

MICROWAVE PATH SURVEY REPORT

RADIO FREQUENCY INTERFERENCE (RFI) MEASUREMENT REPORT

Prepared For

ViaSat

Nashville, TN

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

January 15, 2015

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Addendum 1

Addendum 1 not applicable to this report

ONE

INTRODUCTION AND BACKGROUND

1.1 Introduction

On-site Radio Frequency Interference (RFI) measurements were performed on behalf of ViaSat, Inc. on January 15, 2015 at their proposed site in Nashville, TN. 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

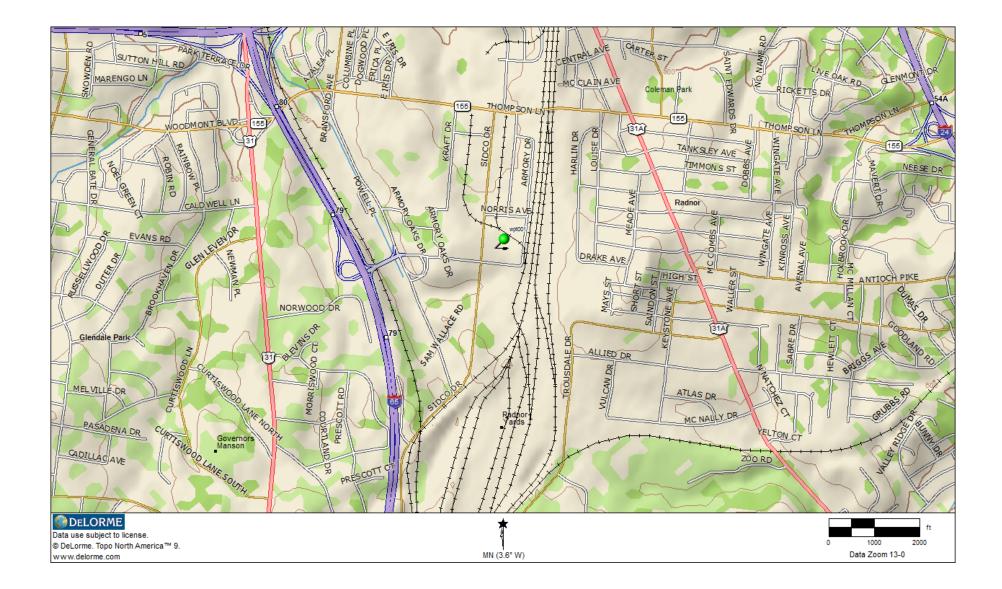
ViaSat, Inc is proposing to locate a new transmit/receive antenna at an existing location of $36^{\circ}6'$ 10.7" N and $86^{\circ}45'$ 18.7" W ViaSat, Inc had requested that Comsearch conduct RFI measurements at the facility to assess the interference potential. This facility is currently nonoperational 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.

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 θ 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.





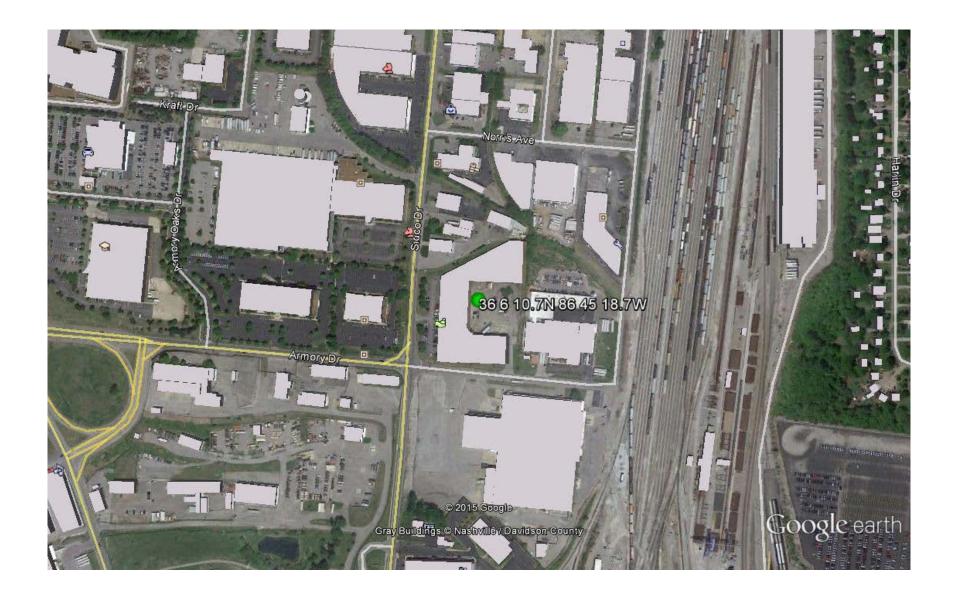


Figure 1.2-2 – Aerial Photograph



TWO

TEST PROCEDURE

2.1 Calibration

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 to 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_I) as seen at the point of test:

 $dBW_I = LI - GA - 30$

Where: $dBW_I = Isotropic level in dBW$

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_I.

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

Test Set Equipment Diagram

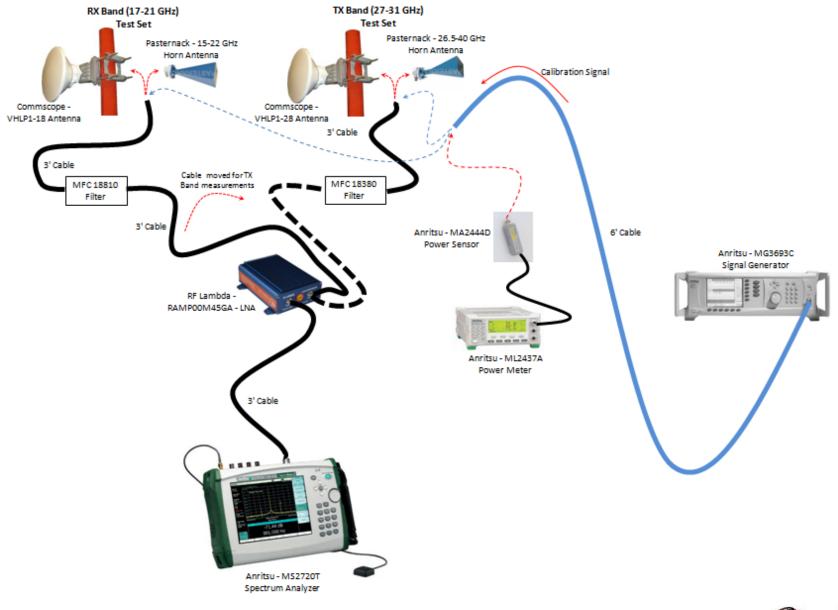




Figure 2.1-1 Receive Test Equipment Block

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Ref Lvl		0.39 dBm (@17.500 G	Hz		12			Spectrum	n Analyzer	
-120.0 dBm 90.0 dB Ext Gain	-120.0 d	iβm				1					
Input Atten 0.0 dB	-130.0										
Detection Peak	-140.0										
#RBW 1 MHz	-150.0										
VBW 300 kHz	–160.0	and water	terre and the second	a faller for the second	pagestran and and	hanner	have a start when the	Hutertown	hatrong	boorna da	
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Traces A: Max Hold	-180.0										
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- intolu Hooy	17.000 G	Hz				, 7.500 GHz .000 GHz			1	8.000 GHz	Setup/JPEG/
Freq		A	mplitude			Span			BW		Marker

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

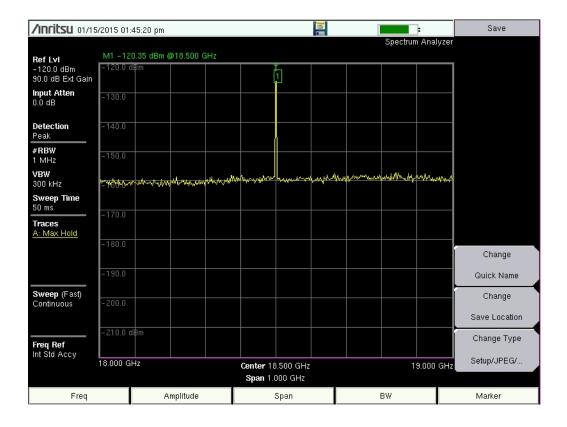


Figure 2.1-2 (B) Calibration Spectrum Photo 18.5 GHz

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Ref Lvl		9.79 dBm (@19.500 G	iHz					Spectrur	n Analyzer	r
-120.0 dBm 90.0 dB Ext Gain	-120.0 (∄Bm				1					
Input Atten 0.0 dB	-130.0										
Detection Peak	-140.0										
#RBW 1 MHz	-150.0										
VBW 300 kHz	<u></u>	nnann	Mapping	Mm.M	Virgenezaniyahan	how	when the way	manna	un mari	NYUNGAM	
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Freq		A	mplitude			Span			BW		Marker

Figure 2.1-2 (C) Calibration Spectrum Photo 19.5 GHz

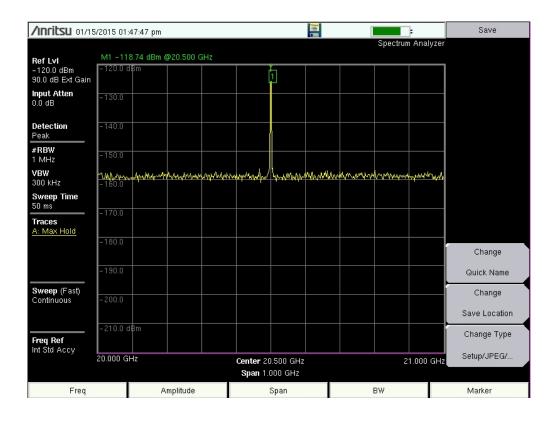


Figure 2.1-2 (D) Calibration Spectrum Photo 20.5 GHz

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Ref LvI			@27.500 @	iHz					Spectrum	n Analyzei	
–120.0 dBm 90.0 dB Ext Gain	-120.0 d	Bm				1					
Input Atten 0.0 dB	-130.0										
Detection Peak	-140.0										
#RBW 1 MHz	-150.0										
VBW 300 kHz	и_{ња с}иља - 160.0	generated	humant	Walkbrigh	. Appendiate	international provide	april a start	wannym yn	mar and the second s	eeggandad	
Sweep Time 50 ms	-170.0										
Traces A: Max Hold											
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	-190.0										Quick Name
Sweep (Fast) Continuous	-200.0										Change Save Location
	-210.0 d	Bm									
Freq Ref Int Std Accy											Change Type
	27.000 Gł	Ηz				7.500 GHz 000 GHz			2	8.000 GH:	z Setup/JPEG/
Freq		A	mplitude			Span			BW		Marker

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

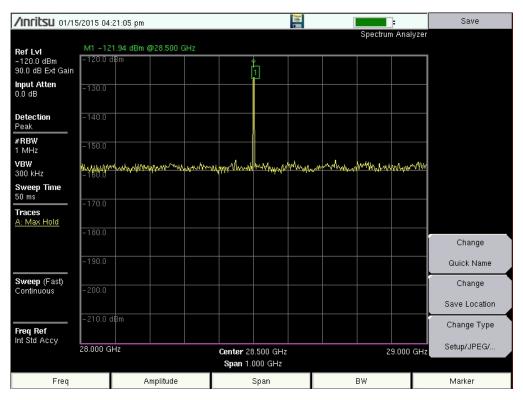


Figure 2.1-2 (F) Calibration Spectrum Photo 28.5 GHz

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Ref Lvl		1.78 dBm @	@29.500 G	Hz					Spectrur	n Analyzei	
-120.0 dBm 90.0 dB Ext Gain	-120.0 c	iBm				1					
Input Atten 0.0 dB	-130.0										
Detection Peak	-140.0										
#RBW 1 MHz	-150.0										
VBW 300 kHz	γγκ/ψγ/ \ -160.0	Martin Mar	www.www.	www.	popular production	harman	the way the	MM MARA	www.puntwo	WAR-march	
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
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	29.000 G	Hz			Center 29 Span 1.0				3	0.000 GHa	Setup/JPEG/
Freq		A	mplitude			Span			BW		Marker

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

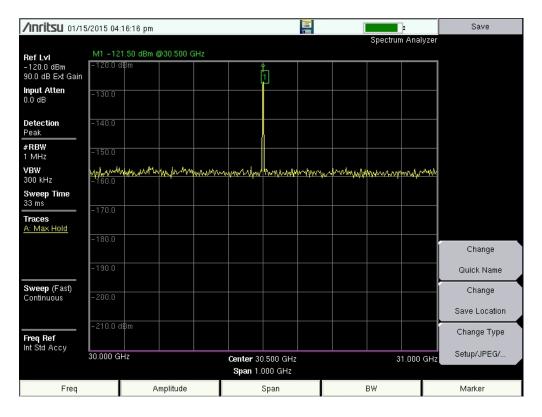


Figure 2.1-2 (H) Calibration Spectrum Photo 30.5 GHz

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 Nashville, TN

- 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:	Nashville, TN	
3.	SITE IDENTIFICATION:	Nashville	
4.	COORDINATES: (NAD 1983)	LATITUDE: LONGITUDE:	36° 6' 10.7" N 86° 45' 18.7" W
5.	GROUND ELEVATION:	177.72 feet AMS	L
6.	MEASUREMENT DATE AND TIMES:	January 15, 2015	
7.	GEOSTATIONARY ARC RANGE: SATELLITE POSITIONS: AZIMUTH: ELEVATION:	55W – 115W 133.6° – 222.4° 36.4° / 38.6°	
8.	GEOSTATIONARY ARC VISIBILITY:	Satellite arc has n	o blockage at this time



North



East



South



West



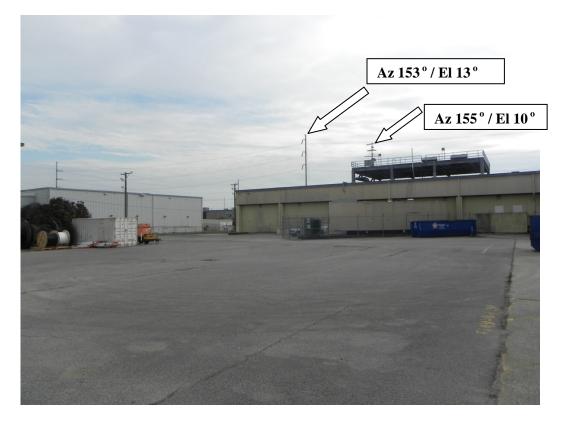


Figure 3.1-2 Horizon Photographs of Earth Station Site





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



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Ref Lvl	M1 -15		@17.500 G	iHz			1		Spectrun	n Analyzer	
–120.0 dBm 90.0 dB Ext Gain	-120.0 t	ib III									
Input Atten 0.0 dB	-130.0										
Detection Peak	-140.0										
#RBW 1 MHz	-150.0					1					
VBW 300 kHz	-160.0	www.	manaral	www.why.com	ytunnah	and the stand and the stand	mand	www.	home	and the started	
Sweep Time 50 ms	-170.0										
Traces A: Max Hold											
	-180.0										Change
	-190.0										Quick Name
Sweep (Fast) Continuous	-200.0										Change
Continuous	200.0										Save Location
Freq Ref Int Std Accy	-210.0 c	IBm									Change Type
	17.000 G	Hz				1 7.500 GHz 000 GHz			1	8.000 GHz	Setup/JPEG/
Freq		A	mplitude		•	Span			BW		Marker

Figure 3.1-3 (A) Spectrum Photos 17-18 GHz 1MHz Res BW Horizontal Pol 360⁰

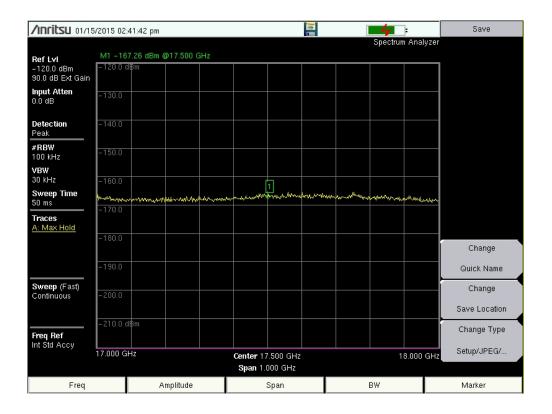


Figure 3.1-3 (B) Spectrum Photos 17-18 GHz 100 KHz Res BW Horizontal Pol 360°

	/2015 02:	:27:52 pm						[4	:	Save
Ref Lvl	M1 -15	7.79 dBm (@17.500(âHz					Spectrum	Analyzer	
-120.0 dBm 90.0 dB Ext Gain	-120.0 d	l₿m									
Input Atten 0.0 dB	-130.0										
Detection Peak	-140.0										
#RBW 1 MHz	-150.0					1					
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	-180.0										Change
	-190.0										Quick Name
Sweep (Fast) Continuous	-200.0										Change
											Save Location
F req Ref nt Std Accy	-210.0 d	i₿m									Change Type
	17.000 G	Hz				, 7.500 GHz 000 GHz			1	3.000 GHz	Setup/JPEG/
Freq		A	mplitude			Span			BW		Marker

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

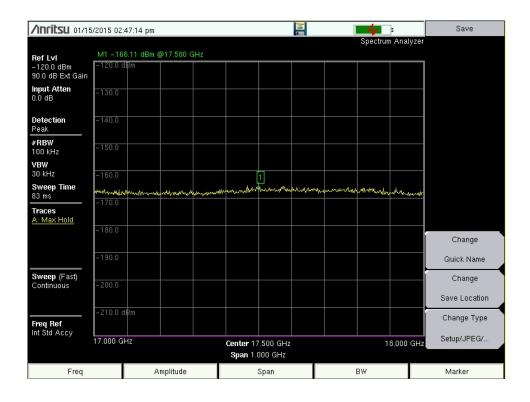


Figure 3.1-3 (D) Spectrum Photos 17-18 GHz 100 KHz Res BW Horizontal Pol Worst Case

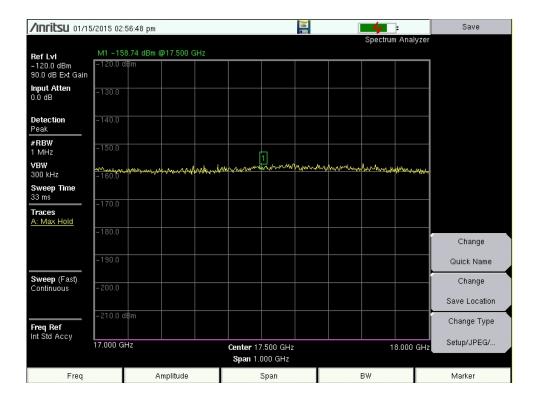


Figure 3.1-3 (E) Spectrum Photos 17-18 GHz 1MHz Res BW Vertical Pol 360°

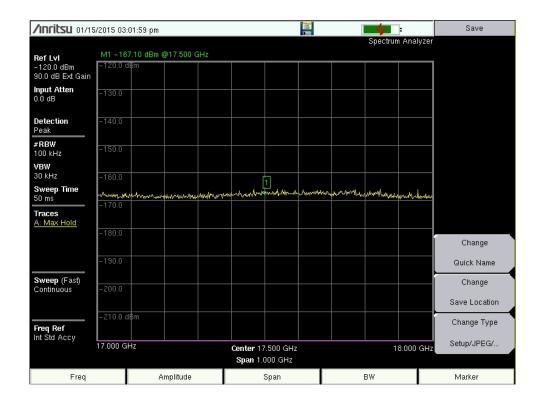


Figure 3.1-3 (F) Spectrum Photos 17-18 GHz 100 KHz Res BW Vertical Pol 360⁰

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Ref L∨I −120.0 dBm 90.0 dB Ext Gain	M1 -15	7.56 dBm (18m	⊉17.500 G	iHz					Spectrur	n Analyzer	
Input Atten 0.0 dB	-130.0										
Detection Peak	-140.0										
#RBW 1 MHz	-150.0					1					
VBW 300 kHz	<mark>√~~^⊾^₩↓</mark> -160.0	Apply marked	Mar and the	hours	munne	en frank and	hunhaya	handhan	and the state of t	www.yon	
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Traces <u>A: Max Hold</u>											
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	-190.0										Quick Name
Sweep (Fast) Continuous	-200.0										Change Save Location
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Freq		A	mplitude			Span			B₩		Marker

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

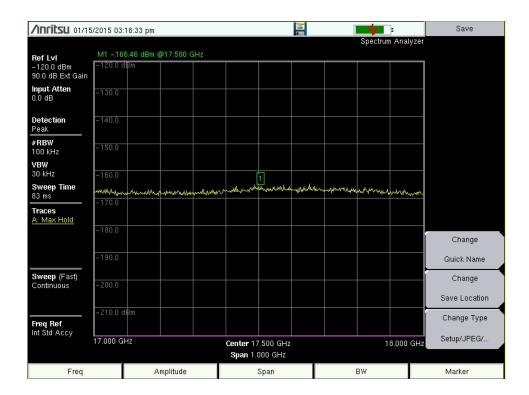


Figure 3.1-3 (H) Spectrum Photos 17-18 GHz 100 KHz Res BW Vertical Pol Worst Case

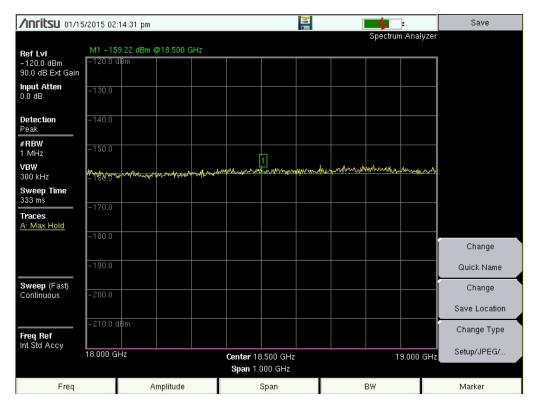


Figure 3.1-4 (A) Spectrum Photos 18-19 GHz 1 MHz Res BW Horizontal Pol 360°

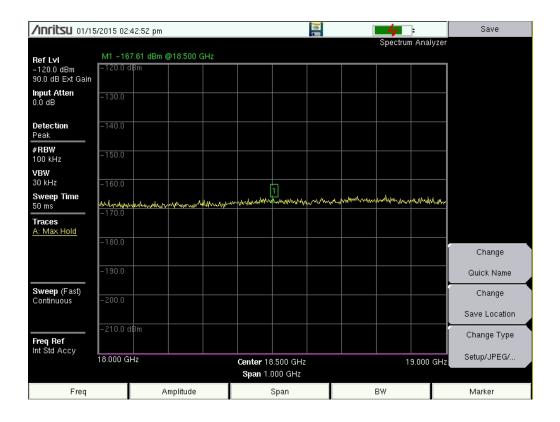


Figure 3.1-4 (B) Spectrum Photos 18-19 GHz 100 KHz Res BW Horizontal Pol 360⁰

/Inritsu 01/18	5/2015 02:	31:18 pm						[-	-	Save
Ref Lvl		8.20 dBm (@18.500 G	iHz					Spectrum	ı Analyzer	
-120.0 dBm 90.0 dB Ext Gain	-120.0 d	lBm									
Input Atten 0.0 dB	-130.0										
Detection Peak	-140.0										
#RBW 1 MHz	-150.0					1					
VBW 300 kHz	-160.0	- Marith Standay Peri	hangthere	Nr Alexant	Manno	month	man	when when the	when	n Manurely Maria	
Sweep Time 50 ms	-170.0										
Traces <u>A: Max Hold</u>	1										
	-180.0										Change
	-190.0										Quick Name
Sweep (Fast) Continuous	-200.0										Change Save Location
Freq Ref	-210.0 c	IBm									Change Type
Int Std Accy	18.000 G	Hz			Center 18 Span 1.0	 3.500 GHz 300 GHz			1	9.000 GHz	Setup/JPEG/
Freq		A	mplitude			Span			BW		Marker

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

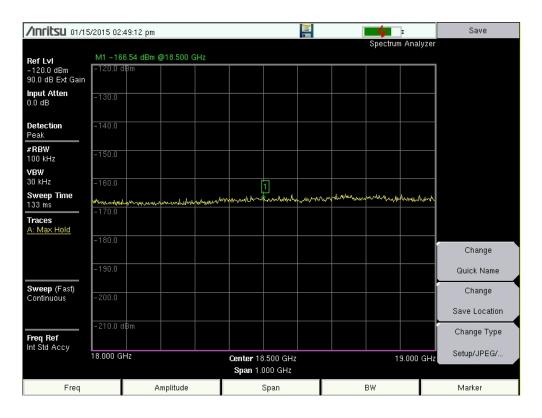


Figure 3.1-4 (D) Spectrum Photos 18-19 GHz 100 KHz Res BW Horizontal Pol Worst Case

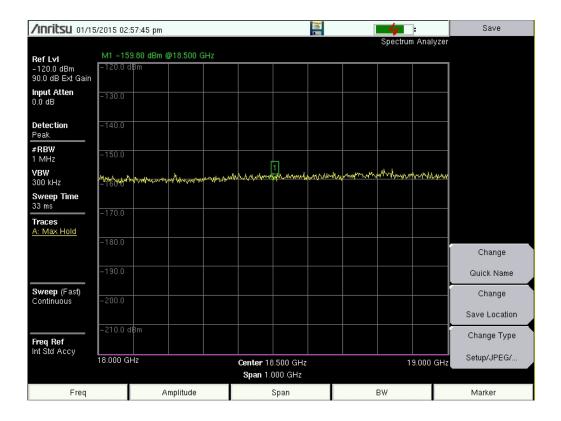


Figure 3.1-4 (E) Spectrum Photos 18-19 GHz 1 MHz Res BW Vertical Pol 360⁰

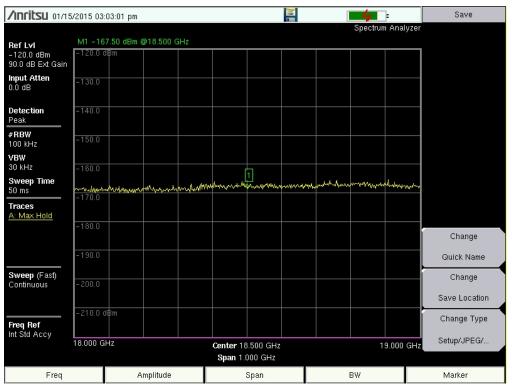


Figure 3.1-4 (F) Spectrum Photos 18-19 GHz 100 KHz Res BW Vertical Pol 360⁰

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-120.0 dBm 90.0 dB Ext Gain	- 120.0 0	a pin									
Input Atten 0.0 dB	-130.0										
Detection Peak	-140.0										
#RBW 1 MHz	-150.0					1					
VBW 300 kHz	-160.0	ahman appa	man	maywald	Maryana	WARNING	yhan May An Mar	when when	N~MN Your-tr	MANNUM.	
Sweep Time 50 ms	-170.0										
Traces <u>A: Max Hold</u>											
	-180.0										Change
	-190.0										Quick Name
Sweep (Fast) Continuous	-200.0										Change
											Save Location
Freq Ref Int Std Accy	-210.0 d										Change Type
	18.000 G	Hz			Center 18 Span 1.1				1	9.000 GHz	Setup/JPEG/
Freq		A	mplitude			Span			BW		Marker

Figure 3.1-5 (G) Spectrum Photos 18-19 GHz 1 MHz Res BW Vertical Pol Worst Case

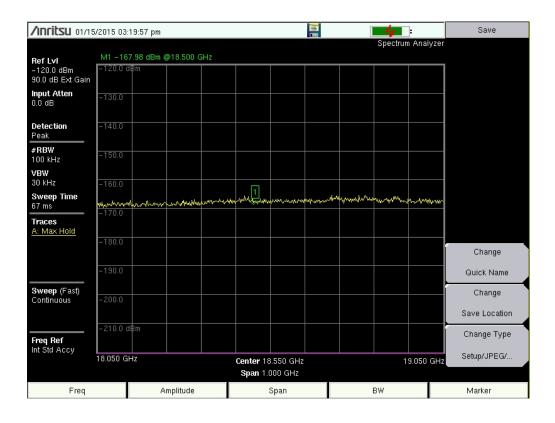
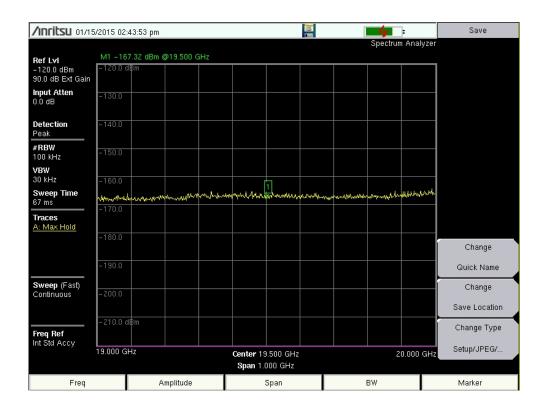


Figure 3.1-4 (H) Spectrum Photos 18-19 GHz 100 KHz Res BW Vertical Worst Case

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90.0 dB Ext Gain											
Input Atten 0.0 dB	-130.0										
Detection Peak	-140.0										-
# RBW 1 MHz	-150.0					 1					-
VBW 300 kHz	-160.0	mahador	unanderse	www.NhuH	mmumulu	yan when	White and	Munner	white	popularit	
Sweep Time 33 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 (18m									Change Type
	19.000 G	Hz			Center 19 Span 1.1	9.500 GHz 000 GHz			2	0.000 GH:	z Setup/JPEG/
Freq		A	mplitude			Span			BW		Marker

Figure 3.1-5 (A) Spectrum Photos 19-20 GHz 1MHz Res BW Horizontal Pol 360°



/Inritsu 01/15	/2015 02:	:34:31 pm]	-	:	Save
Ref Lvi -120.0 dBm	M1 - 15	8.12 dBm (1⊞m	⊉19.500 G	iHz					Spectrum	Analyzer	
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Input Atten 0.0 dB	-130.0										
Detection Peak	-140.0										
#RBW 1 MHz	-150.0			. t.		1				1 4 1.	
VBW 300 kHz	-160.0	hannester	Nhannahma	Marina Maria	Manyamana	or all all a parts	happy and the second	ywfrefigerddaur	where have a start where a start where the start where start where the start where the start where the start w	40,784,48 44741,2 64	
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Traces A: Max Hold											
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	-190.0										Quick Name
Sweep (Fast) Continuous	-200.0									i	Change
											Save Location
Freq Ref Int Std Accy	-210.0 d	18m									Change Type
	19.000 G	Hz				9.500 GHz 000 GHz			2	0.000 GHz	Setup/JPEG/
Freq		A	mplitude			Span		I	ЗW		Marker

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

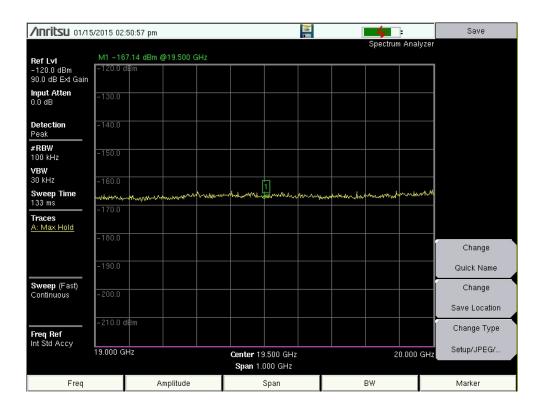


Figure 3.1-5 (D) Spectrum Photos 19-20 GHz 100 KHz Res BW Horizontal Pol Worst Case

/Inritsu 01/15	/2015 02:	:58:44 pm						[):	Save
Ref Lvi -120.0 dBm	M1 - 15	9.16 dBm (18m	@19.500 G	iHz					Spectrun	1 Analyzer	
90.0 dB Ext Gain Input Atten 0.0 dB	-130.0										
Detection Peak	-140.0										
#RBW 1 MHz	-150.0					 ก					
VBW 300 kHz	-160.0	hundred	pourtenanted	www.www.www	notherhy	na wana ang tang tang tang tang tang tang ta	hand	w-norwanger	Manha	m.Anthe Antonio	
Sweep Time 50 ms Traces A: Max Hold	-170.0										
	-180.0										Change
	-190.0										Quick Name
Sweep (Fast) Continuous	-200.0										Change Save Location
Freq Ref Int Std Accy	-210.0 (Change Type
	19.000 GHz				Center 19 Span 1.0).500 GHz 300 GHz		20.000 GHz			Setup/JPEG/
Freq		Amplitude			Span			BW			Marker

Figure 3.1-5 (E) Spectrum Photos 19-20 GHz 1MHz Res BW Vertical Pol 360⁰

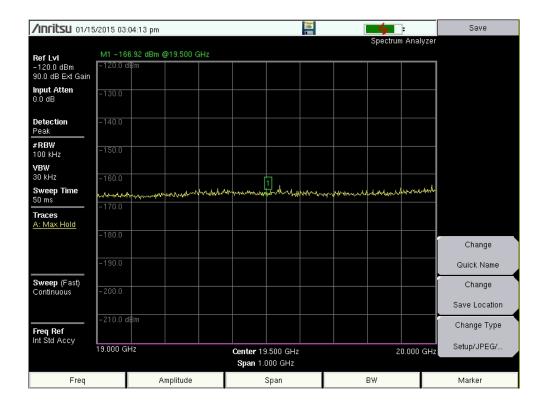


Figure 3.1-5 (F) Spectrum Photos 19-20 GHz 100 KHz Res BW Vertical Pol 360°

/inritsu 01/18	j/2015-03:	13:24 pm						[4	-	Save
Ref Lvl		8.48 dBm (⊉19.500 G	iHz					Spectrum	ı Analyzer	
-120.0 dBm 90.0 dB Ext Gain	-120.0 d	18m									
Input Atten 0.0 dB	-130.0										
Detection Peak	-140.0										
#RBW 1 MHz	-150.0					 1					
VBW 300 kHz	-160.0	homen	ndan	pather and the second	haman	endharthartha	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	manna	nanguala	n-MMM	
Sweep Time 50 ms	170.0										
Traces <u>A: Max Hold</u>	-170.0										
	-180.0										Change
	-190.0										Quick Name
Sweep (Fast) Continuous	-200.0										Change Save Location
Freq Ref	-210.0 0	iBm									Change Type
Int Std Accy	19.000 GHz				Center 19.500 GHz Span 1.000 GHz			20.000 GHz			Setup/JPEG/
Freq		Amplitude			Span			BW			Marker

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

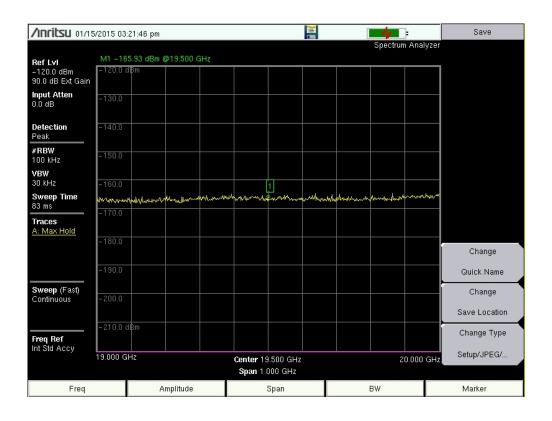


Figure 3.1-5 (H) Spectrum Photos 19-20 GHz 100 KHz Res BW Vertical Pol Worst Case

/Inritsu 01/18	/2015 02:1	18:07 pm						[4	•	Save
Ref L∨I -120.0 dBm 90.0 dB Ext Gain	M1 -159 -120.0 d	9.42 dBm (Bm	@20.500 G	âHz					Spectrun	n Analyzer	
Input Atten 0.0 dB	-130.0										
Detection Peak	-140.0										
#RBW 1 MHz	-150.0					20					
VBW 300 kHz	1400 - 160.0	mpuston	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Multure	harman	an muray	pproversition franks	MinyAnda	apartepoder	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
Sweep Time 83 ms	-170.0										
Traces <u>A: Max Hold</u>											
	-180.0										Change
	-190.0										Quick Name
Sweep (Fast) Continuous	-200.0										Change
Freq Ref	-210.0 d	Bm									Save Location Change Type
Int Std Accy	20.000 Gł	l Hz			Center 20 Span 1.).500 GHz 000 GHz			2	1.000 GHz	Setup/JPEG/
Freq		A	mplitude			Span			BW		Marker

Figure 3.1-6 (A) Spectrum Photos 20-21 GHz 1MHz Res BW Horizontal Pol 360^{0}

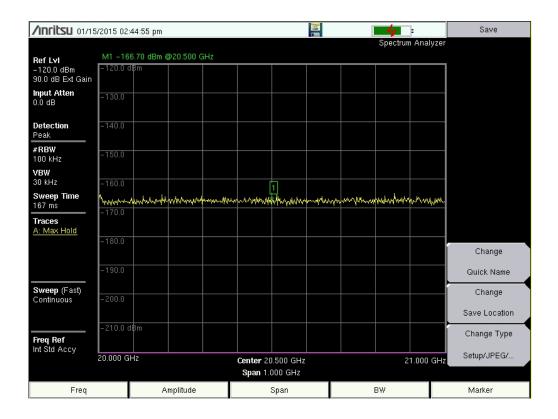


Figure 3.1-6 (B) Spectrum Photos 20-21 GHz 100 KHz Res BW Horizontal Pol 360°

/Inritsu 01/15	/2015 02:	37:37 pm						[-	ŧ	Save
Ref Lvl	M1 -15	7.41 dBm (IPm	⊉20.500 G	iHz					Spectrun	n Analyzer	
-120.0 dBm 90.0 dB Ext Gain	-120.0 (і р іні									
Input Atten 0.0 dB	-130.0										
Detection Peak	-140.0										
#RBW 1 MHz	-150.0					1					
VBW 300 kHz	-160.0	mmuni	hannah	www.www	manywyeuw	ennowh	production	nhha-mhhainh	An Martin	mumm	
Sweep Time 83 ms	-170.0										
Traces A: Max Hold											
	-180.0										Change
	-190.0										Quick Name
Sweep (Fast) Continuous	-200.0										Change
Continuous											Save Location
Freq Ref Int Std Accy	-210.0 c	IBm									Change Type
	20.000 G	Hz).500 GHz 000 GHz			2	1.000 GHz	Setup/JPEG/
Freq		A	mplitude			Span			BW		Marker

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

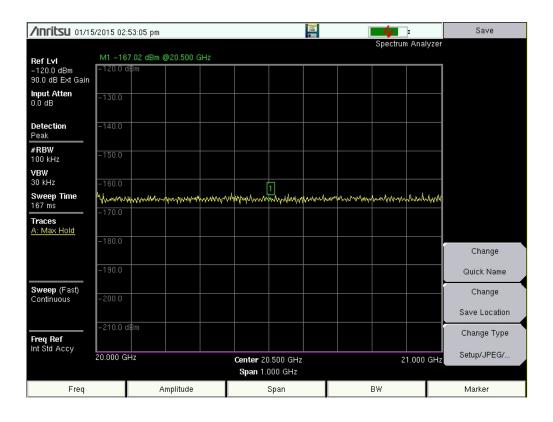


Figure 3.1-6 (D) Spectrum Photos 20-21 GHz 100 KHz Res BW Horizontal Pol Worst Case

/INCIESU 01/18	5/2015 03:	00:00 pm						[-	•	Save
Ref Lvl		8.49 dBm (⊉20.500 G	iHz					Spectrun	n Analyzer	,
-120.0 dBm 90.0 dB Ext Gain	-120.0 d	iBm									
Input Atten 0.0 dB	-130.0										
Detection Peak	-140.0										
#RBW 1 MHz	-150.0					1					
VBW 300 kHz	΄ μηταγμη - 160.0	Manapatra	endered	WWWWHW	hopewoodylawywa	and properties	Apraphy	mannan	manan	ymawn	
Sweep Time 50 ms	-170.0										
Traces <u>A: Max Hold</u>											
	-180.0										Change
	-190.0										Quick Name
Sweep (Fast) Continuous	-200.0										Change
	-210.0 c	10									Save Location
Freq Ref Int Std Accy											Change Type
	20.000 G	Hz			Center 20 Span 1.0).500 GHz 000 GHz			2	1.000 GHz	Setup/JPEG/
Freq		A	mplitude			Span		BW			Marker

Figure 3.1-6 (E) Spectrum Photos 20-21 GHz 1MHz Res BW Vertical Pol 360^{0}

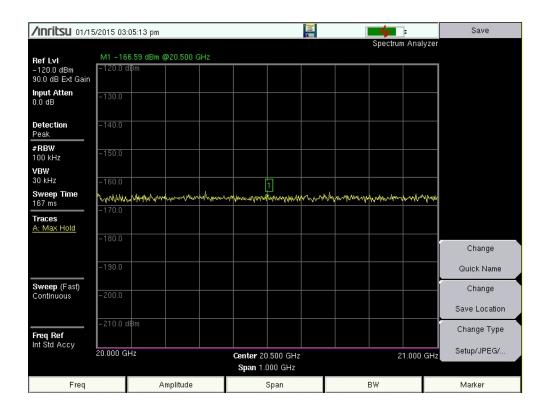


Figure 3.1-6 (F) Spectrum Photos 20-21 GHz 100 KHz Res BW Vertical Pol 360⁰

/INCIESU 01/15	5/2015-03:	:15:49 pm						[4		Save
Ref Lvl -120.0 dBm	M1 - 15	7.30 dBm (18m	₽20.500 G	iHz					Spectrum) Analyzer	
90.0 dB Ext Gain Input Atten 0.0 dB	-130.0										
Detection Peak	-140.0										
#RBW 1 MHz	-150.0					1.					
VBW 300 kHz	Wyr/WW/ -160.0	whenwhen	vinana	www.hava	Manyanta	egalinterrow w	water m	Myhmudu	ntrana	wortherwood	
Sweep Time 50 ms											
Traces <u>A: Max Hold</u>	-170.0										
	-180.0										Change
	-190.0										Quick Name
Sweep (Fast) Continuous	-200.0										Change
Freq Ref	-210.0 c	18m									Save Location Change Type
Int Std Accy	20.000 G	Hz			Center 20 Span 1.1).500 GHz 000 GHz			2	1.000 GHz	Setup/JPEG/
Freq		A	mplitude		•	Span			BW		Marker

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

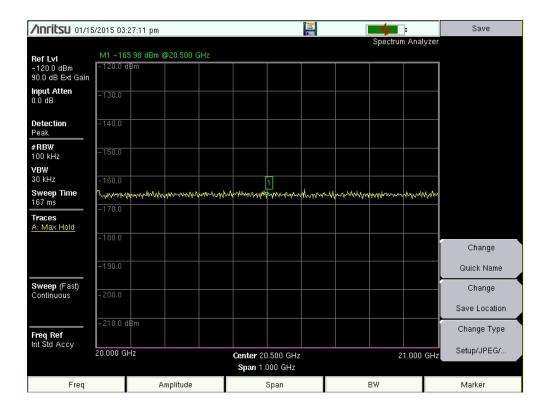


Figure 3.1-6 (H) Spectrum Photos 20-21 GHz 100 KHz Res BW Vertical Pol Worst Case

/Inritsu 01/15	i/2015 03:	39:22 pm						[4		Save
Ref LvI		9.45 dBm (@27.500 G	iHz					Spectrun	n Analyzer	
-120.0 dBm 90.0 dB Ext Gain	-120.0 d	lBm									
Input Atten 0.0 dB	-130.0										
Detection Peak	-140.0										
#RBW 1 MHz	-150.0					<u> </u>					
VBW 300 kHz	₩ <u>₩₩₩</u> -160.0	hannada	wanadada.	man	xatyuutahhyai	and any and	Marria Marriage	within where	Managanan	www.phi	
Sweep Time 33 ms	-170.0										
Traces A: Max Hold											
	-180.0										Change
	-190.0										Quick Name
Sweep (Fast) Continuous	-200.0										Change
Commoda	200.0										Save Location
Freq Ref Int Std Accy	-210.0 c	IBm									Change Type
	27.000 G	Hz				, 7.500 GHz 000 GHz			2	8.000 GHz	Setup/JPEG/
Freq		A	mplitude		Span			BW			Marker

Figure 3.1-7 (A) Spectrum Photos 27-28 GHz 1MHz Res BW Horizontal Pol 360⁰

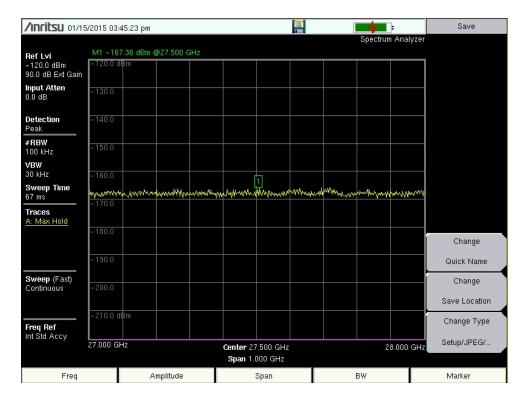


Figure 3.1-7 (B) Spectrum Photos 27-28 GHz 100 KHz Res BW Horizontal Pol 360⁰

/Inritsu 01/18	i/2015 03:	53:29 pm						[-	:	Save
Ref Lvi -120.0 dBm	M1 -16	0.08 dBm (1871 m	@27.500 G	iHz					Spectrur	n Analyzer	
90.0 dB Ext Gain											
Input Atten 0.0 dB	-130.0										
Detection Peak	-140.0										
#RBW 1 MHz	-150.0										
VBW 300 kHz	\nl<u>\</u>	and the second	WWWWWWW	yn ar fer ar	ay polana	and way and	h ^{ard} wedgenere	MUMAN	human	bugg-dapted	
Sweep Time 67 ms	-170.0										
Traces <u>A: Max Hold</u>											
	-180.0										Change
	-190.0										Quick Name
Sweep (Fast) Continuous	-200.0										Change
											Save Location
Freq Ref Int Std Accy	-210.0 c	IBm									Change Type
int old Hooy	27.000 G	Hz				7.500 GHz 000 GHz			2	8.000 GHz	Setup/JPEG/
Freq		A	mplitude		Span				BW	Marker	

Figure 3.1-7 (C) Spectrum Photos 27-28 GHz 1MHz Res BW Vertical Pol 360⁰

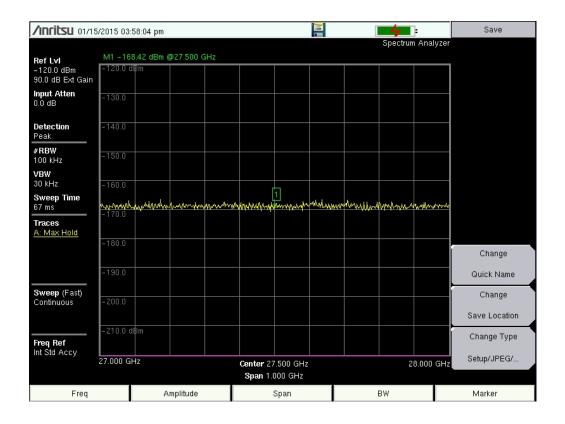


Figure 3.1-7 (D) Spectrum Photos 27-28 GHz 100 KHz Res BW Vertical Pol 360⁰

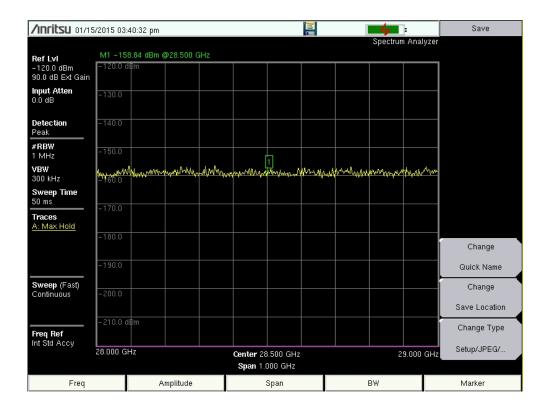


Figure 3.1-8 (A) Spectrum Photos 28-29 GHz 1MHz Res BW Horizontal Pol 360⁰

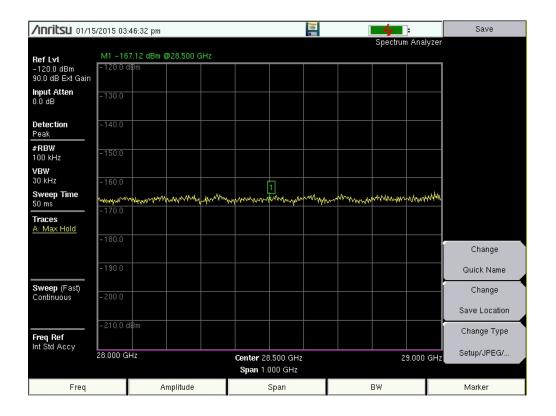


Figure 3.1-8 (B) Spectrum Photos 28-29 GHz 100 KHz Res BW Horizontal Pol 360⁰

/Inritsu 01/15	/2015-03:	:54:25 pm							-	:	Save
Ref L∨I -120.0 dBm 90.0 dB Ext Gain	M1 -15 -120.0 d	7.97 dBm (18m	@28.500 C	GHz					Spectrur	n Analyzer	
Input Atten 0.0 dB	-130.0										
Detection Peak	-140.0										
#RBW 1 MHz	-150.0					1					
VBW 300 kHz	<u>v~~4</u> √₩ -160.0	-nayy danna	Winnyh	app	m man	Server way	manpp	mana	www.awara	man	
Sweep Time 67 ms Traces <u>A: Max Hold</u>	-170.0										
	-190.0										Change Quick Name
Sweep (Fast) Continuous	-200.0										Change
Freq Ref Int Std Accy	-210.0 c	18m									Save Location Change Type
The Sta Accy	28.000 G	Hz			Center 28 Span 1.1	3.500 GHz 000 GHz	I		2	9.000 GHz	Setup/JPEG/
Freq		А	mplitude			Span			BW		Marker

Figure 3.1-8 (C) Spectrum Photos 28-29 GHz 1MHz Res BW Vertical Pol 360°

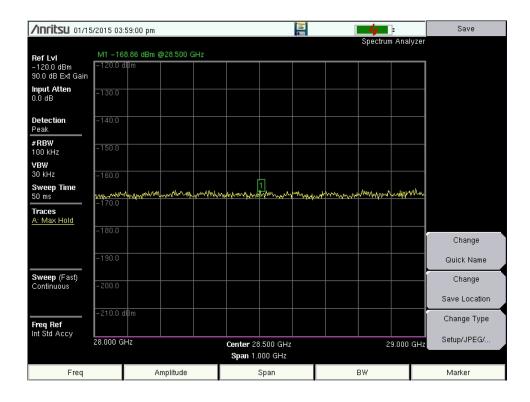


Figure 3.1-8 (D) Spectrum Photos 28-29 GHz 100 KHz Res BW Vertical Pol 360⁰

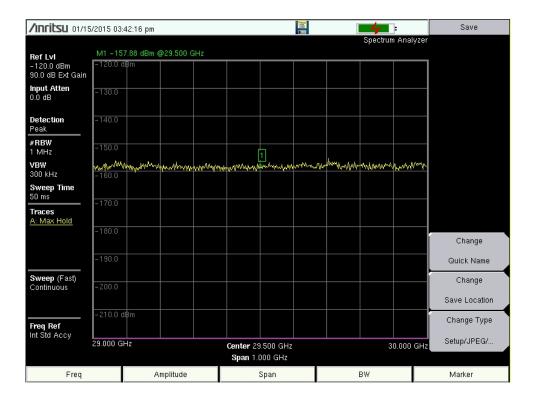


Figure 3.1-9 (A) Spectrum Photos 29-30 GHz 1MHz Res BW Horizontal Pol 360⁰

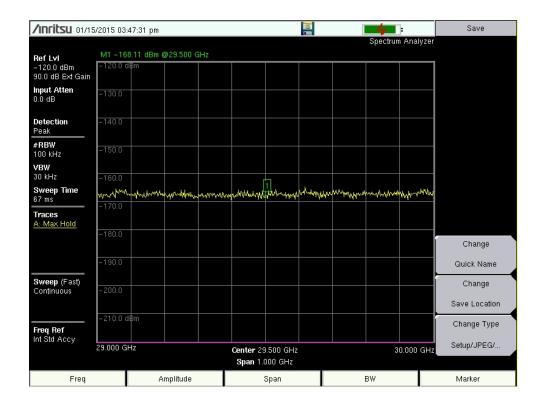


Figure 3.1-9 (B) Spectrum Photos 29-30 GHz 100 KHz Res BW Horizontal Pol 360⁰

/INCIESU 01/15	5/2015-03:	55:23 pm					1	[4		Save
Ref Lvi	M1 -15	7.80 dBm	@29.500 (GHz					Spectrun	1 Analyzer	
-120.0 dBm 90.0 dB Ext Gain	-120.0 d	Bm									
n put Atten 1.0 dB	-130.0										
)etection Peak	-140.0										
RBW MHz	-150.0					1					
/BW :00 kHz	-160.0	Mann	month.	ainantitys	skallennes	innumli	v~W~y~~~	WWW.WWWWW	WYWW-M	www	
weep Time O ms	-170.0										
races : Max Hold											
	-180.0									Í	Change
	-190.0										Quick Name
weep (Fast) ontinuous	-200.0										Change Save Location
req Ref	-210.0 d	Bm									Change Type
t Std Accy	29.000 GI	Hz			Center 29 Span 1.1	9.500 GHz 000 GHz			3	0.000 GHz	Setup/JPEG/
Freq		A	mplitude			Span			BW		Marker

Figure 3.1-9 (C) Spectrum Photos 29-30 GHz 1MHz Res BW Vertical Pol 360⁰

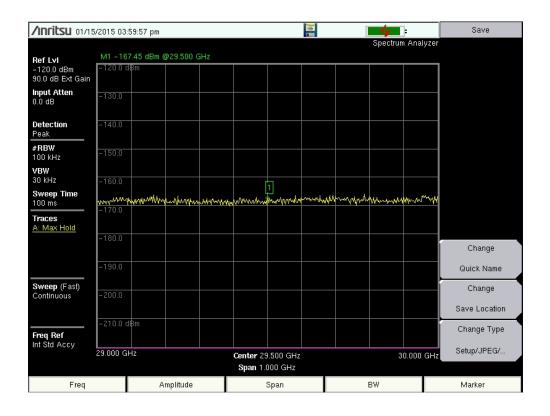


Figure 3.1-9 (D) Spectrum Photos 29-30 GHz 100 KHz Res BW Vertical Pol 360°

/Inritsu 01/15	/2015 03:	56:43 pm							4		Save
Ref Lvi -120.0 dBm	M1 -15	9.07 dBm (IBm	@30.500 G	âHz					Spectrum	Analyzer	
90.0 dB Ext Gain Input Atten 0.0 dB	-130.0										
Detection Peak	-140.0										
#RBW 1 MHz	-150.0					1					
VBW 300 kHz	-160.0	and the second second	www.ww	h warden	Mahan	and mark	www.unit	halpping	ndywelyndyw	mprepete	
Sweep Time 50 ms Traces A: Max Hold	-170.0										
	-180.0										Change
0	-190.0										Quick Name
Sweep (Fast) Continuous	-200.0										Change Save Location
Freq Ref Int Std Accy	-210.0 c	IBm									Change Type
	30.000 G	Hz			Center 30 Span 1.).500 GHz 000 GHz			3	1.000 GHz	Setup/JPEG/
Freq		A	mplitude			Span			BW		Marker

Figure 3.1-10 (A) Spectrum Photos 30-31 GHz 1MHz Res BW Horizontal Pol 360⁰

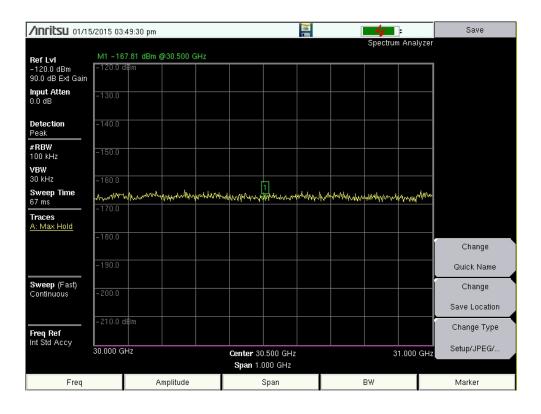


Figure 3.1-10 (B) Spectrum Photos 30-31 GHz 100 KHz Res BW Horizontal Pol 360⁰

/Inritsu 01/15	/2015 03:	56:43 pm						[4		Save
Ref L∨l -120.0 dBm 90.0 dB Ext Gain	M1 -15 -120.0 d	9.07 dBm (IBm	@30.500 G	iHz					Spectrum	n Analyze	1
Input Atten 0.0 dB	-130.0										
Detection Peak	-140.0										
#RBW 1 MHz	-150.0										
VBW 300 kHz	4444	and the second	hmm	hundroph	when	www.www.w	www.	hudephan	polynolyn	mpropol	l.
Sweep Time 50 ms	-170.0										
Traces A: Max Hold											
	-180.0										Change
	-190.0										Quick Name
Sweep (Fast) Continuous	-200.0										Change
	-210.0 c	IB m									Save Location
Freq Ref Int Std Accy	-210.00	ioni									Change Type
	30.000 G	Hz				0.500 GHz 000 GHz			3	1.000 GH	z Setup/JPEG/
Freq		Amplitude				Span		BW			Marker

Figure 3.1-10 (C) Spectrum Photos 30-31 GHz 1 GHz Res BW Vertical Pol 360⁰

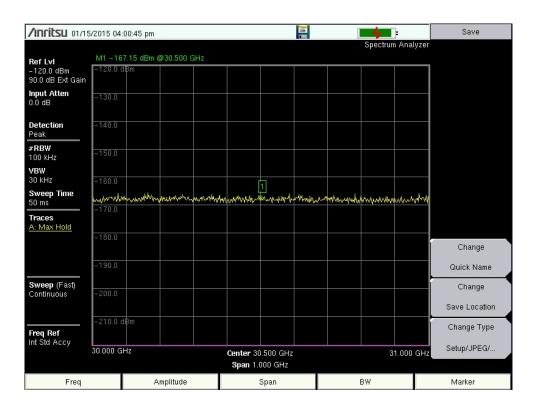


Figure 3.1-10 (D) Spectrum Photos 30-31 GHz 100 KHz Res BW Vertical Pol 360°

FOUR

SUMMARY OF RESULTS

The results of the measurements conducted at the proposed ViaSat, Inc site in Nashville, TN 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.

FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 <u>Conclusions</u>

There were no signals 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.