Testing Tomorrow's Technology

Application for

Title 47 USC, Part 2, Subpart J, Section 2.942 Equipment Authorization of

Modular Certification
Per
FCC Part 25/IC RSS-170

for the

Geoforce Inc
Myte
Model: SCC-002

FCC ID: OWAMYTE
IC: 10540A-MYTE

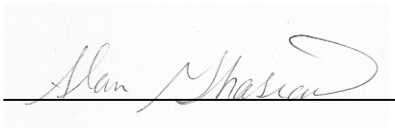
Issue Date: September 27, 2017
UST Project No: 17-0280

Number of pages contained in his report: 51

3505 Francis Circle Alpharetta, GA 30004
PH: 770-740-0717 Fax: 770-740-1508
www.ustech-lab.com

I certify that I am authorized to sign for the test facility and that all of the statements in this report and in the Exhibits attached hereto are true and correct to the best of my knowledge and belief:

US TECH (Agent Responsible For Test):

By: 

Name: Alan Ghasiani

Title: Principal Engineer - President

Date: September 27, 2017

NVLAP®
TESTING
NVLAP LAB CODE 200162-0

MEASUREMENT/TECHNICAL REPORT

COMPANY NAME: Geoforce
MODEL(S): SCC-002
FCC ID: OWAMYTE
IC: 10540A-MYTE
DATE: September 27, 2017

This report concerns (check one): Original grant_X_
Class II change_____

Equipment type: **Intentional Radiator Operating within 1611.25-1618.75 MHz**

Deferred grant requested per 47 CFR 0.457(d) (1) (ii)? yes_____ No_X_

If yes, defer until:_____
date

__N.A.__ agrees to notify the Commission by__N.A.__
date
of the intended date of announcement of the product so that the grant can be issued on that date.

Report prepared by:

US Tech
3505 Francis Circle
Alpharetta, GA 30004

Phone Number: (770) 740-0717
Fax Number: (770) 740-1508

SUMMARY OF TEST REQUIREMENTS

FCC Requirement	Title	Disposition
25.204/6.2	RF Power Output	Pass
25.202(f)	Occupied Bandwidth and Emission Limitations	Pass
2.1051	Spurious Emissions at Antenna Terminals	Pass
25.202(f)	Field Strength of Spurious Radiation	Pass
25.202(d)	Frequency Stability	Pass
25.216	Emissions from Mobile Earth Stations	Pass

N/A = Not applicable for this unit.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF EXHIBITS SUBMITTED SEPARATELY

FCC Agency Agreement
IC Agency Agreement
FCC Application Forms
IC Application Forms
FCC/IC Combined Letter of Confidentiality
Sample Label
Block Diagram
Schematics
Test Configuration Photographs
External Photographs
Internal Photographs
Theory of Operation
User's Manual
RF Exposure Information
IC Cross Reference

1 GENERAL INFORMATION

1.1 Product Description

The Equipment Under Test (EUT is the Geoforce Myte Model SCC-002. It is a surface-mount satellite transmitter compatible for use over Globalstar Simplex Data Service. It is a transmit-only device requiring integration into an application-level assembly. The MYTE transmitter operates over 3.3 VDC +/- 5% input and receives configuration information and data via a dedicated I2C serial interface. The unit is compact and battery powered. The Voltage was varied for testing at the battery connection between nominal and extreme voltages per the test standard.

The EUT was configured to operate at 1611.25 to 1618.75 MHz. For the purpose of this test, the EUT was placed into a maximum transmission mode, transmitting a signal every 5 seconds.

1.2 Related Approvals

The EUT is subject to the following authorizations:

a) Certification as a Non-Broadcast Station Transmitter as specified by FCC Part 25/RSS-170.
b) Verification as a Digital Device as specified by FCC 15.101/ICES-003.

2 Test and Measurements

2.1 Configuration of Tested System

A block diagram of the tested system is shown in Figure 1. Test configuration photographs for spurious emissions measurements are shown in Figures 2 and 3.

2.2 Test Facility

Testing was performed at US Tech's measurement facility at 3505 Francis Circle, Alpharetta, GA. This site has been fully described and registered with the FCC under designation number US5301. Additionally, this site has also been fully described and submitted to Industry Canada (IC), and has been approved under file number 9900A-1.

2.3 Test Equipment

Table 2 describes test equipment used to evaluate this product.

2.4 Modifications to Equipment under Test (EUT)

No modifications were made by US Tech to bring the EUT into compliance with FCC Part 25/IC RSS-170 requirements.

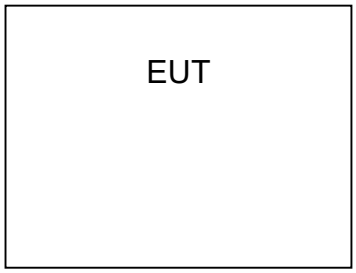


Figure 1. Test Configuration Block Diagram

Table 1. EUT and Peripherals

PERIPHERAL/ MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC/IC ID	CABLES P/D
Myte Transmitter/Geoforce (EUT)	SCC-002	Engineering Sample Rev L	Pending FCC ID: OWAMYTE IC: 10540A-MYTE	1m u USB

s = shielded
u = unshielded

Table 2. Test Instruments

INSTRUMENT	MODEL NUMBER	MANUFACTURER	SERIAL NUMBER	DATE OF LAST CALIBRATION
SPECTRUM ANALYZER	8593E	HEWLETT-PACKARD	3205A00124	11/23/17 extended
SPECTRUM ANALYZER	E4407B	AGILENT	US41442935	6/22/18
BICONICAL ANTENNA	3110B	EMCO	9306-1708	05/02/19 2 yr.
LOG PERIODIC ANTENNA	3146	EMCO	9110-3236	05/01/19 2 yr.
PRE-AMPLIFIER	8447D	HEWLETT-PACKARD	2944A07436	03/07/18
PRE-AMPLIFIER	8449B	HEWLETT-PACKARD	3008A00480	10/26/17
LISN x 2 9247	9247-50-TS-50-N	SOLAR ELECTRONICS	955824	
CALCULATION PROGRAM	N/A	N/A	EMCCALC	N/A

Note: The calibration interval of the above test instruments is 12 months unless stated otherwise and all calibrations are traceable to NIST/USA.

2.5 Antenna Description

The EUT incorporates the following satellite transmit antennas:

1. Spectrum Control, Inc., Ceramic Patch, +3 dBi gain, passive, Part Number PA25-1615-025SA.
2. Spectrum Control Inc., Ceramic Patch, + 5 dBi gain, passive, Part Number PA451615-1575SA.
3. Tallysman Wireless, + 5 dBi gain, Part Number TW2515.

4. Tallysman Wireless, +5 dBi gain, Part Number TW11-0006-X

2.6 RF Power Output (FCC Section 2.1046, 25.204)

In bands shared coequally with terrestrial radio communications services, the equivalent isotropic radiated power (EIRP) transmitted in any direction towards the horizon by an earth station operating in frequency bands between 1 and 16 GHz, shall not exceed the limits below.

For angles of elevation of the horizon greater than 5 degrees there shall be no restriction as to the equivalent isotropic radiated power transmitted by an earth station towards the horizon.

Limit = EIRP < +40 dBW (+70 dBm) in any 4 kHz band for θ = 0 degrees

The manufacturer has stated that the EUT has a maximum output power of +21 dBm.

Table 3. RF Power Output

Frequency of Fundamental (MHz)	Measurement (dBm)	Cable Loss (dB)	Adjusted Measurement (dBm)	Limit (dBm)
1611.25	20.8	0.1	20.9 (0.123W)	+70
1613.75	20.8	0.1	20.9 (0.123W)	+70
1616.25	20.9	0.1	21.0 (0.126W)	+70
1618.75	20.6	0.1	20.7 (0.117W)	+70

Note: Given the output power and antenna gain of +5 dBi, even the direct lobe of radiation meets the FCC's EIRP Requirement for $\theta = 0$ (+40 dBW, +70 dBm).
Note: The EUT was directly connected to the EMI analyzer using its own cable.

Test Date: July 12, 2017

Tester Signature:  **Name: Robert K Mills**

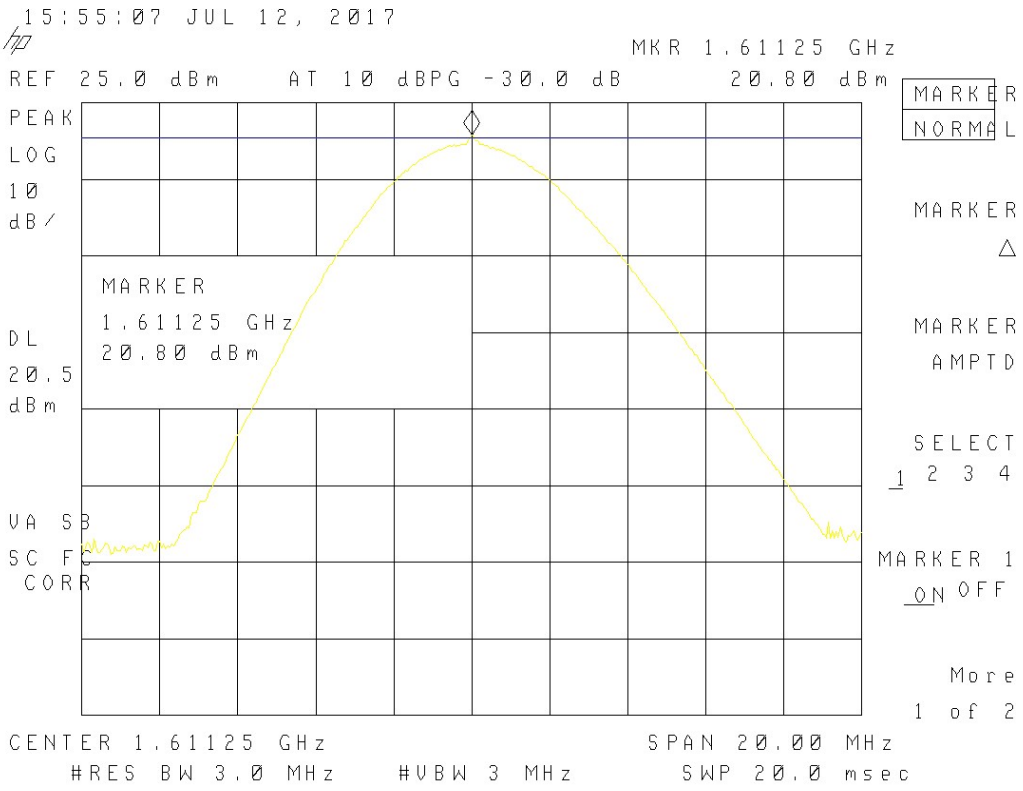


Figure 2. Channel A

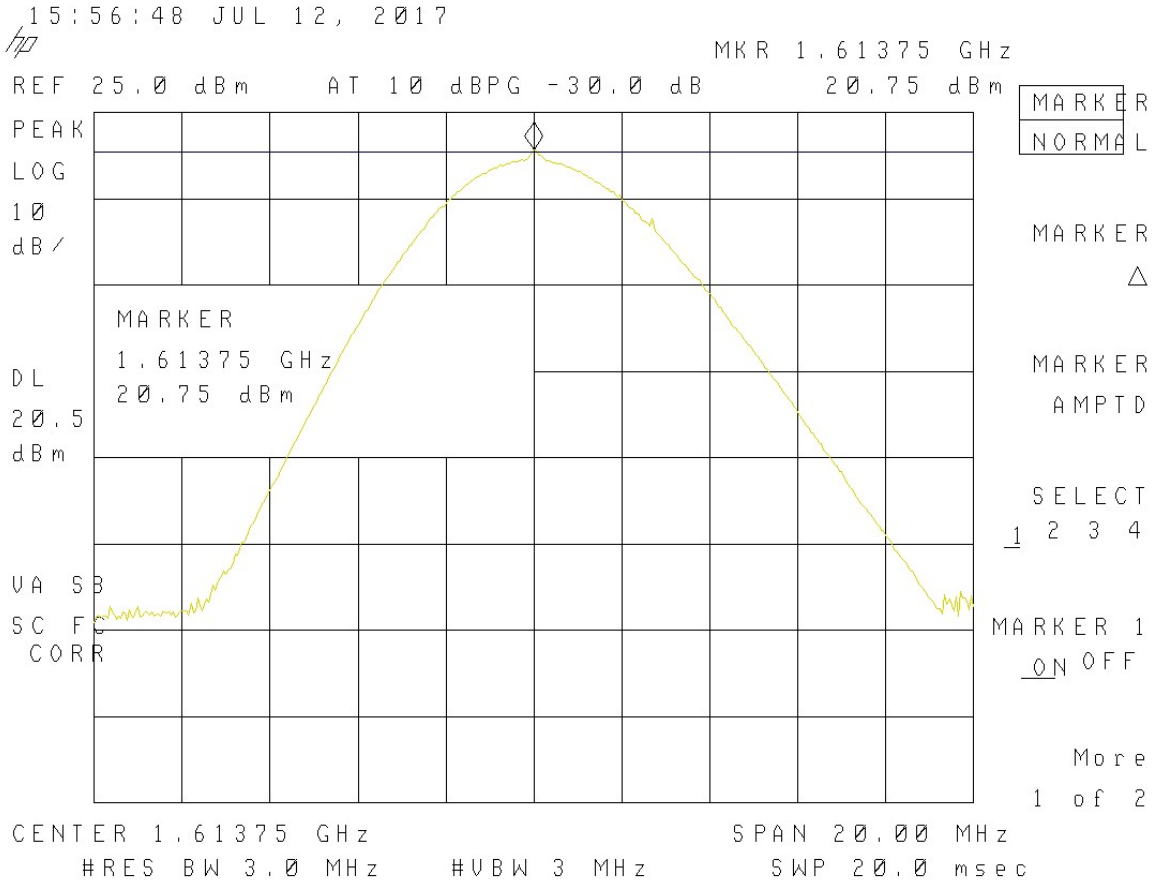


Figure 3. Channel B

Figure 4. Channel C

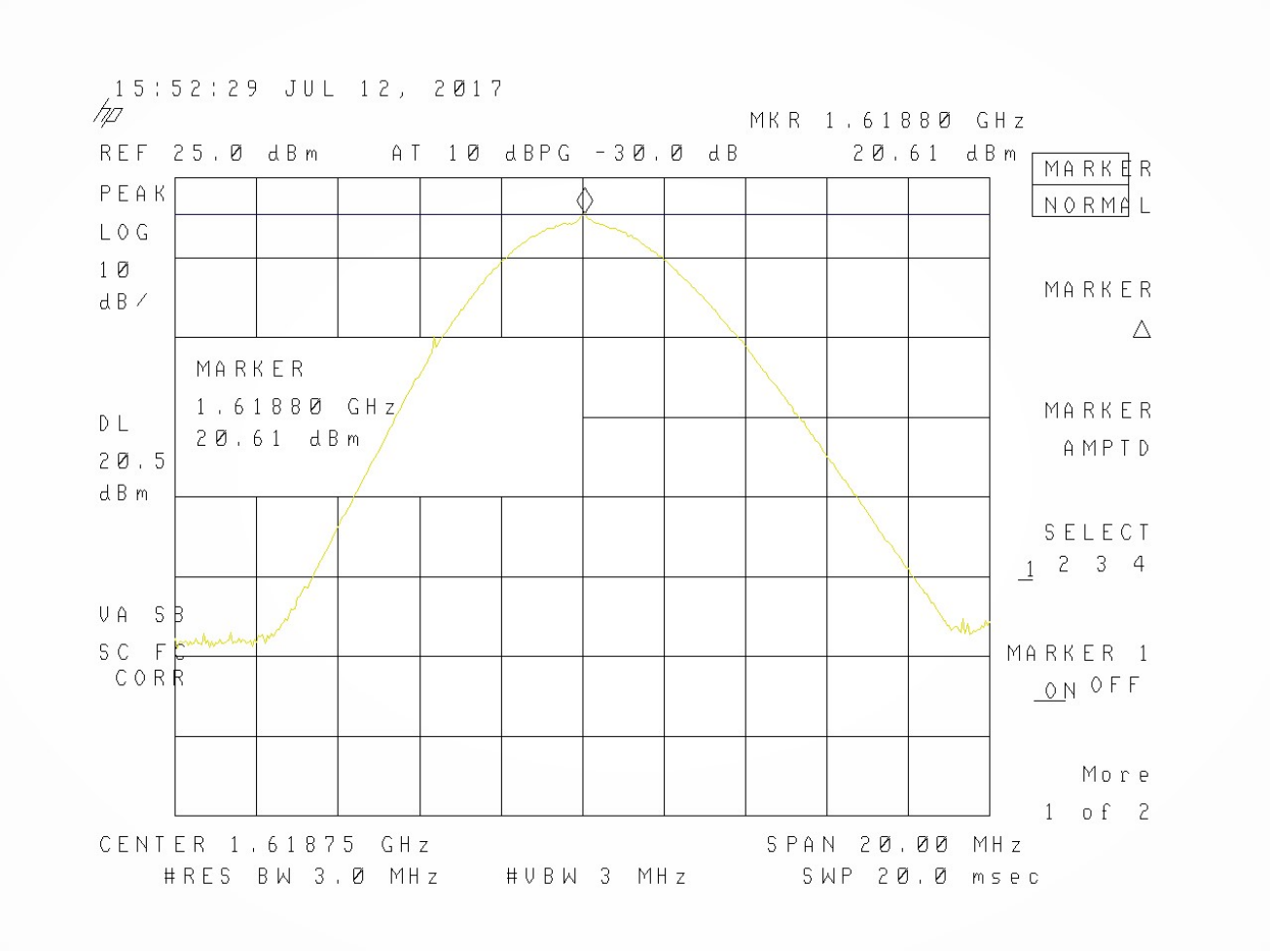


Figure 5. Channel D

2.7 Modulation Characteristics (FCC Section 2.1047)

The EUT uses digital modulation techniques only, which were employed during the tests for occupied bandwidth.

Modulation Type: DSSS, BPSK Data Rate: 100.04bps Packet Type: Digital

2.8 Occupied Bandwidth and Emission Limitations (FCC Sec. 2.1049, 25.202(f))

2.8.1 The EUT was modulated by its own internal sources. Both Low and High Channels were tested. The bandwidth of the fundamental was measured using a spectrum analyzer. The results are shown in Figures 6 and 8. Long sweep times were applied at frequencies near the fundamental to ensure that a good signal was obtained.

2.8.2 Out-of-band emissions at frequencies removed from the midpoint of the assigned frequency by more than 50% up to and including 100% of the authorized bandwidth (2.5 MHz), should be attenuated by at least 25 dB. See figures 7 and 9.

2.8.3 Out-of-band emissions at frequencies removed from the midpoint of the assigned frequency by more than 100% (2.5 MHz to 6.25 MHz) up to and including 250% of the authorized bandwidth (2.5 MHz), should be attenuated by at least 35 dB. See figures 7 and 9.

2.8.4 Out-of-band emissions at frequencies removed from the midpoint of the assigned frequency segment by more than 250% of the authorized bandwidth (2.5 MHz), should be attenuated by at least 43 + 10 log (P_{Watts}) dB below the mean power of the transmitter.

For Lowest Channel = 43 + 10 log (0.123) = 33.9 dB, Limit = 20.9 – 33.9 = - 13 dBm.
For Highest Channel = 43 + 10 log (0.117) = 33.7 dB, Limit = 20.7 – 33.7 = -13 dBm.

Note: A 10 kHz RBW was used instead. This was deemed to meet the 4 kHz RBW requirement.

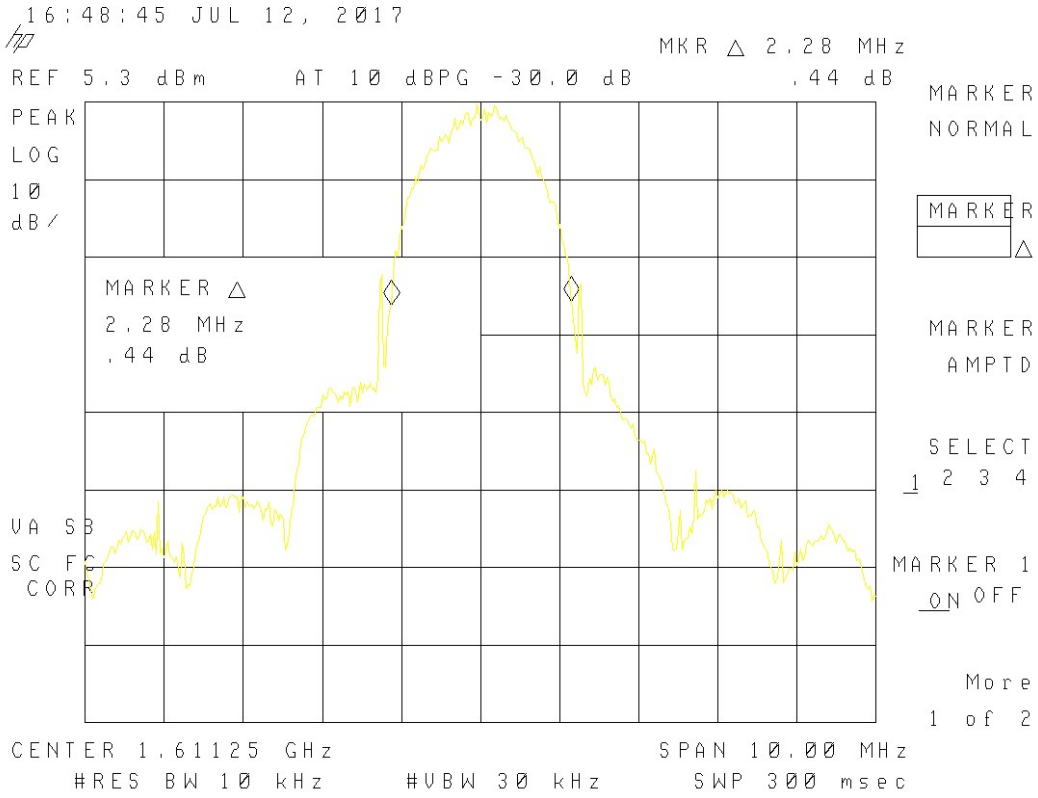


Figure 6. Bandwidth Channel A

Bandwidth = 2.28 MHz

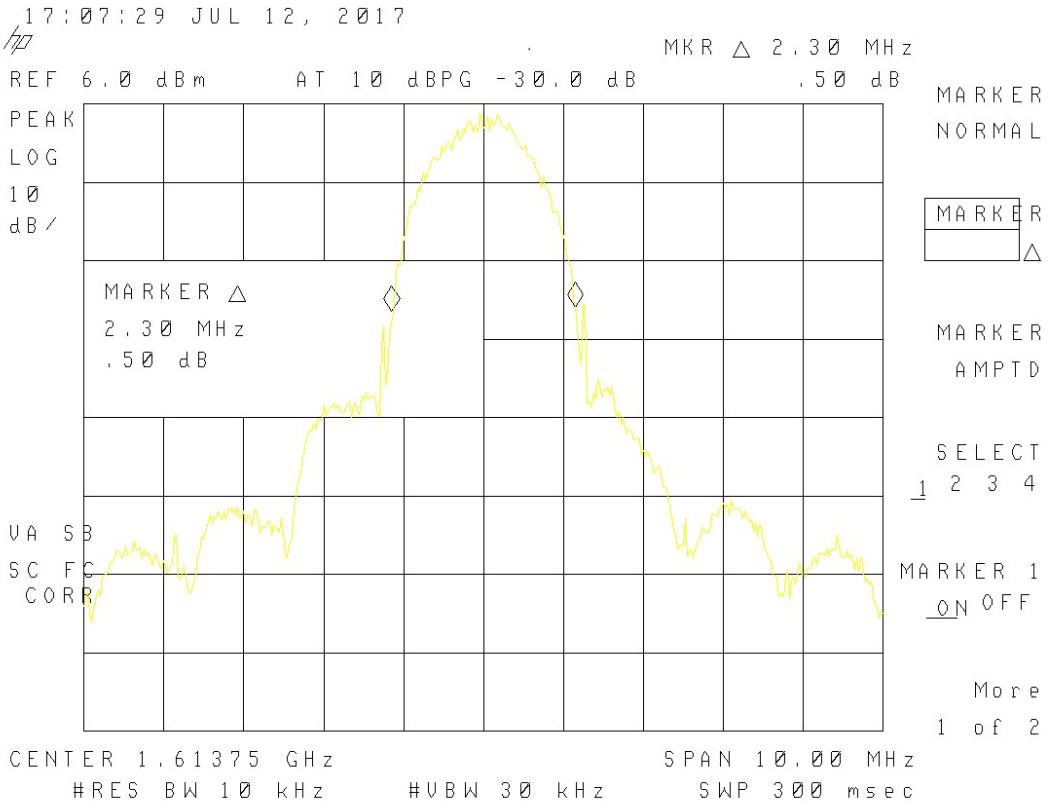


Figure 7. Bandwidth Channel B

Bandwidth = 2.30 MHz

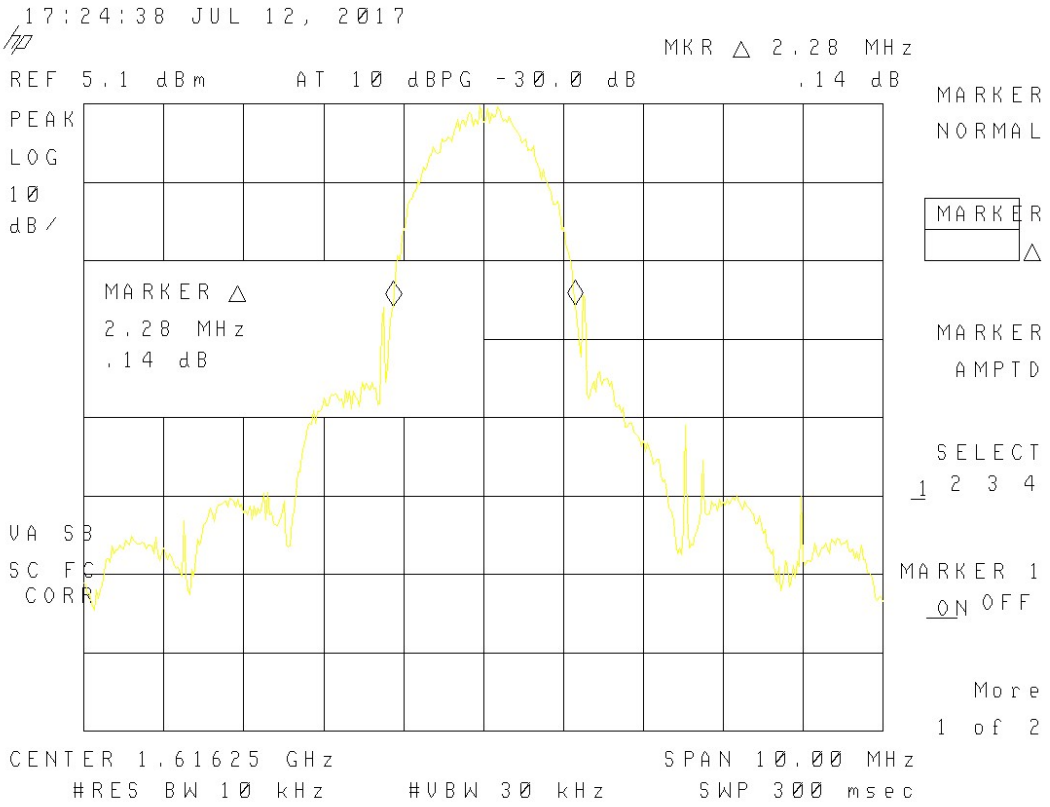


Figure 8. Bandwidth Channel C

Bandwidth = 2.28 MHz

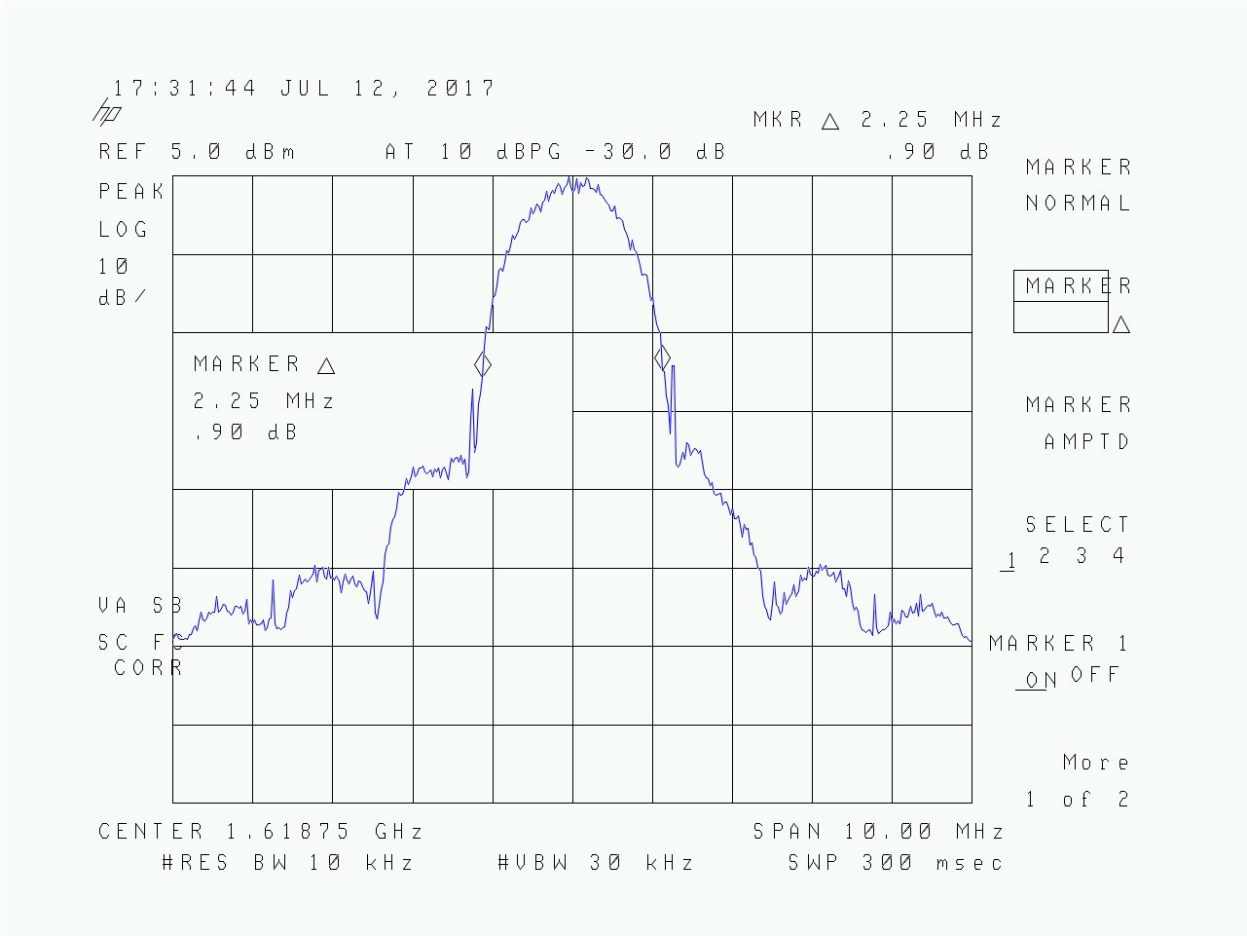


Figure 9. Bandwidth Channel D

Bandwidth = 2.25 MHz

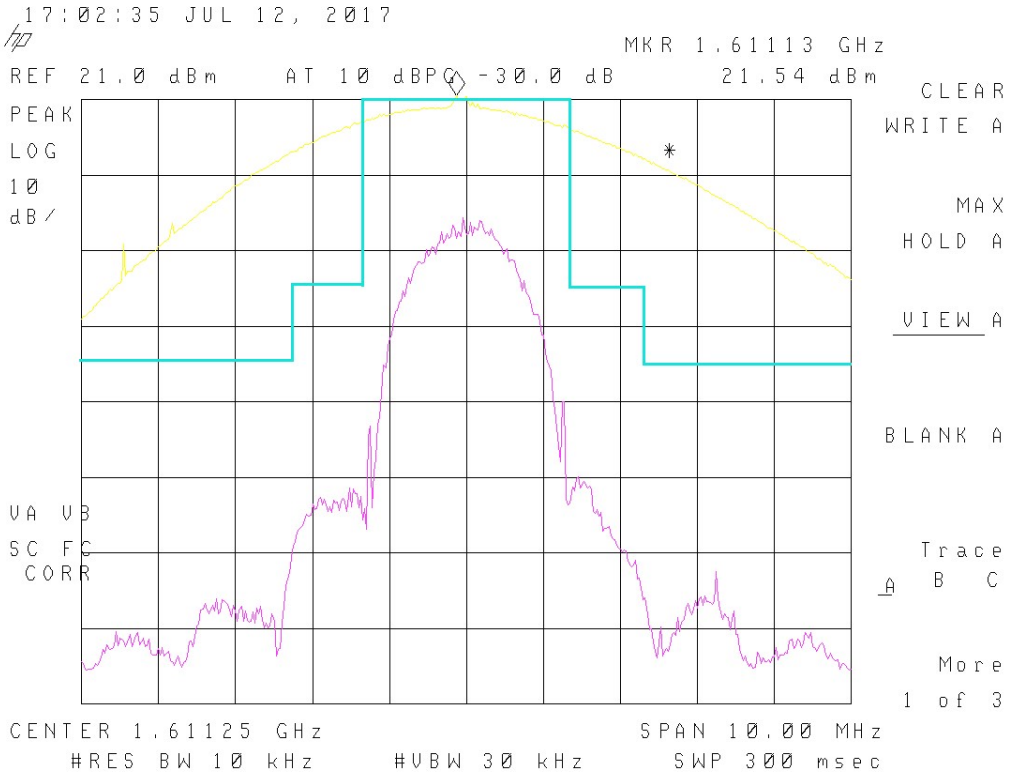


Figure 10. Emissions Mask Channel A

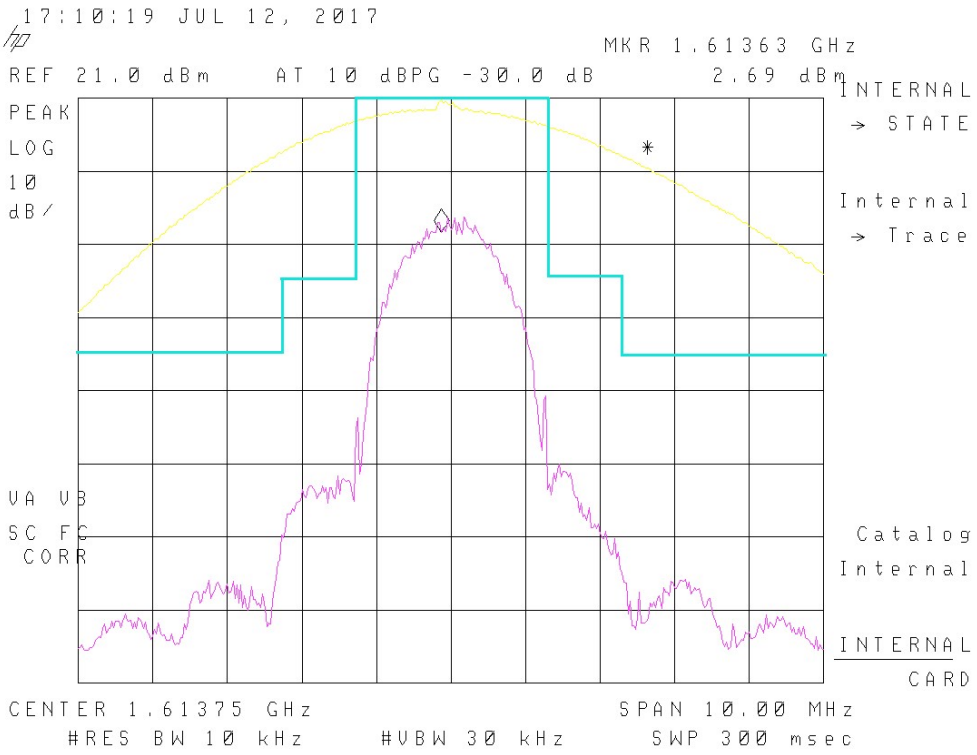


Figure 11. Emissions Mask Channel B

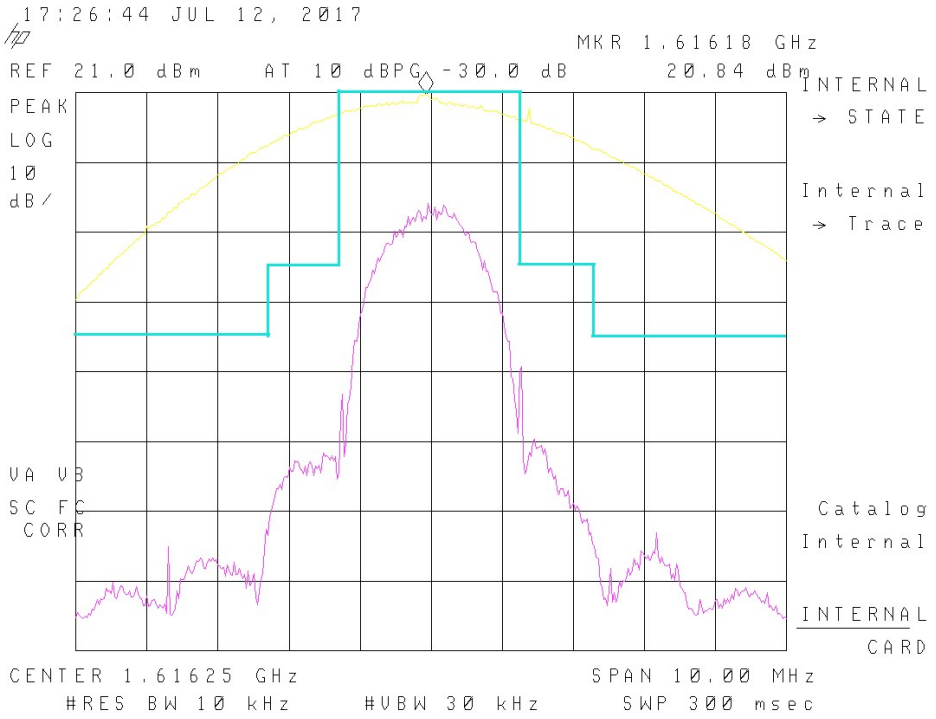


Figure 12. Emissions Mask Channel C

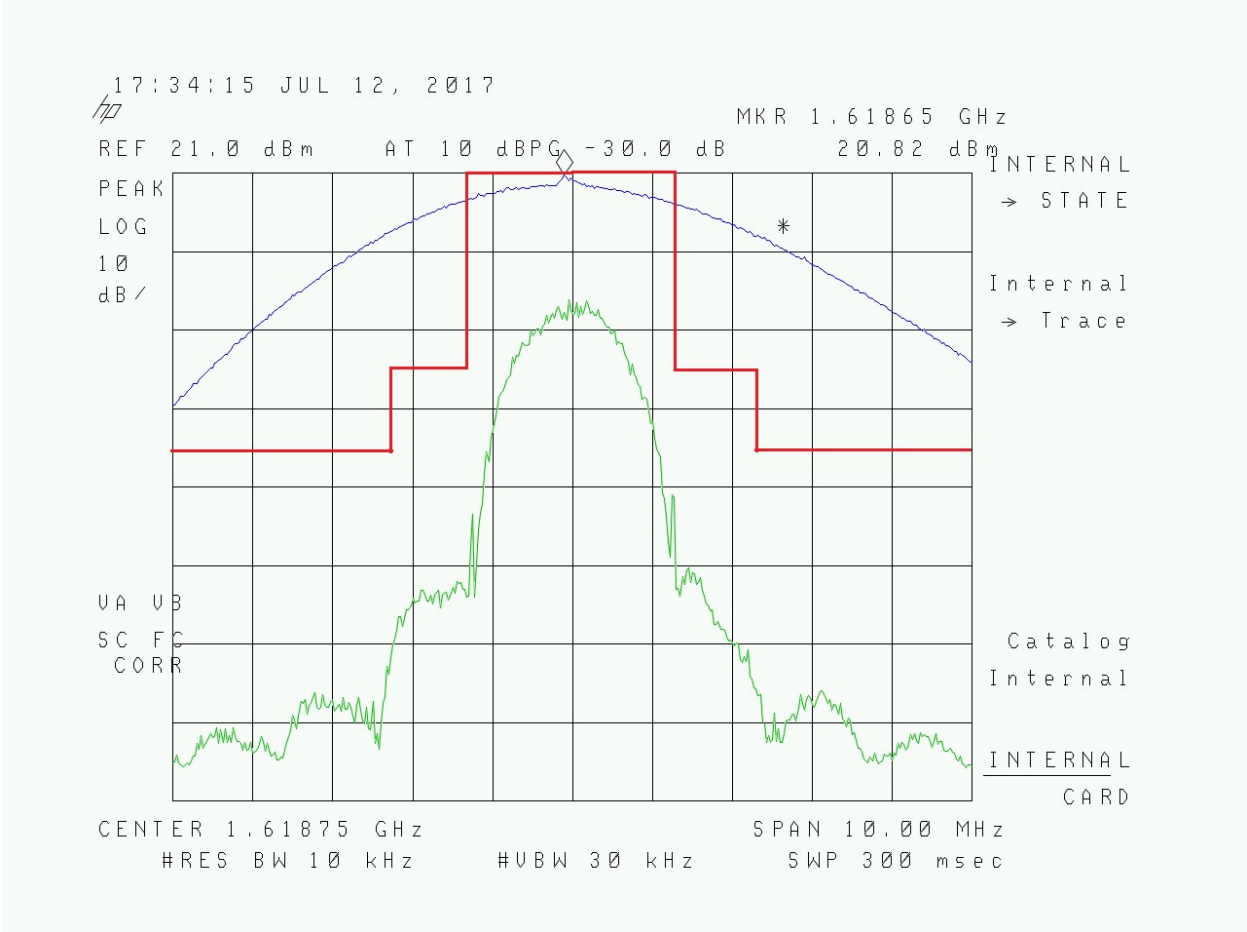


Figure 13. Emissions Mask Channel D

2.9 Spurious Emissions at Antenna Terminals (FCC Section 2.1051)

Out-of-band emissions at frequencies removed from the midpoint of the assigned frequency segment by more than 250% of the authorized bandwidth (2.5 MHz) shall be attenuated by at least:

$$43 + 10 \log (P_{Watts}) \text{ dB below the mean power of the transmitter.}$$

For Lowest Channel = 43 + 10 log (0.123) = 33.9 dB, Limit = 20.9 – 33.9 = - 13 dBm.
For Highest Channel = 43 + 10 log (0.117) = 33.7 dB, Limit = 20.7 – 33.7 = -13 dBm.

Note: A 10 kHz RBW was used instead of 4 kHz. This was deemed to be a worst case for the required 4 kHz RBW.

Spurious emissions appearing at the antenna terminals were measured with a spectrum analyzer by connecting the spectrum analyzer directly via a short cable to the antenna output terminals or across the antenna leads on the PCB as specified by the manufacturer. Results are shown in Figures 10-15 below.

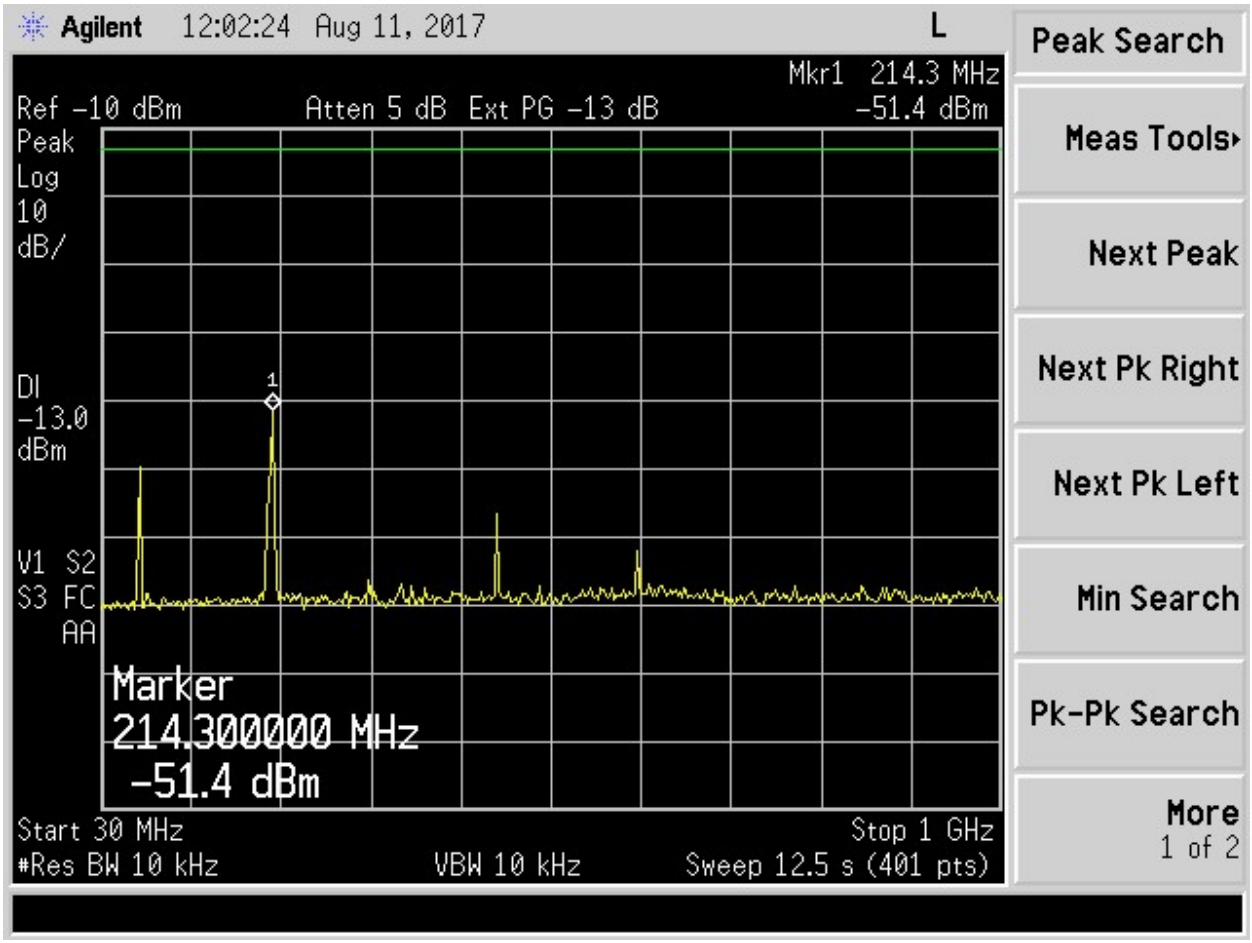


Figure 14. Conducted Spurious Emissions Ch A (30 MHz to 1000 MHz)

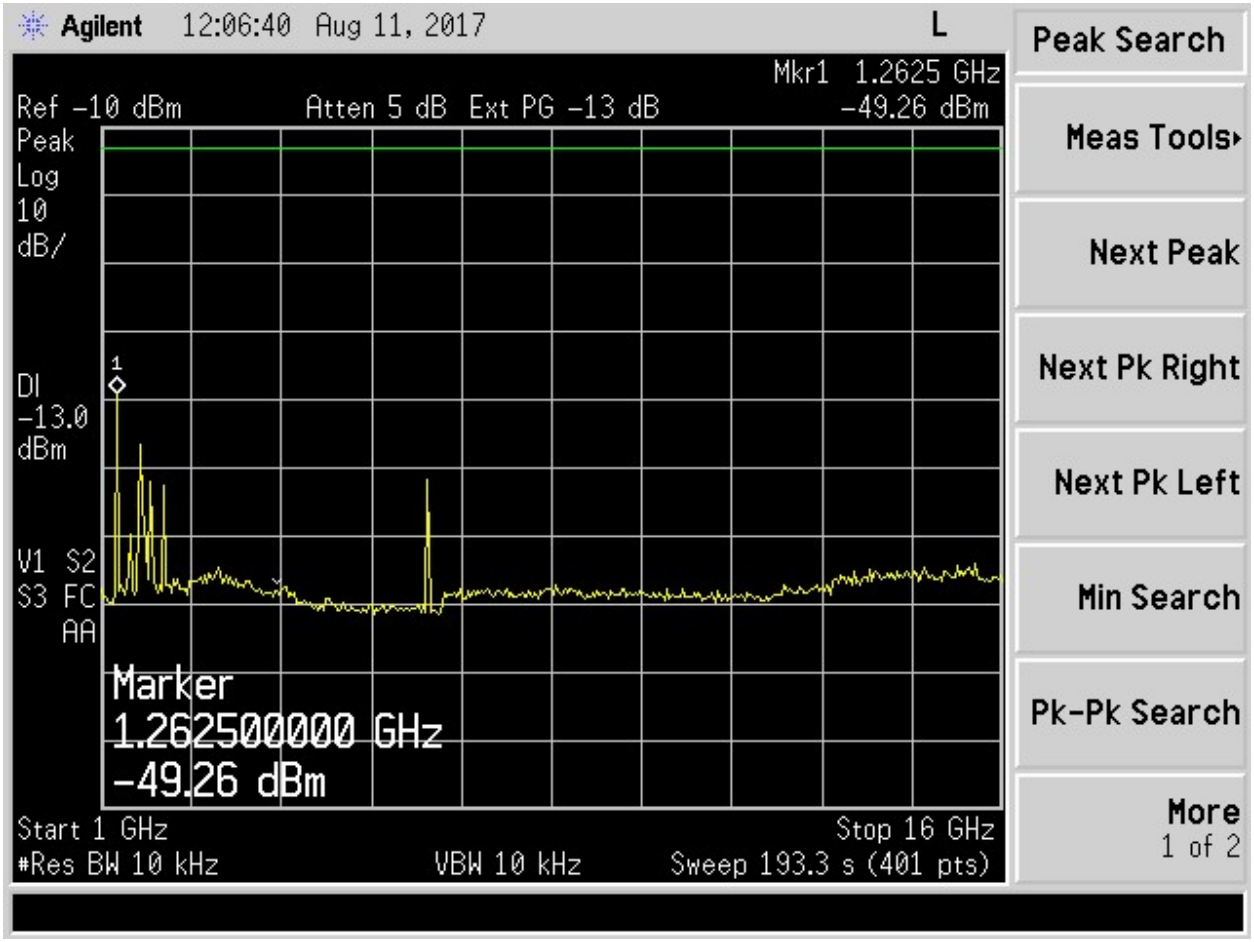


Figure 15. Conducted Spurious Emissions Ch A (1 GHz to 16 GHz)

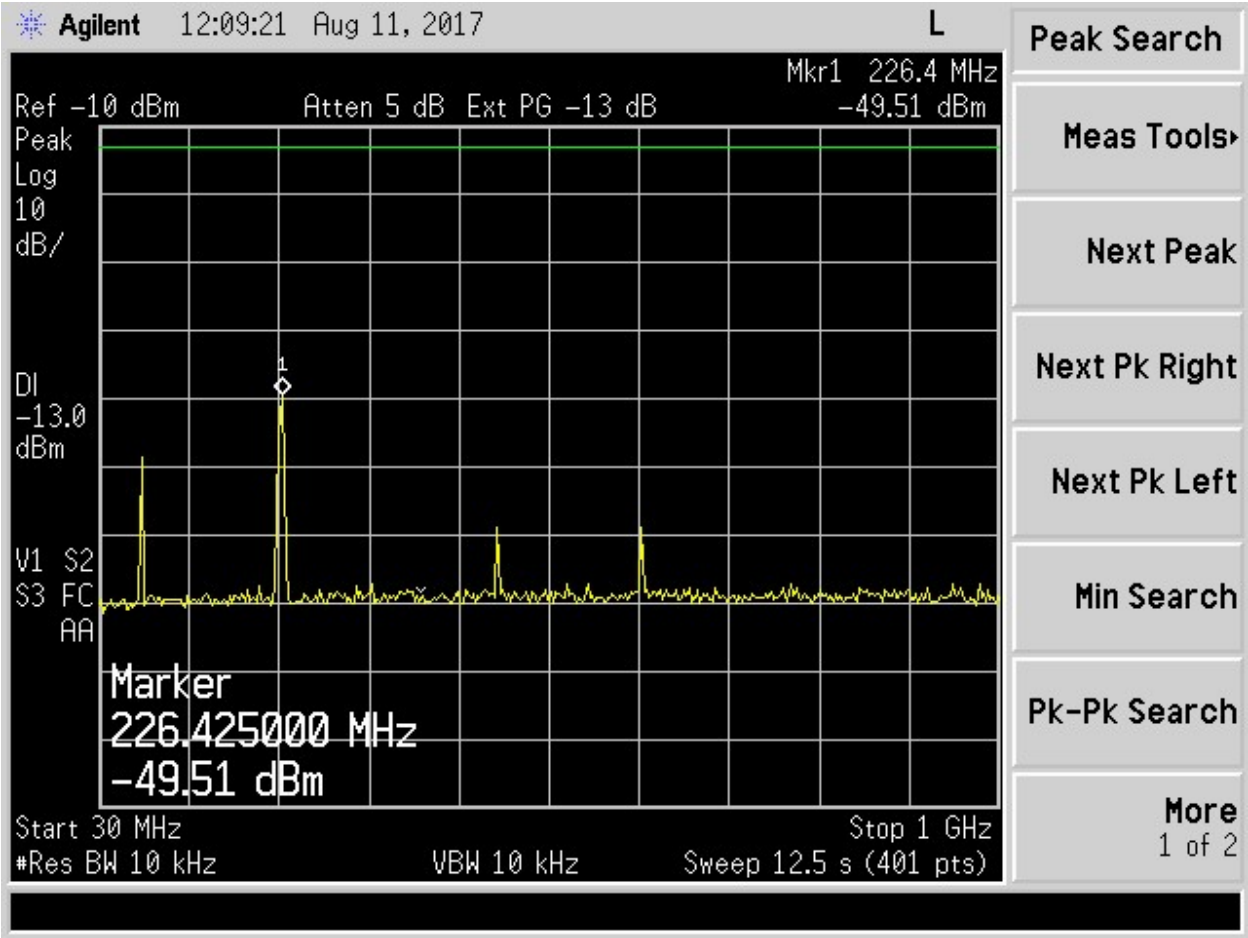


Figure 16. Conducted Spurious Emissions Ch B (30 MHz to 1000 MHz)

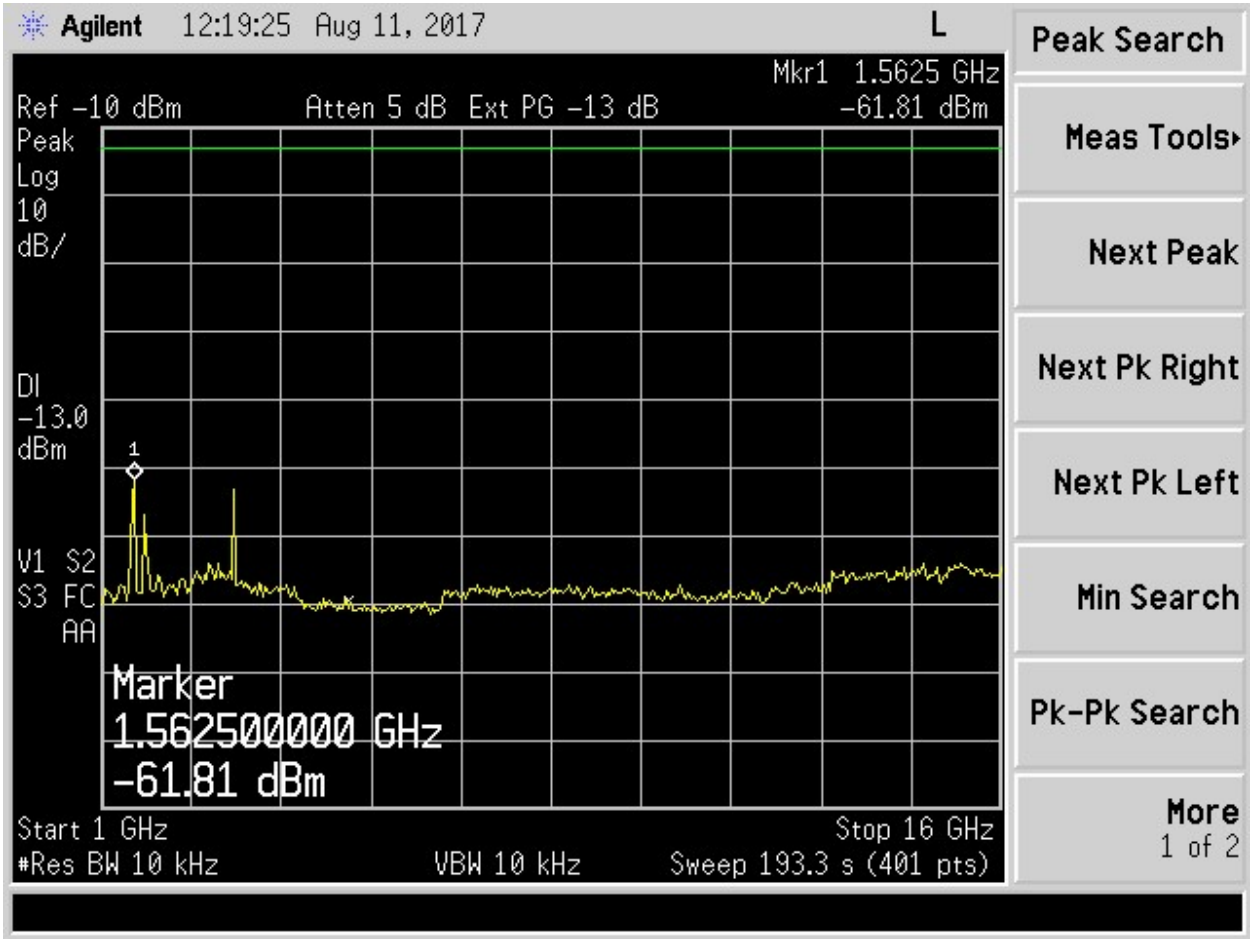


Figure 17. Conducted Spurious Emissions Ch B (1 GHz- 16 GHz)

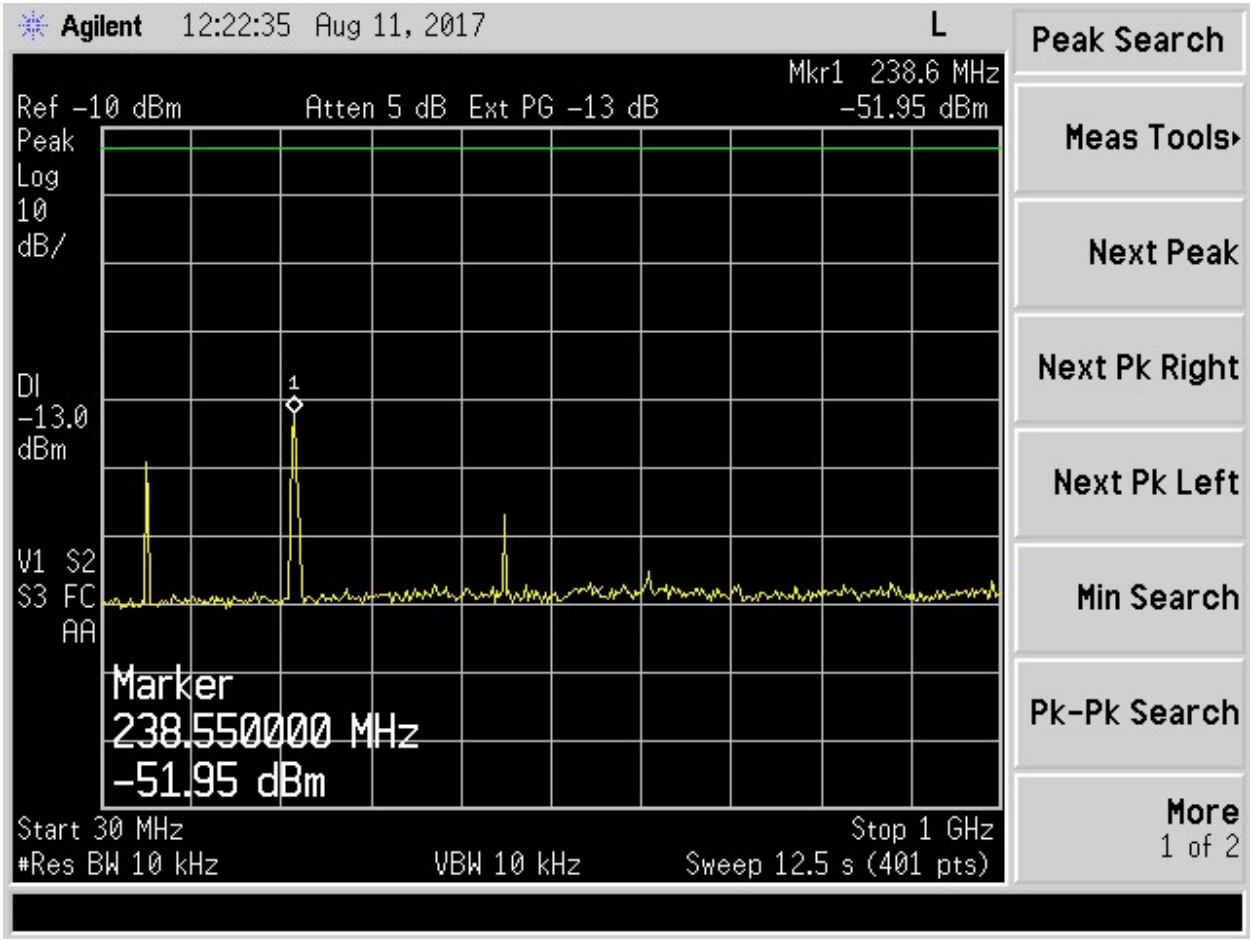


Figure 18. Conducted Spurious Emissions Ch C (30 MHz to 1000 MHz)

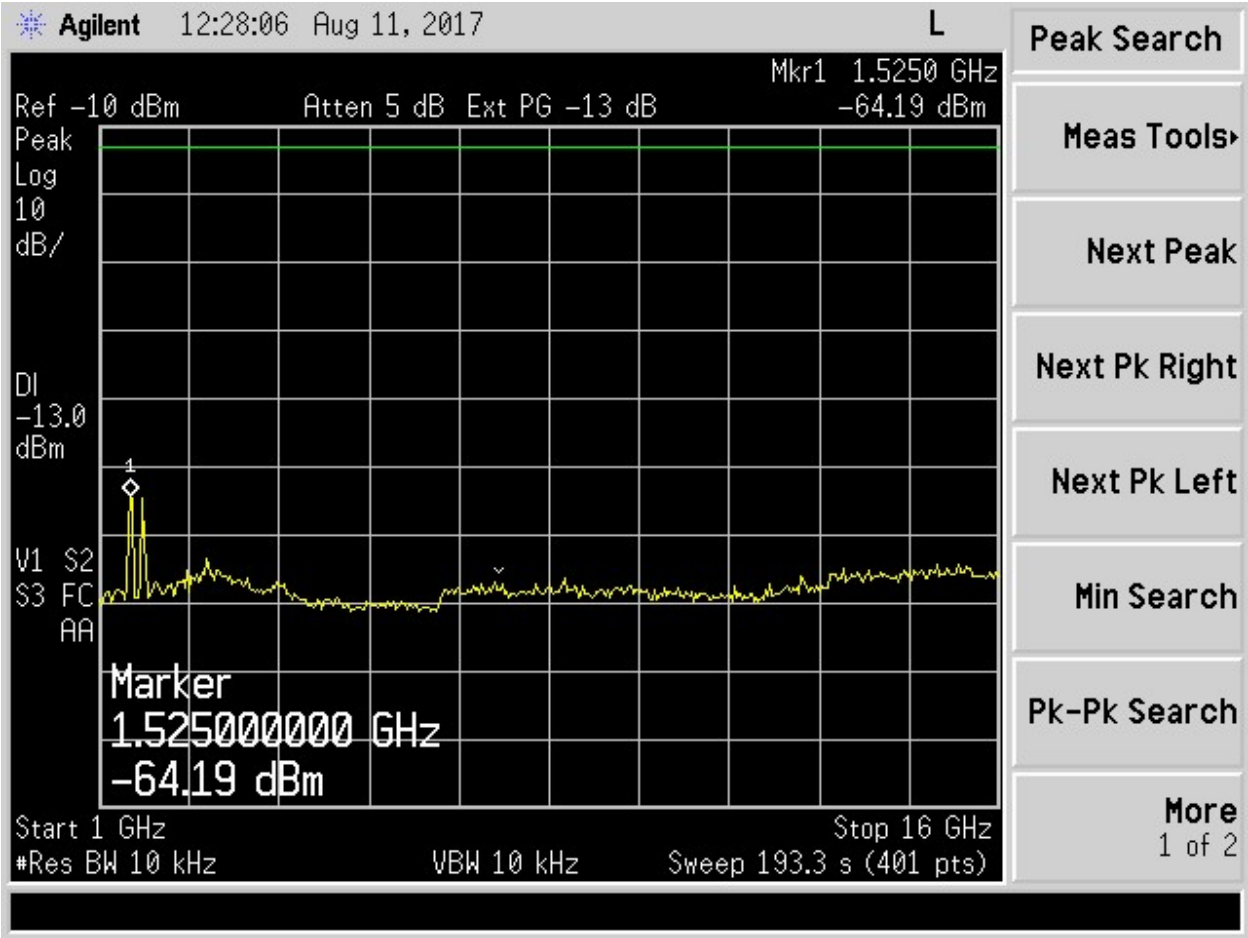


Figure 19. Conducted Spurious Emissions Ch C (1 GHz to 16 GHz)

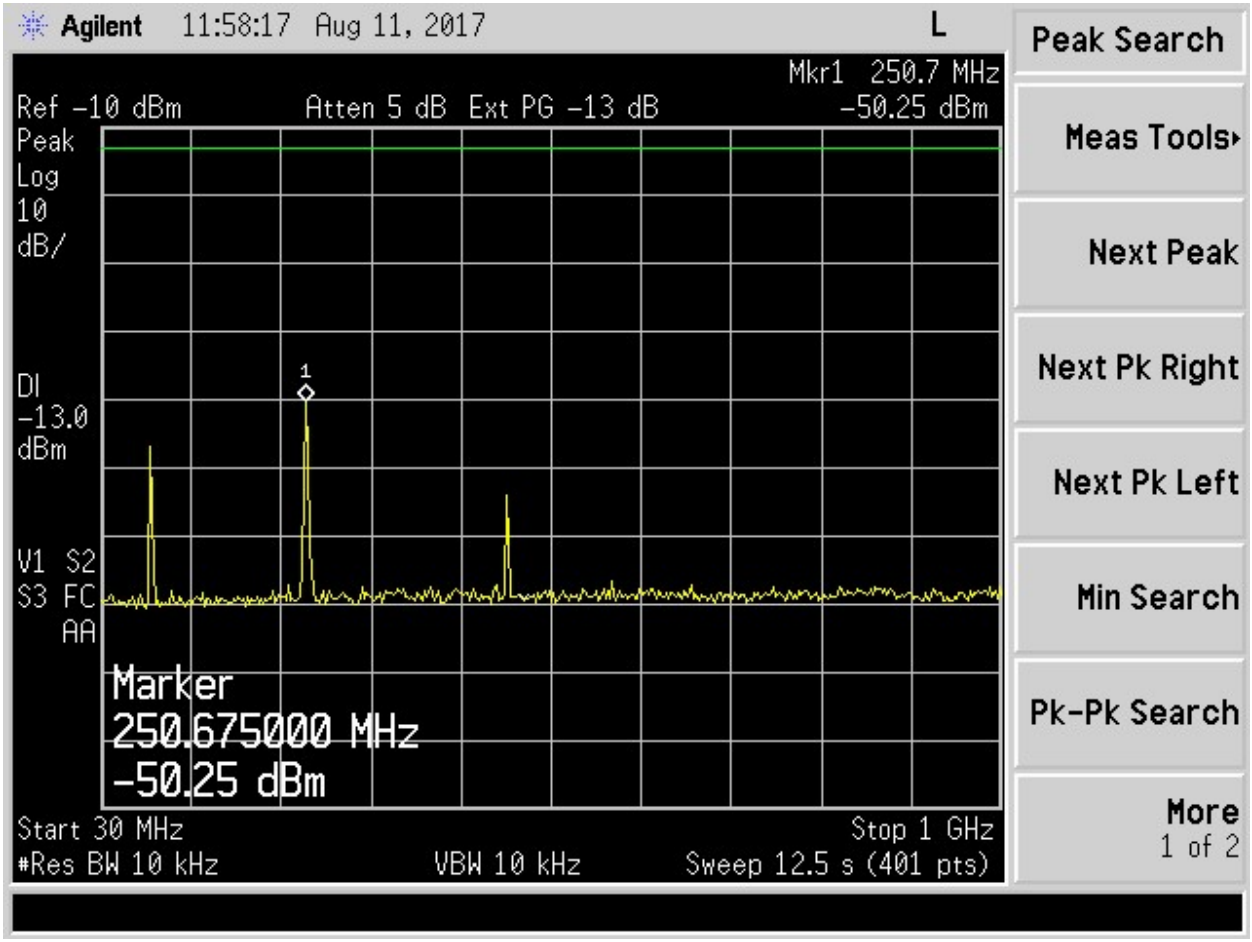


Figure 20. Conducted Spurious Emissions Ch D (30 MHz to 1000 MHz)

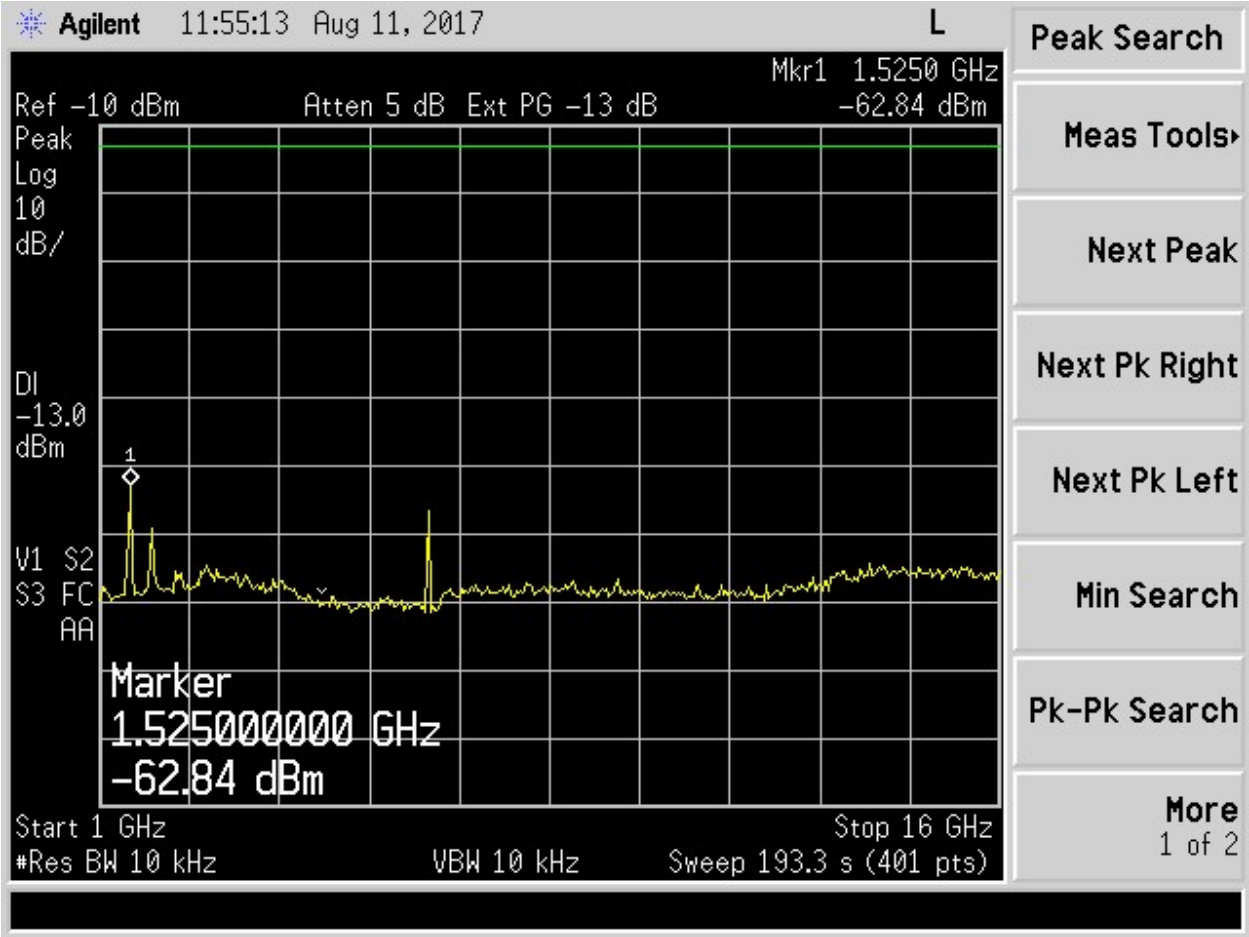


Figure 21. Conducted Spurious Emissions Ch D (1 GHz to 16 GHz)

2.10 Field Strength of Spurious Radiation (FCC Section 2.1053, 25.202(f))

2.10.1 Spurious emissions were evaluated from 30 MHz to 16.2 GHz at an EUT to antenna distance of either 1 or 3 meters. The EUT was tested with an external power source and modulated by its own internal sources. Both low and high channels were tested.

2.10.2 The EUT was placed on an open area test site and the spurious emissions tested with the Substitution Method as stipulated by EIT/TIA-603: 1992 section 2.2.12. Measurements for the 30 MHz to 1000 MHz frequency range were made with the analyzer's bandwidth set to 120 kHz. Measurements above 1 GHz were made with the analyzer's bandwidth set to 1 MHz. The worse case results are shown in Table 4.

2.10.3 For out-of-band emissions at frequencies removed from the midpoint of the assigned frequency segment by more than 250% of the authorized bandwidth (2.5 MHz), signals must be attenuated by at least at least

$$43 + 10 \log (P_{Watts}) \text{ below the mean power of the transmitter}$$

Low channel radiated power = 20.9 dBm = 0.123 watts
High channel radiated power = 20.7 dBm = 0.117 watts
Limits:
For Lowest Channel = $43 + 10 \log (P_{Watts}) = 43 + 10 \log (0.123) = 33.9$ dB attenuation
For Highest Channel = $43 + 10 \log (P_{watts}) = 43 + 10 \log (0.117) = 33.7$ dB attenuation

Limits:
20.9 dBm – 33.9 dB = -13 dBm
20.7 dBm – 33.7 dB = -13 dBm

Table 4. Field Strength of Spurious Radiation (Integral Patch Antenna)

Frequency MHz	Maximum RX Reading (Units A)	Recreated Reading During Substitution (Using Same Units A) - Ideally 0	Difference Column A - B	TX Gain (dBi)	TX Gain Relative to Dipole (dB)	RF Power into TX antenna	RF Power into substitution TX antenna corrected by TX Gain Relative to Dipole and TX Cable (dBm)	Limit (dBm)	Margin Below Limit (dB)
	The following applies information from test as performed								
1611.25	87.5	77.61	9.89	8.824	6.684	30	43.50	70	26.50
1611.25	79.32	77.65	1.67	8.824	6.684	30	35.28	70	34.72
3222.75	51.71	50.99	0.72	8.794	6.654	-50	-46.93	-13	33.93
4838.73	46.06	46.66	-0.6	9.458	7.318	-53	-51.52	-13	38.52
6444.75	47.7	45.51	2.19	10.677	8.537	-50	-45.43	-13	32.43
8057.7	45.14	46.94	-1.8	10.853	8.713	-50	-50.52	-13	37.52
9665.83	44.72	44.35	0.37	11.826	9.686	-53	-50.70	-13	37.70
1613.83	84.65	67.85	16.8	8.824	6.684	30	50.41	70	19.59
1613.83	72.11	67.85	4.26	8.824	6.684	30	37.87	70	32.13
3227.83	51.33	51.47	-0.14	8.794	6.654	-50	-47.79	-13	34.79
4843.33	45.52	46.32	-0.8	9.458	7.318	-50	-48.72	-13	35.72
6455.33	48.81	49.75	-0.94	10.677	8.537	-30	-28.56	-13	15.56
8068.48	45.62	47.88	-2.26	10.853	8.713	-40	-40.98	-13	27.98
9677.78	45.67	46.92	-1.25	11.826	9.686	-40	-39.47	-13	26.47
1616.25	84.38	78.63	5.75	8.824	6.684	30	39.36	70	30.64
1616.25	78.27	78.63	-0.36	8.824	6.684	30	33.25	70	36.75
3232.4	50.92	50.28	0.64	8.794	6.654	-55	-52.01	-13	39.01
4851.8	45.23	47.15	-1.92	9.458	7.318	-55	-54.84	-13	41.84
6465.13	48.91	46.19	2.72	10.677	8.537	-55	-49.90	-13	36.90
8084.08	46.23	45.31	0.92	10.853	8.713	-55	-52.59	-13	39.59
9693.88	45.13	45.8	-0.67	11.826	9.686	-55	-53.89	-13	40.89
1616.88	85.31	83.89	1.42	8.824	6.684	30	35.03	70	34.97
1616.88	71.65	74.46	-2.81	8.824	6.684	20	20.80	70	49.20
3237.48	50.91	49.98	0.93	8.794	6.654	-45	-41.72	-13	28.72
4857.43	44.76	43.26	1.5	9.458	7.318	-50	-46.42	-13	33.42
6475.28	48.98	46.39	2.59	10.677	8.537	-30	-24.91	-13	11.91
8094.6	45.83	48.09	-2.26	10.853	8.713	-30	-30.77	-13	17.77
9712.95	46.56	49.68	-3.12	12.002	9.862	-30	-31.16	-13	18.16

Sample Calculation:
EIRP = Power into TX antenna – Cable loss + substitution antenna gain + Difference Column A –B
EIRP = 30 + (-3.07) + 6.684 + 9.89 = 43.50 dBm

Test Date: August 9, 2017

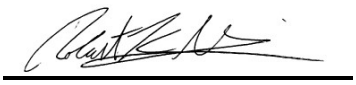
Tester Signature:  **Name: Robert K. Mills**

Table 5. Field Strength of Spurious Radiation (circular Patch Antenna)

Frequency MHz	Maximum RX Reading (Units A)	Recreated Reading During Substitution (Using Same Units A) - Ideally 0	Difference Column A - B	TX Gain (dBi)	TX Gain Relative to Dipole (dB)	RF Power into TX antenna	RF Power into substitution TX antenna corrected by TX Gain Relative to Dipole and TX Cable (dBm)	Limit (dBm)	Margin Below Limit (dB)
	The following applies information from test as performed								
1611.3	85.18	76.05	9.13	8.824	6.684	30	42.74	70	27.26
1611.3	59.29	58.85	0.44	8.824	6.684	10	14.05	70	55.95
3222.65	46.44	44.23	2.21	8.794	6.654	-50	-45.44	-13	32.44
4836.75	42.89	44.15	-1.26	9.458	7.318	-50	-49.18	-13	36.18
6445	46.05	41.97	4.08	10.677	8.537	-50	-43.54	-13	30.54
8060.3	43.21	42.2	1.01	10.853	8.713	-50	-47.71	-13	34.71
9662.15	43.71	42.36	1.35	11.826	9.686	-50	-46.72	-13	33.72
1613.8	87.1	83.17	3.93	8.824	6.684	30	37.54	70	32.46
1613.8	77.5	73.83	3.67	8.824	6.684	20	27.28	70	42.72
3227.6	48.18	47.93	0.25	8.794	6.654	-50	-47.40	-13	34.40
4840	43.35	42.98	0.37	9.458	7.318	-50	-47.55	-13	34.55
6455.25	45.91	42.32	3.59	10.677	8.537	-50	-44.03	-13	31.03
8071.55	44.24	42.04	2.2	10.853	8.713	-50	-46.31	-13	33.31
9682.45	44.55	42.1	2.45	11.826	9.686	-50	-45.77	-13	32.77
1616.3	83.5	81.66	1.84	8.824	6.684	30	35.45	70	34.55
1616.3	66.27	63	3.27	8.824	6.684	10	16.88	70	53.12
3232.65	48.99	45.57	3.42	8.794	6.654	-50	-44.23	-13	31.23
4845.75	45.01	43.14	1.87	9.458	7.318	-50	-46.05	-13	33.05
6465	47.68	41.86	5.82	10.677	8.537	-50	-41.80	-13	28.80
8082.3	44.32	43.3	1.02	10.853	8.713	-50	-47.49	-13	34.49
9690.5	43.52	41.99	1.53	11.826	9.686	-50	-46.69	-13	33.69
1618.75	85.73	73.57	12.16	8.824	6.684	30	45.77	70	24.23
1618.75	68.48	64.39	4.09	8.824	6.684	20	27.70	70	42.30
3237.35	48.13	46.47	1.66	8.794	6.654	-50	-45.99	-13	32.99
4852.95	44.25	43.18	1.07	9.458	7.318	-50	-46.85	-13	33.85
6475.4	47.69	41.88	5.81	10.677	8.537	-50	-41.69	-13	28.69
8102.35	44.69	42.53	2.16	11.043	8.903	-50	-46.16	-13	33.16
9720.35	45.25	43.57	1.68	12.002	9.862	-50	-46.36	-13	33.36

Sample Calculation:
EIRP = Power into TX antenna – Cable loss + substitution antenna gain + Difference Column A –B
EIRP = 30 + (-3.07) + 6.684 + 9.13 = 42.74 dBm

Test Date: August 9, 2017

Tester Signature:  **Name: Robert K. Mills**

Frequency Stability (FCC Section 2.1055 and 25.202(d))

The frequency tolerance of the carrier signal was measured while the ambient temperature was varied from -30 to + 50 degrees centigrade. The frequency tolerance was verified at 10 degree increments. Additionally, the supply voltage was varied from 85% to 115% of the nominal value (except for hand carried, battery powered equipment that was measured at battery endpoint). The carrier frequency of Earth Stations shall be maintained within 0.001 percent = 10 parts per million. Test data is presented below.

Table 6. Frequency Stability versus Temperature at 3.3 VDC

Temperature (degrees C)	Measured Frequency (MHz)	Deviation (ppm)
-30	1616.0002	0.0
-20	1616.0002	0.0
-10	1616.0002	-0.1
0	1616.0002	0.0
10	1616.0002	-0.1
20	1616.0003	0.0
30	1616.0004	0.1
40	1616.0002	-0.1
50	1616.0002	-0.1

Test Date: August 8, 2017
Tested by
Signature:  **Name: Robert K Mills**

2.11 Emissions from Mobile Earth Stations for Protection of Aeronautical Radio navigation-Satellite Service (FCC 25.216)

25.216c(1) Emissions from the EUT were evaluated from 1559 MHz – 1605 MHz and did not exceed the limit at -70dBW/MHz, averaged over 2 milliseconds.

25.216 f & g(1) Emissions from the EUT were evaluated from 1605 MHz – 1610 MHz and did not exceed the limits ranging from –70 dBW/MHz at 1605 MHz to –10dBW/MHz at 1610 MHz, averaged over 2 milliseconds.

25.216(i) Emissions from the EUT were evaluated from 1559 MHz – 1610 MHz and did not exceed the limits at -80 dBW/MHz averaged over any 2 millisecond interval.

Limit = - 70 dBW/MHz = -40 dBm

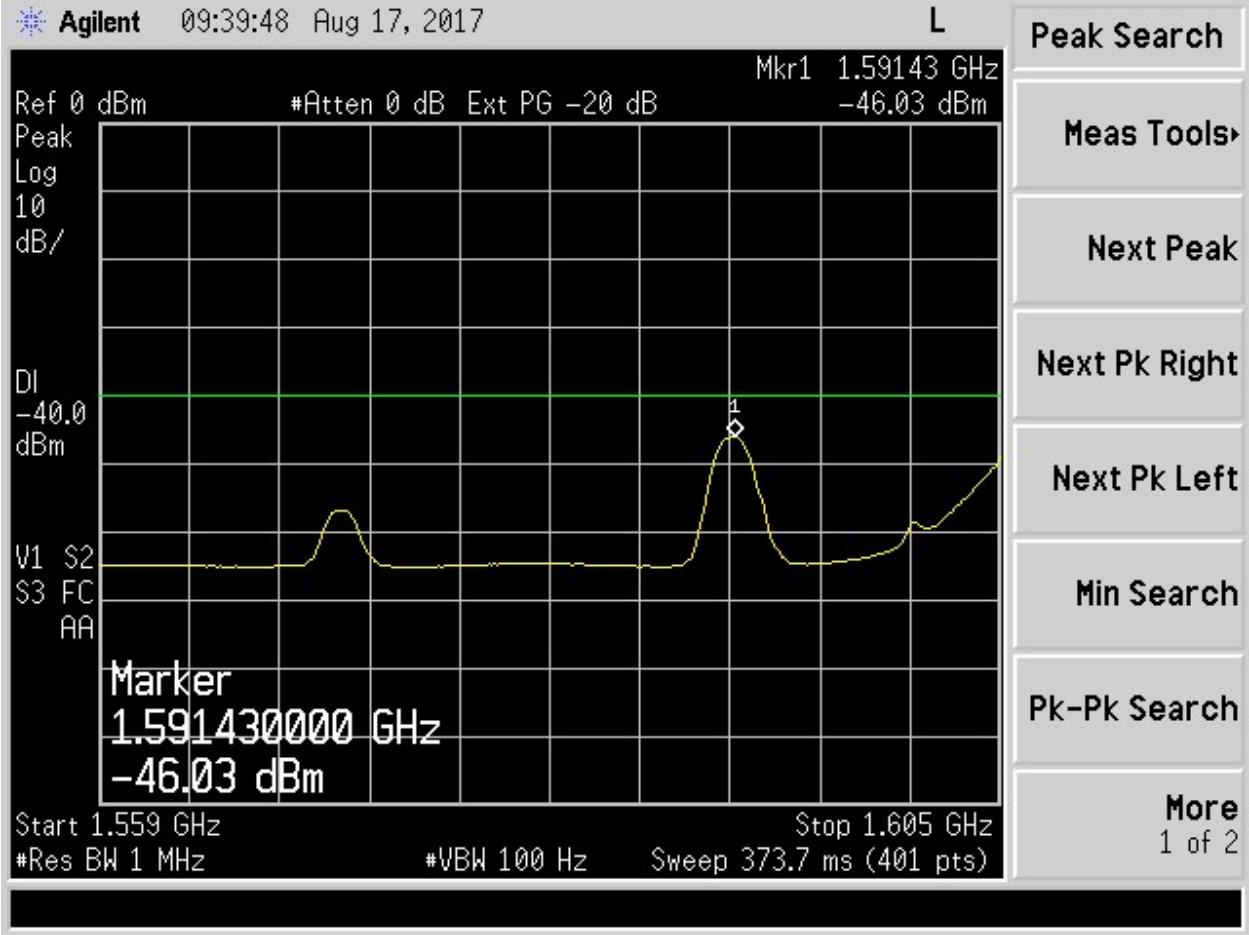


Figure 22. Emissions from Mobile Earth Stations for Protection of Aeronautical Radio-Navigation-Satellite Service (25.216(c) (1))- Channel A

Limit = -70 dBW/MHz at 1605 MHz to –10 dBW/MHz at 1610 (-40 dBm to 20 dBm)

Figure 23. Emissions from Mobile Earth Stations for Protection of Aeronautical Radio-Navigation-Satellite Service (FCC 25.216(g)(1))- channel A

Limit = - 70 dBW/MHz = -40 dBm

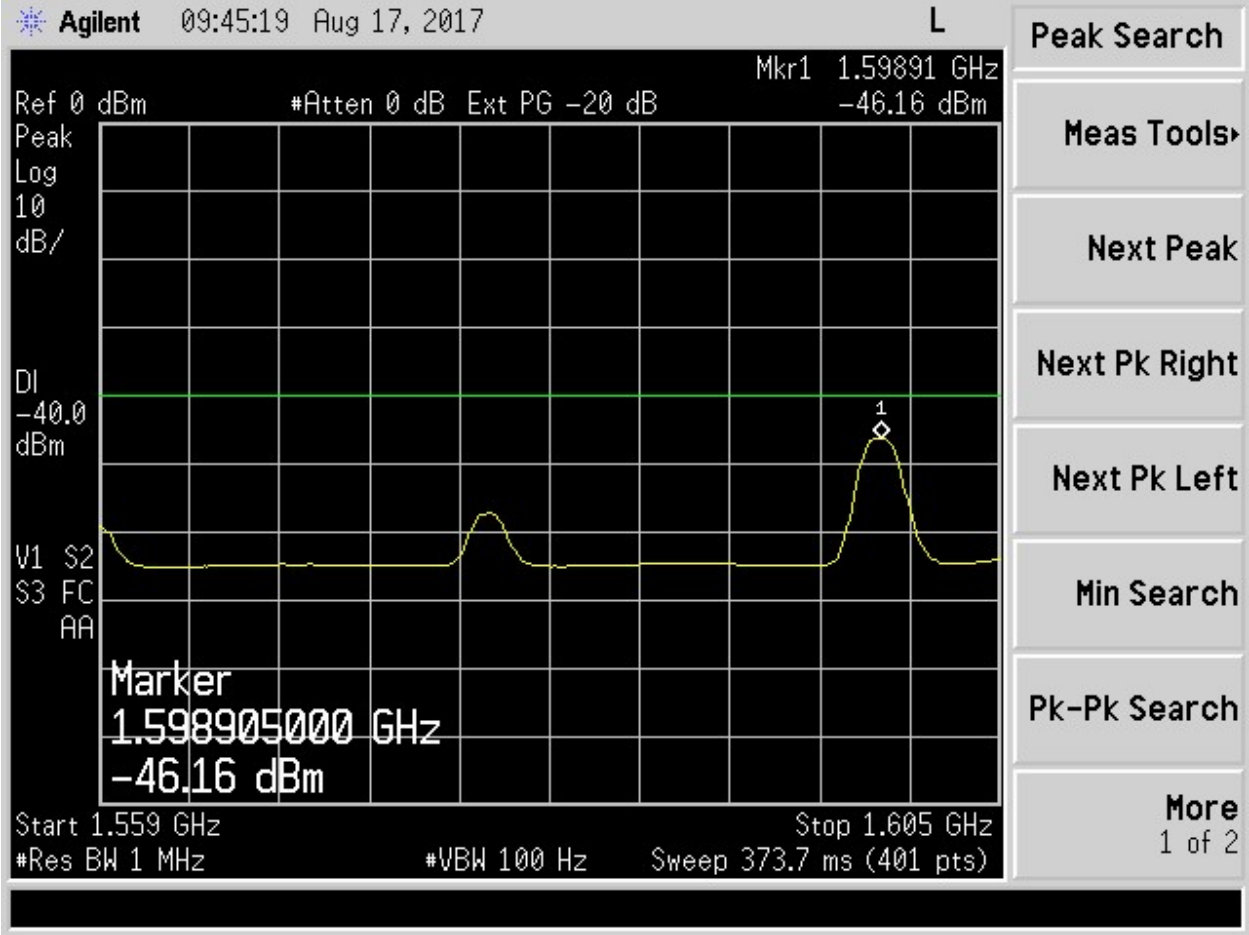


Figure 24. Emissions from Mobile Earth Stations for Protection of Aeronautical Radio-Navigation-Satellite Service (25.216(c) (1))- Channel D

Limit = -70 dBW/MHz at 1605 MHz to –10 dBW/MHz at 1610 (-40 dBm to 20 dBm)

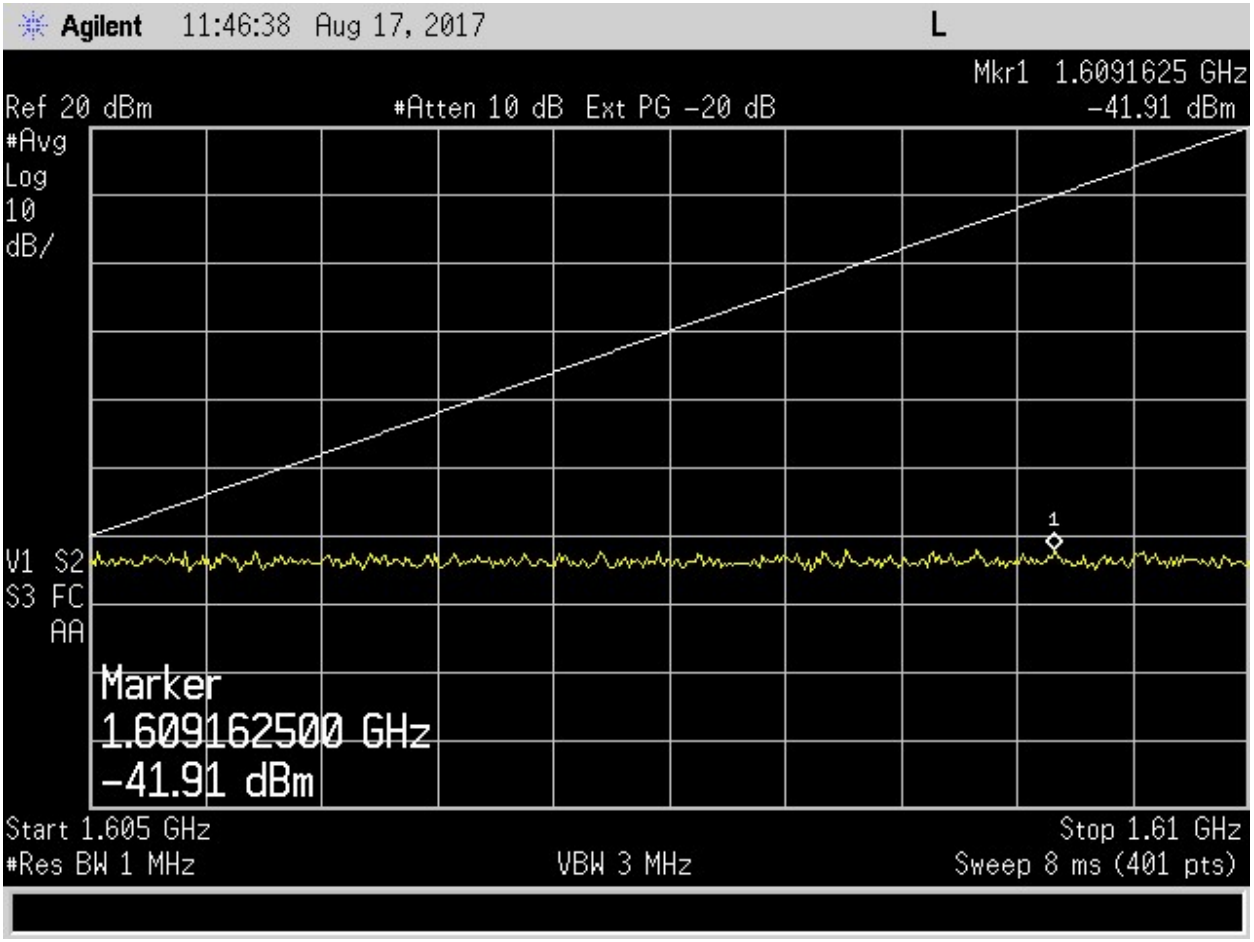


Figure 25. Emissions from Mobile Earth Stations for Protection of Aeronautical Radio-Navigation-Satellite Service (FCC 25.216(g)(1))-Channel D

Carrier OFF, Limit = - 80 dBW/MHz = -50 dBm

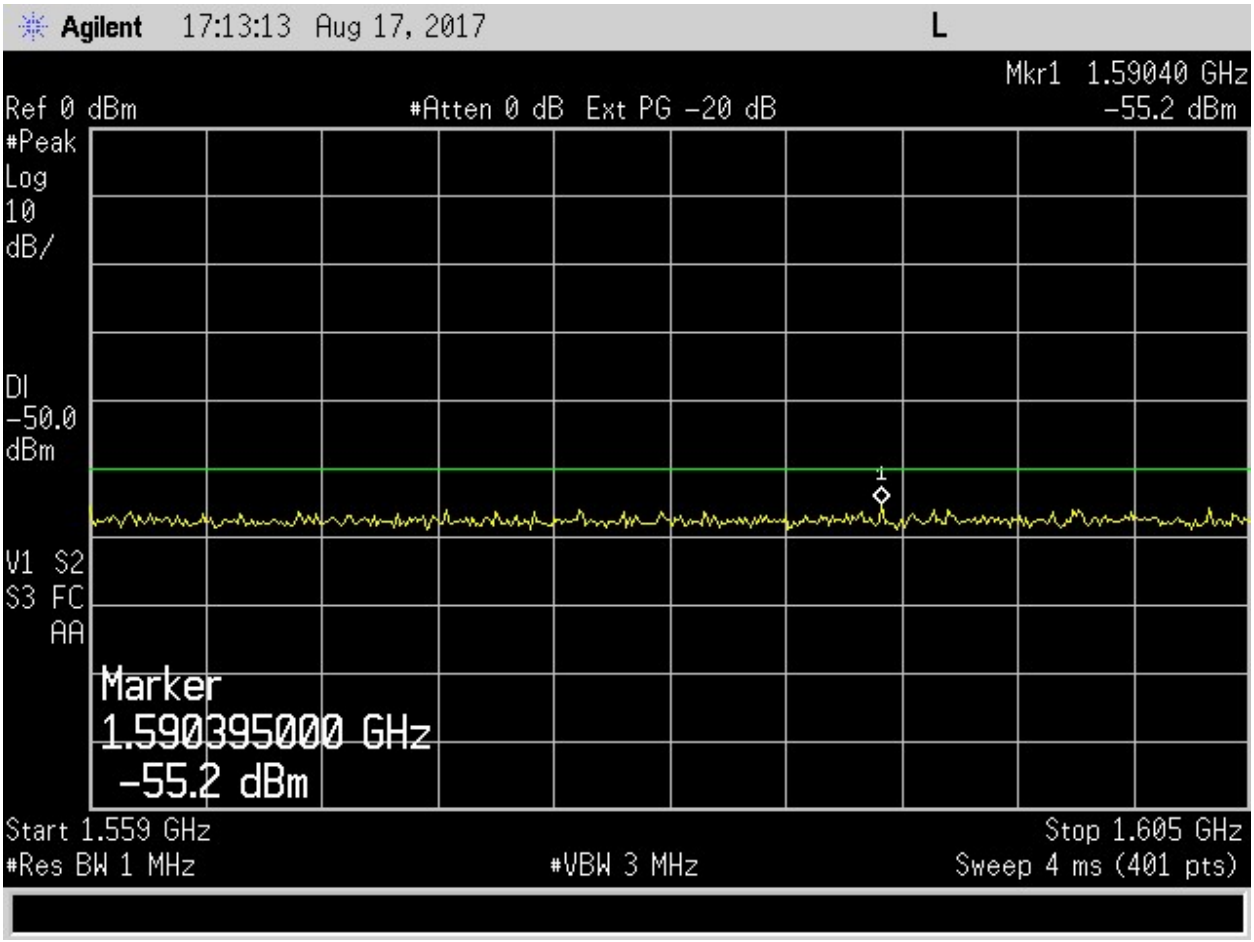


Figure 26. Emissions from Mobile Earth Stations for Protection of Aeronautical Radio-Navigation-Satellite Service (FCC 25.216(i))

2.12 Unintentional Radiator, Radiated Emissions (CFR 15.109)

The transmitter was tested for verification of the Digital Device in sleep mode (TX off); the radiated emissions per CFR15.109 were measured. Power line conducted emissions are not a consideration because the EUT is battery powered.

The radiated measurements were performed over the frequency range of 30 MHz to 16 GHz according to the procedures of ANSI C63.4. The EUT was set up in the 3 meter EMC Chamber. It was placed on a non-conductive table at a height of 80 cm above the ground plane on a 2 meter, diameter turn-table. The EUT was positioned along the Z-axis facing the measurement antenna. The measurement antenna was connected to the receiving device, a Spectrum Analyzer with quasi-peak adaptor, through an RF preamplifier by 50 Ohm, double-shielded, coaxial cable.

The Spectrum Analyzer Resolution and video bandwidths and frequency span controls were adjusted according to the detector used and the frequency range being examined. Below 1 GHz, a resolution bandwidth of 120 kHz was used. Above 1 GHz, the resolution bandwidth was set to 1 MHz. The video bandwidth was coupled to the resolution bandwidth. The Quasi-peak adaptor box was placed in bypass mode for the scanning activities.

During the search for radiated digital device emissions, when a candidate emission was found, the antenna was raised and lowered from 1 meter to 4 meters in height in an attempt to maximize the emission. Also, the turntable was rotated through 360 degrees in an attempt to maximize the emission. If there was a question of the emission being a real digital device emission, the EUT was turned OFF and then back ON while watching the Spectrum Analyzer display for the signal to disappear and then re-appear. After manipulation of the antenna and turntable to maximize the signal, the EUT was re-oriented in the three mutually exclusive orthogonal planes in an attempt to further maximize the signal.

The final readings of digital emissions were made with a peak or quasi-peak detector. Because the limits are Quasi-peak, the peak readings were first used for comparison to the limit. If the peak signals passed the QP limit then QP measurements were not performed. Otherwise QP measurements were performed for comparison to the QP limit. The same process was repeated for the other antenna polarization (Vertical or Horizontal). At least six (6) readings were gathered for reporting purposes. Test results are included in Tables 7 and 8.

Table 7. Unintentional Radiator, Radiated Emissions (CFR 15.109)

Test By: RKM	Test: FCC Part 2.1051/Part 15.109					Client: Geoforce			
	Project: 17-0280			Class: A		Model: SCC-200			
Frequency (MHz)	AF Table	Test Data (dBuV)	Additional Factor	AF+CA-AMP+DC (dB/m)	Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Margin (dB)	Detector PK/QP/AVG
81.19	2BI3mH	33.83	-10.50	-17.39	5.94	40.0	3m./HORZ	34.1	**PK**
134.48	2BI3mH	32.04	-10.50	-14.03	7.51	43.5	3m./HORZ	36.0	**PK**
47.98	2BI3mV	33.25	-10.50	-16.87	5.88	40.0	3m./VERT	34.1	**PK**
105.36	2BI3mV	32.57	-10.50	-15.43	6.64	43.5	3m./VERT	36.9	**PK**
203.08	2LP3mH	32.31	-10.50	-13.70	8.11	43.5	3m./HORZ	35.4	**PK**
392.29	2LP3mH	33.14	-10.50	-9.83	12.81	46.0	3m./HORZ	33.2	**PK**
658.75	2LP3mH	33.80	-10.50	-4.16	19.14	46.0	3m./HORZ	26.9	**PK**
980.30	2LP3mH	31.68	-10.50	0.58	21.76	54.0	3m./HORZ	32.2	**PK**
204.72	2LP3mV	32.16	-10.50	-14.90	6.76	43.5	3m./VERT	36.7	**PK**
430.11	2LP3mV	33.33	-10.50	-9.53	13.30	46.0	3m./VERT	32.7	**PK**
758.75	2LP3mV	33.14	-10.50	-2.48	20.16	46.0	3m./VERT	25.8	**PK**
977.20	2LP3mV	33.01	-10.50	-0.09	22.42	54.0	3m./VERT	31.6	**PK**

No other emissions detected within 20 dB of the FCC Part 15.109 limits
EUT is classified as a Class A device under Part 15.109. Measurements at 3 m were extrapolated to 10 meters using an extrapolation factor of -10.5 dB.

SAMPLE CALCULATION:
RESULTS: At 81.19 MHz: = ((33.83 + (-10.5) + (-17.39) = 5.94 dBuV/m @ 3m
Margin = (40.0 – 5.94) = 34.1 dB

Test Date: July 13, 2017

Tested by
Signature:  **Name: Robert K. Mills**

Table 8. Unintentional Radiator, Radiated Emissions (CFR 15.109)-Above 1 GHz

Unintentional Radiator, Radiated Emissions							
Test By: RKM	**Test: FCC Part 15.109, 15.209**			**Client: Geoforce**			
	Project: 17-0280 Class: B			**Model: SCC-002**			
Frequency(MHz)	**Test Data (dBuV)**	**AF+CL-PA (dB)**	**Results (dBuV/m)**	**Limits (dBuV/m)**	**Distance / Polarization**	**Margin (dB)**	**DETECTOR PK / AVG**
Tested over the 1 GHz to 16.5 GHz range							
2977.50	45.04	1.80	46.84	54.0	3.0m./HORZ	7.2	**PK**
1105.00	47.54	-5.76	41.78	54.0	3.0m./VERT	12.2	**PK**

No other emissions detected within 20 dB of the FCC Part 15.109 limits

SAMPLE CALCULATION:
RESULTS: At 2977.50 MHz: = ((45.04+ (1.80) = 46.84 dBuV/m @ 3m
Margin = (54 – 46.84) = 7.2 dB

Test Date: July 13, 2017

Tested by
Signature:  **Name: Robert K. Mills**

2.13 Unintentional Radiator Power Lines Conducted Emissions (CFR 15.107)

The test data provided herein is to support the Verification requirement for the digital apparatus.

This test was not performed since the EUT is a battery powered device. Testing deemed not applicable.

3 Measurement Uncertainty

3.1 Conducted Emissions Measurement Uncertainty

Measurement Uncertainty (within a 95% confidence level) for this test is ±2.8 dB.

The device is battery powered. This test was not conducted.

3.2 Radiated Emissions Measurement Uncertainty

For a measurement distance of 3 m the measurement uncertainty (with a 95% confidence level) for this test using a Biconical Antenna (30 MHz to 200 MHz) is ±5.3 dB. This value includes all elements of measurement.

The measurement uncertainty (with a 95% confidence level) for this test using a Log Periodic Antenna (200 MHz to 1000 MHz) is ±5.1 dB.

The measurement uncertainty (with a 95% confidence level) for this test using a Horn Antenna is ±5.1 dB.

4 RF Exposure Information

The maximum exposure level to the public from the RF power of the EUT shall not exceed a power density, **S**, of 1 mW/cm^2 at a distance, d, of 20 cm from the EUT.

Therefore, for:

Peak Power (Watts) = 21.0 dBm (0.1259 Watts) (from Table 3, herein)
Gain of Transmit Antenna = 5.0 dB_i = 3.16, numeric (from Paragraph 2.5, herein)
d = Distance = 20 cm = 0.2 m

S = ($PG/ 4\pi d^2$) = EIRP/4A = 0.1259 (3.16)/4*π*0.2*0.2
=0.3978/0.502 = 0.7925 W/m^2
= 0.07925 mW/cm^2

Which is << less than 1 mW/cm^2