TEST REPORT

Report Number: 100387362MIN-001M
Project Number: G100387362

Testing performed on the
Rosemount 708 Wireless Acoustic Transmitter, Class II Permissive Changes
FCC ID: LW2RM708
Industry Canada ID: 2731A-RM708

to
47 CFR Part 15. 247:2009
RSS- 210, Issue 8, 2010

For
Emerson Process Management

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

Test Authorized by:
Emerson Process Management
8200 Market Blvd.
Mail Stop PM17
Chanhassen, MN 55317, USA

Prepared by: _____ Date: April 28, 2011
Uri Spector

Reviewed by: _____ Date: April 28, 2011
Norman Shpilsher

TABLE OF CONTENTS

1.0 GENERAL DESCRIPTION

Model:	Rosemount 708 Wireless Acoustic Transmitter
Type of EUT:	2.4GHz Wireless Acoustic Transmitter
Serial Number:	N/A
FCC ID:	LW2RM708
Industry Canada ID:	2731A-RM708
Related Submittal(s) Grants:	Class II Permissive Changes
Company:	Emerson Process Management
Customer:	Mr. Merritt Pulkrabek
Address:	8200 Market Blvd., Mail Stop PM17 Chanhassen, MN 55317
Phone:	(952) 949-5193
Fax:	(952) 949-7626
Test Standards:	☒ 47 CFR, Part 15:2009, §15.247 ☒ RSS–210, Issue 8, 2010 ☒ RSS-Gen, Issue 2, 2007 ☐ 47 CFR, Part 15:2008, §15.107 and §15.109, Class ☐ Other
Type of radio:	☐ Stand -alone ☒ Module ☐ Hybrid
Date Sample Submitted:	April 20, 2011
Test Work Started:	April 20, 2011
Test Work Completed:	April 28, 2010
Test Sample Conditions:	☐ Damaged ☐Poor (Usable) ☒ Good

1.1 Product Description; Test Facility

Product Description:	2.4 – 2.4835GHz Transceiver
Transmitter Type:	☐ FHSS ☒ Digital Modulation (DSSS) ☐ WiFi ☐ Blue Tooth
Operating Frequency Range(s):	From 2400 to 2483.5 MHz
Number of Channels:	16 (from channel 0 to 15)
Modulation:	QPSK
Emission Designator:	1M49G7D
Antenna(s) Info:	Antenna Type: Omni directional Gain: 0dBi Connector Type: Solder direct to circuit board via coax
Antenna Installation:	☐ User ☐ Professional ☒ Factory
Transmitter power configuration:	☒ Internal battery ☐ External power source ☐ 120VAC ☐ 230VAC ☐ 400VAC ☒ 3.6VDC ☐ Other: Amp. ☐ 50Hz ☐ 60Hz
Special Test Arrangement:	None
Test Facility Accreditation:	A2LA (Certificate No. 1427.01)
Test Methodology:	Measurements performed according to the procedures in ANSI C63.10-2009 and FCC Public Notice DA 00-705

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)

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	2-wire communication cable	<10ft	HART interface	

Support equipment/Services:

No.	Item	Description
1	Laptop PC	Interface PCB
2	Viator HART interface	USB HART interface to control EUT

General Note: The EUT is modified from the original certification using a different antenna. Therefore, the Maximum Output and Spurious Radiated Emissions were measured. RF exposure was calculated to reflect a new antenna.

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**

☐ **Temperature:**	-20 to +50 ° C
☐ **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(μV/m)
RA = Receiver Amplitude in dB(μV)
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(μV) 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(μV/m).

RA = 48.1 dB(μV)
AF = 7.4 dB(m^{-1})
CF = 1.6 dB
AG = 16.0 dB
FS = RA + AF + CF - AG
FS = 48.1 + 7.4 + 1.6 – 16.0
FS = 41.1 dB(μV/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

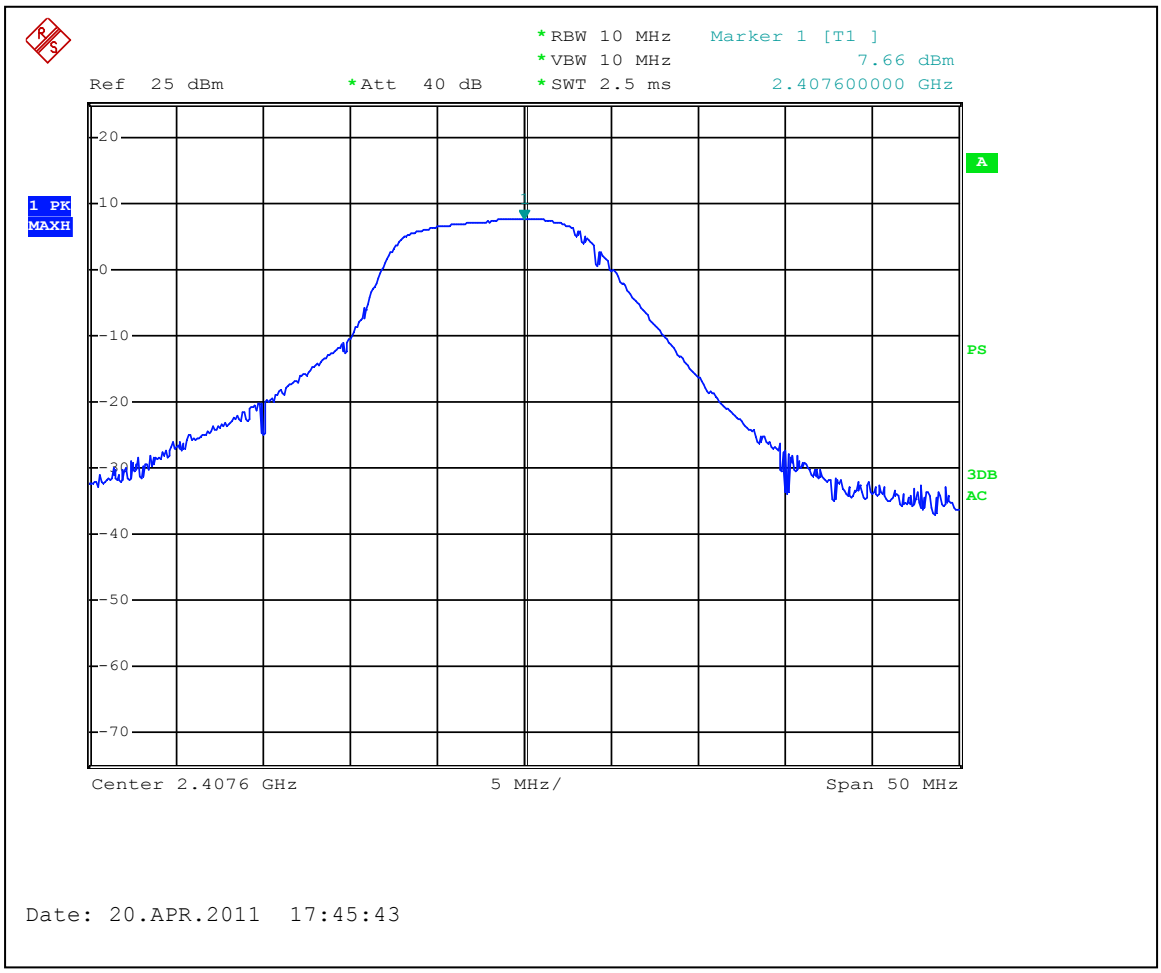
Test location: ☐ OATS ☐ Anechoic Chamber ☒ Other

Test result: **Pass**

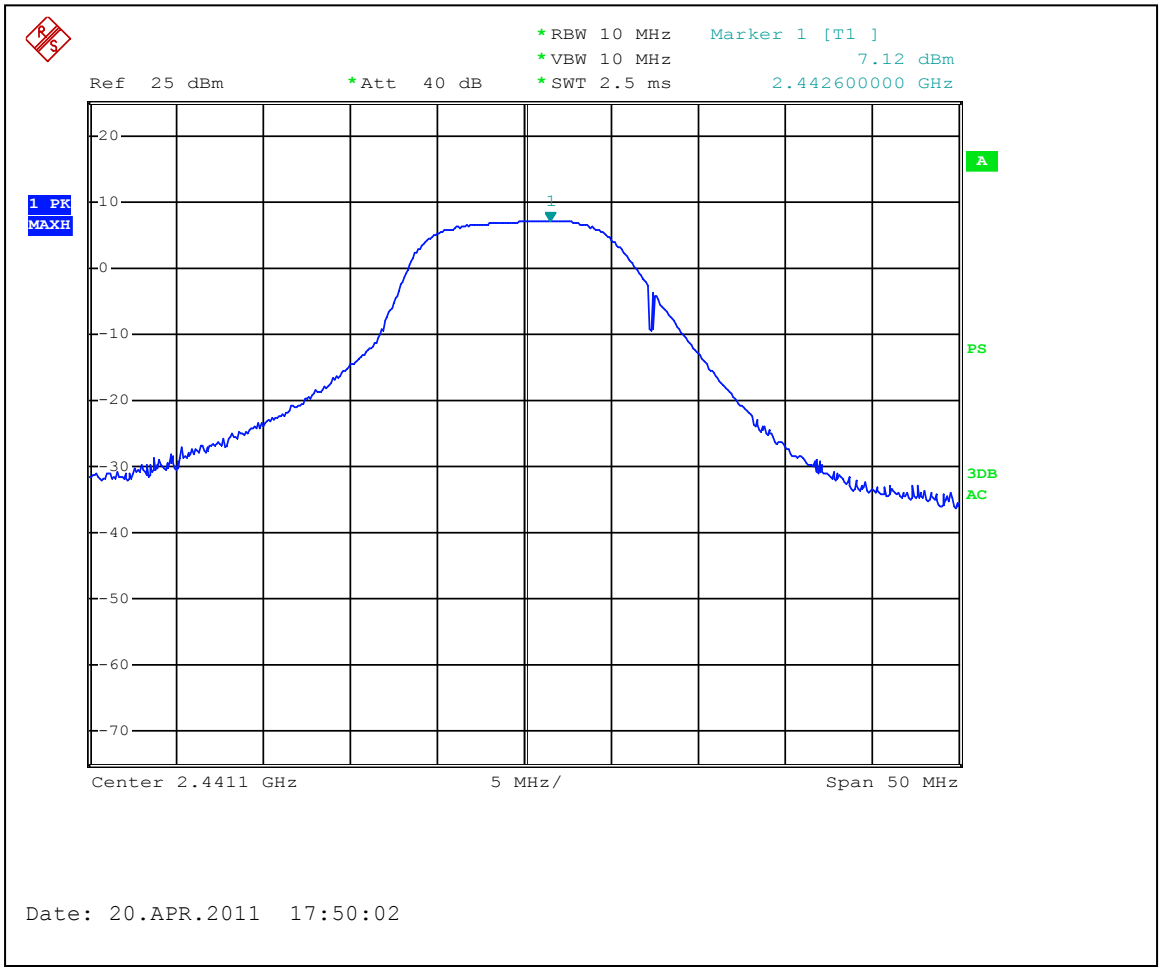
Max. Margin: 22.09dB below the limits

Power Output:	**Conducted**					
Frequency Range:	☐ 902-928MHz ☒ 2400-2483.5MHz ☐ 5725-5850MHz					
Low Frequency MHz	**Measured power dBm**	**Attenuaton dB**	**Power at Antenna dBm**	**Limit dBm**	**Limit Reduction dB**	**Margin dB**
2407.6	7.66	0.25	7.91	30	0	-22.09
Middle Frequency MHz						
2441.1	7.12	0.25	7.37	30	0	-22.63
Upper Frequency MHz						
2480.6	6.41	0.25	6.66	30	0	-23.34
RBW: **VBW:**	☐ 1MHz ☐ 3MHz ☒ 10MHz ☐ 1MHz ☐ 3MHz ☒ 10MHz					
Antenna Gain:	☒ < 6dBi ☐ >6dBi dBi, Output power reduction = dB					

Notes: The maximum peak conducted output power limit is 1 W, or 30dBm
Graphs 3.1.1 to 3.1.3 show the conducted output power


*RBW 10 MHz
*VBW 10 MHz
*SWT 2.5 ms
Marker 1 [T1]
7.66 dBm
2.407600000 GHz
Ref 25 dBm
*Att 40 dB
1 PK
MAXH
A
PS
3DB
AC
20
10
0
-10
-20
-30
-40
-50
-60
-70
Center 2.4076 GHz
5 MHz/
Span 50 MHz
Date: 20.APR.2011 17:45:43

Graph 3.1.1


*RBW 10 MHz
*VBW 10 MHz
*SWT 2.5 ms
Marker 1 [T1]
7.12 dBm
2.442600000 GHz
Ref 25 dBm
*Att 40 dB
1 PK
MAXH
A
PS
3DB
AC
20
10
0
-10
-20
-30
-40
-50
-60
-70
Center 2.4411 GHz
5 MHz/
Span 50 MHz
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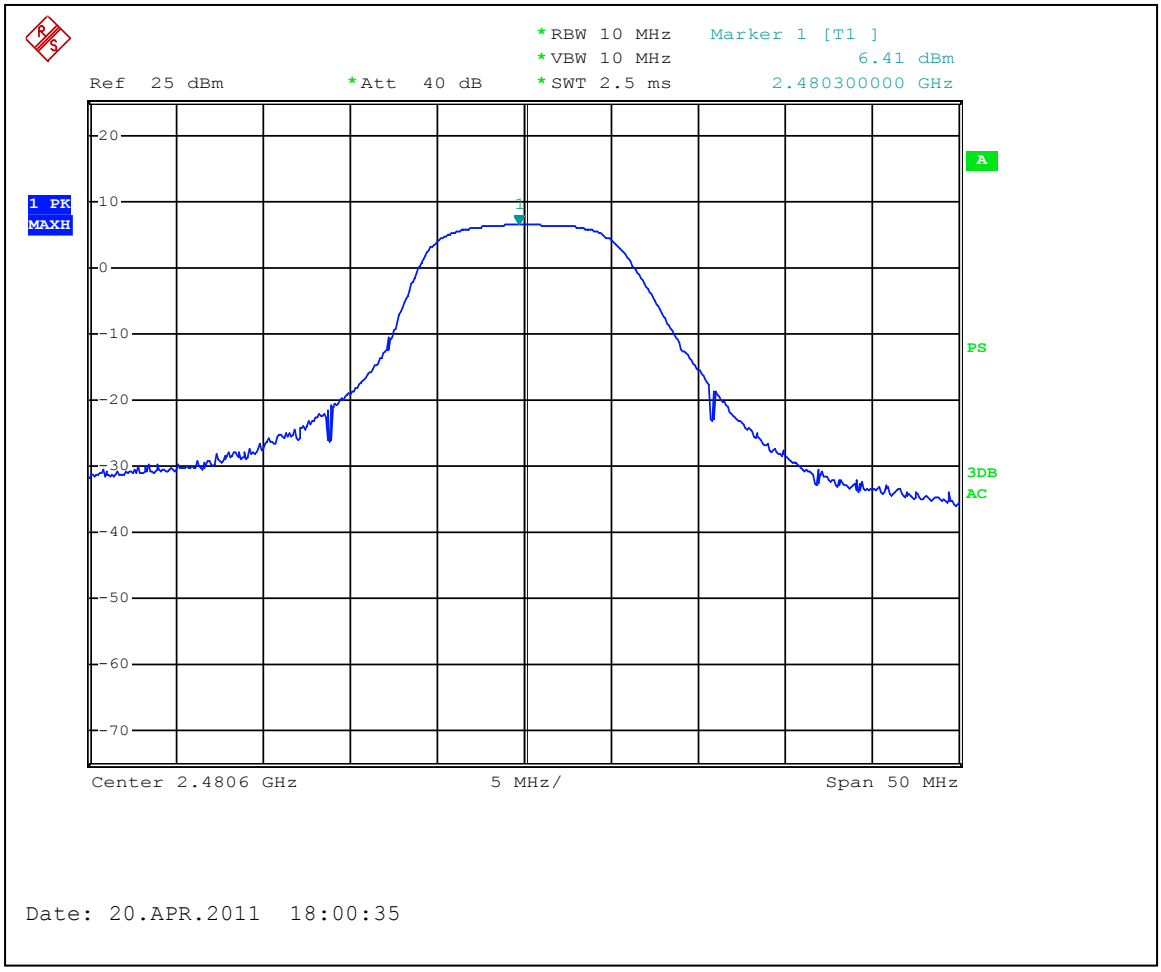
Graph 3.1.2


*RBW 10 MHz
*VBW 10 MHz
*SWT 2.5 ms
Marker 1 [T1]
6.41 dBm
2.480300000 GHz
Ref 25 dBm
*Att 40 dB
1 PK
MAXH
A
PS
3DB
AC
20
10
0
-10
-20
-30
-40
-50
-60
-70
Center 2.4806 GHz
5 MHz/
Span 50 MHz
Date: 20.APR.2011 18:00:35

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 (10^{th} Harmonic)

Test result: **Pass**

Max. Margin: 5.1dB below the limits

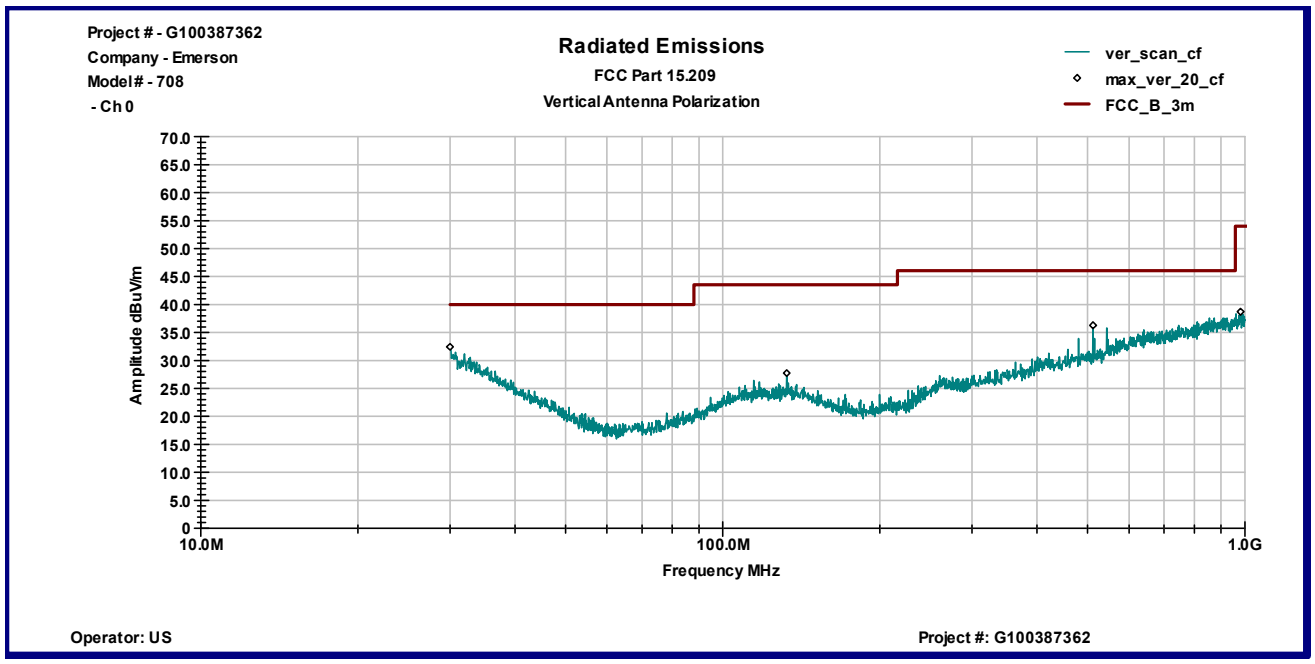
Notes: The table 3.2.1 shows radiated spurious and the 2^{nd}, 3^{rd} and 5^{th} harmonics in restricted band of operation per FCC 15.205
No emissions were detected above ambient at 5th and above harmonics

Date:	April 22, 2011	**Result: Pass**
Standard:	FCC part 15.247(d)	
Tested by:	Uri Spector	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	None	

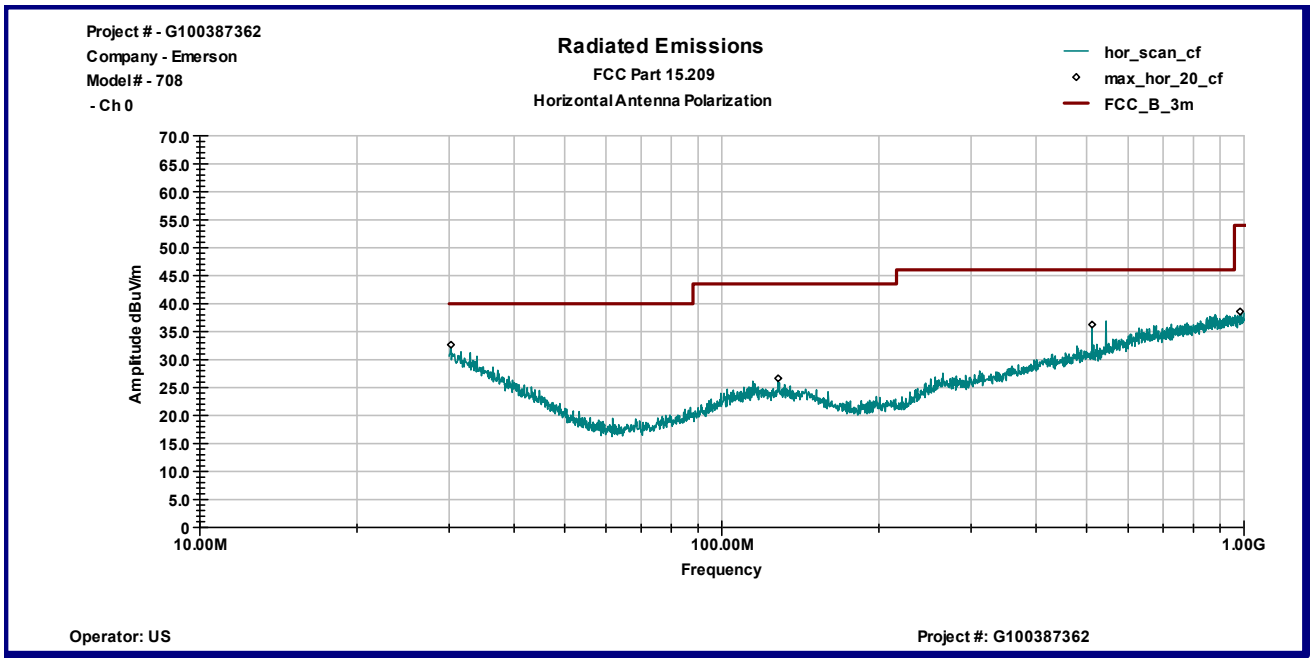
Table 3.2.1

Frequency	Antenna		Ant. CF	Cable loss	Pre-amp	Reading	Total @ 3m	Limit	Margin	Comments
MHz	Polarity	Hts(cm)	dB1/m	dB	Gain (dB)	dBµV	dBµV/m	dBµV/m	dB	
	Channel 0									
4808.92	V	100	32.7	4.9	36.7	31.6	32.6	54.0	-21.4	average
4808.92	H	100	32.7	4.9	36.7	33.0	34.0	54.0	-20.0	average
12030.00	H	100	39.4	7.4	35.5	37.7	48.9	54.0	-5.1	Peak
	Channel 7									
4879.04	V	110	32.9	4.9	36.6	31.5	32.7	54.0	-21.3	average
4879.04	H	118	32.9	4.9	36.6	33.7	34.9	54.0	-19.1	average
7318.36	V	100	36.0	6.2	36.6	23.3	28.9	54.0	-25.1	average
7318.36	H	106	36.0	6.2	36.6	26.6	32.2	54.0	-21.8	average
	Channel 15									
4959.00	V	100	33.0	5.0	36.6	30.9	32.3	54.0	-21.7	average
4959.00	H	100	33.0	5.0	36.6	31.7	33.1	54.0	-20.9	average
7441.36	V	100	36.3	6.3	36.5	23.8	29.9	54.0	-24.1	average
7441.36	H	100	36.3	6.3	36.5	27.4	33.5	54.0	-20.5	average

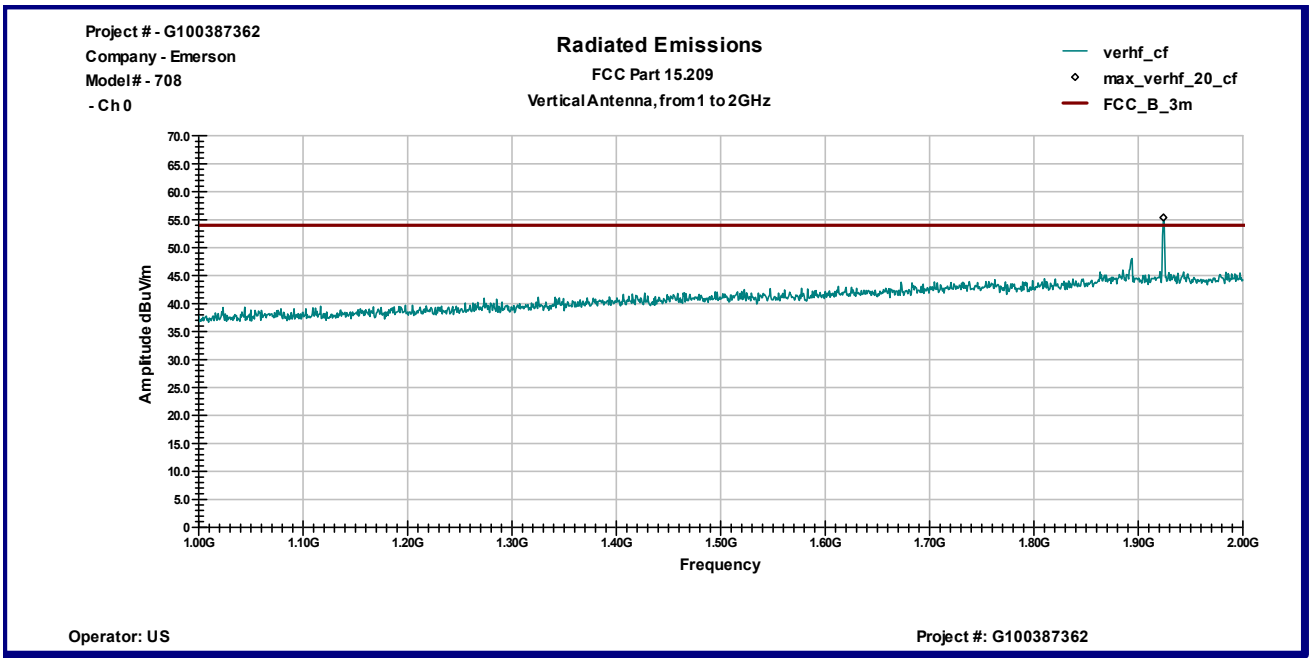
Note:
1. Measurements were taken using an Average Value (RBW 1MHz, VBW 10Hz), or peak detector when commented
2. The table shows supurius emissions and the 2nd and 3rd harmonic in restricted band of operation per FCC 15.205
3. The Frequencies: 1.924GHz to 1.985GHz, 7215.68MHz and 9620.82-9768.49MHz are outside restricted band of operation per FCC 15.205.
4. No emissions were detected above ambient at 5th and above harmonics



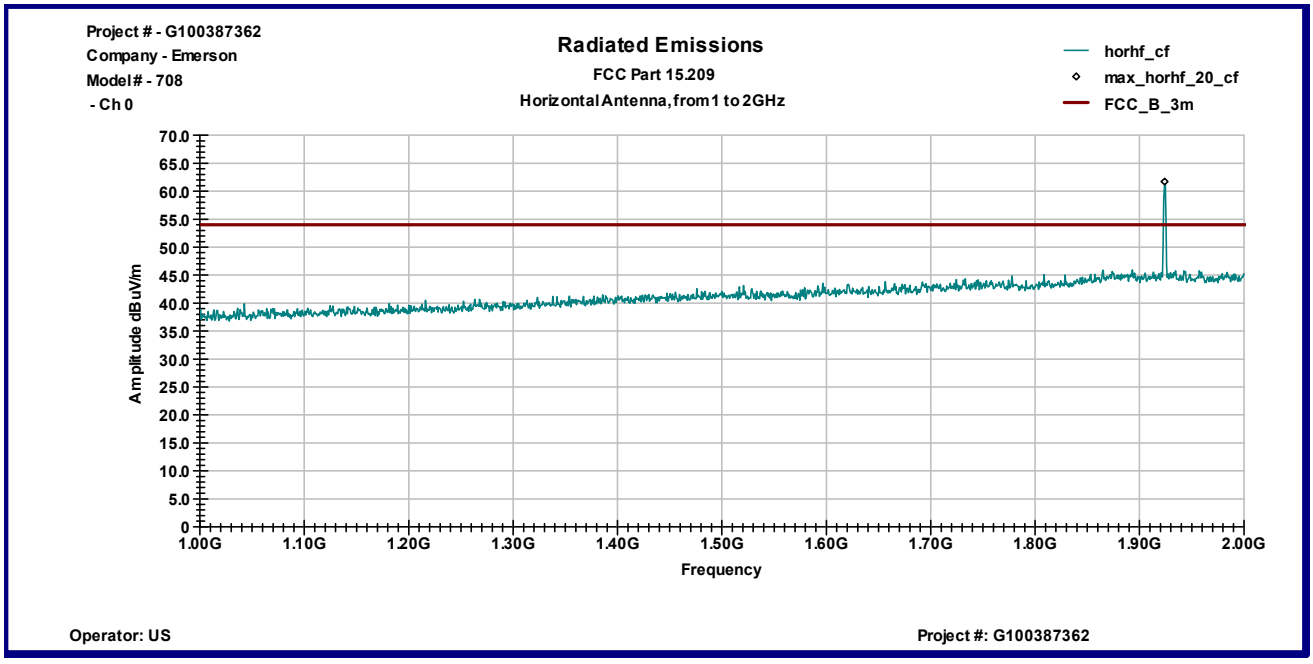
Graph 3.2.1



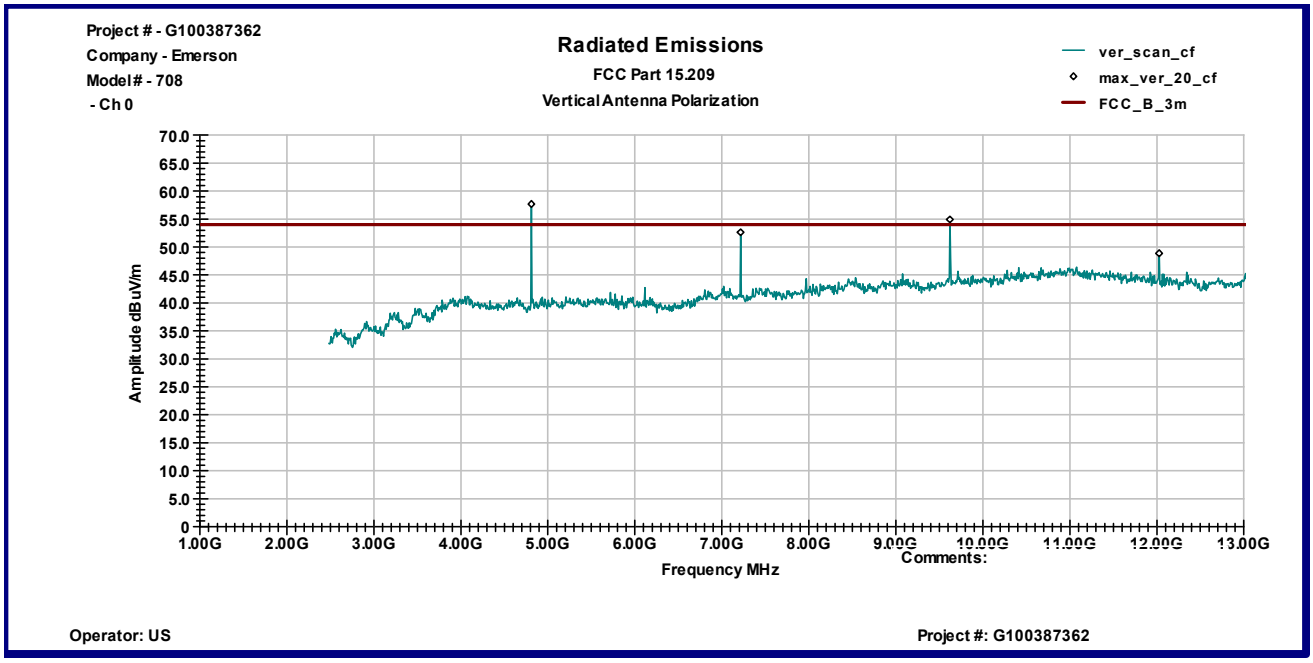
Graph 3.2.2



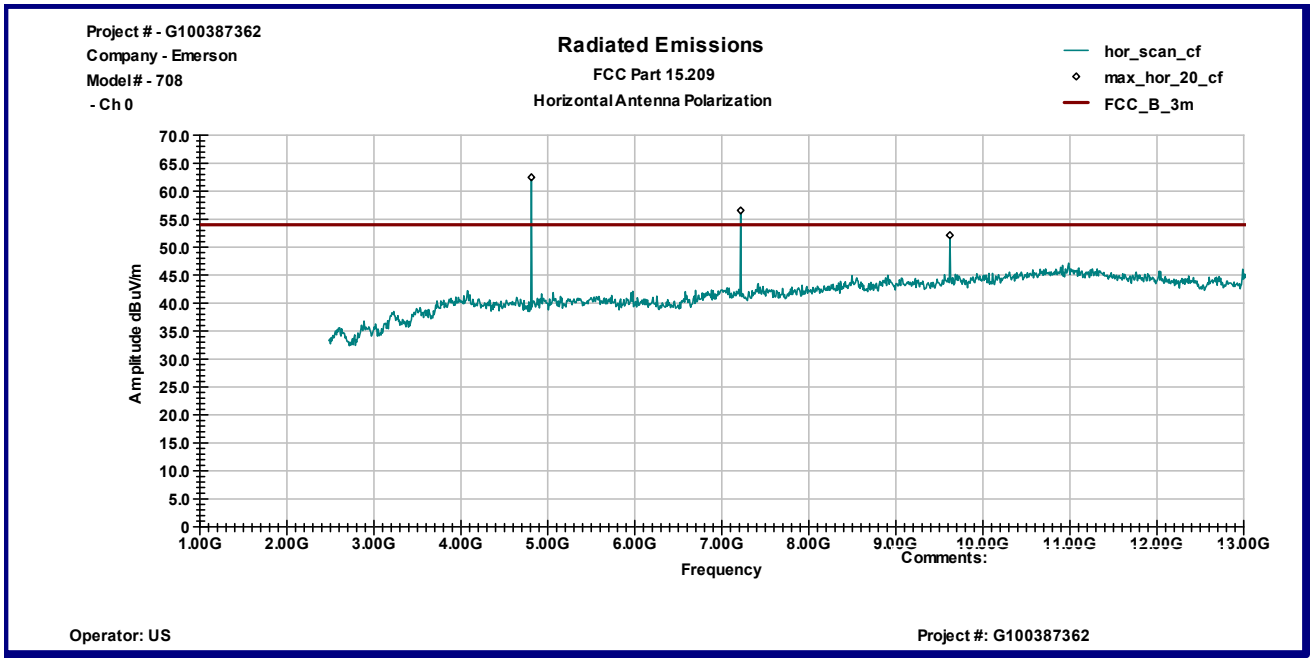
Graph 3.2.3



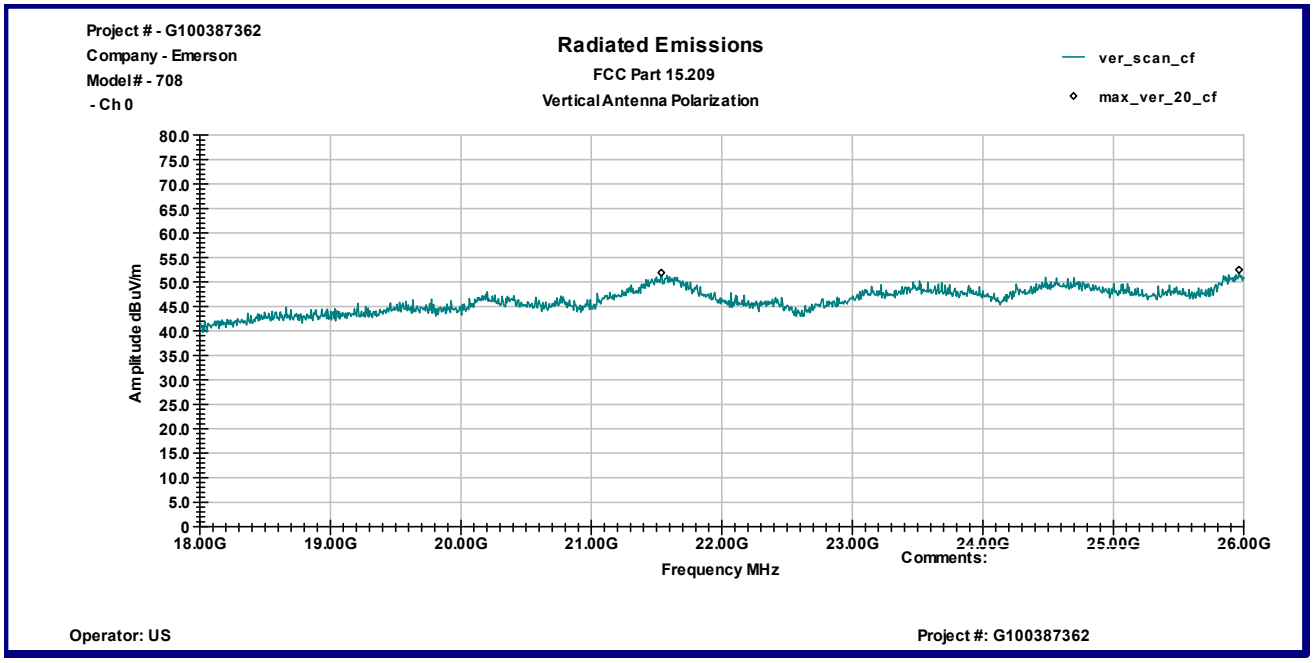
Graph 3.2.4



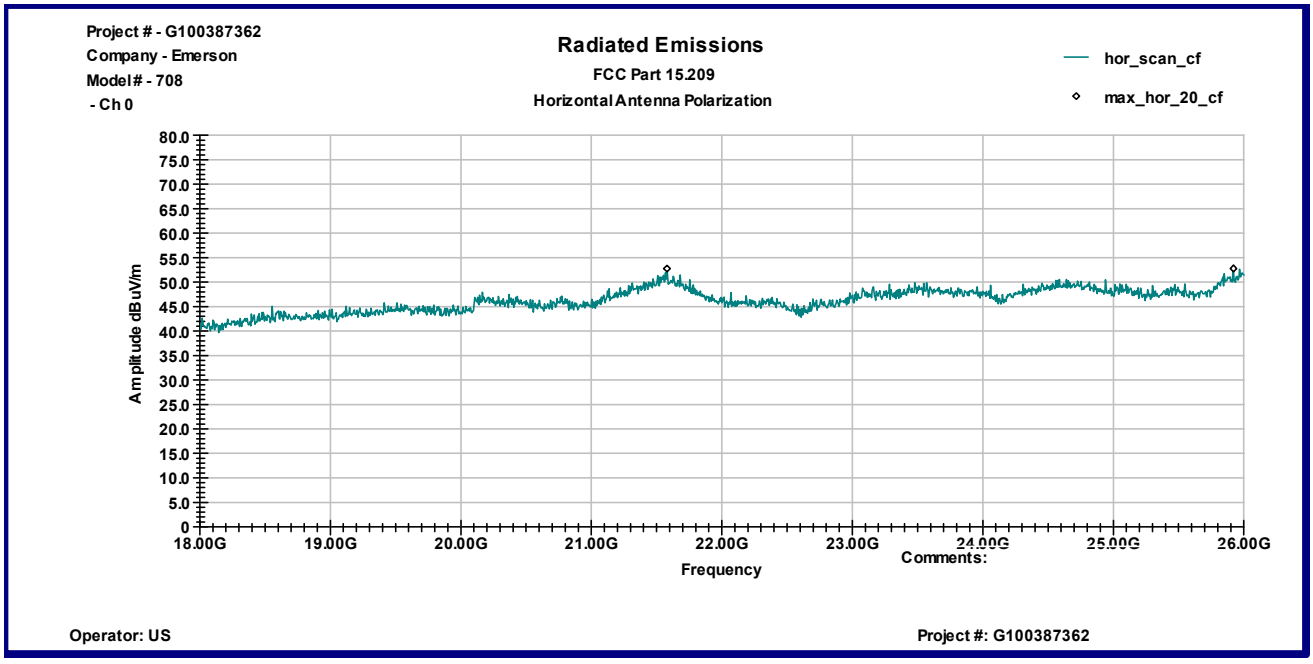
Graph 3.2.5



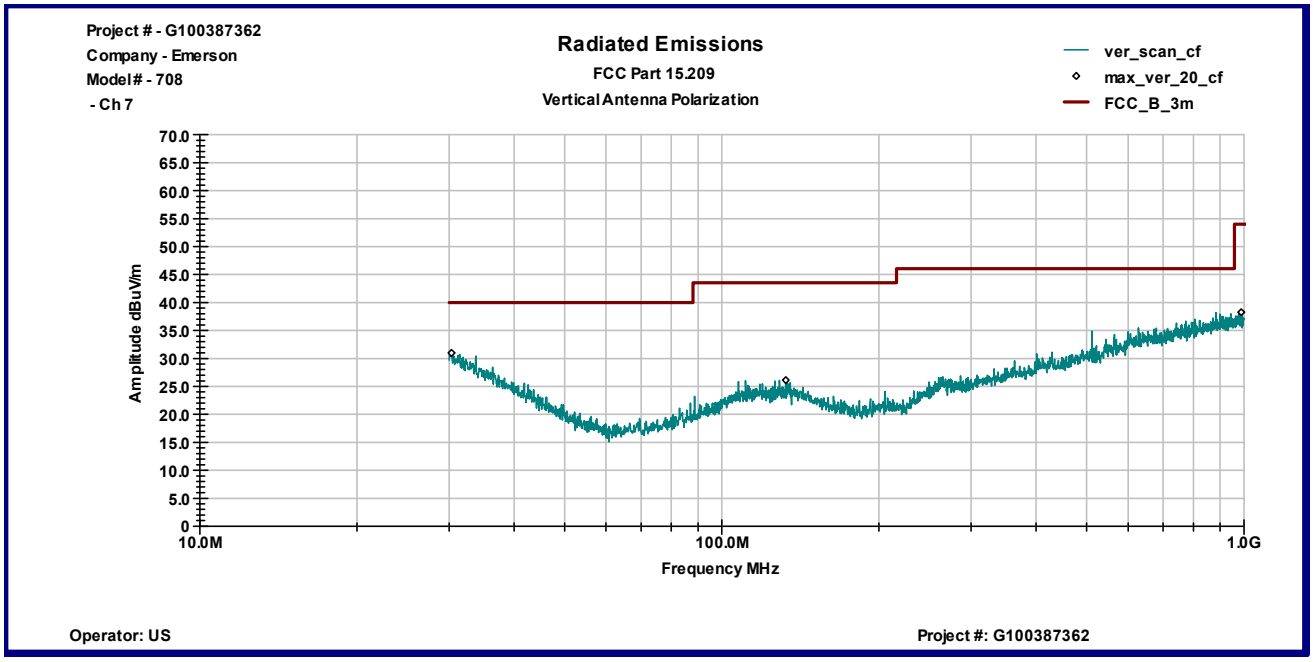
Graph 3.2.6



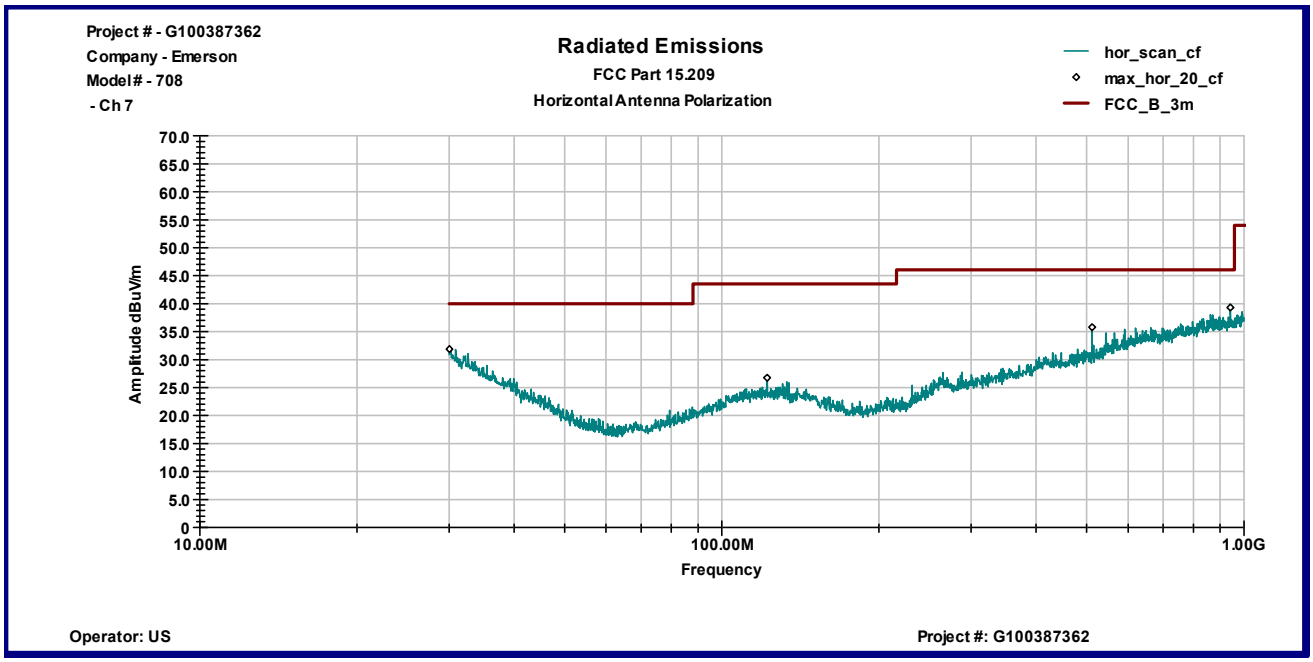
Graph 3.2.7



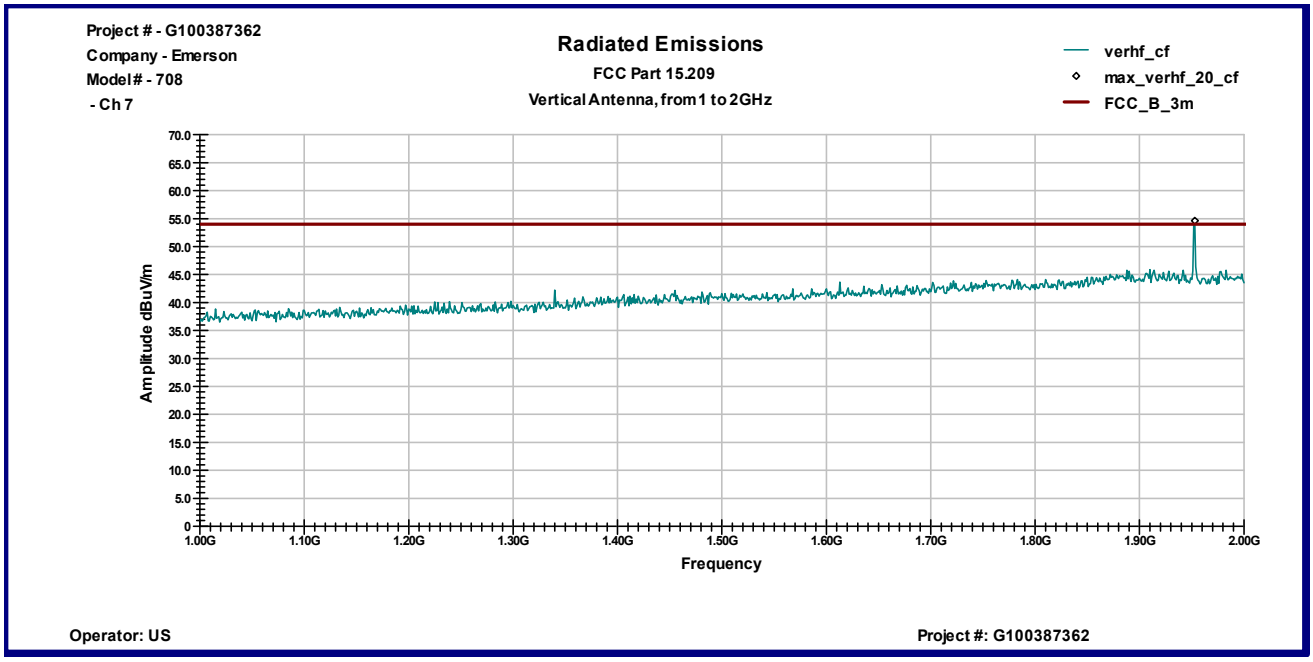
Graph 3.2.8



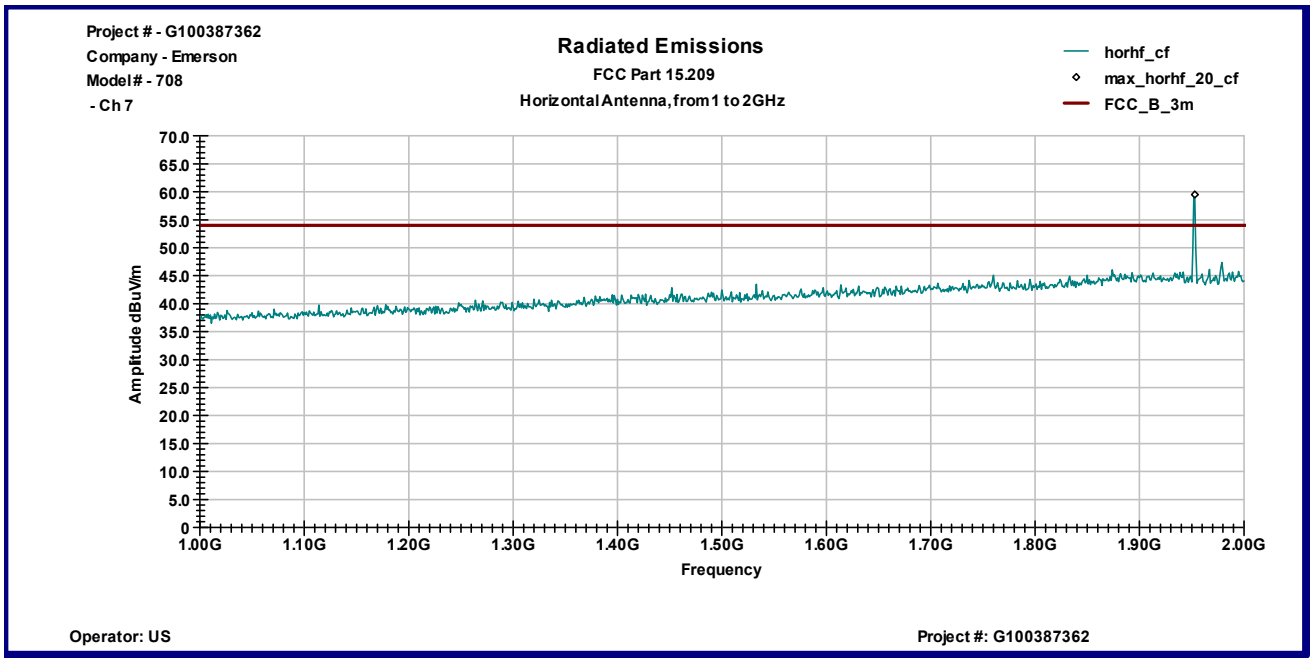
Graph 3.2.9



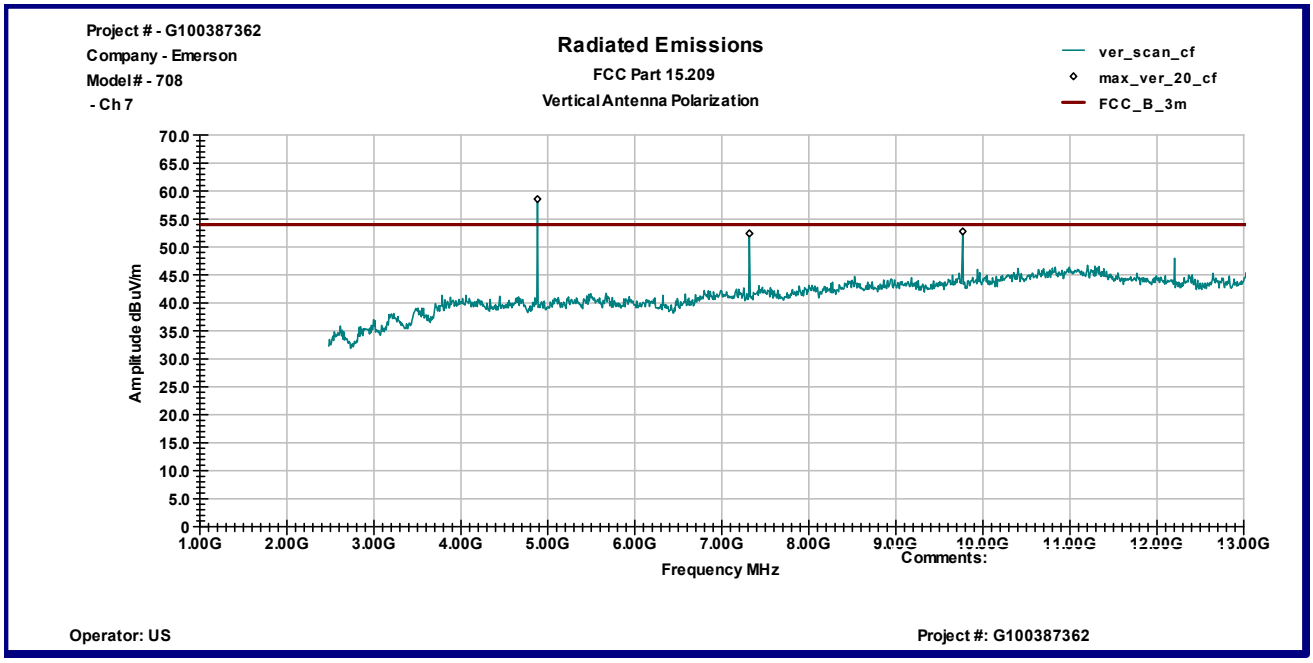
Graph 3.2.10



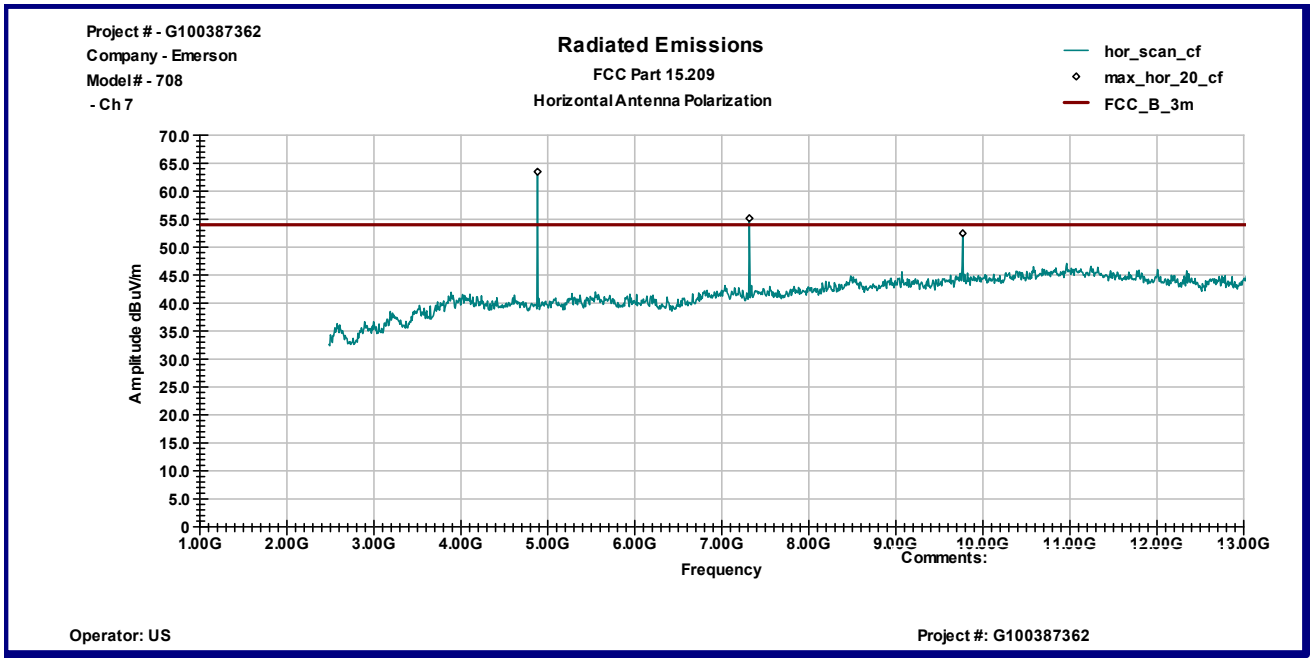
Graph 3.2.11



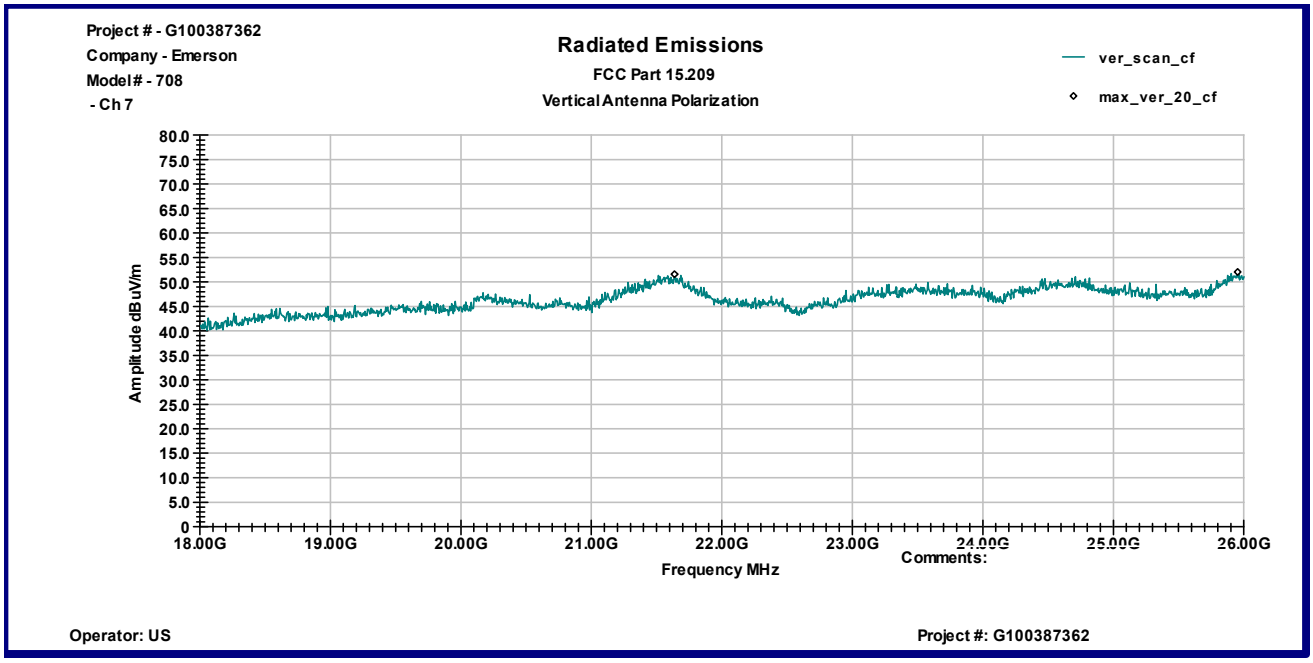
Graph 3.2.12



Graph 3.2.13



Graph 3.2.14



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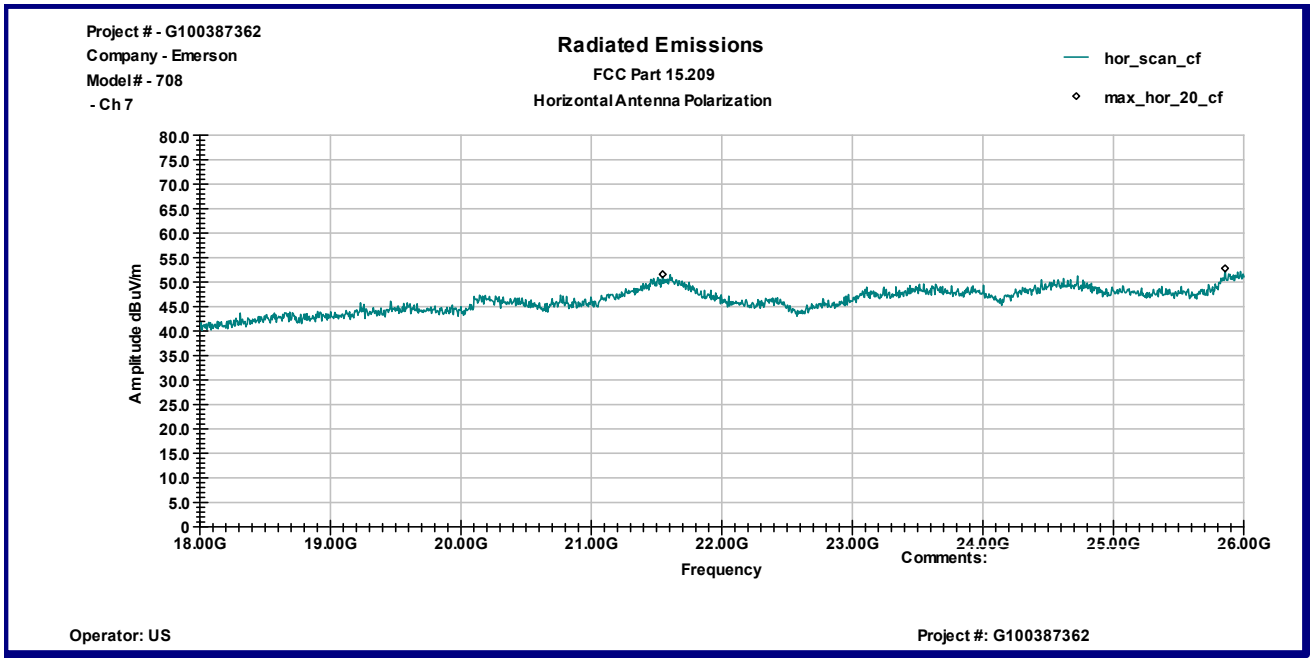
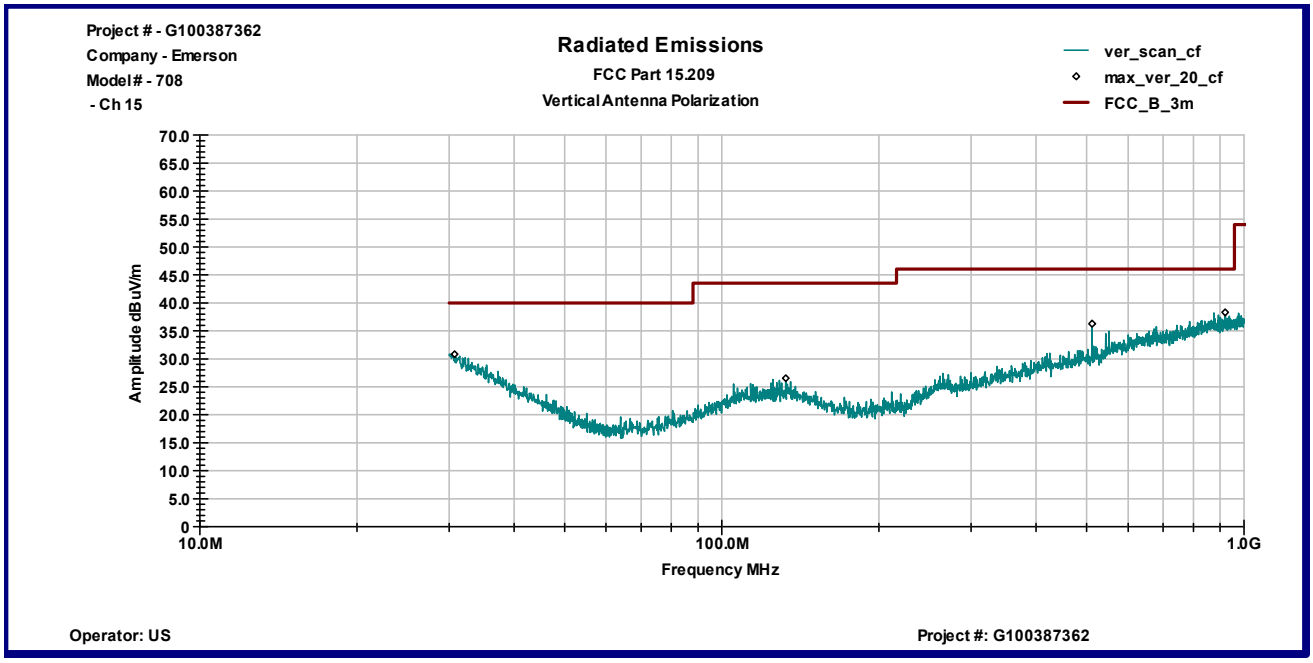
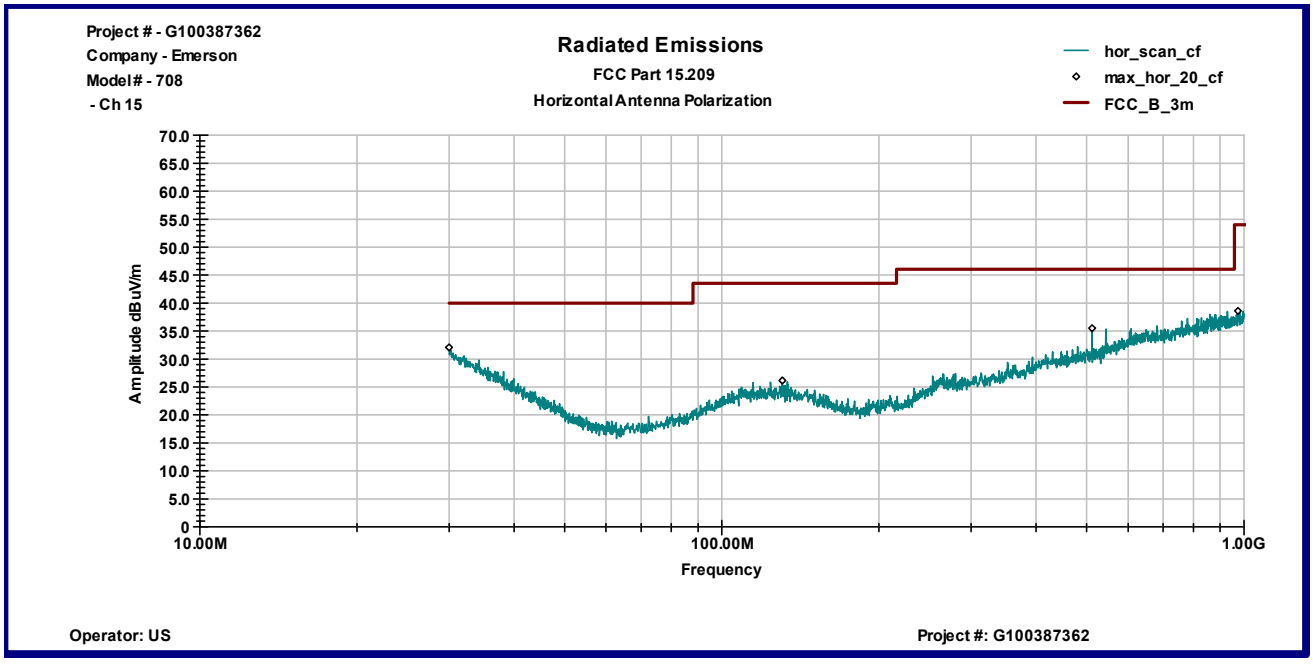


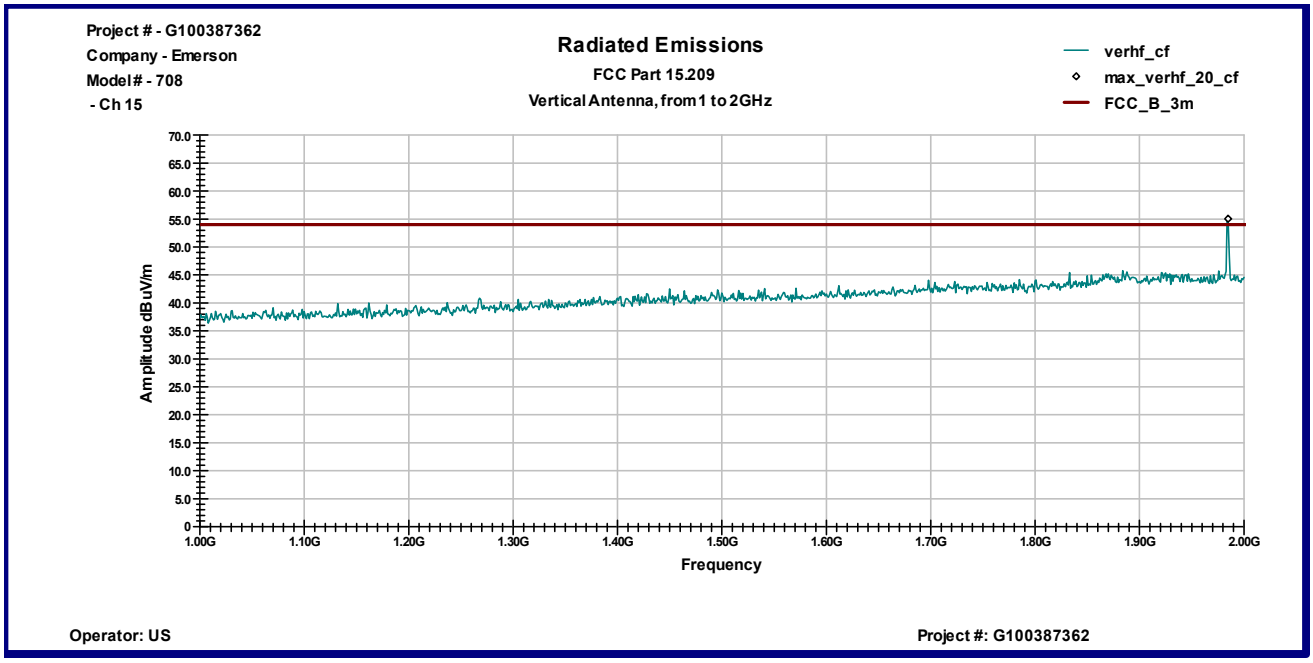
Graph 3.2.16



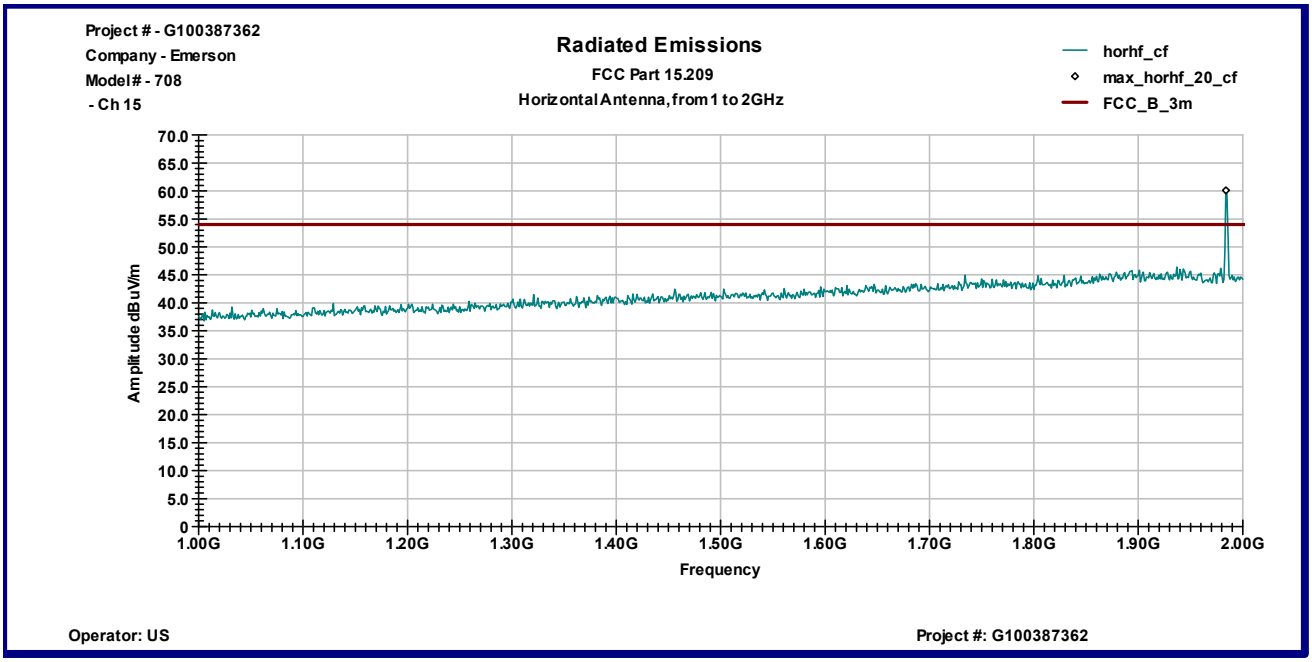
Graph 3.2.17



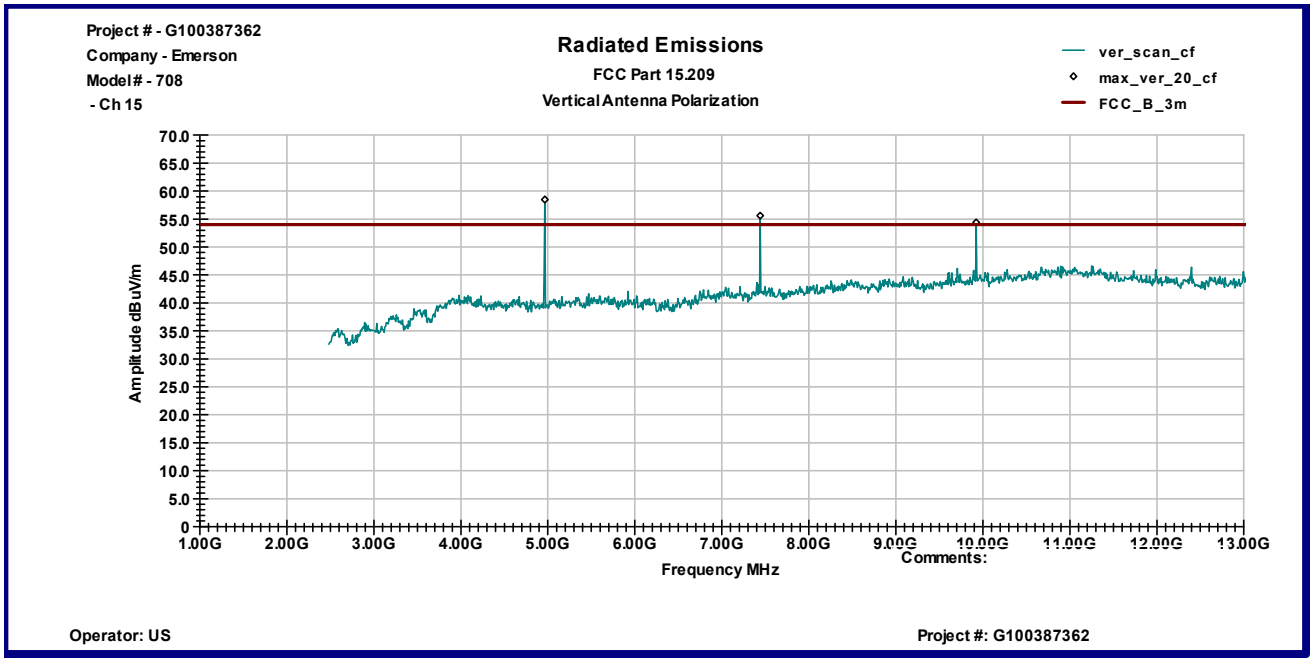
Graph 3.2.18



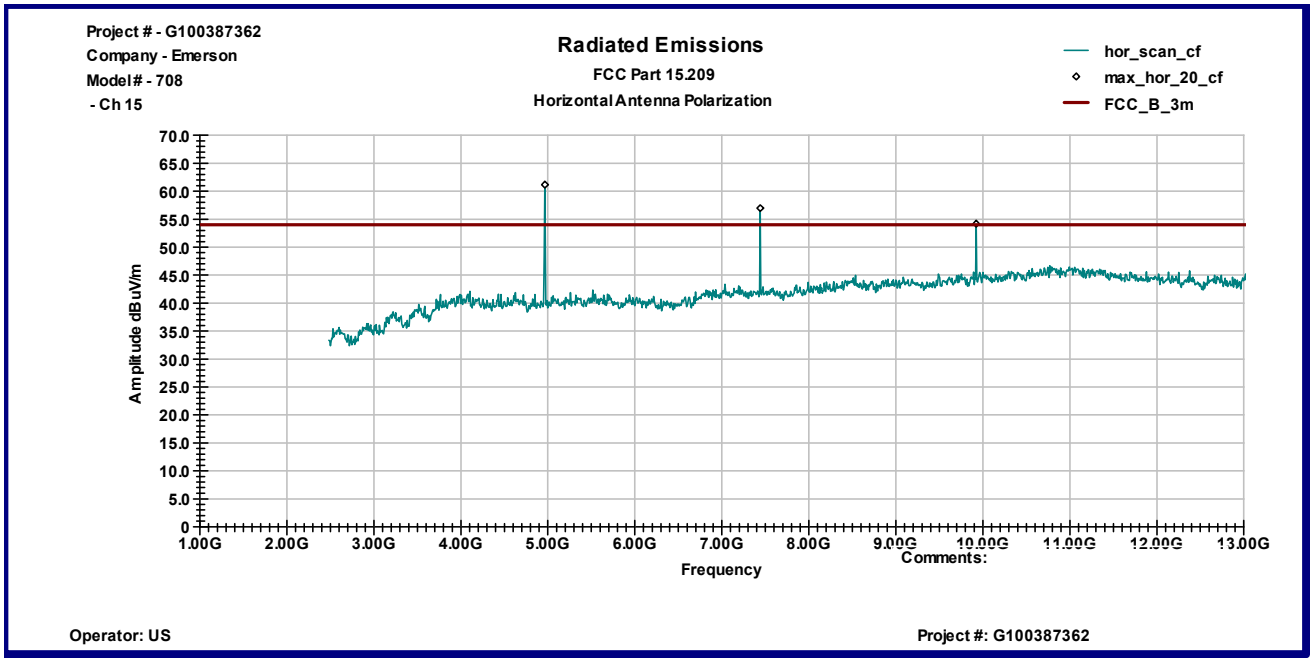
Graph 3.2.19



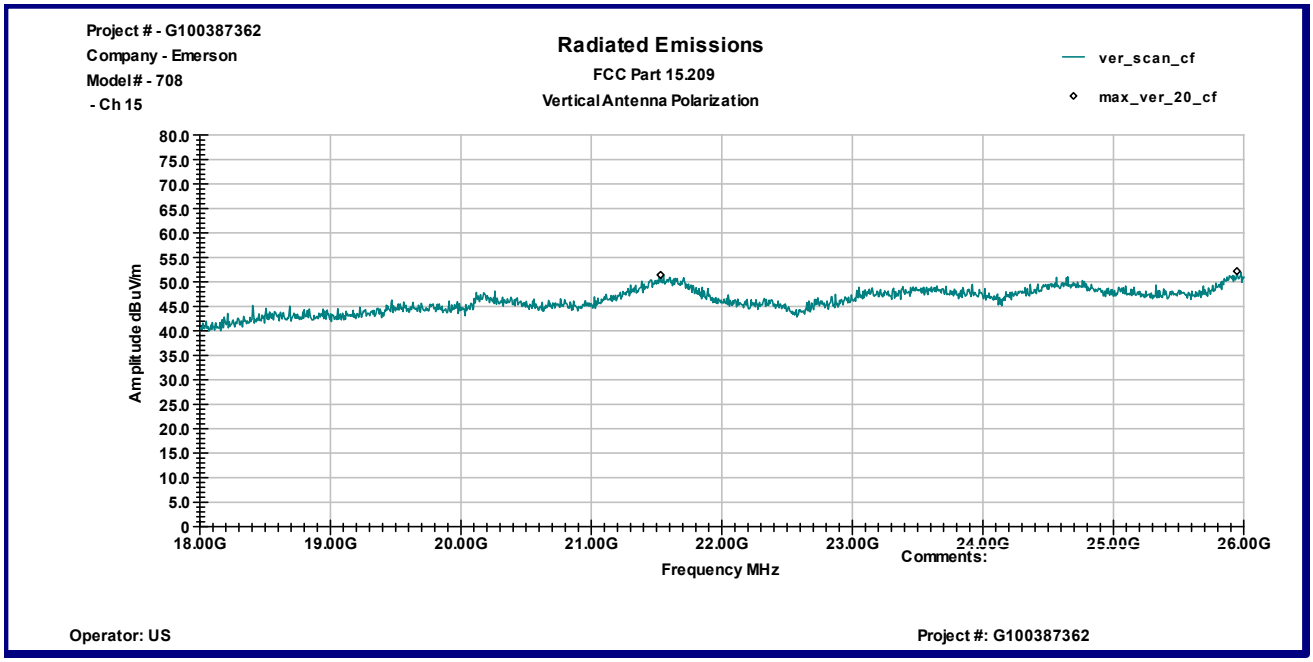
Graph 3.2.20



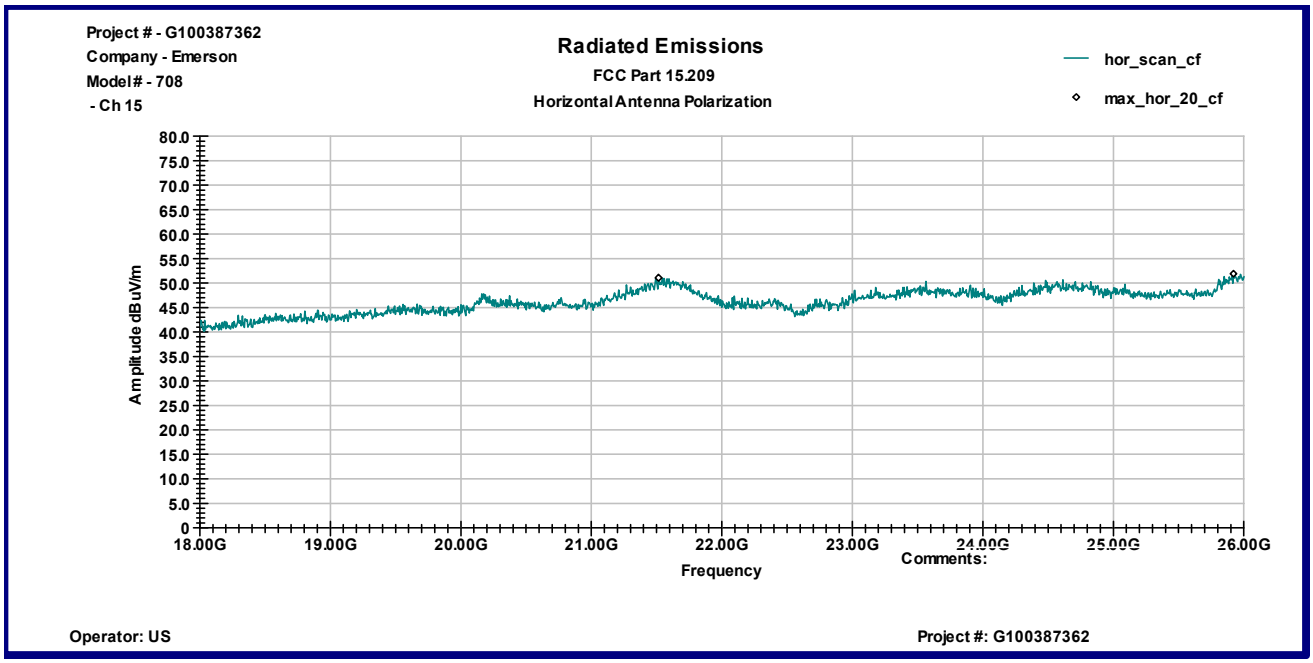
Graph 3.2.21



Graph 3.2.22



Graph 3.2.23



Graph 3.2.24

3.3 RF Exposure Compliance

The maximum measured antenna conducted power, P is 7.91dBm

The antenna gain, G is 0dBi

The maximum EIRP power = P + G
ERP = 7.91+ 0= 7.91dBm, or 0.00618W

The limits for Maximum Permissible Exposure (MPE) for transmitter operating at 2.4Hz, MPE is $1mW/cm^2$, or $10W/m^2$

$S = 10W/m^2$

The Power Density is related to EIRP with the equation:
$S = EIRP / 4\pi D^2$, or $10 = 0.00618 / 4\pi D^2$,

The minimum safe separation distance, D = 0.7cm, 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	12/07/2011	☒
Spectrum Analyzer	R & S	ESCI	100358	12909	07/12/2011	☒
Bicono-Log Antenna	Schaffner-Chase	CBL 6112 B	2468	14459	10/18/2011	☒
Horn Antenna	EMCO	3115	6579	15580	04/29/2011	☒
Waveguide Horn Antenna	EMCO	3116	9904-2423	9705	10/04/2011	☒
Pre-Amplifier	MITEQ	AMF-5D-00501800-28-13P	1122951	13475	10/06/2011	☒
Pre-Amplifier	MITEQ	AMF-6F-16002600-25-10P	1222383	MIN-0065	10/06/2011	☒
High Pass Filter	Reactel	7HS-4G-S12	0223	015274	VBU	☒
System	TILE! Instrument Control		Ver. 3.4.K.29	15259	VBU	☒