

## **MICROWAVE PATH SURVEY REPORT**

## RADIO FREQUENCY INTERFERENCE (RFI) MEASUREMENT REPORT

**Prepared For** 

ViaSat

Indianapolis, IN

**Transmit and Receive Earth Station** 17-21 GHz and 27-31 GHz

May 01, 2015

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#### **INTRODUCTION AND BACKGROUND**

#### **1.1 Introduction**

On-site Radio Frequency interference (RFI) measurements were performed on behalf of ViaSat, Inc. on May 01, 2015, at their proposed site in Indianapolis, IN. The purpose of these measurements was to determine the relative RFI levels in the 17-21 and 27-31 GHz common carrier frequency band and their impact on digital down-link satellite reception. Measurements were performed at one designated location. The purpose of this report is to document the results of these measurements and to present recommendations.

The analysis in this report is based upon the following:

- Andrew 4.1 Meter Antenna
- Satellite Arc: 55 to 115 Degrees West Longitude
- Frequency Range Considered: 17 to 21 GHz and 27-31 GHz
- Interference Objective: -156 dBW/1 MHz
- Type of Reception: Digital
- Measured Antenna Center Line: 6.5 Feet Above Ground Level

#### **1.2 Background**

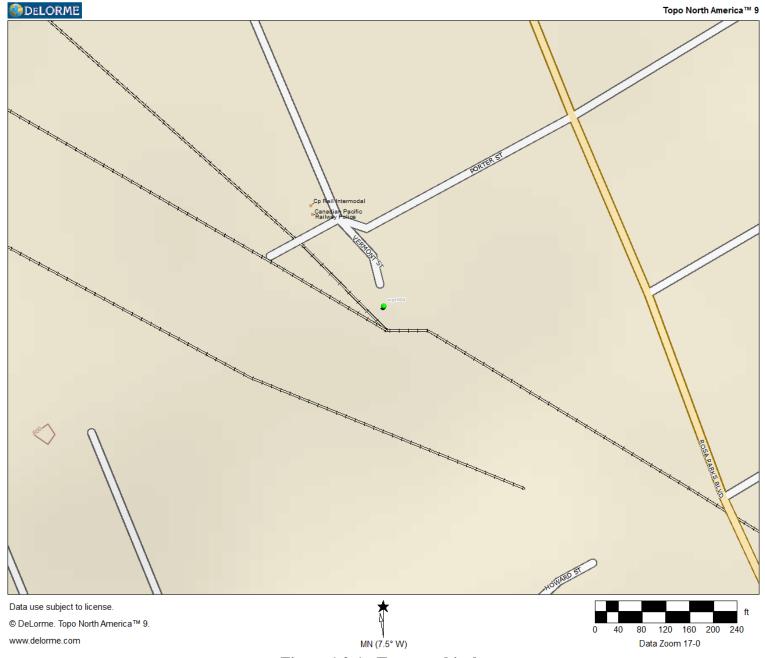
ViaSat, Inc is proposing to locate a new transmit/receive antenna at a new location of 39° 44' 29.3.3" N 086° 09' 06.9" ViaSat, Inc had requested that Comsearch conduct RFI measurements at the facility to assess the interference potential. This facility is currently nonoperational and measurements were done at a point near the proposed antenna locations.

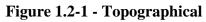
The measured site is identified on a portion of a topographic map shown in Figure 1.2-1. An aerial photo of the site location is shown in Figure 1.2-2. A photo of the measurement using a GPS is shown in Figure 1.2-3. A photo of the surrounding cellular/PCS coverage is shown in Figure 1.2-4.

#### **1.3 Constraints**

The analysis in this report is based upon the following assumptions and constraints.

- The antenna selected will conform to the FCC reference pattern 32-25 Log $\theta$  as specified in 47CFR 25.209(a) (2).
- It is assumed that during the measurement period all of the terrestrial transmitters were active and operating at full transmit power for the licensed frequencies unless otherwise noted.
- The signal identification and frequencies analyzed are based upon information obtained from the various common carriers as to what frequencies were active at the time of the measurements and the traffic these frequencies were supposed to be carrying.
- The actual ground elevation of the site is based on the data from the topographic map.
- The interference objective of -156 dBW/ 1 MHz used throughout this report is based upon estimated link budget parameters and is subject to change. ViaSat, Inc should review the system parameters for this down-link in order to verify the viability of this objective.





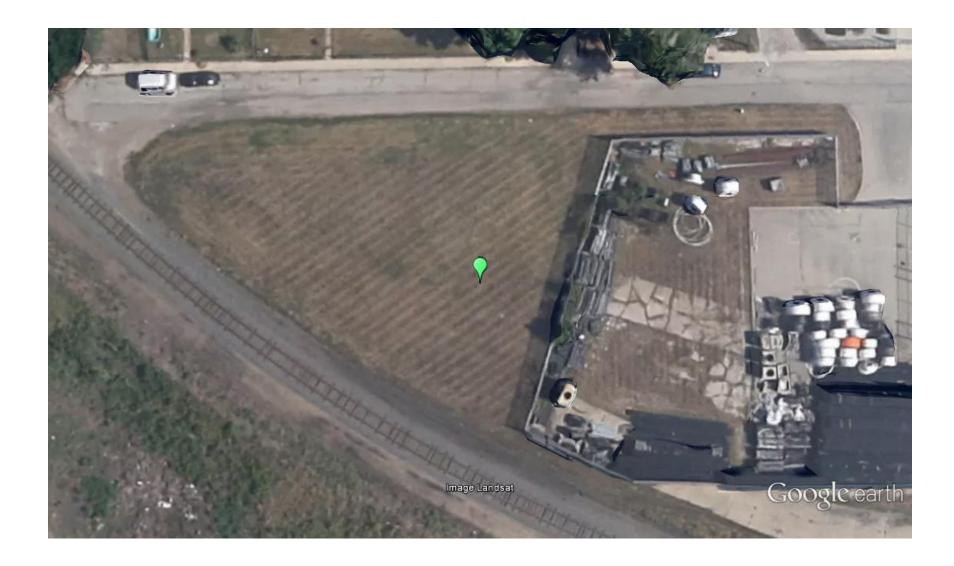
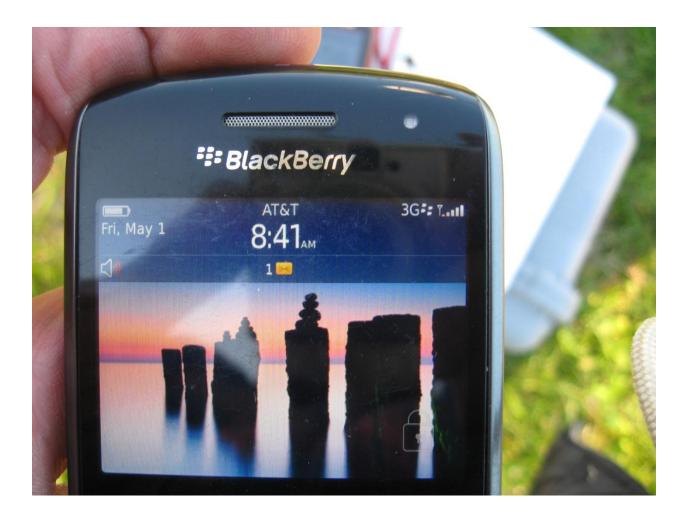


Figure 1.2-2 – Aerial Photograph



Figure 1.2-3 – GPS Photograph



TWO

#### **TEST PROCEDURE**

#### 2.1 Calibration

Where:

Figures 2.1-1 is the block diagram of the test set for all bands to be tested. All test equipment used was allowed a proper warm-up period prior to calibration. The test set was calibrated by the signal substitution method, as recommended by NSMA, utilizing a synthesized signal generator. The reference signal from the signal generator was adjusted for the center frequency of each band to be tested and measured with a thermal power meter for calibrated reference test level (-60 dBm). This calibrated reference signal from the signal generator was then injected into the end of the coaxial cable of the test set at the point, which normally connects to the test antenna. A spectrum analyzer then measured the reference test signal level after passing through the test set. At this point, the spectrum analyzer was calibrated such that the top graticule of the spectrum analyzer display (-60 dBm) corresponded to the injected reference signal (-60 dBm) by utilizing the reference level offset function of the Anritsu –M52720T spectrum analyzer. Upon completion of the calibration process, a known reference level was obtained for the measured in a given set of spectrum analyzer display readings.

The following formula is used to transform the measured signal level as read on the spectrum analyzer display (dBm) to an isotropic reference signal level (dBW<sub>I</sub>) as seen at the point of test:

 $dBW_I = LI - GA - 30$  $dBW_I = Isotropic level in dBW$ 

LI = Level (dBm) of injected signal

GA = Test antenna gain

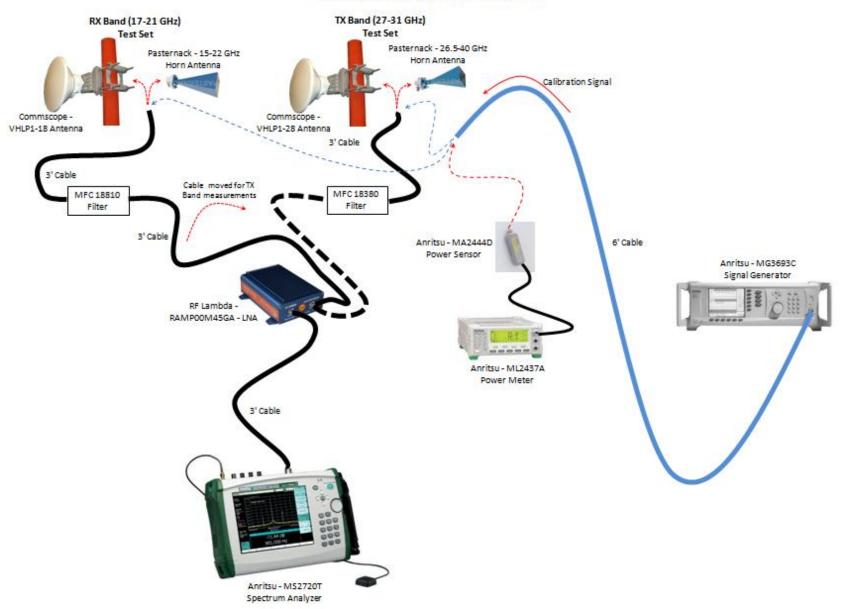
-30 = Conversion factor from dBm to dBW

at 19.5 GHz:  $dBW_I = -60 dBm - 30 dB - 30 dB$ 

 $= -120 \text{ dBW}_{\text{I}}$ 

In this instance, the spectrum analyzer displayed measured signal level of -60 dBm equates to an isotropic signal level of -120 dBW<sub>I</sub>.

Figures 2.1-2 (A-H) displays the spectrum photographs of the described calibration procedure employed during this measurement.



### **Test Set Equipment Diagram**

**Figure 2.1-1 Receive Test Equipment Block** 

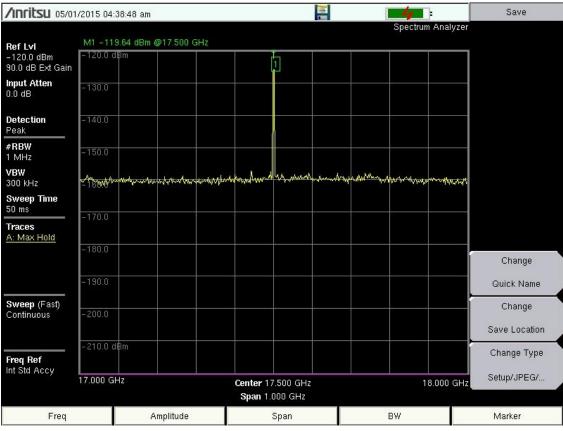


Figure 2.1-2 (A) Calibration Spectrum Photo 17.5 GHz

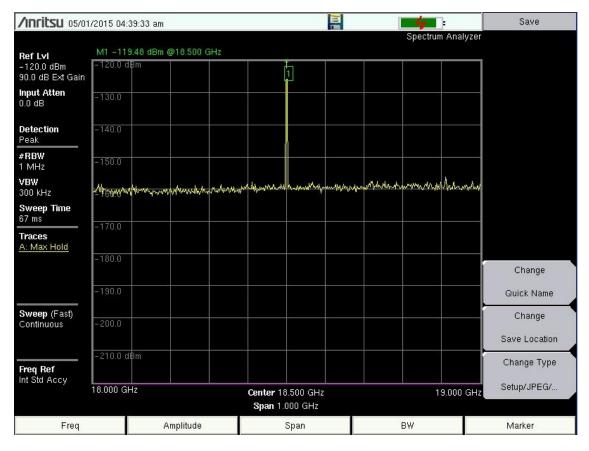
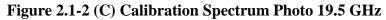


Figure 2.1-2 (B) Calibration Spectrum Photo 18.5 GHz

<b>/INFILSU</b> 05/0	1/2015 04:40:14	4 am				4	•	Save	
						Spectrum	Analyzer		
Ref Lvl	M1 -118.78 dBm @19.500 GHz								
120.0 dBm	-120.0 dBm			1					
I0.0 dB Ext Gain									
n <b>put Atten</b> .0 dB	-130.0								
etection eak	-140.0					9 B			
<b>RBW</b> MHz	-150.0					- <u>2 - 5</u>			
<b>'BW</b> 00 kHz	nghalalyyan	montepersonandor	unner ponder and	www.	Maria	Mundoner	phinnolo		
<b>weep Time</b> 3 ms	-170.0					6 8			
races : Max Hold	2 3						×.		
	-180.0							Change	
-	-190.0							Quick Name	
weep (Fast)								Change	
ontinuous	-200.0							Save Location	
eq Ref	-210.0 dBm							Change Type	
t Std Accy	19.000 GHz							Setup/JPEG/	
				9.500 GHz .000 GHz		2	0.000 GHz		
Freq		Amplitude		Span		BW		Marker	



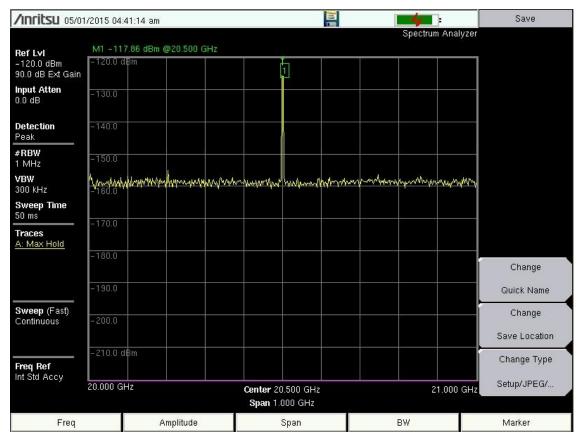


Figure 2.1-2 (D) Calibration Spectrum Photo 20.5 GHz

<b>/INCIESU 05/01</b>	2015 04:42:06 am				Save			
				Spectrum Analyzei	í l			
Ref Lvl	M1 -121.02 dBm @27.500 GHz							
120.0 dBm 10.0 dB Ext Gain	–120.0 dBm							
n <b>put Atten</b> .0 dB	-130.0							
etection eak	-140.0							
<b>RBW</b> MHz	-150.0							
<b>/BW</b> :00 kHz	www.	two	monor Monoral and	www.hupperpart	1			
<b>Sweep Time</b> i7 ms	1700							
T <b>races</b> A: Max Hold	-170.0							
	-180.0				Change			
	-190.0				Quick Name			
Sweep (Fast) Continuous	-200.0				Change			
Sonandodo					Save Location			
req Ref	-210.0 dBm				Change Type			
nt Std Accy	27.000 GHz	Center 27.50	0 CH2	28.000 GH;	Setup/JPEG/			
		Span 1.000		20.000 GH				
Freq	Amplit	ude Spa	in l	BW	Marker			

Figure 2.1-2 (E) Calibration Spectrum Photo 27.5 GHz

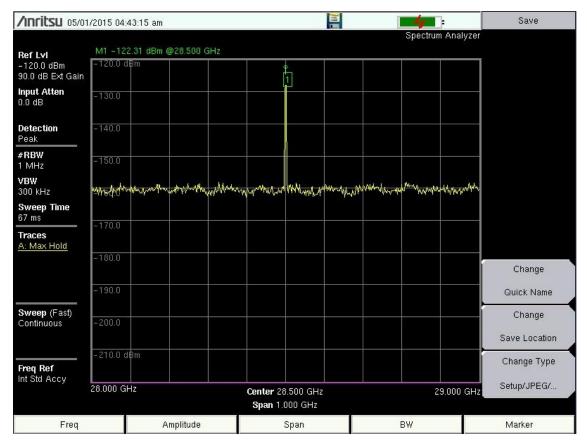


Figure 2.1-2 (F) Calibration Spectrum Photo 28.5 GHz

/Inritsu 05/01	/2015 04:43:5	9 am					4	-	Save
							Spectrum	Analyzer	
Ref Lvl	M1 -121.71 dBm @29.500 GHz								
-120.0 dBm 10.0 dB Ext Gain	-120.0 dBm			¢.					
				1					
n <b>put Atten</b> 1.0 dB	-130.0								
<b>Detection</b> Peak	-140.0				2		2		
<b>RBW</b> MHz	-150.0					<u>()</u>			
<b>/BW</b> 300 kHz	zapeonomination	manyoundant	www.www	man many	manna ann	and the second	opmlada	-ymalledada	
Sweep Time 10 ms	-170.0			-		2 8			
Fraces A: Max Hold	51,8959							o.	
	-180.0								Change
	-190.0								Quick Name
weep (Fast)									Change
ontinuous	-200.0								Save Location
<b>req Ref</b> nt Std Accy	-210.0 dBm								Change Type
	29.000 GHz			ter 29.500 GH			30	).000 GHz	Setup/JPEG/
	1999		S	<b>an</b> 1.000 GHz	10,000			1000	
Freq		Amplitude		Span		В	w		Marker

### Figure 2.1-2 (G) Calibration Spectrum Photo 29.5 GHz

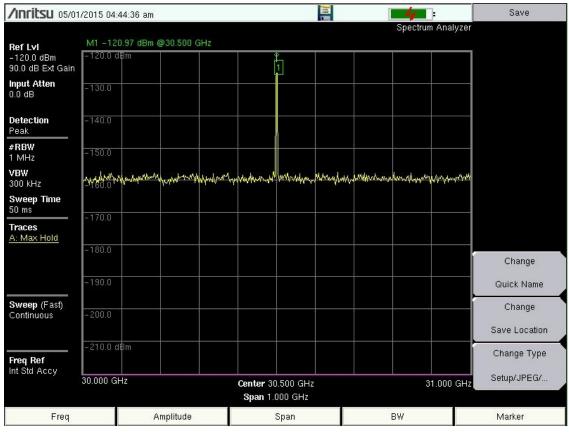


Figure 2.1-2 (H) Calibration Spectrum Photo 30.5 GHz

#### 2.2 Methodology

Upon arriving at the existing earth station site, azimuth and horizon elevation measurements were performed to evaluate if any satellite arc obstructions exist. The coordinates of the existing earth station site were verified on the DeLorme topographic map. Photographs were taken to document the satellite arc (clearance) and are included in this report.

After site coordinates and horizon elevations were verified, the test equipment was set up and calibrated to measure the RF environment. Measurements were conducted at the proposed earth station location for the 17-21 and 27-31 GHz band. After the equipment calibration was completed, the test antenna was mounted on an extendable tower and elevated to a height of 6.5 feet. This height is greater than the centerline of the earth station antenna. The antenna was rotated 360 degrees (scanning), once in each polarization, while activating the peak hold function of the spectrum analyzer. This enabled the analyzer to maintain and display the maximum signal level received for all frequencies under consideration. After the initial documentation of interference, all interference conflicts if observed were peaked on to determine the azimuth and the level of the interference source.

Upon completion of the RF testing, the measured signal levels were transposed to earth station interference levels after accounting for the addition of the corresponding earth station antenna gain.

THREE

## **DATA PRESENTATION**

The following section contains the tables and spectrum photos pertaining to the site location measured.

#### 3.1 Indianapolis, IN

- Table 3.1-1 presents a site data sheet including all pertinent site information.
- Figures 3.1-1 and 3.1-2 are the photographs depicting the existing earth station site and satellite arc.
- Figures 3.1-3 through 3.1-10 are the RF spectrum photographs depicting the interference environment at the test site.

## **TABLE 3.1-1**

## **MEASUREMENT SITE DATA SHEET**

1.	SYSTEM NAME:	ViaSat, Inc	
2.	CITY AND STATE:	Indianapolis, IN	
3.	SITE IDENTIFICATION:	Indianapolis	
4.	COORDINATES: (NAD 1983)	LATITUDE: LONGITUDE:	39° 44' 29.3" N 086° 09' 06.9" W
5.	GROUND ELEVATION:	219.3 feet AMSL	
6.	MEASUREMENT DATE AND TIMES:	May 01, 2015	
7.	GEOSTATIONARY ARC RANGE: SATELLITE POSITIONS: AZIMUTH: ELEVATION:	55W – 115W 136.6° – 220.7° 33.9° / 35.2°	
8.	GEOSTATIONARY ARC VISIBILITY:	Satellite arc has n	o blockage at this time



North



East

Figure 3.1-1 Earth Station Site Photographs



South



West

Figure 3.1-1 (cont.) Earth Station Site Photographs

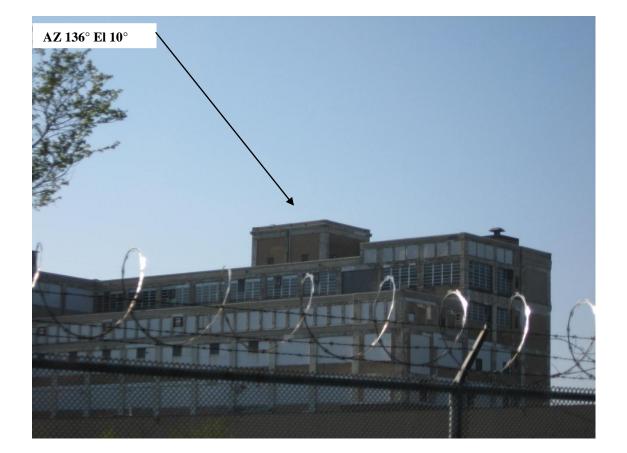




Figure 3.1-2 Horizon Photographs of Earth Station Site



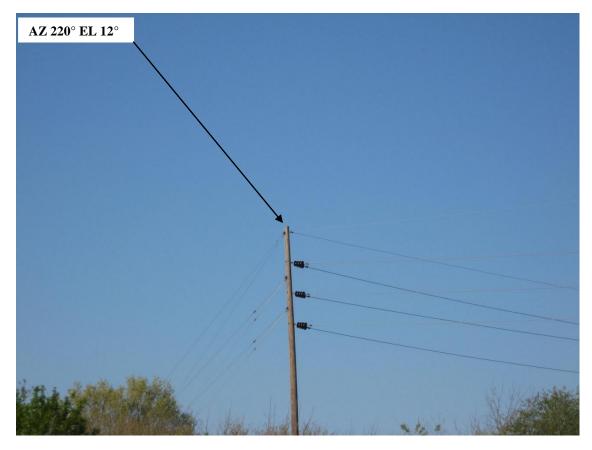
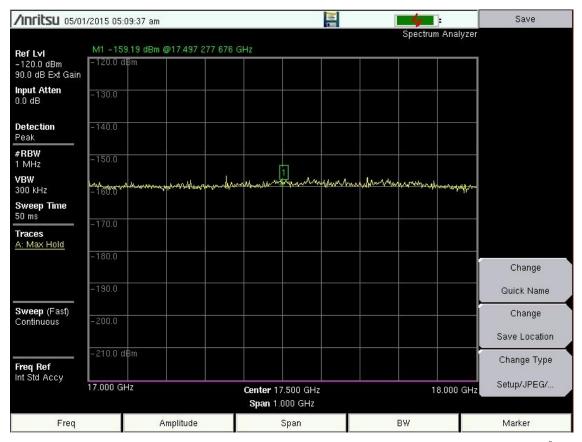
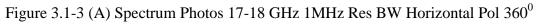


Figure 3.1-2 (cont.) Horizon Photographs of Earth Station Site





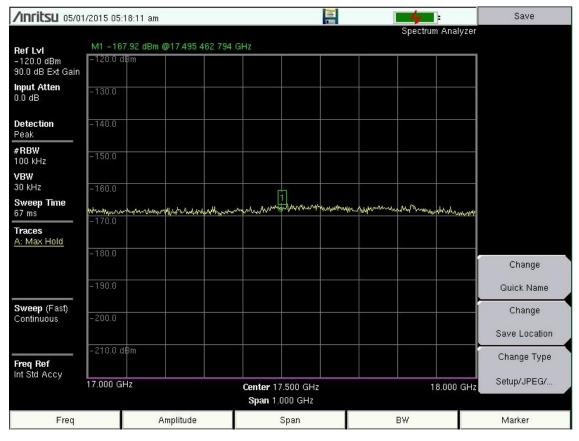


Figure 3.1-3 (B) Spectrum Photos 17-18 GHz 100 kHz Res BW Horizontal Pol 360<sup>0</sup>

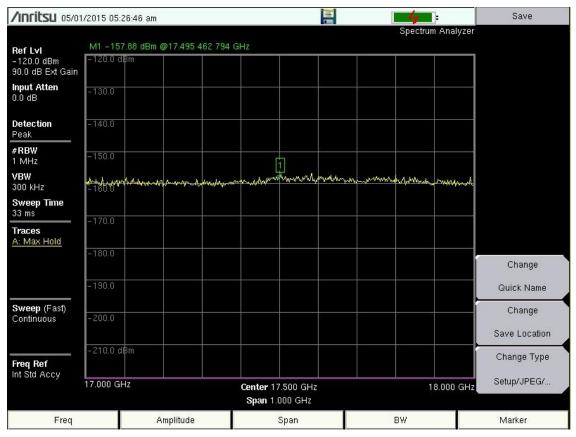


Figure 3.1-3 (C) Spectrum Photos 17-18 GHz 1MHz Res BW Horizontal Pol Worst Case

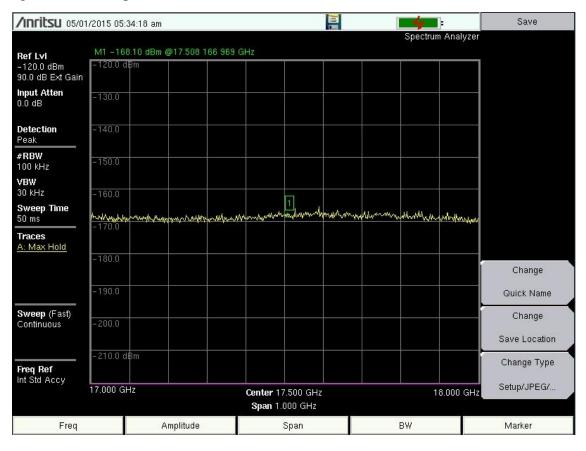


Figure 3.1-3 (D) Spectrum Photos 17-18 GHz 100 KHz Res BW Horizontal Pol Worst Case

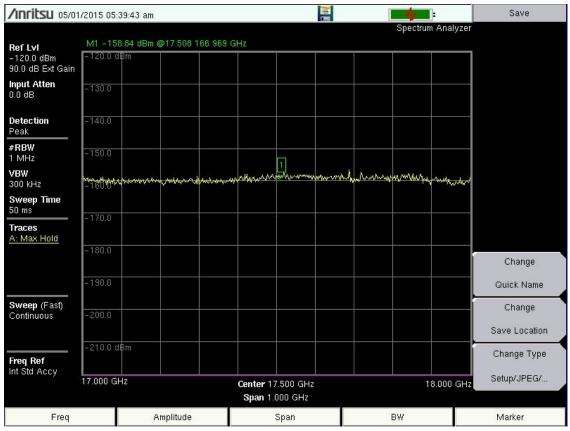


Figure 3.1-3 (E) Spectrum Photos 17-18 GHz 1MHz Res BW Vertical Pol 360<sup>0</sup>

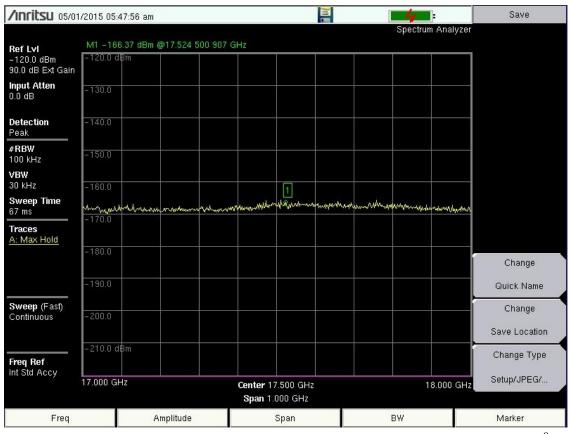


Figure 3.1-3 (F) Spectrum Photos 17-18 GHz 100 kHz Res BW Vertical Pol 360<sup>0</sup>

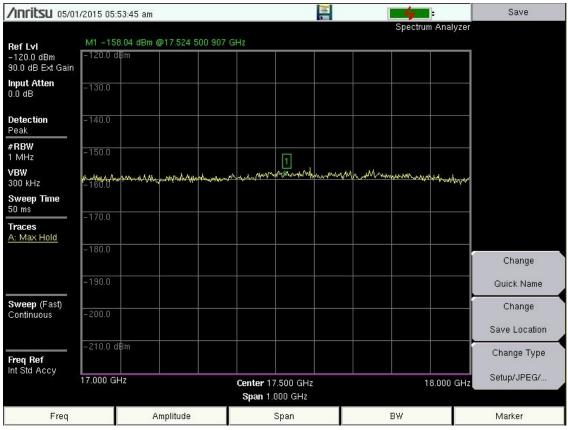


Figure 3.1-3 (G) Spectrum Photos 17-18 GHz 1 MHz Res BW Vertical Pol Worst Case

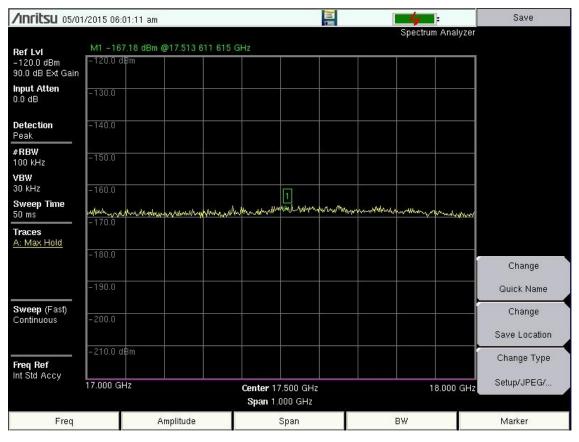


Figure 3.1-3 (H) Spectrum Photos 17-18 GHz 100 kHz Res BW Vertical Pol Worst Case

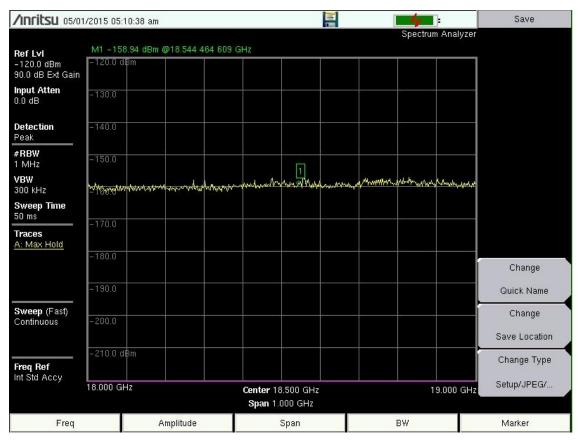


Figure 3.1-4 (A) Spectrum Photos 18-19 GHz 1MHz Res BW Horizontal Pol 360<sup>0</sup>

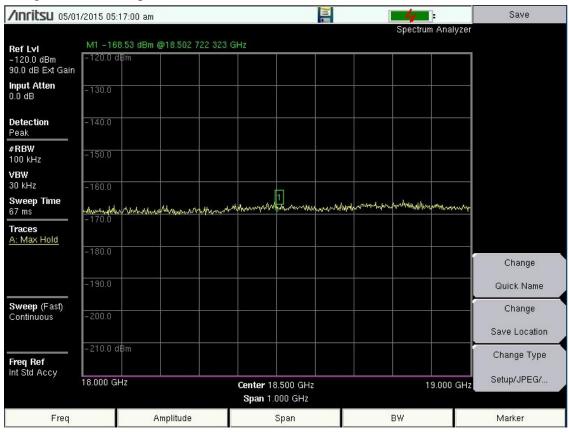


Figure 3.1-4 (B) Spectrum Photos 18-19 GHz 100 kHz Res BW Horizontal Pol 360<sup>0</sup>

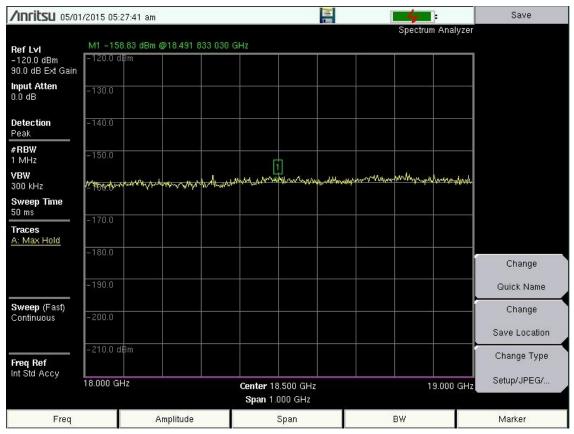


Figure 3.1-4 (C) Spectrum Photos 18-19 GHz 1MHz Res BW Horizontal Pol Worst Case

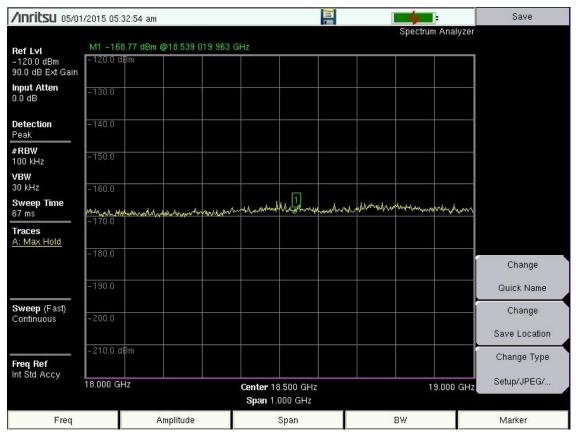


Figure 3.1-4 (D) Spectrum Photos 18-19 GHz 100 kHz Res BW Horizontal Pol Worst Case

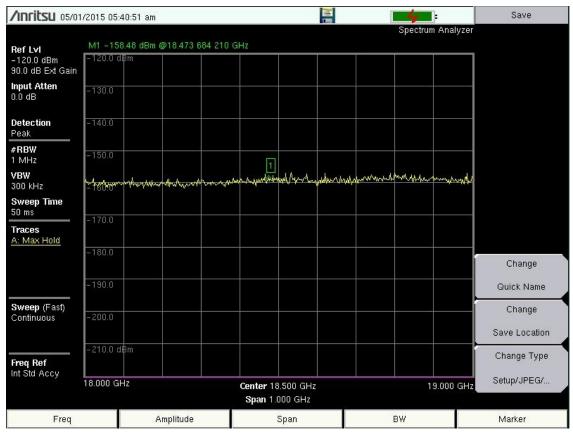


Figure 3.1-4 (E) Spectrum Photos 18-19 GHz 1MHz Res BW Vertical Pol 360<sup>0</sup>

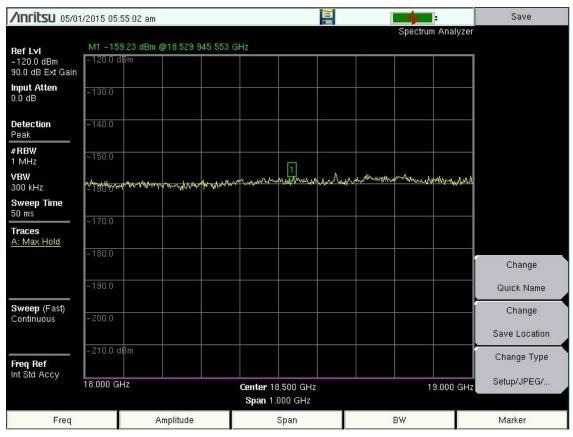


Figure 3.1-4 (F) Spectrum Photos 18-19 GHz 100 kHz Res BW Vertical Pol 360<sup>0</sup>

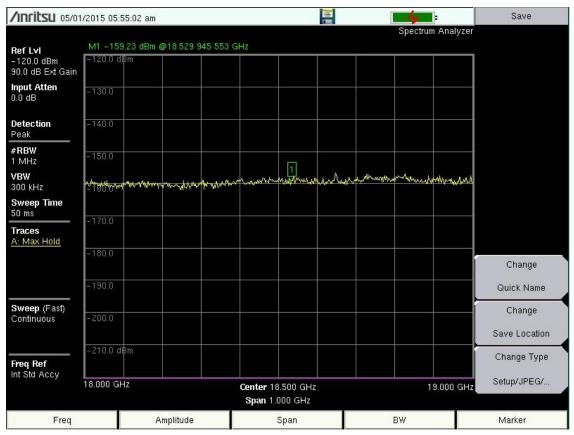


Figure 3.1-4 (G) Spectrum Photos 18-19 GHz 1 MHz Res BW Vertical Pol Worst Case

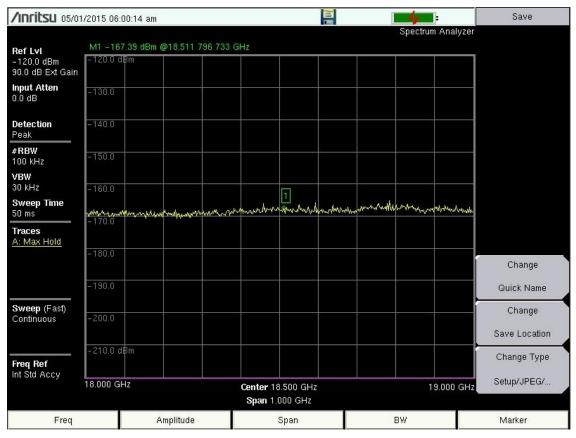
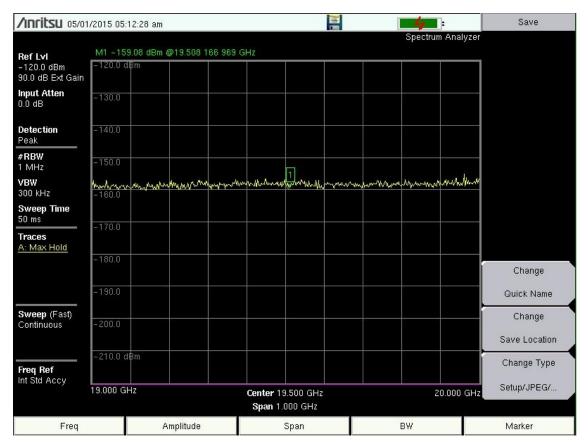


Figure 3.1-4 (H) Spectrum Photos 18-19 GHz 100 kHz Res BW Vertical Pol Worst Case



## Figure 3.1-5 (A) Spectrum Photos 19-20 GHz 1MHz Res BW Horizontal Pol 360<sup>0</sup>

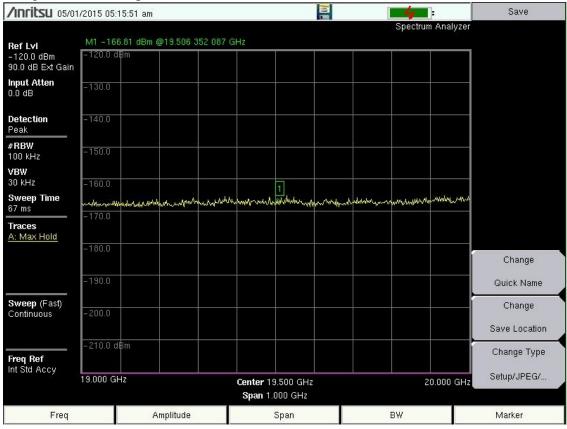


Figure 3.1-5 (B) Spectrum Photos 19-20 GHz 100 kHz Res BW Horizontal Pol 360<sup>0</sup>

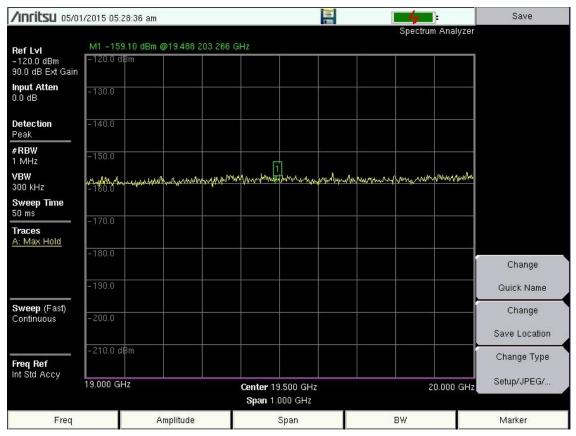


Figure 3.1-5 (C) Spectrum Photos 19-20 GHz 1MHz Res BW Horizontal Pol Worst Case

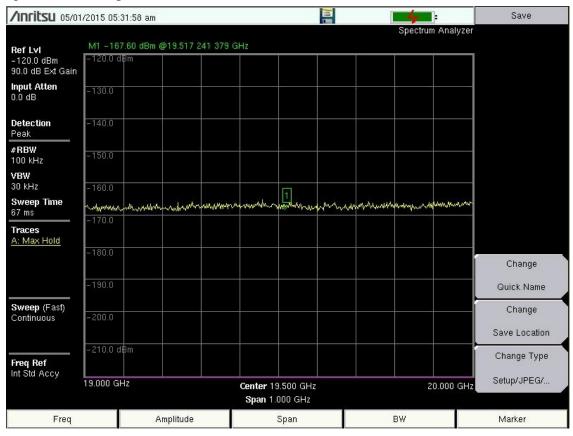


Figure 3.1-5 (D) Spectrum Photos 19-20 GHz 100 kHz Res BW Horizontal Pol Worst Case

/Inritsu 05/01	/2015 05:42:30 am			Save
Ref Lvl	M1 -158.29 dBm @19.515 426 49	97 GHz	Spectrum Analyzer	
-120.0 dBm 90.0 dB Ext Gain	-120.0 dBm			
Input Atten 0.0 dB	-130.0			
Detection Peak	-140.0			
#RBW 1 MHz	-150.0			
<b>VBW</b> 300 kHz	-160.0	ant all and have the second and the second	mahuman ah marana har har har har har har har har har ha	
Sweep Time 50 ms	-170.0			
Traces A: Max Hold				
	-180.0			Change
	-190.0			Quick Name
Sweep (Fast) Continuous	- 200.0			Change Save Location
Freq Ref Int Std Accy	–210.0 dBm			Change Type
	19.000 GHz	Setup/JPEG/		
Freq	Amplitude	Span	BW	Marker

## Figure 3.1-5 (E) Spectrum Photos 19-20 GHz 1MHz Res BW Vertical Pol 360<sup>0</sup>

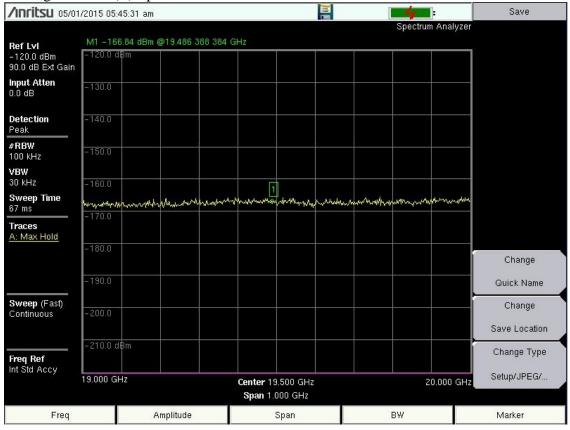


Figure 3.1-5 (F) Spectrum Photos 19-20 GHz 100 kHz Res BW Vertical Pol 360<sup>0</sup>

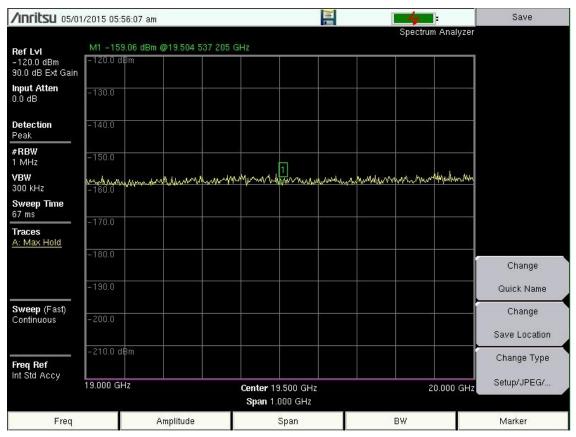


Figure 3.1-5 (G) Spectrum Photos 19-20 GHz 1 MHz Res BW Vertical Pol Worst Case

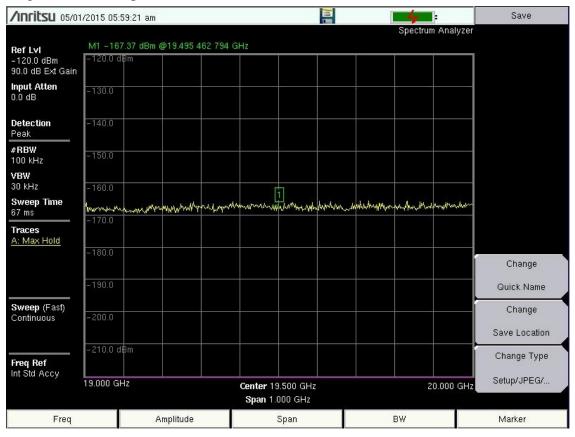


Figure 3.1-5 (H) Spectrum Photos 19-20 GHz 100 kHz Res BW Vertical Pol Worst Case

<b>/INFILSU</b> 05/01	/2015 05:13:41 am		-4	Save
Ref Lvl	M1 -158.54 dBm @20.480 943 738	GHz	Spectrum Analyzer	
-120.0 dBm 90.0 dB Ext Gain	–120.0 dBm			
Input Atten 0.0 dB	-130.0			
Detection Peak	-140.0		2	
#RBW 1 MHz	-150.0			
<b>VBW</b> 300 kHz	Hunnhaly pollow mondaritation	mannentrant	mound by an and an and	
Sweep Time 50 ms	-170.0		· · · · · ·	
Traces <u>A: Max Hold</u>				
	-180.0			Change
	-190.0			Quick Name
<b>Sweep</b> (Fast) Continuous	-200.0			Change Save Location
Freq Ref Int Std Accy	−210.0 d₿m			Change Type
Int old Accy	20,000 GHz	<b>Center</b> 20.500 GHz <b>Span</b> 1.000 GHz	21.000 GHz	Setup/JPEG/
Freq	Amplitude	Span	BW	Marker

## Figure 3.1-6 (A) Spectrum Photos 20-21 GHz 1MHz Res BW Horizontal Pol $360^{\circ}$

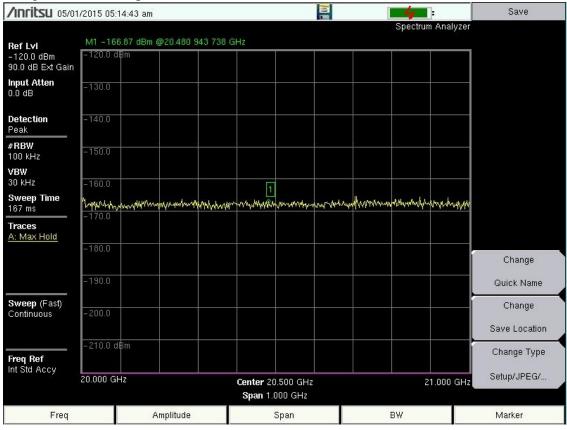


Figure 3.1-6 (B) Spectrum Photos 20-21 GHz 100 kHz Res BW Horizontal Pol  $360^{\circ}$ 

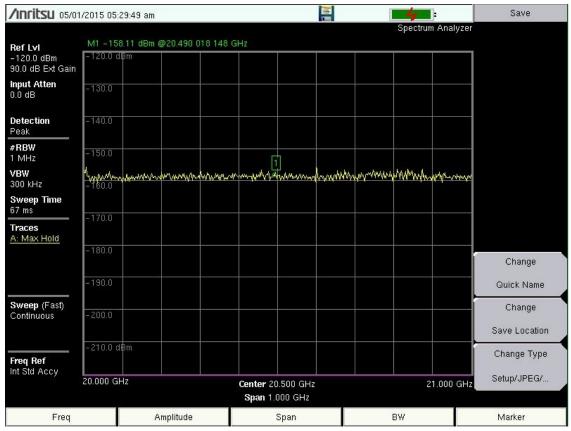


Figure 3.1-6 (C) Spectrum Photos 20-21 GHz 1MHz Res BW Horizontal Pol Worst Case

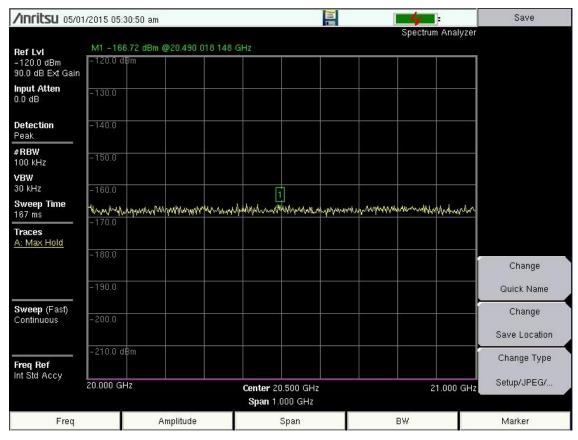


Figure 3.1-6 (D) Spectrum Photos 20-21 GHz 100 kHz Res BW Horizontal Pol Worst Case

/Inritsu 05/01	/2015 05:43:36 am			Save
Ref Lvl	M1 -158.56 dBm @20.499 092 558	) GHz	Spectrum Analyzer	
-120.0 dBm 90.0 dB Ext Gain	–120.0 dBm			
Input Atten 0.0 dB	-130.0			
Detection Peak	-140.0			
#RBW 1 MHz	-150.0			
<b>VBW</b> 300 kHz	Wardenanger warman from the second second	and an and the second second	ward war have not when any the	
Sweep Time 50 ms	-170.0			
Traces A: Max Hold	-180.0			
				Change
	-190.0			Quick Name
<b>Sweep</b> (Fast) Continuous	-200.0			Change Save Location
Freq Ref Int Std Accy	-210.0 dBm 20.000 GHz			Change Type Setup/JPEG/
	20.000 GH2	<b>Center</b> 20.500 GHz <b>Span</b> 1.000 GHz	21.000 GHz	composit domin
Freq	Amplitude	Span	BW	Marker

Figure 3.1-6 (E) Spectrum Photos 20-21 GHz 1MHz Res BW Vertical Pol 360<sup>0</sup>

<b>/INFILSU</b> 05/01	/2015 05:44:28	am					1	4	=	Save
					_			Spectrur	n Analyzer	
Ref Lvl	M1 -166.84 c	IBm @20.499	092 558 Gi	Hz						
120.0 dBm 10.0 dB Ext Gain	–120.0 dBm									
n <b>put Atten</b> .0 dB	-130.0									
)etection 'eak	-140.0		2 3			2		6 S	°	
RBW 00 kHz	-150.0									
<b>/BW</b> 30 kHz	-160.0			r	2		÷			
<b>Sweep Time</b> 167 ms	-170.0	www.	montente	Non	Minthian	mununuu	mahahan	whatthere	Mallow	
<b>Fraces</b> A: Max Hold	-120.0									
	-180.0									Change
	-190.0									Quick Name
Sweep (Fast)								-		Change
Continuous	-200.0									Save Location
Freq Ref	-210.0 dBm									Change Type
nt Std Accy	20.000 GHz			Center 20	500 GHz			2	1.000 GHz	Setup/JPEG/
				Span 1.0						
Freq		Amplitude			Span		1	BW		Marker

Figure 3.1-6 (F) Spectrum Photos 20-21 GHz 100 kHz Res BW Vertical Pol  $360^{\circ}$ 

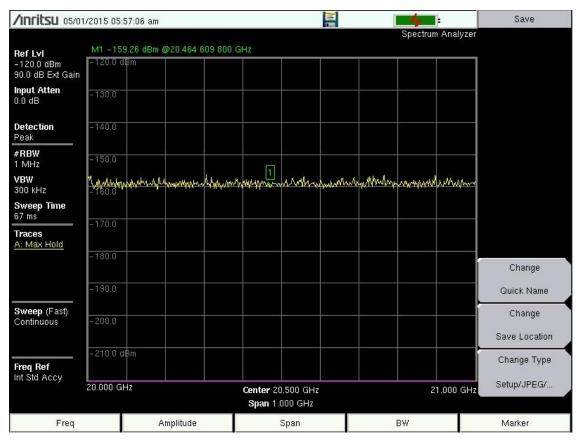


Figure 3.1-6 (G) Spectrum Photos 20-21 GHz 1 MHz Res BW Vertical Pol Worst Case

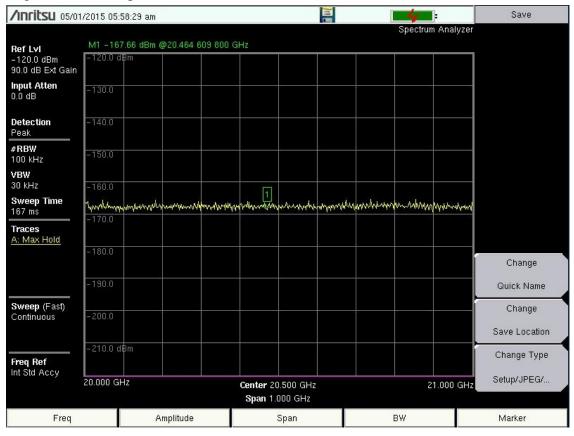


Figure 3.1-6 (H) Spectrum Photos 20-21 GHz 100 kHz Res BW Vertical Pol Worst Case

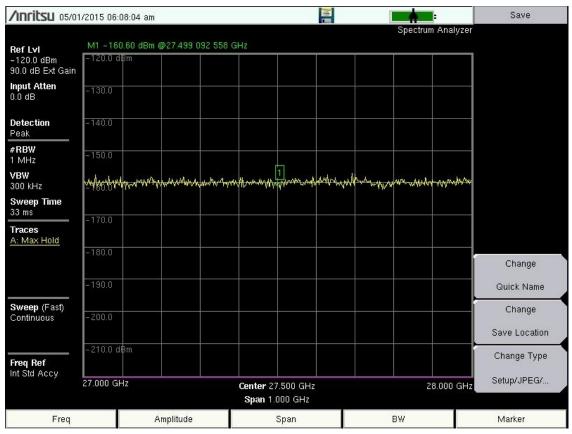


Figure 3.1-7 (A) Spectrum Photos 27-28 GHz 1MHz Res BW Horizontal Pol 360<sup>0</sup>

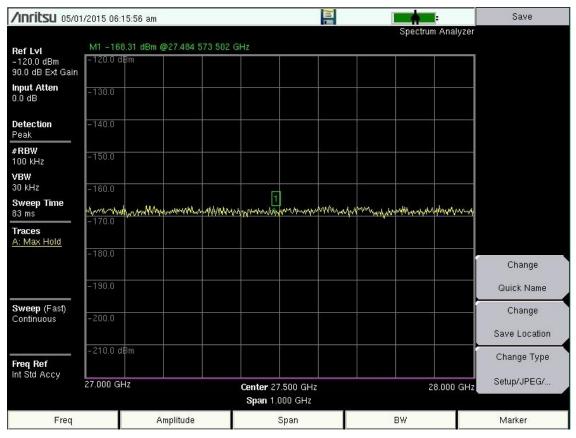


Figure 3.1-7 (B) Spectrum Photos 27-28 GHz 100 kHz Res BW Horizontal Pol 360<sup>0</sup>

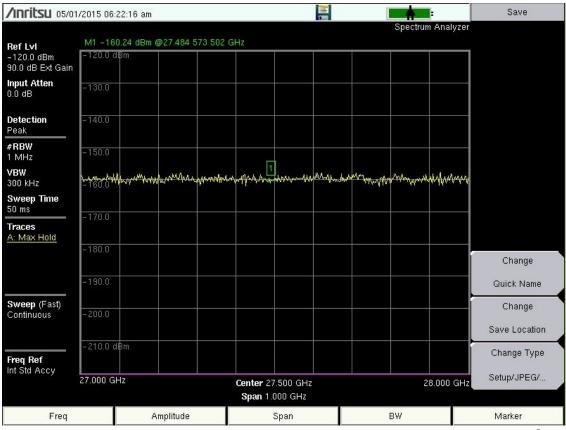


Figure 3.1-7 (C) Spectrum Photos 27-28 GHz 1MHz Res BW Vertical Pol  $\overline{360^0}$ 

	/2015 06:29:47 am			1			Save			
						Spectrum Analy:	zer			
Ref Lvl	M1 -167.93 dBm @27.513 611 615 GHz									
120.0 dBm 0.0 dB Ext Gain	–120.0 dBm						7			
n <b>put Atten</b> .0 dB	-130.0					8				
etection eak	-140.0					2				
RBW 00 kHz	-150.0	<u> </u>		· ·						
<b>'BW</b> 10 kHz	-160.0									
Sweep Time	woodnesserve to far when	a have been been allowed	Mr	1 marman market have	whether whether whether	March of a second	LA POL			
67 ms	170.0		A A MARKAN WAARANG		A	A MANA CANADA AND				
races	-170.0									
races	-170.0						Change			
races	-170.0						_			
iraces <u>A: Max Hold</u> Sweep (Fast)	-170.0 -180.0 -190.0			рания (р. 1997) 1977 — Селена Селена (р. 1997) 1977 — Селена (р. 1997)			Change			
iraces <u>A: Max Hold</u> Sweep (Fast)	-170.0						Change Quick Name			
Traces A: Max Hold Sweep (Fast) Continuous	-170.0 -180.0 -190.0						Change Quick Name Change			
races <u>:: Max Hold</u> Sweep (Fast) Continuous	-170.0 -180.0 -190.0 -200.0		Center 2	7.500 GHz		28.000 G	Change Quick Name Change Save Location Change Type			

Figure 3.1-7 (D) Spectrum Photos 27-28 GHz 100 kHz Res BW Vertical Pol 360<sup>0</sup>

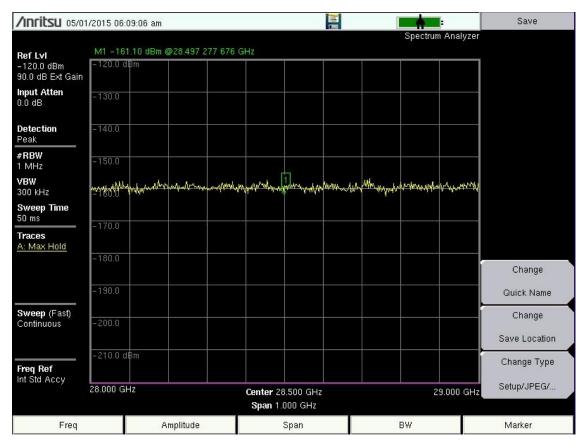


Figure 3.1-8 (A) Spectrum Photos 28-29 GHz 1MHz Res BW Horizontal Pol 360<sup>0</sup>

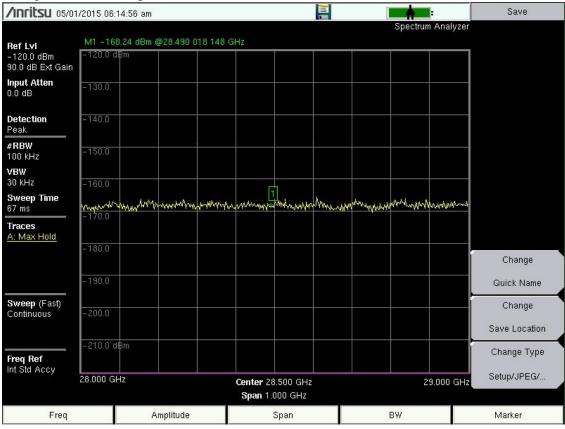


Figure 3.1-8 (B) Spectrum Photos 28-29 GHz 100 kHz Res BW Horizontal Pol 360<sup>0</sup>

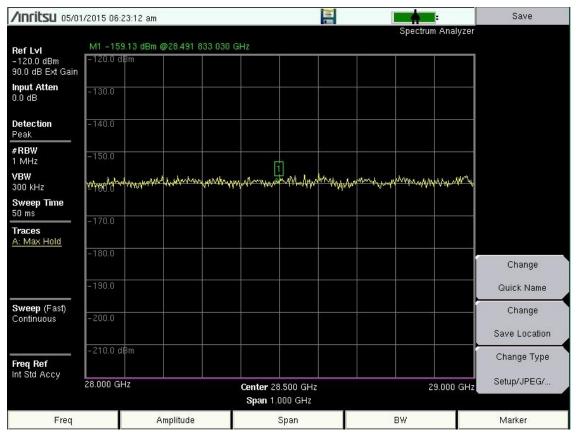


Figure 3.1-8 (C) Spectrum Photos 28-29 GHz 1MHz Res BW Vertical Pol 360<sup>0</sup>

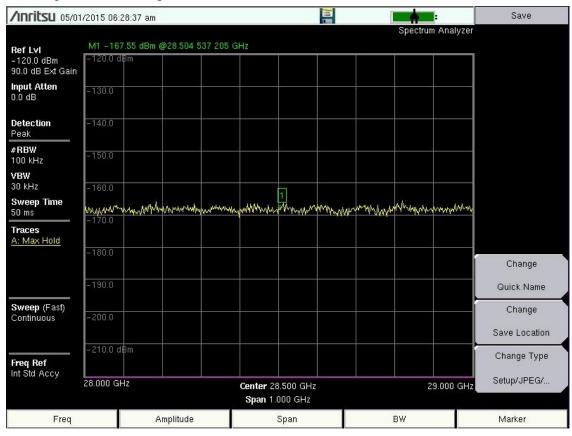


Figure 3.1-8 (D) Spectrum Photos 28-29 GHz 100 kHz Res BW Vertical Pol 360<sup>0</sup>

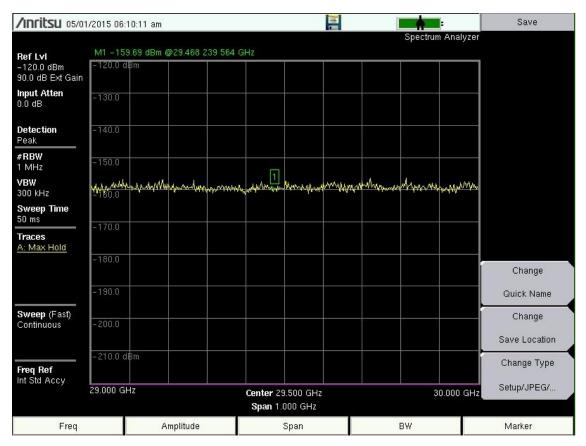


Figure 3.1-9 (A) Spectrum Photos 29-30 GHz 1MHz Res BW Horizontal Pol 360<sup>0</sup>

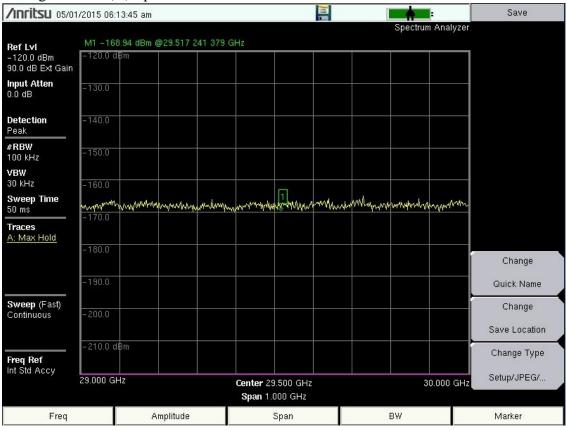


Figure 3.1-9 (B) Spectrum Photos 29-30 GHz 100 kHz Res BW Horizontal Pol 360<sup>0</sup>

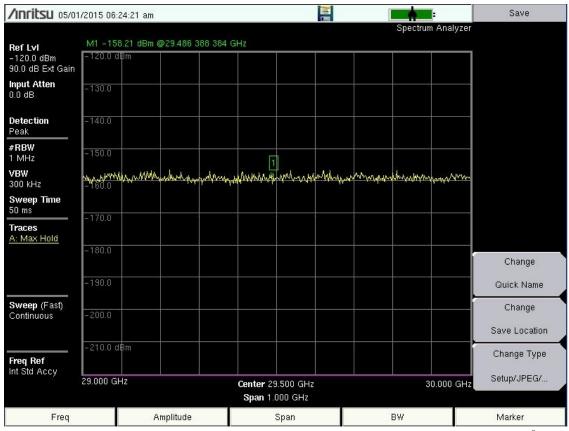


Figure 3.1-9 (C) Spectrum Photos 29-30 GHz 1MHz Res BW Vertical Pol  $360^{\circ}$ 

/Inritsu 05/01	/2015 06:27:30 am						Save			
					Spectr	um Analyzer				
lef Lvl	M1 -167.87 dBm @29.504 537 205 GHz									
120.0 dBm 0.0 dB Ext Gain	–120.0 dBm									
n <b>put Atten</b> .0 dB	-130.0					-				
etection eak	-140.0				6	-				
RBW 00 kHz	-150.0				9	<u></u>				
<b>'BW</b> 0 kHz	-160.0			-						
Sweep Time <sup>i7 ms</sup>	Munimum	www.wayawww.yw	monten	MANA WINAN	mannahum	moundation				
races A: Max Hold						oo				
	-180.0						Change			
	-190.0						Quick Name			
weep (Fast)							Change			
Continuous	-200.0						Save Location			
req Ref	-210.0 d₿m						Change Type			
nt Std Accy	29.000 GHz		<b>Center</b> 29.500 G			30.000 GHz	Setup/JPEG/			
	101201		<b>Span</b> 1.000 GH	z		10/201				
Freq	Am	plitude	Span		BW		Marker			

Figure 3.1-9 (D) Spectrum Photos 29-30 GHz 100 kHz Res BW Vertical Pol 360<sup>0</sup>

/Inritsu 05/01	/2015 06:11:28 am					-	Save
Ref Lvi	M1 -158.74 dBm	@30.517 241 379	I GHz		Spec	trum Analyzer	
-120.0 dBm 90.0 dB Ext Gain	–120.0 dBm						
Input Atten 0.0 dB	-130.0						
Detection Peak	-140.0						
#RBW 1 MHz	-150.0			<b>n</b>			
<b>VBW</b> 300 kHz	414.00 - 160.0	when when the	mudmann	monorthman	when when the marked	manya	
Sweep Time 50 ms	<u>~170.0</u>				0		
Traces <u>A: Max Hold</u>					15		
	-180.0						Change
	-190.0						Quick Name
Sweep (Fast) Continuous	-200.0						Change Save Location
Freq Ref	–210.0 dBm						Change Type
Int Std Accy	30.000 GHz		Center 30.1 Span 1.00			31.000 GHz	Setup/JPEG/
Freq		Amplitude	s	pan	BW		Marker

Figure 3.1-10 (A) Spectrum Photos 30-31 GHz 1MHz Res BW Horizontal Pol  $360^{\circ}$ 

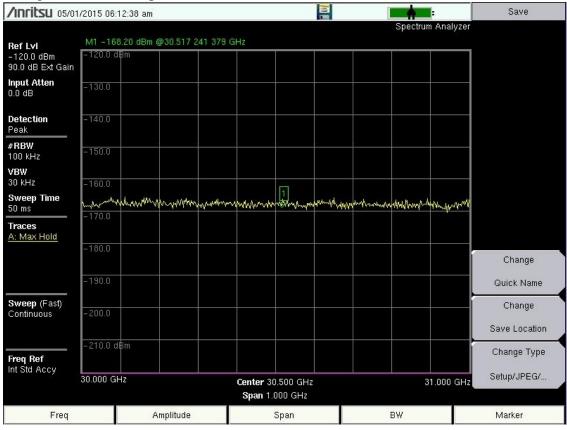


Figure 3.1-10 (B) Spectrum Photos 30-31 GHz 100 kHz Res BW Horizontal Pol 360<sup>0</sup>

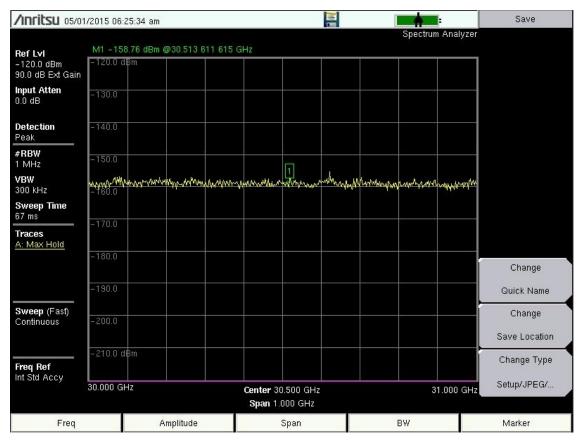


Figure 3.1-10 (C) Spectrum Photos 30-31 GHz 1MHz Res BW Vertical Pol 360<sup>0</sup>

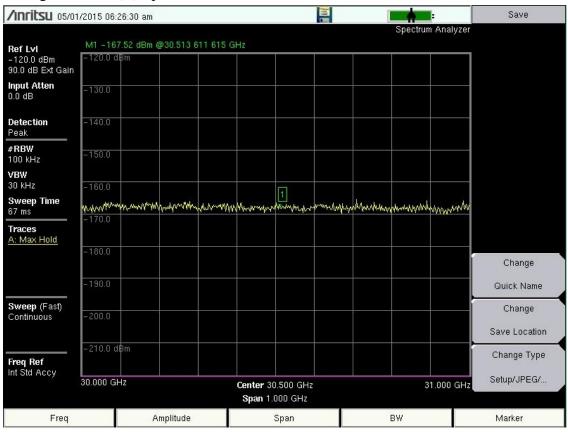


Figure 3.1-10 (D) Spectrum Photos 30-31 GHz 100 kHz Res BW Vertical Pol  $360^{\circ}$ 

# FOUR

### **SUMMARY OF RESULTS**

The results of the measurements conducted at the proposed ViaSat, Inc site in Indianapolis, IN are presented in this section.

#### Arc Clearance:

There is no potential satellite arc blockage at this site. Final arc clearance will depend on antenna placement.

#### **Ku-Band Measurements:**

There was no radio frequency interference cases measured at this site above the noise floor of the test equipment. One conflict was projected with two possible frequencies. These were not found.

**FIVE** 

#### CONCLUSIONS AND RECOMMENDATIONS

### 5.1 <u>Conclusions</u>

There was no signal measured above the -156 dBW/ 1 MHz interference objective for digital reception at this site.

The satellite arc has no potential blockage from 55W through 115W.

### 5.2 <u>Recommendations</u>

It is recommended that frequency coordination of this site be initiated to protect this location at the more stringent digital receive interference objective.