FCC OET BULLETIN 65 SUPPLEMENT C
IEEE STD 1528:2003
IC RSS-102 ISSUE 4

SAR EVALUATION REPORT

For
AR5B125:802.11bgn 1x1

MODEL: AR5B125

FCC ID: PPD-AR5B125
IC: 4104A-AR5B125

REPORT NUMBER: 10U13575-1

ISSUE DATE: March 4, 2011

Prepared for

ATHEROS COMMUNICATIONS, INC.
1700 TECHNOLOGY DR
SAN JOSE, CA 95110

Prepared by

COMPLIANCE CERTIFICATION SERVICES (UL CCS)
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	March 4, 2011	Initial Issue	--

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1. ATTESTATION OF TEST RESULTS

Tested for:	ATHEROS COMMUNICATIONS, INC. 1700 TECHNOLOGY DR SAN JOSE, CA 95110		
EUT description:	AR5B125: 802.11bgn 1x1		
Model number:	AR5B125		
Device category:	Portable		
Exposure category:	General Population/Uncontrolled Exposure		
Date tested:	March 1, 2011		
FCC / IC Rule Parts	Freq. Range [MHz]	The Highest 1g SAR mW/g	Limit (mW/g)
15.247 / RSS-102	2412 - 2462	0.377 (Antenna Horizontal Back)	1.6
The most conservative antenna-to-user separation distances used during the test:		2 cm (refer to setup diagram in section 6.1and 6.2)	
Applicable Standards			Test Results
FCC OET Bulletin 65 Supplement C 01-01, IEEE STD 1528: 2003, IC RSS 102 Issue 4			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:

Sunny Shih
Engineering Team Leader
Compliance Certification Services (UL CCS)

Tested By:

Devin Chang
EMC Engineer
Compliance Certification Services (UL CCS)

2. TEST METHODOLOGY

FCC OET Bulletin 65 Supplement C 01-01, IEEE STD 1528-2003 and the following specific FCC test procedures:

- KDB 248227 SAR measurement procedures for 802.11a/b/g transmitters
- KDB 616217 D03 SAR Supplemental consideration for Notebook/Netbook/Laptop and Tablet

3. FACILITIES AND ACCREDITATION

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

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

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due date		
				MM	DD	Year
Robot - Six Axes	Stäubli	RX90BL	N/A	N/A		
Robot Remote Control	Stäubli	CS7MB	3403-91535	N/A		
DASY4 Measurement Server	SPEAG	SEUMS001BA	1041	N/A		
Probe Alignment Unit	SPEAG	LB (V2)	261	N/A		
SAM Phantom (SAM1)	SPEAG	QD000P40CA	1185	N/A		
SAM Phantom (SAM2)	SPEAG	QD000P40CA	1050	N/A		
Oval Flat Phantom (ELI 4.0)	SPEAG	QD OVA001 B	1003	N/A		
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	EX3DV4	3749	11	13	2011
Thermometer	ERTCO	639-1S	1718	7	19	2011
Data Acquisition Electronics	SPEAG	DAE3 V1	427	7	21	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
4. Impedance is within 5Ω of calibrated measurement

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	0.72	Normal	1	0.64	0.46
Liquid Permittivity - deviation from target	5.00	Rectangular	1.732	0.6	1.73
Liquid Permittivity - measurement	-1.59	Normal	1	0.6	-0.95
				Combined Standard Uncertainty Uc(y) =	9.50
				Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence = 19.00 %	
				Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence = 1.51 dB	

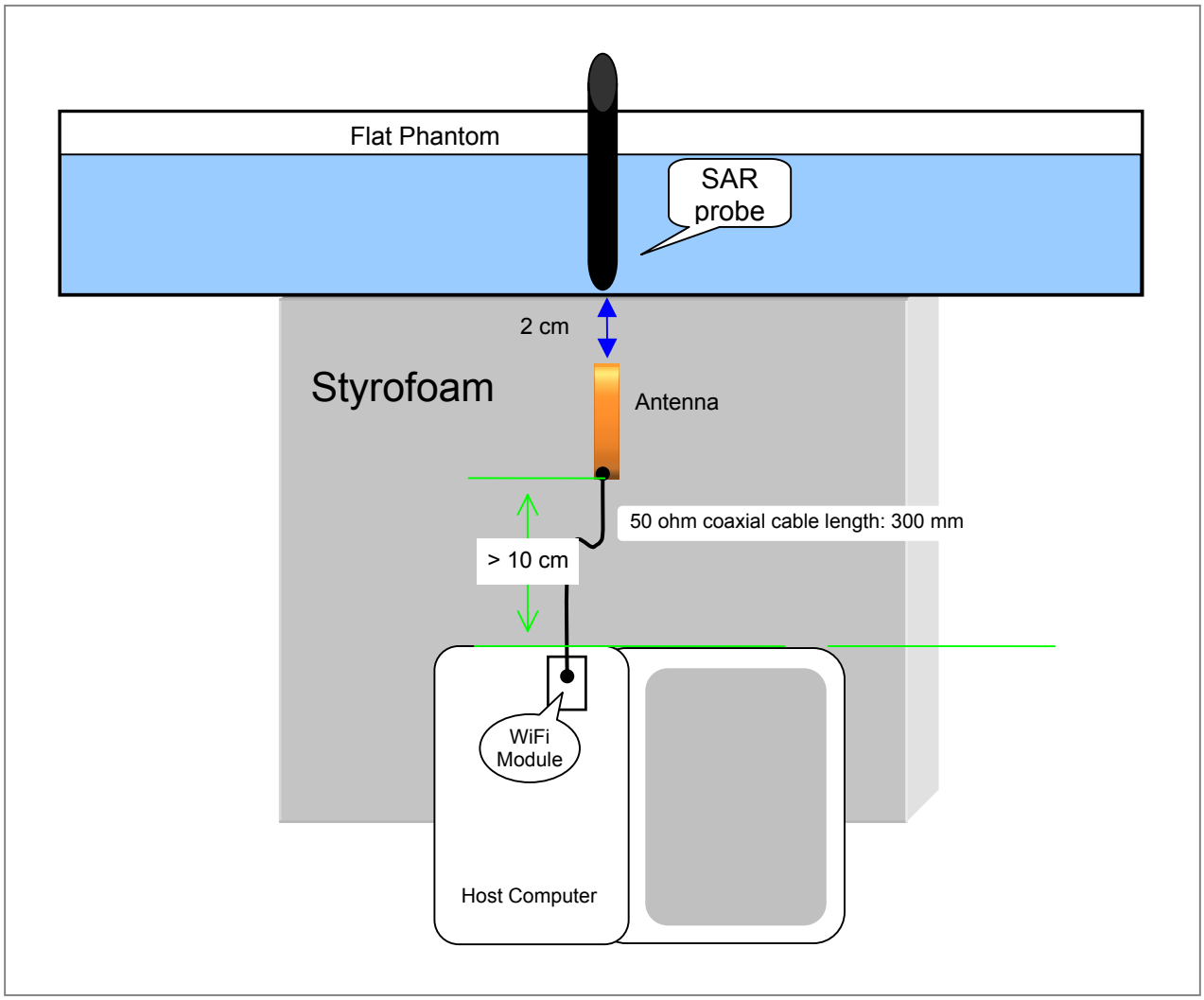
5. EQUIPMENT UNDER TEST

AR5B125: 802.11bgn 1x1	
Antenna tested:	Manufactured: Wistron; Part number: 81.EBJ15.005
The most conservative antenna-to-user separation distances used during the test:	2.0 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.

6. ANTENNA LOCATIONS AND SEPARATION DISTANCES

6.1. ANTENNA POSITIONED VERTICALLY

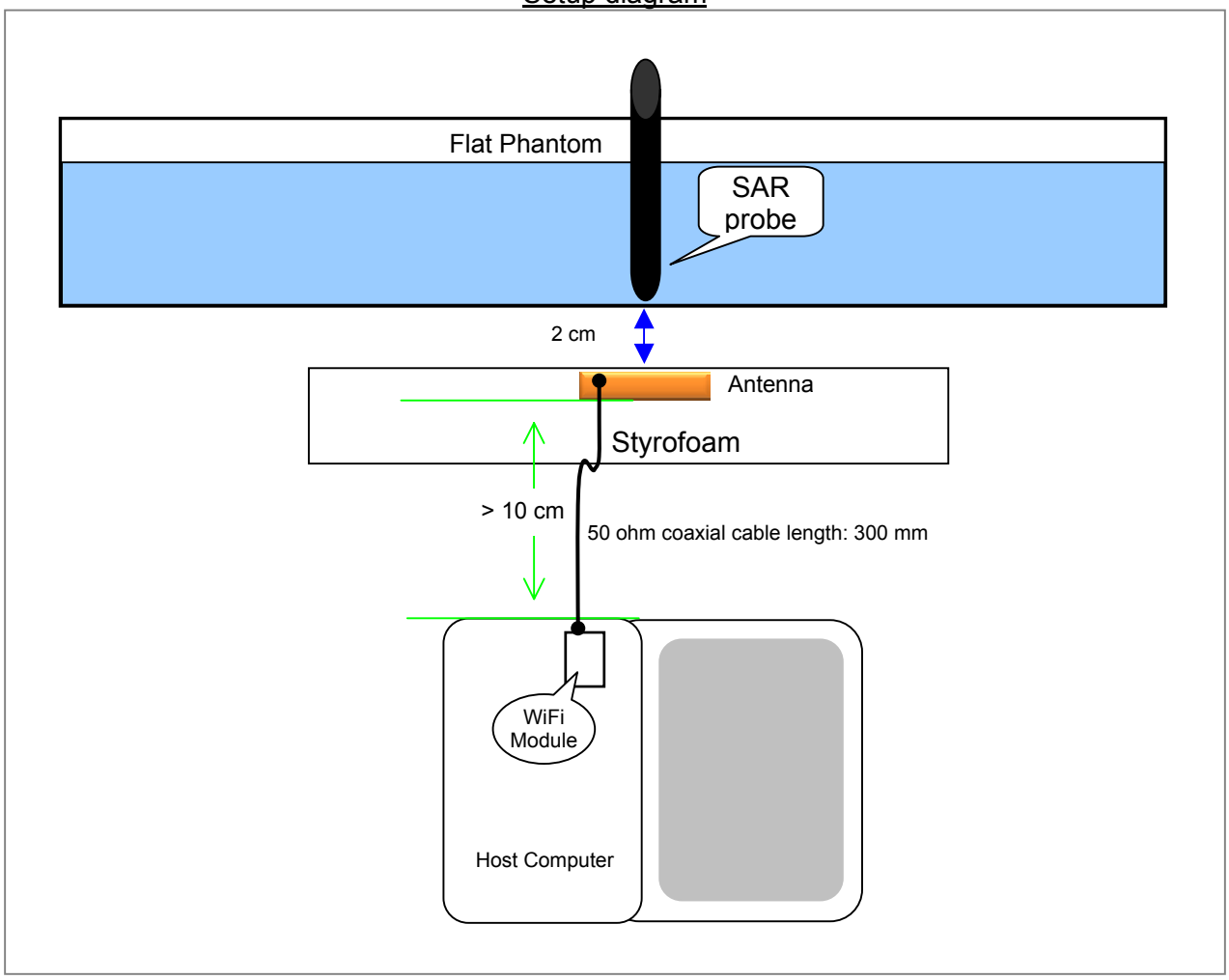
Setup diagram



Test setup: The WiFi module is installed in a host laptop computer during the tests. Test software exercised the radio card.
Test software: New Atheros Radio Test (ART2-GUI), Version: 1.6

6.2. ANTENNA POSITIONED HORIZONTALLY

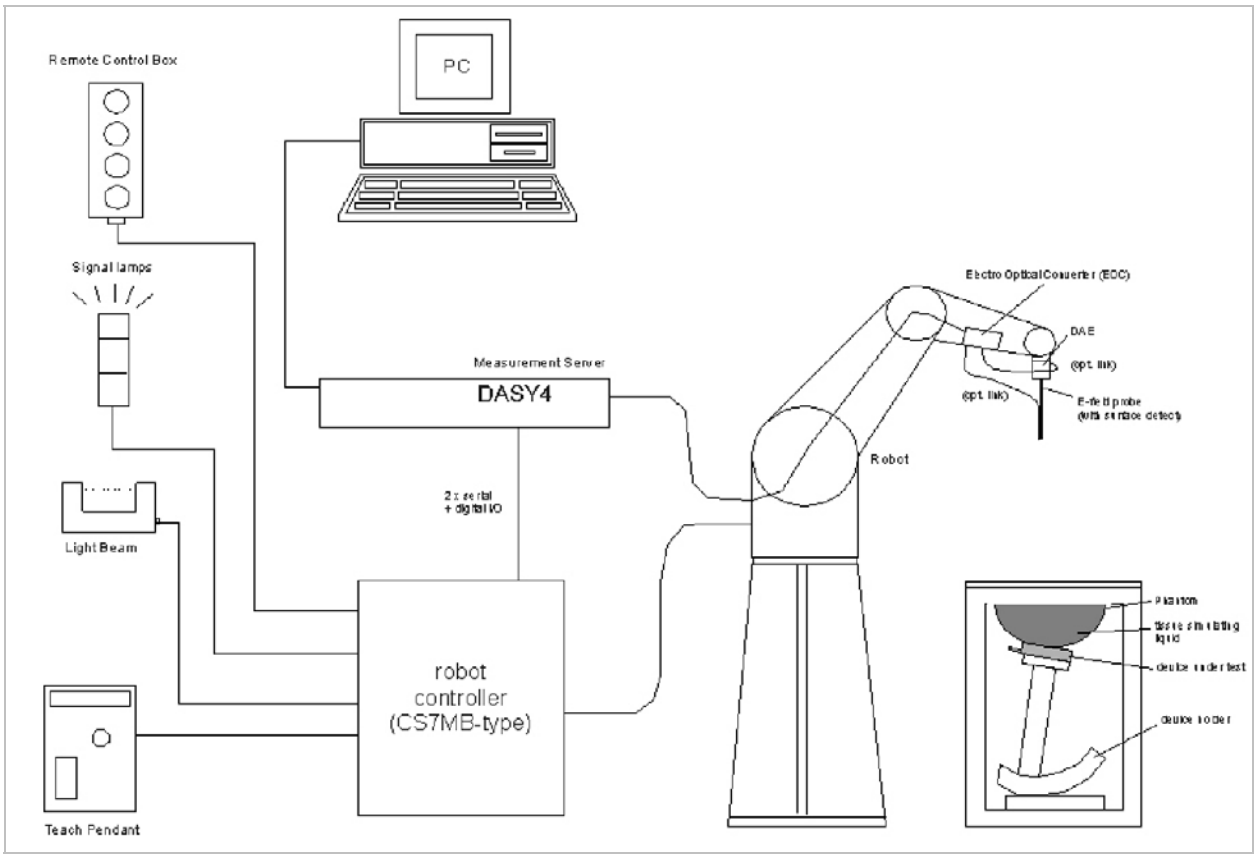
Setup diagram



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

Test software: New Atheros Radio Test (ART2-GUI), Version: 1.6

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. 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)

8.1. TISSUE PARAMETERS CHECK RESULTS

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
02/28/2011	Body 2450	e'	51.8628	Relative Permittivity (ε_r):	51.86	52.70	-1.59	5
		e''	14.4179	Conductivity (σ):	1.96	1.95	0.72	5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 37%
March 01, 2011 09:26 AM

Frequency	e'	e''
2410000000.	51.9739	14.2287
2415000000.	51.9550	14.2493
2420000000.	51.9394	14.2734
2425000000.	51.9246	14.2979
2430000000.	51.9101	14.3210
2435000000.	51.8976	14.3469
2440000000.	51.8859	14.3688
2445000000.	51.8720	14.3941
2450000000.	**51.8628**	**14.4179**
2455000000.	51.8523	14.4396
2460000000.	51.8368	14.4621
2465000000.	51.8239	14.4815
2470000000.	51.8101	14.4989
2475000000.	51.7920	14.5188
2480000000.	51.7756	14.5358
2485000000.	51.7581	14.5508

The conductivity (σ) can be given as:

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

where f = target f * 10^6

ε_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 ±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	Cal. Freq. (GHz)	SAR Avg (mW/g)		
				Tissue:	Head	Body
D2450V2	D2450V2-706_Apr10	4/19/10	2.4	SAR_{1g}:	51.6	52.4
				SAR_{10g}:	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	03/01/11	SAR_{1g}:	51.2	52.4	-2.29	±10
		SAR_{10g}:	23.1	24.5	-5.71	

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 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.

11. RF OUTPUT POWER VERIFICATION

Measurement Results

Mode	Channel #	Freq. (MHz)	Conducted Avg Power	
			(dBm)	(mW)
802.11b	1	2412	16.4	43.7
	6	2437	18.2	66.1
	11	2462	18.0	63.1
802.11g	1	2412	14.6	28.8
	6	2437	18.0	63.1
	11	2462	13.8	24.0
802.11n HT20	1	2412	13.3	21.4
	6	2437	16.5	44.7
	11	2462	12.9	19.5
802.11n HT40	3	2422	12.3	17.0
	6	2437	14.5	28.2
	9	2452	11.8	15.1

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.

12. SUMMARY OF SAR TEST RESULTS

12.1. Antenna Vertical Up

Test result

Mode	Channel	f (MHz)	Avg Pwr	Results (mW/g)	
			(dBm)	1g-SAR	10g-SAR
802.11b (1x1)	1	2412	16.4		
	6	2437	18.2	0.091	0.066
	11	2462	18.0		

Notes:

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.

12.2. Antenna Vertical Down

Test result

Mode	Channel	f (MHz)	Avg Pwr (dBm)	Results (mW/g)	
				1g-SAR	10g-SAR
802.11b (1x1)	1	2412	16.4		
	6	2437	18.2	0.074	0.054
	11	2462	18.0		

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.

12.3. Antenna Horizontal Up

Test result

Mode	Channel	f (MHz)	Avg Pwr (dBm)	Results (mW/g)	
				1g-SAR	10g-SAR
802.11b (1x1)	1	2412	16.4		
	6	2437	18.2	0.291	0.171
	11	2462	18.0		

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.

12.4. Antenna Horizontal Down

Test result

Mode	Channel	f (MHz)	Avg Pwr	Results (mW/g)	
			(dBm)	1g-SAR	10g-SAR
802.11b (1x1)	1	2412	16.4		
	6	2437	18.2	0.082	0.056
	11	2462	18.0		

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.

12.5. Antenna Horizontal Front

Test result

Mode	Channel	f (MHz)	Avg Pwr (dBm)	Results (mW/g)	
				1g-SAR	10g-SAR
802.11b (1x1)	1	2412	16.4		
	6	2437	18.2	0.219	0.129
	11	2462	18.0		

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.

12.6. Antenna Horizontal Back (Worst case)

Test result

Mode	Channel	f (MHz)	Avg Pwr (dBm)	Results (mW/g)	
				1g-SAR	10g-SAR
802.11b (1x1)	1	2412	16.4		
	6	2437	18.2	**0.377**	0.230
	11	2462	18.0		

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. WORST CASE SAR TEST PLOTS

Date/Time: 3/1/2011 4:30:30 PM

Test Laboratory: Compliance Certification Services (UL CCS)

Antenna Horizontal Back

DUT: Atheros; Type: NA; Serial: NA

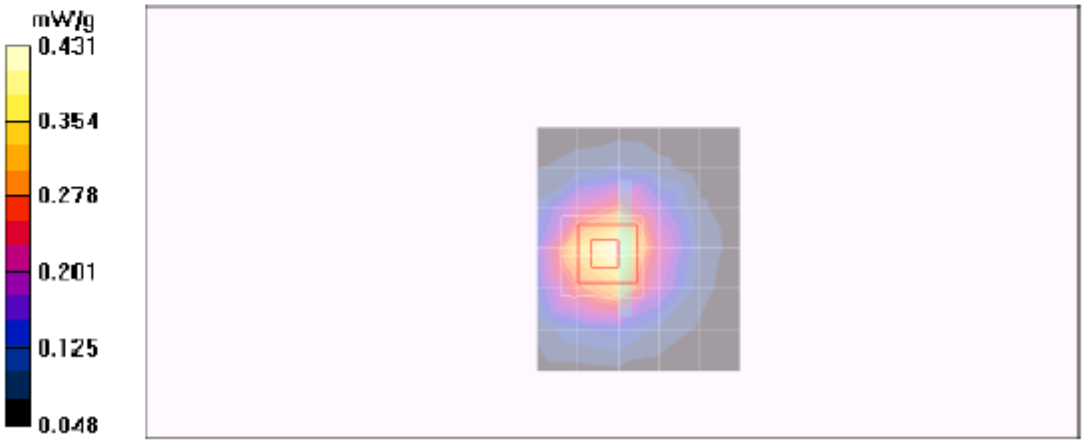
Communication System: 802.11b/g 2.4GHz; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.95 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

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

DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3749; ConvF(6.9, 6.9, 6.9); Calibrated: 12/13/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 7/21/2010
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

802.11b M-ch Main Ant/Area Scan (6x7x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.431 mW/g

802.11b M-ch Main Ant/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 14.8 V/m; Power Drift = 0.210 dB
Peak SAR (extrapolated) = 0.663 W/kg
SAR(1 g) = 0.377 mW/g; SAR(10 g) = 0.230 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.454 mW/g



Date/Time: 3/1/2011 4:33:15 PM

Test Laboratory: Compliance Certification Services (UL CCS)

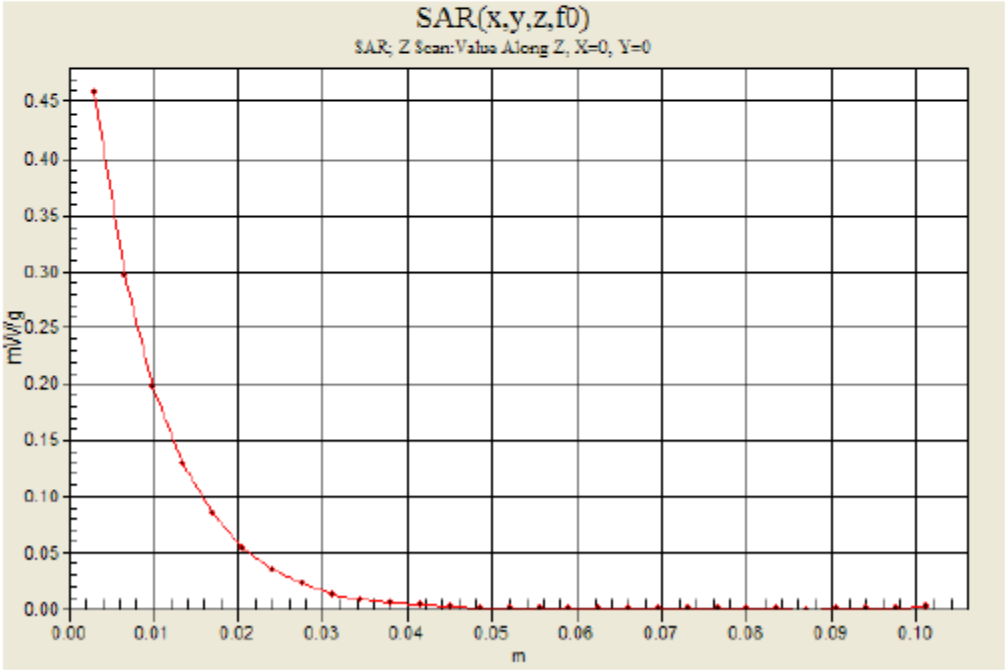
Antenna Horizontal Back

DUT: Atheros; Type: NA; Serial: NA

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

802.11b M-ch Main Ant/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) = 0.458 mW/g



14. 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.

Test configuration	Band	Antenna-to-Phantom distance (cm)		Peak SAR (mW/g)	E-field (V/m)	Lower than Initial (%)
Vertical Up	2.4 GHz	Initial	2	0.091	7.33	
		1	2.5	0.08	6.68	82.9%
		2	3	0.06	6.14	70.1%
		3	3.5	0.05	5.54	57.1%
		4	4	0.04	5.13	48.9%
Vertical Down	2.4 GHz	Initial	2	0.074	6.39	
		1	2.5	0.06	5.90	85.3%
		2	3	0.06	5.53	74.9%
		3	3.5	0.05	5.02	61.7%
		4	4	0.03	4.35	46.5%
Horizontal Up	2.4 GHz	Initial	2	0.291	12.43	
		1	2.5	0.22	10.81	75.6%
		2	3	0.17	9.52	58.6%
		3	3.5	0.14	8.59	47.8%
Horizontal Down	2.4 GHz	Initial	2	0.082	6.95	
		1	2.5	0.06	5.92	72.7%
		2	3	0.05	5.21	56.3%
		3	3.5	0.04	4.89	49.6%
Horizontal Front	2.4 GHz	Initial	2	0.219	11.67	
		1	2.5	0.15	9.75	69.9%
		2	3	0.11	8.18	49.1%
Horizontal Back	2.4 GHz	Initial	2	0.377	15.19	
		1	2.5	0.23	11.92	61.6%
		2	3	0.17	10.09	44.1%

15. ATTACHMENTS

No.	Contents	No. of page (s)
1	System Check Plots	2
2	SAR Test Plots	7
3	Certificate of E-Field Probe - EX3DV3 SN 3531	11
4	Certificate of System Validation Dipole - D2450 SN:706	9

END OF REPORT