



TEST REPORT

Report Number: 101682710MIN-001

Project Number: G101682710

Testing performed on the
52WM-3T, 52WM-T, 52WM-TH, Class II Permissive Changes
FCC ID: RYR52WM

to
47 CFR Part 15.247:2013

For
Therm-O-Disc Inc.

Test Performed by:
Intertek Testing Services NA, Inc.
7250 Hudson Blvd., Suite 100
Oakdale, MN 55128 USA

Test Authorized by:
Therm-O-Disc Inc.
1320 South Main Street
Mansfield, OH 44907 USA

Prepared by: U. Spector
Uri Spector

Date: June 25, 2014

Reviewed by: S. Khazon
Simon Khazon

Date: June 25, 2014

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1.0 GENERAL DESCRIPTION

Model:	52WM-3T, 52WM-T, 52WM-TH The 52WM-3T, 52WM-T, and 52WM-TH are based on the 52WM main board with previously certified RF operation, FCC ID: RYR52WM. The 52WM-3T, 52WM-T, and 52WM-TH are contains temperature / humidity sensor(s). The 52WM-3T Device was partially tested only for Class II Permissive Changes as contains sensor string includes three temperature sensors.
Type of EUT:	MiniTemp Temperature Wireless Sensor
Intertek Sample ID:	MIN1406251339-002
FCC ID:	RYR52WM
Related Submittal(s) Grants:	Class II Permissive Changes
Company:	Therm-O-Disc
Customer:	Mr. Tuong Nguyen
Address:	1320 South Main Street Mansfield, OH 44907 USA
Phone:	(419) 525-8382
Fax:	(419) 525-8365
e-mail:	Tuong.Nguyen@Emerson.com
Test Standards:	<input checked="" type="checkbox"/> 47 CFR, Part 15:2013, §15.247 <input type="checkbox"/> RSS-210, Issue 8, 2010 <input type="checkbox"/> RSS-Gen, Issue 3, 2010 <input type="checkbox"/> 47 CFR, Part 15:2013, §15.107 and §15.109, Class <input type="checkbox"/> ICES-003, Issue 4:2004 <input type="checkbox"/> Other
Type of radio:	<input checked="" type="checkbox"/> Stand -alone <input type="checkbox"/> Module <input type="checkbox"/> Hybrid
Date Sample Submitted:	June 23, 2014
Test Work Started:	June 23, 2014
Test Work Completed:	June 25, 2014
Test Sample Conditions:	<input type="checkbox"/> Damaged <input type="checkbox"/> Poor (Usable) <input checked="" type="checkbox"/> Good



1.1 Product Description; Test Facility

Product Description:	2.4 – 2.4835GHz Transceiver
Transmitter Type:	<input type="checkbox"/> FHSS <input checked="" type="checkbox"/> Digital Modulation <input type="checkbox"/> WiFi <input type="checkbox"/> Blue Tooth
Operating Frequency Range(s):	From 2400 to 2483.5 MHz
Number of Channels:	16 (from channel 0 to 15)
Modulation:	O-QPSK
Emission Designator:	1M56G1D
Antenna(s) Info:	Type: Omnidirectional Chip Antenna, Gain: 1.7dBi <input checked="" type="checkbox"/> RF connector provided
Antenna Installation:	<input type="checkbox"/> User <input type="checkbox"/> Professional <input checked="" type="checkbox"/> Factory
Transmitter power configuration:	<input checked="" type="checkbox"/> Internal battery <input type="checkbox"/> External power source <input type="checkbox"/> 120VAC <input type="checkbox"/> 230VAC <input type="checkbox"/> 400VAC <input checked="" type="checkbox"/> 7.2VDC <input type="checkbox"/> Other: <input type="text"/> <input type="text"/> Amp. <input type="checkbox"/> 50Hz <input type="checkbox"/> 60Hz
Special Test Arrangement:	N/A
Test Facility Accreditation:	A2LA (Certificate No. 1427.01)
Test Methodology:	Measurements performed according to the procedures in ANSI C63.10-2009 and FCC DTS Measurement Guide

1.2 EUT Configuration

The equipment under test was operated during the measurement under the following conditions:

- ☐ - Standby
- ☒ - Continuous transmissions (modulated signal)
- ☒ - Continuous transmissions (un-modulated signal)
- ☐ - Continuous receiving
- ☐ - Test program (customer specific)
- ☐ - [REDACTED]

Operating modes of the EUT:

No.	Description
1	Test was performed at low channel, middle channel, and upper channel

Cables:

No.	Type	Length	Designation	Note
1	Unshielded	<3m	Sensor Interface Cable	

Support equipment/Services:

No.	Item	Description
1	Laptop PC	

General Note: The RF portion was not modified. Interface sensor board and sensor were added to the EUT. Maximum Output and Spurious Radiated Emissions were measured and RF exposure was calculated.

1.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

☒ **Normal**

Temperature:	+15 to +35 ° C
Humidity:	20-75 %
Atmospheric pressure:	86-106 kPa

☐ **Extreme**

<input type="checkbox"/> Temperature:	-20 to +50 ° C
<input type="checkbox"/> Supply voltage:	85% to +115%

1.4 Measurement uncertainty

The expanded uncertainty ($k = 2$) for radiated measurements has been determined to be:

± 4 dB at 10m and ± 5.4 dB at 3m

The expanded uncertainty ($k = 2$) for conducted measurements at antenna terminal has been determined to be:

± 1.0 dB

The expanded uncertainty ($k = 2$) for line conducted measurements has been determined to be:

± 2.6 dB

1.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured emissions reading on the EMI Receiver.

The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where: FS = Field Strength in dB(μ V/m)

RA = Receiver Amplitude in dB(μ V)

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB(m^{-1})

AG = Amplifier Gain in dB

Assume a receiver reading of 48.1 dB(μ V) is obtained. The antenna factor of 7.4 dB(m^{-1}) and cable factor of 1.6 dB is added and amplifier gain of 16.0 dB is subtracted giving field strength of 41.1 dB(μ V/m).

$$RA = 48.1 \text{ dB}(\mu\text{V})$$

$$AF = 7.4 \text{ dB}(m^{-1})$$

$$CF = 1.6 \text{ dB}$$

$$AG = 16.0 \text{ dB}$$

$$FS = RA + AF + CF - AG$$

$$FS = 48.1 + 7.4 + 1.6 - 16.0$$

$$FS = 41.1 \text{ dB}(\mu\text{V}/m)$$

General notes:

2.0 TEST SUMMARY

Referring to the performance criteria and the operating mode during the tests specified in this report, the equipment complies with the requirements according to the following standards.

TEST SPECIFICATION	TEST PARAMETERS	RESULT
15.247(b), (c) / RSS-210 A8.4	Maximum peak output power	Pass
15.247(d) / RSS-210 A8.5	Radiated spurious emissions	Pass
15.247(i) / RSS- Gen 5.5	RF Exposure Compliance	Pass

3.0 TEST CONDITIONS AND RESULTS

3.1 Maximum peak output power

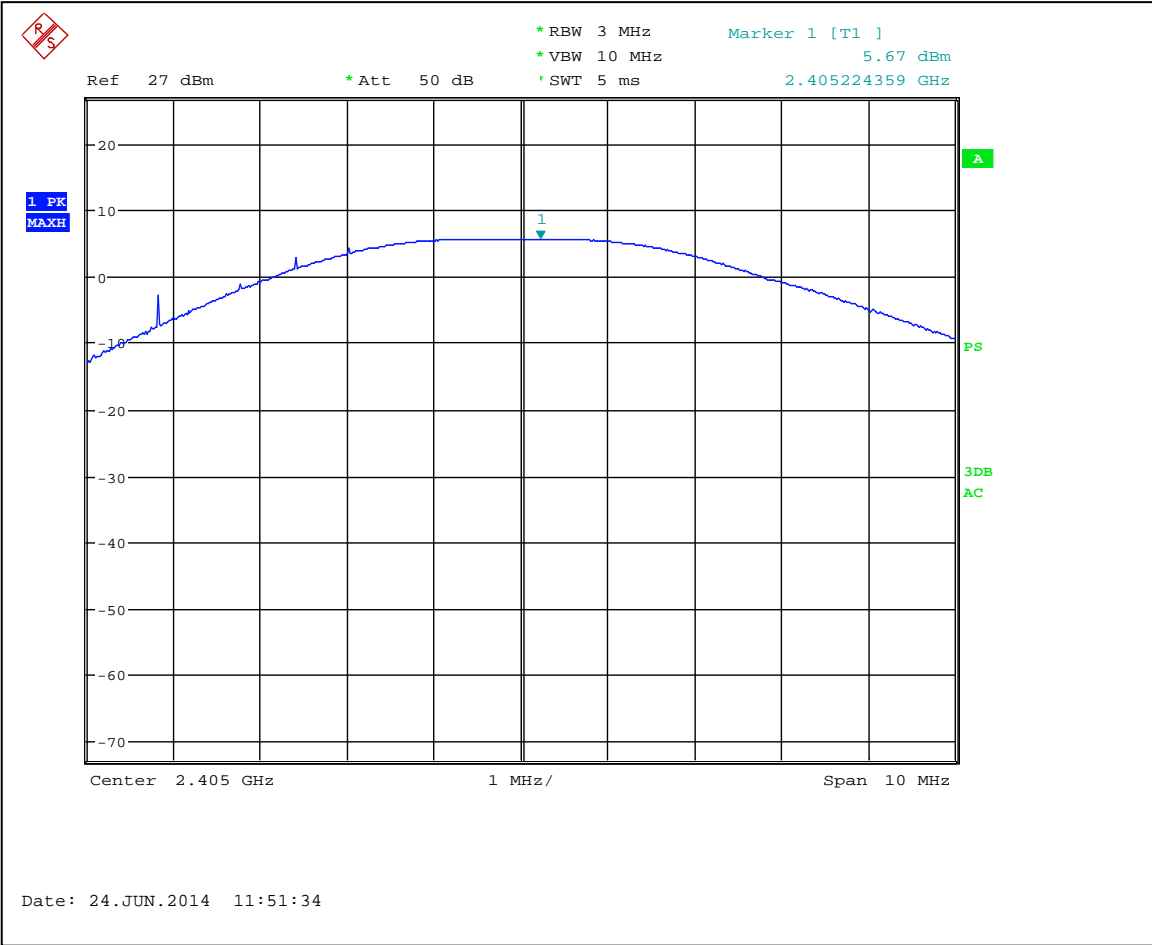
Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test result: **Pass**

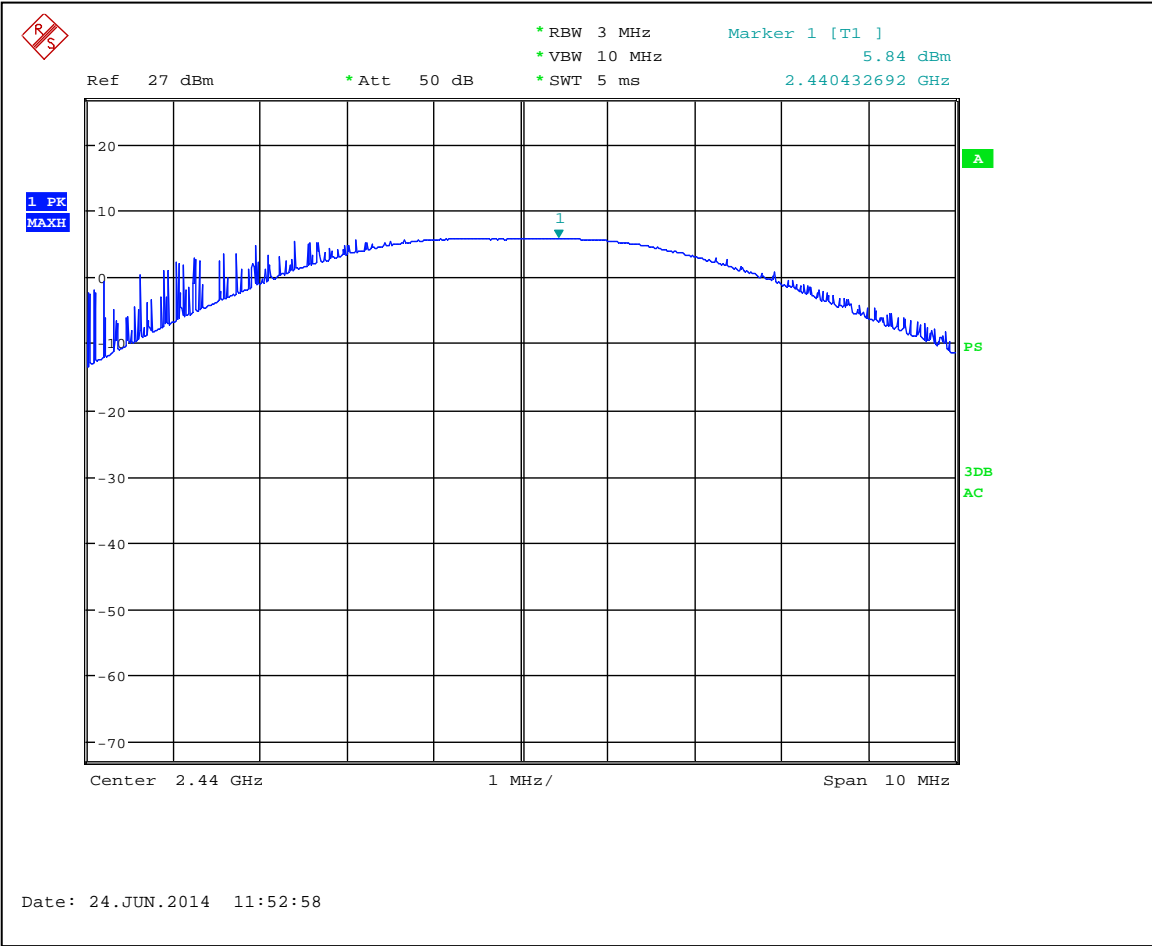
Max. Margin: 22.46dB below the limits

Power Output:	Conducted					
Frequency Range:	<input type="checkbox"/> 902-928MHz <input checked="" type="checkbox"/> 2400-2483.5MHz <input type="checkbox"/> 5725-5850MHz					
Low Frequency MHz	Measured power dBm	Attenuation dB	Power at Antenna dBm	Limit dBm	Limit Reduction dB	Margin dB
2405	5.67	1.70	7.37	30	0	-22.63
Middle Frequency MHz						
2440	5.84	1.70	7.54	30	0	-22.46
Upper Frequency MHz						
2475	5.28	1.70	6.98	30	0	-23.02
RBW:	<input type="checkbox"/> 1MHz <input checked="" type="checkbox"/> 3MHz <input type="checkbox"/> 10MHz					
VBW:	<input type="checkbox"/> 1MHz <input type="checkbox"/> 3MHz <input checked="" type="checkbox"/> 10MHz					
Antenna Gain:	<input checked="" type="checkbox"/> < 6dBi <input type="checkbox"/> >6dBi and = dBi, Output power reduction = dB					

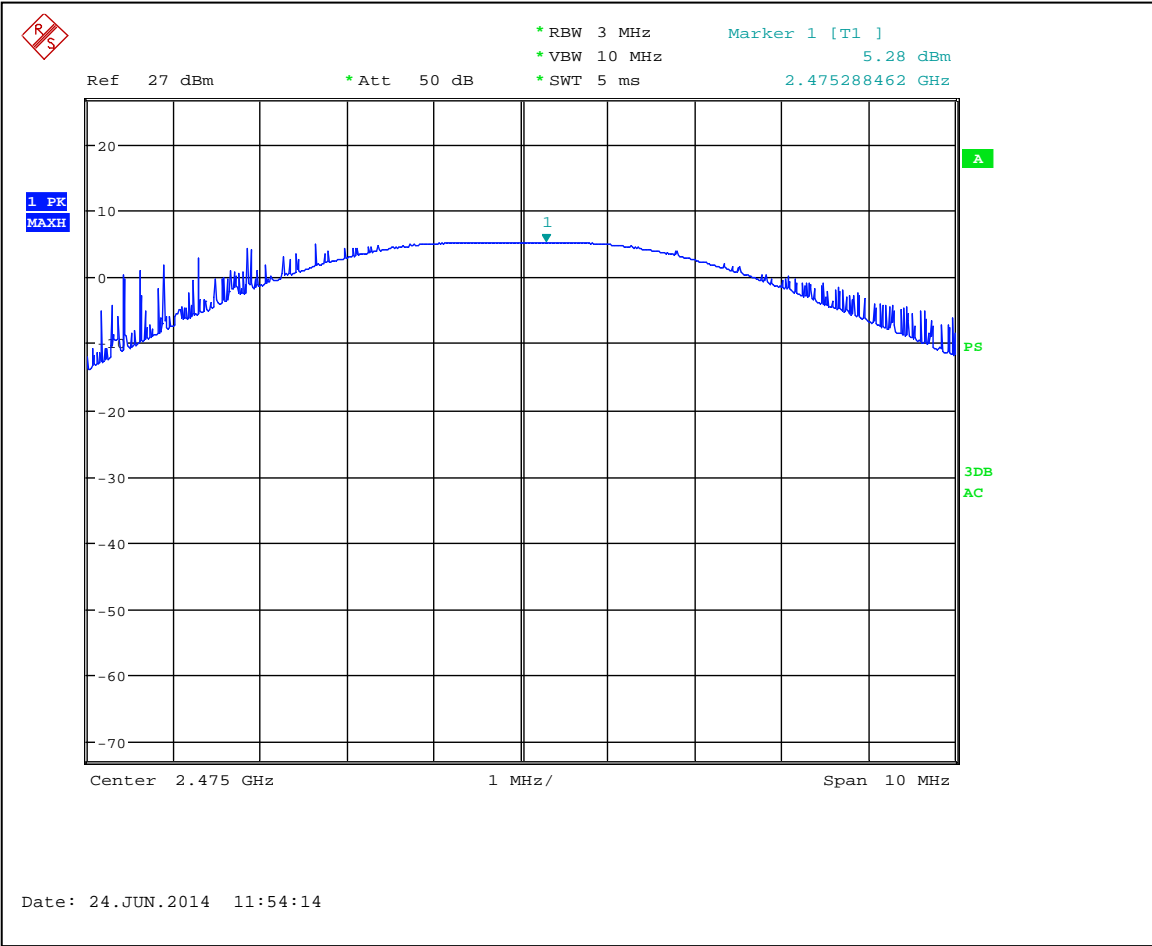
Notes:



Graph 3.1.1



Graph 3.1.2



Graph 3.1.3



3.2 Radiated spurious emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

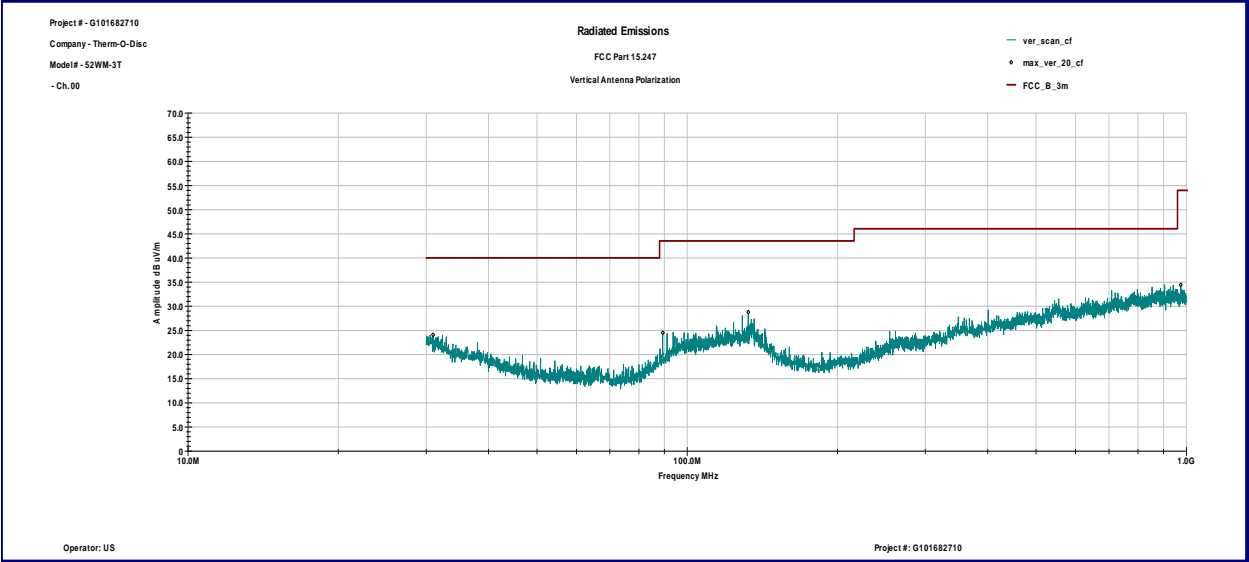
Test distance: ☐ 10 meters ☒ 3 meters

Frequency Range: 30MHz to 25GHz (10th Harmonic)

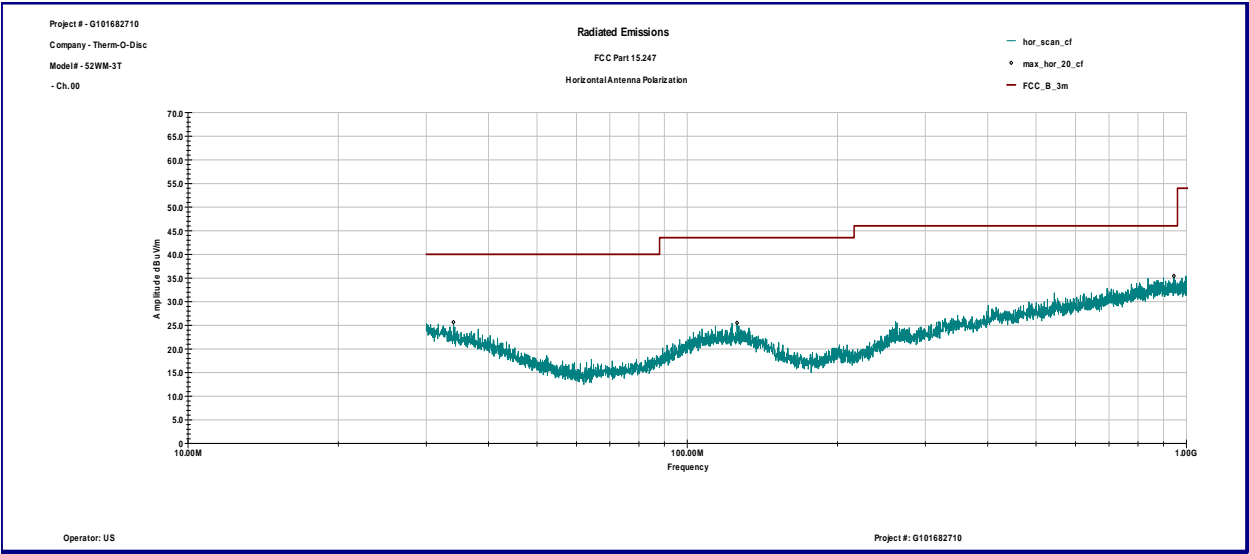
Test result: **Pass**

Max. Margin: dB below the limits

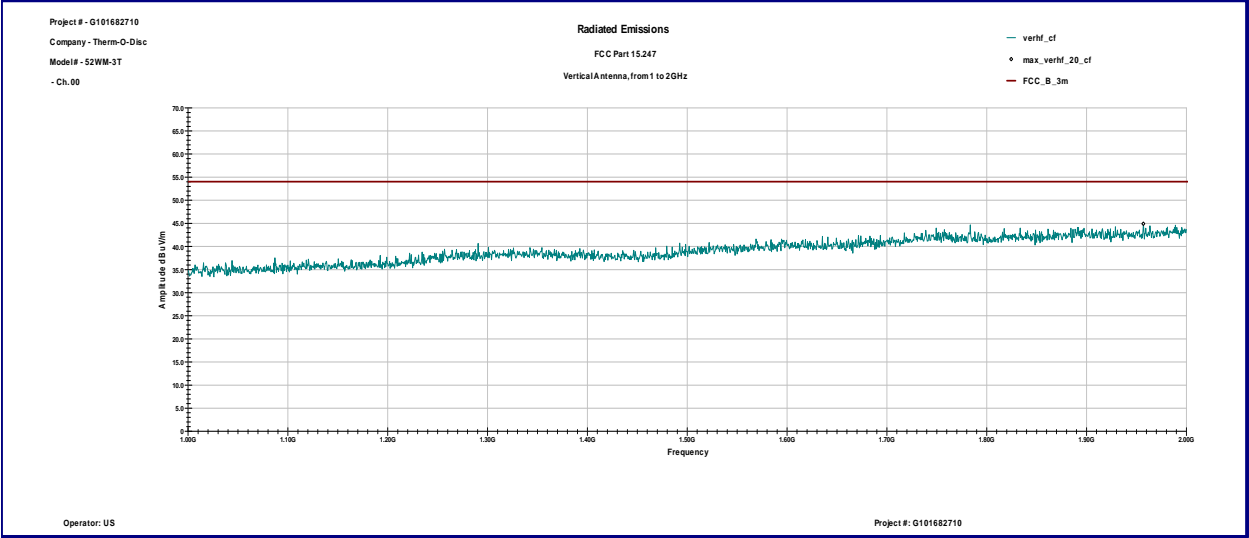
Date:	June 23-25, 2014	Result: Pass
Standard:	FCC part 15.247(d)	
Tested by:	Uri Spector	
Test Point:	Enclosure	
Operation mode:	See Page 5	
Note:	Emissions at fundamental frequency and spurious emissions not related with transmitter operations were excluded from the Table. No spurious emissions and harmonics were detected above the ambient noise (see Graphs 3.2.1 - 3.2.30) Testing was performed at Low, Middle and Upper channels.	



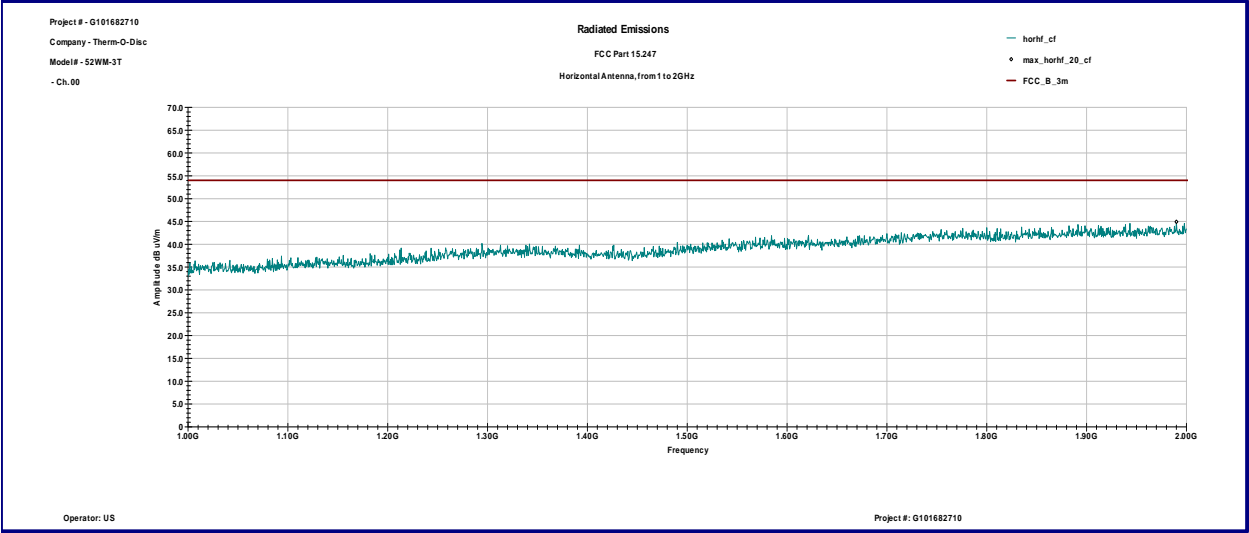
Graph 3.2.1



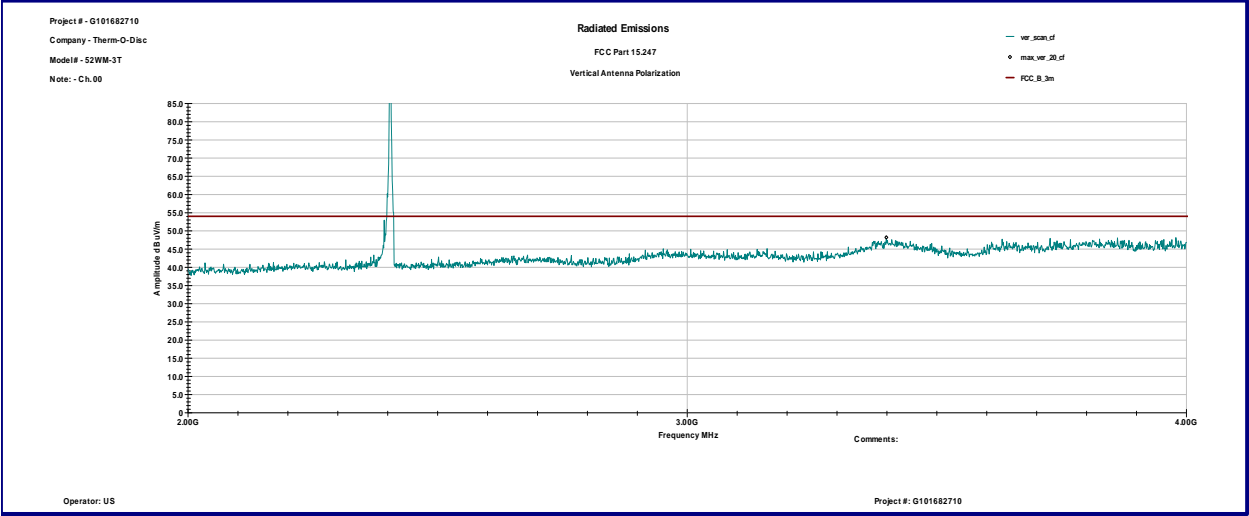
Graph 3.2.2



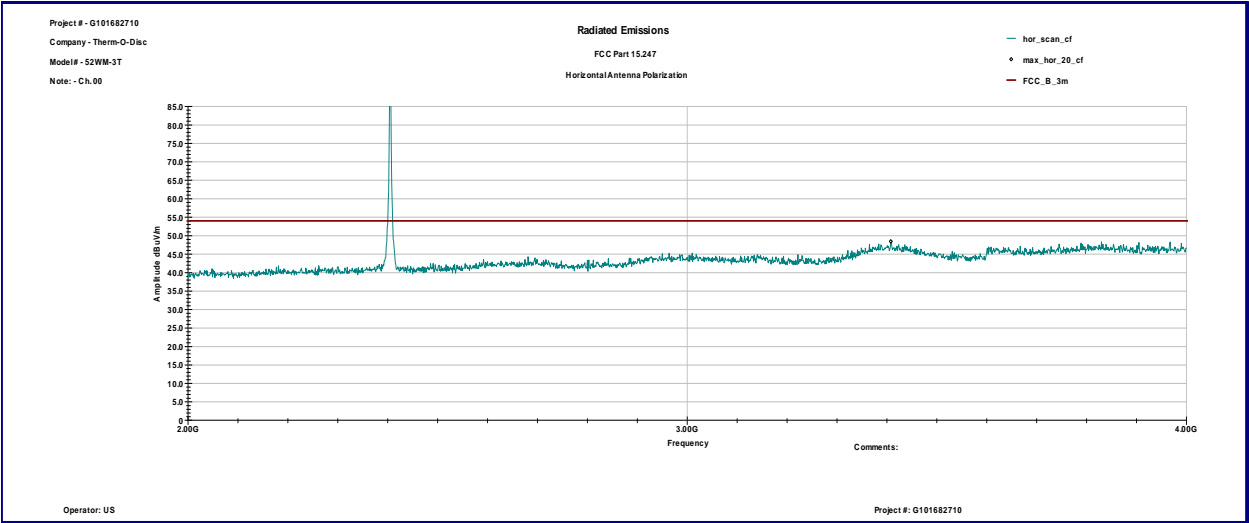
Graph 3.2.3



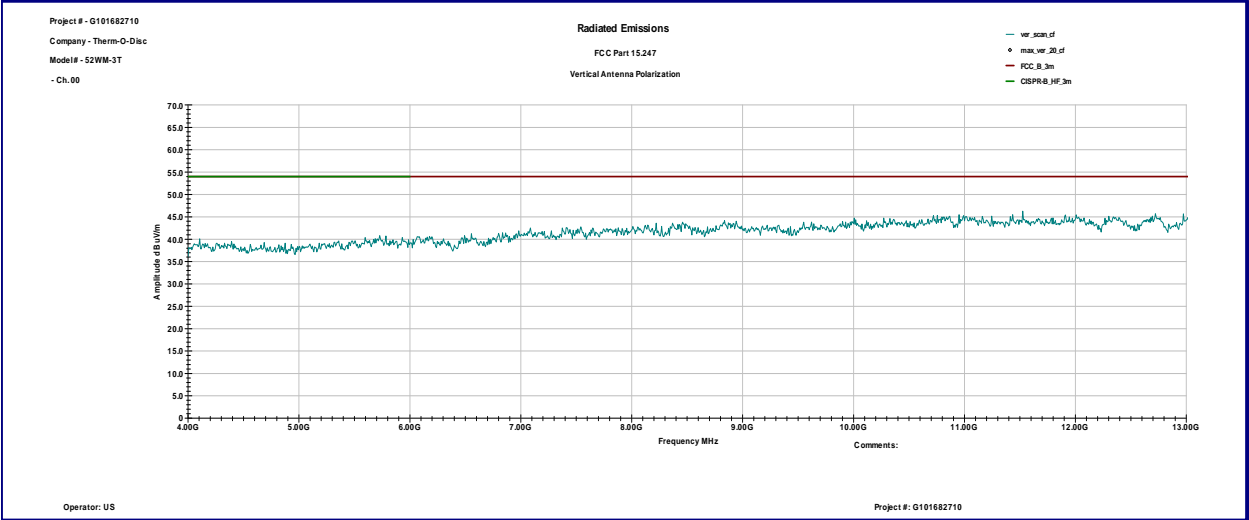
Graph 3.2.4



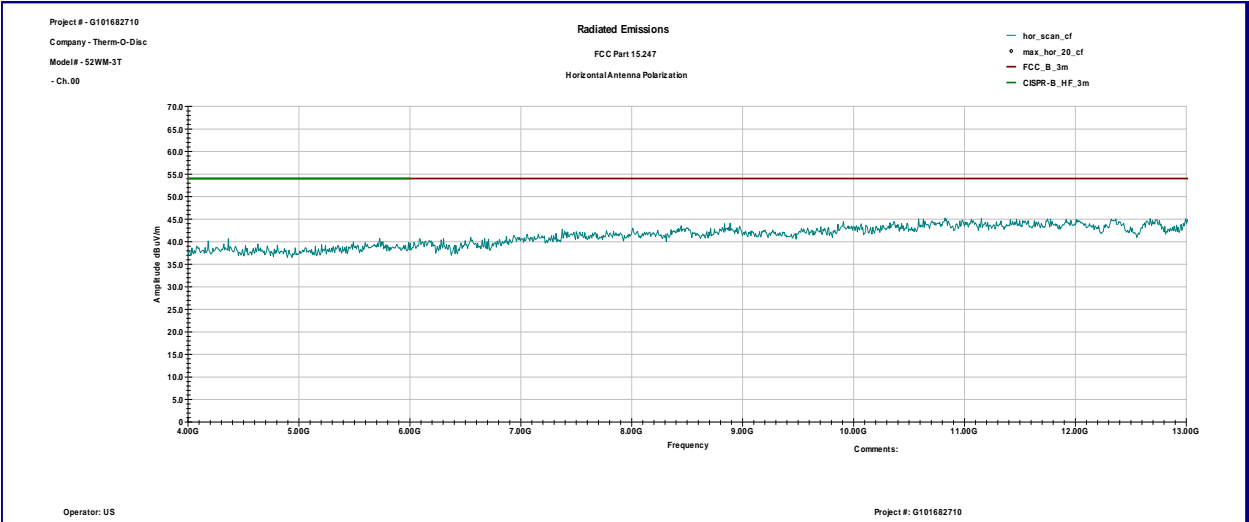
Graph 3.2.5



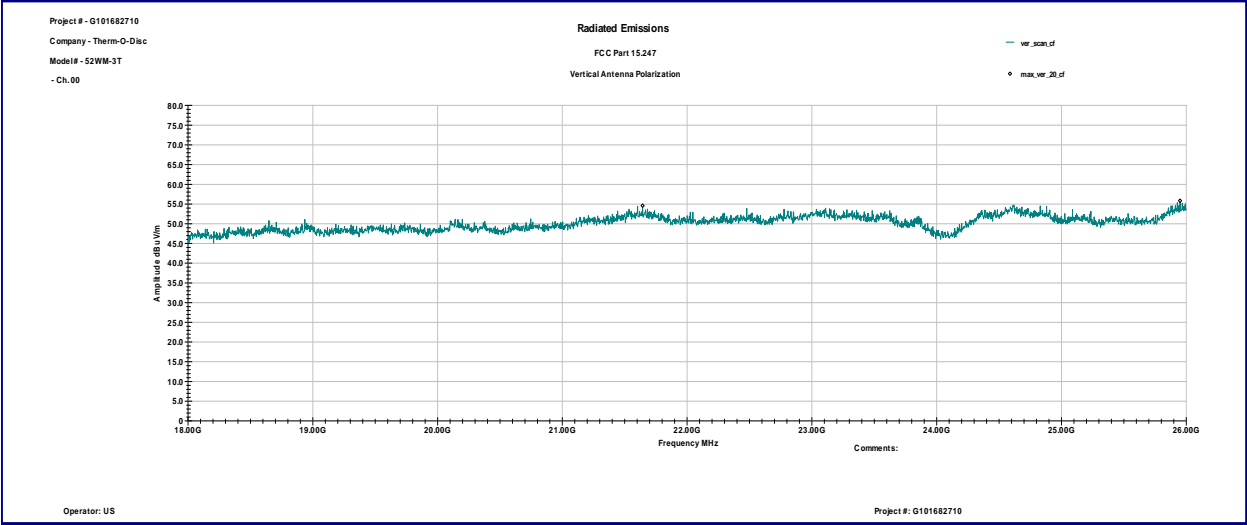
Graph 3.2.6



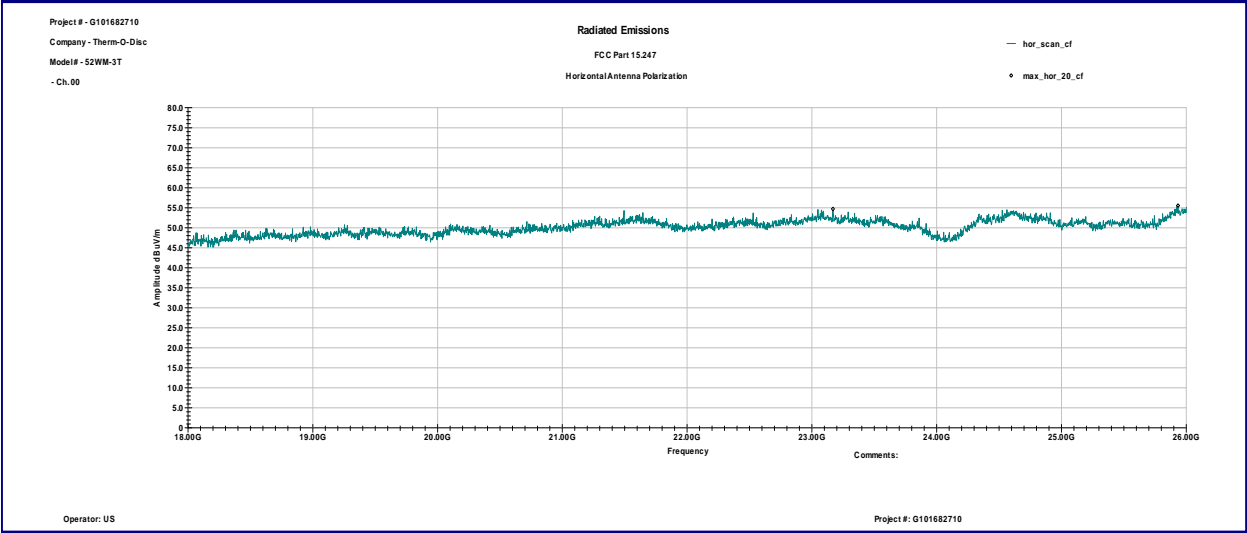
Graph 3.2.7



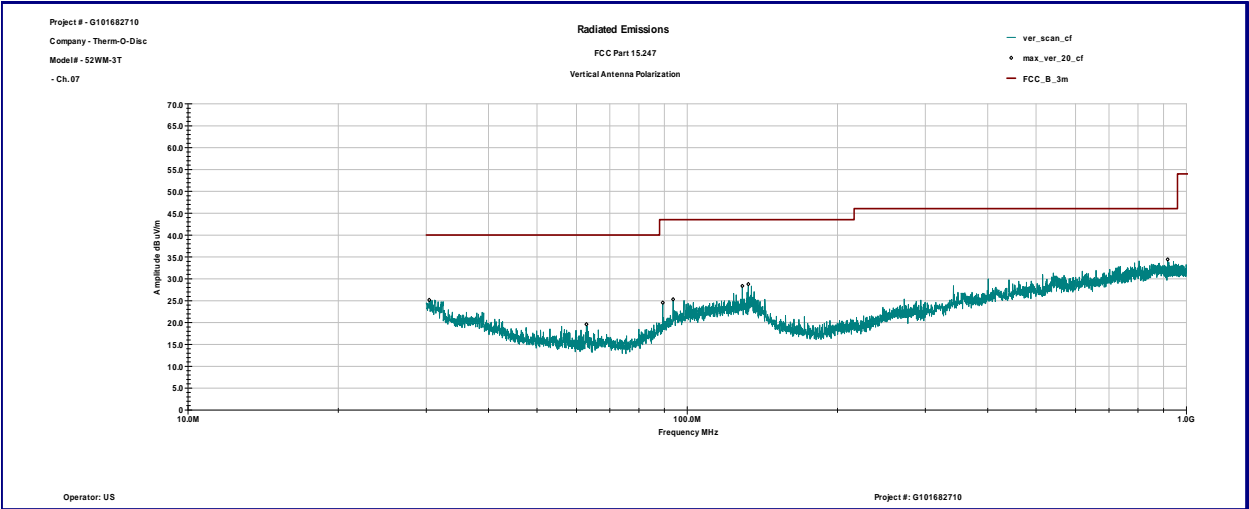
Graph 3.2.8



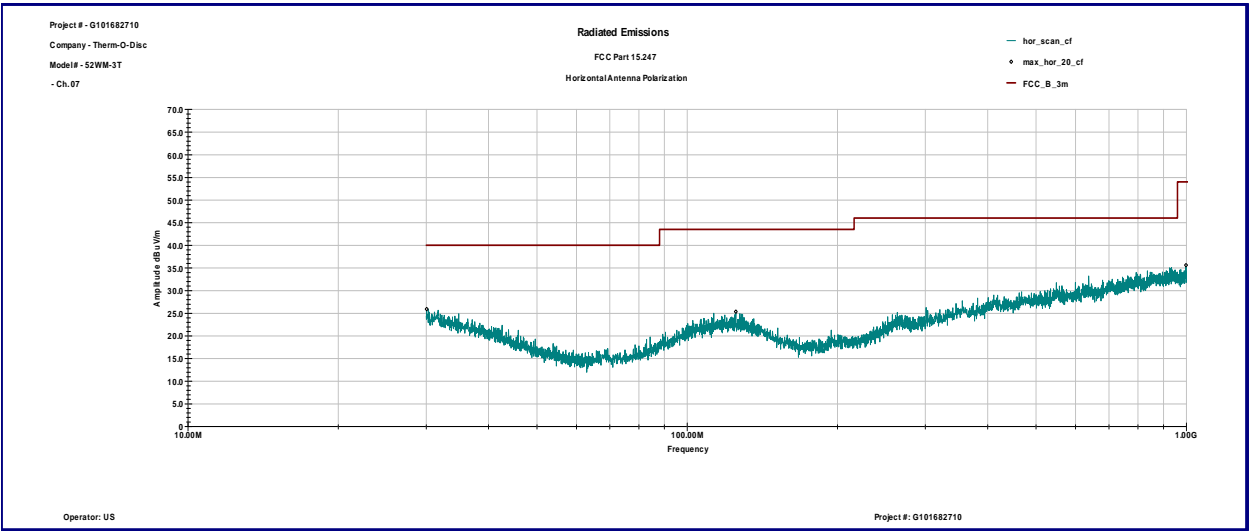
Graph 3.2.9



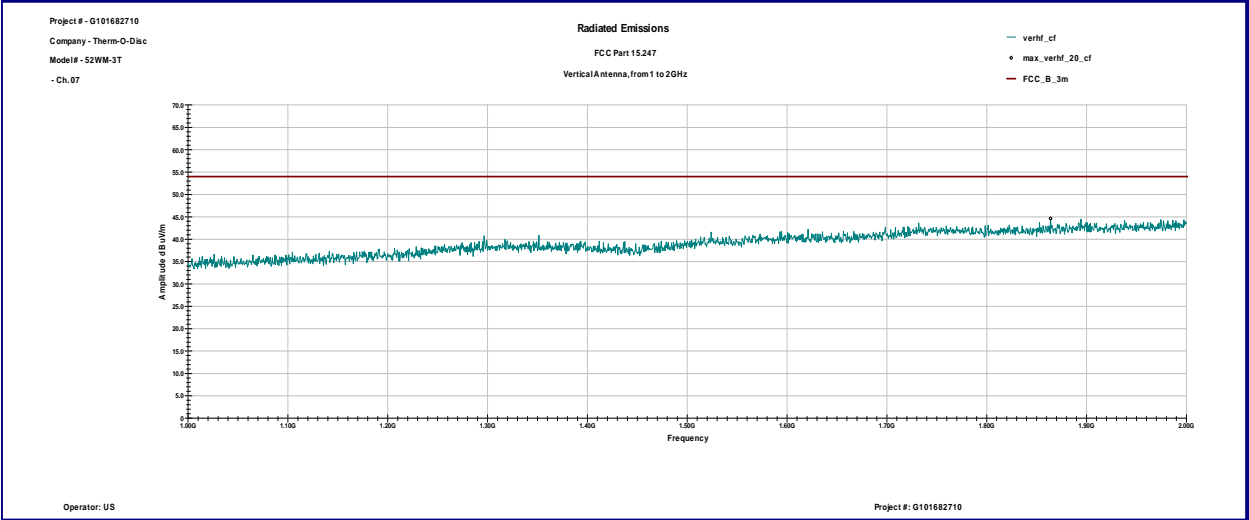
Graph 3.2.10



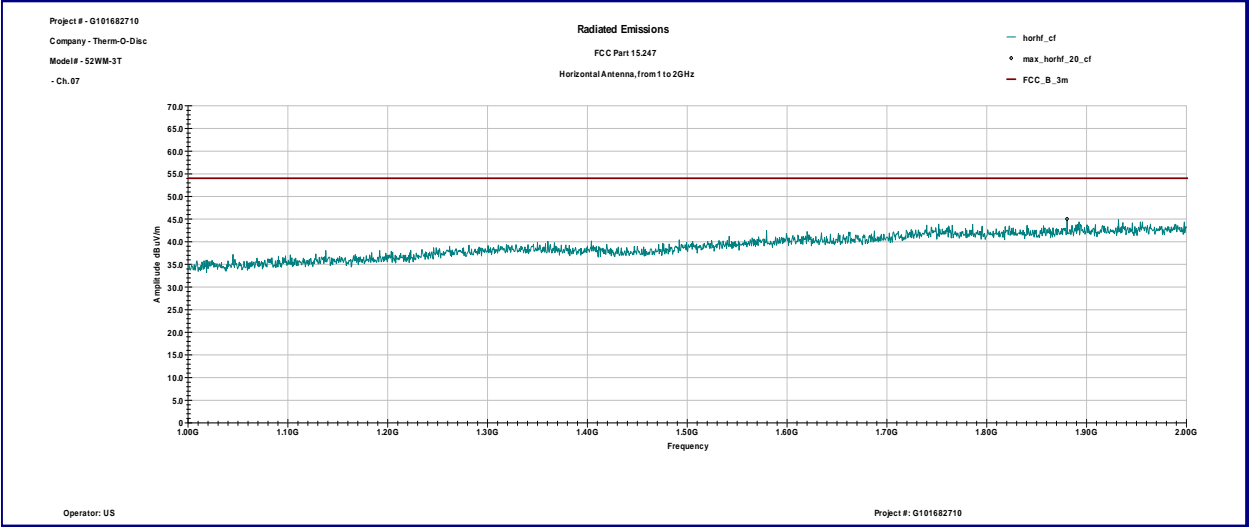
Graph 3.2.11



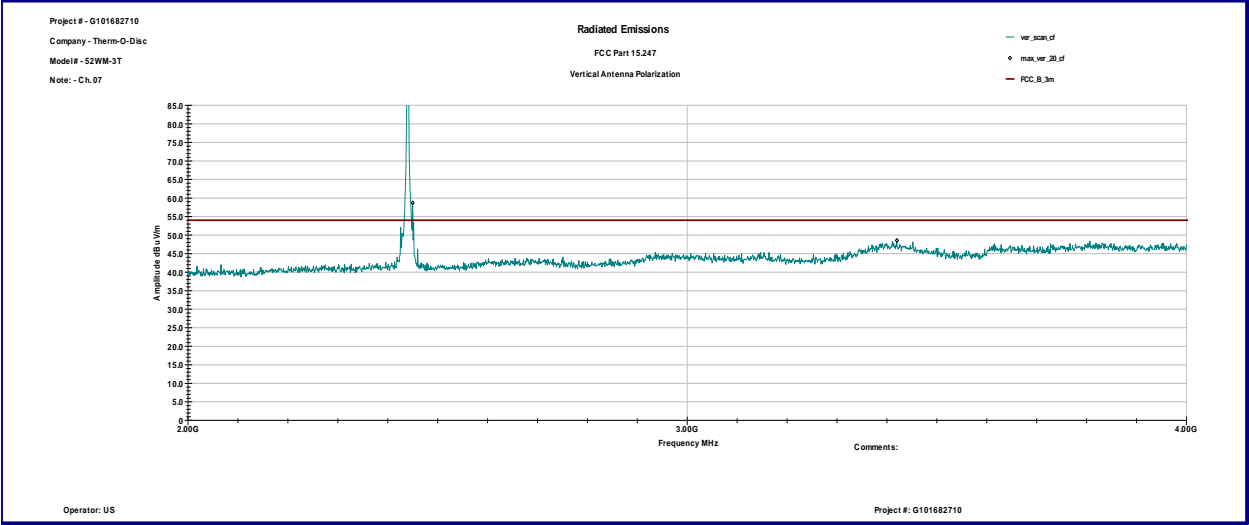
Graph 3.2.12



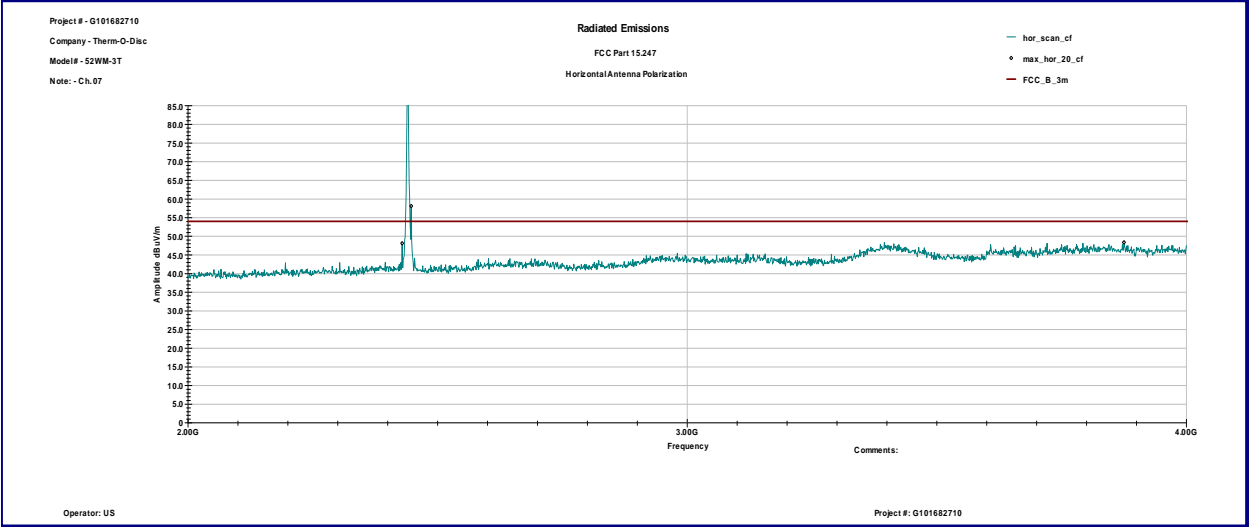
Graph 3.2.13



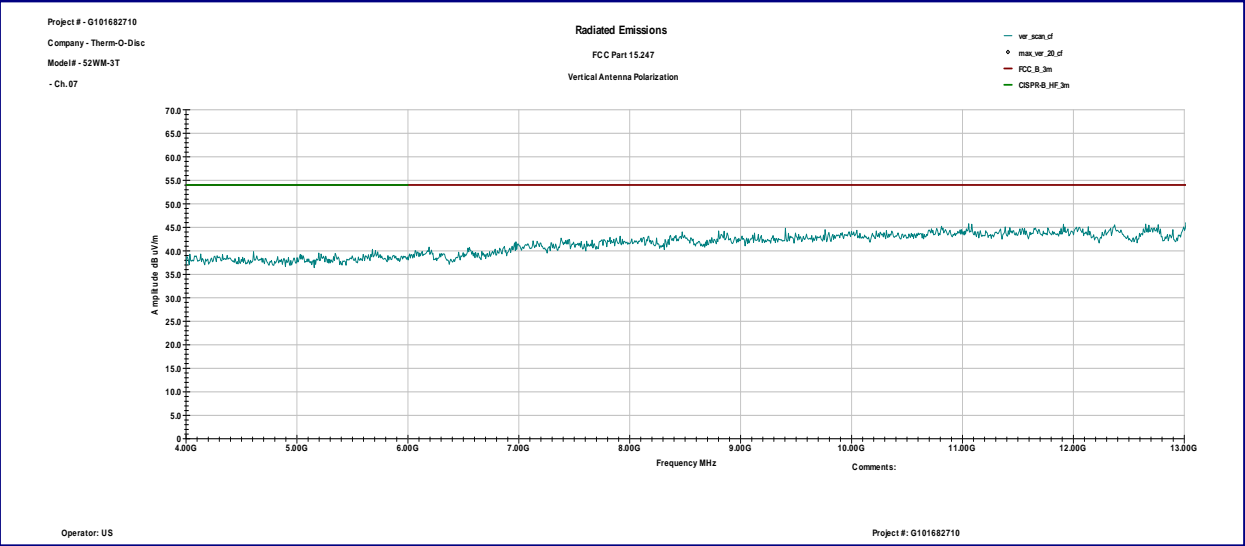
Graph 3.2.14



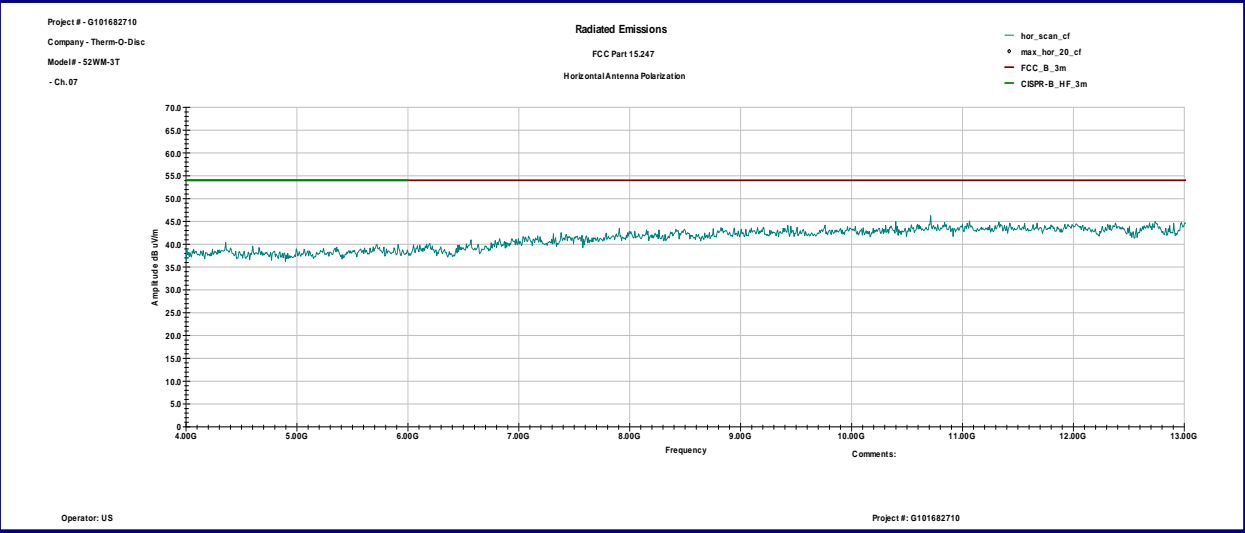
Graph 3.2.15



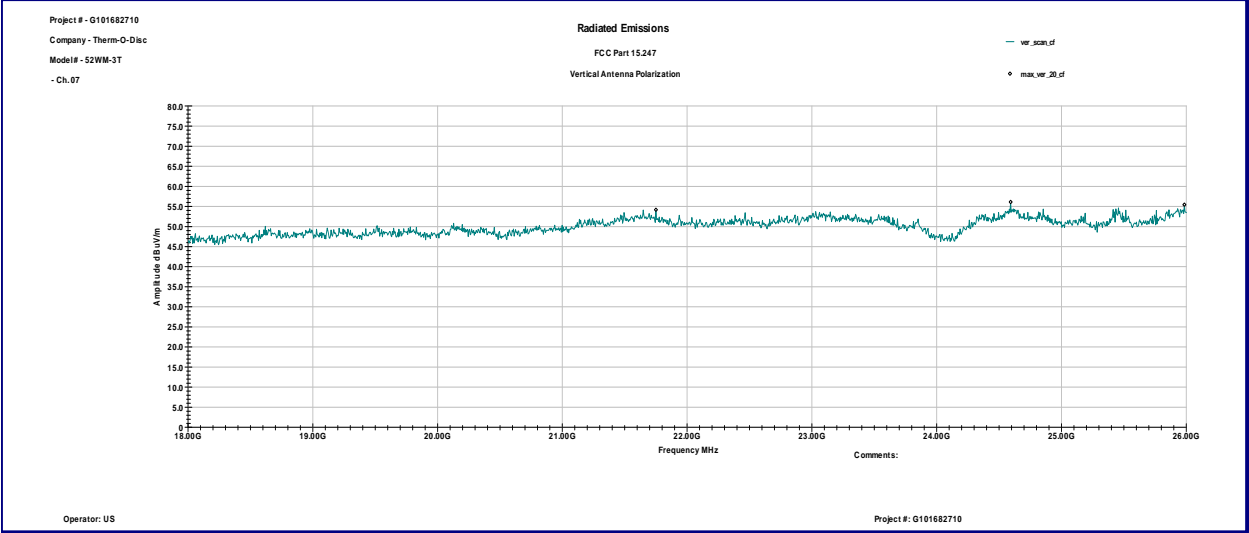
Graph 3.2.16



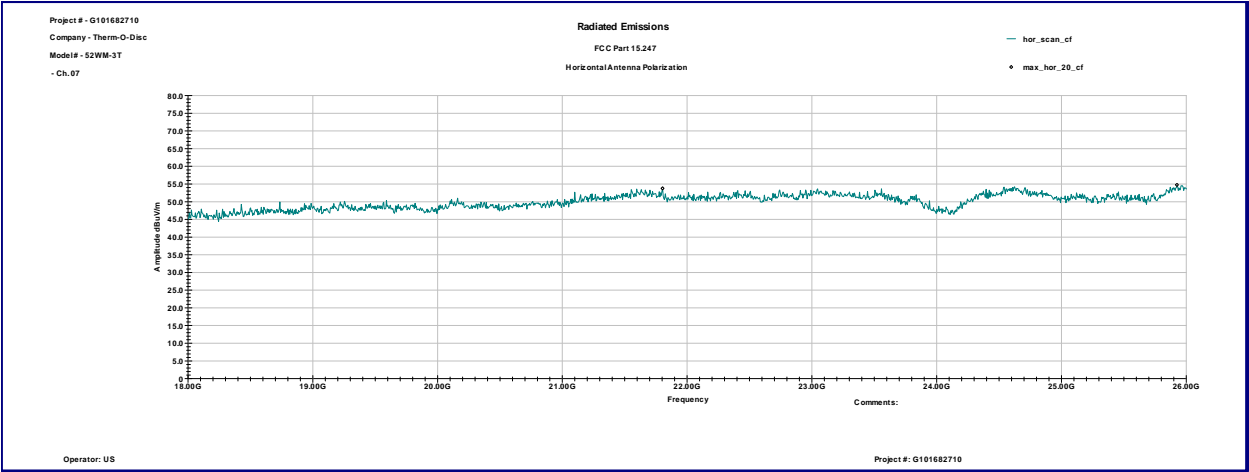
Graph 3.2.17



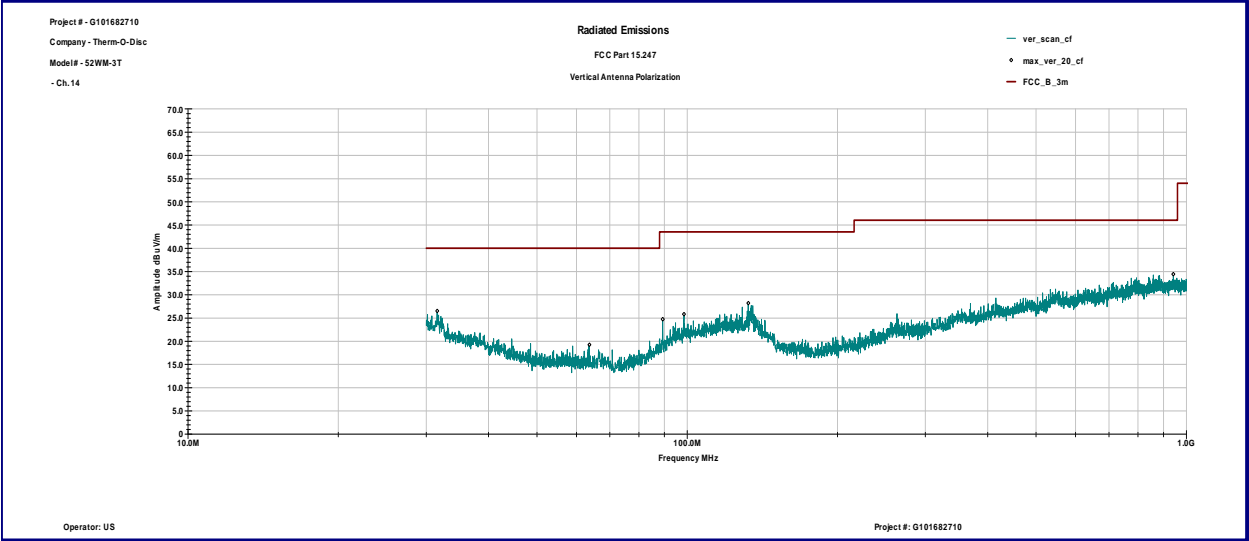
Graph 3.2.18



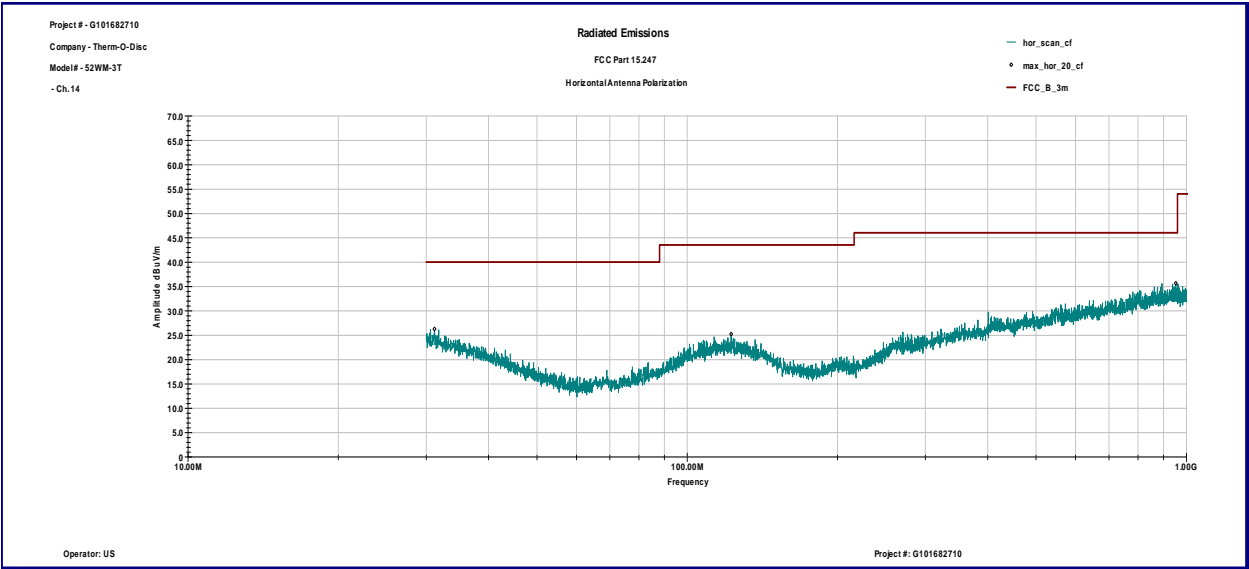
Graph 3.2.19



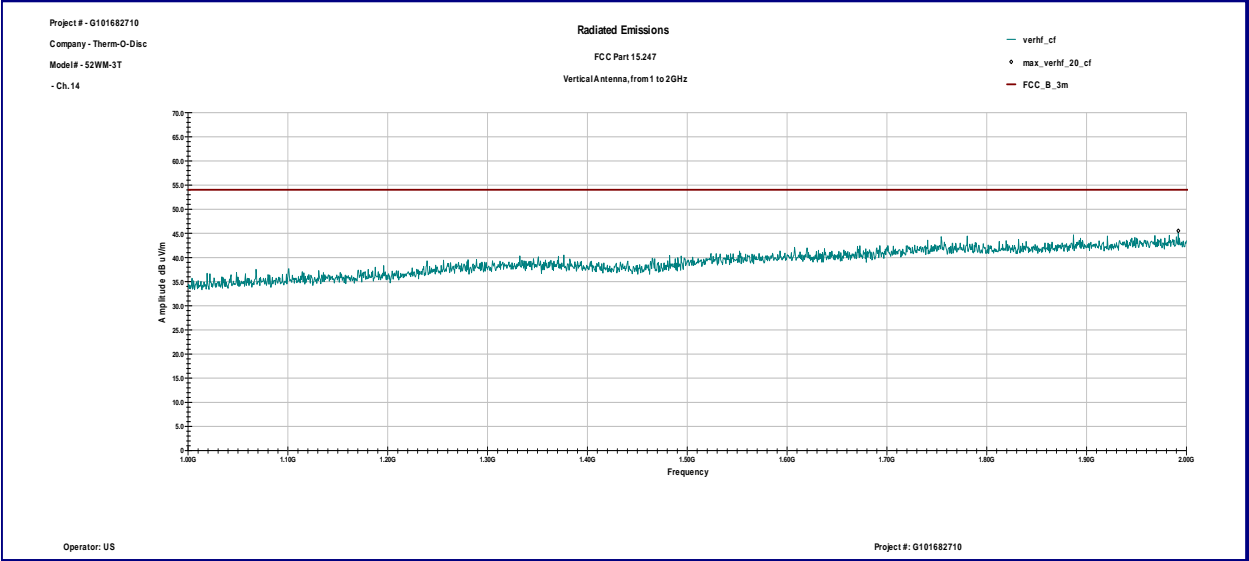
Graph 3.2.20



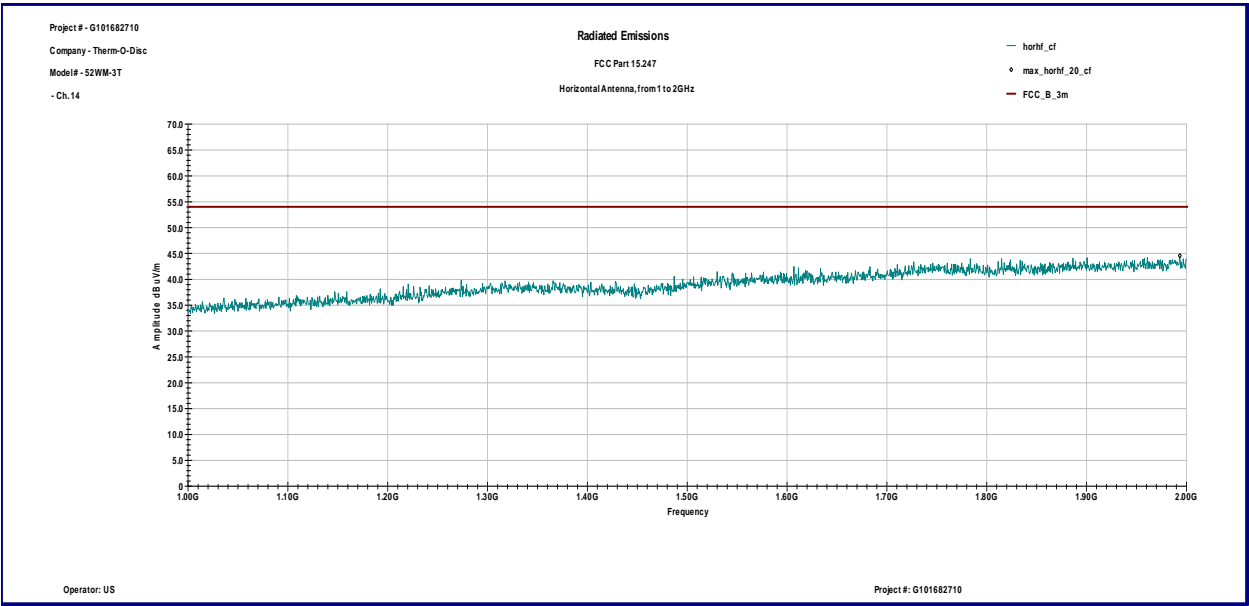
Graph 3.2.21



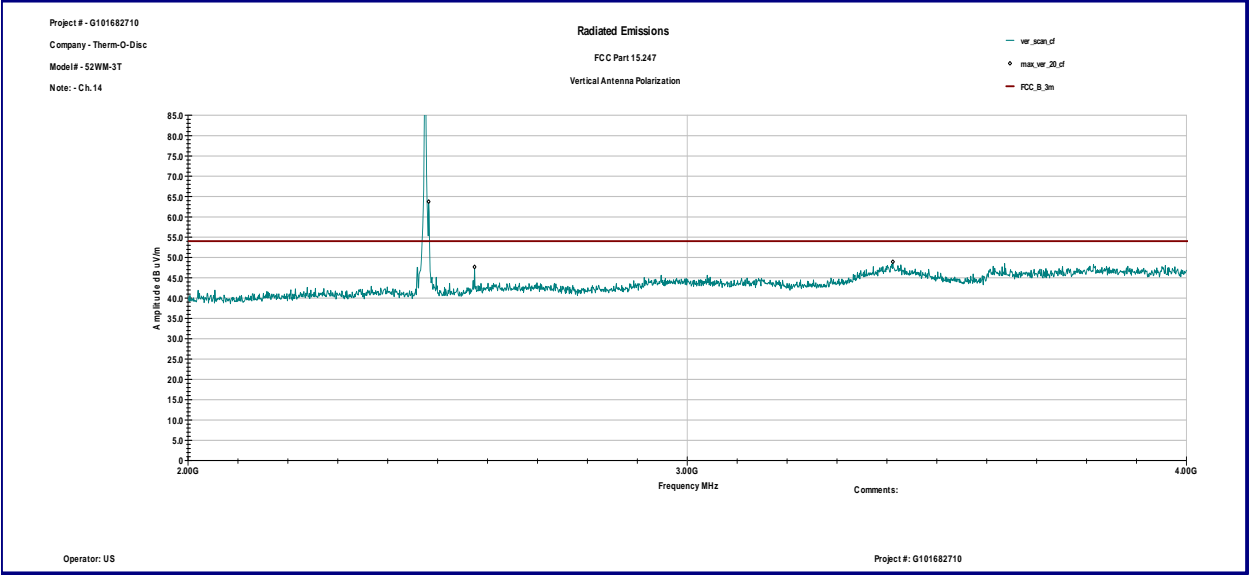
Graph 3.2.22



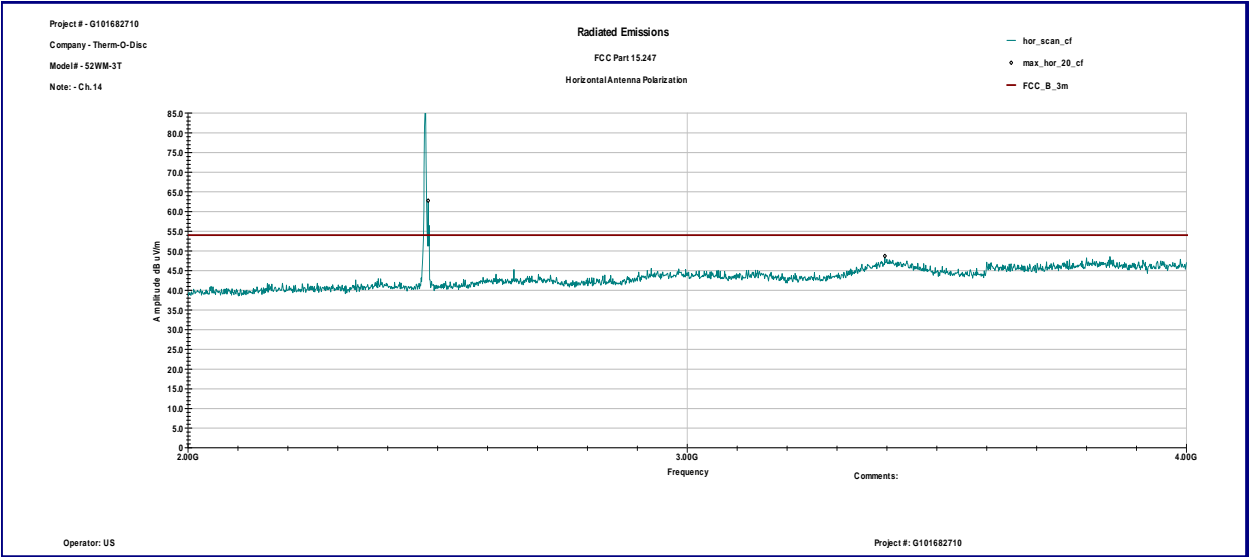
Graph 3.2.23



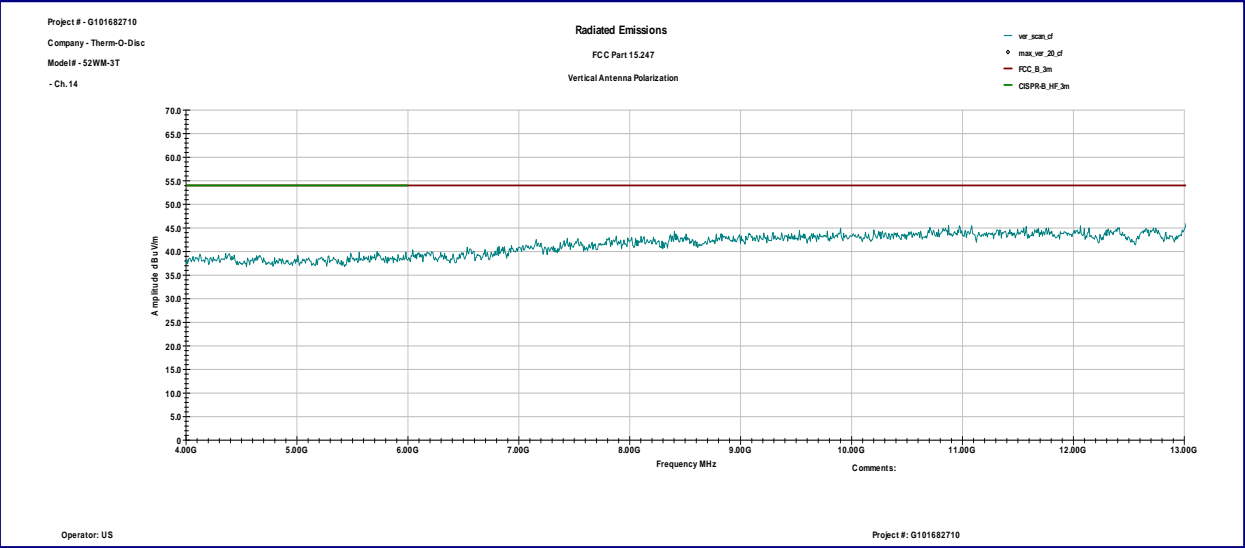
Graph 3.2.24



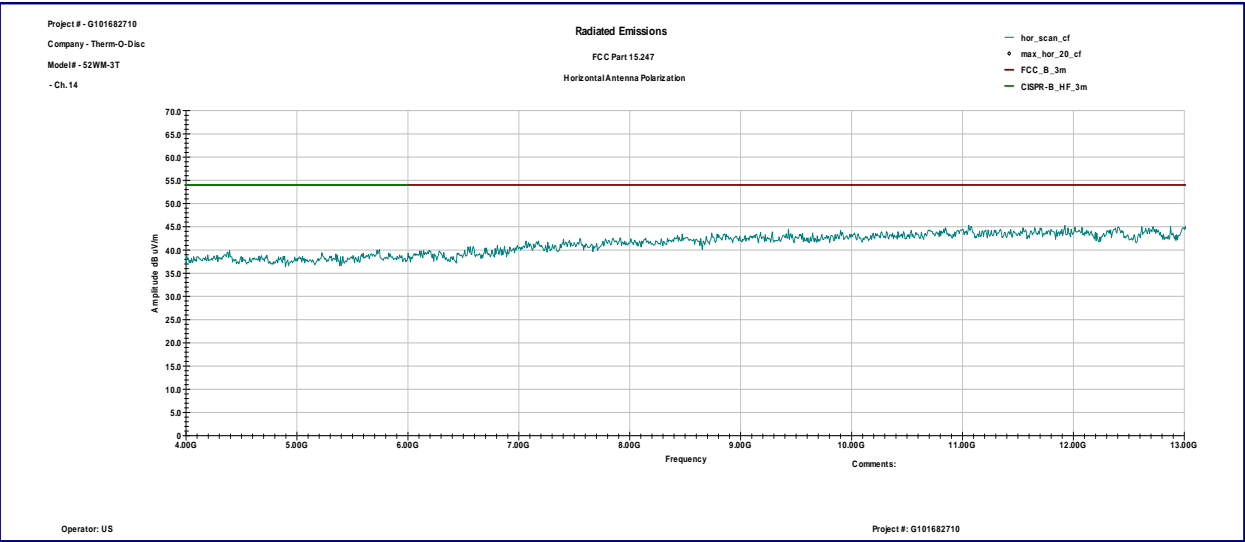
Graph 3.2.25



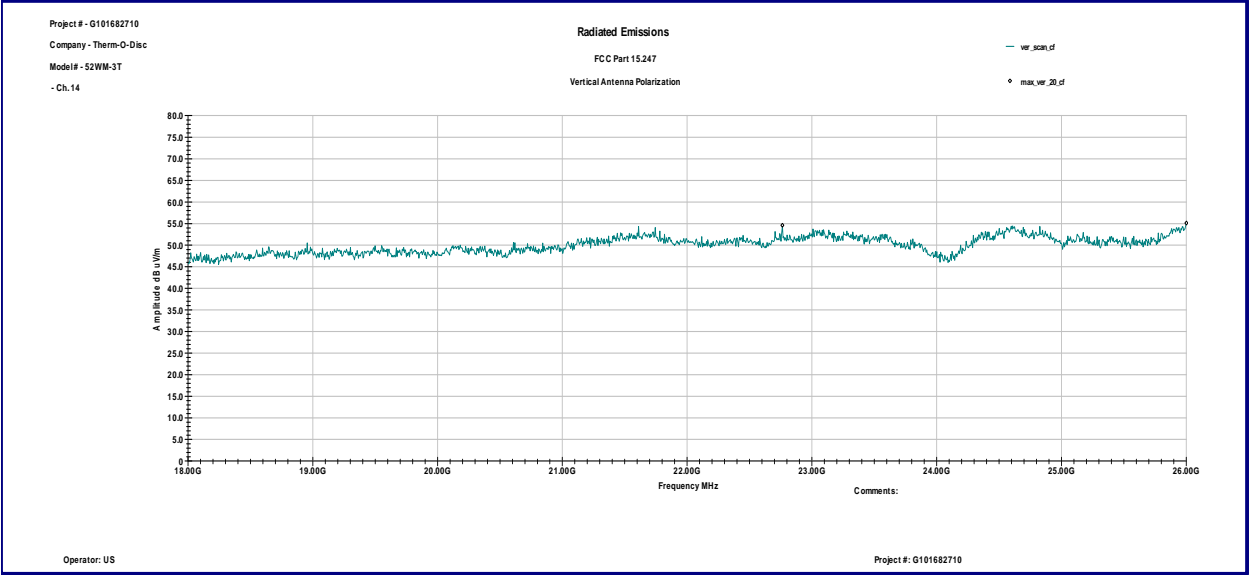
Graph 3.2.26



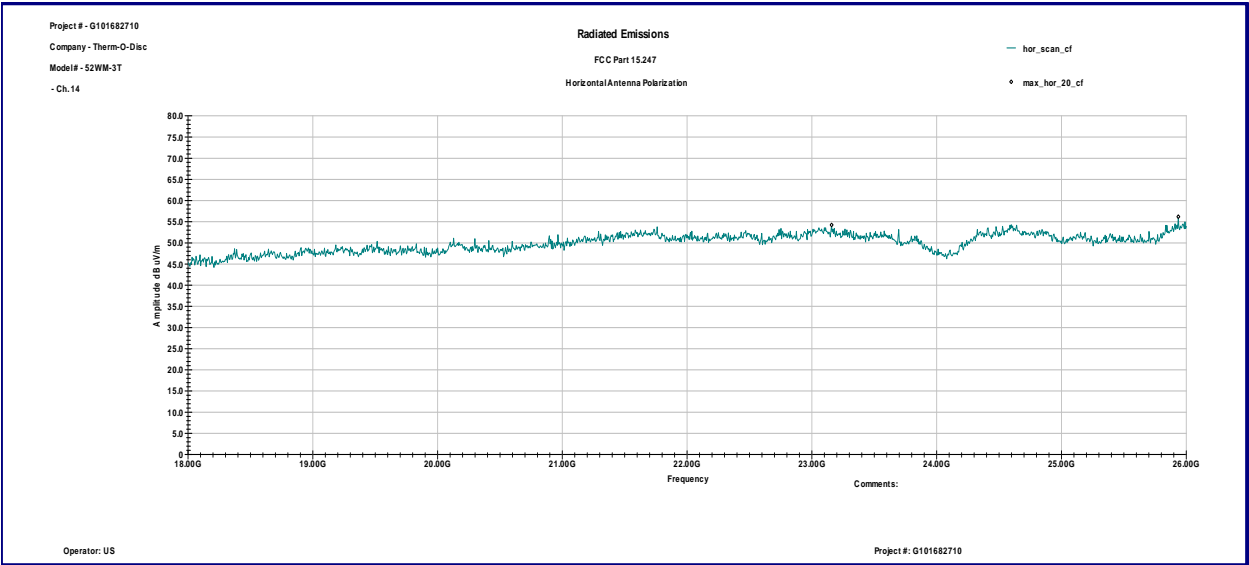
Graph 3.2.27



Graph 3.2.28



Graph 3.2.29



Graph 3.2.30

3.3 RF Exposure Compliance

The maximum measured antenna conducted power, P is 7.54dBm

The antenna gain, G is 1.7dBi

The maximum EIRP power = P + G

ERP = 7.54+1.7= 9.24dBm, or 0.0084W=8.4mW

The limits for Maximum Permissible Exposure (MPE) for transmitter operating at 2.4Hz, MPE is 1mW/cm², or 10W/m²

$S = 10\text{W/m}^2$

The Power Density is related to EIRP with the equation:

$S = \text{EIRP} / 4\pi D^2$, or $10 = 0.0084 / 4\pi D^2$, where D is a separation distance

The minimum safe separation distance, D = 0.82cm, which is below 20cm



4.0 TEST EQUIPMENT

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NO.	INTERTEK ID	CAL DUE	USED
Spectrum Analyzer	R & S	FSP 40	100024	12559	12/12/2014	<input checked="" type="checkbox"/>
Spectrum Analyzer	R & S	ESU	100398	25283	01/07/2015	<input checked="" type="checkbox"/>
Bicono-Log Antenna	Teseq	CBL6112D	32859	25289	08/30/2014	<input checked="" type="checkbox"/>
Horn Antenna	EMCO	3115	6579	15580	07/18/2014	<input checked="" type="checkbox"/>
Waveguide Horn Antenna	EMCO	3116	9904-2423	9705	11/12/2014	<input checked="" type="checkbox"/>
Pre-Amplifier	MITEQ	AMF-5D-00501800-28-13P	1402232	172081	11/12/2014	<input checked="" type="checkbox"/>
Pre-Amplifier	MITEQ	AMF-6F-16002600-25-10P	1222383	MIN-0065	11/12/2014	<input checked="" type="checkbox"/>
System	Quantum Change	TILE! Instrument Control	Ver. 3.4.K.29	15259	VBV	<input checked="" type="checkbox"/>



5.0 Revision History

REVISION LEVEL	DATE	REPORT NUMBER	PREPARED	REVIEWED	NOTES
0	06-25-2014	101682710MIN-001	US	SK	Original Issue