FCC and Industry Canada Testing of the Inmarsat Global Ltd Handheld Satellite Phone, Model: IsatPhone2w In accordance with FCC 47 CFR Part 25, FCC 47 CFR Part 2 and Industry Canada RSS-170 and Industry Canada RSS-GEN

Product Service

Choose certainty.
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Prepared for: Inmarsat Global Ltd
99 City Road
London
England
EC1Y 1AX
United Kingdom

FCC ID: YCT-ISATPHONE2W
IC: 8944A-IsatPhone2w

COMMERCIAL-IN-CONFIDENCE

Date: June 2017
Document Number: 75935241-07 | Issue: 01

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Project Management	Steven White	14 June 2017	
Authorised Signatory	Matthew Russell	14 June 2017	

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	Dan Ralley		
Testing	Graeme Lawler		

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 in compliance with FCC 47 CFR Part 25: 2015, FCC 47 CFR Part 2: 2015 Industry Canada RSS-170 Issue 3, 2015 and Industry Canada RSS-GEN: (Issue 4: 2014).

TÜV SÜD Product Service
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Product Service

Contents

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	14 June 2017

Table 1

1.2 Introduction

Applicant	Inmarsat Global Ltd
Manufacturer	Inmarsat Global Ltd
Model Number(s)	IsatPhone2w
Serial Number(s)	IMEI 353032044022321 and IMEI 353032044022966
Hardware Version(s)	2403
Software Version(s)	Isat2.1-20170202004652
Number of Samples Tested	2
Test Specification/Issue/Date	FCC 47 CFR Part 25: 2015 FCC 47 CFR Part 2: 2015 Industry Canada RSS-170: Issue 3, 2015 Industry Canada RSS-GEN: Issue 4, 2014
Order Number Date	57/00098-01 03-June-2016
Date of Receipt of EUT	13-February-2017
Start of Test	13-February-2017
Finish of Test	22-March-2017
Name of Engineer(s)	Dan Ralley and Graeme Lawler
Related Document(s)	ANSI C63.4 (2014) ANSI C63.26 (2015) KDB 971168 D01 v02r02

Product Service

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 25, FCC 47 CFR Part 2 and 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: Inmarsat Transmitting							
2.1	-	2.1047 (d)	-	-	Modulation Characteristics	-	Declaration
2.2	-	2.1049	-	6.6	Occupied Bandwidth	Pass	
2.3	25.202(d)	-	5.2	-	Frequency Tolerance	Pass	
2.4	25.202(f)	-	5.4.3.1	-	Spurious Emissions at Antenna Terminals	Pass	
2.5	25.202(f)	-	5.4.3.1	-	Radiated Spurious Emissions	Pass	ANSI C63.4
2.6	25.204	-	5.3.2	-	Equivalent Isotropic Radiated Power	Pass	
2.7	25.216	-	5.4.3.2 and 5.4.4	-	Limits on Emissions from Mobile Earth Stations for Protection of Aeronautical Radio navigation-Satellite Service	Pass	ANSI C63.26

Table 2

Product Service

1.4 Application Form

EQUIPMENT DESCRIPTION	
Model Name/Number	IsatPhone2w
Part Number	
Hardware Version	2403
Software Version	Isat2.1-20170202004652
FCC ID:	YCT-ISATPHONE2W
Industry Canada ID:	8944A-IsatPhone2w
Technical Description (Please provide a brief description of the intended use of the equipment)	Handheld Satellite phone for Inmarsat GMR2+ satellite network system

POWER SOURCE				
☐	AC mains	State voltage		
AC supply frequency	(Hz)			
	VAC			
	Max Current			
	Hz			
☐	Single phase	☐	Three phase	
And / Or				
☒	External DC supply			
	Nominal voltage	3.7 V	Max Current	4 A
	Extreme upper voltage	4.2 V		
	Extreme lower voltage	3.55 V		
Battery				
☐	Nickel Cadmium	☐	Lead acid (Vehicle regulated)	
☐	Alkaline	☐	Leclanche	
☒	Lithium	☐	Other Details :	
	Volts nominal.			
End point voltage as quoted by equipment manufacturer		3.2 V		

FREQUENCY INFORMATION					
Frequency Range	1625.5-1660.5 to 1668.0-1660.0	MHz			
Channel Spacing (where applicable)	200 kHz				
Test Frequencies*	Bottom	1626.675	MHz	Channel Number (if applicable)	0
	Middle	1643,675	MHz	Channel Number (if applicable)	85
	Top	1660,475	MHz	Channel Number (if applicable)	204
If alternate test modes are available resulting in different test frequencies please specify which mode is applicable:					

POWER CHARACTERISTICS				
Maximum TX power	2.24	W		
Minimum TX power	0.125	W (if variable)		
Is transmitter intended for :				
Continuous duty			☐ Yes	☒ No
Intermittent duty			☒ Yes	☐ No
If intermittent state DUTY CYCLE				
Transmitter ON	0.0023075seconds			
Transmitter OFF	0.0069075seconds			

ANTENNA CHARACTERISTICS				
☒	Antenna connector	State impedance	50	Ohm
☐	Temporary antenna connector	State impedance		Ohm
☐	Integral antenna	State impedance	2.8	dBi

MODULATION CHARACTERISTICS			
☐	Amplitude	☐	Frequency
☒	Phase	☐	Other (please provide details):
Can the transmitter operate un-modulated?		☐ Yes	☒ No

CLASS OF EMISSION USED		
ITU designation or Class of Emission:		
	1	G7W
	(if applicable) 2	
	(if applicable) 3	
If more than three classes of emission, list separately:		

EXTREME CONDITIONS					
Extreme test voltages (Max)	4.2	V	Extreme test voltages (Min)	3.55	V
Nominal DC Voltage	3.7	V	DC Maximum Current	0.9 RMS	A
Maximum temperature	+55	°C	Minimum temperature	-20	°C

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

Name: Ari Tastula Position held: Senior HW Lead Architect
Date: 10.02.2017

1.5 Product Information

1.5.1 Technical Description

Handheld Satellite phone for Inmarsat GMR2+ satellite network system.

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: IMEI 353032044022321			
0	As supplied by the customer	Not Applicable	Not Applicable
Serial Number: IMEI 353032044022966			
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: Inmarsat Transmitting		
Occupied Bandwidth	Dan Ralley	UKAS
Frequency Tolerance	Dan Ralley	UKAS
Spurious Emissions at Antenna Terminals	Dan Ralley	UKAS
Radiated Spurious Emissions	Graeme Lawler	UKAS
Equivalent Isotropic Radiated Power	Dan Ralley	UKAS
Limits on Emissions from Mobile Earth Stations for Protection of Aeronautical Radio navigation-Satellite Service	Dan Ralley	UKAS

Table 4

Product Service

Office Address:

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

2 Test Details

2.1 Modulation Characteristics

2.1.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1047 (d)

2.1.2 Test Method

Applicant Declaration

2.1.3 Test Results

Transmit, Modulation Characteristics, Customer Description

The data below was supplied:

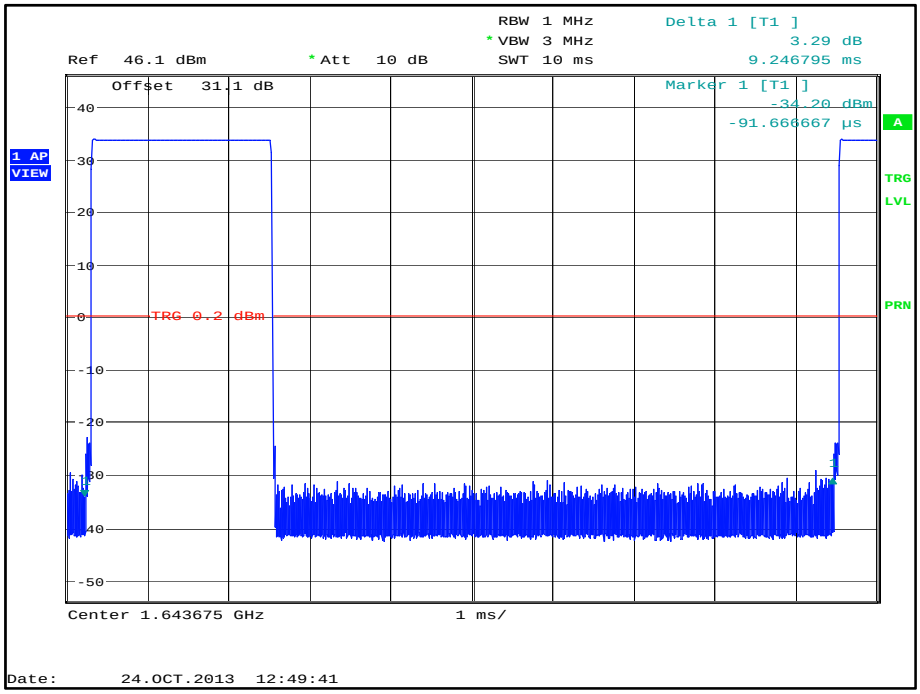


Figure 1 – Transmission Period

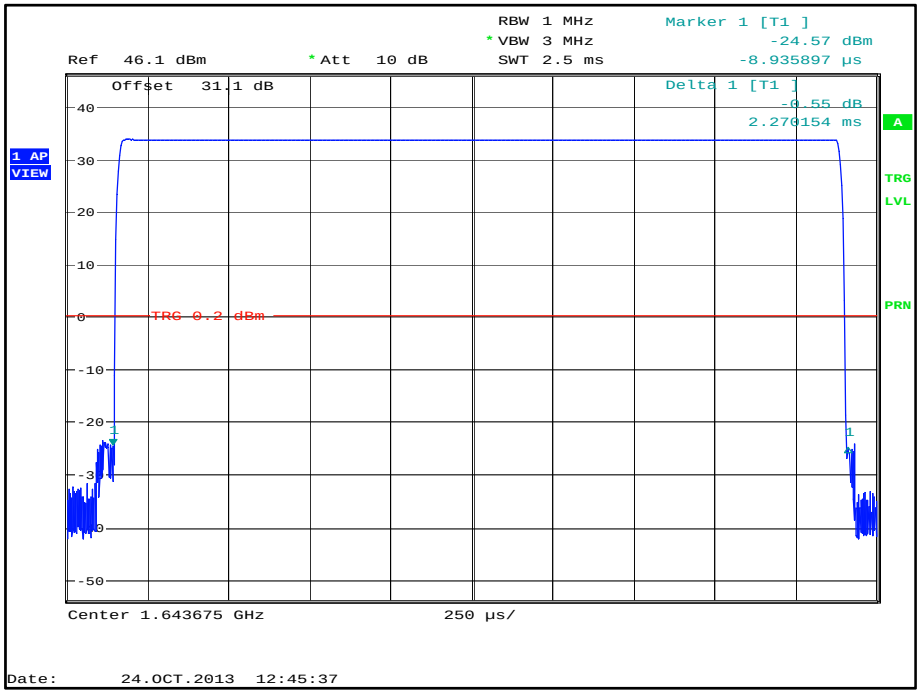


Figure 2 – Transmitter On Time

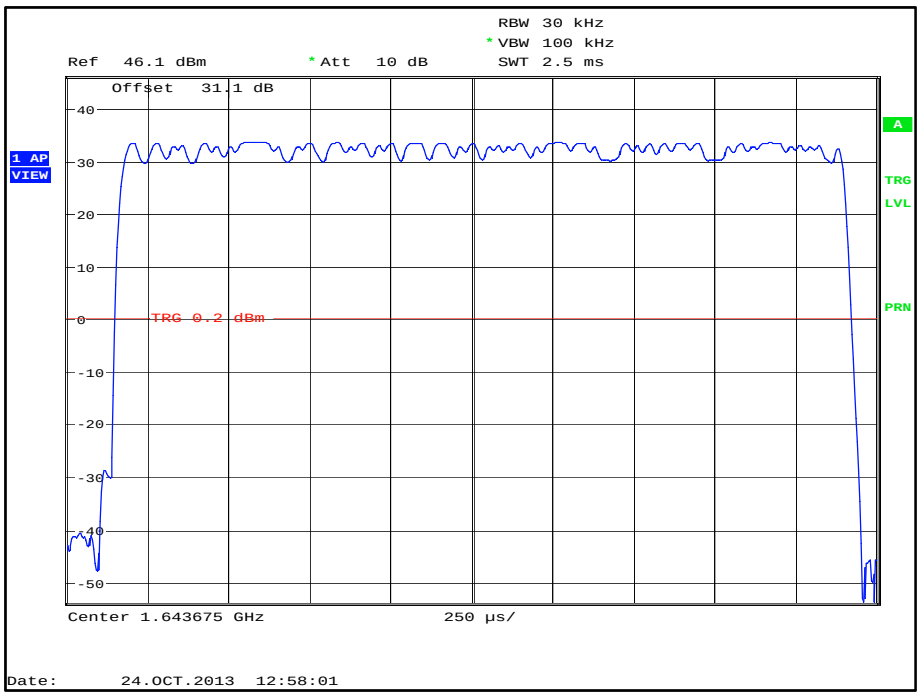
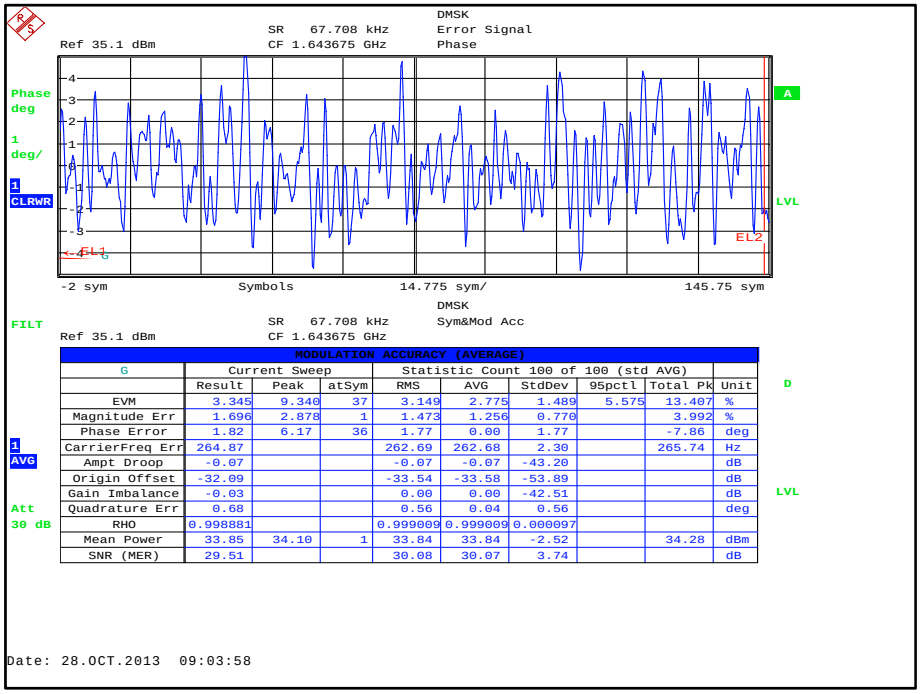


Figure 3 – Transmission Burst



MODULATION ACCURACY (AVERAGE)

G	Current Sweep			Statistic Count 100 of 100 (std AVG)					
	Result	Peak	atSym	RMS	AVG	StdDev	95pctl	Total Pk	Unit
EVM	3.345	9.340	37	3.149	2.775	1.489	5.575	13.407	%
Magnitude Err	1.696	2.878	1	1.473	1.256	0.770		3.992	%
Phase Error	1.82	6.17	36	1.77	0.00	1.77		-7.86	deg
CarrierFreq Err	264.87			262.69	262.68	2.30		265.74	Hz
Ampt Droop	-0.07			-0.07	-0.07	-43.20			dB
Origin Offset	-32.09			-33.54	-33.58	-53.89			dB
Gain Imbalance	-0.03			0.00	0.00	-42.51			dB
Quadrature Err	0.68			0.56	0.04	0.56			deg
RHO	0.998881			0.999009	0.999009	0.000097			
Mean Power	33.85	34.10	1	33.84	33.84	-2.52		34.28	dBm
SNR (MER)	29.51			30.08	30.07	3.74			dB

Figure 4 – Modulation Results

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.

2.2 Occupied Bandwidth

2.2.1 Specification Reference

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

2.2.2 Equipment Under Test and Modification State

IsatPhone2w, S/N: IMEI 353032044022321 - Modification State 0

2.2.3 Date of Test

14-February-2017

2.2.4 Test Method

This test was performed in accordance with FCC 47 CFR Part 2, Clause 2.1049 and Industry Canada RSS-GEN, Clause 6.6.

2.2.5 Environmental Conditions

Ambient Temperature	22.7 °C
Relative Humidity	31.3 %

2.2.6 Test Results

Inmarsat Transmitting

Occupied Bandwidth (kHz)		
1626.675 MHz	1643.675 MHz	1660.475 MHz
61.69	63.01	61.22

Table 5

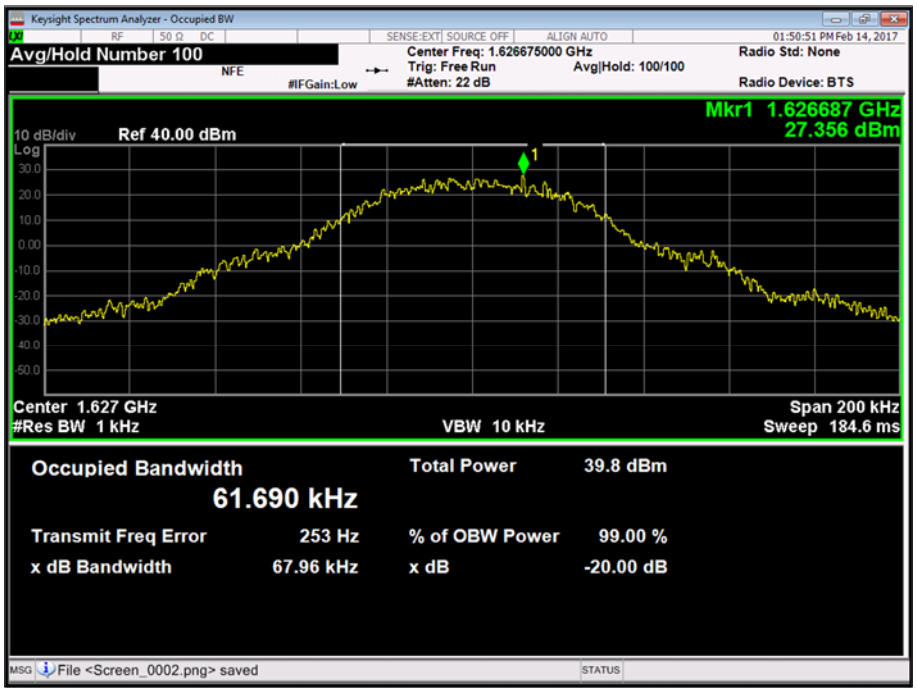


Figure 5 1626.675 MHz

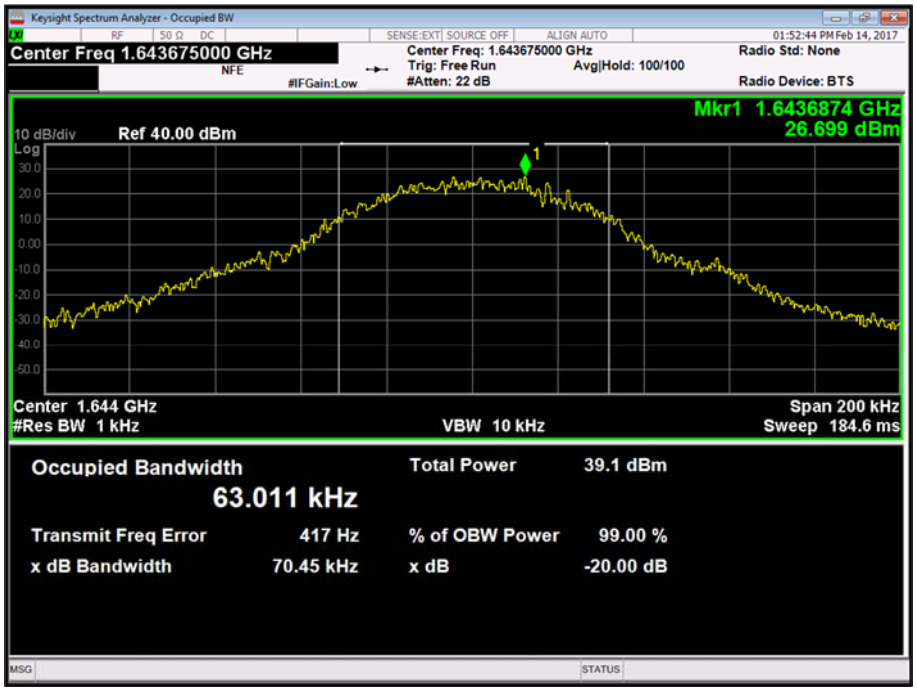


Figure 6 1643.675 MHz

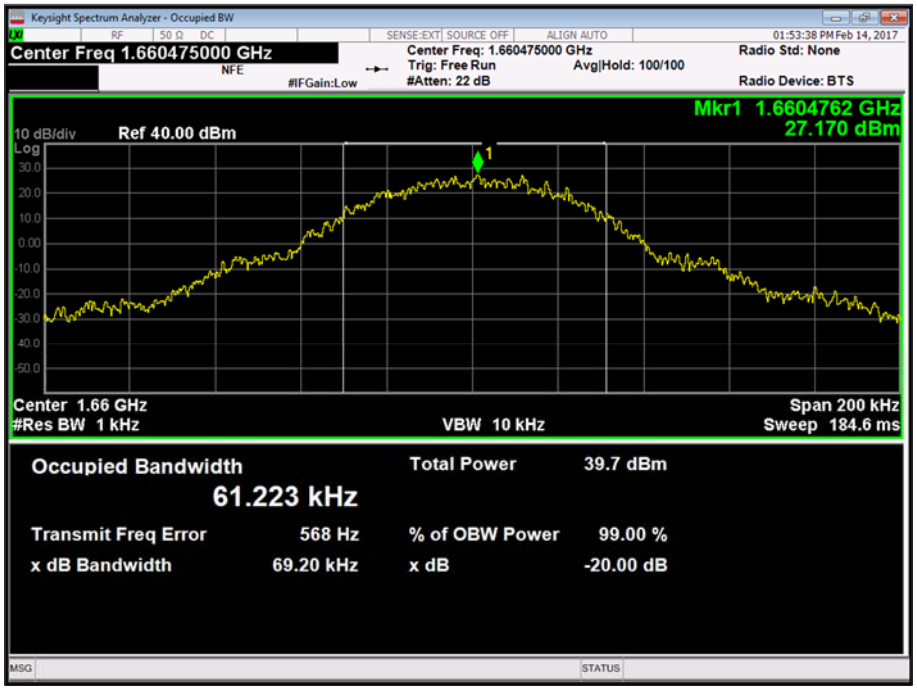


Figure 7 1660.475 MHz

FCC 47 CFR Part 2, Limit Clause

None specified.

Industry Canada RSS-GEN, Limit Clause

None specified.

2.2.7 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
Attenuator (20dB/ 2W)	Pasternack	PE7004-20	489	12	14-Dec-2017
Multimeter	Fluke	79 Series III	611	12	14-Sep-2017
Crystal Detector	Hewlett Packard	8470B	1320	12	08-Jun-2017
Hygrometer	Rotronic	I-1000	3220	12	23-Aug-2017
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3702	12	13-Dec-2017
Combiner/Splitter	Weinschel	1506A	3877	12	30-Mar-2017
DC - 12.4 GHz 10 dB Attenuator	Suhner	6810.17.A	3965	12	25-Oct-2017
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	09-Sep-2017

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	06-Oct-2017
2 Channel PSU	Rohde & Schwarz	HMP2020	4735	-	O/P Mon
2 metre SMA Cable	IW Microwave	3PS-1806LC-788-3PS	4829	12	24-Jan-2018

Table 6

O/P Mon – Output Monitored using calibrated equipment

2.3 Frequency Tolerance

2.3.1 Specification Reference

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

2.3.2 Equipment Under Test and Modification State

IsatPhone2w, S/N: IMEI 353032044022321 - Modification State 0

2.3.3 Date of Test

17-March-2017 to 22-March-2017

2.3.4 Test Method

The test was performed in accordance with FCC 47 CFR Part 2, clause 2.1055 and Industry Canada RSS-GEN, Clause 6.11.

The EUT mode of operation was controlled by a software tool provided by the manufacturer.

2.3.5 Environmental Conditions

Ambient Temperature	22.7 °C
Relative Humidity	33.8 %

2.3.6 Test Results

Inmarsat Transmitting (1643.675 MHz)

Temperature	3.55 V DC		3.70 V DC		4.20 V DC	
	Frequency Error (%)	Frequency Error (ppm)	Frequency Error (%)	Frequency Error (ppm)	Frequency Error (%)	Frequency Error (ppm)
-30.0°C	-0.00005	-0.45629	-0.00008	-0.76049	-0.00008	-0.76049
-20.0°C	-0.00005	-0.45629	-0.00008	-0.76049	-0.00008	-0.76049
-10.0°C	-0.00011	-1.06469	-0.00011	-1.06469	-0.00008	-0.76049
0°C	-0.00012	-1.21679	-0.00011	-1.06469	-0.00011	-1.06469
+10.0°C	-0.00008	-0.76049	-0.00003	-0.30420	-0.00006	-0.60839
+20.0°C	-0.00008	-0.76049	0.00003	0.30420	-0.00008	-0.76049
+30.0°C	-0.00002	-0.15210	-0.00005	-0.45629	0.00002	0.15210
+40.0°C	-0.00003	-0.30420	-0.00006	-0.60839	-0.00003	-0.30420
+50.0°C	-0.00003	-0.30420	0.00003	0.30420	-0.00002	-0.15210

Table 7

Remarks

The voltages stated in the table above were tested in lieu of the voltage variation stated in Industry Canada RSS-GEN, clause 6.11 and FCC 47 CFR Part 2.1055 as the equipment would cease to operate outside of these extremes.

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.

2.3.7 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
Attenuator (20dB/ 2W)	Pasternack	PE7004-20	489	12	14-Dec-2017
Multimeter	Fluke	79 Series III	611	12	14-Sep-2017
Climatic Chamber	TAS	Micro 225	2892	-	O/P Mon
Thermocouple Thermometer	Fluke	51	3172	12	16-Nov-2017
Hygrometer	Rotronic	I-1000	3220	12	23-Aug-2017
Combiner/Splitter	Weinschel	1506A	3877	12	30-Mar-2017
DC - 12.4 GHz 10 dB Attenuator	Suhner	6810.17.A	3965	12	25-Oct-2017
1 Metre K Type Cable	Rhophase	KPS-1501A-1000-KPS	4106	12	14-Dec-2017
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	09-Sep-2017
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	06-Oct-2017
2 Channel PSU	Rohde & Schwarz	HMP2020	4735	-	O/P Mon

Table 8

O/P Mon – Output Monitored using calibrated equipment

2.4 Spurious Emissions at Antenna Terminals

2.4.1 Specification Reference

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

2.4.2 Equipment Under Test and Modification State

IsatPhone2w, S/N: IMEI 353032044022321 - Modification State 0

2.4.3 Date of Test

14-February-2017 to 16-February-2017

2.4.4 Test Method

The test was performed in accordance with KDB 971168 D01, clause 6.

The authorized emissions bandwidth used for measurements below was declared by the manufacturer as 70 kHz.

Measurements have been made in a bandwidth greater than 4 kHz which was considered worst case.

2.4.5 Environmental Conditions

Ambient Temperature	23.3 °C
Relative Humidity	29.1 %

2.4.6 Test Results

Inmarsat Transmitting

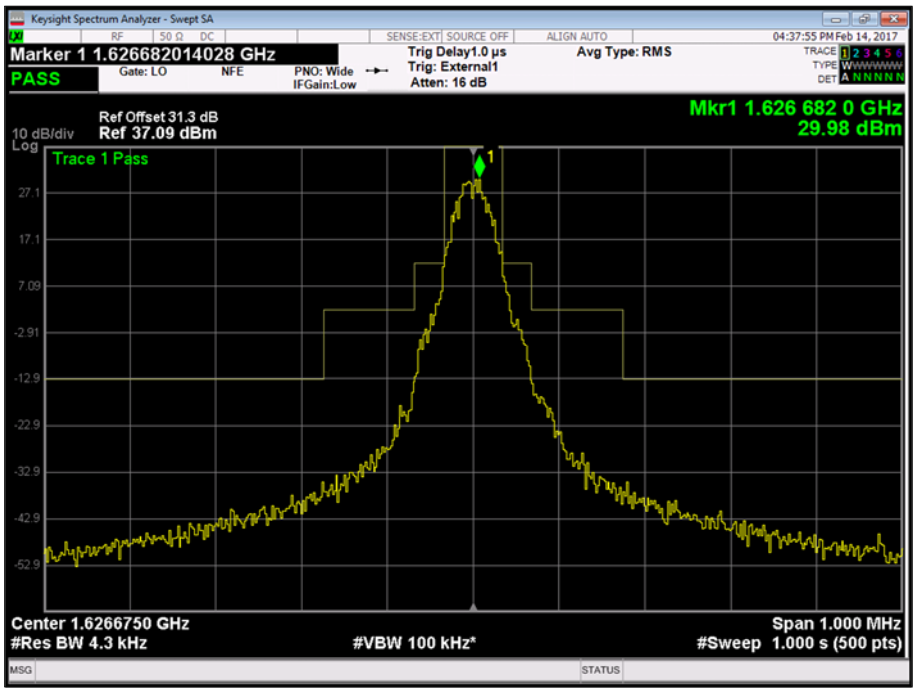


Figure 8 - 1626.675 MHz - Emission Mask

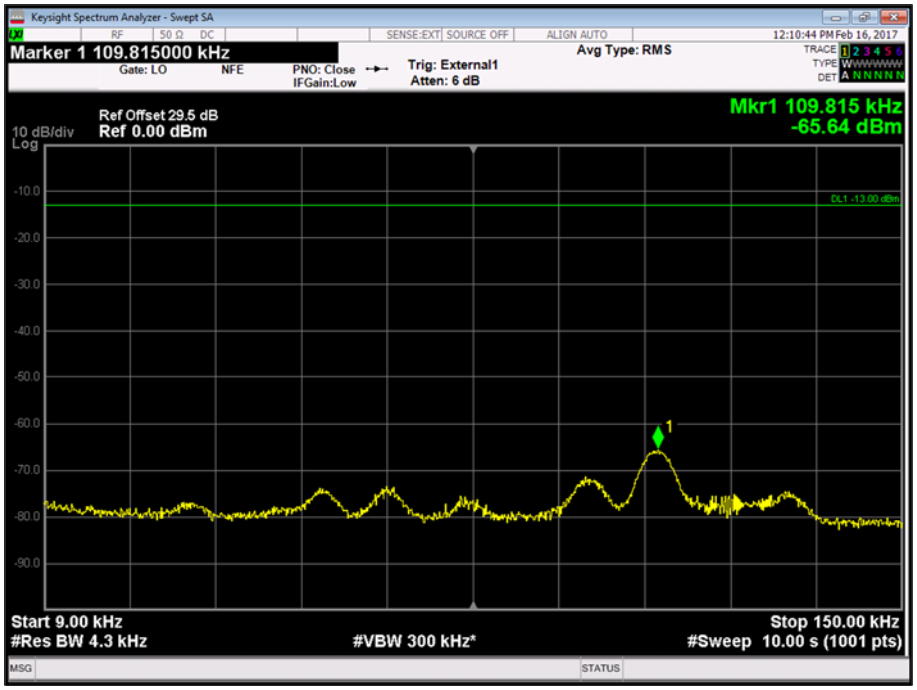


Figure 9 - 1626.675 MHz - 9 kHz to 150 kHz

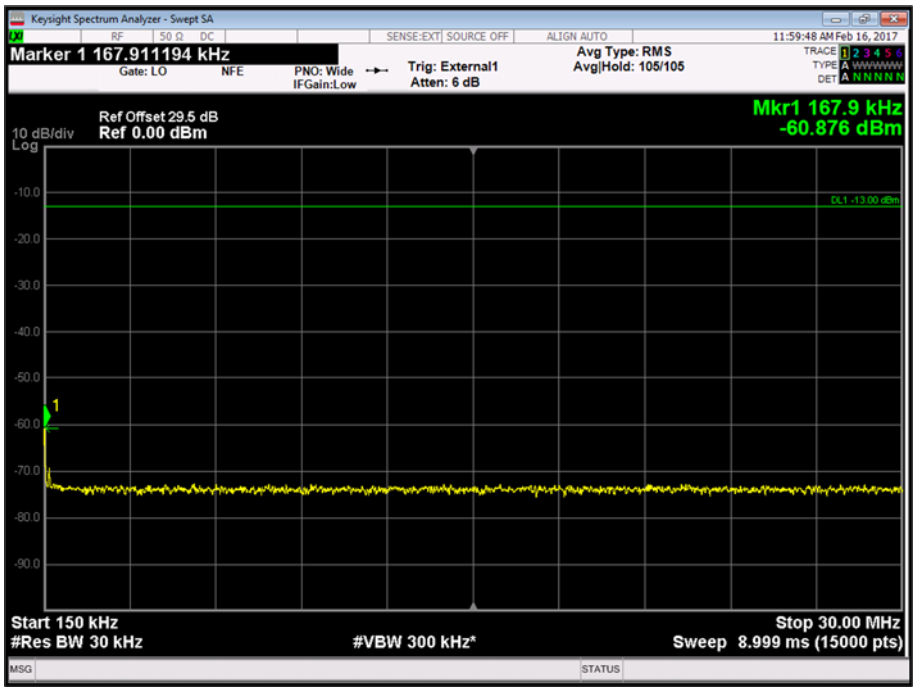


Figure 10 - 1626.675 MHz - 150 kHz to 30 MHz

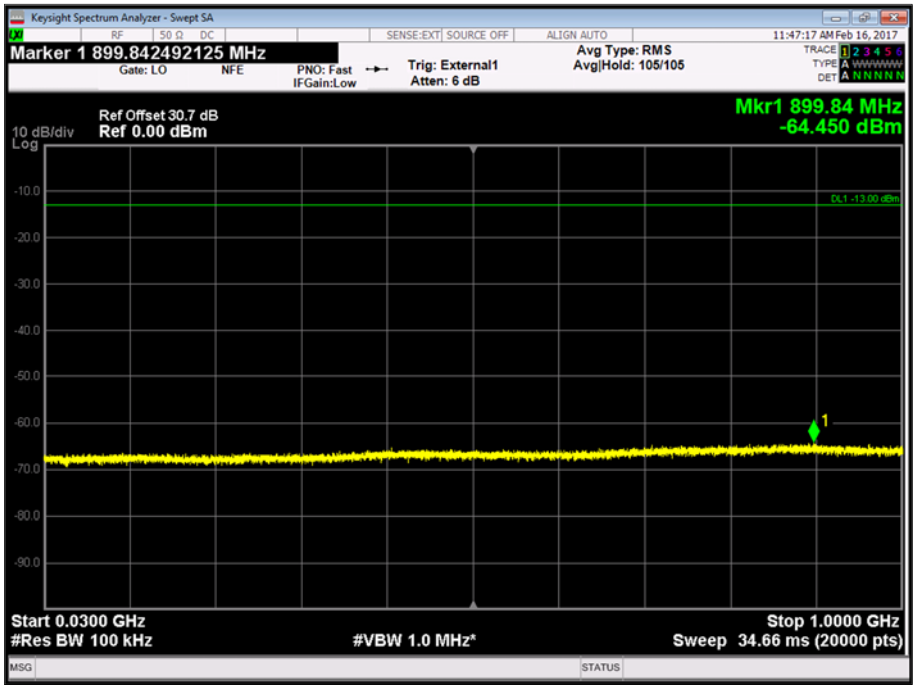


Figure 11 - 1626.675 MHz - 30 MHz to 1 GHz

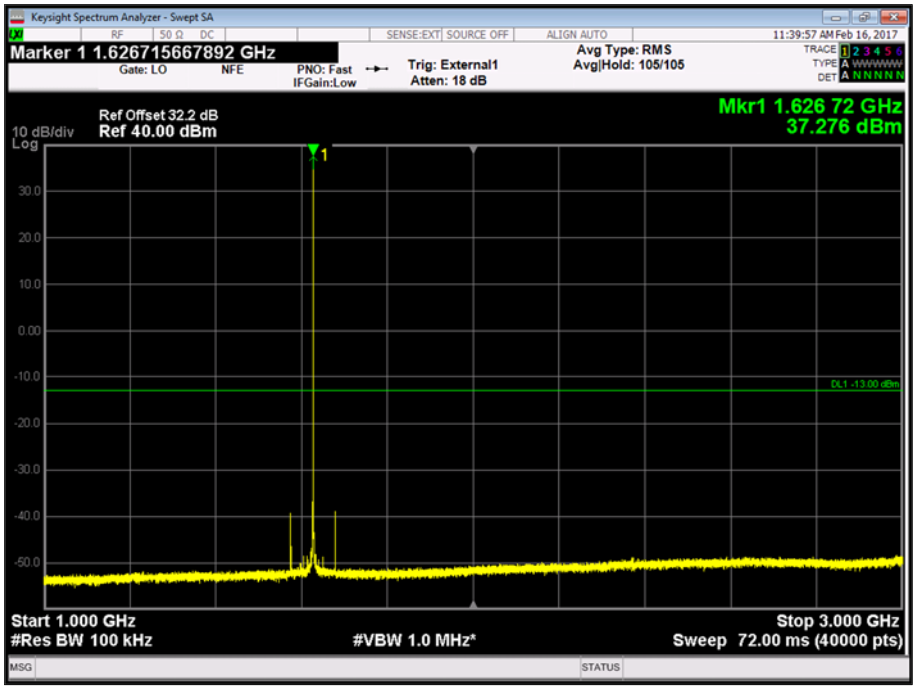


Figure 12 - 1626.675 MHz - 1 GHz to 3 GHz

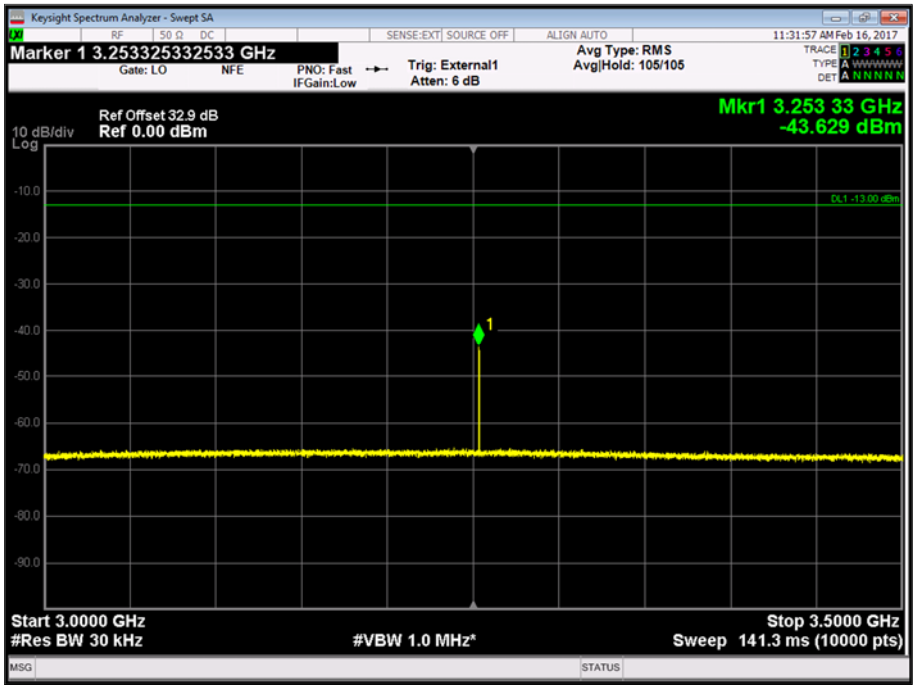


Figure 13 - 1626.675 MHz - 3 GHz to 3.5 GHz

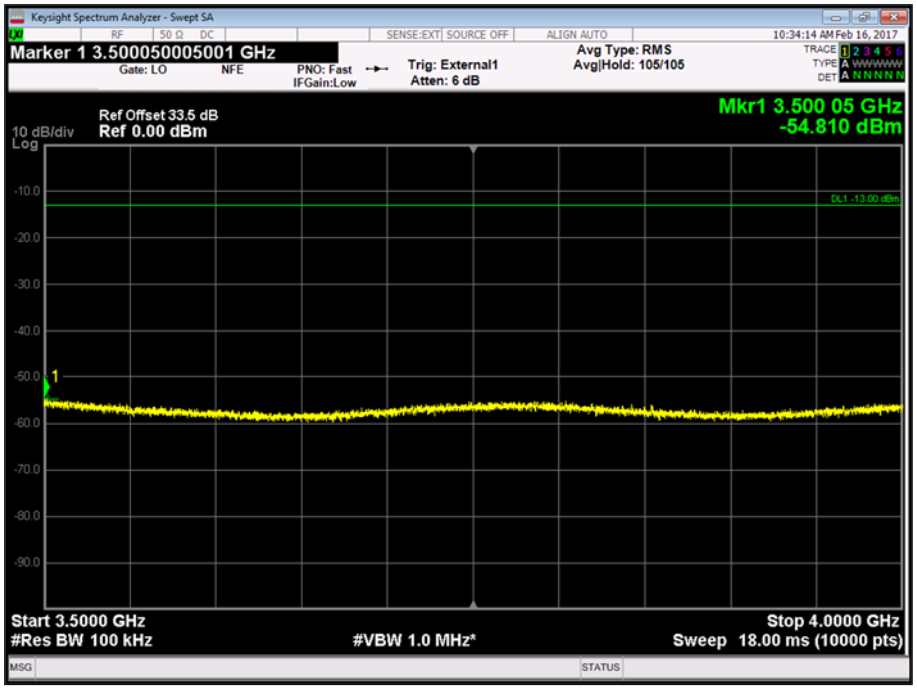


Figure 14 - 1626.675 MHz - 3.5 GHz to 4 GHz

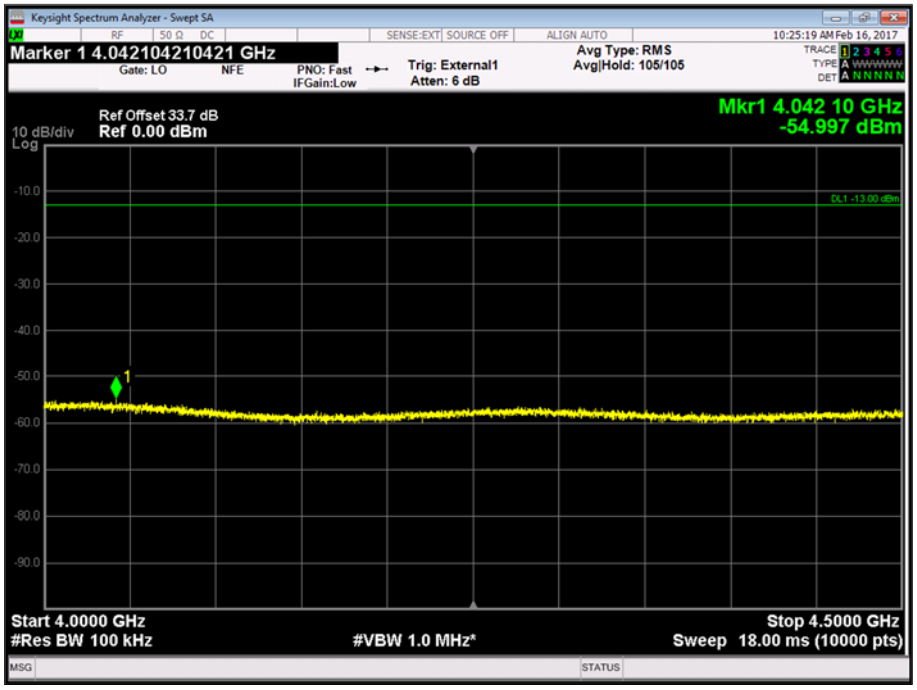


Figure 15 - 1626.675 MHz - 4 GHz to 4.5 GHz

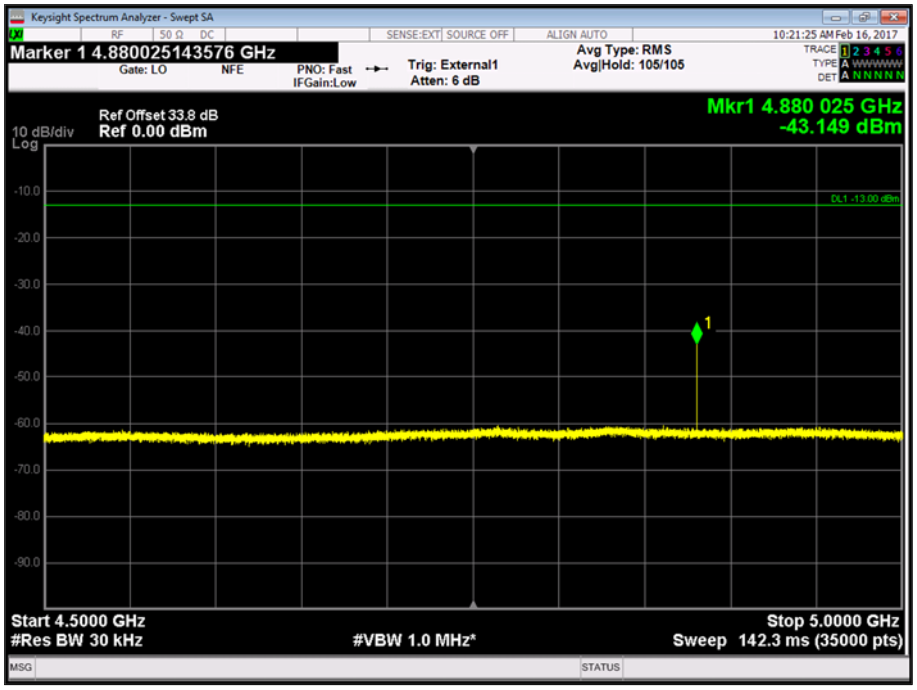


Figure 16 - 1626.675 MHz - 4.5 GHz to 5 GHz

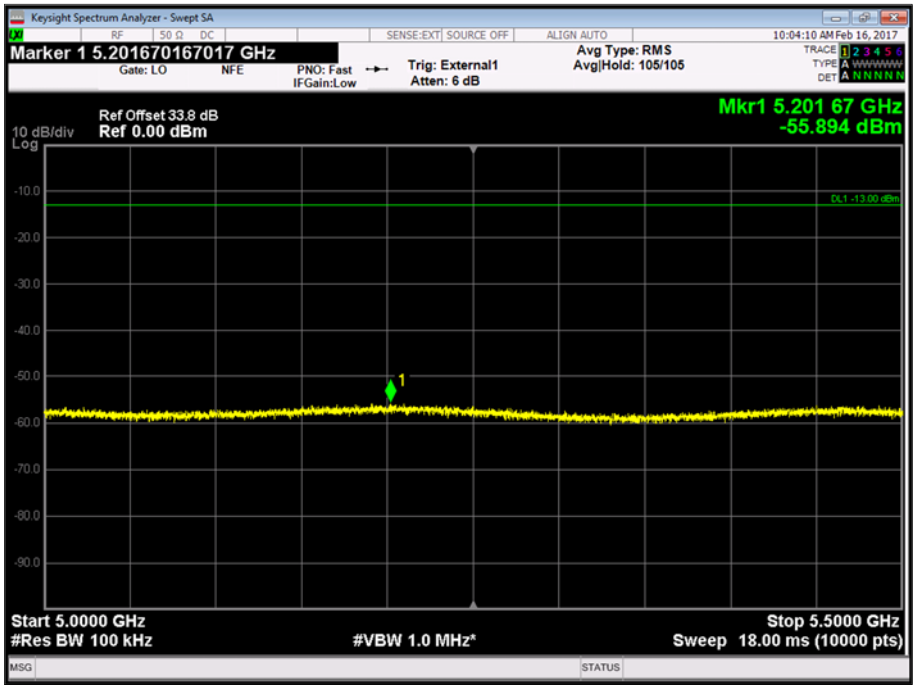


Figure 17 - 1626.675 MHz - 5 GHz to 5.5 GHz

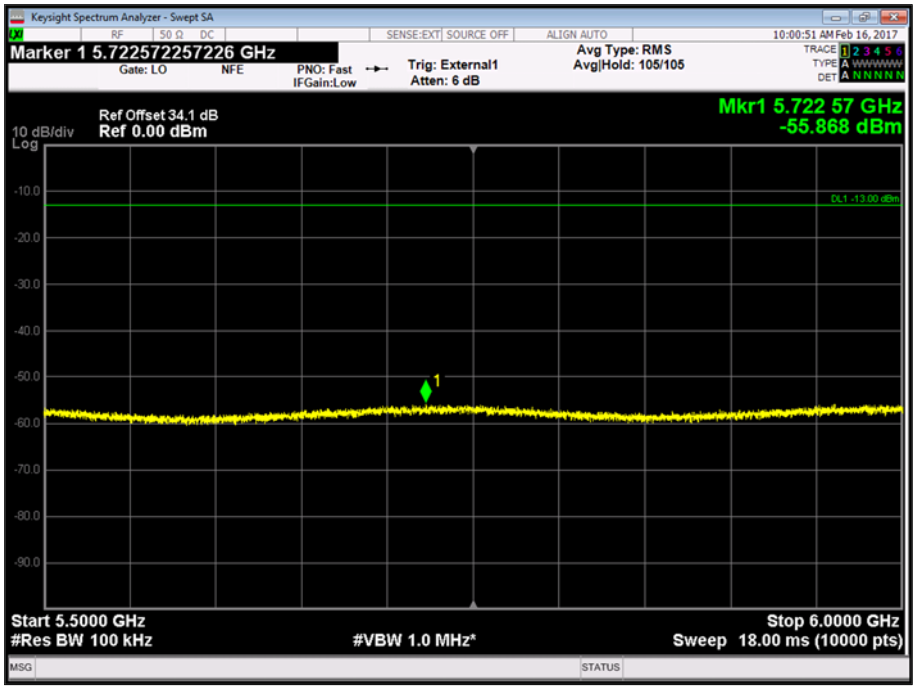


Figure 18 - 1626.675 MHz - 5.5 GHz to 6 GHz

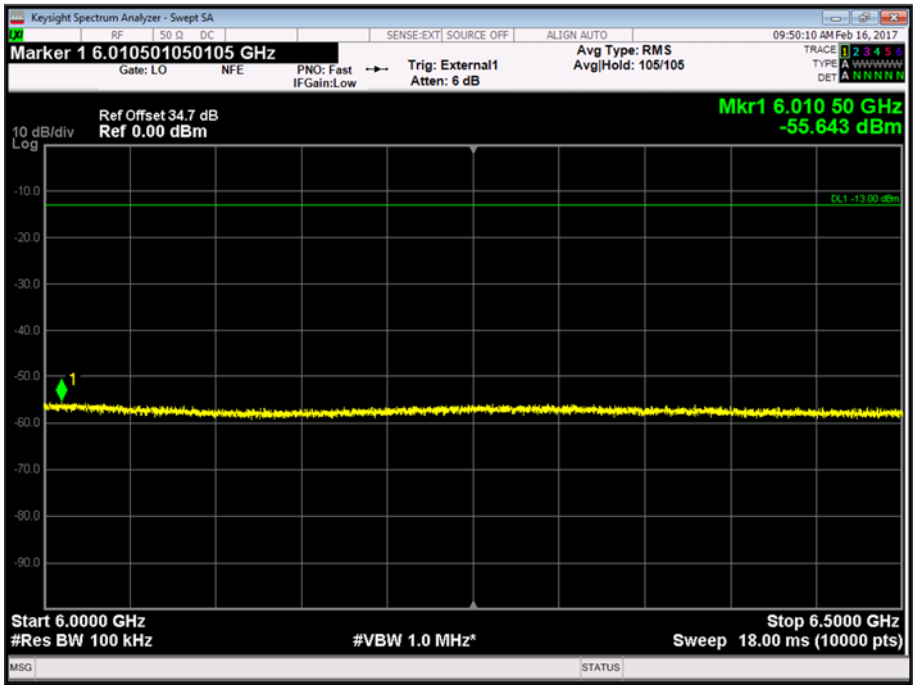


Figure 19 - 1626.675 MHz - 6 GHz to 6.5 GHz

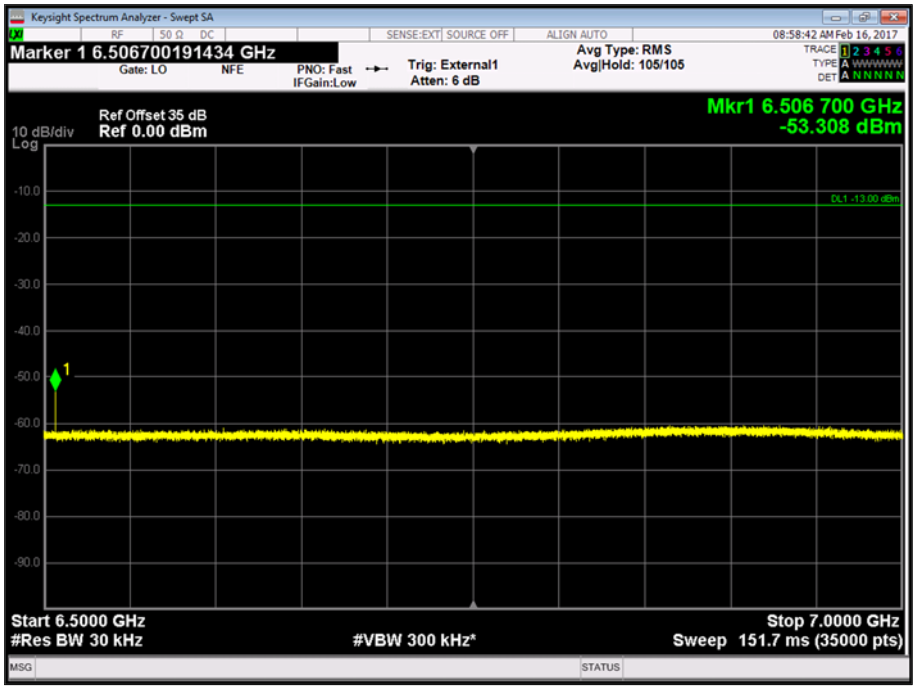


Figure 20 - 1626.675 MHz - 6.5 GHz to 7 GHz

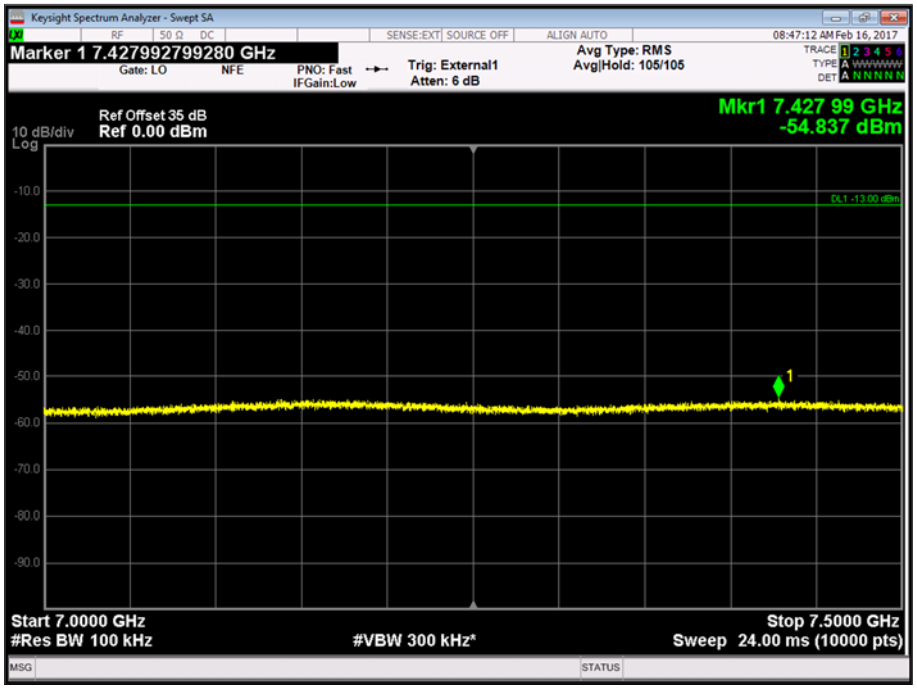


Figure 21 - 1626.675 MHz - 7 GHz to 7.5 GHz

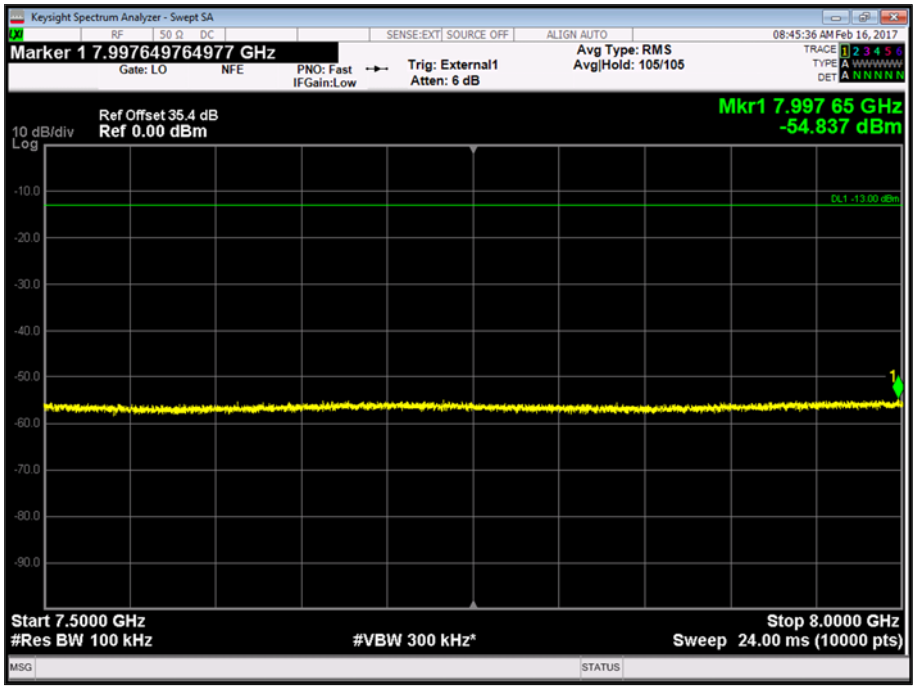


Figure 22 - 1626.675 MHz - 7.5 GHz to 8 GHz

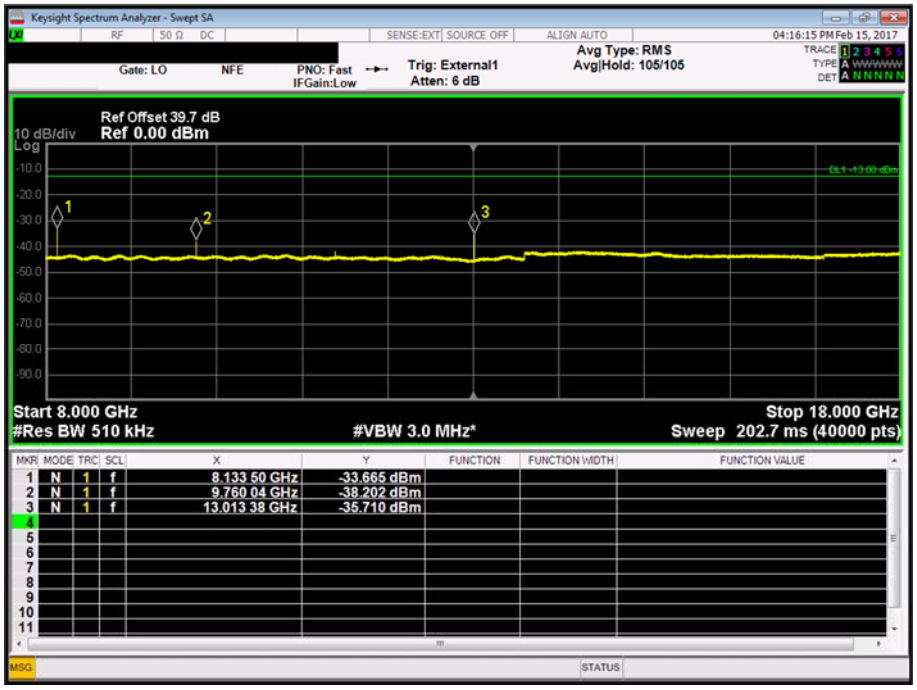


Figure 23 - 1626.675 MHz - 8 GHz to 18 GHz

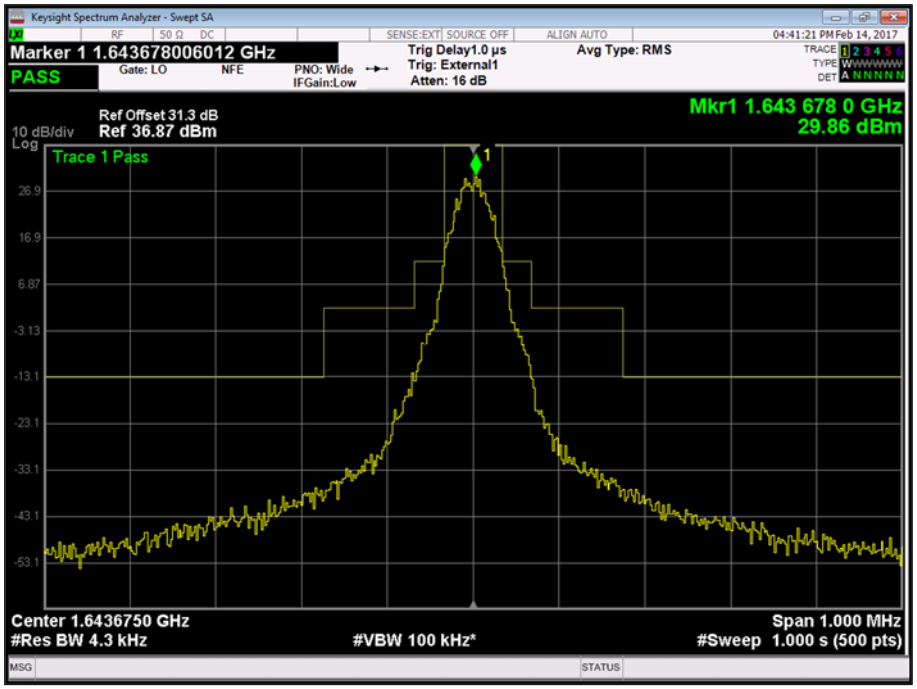


Figure 24 - 1643.675 MHz - Emission Mask

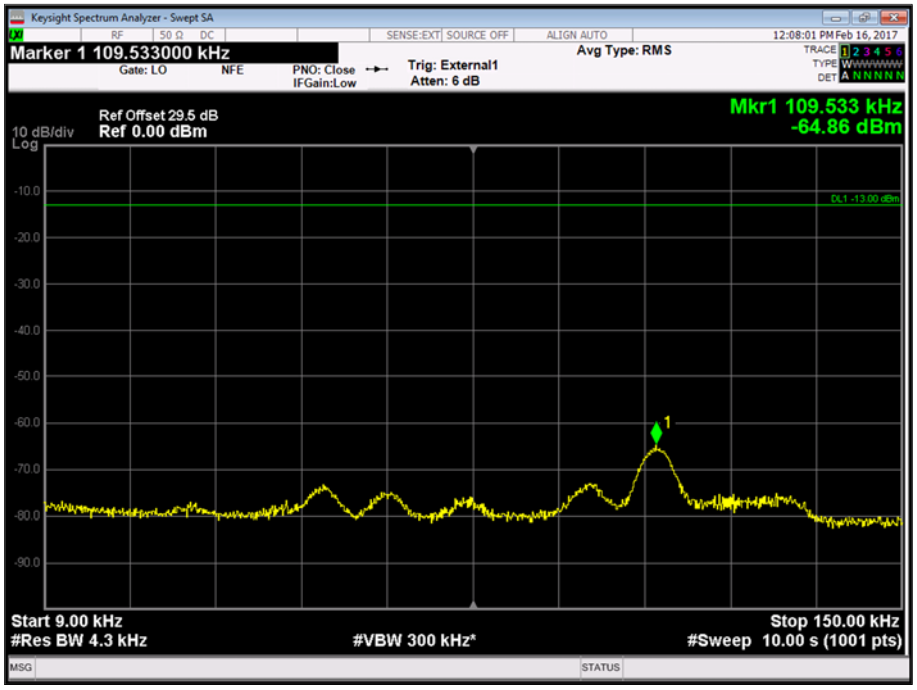


Figure 25 - 1643.675 MHz - 9 kHz to 150 kHz

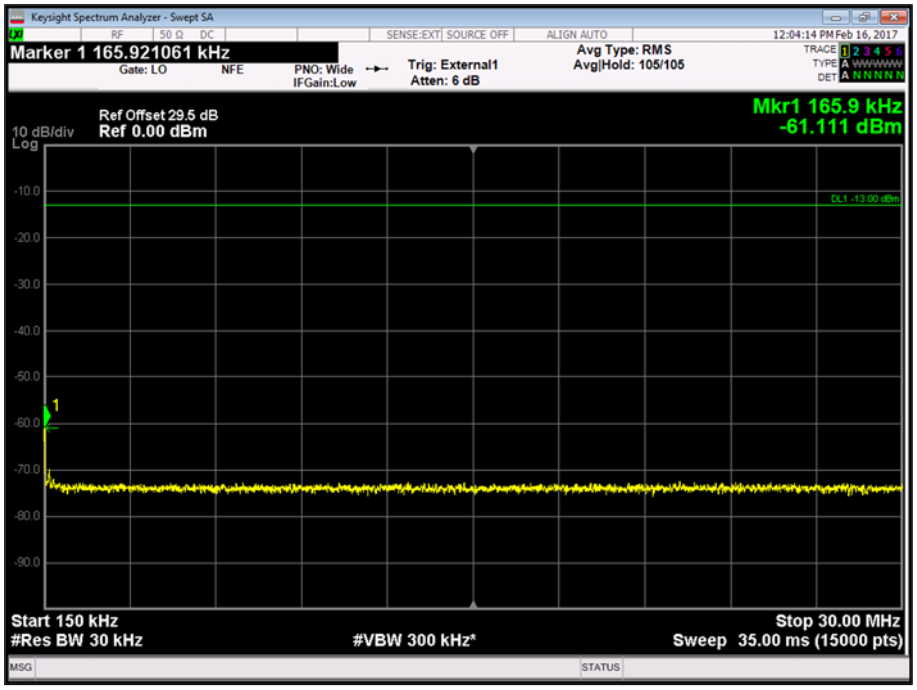


Figure 26 - 1643.675 MHz - 150 kHz to 30 MHz

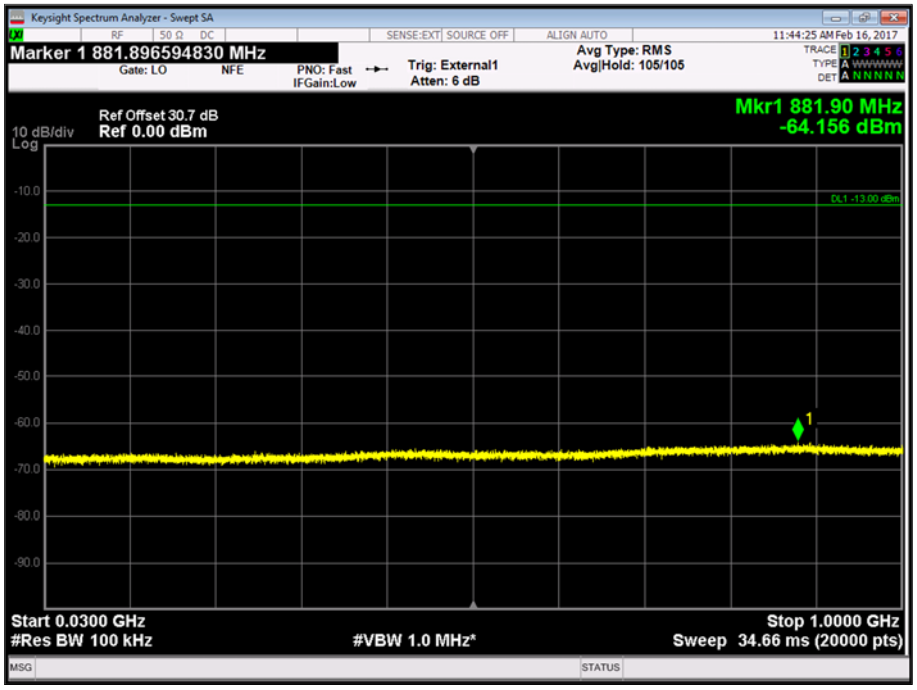


Figure 27 - 1643.675 MHz - 30 MHz to 1 GHz

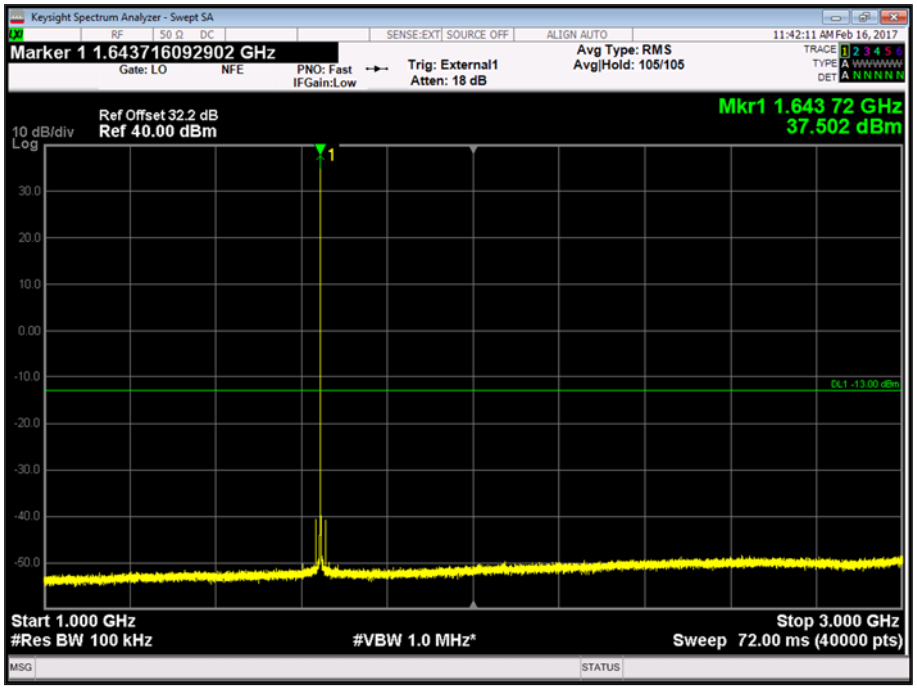


Figure 28 - 1643.675 MHz - 1 GHz to 3 GHz

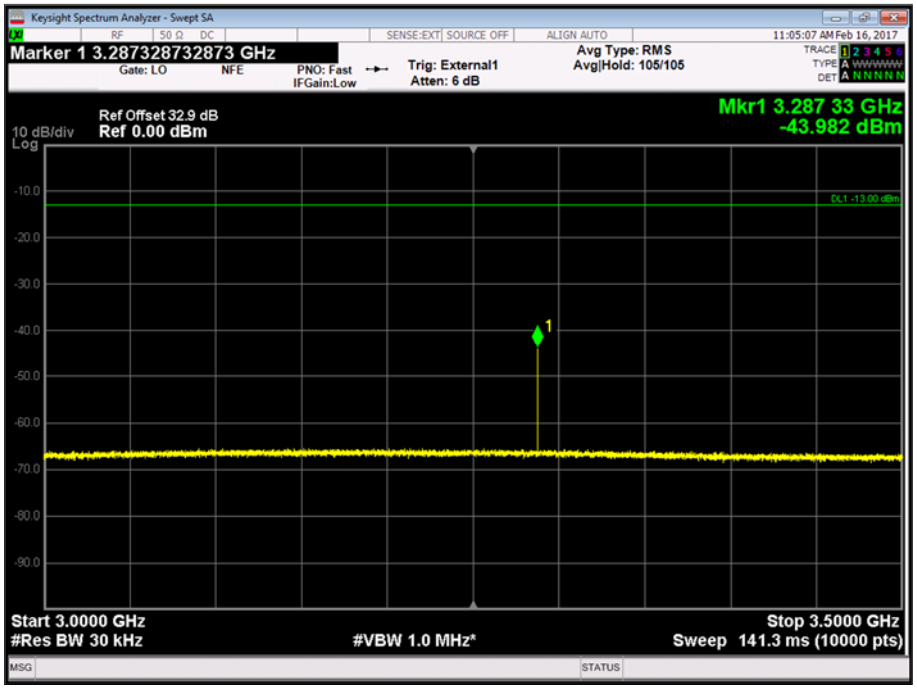


Figure 29 - 1643.675 MHz - 3 GHz to 3.5 GHz

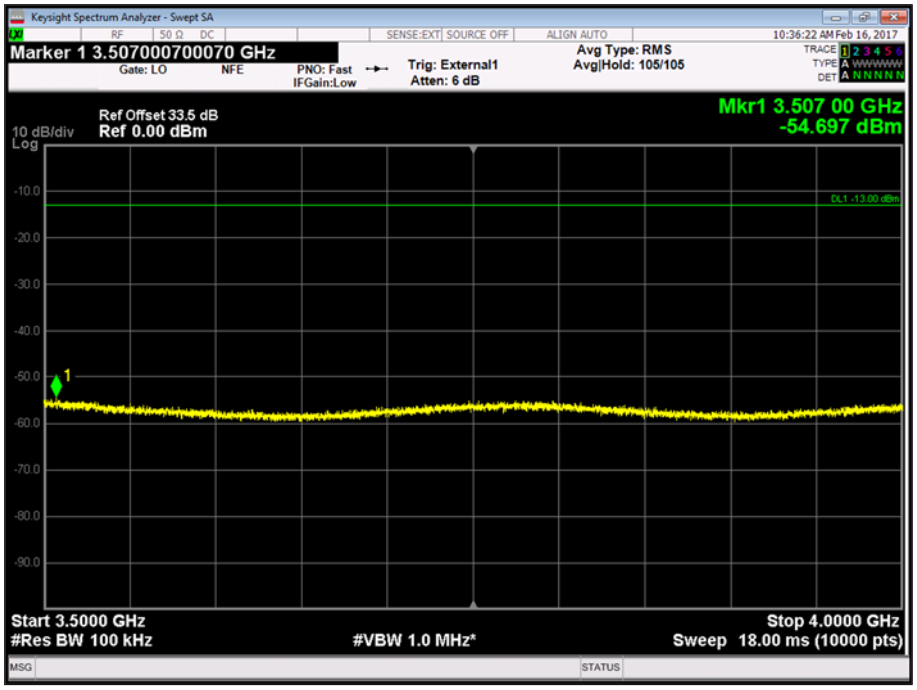


Figure 30 - 1643.675 MHz - 3.5 GHz to 4 GHz

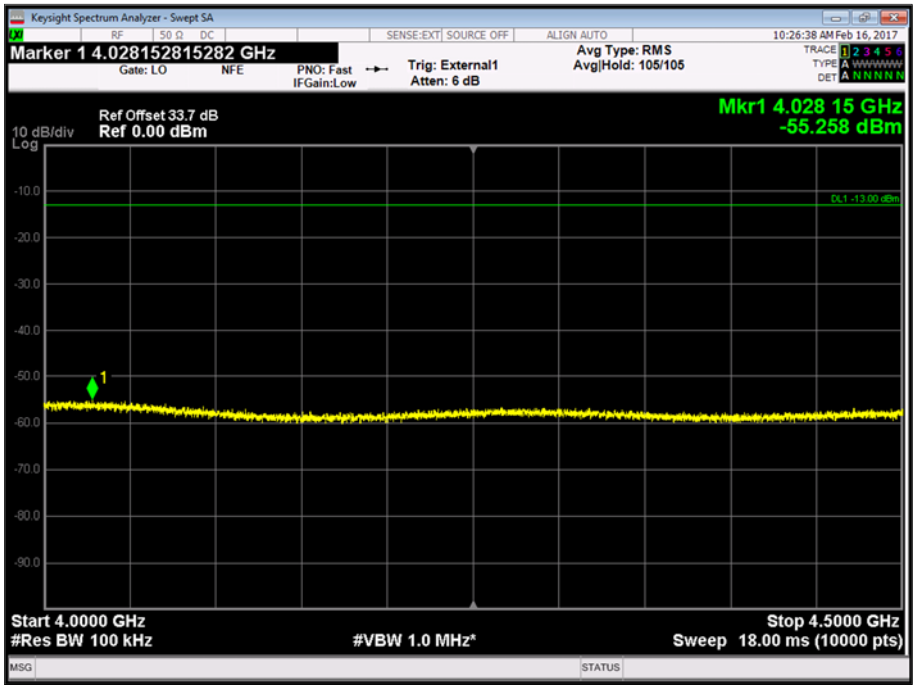


Figure 31 - 1643.675 MHz - 4 GHz to 4.5 GHz

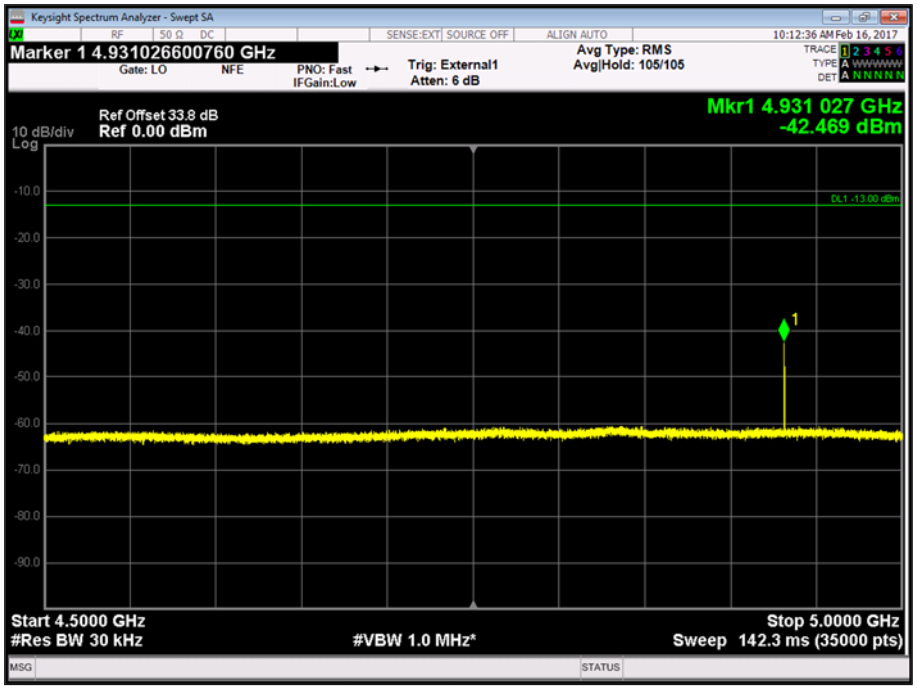


Figure 32 - 1643.675 MHz - 4.5 GHz to 5 GHz

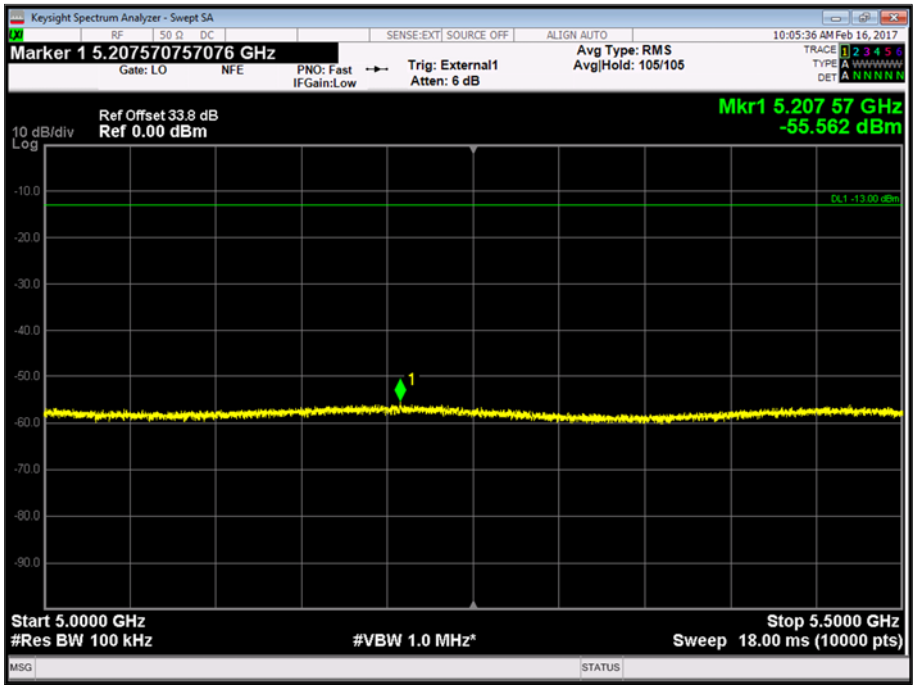


Figure 33 - 1643.675 MHz - 5 GHz to 5.5 GHz

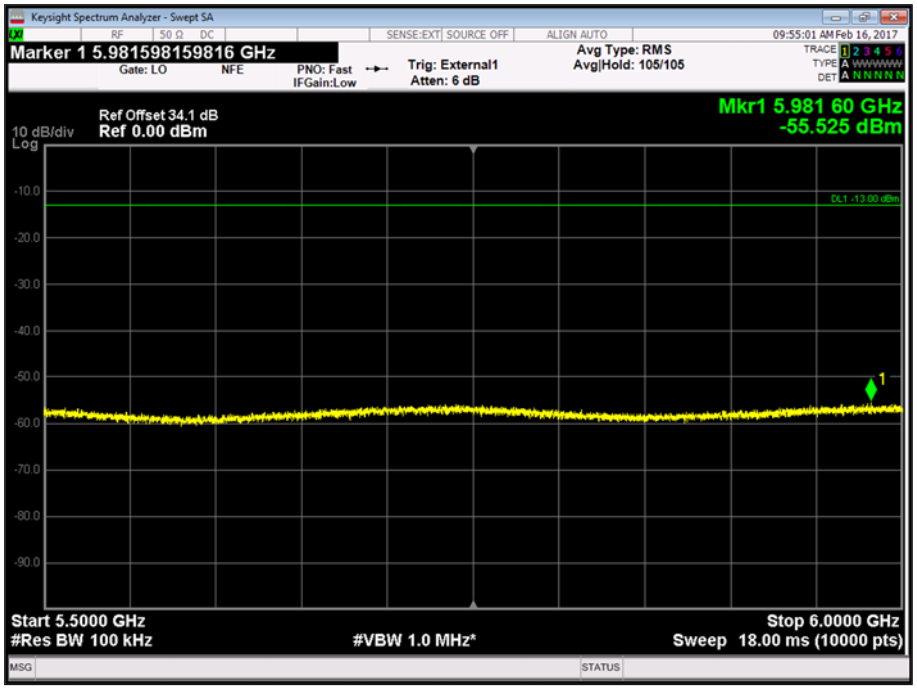


Figure 34 - 1643.675 MHz - 5.5 GHz to 6 GHz

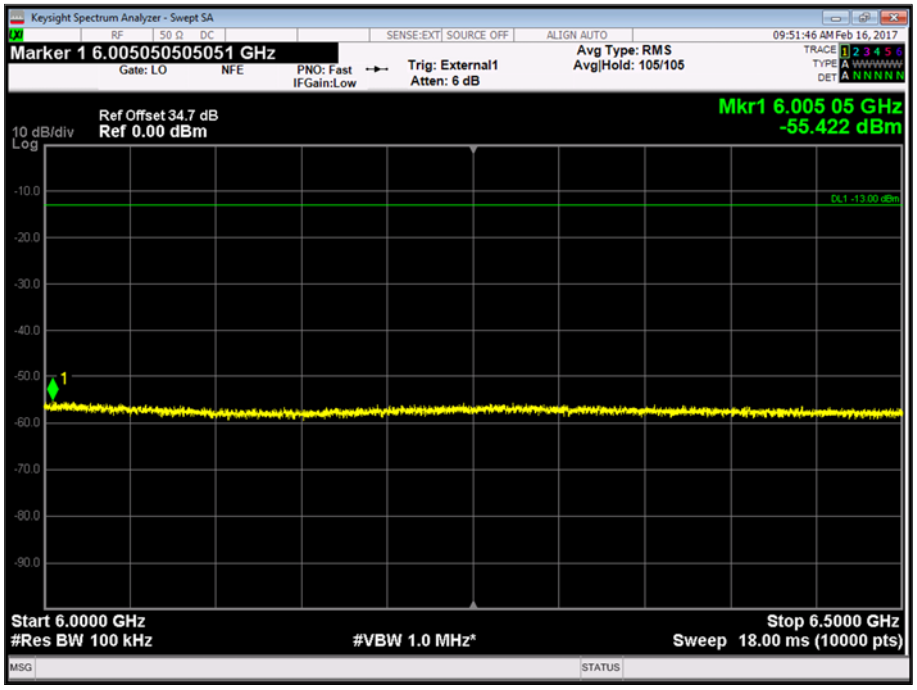


Figure 35 - 1643.675 MHz - 6 GHz to 6.5 GHz

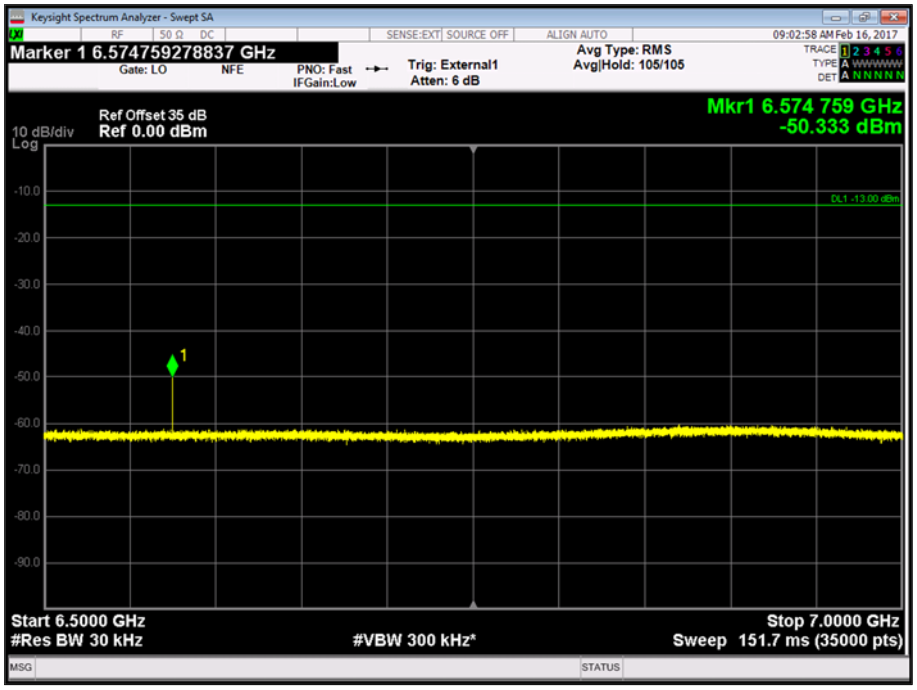


Figure 36 - 1643.675 MHz - 6.5 GHz to 7 GHz

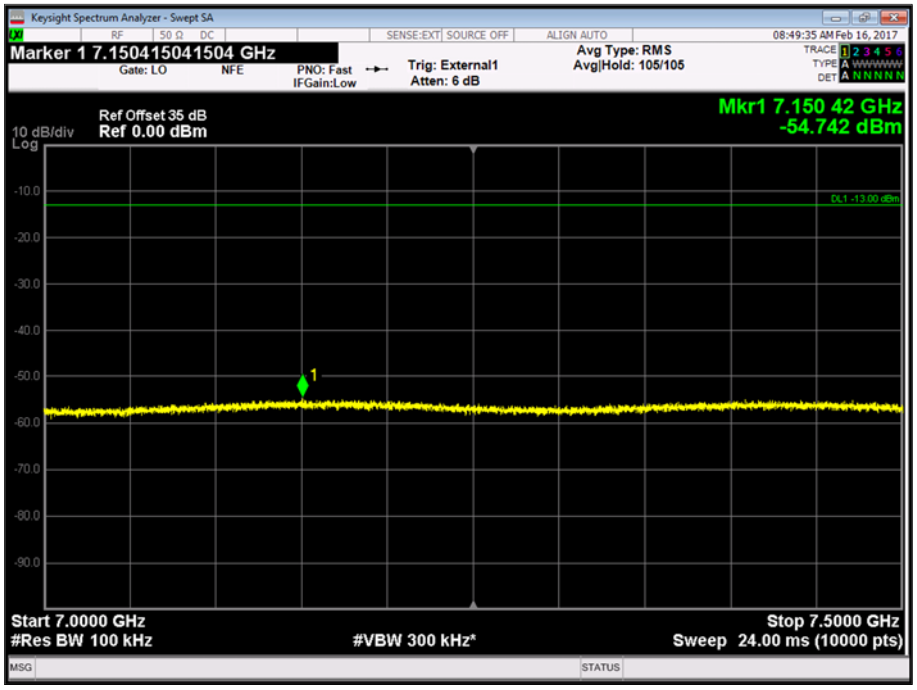


Figure 37 - 1643.675 MHz - 7 GHz to 7.5 GHz

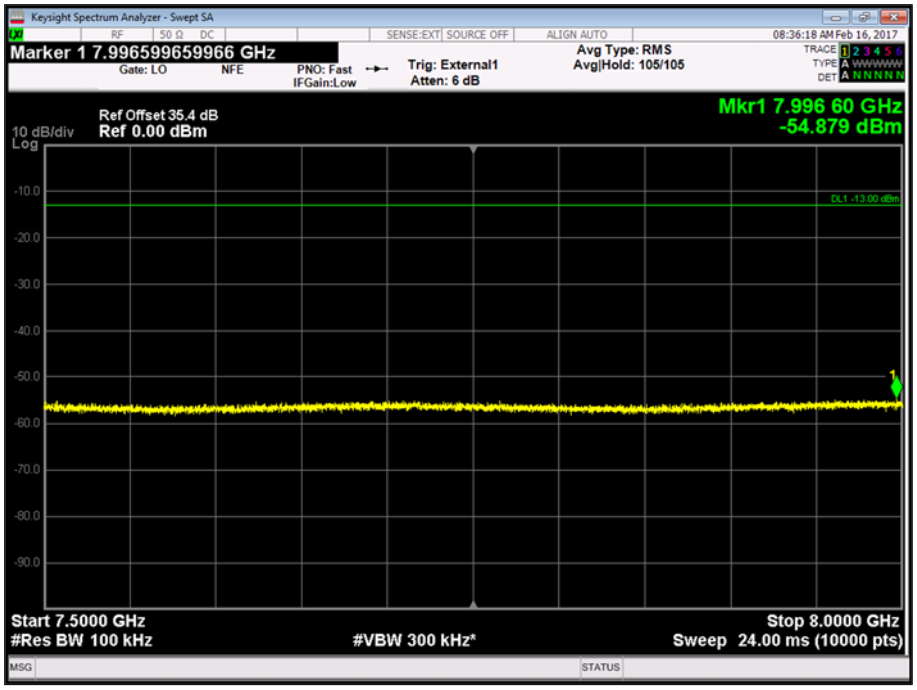


Figure 38 - 1643.675 MHz - 7.5 GHz to 8 GHz

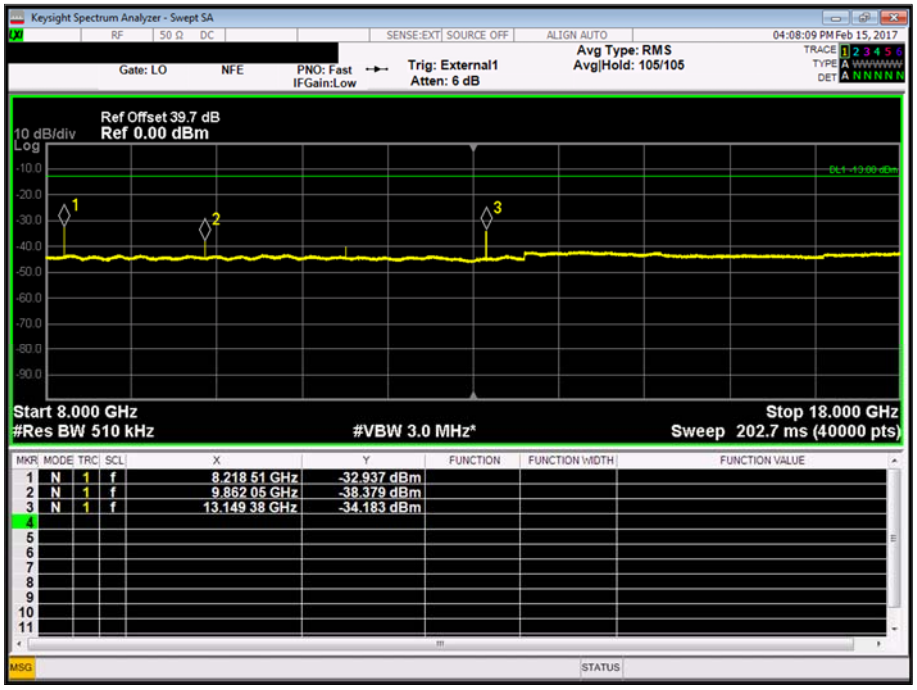


Figure 39 - 1643.675 MHz - 8 GHz to 18 GHz

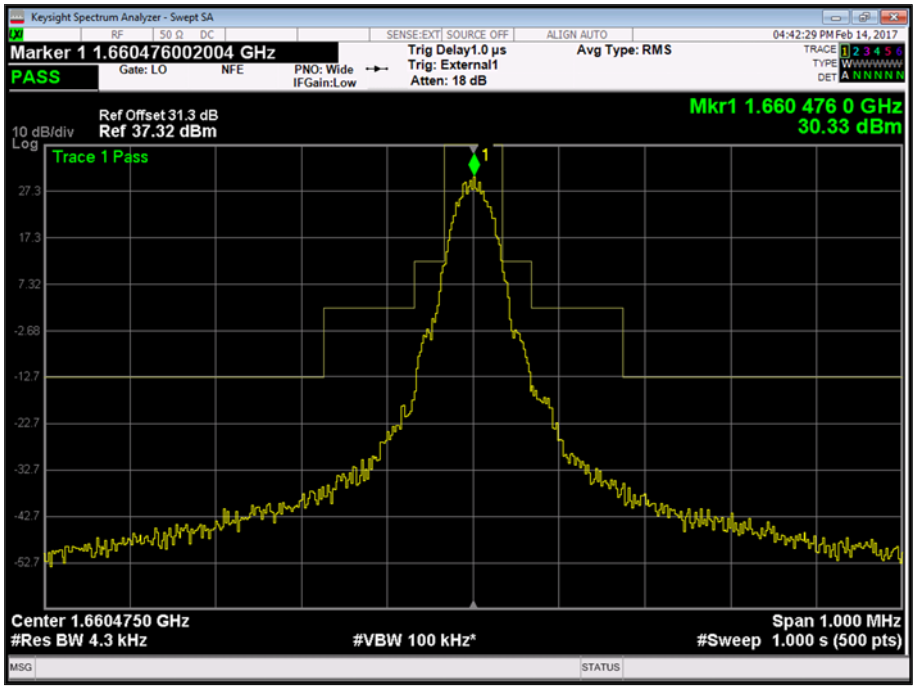


Figure 40 - 1660.475 MHz - Emission Mask

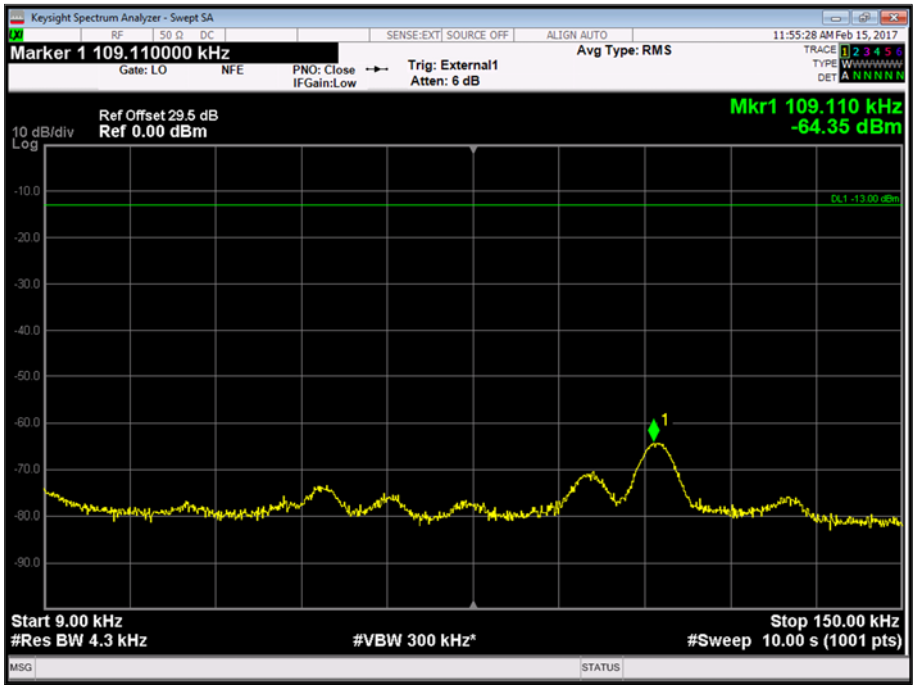


Figure 41 - 1660.475 MHz - 9 kHz to 150 kHz

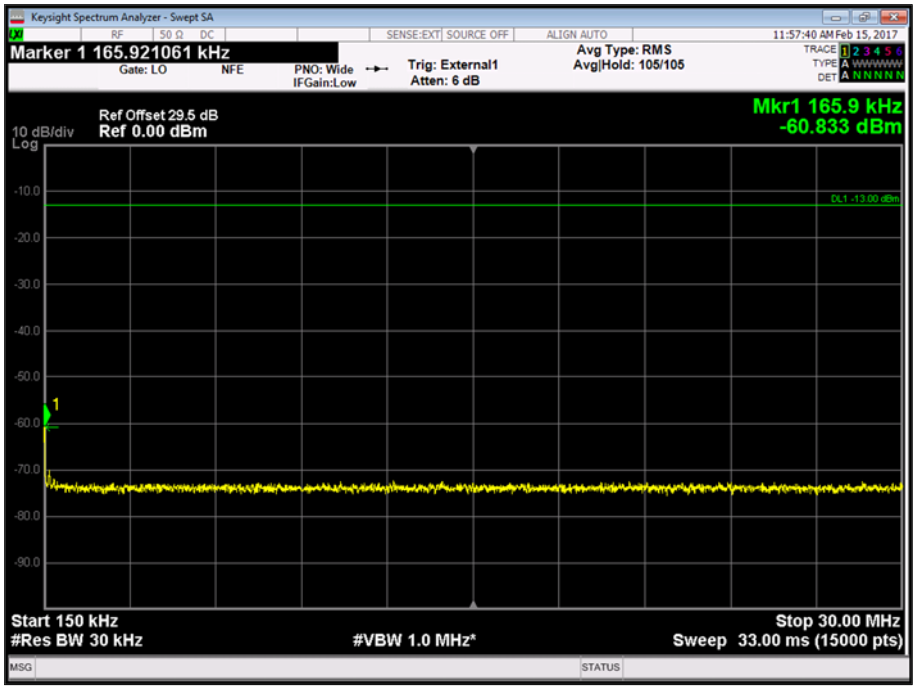


Figure 42 - 1660.475 MHz - 150 kHz to 30 MHz

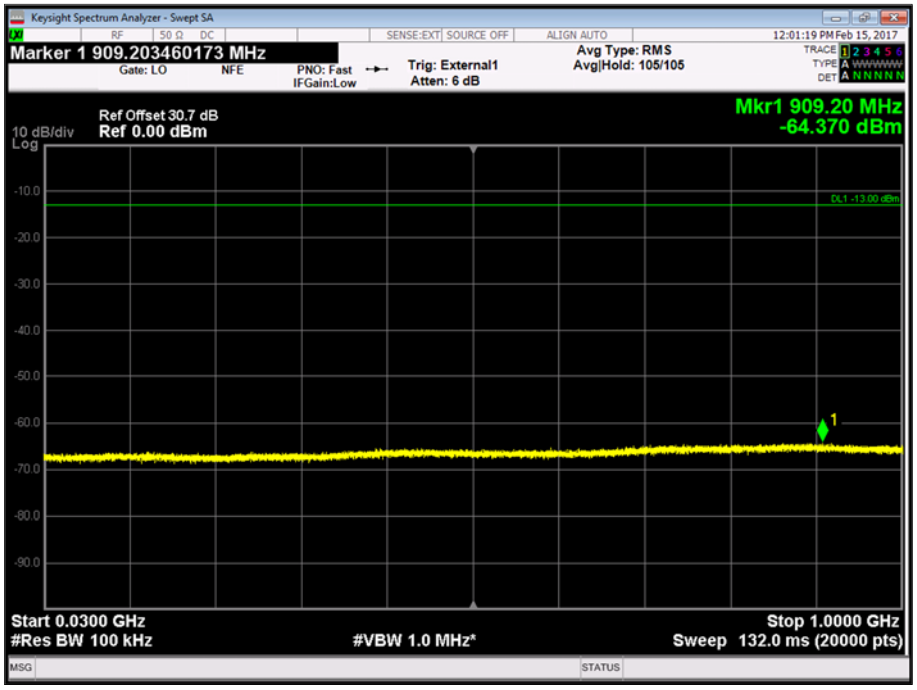


Figure 43 - 1660.475 MHz - 30 MHz to 1 GHz

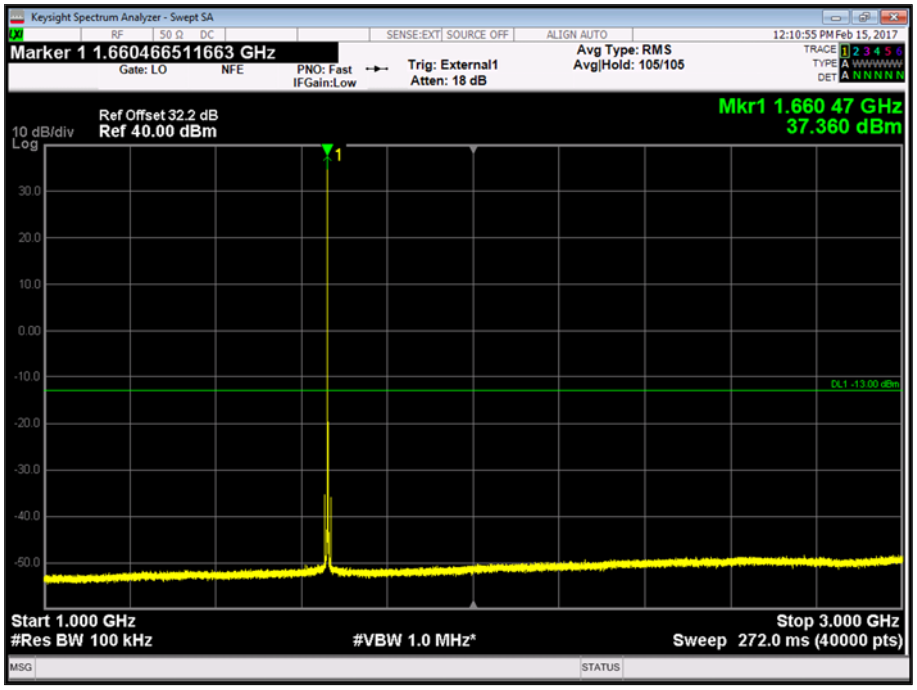


Figure 44 - 1660.475 MHz - 1 GHz to 3 GHz

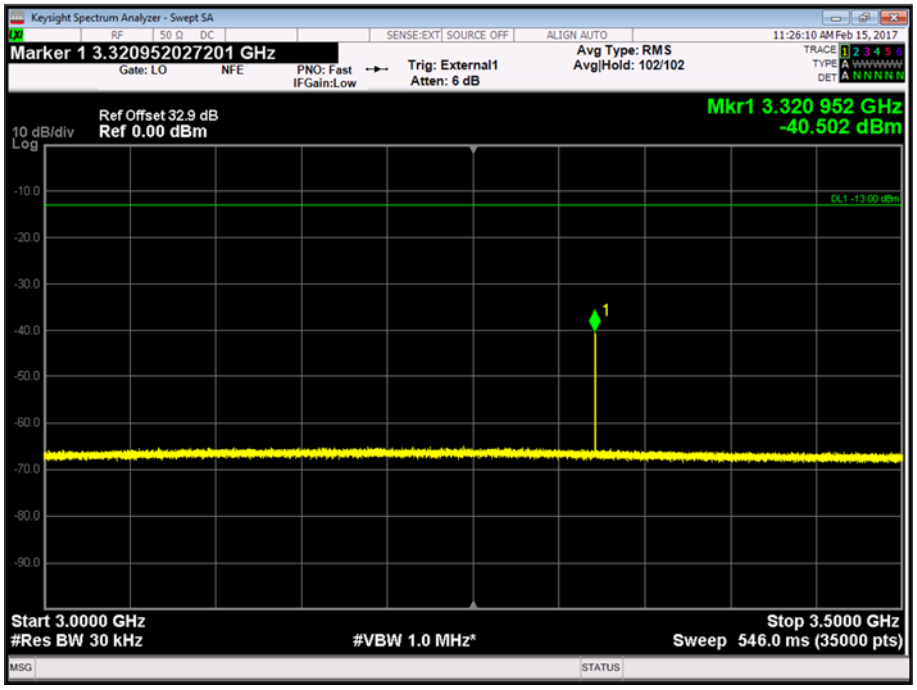


Figure 45 - 1660.475 MHz - 3 GHz to 3.5 GHz

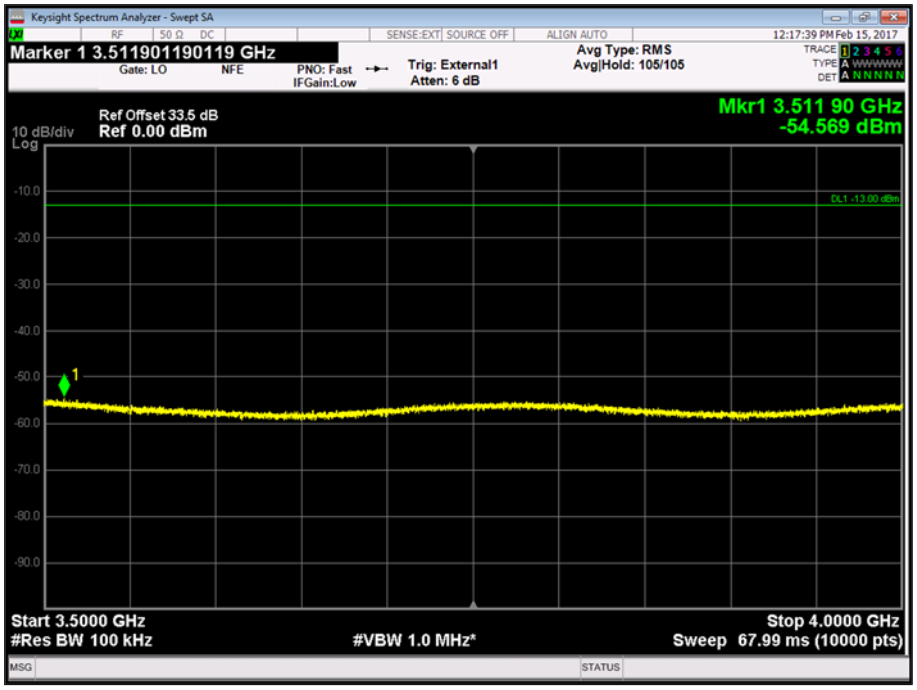


Figure 46 - 1660.475 MHz - 3.5 GHz to 4 GHz

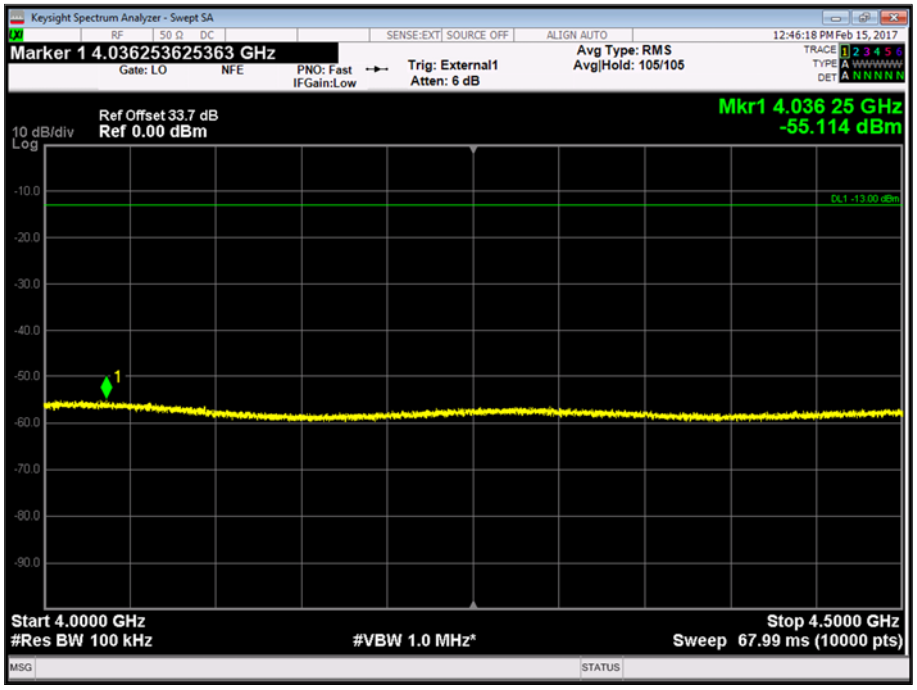


Figure 47 - 1660.475 MHz - 4 GHz to 4.5 GHz

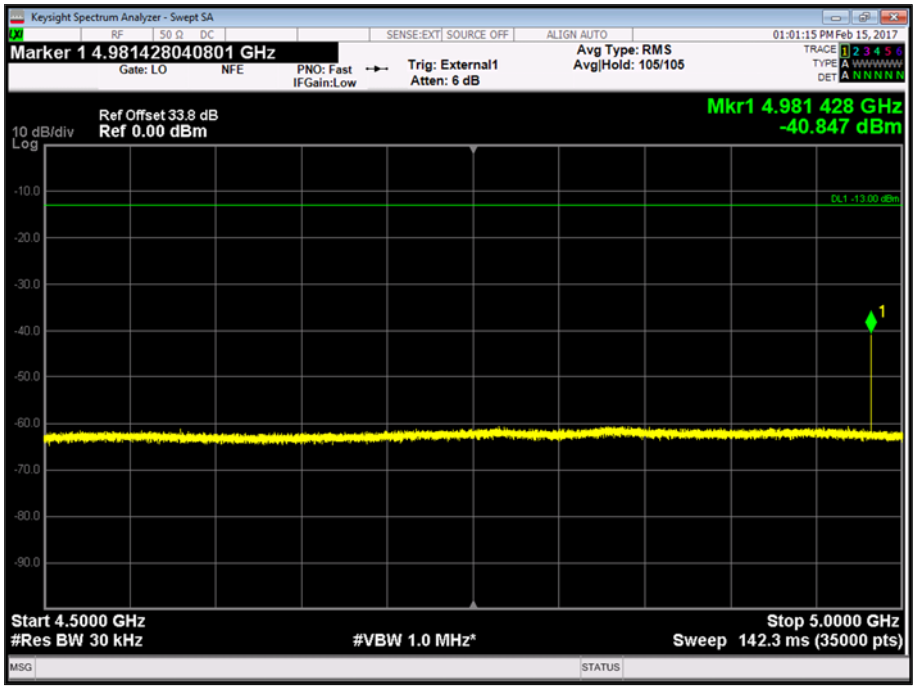


Figure 48 - 1660.475 MHz - 4.5 GHz to 5 GHz

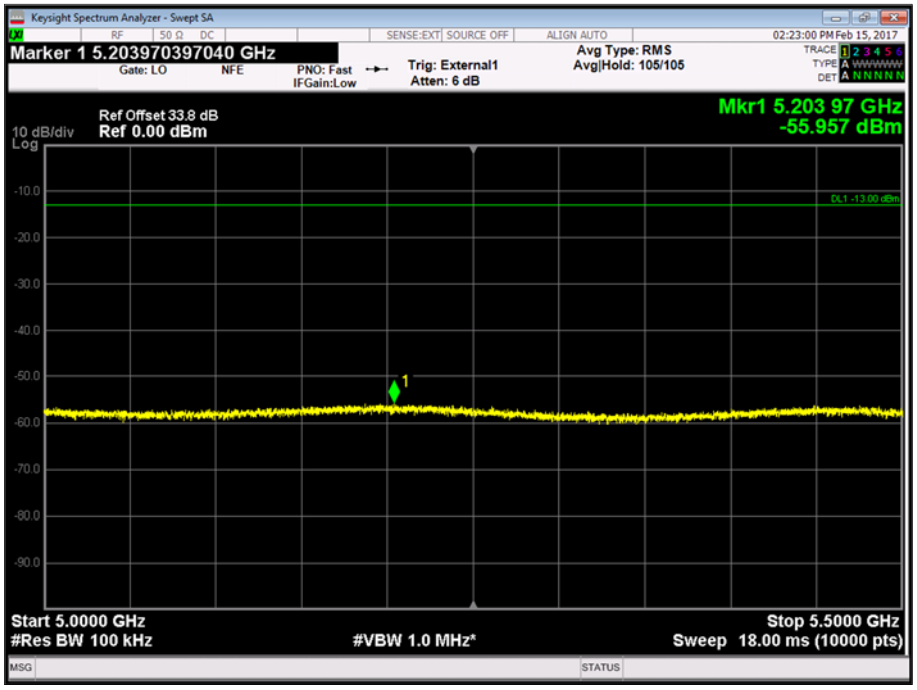


Figure 49 - 1660.475 MHz - 5 GHz to 5.5 GHz

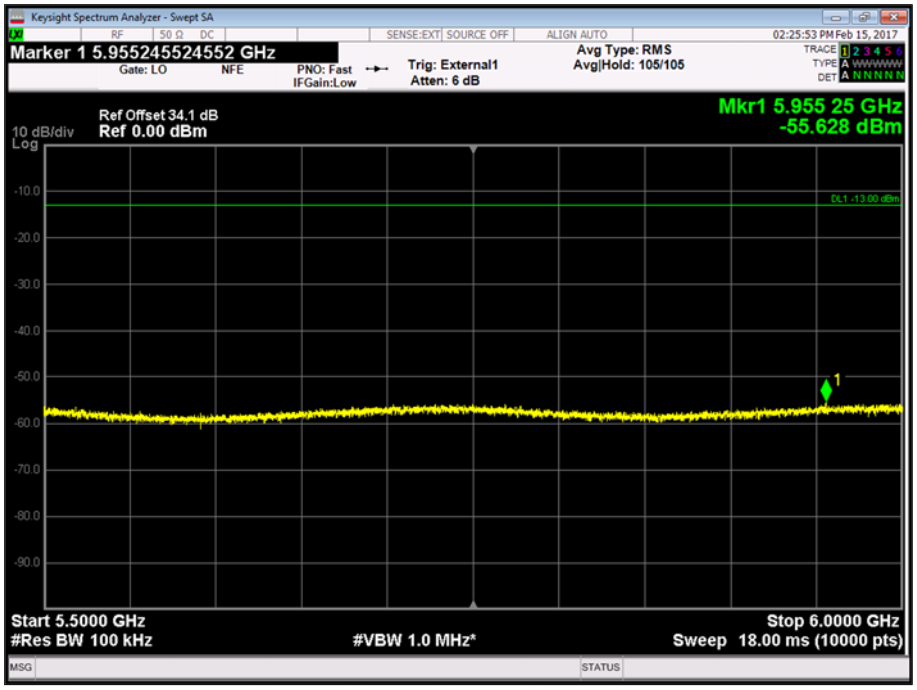


Figure 50 - 1660.475 MHz - 5.5 GHz to 6 GHz

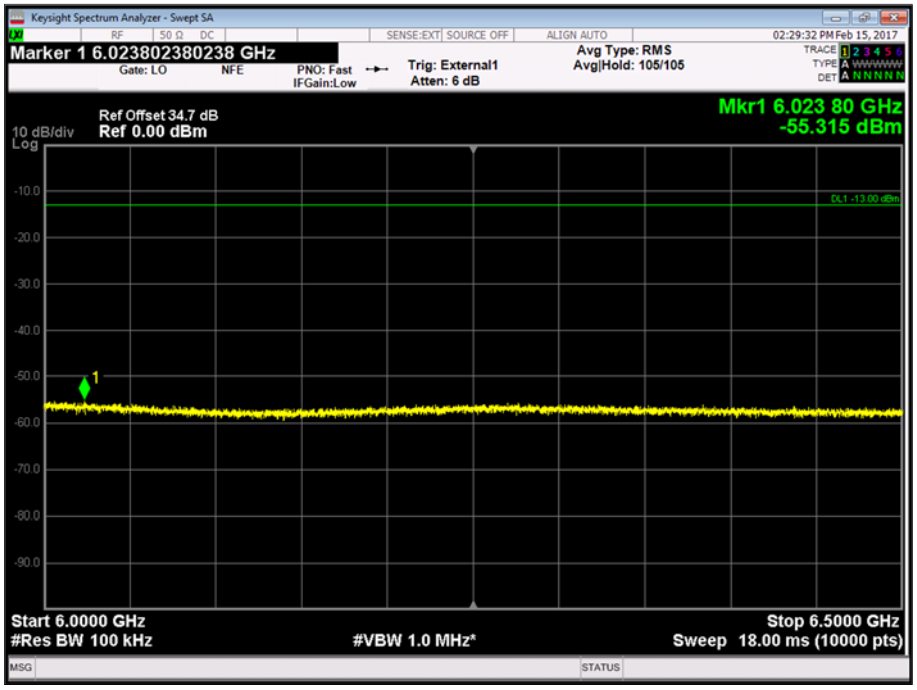


Figure 51 - 1660.475 MHz - 6 GHz to 6.5 GHz

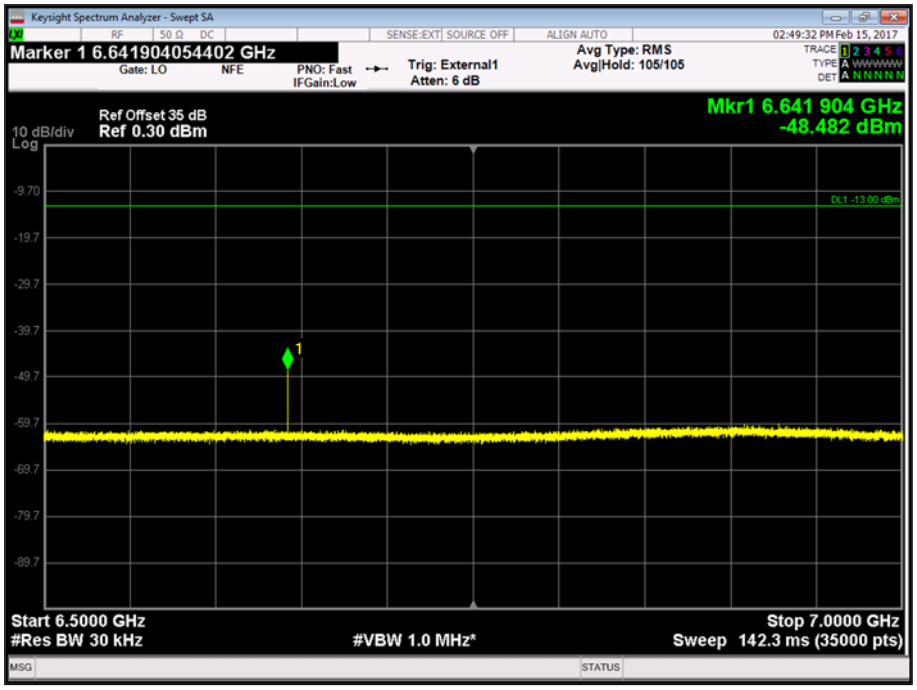


Figure 52 - 1660.475 MHz - 6.5 GHz to 7 GHz

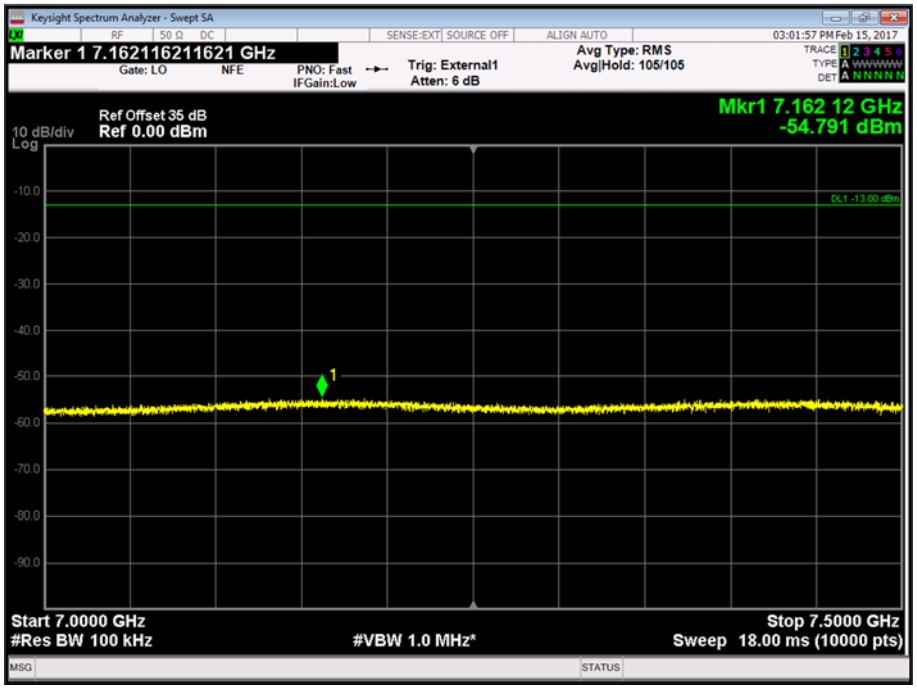


Figure 53 - 1660.475 MHz - 7 GHz to 7.5 GHz

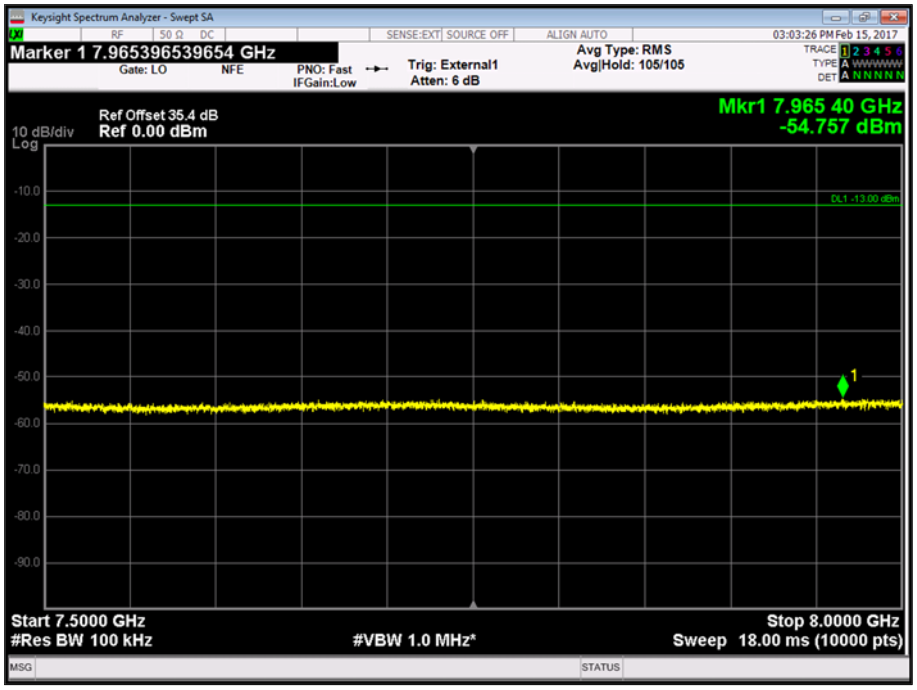


Figure 54 - 1660.475 MHz - 7.5 GHz to 8 GHz

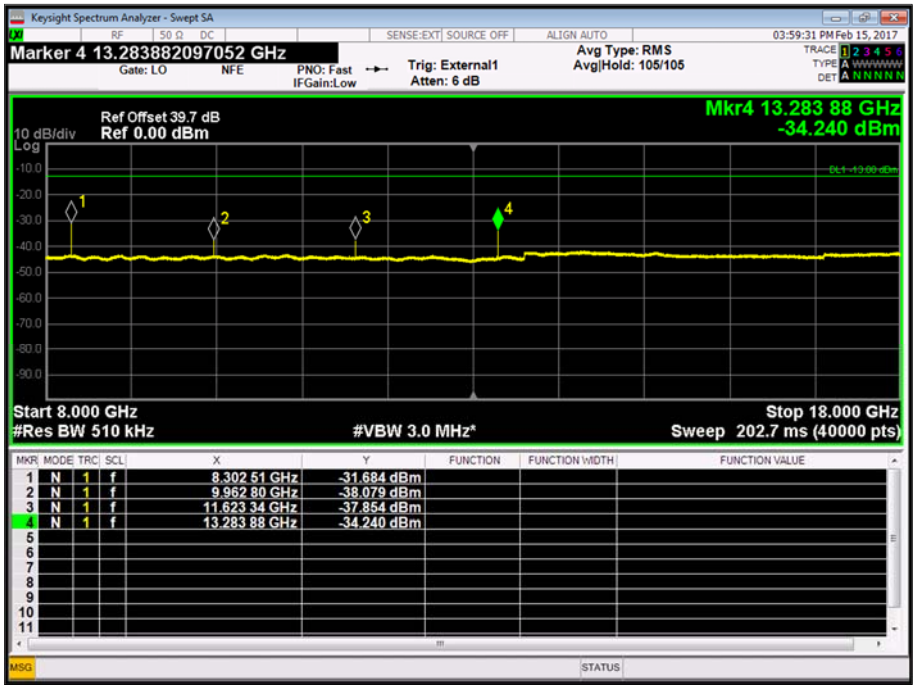


Figure 55 - 1660.475 MHz - 8 GHz to 18 GHz

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.

2.4.7 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
Attenuator (20dB/ 2W)	Pasternack	PE7004-20	489	12	14-Dec-2017
Multimeter	Fluke	79 Series III	611	12	14-Sep-2017
Crystal Detector	Hewlett Packard	8470B	1320	12	08-Jun-2017
Filter (Hi Pass)	Lorch	5HP7-2500-SR	2779	12	22-Dec-2017
Hygrometer	Rotronic	I-1000	3220	12	23-Aug-2017
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	15-Sep-2017
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3702	12	13-Dec-2017
Combiner/Splitter	Weinschel	1506A	3877	12	30-Mar-2017
DC - 12.4 GHz 10 dB Attenuator	Suhner	6810.17.A	3965	12	25-Oct-2017
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	08-Sep-2017
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	09-Sep-2017
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	06-Oct-2017
2 Channel PSU	Rohde & Schwarz	HMP2020	4735	-	O/P Mon
2 metre SMA Cable	IW Microwave	3PS-1806LC-788-3PS	4829	12	24-Jan-2018

Table 9

O/P Mon – Output Monitored using calibrated equipment

2.5 Radiated Spurious Emissions

2.5.1 Specification Reference

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

2.5.2 Equipment Under Test and Modification State

IsatPhone2w, S/N: IMEI 353032044022966 - Modification State 0

2.5.3 Date of Test

13-February-2017

2.5.4 Test Method

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

2.5.5 Environmental Conditions

Ambient Temperature	19.1 °C
Relative Humidity	29.0 %

2.5.6 Test Results

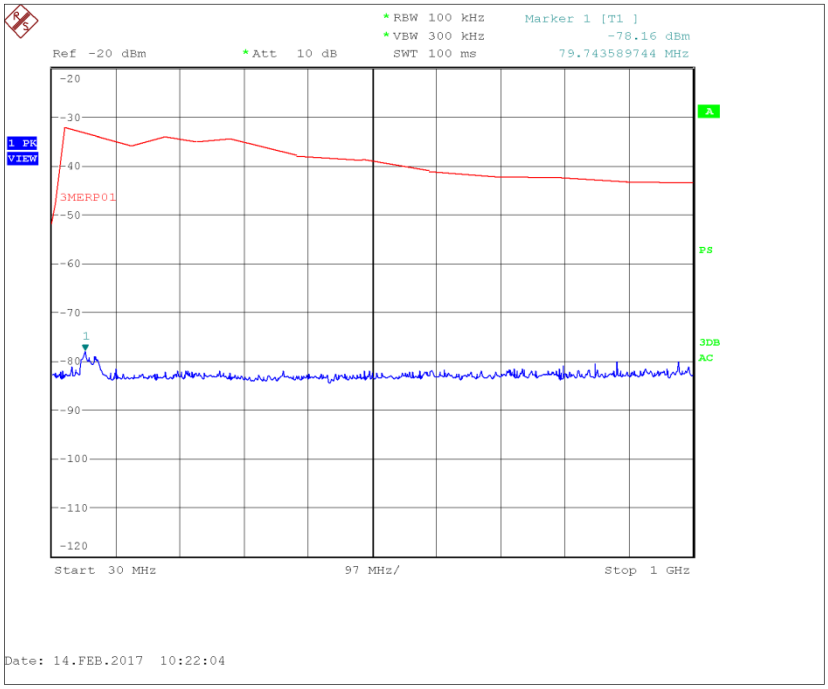
Inmarsat Transmitting

1626.675 MHz

Frequency (MHz)	Result (dBm)
*	

Table 10 – 30 MHz to 1 GHz

*No emissions were found within 20 dB of the limit.



1626.675 MHz - 30 MHz to 1 GHz

Frequency (MHz)	Result (dBm)
*	

Table 11 – 1 GHz to 17 GHz

*No emissions were found within 20 dB of the limit.

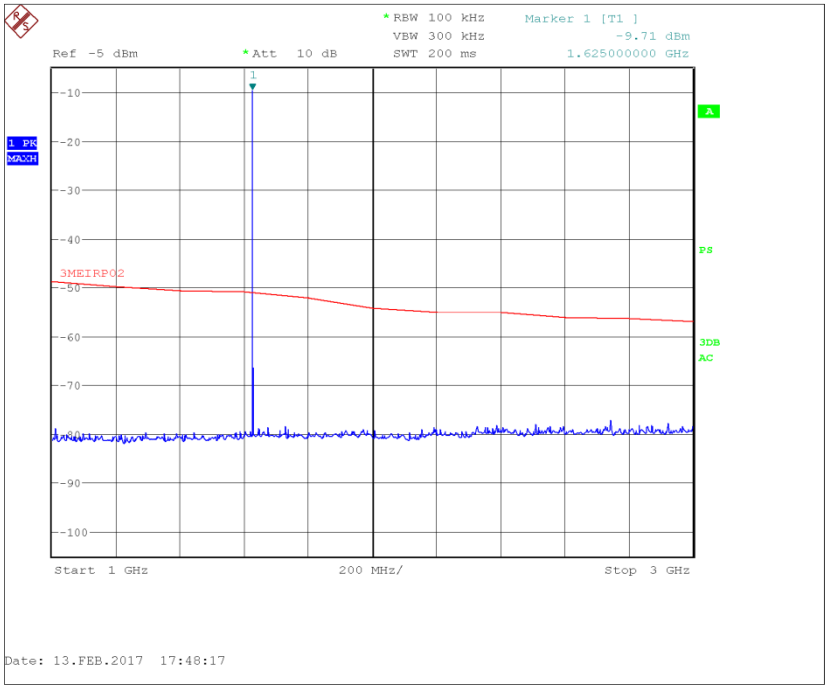


Figure 56 - 1626.675 MHz - 1 GHz to 3 GHz

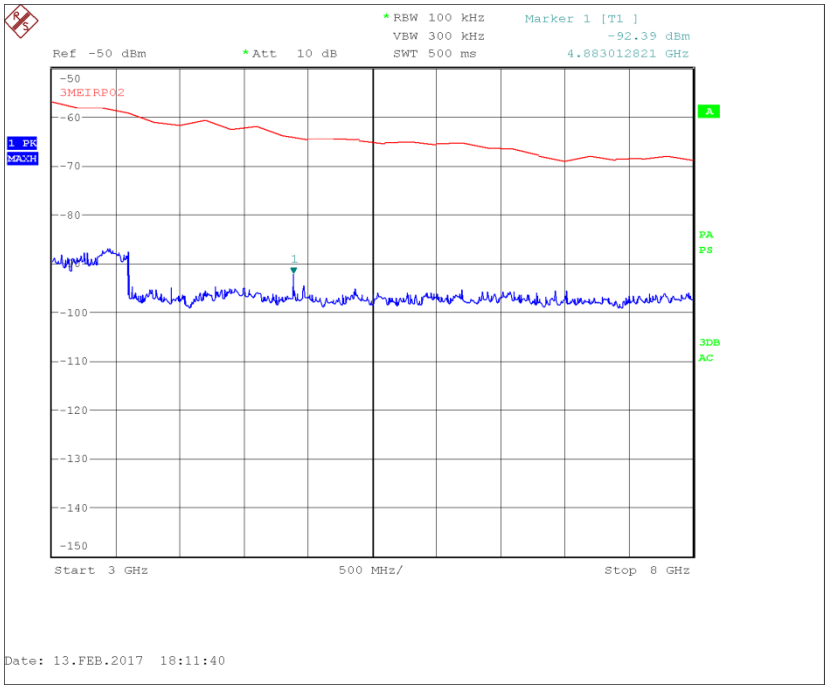


Figure 57 - 1626.675 MHz - 3 GHz to 8 GHz

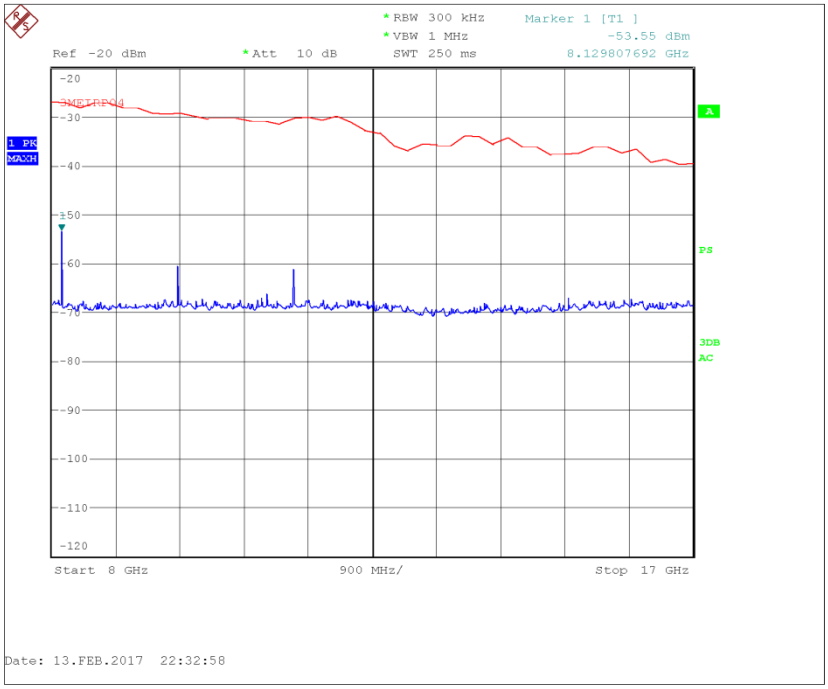


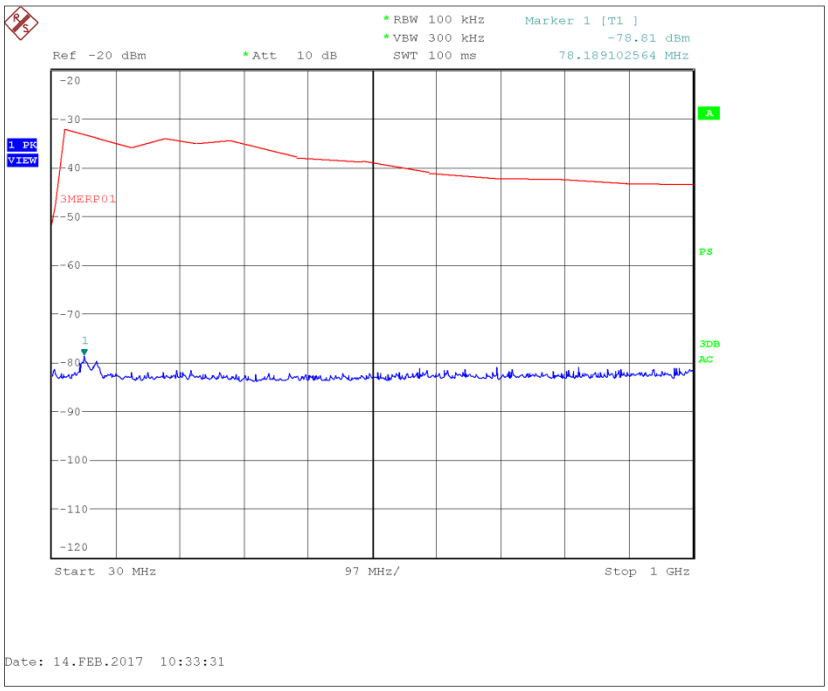
Figure 58 - 1626.675 MHz - 8 GHz to 17 GHz

1643.675 MHz

Frequency (MHz)	Result (dBm)
*	

Table 12 – 30 MHz to 1 GHz

*No emissions were found within 20 dB of the limit.



1643.675 MHz - 30 MHz to 1 GHz

Frequency (MHz)	Result (dBm)
3287.383	-26.44
4930.975	-31.90

Table 13 - 1 GHz to 17 GHz

No other emissions were found within 20 dB of the limit.

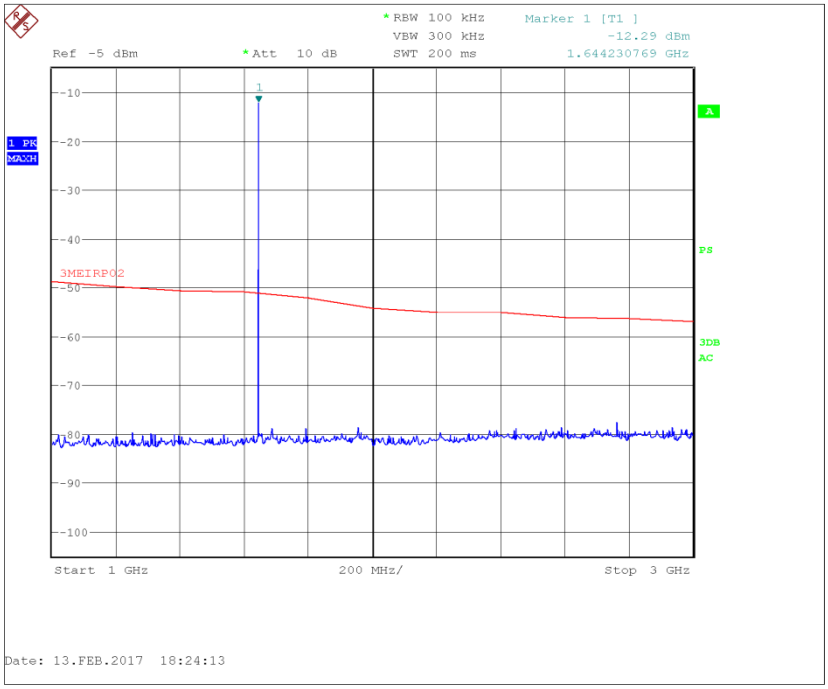


Figure 59 - 1643.675 MHz - 1 GHz to 3 GHz

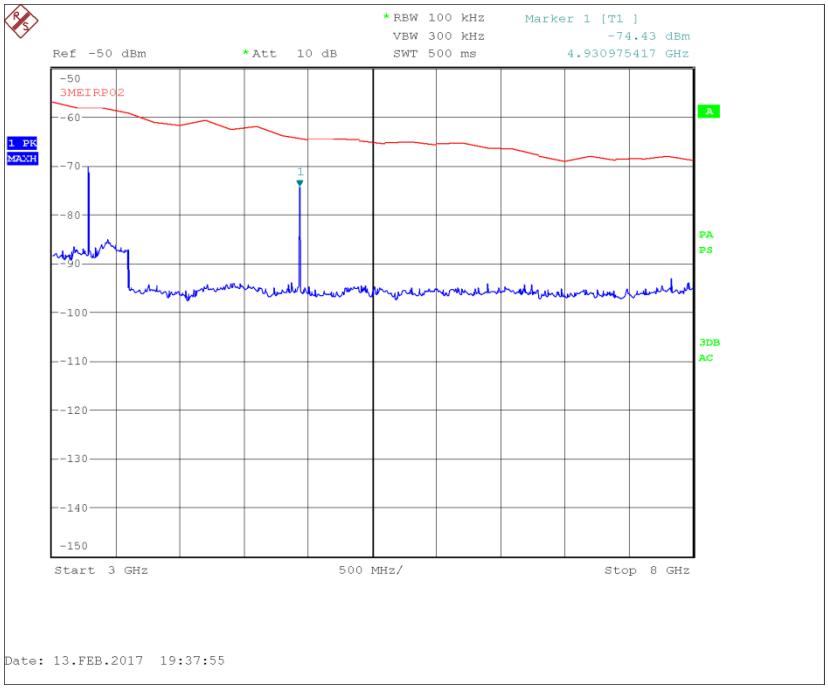


Figure 60 - 1643.675 MHz - 3 GHz to 8 GHz

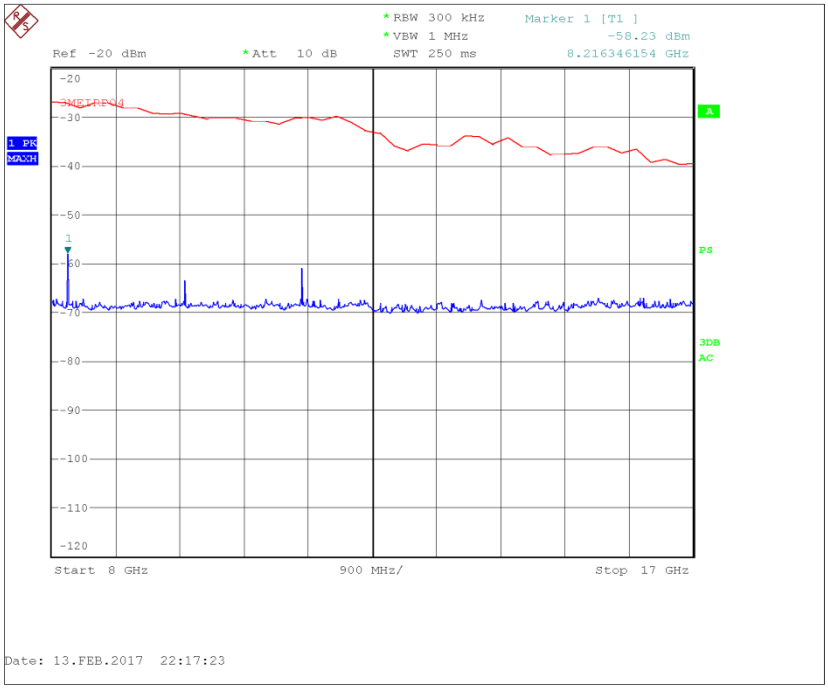


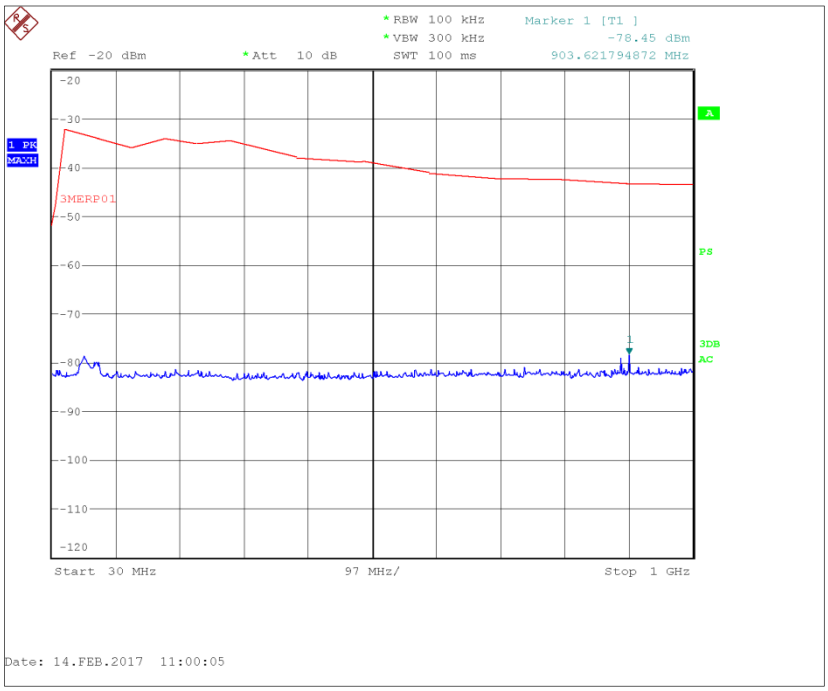
Figure 61 - 1643.675 MHz - 8 GHz to 17 GHz

1660.475 MHz

Frequency (MHz)	Result (dBm)
*	

Table 14 – 30 MHz to 1 GHz

*No emissions were found within 20 dB of the limit.



1660.475 MHz - 30 MHz to 1 GHz

Frequency (MHz)	Result (dBm)
3320.983	-26.71
4981.475	-32.84

Table 15 - 1 GHz to 17 GHz

No other emissions were found within 20 dB of the limit.

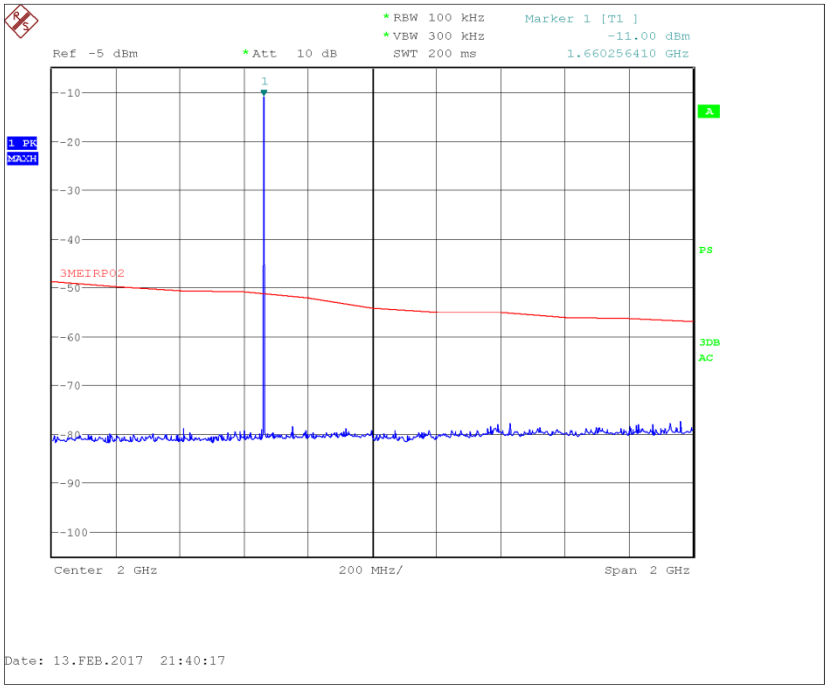


Figure 62 - 1660.475 MHz - 1 GHz to 3 GHz

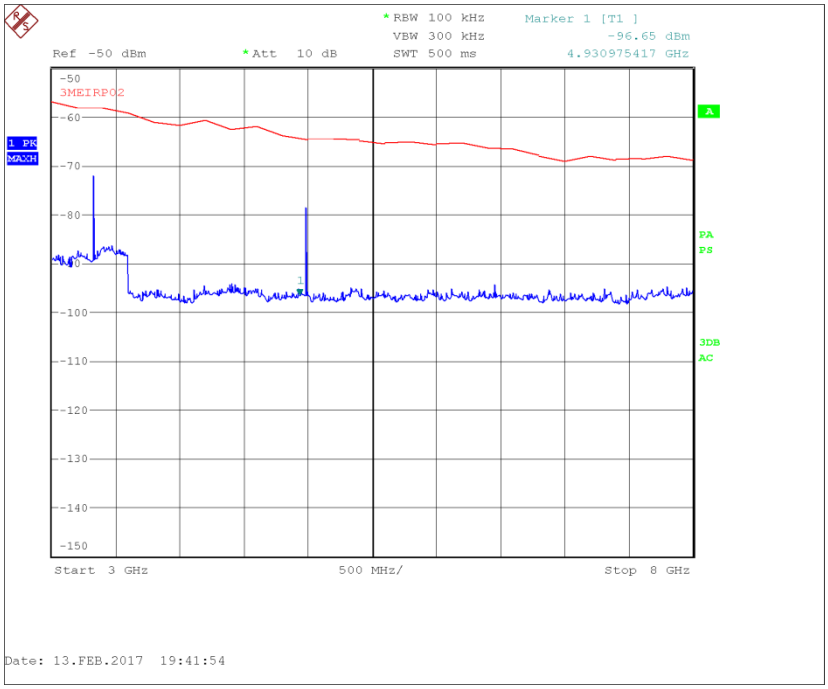


Figure 63 - 1660.475 MHz - 3 GHz to 8 GHz

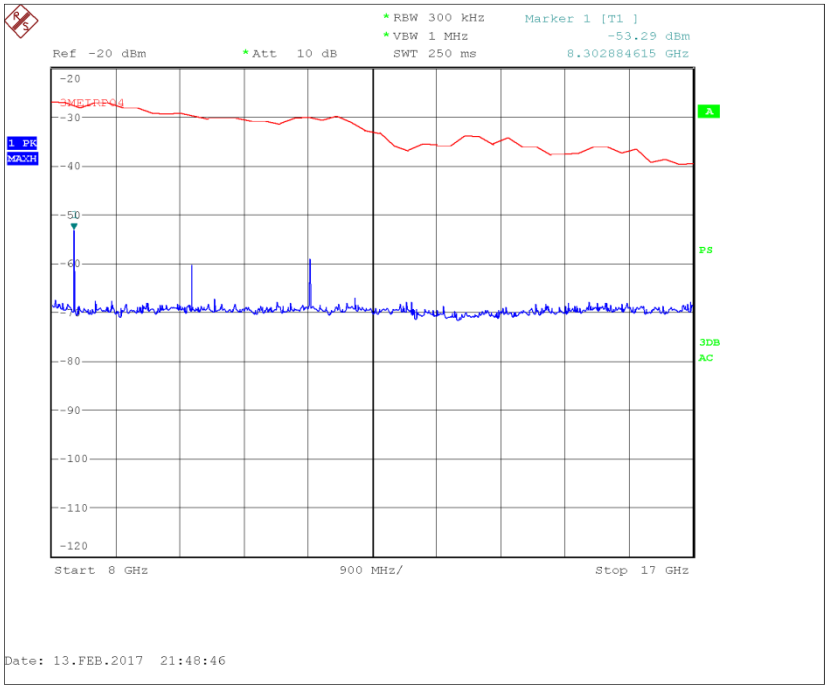


Figure 64 - 1660.475 MHz - 8 GHz to 17 GHz

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.

2.5.7 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	29-Jul-2017
Screened Room (5)	Rainford	Rainford	1545	36	20-Dec-2017
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Hygrometer	Rotronic	HYGROPALM 1	2338	12	21-Sep-2017
Antenna (DRG Horn)	ETS-Lindgren	3115	3125	12	25-Jul-2017
Cable (N-N, 8m)	Rhophase	NPS-2302-8000-NPS	3248	-	O/P Mon
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	26-Feb-2017
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	12-Nov-2017
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU
1501A 4.0M Km Km Cable	Rhophase	KPS-1501A-4000-KPS	4301	12	03-Aug-2017
Suspended Substrate Highpass Filter	Advance Power Components	11SH10-3000/X18000-O/O	4411	12	23-Mar-2017
Cable (Rx, Nm-Nm, 5m)	Scott Cables	SLU18-NMNM-05.00M	4482	6	06-Jun-2017
Cable (Yellow, Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4527	-	O/P Mon
Cable (Rx, SMAm-SMAm 0.5m)	Scott Cables	SLSLL18-SMSM-00.50M	4528	6	03-Feb-2017
Double Ridged Waveguide Horn Antenna	ETS-Lindgren	3117	4722	12	27-Feb-2017

Table 16

TU - Traceability Unscheduled
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
Industry Canada RSS-170, Clause 5.3.2

2.6.2 Equipment Under Test and Modification State

IsatPhone2w, S/N: IMEI 353032044022321 - Modification State 0

2.6.3 Date of Test

14-February-2017

2.6.4 Test Method

The test was performed in accordance with KDB 971168 D01, Clause 5.2.

2.6.5 Environmental Conditions

Ambient Temperature	23.3 °C
Relative Humidity	28.4 %

2.6.6 Test Results

Inmarsat Transmitting

EIRP (dBW)		
1626.675 MHz	1643.675 MHz	1660.475 MHz
7.09	6.87	7.32

Table 17

FCC 47 CFR Part 25, Limit Clause 25.204

+40 dBW in any 4 kHz band for $\theta \leq 0°$
+40 + 3θ dBW in any 4 kHz band for $0° < \theta \leq 5°$
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 5.3.2

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
Attenuator (20dB/ 2W)	Pasternack	PE7004-20	489	12	14-Dec-2017
Multimeter	Fluke	79 Series III	611	12	14-Sep-2017
Crystal Detector	Hewlett Packard	8470B	1320	12	08-Jun-2017
Hygrometer	Rotronic	I-1000	3220	12	23-Aug-2017
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3702	12	13-Dec-2017
Combiner/Splitter	Weinschel	1506A	3877	12	30-Mar-2017
DC - 12.4 GHz 10 dB Attenuator	Suhner	6810.17.A	3965	12	25-Oct-2017
DC to TTL Converter	TUV SUD Product Service	N/A	4378	-	TU
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	09-Sep-2017
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	06-Oct-2017
2 Channel PSU	Rohde & Schwarz	HMP2020	4735	-	O/P Mon
2 metre SMA Cable	IW Microwave	3PS-1806LC-788-3PS	4829	12	24-Jan-2018

Table 18

TU - Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment

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

2.7.1 Specification Reference

FCC 47 CFR Part 25, Clause 25.216
Industry Canada RSS-170, Clause 5.4.3.2 and 5.4.4

2.7.2 Equipment Under Test and Modification State

IsatPhone2w, S/N: IMEI 353032044022321 - Modification State 0

2.7.3 Date of Test

17-February-2017

2.7.4 Test Method

This test was performed in accordance with ANSI C63.26, clause 5.7 within the requirements of FCC CFR 47 Part 25, clause 25.216 and Industry Canada RSS-170, clause 5.4.3.

2.7.5 Environmental Conditions

Ambient Temperature	23.3 °C
Relative Humidity	28.1 %

2.7.6 Test Results

Inmarsat Transmitting

1626.675 MHz – Broadband Emission Results

Frequency (MHz)	Level (dBW)
1574.64	-10.826

Table 19

No other emissions were detected within 10 dB of the limit.

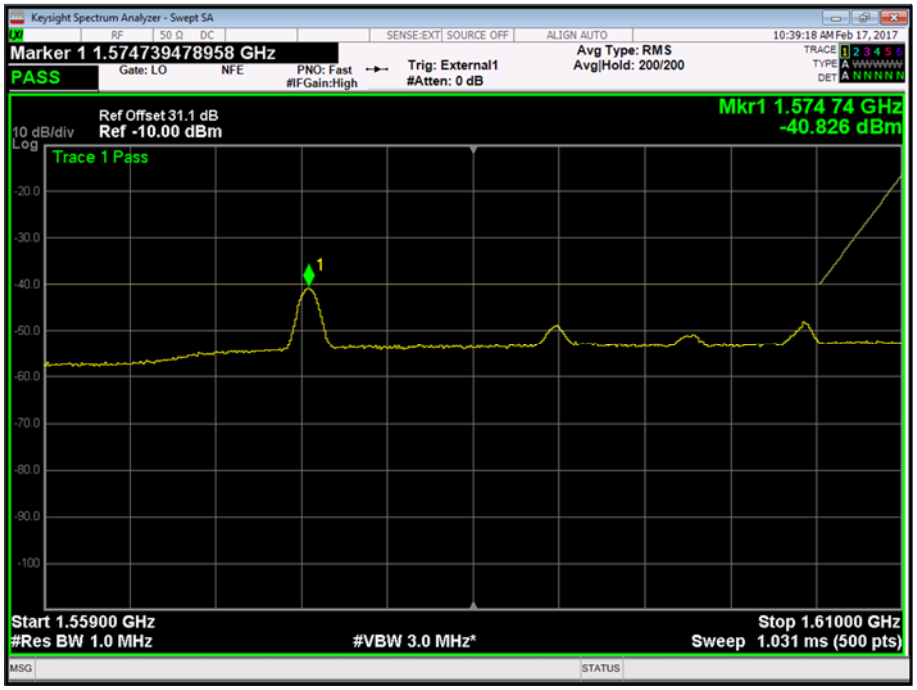


Figure 65

1626.675 MHz – Discrete Emission Results

Frequency (MHz)	Level (dBW)
*	

Table 20

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

1643.675 MHz – Broadband Emission Results

Frequency (MHz)	Level (dBW)
*	

Table 21

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

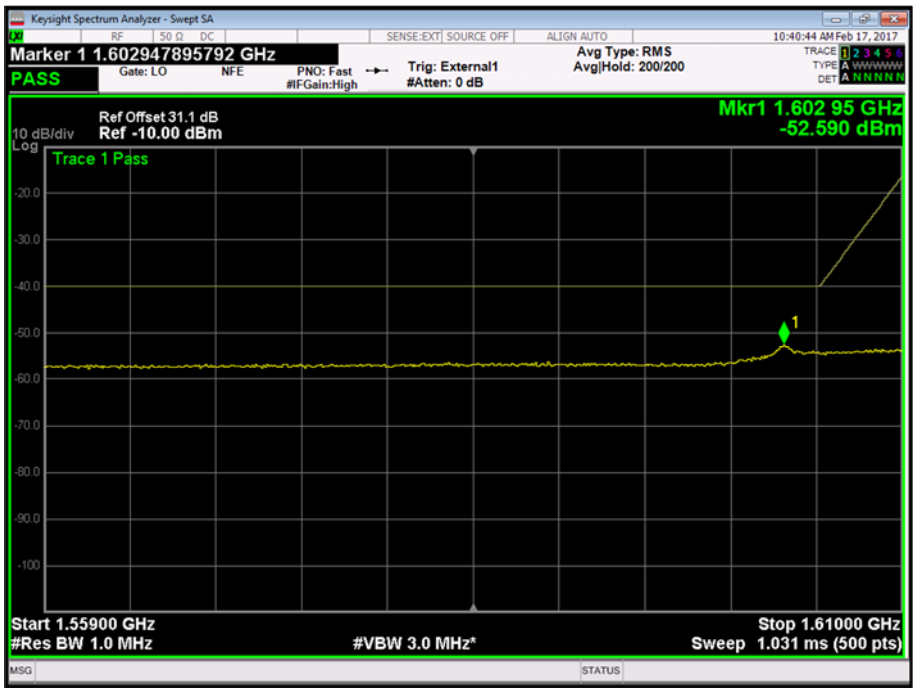


Figure 66

1643.675 MHz – Discrete Emission Results

Frequency (MHz)	Level (dBW)
*	

Table 22

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

1660.475 MHz – Broadband Emission Results

Frequency (MHz)	Level (dBW)
*	

Table 23

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

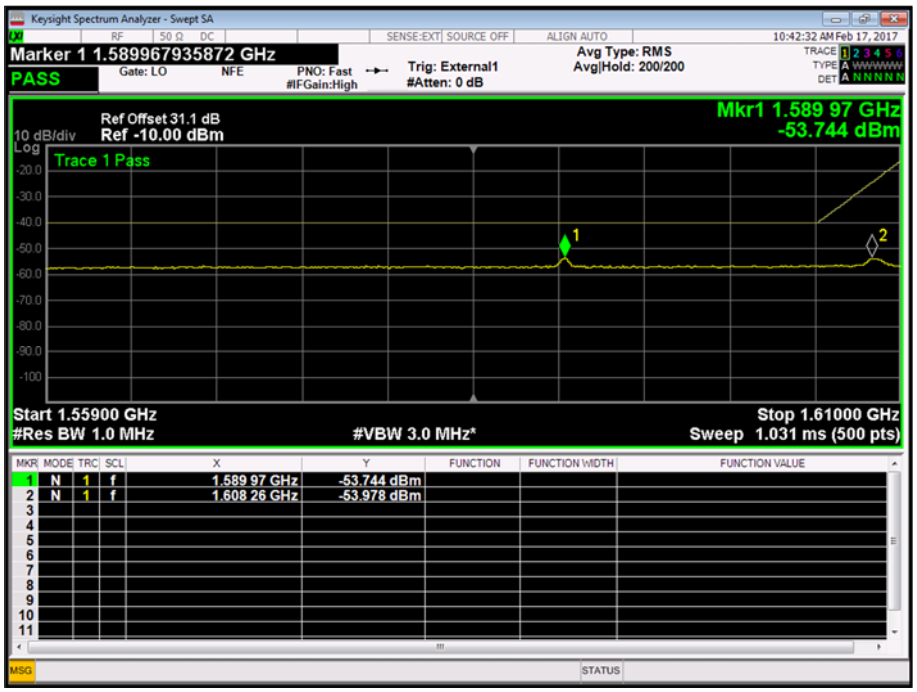


Figure 67

1660.475 MHz – Discrete Emission Results

Frequency (MHz)	Level (dBW)
*	

Table 24

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

Carrier-off state Broadband Emissions

Frequency (MHz)	Level (dBW)
*	

Table 25

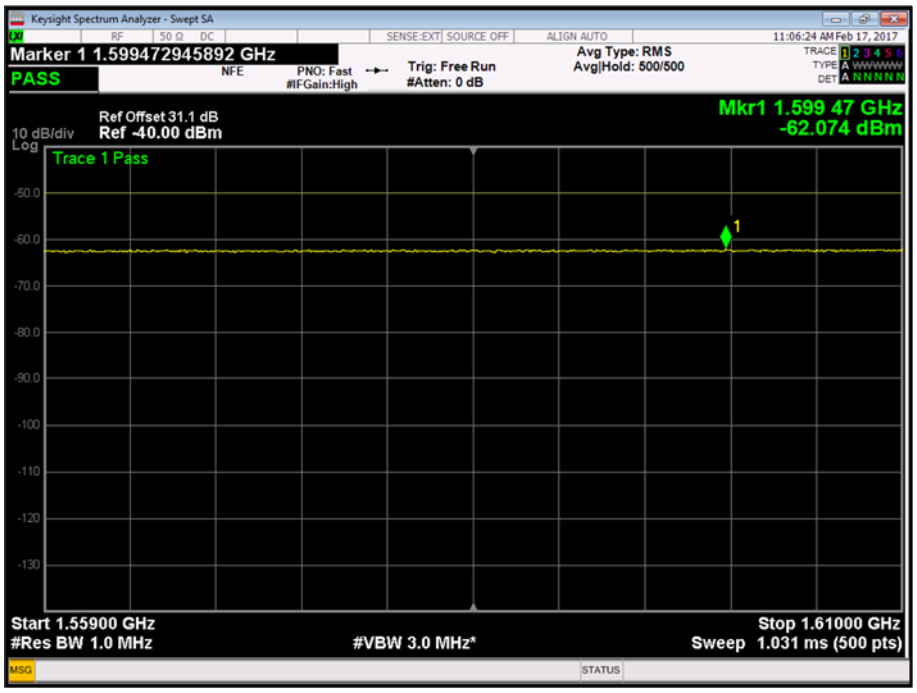


Figure 68

Carrier-off state Discrete Emissions

Frequency (MHz)	Level (dBW)
*	

Table 26

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

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(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

Mobile earth stations with transmitting frequencies between 1626.5 MHz and 1660.5 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 –46 dBW/MHz at 1610 MHz, for broadband emissions; and

(2) –80 dBW/kHz at 1605 MHz, linearly interpolated to –56 dBW/kHz at 1610 MHz, for discrete emissions.

Industry Canada RSS-170, Limit Clause 5.4.4

Mobile equipment with transmitting frequencies between 1 GHz and 3 GHz shall have the e.i.r.p. density of carrier-off state emissions in the band 1559-1610 MHz not exceed –80 dBW/MHz.

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
Attenuator (20dB/ 2W)	Pasternack	PE7004-20	489	12	14-Dec-2017
Multimeter	Fluke	79 Series III	611	12	14-Sep-2017
Crystal Detector	Hewlett Packard	8470B	1320	12	08-Jun-2017
Hygrometer	Rotronic	I-1000	3220	12	23-Aug-2017
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	15-Sep-2017
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3702	12	13-Dec-2017
Combiner/Splitter	Weinschel	1506A	3877	12	30-Mar-2017
DC - 12.4 GHz 10 dB Attenuator	Suhner	6810.17.A	3965	12	25-Oct-2017
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	08-Sep-2017
DC to TTL Converter	TUV SUD Product Service	N/A	4378	-	TU
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	09-Sep-2017
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	06-Oct-2017
2 Channel PSU	Rohde & Schwarz	HMP2020	4735	-	O/P Mon
2 metre SMA Cable	IW Microwave	3PS-1806LC-788-3PS	4829	12	24-Jan-2018

Table 27

TU - Traceability Unscheduled
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
Modulation Characteristics	-
Occupied Bandwidth	± 16.74 kHz
Frequency Tolerance	± 3.54 Hz
Spurious Emissions at Antenna Terminals	± 3.08 dB
Radiated Spurious Emissions	30 MHz to 1 GHz: ± 5.1 dB 1 GHz to 18 GHz: ± 6.3 dB
Equivalent Isotropic Radiated Power	Conducted: ± 0.7 dB Radiated: ± 6.3 dB (1 GHz to 18 GHz)
20 dB Bandwidth	± 16.74 kHz
Limits on Emissions from Mobile Earth Stations for Protection of Aeronautical Radio navigation-Satellite Service	Conducted: ± 3.45 dB Radiated: ± 6.3 dB

Table 28