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SAR EVALUATION REPORT

For
Intel® Condor Peak® 802.11b/g/n 1x2 PCI-e Half Minicard
(Tested inside of SAMSUNG Notebook PC, NP300E4A)

MODEL NUMBER: 112BNHMW
FCC ID: A3L112BNH
IC: 649E-112BNH

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1. ATTESTATION OF TEST RESULTS

Applicant name:	Samsung Electronics Co., LTD		
EUT description:	Intel® Condor Peak® 802.11b/g/n 1x2 PCI-e Half Minicard (Tested inside of SAMSUNG Notebook PC, NP300E4A)		
Model number:	112BNHMW		
Device category:	Portable		
Exposure category:	General Population/Uncontrolled Exposure		
Date tested:	Aug 05, 2011		
FCC / IC Rule Parts	Freq. Range [MHz]	The Highest 1g SAR mW/g	Limit (mW/g)
15.247 / RSS-102	2412 – 2462	FCC: 0.0565 mW/g (Lap-held) IC: 0.197 mW/g (Bystander with 15 mm separation distance)	1.6
Applicable Standards			Test Results
FCC OET Bulletin 65 Supplement C 01-01, IEEE STD 1528: 2003, RSS-102 Issue 4, March 2010 and RSS-102 Supplementary Procedures (SPR)-001, January 1, 2011			Pass
<p>Compliance Certification Services, Inc. (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.</p> <p>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.</p>			
Approved & Released For CCS By:		Tested By:	
			
Sunny Shih Engineering Team Leader Compliance Certification Services (UL CCS)		David Rodgers SAR Engineer Compliance Certification Services (UL CCS)	

2. TEST METHODOLOGY

FCC OET Bulletin 65 Supplement C 01-01, IEEE STD 1528: 2003, RSS-102 Issue 4, March 2010 RSS-102 Supplementary Procedures (SPR)-001, January 1, 2011 and the following KDBs test 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	S-0396	N/A		
DASY4 Measurement Server	SPEAG	SEUMS001BA	1246	N/A		
Probe Alignment Unit	SPEAG	LB5/ 80	SE UKS 030 AA	N/A		
SAM Twin Phantom	SPEAG	QDOOOP40CD	1629	N/A		
Oval Flat Phantom (ELI 5.0) A	SPEAG	QDOVA001BB	1120	N/A		
Oval Flat Phantom (ELI 5.0) B	SPEAG	QDOVA001BB	1118	N/A		
Dielectric Probe kit	HP	85070C	N/A	N/A		
ESA Series Network Analyzer	Agilent	E5071B	MY42100131	2	2	2012
Synthesized Signal Generator	HP	83732B	US34490599	7	14	2012
E-Field Probe	SPEAG	EX3DV4	3773	5	3	2012
Thermometer, Mercury Bulb	ERTCO	639-1S	8350	7	30	2012
Data Acquisition Electronics	SPEAG	DAE4	1258	5	2	2012
System Validation Dipole	SPEAG	*D2450V2	706	4	19	2012
Power Meter	Giga-tronics	8651A	8651404	3	13	2012
Power Sensor	Giga-tronics	80701A	1834588	3	13	2012
Amplifier	Mini-Circuits	ZVE-8G	90606	N/A		
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 year calibration intervals. On an annual basis each measurement dipole is evaluated for compliance with the following criteria:

1. There is no physical damage to the dipole.
2. System validation with a specific dipole is within 10% of calibrated value.
3. Return-loss is within 20% of calibrated measurement (See Appendix D: Calibration Certificate - Validation Dipole D2450V2 - SN 706 with extended cal. data)
4. Impedance is within 5Ω of calibrated measurement (See Appendix D: Calibration Certificate - Validation Dipole D2450V2 - SN 706 with extended cal. data)

4.2. MEASUREMENT UNCERTAINTY

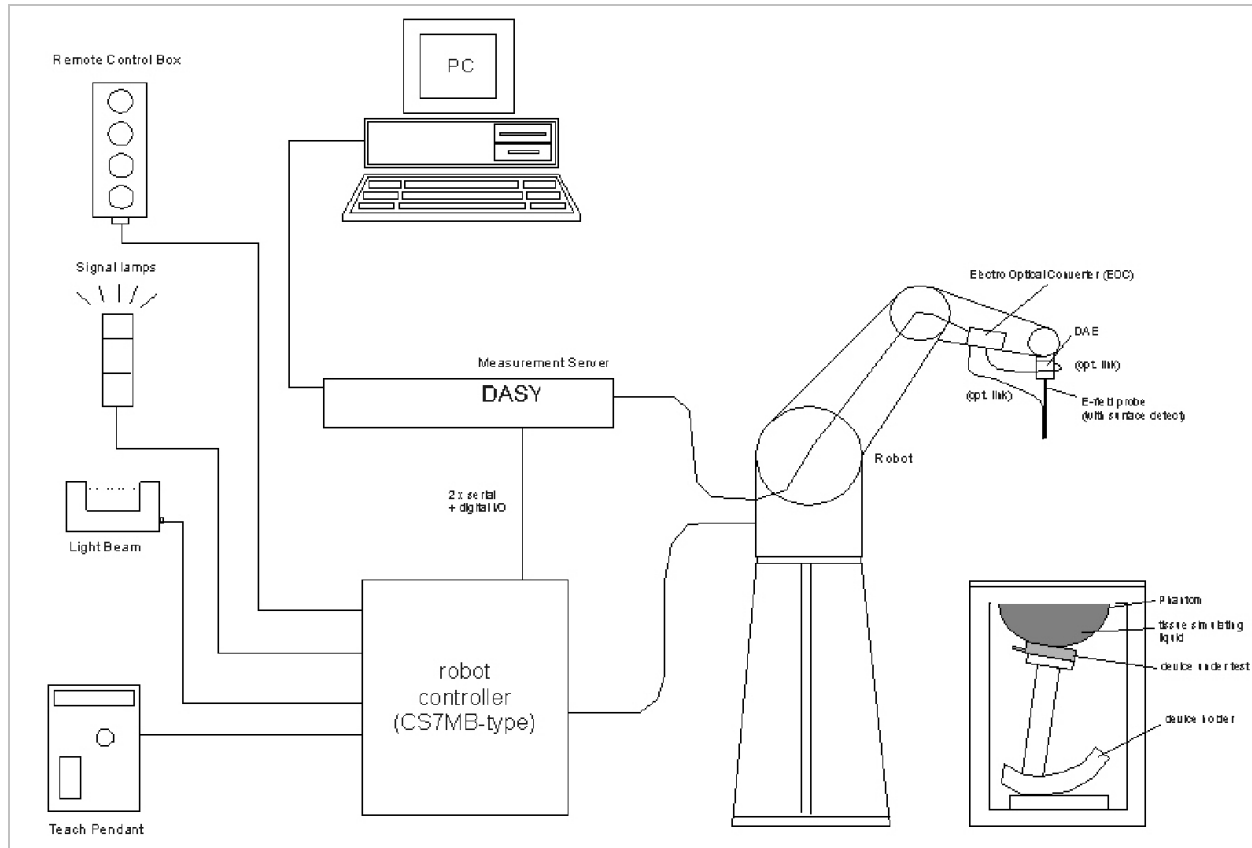
Measurement uncertainty for 300 MHz to 3 GHz averaged over 1 gram

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	-0.46	Normal	1	0.64	-0.29
Liquid Permittivity - deviation from target		Rectangular	1.732	0.6	0.00
Liquid Permittivity - measurement uncertainty	-0.20	Normal	1	0.6	-0.12
Combined Standard Uncertainty U _c (y) =					9.29
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				18.57	%
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				1.48	dB

5. EQUIPMENT UNDER TEST

<p>The Intel® Condor Peak® model 112BNHMW is an 802.11b/g/n 1x2 PCI-e Half Minicard. (Tested inside of SAMSUNG Notebook PC, NP300E4A)</p>							
Normal operation:	Laptop mode (display open at 90° to the keyboard)						
Antenna tested:	<table border="0"> <tr> <td><u>Manufactured</u></td> <td><u>Part number</u></td> <td><u>2.4 Gain</u></td> </tr> <tr> <td>Wistron</td> <td><input checked="" type="checkbox"/> Main 81.EHD15.G43</td> <td>1.93</td> </tr> </table> <p>Note: All SAR testing done on TE main antenna as Aux does not Tx.</p>	<u>Manufactured</u>	<u>Part number</u>	<u>2.4 Gain</u>	Wistron	<input checked="" type="checkbox"/> Main 81.EHD15.G43	1.93
<u>Manufactured</u>	<u>Part number</u>	<u>2.4 Gain</u>					
Wistron	<input checked="" type="checkbox"/> Main 81.EHD15.G43	1.93					
Antenna-to-antenna/user separation distances:	See Section 15 for details of antenna locations and separation distances						
Simultaneous transmission:	WiFi can transmit simultaneously with Bluetooth Broadcom BCM92070MD_REF BT 2.1 (FCC ID : QDS-BRCM1043, IC : 4324A-BRCM1043)						
Assessment for SAR evaluation for Simultaneous transmission:	<p>WiFi and BT</p> <p>The Bluetooth's output power is $\leq 60/f(\text{GHz})$ mW making a stand-alone SAR evaluation not necessary. Thus, a simultaneous transmission SAR evaluation is not required for the WiFi and Bluetooth antenna pair.</p>						

6. SYSTEM SPECIFICATIONS



The DASY 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		900		1800 - 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. SIMULATING LIQUID PARAMETERS

The simulating liquids are 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 were within $\pm 5\%$ of the target values. For frequencies above 2 GHz the measured conductivity was within $\pm 5\%$ of the target values. The measured relative permittivity tolerance was within $\pm 10\%$ of the target value.

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
5800	35.3	5.27	48.2	6

(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 emulsifier. Dielectric parameters of these liquids were measured using an HP 8570C Dielectric Probe Kit in conjunction with an 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.

f (MHz)	Body Tissue		Reference
	rel. permittivity	conductivity	
3000	52.0	2.73	Standard
5100	49.1	5.18	Interpolated
5200	49.0	5.30	Interpolated
5300	48.9	5.42	Interpolated
5400	48.7	5.53	Interpolated
5500	48.6	5.65	Interpolated
5600	48.5	5.77	Interpolated
5700	48.3	5.88	Interpolated
5800	48.2	6.00	Standard

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

8.1. SIMULATING LIQUID CHECK RESULTS

Measured by: David Rodgers

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
8/5/2011	Body 2450	e'	52.5967	Relative Permittivity (ε _r):	52.60	52.70	-0.20	5
		e''	14.2487	Conductivity (σ):	1.94	1.95	-0.46	5

Liquid Check

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

August 05, 2011 08:35 AM

Frequency	e'	e''
2350000000.	52.9286	13.7750
2355000000.	52.9059	13.7960
2360000000.	52.8846	13.8201
2365000000.	52.8553	13.8448
2370000000.	52.8297	13.8693
2375000000.	52.8025	13.8984
2380000000.	52.7775	13.9271
2385000000.	52.7543	13.9560
2390000000.	52.7331	13.9863
2395000000.	52.7140	14.0149
2400000000.	52.7000	14.0461
2405000000.	52.6876	14.0718
2410000000.	52.6746	14.0982
2415000000.	52.6672	14.1187
2420000000.	52.6580	14.1402
2425000000.	52.6494	14.1581
2430000000.	52.6424	14.1786
2435000000.	52.6315	14.1957
2440000000.	52.6220	14.2140
2445000000.	52.6104	14.2324
2450000000.	52.5967	14.2487
2455000000.	52.5794	14.2663
2460000000.	52.5611	14.2873
2465000000.	52.5421	14.3063
2470000000.	52.5198	14.3289
2475000000.	52.4952	14.3519
2480000000.	52.4725	14.3751
2485000000.	52.4469	14.4020
2490000000.	52.4214	14.4291
2495000000.	52.4006	14.4579
2500000000.	52.3765	14.4849

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 accuracy. The system performance check verifies that the system operates within its specifications of $\pm 10\%$.

System Performance Check Measurement Conditions

- The measurements were performed in the flat section of the SAM twin phantom filled with Body simulating liquid of the following parameters.
- The DASY5 system with an Isotropic E-Field Probe EX3DV4-SN: 3773 was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
 For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (2.4 GHz) fine cube was chosen for cube integration and Special 8x8x10 (5 GHz) fine cube was chosen for cube integration
- Distance between probe sensors and phantom surface was set to 3 mm.
 For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input powers (forward power) were 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	D2450V2-706_Apr10	4/19/10	2.4	1g SAR:	51.6	52.4
				10g SAR:	24.4	24.5

9.1. SYSTEM CHECK RESULTS

System validation dipole	Date Tested	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
		Tissue:	Body			
D2450V2	08/05/11	1g SAR:	54.8	52.4	4.58	± 10
		10g SAR:	25.8	24.5	5.31	

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 DASY5 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 $\geq 7 \times 7 \times 9$ (above 4.5 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. 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 enabled the user to control the frequency and output power of the module.

11.1. RF OUTPUT POWER

2.4 GHz Band					
Mode	Ch. #	Freq. (MHz)	Rate	Original Output Pwr (dBm)	Actual Measured Pwr (dBm)
				Chain A (Main)	Chain A (Main)
802.11b	1	2412	1 kbps	16.50	
	6	2437	1 kbps	16.50	16.70
	11	2462	1 kbps	16.30	
802.11g	1	2412	6 kbps	12.20	
	6	2437	6 kbps	16.50	16.60
	11	2462	6 kbps	11.20	
802.11n HT20	1	2412	HT0	11.60	
	6	2437	HT0	16.50	16.70
	11	2462	HT0	10.70	
802.11n HT40	3	2422	HT7	10.50	
	6	2437	HT7	12.10	
	9	2450	HT7	9.50	

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: PD9112BNH) for Average Power information as documented in 06/04/2009 original filing.

12. SAR TEST RESULTS

Lap-held

Mode	Channel	f (MHz)	Antenna	Results (mW/g)	
				1g-SAR	10g-SAR
802.11b	1	2412	Main (A)		
	6	2437	Main (A)	0.0486	0.0259
	11	2462	Main (A)		
802.11g	1	2412	Main (A)		
	6	2437	Main (A)	0.0446	0.0238
	11	2462	Main (A)		
802.11nHT20	1	2412	Main (A)		
	6	2437	Main (A)	0.0565	0.0310
	11	2462	Main (A)		

Bystander at 15 mm separation distance

Mode	Channel	f (MHz)	Antenna	Results (mW/g)	
				1g-SAR	10g-SAR
802.11nHT20	1	2412	Main (A)		
	6	2437	Main (A)	0.1970	0.1050
	11	2462	Main (A)		

Note:

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

13. WORST CASE SAR TEST PLOTS

Date: 8/5/2011

Test Laboratory: UL CCS SAR Lab B

004_Lap held

Communication System: 802.11nHT20; Frequency: 2437 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.926$ mho/m; $\epsilon_r = 52.628$; $\rho = 1000$ 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)

802.11nHT20/Ch 6/Area Scan (151x141x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.078 mW/g

802.11nHT20/Ch 6/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

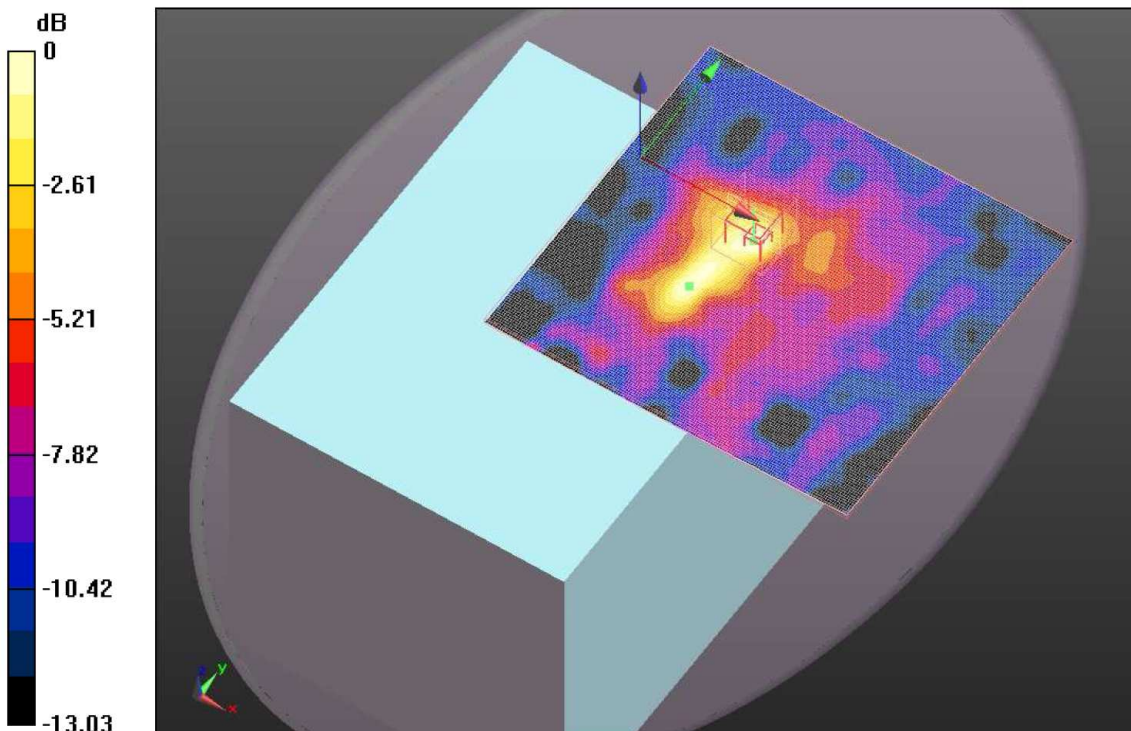
Reference Value = 6.301 V/m; Power Drift = -0.16 dB

Peak SAR (extrapolated) = 0.098 W/kg

SAR(1 g) = 0.056 mW/g; SAR(10 g) = 0.031 mW/g

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

Maximum value of SAR (measured) = 0.070 mW/g



0 dB = 0.070mW/g

Date: 8/5/2011

Test Laboratory: UL CCS SAR Lab B

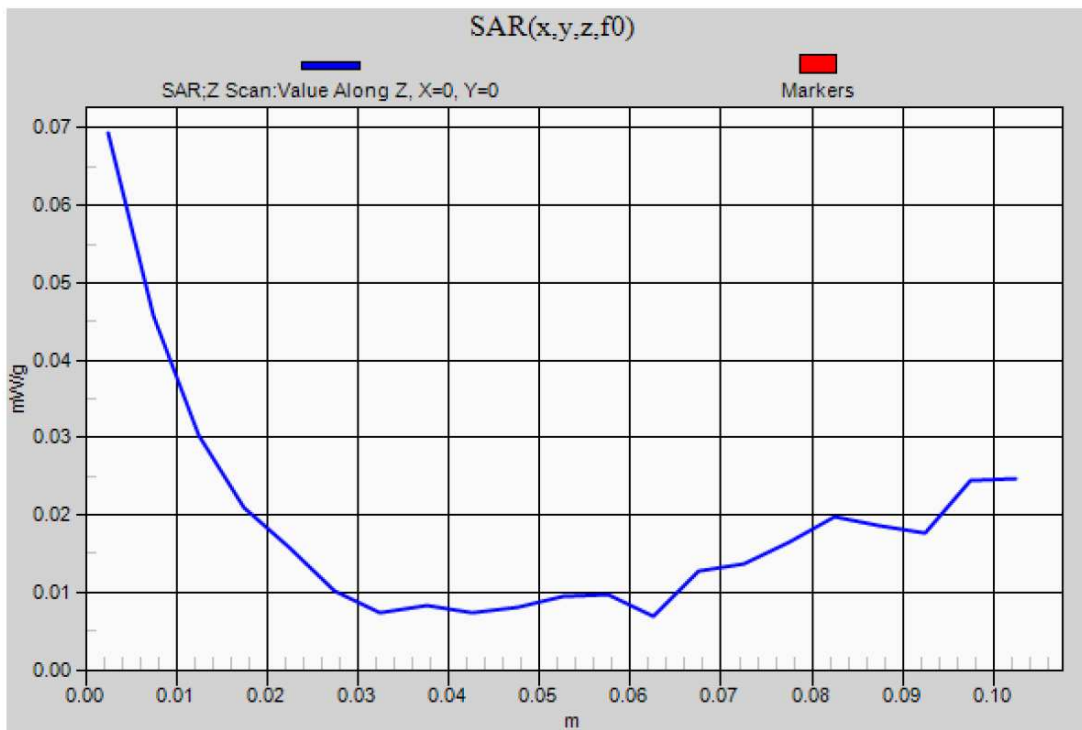
004_Lap held

Communication System: 802.11nHT20; Frequency: 2437 MHz; Duty Cycle: 1:1

802.11nHT20/Ch 6/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

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

Maximum value of SAR (measured) = 0.069 mW/g



Date: 8/5/2011

Test Laboratory: UL CCS SAR Lab B

005_Bystanders

Communication System: 802.11nHT20; Frequency: 2437 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.926$ mho/m; $\epsilon_r = 52.628$; $\rho = 1000$ 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)

802.11nHT20/Ch 6/Area Scan (151x161x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.254 mW/g

802.11nHT20/Ch 6/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

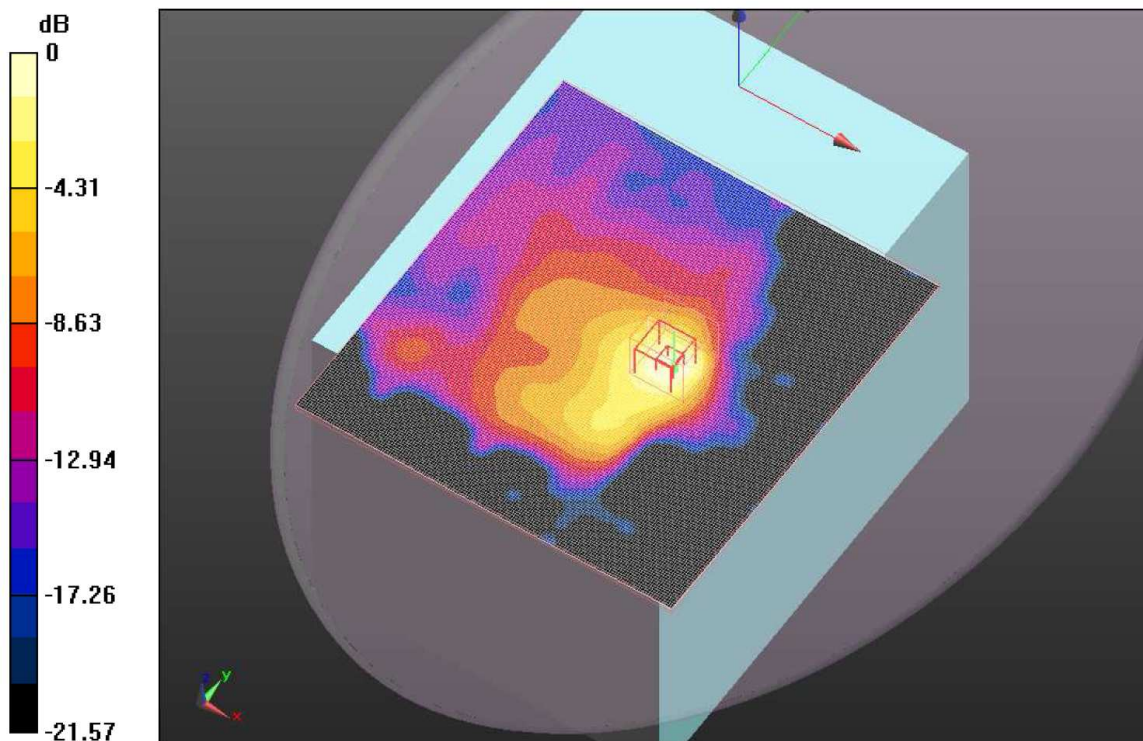
Reference Value = 10.775 V/m; Power Drift = 0.15 dB

Peak SAR (extrapolated) = 0.385 W/kg

SAR(1 g) = 0.197 mW/g; SAR(10 g) = 0.105 mW/g

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

Maximum value of SAR (measured) = 0.267 mW/g



0 dB = 0.270mW/g

Date: 8/5/2011

Test Laboratory: UL CCS SAR Lab B

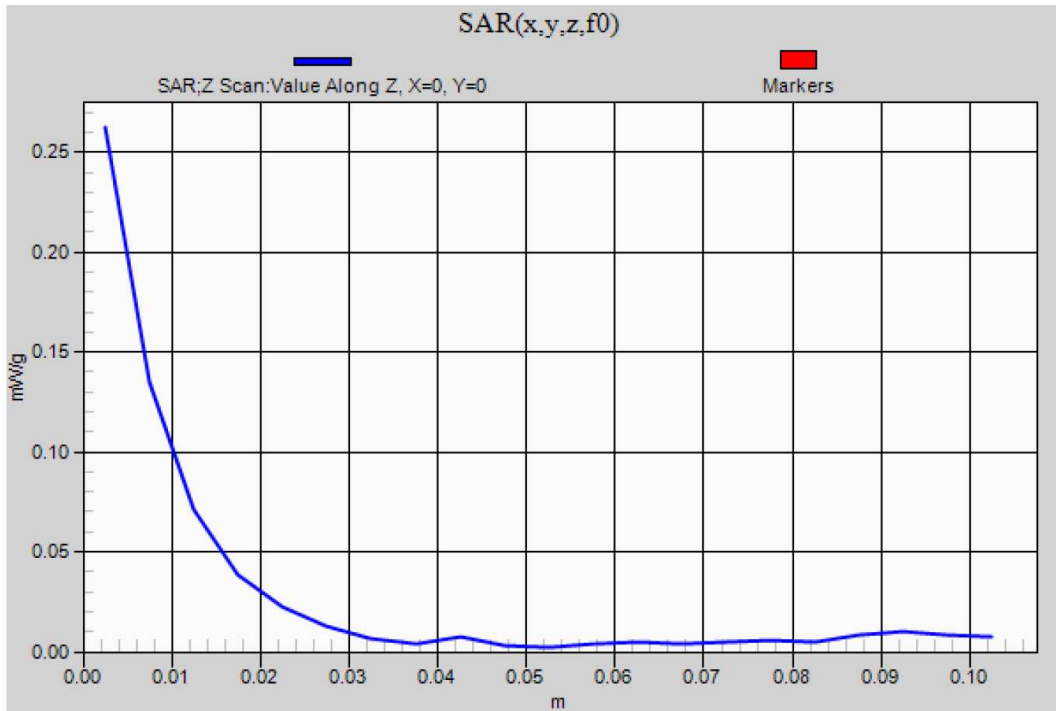
005_Bystanders

Communication System: 802.11nHT20; Frequency: 2437 MHz; Duty Cycle: 1:1

802.11nHT20/Ch 6/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

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

Maximum value of SAR (measured) = 0.262 mW/g



14. APPENDIXES

Refer to separated files for the following appendixes.

- 14.1. Appendix A: System Check Plots**
- 14.2. Appendix B: SAR Test Plots**
- 14.3. Appendix C: Certificate of E-Field Probe - EX3DV3 SN 3773**
- 14.4. Appendix D: Calibration certificate for D2450V2 SN: 706 w/ extended cal. data**