


System Verification

EUT:	Imp	Work Order:	ELIM0001
Serial Number:	0c2a6900003f	Date:	See Data Sheets
Customer:	Electric Imp	Temperature:	See Data Sheets
Attendees:	Hugo Fiennes	Humidity:	See Data Sheets
Project:	None	Barometric Pres.:	See Data Sheets
Tested by:	Ethan Schoonover	Job Site:	EV08
TEST SPECIFICATIONS		Test Method	
FCC 2.1093:2011		FCC OET 65C:2001	
Health Safety Code 6:2009		IEEE Std 1528:2003	
		RSS-102, Issue 4:2010	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
No Deviations			
Configuration #	NA	Signature 	

Date	Liquid part number and frequency	Conducted Power into the Dipole (dBm)	Correction Factor	1g Measured	10g Measured	1g Normalized to 1W	10g Normalized to 1W	Target 1g (Normalized to 1W) - Get from Dipole cal cert	Target 10g (Normalized to 1W) - Get from Dipole cal cert	% difference 1g	% difference 10 g	Comments
6/25/2012	MSL2450 2450MHz	20.00	10.00	5.13	2.44	51.30	24.40	50.40	23.70	1.79	2.95	

EMC

SAR TEST DATA

Room Temperature (°C):	23.7	Humidity (%):	40.6	Test Date:	06/25/12
Liquid Temperature (°C):	21.9	Barometric Pressure (mb):	1013	Tested by:	Ethan Schoonover

MSL2450 System Check 6-25-12

DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN:xxx

Communication System: CW; Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz; Communication System PAR: 0 dB; PMF: 1
 Medium parameters used: $f = 2450$ MHz; $\sigma = 1.942$ mho/m; $\epsilon_r = 50.611$; $\rho = 1000$ kg/m³, Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section
 Measurement Standard: DASYS5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

System Check/System Check/Area Scan (51x61x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 5.50 mW/g

System Check/System Check/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of Total (measured) = 63.58 V/m

System Check/System Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 50.383 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 10.065 mW/g

SAR(1 g) = 5.13 mW/g; SAR(10 g) = 2.44 mW/g

Maximum value of SAR (measured) = 5.18 mW/g

Date/Time: 6/25/2012 8:31:20 AM

Test Laboratory: Northwest EMC Inc.

DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN:xxx

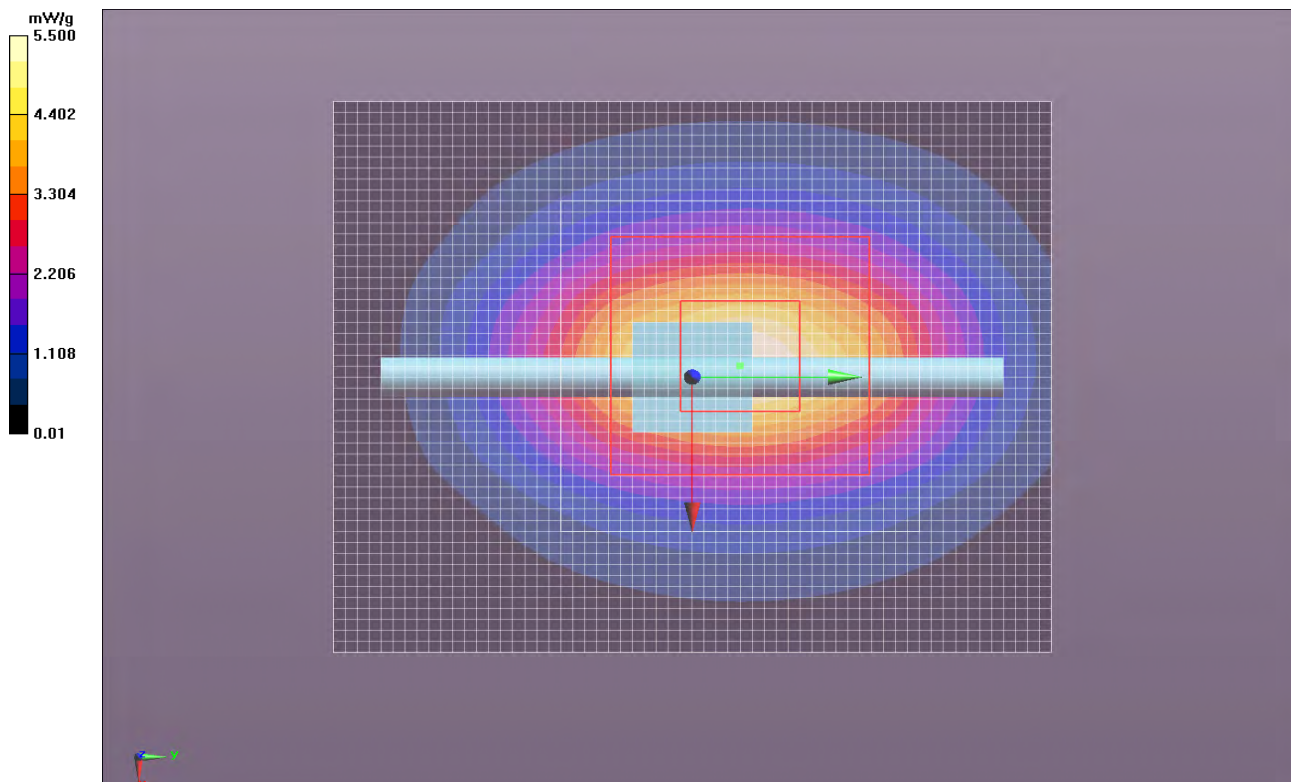
Communication System: CW; Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz; Communication System PAR: 0 dB; PMF: 1
 Medium parameters used: $f = 2450$ MHz; $\sigma = 1.942$ mho/m; $\epsilon_r = 50.611$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section
 Measurement Standard: DASYS5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

System Check/System Check/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (measured) = 7.85 mW/g



Test Configurations

In normal operation, the EUT will be placed in a host device. Per FCC KDB 447498 D01 v04, Item 2(a)(i)

“A device may be used in portable exposure conditions with no restrictions on host platforms when either the source-based time-averaged output power is $\leq 60/f(\text{GHz})$ mW or all measured 1-g SAR are < 0.4 W/kg. When SAR evaluation is required, the most conservative exposure conditions for all expected operating configurations must be tested.”

To provide the maximum flexibility, the EUT was tested at the most conservative (worst case) distance of 1.1cm as specified by the client, Electric Imp.

Duty Factor

All testing was performed with the EUT configured in a worst-case configuration and operating mode to produce the highest SAR levels. The EUT used Electric Imp test software that permitted the selection of transmit channel, modulation type, and data rate. It operated continuously at its maximum duty cycle of 77%. The maximum duty cycle of 77% is a hardware limitation.

Summary

The following tables summarize the measured SAR values.

Per FCC KDB 248227, among the channels required for normal testing, SAR must be measured on the channel with the highest conducted output power. When the SAR measured on the highest output channel is >0.8 W/kg, SAR evaluation for the other required test channels is necessary.

EMC		Work Order: ELIM0001	
EUT: IMP		Date: See Data Sheets	
Serial Number: 0c2a6900003f		Temperature: See Data Sheets	
Customer: Electric Imp		Humidity: See Data Sheets	
Attendees: Hugo Fiennes		Barometric Pres.: See Data Sheets	
Project: None		Job Site: EV08	
Tested by: Ethan Schoonover			
TEST SPECIFICATIONS		Test Method	
FCC 2.1093:2011		FCC OET 65C:2001	
FCC 15.247:2011		IEEE Std 1528:2003	
Health Safety Code 6:2009		FCC KDB 447498 D01 v04	
		FCC KDB 248227 D01 V01r02	
		RSS-102, Issue 4:2010	
COMMENTS			
11mm spacing between EUT and phantom			
DEVIATIONS FROM TEST STANDARD			
No Deviations			
Configuration #	1	Signature	

Test Configuration	Frequency Band	Transmit Frequency (MHz)	Transmit Channel	Data Rate (Mbps)	Transmit Mode	Body-Worn Accessory	Accessory	EUT Position	SAR Drift During Test (dB)	Measured 1g SAR Level (mW/g)	Test #
Body	2450	2412	1	1	BPSK	None	None	Front	0.06	0.392	8
	2450	2412	1	1	BPSK	None	None	Back	0	0.382	9
	2450	2412	1	1	BPSK	None	None	End	0.17	0.087	10
	2450	2412	1	1	BPSK	None	None	Cable End	0.16	0.161	11
	2450	2412	1	1	BPSK	None	None	Right Side	-0.01	0.176	12
	2450	2412	1	1	BPSK	None	None	Left Side	0.23	0.08	13

EMC

SAR TEST DATA

Room Temperature (°C):	23.1	Humidity (%):	40.6	Test Date:	06/25/12
Liquid Temperature (°C):	21.8	Barometric Pressure (mb):	1013	Tested by:	Ethan Schoonover

Test 8

DUT: Wireless Network Node; Type: Imp; Serial: 0c2a6900003f

Communication System: CW; Communication System Band: D2450 (2450.0 MHz); Frequency: 2412 MHz; Communication System PAR: 0 dB; PMF: 1
 Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1000$ kg/m³, Medium parameters used (interpolated): $f = 2412$ MHz; $\sigma = 1.864$ mho/m; $\epsilon_r = 51.07$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section
 Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Body/Body/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

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

Maximum value of Total (measured) = 0.284 mW/g

Body/Body/Area scan (71x71x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.485 mW/g

Body/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

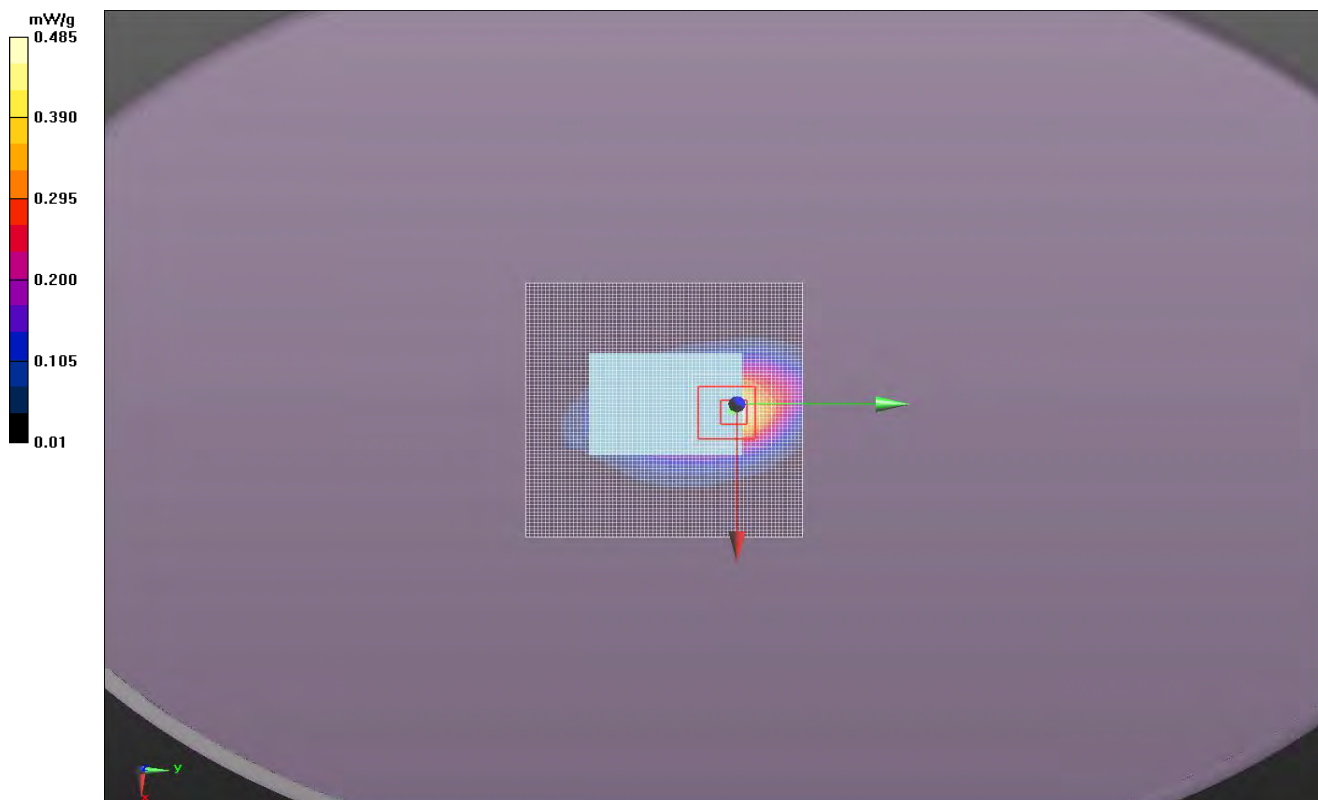
Reference Value = 14.803 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 0.676 mW/g

SAR(1 g) = 0.392 mW/g; SAR(10 g) = 0.217 mW/g

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

Maximum value of SAR (measured) = 0.478 mW/g



Room Temperature (°C):	23.1	Humidity (%):	40.6	Test Date:	06/25/12
Liquid Temperature (°C):	21.8	Barometric Pressure (mb):	1013	Tested by:	Ethan Schoonover

Test 9

DUT: Wireless Network Node; Type: Imp; Serial: 0c2a6900003f

Communication System: CW; Communication System Band: D2450 (2450.0 MHz); Frequency: 2412 MHz; Communication System PAR: 0 dB; PMF: 1
 Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1000$ kg/m³, Medium parameters used (interpolated): $f = 2412$ MHz; $\sigma = 1.864$ mho/m; $\epsilon_r = 51.07$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section
 Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Body/Body/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

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

Maximum value of Total (measured) = 0.267 mW/g

Body/Body/Area scan (71x71x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.485 mW/g

Body/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

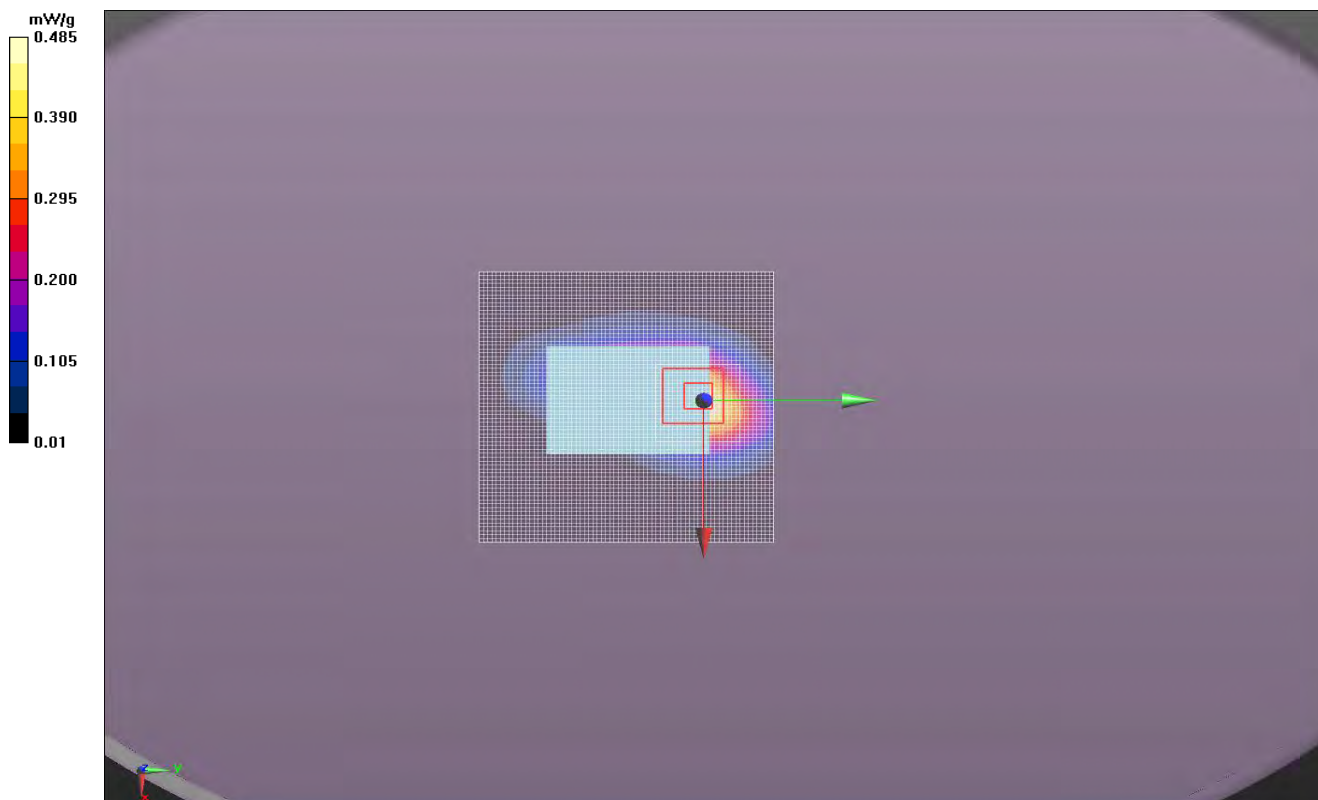
Reference Value = 15.622 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 0.671 mW/g

SAR(1 g) = 0.382 mW/g; SAR(10 g) = 0.212 mW/g

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

Maximum value of SAR (measured) = 0.467 mW/g



Room Temperature (°C):	23.1	Humidity (%):	40.6	Test Date:	06/25/12
Liquid Temperature (°C):	21.8	Barometric Pressure (mb):	1013	Tested by:	Ethan Schoonover

Test 10

DUT: Wireless Network Node; Type: Imp; Serial: 0c2a6900003f

Communication System: CW; Communication System Band: D2450 (2450.0 MHz); Frequency: 2412 MHz; Communication System PAR: 0 dB; PMF: 1
 Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1000$ kg/m³, Medium parameters used (interpolated): $f = 2412$ MHz; $\sigma = 1.864$ mho/m; $\epsilon_r = 51.07$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section
 Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Body/Body/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

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

Maximum value of Total (measured) = 0.0618 mW/g

Body/Body/Area scan (71x71x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.0984 mW/g

Body/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

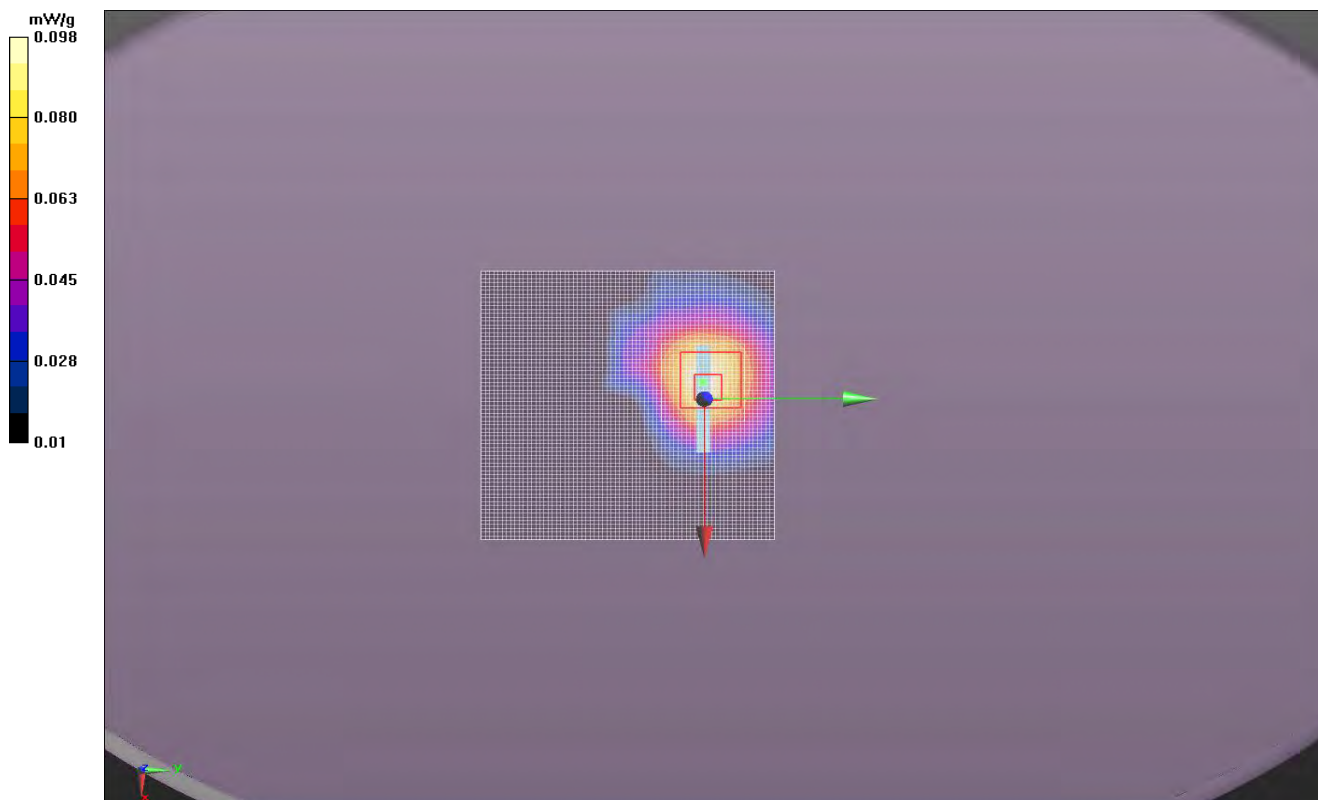
Reference Value = 7.083 V/m; Power Drift = 0.17 dB

Peak SAR (extrapolated) = 0.157 mW/g

SAR(1 g) = 0.087 mW/g; SAR(10 g) = 0.048 mW/g

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

Maximum value of SAR (measured) = 0.107 mW/g



Room Temperature (°C):	23.1	Humidity (%):	40.6	Test Date:	06/25/12
Liquid Temperature (°C):	21.8	Barometric Pressure (mb):	1013	Tested by:	Ethan Schoonover

Test 11

DUT: Wireless Network Node; Type: Imp; Serial: 0c2a6900003f

Communication System: CW; Communication System Band: D2450 (2450.0 MHz); Frequency: 2412 MHz; Communication System PAR: 0 dB; PMF: 1
 Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1000$ kg/m³, Medium parameters used (interpolated): $f = 2412$ MHz; $\sigma = 1.864$ mho/m; $\epsilon_r = 51.07$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section
 Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Body/Body/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

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

Maximum value of Total (measured) = 0.0887 mW/g

Body/Body/Area scan (71x71x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.156 mW/g

Body/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

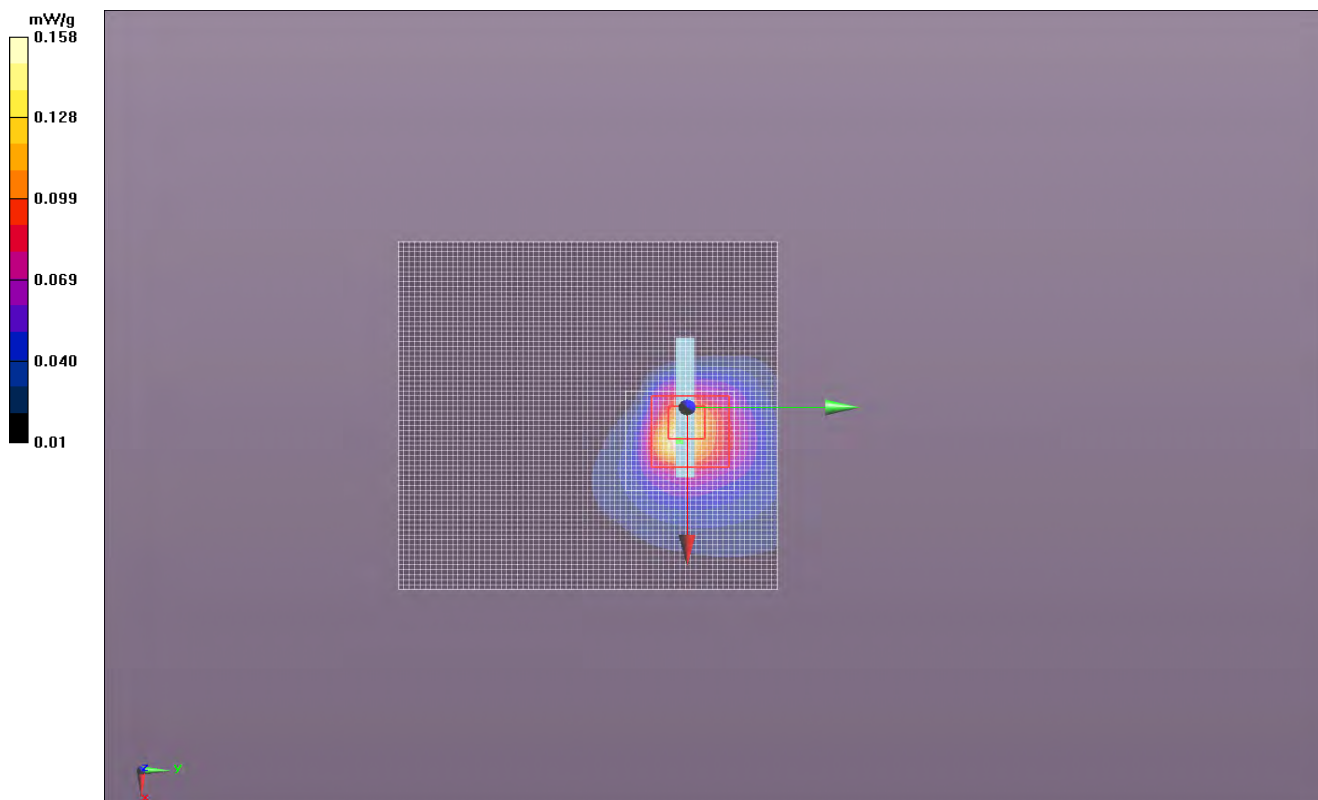
Reference Value = 8.868 V/m; Power Drift = 0.16 dB

Peak SAR (extrapolated) = 0.490 mW/g

SAR(1 g) = 0.161 mW/g; SAR(10 g) = 0.064 mW/g

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

Maximum value of SAR (measured) = 0.233 mW/g



EMC

SAR TEST DATA

Room Temperature (°C):	23.1	Humidity (%):	40.6	Test Date:	06/25/12
Liquid Temperature (°C):	21.8	Barometric Pressure (mb):	1013	Tested by:	Ethan Schoonover

Test 12

DUT: Wireless Network Node; Type: Imp; Serial: 0c2a6900003f

Communication System: CW; Communication System Band: D2450 (2450.0 MHz); Frequency: 2412 MHz; Communication System PAR: 0 dB; PMF: 1
 Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1000$ kg/m³, Medium parameters used (interpolated): $f = 2412$ MHz; $\sigma = 1.864$ mho/m; $\epsilon_r = 51.07$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section
 Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Body/Body/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

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

Maximum value of Total (measured) = 0.120 mW/g

Body/Body/Area scan (71x71x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.217 mW/g

Body/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 10.393 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.322 mW/g

SAR(1 g) = 0.176 mW/g; SAR(10 g) = 0.100 mW/g

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

Maximum value of SAR (measured) = 0.221 mW/g

