



FCC OET BULLETIN 65 SUPPLEMENT C 01-01
IEEE STD 1528:2003
RSS-102 Issue 4, March 2010

SAR EVALUATION REPORT

For
Intel® Centrino® Advanced-N6205
(Tested inside of Panasonic Tablet PC CF-D1)

MODEL: WL11A
FCC ID: ACJ9TGWL11A
IC: 216A-CFWL11A

REPORT NUMBER: 11J13787-1A

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NVLAP LAB CODE 200065-0

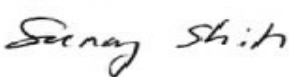
Revision History

Rev.	Issue Date	Revisions	Revised By
–	June 27, 2011	Initial Issue	--
A	July 17, 2011	Additional test without handle	Sunny Shih

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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 Tablet PC CF-D1)		
Model number:	WL11A		
Device Category:	Portable		
Exposure category:	General Population/Uncontrolled Exposure		
Date of tested:	May 24 – 26, 2011 July 9 – 11, 2011 (Additional test without handle)		
FCC / IC Rule Parts	Freq. Range [MHz]	The Highest 1g SAR	Limit (W/kg)
15.247 / RSS-102	2412 – 2462	0.714 W/kg (Bottom Face without handle)	1.6
	5725 – 5850	1.430 W/kg (Bottom Face without handle)	
15.407 / RSS-102	5150 – 5250	0.352 W/kg (Bottom Face without handle)	
	5250 – 5350	0.492 W/kg (Bottom Face without handle)	
	5470 – 5725	1.460 W/kg (Bottom Face without handle)	
Applicable Standards			Test Results
OET Bulletin 65 Supplement C 01-01, IEEE STD 1528: 2003, RSS-102 Issue 4, March 2010			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)		Tomochika Sato 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, RSS-102 Issue 4, March 2010 and the following KDB Procedures.

- 248227 SAR measurement procedures for 802.11a/b/g transmitters
- 447498 D01 Mobile Portable RF Exposure v04

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
Dielectronic Probe kit	HP	85070C	N/A	N/A		
Wireless communication test set	Agilent	E5515C (8960)	GB46160222	6	17	2012
E-Field Probe	SPEAG	EX3DV4	3773	3	3	2012
Data Acquisition Electronics	SPEAG	DAE4	1258	5	2	2012
System Validation Dipole	SPEAG	*D2450V2	706	4	19	2012
System Validation Dipole	SPEAG	*D5GHZV2	1075	9	3	2011
Thermometer	ERTCO	639-1S	1718	7	19	2011
Amplifier	Mini-Circuits	ZVE-8G	90606	N/A		
Amplifier	Mini-Circuits	ZHL-42W	D072701-5	N/A		
ESA Series Network Analyzer	Agilent	E5071B	MY42100131	8	2	2011
Synthesized Signal Generator	HP	83732B	US34490599	7	14	2012
Power Meter	Giga-tronics	8651A	8651404	3	13	2012
Power Sensor	Giga-tronics	80701A	1834588	3	13	2012
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 (Xi), %
Measurement System					
Probe Calibration (k=1)	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	3.25	Normal	1	0.64	2.08
Liquid Permittivity - deviation from target	5.00	Rectangular	1.732	0.6	1.73
Liquid Permittivity - measurement	1.64	Normal	1	0.6	0.98
Combined Standard Uncertainty Uc(y) =					9.72
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				19.43	%
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				1.54	dB

Measurement uncertainty for 3 to 6 GHz averaged over 1 gram

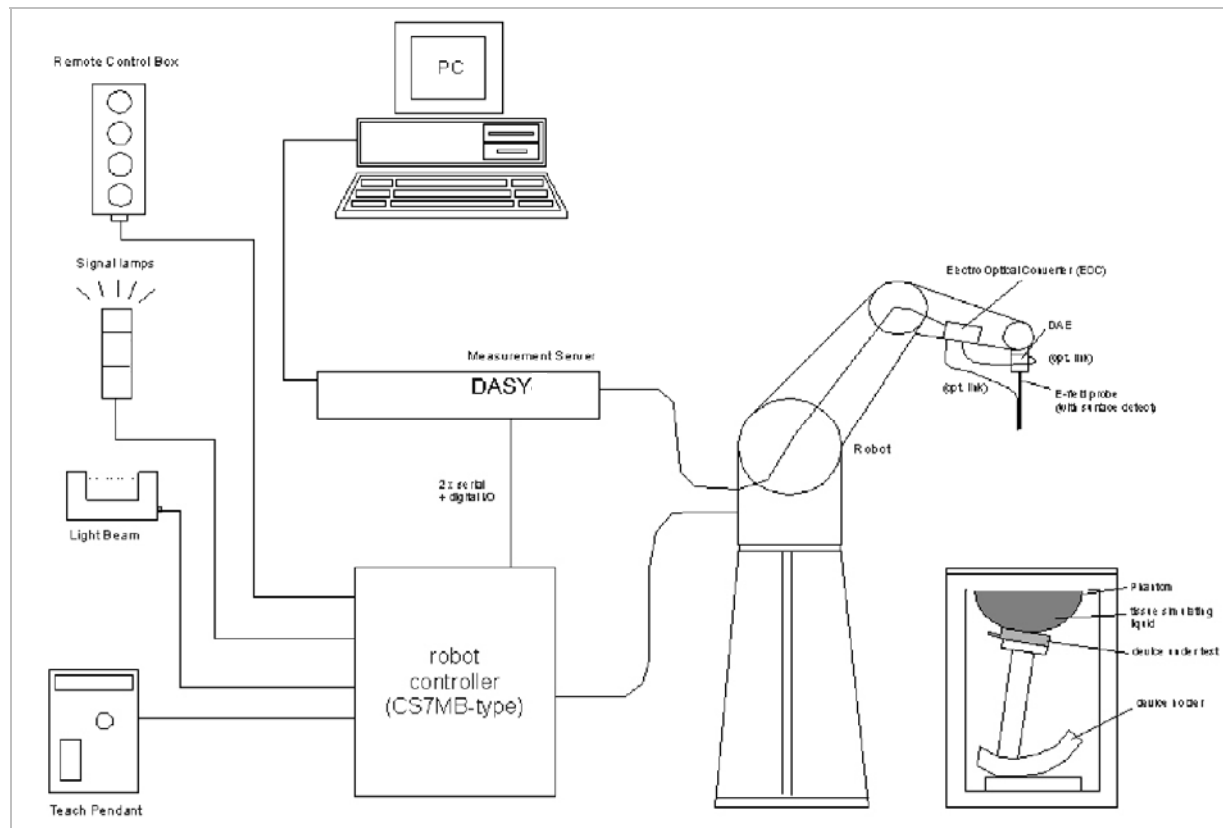
Component	error, %	Distribution	Divisor	Sensitivity	U (Xi), %
Measurement System					
Probe Calibration (k=1)	6.55	Normal	1	1	6.55
Axial Isotropy	1.15	Rectangular	1.732	0.7071	0.47
Hemispherical Isotropy	2.30	Rectangular	1.732	0.7071	0.94
Boundary Effect	0.90	Rectangular	1.732	1	0.52
Probe Linearity	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	1.19	Normal	1	0.64	0.76
Liquid Permittivity - deviation from target	10.00	Rectangular	1.732	0.6	3.46
Liquid Permittivity - measurement uncertainty	5.63	Normal	1	0.6	3.38
Combined Standard Uncertainty Uc(y), %:					11.01
Expanded Uncertainty U, Coverage Factor = 1.96, > 95 % Confidence =				21.58	%
Expanded Uncertainty U, Coverage Factor = 1.96, > 95 % Confidence =				1.70	dB

5. EQUIPMENT UNDER TEST

Intel® Centrino® Advanced-N6205, Model WL11A.
(Tested inside of Panasonic Tablet PC CF-D1)

Normal operation:	Tablet mode - Multiple display orientations supporting both portrait and landscape configurations. <i>Note: Primary landscape SAR is not required since antennas are disabled by software at secondary landscape orientation.</i>				
Antenna tested:	<table><tr><td><u>Manufactured</u></td><td><u>Part number</u></td></tr><tr><td>Panasonic</td><td>Main (Chain A): DFUP2055ZA(1) Aux (Chain B): DFUP2055ZA(2)</td></tr></table>	<u>Manufactured</u>	<u>Part number</u>	Panasonic	Main (Chain A): DFUP2055ZA(1) Aux (Chain B): DFUP2055ZA(2)
<u>Manufactured</u>	<u>Part number</u>				
Panasonic	Main (Chain A): DFUP2055ZA(1) Aux (Chain B): DFUP2055ZA(2)				
Antenna-to-antenna/user separation distances:	Refer to Sec. 15 for details of antenna locations and separation distances.				
Assessment for SAR evaluation for Simultaneous transmission:	WiFi can transmit simultaneously with Bluetooth. WiFi can transmit simultaneously with Bluetooth. Due to Bluetooth's (FCC ID: DFUP2066ZA; IC: 216A-CFBT11A) 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

Measured by: Art Tham

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
5/24/2011	Body 2450	e'	53.5664	Relative Permittivity (ε _r):	53.57	52.70	1.64	5
		e''	14.7802	Conductivity (σ):	2.01	1.95	3.25	5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 39%
May 24, 2011 07:32 PM

Frequency	e'	e''
2410000000.	53.7087	14.6125
2415000000.	53.6951	14.6355
2420000000.	53.6805	14.6551
2425000000.	53.6615	14.6769
2430000000.	53.6446	14.6966
2435000000.	53.6246	14.7190
2440000000.	53.6059	14.7387
2445000000.	53.5866	14.7608
2450000000.	53.5664	14.7802
2455000000.	53.5487	14.8026
2460000000.	53.5310	14.8248
2465000000.	53.5100	14.8455
2470000000.	53.4909	14.8684
2475000000.	53.4654	14.8906
2480000000.	53.4418	14.9119
2485000000.	53.4204	14.9313

The conductivity (σ) can be given as:

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

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

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

Measured by: Art Tham

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)
5/25/2011	Body 5200	e'	50.7829	Relative Permittivity (ϵ_r):	50.78	49.02	3.60
		e''	17.9883	Conductivity (σ):	5.20	5.29	-1.77
5/25/2011	Body 5500	e'	50.2017	Relative Permittivity (ϵ_r):	50.20	48.61	3.27
		e''	18.4093	Conductivity (σ):	5.63	5.64	-0.26
5/25/2011	Body 5800	e'	49.6407	Relative Permittivity (ϵ_r):	49.64	48.20	2.99
		e''	18.8256	Conductivity (σ):	6.07	6.00	1.19

Liquid Check

Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 40%

May 25, 2011 06:52 PM

Frequency	e'	e''
4600000000.	51.9729	17.0039
4650000000.	51.8849	17.0715
4700000000.	51.7811	17.1761
4750000000.	51.6846	17.2489
4800000000.	51.5857	17.3537
4850000000.	51.4985	17.4204
4900000000.	51.3831	17.5142
4950000000.	51.2916	17.5907
5000000000.	51.1898	17.6778
5050000000.	51.0904	17.7396
5100000000.	50.9769	17.8346
5150000000.	50.8836	17.8980
5200000000.	50.7829	17.9883
5250000000.	50.6856	18.0464
5300000000.	50.5851	18.1308
5350000000.	50.4915	18.1912
5400000000.	50.3899	18.2708
5450000000.	50.2985	18.3321
5500000000.	50.2017	18.4093
5550000000.	50.1094	18.4686
5600000000.	50.0104	18.5524
5650000000.	49.9242	18.6098
5700000000.	49.8230	18.6878
5750000000.	49.7460	18.7566
5800000000.	49.6407	18.8256
5850000000.	49.5650	18.8993
5900000000.	49.4673	18.9678
5950000000.	49.3842	19.0397
6000000000.	49.2818	19.1129

The conductivity (σ) can be given as:

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

where f = target $f * 10^6$

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

Measured by: Art Tham

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)
5/26/2011	Body 5200	e'	51.7805	Relative Permittivity (ϵ_r):	51.78	49.02	5.63
		e''	17.5146	Conductivity (σ):	5.06	5.29	-4.36
5/26/2011	Body 5500	e'	51.2205	Relative Permittivity (ϵ_r):	51.22	48.61	5.36
		e''	17.9931	Conductivity (σ):	5.50	5.64	-2.51
5/26/2011	Body 5800	e'	50.6567	Relative Permittivity (ϵ_r):	50.66	48.20	5.10
		e''	18.4425	Conductivity (σ):	5.95	6.00	-0.87

Liquid Check

Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 40%

May 26, 2011 05:53 PM

Frequency	e'	e''
4600000000.	52.9565	16.4441
4650000000.	52.8598	16.5072
4700000000.	52.7566	16.6389
4750000000.	52.6724	16.7059
4800000000.	52.5626	16.8194
4850000000.	52.4801	16.8917
4900000000.	52.3584	16.9980
4950000000.	52.2850	17.0775
5000000000.	52.1576	17.1713
5050000000.	52.0874	17.2547
5100000000.	51.9642	17.3429
5150000000.	51.8848	17.4258
5200000000.	51.7805	17.5146
5250000000.	51.6823	17.5848
5300000000.	51.5965	17.6706
5350000000.	51.4767	17.7430
5400000000.	51.4143	17.8375
5450000000.	51.2860	17.8899
5500000000.	51.2205	17.9931
5550000000.	51.1084	18.0409
5600000000.	51.0274	18.1461
5650000000.	50.9350	18.1944
5700000000.	50.8426	18.2923
5750000000.	50.7601	18.3487
5800000000.	50.6567	18.4425
5850000000.	50.5842	18.5047
5900000000.	50.4751	18.5888
5950000000.	50.4025	18.6654
6000000000.	50.2996	18.7526

The conductivity (σ) can be given as:

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

where f = target $f * 10^6$

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

Measured by: Tomochika Sato

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
7/9/2011	Body 5200	e'	48.4686	Relative Permittivity (ϵ_r):	48.47	49.02	-1.12	10
		e"	17.7480	Conductivity (σ):	5.13	5.29	-3.08	5
7/9/2011	Body 5500	e'	47.8552	Relative Permittivity (ϵ_r):	47.86	48.61	-1.56	10
		e"	18.2031	Conductivity (σ):	5.57	5.64	-1.38	5
7/9/2011	Body 5800	e'	47.1916	Relative Permittivity (ϵ_r):	47.19	48.20	-2.09	10
		e"	18.6065	Conductivity (σ):	6.00	6.00	0.01	5

Liquid Check

Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 40%

July 09, 2011 09:56 PM

Frequency	e'	e''		
4600000000.	49.6899	16.7199	49.6899	16.7199
4650000000.	49.6159	16.7981	49.6159	16.7981
4700000000.	49.5414	16.9325	49.5414	16.9325
4750000000.	49.4642	16.9941	49.4642	16.9941
4800000000.	49.3185	17.0935	49.3185	17.0935
4850000000.	49.1874	17.1434	49.1874	17.1434
4900000000.	49.0305	17.2359	49.0305	17.2359
4950000000.	48.9384	17.3123	48.9384	17.3123
5000000000.	48.8377	17.4144	48.8377	17.4144
5050000000.	48.7793	17.5072	48.7793	17.5072
5100000000.	48.6961	17.6061	48.6961	17.6061
5150000000.	48.5995	17.6748	48.5995	17.6748
5200000000.	48.4686	17.7480	48.4686	17.7480
5250000000.	48.3254	17.7973	48.3254	17.7973
5300000000.	48.2001	17.8743	48.2001	17.8743
5350000000.	48.0842	17.9367	48.0842	17.9367
5400000000.	48.0034	18.0389	48.0034	18.0389
5450000000.	47.9359	18.1127	47.9359	18.1127
5500000000.	47.8552	18.2031	47.8552	18.2031
5550000000.	47.7610	18.2567	47.7610	18.2567
5600000000.	47.6244	18.3315	47.6244	18.3315
5650000000.	47.5134	18.3780	47.5134	18.3780
5700000000.	47.3688	18.4462	47.3688	18.4462
5750000000.	47.2840	18.5232	47.2840	18.5232
5800000000.	47.1916	18.6065	47.1916	18.6065
5850000000.	47.1384	18.6903	47.1384	18.6903
5900000000.	47.0403	18.7590	47.0403	18.7590
5950000000.	46.9468	18.8380	46.9468	18.8380
6000000000.	46.8223	18.8918	46.8223	18.8918

The conductivity (σ) can be given as:

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

where f = target $f * 10^6$

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

Measured by: David Rodgers

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)
2011/7/11	Body 5200	e'	49.0875	Relative Permittivity (ϵ_r):	49.09	49.02	0.14
		e''	18.5294	Conductivity (σ):	5.36	5.29	1.19
2011/7/11	Body 5500	e'	48.2808	Relative Permittivity (ϵ_r):	48.28	48.61	-0.68
		e''	19.0234	Conductivity (σ):	5.82	5.64	3.07
2011/7/11	Body 5800	e'	47.4935	Relative Permittivity (ϵ_r):	47.49	48.20	-1.47
		e''	19.4506	Conductivity (σ):	6.27	6.00	4.55

Liquid Check

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

July 11, 2011 03:23 PM

Frequency	e'	e''
5180000000.	49.1677	18.5053
5185000000.	49.1494	18.5124
5190000000.	49.1279	18.5182
5195000000.	49.1052	18.5243
5200000000.	49.0875	18.5294
5450000000.	48.3927	18.8981
5455000000.	48.3770	18.9076
5460000000.	48.3563	18.9194
5465000000.	48.3414	18.9298
5470000000.	48.3278	18.9454
5475000000.	48.3149	18.9556
5480000000.	48.3054	18.9728
5485000000.	48.2973	18.9866
5490000000.	48.2896	19.0006
5495000000.	48.2849	19.0131
5500000000.	48.2808	19.0234
5750000000.	47.6532	19.3607
5755000000.	47.6345	19.3663
5760000000.	47.6157	19.3737
5765000000.	47.5986	19.3802
5770000000.	47.5810	19.3853
5775000000.	47.5658	19.3931
5780000000.	47.5503	19.4010
5785000000.	47.5335	19.4103
5790000000.	47.5195	19.4258
5795000000.	47.5033	19.4390
5800000000.	47.4935	19.4506

The conductivity (σ) can be given as:

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

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

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

Measured by: Hung Thai

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)
7/12/2011	Body 2450	e'	52.8125	Relative Permittivity (ε _r):	52.81	52.70	0.21
		e''	14.0775	Conductivity (σ):	1.92	1.95	-1.65

Liquid Check

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

July 12, 2011 08:47 AM

Frequency	e'	e''
2350000000.	53.1332	13.6441
2355000000.	53.1173	13.6652
2360000000.	53.0987	13.6881
2365000000.	53.0826	13.7078
2370000000.	53.0641	13.7320
2375000000.	53.0481	13.7537
2380000000.	53.0300	13.7754
2385000000.	53.0145	13.8004
2390000000.	52.9974	13.8244
2395000000.	52.9816	13.8477
2400000000.	52.9688	13.8733
2405000000.	52.9523	13.8979
2410000000.	52.9392	13.9185
2415000000.	52.9261	13.9398
2420000000.	52.9107	13.9555
2425000000.	52.8961	13.9763
2430000000.	52.8812	13.9952
2435000000.	52.8634	14.0154
2440000000.	52.8481	14.0365
2445000000.	52.8303	14.0576
2450000000.	52.8125	14.0775
2455000000.	52.7955	14.0997
2460000000.	52.7787	14.1217
2465000000.	52.7628	14.1425
2470000000.	52.7445	14.1651
2475000000.	52.7240	14.1882
2480000000.	52.7079	14.2114
2485000000.	52.6917	14.2350
2490000000.	52.6758	14.2583
2495000000.	52.6610	14.2832
2500000000.	52.6474	14.3072

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)	05/24/11	1g SAR:	55.7	52.4	6.30	±10
		10g SAR:	25.5	24.5	4.08	
D5GHzV2 (5.2GHz)	05/25/11	1g SAR:	78.0	79.0	-1.27	±10
		10g SAR:	22.6	22.0	2.73	
D5GHzV2 (5.5GHz)	05/25/11	1g SAR:	88.9	85.4	4.10	±10
		10g SAR:	25.2	23.5	7.23	
D5GHzV2 (5.8GHz)	05/25/11	1g SAR:	71.6	73.2	-2.19	±10
		10g SAR:	20.3	20.1	1.00	
D5GHzV2 (5.2GHz)	05/26/11	1g SAR:	74.6	79.0	-5.57	±10
		10g SAR:	21.6	22.0	-1.82	
D5GHzV2 (5.5GHz)	05/26/11	1g SAR:	79.7	85.4	-6.67	±10
		10g SAR:	22.6	23.5	-3.83	
D5GHzV2 (5.8GHz)	05/26/11	1g SAR:	69.8	73.2	-4.64	±10
		10g SAR:	20.0	20.1	-0.50	
D5GHzV2 (5.5GHz)	07/09/11	1g SAR:	80.2	85.4	-6.09	±10
		10g SAR:	22.6	23.5	-3.83	
D5GHzV2 (5.8GHz)	07/09/11	1g SAR:	70.7	73.2	-3.42	±10
		10g SAR:	19.9	20.1	-1.00	
D2450V2 (2.45GHz)	07/11/11	1g SAR:	53.2	52.4	1.53	±10
		10g SAR:	25.2	24.5	2.86	
D5GHzV2 (5.2GHz)	07/11/11	1g SAR:	80.2	79.0	1.52	±10
		10g SAR:	22.8	22.0	3.64	

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 $\geq 7 \times 7 \times 9$ (3 - 6 GHz) or $5 \times 5 \times 7$ (below 3 GHz) 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

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		15.77	
	11	2462	15.5			
	1	2412		15.6		
	6	2437		15.5		15.73
	11	2462		15.6		
802.11g	1	2412	14.0			
	6	2437	16.6		16.67	
	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		16.81
	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		16.06	
	48	5240	16.1			
	36	5180		16.2		
	40	5200		16.1		16.23
	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		16.41	
	64	5320	16.1			
	52	5260		16.2		
	60	5300		16.2		16.39
	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		
802.11n HT40	64	5320	10.5	10.3		
	54	5270	16.5		16.52	
	62	5310	11.2			
	54	5270		16.6		16.73
	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		16.81	
	140	5700	16.6			
	100	5500		16.6		
	120	5600		16.7		16.79
	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		16.61	
	165	5825	16.5			
	149	5745		16.5		
	157	5785		16.5		16.57
	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		
802.11n HT40	165	5825	13.6	13.7		
	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

12.1. SUMMARY OF SAR TEST CONFIGURATIONS

Configuration	Antenna-to-User distance	SAR Require	Comments
(1) Bottom Face w/ handle	40 mm (w/ handle) From Main Antenna to-User 43 mm (w/handle) From Aux Antenna to-User	Yes	
(1) Bottom Face without handle	7 mm (without handle) From Main Antenna to-User 10 mm (without/handle) From Aux Antenna to-User	Yes	
Primary Portrait	107 mm from Aux antenna to User	No	This is not the most conservative antenna-to-user distance at edge mode. According to KDB 447498 4) b) ii) (2), SAR is required only for the edge with the most conservative exposure conditions
(2) Secondary Portrait	106 mm From Main Antenna to-User	Yes	
Primary Landscape	235 mm from Main and aux antenna to User	No	SAR is not required due to separation distance > 20 cm from antenna-to-user.
Secondary Landscape	9 mm from Main and Aux antenna to User	No	SAR is not required since antennas are disabled by software at secondary landscape orientation.

12.2. 2.4 GHZ

(1) Bottom Face with handle

Mode	Channel	f (MHz)	Avg. Output Power (dBm)		Measured Result (mW/g)	
			Chain A	Chain B	1g-SAR	10g-SAR
802.11b	1	2412				
	6	2437	15.9		0.031	0.018
	11	2462				
	1	2412				
	6	2437		15.6	0.030	0.018
	11	2462				
802.11g	1	2412				
	6	2437	16.8		0.037	0.022
	11	2462				
802.11n HT20	1	2412				
	6	2437		16.8	0.028	0.016
	11	2462				

(1) Bottom Face without handle

Mode	Channel	f (MHz)	Avg. Output Power (dBm)		Measured Result (mW/g)	
			Chain A	Chain B	1g-SAR	10g-SAR
802.11b	1	2412				
	6	2437	15.77		0.583	0.273
	11	2462				
	1	2412				
	6	2437		15.73	0.501	0.252
	11	2462				
802.11g	1	2412				
	6	2437	16.67		0.714	0.334
	11	2462				
802.11n HT20	1	2412				
	6	2437		16.81	0.627	0.316
	11	2462				

(2) Secondary Portrait

Mode	Channel	f (MHz)	Avg. Output Power (dBm)		Measured Result (mW/g)	
			Chain A	Chain B	1g-SAR	10g-SAR
802.11b	1	2412				
	6	2437	15.9		0.044	0.023
	11	2462				
802.11g	1	2412				
	6	2437	16.8		0.053	0.027
	11	2462				

Notes:

1. The modes with highest output power channel were chosen for the conducted output power.
2. *: SAR is not required for 802.11g channels when the maximum average output power is less then 1/4 dB then that measured on the corresponding 802.11g channels.

12.3. 5 GHZ BANDS

(1) Bottom Face (Main/Chain A and Aux Chain B antennas) with handle

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	16.2		0.028	0.012
	48	5240				
	36	5180				
	40	5200		16.2	0.041	0.014
	48	5240				
5.3 GHz Band						
Mode	Ch. #	Freq. (MHz)	Avg. Output Power (dBm)		Measured Result (mW/g)	
			Chain A	Chain B	1g-SAR	10g-SAR
802.11a	52	5260				
	60	5300	16.2		0.044	0.020
	64	5320				
	52	5260				
	60	5300		16.2	0.029	0.012
	64	5320				
802.11n HT40	54	5270	16.6		0.043	0.019
	54	5270		16.7	0.036	0.013
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		0.072	0.029
	140	5700				
	100	5500				
	120	5600		16.7	0.037	0.016
	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	16.6		0.110	0.048
	165	5825				
	149	5745				
	157	5785		16.8	0.048	0.020
	165	5825				

(1) Bottom Face (Main/Chain A and Aux Chain B antennas) without handle

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	16.06		0.285	0.099
	48	5240				
	36	5180				
	40	5200		16.23	0.352	0.126
	48	5240				
5.3 GHz Band						
Mode	Ch. #	Freq. (MHz)	Avg. Output Power (dBm)		Measured Result (mW/g)	
			Chain A	Chain B	1g-SAR	10g-SAR
802.11a	52	5260				
	60	5300	16.41		0.492	0.170
	64	5320				
	52	5260				
	60	5300		16.39	0.339	0.116
	64	5320				
802.11n HT40	54	5270	16.52		0.391	0.138
	54	5270		16.73	0.337	0.118
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	16.81		0.692	0.224
	120	5600	16.81		1.220	0.369
	140	5700	16.81		1.460	0.420
	100	5500				
	120	5600		16.79	0.494	0.162
	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	16.72		1.430	0.420
	157	5785	16.61		1.320	0.414
	165	5825	16.64		1.280	0.405
	149	5745				
	157	5785		16.57	0.441	0.139
	165	5825				

(2) Secondary Portrait (Main/Chain A)

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	16.2		0.00995	0.00366
	48	5240				
5.3 GHz Band						
Mode	Ch. #	Freq. (MHz)	Avg. Output Power (dBm)		Measured Result (mW/g)	
			Chain A	Chain B	1g-SAR	10g-SAR
802.11a	52	5260				
	60	5300	16.2		0.020	0.00814
	64	5320				
802.11n HT40	54	5270	16.6		0.014	0.00432
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		0.048	0.016
	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	16.6		0.042	0.013
	165	5825				

Notes:

The modes with highest output power channel were chosen for SAR tested.

13. WORST-CASE SAR TEST PLOTS

2.4 GHz

Date: 7/12/2011

Test Laboratory: UL CCS SAR Lab B

Bottom Face without handle_2.4 GHz

Communication System: WLAN_2.4GHz; Frequency: 2437 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.901$ mho/m; $\epsilon_r = 52.857$; $\rho = 1000$ 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 - SN3773; ConvF(6.87, 6.87, 6.87); Calibrated: 5/3/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1258; Calibrated: 5/2/2011
- Phantom: ELI v5.0 (B); Type: QDOVA001BB; Serial: 1118
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

802.11g_Ch 6_Cahin A/Area Scan (71x141x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 1.050 mW/g

802.11g_Ch 6_Cahin A/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

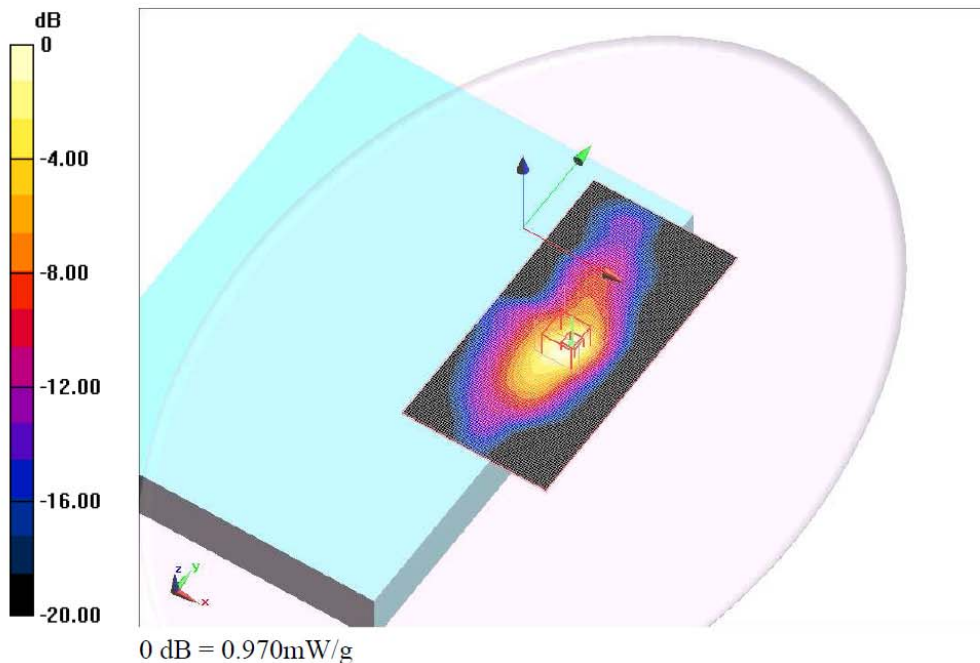
Reference Value = 22.364 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 1.511 W/kg

SAR(1 g) = 0.714 mW/g; SAR(10 g) = 0.334 mW/g

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

Maximum value of SAR (measured) = 0.968 mW/g



Z plot

Date: 7/12/2011

Test Laboratory: UL CCS SAR Lab B

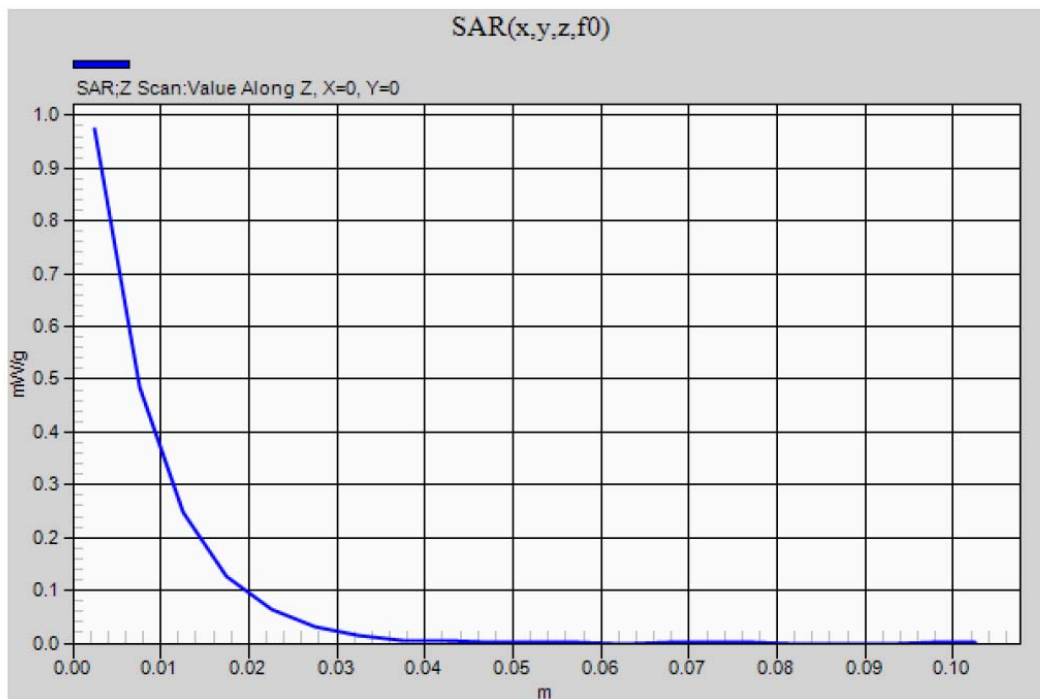
Bottom Face without handle_2.4GHz

Communication System: WLAN_2.4GHz; Frequency: 2437 MHz; Duty Cycle: 1:1

802.11g_Ch 6_Cahin A/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

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

Maximum value of SAR (measured) = 0.974 mW/g



5.2 GHz

Date: 7/11/2011

Test Laboratory: UL CCS SAR Lab B

Bottom Face without handle_5.2 GHz band

Communication System: WLAN_5GHz; Frequency: 5200 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5200$ MHz; $\sigma = 5.36$ mho/m; $\epsilon_r = 49.087$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

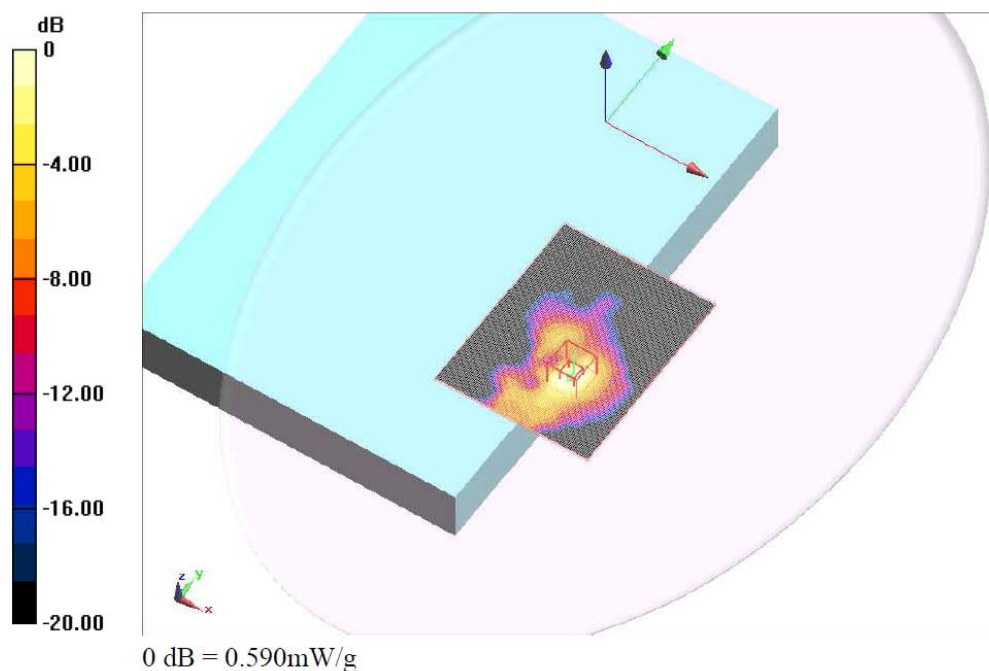
Room Ambient Temperature: 25.0 deg. C; Liquid Temperature: 24.0 deg. C

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 - SN3773; ConvF(4.1, 4.1, 4.1); Calibrated: 5/3/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1258; Calibrated: 5/2/2011
- Phantom: ELI v5.0 (A); Type: QDOVA001BB; Serial: 1120
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

802.11a_Ch 40_Chain B/Area Scan (111x141x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.590 mW/g

802.11a_Ch 40_Chain B/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 10.894 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 1.042 W/kg
SAR(1 g) = 0.352 mW/g; SAR(10 g) = 0.126 mW/g
Maximum value of SAR (measured) = 0.592 mW/g



Z plot

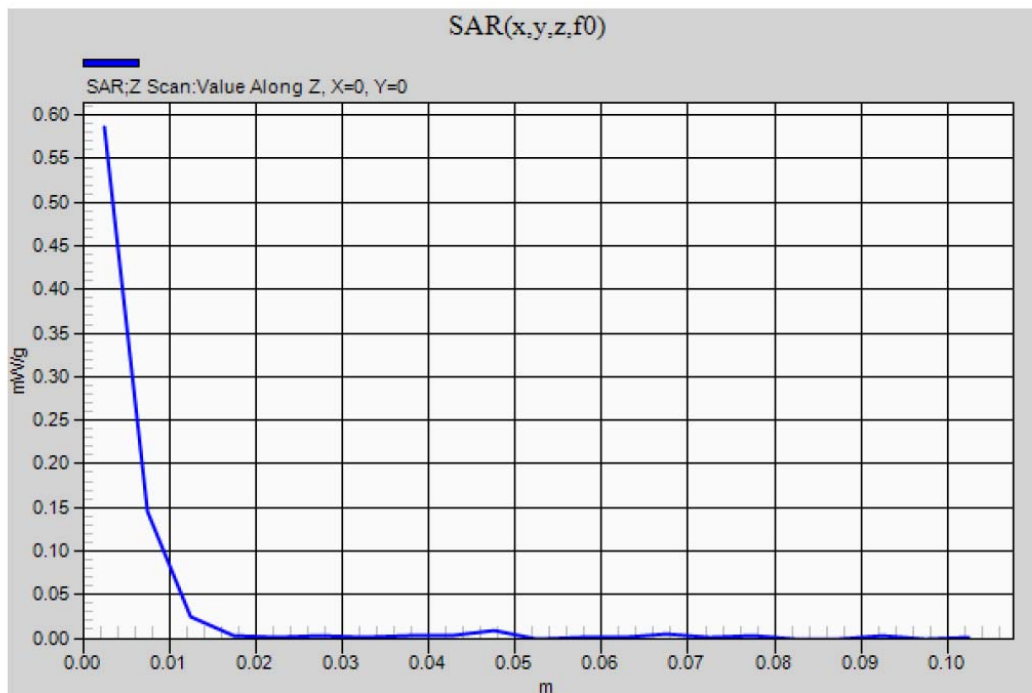
Date: 7/12/2011

Test Laboratory: UL CCS SAR Lab B

Bottom Face without handle_5.2 GHz band

Communication System: WLAN_5GHz; Frequency: 5200 MHz; Duty Cycle: 1:1

802.11a_Ch 40_Chain B/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.586 mW/g



5.3 GHz

Date: 7/11/2011

Test Laboratory: UL CCS SAR Lab B

Bottom Face without handle_5.3 GHz band

Communication System: WLAN_5GHz; Frequency: 5300 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5300$ MHz; $\sigma = 5.515$ mho/m; $\epsilon_r = 48.816$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

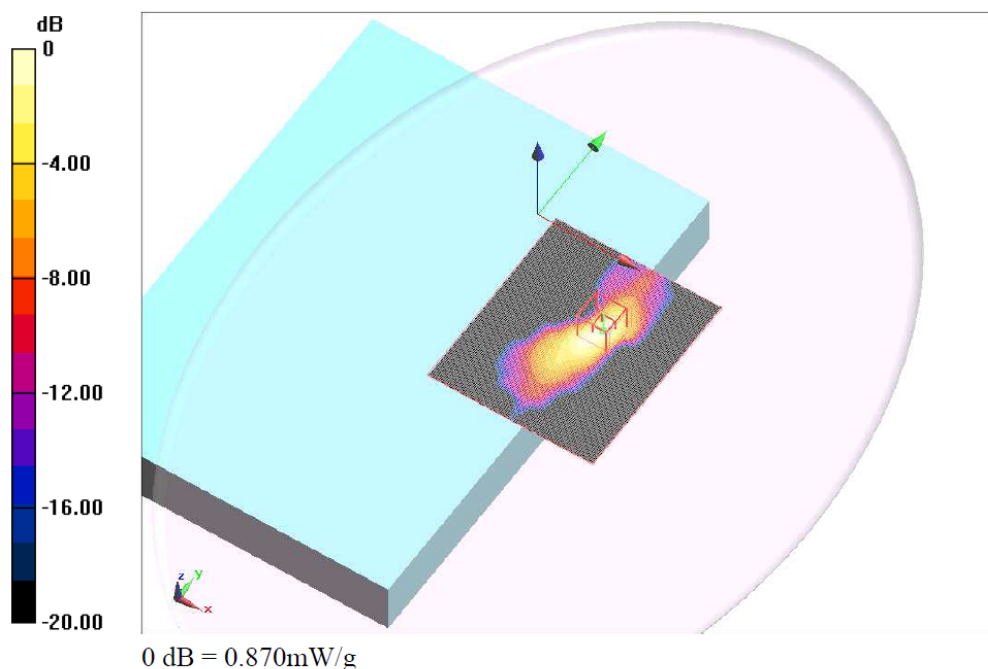
Room Ambient Temperature: 25.0 deg. C; Liquid Temperature: 24.0 deg. C

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 - SN3773; ConvF(3.88, 3.88, 3.88); Calibrated: 5/3/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1258; Calibrated: 5/2/2011
- Phantom: ELI v5.0 (A); Type: QDOVA001BB; Serial: 1120
- Measurement SW: DASY52, Version 52.6 (2);SEMCAD X Version 14.4.5 (3634)

802.11a_Ch 60_Chain A/Area Scan (121x141x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.917 mW/g

802.11a_Ch 60_Chain A/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 13.478 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.668 W/kg
SAR(1 g) = 0.492 mW/g; SAR(10 g) = 0.170 mW/g
Maximum value of SAR (measured) = 0.871 mW/g



Z plot

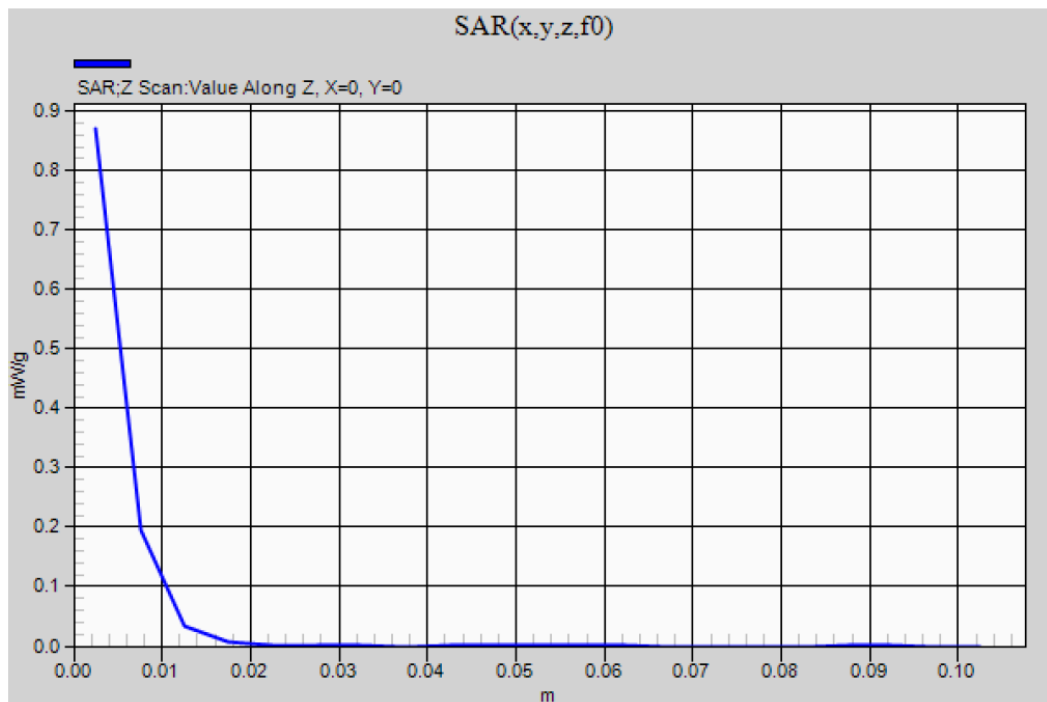
Date: 7/11/2011

Test Laboratory: UL CCS SAR Lab B

Bottom Face without handle_5.3 GHz band

Communication System: WLAN_5GHz; Frequency: 5300 MHz;Duty Cycle: 1:1

802.11a_Ch 60_Chain A/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.870 mW/g



5.5 GHz

Date: 7/9/2011

Test Laboratory: UL CCS SAR Lab B

Bottom Face without handle_5.5 GHz band

Communication System: WLAN_5GHz; Frequency: 5700 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5700$ MHz; $\sigma = 5.849$ mho/m; $\epsilon_r = 47.369$; $\rho = 1000$ 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 - SN3773; ConvF(3.26, 3.26, 3.26); Calibrated: 5/3/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1258; Calibrated: 5/2/2011
- Phantom: ELI v5.0 (A); Type: QDOVA001BB; Serial: 1120
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

802.11a_Ch 140_Chain A/Area Scan (121x141x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 2.738 mW/g

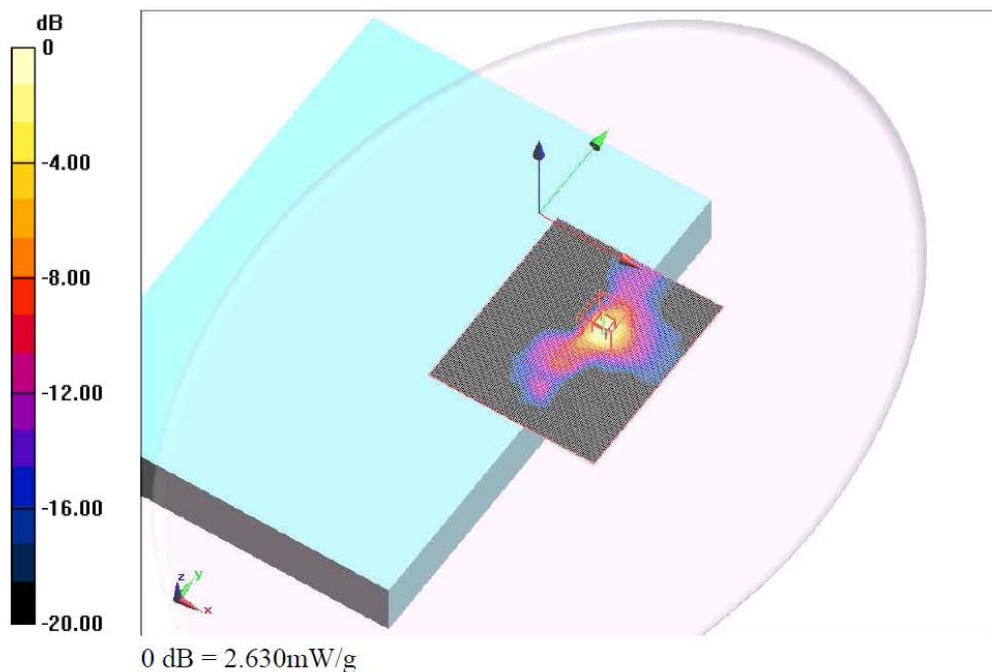
802.11a_Ch 140_Chain A/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 21.890 V/m; Power Drift = 0.13 dB

Peak SAR (extrapolated) = 5.293 W/kg

SAR(1 g) = 1.46 mW/g; SAR(10 g) = 0.420 mW/g

Maximum value of SAR (measured) = 2.629 mW/g



Z plot

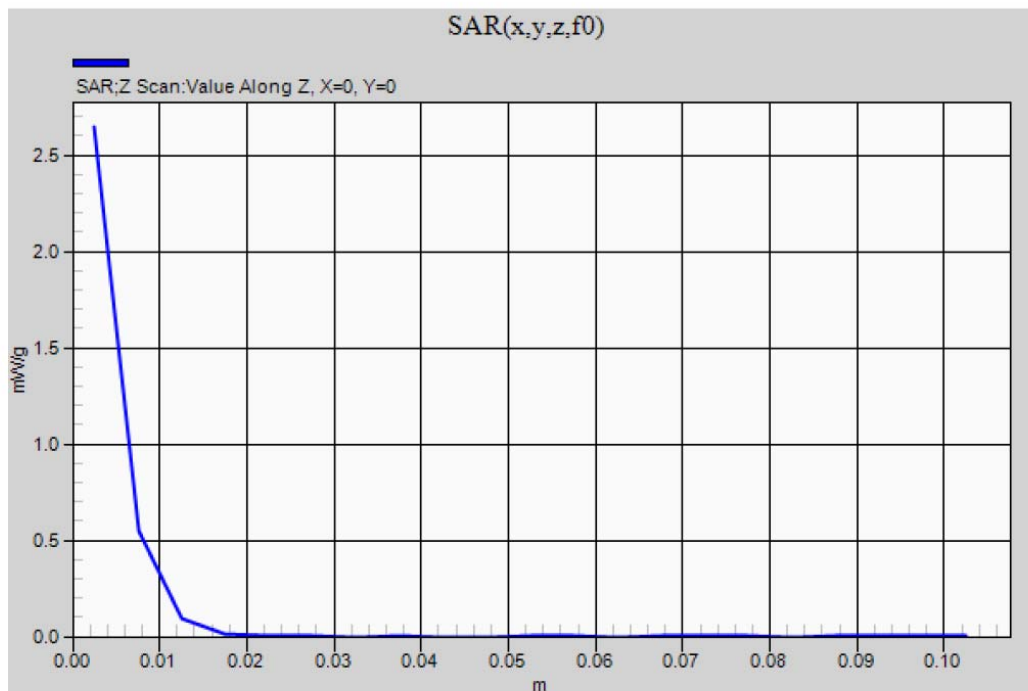
Date: 7/9/2011

Test Laboratory: UL CCS SAR Lab B

Bottom Face without handle_5.5 GHz band

Communication System: WLAN_5GHz; Frequency: 5700 MHz; Duty Cycle: 1:1

802.11a_Ch 140_Chain A/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 2.645 mW/g



5.8 GHz

Date: 7/9/2011

Test Laboratory: UL CCS SAR Lab B

Bottom Face without handle_5.8 GHz band

Communication System: WLAN_5GHz; Frequency: 5745 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 5745$ MHz; $\sigma = 5.918$ mho/m; $\epsilon_r = 47.292$; $\rho = 1000$ 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 - SN3773; ConvF(3.58, 3.58, 3.58); Calibrated: 5/3/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1258; Calibrated: 5/2/2011
- Phantom: ELI v5.0 (A); Type: QDOVA001BB; Serial: 1120
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

802.11a_Ch 149_Chain A/Area Scan (121x141x1): Measurement grid: dx=10mm, dy=10mm

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

Maximum value of SAR (interpolated) = 3.169 mW/g

802.11a_Ch 149_Chain A/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

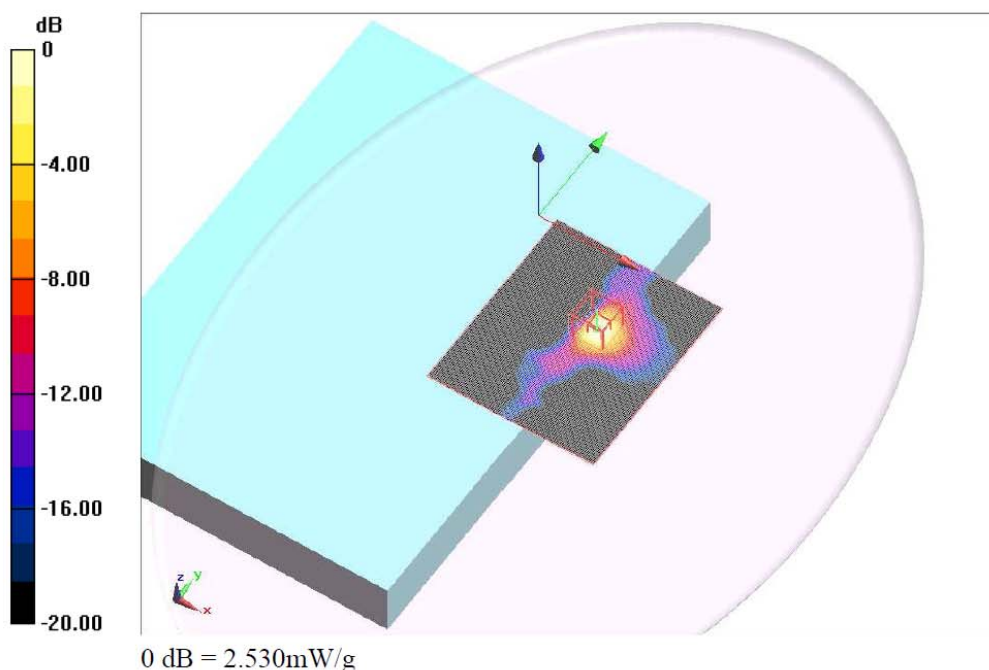
Reference Value = 19.493 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 5.168 W/kg

SAR(1 g) = 1.43 mW/g; SAR(10 g) = 0.420 mW/g

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

Maximum value of SAR (measured) = 2.528 mW/g



Z plot

Date: 7/9/2011

Test Laboratory: UL CCS SAR Lab B

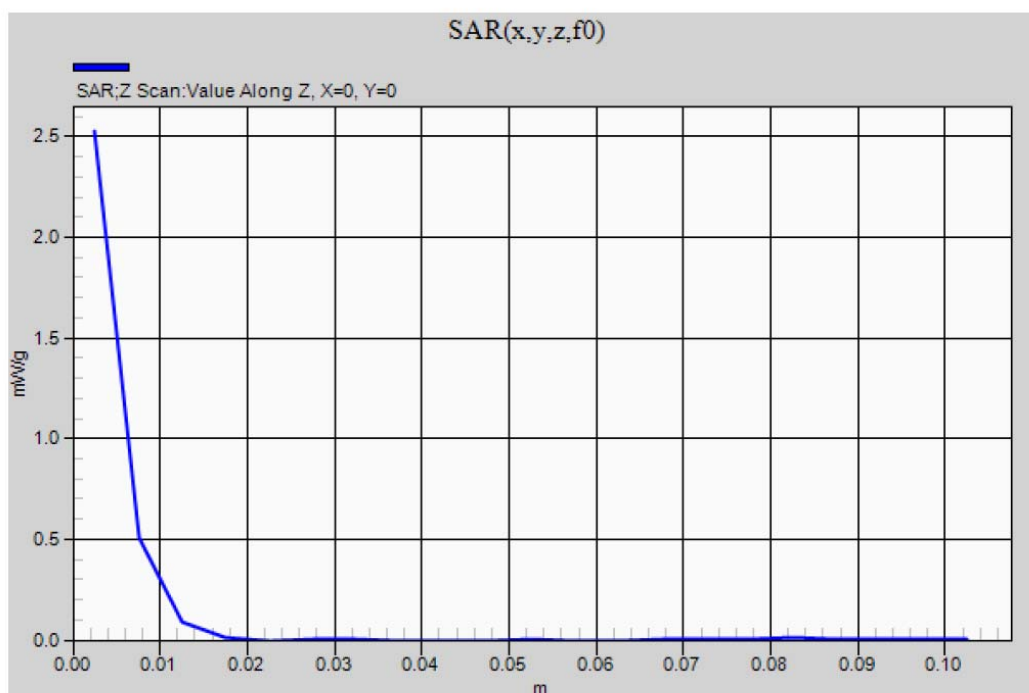
Bottom Face without handle_5.8 GHz band

Communication System: WLAN_5GHz; Frequency: 5745 MHz;Duty Cycle: 1:1

802.11a_Ch 149_Chain A/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

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

Maximum value of SAR (measured) = 2.526 mW/g



14. ATTACHMENTS

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