FCC OET BULLETIN 65 SUPPLEMENT C
IEEE STD 1528:2003
RSS-102 Issue 4, March 2010
RSS-102 Supplementary Procedures (SPR)-001, January 1, 2011

SAR EVALUATION REPORT

For
Intel Centrino Wireless-N 1030

MODEL: 130BNHMW & 130BNHU

FCC ID: PD9130BNH & PD9130BNHU
IC: 1000M-130BNH & 1000M-130BNHU

REPORT NUMBER: 11U13738-1A

ISSUE DATE: April 26, 2011

Prepared for

INTEL CORPORATION
2111 N.E. 25TH AVENUE
HILLSBORO, OR 97124, USA

Prepared by

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	April 19, 2011	Initial Issue	--
A	April 26, 2011	Added WiFi and Bluetooth simultaneous transmission statement in section 5	Sunny Shih

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1. ATTESTATION OF TEST RESULTS

Company name:	INTEL CORPORATION 2111 N.E. 25TH AVENUE HILLSBORO, OR 97124, USA		
EUT Description:	Intel Centrino Wireless-N 1030		
Model number:	130BNHMW & 130BNHU		
Device Category:	Portable		
Exposure category:	General Population/Uncontrolled Exposure		
Date of tested:	April 4 and 19, 2011		
FCC / IC Rule Parts	Freq. Range [MHz]	The Highest 1g SAR	Limit (W/kg)
15.247 / RSS-102	2412 - 2462	0.355 W/kg (Antenna Horizontal Down)	1.6
The most conservative antenna-to-user separation distances used during the test:		0.8 cm (refer to setup diagram in section 6.1 & 6.2)	
Applicable Standards			Test Results
FCC OET Bulletin 65 Supplement C Edition 01-01, IEEE STD 1528, RSS-102 Issue 4, March 2010 and RSS-102 Supplementary Procedures (SPR)-001, January 1, 2011			Pass

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.

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)	Devin Chang EMC 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 01-01, IEEE STD 1528-2003 RSS-102 Issue 4, March 2010, RSS-102 Supplementary Procedures (SPR)-001, January 1, 2011 and the following specific FCC Test Procedures.

- KDB 248227 SAR measurement procedures for 802.11a/b/g transmitters
- KDB 616217 Appendix Configuring Conservative SAR Test Conditions

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	TX90	C01209	N/A		
Robot Remote Control	Stäubli	CS8C	N/A	N/A		
DASY5 Measurement Server	SPEAG	SEUMS014AA	1064	N/A		
Probe Alignment Unit	SPEAG	LB5 / 80	N/A	N/A		
SAM Phantom	SPEAG	QP 000 P40 CC	1602	N/A		
Oval Flat Phantom (ELI 4.0)	SPEAG	QD OVA001 BB	1099	N/A		
Dielectronic Probe kit	HP	85070C	N/A	N/A		
ESA Series Network Analyzer	Agilent	E5071B	MY42100131	8	2	2011
Synthesized Signal Generator	HP	83732B	US34490599	7	14	2012
E-Field Probe	SPEAG	EX3DV3	3686	1	24	2012
Thermometer	ERTCO	639-1S	1718	7	19	2011
Data Acquisition Electronics	SPEAG	DAE3 V4	1239	11	17	2011
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 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) @ 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	1.51	Normal	1	0.64	0.97
Liquid Permittivity - deviation from target	5.00	Rectangular	1.732	0.6	1.73
Liquid Permittivity - measurement	-2.83	Normal	1	0.6	-1.70
Combined Standard Uncertainty Uc(y) =					9.64
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				19.28	%
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				1.53	dB

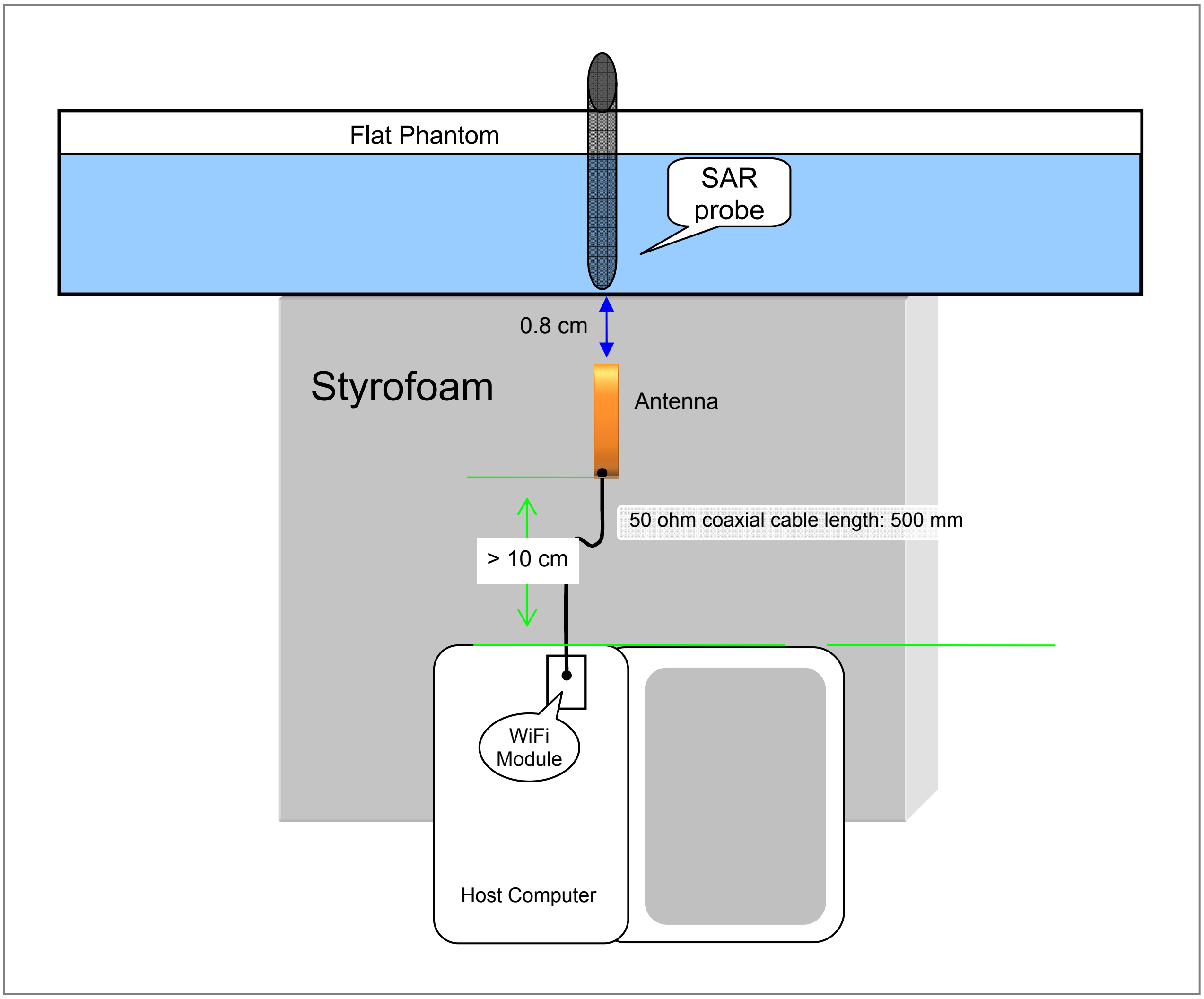
5. EQUIPMENT UNDER TEST

Intel Centrino Wireless-N 1030	
Antenna tested:	<u>Manufactured</u>: Shanghai Universe <u>Part number</u>: IntelWiMax/WLAN Reference Antenna
The most conservative antenna-to-user separation distances used during the test:	0.8 cm from antenna-to-user (refer to setup diagram in section 6.1 and 6.2)
Antenna-to-antenna physical separation distances used during the test with Vertical placement:	Only one antenna provided.
Antenna-to-antenna physical separation distances used during the test with Horizontal placement:	Only one antenna provided.
The most conservative physical separation distance between Main/Aux antennas to avoid SAR distribution overlap:	Only one antenna provided.
Simultaneous transmission:	**WiFi vs Bluetooth** WiFi (chain A) can transmit simultaneously with Bluetooth (Chain B)
Assessment for SAR evaluation for Simultaneous transmission:	Due to Bluetooth's maximum output is 5.5 mW <60/f(GHz) and stand-alone SAR is not required, thus simultaneous transmission evaluation is not required.

6. ANTENNA LOCATIONS AND SEPARATION DISTANCES

6.1. ANTENNA POSITIONED VERTICALLY

Setup diagram



Test setup: The WiFi module is installed in a host laptop computer during the tests. Test software exercised the radio card.
Test software: DRTU, Version 1.2.12-0197

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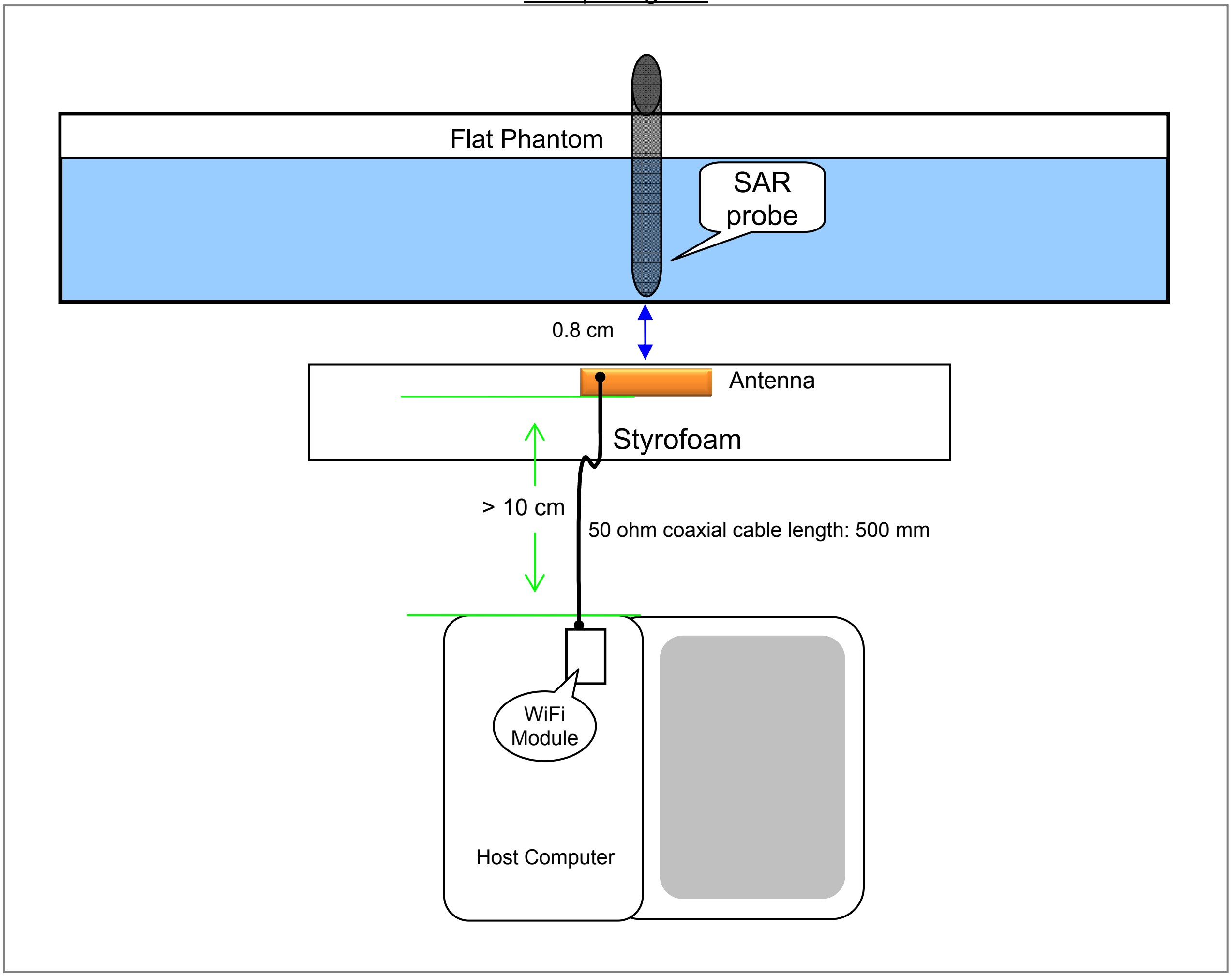
6.2. ANTENNA POSITIONED HORIZONTALLY

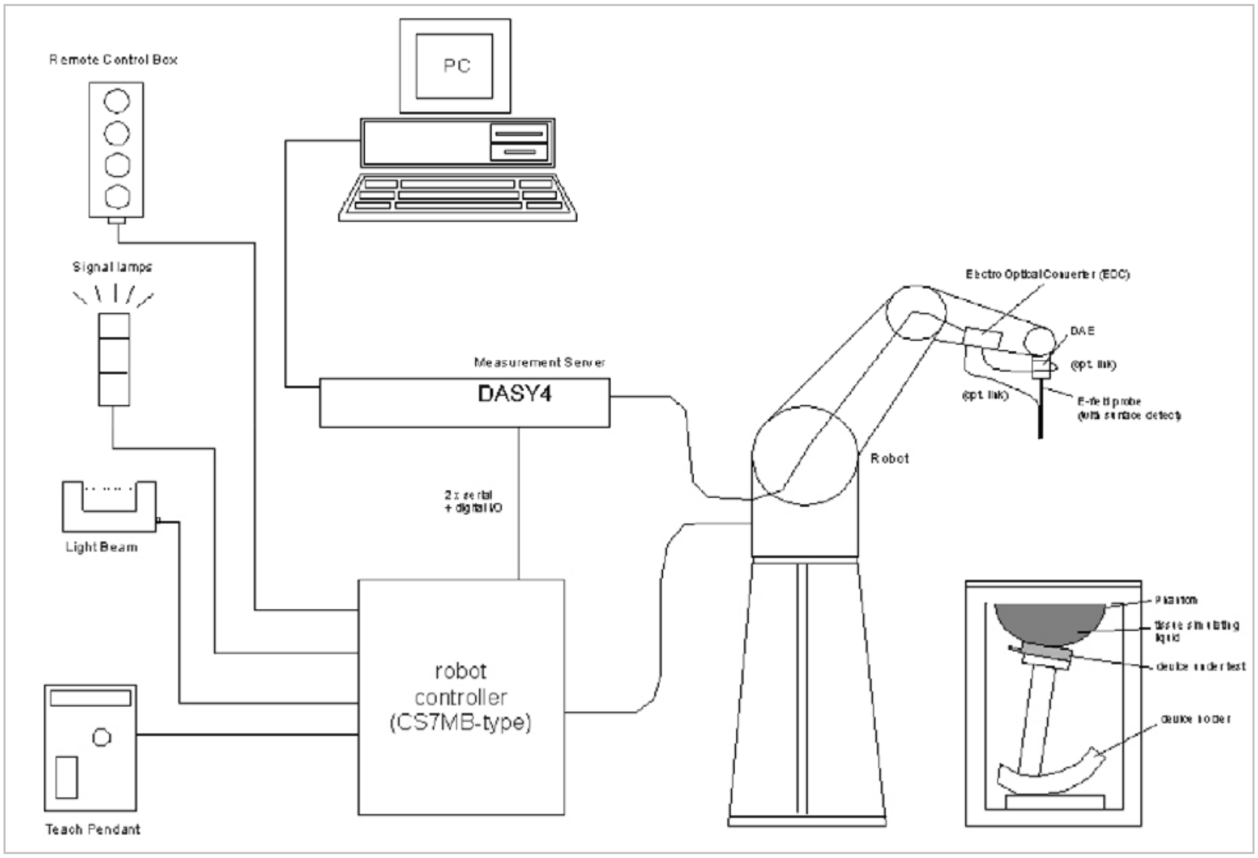
Setup diagram



Test setup: The WiFi module is installed in a host laptop computer during the tests. Test software exercised the radio card.

Test software: DRTU, Version 1.2.12-0197

7. SYSTEM SPECIFICATIONS



The DASY4 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Stäubli RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 2000 or Windows XP.
- DASY4 software.
- Remote controls with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing validating the proper functioning of the system.

8. 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

9. TISSUE DIELECTRIC PARAMETERS

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine of the dielectric parameters are within the tolerances of the specified target values. For frequencies in 300 MHz to 2 GHz, the measured conductivity and relative permittivity should be within ± 5% of the target values. For frequencies in the range of 2–3 GHz and above the measured conductivity should be within ± 5% of the target values. The measured relative permittivity tolerance can be relaxed to no more than ± 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
5800	35.3	5.27	48.2	6

(ε_r = relative permittivity, σ = conductivity and ρ = 1000 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 suing 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 ±5% for the whole 5 to 5.8 GHz range.

f (MHz)	Body Tissue		Reference
	rel. permitivity	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 ρ = 1000 kg/m^3)

9.1. TISSUE PARAMETERS CHECK RESULTS

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
4/4/2011	Body 2450	e'	51.2108	Relative Permittivity (ϵ_r):	51.21	52.70	-2.83	5
		e"	14.5299	Conductivity (σ):	1.98	1.95	1.51	5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 37%
April 04, 2011 10:03 AM

Frequency	e'	e"
2410000000.	51.3530	14.3670
2415000000.	51.3369	14.3891
2420000000.	51.3185	14.4105
2425000000.	51.3010	14.4298
2430000000.	51.2842	14.4506
2435000000.	51.2648	14.4718
2440000000.	51.2482	14.4933
2445000000.	51.2300	14.5118
2450000000.	**51.2108**	**14.5299**
2455000000.	51.1923	14.5472
2460000000.	51.1710	14.5669
2465000000.	51.1516	14.5861
2470000000.	51.1319	14.6056
2475000000.	51.1099	14.6243
2480000000.	51.0933	14.6419
2485000000.	51.0747	14.6592

The conductivity (σ) can be given as:

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

where f = target $f * 10^6$

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

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
4/192011	Body 2450	e'	51.5817	Relative Permittivity (ϵ_r):	51.58	52.70	-2.12	5
		e''	14.4965	Conductivity (σ):	1.97	1.95	1.27	5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 41%
April 19, 2011 09:52 AM

Frequency	e'	e''
2410000000.	51.7152	14.3421
2415000000.	51.6965	14.3622
2420000000.	51.6850	14.3828
2425000000.	51.6671	14.4033
2430000000.	51.6503	14.4231
2435000000.	51.6342	14.4434
2440000000.	51.6180	14.4600
2445000000.	51.5983	14.4785
2450000000.	**51.5817**	**14.4965**
2455000000.	51.5631	14.5132
2460000000.	51.5464	14.5317
2465000000.	51.5266	14.5484
2470000000.	51.5079	14.5686
2475000000.	51.4906	14.5833
2480000000.	51.4676	14.6036
2485000000.	51.4515	14.6224

The conductivity (σ) can be given as:

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

where f = target $f * 10^6$

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

10. SYSTEM 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 ±10%.

System Performance Check Measurement Conditions

- The measurements were performed in the flat section of the SAM twin phantom filled with Body simulating liquid of the following parameters.
- The DASY4 system with an Isotropic E-Field Probe EX3DV3-SN: 3531 was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
  For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (2.4 GHz) fine cube was chosen for cube integration and Special 8x8x10 (5 GHz) fine cube was chosen for cube integration
- Distance between probe sensors and phantom surface was set to 3 mm.
  For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.5 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	SAR Avg (mW/g)		
			Tissue:	Head	Body
D2450V2	D2450V2-706_Apr10	04/19/10	1g SAR:	51.6	52.4
			10g SAR:	24.4	24.5

10.1. SYSTEM CHECK RESULTS

System validation dipole	Date Tested	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
		Tissue:	Body			
D2450V2	04/04/11	1g SAR:	53.0	52.4	1.15	±10
		10g SAR:	24.3	24.5	-0.82	
D2450V2	04/19/11	1g SAR:	52.8	52.4	0.76	±10
		10g SAR:	24.4	24.5	-0.41	

11. 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 ≥ 7 x 7 x 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.

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12. OUTPUT POWER VERIFICATION

Measurement Results

2.4 GHz Band

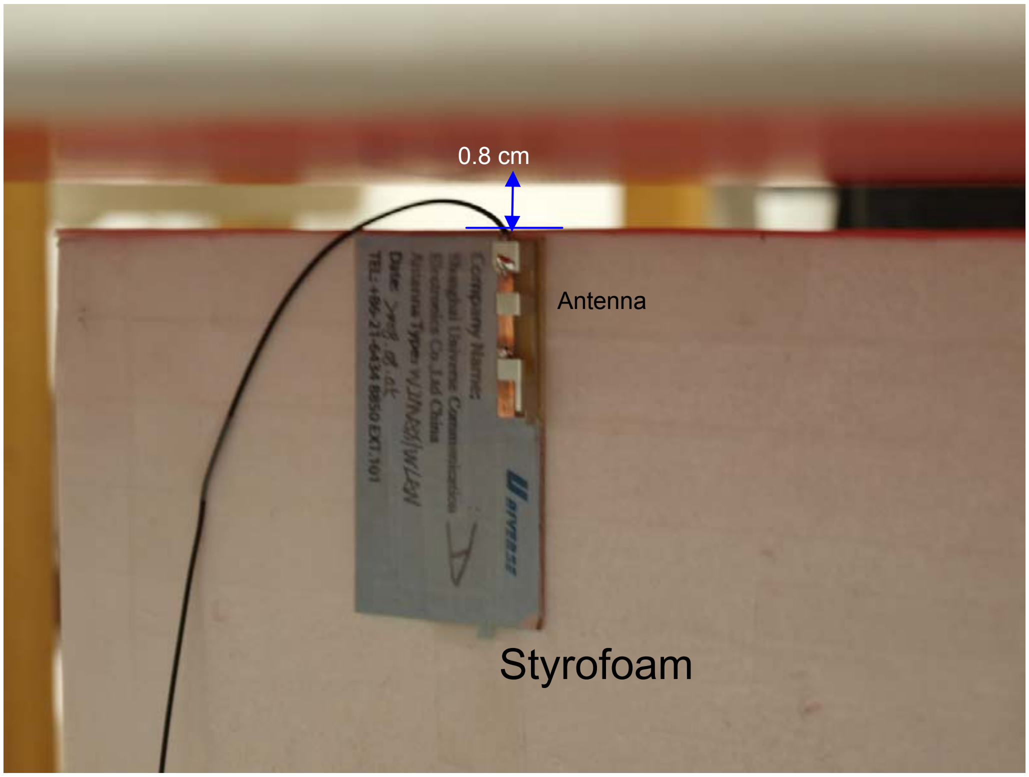
Mode	Ch. #	Freq. (MHz)	Target Pwr form EMC report (dBm)	Actual Measured Pwr (dBm)
802.11b	1	2412	16.8	
	6	2437	16.8	16.8
	11	2462	16.8	
802.11g	1	2412	16.7	
	6	2437	16.7	
	11	2462	14.1	
802.11n HT20	1	2412	14.2	
	6	2437	16.7	
	11	2462	13.8	
802.11n HT40	3	2422	12.2	
	6	2437	14.7	
	9	2450	12.3	

Note(s):

1. SAR tested on the highest output power channel.
2. According to KDB 248227, SAR is not required for 802.11g/HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels.

13. SUMMARY OF SAR TEST RESULTS

13.1. Antenna Vertical Up

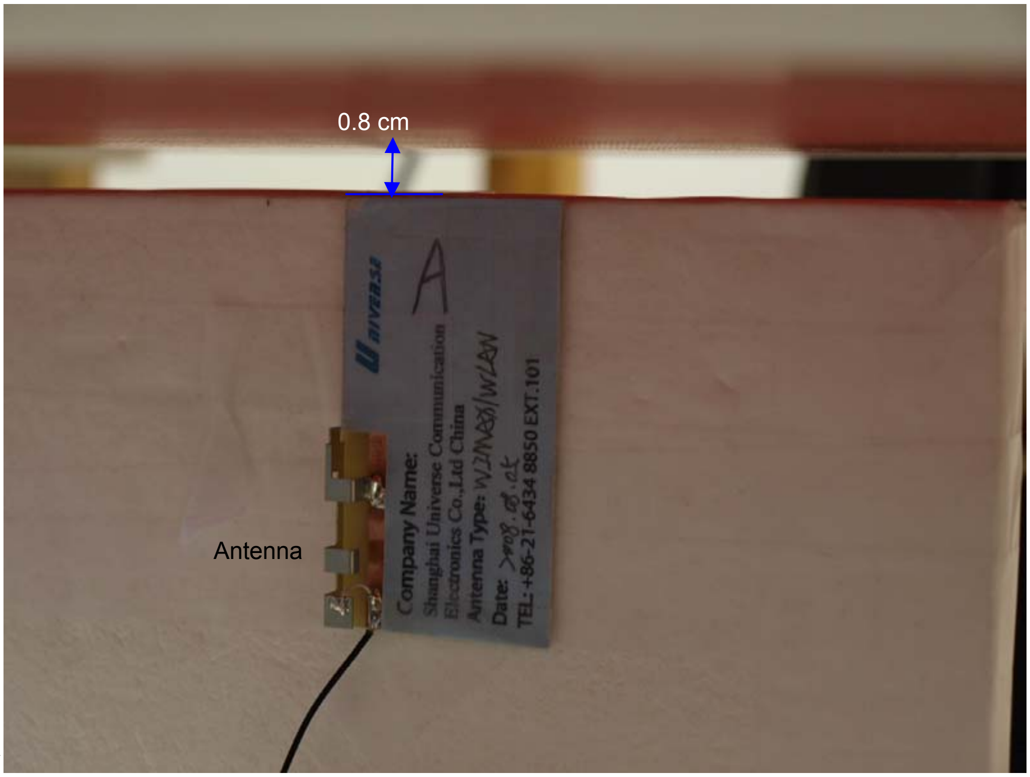


Test result

Mode	Channel	f (MHz)	Avg Pwr	Results (mW/g)	
			(dBm)	1g-SAR	10g-SAR
802.11b (1x1)	1	2412	16.8		
	6	2437	16.8	0.092	0.044
	11	2462	16.8		

Notes:
1. SAR tested on the highest output power channel.
2. This module is not capable of single antnena transmitting mode in either b/g/H20/H40
3. According to KDB 248227. SAR is not required for 802.11g/HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels.

13.2. Antenna Vertical Down



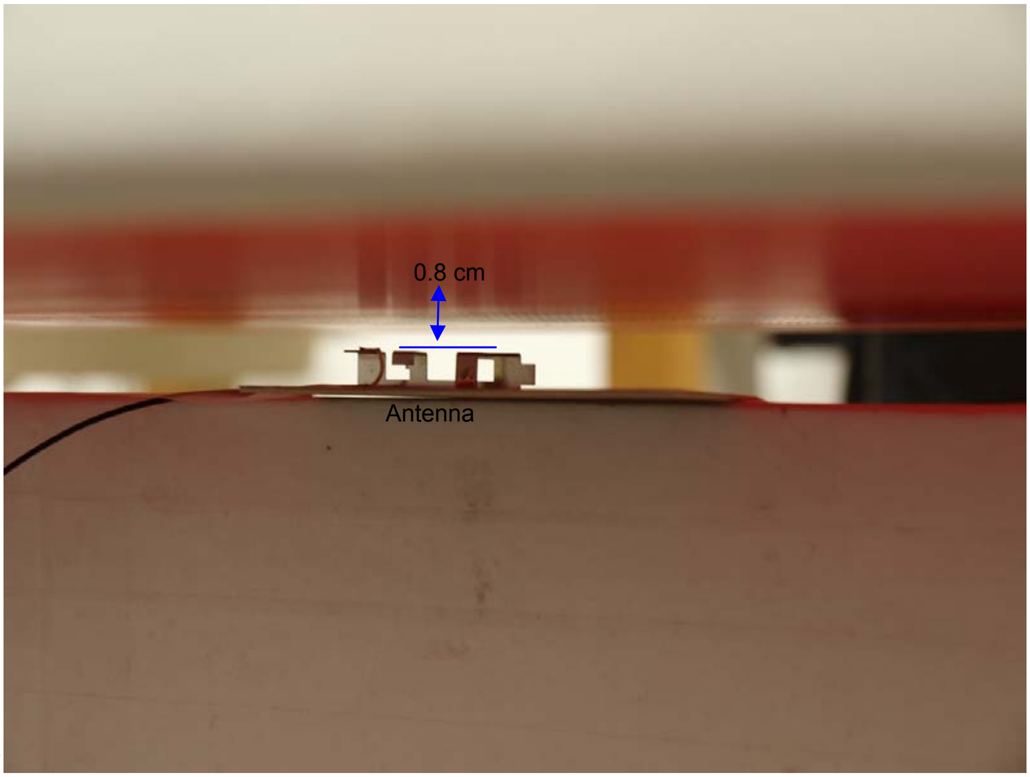
Test result

Mode	Channel	f (MHz)	Avg Pwr (dBm)	Results (mW/g) 1g-SAR	Results (mW/g) 10g-SAR
802.11b (1x1)	1	2412	16.8		
	6	2437	16.8	0.0946	0.0507
	11	2462	16.8		

Notes:

1. SAR tested on the highest output power channel.
2. This module is not capable of single antnena transmitting mode in either b/g/H20/H40
3. According to KDB 248227. SAR is not required for 802.11g/HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels.

13.3. Antenna Horizontal Up



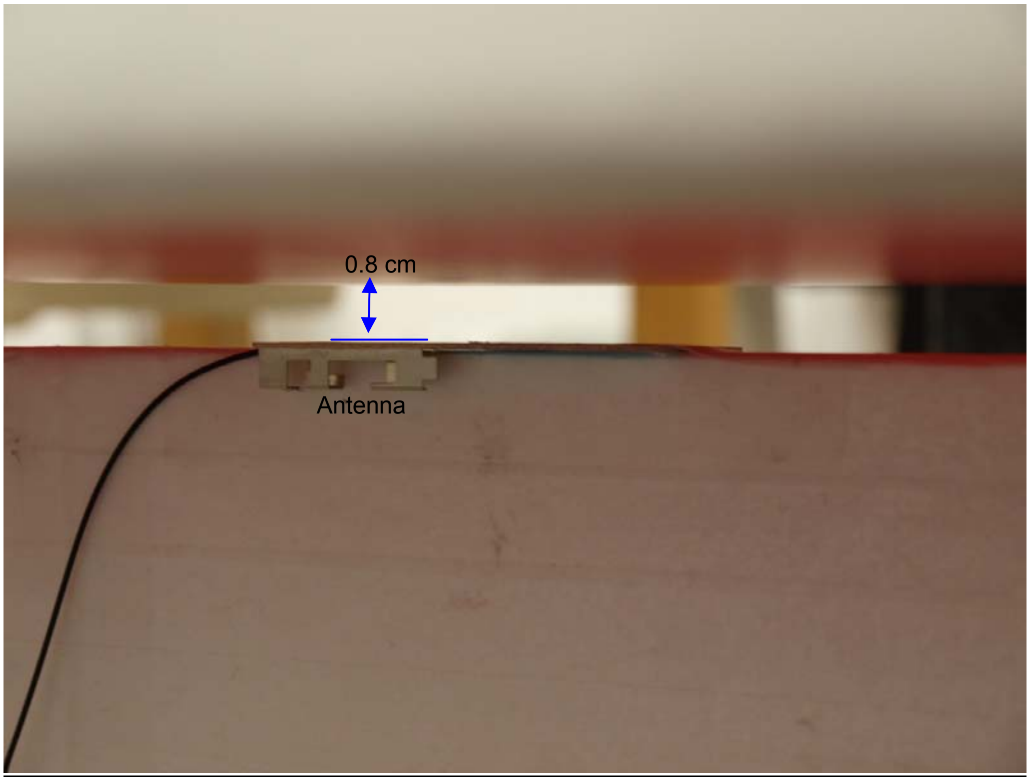
Test result

Mode	Channel	f (MHz)	Avg Pwr (dBm)	Results (mW/g) 1g-SAR	10g-SAR
802.11b (1x1)	1	2412	16.8		
	6	2437	16.8	0.252	0.135
	11	2462	16.8		

Notes:

1. SAR tested on the highest output power channel.
2. This module is not capable of single antnena transmitting mode in either b/g/H20/H40
3. According to KDB 248227. SAR is not required for 802.11g/HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels.

13.4. Antenna Horizontal Down (Worst-case)



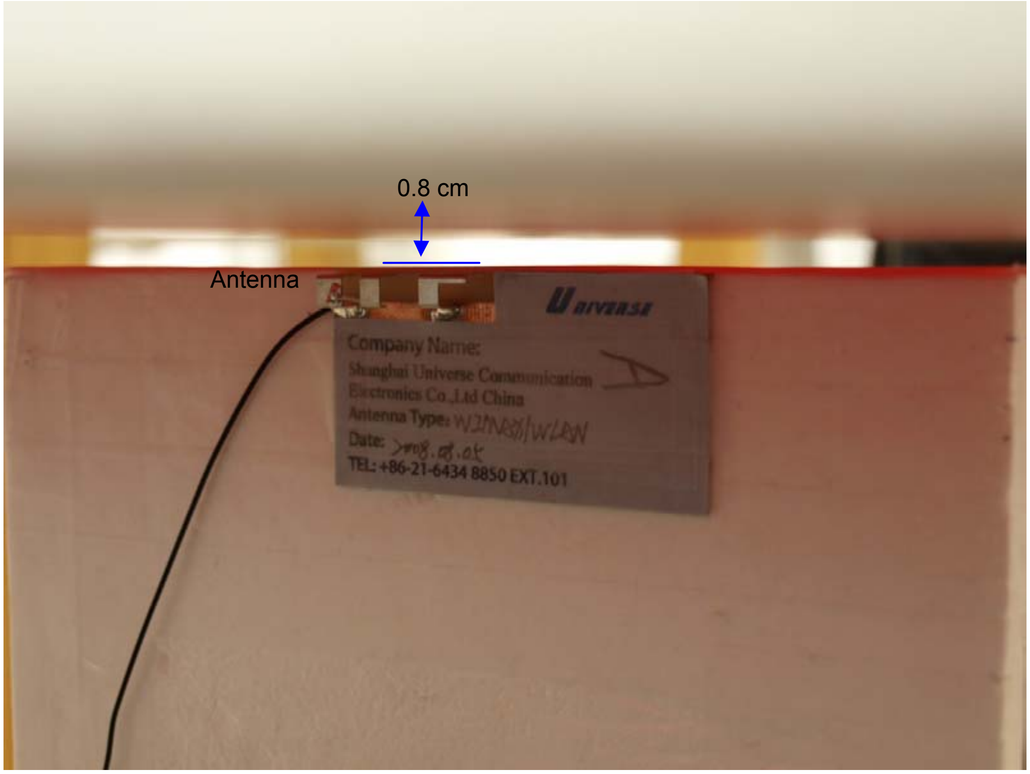
Test result

Mode	Channel	f (MHz)	Avg Pwr (dBm)	Results (mW/g) 1g-SAR	10g-SAR
802.11b (1x1)	1	2412	16.8		
	6	2437	16.8	**0.355**	0.187
	11	2462	16.8		

Notes:

1. SAR tested on the highest output power channel.
2. This module is not capable of single antnena transmitting mode in either b/g/H20/H40
3. According to KDB 248227. SAR is not required for 802.11g/HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels.

13.5. Antenna Horizontal Front



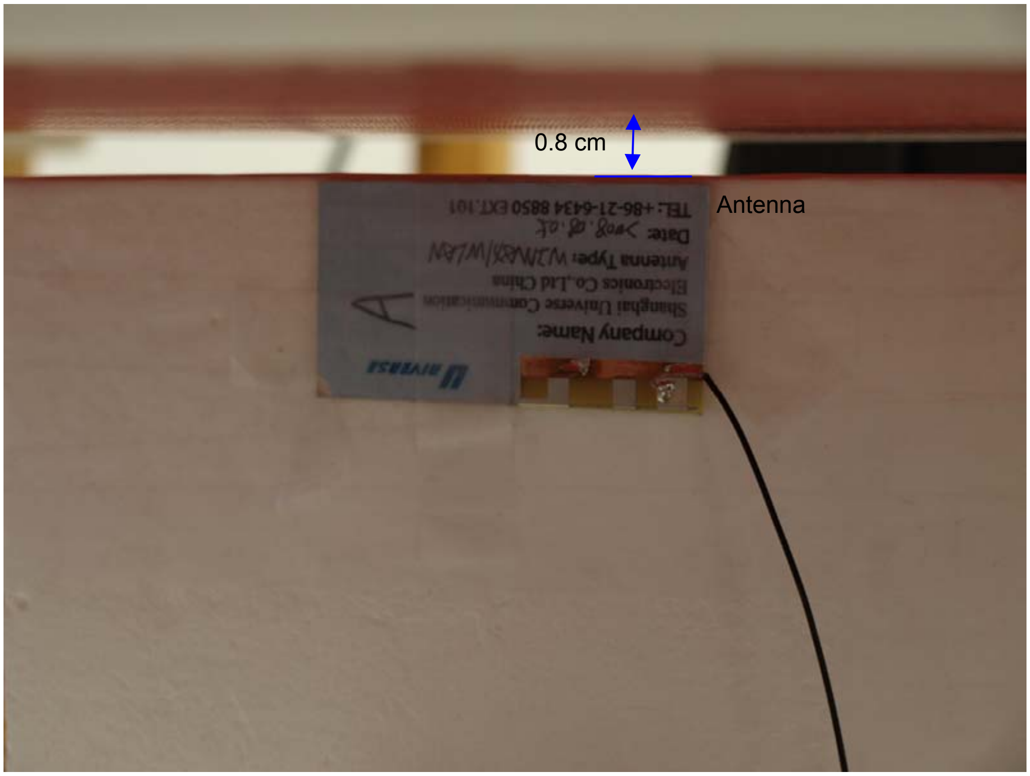
Test result

Mode	Channel	f (MHz)	Avg Pwr (dBm)	Results (mW/g)	
				1g-SAR	10g-SAR
802.11b (1x1)	1	2412	16.8		
	6	2437	16.8	0.098	0.053
	11	2462	16.8		

Notes:

1. SAR tested on the highest output power channel.
2. This module is not capable of single antnena transmitting mode in either b/g/H20/H40
3. According to KDB 248227. SAR is not required for 802.11g/HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels.

13.6. Antenna Horizontal Back



Test result

Mode	Channel	f (MHz)	Avg Pwr (dBm)	Results (mW/g) 1g-SAR	Results (mW/g) 10g-SAR
802.11b (1x1)	1	2412	16.8		
	6	2437	16.8	0.056	0.031
	11	2462	16.8		

Notes:
1. SAR tested on the highest output power channel.
2. This module is not capable of single antnena transmitting mode in either b/g/H20/H40
3. According to KDB 248227. SAR is not required for 802.11g/HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels.

14. WORST CASE SAR TEST PLOTS

Date/Time: 4/4/2011 2:11:41 PM

Test Laboratory: UL CCS

Antenna Horizonta Down

DUT: Intel; Type: NA; Serial: NA

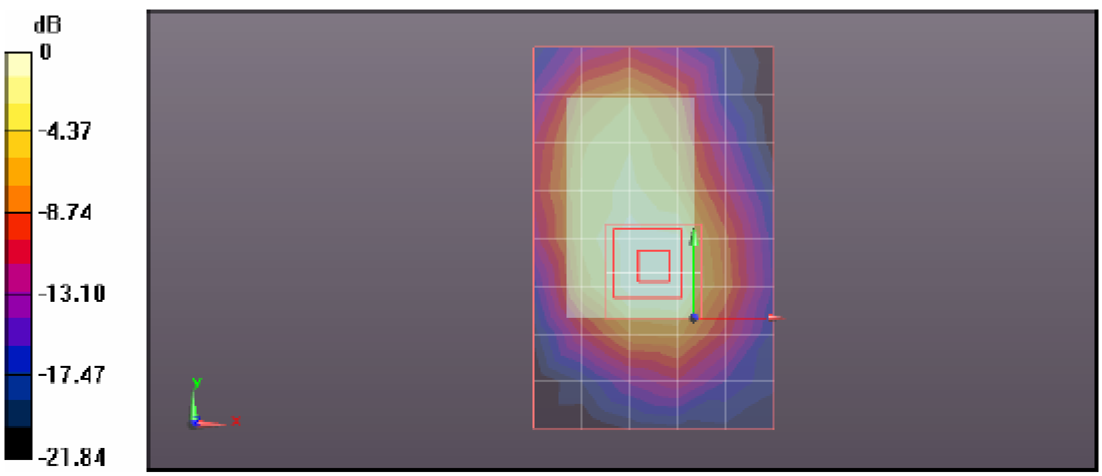
Communication System: 802.11b/g 2.4GHz; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.963 mho/m; ε_r = 51.258; ρ = 1000 kg/m^3
Phantom section: Flat Section

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)

802.11b/M-ch_8mm/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.356 mW/g

802.11b/M-ch_8mm/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 13.238 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 0.636 W/kg
SAR(1 g) = 0.355 mW/g; SAR(10 g) = 0.187 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.393 mW/g



0 dB = 0.390mW/g

COMPLIANCE CERTIFICATION SERVICES (UL CCS)
FORM NO: CCSUP4031B
47173 BENICIA STREET, FREMONT, CA 94538, USA
TEL: (510) 771-1000 FAX: (510) 661-0888

Date/Time: 4/4/2011 2:27:17 PM

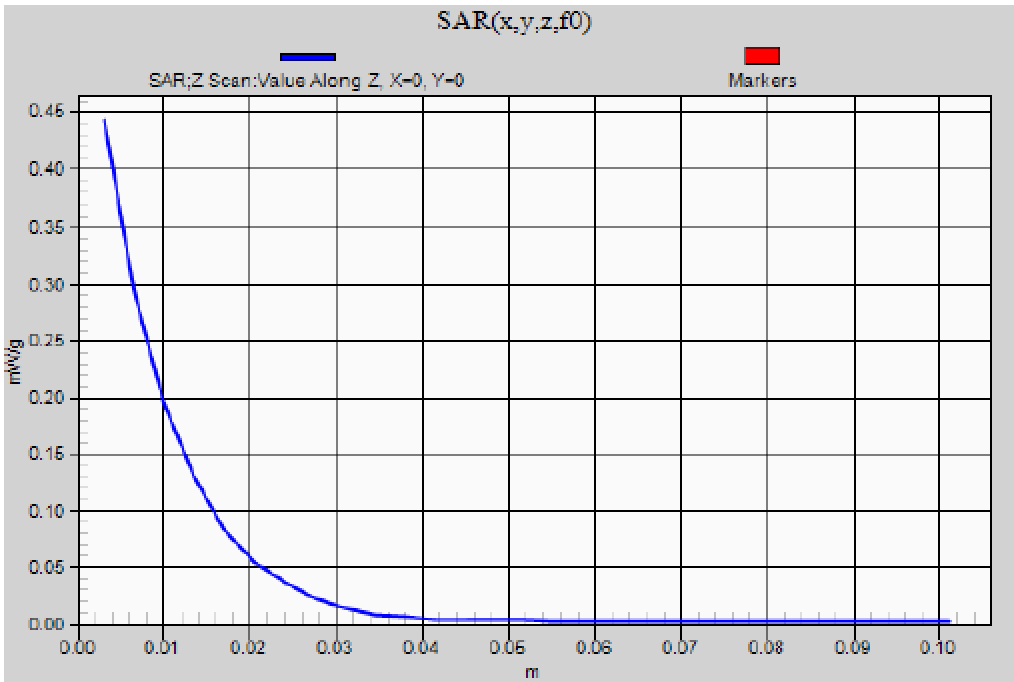
Test Laboratory: UL CCS

Antenna Horizonta Down

DUT: Intel; Type: NA; Serial: NA

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

802.11b/M-ch_8mm/Z Scan (1x1x29): Measurement grid: dx=20mm, dy=20mm, dz=3.5mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.443 mW/g



15. ENHANCED ENERGY COUPLING

According to KDB 616217 in referencing to KDB 447498, the test configuration with the highest 1-g SAR must be used to determine if additional SAR evaluation is required due to enhanced energy coupling at increased separation distances.

From the test results below, additional 1-g SAR evaluation is not required.

Worst-case test configuration	Band	Antenna-to-person distance (cm)		Peak SAR (mW/g)	E-field (V/m)	Lower than Initial (%)
Vertical Up	2.4 GHz	Initial	0.8	0.092	7.17	
		1	1	0.07	6.30	77.0%
		2	1.5	0.04	4.83	45.4%
Vertical Down	2.4 GHz	Initial	0.8	0.095	7.61	
		1	1	0.07	6.54	73.8%
		2	1.5	0.04	4.86	40.7%
Horizontal Up	2.4 GHz	Initial	0.8	0.252	12.61	
		1	1	0.20	11.25	79.6%
		2	1.5	0.11	8.26	42.9%
Horizontal Down	2.4 GHz	Initial	0.8	0.355	13.24	
		1	1	0.26	11.41	74.3%
		2	1.5	0.14	8.33	39.6%
Horizontal Front	2.4 GHz	Initial	0.8	0.098	7.75	
		1	1	0.07	6.66	73.8%
		2	1.5	0.04	5.04	42.3%
Horizontal Back	2.4 GHz	Initial	0.8	0.056	5.83	
		1	1	0.05	5.58	91.8%
		2	1.5	0.03	4.50	59.6%
		3	2	0.02	3.73	41.0%

16. ATTACHMENTS

No.	Contents	No. of page (s)
1	System Check Plots	4
2	SAR Test Plots for 2.4 GHz band	7
3	Certificate of E-Field Probe - EX3DV3 SN 3686	11
4	Certificate of System Validation Dipole - D2450 SN:706	9

17. EUT PHOTOS

Front side

Back side

PIFA Antenna

50 ohm coaxial cable length: 500 mm

END OF REPORT