



**FCC OET BULLETIN 65 SUPPLEMENT C 01-01
IEEE STD 1528:2003**

SAR EVALUATION REPORT

For
Tablet with 802.11abgn, BT3.0

**MODEL: GT-P6211
FCC ID: A3LGTP6210**

REPORT NUMBER: 11I14172-2

ISSUE DATE: December 29, 2011

Prepared for
**Samsung Electronics Co., Ltd.
18600 Broadwick St.
Rancho Dominguez, CA 90220**

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



NVLAP LAB CODE 200065-0

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	December 29, 2011	Initial Issue	--

Table of Contents

1. Attestation of Test Results	5
2. Test Methodology	6
3. Facilities and Accreditation	6
4. Calibration and Uncertainty	7
4.1. <i>Measuring Instrument Calibration.....</i>	<i>7</i>
4.2. <i>Measurement Uncertainty.....</i>	<i>8</i>
5. Equipment Under Test	9
5.1. <i>Band and Air interfaces</i>	<i>9</i>
5.2. <i>Simultaneous Transmission Conditions.....</i>	<i>9</i>
6. System Specifications.....	12
7. Composition of Ingredients for Simulating Liquids	13
8. Simulating Liquid Parameters	14
8.1. <i>Liquid Check Results.....</i>	<i>15</i>
9. System Verification	16
9.1. <i>System Check Results.....</i>	<i>17</i>
10. SAR Measurement Procedures	18
11. RF Output Power Measurement	10
11.1. <i>Wi-Fi.....</i>	<i>10</i>
11.2. <i>Bluetooth.....</i>	<i>11</i>
12. Summary of Test Configurations (as per KDB 447498)	19
13. SAR Test Results	20
13.1. <i>Head SAR</i>	<i>20</i>
13.2. <i>Body SAR</i>	<i>22</i>
14. Summary of Highest 1g SAR	24
15. Worst-case SAR Plots	25
16. Appendixes	45
16.1. <i>System check plots</i>	<i>45</i>
16.2. <i>SAR test plots for WiFi 2.4 GHz.....</i>	<i>45</i>
16.3. <i>SAR test plots for WiFi 5 GHz Bands.....</i>	<i>45</i>
16.4. <i>Calibration certificate for E-Field Probe EX3DV4 SN 3686.....</i>	<i>45</i>

16.5.	Calibration certificate for D2450V2 SN: 706 w/ extended cal. data	45
16.6.	Certificate - Validation Dipole D5GHzV2 - SN 1003	45
17.	Antenna Locations & Separation Distances	46
18.	Setup Photos.....	47
18.1.	SAR Tests in Mouth and Jaw Regions of the SAM Phantom	48
18.2.	Body	50
19.	External Photos	52

1. Attestation of Test Results

Applicant:	SAMSUNG ELECTRONICS CO., LTD.		
EUT description:	Tablet with 802.11abgn, BT3.0		
Model number:	GT-P6211		
Device category:	Tablet Portable devices		
Exposure category:	General Population/Uncontrolled Exposure		
Date tested:	December 21,2011 – December 28, 2011		
FCC Rule Parts	Freq. Range [MHz]	Highest 1-g SAR (W/kg)	Limit (W/kg)
15.247	2412 – 2462	Head: 0.05 W/kg Body: 0.38 W/kg (Rear)	1.6
15.407	5180 – 5240	Head: 0.11 W/kg Body: 0.68 W/kg (Rear)	
	5260 – 5320	Head: 0.08 W/kg Body: 0.63 W/kg (Rear)	
	5500 – 5700	Head: 0.11 W/kg Body: 0.43 W/kg (Rear)	
15.247	5745 – 5825	Head: 0.11 W/kg Body: 0.38 W/kg (Rear)	
Applicable Standards			Test Results
FCC OET Bulletin 65 Supplement C 01-01, IEEE Std 1528:2003			Pass
Compliance Certification Services, Inc. (UL CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report. Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government (NIST Handbook 150, Annex A). This report is written to support regulatory compliance of the applicable standards stated above.			
Approved & Released For UL CCS By:		Tested By:	
			
Sunny Shih Engineering Team Leader Compliance Certification Services (UL CCS)		Elijah Garcia Laboratory Technician I Compliance Certification Services (UL CCS)	

2. Test Methodology

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

- o 248227 D01 SAR meas for 802 11abg v01r02
- o 648474 D01 SAR Handsets Multi Xmitter and Ant, v01r05
- o 447498 D01 Mobile Portable RF Exposure v04
- o 865664 SAR 3 to 6 GHz Rev "SAR measurement procedures for transmitters operating in the 3 to 6 GHz range."

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 used 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	8	2	2012
Synthesized Signal Generator	HP	83732B	US34490599	7	14	2012
E-Field Probe	SPEAG	EX3DV4	3686	1	24	2012
Thermometer	ERTCO	639-1S	1718	7	19	2012
Data Acquisition Electronics	SPEAG	DAE4	1239	11	17	2011
System Validation Dipole	SPEAG	*D2450V2	706	4	19	2012
System Validation Dipole	SPEAG	D5GHzV2	1003	8	23	2012
Power Meter	Giga-tronics	8651A	8651404	5	13	2012
Power Sensor	Giga-tronics	80701A	1834588	5	13	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		
Simulating Liquid	SPEAG	H2450	N/A	Within 24 hrs of first test		
Simulating Liquid	SPAEG	H5800	N/A	Within 24 hrs of first test		
Simulating Liquid	SPEAG	M2450	N/A	Within 24 hrs of first test		
Simulating Liquid	SPAEG	M5800	N/A	Within 24 hrs of first test		

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 Appendix 16.5: Calibration Certificate - Validation Dipole D2450V2 - SN 706 with extended cal. data)
4. Impedance is within 5Ω of calibrated measurement (See Appendix 16.5: Calibration Certificate - Validation Dipole D2450V2 - SN 706 with extended cal. data)

4.2. Measurement Uncertainty

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

Component	error, %	Probe Distribution	Divisor	Sensitivity	U (X), %
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	-4.88	Normal	1	0.64	-3.12
Liquid Permittivity - deviation from target	5.00	Rectangular	1.732	0.6	1.73
Liquid Permittivity - measurement uncertainty	-2.49	Normal	1	0.6	-1.49
Combined Standard Uncertainty Uc(y) =					10.06
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				20.11	%
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				1.59	dB

Measurement uncertainty for 3 to 6 GHz averaged over 1 gram

Component	error, %	Distribution	Divisor	Sensitivity	U (X), %
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	4.92	Normal	1	0.64	3.15
Liquid Permittivity - deviation from target	10.00	Rectangular	1.732	0.6	3.46
Liquid Permittivity - measurement uncertainty	-3.70	Normal	1	0.6	-2.22
Combined Standard Uncertainty Uc(y), %:					11.14
Expanded Uncertainty U, Coverage Factor = 1.96, > 95 % Confidence =				21.83	%
Expanded Uncertainty U, Coverage Factor = 1.96, > 95 % Confidence =				1.72	dB

5. Equipment Under Test

Tablet PC 802.11abgn 1x1+BT3.0
Model: GT-P6211 (A3LGTP6210)

Normal operation:	- Held to head, - Bottom face, and - Edges - Multiple display orientations supporting both portrait and landscape configurations
-------------------	--

Body Worn Accessory	- Headset
---------------------	---

Antenna-to-antenna and antenna-to-edges separation distances:	Please refer to section 17 Antenna Locations & Separation Distances for details
---	---

5.1. Band and Air interfaces

Tx Frequency Bands:	WiFi: 802.11abgn: 2.4GHz, 5GHz Bluetooth: 2.4 GHz
---------------------	--

Air Interfaces:	WiFi: 802.11abgn: 2.4GHz, 5GHz Bluetooth Ver 3.0
-----------------	---

5.2. Simultaneous Transmission Conditions

WiFi and Bluetooth can transmit simultaneously.

SAR is not required for the simultaneous transmission conditions because Bluetooth's output power is $\leq 60/f_{(\text{GHz})}$ mW and stand-alone SAR evaluation is not required as per KDB 447498 D01 Mobile Portable RF Exposure v04, 3 b) ii) (1) (c).

6. RF Output Power Verifications

6.1. Wi-Fi

2.4GHz Band

Mode	Channel #	Freq. (MHz)	Target power from Report #11114021-5A2		Actual Measured	
			(dBm)	(mW)	(dBm)	(mW)
802.11b	1	2412	13.45	22.13	13.50	22.39
	6	2437	12.94	19.68	13.00	19.95
	11	2462	13.19	20.84	13.20	20.89
802.11g	1	2412	12.43	17.50	12.45	17.58
	6	2437	12.06	16.07	12.10	16.22
	11	2462	12.44	17.54	12.50	17.78
802.11n (HT20)	1	2412	12.29	16.94	12.35	17.18
	6	2437	12.37	17.26	12.46	17.62
	11	2462	12.79	19.01	12.88	19.41

5.2 GHz band (5150-5250 MHz)

Mode	Channel #	Freq. (MHz)	Target power from Report #11114021-5A2		Actual Measured	
			(dBm)	(mW)	(dBm)	(mW)
802.11a	36	5180	8.15	6.53	8.21	6.62
	40	5200	8.61	7.26	8.73	7.46
	48	5240	8.75	7.50	8.83	7.64
802.11n (HT20)	36	5180	8.23	6.65	8.25	6.68
	40	5200	8.49	7.06	8.50	7.08
	48	5240	8.65	7.33	8.69	7.40
802.11n (HT40)	38	5190	8.88	7.73	8.90	7.76
	46	5230	8.93	7.82	8.98	7.91

5.3 GHz band (5250-5350 MHz)

Mode	Channel #	Freq. (MHz)	Target power from Report #11114021-5A2		Actual Measured	
			(dBm)	(mW)	(dBm)	(mW)
802.11a	52	5260	8.41	6.93	8.51	7.10
	60	5300	8.97	7.89	9.08	8.09
	64	5320	8.48	7.05	8.57	7.19
802.11n (HT20)	52	5260	8.32	6.79	8.35	6.84
	60	5300	8.48	7.05	8.52	7.11
	64	5320	8.38	6.89	8.41	6.93
802.11n (HT40)	54	5270	9.73	9.40	9.81	9.57
	62	5310	9.44	8.79	9.53	8.97

5.5 GHz band (5500-5700 MHz)

Mode	Channel #	Freq. (MHz)	Target power from Report #11114021-5A2		Actual Measured	
			(dBm)	(mW)	(dBm)	(mW)
802.11a	100	5500	10.27	10.64	10.33	10.79
	120	5600	10.67	11.67	10.71	11.78
	140	5700	11.48	14.06	11.50	14.13
802.11n (HT20)	100	5500	10.19	10.45	10.22	10.52
	120	5600	10.65	11.61	10.66	11.64
	140	5700	11.41	13.84	11.45	13.96
802.11n (HT40)	102	5510	11.31	13.52	11.35	13.65
	134	5670	11.74	14.93	11.76	15.00

5.8 GHz band (5725-5850 MHz)

Mode	Channel #	Freq. (MHz)	Target power from Report #11114021-5A2		Actual Measured	
			(dBm)	(mW)	(dBm)	(mW)
802.11a	149	5745	12.30	16.98	12.32	17.06
	157	5785	12.59	18.16	12.64	18.37
	165	5825	11.77	15.03	11.79	15.10
802.11n (HT20)	149	5745	11.87	15.38	11.90	15.49
	157	5785	12.57	18.07	12.60	18.20
	165	5825	11.68	14.72	11.69	14.76
802.11n (HT40)	151	5755	12.56	18.03	12.60	18.20
	159	5795	12.74	18.79	12.79	19.01

Note(s):

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.

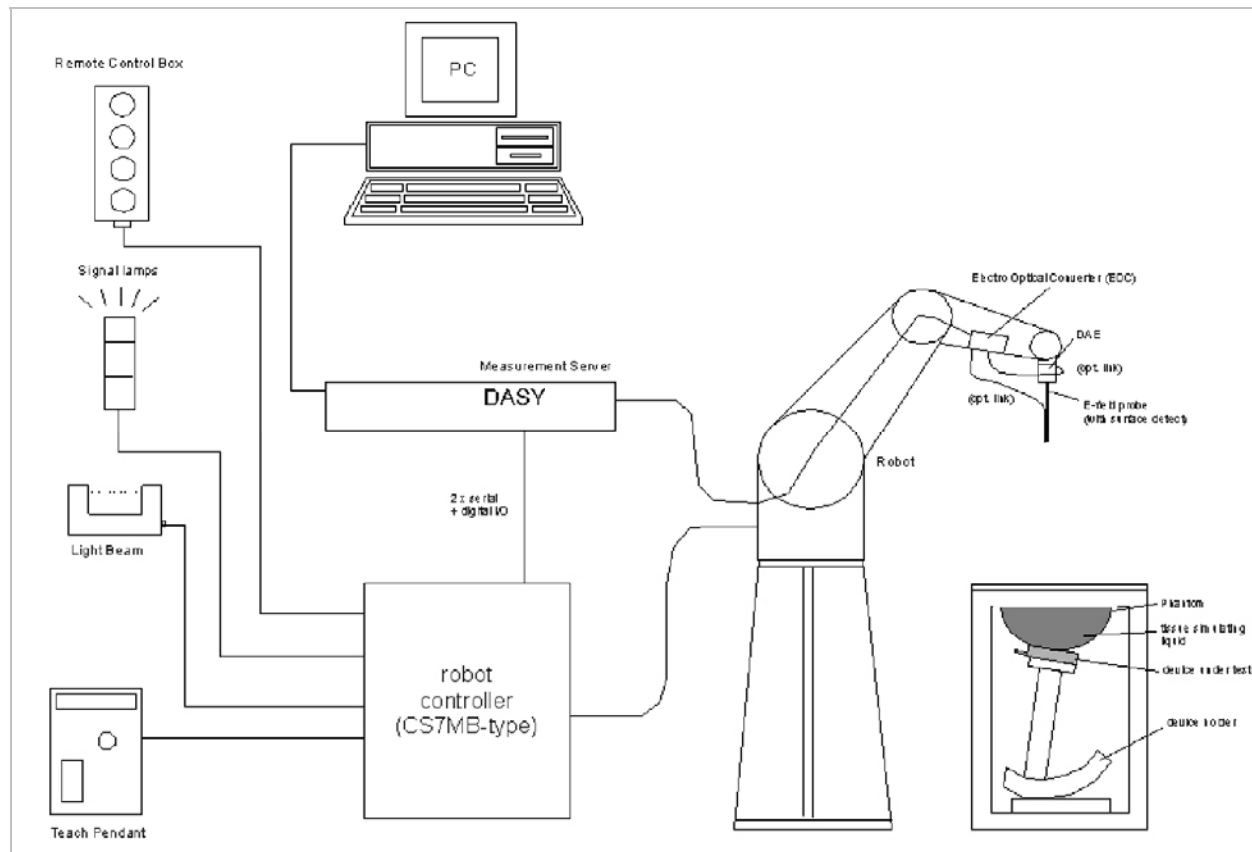
6.2. Bluetooth

Mode	Channel	Freq. (MHz)	Average Power (dBm)
GFSK	0	2402	8.29
	39	2441	8.25
	78	2480	8.82
8PSK	0	2402	5.46
	39	2441	5.94
	78	2480	6.67

Note(s):

1. Stand-alone SAR is not required due to output power is $\leq 60/f(\text{GHz})$ mW

7. 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.

8. Composition of Ingredients for Simulating Liquids

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

Ingredients (% by weight)	Frequency (MHz)									
	450		835		900		1800 - 1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

Salt: 99+% Pure Sodium Chloride

Sugar: 98+% Pure Sucrose

Water: De-ionized, 16 MΩ+ resistivity

HEC: Hydroxyethyl Cellulose

DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]

Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

Simulating Liquids for 5 GHz, Manufactured by SPEAG

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

9. 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 should be within $\pm 5\%$ of the target values. For frequencies in the range of 2–3 GHz and above the measured conductivity should be within $\pm 5\%$ of the target values. The measured relative permittivity tolerance can be relaxed to no more than $\pm 10\%$.

Reference Values of Tissue Dielectric Parameters for Head & Body Phantom

The body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations and extrapolated according to the head parameters specified in IEEE Standard 1528.

Target Frequency (MHz)	Head		Body	
	ϵ_r	σ (S/m)	ϵ_r	σ (S/m)
150	52.3	0.76	61.9	0.8
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.9	55.2	0.97
900	41.5	0.97	55	1.05
915	41.5	0.98	55	1.06
1450	40.5	1.2	54	1.3
1610	40.3	1.29	53.8	1.4
1800 – 2000	40	1.4	53.3	1.52
2450	39.2	1.8	52.7	1.95
3000	38.5	2.4	52	2.73

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

Reference Values of Tissue Dielectric Parameters for Body Phantom (for 3000 MHz – 5800 MHz)

In the current guidelines and draft standards for compliance testing of mobile phones (i.e., IEEE P1528, OET 65 Supplement C), the dielectric parameters suggested for head and body tissue simulating liquid are given only at 3.0 GHz and 5.8 GHz. As an intermediate solution, dielectric parameters for the frequencies between 5 to 5.8 GHz were obtained using linear interpolation (see table below).

SPEAG has developed suitable head and body tissue simulating liquids consisting of the following ingredients: de-ionized water, salt and a special composition including mineral oil and an emulgators. Dielectric parameters of these liquids were measured using a HP 8570C Dielectric Probe Kit in conjunction with HP 8753ES Network Analyzer (30 kHz – 6G Hz). The differences with respect to the interpolated values were well within the desired $\pm 5\%$ for the whole 5 to 5.8 GHz range.

Target Frequency (MHz)	Head		Body	
	ϵ_r	σ (S/m)	ϵ_r	σ (S/m)
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

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

9.1. Liquid Check Results

Date	Freq. (MHz)		Liquid Parameters	Measured	Target	Delta (%)	Limit ±(%)
12/21/2011	Body 5180	e'	47.5786 Relative Permittivity (ϵ_r):	47.58	49.05	-2.99	10
		e"	18.6441 Conductivity (σ):	5.37	5.27	1.87	5
	Body 5200	e'	47.5179 Relative Permittivity (ϵ_r):	47.52	49.02	-3.06	10
		e"	18.6793 Conductivity (σ):	5.40	5.29	2.00	5
	Body 5500	e'	46.9535 Relative Permittivity (ϵ_r):	46.95	48.61	-3.41	10
		e"	18.9736 Conductivity (σ):	5.80	5.64	2.80	5
	Body 5800	e'	46.4154 Relative Permittivity (ϵ_r):	46.42	48.20	-3.70	10
		e"	19.2597 Conductivity (σ):	6.21	6.00	3.52	5
12/27/2011	Head 5200	e'	35.7582 Relative Permittivity (ϵ_r):	35.76	35.99	-0.64	10
		e"	16.7386 Conductivity (σ):	4.84	4.65	4.06	5
	Head 5500	e'	35.2452 Relative Permittivity (ϵ_r):	35.25	35.65	-1.13	10
		e"	16.9400 Conductivity (σ):	5.18	4.96	4.49	5
	Head 5800	e'	34.7345 Relative Permittivity (ϵ_r):	34.73	35.30	-1.60	10
		e"	17.1453 Conductivity (σ):	5.53	5.27	4.92	5
	Head 5180	e'	35.7784 Relative Permittivity (ϵ_r):	35.78	36.01	-0.65	10
		e"	16.7064 Conductivity (σ):	4.81	4.63	3.92	5
12/28/2011	Body 2450	e'	51.4094 Relative Permittivity (ϵ_r):	51.41	52.70	-2.45	5
		e"	13.6857 Conductivity (σ):	1.86	1.95	-4.39	5
	Body 2410	e'	51.5431 Relative Permittivity (ϵ_r):	51.54	52.76	-2.31	5
		e"	13.5399 Conductivity (σ):	1.81	1.91	-4.88	5
	Body 2435	e'	51.4616 Relative Permittivity (ϵ_r):	51.46	52.73	-2.40	5
		e"	13.6329 Conductivity (σ):	1.85	1.93	-4.42	5
	Body 2460	e'	51.3752 Relative Permittivity (ϵ_r):	51.38	52.69	-2.49	5
		e"	13.7250 Conductivity (σ):	1.88	1.96	-4.41	5
12/28/2011	Head 2450	e'	39.9702 Relative Permittivity (ϵ_r):	39.97	39.20	1.96	5
		e"	13.0047 Conductivity (σ):	1.77	1.80	-1.58	5
	Head 2410	e'	40.0944 Relative Permittivity (ϵ_r):	40.09	39.28	2.08	5
		e"	12.9011 Conductivity (σ):	1.73	1.76	-1.80	5
	Head 2435	e'	40.0192 Relative Permittivity (ϵ_r):	40.02	39.24	2.00	5
		e"	12.9670 Conductivity (σ):	1.76	1.78	-1.50	5
	Head 2460	e'	39.9347 Relative Permittivity (ϵ_r):	39.93	39.19	1.91	5
		e"	13.0318 Conductivity (σ):	1.78	1.81	-1.56	5

10. System Verification

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

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 Isotropic E-Field Probe EX3DV4-SN: 3686 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.

Cal. certificate #	Validation dipole	Cal. date	Freq. (MHz)	Ref. SAR values (mW/g) (from cal. certificate)		
				Tissue:	Head	Body
D2450V2-706_Apr10	D2450V2	4/19/10	2450	1g SAR:	51.6	52.4
				10g SAR:	24.4	24.5
D5GHz-1003_Aug11	D5GHzV2	8/23/11	5200	1g SAR:	76.5	74.5
				10g SAR:	21.8	20.8
			5500	1g SAR:	80.9	80
				10g SAR:	23.1	22.3
			5800	1g SAR:	76.3	76.3
				10g SAR:	21.7	21.2

10.1. System Check Results

Date Tested	System Validation Dipole	Freq. (MHz)	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
12/21/11	D5GHzV2 Body	5200	1g SAR:	76.3	74.5	2.42	±10
			10g SAR:	21.5	20.8	3.37	
	D5GHzV2 Body	5500	1g SAR:	82.6	80	3.25	±10
			10g SAR:	23.1	22.3	3.59	
	D5GHzV2 Body	5800	1g SAR:	73.3	76.3	-3.93	±10
			10g SAR:	20.6	21.2	-2.83	
12/27/11	D5GHzV2 Head	5200	1g SAR:	69.7	76.5	-8.89	±10
			10g SAR:	20.1	21.8	-7.80	
	D5GHzV2 Head	5500	1g SAR:	75.1	80.7	-6.94	±10
			10g SAR:	21.1	23.0	-8.26	
	D5GHzV2 Head	5800	1g SAR:	79.2	76.3	3.80	±10
			10g SAR:	22.5	21.7	3.69	
12/28/11	D2450V2-706 Body	2450	1g SAR:	50.80	52.40	-3.05	±10
			10g SAR:	23.40	24.50	-4.49	
12/28/11	D2450V2-706 Head	2450	1g SAR:	50.3	51.6	-2.52	±10
			10g SAR:	23.0	24.4	-5.74	

11. SAR Measurement Procedures

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The Minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the Distance of sensor calibration points to probe tip as defined in the probe properties.

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 $\geq 7 \times 7 \times 9$ (above 4.5 GHz) or $5 \times 5 \times 7$ (below 3 GHz) points within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

Step 5: Z-Scan

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation, the extrapolated distance should not be larger than the step size in Z-direction.

12. Summary of Test Configurations (as per KDB 447498)

Configuration	Antenna-to-edge/surface	SAR Required	note
Rear	< 0.85 mm	Yes	SAR evaluated with the base/bottom of the tablet in direct contact with a flat phantom as per KDB 447498 4) b) i)
Top edge	>121 mm	No	This is not the most conservative antenna-to-user distance at edge mode. According to KDB 447498 4) b) ii) (2), SAR is required only for the edge with the most conservative exposure conditions.
Bottom edge	> 54 mm	No	ditto
Left edge	< 6 mm	Yes	This is the most conservative antenna-to-user distance at edge mode as per KDB 447498 4) b) ii) (2)
Right edge	> 107 mm	No	This is not the most conservative antenna-to-user distance at edge mode. According to KDB 447498 4) b) ii) (2), SAR is required only for the edge with the most conservative exposure conditions.

13. SAR Test Results

13.1. Head SAR

Justification for using body phantom for measuring head SAR

Due to the size of the EUT and the position of the WiFi antenna it was impossible to get meaningful data for head SAR.

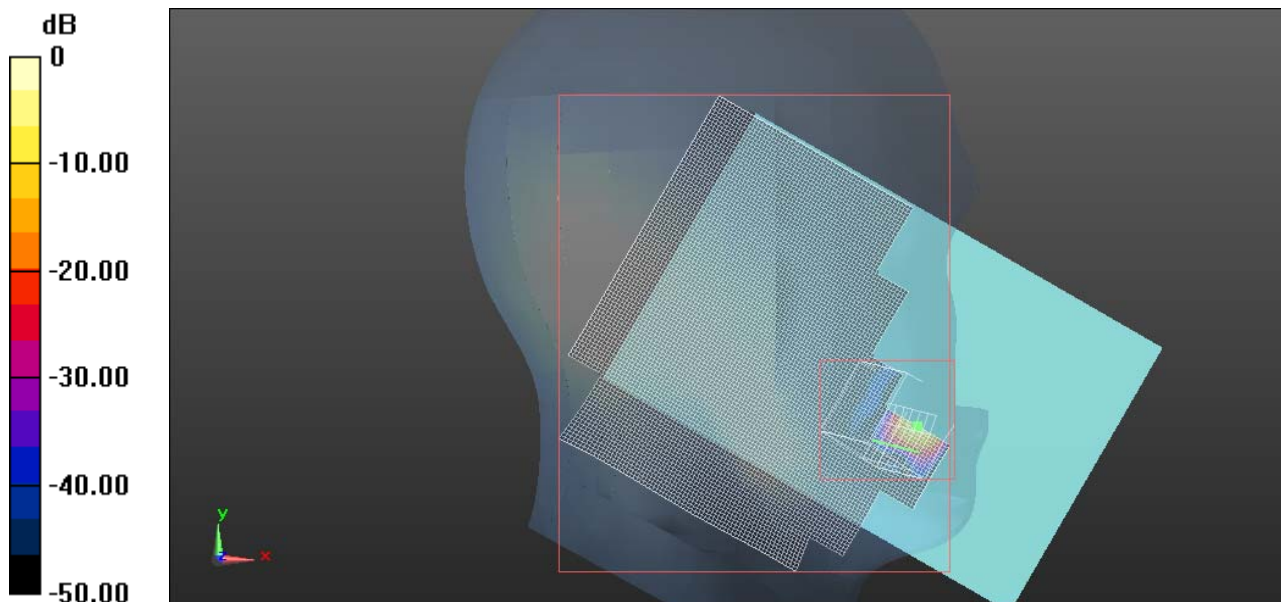
The following procedure was applied (KDB 648474 section on SAR Tests in Mouth and Jaw Regions of the SAM Phantom):

- EUT was positioned with its bottom edge positioned from the flat phantom with the same distance provided by the cheek touching position using SAM.
- The ear reference point (ERP, as defined for SAM) of the device should be positioned $\frac{1}{2}$ cm from the flat phantom shell.
- The lower half of the EUT is secured in the test device holder at a fixed distance below the flat phantom determined by the minimum separation along the lower edge of the EUT in the cheek touching position using SAM.

The EUT protruded too far from the SAM to allow measurement from its bottom edge. The separation distance from the antenna to the phantom was used as a reference. This resulted in the antenna being closer to the phantom when the EUT was mounted on the left. Therefore the left head distance was used as the most conservative.

See section 18 Setup Photos for details on device positioning and photographs showing how separation distances are determined.

The following head SAR plot is provided to show the difficulties associated with using the SAM for measuring head SAR with this EUT.



Head SAR using body phantom

Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
				1-g	10-g	
802.11b	1	2412	13.50	0.050	0.020	
	6	2437	13.00			1
	11	2462	13.20			1
Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
				1-g	10-g	
802.11a	36	5180	8.21			1
	40	5200	8.73			1
	48	5240	8.83	0.073	0.036	
802.11n HT40	38	5190	8.90			1
	46	5230	8.98	0.109	0.047	
Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
				1-g	10-g	
802.11a	52	5260	8.51			1
	60	5300	9.08	0.071	0.023	
	64	5320	8.57			1
802.11n HT40	54	5270	9.81	0.081	0.0238	
	62	5310	9.53			1
Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
				1-g	10-g	
802.11a	100	5500	10.33			2
	120	5600	10.71			2
	140	5700	11.50	0.093	0.028	
802.11n HT40	102	5510	11.35			2
	134	5670	11.76	0.114	0.033	
Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
				1-g	10-g	
802.11a	149	5745	12.32			1
	157	5785	12.64	0.081	0.023	
	165	5825	11.79			1
802.11n HT40	151	5755	12.60			1
	159	5795	12.79	0.114	0.052	

Note(s):

1. Testing was performed on the channel with the highest output power only as the SAR was ≤ 0.8 W/kg with the operating frequency band having a range of < 100 MHz. Per KDB 447498 1) e) i).
2. Testing was performed on the channel with the highest output power only as the SAR was ≤ 0.4 W/kg with the operating frequency band having a range of ≤ 200 MHz. Per KDB 447498 1) e) ii).

13.2. Body SAR

Rear with 0 mm Separation Distance

Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
				1-g	10-g	
802.11b	1	2412	13.50	0.383	0.151	
	1	2412	13.50	0.377	0.150	3
	6	2437	13.00			1
	11	2462	13.20			1
Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
				1-g	10-g	
802.11a	36	5180	8.21			1
	40	5200	8.73			1
	48	5240	8.83	0.530	0.115	
802.11n HT40	38	5190	8.90			1
	46	5230	8.98	0.684	0.153	
	46	5230	8.98	0.563	0.119	3
Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
				1-g	10-g	
802.11a	52	5260	8.51			1
	60	5300	9.08	0.553	0.125	
	64	5320	8.57			1
802.11n HT40	54	5270	9.81	0.629	0.140	
	62	5310	9.53			1
Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
				1-g	10-g	
802.11a	100	5500	10.33			2
	120	5600	10.71			2
	140	5700	11.50	0.392	0.090	
802.11n HT40	102	5510	11.35			2
	134	5670	11.76	0.429	0.101	
Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
				1-g	10-g	
802.11a	149	5745	12.32			1
	157	5785	12.64	0.354	0.085	
	165	5825	11.79			1
802.11n HT40	151	5755	12.60			1
	159	5795	12.79	0.378	0.089	

Note(s):

- Testing was performed on the channel with the highest output power only as the SAR was ≤ 0.8 W/kg with the operating frequency band having a range of < 100 MHz. Per KDB 447498 1) e) i).
- Testing was performed on the channel with the highest output power only as the SAR was ≤ 0.4 W/kg with the operating frequency band having a range of ≤ 200 MHz. Per KDB 447498 1) e) ii).
- With Headset

Left edge with 0 mm Separation Distance

Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
				1-g	10-g	
802.11b	1	2412	13.50	0.097	0.044	
	6	2437	13.00			1
	11	2462	13.20			1
Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
				1-g	10-g	
802.11a	36	5180	8.21			1
	40	5200	8.73			1
	48	5240	8.83	0.174	0.043	
802.11n HT40	38	5190	8.90			1
	46	5230	8.98	0.253	0.063	
Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
				1-g	10-g	
802.11a	52	5260	8.51			1
	60	5300	9.08	0.232	0.058	
	64	5320	8.57			1
802.11n HT40	54	5270	9.81	0.309	0.076	
	62	5310	9.53			1
Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
				1-g	10-g	
802.11a	100	5500	10.33			2
	120	5600	10.71			2
	140	5700	11.50	0.235	0.056	
802.11n HT40	102	5510	11.35			2
	134	5670	11.76	0.264	0.067	
Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
				1-g	10-g	
802.11a	149	5745	12.32			1
	157	5785	12.64	0.219	0.0552	
	165	5825	11.79			1
802.11n HT40	151	5755	12.60			1
	159	5795	12.79	0.218	0.055	

Note(s):

1. Testing was performed on the channel with the highest output power only as the SAR was ≤ 0.8 W/kg with the operating frequency band having a range of < 100 MHz. Per KDB 447498 1) e) i).
2. Testing was performed on the channel with the highest output power only as the SAR was ≤ 0.4 W/kg with the operating frequency band having a range of ≤ 200 MHz. Per KDB 447498 1) e) ii).
3. With Headset

14. Summary of Highest 1g SAR

FCC rule part	Technology	Test configuration	Mode	Highest 1g SAR (W/kg)
15.247	WIFI 2.4 GHz	Head	802.11b	0.050
		Rear	802.11b	0.383
15.407	WIFI 5.2 GHz	Head	802.11n HT40	0.109
		Rear	802.11n HT40	0.684
15.407	WIFI 5.3 GHz	Head	802.11n HT40	0.081
		Rear	802.11n HT40	0.629
15.407	WIFI 5.5 GHz	Head	802.11n HT40	0.114
		Rear	802.11n HT40	0.429
15.247	WIFI 5.8 GHz	Head	802.11n HT40	0.114
		Rear	802.11n HT40	0.378

15. Worst-case SAR Plots

Head 2.4GHz

Date: 12/28/2011

Test Laboratory: UL CCS SAR Lab C

WiFi 2.45GHz Head SAR on Flat Phantom

Communication System: IEEE 802.11b/g/n 2.4 GHz Band; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2412$ MHz; $\sigma = 1.732$ mho/m; $\epsilon_r = 40.088$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

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

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(6.82, 6.82, 6.82); Calibrated: 1/24/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 10/18/2011
- Phantom: SAM with CRP v5.0; Type: QD000P40CD; Serial: TP1632
- Measurement SW: DASY52, Version 52.6 (2);SEMCAD X Version 14.4.5 (3634)

Front/802.11a_Ch 1/Area Scan (181x211x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.065 mW/g

Front/802.11a_Ch 1/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 6.149 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.104 W/kg

SAR(1 g) = 0.050 mW/g; SAR(10 g) = 0.020 mW/g

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

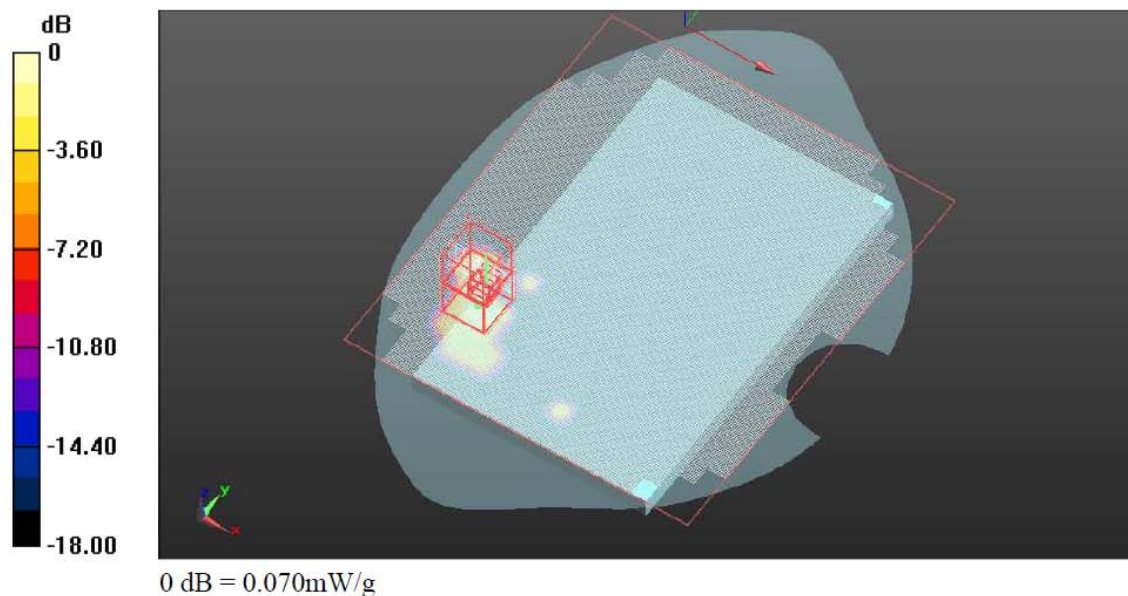
Front/802.11a_Ch 1/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 6.149 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.110 W/kg

SAR(1 g) = 0.048 mW/g; SAR(10 g) = 0.020 mW/g

Maximum value of SAR (measured) = 0.072 mW/g



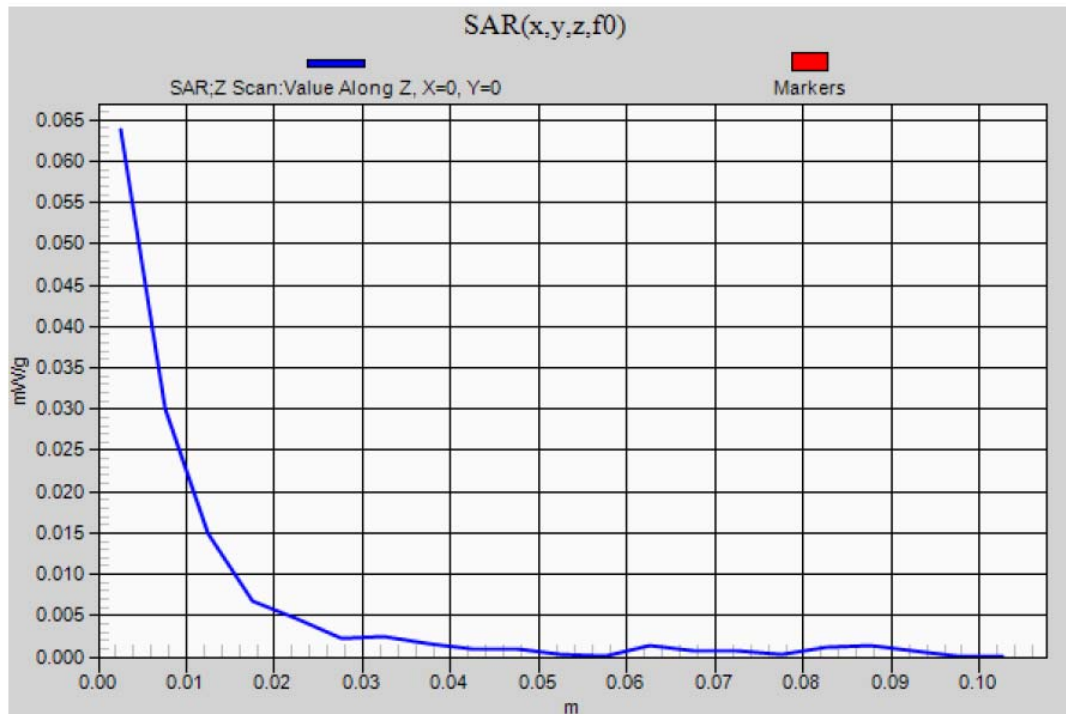
Date: 12/28/2011

Test Laboratory: UL CCS SAR Lab C

WiFi 2.45GHz Head SAR on Flat Phantom

Communication System: IEEE 802.11b/g/n 2.4 GHz Band; Frequency: 2412 MHz; Duty Cycle: 1:1

Front/802.11a_Ch 1/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.064 mW/g



Body 2.4GHz

Date: 12/28/2011

Test Laboratory: UL CCS SAR Lab C

2.4GHz Band

Communication System: IEEE 802.11b/g/n 2.4 GHz Band; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2412$ MHz; $\sigma = 1.818$ mho/m; $\epsilon_r = 51.537$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

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

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(6.86, 6.86, 6.86); Calibrated: 1/24/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 11/17/2010
- Phantom: ELI v4.0 (B); Type: QDOVA001BB; Serial: 1121
- Measurement SW: DASY52, Version 52.6 (2);SEMCAD X Version 14.4.5 (3634)

Rear/802.11b_Ch 1/Area Scan (141x191x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.713 mW/g

Rear/802.11b_Ch 1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

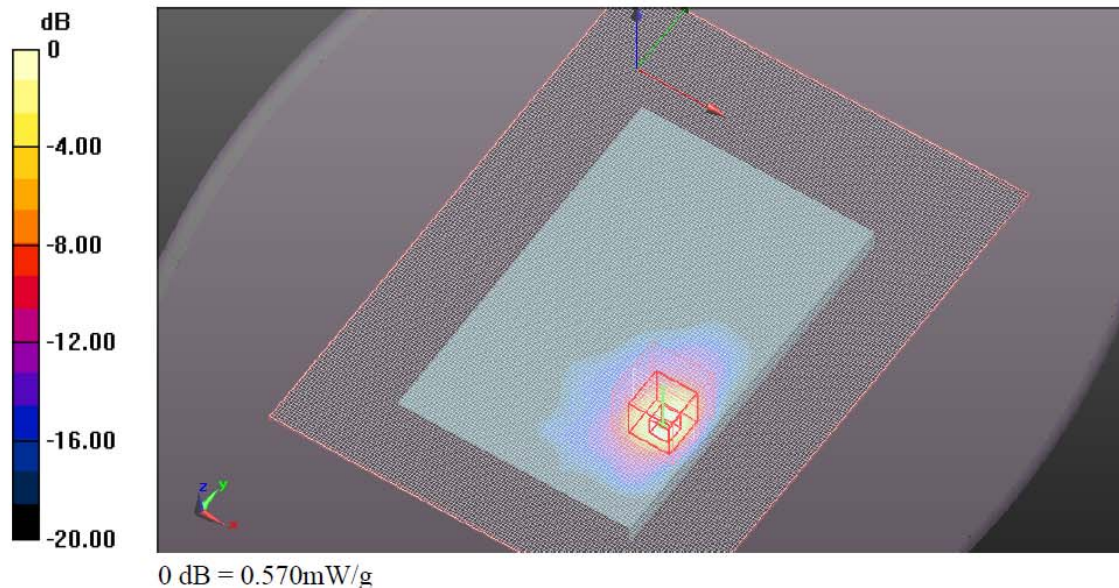
Reference Value = 17.735 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 1.038 W/kg

SAR(1 g) = 0.383 mW/g; SAR(10 g) = 0.151 mW/g

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

Maximum value of SAR (measured) = 0.572 mW/g



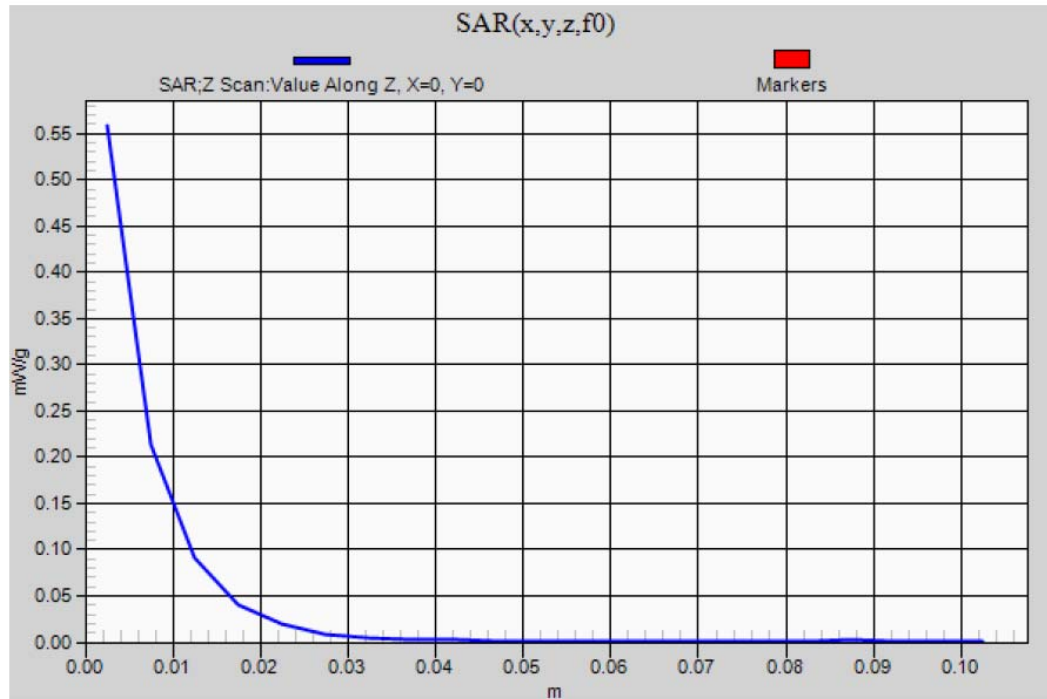
Date: 12/28/2011

Test Laboratory: UL CCS SAR Lab C

2.4GHz Band

Communication System: IEEE 802.11b/g/n 2.4 GHz Band; Frequency: 2412 MHz; Duty Cycle: 1:1

Rear/802.11b_Ch 1/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.558 mW/g



Head 5.2 GHz

Date: 12/28/2011

Test Laboratory: UL CCS SAR Lab C

WiFi 5GHz Head SAR in body phantom

Communication System: IEEE 802.11a/n 5 GHz Band; Frequency: 5230 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5230$ MHz; $\sigma = 4.867$ mho/m; $\epsilon_r = 35.722$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

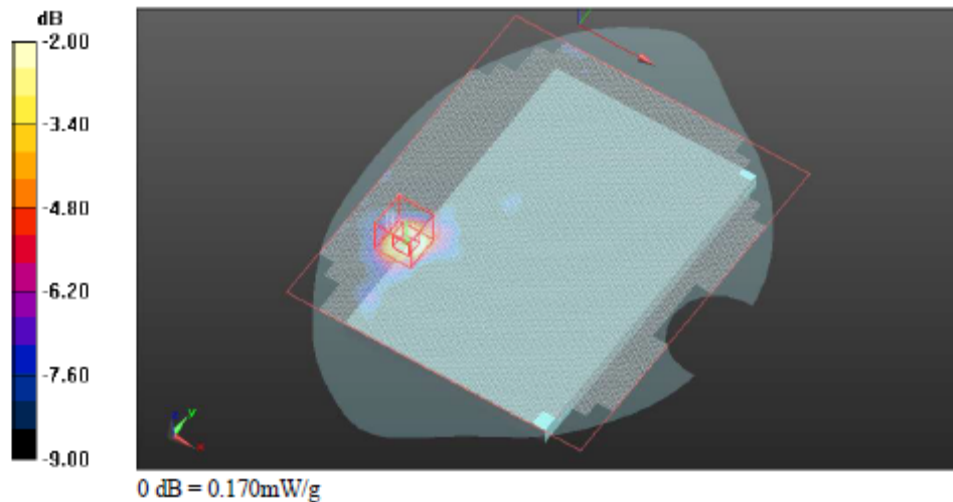
Room Ambient Temperature: 25.0 deg. C; Liquid Temperature: 24.0 deg. C

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(4.54, 4.54, 4.54); Calibrated: 1/24/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 10/18/2011
- Phantom: SAM with CRP v5.0; Type: QD000P40CD; Serial: TP1632
- Measurement SW: DASY52, Version 52.6 (2);SEMCAD X Version 14.4.5 (3634)

Front/802.11n_HT40_Ch 46/Area Scan (181x211x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.153 mW/g

Front/802.11n_HT40_Ch 46/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 5.343 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 0.472 W/kg
SAR(1 g) = 0.109 mW/g; SAR(10 g) = 0.047 mW/g
Maximum value of SAR (measured) = 0.168 mW/g



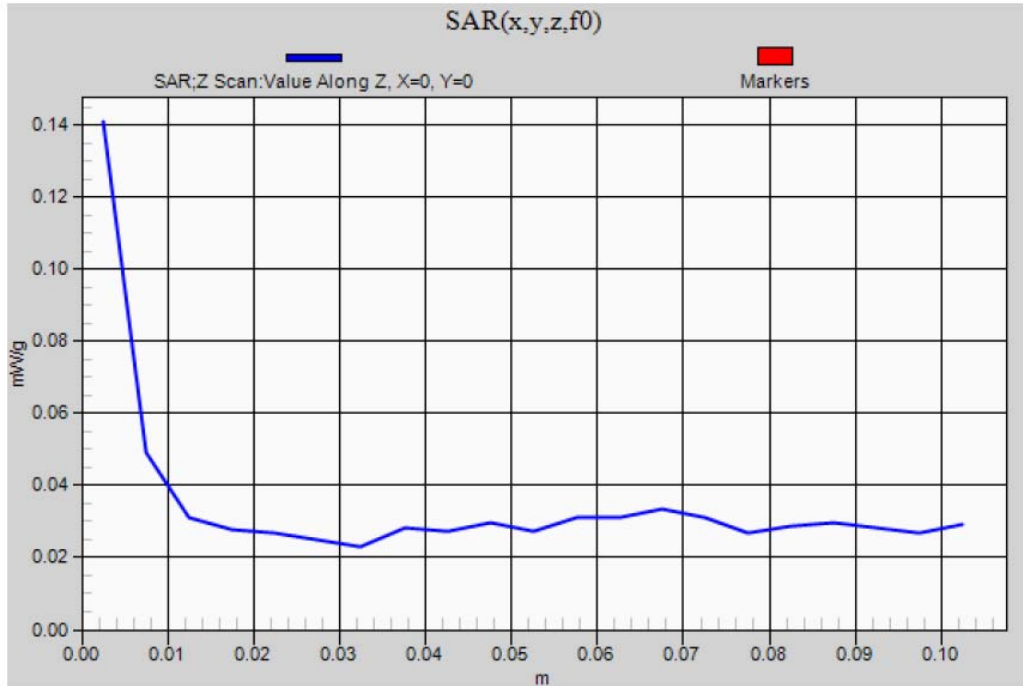
Date: 12/28/2011

Test Laboratory: UL CCS SAR Lab C

WiFi 5GHz Head SAR in body phantom

Communication System: IEEE 802.11a/n 5 GHz Band; Frequency: 5230 MHz; Duty Cycle: 1:1

Front/802.11n_HT40_Ch 46/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.141 mW/g



Body 5.2 GHz

Date: 12/21/2011

Test Laboratory: UL CCS SAR Lab C

WiFi 5GHz body

Communication System: IEEE 802.11a/n 5 GHz Band; Frequency: 5230 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5230$ MHz; $\sigma = 5.443$ mho/m; $\epsilon_r = 47.461$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

Room Ambient Temperature: 25.0 deg. C; Liquid Temperature: 24.0 deg. C

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(3.98, 3.98, 3.98); Calibrated: 1/24/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 11/17/2010
- Phantom: ELI v4.0 (B); Type: QDOVA001BB; Serial: 1121
- Measurement SW: DASY52, Version 52.6 (2);SEMCAD X Version 14.4.5 (3634)

Rear/802.11n_HT40_Ch 46/Area Scan (151x191x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.189 mW/kg

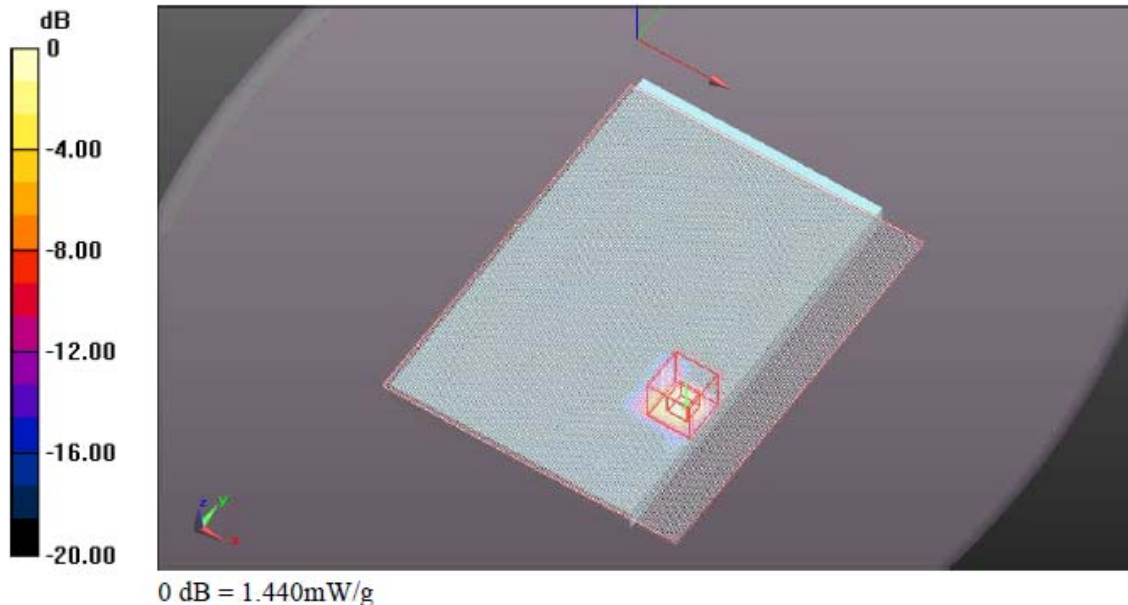
Rear/802.11n_HT40_Ch 46/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 14.859 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 3.190 W/kg

SAR(1 g) = 0.684 mW/g; SAR(10 g) = 0.153 mW/g

Maximum value of SAR (measured) = 1.443 mW/g



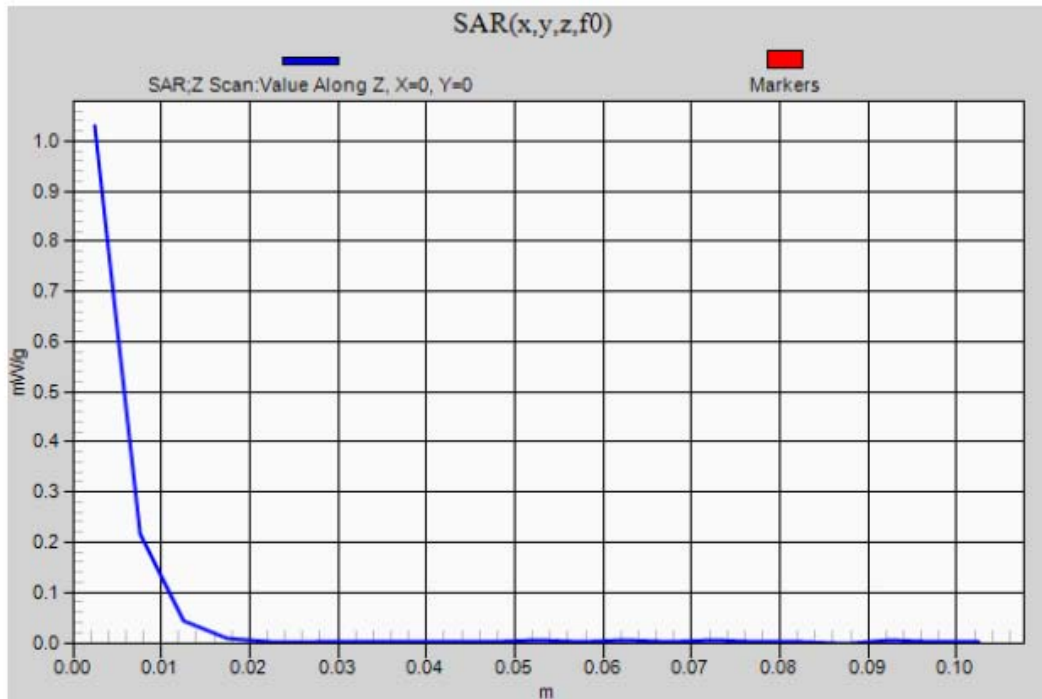
Date: 12/21/2011

Test Laboratory: UL CCS SAR Lab C

WiFi 5GHz body

Communication System: IEEE 802.11a/n 5 GHz Band; Frequency: 5230 MHz; Duty Cycle: 1:1

Rear/802.11n_HT40_Ch 46/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 1.030 mW/g



Head 5.3 GHz

Date: 12/27/2011

Test Laboratory: UL CCS SAR Lab C

WiFi 5GHz Head SAR in body phantom

Communication System: IEEE 802.11a/n 5 GHz Band; Frequency: 5270 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5270$ MHz; $\sigma = 4.915$ mho/m; $\epsilon_r = 35.63$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

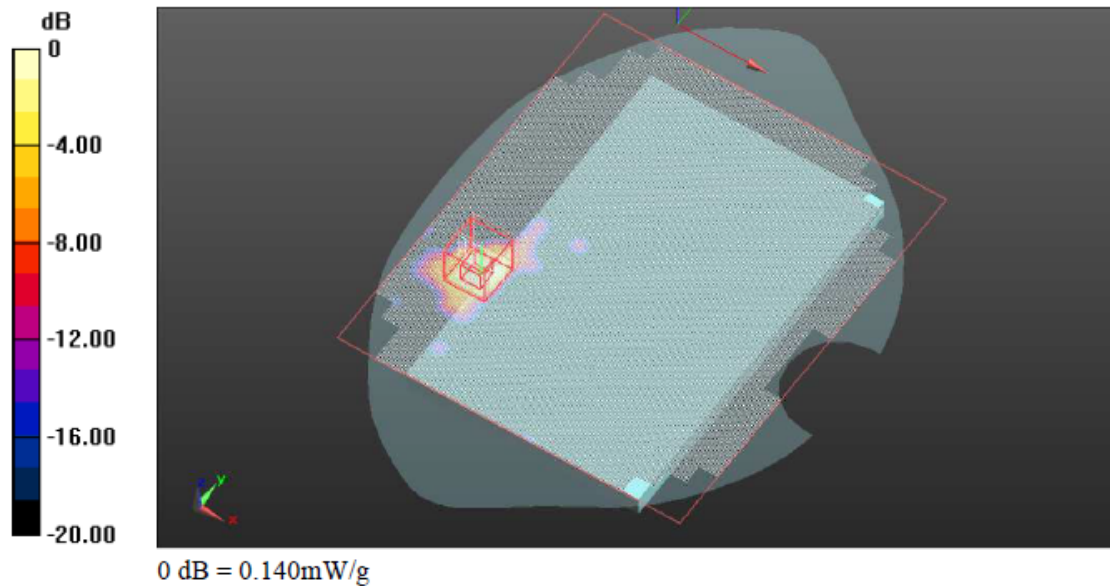
Room Ambient Temperature: 25.0 deg. C; Liquid Temperature: 24.0 deg. C

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(4.35, 4.35, 4.35); Calibrated: 1/24/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 10/18/2011
- Phantom: SAM with CRP v5.0; Type: QD000P40CD; Serial: TP1632
- Measurement SW: DASY52, Version 52.6 (2);SEMCAD X Version 14.4.5 (3634)

Front/802.11n_HT40_Ch 54/Area Scan (181x211x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.184 mW/g

Front/802.11n_HT40_Ch 54/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 5.571 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 0.283 W/kg
SAR(1 g) = 0.081 mW/g; SAR(10 g) = 0.024 mW/g
Maximum value of SAR (measured) = 0.140 mW/g



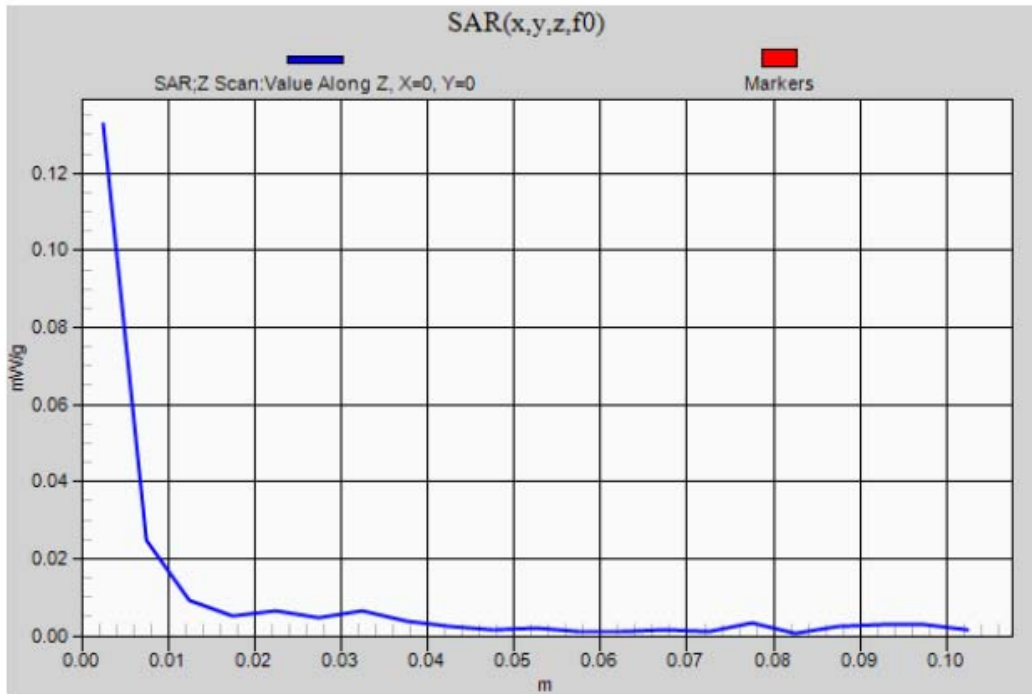
Date: 12/27/2011

Test Laboratory: UL CCS SAR Lab C

WiFi 5GHz Head SAR in body phantom

Communication System: IEEE 802.11a/n 5 GHz Band; Frequency: 5270 MHz; Duty Cycle: 1:1

Front/802.11n_HT40_Ch 54/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.133 mW/g



Body 5.3 GHz

Date: 12/21/2011

Test Laboratory: UL CCS SAR Lab C

WiFi 5GHz body

Communication System: IEEE 802.11a/n 5 GHz Band; Frequency: 5270 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5270$ MHz; $\sigma = 5.496$ mho/m; $\epsilon_r = 47.408$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

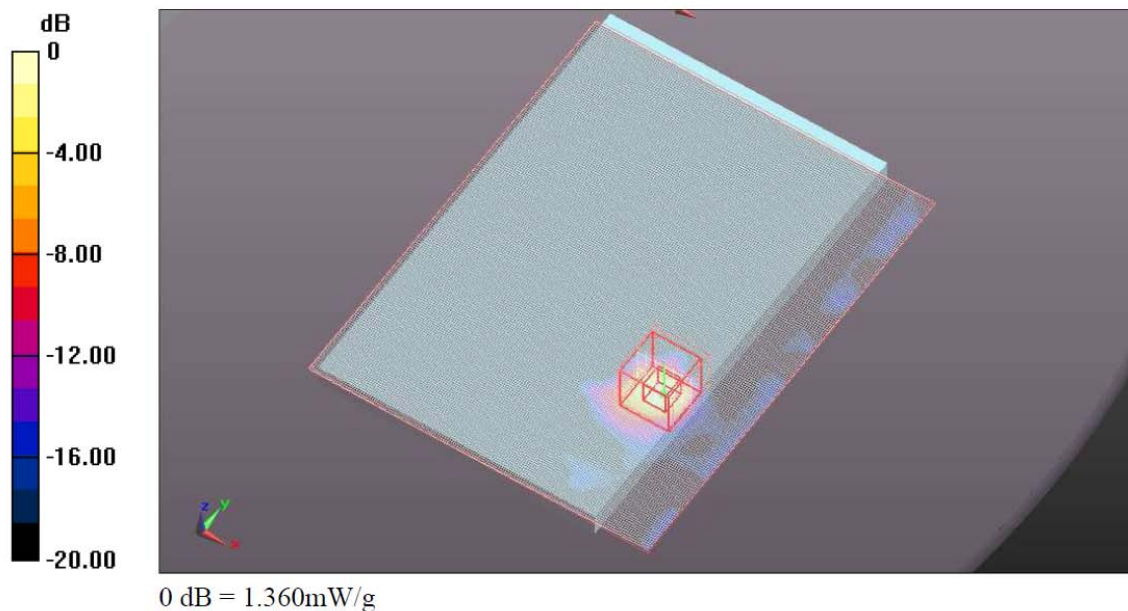
Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 deg. C

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(3.7, 3.7, 3.7); Calibrated: 1/24/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 11/17/2010
- Phantom: ELI v4.0 (B); Type: QDOVA001BB; Serial: 1121
- Measurement SW: DASY52, Version 52.6 (2);SEMCAD X Version 14.4.5 (3634)

Rear/802.11n_HT40_Ch 54/Area Scan (151x191x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.245 mW/g

Rear/802.11n_HT40_Ch 54/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 12.123 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 2.935 W/kg
SAR(1 g) = 0.629 mW/g; SAR(10 g) = 0.140 mW/g
Maximum value of SAR (measured) = 1.364 mW/g



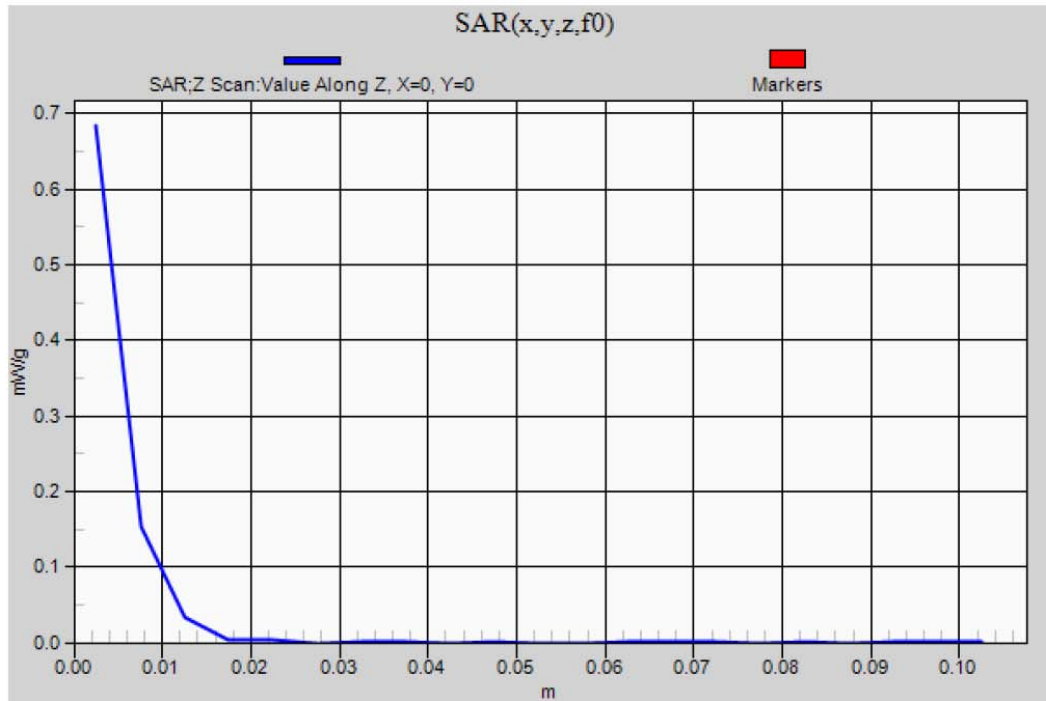
Date: 12/21/2011

Test Laboratory: UL CCS SAR Lab C

WiFi 5GHz body

Communication System: IEEE 802.11a/n 5 GHz Band; Frequency: 5270 MHz; Duty Cycle: 1:1

Rear/802.11n_HT40_Ch 54/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.684 mW/g



Head 5.5 GHz

Date: 12/27/2011

Test Laboratory: UL CCS SAR Lab C

WiFi 5GHz Head SAR in body phantom

Communication System: IEEE 802.11a/n 5 GHz Band; Frequency: 5670 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5670$ MHz; $\sigma = 5.374$ mho/m; $\epsilon_r = 34.959$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

Room Ambient Temperature: 25.0 deg. C; Liquid Temperature: 24.0 deg. C

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(3.96, 3.96, 3.96); Calibrated: 1/24/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 10/18/2011
- Phantom: SAM with CRP v5.0; Type: QD000P40CD; Serial: TP1632
- Measurement SW: DASY52, Version 52.6 (2);SEMCAD X Version 14.4.5 (3634)

Front/802.11n_HT40_Ch 134/Area Scan (181x211x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.298 mW/g

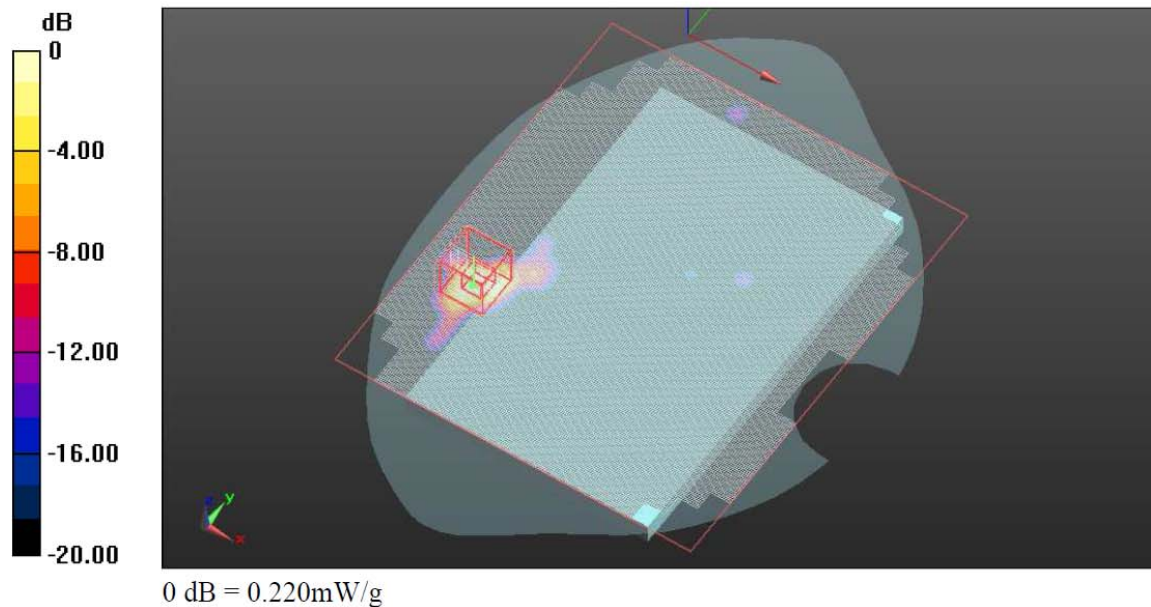
Front/802.11n_HT40_Ch 134/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 6.166 V/m; Power Drift = 0.13 dB

Peak SAR (extrapolated) = 0.434 W/kg

SAR(1 g) = 0.114 mW/g; SAR(10 g) = 0.033 mW/g

Maximum value of SAR (measured) = 0.218 mW/g



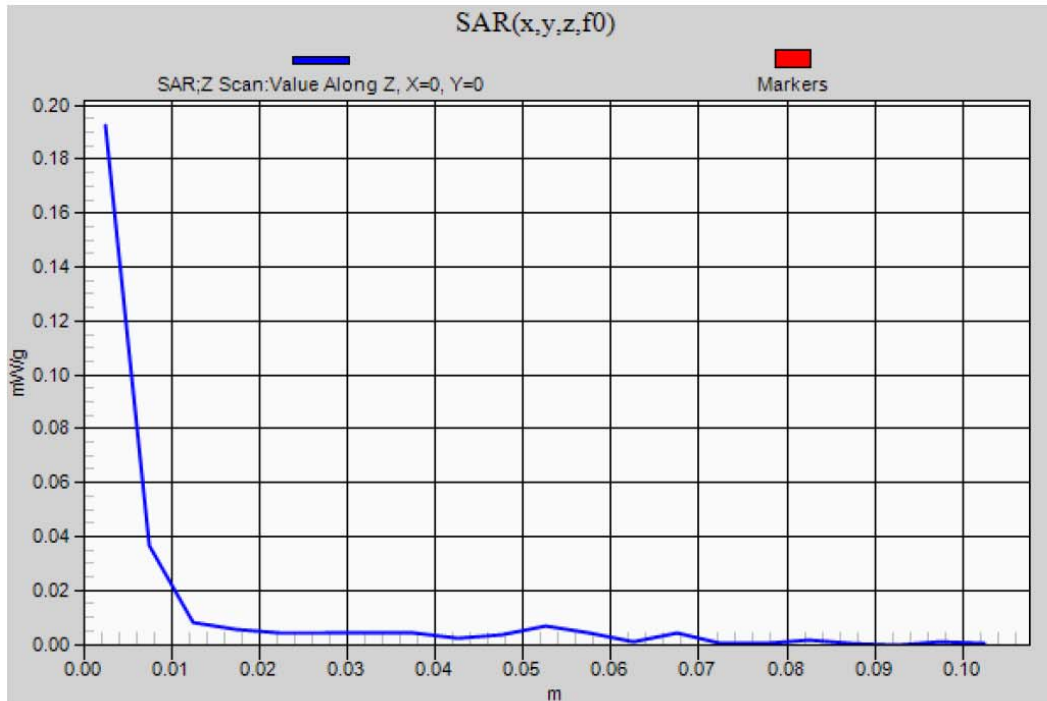
Date: 12/27/2011

Test Laboratory: UL CCS SAR Lab C

WiFi 5GHz Head SAR in body phantom

Communication System: IEEE 802.11a/n 5 GHz Band; Frequency: 5670 MHz; Duty Cycle: 1:1

Front/802.11n_HT40_Ch 134/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.192 mW/g



Body 5.5 GHz

Date: 12/21/2011

Test Laboratory: UL CCS SAR Lab C

WiFi 5GHz body

Communication System: IEEE 802.11a/n 5 GHz Band; Frequency: 5670 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5670$ MHz; $\sigma = 6.022$ mho/m; $\epsilon_r = 46.618$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

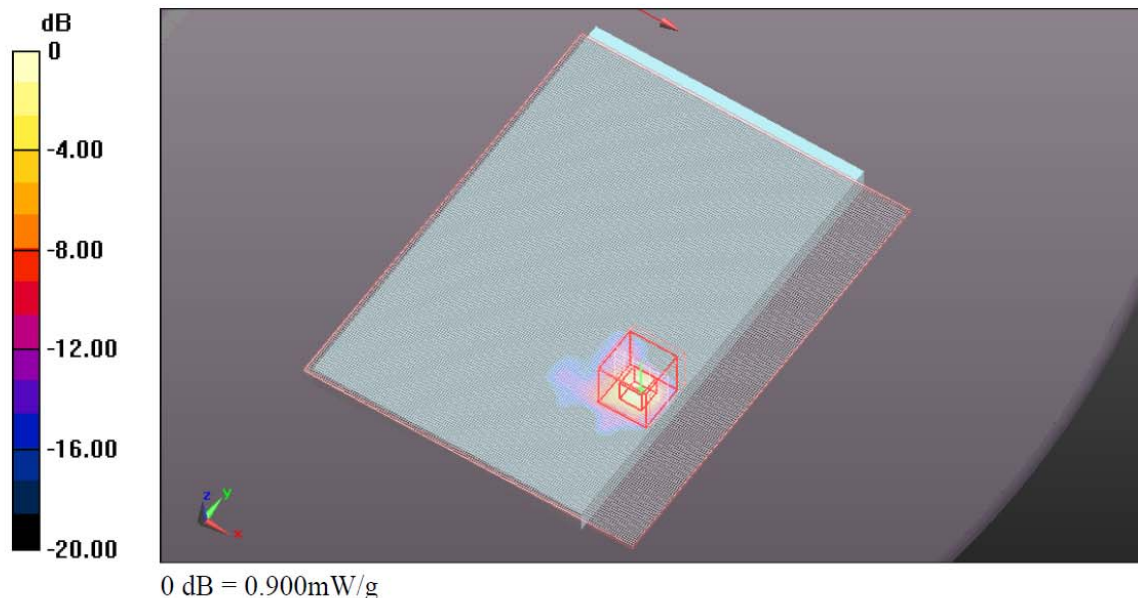
Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 deg. C

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(3.29, 3.29, 3.29); Calibrated: 1/24/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 11/17/2010
- Phantom: ELI v4.0 (B); Type: QDOVA001BB; Serial: 1121
- Measurement SW: DASY52, Version 52.6 (2);SEMCAD X Version 14.4.5 (3634)

Rear/802.11n_HT40_Ch 134/Area Scan (151x191x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.593 mW/g

Rear/802.11n_HT40_Ch 134/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 12.507 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 1.735 W/kg
SAR(1 g) = 0.429 mW/g; SAR(10 g) = 0.101 mW/g
Maximum value of SAR (measured) = 0.904 mW/g



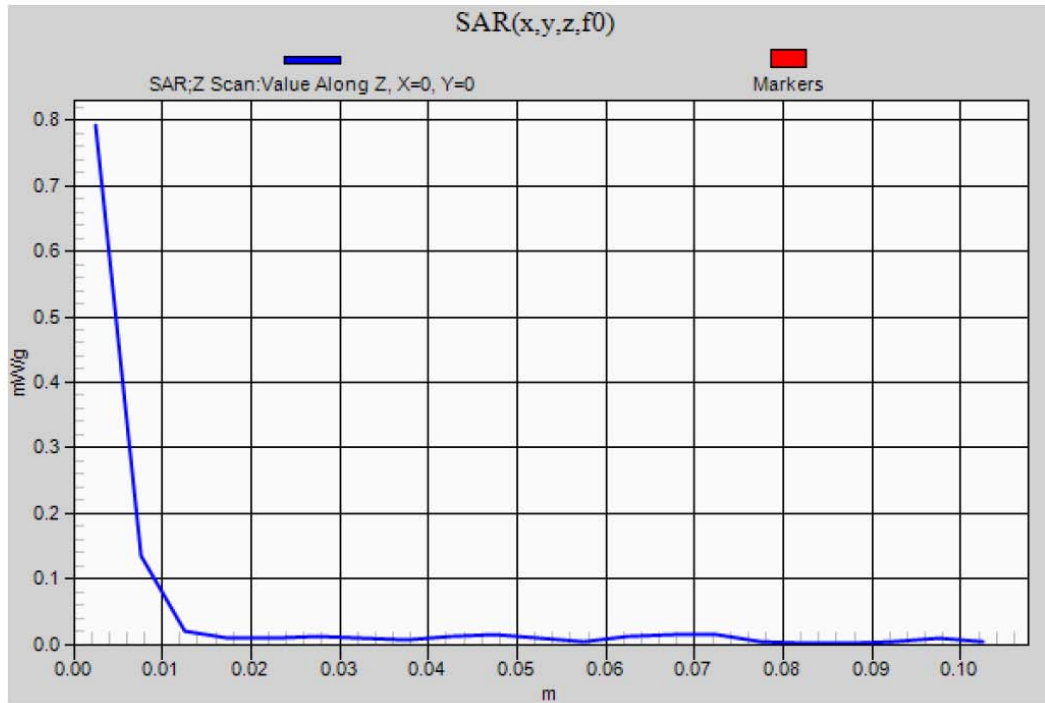
Date: 12/21/2011

Test Laboratory: UL CCS SAR Lab C

WiFi 5GHz body

Communication System: IEEE 802.11a/n 5 GHz Band; Frequency: 5670 MHz; Duty Cycle: 1:1

Rear/802.11n_HT40_Ch 134/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.792 mW/g



Head 5.8 GHz

Date: 12/27/2011

Test Laboratory: UL CCS SAR Lab C

WiFi 5GHz Head SAR in body phantom

Communication System: IEEE 802.11a/n 5 GHz Band; Frequency: 5670 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5670$ MHz; $\sigma = 5.374$ mho/m; $\epsilon_r = 34.959$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

Room Ambient Temperature: 25.0 deg. C; Liquid Temperature: 24.0 deg. C

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(3.96, 3.96, 3.96); Calibrated: 1/24/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 10/18/2011
- Phantom: SAM with CRP v5.0; Type: QD000P40CD; Serial: TP1632
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Front/802.11n_HT40_Ch 134/Area Scan (181x211x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.298 mW/g

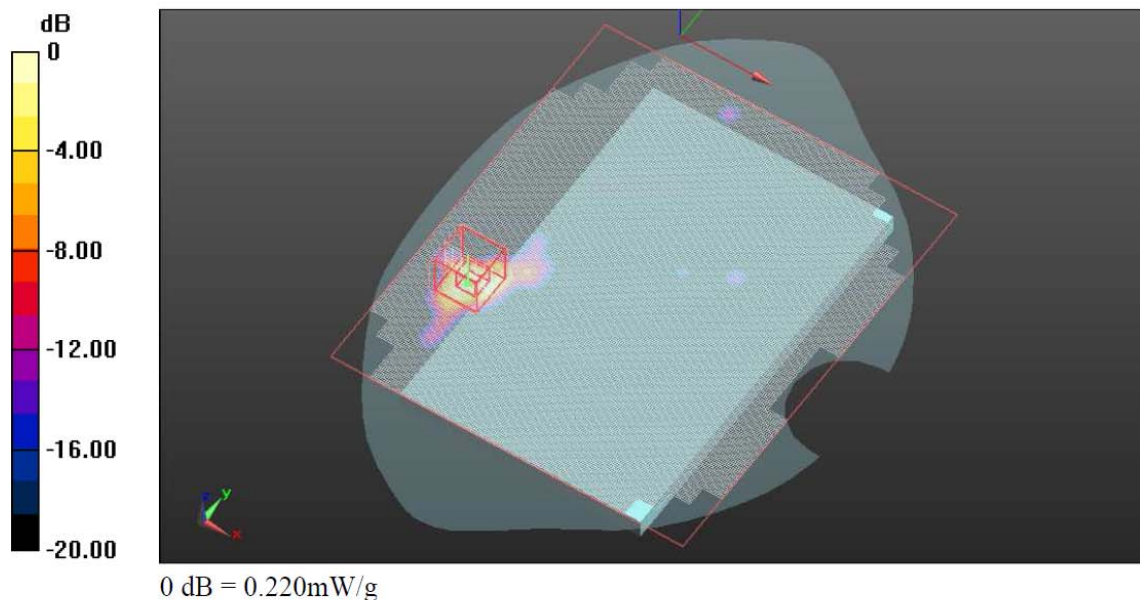
Front/802.11n_HT40_Ch 134/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 6.166 V/m; Power Drift = 0.13 dB

Peak SAR (extrapolated) = 0.434 W/kg

SAR(1 g) = 0.114 mW/g; SAR(10 g) = 0.033 mW/g

Maximum value of SAR (measured) = 0.218 mW/g



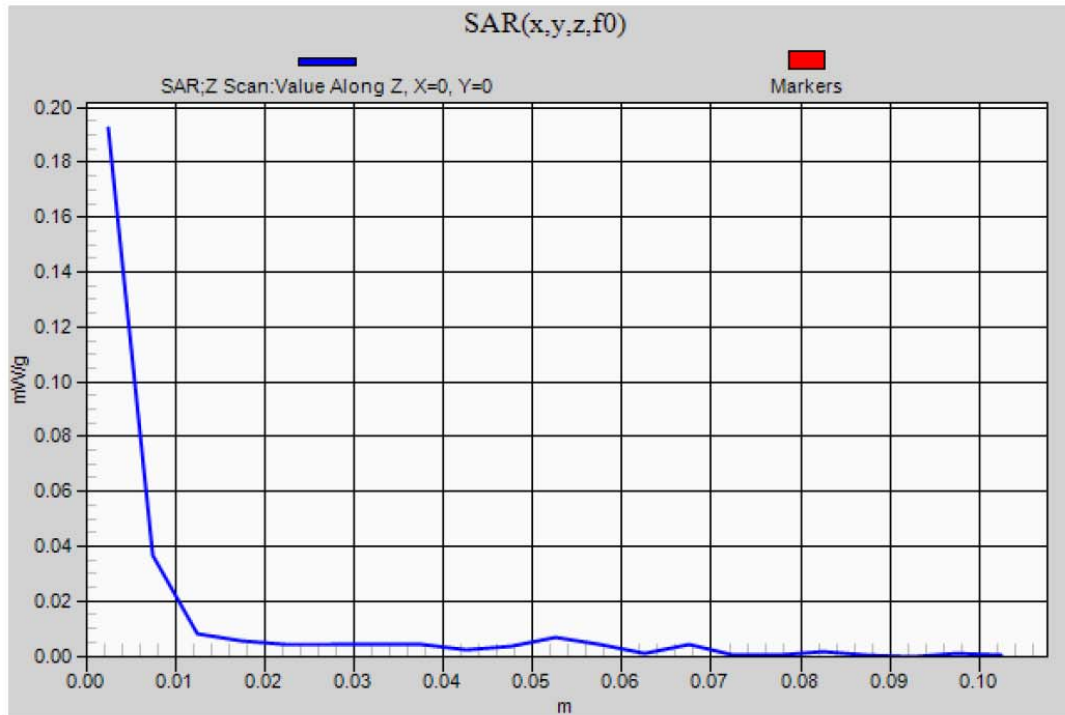
Date: 12/27/2011

Test Laboratory: UL CCS SAR Lab C

WiFi 5GHz Head SAR in body phantom

Communication System: IEEE 802.11a/n 5 GHz Band; Frequency: 5670 MHz; Duty Cycle: 1:1

Front/802.11n_HT40_Ch 134/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.192 mW/g



Body 5.8 GHz

Date: 12/21/2011

Test Laboratory: UL CCS SAR Lab C

WiFi 5GHz body

Communication System: IEEE 802.11a/n 5 GHz Band; Frequency: 5795 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5795$ MHz; $\sigma = 6.205$ mho/m; $\epsilon_r = 46.418$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

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

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(3.7, 3.7, 3.7); Calibrated: 1/24/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 11/17/2010
- Phantom: ELI v4.0 (B); Type: QDOVA001BB; Serial: 1121
- Measurement SW: DASY52, Version 52.6 (2);SEMCAD X Version 14.4.5 (3634)

Rear/802.11n_HT40_Ch 159/Area Scan (151x191x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.523 mW/g

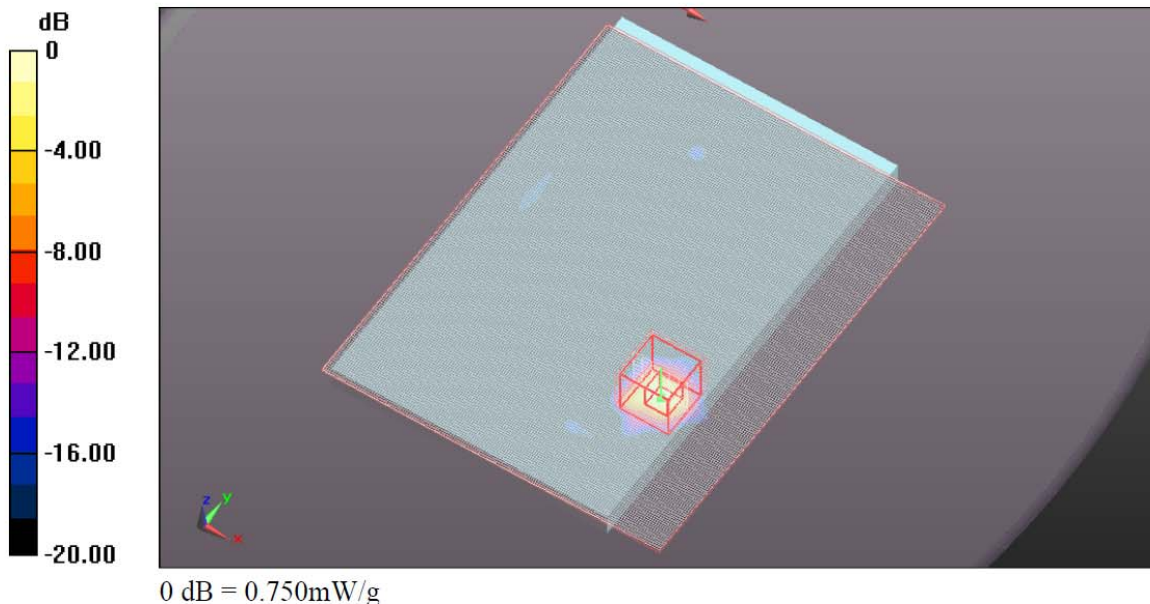
Rear/802.11n_HT40_Ch 159/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 11.551 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 1.557 W/kg

SAR(1 g) = 0.378 mW/g; SAR(10 g) = 0.089 mW/g

Maximum value of SAR (measured) = 0.753 mW/g



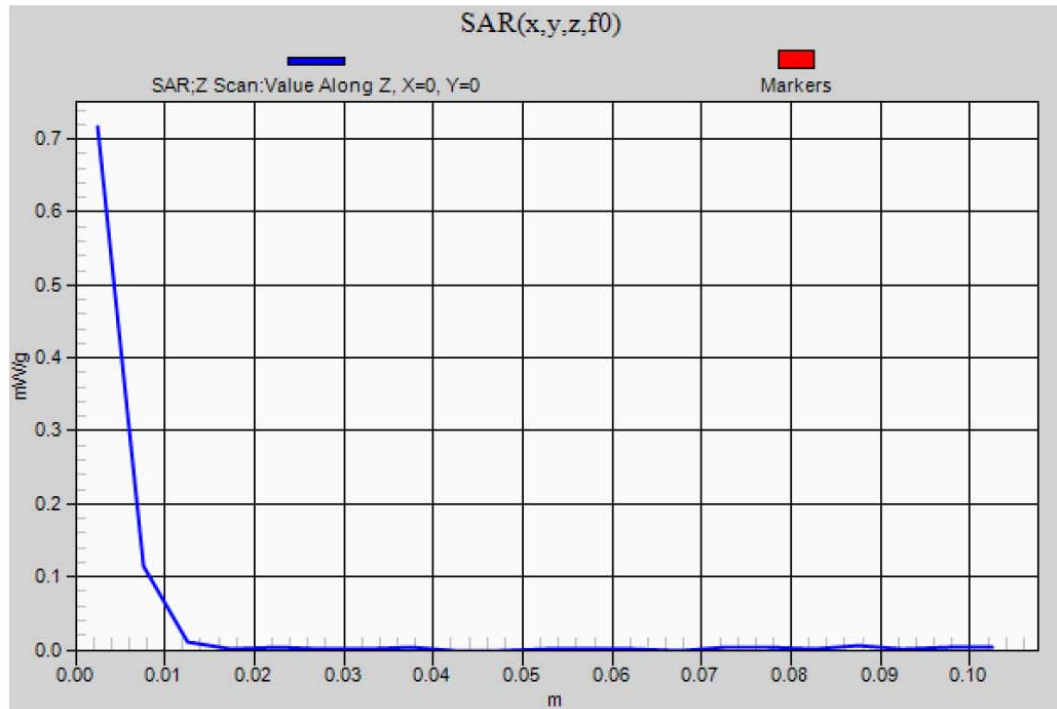
Date: 12/21/2011

Test Laboratory: UL CCS SAR Lab C

WiFi 5GHz body

Communication System: IEEE 802.11a/n 5 GHz Band; Frequency: 5795 MHz; Duty Cycle: 1:1

Rear/802.11n_HT40_Ch 159/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.716 mW/g



16. Appendixes

Refer to separate files for the following appendixes

- 16.1. System check plots**
- 16.2. SAR test plots for WiFi 2.4 GHz**
- 16.3. SAR test plots for WiFi 5 GHz Bands**
- 16.4. Calibration certificate for E-Field Probe EX3DV4 SN 3686**
- 16.5. Calibration certificate for D2450V2 SN: 706 w/ extended cal. data**
- 16.6. Certificate - Validation Dipole D5GHzV2 - SN 1003**