FCC OET BULLETIN 65 SUPPLEMENT C
IC RSS-102 ISSUE 3

SAR EVALUATION REPORT
(WLAN PORTION)

For

Intel® Centrino® Advanced-N + WiMAX 6250
(Tested inside of Lenovo ThinkPad Mini 10 Series Netbook, Model: 3507XXXX)
NETBOOK Model No.:
3506XXXX, 3507XXXX, 3508XXXX and 2876XXXX (X=0-9, a-z, any symbol or blank)

MODEL: 622ANXHMW

FCC ID: PD9622ANXHU

REPORT NUMBER: 09U12989-2

ISSUE DATE: January 16, 2010

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.	Issue Date	Revisions	Revised By
--	January 16, 2010	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® Centrino® Advanced-N + WiMAX 6250 (Tested inside of Lenovo ThinkPad Mini 10 Series Netbook, Model: 3507XXXX)
MODEL NUMBER:	622ANXHMW
DEVICE CATEGORY:	Portable
EXPOSURE CATEGORY:	General Population/Uncontrolled Exposure
DATE TESTED:	January 13 - 14, 2010

THE HIGHEST SAR VALUES:

FCC / IC Rule Parts	Frequency Range [MHz]	1-g SAR (mW/g)	Limit (mW/g)
15.247 / RSS-102	2400 – 2483.5	0.026	1.6
	5725 – 5850	0.060	
15.407 / RSS-102	5150 – 5250	0.029	
	5250 – 5350	0.055	
	5470 – 5725	0.014	

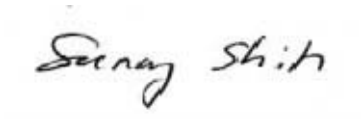
APPLICABLE STANDARDS AND TEST PROCEDURES:

STANDARD	TEST RESULT
FCC OET BULLETIN 65 SUPPLEMENT C and the following Test Procedures: o KDB 248227 SAR measurement procedures for 802.11a/b/g transmitters o KDB 447498 D01 Mobile Portable RF Exposure v04, suppl. to KDB 616217 D03	Pass
RSS-102 ISSUE 3	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. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

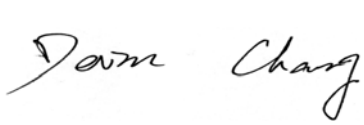
Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For CCS By:



SUNNY SHIH
ENGINEERING SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Tested By:



DEVIN CHANG
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

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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 802.11abg Transmitters, KDB 447498 D01 Mobile Portable RF Exposure v04, supplemental to KDB 616217 D03 and IC RSS 102 Issue 3.

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.

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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.

Name of Equipment	Manufacturer	Type/Model	Serial No.	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	22	2010
Signal Generator	Agilent	8753ES-6	MY40001647	11	22	2010
E-Field Probe	SPEAG	EX3DV4	3686	3	23	1010
Data Acquisition Electronics	SPEAG	DAE3 V1	500	9	15	2010
System Validation Dipole	SPEAG	D900V2	108	1	21	2010
System Validation Dipole	SPEAG	D1800V2	294	1	29	2010
System Validation Dipole	SPEAG	D1900V2	5d043	1	29	2010
System Validation Dipole	SPEAG	D2450V2	748	4	14	2010
System Validation Dipole	SPEAG	D5GHzV2	1075	10	3	2011
ESG Vector Signal Generator	Agilent	E4438C	US44271090	9	17	2010
Amplifier	Mini-Circuits	ZVE-8G	90606	N/A		
Amplifier	Mini-Circuits	ZHL-42W	D072701-5	N/A		
Simulating Liquid	SPAEG	M2450	N/A	Within 24 hrs of first test		
Simulating Liquid	SPAEG	M5800	N/A	Within 24 hrs of first test		

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4.2. 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
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

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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

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5. EQUIPMENT UNDER TEST

Intel WiFi Link 5100 Series (820.11abgn MIMO with HT20 and HT40) Tested inside of Lenovo ThinkPad Mini 10 model: 3507XXXX NETBOOK Model No.: 3506XXXX, 3507XXXX, 3508XXXX and 2876XXXX (X=0-9, a-z, any symbol or blank)	
Normal operation:	Lap-held only SAR test with display open at 90° to the keyboard
Antenna tested:	Quanta, Main Antenna, Part Number: QADCFL3_WL_M Auxiliary Antenna, Part Number: QADCFL3_WL_A
Antenna-to-user separation distance:	19.3 cm from Tx (Main)-to-user
Antenna-to-antenna separation distance:	5 mm from WWAN main-to-WLAN main antenna 14 mm from WWAN aux-to-WLAN aux antenna.
Require SAR evaluation for Simultaneous transmission?	WLAN – Bluetooth: The antenna separation distance between the WLAN and Bluetooth is greater than 20 cm, so both are not considered as co-located transmitters each other. WLAN – WWAN: WLAN and WWAN do not transmit simultaneously. Both transmitter devices are controlled by proprietary software ”Access Connection” which manages handover of transmission between WWAN and WLAN devices within 11 seconds.
Power supply:	Power supplied through laptop computer (host device)

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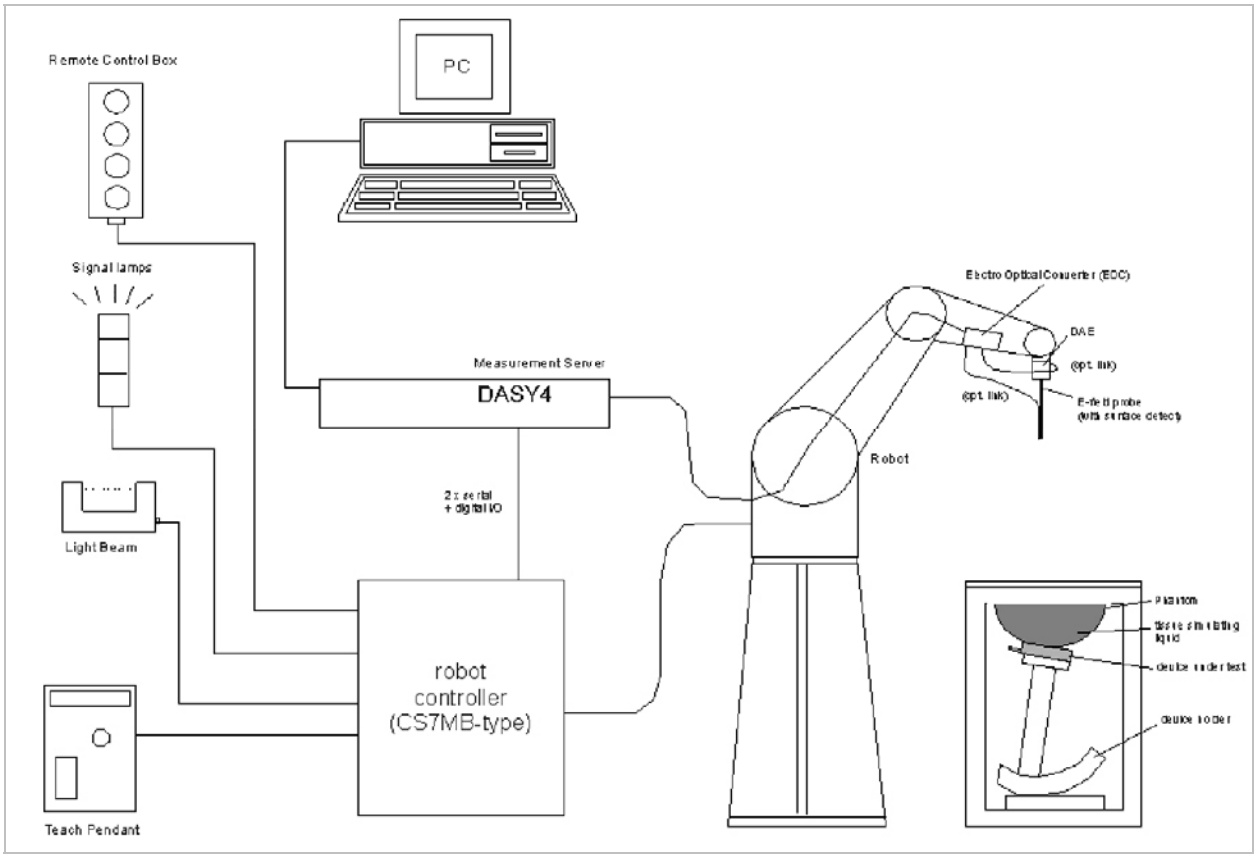
6. SYSTEM SPECIFICATIONS



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.

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7. 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

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8. 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.

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	0.8
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.9	55.2	0.97
900	41.5	0.97	55	1.05
915	41.5	0.98	55	1.06
1450	40.5	1.2	54	1.3
1610	40.3	1.29	53.8	1.4
1800 – 2000	40	1.4	53.3	1.52
2450	39.2	1.8	52.7	1.95
3000	38.5	2.4	52	2.73
5800	35.3	5.27	48.2	6

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

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8.1. LIQUID CHECK RESULTS FOR 2450 MHZ

Simulating Liquid Dielectric Parameters for Body 2450 MHz

Room Ambient Temperature = 24°C; Relative humidity = 40% Measured by: Devin Chang

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
2450	e'	52.555	Relative Permittivity (ϵ_r):	52.555	52.7	-0.27	± 5
	e"	14.72	Conductivity (σ):	2.006	1.95	2.85	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C
January 10, 2010 03:50 PM

Frequency	e'	e"
2400000000.	53.7561	15.0760
2405000000.	53.7867	14.9962
2410000000.	53.7665	14.9198
2415000000.	53.7109	14.8466
2420000000.	53.6049	14.7770
2425000000.	53.4632	14.7159
2430000000.	53.2854	14.6835
2435000000.	53.0882	14.6657
2440000000.	52.8899	14.6581
2445000000.	52.7228	14.6650
2450000000.	**52.5552**	**14.7154**
2455000000.	52.4201	14.7934
2460000000.	52.3273	14.8860
2465000000.	52.2910	14.9982
2470000000.	52.2840	15.1268
2475000000.	52.2951	15.2632
2480000000.	52.3572	15.3996
2485000000.	52.4504	15.5117
2490000000.	52.5605	15.6060
2495000000.	52.6970	15.6659
2500000000.	52.8431	15.6814

The conductivity (σ) can be given as:

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

where f = target f * 10^6

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

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8.2. LIQUID CHECK RESULTS FOR 5 GHZ

Simulating Liquid Dielectric Parameters for Muscle 5 GHz

Room Ambient Temperature = 25°C; Relative humidity = 38% Measured by: Devin Chang

f (MHz)	Muscle Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
5200	e'	45.5338	Relative Permittivity (ε_r):	45.5338	49.0	-7.07	± 10
	e"	18.6721	Conductivity (σ):	5.40151	5.30	1.92	± 5
5500	e'	45.8455	Relative Permittivity (ε_r):	45.8455	48.6	-5.67	± 10
	e"	18.2747	Conductivity (σ):	5.59155	5.65	-1.03	± 5
5800	e'	44.5953	Relative Permittivity (ε_r):	44.5953	48.2	-7.48	± 10
	e"	19.2572	Conductivity (σ):	6.21356	6.00	3.56	± 5

Liquid temperature: 24 deg. C
January 13, 2010 07:32 PM

Frequency	e'	e"
4900000000.	47.5218	17.7577
4950000000.	45.9327	17.9226
5000000000.	47.1936	18.3950
5050000000.	45.8671	17.7235
5100000000.	46.3048	18.7155
5150000000.	46.2843	17.8030
5200000000.	**45.5338**	**18.6721**
5250000000.	46.6361	18.2945
5300000000.	45.2179	18.4648
5350000000.	46.3614	18.8666
5400000000.	45.3717	18.1994
5450000000.	45.6430	19.1451
5500000000.	**45.8455**	**18.2747**
5550000000.	44.9437	19.0637
5600000000.	45.8063	18.7918
5650000000.	44.6127	18.8129
5700000000.	45.5174	19.2277
5750000000.	45.0038	18.7363
5800000000.	**44.5953**	**19.2572**
5850000000.	45.0350	19.1091
5900000000.	44.2991	19.0419
5950000000.	44.3451	19.1739
6000000000.	44.3192	19.4314

The conductivity (σ) can be given as:

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

where f = target f * 10^6

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

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Simulating Liquid Dielectric Parameters for Muscle 5 GHz

Room Ambient Temperature = 25°C; Relative humidity = 38% Measured by: Devin Chang

f (MHz)	Muscle Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
5200	e'	45.5559	Relative Permittivity (ϵ_r):	45.5559	49.0	-7.03	± 10
	e"	18.6879	Conductivity (σ):	5.40608	5.30	2.00	± 5
5500	e'	45.8586	Relative Permittivity (ϵ_r):	45.8586	48.6	-5.64	± 10
	e"	18.2727	Conductivity (σ):	5.59093	5.65	-1.05	± 5
5800	e'	44.6159	Relative Permittivity (ϵ_r):	44.6159	48.2	-7.44	± 10
	e"	19.2758	Conductivity (σ):	6.21956	6.00	3.66	± 5

Liquid temperature: 24 deg. C
January 14, 2010 04:24 PM

Frequency	e'	e"
4850000000.	46.5787	18.2218
4900000000.	47.5468	17.7611
4950000000.	45.9251	17.9018
5000000000.	47.2291	18.3811
5050000000.	45.9066	17.7159
5100000000.	46.3430	18.7091
5150000000.	46.3143	17.8008
5200000000.	**45.5559**	**18.6879**
5250000000.	46.6637	18.2954
5300000000.	45.2500	18.4633
5350000000.	46.4024	18.8679
5400000000.	45.4017	18.2074
5450000000.	45.6579	19.1459
5500000000.	**45.8586**	**18.2727**
5550000000.	44.9756	19.0655
5600000000.	45.8308	18.8001
5650000000.	44.6343	18.8105
5700000000.	45.5392	19.2269
5750000000.	45.0232	18.7351
5800000000.	**44.6159**	**19.2758**
5850000000.	45.0576	19.1168
5900000000.	44.3199	19.0452
5950000000.	44.3703	19.1778
6000000000.	44.3501	19.4275

The conductivity (σ) can be given as:

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

where f = target f * 10^6

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

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9. SYSTEM 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 Head or Body simulating liquid of the following parameters.
- The DASY4 system with an Isotropic E-Field Probe EX3DV3 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 fine cube was chosen for cube
- 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 2.5 mm
- The dipole input power (forward power) was 100 mW±3%.
- The results are normalized to 1 W input power.

Reference SAR Values for HEAD & BODY-tissue from calibration certificate of SPEAG. Certificate no: D2450V2-748_Apr08

f (MHz)	Head Tissue		Body Tissue	
	SAR_{1g}	SAR_{10g}	SAR_{1g}	SAR_{10g}
2450			50.8	23.7

Reference SAR Values for BODY-tissue from calibration certificate of SPEAG.
Certificate no: D5GHzV2-1075_Sep09

f (MHz)	Head Tissue		Body Tissue	
	SAR_{1g}	SAR_{10g}	SAR_{1g}	SAR_{10g}
5200			78.7	21.9
5500			85.0	23.4
5800			72.9	20.0

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9.1. SYSTEM CHECK RESULTS FOR D2450V2

System Validation Dipole: D2450V2 SN: 748

Date: January 13, 2010

Ambient Temperature = 24°C; Relative humidity = 40% Measured by: Devin Chang

Medium	CW Signal (MHz)	Forward Pwr (mW)	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
Body	2450	100	1g SAR:	49.6	50.8	-2.36	±10
			10g SAR:	23	23.7	-2.95	

9.2. SYSTEM CHECK RESULTS FOR D5GHzV2

System Validation Dipole: D5GHzV2 SN 1075

Date: January 13, 2010

Ambient Temperature = 25°C; Relative humidity = 40% Measured by: Devin Chang

Medium	CW Signal (MHz)	Forward Pwr (mW)	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
Body	5200	100	1g SAR:	79.0	78.7	0.38	±10
			10g SAR:	23.0	21.9	5.02	
	5500	100	1g SAR:	83.7	85.0	-1.53	±10
			10g SAR:	24.1	23.4	2.99	
	5800	100	1g SAR:	73.6	72.9	0.96	±10
			10g SAR:	21.2	20.0	6.00	

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10. 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 v5.15.36.0, 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 (2.4 GHz band)

Mode	Channel	Chain	f (MHz)	Average Output Power (dBm)	Duty Cycle (%)
802.11b	6	A	2437	16.80	100
802.11b	6	B	2437	16.80	100

802.11a (5.2 GHz band)

Mode	Channel	chain	f (MHz)	Average Output Power (dBm)	Duty Cycle (%)
802.11a	40	A	5200	16.80	99
802.11a	48	B	5240	16.70	99

802.11a (5.3 GHz band)

Mode	Channel	chain	f (MHz)	Average Output Power (dBm)	Duty Cycle (%)
802.11n 20MHz	52	A	5260	16.80	99
802.11n 40MHz	62	B	5310	16.80	99

802.11a (5.5 GHz band)

Mode	Channel	Chain	f (MHz)	Average Output Power (dBm)	Duty Cycle (%)
802.11a	120	A	5600	16.80	99
802.11a	140	B	5700	16.80	99

802.11a (5.8 GHz band)

Mode	Channel	Chain	f (MHz)	Average Output Power (dBm)	Duty Cycle (%)
802.11a	157	A	5785	16.80	99
802.11a	165	B	5825	16.70	99

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11. SUMMARY OF TEST RESULTS

If the SAR measured at the middle channel for each test configuration is at least 3.0 dB (0.8 mW/g) lower than the SAR limit (1.6 mW/g), testing at the high and low channels is optional for such test configuration(s).

11.1. SAR TEST RESULT FOR THE 2.4 GHZ BAND

Mode	Channel	f (MHz)	Antenna	Results (mW/g)	
				1g-SAR	10g-SAR
802.11b	6	2437 (M)	Main (A)	**0.026**	0.017
	6	2437 (M)	Aux (B)	0.013	0.009

11.2. SAR TEST RESULT FOR THE 5 GHZ BANDS

Mode	Channel	f (MHz)	Antenna	Results (mW/g)	
				1g-SAR	10g-SAR
802.11a	40	5200 (M)	Main (A)	**0.029**	0.0077
	56	5280 (M)	Main (A)	**0.055**	0.0130
	120	5600 (M)	Main (A)	0.009	0.0015
	157	5785 (M)	Main (A)	**0.060**	0.0230
802.11a	40	5200 (M)	Aux (B)	0.012	0.0045
	56	5280 (M)	Aux (B)	0.011	0.0041
	120	5600 (M)	Aux (B)	**0.014**	0.0052
	157	5785 (M)	Aux (B)	0.012	0.0046

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12. WORST-CASE SAR TEST PLOTS

WORST-CASE SAR PLOT for 2.4 GHz Band

Date/Time: 1/13/2010 3:04:47 PM

Test Laboratory: Compliance Certification Services

Laptop - Lapheld

DUT: Intel; Type: NA; Serial: NA

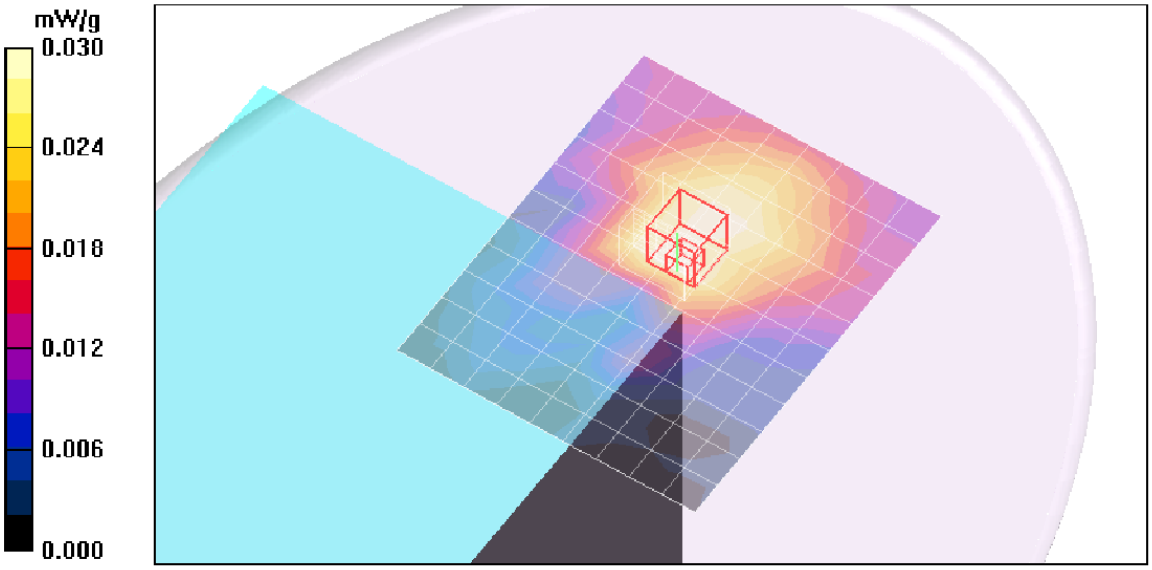
Communication System: 802.11b; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 2 mho/m; ε_r = 54; ρ = 1000 kg/m^3
Phantom section: Flat Section

Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 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: EX3DV4 - SN3686; ConvF(6.48, 6.48, 6.48); Calibrated: 3/23/2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn500; Calibrated: 9/15/2009
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

802.11b_Main Ant M_Ch 6/Area Scan (10x12x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.030 mW/g

802.11b_Main Ant M_Ch 6/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 3.92 V/m; Power Drift = -0.162 dB
Peak SAR (extrapolated) = 0.045 W/kg
SAR(1 g) = 0.026 mW/g; SAR(10 g) = 0.017 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.031 mW/g



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WORST-CASE SAR PLOT for 5.2 GHz Band

Date/Time: 1/14/2010 10:31:05 AM

Test Laboratory: Compliance Certification Services

Laptop - Lapheld Main Antenna 5.2 GHz Band

DUT: Intel; Type: NA; Serial: NA

Communication System: 802.11abgn; Frequency: 5200 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5200 MHz; σ = 5.4 mho/m; ε_r = 45.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

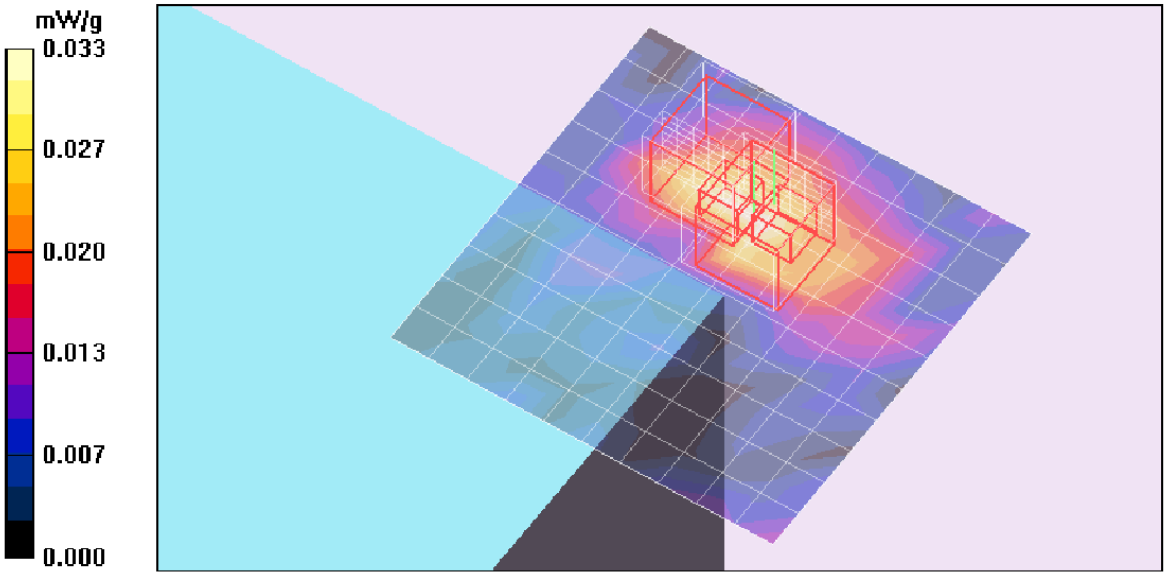
Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 deg. C

DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(4.08, 4.08, 4.08); Calibrated: 3/23/2009
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn500; Calibrated: 9/15/2009
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

802.11a_Ant M_Ch 40/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.033 mW/g

802.11a_Ant M_Ch 40/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 2.74 V/m; Power Drift = -0.426 dB
Peak SAR (extrapolated) = 0.074 W/kg
SAR(1 g) = 0.021 mW/g; SAR(10 g) = 0.00831 mW/g
Maximum value of SAR (measured) = 0.036 mW/g

802.11a_Ant M_Ch 40/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 2.74 V/m; Power Drift = -0.426 dB
Peak SAR (extrapolated) = 0.270 W/kg
SAR(1 g) = 0.029 mW/g; SAR(10 g) = 0.00768 mW/g
Maximum value of SAR (measured) = 0.034 mW/g



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WORST-CASE SAR PLOT for 5.3 GHz Band

Date/Time: 1/14/2010 11:37:58 AM

Test Laboratory: Compliance Certification Services

Laptop - Lapheld Main Antenna 5.3 GHz Band

DUT: Intel; Type: NA; Serial: NA

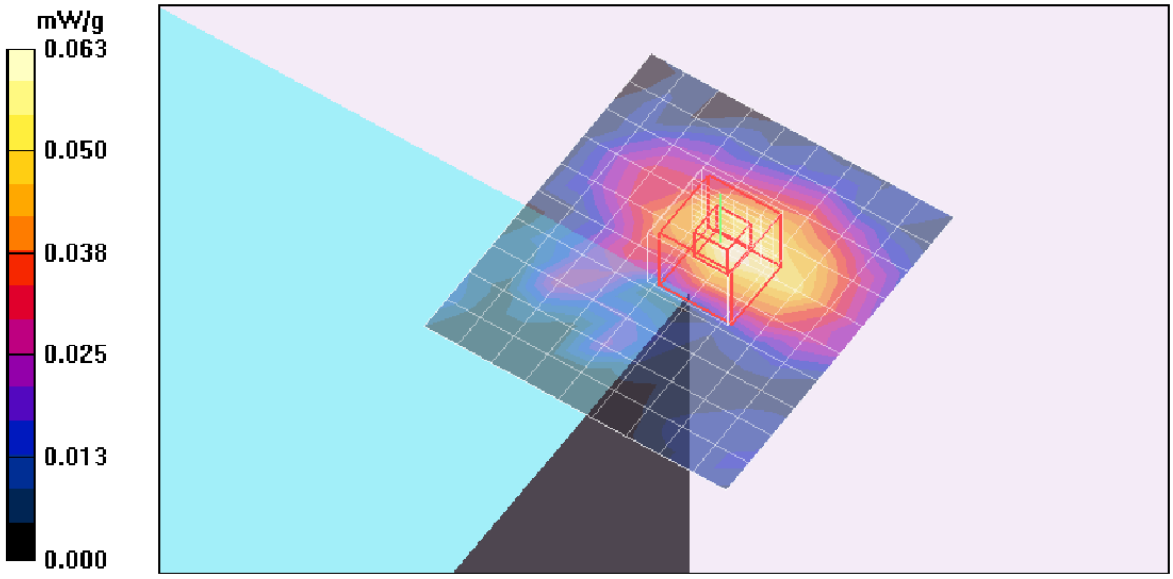
Communication System: 802.11abgn; Frequency: 5280 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5280 MHz; σ = 5.4 mho/m; ε_r = 45.8; ρ = 1000 kg/m^3
Phantom section: Flat Section

Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 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: EX3DV4 - SN3686; ConvF(3.81, 3.81, 3.81); Calibrated: 3/23/2009
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn500; Calibrated: 9/15/2009
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

802.11a_Ant M_Ch 56/Area Scan (10x11x1): Measurement grid: dx=10mm, dy=10mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.063 mW/g

802.11a_Ant M_Ch 56/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 3.49 V/m; Power Drift = 0.459 dB
Peak SAR (extrapolated) = 0.528 W/kg
SAR(1 g) = 0.055 mW/g; SAR(10 g) = 0.013 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.060 mW/g



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WORST-CASE SAR PLOT for 5.5 GHz Band

Date/Time: 1/14/2010 8:08:55 PM

Test Laboratory: Compliance Certification Services

Laptop - Lapheld Aux Antenna 5.6 GHz Band

DUT: Intel; Type: NA; Serial: NA

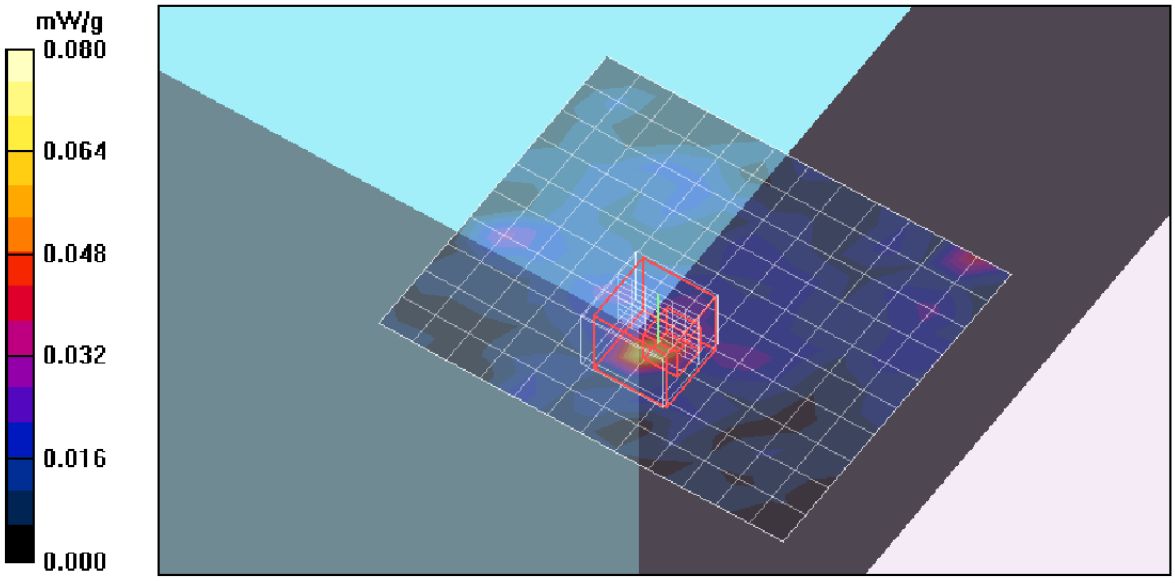
Communication System: 802.11abgn; Frequency: 5600 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5600 MHz; σ = 5.86 mho/m; ε_r = 45.8; ρ = 1000 kg/m^3
Phantom section: Flat Section

Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 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: EX3DV4 - SN3686; ConvF(3.61, 3.61, 3.61); Calibrated: 3/23/2009
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn500; Calibrated: 9/15/2009
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

802.11a_Ant Aux_Ch 120/Area Scan (13x11x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.080 mW/g

802.11a_Ant Aux_Ch 120/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 2.15 V/m; Power Drift = 0.002 dB
Peak SAR (extrapolated) = 0.114 W/kg
SAR(1 g) = 0.014 mW/g; SAR(10 g) = 0.00518 mW/g
Maximum value of SAR (measured) = 0.049 mW/g



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WORST-CASE SAR PLOT for 5.8 GHz Band

Date/Time: 1/14/2010 3:32:19 PM

Test Laboratory: Compliance Certification Services

Laptop - Lapheld Main Antenna 5.8 GHz Band

DUT: Intel; Type: NA; Serial: NA

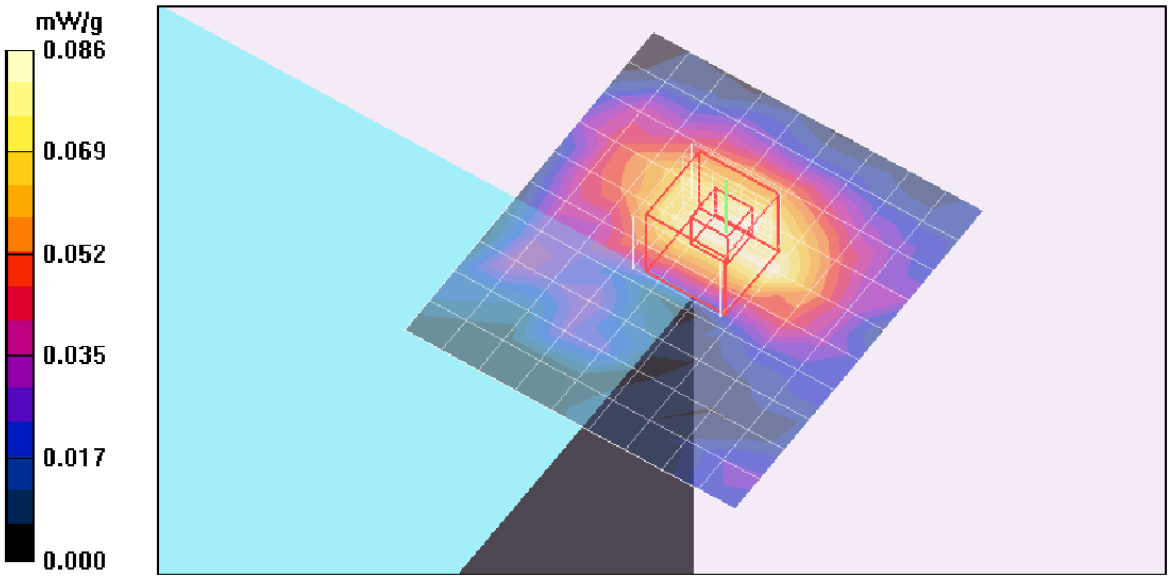
Communication System: 802.11abgn; Frequency: 5785 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5785 MHz; σ = 6.15 mho/m; ε_r = 44.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 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: EX3DV4 - SN3686; ConvF(3.84, 3.84, 3.84); Calibrated: 3/23/2009
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn500; Calibrated: 9/15/2009
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

802.11a_Ant M_Ch 157/Area Scan (10x11x1): Measurement grid: dx=10mm, dy=10mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.086 mW/g

802.11a_Ant M_Ch 157/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 4.19 V/m; Power Drift = -0.122 dB
Peak SAR (extrapolated) = 0.159 W/kg
SAR(1 g) = 0.060 mW/g; SAR(10 g) = 0.023 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.094 mW/g



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13. ATTACHMENTS

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2	SAR Test Plots	11
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4	Certificate of System Validation Dipole - D2450V2 SN:748	6
5	Certificate of System Validation Dipole – D5GHzV2 SN: 1075	9

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