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: 09U12394-1

ISSUE DATE: FEBRUARY 20, 2009

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
--	February 20, 2009	Initial issue	--

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1 ATTESTATION OF TEST RESULTS

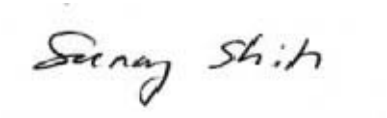
COMPANY NAME:	INTEL CORPORATION 2111 N.E. 25TH AVENUE HILLSBORO, OR 97124, USA
EUT DESCRIPTION:	Intel Wi-Fi Link 5100 Series
FCC ID:	PD9LEN512ANMU
IC:	1000M-L512ANMU
FCC MODEL:	512AN_MMW
IC MODEL:	L512ANMU
DEVICE CATEGORY:	Portable
EXPOSURE CATEGORY:	General Population/Uncontrolled Exposure
DATE TESTED:	February 19 - 20, 2009
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	0.017 0.020	1.6
15.407 / RSS-102	5150 – 5250 5250 – 5350 5470 – 5725	0.016 0.015 0.020	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

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://ts.nist.gov/Standards/scopes/2000650.htm.

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

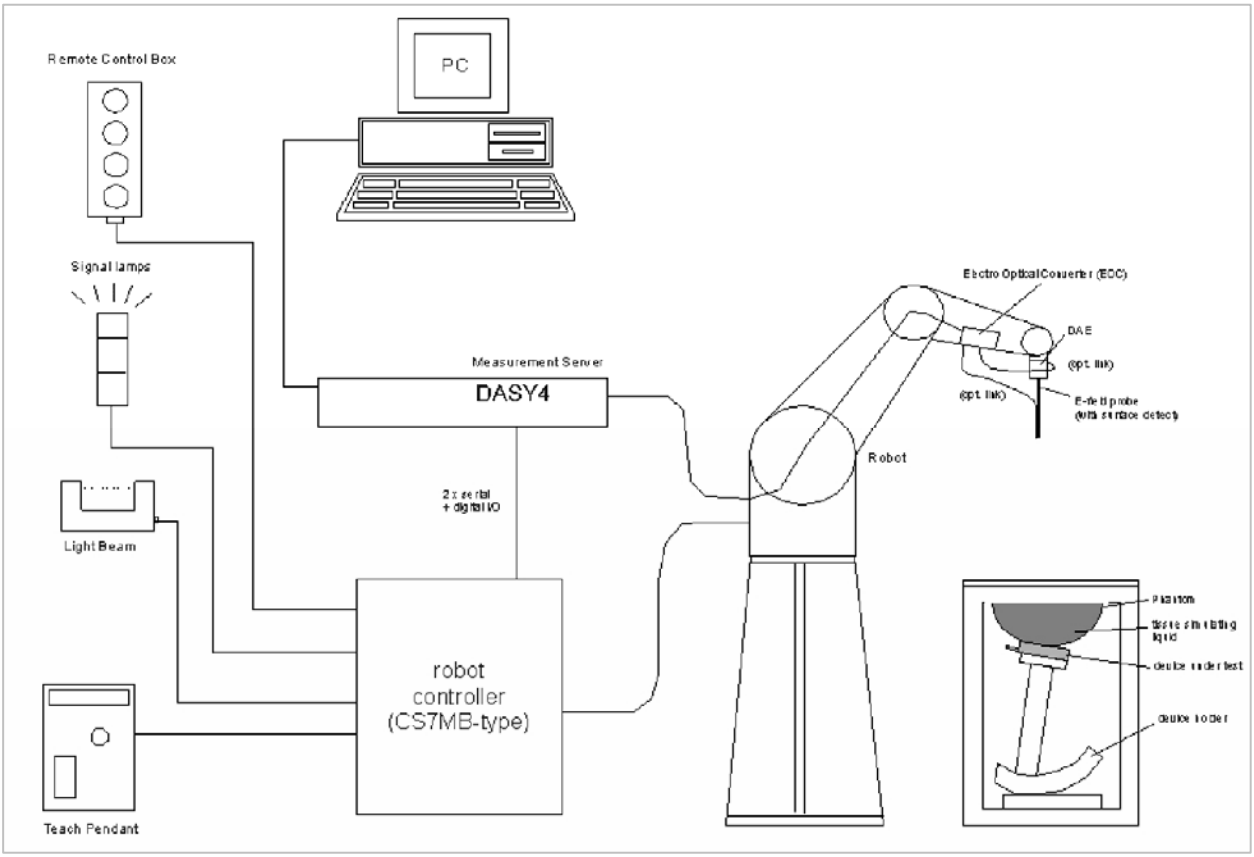
6 TEST EQUIPMENT LIST

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	20	2010
E-Field Probe	SPEAG	EX3DV3	3531	4	23	2009
Thermometer	ERTCO	639-1S	1718	5	28	2009
Data Acquisition Electronics	SPEAG	DAE3 V1	427	10	20	2009
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 ideapad U130) 820.11abgn MISO with HT20 and HT40	
Normal operation:	Laptop Mode
Antenna tested:	Ready Two, TX 1 Antenna, Part Number: LX1564-11-000-R
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

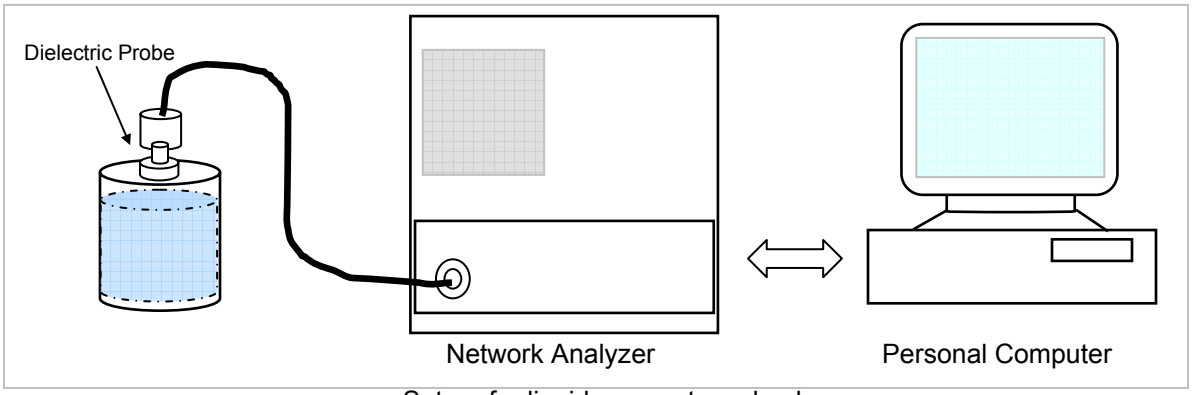
The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

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 2.4 GHZ BODY LIQUID PARAMETER CHECK RESULTS

Room Ambient Temperature = 25°C; Relative humidity = 39% Measured by: Sunny Shih

Simulating Liquid		Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Depth (cm)							
2450	15	e'	50.9212	Relative Permittivity (ε_r):	50.9212	52.7	-3.38	± 5
		e"	14.4911	Conductivity (σ):	1.97509	1.95	1.29	± 5

Liquid Check
Ambient temperature: 25 deg. C; Liquid temperature: 24 deg. C
February 20, 2009 08:54 AM

Frequency	e'	e"
2400000000.	51.1912	14.5280
2405000000.	51.1870	14.4029
2410000000.	51.0947	14.3778
2415000000.	51.1805	14.2938
2420000000.	51.1055	14.3220
2425000000.	51.0517	14.2981
2430000000.	51.0086	14.3756
2435000000.	50.8764	14.3861
2440000000.	50.8956	14.4866
2445000000.	50.8704	14.4732
2450000000.	**50.9212**	**14.4911**
2455000000.	50.9441	14.6470
2460000000.	50.9884	14.7840
2465000000.	51.0391	14.8839
2470000000.	51.0806	15.0144
2475000000.	51.0088	15.2120
2480000000.	51.0260	15.1458
2485000000.	50.9703	15.2534
2490000000.	50.9464	15.1570
2495000000.	50.8748	15.0729
2500000000.	50.8848	15.0390

The conductivity (σ) can be given as:

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

where $f = target\ f * 10^6$
$\varepsilon_0 = 8.854 * 10^{-12}$

9.2 5 GHZ BODY LIQUID PARAMETER CHECK RESULTS

Room Ambient Temperature = 25°C; Relative humidity = 33% Measured by: Sunny Shih

Simulating Liquid f (MHz)	Parameters			Measured	Target	Deviation (%)	Limit (%)
5200	e'	46.1595	Relative Permittivity (ϵ_r):	46.1595	49.0	-5.80	± 10
	e"	18.5169	Conductivity (σ):	5.35662	5.30	1.07	± 5
5500	e'	46.0483	Relative Permittivity (ϵ_r):	46.0483	48.6	-5.25	± 10
	e"	18.9631	Conductivity (σ):	5.80218	5.65	2.69	± 5
5800	e'	45.0161	Relative Permittivity (ϵ_r):	45.0161	48.2	-6.61	± 10
	e"	19.0545	Conductivity (σ):	6.14815	6.00	2.47	± 5

Liquid Check
Ambient temperature: 25 deg. C; Liquid temperature: 24 deg. C
February 19, 2009 08:39 AM

Frequency	e'	e"
4600000000.	47.4086	17.6679
4650000000.	47.5367	17.9107
4700000000.	47.3351	17.7396
4750000000.	47.2377	18.1267
4800000000.	47.3697	17.9757
4850000000.	46.9982	18.0821
4900000000.	47.1472	18.3025
4950000000.	46.8093	18.1065
5000000000.	46.6590	18.4445
5050000000.	46.6179	18.2985
5100000000.	46.3007	18.4702
5150000000.	46.4275	18.3940
5200000000.	**46.1595**	**18.5169**
5250000000.	46.3365	18.5984
5300000000.	45.9323	18.6557
5350000000.	46.0959	18.8989
5400000000.	45.9693	18.7748
5450000000.	45.8011	19.0125
5500000000.	**46.0483**	**18.9631**
5550000000.	45.7695	19.1100
5600000000.	45.9095	19.2157
5650000000.	45.6546	18.9717
5700000000.	45.6284	19.1709
5750000000.	45.5126	18.9730
5800000000.	**45.0161**	**19.0545**
5850000000.	44.9743	19.0808
5900000000.	44.7006	19.0444
5950000000.	44.3064	19.0539
6000000000.	44.2710	19.3810

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 5GHZ SYSTEM PERFORMANCE CHECK RESULTS

System Validation Dipole: D5GHzV2 SN 1003

The dipole input power (forward power): 250 mW

Results

Date: February 19, 2009

Ambient Temperature = 25 °C; Relative humidity = 40% Measured by: Sunny Shih

Body Simulating Liquid			Normalized to 1 W		Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)					
5200	24	15	1g	76.3	75.6	0.93	± 10
			10g	22	21.3	3.29	± 10

Body Simulating Liquid			Normalized to 1 W		Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)					
5500	24	15	1g	85	81.1	4.81	± 10
			10g	24.3	22.7	7.05	± 10

Body Simulating Liquid			Normalized to 1 W		Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)					
5800	24	15	1g	77.6	71.9	7.93	± 10
			10g	21.9	20.1	8.96	± 10

10.2 2.4 GHZ SYSTEM PERFORMANCE CHECK RESULTS

System Validation Dipole: D2450V2 SN: 748

The dipole input power (forward power): 250 mW

Results

Date: February 20, 2009

Ambient Temperature = 25°C; Relative humidity = 40% Measured by: Sunny Shih

Body Simulating Liquid			SAR (mW/g)	Normalized	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)					
2450	24	15	1g	48.7	51.2	-4.88	± 10
			10g	22.3	23.7	-5.91	± 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.

Mode	Channel	f (MHz)	Antenna	Measured SAR 1g (mW/g)	Limit
802.11b	6	2437 (M)	TX 1	0.017	1.6
802.11n 20 MHz	6	2437 (M)	TX 1	0.007	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 SAR Plot & Data for 2.4 GHz Band

Date/Time: 2/20/2009 11:42:01 AM

Test Laboratory: Compliance Certification Services

2.4 GHz Band

DUT: Lenovo ideapad ; Type: U130; Serial: n/a

Communication System: 802.11bg; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.96 mho/m; ε_r = 50.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

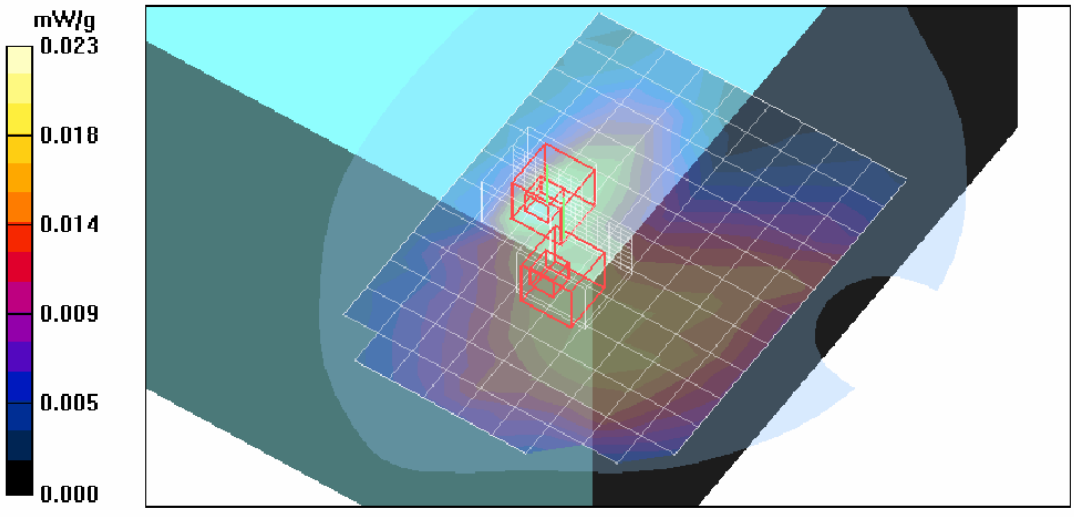
Room Ambient Temperature: 23.0 deg. C; Liquid Temperature: 22.0 deg. C

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 Sn427; Calibrated: 10/20/2008
- 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 TX 1 M-ch/Area Scan (10x13x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.023 mW/g

802.11b TX 1 M-ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 2.33 V/m; Power Drift = 0.101 dB
Peak SAR (extrapolated) = 0.031 W/kg
SAR(1 g) = 0.017 mW/g; SAR(10 g) = 0.00991 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.021 mW/g

802.11b TX 1 M-ch/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 2.33 V/m; Power Drift = 0.101 dB
Peak SAR (extrapolated) = 0.035 W/kg
SAR(1 g) = 0.014 mW/g; SAR(10 g) = 0.00783 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.018 mW/g



The SAR Plot & Data for 2.4 GHz Band

Date/Time: 2/20/2009 12:27:00 PM

Test Laboratory: Compliance Certification Services

2.4 GHz Band

DUT: Lenovo ideapad ; Type: U130; Serial: n/a

Communication System: 802.11bg; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.96 mho/m; ε_r = 50.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

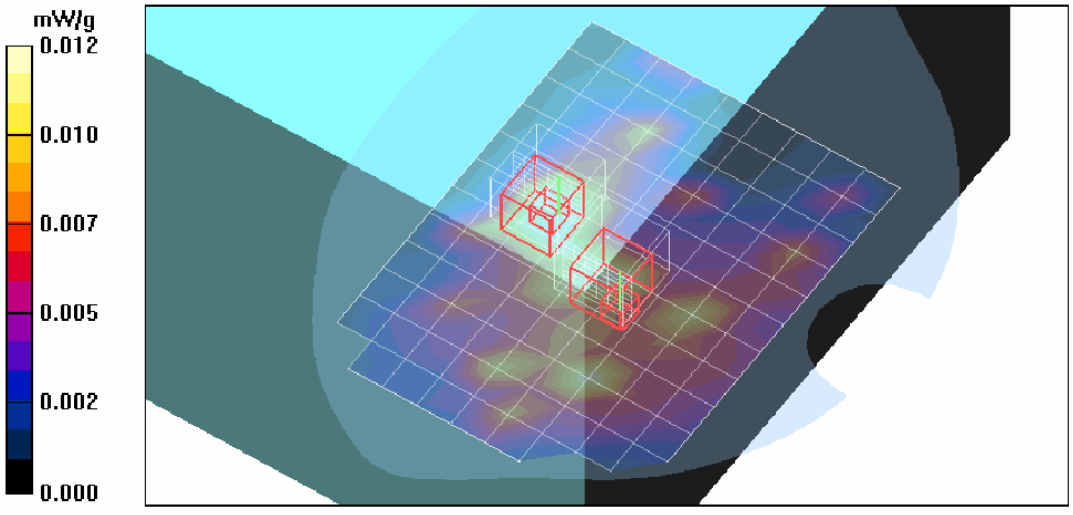
Room Ambient Temperature: 23.0 deg. C; Liquid Temperature: 22.0 deg. C

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 Sn427; Calibrated: 10/20/2008
- Phantom: SAM 2 (Twin); Type: SAM 2; Serial: 1050
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

TX 1 M-ch HT20/Area Scan (10x13x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.012 mW/g

TX 1 M-ch HT20/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 1.46 V/m; Power Drift = 0.381 dB
Peak SAR (extrapolated) = 0.015 W/kg
SAR(1 g) = 0.00731 mW/g; SAR(10 g) = 0.00387 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.009 mW/g

TX 1 M-ch HT20/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 1.46 V/m; Power Drift = 0.381 dB
Peak SAR (extrapolated) = 0.020 W/kg
SAR(1 g) = 0.00636 mW/g; SAR(10 g) = 0.00358 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.008 mW/g



12.2 SAR TEST RESULT FOR 5 GHZ BANDS

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

Mode	Channel	f (MHz)	Antenna	Measured SAR 1g (mW/g)	Limit
802.11a	40	5200 (M)	TX 1	0.016	1.6
802.11a	56	5280 (M)	TX 1	0.015	1.6
802.11a	100	5500 (L)	TX 1	0.020	1.6
802.11a	157	5785 (M)	TX 1	0.020	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: 2/19/2009 2:05:20 PM

Test Laboratory: Compliance Certification Services

5 GHz Band

DUT: Lenovo ideapad ; Type: U130;Serial: n/a

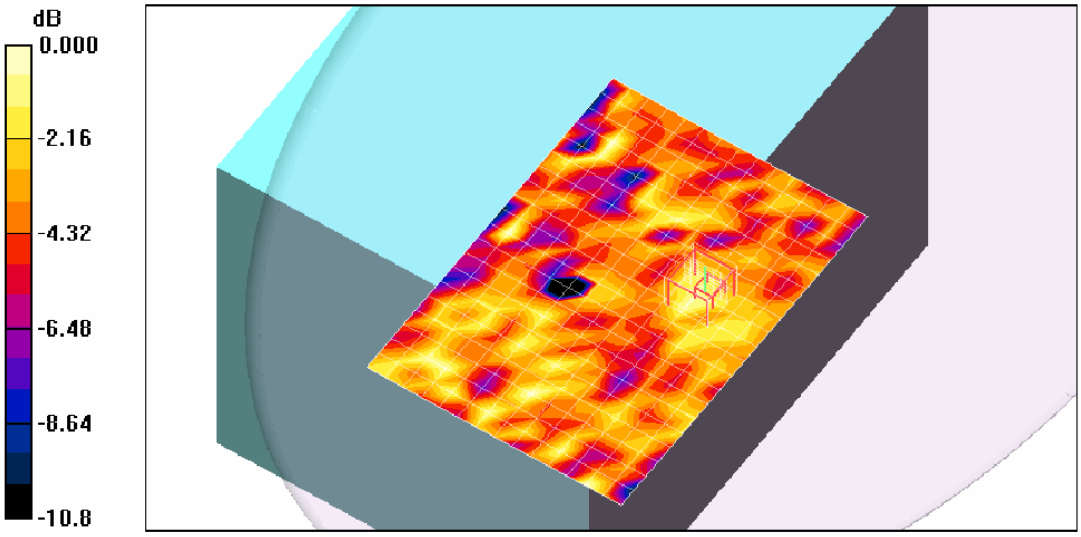
Communication System: 802.11abgn;Frequency: 5200 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5200 MHz; σ = 5.36 mho/m; ε_r = 46.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

Room AmbientTemperature: 23.0deg. C; Liquid Temperature: 22.0 deg. C

DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and witha 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 Sn427; Calibrated: 10/20/2008
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

802.11a, CH 40/Area Scan (15x21x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.031 mW/g

802.11a, CH 40/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 1.73 V/m; Power Drift = -1.65 dB
Peak SAR (extrapolated) = 0.042 W/kg
SAR(1 g) = 0.016 mW/g; SAR(10 g) = 0.014 mW/g
Maximum value of SAR (measured) = 0.030 mW/g



0 dB = 0.030mW/g

The Highest SAR Plot & Data for 5.3 GHz Band

Date/Time: 2/19/2009 1:18:30 PM

Test Laboratory: Compliance Certification Services

5 GHz Band

DUT: Lenovo ideapad ; Type: U130;Serial: n/a

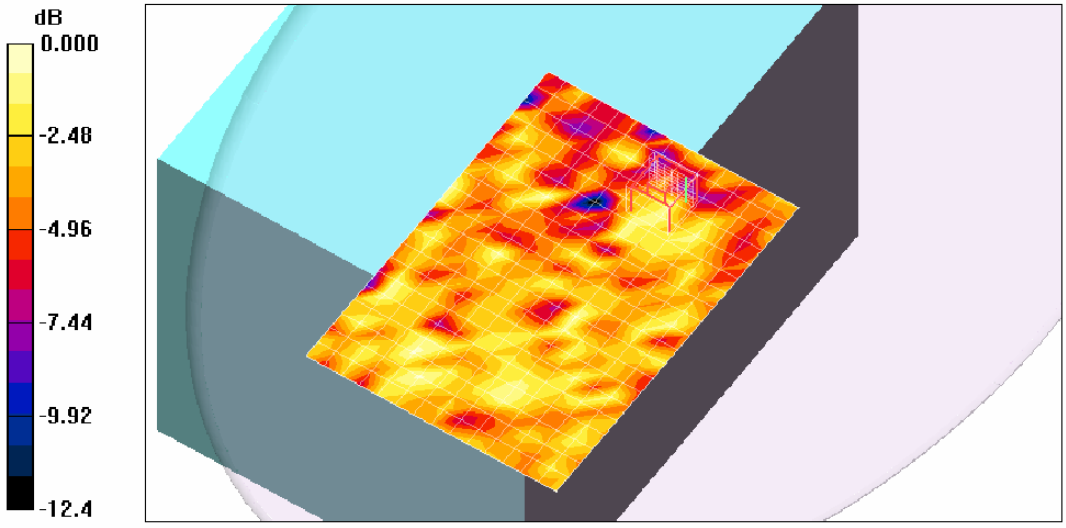
Communication System: 802.11abgn;Frequency: 5280 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5280 MHz; σ = 5.47 mho/m; ε_r = 46.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

Room AmbientTemperature: 23.0deg. C; Liquid Temperature: 22.0 deg. C

DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and witha 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 Sn427; Calibrated: 10/20/2008
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

802.11a, CH 56/Area Scan (15x21x1): Measurement grid: dx=10mm, dy=10mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.032 mW/g

802.11a, CH 56/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 1.73 V/m; Power Drift = 0.276 dB
Peak SAR (extrapolated) = 0.062 W/kg
SAR(1 g) = 0.015 mW/g; SAR(10 g) = 0.012 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.036 mW/g



0 dB = 0.036mW/g

The Highest SAR Plot & Data for 5.5 GHz Band

Date/Time: 2/19/2009 11:43:25 AM

Test Laboratory: Compliance Certification Services

5 GHz Band

DUT: Lenovo ideapad ; Type: U130;Serial: n/a

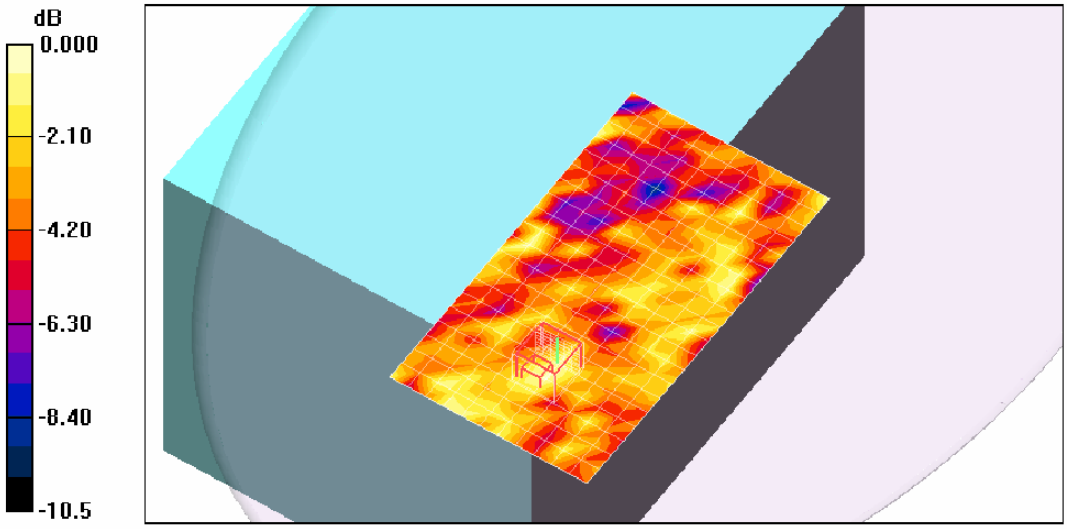
Communication System: 802.11abgn;Frequency: 5500 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5500 MHz; σ = 5.8 mho/m; ε_r = 46; ρ = 1000 kg/m^3
Phantom section: Flat Section

Room AmbientTemperature: 23.0deg. C; Liquid Temperature: 22.0 deg. C

DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and witha 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 Sn427; Calibrated: 10/20/2008
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

802.11a, CH 100/Area Scan (12x21x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.030 mW/g

802.11a, CH 100/Zoom Scan 2 (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 1.24 V/m; Power Drift = 4.38 dB
Peak SAR (extrapolated) = 0.097 W/kg
SAR(1 g) = 0.020 mW/g; SAR(10 g) = 0.016 mW/g
Maximum value of SAR (measured) = 0.033 mW/g



0 dB = 0.033mW/g

The Highest SAR Plot & Data for 5.8 GHz Band

Date/Time: 2/19/2009 2:51:13 PM

Test Laboratory: Compliance Certification Services

5 GHz Band

DUT: Lenovo ideapad ; Type: U130;Serial: n/a

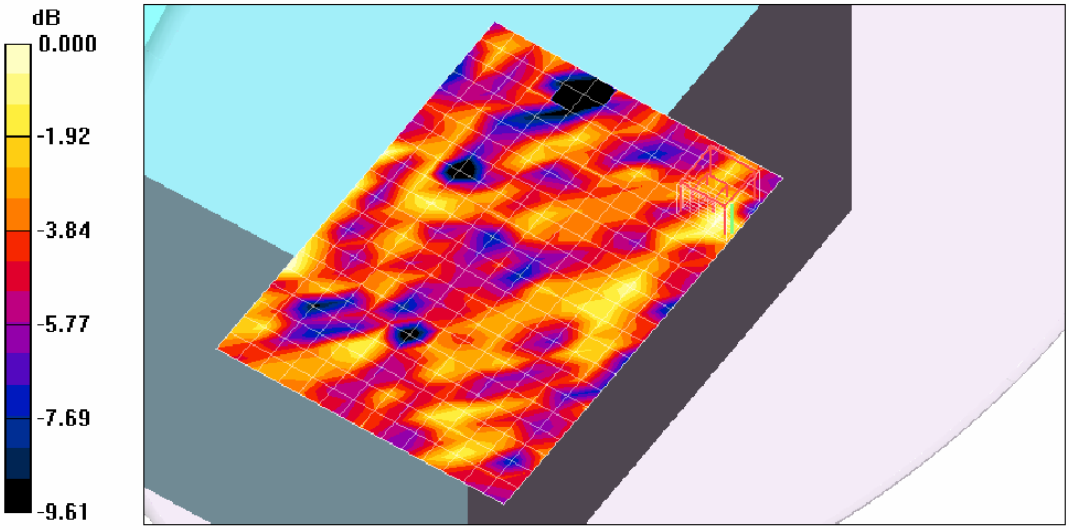
Communication System: 802.11abgn;Frequency: 5785 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5785 MHz; σ = 6.12 mho/m; ε_r = 45.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

Room AmbientTemperature: 23.0deg. C; Liquid Temperature: 22.0 deg. C

DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and withа 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 Sn427; Calibrated: 10/20/2008
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

802.11a, CH 157/Area Scan (15x21x1): Measurement grid: dx=10mm, dy=10mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.047 mW/g

802.11a, CH 157/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 1.31 V/m; Power Drift = 1.69 dB
Peak SAR (extrapolated) = 0.081 W/kg
SAR(1 g) = 0.020 mW/g; SAR(10 g) = 0.015 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.043 mW/g



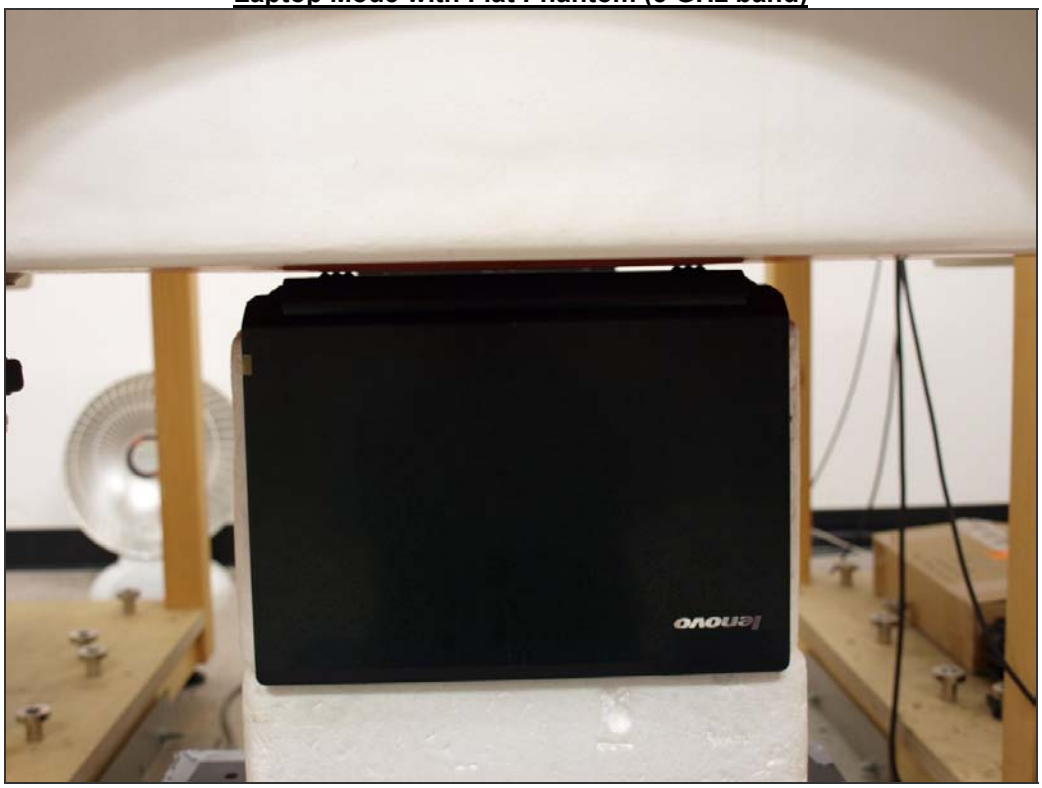
0 dB = 0.043mW/g

13 ATTACHMENTS

No.	Contents	No. Of Pages
1	System Performance Check Plots	8
2	Certificate of E-Field Probe - EX3DV3SN3531	10
3	Certificate of System Validation Dipole - D2450V2 SN:748	6
4	Certificate of System Validation Dipole - D5GHzV2 SN:1003	15

14 SETUP PHOTOS

Laptop Mode with Flat Phantom (5 GHz band)



Laptop Mode with SAM phantom (2.4 GHz band)

END OF REPORT