FCC OET BULLETIN 65 SUPPLEMENT C
IC RSS-102 ISSUE 2

SAR EVALUATION REPORT

FOR

EUT: Intel WiFi Link 5100 Series

FCC ID: PD9LEN512ANMU

IC: 1000M-L512ANMU

FCC Model: 512AN_MMW

IC Model: L512ANMU

REPORT NUMBER: 08U12055-3A

ISSUE DATE: SEPTEMBER 15, 2008

Prepared for

INTEL CORPORATION
2111 N.E. 25TH AVENUE
HILLSBORO, OR 97124, USA

Prepared by

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issued date	Revisions	Revised By
--	September 12, 2008	Initial issue	--
A	September 15, 2008	Update EUT description in section 7	Sunny Shih

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1 ATTESTATION OF TEST RESULTS

COMPANY NAME:	INTEL CORPORATION 2111 N.E. 25TH AVENUE HILLSBORO, OR 97124, USA
EUT DESCRIPTION:	Intel Wi-Fi Link 5100 Series
FCC ID:	PD9LEN512ANMU
IC:	1000M-L512ANMU
FCC MODEL:	512AN_MMW
IC MODEL:	L512ANMU
DEVICE CATEGORY:	Portable
EXPOSURE CATEGORY:	General Population/Uncontrolled Exposure
DATE TESTED:	September 9-10, 2008
THE HIGHEST SAR VALUES:	See Table below

FCC / IC Rule Parts	Frequency Range [MHz]	The Highest SAR Values (1g_mW/g)	Limit (mW/g)
15.247 / RSS-102	2400 – 2483.5 5725 – 5850	0.040 (Secondary Landscape) 0.039 (Secondary Landscape)	1.6
15.407 / RSS-102	5150 – 5250 5250 – 5350 5470 – 5725	0.022 (Secondary Landscape) 0.050 (Secondary Landscape) 0.091 (Secondary Landscape)	1.6

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC OET BULLETIN 65 SUPPLEMENT C	Pass
RSS-102 ISSUE 2	Pass

Compliance Certification Services, Inc. (CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by CCS based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by CCS will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

SUNNY SHIH
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Tested By:

CAROL BAUMANN
SAR ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2 TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC OET Bulletin 65 Supplement C, Specific FCC Procedure KDB 248227 SAR Measurement Procedure for 820.11abg Transmitters May 2007, KDB 447498_RF Exposure Requirements and Procedures for mobile and portable devices and IC RSS 102 Issue 2: NOVEMBER 2005.

3 FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.
CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

4 CALIBRATION AND UNCERTAINTY

4.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

5 MEASUREMENT UNCERTAINTY

Measurement uncertainty for 300 MHz – 3000 MHz

Uncertainty component	Tol. (±%)	Probe Dist.	Div.	Ci (1g)	Ci (10g)	Std. Unc.(±%)	
						Ui (1g)	Ui(10g)
Measurement System							
Probe Calibration	4.80	N	1	1	1	4.80	4.80
Axial Isotropy	4.70	R	1.732	0.707	0.707	1.92	1.92
Hemispherical Isotropy	9.60	R	1.732	0.707	0.707	3.92	3.92
Boundary Effects	1.00	R	1.732	1	1	0.58	0.58
Linearity	4.70	R	1.732	1	1	2.71	2.71
System Detection Limits	1.00	R	1.732	1	1	0.58	0.58
Readout Electronics	1.00	N	1	1	1	1.00	1.00
Response Time	0.80	R	1.732	1	1	0.46	0.46
Integration Time	2.60	R	1.732	1	1	1.50	1.50
RF Ambient Conditions - Noise	1.59	R	1.732	1	1	0.92	0.92
RF Ambient Conditions - Reflections	0.00	R	1.732	1	1	0.00	0.00
Probe Positioner Mechnical Tolerance	0.40	R	1.732	1	1	0.23	0.23
Probe Positioning With Respect to Phantom Shell	2.90	R	1.732	1	1	1.67	1.67
Extrapolation, interpolation, and integration algorithms for max. SAR evaluation	3.90	R	1.732	1	1	2.25	2.25
Test sample Related							
Test Sample Positioning	1.10	N	1	1	1	1.10	1.10
Device Holder Uncertainty	3.60	N	1	1	1	3.60	3.60
Power and SAR Drift Measurement	5.00	R	1.732	1	1	2.89	2.89
Phantom and Tissue Parameters							
Phantom Uncertainty	4.00	R	1.732	1	1	2.31	2.31
Liquid Conductivity - Target	5.00	R	1.732	0.64	0.43	1.85	1.24
Liquid Conductivity - Meas.	8.60	N	1	0.64	0.43	5.50	3.70
Liquid Permittivity - Target	5.00	R	1.732	0.6	0.49	1.73	1.41
Liquid Permittivity - Meas.	3.30	N	1	0.6	0.49	1.98	1.62
Combined Standard Uncertainty	RSS					11.44	10.49
Expanded Uncertainty (95% Confidence Interval)	K=2					22.87	20.98

Notesfor table
1. Tol. - tolerance in influence quaitity
2. N - Nomal
3. R - Rectangular
4. Div. - Divisor used to obtain standard uncertainty
5. Ci - is te sensitivity coefficient

Measurement uncertainty for 3 GHz – 6 GHz

Uncertainty component	Tol. (±%)	Probe Dist.	Div.	Ci (1g)	Ci (10g)	Std. Unc.(±%)	
						Ui (1g)	Ui(10g)
Measurement System							
Probe Calibration	4.80	N	1	1	1	4.80	4.80
Axial Isotropy	4.70	R	1.732	0.707	0.707	1.92	1.92
Hemispherical Isotropy	9.60	R	1.732	0.707	0.707	3.92	3.92
Boundary Effects	1.00	R	1.732	1	1	0.58	0.58
Linearity	4.70	R	1.732	1	1	2.71	2.71
System Detection Limits	1.00	R	1.732	1	1	0.58	0.58
Readout Electronics	1.00	N	1	1	1	1.00	1.00
Response Time	0.80	R	1.732	1	1	0.46	0.46
Integration Time	2.60	R	1.732	1	1	1.50	1.50
RF Ambient Conditions - Noise	3.00	R	1.732	1	1	1.73	1.73
RF Ambient Conditions - Reflections	3.00	R	1.732	1	1	1.73	1.73
Probe Positioner Mechnical Tolerance	0.40	R	1.732	1	1	0.23	0.23
Probe Positioning With Respect to Phantom Shell	2.90	R	1.732	1	1	1.67	1.67
Extrapolation, interpolation, and integration algorithms for max. SAR evaluation	3.90	R	1.732	1	1	2.25	2.25
Test sample Related							
Test Sample Positioning	1.10	N	1	1	1	1.10	1.10
Device Holder Uncertainty	3.60	N	1	1	1	3.60	3.60
Power and SAR Drift Measurement	5.00	R	1.732	1	1	2.89	2.89
Phantom and Tissue Parameters							
Phantom Uncertainty	4.00	R	1.732	1	1	2.31	2.31
Liquid Conductivity - Target	5.00	R	1.732	0.64	0.43	1.85	1.24
Liquid Conductivity - Meas.	8.60	N	1	0.64	0.43	5.50	3.70
Liquid Permittivity - Target	5.00	R	1.732	0.6	0.49	1.73	1.41
Liquid Permittivity - Meas.	3.30	N	1	0.6	0.49	1.98	1.62
Combined Standard Uncertainty	RSS					11.66	10.73
Expanded Uncertainty (95% Confidence Interval)	K=2					23.32	21.46

Notesfor table
1. Tol. - tolerance in influence quaitity
2. N - Nomal
3. R - Rectangular
4. Div. - Divisor used to obtain standard uncertainty
5. Ci - is te sensitivity coefficient

6 TEST EQUIPMENT LIST

Name of Equipment	Manufacturer	Type/Model	Serial Number	Cal. Due date		
				MM	DD	Year
Robot - Six Axes	Stäubli	RX90BL	N/A	N/A		
Robot Remote Control	Stäubli	CS7MB	3403-91535	N/A		
DASY4 Measurement Server	SPEAG	SEUMS001BA	1041	N/A		
Probe Alignment Unit	SPEAG	LB (V2)	261	N/A		
SAM Phantom (SAM1)	SPEAG	QD000P40CA	1185	N/A		
SAM Phantom (SAM2)	SPEAG	QD000P40CA	1050	N/A		
Oval Flat Phantom (ELI 4.0)	SPEAG	QD OVA001 B	1003	N/A		
Electronic Probe kit	HP	85070C	N/A	N/A		
S-Parameter Network Analyzer	Agilent	8753ES-6	MY40001647	11	14	2008
E-Field Probe	SPEAG	EX3DV3	3531	4	23	2009
Thermometer	ERTCO	639-1S	1718	5	28	2009
Data Acquisition Electronics	SPEAG	DAE3 V1	500	11	16	2008
System Validation Dipole	SPEAG	D2450V2	748	4	14	2009
System Validation Dipole	SPEAG	D5GHzV2	1003	11	21	2009
Signal Generator	R&S	SMP 04	DE34210	2	16	2009
Power Meter	Giga-tronics	8651A	8651404	1	11	2010
Power Sensor	Giga-tronics	80701A	1834588	1	11	2010
Amplifier	Mini-Circuits	ZVE-8G	90606	N/A		
Amplifier	Mini-Circuits	ZHL-42W	D072701-5	N/A		
Simulating Liquid	CCS	M2450	N/A	Within 24 hrs of first test		
Simulating Liquid	SPEAG	M5200-5800	N/A	Within 24 hrs of first test		

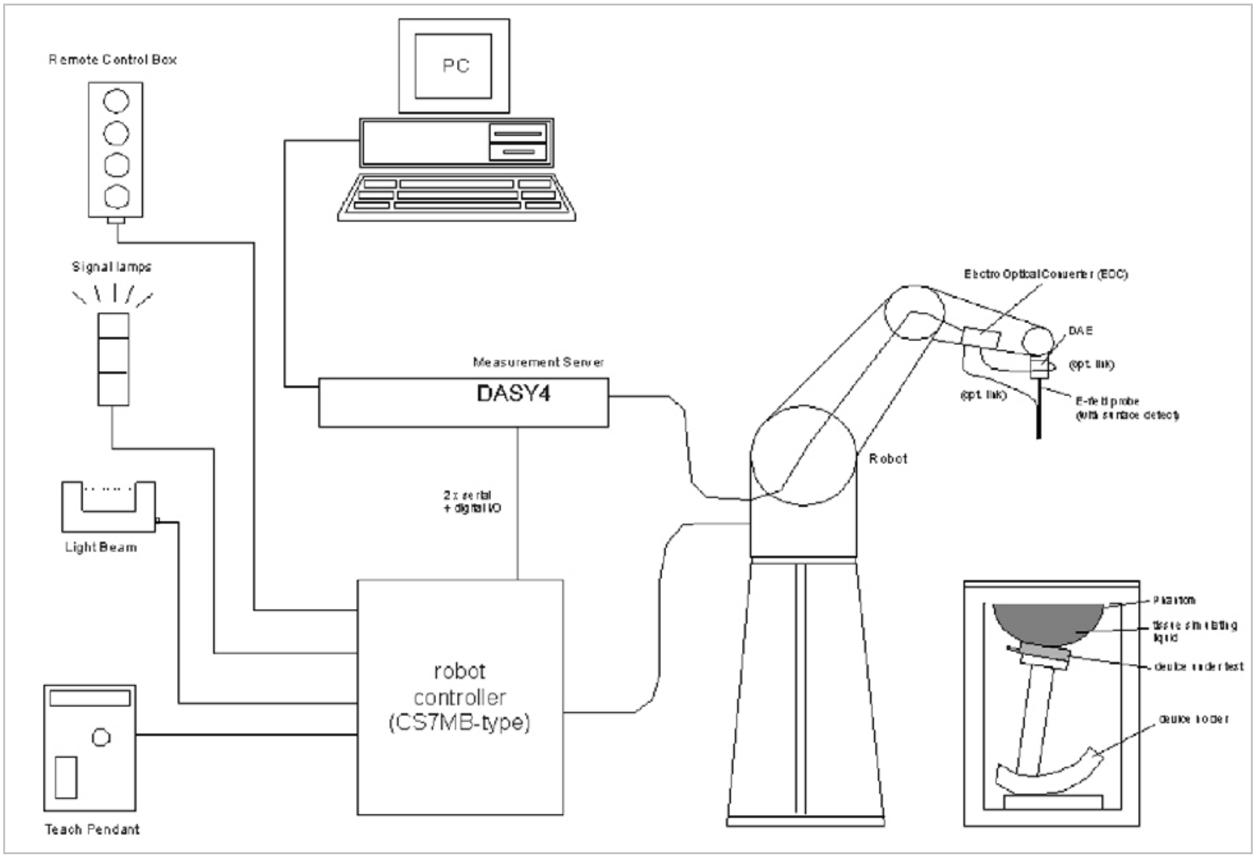
7 DEVICE UNDER TEST (DUT) DESCRIPTION

Intel Wi-Fi Link 5100 Series (Tested inside of LENOVO THINKPAD X200 TABLET SERIES)	

Normal operation:	• Laptop Mode
	• Tablet Mode – in the following configurations.
	  o Bottom Face
	  o Edge - Primary/Secondary landscape and Primary/Secondary portrait orientations.

Antenna tested:	ACON Main Antenna (25.90675.001)
Power supply:	Power supplied through laptop computer (host device)

8 SYSTEM DESCRIPTION



The DASY4 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Stäubli RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 2000 or Windows XP.
- DASY4 software.
- Remote controls with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing to validate the proper functioning of the system.

8.1 COMPOSITION OF INGREDIENTS FOR TISSUE SIMULATING LIQUIDS

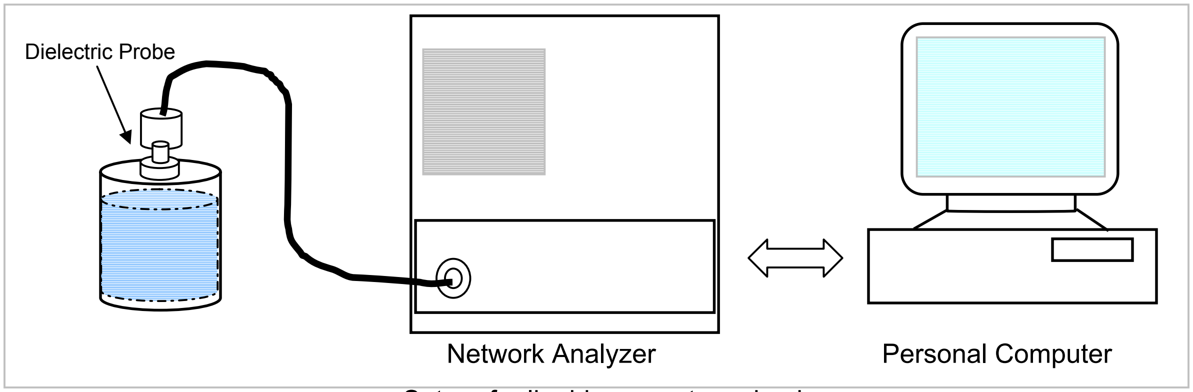
The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Ingredients (% by weight)	Frequency (MHz)									
	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

Salt: 99+% Pure Sodium Chloride Sugar: 98+% Pure Sucrose
Water: De-ionized, 16 MΩ+ resistivity HEC: Hydroxyethyl Cellulose
DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]
Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

9 SIMULATING LIQUID PARAMETERS CHECK

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine of the dielectric parameters are within the tolerances of the specified target values. The relative permittivity and conductivity of the tissue material should be within ± 5% of the values given in the table below.



Set-up for liquid parameters check

Reference Values of Tissue Dielectric Parameters for Head and Body Phantom (for 150 – 3000 MHz and 5800 MHz)

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in IEEE Standard 1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations and extrapolated according to the head parameters specified in IEEE Standard 1528.

Target Frequency (MHz)	**Head**		**Body**	
	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	**55.0**	**1.05**
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	**53.3**	**1.52**
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

(ε_r = relative permittivity, σ = conductivity and ρ = 1000 kg/m^3)

9.1 SIMULATING LIQUID PARAMETER CHECK RESULT

Simulating Liquid Dielectric Parameter Check Result @ Muscle 2450 MHz

Room Ambient Temperature = 25°C; Relative humidity = 40% Measured by: Carol Baumann

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
2450	24	15	e'	51.5430	Relative Permittivity (ϵ_r):	51.5430	52.7	-2.20	± 5
			e''	13.9229	Conductivity (σ):	1.89764	1.95	-2.68	± 5

Liquid Check
Ambient temperature: 25 deg. C; Liquid temperature: 24 deg. C
September 09, 2008 08:36 AM

Frequency	e'	e''
2400000000.	51.7964	13.6271
2405000000.	51.7596	13.7357
2410000000.	51.7688	13.6756
2415000000.	51.7533	13.6134
2420000000.	51.8169	13.7529
2425000000.	51.6534	13.7504
2430000000.	51.7603	13.7607
2435000000.	51.6781	13.8131
2440000000.	51.6530	13.7893
2445000000.	51.5270	13.9089
2450000000.	**51.5430**	**13.9229**
2455000000.	51.5353	13.9824
2460000000.	51.6146	13.9458
2465000000.	51.5845	14.0571
2470000000.	51.5900	14.1637
2475000000.	51.5917	14.2231
2480000000.	51.4919	14.2556
2485000000.	51.4737	14.3072
2490000000.	51.4474	14.3319
2495000000.	51.4296	14.2409
2500000000.	51.4165	14.2229

The conductivity (σ) can be given as:

$$\sigma = \omega\varepsilon_0 e'' = 2\pi f \varepsilon_0 e''$$

where f = target $f * 10^6$

$\varepsilon_0 = 8.854 * 10^{-12}$

Simulating Liquid Parameter Check Result @ Muscle 5GHz

Room Ambient Temperature = 25°C; Relative humidity = 40% Measured by: Carol Baumann

Simulating Liquid f (MHz)	Parameters			Measured	Target	Deviation (%)	Limit (%)
5200	e'	45.9119	Relative Permittivity (ϵ_r):	45.9119	49.0	-6.30	± 10
	e"	18.8041	Conductivity (σ):	5.43970	5.30	2.64	± 5
5500	e'	45.3342	Relative Permittivity (ϵ_r):	45.3342	48.6	-6.72	± 10
	e"	18.9970	Conductivity (σ):	5.81255	5.65	2.88	± 5
5800	e'	44.656	Relative Permittivity (ϵ_r):	44.6560	48.2	-7.35	± 10
	e"	19.2175	Conductivity (σ):	6.20075	6.00	3.35	± 5

Liquid Check
Ambient temperature: 25 deg. C; Liquid temperature: 24 deg. C
September 10, 2008 08:48 AM

Frequency	e'	e"
4600000000.	47.1887	17.8076
4650000000.	47.1421	18.0118
4700000000.	47.0342	17.9846
4750000000.	46.8664	18.1424
4800000000.	46.8418	18.1538
4850000000.	46.6441	18.1934
4900000000.	46.6819	18.2841
4950000000.	46.4880	18.3179
5000000000.	46.4770	18.4286
5050000000.	46.3870	18.4304
5100000000.	46.2732	18.6111
5150000000.	46.2202	18.7364
5200000000.	**45.9119**	**18.8041**
5250000000.	45.8134	18.8142
5300000000.	45.7299	18.7836
5350000000.	45.5769	18.8725
5400000000.	45.5619	18.8948
5450000000.	45.3998	18.9558
5500000000.	**45.3342**	**18.9970**
5550000000.	45.1959	19.0817
5600000000.	45.1065	19.0749
5650000000.	44.9741	19.1997
5700000000.	44.9016	19.1396
5750000000.	44.7250	19.2705
5800000000.	**44.6560**	**19.2175**
5850000000.	44.4200	19.3377
5900000000.	44.5169	19.3309
5950000000.	44.2176	19.3747
6000000000.	44.2502	19.3811

The conductivity (σ) can be given as:

$$\sigma = \omega \varepsilon_0 e'' = 2 \pi f \varepsilon_0 e''$$

where $f = target\ f * 10^6$

$\varepsilon_0 = 8.854 * 10^{-12}$

10 SYSTEM PERFORMANCE CHECK

The system performance check is performed prior to any usage of the system in order to guarantee reproducible results. The system performance check verifies that the system operates within its specifications of ±10%.

System Performance Check Measurement Conditions

- The measurements were performed in the flat section of the SAM twin phantom filled with Body simulating liquid of the following parameters.
- The DASY4 system with an Isotropic E-Field Probe EX3DV3-SN: 3531 was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
  For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (2.4 GHz) fine cube was chosen for cube integration and Special 8x8x10 (5 GHz) fine cube was chosen for cube integration
- Distance between probe sensors and phantom surface was set to 3 mm.
  For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.5mm
- The dipole input power (forward power) was 250 mW±3%.
- The results are normalized to 1 W input power.

450 to 2450 MHz Reference SAR Values for body-tissue

In the table below, the numerical reference SAR values of a SPEAG validation dipoles placed below the flat phantom filled with body-tissue simulating liquid are given. The reference SAR values were calculated using the finite-difference time-domain method and the geometry parameters.

Dipole Type	Distance (mm)	Frequency (MHz)	SAR (1g) [W/kg]	SAR (10g) [W/kg]	SAR (peak) [W/kg]
D450V2	15	450	5.01	3.36	7.22
D835V2	15	835	9.71	6.38	14.1
D900V2	15	900	**11.1**	**7.17**	16.3
D1450V2	10	1450	29.6	16.6	49.8
D1800V2	10	1800	**38.5**	**20.3**	67.5
D1900V2	10	1900	39.8	20.8	69.6
D2000V2	10	2000	**40.9**	**21.2**	71.5
D2450V2	10	2450	51.2	23.7	97.6

Note: All SAR values normalized to 1 W forward power.

5 GHz Reference SAR Values for body-tissue

The reference SAR values are measurement results from the Certificate of Dipole D5GHzV2.

10.1 SYSTEM PERFORMANCE CHECK RESULTS

System Validation Dipole: D2450V2 SN: 748

The dipole input power (forward power): 250 mW

Results

Date: September 9, 2008

Ambient Temperature = 25°C; Relative humidity = 40% Measured by: Carol Baumann

Body Simulating Liquid			SAR (mW/g)	Normalized	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)					
2450	24	15	1g	46.5	51.2	-9.18	± 10
			10g	22	23.7	-7.17	± 10

System Validation Dipole: D5GHzV2 SN 1003

The dipole input power (forward power): 250 mW

Results

Date: September 10, 2008

Ambient Temperature = 25 °C; Relative humidity = 40% Measured by: Carol Baumann

Body Simulating Liquid			Normalized to 1 W		Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)					
5200	24	15	1g	81.7	75.6	8.07	± 10
			10g	23.1	21.3	8.45	± 10

Body Simulating Liquid			Normalized to 1 W		Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)					
5500	24	15	1g	82.1	81.1	1.23	± 10
			10g	23.1	22.7	1.76	± 10

Body Simulating Liquid			Normalized to 1 W		Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)					
5800	24	15	1g	78.4	71.9	9.04	± 10
			10g	21.9	20.1	8.96	± 10

11 OUTPUT POWER VERIFICATION

The following procedures had been used to prepare the EUT for the SAR test.

The client provided a special driver and program, CRTU v5.0.69.0, which enable a user to control the frequency and output power of the module.

The modes with highest output power channel were chosen for the conducted output power measurement.

Results:

802.11bgn mode (2.4 GHz band)

Mode	Channel	f (MHz)	Average Output Power	Duty Cycle (%)
802.11b	6	2437 (M)	19.7	100
802.11n 20 MHz	6	2437 (M)	17.3	99

802.11an mode (5.8 GHz band)

Mode	Channel	f (MHz)	Average Output Power	Duty Cycle (%)
802.11a	157	5785	16.5	99
802.11n 40 MHz	159	5795	16.6	98

802.11an mode (5.2 GHz band)

Mode	Channel	f (MHz)	Average Output Power	Duty Cycle (%)
802.11a	40	5200	16.9	99
802.11n 20 MHz	40	5200	16.8	99

802.11an mode (5.3 GHz band)

Mode	Channel	f (MHz)	Average Output Power	Duty Cycle (%)
802.11a	56	5280	16.8	99
802.11n 40 MHz	54	5270	16.8	98

802.11an mode (5.5 GHz band)

Mode	Channel	f (MHz)	Average Output Power	Duty Cycle (%)
802.11a	100	5500	19.1	99
802.11n 40 MHz	118	5590	17.0	98

12 SAR TEST RESULTS

12.1 SAR TEST RESULT FOR THE 2.4 GHZ BAND

Laptop Mode: Lap-held with the display open at 90° to the keyboard.
- SAR testing is not required due to the large distance (> 16.9 cm) between main antenna (located on the right of the LCD panel) and person's body.

Tablet Mode 1: Edge - Primary Landscape (14 cm between main antenna and person's body)

Mode	Channel	f (MHz)	Antenna	Measured SAR 1g (mW/g)	Limit
802.11b	6	2437 (M)	main	0.032	1.6

Notes:

1) The modes with highest output power channel were chosen for the testing.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.

Tablet Mode 2: Edge - Secondary Landscape (4 cm between main antenna and person's body)

Mode	Channel	f (MHz)	Antenna	Measured SAR 1g (mW/g)	Limit
802.11b	6	2437 (M)	main	**0.040**	1.6
802.11n 20 MHz	6	2437 (M)	main	0.029	1.6

Notes:

1) The modes with highest output power channel were chosen for the testing.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.

Tablet Mode 3: Edge - Primary Portrait
- SAR testing is not required since the main antenna is disabled by software tool for this configuration.

Tablet Mode 4: Edge - Secondary Portrait
- SAR testing is not required due to the large distance (> 25 cm) between main antenna and person's body.

Tablet Mode 5: Bottom Face - Lap-held (3.05 cm between main antenna and person's body)

Mode	Channel	f (MHz)	Antenna	Measured SAR 1g (mW/g)	Limit
802.11b	6	2437 (M)	main	0.015	1.6
802.11n 20 MHz	6	2437 (M)	main	0.011	1.6

Notes:

1) The modes with highest output power channel were chosen for the testing.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.

The Highest SAR Plot & Data for 2.4 GHz Band

Date/Time: 9/9/2008 4:49:29 PM

Test Laboratory: Compliance Certification Services

Tablet Mode 2 Edge - Secondary Landscape

DUT: Lenovo X200 Tablet; Type: N/A; Serial: N/A

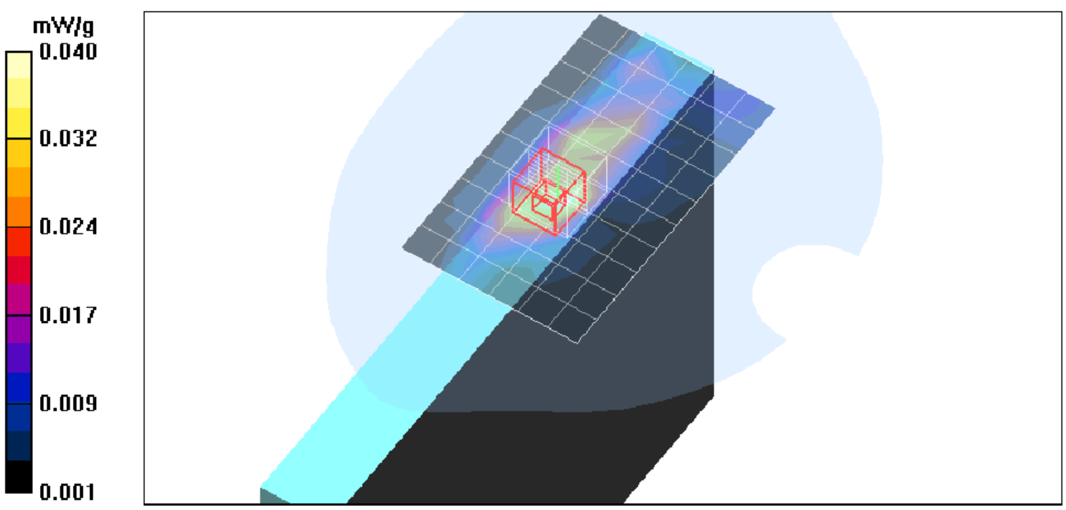
Communication System: 802.11bg; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.87 mho/m; ε_r = 51.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

Room Ambient Temperature: 25.0 deg. C; Liquid Temperature: 24.0 deg. C

DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV3 - SN3531; ConvF(7.91, 7.91, 7.91); Calibrated: 4/23/2008
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn500; Calibrated: 11/16/2007
- Phantom: SAM 2 (Twin); Type: SAM 2; Serial: 1050
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

802.11b_M-Ch/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.040 mW/g

802.11b_M-Ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 2.20 V/m; Power Drift = 0.846 dB
Peak SAR (extrapolated) = 0.076 W/kg
SAR(1 g) = 0.040 mW/g; SAR(10 g) = 0.020 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.050 mW/g



12.2 SAR TEST RESULT FOR 5 GHZ BANDS

Laptop Mode: Lap-held with the display open at 90° to the keyboard

- SAR testing is not required due to the large distance (> 16.9 cm) between main antenna (located on the right of the LCD panel) and person's body.

Tablet Mode 1: Edge - Primary Landscape (14 cm between main antenna and person's body)

- SAR testing was skipped after pre-scan showed no hot spots.

Mode	Channel	f (MHz)	Antenna	Measured SAR 1g (mW/g)	Limit
802.11a	40	5200 (M)	main	noise only	1.6
802.11a	56	5280 (M)	main	noise only	1.6
802.11a	100	5500 (L)	main	noise only	1.6
802.11a	157	5785 (L)	main	noise only	1.6

Note: - SAR testing was skipped after pre-scan showed no hot spots.

Tablet Mode 2: Edge - Secondary Landscape (4 cm between main antenna and person's body)

Mode	Channel	f (MHz)	Antenna	Measured SAR 1g (mW/g)	Limit
802.11a	40	5200 (M)	main	0.022	1.6
802.11a	56	5280 (M)	main	0.050	1.6
802.11a	100	5500 (L)	main	0.091	1.6
802.11n 40 MHz	118	5590 (M)	main	0.078	1.6
802.11a	157	5785 (M)	main	0.039	1.6

Notes:

1) The modes with highest output power channel were chosen for the testing.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.

Tablet Mode 3: Edge - Primary Portrait

- SAR testing is not required since the main antenna is disabled by software tool for this configuration.

Tablet Mode 4: Edge - Secondary Portrait

- SAR testing is not required due to the large distance (> 25 cm) between main antenna and person's body.

Tablet Mode 5: Bottom Face - Lap-held (3.05 cm between main antenna and person's body)

Mode	Channel	f (MHz)	Antenna	Measured SAR 1g (mW/g)	Limit
802.11a	40	5200 (M)	main	noise only	1.6
802.11a	56	5280 (M)	main	0.00335	1.6
802.11a	100	5500 (L)	main	0.00519	1.6
802.11a	157	5785 (M)	main	0.00527	1.6

Notes:

1) The modes with highest output power channel were chosen for the testing.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.

The Highest SAR Plot & Data for 5.2 GHz Band

Date/Time: 9/10/2008 2:31:33 PM

Test Laboratory: Compliance Certification Services

Tablet Mode 2 Edge - Secondary Landscape

DUT: Lenovo X200 Tablet; Type: N/A; Serial: N/A

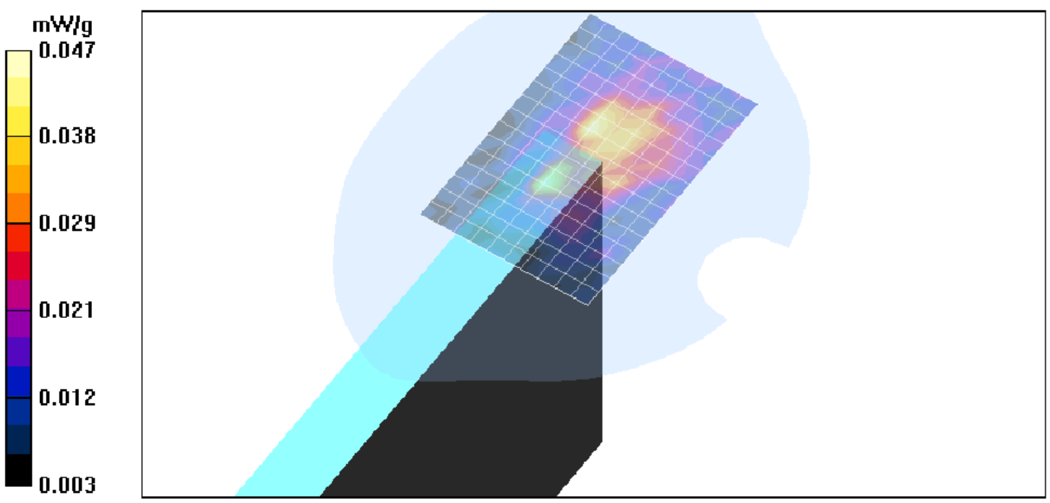
Communication System: 802.11abgn; Frequency: 5200 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5200 MHz; σ = 5.44 mho/m; ε_r = 45.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

Room Ambient Temperature: 25.0 deg. C; Liquid Temperature: 24.0 deg. C

DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV3 - SN3531; ConvF(4.21, 4.21, 4.21); Calibrated: 4/23/2008
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn500; Calibrated: 11/16/2007
- Phantom: SAM 2 (Twin); Type: SAM 2; Serial: 1050
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

802.11a_M-Ch/Area Scan (11x16x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.047 mW/g

802.11a_M-Ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 2.20 V/m; Power Drift = 0.278 dB
Peak SAR (extrapolated) = 0.184 W/kg
SAR(1 g) = 0.022 mW/g; SAR(10 g) = 0.00732 mW/g
Maximum value of SAR (measured) = 0.050 mW/g



The Highest SAR Plot & Data for 5.3 GHz Band

Date/Time: 9/10/2008 4:23:26 PM

Test Laboratory: Compliance Certification Services

Tablet Mode 2 Edge - Secondary Landscape

DUT: Lenovo X200 Tablet; Type: N/A; Serial: N/A

Communication System: 802.11abgn; Frequency: 5280 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5280 MHz; σ = 5.52 mho/m; ε_r = 45.8; ρ = 1000 kg/m^3
Phantom section: Flat Section

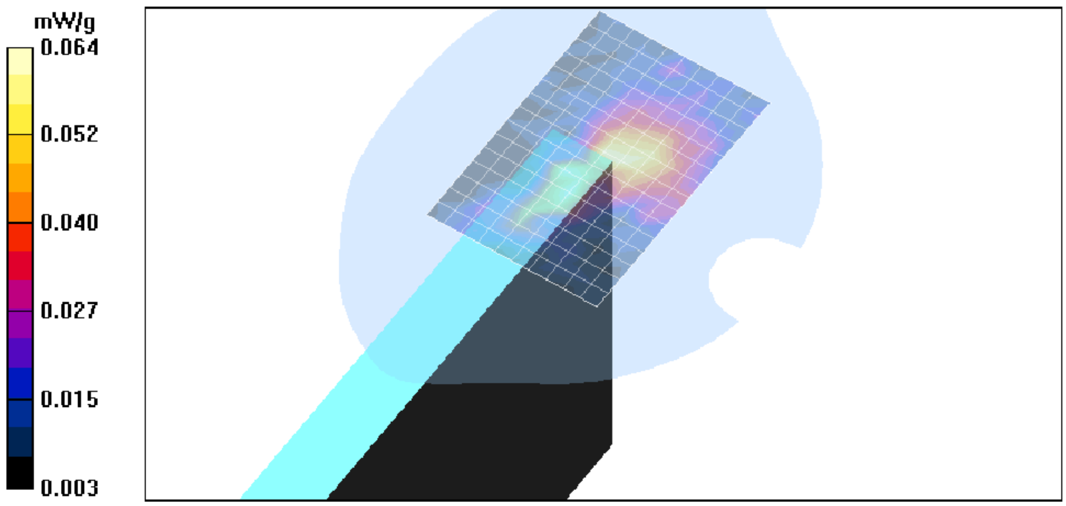
Room Ambient Temperature: 25.0 deg. C; Liquid Temperature: 24.0 deg. C

DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV3 - SN3531; ConvF(3.92, 3.92, 3.92); Calibrated: 4/23/2008
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn500; Calibrated: 11/16/2007
- Phantom: SAM 2 (Twin); Type: SAM 2; Serial: 1050
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

802.11a_M-Ch/Area Scan (11x16x1): Measurement grid: dx=10mm, dy=10mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.064 mW/g

802.11a_M-Ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 2.75 V/m; Power Drift = -0.990 dB
Peak SAR (extrapolated) = 0.234 W/kg
SAR(1 g) = 0.050 mW/g; SAR(10 g) = 0.016 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.095 mW/g

802.11a_M-Ch/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 2.75 V/m; Power Drift = -0.990 dB
Peak SAR (extrapolated) = 0.516 W/kg
SAR(1 g) = 0.049 mW/g; SAR(10 g) = 0.011 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.100 mW/g



The Highest SAR Plot & Data for 5.5 GHz Band

Date/Time: 9/10/2008 5:23:15 PM

Test Laboratory: Compliance Certification Services

Tablet Mode 2 Edge - Secondary Landscape

DUT: Lenovo X200 Tablet; Type: N/A; Serial: N/A

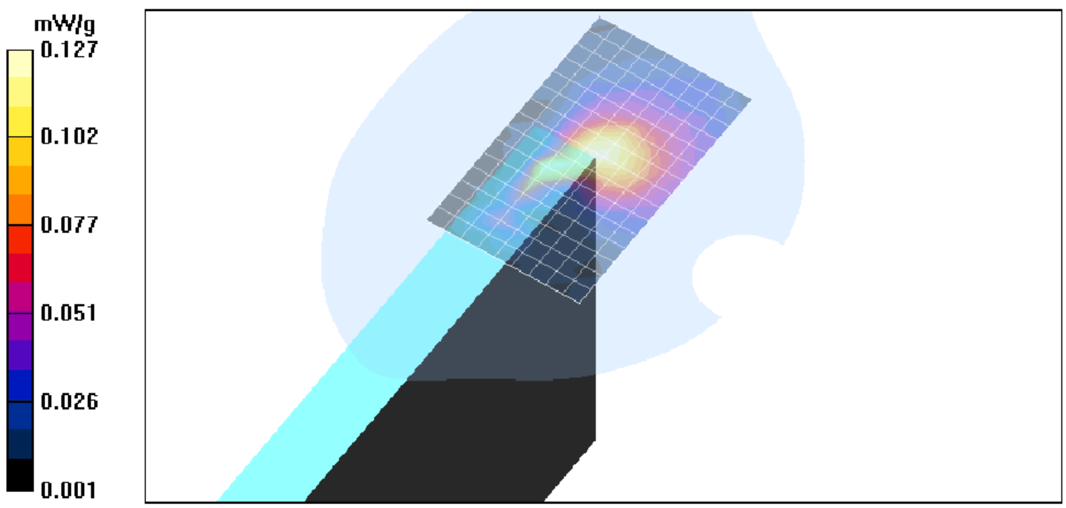
Communication System: 802.11abgn; Frequency: 5500 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5500 MHz; σ = 5.81 mho/m; ε_r = 45.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

Room Ambient Temperature: 25.0 deg. C; Liquid Temperature: 24.0 deg. C

DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV3 - SN3531; ConvF(3.99, 3.99, 3.99); Calibrated: 4/23/2008
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn500; Calibrated: 11/16/2007
- Phantom: SAM 2 (Twin); Type: SAM 2; Serial: 1050
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

802.11a_M-Ch/Area Scan (10x16x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.127 mW/g

802.11a_M-Ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 2.86 V/m; Power Drift = 1.55 dB
Peak SAR (extrapolated) = 0.356 W/kg
SAR(1 g) = 0.091 mW/g; SAR(10 g) = 0.026 mW/g
Maximum value of SAR (measured) = 0.181 mW/g



The Highest SAR Plot & Data for 5.8 GHz Band

Date/Time: 9/10/2008 6:57:45 PM

Test Laboratory: Compliance Certification Services

Tablet Mode 2 Edge - Secondary Landscape

DUT: Lenovo X200 Tablet; Type: N/A; Serial: N/A

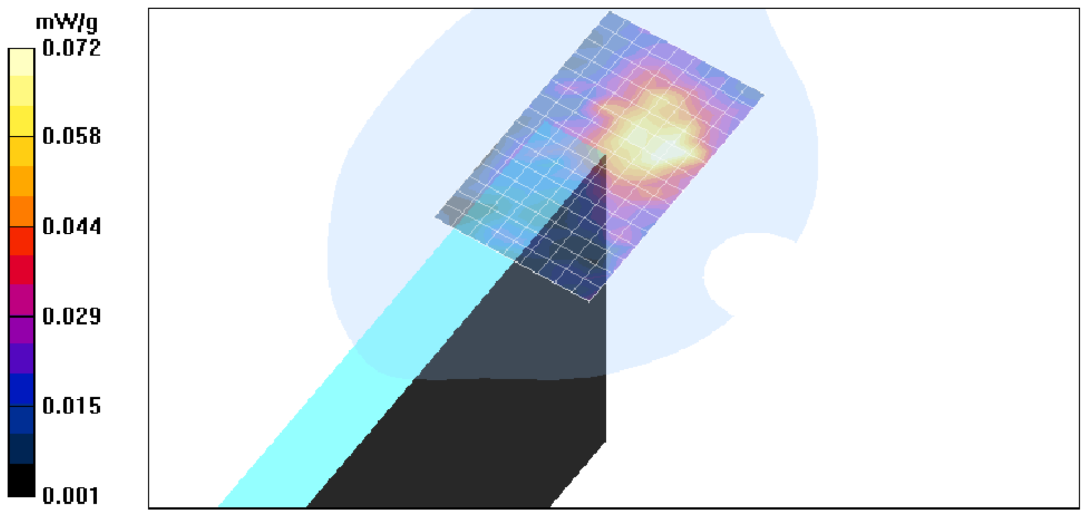
Communication System: 802.11abgn; Frequency: 5785 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5785 MHz; σ = 6.19 mho/m; ε_r = 44.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

Room Ambient Temperature: 25.0 deg. C; Liquid Temperature: 24.0 deg. C

DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV3 - SN3531; ConvF(3.7, 3.7, 3.7); Calibrated: 4/23/2008
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn500; Calibrated: 11/16/2007
- Phantom: SAM 2 (Twin); Type: SAM 2; Serial: 1050
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

802.11a_M-Ch/Area Scan (10x16x1): Measurement grid: dx=10mm, dy=10mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.072 mW/g

802.11a_M-Ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 1.98 V/m; Power Drift = -0.463 dB
Peak SAR (extrapolated) = 0.157 W/kg
SAR(1 g) = 0.039 mW/g; SAR(10 g) = 0.015 mW/g
Info: Interpolated medium parameters used for SAR evaluation.



13 ATTACHMENTS

No.	Contents	No. Of Pages
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14 SETUP PHOTOS

Tablet Mode: Edge – Primary Landscape

Tablet Mode: Edge – Secondary Landscape

Tablet Mode: Bottom Face – Lap-held

END OF REPORT