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IEEE STD 1528:2003
RSS-102 Issue 4, March 2010
RSS-102 Supplementary Procedures (SPR)-001, January 1, 2011

SAR EVALUATION REPORT

For

802.11g / Draft 802.11n WLAN + Bluetooth PCI-E Minicard
(Tested inside of SAMSUNG Notebook PC, NP305U1A)

MODEL NUMBER: BCM94313HMGB
FCC ID: QDS-BRCM1051
IC: 4324A-BRCM1051

REPORT NUMBER: 11I13886-1, Revision A
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Prepared for

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	Aug 1, 2011	Initial Issue	--
A	Aug 3, 2011	Revised model name on Section 1	A. Zaffar

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1. ATTESTATION OF TEST RESULTS

Applicant name:	Broadcom Corporation 190 Mathilda Place Sunnyvale, CA 94086		
EUT description:	802.11g / Draft 802.11n WLAN + Bluetooth PCI-E Minicard (Tested inside of SAMSUNG Notebook PC, NP305U1A)		
Model number:	BCM94313HMGB		
Device category:	Portable		
Exposure category:	General Population/Uncontrolled Exposure		
Date tested:	July 19, 2011, July 30, 2011		
FCC / IC Rule Parts	Freq. Range [MHz]	The Highest 1g SAR mW/g	Limit (mW/g)
15.247 / RSS-102	2412 – 2462	FCC: 0.337 mW/g (Lap-held) IC: 0.090 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

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 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, 2011and the following KDB test procedures:

- KDB 248227 SAR measurement procedures for 802.11a/b/g transmitters
- KDB 616217 Laptop Computer SAR Procedures

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	8	2	2011
Synthesized Signal Generator	HP	83732B	US34490599	7	14	2012
E-Field Probe	SPEAG	EX3DV4	3773	5	3	2012
Thermometer	ERTCO	639-1S	1718	8	19	2011
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 3)
4. Impedance is within 5Ω of calibrated measurement (See appendix 3)

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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	1.94	Normal	1	0.64	1.24
Liquid Permittivity - deviation from target		Rectangular	1.732	0.6	0.00
Liquid Permittivity - measurement uncertainty	-2.54	Normal	1	0.6	-1.52
Combined Standard Uncertainty Uc(y) =					9.49
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				18.97	%
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				1.51	dB

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5. EQUIPMENT UNDER TEST

The BRCM1051 is a 802.11g / Draft 802.11n WLAN + Bluetooth PCI-E Minicard.
(Tested inside of SAMSUNG Notebook PC, NP305U1A)

Normal operation:	Laptop mode (display open at 90° to the keyboard)
Antenna tested:	<u>Manufacturer</u> <u>Part number</u> <u>2.4 Gain</u> TE ☒ Aux: 2108192-1 0.47 TE ☒ Main: 2108191-1 2.09
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 (Bluetooth - FCC ID: QDS-BRCM1051; IC ID: 4324A-BRCM1051)
Assessment for SAR evaluation for Simultaneous transmission:	**WiFi and BT** The Bluetooth's output power (2.79mW) is ≤ 60/f(GHz) mW and stand-alone SAR evaluation is not required. Thus, simultaneous transmission SAR evaluation is not required for the WiFi and Bluetooth antenna pair.
Battery Pack:	Li-Ion Battery, Model: AA-PB0VC6S, rated 7.4 Vdc, 48Wh

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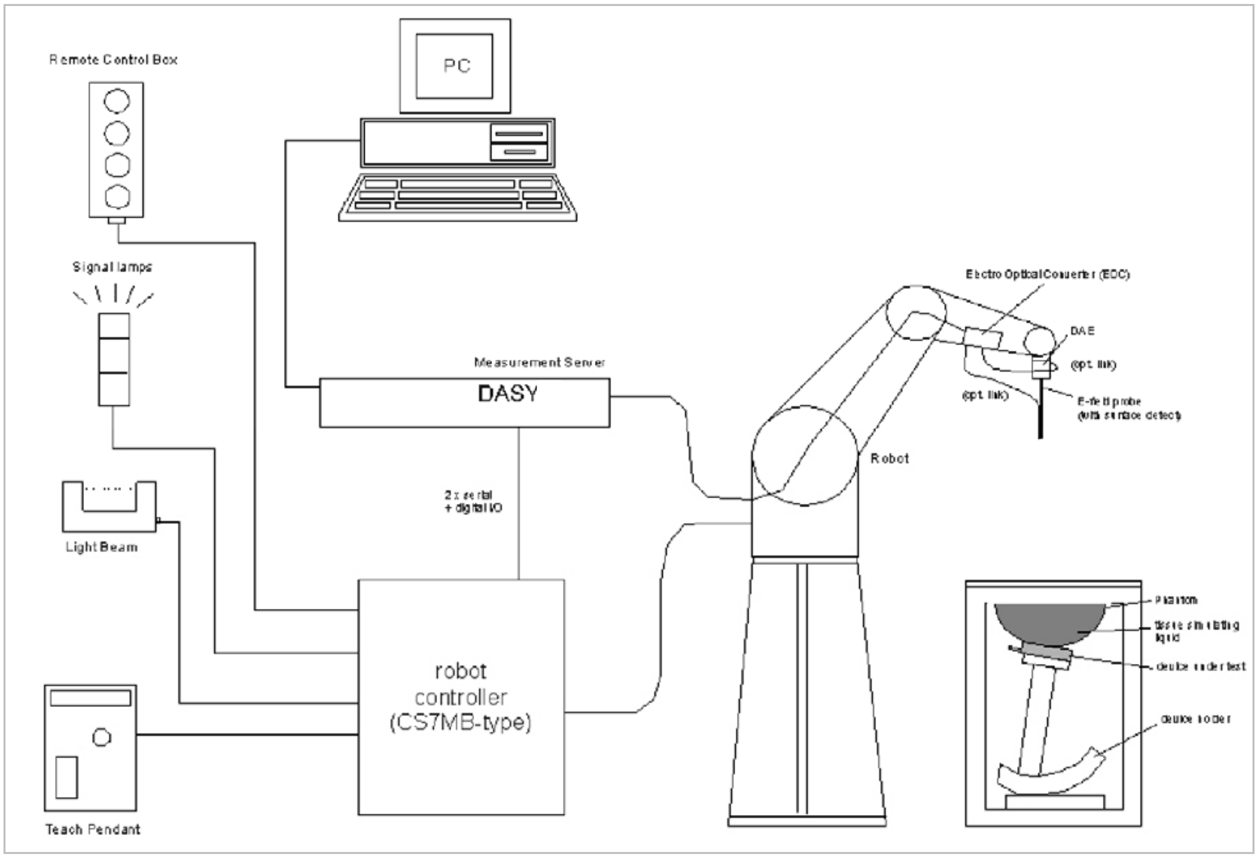
6. SYSTEM SPECIFICATIONS



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.

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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 ± 5% of the target values. For frequencies above 2 GHz the measured conductivity was within ± 5% of the target values. The measured relative permittivity tolerance was within ± 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 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 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 ±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. SIMULATING LIQUID CHECK RESULTS

Measured by: David Rodgers

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
7/19/2011	Body 2450	e'	51.3624	Relative Permittivity (ϵ_r):	51.36	52.70	-2.54	5
		e''	14.5917	Conductivity (σ):	1.99	1.95	1.94	5

Liquid Check
Ambient temperature: 25 deg. C; Liquid temperature: 24 deg. C; Relative humidity = 40%
July 19, 2011 09:18 AM

Frequency	e'	e''
2300000000.	51.8943	13.9657
2310000000.	51.8585	14.0094
2320000000.	51.8230	14.0502
2330000000.	51.7866	14.0904
2340000000.	51.7472	14.1339
2350000000.	51.7084	14.1740
2360000000.	51.6713	14.2154
2370000000.	51.6323	14.2584
2380000000.	51.5961	14.3017
2390000000.	51.5638	14.3475
2400000000.	51.5317	14.3931
2410000000.	51.5035	14.4369
2420000000.	51.4715	14.4740
2430000000.	51.4373	14.5124
2440000000.	51.3999	14.5499
2450000000.	**51.3624**	**14.5917**
2460000000.	51.3274	14.6312
2470000000.	51.2902	14.6752
2480000000.	51.2547	14.7205
2490000000.	51.2204	14.7659
2500000000.	51.1913	14.8120
2510000000.	51.1621	14.8581
2520000000.	51.1307	14.9009
2530000000.	51.0981	14.9388
2540000000.	51.0612	14.9789
2550000000.	51.0226	15.0206
2560000000.	50.9824	15.0624
2570000000.	50.9450	15.1079
2580000000.	50.9069	15.1523
2590000000.	50.8704	15.2007
2600000000.	50.8388	15.2470

The conductivity (σ) can be given as:

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

where f = target $f * 10^6$

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

Measured by: David Rodgers

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
7/30/2011	Body 2450	e'	51.3639	Relative Permittivity (ϵ_r):	51.36	52.70	-2.54	5
		e"	14.3000	Conductivity (σ):	1.95	1.95	-0.10	5

Liquid Check
Ambient temperature: 25 deg. C; Liquid temperature: 24 deg. C; Relative humidity = 40%
July 30, 2011 11:41 AM

Frequency	e'	e''
2400000000.	51.6236	14.2643
2405000000.	51.6130	14.2712
2410000000.	51.5971	14.2735
2415000000.	51.5795	14.2703
2420000000.	51.5555	14.2636
2425000000.	51.5259	14.2578
2430000000.	51.4960	14.2574
2435000000.	51.4630	14.2586
2440000000.	51.4279	14.2652
2445000000.	51.3948	14.2791
2450000000.	**51.3639**	**14.3000**
2455000000.	51.3353	14.3278
2460000000.	51.3120	14.3639
2465000000.	51.2906	14.4031
2470000000.	51.2748	14.4476
2475000000.	51.2650	14.4954
2480000000.	51.2569	14.5446
2485000000.	51.2529	14.5930
2490000000.	51.2525	14.6373
2495000000.	51.2536	14.6784
2500000000.	51.2534	14.7096
2505000000.	51.2543	14.7378
2510000000.	51.2520	14.7562
2515000000.	51.2464	14.7689
2520000000.	51.2369	14.7721
2525000000.	51.2233	14.7687
2530000000.	51.2033	14.7645
2535000000.	51.1787	14.7588
2540000000.	51.1492	14.7530
2545000000.	51.1164	14.7486
2550000000.	51.0836	14.7495
2555000000.	51.0480	14.7573

The conductivity (σ) can be given as:

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

where f = target $f * 10^6$
$\varepsilon_0 = 8.854 * 10^{-12}$

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 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	07/19/11	1g SAR:	53.9	52.4	2.86	±10
		10g SAR:	24.9	24.5	1.63	
D2450V2	07/30/11	1g SAR:	56.2	52.4	7.25	±10
		10g SAR:	26.3	24.5	7.35	

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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 ≥ 7x7x9 (above 4.5 GHz) or 5x5x7 (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.

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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

802.11b			
Channel #	Freq. (MHz)	Conducted Avg Power from original filling (dBm)	Actual Measured Power
1	2412	19.23	19.30
6	2437	19.30	19.45
13	2472	18.00	18.20
802.11g			
1	2412	18.58	18.75
6	2437	18.60	18.80
13	2472	10.11	10.26

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: QDS-BRCM1051) for Average Power information as documented in 11/10/2009 original filing.

12. SUMMARY OF SAR TEST RESULTS

12.1. SUMMARY OF SAR TEST CONFIGURATIONS

Configuration	Antenna-to-User distance	SAR Require	Comments
Lap-held	10 mm From Main-to-user	Yes	
Lap-held	5 mm From Aux-to-user	Yes	
Bystander	15 mm From Main-to-bystanders	Yes	SAR tested 15 mm from back of the display. Per RSS-102 Supplementary Procedures (SPR)-001 January 1, 2011. IC requires SAR measurements to be performed if the integrated antenna(s) are located in the back side of the display screen.

12.2. SAR TEST RESULTS

Lap-held Main Antenna

Mode	Channel	f (MHz)	Antenna	Results (mW/g)	
				1g-SAR	10g-SAR
802.11b	1	2412	Main		
	6	2437	Main	0.031	0.027
	11	2462	Main		

Bystander at 15 mm separation distance Main Antenna

Mode	Channel	f (MHz)	Antenna	Results (mW/g)	
				1g-SAR	10g-SAR
802.11b	1	2412	Main		
	6	2437	Main	0.090	0.064
	11	2462	Main		

Lap-held Aux Antenna

Mode	Channel	f (MHz)	Antenna	Results (mW/g)	
				1g-SAR	10g-SAR
802.11b	1	2412	Aux		
	6	2437	Aux	0.337	0.177
	11	2462	Aux		

Note:

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 than 1/4 dB higher than that measured on the corresponding 802.11b channels.

13. WORST CASE SAR TEST PLOTS

Date: 7/19/2011

Test Laboratory: UL CCS SAR Lab B

004_Bystanders

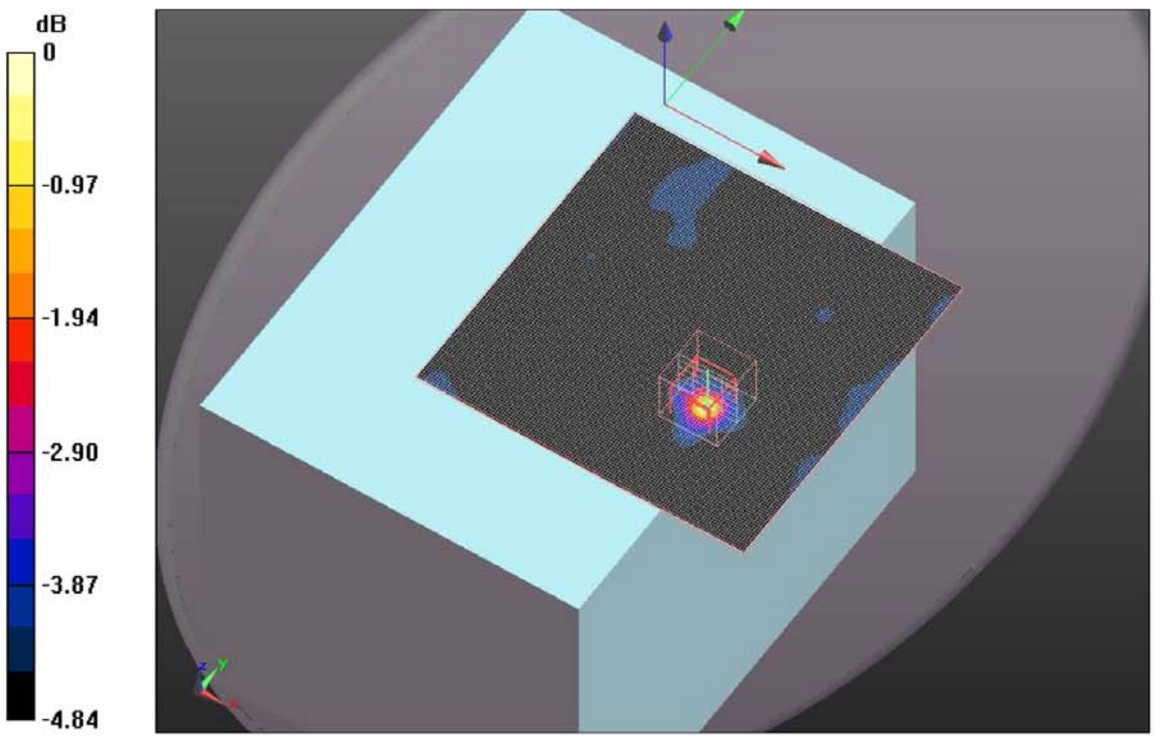
DUT: Samsung NP305U1A; Type: NOTEBOOK PC; Serial: N/A

Communication System: 802.11b/g 2.4GHz; Frequency: 2437 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.971 mho/m; ε_r = 51.411; ρ = 1000 kg/m^3
Phantom section: Flat Section

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)

Main Ant/Ch 6/Area Scan (121x121x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.111 mW/g

Main Ant/Ch 6/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.713 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 0.167 W/kg
SAR(1 g) = 0.090 mW/g; SAR(10 g) = 0.064 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.116 mW/g



0 dB = 0.120mW/g

Date: 7/30/2011

Test Laboratory: UL CCS SAR Lab B

005_Lap held

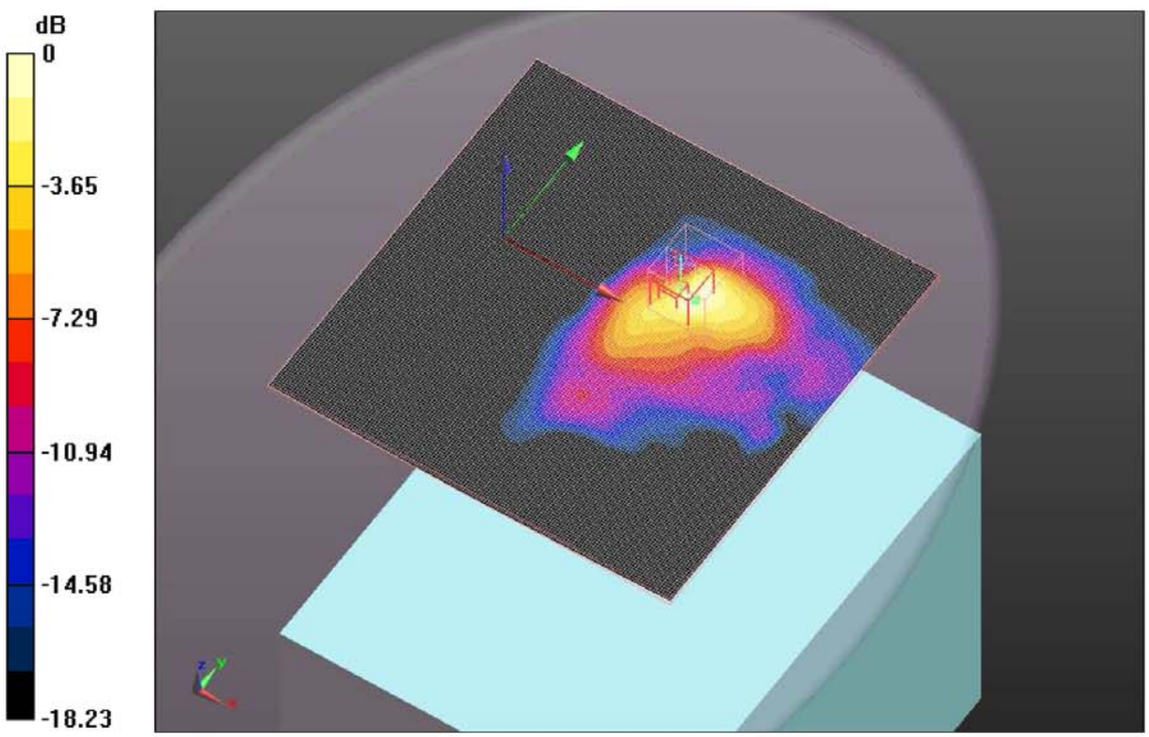
DUT: Samsung NP305U1A; Type: NOTEBOOK PC; Serial: N/A

Communication System: 802.11b/g 2.4GHz; Frequency: 2437 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.933 mho/m; ε_r = 51.449; ρ = 1000 kg/m^3
Phantom section: Flat Section

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)

Aux Ant/Ch 6/Area Scan (151x151x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.473 mW/g

Aux Ant/Ch 6/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.761 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 0.670 W/kg
SAR(1 g) = 0.337 mW/g; SAR(10 g) = 0.177 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.499 mW/g



0 dB = 0.500mW/g

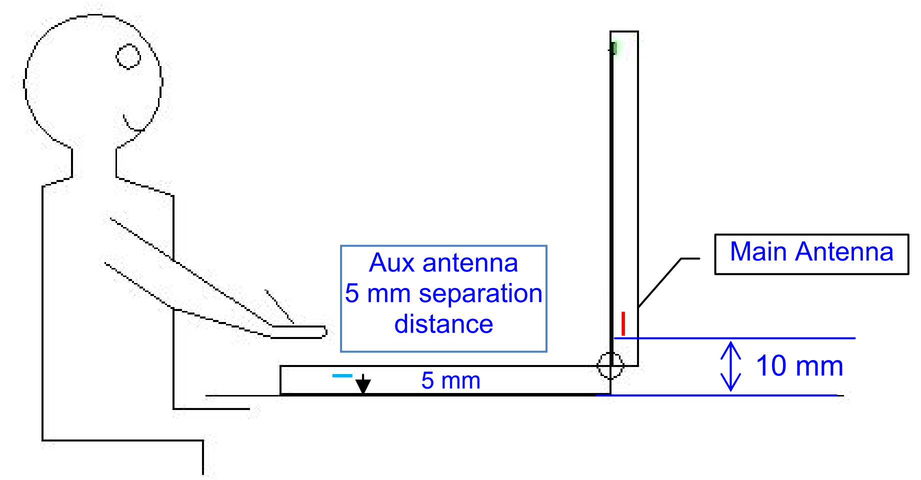
14. APPENDIX

No.	Contents	No. of page (s)
1	System Check Plots	4
2	SAR Test Plots	5
3	Certificate of E-Field Probe - EX3DV3 SN 3773	11
4	Certificate of System Validation Dipole - D2450 SN:706	11

15. ANTENNA LOCATIONS AND SEPARATION DISTANCES

ANTENNA-TO-USERS AND NEARBY PERSONS

Lap-held configuration
(Separation distance between antennas and user)



Nearby person configuration
(Separation distance between antenna and nearby person)