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

SAR EVALUATION REPORT

For

A tablet (PAD) computer, contains 802.11a/b/g/n transceiver (radio module)
The radio module (Model: 62205ANSFF) is manufactured by Intel

Model: TP00045A1
FCC ID: PU5-TP00045A1IT

Report Number: 12U14545-3A
Issue Date: 11/15/2012

Prepared for

Lenovo US
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Prepared by

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	10/29/2012	Initial Issue	--
A	11/15/2012	Section 7.1 – added note explaining Bluetooth was a separately certified module. Section 14 – Added simultaneous transmission analysis. Section 9 – Corrected typographical errors	Dave Weaver

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1. Attestation of Test Results

Applicant	Lenovo US		
DUT description	A tablet (PAD) computer, contains 802.11a/b/g/n transceiver (radio module)		
Model	TP00045A1		
Test device is	An identical prototype		
Device category	Portable		
Exposure category	General Population/Uncontrolled Exposure		
Date tested	9/26/2012 – 10/5/2012		
FCC Rule Parts	Freq. Range	Highest 1-g SAR	Limit
15.247	2412-2462	1.27W/kg (Rear 20º Tilt @Edge1)	1.6 W/kg
15.407	5150-5250	1.31W/kg (Rear 20º Tilt @Edge2)	
	5250-5350	1.37W/kg (Rear 20º Tilt @Edge1)	
	5500-5700	1.36W/kg (Rear 20º Tilt @Edge1)	
15.247	5725-5850	1.25W/kg (Rear 20º Tilt @Edge1)	
Applicable Standards			Test Results
FCC OET Bulletin 65 Supplement C 01-01, IEEE Std 1528-2003 and 1528a-2005			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:

Dave Weaver
Program Manager
UL CCS

Tested By:

Kent Huang
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 & 1528a-2005 and the following KDB Procedures:

- 447498 D01 Mobile Portable RF Exposure v04
- 248227 D01 SAR meas for 802 11abg v01r02
- 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 manufacturers' 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		
Base Station Simulator	Agilent	8960	MY48360228	11	28	2012
ESA Series Network Analyzer	Agilent	E5071B	MY42100131	2	11	2013
Synthesized Signal Generator	HP	8665B	3438A00633	2	22	2013
E-Field Probe	SPEAG	EX3DV4	3749	1	27	2013
Thermometer	ERTCO	639-1S	8350	7	30	2013
Data Acquisition Electronics	SPEAG	DAE3	500	6	13	2013
System Validation Dipole	SPEAG	D2450V2	748	2	7	2013
System Validation Dipole	SPEAG	D5GHzV2	1075	2	14	2013
Power Meter	HP	438A	3513U04320	9	17	2013
Power Sensor A	HP	8481A	2237A31744	8	17	2013
Power Sensor B	HP	8481A	3318A95392	8	17	2013
Amplifier	MITEQ	4D00400600-50-30P	1622052	N/A		
Directional coupler	Werlatone	C8060-102	2149	N/A		
Synthesized Signal Generator	HP	8665B	3744A01084	5	3	2013
Power Meter	HP	438A	2822A05684	10	7	2013
Power Sensor A	HP	8481A	2702A66876	8	1	2013
Power Sensor B	HP	8482A	2349A08568	4	14	2013
Amplifier	MITEQ	4D00400600-50-30P	1620606	N/A		
Directional coupler	Werlatone	C8060-102	2141	N/A		

4.2. Measurement Uncertainty

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

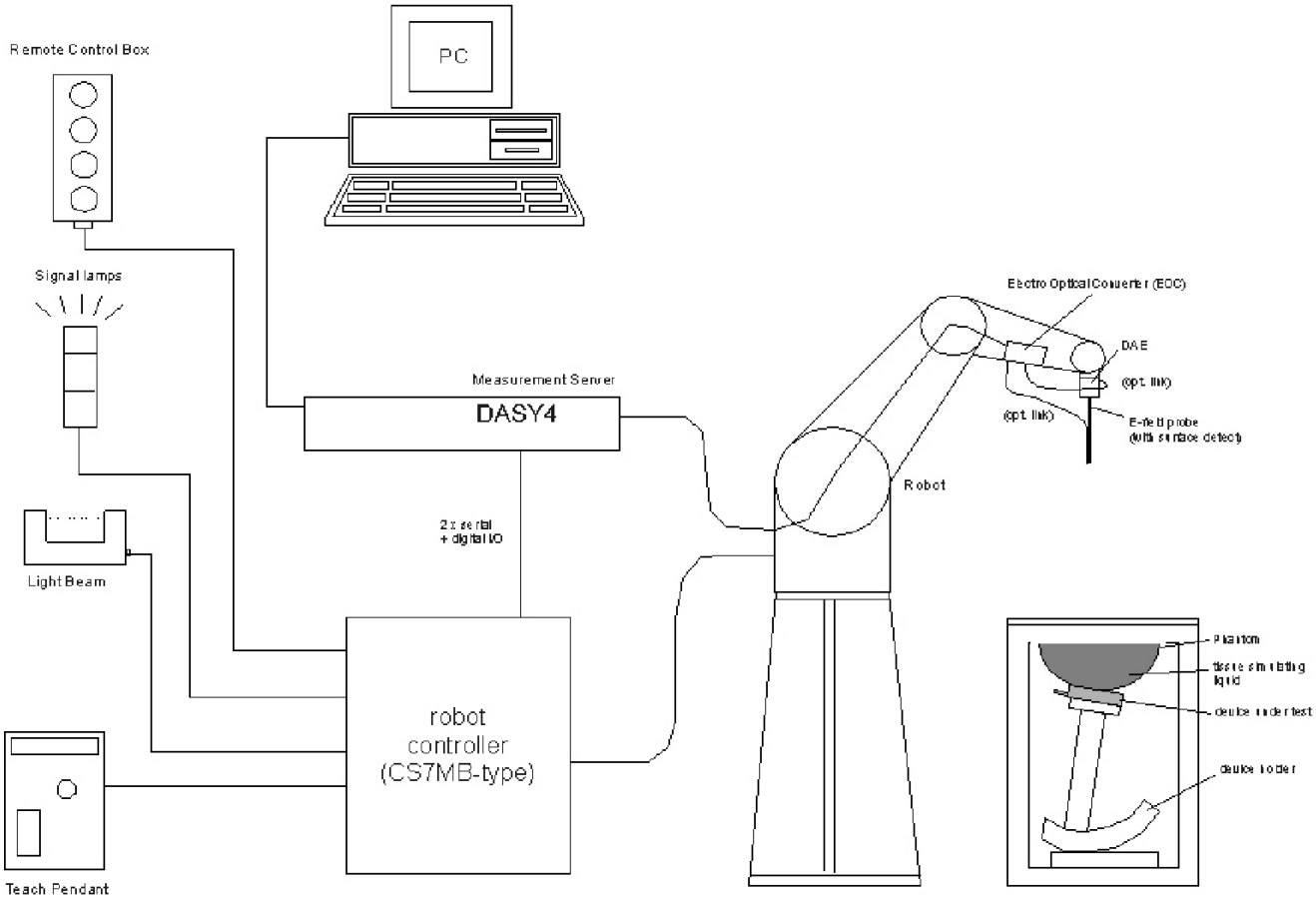
Component	Error, %	Distribution	Divisor	Sensitivity	U (Xi), %
Measurement System					
Probe Calibration (k=1)	**6.00**	Normal	1	1	6.00
Axial Isotropy	1.15	Rectangular	1.732	0.7071	0.47
Hemispherical Isotropy	2.30	Rectangular	1.732	0.7071	0.94
Boundary Effect	0.90	Rectangular	1.732	1	0.52
Probe Linearity	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	**1.31**	Normal	1	0.64	0.84
Liquid Permittivity - deviation from target	5.00	Rectangular	1.732	0.6	1.73
Liquid Permittivity - measurement uncertainty	**-3.81**	Normal	1	0.6	-2.29
Combined Standard Uncertainty Uc(y) =					10.04
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				20.08	%
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 (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	**3.07**	Normal	1	0.64	1.96
Liquid Permittivity - deviation from target	10.00	Rectangular	1.732	0.6	3.46
Liquid Permittivity - measurement uncertainty	**-4.32**	Normal	1	0.6	-2.59
Combined Standard Uncertainty Uc(y), %:					10.95
Expanded Uncertainty U, Coverage Factor = 1.96, > 95 % Confidence =				21.45	%
Expanded Uncertainty U, Coverage Factor = 1.96, > 95 % Confidence =				1.69	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 (FCC only)
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.

6.2. Volume Scan 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 ≥ 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: Volume Scan
Volume Scans are used to assess peak SAR and averaged SAR measurements in largely extended 3-dimensional volumes within any phantom. This measurement does not need any previous area scan. The grid can be anchored to a user specific point or to the current probe location.

Step 5: 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.

7. Device Under Test

A tablet (PAD) computer, containing 802.11a/b/g/n transceiver (radio module) Models: TP00045A1		
Normal operation	Body (Rear/Bottom and each edge): Multiple display orientations supporting both portrait and landscape configurations	
Device Dimension (mm)	295 mm(L) x 188 mm(W) x 11 mm (H)	
Antenna Tested	Manufactured	Part number
	Wistron Neweb Corporation	Main Antenna: (P/N:25.90AFI.001)
	Wistron Neweb Corporation	Aux. Antenna: (P/N:25.90AFJ.001)

7.1. Band and Air Interfaces

Air Interfaces	- 802.11a/b/g/n - Bluetooth Ver 4.0
Tx Frequency Bands	- 802.11a/b/g/n: 2412 - 2462 MHz - 5180 - 5240 MHz - 5260 - 5320 MHz - 5500 - 5700 MHz - 5745 - 5825 MHz Note: There are two antennas for WLAN. Both antennas can transmit 2.4GHz and 5GHz bands. The WLAN and BT can simultaneously transmit. There is a separate Bluetooth antenna. - Bluetooth: 2402 - 2480 MHz Note: Bluetooth operation is provided by the installation of a module (FCC ID QDS-BRCM1067) and is not part of the DUT's FCC ID for this application

7.2. Simultaneous Transmission

No.	Conditions	Head	Body	Hotspot
1	Wi-Fi 5.2GHz Band+ BT	☐	☒	☐
2	Wi-Fi 5.3GHz Band+ BT	☐	☒	☐
3	Wi-Fi 5.5GHz Band+ BT	☐	☒	☐
4	Wi-Fi 5.8GHz Band+ BT	☐	☒	☐
5	Wi-Fi 2.4GHz Band+ BT	☐	☒	☐

8. Summary of Test Configurations

The following test configurations are based on KDB 447498 4) b) Tablet Mode

8.1. Body Exposure Conditions for Wi-Fi (Main Antenna)

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear/Bottom	< 25 mm	Yes	
Rear 20º Tilt @Edge1	< 25 mm	Yes	
Edge 1	3.5 mm	Yes	
Edge 2	48 mm	No	This is not the most conservative antenna-to-user distance at edge mode as per KDB 447498 4) b) ii) (2)
Edge 3	172 mm	No	This is not the most conservative antenna-to-user distance at edge mode as per KDB 447498 4) b) ii) (2)
Edge 4	223 mm	No	This is not the most conservative antenna-to-user distance at edge mode as per KDB 447498 4) b) ii) (2)

8.2. Body Exposure Conditions for Wi-Fi (Aux Antenna)

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear/Bottom	< 25 mm	Yes	
Rear 20º Tilt @Edge2	< 25 mm	Yes	
Edge 1	133 mm	No	This is not the most conservative antenna-to-user distance at edge mode as per KDB 447498 4) b) ii) (2)
Edge 2	3.5 mm	Yes	
Edge 3	31 mm	No	This is not the most conservative antenna-to-user distance at edge mode as per KDB 447498 4) b) ii) (2)
Edge 4	282 mm	No	This is not the most conservative antenna-to-user distance at edge mode as per KDB 447498 4) b) ii) (2)

8.3. Rear 20° Tilt testing justification

The rear of the DUT has a 20° bevel along each edge. As a result the most conservative antenna-to-user distance occurs when the beveled edge is placed directly against the user's body. Testing with the beveled edge placed directly against the phantom was considered necessary to ensure compliance.

9. RF Output Power Measurement

9.1. Wi-Fi Target Powers

The Wi-Fi target powers provided by the client are absolute maximums. A software test tool was used to adjust the output power to as close to the target as possible.

9.2. Wi-Fi (2.4 GHz Band)

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#	√	∇

Notes:
√ = "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.

Note(s):

SAR is not required for 802.11g/HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a/b channels. As per KDB 248227

Band (MHz)	Mode	Data rate (Mbps)	Ch #	Freq. (MHz)	Target Pwr (dBm)		Avg. Pwr (dBm)	
					Chain A	Chain B	Chain A	Chain B
2.4	802.11b 1 Tx	1	1	2412	15.5		15.3	
			6	2437	15.5		15.5	
			11	2462	15.5		15.2	
			1	2412		15.5		15.3
			6	2437		15.5		15.4
			11	2462		15.5		15.2
	802.11g 1 Tx	6	1	2412	14.0		13.8	
			2	2417	16.0		15.9	
			6	2437	16.0		16.0	
			10	2457	16.5		16.5	
			11	2462	14.0		14.0	
			1	2412		14.0		13.8
			2	2417		16.0		15.8
			6	2437		16.0		16.0
			10	2457		16.5		16.3
			11	2462		14.0		13.9
	802.11n (HT20) 1 Tx	6.5	1	2412	13.0		13.0	
			2	2417	16.0		15.9	
			6	2437	16.0		16.0	
			10	2457	16.0		15.9	
			11	2462	12.5		12.5	
			1	2412		13.0		12.8
			2	2417		16.0		15.8
			6	2437		16.0		16.0
			10	2457		16.0		15.9
			11	2462		12.5		12.4
	802.11n (HT20) 2 Tx	6.5	1	2412	11.0	11.0	11.0	11.0
			2	2417	13.0	13.0	13.0	12.9
			6	2437	13.0	13.0	13.0	13.0
			10	2457	13.0	13.0	13.0	13.0
			11	2462	11.0	11.0	11.0	11.0
	802.11n (HT40) 1 Tx	13.5	3	2422	9.0		8.9	
			4	2427	10.5		10.5	
			5	2432	12.5		12.5	
			7	2442	12.5		12.4	
			8	2447	10.5		10.5	
			9	2452	9.5		9.5	
			3	2422		9.0		9.0
			4	2427		10.5		10.4
			5	2432		12.5		12.5
			7	2442		12.5		12.5
			8	2447		10.5		10.4
			9	2452		9.5		9.5
	802.11n (HT40) 2 Tx	13.5	3	2422	8.0	8.0	8.0	8.0
			4	2427	9.5	9.5	9.5	9.4
			5	2432	11.5	11.5	11.5	11.4
			7	2442	11.5	11.5	11.5	11.5
			8	2447	9.5	9.5	9.4	9.3
			9	2452	8.5	8.5	8.5	8.3

9.3. Wi-Fi (5 GHz Bands)

Mode		Band	GHz	Channel	"Default Test Channels"	
					802.11a	
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"

= 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.

Band (MHz)	Mode	Data rate (Mbps)	Ch #	Freq. (MHz)	Target Pwr (dBm)		Avg Pwr (dBm)	
					Chain A	Chain B	Chain A	Chain B
5.2	802.11a 1 Tx	6	36	5180	15.5		15.5	
			40	5200	15.5		15.5	
			44	5220	15.5		15.5	
			48	5240	15.5		15.5	
			36	5180		15.5		15.5
			40	5200		15.5		15.5
			44	5220		15.5		15.4
			48	5240		15.5		15.5
	802.11n (HT20) 1 Tx	6.5	36	5180	15.0		15.0	
			40	5200	15.0		15.0	
			48	5240	15.0		14.9	
			36	5180		15.0		15.0
			40	5200		15.0		15.0
			48	5240		15.0		15.0
	802.11n (HT20) 2 Tx		36	5180	13.0	13.0	13.0	13.0
			40	5200	13.0	13.0	13.0	13.0
			48	5240	13.0	13.0	13.0	13.0
	802.11n (HT40) 1 Tx	13.5	38	5190	10.5		10.5	
			46	5230	10.5		10.4	
			38	5190		10.5		10.4
			46	5230		10.5		10.5
	802.11n (HT40) 2 Tx		38	5190	9.0	9.0	9.0	9.0
			46	5230	9.0	9.0	9.0	9.0

Band (MHz)	Mode	Data rate (Mbps)	Ch #	Freq. (MHz)	Target Pwr (dBm)		Avg Pwr (dBm)	
					Chain A	Chain B	Chain A	Chain B
5.3	802.11a 1 Tx	6	52	5260	15.0		15.0	
			56	5280	15.0		15.0	
			60	5300	15.0		15.0	
			64	5320	15.0		15.0	
			52	5260		15.0		15.0
			56	5280		15.0		15.0
			60	5300		15.0		15.0
			64	5320		15.0		15.0
	802.11n (HT20) 1 Tx	6.5	52	5260	15.5		15.5	
			60	5300	15.5		15.5	
			64	5320	15.5		15.5	
			52	5260		15.5		15.5
			60	5300		15.5		15.5
			64	5320		15.5		15.5
	802.11n (HT20) 2 Tx		52	5260	13.0	13.0	13.0	13.0
			60	5300	13.0	13.0	13.0	13.0
			64	5320	13.0	13.0	12.9	13.0
	802.11n (HT40) 1 Tx	13.5	54	5270	11.0		10.9	
			62	5310	11.0		11.0	
			54	5270		11.0		11.0
			62	5310		11.0		11.0
	802.11n (HT40) 2 Tx		54	5270	9.5	9.5	9.5	9.5
			62	5310	9.5	9.5	9.5	9.5

Band (MHz)	Mode	Data rate (Mbps)	Ch #	Freq. (MHz)	Target Pwr (dBm)		Avg Pwr (dBm)	
					Chain A	Chain B	Chain A	Chain B
5.5	802.11a 1 Tx	6	100	5500	16.0		16.0	
			104	5520	16.0		16.0	
			108	5540	16.0		15.9	
			112	5560	16.0		15.8	
			116	5580	16.0		15.8	
			120	5600	16.0		15.9	
			124	5620	16.0		15.9	
			128	5640	16.0		16.0	
			132	5660	16.0		16.0	
			136	5680	16.0		15.8	
			140	5700	15.5		15.5	
			100	5500		16.0		16.0
			104	5520		16.0		16.0
			108	5540		16.0		16.0
			112	5560		16.0		16.0
			116	5580		16.0		15.9
			120	5600		16.0		16.0
			124	5620		16.0		15.7
			128	5640		16.0		16.0
			132	5660		16.0		16.0
			136	5680		16.0		16.0
			140	5700		15.5		15.4
	802.11n (HT20) 1 Tx	6.5	100	5500	16.0		15.9	
			120	5600	16.0		15.9	
			140	5700	15.5		15.4	
			100	5500		16.0		16.0
			120	5600		16.0		15.9
			140	5700		15.5		15.5
	802.11n (HT20) 2 Tx		100	5500	13.0	13.0	13.0	12.9
			120	5600	13.0	13.0	13.0	12.9
			140	5700	13.5	13.5	13.5	13.5
	802.11n (HT40) 1 Tx	13.5	102	5510	13.5		13.5	
			118	5590	13.5		13.5	
			134	5670	15.5		15.4	
			102	5510		13.5		13.4
			118	5590		15.5		15.4
			134	5670		15.5		15.5
	802.11n (HT40) 2 Tx		102	5510	12.5	12.5	12.5	12.5
			118	5590	12.5	12.5	12.5	12.4
			134	5670	13.0	13.0	13.0	13.0

Band (MHz)	Mode	Data rate (Mbps)	Ch #	Freq. (MHz)	Target Pwr (dBm)		Avg Pwr (dBm)	
					Chian A	Chain B	Chain A	Chain B
5.8	802.11a 1 Tx	6	149	5745	16.5		16.5	
			153	5765	16.5		16.5	
			157	5785	16.5		16.5	
			161	5805	16.5		16.5	
			165	5825	16.5		16.4	
			149	5745		16.5		16.3
			153	5765		16.5		16.5
			157	5785		16.5		16.3
			161	5805		16.5		16.5
			165	5825		16.5		16.5
	802.11n (HT20) 1 Tx	6.5	149	5745	15.5		15.5	
			157	5785	15.5		15.4	
			165	5825	15.5		15.5	
			149	5745		16.0		16.0
			157	5785		16.0		15.9
			165	5825		16.0		15.9
	802.11n (HT20) 2 Tx		149	5745	13.5	13.5	13.5	13.5
			157	5785	13.5	13.5	13.4	13.4
			165	5825	13.5	13.5	13.4	13.3
	802.11n (HT40) 1 Tx	13.5	151	5755	15.5		15.4	
			159	5795	15.5		15.5	
			151	5755		16.0		15.8
			159	5795		16.0		15.9
	802.11n (HT40) 2 Tx		151	5755	12.5	12.5	12.5	12.4
			159	5795	12.5	12.5	12.5	12.4

9.4. Bluetooth

Version 4.0, Power class: 2 (2.5 mW/4 dBm)

Mode	Channel #	Freq. (MHz)	Measured Avg Pwr(dBm)
GFSK	0	2402	0.41
	39	2441	0.91
	78	2480	0.62
8-PSK	0	2402	1.68
	39	2441	2.19
	78	2480	1.31
BLE	0	2402	0.88
	19	2440	1.40
	38	2480	1.13

Note(s):

According to KDB 648474, Table 2, Unlicensed transmitters
When there is simultaneous transmission, Stand-alone SAR not required due to

☒ Output ≤ 2 · P_{Ref} (13.8dBm / 24 mW) and antenna is ≥ 5.0 cm from other antennas
☐ Output ≤ P_{Ref} (10.79dBm / 12 mW) and antenna is ≥ 2.5 cm from other antennas
☐ Output ≤ P_{Ref} (10.79dBm / 12 mW) and antenna is < 2.5 cm from other antennas

10. 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

FCC OET Bulletin 65 Supplement C 01-01

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

10.1. 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

10.2. Tissue Dielectric Parameter Check Results

Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
2012/9/26	Body 5180	e'	47.2783	Relative Permittivity (ϵ_r):	47.28	49.05	-3.61	10
		e''	18.1466	Conductivity (σ):	5.23	5.27	-0.85	5
	Body 5200	e'	47.1816	Relative Permittivity (ϵ_r):	47.18	49.02	-3.75	10
		e''	18.0348	Conductivity (σ):	5.21	5.29	-1.51	5
	Body 5500	e'	46.5993	Relative Permittivity (ϵ_r):	46.60	48.61	-4.14	10
		e''	18.2869	Conductivity (σ):	5.59	5.64	-0.92	5
	Body 5800	e'	46.1278	Relative Permittivity (ϵ_r):	46.13	48.20	-4.30	10
		e''	18.3336	Conductivity (σ):	5.91	6.00	-1.46	5
	Body 5825	e'	46.1181	Relative Permittivity (ϵ_r):	46.12	48.20	-4.32	10
		e''	18.2650	Conductivity (σ):	5.92	6.00	-1.40	5
2012/9/27	Body 5180	e'	48.4009	Relative Permittivity (ϵ_r):	48.40	49.05	-1.32	10
		e''	17.6626	Conductivity (σ):	5.09	5.27	-3.49	5
	Body 5200	e'	48.4375	Relative Permittivity (ϵ_r):	48.44	49.02	-1.19	10
		e''	17.6581	Conductivity (σ):	5.11	5.29	-3.57	5
	Body 5500	e'	47.8432	Relative Permittivity (ϵ_r):	47.84	48.61	-1.58	10
		e''	17.9077	Conductivity (σ):	5.48	5.64	-2.98	5
	Body 5800	e'	47.2290	Relative Permittivity (ϵ_r):	47.23	48.20	-2.01	10
		e''	18.1686	Conductivity (σ):	5.86	6.00	-2.34	5
	Body 5825	e'	47.3084	Relative Permittivity (ϵ_r):	47.31	48.20	-1.85	10
		e''	18.1649	Conductivity (σ):	5.88	6.00	-1.94	5
2012/9/28	Body 5180	e'	48.0026	Relative Permittivity (ϵ_r):	48.00	49.05	-2.13	10
		e''	17.9160	Conductivity (σ):	5.16	5.27	-2.11	5
	Body 5200	e'	47.9574	Relative Permittivity (ϵ_r):	47.96	49.02	-2.17	10
		e''	17.9192	Conductivity (σ):	5.18	5.29	-2.15	5
	Body 5500	e'	47.4599	Relative Permittivity (ϵ_r):	47.46	48.61	-2.37	10
		e''	18.1713	Conductivity (σ):	5.56	5.64	-1.55	5
	Body 5800	e'	47.1212	Relative Permittivity (ϵ_r):	47.12	48.20	-2.24	10
		e''	18.3653	Conductivity (σ):	5.92	6.00	-1.29	5
	Body 5825	e'	47.0980	Relative Permittivity (ϵ_r):	47.10	48.20	-2.29	10
		e''	18.4905	Conductivity (σ):	5.99	6.00	-0.19	5
2012/10/1	Body 5180	e'	48.4342	Relative Permittivity (ϵ_r):	48.43	49.05	-1.25	10
		e''	18.4398	Conductivity (σ):	5.31	5.27	0.75	5
	Body 5200	e'	48.3742	Relative Permittivity (ϵ_r):	48.37	49.02	-1.32	10
		e''	18.5385	Conductivity (σ):	5.36	5.29	1.24	5
	Body 5500	e'	47.8929	Relative Permittivity (ϵ_r):	47.89	48.61	-1.48	10
		e''	18.8064	Conductivity (σ):	5.75	5.64	1.89	5
	Body 5800	e'	47.4794	Relative Permittivity (ϵ_r):	47.48	48.20	-1.50	10
		e''	19.1450	Conductivity (σ):	6.17	6.00	2.90	5
	Body 5825	e'	47.3401	Relative Permittivity (ϵ_r):	47.34	48.20	-1.78	10
		e''	19.0928	Conductivity (σ):	6.18	6.00	3.07	5
2012/10/2	Body 5180	e'	47.8312	Relative Permittivity (ϵ_r):	47.83	49.05	-2.48	10
		e''	18.2458	Conductivity (σ):	5.26	5.27	-0.31	5
	Body 5200	e'	47.6699	Relative Permittivity (ϵ_r):	47.67	49.02	-2.75	10
		e''	18.0484	Conductivity (σ):	5.22	5.29	-1.44	5
	Body 5500	e'	47.2084	Relative Permittivity (ϵ_r):	47.21	48.61	-2.89	10
		e''	18.3071	Conductivity (σ):	5.60	5.64	-0.81	5
	Body 5800	e'	46.8753	Relative Permittivity (ϵ_r):	46.88	48.20	-2.75	10
		e''	18.5683	Conductivity (σ):	5.99	6.00	-0.20	5
	Body 5825	e'	46.6331	Relative Permittivity (ϵ_r):	46.63	48.20	-3.25	10
		e''	18.5555	Conductivity (σ):	6.01	6.00	0.17	5

Tissue Dielectric Parameter Check Results

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
2012/10/3	Body 5180	e'	47.7787	Relative Permittivity (ϵ_r):	47.78	49.05	-2.59	10
		e''	18.1849	Conductivity (σ):	5.24	5.27	-0.64	5
	Body 5200	e'	47.8202	Relative Permittivity (ϵ_r):	47.82	49.02	-2.45	10
		e''	18.0413	Conductivity (σ):	5.22	5.29	-1.48	5
	Body 5500	e'	47.3450	Relative Permittivity (ϵ_r):	47.35	48.61	-2.61	10
		e''	18.2901	Conductivity (σ):	5.59	5.64	-0.90	5
	Body 5800	e'	46.7842	Relative Permittivity (ϵ_r):	46.78	48.20	-2.94	10
		e''	18.6441	Conductivity (σ):	6.01	6.00	0.21	5
	Body 5825	e'	46.7975	Relative Permittivity (ϵ_r):	46.80	48.20	-2.91	10
		e''	18.5062	Conductivity (σ):	5.99	6.00	-0.10	5
2012/10/4	Body 2450	e'	50.6919	Relative Permittivity (ϵ_r):	50.69	52.70	-3.81	5
		e''	14.5014	Conductivity (σ):	1.98	1.95	1.31	5
	Body 2410	e'	50.7900	Relative Permittivity (ϵ_r):	50.79	52.76	-3.73	5
		e''	14.3032	Conductivity (σ):	1.92	1.91	0.48	5
	Body 2435	e'	50.7300	Relative Permittivity (ϵ_r):	50.73	52.73	-3.79	5
		e''	14.4397	Conductivity (σ):	1.96	1.93	1.24	5
	Body 2460	e'	50.7089	Relative Permittivity (ϵ_r):	50.71	52.69	-3.76	5
		e''	14.5395	Conductivity (σ):	1.99	1.96	1.26	5
2012/10/5	Body 5180	e'	48.2049	Relative Permittivity (ϵ_r):	48.20	49.05	-1.72	10
		e''	18.1728	Conductivity (σ):	5.23	5.27	-0.71	5
	Body 5200	e'	48.2805	Relative Permittivity (ϵ_r):	48.28	49.02	-1.51	10
		e''	18.1731	Conductivity (σ):	5.25	5.29	-0.76	5
	Body 5500	e'	47.7238	Relative Permittivity (ϵ_r):	47.72	48.61	-1.83	10
		e''	18.5201	Conductivity (σ):	5.66	5.64	0.34	5
	Body 5800	e'	47.2389	Relative Permittivity (ϵ_r):	47.24	48.20	-1.99	10
		e''	18.6871	Conductivity (σ):	6.03	6.00	0.44	5
	Body 5825	e'	47.2262	Relative Permittivity (ϵ_r):	47.23	48.20	-2.02	10
		e''	18.7260	Conductivity (σ):	6.07	6.00	1.09	5
2012/10/8	Body 5180	e'	47.7169	Relative Permittivity (ϵ_r):	47.72	49.05	-2.71	10
		e''	18.0899	Conductivity (σ):	5.21	5.27	-1.16	5
	Body 5200	e'	47.7225	Relative Permittivity (ϵ_r):	47.72	49.02	-2.65	10
		e''	18.0758	Conductivity (σ):	5.23	5.29	-1.29	5
	Body 5500	e'	47.2367	Relative Permittivity (ϵ_r):	47.24	48.61	-2.83	10
		e''	18.3528	Conductivity (σ):	5.61	5.64	-0.56	5
	Body 5800	e'	46.5710	Relative Permittivity (ϵ_r):	46.57	48.20	-3.38	10
		e''	18.6154	Conductivity (σ):	6.00	6.00	0.06	5
	Body 5825	e'	46.7122	Relative Permittivity (ϵ_r):	46.71	48.20	-3.09	10
		e''	18.7780	Conductivity (σ):	6.08	6.00	1.37	5

11. 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%.

11.1. 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 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube was chosen for the 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.

11.2. 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)	SAR Measured (mW/g)		
				1g/10g	Head	Body
D2450V2	748	2/7/12	2450	1g	52.7	49.9
				10g	24.6	23.4
D5GHzV2	1075	2/14/12	5200	1g	79.4	72.7
				10g	22.8	20.5
			5500	1g	85.7	77.7
				10g	24.3	21.7
			5800	1g	78.9	72.5
				10g	22.5	20.2

11.3. 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.						
9/26/2012	D5GHz V2 (5.2 GHz)	1075	Body	1g	71.6	72.7	-1.51	±10
				10g	20.6	20.5	0.49	
9/27/2012	D5GHz V2 (5.2 GHz)	1075	Body	1g	70.6	72.7	-2.89	±10
				10g	20.2	20.5	-1.46	
9/28/2012	D5GHz V2 (5.8 GHz)	1075	Body	1g	68.7	72.5	-5.24	±10
				10g	19.5	20.2	-3.47	
10/1/2012	D5GHz V2 (5.2 GHz)	1075	Body	1g	73.2	72.7	0.69	±10
				10g	21.1	20.5	2.93	
10/2/2012	D5GHz V2 (5.2 GHz)	1075	Body	1g	69.5	72.7	-4.40	±10
				10g	20.0	20.5	-2.44	
10/3/2012	D5GHz V2 (5.5 GHz)	1075	Body	1g	76.5	77.7	-1.54	±10
				10g	21.8	21.7	0.46	
10/4/2012	D5GHz V2 (5.2 GHz)	1075	Body	1g	72.4	72.7	-0.41	±10
				10g	20.7	20.5	0.98	
10/4/2012	D2450 V2 (2.4 GHz)	748	Body	1g	50.7	49.9	1.60	±10
				10g	23.4	23.4	0.00	
10/5/2012	D5GHz V2 (5.8 GHz)	1075	Body	1g	70.3	72.5	-3.03	±10
				10g	20.3	20.2	0.50	
10/8/2012	D5GHz V2 (5.2 GHz)	1075	Body	1g	70.4	72.8	-3.30	±10
				10g	20.3	20.5	-0.98	
10/8/2012	D5GHz V2 (5.8 GHz)	1075	Body	1g	72.7	72.5	0.28	±10
				10g	20.8	20.2	2.97	

12. SAR Test Results

12.1. Wi-Fi (2.4GHz Band)

Test Reduction Consideration

SAR is not required for 802.11g/n (HT20/HT40) channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels as per KDB 248227.

Test Position	Mode	Antenna	Dist. (mm)	Ch #.	Freq. (MHz)	Target Power (dBm)	Measured Power (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Note
Rear	802.11b	Main	0	1	2412.0	15.6	15.3	0.974	1.044	
				6	2437.0	15.6	15.5	0.867	0.887	
				11	2462.0	15.5	15.2	**1.040**	1.114	
	802.11g	Main	0	2	2417.0	16.0	15.9	1.200	1.228	
				6	2437.0	16.0	16.0	1.220	1.220	
				10	2457.0	16.5	16.5	**1.260**	1.260	
Rear Tilt (Tilt @Edge1)	802.11b	Main	0	1	2412.0	15.6	15.3	0.761	0.815	
				6	2437.0	15.6	15.5	0.928	0.950	
				11	2462.0	15.5	15.2	0.856	0.917	
	802.11g	Main	0	2	2417.0	16.0	15.9	0.864	0.884	
				6	2437.0	16.0	16.0	0.925	0.925	
				10	2457.0	16.5	16.5	**1.270**	1.270	
Edge 1	802.11b	Main	0	1	2412.0	15.6	15.3			1
				6	2437.0	15.6	15.5	0.347	0.355	
				11	2462.0	15.5	15.2			1
	802.11g	Main	0	2	2417.0	16.0	15.9			1
				6	2437.0	16.0	16.0			1
				10	2457.0	16.5	16.5	0.538	0.538	

Test Position	Mode	Antenna	Dist. (mm)	Ch #.	Freq. (MHz)	Target Power (dBm)	Measured Power (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Note
Rear	802.11b	Aux	0	1	2412.0	15.5	15.3			1
				6	2437.0	15.5	15.4	0.778	0.796	
				11	2462.0	15.5	15.2			1
	802.11g	Aux	0	2	2417.0	16.0	15.8	0.654	0.685	
				6	2437.0	16.0	16.0	0.760	0.760	
				10	2457.0	16.6	16.3	**0.854**	0.915	
Rear Tilt (Tilt @Edge2)	802.11b	Aux	0	1	2412.0	15.6	15.3			1
				6	2437.0	15.6	15.4	0.703	0.736	
				11	2462.0	15.5	15.2			1
	802.11g	Aux	0	2	2417.0	16.0	15.8			1
				6	2437.0	16.0	16.0			1
				10	2457.0	16.6	16.3	0.786	0.842	
Edge 2	802.11b	Aux	0	1	2412.0	15.6	15.3			1
				6	2437.0	15.6	15.4	0.663	0.694	
				11	2462.0	15.5	15.2			1
	802.11g	Aux	0	2	2417.0	16.0	15.8			1
				6	2437.0	16.0	16.0			1
				10	2457.0	16.6	16.3	0.783	0.839	

Note(s):

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)

12.2. Wi-Fi (5GHz Bands)

Test Reduction Consideration

SAR is not required for 802.11n (HT20/HT40) channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a channels as per KDB 248227.

5.2GHz Band

Test Position	Mode	Antenna	Dist. (mm)	Ch #.	Freq. (MHz)	Target Power (dBm)	Measured Power (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)
Rear	802.11a	Main	0	36	5180.0	15.5	15.5	0.600	0.600
				48	5240.0	15.5	15.5	0.823	**0.823**
Rear Tilt (Tilt @Edge1)	802.11a	Main	0	36	5180.0	15.5	15.5	1.260	1.260
				48	5240.0	15.5	15.5	1.200	1.200
Edge 1	802.11a	Main	0	36	5180.0	15.5	15.5	0.243	0.243
				48	5240.0	15.5	15.5	0.284	0.284
Test Position	Mode	Antenna	Dist. (mm)	Ch #.	Freq. (MHz)	Target Power (dBm)	Measured Power (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)
Rear	802.11a	Aux	0	36	5180.0	15.5	15.5	0.653	0.653
				48	5240.0	15.5	15.5	0.780	0.780
Rear Tilt (Tilt @Edge2)	802.11a	Aux	0	36	5180.0	15.5	15.5	**1.310**	1.310
				48	5240.0	15.5	15.5	1.260	1.260
Edge 2	802.11a	Aux	0	36	5180.0	15.5	15.5	1.100	1.100
				48	5240.0	15.5	15.5	1.140	1.140

5.3GHz Band

Test Position	Mode	Antenna	Dist. (mm)	Ch #.	Freq. (MHz)	Target Power (dBm)	Measured Power (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)
Rear	802.11a	Main	0	52	5260.0	15.0	15.0	0.879	0.879
				64	5320.0	15.0	15.0	0.603	0.603
	802.11n HT20	Main	0	52	5260.0	15.5	15.5	0.885	**0.885**
				64	5320.0	15.5	15.5	0.841	0.841
Rear Tilt (Tilt @Edge1)	802.11a	Main	0	52	5260.0	15.0	15.0	1.260	1.260
				64	5320.0	15.0	15.0	1.280	1.280
	802.11n HT20	Main	0	52	5260.0	15.5	15.5	**1.370**	1.370
				64	5320.0	15.5	15.5	1.260	1.260
Edge 1	802.11a	Main	0	52	5260.0	15.0	15.0	0.261	0.261
				64	5320.0	15.0	15.0	0.229	0.229
	802.11n HT20	Main	0	52	5260.0	15.5	15.5	0.291	0.291
				64	5320.0	15.5	15.5	0.261	0.261
Test Position	Mode	Antenna	Dist. (mm)	Ch #.	Freq. (MHz)	Target Power (dBm)	Measured Power (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)
Rear	802.11a	Aux	0	52	5260.0	15.0	15.0	0.518	0.518
				64	5320.0	15.0	15.0	0.515	0.515
	802.11n HT20	Aux	0	52	5260.0	15.5	15.5	0.532	0.532
				64	5320.0	15.5	15.5	0.566	**0.566**
Rear Tilt (Tilt @Edge2)	802.11a	Aux	0	52	5260.0	15.0	15.0	1.020	1.020
				64	5320.0	15.0	15.0	0.904	0.904
	802.11n HT20	Aux	0	52	5260.0	15.5	15.5	1.140	1.140
				64	5320.0	15.5	15.5	1.090	1.090
Edge 2	802.11a	Aux	0	52	5260.0	15.0	15.0	1.100	1.100
				64	5320.0	15.0	15.0	0.999	0.999
	802.11n HT20	Aux	0	52	5260.0	15.5	15.5	1.290	1.290
				64	5320.0	15.5	15.5	1.180	1.180

5.5GHz Band

Test Position	Mode	Antenna	Dist. (mm)	Ch #.	Freq. (MHz)	Target Power (dBm)	Measured Power (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)
Rear	802.11a	Main	0	104	5520.0	16.0	16.0	0.997	0.997
				116	5580.0	16.0	15.8	1.320	**1.382**
				124	5620.0	16.0	15.9	1.270	1.300
				136	5680.0	16.0	15.8	0.829	0.868
Rear Tilt (Tilt @Edge1)	802.11a	Main	0	104	5520.0	16.0	16.0	1.330	1.330
				116	5580.0	16.0	15.8	1.340	1.403
				124	5620.0	16.0	15.9	**1.360**	1.392
				136	5680.0	16.0	15.8	0.914	0.957
Edge 1	802.11a	Main	0	104	5520.0	16.0	16.0	0.381	0.381
				116	5580.0	16.0	15.8	0.520	0.545
				124	5620.0	16.0	15.9	0.506	0.518
				136	5680.0	16.0	15.8	0.408	0.427
Test Position	Mode	Antenna	Dist. (mm)	Ch #.	Freq. (MHz)	Target Power (dBm)	Measured Power (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)
Rear	802.11a	Aux	0	104	5520.0	16.0	16.0	0.501	**0.501**
				116	5580.0	16.0	15.9	0.398	0.407
				124	5620.0	16.0	15.7	0.423	0.453
				136	5680.0	16.0	16.0	0.416	0.416
Rear Tilt (Tilt @Edge2)	802.11a	Aux	0	104	5520.0	16.0	16.0	1.330	1.330
				116	5580.0	16.0	15.9	0.994	1.017
				124	5620.0	16.0	15.7	0.821	0.880
				136	5680.0	16.0	16.0	0.861	0.861
Edge 2	802.11a	Aux	0	104	5520.0	16.0	16.0	1.220	1.220
				116	5580.0	16.0	15.9	1.010	1.034
				124	5620.0	16.0	15.7	0.939	1.006
				136	5680.0	16.0	16.0	0.916	0.916

5.8GHz Band

Test Position	Mode	Antenna	Dist. (mm)	Ch #.	Freq. (MHz)	Target Power (dBm)	Measured Power (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)
Rear	802.11a	Main	0	149	5745.0	16.5	16.5	0.544	0.544
				157	5785.0	16.5	16.5	0.519	0.519
				165	5825.0	16.5	16.4	0.618	**0.632**
Rear Tilt (Tilt @Edge1)	802.11a	Main	0	149	5745.0	16.5	16.5	**1.250**	1.250
				157	5785.0	16.5	16.5	1.210	1.210
				165	5825.0	16.5	16.4	1.160	1.187
Edge 1	802.11a	Main	0	149	5745.0	16.5	16.5	0.489	0.489
				157	5785.0	16.5	16.5	0.411	0.411
				165	5825.0	16.5	16.4	0.443	0.453
Test Position	Mode	Antenna	Dist. (mm)	Ch #.	Freq. (MHz)	Target Power (dBm)	Measured Power (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)
Rear	802.11a	Aux	0	149	5745.0	16.5	16.3	0.296	0.310
				157	5785.0	16.5	16.3	0.265	0.277
				165	5825.0	16.5	16.5	0.353	**0.353**
Rear Tilt (Tilt @Edge2)	802.11a	Aux	0	149	5745.0	16.5	16.3	0.820	0.859
				157	5785.0	16.5	16.3	0.787	0.824
				165	5825.0	16.5	16.5	0.750	0.750
Edge 2	802.11a	Aux	0	149	5745.0	16.5	16.3	1.050	1.099
				157	5785.0	16.5	16.3	1.100	1.152
				165	5825.0	16.5	16.5	1.190	1.190

13. Summary of Highest SAR Values

Results for highest Body SAR values for each frequency band and mode

Technology/Band	Test configuration	Mode	Highest Measured 1g-SAR (W/kg)
WiFi 2.4 GHz	Rear 20º Tilt @Edge1	802.11g 6Mbps	1.27
WiFi 5.2 GHz	Rear 20º Tilt @Edge2	802.11a 6Mbps	1.31
WiFi 5.3 GHz	Rear 20º Tilt @Edge1	802.11n HT20 MCS0	1.37
WiFi 5.5 GHz	Rear 20º Tilt @Edge1	802.11a 6Mbps	1.36
WiFi 5.8 GHz	Rear 20º Tilt @Edge1	802.11a 6Mbps	1.25

13.1. SAR Plots (from Summary of Highest Measured SAR Values)

Test Laboratory: UL CCS SAR Lab D Date/Time: 10/4/2012

WiFi 2.4GHz Band

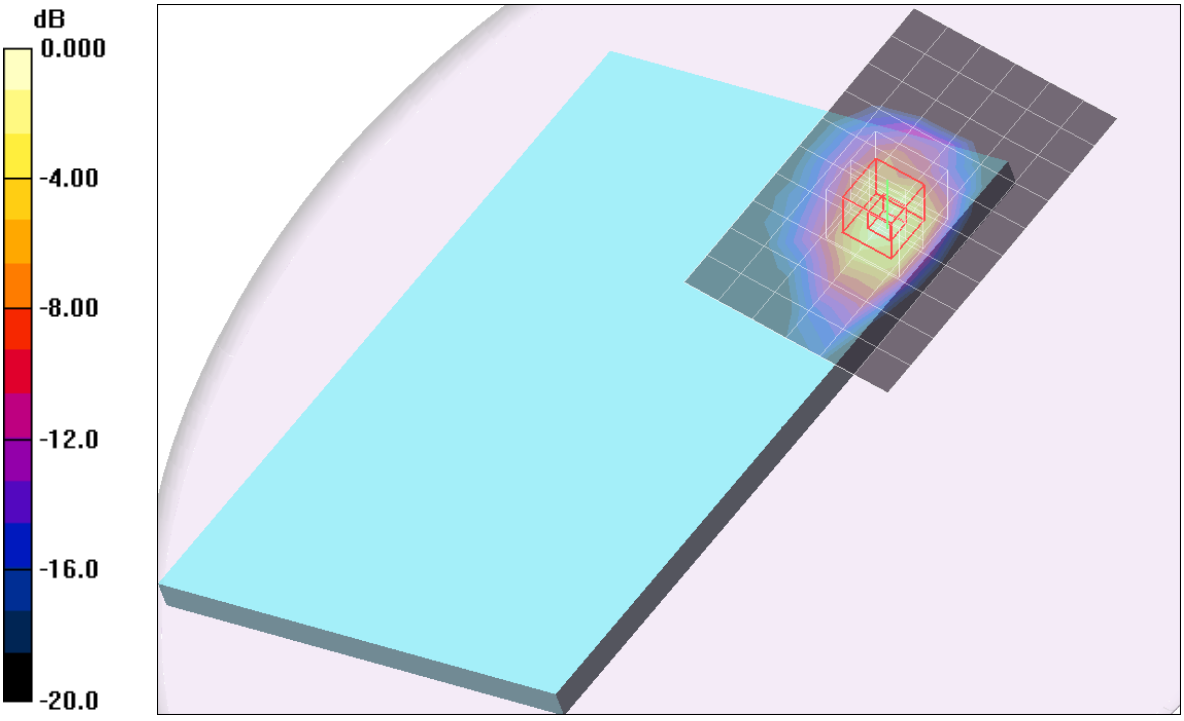
Frequency: 2457 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used (interpolated): f = 2457 MHz; σ = 1.99 mho/m; ε_r = 50.7; ρ = 1000 kg/m^3 ;
DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE3 Sn500; Calibrated: 6/13/2012
- 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: QDOVA001BB; Serial: SN:1017

Rear 20 deg. tilt @ Edge 1/Main Ant/802.11g/Ch 10/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.37 mW/g

Rear 20 deg. tilt @ Edge 1/Main Ant/802.11g/Ch 10/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 27.8 V/m; Power Drift = -0.047 dB
Peak SAR (extrapolated) = 2.80 W/kg
SAR(1 g) = 1.27 mW/g; SAR(10 g) = 0.547 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.78 mW/g



0 dB = 1.78mW/g

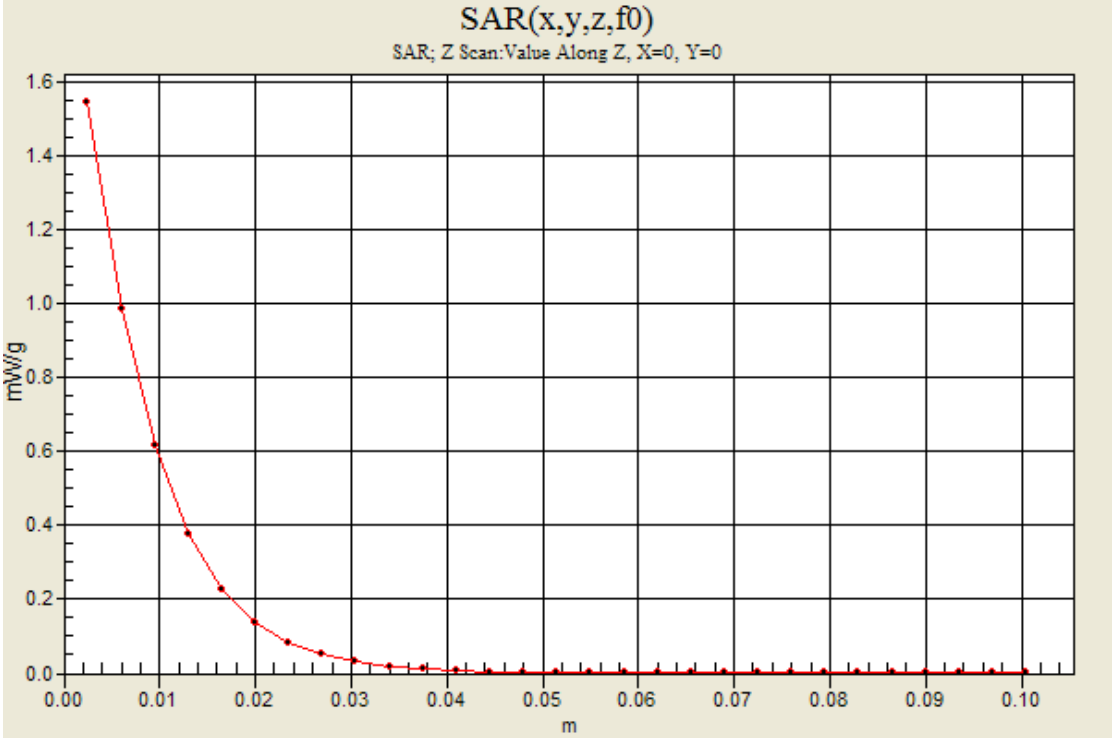
Test Laboratory: UL CCS SAR Lab D
Date/Time: 10/4/2012

WiFi 2.4GHz Band

Frequency: 2457 MHz; Duty Cycle: 1:1

Rear 20 deg. tilt @ Edge 1/Main Ant/802.11g/Ch 10/Z Scan (1x1x29): Measurement grid: dx=20mm, dy=20mm, dz=3.5mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.55 mW/g



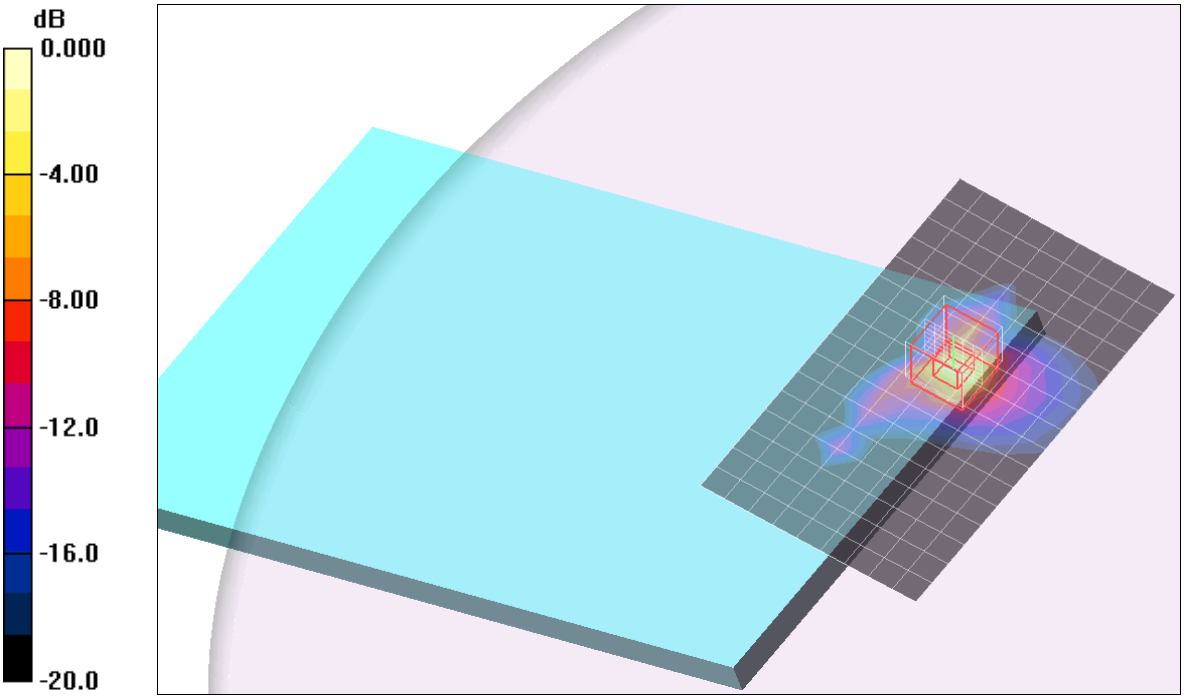
Test Laboratory: UL CCS SAR Lab D
Date/Time: 10/1/2012

WiFi 5.2 GHz Band

Frequency: 5180 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C
Medium parameters used: f = 5180 MHz; σ = 5.31 mho/m; ε_r = 48.4; ρ = 1000 kg/m^3 ;
DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE3 Sn500; Calibrated: 6/13/2012
- 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: QDOVA001BB; Serial: SN:1017

Rear 20 deg. tilt @ Edge 2/Aux Ant/Ch 36/Area Scan (10x17x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 1.72 mW/g

Rear 20 deg. tilt @ Edge 2/Aux Ant/Ch 36/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 21.0 V/m; Power Drift = 0.064 dB
Peak SAR (extrapolated) = 6.33 W/kg
SAR(1 g) = 1.31 mW/g; SAR(10 g) = 0.305 mW/g
Maximum value of SAR (measured) = 2.71 mW/g



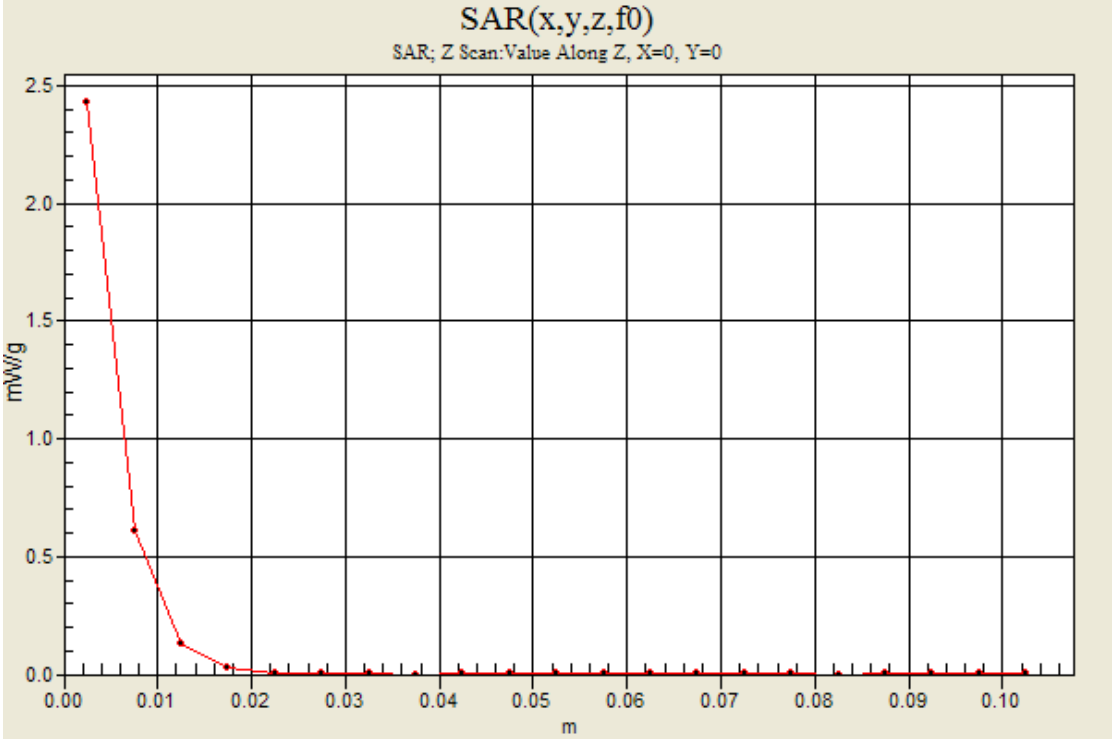
0 dB = 2.71mW/g

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

WiFi 5.2 GHz Band

Frequency: 5180 MHz; Duty Cycle: 1:1

Rear 20 deg. tilt @ Edge 2/Aux Ant/Ch 36/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 2.43 mW/g



Test Laboratory: UL CCS SAR Lab D
Date/Time: 10/4/2012

WiFi 5.3 GHz Band

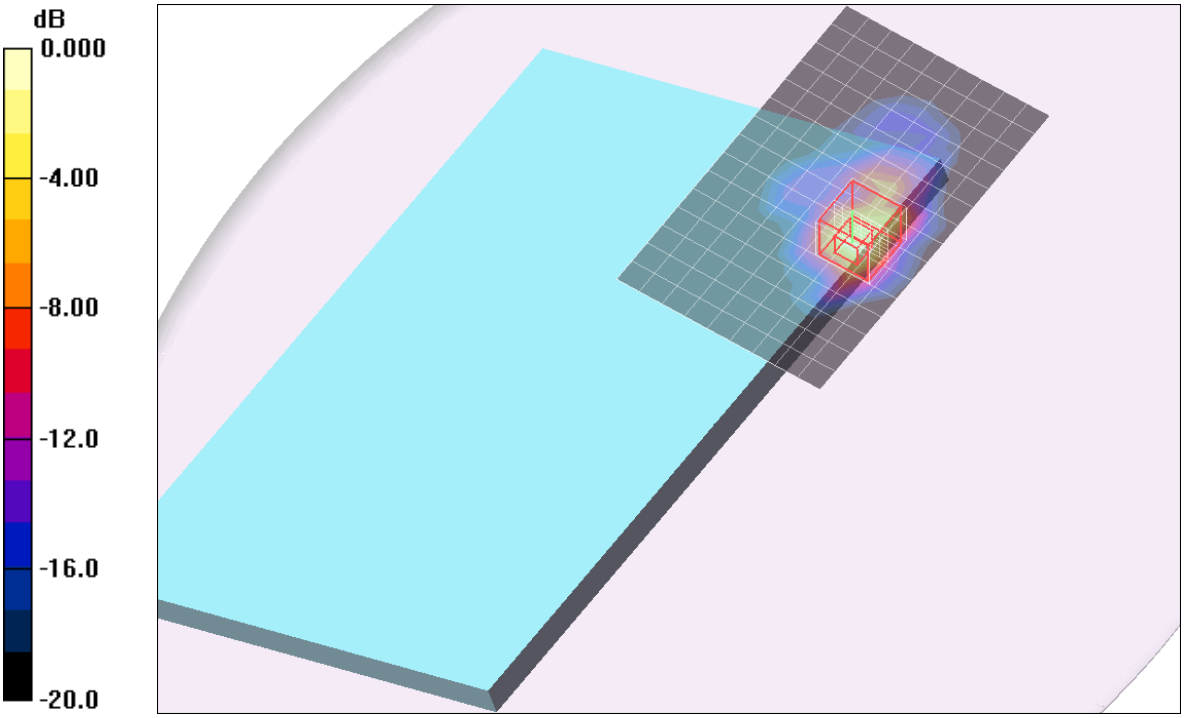
Frequency: 5260 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C
Medium parameters used: f = 5260 MHz; σ = 5.35 mho/m; ε_r = 47.6; ρ = 1000 kg/m^3 ;
DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE3 Sn500; Calibrated: 6/13/2012
- 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: QDOVA001BB; Serial: SN:1017

Rear 20 deg. tilt @ Edge 1/Main Ant/802.11n HT20/Ch 52/Area Scan (10x16x1):

Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 2.08 mW/g

Rear 20 deg. tilt @ Edge 1/Main Ant/802.11n HT20/Ch 52/Zoom Scan (7x7x9)/Cube 0:

Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 15.7 V/m; Power Drift = 0.013 dB
Peak SAR (extrapolated) = 7.27 W/kg
SAR(1 g) = 1.37 mW/g; SAR(10 g) = 0.354 mW/g
Maximum value of SAR (measured) = 2.84 mW/g



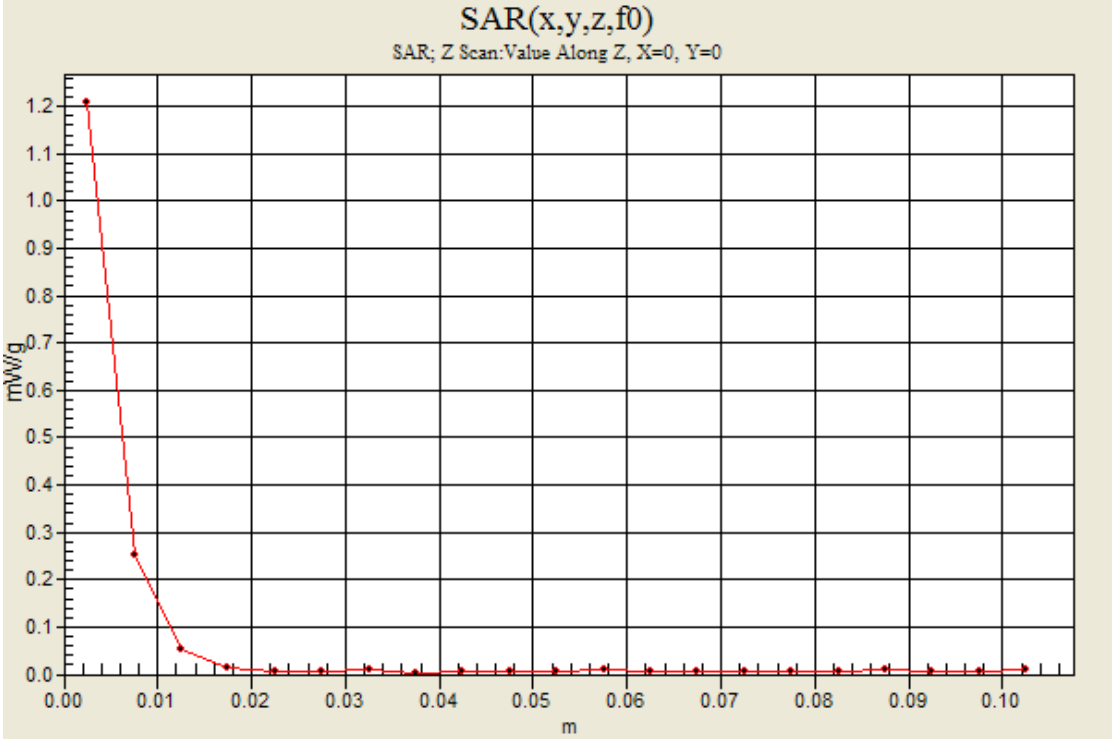
0 dB = 2.84mW/g

Test Laboratory: UL CCS SAR Lab D
Date/Time: 10/4/2012

WiFi 5.3 GHz Band

Frequency: 5260 MHz; Duty Cycle: 1:1

Rear 20 deg. tilt @ Edge 1/Main Ant/802.11n HT20/Ch 52/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 1.21 mW/g



Test Laboratory: UL CCS SAR Lab D
Date/Time: 10/3/2012

WiFi 5.5 GHz Band

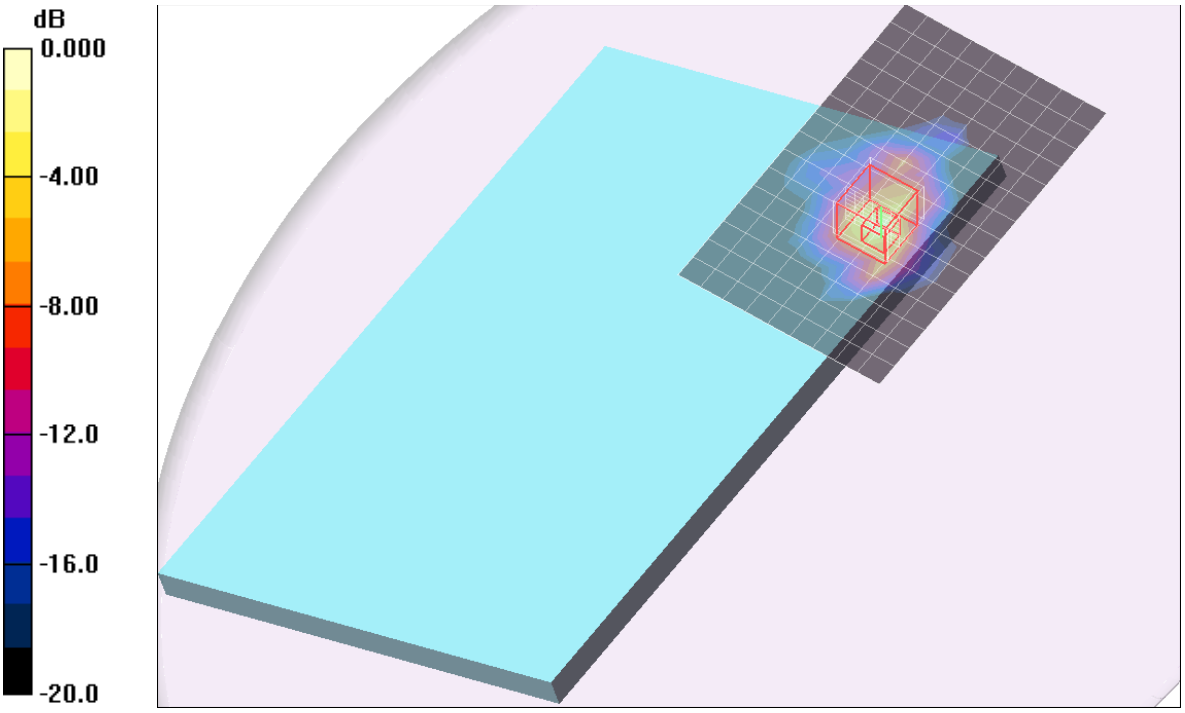
Frequency: 5620 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C
Medium parameters used: f = 5620 MHz; σ = 5.79 mho/m; ε_r = 47.1; ρ = 1000 kg/m^3 ;
DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE3 Sn500; Calibrated: 6/13/2012
- Probe: EX3DV4 - SN3749; ConvF(3.57, 3.57, 3.57); Calibrated: 1/27/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BB; Serial: SN:1017

Rear 20 deg. tilt @ Edge 1/Main Ant/802.11a/Ch 124/Area Scan (10x16x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 2.25 mW/g

Rear 20 deg. tilt @ Edge 1/Main Ant/802.11a/Ch 124/Zoom Scan (7x7x9)/Cube 0:

Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 20.9 V/m; Power Drift = -0.120 dB
Peak SAR (extrapolated) = 7.83 W/kg
SAR(1 g) = 1.36 mW/g; SAR(10 g) = 0.369 mW/g
Maximum value of SAR (measured) = 2.84 mW/g



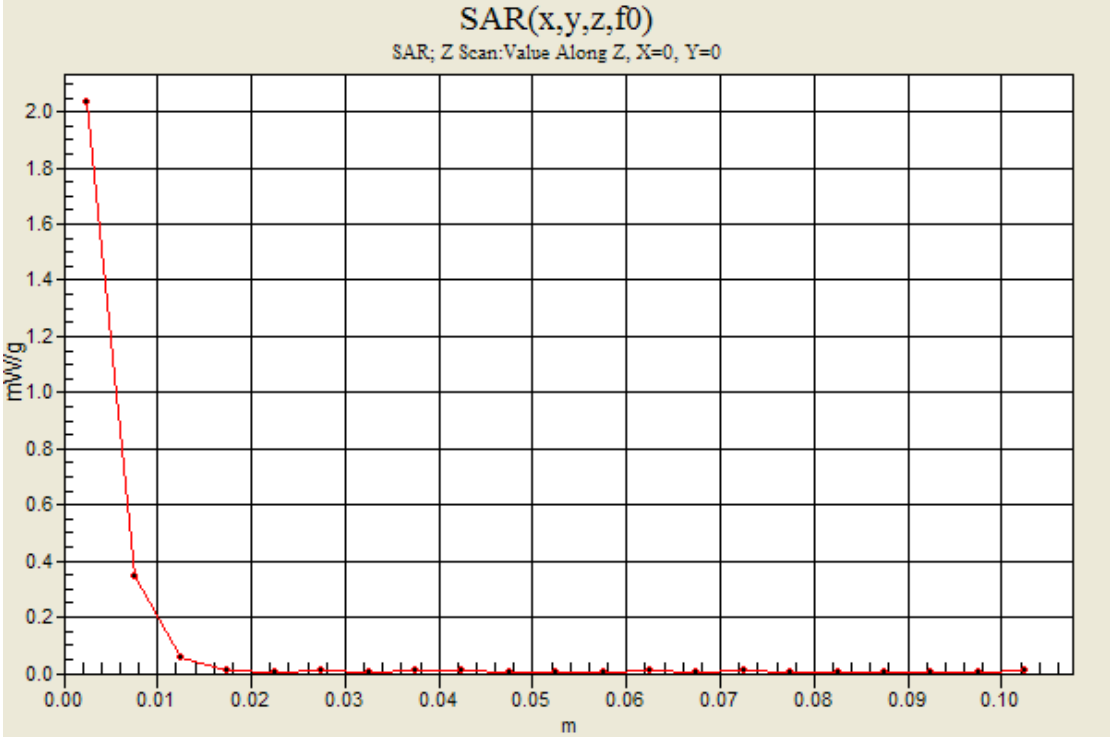
0 dB = 2.84mW/g

Test Laboratory: UL CCS SAR Lab D
Date/Time: 10/3/2012 2:16:47 PM

WiFi 5.5 GHz Band

Frequency: 5620 MHz; Duty Cycle: 1:1

Rear 20 deg. tilt @ Edge 1/Main Ant/802.11a/Ch 124/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 2.03 mW/g



Test Laboratory: UL CCS SAR Lab D
Date/Time: 10/5/2012

WiFi 5.8 GHz Band

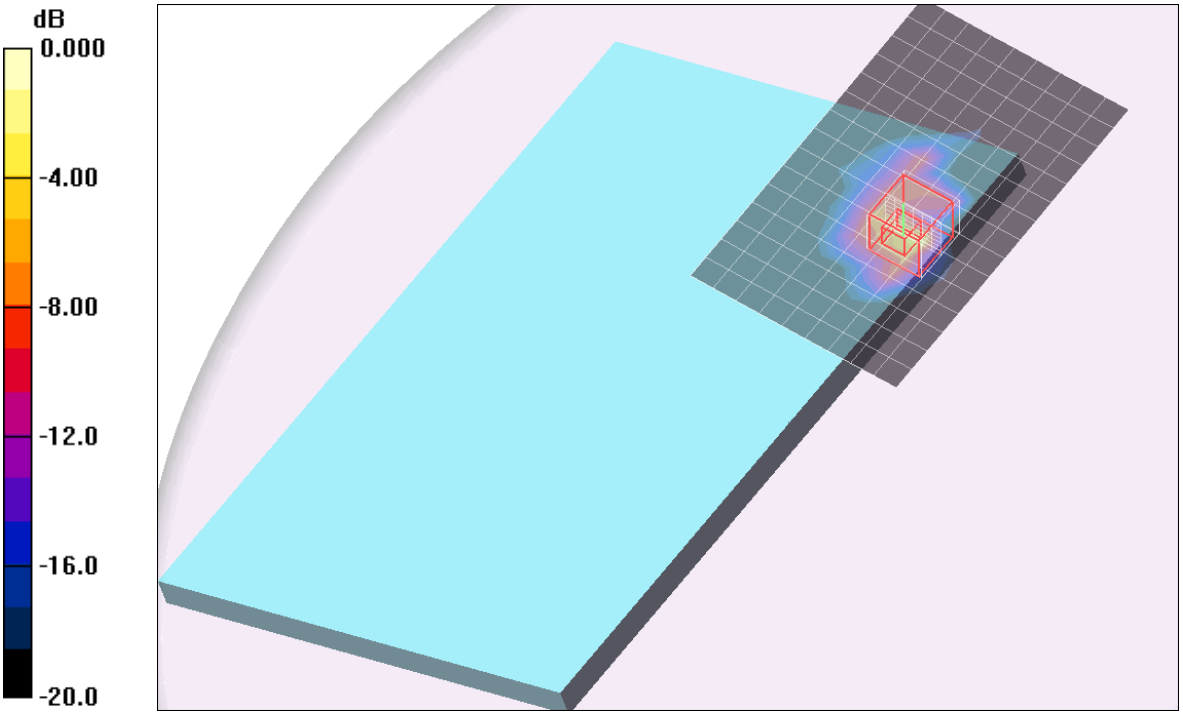
Frequency: 5745 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C
Medium parameters used: f = 5745 MHz; σ = 5.96 mho/m; ε_r = 47.5; ρ = 1000 kg/m^3 ;
DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE3 Sn500; Calibrated: 6/13/2012
- Probe: EX3DV4 - SN3749; ConvF(3.81, 3.81, 3.81); Calibrated: 1/27/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BB; Serial: SN:1017

Rear 20 deg. tilt @ Edge 1/Main Ant/802.11a/Ch 149/Area Scan (10x16x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 1.36 mW/g

Rear 20 deg. tilt @ Edge 1/Main Ant/802.11a/Ch 149/Zoom Scan (7x7x9)/Cube 0:

Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 10.3 V/m; Power Drift = 0.156 dB
Peak SAR (extrapolated) = 14.4 W/kg
SAR(1 g) = 1.25 mW/g; SAR(10 g) = 0.303 mW/g
Maximum value of SAR (measured) = 3.36 mW/g



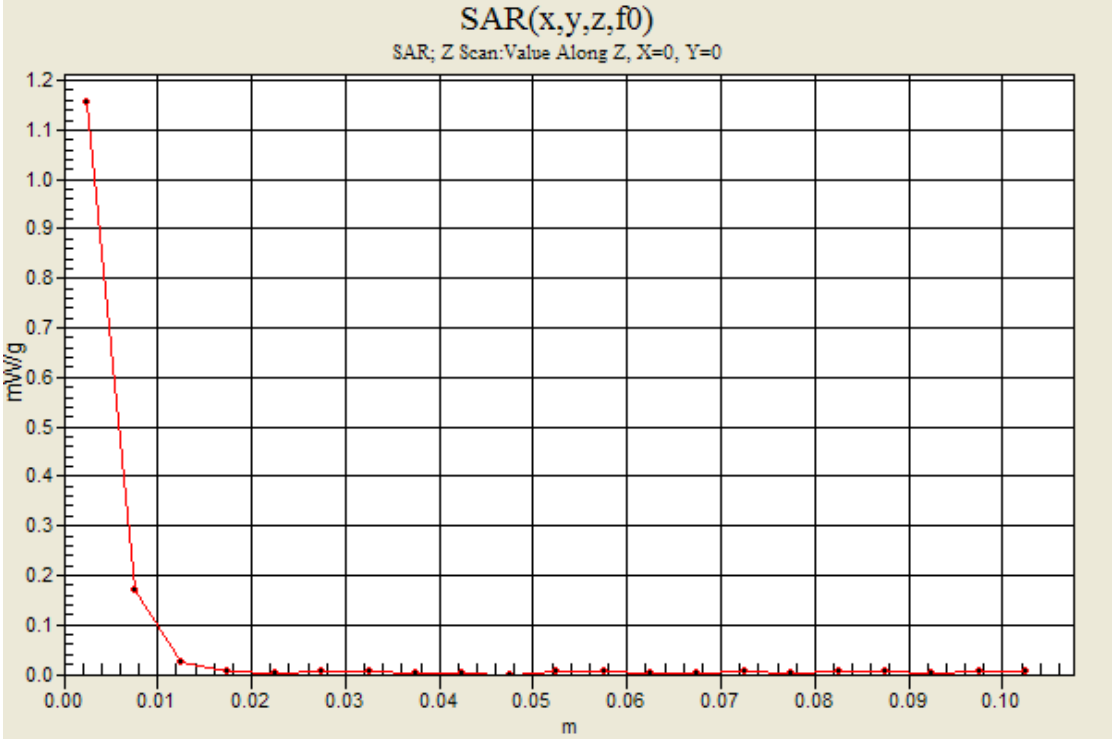
0 dB = 3.36mW/g

Test Laboratory: UL CCS SAR Lab D
Date/Time: 10/5/2012

WiFi 5.8 GHz Band

Frequency: 5745 MHz; Duty Cycle: 1:1

Rear 20 deg. tilt @ Edge 1/Main Ant/802.11a/Ch 149 3/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 1.16 mW/g



14. Simultaneous Transmission SAR Analysis

14.1. Bluetooth Test Exclusion

As Bluetooth's max average power is 1.6 mW [<60/f(GHz) mW] standalone SAR is not required. Also the Bluetooth antenna is more than 5cm away from other transmitting antennas. Therefore, Bluetooth simultaneous transmission SAR evaluation with Wi-Fi and WWAN is not required.

14.2. Wi-Fi Simultaneous Transmission Analysis

Standalone testing of the 802.11n (HT20 and HT40) 2Tx (MIMO) modes was not performed based upon the test exclusion guidelines in KDB 248227. However as simultaneous transmission between the WLAN main and aux antennas is possible simultaneous transmission SAR analysis is required.

As the 802.11b and g output power is higher than the 802.11n output power it was judged that performing the simultaneous transmission SAR analysis using the 802.11b and g SAR data could be considered a worst case situation. If the DUT is compliant using the 802.11b and g SAR data then 802.11n 2Tx can be presumed compliant too.

14.3. Sum of the 1g SAR for Body Exposure Condition

Sum of the 1g Scaled SAR of Body Exposure Condition

Test Position	WiFi 2.4 GHz Band		∑ 1-g SAR (mW/g)
	Main	AUX	
Rear 802.11b	1.114	0.796	1.910
Test Position	WiFi 2.4 GHz Band		∑ 1-g SAR (mW/g)
	Main	AUX	
Rear 802.11g	1.260	0.915	2.175
Test Position	WiFi 5.2 GHz Band		∑ 1-g SAR (mW/g)
	Main	AUX	
Rear 802.11a	0.823	0.78	1.603
Test Position	WiFi 5.3 GHz Band		∑ 1-g SAR (mW/g)
	Main	AUX	
Rear 802.11n	0.885	0.566	1.451
Test Position	WiFi 5.5 GHz Band		∑ 1-g SAR (mW/g)
	Main	AUX	
Rear 802.11a	1.382	0.501	1.883
Test Position	WiFi 5.8 GHz Band		∑ 1-g SAR (mW/g)
	Main	AUX	
Rear 802.11a	0.632	0.353	0.985

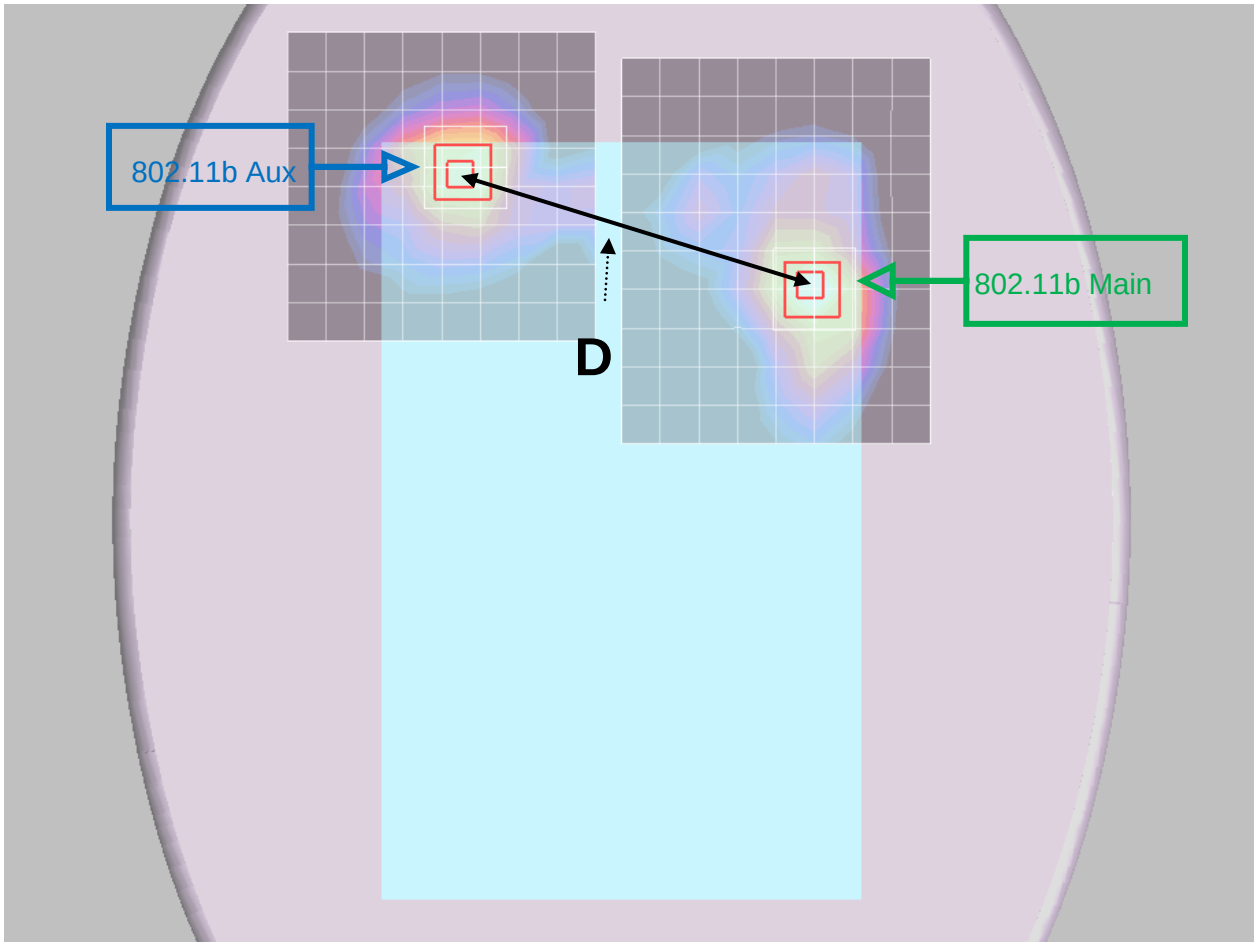
1. Where the ∑ 1-g SAR exceeds 1.6mW/g SPLSR calculations will determine if further Simultaneous transmission SAR measurements (Volume Scan) are required.
2. Simultaneous transmission SAR measurement (Volume Scan) is not required when the ∑ 1-g SAR is < 1.6 mW/g.

14.4. SAR to Peak Location Separation Ratio (SPLSR) for MIMO Wi-Fi 2.4GHz

Test Position	WiFi 2.4GHz Band		∑ 1-g SAR (mW/g)	Calculated distance (cm)	SPLSR	Figure
	Main	Aux				
Rear 802.11b	1.114	0.796	1.910	14.55	0.131	1
Test Position	WiFi 2.4GHz Band		∑ 1-g SAR (mW/g)	Calculated distance (cm)	SPLSR	Figure
	Main	Aux				
Rear 802.11g	1.260	0.915	2.175	14.35	0.152	2
Test Position	WiFi 5.2GHz Band		∑ 1-g SAR (mW/g)	Calculated distance (cm)	SPLSR	Figure
	Main	Aux				
Rear 802.11a	0.823	0.78	1.603	13.71	0.117	3
Test Position	WiFi 5.3GHz Band		∑ 1-g SAR (mW/g)	Calculated distance (cm)	SPLSR	Figure
	Main	Aux				
Rear 802.11n	0.885	0.566	1.451	13.02	0.111	4
Test Position	WiFi 5.5GHz Band		∑ 1-g SAR (mW/g)	Calculated distance (cm)	SPLSR	Figure
	Main	Aux				
Rear 802.11a	1.382	0.501	1.883	13.18	0.143	5
Test Position	WiFi 5.8GHz Band		∑ 1-g SAR (mW/g)	Calculated distance (cm)	SPLSR	Figure
	Main	Aux				
Rear 802.11a	0.632	0.353	0.985	13.17	0.075	6

SAR Peak Location Separation Distance

Figure (1)

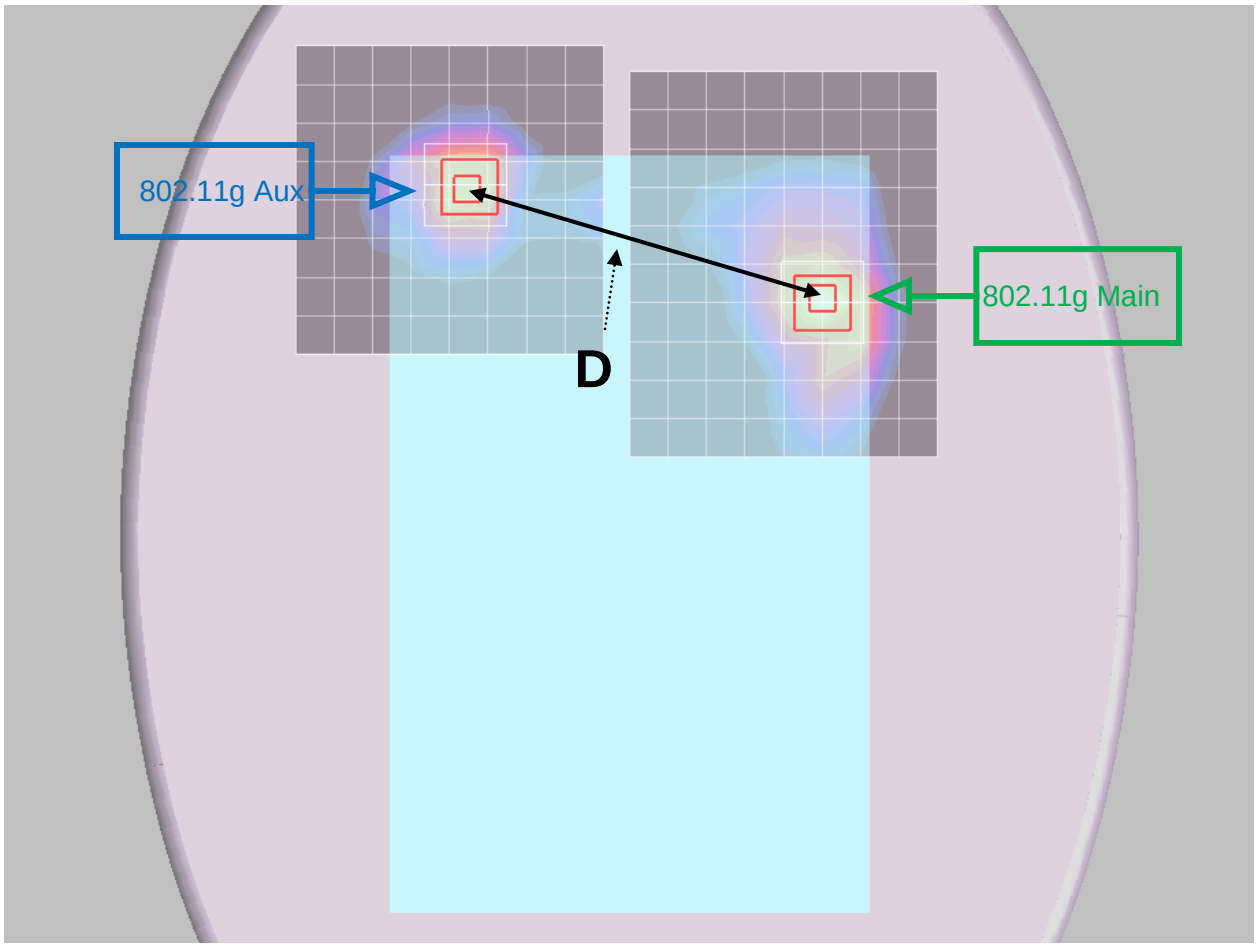


Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
802.11b main antenna	2.42	0.0735	0.0916	-0.18
802.11b Aux antenna	1.67	-0.0657	0.134	-0.18

Separation distance (cm)
14.55

Note: SQRT((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)

Figure (2)

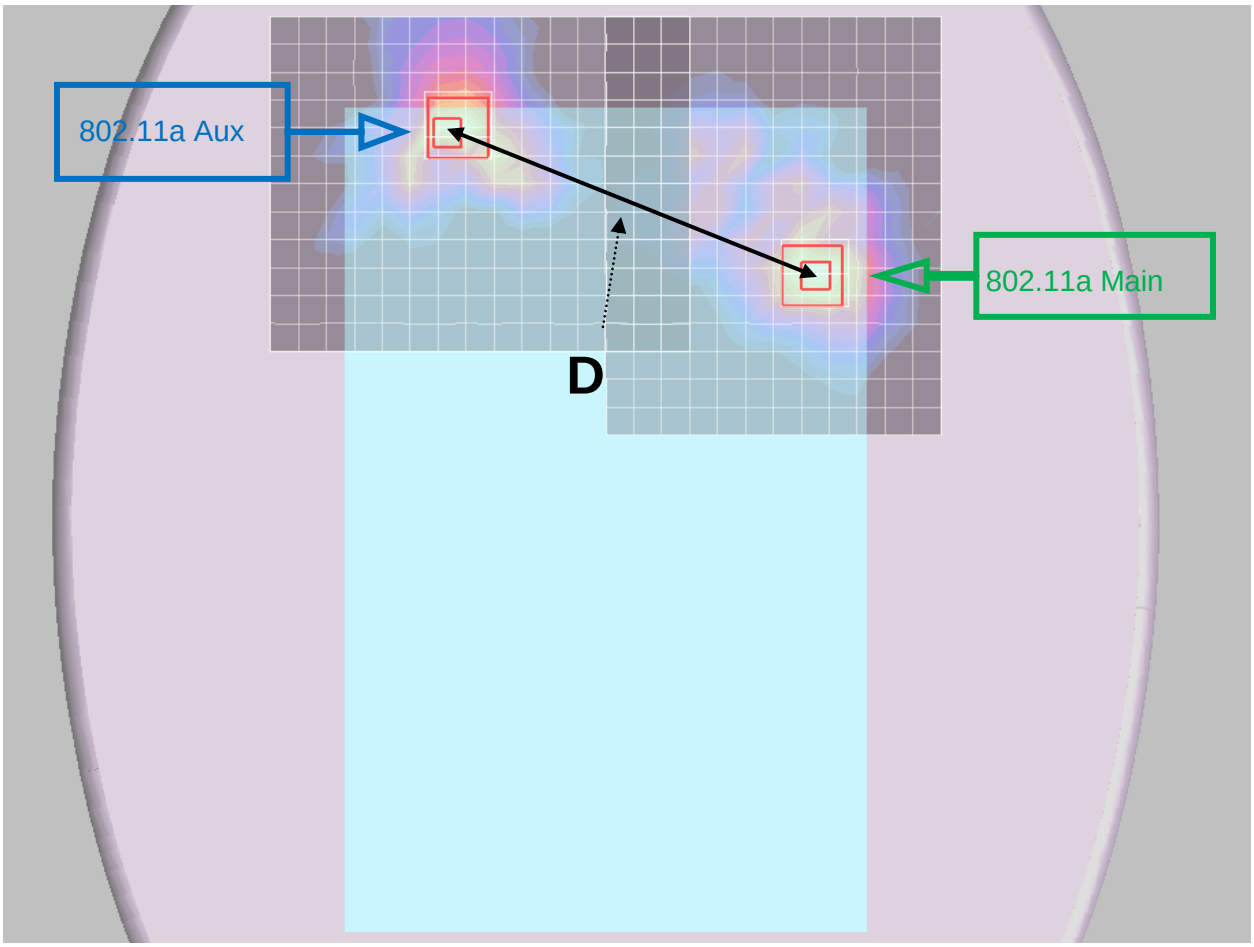


Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
802.11g main antenna	2.84	0.075	0.0916	-0.18
802.11g Aux antenna	1.77	-0.0624	0.133	-0.18

Separation distance (cm)
14.35

Note: SQRT((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)

Figure (3)

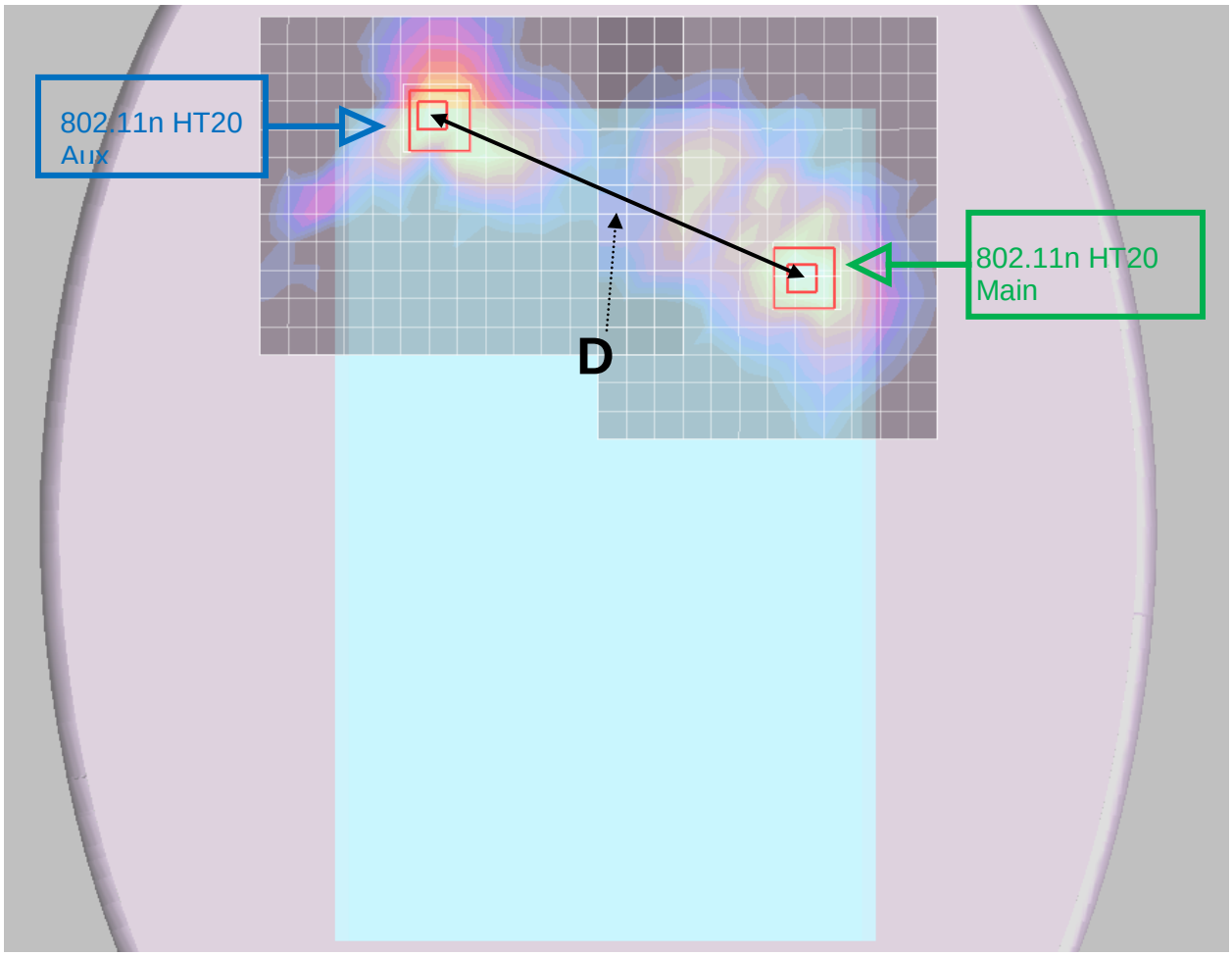


Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
802.11a main antenna	3.1	0.0734	0.088	-0.18
802.11a Aux antenna	3.26	-0.0554	0.135	-0.179

Separation distance (cm)
13.71

Note: SQRT((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)

Figure (4)

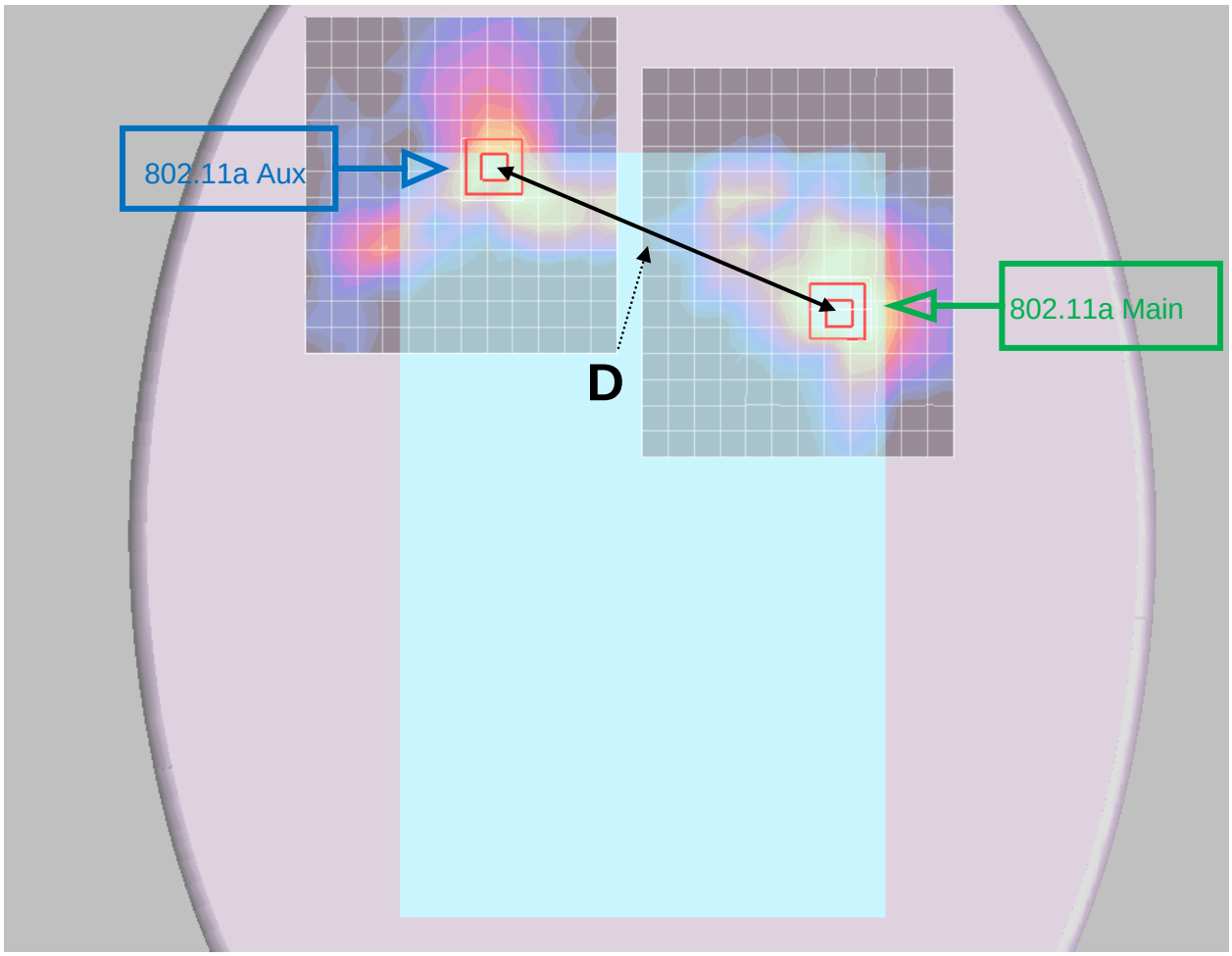


Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
802.11n main antenna	3.53	0.074	0.0872	-0.18
802.11n Aux antenna	2.99	-0.0482	0.132	-0.179

Separation distance (cm)
13.02

Note: SQRT((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)

Figure (5)

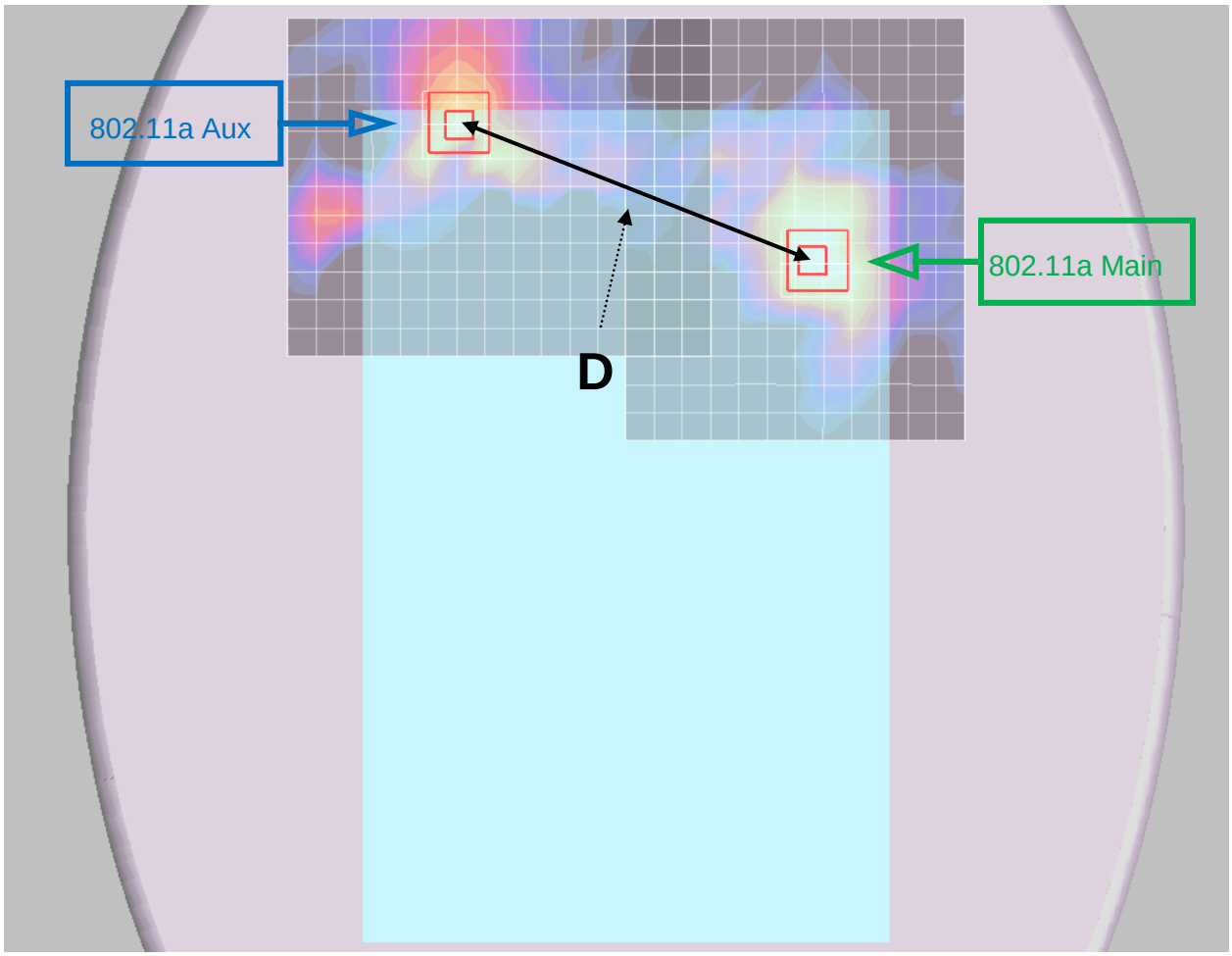


Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
802.11a main antenna	5.35	0.0784	0.0854	-0.18
802.11a Aux antenna	2.8	-0.046	0.129	-0.18

Separation distance (cm)
13.18

Note: SQRT((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)

Figure (6)



Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
802.11a main antenna	3.03	0.0654	0.0938	-0.18
802.11a Aux antenna	1.73	-0.0575	0.141	-0.179

Separation distance (cm)
13.17

Note: SQRT((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)

15. Appendixes

Refer to separated files for the following appendixes.

15.1. System Performance Check Plots

15.2. SAR Test Plots for Wi-Fi 2.4 GHz Band

15.3. SAR Test Plots for Wi-Fi 5 GHz Bands

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

15.5. Calibration Certificate for D2450V2 - SN 748

15.6. Calibration Certificate for D5GHzV2 - SN 1075