Report on the FCC and IC Testing of the Iridium Satellite LLC Handset, Model: 9555N In accordance with FCC 47 CFR Part 25, FCC 47 CFR Part 2, Industry Canada RSS-170 and Industry Canada RSS-GEN

Prepared for: Iridium Satellite LLC
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FCC ID: Q639555N, IC: 4629A-9555N

COMMERCIAL-IN-CONFIDENCE

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RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Project Management	Natalie Bennett	23 April 2018	
Authorised Signatory	Matthew Russell	23 April 2018	

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 25, FCC 47 CFR Part 2, Industry Canada RSS-170 and Industry Canada RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Nicolas Salguero Camarena	23 April 2018	
Testing	Graeme Lawler	23 April 2018	
Testing	Joe Santos	23 April 2018	
Testing	Mehadi Choudhury	23 April 2018	

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

Industry Canada Accreditation
IC2932B-1 Octagon House, Fareham Test Laboratory

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 25: 2017, FCC 47 CFR Part 2: 2017, Industry Canada RSS-170, Issue 3: 2015 and Industry Canada RSS-GEN, Issue 4, 2014

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1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	23 April 2018

Table 1

1.2 Introduction

Applicant	Iridium Satellite LLC
Manufacturer	Iridium Satellite LLC
Model Number(s)	Handset: 9555N
Serial Number(s)	Handset: #12 P0600-GR-169 (B05UM3) Handset: #8 P0600-GR-139 (B00JCM) Handset: #9 P0600-GR-165 (B05TNY)
Hardware Version(s)	9555N #8 (P0600-GR-139): Application Board: Rev G, Transceiver Board: Rev A P1638-CN-039 v0.3 REVG-BOOT0fa3/9555N5NRevA/02/RAW16 9555N #9 (P0600-GR-165), #12 (P0600-GR-169): Application Board: Rev J, Transceiver Board: Rev A P1638-CN-039 v0.3 REVG-BOOT0fa3/9555N5NRevA/02/RAW16
Software Version(s)	HT-10644-1I-HB-HUT9555NA-107-DEVSNAP FW: 10563_3-9580-DB17999
Number of Samples Tested	3
Test Specification/Issue/Date	FCC 47 CFR Part 25: 2017 FCC 47 CFR Part 2: 2017 Industry Canada RSS-170, Issue 3: 2015 Industry Canada RSS-GEN, Issue 4, 2014
Order Number Date	47481 15-January-2018
Date of Receipt of EUT	06-February-2018, 07-February-2018 and 22-March-2018
Start of Test	07-February-2018
Finish of Test	29-March-2018
Name of Engineer(s)	Nicolas Salguero Camarena, Graeme Lawler, Joe Santos and Mehadi Choudhury
Related Document(s)	ANSI C63.26 (2015)

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 25 and FCC 47 CFR Part 2, Industry Canada RSS-170 and Industry Canada RSS-GEN is shown below.

Section	Specification Clause				Test Description	Result	Comments/Base Standard
	Part 25	Part 2	RSS-170	RSS-GEN			
Configuration and Mode: Iridium Transceiver							
2.1	25.202(f)	2.1051	5.4.3.1	6.13	Spurious Emissions at Antenna Terminals	Pass	ANSI C63.26
2.2	25.202(f)	2.1053	5.4.3.1	6.13	Radiated Spurious Emissions	Pass	ANSI C63.26
2.3	-	2.1047 (d)	-	-	Modulation Characteristics	Declaration	
2.4	-	2.1049	-	6.6	Occupied Bandwidth	Pass	ANSI C63.26
2.5	25.202(d)	2.1055	5.2	-	Frequency Tolerance	Pass	ANSI C63.26
2.6	25.204	2.1046	5.3	6.12	Equivalent Isotropic Radiated Power	Pass	ANSI C63.26
2.7	25.216	-	5.4.3	-	Limits on Emissions from Mobile Earth Stations for Protection of Aeronautical Radionavigation-Satellite Service	Pass	ANSI C63.26

Table 2

1.4 Application Form

EQUIPMENT DESCRIPTION	
Model Name/Number	Iridium 9555N
Part Number	IRID0115N
Hardware Version	9555N #8 (P0600-GR-139): Application Board: Rev G, Transceiver Board: Rev A P1638-CN-039 v0.3 REVG-BOOT0fa3/95555NRevA/02/RAW16 9555N #12 (P0600-GR-169): Application Board: Rev J, Transceiver Board: Rev A P1638-CN-039 v0.3 REVJ-BOOT0fa3/95555NRevA/02/RAW16
Software Version	HT-10644-1I-HB-HUT9555A-107-DEVSNAP FW: 10563_3-9580-DB17999
FCC ID (if applicable)	Q639555N
Industry Canada ID (if applicable)	4629A-9555N
Technical Description (Please provide a brief description of the intended use of the equipment)	Satellite phone for operation with the Iridium satellite network.

INTENTIONAL RADIATORS									
Technology	Frequency Band (MHz)	Conducted Declared Output Power (dBm)	Antenna Gain (dBi)	Supported Bandwidth (s) (MHz)	Modulation Scheme(s)	ITU Emission Designator	Test Channels (MHz)		
							Bottom	Middle	Top
Iridium	1616 - 1626	37.7+/-0.5	3.0	0.041667	DE-QPSK/DE-BPSK	41K7Q7W	1616.020833	1621.020833	1625.979166

UN-INTENTIONAL RADIATOR	
Highest frequency generated or used in the device or on which the device operates or tunes	3254.6MHz
Lowest frequency generated or used in the device or on which the device operates or tunes	0.032768MHz (Other clock frequencies: 16.8MHz, 26MHz, 14.8MHz)
Class A Digital Device (Use in commercial, industrial or business environment) ☐ Class B Digital Device (Use in residential environment only) ☒	

Power Source			
AC	Single Phase	Three Phase	Nominal Voltage
External DC	Nominal Voltage	Maximum Current	
Battery	Nominal Voltage	Battery Operating End Point Voltage	

	3.7	3.1V (in call mode)/3.3V(in idle mode)
Can EUT transmit whilst being charged?		Yes ☒ No ☐

EXTREME CONDITIONS					
Maximum temperature	+55	°C	Minimum temperature	-10	°C

Ancillaries
Please list all ancillaries which will be used with the device.
A/C Charger - ACTC1601
International Plug Kit - IPK0601
Auto Charger - AUT1601
USB to MiniUSB Cable - USBC1101
Headset - HFHS0601
External Antenna - MXTENA1401-TNC
Battery - BAT21601
Holster - HOL0801

ANTENNA CHARACTERISTICS						
☒	Antenna connector			State impedance	50	Ohm
☐	Temporary antenna connector			State impedance		Ohm
☒	Integral antenna	Type	Passive RHCP Quadrifilar Helix Antenna: Peak Gain 3.0dBi			
☒	External antenna	Type	MXTENA1401-TNC: Peak Gain 1dBic, RHCP			

I hereby declare that the information supplied is correct and complete.

Name: Jonathan Jones
Position held: Principal Engineer Date: 23/01/2018

1.5 Product Information

1.5.1 Technical Description

Satellite phone for operation with the Iridium satellite network.

1.6 Deviations from the Standard

No deviations from the applicable test standard were made during testing.

1.7 EUT Modification Record

The table below details modifications made to the EUT during the test programme.
The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
Serial Number: #12 P0600-GR-169 (B05UM3)			
0	As supplied by the customer	Not Applicable	Not Applicable
Serial Number: #8 P0600-GR-139 (B00JCM)			
0	As supplied by the customer	Not Applicable	Not Applicable
Serial Number: #9 P0600-GR-165 (B05TNY)			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 3

1.8 Test Location

TÜV SÜD Product Service conducted the following tests at our Fareham Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: Iridium Transceiver		
Spurious Emissions at Antenna Terminals	Nicolas Salguero Camarena	UKAS
Radiated Spurious Emissions	Graeme Lawler	UKAS
Occupied Bandwidth	Joe Santos	UKAS
Frequency Tolerance	Joe Santos	UKAS
Equivalent Isotropic Radiated Power	Mehadi Choudhury	UKAS
Limits on Emissions from Mobile Earth Stations for Protection of Aeronautical Radionavigation-Satellite Service	Mehadi Choudhury	UKAS

Table 4

Office Address:

Octagon House
Concorde Way
Segensworth North
Fareham
Hampshire
PO15 5RL
United Kingdom

2 Test Details

2.1 Spurious Emissions at Antenna Terminals

2.1.1 Specification Reference

FCC 47 CFR Part 25, Clause 25.202(f)
FCC 47 CFR Part 2, Clause 2.1051
Industry Canada RSS-170, Clause 5.4.3.1
Industry Canada RSS-GEN, Clause 6.1.3

2.1.2 Equipment Under Test and Modification State

9555N, S/N: #8 P0600-GR-139 (B00JCM) - Modification State 0

2.1.3 Date of Test

20-February-2018 to 21-February-2018

2.1.4 Test Method

This test was performed in accordance with ANSI C63.26, clause 5.7.

Where a RBW > 4 kHz was used, this was considered worst case. For measurements below 3 GHz, a gated trigger was used and measurements were averaged over the active part of the burst. For measurements above 3 GHz, a 3 GHz high pass filter was used, therefore the trace was set to max hold which again was considered worst case.

The antenna gain declared by the manufacturer was included in the reference level offset.

2.1.5 Environmental Conditions

Ambient Temperature	22.2 - 22.5 °C
Relative Humidity	25.1 - 25.7 %

2.1.6 Test Results

Iridium Transceiver

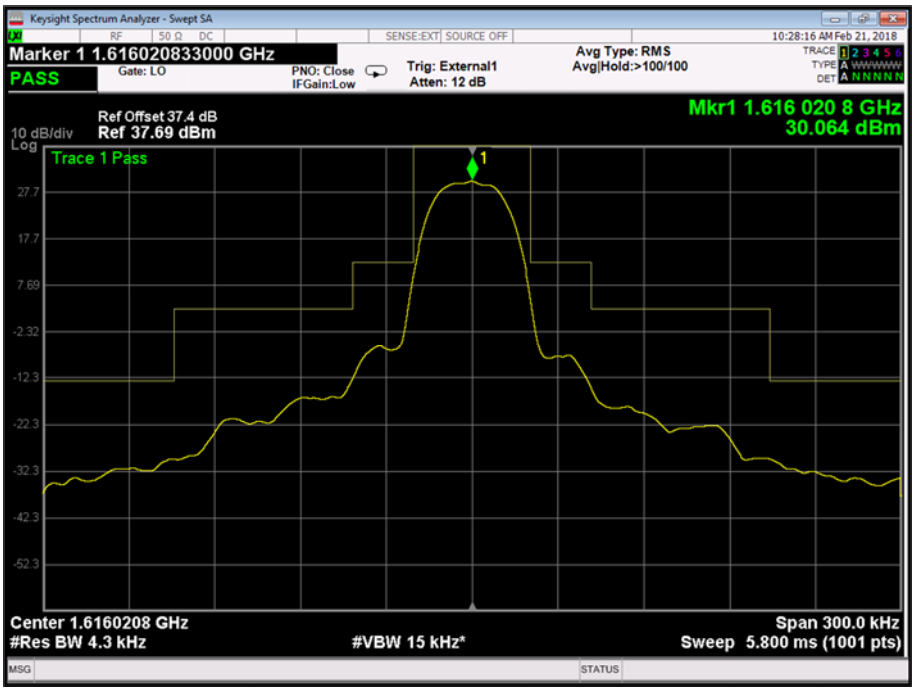

Figure 1 - 1616.020833 MHz - Emission Mask

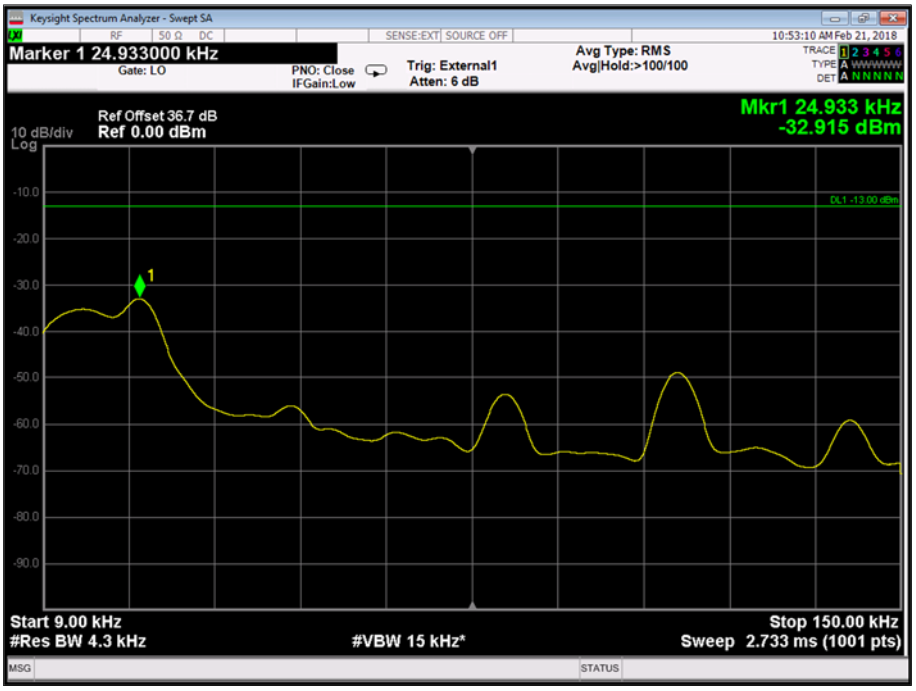

Figure 2 - 1616.020833 MHz - 9 kHz to 150 kHz

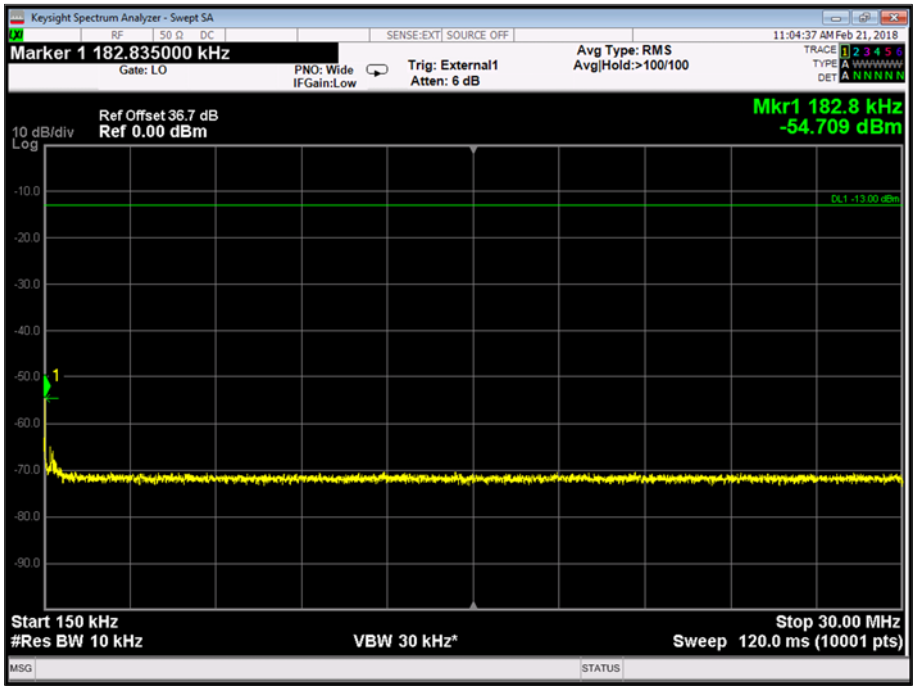

Figure 3 - 1616.020833 MHz - 150 kHz to 30 MHz

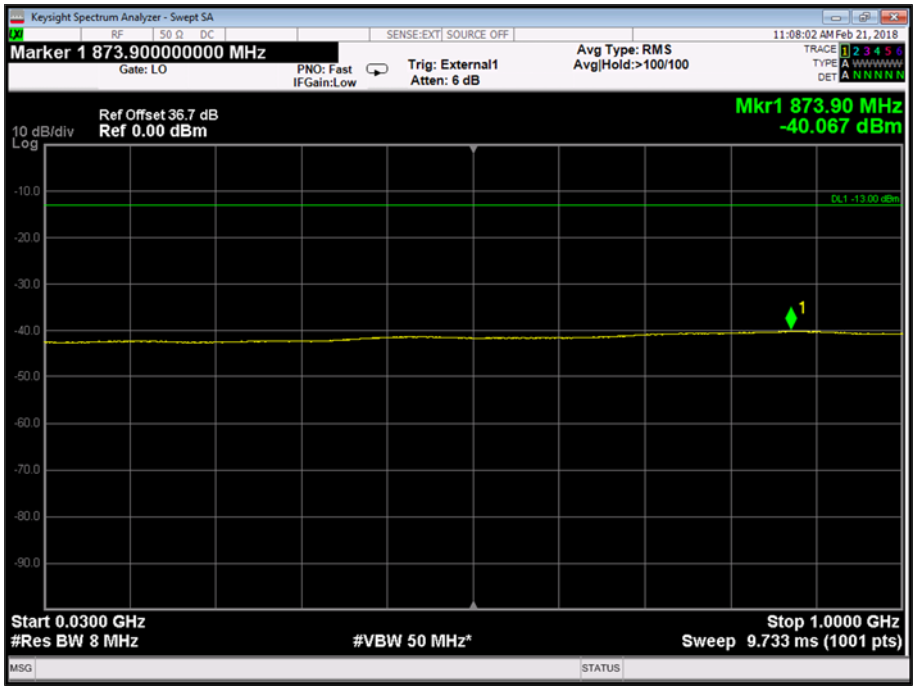

Figure 4 - 1616.020833 MHz - 30 MHz to 1 GHz

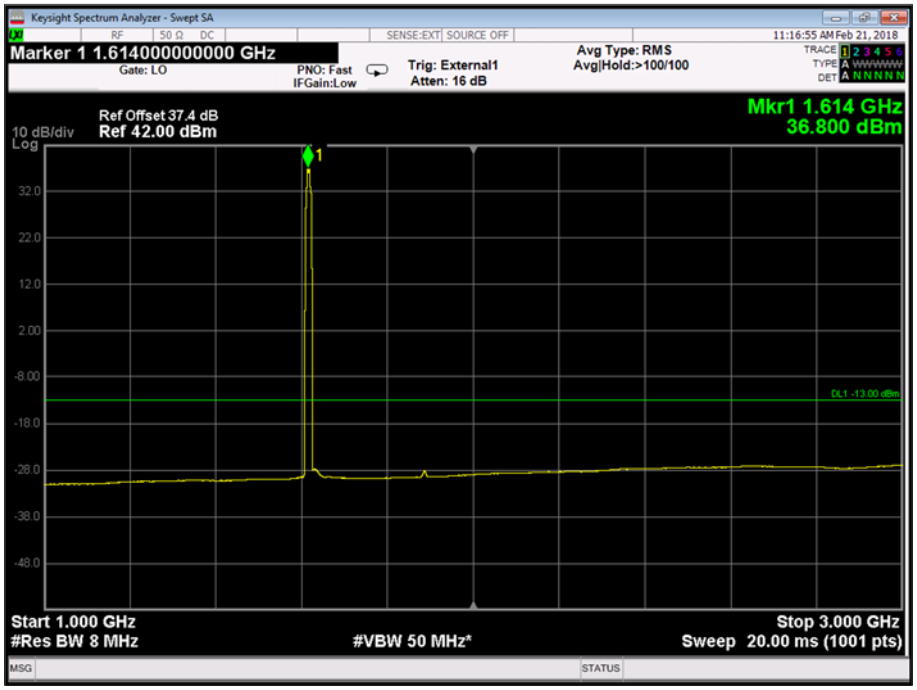

Figure 5 - 1616.020833 MHz - 1 GHz to 3 GHz

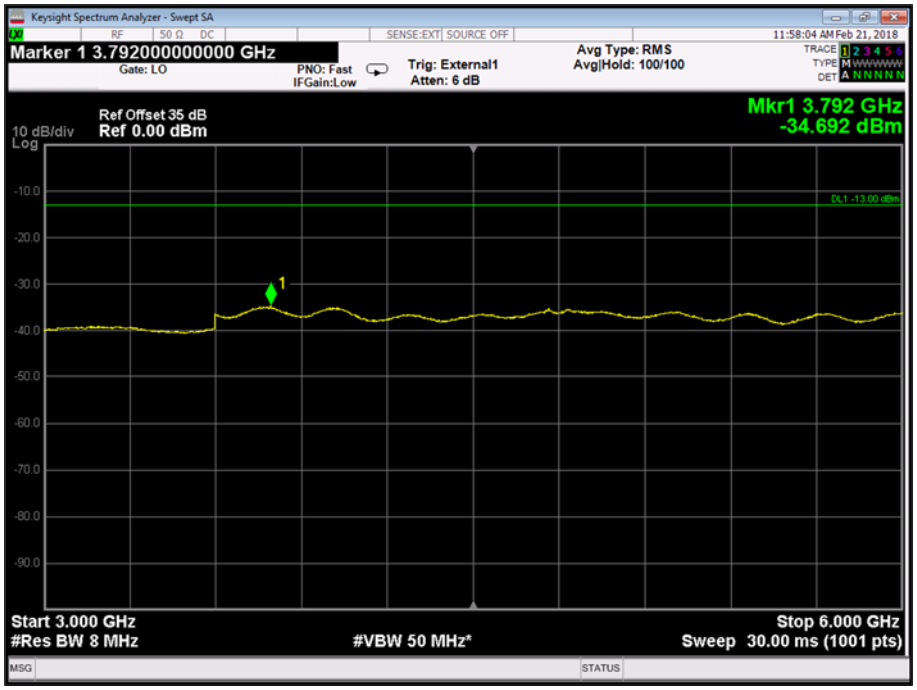

Figure 6 - 1616.020833 MHz - 3 GHz to 6 GHz

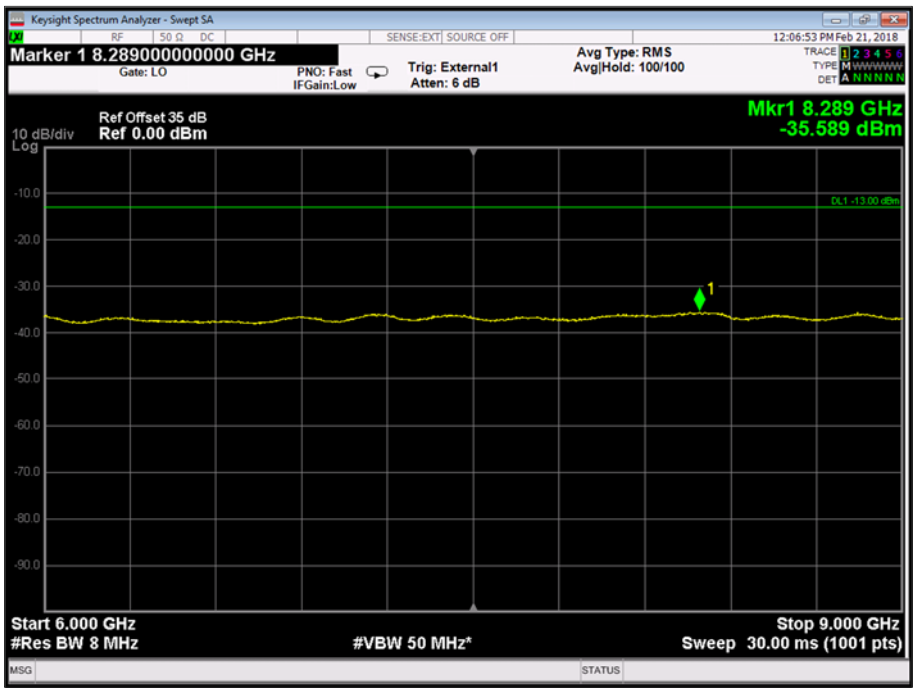

Figure 7 - 1616.020833 MHz - 6 GHz to 9 GHz

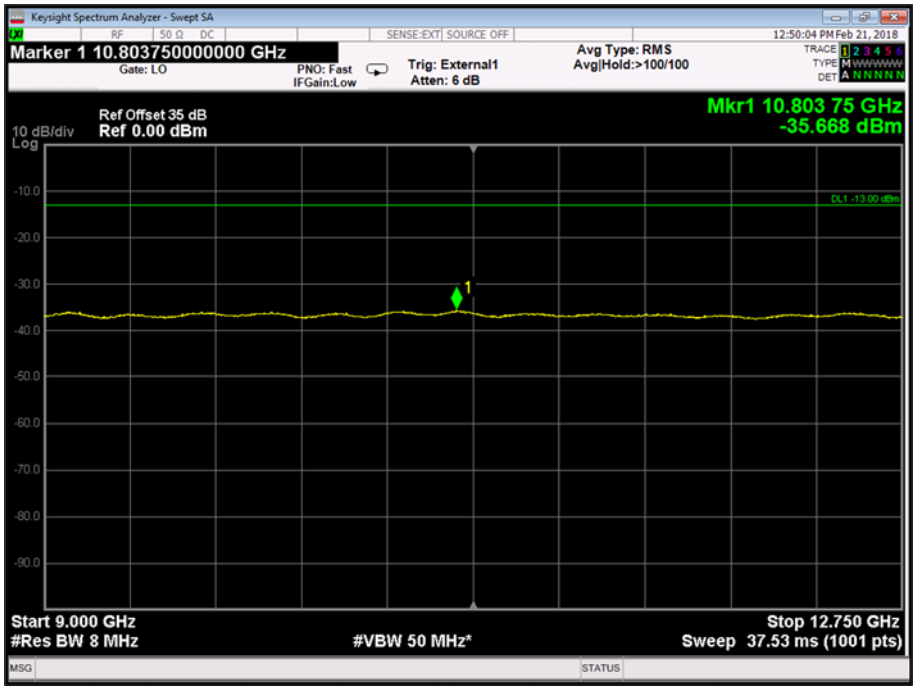

Figure 8 - 1616.020833 MHz - 9 GHz to 12.75 GHz

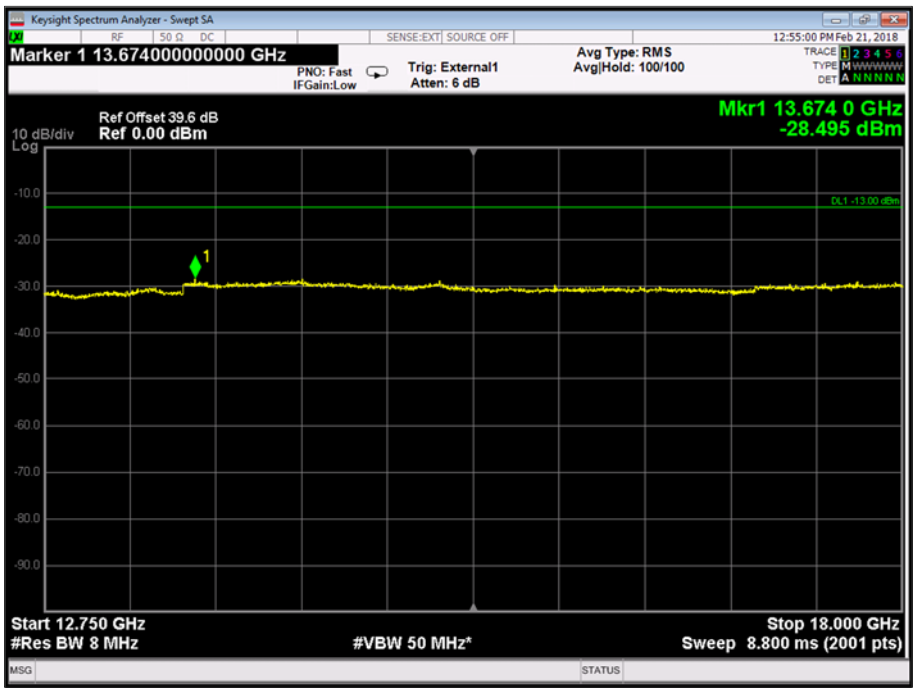

Figure 9 - 1616.020833 MHz - 12.75 GHz to 18 GHz

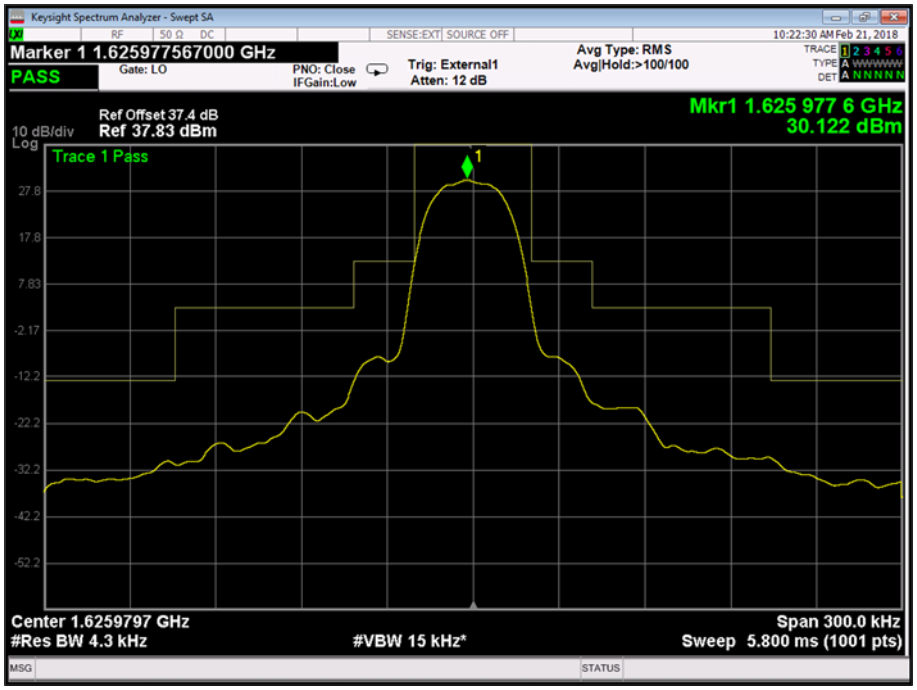

Figure 10 - 1625.979166 MHz - Emission Mask

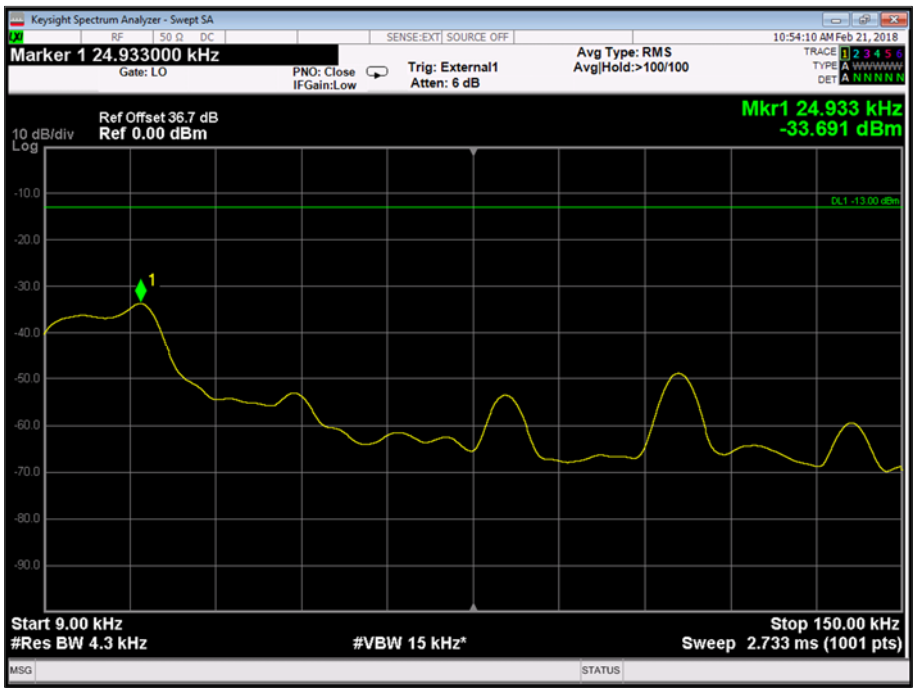

Figure 11 - 1625.979166 MHz - 9 kHz to 150 kHz

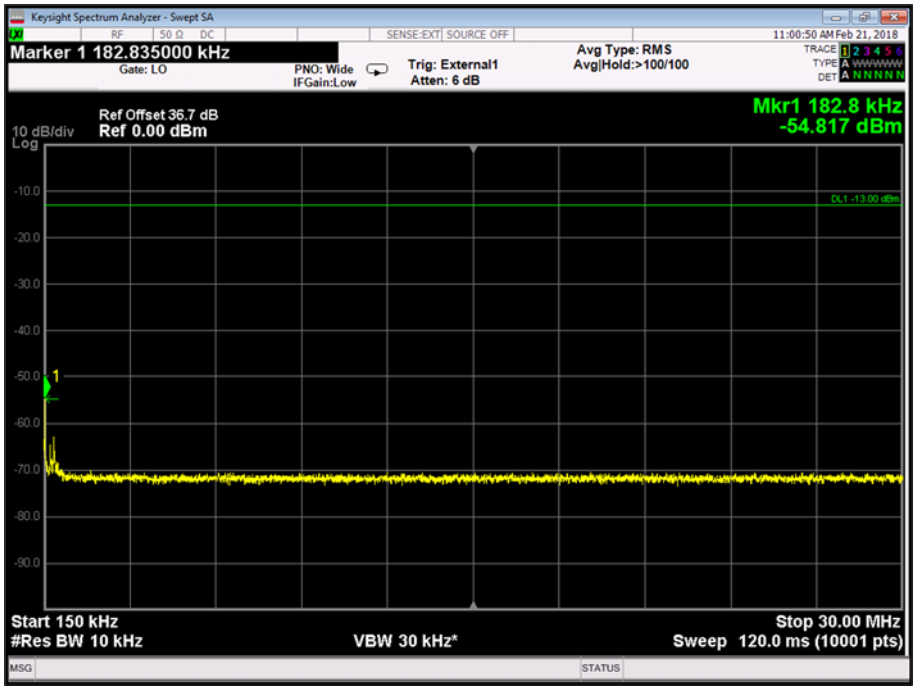

Figure 12 - 1625.979166 MHz - 150 kHz to 30 MHz

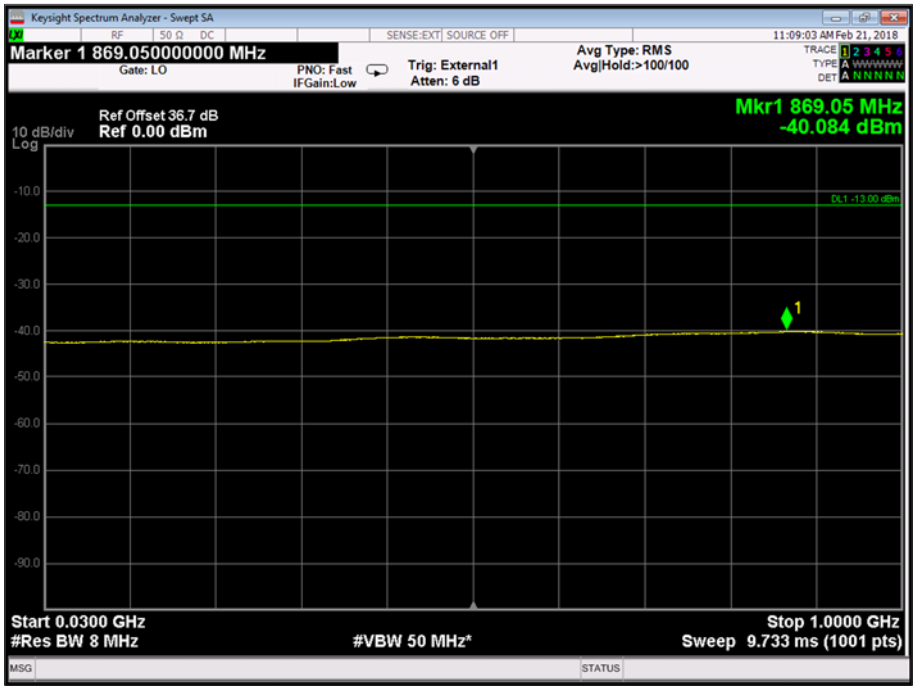

Figure 13 - 1625.979166 MHz - 30 MHz to 1 GHz

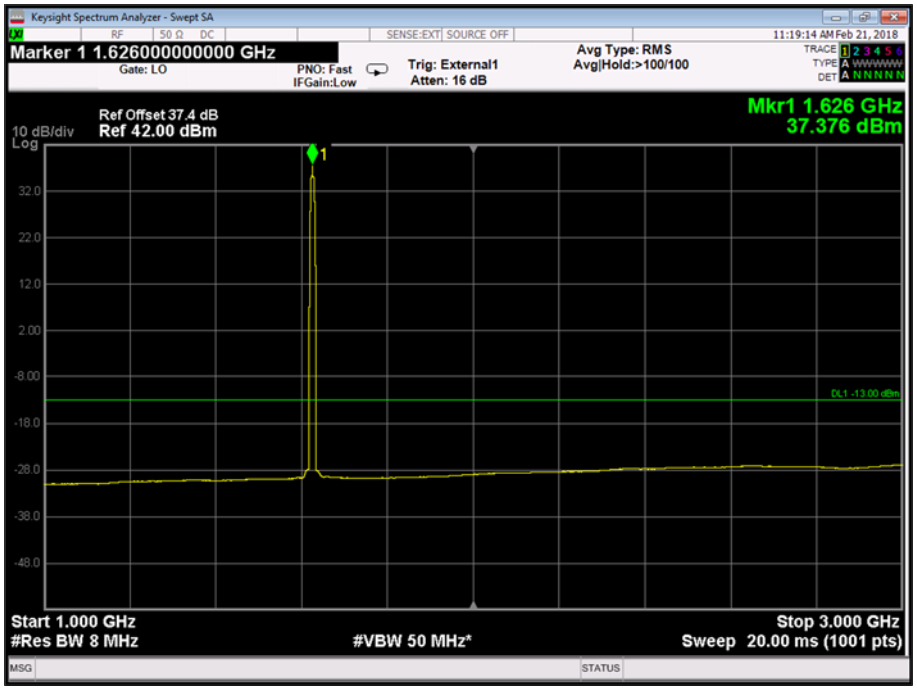

Figure 14 - 1625.979166 MHz - 1 GHz to 3 GHz

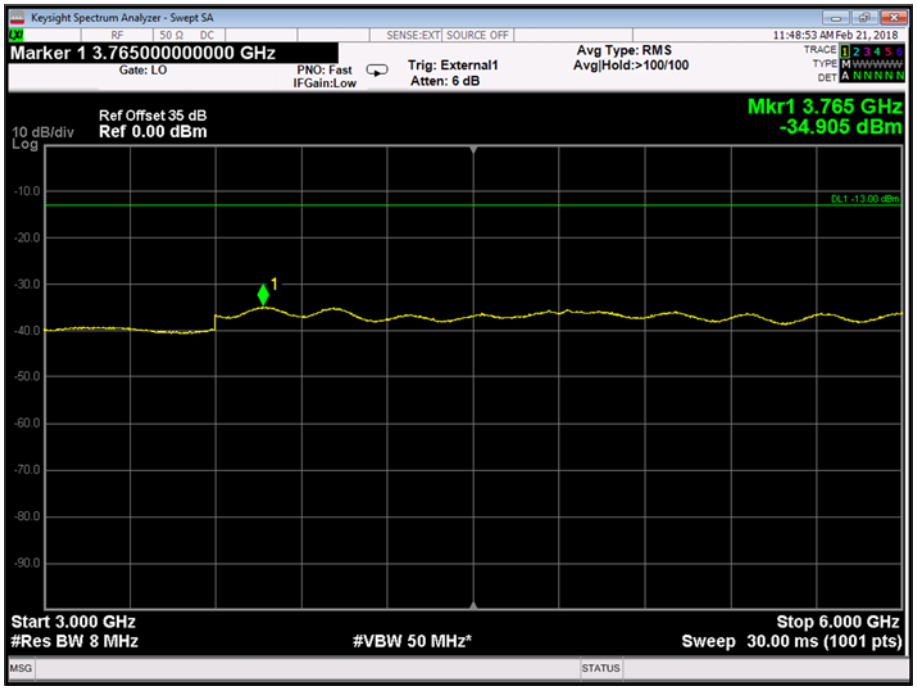

Figure 15 - 1625.979166 MHz - 3 GHz to 6 GHz

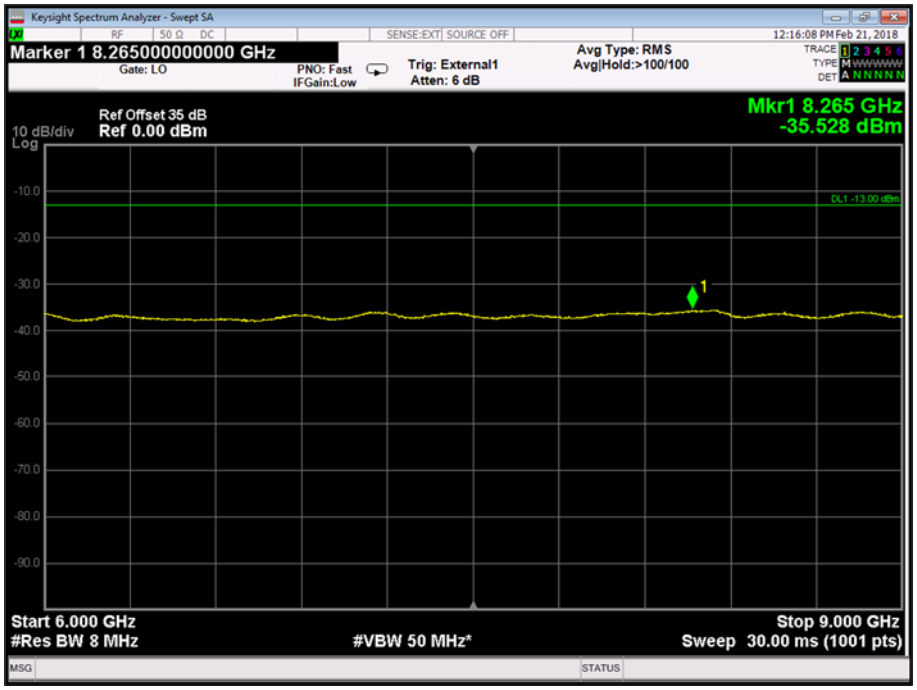

Figure 16 - 1625.979166 MHz - 6 GHz to 9 GHz

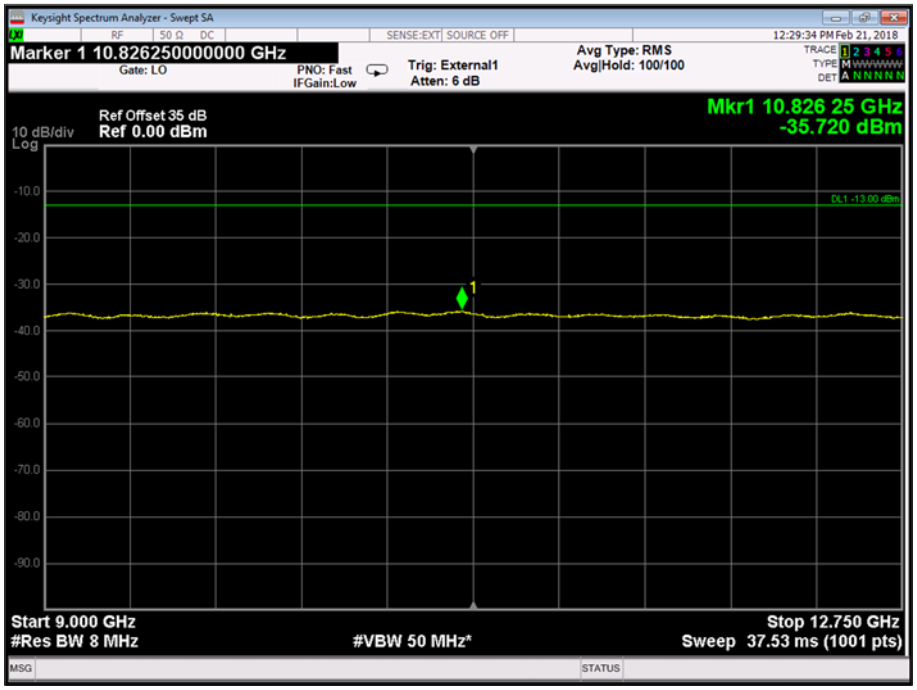

Figure 17 - 1625.979166 MHz - 9 GHz to 12.75 GHz

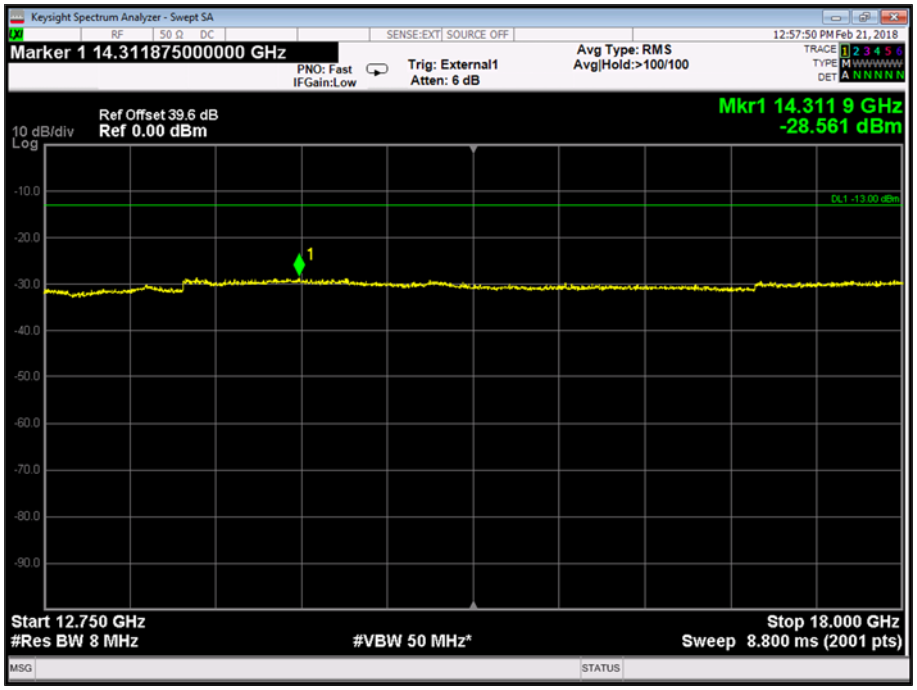

Figure 18 - 1625.979166 MHz - 12.75 GHz to 18 GHz

FCC 47 CFR Part 2, Limit Clause 25.202(f)

The average power of unwanted emissions shall be attenuated below the average output power, P(dBW), of the transmitter, as specified below:

1) 25 dB in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 50%, up to and including 100% of the authorised bandwidth;
2) 35 dB in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 100%, up to and including 250% of the authorised bandwidth;
3) 43 + 10 Log p (watts) in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 250% of the authorised bandwidth.

Industry Canada RSS-170, Limit Clause 5.4.3.1

The average power of unwanted emissions shall be attenuated below the average output power, P(dBW), of the transmitter, as specified below:

1) 25 dB in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 50%, up to and including 100% of the occupied bandwidth or necessary bandwidth, whichever is greater
2) 35 dB in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 100%, up to and including 250% of the occupied bandwidth or necessary bandwidth, whichever is greater
3) 43 + 10 Log p (watts) in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 250% of the occupied bandwidth or necessary bandwidth, whichever is greater.

2.1.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Crystal Detector	Hewlett Packard	8470B	1320	12	9-Jun-2018
Hygrometer	Rotronic	I-1000	3220	12	30-Aug-2018
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Oct-2018
'N' - 'N' RF Cable (1m)	Rhophase	NPS-1803-1000-NPS	3700	12	31-Jan-2019
Combiner/Splitter	Weinschel	1506A	3878	12	13-Jun-2018
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	19-Sep-2018
DC to TTL Converter	TUV SUD Product Service	N/A	4377	-	TU
Suspended Substrate Highpass Filter	Advance Power Components	11SH10-3000/X18000-O/O	4412	12	3-Apr-2018
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	6-Oct-2018
4 Channel PSU	Rohde & Schwarz	HMP4040	4736	-	TU
Attenuator (30dB, 100W)	Weinschel	48-30-43	4863	12	3-May-2018

Table 5

TU – Traceability Unscheduled

2.2 Radiated Spurious Emissions

2.2.1 Specification Reference

FCC 47 CFR Part 25, Clause 25.202(f)
FCC 47 CFR Part 2, Clause 2.1053
Industry Canada RSS-170, Clause 5.4.3.1
Industry Canada RSS-GEN, Clause 6.1.3

2.2.2 Equipment Under Test and Modification State

9555N, S/N: #12 P0600-GR-169 (B05UM3) - Modification State 0

2.2.3 Date of Test

07-February-2018

2.2.4 Test Method

Testing was performed in accordance with ANSI C63.26, clause 5.5.

Prescans were performed using the direct field strength method. Any emissions found within 10 dB of the specification limit were formally measured using the substitution method. All measurements were performed at a distance of 3m and the limit was corrected by a factor of 95.2 to convert from EIRP to field strength at 3m.

The limit line on the prescan plots was calculated from equation c) in clause 5.2.7.

Measurements were performed using a peak detector and max hold trace with an RBW > 4 kHz which was considered worst case.

2.2.5 Environmental Conditions

Ambient Temperature	19.8 °C
Relative Humidity	23.0 %

2.2.6 Test Results

Iridium Transceiver

Frequency (MHz)	Result (dBm)
*	

Table 6 - Emission Results, 1616.020833MHz, 30 MHz to 1 GHz

*No emissions were found within 10 dB of the limit.

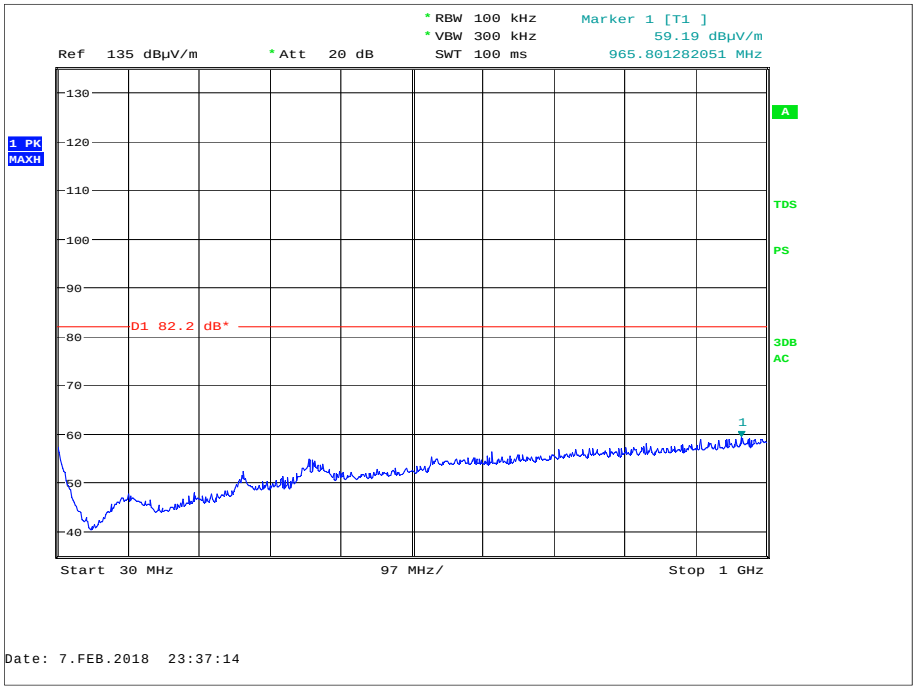

Figure 19 - 1616.020833 MHz - Test Frequency Range 30 MHz to 1 GHz

Frequency (MHz)	Result (dBm)
*	

Table 7 - Emission Results, 1616.020833MHz, 1 GHz to 17 GHz

*No emissions were found within 10 dB of the limit.

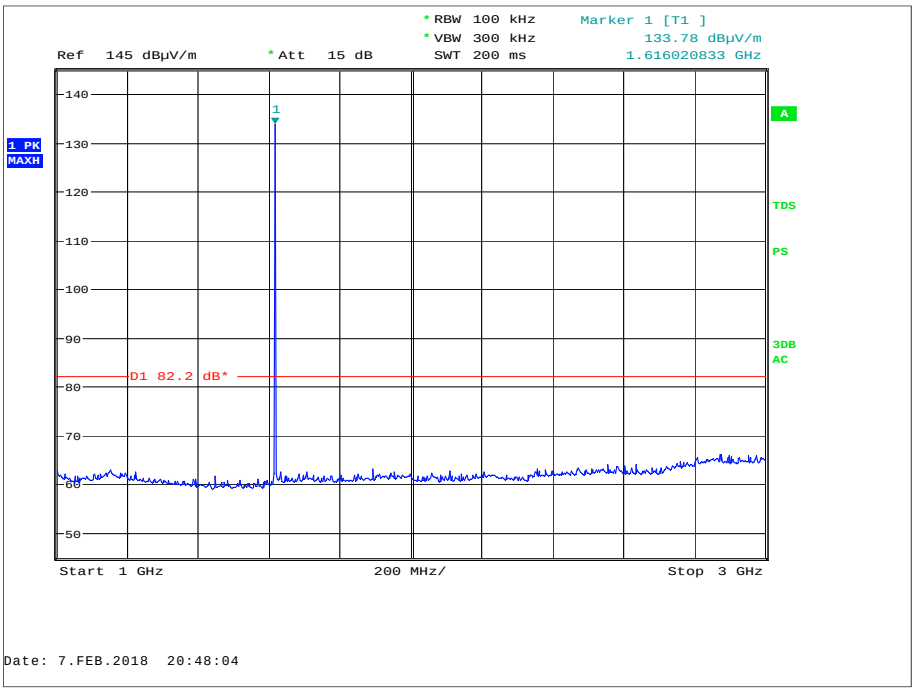

Figure 20 - 1616.020833 MHz - Test Frequency Range 1 GHz to 3 GHz

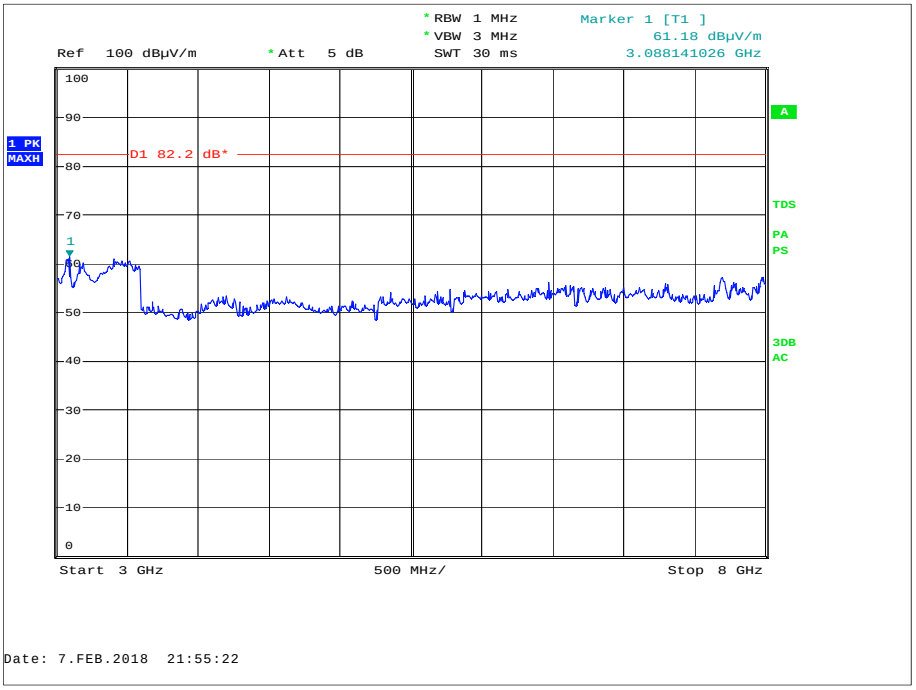

Figure 21 - 1616.020833 MHz - Test Frequency Range 3 GHz to 8 GHz

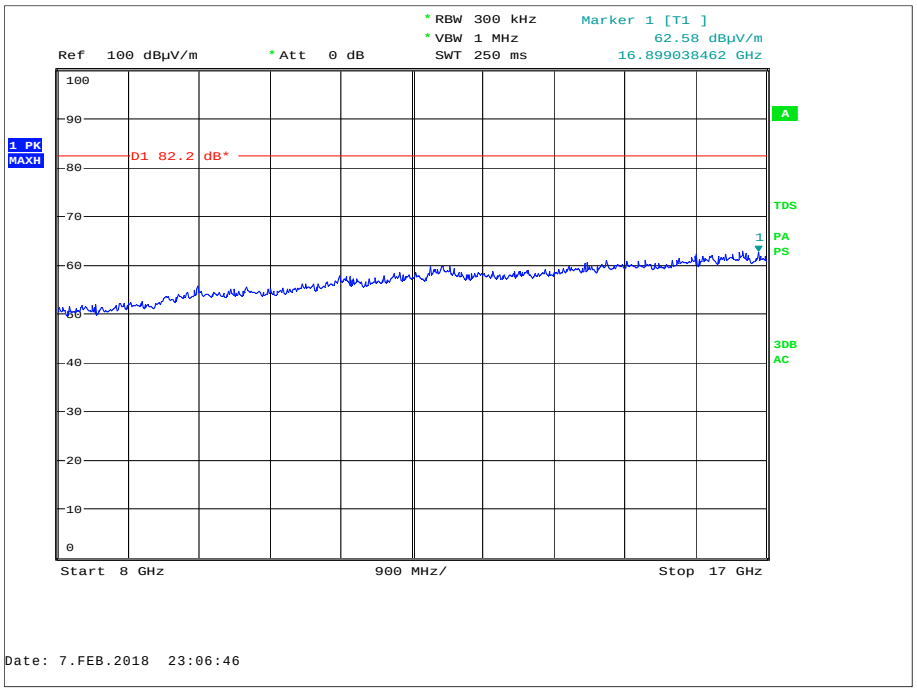

Figure 22 - 1616.020833 MHz - Test Frequency Range 8 GHz to 17 GHz

Frequency (MHz)	Result (dBm)
*	

Table 8 - Emission Results, 1621.020833MHz, 30 MHz to 1 GHz

*No emissions were found within 10 dB of the limit.

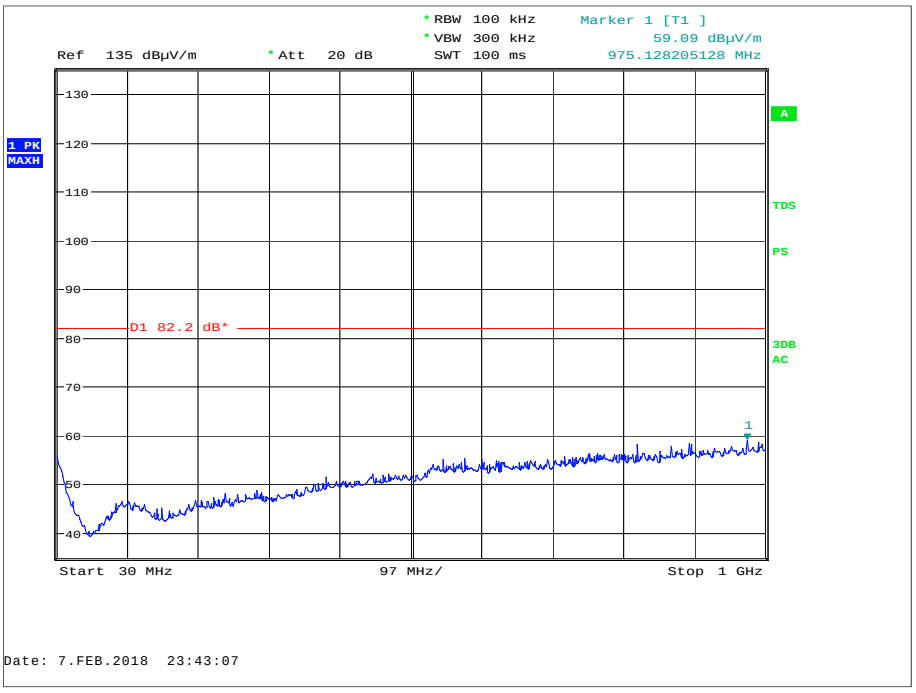

Figure 23 - 1621.020833 MHz - Test Frequency Range 30 MHz to 1 GHz

Frequency (MHz)	Result (dBm)
*	

Table 9 - Emissions Results, 1621.020833MHz, 1 GHz to 17 GHz

*No emissions were found within 10 dB of the limit.

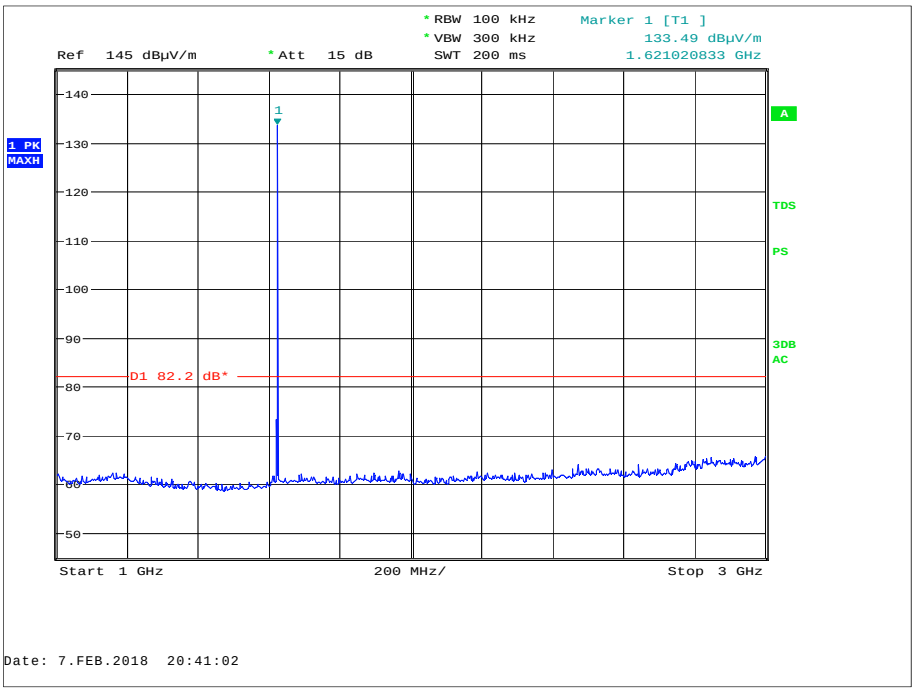

Figure 24 - 1621.020833 MHz - Test Frequency Range 1 GHz to 3 GHz

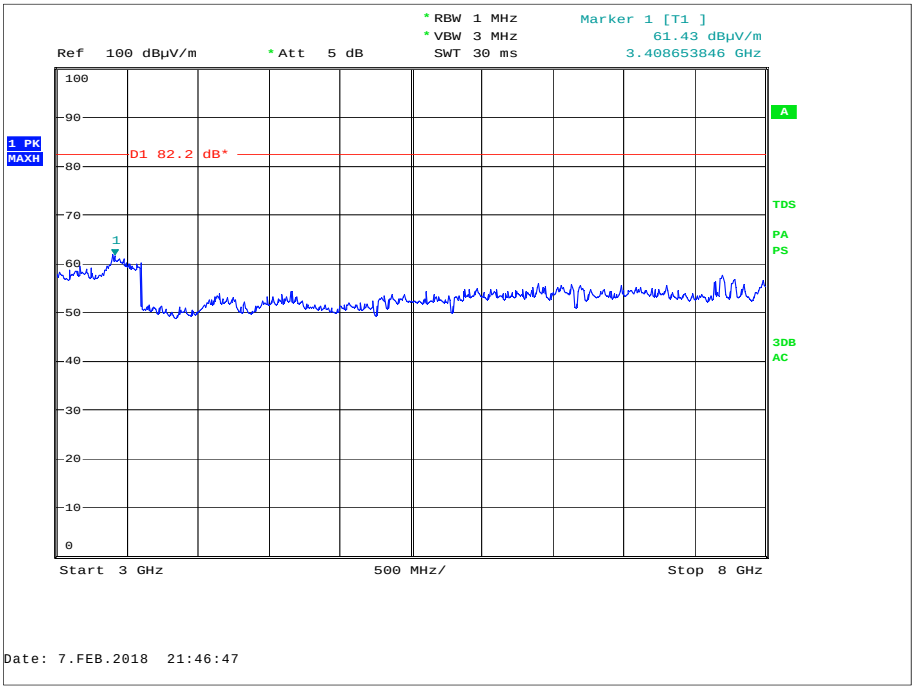

Figure 25 - 1621.020833 MHz - Test Frequency Range 3 GHz to 8 GHz

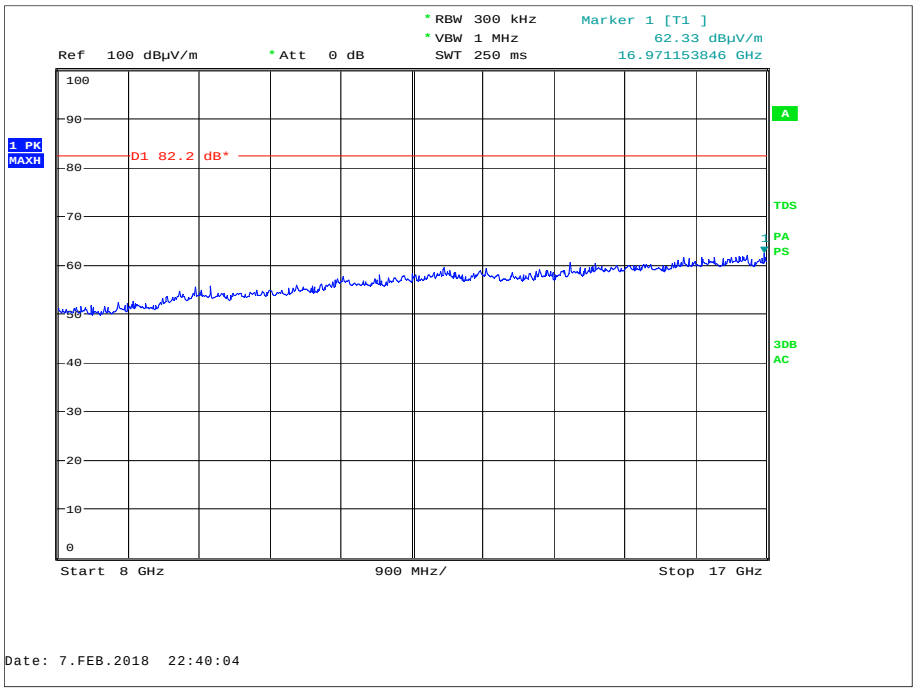

Figure 26 - 1621.020833 MHz - Test Frequency Range 8 GHz to 17 GHz

Frequency (MHz)	Result (dBm)
*	

Table 10 - Emission Results, 1625.979166MHz, 30 MHz to 1 GHz

*No emissions were found within 10 dB of the limit.

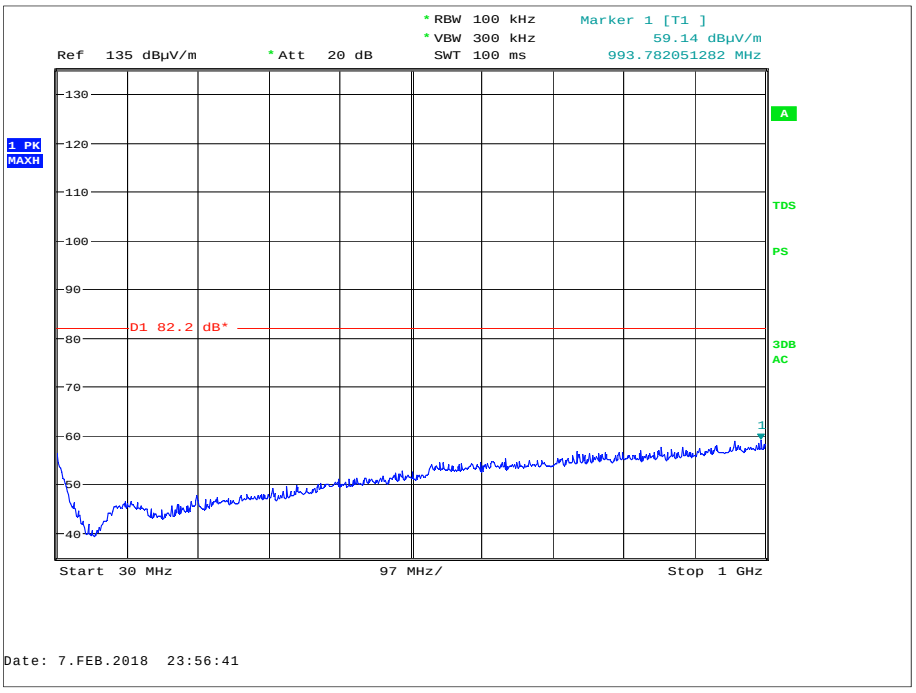

Figure 27 - 1625.979166 MHz - Test Frequency Range 30 MHz to 1 GHz

Frequency (MHz)	Result (dBm)
*	

Table 11, Emission Results, 1625.979166 MHz, 1 GHz to 17 GHz

*No emissions were found within 10 dB of the limit.

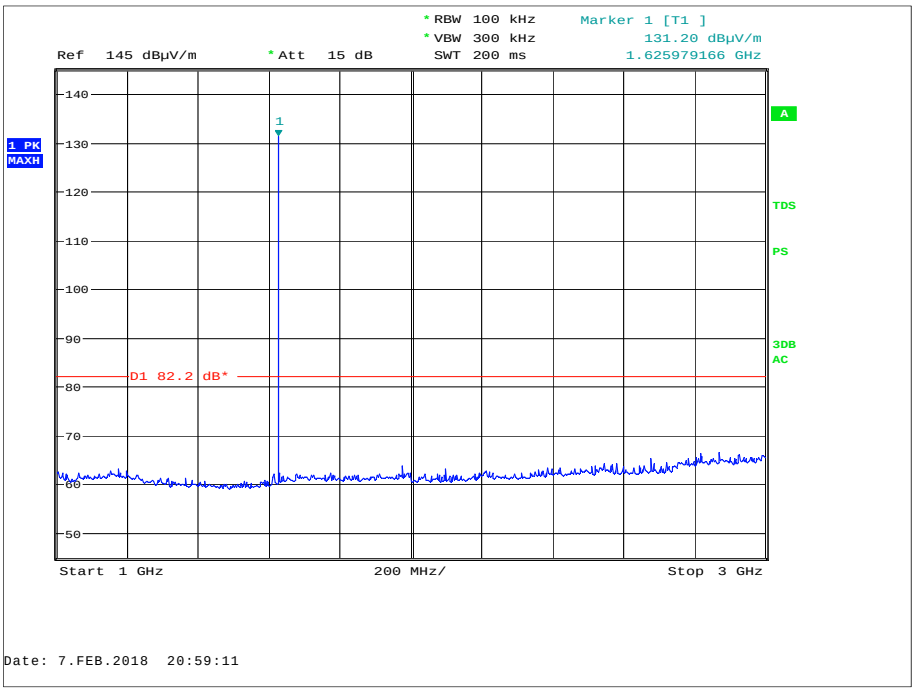

Figure 28 - 1625.979166 MHz - Test Frequency Range 1 GHz to 3 GHz

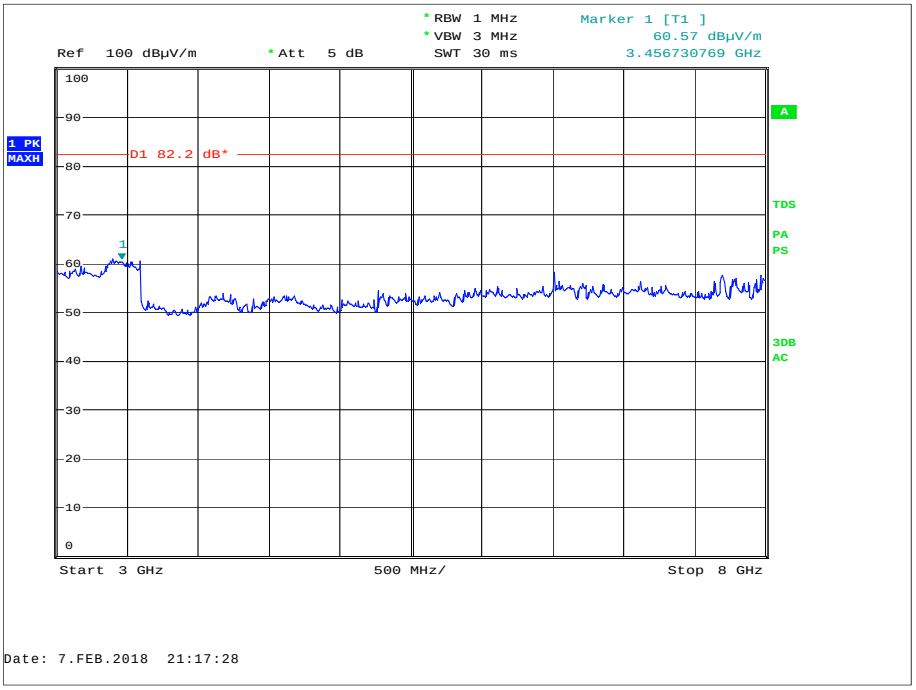

Figure 29 - 1625.979166 MHz - Test Frequency Range 3 GHz to 8 GHz

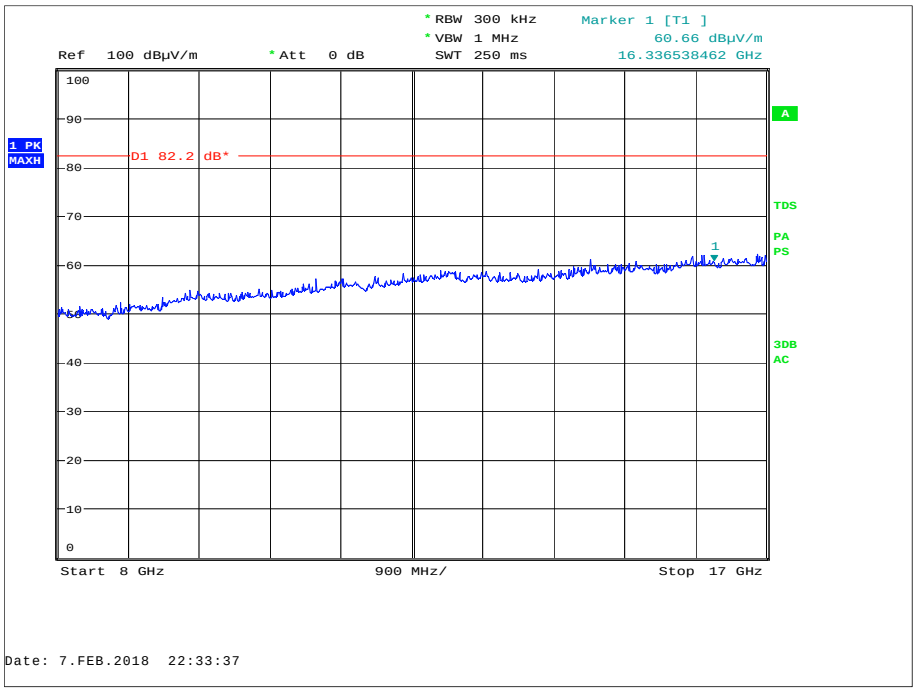

Figure 30 - 1625.979166 MHz - Test Frequency Range 8 GHz to 17 GHz

FCC 47 CFR Part 25, Limit Clause 25.202(f)

The average power of unwanted emissions shall be attenuated below the average output power, P(dBW), of the transmitter, as specified below:

1) 25 dB in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 50%, up to and including 100% of the authorised bandwidth;
2) 35 dB in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 100%, up to and including 250% of the authorised bandwidth;
3) 43 + 10 Log p (watts) in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 250% of the authorised bandwidth.

Industry Canada RSS-170, Limit Clause 5.4.3.1

The average power of unwanted emissions shall be attenuated below the average output power, P(dBW), of the transmitter, as specified below:

1) 25 dB in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 50%, up to and including 100% of the occupied bandwidth or necessary bandwidth, whichever is greater
2) 35 dB in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 100%, up to and including 250% of the occupied bandwidth or necessary bandwidth, whichever is greater
3) 43 + 10 Log p (watts) in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 250% of the occupied bandwidth or necessary bandwidth, whichever is greater.

2.2.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Pre-Amplifier	Phase One	PS04-0086	1533	12	12-Jan-2019
Screened Room (5)	Rainford	Rainford	1545	36	9-Jun-2018
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Hygromer	Rotronic	A1	2138	12	21-Feb-2019
Digital Multimeter	Iso-tech	IDM-101	2895	12	20-Jul-2018
Cable (N-N, 8m)	Rhophase	NPS-2302-8000-NPS	3248	12	2-May-2018
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Nov-2018
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU
1GHz to 8GHz Low Noise Amplifier	Wright Technologies	APS04-0085	4365	12	18-Oct-2018
Cable (Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4526	6	22-May-2018
Cable (Rx, SMAm-SMAm 0.5m)	Scott Cables	SLSLL18-SMSM-00.50M	4528	6	15-Aug-2018
Double Ridged Waveguide Horn Antenna	ETS-Lindgren	3117	4722	12	1-Mar-2019

Table 12

TU – Traceability Unscheduled

2.3 Modulation Characteristics

2.3.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1047 (d)

2.3.2 Equipment Under Test

9555N

2.3.3 Test Method

A declaration was made by the manufacturer.

2.3.4 Test Results

Iridium Transceiver

Modulation characteristics description as provided by the customer.
Traffic, broadcast, and ring alert channels use differentially encoded quadrature phase shift keyed (DE-QPSK) modulation with 40% square root raised cosine pulse shaping. The burst transmission rate is 25ksps or 50 kbps. The phase of the QPSK symbol states relative to the carrier phase is (Symbol State/Phase in deg): 00/0, 01/-90, 10/+90, 11/180. The acquisition channel uses differentially encoded binary phase shift keyed (DE-BPSK) with 40% square root raised cosine pulse shaping. The burst rate on these channels is 25 kbps. The sync channel uses 25 kbps DE-BPSK on the uplink and 50 kbps DE-QPSK on the downlink. Both with 40% square root raised cosine pulse shaping.

Table 13

FCC 47 CFR Part 2, Limit Clause 2.1047 (d)

A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

2.4 Occupied Bandwidth

2.4.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1049
Industry Canada RSS-GEN, Clause 6.6

2.4.2 Equipment Under Test and Modification State

9555N, S/N: #8 P0600-GR-139 (B00JCM) - Modification State 0

2.4.3 Date of Test

15-March-2018

2.4.4 Test Method

This test was performed in accordance with ANSI C63.26, clause 5.4.4.

2.4.5 Environmental Conditions

Ambient Temperature	22.4 °C
Relative Humidity	38.1 %

2.4.6 Test Results

Iridium Transceiver

Occupied Bandwidth (kHz)		
1616.020833 MHz	1621.020833 MHz	1625.979166 MHz
31.851	31.1298	31.611

Table 14 - Occupied Bandwidth Results

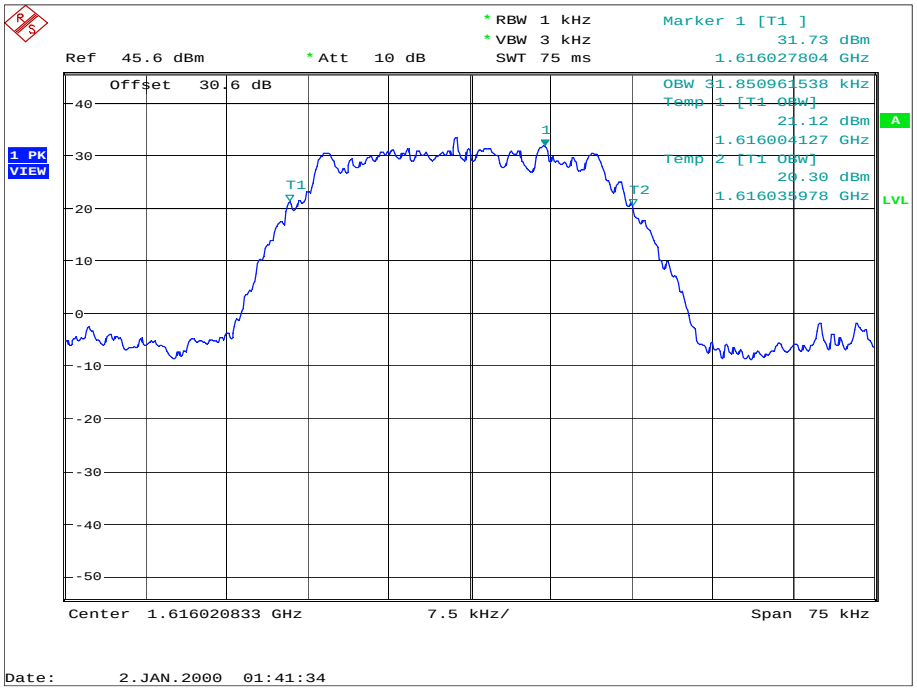

Figure 31 - 1616.020833 MHz

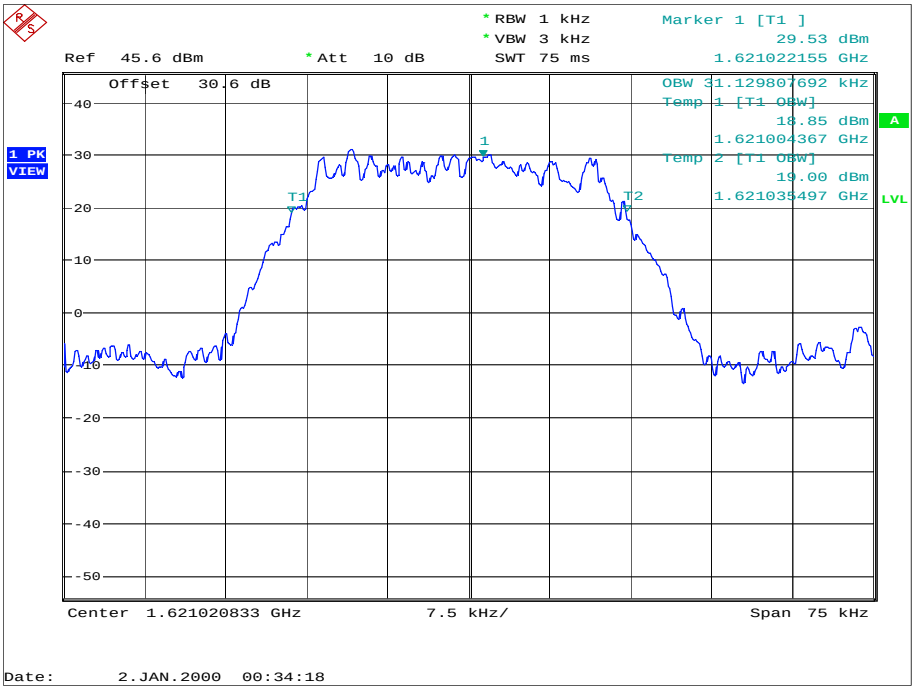

Figure 32 - 1621.020833 MHz

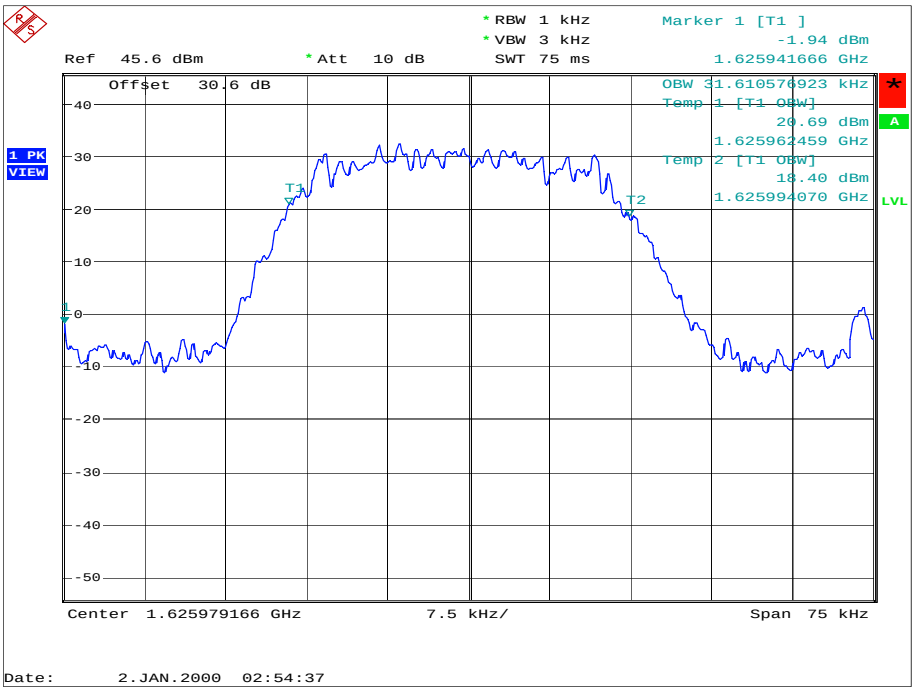

Figure 33 - 1625.979166 MHz

FCC 47 CFR Part 2, Limit Clause

None specified.

Industry Canada RSS-GEN, Limit Clause

None specified.

2.4.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 3.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Multimeter	White Gold	WG022	190	12	24-Nov-2018
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	19-Feb-2019
Hygrometer	Rotronic	I-1000	2891	12	30-Aug-2018
Vector Signal Generator	Rohde & Schwarz	SMU 200A	3493	12	08-Aug-2018
1 metre K-Type Cable	Florida Labs	KMS-180SP-39.4-KMS	4520	12	13-Feb-2019
Attenuator (30dB, 100W)	Weinschel	48-30-43	4863	12	3-May-2018
Quad Power Supply	Rohde & Schwarz	HMP4040	4955	-	O/P Mon

Table 15

O/P Mon – Output Monitored using calibrated equipment

2.5 Frequency Tolerance

2.5.1 Specification Reference

FCC 47 CFR Part 25, Clause 25.202(d)
FCC 47 CFR Part 2, Clause 2.1055
Industry Canada RSS-170, Clause 5.2

2.5.2 Equipment Under Test and Modification State

9555N, S/N: #8 P0600-GR-139 (B00JCM) - Modification State 0

2.5.3 Date of Test

19-March-2018

2.5.4 Test Method

This test was performed in accordance with ANSI C63.26, clause 5.6.

The measurement was made with the carrier modulated using a spectrum analyser. The mid-point frequency was determined from the upper and lower -10 dBc points.

2.5.5 Environmental Conditions

Ambient Temperature 19.7 °C
Relative Humidity 18.3 %

2.5.6 Test Results

Iridium Transceiver

Test Condition	1621.020833 MHz	
Temperature	Frequency Error (%)	Frequency Error (ppm)
-30.0°C	0.00000027	0.27192741
-20.0°C	0.00000040	0.39530646
-10.0°C	0.00000052	0.51899395
0°C	0.00000012	0.12356411
+10.0°C	0.00000049	0.49400969
+20.0°C	0.00000059	0.59332982
+30.0°C	0.00000059	0.58716087
+40.0°C	0.00000049	0.49431814
+50.0°C	0.00000089	0.88718786

Table 16 - Frequency Stability over Variation in Temperature

Test Condition	1621.020833 MHz	
Supply Voltage	Frequency Error (%)	Frequency Error (ppm)
4.26 V DC	0.00000062	0.61800563
3.70 V DC	0.00000059	0.59302137
3.14 V DC	0.00000060	0.59733964

Table 17 Frequency Stability when Varying Supply Voltage

FCC 47 CFR Part 25, Limit Clause 25.202(d)

The carrier frequency of each earth station transmitter authorized in these services shall be maintained within 0.001 percent of the reference frequency.

Industry Canada RSS-170, Limit Clause 5.2

For mobile earth station equipment, the carrier frequency shall not depart from the reference frequency by more than ±10 ppm.

2.5.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 3.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Multimeter	White Gold	WG022	190	12	24-Nov-2018
Digital Temperature Indicator	Fluke	51	2267	12	05-Jul-2018
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	19-Feb-2019
Hygrometer	Rotronic	I-1000	2891	12	30-Aug-2018
Climatic Chamber	TAS	Micro 225	2892	-	O/P Mon
Combiner/Splitter	Weinschel	1506A	3878	12	13-Jun-2018
Attenuator (30dB, 100W)	Weinschel	48-30-43	4863	12	3-May-2018
1 metre K-Type Cable	Florida Labs	KMS-180SP-39.4-KMS	4520	12	13-Feb-2019
Quad Power Supply	Rohde & Schwarz	HMP4040	4955	-	O/P Mon

Table 18

O/P Mon – Output Monitored using calibrated equipment

2.6 Equivalent Isotropic Radiated Power

2.6.1 Specification Reference

FCC 47 CFR Part 25, Clause 25.204

2.6.2 Equipment Under Test and Modification State

9555N, S/N: #9 P0600-GR-165 (B05TNY) - Modification State 0

2.6.3 Date of Test

28-March-2018

2.6.4 Test Method

This test was performed in accordance with ANSI C63.26, clause 5.2.4.4.

The RBW was configured to 3 kHz and the reference level offset increased to account for the correction factor required to show the result as 4 kHz bandwidth. The correction factor was obtained using the following formula:

10Log(4/3) = 1.25 dB

The antenna gain was also included in the offset, which was declared by the manufacturer as 3 dBi.

The total EIRP was calculated by adding 10Log(OCB/4), where OCB is the measured occupied bandwidth as recorded in section 2.4. The antenna gain was added to the declared output power provided by the manufacturer and compared with the calculated results for total EIRP..

2.6.5 Environmental Conditions

Ambient Temperature	20.6 °C
Relative Humidity	35.2 %

2.6.6 Test Results

Iridium Transceiver

EIRP (dBm/4 kHz)		
1616.020833 MHz	1621.020833 MHz	1625.979166 MHz
30.88	32.57	31.68

Table 19 - EIRP Spectral Density

1616.020833 MHz		1621.020833 MHz		1625.979166 MHz	
EIRP (dBm)	Δ from declared EIRP (dBm)	EIRP (dBm)	Δ from declared EIRP (dBm)	EIRP (dBm)	Δ from declared EIRP (dBm)
39.88	-1.32	41.56	0.36	40.68	-0.52

Table 20 - Total EIRP

FCC 47 CFR Part 25, Limit Clause 25.204

+40 dBW in any 4 kHz band for θ ≤ 0°
+40 + 3θ dBW in any 4 kHz band for 0° < θ ≤ 5°
For angles of elevation of the horizon greater than 5° there shall be no restriction as to the equivalent isotropically radiated power transmitted by an earth station towards the horizon.

Industry Canada RSS-170, Limit Clause 5.3

The application for MES certification shall state the MES e.i.r.p. that is necessary for satisfactory communication. The maximum permissible e.i.r.p. will be the stated necessary e.i.r.p. plus a 2 dB margin. If a detachable antenna is used, the certification application shall state the recommended antenna type and manufacturer, the antenna gain and the maximum transmitter output power at the antenna terminal

2.6.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Multimeter	White Gold	WG022	190	12	24-Nov-2018
Hygrometer	Rotronic	I-1000	3220	12	30-Aug-2018
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	-	O/P Mon
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Oct-2018
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	19-Sep-2018
1 metre K-Type Cable	Florida Labs	KMS-180SP-39.4-KMS	4520	12	13-Feb-2019
Quad Power Supply	Rohde & Schwarz	HMP4040	4954	-	O/P Mon
Analyser	Keysight Technologies	N9010B	4969	12	21-Dec-2018

Table 21

2.7 Limits on Emissions from Mobile Earth Stations for Protection of Aeronautical Radionavigation-Satellite Service

2.7.1 Specification Reference

FCC 47 CFR Part 25, Clause 25.216
Industry Canada RSS-170, Clause 5.4.3

2.7.2 Equipment Under Test and Modification State

9555N, S/N: #9 P0600-GR-165 (B05TNY) - Modification State 0

2.7.3 Date of Test

29-March-2018

2.7.4 Test Method

This test was performed in accordance with ANSI C63.26, clause 5.7.

Any emission detected within 6 dB of the broadband emission limit was investigated to determine whether the emission was broadband or discrete by reducing the RBW until the spectral shape of the emission could be observed. Where the emission was found to be broadband in nature, the level in a 1 MHz RBW was recorded. It was confirmed that any discrete emissions complied with the discrete emission limit using a 1 kHz RBW.

2.7.5 Environmental Conditions

Ambient Temperature	22.8 °C
Relative Humidity	46.0 %

2.7.6 Test Results

Iridium Transceiver

Frequency (MHz)	Level (dBW)
1559.188	-70.24

Table 22 - 1616.020833 MHz, Broadband Emission Results

No other emissions were detected within 6 dB of the limit.

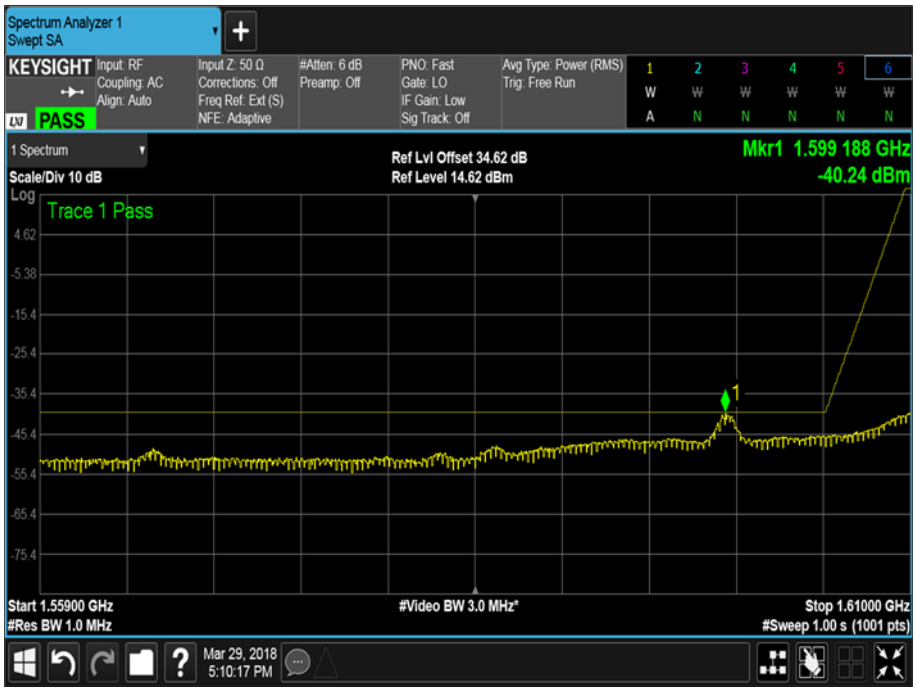

Figure 34 - 1616.020833 MHz - Broadband Emission Results

Frequency (MHz)	Level (dBW)
*	

Table 23 - 1616.020833 MHz, Discrete Emission Results

*No emissions were detected within 6 dB of the limit.

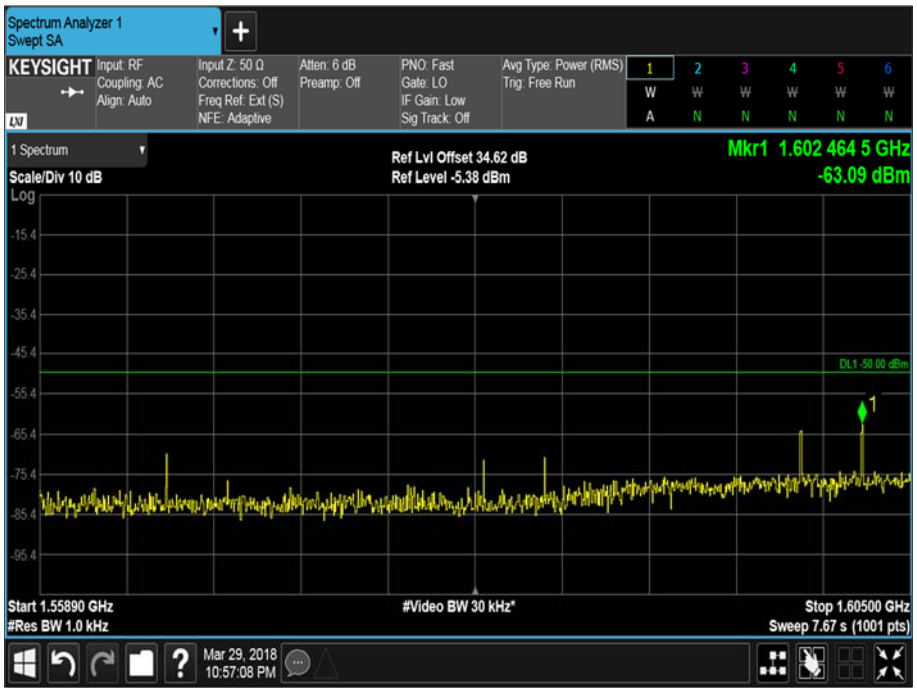

Figure 35 - 1616.020833 MHz - Discrete Emission Results

Frequency (MHz)	Level (dBW)
1604.186	-71.34

Table 24 - 1621.020833 MHz, Broadband Emission Results

No other emissions were detected within 6 dB of the limit.

Figure 36- 1621.020833 MHz - Broadband Emission Results

Frequency (MHz)	Level (dBW)
*	

Table 25 - 1621.020833 MHz, Discrete Emission Results

*No emissions were detected within 6 dB of the limit.

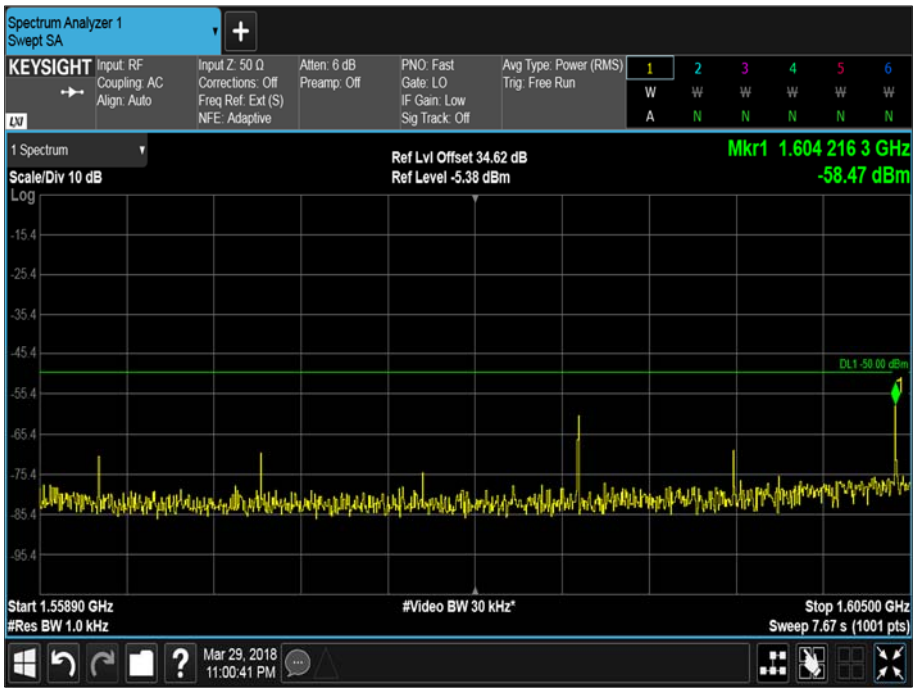

Figure 37 - 1621.020833 MHz - Discrete Emission Results

Frequency (MHz)	Level (dBW)
1592.456	-70.33

Table 26 - 1625.979166 MHz, Broadband Emission Results

No other emissions were detected within 6 dB of the limit.

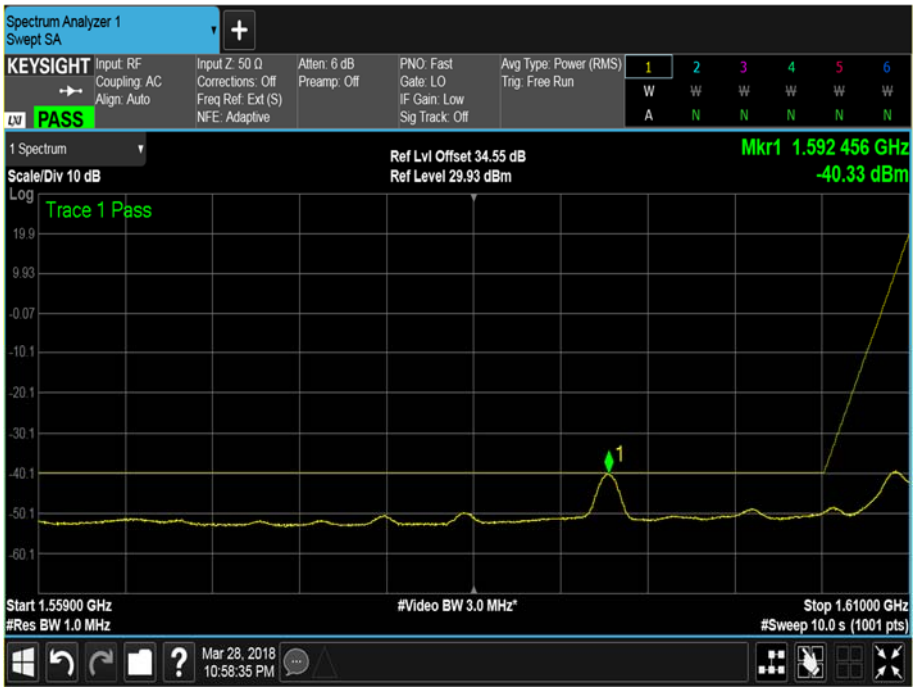

Figure 38 - 1625.979166 MHz - Broadband Emission Results

Frequency (MHz)	Level (dBW)
1592.369	-85.62

Table 27 - 1625.979166 MHz, Discrete Emission Results

No other emissions were detected within 6 dB of the limit.

Figure 39 - 1625.979166 MHz - Discrete Emission Results

Frequency (MHz)	Level (dBW)
*	

Table 28, Carrier Off State Emissions

*No emissions were detected within 6 dB of the limit.

Figure 40 - Carrier-off state Emissions

FCC 47 CFR Part 25, Limit Clause 25.216

25.216(c) The e.i.r.p. density of emissions from mobile earth stations placed in service after July 21, 2002 with assigned uplink frequencies between 1610 MHz and 1660.5 MHz shall not exceed -70 dBW/MHz, averaged over any 2 millisecond active transmission interval, in the band 1559–1605 MHz. The e.i.r.p. of discrete emissions of less than 700 Hz bandwidth from such stations shall not exceed -80 dBW, averaged over any 2 millisecond active transmission interval, in the 1559–1605 MHz band.

25.216(g) Mobile earth stations manufactured more than six months after FEDERAL REGISTER publication of the rule changes adopted in FCC 03–283 with assigned uplink frequencies in the 1610–1626.5 MHz band shall suppress the power density of emissions in the 1605–1610 MHz band-segment to an extent determined by linear interpolation from -70 dBW/MHz at 1605 MHz to -10 dBW/MHz at 1610 MHz averaged over any 2 millisecond active transmission interval. The e.i.r.p of discrete emissions of less than 700 Hz bandwidth from such stations shall not exceed a level determined by linear interpolation from -80 dBW at 1605 MHz to -20 dBW at 1610 MHz, averaged over any 2 millisecond active transmission interval.

25.216(i) The e.i.r.p density of carrier-off state emissions from mobile earth stations manufactured more than six months after FEDERAL REGISTER publication of the rule changes adopted in FCC 03–283 with assigned uplink frequencies between 1 and 3 GHz shall not exceed -80 dBW/MHz in the 1559–1610 MHz band averaged over any two millisecond interval.

Industry Canada, RSS-170, Limit Clause 5.4.3.2.1

Mobile earth stations with transmitting frequencies between 1610 MHz and 1626.5 MHz shall have the e.i.r.p. density of unwanted emissions in the band 1605-1610 MHz, averaged over any 2-ms active transmission interval, not exceed the following limits:

(1) –70 dBW/MHz at 1605 MHz, linearly interpolated to –10 dBW/MHz at 1610 MHz for broadband emissions; and

(2) –80 dBW/kHz at 1605 MHz, linearly interpolated to –20 dBW/kHz at 1610 MHz for discrete emissions.

2.7.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Multimeter	White Gold	WG022	190	12	24-Nov-2018
Hygrometer	Rotronic	I-1000	3220	12	30-Aug-2018
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	-	O/P Mon
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Oct-2018
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	19-Sep-2018
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	12	11-Apr-2018
Quad Power Supply	Rohde & Schwarz	HMP4040	4954	-	O/P Mon
Analyser	Keysight Technologies	N9010B	4969	12	21-Dec-2018

Table 29

O/P Mon – Output Monitored using calibrated equipment

3 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

Test Name	Measurement Uncertainty
Spurious Emissions at Antenna Terminals	± 3.08 dB
Radiated Spurious Emissions	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 18 GHz: ± 6.3 dB
Modulation Characteristics	-
Occupied Bandwidth	± 16.74 kHz
Frequency Tolerance	± 3.54 Hz
Equivalent Isotropic Radiated Power	Conducted: ± 3.2 dB Radiated: ± 6.3 dB (1 GHz to 18 GHz)
Limits on Emissions from Mobile Earth Stations for Protection of Aeronautical Radionavigation-Satellite Service	Conducted: ± 3.45 dB Radiated: ± 6.3 dB

Table 30