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Report On

FCC and Industry Canada Testing of the
Iridium Communications Inc. 9603N
In accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 25 and
Industry Canada RSS-170

COMMERCIAL-IN-CONFIDENCE

FCC ID: Q639603N
IC: 4629A-9603N

Document 75926443 Report 05 Issue 2

August 2014



Product Service

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COMMERCIAL-IN-CONFIDENCE

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FCC and Industry Canada Testing of the Iridium Communications Inc. 9603N
In accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 25 and Industry Canada RSS-170

Document 75926443 Report 05 Issue 2

August 2014

PREPARED FOR

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Mark Jenkins
Authorised Signatory

DATED

07 August 2014

This report has been up issued to Issue 2 to include an amended model number.

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 CFR 47 Part 2, FCC CFR 47 Part 25 and Industry Canada RSS-170. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

G Lawler

M Russell





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SECTION 1

REPORT SUMMARY

FCC and Industry Canada Testing of the
Iridium Communications Inc. 9603N
In accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 25 and Industry Canada RSS-170



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1.1 INTRODUCTION

The information contained in this report is intended to show the verification of FCC and Industry Canada Testing of the Iridium Communications Inc. 9603N to the requirements of FCC CFR 47 Part 2, FCC CFR 47 Part 25 and Industry Canada RSS-170.

Objective	To perform FCC and Industry Canada Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Iridium Communications Inc
Model Number(s)	9603N
Serial Number(s)	124, 130
Number of Samples Tested	2
Test Specification/Issue/Date	FCC CFR 47 Part 2 (2013) FCC CFR 47 Part 25 (2013) Industry Canada RSS-170 (2011)
Incoming Release Date	Application Form 22 May 2014
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	23491/WH 07 April 2014
Start of Test	23 May 2014
Finish of Test	5 June 2014
Name of Engineer(s)	G Lawler M Russell
Related Document(s)	ANSI C63.4 (2003) RSS-GEN Issue 3 December 2012



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1.2 BRIEF SUMMARY OF RESULTS

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

Section	Spec Clause			Test Description	Result	Comments/Base Standard
	Pt 2	Pt 25	RSS			
Transmit						
2.1	2.1055	25.202(d)	5.2	Frequency Tolerance	Pass	
2.2	2.1053	25.202(f)	5.4.3.1	Emission Limitations	Pass	
2.3	-	25.204	5.3	Power Limits	Pass	
2.4	2.1047(d)	-	-	Modulation Characteristics	Pass	
2.5	-	25.216	5.4.3	Limits on Emissions from Mobile Earth Stations for Protection of Aeronautical Radionavigation-Satellite Service	Pass	
2.6	2.1049	-	4.6.1-	Occupied Bandwidth	Pass	



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1.3 APPLICATION FORM

APPLICATION FORM FOR TESTING TO FCC/INDUSTRY CANADA REQUIREMENTS

APPLICANT'S DETAILS	
COMPANY NAME :	Cambridge Consultants Ltd.
ADDRESS :	Science Park, Milton Road Cambridge England, CB5 0DW
NAME FOR CONTACT PURPOSES :	David Freeborough
TELEPHONE NO: +44 1223 392029	FAX NO: +44 1223 423373
E-MAIL: david.freeborough@cambridgeconsultants.com	

EQUIPMENT INFORMATION			
Model name/number	9603N	Identification/Part number	9603N
Hardware Version	rev D4	Software Version	TA14roc dev: 3681
Manufacturer	Iridium Communications Inc.	Country of Origin	UK
FCC ID	Q639603N	Industry Canada ID	4629A-9603N
Technical description (a brief description of the intended use and operation)			
Satellite Short Burst Data Modem			
<u>Supply Voltage:</u>			
<input type="checkbox"/>	AC mains	State AC voltage	V and AC frequency Hz
<input checked="" type="checkbox"/>	DC (external)	State DC voltage	5.0V and DC current 2.0A
<input type="checkbox"/>	DC (internal)	State DC voltage	V and Battery type
<u>Frequency characteristics:</u>			
Transmitter Frequency range	1616 MHz to 1626.5MHz	Channel spacing	41.667KHz (if channelized)
Receiver Frequency range (if different)	1616 MHz to 1626.5MHz	Channel spacing	41.667KHz (if channelized)
Designated test frequencies:			
Bottom: 1616.020833 MHz		Middle: 1621.020833 MHz	Top: 1625.979167 MHz
Intermediate Frequencies :		0.6 MHz	
Highest Internally Generated Frequency :		3253 MHz	
<u>Power characteristics:</u>			
Maximum transmitter power	1.479 W	Minimum transmitter power	..... W (if variable)
<input type="checkbox"/>	Continuous transmission		
<input checked="" type="checkbox"/>	Intermittent transmission	State duty cycle 9.2%	
If intermittent, can transmitter be set to continuous transmit test mode? N			
<u>Antenna characteristics:</u>			
<input checked="" type="checkbox"/>	Antenna connector	State impedance	50 ohm
<input type="checkbox"/>	Temporary antenna connector	State impedance	..... ohm
<input type="checkbox"/>	Integral antenna Type	State gain	..... dBi
<input checked="" type="checkbox"/>	External Antenna Type Monopole	State gain	3.0dBi
<u>Modulation characteristics:</u>			
<input type="checkbox"/>	Amplitude	<input checked="" type="checkbox"/>	Other
<input type="checkbox"/>	Frequency	Details: DE-QPSK/DE-BPSK	
<input type="checkbox"/>	Phase		
Can the transmitter operate un-modulated?		Y (Only in test mode)	
ITU Class of emission: 41K7Q7D			
<u>Battery/Power Supply</u>			
Model name/number	N/A	Identification/Part number	.....
Manufacturer	.....	Country of Origin	.....
<u>Ancillaries (if applicable)</u>			
Model name/number	N/A	Identification/Part number	.....
Manufacturer	.....	Country of Origin	.....
<u>Extreme conditions:</u>			
Maximum temperature	70 °C	Minimum temperature	-40 °C
Maximum supply voltage	5.5 V	Minimum supply voltage	4.5V



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I hereby declare that I am entitled to sign on behalf of the applicant and that the information supplied is correct and complete.

Signature : 

Name : Jonathan Jones

Position held : Senior Engineer

Date : 22/05/2014



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PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a Iridium Communications Inc. 9603N. A full technical description can be found in the manufacturer's documentation.

1.4 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure.

The EUT was powered from a 5.0 V DC supply.

FCC Measurement Facility Registration Number
90987 Octagon House, Fareham Test Laboratory

Industry Canada Company Address Code
IC2932B-1 Octagon House, Fareham Test Laboratory

1.5 DEVIATIONS FROM THE STANDARD

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

1.6 MODIFICATION RECORD

Modification 0 - No modifications were made to the test sample during testing.



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SECTION 2

TEST DETAILS

FCC and Industry Canada Testing of the
Iridium Communications Inc. 9603N
In accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 25 and Industry Canada RSS-170



2.1 FREQUENCY TOLERANCE

2.1.1 Specification Reference

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

2.1.2 Equipment Under Test and Modification State

9603N S/N: 124 - Modification State 0

2.1.3 Date of Test

27 May 2014 & 29 May 2014

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.5 Test Procedure

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 25.202(d) and FCC CFR 47 Part 2.1055 (a) (1), (d) (1).

The EUT was set to transmit an unmodulated carrier on the middle channel with a frequency offset of + 6.25 kHz. The EUT was connected to a spectrum analyser via a cable and attenuator. The spectrum analyser was set to an external 10 MHz rubidium frequency standard. The difference between the frequency of the fundamental and the frequency of the assigned channel in accordance with the manufactures documentation was recorded.

The temperature was varied from +50° to -30°C in 10° steps. Voltage variations were additionally made at +20°C at both voltage minimum and maximum as per the manufactures application form.

2.1.6 Environmental Conditions

Ambient Temperature	25.1 - 26.3°C
Relative Humidity	40.9 - 41.0%



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2.1.7 Test Results

5.0 V DC Supply

Under Temperature Variations

1621.0208033 MHz

Temperature Interval °C	Frequency Error	
	%	ppm
-30	0.00030	3.047
-20	0.00028	2.776
-10	0.00026	2.591
0	0.00027	2.714
+10	0.00027	2.690
+20	0.00027	2.690
+30	-0.00020	-1.024
+40	-0.00008	-0.839
+50	0.00032	3.208

Under Voltage Variations

1621.0208033 MHz

DC Voltage	Frequency Error	
	%	ppm
4.50	0.00028	2.751
5.00	0.00027	2.690
5.50	0.00027	2.714

Limit Clause FCC CFR 47, 25.202(d)

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

Limit Clause RSS-170, 5.2

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



2.2 EMISSION LIMITATIONS

2.2.1 Specification Reference

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

2.2.2 Equipment Under Test and Modification State

Iridium Communications Inc. 9603N S/N: 124 - Modification State 0

2.2.3 Date of Test

23 May 2014 & 3 June 2014

2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.5 Test Procedure

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 25.202(f), FCC CFR 47 Part 2.1051 and 2.1053.

For emissions removed less than 250% of the authorized bandwidth from the assigned frequency, measurements were performed conducted as follows:

The EUT was connected to a spectrum analyser via a cable and attenuator. The EUT was transmitting at maximum power, for bottom, middle and top channels. The EUT was modulated as stated in the manufactures application form. The path loss between the EUT and analyser was calibrated using a network analyser and entered in to the spectrum analyser as a reference level offset. The reference level for the mask was set to the manufacturers declared maximum output power as per the application form. The analyser was configured with an RBW and VBW of 3 kHz and 100 kHz respectfully with the trace set to max hold using an RMS detector. $10\text{Log}(4/3) = 1.25$ dB was added to the reference level offset to make the result relative to any 4 kHz band as per the requirement in 25.202(f) The mask as specified in clause 25.202(f) was then applied.

For emissions removed more than 250% of the authorized bandwidth from the assigned frequency, measurements were performed both conducted and radiated as follows:

Conducted: A network analyser was used to measure the path loss and the worst case was entered as a reference level offset in to the spectrum analyser. From 9 kHz to 3 GHz, the EUT was connected to a spectrum analyser via an attenuator and cable. Between 3 GHz and 20 GHz a 3 GHz high pass filter was used. The EUT was configured to maximum power on bottom, middle or top channel with normal modulation. The spectrum analyser was configured with an RBW and VBW of 1 MHz and 3 MHz respectfully with the trace set to max hold using an RMS detector.

Radiated; A preliminary profile of the Spurious Radiated Emissions was obtained up to a minimum of the 10th harmonic of the highest internally generated frequency by operating the EUT on a remotely controlled turntable within a semi-anechoic chamber. Measurements of



Product Service

emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst-case emissions together with the EUT azimuth and antenna polarisation.

Using the information from the preliminary profiling of the EUT, the list of emissions was then confirmed or updated under Alternative Open Site conditions. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth.

The EUT was set to transmit on maximum power in turn on bottom, middle and top channels.

For any emissions found the EUT was then removed from the chamber and replaced with a substitution antenna. Using a signal generator the level was adjusted to achieve the same value on the measuring instrument as previously recorded with the EUT. The final result was determined by a calculation using the signal generator level, antenna gain and cable loss.

The measurements were performed at a 3m distance unless otherwise stated.

2.2.6 Environmental Conditions

Ambient Temperature	21.4 - 23.1°C
Relative Humidity	42.0 - 43.6%



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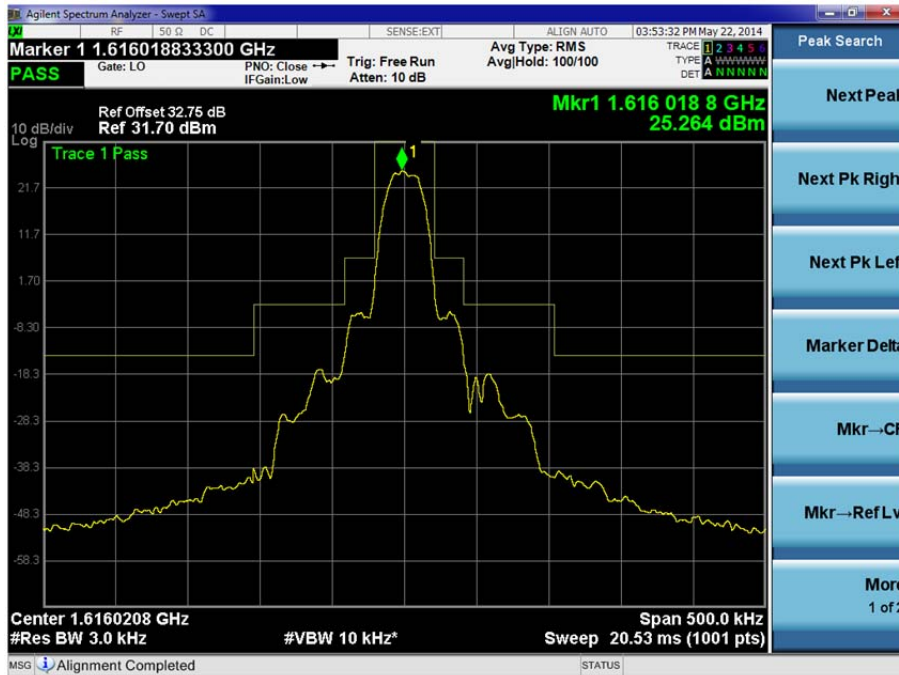
2.2.7 Test Results

5.0 V DC Supply

Conducted

1616.0208033 MHz

Mask

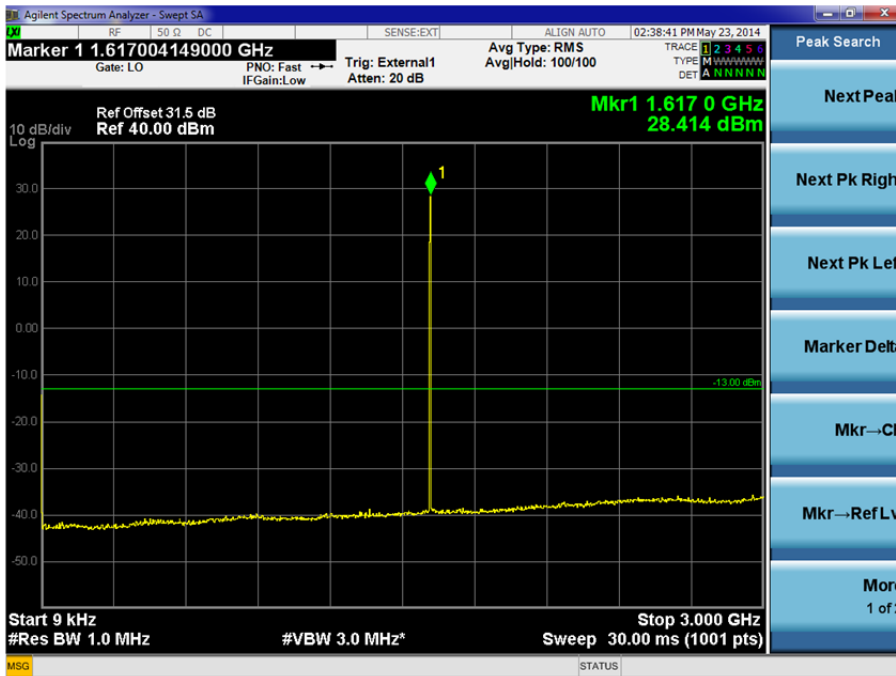


*The authorized bandwidth is 41.667 kHz.

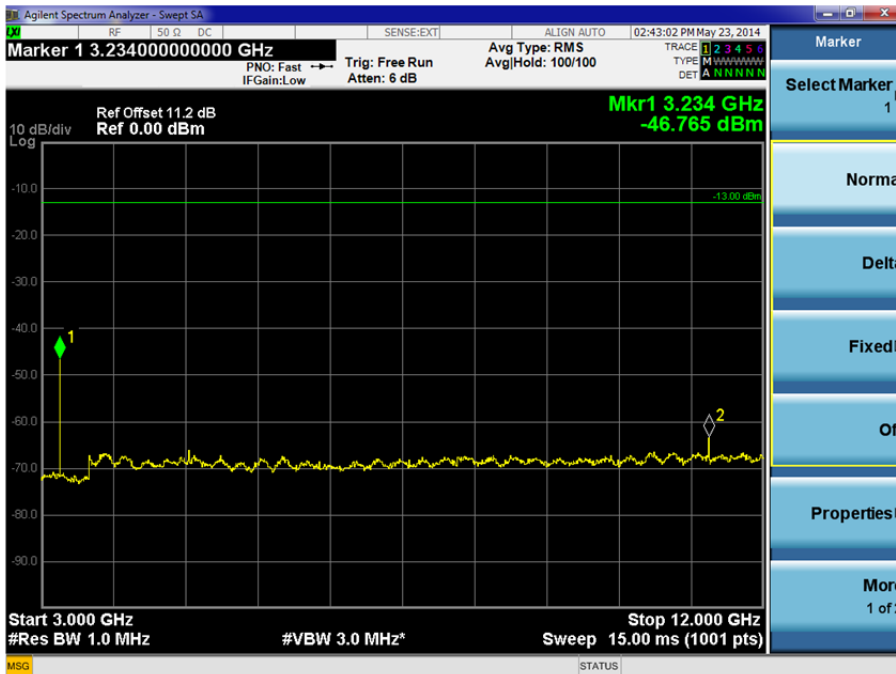


Product Service

9 kHz to 3 GHz



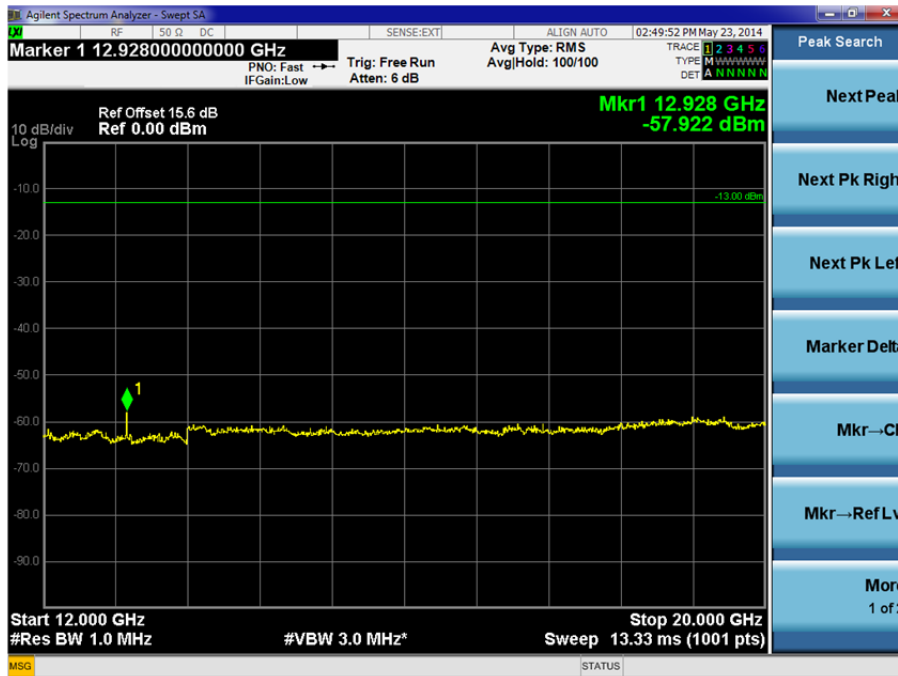
3 GHz to 12 GHz





Product Service

12 GHz to 20 GHz



1621.0208033 MHz

Mask

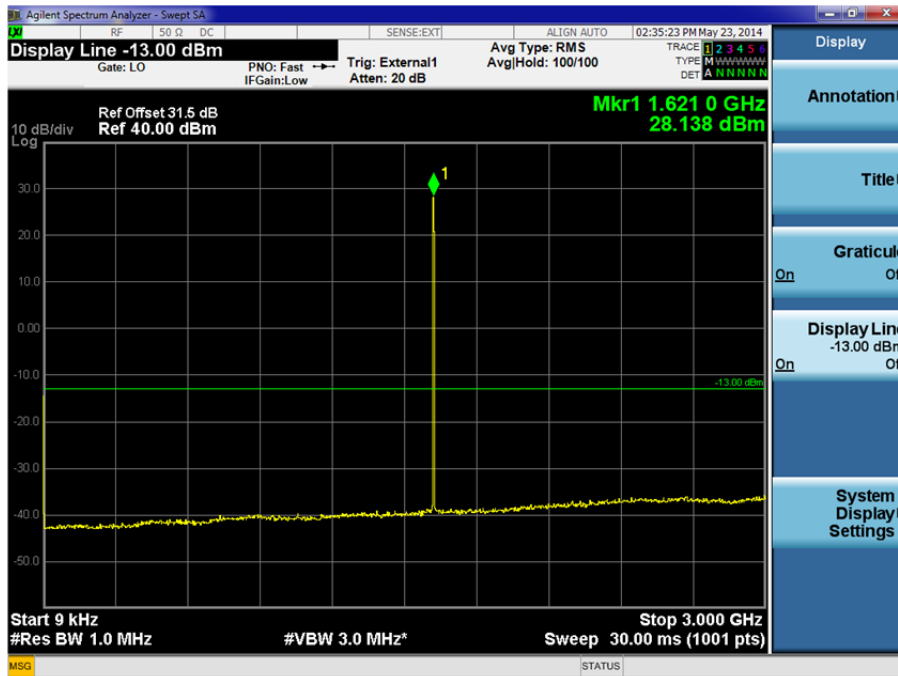


*The authorized bandwidth is 41.667 kHz.

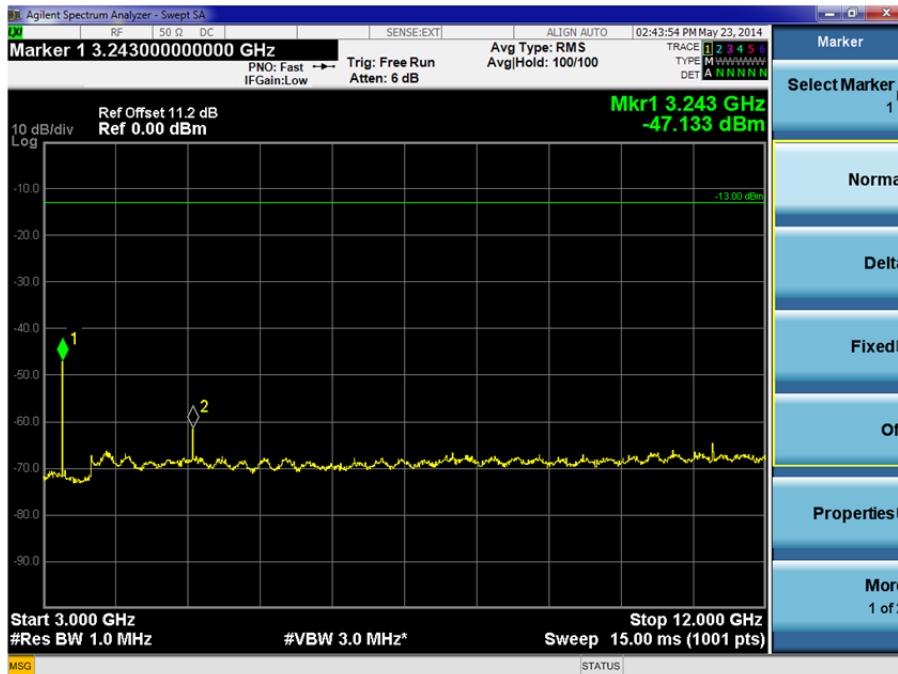


Product Service

9 kHz to 3 GHz



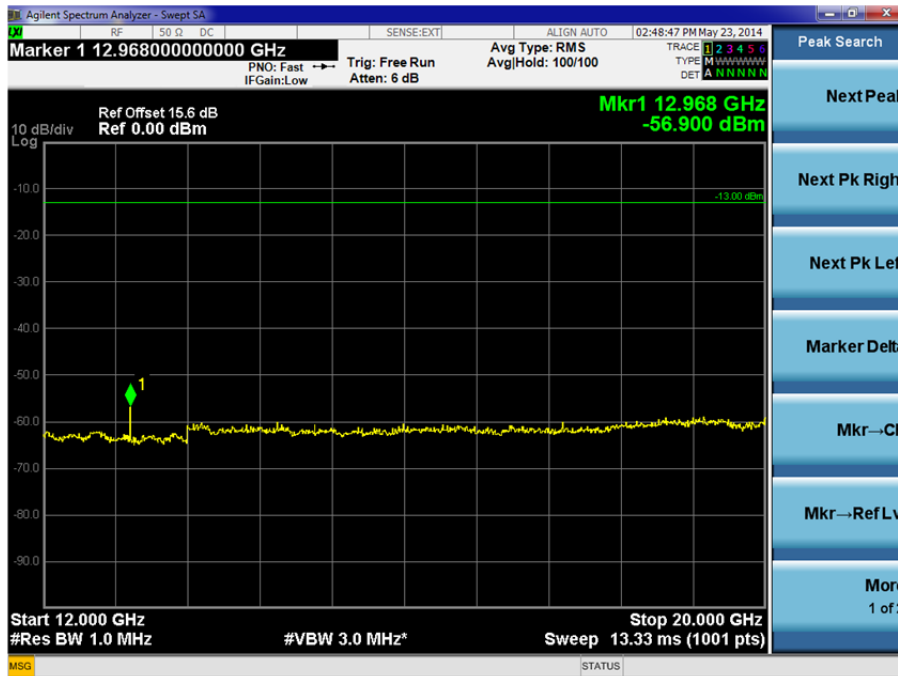
3 GHz to 12 GHz





Product Service

12 GHz to 20 GHz



1625.979167 MHz

Mask

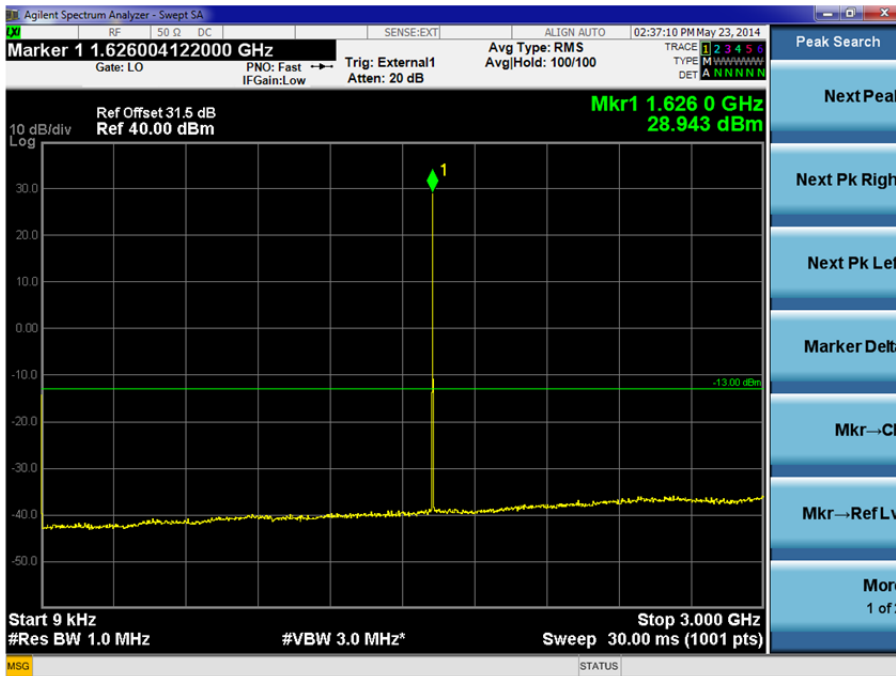


*The authorized bandwidth is 41.667 kHz.

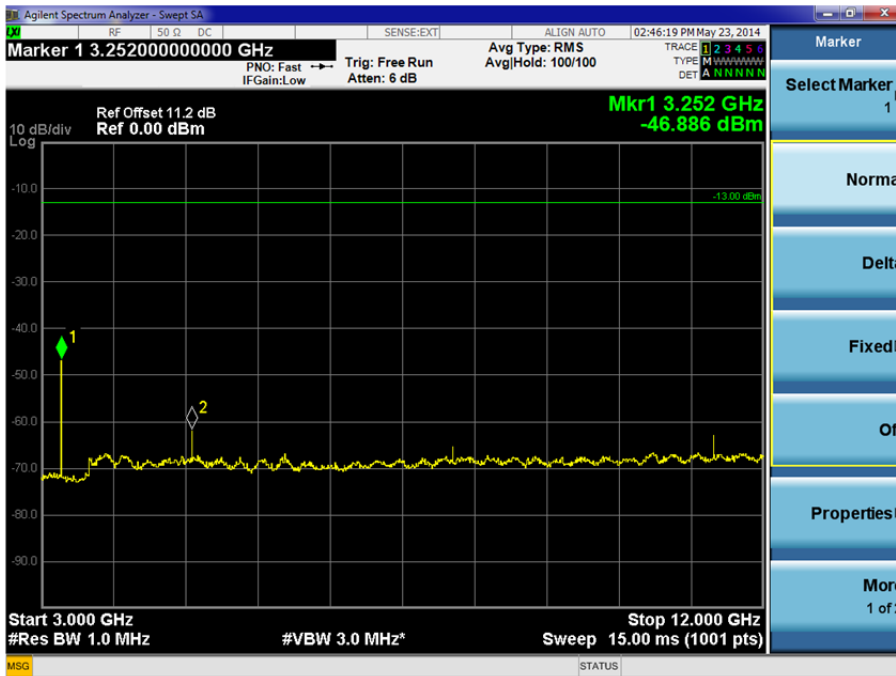


Product Service

9 kHz to 3 GHz



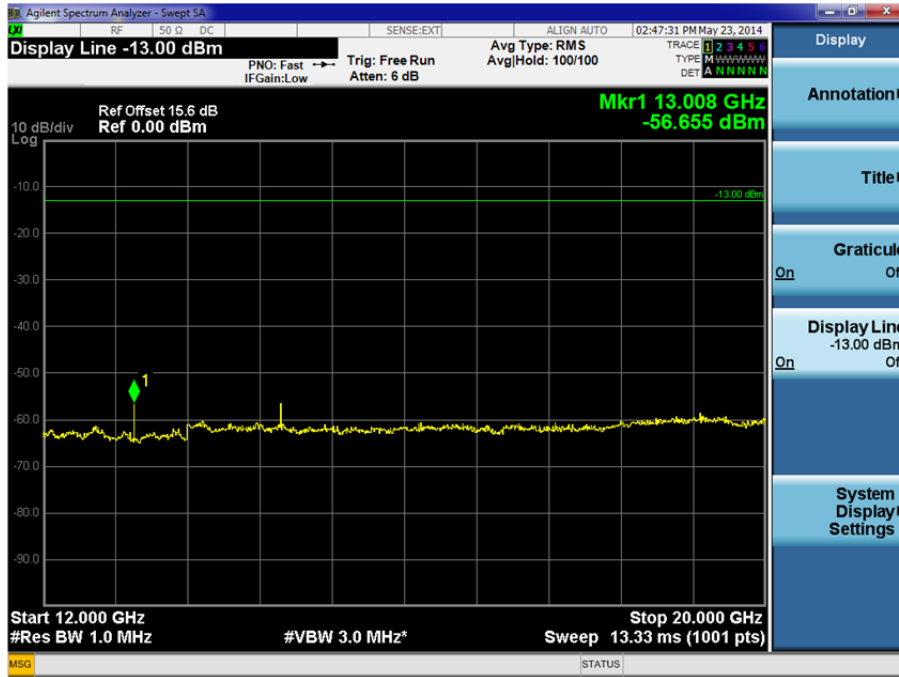
3 GHz to 12 GHz





Product Service

12 GHz to 20 GHz



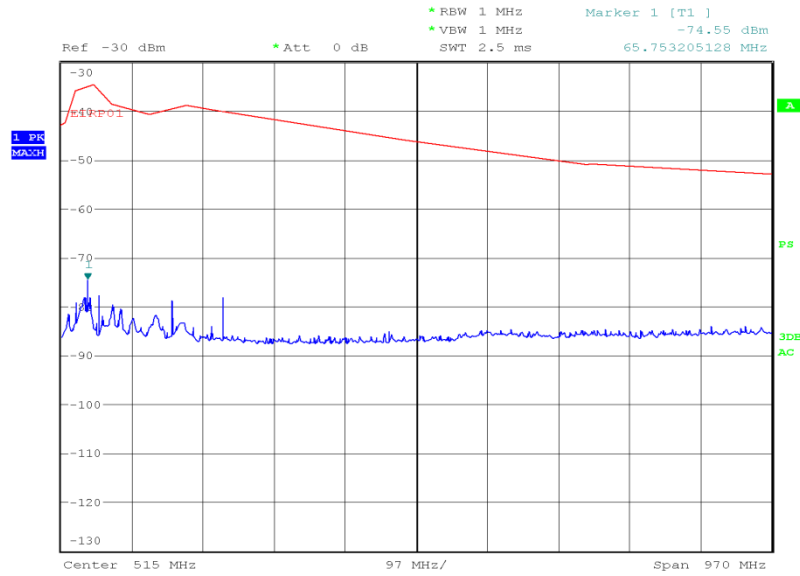


Product Service

Radiated

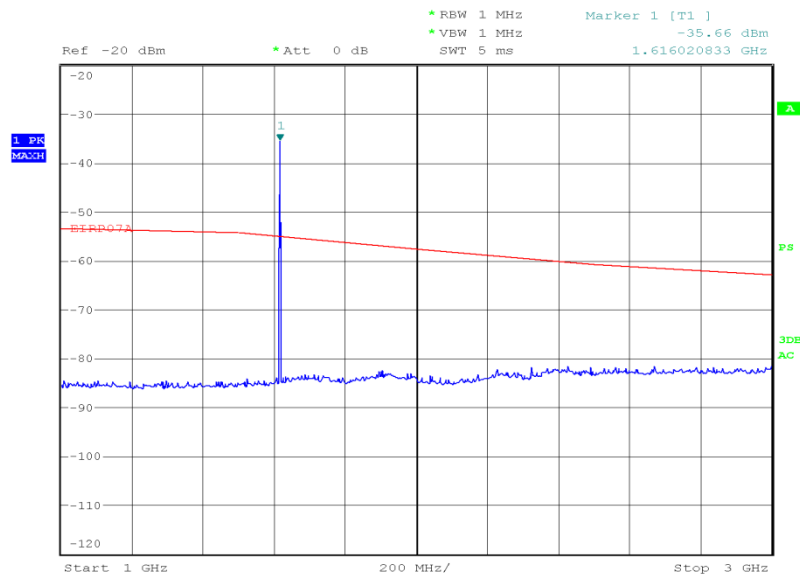
1616.0208033 MHz

30 MHz to 1 GHz



Date: 3.JUN.2014 17:39:50

1 GHz to 3 GHz

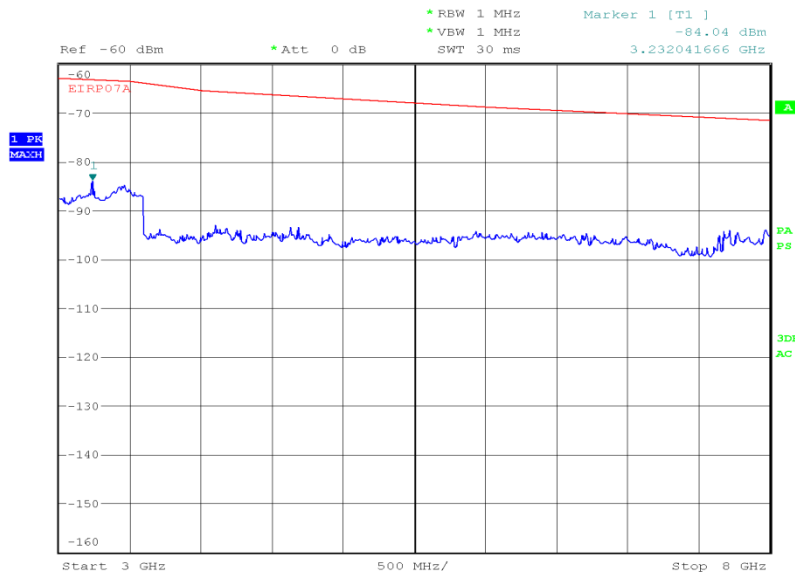


Date: 3.JUN.2014 20:19:48



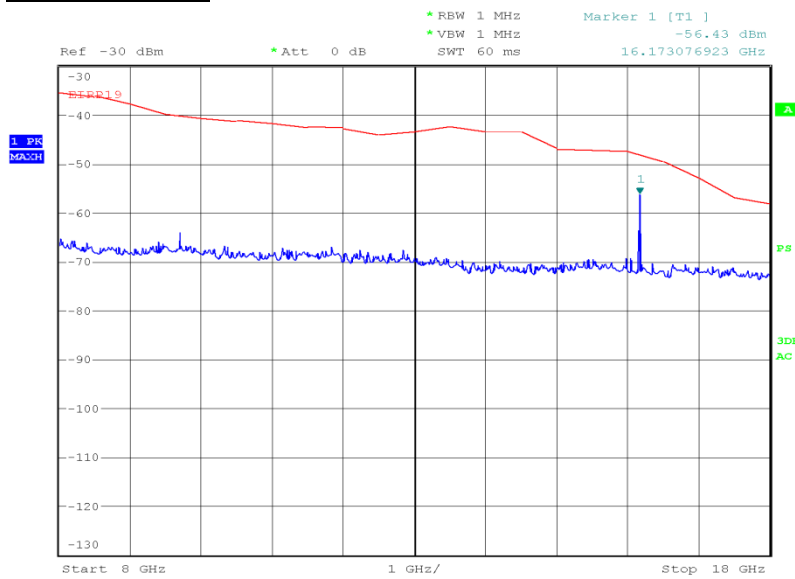
Product Service

3 GHz to 8 GHz



Date: 3.JUN.2014 20:24:27

8 GHz to 18 GHz



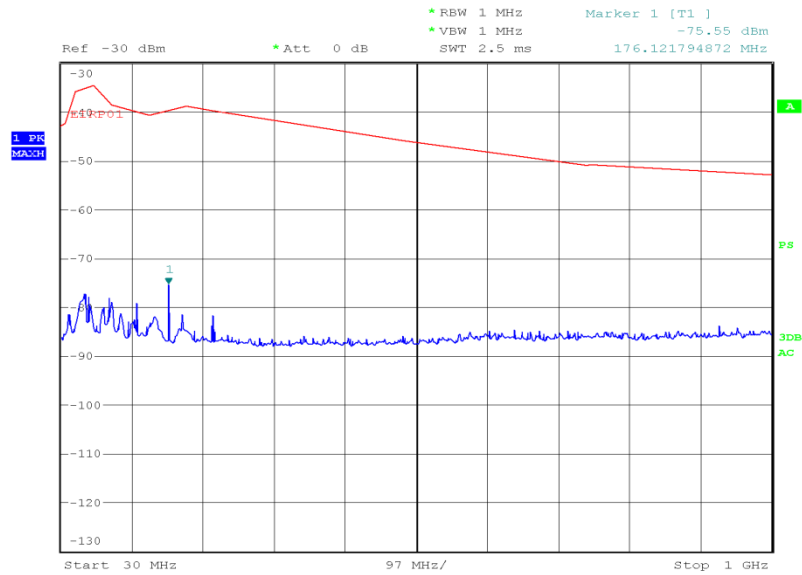
Date: 3.JUN.2014 21:40:00



Product Service

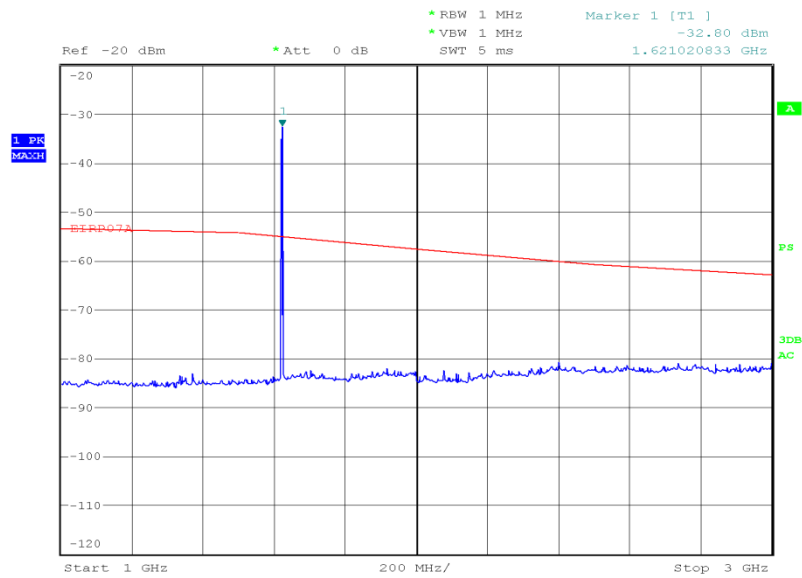
1621.0208033 MHz

30 MHz to 1 GHz



Date: 3.JUN.2014 17:46:12

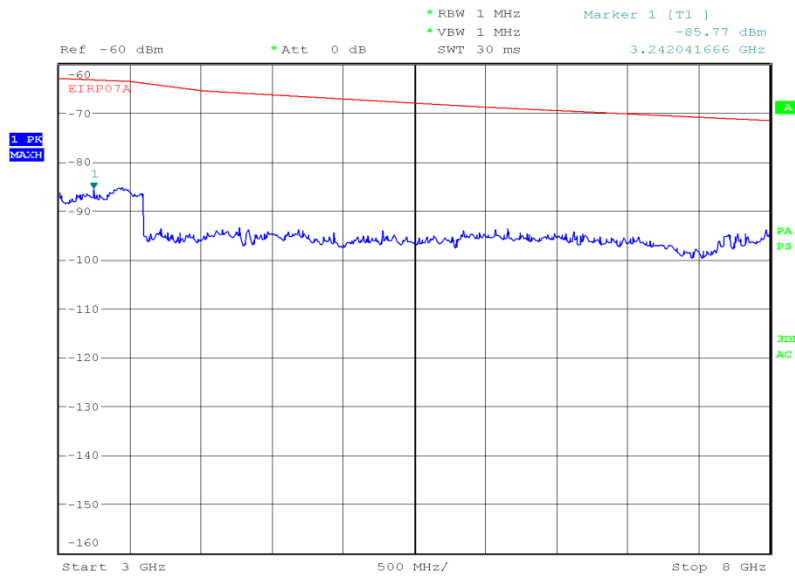
1 GHz to 3 GHz



Date: 3.JUN.2014 20:38:34

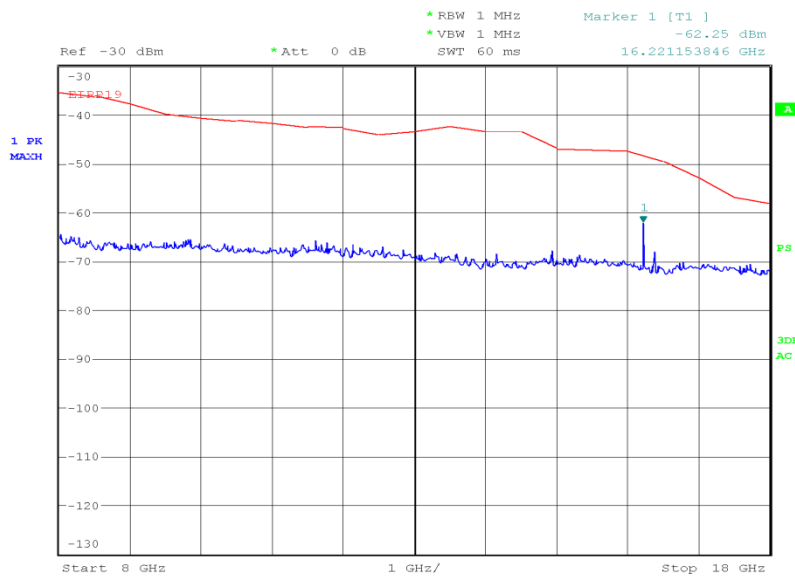


3 GHz to 8 GHz



Date: 3.JUN.2014 20:32:02

8 GHz to 18 GHz

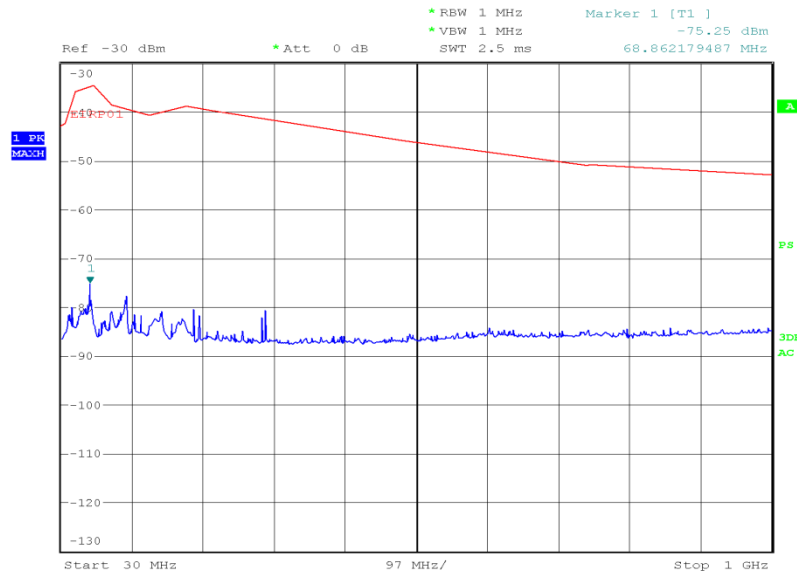


Date: 3.JUN.2014 21:22:44



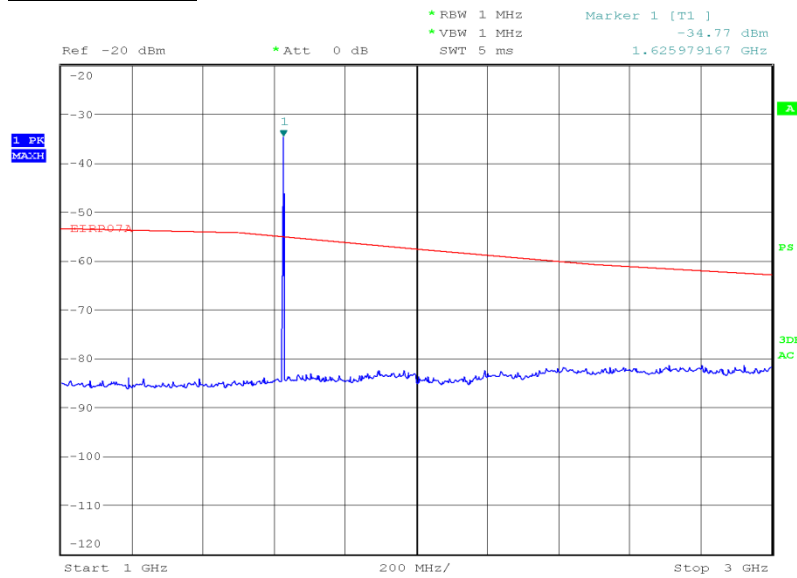
1625.979167 MHz

30 MHz to 1 GHz



Date: 3.JUN.2014 17:57:02

1 GHz to 3 GHz

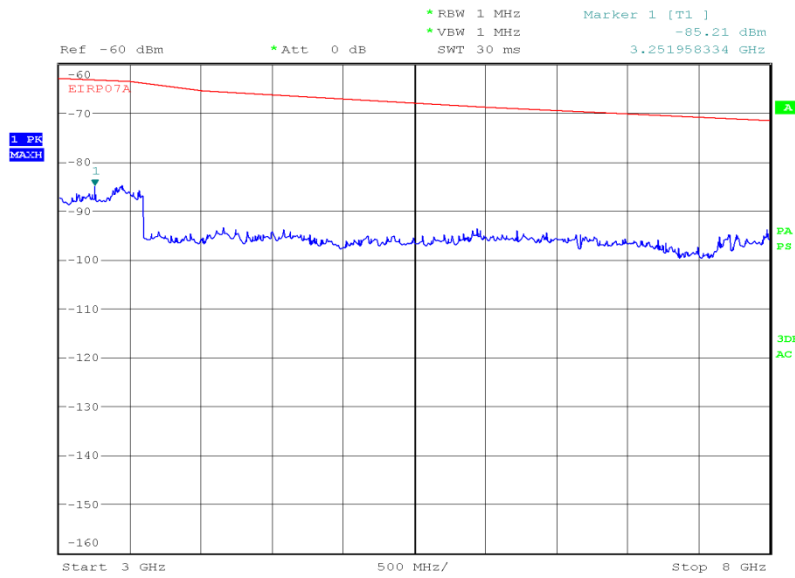


Date: 3.JUN.2014 20:42:55



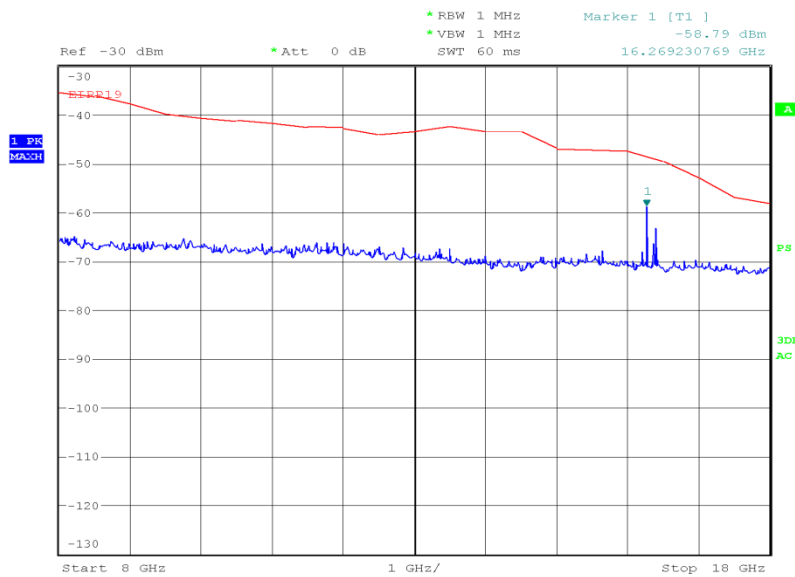
Product Service

3 GHz to 8 GHz



Date: 3.JUN.2014 20:45:21

8 GHz to 18 GHz



Date: 3.JUN.2014 20:55:54



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Limit Clause FCC CFR 47, 25.202(f) and RSS-170, 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;
- 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;
- 3) $43 + 10 \text{ Log } p$ (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.



2.3 POWER LIMITS

2.3.1 Specification Reference

FCC CFR 47 Part 25, Clause 25.204
Industry Canada RSS-170, Clause 5.3

2.3.2 Equipment Under Test and Modification State

Iridium Communications Inc. 9603N S/N: 124 - Modification State 0

2.3.3 Date of Test

23 May 2014 & 3 June 2014

2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.5 Test Procedure

For conducted power, the EUT was connected to a spectrum analyser via a cable and 30dB attenuator. The path loss was measured using a network analyser and entered as a reference level offset into the instrumentation. The spectrum analyser was configured with an RBW of 3 kHz and VBW of 10 kHz. $10\text{Log}(4/3) = 1.25$ dB was added to the reference level offset to make the result relative to any 4 kHz band as per the requirement in 25.204(a). The transmit power was measured over the active part of the burst using an RMS detector, the spectrum analyser was set to max hold and the peak result recorded.

For radiated power, the EUT was transmitted at maximum power via a cable to the Spectrum Analyser. The Analyser settings were adjusted to display the resultant trace on screen and a resolution bandwidth and video bandwidth of 1 MHz were used to perform the measurement. The level on the spectrum analyser was maximised by rotating the EUT through 360° and a height search of the measuring antenna. A substitution was then performed using a suitable calibrated antenna and signal generator.

This level was maximised by adjusting the height of the measuring antenna once more. The level from the signal generator was then adjusted to achieve the same raw result as with the EUT. This level was then corrected to account for cable loss and antenna factor.

A calculation was then performed to obtain the final figure.

2.3.6 Environmental Conditions

Ambient Temperature	21.4 - 24.3°C
Relative Humidity	39.1 - 42.0%



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2.3.7 Test Results

5.0 V DC Supply

Conducted

EIRP (dBW)		
1616.0208033 MHz	1621.0208033 MHz	1625.979167 MHz
2.25	2.61	2.54

Radiated

EIRP (dBW)		
1616.0208033 MHz	1621.0208033 MHz	1625.979167 MHz
4.29	4.32	3.85

Limit Clause FCC CFR 47, 25.204

- +40 dBW in any 4 kHz band for $\theta \leq 0^\circ$
- +40 + 3 θ dBW in any 4 kHz band for $0^\circ < \theta \leq 5^\circ$

Limit Clause RSS-170, 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.



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2.4 MODULATION CHARACTERISTICS

2.4.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1047(d)

2.4.2 Equipment Under Test and Modification State

Iridium Communications Inc. 9603N S/N: 124 - Modification State 0

2.4.3 Date of Test

5 June 2014

2.4.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.5 Test Procedure

The description below of the modulation used was declared by the manufacturer.

To support this description, plots of the transmitted burst in the time and frequency domains have been provided.

2.4.6 Environmental Conditions

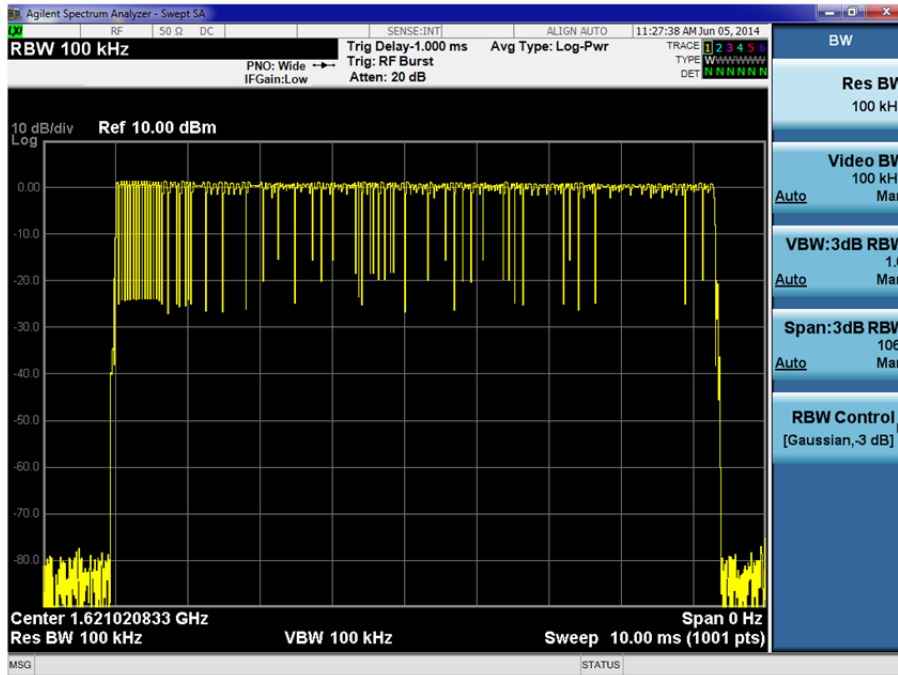
Ambient Temperature	24.0°C
Relative Humidity	31.3%



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2.4.7 Test Results

1621.0208033 MHz



Traffic, broadcast, and ring alert channels use differentially encoded quaternary 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.



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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.



2.5 LIMITS ON EMISSIONS FROM MOBILE EARTH STATIONS FOR PROTECTION OF AERONAUTICAL RADIONAVIGATION-SATELLITE SERVICE

2.5.1 Specification Reference

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

2.5.2 Equipment Under Test and Modification State

Iridium Communications Inc. 9603N S/N: 130 - Modification State 0

2.5.3 Date of Test

30 June 2014

2.5.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.5 Test Procedure

This test was performed in accordance with the test method requirements as stated in FCC CFR 47 Part 25.216 (c), (f), (i) & (j).

The EUT was set to transmit at maximum power using modulation as described in the manufacturers application form. The EUT was connected to a spectrum analyser via a cable, attenuator and notch filter which was tuned to the assigned frequency of the transmitter. The path loss was measured using a vector network analyser and entered as a reference level offset in the EUT. The gated trigger of the analyser was used so that average measurements were taken over a 2 ms period of the active burst. The spectrum analyser was adjusted to show the frequency range of interest on screen with an RBW & VBW of 1 MHz and 3 MHz respectfully. The analyser was set with an RMS detector and average trace.

Any spur within 20 dB of -70 dBW/MHz was investigated further to determine the bandwidth of the emission. Each spur was individually investigated and the RBW of the analyser was reduced to allow an approximation of the emission bandwidth of the spur. It was confirmed that all discrete emissions have a power density less than -80 dBW/MHz. The limit was reduced by 3 dB to take in to consideration the maximum antenna gain allowed as declared by the manufacturer.

For emissions in the carrier off state, the EUT was configured in a state of continuous non-transmission. The EUT was connected to a spectrum analyser via a cable and attenuator. The path loss was measured using a vector network analyser and entered as a reference level offset in the EUT. The spectrum analyser was adjusted to show the frequency range of interest on screen with an RBW & VBW of 1 MHz and 3 MHz respectfully. The analyser was set with an RMS detector and average trace.

2.5.6 Environmental Conditions

Ambient Temperature	22.8°C
Relative Humidity	45.6%



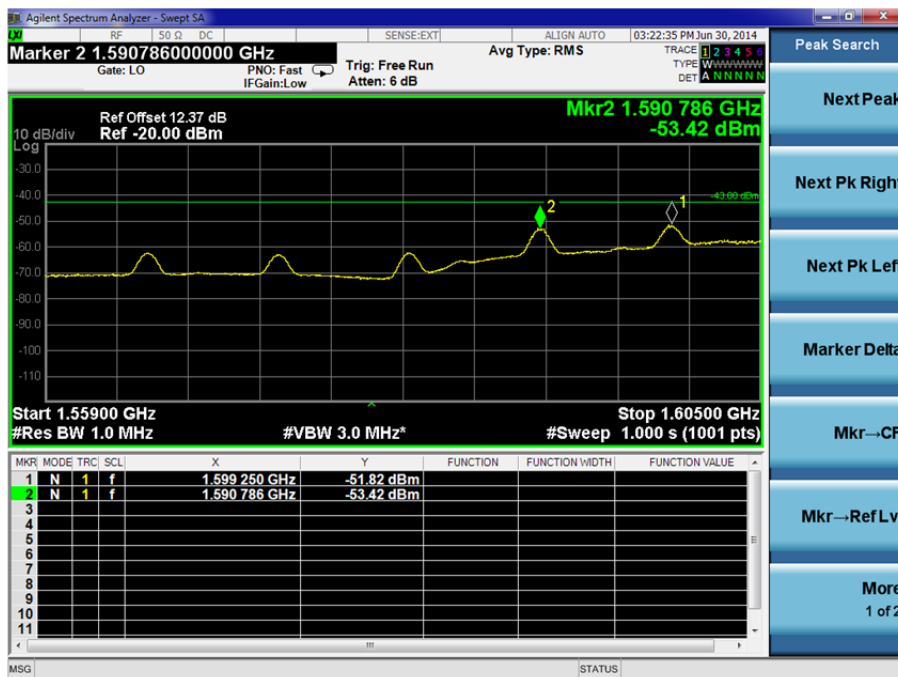
Product Service

2.5.7 Test Results

5.0 V DC Supply

EIRP Density – Broadband Emissions (dBW/MHz)		
1616.0208033 MHz	1621.0208033 MHz	1625.979167 MHz
-51.82	-51.02	-48.47

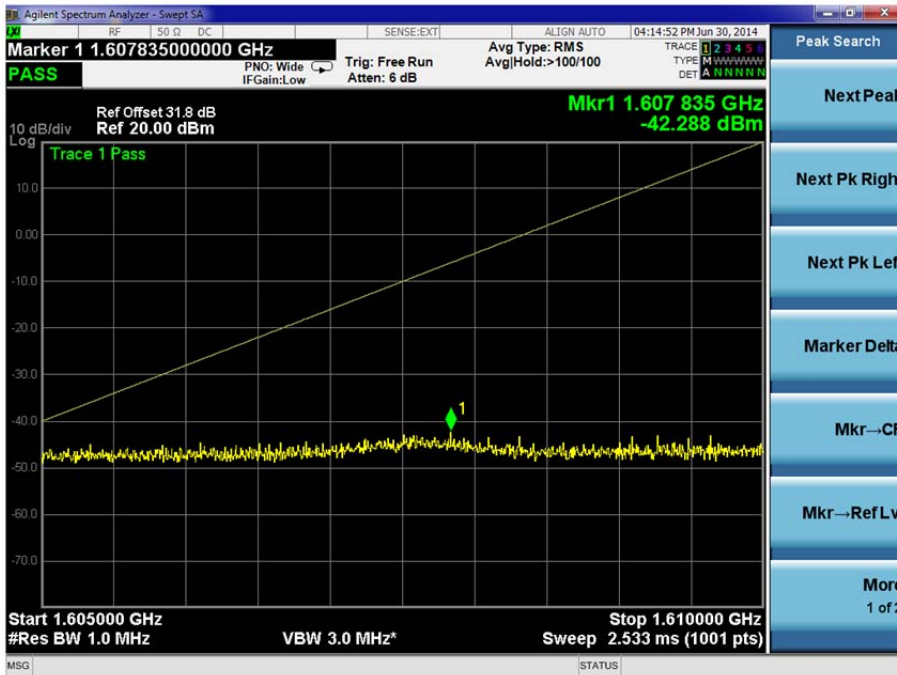
1616.0208033 MHz



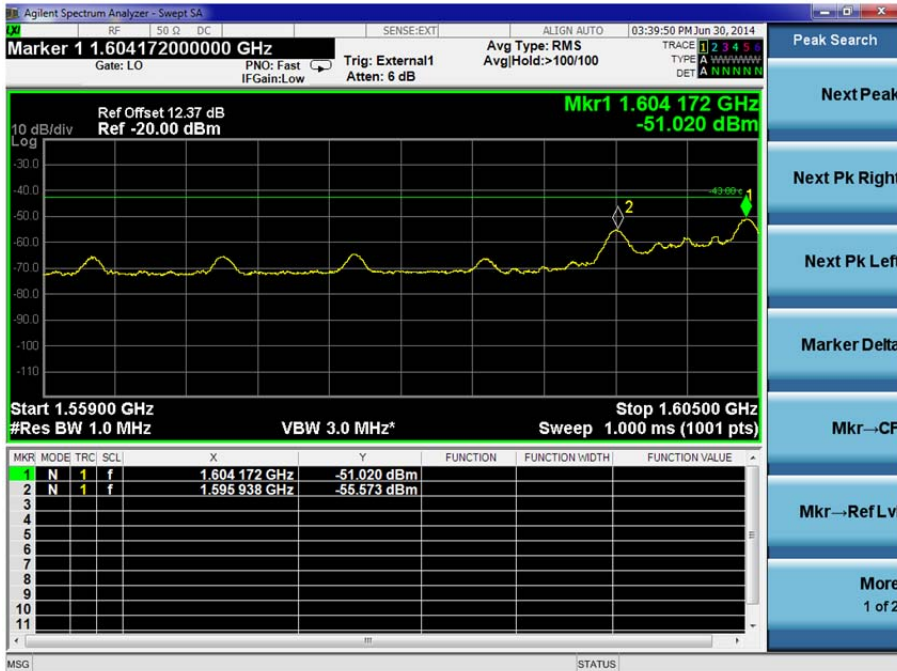
Marker 1 indicates the greatest broadband emission.



Product Service



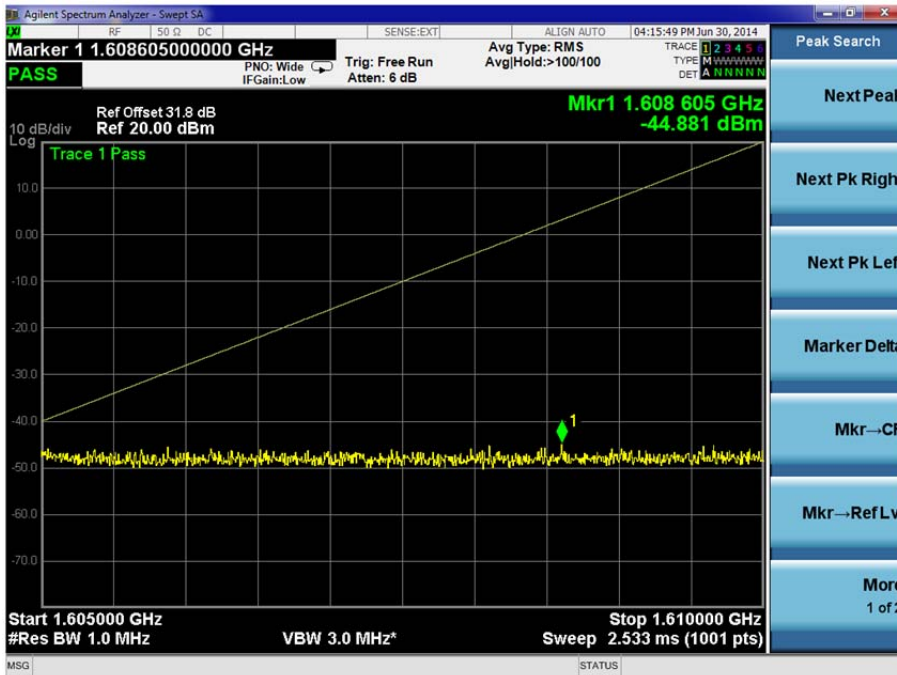
1621.0208033 MHz



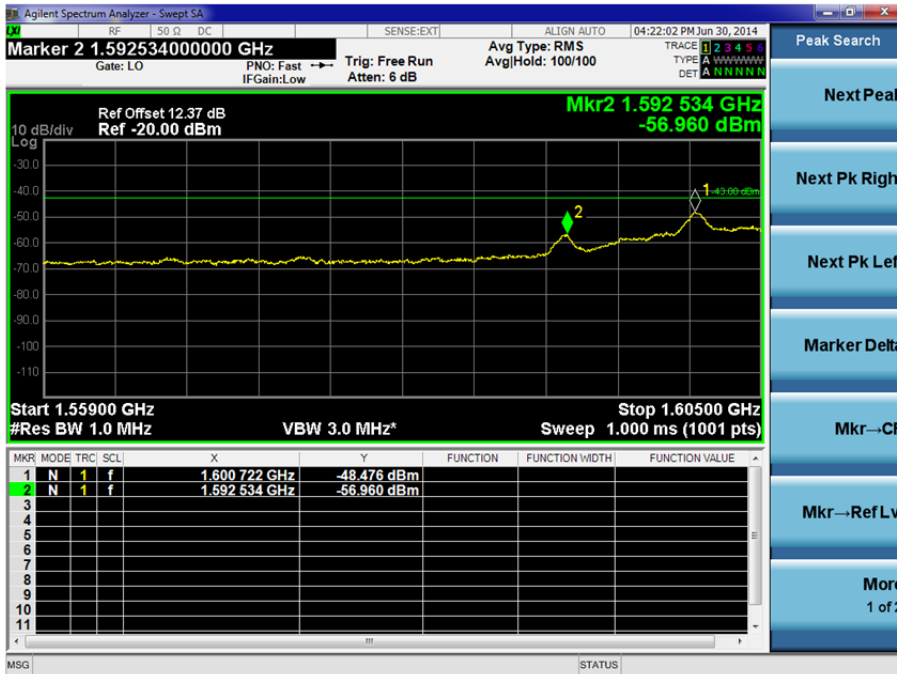
Marker 1 indicates the greatest broadband emission.



Product Service



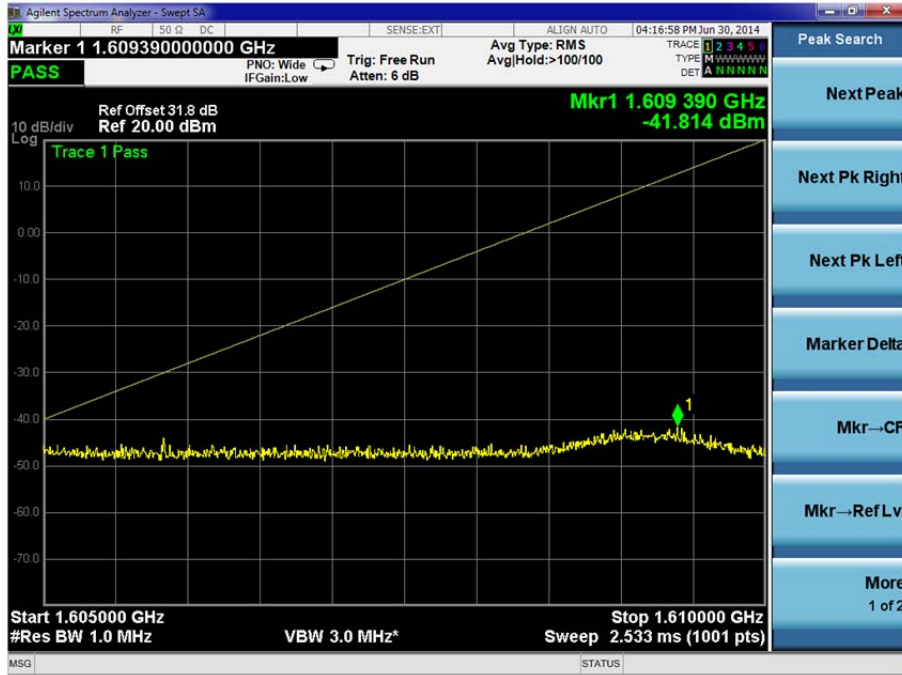
1621.0208033 MHz



Marker 1 indicates the greatest broadband emission



Product Service



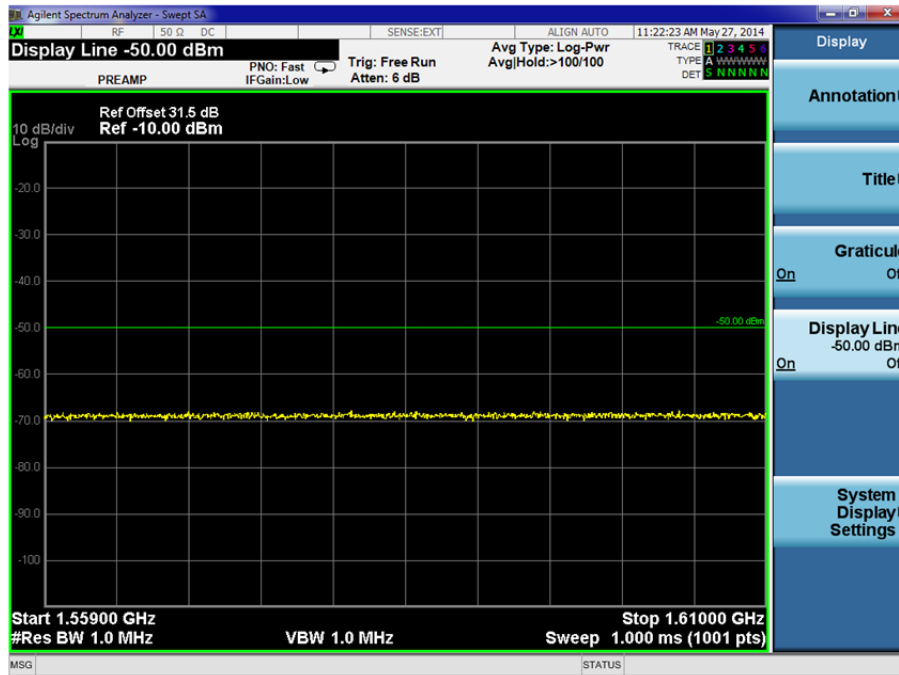
EIRP Density – Discrete Emissions (dBW)		
1616.0208033 MHz	1621.0208033 MHz	1625.979167 MHz
*No discrete emissions found.	*No discrete emissions found.	*No discrete emissions found.



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EIRP Density- Carrier-off State Emissions (dBW/MHz)
1621.0208033 MHz
< 80

1621.0208033 MHz



No emissions within 10 dB of the limit were observed.

Limit Clause FCC CFR 47, 25.216 and IC RSS-170, 5.4.3

The e.i.r.p density of emissions from mobile earth stations with assigned uplink frequencies between 1610 MHz and 1660.5 MHz shall not exceed -70 dBW/MHz. The e.i.r.p. of discrete emissions of less than 700 Hz bandwidth from such stations shall not exceed -80 dBW.

Mobile earth stations placed in service after July 21, 2002 with assigned uplink frequencies in the 1610-1660.5 MHz band shall suppress the power density of emissions in the 1605-1610 MHz band to an extent determined by linear interpolation from -70 dBW/MHz at 1605 MHz to -10 dBW/MHz at 1610 MHz.

The e.i.r.p. density of carrier-off state emissions from mobile earth stations 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 milli-second interval.



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2.6 OCCUPIED BANDWIDTH

2.6.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1049
RSS-GEN Issue 3, Clause 4.6.1

2.6.2 Equipment Under Test and Modification State

9603N S/N: 124 - Modification State 0

2.6.3 Date of Test

23 May 2014

2.6.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.5 Test Procedure

The test was applied in accordance with the test method requirements of Part 2.1051 and KDB 971168.

The EUT was connected to a spectrum analyser via a cable and attenuator. The EUT was configured to transmit on bottom, middle and top channels at maximum power. The spectrum analyser was configured to measure only over the active part of the burst. The settings of the analyser were configured with an RBW of 1.8 kHz and VBW of 18 kHz using an RMS detector and average trace. The Occupied bandwidth measurement function of the analyser was then utilized to make the measurement and the 99% occupied bandwidth was recorded.

2.6.6 Environmental Conditions

Ambient Temperature	24.3°C
Relative Humidity	39.1%



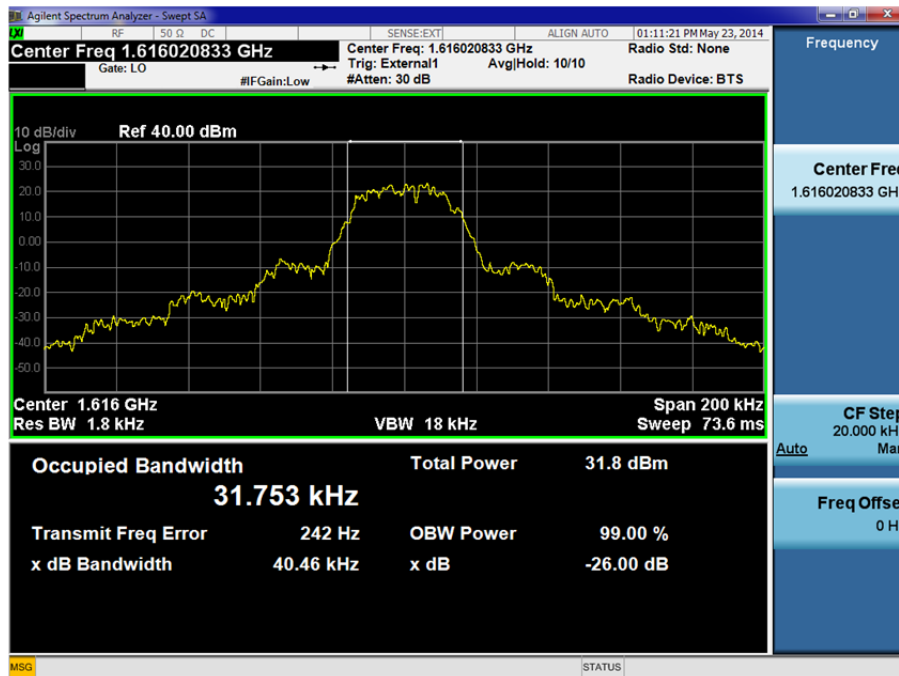
Product Service

2.6.7 Test Results

5.0 V DC

Frequency (MHz)	Occupied Bandwidth (kHz)
1616.0208033 MHz	31.753
1621.0208033 MHz	32.756
1625.979167 MHz	33.456

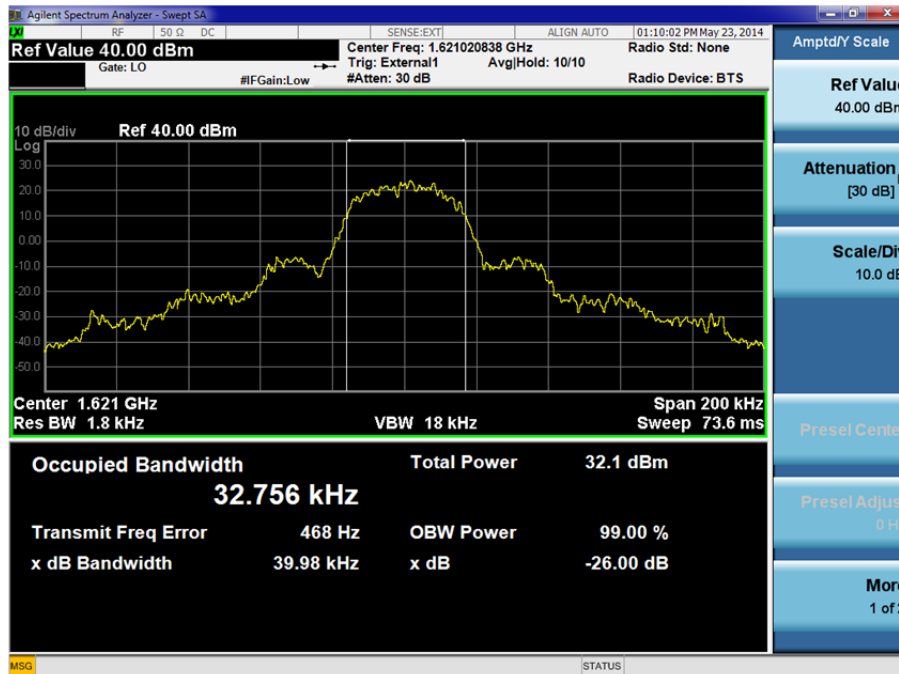
1616.0208033 MHz





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1621.0208033 MHz



1625.979167 MHz



Limit Clause FCC CFR 47 Part 25.202(b)

(b) Other frequencies and associated bandwidths of emission may be assigned on a case-by-case basis to space systems under this part in conformance with § 2.106 of this chapter and the Commission's rules and policies.



Product Service

SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.1 - Frequency Tolerance					
Power Supply Unit	Hewlett Packard	6267B	21	-	TU
Climatic Chamber	Votsch	VT4002	161	-	O/P Mon
Digital Temperature Indicator + T/C	Fluke	51	412	12	12-Feb-2015
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	22-Jul-2014
Digital Temperature Indicator	Fluke	51	2267	12	11-Sep-2014
Multimeter	Iso-tech	IDM101	2419	12	9-Oct-2014
Hygrometer	Rotronic	I-1000	3220	12	16-Jul-2014
Function Generator	Thurlby Thandar Instruments	TG2000	3334	-	TU
'N' - 'N' RF Cable (1m)	Rhophase	NPS-1803-1000-NPS	3701	12	6-Mar-2015
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	27-Jun-2014
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	22-Jul-2014
PXA Signal Analyser	Agilent Technologies	N9030A PXA	4409	12	27-Feb-2015
Section 2.2 - Emission Limitations					
Power Supply Unit	Hewlett Packard	6267B	21	-	TU
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	2-May-2015
Pre-Amplifier	Phase One	PS04-0086	1533	12	19-Dec-2014
Screened Room (5)	Rainford	Rainford	1545	24	10-Jan-2015
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Multimeter	Iso-tech	IDM101	2419	12	9-Oct-2014
Antenna (Bilog)	Chase	CBL6143	2904	24	10-Jun-2015
Antenna (DRG Horn)	ETS-LINDGREN	3115	3125	12	17-Jul-2014
Attenuator (10dB, 50W)	Aeroflex / Weinschel	47-10-34	3166	12	12-Sep-2014
Hygrometer	Rotronic	I-1000	3220	12	16-Jul-2014
Function Generator	Thurlby Thandar Instruments	TG2000	3334	-	TU
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	10-Feb-2015
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Oct-2014
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	4-Jul-2014
7m Armoured RF Cable	SSI Cable Corp.	1501-13-13-7m WA(-)	3600	-	TU
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	-	TU
Tilt Antenna Mast	matur GmbH	TAM 4.0-P	3916	-	TU
Mast Controller	matur GmbH	NCD	3917	-	TU
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	27-Jun-2014
1 Metre SMA Cable	Rhophase	3PS-1801A-1000-3PS	4101	12	5-Nov-2014
1GHz to 8GHz Low Noise Amplifier	Wright Technologies	APS04-0085	4365	12	1-Oct-2014
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	18-Sep-2014
PXA Signal Analyser	Agilent Technologies	N9030A PXA	4409	12	27-Feb-2015
Suspended Substrate Highpass Filter	Advance Power Components	11SH10-3000/X18000-O/O	4411	12	21-Mar-2015
Suspended Substrate Highpass Filter	Advance Power Components	11SH10-3000/X18000-O/O	4412	12	21-Mar-2015



Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.3 - Power Limits					
Power Supply Unit	Hewlett Packard	6267B	21	-	TU
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	2-May-2015
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	8-Nov-2014
Screened Room (5)	Rainford	Rainford	1545	24	10-Jan-2015
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Multimeter	Iso-tech	IDM101	2419	12	9-Oct-2014
Hygrometer	Rotronic	I-1000	3220	12	16-Jul-2014
Function Generator	Thurlby Thandar Instruments	TG2000	3334	-	TU
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	10-Feb-2015
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Oct-2014
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	4-Jul-2014
7m Armoured RF Cable	SSI Cable Corp.	1501-13-13-7m WA(-)	3600	-	TU
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	-	TU
Tilt Antenna Mast	matur GmbH	TAM 4.0-P	3916	-	TU
Mast Controller	matur GmbH	NCD	3917	-	TU
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	27-Jun-2014
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	18-Sep-2014
PXA Signal Analyser	Agilent Technologies	N9030A PXA	4409	12	27-Feb-2015
Section 2.5 - Limits on Emissions from Mobile Earth Stations for Protection of Aeronautical Radionavigation-Satellite Service					
Multimeter	White Gold	WG022	190	12	28-Oct-2014
Tuneable Notch Filter	K&L Microwave	5TNF-1500/3000-N/N	435	-	TU
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	22-Jul-2014
Power Supply	Hewlett Packard	6104A	1948	-	TU
Hygrometer	Rotronic	I-1000	3220	12	16-Jul-2014
Function Generator	Thurlby Thandar Instruments	TG2000	3334	-	TU
Attenuator (10dB, 150W)	Narda	769-10	3368	12	28-May-2015
Attenuator (30dB, 150W)	Narda	769-30	3369	12	28-May-2015
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Sep-2014
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	18-Sep-2014
Section 2.6 - Occupied Bandwidth					
Power Supply Unit	Hewlett Packard	6267B	21	-	TU
Multimeter	Iso-tech	IDM101	2419	12	9-Oct-2014
Hygrometer	Rotronic	I-1000	3220	12	16-Jul-2014
Function Generator	Thurlby Thandar Instruments	TG2000	3334	-	TU
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	27-Jun-2014
PXA Signal Analyser	Agilent Technologies	N9030A PXA	4409	12	27-Feb-2015

TU – Traceability Unscheduled

O/P MON – Output Monitored with Calibrated Equipment



Product Service

3.2 MEASUREMENT UNCERTAINTY

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

Test Discipline	MU
Power Limits	Conducted: ± 0.70 dB Radiated: ± 6.3 dB
Modulation Characteristics	-
Limits on Emissions from Mobile Earth Stations for Protection of Aeronautical Radionavigation-Satellite Service	± 3.08 dB
Frequency Tolerance	± 3.54 Hz
Emission Limitations	Conducted: ± 3.08 dB Radiated: 30 MHz to 1 GHz: ± 5.1 dB 1 GHz to 17 GHz: ± 6.3 dB
Occupied Bandwidth	± 16.74 kHz



Product Service

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



Product Service

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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