AT4 wireless, S.A.
Parque Tecnológico de Andalucía,
c/ Severo Ochoa nº 2
29590 Campanillas/ Málaga/ España
Tel. 952 61 91 00 - Fax 952 61 91 13
MÁLAGA, C.I.F. A29 507 456
Registro Mercantil de Málaga,Tomo 1169,
Libro 82, Folio 133, Hoja MA3729

ENSAYOS Nº 51/LE342

TEST REPORT

REFERENCE STANDARDS:

FCC 47CFR Part 2.1093 (10-1-10 Edition)

FCC OET Bulletin 65, Supplement C (Edition 01-01)

IC RSS-102 Issue 4 (2010-03)

NIE ..... :	35188RRF.002
Approved by (name / position & signature) ..... :	A. Llamas / RF Lab Manager
Elaboration date ..... :	2012-01-30

Alejandro Llamas Rodríguez
Firmado digitalmente por Alejandro Llamas Rodríguez
Fecha: 2012.01.31 08:29:32 +01'00'

Identification of item tested ..... :	Intel® Centrino® Advanced-N 6230 inside a host laptop
Trademark ..... :	Intel
Model and/or type reference ..... :	62230ANHMW / 62230ANHU
Serial number ..... :	MAC: 88532E53B16E
Other identification of the product ..... :	FCC ID: PD962230ANHU / IC: 1000M-62230ANHU
Features ..... :	802.11 a/b/g/n
Description ..... :	Wireles Module: Intel® Centrino® Advanced-N 6230 Antenna Type: Yageo CAN4313DQ0612LXB1 Host platform: Dell P29G
Applicant ..... :	Intel Corporation
Address ..... :	100 Center Point Circle, Suite 200, Columbia, SC 29210, USA
CIF/NIF/Passport ..... :	---
Contact person:	Steven C. Hackett (Wireless Regulatory Engineer)
Telephone / Fax ..... :	803-216-2344
e-mail: ..... :	steven.c.hackett@intel.com
Test samples supplier ..... :	Same as applicant
Manufacturer ..... :	Same as applicant

Test method requested .....:	See Standard
Standard .....:	1. FCC 47 CFR Part 2.1093 (10-1-10 Edition). Radiofrequency radiation exposure evaluation: portable devices. 2. FCC OET Bulletin 65, Supplement C (Edition 01-01), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields". 3. IC RSS-102 Issue 4 (2010-03). Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
Application Notes .....:	1. FCC OET KDB 248227 – SAR Measurements Procedures 802.11a/b/g Transmitters (May 2007 – Revised). 2. FCC OET KDB 616217 D03 – SAR Evaluation Considerations for Laptop/Notebook/Netbook and Tablet Computers – Supplement to KDB 616217 (November 2009) 3. FCC OET KDB 865664 – SAR Measurements Requirements for 3-6 GHz (October 2006). 4. FCC OET KDB 450824 – SAR Probe Calibration and System Verification Considerations for measurements at 150 MHz – 3 GHz (January 2007). 5. IC RSS-102 Supplementary Procedures (SPR)-001 (2011-01). SAR testing requirements with regard to bystanders for laptop type computers with antennas built-in on display screen (laptop mode/tablet mode).
Test procedure .....:	PERF019
Non-standardized test method .....:	N/A
Used instrumentation .....:	1. Dosimetric E-field probe SPEAG ES3DV3 2. Dosimetric E-field probe SPEAG EX3DV4 3. Data acquisition device SPEAG DAE4 4. Electro-optical converter SPEAG EOC3 5. 2450 MHz dipole validation kit SPEAG D2450V2 6. 5GHz dipole validation kit SPEAG D5GHzV2 7. Robot STÄUBLI RX60BL 8. Robot controller STÄUBLI CM7MB 9. Oval flat phantom SPEAG ELI 4 10. SAR measurement software SPEAG DASY52 V52.6.2.424 11. Measurement server SPEAG DASY5 SE UMS 011 BS 12. Body Tissue Equivalent Liquids for 2450MHz and 5GHz bands 13. Vector network analyzer Agilent E5071C 14. Dielectric probe kit Agilent 85070C 15. Power meter R&S NRVD 16. Power Sensor R&S NRV-Z51 17. Power Sensor R&S NRV-Z1 18. RF Generator Agilent ESG E4438C 19. Dual directional coupler NARDA FSCM 99899 20. Power amplifier MITEQ AMF-4D-00400600-50-30P 21. Laptop positioning extension SPEAG Laptop Holder
Report template No. .....:	FDT08_12

INDEX

Competences and guarantees

AT4 wireless is a testing laboratory accredited by the National Accreditation Body (ENAC -Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 51/LE 342.

In order to assure the traceability to other national and international laboratories, AT4 wireless has a calibration and maintenance programme for its measurement equipment.

AT4 wireless guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at AT4 wireless at the time of performance of the test.

AT4 wireless is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of AT4 wireless.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of AT4 wireless and the Accreditation Bodies.

Uncertainty

Uncertainty (factor k=2) was calculated according to the following documents:

1. FCC OET Bulletin 65, Supplement C (Edition 01-01), “Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields”.
2. FCC OET KDB 865664 – SAR Measurements Requirements for 3-6 GHz (October 2006).

Usage of samples

Samples undergoing test have been selected by: **the client**.

Sample M/01 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
35188/02	WiFi module inside a laptop PC	Intel® Centrino® Advanced-N 6230 / Dell P29G / Yageo Antennas	MAC: 88532E53B16E	2011-12-15

1. Sample M/01 has undergone the test(s) specified in subclause "Test method requested".

Testing period

The performed test started on 2012-01-16 and finished on 2012-01-26.

The tests have been performed at AT4 wireless.

Environmental conditions

In the laboratory for measurements, the following limits were not exceeded during the test:

Temperature	Min. = 20.18 ºC Max. = 23.95 ºC
Relative humidity	Min. = 32.95 % Max. = 43.46 %

Summary

Considering the results of the performed test according to FCC 47CFR Part 2.1093, the item under test is **IN COMPLIANCE** with the requested specifications specified in the standard.

The maximum 1g volume averaged SAR found during this test has been 1.170 W/kg, for the 5600 MHz band and 802.11n with 40MHz BW mode.

NOTE: The results presented in this Test Report apply only to the particular item under test established in page 1 of this document, as presented for test on the date(s) shown in section, "USAGE OF SAMPLES, TESTING PERIOD AND ENVIRONMENTAL CONDITIONS".

Remarks and comments

1: 802.11n = 20MHz BW / 802.11n* = 40MHz BW.

2: Testing of 802.11g is not required due to the testing reductions mentioned in FCC OET KDB 248227 – SAR Measurements Procedures 802.11a/b/g Transmitters (May 2007 – Revised), paragraph "Frequency Channel Configurations".

3: Testing of other channels in each band is optional when the maximum output channel SAR fulfills the testing reductions mentioned in FCC OET KDB 248227 – SAR Measurements Procedures 802.11a/b/g Transmitters (May 2007 – Revised), paragraph "Frequency Channel Configurations".

4: All the test positions of device relative to body were measured placing the device in direct contact with the phantom surface, so the requirements mentioned at RSS-102 Supplementary Procedures (SPR)-001 - SAR TESTING REQUIREMENTS WITH REGARD TO BYSTANDERS FOR LAPTOP TYPE COMPUTERS WITH ANTENNAS BUILT-IN ON DISPLAY SCREEN (LAPTOP MODE/TABLET MODE) are covered. Antenna to phantom distance during measurements was 5.9 mm (< 25 mm).

5: Only the plots of the highest SAR for each test configuration and each chain is included in appendix C, according to FCC OET Bulletin 65, Supplement C (Edition 01-01), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields", appendix B.

Testing verdicts

Not applicable ..... : NA

Pass..... : P

Fail ..... : F

Not measured..... : NM

2450 MHz band

FCC 47CFR Part 2.1093 Paragraph	VERDICT			
	NA	P	F	NM
(d)(2) 802.11b		P		
(d)(2) 802.11g				NM[2]
(d)(2) 802.11n[1]		P		
(d)(2) 802.11n*[1]		P		

1 and 2: See Remarks and Comments.

5.2 – 5.8 GHz band

FCC 47CFR Part 2.1093 Paragraph	VERDICT			
	NA	P	F	NM
Lower Band (5.18 – 5.32 GHz)				
(d)(2) 802.11a				NM[2]
(d)(2) 802.11n[1]				NM[2]
(d)(2) 802.11n*[1]		P		
Middle Band (5.5 – 5.7 GHz)				
(d)(2) 802.11a				NM[2]
(d)(2) 802.11n[1]				NM[2]
(d)(2) 802.11n*[1]		P		
Higher Band (5.745 – 5.825 GHz)				
(d)(2) 802.11a				NM[2]
(d)(2) 802.11n[1]				NM[2]
(d)(2) 802.11n*[1]		P		

1 and 2: See Remarks and Comments.

APPENDIX A: Test Configuration

INDEX

1. GENERAL INTRODUCTION

1.1. Application Standard

The Federal Communications Commission (FCC) sets the limits for General Population / Uncontrolled exposure to radio frequency electromagnetic fields for transmitting devices designed to be used within 20 centimetres of the user body under FCC 47 CFR Part 2.1093 - "Radiofrequency radiation exposure evaluation: portable devices", paragraph (d)(2).

Specific requirements and procedure for SAR assessment are describe under FCC OET Bulletin 65, Supplement C (Edition 01-01), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields", and all the FCC OET Knowledge Database documents referred at the beginning of this document.

1.2. General requirements

The SAR measurement has been performed continuing the following considerations and environment conditions:

- The ambient temperature shall be in the range of 18ºC to 25ºC and the variation shall not exceed +/-2ºC during the test.
- The ambient humidity shall be in the range of and 30% - 70%.
- The device battery shall be fully charged before each measurement.

1.3. Measurement system and phantom requirements

The measurement system used for SAR tests fulfils the procedural and technical requirements described at the reference standards used.

The phantom is a simplified representation of the human anatomy and comprised of material with electrical properties similar to the corresponding tissues in human body.

1.4. Measurement Liquids requirements.

The liquids used to simulate the human tissues, must fulfils the requirements of the dielectric properties required. These target dielectric properties per FCC OET KDB 450824 instructions come from the dipole and probe calibration data which are included in Appendix B, Section 2, of this document (the values for 5200 and 5600 MHz are linearly interpolated between the specified values for 3000 and 5800 MHz indicated in FCC OET Bulletin 65 – Supplement C, Appendix C, 'Tissue Dielectric Parameters').

As indicated in FCC OET KDB 450824, it is allowed a 5% variation of the above mentioned level at the 2450 MHz band. As indicated in FCC OET KDB 865664 – 'Measurements Requirements for 3-6 GHz', it is allowed a 10% and a 5% variation of permittivity and conductivity respectively at the 5200-5800 GHz band.

2. MEASUREMENT SYSTEM

2.1. Measurement System

Manufacturer	Device	Type
Schmid & Partner Engineering AG	Dosimetric E-Fiel Probe	ES3DV3
Schmid & Partner Engineering AG	Dosimetric E-Fiel Probe	EX3DV4
Schmid & Partner Engineering AG	Data Acquisition Electronics	DAE4
Schmid & Partner Engineering AG	Electro-Optical Converter	EOC5
Schmid & Partner Engineering AG	2450 MHz System Validation Dipole	D2450V2
Schmid & Partner Engineering AG	5GHz System Validation Dipole	D5GHzV2
Stäubli	Robot	RX60BL
Stäubli	Robot controller	CM7MB
Schmid & Partner Engineering AG	Oval flat phantom	ELI 4
Schmid & Partner Engineering AG	Measurement Software	DASY52 V52.6.2.424
Schmid & Partner Engineering AG	Measurement Server	DASY5 SE UMS 011 BS
Agilent	Vector Network Analyser	E5071C
Agilent	Dielectric Probe Kit	85070C
Rohde & Schwarz	Power Meter	NRVD
Rohde & Schwarz	Power Sensor	NRV-Z51
Rohde & Schwarz	Power Sensor	NRV-Z1
Agilent	RF Generator	ESG E4438C
NARDA	Dual directional coupler	FSCM 99899
MITEQ	Power amplifier	AMF-4D-00400600-50-30P
Schmid & Partner Engineering AG	Laptop Holder	SM LH1 001 AC

Table 1: Measurement Equipment

2.2. Test Positions of device relative to body [4]

The laptop device was tested in one position for all tests, with the bottom face placed directly against the phantom so the position of the laptop would be used (normal use condition). Further analysis was performed to determine the location which showed the highest SAR.

The antennas on the laptop are located within the edge screen. According to FCC OET Bulletin 65 – Supplement C, the antennas which would applied in the test are antennas or radiating structures in direct contact with the user's body within 20 centimetres of the body of a user under normal operating conditions.

2.3. Test to be performed

In all operating modes and bands the measurements have to be performed on the "default test channels" defined at FCC OET KDB 248227 – SAR Measurements Procedures 802.11a/b/g Transmitters (May 2007 – Revised), except those channels defined as "required test channels" at the same document..

2.4. Description of interpolation/extrapolation scheme

The local SAR inside the Phantom is measured using small dipole sensing elements inside a probe element. The probe tip must not be in contact with the Phantom's surface in order to minimise measurement errors, but the highest local SAR is obtained from measurements at a certain distances from the shell trough extrapolation. The accurate assessment of the maximum SAR averaged over 1 gr. requires a very fine resolution in the three dimensional scanned data array. Since the measurements have to be performed over a limited time, the measured data have to be interpolated to provide an array of sufficient resolution.

The interpolation of 2D area scan is used after the initial area scan, at a fixed distance from the Phantom shell wall. The initial scan data is collected with a proper spatial resolution and this interpolation is used to find the location of the local maximum for positioning the subsequent 3D scanning to within a 1mm resolution.

For the 3D scan, data is collected on a spatially regular 3D grid having 5mm steps in both lateral directions, and 5mm in depth direction for the 2450MHz band. Over the 5GHz band, a 4mm lateral resolution is required, and 2.5mm in depth direction. After the data collection by the SAR probe, the data are extrapolated in the depth direction to assign values to points in the 3D array closer to the shell wall. A notional extrapolation value is also assigned to the first point outside the shell wall so that subsequent interpolation schemes will de applicable right up to the shell wall boundary.

2.5. Determination of the largest peak spatial-average SAR

To determine the maximum value of the peak spatial-average SAR of a EUT, all device positions, configurations and operational modes should be tested for each frequency band.

According to FCC 47 CFR Part 2.1093, the averaging volume shall be chosen as 1 g of contiguous tissue. The cubic volumes, over which the SAR measurements are averaged after extrapolation and interpolation, are chosen in order to include the highest values of local SAR.

The maximum SAR level for the EUT will be the maximum level obtained of the performed measurements, and indicated in the previous points.

2.6. System Validation

Prior to the SAR measurements, system verification is done daily to verify the system accuracy. As FCC OET Bulletin 65 – Supplement C, Appendix D "SAR measurement procedures" Paragraph "System Verification" specifies, a complete SAR evaluation is done using a half-wavelength dipole as source with the frequency of the mid-band channel of the operating band, or within 100MHz of this channel.

The measured one-gram SAR should be within 10% of the expected target values specified in the calibration certificate of the dipole, for the specific tissue and frequency used.

3. UNCERTAINTY

Uncertainty for 300 MHz – 6 GHz

ERROR SOURCES	Uncertainty value (%)	Probability distribution	Divisor	(c_i) 1g	(c_i) 10g	Standard uncertainty (1g) (%)	Standard uncertainty (10g) (%)	v_i v_{eff}
Measurement Equipment								
Probe Calibration	±4.480	Normal	1	1	1	±4.480	±4.480	∞
Axial Isotropy	±7.558	Rectangular	$\sqrt{3}$	1	1	±4.364	±4.364	∞
Hemispherical Isotropy	±2.000	Rectangular	$\sqrt{3}$	1	1	±1.155	±1.155	∞
Boundary effect	±4.700	Rectangular	$\sqrt{3}$	1	1	±2.714	±2.714	∞
Linearity	±1.000	Rectangular	$\sqrt{3}$	1	1	±0.577	±0.577	∞
System detection limits	±0.300	Rectangular	$\sqrt{3}$	1	1	±0.300	±0.300	∞
Readout electronics	±1.010	Normal	1	1	1	±0.583	±0.583	∞
Response time	±2.600	Rectangular	$\sqrt{3}$	1	1	±1.501	±1.501	∞
Integration time	±3.000	Rectangular	$\sqrt{3}$	1	1	±1.732	±1.732	∞
RF Ambien conditions	±3.000	Rectangular	$\sqrt{3}$	1	1	±1.732	±1.732	∞
Probe positioner	±0.800	Rectangular	$\sqrt{3}$	1	1	±0.462	±0.462	∞
Probe positioning	±9.900	Rectangular	$\sqrt{3}$	1	1	±5.716	±5.716	∞
Maximum SAR evaluation	±1.000	Rectangular	$\sqrt{3}$	1	1	±0.577	±0.577	∞
Test Sample Related								
Device positioning	±2.900	Normal	1	1	1	±2.900	±2.900	145
Device Holder	±3.600	Normal	1	1	1	±3.600	±3.600	5
Power Drift	±5.000	Rectangular	$\sqrt{3}$	1	1	±2.887	±2.887	∞
Phantom and Setup								
Phantom uncertainty	±4.000	Rectangular	$\sqrt{3}$	1	1	±2.309	±2.309	∞
Liquid conductivity (deviation from target)	±5.000	Rectangular	$\sqrt{3}$	0.64	0.43	±1.848	±1.241	∞
Liquid conductivity (measurement error)	±3.100	Normal	1	0.64	0.43	±1.984	±1.333	∞
Liquid permittivity (deviation from target)	±5.000	Rectangular	$\sqrt{3}$	0.64	0.43	±1.848	±1.241	∞
Liquid permittivity (measurement error)	±4.410	Normal	1	0.64	0.43	±2.822	±1.896	∞
Combined standard uncertainty	$u_c = \sqrt{\sum_{1=1}^{m} c_i^2 \cdot u_i^2}$					**±11.99**	**±11.56**	330
Expanded uncertainty (confidence interval of 95%)	*ue =2.00 uc*					**±23.98**	**±23.11**	

Table 2: Uncertainty Assessment for 300 MHz - 6 GHz

4. SAR LIMIT

Having a worst case measurement, the SAR limit is valid for general population/uncontrolled exposure.

The SAR values have to be averaged over a mass of 1 gr. ($SAR_{1\ gr.}$) with the shape of a cube. This level couldn't exceed the values indicated in the application Standard:

Standard	SAR	SAR Limit (W/Kg)
FCC 47 CFR Part 2.1093 Paragraph (d)(2)	$SAR_{1\ gr.}$	1.6

Table 3: SAR limit

APPENDIX B: Test results

INDEX

1. TEST CONDITIONS

1.1. Temperature (ºC):

T_n = +20.18 to +23.95

The subscript n indicates normal test conditions.

1.2. Test signal, Output Power and Frequencies

The device was put into operation by using an own control software to program the test mode required for select the continuous transmission with 100% duty cycle.

In all operating bands the measurements were performed on the "default test channels" defined at FCC OET KDB 248227 – SAR Measurements Procedures 802.11a/b/g Transmitters (May 2007 – Revised), except those that fulfil the frequency channel selection criteria mentioned on paragraph "Frequency Channel Configuration" at the same document.

The output power of the device was set to maximum power level for all tests; a fully charged battery was used for every test sequence.

The maximum average conducted power of the device was measured with a Power meter R&S NRVD and a thermocoupled Power sensor NRV-Z51.

1.3. DUT information

The device under test was the Intel® Centrino® Advanced-N 6230 card located inside a host laptop (Dell P29G) computer which utilises a set of Yageo antennas (CAN4313DQ0612LXB1). The card was operated utilizing proprietary software (DRTU version 1.5.3-0322) and each channel was measured using a broadband power meter to determine the maximum average power.

According to host device manufacturer, the source-based time-averaged output power of the Bluetooth device is far bellow the SAR threshold (60/f(GHz) mW). Therefore, neither SAR testing nor co-transmission evaluation is required for the Bluetooth transmitter, following the guidelines stated at FCC OET KDB 616217 D03 – SAR Evaluation Considerations for Laptop/Notebook/Netbook and Tablet Computers – Supplement to KDB 616217 (November 2009), paragraph 4).

Collocation with WWAN transmitter has not been considered following grantee request because this collocation will be considered in the WWAN transmitter SAR testing.

2. TISSUE PARAMETERS MEASUREMENTS

Frequency (MHz)	Target Body Tissue: Parameters used in Probe Calibration		Target Body Tissue: Parameters used in Dipole Calibration		Measured Body Tissue		Measured Date
	Permittivity	Conductivity [S/m]	Permittivity	Conductivity [S/m]	Permittivity	Conductivity [S/m]	
2450	52.7 ± 5%	1.95 ± 5%	51.8 ± 6%	2.02 ± 6%	51.38	2.01	2012-01-25
5200	49.0 ± 10%	5.30 ± 5%	48.8 ± 6%	5.45 ± 6%	49.78	5.25	2012-01-18
5500	48.6 ± 10%	5.65 ± 5%	48.2 ± 6%	5.85 ± 6%	49.10	5.64	2012-01-18
5800	48.2 ± 10%	6.00 ± 5%	47.7 ± 6%	6.27 ± 6%	48.33	6.06	2012-01-18

Note: The dielectric properties have been measured by the contact probe method at 22° C.

3. SYSTEM VALIDATION MEASUREMENTS

3.1. Validation results in 2450 MHz Band for Body TSL

SAR	Target SAR (W/kg)	Measured SAR (W/kg)	Drift (%)	Limit (%)
1 gr.	52.10	56.53	8.51	± 10
10 gr.	24.40	25.36	3.95	± 10

3.2. Validation results in 5200 MHz Band for Body TSL

SAR	Target SAR (W/kg)	Measured SAR (W/kg)	Drift (%)	Limit (%)
1 gr.	76.40	76.83	0.57	± 10
10 gr.	21.40	21.90	2.33	± 10

3.3. Validation results in 5500 MHz Band for Body TSL

SAR	Target SAR (W/kg)	Measured SAR (W/kg)	Drift (%)	Limit (%)
1 gr.	82.50	84.52	2.45	± 10
10 gr.	23.00	23.96	4.18	± 10

3.4. Validation results in 5800 MHz Band for Body TSL

SAR	Target SAR (W/kg)	Measured SAR (W/kg)	Drift (%)	Limit (%)
1 gr.	77.10	78.72	2.10	± 10
10 gr.	21.50	22.03	2.45	± 10

4. CONDUCTED AVERAGE POWER MEASUREMENTS

Band	Mode	Channel	Frequency (MHz)	Conducted Power (dBm)	
				Chain A	Chain B
2450 MHz	802.11b	1	2412	16.85	16.48
		6	2437	16.80	14.84
		11	2462	16.78	15.96
	802.11g	1	2412	14.02	13.89
		6	2437	16.69	16.55
		11	2462	13.99	13.64
	802.11n[1]	1	2417	13.17	12.56
		6	2437	16.65	16.49
		11	2457	12.44	12.37
	802.11n*[1]	3	2422	10.59	9.35
		6	2437	13.42	12.69
		9	2452	9.95	10.17
5200 MHz	802.11a	36	5180	16.21	15.89
		48	5240	15.78	15.70
		52	5260	15.87	15.48
		64	5320	16.50	16.02
	802.11n[1]	36	5180	15.91	16.04
		48	5240	16.25	15.84
		52	5260	16.22	15.32
		64	5320	16.51	15.85
	802.11n*[1]	38	5190	12.75	12.62
		46	5230	16.35	15.89
		54	5270	16.06	15.24
		62	5310	11.37	12.37

1: See Remarks and Comments.

Band	Mode	Channel	Frequency (MHz)	Conducted Power (dBm)	
				Chain A	Chain B
5600 MHz	802.11a	100	5500	16.40	15.75
		116	5580	16.55	15.79
		140	5700	16.42	15.61
	802.11n[1]	100	5500	16.34	15.65
		116	5580	16.49	15.68
		140	5700	16.32	15.42
	802.11n*[1]	102	5510	15.57	14.61
		118	5590	16.51	15.92
		134	5670	16.29	15.58
5800 MHz	802.11a	149	5745	16.52	16.58
		157	5785	16.44	16.74
		165	5825	16.58	16.66
	802.11n[1]	149	5745	16.48	16.72
		157	5785	16.36	16.68
		165	5825	16.51	16.59
	802.11n*[1]	151	5755	16.64	16.63
		159	5795	16.54	16.55

1: See Remarks and Comments.

For the simultaneous transmission operation, the individual output power for each chain is reduced when more than one chain are transmitting at the same time. Therefore, the simultaneous transmission evaluation was calculated using the SAR results obtained with the reduced power presented in the table below:

Band	Mode	Channel	Frequency (MHz)	Conducted Power (dBm)		
				Chain A	Chain B	Combined
5600 MHz	802.11n*[1]	110	5550	13.32	13.30	16.32
5800 MHz	802.11n*[1]	151	5755	13.58	13.53	16.57

5. MEASUREMENT RESULTS FOR SAR (SPECIFIC ABSORPTION RATE)

5.1. Summary maximum results

Band	Chain	Mode	Channel	Frequency (MHz)	Measured SAR 1g (W/Kg)	SAR limit 1g (W/Kg)
2450 MHz	A	802.11b	1	2412	0.375	1.6
	B	802.11b	1	2412	0.475	1.6
5200 MHz	A	802.11n*[1]	46	5230	1.030	1.6
	B	802.11n*[1]	54	5270	0.548	1.6
5600 MHz	A	802.11n*[1]	110	5550	1.170	1.6
	B	802.11n*[1]	134	5670	0.990	1.6
5800 MHz	A	802.11n*[1]	159	5795	1.130	1.6
	B	802.11n*[1]	151	5755	0.997	1.6

1: See Remarks and Comments.

5.2. Results for 2450 MHz Band

5.2.1. Lapheld Mode

Mode	Chain	Channel	Frequency (MHz)	SAR averaged over 1g (W/Kg)	Power Drift (%)
802.11b	A	1	2412	0.375	0.22
		6	2437	NM[3]	-
		11	2462	NM[3]	-
	B	1	2412	0.475	-0.86
		6	2437	NM[3]	-
		11	2462	NM[3]	-
802.11n[1]	A	1	2412	NM[3]	-
		6	2437	0.347	0.50
		11	2462	NM[3]	-
	B	1	2412	NM[3]	-
		6	2437	0.464	-1.49
		11	2462	NM[3]	-
802.11n*[1]	A	3	2422	NM[3]	-
		6	2437	0.168	-1.60
		9	2452	NM[3]	-
	B	3	2422	NM[3]	-
		6	2437	0.200	-1.37
		9	2452	NM[3]	-

1 and 3: See Remarks and Comments.

5.3. Results for 5200 MHz Band

5.3.1. Lapheld Mode

Mode	Chain	Channel	Frequency (MHz)	SAR averaged over 1g (W/Kg)	Power Drift (%)
802.11n*[1]	A	38	5190	0.356	2.68
		46	5230	1.030	0.02
		54	5270	0.970	-2.28
		62	5310	0.279	-2.05
	B	38	5190	0.185	-0.18
		46	5230	0.419	-1.83
		54	5270	0.548	-0.64
		62	5310	0.517	2.21

1 and 3: See Remarks and Comments.

5.4. Results for 5600 MHz Band

5.4.1. Lapheld Mode

Mode	Chain	Channel	Frequency (MHz)	SAR averaged over 1g (W/Kg)	Power Drift (%)
802.11n*[1]	A	102	5510	0.789	-2.84
		110	5550	1.170	-0.75
		134	5670	1.030	0.00
	B	102	5510	0.516	-0.32
		110	5550	0.712	-0.81
		134	5670	0.990	0.24

1 and 3: See Remarks and Comments.

5.5. Results for 5800 MHz Band

5.5.1. Lapheld Mode

Mode	Chain	Channel	Frequency (MHz)	SAR averaged over 1g (W/Kg)	Power Drift (%)
802.11n*[1]	A	151	5755	1.030	-1.37
		159	5795	1.130	-0.80
	B	151	5755	0.997	-0.79
		159	5795	0.878	-1.14

1 and 3: See Remarks and Comments.

5.6. Simultaneous transmission considerations

As stated at FCC OET KDB 616217 D03 – SAR Evaluation Considerations for Laptop/Notebook/Netbook and Tablet Computers – Supplement to KDB 616217 (November 2009), paragraph 4), the simultaneous SAR transmission evaluation is not required when the sum of stand-alone 1-g SAR is < SAR limit, or the separation distance between each antenna is greater than $5 \cdot [(SAR_1 + SAR_2) / 1.6]^{1.5}$.

The WLAN operation only admits the simultaneous transmission between antennas when both of them uses the same channel, so the sum of stand-alone SAR was evaluated considering the highest result for each antenna and the corresponding value of the other one with the same channel.

For the simultaneous transmission operation, the individual output power for each chain is reduced when more than one chain are transmitting at the same time. Therefore, the simultaneous transmission evaluation was calculated using the SAR results obtained with the reduced power presented at paragraph 4 above.

Transmission Mode	Band	Channel	Frequency	Chain	Max. SAR averaged over 1g (W/kg)	$\sum SAR_i$ 1g (W/Kg)	SAR limit 1g (W/Kg)
802.11n*[1]	5.6GHz	110	5550 MHz	A	0.487	0.942	1.6
				B	0.455		
802.11n*[1]	5.8 GHz	151	5755 MHz	A	0.566	1.123	1.6
				B	0.557		

According to host device manufacturer, the source-based time-averaged output power of the Bluetooth device is far bellow the SAR threshold (60/f(GHz) mW). Therefore, neither SAR testing nor co-transmission evaluation is required for the Bluetooth transmitter, following the guidelines stated at FCC OET KDB 616217 D03 – SAR Evaluation Considerations for Laptop/Notebook/Netbook and Tablet Computers – Supplement to KDB 616217 (November 2009), paragraph 4).

Collocation with WWAN transmitter has not been considered following grantee request because this collocation will be considered in the WWAN transmitter SAR testing.

APPENDIX C: Measurements Reports

2450 MHz Band – 802.11b, Channel 1 – Chain A

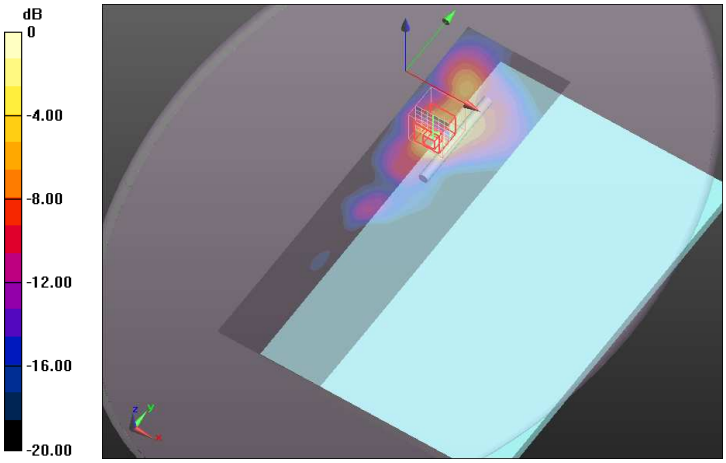
DUT: Dell P29G + Intel 62230ANHMW + Yageo; Type: Laptop; Serial: P/N 5N793

Communication System: IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Frequency: 2412 MHz; Duty Cycle: 1:1.53886
Medium parameters used (interpolated): f = 2412 MHz; σ = 1.962 mho/m; ε_r = 51.484; ρ = 1000 kg/m^3
Phantom section: Flat Section

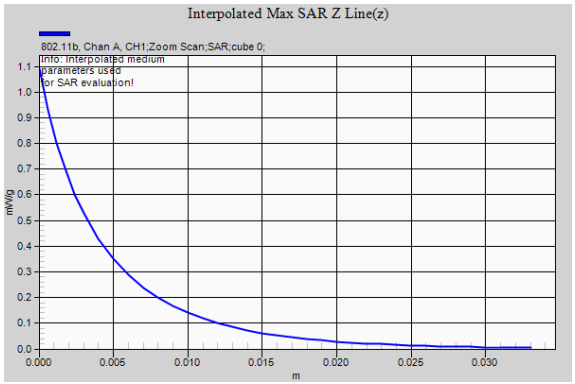
DASY5 Configuration:
- Probe: ES3DV3 - SN3052; ConvF(4.15, 4.15, 4.15); Calibrated: 23/11/2011
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 23/11/2011
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.4 (2829)

2.4GHz - Lapheld/802.11b, Chan A, CH1/Area Scan (61x221x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.477 mW/g

2.4GHz - Lapheld/802.11b, Chan A, CH1/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 14.557 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 1.090 W/kg
SAR(1 g) = 0.375 mW/g; SAR(10 g) = 0.157 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.533 mW/g



0 dB = 0.530mW/g



2450 MHz Band – 802.11b Channel 1 – Chain B

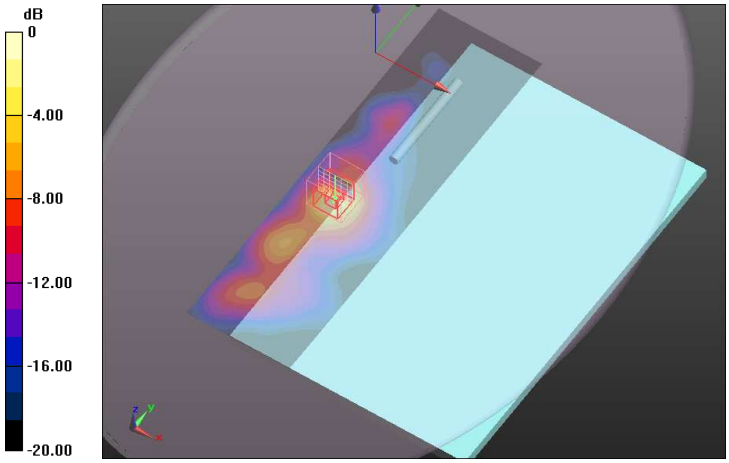
DUT: Dell P29G + Intel 62230ANHMW + Yageo; Type: Laptop; Serial: P/N 5N793

Communication System: IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Frequency: 2412 MHz; Duty Cycle: 1:1.53886
Medium parameters used (interpolated): f = 2412 MHz; σ = 1.962 mho/m; ε_r = 51.484; ρ = 1000 kg/m^3
Phantom section: Flat Section

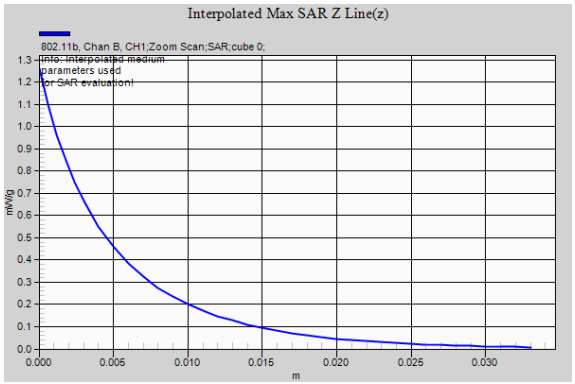
DASY5 Configuration:
- Probe: ES3DV3 - SN3052; ConvF(4.15, 4.15, 4.15); Calibrated: 23/11/2011
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 23/11/2011
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.4 (2829)

2.4GHz - Lapheld/802.11b, Chan B, CH1/Area Scan (61x221x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.626 mW/g

2.4GHz - Lapheld/802.11b, Chan B, CH1/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 17.137 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 1.259 W/kg
SAR(1 g) = 0.475 mW/g; SAR(10 g) = 0.197 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.657 mW/g



0 dB = 0.660mW/g



2450 MHz Band – 802.11n Channel 6 – Chain A

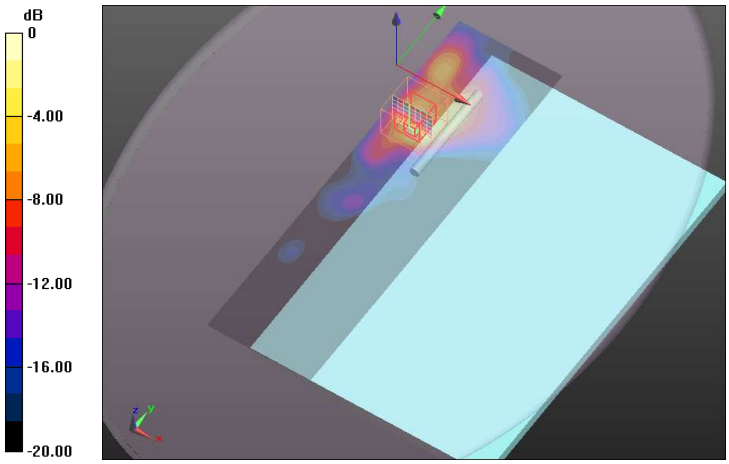
DUT: Dell P29G + Intel 62230ANHMW + Yageo; Type: Laptop; Serial: P/N 5N793

Communication System: IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK); Frequency: 2437 MHz; Duty Cycle: 1:10.4713
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.987 mho/m; ε_r = 51.409; ρ = 1000 kg/m^3
Phantom section: Flat Section

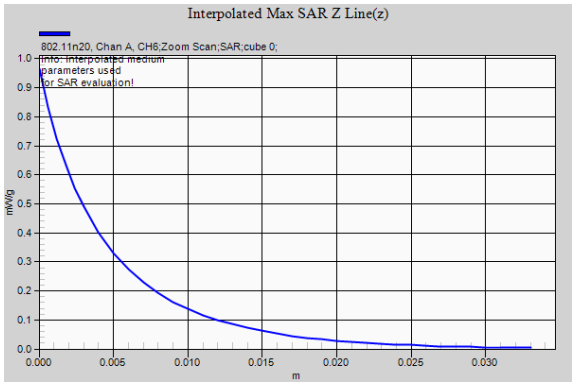
DASY5 Configuration:
- Probe: ES3DV3 - SN3052; ConvF(4.15, 4.15, 4.15); Calibrated: 23/11/2011
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 23/11/2011
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.4 (2829)

2.4GHz - Lapheld/802.11n20, Chan A, CH6/Area Scan (61x221x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.383 mW/g

2.4GHz - Lapheld/802.11n20, Chan A, CH6/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.714 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.965 W/kg
SAR(1 g) = 0.347 mW/g; SAR(10 g) = 0.147 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.454 mW/g



0 dB = 0.450mW/g



2450 MHz Band – 802.11n Channel 6 – Chain B

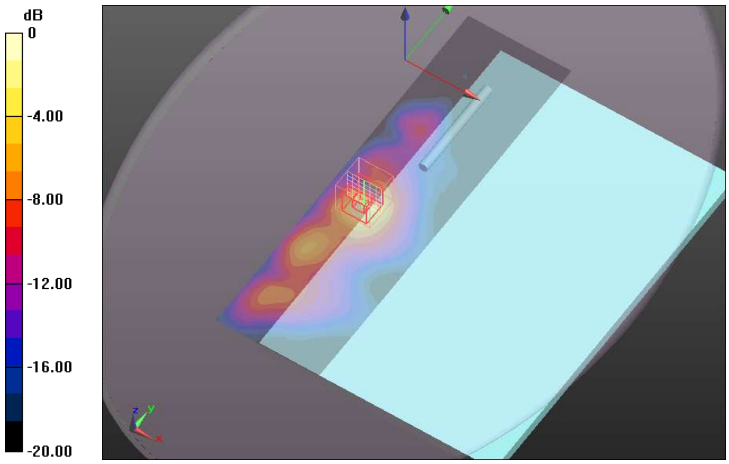
DUT: Dell P29G + Intel 62230ANHMW + Yageo; Type: Laptop; Serial: P/N 5N793

Communication System: IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK); Frequency: 2437 MHz; Duty Cycle: 1:10.4713
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.987 mho/m; ε_r = 51.409; ρ = 1000 kg/m^3
Phantom section: Flat Section

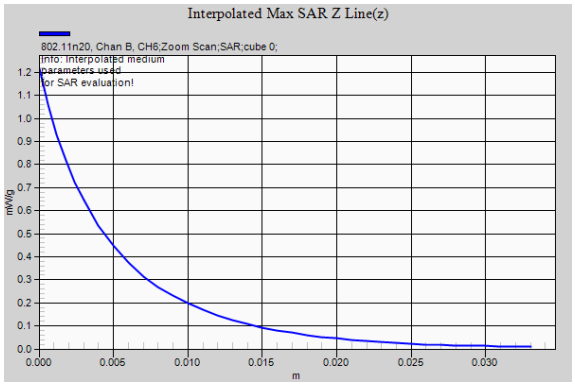
DASY5 Configuration:
- Probe: ES3DV3 - SN3052; ConvF(4.15, 4.15, 4.15); Calibrated: 23/11/2011
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 23/11/2011
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.4 (2829)

2.4GHz - Lapheld/802.11n20, Chan B, CH6/Area Scan (61x221x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.657 mW/g

2.4GHz - Lapheld/802.11n20, Chan B, CH6/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 18.013 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 1.215 W/kg
SAR(1 g) = 0.464 mW/g; SAR(10 g) = 0.195 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.630 mW/g



0 dB = 0.630mW/g



2450 MHz Band – 802.11n* Channel 6 – Chain A

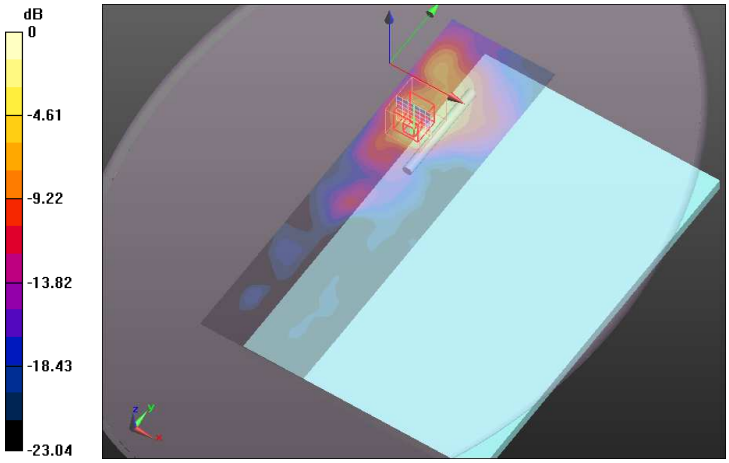
DUT: Dell P29G + Intel 62230ANHMW + Yageo; Type: Laptop; Serial: P/N 5N793

Communication System: IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK); Frequency: 2437 MHz; Duty Cycle: 1:11.4815
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.987 mho/m; ε_r = 51.409; ρ = 1000 kg/m^3
Phantom section: Flat Section

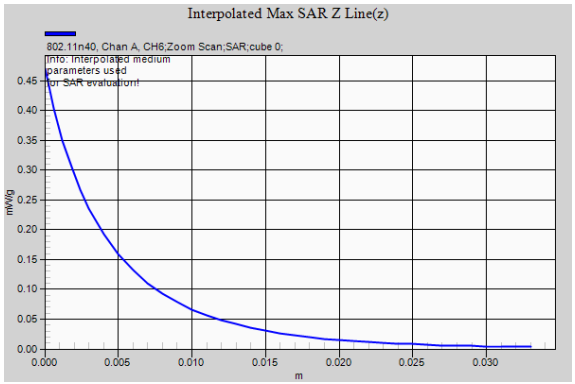
DASY5 Configuration:
- Probe: ES3DV3 - SN3052; ConvF(4.15, 4.15, 4.15); Calibrated: 23/11/2011
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 23/11/2011
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.4 (2829)

2.4GHz - Lapheld/802.11n40, Chan A, CH6/Area Scan (61x221x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.182 mW/g

2.4GHz - Lapheld/802.11n40, Chan A, CH6/Zoom Scan (7x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.738 V/m; Power Drift = -0.14 dB
Peak SAR (extrapolated) = 0.470 W/kg
SAR(1 g) = 0.168 mW/g; SAR(10 g) = 0.072 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.228 mW/g



0 dB = 0.230mW/g



2450 MHz Band – 802.11n* Channel 6 – Chain B

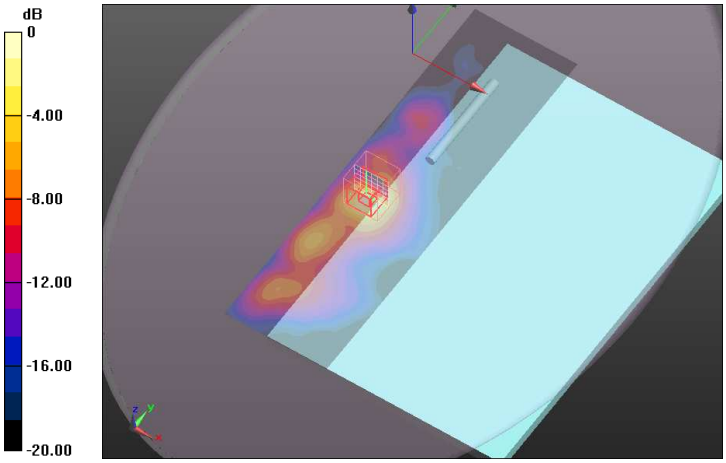
DUT: Dell P29G + Intel 62230ANHMW + Yageo; Type: Laptop; Serial: P/N 5N793

Communication System: IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK); Frequency: 2437 MHz; Duty Cycle: 1:11.4815
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.987 mho/m; ε_r = 51.409; ρ = 1000 kg/m^3
Phantom section: Flat Section

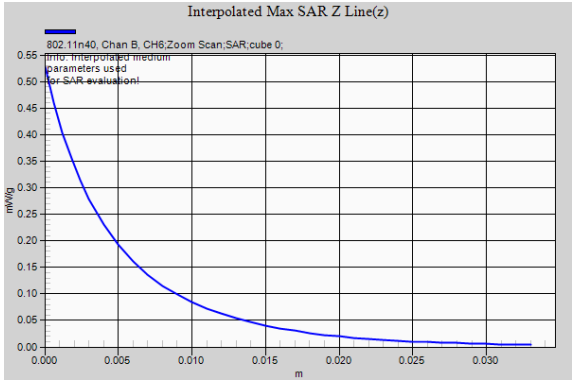
DASY5 Configuration:
- Probe: ES3DV3 - SN3052; ConvF(4.15, 4.15, 4.15); Calibrated: 23/11/2011
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 23/11/2011
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.4 (2829)

2.4GHz - Lapheld/802.11n40, Chan B, CH6/Area Scan (61x221x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.294 mW/g

2.4GHz - Lapheld/802.11n40, Chan B, CH6/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 11.586 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 0.527 W/kg
SAR(1 g) = 0.200 mW/g; SAR(10 g) = 0.083 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.263 mW/g



0 dB = 0.260mW/g



5200 MHz Band – 802.11n*, Channel 46 – Chain A

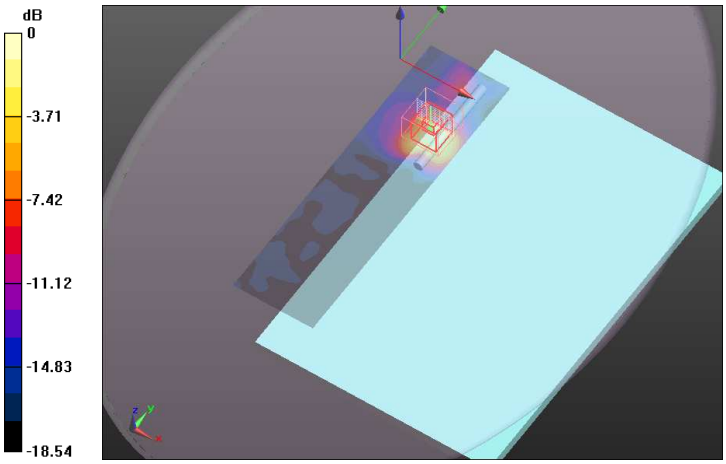
DUT: Dell P29G + Intel 62230ANHMW + Yageo; Type: Laptop; Serial: P/N 5N793

Communication System: IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK); Frequency: 5230 MHz; Duty Cycle: 1:11.4815
Medium parameters used (interpolated): f = 5230 MHz; σ = 5.285 mho/m; ε_r = 49.645; ρ = 1000 kg/m^3
Phantom section: Flat Section

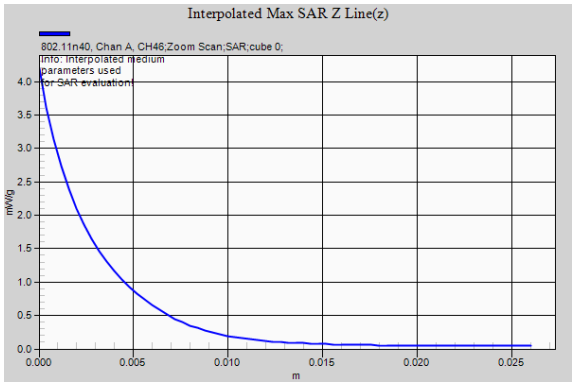
DASY5 Configuration:
- Probe: EX3DV4 - SN3687; ConvF(4.01, 4.01, 4.01); Calibrated: 21/07/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 23/11/2011
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.4 (2829)

5GHz - Lapheld/802.11n40, Chan A, CH46/Area Scan (71x261x1): Measurement grid: dx=10mm, dy=10mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 2.236 mW/g

5GHz - Lapheld/802.11n40, Chan A, CH46/Zoom Scan (9x9x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 21.861 V/m; Power Drift = 0.0014 dB
Peak SAR (extrapolated) = 4.187 W/kg
SAR(1 g) = 1.03 mW/g; SAR(10 g) = 0.398 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.035 mW/g



0 dB = 2.040mW/g



5200 MHz Band – 802.11n*, Channel 54 – Chain B

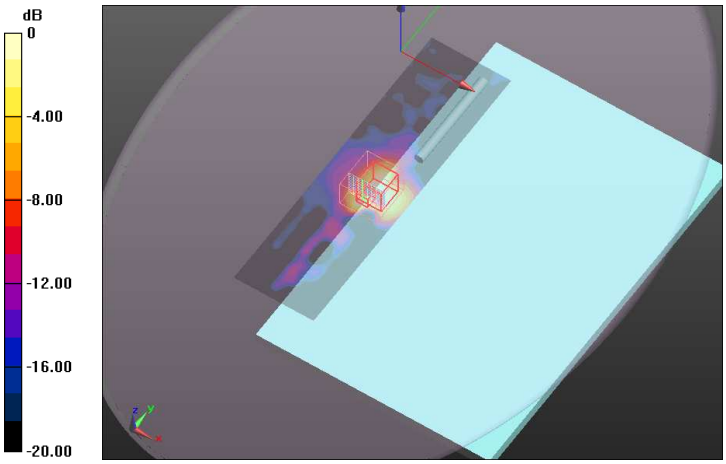
DUT: Dell P29G + Intel 62230ANHMW + Yageo; Type: Laptop; Serial: P/N 5N793

Communication System: IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK); Frequency: 5270 MHz; Duty Cycle: 1:11.4815
Medium parameters used (interpolated): f = 5270 MHz; σ = 5.34 mho/m; ε_r = 49.6; ρ = 1000 kg/m^3
Phantom section: Flat Section

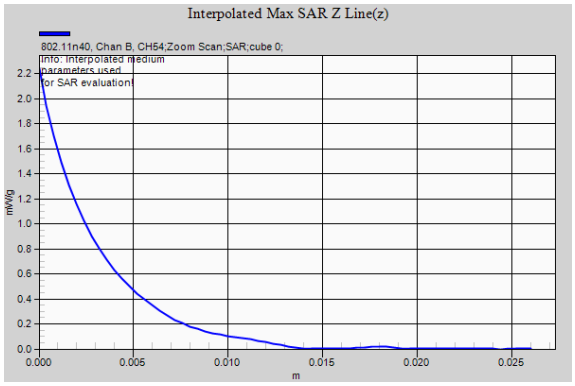
DASY5 Configuration:
- Probe: EX3DV4 - SN3687; ConvF(4.01, 4.01, 4.01); Calibrated: 21/07/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 23/11/2011
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.4 (2829)

5GHz - Lapheld/802.11n40, Chan B, CH54/Area Scan (71x261x1): Measurement grid: dx=10mm, dy=10mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 1.543 mW/g

5GHz - Lapheld/802.11n40, Chan B, CH54/Zoom Scan (9x10x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 15.602 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 2.239 W/kg
SAR(1 g) = 0.548 mW/g; SAR(10 g) = 0.212 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.113 mW/g



0 dB = 1.110mW/g



5600 MHz Band – 802.11n*, Channel 110 – Chain A

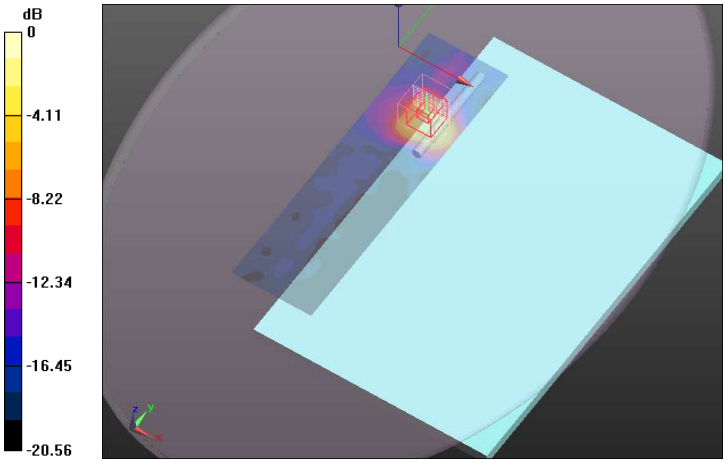
DUT: Dell P29G + Intel 62230ANHMW + Yageo; Type: Laptop; Serial: P/N 5N793

Communication System: IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK); Frequency: 5550 MHz; Duty Cycle: 1:11.4815
Medium parameters used (interpolated): f = 5550 MHz; σ = 5.72 mho/m; ε_r = 48.98; ρ = 1000 kg/m^3
Phantom section: Flat Section

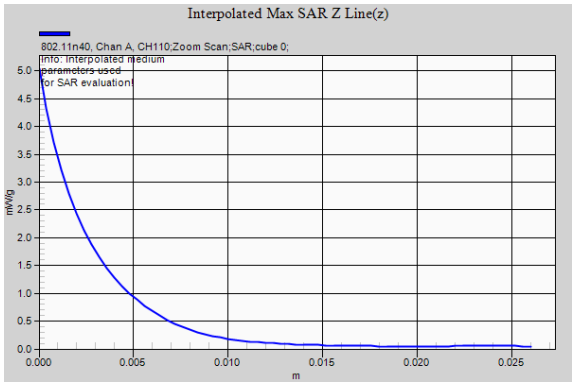
DASY5 Configuration:
- Probe: EX3DV4 - SN3687; ConvF(3.51, 3.51, 3.51); Calibrated: 21/07/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 23/11/2011
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.4 (2829)

5GHz - Lapheld/802.11n40, Chan A, CH110/Area Scan (71x261x1): Measurement grid: dx=10mm, dy=10mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 2.232 mW/g

5GHz - Lapheld/802.11n40, Chan A, CH110/Zoom Scan (9x9x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 23.378 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 5.033 W/kg
SAR(1 g) = 1.17 mW/g; SAR(10 g) = 0.425 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.334 mW/g



0 dB = 2.330mW/g



5600 MHz Band – 802.11n*, Channel 134 – Chain B

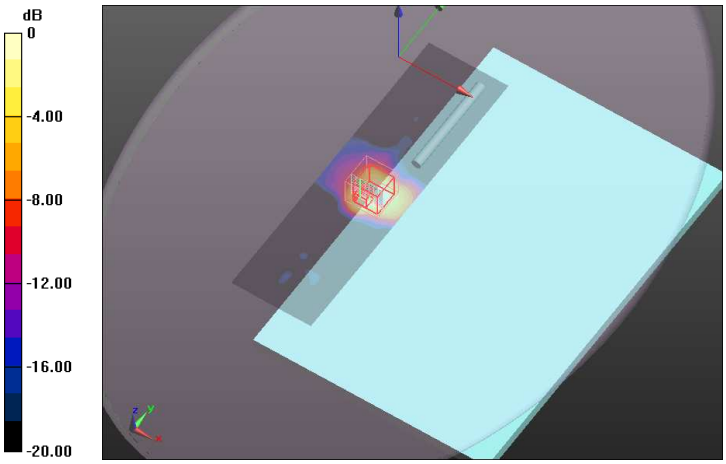
DUT: Dell P29G + Intel 62230ANHMW + Yageo; Type: Laptop; Serial: P/N 5N793

Communication System: IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK); Frequency: 5670 MHz; Duty Cycle: 1:11.4815
Medium parameters used (interpolated): f = 5670 MHz; σ = 5.87 mho/m; ε_r = 48.665; ρ = 1000 kg/m^3
Phantom section: Flat Section

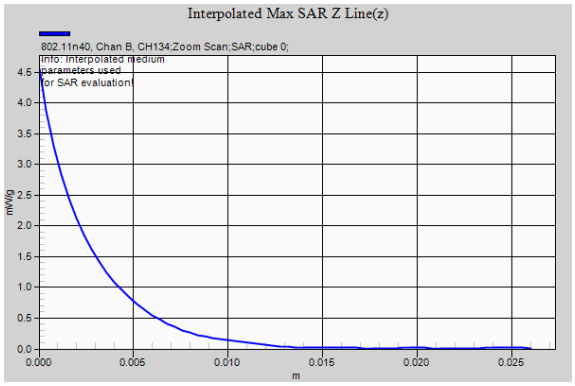
DASY5 Configuration:
- Probe: EX3DV4 - SN3687; ConvF(3.51, 3.51, 3.51); Calibrated: 21/07/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 23/11/2011
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.4 (2829)

5GHz - Lapheld/802.11n40, Chan B, CH134/Area Scan (71x261x1): Measurement grid: dx=10mm, dy=10mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 2.318 mW/g

5GHz - Lapheld/802.11n40, Chan B, CH134/Zoom Scan (8x8x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 19.435 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 4.555 W/kg
SAR(1 g) = 0.990 mW/g; SAR(10 g) = 0.377 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.054 mW/g



0 dB = 2.050mW/g



5800 MHz Band – 802.11n*, Channel 159 – Chain A

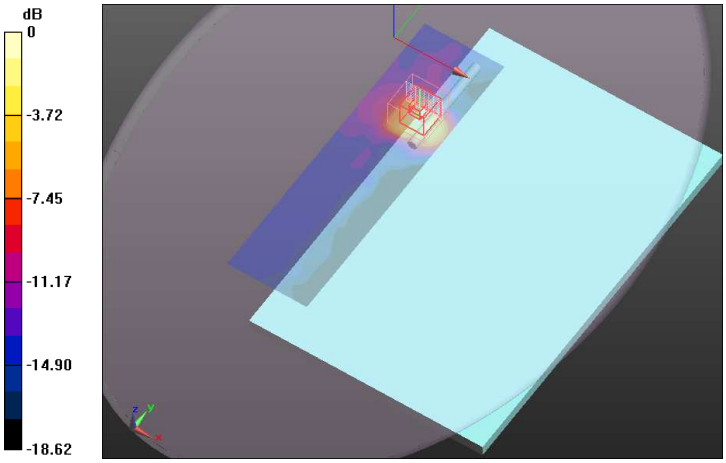
DUT: Dell P29G + Intel 62230ANHMW + Yageo; Type: Laptop; Serial: P/N 5N793

Communication System: IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK); Frequency: 5795 MHz; Duty Cycle: 1:11.4815
Medium parameters used (interpolated): f = 5795 MHz; σ = 6.053 mho/m; ε_r = 48.347; ρ = 1000 kg/m^3
Phantom section: Flat Section

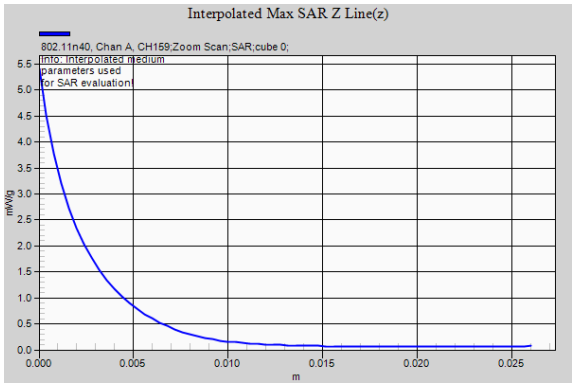
DASY5 Configuration:
- Probe: EX3DV4 - SN3687; ConvF(3.72, 3.72, 3.72); Calibrated: 21/07/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 23/11/2011
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.4 (2829)

5GHz - Lapheld/802.11n40, Chan A, CH159/Area Scan (71x261x1): Measurement grid: dx=10mm, dy=10mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 2.426 mW/g

5GHz - Lapheld/802.11n40, Chan A, CH159/Zoom Scan (9x9x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 16.971 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 5.399 W/kg
SAR(1 g) = 1.13 mW/g; SAR(10 g) = 0.416 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.324 mW/g



0 dB = 2.320mW/g



5800 MHz Band – 802.11n*, Channel 151 – Chain B

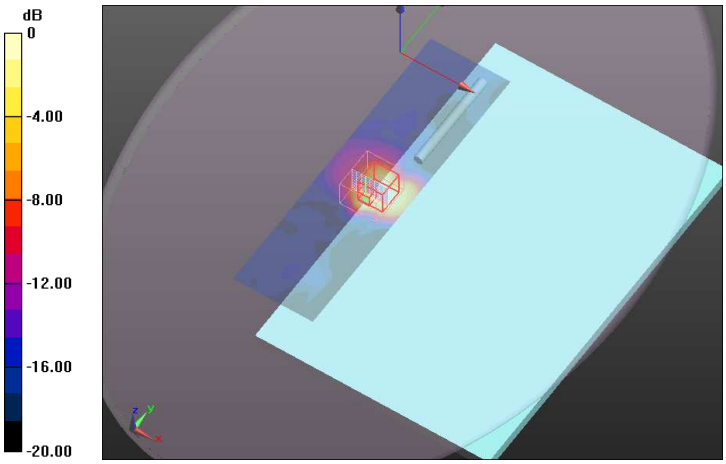
DUT: Dell P29G + Intel 62230ANHMW + Yageo; Type: Laptop; Serial: P/N 5N793

Communication System: IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK); Frequency: 5755 MHz; Duty Cycle: 1:11.4815
Medium parameters used (interpolated): f = 5755 MHz; σ = 6.002 mho/m; ε_r = 48.477; ρ = 1000 kg/m^3
Phantom section: Flat Section

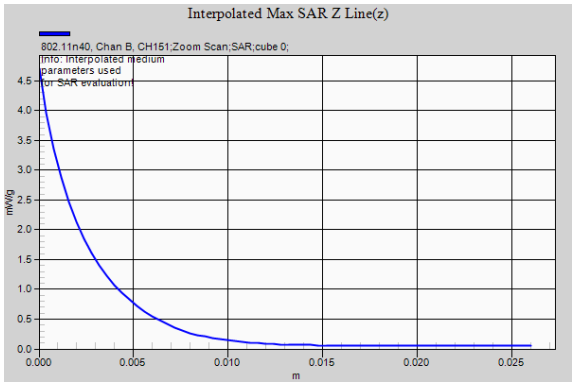
DASY5 Configuration:
- Probe: EX3DV4 - SN3687; ConvF(3.72, 3.72, 3.72); Calibrated: 21/07/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 23/11/2011
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.4 (2829)

5GHz - Lapheld/802.11n40, Chan B, CH151/Area Scan (71x261x1): Measurement grid: dx=10mm, dy=10mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 2.585 mW/g

5GHz - Lapheld/802.11n40, Chan B, CH151/Zoom Scan (9x10x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 19.061 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 4.699 W/kg
SAR(1 g) = 0.997 mW/g; SAR(10 g) = 0.386 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.043 mW/g



0 dB = 2.040mW/g



5600 MHz Band – 802.11n*, Channel 110 – Chain A+B

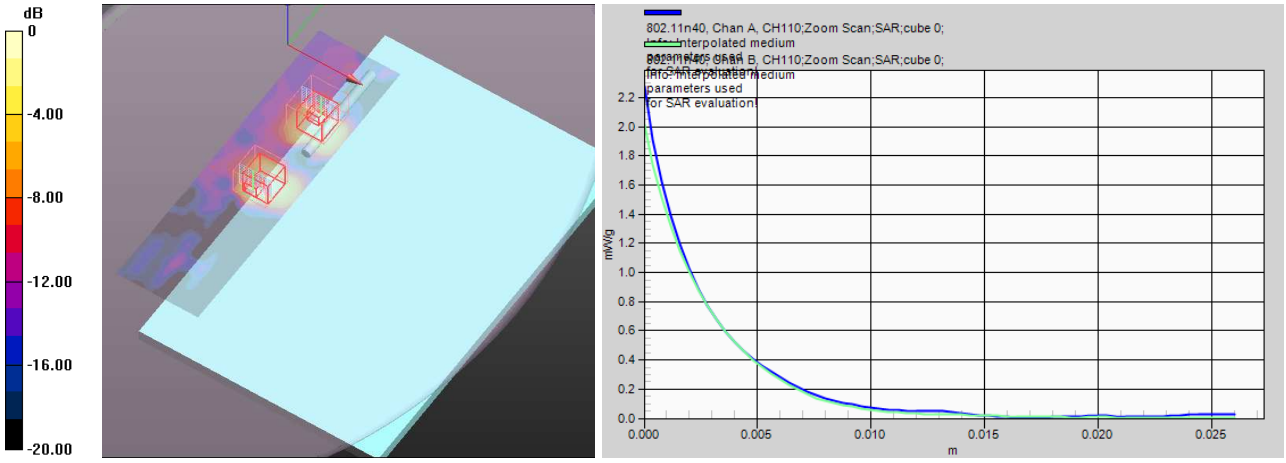
DUT: Dell P29G + Intel 62230ANHMW + Yageo; Type: Laptop; Serial: P/N 5N793

Communication System: IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK); Frequency: 5550 MHz; Duty Cycle: 1:11.4815
Medium parameters used (interpolated): f = 5550 MHz; σ = 5.72 mho/m; ε_r = 48.98; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:
- Probe: EX3DV4 - SN3687; ConvF(3.51, 3.51, 3.51); Calibrated: 21/07/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 23/11/2011
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.4 (2829)

5GHz - Lapheld (Reduced Power)/802.11n40, Chan A, CH110/Zoom Scan (9x9x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 13.697 V/m; Power Drift = 0.18 dB
Peak SAR (extrapolated) = 2.277 W/kg
SAR(1 g) = 0.487 mW/g; SAR(10 g) = 0.176 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.943 mW/g

5GHz - Lapheld (Reduced Power)/802.11n40, Chan B, CH110/Zoom Scan (8x8x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 14.202 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 2.012 W/kg
SAR(1 g) = 0.455 mW/g; SAR(10 g) = 0.182 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.967 mW/g



0 dB = 0.970mW/g

5600 MHz Band – 802.11n*, Channel 151 – Chain A+B

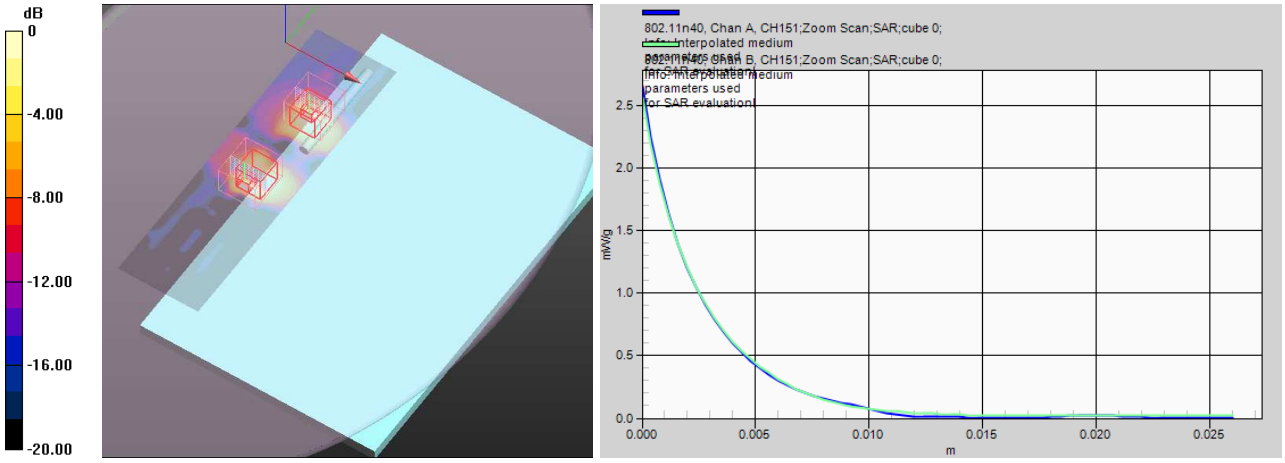
DUT: Dell P29G + Intel 62230ANHMW + Yageo; Type: Laptop; Serial: P/N 5N793

Communication System: IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK); Frequency: 5755 MHz; Duty Cycle: 1:11.4815
Medium parameters used (interpolated): f = 5755 MHz; σ = 6.002 mho/m; ε_r = 48.477; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:
- Probe: EX3DV4 - SN3687; ConvF(3.72, 3.72, 3.72); Calibrated: 21/07/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 23/11/2011
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.4 (2829)

5GHz - Lapheld (Reduced Power)/802.11n40, Chan A, CH151/Zoom Scan (9x9x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 13.495 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 2.658 W/kg
SAR(1 g) = 0.566 mW/g; SAR(10 g) = 0.201 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.208 mW/g

5GHz - Lapheld (Reduced Power)/802.11n40, Chan B, CH151/Zoom Scan (9x10x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 12.968 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 2.569 W/kg
SAR(1 g) = 0.557 mW/g; SAR(10 g) = 0.211 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.125 mW/g



0 dB = 1.120mW/g

APPENDIX D: Calibration Data

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 AT4 wireless

Certificate No: ES3-3052_Nov11

CALIBRATION CERTIFICATE

Object ES3DV3 - SN:3052

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

Calibration date: November 23, 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	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

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

Issued: November 23, 2011

Probe ES3DV3

SN:3052

Manufactured: September 30, 2003
Calibrated: November 23, 2011

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3052

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.11	1.16	1.17	± 10.1 %
DCP (mV)[B]	103.1	100.4	101.0	

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	300.0	±1.5 %
			Y	0.00	0.00	1.00	300.0	
			Z	0.00	0.00	1.00	300.0	
10011	UMTS-FDD (WCDMA)	3.40	X	3.50	65.9	18.3	111.8	±0.5 %
			Y	3.49	65.3	17.7	119.9	
			Z	3.53	65.8	18.2	117.0	
10012	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	1.87	X	2.98	68.7	18.9	114.9	±0.7 %
			Y	3.27	69.4	18.7	123.6	
			Z	3.11	69.2	18.9	119.9	
10013	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	11.13	X	12.63	72.1	25.3	109.4	±4.6 %
			Y	12.98	72.6	25.4	120.8	
			Z	12.85	72.9	25.9	113.7	
10021	GSM-FDD (TDMA, GMSK)	9.20	X	25.22	99.4	28.3	136.4	±1.2 %
			Y	16.15	90.8	25.7	103.3	
			Z	24.23	99.8	28.2	133.6	
10023	GPRS-FDD (TDMA, GMSK, TN 0)	9.40	X	15.00	89.2	24.4	129.8	±1.7 %
			Y	17.74	91.6	25.5	99.4	
			Z	13.38	87.9	23.6	128.5	
10024	GPRS-FDD (TDMA, GMSK, TN 0-1)	6.40	X	41.65	99.6	24.9	110.1	±2.2 %
			Y	42.81	99.6	25.1	127.5	
			Z	44.23	99.6	24.2	110.8	
10025	EDGE-FDD (TDMA, 8PSK, TN 0)	9.40	X	9.23	79.5	19.6	124.8	±2.5 %
			Y	10.50	80.0	19.8	141.5	
			Z	6.55	74.4	16.8	123.8	
10026	EDGE-FDD (TDMA, 8PSK, TN 0-1)	6.40	X	4.19	67.4	12.6	107.7	±1.4 %
			Y	6.66	71.8	14.7	127.3	
			Z	6.26	72.2	14.0	109.9	
10027	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	4.60	X	62.82	99.7	22.8	121.3	±2.5 %
			Y	59.26	99.9	23.3	137.6	
			Z	16.58	84.6	18.3	123.3	
10028	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	3.40	X	57.16	99.9	22.6	128.1	±2.2 %
			Y	8.77	77.0	15.7	144.3	
			Z	76.33	99.6	21.3	131.3	
10029	EDGE-FDD (TDMA, 8PSK, TN 0-1-2)	7.80	X	18.77	99.5	33.3	121.9	±2.5 %
			Y	14.93	92.1	30.2	140.8	
			Z	17.43	99.3	33.5	124.2	

10048	DECT (TDD, TDMA/FDM, GFSK, Full Slot, 24)	13.80	X	15.82	96.5	31.7	102.6	±1.9 %
			Y	14.21	92.7	30.4	80.8	
			Z	14.80	96.9	31.8	99.8	
10049	DECT (TDD, TDMA/FDM, GFSK, Double Slot, 12)	10.80	X	18.15	94.2	27.8	122.6	±1.2 %
			Y	17.25	92.1	27.2	137.0	
			Z	18.28	95.5	28.0	121.1	
10058	EDGE-FDD (TDMA, 8PSK, TN 0-1-2-3)	6.60	X	14.90	93.9	30.4	129.8	±1.7 %
			Y	12.30	87.5	27.5	148.3	
			Z	17.73	99.4	32.7	133.0	
10098	UMTS-FDD (HSUPA)	5.23	X	5.38	66.1	19.1	118.4	±0.9 %
			Y	5.48	66.2	18.9	128.4	
			Z	5.48	66.4	19.2	124.5	
10108	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	8.22	X	8.27	68.4	21.9	123.0	±2.7 %
			Y	8.41	68.5	21.8	134.0	
			Z	8.43	69.0	22.3	129.6	
10109	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)	9.07	X	9.60	69.8	23.0	130.5	±3.5 %
			Y	9.71	69.8	22.9	142.6	
			Z	9.75	70.3	23.4	137.7	
10110	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	7.24	X	7.21	67.4	20.8	120.4	±1.9 %
			Y	7.30	67.4	20.6	130.6	
			Z	7.27	67.6	21.0	126.5	
10111	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)	7.91	X	8.26	68.4	21.6	126.6	±2.5 %
			Y	8.43	68.6	21.5	138.6	
			Z	8.39	68.8	21.8	133.6	
10112	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)	8.95	X	9.63	69.8	23.0	132.3	±3.5 %
			Y	9.76	70.0	22.9	144.8	
			Z	9.77	70.4	23.3	139.2	
10113	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)	9.15	X	9.50	69.7	23.1	128.3	±3.5 %
			Y	9.64	69.7	22.9	140.3	
			Z	9.66	70.2	23.5	135.1	
10117	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	10.60	X	12.56	71.7	24.6	113.2	±4.1 %
			Y	12.60	71.6	24.4	124.1	
			Z	12.79	72.3	25.0	119.7	
10154	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	7.40	X	7.32	67.4	20.9	120.4	±1.9 %
			Y	7.43	67.5	20.8	130.8	
			Z	7.42	67.7	21.1	126.6	
10155	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)	8.10	X	8.46	68.6	21.9	127.1	±2.7 %
			Y	8.57	68.6	21.7	138.4	
			Z	8.55	68.9	22.0	133.7	
10156	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, QPSK)	7.40	X	7.08	67.1	20.8	117.5	±1.9 %
			Y	7.21	67.2	20.7	127.6	
			Z	7.17	67.4	21.0	123.3	
10157	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)	8.37	X	8.34	68.4	22.0	122.3	±2.7 %
			Y	8.52	68.7	21.9	134.1	
			Z	8.49	69.0	22.3	128.7	

10158	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)	9.15	X	9.50	69.7	23.1	128.2	±3.5 %
			Y	9.62	69.7	22.9	140.1	
			Z	9.65	70.2	23.4	135.1	
10159	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)	8.40	X	8.47	68.7	22.1	123.3	±2.7 %
			Y	8.63	68.8	22.0	134.8	
			Z	8.58	69.1	22.4	129.3	
10175	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	6.50	X	5.83	68.1	21.1	146.3	±1.4 %
			Y	5.52	66.0	19.6	114.5	
			Z	5.46	66.3	20.0	110.2	
10176	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)	7.20	X	6.60	69.4	22.1	146.3	±1.9 %
			Y	6.25	67.1	20.6	114.6	
			Z	6.15	67.4	21.0	109.6	
10177	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, QPSK)	6.53	X	5.84	68.0	21.1	146.1	±1.4 %
			Y	5.57	66.1	19.7	114.5	
			Z	5.52	66.4	20.2	109.8	
10178	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)	7.73	X	7.03	69.6	22.6	145.8	±2.5 %
			Y	6.68	67.4	21.1	114.5	
			Z	6.58	67.6	21.4	109.5	
10179	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)	7.62	X	6.96	69.6	22.5	146.0	±2.2 %
			Y	6.59	67.4	21.0	114.2	
			Z	6.48	67.6	21.3	109.7	
10180	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)	7.62	X	6.97	69.6	22.5	146.2	±2.2 %
			Y	6.57	67.3	20.9	113.8	
			Z	6.47	67.5	21.3	109.7	
10196	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	10.20	X	11.73	70.7	23.9	108.2	±3.8 %
			Y	11.83	70.7	23.7	118.4	
			Z	11.89	71.2	24.2	113.8	
10225	UMTS-FDD (HSPA+)	6.70	X	7.71	67.8	20.5	133.7	±1.7 %
			Y	7.91	68.2	20.5	146.6	
			Z	7.79	68.1	20.6	140.1	

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: ES3DV3 - SN:3052

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	6.10	6.10	6.10	0.34	1.62	± 12.0 %
835	41.5	0.90	5.85	5.85	5.85	0.23	2.15	± 12.0 %
900	41.5	0.97	5.83	5.83	5.83	0.50	1.33	± 12.0 %
1750	40.1	1.37	5.07	5.07	5.07	0.31	2.06	± 12.0 %
1900	40.0	1.40	4.85	4.85	4.85	0.41	1.68	± 12.0 %
2000	40.0	1.40	4.80	4.80	4.80	0.48	1.50	± 12.0 %
2450	39.2	1.80	4.23	4.23	4.23	0.72	1.25	± 12.0 %
2600	39.0	1.96	4.10	4.10	4.10	0.80	1.15	± 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: ES3DV3- SN:3052

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	6.05	6.05	6.05	0.45	1.44	± 12.0 %
835	55.2	0.97	5.92	5.92	5.92	0.34	1.77	± 12.0 %
900	55.0	1.05	5.90	5.90	5.90	0.68	1.20	± 12.0 %
1750	53.4	1.49	4.77	4.77	4.77	0.28	2.52	± 12.0 %
1900	53.3	1.52	4.55	4.55	4.55	0.28	2.81	± 12.0 %
2000	53.3	1.52	4.60	4.60	4.60	0.37	2.04	± 12.0 %
2450	52.7	1.95	4.15	4.15	4.15	0.80	0.66	± 12.0 %
2600	52.5	2.16	3.97	3.97	3.97	0.80	0.50	± 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.

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 AT4 Wireless

Certificate No: EX3-3687_Jul11

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3687

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

Calibration date: July 21, 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	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
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: July 21, 2011

Probe EX3DV4

SN:3687

Manufactured: March 10, 2009
Calibrated: July 21, 2011

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3687

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.53	0.44	0.48	± 10.1 %
DCP (mV)[B]	97.6	95.3	97.3	

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	118.8	±3.3 %
			Y	0.00	0.00	1.00	106.2	
			Z	0.00	0.00	1.00	112.4	
10062	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps)	12.32	X	13.69	72.9	26.2	125.2	±3.8 %
			Y	13.44	71.4	25.0	110.3	
			Z	13.70	72.6	26.0	119.5	
10117	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	10.60	X	12.68	71.6	24.2	134.9	±3.3 %
			Y	12.35	70.2	23.2	118.1	
			Z	12.65	71.3	24.0	128.0	
10196	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	10.20	X	11.79	70.6	23.5	126.8	±3.5 %
			Y	11.61	69.4	22.6	113.2	
			Z	11.77	70.4	23.4	120.7	

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: EX3DV4 - SN:3687

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)
5200	36.0	4.66	4.50	4.50	4.50	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.12	4.12	4.12	0.42	1.80	± 13.1 %
5800	35.3	5.27	3.96	3.96	3.96	0.45	1.80	± 13.1 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

DASY/EASY - Parameters of Probe: EX3DV4- SN:3687

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)
5200	49.0	5.30	4.01	4.01	4.01	0.54	1.90	± 13.1 %
5600	48.5	5.77	3.51	3.51	3.51	0.55	1.90	± 13.1 %
5800	48.2	6.00	3.72	3.72	3.72	0.55	1.90	± 13.1 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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 AT4 wireless

Certificate No: D2450V2-756_Aug11

CALIBRATION CERTIFICATE

Object: D2450V2 - SN: 756

Calibration procedure(s): QA CAL-05.v8
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: August 25, 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: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe ES3DV3	SN: 3205	29-Apr-11 (No. ES3-3205_Apr11)	Apr-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	04-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:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 25, 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) **Accreditation No.: SCS 108**
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

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	V52.6.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

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	51.8 ± 6 %	2.02 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.3 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**52.1 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.17 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**24.4 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Body TSL

Impedance, transformed to feed point	52.1 Ω + 4.1 jΩ
Return Loss	- 26.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.126 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	April 22, 2004

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 AT4 Wireless

Certificate No: D5GHz-1071_Jul11

CALIBRATION CERTIFICATE

Object: D5GHzV2 - SN: 1071

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

Calibration date: July 14, 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)	29-Mar-11 (No. 217-01368)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe EX3DV4	SN: 3503	04-Mar-11 (No. EX3-3503_Mar11)	Mar-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	04-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: July 14, 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

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	V52.6.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz ± 1 MHz 5500 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.8 ± 6 %	4.55 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.13 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**81.2 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.32 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**23.1 mW /g ± 16.5 % (k=2)**

Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.3 ± 6 %	4.85 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.49 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**84.7 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.42 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**24.1 mW / g ± 16.5 % (k=2)**

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.9 ± 6 %	5.15 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.04 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**80.1 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.29 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**22.8 mW / g ± 16.5 % (k=2)**

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	48.8 ± 6 %	5.45 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °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	7.65 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**76.4 mW / g ± 18.1 % (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 for nominal Body TSL parameters	normalized to 1W	**21.4 mW / g ± 17.6 % (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	48.2 ± 6 %	5.85 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °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	8.26 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**82.5 mW / g ± 18.1 % (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 for nominal Body TSL parameters	normalized to 1W	**23.0 mW / g ± 17.6 % (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	47.7 ± 6 %	6.27 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.72 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**77.1 mW / g ± 18.1 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.15 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**21.5 mW / g ± 17.6 % (k=2)**

Appendix

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	51.2 Ω - 6.1 jΩ
Return Loss	- 24.3 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	53.6 Ω - 3.7 jΩ
Return Loss	- 26.0 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	51.6 Ω - 3.4 jΩ
Return Loss	- 28.7 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	51.8 Ω - 4.4 jΩ
Return Loss	- 26.5 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	54.1 Ω - 1.5 jΩ
Return Loss	- 27.5 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	52.9 Ω - 0.9 jΩ
Return Loss	- 30.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.209 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	September 26, 2008