



TEST REPORT

Report Number: 101039189MIN-001E

Project Number: G101039189

**Testing performed on the
AdvisorOne
AVO-GSM3 1700MHz Radio**

**FCC ID: B4Z-944E-3G
Industry Canada ID: 1175C-944E3G**

**to
47 CFR Part 27:2010
47 CFR Part 15:2010, §15.107 and §15.109, Class B
RSS-139 Issue 2, 2009
ICES-003, Issue 5, 2012**

**For
UTC Fire & Security Americas Corporation, Inc.**

Test Performed by:
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Test Authorized by:
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Date: May 21, 2013

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Date: May 21, 2013

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1.0 GENERAL DESCRIPTION

Model:	AdvisorOne
Type of EUT:	Wireless Security System
FCC ID:	B4Z-944E-3G
Industry Canada ID:	1175C-944E3G
Related Submittal(s) Grants:	N/A
Company:	UTC Fire & Security Americas Corporation, Inc.
Customer:	Mr. Kevin Flanders
Address:	1275 Red Fox Road Arden Hills, MN 55112
Phone:	651-773-4663
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Test Standards:	☒ 47 CFR, Part 27:2010 ☒ RSS-139, Issue 2, 2009 ☒ ICES-003, Issue 5, 2012 ☒ 47 CFR, Part 15:2009, §15.107 and §15.109, Class B ☐ Other [REDACTED]
Type of radio:	☐ Stand -alone ☒ Module ☐ Hybrid
Date Sample Submitted:	February 15, 2013
Test Work Started:	February 15, 2013
Test Work Completed:	April 22, 2013
Test Sample Conditions:	☐ Damaged ☐ Poor (Usable) ☒ Good



1.1 Product Description; Test Facility

Product Description:	AVO-GSM3 1700MHz Radio
Board Revision:	55-944
Transmitter Type:	☐ FHSS ☒ Digital Modulation ☐ WiFi ☐ Blue Tooth
Operating Frequency Range(s):	From 1712.4 to 1752.6MHz
Modulation:	DQPSK-WCDMA
Emission Designator:	4M1F9W
Antenna Gain:	1.8dBi
Antenna Installation:	☐ User ☐ Professional ☒ Factory
Transmitter power configuration:	☐ Internal battery ☒ External power source ☒ 120VAC ☐ 230VAC ☐ 400VAC ☐ [redacted] VDC ☐ Other: [redacted] [redacted] Amp. ☐ 50Hz ☒ 60Hz
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)
- ☐ -

Operating modes of the EUT:

No.	Description
1	Continuous communication with Radio Communication Tester. Test was performed at low channel, middle channel, and upper channel.

Cables:

No.	Type	Length	Designation	Note
1	RJ45, not shielded	<100ft	Ethernet WAN cable	
2	RJ45, not shielded	<100ft	Ethernet LAN cable	
3	RJ45, not shielded	>100ft	Home telephone connection cable	
4	2-wire not shielded DC power	6ft	Battery Connection	
5	2-wire not shielded DC power	>100ft	Telephone bell	
6	Zones 1, 2, 3, 4,5	>100ft	Superbus	
7	External antenna cable	<6ft	319.5MHz receive antenna	
8	External antenna cable	<6ft	GSM-GPRS antenna	

Support equipment/Services:

No.	Item	Description
1	Agilent 8960 Series	Wireless Communication Test Set
2	Mini-Circuits ZABDC20-252H-S+	Coupler

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:	-30 to +50 ° C
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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).

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

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

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

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

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

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

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

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
27.50/RSS-139	RF output power ERP	Pass
27.54/RSS-139	Frequency Stability	Pass
2.1049/RSS-139	Occupied Bandwidth	Pass
27.53/RSS-139	Antenna conducted spurious emissions	Pass
27.53/RSS-139	Enclosure Radiated spurious emissions	Pass
27.53/RSS-139	Antenna conducted spurious emissions at Block Edges	Pass
1.1310, 2.1091(c)/ RSS- Gen 5.5	RF Exposure Compliance	Pass
15.109/ICES-003	Receiver/digital device radiated emissions	Pass
15.107/ICES-003	Digital device conducted emissions	Pass



3.0 TEST CONDITIONS AND RESULTS

3.1 RF Output Power ERP

Test location: ☐ OATS ☐ Anechoic Chamber ☐ Other

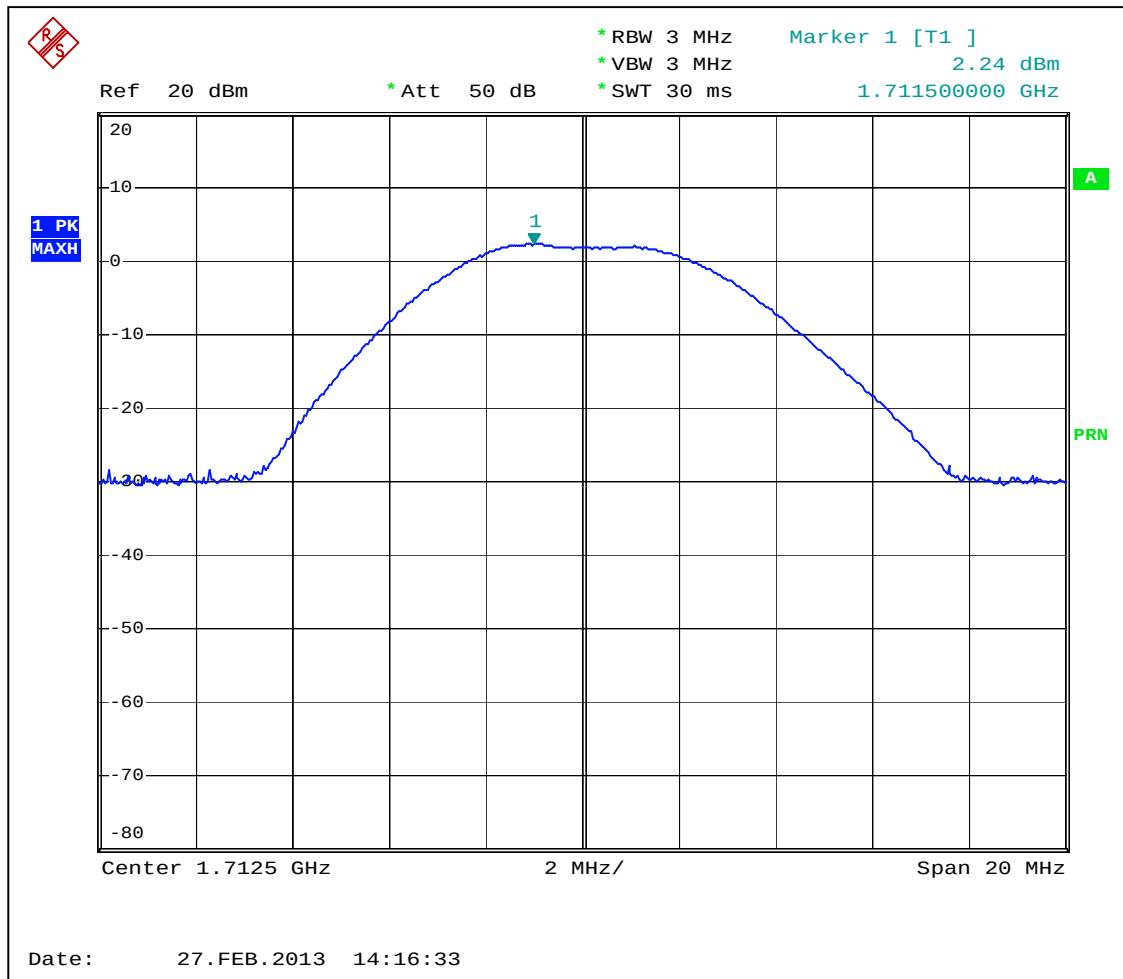
Test result: **Pass**

Max. Margin: 3.3dB below the limits

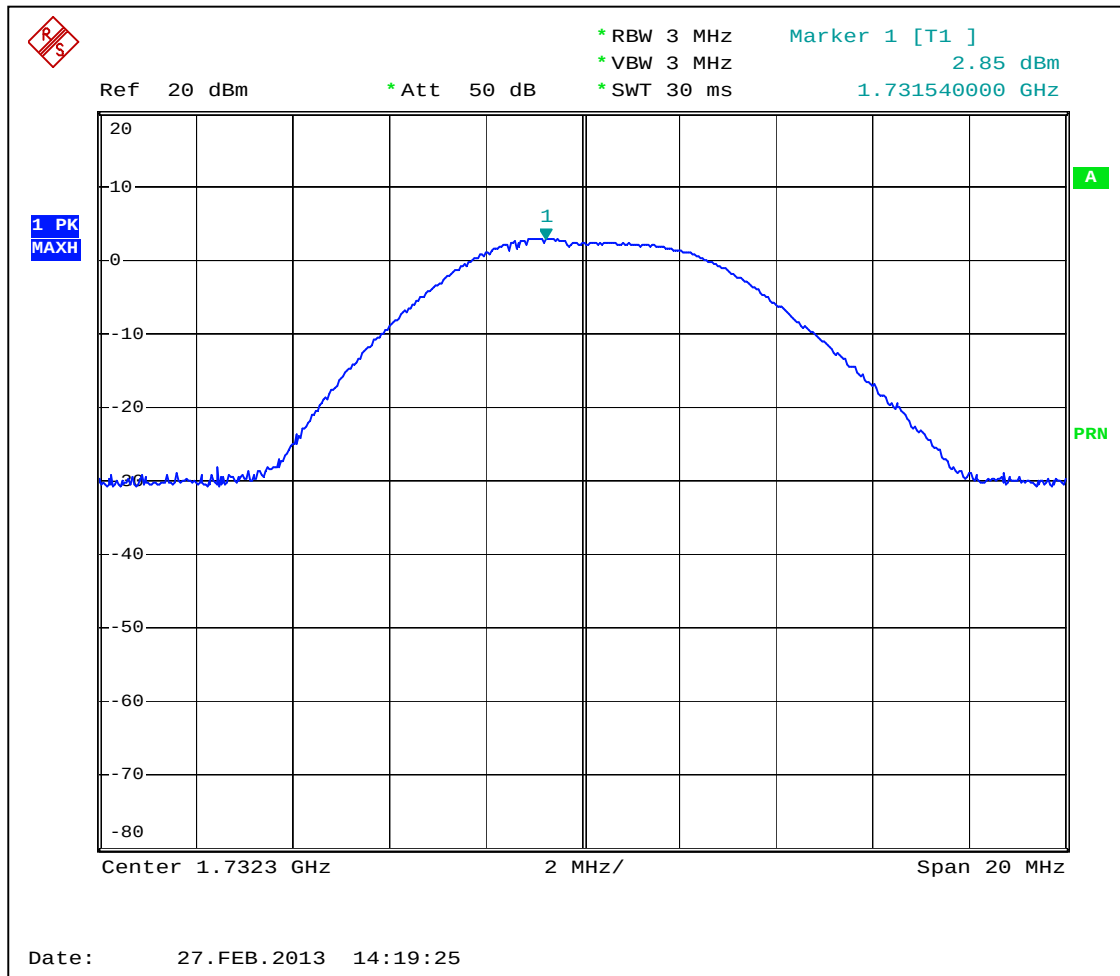
WCDMA mode

Power Output:	Conducted				
Frequency Range:	☒ 1850.2-1909.8MHz				
Low Frequency MHz	Measured power dBm	Total CF dB	ERP dBm	ERP Limit dBm	Margin dB
1712.5	2.2	23.8	26.0	30.0	-4.0
Middle Frequency MHz					
1732.3	2.9	23.8	26.7	30.0	-3.3
Upper Frequency MHz					
1752.4	2.2	23.8	26.0	30.0	-4.0
RBW:	☐ 1MHz ☒ 3MHz ☐ 10MHz				
VBW:	☐ 1MHz ☒ 3MHz ☐ 10MHz				
CF=Cable/Coupler Insertion Loss:	☒ 22.0dB				
Antenna Gain (dBi)	☒ 1.8dBi				
Total CF=CF+Antenna Gain	☒ 23.8dBi				

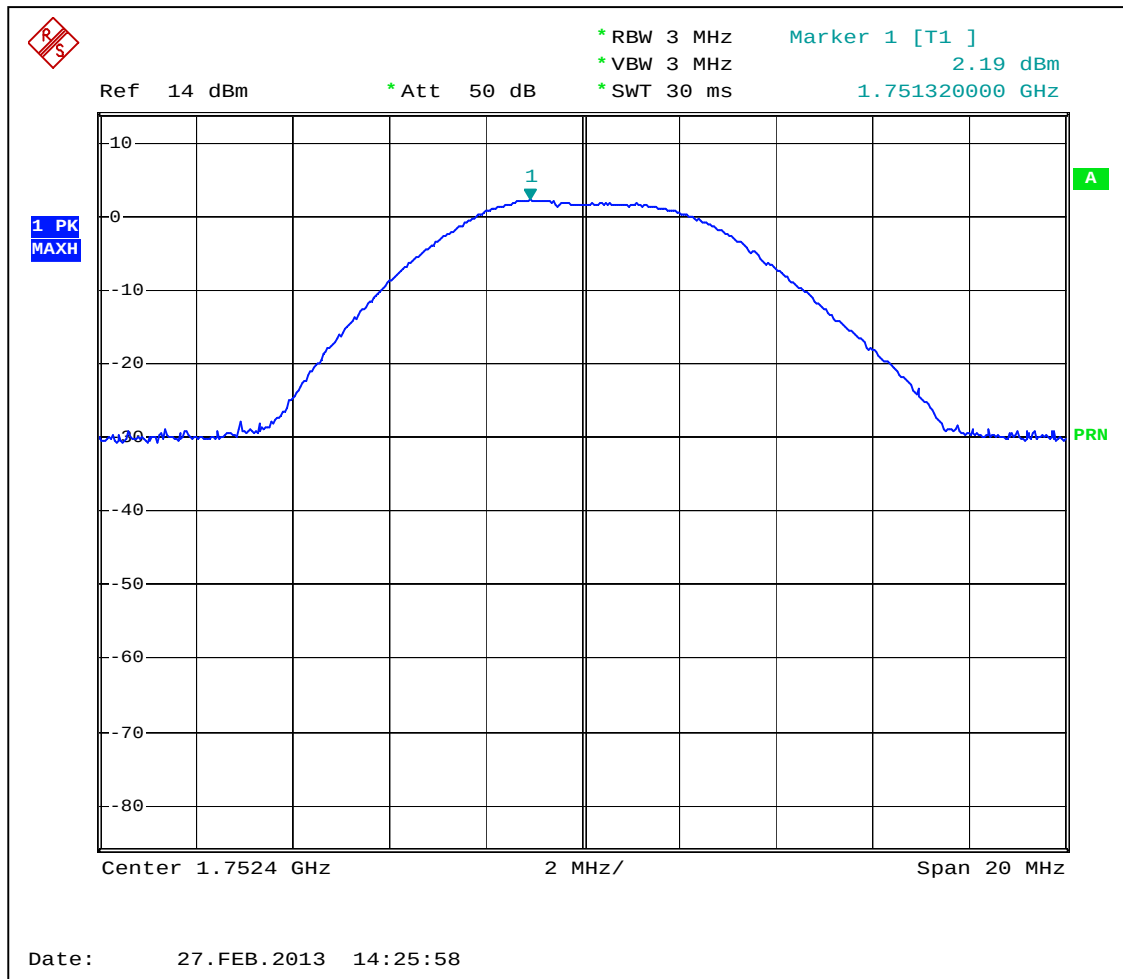
- Notes:**
1. The Conducted RF output power measurements were made at the RF output terminal of the EUT using coupler and spectrum analyzer. The EUT was controlled via Agilent 8960 Series station selecting maximum power of the EUT.
 2. Max ERP is 1W or 30.0dBm
 3. The maximum output ERP is 26.7dBm or 0.47W



Graph 3.1.1



Graph 3.1.2



Graph 3.1.3



3.3 Frequency Stability

Table 3.3.1

Temperature Degree C	Frequency Deviation Hz	Frequency Stability ppm	Frequency error limit ppm	Test Result
-30	32.0	0.038	±2.5	Pass
-20	29.0	0.035	±2.5	Pass
-10	25.6	0.031	±2.5	Pass
0	25.4	0.030	±2.5	Pass
10	24.5	0.029	±2.5	Pass
20	23.1	0.028	±2.5	Pass
25	0.0	0.000	±2.5	Pass
30	24.5	0.029	±2.5	Pass
40	27.1	0.032	±2.5	Pass
50	30.3	0.036	±2.5	Pass

Table 3.3.2

Input Voltage V	Frequency Deviation Hz	Frequency Stability ppm	Frequency error limit ppm	Test Result
138	19.7	0.024	±2.5	Pass
120	0.0	0.000	±2.5	Pass
102	21.9	0.026	±2.5	Pass

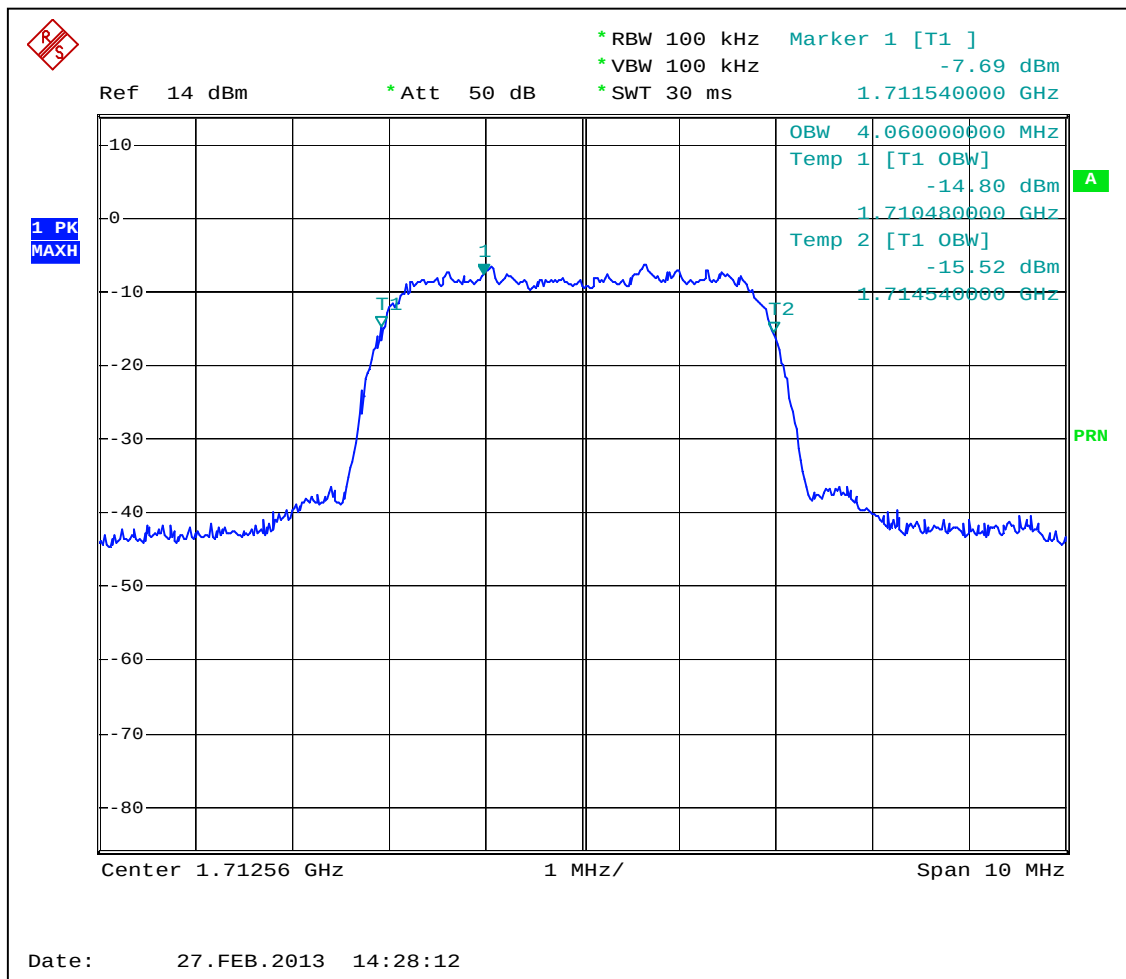
Notes: Frequency stability over voltage variations measurements were made at room temperature at the ±15% of the nominal mains 120VAC. Measurements were made at the low transmit channel.



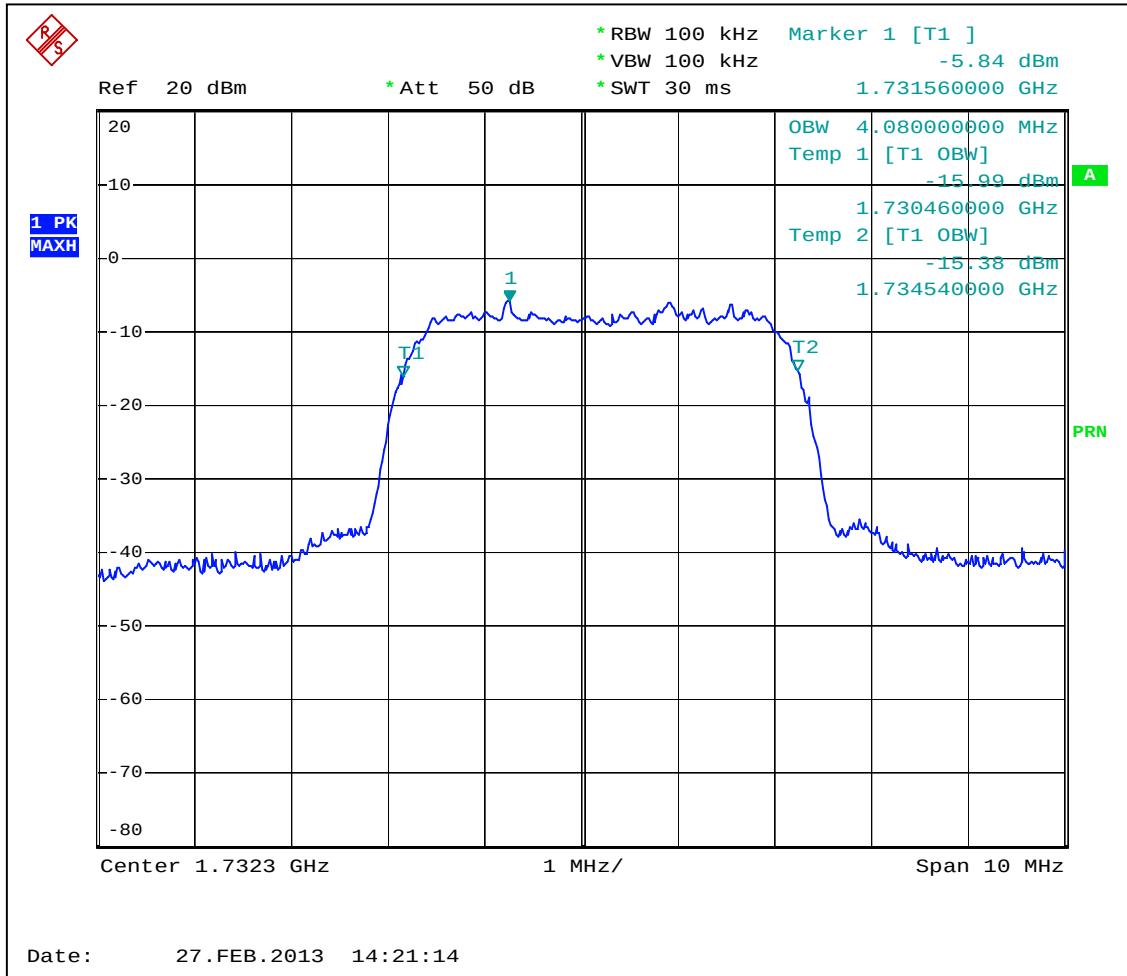
3.4 99% Occupied Bandwidth

Low Frequency Channel MHz	Middle Frequency Channel MHz	Upper Frequency Channel MHz
4.06	4.08	4.08
RBW: VBW:	☒ 100kHz ☐ other kHz ☒ 100kHz ☐ 300kHz ☐ other kHz	

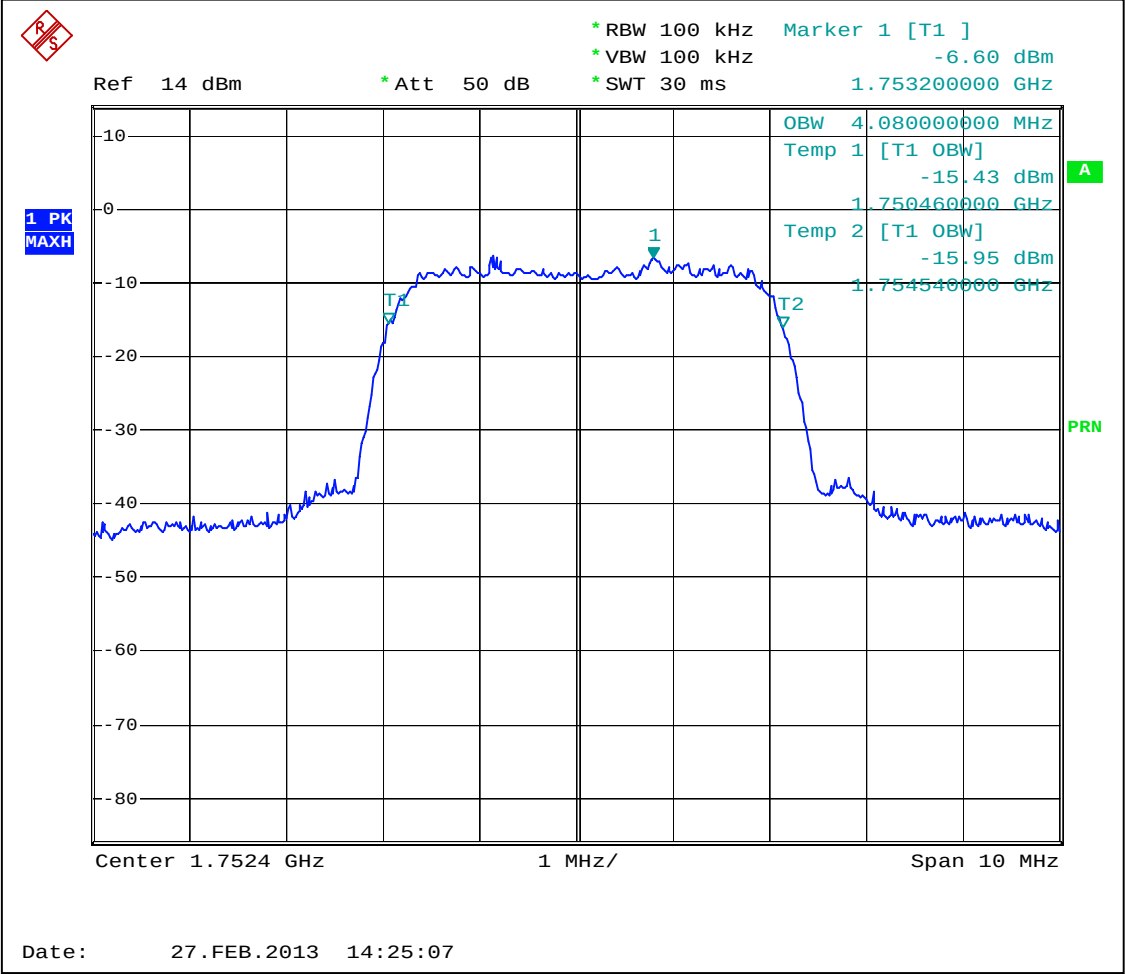
Notes: None



Graph 3.4.1 low channel



Graph 3.4.2 middle channel



Graph 3.4.3 high channel

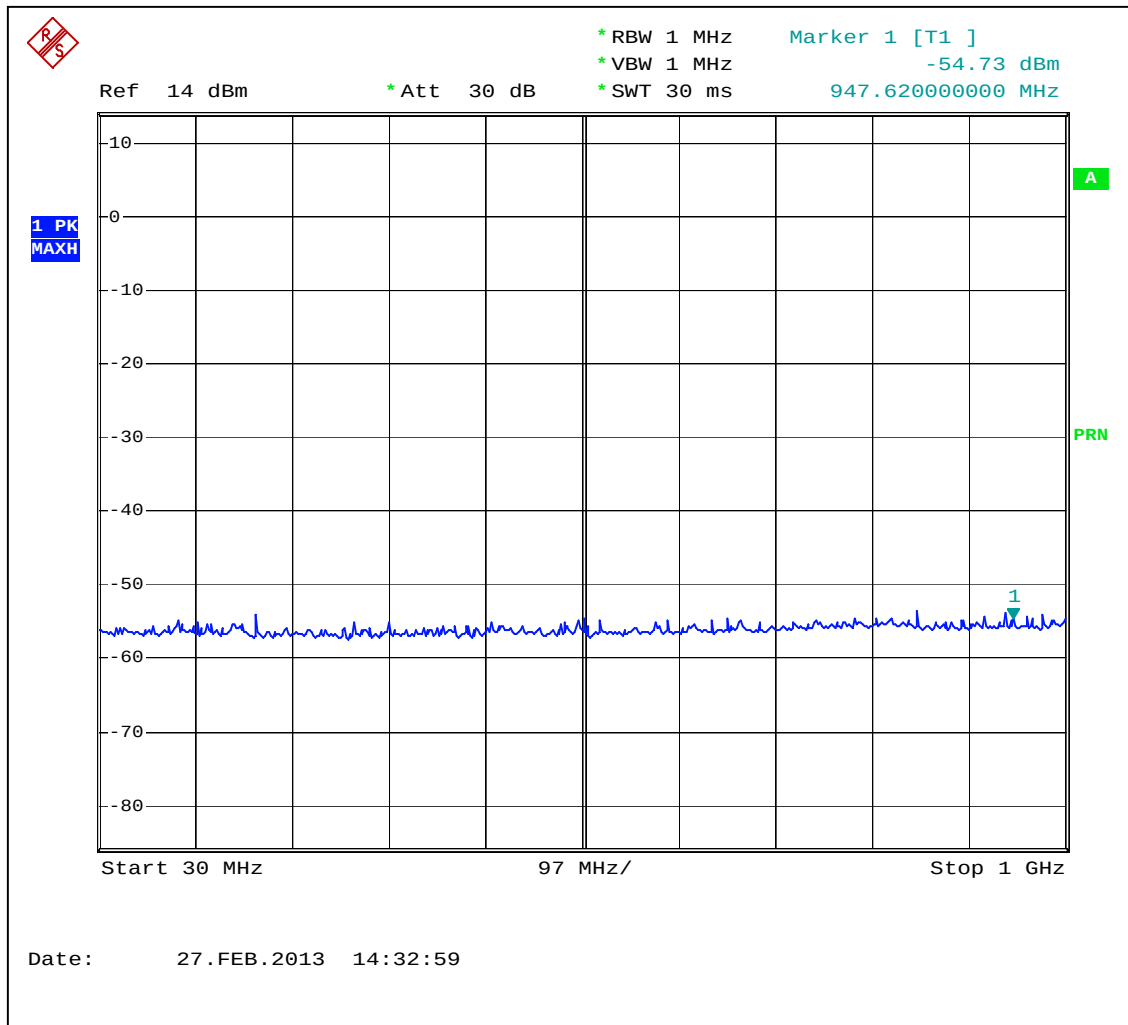


3.5 Antenna conducted spurious emissions

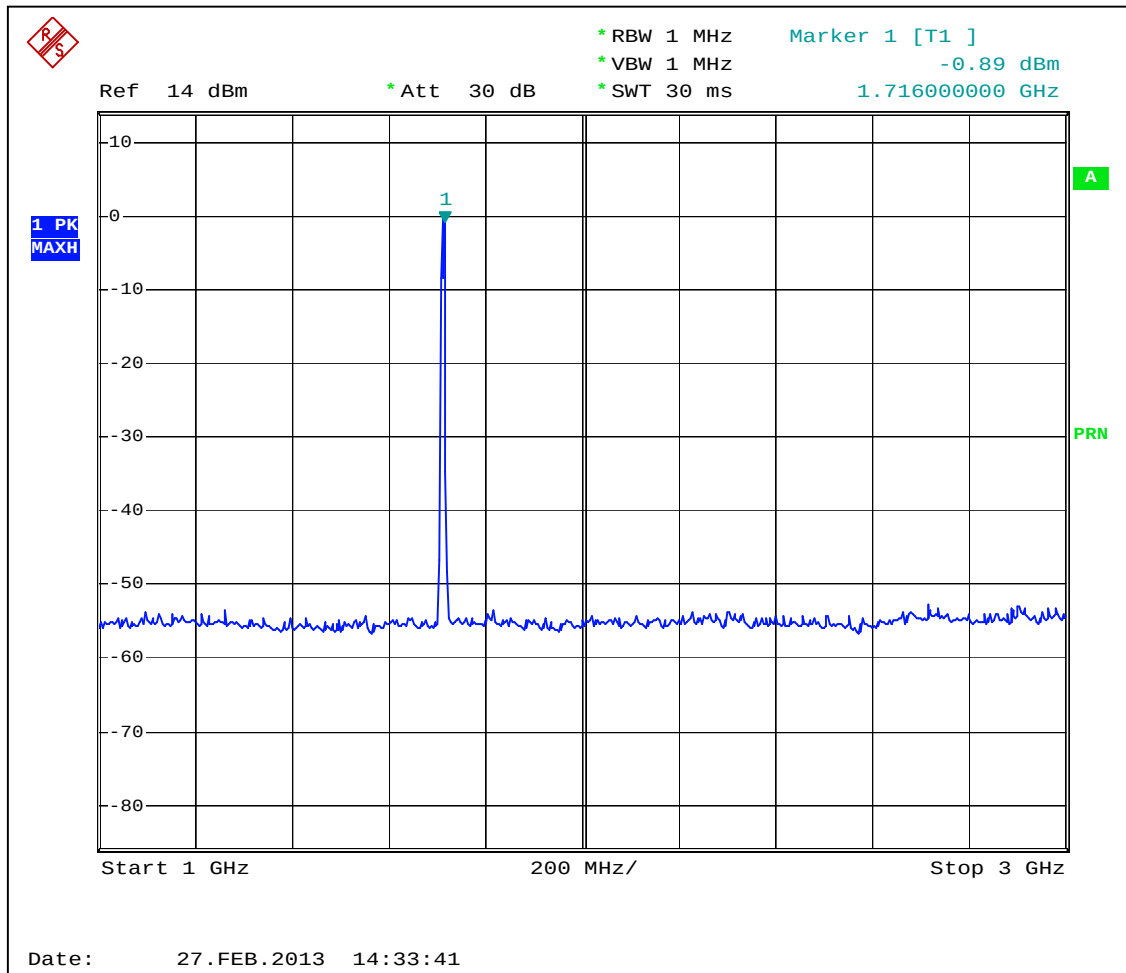
Test location: ☐ OATS ☐ Anechoic Chamber ☐ Other

Test result: **Pass**

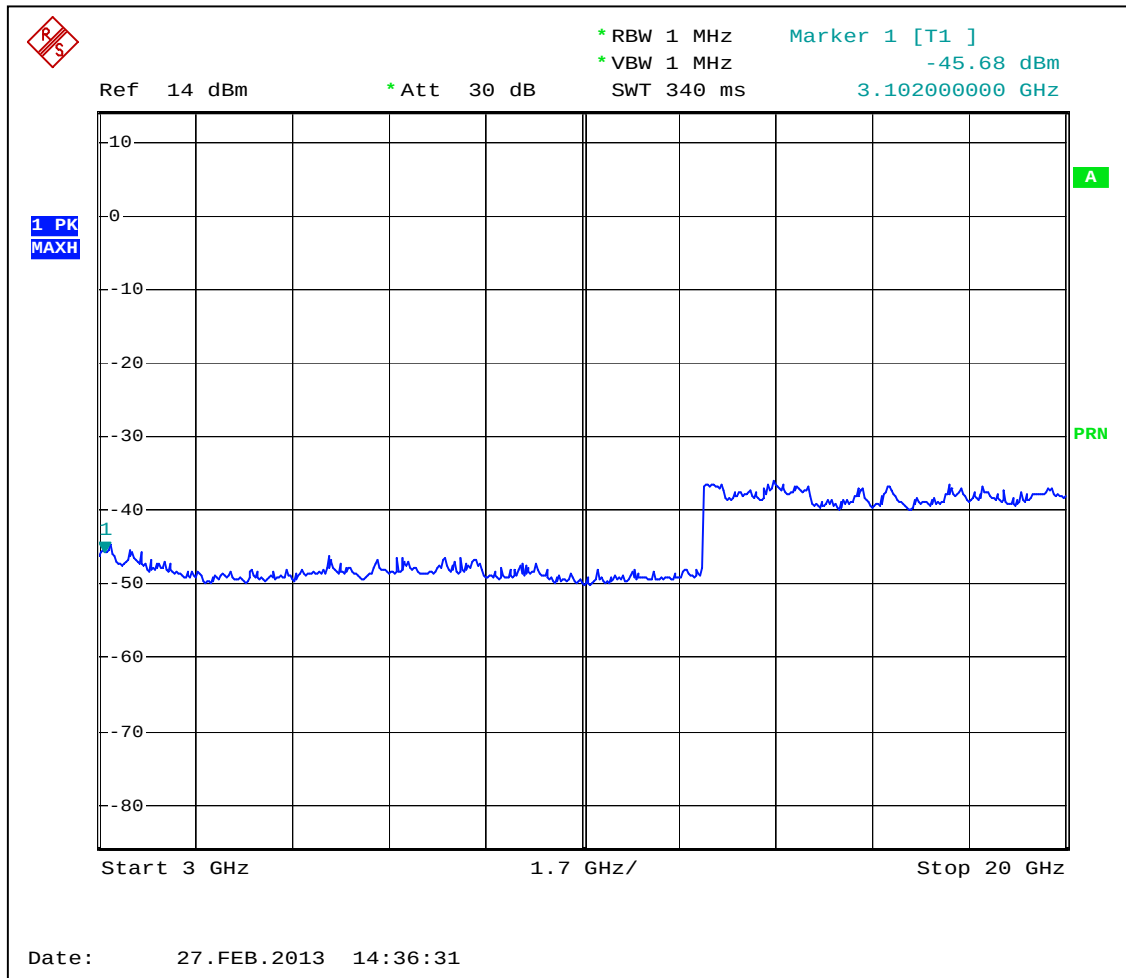
Notes: The power of spurious emissions should be attenuated at least $43+10\log(P)$ dB, P in watts, so that the level in dBm is -13dBm.
The maximum detected spurious emission is -45.5dBm or -21.7dBm ERP. The margin of the maximum emissions is $-21.7\text{dB} - (-13\text{dB}) = -8.7\text{dB}$. For passing results see Graphs 3.5.1-3.5.3 (low channel), Graphs 3.5.4-3.5.6 (middle channel) and Graphs 3.5.7-3.5.9 (high channel).
Fundamental frequencies are excluded from the measurements.



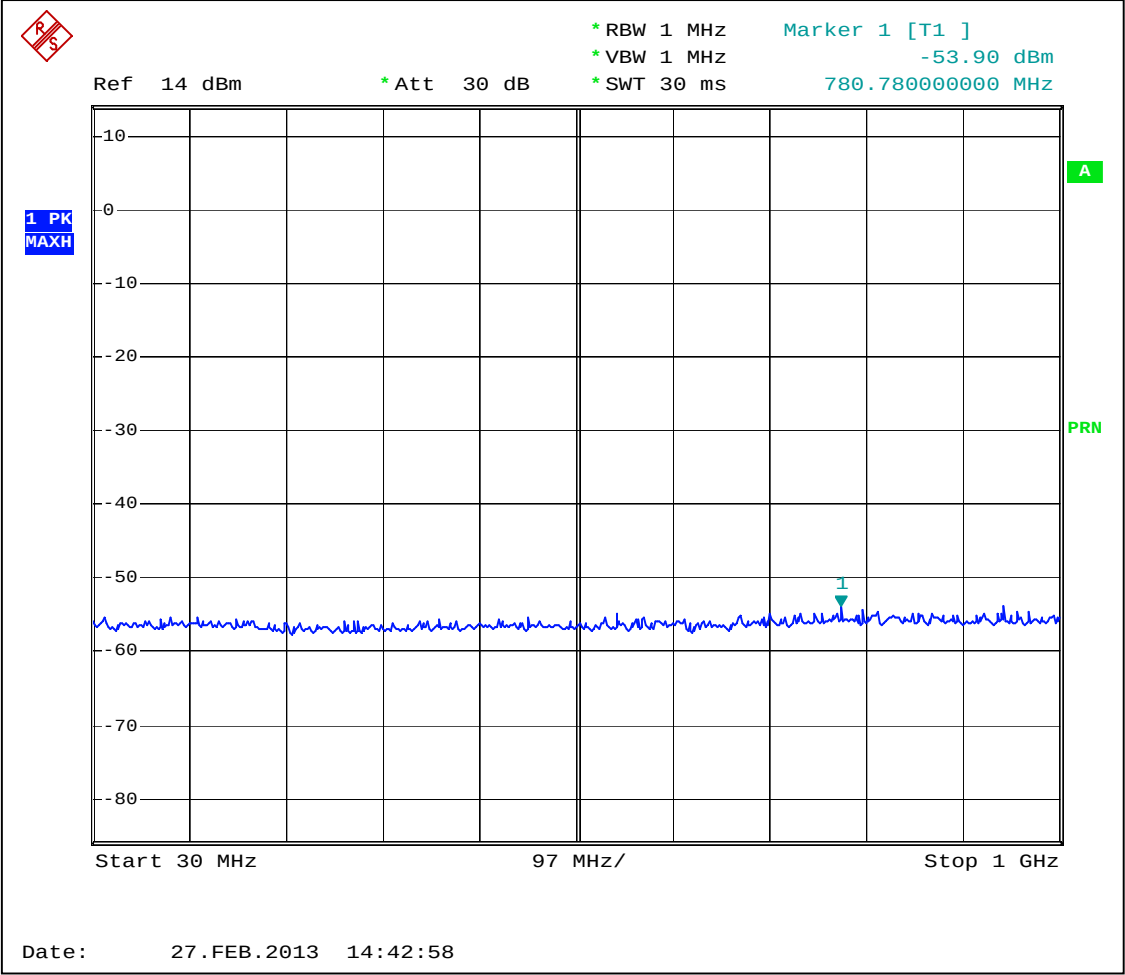
Graph 3.5.1



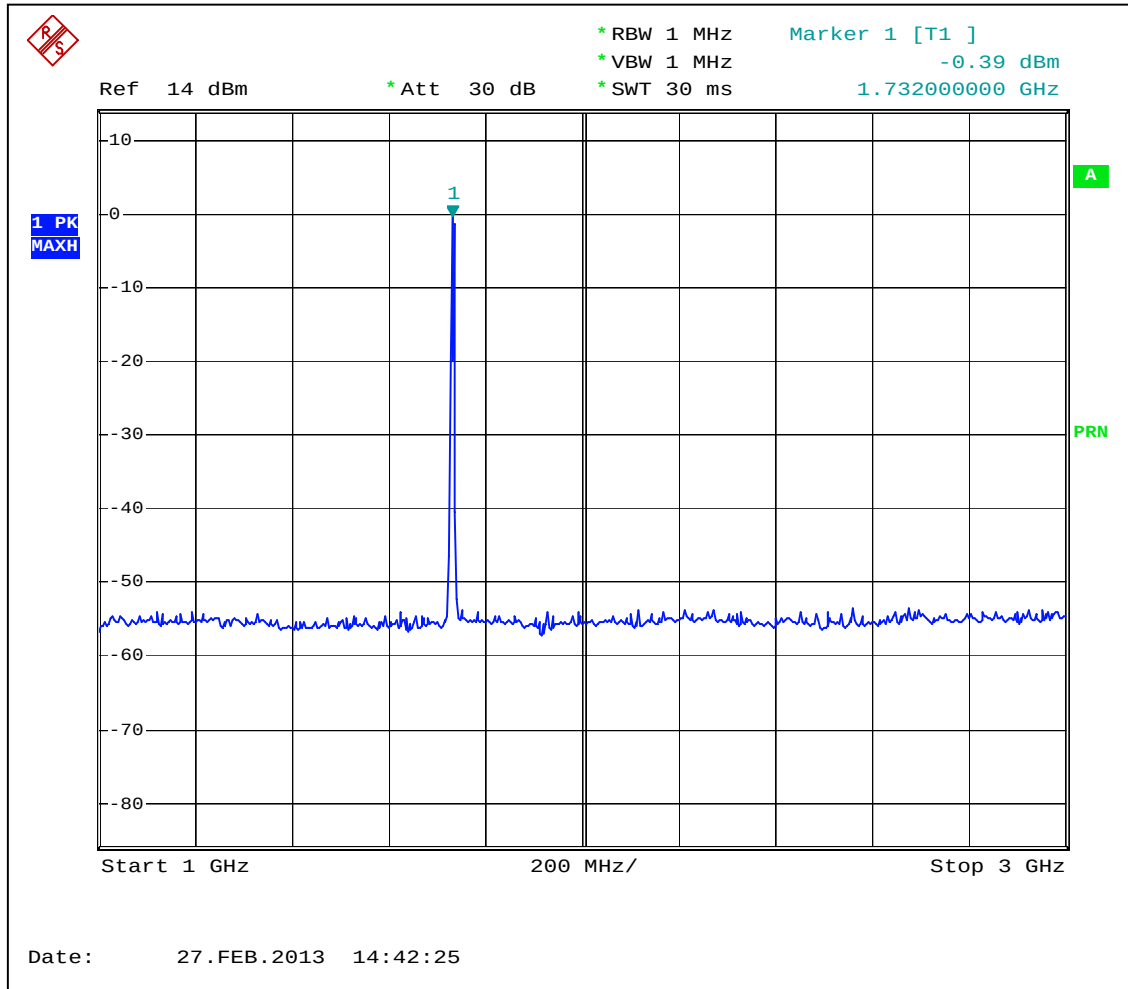
Graph 3.5.2



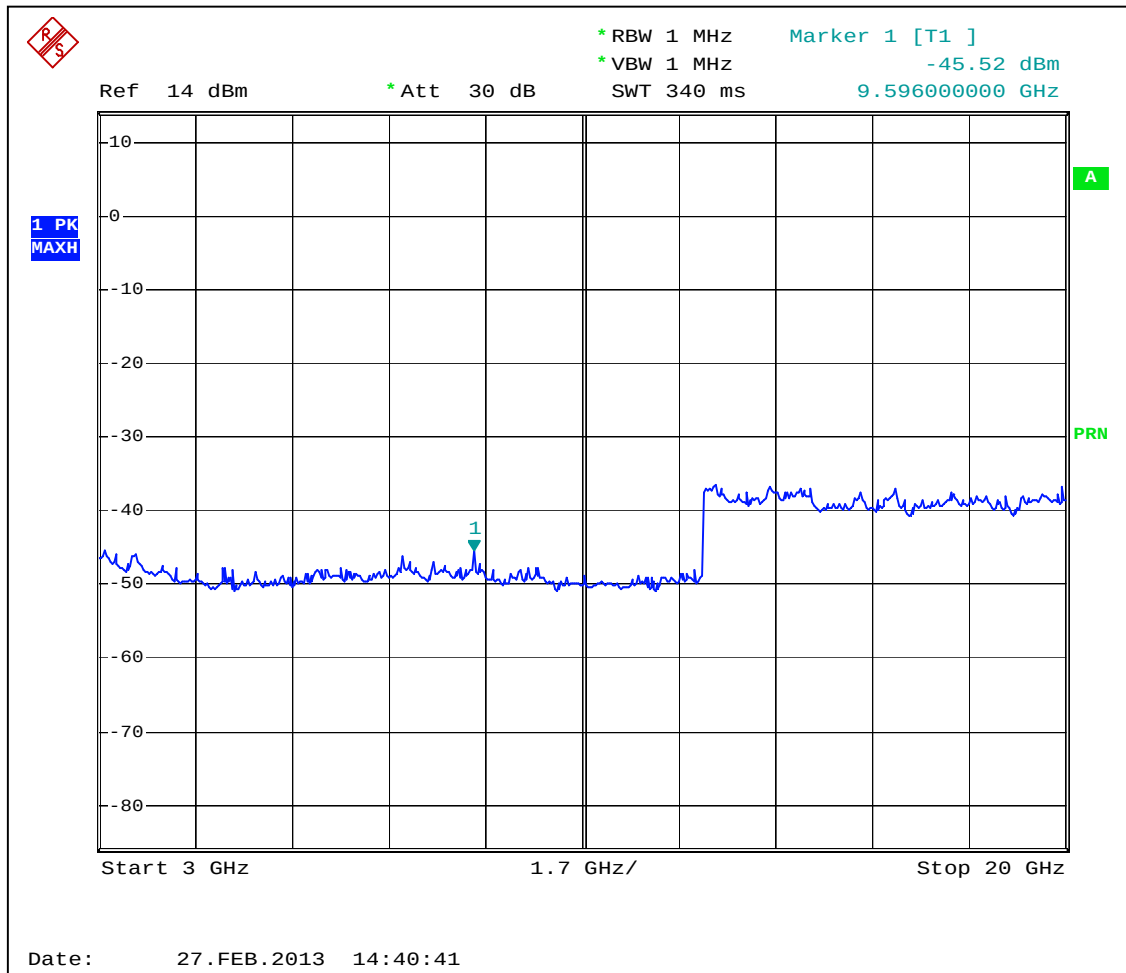
Graph 3.5.3



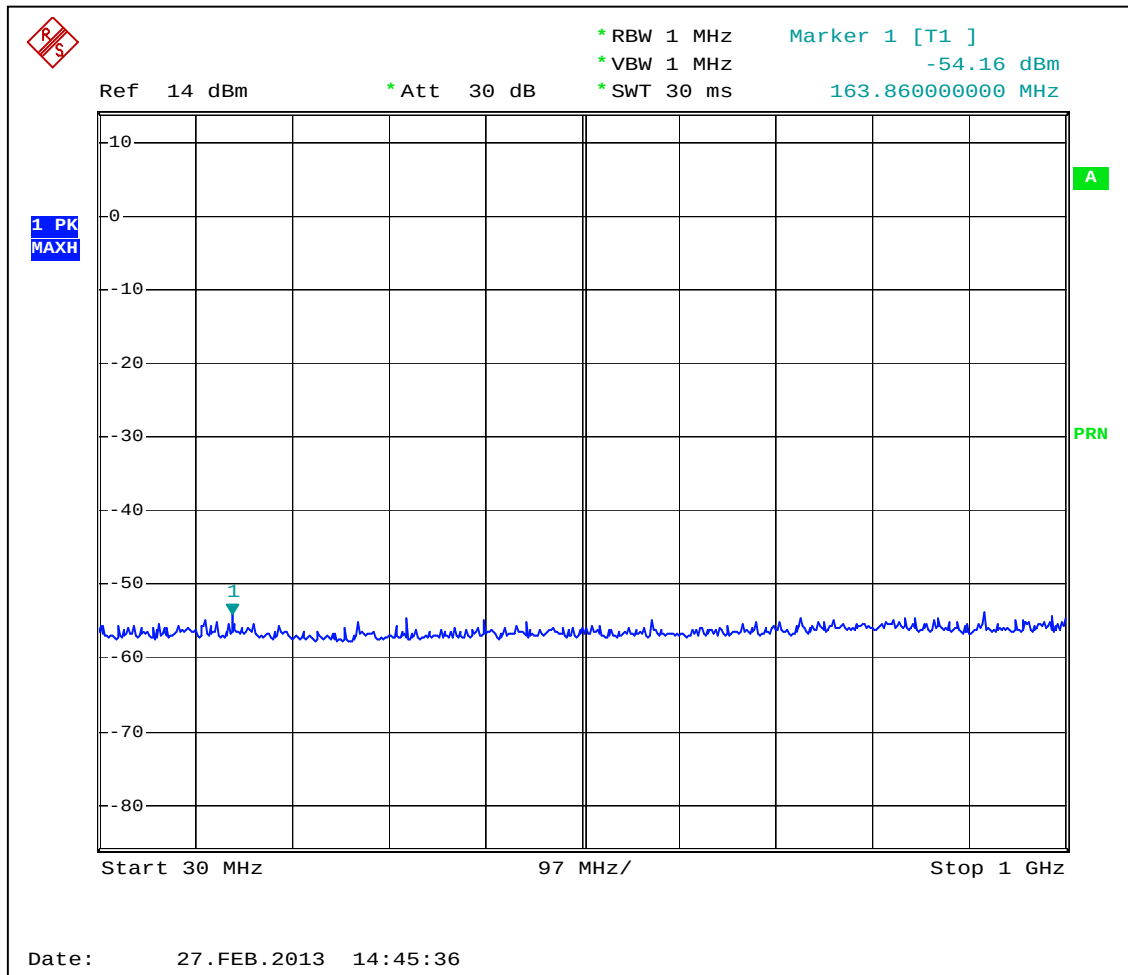
Graph 3.5.4



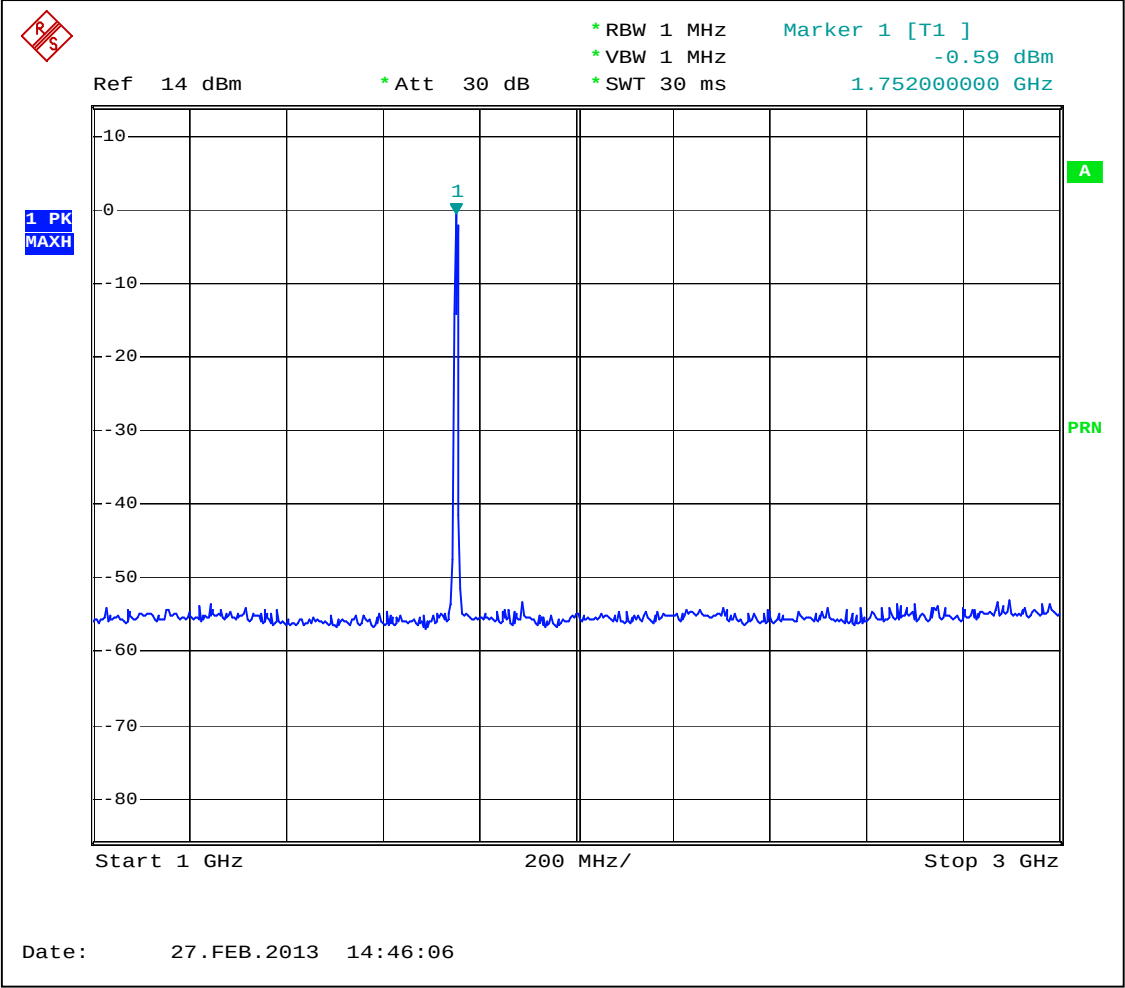
Graph 3.5.5



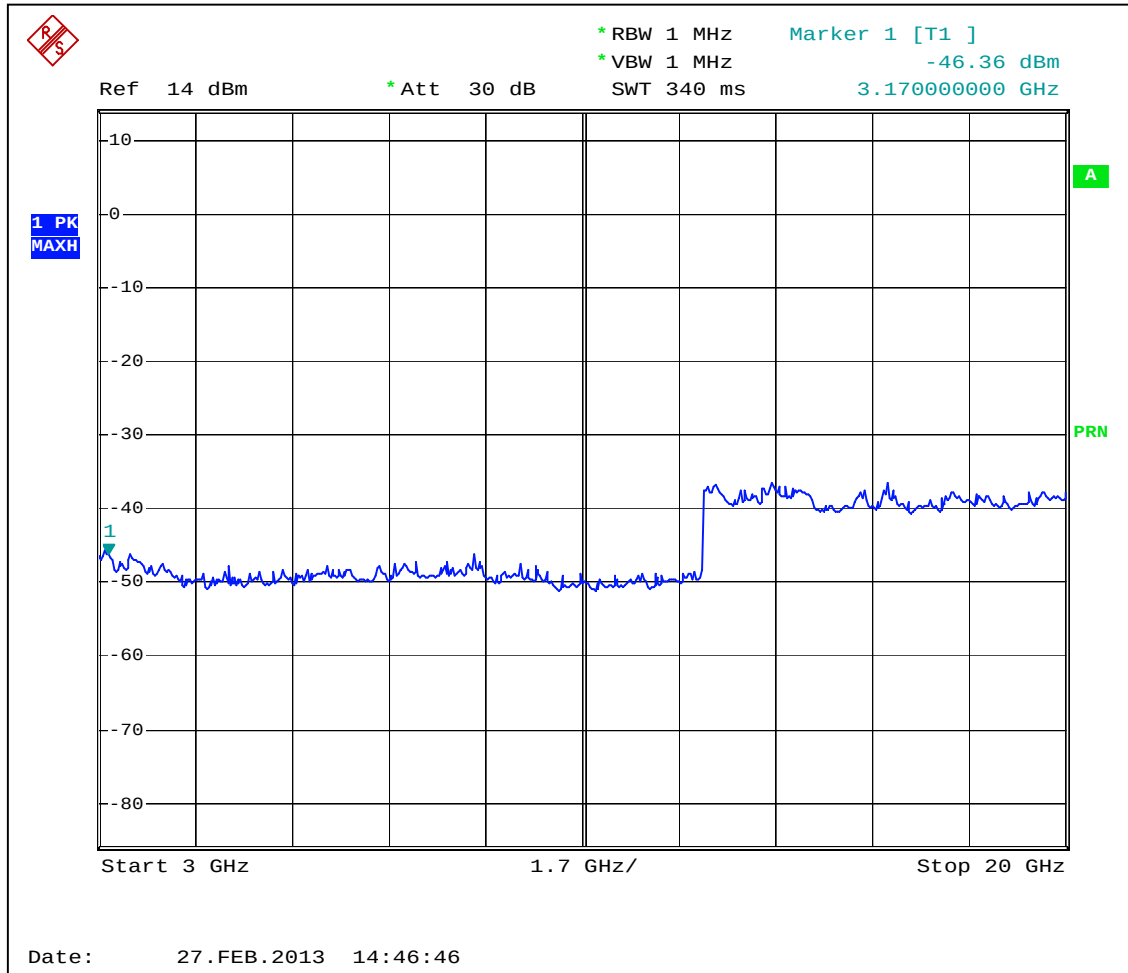
Graph 3.5.6



Graph 3.5.7



Graph 3.5.8



Graph 3.5.9



3.6 Enclosure Radiated spurious emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test result: **Pass**

Tables 3.6.1 and 3.6.2 show detected Spurious Radiated Emissions from 30MHz to 20GHz . Graphs 3.6.1- to 3.6.24 show the EUT peak Radiated Emissions.

The Spurious Radiated Power limits of -13dBm was correlated with field strength reference level of 82.2dBμV/m during field strength measurements at 3m measurement distance.

No emissions were chosen for substitution measurements as the maximum emission is more than 20dB below the reference limit. The transmitting fundamental frequency was excluded form the measurements.

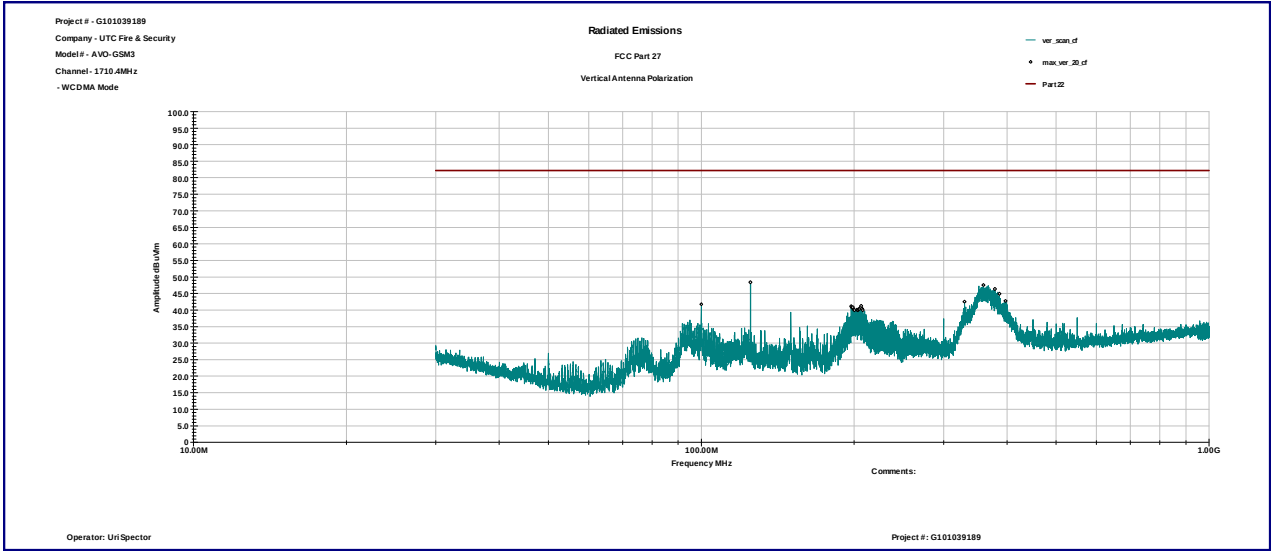
Table 3.6.1

Frequency	Ant. Polarity	Peak Reading dBμV	Total C.F. dB1/m	Total at 3m dBμV/m	Limit dBμV/m	Margin dB
Low Channel						
124.99 MHz	V	34.4	14.0	48.4	82.2	-33.8
330.02 MHz	V	25.8	16.7	42.5	82.2	-39.7
359.53 MHz	V	29.6	17.9	47.6	82.2	-34.7
378.84 MHz	V	28.3	18.1	46.4	82.2	-35.8
386.45 MHz	V	26.6	18.3	44.9	82.2	-37.3
350.53 MHz	H	34.3	17.5	51.9	82.2	-30.4
356.53 MHz	H	35.8	17.8	53.6	82.2	-28.6
363.34 MHz	H	36.9	17.8	54.7	82.2	-27.5
367.44 MHz	H	35.4	17.8	53.1	82.2	-29.1
Middle Channel						
125.02 MHz	V	33.4	14.0	47.4	82.2	-34.8
330.02 MHz	V	27.6	16.7	44.3	82.2	-37.9
359.83 MHz	V	30.0	17.9	47.9	82.2	-34.3
376.24 MHz	V	29.7	18.0	47.7	82.2	-34.5
125.02 MHz	H	34.1	14.0	48.0	82.2	-34.2
358.33 MHz	H	35.4	17.9	53.3	82.2	-28.9
363.04 MHz	H	35.4	17.8	53.2	82.2	-29.0
373.44 MHz	H	34.8	17.9	52.7	82.2	-29.5
High Channel						
125.02 MHz	V	33.8	14.0	47.8	82.2	-34.4
347.23 MHz	V	28.4	17.3	45.6	82.2	-36.6
361.43 MHz	V	30.5	17.9	48.4	82.2	-33.8
398.56 MHz	V	24.1	18.8	42.9	82.2	-39.3
125.02 MHz	H	33.9	14.0	47.8	82.2	-34.4
361.93 MHz	H	36.3	17.9	54.1	82.2	-28.1
366.24 MHz	H	36.6	17.8	54.3	82.2	-27.9
368.44 MHz	H	36.2	17.8	54.0	82.2	-28.2
371.24 MHz	H	35.4	17.8	53.2	82.2	-29.0

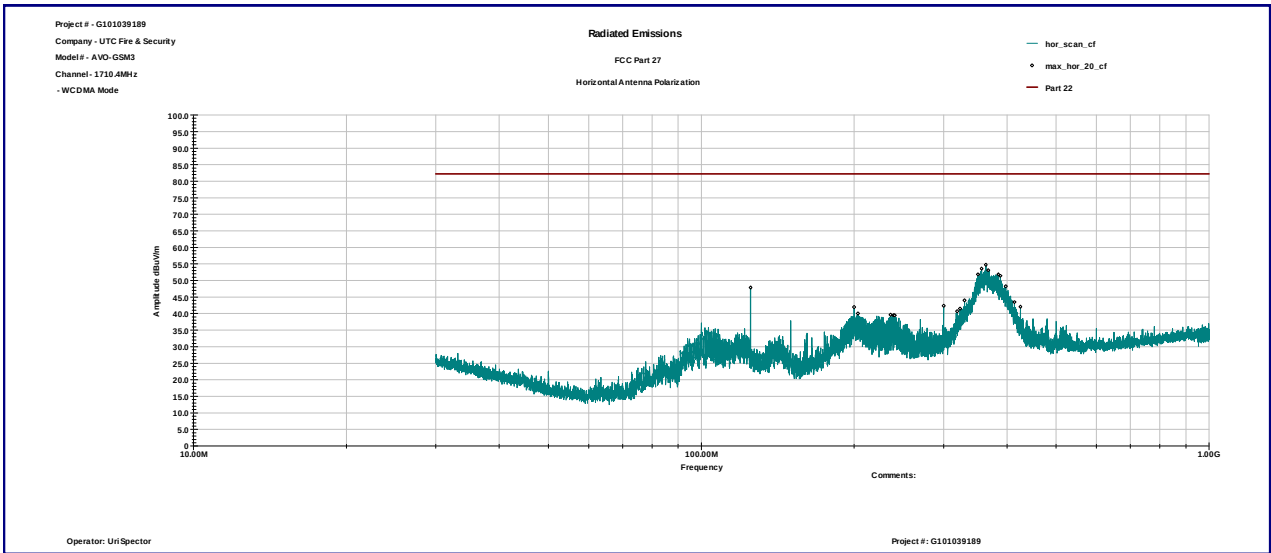


Table 3.6.2

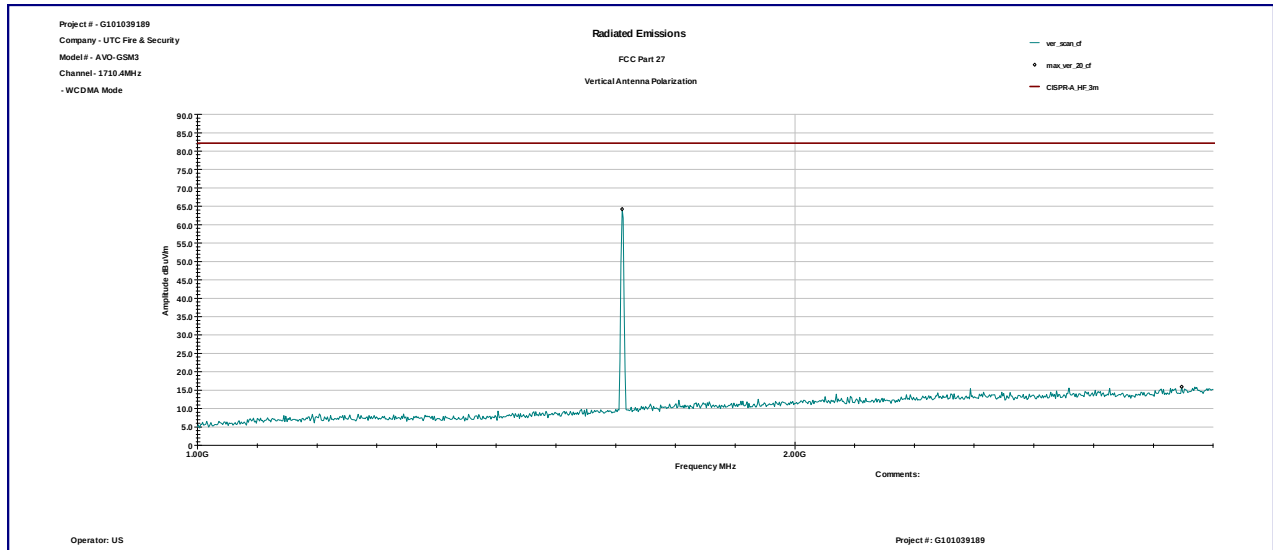
Frequency MHz	Antenna Polarity	Peak Reading dB μ V	Total C.F. dB1/m	Pre-Amp. Gain (dB)	Total at 3m dB μ V/m	Limit dB μ V/m	Margin dB
Low Channel							
3.4222 GHz	V	51.7	34.8	43.6	42.8	82.2	-39.4
3.4222 GHz	H	51.7	34.5	43.6	42.6	82.2	-39.6
Middle Channel							
3.465 GHz	V	50.4	34.9	43.6	41.7	82.2	-40.5



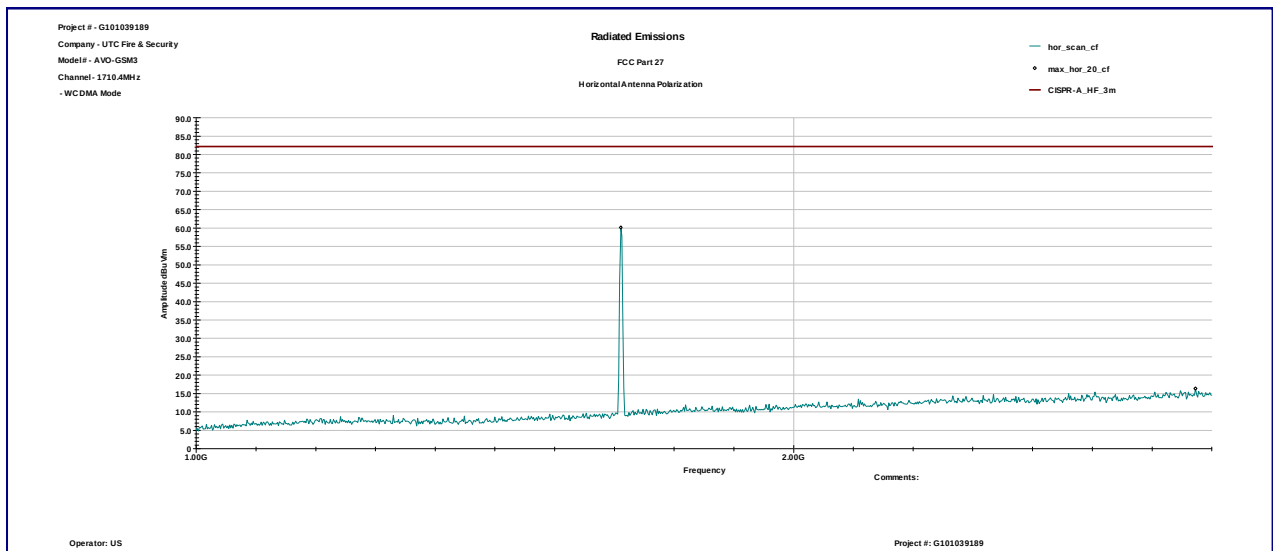
Graph 3.6.1



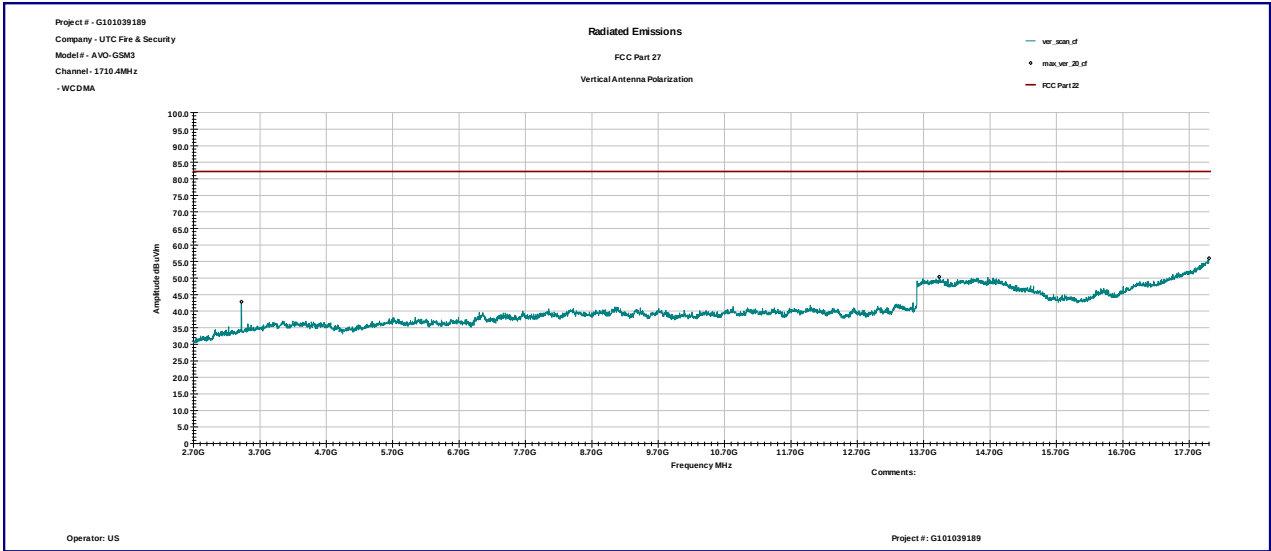
Graph 3.6.2



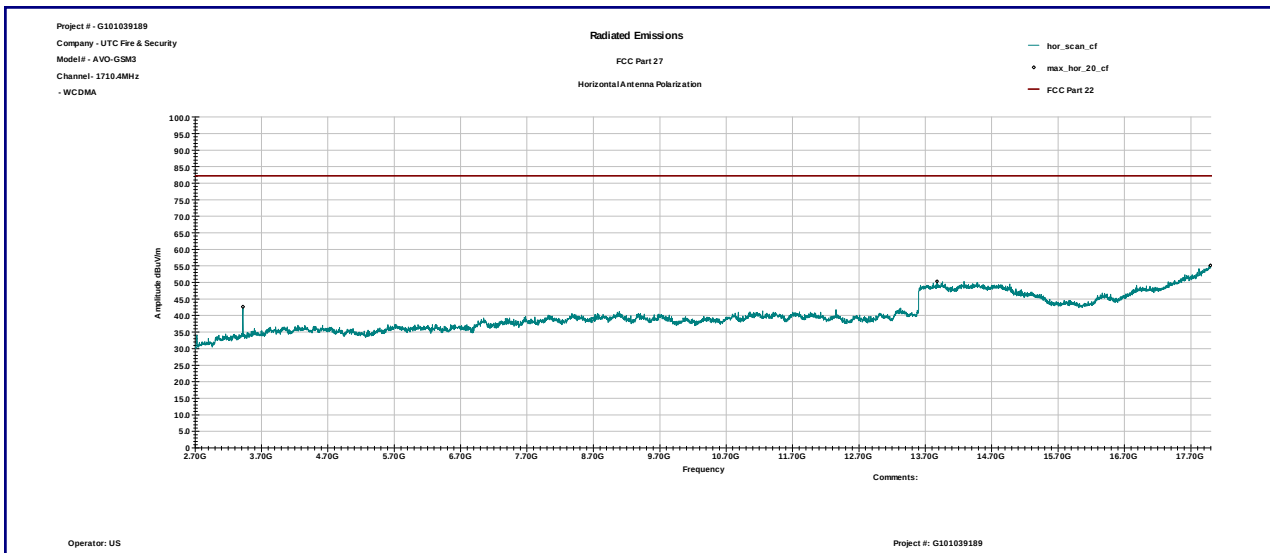
Graph 3.6.3



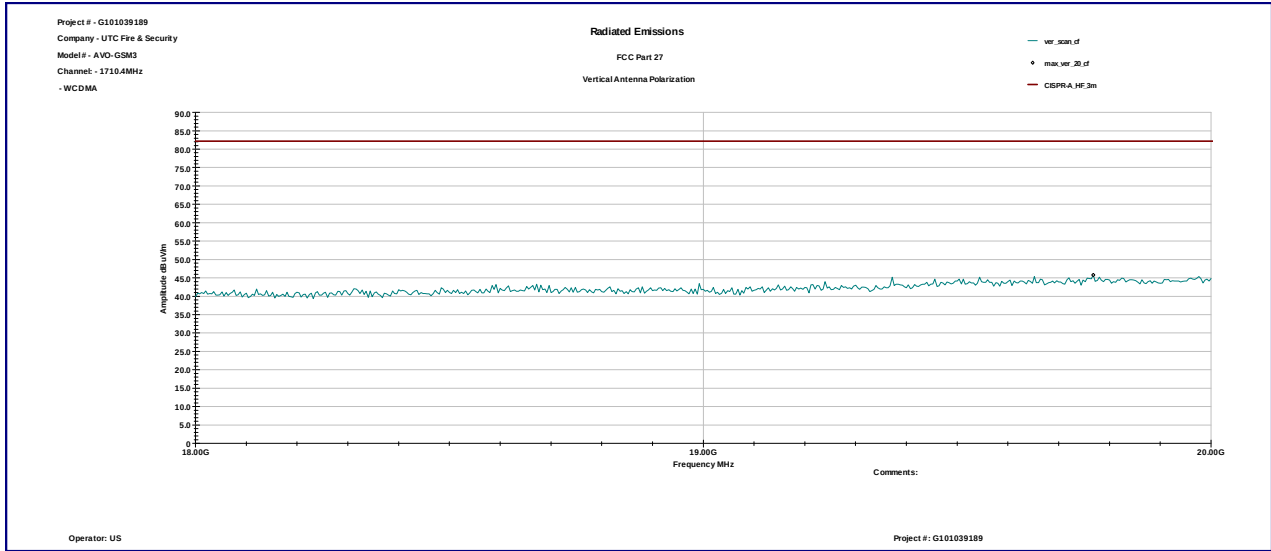
Graph 3.6.4



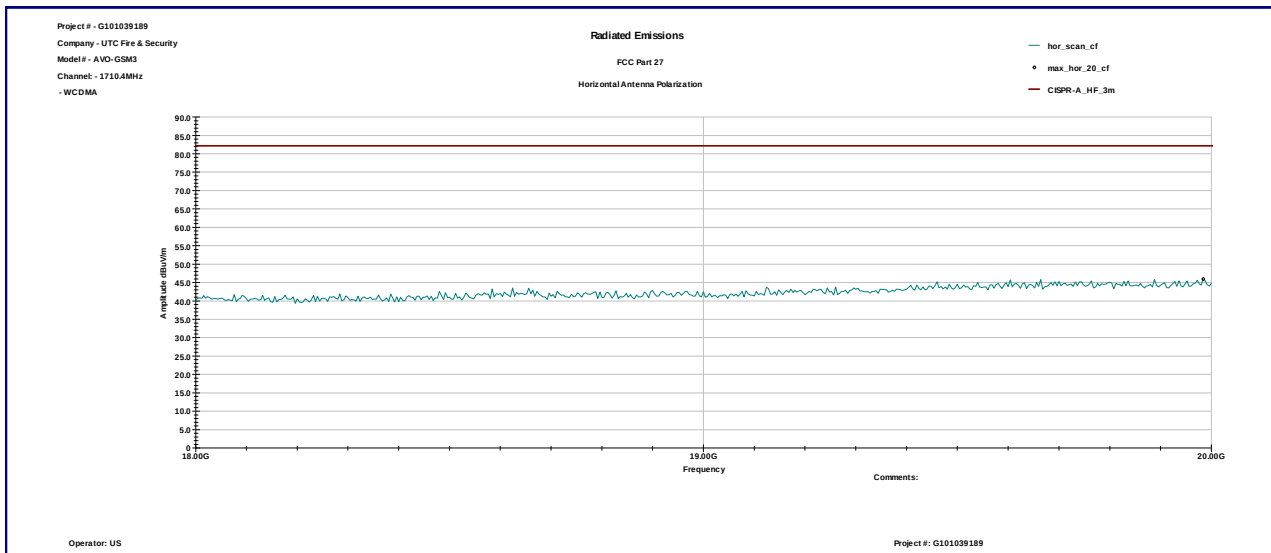
Graph 3.6.5



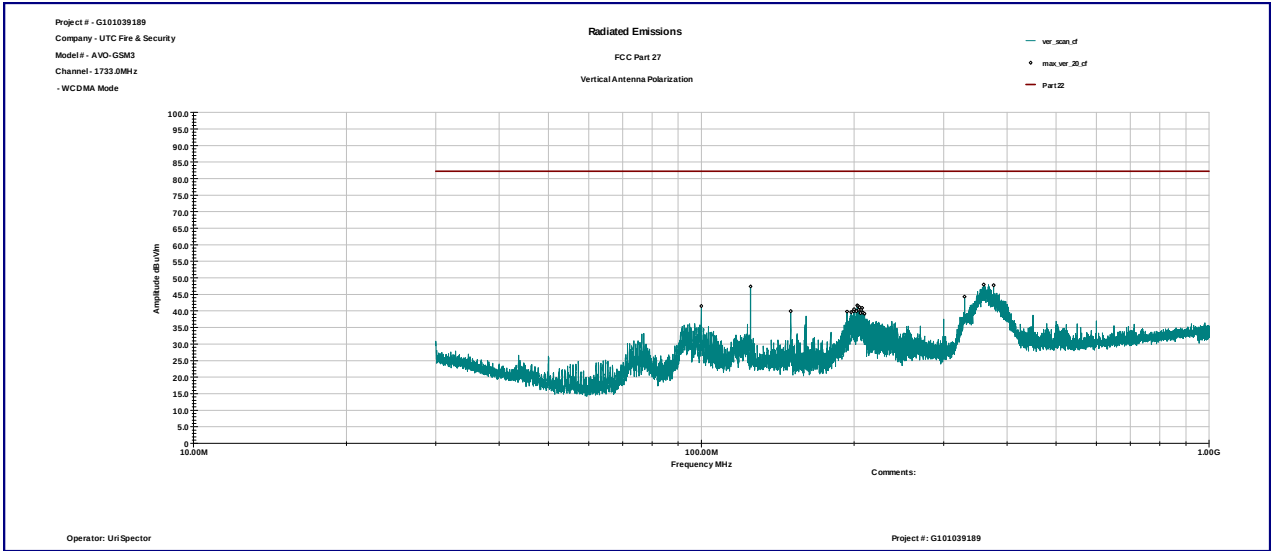
Graph 3.6.6



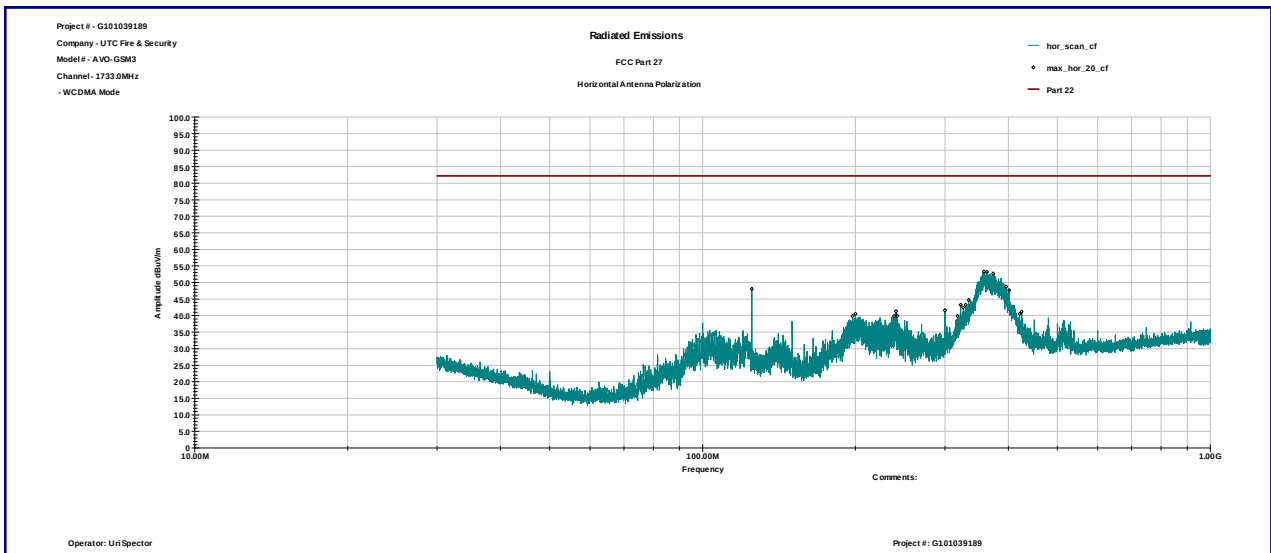
Graph 3.6.7



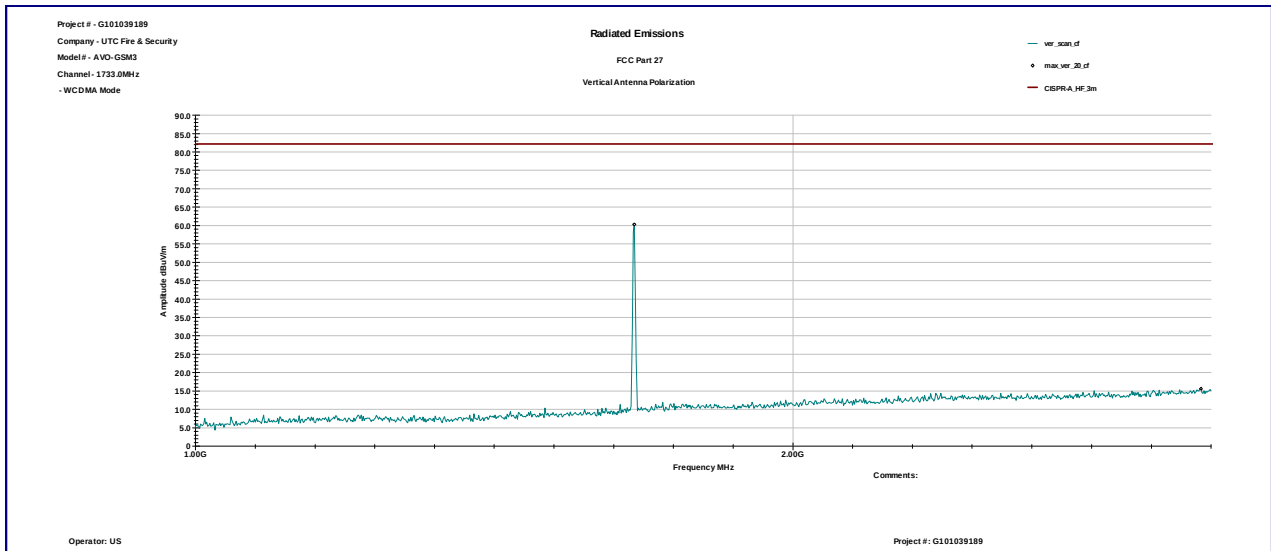
Graph 3.6.8



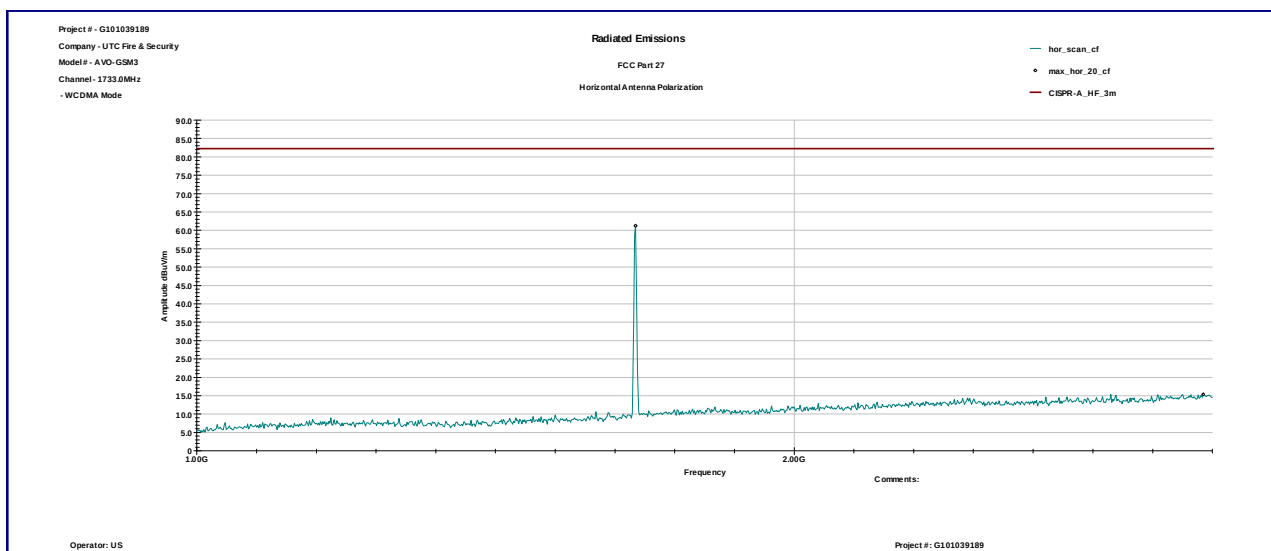
Graph 3.6.9



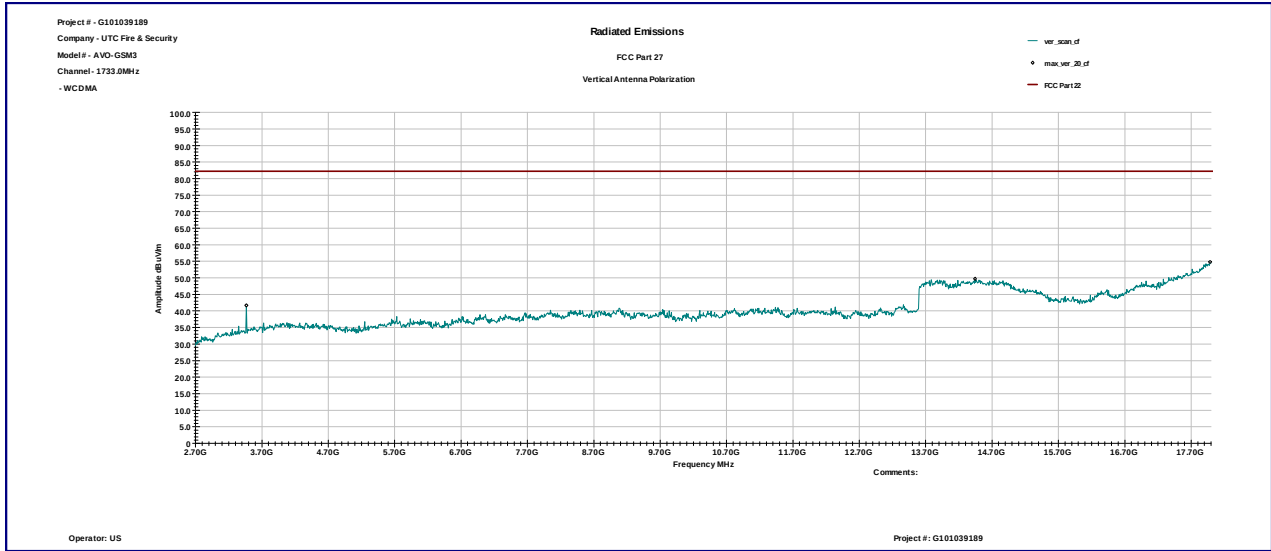
Graph 3.6.10



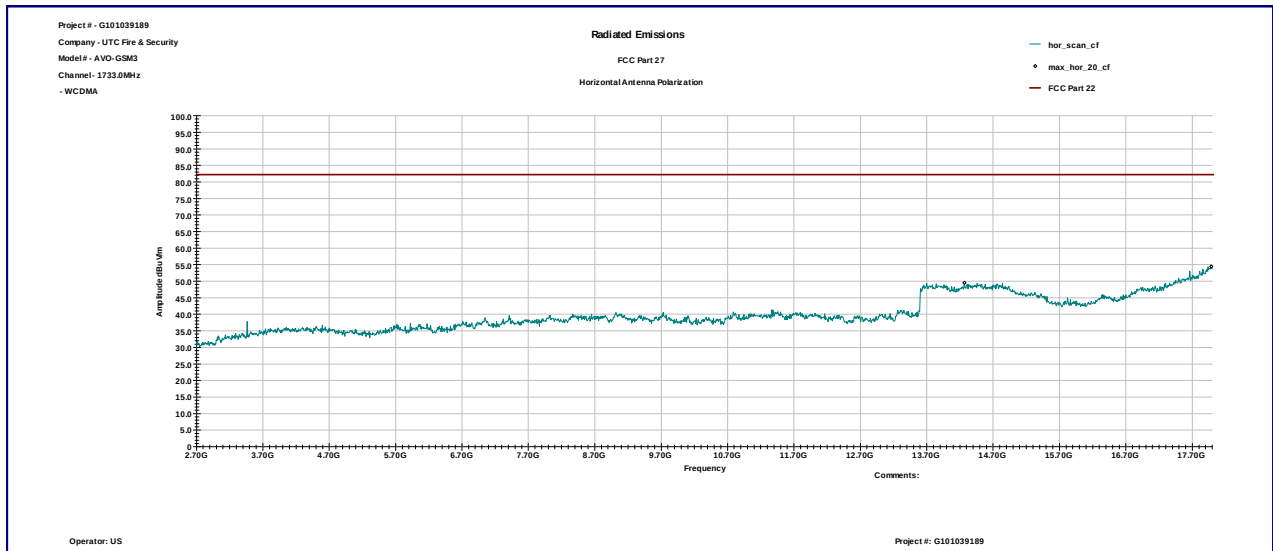
Graph 3.6.11



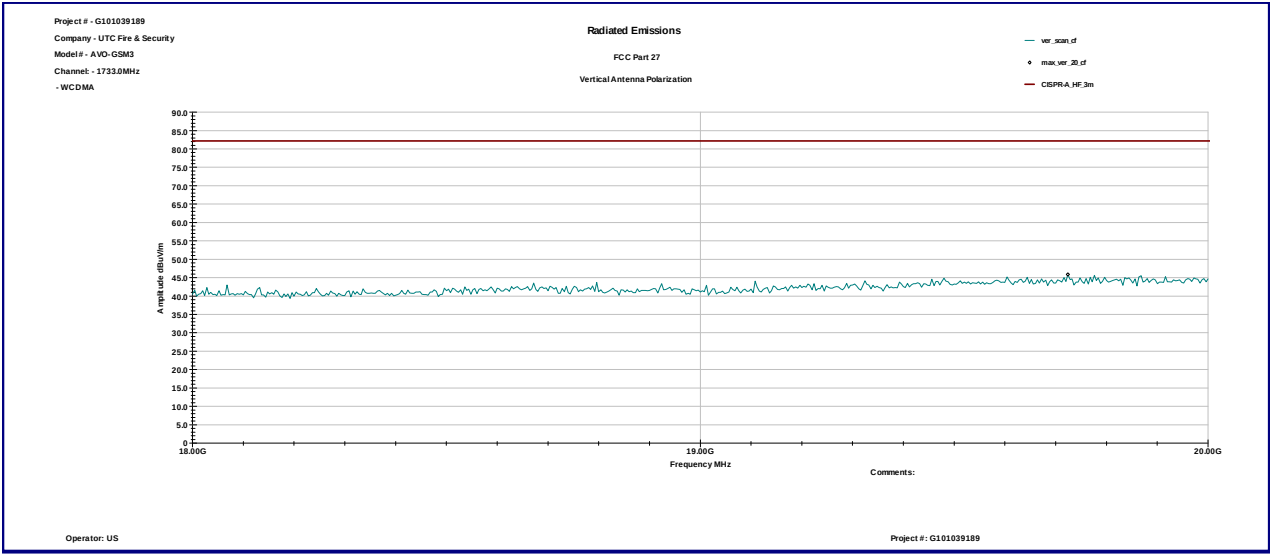
Graph 3.6.12



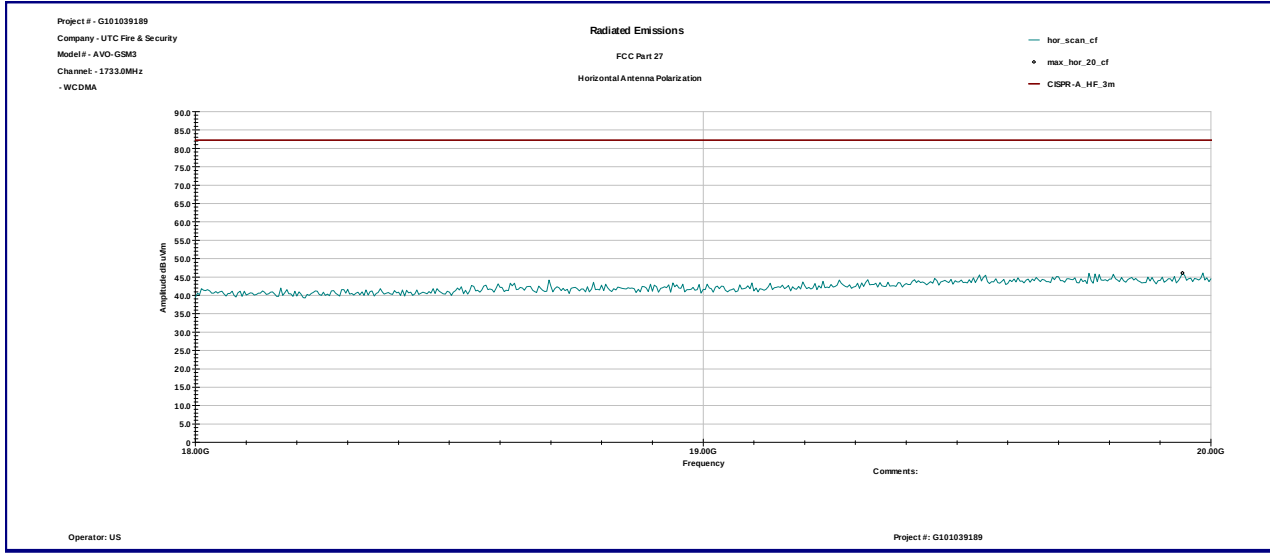
Graph 3.6.13



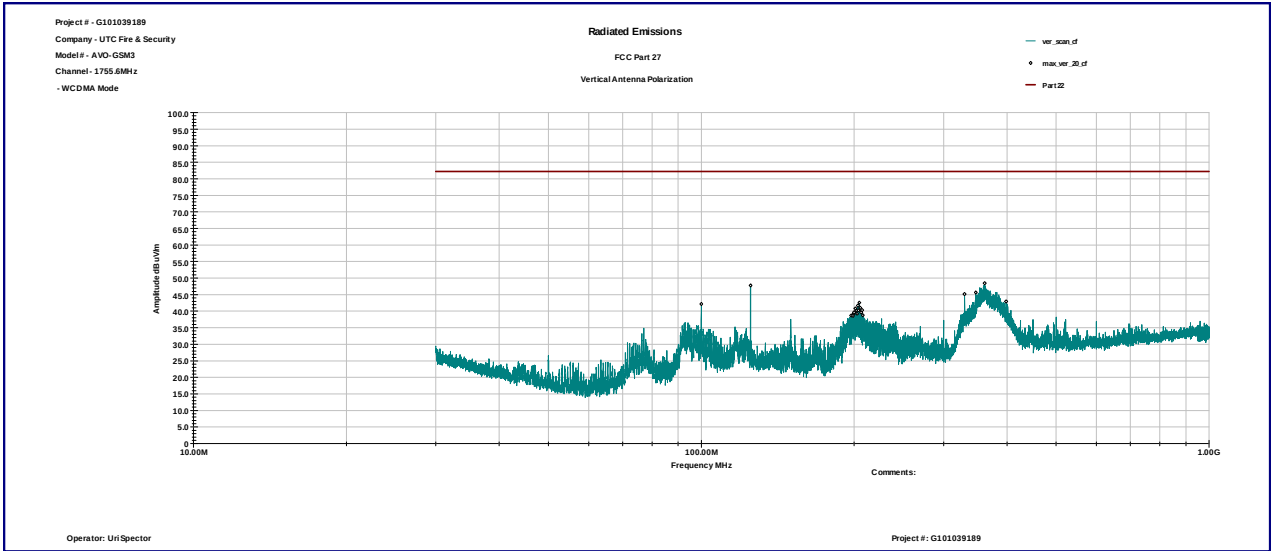
Graph 3.6.14



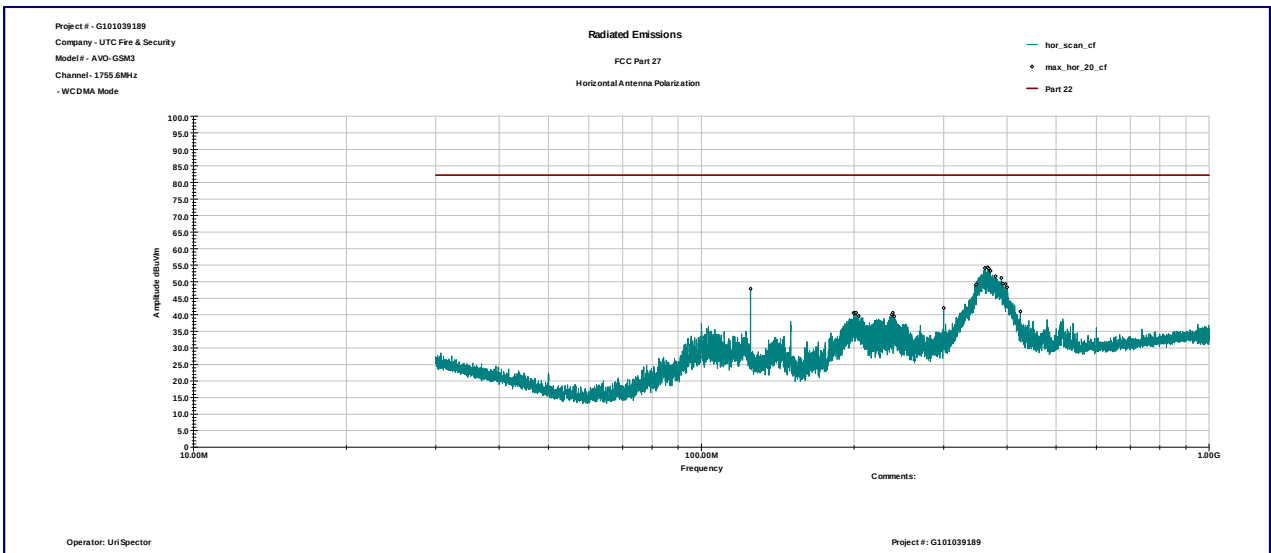
Graph 3.6.15



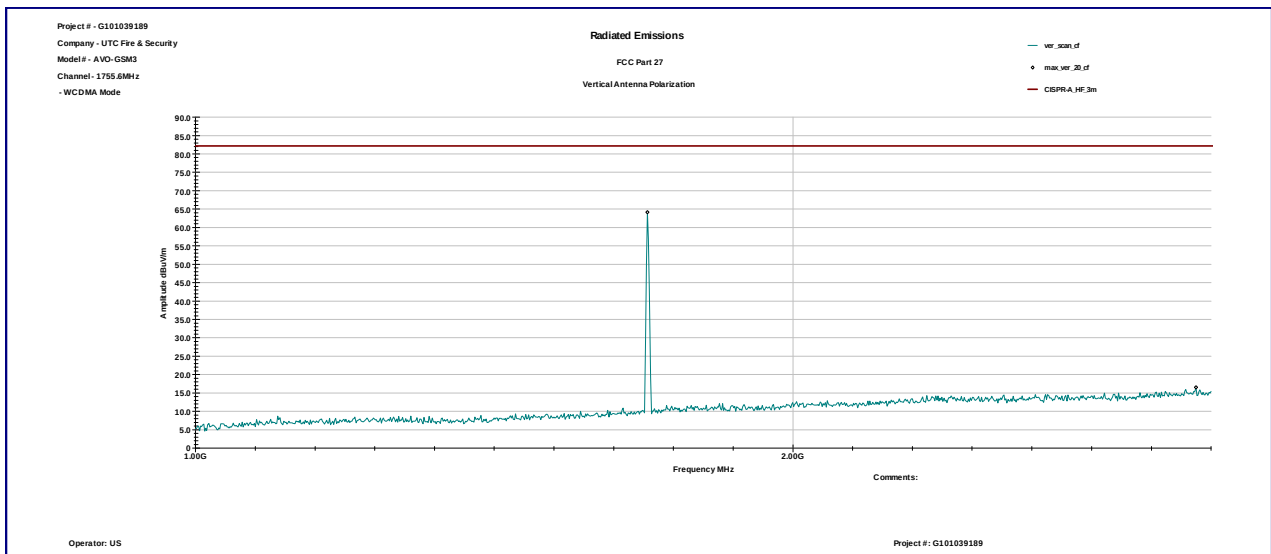
Graph 3.6.16



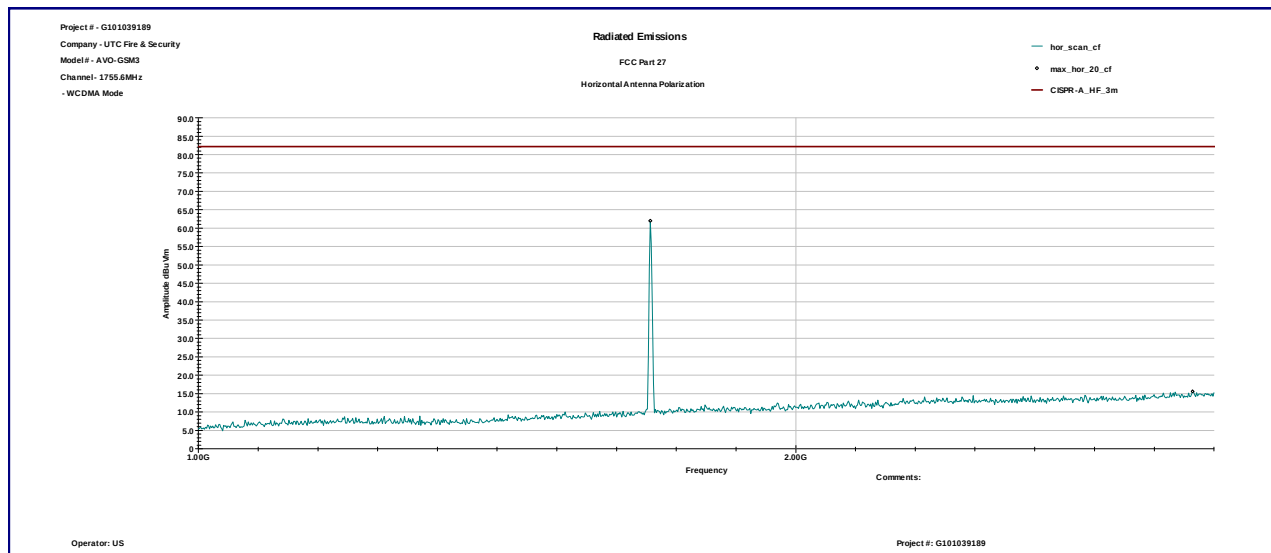
Graph 3.6.17



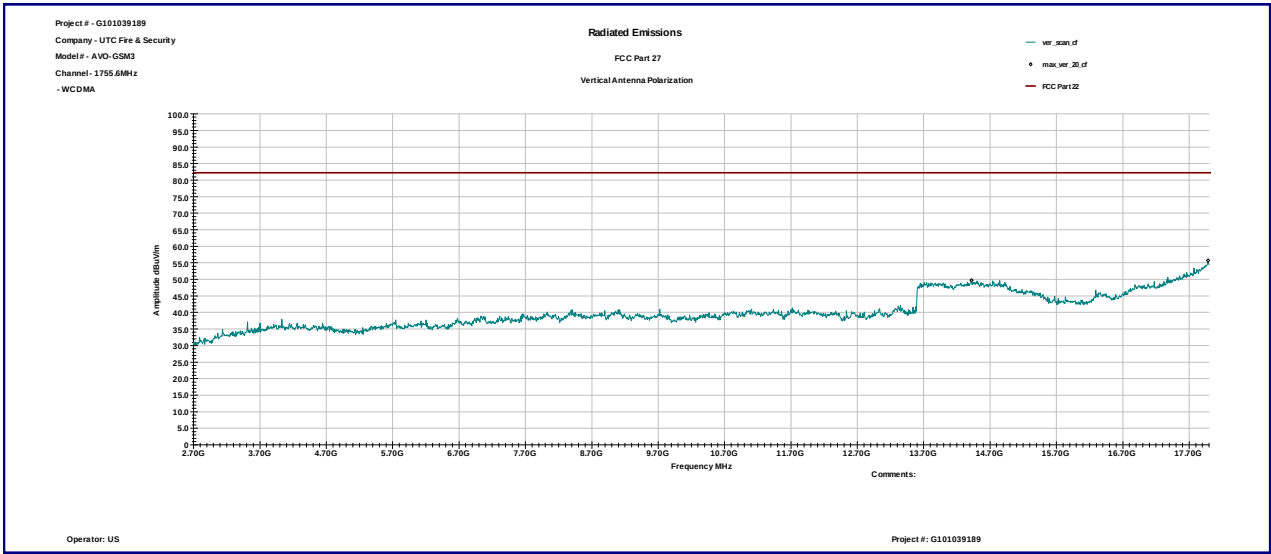
Graph 3.6.18



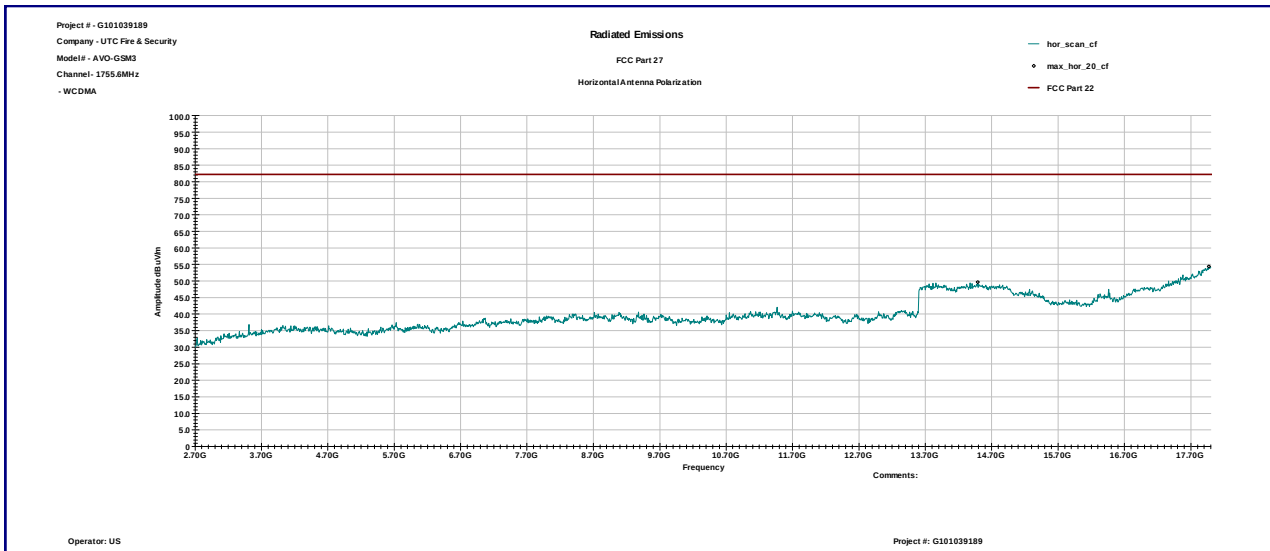
Graph 3.6.19



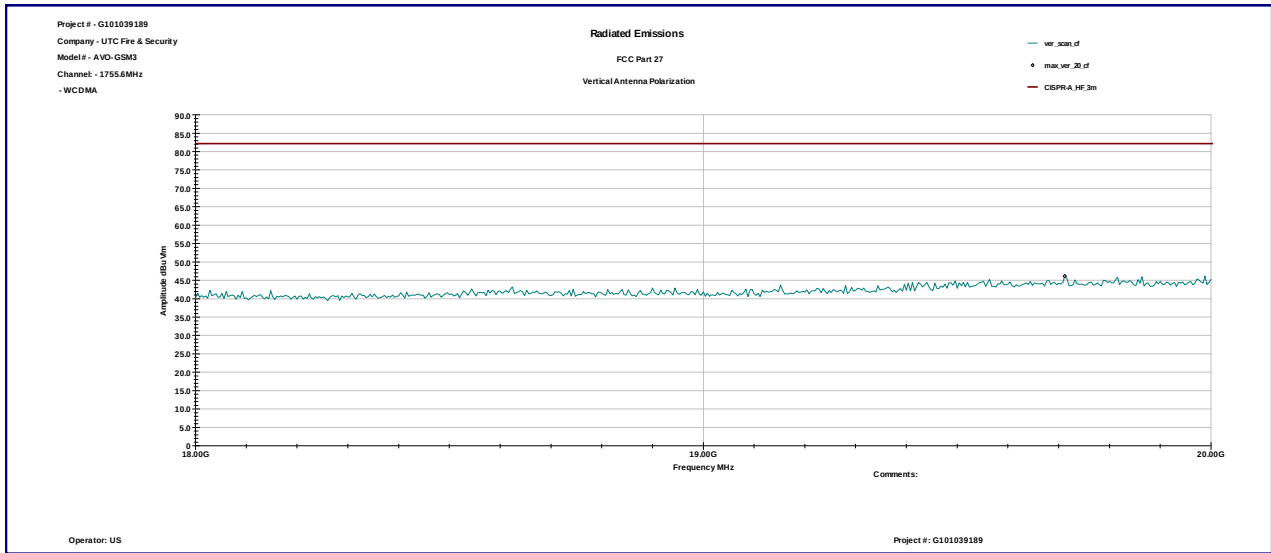
Graph 3.6.20



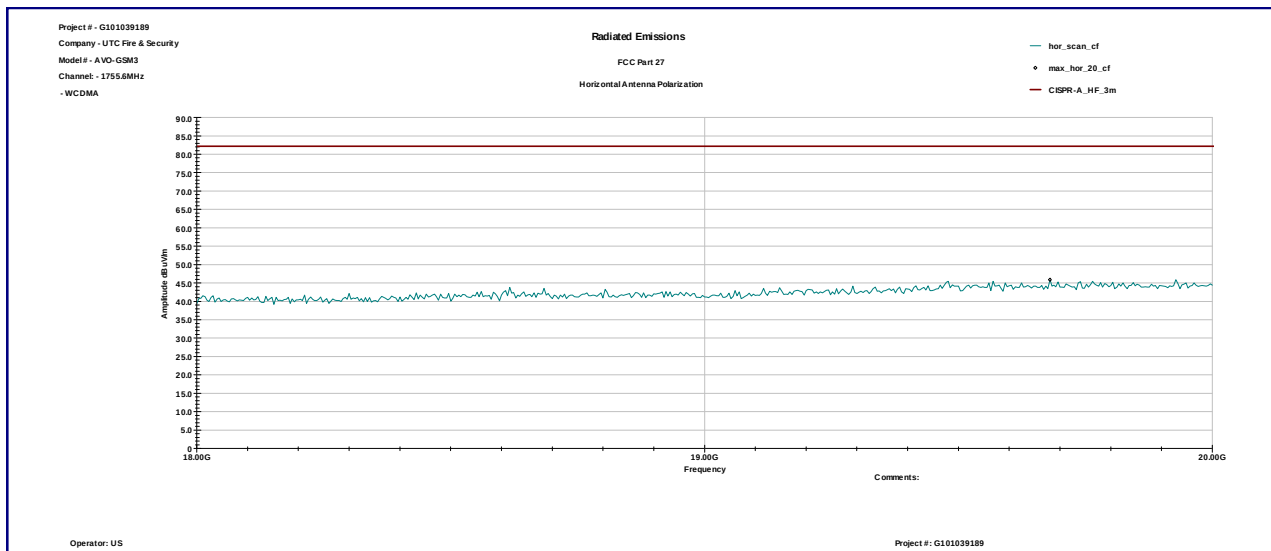
Graph 3.6.21



Graph 3.6.22



Graph 3.6.23



Graph 3.6.24



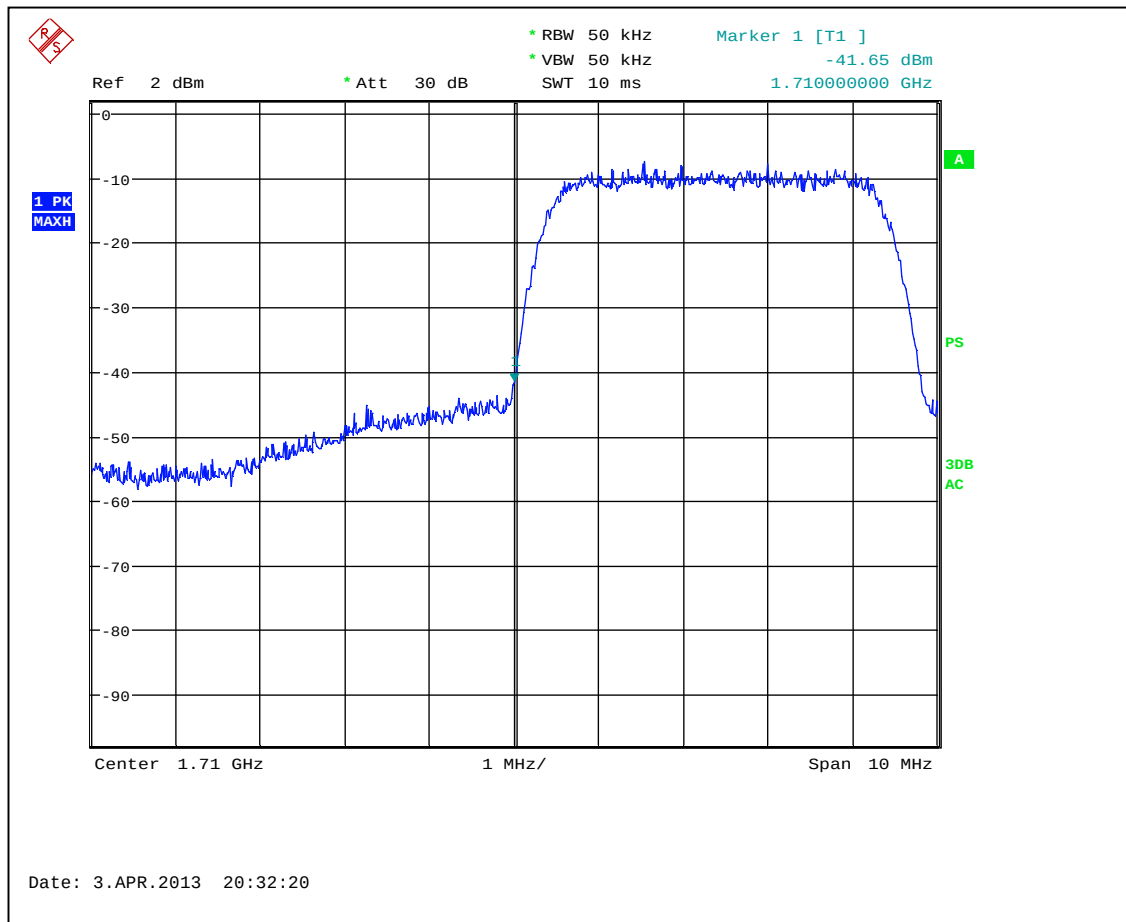
3.7 Spurious emissions at antenna terminal at Block Edges

Test location: ☐ OATS ☐ Anechoic Chamber ☐ Other

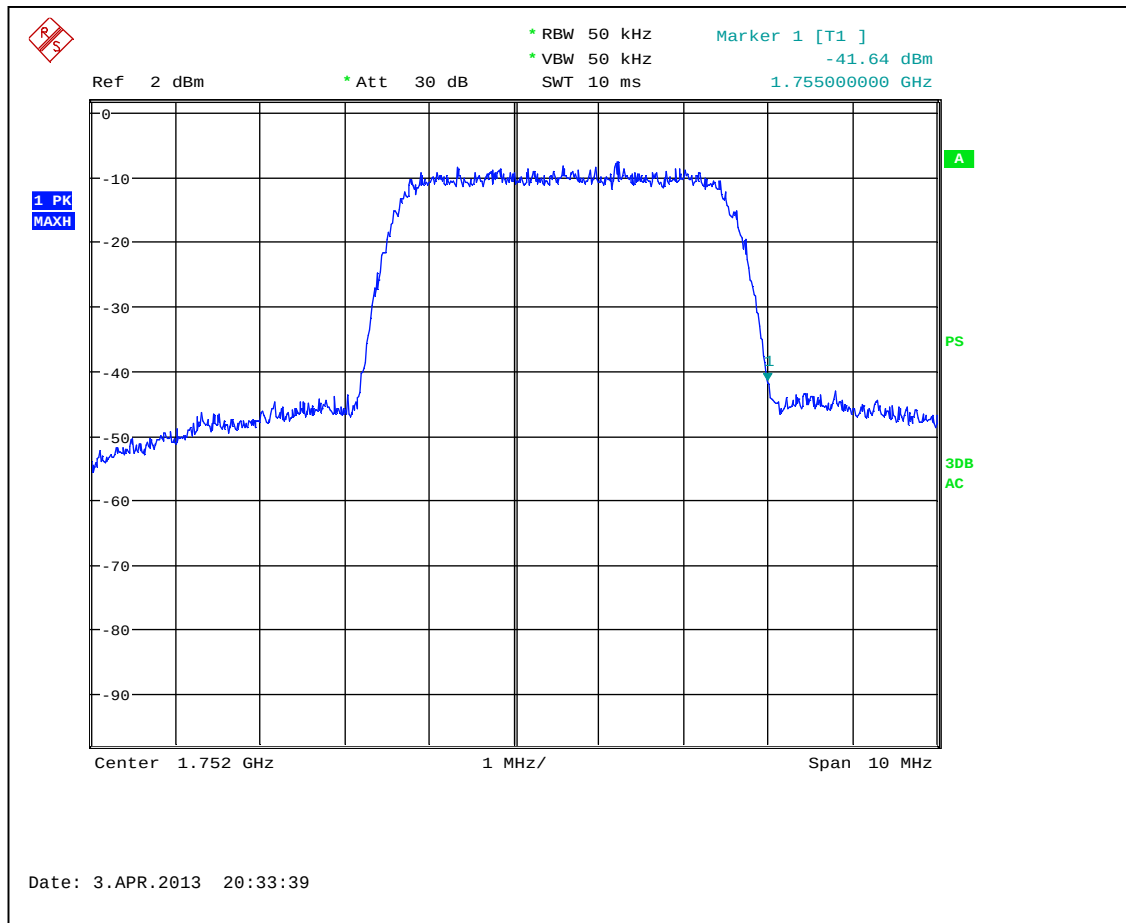
Test result: **Pass**

Low Channel	Measured power dBm	Total CF dB	Total dBm	Limit dBm	Margin dB
Low	-41.7	23.8	-17.9	-13.0	-4.9
Highest Channel					
High	-41.6	23.8	-17.9	-13.0	-4.8
CF=Cable/Coupler Insertion Loss:	☒ 22.0dB				
Antenna Gain (dBi)	☒ 1.8dBi				

Notes: For passing results see Graphs 3.7.1-3.7.2. Fundamental frequencies are excluded from the measurements.



Graph 3.7.1



Graph 3.7.2



3.8 RF Exposure Compliance

MPE Requirement:

1.0 mW/cm²

Calculation:

Antenna Gain= 1.8dBi

The maximum EIRP power = 470mW

D = distance of 20cm

$S(\text{mW/cm}^2) = \text{EIRP}(\text{mW}) / 4\pi D^2$, or $S = 470 / (4\pi \times 400) = 0.09\text{mW/cm}^2, < 1.0 \text{ mW/cm}^2$



3.9 Receiver/digital device radiated emissions, FCC Part 15.109

Test location: ☐ OATS ☒ Anechoic Chamber

Test distance: ☐ 10 meters ☒ 3 meters

Test result: **Pass**

Frequency range: 30MHz-5000MHz

Max. Emissions margin: 7.3dB below the limits

Notes: The Radiated Emissions test was performed in the Anechoic chamber at 3m measurement distance (see Table 3.5.1 and Graphs 3.5.1and 3.5.2)



Date:	April 22, 2013	Result: Pass
Standard:	FCC Part 15.109, Class B	
Tested by:	Uri Spector	
Test Point:	Enclosure	
Operation mode:	See page 5	
Note:	30MHz-5000MHz	

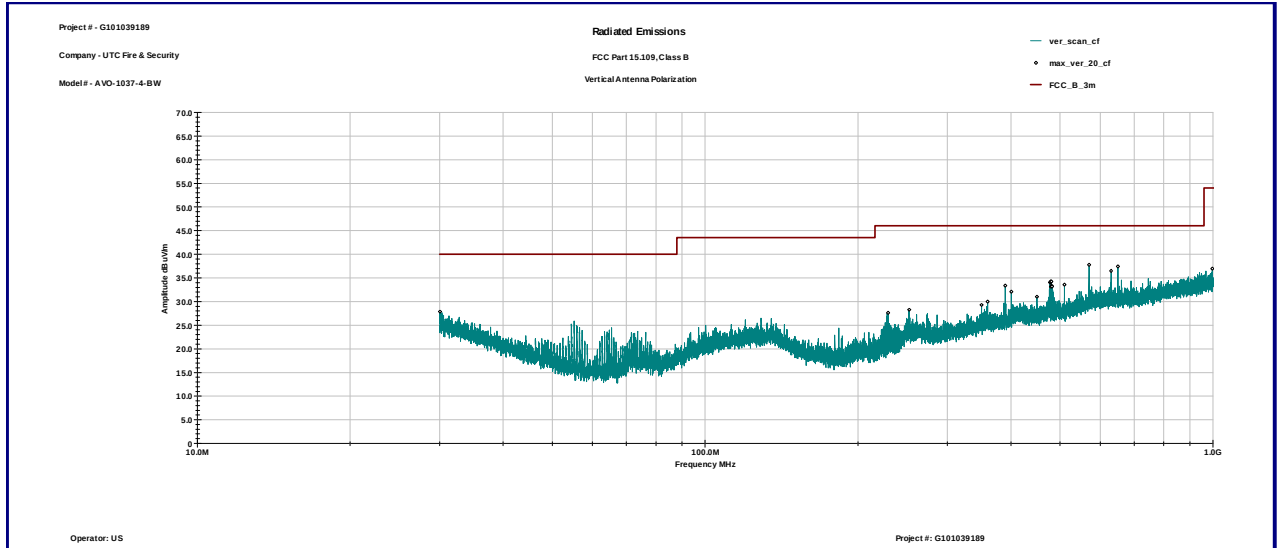
Table 3.5.1

Frequency	Ant. Polarity	Peak Reading dBμV	Total C.F. dB1/m	Total at 3m dBμV/m	Limit dBμV/m	Margin dB
30.056 MHz	V	7.7	20.2	27.8	40.0	-12.2
229.09 MHz	V	14.8	12.8	27.6	46.0	-18.4
252.23 MHz	V	13.4	14.9	28.3	46.0	-17.8
350.09 MHz	V	11.8	17.5	29.3	46.0	-16.8
359.93 MHz	V	12.1	17.9	30.0	46.0	-16.0
390.01 MHz	V	15.0	18.4	33.4	46.0	-12.6
400.86 MHz	V	13.1	18.9	32.1	46.0	-14.0
450.03 MHz	V	11.5	19.5	31.0	46.0	-15.0
477.95 MHz	V	13.9	20.1	34.0	46.0	-12.0
478.59 MHz	V	13.9	20.1	34.0	46.0	-12.0
479.33 MHz	V	14.1	20.1	34.3	46.0	-11.8
510.01 MHz	V	13.2	20.4	33.6	46.0	-12.5
570.0 MHz	V	16.1	21.7	37.7	46.0	-8.3
629.95 MHz	V	14.0	22.5	36.5	46.0	-9.6
650.11 MHz	V	14.7	22.7	37.4	46.0	-8.6
390.01 MHz	H	18.2	18.4	36.6	46.0	-9.4
420.06 MHz	H	14.5	19.6	34.1	46.0	-11.9
477.31 MHz	H	18.6	20.1	38.7	46.0	-7.3
479.33 MHz	H	17.5	20.1	37.6	46.0	-8.5
480.71 MHz	H	18.2	20.1	38.3	46.0	-7.7
481.35 MHz	H	17.8	20.2	37.9	46.0	-8.1
482.73 MHz	H	18.2	20.2	38.4	46.0	-7.6
483.37 MHz	H	16.9	20.2	37.1	46.0	-8.9

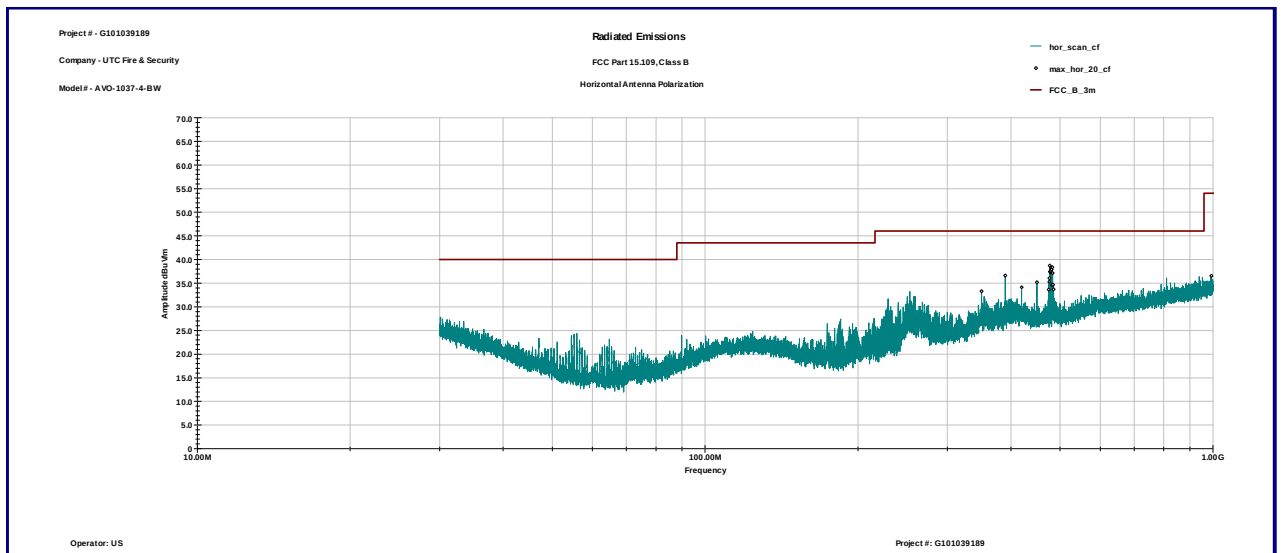


Graph 3.5.1

Vertical antenna polarization



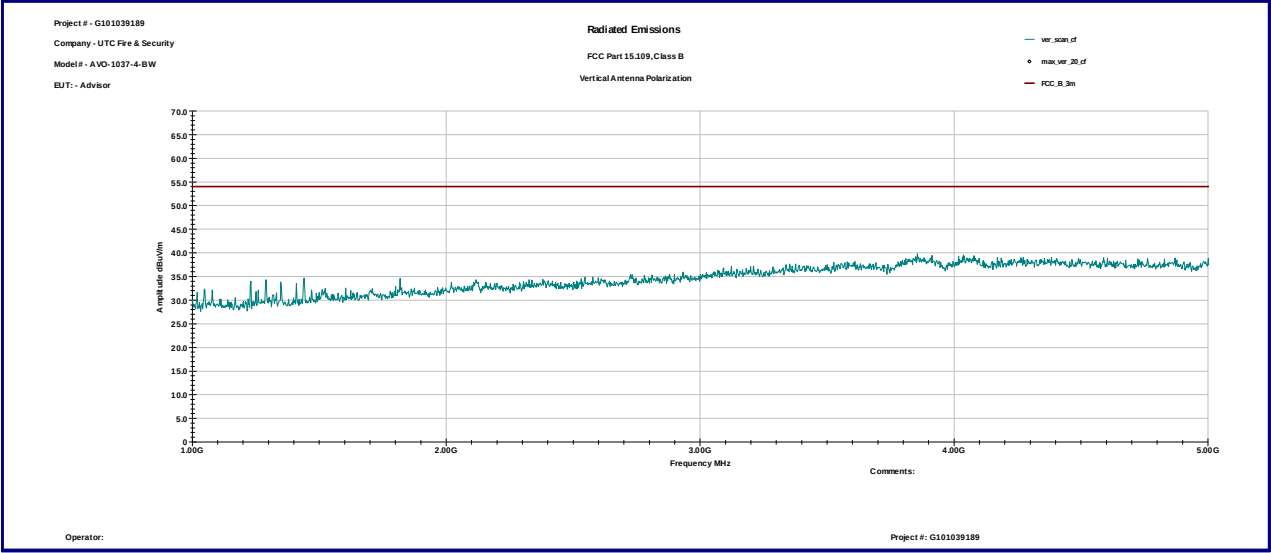
Horizontal antenna polarization



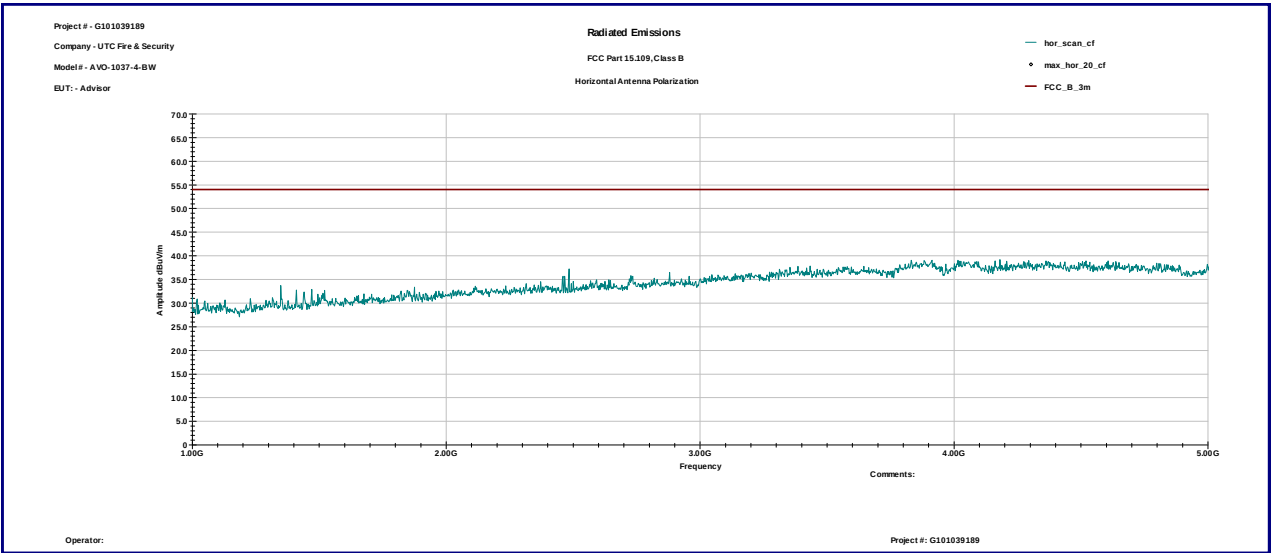


Graph 3.5.2

Vertical antenna polarization



Horizontal antenna polarization





3.10 AC Power line conducted emissions, FCC Part 15.107

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test result: **Pass**

Frequency range: 0.15MHz-30MHz

Max. Emissions margin: 3.3dB below the limits

Notes: None



Date:	April 22, 2013	Result: Pass
Standard:	FCC 15.107, Class B	
Tested by:	Uri Spector	
Test Point:	Power Line	
Operation mode:	See page 5	
Note:	None	

Table 3.6.1

Line 1

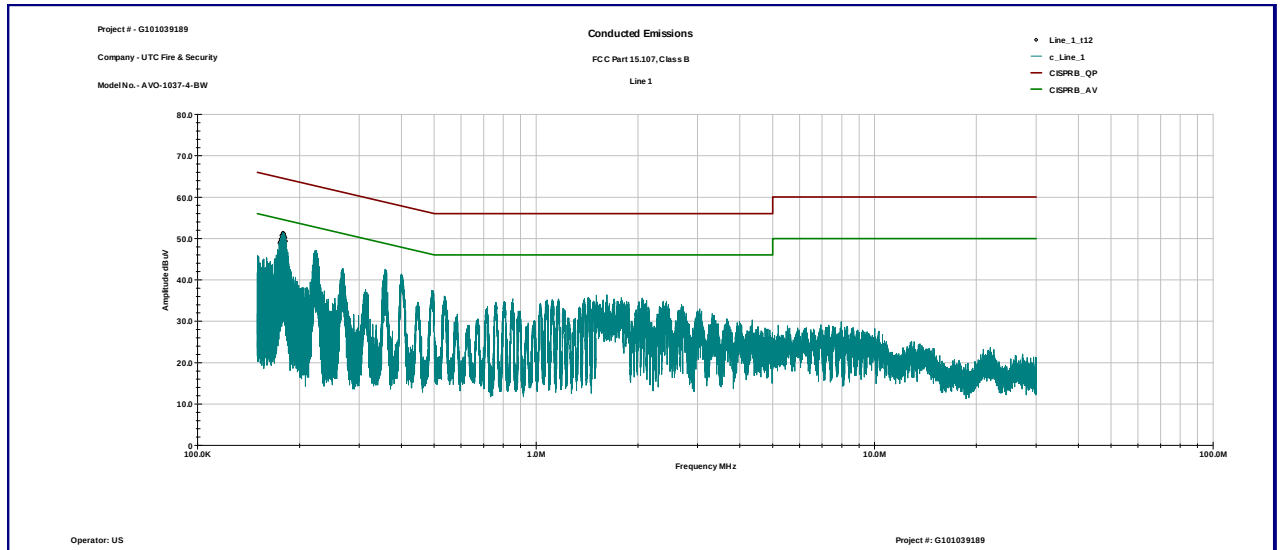
Frequency MHz	QP dBμV	AVG dBμV	Cable Loss dB	QP Lim dBμV	AVG Lim dBμV	QP Margin dB	AVG Margin dB
0.180	49.0	35.5	0.1	64.5	54.5	-15.4	-18.9
0.222	45.1	34.6	0.1	62.7	52.7	-17.5	-18.0
0.267	39.9	32.8	0.1	61.2	51.2	-21.2	-18.3
0.358	40.2	34.3	0.1	58.8	48.8	-18.4	-14.3
0.400	39.9	36.7	0.1	57.9	47.9	-17.8	-11.0
0.491	35.6	32.7	0.2	56.2	46.2	-20.4	-13.3

Line 2

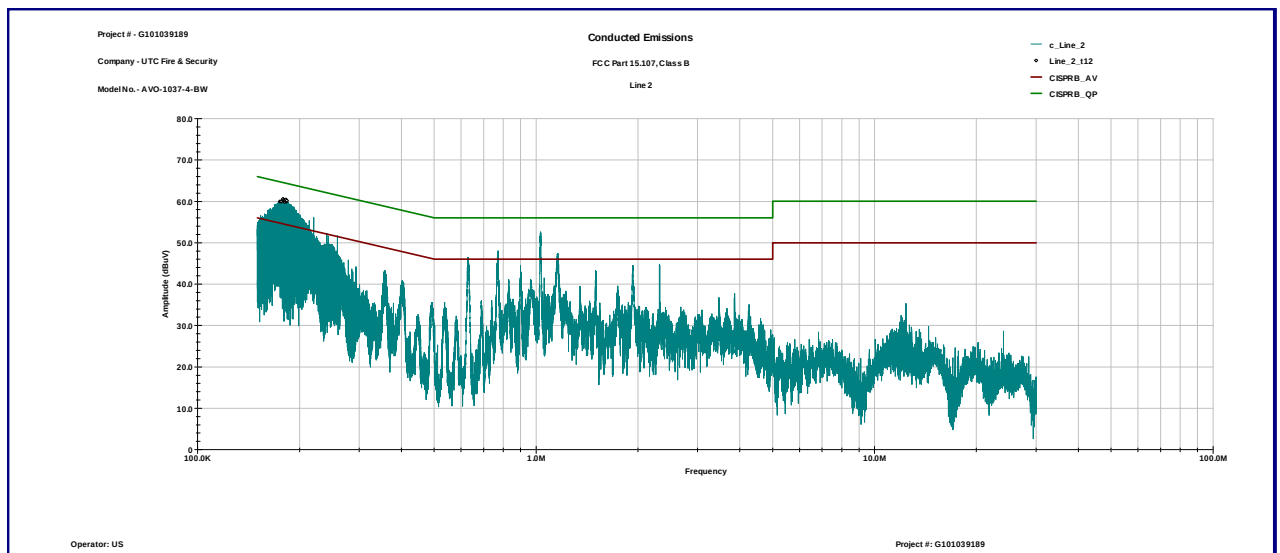
Frequency MHz	QP dBμV	AVG dBμV	Cable Loss dB	QP Lim dBμV	AVG Lim dBμV	QP Margin dB	AVG Margin dB
0.182	54.4	38.2	0.1	64.4	54.4	-9.9	-16.1
0.630	45.5	41.4	0.2	56.0	46.0	-10.3	-4.4
0.770	46.2	42.5	0.2	56.0	46.0	-9.6	-3.3
1.030	43.3	39.8	0.2	56.0	46.0	-12.5	-6.0
1.158	38.6	34.0	0.2	56.0	46.0	-17.2	-11.8
2.314	31.7	23.2	0.4	56.0	46.0	-23.9	-22.4

Graph 3.6.1

Line 1



Line 2





4.0 TEST EQUIPMENT

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NO.	INTERTEK ID	CAL DUE	USED
Spectrum Analyzer	R & S	ESU	100398	25283	12/19/2013	☒
Spectrum Analyzer	R & S	FSP 40	100024	12559	11/29/2013	☒
Bicono-Log Antenna	Teseq	CBL6112D	32859	25289	08/09/2013	☒
Horn Antenna	EMCO	3115	9507-4513	9936	05/16/2013	☒
LISN	Fischer Custom Communications	FCC-LISN-2 MOD.SD	316	9945	07/17/2013	☒
Waveguide Horn Antenna	EMCO	3116	9904-2423	9705	11/07/2013	☒
Pre-Amplifier	MITEQ	AMF-6F-16002600-25-10P	1222383	MIN-0065	11/01/2013	☒
High Pass Filter	Reactel Inc.	7HS-4G-S12	0223	15274	VBU	☒
Pre-Amplifier	MITEQ	AMF-5D-00501800-28-13P	1122951	13475	11/01/2013	☒
System	Quantum Change	TILE! Instrument Control	Ver. 3.4.K.29	15259	VBU	☒