

TEST REPORT

ACCORDING TO: FCC CFR 47 Part 15 subpart C, section 15.231(a) and subpart B,
RSS-210 issue 8 Annex 1

FOR:

Medical Surgery Technologies Ltd. (MST)
Command Unit (CU) for the AutoLap System
Model: CU Clip
Model number: ASS03000
FCC ID:OSEALCU

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1 Applicant information

Client name: Medical Surgery Technologies Ltd. (MST)
Address: P.O.Box 685, Yokneam 20692, Israel
Telephone: +972 (73) 7965570
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E-mail: alon@mst-sys.com
Contact name: Mr. Alon Shacham

2 Equipment under test attributes

Product name: Command Unit (CU) for the AutoLap System
Product type: Transmitter operating at 915.9 MHz
Model(s): CU Clip
Model number: ASS03000
Serial number: 75
Hardware version: 1.0
Software release: 1.0
Receipt date: 12/18/2011

3 Manufacturer information

Manufacturer name: Medical Surgery Technologies Ltd. (MST)
Address: P.O.Box 685, Yokneam 20692, Israel
Telephone: +972 (73) 7965570
Fax: +972 (73) 7965571
E-Mail: alon@mst-sys.com
Contact name: Mr. Alon Shacham




4 Test details

Project ID: 22832
Location: Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started: 12/18/2011
Test completed: 1/10/2012
Test specification(s): FCC 47CFR part 15, subpart C, §15.231(a); subpart B class B;
RSS-210 issue 8 Annex 1, RSS-Gen issue 3

5 Tests summary

Test	Status
Transmitter characteristics	
FCC Part 15, Section 231(a) / RSS-210, Section A1.1.1, Periodic operation requirements	Pass
FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions	Pass
FCC Part 15, Section 231(c) / RSS-210, Section A1.1.3, Occupied bandwidth	Pass
FCC Part 15, Section 207 / RSS-Gen, Section 7.2.2, Conducted emission	Not required
FCC Part 15, Section 203 / RSS-Gen, Section 7.1.4, Antenna requirements	Pass
Unintentional emissions	
FCC Part 15, Section 107 / RSS-Gen, Section 7.1.6 / ICES-003, Conducted emission at AC power port	Not required
FCC Part 15, Section 109 / RSS-Gen, Section 7.2.3 / ICES-003, Class B, Radiated emission	Pass

Testing was completed against all relevant requirements of the test standard. The results obtained indicate that the product under test complies in full with the requirements tested.
The test results relate only to the items tested. Pass/ fail decision was based on nominal values.

	Name and Title	Date	Signature
Tested by:	Mr. Alex Chaplik, test engineer	January 10, 2012	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	April 10, 2012	
Approved by:	Mr. M. Nikishin, EMC and Radio group manager	April 23, 2012	

6 EUT description

6.1 General information

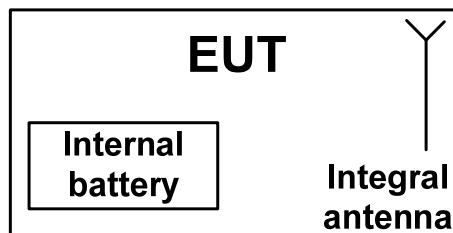
The EUT is a Command Unit (CU) - RF Button for Robotic Arm, which is a part of the AutoLap system. The EUT transmits at 915.9 MHz, has integral antenna and is powered from internal 3V battery.

The AutoLap system is designed to hold and position the laparoscope during laparoscopic surgery. When the camera is in position, the AutoLap system holds it in a stable manner. When the surgeon wishes to change the camera's position, the system positions the laparoscopic camera by maneuvering the video image using a joystick, or by pressing the Manual Activation button, which is located on the ARM. The movement of the laparoscopic camera is enabled and disabled by the surgeon.

The surgeon uses the CU Clip to control the laparoscope's movement. Typical use of the CU Clip is: before the laparoscopic surgery starts, the CU Clip shall transmit a signal to be registered to the system. The CU Clip is attached to the surgical tool.

After the surgeon attaches the laparoscope to the AutoLap, movement of the laparoscope is enabled or disabled by the CU Clip or by using the Manual Activation button.

6.2 Test configuration



6.3 Changes made in EUT

No changes were implemented in the EUT.

6.4 EUT test positions

Photograph 6.4.1 EUT in X-axis orthogonal position



Photograph 6.4.2 EUT in Y-axis orthogonal position



Photograph 6.4.3 EUT in Z-axis orthogonal position



6.5 Transmitter characteristics

Type of equipment						
X	Stand-alone (Equipment with or without its own control provisions)					
	Combined equipment (Equipment where the radio part is fully integrated within another type of equipment)					
	Plug-in card (Equipment intended for a variety of host systems)					
Operating frequency		915.9 MHz				
Maximum rated output power		Maximum field strength		100.5 (μV/m) at 3 m test distance		
Is transmitter output power variable?		X	No			
		Yes	continuous variable			
			stepped variable with stepsize			
			dB			
			dBm			
		maximum RF power				
		dBm				
Antenna connection						
unique coupling		standard connector		X	integral	
				X	without temporary RF connector	
Antenna/s technical characteristics						
Type		Manufacturer		Model number		
Integral		JOHANSON Technology		0915AT43A0026		
Gain		-1 dBi peak				
Transmitter aggregate data rate/s		250 kbps				
Type of modulation		MSK				
Transmitter power source						
X	Battery	Nominal rated voltage	3.0 VDC	Battery type		
	DC	Nominal rated voltage	VDC			
	AC mains	Nominal rated voltage	VAC	Frequency		

Test specification:		FCC Part 15, Section 231(a) / RSS-210, Section A1.1.1, Periodic operation requirements	
Test procedure:		Supplier declaration	
Test mode:		Compliance	Verdict: PASS
Date(s):		1/10/2012	
Temperature: 20.4 °C	Air Pressure: 1019 hPa	Relative Humidity: 42 %	Power Supply: 3V Battery
Remarks:			

7 Transmitter tests according to 47CFR part 15 subpart C and RSS-210 Annex 1 requirements

7.1 Periodic operation requirements

7.1.1 General

The EUT was verified for compliance with periodic operation requirements listed below:

- Continuous transmissions such as voice, video and the radio control of toys are not permitted;
- A manually operated transmitter shall employ switch that will automatically deactivate the transmitter within not more than 5 seconds of being released;
- A transmitter activated automatically shall cease transmission within 5 seconds after activation;
- Periodic transmissions, excluding polling or supervision transmissions, at regular predetermined intervals are not permitted;
- Total duration of polling or supervision transmissions, including data, to determine system integrity in security or safety applications shall not exceed 2 seconds per hour;
- Transmission of set-up information for security systems may exceed the transmission duration limits of 5 seconds, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

The rationale for compliance with the above requirements was either test results or supplier declaration. The summary of results is provided in Table 7.1.1.

7.1.2 Test procedure for transmitter shut down test

7.1.2.1 The EUT was set up as shown in Figure 7.1.1.

7.1.2.2 The spectrum analyzer center frequency was adjusted to the EUT carrier, span set to zero and video triggered for transmission.

7.1.2.3 The transmitter was activated either manually or automatically. Once manually operated transmitter was activated, the switch was immediately released.

7.1.2.4 The transmission time was captured and shown in Plot 7.1.1.

Figure 7.1.1 Setup for transmitter shut down test

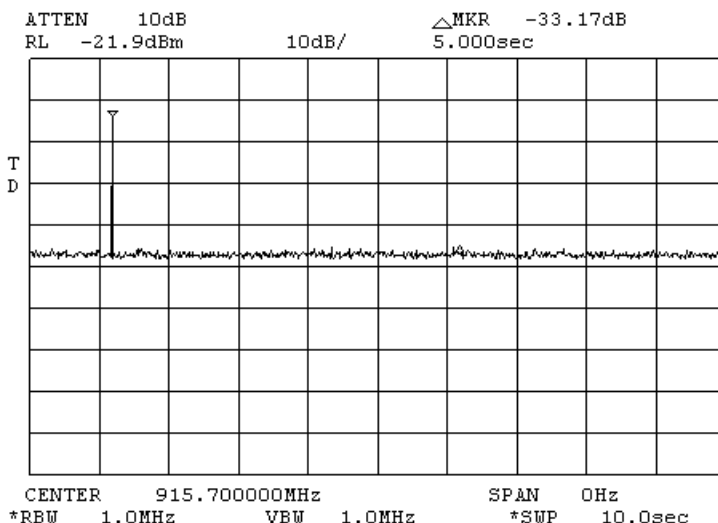


Test specification:	FCC Part 15, Section 231(a) / RSS-210, Section A1.1.1, Periodic operation requirements		
Test procedure:	Supplier declaration		
Test mode:	Compliance	Verdict:	PASS
Date(s):	1/10/2012		
Temperature: 20.4 °C	Air Pressure: 1019 hPa	Relative Humidity: 42 %	Power Supply: 3V Battery
Remarks:			

Table 7.1.1 Periodic operation requirements

Requirement	Rationale	Verdict
Continuous transmissions are not permitted	Supplier declaration	Comply
A manually operated transmitter shall be deactivated within not more than 5 seconds of switch being released	Plot 7.1.1	Comply
Transmitter activated automatically shall cease transmission within 5 seconds	NA	NA
Periodic transmissions at regular predetermined intervals are not permitted	Supplier declaration	Comply
Total duration of polling or supervision transmissions shall not exceed 2 seconds per hour	Supplier declaration	NA
Transmission of set-up information for security systems may exceed the transmission duration limits of 5 seconds, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.	NA	NA

Plot 7.1.1 Transmitter shut down test result



Reference numbers of test equipment used

HL 0521						
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Full description is given in Appendix A.

Test specification:	FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	12/18/2011 - 1/1/2012		
Temperature: 20.4 °C	Air Pressure: 1017 hPa	Relative Humidity: 42 %	Power Supply: 3V Battery
Remarks:			

7.2 Field strength of emissions

7.2.1 General

This test was performed to measure field strength of fundamental and spurious emissions from the EUT. Specification test limits are given in Table 7.2.1 and Table 7.2.2.

Table 7.2.1 Radiated fundamental emission limits

Fundamental frequency, MHz	Field strength at 3 m, dB(μV/m)	
	Peak	Average
902.0 – 928.0	102.0	82.0

Table 7.2.2 Radiated spurious emissions limits

Frequency, MHz	Field strength at 3 m, dB(μV/m)				
	Within restricted bands			Outside restricted bands	
	Peak	Quasi Peak	Average	Peak	Average
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**	82.0	62.0
0.090 – 0.110	NA	108.5 – 106.8**	NA		
0.110 – 0.490	126.8 – 113.8	NA	106.8 – 93.8**		
0.490 – 1.705	NA	73.8 – 63.0**	NA		
1.705 – 30.0*		69.5			
30 – 88		40.0			
88 – 216		43.5			
216 – 960		46.0			
960 - 1000		54.0			
Above 1000	74.0	NA	54.0		

*- The limit for 3 m test distance was calculated using the inverse square distance extrapolation factor as follows:

$$\text{Lim}_{S2} = \text{Lim}_{S1} + 40 \log(S_1/S_2),$$

where S_1 and S_2 – standard defined and test distance respectively in meters.

**-. The limit decreases linearly with the logarithm of frequency.

Note 1: The fundamental emission limit in dB(μV/m) was calculated as follows:

$$\text{Lim}_{AVR} = 20 \times \log(56.81818 \times F - 6136.3636) - \text{within } 130 - 174 \text{ MHz band};$$

$$\text{Lim}_{AVR} = 20 \times \log(41.6667 \times F - 7083.3333) - \text{within } 260 - 470 \text{ MHz band},$$

where F is the carrier frequency in MHz.

The limit for spurious emissions was 20 dB lower than fundamental emission limit.

The above limits provided in terms of average values, peak limit was 20 dB above the average limit.

Note 2: The above field strength limits applied from the lowest radio frequency generated in the device, without going below 9 kHz up to the tenth harmonic of the highest fundamental frequency.



Test specification:	FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	12/18/2011 - 1/1/2012		
Temperature: 20.4 °C	Air Pressure: 1017 hPa	Relative Humidity: 42 %	Power Supply: 3V Battery
Remarks:			

7.2.2 Test procedure for spurious emission field strength measurements in 9 kHz to 30 MHz band

7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and the performance check was conducted.

7.2.2.2 The measurements were performed in three EUT orthogonal positions.

7.2.2.3 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360° and the measuring antenna was rotated around its vertical axis.

7.2.2.4 The worst test results (the lowest margins) were recorded in Table 7.2.3, Table 7.2.5 and shown in the associated plots.

7.2.3 Test procedure for spurious emission field strength measurements above 30 MHz

7.2.3.1 The EUT was set up as shown in Figure 7.2.2, energized and the performance check was conducted.

7.2.3.2 The measurements were performed in three EUT orthogonal positions.

7.2.3.3 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360°, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal.

7.2.3.4 The worst test results (the lowest margins) were recorded in Table 7.2.3, Table 7.2.5 and shown in the associated plots.

Test specification:		FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		12/18/2011 - 1/1/2012	
Temperature: 20.4 °C	Air Pressure: 1017 hPa	Relative Humidity: 42 %	Power Supply: 3V Battery
Remarks:			

Figure 7.2.1 Setup for spurious emission field strength measurements below 30 MHz

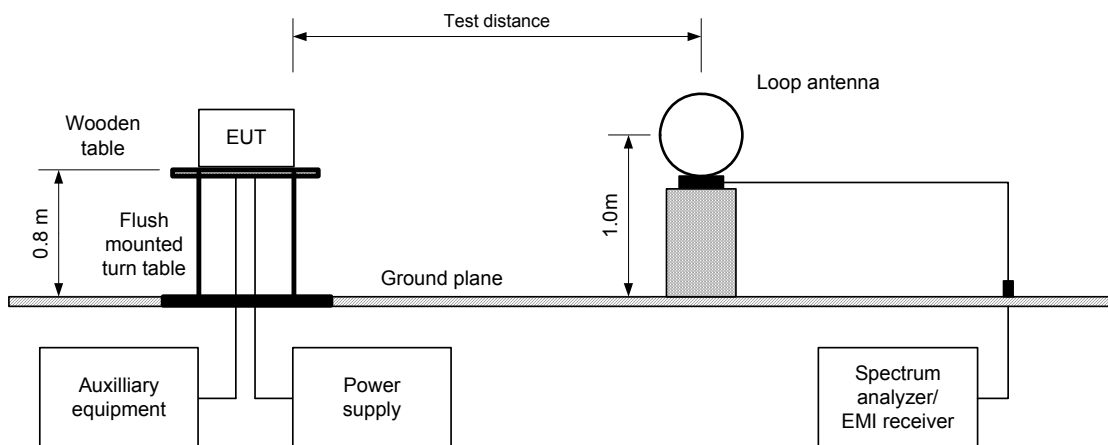
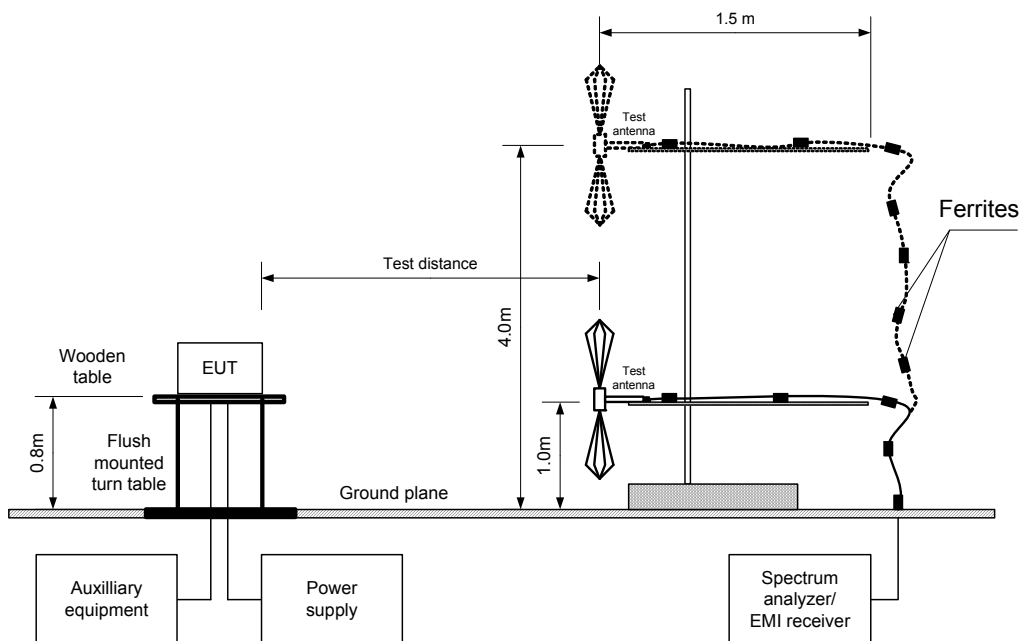


Figure 7.2.2 Setup for spurious emission field strength measurements above 30 MHz



Test specification:	FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	12/18/2011 - 1/1/2012		
Temperature: 20.4 °C	Air Pressure: 1017 hPa	Relative Humidity: 42 %	Power Supply: 3V Battery
Remarks:			

Table 7.2.3 Field strength of fundamental emission, spurious emissions outside restricted bands and within restricted bands at frequencies above 1 GHz

TEST DISTANCE: 3 m
EUT POSITION: 3 orthogonal (X / Y / Z)
MODULATION: MSK
BIT RATE: 250 kbps
TRANSMITTER OUTPUT POWER SETTINGS: 7 dBm
INVESTIGATED FREQUENCY RANGE: 0.009 -10000 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 0.2 kHz (9 kHz – 150 kHz)
9.0 kHz (150 kHz – 30 MHz)
120 kHz (30 MHz – 1000 MHz)
1.0 MHz (above 1000 MHz)
VIDEO BANDWIDTH: ≥ Resolution bandwidth
TEST ANTENNA TYPE: Double ridged guide (above 1000 MHz)

Antenna			Azimuth, degrees*	Peak field strength			Measured, dB(μV/m)	Average field strength			Verdict
F, MHz	Pol.	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**		Calculated, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	
Fundamental emission***											
915.935	H	1.1	285	100.47	102.00	-1.53	NA	73.38	82.00	-8.62	Pass
Spurious emissions											
1831.9125	V	1.1	300	55.36	82.00	-26.64	50.31	23.21	62.00	-38.79	Pass
2747.7875	V	1.1	330	61.02	74.00	-12.98	58.45	31.35	54.00	-22.65	
3663.5125	H	1.2	270	57.49	74.00	-16.51	53.93	26.83	54.00	-27.17	
4579.5500	V	1.4	100	51.25	74.00	-22.75	41.34	14.24	54.00	-39.76	
5495.4875	V	1.1	280	57.44	82.00	-24.56	48.16	21.06	62.00	-40.94	
6409.4500	V	1.2	180	57.79	82.00	-24.21	44.43	17.33	62.00	-44.67	
7327.2250	V	1.2	270	60.38	74.00	-13.62	50.53	23.43	54.00	-30.57	
8244.1250	H	1.2	270	59.39	74.00	-14.61	46.51	19.41	54.00	-34.59	
9159.0000	H	1.2	130	60.07	74.00	-13.93	50.17	23.07	54.00	-30.93	

*- EUT front panel refers to 0 degrees position of turntable.
**- Margin = dB below (negative if above) specification limit.
*** Max value was obtained in Z-axis orthogonal position.

Table 7.2.4 Average factor calculation

Transmission pulse		Transmission burst		Transmission train duration, ms	Average factor, dB
Duration, ms	Period, ms	Duration, ms	Period, ms		
0.74	16.75	NA	NA	NA	-27.0957

*- Average factor was calculated as follows

for pulse train shorter than 100 ms:

$$\text{Average factor} = 20 \times \log_{10} \left(\frac{\text{Pulse duration}}{\text{Pulse period}} \times \frac{\text{Burst duration}}{\text{Train duration}} \times \text{Number of bursts within pulse train} \right)$$

for pulse train longer than 100 ms:

$$\text{Average factor} = 20 \times \log_{10} \left(\frac{\text{Pulse duration}}{\text{Pulse period}} \times \frac{\text{Burst duration}}{100 \text{ ms}} \times \text{Number of bursts within 100 ms} \right)$$

Reference numbers of test equipment used

HL 0446	HL 0521	HL 0592	HL 0604	HL 2432	HL 2871	HL 3617	
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Full description is given in Appendix A.



HERMON LABORATORIES

Report ID: MSTRAD_FCC.22832.doc
Date of Issue: 23-Apr-12

Test specification:	FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	12/18/2011 - 1/1/2012		
Temperature: 20.4 °C	Air Pressure: 1017 hPa	Relative Humidity: 42 %	Power Supply: 3V Battery
Remarks:			

Table 7.2.5 Field strength of emissions below 1 GHz within restricted bands

TEST DISTANCE: 3 m
EUT POSITION: 3 orthogonal (X / Y / Z)
MODULATION: MSK
BIT RATE: 250 kbps
TRANSMITTER OUTPUT POWER SETTINGS: 7 dBm
INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 0.2 kHz (9 kHz – 150 kHz)
9.0 kHz (150 kHz – 30 MHz)
120 kHz (30 MHz – 1000 MHz)
VIDEO BANDWIDTH: ≥ Resolution bandwidth
TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
Biconilog (30 MHz – 1000 MHz)

Frequency, MHz	Peak emission, dB(μV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
No emissions were found								Pass

*- Margin = Measured emission - specification limit.

** - EUT front panel refer to 0 degrees position of turntable.

Reference numbers of test equipment used

HL 0446	HL 0521	HL 0592	HL 0604	HL 2871	HL 3617		
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Full description is given in Appendix A.



Test specification:	FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions				
Test procedure:	ANSI C63.4, Section 13.1.4				
Test mode:	Compliance	Verdict:		PASS	
Date(s):	12/18/2011 - 1/1/2012				
Temperature: 20.4 °C	Air Pressure: 1017 hPa	Relative Humidity: 42 %		Power Supply: 3V Battery	
Remarks:					

Table 7.2.6 Restricted bands according to FCC 15, Section 205

MHz	MHz	MHz	MHz	MHz	GHz
0.09 - 0.11	8.37625 - 8.38675	73 - 74.6	399.9 - 410	2690 - 2900	10.6 - 12.7
0.495 - 0.505	8.41425 - 8.41475	74.8 - 75.2	608 - 614	3260 - 3267	13.25 - 13.4
2.1735 - 2.1905	12.290 - 12.293	108 - 121.94	960 - 1240	3332 - 3339	14.47 - 14.5
4.125 - 4.128	12.51975 - 12.52025	123 - 138	1300 - 1427	3345.8 - 3358	15.35 - 16.2
4.17725 - 4.17775	12.57675 - 12.57725	149.9 - 150.05	1435 - 1626.5	3600 - 4400	17.7 - 21.4
4.20725 - 4.20775	13.36 - 13.41	156.52475 - 156.52525	1645.5 - 1646.5	4500 - 5150	22.01 - 23.12
6.215 - 6.218	16.420 - 16.423	156.7 - 156.9	1660 - 1710	5350 - 5460	23.6 - 24
6.26775 - 6.26825	16.69475 - 16.69525	162.0125 - 167.17	1718.8 - 1722.2	7250 - 7750	31.2 - 31.8
6.31175 - 6.31225	16.80425 - 16.80475	167.72 - 173.2	2200 - 2300	8025 - 8500	36.43 - 36.5
8.291 - 8.294	25.5 - 25.67	240 - 285	2310 - 2390	9000 - 9200	Above 38.6
8.362 - 8.366	37.5 - 38.25	322 - 335.4	2483.5 - 2500	9300 - 9500	

Table 7.2.7 Restricted bands according to RSS-Gen, Table 3

MHz	MHz	MHz	MHz	MHz	GHz
0.09 - 0.11	8.291 - 8.294	16.80425 - 16.80475	399.9 - 410	3260 - 3267	10.6 - 12.7
2.1735 - 2.190	8.362 - 8.366	25.5 - 25.67	608 - 614	3332 - 3339	13.25 - 13.4
3.020 - 3.026	8.37625 - 8.38675	37.5 - 38.25	960 - 1427	3345.8 - 3358	14.47 - 14.5
4.125 - 4.128	8.41425 - 8.41475	73 - 74.6	1435 - 1626.5	3500 - 4400	15.35 - 16.2
4.17725 - 4.17775	12.290 - 12.293	74.8 - 75.2	1645.5 - 1646.5	4500 - 5150	17.7 - 21.4
4.20725 - 4.20775	12.51975 - 12.52025	108 - 138	1660 - 1710	5350 - 5460	22.01 - 23.12
5.677 - 5.683	12.57675 - 12.57725	156.52475 - 156.52525	1718.8 - 1722.2	7250 - 7750	23.6 - 24.0
6.215 - 6.218	13.36 - 13.41	156.7 - 156.9	2200 - 2300	8025 - 8500	31.2 - 31.8
6.26775 - 6.26825	16.42 - 16.423	240 - 285	2310 - 2390	9000 - 9200	36.43 - 36.5
6.31175 - 6.31225	16.69475 - 16.69525	322 - 335.4	2655 - 2900	9300 - 9500	Above 38.6

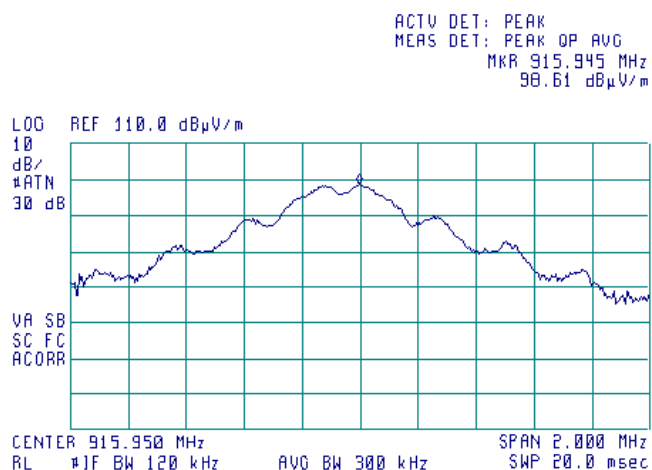


HERMON LABORATORIES

Test specification:	FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	12/18/2011 - 1/1/2012		
Temperature: 20.4 °C	Air Pressure: 1017 hPa	Relative Humidity: 42 %	Power Supply: 3V Battery
Remarks:			

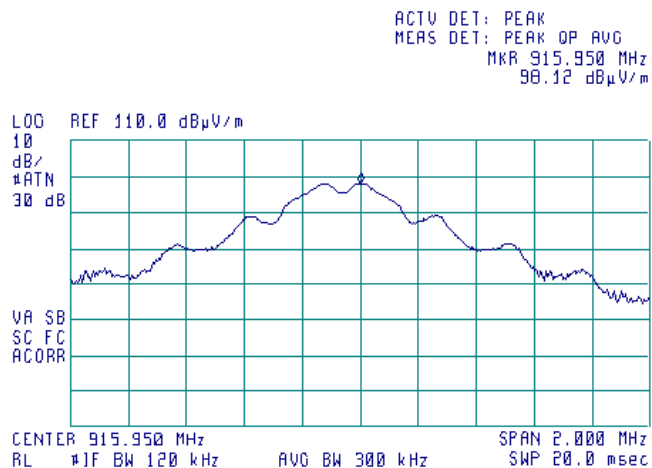
Plot 7.2.1 Radiated emission measurements at the fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: X-axis
INPUT VOLTAGE: Unom



Plot 7.2.2 Radiated emission measurements at the fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: X-axis
INPUT VOLTAGE: 115%Unom



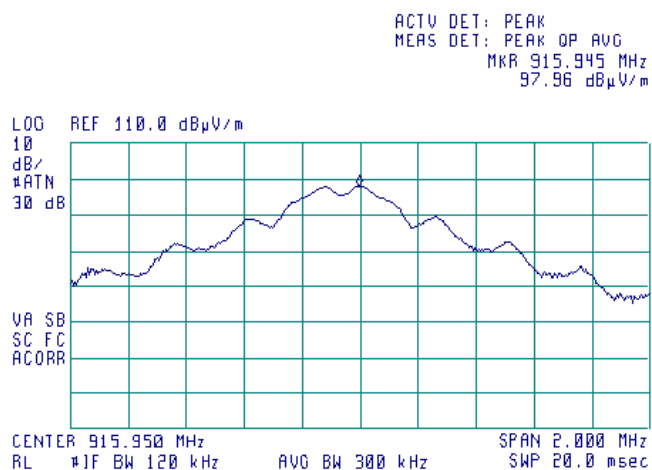


HERMON LABORATORIES

Test specification:	FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	12/18/2011 - 1/1/2012		
Temperature: 20.4 °C	Air Pressure: 1017 hPa	Relative Humidity: 42 %	Power Supply: 3V Battery
Remarks:			

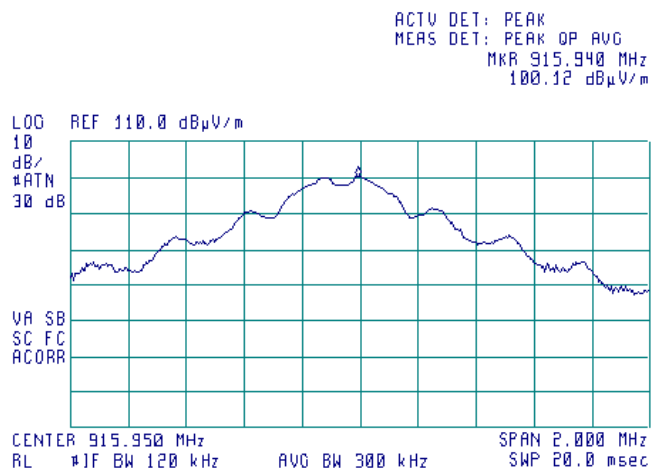
Plot 7.2.3 Radiated emission measurements at the fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: X-axis
INPUT VOLTAGE: 85%Unom



Plot 7.2.4 Radiated emission measurements at the fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: X-axis
INPUT VOLTAGE: Unom



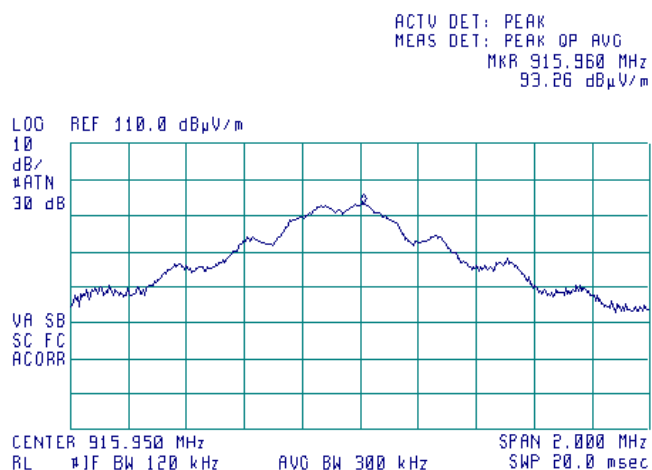


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Test specification:	FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	12/18/2011 - 1/1/2012		
Temperature: 20.4 °C	Air Pressure: 1017 hPa	Relative Humidity: 42 %	Power Supply: 3V Battery
Remarks:			

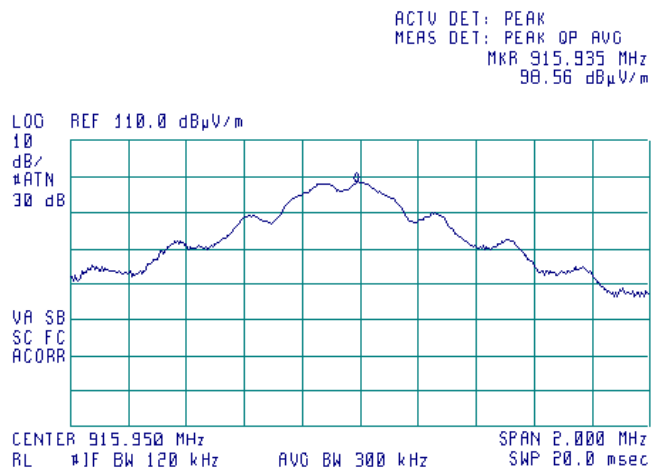
Plot 7.2.5 Radiated emission measurements at the fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Y-axis
INPUT VOLTAGE: Unom



Plot 7.2.6 Radiated emission measurements at the fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Y-axis
INPUT VOLTAGE: Unom



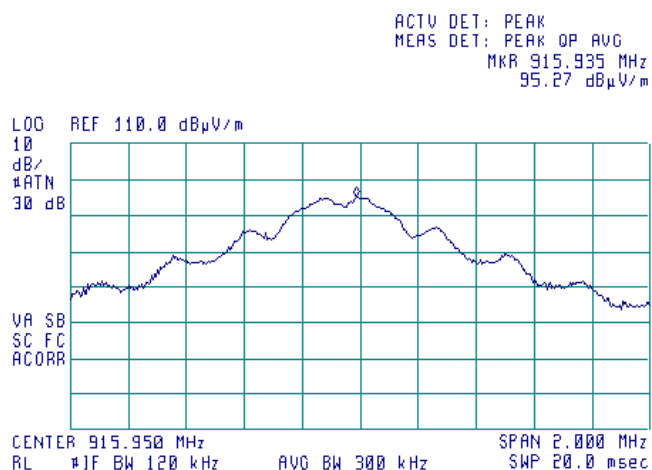


HERMON LABORATORIES

Test specification:	FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	12/18/2011 - 1/1/2012		
Temperature: 20.4 °C	Air Pressure: 1017 hPa	Relative Humidity: 42 %	Power Supply: 3V Battery
Remarks:			

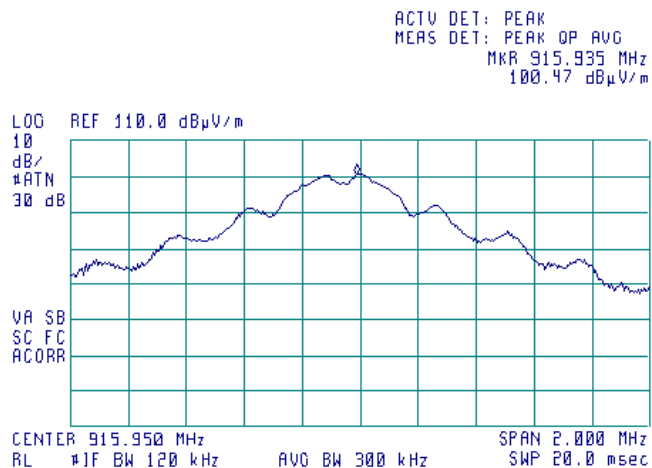
Plot 7.2.7 Radiated emission measurements at the fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Z-axis
INPUT VOLTAGE: Unom



Plot 7.2.8 Radiated emission measurements at the fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Z-axis
INPUT VOLTAGE: Unom



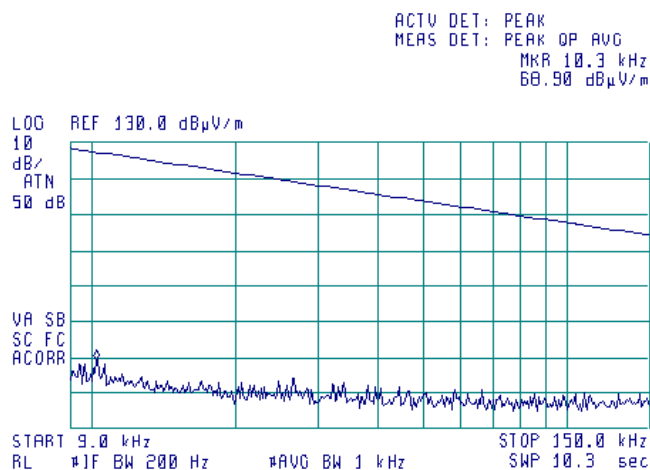


HERMON LABORATORIES

Test specification:	FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	12/18/2011 - 1/1/2012		
Temperature: 20.4 °C	Air Pressure: 1017 hPa	Relative Humidity: 42 %	Power Supply: 3V Battery
Remarks:			

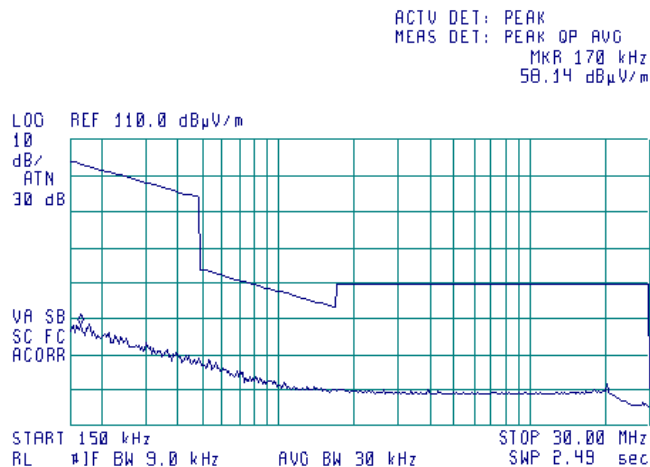
Plot 7.2.9 Radiated emission measurements from 9 to 150 kHz

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Z-axis



Plot 7.2.10 Radiated emission measurements from 0.15 to 30 MHz

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Z-axis





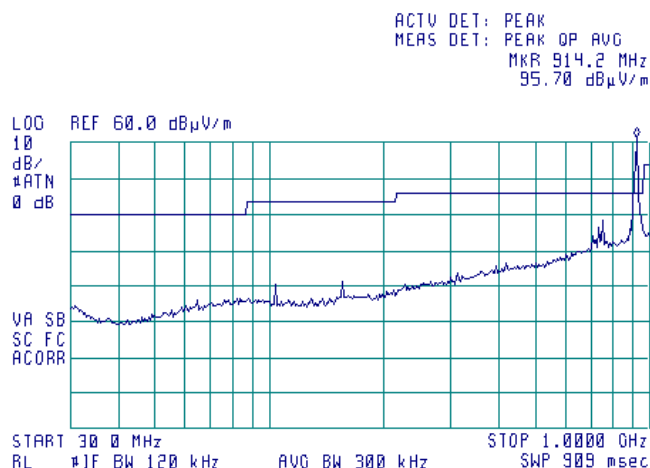
HERMON LABORATORIES

Report ID: MSTRAD_FCC.22832.doc
Date of Issue: 23-Apr-12

Test specification:	FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	12/18/2011 - 1/1/2012		
Temperature: 20.4 °C	Air Pressure: 1017 hPa	Relative Humidity: 42 %	Power Supply: 3V Battery
Remarks:			

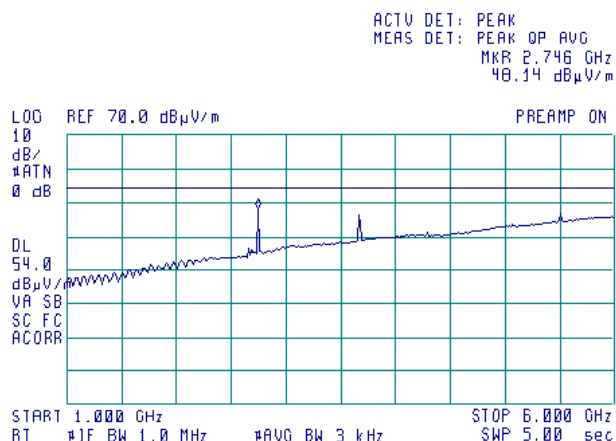
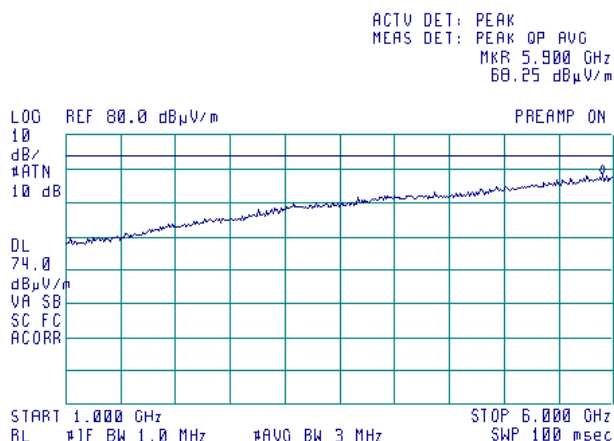
Plot 7.2.11 Radiated emission measurements from 30 to 1000 MHz

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Z-axis



Plot 7.2.12 Radiated emission measurements from 1000 to 6000 MHz

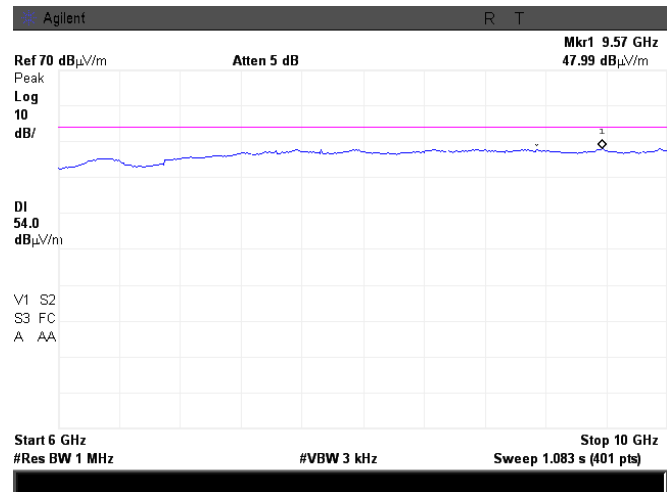
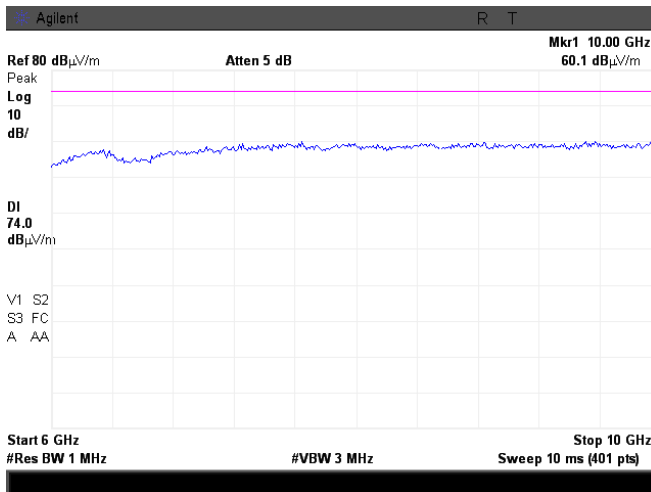
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Z-axis



Test specification:		FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		12/18/2011 - 1/1/2012	
Temperature: 20.4 °C	Air Pressure: 1017 hPa	Relative Humidity: 42 %	Power Supply: 3V Battery
Remarks:			

Plot 7.2.13 Radiated emission measurements from 6000 to 10000 MHz

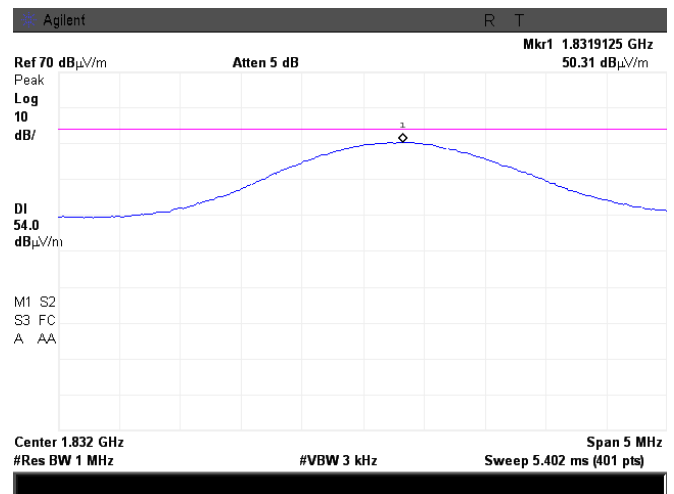
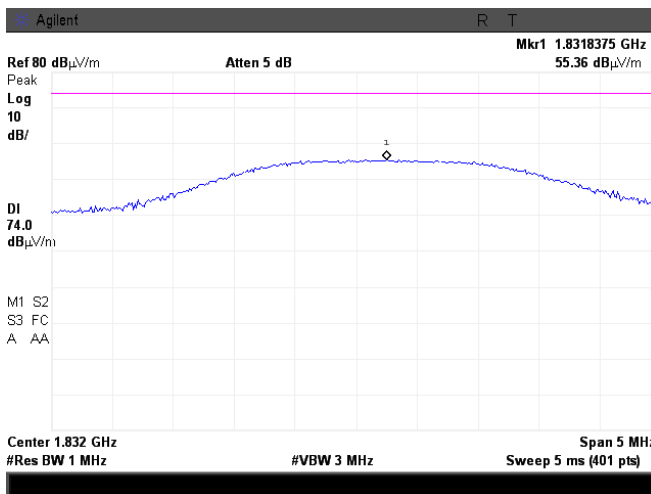
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Z-axis



Test specification:		FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		12/18/2011 - 1/1/2012	
Temperature: 20.4 °C	Air Pressure: 1017 hPa	Relative Humidity: 42 %	Power Supply: 3V Battery
Remarks:			

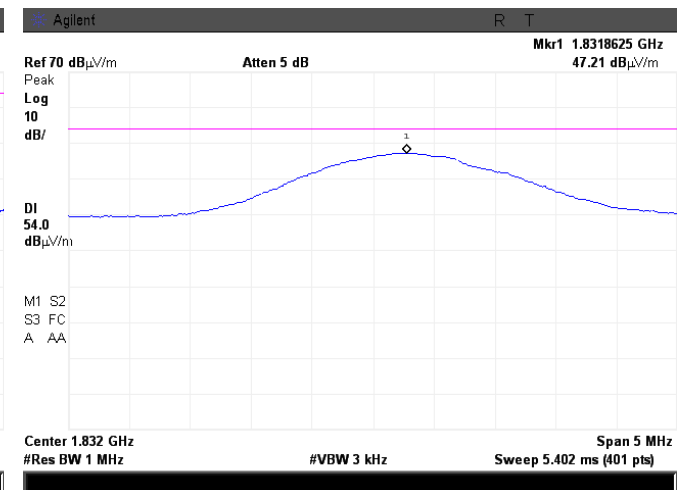
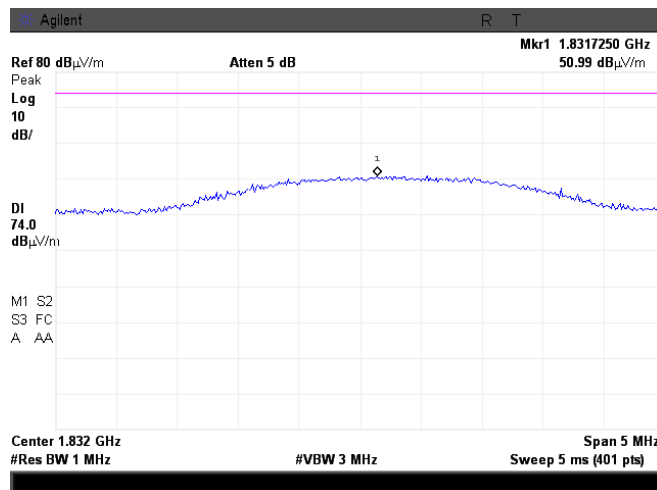
Plot 7.2.14 Radiated emission measurements at the second harmonic frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Z-axis



Plot 7.2.15 Radiated emission measurements at the second harmonic frequency

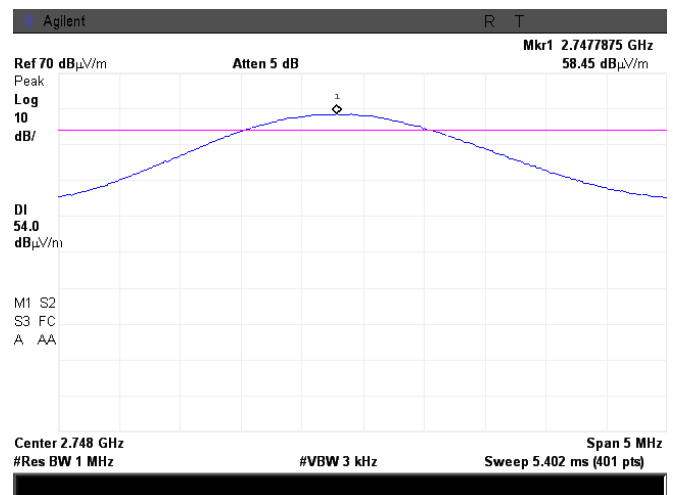
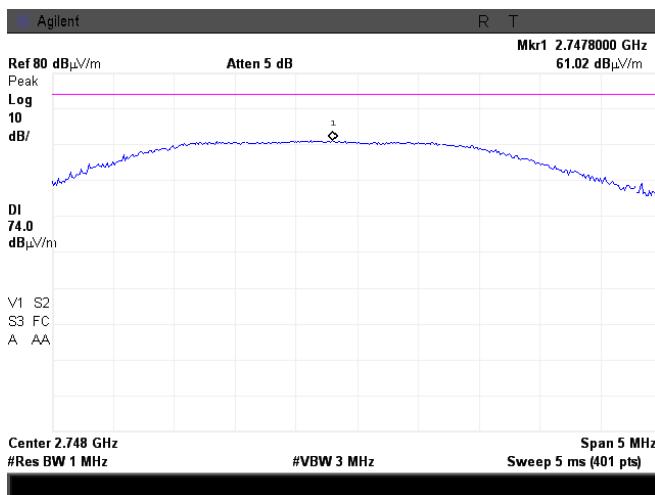
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Z-axis



Test specification:		FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		12/18/2011 - 1/1/2012	
Temperature: 20.4 °C	Air Pressure: 1017 hPa	Relative Humidity: 42 %	Power Supply: 3V Battery
Remarks:			

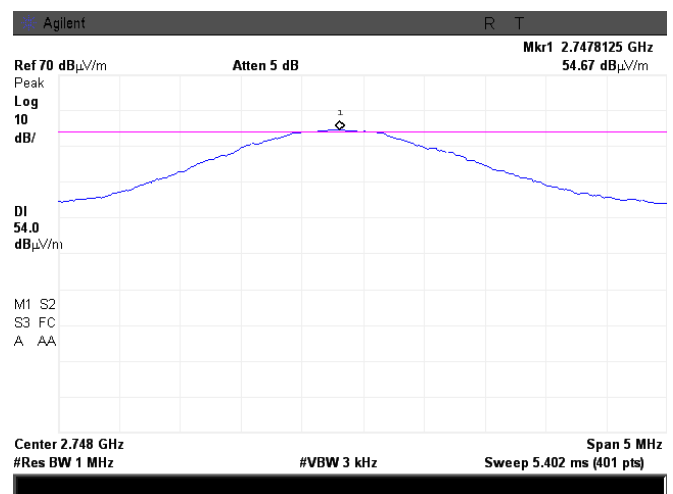
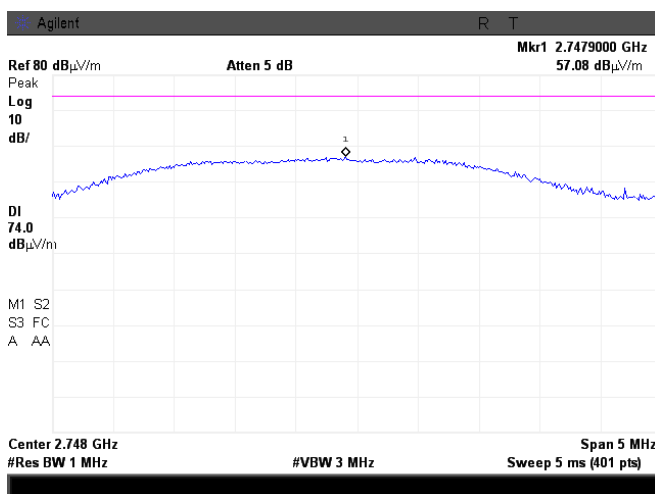
Plot 7.2.16 Radiated emission measurements at the third harmonic frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Z-axis



Plot 7.2.17 Radiated emission measurements at the third harmonic frequency

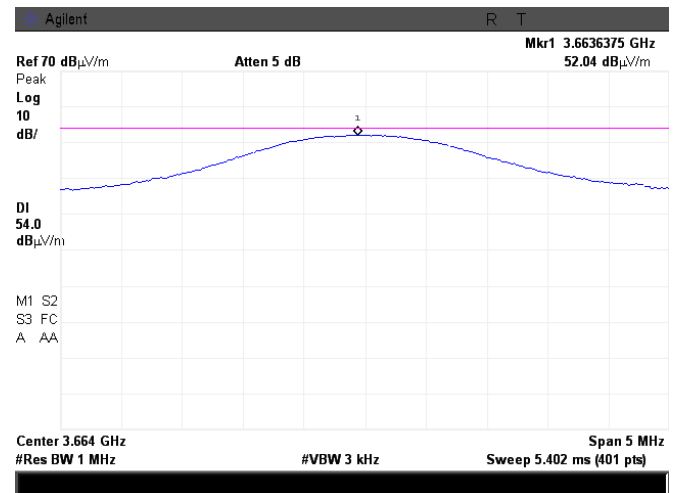
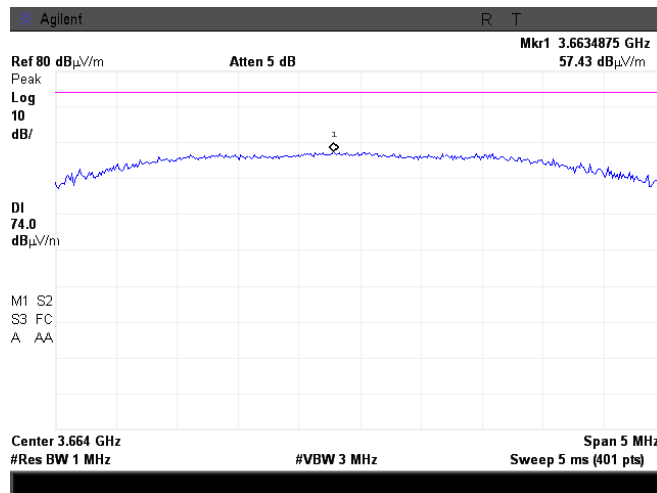
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Z-axis



Test specification:		FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		12/18/2011 - 1/1/2012	
Temperature: 20.4 °C	Air Pressure: 1017 hPa	Relative Humidity: 42 %	Power Supply: 3V Battery
Remarks:			

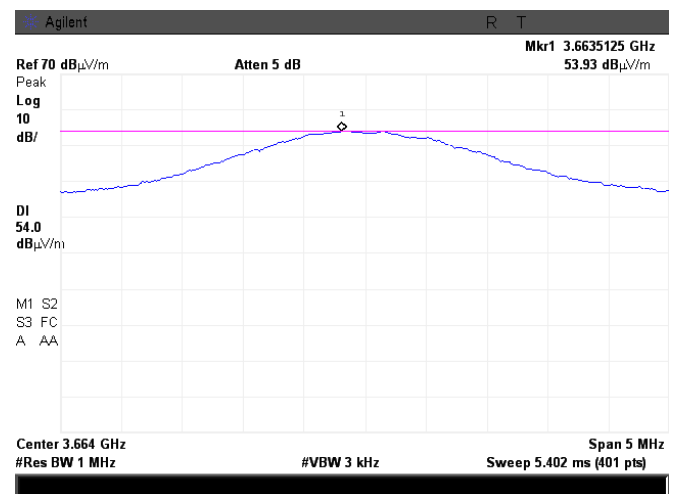
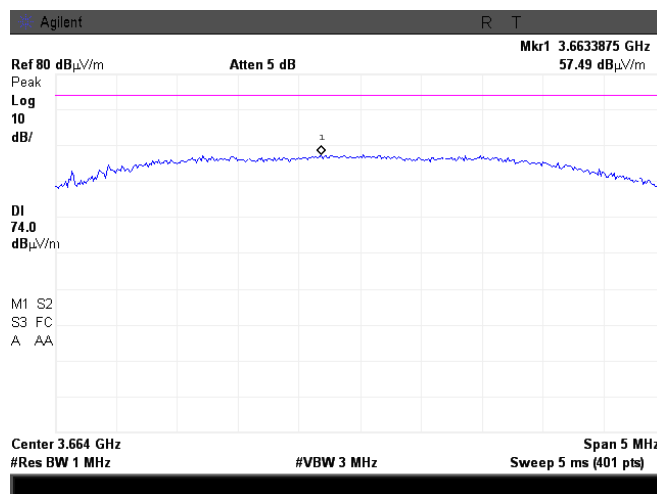
Plot 7.2.18 Radiated emission measurements at the fourth harmonic frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical 320 dgr 1.2m
EUT POSITION: Z-axis



Plot 7.2.19 Radiated emission measurements at the fourth harmonic frequency

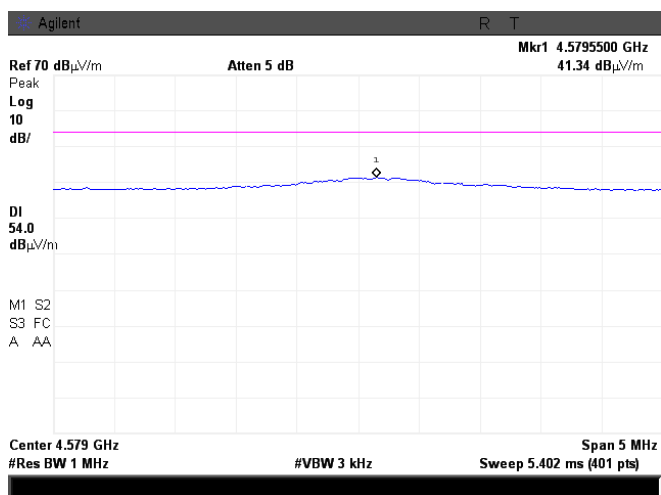
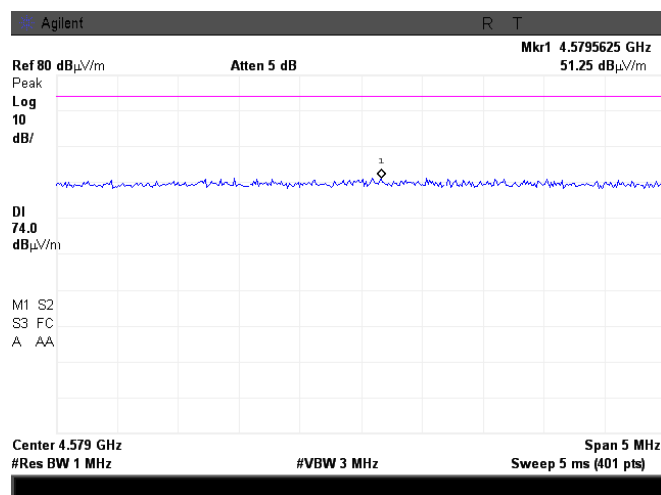
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Z-axis



Test specification:		FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		12/18/2011 - 1/1/2012	
Temperature: 20.4 °C	Air Pressure: 1017 hPa	Relative Humidity: 42 %	Power Supply: 3V Battery
Remarks:			

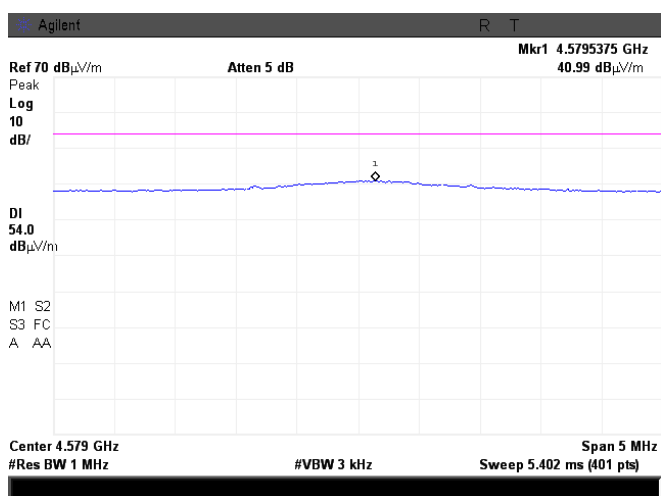
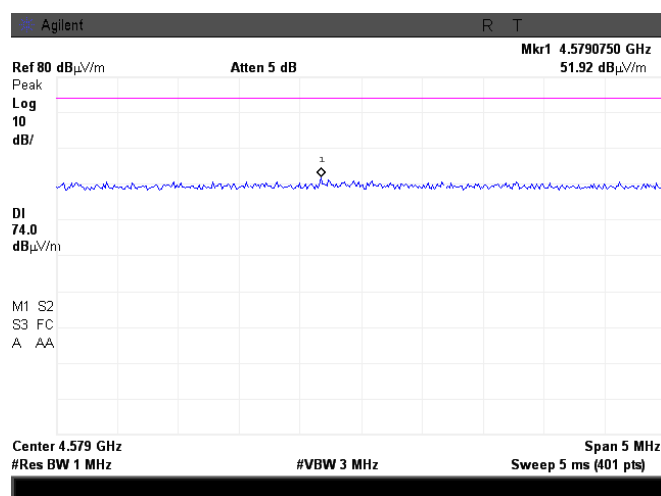
Plot 7.2.20 Radiated emission measurements at the fifth harmonic frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Z-axis



Plot 7.2.21 Radiated emission measurements at the fifth harmonic frequency

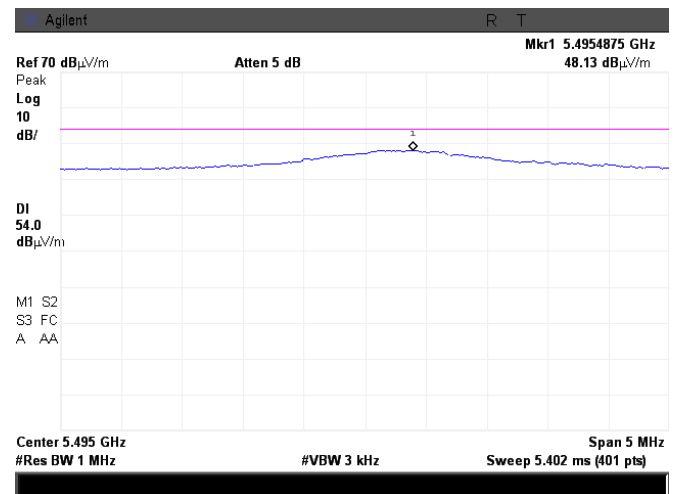
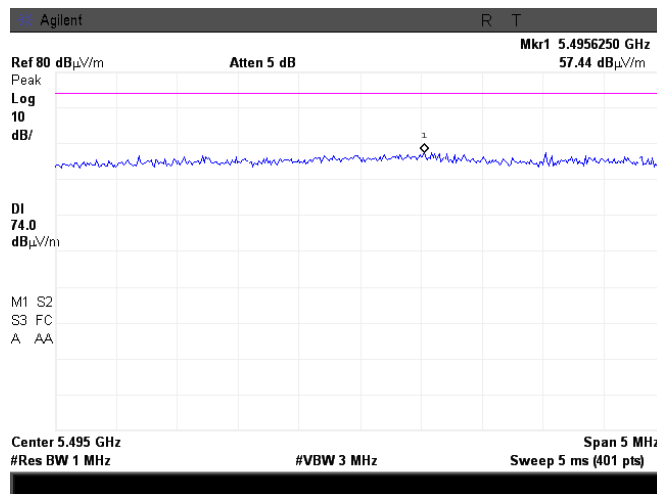
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Z-axis



Test specification:		FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		12/18/2011 - 1/1/2012	
Temperature: 20.4 °C	Air Pressure: 1017 hPa	Relative Humidity: 42 %	Power Supply: 3V Battery
Remarks:			

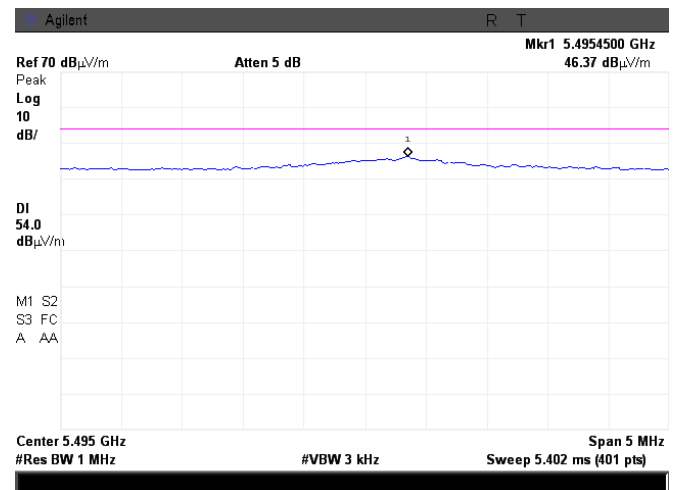
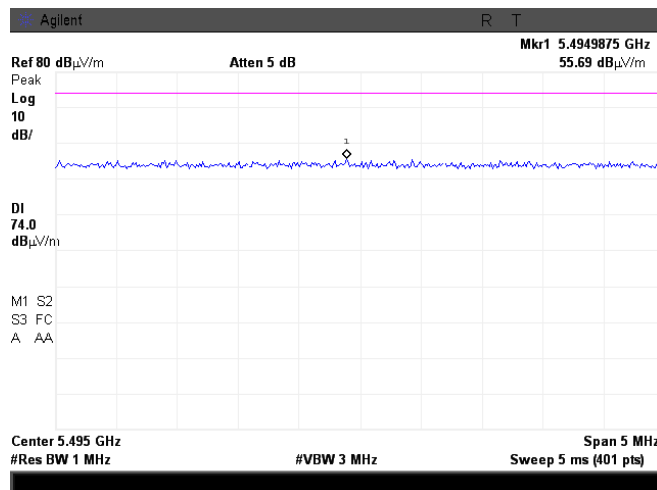
Plot 7.2.22 Radiated emission measurements at the sixth harmonic frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Z-axis



Plot 7.2.23 Radiated emission measurements at the sixth harmonic frequency

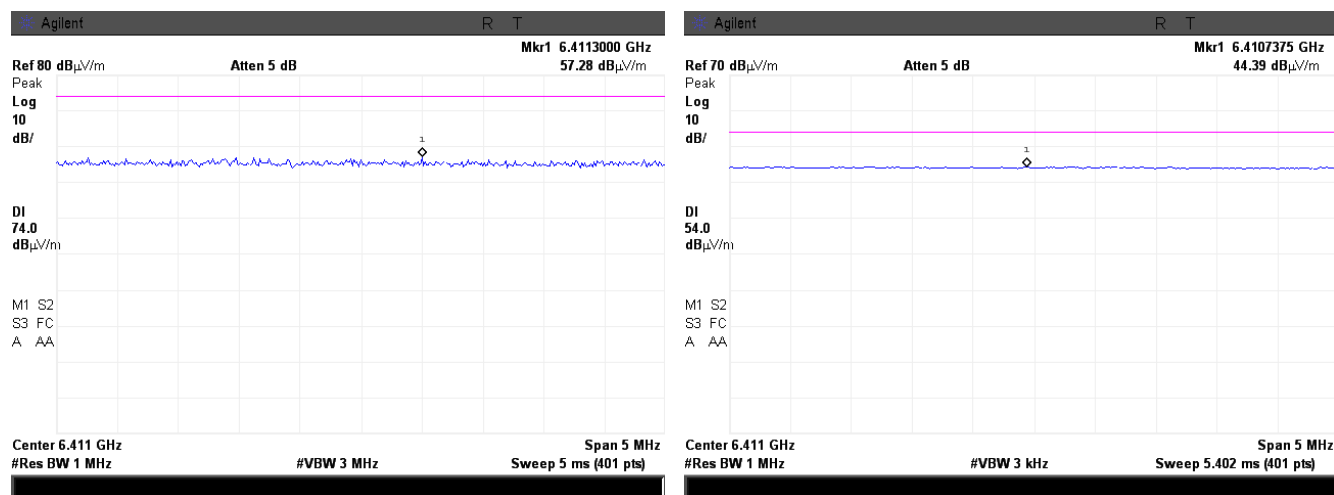
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Z-axis



Test specification:		FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		12/18/2011 - 1/1/2012	
Temperature: 20.4 °C	Air Pressure: 1017 hPa	Relative Humidity: 42 %	Power Supply: 3V Battery
Remarks:			

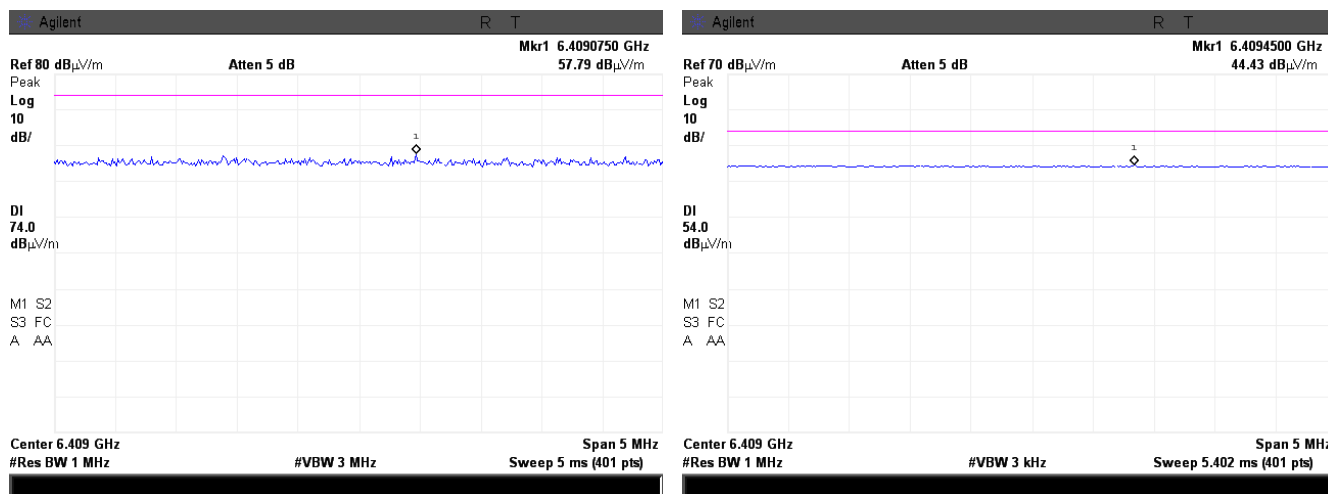
Plot 7.2.24 Radiated emission measurements at the seventh harmonic frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Z-axis



Plot 7.2.25 Radiated emission measurements at the seventh harmonic frequency

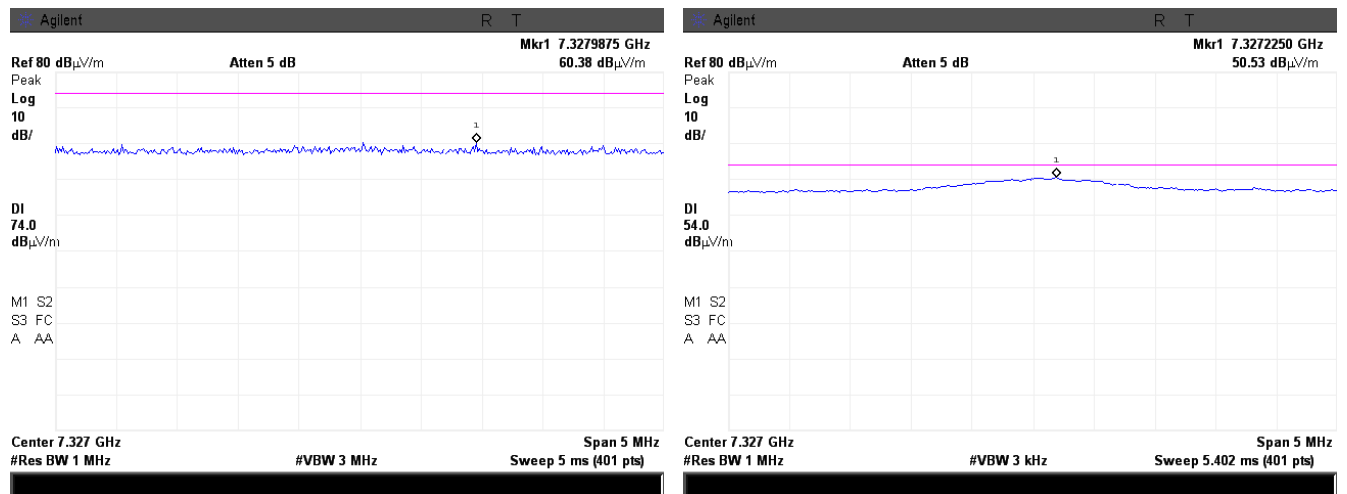
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Z-axis



Test specification:		FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		12/18/2011 - 1/1/2012	
Temperature: 20.4 °C	Air Pressure: 1017 hPa	Relative Humidity: 42 %	Power Supply: 3V Battery
Remarks:			

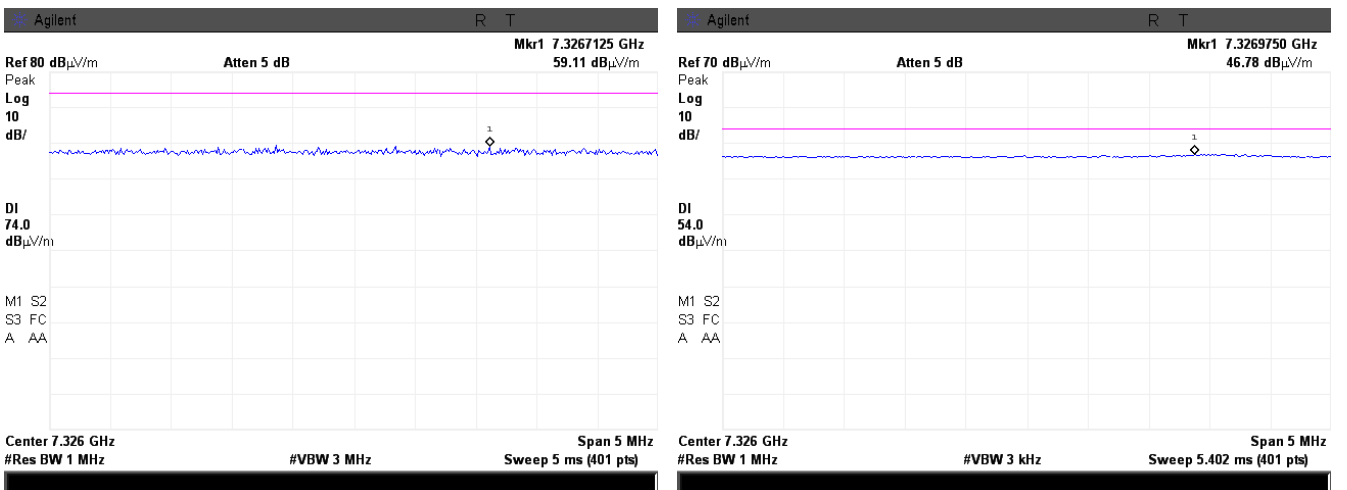
Plot 7.2.26 Radiated emission measurements at the eighth harmonic frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Z-axis



Plot 7.2.27 Radiated emission measurements at the eighth harmonic frequency

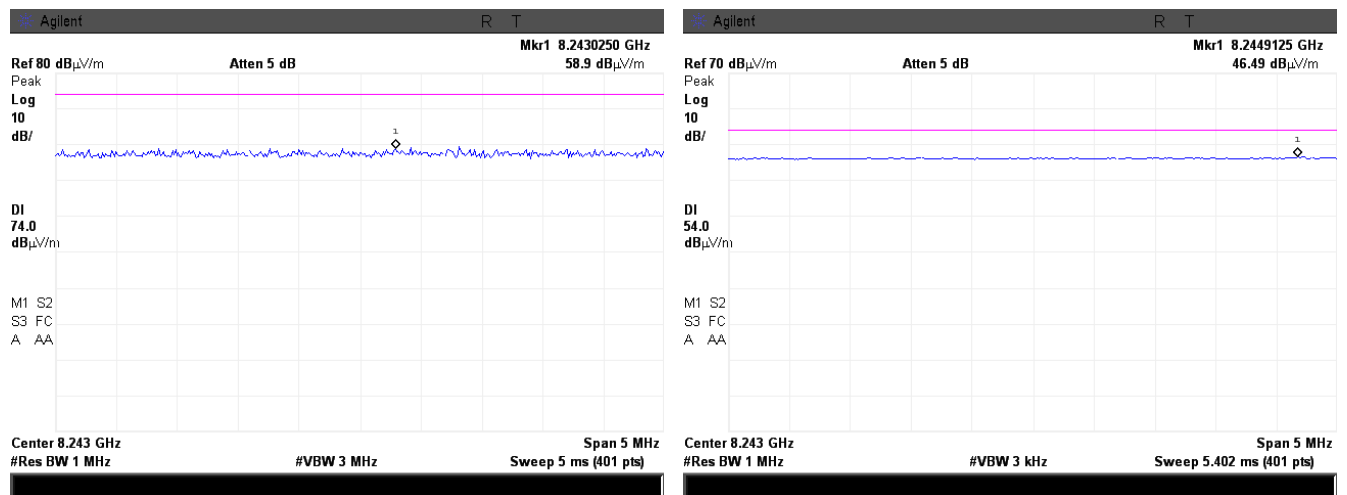
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Z-axis



Test specification:		FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		12/18/2011 - 1/1/2012	
Temperature: 20.4 °C	Air Pressure: 1017 hPa	Relative Humidity: 42 %	Power Supply: 3V Battery
Remarks:			

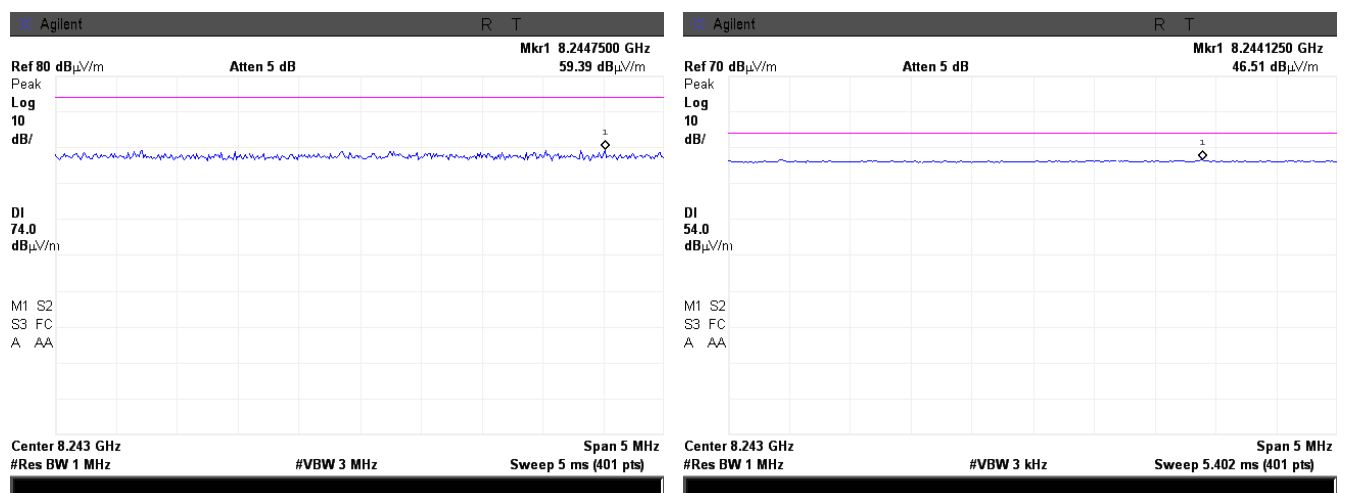
Plot 7.2.28 Radiated emission measurements at the ninth harmonic frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Z-axis



Plot 7.2.29 Radiated emission measurements at the ninth harmonic frequency

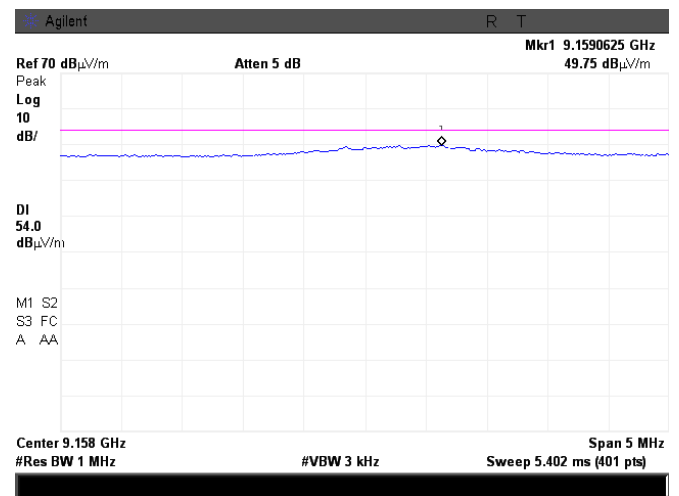
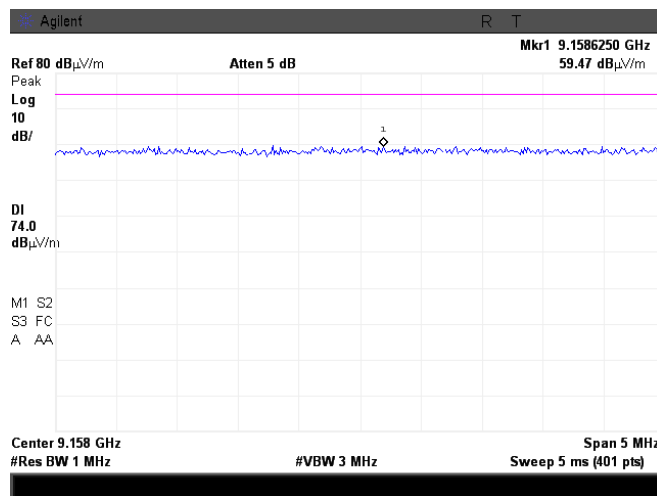
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Z-axis



Test specification:		FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		12/18/2011 - 1/1/2012	
Temperature: 20.4 °C	Air Pressure: 1017 hPa	Relative Humidity: 42 %	Power Supply: 3V Battery
Remarks:			

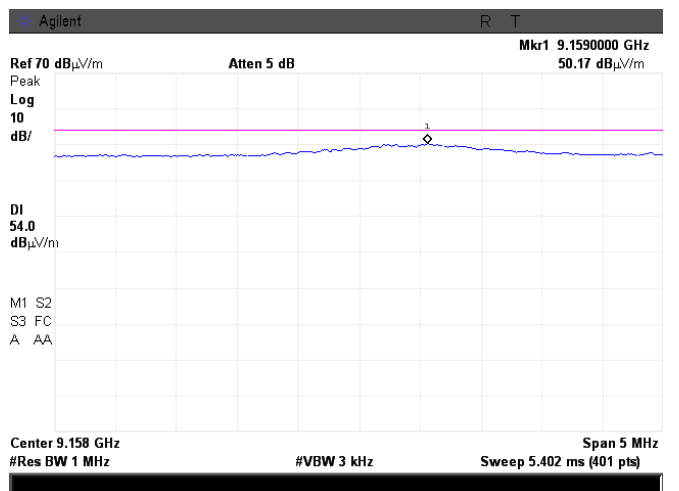
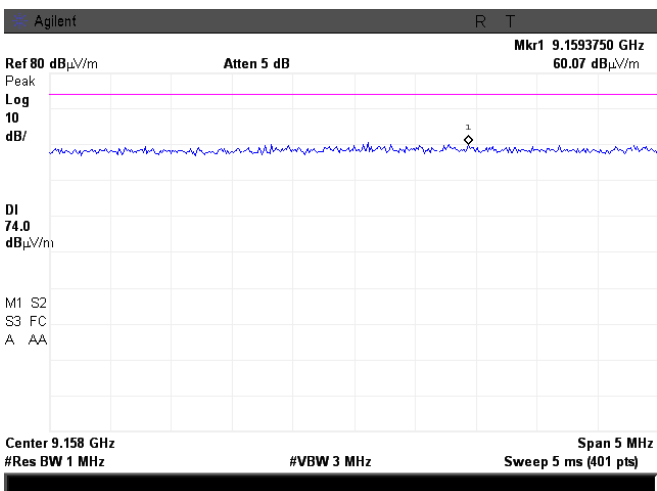
Plot 7.2.30 Radiated emission measurements at the tenth harmonic frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Z-axis



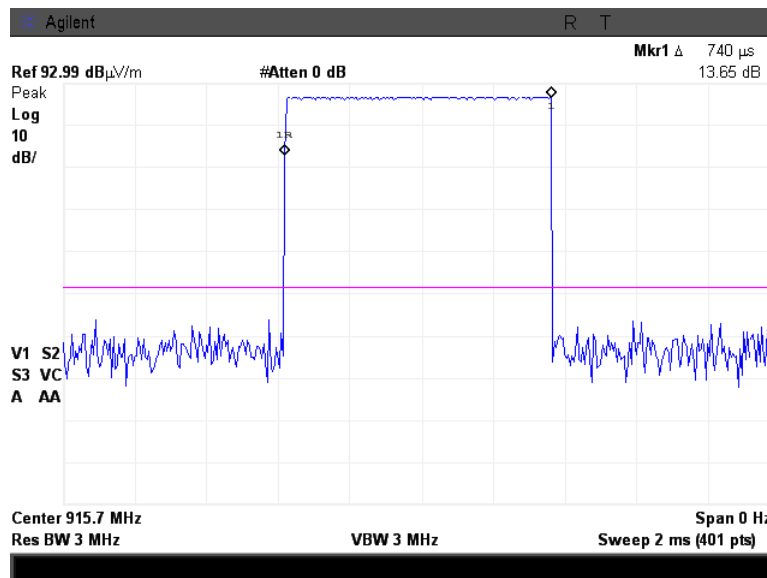
Plot 7.2.31 Radiated emission measurements at the tenth harmonic frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Z-axis

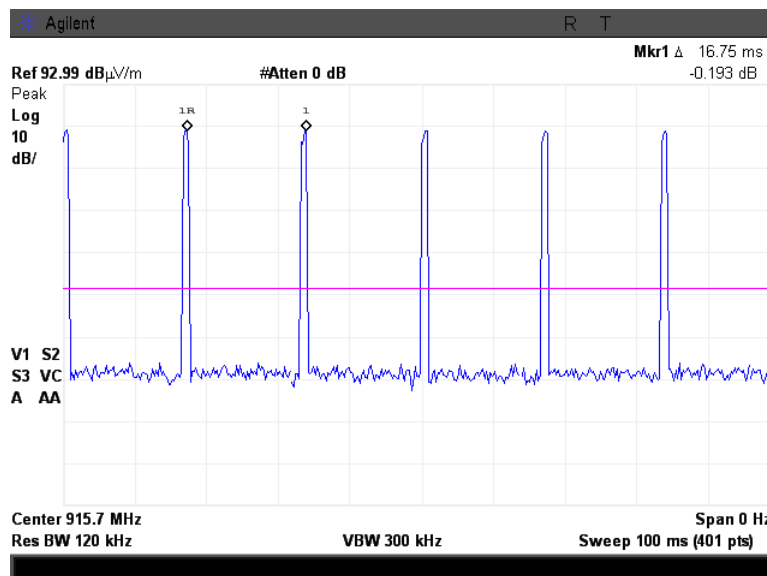


Test specification:		FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		12/18/2011 - 1/1/2012	
Temperature: 20.4 °C	Air Pressure: 1017 hPa	Relative Humidity: 42 %	Power Supply: 3V Battery
Remarks:			

Plot 7.2.32 Transmission pulse duration



Plot 7.2.33 Transmission pulse period



Test specification:		FCC Part 15, Section 231(c) / RSS-210, Section A1.1.3, Occupied bandwidth	
Test procedure:		ANSI C63.4, Section 13.1.7	
Test mode:		Compliance	Verdict: PASS
Date(s):		1/2/2012	
Temperature: 20.5 °C	Air Pressure: 1019 hPa	Relative Humidity: 51 %	Power Supply: 3V Battery
Remarks:			

7.3 Occupied bandwidth test

7.3.1 General

This test was performed to measure transmitter occupied bandwidth. Specification test limits are given in Table 7.3.1.

Table 7.3.1 Occupied bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc	Maximum allowed bandwidth, % of the carrier frequency
70 - 900	20.0	0.25
Above 900		0.50

*- Modulation envelope reference points provided in terms of attenuation below modulated carrier.

7.3.2 Test procedure

7.3.2.1 The EUT was set up as shown in Figure 7.3.1, energized and its proper operation was checked.

7.3.2.2 The EUT was set to transmit modulated carrier.

7.3.2.3 The transmitter occupied bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.3.2 and associated plots.

Figure 7.3.1 Occupied bandwidth test setup





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Report ID: MSTRAD_FCC.22832.doc
Date of Issue: 23-Apr-12

Test specification:		FCC Part 15, Section 231(c) / RSS-210, Section A1.1.3, Occupied bandwidth	
Test procedure:		ANSI C63.4, Section 13.1.7	
Test mode:		Compliance	Verdict: PASS
Date(s):		1/2/2012	
Temperature: 20.5 °C	Air Pressure: 1019 hPa	Relative Humidity: 51 %	Power Supply: 3V Battery
Remarks:			

Table 7.3.2 Occupied bandwidth test results

DETECTOR USED: Peak hold
 RESOLUTION BANDWIDTH: 100 kHz
 VIDEO BANDWIDTH: 300 kHz
 MODULATION ENVELOPE REFERENCE POINTS: 20 dBc
 MODULATION: MSK
 BIT RATE: 250kbps

Carrier frequency, MHz	Occupied bandwidth, kHz	Limit		Margin, kHz	Verdict
		% of the carrier frequency	kHz		
915.95	1270	0.5	4579.75	-3309.75	Pass

Reference numbers of test equipment used

HL 1425	HL 1478	HL 4135						
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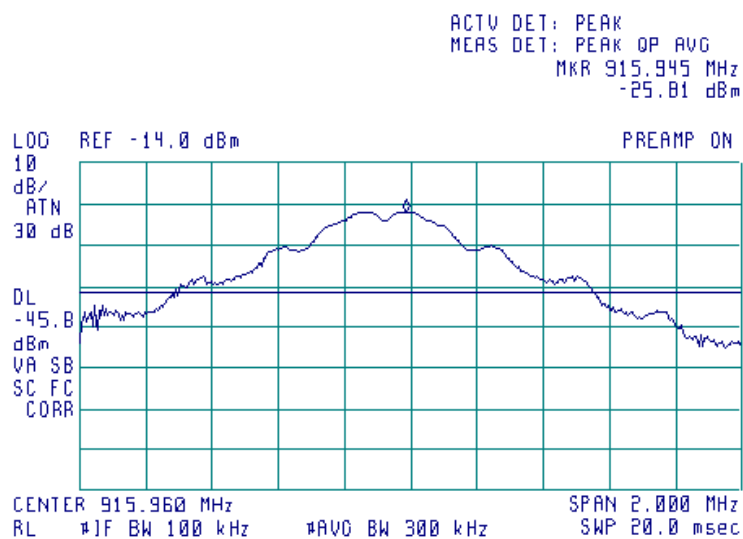
Full description is given in Appendix A.



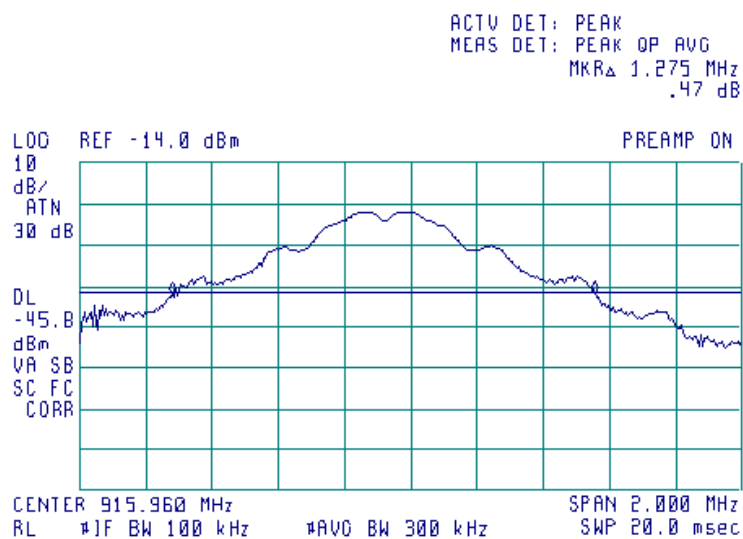
HERMON LABORATORIES

Test specification:		FCC Part 15, Section 231(c) / RSS-210, Section A1.1.3, Occupied bandwidth	
Test procedure:		ANSI C63.4, Section 13.1.7	
Test mode:		Compliance	Verdict: PASS
Date(s):		1/2/2012	
Temperature: 20.5 °C	Air Pressure: 1019 hPa	Relative Humidity: 51 %	Power Supply: 3V Battery
Remarks:			

Plot 7.3.1 Occupied bandwidth test result



Plot 7.3.2 Occupied bandwidth test result



Test specification: FCC Part 15, Section 203 / RSS-Gen, Section 7.1.4, Antenna requirements			
Test procedure: Visual inspection / supplier declaration			
Test mode: Compliance		Verdict: PASS	
Date(s): 1/3/2012			
Temperature: 20.4 °C	Air Pressure: 1017 hPa	Relative Humidity: 42 %	Power Supply: 3V Battery
Remarks:			

7.4 Antenna requirements

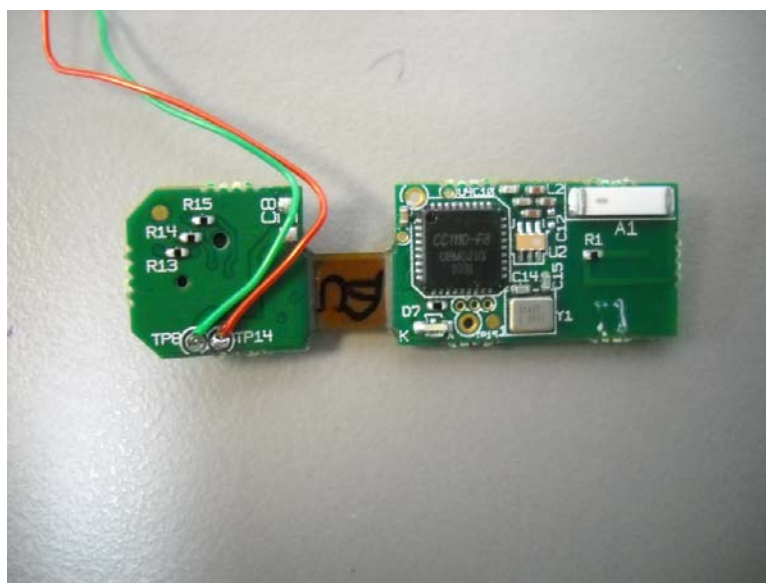
The EUT was verified for compliance with antenna requirements. A transmitter shall be designed to ensure that no antenna other than that furnished by the responsible party will be used with the device. It may be either permanently attached or employs a unique antenna connector for every antenna proposed for use with the EUT. This requirement does not apply to professionally installed transmitters.

The rationale for compliance with the above requirements was either visual inspection results or supplier declaration. The summary of results is provided in Table 7.4.1.

Table 7.4.1 Antenna requirements

Requirement	Rationale	Verdict
The transmitter antenna is permanently attached	Visual inspection	Comply
The transmitter employs a unique antenna connector	NA	
The transmitter requires professional installation	NA	

Photograph 7.4.1 Antenna assembly



Test specification:	FCC Part 15, Section 109 / RSS-Gen, Section 7.2.3 / ICES-003, Class B, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4 / RSS-Gen, Section 4.10 / CISPR 22		
Test mode:	Compliance	Verdict:	PASS
Date(s):	1/1/2012		
Temperature: 20.7 °C	Air Pressure: 1017 hPa	Relative Humidity: 54 %	Power Supply: 3V Battery
Remarks:			

8 Unintentional emissions

8.1 Radiated emission measurements

8.1.1 General

This test was performed to measure radiated emissions from the EUT enclosure. Specification test limits are given in Table 8.1.1, Table 8.1.2.

Table 8.1.1 Radiated emission limits according to FCC Part 15, Section 109

Frequency, MHz	Class B limit, dB(μV/m)		Class A limit, dB(μV/m)	
	10 m distance	3 m distance	10 m distance	3 m distance
30 - 88	29.5*	40.0	39.0	49.5*
88 - 216	33.0*	43.5	43.5	54.0*
216 - 960	35.5*	46.0	46.4	56.9*
960 - 5 th harmonic**	43.5*	54.0	49.5	60.0*

* - The limit for test distance other than specified was calculated using the inverse linear distance extrapolation factor as follows: $\text{Lim}_{S_2} = \text{Lim}_{S_1} + 20 \log(S_1/S_2)$,

where S_1 and S_2 – standard defined and test distance respectively in meters.

** - harmonic of the highest frequency the EUT generates, uses, operates or tunes to.

Table 8.1.2 Radiated emission limits according to ICES-003, Section 5 Class B

Frequency, MHz	Limit, dB(μV/m)	
	10 m distance	3 m distance
30 - 230	30.0	40.0*
230 - 1000	37.0	47.0*

* The limit for 3-m test distance shall be increased by 10 dB.

8.1.2 Test procedure

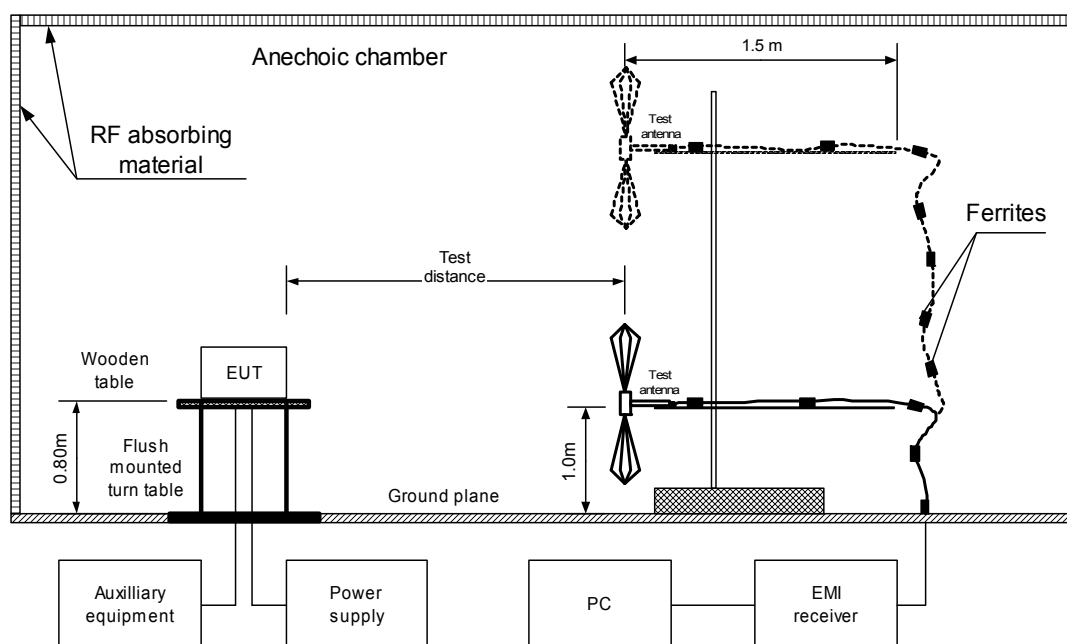
8.1.2.1 The EUT was set up as shown in Figure 8.1.1 and associated photographs, energized and the performance check was conducted.

8.1.2.2 The specified frequency range was investigated with biconilog antenna connected to EMI receiver. To find maximum radiation the turntable was rotated 360°, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal and the EUT cables position was varied.

8.1.2.3 The worst test results (the lowest margins) were provided in the associated tables and plots.

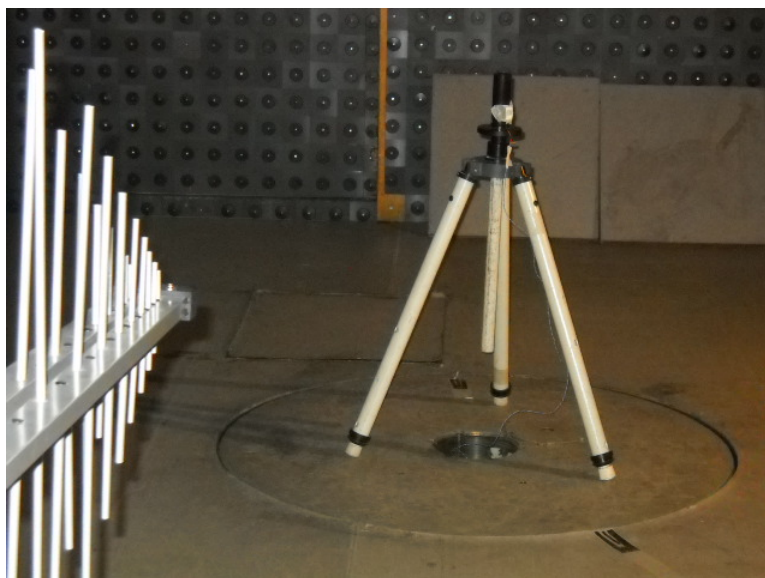
Test specification:		FCC Part 15, Section 109 / RSS-Gen, Section 7.2.3 / ICES-003, Class B, Radiated emission	
Test procedure:		ANSI C63.4, Sections 11.6 and 12.1.4 / RSS-Gen, Section 4.10 / CISPR 22	
Test mode:		Compliance	Verdict: PASS
Date(s):		1/1/2012	
Temperature: 20.7 °C	Air Pressure: 1017 hPa	Relative Humidity: 54 %	Power Supply: 3V Battery
Remarks:			

Figure 8.1.1 Setup for radiated emission measurements in anechoic chamber, table-top equipment

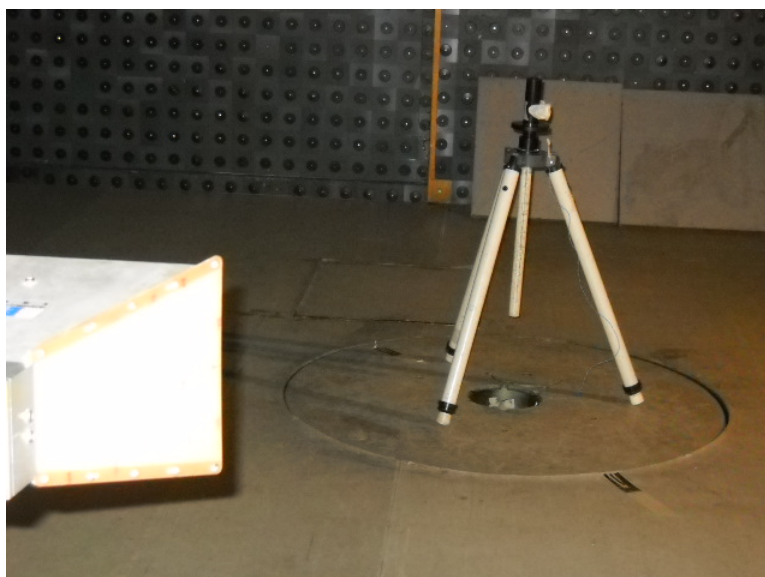


Test specification:	FCC Part 15, Section 109 / RSS-Gen, Section 7.2.3 / ICES-003, Class B, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4 / RSS-Gen, Section 4.10 / CISPR 22		
Test mode:	Compliance	Verdict: PASS	
Date(s):	1/1/2012		
Temperature: 20.7 °C	Air Pressure: 1017 hPa	Relative Humidity: 54 %	Power Supply: 3V Battery
Remarks:			

Photograph 8.1.1 Setup for radiated emission measurements in 30-1000 MHz range



Photograph 8.1.2 Setup for radiated emission measurements in 1000 – 6000 MHz range





Test specification:	FCC Part 15, Section 109 / RSS-Gen, Section 7.2.3 / ICES-003, Class B, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4 / RSS-Gen, Section 4.10 / CISPR 22		
Test mode:	Compliance	Verdict:	PASS
Date(s):	1/1/2012		
Temperature: 20.7 °C	Air Pressure: 1017 hPa	Relative Humidity: 54 %	Power Supply: 3V Battery
Remarks:			

Table 8.1.3 Radiated emission test results

EUT SET UP: TABLE-TOP
LIMIT: Class B
EUT OPERATING MODE: Stand-by
TEST SITE: SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m

DETECTORS USED: PEAK / QUASI-PEAK
FREQUENCY RANGE: 30 MHz – 1000 MHz
RESOLUTION BANDWIDTH: 120 kHz

Resolution Bandwidth: 120 kHz					Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
Frequency, MHz	Peak emission, dB(μV/m)	Quasi-peak						
		Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
No emissions were found								Pass

DETECTORS USED: PEAK / AVERAGE
FREQUENCY RANGE: 1000 MHz – 6000 MHz
RESOLUTION BANDWIDTH: 1000 kHz

RECESSION BANDWIDTH:				1000 KHz			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
Frequency, MHz	Peak			Average						
	Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*	Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
No emissions were found										Pass

*- Margin = Measured emission - specification limit.

** - EUT front panel refer to 0 degrees position of turntable.

Reference numbers of test equipment used

HL 0521	HL 0592	HL 0604	HL 2432	HL 2871	HL 3617		
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Full description is given in Appendix A.

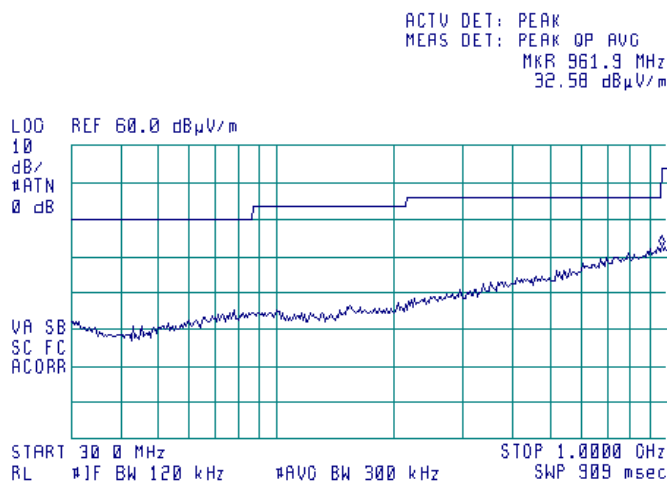


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Test specification:	FCC Part 15, Section 109 / RSS-Gen, Section 7.2.3 / ICES-003, Class B, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4 / RSS-Gen, Section 4.10 / CISPR 22		
Test mode:	Compliance	Verdict:	PASS
Date(s):	1/1/2012		
Temperature: 20.7 °C	Air Pressure: 1017 hPa	Relative Humidity: 54 %	Power Supply: 3V Battery
Remarks:			

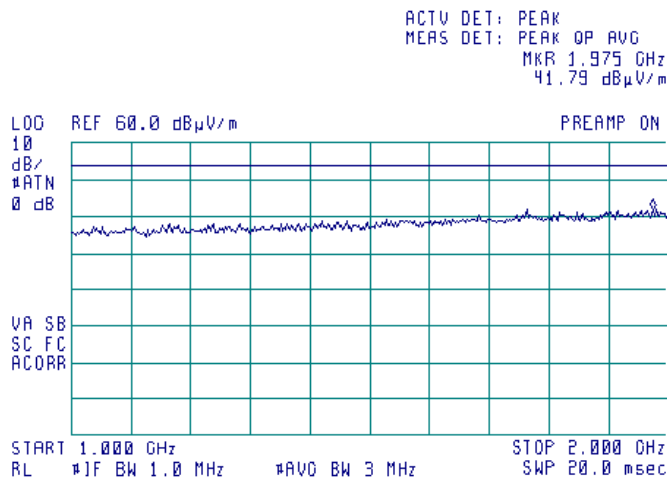
Plot 8.1.1 Radiated emission measurements in 30 - 1000 MHz range, vertical and horizontal antenna polarization

TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Stand-by



Plot 8.1.2 Radiated emission measurements in 1.0 – 2.0 GHz, vertical and horizontal antenna polarization

TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Stand-by





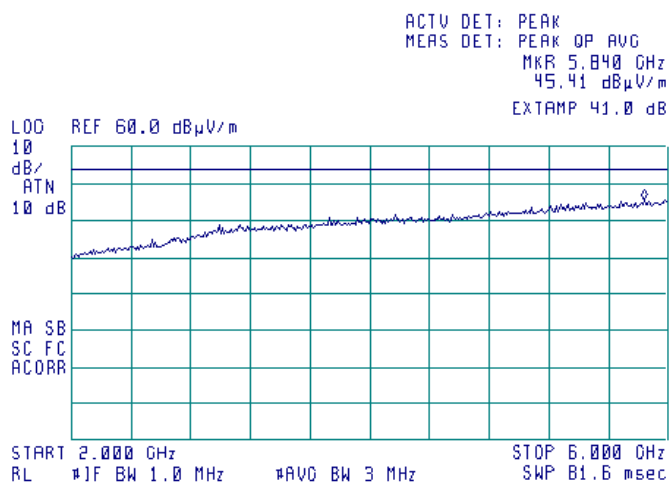
HERMON LABORATORIES

Report ID: MSTRAD_FCC.22832.doc
Date of Issue: 23-Apr-12

Test specification:	FCC Part 15, Section 109 / RSS-Gen, Section 7.2.3 / ICES-003, Class B, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4 / RSS-Gen, Section 4.10 / CISPR 22		
Test mode:	Compliance	Verdict:	PASS
Date(s):	1/1/2012		
Temperature: 20.7 °C	Air Pressure: 1017 hPa	Relative Humidity: 54 %	Power Supply: 3V Battery
Remarks:			

Plot 8.1.3 Radiated emission measurements in 2.0-6.0 GHz, vertical and horizontal antenna polarization

TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Stand-by



9 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	03-Jul-11	03-Jul-12
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A002 53	29-Aug-11	29-Sep-12
0592	Position Controller	Hermon Laboratories	L2-SR3000 (HL CRL-3)	100	12-Feb-12	12-Feb-13
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	11-Jan-11	11-Jan-13
1425	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1426, HL1427	Agilent Technologies	8542E	3710A002 22, 3705A002 04	24-Aug-11	24-Aug-12
1478	Cable, 1 m, N/N-type	Harbour Industries	MIL 17/60-RG142	1478	01-Sep-11	01-Sep-12
2432	Antenna, Double-Ridged Waveguide Horn 1-18 GHz	EMC Test Systems	3115	00027177	25-Nov-11	25-Nov-12
2871	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-8155-00	2871	15-Jan-12	15-Jan-13
3617	Cable RF, 6.5 m, N type-N type, DC-6.5 GHz	Suhner Switzerland	RG 214/U	NA	19-May-11	19-May-12
4135	Shield Box	TESCOM CO., LTD	TC-5916A	5916A000 136	10-Apr-11	10-Apr-12

10 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Radiated emissions at 10 m measuring distance Horizontal polarization	Biconilog antenna: ± 5.0 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.1 dB Double ridged horn antenna: ± 5.3 dB
Vertical polarization	Biconilog antenna: ± 5.5 dB Biconical antenna: ± 5.5 dB Log periodic antenna: ± 5.6 dB Double ridged horn antenna: ± 5.8 dB
Radiated emissions at 3 m measuring distance Horizontal polarization	Biconilog antenna: ± 5.3 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB
Vertical polarization	Biconilog antenna: ± 6.0 dB Biconical antenna: ± 5.7 dB Log periodic antenna: ± 6.0 dB Double ridged horn antenna: ± 6.0 dB
Duty cycle, timing (Tx ON / OFF) and average factor measurements	± 1.0 %
Occupied bandwidth	± 8.0 %

Hermon Laboratories is accredited by A2LA for calibration according to present requirements of ISO/IEC 17025 and NCSL Z540-1. The accreditation is granted to perform calibration of parameters that are listed in the Scope of Hermon Laboratories Accreditation.

Hermon Laboratories calibrates its reference and transfer standards by calibration laboratories accredited to ISO/IEC 17025 by a mutually recognized Accreditation Body or by a recognized national metrology institute. All reference and transfer standards used in the calibration system are traceable to national or international standards.

In-house calibration of all test and measurement equipment is performed on a regular basis according to Hermon Laboratories calibration procedures, manufacturer calibration/verification procedures or procedures defined in the relevant standards. The Hermon Laboratories test and measurement equipment is calibrated within the tolerances specified by the manufacturers and/or by the relevant standards.

11 APPENDIX C Test laboratory description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, safety, environmental and telecommunication testing facility.

Hermon Laboratories is listed by the Federal Communications Commission (USA) for all parts of Code of Federal Regulations 47 (CFR 47), Registration Numbers 90624 for OATS and 90623 for the anechoic chamber; by Industry Canada for electromagnetic emissions (file numbers IC 2186A-1 for OATS, IC 2186A-2 for anechoic chamber, IC 2186A-3 for full-anechoic chamber for RE measurements above 1 GHz), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, G-27 for full-anechoic chamber for RE measurements above 1 GHz, C-845 for conducted emissions site, T-1606 for conducted emissions at telecommunication ports), has a status of a Telefication - Listed Testing Laboratory, Certificate No. L138/00. The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing and environmental simulation (for exact scope please refer to Certificate No. 839.01). The FCC Designation Number is US1003.

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e-mail: mail@hermonlabs.com
website: www.hermonlabs.com

Person for contact: Mr. Alex Usoskin, CEO.

12 APPENDIX D Specification references

47CFR part 15: 2011	Radio Frequency Devices.
ANSI C63.2: 1996	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications.
ANSI C63.4: 2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
RSS-210 Issue 8: 2010	Low Power Licence- Exempt Radiocommunication Devices
RSS-Gen Issue 3, September 2010	General Requirements and Information for the certification of Radiocommunication Equipment
ICES-003 Issue 4: 2004	Digital Apparatus
CAN/CSA-CEI/IEC CISPR 22: 2002	Information Technology Equipment- Radio Disturbance Characteristics- Limits and Methods of measurement

13 APPENDIX E Test equipment correction factors

Antenna factor
Active loop antenna
Model 6502, S/N 2857, HL 0446

Frequency, MHz	Magnetic antenna factor, dB	Electric antenna factor, dB
0.009	-32.8	18.7
0.010	-33.8	17.7
0.020	-38.3	13.2
0.050	-41.1	10.4
0.075	-41.3	10.2
0.100	-41.6	9.9
0.150	-41.7	9.8
0.250	-41.6	9.9
0.500	-41.8	9.8
0.750	-41.9	9.7
1.000	-41.4	10.1
2.000	-41.5	10.0
3.000	-41.4	10.2
4.000	-41.4	10.1
5.000	-41.5	10.1
10.000	-41.9	9.6
15.000	-41.9	9.6
20.000	-42.2	9.3
25.000	-42.8	8.7
30.000	-44.0	7.5

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μ V) to convert it into field intensity in dB(μ V/m).

Antenna factor
Biconilog antenna EMCO Model 3141
Ser.No.1011, HL 0604

Frequency, MHz	Antenna Factor, dB(1/m)	Frequency, MHz	Antenna Factor, dB(1/m)
26	7.8	940	24.0
28	7.8	960	24.1
30	7.8	980	24.5
40	7.2	1000	24.9
60	7.1	1020	25.0
70	8.5	1040	25.2
80	9.4	1060	25.4
90	9.8	1080	25.6
100	9.7	1100	25.7
110	9.3	1120	26.0
120	8.8	1140	26.4
130	8.7	1160	27.0
140	9.2	1180	27.0
150	9.8	1200	26.7
160	10.2	1220	26.5
170	10.4	1240	26.5
180	10.4	1260	26.5
190	10.3	1280	26.6
200	10.6	1300	27.0
220	11.6	1320	27.8
240	12.4	1340	28.3
260	12.8	1360	28.2
280	13.7	1380	27.9
300	14.7	1400	27.9
320	15.2	1420	27.9
340	15.4	1440	27.8
360	16.1	1460	27.8
380	16.4	1480	28.0
400	16.6	1500	28.5
420	16.7	1520	28.9
440	17.0	1540	29.6
460	17.7	1560	29.8
480	18.1	1580	29.6
500	18.5	1600	29.5
520	19.1	1620	29.3
540	19.5	1640	29.2
560	19.8	1660	29.4
580	20.6	1680	29.6
600	21.3	1700	29.8
620	21.5	1720	30.3
640	21.2	1740	30.8
660	21.4	1760	31.1
680	21.9	1780	31.0
700	22.2	1800	30.9
720	22.2	1820	30.7
740	22.1	1840	30.6
760	22.3	1860	30.6
780	22.6	1880	30.6
800	22.7	1900	30.6
820	22.9	1920	30.7
840	23.1	1940	30.9
860	23.4	1960	31.2
880	23.8	1980	31.6
900	24.1	2000	32.0
920	24.1		

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μ V) to convert it into field intensity in dB(μ V/m).

S

Antenna factor
Double-ridged guide horn antenna
Model 3115, serial number: 00027177, HL 2432

Frequency, MHz	Antenna factor. dB(1/m)
1000.0	24.7
1500.0	25.7
2000.0	27.8
2500.0	28.9
3000.0	30.7
3500.0	31.8
4000.0	33.0
4500.0	32.8
5000.0	34.2
5500.0	34.9
6000.0	35.2
6500.0	35.4
7000.0	36.3
7500.0	37.3
8000.0	37.5
8500.0	38.0
9000.0	38.3
9500.0	38.3
10000.0	38.7
10500.0	38.7
11000.0	38.9
11500.0	39.5
12000.0	39.5
12500.0	39.4
13000.0	40.5
13500.0	40.8
14000.0	41.5
14500.0	41.3
15000.0	40.2
15500.0	38.7
16000.0	38.5
16500.0	39.8
17000.0	41.9
17500.0	45.8
18000.0	49.1

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μ V) to convert it into field strength in dB(μ V/m).

Cable loss
Cable coaxial, Huber-Suhner, 18 GHz, 6.4 m, SMA - SMA, model 198-8155-00,
HL 2871

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.12	5750	2.34	12000	3.55
30	0.14	6000	2.39	12250	3.61
100	0.27	6250	2.46	12500	3.67
250	0.45	6500	2.52	12750	3.74
500	0.63	6750	2.58	13000	3.79
750	0.76	7000	2.64	13250	3.82
1000	0.89	7250	2.68	13500	3.83
1250	1.01	7500	2.73	13750	3.83
1500	1.12	7750	2.78	14000	3.88
1750	1.23	8000	2.83	14250	3.93
2000	1.32	8250	2.88	14500	3.96
2250	1.41	8500	2.94	14750	4.01
2500	1.49	8750	2.97	15000	4.00
2750	1.58	9000	3.02	15250	4.01
3000	1.66	9250	3.07	15500	4.00
3250	1.73	9500	3.13	15750	4.13
3500	1.80	9750	3.18	16000	4.22
3750	1.87	10000	3.21	16250	4.29
4000	1.93	10250	3.26	16500	4.29
4250	2.01	10500	3.30	16750	4.32
4500	2.06	10750	3.36	17000	4.37
4750	2.12	11000	3.39	17250	4.45
5000	2.17	11250	3.44	17500	4.49
5250	2.24	11500	3.48	17750	4.53
5500	2.29	11750	3.52	18000	4.55

Cable loss
Cable coaxial, RG-214/U, N type-N type, 6.5 m
Suhner Switzerland, HL 3617

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.13	2200	2.97	4500	5.10
50	0.33	2300	3.06	4600	5.20
100	0.48	2400	3.16	4700	5.34
200	0.71	2500	3.23	4800	5.36
300	0.89	2600	3.34	4900	5.48
400	1.04	2700	3.42	5000	5.52
500	1.19	2800	3.52	5100	5.61
600	1.32	2900	3.61	5200	5.72
700	1.44	3000	3.69	5300	5.81
800	1.56	3100	3.80	5400	5.93
900	1.68	3200	3.86	5500	6.08
1000	1.80	3300	3.98	5600	6.12
1100	1.90	3400	4.07	5700	6.25
1200	2.00	3500	4.14	5800	6.31
1300	2.11	3600	4.27	5900	6.41
1400	2.21	3700	4.36	6000	6.51
1500	2.30	3800	4.47	6100	6.62
1600	2.40	3900	4.62	6200	6.73
1700	2.49	4000	4.63	6300	6.86
1800	2.61	4100	4.76	6400	6.94
1900	2.69	4200	4.83	6500	7.06
2000	2.79	4300	4.89		
2100	2.88	4400	5.04		

14 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
AM	amplitude modulation
AVRG	average (detector)
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(μ V)	decibel referred to one microvolt
dB(μ V/m)	decibel referred to one microvolt per meter
dB(μ A)	decibel referred to one microampere
DC	direct current
EIRP	equivalent isotropically radiated power
ERP	effective radiated power
EUT	equipment under test
F	frequency
GHz	gigahertz
GND	ground
H	height
HL	Hermon laboratories
Hz	hertz
k	kilo
kHz	kilohertz
LO	local oscillator
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μ s	microsecond
NA	not applicable
NB	narrow band
OATS	open area test site
Ω	Ohm
PM	pulse modulation
PS	power supply
ppm	part per million (10^{-6})
QP	quasi-peak
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
WB	wideband

END OF DOCUMENT