TEST REPORT

Report Number: 101808378MIN-001
Project Number: G101808378

Testing performed on the
W300
FCC ID: TZF-W300
Industry Canada ID: 7659A-W300

to
47 CFR Part 25:2013
RSS- 170, Issue 2, 2011
RSS-Gen, Issue 3, 2010

For
Advanced Telemetry Systems, Inc.

Test Performed by:	Test Authorized by:
Intertek Testing Services NA, Inc.	Advanced Telemetry Systems, Inc.
7250 Hudson Blvd., Suite 100	470 1st Avenue N
Oakdale, MN 55128 USA	Isanti, MN 55040, USA

Prepared by: Richard Blonigen — Date: October 28, 2014

Reviewed by: Uri Spector — Date: October 28, 2014

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1.0 GENERAL DESCRIPTION

Model:	W300
Type of EUT:	GPS Tracking device
FCC ID:	TZF-W300
Industry Canada ID:	7659A-W300
Related Submittal(s) Grants:	None
Company:	Advanced Telemetry Systems, Inc.
Customer:	Mr. Larry Kuechle
Address:	470 1st Avenue N Isanti, MN 55040, USA
Phone:	763-444-9267
Fax:	763-444-9384
Email:	lkuechle@atstrack.com
Test Standards:	☒ 47 CFR, Part 25:2013 ☒ RSS–170, Issue 2, 2011 ☒ RSS-Gen, Issue 3, 2010 ☐ 47 CFR, Part 15:2013, §15.107 and §15.109, Class ☐ ICES-003, Issue 5:2012 ☐ Other
Type of radio:	☐ Stand -alone ☐ Module ☐ Hybrid
Date Sample Submitted:	September 22, 2014
Test Work Started:	September 22, 2014
Test Work Completed:	October 1, 2014
Test Sample Conditions:	☐ Damaged ☐Poor (Usable) ☒ Good

1.1 Product Description; Test Facility

Product Description:	GPS Tracking device
Operating Frequencies	1611.2 – 1618.7 MHz
Operating Frequency Band:	1610 – 1626.6 MHz
Modulation:	G1D
Emission Designator:	2MOG1D
Antenna(s) Info:	Intergral
Antenna Installation:	☐ User ☐ Professional ☐ Factory
Transmitter Power Configuration:	☒ Internal battery ☐ External power source ☐ 120VAC ☐ 230VAC ☐ 400VAC ☒ 3.6 VDC ☐ Other: Amp. ☐ 50Hz ☐ 60Hz
Special Test Arrangement:	As a 3-D device, the EUT was rotated through three orthogonal axes to determine and tested with the maximum emissions
Test Facility Accreditation:	A2LA (Certificate No. 1427.01)
Test Methodology:	Measurements performed according to the procedures in ANSI C63.10-2009

1.2 EUT Configuration

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

☐ - Standby
☒ - Continuous
☐ - Continuous un-modulated
☐ - Test program (customer specific)
☐ -

Operating modes of the EUT:

No.	Description
1	The EUT was pre-programmed to transmit continuously at 1611, 1613, 1616, and 1618 MHz

Cables:

No.	Type	Length	Designation	Note
1	None			

Support equipment/Services:

No.	Item	Description
1		DC Power Supply

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
☒ **Supply voltage:**	85% to +115%

1.4 Measurement uncertainty

The expanded uncertainty (k = 2) for radiated emissions from 30 to 1000 MHz has been determined to be: ±4 dB at 10m and ±5.4 dB at 3m

The expanded uncertainty (k = 2) for conducted emissions from 150 kHz to 30 MHz 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
25.204	Power Limits	Pass
25.202(f)	Emissions Limitations for Mobile Earth Statiions	Pass
25.202(f)	Emissions Mask	Pass
25.216(c)(g)(i)	Emissions Limits for Mobile Earth Stations	Pass
25.202(d)	Frequency Tolerance	Pass

General notes: A 20dB attenuator was connected in series for Conducted measurements to protect Spectrum Analyzer. Therefore, 20dB needs to be added to all Conducted measurements.

3.0 TEST CONDITIONS AND RESULTS

3.1 Power Limits, Part 25.204

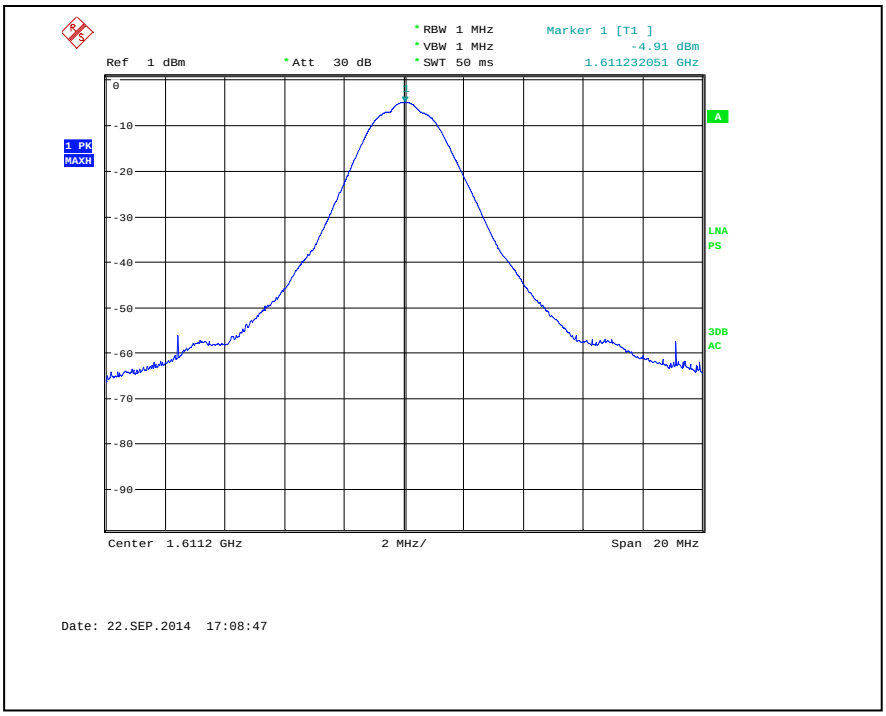
Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test result: **Pass**

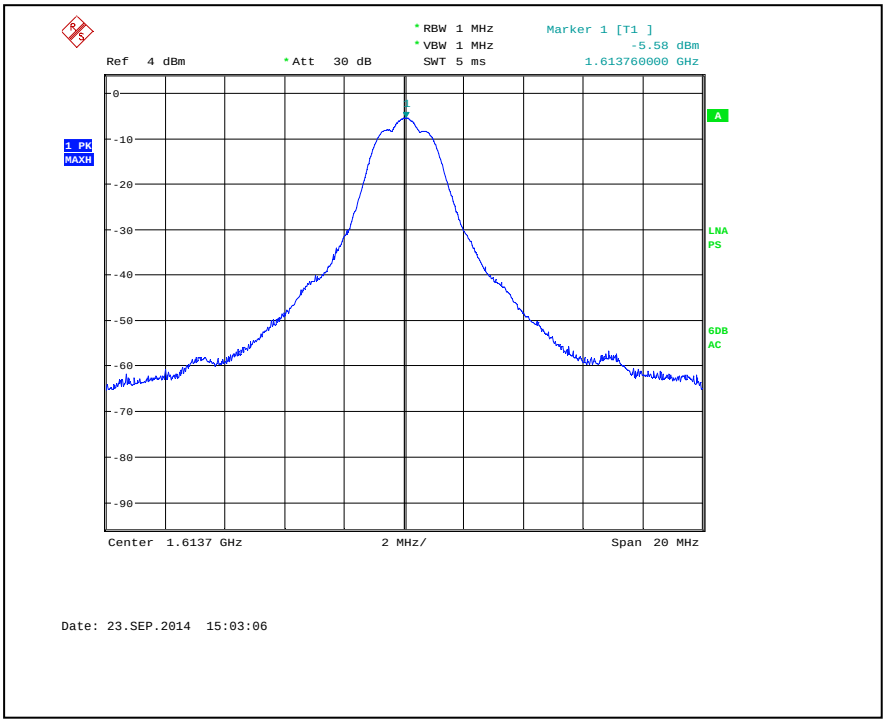
Max. Margin: 54.91dB below the limits

Power Output:	**Conducted**				
Frequency MHz	**Measured power dBm**	**Attenuaton dB**	**Power at Antenna dBm**	**Limit dBm**	**Margin dB**
1611.2	-4.91	20	15.09	70	-54.91
1613.7	-5.58	20	14.42	70	-55.58
1616.3	-5.77	20	14.23	70	-55.77
1618.7	-5.53	20	14.47	70	-55.53
RBW: **VBW:**	☒ 1MHz ☐ 3MHz ☐ 10MHz ☒ 1MHz ☐ 3MHz ☐ 10MHz				
Antenna Gain:	☐ < 6dBi ☐ >6dBi and = dBi, Output power reduction = dB				

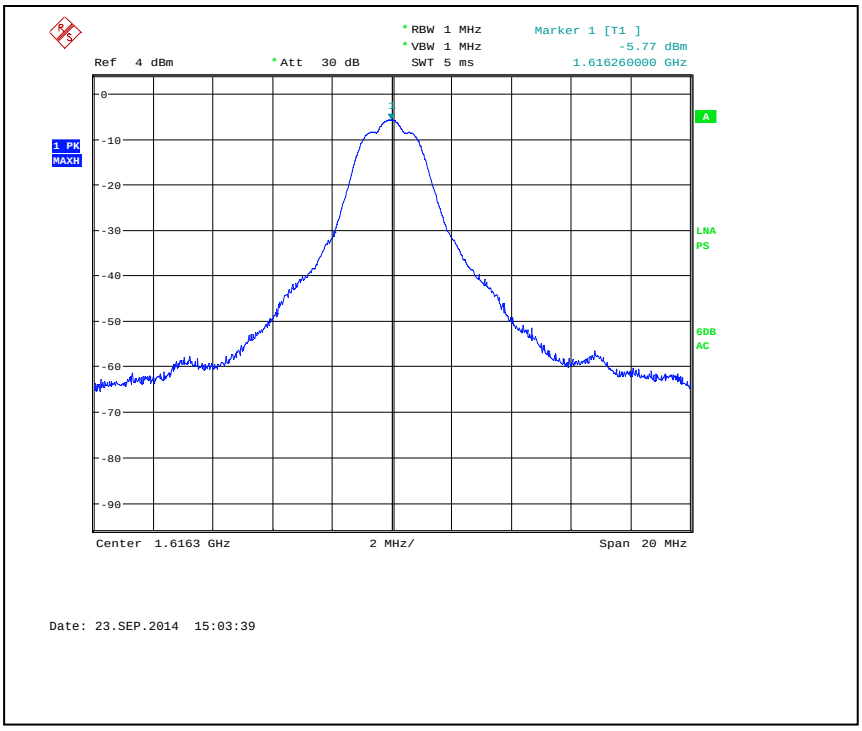
Notes:



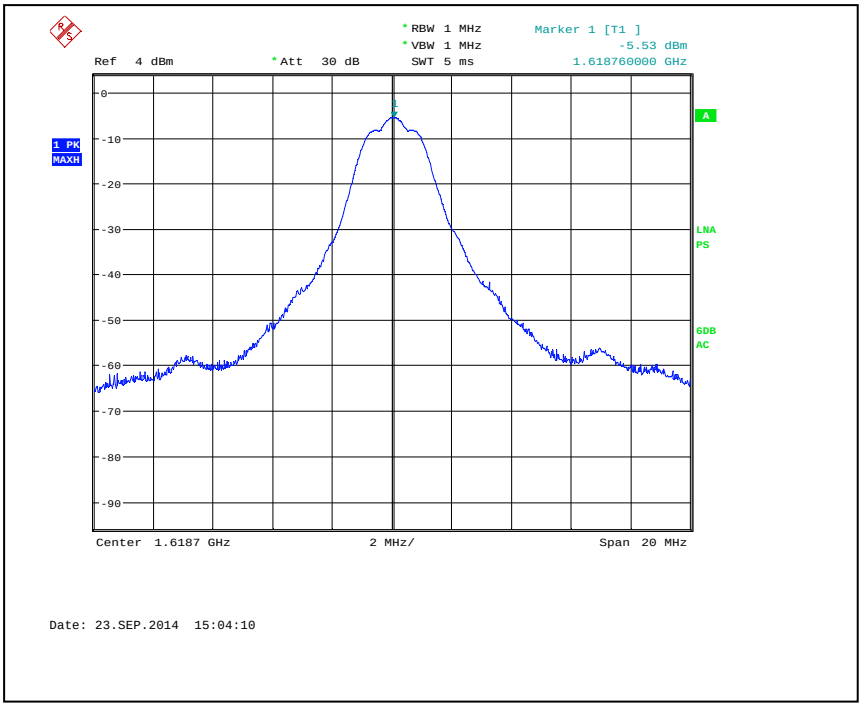
Graph 3.1.1



Graph 3.1.2



Graph 3.1.3



Graph 3.1.4

3.2 Emissions Limitations for Mobile Earth Stations

3.2.1 Spurious Emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

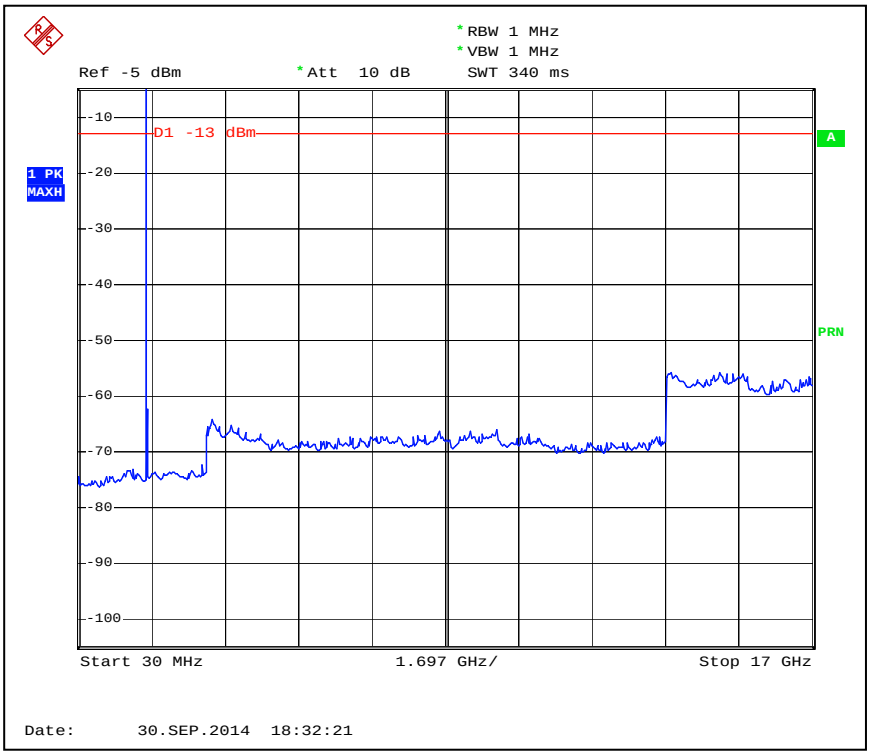
Measurement: ☒ Conducted ☒ Radiated

Test result: **Pass**

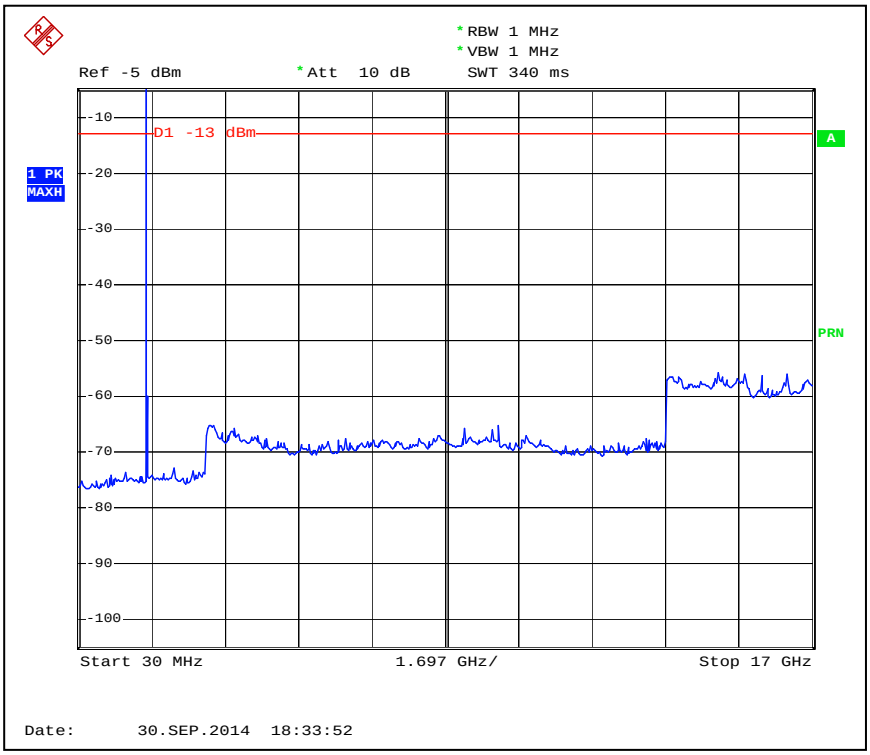
Frequency Range: **30MHz – 17GHz**

Notes:

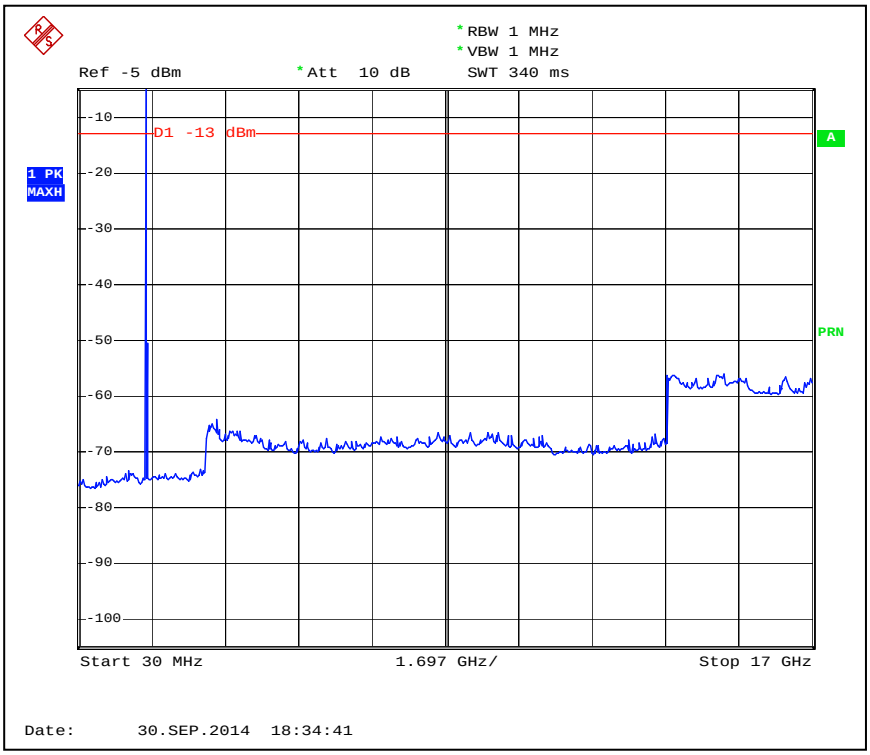
1. Fundamental Emissions were not considered for Substitution measurements.
2. No emissions were within 20dB of limits therefore substitution measurements were not performed.
3. Graphs 3.2.1 – 3.2.4 show Conducted measurements
4. Graphs 3.2.5 – 3.2.12 show Radiated measurements



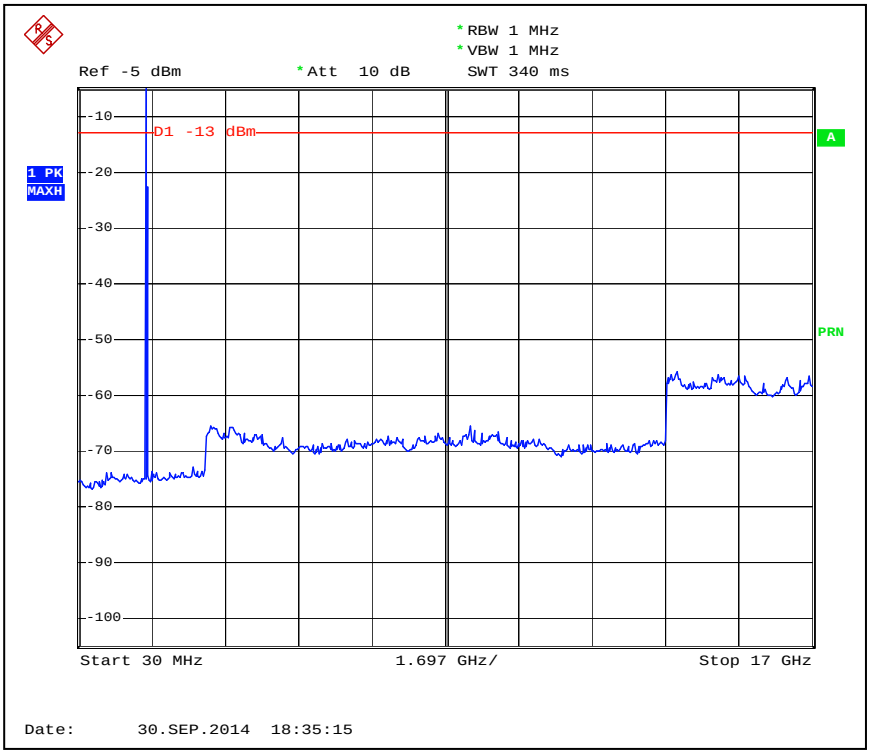
Graph 3.2.1



Graph 3.2.2



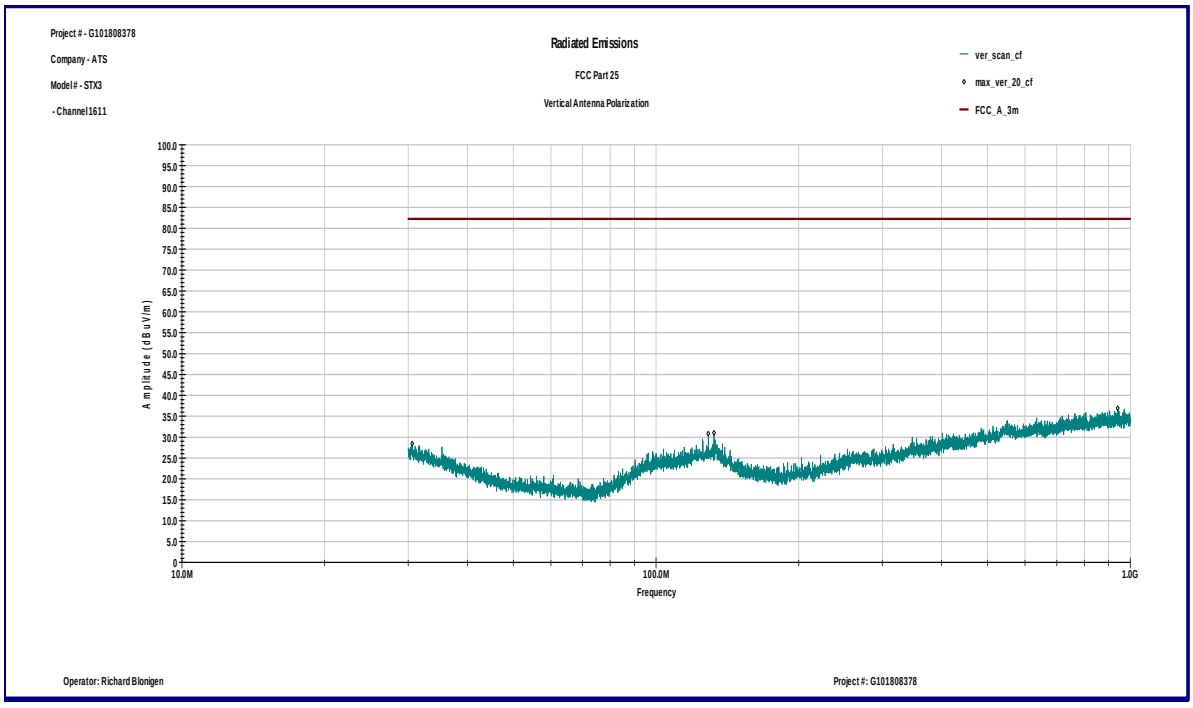
Graph 3.2.3



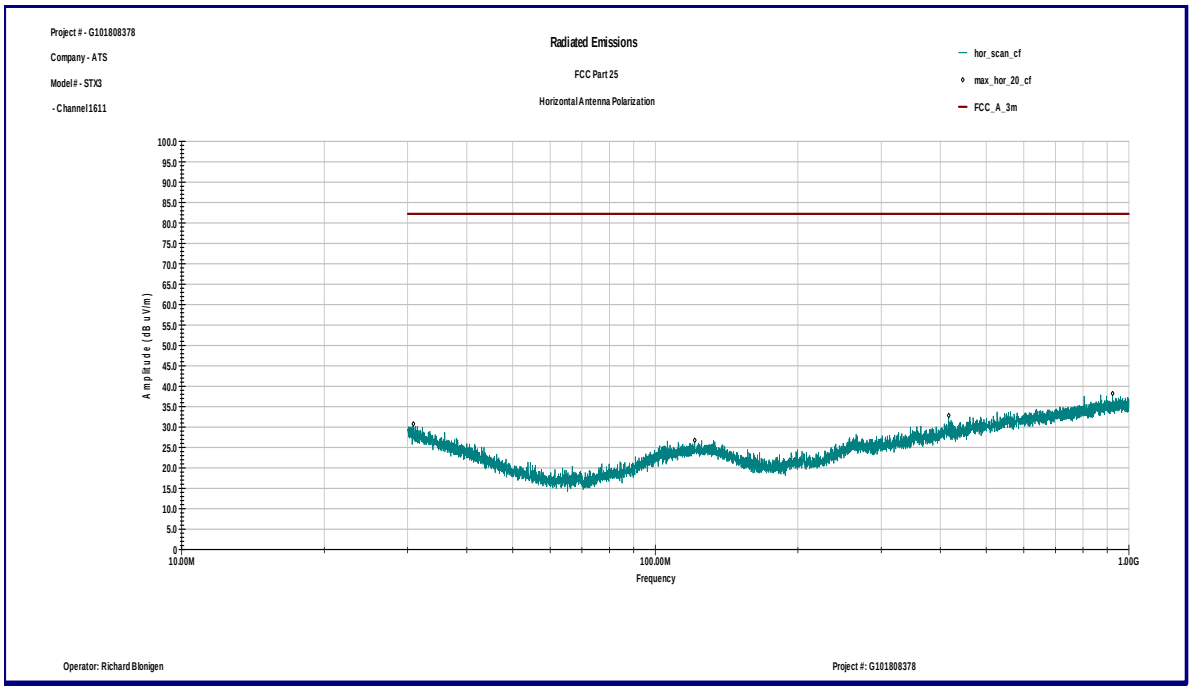
Graph 3.2.4

Graph 3.2.5

Vertical antenna polarization

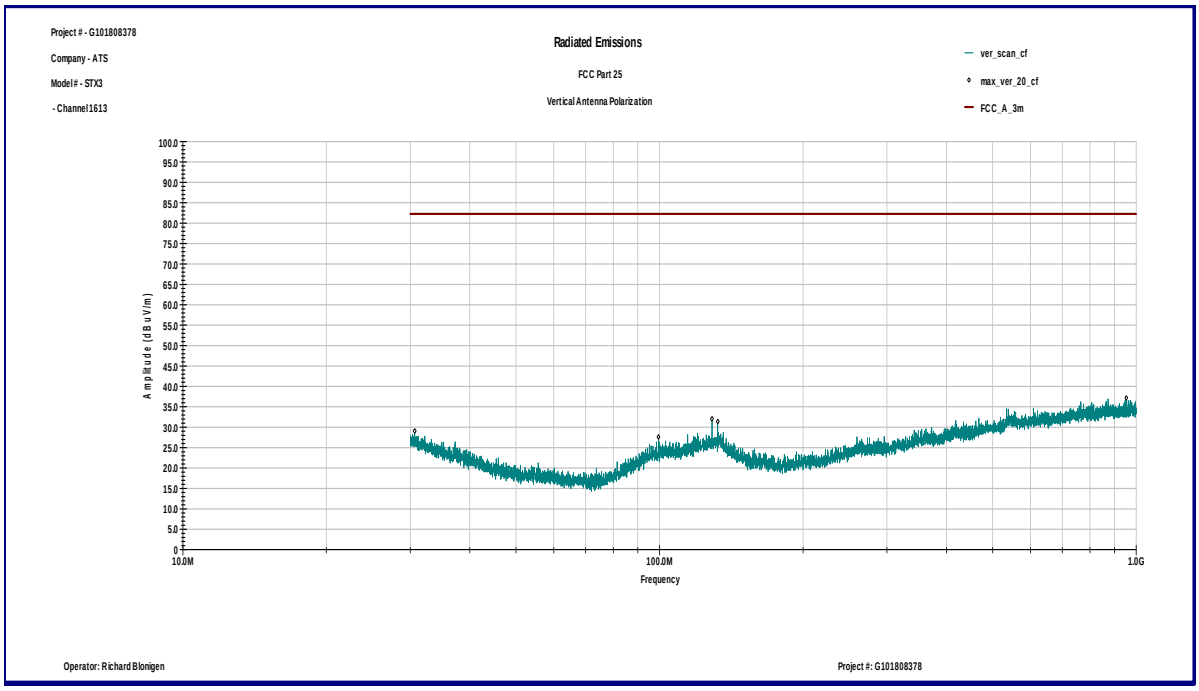


Horizontal antenna polarization

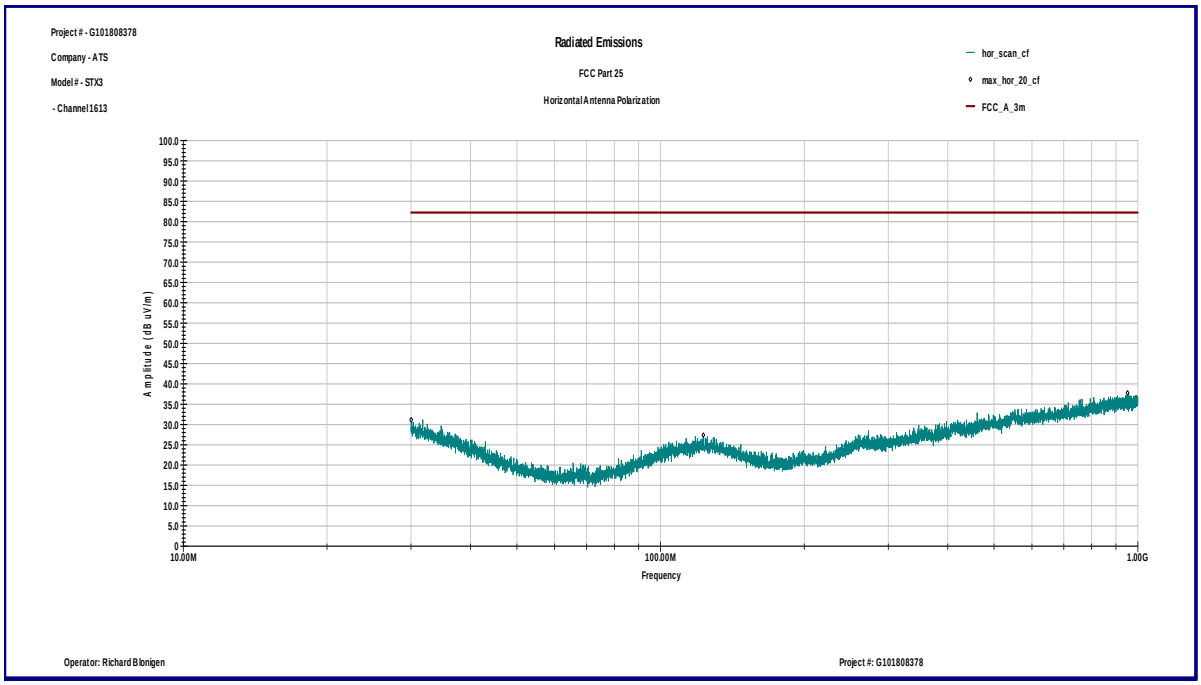


Graph 3.2.6

Vertical antenna polarization

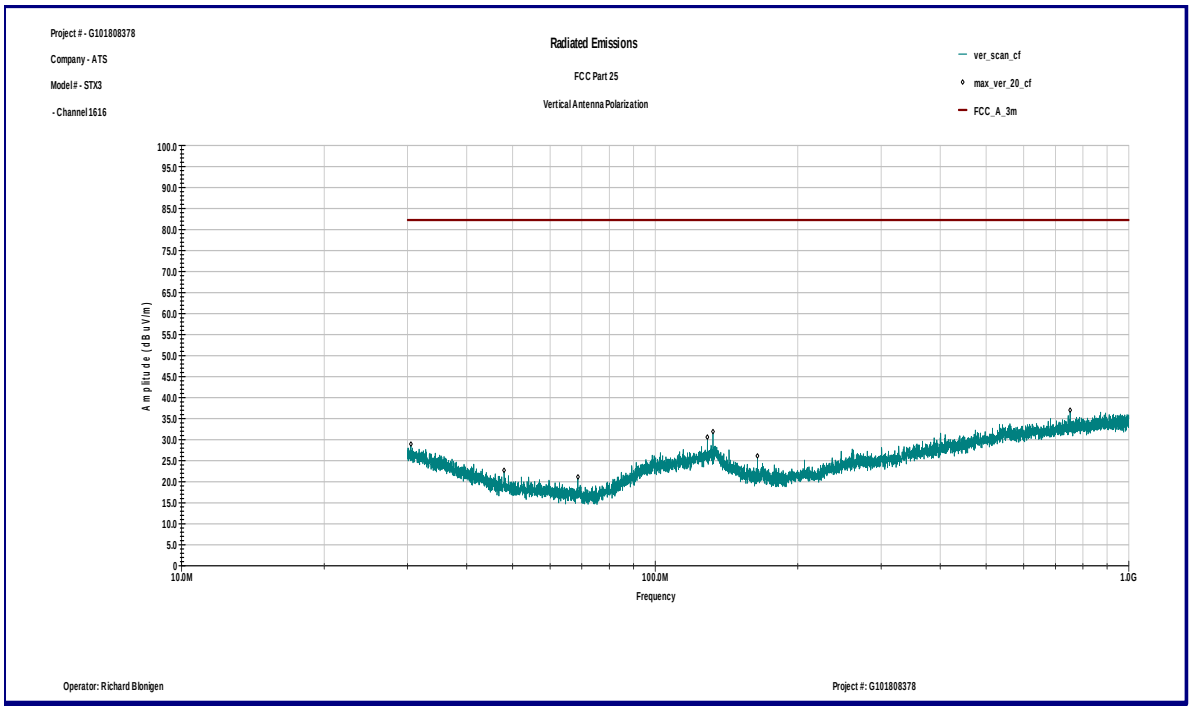


Horizontal antenna polarization

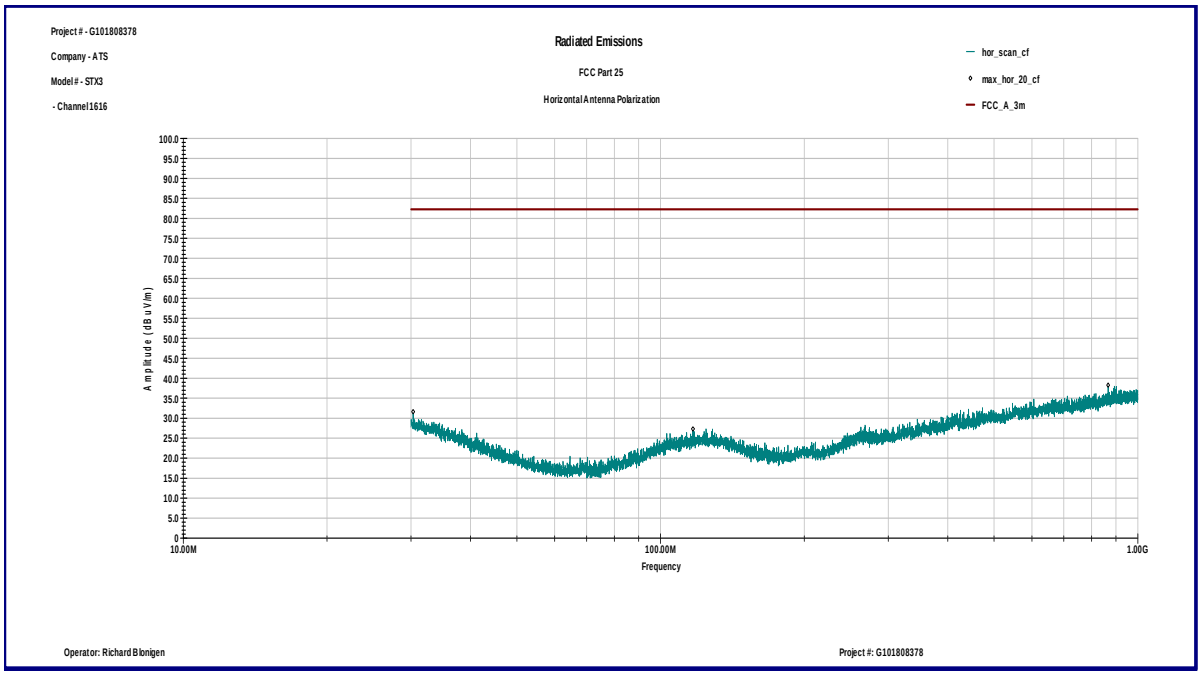


Graph 3.2.7

Vertical antenna polarization

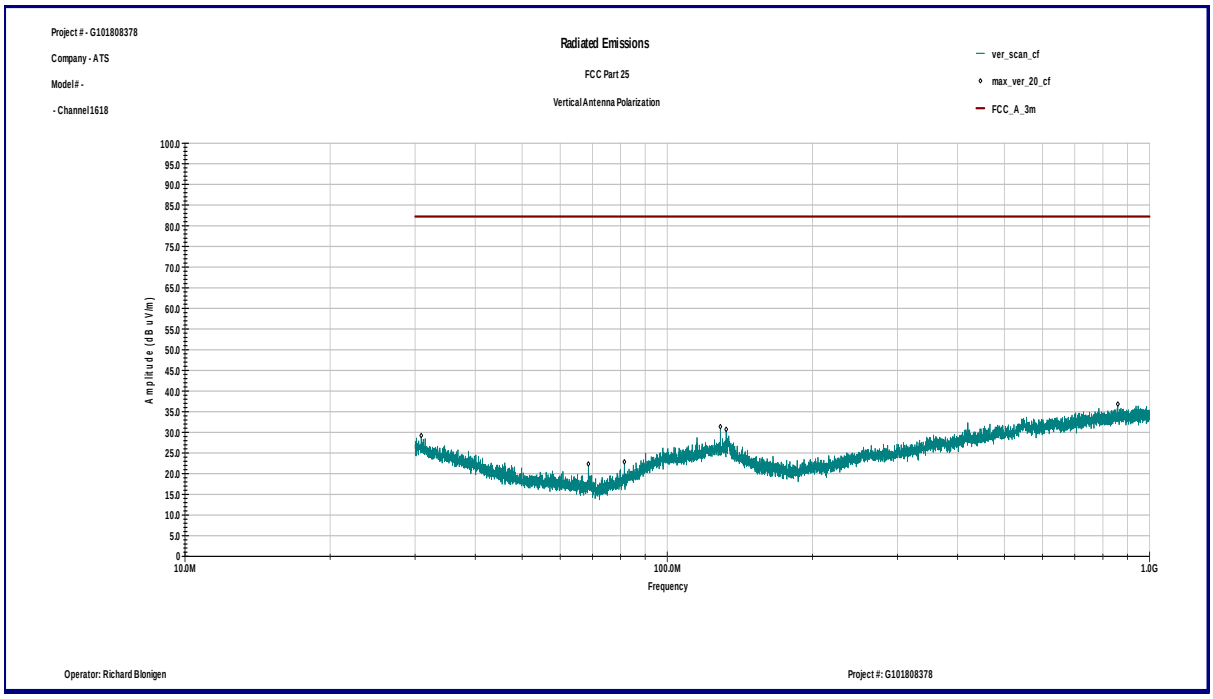


Horizontal antenna polarization

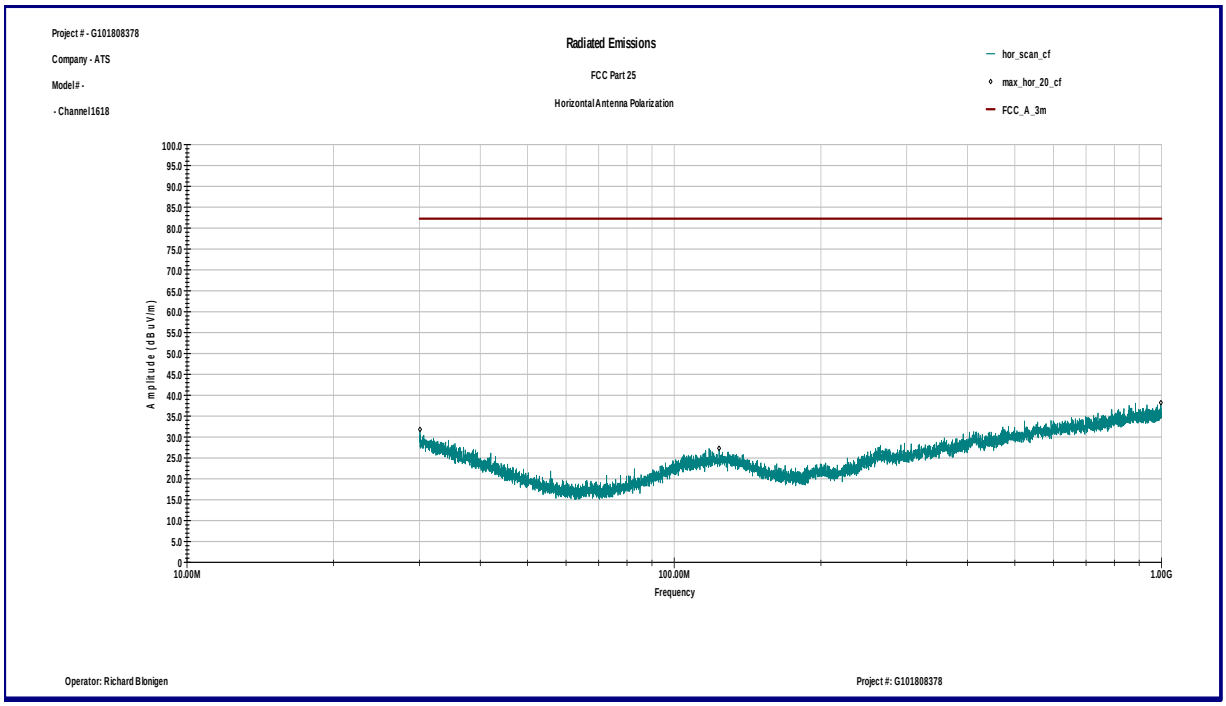


Graph 3.2.8

Vertical antenna polarization

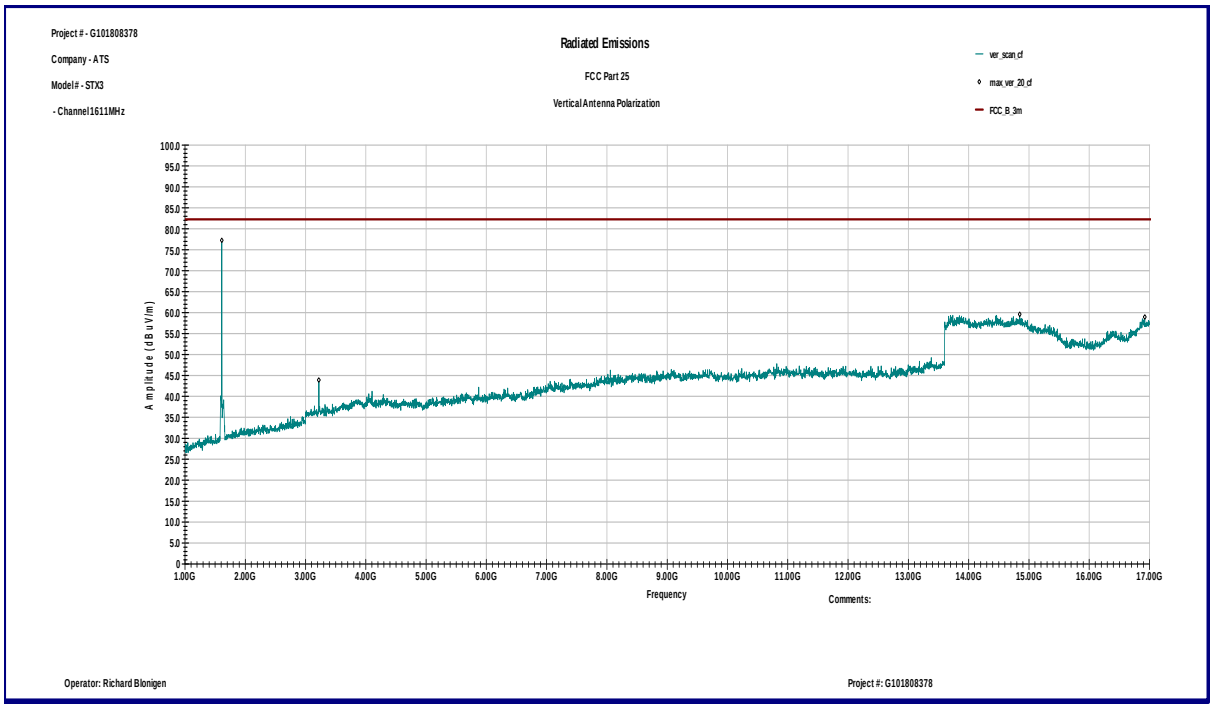


Horizontal antenna polarization

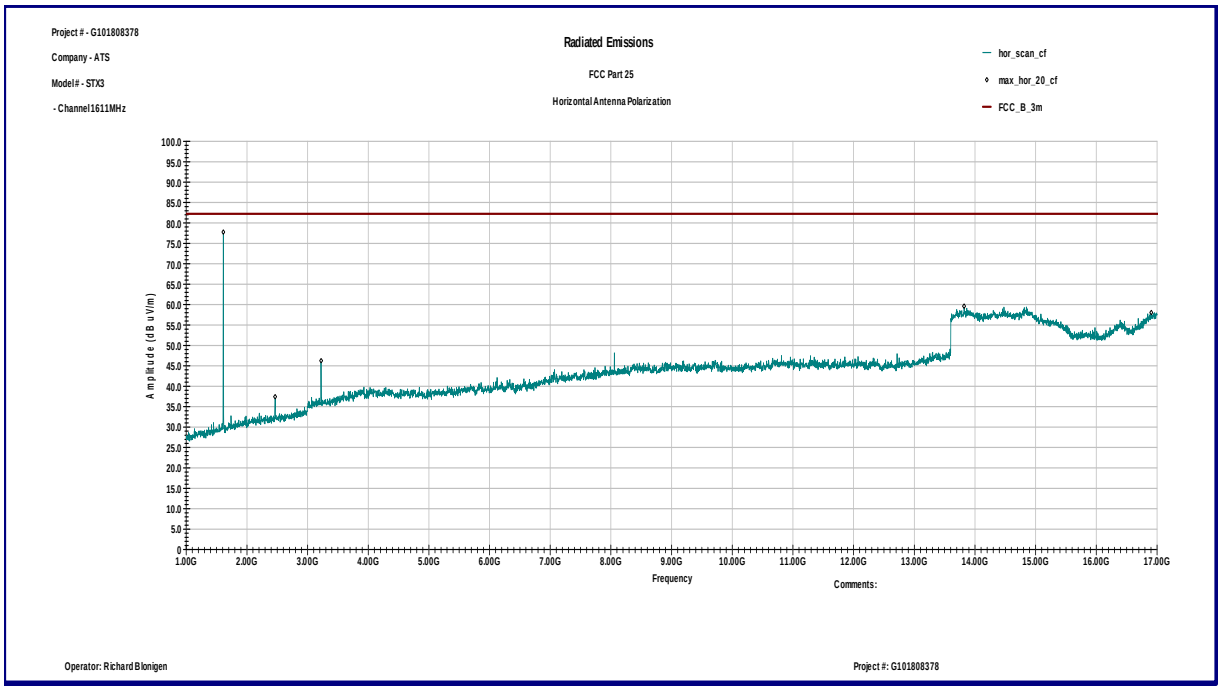


Graph 3.2.9

Vertical antenna polarization

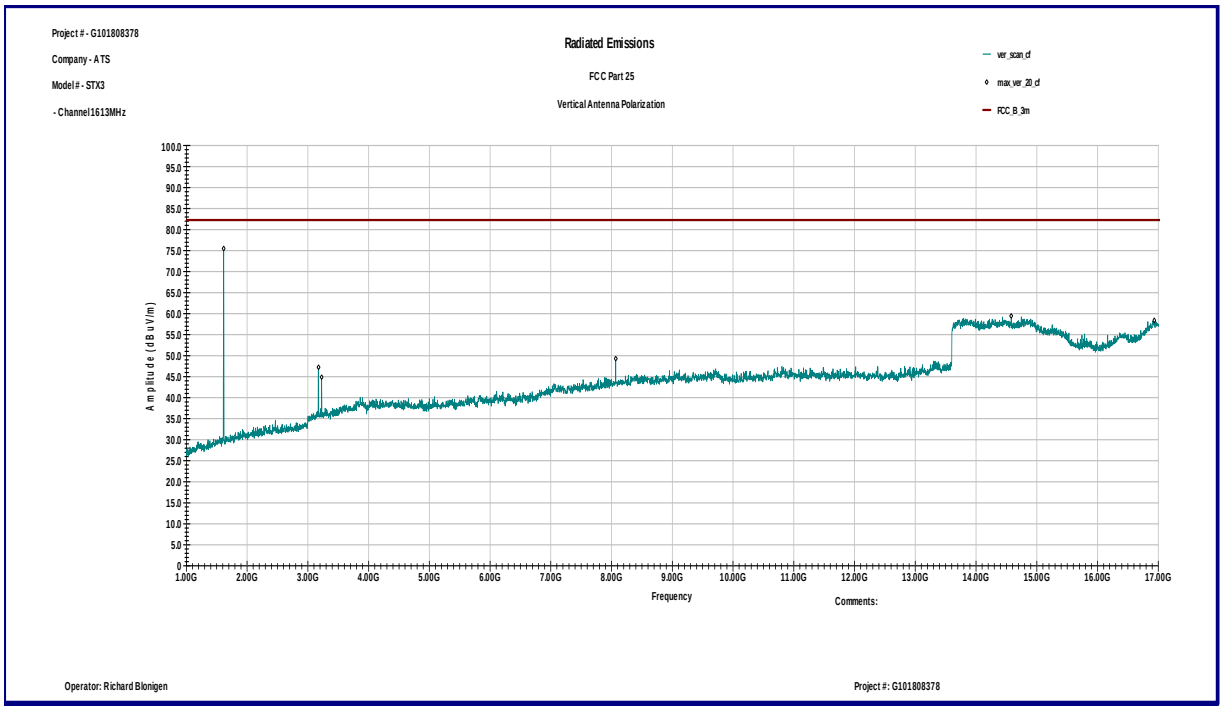


Horizontal antenna polarization

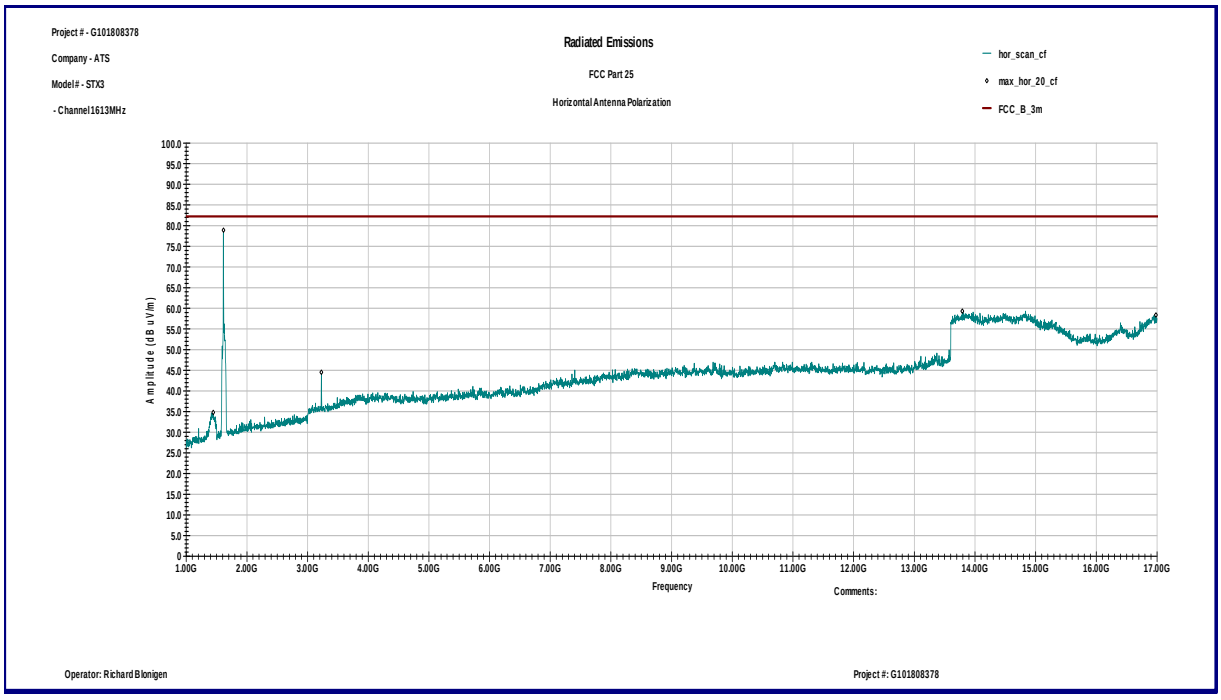


Graph 3.2.10

Vertical antenna polarization

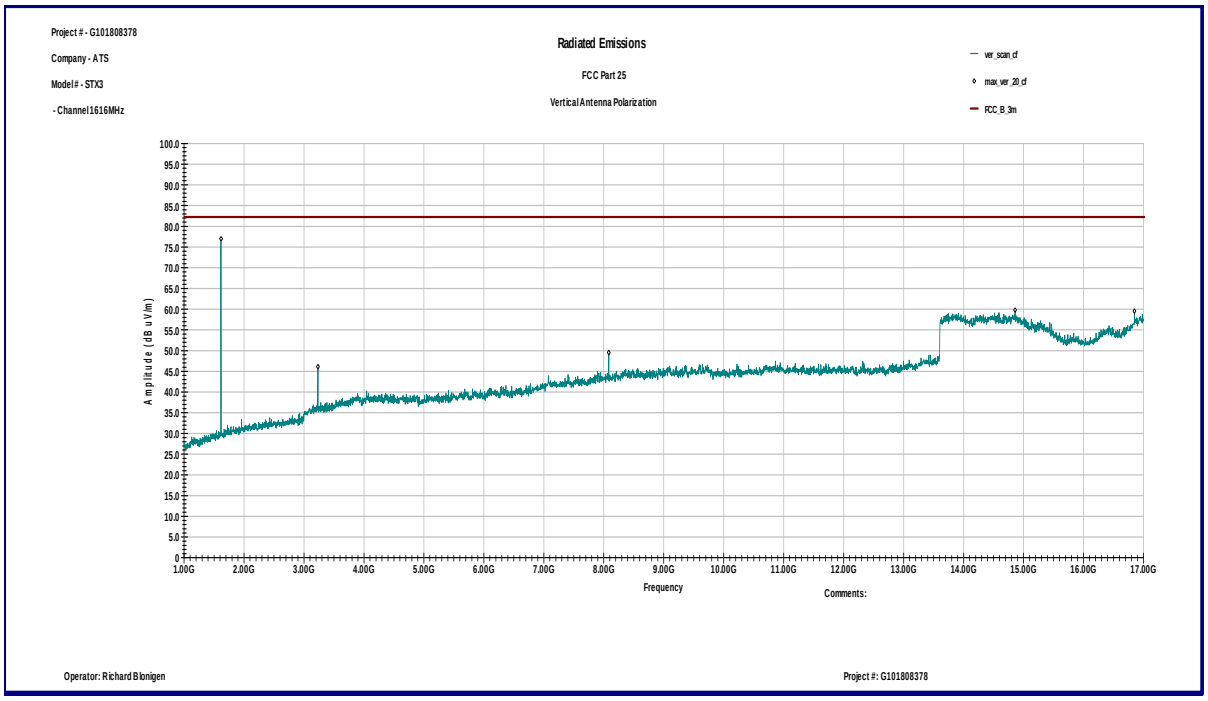


Horizontal antenna polarization

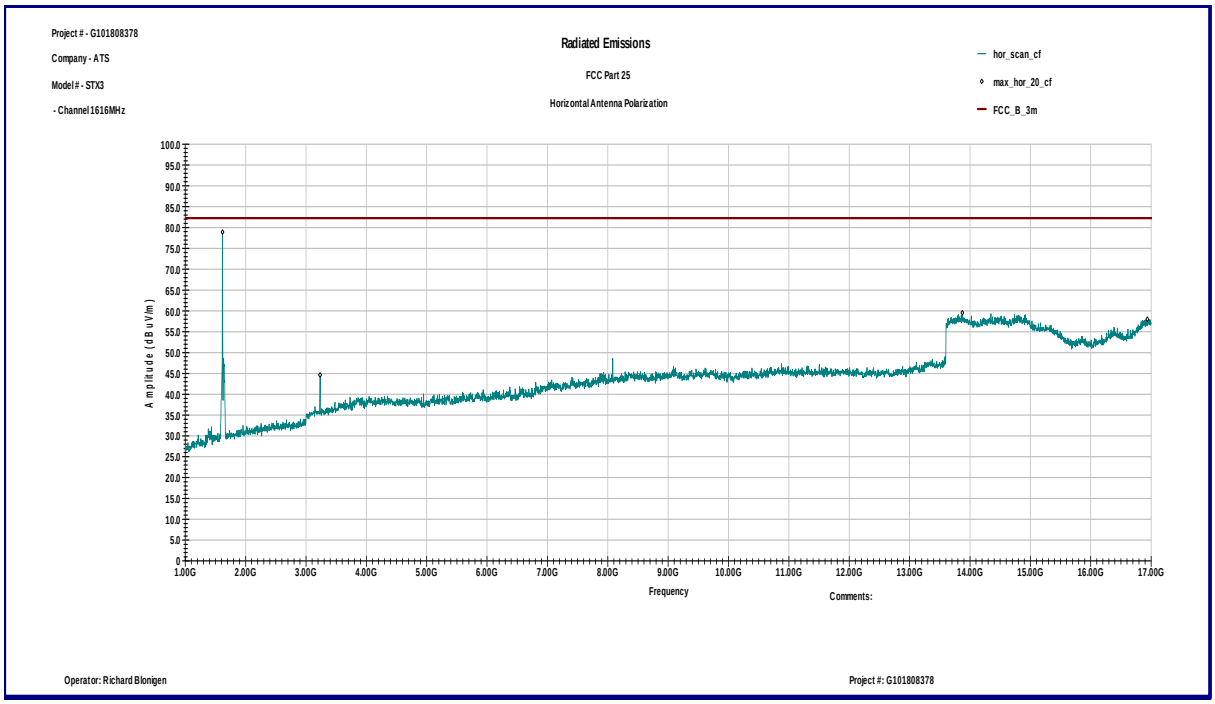


Graph 3.2.11

Vertical antenna polarization

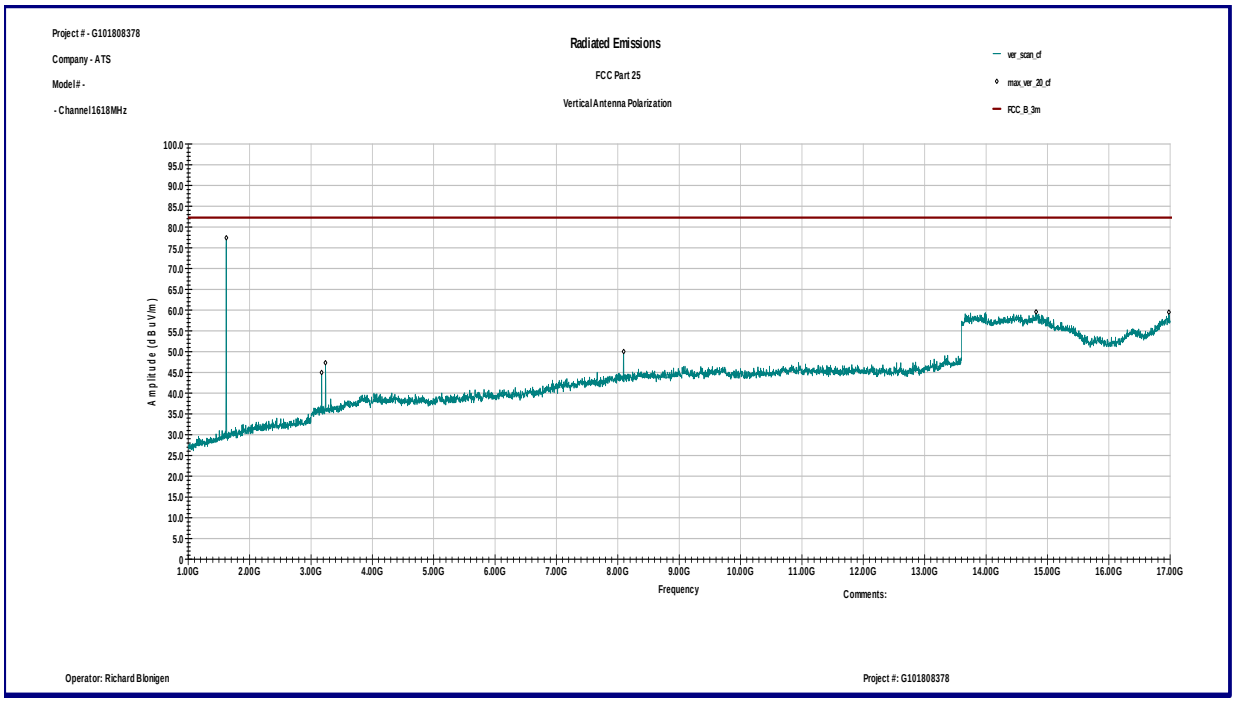


Horizontal antenna polarization

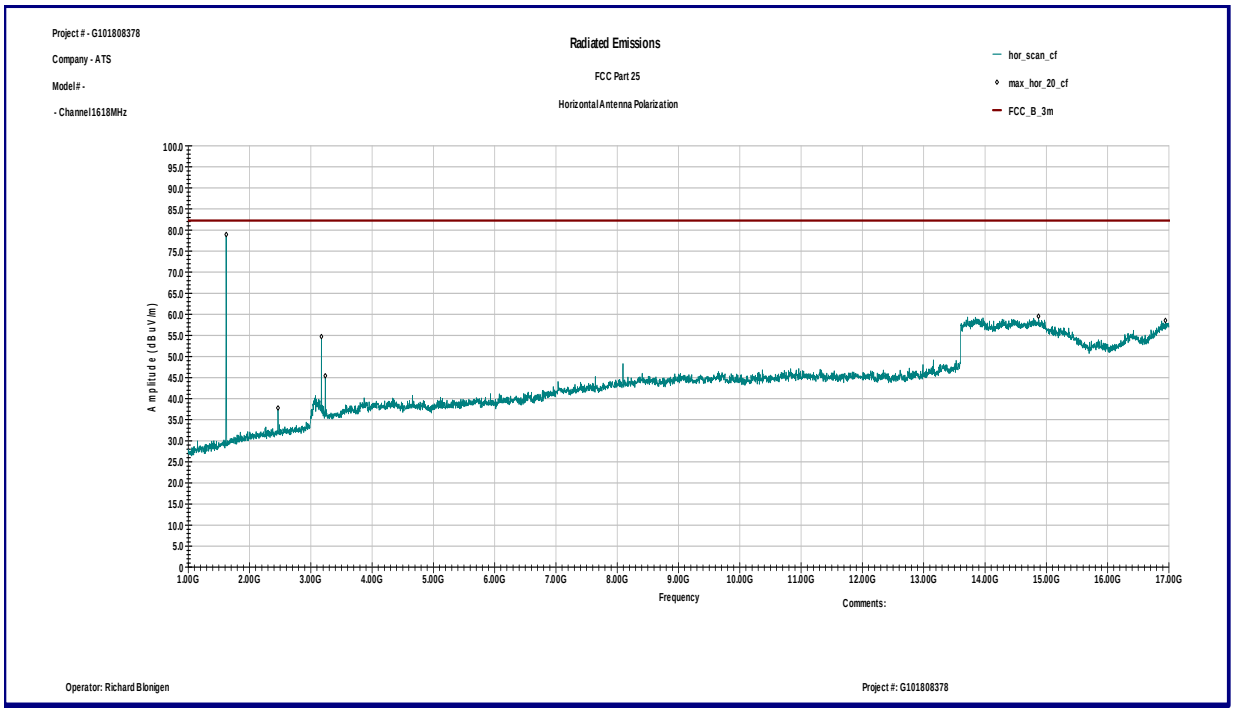


Graph 3.2.12

Vertical antenna polarization



Horizontal antenna polarization

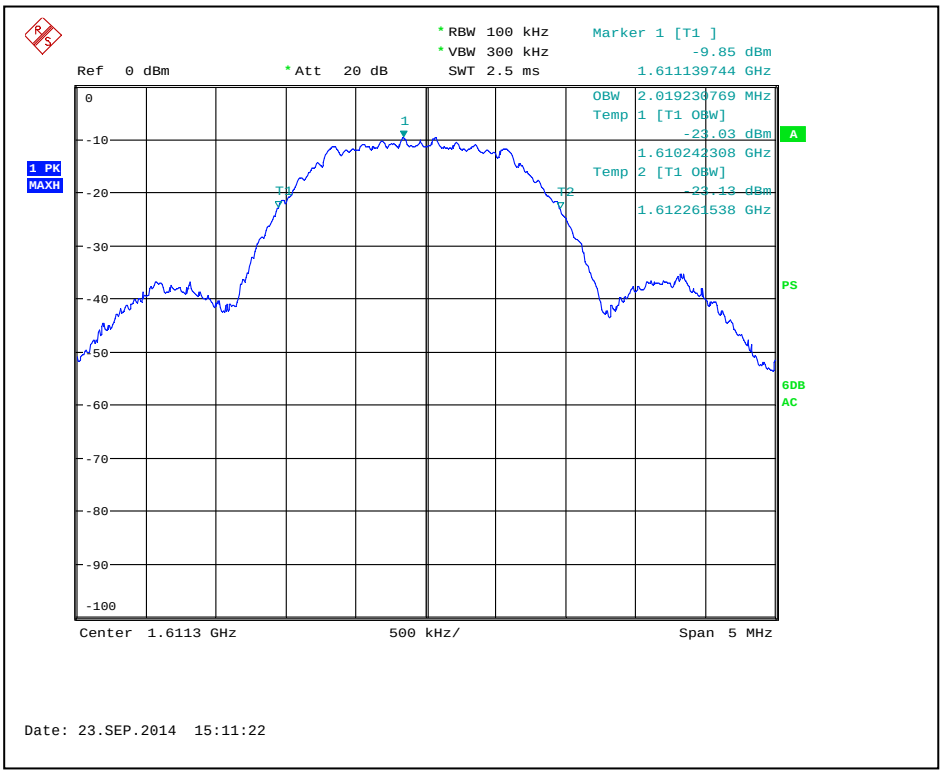


3.2.2 Occupied Bandwidth

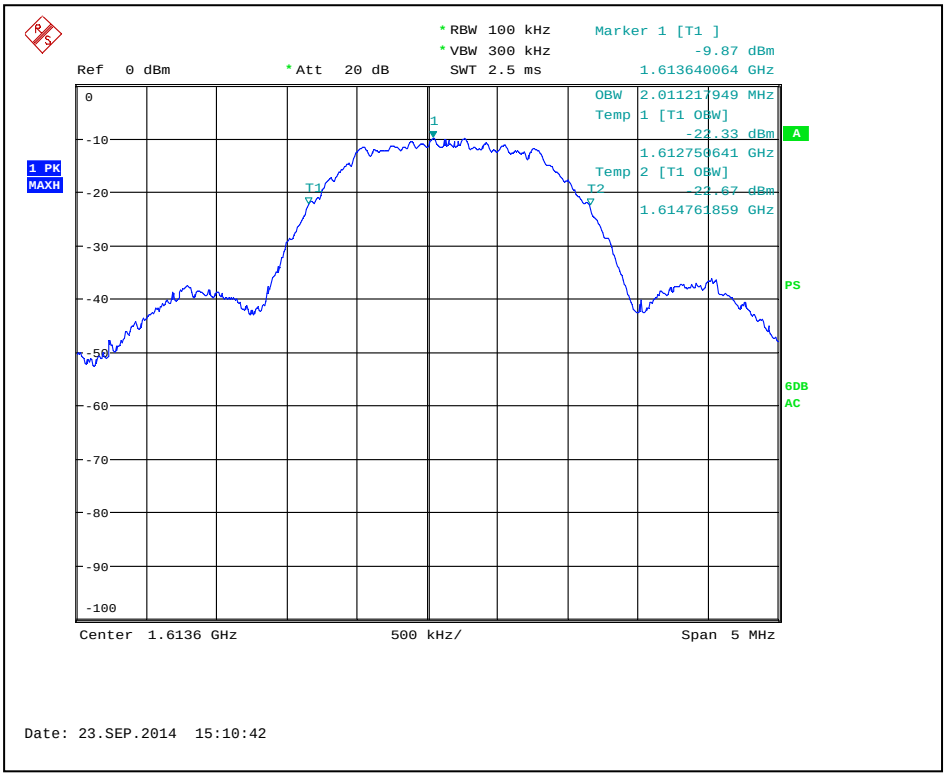
Center Frequency of operation MHz	Measured bandwidth MHz
1611.2	2.02
1613.7	2.01
1616.3	2.00
1618.7	2.01

Notes: There is no requirement for Occupied Bandwidth. However, the Emissions masks are based upon the occupied bandwidth. This information is for reference only and to determine the Emissions Designator.

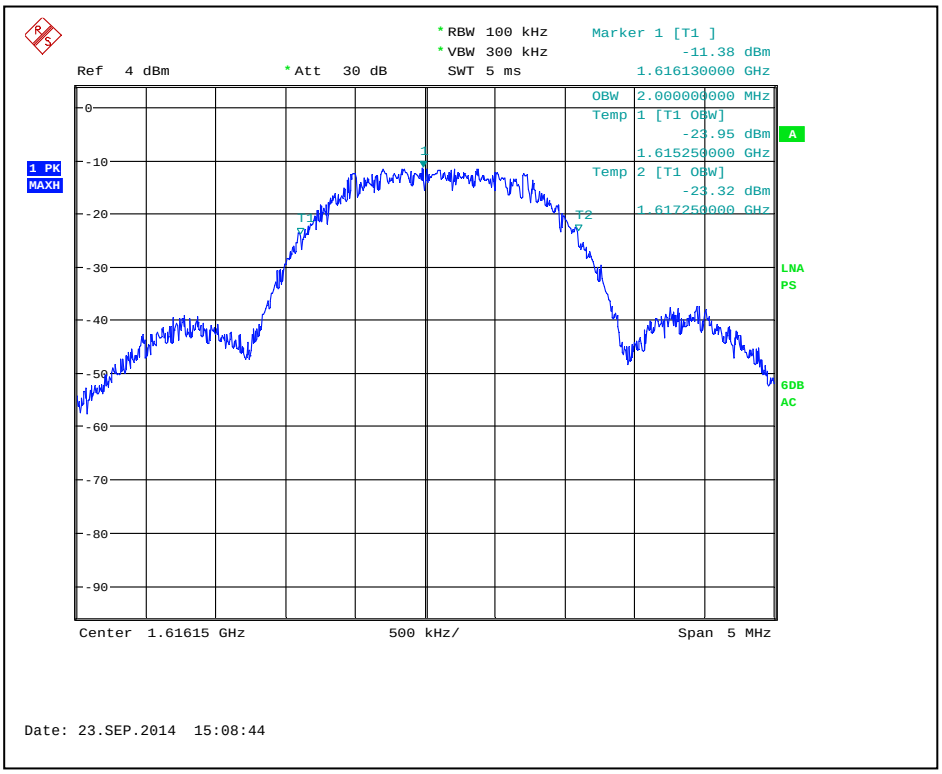
Graph 3.2.2.1



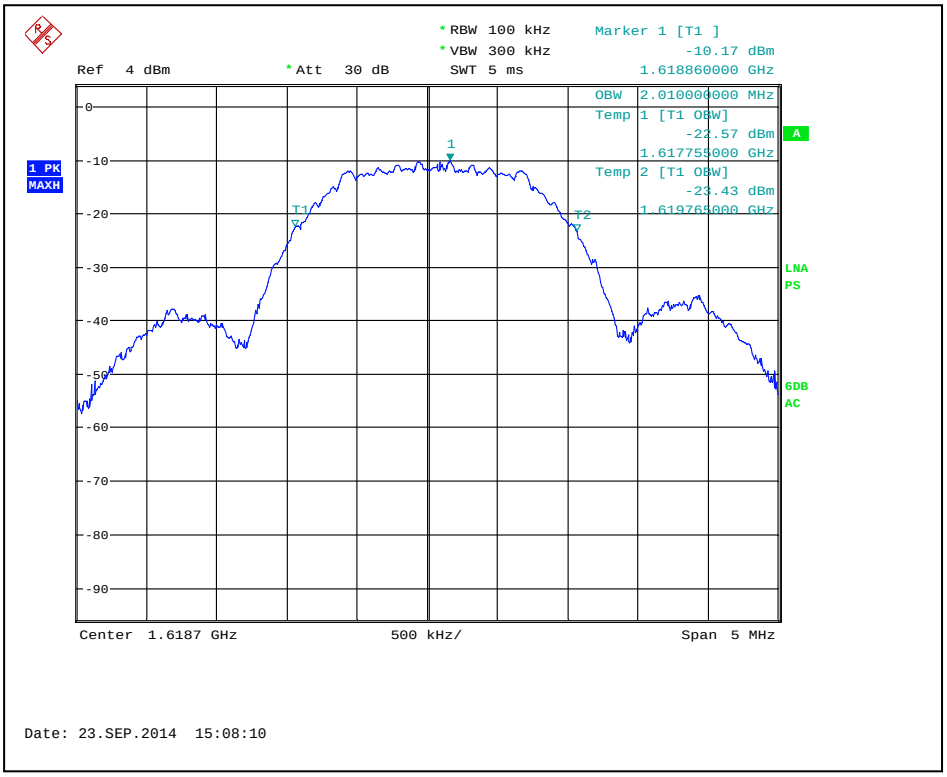
Graph 3.2.2.2



Graph 3.2.2.3



Graph 3.2.2.4

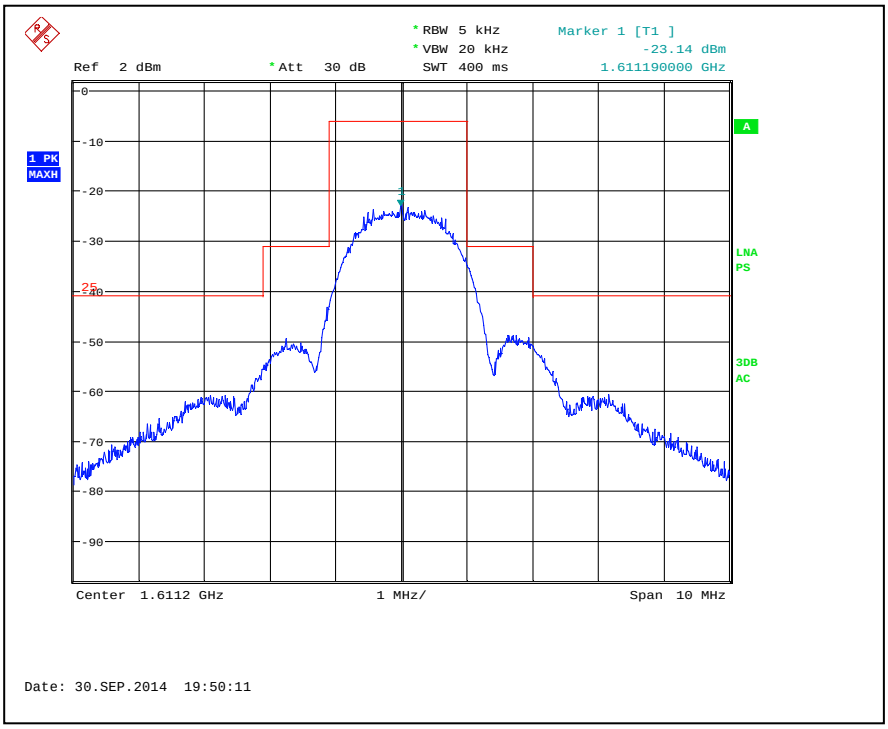


3.2.3 Emission Mask

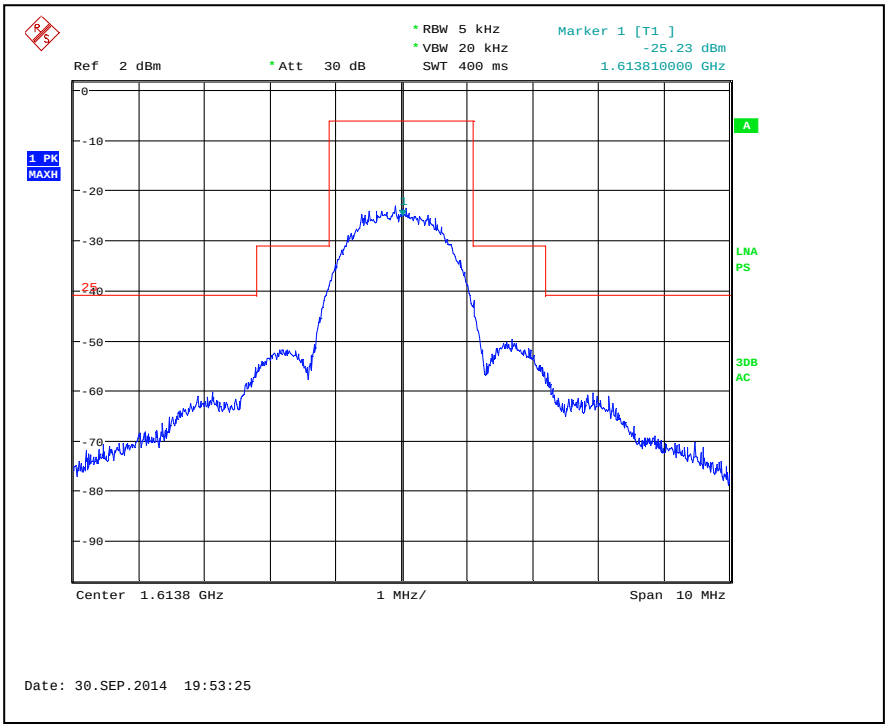
Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test result: **Pass**

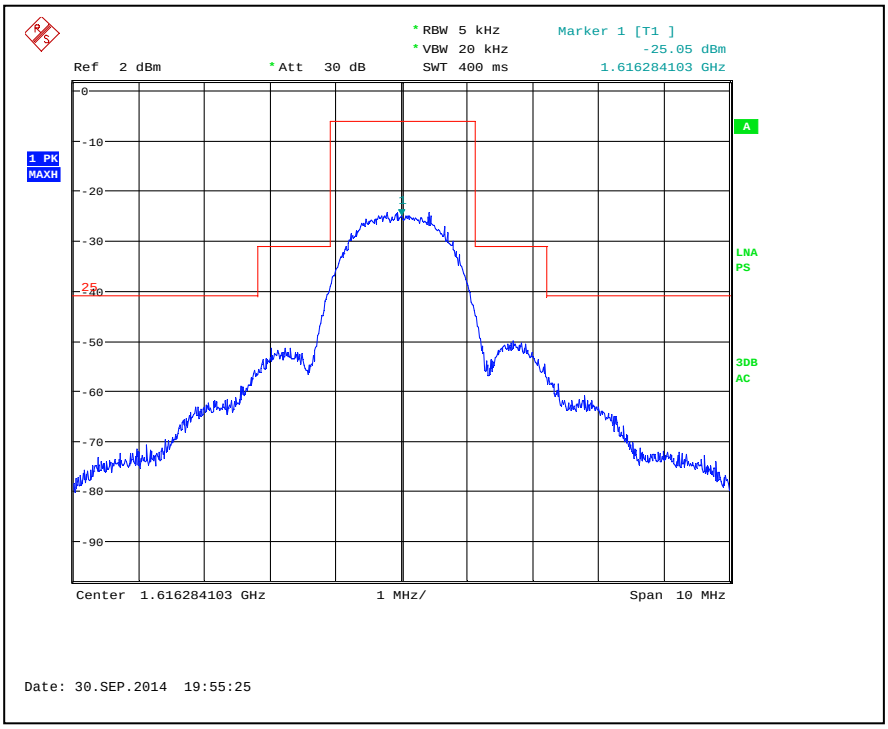
Notes: None



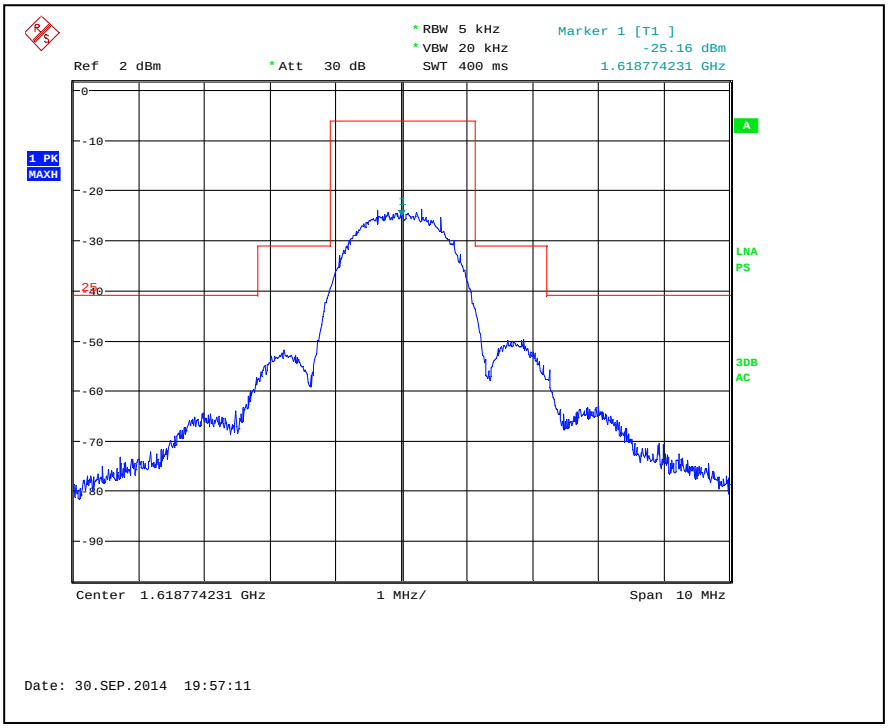
Graph 3.2.3.1



Graph 3.2.3.2



Graph 3.2.3.3



Graph 3.2.3.4

3.3 Emissions Limitations for Mobile Earth Stations

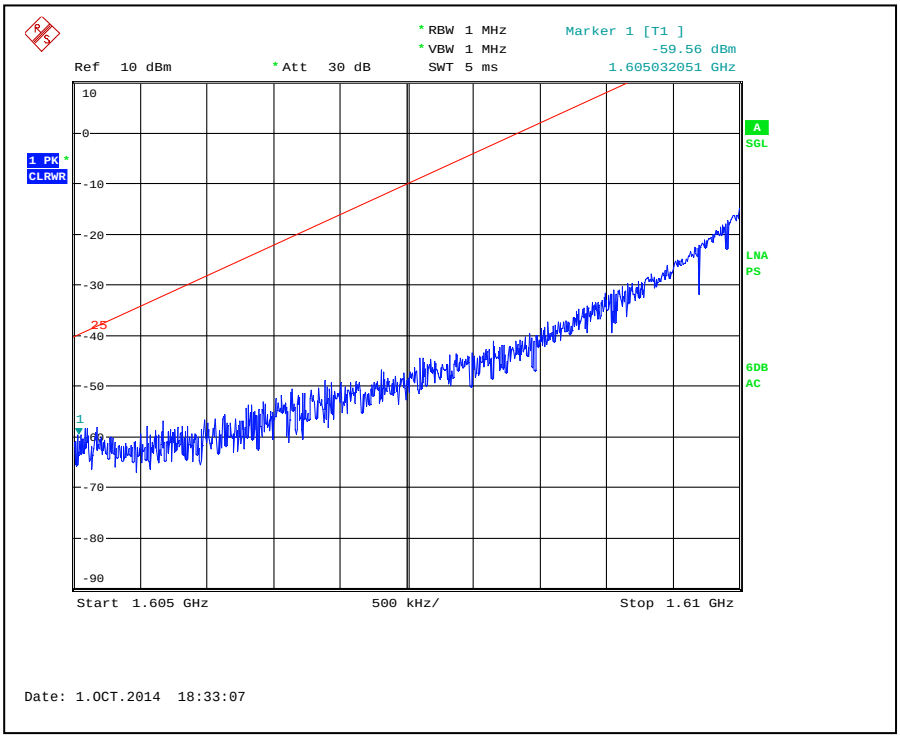
Test result: **Pass**

Frequency range: 1559 – 1610MHz

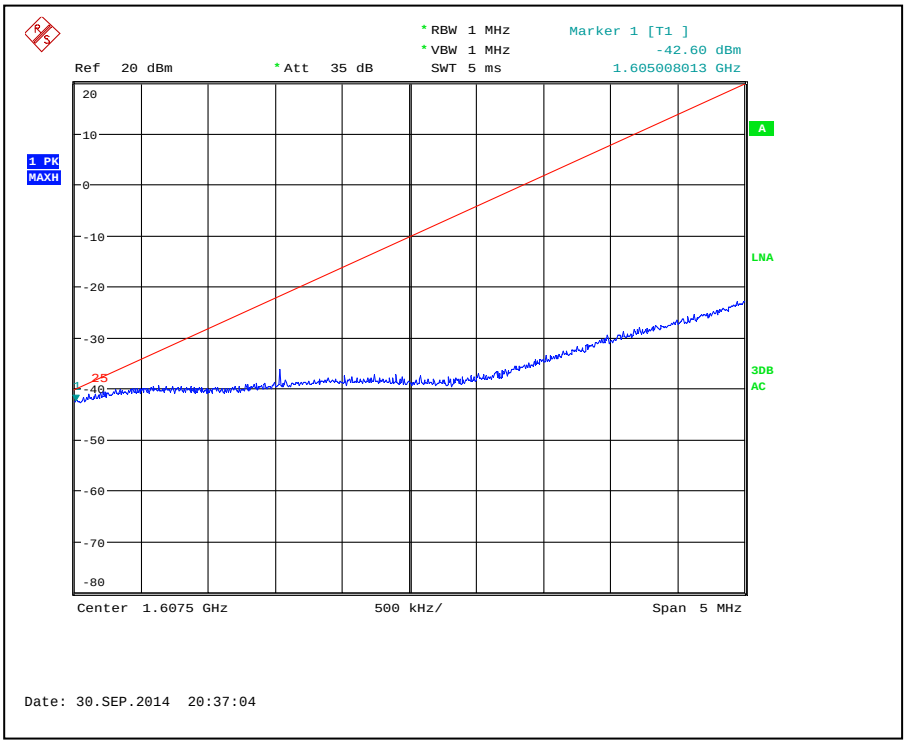
Notes:

1. The EUT was connected directly to a spectrum analyzer during testing.
2. Graphs 3.3.1 – 3.3.4 shows 1605 – 1610MHz range using 1MHz RBW
3. Graphs 3.3.5 – 3.3.8 shows 1605 – 1610MHz range using 1kHz RBW
4. Graphs 3.3.9 – 3.3.12 shows 1559 – 1605MHz range using 1MHz RBW
5. Graphs 3.3.13 – 3.3.16 shows 1559 – 1605MHz range using 1kHz RBW
6. Graph 3.3.17 shows 1559 – 1610MHz range in standby mode.

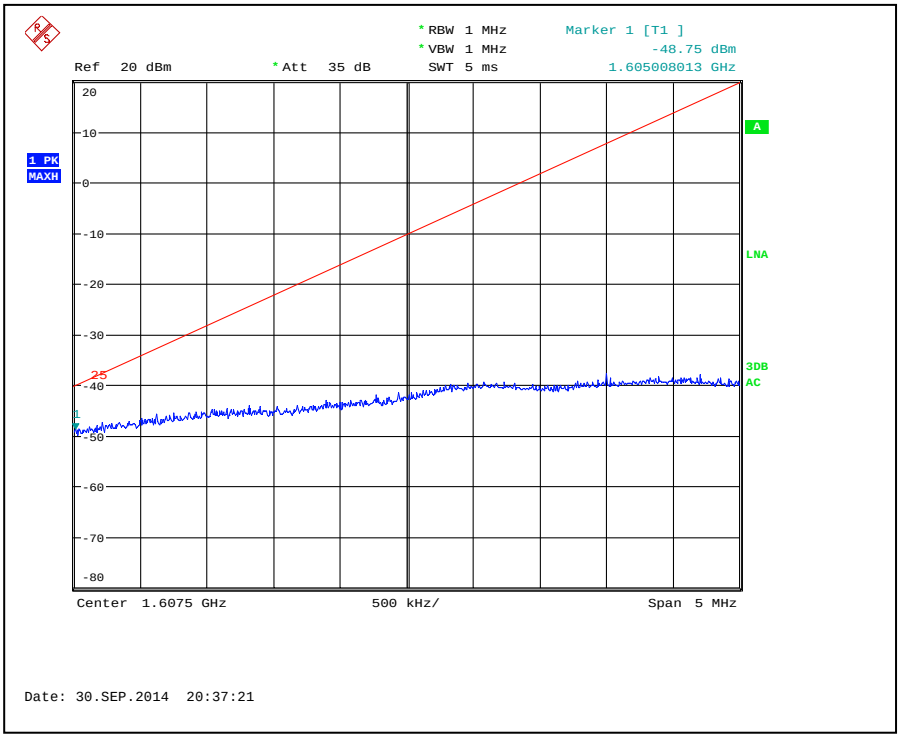
Graph 3.3.1 (1611MHz)



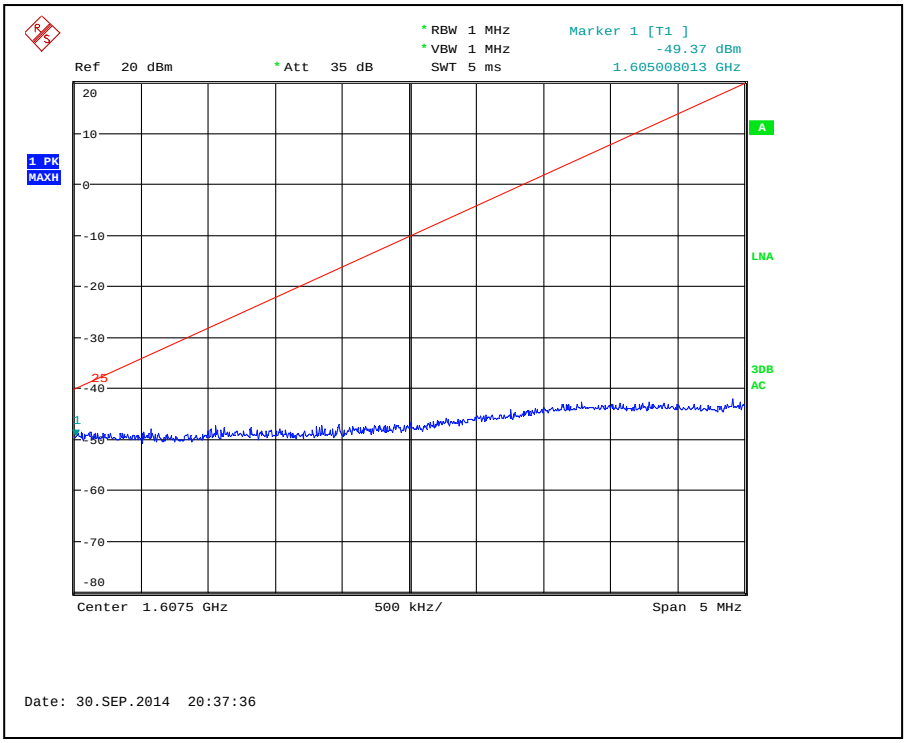
Graph 3.3.2 (1613MHz)



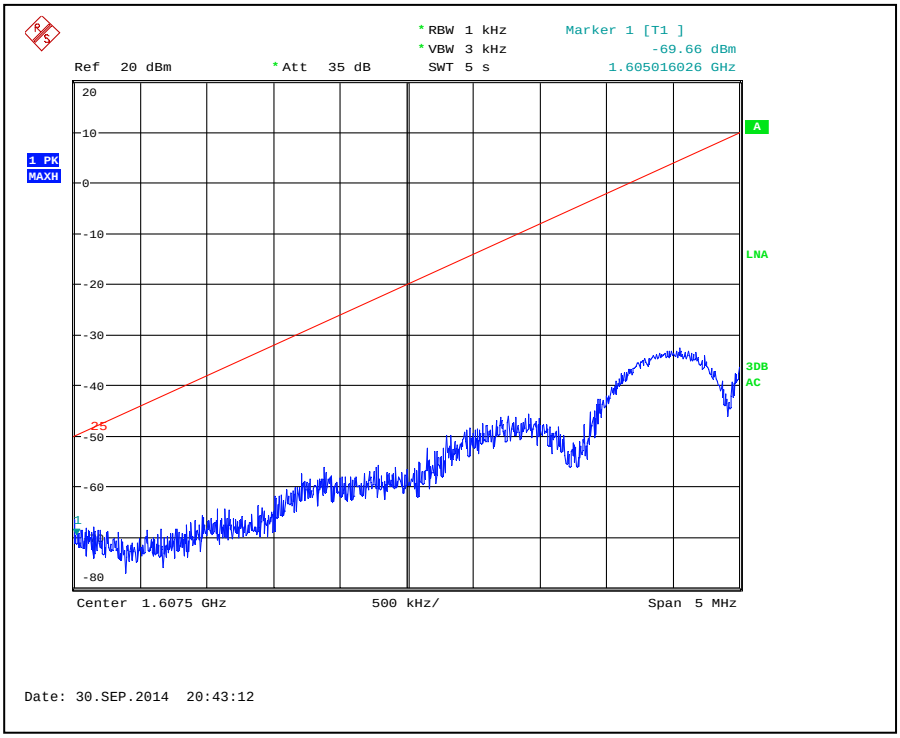
Graph 3.3.3 (1616MHz)



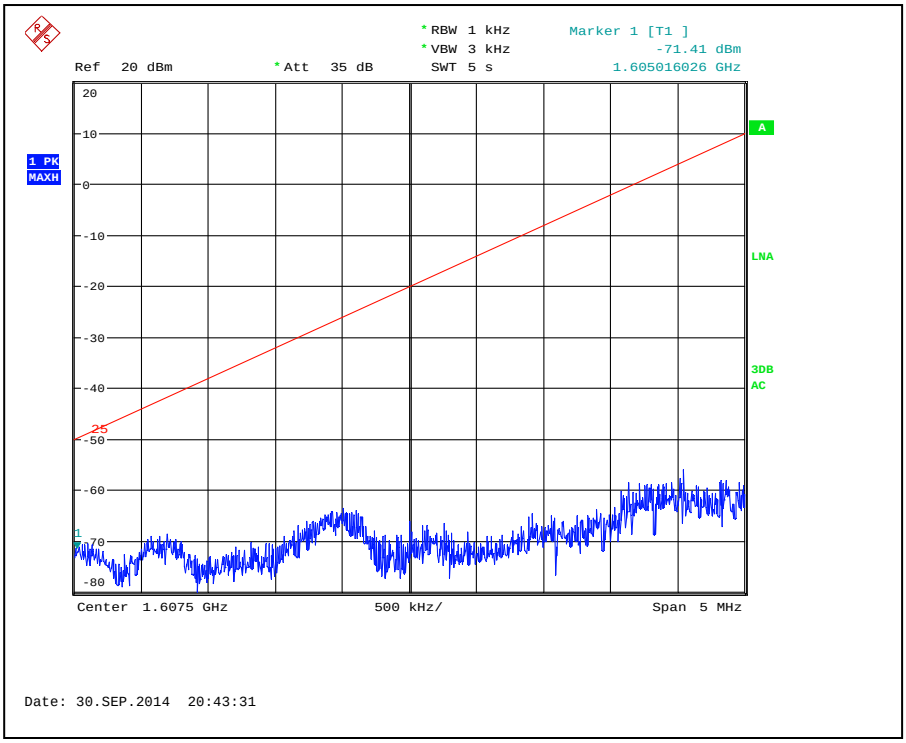
Graph 3.3.4 (1618MHz)



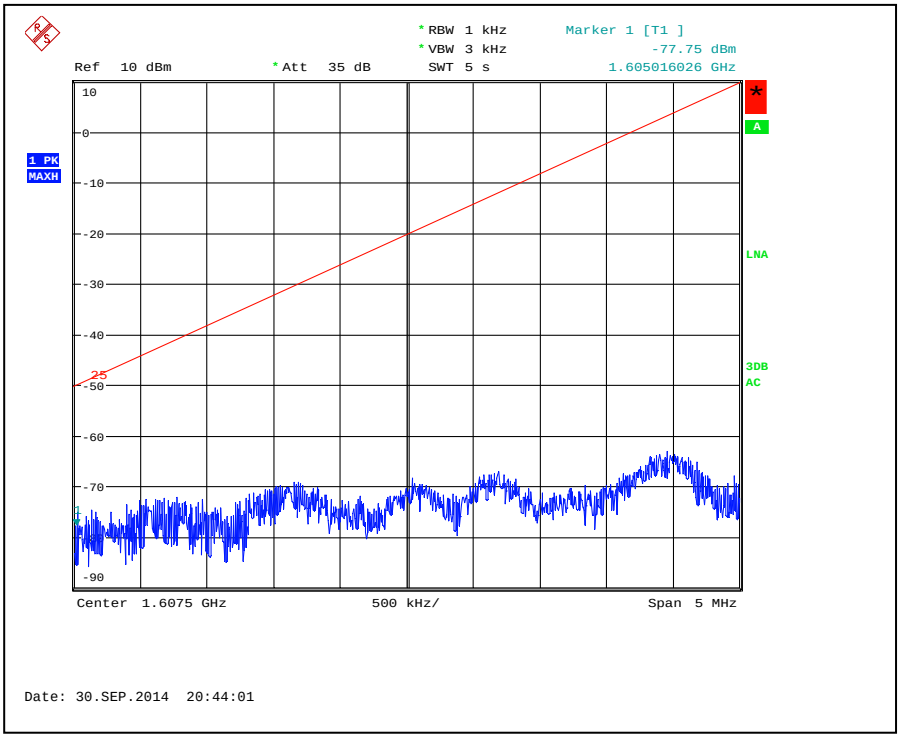
Graph 3.3.5 (1611MHz)



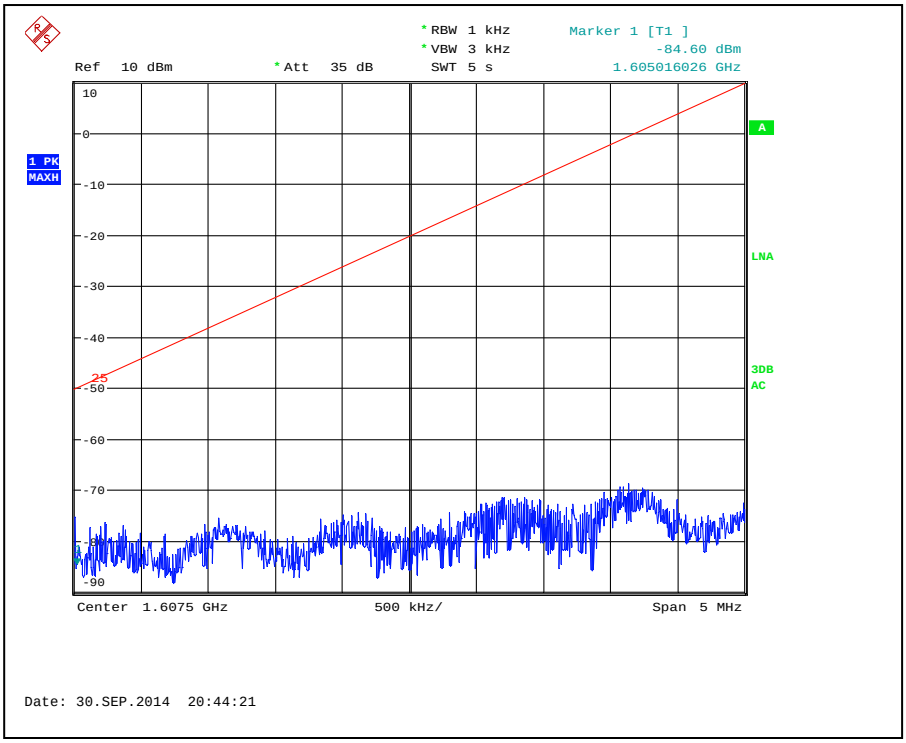
Graph 3.3.6 (1613MHz)



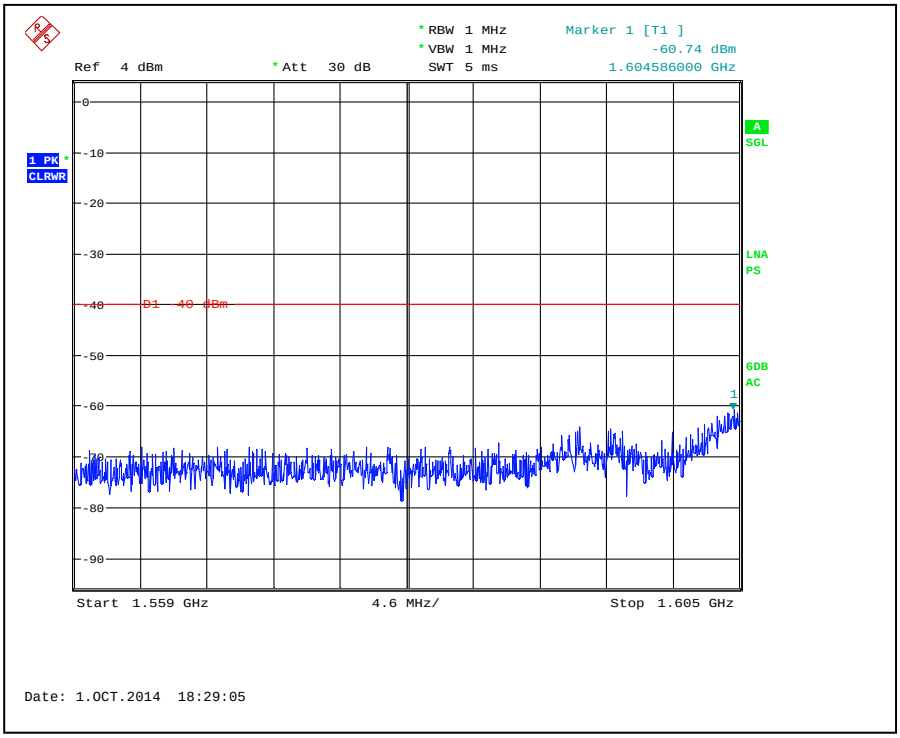
Graph 3.3.7 (1618MHz)



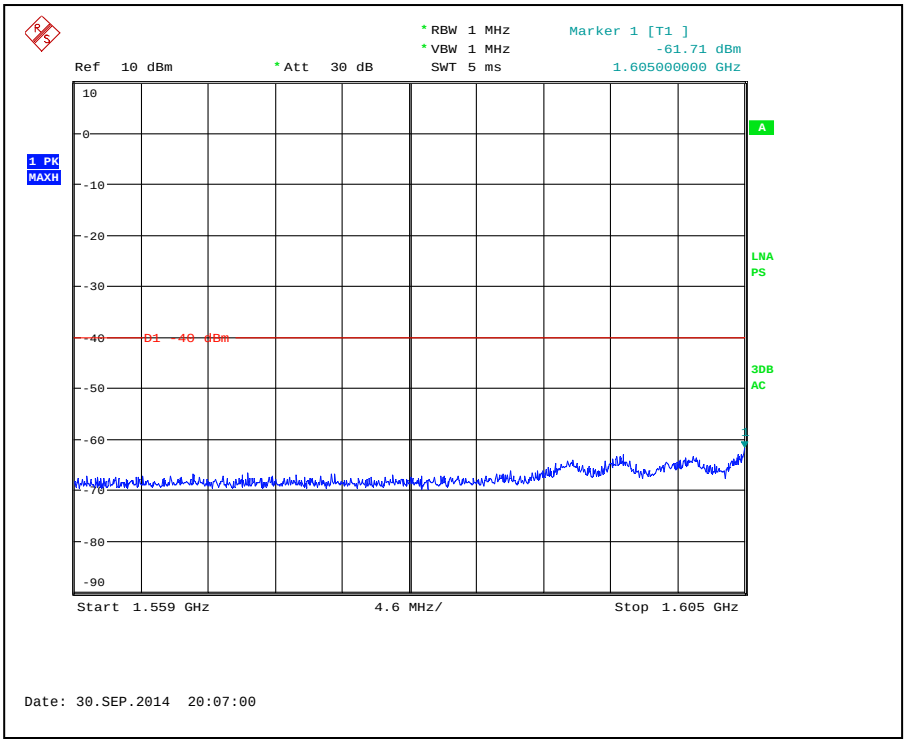
Graph 3.3.8 (1618MHz)



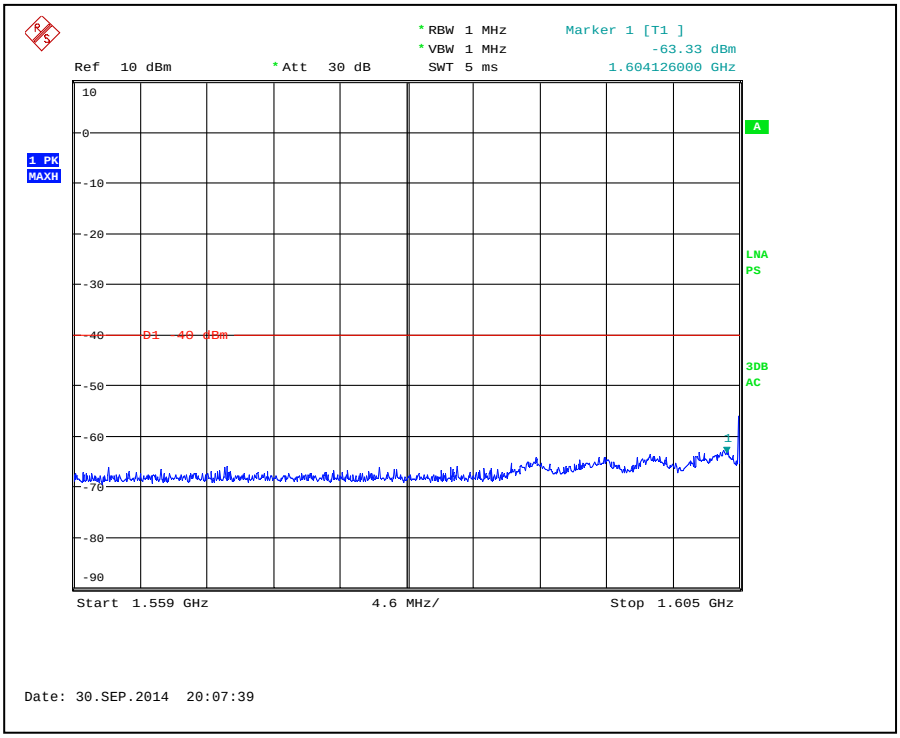
Graph 3.3.9 (1611MHz)



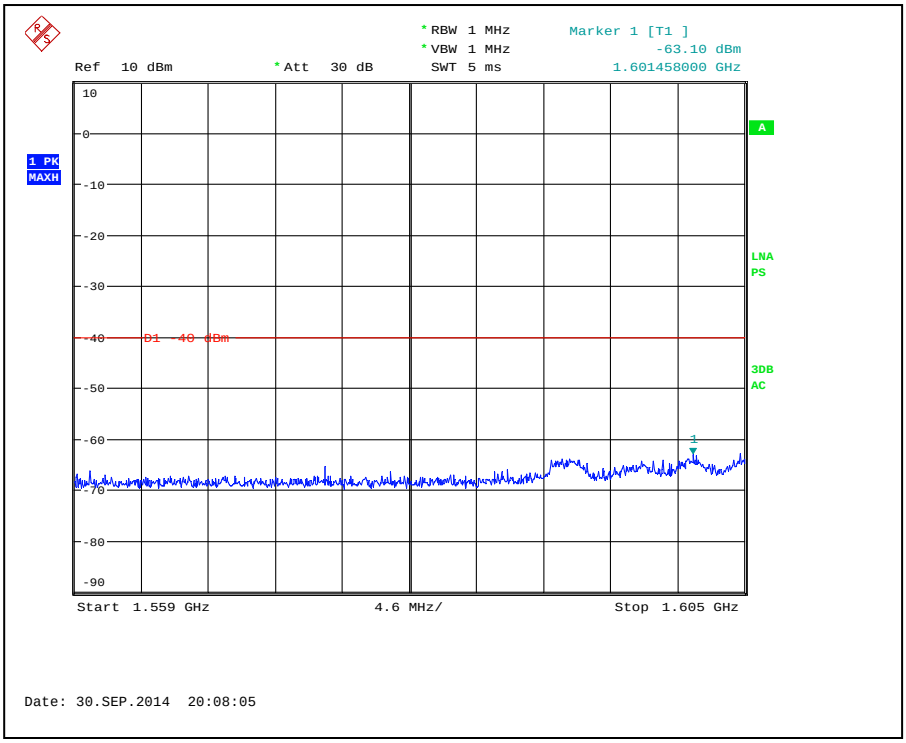
Graph 3.3.10 (1613MHz)



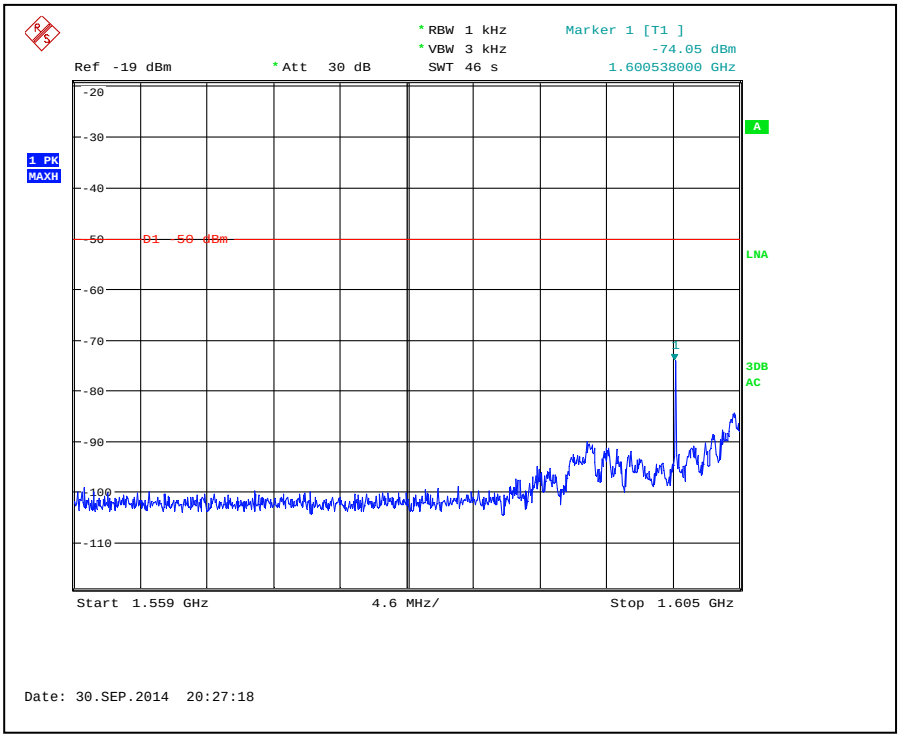
Graph 3.3.11 (1616MHz)



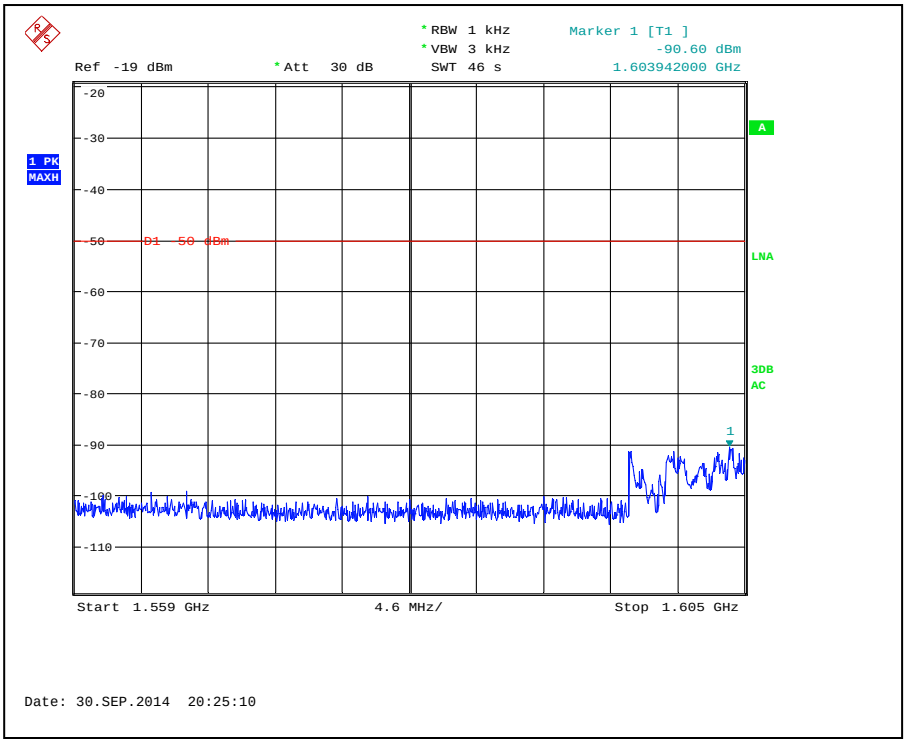
Graph 3.3.12 (1618MHz)



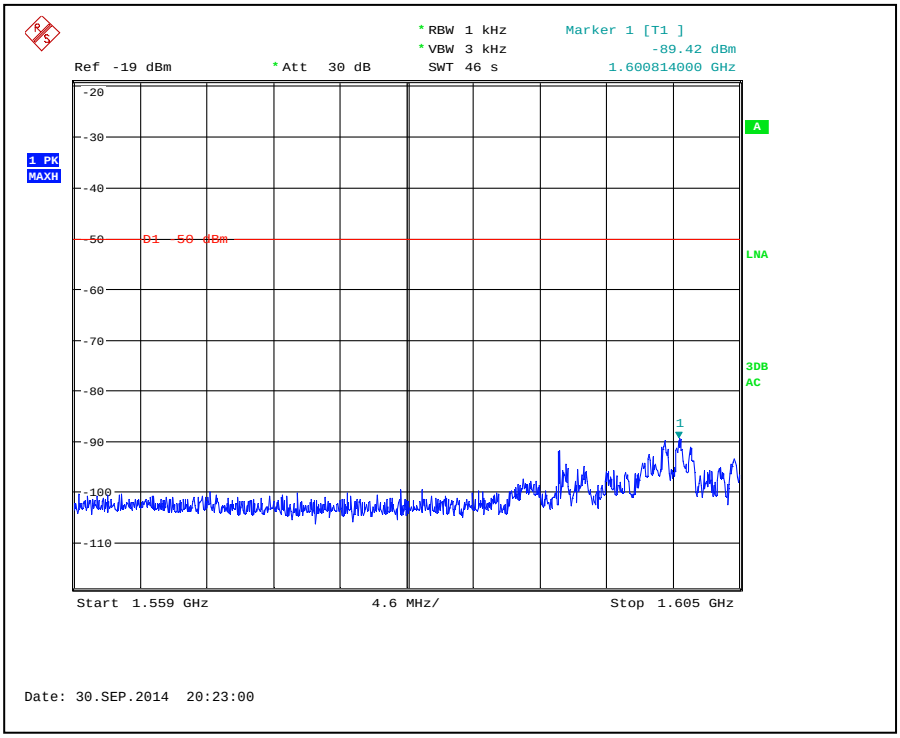
Graph 3.3.13 (1611MHz)



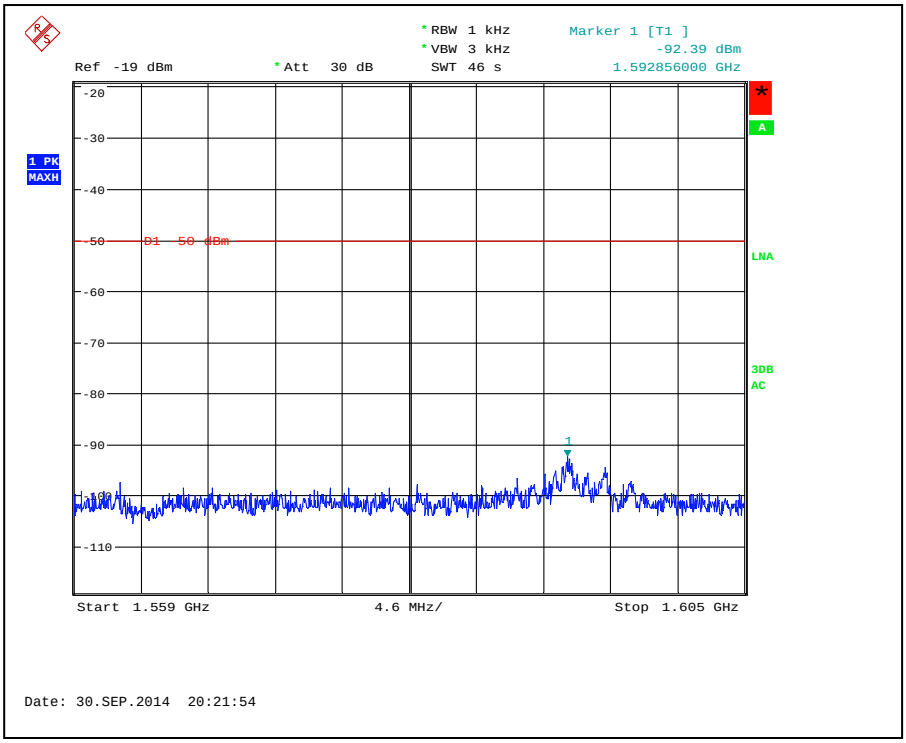
Graph 3.3.14 (1613MHz)

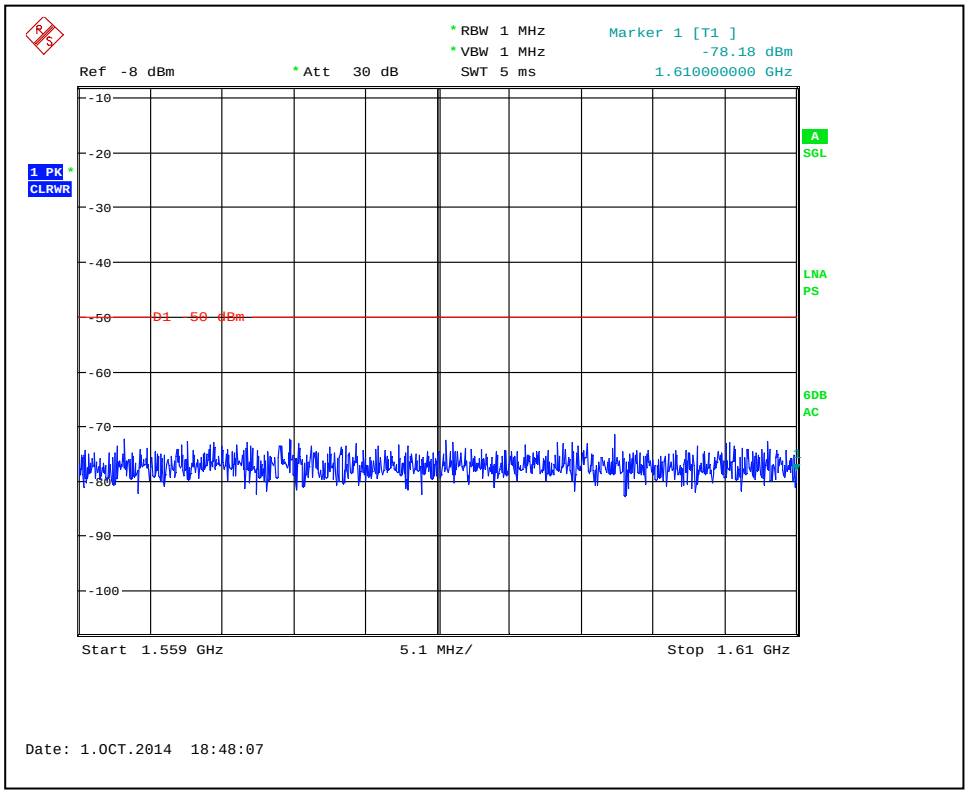


Graph 3.3.15 (1616MHz)



Graph 3.3.16 (1618MHz)




RBW 1 MHz
VBW 1 MHz
SWT 5 ms
Marker 1 [T1]
-78.18 dBm
1.610000000 GHz
Ref -8 dBm
Att 30 dB
1 PK
CLRWR
A
SGL
LNA
PS
6DB
AC
D1 -50 dBm
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
Start 1.559 GHz
5.1 MHz/
Stop 1.61 GHz
Date: 1.OCT.2014 18:48:07

Graph 3.3.17

3.4 Frequency Tolerance

Test date: October 1, 2014

Tested by: Richard Blonigen

The maximum deviation: 1.5kHz or 0.0001%

Test result: **Pass**

☒ Conducted			
	Test Results		
Voltage	**Measured Frequency (MHz)**	**Frequency Variation (kHz)**	**Limit (kHz)**
-15%	1613.719	1.00	16.13729
0	1613.729	0	0
+15%	1613.729	0	16.13729
Temperature (C)	**Measured Frequency (MHz)**	**Frequency Variation (kHz)**	**Limit (kHz)**
-30	1613.735	1.50	16.13729
-20	1613.735	1.50	16.13729
-10	1613.736	1.40	16.13729
0	1613.738	1.20	16.13729
10	1613.742	0.80	16.13729
20	1613.750	0	0
30	1613.750	0	16.13729
40	1613.751	0.10	16.13729
50	1613.751	0.10	16.13729

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	☒
Spectrum Analyzer	R & S	ESU	100398	25283	01/07/2015	☒
Bicono-Log Antenna	Teseq	CBL6112D	32859	25289	09/10/2015	☒
Horn Antenna	EMCO	3115	9507-4513	9936	06/27/2015	☒
Waveguide Horn Antenna	EMCO	3116	9904-2423	9705	11/12/2014	☒
Pre-Amplifier	MITEQ	AMF-5D-00501800-28-13P	1402232	172081	11/12/2014	☒
Pre-Amplifier	MITEQ	AMF-6F-16002600-25-10P	1222383	MIN-0065	11/12/2014	☒
System	Quantum Change	TILE! Instrument Control	Ver. 3.4.K.29	15259	VBU	☒

5.0 Revision History

REVISION LEVEL	DATE	REPORT NUMBER	PREPARED	REVIEWED	NOTES
0	10-14-2014	101808378MIN-001	RB	NS	Original Issue