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

SAR EVALUATION REPORT

FOR

INTEL WI-FI LINK 5300 SERIES

FCC MODEL: 533AN_MMW
IC MODEL: 533ANMU

FCC ID: PD9533ANMU
IC: 1000M-533ANMU

REPORT NUMBER: 09U12413-1A

ISSUE DATE: MARCH 9, 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 27, 2009	Initial issue	--
A	March 9, 2009	Removed WNC antenna information	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 5300 Series
FCC ID: **FCC MODEL:**	PD9533ANMU 533AN_MMW
IC #: **IC MODEL:**	1000M-533ANMU 533ANMU
DEVICE CATEGORY:	Portable
EXPOSURE CATEGORY:	General Population/Uncontrolled Exposure
DATE TESTED:	February 25 – 27, 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	0.023 0.161	1.6
15.407 / RSS-102	5150 – 5250 5250 – 5350 5470 – 5725	0.160 0.166 0.183	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, KDB 447498_RF Exposure Requirements and Procedures for mobile and portable devices and IC RSS 102 Issue 2.

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		

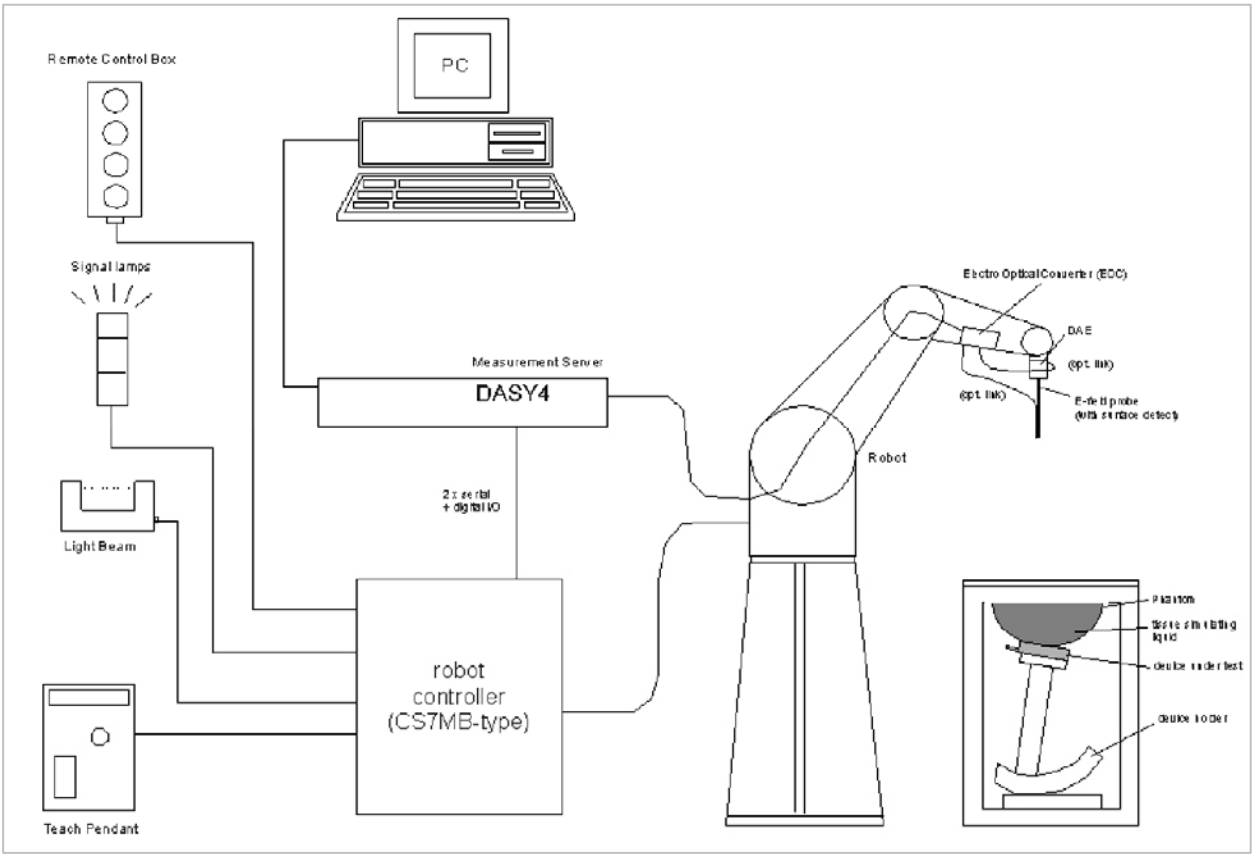
7 DEVICE UNDER TEST (DUT) DESCRIPTION

Intel Wi-Fi Link 5100 Series (Tested inside of LENOVO ideapad Y550)	
Normal operation:	Laptop Mode
Antenna Tested:	The radio has been tested with the highest antenna.

No	Vender	Antenna	Part number
1	Yageo	TX3	CAN4313813012501B

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

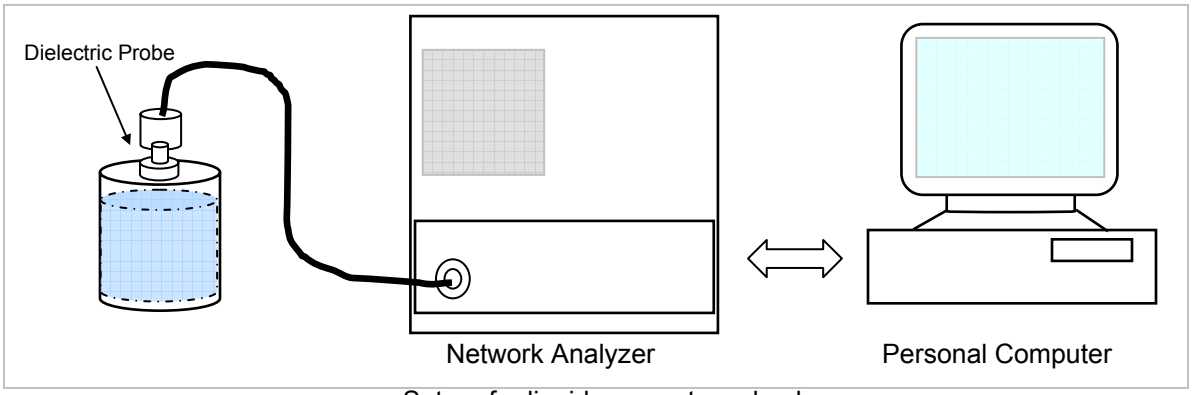
The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

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 LIQUID PARAMETER CHECK RESULT

Simulating Liquid Dielectric Parameter Check Result @ Muscle 2450 MHz

Room Ambient Temperature = 25°C; Relative humidity = 35% Measured by: Sunny Shih

Simulating Liquid		Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Depth (cm)							
2450	15	e'	54.2381	Relative Permittivity (ϵ_r):	54.2381	52.7	2.92	? 5
		e"	14.7290	Conductivity (σ):	2.00751	1.95	2.95	? 5

Liquid Check
Ambient temperature: 25 deg. C; Liquid temperature: 24 deg. C
February 25, 2009 10:46 AM

Frequency	e'	e"
2400000000.	54.3095	14.7523
2405000000.	54.4389	14.7173
2410000000.	54.2876	14.6576
2415000000.	54.3543	14.6616
2420000000.	54.2538	14.6545
2425000000.	54.1894	14.6350
2430000000.	54.2686	14.6744
2435000000.	54.1786	14.6863
2440000000.	54.2121	14.7917
2445000000.	54.1380	14.7704
2450000000.	**54.2381**	**14.7290**
2455000000.	54.1164	14.8785
2460000000.	54.2176	14.9079
2465000000.	54.0782	14.8969
2470000000.	54.1434	14.9841
2475000000.	54.1244	15.1071
2480000000.	54.0519	15.0206
2485000000.	54.0743	15.0870
2490000000.	54.0770	15.0955
2495000000.	53.9794	15.0897
2500000000.	54.0952	15.1522

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 LIQUID PARAMETER CHECK RESULT

Simulating Liquid Parameter Check Result @ Muscle 5GHz

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

Simulating Liquid f (MHz)	Parameters			Measured	Target	Deviation (%)	Limit (%)
5200	e'	45.9531	Relative Permittivity (ε_r):	45.9531	49.0	-6.22	? 10
	e"	18.7744	Conductivity (σ):	5.43111	5.30	2.47	? 5
5500	e'	45.9075	Relative Permittivity (ε_r):	45.9075	48.6	-5.54	? 10
	e"	19.2372	Conductivity (σ):	5.88604	5.65	4.18	? 5
5800	e'	44.8682	Relative Permittivity (ε_r):	44.8682	48.2	-6.91	? 10
	e"	19.3522	Conductivity (σ):	6.24421	6.00	4.07	? 5

Liquid Check
Ambient temperature: 25 deg. C; Liquid temperature: 24 deg. C
February 26, 2009 11:53 AM

Frequency	e'	e"
4600000000.	47.3698	18.0796
4650000000.	47.4214	18.3541
4700000000.	47.2560	18.1485
4750000000.	47.0309	18.5116
4800000000.	47.2818	18.3957
4850000000.	46.8107	18.4570
4900000000.	47.0234	18.7142
4950000000.	46.6454	18.5399
5000000000.	46.4623	18.8402
5050000000.	46.4207	18.6982
5100000000.	45.9658	18.8463
5150000000.	46.2093	18.6849
5200000000.	**45.9531**	**18.7744**
5250000000.	46.1288	18.9155
5300000000.	45.8743	18.9980
5350000000.	45.8649	19.2256
5400000000.	45.8335	19.1085
5450000000.	45.6241	19.3642
5500000000.	**45.9075**	**19.2372**
5550000000.	45.6703	19.5036
5600000000.	45.7957	19.4670
5650000000.	45.4488	19.3978
5700000000.	45.4902	19.4529
5750000000.	45.3694	19.3632
5800000000.	**44.8682**	**19.3522**
5850000000.	44.6816	19.4135
5900000000.	44.5117	19.3722
5950000000.	44.0389	19.2774
6000000000.	44.0761	19.6161

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

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 finite-difference time-domain FDTD method (feed point-impedance set to 50 ohms) and the mechanical dimensions of the D5GHzV2 dipole (manufactured by SPEAG).

f (MHz)	Head Tissue		Body Tissue		
	SAR_{1g}	SAR_{10g}	SAR_{1g}	SAR_{10g}	SAR_{Peak}
5000	72.9	20.7	68.1	19.2	260.3
5100	74.6	21.1	78.8	19.6	272.3
5200	76.5	21.6	71.8	20.1	284.7
5500	83.3	23.4	79.1	22.0	326.3
5800	78.0	21.9	74.1	20.5	324.7

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

10.1 2.4 GHZ SYSTEM PERFORMANCE CHECK RESULT

System Validation Dipole: D2450V2 SN: 748

The dipole input power (forward power): 250 mW

Results

Date: February 25, 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. (蚓)	Depth (cm)					
2450	24	15	1g	49.8	51.2	-2.73	? 10
			10g	23.1	23.7	-2.53	? 10

10.2 5 GHZ SYSTEM PERFORMANCE CHECK RESULT

System Validation Dipole: D5GHzV2 SN 1003

Date: February 26, 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. (蚓)	Depth (cm)					
5200	24	15	1g	79.7	74.7	6.69	? 10
			10g	22.7	21.1	7.58	? 10
5500	24	15	1g	80.3	80.1	0.25	? 10
			10g	22.4	22.5	-0.44	? 10
5800	24	15	1g	75.2	70.8	6.21	? 10
			10g	21.2	19.8	7.07	? 10

11 OUTPUT POWER VERIFICATION

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

The client provided a special driver and program, CRTU v5.0.69.0, which enables 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:

802.11gn mode (2.4 GHz band)

Mode	Channel	f (MHz)	Antenna			Duty cycle (%)	Gain power setting
			A (TX1)	B (TX2)	C (TX3)		
802.11b	6	2437			16.78	100	22
802.11n 40 MHz	6	2437	16.55		16.81	97	26.5 / 26

Note: A, B and C denote TX1, TX2 and TX3 Antenna

802.11an mode (5 GHz band)

Mode	Channel	f (MHz)	Antenna			Duty cycle (%)	Gain power setting
			A (TX1)	B (TX2)	C (TX3)		
5.2 GHz Band							
802.11a	40	5200			16.6	99	27
802.11n 20 MHz	40	5200	16.7		16.7	98	29.5/28
5.3 GHz Band							
802.11a	56	5280			16.7	99	26
802.11n 20 MHz	56	5280	16.7		16.7	98	26.5/26.5
5.5 GHz Band							
802.11a	120	5600			16.8	99	23.5
802.11n 20 MHz	120	5600	16.7		16.7	98	25/24.5
5.8 GHz Band							
802.11a	157	5785			16.8	99	25
802.11n 40 MHz	159	5795	16.7		16.7	97	25/25

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	TX3	0.023	1.6
802.11n 40 MHz	6	2437	TX1 + TX3	0.019	1.6

Notes:

a. The modes with highest output power channel were chosen for the testing.

b. 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: 2/25/2009 2:41:32 PM

Test Laboratory: Compliance Certification Services

2.4 GHz Band

DUT: Lenovo; Type: Y550; Serial: NKIWB10064

Communication System: 802.11bg; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 2 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

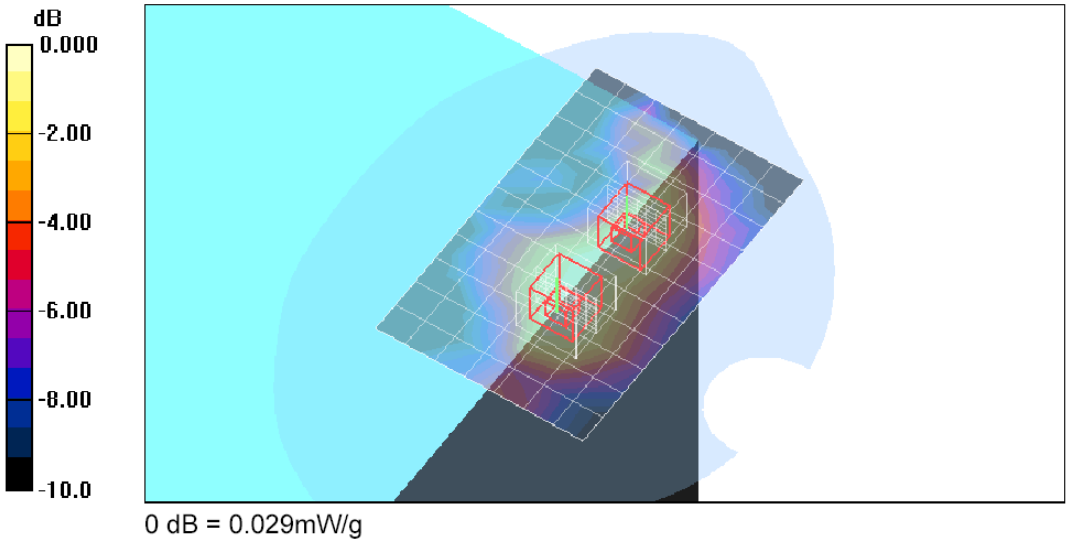
Room Ambient Temperature: 25.0 deg. C; Liquid Temperature: 24.0 deg. C

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 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 M-ch C (TX3) Ant/Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.028 mW/g

802.11b M-ch C (TX3) Ant/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 3.85 V/m; Power Drift = 0.049 dB
Peak SAR (extrapolated) = 0.042 W/kg
SAR(1 g) = 0.022 mW/g; SAR(10 g) = 0.013 mW/g
Info: Interpolated medium parameters used for SAR evaluation.

802.11b M-ch C (TX3) Ant/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 3.85 V/m; Power Drift = 0.049 dB
Peak SAR (extrapolated) = 0.042 W/kg
SAR(1 g) = 0.023 mW/g; SAR(10 g) = 0.013 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.029 mW/g



0 dB = 0.029mW/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
5.2 GHz Band					
802.11a	40	5200	TX3	0.129	1.6
802.11n 20 MHz	40	5200	TX1 + TX3	**0.160**	1.6
5.3 GHz Band					
802.11a	56	5280	TX3	**0.166**	1.6
802.11n 20 MHz	56	5280	TX1 + TX3	0.108	1.6
5.5 GHz Band					
802.11a	120	5600	TX3	**0.183**	1.6
802.11n 20 MHz	120	5600	TX1 + TX3	0.158	1.6
5.8 GHz Band					
802.11a	157	5785	TX3	**0.161**	1.6
802.11n 40 MHz	159	5795	TX1 + TX3	0.125	1.6

Notes:

a. The modes with highest output power channel were chosen for the testing.

b. 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: 2/26/2009 4:16:20 PM

Test Laboratory: Compliance Certification Services

5.2 GHz Band

DUT: Lenovo; Type: Y550; Serial: NKIWB10064

Communication System: 802.11abgn; Frequency: 5200 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5200 MHz; σ = 5.43 mho/m; ε_r = 46; ρ = 1000 kg/m^3
Phantom section: Flat Section

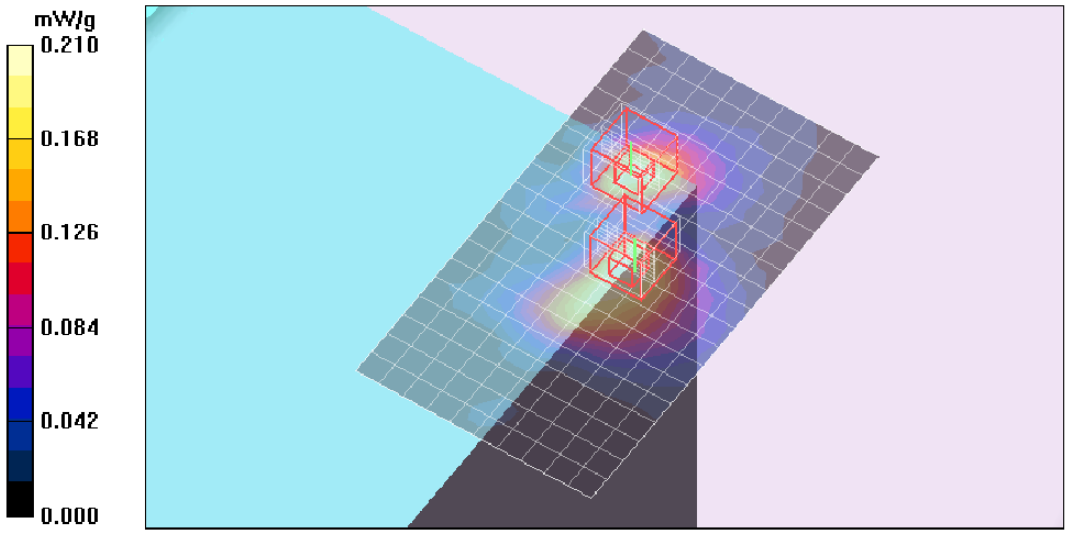
Room Ambient Temperature: 25.0 deg. C; Liquid Temperature: 24.0 deg. C

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 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

802.11n 20 MHz, CH 40/Area Scan (11x19x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.210 mW/g

802.11n 20 MHz, CH 40/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 1.66 V/m; Power Drift = 0.847 dB
Peak SAR (extrapolated) = 0.482 W/kg
SAR(1 g) = 0.160 mW/g; SAR(10 g) = 0.064 mW/g
Maximum value of SAR (measured) = 0.245 mW/g

802.11n 20 MHz, CH 40/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 1.66 V/m; Power Drift = 0.847 dB
Peak SAR (extrapolated) = 0.464 W/kg
SAR(1 g) = 0.150 mW/g; SAR(10 g) = 0.060 mW/g
Maximum value of SAR (measured) = 0.237 mW/g



The Highest SAR Plot & Data for 5.3 GHz Band

Date/Time: 2/26/2009 5:57:19 PM

Test Laboratory: Compliance Certification Services

5.3 GHz Band

DUT: Lenovo; Type: Y550; Serial: NKIWB10064

Communication System: 802.11abgn; Frequency: 5280 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5280 MHz; σ = 5.57 mho/m; ε_r = 46; ρ = 1000 kg/m^3
Phantom section: Flat Section

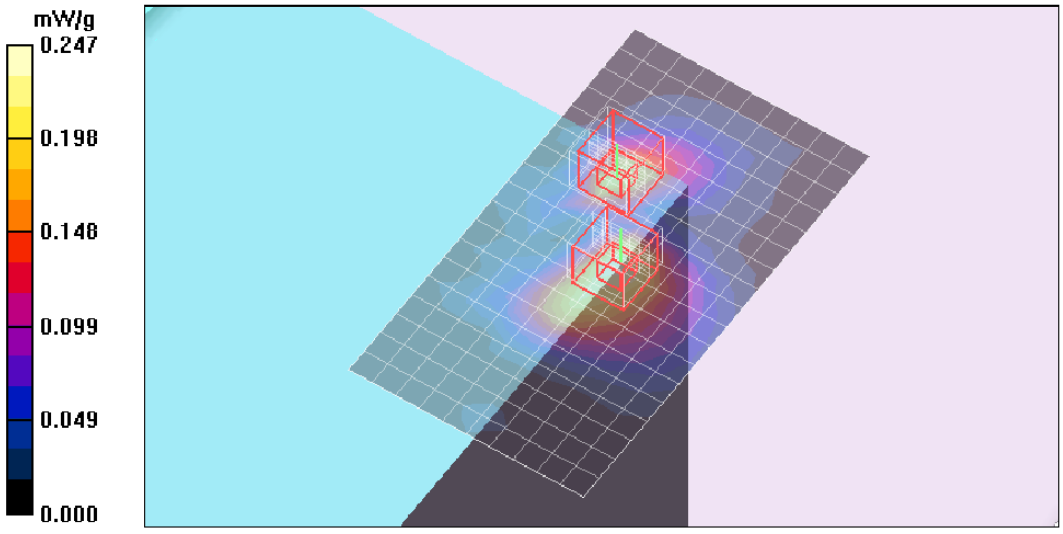
Room Ambient Temperature: 25.0 deg. C; Liquid Temperature: 24.0 deg. C

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 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 (11x19x1): Measurement grid: dx=10mm, dy=10mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.247 mW/g

802.11a, CH 56/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 2.05 V/m; Power Drift = -0.703 dB
Peak SAR (extrapolated) = 0.511 W/kg
SAR(1 g) = 0.166 mW/g; SAR(10 g) = 0.071 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.253 mW/g

802.11a, CH 56/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 2.05 V/m; Power Drift = -0.703 dB
Peak SAR (extrapolated) = 0.443 W/kg
SAR(1 g) = 0.135 mW/g; SAR(10 g) = 0.054 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.213 mW/g



The Highest SAR Plot & Data for 5.5 GHz Band

Date/Time: 2/26/2009 8:47:18 PM

Test Laboratory: Compliance Certification Services

5.5 GHz Band

DUT: Lenovo; Type: Y550; Serial: NKIWB10064

Communication System: 802.11abgn; Frequency: 5600 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5600 MHz; σ = 6.06 mho/m; ε_r = 45.8; ρ = 1000 kg/m^3
Phantom section: Flat Section

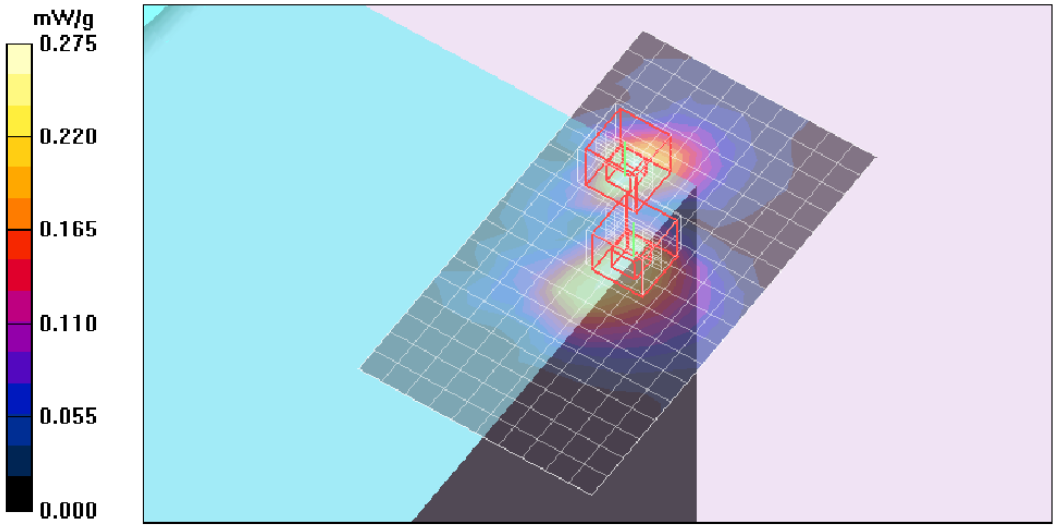
Room Ambient Temperature: 25.0 deg. C; Liquid Temperature: 24.0 deg. C

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(3.5, 3.5, 3.5); 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 120/Area Scan (11x19x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.275 mW/g

802.11a, CH 120/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 1.71 V/m; Power Drift = 1.14 dB
Peak SAR (extrapolated) = 0.640 W/kg
SAR(1 g) = 0.183 mW/g; SAR(10 g) = 0.074 mW/g
Maximum value of SAR (measured) = 0.293 mW/g

802.11a, CH 120/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 1.71 V/m; Power Drift = 1.14 dB
Peak SAR (extrapolated) = 0.574 W/kg
SAR(1 g) = 0.172 mW/g; SAR(10 g) = 0.069 mW/g
Maximum value of SAR (measured) = 0.276 mW/g



The Highest SAR Plot & Data for 5.8 GHz Band

Date/Time: 2/27/2009 09:00:08 AM

Test Laboratory: Compliance Certification Services

5.8 GHz Band

DUT: Lenovo; Type: Y550; Serial: NKIWB10064

Communication System: 802.11abgn; Frequency: 5785 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5785 MHz; σ = 6.23 mho/m; ε_r = 45; ρ = 1000 kg/m^3
Phantom section: Flat Section

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

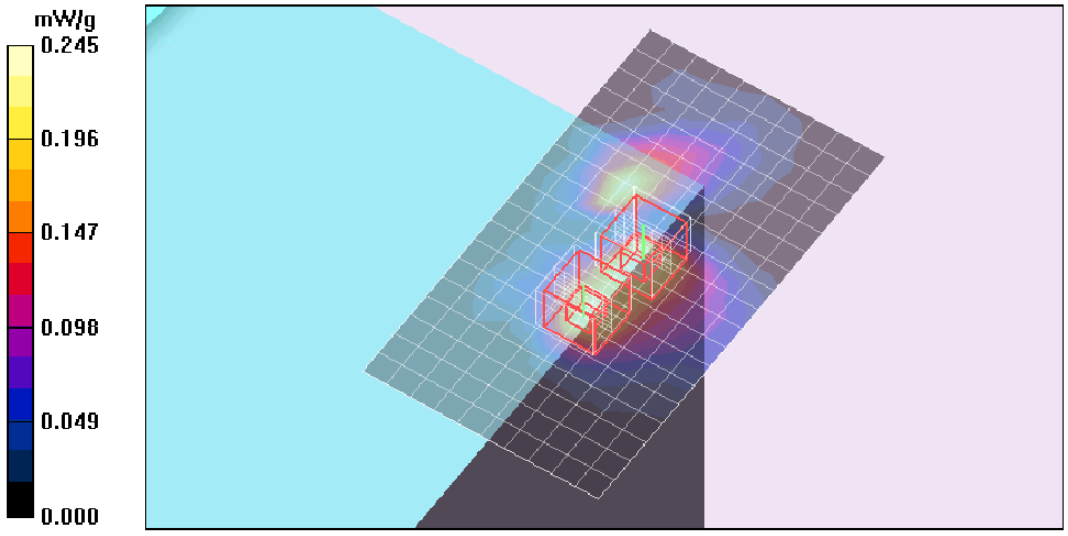
DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV3 - SN3531; ConvF(3.7, 3.7, 3.7); Calibrated: 4/23/2008
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 10/20/2008
- 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 (11x19x1): Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.245 mW/g

802.11a, CH 157/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 2.24 V/m; Power Drift = -1.99 dB
Peak SAR (extrapolated) = 0.535 W/kg
SAR(1 g) = 0.161 mW/g; SAR(10 g) = 0.061 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.265 mW/g

802.11a, CH 157/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 2.24 V/m; Power Drift = -1.99 dB
Peak SAR (extrapolated) = 0.518 W/kg
SAR(1 g) = 0.144 mW/g; SAR(10 g) = 0.058 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.236 mW/g



13 ATTACHMENTS

No.	Contents	No. Of Pages
1-1	System Performance Check Plots for 2.4 GHz	2
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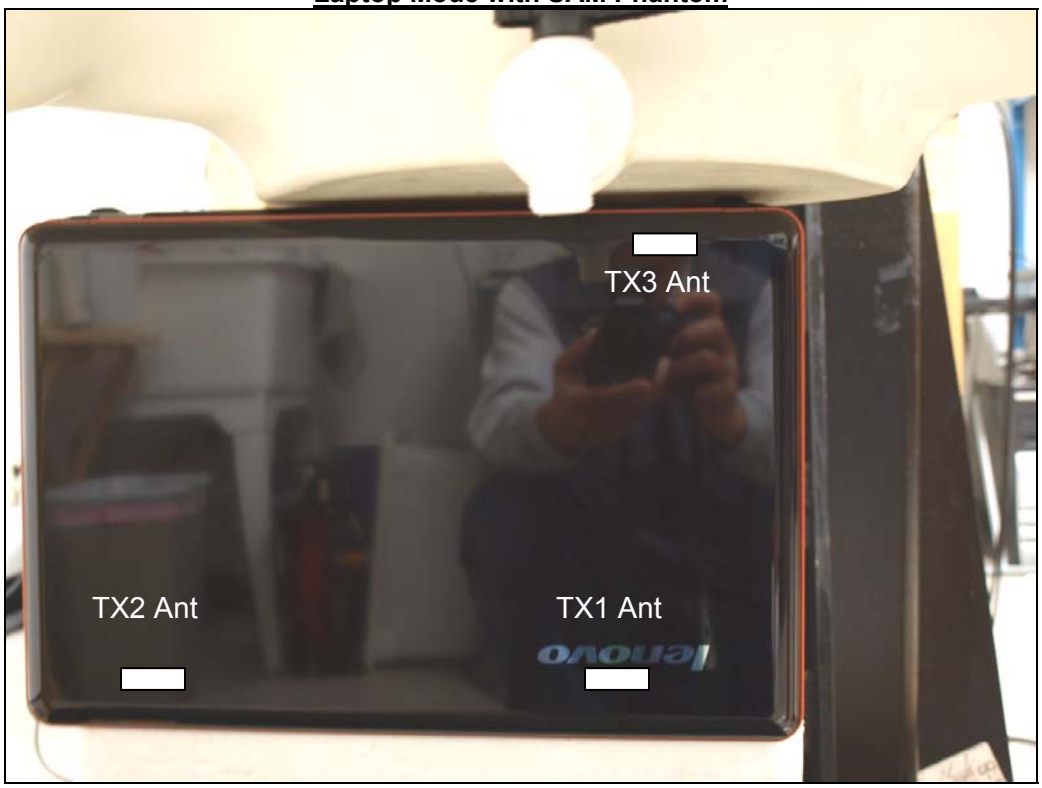
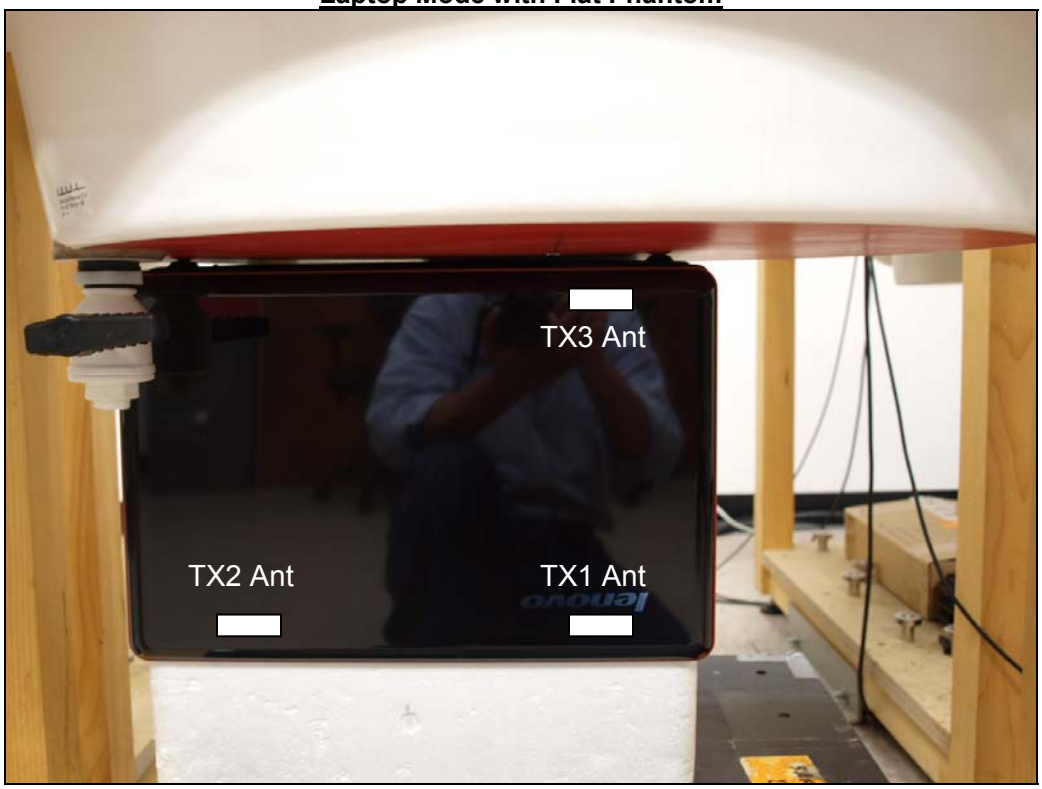
2-1	2.4 GHz Test Plots	3
2-2	5 GHz Test Plots	9
3	Certificate of E-Field Probe - EX3DV3SN3531	10
4	Certificate of System Validation Dipole - D2450V2 SN:748	6
5	Certificate of System Validation Dipole - D5GHzV2 SN:1003	15

14 SETUP PHOTOS

Laptop Mode with SAM Phantom



Laptop Mode with Flat Phantom



END OF REPORT