



TEST REPORT

Report Number: 101039189MIN-001F

Project Number: G101039189

Testing performed on the
AdvisorOne
AVO-BTWI, Bluetooth

FCC ID: B4Z-958F-BTWI
Industry Canada ID: 1175C-958FBTWI

to
47 CFR Part 15. 247:2010
RSS- 210, Issue 8, 2010
RSS-Gen, Issue 3, 2010
47 CFR, Part 15:2010, §15.107 and §15.109, Class / ICES-003, Issue 5:2012

For
UTC Fire & Security Americas Corporation, Inc.

Test Performed by:
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Date: May 23, 2013

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1.0 GENERAL DESCRIPTION

Model:	AdvisorOne
Type of EUT:	Security Alarm
FCC ID:	B4Z-958F-BTWI
Industry Canada ID:	1175C-958FBTWI
Related Submittal(s) Grants:	None
Company:	UTC Fire & Security Americas Corporation, Inc.
Customer:	Mr. Kevin Flanders
Address:	1275 Red Fox Road Arden Hills, MN 55112 USA
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Test Standards:	☒ 47 CFR, Part 15:2010, §15.247 ☐ RSS-210, Issue 8, 2010 ☒ RSS-Gen, Issue 3, 2010 ☒ 47 CFR, Part 15:2010, §15.107 and §15.109, Class B ☒ ICES-003, Issue 5:2012 ☐ Other
Type of radio:	☒ Stand -alone ☐ Module ☐ Hybrid
Date Sample Submitted:	March 11, 2013
Test Work Started:	March 11, 2013
Test Work Completed:	April 30, 2013
Test Sample Conditions:	☐ Damaged ☐ Poor (Usable) ☒ Good



1.1 Product Description; Test Facility

Product Description:	AVO-BTWI, Bluetooth
Board Revision:	55-958
Transmitter Type:	☒ FHSS ☐ Digital Modulation ☐ WiFi ☒ BlueTooth
Operating Frequency Range(s):	From 2402.0 to 2480.0 MHz
Number of Channels:	79
Modulation:	GFSK EDR2 EDR3
Emission Designator:	933KF1D (GFSK) 1M38F1E (EDR2) 1M38F1F (EDR3)
Antenna(s) Info:	High Efficiency loop antenna Gain: 2.5dBi
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 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 with hopping function enabled
- ☒ - Continuous transmissions with hopping function disabled (modulated signal)
- ☒ - Continuous transmissions with hopping function disabled (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
2	Hopping function measurements cover GFSK, EDR2 and EDR3 modes. All other measurements were performed for each GFSK, EDR2 and EDR3 modes.

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	None	

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(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
15.247(b), (c) / RSS-210 A8.4	Maximum peak output power	Pass
15.247(e) / RSS-210 A8.1	Hopping channel carrier frequencies separation	Pass
15.247(a) / RSS-210 A8.1	20dB bandwidth of the hopping channel	Pass
15.247(e) / RSS-210 A8.1	Number of hopping frequencies	Pass
15.247(e) / RSS-210 A8.1	Average time of occupancy of hopping frequency	Pass
15.247(d) / RSS-210 A8.5	Antenna conducted spurious and band edge emissions	Pass
15.247(d) / RSS-210 A8.5	Radiated spurious emissions	Pass
15.247(i) / RSS- Gen 5.5	RF Exposure Compliance	Pass
15.207 / RSS-Gen 7.2.2	Transmitter Power Line conducted emissions	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 Maximum peak output power

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test result: **Pass**

Max. Margin: 22.0dB below the limits

GFSK

Power Output:	Conducted					
Frequency Range:	☐ 902-928MHz ☒ 2400-2483.5MHz ☐ 5725-5850MHz					
Low Frequency MHz	Measured power dBm	Attenuation dB	Power at Antenna dBm	Limit dBm	Limit Reduction dB	Margin dB
2402.0	6.0	1.3	7.3	30	0	-22.7
Middle Frequency MHz						
2441.0	5.6	1.3	6.9	30	0	-23.1
Upper Frequency MHz						
2480.0	5.8	1.3	7.1	30	0	-22.9
RBW:	☐ 1MHz ☐ 3MHz ☒ 10MHz					
VBW:	☐ 1MHz ☐ 3MHz ☒ 10MHz					
Antenna Gain:	☒ < 6dBi ☐ >6dBi and = dBi, Output power reduction = dB					



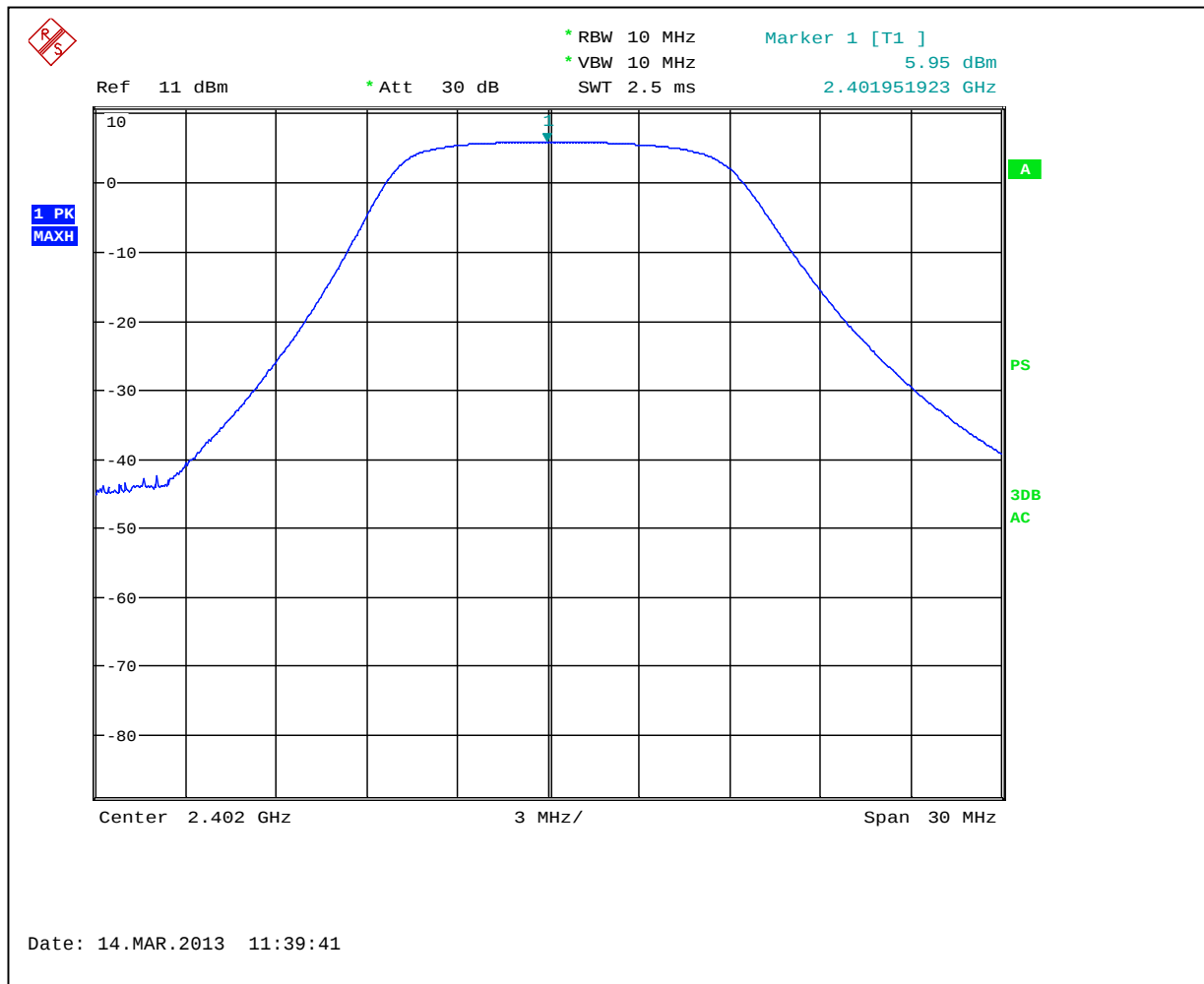
EDR2

Power Output:	Conducted					
Frequency Range:	☐ 902-928MHz ☒ 2400-2483.5MHz ☐ 5725-5850MHz					
Low Frequency MHz	Measured power dBm	Attenuation dB	Power at Antenna dBm	Limit dBm	Limit Reduction dB	Margin dB
2402.0	6.2	1.3	7.5	30	0	-22.5
Middle Frequency MHz						
2441.0	5.9	1.3	7.2	30	0	-22.8
Upper Frequency MHz						
2480.0	6.0	1.3	7.3	30	0	-22.7
RBW:	☐ 1MHz ☐ 3MHz ☒ 10MHz					
VBW:	☐ 1MHz ☐ 3MHz ☒ 10MHz					
Antenna Gain:	☒ < 6dBi ☐ >6dBi and = dBi, Output power reduction = dB					

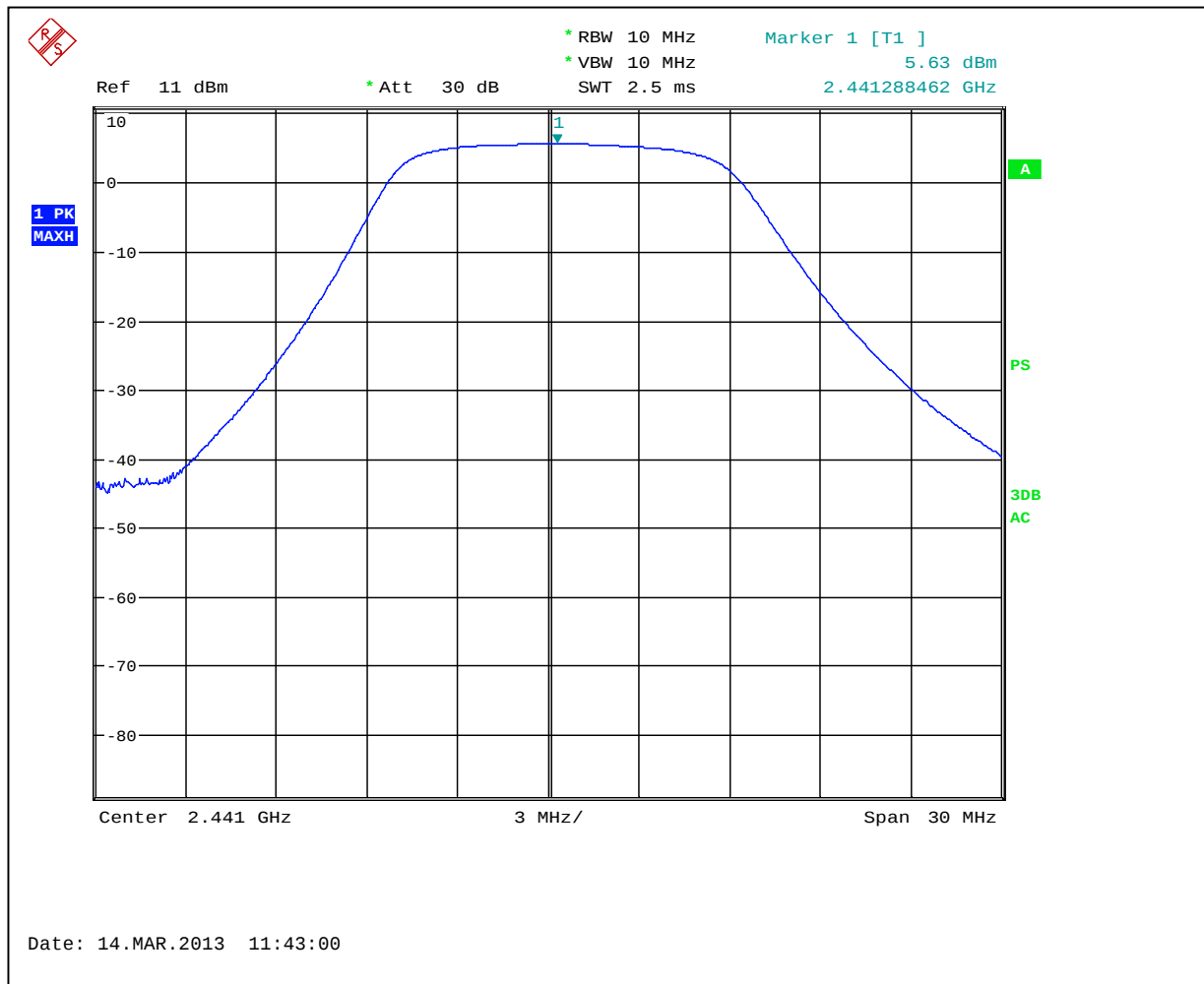
**EDR3**

Power Output:	Conducted					
Frequency Range:	☐ 902-928MHz ☒ 2400-2483.5MHz ☐ 5725-5850MHz					
Low Frequency MHz	Measured power dBm	Attenuation dB	Power at Antenna dBm	Limit dBm	Limit Reduction dB	Margin dB
2402.0	6.7	1.3	8.0	30	0	-22.0
Middle Frequency MHz						
2441.0	6.5	1.3	7.8	30	0	-22.2
Upper Frequency MHz						
2480.0	6.7	1.3	8.0	30	0	-22.0
RBW:	☐ 1MHz ☐ 3MHz ☒ 10MHz					
VBW:	☐ 1MHz ☐ 3MHz ☒ 10MHz					
Antenna Gain:	☒ < 6dBi ☐ >6dBi and = dBi, Output power reduction = dB					

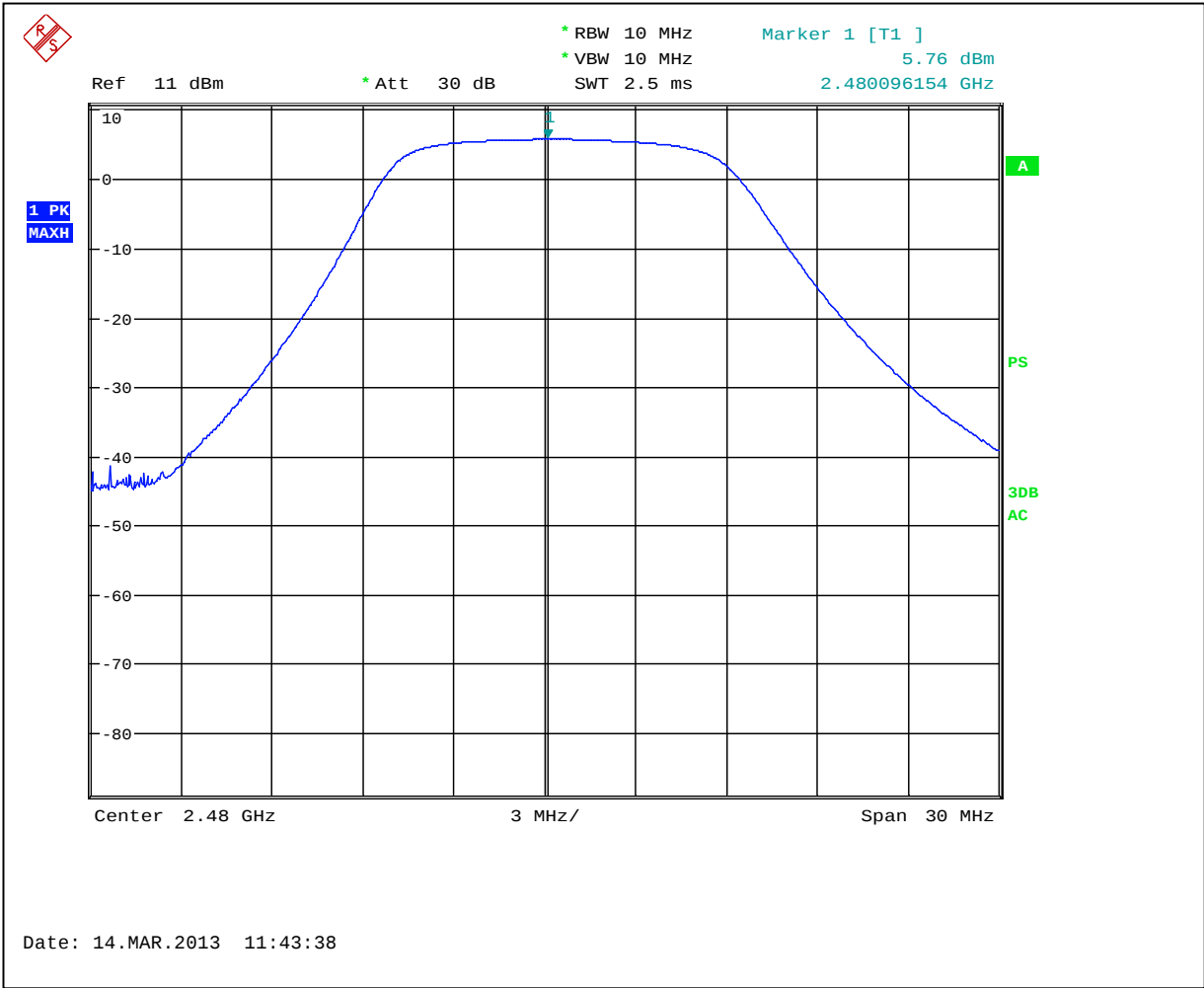
Notes: None



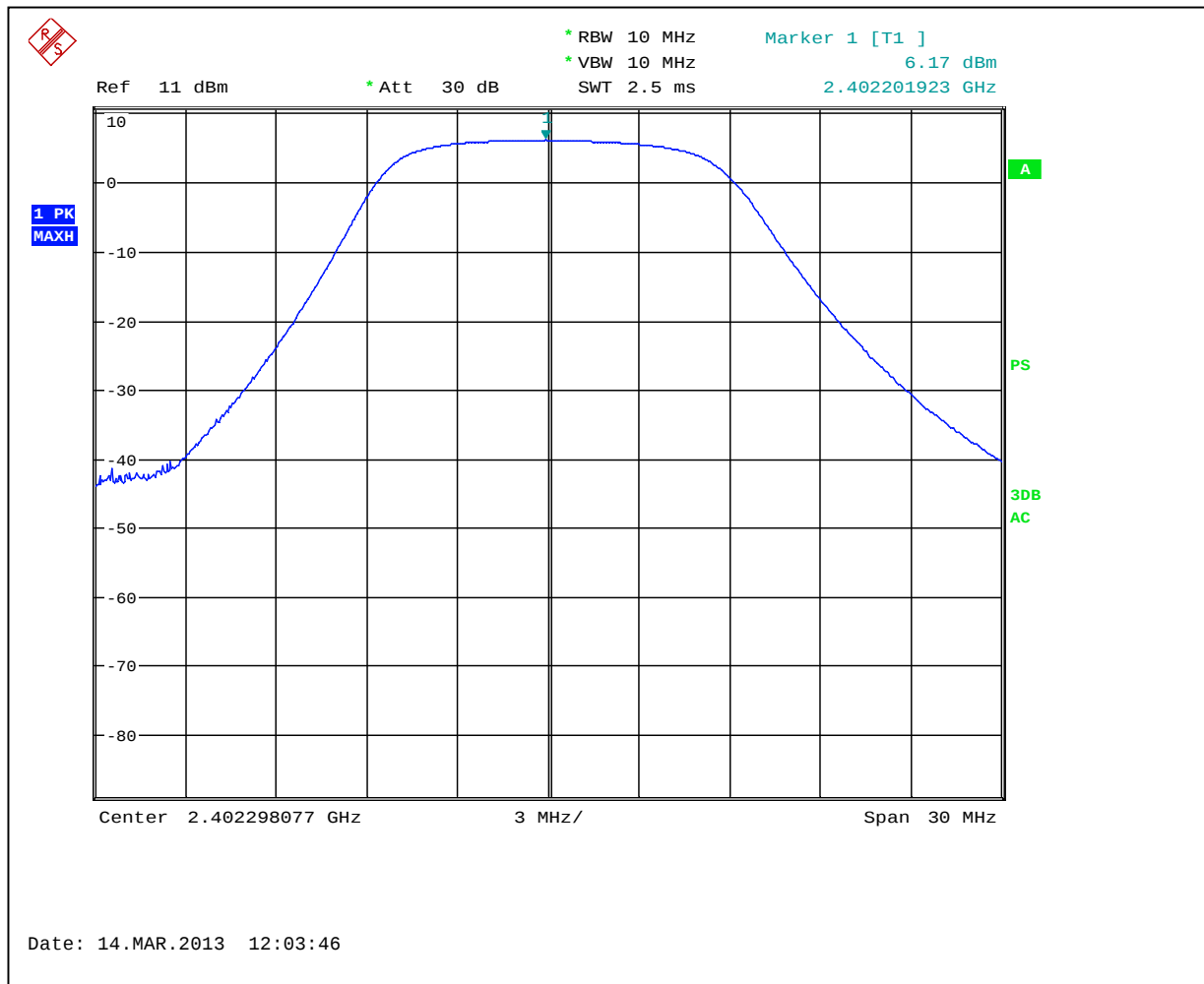
Graph 3.1.1



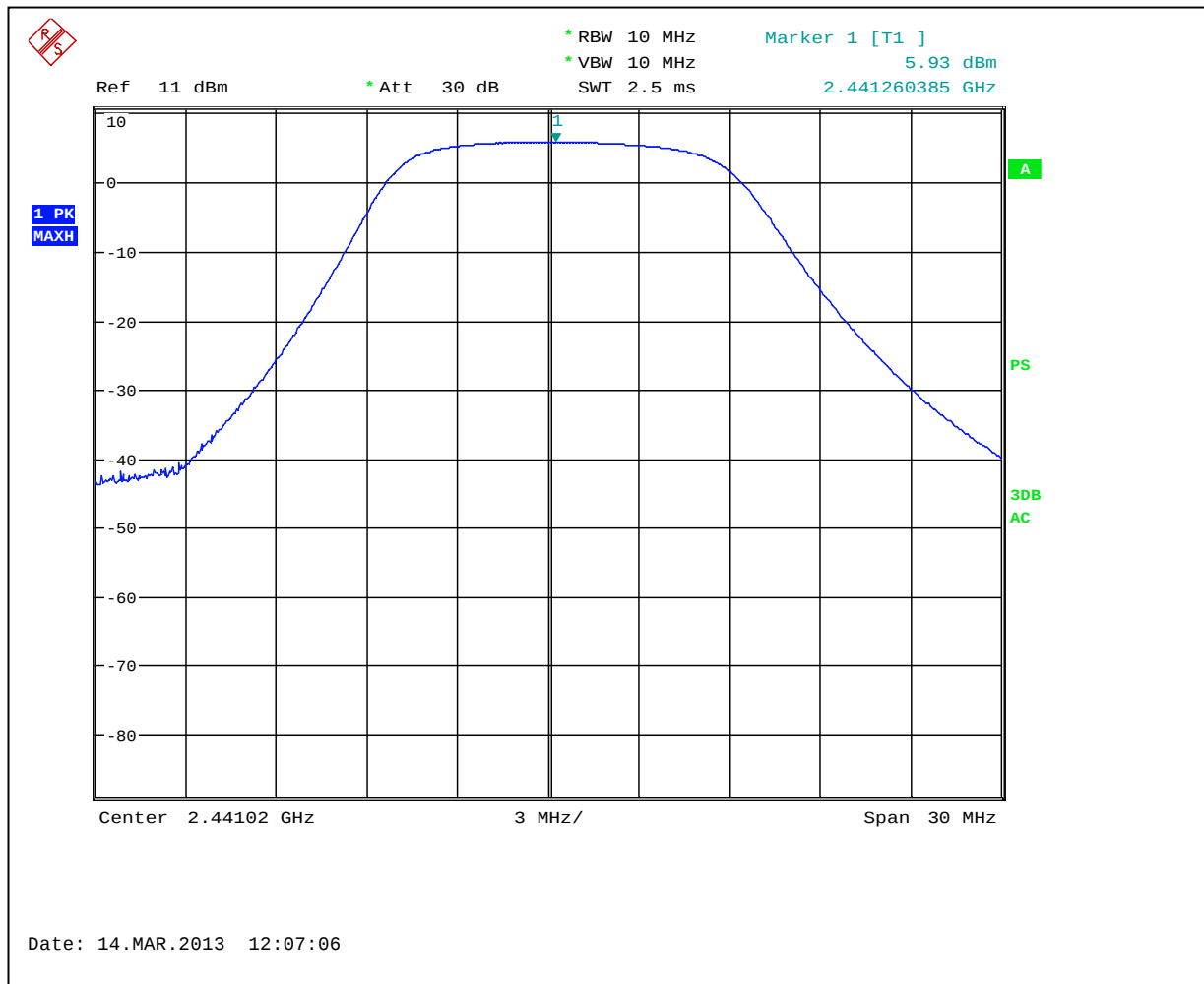
Graph 3.1.2



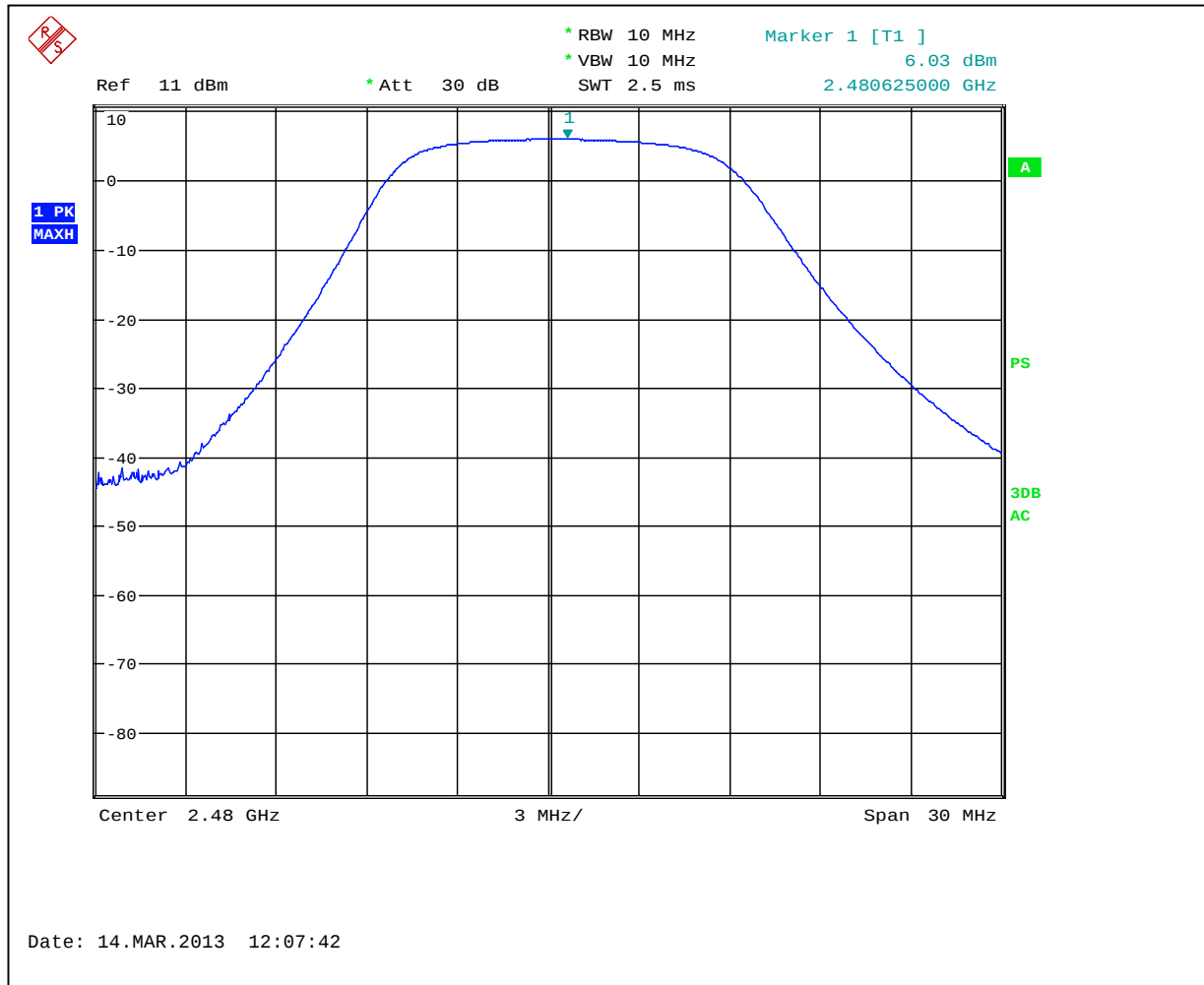
Graph 3.1.3



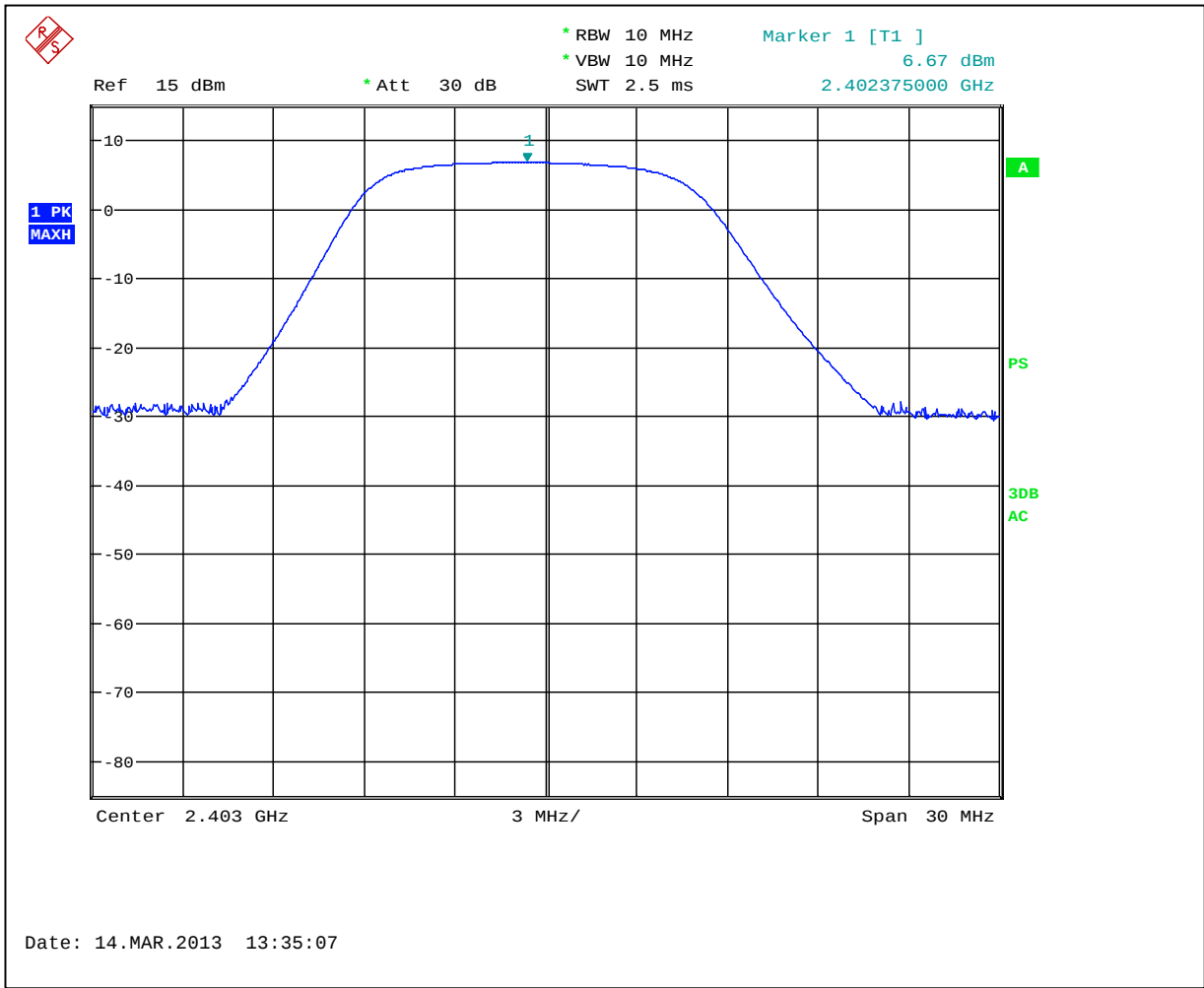
Graph 3.1.4



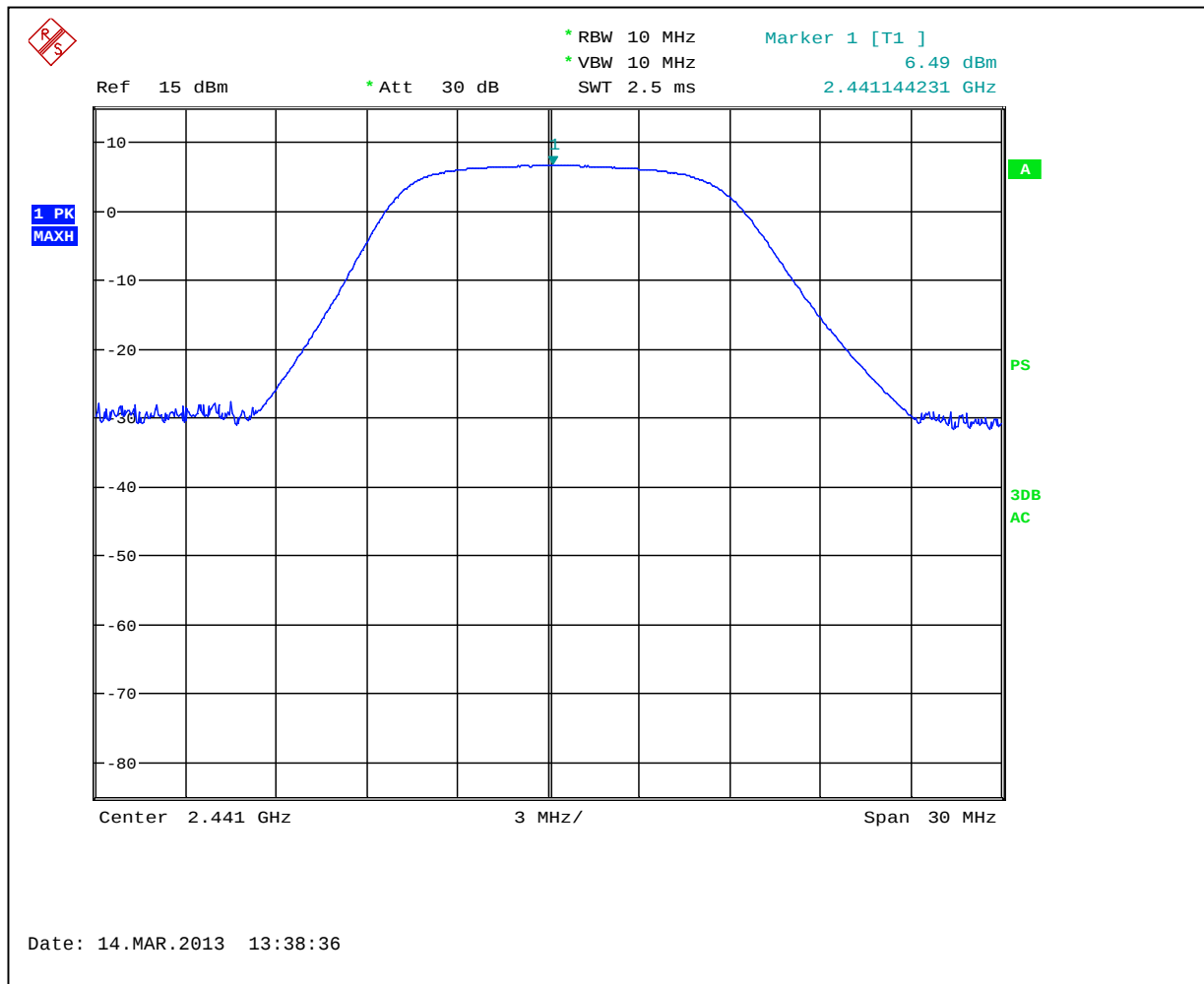
Graph 3.1.5



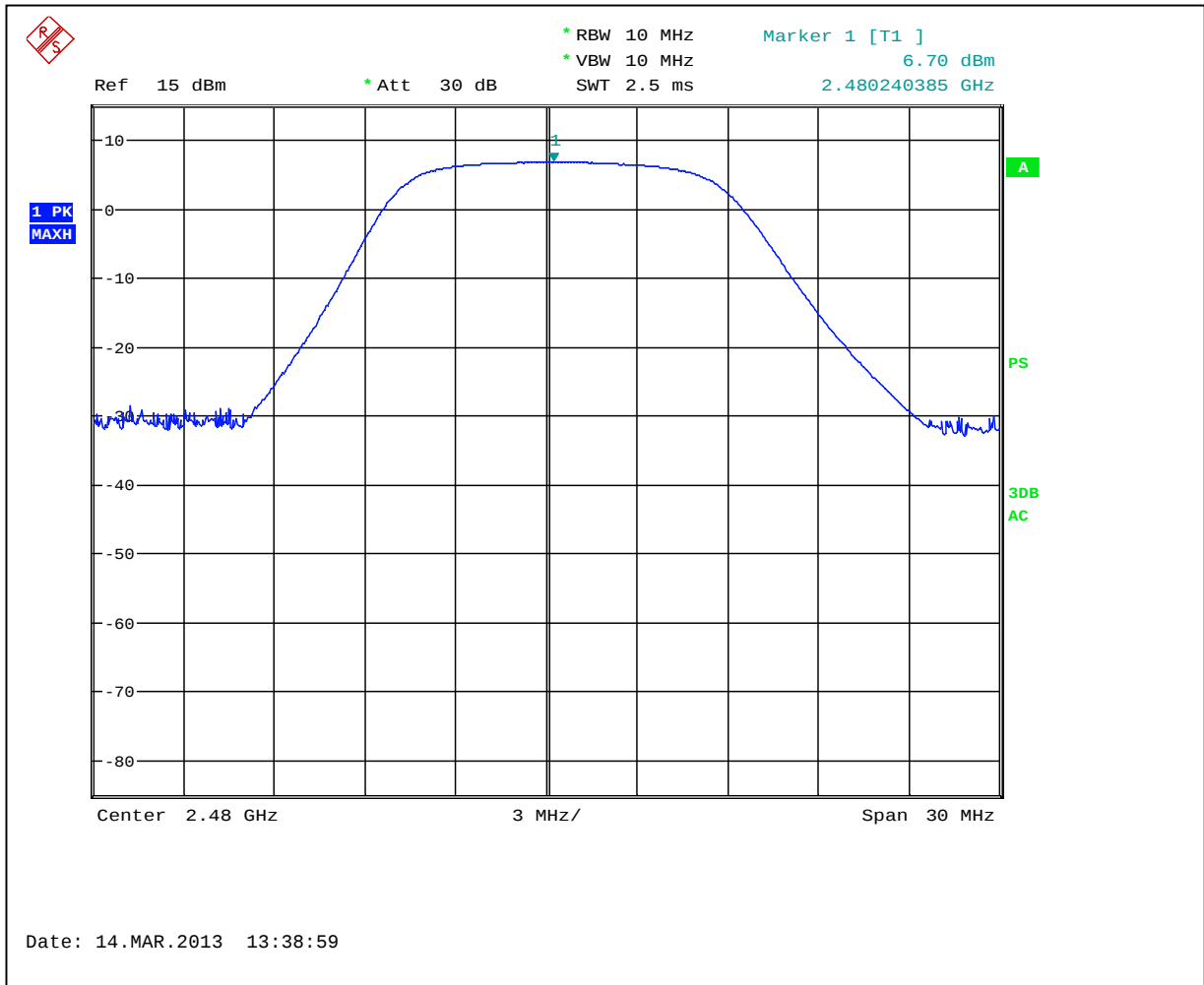
Graph 3.1.6



Graph 3.1.7



Graph 3.1.8



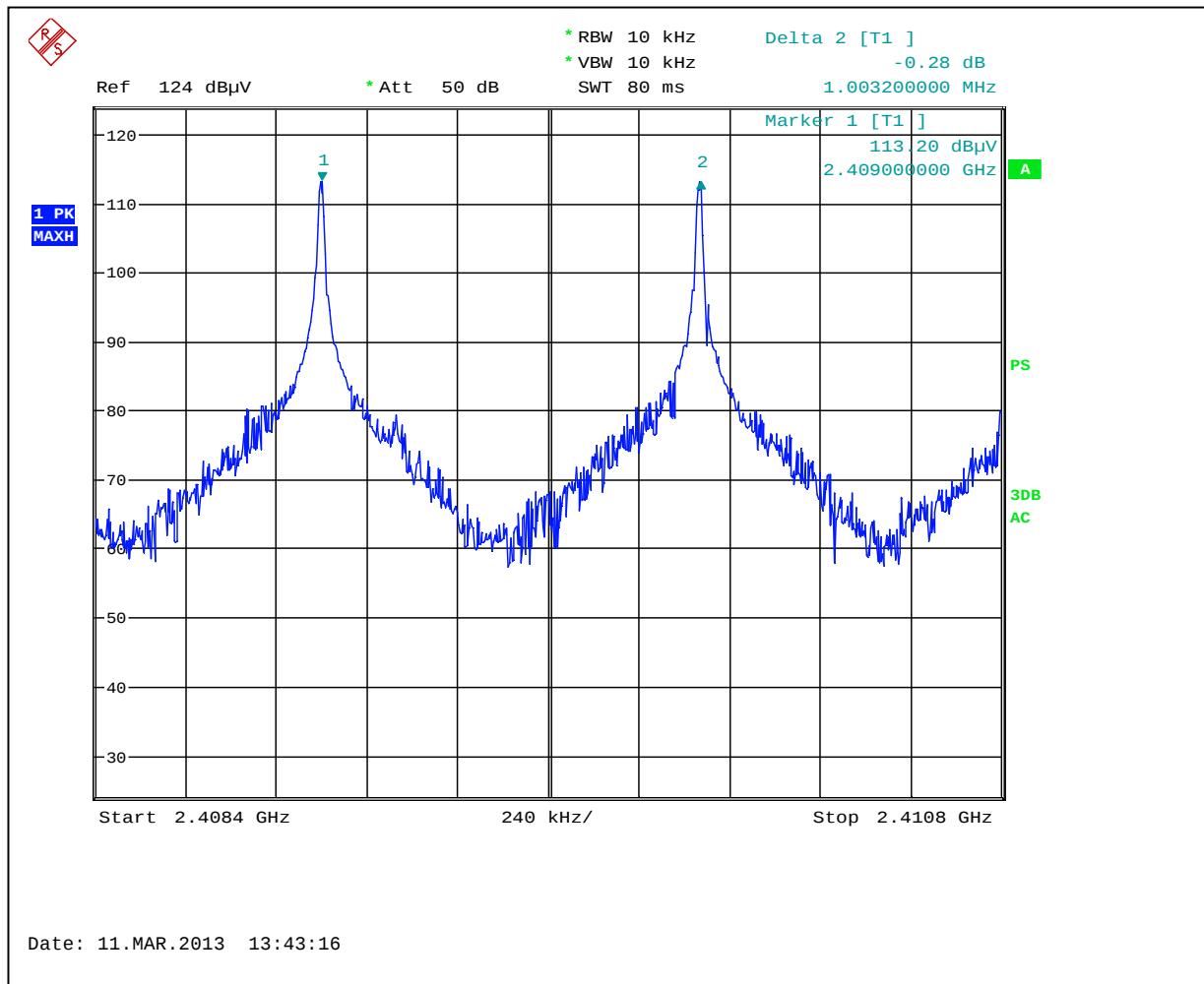
Graph 3.1.9



3.2 Hopping channel carrier frequencies separation

Frequency Range:	☐ 902-928MHz ☒ 2400-2483.5MHz ☐ 5725-5850MHz			
Measured Separation (MHz)	Limit (MHz)		Result	
1.000	0.920		Pass	
Limit:	☐ 25kHz ☐ 20dB channel bandwidth ☒ 2/3 of 20dB channel bandwidth			
Span:	kHz			
RBW:	☐ 3kHz ☒ 10kHz ☐ 100kHz ☐ other	kHz		
VBW:	☐ 3kHz ☒ 10kHz ☐ 100kHz ☐ other	kHz		

Notes: Highest 20dB channel bandwidth of 1.381MHz was used to calculate minimum channel separation limit.



Graph 3.2.1



3.3 20dB bandwidth of the hopping channel

GFSK

Frequency Range:	☐ 902-928MHz ☒ 2400-2483.5MHz ☐ 5725-5850MHz			
Low Frequency Channel (kHz)	Middle Frequency Channel (kHz)	Upper Frequency Channel (kHz)	Limit	Result
932.7	926.3	929.5	N/A	Pass
Span:	kHz			
RBW:	☐ 3kHz ☒ 10kHz ☐ 100kHz ☐ other kHz			
VBW:	☐ 3kHz ☒ 30kHz ☐ 100kHz ☐ other kHz			

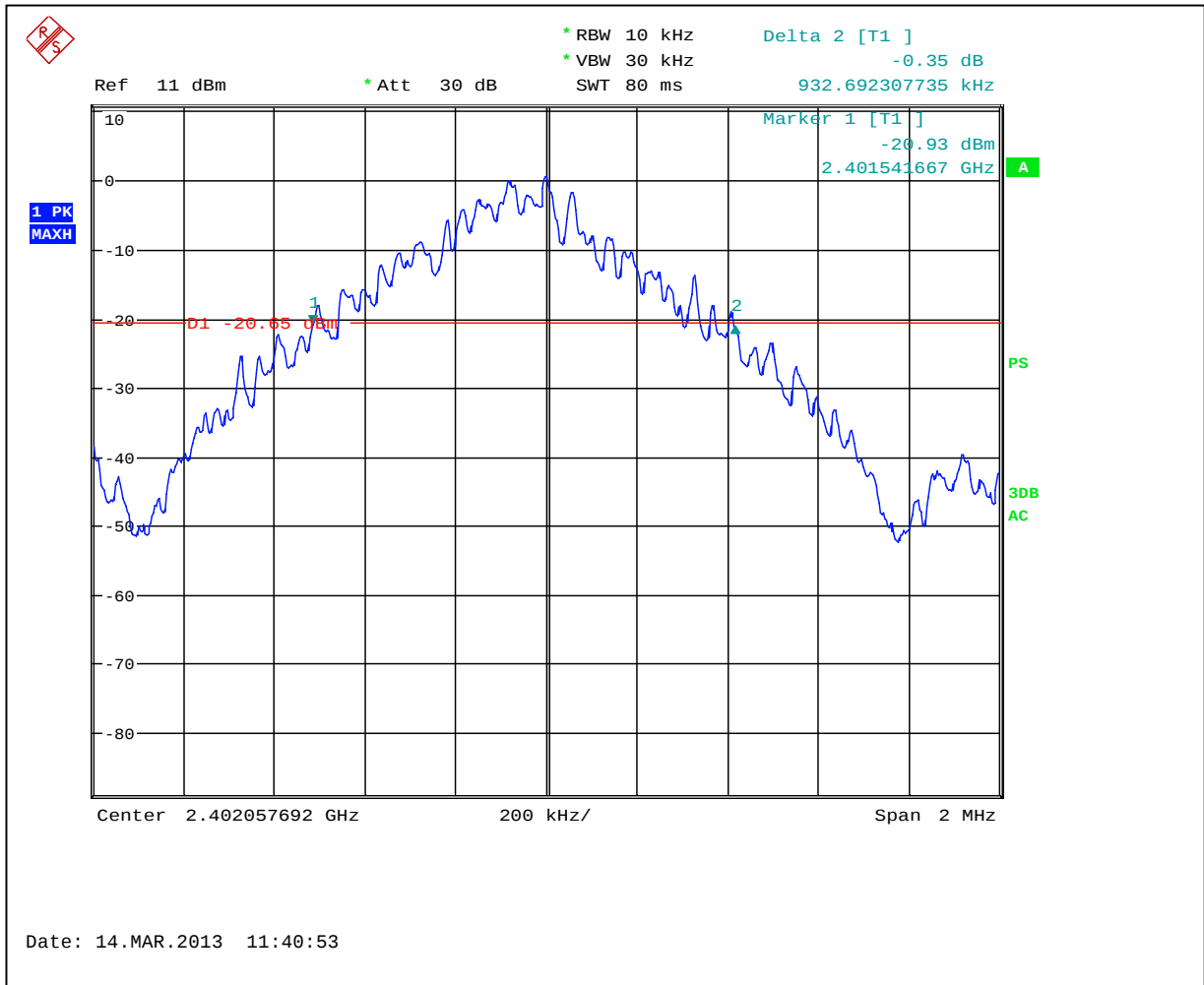
EDR2

Frequency Range:	☐ 902-928MHz ☒ 2400-2483.5MHz ☐ 5725-5850MHz			
Low Frequency Channel (MHz)	Middle Frequency Channel (MHz)	Upper Frequency Channel (MHz)	Limit	Result
1.378	1.310	1.371	N/A	Pass
Span:	kHz			
RBW:	☐ 3kHz ☒ 10kHz ☐ 100kHz ☐ other kHz			
VBW:	☐ 3kHz ☒ 30kHz ☐ 100kHz ☐ other kHz			

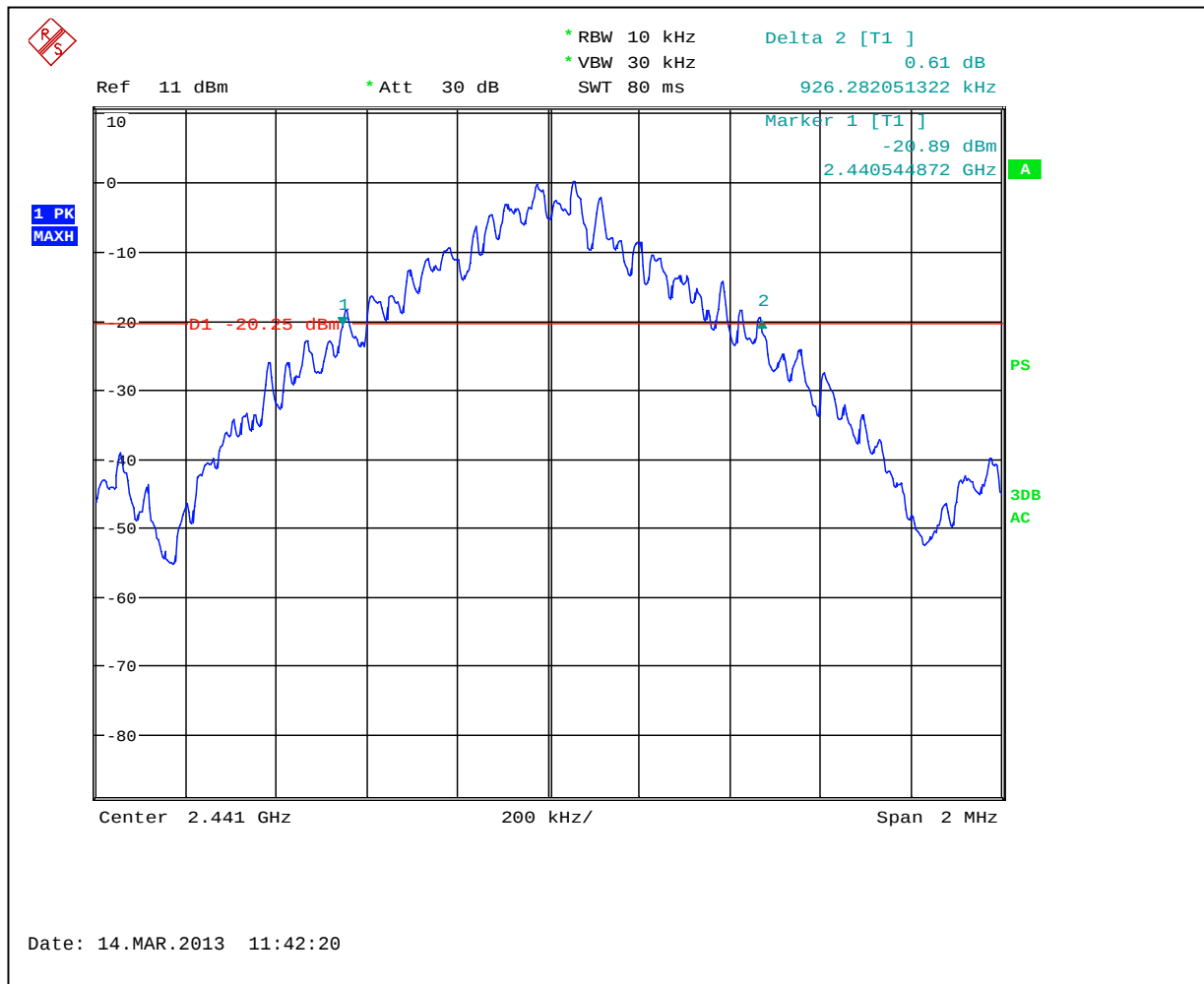
EDR3

Frequency Range:	☐ 902-928MHz ☒ 2400-2483.5MHz ☐ 5725-5850MHz			
Low Frequency Channel (MHz)	Middle Frequency Channel (MHz)	Upper Frequency Channel (MHz)	Limit	Result
1.368	1.371	1.381	N/A	Pass
Span:	kHz			
RBW:	☐ 3kHz ☒ 10kHz ☐ 100kHz ☐ other kHz			
VBW:	☐ 3kHz ☒ 30kHz ☐ 100kHz ☐ other kHz			

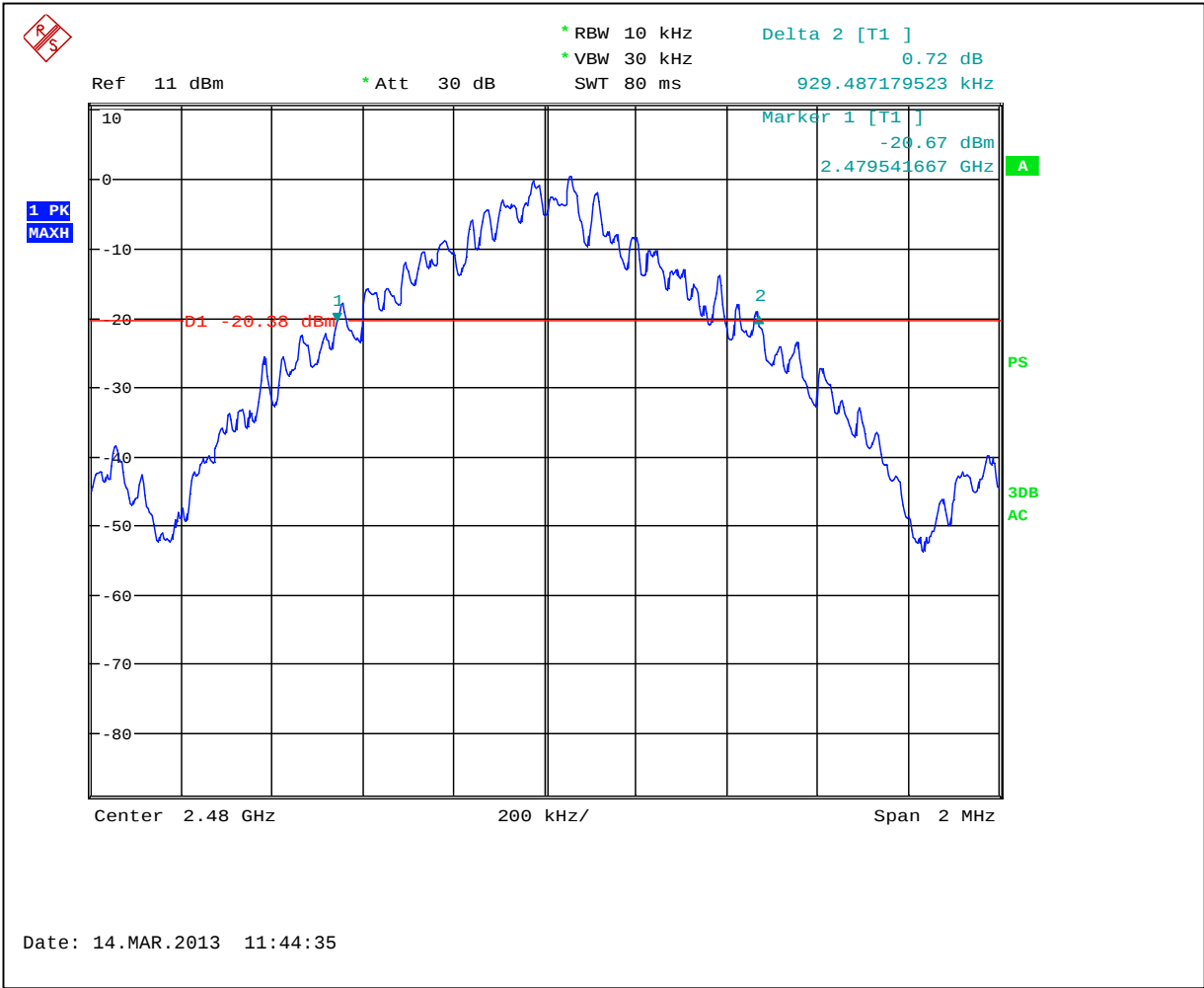
Notes:



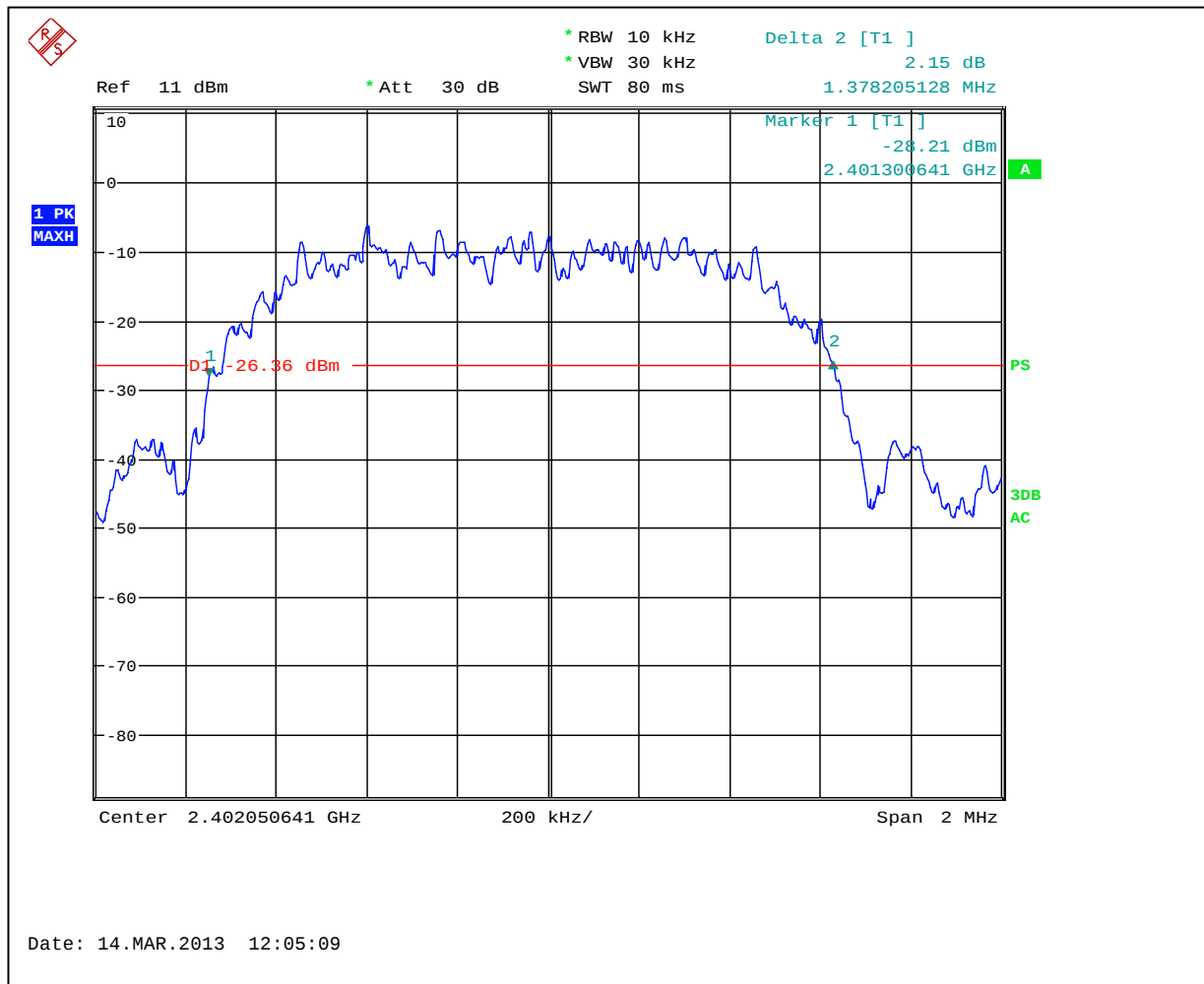
Graph 3.3.1



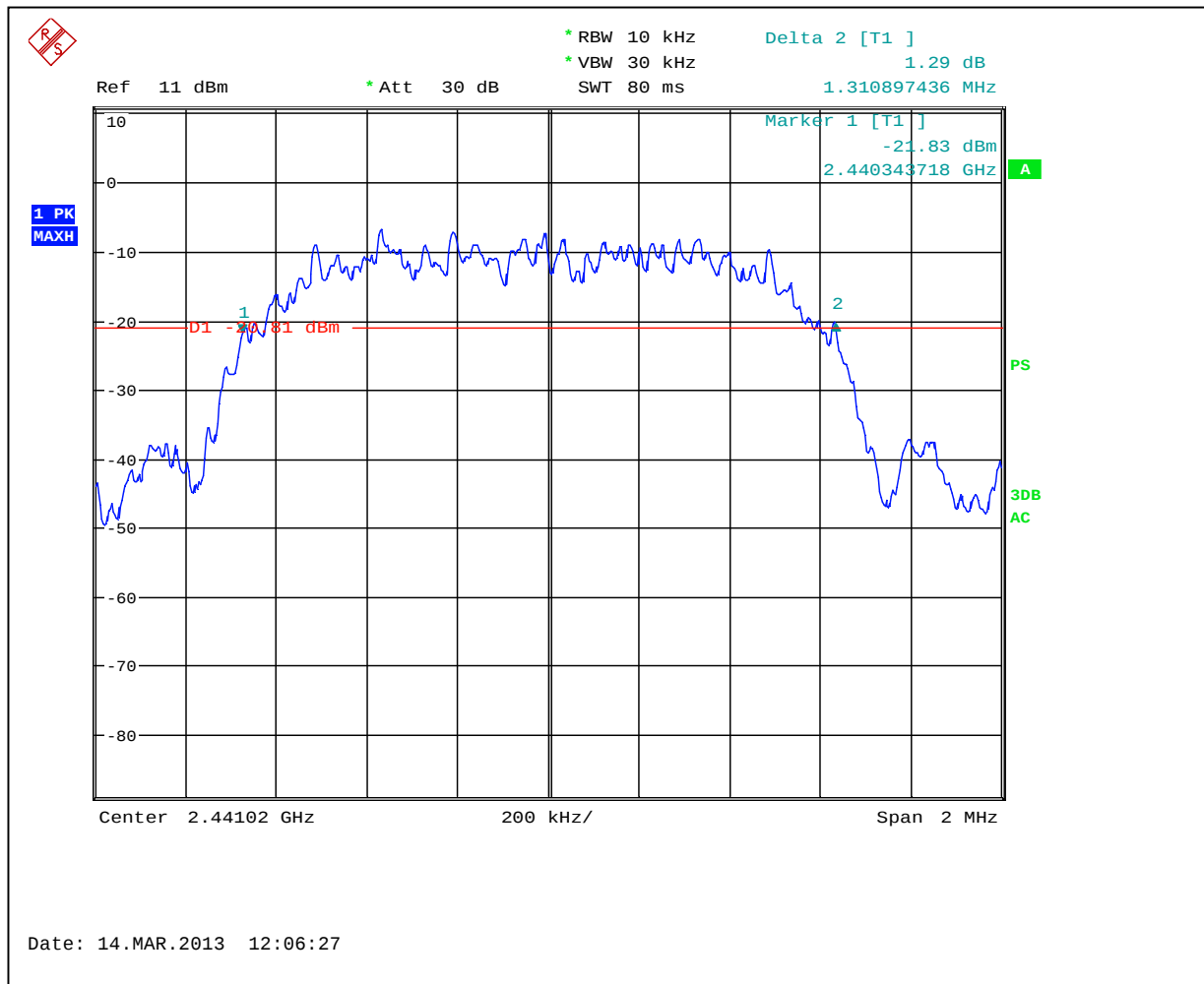
Graph 3.3.2



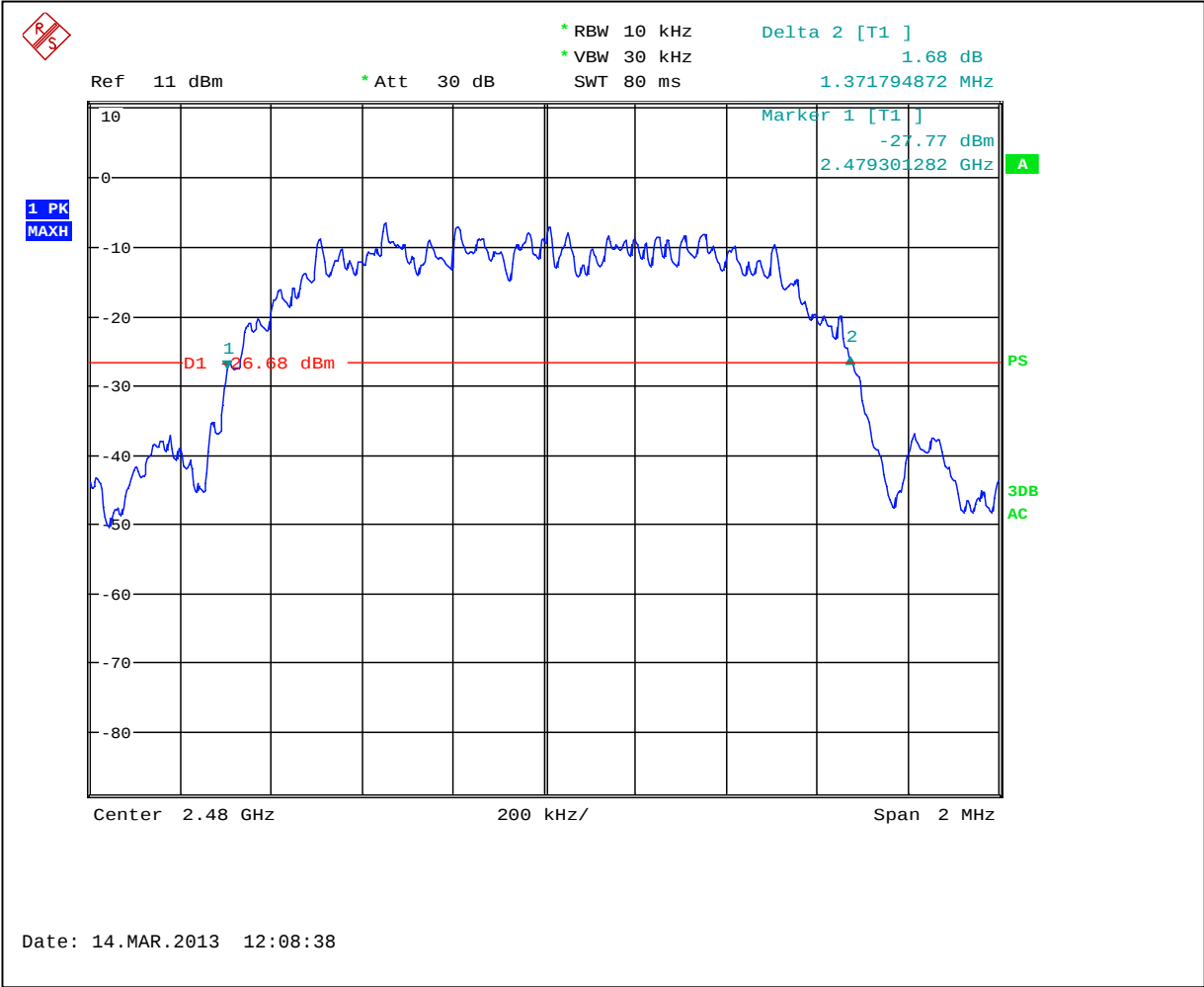
Graph 3.3.3



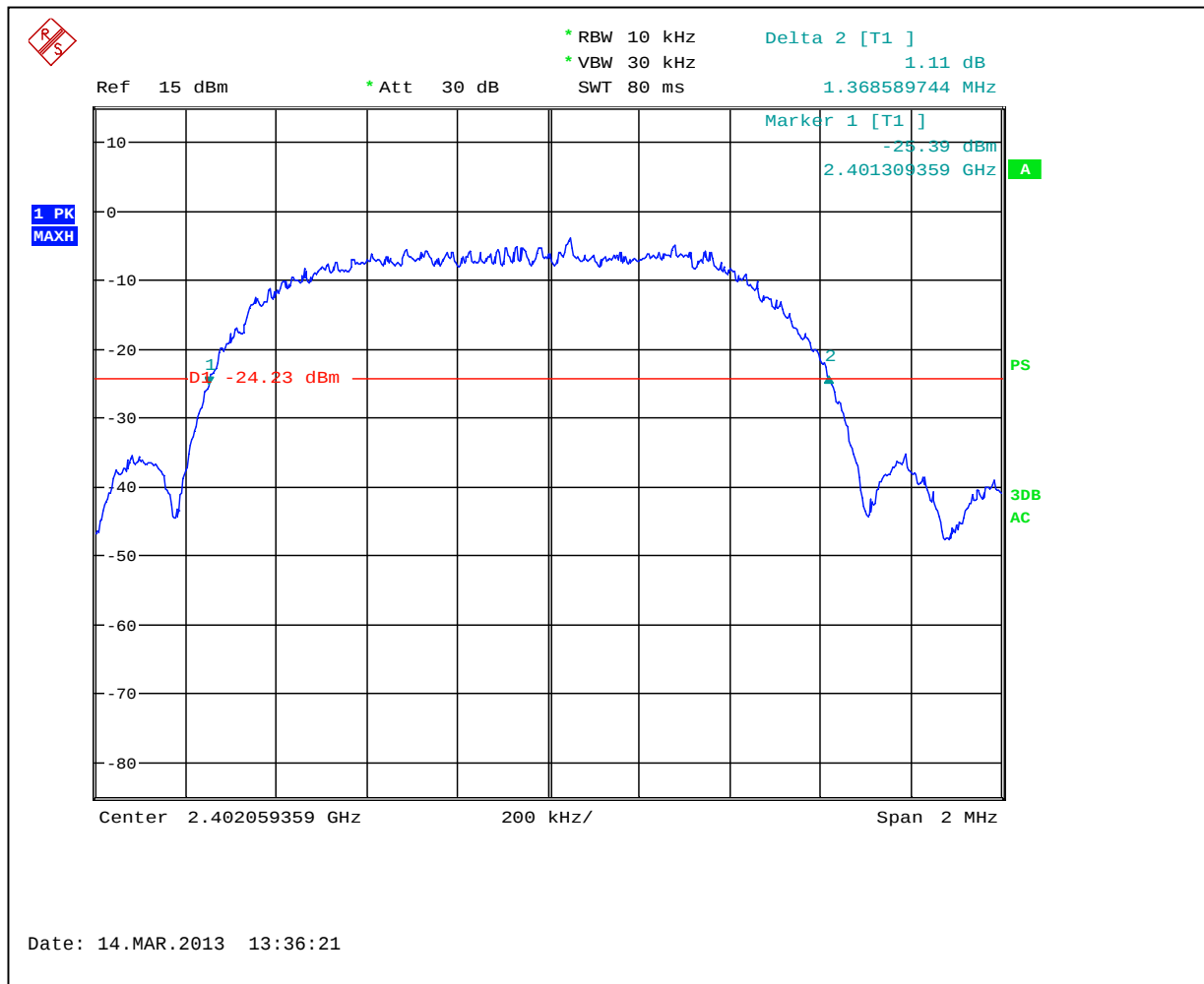
Graph 3.3.4



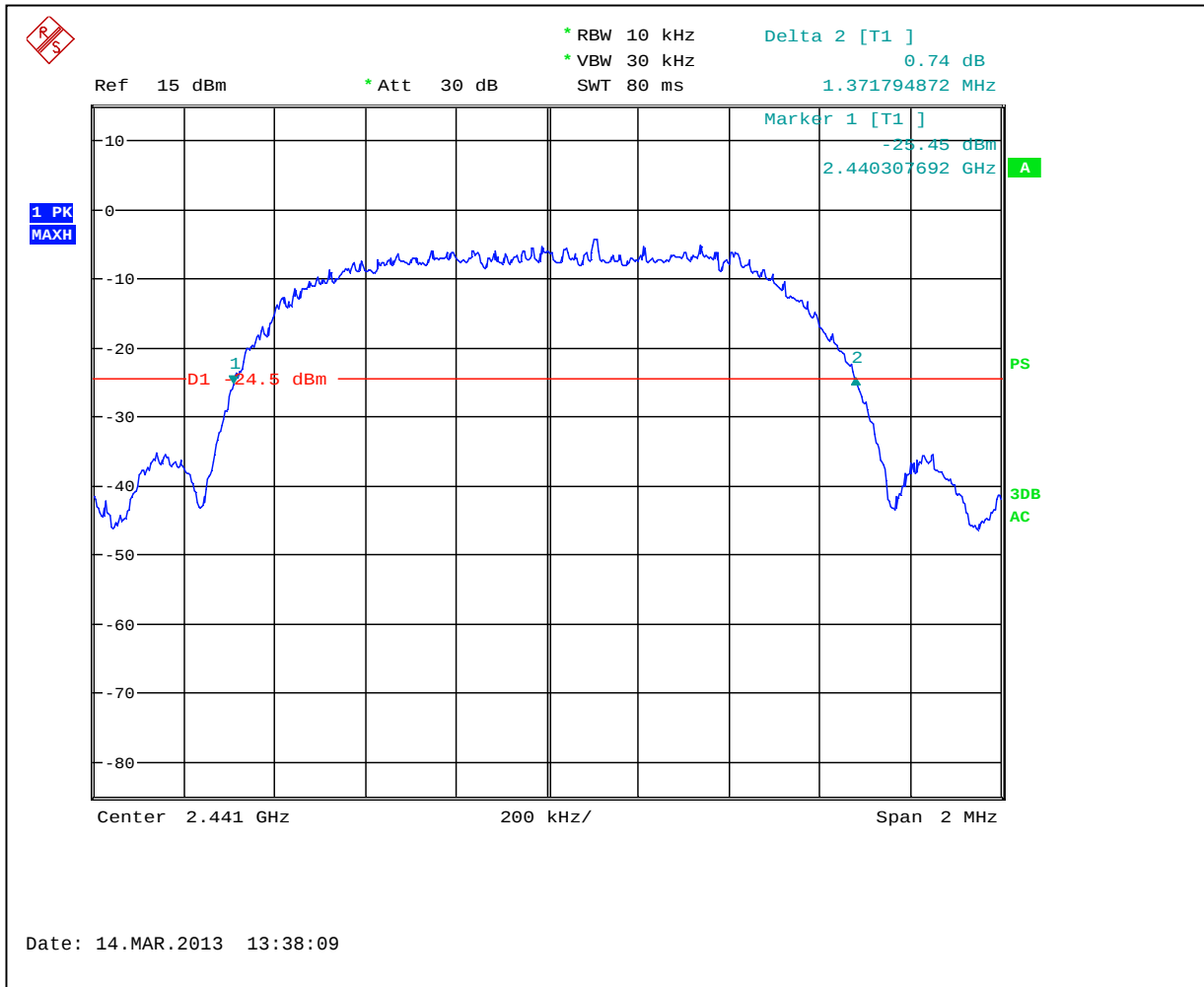
Graph 3.3.5



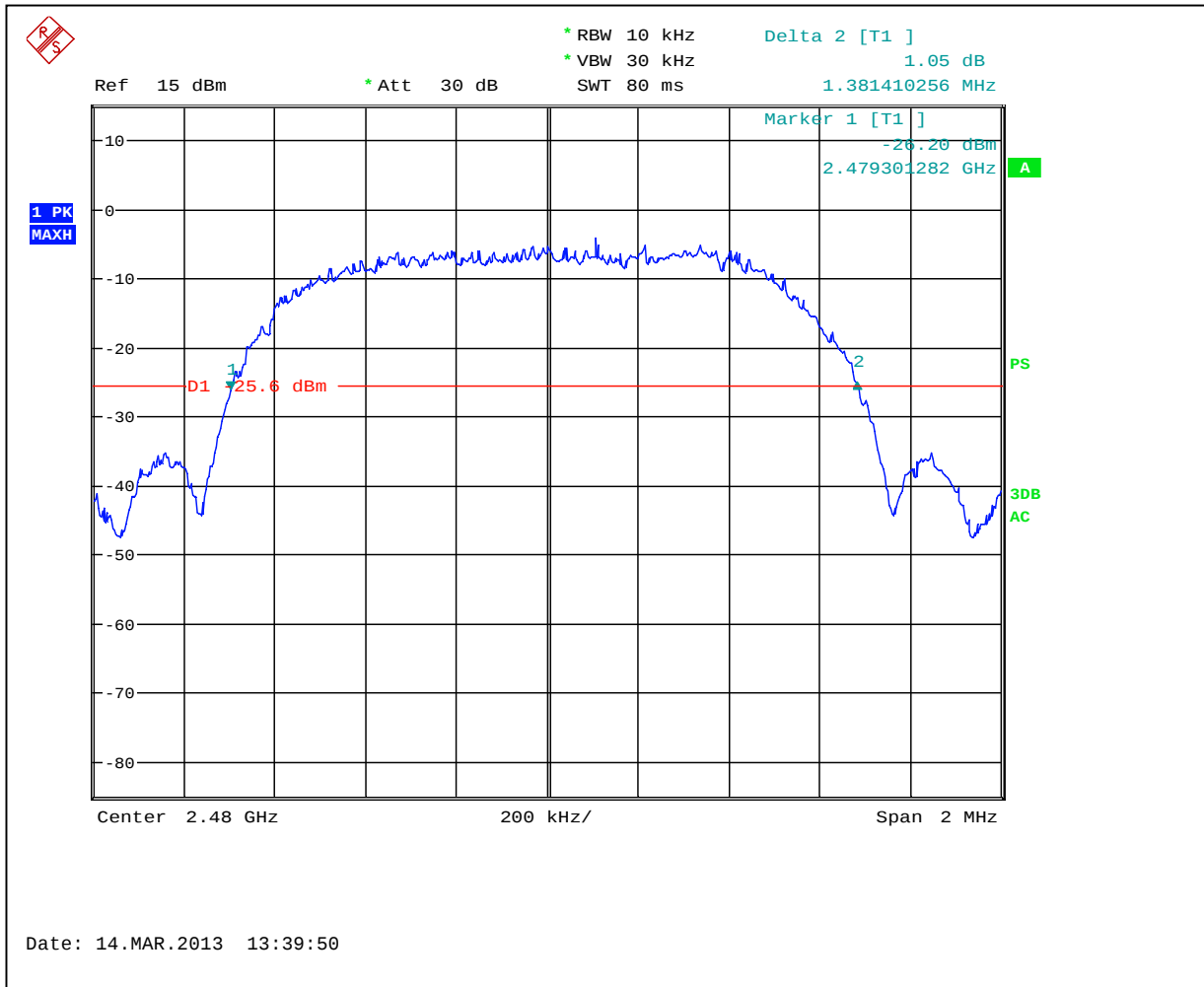
Graph 3.3.6



Graph 3.3.7



Graph 3.3.8



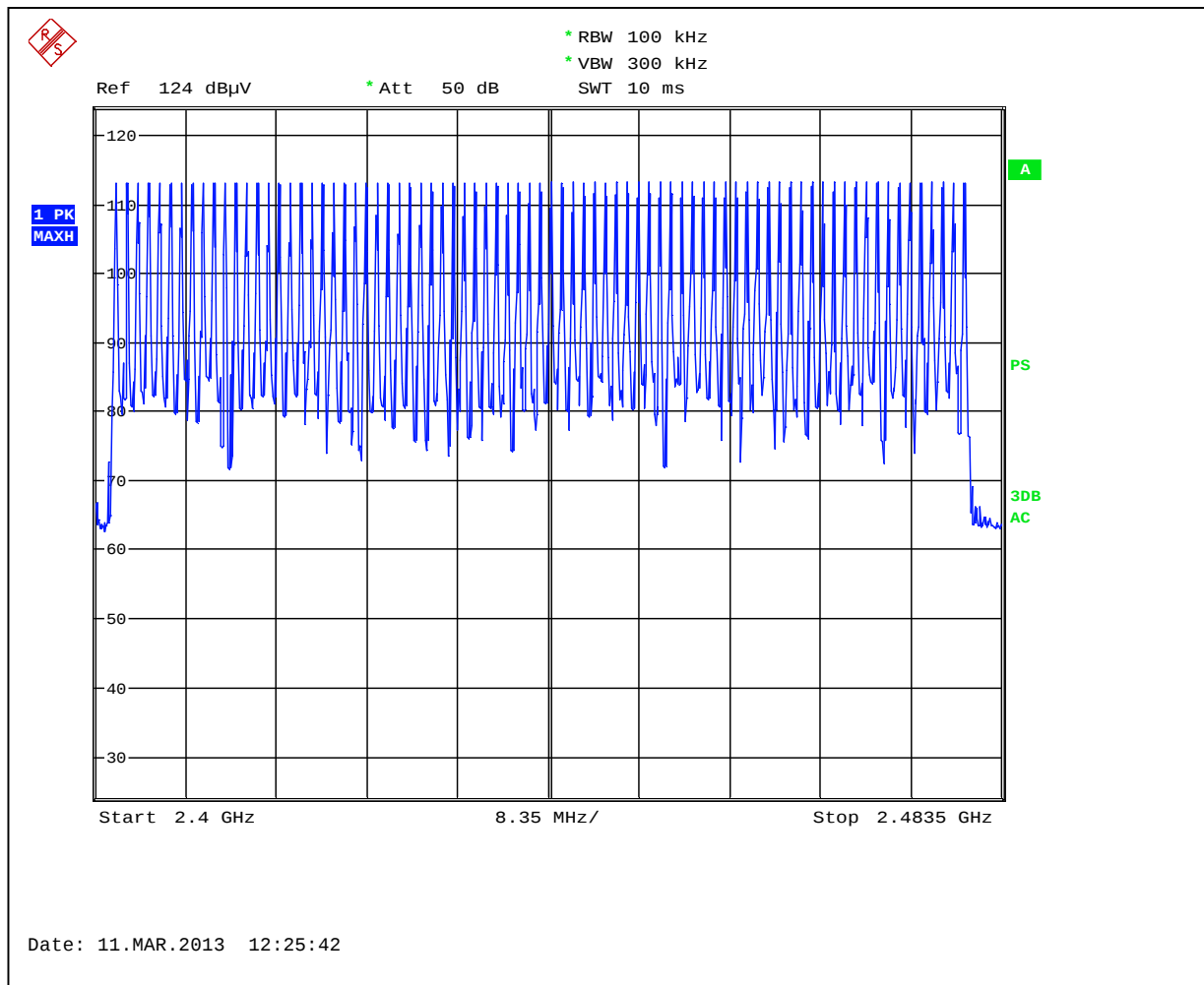
Graph 3.3.9



3.4 Number of hopping frequencies

Frequency Range:	☐ 902-928MHz ☒ 2400-2483.5MHz ☐ 5725-5850MHz	
Measured Number	Requirements	Result
79	15	Pass
Channel 20dB Bandwidth:	☐ <250kHz ☒ ≥250kHz	

Notes:



Graph 3.4.1



3.5 Average time of occupancy of hopping frequency

Frequency Range:	☐ 902-928MHz ☒ 2400-2483.5MHz ☐ 5725-5850MHz		
Measured / Calculated Time sec	Period sec	Limit sec	Result
0.122	31.6	0.4	Pass
Period:	☐ 10s ☐ 20s ☐ 30s ☒ 0.4s multiplied by the channel number		
Channel 20dB Bandwidth:	☐ <250kHz ☒ ≥250kHz		

Time of occupancy calculation:

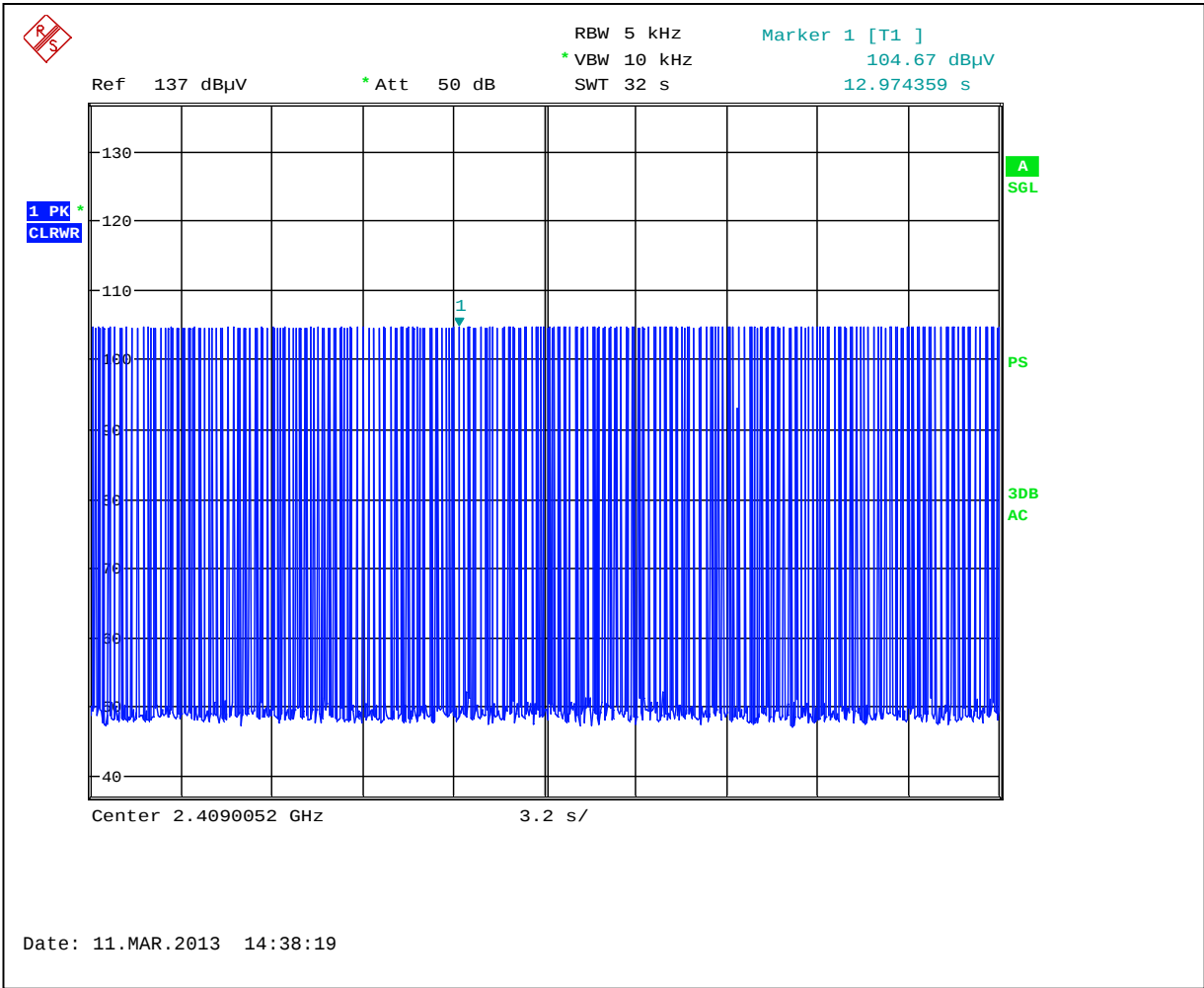
The minimum measured repetition of the channel occupancy (repetition) = 10 times in 1 sec or 316 times in 31.6 sec period.

Single occupancy duration (single duration) = 386μsec

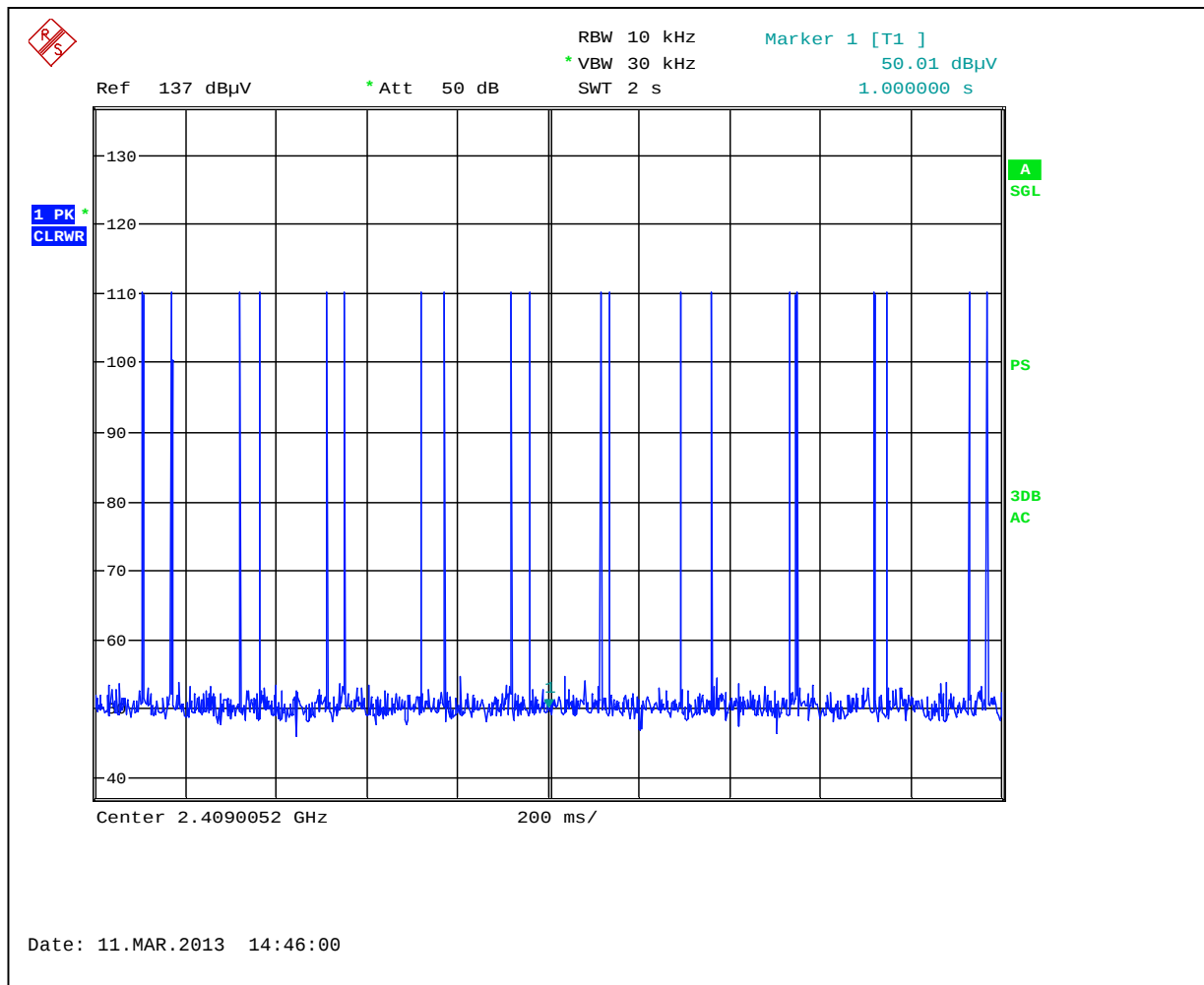
Period = 31.6 sec

Time of occupancy = (single duration) x (repetition) = 316 x 0.000386 (sec) = 0.122sec

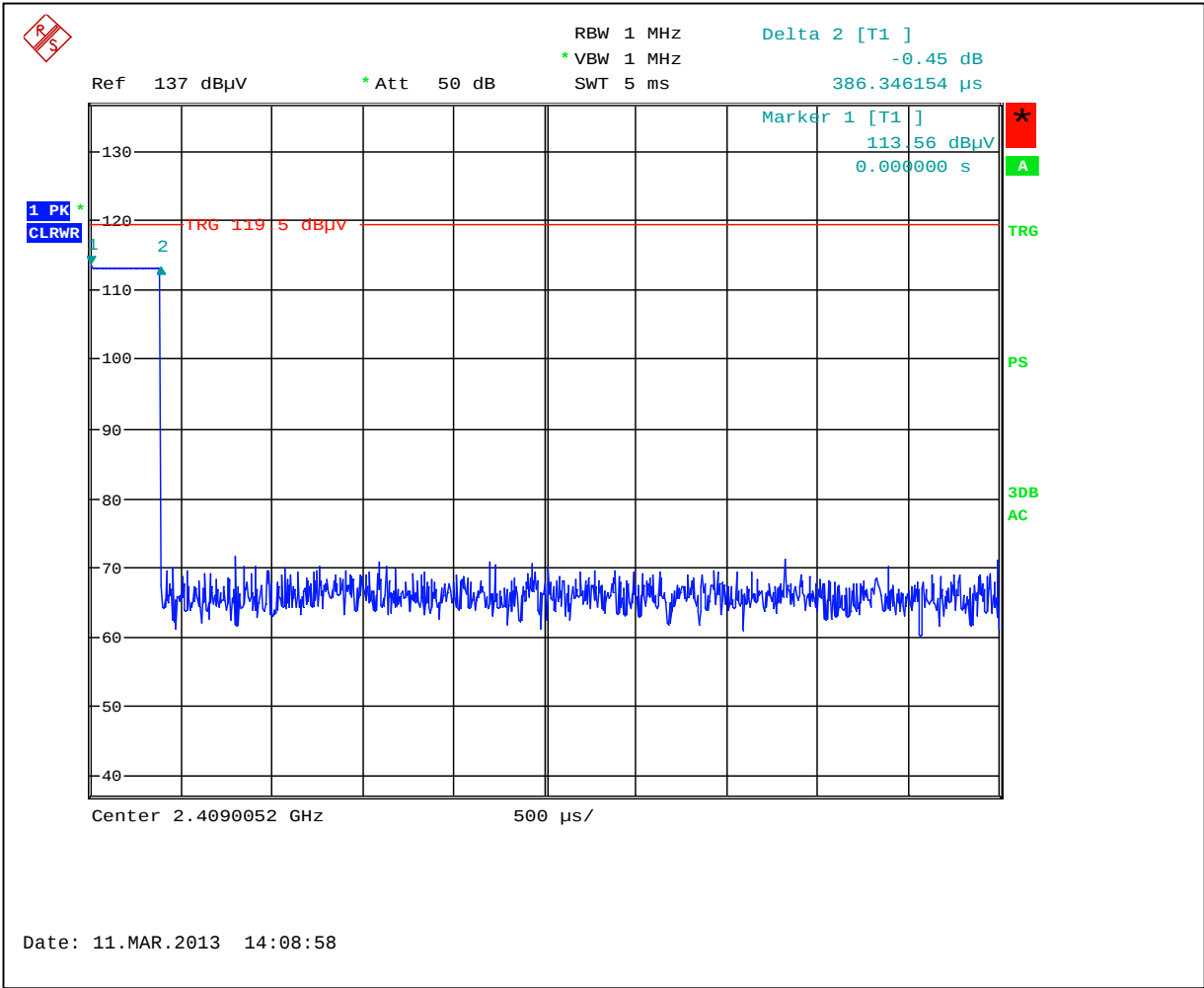
Notes:



Graph 3.5.1



Graph 3.5.2



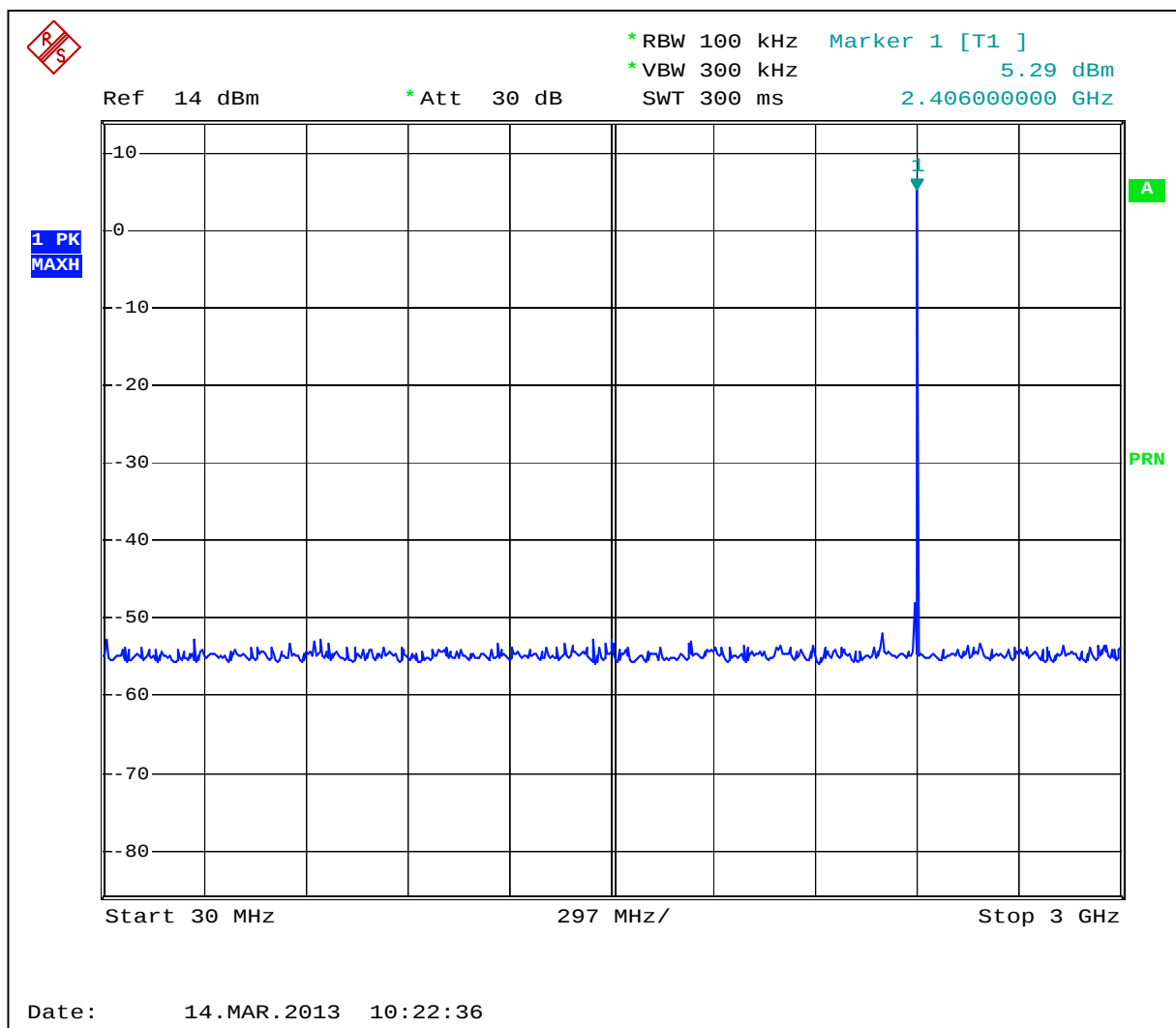
Graph 3.5.3



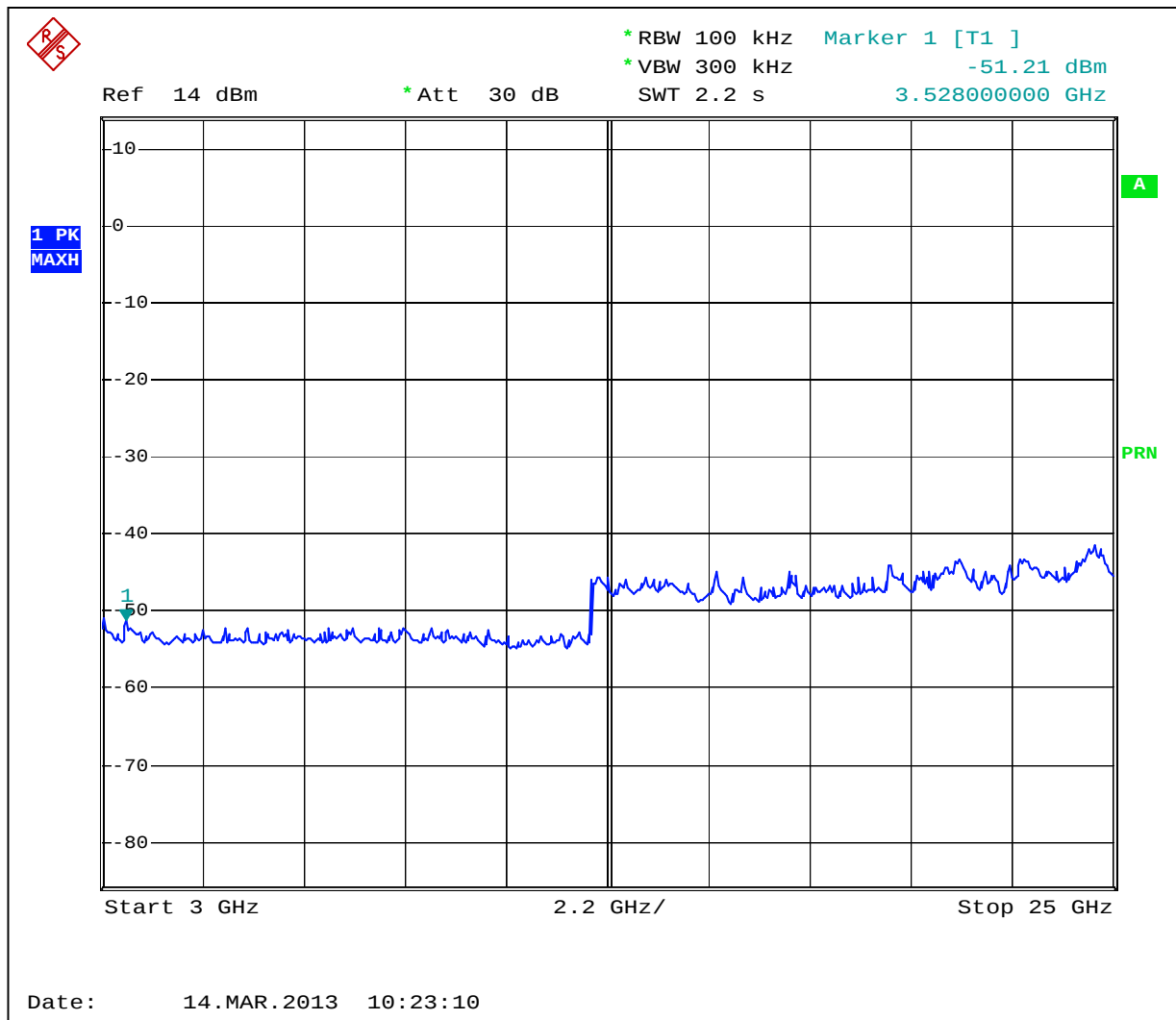
3.6 Antenna conducted spurious emissions

Frequency Range:	☐ 902-928MHz ☒ 2400-2483.5MHz ☐ 5725-5850MHz		
	Minimum Measured Attenuation dB	Minimum Allowed Attenuation dB	Margin dB
Low Frequency Channel		20	
Middle Frequency Channel		20	
Upper Frequency Channel		20	
Analyzer Settings:	☒ RBW=100KHz		
Minimum Allowed Attenuation:	☒ 20dB ☐ 30dB (for digital systems with conducted power measured using RMS averaging over a time interval)		

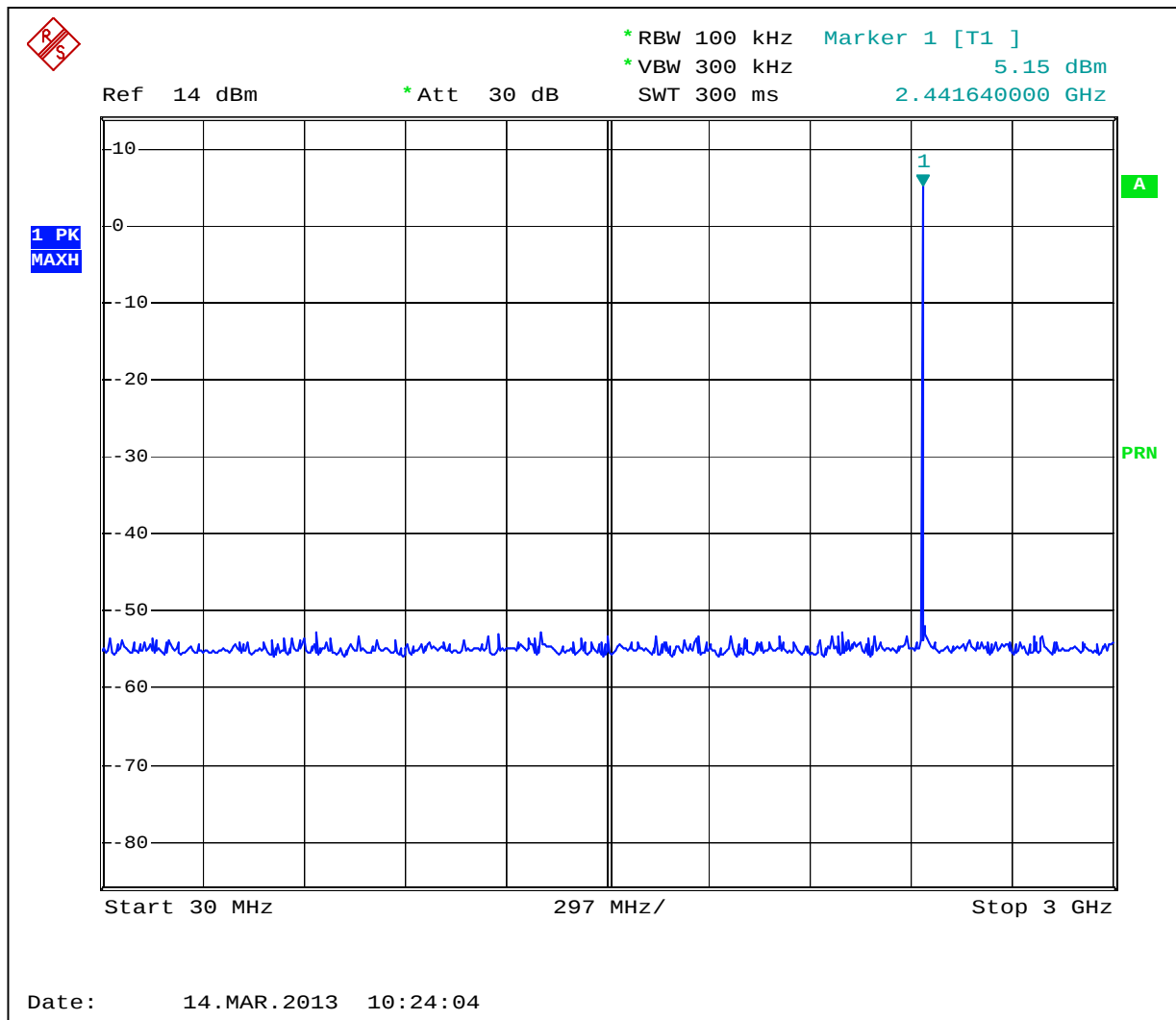
Notes: No spurious emissions were detected. Fundamental frequencies were excluded.
Graphs 3.6.1-3.6.6 show spurious emissions for GFSK mode.
Graphs 3.6.7-3.6.12 show spurious emissions for EDR2 mode.
Graphs 3.6.13-3.6.18 show spurious emissions for EDR3 mode.



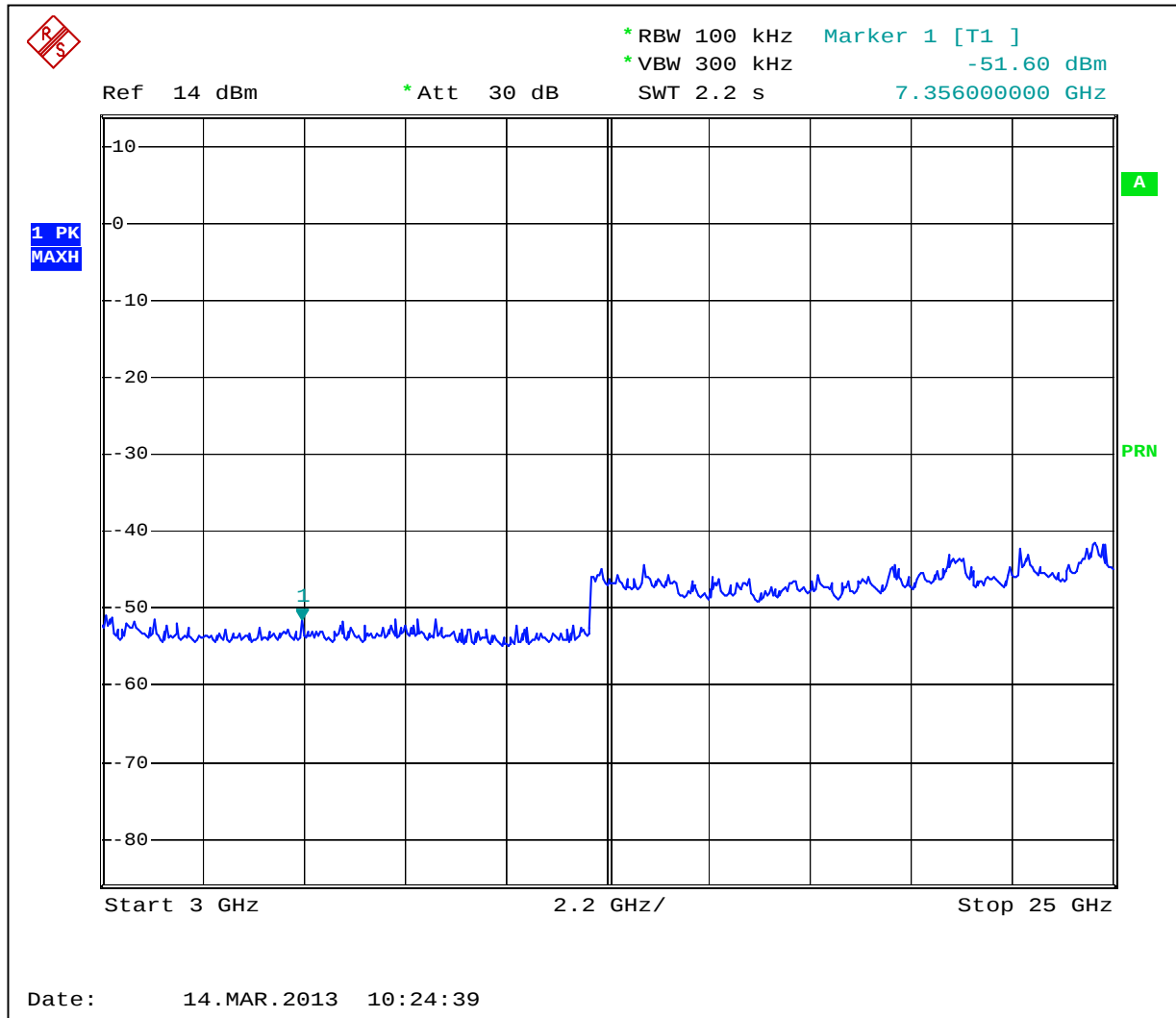
Graph 3.6.1



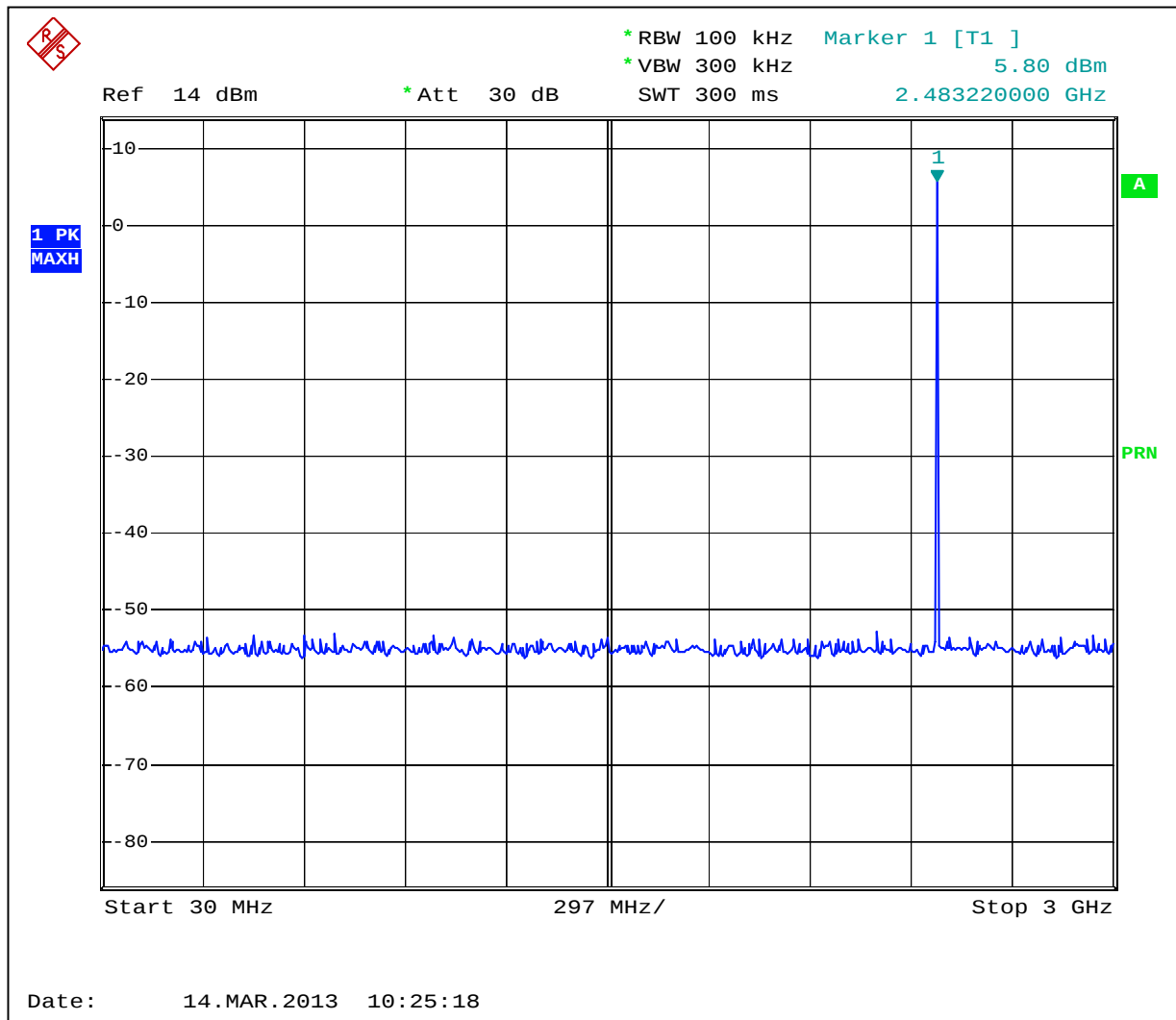
Graph 3.6.2



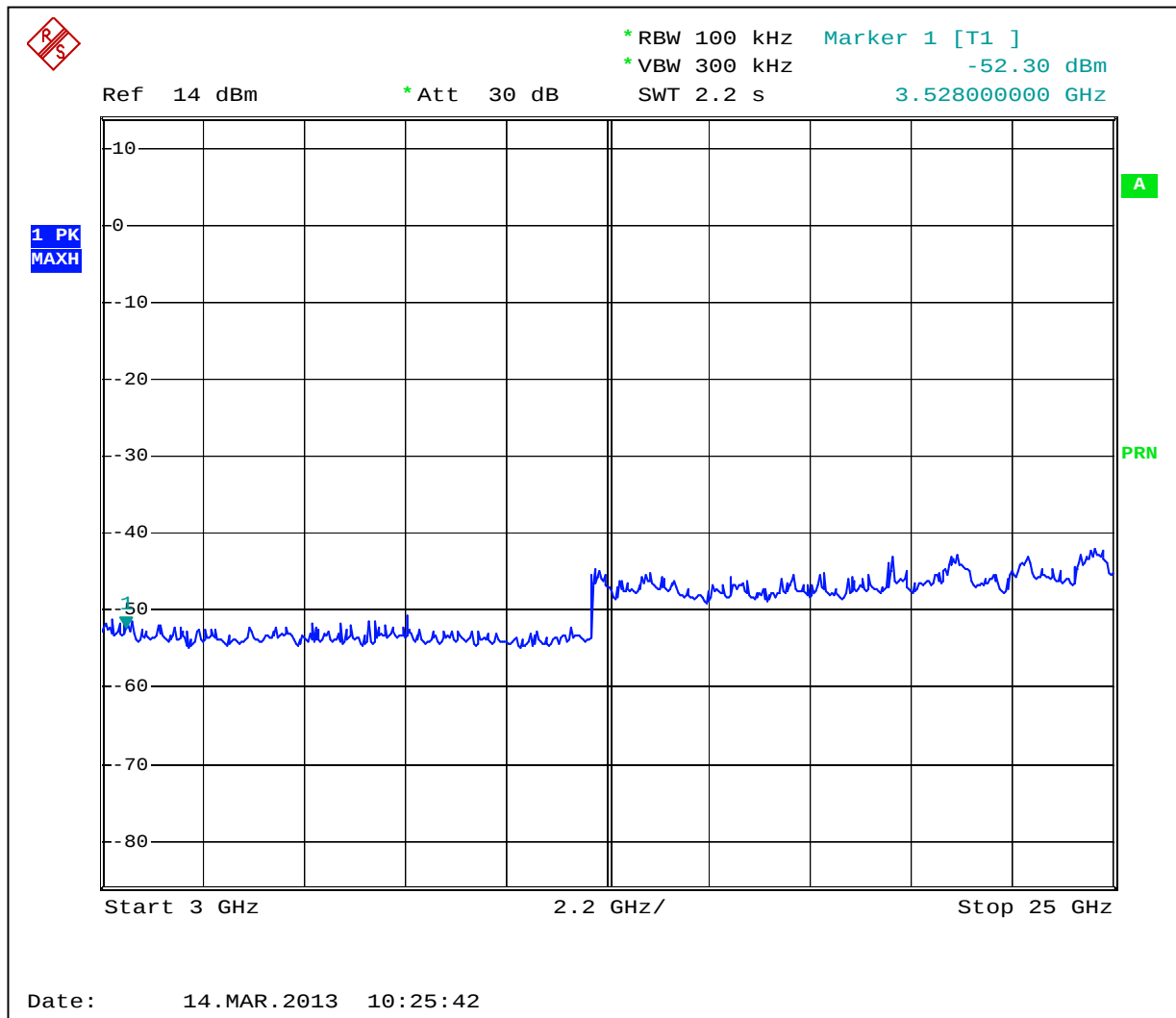
Graph 3.6.3



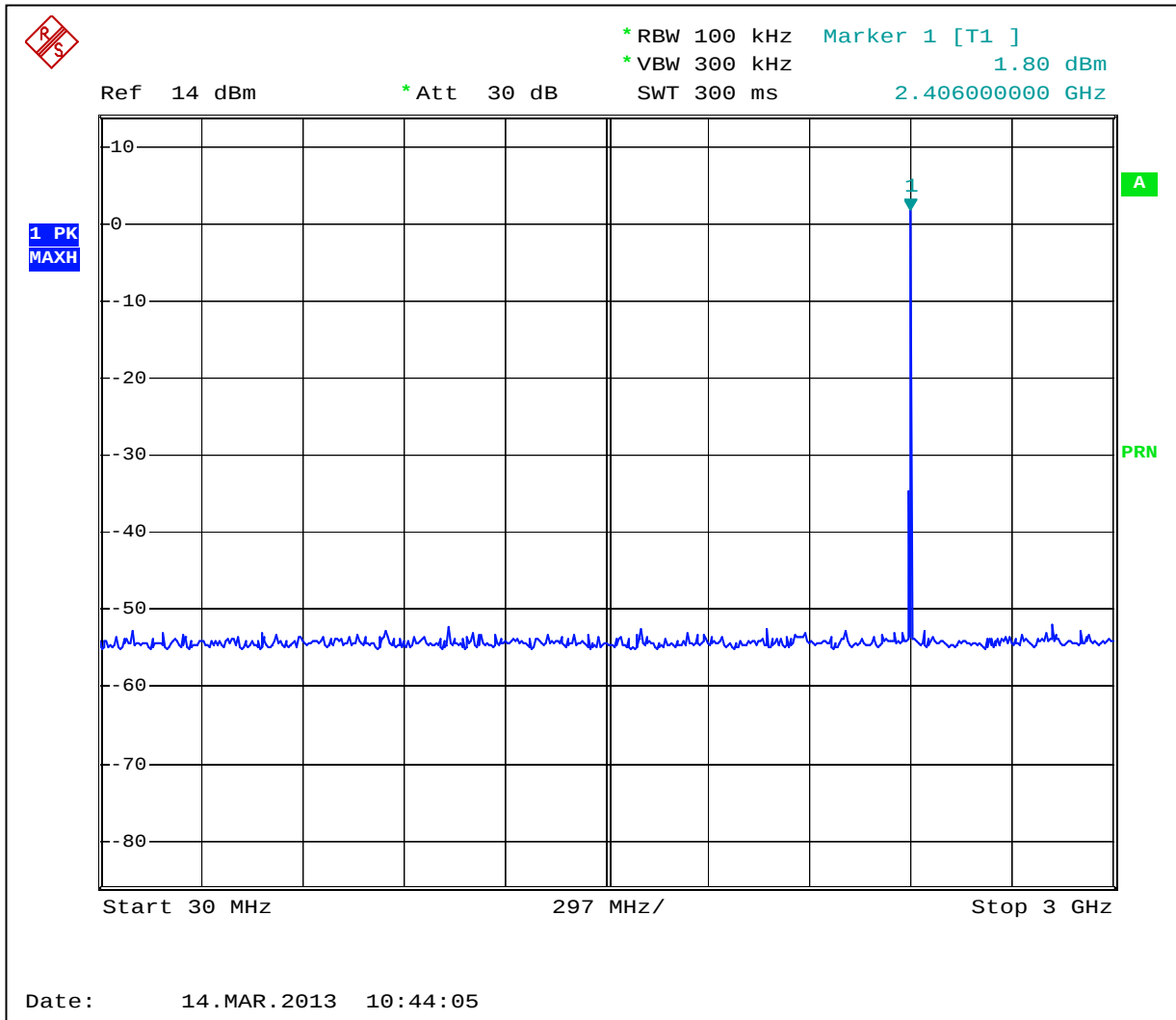
Graph 3.6.4



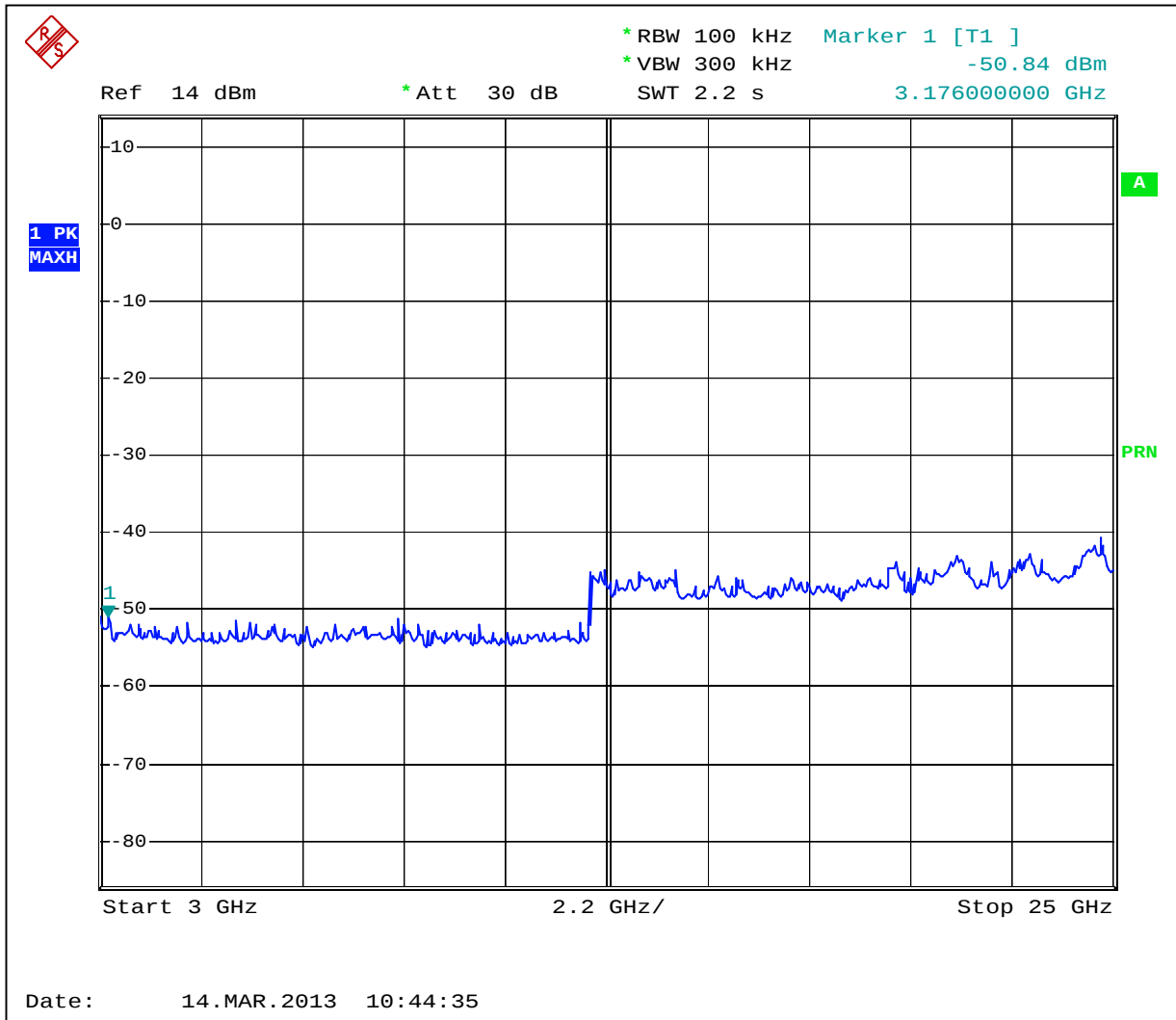
Graph 3.6.5



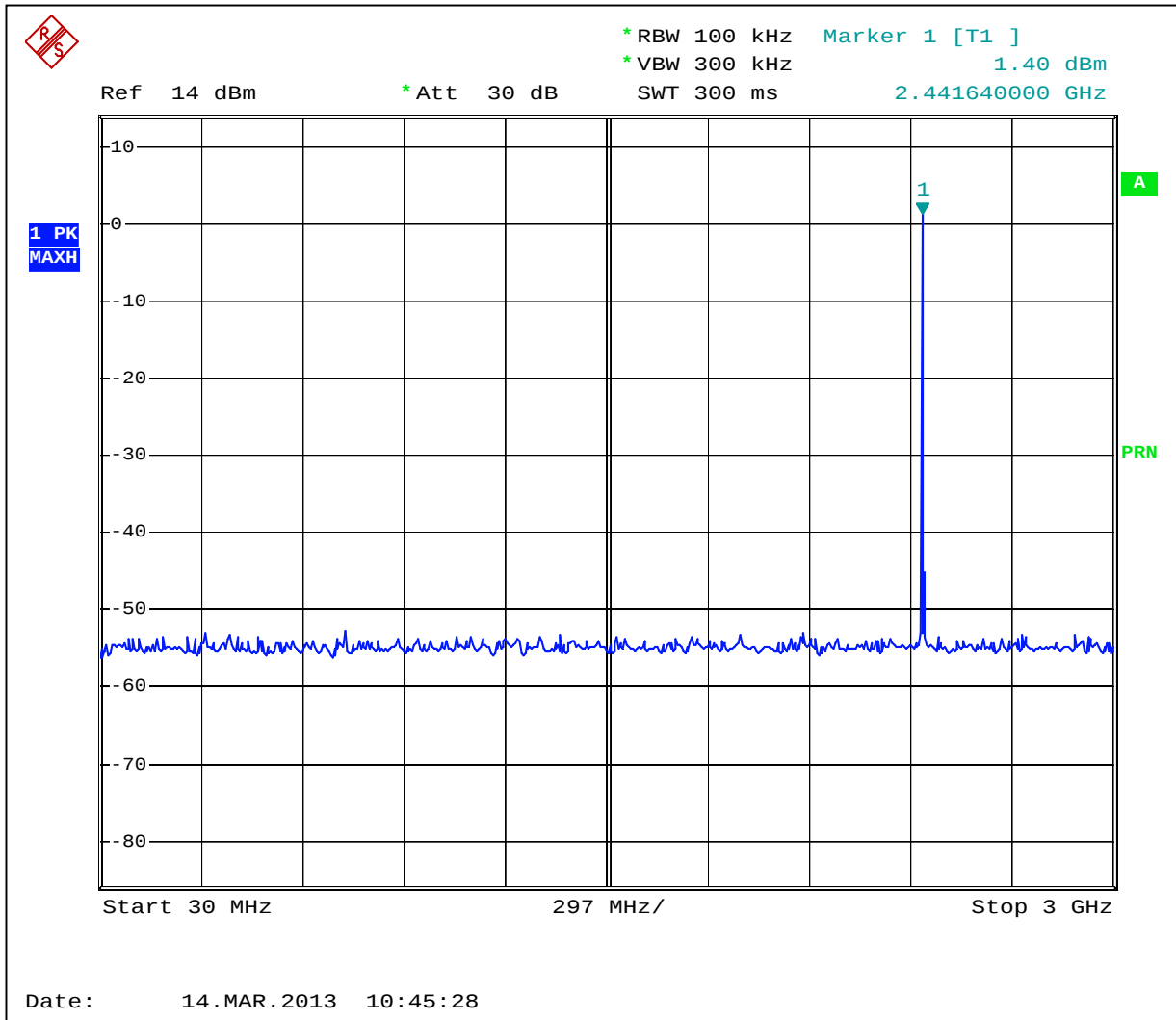
Graph 3.6.6



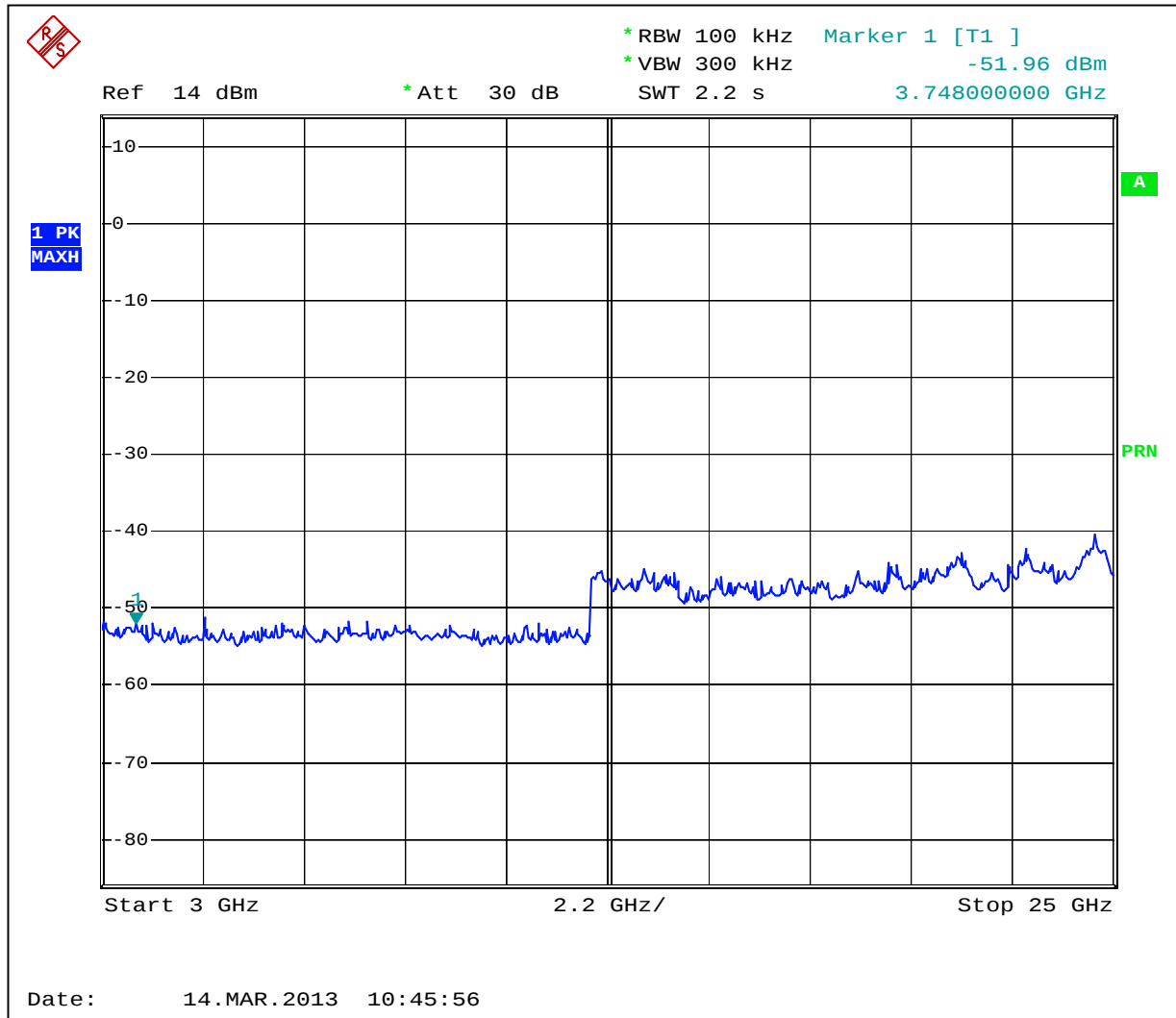
Graph 3.6.7



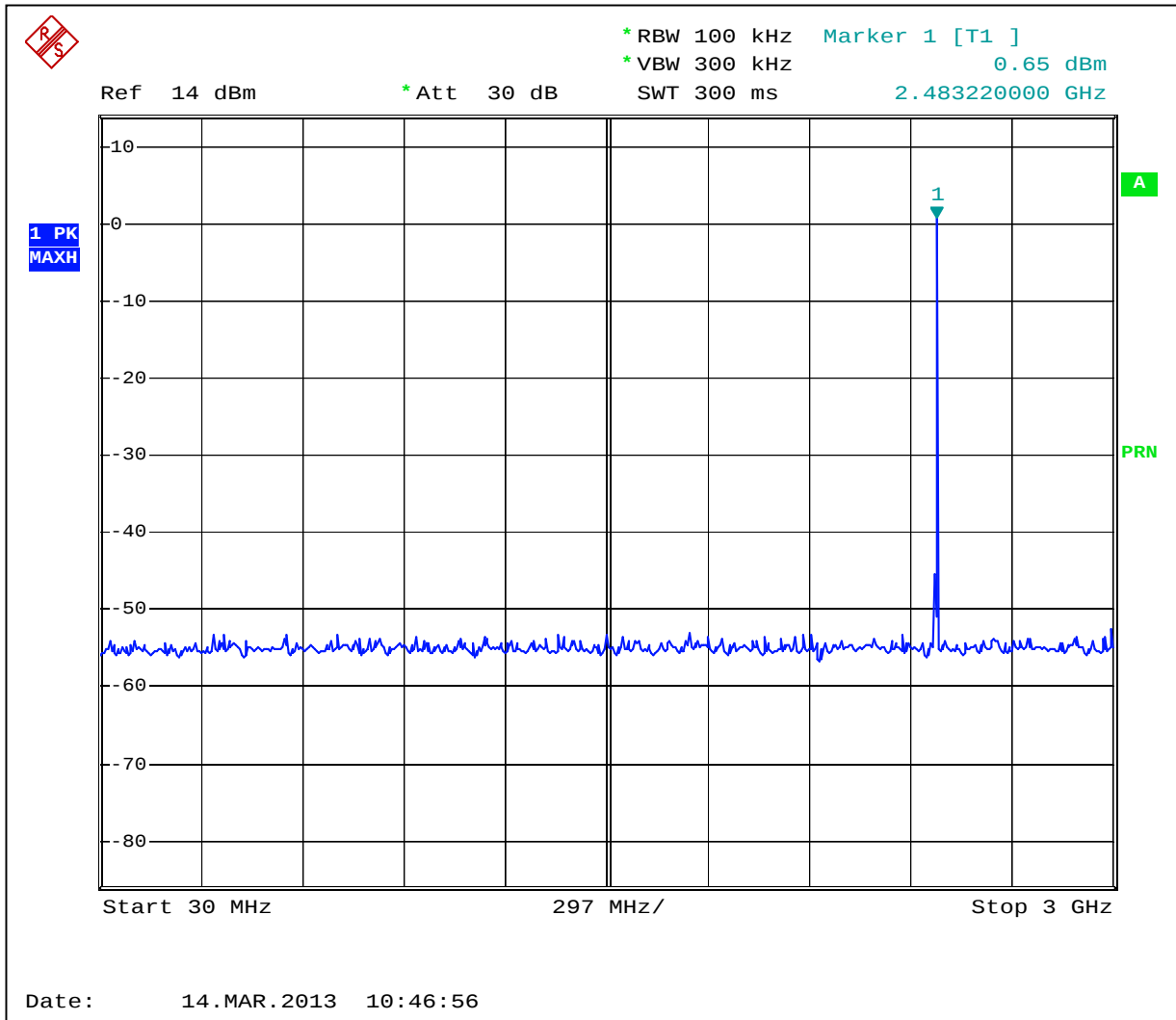
Graph 3.6.8



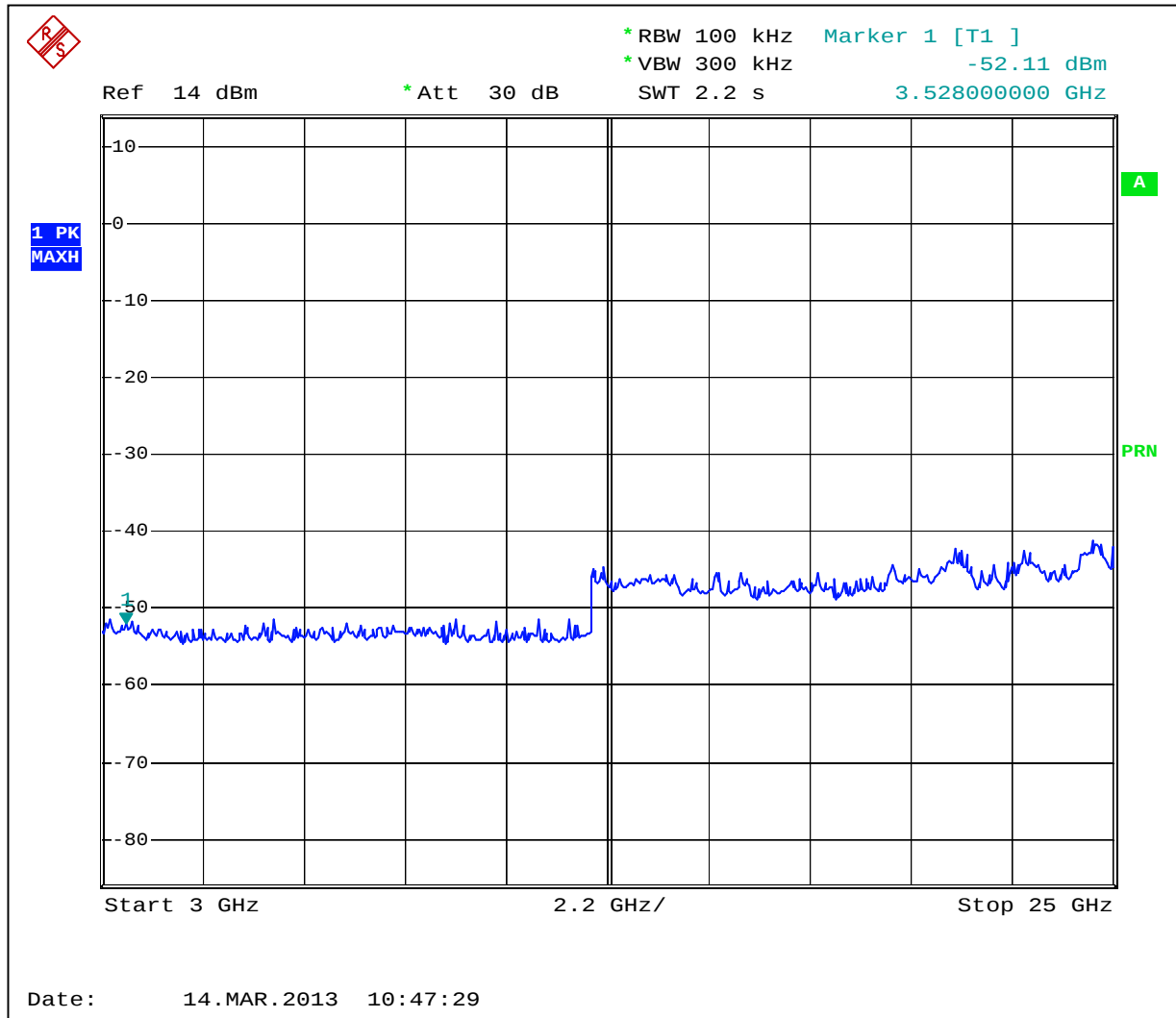
Graph 3.6.9



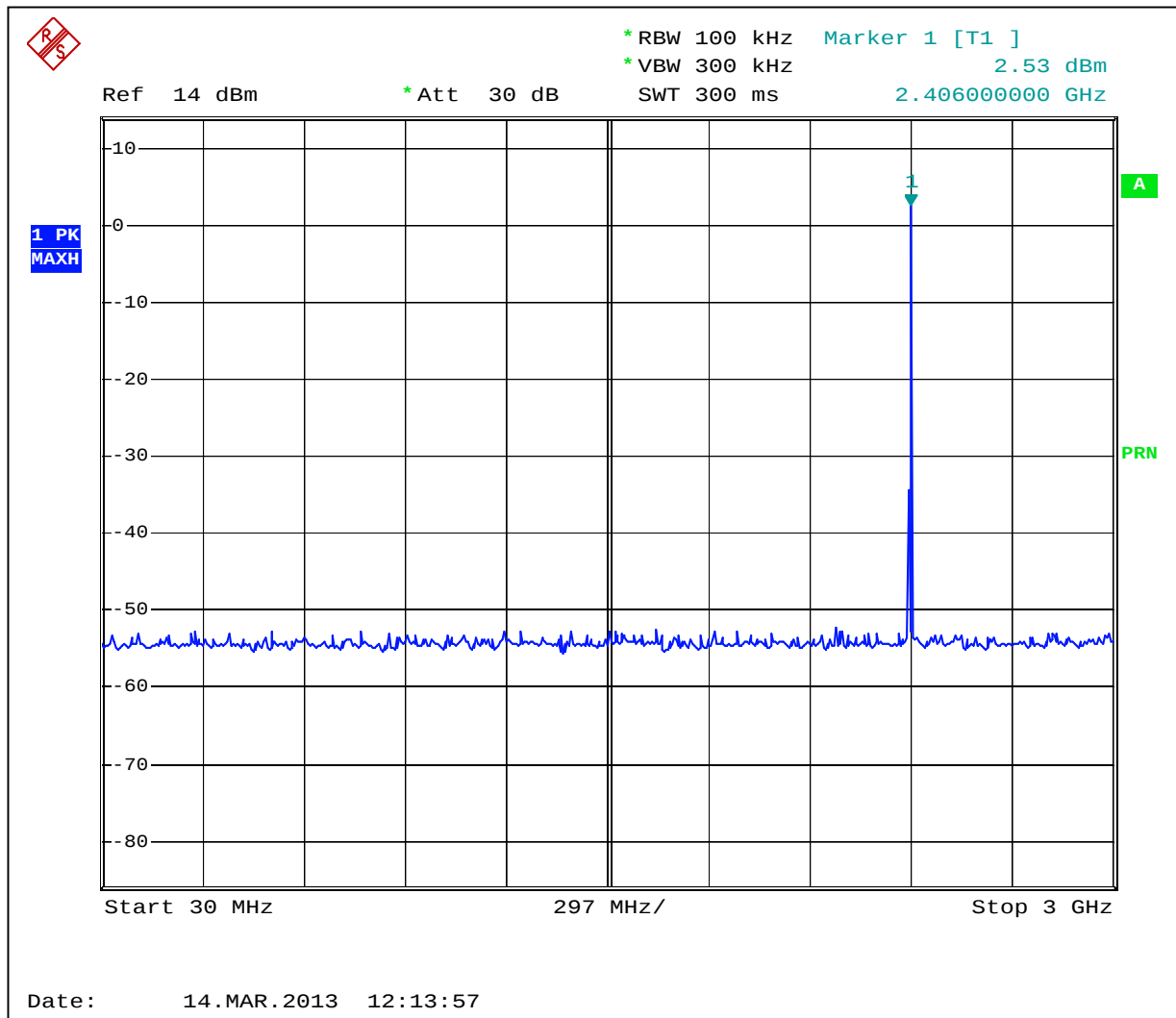
Graph 3.6.10



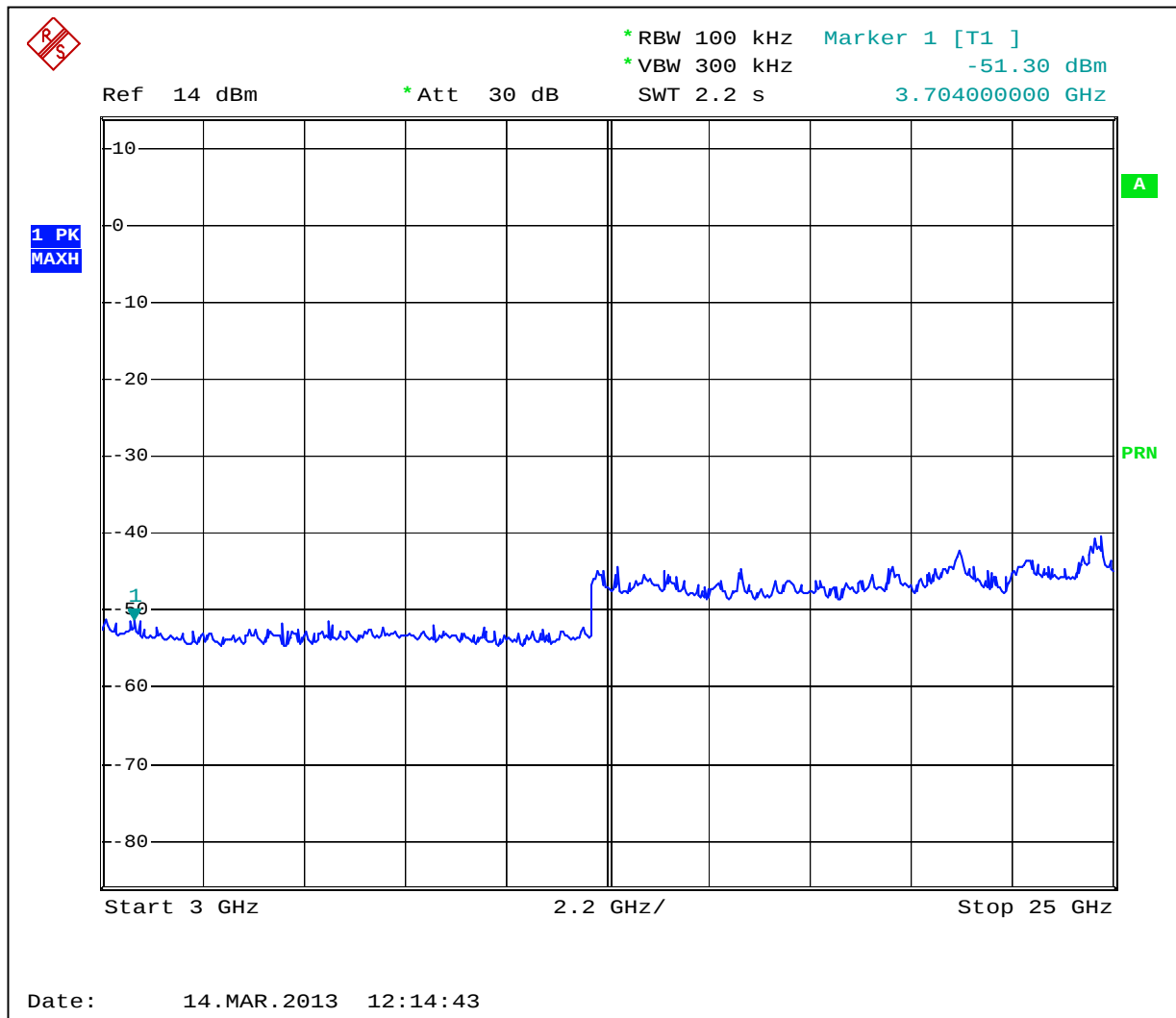
Graph 3.6.11



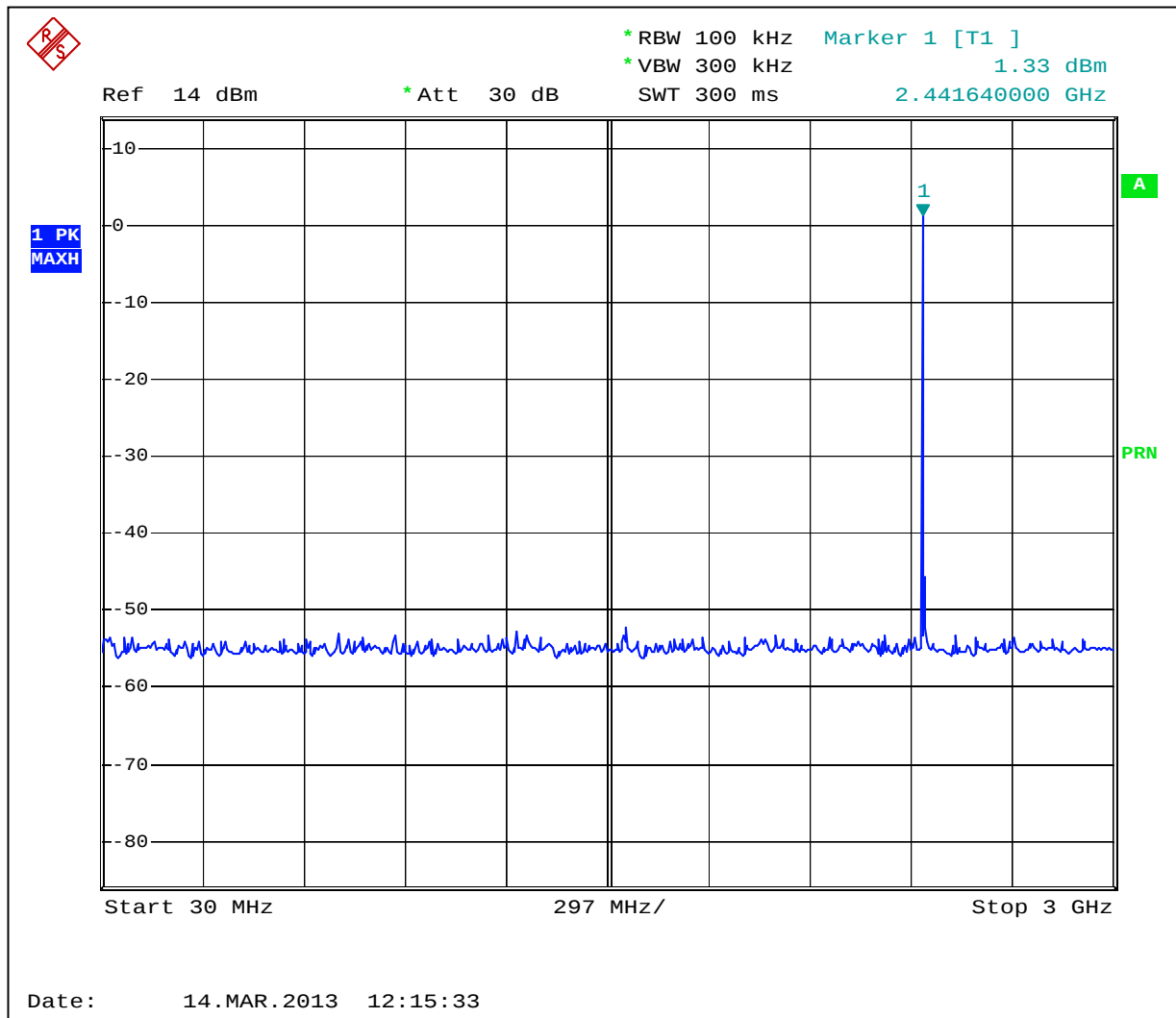
Graph 3.6.12



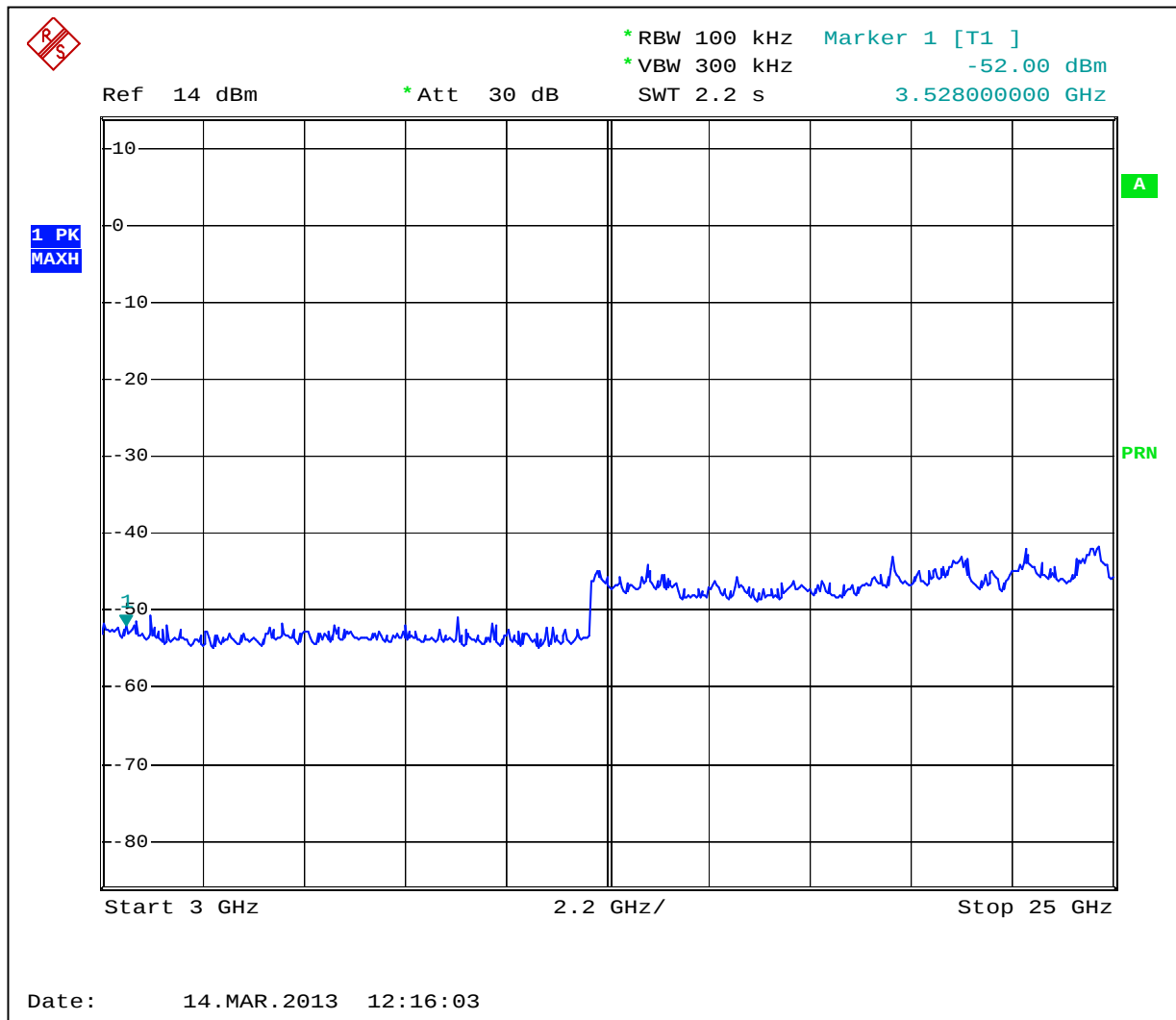
Graph 3.6.13



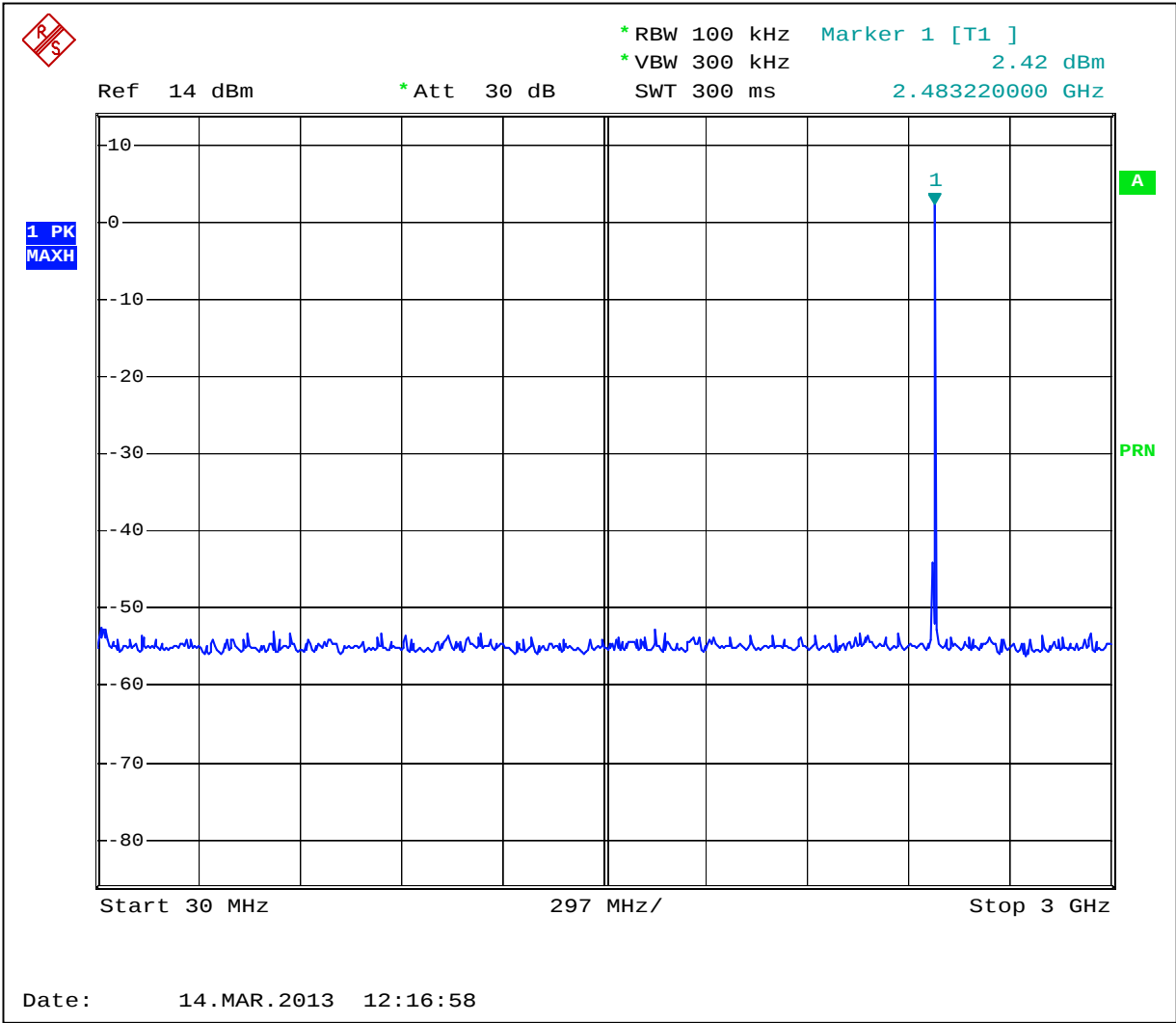
Graph 3.6.14



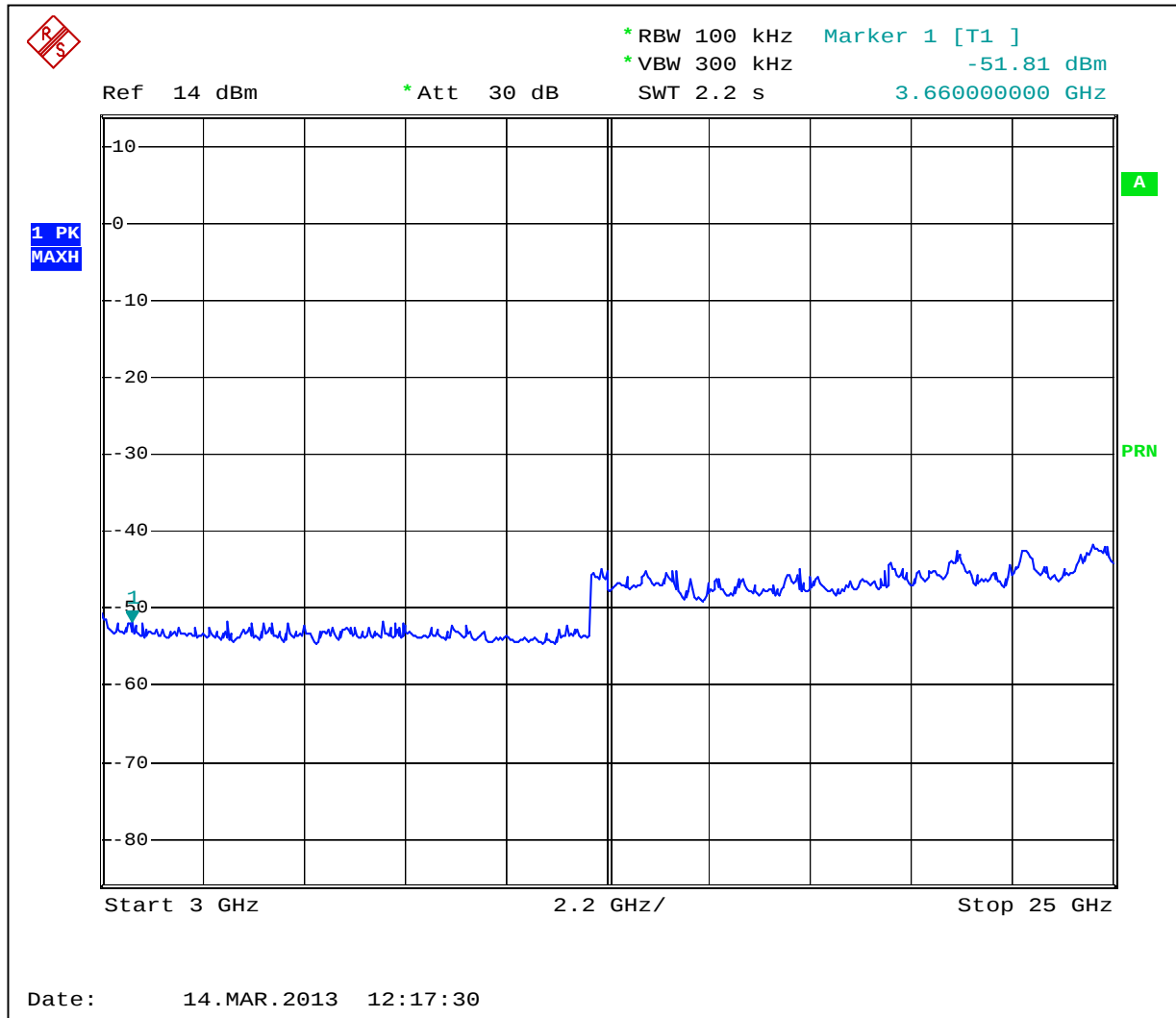
Graph 3.6.15



Graph 3.6.16



Graph 3.6.17



Graph 3.6.18



3.6.1 Antenna conducted band edge compliance

GFSK

Frequency Range:	☐ 902-928MHz ☒ 2400-2483.5MHz ☐ 5725-5850MHz		
	Minimum Measured Attenuation dB	Minimum Allowed Attenuation dB	Margin dB
Low Frequency Channel	59.4	20	-39.4
Upper Frequency Channel	64.7	20	-44.7
Analyzer Settings:	☒ RBW=100KHz		
Minimum Allowed Attenuation:	☒ 20dB ☐ 30dB (for digital systems with conducted power measured using RMS averaging over a time interval)		

EDR2

Frequency Range:	☐ 902-928MHz ☒ 2400-2483.5MHz ☐ 5725-5850MHz		
	Minimum Measured Attenuation dB	Minimum Allowed Attenuation dB	Margin dB
Low Frequency Channel	48.9	20	-28.9
Upper Frequency Channel	54.1	20	-34.1
Analyzer Settings:	☒ RBW=100KHz		
Minimum Allowed Attenuation:	☒ 20dB ☐ 30dB (for digital systems with conducted power measured using RMS averaging over a time interval)		

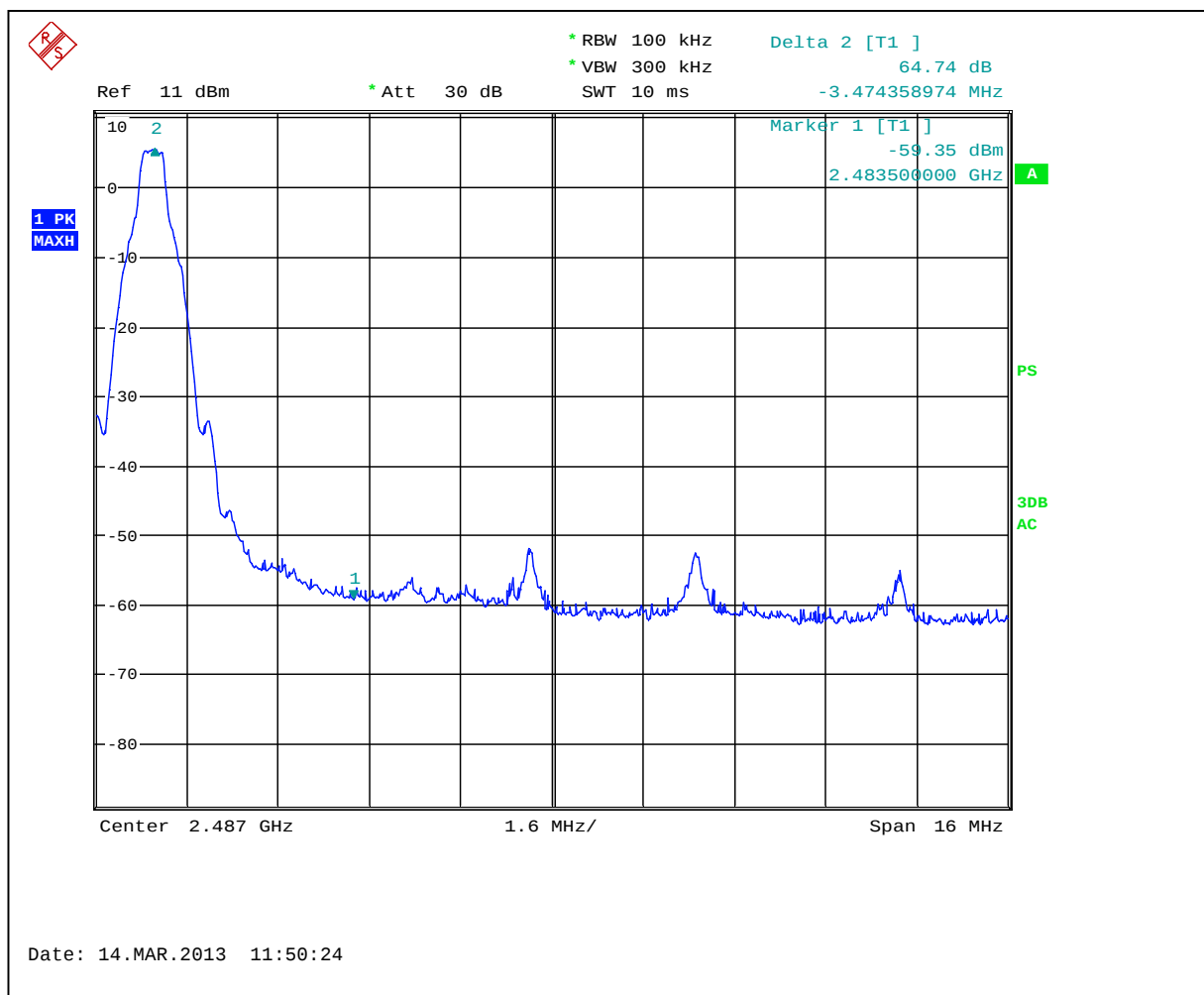
EDR3

Frequency Range:	☐ 902-928MHz ☒ 2400-2483.5MHz ☐ 5725-5850MHz		
	Minimum Measured Attenuation dB	Minimum Allowed Attenuation dB	Margin dB
Low Frequency Channel	48.4	20	-28.4
Upper Frequency Channel	51.9	20	-31.9
Analyzer Settings:	☒ RBW=100KHz		
Minimum Allowed Attenuation:	☒ 20dB ☐ 30dB (for digital systems with conducted power measured using RMS averaging over a time interval)		

Notes:



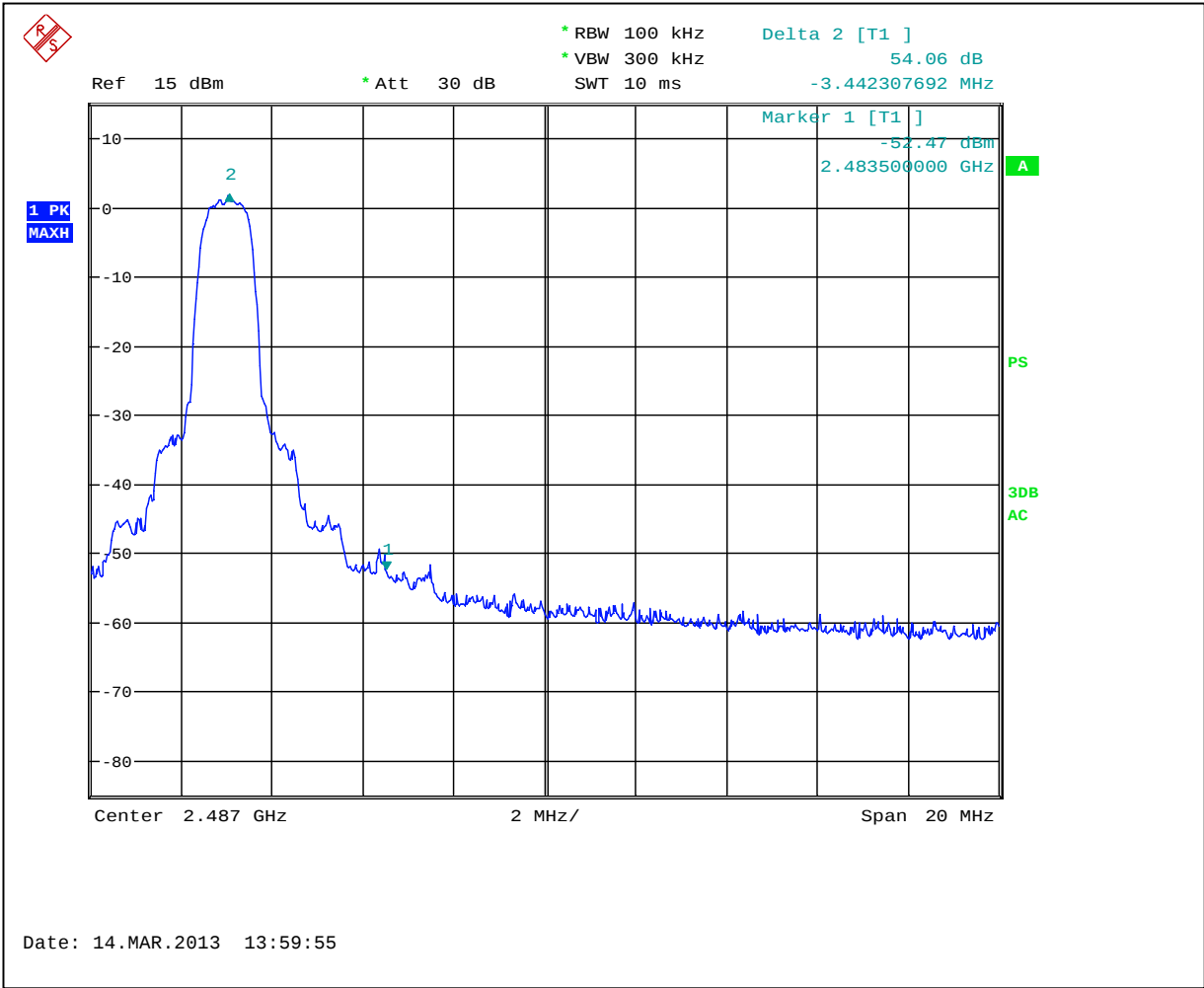
Graph 3.6.19



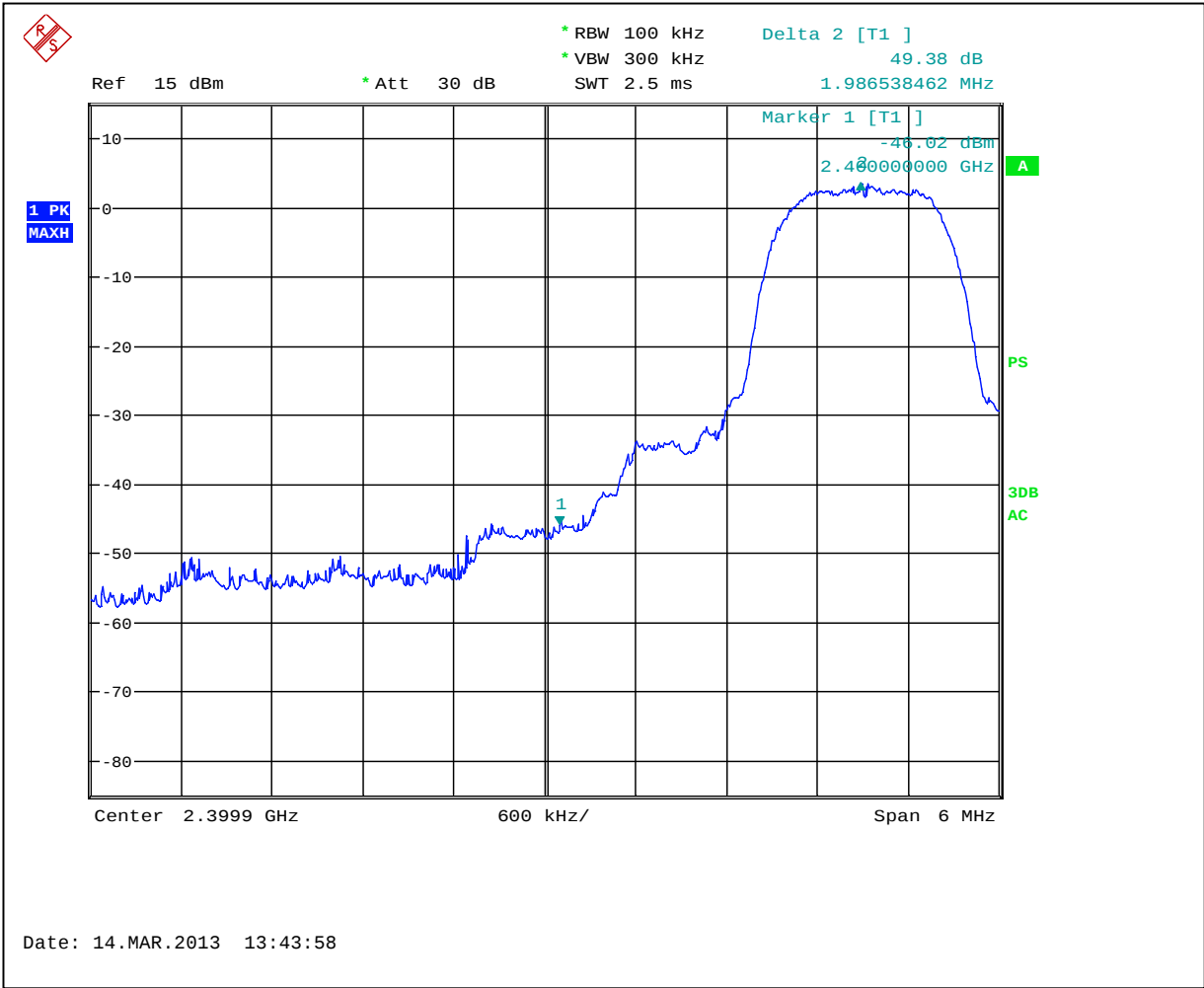
Graph 3.6.20



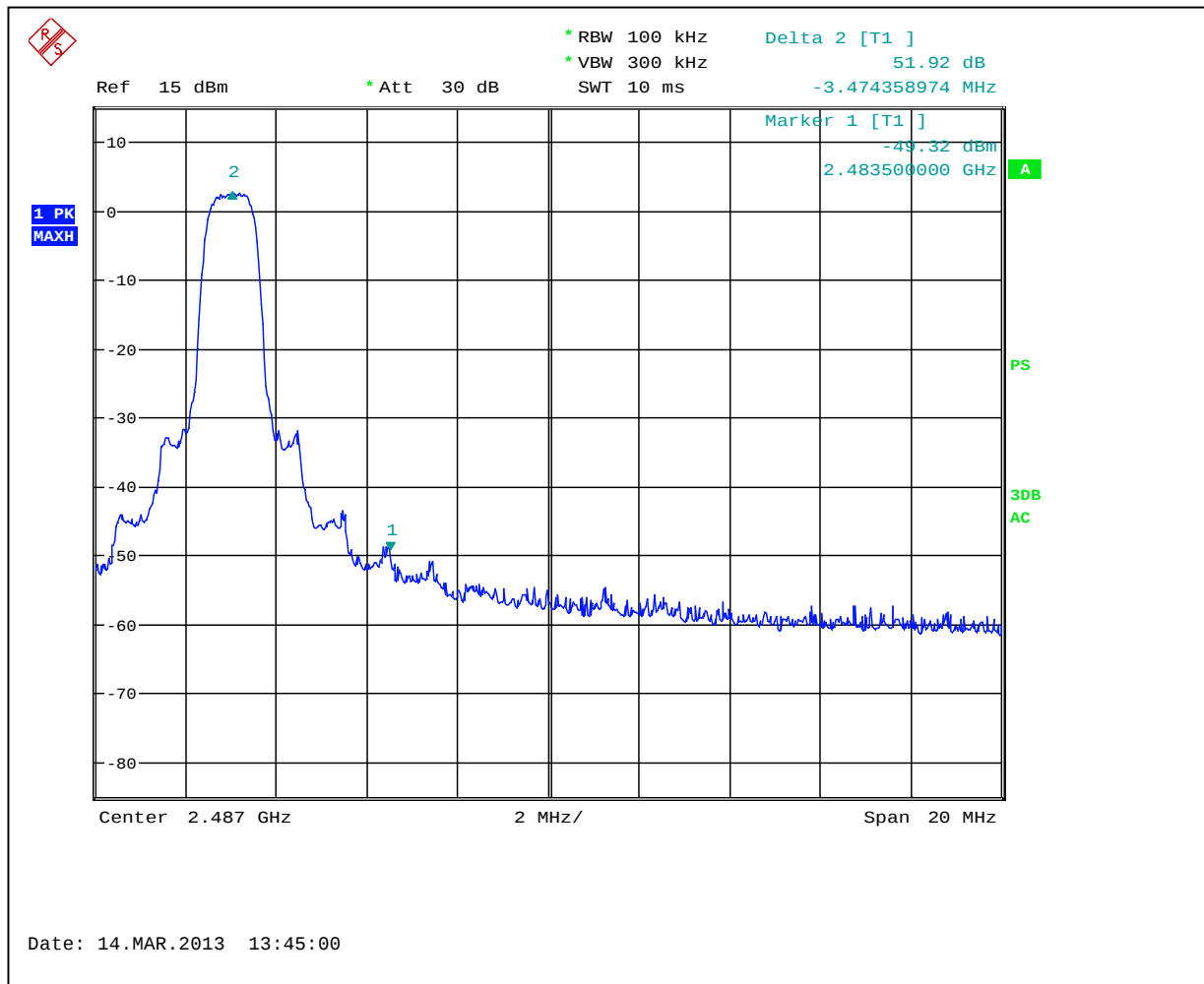
Graph 3.6.21



Graph 3.6.22



Graph 3.6.23



Graph 3.6.24



3.7 Radiated spurious emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test distance: ☐ 10 meters ☒ 3 meters

Test result: **Pass**

Max. Margin: 10.7dB below the limits

Date:	March 15-April 25, 2013	Result: Pass
Tested by:	Uri Spector	
Standard:	FCC part 15.247(d)	
Test Point:	Enclosure	
Operation mode:	See page 5 (GFSK mode)	
Note:	Frequencies not related with transmitter portion and fundamental frequencies were excluded from the table	

Table 3.7.1

Frequency MHz	Antenna Polarity	Peak Reading dBμV	Total C.F. dB1/m	Pre-Amp. Gain (dB)	Total at 3m dBμV/m	Limit dBμV/m	Margin dB
Middle channel							
4.8829 GHz	H	43.5	37.2	39.1	41.7	54.0	-12.3
High channel							
4.9585 GHz	H	44.4	37.3	39.0	42.7	54.0	-11.3



Date:	March 15-April 25, 2013	Result: Pass
Tested by:	Uri Spector	
Standard:	FCC part 15.247(d)	
Test Point:	Enclosure	
Operation mode:	See page 5 (EDR2 mode)	
Note:	Frequencies not related with transmitter portion and fundamental frequencies were excluded from the table	

Table 3.7.2

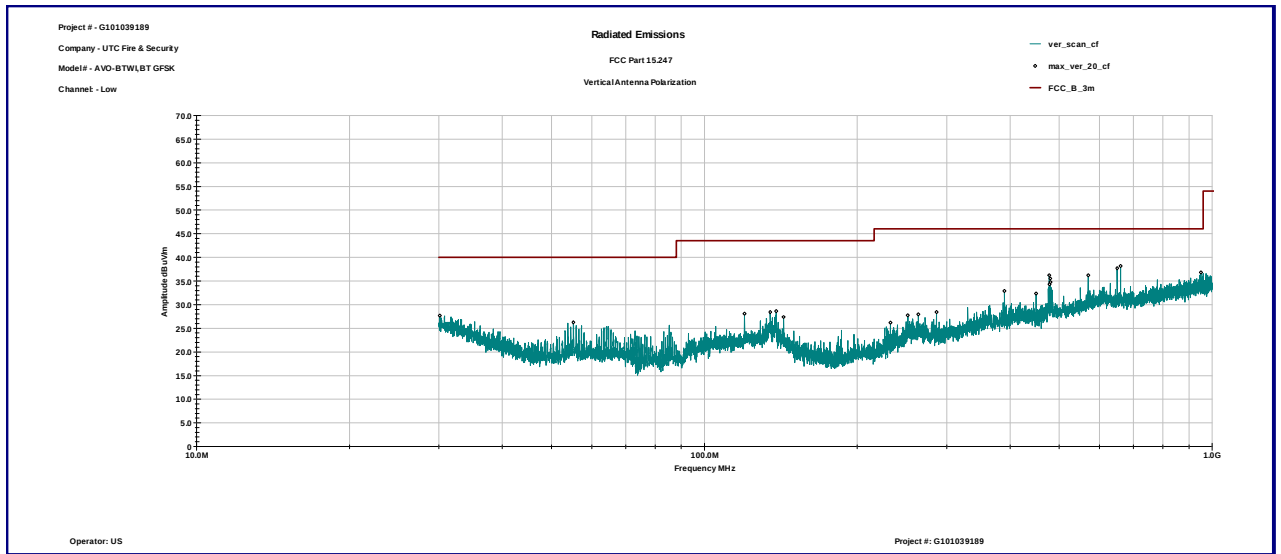
Frequency MHz	Antenna Polarity	Peak Reading dBμV	Total C.F. dB1/m	Pre-Amp. Gain (dB)	Total at 3m dBμV/m	Limit dBμV/m	Margin dB
Middle channel							
4.8858 GHz	H	43.5	37.2	39.1	41.7	54.0	-12.3
High channel channel							
4.9585 GHz	H	44.1	37.3	39.0	42.4	54.0	-11.6



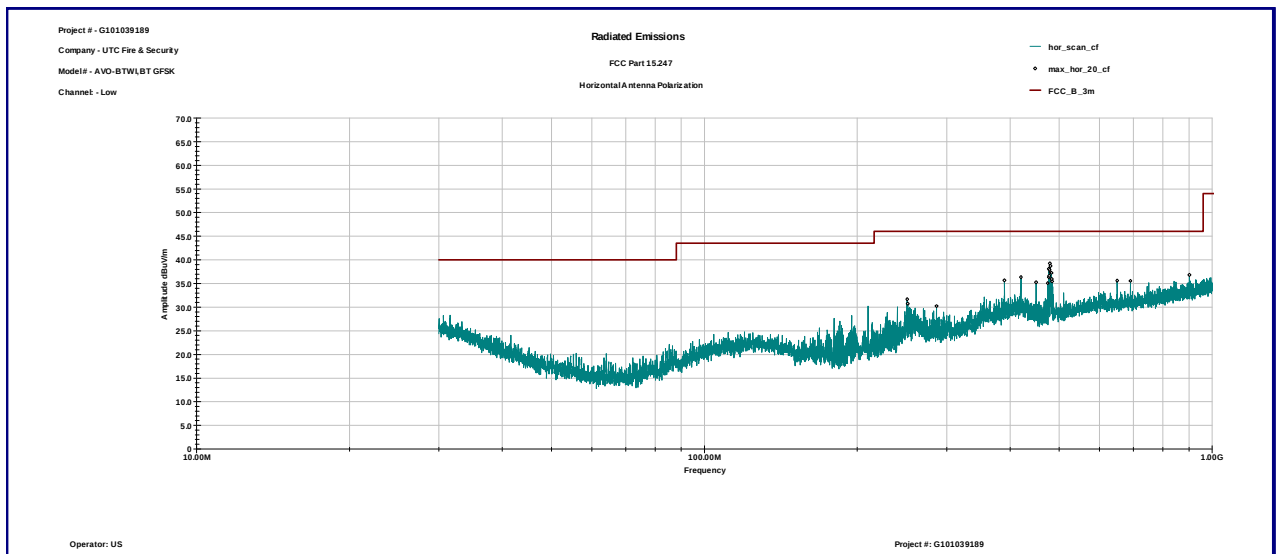
Date:	March 15-April 25, 2013	Result: Pass
Tested by:	Uri Spector	
Standard:	FCC part 15.247(d)	
Test Point:	Enclosure	
Operation mode:	See page 5 (EDR3 mode)	
Note:	Frequencies not related with transmitter portion and fundamental frequencies were excluded from the table	

Table 3.7.3

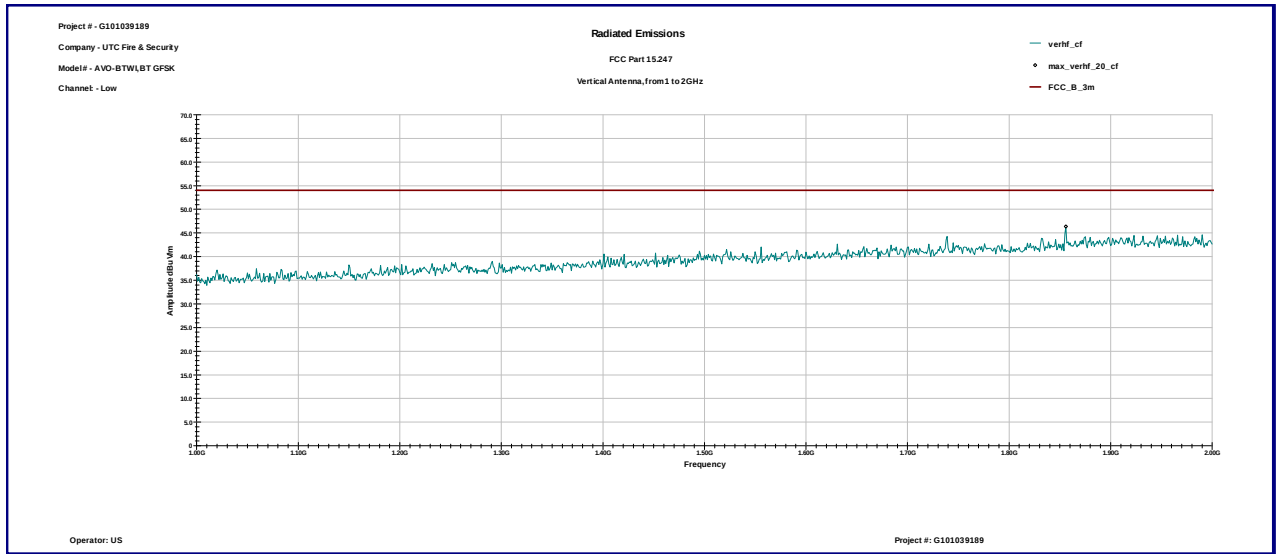
Frequency MHz	Antenna Polarity	Peak Reading dBμV	Total C.F. dB1/m	Pre-Amp. Gain (dB)	Total at 3m dBμV/m	Limit dBμV/m	Margin dB
High channel channel							
4.96 GHz	H	45.0	37.3	39.0	43.3	54.0	-10.7



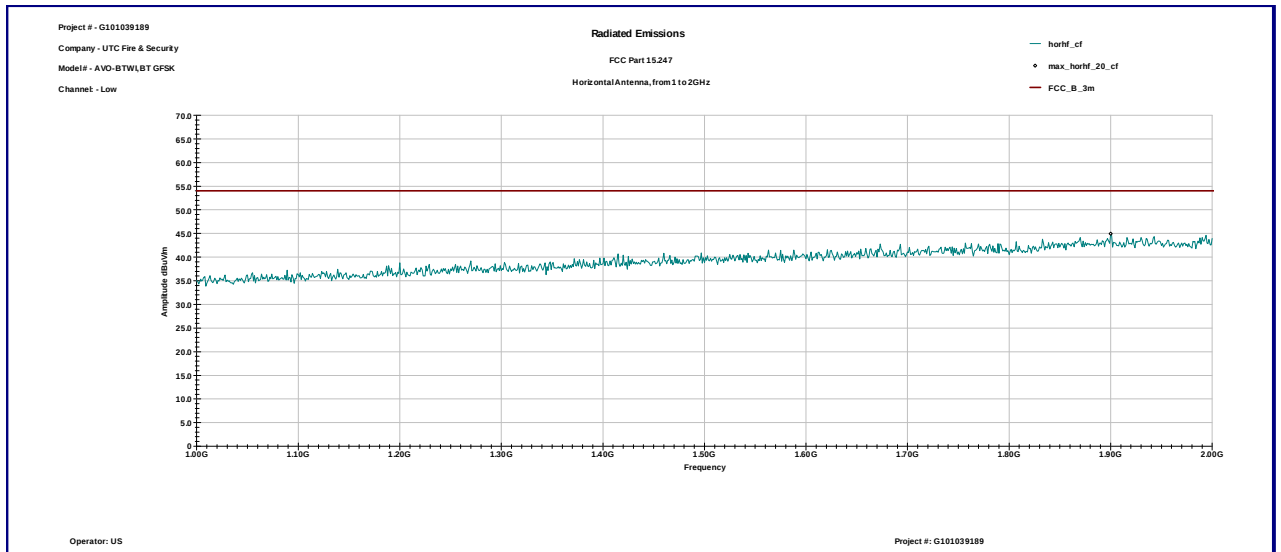
Graph 3.7.1



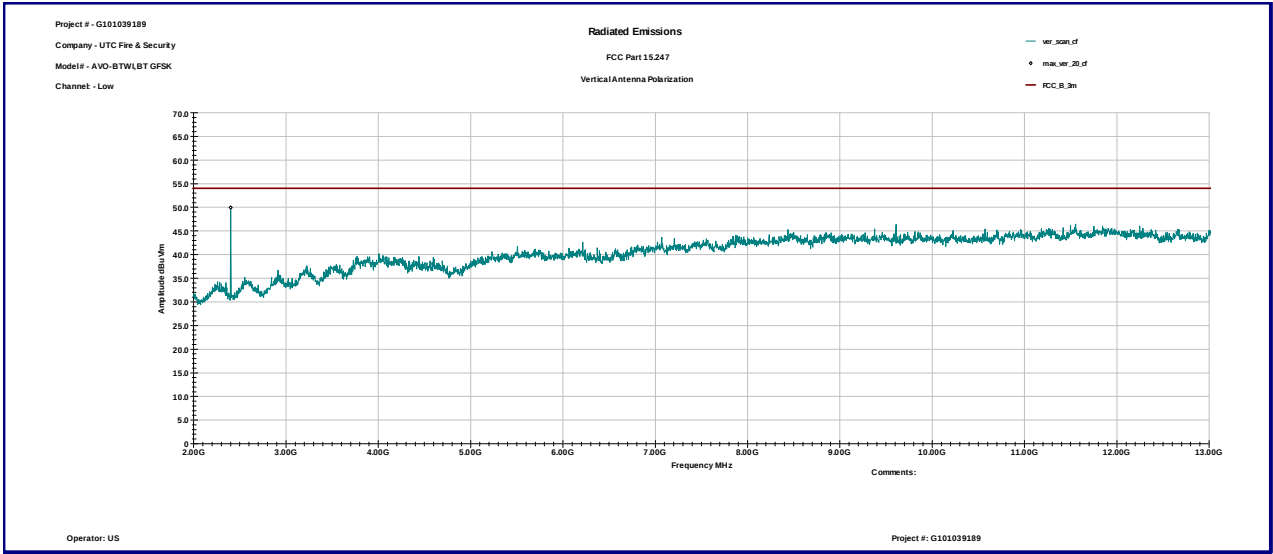
Graph 3.7.2



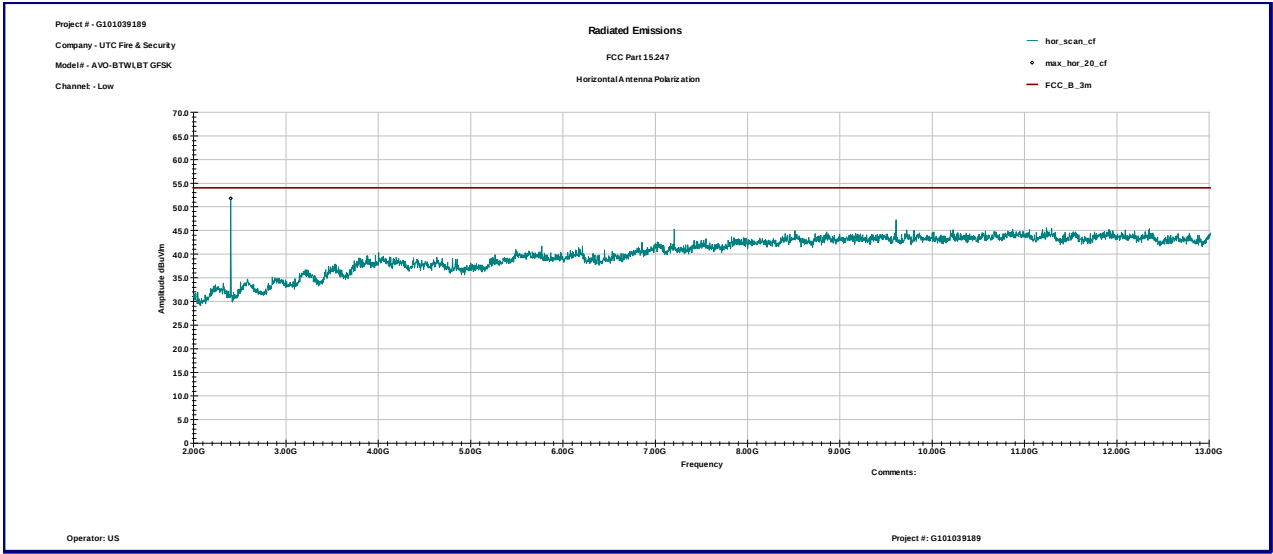
Graph 3.7.3



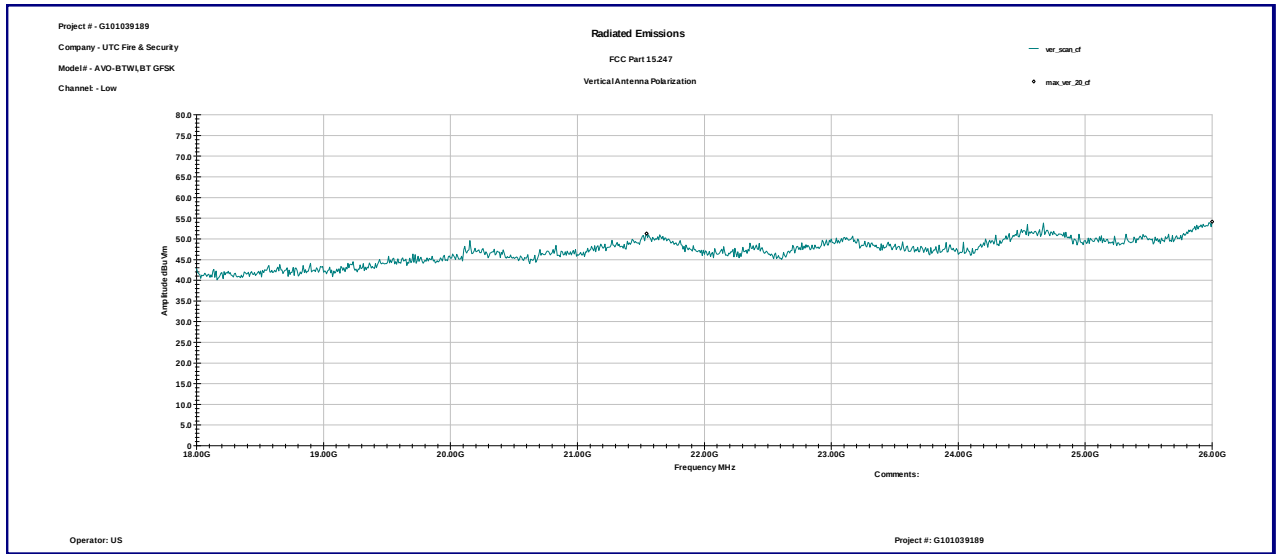
Graph 3.7.4



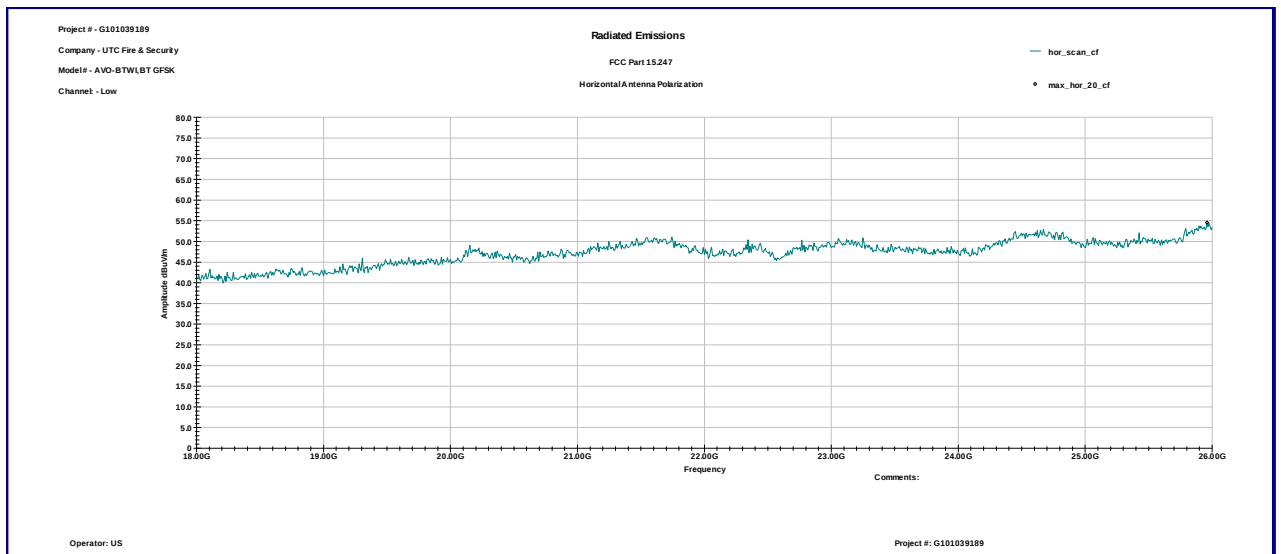
Graph 3.7.5



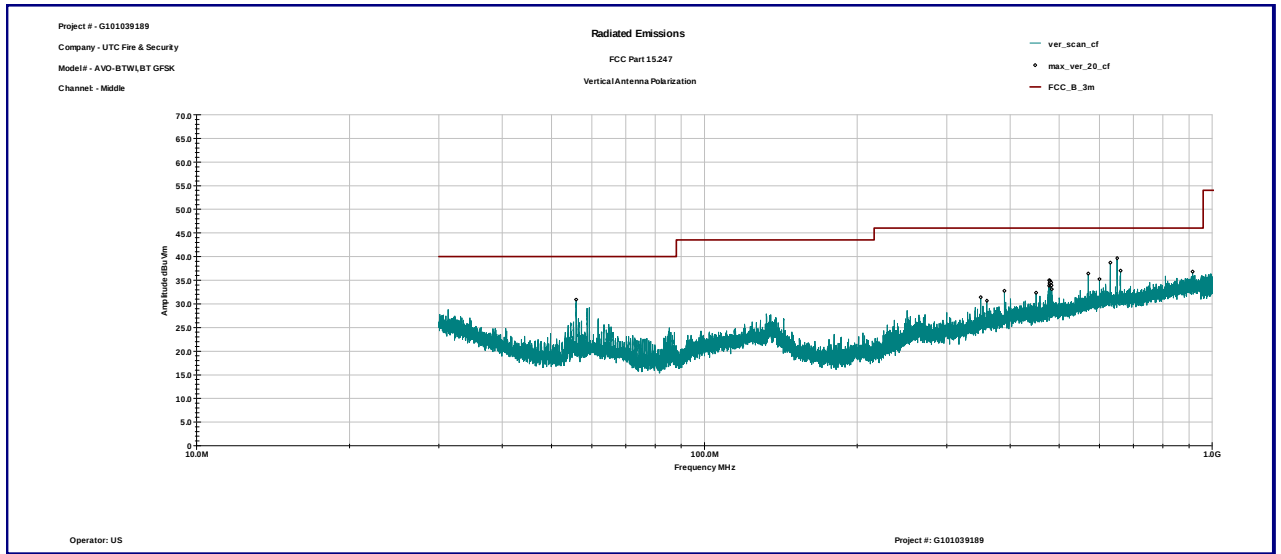
Graph 3.7.6



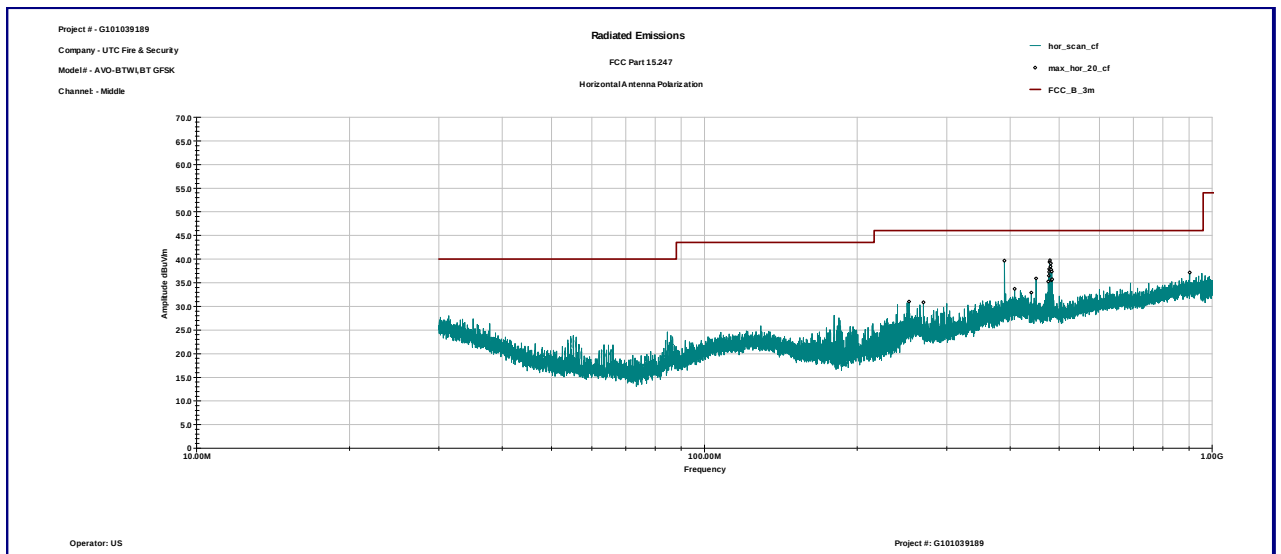
Graph 3.7.7



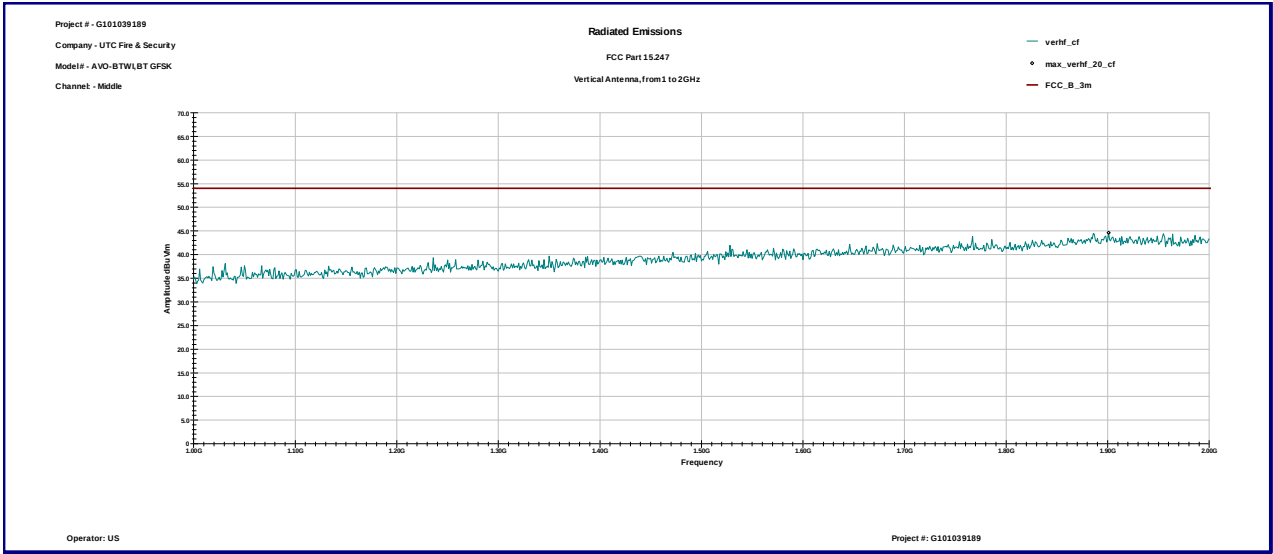
Graph 3.7.8



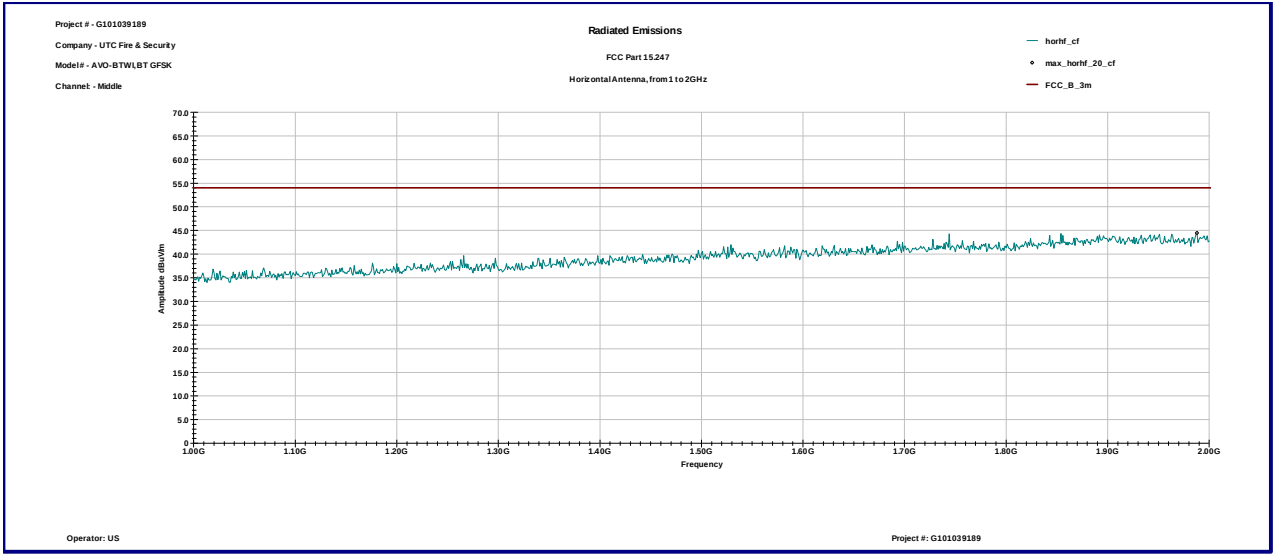
Graph 3.7.9



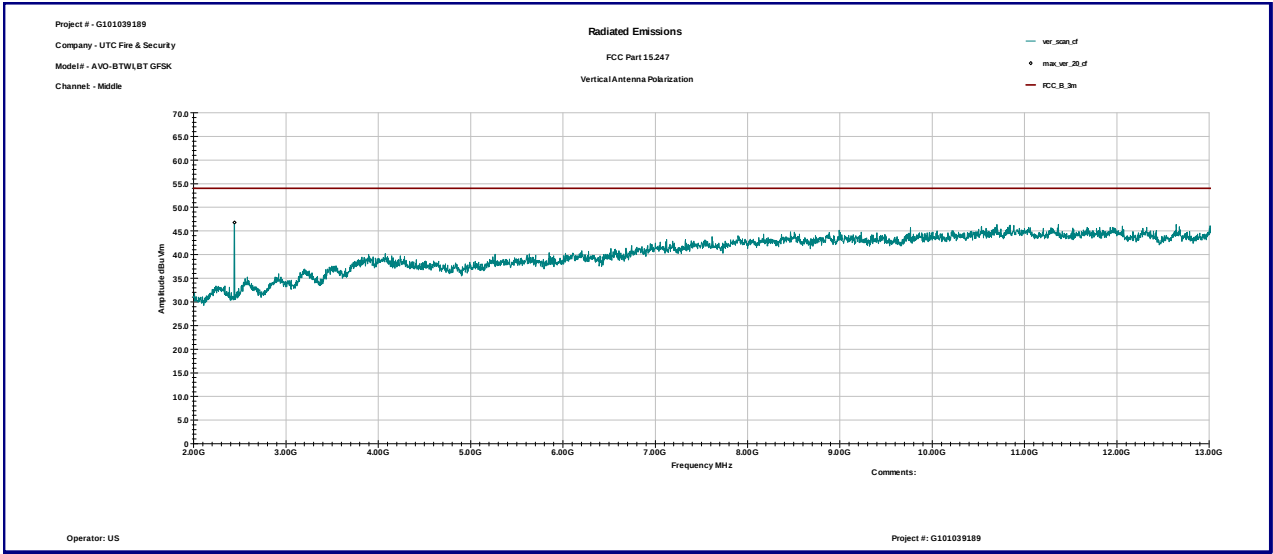
Graph 3.7.10



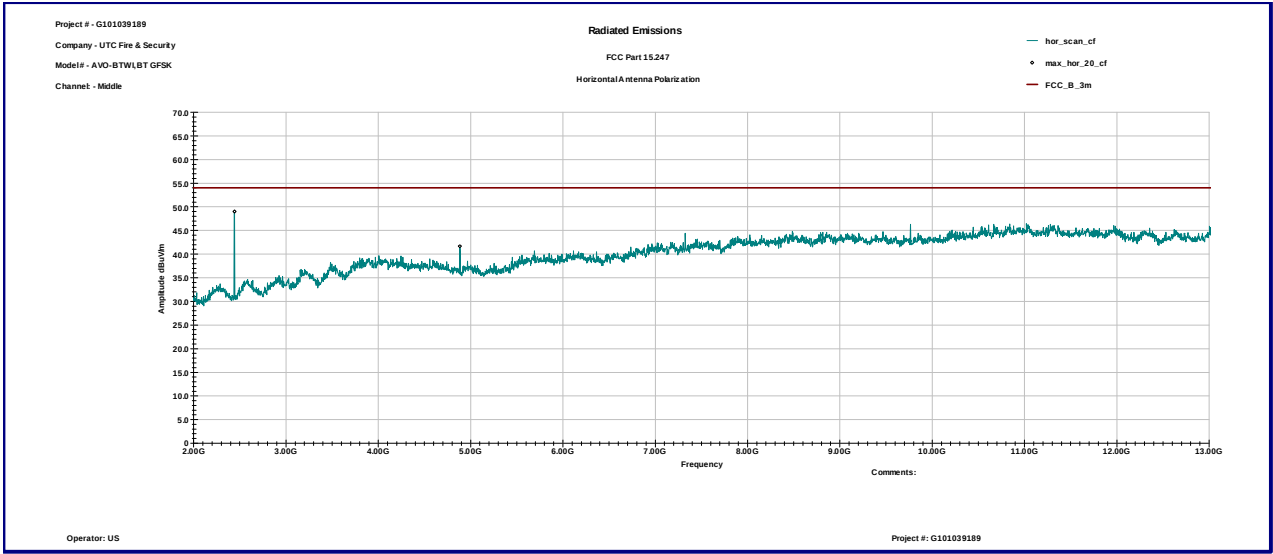
Graph 3.7.11



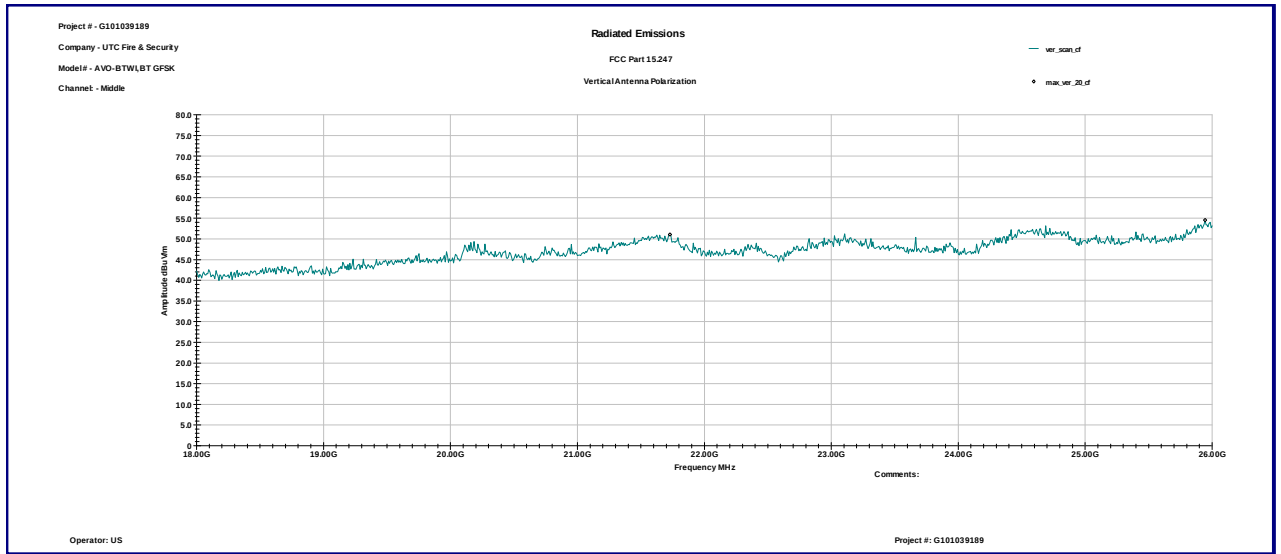
Graph 3.7.12



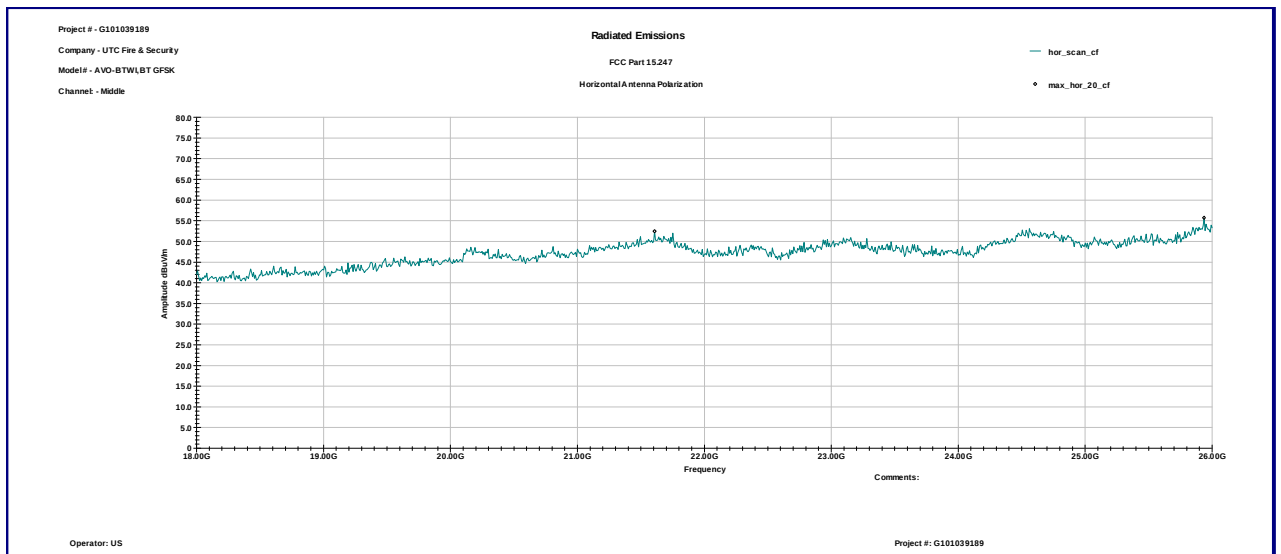
Graph 3.7.13



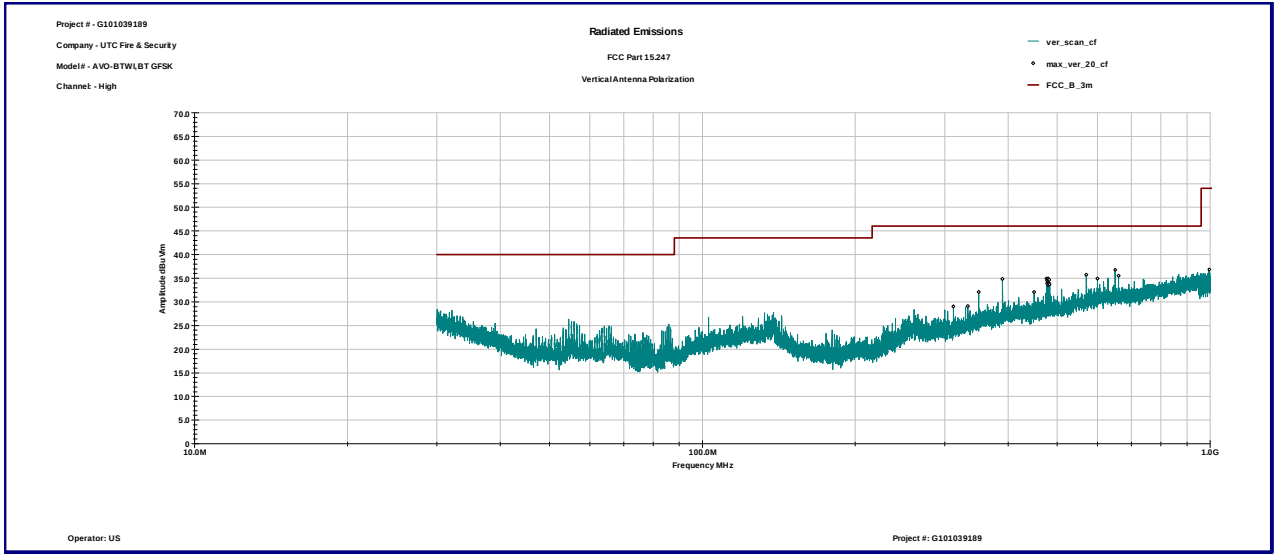
Graph 3.7.14



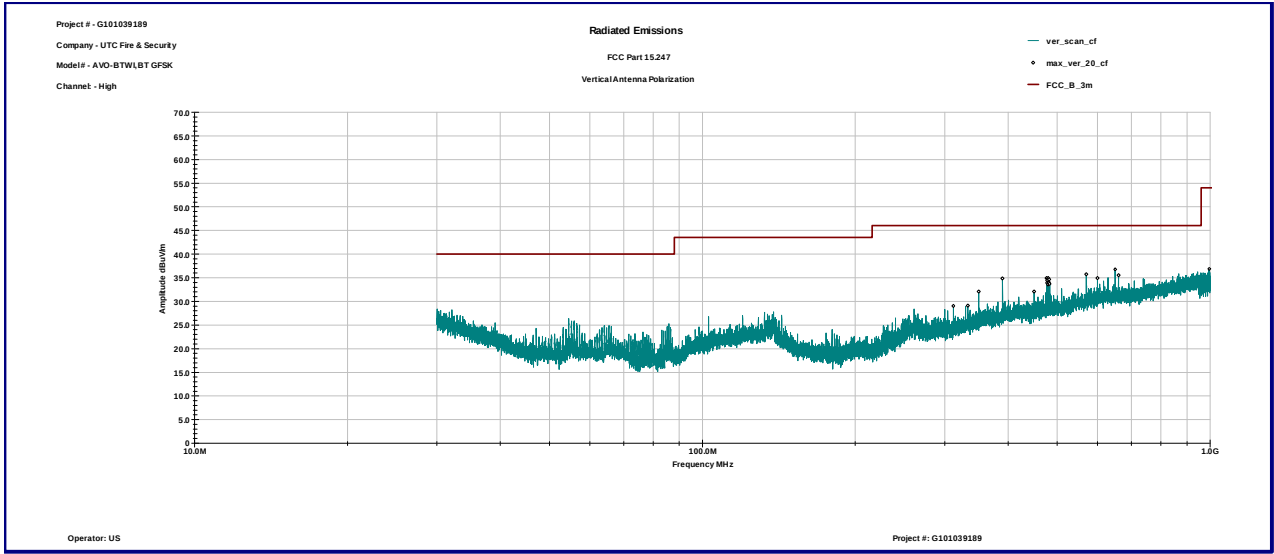
Graph 3.7.15



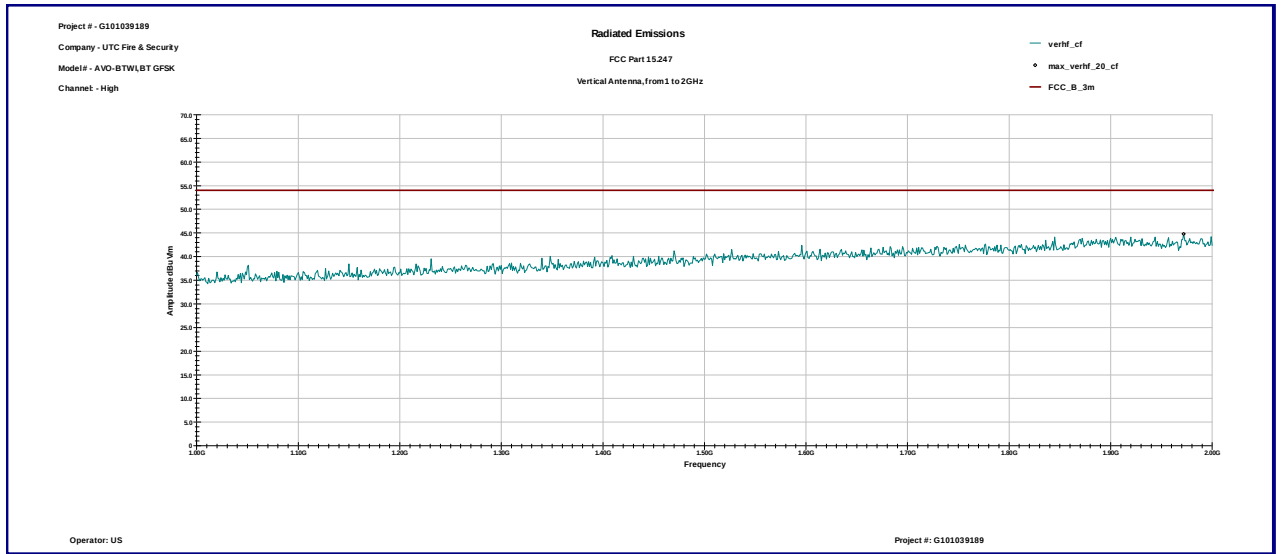
Graph 3.7.16



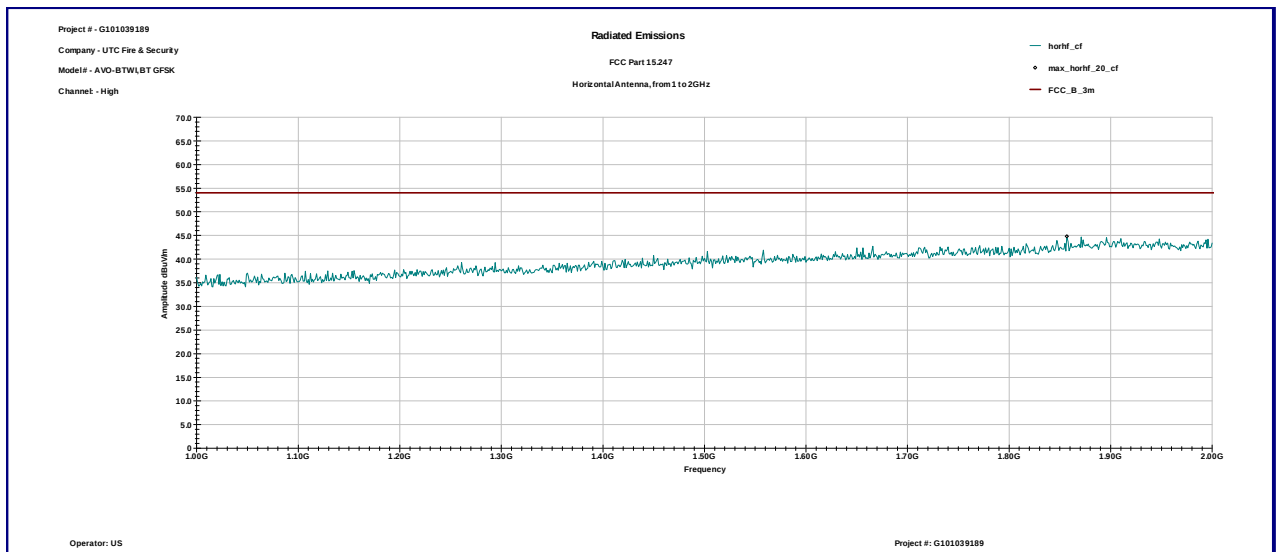
Graph 3.7.17



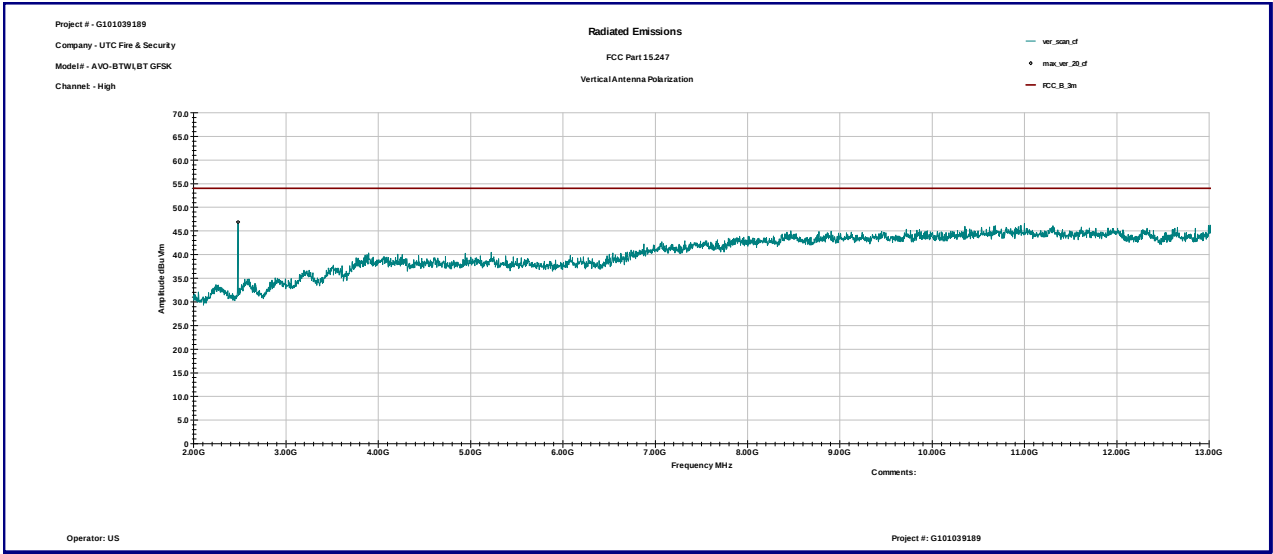
Graph 3.7.18



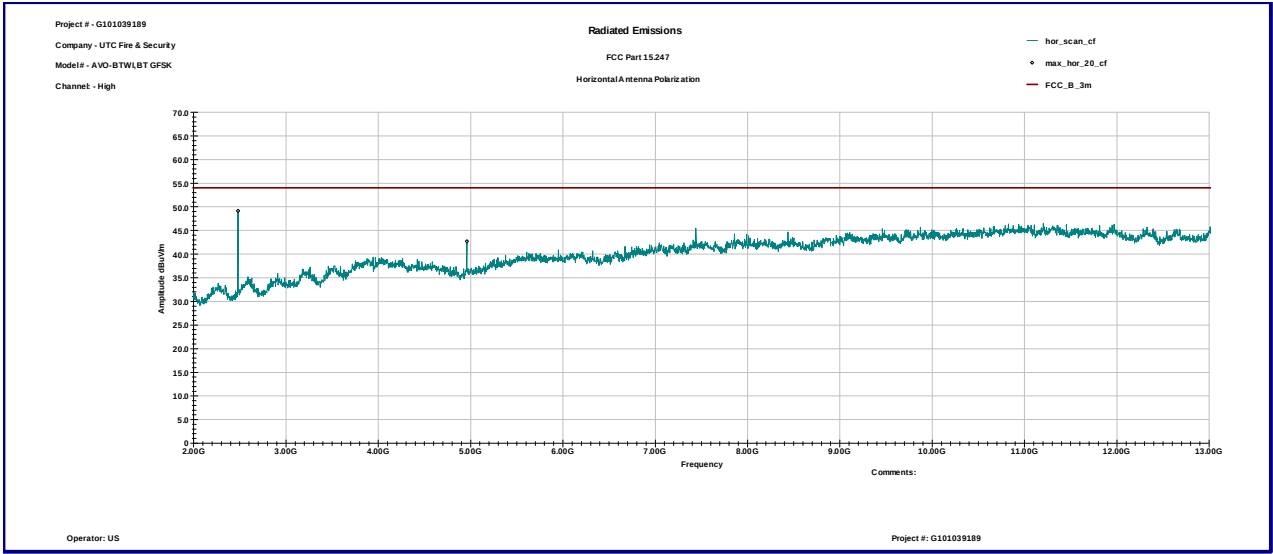
Graph 3.7.19



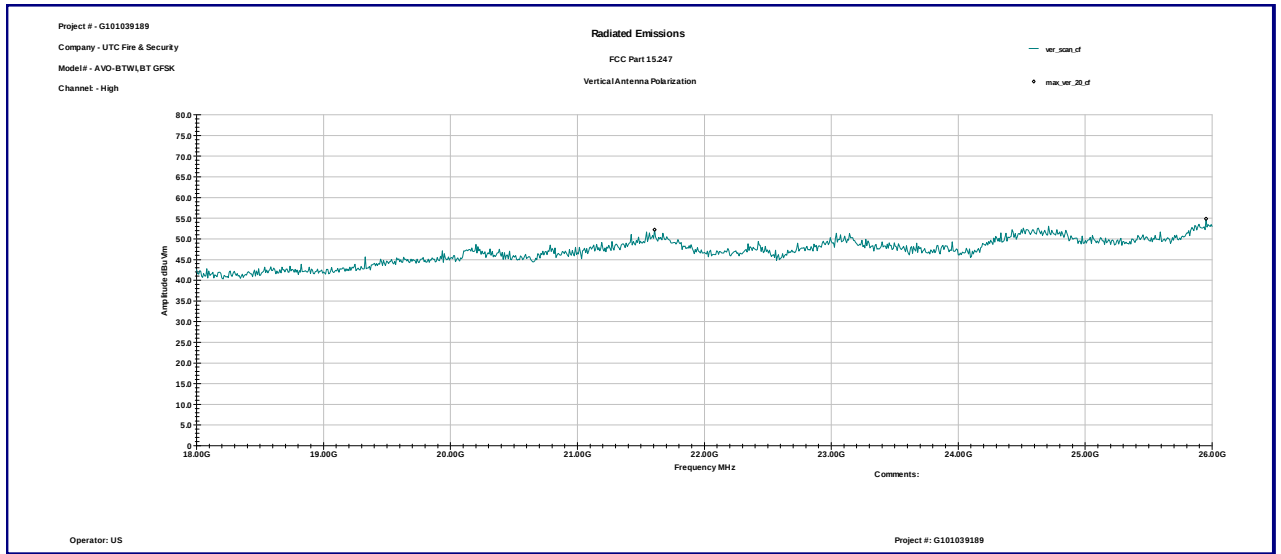
Graph 3.7.20



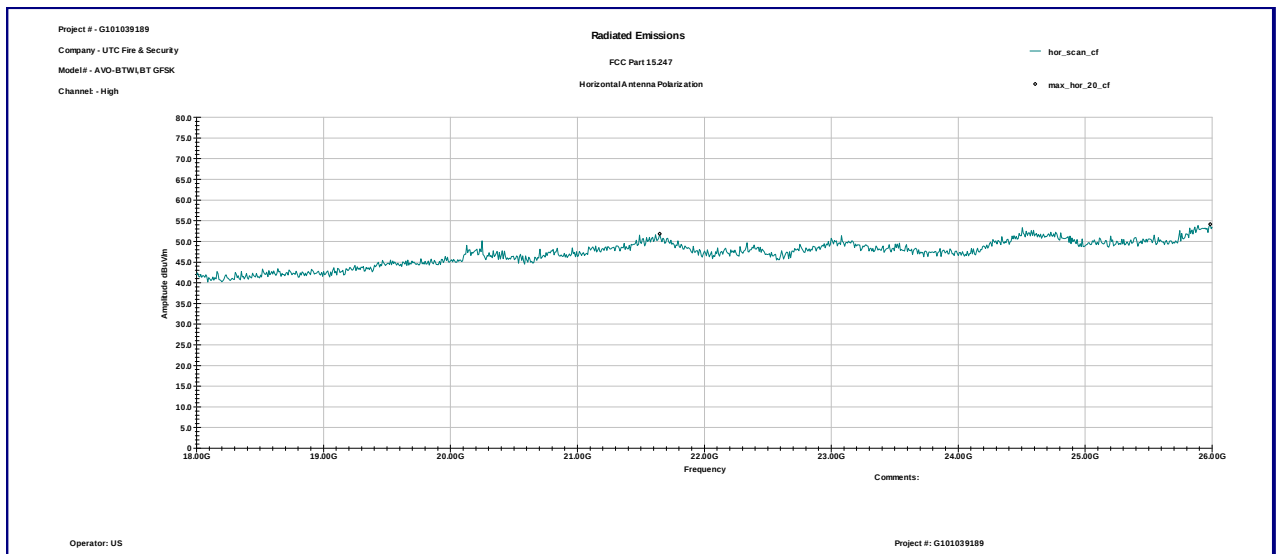
Graph 3.7.21



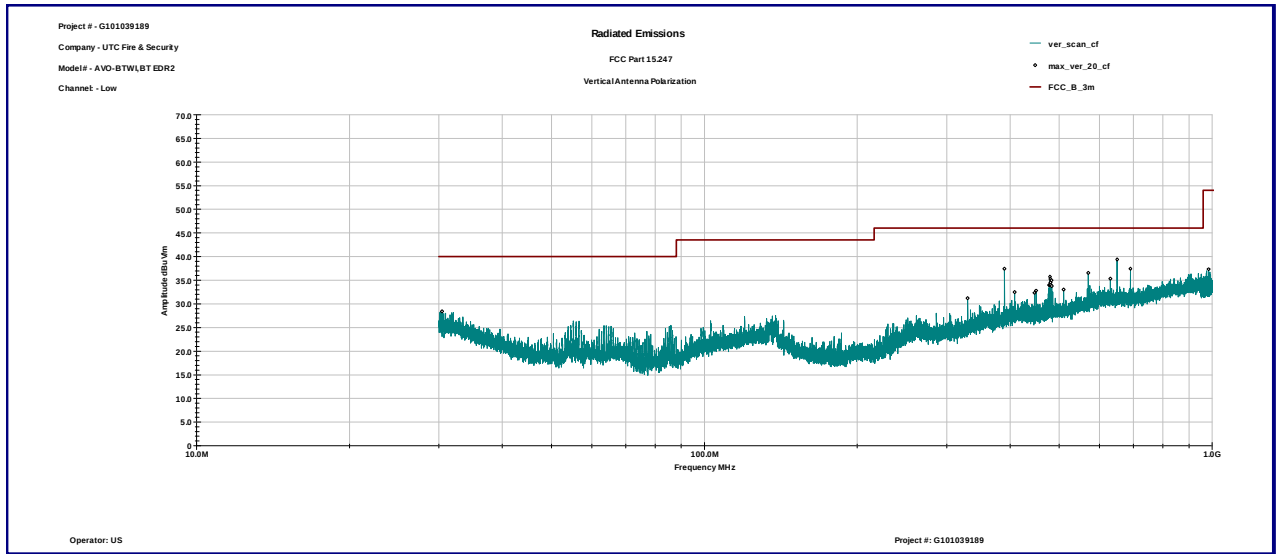
Graph 3.7.22



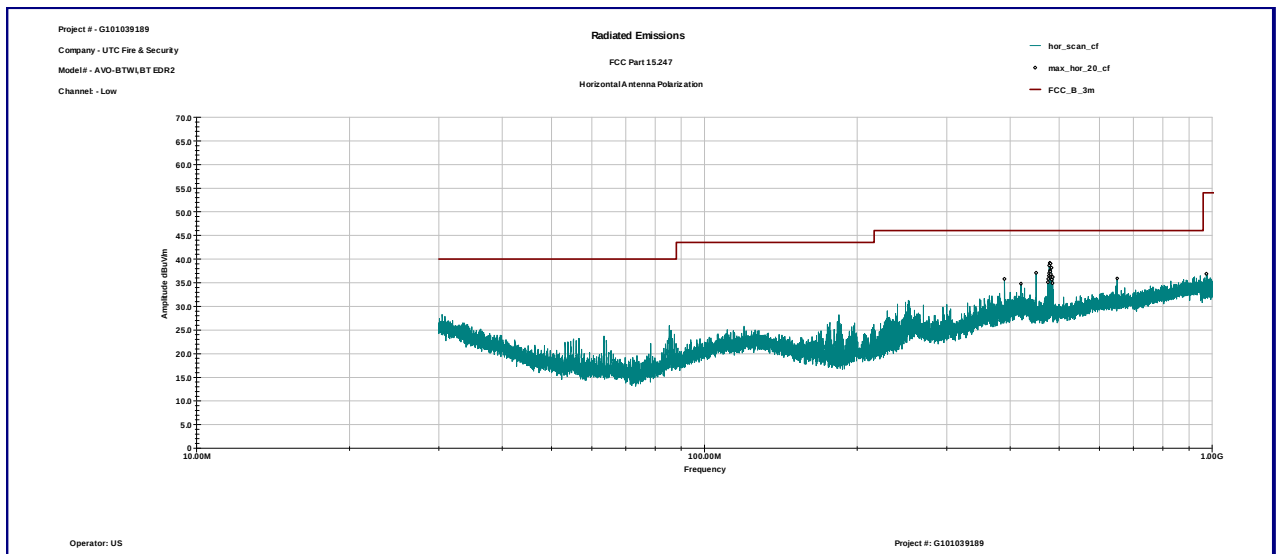
Graph 3.7.23



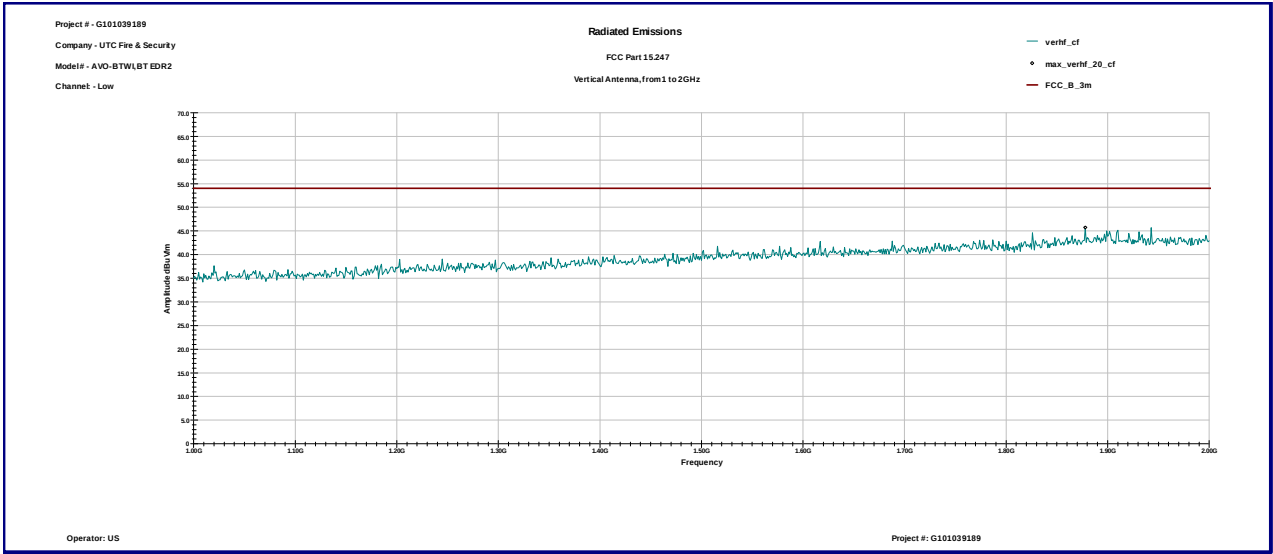
Graph 3.7.24



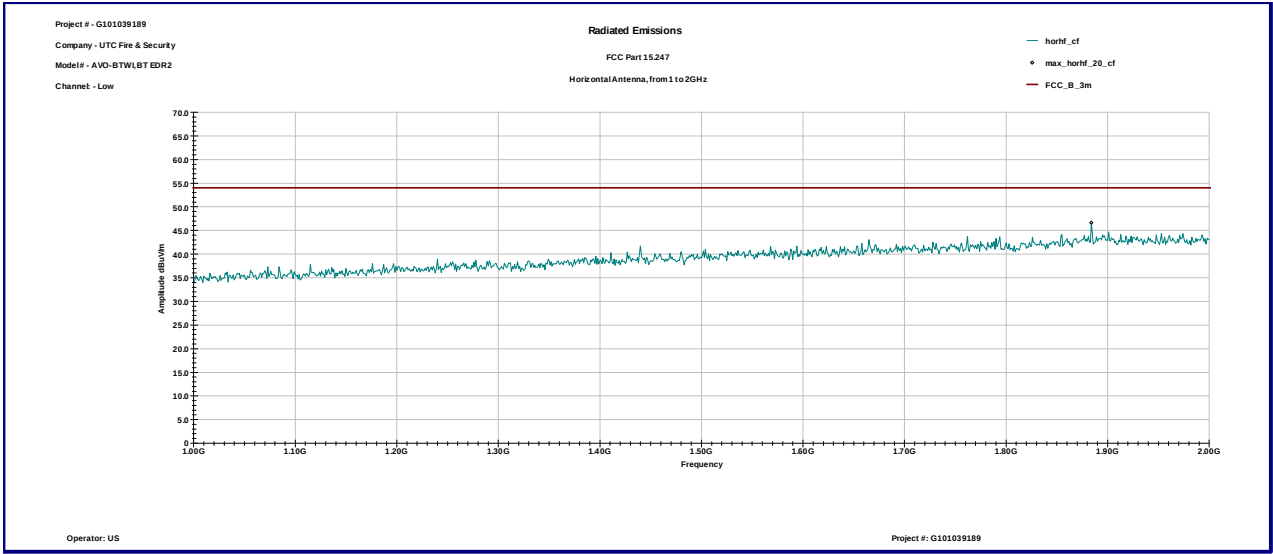
Graph 3.7.25



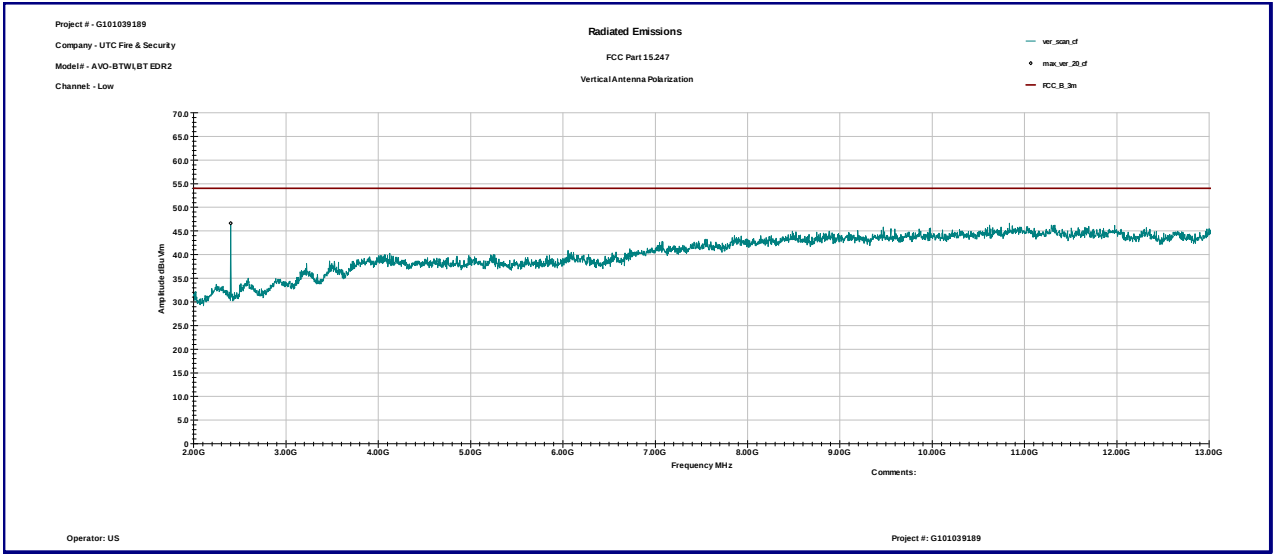
Graph 3.7.26



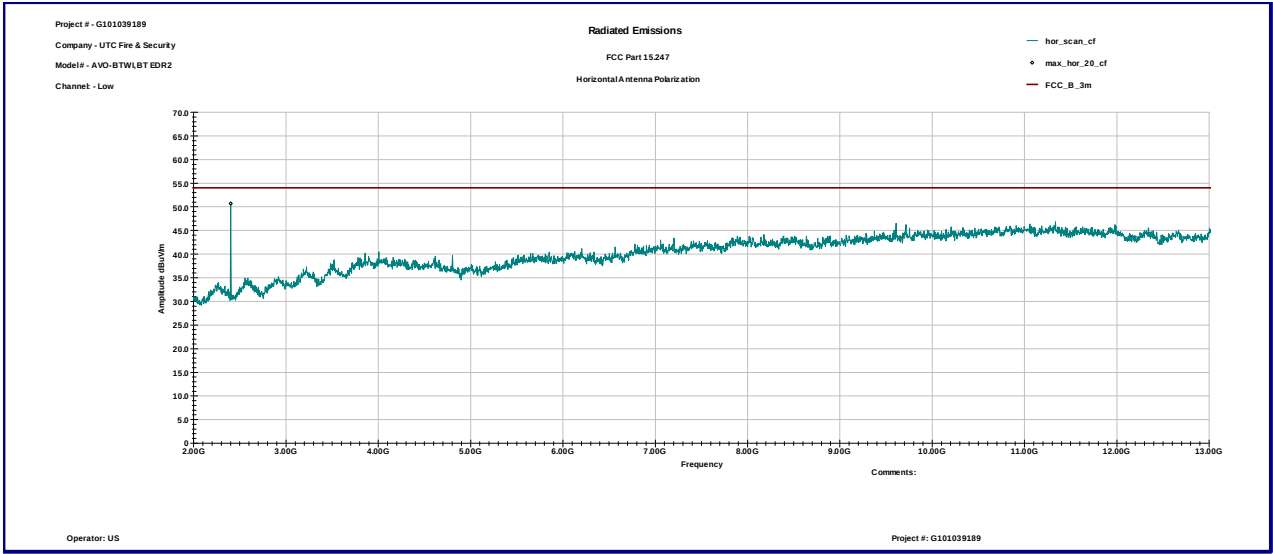
Graph 3.7.27



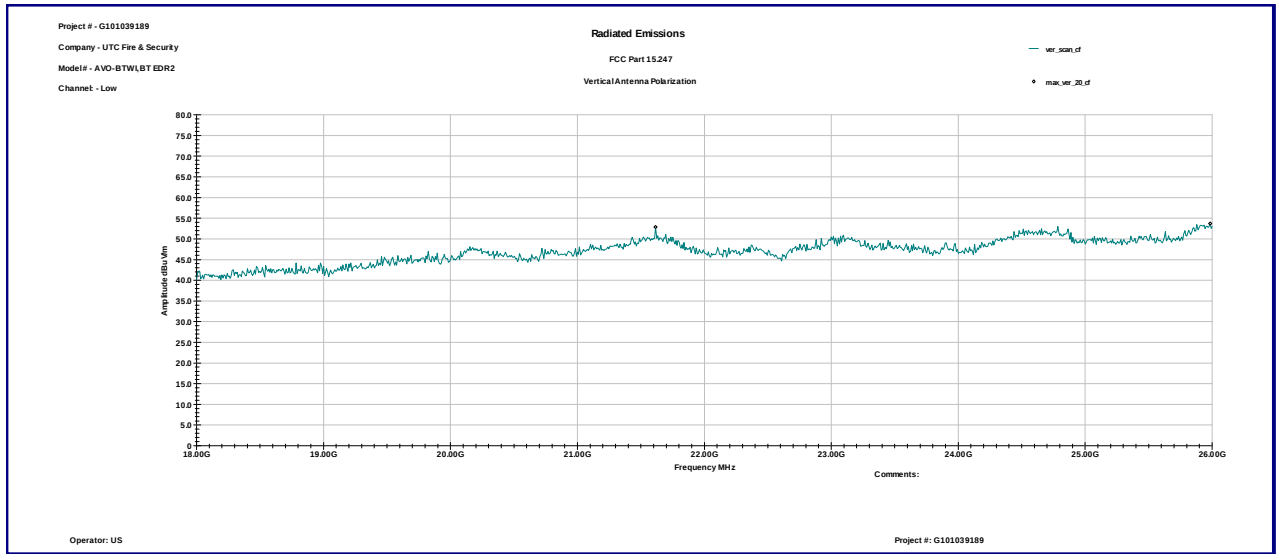
Graph 3.7.28



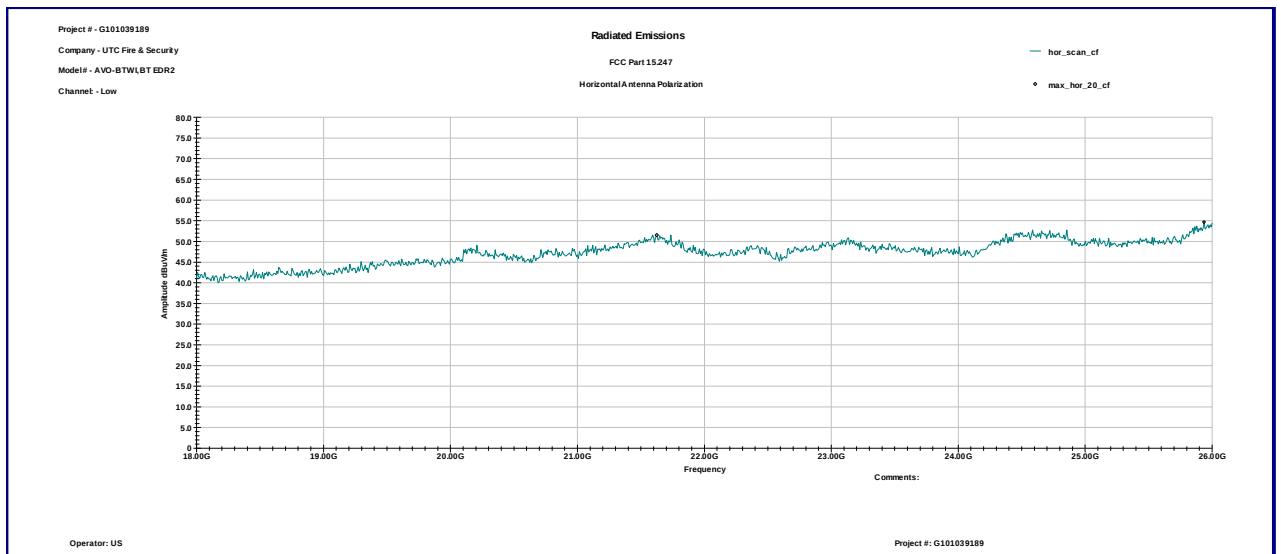
Graph 3.7.29



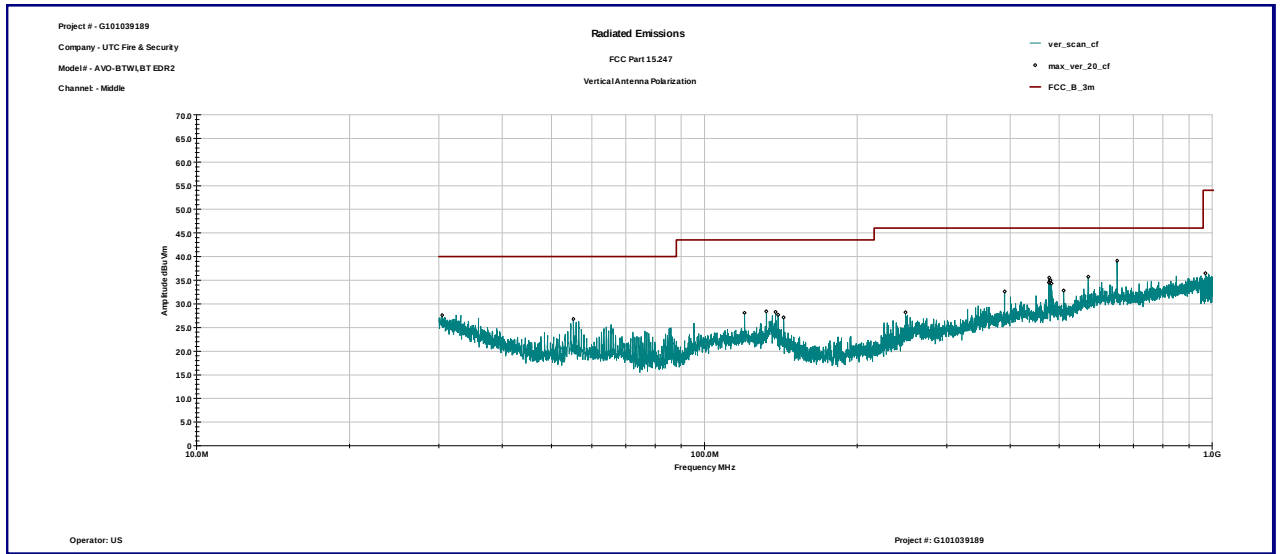
Graph 3.7.30



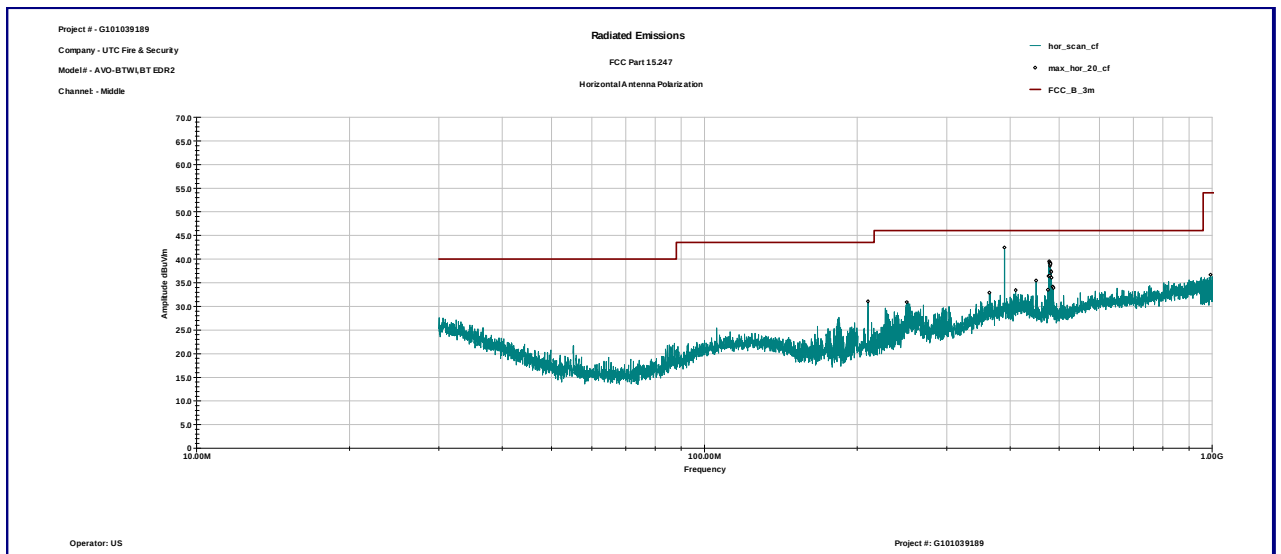
Graph 3.7.31



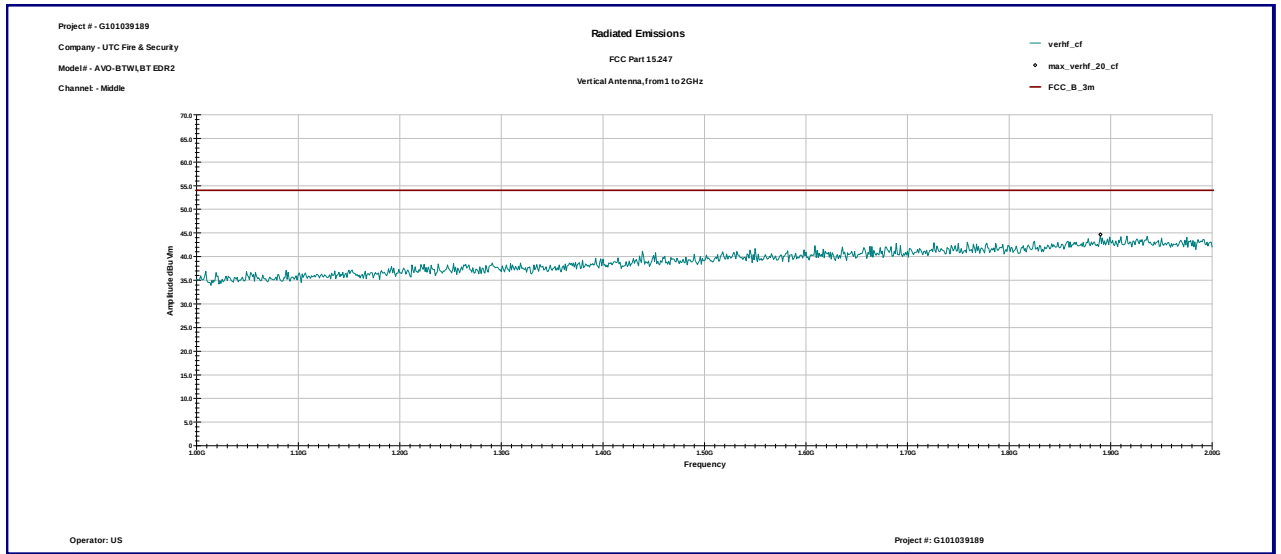
Graph 3.7.32



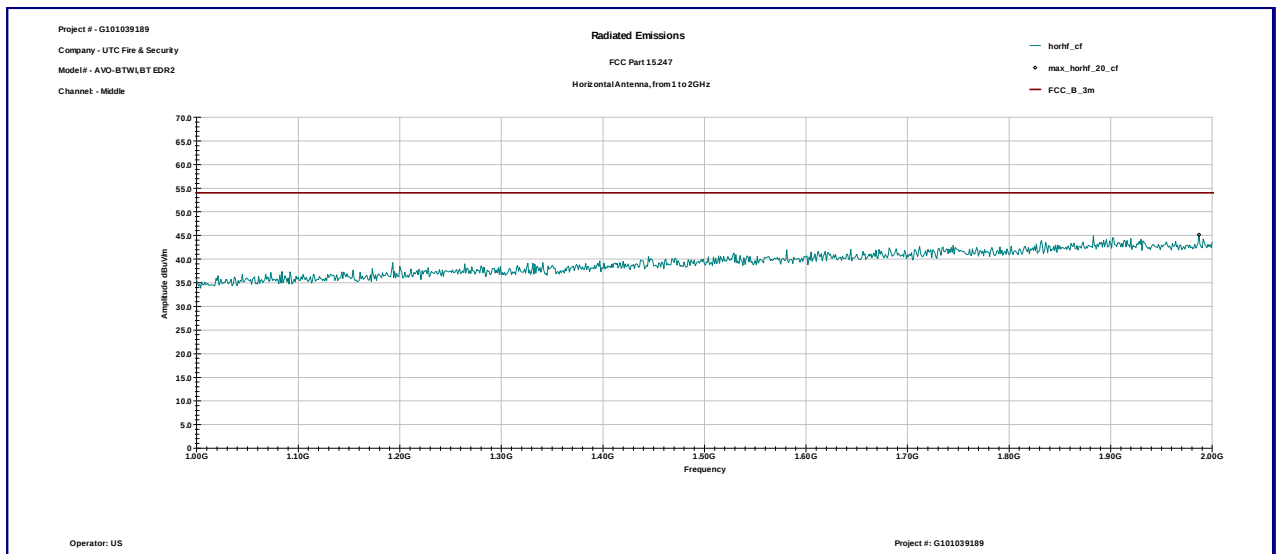
Graph 3.7.33



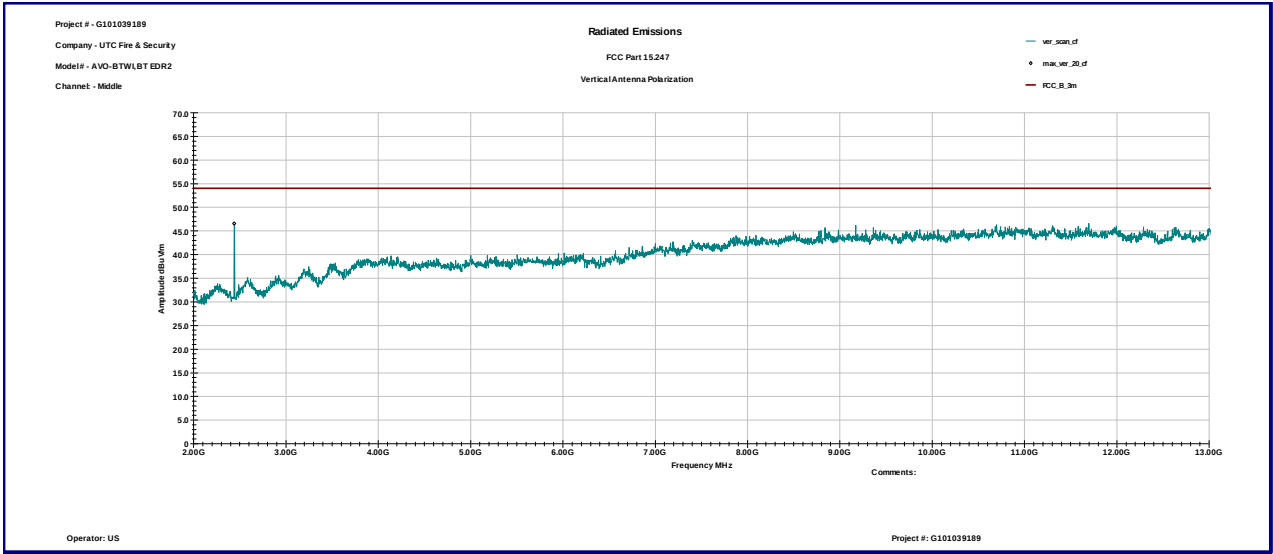
Graph 3.7.34



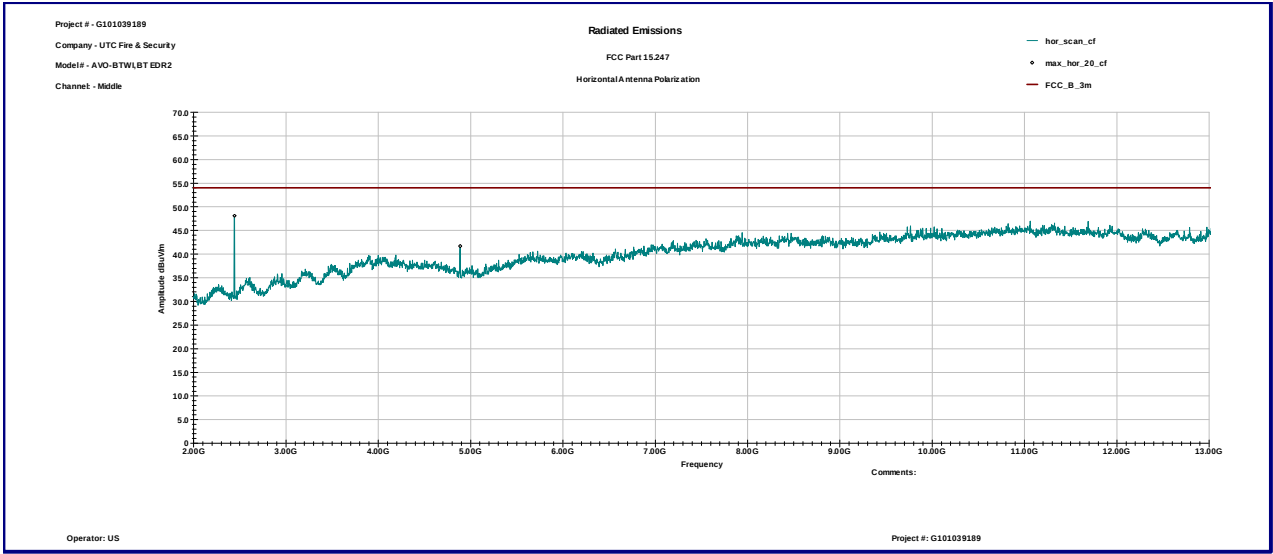
Graph 3.7.35



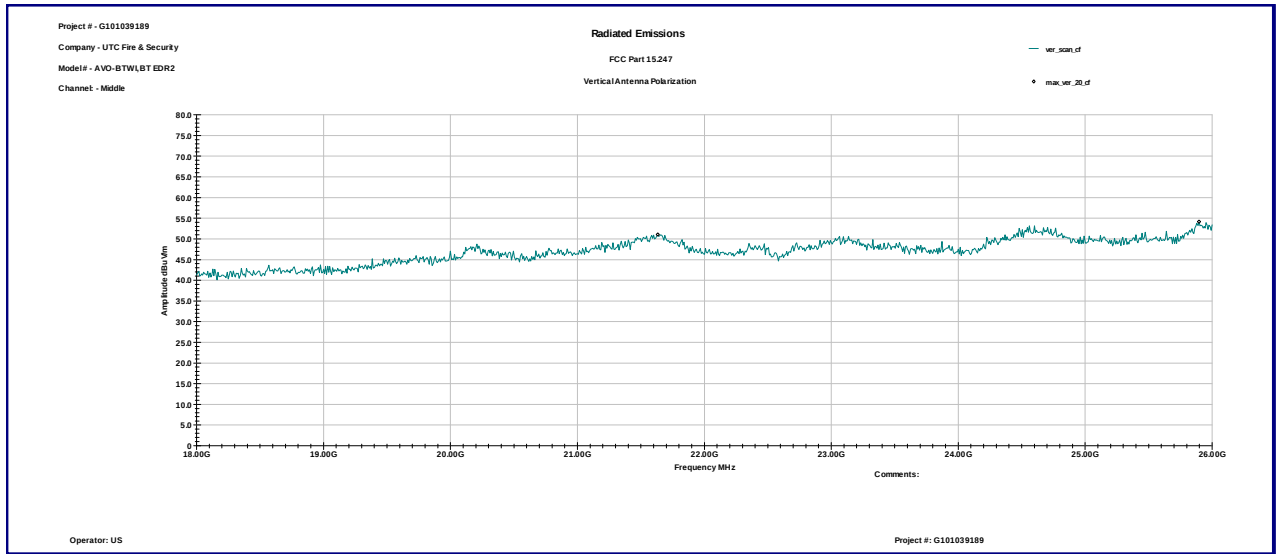
Graph 3.7.36



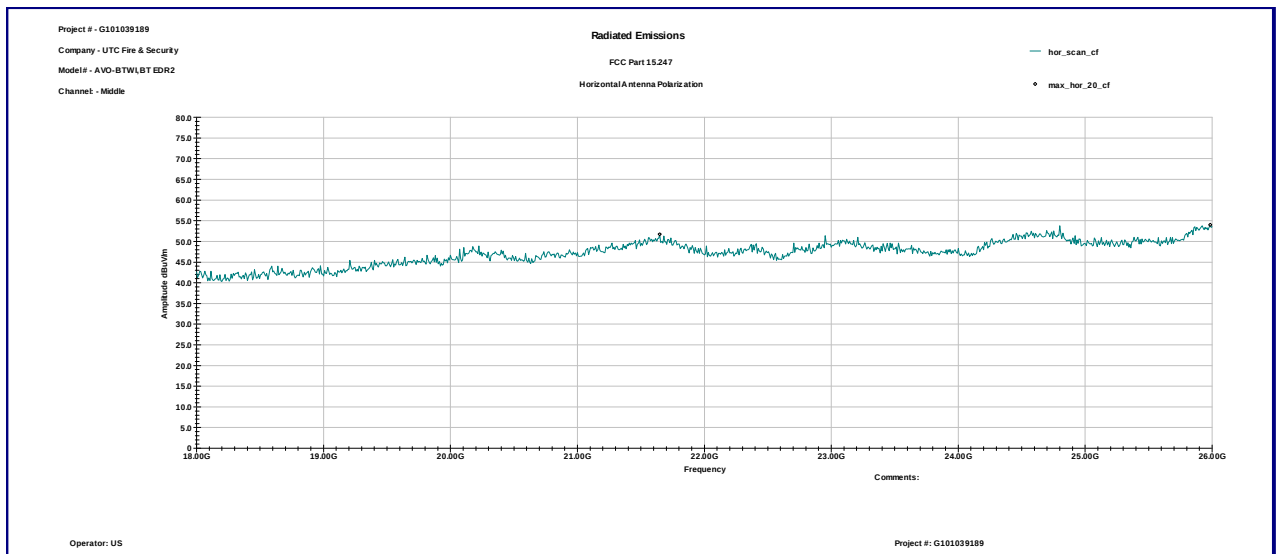
Graph 3.7.37



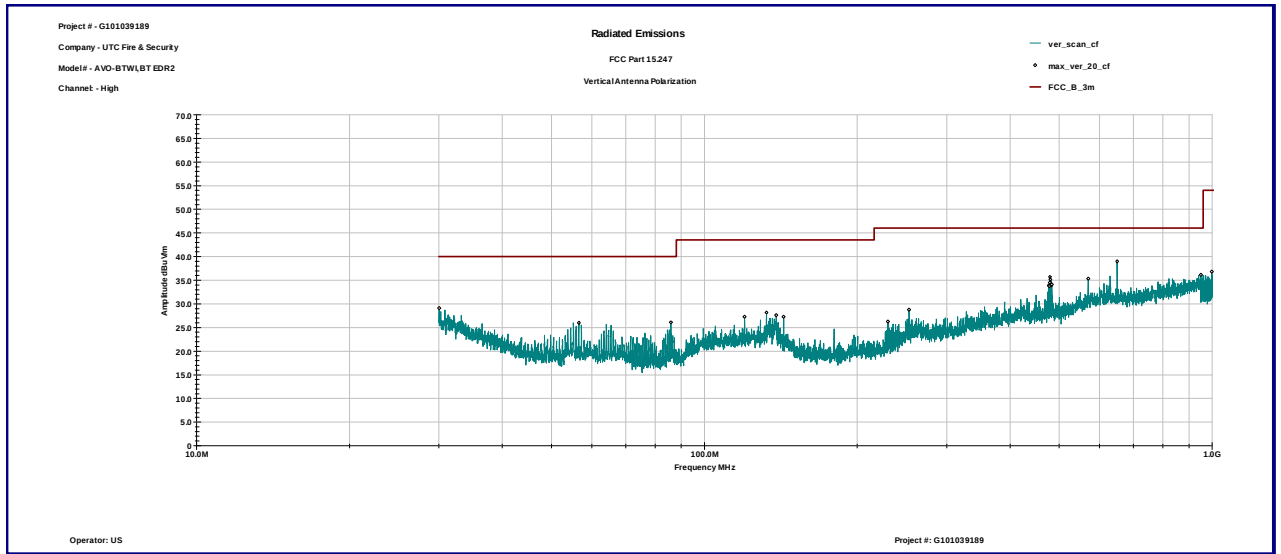
Graph 3.7.38



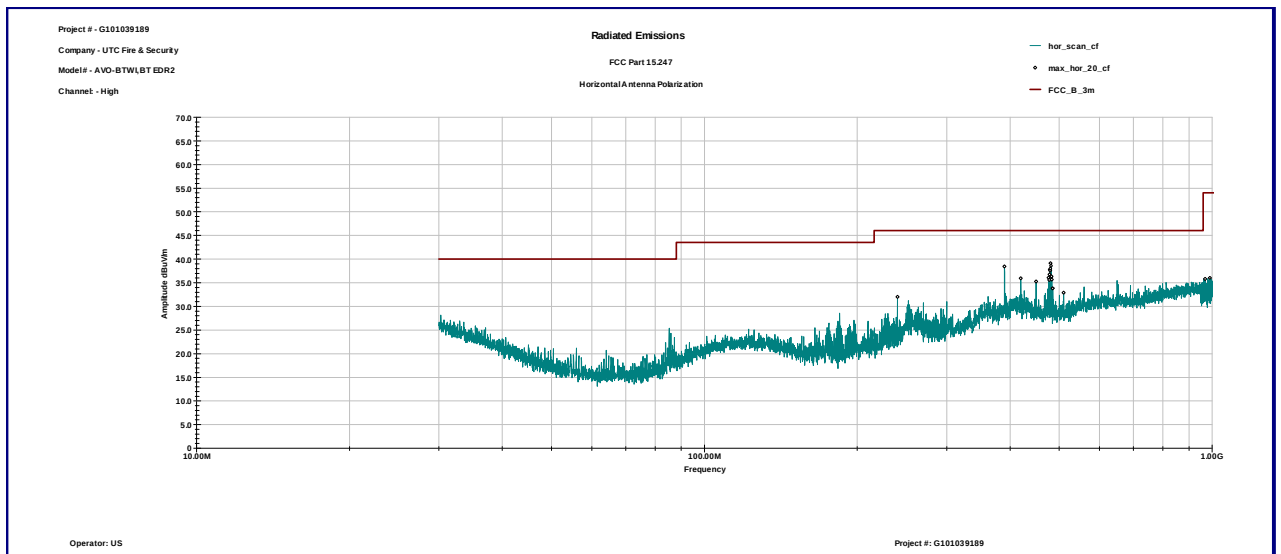
Graph 3.7.39



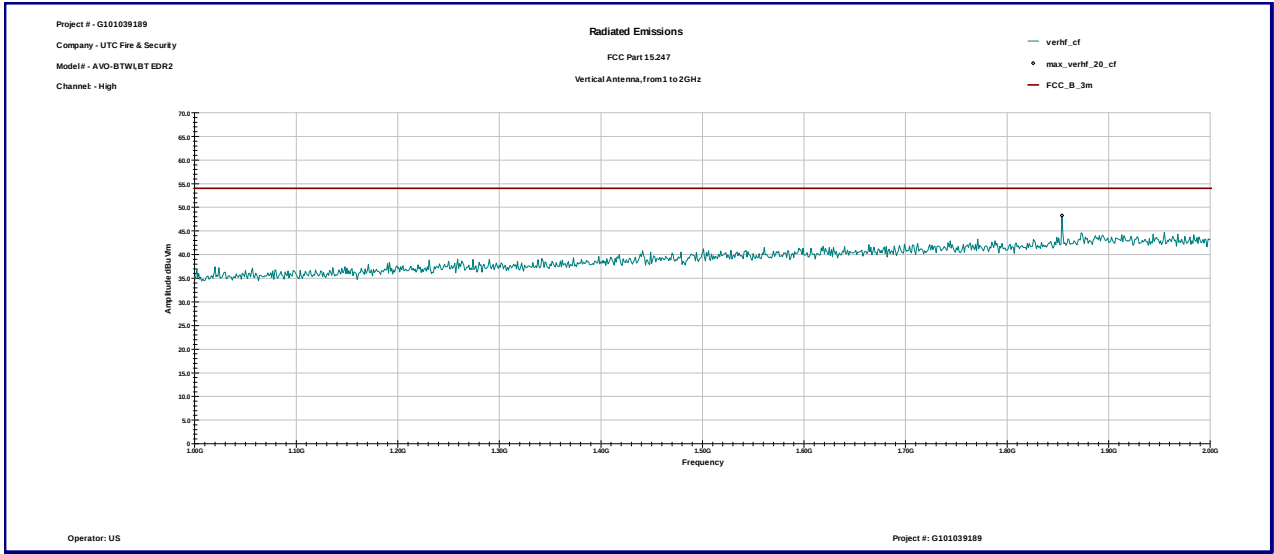
Graph 3.7.40



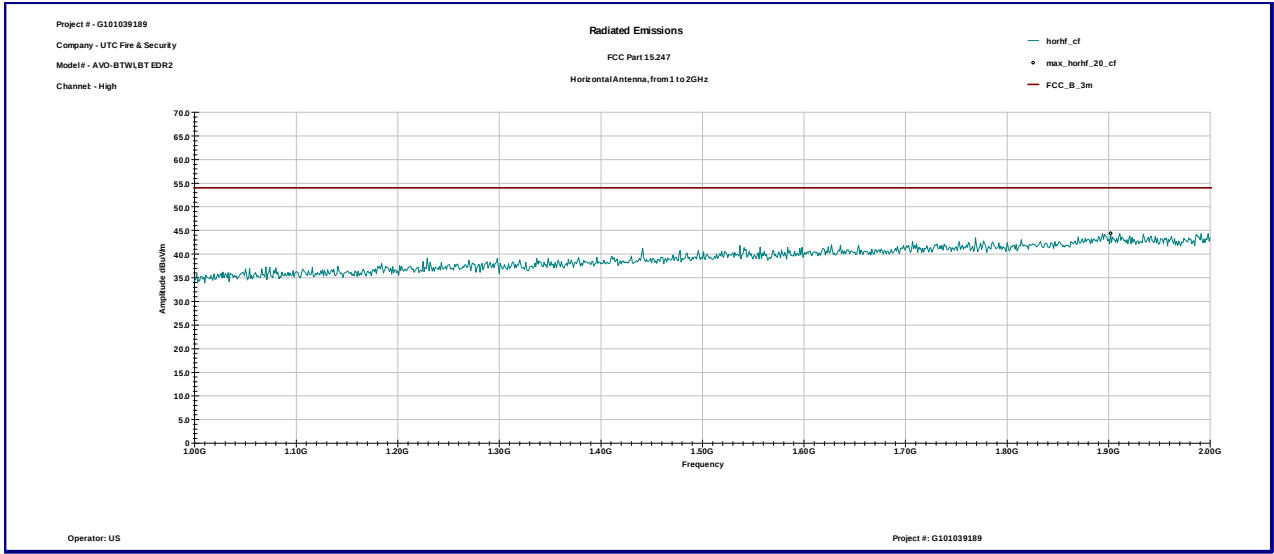
Graph 3.7.41



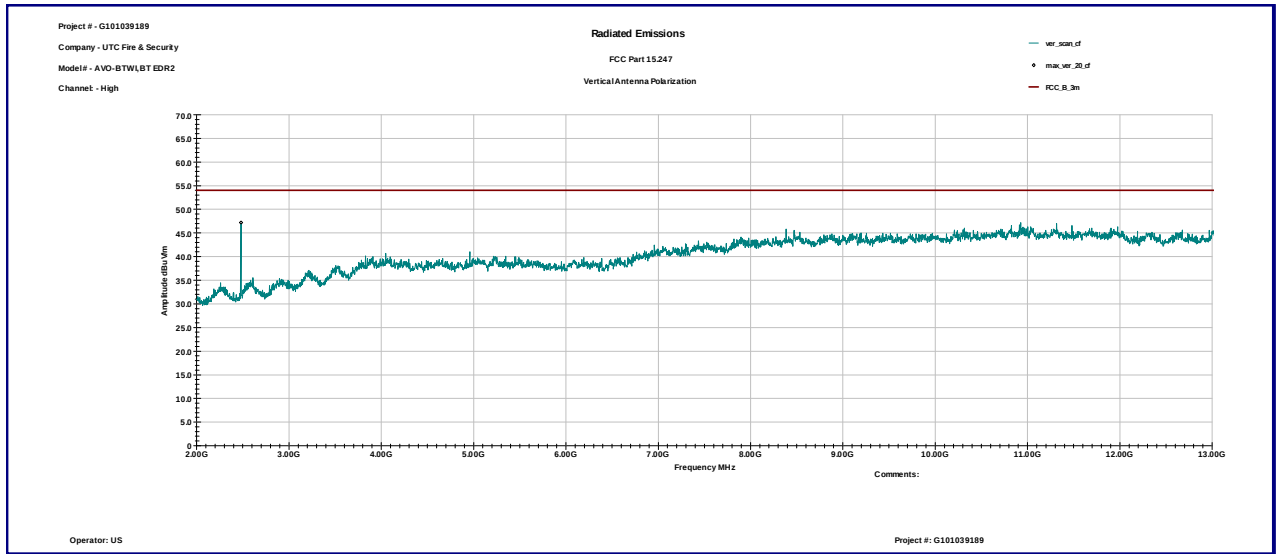
Graph 3.7.42



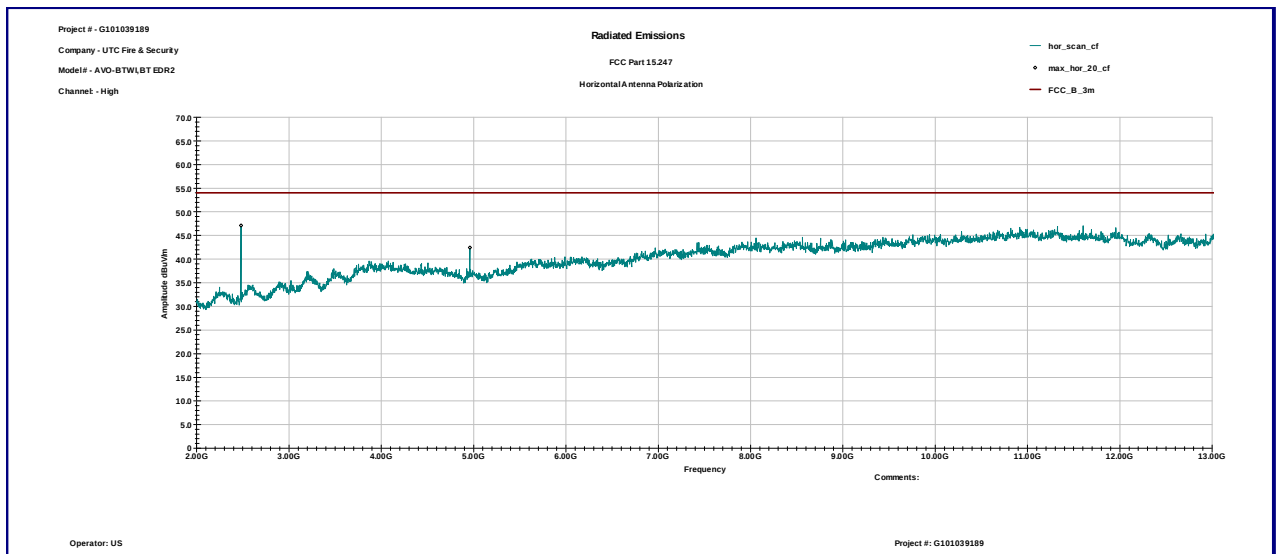
Graph 3.7.43



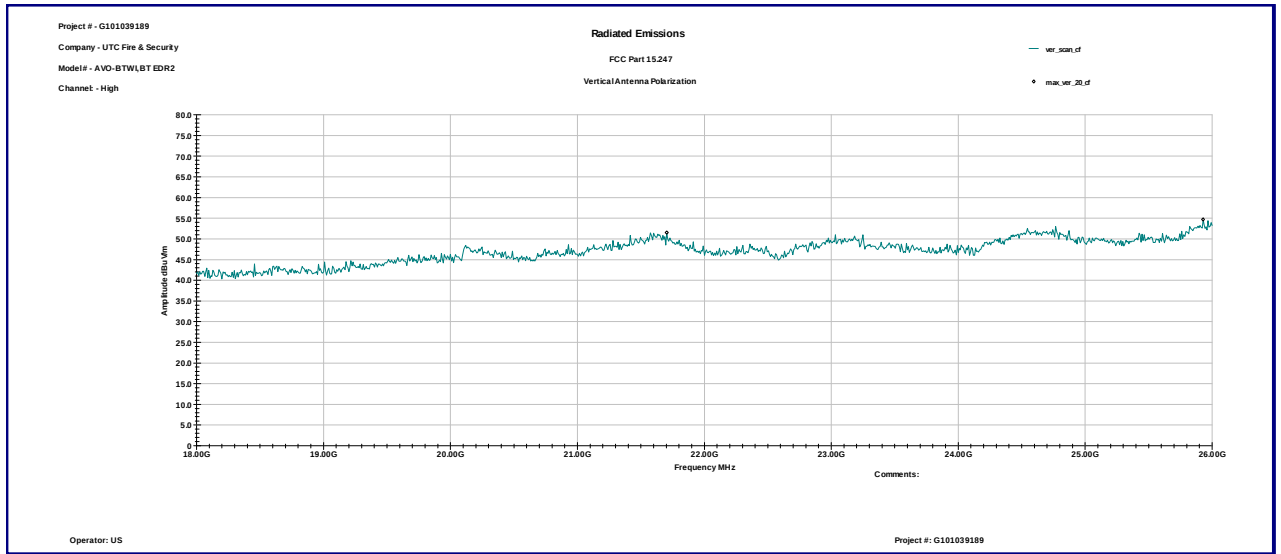
Graph 3.7.44



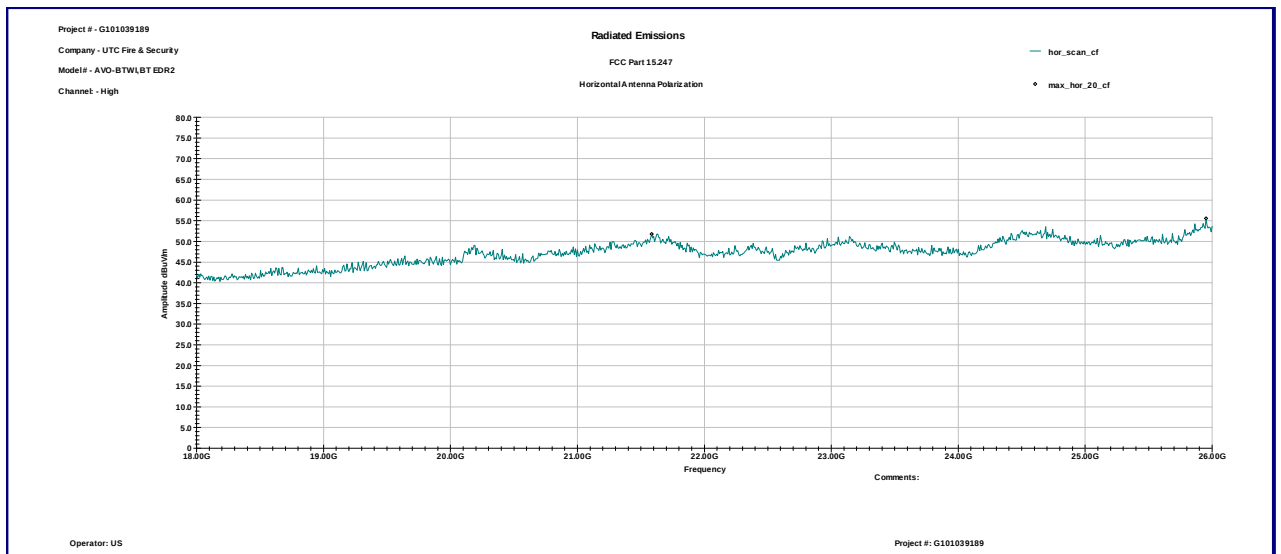
Graph 3.7.45



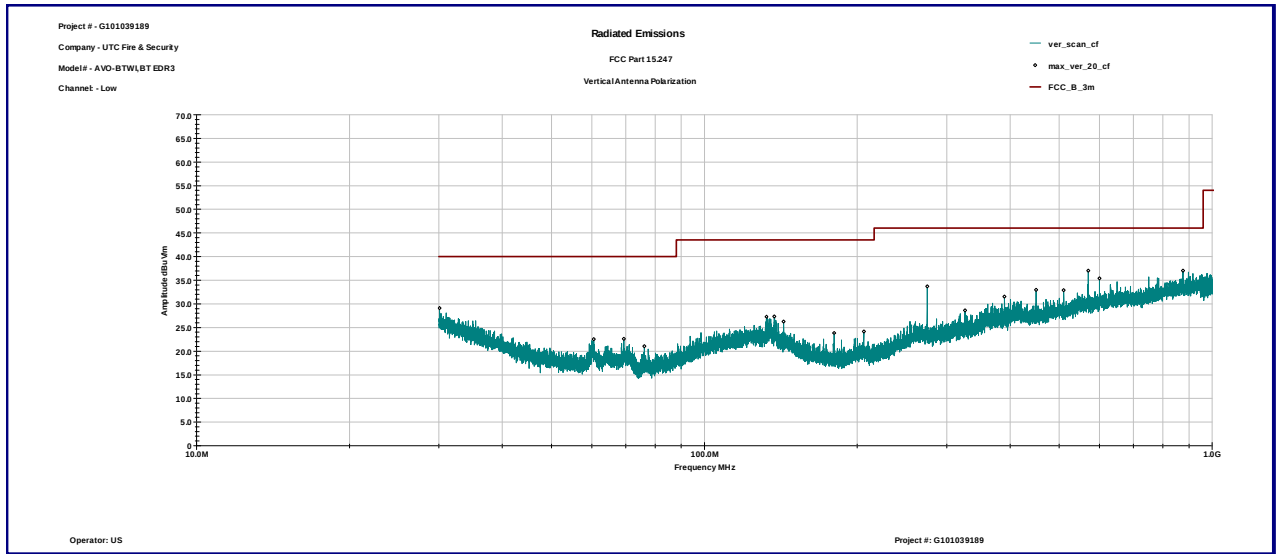
Graph 3.7.46



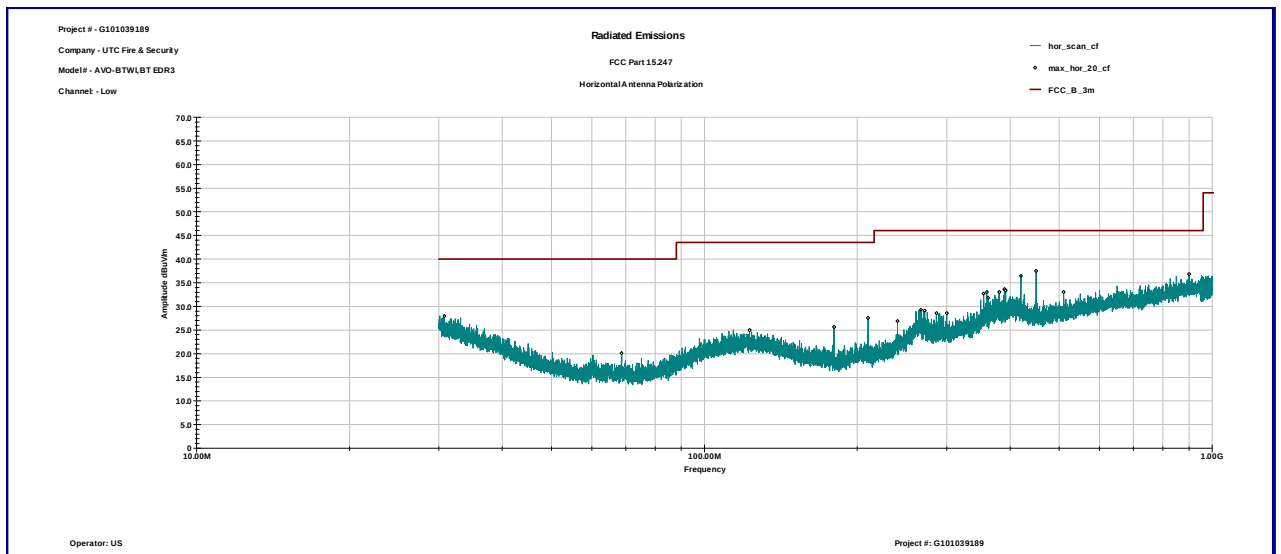
Graph 3.7.47



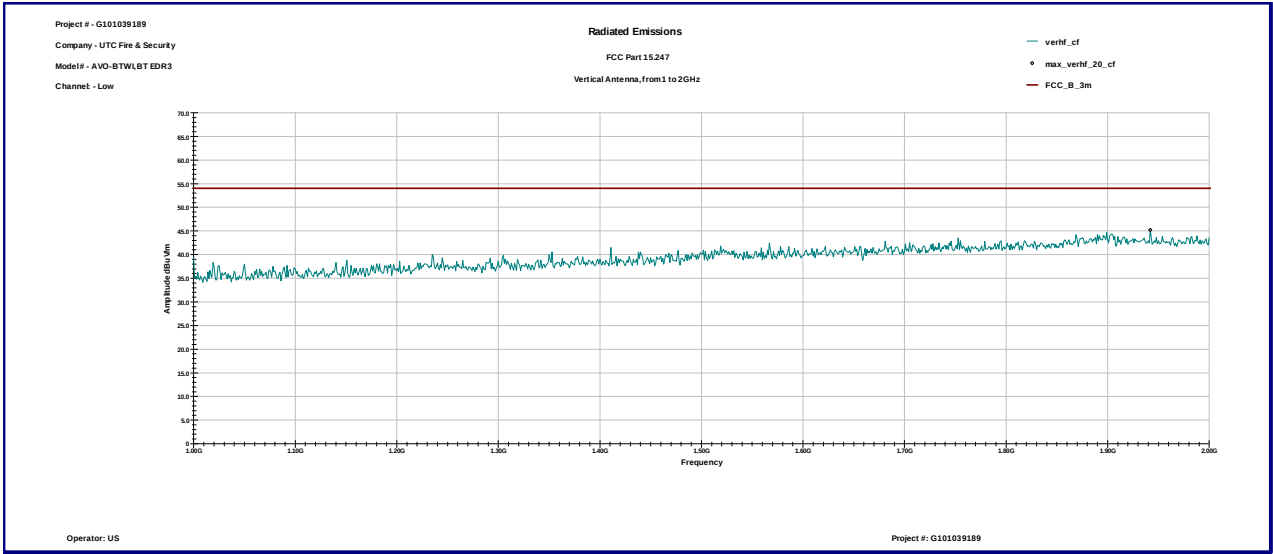
Graph 3.7.48



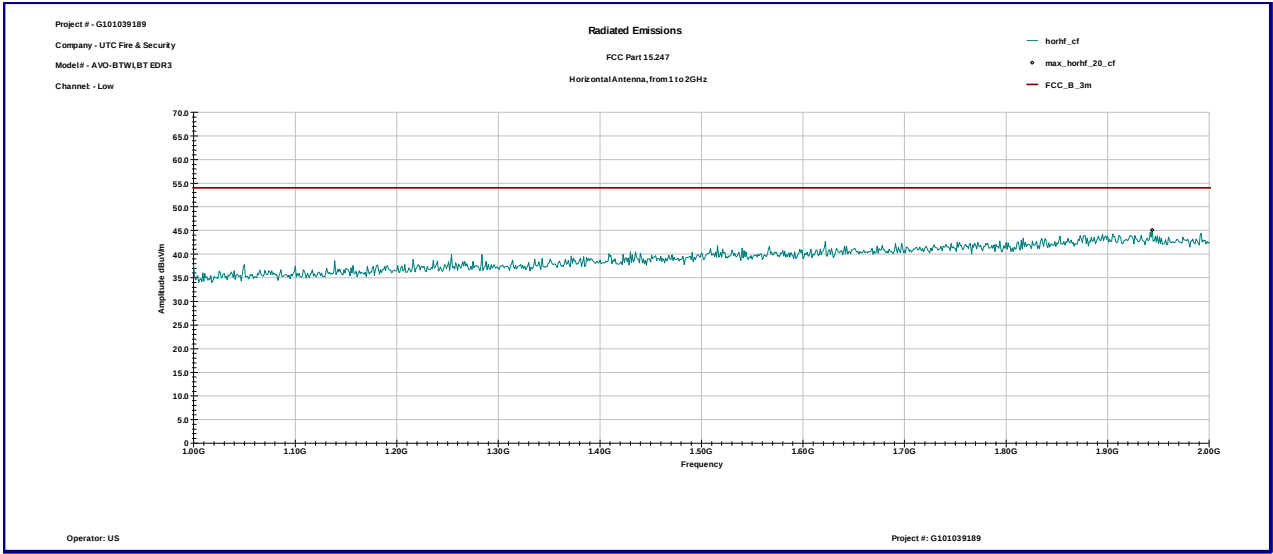
Graph 3.7.50



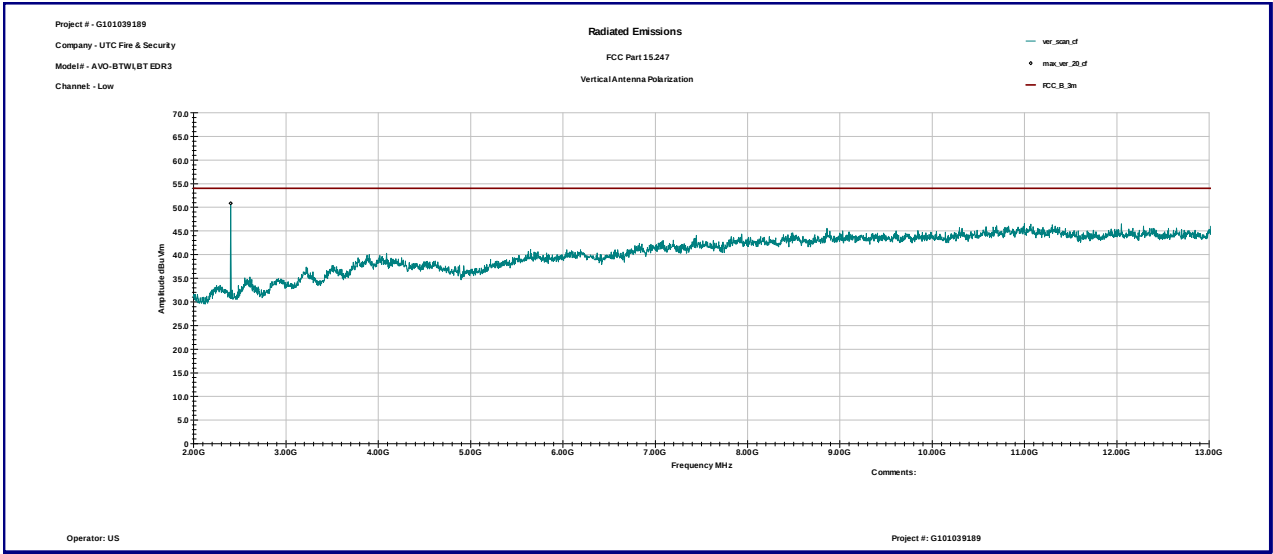
Graph 3.7.51



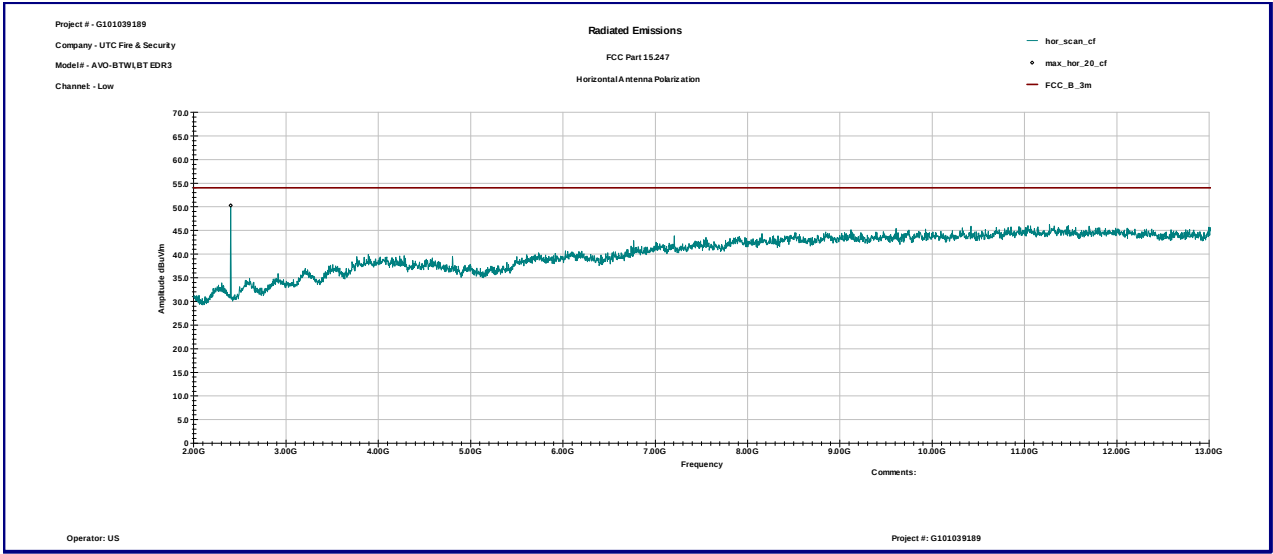
Graph 3.7.52



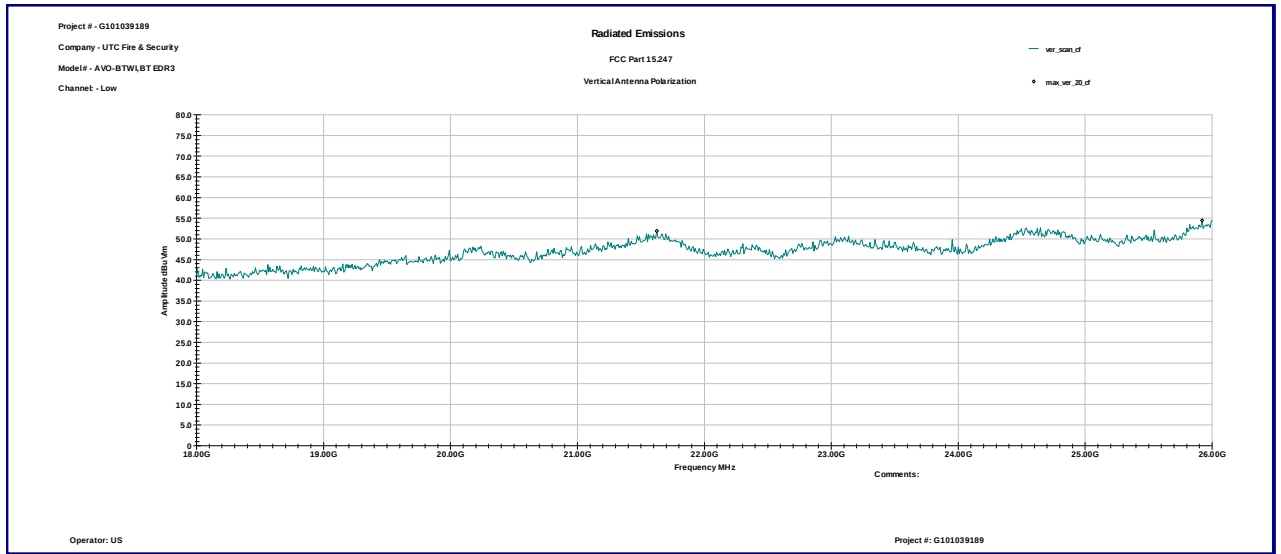
Graph 3.7.53



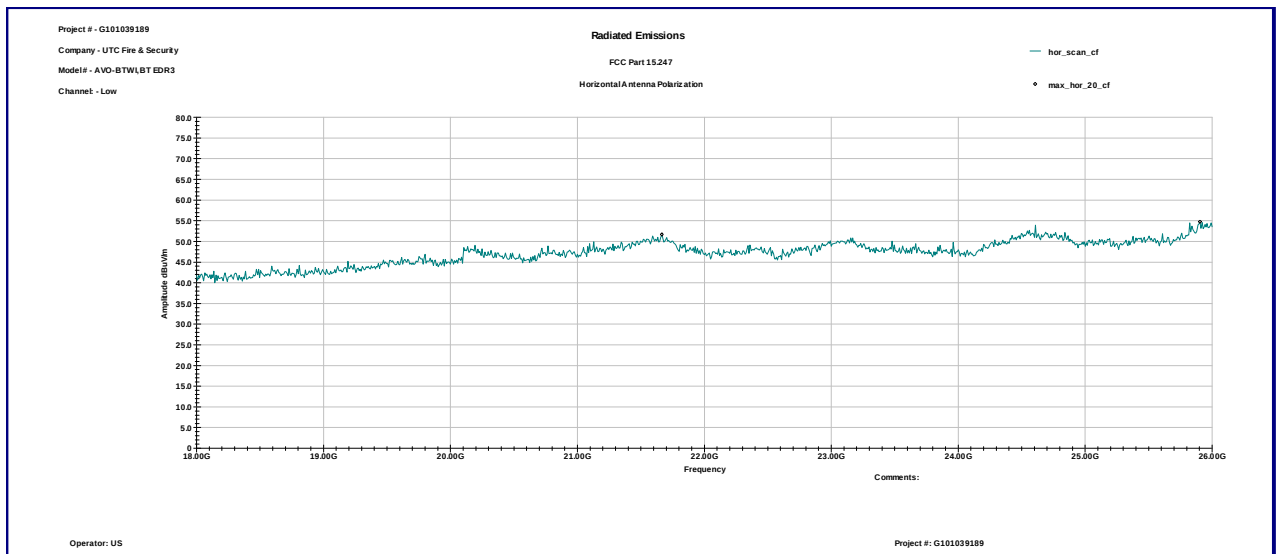
Graph 3.7.54



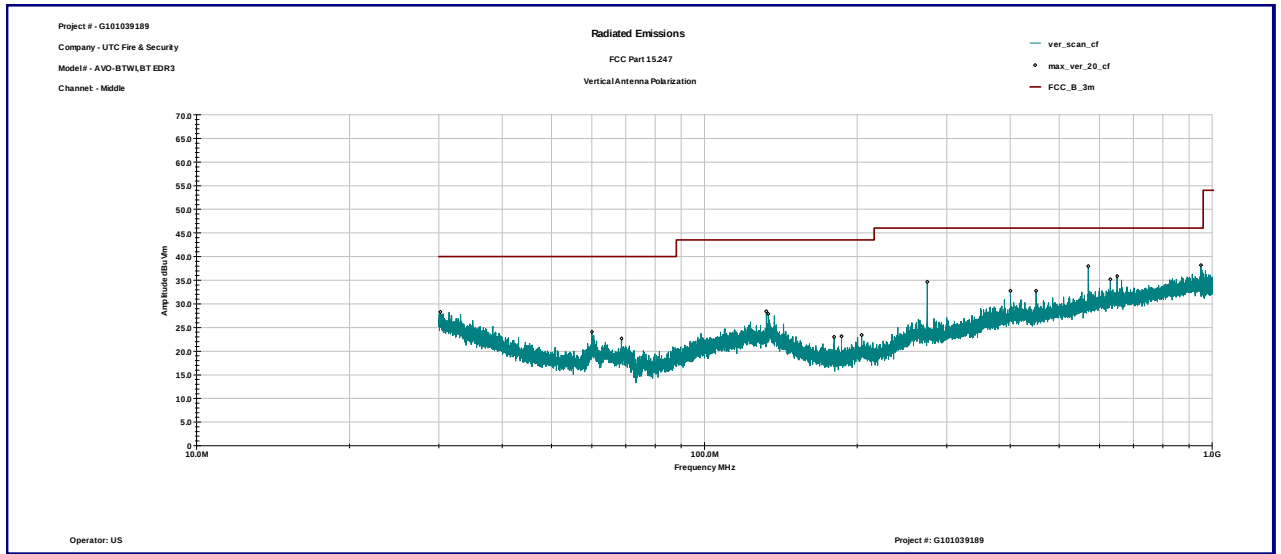
Graph 3.7.55



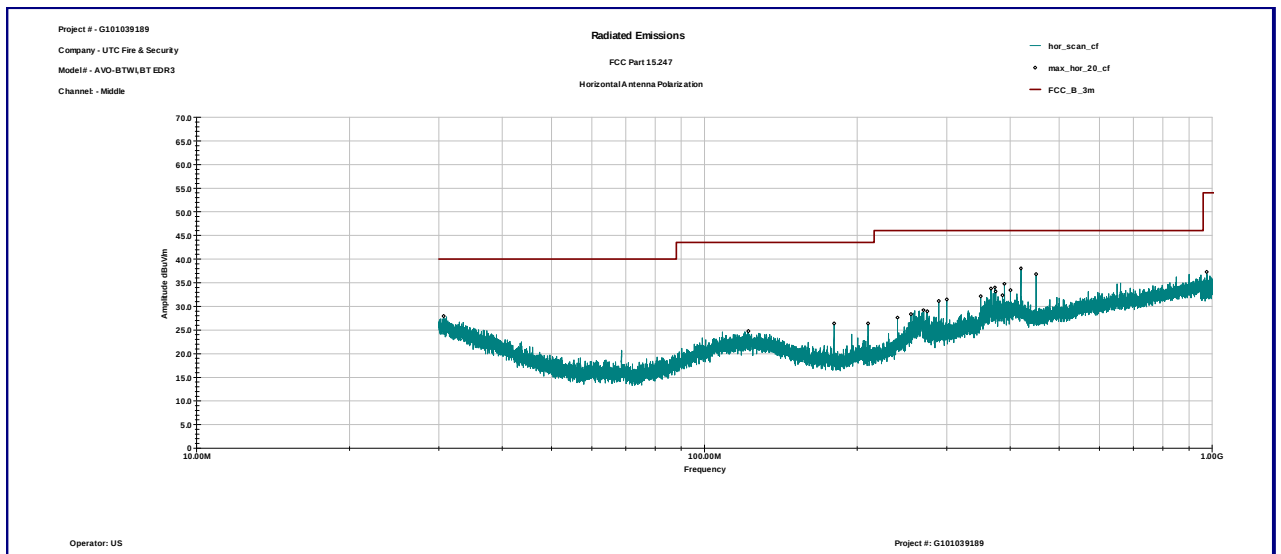
Graph 3.7.56



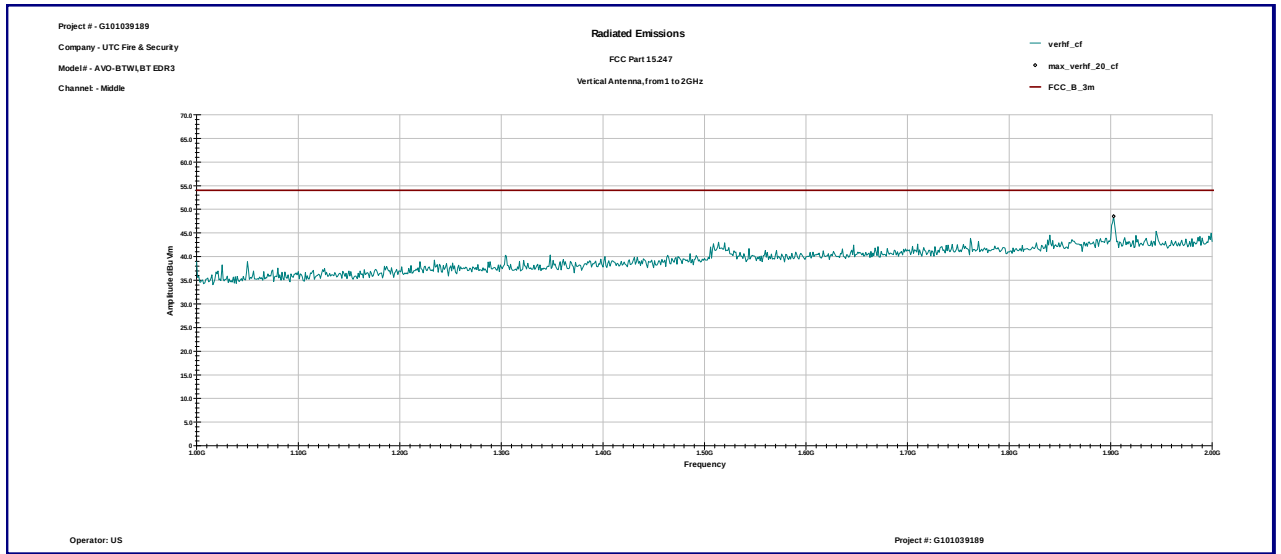
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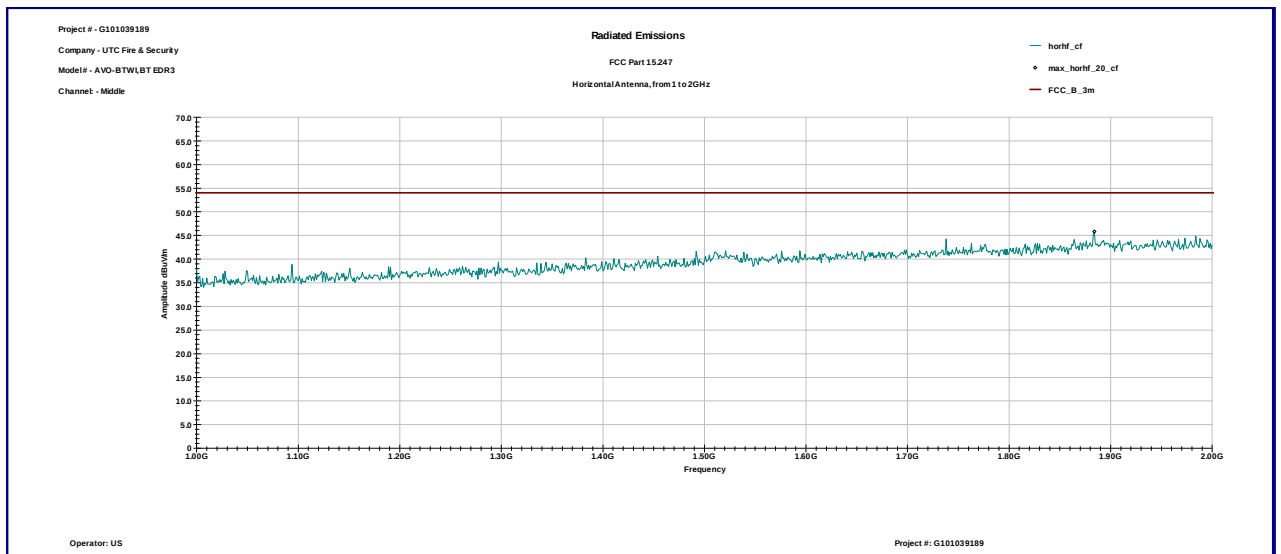
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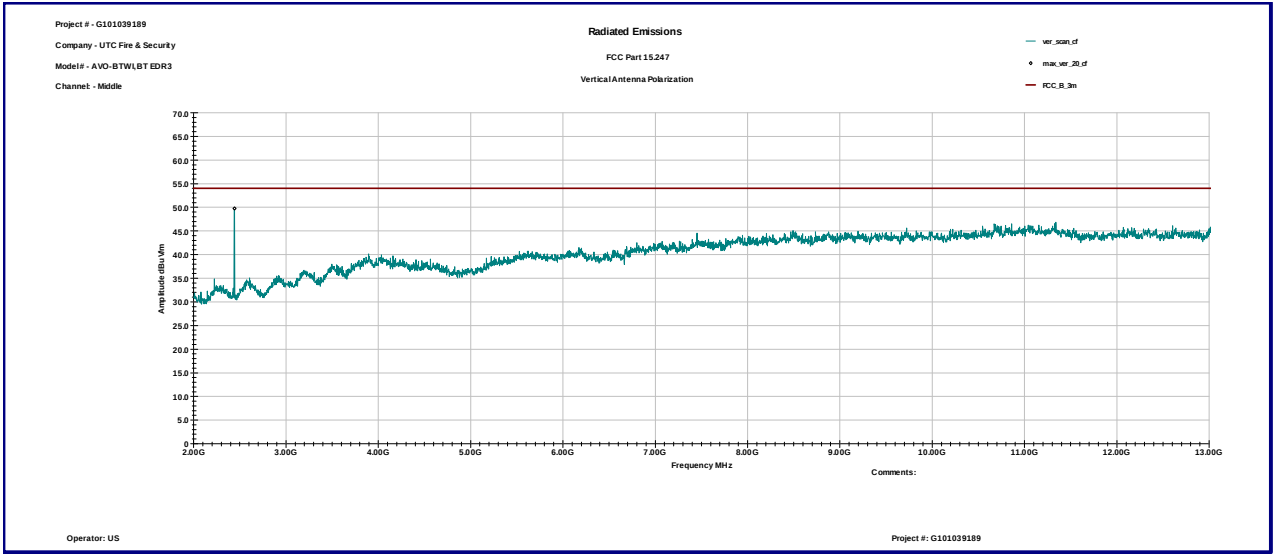
Graph 3.7.59



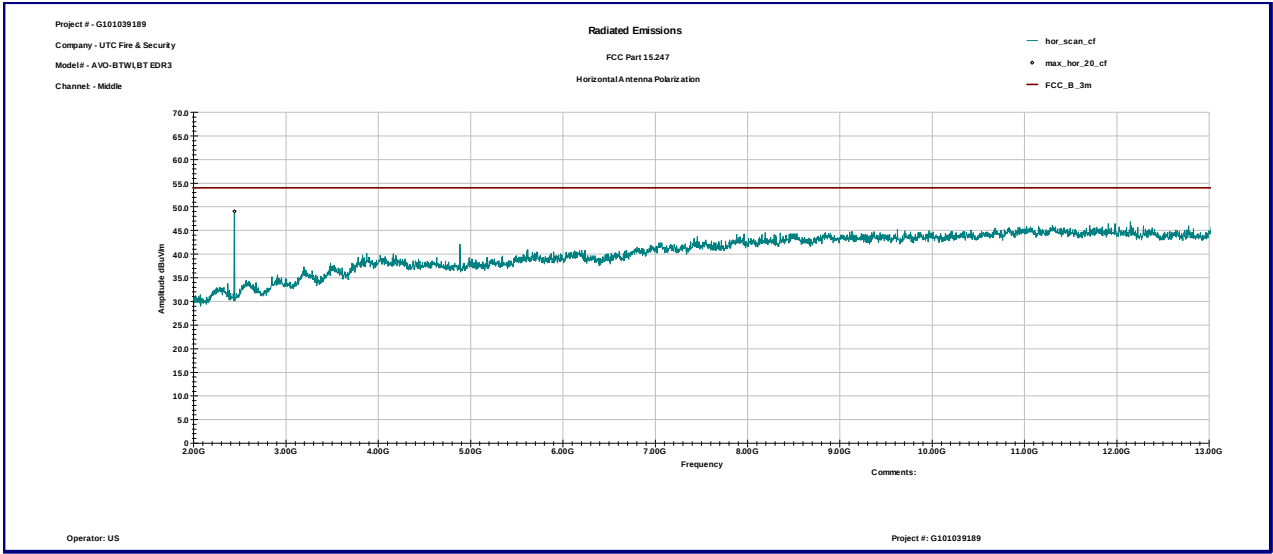
Graph 3.7.61



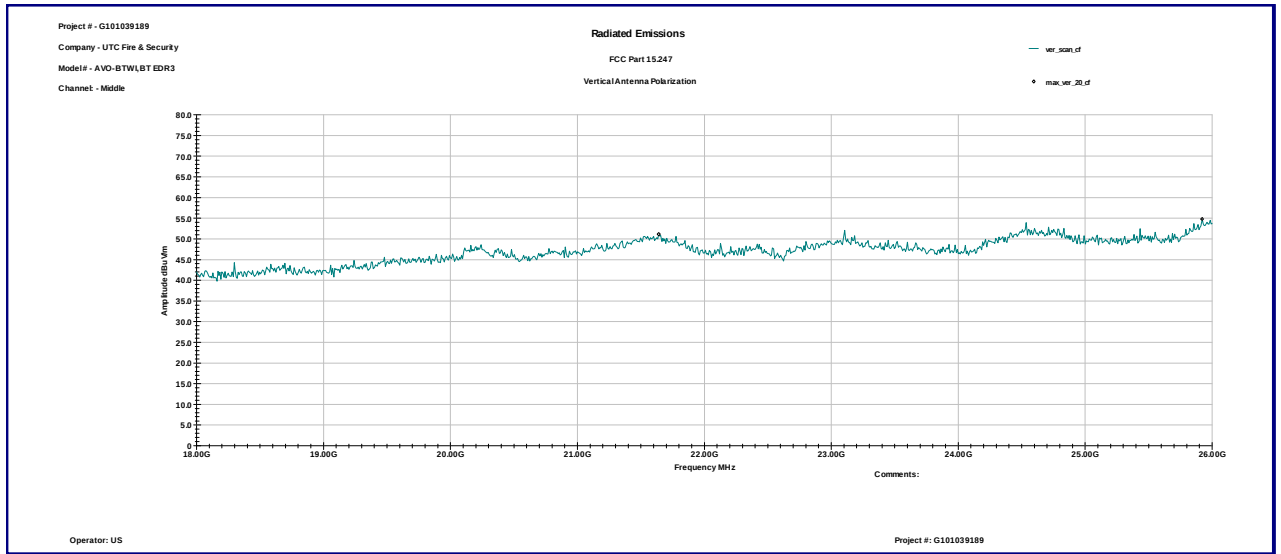
Graph 3.7.62



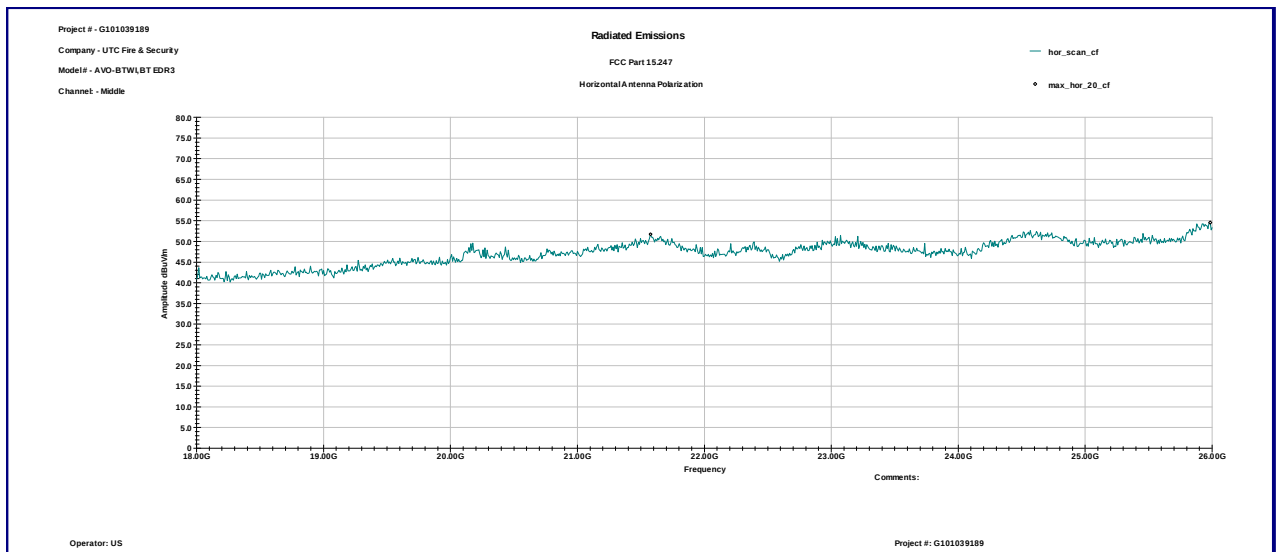
Graph 3.7.63



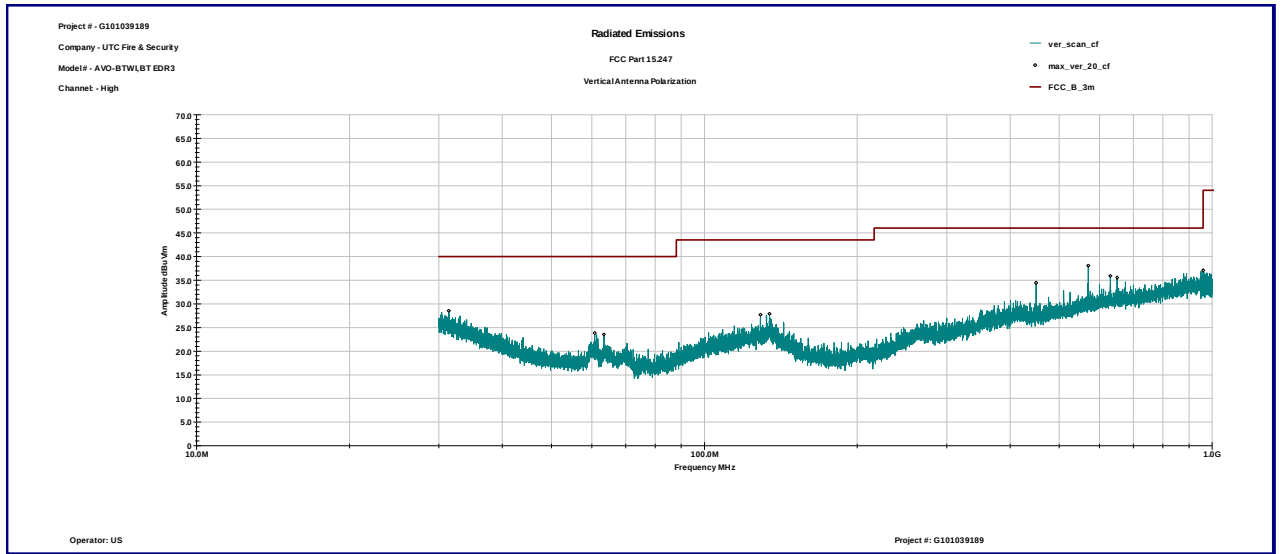
Graph 3.7.64



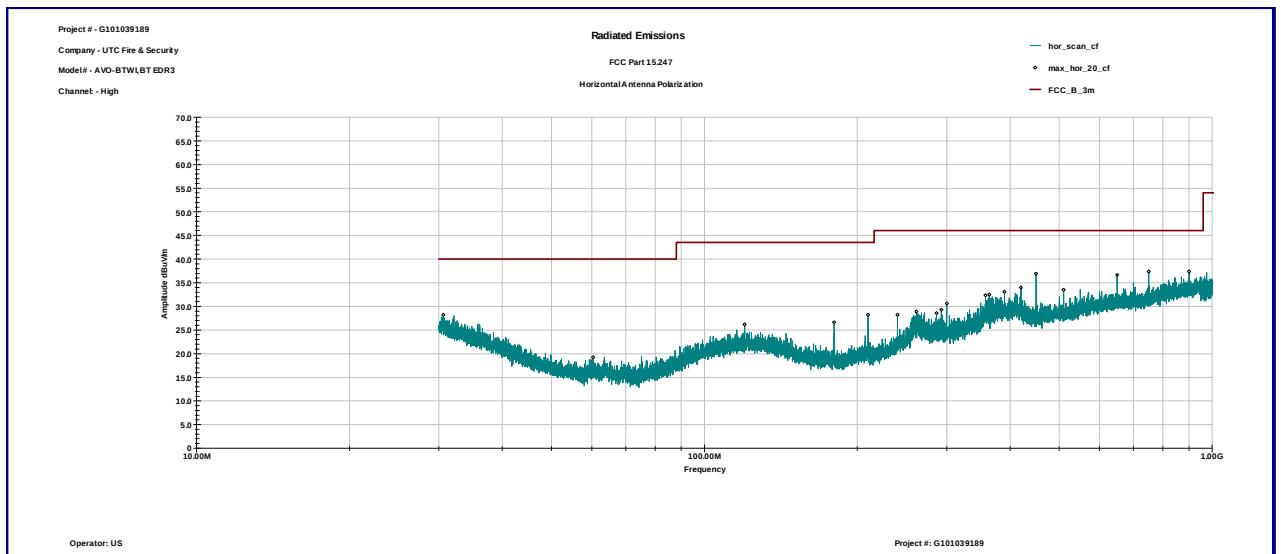
Graph 3.7.65



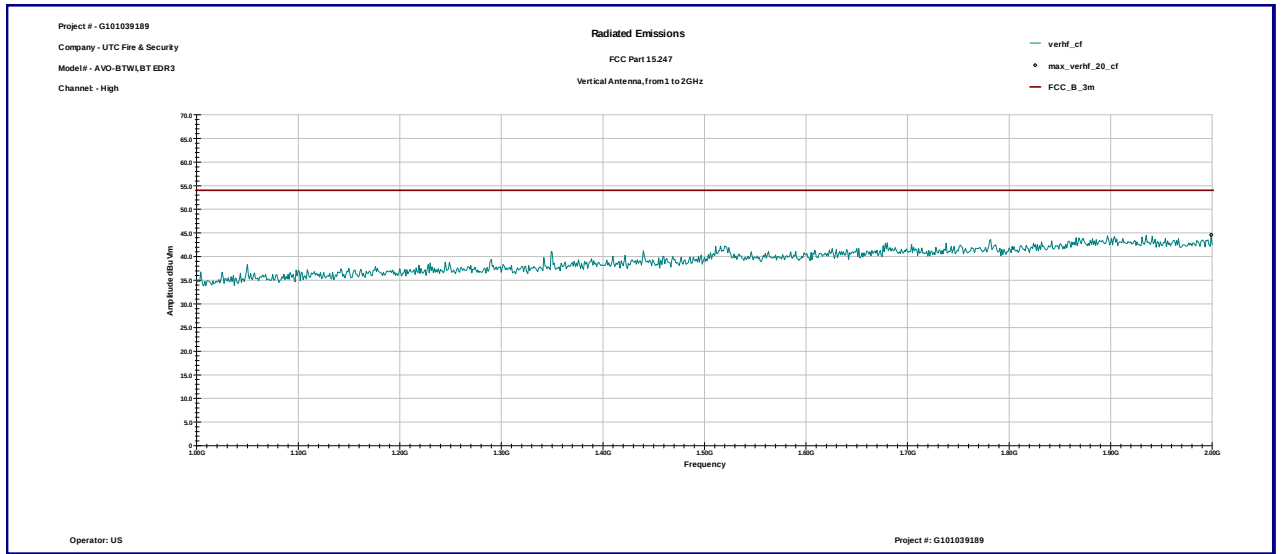
Graph 3.7.66



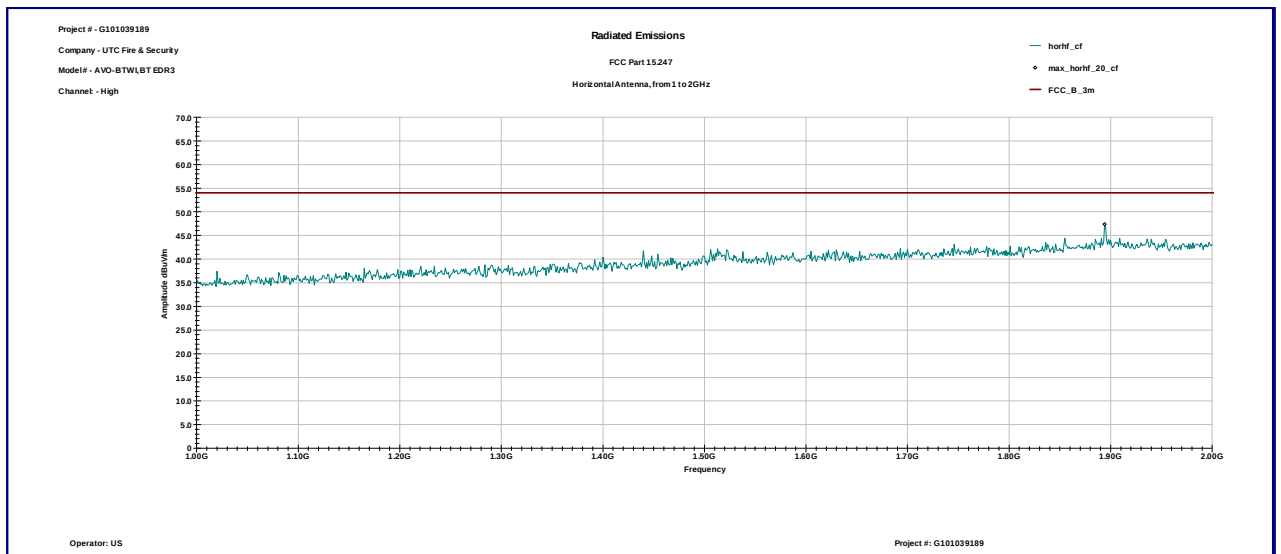
Graph 3.7.67



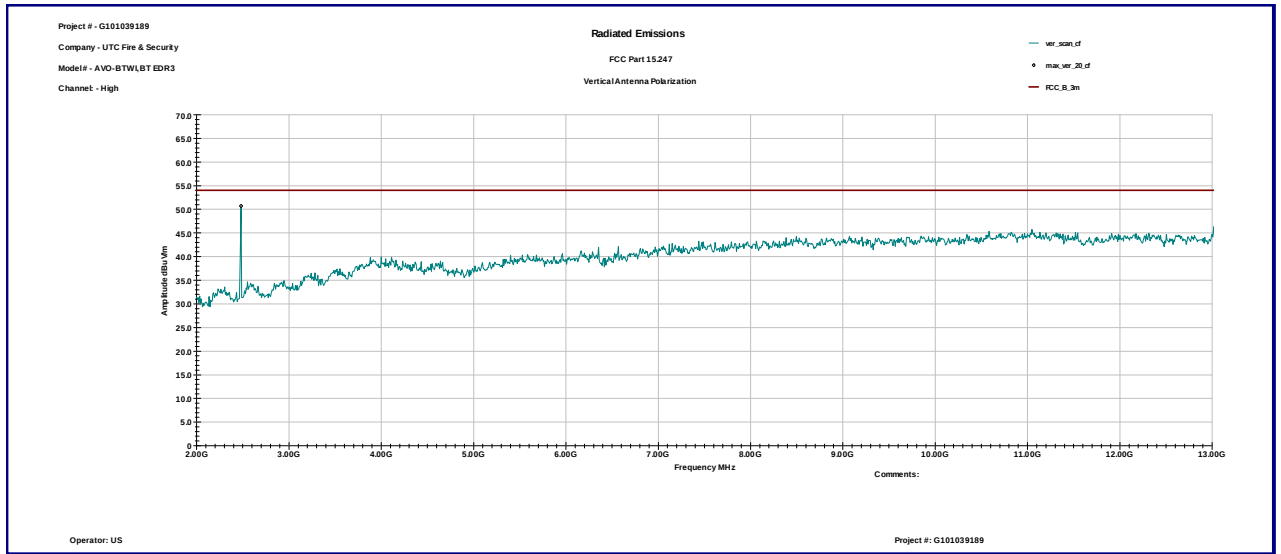
Graph 3.7.68



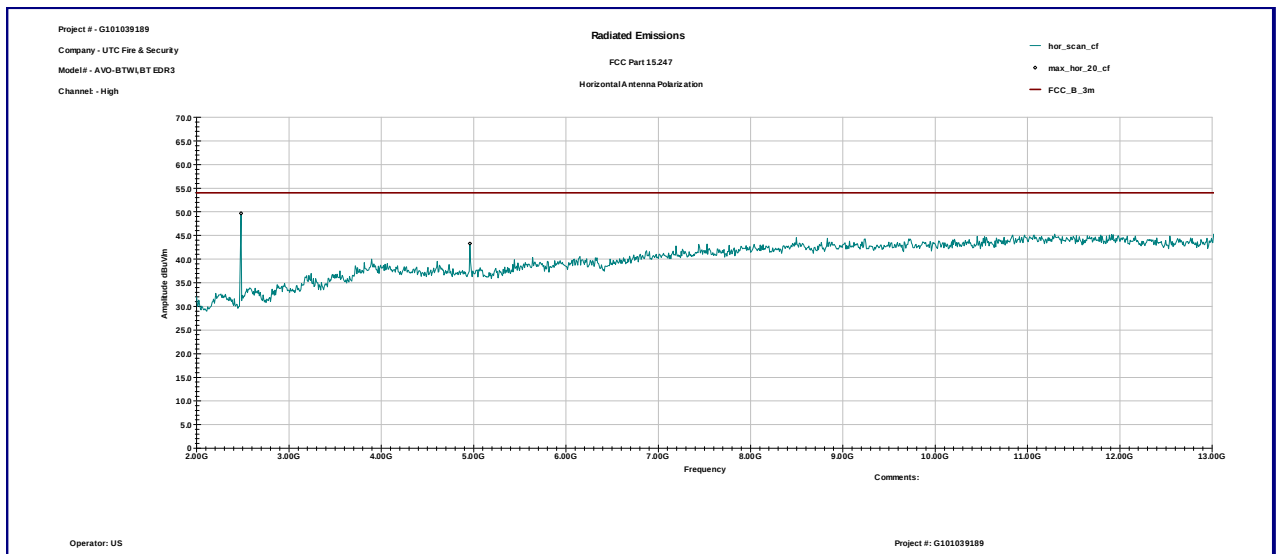
Graph 3.7.69



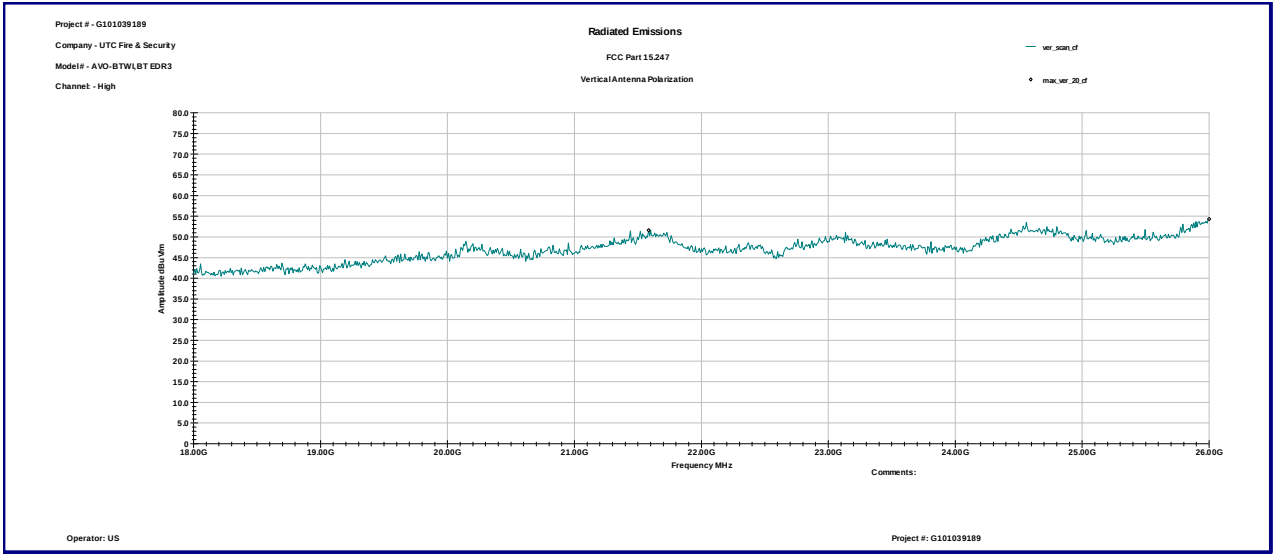
Graph 3.7.70



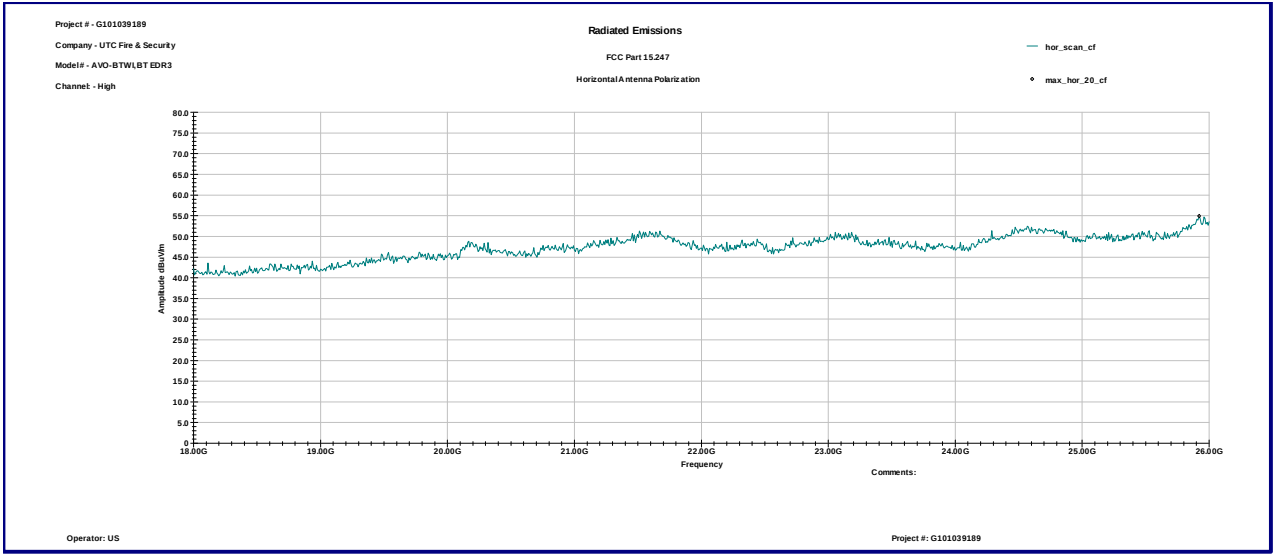
Graph 3.7.71



Graph 3.7.72



Graph 3.7.73



Graph 3.7.74



3.8 RF Exposure Compliance

The maximum measured antenna conducted power, P is 8.0dBm

The antenna gain, G is 2.5dBi

The maximum EIRP power = P + G

ERP = 8.0+ 2.5 = 10.5dBm, or 0.011W

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

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

The Power Density is related to EIRP with the equation:

$$S = \text{EIRP} / 4\pi D^2, \text{ or } 10 = 0.011 / 4\pi D^2,$$

The minimum safe separation distance, D = 0.94cm, which is below 20cm, or RF Exposure at 20cm distance is $0.0022\text{mW}/\text{cm}^2$



3.9 Transmitter power line conducted emissions

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 30, 2013	Result: Pass
Tested by:	Uri Spector	
Standard:	FCC Part 15.207	
Test Point:	AC Power Line	
Operation mode:	See page 5	
Note:	None	

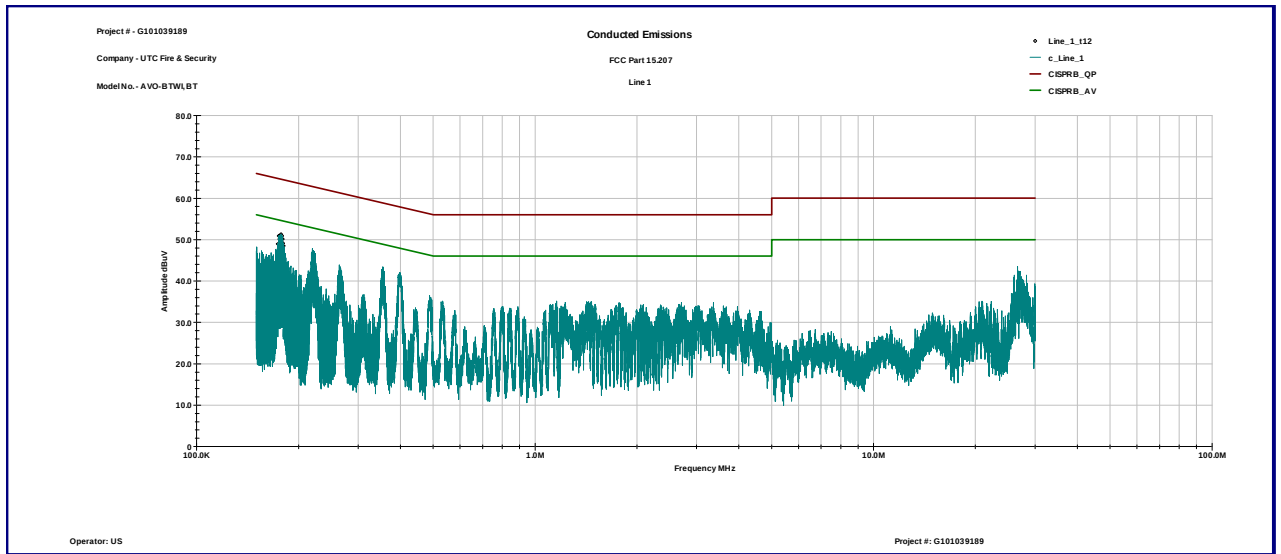
Table 3.9.1

Line 1

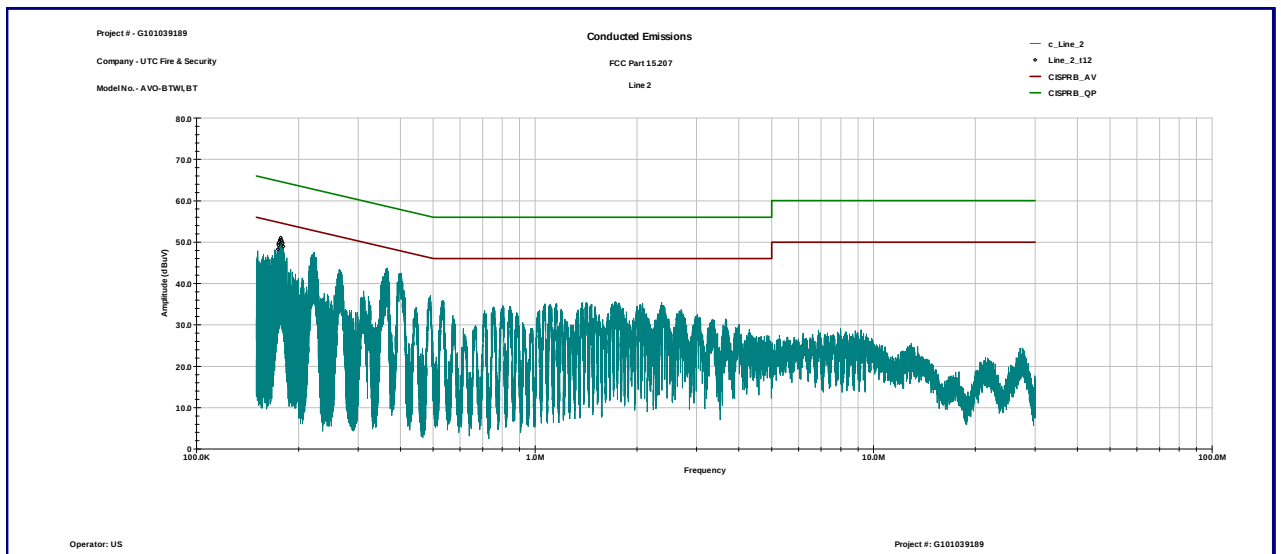
Frequency	Peak dBμV	QP Limit dBμV	AVG Limit dBμV	QP Margin dB	AVG Margin dB
173.73 KHz	48.9	64.8	54.8	-15.8	-5.8
176.14 KHz	51.0	64.7	54.7	-13.7	-3.7
177.42 KHz	51.3	64.6	54.6	-13.3	-3.3
178.74 KHz	50.9	64.5	54.5	-13.6	-3.6
755.28 KHz	33.3	56.0	46.0	-22.7	-12.7
1.456 MHz	34.9	56.0	46.0	-21.1	-11.1

Line 2

Frequency	Peak dBμV	QP Limit dBmV	AVG Limit dBmV	QP Margin dB	AVG Margin dB
173.65 KHz	48.3	64.8	54.8	-16.5	-6.5
174.27 KHz	49.6	64.8	54.8	-15.2	-5.2
177.11 KHz	51.1	64.6	54.6	-13.6	-3.6
178.35 KHz	50.5	64.6	54.6	-14.1	-4.1
844.43 KHz	34.3	56.0	46.0	-21.7	-11.7
1.770 MHz	35.2	56.0	46.0	20.8	-10.8



Graph 3.9.1



Graph 3.9.2



3.10 Receiver/digital device radiated emissions

Test location: ☐ OATS ☒ Anechoic Chamber

Test distance: ☐ 10 meters ☒ 3 meters

Test result: **Pass**

Frequency range: 30MHz-13000MHz

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 3.10.1 and Graphs 3.10.1and 3.10.2)

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-13000MHz	

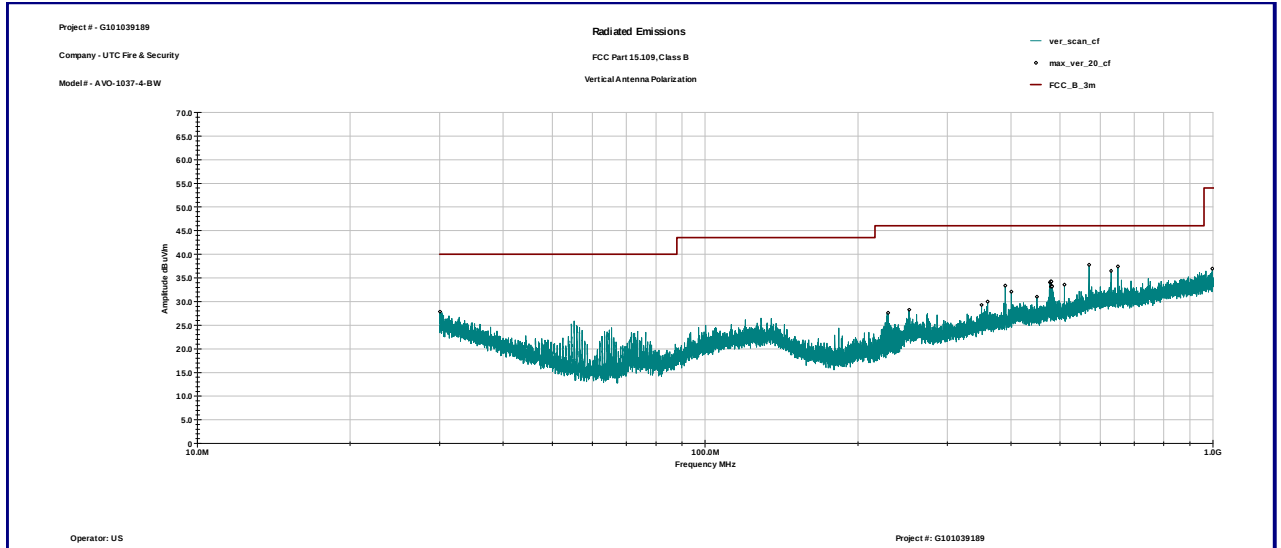
Table 3.10.1

Frequency	Ant. Polarity	Peak Reading dB μ V	Total C.F. dB1/m	Total at 3m dB μ V/m	Limit dB μ V/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

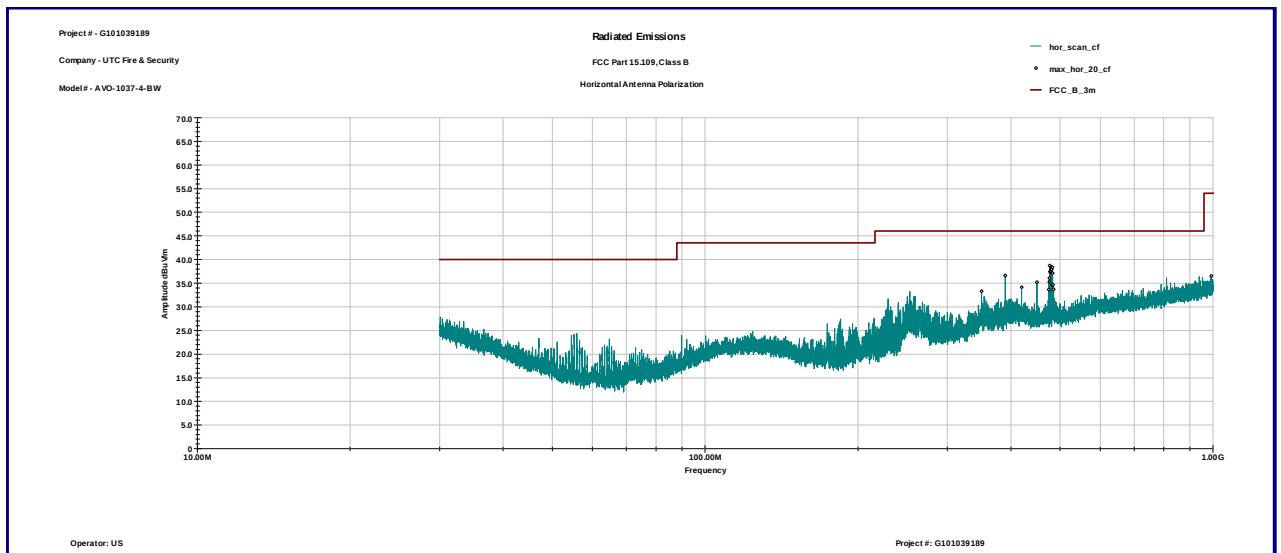


Graph 3.10.1

Vertical antenna polarization



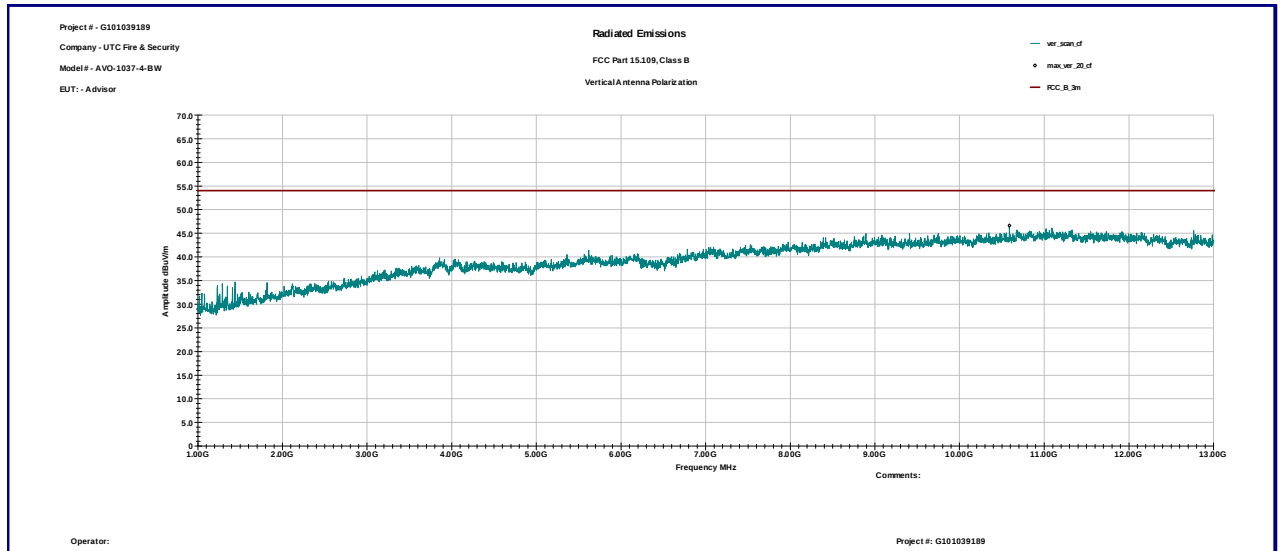
Horizontal antenna polarization



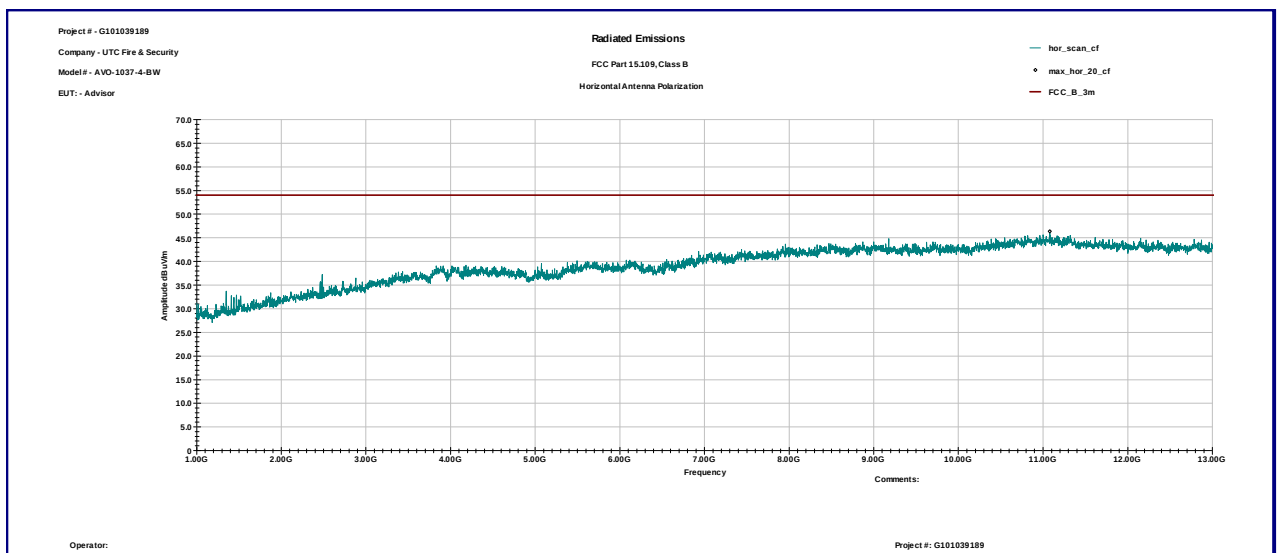


Graph 3.10.2

Vertical antenna polarization



Horizontal antenna polarization





3.11 Digital device conducted emissions

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 3.11.1

Line 1

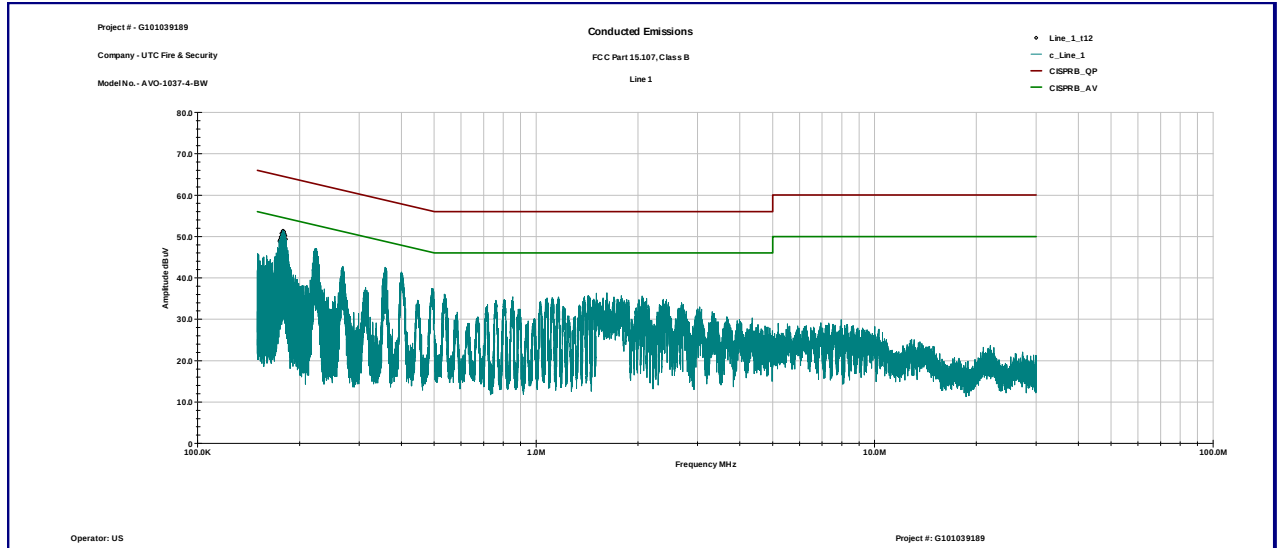
Frequency MHz	QP dBμV	AVG dBμV	Cable Loss dB	QP Lim dBμV	AVG Lim dBμV	QP Margin dB	AVG Margin dB
0.180	49.0	35.5	0.1	64.5	54.5	-15.4	-18.9
0.222	45.1	34.6	0.1	62.7	52.7	-17.5	-18.0
0.267	39.9	32.8	0.1	61.2	51.2	-21.2	-18.3
0.358	40.2	34.3	0.1	58.8	48.8	-18.4	-14.3
0.400	39.9	36.7	0.1	57.9	47.9	-17.8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

Line 2

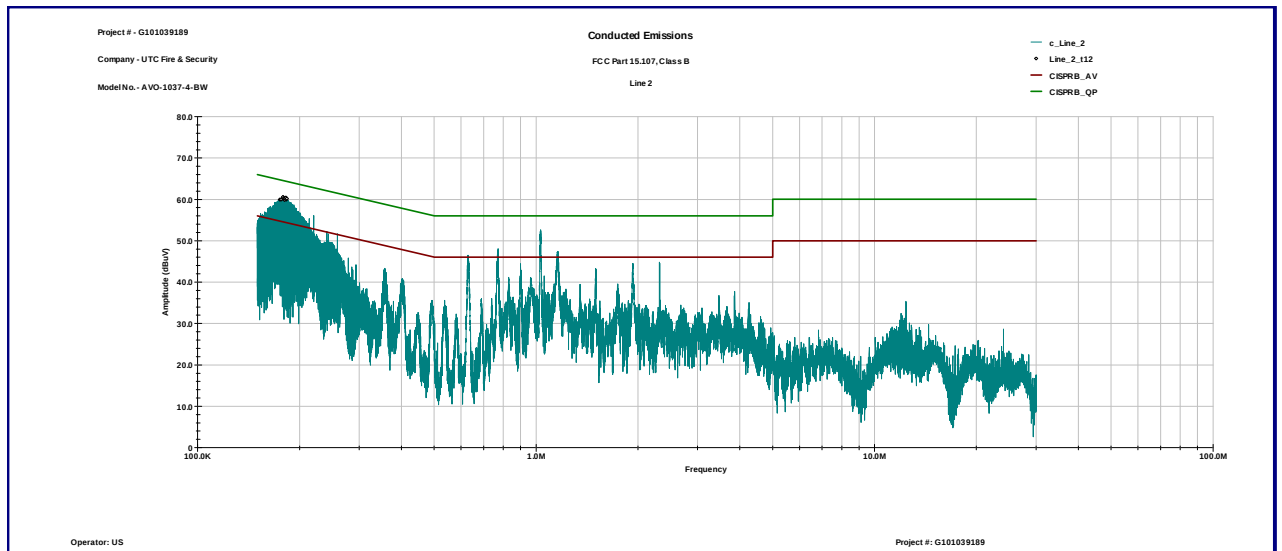
Frequency MHz	QP dBμV	AVG dBμV	Cable Loss dB	QP Lim dBμV	AVG Lim dBμV	QP Margin dB	AVG Margin dB
0.182	54.4	38.2	0.1	64.4	54.4	-9.9	-16.1
0.630	45.5	41.4	0.2	56.0	46.0	-10.3	-4.4
0.770	46.2	42.5	0.2	56.0	46.0	-9.6	-3.3
1.030	43.3	39.8	0.2	56.0	46.0	-12.5	-6.0
1.158	38.6	34.0	0.2	56.0	46.0	-17.2	-11.8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

Graph 3.11.1

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	☒