



DETAILED INTERFERENCE ANALYSIS REPORT

Transmit/Receive Earth Station

Prepared For
Moynk Properties, LLC
Kapolei, Hawaii
Transmit/Receive Earth Station

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SECTION 1

INTRODUCTION

Transmit/Receive Earth Station

This report presents the results of a detailed interference analysis for the proposed S-band uplink earth station. The site was selected by Moynk Properties and is located in Kapolei, Hawaii.

The analysis was performed for a 5.4 meter antenna. The long term interference objective at 2 GHz, was -154 dBW/4 kHz.

The earth station was analyzed for transmission of data traffic down to a minimum elevation of 5 degrees.

This detailed interference analysis is meant to provide an estimate of potential interference at this location, and to recommend a course of future action.

SECTION 2

REPORT CONTENTS AND PROCEDURES

Transmit/Receive Earth Station

This section describes the contents of the report for the proposed S-band transmit earth station.

Section 1 describes the site location, the antenna considered, and the system parameters considered in the detailed interference analysis. The analysis was undertaken to determine the potential for microwave interference for the transmit earth station at the site specified.

Initially, a computer analysis of this site was performed to determine the extent of potential interference on a line-of-sight (LOS) basis. This analysis considers the microwave environment with respect to the earth station and calculates predicted signal levels between these systems. Paths that exceed a given objective level are listed for further analysis. The objective levels present the maximum interference levels allowed between the earth station and the surrounding terrestrial microwave environment for the frequency band of interest.

To further analyze the effect of the predicted interference conflicts, terrain path profiles were prepared for the critical cases. This involves plotting the interference path on topographic maps, typically 7.5 minute series U.S.G.S. maps, to determine the terrain characteristics of the path. Once this has been accomplished, predicted over-the-horizon (O-H) losses are calculated using the techniques of the National Bureau of Standards Technical Note 101 (Revised).

These calculations give the amount of signal attenuation achieved due to terrain blockage.

Section 3 summarizes the results of the site analysis. This summary includes the number of cases that were considered, the interference cases that remain, and the proposed resolution of the interference problems.

Table 3.1-1 lists the Great Circle interference cases and the predicted O-H losses calculated on the various 2 GHz paths, respectively. If multiple analyses are considered, such as changes in satellite arc or antenna, the results are presented in Tables 3.1-1.1, 3.1-1.2, 3.2-1.1, 3.2-1.2, etc.....

A brief explanation of the various columns shown in Table 3.1-1 follows:

PATH ID: This is the predicted interference path. The first site listed is the receiver at 2 GHz.

BAND: This shows the frequency plan of the interfering paths. The 2 GHz paths affect transmission of the uplink.

DIST: This is the distance from the earth station to the terrestrial station in kilometers.

AZ: This is the azimuth bearing in degrees (taken from True North), from the earth station toward the terrestrial station.

ES DISC: This is the earth station discrimination angle in degrees, towards the involved terrestrial facility.

ES GAIN: This is the gain of the earth station in dBi, at the calculated earth station discrimination angle.

LOS LOSS REQ'D: This is the amount of loss required in dB, on a line-of-sight basis, to meet the interference objective.

O-H LOSS: This is the calculated over-the-horizon (O-H) losses in dB, between the earth station and the involved terrestrial station. The 20 percent column represents losses for the long term objective. The 0.0025 and .01 percent columns present the losses for the short term objective at 18 GHz.

REVISED MARGIN: This is the difference between the LOS margin and the predicted O-H losses achieved due to terrain blockage. Sufficient attenuation is calculated for the paths, which show the word "CLEAR" in the revised margin. Cases showing a positive revised margin will require additional losses to meet the interference objective.

The information listed at the bottom of the table reflects the antennas, satellite arc, and interference objectives considered for the proposed site.

Section 4 presents conclusions and recommendations. It gives an overall description of the microwave environment and suggests a future course of action.

Table 5.1-1 contains the operational parameters for the proposed earth station.

Figure 5.1-1 indicates the location of the site analyzed. This location should be verified. **If it is not the desired site, Comsearch should be notified immediately so that the precise location can be analyzed.**

SECTION 3

SUMMARY AND RESULTS

The detailed interference analysis for the proposed earth station site to be located in Kapolei, Hawaii revealed that multiple potential interference conflicts exist in the 2 GHz band with TV Auxiliary Broadcast users. This is based on a search of the Comsearch database and of those 2 GHz paths that had been filed for license at the FCC. Table 3.1-1 provides a summary of all the cases considered in this analysis.

It should be noted however, these are only referenced sites from FCC licensing efforts and do not consider temporary mobile locations that local Auxiliary Broadcasters may use in their ENG operations. The local Broadcasters operate on distinct channel plans identified below.

<u>Channel</u>	<u>(MHz)</u>	<u>(MHz)</u>	<u>(MHz)</u>
1	2025.0	2037.4	12.4
2	2037.4	2049.5	12.1
3	2049.5	2061.6	12.1
4	2061.6	2073.7	12.1
5	2073.7	2085.8	12.1
6	2085.8	2097.9	12.1
7	2097.9	2110.0	12.1

Based on this information, the Kapolei uplink may affect Broadcaster operation on all channels.

SECTION 4

CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

Based on the results of the detailed interference analysis, four direct potential cases of interference were identified to fixed locations operating on receive channels that would be affected by the proposed uplink frequencies of 2025 - 2110 MHz. Potential interference conflicts to mobile ENG locations operated by local Auxiliary Broadcasters could present a problem depending on the areas of operation reported by the individual Broadcasters.

The initial contact with the local Broadcasters operating near the Boardman earth station facility during the frequency coordination of this site may identify additional areas of concern. Moynk Properties may receive opposition from the local Broadcasters based on previous coordination efforts in this band and possible requests from the Broadcasters for on-site testing between the proposed earth station site and the areas identified by the local Broadcasters.

4.2 Recommendations

It is recommended that Moynk Properties review the operating parameters of the proposed uplink and determine whether any modifications to transmit power, uplink frequency range or minimum elevation angle can be tolerated to lessen the impact on local 2 GHz Auxiliary Broadcast receiver locations.

It is also recommended that frequency coordination be initiated to allow for adequate time in resolving potential interference conflicts with local Broadcasters.

Table 4.1-1

Great Circle Interference Conflicts
09/10/2018

Earth Station Name	KAPOLEI, HI										
Owner	Moynk Properties										
Latitude (DMS) (NAD83)	21	20	11.5	N							
Longitude (DMS) (NAD83)	158	5	23.7	W							
Ground Elevation (ft/m)	128.48 /		39.16 Amsl								
Antenna Centerline (ft/m)	12.00 /		3.66 Agl								
Antenna Model	ViaSat 5.4 meter										
Objectives: Transmit	-154.0 (dBW /4 kHz)		Tx Power	9.8 (dBW/4 kHz)							

	Terrestrial Path		Gnd	Edisct	Ges	FsLoss	Dist	Pr	Tpwr	Plan
Latitude	Longitude	Call Sign	Acl	Tdisct	Gts	Tant	Az	Margin	LL	
Owner	Loading									
Freq/Pol										
1	TEMPY RX	HITEMPY LOC	HI	0.00	74.5	10.0	127.1	26.9-87.3	0.0	BS
	21 17 27 157 50	8 RXONLY		6.10	289.8	20.0	O20000	100.8	66.7	0.0
	NEXMID: <u>NEXSTAR BROADCASTING, INC.</u>					1	CH	FMV	RCN:	
	1990.0000B	2025.0000B	2042.0000B	2450.0000B	2467.0000B	2484.0000B				
	Status: L		Equipment: AB0199 Emission: 17M0F9W							
	OH LOSS 20% / 0.0025%:		18.70 / 13.00							
7	MT HALEAKALAHI2005	KAILIA	HI	2952.60	78.0	10.0	144.6	202.4-92.1	0.0	BT
	20 42 22 156 15 44	RXONLY		3.35	358.9	32.7	A24203	109.8	61.9	0.0
	KHNFV: <u>KHNL/KGMB License Subsidiary, LLC</u>					480	CH	DIG	RCN: 10082402	
	2073.5000B									
	Status: L		Equipment: TEMQ05 Emission: 12M0D7W							
	OH LOSS 20% / 0.0025%:		0.00 / 0.00							
8	PALEHUA	HITEMPY LOC	HI	755.90	75.9	10.0	115.2	6.9-105.4	0.0	BT
	21 23 52 158 6 0	RXONLY		60.60	56.3	-10.0	2PMRC2	351.2	48.6	0.0
	KHNFV: <u>KHNL/KGMB License Subsidiary, LLC</u>					1	CH	FMV	RCN:	
	2025.5000B									
	Status: L		Equipment: AB9918 Emission: 12M0F8W							
	OH LOSS 20% / 0.0025%:		25.40 / 24.00							
12	CENTURY SQ	HITEMPY LOC	HI	129.00	73.1	10.0	126.1	24.1-116.3	0.0	BT
	21 18 38 157 51 32	RXONLY		103.70	134.7	-10.0	2PMRC2	96.8	37.7	0.0
	KHNFV: <u>KHNL/KGMB License Subsidiary, LLC</u>					1	CH	FMV	RCN:	
	2025.5000B									
	Status: L		Equipment: AB9918 Emission: 12M0F8W							
	OH LOSS 20% / 0.0025%:		11.30 / 6.30							

Table 5.1-1

SATELLITE EARTH STATION
FREQUENCY COORDINATION DATA
09/10/2018

Company	Moynk Properties	
Owner Code	MOYNKP	
Earth Station Name, State	KAPOLEI, HI	
Latitude (DMS) (NAD83)	21 20 11.5	
Longitude (DMS) (NAD83)	N 158 5	
Ground Elevation AMSL (ft/m)	23128W48 /	39.16
Antenna Centerline AGL (ft/m)	12.00 /	3.66
Transmit Antenna Type:	FCC32	ViaSat
		5.4 meter
2.0 GHz Gain (dBi) / Diameter (m)	39.2 /	5.4
3 dB / 15 dB Half Beamwidth	0.69 /	1.85
Operating Mode	TRANSMIT ONLY	
Modulation	DIGITAL	
Emission / Transmit Band (MHz)	NON - 1M32G1D / 2025.0000 - 2110.0000	
Max. Available RF Power (dBW)/4 kHz	9.80	
(dBW)/MHz	33.80	
Max. EIRP (dBW)/4 kHz	49.00	
(dBW)/MHz	73.00	
Max. Permissible Interference Power		
2.0 GHz, 20% (dBW/4 kHz)	-154.0	
2.0 GHz, 0.0025% (dBW/4 kHz)	-131.0	
Low Earth Orbit Satellite		
Azimuth Range (Min/Max) Degrees	0.0 / 360.0	
Minimum Elevation Angle Degrees	5.0	
Radio Climate	B	
Rain Zone	4	
Max. Great Circle Coordination Distance (mi./km)		
2.0 GHz	193.9 / 312.0	
Precipitation Scatter Contour Radius (mi./km)		
2.0 GHz	173.5 / 279.3	

Note: Horizon is less than 0.2 degrees at all azimuths



Figure 5.1-1

Table
Interference Case Summary
Kapolei, Hawaii

Case #	Path ID	Band (GHz)	Distance (km)	Azimuth (°)	ES	ES	LOS Loss Required (dB)	OH Loss		Revised Margin		
					Disc (°)	Gain (dBi)		20% (dB)	0.01% (dB)	20% (dB)	0.01% (dB)	
1	TEMPY RX	TEMPY LOC	2.0	26.9	100.8	74.5	10.0	66.7	18.7	13.0	48.0	30.7
2	TEMPY RX	TEMPY LOC	2.0	26.9	100.8	74.5	10.0	66.7	18.7	13.0	48.0	30.7
3	TEMPY RX	TEMPY LOC	2.0	26.9	100.8	74.5	10.0	66.7	18.7	13.0	48.0	30.7
4	TEMPY RX	TEMPY LOC	2.0	26.9	100.8	74.5	10.0	66.7	18.7	13.0	48.0	30.7
5	TEMPY RX	TEMPY LOC	2.0	26.9	100.8	74.5	10.0	66.7	18.7	13.0	48.0	30.7
6	TEMPY RX	TEMPY LOC	2.0	26.9	100.8	74.5	10.0	66.7	18.7	13.0	48.0	30.7
7	MT HALEAKALA	2005 KAILIA	2.0	202.4	109.8	78.0	10.0	61.9	0.0	0.0	61.9	38.9
8	PALEHUA	TEMPY LOC	2.0	6.9	351.2	75.9	10.0	48.6	25.4	24.0	23.2	1.6
9	PALEHUA	TEMPY LOC	2.0	6.9	351.2	75.9	10.0	48.6	25.4	24.0	23.2	1.6
10	TEMPY RX	TEMPY LOC	2.0	284.7	94.7	72.3	10.0	42.2	70.2	-5.9	CLEAR	25.1
11	TEMPY RX	TEMPY LOC	2.0	284.7	94.7	72.3	10.0	42.2	70.2	-5.9	CLEAR	25.1
12	CENTURY SQ	TEMPY LOC	2.0	24.1	96.8	73.1	10.0	37.7	11.3	6.3	26.4	8.4
13	CENTURY SQ	TEMPY LOC	2.0	24.1	96.8	73.1	10.0	37.7	11.3	6.3	26.4	8.4

Antenna Type: ViaSat 5.4 meter
Uplink Power: 9.8 dBW/4 kHz
Satellite Arc: Min Elevation 5 degrees
Objectives: Long Term: -154.0 dBW/4 kHz Short Term: -131.0 dBW/4 kHz