450 MHz; σ = 1.95 mho/m; ε_r = 52.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

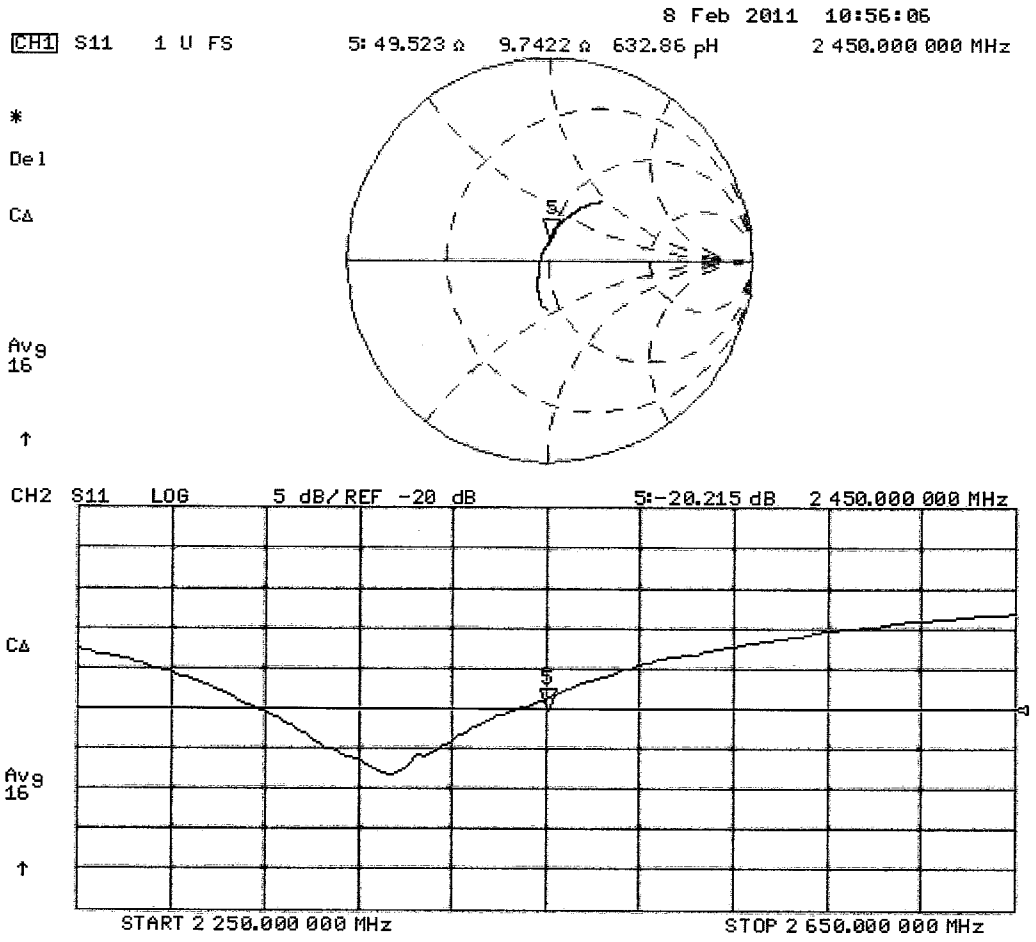
- Probe: ES3DV3 - SN3205; ConvF(4.31, 4.31, 4.31); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.406 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 27.401 W/kg
SAR(1 g) = 13 mW/g; SAR(10 g) = 6.04 mW/g
Maximum value of SAR (measured) = 17.121 mW/g



0 dB = 17.120mW/g

Impedance Measurement Plot for Body TSL



ASSET: A1377 Checked by [illegible] 21/02/2011

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 RFI

Certificate No: D5GHzV2-1016_Feb11

CALIBRATION CERTIFICATE

Object: D5GHzV2 - SN: 1016

Calibration procedure(s): QA CAL-22.v1
Calibration procedure for dipole validation kits between 3-6 GHz

Calibration date: February 10, 2011

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	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe EX3DV4	SN: 3503	05-Mar-10 (No. EX3-3503_Mar10)	Mar-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Dimce Iliev	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 11, 2011

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

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.

Measurement Conditions

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

DASY Version	DASY5	V52.6
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Area Scan resolution	dx, dy = 10 mm	
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 2.0 mm	
Frequency	5200 MHz ± 1 MHz 5500 MHz ± 1 MHz 5800 MHz ± 1 MHz	

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	47.2 ± 6 %	5.37 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	condition	
SAR measured	100 mW input power	7.73 mW / g
SAR normalized	normalized to 1W	77.3 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**76.7 mW / g ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.14 mW / g
SAR normalized	normalized to 1W	21.4 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**21.2 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	46.6 ± 6 %	5.75 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	condition	
SAR measured	100 mW input power	8.35 mW / g
SAR normalized	normalized to 1W	83.5 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**82.8 mW / g ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.30 mW / g
SAR normalized	normalized to 1W	23.0 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**22.8 mW / g ± 19.5 % (k=2)**

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	46.2 ± 6 %	6.16 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 0.2) °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	7.22 mW / g
SAR normalized	normalized to 1W	72.2 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**71.7 mW / g ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	1.99 mW / g
SAR normalized	normalized to 1W	19.9 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**19.7 mW / g ± 19.5 % (k=2)**

Appendix

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	53.8 Ω - 8.9 jΩ
Return Loss	-20.6 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	48.4 Ω - 0.9 jΩ
Return Loss	-34.8 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	54.4 Ω + 8.3 jΩ
Return Loss	-21.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.200 ns

After long term use with 40 W 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.
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	November 14, 2003

DASY5 Validation Report for Body TSL

Date/Time: 10.02.2011 17:44:53

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHz; Serial: D5GHzV2 - SN:1016

Communication System: CW; Frequency: 5200 MHz, Frequency: 5500 MHz, Frequency: 5800 MHz; Duty Cycle: 1:1
Medium: MSL 5000 MHz
Medium parameters used: f = 5200 MHz; σ = 5.37 mho/m; ε_r = 47.2; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5500 MHz; σ = 5.75 mho/m; ε_r = 46.6; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5800 MHz; σ = 6.16 mho/m; ε_r = 46.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

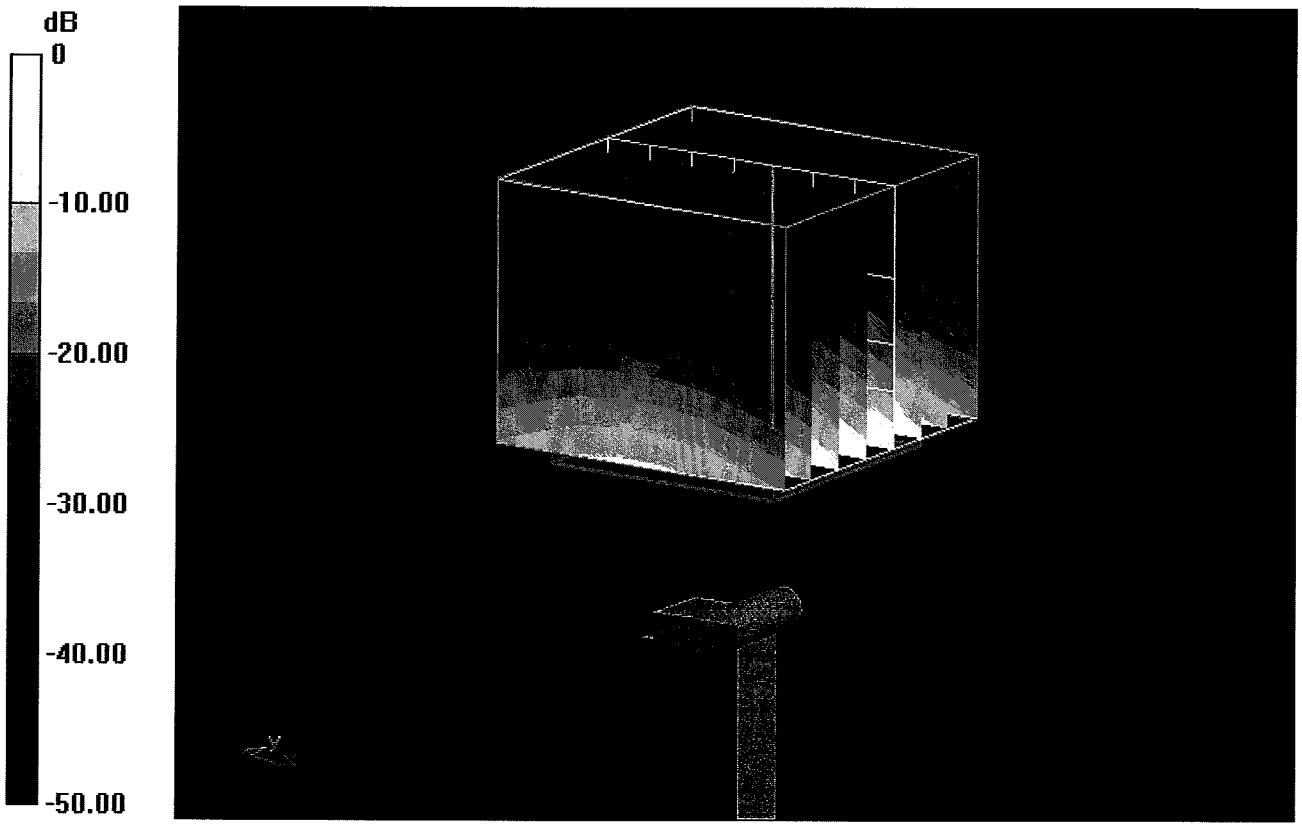
DASY5 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.88, 4.88, 4.88), ConvF(4.37, 4.37, 4.37), ConvF(4.57, 4.57, 4.57); Calibrated: 05.03.2010
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

Pin=100mW, d=10mm, f=5200 MHz /Zoom Scan (4x4x2mm), dist=2mm (8x8x6)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 59.968 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 30.597 W/kg
SAR(1 g) = 7.73 mW/g; SAR(10 g) = 2.14 mW/g
Maximum value of SAR (measured) = 14.853 mW/g

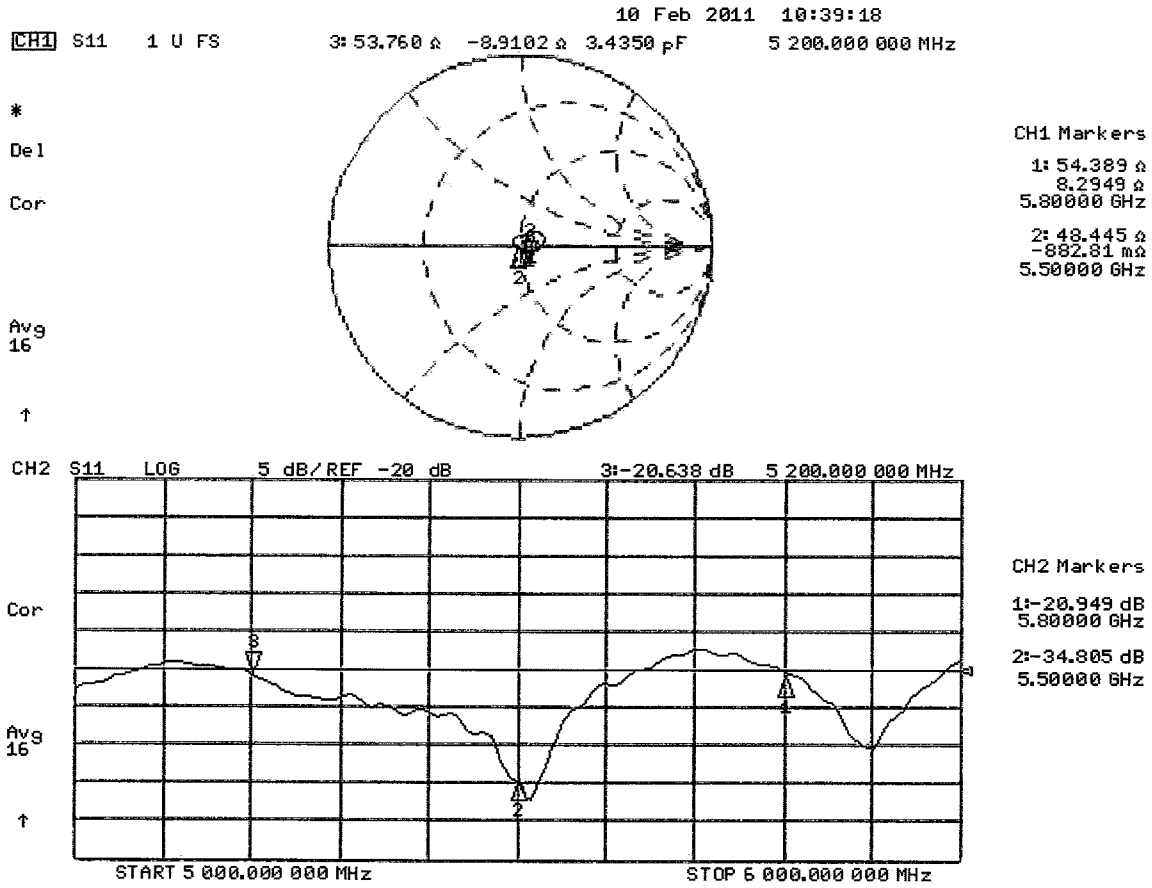
Pin=100mW, d=10mm, f=5500 MHz/Zoom Scan (4x4x2mm), dist=2mm (8x8x6)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 60.866 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 35.356 W/kg
SAR(1 g) = 8.35 mW/g; SAR(10 g) = 2.3 mW/g
Maximum value of SAR (measured) = 16.244 mW/g

Pin=100mW, d=10mm, f=5800 MHz /Zoom Scan (4x4x2mm), dist=2mm (8x8x6)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 54.353 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 32.295 W/kg
SAR(1 g) = 7.22 mW/g; SAR(10 g) = 1.99 mW/g
Maximum value of SAR (measured) = 14.254 mW/g



0 dB = 14.250mW/g

Impedance Measurement Plot for Body TSL



ASSET:- A1378 Checked by [illegible]
21/02/2011

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 RFI

Certificate No: EX-3508_Feb11

CALIBRATION CERTIFICATE

Object: EX3DV3 - SN:3508

Calibration procedure(s): QA CAL-01.v7, QA CAL-12.v6, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v3
Calibration procedure for dosimetric E-field probes

Calibration date: February 15, 2011

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	01-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41495277	01-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41498087	01-Apr-10 (No. 217-01136)	Apr-11
Reference 3 dB Attenuator	SN: S5054 (3c)	30-Mar-10 (No. 217-01159)	Mar-11
Reference 20 dB Attenuator	SN: S5086 (20b)	30-Mar-10 (No. 217-01161)	Mar-11
Reference 30 dB Attenuator	SN: S5129 (30b)	30-Mar-10 (No. 217-01160)	Mar-11
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	23-Apr-10 (No. DAE4-654_Apr10)	Apr-11
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Niels Kuster	Quality Manager	

Issued: February 15, 2011

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

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 ω	ω 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., $\vartheta = 0$ 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 $\vartheta = 0$ ($f \leq 900$ 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* are numerical linearization parameters in dB assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media.
- *VR:* VR is the validity range of the calibration related to the average diode voltage or DAE voltage in mV.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ 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 EX3DV3

SN:3508

Manufactured: December 19, 2003
Calibrated: February 15, 2011

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

DASY/EASY - Parameters of Probe: EX3DV3 - SN:3508

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.74	0.66	0.65	± 10.1 %
DCP (mV)[B]	101.8	102.3	101.3	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	146.8	±2.2 %
			Y	0.00	0.00	1.00	139.4	
			Z	0.00	0.00	1.00	124.4	

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.

DASY/EASY - Parameters of Probe: EX3DV3 - SN:3508

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)
450	43.5	0.87	11.15	11.15	11.15	0.11	1.00	± 13.4 %
750	41.9	0.89	10.73	10.73	10.73	0.36	0.82	± 12.0 %
900	41.5	0.97	10.23	10.23	10.23	0.38	0.81	± 12.0 %
1750	40.1	1.37	9.15	9.15	9.15	0.66	0.56	± 12.0 %
1900	40.0	1.40	8.83	8.83	8.83	0.53	0.65	± 12.0 %
2450	39.2	1.80	7.88	7.88	7.88	0.29	0.91	± 12.0 %

[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.

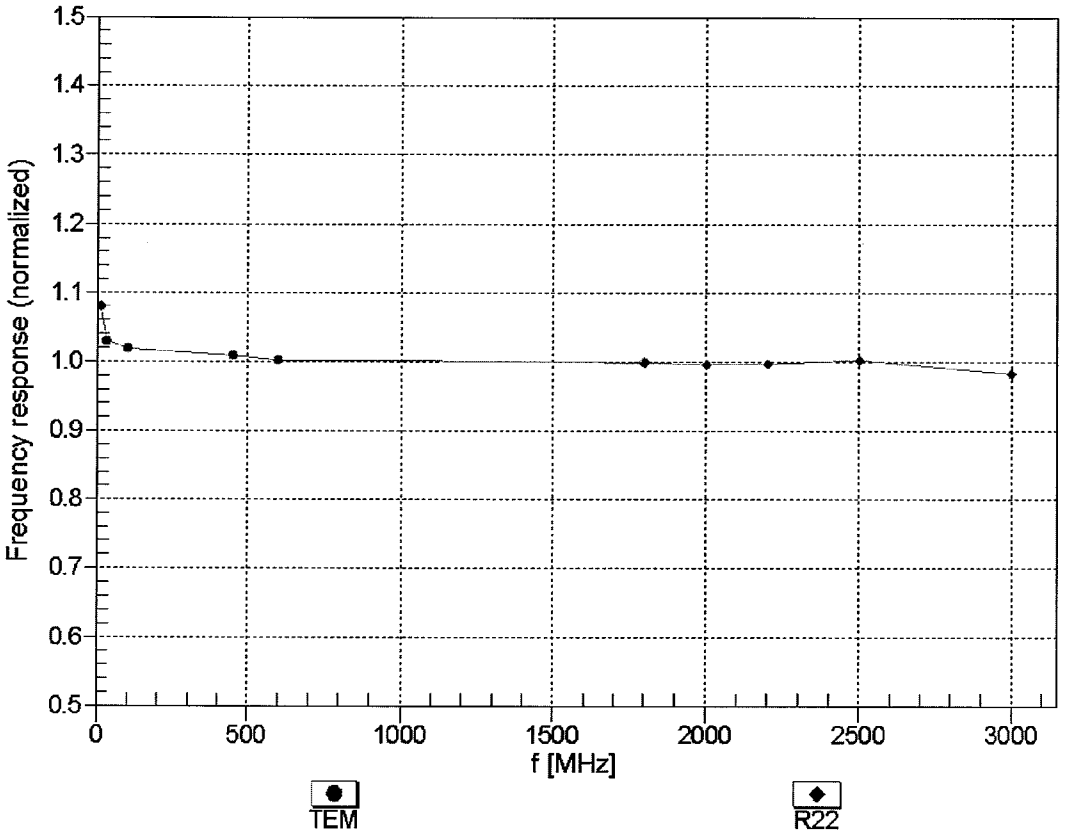
DASY/EASY - Parameters of Probe: EX3DV3- SN:3508

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)
450	56.7	0.94	11.80	11.80	11.80	0.02	1.00	± 13.4 %
750	55.5	0.96	10.54	10.54	10.54	0.37	0.86	± 12.0 %
900	55.0	1.05	10.27	10.27	10.27	0.30	0.95	± 12.0 %
1750	53.4	1.49	9.08	9.08	9.08	0.40	0.87	± 12.0 %
1900	53.3	1.52	8.56	8.56	8.56	0.35	0.78	± 12.0 %
2150	53.1	1.66	8.51	8.51	8.51	0.18	1.30	± 12.0 %
2450	52.7	1.95	7.97	7.97	7.97	0.39	0.72	± 12.0 %
2600	52.5	2.16	7.62	7.62	7.62	0.33	0.75	± 12.0 %
3700	51.0	3.55	6.84	6.84	6.84	0.25	1.70	± 13.1 %
5200	49.0	5.30	4.19	4.19	4.19	0.50	1.95	± 13.1 %
5500	48.6	5.65	3.72	3.72	3.72	0.58	1.95	± 13.1 %
5800	48.2	6.00	3.71	3.71	3.71	0.65	1.95	± 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.

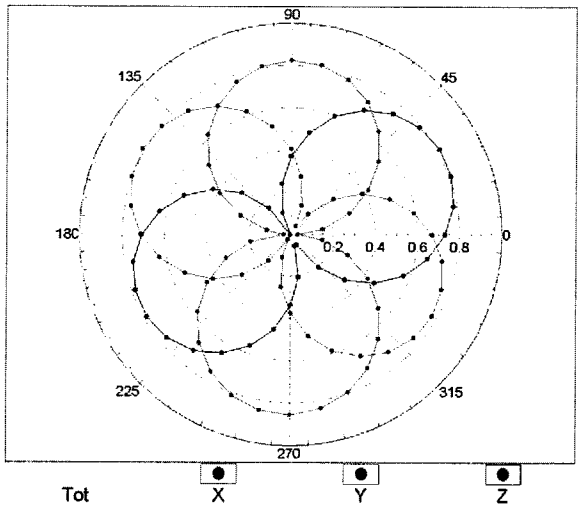
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



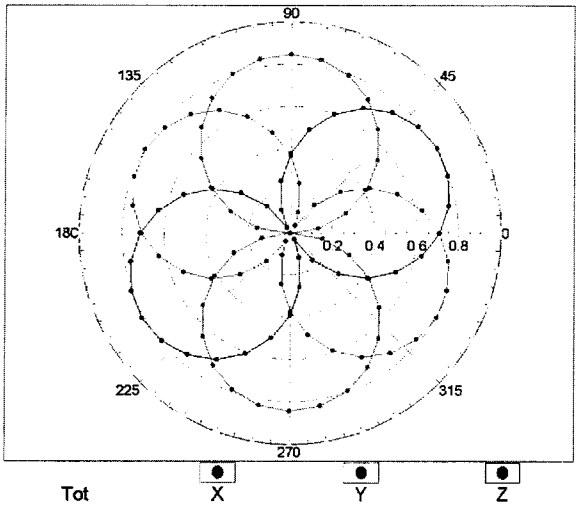
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

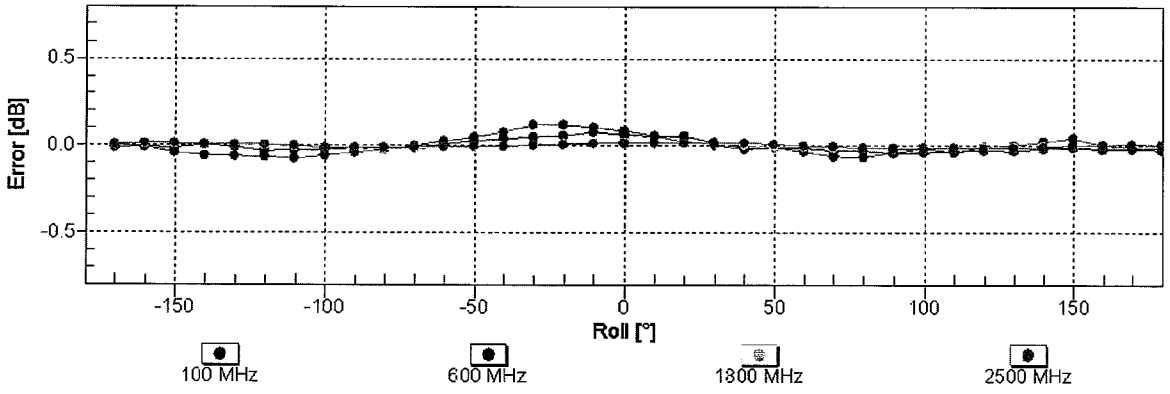
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



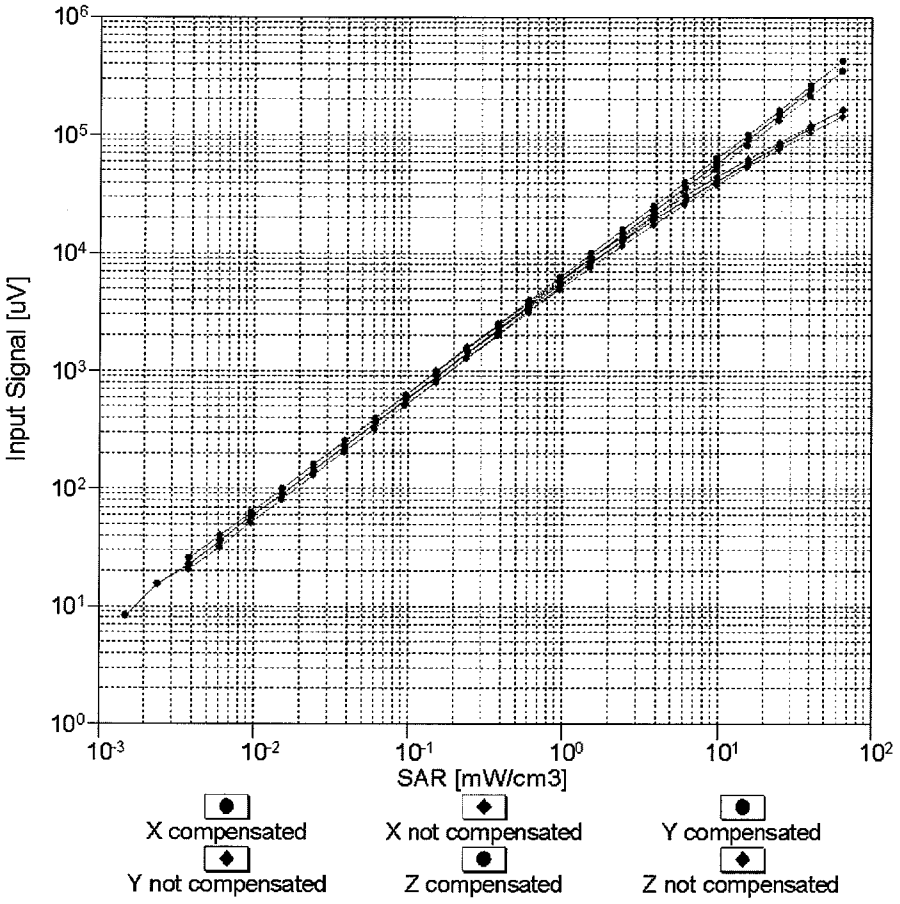
f=1800 MHz,R22

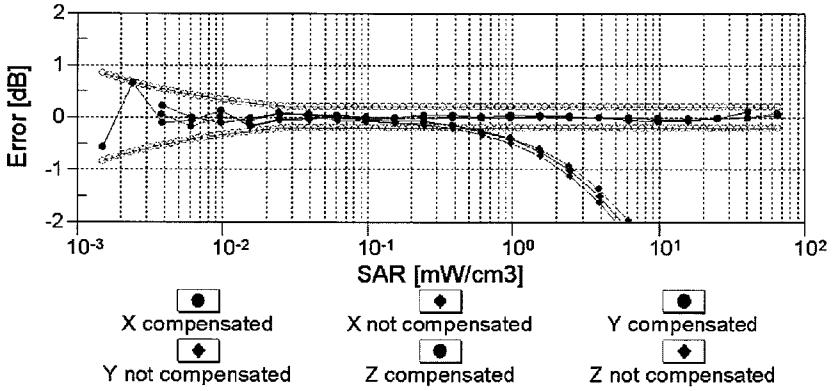




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})
(TEM cell , f = 900 MHz)

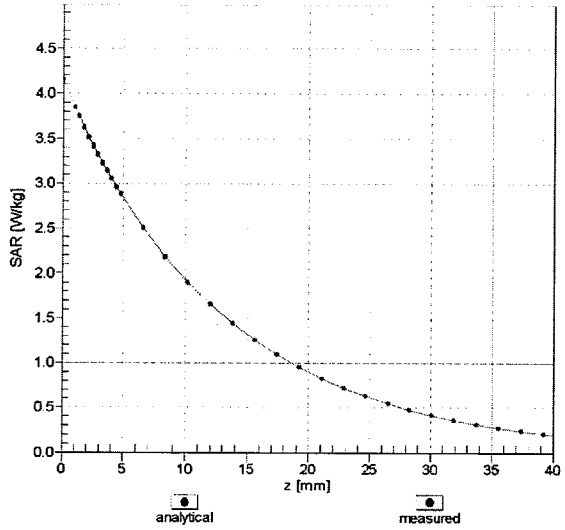




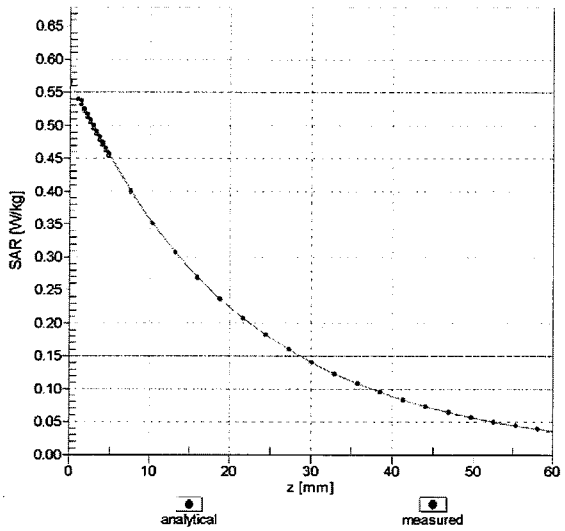
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 1750 MHz,WGLS R22 (H_convF)

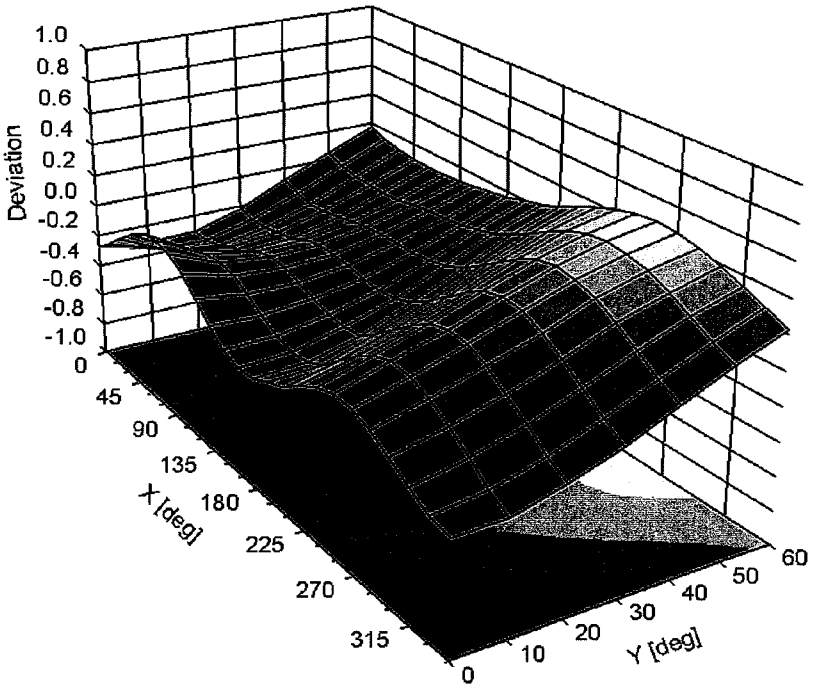


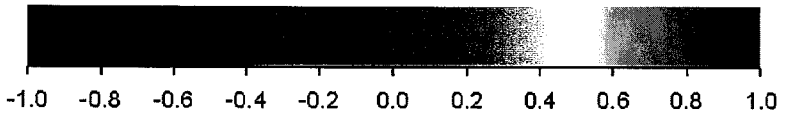
f = 750 MHz,WGLS R9 (H_convF)



Deviation from Isotropy in Air

Error (ϕ, ϑ), f = 900 MHz





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

DASY/EASY - Parameters of Probe: EX3DV3 - SN:3508

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
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

Appendix 2. Measurement Methods

A.2.1. Evaluation Procedure

The Specific Absorption Rate (SAR) evaluation was performed in the following manner:

a) (i) The evaluation was performed in an applicable area of the phantom depending on the type of device being tested. For devices worn about the ear during normal operation, both the left and right ear positions were evaluated at the centre frequency of the band at maximum power. The side, which produced the greatest SAR, determined which side of the phantom would be used for the entire evaluation. The positioning of the head worn device relative to the phantom was dictated by the test specification identified in section 3.1 of this report.

(ii) For body worn devices or devices which can be operated within 20 cm of the body, the flat section of the SAM phantom was used were the size of the device(s) is normal. for bigger devices and base station the 2mm Oval phantom is used for evaluation. The type of device being evaluated dictated the distance of the EUT to the outer surface of the phantom flat section.

b) The SAR was determined by a pre-defined procedure within the DASY4 software. The exposed region of the phantom was scanned near the inner surface with a grid spacing of 20mm x 20mm or appropriate resolution.

c) A 5x5x7 matrix was performed around the greatest spatial SAR distribution found during the area scan of the applicable exposed region. SAR values were then calculated using a 3-D spline interpolation algorithm and averaged over spatial volumes of 1 and 10 grams.

d) If the EUT had any appreciable drift over the course of the evaluation, then the EUT was re-evaluated. Any unusual anomalies over the course of the test also warranted a re-evaluation.

A.2.2. Specific Absorption Rate (SAR) Measurements to OET Bulletin 65 Supplement C: (2001-01)

Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields

SAR measurements were performed in accordance with Appendix D of the standard FCC OET Bulletin 65 Supplement C: 2001, IEEE 1528 and FCC KDB procedures, against appropriate limits for each measurement position in accordance with the standard. In some cases the FCC was contacted using a PBA or KDB process to ensure test is performed correctly.

The test was performed in a shielded enclosure with the temperature controlled to remain between +18.0ºC and +25.0ºC. The tissue equivalent material fluid temperature was controlled to give a maximum variation of ± 2.0ºC

Prior to any SAR measurements on the EUT, system validation and material dielectric property measurements were conducted. In the absence of a detailed procedure within the specification, system validation and material dielectric property measurements were performed in accordance with Appendix C and Appendix D of FCC OET Bulletin 65 Supplement C: 2001 and FCC KDB publication 450824.

Following the successful system validation and material dielectric property measurements, a SAR versus time sweep shall be performed within 10 mm of the phantom inner surface. If the EUT power output is stable after three minutes then the measurement probe will perform a coarse surface level scan at each test position in order to ascertain the location of the maximum local SAR level. Once this area had been established, a 5x5x7 cube of 343 points (5 mm spacing in each axis ≈ 27g) will be centred at the area of concern. Extrapolation and interpolation will then be carried out on the 27g of tissue and the highest averaged SAR over a 10g cube determined.

Once the maximum interpolated SAR measurement is complete; the coarse scan is visually assessed to check for secondary peaks within 50% of the maximum SAR level. If there are any further SAR measurements required, extra 5x5x7 cubes shall be centred on each of these extra local SAR maxima.

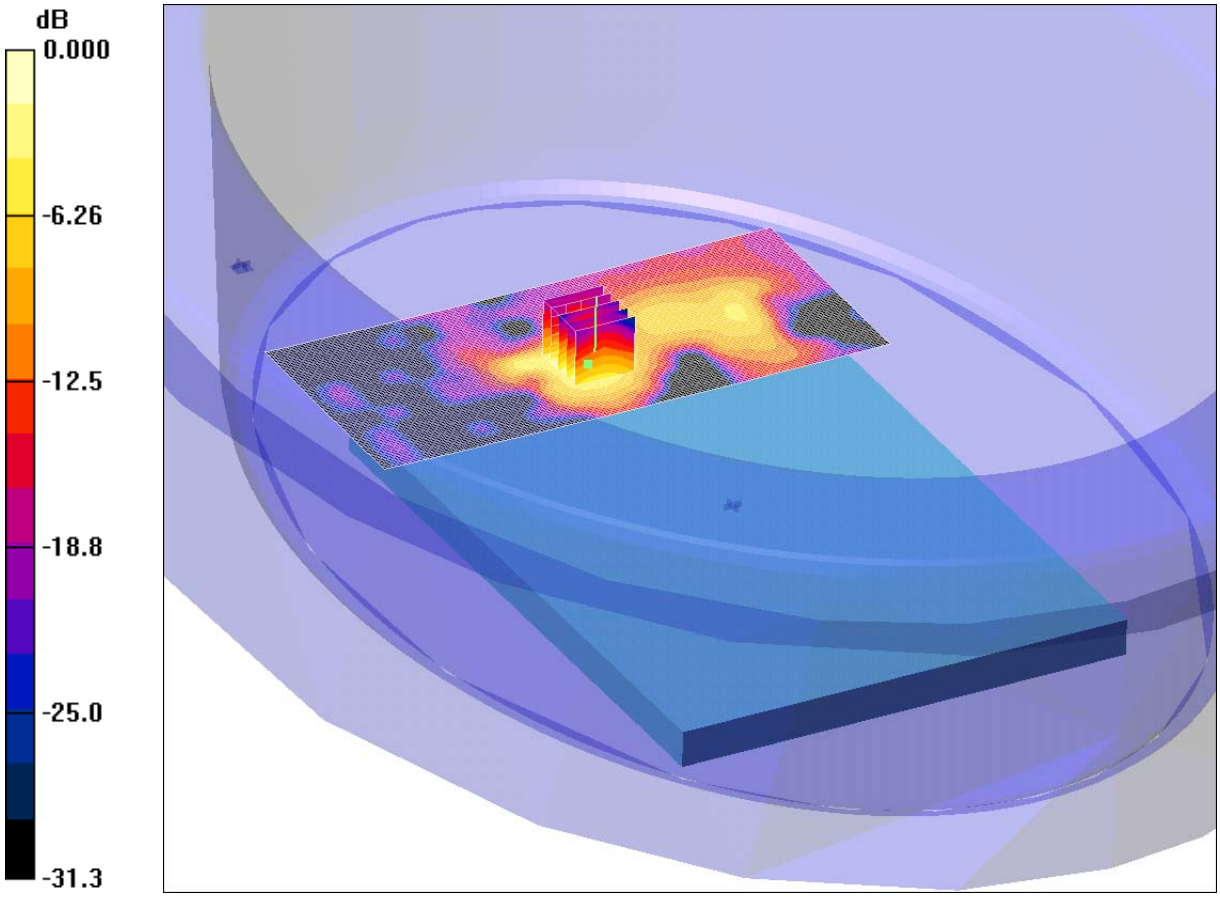
At the end of each position test case a second time sweep shall be performed to check whether the EUT has remained stable throughout the test.

Appendix 3. SAR Distribution Scans

This appendix contains SAR distribution scans which are not included in the total number of pages for this report.

Scan Reference Number	Title
SCN/81199JD01/001	Base of EUT Facing Phantom Antenna A WiFi 802.11b 1Mbps CH6 0mm
SCN/81199JD01/002	Base of EUT Facing Phantom Antenna B WiFi 802.11b 1Mbps CH6 0mm
SCN/81199JD01/003	Base of EUT Facing Phantom Antenna A WiFi 802.11g 6Mbps CH6 0mm
SCN/81199JD01/004	Base of EUT Facing Phantom Antenna B WiFi 802.11g 6Mbps CH6 0mm
SCN/81199JD01/005	Back of Display of EUT Bystander Facing Phantom Antenna A WiFi 802.11b 1Mbps CH6 25mm
SCN/81199JD01/006	Back of Display of EUT Bystander Facing Phantom Antenna B WiFi 802.11b 1Mbps CH6 25mm
SCN/81199JD01/007	Back of Display of EUT Bystander Facing Phantom Antenna A WiFi 802.11g 6Mbps CH6 25mm
SCN/81199JD01/008	Back of Display of EUT Bystander Facing Phantom Antenna B WiFi 802.11g 6Mbps CH6 25mm
SCN/81199JD01/009	Base of EUT Facing Phantom Antenna A WiFi 802.11a 6Mbps CH157 0mm
SCN/81199JD01/010	Base of EUT Facing Phantom Antenna B WiFi 802.11a 6Mbps CH157 0mm
SCN/81199JD01/011	System Performance Check 2450MHz Body 21 03 11
SCN/81199JD01/012	System Performance Check 2450MHz Body 22 03 11
SCN/81199JD01/013	System Performance Check 5800MHz Body 26 03 11
SCN/81199JD01/014	Base of EUT Facing Phantom Antenna A WiFi 802.11a 6Mbps CH36 0mm
SCN/81199JD01/015	Base of EUT Facing Phantom Antenna B WiFi 802.11a 6Mbps CH36 0mm
SCN/81199JD01/016	Base of EUT Facing Phantom Antenna A WiFi 802.11a 6Mbps CH52 0mm
SCN/81199JD01/017	Base of EUT Facing Phantom Antenna B WiFi 802.11a 6Mbps CH52 0mm
SCN/81199JD01/018	Base of EUT Facing Phantom Antenna A WiFi 802.11a 6Mbps CH116 0mm
SCN/81199JD01/019	Base of EUT Facing Phantom Antenna B WiFi 802.11a 6Mbps CH116 0mm
SCN/81199JD01/020	System Performance Check 5200MHz Body 08 04 11
SCN/81199JD01/021	System Performance Check 5800MHz Body 08 04 11

SCN/81199JD01/001: Base of EUT Facing Phantom Antenna A WiFi 802.11b 1Mbps CH6 0mm
Date 22/03/2011
DUT: Samsung Notebook; Type: Rainbow Peak;



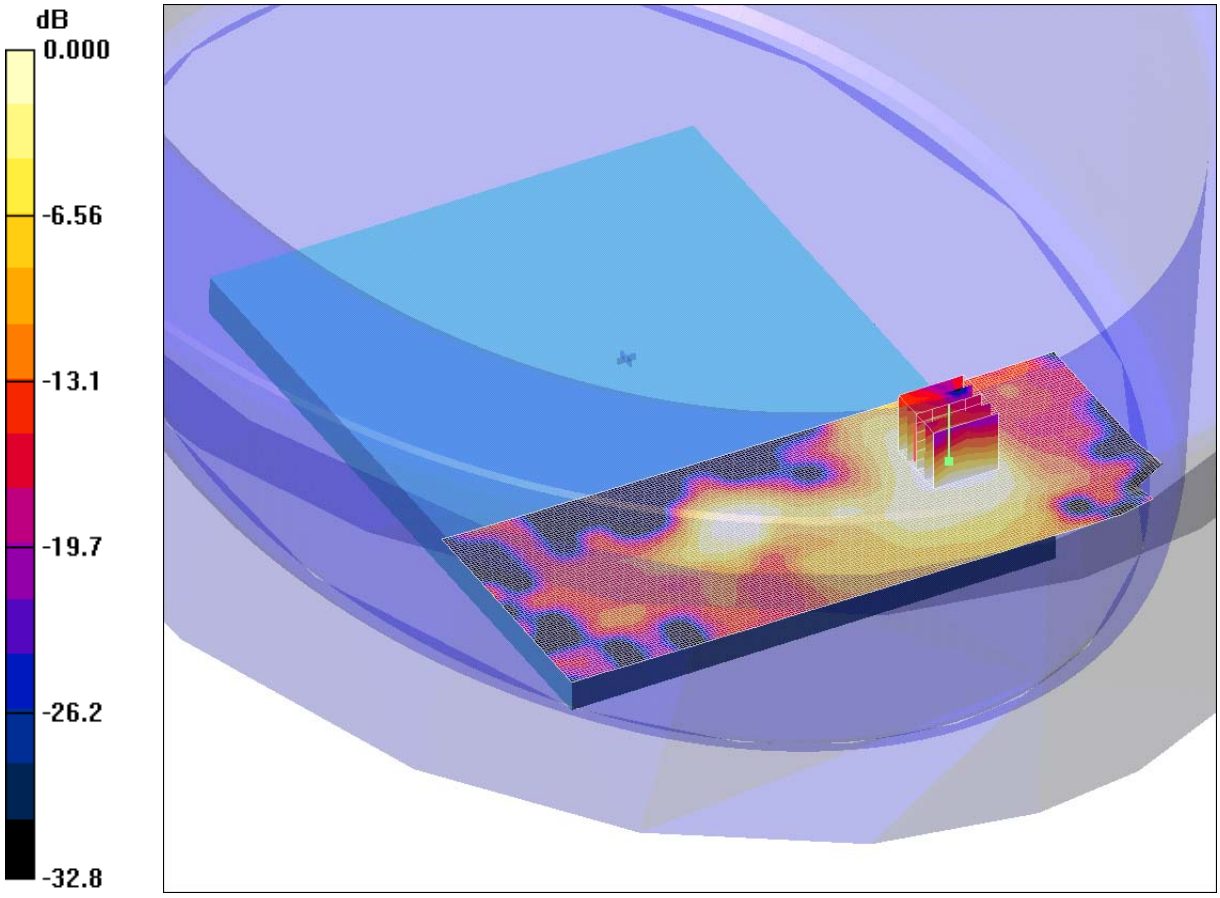
0 dB = 0.098mW/g

Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 MHz MSL Medium parameters used (interpolated): f = 2437 MHz; σ = 1.98 mho/m; ε_r = 51.3; ρ = 1000 kg/m^3
Phantom section: basin Section

DASY4 Configuration:
- Probe: EX3DV3 - SN3508; ConvF(7.97, 7.97, 7.97); Calibrated: 15/02/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: basin 3mm; Type: 3mm; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Base of EUT Facing Phantom - Middle/Area Scan (181x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.088 mW/g
Base of EUT Facing Phantom - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.92 V/m; Power Drift = -0.191 dB
Peak SAR (extrapolated) = 0.158 W/kg
SAR(1 g) = 0.072 mW/g; SAR(10 g) = 0.034 mW/g
Maximum value of SAR (measured) = 0.098 mW/g

SCN/81199JD01/002: Base of EUT Facing Phantom Antenna B WiFi 802.11b 1Mbps CH6 0mm
Date 22/03/2011
DUT: Samsung Notebook; Type: Rainbow Peak



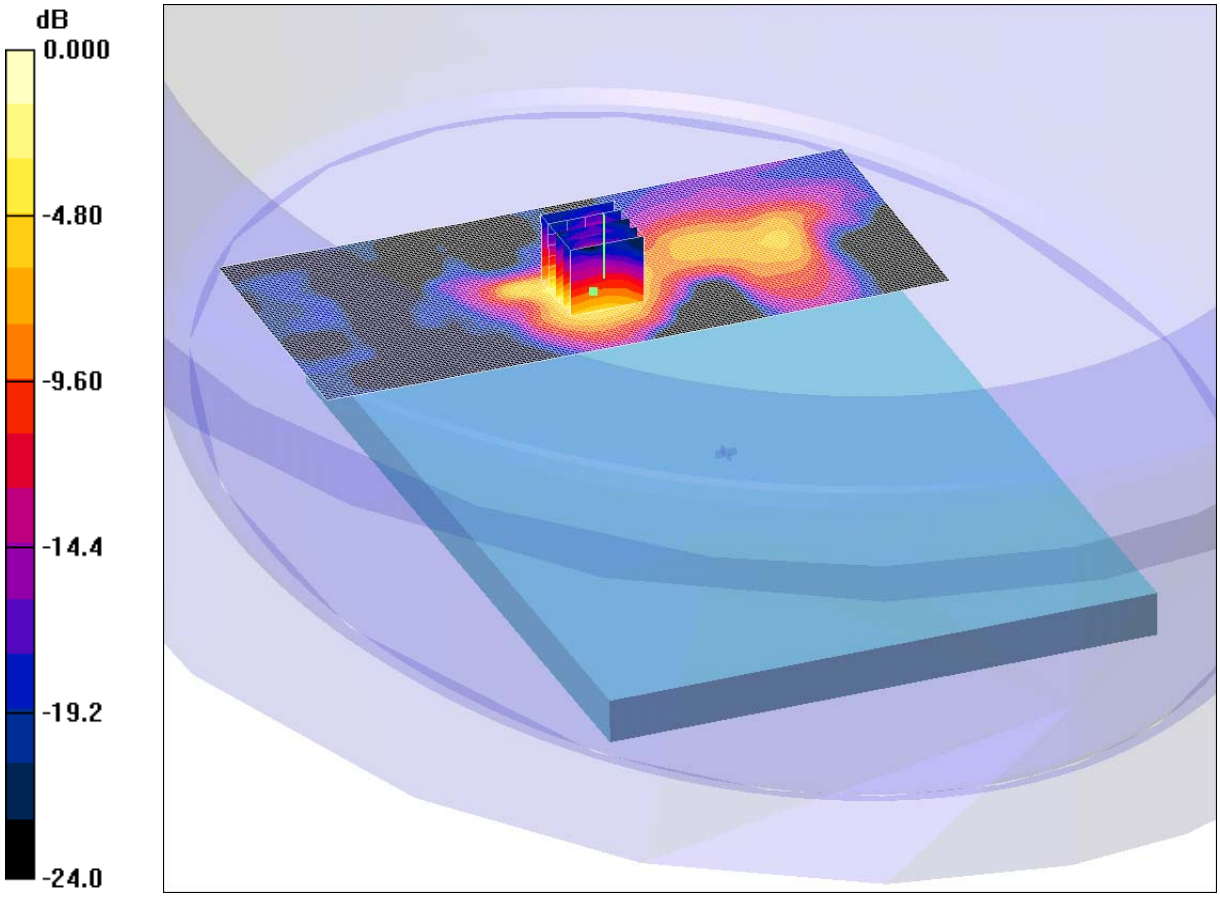
0 dB = 0.032mW/g

Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 MHz MSL Medium parameters used (interpolated): f = 2437 MHz; σ = 1.98 mho/m; ε_r = 51.3; ρ = 1000 kg/m^3
Phantom section: basin Section

DASY4 Configuration:
- Probe: EX3DV3 - SN3508; ConvF(7.97, 7.97, 7.97); Calibrated: 15/02/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: basin 3mm; Type: 3mm; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Base of EUT Facing Phantom - Middle/Area Scan (201x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.035 mW/g
Base of EUT Facing Phantom - Middle/Zoom Scan (5x5x7) 2 (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.08 V/m; Power Drift = 0.333 dB
Peak SAR (extrapolated) = 0.048 W/kg
SAR(1 g) = 0.025 mW/g; SAR(10 g) = 0.014 mW/g
Maximum value of SAR (measured) = 0.032 mW/g

SCN/81199JD01/003: Base of EUT Facing Phantom Antenna A WiFi 802.11g 6Mbps CH6 0mm
Date 22/03/2011
DUT: Samsung Notebook; Type: Rainbow Peak



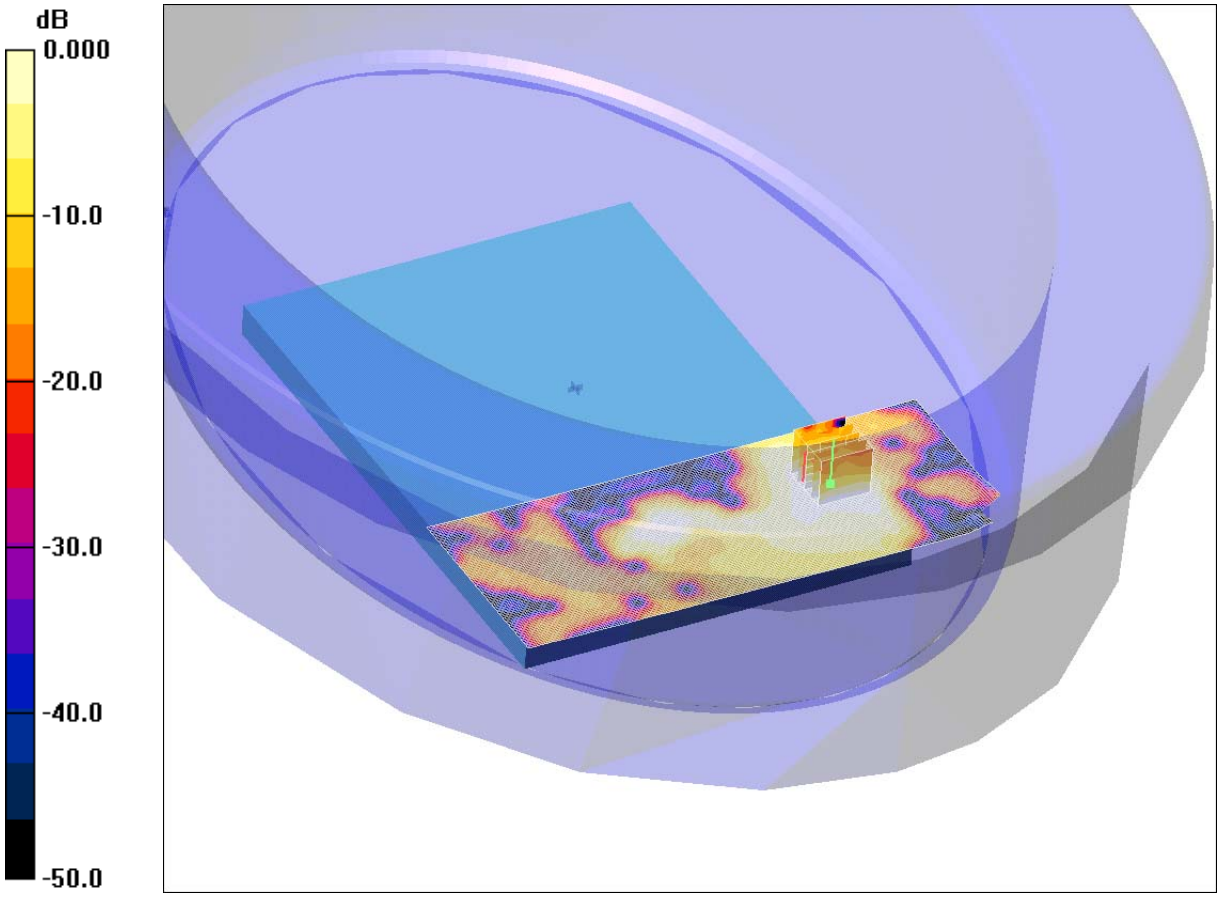
0 dB = 0.093mW/g

Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 MHz MSL Medium parameters used (interpolated): f = 2437 MHz; σ = 1.98 mho/m; ε_r = 51.3; ρ = 1000 kg/m^3
Phantom section: basin Section

DASY4 Configuration:
- Probe: EX3DV3 - SN3508; ConvF(7.97, 7.97, 7.97); Calibrated: 15/02/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: basin 3mm; Type: 3mm; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Base of EUT Facing Phantom - Middle/Area Scan (181x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.084 mW/g
Base of EUT Facing Phantom - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.90 V/m; Power Drift = -0.051 dB
Peak SAR (extrapolated) = 0.148 W/kg
SAR(1 g) = 0.068 mW/g; SAR(10 g) = 0.032 mW/g
Maximum value of SAR (measured) = 0.093 mW/g

SCN/81199JD01/004: Base of EUT Facing Phantom Antenna B WiFi 802.11g 6Mbps CH6 0mm
Date 22/03/2011
DUT: Samsung Notebook; Type: Rainbow Peak



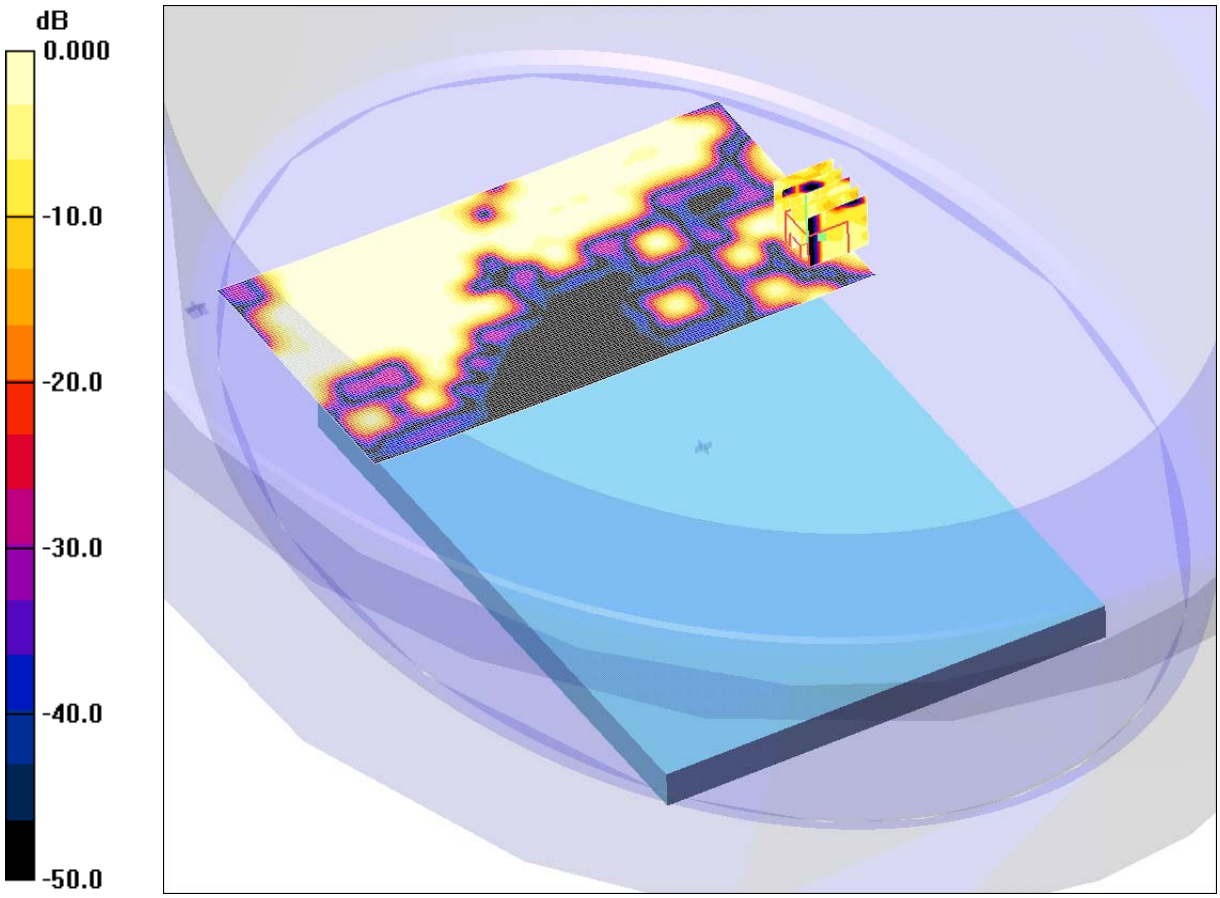
0 dB = 0.024mW/g

Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 MHz MSL Medium parameters used (interpolated): f = 2437 MHz; σ = 1.98 mho/m; ε_r = 51.3; ρ = 1000 kg/m^3
Phantom section: basin Section

DASY4 Configuration:
- Probe: EX3DV3 - SN3508; ConvF(7.97, 7.97, 7.97); Calibrated: 15/02/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: basin 3mm; Type: 3mm;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Base of EUT Facing Phantom - Middle/Area Scan (201x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.027 mW/g
Base of EUT Facing Phantom - Middle/Zoom Scan (5x5x7) 2 (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 1.65 V/m; Power Drift = 0.376 dB
Peak SAR (extrapolated) = 0.036 W/kg
SAR(1 g) = 0.019 mW/g; SAR(10 g) = 0.011 mW/g
Maximum value of SAR (measured) = 0.024 mW/g

SCN/81199JD01/005: Back of Display of EUT Bystander Facing Phantom Antenna A WiFi 802.11b 1Mbps CH6 25mm
Date 22/03/2011
DUT: Samsung Notebook; Type: Rainbow Peak



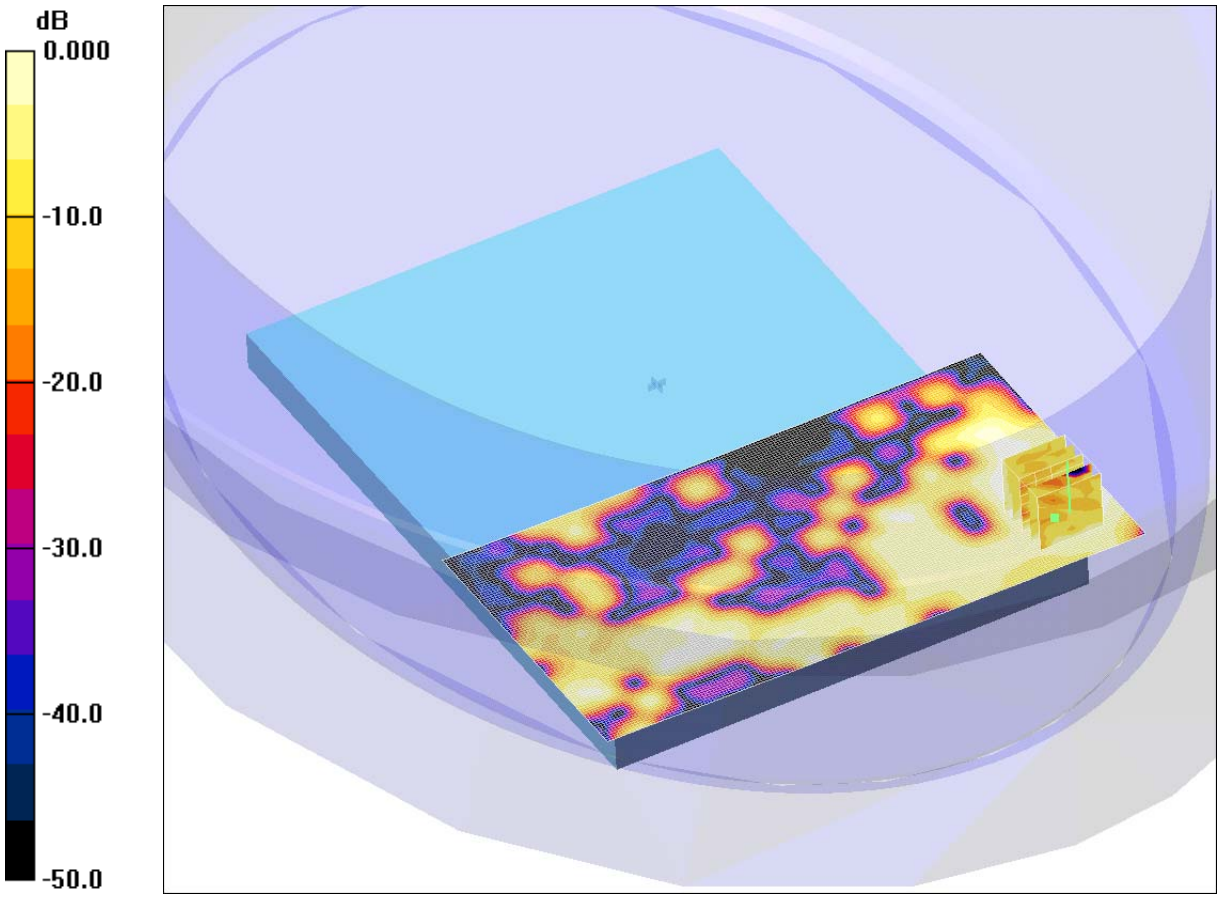
0 dB = 0.002mW/g

Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 MHz MSL Medium parameters used (interpolated): f = 2437 MHz; σ = 1.98 mho/m; ε_r = 51.3; ρ = 1000 kg/m^3
Phantom section: basin Section

DASY4 Configuration:
- Probe: EX3DV3 - SN3508; ConvF(7.97, 7.97, 7.97); Calibrated: 15/02/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: basin 3mm; Type: 3mm; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Back of Screen EUT Facing Phantom - Middle/Area Scan (181x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.004 mW/g
Back of Screen EUT Facing Phantom - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0.893 V/m; Power Drift = 0.244 dB
Peak SAR (extrapolated) = 0.004 W/kg
SAR(1 g) = 0.00133 mW/g; SAR(10 g) = 0.000347 mW/g
Maximum value of SAR (measured) = 0.002 mW/g

SCN/81199JD01/006: Back of Display of EUT Bystander Facing Phantom Antenna B WiFi 802.11b 1Mbps CH6 25mm
Date 22/03/2011
DUT: Samsung Notebook; Type: Rainbow Peak



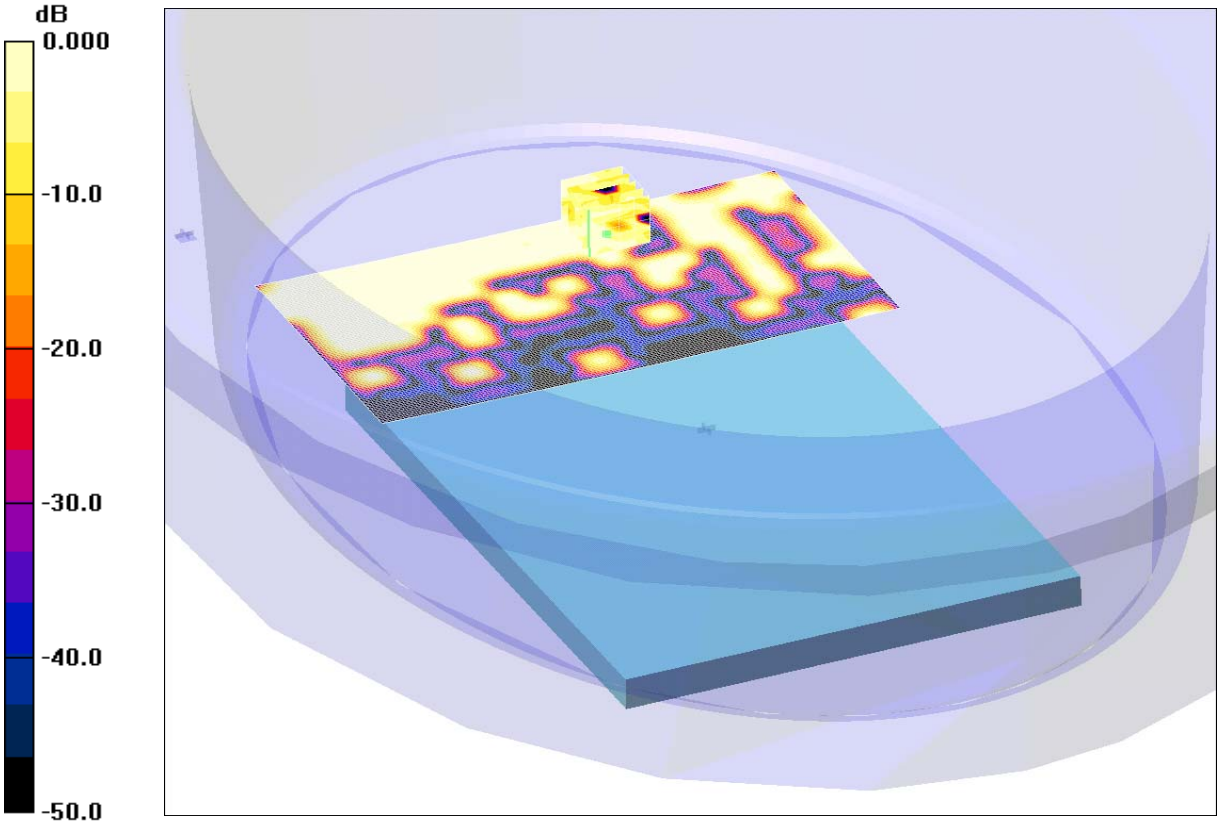
0 dB = 0.004mW/g

Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 MHz MSL Medium parameters used (interpolated): f = 2437 MHz; σ = 1.98 mho/m; ε_r = 51.3; ρ = 1000 kg/m^3
Phantom section: basin Section

DASY4 Configuration:
- Probe: EX3DV3 - SN3508; ConvF(7.97, 7.97, 7.97); Calibrated: 15/02/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: basin 3mm; Type: 3mm; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Back of Screen EUT Facing Phantom - Middle/Area Scan (181x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.004 mW/g
Back of Screen EUT Facing Phantom - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0.909 V/m; Power Drift = 0.345 dB
Peak SAR (extrapolated) = 0.005 W/kg
SAR(1 g) = 0.00261 mW/g; SAR(10 g) = 0.00153 mW/g
Maximum value of SAR (measured) = 0.004 mW/g

SCN/81199JD01/007: Back of Display of EUT Bystander Facing Phantom Antenna A WiFi 802.11g 6Mbps CH6 25mm
Date 22/03/2011
DUT: Samsung Notebook; Type: Rainbow Peak



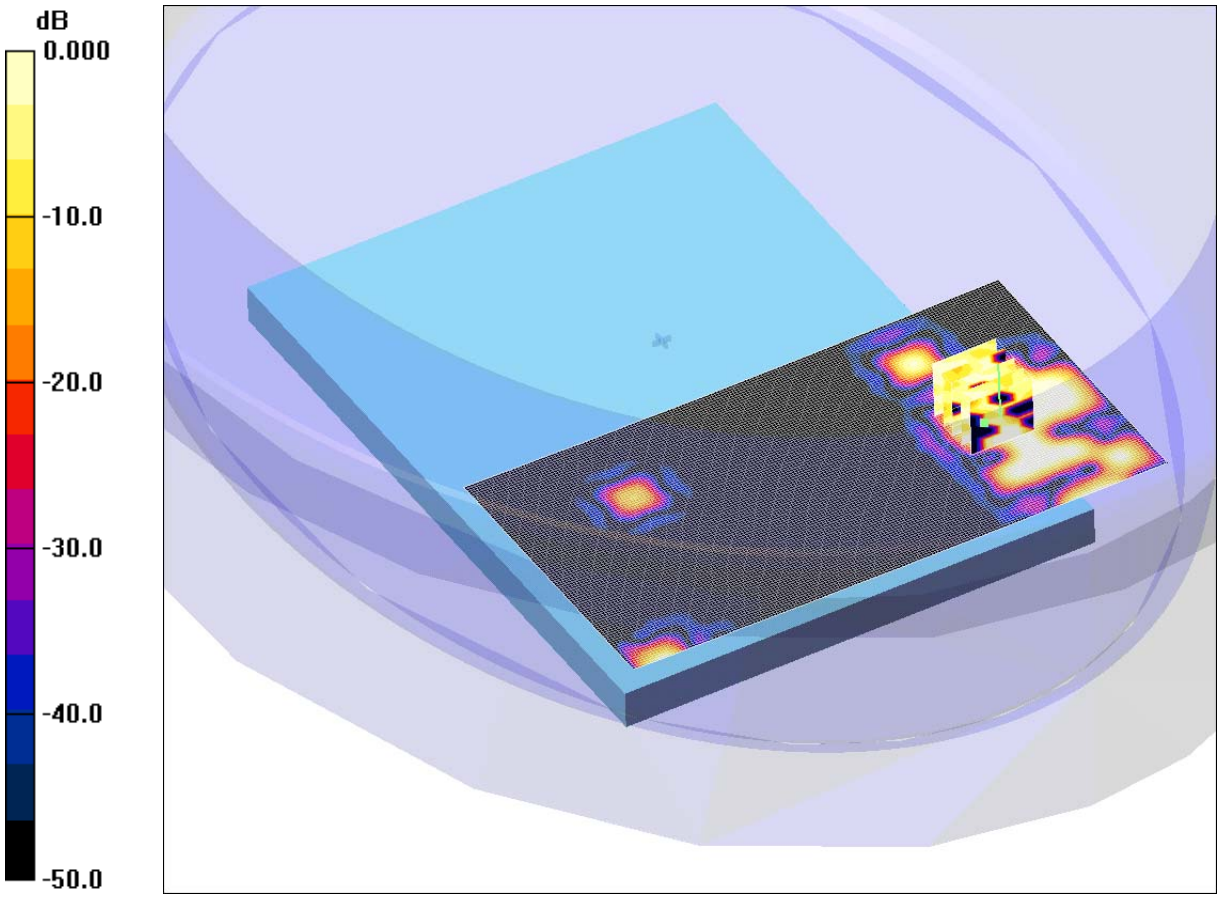
0 dB = 0.001mW/g

Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 MHz MSL Medium parameters used (interpolated): f = 2437 MHz; σ = 1.98 mho/m; ε_r = 51.3; ρ = 1000 kg/m^3
Phantom section: basin Section

DASY4 Configuration:
- Probe: EX3DV3 - SN3508; ConvF(7.97, 7.97, 7.97); Calibrated: 15/02/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: basin 3mm; Type: 3mm; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Back of Screen EUT Facing Phantom - Middle/Area Scan (181x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.002 mW/g
Back of Screen EUT Facing Phantom - Middle/Zoom Scan (5x5x7) 2 (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0.347 V/m; Power Drift = -0.136 dB
Peak SAR (extrapolated) = 0.002 W/kg
SAR(1 g) = 0.000442 mW/g; SAR(10 g) = 0.000185 mW/g
Maximum value of SAR (measured) = 0.001 mW/g

SCN/81199JD01/008: Back of Display of EUT Bystander Facing Phantom Antenna B WiFi 802.11g 6Mbps CH6 25mm
Date 21/03/2011
DUT: Samsung Notebook; Type: Rainbow Peak



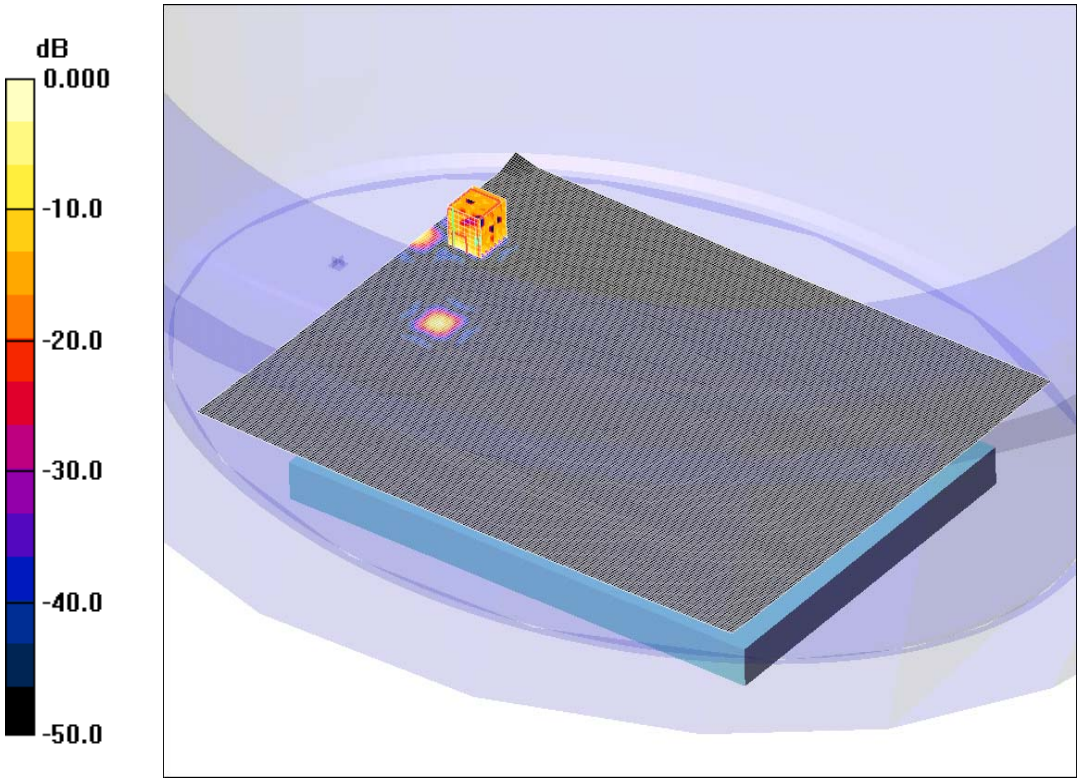
0 dB = 0.001mW/g

Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 MHz MSL Medium parameters used (interpolated): f = 2437 MHz; σ = 1.98 mho/m; ε_r = 51.3; ρ = 1000 kg/m^3
Phantom section: basin Section

DASY4 Configuration:
- Probe: EX3DV3 - SN3508; ConvF(7.97, 7.97, 7.97); Calibrated: 15/02/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: basin 3mm; Type: 3mm; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Back of Screen EUT Facing Phantom - Middle/Area Scan (181x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.004 mW/g
Back of Screen EUT Facing Phantom - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0.486 V/m; Power Drift = 0.041 dB
Peak SAR (extrapolated) = 0.004 W/kg
SAR(1 g) = 0.000768 mW/g; SAR(10 g) = 0.000351 mW/g
Maximum value of SAR (measured) = 0.001 mW/g

SCN/81199JD01/009: Base of EUT Facing Phantom Antenna A WiFi 802.11a 6Mbps CH157 0mm
Date 26/03/2011
DUT: Samsung Notebook; Type: Rainbow Peak



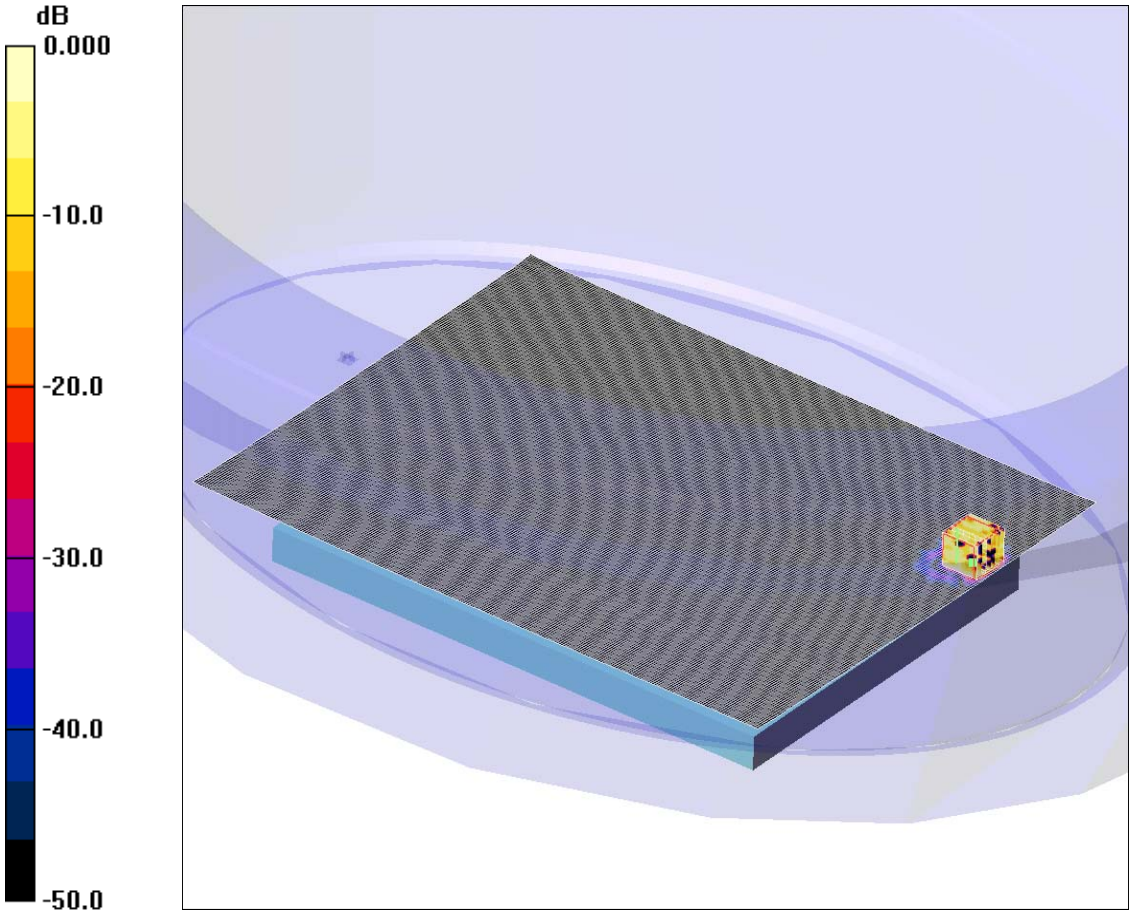
0 dB = 0.070mW/g

Communication System: WLAN; Frequency: 5785 MHz;Duty Cycle: 1:1
Medium: 5800 MHz MSL Medium parameters used (interpolated): f = 5785 MHz; σ = 6.15 mho/m; εr = 47.1; ρ = 1000 kg/m3
Phantom section: basin Section

DASY4 Configuration:
- Probe: EX3DV3 - SN3508; ConvF(3.71, 3.71, 3.71); Calibrated: 15/02/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: basin 3mm; Type: 3mm;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Base of EUT Facing Phantom - Middle 2 2/Area Scan 2 (201x261x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.022 mW/g
Base of EUT Facing Phantom - Middle 2 2/Zoom Scan (7x7x9) (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 1.43 V/m; Power Drift = -0.084 dB
Peak SAR (extrapolated) = 0.083 W/kg
SAR(1 g) = 0.018 mW/g; SAR(10 g) = 0.00566 mW/g
Maximum value of SAR (measured) = 0.030 mW/g

SCN/81199JD01/010: Base of EUT Facing Phantom Antenna B WiFi 802.11a 6Mbps CH157 0mm
Date 26/03/2011
DUT: Samsung Notebook; Type: Rainbow Peak



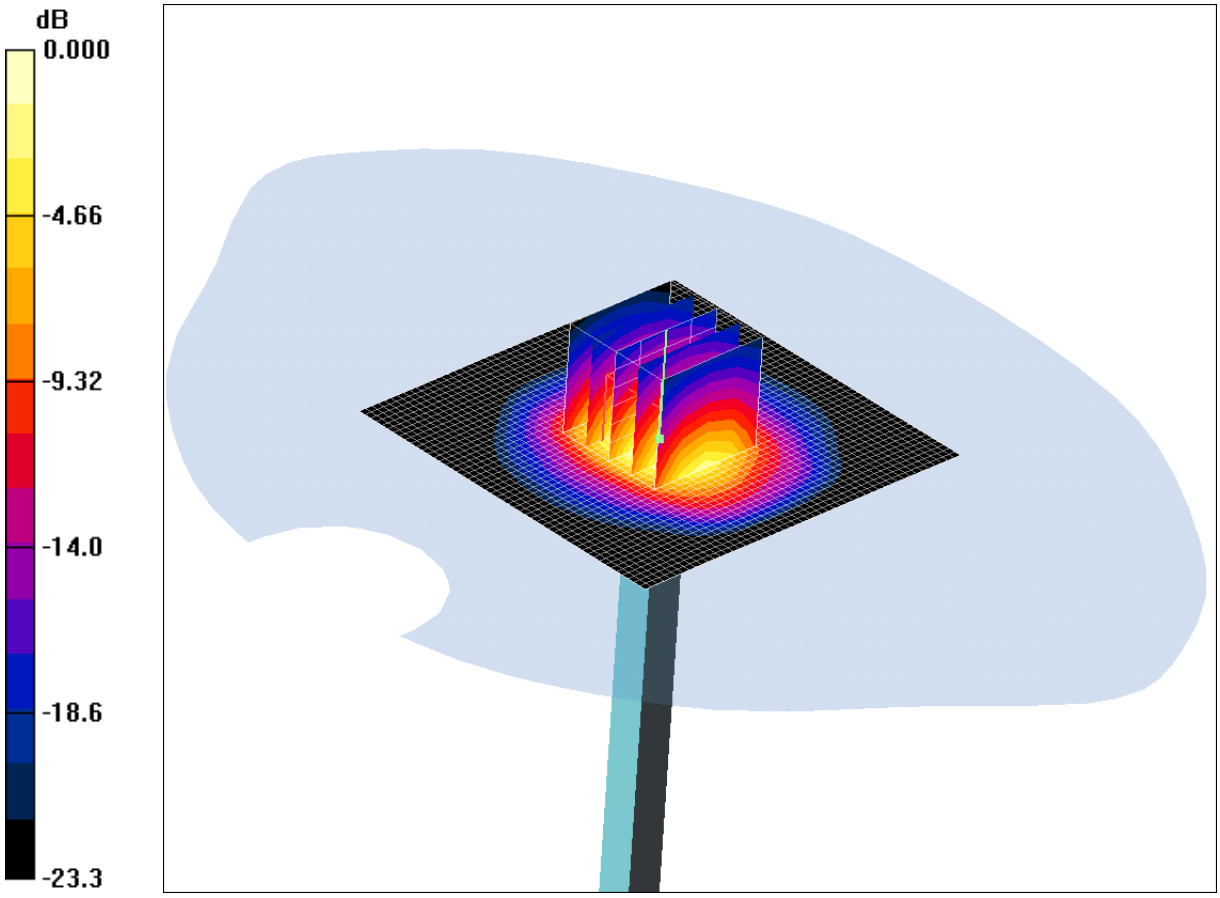
0 dB = 0.010mW/g

Communication System: WLAN; Frequency: 5785 MHz;Duty Cycle: 1:1
Medium: 5800 MHz MSL Medium parameters used (interpolated): f = 5785 MHz; σ = 6.15 mho/m; εr = 47.1; ρ = 1000 kg/m3
Phantom section: basin Section

DASY4 Configuration:
- Probe: EX3DV3 - SN3508; ConvF(3.71, 3.71, 3.71); Calibrated: 15/02/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: basin 3mm; Type: 3mm;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Base of EUT Facing Phantom - Middle 2 2/Area Scan 2 (201x261x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.025 mW/g
Base of EUT Facing Phantom - Middle 2 2/Zoom Scan (7x7x9) (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 1.80 V/m; Power Drift = 0.529 dB
Peak SAR (extrapolated) = 0.083 W/kg
SAR(1 g) = 0.015 mW/g; SAR(10 g) = 0.00526 mW/g
Maximum value of SAR (measured) = 0.028 mW/g

SCN/81199JD01/011: System Performance Check 2450MHz Body 21 03 11
Date 21/03/2011
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 725



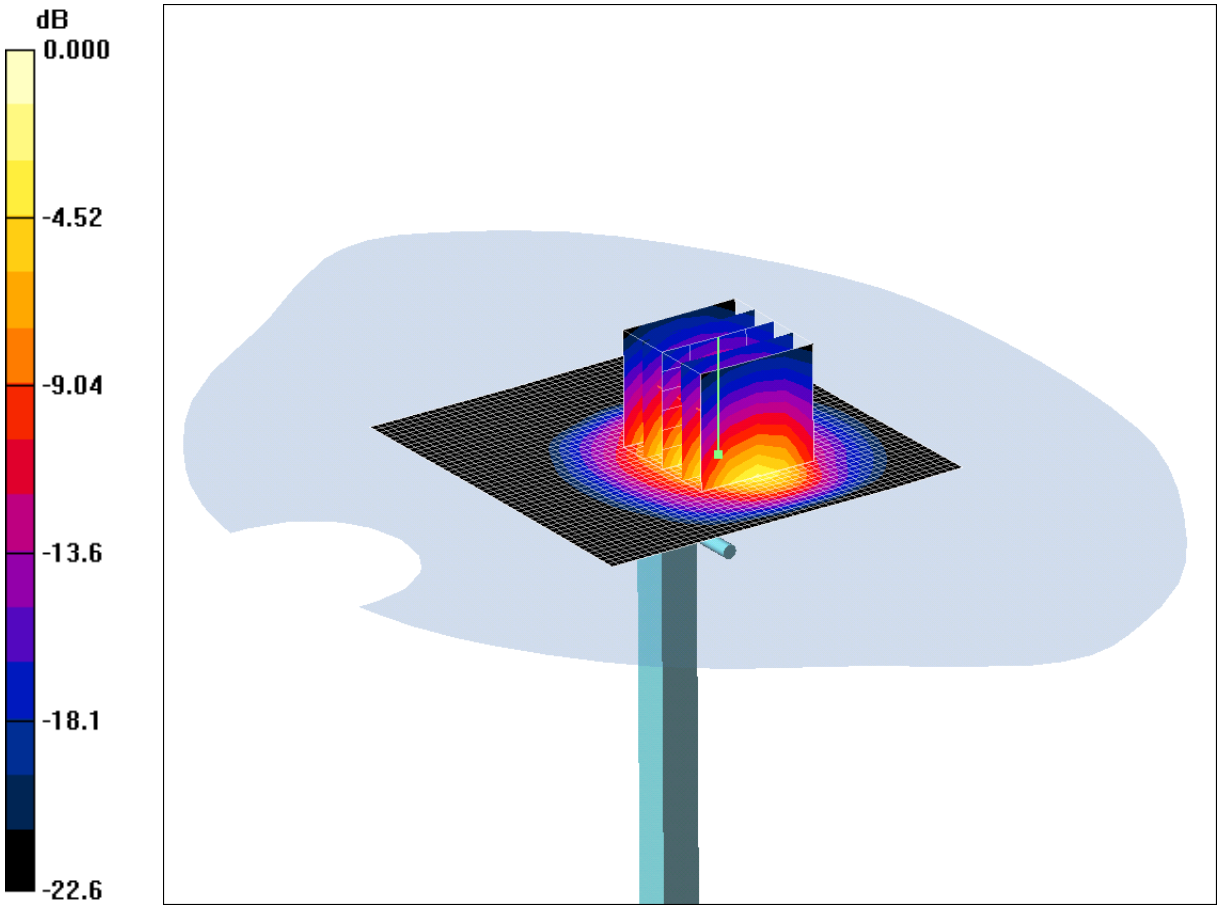
0 dB = 14.5mW/g

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: 2450 MHz MSL Medium parameters used: f = 2450 MHz; σ = 1.99 mho/m; ε_r = 51.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV3 - SN3508; ConvF(7.97, 7.97, 7.97); Calibrated: 15/02/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: SAM 12a; Type: SAM 4.0; Serial: TP:1193
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

d=10mm, Pin=250mW 1 2 2/Area Scan (51x51x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 17.0 mW/g
d=10mm, Pin=250mW 1 2 2/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 82.4 V/m; Power Drift = -0.003 dB
Peak SAR (extrapolated) = 27.5 W/kg
SAR(1 g) = 13.1 mW/g; SAR(10 g) = 5.98 mW/g
Maximum value of SAR (measured) = 14.5 mW/g

SCN/81199JD01/012: System Performance Check 2450MHz Body 22 03 11
Date 22/03/2011
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 725



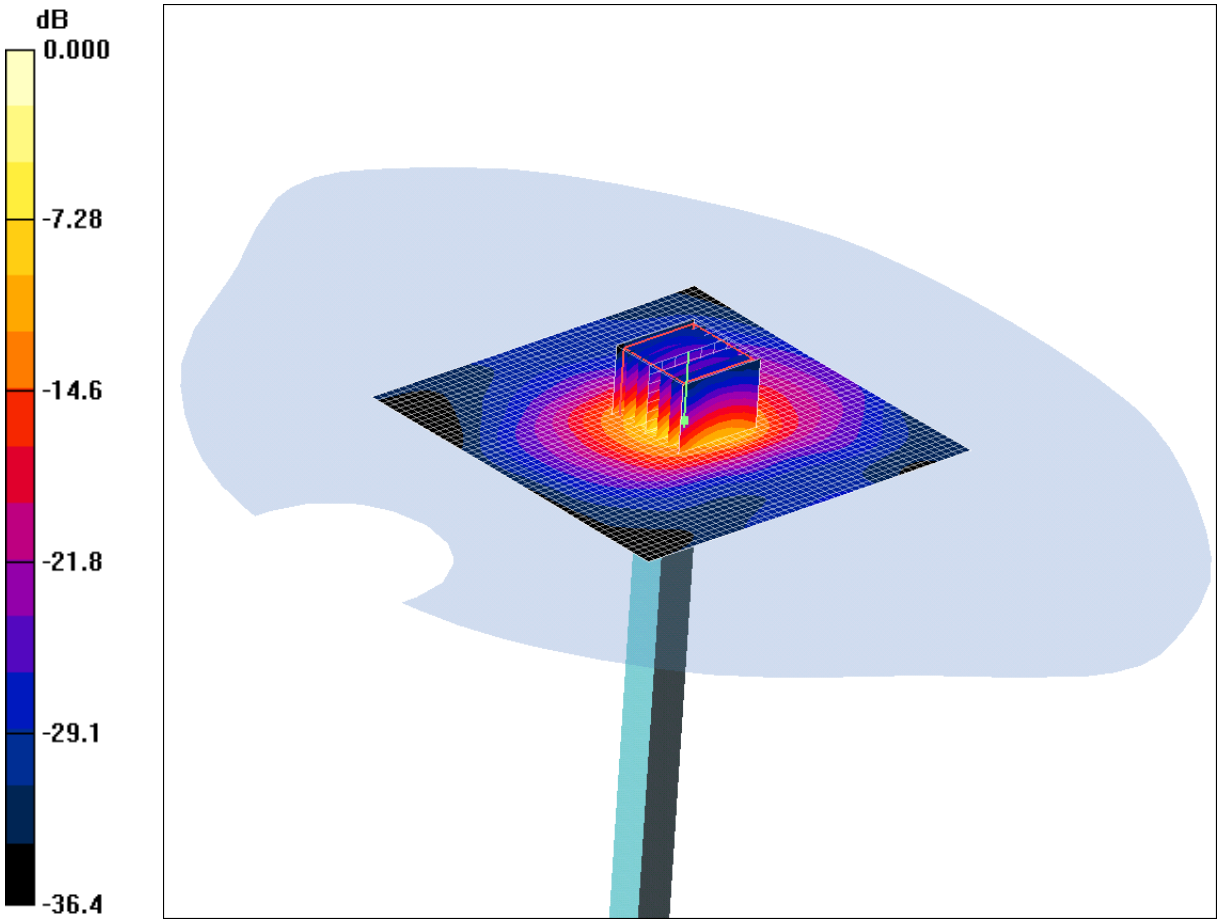
0 dB = 14.9mW/g

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: 2450 MHz MSL Medium parameters used: f = 2450 MHz; σ = 1.99 mho/m; ε_r = 51.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV3 - SN3508; ConvF(7.97, 7.97, 7.97); Calibrated: 15/02/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: SAM 12b; Type: SAM 4.0; Serial: TP:1207
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

d=10mm, Pin=250mW 1 2 2/Area Scan (51x51x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 14.5 mW/g
d=10mm, Pin=250mW 1 2 2/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 59.2 V/m; Power Drift = 0.096 dB
Peak SAR (extrapolated) = 27.2 W/kg
SAR(1 g) = 13.1 mW/g; SAR(10 g) = 6.01 mW/g
Maximum value of SAR (measured) = 14.9 mW/g

SCN/81199JD01/013: System Performance Check 5800MHz Body 26 03 11
Date/Time: 26/03/2011
DUT: 5GHz Dipole; Type: D5GHzV2; Serial: SN: 1016



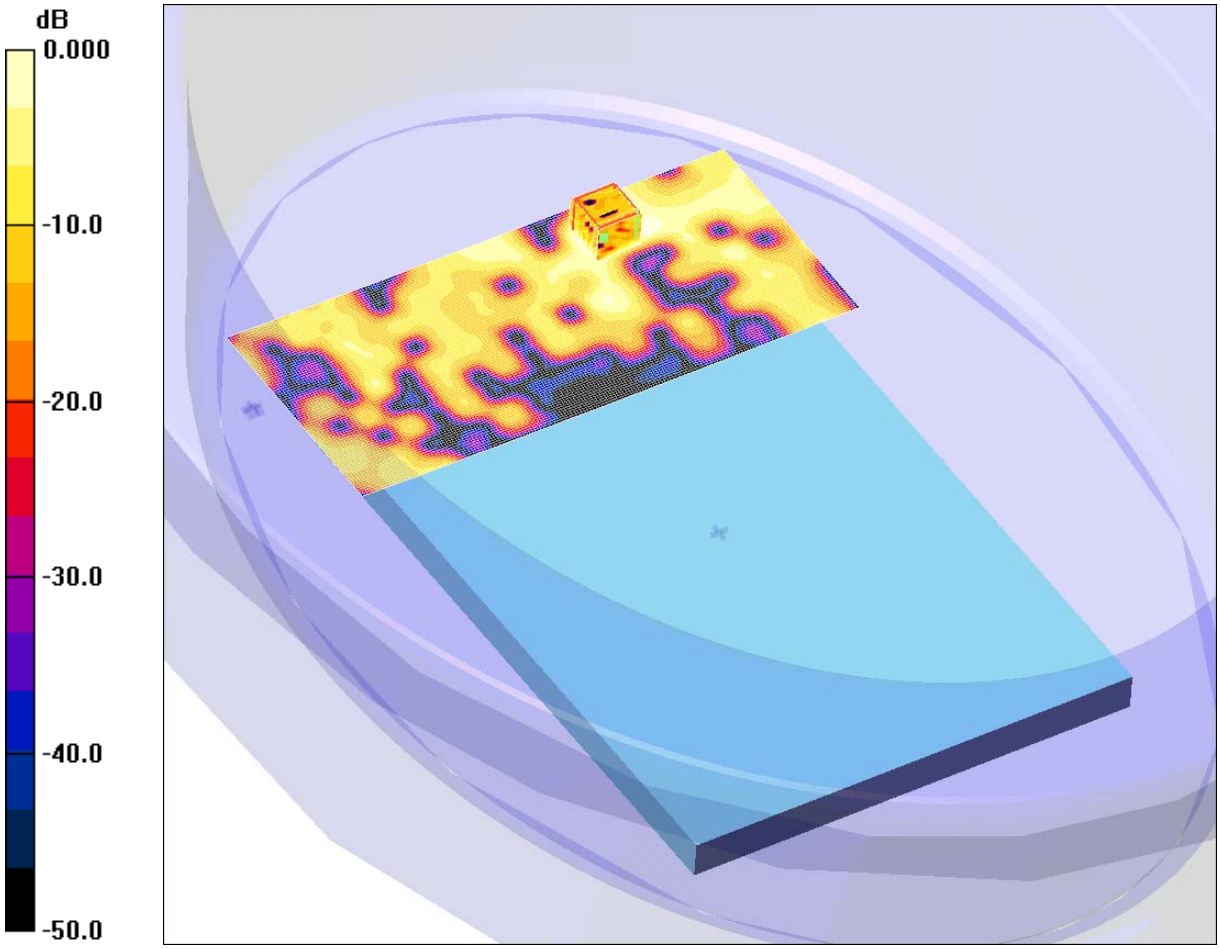
0 dB = 22.5mW/g

Communication System: CW; Frequency: 5800 MHz;Duty Cycle: 1:1
Medium: 5800 MHz MSL Medium parameters used: f = 5800 MHz; σ = 6.17 mho/m; ε_r = 47; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV3 - SN3508; ConvF(3.71, 3.71, 3.71); Calibrated: 15/02/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: SAM 12b; Type: SAM 4.0; Serial: TP:1207
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

d=10mm, Pin=141mW /Area Scan (51x51x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 8.00 mW/g
d=10mm, Pin=141mW /Zoom Scan (7x7x9) (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 44.4 V/m; Power Drift = -0.158 dB
Peak SAR (extrapolated) = 37.0 W/kg
SAR(1 g) = 10.9 mW/g; SAR(10 g) = 3.05 mW/g
Maximum value of SAR (measured) = 22.5 mW/g

SCN/81199JD01/014: Base of EUT Facing Phantom Antenna A WiFi 802.11a 6Mbps CH36 0mm
Date 08/04/2011
DUT: Samsung Notebook; Type: Rainbow Peak



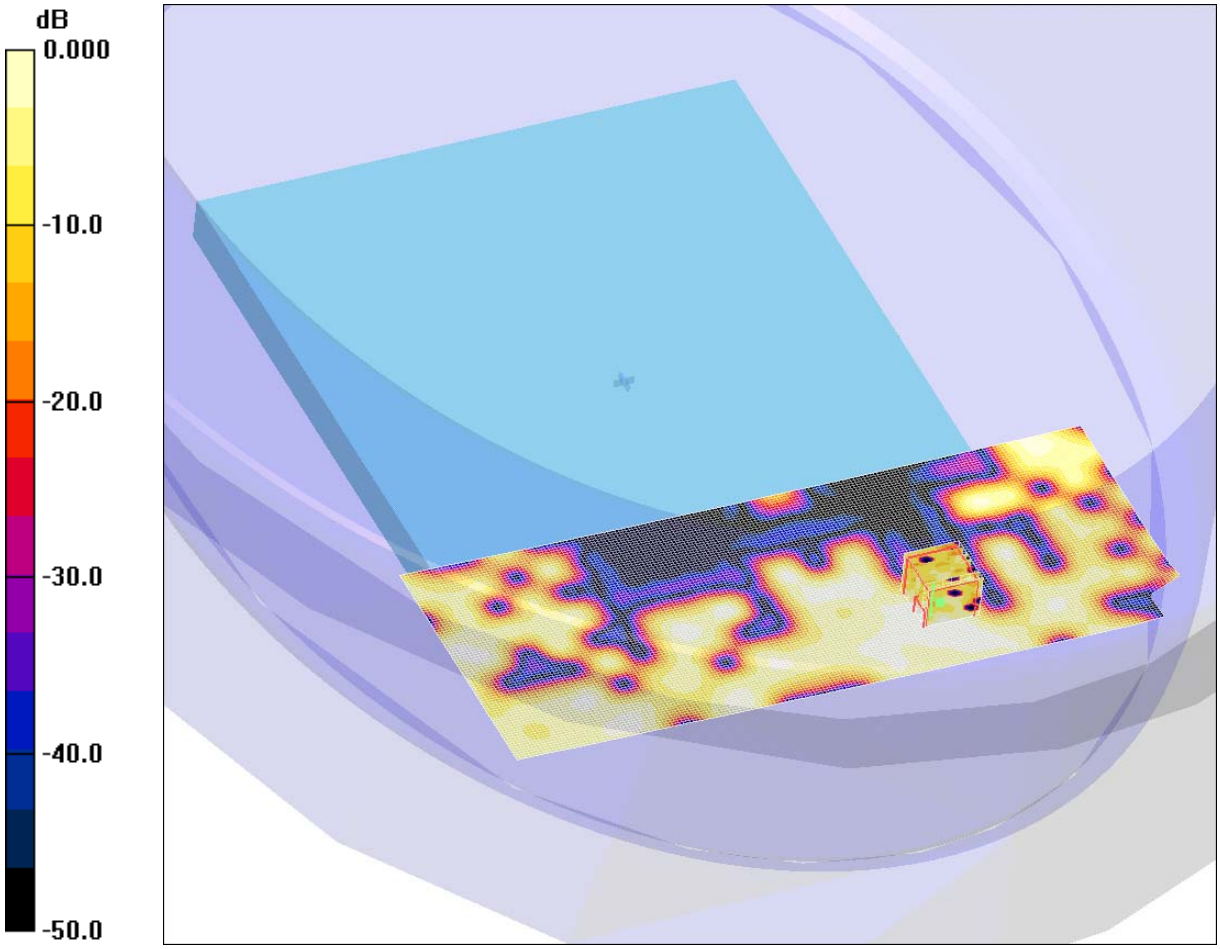
0 dB = 0.027mW/g

Communication System: WLAN 802.11a UNII; Frequency: 5180 MHz;Duty Cycle: 1:1
Medium: 5800 MHz MSL Medium parameters used (interpolated): f = 5180 MHz; σ = 5.26 mho/m; ε_r = 49.3; ρ = 1000 kg/m^3
Phantom section: basin Section

DASY4 Configuration:
- Probe: EX3DV3 - SN3508; ConvF(4.19, 4.19, 4.19); Calibrated: 15/02/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: basin 3mm; Type: 3mm; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Base of EUT Facing Phantom - Middle/Area Scan (181x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.048 mW/g
Base of EUT Facing Phantom - Middle/Zoom Scan (7x7x9) (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0.540 V/m; Power Drift = 0.416 dB
Peak SAR (extrapolated) = 0.077 W/kg
SAR(1 g) = 0.014 mW/g; SAR(10 g) = 0.00622 mW/g
Maximum value of SAR (measured) = 0.027 mW/g

SCN/81199JD01/015: Base of EUT Facing Phantom Antenna B WiFi 802.11a 6Mbps CH36 0mm
Date 08/04/2011
DUT: Samsung Notebook; Type: Rainbow Peak



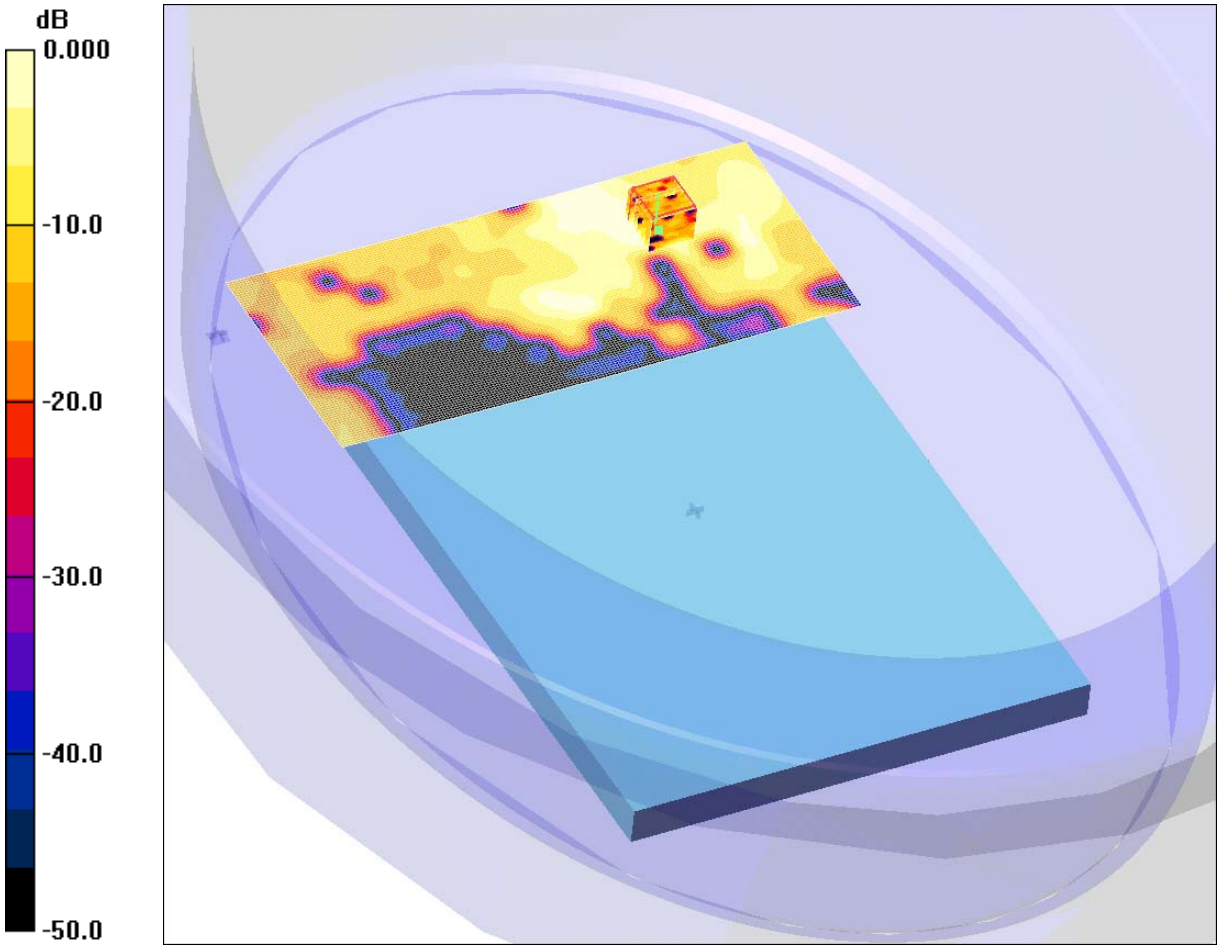
0 dB = 0.012mW/g

Communication System: WLAN 802.11a UNII; Frequency: 5180 MHz;Duty Cycle: 1:1
Medium: 5800 MHz MSL Medium parameters used (interpolated): f = 5180 MHz; σ = 5.26 mho/m; ε_r = 49.3; ρ = 1000 kg/m^3
Phantom section: basin Section

DASY4 Configuration:
- Probe: EX3DV3 - SN3508; ConvF(4.19, 4.19, 4.19); Calibrated: 15/02/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: basin 3mm; Type: 3mm; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Base of EUT Facing Phantom - Middle/Area Scan (201x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.011 mW/g
Base of EUT Facing Phantom - Middle/Zoom Scan (7x7x9) (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 0.850 V/m; Power Drift = -2.40 dB
Peak SAR (extrapolated) = 0.027 W/kg
SAR(1 g) = 0.0065 mW/g; SAR(10 g) = 0.00231 mW/g
Maximum value of SAR (measured) = 0.012 mW/g

SCN/81199JD01/016: Base of EUT Facing Phantom Antenna A WiFi 802.11a 6Mbps CH52 0mm
Date 08/04/2011
DUT: Samsung Notebook; Type: Rainbow Peak



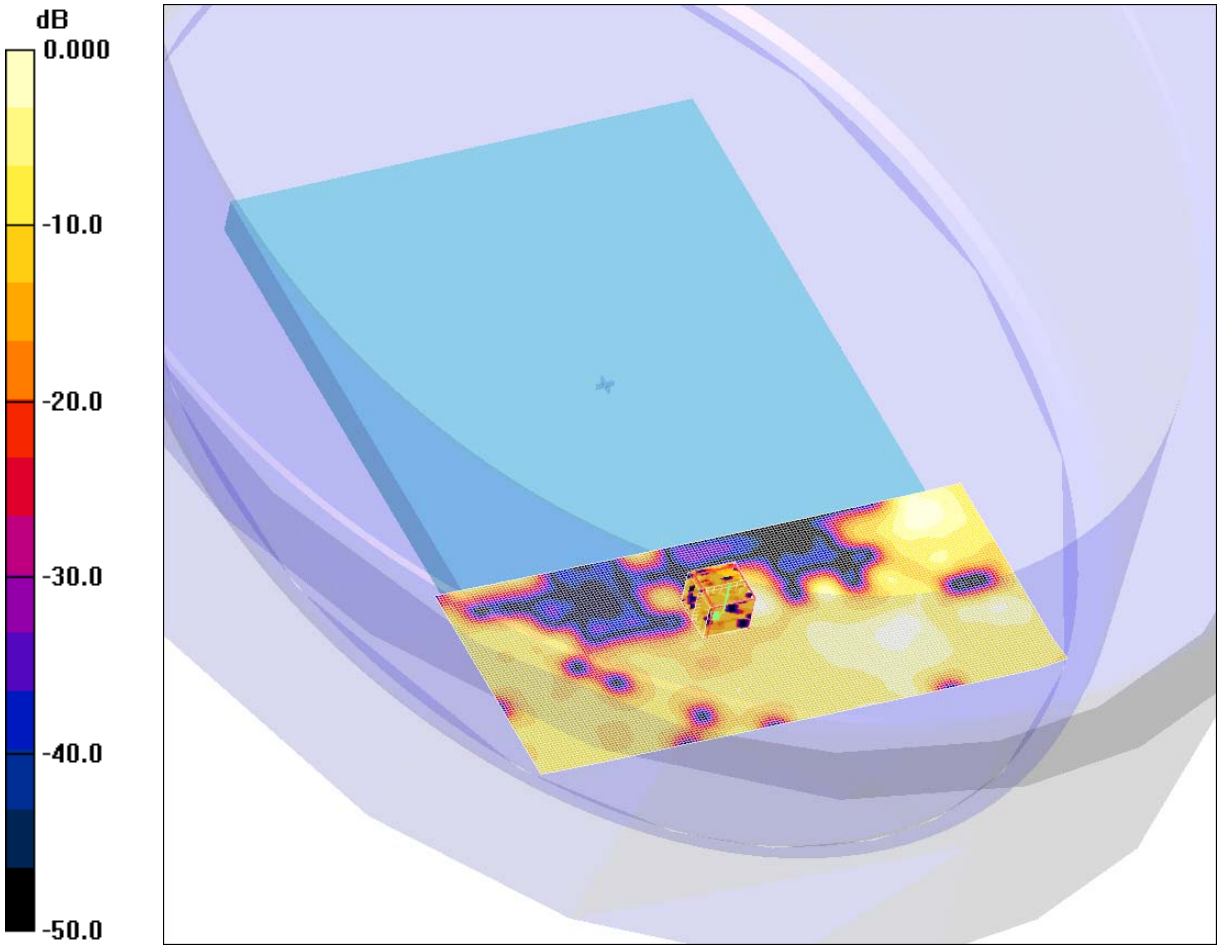
0 dB = 0.046mW/g

Communication System: WLAN 802.11a UNII; Frequency: 5260 MHz;Duty Cycle: 1:1
Medium: 5800 MHz MSL Medium parameters used (interpolated): f = 5260 MHz; σ = 5.4 mho/m; ε_r = 49; ρ = 1000 kg/m^3
Phantom section: basin Section

DASY4 Configuration:
- Probe: EX3DV3 - SN3508; ConvF(4.19, 4.19, 4.19); Calibrated: 15/02/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: basin 3mm; Type: 3mm; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Base of EUT Facing Phantom - Middle/Area Scan (181x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.052 mW/g
Base of EUT Facing Phantom - Middle/Zoom Scan (7x7x9) (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 3.20 V/m; Power Drift = -0.630 dB
Peak SAR (extrapolated) = 0.096 W/kg
SAR(1 g) = 0.020 mW/g; SAR(10 g) = 0.00858 mW/g
Maximum value of SAR (measured) = 0.046 mW/g

SCN/81199JD01/017: Base of EUT Facing Phantom Antenna B WiFi 802.11a 6Mbps CH52 0mm
Date 08/04/2011
DUT: Samsung Notebook; Type: Rainbow Peak



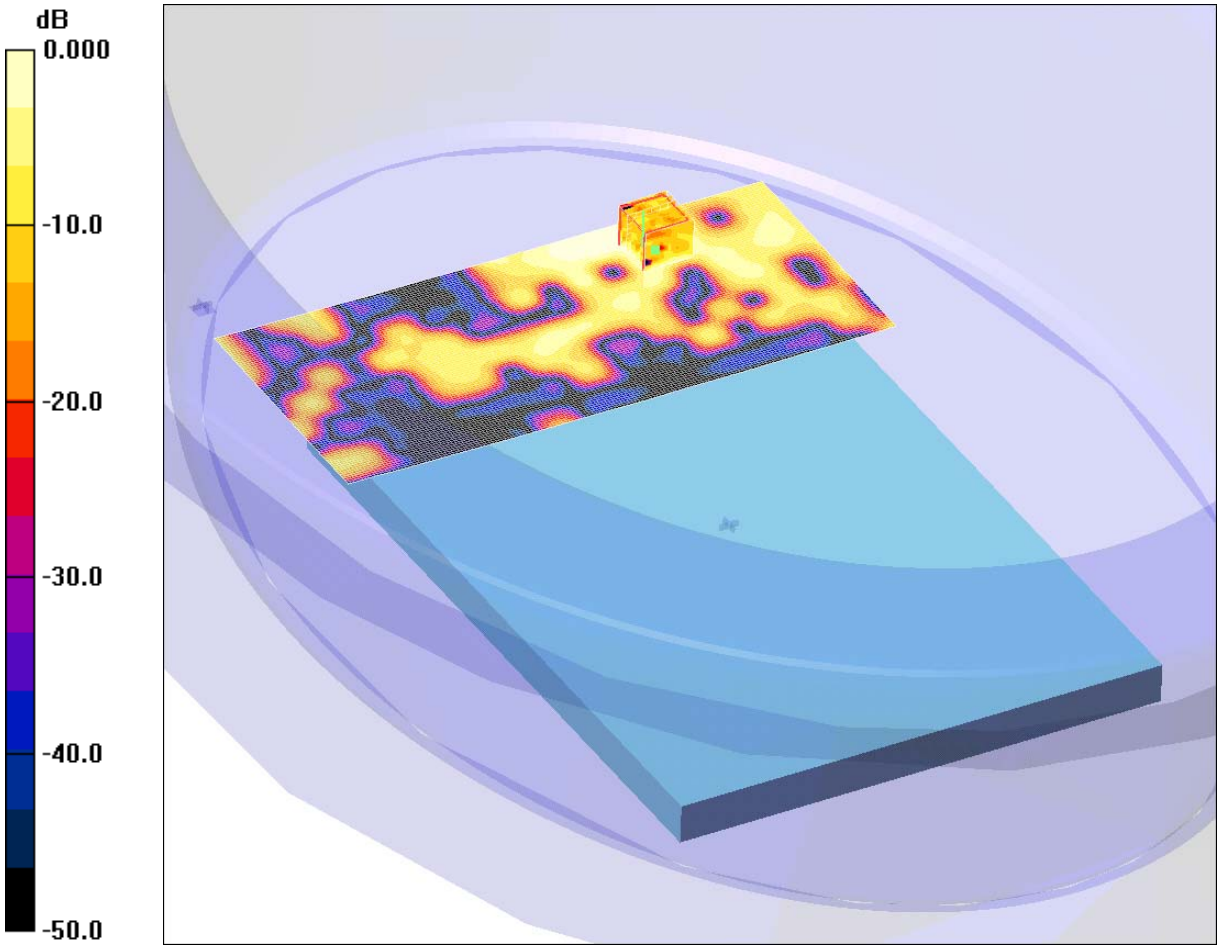
0 dB = 0.028mW/g

Communication System: WLAN 802.11a UNII; Frequency: 5260 MHz;Duty Cycle: 1:1
Medium: 5800 MHz MSL Medium parameters used (interpolated): f = 5260 MHz; σ = 5.4 mho/m; ε_r = 49; ρ = 1000 kg/m^3
Phantom section: basin Section

DASY4 Configuration:
- Probe: EX3DV3 - SN3508; ConvF(4.19, 4.19, 4.19); Calibrated: 15/02/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: basin 3mm; Type: 3mm; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Base of EUT Facing Phantom - Middle/Area Scan (181x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.024 mW/g
Base of EUT Facing Phantom - Middle/Zoom Scan (7x7x9) (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 1.42 V/m; Power Drift = 0.122 dB
Peak SAR (extrapolated) = 0.049 W/kg
SAR(1 g) = 0.011 mW/g; SAR(10 g) = 0.00243 mW/g
Maximum value of SAR (measured) = 0.028 mW/g

SCN/81199JD01/018: Base of EUT Facing Phantom Antenna A WiFi 802.11a 6Mbps CH116 0mm
Date 08/04/2011
DUT: Samsung Notebook; Type: Rainbow Peak



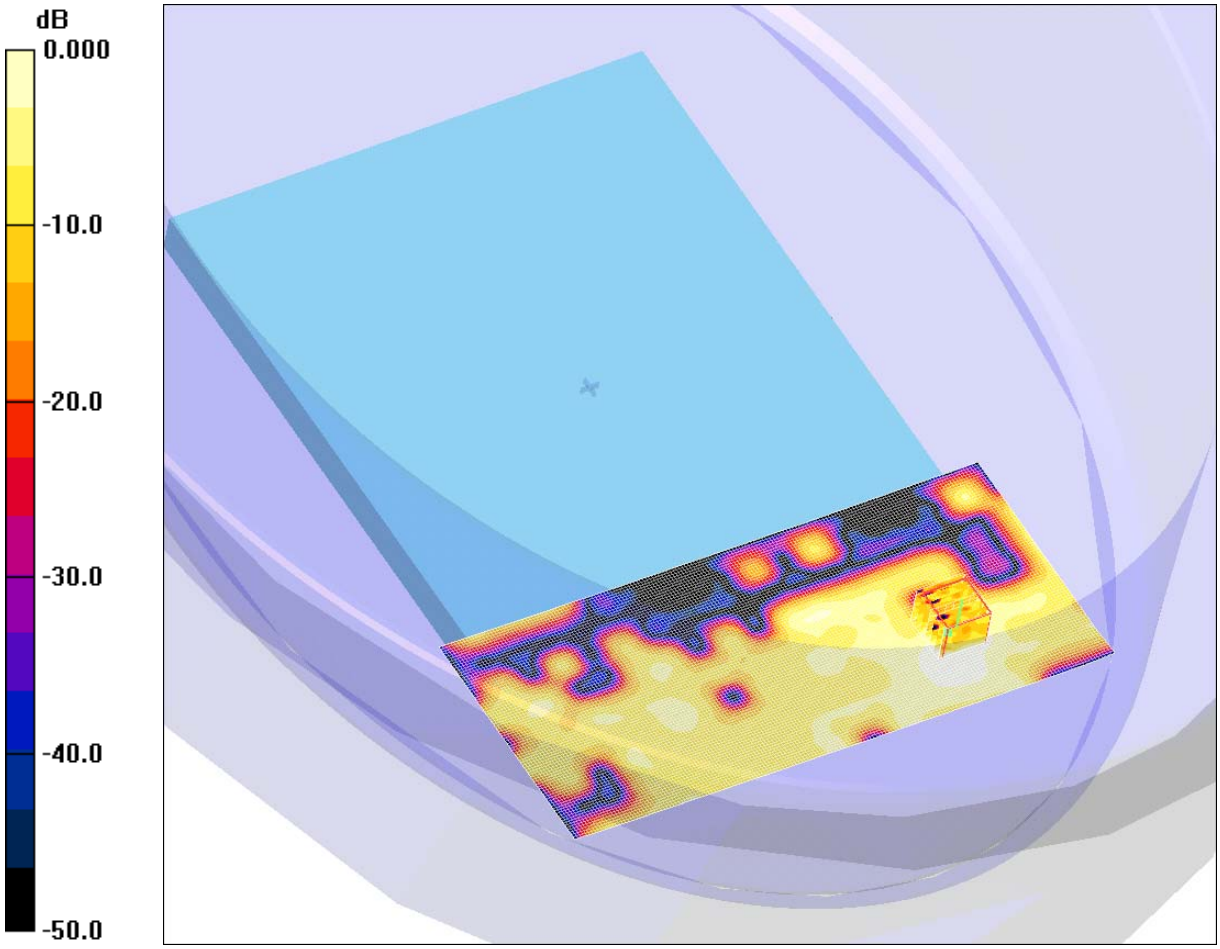
0 dB = 0.031mW/g

Communication System: WLAN 802.11a UNII; Frequency: 5580 MHz;Duty Cycle: 1:1
Medium: 5800 MHz MSL Medium parameters used (interpolated): f = 5580 MHz; σ = 5.89 mho/m; ε_r = 48.2; ρ = 1000 kg/m^3
Phantom section: basin Section

DASY4 Configuration:
- Probe: EX3DV3 - SN3508; ConvF(3.72, 3.72, 3.72); Calibrated: 15/02/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: basin 3mm; Type: 3mm; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Base of EUT Facing Phantom - Middle/Area Scan (181x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.048 mW/g
Base of EUT Facing Phantom - Middle/Zoom Scan (7x7x9) (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 2.13 V/m; Power Drift = 0.256 dB
Peak SAR (extrapolated) = 0.090 W/kg
SAR(1 g) = 0.015 mW/g; SAR(10 g) = 0.00656 mW/g
Maximum value of SAR (measured) = 0.031 mW/g

SCN/81199JD01/019: Base of EUT Facing Phantom Antenna B WiFi 802.11a 6Mbps CH116 0mm
Date 08/04/2011
DUT: Samsung Notebook; Type: Rainbow Peak



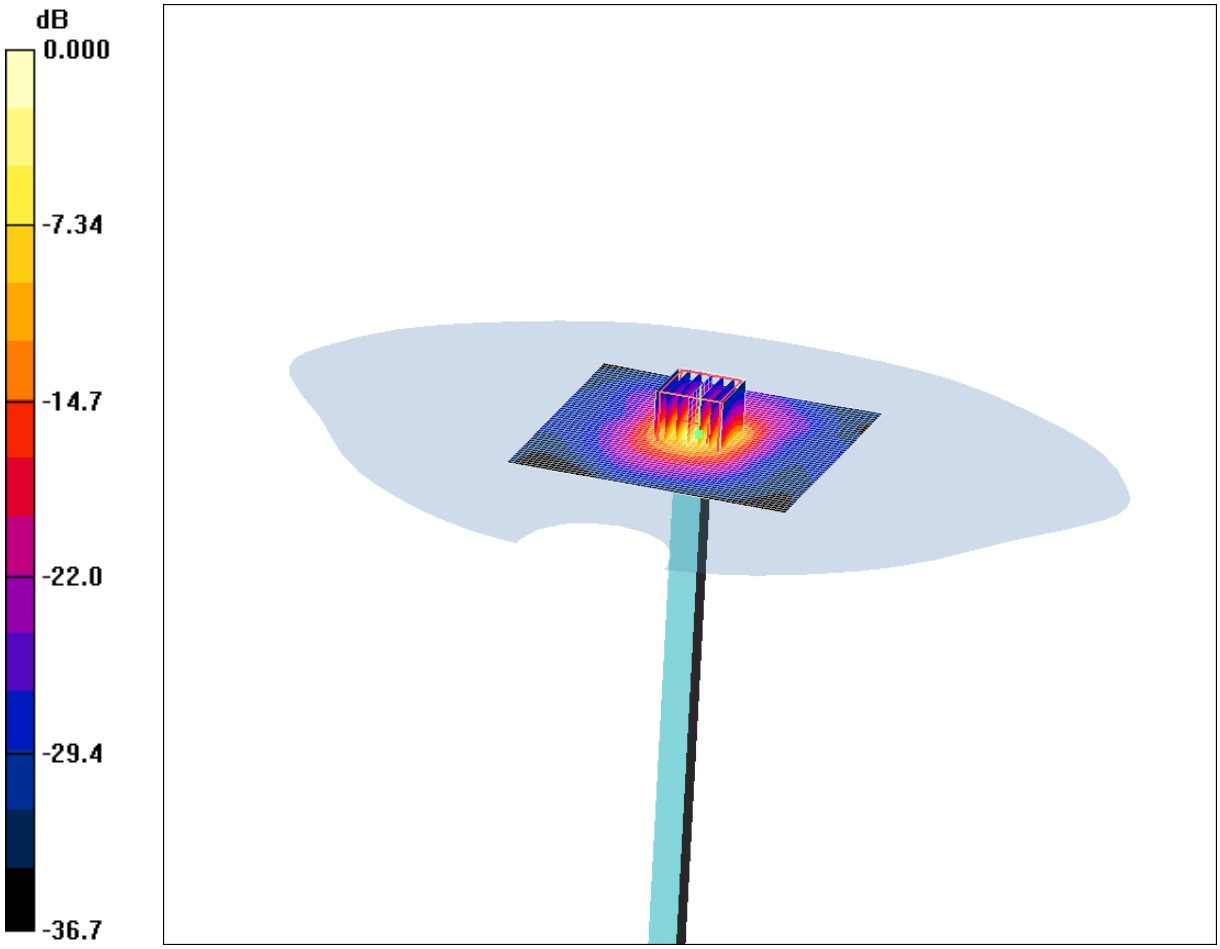
0 dB = 0.025mW/g

Communication System: WLAN 802.11a UNII; Frequency: 5580 MHz;Duty Cycle: 1:1
Medium: 5800 MHz MSL Medium parameters used (interpolated): f = 5580 MHz; σ = 5.89 mho/m; ε_r = 48.2; ρ = 1000 kg/m^3
Phantom section: basin Section

DASY4 Configuration:
- Probe: EX3DV3 - SN3508; ConvF(3.72, 3.72, 3.72); Calibrated: 15/02/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: basin 3mm; Type: 3mm; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Base of EUT Facing Phantom - Middle/Area Scan (181x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.026 mW/g
Base of EUT Facing Phantom - Middle/Zoom Scan (7x7x9) (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 2.09 V/m; Power Drift = -2.27 dB
Peak SAR (extrapolated) = 0.042 W/kg
SAR(1 g) = 0.012 mW/g; SAR(10 g) = 0.00502 mW/g
Maximum value of SAR (measured) = 0.025 mW/g

SCN/81199JD01/020: System Performance Check 5200MHz Body 08 04 11
Date/Time: 08/04/2011
DUT: 5GHz Dipole; Type: D5GHzV2; Serial: SN: 1016



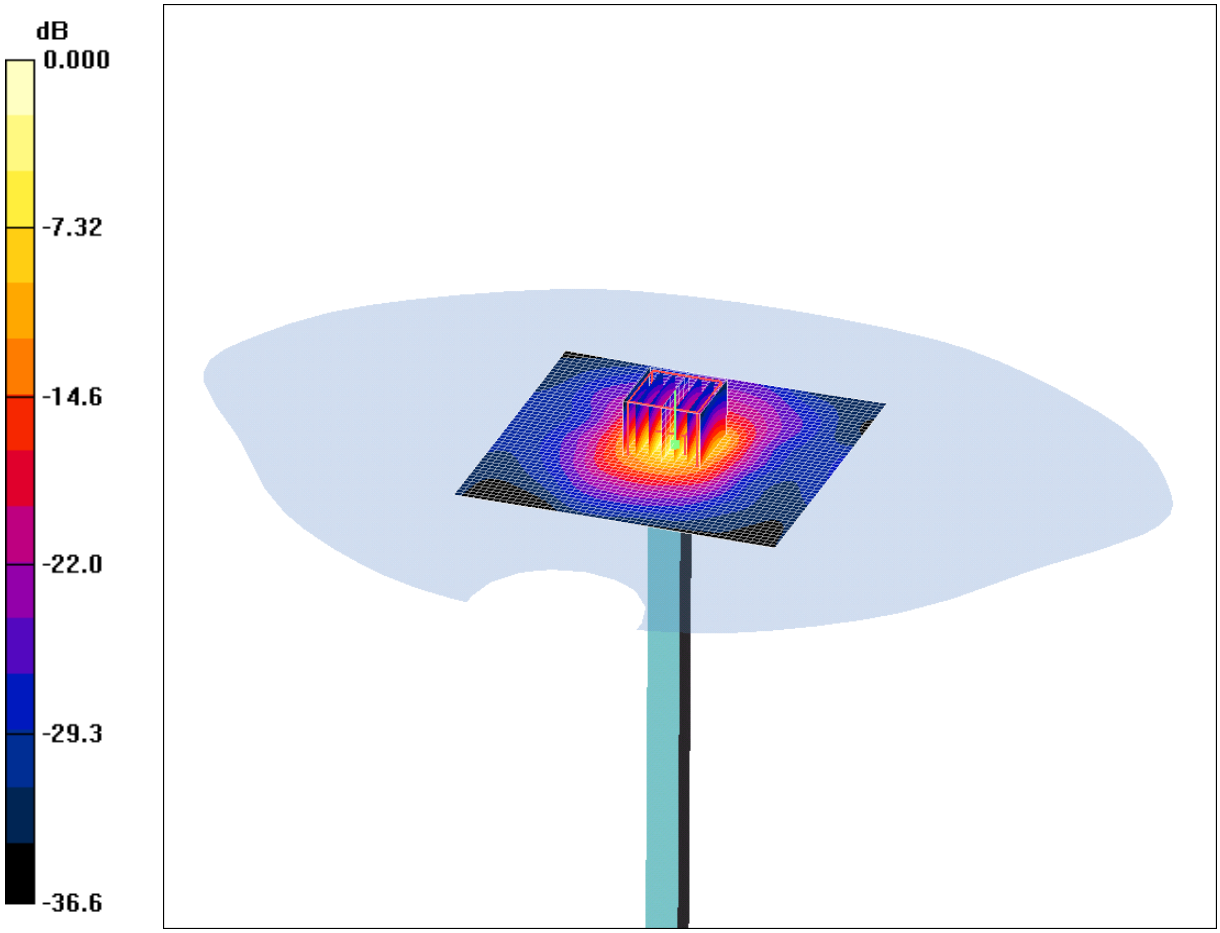
0 dB = 18.3mW/g

Communication System: CW; Frequency: 5200 MHz;Duty Cycle: 1:1
Medium: 5800 MHz MSL Medium parameters used: f = 5200 MHz; σ = 5.29 mho/m; ε_r = 49.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV3 - SN3508; ConvF(4.19, 4.19, 4.19); Calibrated: 15/02/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: SAM 12b; Type: SAM 4.0; Serial: TP:1207
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

d=10mm, Pin=111mW 2 2/Area Scan (51x51x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 6.20 mW/g
d=10mm, Pin=111mW 2 2/Zoom Scan (7x7x9) (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 41.8 V/m; Power Drift = -0.158 dB
Peak SAR (extrapolated) = 32.7 W/kg
SAR(1 g) = 8.77 mW/g; SAR(10 g) = 2.45 mW/g
Maximum value of SAR (measured) = 18.3 mW/g

SCN/81199JD01/021: System Performance Check 5500MHz Body 08 04 11
Date/Time: 26/03/2011
DUT: 5GHz Dipole; Type: D5GHzV2; Serial: SN: 1016



0 dB = 21.7mW/g

Communication System: CW; Frequency: 5500 MHz;Duty Cycle: 1:1
Medium: 5800 MHz MSL Medium parameters used: f = 5500 MHz; σ = 5.78 mho/m; ε_r = 48.4; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV3 - SN3508; ConvF(3.72, 3.72, 3.72); Calibrated: 15/02/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: SAM 12b; Type: SAM 4.0; Serial: TP:1207
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

d=10mm, Pin=125mW 2 2/Area Scan (51x51x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 7.55 mW/g
d=10mm, Pin=125mW 2 2/Zoom Scan (7x7x9) (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm Reference Value = 44.3 V/m; Power Drift = -0.158 dB
Peak SAR (extrapolated) = 37.2 W/kg
SAR(1 g) = 10.4 mW/g; SAR(10 g) = 2.93 mW/g
Maximum value of SAR (measured) = 21.7 mW/g