



**FCC OET BULLETIN 65 SUPPLEMENT C 01-01
IEEE STD 1528:2003**

SAR EVALUATION REPORT

For

**Intel® Centrino® Advanced-N6205
(Tested inside of Panasonic Laptop, Model: CF-31)**

**MODEL NUMBER: WL11A
FCC ID: ACJ9TGWL11A**

**REPORT NUMBER: 11J13744-3
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Prepared for

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NVLAP LAB CODE 200065-0

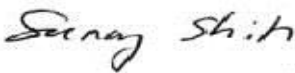
Revision History

Rev.	Issue Date	Revisions	Revised By
--	May 16, 2011	Initial Issue	--

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1. ATTESTATION OF TEST RESULTS

Company name:	PANASONIC CORPORATION OF NORTH AMERICA ONE PANASONIC WAY, 4B-8 SECAUCUS, NEW JERSEY 07094, U.S.A.		
EUT Description:	Intel® Centrino® Advanced-N6205 (Tested inside of Panasonic Laptop, Model: CF-31)		
Model number:	WL11A		
Device Category:	Portable		
Exposure category:	General Population/Uncontrolled Exposure		
Date of tested:	April 28 – May 6, 2011		
FCC / IC Rule Parts	Freq. Range [MHz]	The Highest 1g SAR	Limit (W/kg)
15.247 / RSS-102	2400 – 2483.5	0.059 W/kg	1.6
	5725 – 5850	0.000057W/kg	
15.407 / RSS-102	5150 – 5250	0.000104W/kg	
	5250 – 5350	0.019W/kg	
	5470 – 5725	0.00116W/kg	
Applicable Standards			Test Results
OET Bulletin 65 Supplement C 01-01, IEEE STD 1528: 2003			Pass
Compliance Certification Services (UL 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 UL 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 UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL 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 (NIST Handbook 150, Annex A). This report is written to support regulatory compliance of the applicable standards stated above.			
Approved & Released For UL CCS By:		Tested By:	
			
Sunny Shih Engineering Team Leader Compliance Certification Services (UL CCS)		Hung Thai RF Engineer Compliance Certification Services (UL CCS)	

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC OET Bulletin 65 Supplement C Edition 01-01, IEEE STD 1528:2003, and January 1, 2011 and the following KDB Procedures.

- 248227 SAR measurement procedures for 802.11a/b/g transmitters
- 616217 D03 SAR Supp Note and Netbook Laptop V01

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>

4. CALIBRATION AND UNCERTAINTY

4.1.MEASURING INSTRUMENT CALIBRATION

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

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
Probe Alignment Unit	SPEAG	LB (V2)	261			N/A
Oval Flat Phantom (ELI 4.0)	SPEAG	QD OVA001 B	1099			N/A
Dielectronic Probe kit	HP	85070C	N/A			N/A
ESA Series Network Analyzer	Agilent	E5071B	MY42100131	8	2	2011
E-Field Probe	SPEAG	EX3DV4	3686	1	24	2012
Data Acquisition Electronics	SPEAG	DAE4	1239	11	17	2011
Thermometer	ERTCO	639-1S	1718	7	19	2011
System Validation Dipole	SPEAG	D2450V2	706	4	19	2012
Power Meter	Giga-tronics	8651A	8651404	3	13	2012
Amplifier	Mini-Circuits	ZHL-42W	D072701-5			N/A
Simulating Liquid	SPEAG	M2450	N/A	Within 24 hrs of first test		

***Note:** Per KDB 450824 D02 requirements for dipole calibration, UL CCS has adopted two years calibration intervals. On annual basis, each measurement dipole has been evaluated and is in compliance with the following criteria:

1. There is no physical damage on the dipole
2. System validation with specific dipole is within 10% of calibrated value.
3. Return-loss is within 20% of calibrated measurement (test data on file in UL CCS)
4. Impedance is within 5Ω of calibrated measurement (test data on file in UL CCS)

4.2. MEASUREMENT UNCERTAINTY

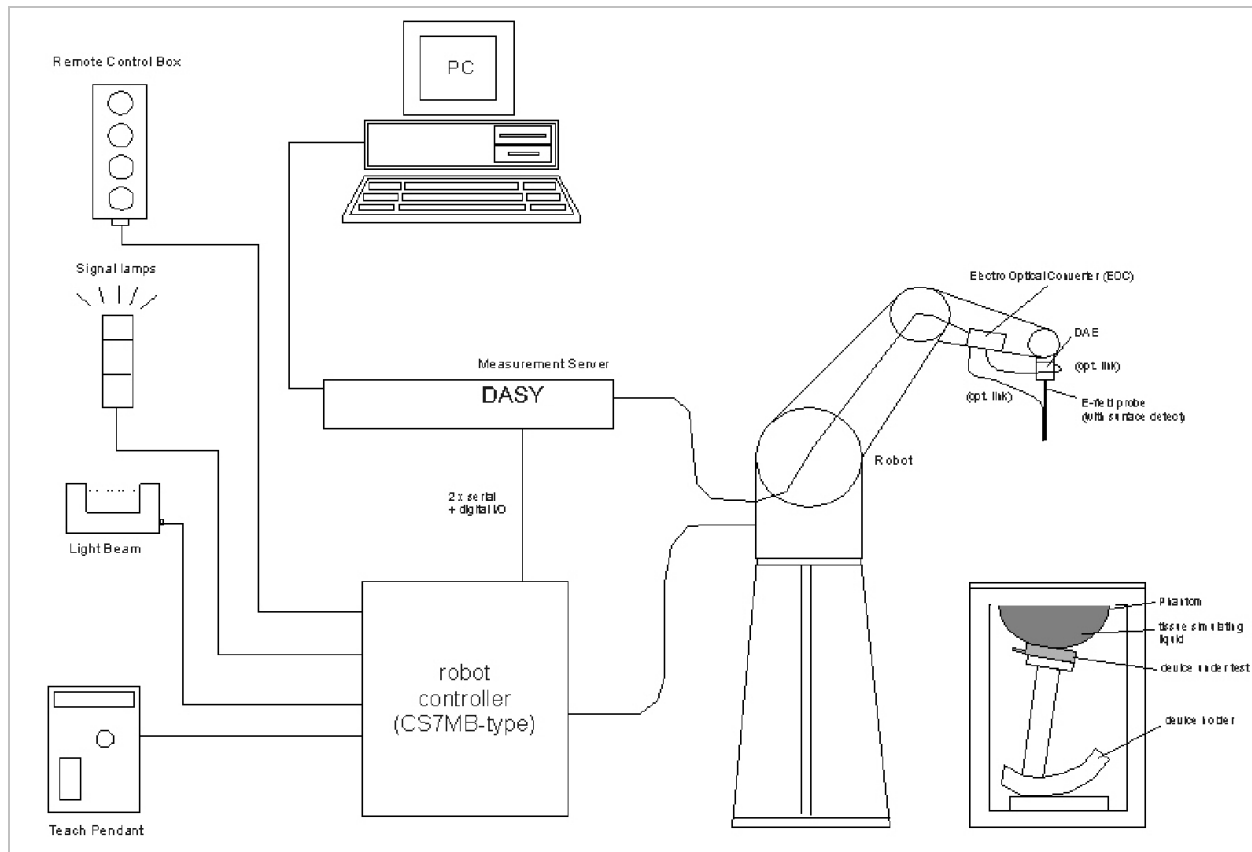
Measurement uncertainty for 300 MHz to 3 GHz averaged over 1 gram					
Component	error, %	Probe Distribution	Divisor	Sensitivity	U (X), %
Measurement System					
Probe Calibration (k=1) @ Body 2450 MHz	5.50	Normal	1	1	5.50
Axial Isotropy	1.15	Rectangular	1.732	0.7071	0.47
Hemispherical Isotropy	2.30	Rectangular	1.732	0.7071	0.94
Boundary Effect	0.90	Rectangular	1.732	1	0.52
Probe Linearity	3.45	Rectangular	1.732	1	1.99
System Detection Limits	1.00	Rectangular	1.732	1	0.58
Readout Electronics	0.30	Normal	1	1	0.30
Response Time	0.80	Rectangular	1.732	1	0.46
Integration Time	2.60	Rectangular	1.732	1	1.50
RF Ambient Conditions - Noise	3.00	Rectangular	1.732	1	1.73
RF Ambient Conditions - Reflections	3.00	Rectangular	1.732	1	1.73
Probe Positioner Mechanical Tolerance	0.40	Rectangular	1.732	1	0.23
Probe Positioning with respect to Phantom	2.90	Rectangular	1.732	1	1.67
Extrapolation, Interpolation and Integration	1.00	Rectangular	1.732	1	0.58
Test Sample Related					
Test Sample Positioning	2.90	Normal	1	1	2.90
Device Holder Uncertainty	3.60	Normal	1	1	3.60
Output Power Variation - SAR Drift	5.00	Rectangular	1.732	1	2.89
Phantom and Tissue Parameters					
Phantom Uncertainty (shape and thickness)	4.00	Rectangular	1.732	1	2.31
Liquid Conductivity - deviation from target	5.00	Rectangular	1.732	0.64	1.85
Liquid Conductivity - measurement	3.22	Normal	1	0.64	2.06
Liquid Permittivity - deviation from target	5.00	Rectangular	1.732	0.6	1.73
Liquid Permittivity - measurement	1.87	Normal	1	0.6	1.12
Combined Standard Uncertainty Uc(y) =					9.73
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				19.46	%
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				1.54	dB
3 to 6 GHz averaged over 1 gram					
Component	error, %	Distribution	Divisor	Sensitivity	U (X), %
Measurement System					
Probe Calibration (k=1) @ 5GHz	6.55	Normal	1	1	6.55
Axial Isotropy	1.15	Rectangular	1.732	0.7071	0.47
Hemispherical Isotropy	2.30	Rectangular	1.732	0.7071	0.94
Boundary Effect	0.90	Rectangular	1.732	1	0.52
Probe Linearity	3.45	Rectangular	1.732	1	1.99
System Detection Limits	1.00	Rectangular	1.732	1	0.58
Readout Electronics	1.00	Normal	1	1	1.00
Response Time	0.80	Rectangular	1.732	1	0.46
Integration Time	2.60	Rectangular	1.732	1	1.50
RF Ambient Conditions - Noise	3.00	Rectangular	1.732	1	1.73
RF Ambient Conditions - Reflections	3.00	Rectangular	1.732	1	1.73
Probe Positioner Mechanical Tolerance	0.40	Rectangular	1.732	1	0.23
Probe Positioning with respect to Phantom	2.90	Rectangular	1.732	1	1.67
Extrapolation, Interpolation and Integration	3.90	Rectangular	1.732	1	2.25
Test Sample Related					
Test Sample Positioning	1.10	Normal	1	1	1.10
Device Holder Uncertainty	3.60	Normal	1	1	3.60
Output Power Variation - SAR Drift	5.00	Rectangular	1.732	1	2.89
Phantom and Tissue Parameters					
Phantom Uncertainty (shape and thickness)	4.00	Rectangular	1.732	1	2.31
Liquid Conductivity - deviation from target	5.00	Rectangular	1.732	0.64	1.85
Liquid Conductivity - measurement	3.03	Normal	1	0.64	1.94
Liquid Permittivity - deviation from target	5.00	Rectangular	1.732	0.6	1.73
Liquid Permittivity - measurement	5.08	Normal	1	0.6	3.05
Combined Standard Uncertainty Uc(y), %:					10.64
Expanded Uncertainty U, Coverage Factor = 1.96, > 95 % Confidence =				20.86	%
Expanded Uncertainty U, Coverage Factor = 1.96, > 95 % Confidence =				1.65	dB

5. EQUIPMENT UNDER TEST

Intel® Centrino® Advanced-N6205, model: WL11A
(Tested inside of Panasonic Laptop, Model: CF-31)

Normal operation:	Laptop mode - with display open at 90° to the keyboard	
Antenna tested:	<u>Manufactured</u> Panasonic Corporation	<u>Part number</u> Main (Chain A) Ant.: DFUP1986ZA(1)-2 Aux (Chain B) Ant.: DFUP2061ZA
Antenna-to-antenna/user separation distances:	Refer to Sec. 14 for details of antenna locations and separation distances.	
Assessment for SAR evaluation for Simultaneous transmission:	WiFi can transmit simultaneously with Bluetooth. Note: Due to Bluetooth's (FCC ID: ACJ9TGWT11A) maximum output is [$< 60/f(\text{GHz})$] mW and stand-alone SAR is not required, thus WiFi and Bluetooth are not considered as co-located transmitters each other WWAN co-located RF exposure assessment will be addressed in a separate FCC application filed under WWAN application.	

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.
- DASY 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 validating the proper functioning of the system.

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

Simulating Liquids for 5 GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	78
Mineral oil	11
Emulsifiers	9
Additives and Salt	2

8. TISSUE DIELECTRIC PARAMETERS

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine if the dielectric parameters are within the tolerances of the specified target values. For frequencies in 300 MHz to just under 2 GHz, the measured conductivity and relative permittivity should be within $\pm 5\%$ of the target values. For frequencies in the range of 2–3 GHz and above the measured conductivity should be within $\pm 5\%$ of the target values. The measured relative permittivity tolerance can be relaxed to no more than $\pm 10\%$.

Reference Values of Tissue Dielectric Parameters for Head & Body Phantom

The 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

(ϵ_r = relative permittivity, σ = conductivity and $\rho = 1000 \text{ kg/m}^3$)

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

In the current guidelines and draft standards for compliance testing of mobile phones (i.e., IEEE P1528, OET 65 Supplement C), the dielectric parameters suggested for head and body tissue simulating liquid are given only at 3.0 GHz and 5.8 GHz. As an intermediate solution, dielectric parameters for the frequencies between 5 to 5.8 GHz were obtained using linear interpolation (see table below).

SPEAG has developed suitable head and body tissue simulating liquids consisting of the following ingredients: de-ionized water, salt and a special composition including mineral oil and an emulgators. Dielectric parameters of these liquids were measured using a HP 8570C Dielectric Probe Kit in conjunction with HP 8753ES Network Analyzer (30 kHz – 6G Hz). The differences with respect to the interpolated values were well within the desired $\pm 5\%$ for the whole 5 to 5.8 GHz range.

Target Frequency (MHz)	Head		Body	
	ϵ_r	σ (S/m)	ϵ_r	σ (S/m)
5000	36.2	4.45	49.3	5.07
5100	36.1	4.55	49.1	5.18
5200	36.0	4.66	49.0	5.30
5300	35.9	4.76	48.9	5.42
5400	35.8	4.86	48.7	5.53
5500	35.6	4.96	48.6	5.65
5600	35.5	5.07	48.5	5.77
5700	35.4	5.17	48.3	5.88
5800	35.3	5.27	48.2	6.00

(ϵ_r = relative permittivity, σ = conductivity and $\rho = 1000 \text{ kg/m}^3$)

8.1. TISSUE PARAMETERS CHECK RESULTS

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)
04/28/2011	Body 2450	e'	51.7121	Relative Permittivity (ε _r):	51.71	52.70	-1.87
		e''	14.7758	Conductivity (σ):	2.01	1.95	3.22

Liquid Check

Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 38%

April 28, 2011 07:58 AM

Frequency	e'	e''
2410000000.	51.9054	14.6168
2415000000.	51.8714	14.6771
2420000000.	51.8722	14.7111
2425000000.	51.8769	14.7212
2430000000.	51.8723	14.6376
2435000000.	51.8161	14.7421
2440000000.	51.7373	14.7817
2445000000.	51.7967	14.8212
2450000000.	51.7121	14.7758
2455000000.	51.7520	14.8565
2460000000.	51.7136	14.8855
2465000000.	51.7571	14.7982
2470000000.	51.7614	14.9224
2475000000.	51.6719	14.9655
2480000000.	51.6974	14.9700
2485000000.	51.5920	14.9399

The conductivity (σ) can be given as:

$$\sigma = \omega \epsilon_0 e'' = 2 \pi f \epsilon_0 e''$$

where $f = \text{target } f * 10^6$

$$\epsilon_0 = 8.854 * 10^{-12}$$

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)
05/04/2011	Body 5200	e'	50.0737	Relative Permittivity (ϵ_r):	50.07	49.02	2.15
		e''	18.2118	Conductivity (σ):	5.27	5.29	-0.55
05/04/2011	Body 5500	e'	49.4127	Relative Permittivity (ϵ_r):	49.41	48.61	1.64
		e''	18.7295	Conductivity (σ):	5.73	5.64	1.48
05/04/2011	Body 5800	e'	49.0618	Relative Permittivity (ϵ_r):	49.06	48.20	1.79
		e''	19.1120	Conductivity (σ):	6.16	6.00	2.73

Liquid Check

Ambient temperature: 25 deg. C; Liquid temperature: 24 deg. C; Relative humidity = 40%

May 04, 2011 02:22 PM

Frequency	e'	e''
4600000000.	51.1630	17.6303
4650000000.	51.0057	17.6184
4700000000.	51.1523	17.7525
4750000000.	50.8227	17.7659
4800000000.	50.7052	17.8394
4850000000.	50.6752	17.9775
4900000000.	50.6132	18.0759
4950000000.	50.4823	18.0887
5000000000.	50.4377	18.1753
5050000000.	50.2879	18.2346
5100000000.	50.2759	18.2826
5150000000.	50.1969	18.3220
5200000000.	50.0737	18.2118
5250000000.	49.9651	18.4973
5300000000.	49.9225	18.4995
5350000000.	49.7905	18.5083
5400000000.	49.8595	18.6709
5450000000.	49.7079	18.6360
5500000000.	49.4127	18.7295
5550000000.	49.5298	18.7157
5600000000.	49.4219	18.8268
5650000000.	49.3308	18.9417
5700000000.	49.1897	18.8739
5750000000.	49.0730	19.0829
5800000000.	49.0618	19.1120
5850000000.	48.9265	19.0248
5900000000.	48.8632	19.3799
5950000000.	48.8808	19.2411
6000000000.	48.6773	19.2311

The conductivity (σ) can be given as:

$$\sigma = \omega \epsilon_0 e'' = 2 \pi f \epsilon_0 e''$$

where $f = \text{target } f * 10^6$

$$\epsilon_0 = 8.854 * 10^{-12}$$

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
05/05/2011	Body 5200	e'	46.9065	Relative Permittivity (ϵ_r):	46.91	49.02	-4.31	10
		e"	18.2889	Conductivity (σ):	5.29	5.29	-0.13	5
05/05/2011	Body 5500	e'	46.2415	Relative Permittivity (ϵ_r):	46.24	48.61	-4.88	10
		e"	18.6853	Conductivity (σ):	5.71	5.64	1.24	5
05/05/2011	Body 5800	e'	45.7518	Relative Permittivity (ϵ_r):	45.75	48.20	-5.08	10
		e"	19.1684	Conductivity (σ):	6.18	6.00	3.03	5

Liquid Check

Ambient temperature: 25 deg. C; Liquid temperature: 24 deg. C; Relative humidity = 40%

May 05, 2011 04:49 PM

Frequency	e'	e''
4600000000.	48.0926	17.4217
4650000000.	48.0987	17.4576
4700000000.	47.8166	17.5088
4750000000.	47.6956	17.6223
4800000000.	47.6999	17.7910
4850000000.	47.5857	17.7910
4900000000.	47.5263	17.9216
4950000000.	47.4325	17.9188
5000000000.	47.3069	18.1016
5050000000.	47.3282	18.2171
5100000000.	47.1598	18.2426
5150000000.	46.9497	18.3778
5200000000.	46.9065	18.2889
5250000000.	46.7198	18.4364
5300000000.	46.7585	18.4467
5350000000.	46.6945	18.5358
5400000000.	46.5124	18.7331
5450000000.	46.3662	18.7100
5500000000.	46.2415	18.6853
5550000000.	46.3400	18.8277
5600000000.	46.1152	18.9795
5650000000.	46.0621	18.8982
5700000000.	45.9664	19.0198
5750000000.	45.8894	19.1138
5800000000.	45.7518	19.1684
5850000000.	45.7496	19.1187
5900000000.	45.4206	19.3556
5950000000.	45.4176	19.3449
6000000000.	45.3720	19.5114

The conductivity (σ) can be given as:

$$\sigma = \omega \epsilon_0 e'' = 2 \pi f \epsilon_0 e''$$

where $f = \text{target } f * 10^6$

$$\epsilon_0 = 8.854 * 10^{-12}$$

9. SYSTEM VERIFICATION

The system performance check is performed prior to any usage of the system in order to verify SAR system measurement accuracy. The system performance check verifies that the system operates within its specifications of $\pm 10\%$.

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 EX3DV4 SN 3749 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
- The results are normalized to 1 W input power

Reference SAR Values for HEAD & BODY-tissue from calibration certificate of SPEAG.

System validation dipole	Cal. certificate #	Cal. date	Cal. Freq. (GHz)	SAR Avg (mW/g)		
				Tissue:	Head	Body
D2450V2 SN 706	D2450V2-706_Apr10	4/19/10	2.4	1g SAR:	51.6	52.4
				10g SAR:	24.4	24.5
D5GHzV2 SN 1075	D5GHzV2-1075_Sep09	9/3/09	5.2	1g SAR:		79.0
				10g SAR:		22.0
			5.5	1g SAR:		85.4
				10g SAR:		23.5
			5.8	1g SAR:		73.2
				10g SAR:		20.1

9.1. SYSTEM CHECK RESULTS

System validation dipole	Date Tested	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
		Tissue:	Body			
D2450V2 (2.45GHz)	04/28/11	1g SAR:	55.5	52.4	5.92	±10
		10g SAR:	25.5	24.5	4.08	
D5GHzV2 (5.2GHz)	05/04/11	1g SAR:	73.8	79.0	-6.58	±10
		10g SAR:	21.3	22.0	-3.18	
D5GHzV2 (5.5GHz)	05/04/11	1g SAR:	80.0	85.4	-6.32	±10
		10g SAR:	22.7	23.5	-3.40	
D5GHzV2 (5.8GHz)	05/04/11	1g SAR:	74.7	73.2	2.05	±10
		10g SAR:	21.3	20.1	5.97	
D5GHzV2 (5.2GHz)	05/05/11	1g SAR:	82.9	79.0	4.94	±10
		10g SAR:	23.6	22.0	7.27	
D5GHzV2 (5.5GHz)	05/05/11	1g SAR:	87.5	85.4	2.46	±10
		10g SAR:	23.1	23.5	-1.70	
D5GHzV2 (5.8GHz)	05/05/11	1g SAR:	75.8	73.2	3.55	±10
		10g SAR:	21.3	20.1	5.97	

10. SAR MEASUREMENT PROCEDURES

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The Minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the Distance of sensor calibration points to probe tip as defined in the probe properties (for example, 1.2 mm for an EX3DV3 probe type).

Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY4 software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528, EN 50361 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

Step 3: Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures $\geq 7 \times 7 \times 9$ points within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

Step 5: Z-Scan

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation, the extrapolated distance should not be larger than the step size in Z-direction.

11. RF 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, Intel DRTU v1.3.12-0263, which enable a user to control the frequency and output power of the module.

11.1. RF OUTPUT POWER FOR 2.4 GHZ BAND

2.4 GHz Band						
Mode	Ch. #	Freq. (MHz)	Original Target Pwr (dBm)		Actual Measured Pwr	
			Chain A	Chain B	Chain A	Chain B
802.11b	1	2412	15.5			
	6	2437	15.7		15.8	
	11	2462	15.5			
	1	2412		15.6		
	6	2437		15.5		15.6
	11	2462		15.6		
802.11g	1	2412	14.0			
	6	2437	16.6		16.7	
	11	2462	14.0			
	1	2412		14.1		
	6	2437		16.5		
	11	2462		14.1		
802.11n HT20	1	2412	13.1			
	6	2437	16.5			
	11	2462	12.4			
	1	2412		13.1		
	6	2437		16.8		16.9
	11	2462		12.8		
	1	2412	11.6	11.6		
	6	2437	13.7	13.7		
	11	2462	11.9	11.7		
802.11n HT40	3	2422	9.1			
	6	2437	16.6			
	9	2450	9.6			
	3	2422		9.6		
	6	2437		16.4		
	9	2450		10.0		
	3	2422	8.0	8.0		
	6	2437	13.7	13.7		
	9	2450	8.6	8.6		

Notes:

1. The modes with highest output power channel were chosen for the conducted output power.
2. Original target power is from EMC report. Please refer to original report (FCC ID: PD962205ANH) for Average Power information as documented in 09/13/2010 original filing.

11.2. RF OUTPUT POWER FOR 5 GHZ BANDS

5.2 GHz Band						
Mode	Ch. #	Freq. (MHz)	Original Target Pwr (dBm)		Actual Measured Pwr	
			Chain A	Chain B	Chain A	Chain B
802.11a	36	5180	16.1			
	40	5200	16.0		16.2	
	48	5240	16.1			
	36	5180		16.2		
	40	5200		16.1		16.1
	48	5240		16.1		
802.11n HT20	36	5180	15.6			
	40	5200	16.1			
	48	5240	16.1			
	36	5180		15.6		
	40	5200		16.1		
	48	5240		16.0		
	36	5180	10.5	10.5		
	40	5200	11.0	11.1		
	48	5240	11.0	10.5		
802.11n HT40	38	5190	11.1			
	46	5230	16.1			
	38	5190		11.1		
	46	5230		16.0		
	38	5190	8.5	8.3		
	46	5230	11.7	10.6		

Notes:

1. The modes with highest output power channel were chosen for the conducted output power.
2. Original target power is from EMC report. Please refer to original report (FCC ID: PD962205ANH) for Average Power information as documented in 09/13/2010 original filing.

5.3 GHz Band						
Mode	Ch. #	Freq. (MHz)	Original Target Pwr (dBm)		Actual Measured Pwr	
			Chain A	Chain B	Chain A	Chain B
802.11a	52	5260	16.1			
	60	5300	16.2		16.2	
	64	5320	16.1			
	52	5260		16.2		
	60	5300		16.2		16.2
	64	5320		16.2		
802.11n HT20	52	5260	16.2			
	60	5300	16.1			
	64	5320	16.0			
	52	5260		16.2		
	60	5300		16.1		
	64	5320		16.2		
	52	5260	10.6	10.9		
	60	5300	11.0	10.2		
	64	5320	10.5	10.3		
802.11n HT40	54	5270	16.5		16.5	
	62	5310	11.2			
	54	5270		16.6		16.6
	62	5310		11.1		
	54	5270	10.8	11.3		
	62	5310	7.9	7.5		

Notes:

1. The modes with highest output power channel were chosen for the conducted output power.
2. Original target power is from EMC report. Please refer to original report (FCC ID: PD962205ANH) for Average Power information as documented in 09/13/2010 original filing.

5.5 GHz Band						
Mode	Ch. #	Freq. (MHz)	Original Target Pwr (dBm)		Actual Measured Pwr	
			Chain A	Chain B	Chain A	Chain B
802.11a	100	5500	16.6			
	120	5600	16.6		16.7	
	140	5700	16.6			
	100	5500		16.6		
	120	5600		16.7		16.7
	140	5700		16.5		
802.11n HT20	100	5500	16.7			
	120	5600	16.7			
	140	5700	16.5			
	100	5500		16.6		
	120	5600		16.6		
	140	5700		16.7		
	100	5500	11.3	10.9		
	120	5600	11.5	12.2		
	140	5700	12.0	11.7		
802.11n HT40	102	5510	13.7			
	118	5590	16.5			
	134	5670	16.5			
	102	5510		13.6		
	118	5590		16.7		
	134	5670		16.7		
	102	5510	10.3	10.8		
	118	5590	11.2	11.2		
	134	5670	11.4	11.8		

Notes:

1. The modes with highest output power channel were chosen for the conducted output power.
2. Original target power is from EMC report. Please refer to original report (FCC ID: PD962205ANH) for Average Power information as documented in 09/13/2010 original filing.

5.8 GHz Band						
Mode	Ch. #	Freq. (MHz)	Original Target Pwr (dBm)		Actual Measured Pwr	
			Chain A	Chain B	Chain A	Chain B
802.11a	149	5745	16.6			
	157	5785	16.5		16.6	
	165	5825	16.5			
	149	5745		16.5		
	157	5785		16.5		16.8
	165	5825		16.5		
802.11n HT20	149	5745	16.7			
	157	5785	16.7			
	165	5825	16.6			
	149	5745		16.7		
	157	5785		16.6		
	165	5825		16.6		
	149	5745	13.6	13.7		
	157	5785	13.7	13.7		
	165	5825	13.6	13.7		
802.11n HT40	151	5755	16.7			
	159	5795	16.6			
	151	5755		16.5		
	159	5795		16.6		
	151	5755	13.6	13.7		
	159	5795	13.5	13.7		

Notes:

1. The modes with highest output power channel were chosen for the conducted output power.
2. Original target power is from EMC report. Please refer to original report (FCC ID: PD962205ANH) for Average Power information as documented in 09/13/2010 original filing.

12. SUMMARY OF SAR TEST RESULTS

SUMMARY OF SAR TEST CONFIGURATIONS

Configuration	Antenna-to-User distance	SAR Require	Comments
Laptop mode: Lap-held	312 mm From Main (Chain A)- to-user	No	This is not the most conservative antenna-to-user distance at edge mode, which distance is greater than 20cm
	46 mm from Aux (Chain B)-to- user	Yes	SAR evaluation

12.1. 2.4 GHZ BAND

Laptop mode: Lap-held (Aux/Chain B only)

Mode	Ch. #	Freq. (MHz)	Avg Output Pwr (dBm)		Results (mW/g)	
			Chain A	Chain B	1g-SAR	10g-SAR
802.11b	1	2412				
	6	2437		15.6	0.059	0.027
	11	2462				
802.11n HT20	1	2412				
	6	2437		16.9	0.049	0.012
	11	2462				

Note(s):

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

12.2. 5 GHZ BANDS

Laptop mode: Lap-held (Aux/Chain B only)

5.2 GHz Band						
Mode	Ch. #	Freq. (MHz)	Avg. Output Pwr (dBm)		Results (mW/g)	
			Chain A	Chain B	1g-SAR	10g-SAR
802.11a	36	5180				
	40	5200		16.1	0.000104	0.0000032
	48	5240				
5.3 GHz Band						
Mode	Ch. #	Freq. (MHz)	Avg. Output Pwr (dBm)		Results (mW/g)	
			Chain A	Chain B	1g-SAR	10g-SAR
802.11a	52	5260				
	60	5300		16.2	0.00168	0.000164
	64	5320				
802.11n HT40	54	5270				
	62	5310				
	54	5270		16.6	0.019	0.00585
5.5 GHz Band						
Mode	Ch. #	Freq. (MHz)	Avg. Output Power (dBm)		Measured Result (mW/g)	
			Chain A	Chain B	1g-SAR	10g-SAR
802.11a	100	5500				
	120	5600		16.7	0.00116	0.000151
	140	5700				
5.8 GHz Band						
Mode	Ch. #	Freq. (MHz)	Avg. Output Power (dBm)		Measured Result (mW/g)	
			Chain A	Chain B	1g-SAR	10g-SAR
802.11a	149	5745				
	157	5785		16.8	0.000057	0.00000340
	165	5825				

Note(s):

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

WORST-CASE SAR TEST PLOTS

2.4 GHZ

Date/Time: 4/29/2011 1:26:44 AM

Test Laboratory: UL CCS

Lap-held AUX (chain B)

DUT: Panasonic; Type: Tablet; Serial: 1BKKS00017

Communication System: 802.11b/g 2.4GHz; Frequency: 2437 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 2.001$ mho/m; $\epsilon_r = 51.785$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

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

DASY5 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(6.86, 6.86, 6.86); Calibrated: 1/24/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 11/17/2010
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1099
- Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

Configuration/802.11b_Ant-Main/Area Scan (12x13x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.056 mW/g

Configuration/802.11b_Ant-Main/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm

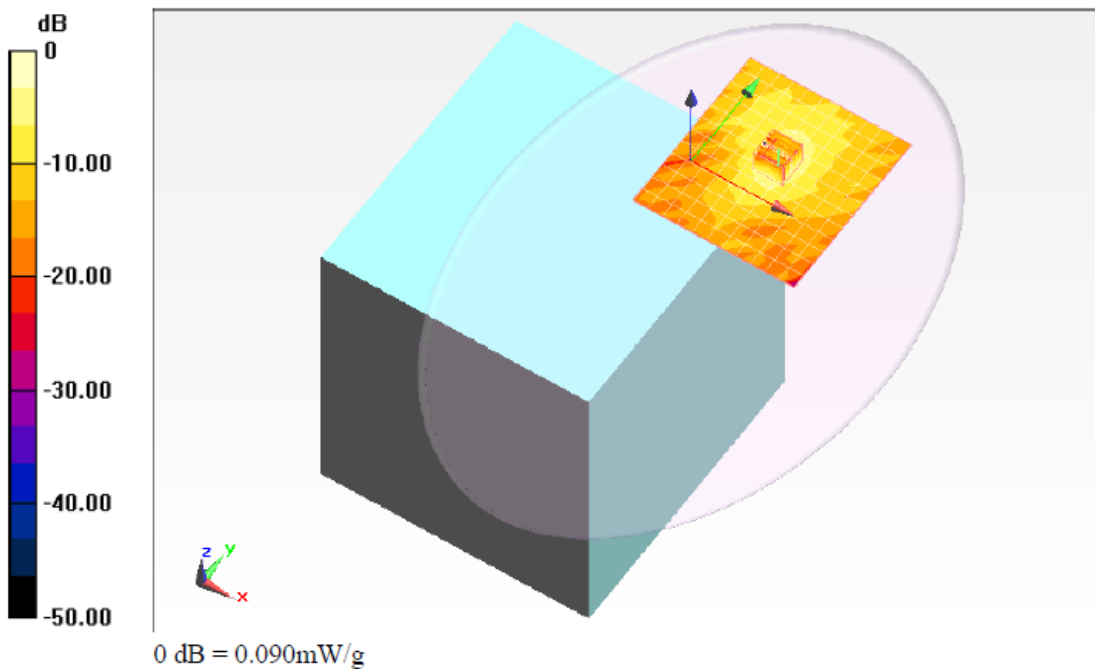
Reference Value = 0.830 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.139 W/kg

SAR(1 g) = 0.059 mW/g; SAR(10 g) = 0.027 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.087 mW/g



Z plot

Date/Time: 4/29/2011 1:45:13 AM

Test Laboratory: UL CCS

laptop mode lap held AUX chain B

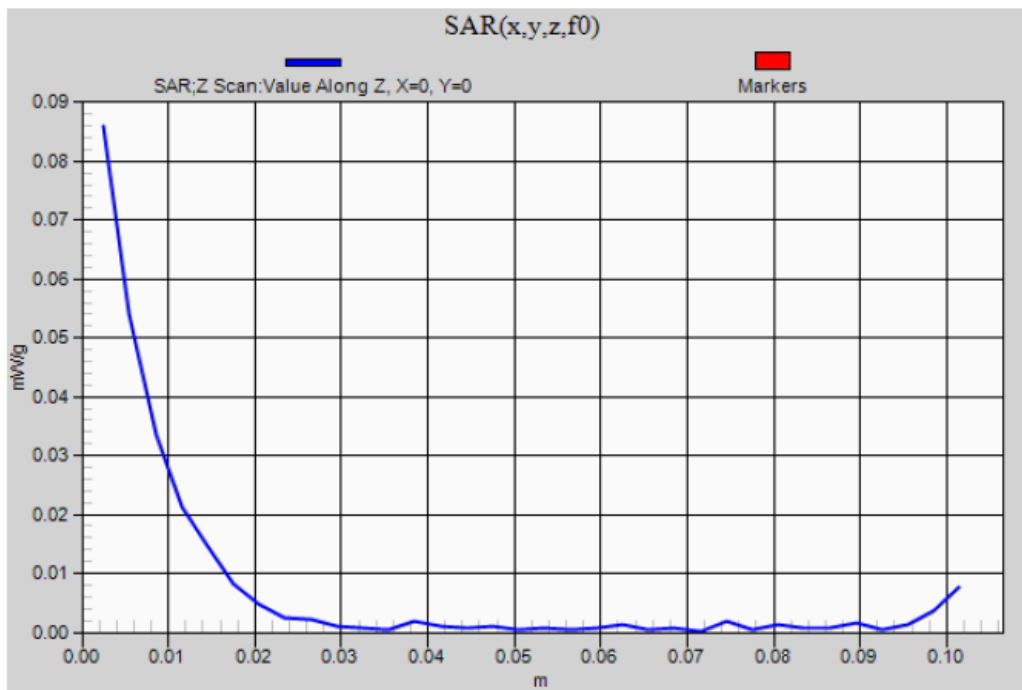
DUT: Panasonic; Type: Tablet; Serial: 1BKksA00017

Communication System: 802.11b/g 2.4GHz; Frequency: 2437 MHz; Duty Cycle: 1:1

Configuration/802.11b_Ant-Main/Z Scan (1x1x34): Measurement grid: dx=20mm, dy=20mm, dz=3mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.086 mW/g



5.2 GHz

Date/Time: 5/5/2011 12:07:45 PM

Test Laboratory: UL CCS

Lap held

DUT: Panasonic; Type: Laptop; Serial: n/a

Communication System: 802.11a 5.2-5.3GHz; Frequency: 5200 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5200$ MHz; $\sigma = 5.268$ mho/m; $\epsilon_r = 50.074$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

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

DASY5 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(3.98, 3.98, 3.98); Calibrated: 1/24/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 11/17/2010
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1099
- Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

5.2 GHz/802.11a_Ant_Aux Ch 40/Area Scan (15x17x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.028 mW/g

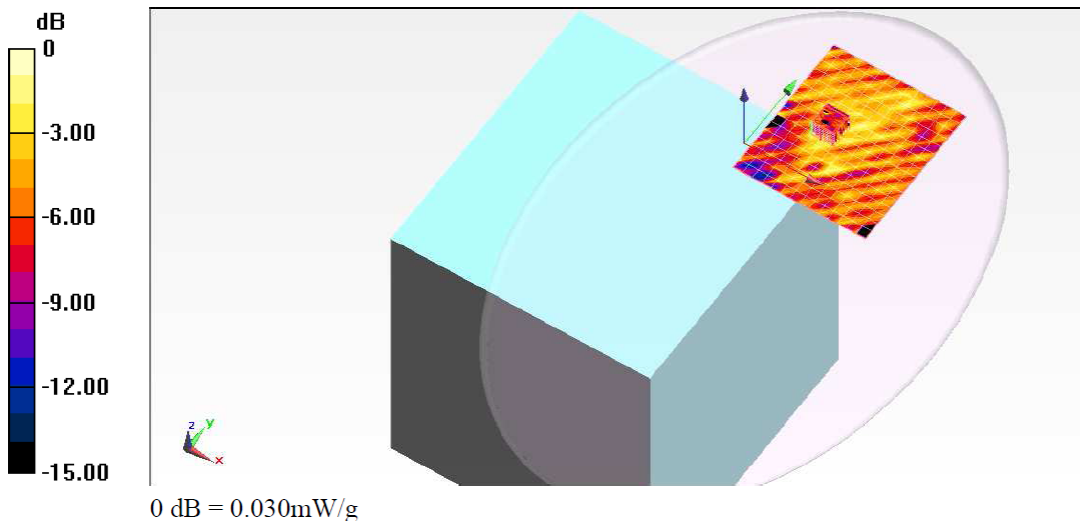
5.2 GHz/802.11a_Ant_Aux Ch 40/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 1.033 V/m; Power Drift = -0.24 dB

Peak SAR (extrapolated) = 0.076 W/kg

SAR(1 g) = 0.000104 mW/g; SAR(10 g) = 3.15e-006 mW/g

Maximum value of SAR (measured) = 0.076 mW/g



5.3 GHz

Date/Time: 5/5/2011 3:25:00 PM

Test Laboratory: UL CCS

Lap held

DUT: Panasonic; Type: Laptop; Serial: n/a

Communication System: 802.11a 5.2-5.3GHz; Frequency: 5270 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 5270$ MHz; $\sigma = 5.423$ mho/m; $\epsilon_r = 49.948$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

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

DASY5 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(3.7, 3.7, 3.7); Calibrated: 1/24/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 11/17/2010
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1099
- Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

5.3 GHz/802.11n_Ant_Aux Ch 54/Area Scan (15x17x1): Measurement grid: dx=10mm, dy=10mm

Info: [Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.133 mW/g

5.3 GHz/802.11n_Ant_Aux Ch 54/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

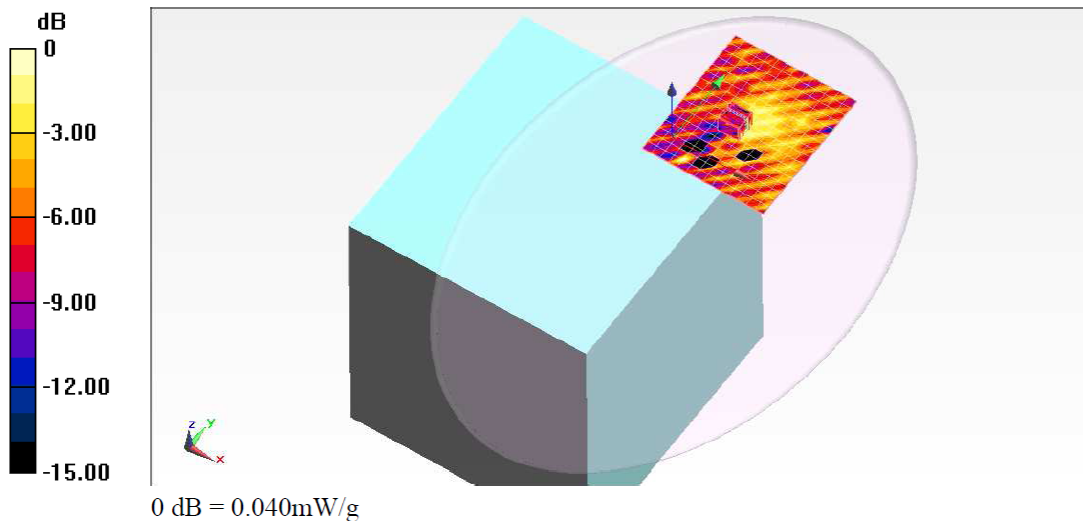
Reference Value = 0.947 V/m; Power Drift = 0.24 dB

Peak SAR (extrapolated) = 0.135 W/kg

SAR(1 g) = 0.019 mW/g; SAR(10 g) = 0.00585 mW/g

Info: [Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.037 mW/g



Z-Plot

Date/Time: 5/5/2011 3:43:40 PM

Test Laboratory: UL CCS

Laptop Mode Lap Held

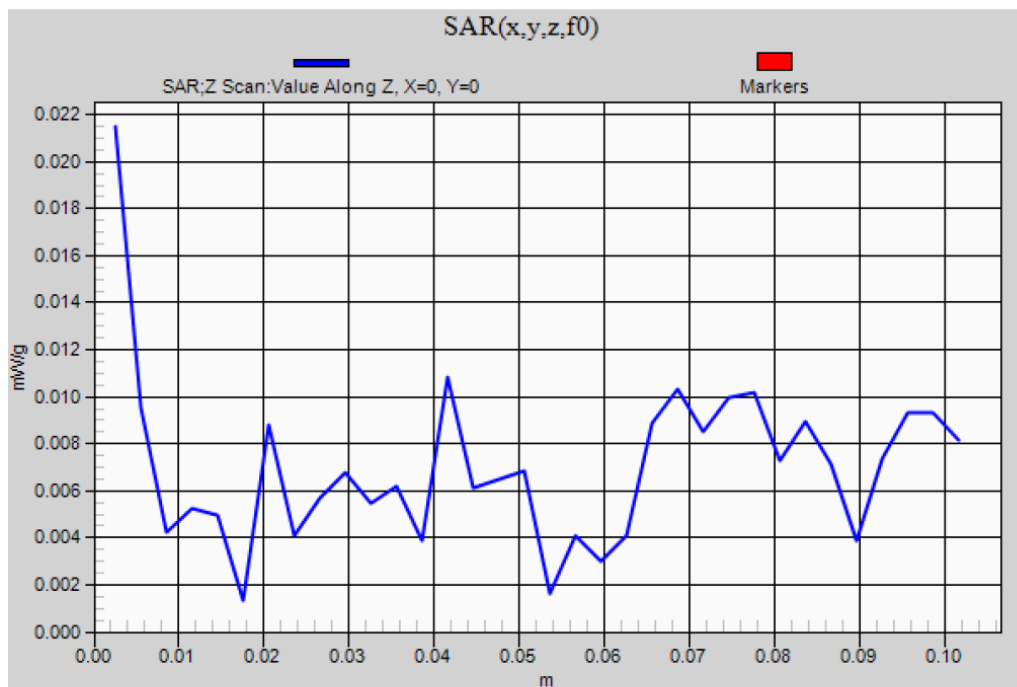
DUT: Panasonic; Type: Tablet; Serial: 1BKKS A00017

Communication System: 802.11a 5.2-5.3GHz; Frequency: 5270 MHz; Duty Cycle: 1:1

5.3 GHz/802.11n_Ant_Aux Ch 54/Z Scan (1x1x34): Measurement grid: dx=20mm, dy=20mm, dz=3mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.021 mW/g



5.5 GHz

Date/Time: 5/6/2011 12:04:06 AM

Test Laboratory: UL CCS

Laptop Mode Lap Held

DUT: Panasonic; Type: Laptop; Serial: n/a

Communication System: 802.11a 5.5GHz; Frequency: 5600 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5600$ MHz; $\sigma = 5.913$ mho/m; $\epsilon_r = 46.115$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

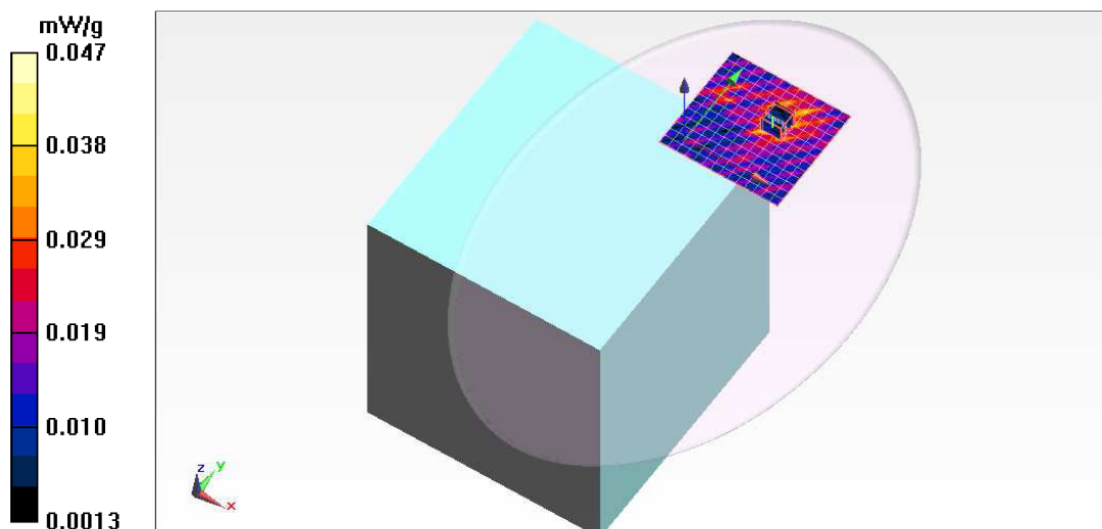
Room Ambient Temperature: 25.0 deg. C; Liquid Temperature: 24.0 deg. C

DASY5 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(3.29, 3.29, 3.29); Calibrated: 1/24/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 11/17/2010
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1099
- Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

5.5GHz/802.11a_Ant_Aux Ch 120/Area Scan (15x14x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.047 mW/g

5.5GHz/802.11a_Ant_Aux Ch 120/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 1.275 V/m; Power Drift = -0.22 dB
Peak SAR (extrapolated) = 0.092 W/kg
SAR(1 g) = 0.00116 mW/g; SAR(10 g) = 0.000151 mW/g
Maximum value of SAR (measured) = 0.054 mW/g



5.8 GHz

Date/Time: 5/6/2011 12:48:31 AM

Test Laboratory: UL CCS

Laptop Mode Lap Held

DUT: Panasonic; Type: Laptop; Serial: n/a

Communication System: 802.11a 5.8GHz; Frequency: 5785 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 5785 \text{ MHz}$; $\sigma = 6.164 \text{ mho/m}$; $\epsilon_r = 45.793$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section

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

DASY5 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(3.7, 3.7, 3.7); Calibrated: 1/24/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 11/17/2010
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1099
- Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

5.8 GHz/802.11a_Ant_Aux Ch 157/Area Scan (15x13x1): Measurement grid: dx=10mm, dy=10mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.035 mW/g

5.8 GHz/802.11a_Ant_Aux Ch 157/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

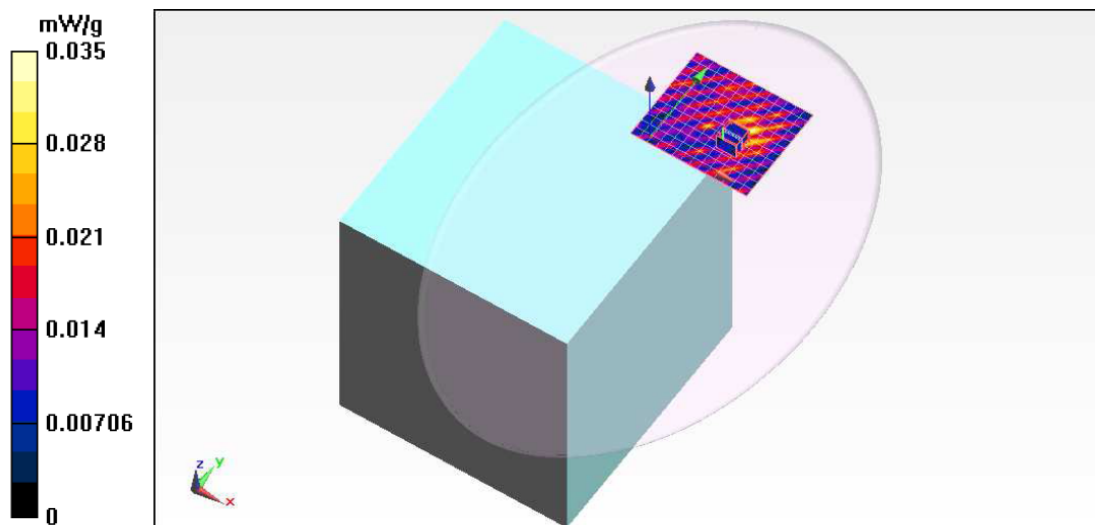
Reference Value = 0.855 V/m; Power Drift = -0.125 dB

Peak SAR (extrapolated) = 0.055 W/kg

SAR(1 g) = 5.7e-005 mW/g; SAR(10 g) = 3.4e-006 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.055 mW/g



13. ATTACHMENTS

<u>No.</u>	<u>Contents</u>	<u>No. of page (s)</u>
1-1	System Check Plots for D2450V2 SN 706	4
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2-1	SAR Test Plots for 2.4 GHz	3
2-2	SAR Test Plots for 5 GHz Bands	6
3	Certificate of E-Field Probe - EX3DV3 SN 3686	11
4	Certificate of System Validation Dipole - D2450 SN 706	9
5	Certificate of System Validation Dipole - D5GHzV2 SN 1075	11