FCC OET BULLETIN 65 SUPPLEMENT C 01-01
IEEE Std 1528-2003 & IEEE Std 1528a-2005

SAR EVALUATION REPORT

For
802.11a/g/n 3x3 MIMO WLAN + Bluetooth Combo PCI-E Minicard
(Tested inside of 17-inch MacBook Pro. model A1297)

Model: BCM94331PCIEBT4
FCC ID: QDS-BRCM1055

Report Number: 12U14245-3C
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Revision History

Rev.	Issue Date	Revisions	Revised By
--	04/09/2012	Initial Issue	--
A	05/22/2012	Added explanation under Note in Section 8, RF Power Measurement. Added internal photo WiFi module location	Sunny Shih
B	10/18/2102	Made the following revisions: 1. Added Sec. 7.1 Possible Combinations of 802.11 Modes vs. Tx Diversity Configurations 2. Sec. 8: Updated tables, arranged frequency bands into subsections 3. Sec. 9: Updated table, arranged frequency bands into subsections 4. Added IEEE Std 1528a-2005 to the list of test methodologies applied 5. Sec. 14.1: Added section 14.1 Scaled SAR Values to the Maximum Target Output Power	Sunny Shih
B1	11/20/2012	Deleted Notes below power table in Section 11	Sunny Shih
C	1/16/2013	Sec. 11: Added statement: “Spot check has been conducted for all configurations that are excluded from SAR.”	Sunny Shih

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1. Attestation of Test Results

Applicant	BROADCOM CORPORATION		
EUT description	802.11a/g/n 3x3 MIMO WLAN + Bluetooth Combo PCI-E Minicard (Tested inside of 17-inch MacBook Pro. model A1297)		
Model numbers	BCM94331PCIEBT4		
Test device is	An identical prototype		
Device category	Portable device		
Exposure category	General Population/Uncontrolled Exposure		
Date tested	January 26 – February 15, 2012		
FCC Rule Parts	Freq. Range	Highest 1-g SAR (W/kg)	Limit
15.247	2412-2462 MHz	Body: 1.19 W/kg (Lap held w/ 0 mm distance)	1.6 W/kg
15.407	5150-5250 MHz	Body: 0.578 W/kg (Lap held w/ 0 mm distance)	
	5250-5350 MHz	Body: 0.753 W/kg (Lap held w/ 0 mm distance)	
	5500-5700 MHz	Body: 0.817 W/kg (Lap held w/ 0 mm distance)	
15.247	5725-5850 MHz	Body: 0.689 W/kg (Lap held w/ 0 mm distance)	
Applicable Standards			Test Results
FCC OET Bulletin 65 Supplement C 01-01 IEEE STD 1528:2003 & IEEE Std 1528a-2005			Pass

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
UL CCS

Tested By:

Ray Su
SAR Engineer
UL CCS

2. Test Methodology

The tests documented in this report were performed in accordance with FCC OET Bulletin 65 Supplement C Edition 01-01, IEEE STD 1528-2003 & IEEE Std 1528a-2005, and the following KDB Procedures.

- KDB 248227 D01 SAR meas for 802 11 a b g v01r02
- KDB 865664 SAR 3 to 6 GHz Rev
- KDB 616217 D03 SAR Supp Note and Netbook Laptop V01
- KDB 447498 D01 Mobile Portable RF Exposure v04

3. Facilities and Accreditation

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

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

4. Calibration and Uncertainty

4.1. Measuring Instrument Calibration

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

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due date		
				MM	DD	Year
Dielectronic Probe kit	HP	85070C	N/A	N/A		
ESA Series Network Analyzer	Agilent	E5071B	MY42100131	2	11	2013
Synthesized Signal Generator	HP	83732B	US34490599	7	14	2012
E-Field Probe	SPEAG	EX3DV4	3773	5	3	2012
E-Field Probe	SPEAG	EX3DV4	3749	1	27	2013
Thermometer	ERTCO	639-1S	1718	7	19	2012
Data Acquisition Electronics	SPEAG	DAE4	1259	5	3	2012
Data Acquisition Electronics	SPEAG	DAE3	427	1	17	2013
System Validation Dipole	SPEAG	*D2450V2	706	4	19	2012
System Validation Dipole	SPEAG	D5GHzV2	1003	8	23	2012
Power Meter	HP	437B	3125U16345	5	13	2012
Power Sensor	HP	8481A	2702A60780	5	13	2012
Amplifier	MITEQ	4D00400600-50-30P	1620606	N/A		
Directional coupler	Werlatone	C8060-102	2141	N/A		

Notes:

*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. (See Appendixes Calibration Certificate for D2450V2 SN 706 incl. extended cal. data)
4. Impedance is within 5Ω of calibrated measurement (See Appendixes Calibration Certificate for D2450V2 SN 706 incl. extended cal. data)

4.2. Measurement Uncertainty

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

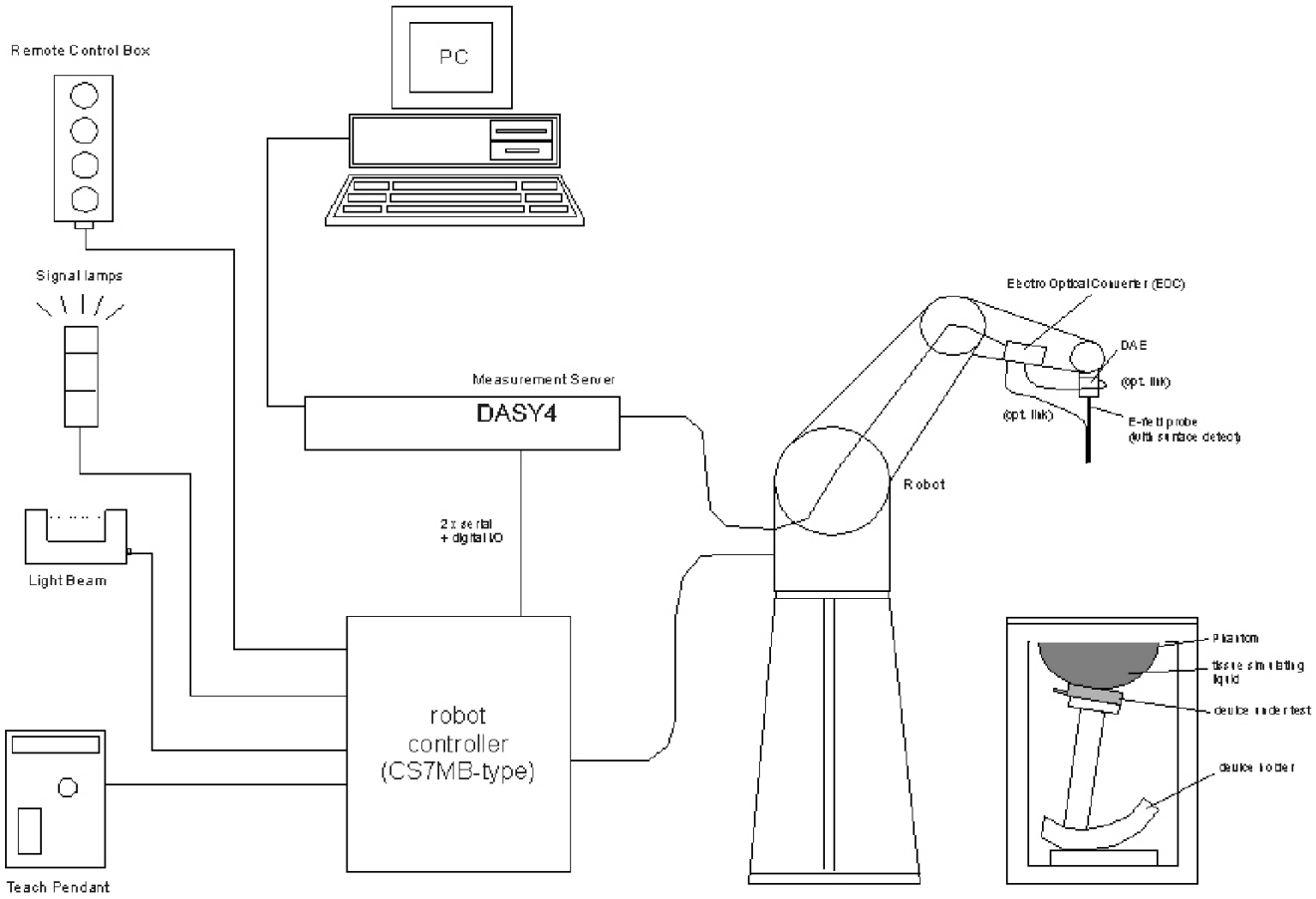
Component	Error, %	Distribution	Divisor	Sensitivity	U (Xi), %
Measurement System					
Probe Calibration (k=1)	**6.00**	Normal	1	1	6.00
Axial Isotropy	1.15	Rectangular	1.732	0.7071	0.47
Hemispherical Isotropy	2.30	Rectangular	1.732	0.7071	0.94
Boundary Effect	0.90	Rectangular	1.732	1	0.52
Probe Linearity	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	**-2.20**	Normal	1	0.64	-1.41
Liquid Permittivity - deviation from target	5.00	Rectangular	1.732	0.6	1.73
Liquid Permittivity - measurement uncertainty	**-1.00**	Normal	1	0.6	-0.60
				Combined Standard Uncertainty Uc(y) =	9.86
				Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence = 19.72	%
				Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence = 1.56	dB

Measurement uncertainty for 3 to 6 GHz averaged over 1 gram

Component	Error, %	Distribution	Divisor	Sensitivity	U (Xi), %
Measurement System					
Probe Calibration (k=1)	**6.55**	Normal	1	1	6.55
Axial Isotropy	1.15	Rectangular	1.732	0.7071	0.47
Hemispherical Isotropy	2.30	Rectangular	1.732	0.7071	0.94
Boundary Effect	0.90	Rectangular	1.732	1	0.52
Probe Linearity	3.45	Rectangular	1.732	1	1.99
System Detection Limits	1.00	Rectangular	1.732	1	0.58
Readout Electronics	1.00	Normal	1	1	1.00
Response Time	0.80	Rectangular	1.732	1	0.46
Integration Time	2.60	Rectangular	1.732	1	1.50
RF Ambient Conditions - Noise	3.00	Rectangular	1.732	1	1.73
RF Ambient Conditions - Reflections	3.00	Rectangular	1.732	1	1.73
Probe Positioner Mechanical Tolerance	0.40	Rectangular	1.732	1	0.23
Probe Positioning with respect to Phantom	2.90	Rectangular	1.732	1	1.67
Extrapolation, Interpolation and Integration	3.90	Rectangular	1.732	1	2.25
Test Sample Related					
Test Sample Positioning	1.10	Normal	1	1	1.10
Device Holder Uncertainty	3.60	Normal	1	1	3.60
Output Power Variation - SAR Drift	5.00	Rectangular	1.732	1	2.89
Phantom and Tissue Parameters					
Phantom Uncertainty (shape and thickness)	4.00	Rectangular	1.732	1	2.31
Liquid Conductivity - deviation from target	5.00	Rectangular	1.732	0.64	1.85
Liquid Conductivity - measurement	**4.77**	Normal	1	0.64	3.05
Liquid Permittivity - deviation from target	10.00	Rectangular	1.732	0.6	3.46
Liquid Permittivity - measurement uncertainty	**4.90**	Normal	1	0.6	2.94
				Combined Standard Uncertainty Uc(y), %:	11.28
				Expanded Uncertainty U, Coverage Factor = 1.96, > 95 % Confidence = 22.10	%
				Expanded Uncertainty U, Coverage Factor = 1.96, > 95 % Confidence = 1.73	dB

5. Measurement System Description and Setup

The DASY4 system used 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.
- 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 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.

6. SAR Measurement Procedures

6.1. Normal SAR Measurement Procedure

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.

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 DASY 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 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.

7. Device Under Test

802.11a/g/n 3x3 MIMO WLAN + Bluetooth Combo PCI-E Minicard, The radio module is manufactured by Broadcom. (Tested inside of 17-inch MacBook Pro. model A1297) Model: BCM94331PCIEBT4	
Normal operation	Laptop mode (notebook).
Antennas tested	Manufacturer / Part Number Amphenol/Molex — WiFi 3: 604-1852 (for chain 0) WiFi 2: 604-1852 (for chain 1) WiFi 1: 604-1852 (for chain 2) BT: 631-1570
Simultaneous transmission	WiFi 5 GHz bands can transmit simultaneously with Bluetooth WiFi 2.4 GHz band can transmit simultaneously with Bluetooth
Assessment for SAR evaluation for Simultaneous transmission	**WiFi vs Bluetooth** As Bluetooth's max average power is 0.87 mW [<60/f(GHz) mW], standalone SAR is not required. Therefore, WiFi and Bluetooth simultaneous transmission SAR evaluation is not required.

7.1. Possible Combinations of 802.11 Modes vs. Tx Diversity Configurations

Band (GHz)	802.11 modes	Tx diversity configurations	Original	C2PC
2.4	11b	1 Tx	√	√
		2 Tx	√	√
		3 Tx	√	√
	11g	1 Tx	√	√
		2 Tx	√	√
		3 Tx	√	√
	11n	HT20 (1 Tx)	√	√
		HT40 (1 Tx)	disabled	disabled
		HT20 (2 Tx)	√	√
		HT40 (2 Tx)	disabled	disabled
		HT20 (3 Tx)	√	√
		HT40 (3Tx)	disabled	disabled
Note: 1Tx, 2Tx and 3Tx power levels detailed apply to all CDD/STBC/SDM modes as applicable.				

Band (GHz)	802.11 modes	Tx diversity configurations	Original	C2PC
5.2	11a	Legacy (1 Tx)	√	√
		CDD (2 Tx)	disabled	disabled
		CDD (3 Tx)	disabled	disabled
	11n	HT20 SISO (1 Tx)	√	√
		HT40 SISO (1 Tx)	√	√
		HT20 CDD (2 Tx)	disabled	disabled
		HT20 STBC (2 Tx)	√	√
		HT20 SDM (2 Tx)	√	√
		HT40 CDD (2 Tx)	√	√
		HT40 STBC (2 Tx)	√	√
		HT40 SDM (2 Tx)	√	√
		HT20 CDD (3 Tx)	disabled	disabled
		HT20 STBC (3 Tx)	√	√
		HT20 SDM (3 Tx)	√	√
		HT40 CDD (3 Tx)	disabled	disabled
		HT40 STBC (3 Tx)	√	√
		HT40 SDM (3 Tx)	√	√
Band (GHz)	802.11 modes	Tx diversity configurations	Original	C2PC
5.3	11a	Legacy (1 Tx)	√	√
		CDD (2 Tx)	√	√
		CDD (3 Tx)	√	√
	11n	HT20 SISO (1 Tx)	√	√
		HT40 SISO (1 Tx)	√	√
		HT20 CDD (2 Tx)	√	√
		HT20 STBC (2 Tx)	√	√
		HT20 SDM (2 Tx)	√	√
		HT40 CDD (2 Tx)	√	√
		HT40 STBC (2 Tx)	√	√
		HT40 SDM (2 Tx)	√	√
		HT20 CDD (3 Tx)	√	√
		HT20 STBC (3 Tx)	√	√
		HT20 SDM (3 Tx)	√	√
		HT40 CDD (3 Tx)	√	√
		HT40 STBC (3 Tx)	√	√
		HT40 SDM (3 Tx)	√	√

Possible Combinations of 802.11 Modes vs. Tx Diversity Configurations Continued

Band (GHz)	802.11 modes	Tx diversity configurations	Original	C2PC
5.5	11a	Legacy (1 Tx)	√	√
		CDD (2 Tx)	√	√
		CDD (3 Tx)	√	√
	11n	HT20 SISO (1 Tx)	√	√
		HT40 SISO (1 Tx)	√	√
		HT20 CDD (2 Tx)	√	√
		HT20 STBC (2 Tx)	√	√
		HT20 SDM (2 Tx)	√	√
		HT40 CDD (2 Tx)	√	√
		HT40 STBC (2 Tx)	√	√
		HT40 SDM (2 Tx)	√	√
		HT20 CDD (3 Tx)	√	√
		HT20 STBC (3 Tx)	√	√
		HT20 SDM (3 Tx)	√	√
		HT40 CDD (3 Tx)	√	√
		HT40 STBC (3 Tx)	√	√
		HT40 SDM (3 Tx)	√	√
Band (GHz)	802.11 modes	Tx diversity configurations	Original	C2PC
5.8	11a	Legacy (1 Tx)	√	√
		CDD (2 Tx)	√	√
		CDD (3 Tx)	√	√
	11n	HT20 SISO (1 Tx)	√	√
		HT40 SISO (1 Tx)	√	√
		HT20 CDD (2 Tx)	√	√
		HT20 STBC (2 Tx)	√	√
		HT20 SDM (2 Tx)	√	√
		HT40 CDD (2 Tx)	√	√
		HT40 STBC (2 Tx)	√	√
		HT40 SDM (2 Tx)	√	√
		HT20 CDD (3 Tx)	√	√
		HT20 STBC (3 Tx)	√	√
		HT20 SDM (3 Tx)	√	√
		HT40 CDD (3 Tx)	√	√
		HT40 STBC (3 Tx)	√	√
		HT40 SDM (3 Tx)	√	√

8. Tissue Dielectric Properties

IEEE Std 1528-2003 Table 2

Target Frequency (MHz)	Head	
	ε_r	σ (S/m)
300	45.3	0.87
450	43.5	0.87
835	41.5	0.90
900	41.5	0.97
1450	40.5	1.20
1800 – 2000	40.0	1.40
2450	39.2	1.80
2600	39.0	1.96
3000	38.5	2.40

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Target Frequency (MHz)	Head		Body	
	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5000	36.2	4.45	49.3	5.07
5100	36.1	4.55	49.1	5.18
5200	36.0	4.66	49.0	5.30
5300	35.9	4.76	48.9	5.42
5400	35.8	4.86	48.7	5.53
5500	35.6	4.96	48.6	5.65
5600	35.5	5.07	48.5	5.77
5700	35.4	5.17	48.3	5.88
5800	35.3	5.27	48.2	6.00

8.1. Composition of Ingredients for the Tissue Material Used in the SAR Tests

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Ingredients (% by weight)	Frequency (MHz)									
	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

Salt: 99+% Pure Sodium Chloride Sugar: 98+% Pure Sucrose
Water: De-ionized, 16 MΩ+ resistivity HEC: Hydroxyethyl Cellulose
DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]
Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

Simulating Liquids for 5 GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	78
Mineral oil	11
Emulsifiers	9
Additives and Salt	2

8.2. Tissue Dielectric Parameter Check Results

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
1/26/2012	Body 5180	e'	49.6073	Relative Permittivity (ϵ_r):	49.61	49.05	1.14	10
		e''	18.6195	Conductivity (σ):	5.36	5.27	1.74	5
	Body 5200	e'	49.5805	Relative Permittivity (ϵ_r):	49.58	49.02	1.14	10
		e''	18.6589	Conductivity (σ):	5.39	5.29	1.89	5
	Body 5500	e'	49.0113	Relative Permittivity (ϵ_r):	49.01	48.61	0.82	10
		e''	19.0445	Conductivity (σ):	5.82	5.64	3.18	5
	Body 5800	e'	48.4478	Relative Permittivity (ϵ_r):	48.45	48.20	0.51	10
		e''	19.3941	Conductivity (σ):	6.25	6.00	4.24	5
	Body 5825	e'	48.4187	Relative Permittivity (ϵ_r):	48.42	48.20	0.45	10
		e''	19.4196	Conductivity (σ):	6.29	6.00	4.83	5
1/29/2012	Body 5180	e'	47.6247	Relative Permittivity (ϵ_r):	47.62	49.05	-2.90	10
		e''	17.9580	Conductivity (σ):	5.17	5.27	-1.88	5
	Body 5200	e'	47.5177	Relative Permittivity (ϵ_r):	47.52	49.02	-3.06	10
		e''	17.9687	Conductivity (σ):	5.20	5.29	-1.88	5
	Body 5500	e'	46.9825	Relative Permittivity (ϵ_r):	46.98	48.61	-3.35	10
		e''	18.2135	Conductivity (σ):	5.57	5.64	-1.32	5
	Body 5800	e'	46.5041	Relative Permittivity (ϵ_r):	46.50	48.20	-3.52	10
		e''	18.5443	Conductivity (σ):	5.98	6.00	-0.32	5
	Body 5825	e'	46.3542	Relative Permittivity (ϵ_r):	46.35	48.20	-3.83	10
		e''	18.6084	Conductivity (σ):	6.03	6.00	0.45	5
2/6/2012	Body 5180	e'	48.6167	Relative Permittivity (ϵ_r):	48.62	49.05	-0.88	10
		e''	18.5279	Conductivity (σ):	5.34	5.27	1.23	5
	Body 5200	e'	48.4967	Relative Permittivity (ϵ_r):	48.50	49.02	-1.07	10
		e''	18.5586	Conductivity (σ):	5.37	5.29	1.35	5
	Body 5500	e'	47.9431	Relative Permittivity (ϵ_r):	47.94	48.61	-1.38	10
		e''	19.0037	Conductivity (σ):	5.81	5.64	2.96	5
	Body 5800	e'	47.4122	Relative Permittivity (ϵ_r):	47.41	48.20	-1.63	10
		e''	19.3735	Conductivity (σ):	6.25	6.00	4.13	5
	Body 5825	e'	47.2200	Relative Permittivity (ϵ_r):	47.22	48.20	-2.03	10
		e''	19.3365	Conductivity (σ):	6.26	6.00	4.38	5
2/7/2012	Body 5180	e'	48.4956	Relative Permittivity (ϵ_r):	48.50	49.05	-1.12	10
		e''	18.6561	Conductivity (σ):	5.37	5.27	1.94	5
	Body 5200	e'	48.3829	Relative Permittivity (ϵ_r):	48.38	49.02	-1.30	10
		e''	18.7381	Conductivity (σ):	5.42	5.29	2.33	5
	Body 5500	e'	47.8790	Relative Permittivity (ϵ_r):	47.88	48.61	-1.51	10
		e''	18.6183	Conductivity (σ):	5.69	5.64	0.87	5
	Body 5800	e'	47.3168	Relative Permittivity (ϵ_r):	47.32	48.20	-1.83	10
		e''	18.3235	Conductivity (σ):	5.91	6.00	-1.51	5
	Body 5825	e'	47.0820	Relative Permittivity (ϵ_r):	47.08	48.20	-2.32	10
		e''	18.3158	Conductivity (σ):	5.93	6.00	-1.13	5
2/9/2012	Body 2450	e'	52.2437	Relative Permittivity (ϵ_r):	52.24	52.70	-0.87	5
		e''	14.0606	Conductivity (σ):	1.92	1.95	-1.77	5
	Body 2410	e'	52.3805	Relative Permittivity (ϵ_r):	52.38	52.76	-0.72	5
		e''	13.9208	Conductivity (σ):	1.87	1.91	-2.20	5
	Body 2435	e'	52.3183	Relative Permittivity (ϵ_r):	52.32	52.73	-0.77	5
		e''	14.0726	Conductivity (σ):	1.91	1.93	-1.33	5
	Body 2460	e'	52.1582	Relative Permittivity (ϵ_r):	52.16	52.69	-1.00	5
		e''	14.1691	Conductivity (σ):	1.94	1.96	-1.32	5

Tissue dielectric parameters check results continued

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
02/15/2012	Body 5180	e'	51.4481	Relative Permittivity (ϵ_r):	51.45	49.05	4.90	10
		e''	18.4936	Conductivity (σ):	5.33	5.27	1.05	5
	Body 5200	e'	51.4089	Relative Permittivity (ϵ_r):	51.41	49.02	4.87	10
		e''	18.5376	Conductivity (σ):	5.36	5.29	1.23	5
	Body 5500	e'	50.8451	Relative Permittivity (ϵ_r):	50.85	48.61	4.59	10
		e''	18.9646	Conductivity (σ):	5.80	5.64	2.75	5
	Body 5800	e'	50.2800	Relative Permittivity (ϵ_r):	50.28	48.20	4.32	10
		e''	19.3714	Conductivity (σ):	6.25	6.00	4.12	5
	Body 5825	e'	50.2388	Relative Permittivity (ϵ_r):	50.24	48.20	4.23	10
		e''	19.4094	Conductivity (σ):	6.29	6.00	4.77	5

9. System Performance Check

The system performance check is performed prior to any usage of the system in order to verify SAR system measurement accuracy. The system performance check verifies that the system operates within its specifications of ±10%.

9.1. System Performance Check Measurement Conditions

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ±0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
  For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 fine cube was chosen for cube.
- Distance between probe sensors and phantom surface was set to 3 mm.
  For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input power (forward power) was 100 mW.
- The results are normalized to 1 W input power.

9.2. Reference SAR Values for System Performance Check

The reference SAR values can be obtained from the calibration certificate of system validation dipoles

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Target SAR Values (mW/g)		
				1g/10g	Head	Body
D2450V2	706	4/19/11	2450	1g	51.6	52.4
				10g	24.4	24.5
D5GHzV2	1003	8/23/11	5200	1g	76.5	74.5
				10g	21.8	20.8
			5500	1g	80.9	80.0
				10g	23.1	22.3
			5800	1g	76.3	76.3
				10g	21.7	21.2

9.3. System Performance Check Results

Date Tested	System Dipole		T.S. Liquid	SAR Measured (Normalized to 1 W)		Target (Ref. Value)	Delta (%)	Tolerance (%)
	Type	Serial No.						
1/26/2012	D5GHzV2 5.5 GHz	1003	Body	1g	82.4	80	3.00	±10
				10g	23.4	22.3	4.93	
	D5GHzV2 5.8 GHz	1003	Body	1g	74.2	76.3	-2.75	±10
				10g	21.0	21.2	-0.94	
1/29/2012	D5GHzV2 5.5 GHz	1003	Body	1g	84.4	80	5.50	±10
				10g	24.0	22.3	7.62	
2/6/2012	D5GHzV2 5.2 GHz	1003	Body	1g	73.8	74.5	-0.94	±10
				10g	21.2	20.8	1.92	
2/7/2012	D5GHzV2 5.2 GHz	1003	Body	1g	76.1	74.5	2.15	±10
				10g	21.9	20.8	5.29	
2/9/2012	D2450V2	706	Body	1g	55.5	52.4	5.92	±10
				10g	26.1	24.5	6.53	
2/15/2012	D5GHzV2 5.5 GHz	1003	Body	1g	78.1	80	-2.38	±10
				10g	22.0	22.3	-1.35	

10. Summary of Required Test Modes

10.1. Summary of Required Test Mode for 2.4 GHz Band

Mode (802.11)	No. of Transmitters	Ch. #	Freq. (MHz)	Maximum Shipping power level from original approval (*1 See Note) (dBm)	Maximum Shipping power level from C2PC / 17" Host (dBm)	SAR Test (Yes/No)
11b Legacy	**1 Tx (CDD)**	**1**	**2412**	**18.0**	**18.0**	**Yes**
		6	**2437**	**18.0**	**18.0**	
		11	**2462**	**18.0**	**18.0**	
	2 Tx (CDD)	**1**	**2412**	**18.0**	**18.0**	**Yes**
		6	**2437**	**18.0**	**18.0**	
		11	**2462**	**18.0**	**18.0**	
	3 Tx (CDD)	**1**	**2412**	**18.0**	**18.0**	**Yes**
		6	**2437**	**18.0**	**18.0**	
		11	**2462**	**18.0**	**18.0**	
11g	1 Tx	1	2412	17.0	17.0	No (Test reduction per KDB)
		2	2417	18.0	18.0	
		6	2437	19.0	18.0	
		10	2457	20.0	18.0	
		11	2462	17.5	17.5	
	2 Tx (CDD)	1	2412	16.5	16.5	No (Test reduction per KDB)
		2	2417	18.0	18.0	
		6	2437	18.5	18.0	
		10	2457	18.5	18.0	
		11	2462	16.5	16.5	
	3 Tx (CDD)	1	2412	15.0	15.0	No (Test reduction per KDB)
		2	2422	17.0	17.0	
		6	2437	21.5	18.0	
		10	2457	17.5	17.5	
		11	2462	15.0	15.0	

Note(s):

*1 The "Original Approval" power levels were based upon FCC modular approval testing of the BCM94331PCIEBT4 radio. These power levels were approved up to maximum regulatory levels to cover a number of different potential applications. The original maximum regulatory power levels may be reduced further by the driver for one of the following two reasons:

1) For performance (i.e. non-regulatory) reasons to ensure that PER and EVM of the radio meet internal specifications.
2) For application specifics. In this case the power is reduced to meet the specific SAR requirement per transmit chain over frequency band/channel as per the "Target Maximum Average Power per chain for C2PC" column.

*2 The 11n 2Tx,3Tx HT20/HT40 "All" modes detailed apply to all of CDD/STBC/SDM modes.

*3The power levels per transmit chain are all equivalent

Summary of Required Test Modes for 2.4 GHz Band (continued)

Mode (802.11)	No. of Transmitters	Ch. #	Freq. (MHz)	Maximum Shipping power level from original approval (*1 See Note) (dBm)	Maximum Shipping power level from C2PC / 17" Host (dBm)	SAR Test (Yes/No)
11n	HT20 (1 Tx)	1	2412	17.0	17.0	No (Test reduction per KDB)
		2	2422	18.0	18.0	
		6	2437	19.0	18.0	
		10	2457	20.0	18.0	
		11	2462	17.5	17.5	
	HT40 (1Tx)	40MHz Transmission disabled in the 2.4GHz Band				
	HT20 All *2 (2 Tx)	1	2412	16.5	16.5	No (Test reduction per KDB)
		2	2422	18.0	18.0	
		6	2437	18.5	18.0	
		10	2457	18.5	18.0	
		11	2462	16.5	16.5	
	HT40 All *2 (2Tx)	40MHz Transmission disabled in the 2.4GHz Band				
	HT20 All *2 (3 Tx)	1	2412	15.0	15.0	No (Test reduction per KDB)
		2	2422	17.0	17.0	
		6	2437	21.5	18.0	
		10	2457	17.5	17.5	
		11	2462	15.0	15.0	
	HT40 All *2 (3Tx)	40MHz Transmission disabled in the 2.4GHz Band				

Note(s):

*1 The "Original Approval" power levels were based upon FCC modular approval testing of the BCM94331PCIEBT4 radio. These power levels were approved up to maximum regulatory levels to cover a number of different potential applications. The original maximum regulatory power levels may be reduced further by the driver for one of the following two reasons:

1) For performance (i.e. non-regulatory) reasons to ensure that PER and EVM of the radio meet internal specifications.
2) For application specifics. In this case the power is reduced to meet the specific SAR requirement per transmit chain over frequency band/channel as per the "Target Maximum Average Power per chain for C2PC" column.

*2 The 11n 2Tx,3Tx HT20/HT40 "All" modes detailed apply to all of CDD/STBC/SDM modes.

*3The power levels per transmit chain are all equivalent

10.2. Summary of Required Test Mode for 5.2 GHz Band

Mode (802.11)	No. of Transmitters	Ch. #	Freq. (MHz)	Maximum Shipping power level from original approval (*1 See Note) (dBm)	Maximum Shipping power level from C2PC / 17" Host (dBm)	SAR Test (Yes/No)
11a	**1Tx (CDD)**	**36**	**5180**	**14.0**	**14.0**	**Yes**
		40	**5200**	**14.0**	**14.0**	
		44	**5220**	**14.0**	**14.0**	
		48	**5240**	**14.0**	**14.0**	
	2TX (CDD)	This mode disabled in driver.				
	3Tx (CDD)	This mode disabled in driver.				
11n	HT20 SISO (1 Tx)	36	5180	14.0	14.0	No (Test reduction per KDB)
		44	5220	14.0	14.0	
		48	5240	14.0	14.0	
	HT40 SISO (1 Tx)	**38**	**5190**	**15.5**	**15.0**	**Yes**
		46	**5230**	**16.5**	**15.0**	
	HT20 CDD (2 Tx)	This mode disabled in driver.				
	HT20 STBC/SDM (2 Tx)	36	5180	11.25	11.25	No (Test reduction per KDB)
		40	5200	11.25	11.25	
		48	5240	11.25	11.25	
	HT40 CDD (2 Tx)	38	5190	10.0	10.0	No (Test reduction per KDB)
		46	5230	10.0	10.0	
	HT40 STBC (2 Tx)	**38**	**5190**	**13.75**	**13.75**	**Yes (see Note *3)**
		46	**5230**	**13.75**	**13.75**	
	HT40 SDM (2 Tx)	38	5190	13.75	13.75	No (Test reduction per KDB)
		46	5230	13.75	13.75	
	HT20 CDD (3 Tx)	This mode disabled in driver.				
	HT20 STBC (3 Tx)	36	5180	9.25	9.25	No (Test reduction per KDB)
		40	5200	9.25	9.25	
		48	5240	9.25	9.25	
	HT20 SDM (3 Tx)	36	5180	10.25	10.25	No (Test reduction per KDB)
		40	5200	10.25	10.25	
		48	5240	10.25	10.25	
	HT40 CDD (3 Tx)	This mode disabled in driver.				
	HT40 STBC (3 Tx)	**38**	**5190**	**12.0**	**12.0**	**Yes (see Note *3)**
		46	**5230**	**12.0**	**12.0**	
	HT40 SDM (3 Tx)	38	5190	12.0	12.0	No (Test reduction per KDB)
		46	5230	12.0	12.0	

Note(s):

*1 The "Original Approval" power levels were based upon FCC modular approval testing of the BCM94331PCIEBT4 radio. These power levels were approved up to maximum regulatory levels to cover a number of different potential applications. The original maximum regulatory power levels may be reduced further by the driver for one of the following two reasons:

1) For performance (i.e. non-regulatory) reasons to ensure that PER and EVM of the radio meet internal specifications.
2) For application specifics. In this case the power is reduced to meet the specific SAR requirement per transmit chain over frequency band/channel as per the "Target Maximum Average Power per chain for C2PC" column

*2 The power levels per transmit chain are all equivalent

*3 SAR evaluation is performed at HT40 STBC mode because output power is higher vs others data rate modes.

10.3. Summary of Required Test Mode for 5.3 GHz Band

Mode (802.11)	No. of Transmitters	Ch. #	Freq. (MHz)	Maximum Shipping power level from original approval (*1 See Note) (dBm)	Maximum Shipping power level from C2PC / 17" Host (dBm)	SAR Test (Yes/No)
11a	**1Tx (CDD)**	**52**	**5260**	**18.5**	**15.0**	**Yes**
		56	**5280**	**18.5**	**15.0**	
		60	**5300**	**18.5**	**15.0**	
		64	**5320**	**17.5**	**15.0**	
	2TX (CDD)	52	5260	14.5	14.5	No. Covered by HT20 STBC/SDM (2 Tx) (see Note *4)
		56	5280	14.5	14.5	
		60	5300	14.5	14.5	
		64	5320	14.5	14.5	
	3Tx (CDD)	52	5260	11.5	11.5	No. Covered by HT20 STBC/SDM (3 Tx) (see Note *4)
		56	5280	11.5	11.5	
		60	5300	11.5	11.5	
		64	5320	11.5	11.5	
11n	HT20 SISO (1 Tx)	52	5260	18.5	15.0	No (Test reduction per KDB)
		60	5300	18.5	15.0	
		64	5320	17.5	15.0	
	HT40 SISO (1 Tx)	54	5270	18.0	15.0	No (Test reduction per KDB)
		62	5310	14.0	14.0	
	HT20 CDD (2 Tx)	52	5260	14.5	14.5	No (Test reduction per KDB)
		60	5300	14.5	14.5	
		64	5320	14.5	14.5	
	HT20 STBC/SDM (2 Tx)	**52**	**5260**	**17.0**	**15.0**	**Yes (see Note *3)**
		56	**5280**	**17.0**	**15.0**	
		64	**5320**	**14.5**	**14.5**	
	HT40 CDD (2Tx)	54	5270	16.0	15.0	No (Test reduction per KDB)
		62	5310	13.0	13.0	
	HT40 STBC/SDM (2Tx)	54	5270	18.0	15.0	No (Test reduction per KDB)
		62	5310	15.0	15.0	
	HT20 CDD (3 Tx)	52	5260	11.5	11.5	No (Test reduction per KDB)
		60	5300	11.5	11.5	
		64	5320	11.5	11.5	
	HT20 STBC/SDM (3 Tx)	**52**	**5260**	**15.5**	**15.0**	**Yes (see Note *3)**
		56	**5280**	**15.5**	**15.0**	
		64	**5320**	**15.5**	**15.0**	
	HT40 CDD (3Tx)	54	5270	13.5	13.5	No (Test reduction per KDB)
		62	5310	11.5	11.5	
	HT40 STBC/SDM (3 Tx)	54	5270	18.0	15.0	No (Test reduction per KDB)
		62	5310	12.5	12.5	

Note(s):

*1 The "Original Approval" power levels were based upon FCC modular approval testing of the BCM94331PCIEBT4 radio. These power levels were approved up to maximum regulatory levels to cover a number of different potential applications. The original maximum regulatory power levels may be reduced further by the driver for one of the following two reasons:

1) For performance (i.e. non-regulatory) reasons to ensure that PER and EVM of the radio meet internal specifications.
2) For application specifics. In this case the power is reduced to meet the specific SAR requirement per transmit chain over frequency band/channel as per the "Target Maximum Average Power per chain for C2PC" column

*2 The power levels per transmit chain are all equivalent

*3 SAR evaluation is performed at HT20 STBC/SDM mode because output power is higher vs others data rate modes.

*4 SAR evaluation is performed at STBC/SDM mode because output power is higher vs CDD mode.

10.4. Summary of Required Test Mode for 5.5 GHz Band

Mode (802.11)	No. of Transmitters	Ch. #	Freq. (MHz)	Maximum Shipping power level from original approval (*1 See Note) (dBm)	Maximum Shipping power level from C2PC / 17" Host (dBm)	SAR Test (Yes/No)
11a	**1Tx (CDD)**	**100**	**5500**	**18.0**	**15.0**	**Yes**
		104	**5520**	**18.0**	**15.0**	
		108	**5540**	**18.0**	**15.0**	
		112	**5560**	**18.0**	**15.0**	
		116	**5580**	**18.0**	**15.0**	
		120	**5600**	**18.0**	**15.0**	
		124	**5620**	**18.0**	**15.0**	
		128	**5640**	**18.0**	**15.0**	
		132	**5660**	**18.0**	**15.0**	
		136	**5680**	**18.0**	**15.0**	
		140	**5700**	**18.0**	**15.0**	
	2TX (CDD)	100	5500	14.5	14.5	No. Covered by HT20 STBC/SDM (2 Tx) (see Note *4)
		104	5520	14.5	14.5	
		108	5540	14.5	14.5	
		112	5560	14.5	14.5	
		116	5580	14.5	14.5	
		120	5600	14.5	14.5	
		124	5620	14.5	14.5	
		128	5640	14.5	14.5	
		132	5660	14.5	14.5	
		136	5680	14.5	14.5	
		140	5700	14.5	14.5	
	3TX (CDD)	100	5500	13.5	13.5	No. Covered by HT20 STBC/SDM (3 Tx) (see Note *4)
		104	5520	13.5	13.5	
		108	5540	13.5	13.5	
		112	5560	13.5	13.5	
		116	5580	13.5	13.5	
		120	5600	13.5	13.5	
		124	5620	13.5	13.5	
		128	5640	13.5	13.5	
		132	5660	13.5	13.5	
		136	5680	13.5	13.5	
		140	5700	13.5	13.5	

Summary of Required Test Modes for 5.5 GHz Band (continued)

Mode (802.11)	No. of Transmitters	Ch. #	Freq. (MHz)	Maximum Shipping power level from original approval (*1 See Note) (dBm)	Maximum Shipping power level from C2PC / 17" Host (dBm)	SAR Test (Yes/No)
11n	HT20 SISO (1 Tx)	100	5510	18.0	15.0	No (Test reduction per KDB)
		116	5550	18.0	15.0	
		140	5670	18.0	15.0	
	HT40 SISO (1 Tx)	102	5510	15.5	15.0	No (Test reduction per KDB)
		110	5550	21.5	15.0	
		134	5670	21.5	15.0	
	HT20 CDD (2 Tx)	100	5500	14.5	14.5	No (Test reduction per KDB)
		116	5580	14.5	14.5	
		140	5700	14.5	14.5	
	HT20 STBC/SDM (2 Tx)	**100**	**5500**	**14.5**	**14.5**	**Yes (see Note *3)**
		116	**5580**	**17.0**	**15.0**	
		140	**5700**	**17.0**	**15.0**	
	HT40 CDD (2Tx)	102	5510	11.0	11.0	No (Test reduction per KDB)
		110	5550	16.0	15.0	
		134	5670	16.0	15.0	
	HT40 STBC/SDM (2Tx)	102	5510	13.0	13.0	No (Test reduction per KDB)
		110	5550	18.0	15.0	
		134	5670	18.0	15.0	
	HT20 CDD (3 Tx)	100	5500	13.5	13.5	No (Test reduction per KDB)
		116	5580	13.5	13.5	
		140	5700	13.5	13.5	
	HT20 STBC/SDM (3 Tx)	**100**	**5500**	**15.0**	**15.0**	**Yes (see Note *3)**
		116	**5580**	**15.5**	**15.0**	
		140	**5700**	**15.5**	**15.0**	
	HT40 CDD (3 Tx)	102	5510	9.5	9.5	No (Test reduction per KDB)
		110	5550	13.25	13.25	
		134	5670	13.25	13.25	
	HT40 STBC/SDM (3 Tx)	102	5510	10.5	10.5	No (Test reduction per KDB)
		110	5550	18.0	15.0	
		134	5670	18.0	15.0	

Note(s):

*1 The "Original Approval" power levels were based upon FCC modular approval testing of the BCM94331PCIEBT4 radio. These power levels were approved up to maximum regulatory levels to cover a number of different potential applications. The original maximum regulatory power levels may be reduced further by the driver for one of the following two reasons:

1) For performance (i.e. non-regulatory) reasons to ensure that PER and EVM of the radio meet internal specifications.
2) For application specifics. In this case the power is reduced to meet the specific SAR requirement per transmit chain over frequency band/channel as per the "Target Maximum Average Power per chain for C2PC" column

*2 The power levels per transmit chain are all equivalent

*3 SAR evaluation is performed at HT20 STBC/SDM mode because output power is higher vs others data rate modes.

*4 SAR evaluation is performed at STBC/SDM mode because output power is higher vs CDD mode.

10.5. Summary of Required Test Mode for 5.8 GHz Band

Mode (802.11)	No. of Transmitters	Ch. #	Freq. (MHz)	Maximum Shipping power level from original approval (*1 See Note) (dBm)	Maximum Shipping power level from C2PC / 17" Host (dBm)	SAR Test (Yes/No)
11a	**1Tx (CDD)**	**149**	**5745**	**18.0**	**15.0**	**Yes**
		153	**5765**	**18.0**	**15.0**	
		157	**5785**	**18.0**	**15.0**	
		161	**5805**	**18.0**	**15.0**	
		165	**5825**	**18.0**	**15.0**	
	2TX (CDD)	**149**	**5745**	**18.0**	**15.0**	**Yes**
		153	**5765**	**18.0**	**15.0**	
		157	**5785**	**21.5**	**15.0**	
		161	**5805**	**18.0**	**15.0**	
		165	**5825**	**18.0**	**15.0**	
	3TX (CDD)	**149**	**5745**	**18.0**	**15.0**	**Yes**
		153	**5765**	**18.0**	**15.0**	
		157	**5785**	**19.5**	**15.0**	
		161	**5805**	**18.0**	**15.0**	
		165	**5825**	**18.0**	**15.0**	
11n	HT20 SISO (1 Tx)	149	5745	18.0	15.0	No (Test reduction per KDB)
		157	5785	18.0	15.0	
		165	5825	18.0	15.0	
	HT40 SISO (1 Tx)	151	5755	18.0	15.0	No (Test reduction per KDB)
		159	5795	18.0	15.0	
	HT20 CDD/STBC/SDM (2 Tx)	149	5745	18.0	15.0	No (Test reduction per KDB)
		157	5785	21.5	15.0	
		165	5825	18.0	15.0	
	HT40 CDD/STBC/SDM (2 Tx)	151	5755	15.5	15.0	No (Test reduction per KDB)
		159	5795	15.5	15.0	
	HT20 CDD/SDM/STBC (3 Tx)	149	5745	18.0	15.0	No (Test reduction per KDB)
		157	5785	19.0	15.0	
		165	5825	18.0	15.0	
	HT40 CDD (3 Tx)	151	5755	15.5	15.0	No (Test reduction per KDB)
		159	5795	15.5	15.0	
	HT40 STBC/SDM (3 Tx)	151	5755	15.5	15.0	No (Test reduction per KDB)
		159	5795	15.5	15.0	

Note(s):

*1 The "Original Approval" power levels were based upon FCC modular approval testing of the BCM94331PCIEBT4 radio. These power levels were approved up to maximum regulatory levels to cover a number of different potential applications. The original maximum regulatory power levels may be reduced further by the driver for one of the following two reasons:

1) For performance (i.e. non-regulatory) reasons to ensure that PER and EVM of the radio meet internal specifications.
2) For application specifics. In this case the power is reduced to meet the specific SAR requirement per transmit chain over frequency band/channel as per the "Target Maximum Average Power per chain for C2PC" column

*2 The power levels per transmit chain are all equivalent

11. RF Output Power Measurement

The following power measurement is based on Sec. 8 required test modes. Spot check has been conducted for all configurations that are excluded from SAR.

11.1. RF Output Power Measurement for 2.4 GHz Band

Mode (802.11)	No. of Transmitters	Ch. #	Freq. (MHz)	Target Maximum Average Power per chain for C2PC (dBm)			Measured Pwr (dBm)		
				Chain 0	Chain 1	Chain 2	Chain 0	Chain 1	Chain 2
11b	1 Tx (CDD)	1	2412	18.0			**18.0**		
		6	2437	18.0			17.9		
		11	2462	18.0			18.0		
		1	2412		18.0			18.0	
		6	2437		18.0			**18.0**	
		11	2462		18.0			18.0	
		1	2412			18.0			18.0
		6	2437			18.0			**18.0**
		11	2462			18.0			18.0
	2 Tx (CDD)	1	2412	18.0	18.0		17.8	17.9	
		6	2437	18.0	18.0		**17.9**	**18.0**	
		11	2462	18.0	18.0		18.0	18.0	
		1	2412	18.0		18.0	17.7		17.9
		6	2437	18.0		18.0	17.7		18.0
		11	2462	18.0		18.0	**17.9**		**18.0**
		1	2412		18.0	18.0		**18.0**	**17.9**
		6	2437		18.0	18.0		18.0	17.9
		11	2462		18.0	18.0		18.0	18.0
	3 Tx (CDD)	1	2412	18.0	18.0	18.0	17.9	18.0	17.9
		6	2437	18.0	18.0	18.0	17.9	18.0	17.9
		11	2462	18.0	18.0	18.0	**18.0**	**18.0**	**17.9**

11.2. RF Output Power Measurement for 5.2 GHz Band

Mode (802.11)	No. of Transmitters	Ch. #	Freq. (MHz)	Target Maximum Average Power per chain for C2PC (dBm)			Measured Pwr (dBm)		
				Chain 0	Chain 1	Chain 2	Chain 0	Chain 1	Chain 2
11a	CDD (1 Tx)	36	5180	14.0			13.9		
		40	5200	14.0			13.9		
		44	5220	14.0			14.0		
		48	5240	14.0			**14.0**		
		36	5180		14.0			**14.0**	
		40	5200		14.0			13.9	
		44	5220		14.0			13.9	
		48	5240		14.0			14.0	
		36	5180			14.0			**14.0**
		40	5200			14.0			14.0
		44	5220			14.0			14.0
		48	5240			14.0			14.0
11n	HT40 SISO (1 Tx)	38	5190	15.0			**15.0**		
		46	5230	15.0			15.0		
		38	5190		15.0			**15.0**	
		46	5230		15.0			15.0	
		38	5190			15.0			**15.0**
		46	5230			15.0			15.0
	HT40 STBC (2 Tx)	38	5190	13.75	13.75		**13.75**	**13.70**	
		46	5230	13.75	13.75		13.70	13.70	
		38	5190	13.75		13.75	**13.75**		**13.40**
		46	5230	13.75		13.75	13.70		13.40
		38	5190		13.75	13.75		13.70	13.70
		46	5230		13.75	13.75		**13.70**	**13.71**
	HT40 STBC (3 Tx)	38	5190	12.0	12.0	12.0	12.0	11.8	11.8
		46	5230	12.0	12.0	12.0	**12.0**	**12.0**	**12.0**

11.3. RF Output Power Measurement for 5.3 GHz Band

Mode (802.11)	No. of Transmitters	Ch. #	Freq. (MHz)	Target Maximum Average Power per chain for C2PC (dBm)			Measured Pwr (dBm)		
				Chain 0	Chain 1	Chain 2	Chain 0	Chain 1	Chain 2
11a	CDD (1 Tx)	52	5260	15.0			14.9		
		56	5280	15.0			14.9		
		60	5300	15.0			**15.0**		
		64	5320	15.0			14.9		
		52	5260		15.0			14.9	
		56	5280		15.0			14.9	
		60	5300		15.0			15.0	
		64	5320		15.0			**15.0**	
		52	5260			15.0			14.9
		56	5280			15.0			14.9
		60	5300			15.0			**15.0**
		64	5320			15.0			14.9
11n	HT20 STBC/SDM (2 Tx)	52	5260	15.0	15.0		**15.0**	**14.6**	
		60	5300	15.0	15.0		15.0	14.5	
		64	5320	14.5	14.5		14.5	14.5	
		52	5260	15.0		15.0	**15.0**		**14.6**
		60	5300	15.0		15.0	15.0		14.5
		64	5320	14.5		14.5	14.5		14.5
		52	5260		15.0	15.0		15.0	14.8
		60	5300		15.0	15.0		**15.0**	**14.7**
		64	5320		14.5	14.5		14.5	14.5
	HT20 STBC/SDM (3 Tx)	52	5260	15.0	15.0	15.0	15.0	14.8	14.7
		60	5300	15.0	15.0	15.0	**15.0**	**14.9**	**14.7**
		64	5320	15.0	15.0	15.0	15.0	14.8	14.7

11.4. RF Output Power Measurement for 5.5 GHz Band

Mode (802.11)	No. of Transmitters	Ch. #	Freq. (MHz)	Target Maximum Average Power per chain for C2PC (dBm)			Measured Pwr (dBm)		
				Chain 0	Chain 1	Chain 2	Chain 0	Chain 1	Chain 2
11a	CDD (1 Tx)	100	5500	15.0			**15.0**		
		104	5520	15.0			14.9		
		108	5540	15.0			14.9		
		112	5560	15.0			14.9		
		116	5580	15.0			14.9		
		120	5600	15.0			15.0		
		124	5620	15.0			15.0		
		128	5640	15.0			14.9		
		132	5660	15.0			14.9		
		136	5680	15.0			14.9		
		140	5700	15.0			15.0		
		100	5500		15.0			15.0	
		104	5520		15.0			14.9	
		108	5540		15.0			14.9	
		112	5560		15.0			14.9	
		116	5580		15.0			15.0	
		120	5600		15.0			**15.0**	
		124	5620		15.0			14.9	
		128	5640		15.0			15.0	
		132	5660		15.0			14.9	
		136	5680		15.0			14.9	
		140	5700		15.0			15.0	
		100	5500			15.0			15.0
		104	5520			15.0			14.9
		108	5540			15.0			14.9
		112	5560			15.0			15.0
		116	5580			15.0			15.0
		120	5600			15.0			**15.0**
		124	5620			15.0			14.9
		128	5640			15.0			15.0
		132	5660			15.0			14.9
		136	5680			15.0			14.9
		140	5700			15.0			15.0
11n	HT20 STBC/SDM (2 Tx)	100	5500	14.5	14.5		14.5	14.5	
		120	5600	15.0	15.0		**15.0**	**15.0**	
		140	5700	15.0	15.0		14.8	14.9	
		100	5500	14.5		14.5	14.5		14.5
		120	5600	15.0		15.0	**15.0**		**15.0**
		140	5700	15.0		15.0	14.8		14.8
		100	5500		14.5	14.5		14.5	14.5
		120	5600		15.0	15.0		**14.9**	**14.8**
		140	5700		15.0	15.0		14.8	14.8
	HT20 STBC/SDM (3 Tx)	100	5500	15.0	15.0	15.0	**14.9**	**15.0**	**15.0**
		120	5600	15.0	15.0	15.0	14.9	15.0	14.9
		140	5700	15.0	15.0	15.0	14.8	14.8	14.8

11.5. RF Output Power Measurement for 5.8 GHz Band

Mode (802.11)	No. of Transmitters	Ch. #	Freq. (MHz)	Target Maximum Average Power per chain for C2PC (dBm)			Measured Pwr (dBm)		
				Chain 0	Chain 1	Chain 2	Chain 0	Chain 1	Chain 2
11a	CDD (1 Tx)	149	5745	15.0			15.0		
		153	5765	15.0			15.0		
		157	5785	15.0			**15.0**		
		161	5805	15.0			15.0		
		165	5825	15.0			15.0		
		149	5745		15.0			**15.0**	
		153	5765		15.0			15.0	
		157	5785		15.0			15.0	
		161	5805		15.0			15.0	
		165	5825		15.0			15.0	
		149	5745			15.0			15.0
		153	5765			15.0			15.0
		157	5785			15.0			**15.0**
		161	5805			15.0			15.0
		165	5825			15.0			15.0
	CDD (2 Tx)	149	5745	15.0	15.0		**15.0**	**15.0**	
		157	5785	15.0	15.0		14.9	14.9	
		165	5825	15.0	15.0		14.8	14.9	
		149	5745	15.0		15.0	**14.8**		**14.8**
		157	5785	15.0		15.0	14.8		14.8
		165	5825	15.0		15.0	14.8		14.8
		149	5745		15.0	15.0		**14.8**	**14.9**
		157	5785		15.0	15.0		14.7	14.9
		165	5825		15.0	15.0		14.6	14.9
	CDD (3 Tx)	149	5745	15.0	15.0	15.0	14.8	14.9	14.9
		157	5785	15.0	15.0	15.0	**15.0**	**15.0**	**15.0**
		165	5825	15.0	15.0	15.0	14.7	15.0	14.9

12. Required Test Channels per KDB 248227 D01

Mode		Band	GHz	Channel	"Default Test Channels"	
					802.11b	802.11g
802.11b/g		2.4 GHz	2.412	1#	√	∇
			2.437	6	√	∇
			2.462	11#	√	∇
802.11a	UNII (15.407)	5.2 GHz	5.180	36	√	
			5.200	40		*
			2.220	44		*
			5.240	48	√	
		5.3 GHz	5.260	52	√	
			5.280	56		*
			5.300	60		*
			5.320	64	√	
		5.5 GHz	5.500	100		
			5.520	104	√	
			5.540	108		*
			5.560	112		*
			5.580	116	√	
			5.600	120		*
			5.620	124	√	
			5.640	128		*
			5.660	132		*
			5.680	136	√	
			5.700	140		*
	DTS (15.247)	5.8 GHz	5.745	149	√	
			5.765	153		*
			5.785	157	√	
			5.805	161		*
			5.825	165	√	

√ = "default test channels"

* = possible 802.11a channels with maximum average output > the "default test channels"

∇ = possible 802.11g channels with maximum average output ¼ dB ≥ the "default test channels"

= when output power is reduced for channel 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels should be tested.

13. SAR Test Results

13.1. 2.4GHz Band

Test mode reduction considerations

1. For frequency bands with an operating range of < 100 MHz, when the SAR for the highest output power channel within is ≤ 0.8 W/kg, SAR for the remaining channels is not required. Per KDB 447498 1) e) i).
2. KDB 248227 - SAR is not required for 802.11g/HT20 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels.

Lap-held

Band (GHz)	Mode (802.11)	# of Tx	Ch. #	Freq. (MHz)	Measured Pwr (dBm)			1-g SAR (W/kg)			Note
					Chain 0	Chain 1	Chain 2	Chain 0	Chain 1	Chain 2	
2.4	11b CDD	1 Tx	1	2412	18.0			0.526			
			1	2412		18.0			0.985		
			6	2437		18.0			1.08		
			11	2462		18.0			**1.09**		*
			1	2412			18.0			0.801	
			6	2437			18.0			0.759	
			11	2462			18.0			0.768	
		2 Tx	1	2412	17.8	17.9		0.731	1.01		
			6	2437	17.9	18.0		0.839	1.11		
			11	2462	18.0	18.0		0.952	**1.19**		*
			1	2412	17.7		17.9	0.595		0.783	
			6	2437	17.7		18.0	0.696		0.747	
			11	2462	17.9		18.0	0.838		0.784	
			1	2412		18.0	17.9		1.11	0.833	
			6	2437		18.0	17.9		1.17	0.762	
			11	2462		18.0	18.0		1.19	0.713	
		3 Tx	1	2412	17.9	18.0	17.9	0.816	1.13	0.800	
			6	2437	17.9	18.0	17.9	0.867	**1.17**	0.781	*
			11	2462	18.0	18.0	17.9	0.947	1.15	0.727	

Note(s):

*: Worst case SAR results for the given mode/transmit condition in the corresponding frequency band.

13.2. 5 GHz Bands

Test mode reduction considerations

1. For frequency bands with an operating range of < 100 MHz, when the SAR for the highest output power channel within is ≤ 0.8 W/kg, SAR for the remaining channels is not required. Per KDB 447498 1) e) i).
2. For frequency bands with an operating range of < 200 MHz, when the SAR for the highest output power channel within is ≤ 0.4 W/kg, SAR for the remaining channels is not required. Per KDB 447498 1) e) ii).

Lap-held

Band (GHz)	Mode (802.11)	# of Tx	Ch. #	Freq. (MHz)	Measured Pwr (dBm)			1-g SAR (W/kg)			Note
					Chain 0	Chain 1	Chain 2	Chain 0	Chain 1	Chain 2	
5.2GHz	11a CDD	1 Tx	48	5240	14.0			**0.435**			*
			36	5180		14.0			0.377		
			36	5180			14.0			0.292	
	11n HT40 SISO	1 Tx	38	5190	15.0			**0.578**			*
			38	5190		15.0			0.529		
			38	5190			15.0			0.371	
	11n HT40 STBC	2 Tx	38	5190	13.75	13.70		**0.436**	0.392		*
			38	5190	13.75		13.40	0.427		0.261	
			46	5230		13.70	13.71		0.389	0.270	
	11n HT40 STBC	3 Tx	46	5230	12.0	12.0	12.0	**0.483**	0.350	0.379	*
5.3GHz	11a CDD	1 Tx	60	5300	15.0			**0.581**			*
			64	5320		15.0			0.535		
			60	5300			15.0			0.417	
	11n HT20 STBC/SDM	2 Tx	52	5260	15.0	14.6		**0.709**	0.522		*
			52	5260	15.0		14.6	0.688		0.358	
			60	5300		15.0	14.7		0.608	0.527	
	11n HT20 STBC/SDM	3 Tx	60	5300	15.0	14.9	14.7	**0.753**	0.583	0.504	*
5.5GHz	11a CDD	1 Tx	100	5500	15.0			0.553			
			120	5600	15.0			0.600			
			124	5620	15.0			0.600			
			140	5700	15.0			0.577			
			100	5500		15.0			0.663		
			116	5580		15.0			0.667		
			120	5600		15.0			**0.685**		*
			140	5700		15.0			0.548		
			100	5500			15.0			0.674	
			116	5580			15.0			0.528	
			120	5600			15.0			0.570	
			140	5700			15.0			0.476	
	11n HT20 STBC/SDM	2 Tx	120	5600	15.0	15.0		0.624	0.653		
			140	5700	14.8	14.9		0.574	0.569		
			120	5600	15.0		15.0	0.621		**0.705**	
			140	5700	14.8		14.8	0.571		0.552	
			120	5600		14.9	14.8		0.673	0.605	
			140	5700		14.8	14.8		0.531	0.603	
	11n HT20 STBC/SDM	3 Tx	100	5500	14.9	15.0	15.0	0.649	0.789	**0.817**	*
			120	5600	14.9	15.0	14.9	0.644	0.710	0.724	
			140	5700	14.8	14.8	14.8	0.595	0.571	0.675	

5 GHz Bands continued

Band (GHz)	Mode (802.11)	# of Tx	Ch. #	Freq. (MHz)	Measured Pwr (dBm)			1-g SAR (W/kg)			Note
					Chain 0	Chain 1	Chain 2	Chain 0	Chain 1	Chain 2	
5.8GHz	11a CDD	1 Tx	157	5785	15.0			**0.580**			*
			149	5745		15.0			0.567		
			157	5785			15.0			0.546	
	11a CDD	2 Tx	149	5745	15.0	15.0		**0.598**	0.592		*
			149	5745	14.8		14.8	0.566		0.524	
			149	5745		14.8	14.9		0.519	0.578	
	11a CDD	3 Tx	157	5785	15.0	15.0	15.0	0.635	0.577	**0.689**	*

Note(s):

*: Worst case SAR results for the given mode/transmit condition in the corresponding frequency band.

14. Summary of Highest SAR Values

Technology/Band	Test configuration	Mode	Separation distance (mm)	Highest 1g SAR (W/kg)
WiFi 2.4 GHz	Lap-held	802.11b CDD 1Tx	0	1.09
		802.11b CDD 2Tx	0	**1.19**
		802.11b CDD 3Tx	0	1.17
WiFi 5.2 GHz	Lap-held	802.11a CDD 1Tx	0	0.435
		802.11n HT40 SISO 1Tx	0	**0.578**
		802.11n HT40 STBC 2Tx	0	0.436
		802.11n HT40 STBC 3Tx	0	0.483
WiFi 5.3 GHz	Lap-held	802.11a CDD 1Tx	0	0.581
		802.11n HT20 STBC/SDM 2Tx	0	0.709
		802.11n HT20 STBC/SDM 3Tx	0	**0.753**
WiFi 5.5 GHz	Lap-held	802.11a CDD 1Tx	0	0.685
		802.11n HT20 STBC/SDM 2Tx	0	0.705
		802.11n HT20 STBC/SDM 3Tx	0	**0.817**
WiFi 5.8 GHz	Lap-held	802.11a CDD 1Tx	0	0.580
		802.11a CDD 2Tx	0	0.598
		802.11a CDD 3Tx	0	**0.689**

14.1. Scaled SAR Values to the Maximum Target Output Power

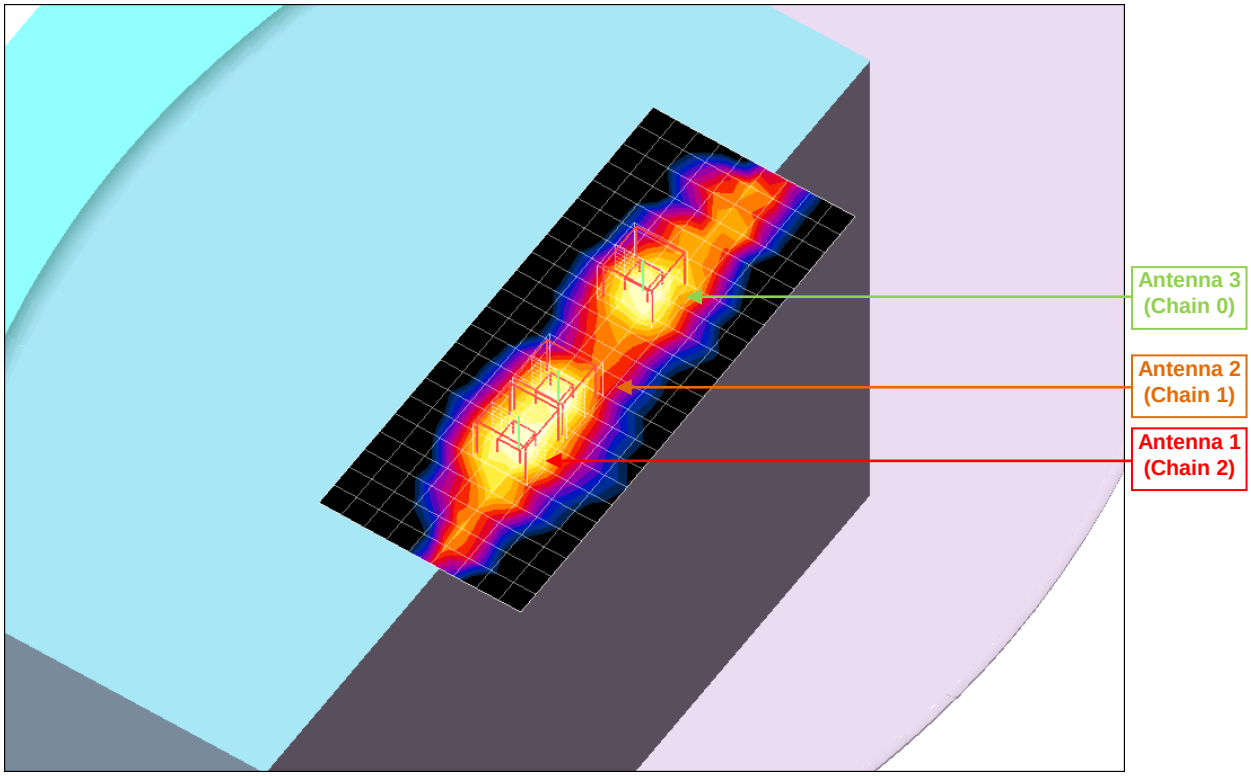
The highest measured SAR results were scaled, in cases where measured output power is lower than the maximum Target output power level, in each frequency band.

Technology /Band	Test Configuration		Mode (802.11)	# of Tx	Ch #.	Freq. (MHz)	Power (dBm)		SAR (W/kg)	
	Exposure	Position					Tune-up limit	Measured	Measured	Scaled
WiFi 2.4 GHz	Body	Lap-held	11b CDD	2 Tx	11	2462	18.0	18.0	1.190	*
WiFi 5.2 GHz	Body	Lap-held	11n HT40 SISO	1 Tx	38	5190	15.0	15.0	0.578	*
WiFi 5.3 GHz	Body	Lap-held	11n HT20 STBC/SDM	3 Tx	60	5300	15.0	15.0	0.753	*
WiFi 5.5 GHz	Body	Lap-held	11n HT20 STBC/SDM	3 Tx	100	5500	15.0	15.0	0.817	*
WiFi 5.8 GHz	Body	Lap-held	11a CDD	3 Tx	157	5785	15.0	15.0	0.689	*

Note(s):
*: SAR Scaling was not applied when the measured output power is equal or greater than the maximum target output power.

14.2. Worst-Case SAR Plots (from Summary of Highest SAR Values table)

The figure below illustrates the approximate locations of the zoom scan cubes for each of the labeled Antennas/Chains. Though the cube location for an Antenna/Chain may vary slightly based on differing operating frequency range and modes, its relation to the cube locations of other Antennas/Chains and the area scan as a whole should remain constant.



14.2.1. Worst-Case SAR Plots for 2.4 GHz Band

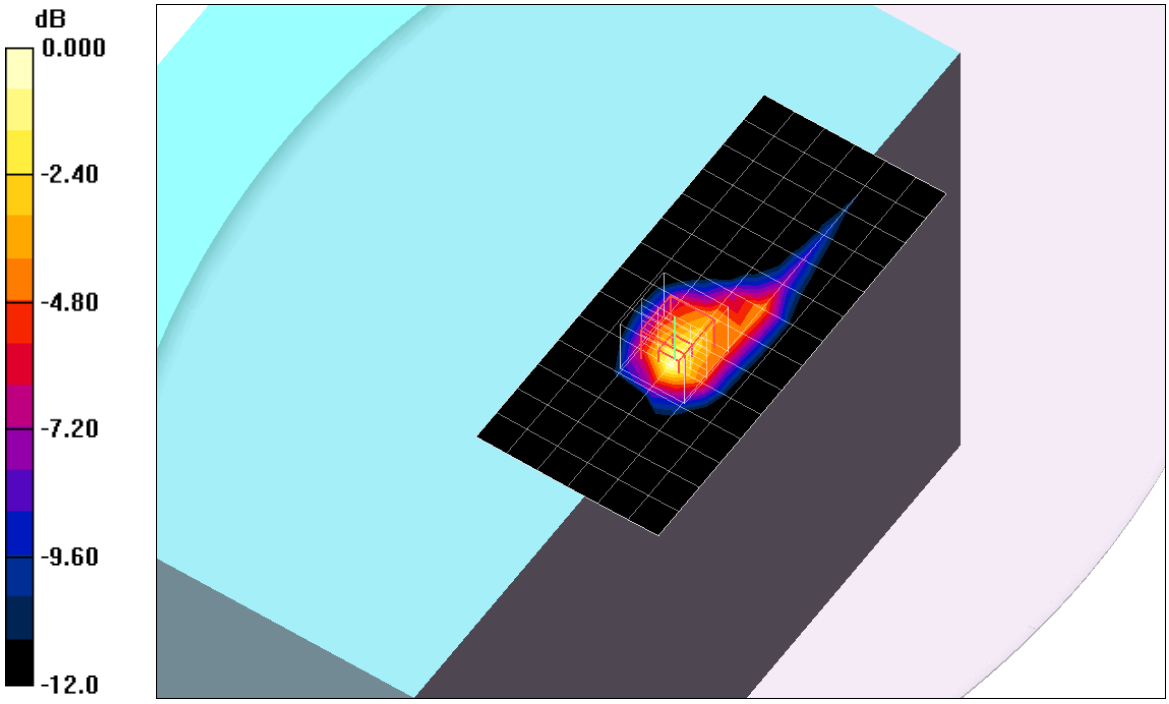
Test Laboratory: UL CCS SAR Lab D Date/Time: 2/10/2012 11:31:17 AM

2.4 GHz band

Frequency: 2462 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used (interpolated): f = 2462 MHz; σ = 1.94 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3 ;
DASY4 Configuration:
- Electronics: DAE3 Sn427; Calibrated: 1/17/2012
- Probe: EX3DV4 - SN3749; ConvF(6.66, 6.66, 6.66); Calibrated: 1/27/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003

802.11b, Chain 1_Ch 11/Area Scan (15x7x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.47 mW/g

802.11b, Chain 1_Ch 11/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 27.8 V/m; Power Drift = -0.010 dB
Peak SAR (extrapolated) = 2.46 W/kg
SAR(1 g) = 1.09 mW/g; SAR(10 g) = 0.523 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.60 mW/g



0 dB = 1.60mW/g

Test Laboratory: UL CCS SAR Lab D
Date/Time: 2/10/2012 12:17:34 AM

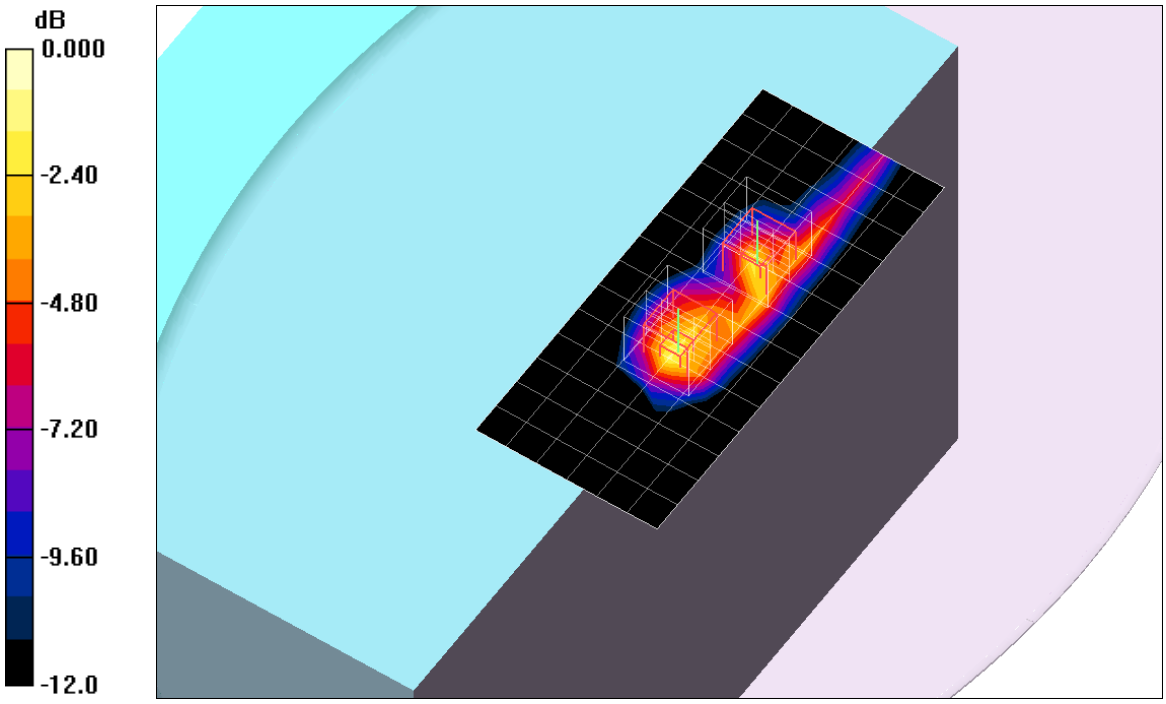
2.4 GHz band

Frequency: 2462 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used (interpolated): f = 2462 MHz; σ = 1.94 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3 ;
DASY4 Configuration:
- Electronics: DAE3 Sn427; Calibrated: 1/17/2012
- Probe: EX3DV4 - SN3749; ConvF(6.66, 6.66, 6.66); Calibrated: 1/27/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003

802.11b, Chain 0,1_Ch 11/Area Scan (15x7x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.26 mW/g

802.11b, Chain 0_Ch 11/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.9 V/m; Power Drift = -0.125 dB
Peak SAR (extrapolated) = 1.93 W/kg
SAR(1 g) = 0.952 mW/g; SAR(10 g) = 0.473 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.35 mW/g

802.11b, Chain 1_Ch 11/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.9 V/m; Power Drift = -0.125 dB
Peak SAR (extrapolated) = 2.60 W/kg
SAR(1 g) = 1.19 mW/g; SAR(10 g) = 0.582 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.69 mW/g



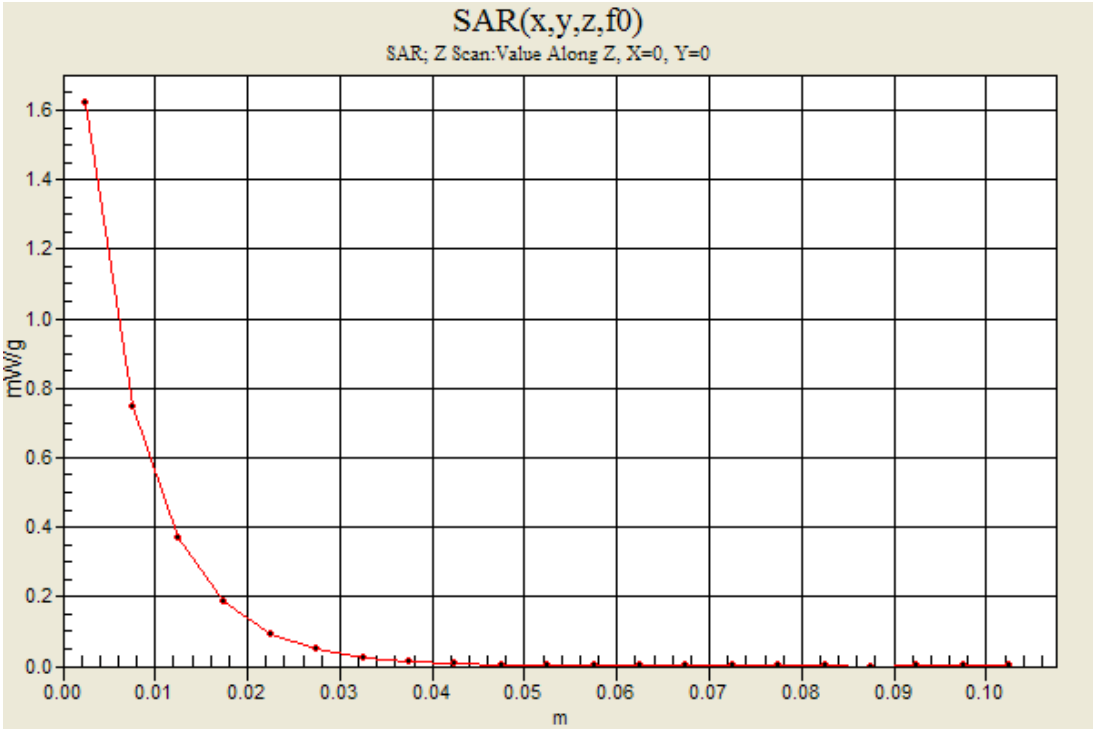
0 dB = 1.69mW/g

Test Laboratory: UL CCS SAR Lab D
Date/Time: 2/10/2012 12:34:18 AM

2.4 GHz band

Frequency: 2462 MHz; Duty Cycle: 1:1

802.11b, Chain 0,1_Ch 11/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.62 mW/g



Test Laboratory: UL CCS SAR Lab D
Date/Time: 2/9/2012 8:45:26 PM

2.4 GHz band

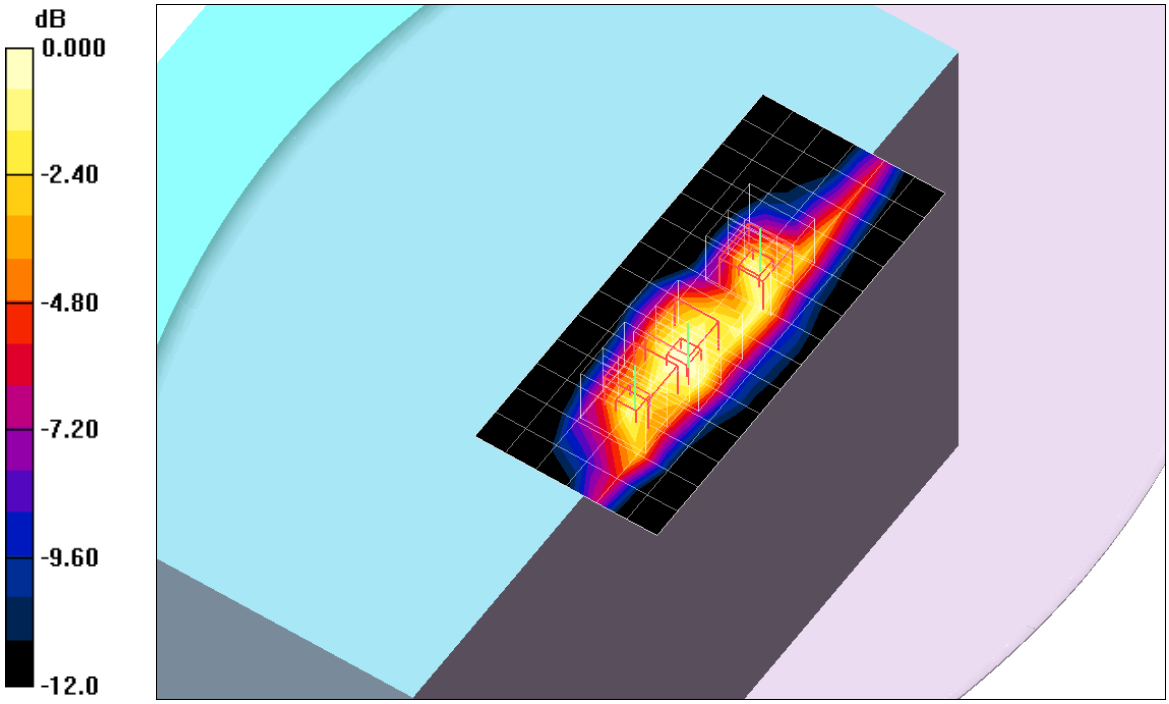
Frequency: 2437 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.91 mho/m; ε_r = 52.3; ρ = 1000 kg/m^3 ;
DASY4 Configuration:
- Electronics: DAE3 Sn427; Calibrated: 1/17/2012
- Probe: EX3DV4 - SN3749; ConvF(6.66, 6.66, 6.66); Calibrated: 1/27/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003

802.11b, Chain 0,1,2_Ch 6/Area Scan (15x7x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.07 mW/g

802.11b, Chain 0_Ch 6/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 27.3 V/m; Power Drift = -0.151 dB
Peak SAR (extrapolated) = 1.94 W/kg
SAR(1 g) = 0.867 mW/g; SAR(10 g) = 0.445 mW/g
Maximum value of SAR (measured) = 1.18 mW/g

802.11b, Chain 1_Ch 6/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 27.3 V/m; Power Drift = -0.151 dB
Peak SAR (extrapolated) = 2.55 W/kg
SAR(1 g) = 1.17 mW/g; SAR(10 g) = 0.587 mW/g
Maximum value of SAR (measured) = 1.64 mW/g

802.11b, Chain 2_Ch 6/Zoom Scan 2 (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 27.3 V/m; Power Drift = -0.151 dB
Peak SAR (extrapolated) = 1.62 W/kg
SAR(1 g) = 0.781 mW/g; SAR(10 g) = 0.409 mW/g
Maximum value of SAR (measured) = 1.11 mW/g



0 dB = 1.11mW/g

14.2.2. Worst-Case SAR Plots for 5.2 GHz Band

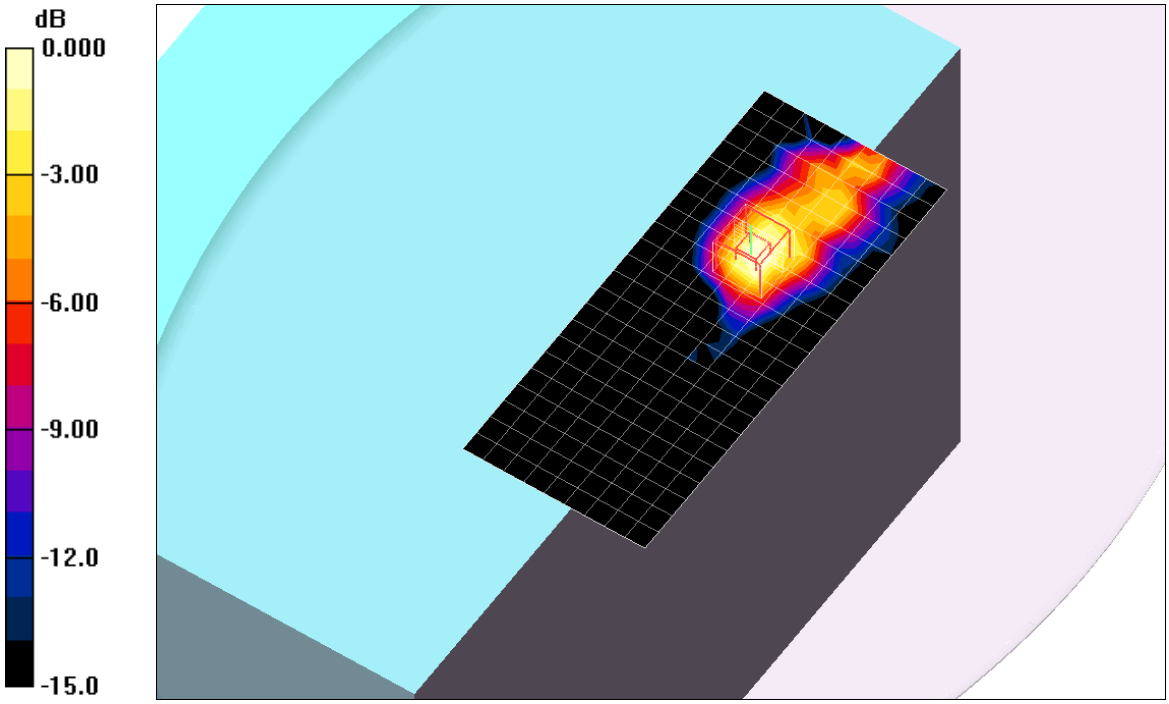
Test Laboratory: UL CCS SAR Lab D Date/Time: 2/7/2012 12:17:12 PM

5GHz bands

Frequency: 5240 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C
Medium parameters used: f = 5240 MHz; σ = 5.45 mho/m; ε_r = 48.3; ρ = 1000 kg/m^3 ;
DASY4 Configuration:
- Electronics: DAE3 Sn427; Calibrated: 1/17/2012
- Probe: EX3DV4 - SN3749; ConvF(4.23, 4.23, 4.23); Calibrated: 1/27/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003

802.11a,Chain 0_Ch 48/Area Scan (23x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.650 mW/g

802.11a,Chain 0_Ch 48/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 12.1 V/m; Power Drift = -0.103 dB
Peak SAR (extrapolated) = 1.36 W/kg
SAR(1 g) = 0.435 mW/g; SAR(10 g) = 0.164 mW/g
Maximum value of SAR (measured) = 0.705 mW/g



0 dB = 0.705mW/g

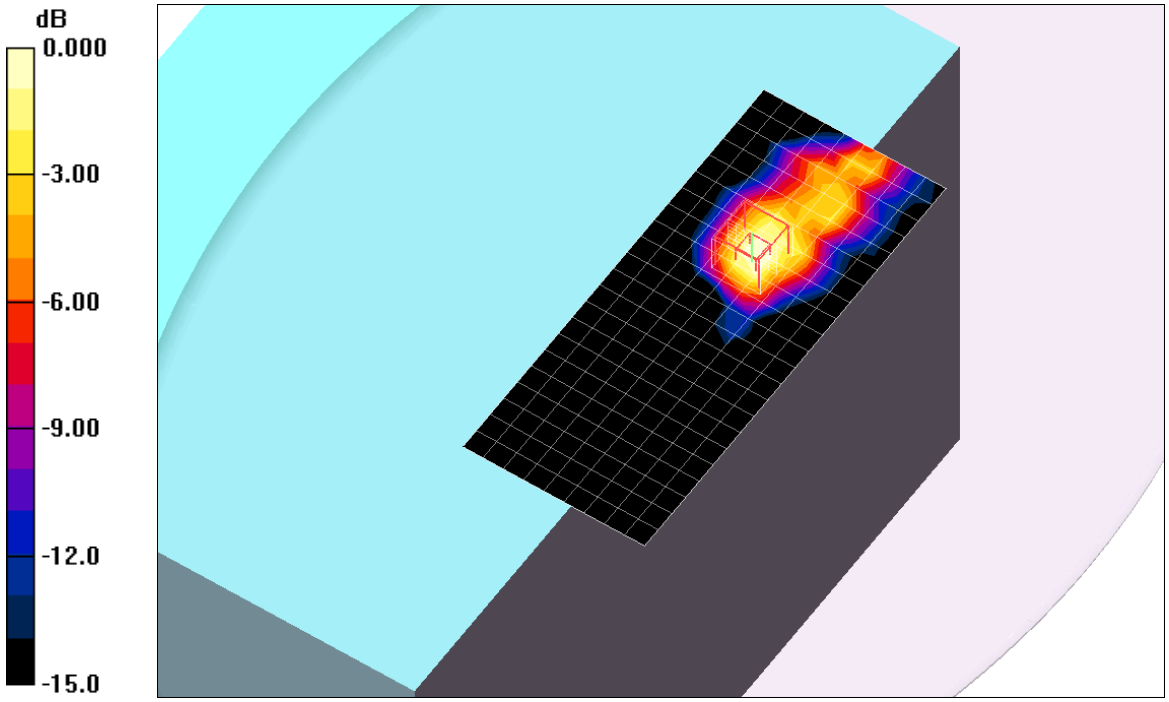
Test Laboratory: UL CCS SAR Lab D
Date/Time: 2/7/2012 10:45:51 AM

5GHz bands

Frequency: 5190 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C
Medium parameters used: f = 5190 MHz; σ = 5.42 mho/m; ε_r = 48.6; ρ = 1000 kg/m^3 ;
DASY4 Configuration:
- Electronics: DAE3 Sn427; Calibrated: 1/17/2012
- Probe: EX3DV4 - SN3749; ConvF(4.23, 4.23, 4.23); Calibrated: 1/27/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003

802.11n HT40,Chain 0_Ch 38/Area Scan (23x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.850 mW/g

802.11n HT40,Chain 0_Ch 38/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 13.6 V/m; Power Drift = -0.123 dB
Peak SAR (extrapolated) = 1.81 W/kg
SAR(1 g) = 0.578 mW/g; SAR(10 g) = 0.222 mW/g
Maximum value of SAR (measured) = 0.934 mW/g



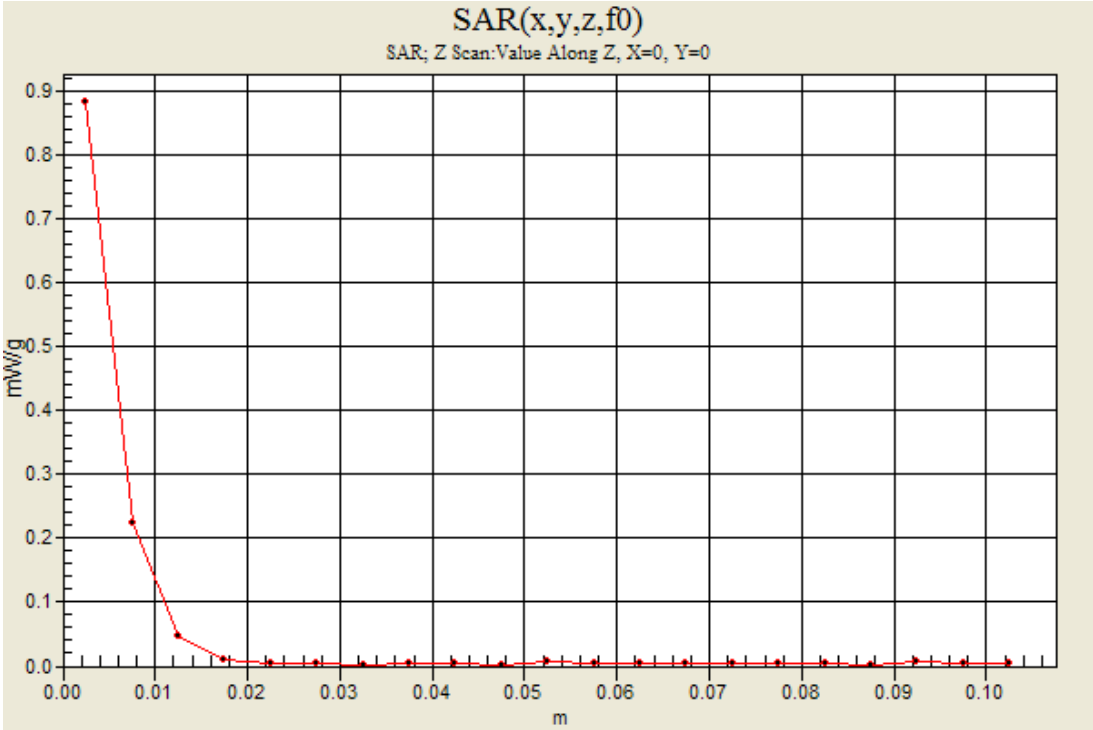
0 dB = 0.934mW/g

Test Laboratory: UL CCS SAR Lab D
Date/Time: 2/7/2012 11:12:53 AM

5GHz bands

Frequency: 5190 MHz; Duty Cycle: 1:1

802.11n HT40,Chain 0_Ch 38/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.883 mW/g



Test Laboratory: UL CCS SAR Lab D
Date/Time: 2/6/2012 11:47:38 PM

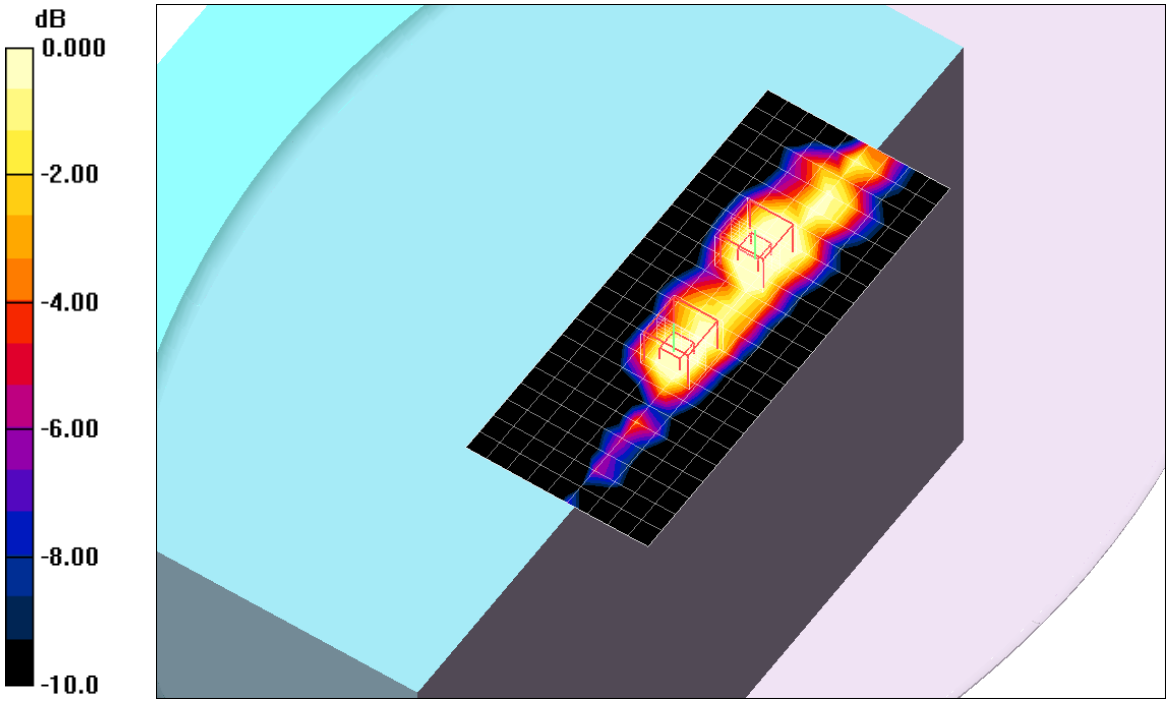
5GHz bands

Frequency: 5190 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C
Medium parameters used: f = 5190 MHz; σ = 5.35 mho/m; ε_r = 48.6; ρ = 1000 kg/m^3 ;
DASY4 Configuration:
- Electronics: DAE3 Sn427; Calibrated: 1/17/2012
- Probe: EX3DV4 - SN3749; ConvF(4.23, 4.23, 4.23); Calibrated: 1/27/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003

802.11n HT40,Chain 0,1_Ch 38/Area Scan (23x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.996 mW/g

802.11n HT40,Chain 0_Ch 38/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 10.7 V/m; Power Drift = 0.141 dB
Peak SAR (extrapolated) = 1.39 W/kg
SAR(1 g) = 0.436 mW/g; SAR(10 g) = 0.179 mW/g
Maximum value of SAR (measured) = 0.684 mW/g

802.11n HT40,Chain 1_Ch 38/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 10.7 V/m; Power Drift = 0.141 dB
Peak SAR (extrapolated) = 1.22 W/kg
SAR(1 g) = 0.392 mW/g; SAR(10 g) = 0.139 mW/g
Maximum value of SAR (measured) = 0.644 mW/g



0 dB = 0.644mW/g

Test Laboratory: UL CCS SAR Lab D
Date/Time: 2/6/2012 9:15:12 PM

5GHz bands

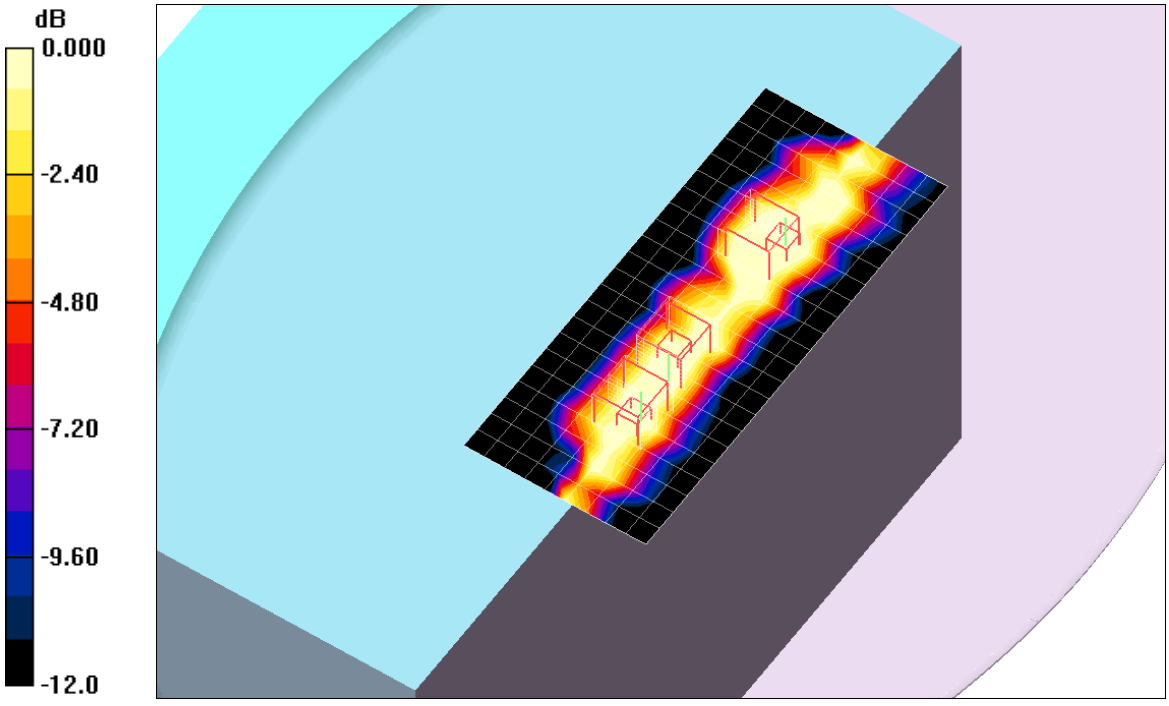
Frequency: 5230 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C
Medium parameters used: f = 5230 MHz; σ = 5.46 mho/m; ε_r = 48.5; ρ = 1000 kg/m^3 ;
DASY4 Configuration:
- Electronics: DAE3 Sn427; Calibrated: 1/17/2012
- Probe: EX3DV4 - SN3749; ConvF(4.23, 4.23, 4.23); Calibrated: 1/27/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003

802.11n HT40,Chain 0,1,2_Ch 46/Area Scan (23x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 1.10 mW/g

802.11n HT40,Chain 0 _Ch 46/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 13.2 V/m; Power Drift = -0.148 dB
Peak SAR (extrapolated) = 1.60 W/kg
SAR(1 g) = 0.483 mW/g; SAR(10 g) = 0.204 mW/g
Maximum value of SAR (measured) = 0.827 mW/g

802.11n HT40,Chain 1_Ch 46/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 13.2 V/m; Power Drift = -0.148 dB
Peak SAR (extrapolated) = 1.30 W/kg
SAR(1 g) = 0.350 mW/g; SAR(10 g) = 0.134 mW/g
Maximum value of SAR (measured) = 0.601 mW/g

802.11n HT40,Chain 2_Ch 46/Zoom Scan 2 (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 13.2 V/m; Power Drift = -0.148 dB
Peak SAR (extrapolated) = 1.21 W/kg
SAR(1 g) = 0.379 mW/g; SAR(10 g) = 0.140 mW/g
Maximum value of SAR (measured) = 0.616 mW/g



0 dB = 0.616mW/g

14.2.3. Worst-Case SAR Plots for 5.3 GHz Band

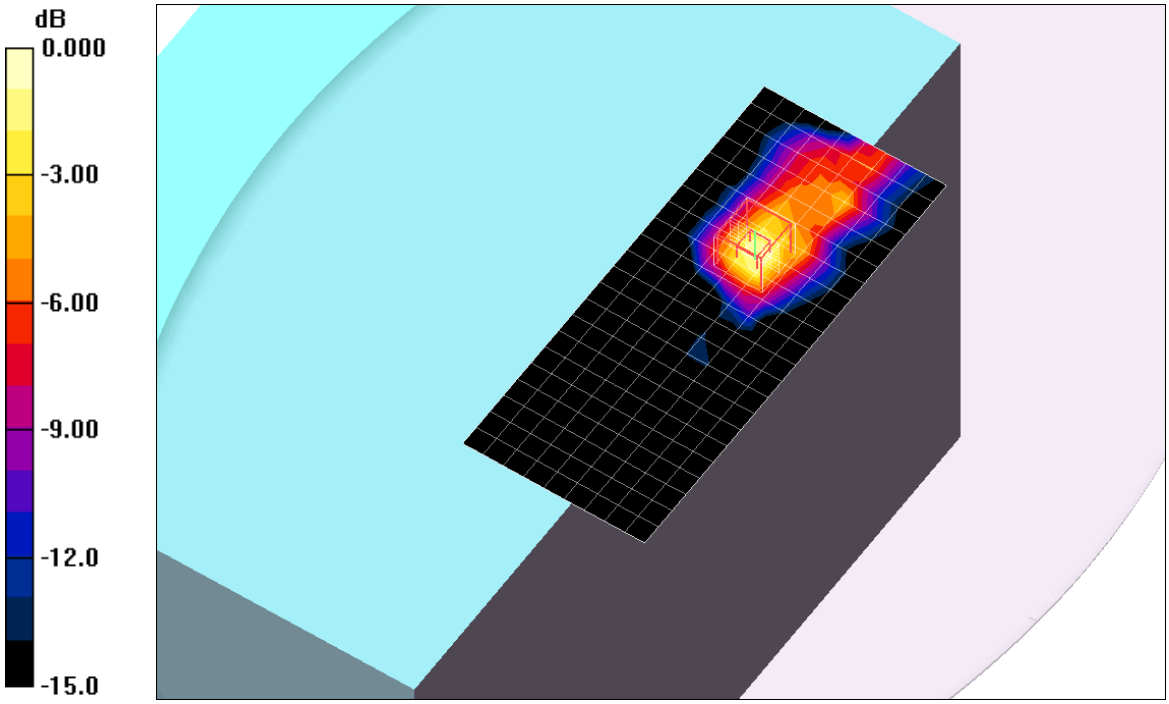
Test Laboratory: UL CCS SAR Lab D Date/Time: 2/7/2012 9:42:11 PM

5GHz bands

Frequency: 5300 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C
Medium parameters used: f = 5300 MHz; σ = 5.5 mho/m; ε_r = 48.3; ρ = 1000 kg/m^3 ;
DASY4 Configuration:
- Electronics: DAE3 Sn427; Calibrated: 1/17/2012
- Probe: EX3DV4 - SN3749; ConvF(4.11, 4.11, 4.11); Calibrated: 1/27/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003

802.11a, Chain 0_Ch 60/Area Scan (23x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.692 mW/g

802.11a, Chain 0_Ch 60/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 10.9 V/m; Power Drift = 0.061 dB
Peak SAR (extrapolated) = 1.87 W/kg
SAR(1 g) = 0.581 mW/g; SAR(10 g) = 0.213 mW/g
Maximum value of SAR (measured) = 0.946 mW/g



0 dB = 0.946mW/g

Test Laboratory: UL CCS SAR Lab D
Date/Time: 2/7/2012 7:37:19 PM

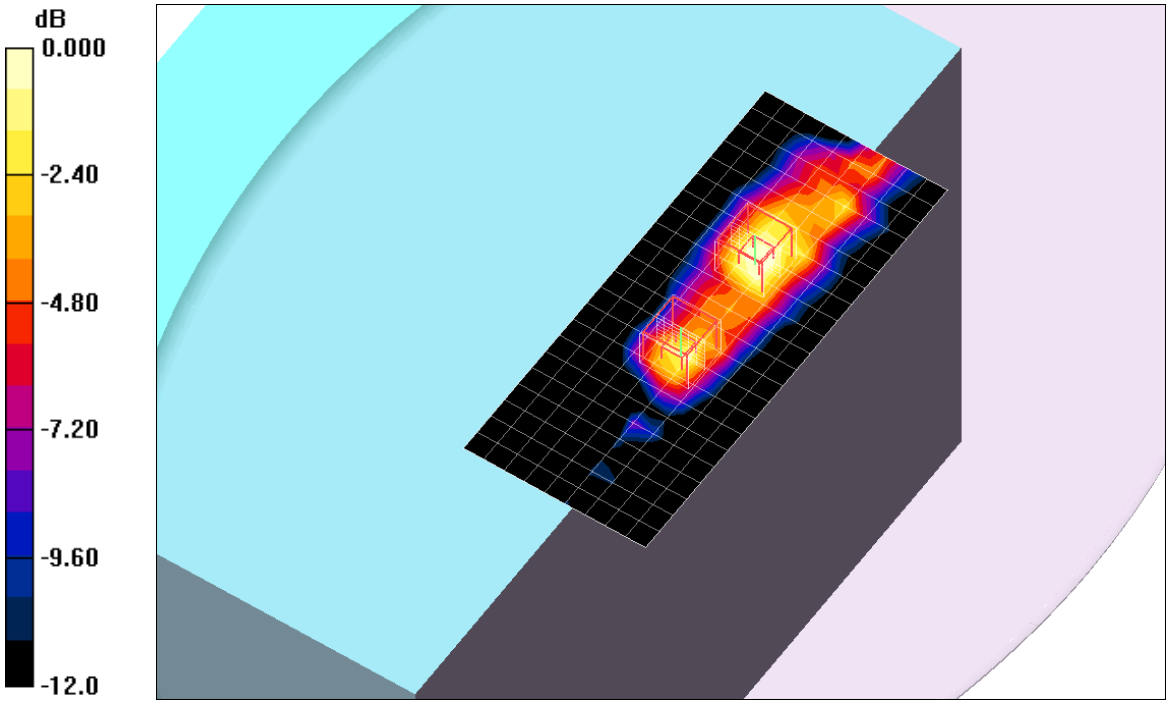
5GHz bands

Frequency: 5260 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C
Medium parameters used: f = 5260 MHz; σ = 5.47 mho/m; ε_r = 48.4; ρ = 1000 kg/m^3 ;
DASY4 Configuration:
- Electronics: DAE3 Sn427; Calibrated: 1/17/2012
- Probe: EX3DV4 - SN3749; ConvF(4.11, 4.11, 4.11); Calibrated: 1/27/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003

802.11n HT20,Chain 0,1_Ch 52/Area Scan (23x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.862 mW/g

802.11n HT20,Chain 0_Ch 52/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 12.1 V/m; Power Drift = 0.091 dB
Peak SAR (extrapolated) = 2.21 W/kg
SAR(1 g) = 0.709 mW/g; SAR(10 g) = 0.273 mW/g
Maximum value of SAR (measured) = 1.15 mW/g

802.11n HT20,Chain 1_Ch 52/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 12.1 V/m; Power Drift = 0.091 dB
Peak SAR (extrapolated) = 1.73 W/kg
SAR(1 g) = 0.522 mW/g; SAR(10 g) = 0.182 mW/g
Maximum value of SAR (measured) = 0.887 mW/g



0 dB = 0.887mW/g

Test Laboratory: UL CCS SAR Lab D
Date/Time: 2/8/2012 12:33:28 AM

5GHz bands

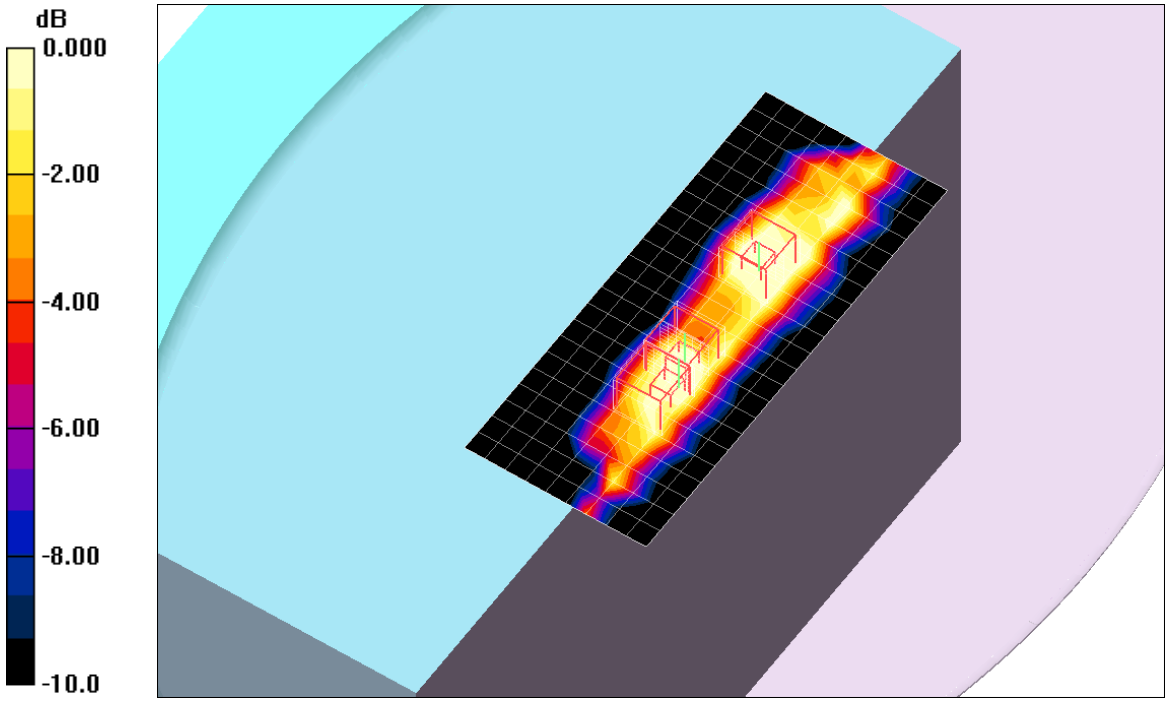
Frequency: 5300 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C
Medium parameters used: f = 5300 MHz; σ = 5.5 mho/m; ε_r = 48.3; ρ = 1000 kg/m^3 ;
DASY4 Configuration:
- Electronics: DAE3 Sn427; Calibrated: 1/17/2012
- Probe: EX3DV4 - SN3749; ConvF(4.11, 4.11, 4.11); Calibrated: 1/27/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003

802.11n HT20,Chain 0,1,2_Ch 60/Area Scan (23x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 1.63 mW/g

802.11n HT20,Chain 0_Ch 60/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 16.2 V/m; Power Drift = -0.057 dB
Peak SAR (extrapolated) = 2.43 W/kg
SAR(1 g) = 0.753 mW/g; SAR(10 g) = 0.296 mW/g
Maximum value of SAR (measured) = 1.22 mW/g

802.11n HT20,Chain 1_Ch 60/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 16.2 V/m; Power Drift = -0.057 dB
Peak SAR (extrapolated) = 1.97 W/kg
SAR(1 g) = 0.583 mW/g; SAR(10 g) = 0.225 mW/g
Maximum value of SAR (measured) = 1.00 mW/g

802.11n HT20,Chain 2_Ch 60/Zoom Scan 2 (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 16.2 V/m; Power Drift = -0.057 dB
Peak SAR (extrapolated) = 1.63 W/kg
SAR(1 g) = 0.504 mW/g; SAR(10 g) = 0.204 mW/g
Maximum value of SAR (measured) = 0.853 mW/g



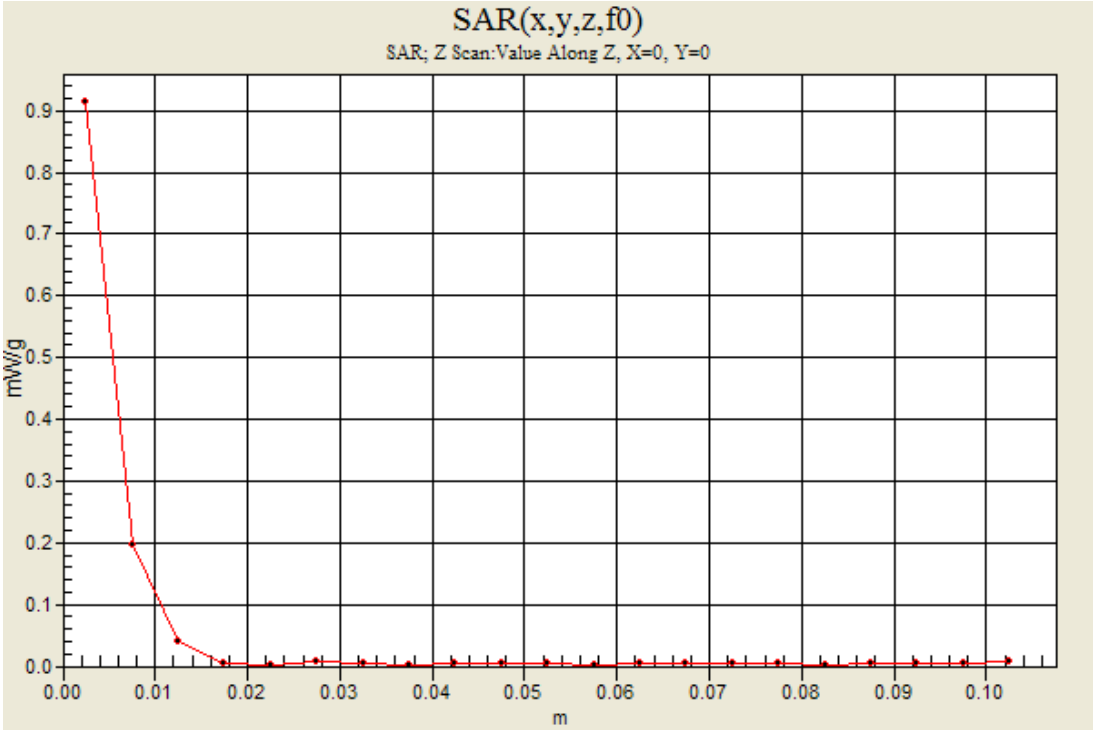
0 dB = 0.853mW/g

Test Laboratory: UL CCS SAR Lab D
Date/Time: 2/8/2012 1:25:04 AM

5GHz bands

Frequency: 5300 MHz; Duty Cycle: 1:1

802.11n HT20,Chain 0,1,2_Ch 60/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.914 mW/g



14.2.4. Worst-Case SAR Plots for 5.5 GHz Band

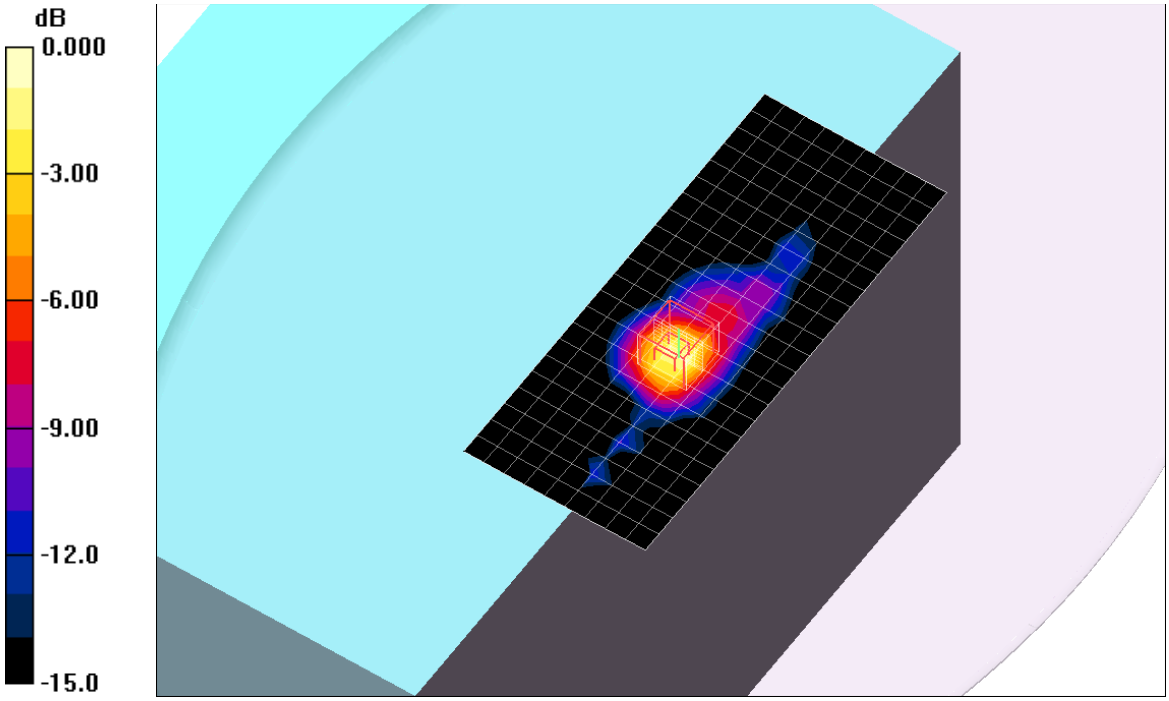
Test Laboratory: UL CCS SAR Lab D Date/Time: 1/26/2012 10:16:26 PM

5GHz bands

Frequency: 5600 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C
Medium parameters used: f = 5600 MHz; σ = 5.97 mho/m; ε_r = 48.8; ρ = 1000 kg/m^3 ;
DASY4 Configuration:
- Electronics: DAE4 Sn1259; Calibrated: 5/3/2011
- Probe: EX3DV4 - SN3773; ConvF(3.26, 3.26, 3.26); Calibrated: 5/3/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003

802.11a ,Chain 1_Ch 120/Area Scan (23x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.922 mW/g

802.11a ,Chain 1_Ch 120/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 1.97 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 2.31 W/kg
SAR(1 g) = 0.685 mW/g; SAR(10 g) = 0.228 mW/g
Maximum value of SAR (measured) = 1.16 mW/g



0 dB = 1.16mW/g

Test Laboratory: UL CCS SAR Lab D
Date/Time: 1/27/2012 12:40:31 AM

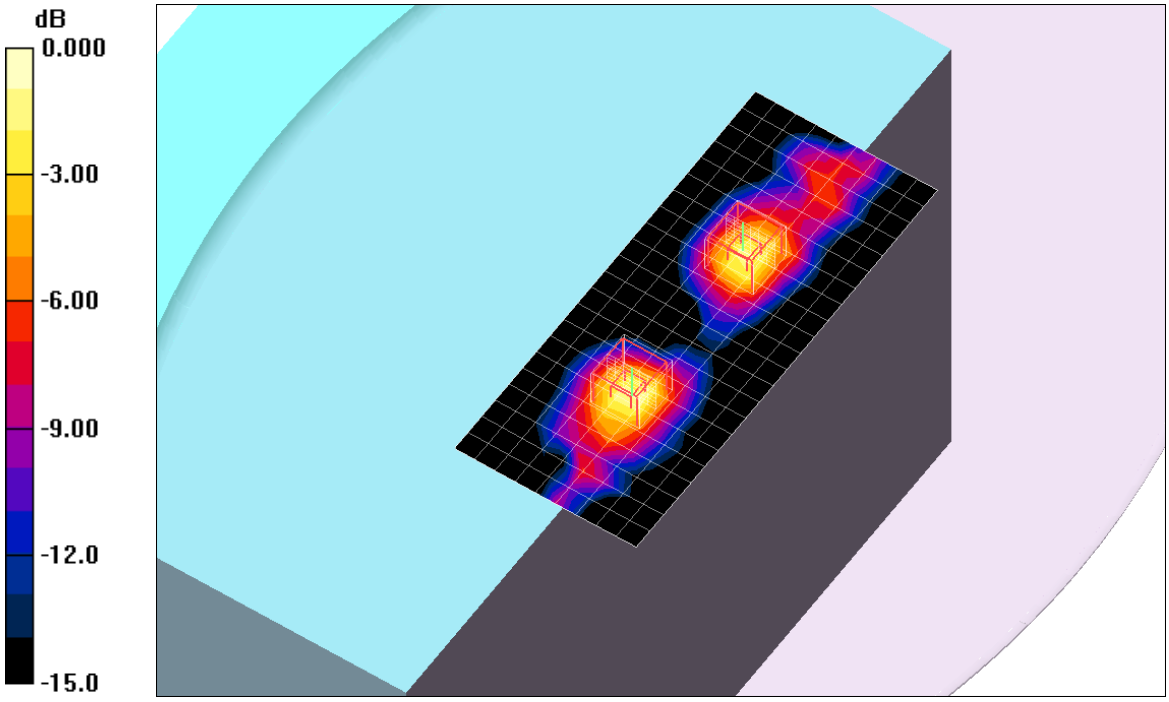
5GHz bands

Frequency: 5600 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C
Medium parameters used: f = 5600 MHz; σ = 5.97 mho/m; ε_r = 48.8; ρ = 1000 kg/m^3 ;
DASY4 Configuration:
- Electronics: DAE4 Sn1259; Calibrated: 5/3/2011
- Probe: EX3DV4 - SN3773; ConvF(3.26, 3.26, 3.26); Calibrated: 5/3/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003

802.11n HT20,Chain 0,2_Ch 120/Area Scan (23x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.866 mW/g

802.11n HT20,Chain 0_Ch 120/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 14.7 V/m; Power Drift = -0.107 dB
Peak SAR (extrapolated) = 1.97 W/kg
SAR(1 g) = 0.621 mW/g; SAR(10 g) = 0.230 mW/g
Maximum value of SAR (measured) = 1.01 mW/g

802.11n HT20,Chain 2_Ch 120/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 14.7 V/m; Power Drift = -0.107 dB
Peak SAR (extrapolated) = 2.31 W/kg
SAR(1 g) = 0.705 mW/g; SAR(10 g) = 0.252 mW/g
Maximum value of SAR (measured) = 1.19 mW/g



0 dB = 1.19mW/g

Test Laboratory: UL CCS SAR Lab D
Date/Time: 1/27/2012 2:54:50 AM

5GHz bands

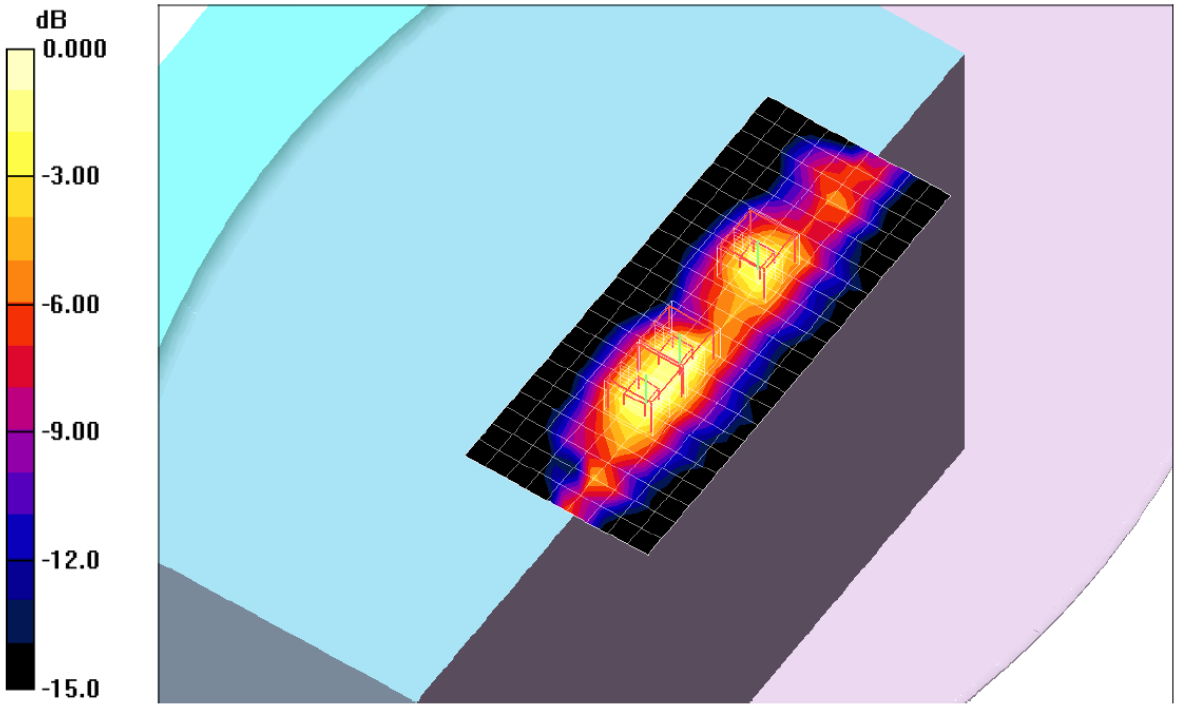
Frequency: 5500 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C
Medium parameters used: f = 5500 MHz; σ = 5.83 mho/m; ε_r = 49; ρ = 1000 kg/m^3 ;
DASY4 Configuration:
- Electronics: DAE4 Sn1259; Calibrated: 5/3/2011
- Probe: EX3DV4 - SN3773; ConvF(3.49, 3.49, 3.49); Calibrated: 5/3/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003

802.11n HT20,Chain 0,1,2_Ch 100/Area Scan (23x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 1.08 mW/g

802.11n HT20,Chain 0_Ch 100/Zoom Scan (7x7x9)/Cube 2: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 14.3 V/m; Power Drift = 0.125 dB
Peak SAR (extrapolated) = 1.98 W/kg
SAR(1 g) = 0.649 mW/g; SAR(10 g) = 0.254 mW/g
Maximum value of SAR (measured) = 1.06 mW/g

802.11n HT20,Chain 1_Ch 100/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 14.3 V/m; Power Drift = 0.125 dB
Peak SAR (extrapolated) = 2.53 W/kg
SAR(1 g) = 0.789 mW/g; SAR(10 g) = 0.303 mW/g
Maximum value of SAR (measured) = 1.30 mW/g

802.11n HT20,Chain 2_Ch 100/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 14.3 V/m; Power Drift = 0.125 dB
Peak SAR (extrapolated) = 2.54 W/kg
SAR(1 g) = 0.817 mW/g; SAR(10 g) = 0.313 mW/g
Maximum value of SAR (measured) = 1.34 mW/g



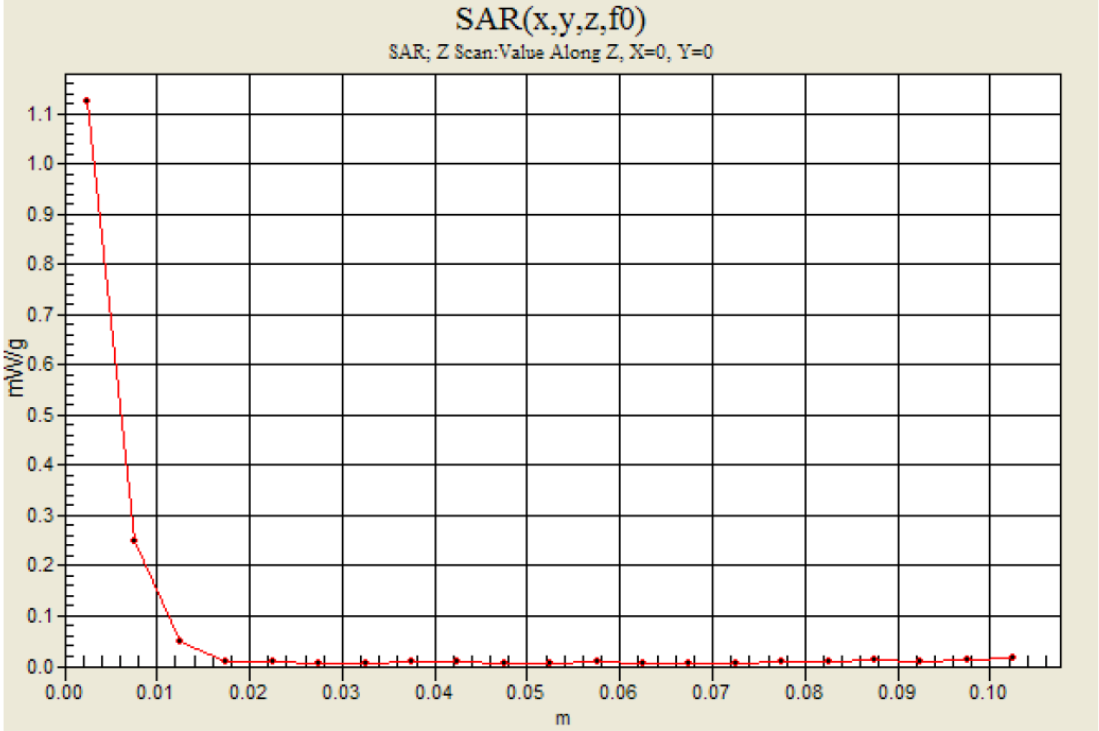
0 dB = 1.34mW/g

Test Laboratory: UL CCS SAR Lab D
Date/Time: 1/27/2012 3:46:23 AM

5GHz bands

Frequency: 5500 MHz; Duty Cycle: 1:1

802.11n HT20,Chain 0,1,2_Ch 100/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 1.13 mW/g



14.2.5. Worst-Case SAR Plots for 5.8 GHz Band

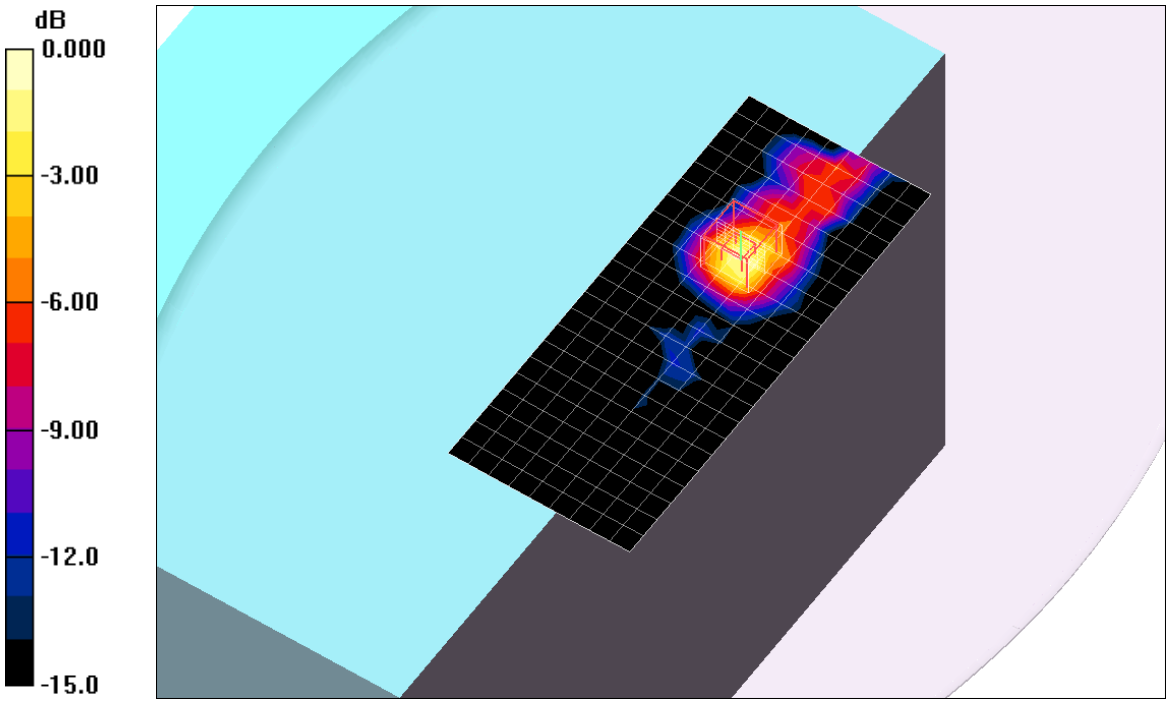
Test Laboratory: UL CCS SAR Lab D Date/Time: 1/26/2012 7:48:35 PM

5GHz bands

Frequency: 5785 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C
Medium parameters used: f = 5785 MHz; σ = 6.23 mho/m; ε_r = 48.5; ρ = 1000 kg/m^3 ;
DASY4 Configuration:
- Electronics: DAE4 Sn1259; Calibrated: 5/3/2011
- Probe: EX3DV4 - SN3773; ConvF(3.58, 3.58, 3.58); Calibrated: 5/3/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003

802.11a ,Chain 0_Ch 157/Area Scan (23x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.808 mW/g

802.11a ,Chain 0_Ch 157/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 13.4 V/m; Power Drift = -0.096 dB
Peak SAR (extrapolated) = 1.97 W/kg
SAR(1 g) = 0.580 mW/g; SAR(10 g) = 0.202 mW/g
Maximum value of SAR (measured) = 0.949 mW/g



0 dB = 0.949mW/g

Test Laboratory: UL CCS SAR Lab D
Date/Time: 1/26/2012 1:43:24 PM

5GHz bands

Frequency: 5745 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C
Medium parameters used: f = 5745 MHz; σ = 6.17 mho/m; ε_r = 48.6; ρ = 1000 kg/m^3 ;
DASY4 Configuration:
- Electronics: DAE4 Sn1259; Calibrated: 5/3/2011
- Probe: EX3DV4 - SN3773; ConvF(3.58, 3.58, 3.58); Calibrated: 5/3/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003

802.11a,Chain 0,1_Ch 149/Area Scan (23x10x1): Measurement grid: dx=10mm, dy=10mm

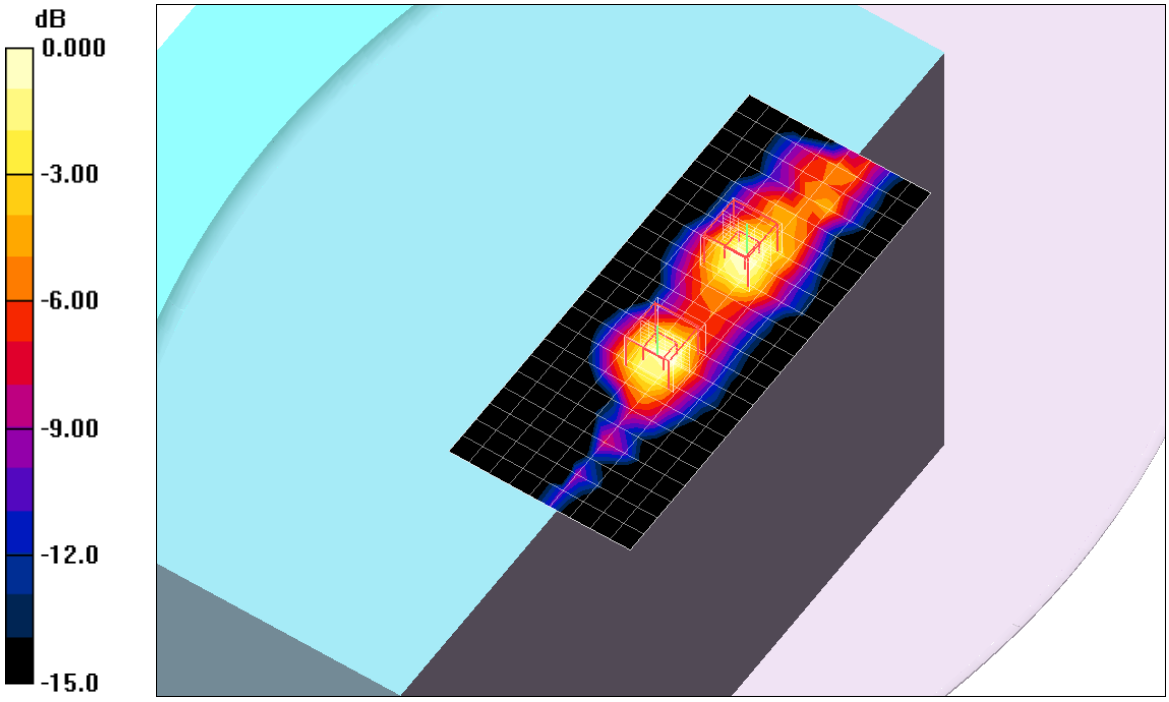
Maximum value of SAR (measured) = 0.981 mW/g

802.11a,Chain 0_Ch 149/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 12.1 V/m; Power Drift = 0.129 dB
Peak SAR (extrapolated) = 1.99 W/kg
SAR(1 g) = 0.598 mW/g; SAR(10 g) = 0.222 mW/g
Maximum value of SAR (measured) = 1.00 mW/g

802.11a,Chain 1_Ch 149/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 12.1 V/m; Power Drift = 0.129 dB
Peak SAR (extrapolated) = 2.10 W/kg
SAR(1 g) = 0.592 mW/g; SAR(10 g) = 0.199 mW/g
Maximum value of SAR (measured) = 0.999 mW/g



0 dB = 0.999mW/g

Test Laboratory: UL CCS SAR Lab D
Date/Time: 1/26/2012 3:47:58 PM

5GHz bands

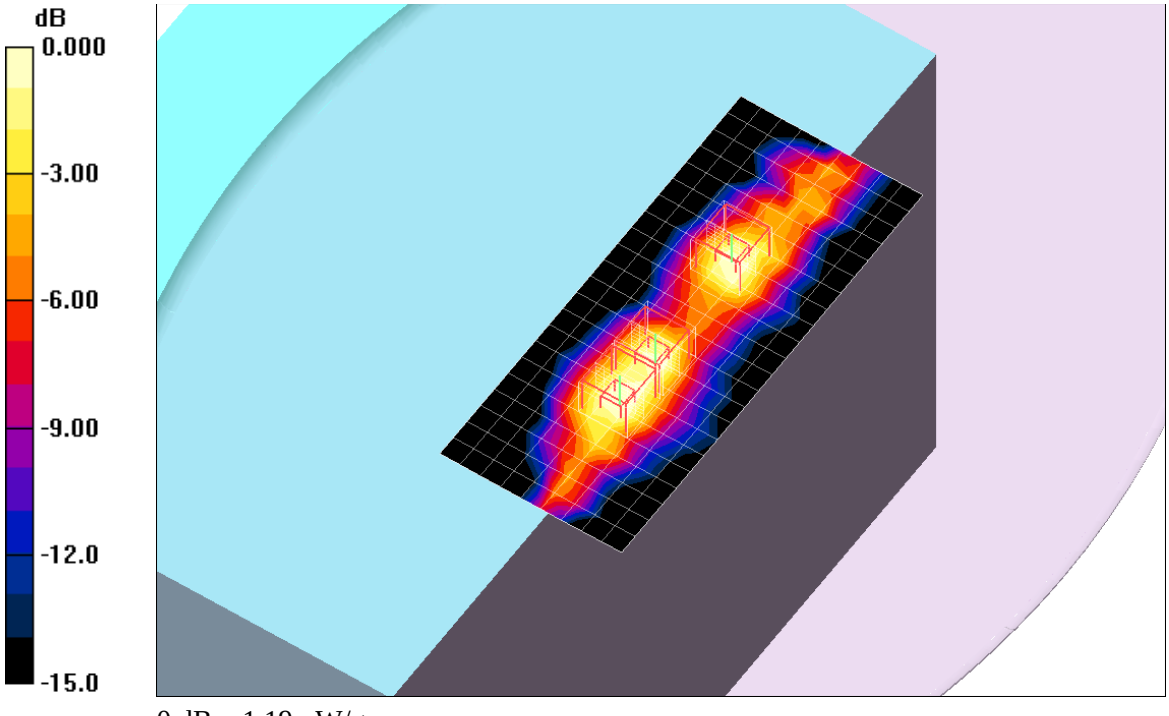
Frequency: 5785 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C
Medium parameters used: f = 5785 MHz; σ = 6.23 mho/m; ε_r = 48.5; ρ = 1000 kg/m^3 ;
DASY4 Configuration:
- Electronics: DAE4 Sn1259; Calibrated: 5/3/2011
- Probe: EX3DV4 - SN3773; ConvF(3.58, 3.58, 3.58); Calibrated: 5/3/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003

802.11a,Chain 0,1,2_Ch 157/Area Scan (23x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 1.28 mW/g

802.11a,Chain 0_Ch 157/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 13.9 V/m; Power Drift = 0.103 dB
Peak SAR (extrapolated) = 2.06 W/kg
SAR(1 g) = 0.635 mW/g; SAR(10 g) = 0.236 mW/g
Maximum value of SAR (measured) = 1.04 mW/g

802.11a,Chain 1_Ch 157/Zoom Scan (7x7x9)/Cube 2: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 13.9 V/m; Power Drift = 0.103 dB
Peak SAR (extrapolated) = 3.97 W/kg
SAR(1 g) = 0.577 mW/g; SAR(10 g) = 0.214 mW/g
Maximum value of SAR (measured) = 0.984 mW/g

802.11a,Chain 2_Ch 157/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 13.9 V/m; Power Drift = 0.103 dB
Peak SAR (extrapolated) = 2.39 W/kg
SAR(1 g) = 0.689 mW/g; SAR(10 g) = 0.250 mW/g
Maximum value of SAR (measured) = 1.19 mW/g



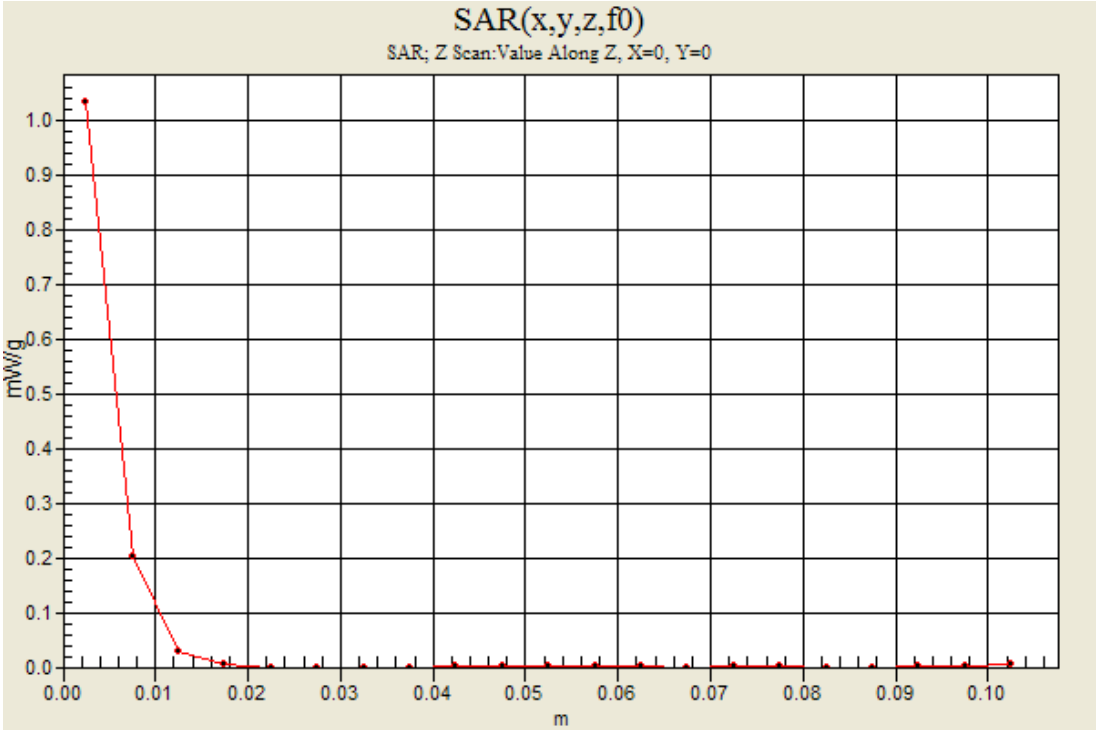
0 dB = 1.19mW/g

Test Laboratory: UL CCS SAR Lab D
Date/Time: 1/26/2012 4:36:32 PM

5GHz bands

Frequency: 5785 MHz; Duty Cycle: 1:1

802.11a,Chain 0,1,2_Ch 157/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 1.03 mW/g



15. Appendixes

Refer to separated files for the following appendixes.

15.1. System Performance Check Plots

15.2. SAR Test Plots for WiFi 2.4 GHz Band

15.3. SAR Test Plots for WiFi 5 GHz Bands

15.4. Calibration Certificate for E-Field Probe EX3DV4 - SN 3773

15.5. Calibration Certificate for E-Field Probe EX3DV4 - SN 3749

15.6. Calibration Certificate for D2450V2 - SN: 706 w/ Extended Cal. Data

15.7. Calibration Certificate for D5GHzV2 - SN 1003