



DETAILED INTERFERENCE ANALYSIS REPORT

Transmit/Receive Earth Station

Prepared For
DirectTV
Bakersfield, California
DBS Transmit/Receive Earth Station
(13.2 Meter)

April 16, 2013

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SECTION 1

INTRODUCTION

Transmit/Receive Earth Station

This report presents the results of a detailed interference analysis for modifications to the uplink band of the existing 13.2 meter transmit/receive earth station location in Bakersfield, California.

The analysis was performed for a 13.2 meter antenna that meets the FCC reference pattern designated in Part 25.209 of the FCC rules and regulations. The long term interference objective was -154 dBW/4 kHz, as specified by the FCC.

The earth station was analyzed for transmission and reception of digital traffic to and from all satellites located between 70 and 125 degrees West Longitude.

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 a proposed DBS transmit/receive 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/receive 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 which 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 6 GHz paths, respectively.

A brief explanation of the various columns shown in Tables 3.1-1 and 3.1-2 follows:

PATH ID: This is the predicted interference path. The first site listed is the transmitter at 12 GHz or the receiver at 18 GHz.

BAND: This shows the frequency plan of the interfering paths. The 12 GHz paths affect reception of the downlink, while the 18 GHz terrestrial facilities are affected by 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 and 12 GHz, respectively.

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. Tables 5.1-2 provides azimuth and elevation data for the Geostationary arc, and identifies the locations of particular satellites within that arc.

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 6 presents the Great Circle interference cases. This provides a listing of the utilized channels and type of traffic loading for each path.

SECTION 3

SUMMARY AND RESULTS

The detailed interference analysis for the proposed earth station site to be located in Bakersfield, California revealed that 67 potential interference conflicts exist in the 18 GHz uplink band. Path profiles were able to clear all but four of these cases.

Transmit Band 17300 - 17800 MHz

<u>Path</u>	<u>Distance (Km)</u>	<u>Azimuth (Degrees)</u>	<u>Line-of-Sight Margin (dB)</u>	<u>Revised Margin 20% (dB)</u>
LA-500 - LA-375-19	25.3	89.7	14.7	14.7
Valley Wire - Teleplex	3.2	183.8	10.0	10.0
Site 2 - Teleplex	18.0	17.0	1.4	1.4

Receive Band 12200 - 12700 MHz

No interference conflicts were identified within the coordination contours of the proposed earth station site for the 12200 - 12700 MHz receive band.

SECTION 4

CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

Based on the results of the detailed interference analysis, three potential conflicts were identified in the 17.3 - 17.8 GHz transmit band after terrain pathloss calculations were completed.

The case margins into these receivers are based on a Maximum EIRP Density of 64.4 dBW/4 kHz. A reduction in the Maximum EIRP Density to 49.7 dBW/4 kHz would resolve all of these cases.

No conflicts were identified in the 12.2 - 12.7 GHz receive band within the coordination contours of the proposed earth station.

4.2 Recommendations

It is recommended that DirecTV review the proposed modifications to this antenna and determine whether the proposed power and frequency restrictions are acceptable and then proceed with the frequency coordination and licensing at this location.

Table 5.1-1
 SATELLITE EARTH STATION
 FREQUENCY COORDINATION DATA
 04/15/2013

Company	DIRECTV Enterprises, LLC	
Owner Code	ZDIRTV	
Earth Station Name, State	BAKERSFIELD, CA	
Latitude (DMS) (NAD83)	35 18 35.5 N	
Longitude (DMS) (NAD83)	119 4 35.9 W	
Ground Elevation AMSL (ft/m)	370.00 /	112.78
Antenna Centerline AGL (ft/m)	27.00 /	8.23
Receive Antenna Type:	FCC32	FCC REFERENCE
		32-25LOG(THETA)
12.0 GHz Gain (dBi) / Diameter (m)	61.5 /	13.2
3 dB / 15 dB Half Beamwidth	0.07 /	0.16
Transmit Antenna Type:	FCC32	FCC REFERENCE
		32-25LOG(THETA)
18.0 GHz Gain (dBi) / Diameter (m)	64.9 /	13.2
3 dB / 15 dB Half Beamwidth	0.03 /	0.05
Operating Mode	TRANSMIT AND RECEIVE	
Modulation	DIGITAL	
Emission / Receive Band (MHz)	1M00F2D - 24M0G7W/	17300.0000 - 17800.0000
Emission / Transmit Band (MHz)	1M00F2D - 24M0G7W /	12200.0000 - 12700.0000
Max. Available RF Power (dBW)/4 kHz)		-0.50
(dBW)/MHz)		23.50
Max. EIRP (dBW)/4 kHz)		64.40
(dBW)/MHz)		88.40
Max. Permissible Interference Power		
12.0 GHz, 20% (dBW/1 MHz)		-156.0
12.0 GHz, 0.0100% (dBW/1 MHz)		-146.0
18.0 GHz, 20% (dBW/4 kHz)		-151.0
18.0 GHz, 0.0025% (dBW/4 kHz)		-128.0
Range of Satellite Arc (Geostationary)		
Degrees Longitude	70.0 W /	125.0 W
Azimuth Range (Min/Max)	116.6 /	190.2
Corresponding Elevation Angles	24.4 /	48.5
Radio Climate	A	
Rain Zone	4	
Max. Great Circle Coordination Distance (mi./km)		
12.0 GHz	165.6 /	266.4
18.0 GHz	112.9 /	181.7
Precipitation Scatter Contour Radius (mi./km)		
12.0 GHz	221.7 /	356.7
18.0 GHz	84.9 /	136.6

Table 5.2-1

Earth Station Azimuth and Elevation Table
04/15/2013

Earth Station Name BAKERSFIELD, CA
 Owner DIRECTV Enterprises, LLC
 Latitude (DMS) (NAD83) 35 18 35.5 N
 Longitude (DMS) (NAD83) 119 4 35.9 W
 Ground Elevation (ft/m) 370.00 / 112.78 Amsl
 Antenna Centerline (ft/m) 27.00 / 8.23 Agl
 Satellite Arc Range 70.0 W
 125.0 W

Satellite Longitude	Azimuth (Degrees)	Elevation (Degrees)	Satellite Name
70.0	116.6	24.4	
71.0	117.4	25.2	
72.0	118.3	25.9	AMC 6
72.0	118.3	25.9	NAHUEL 1
72.5	118.7	26.3	DIRECTV 1
73.0	119.1	26.7	
74.0	120.0	27.5	SBS 6
75.0	120.8	28.2	
76.0	121.7	29.0	
77.0	122.6	29.7	
78.0	123.6	30.5	
79.0	124.5	31.2	AMC-5
80.0	125.4	31.9	
81.0	126.4	32.7	
82.0	127.4	33.4	NIMIQ 2
83.0	128.4	34.1	AMC 9
84.0	129.5	34.8	
85.0	130.5	35.4	AMC 2
85.1	130.6	35.5	XM 3
86.0	131.6	36.1	
87.0	132.7	36.8	AMC 3
88.0	133.8	37.4	
89.0	134.9	38.1	GALAXY 28
90.0	136.1	38.7	
91.0	137.3	39.3	NIMIQ 1
91.0	137.3	39.3	GALAXY 11
92.0	138.5	39.9	
93.0	139.7	40.5	GALAXY 26
94.0	141.0	41.1	
95.0	142.3	41.7	GALAXY 3C
96.0	143.6	42.2	
97.0	144.9	42.8	GALAXY 25
98.0	146.3	43.3	
99.0	147.7	43.8	GALAXY 16
99.2	148.0	43.9	SPACEWAY 2
100.0	149.1	44.2	
101.0	150.5	44.7	AMC 4
101.0	150.5	44.7	DIRECTV 8
101.0	150.5	44.7	DIRECTV 4S
101.0	150.5	44.7	DIRECTV IR
101.1	150.7	44.7	DIRECTV 95

Earth Station Azimuth and Elevation Table
04/15/2013

Earth Station Name BAKERSFIELD, CA
 Owner DIRECTV Enterprises, LLC
 Latitude (DMS) (NAD83) 35 18 35.5 N
 Longitude (DMS) (NAD83) 119 4 35.9 W
 Ground Elevation (ft/m) 370.00 / 112.78 Amsl
 Antenna Centerline (ft/m) 27.00 / 8.23 Agl
 Satellite Arc Range 70.0 W
 125.0 W

Satellite Longitude	Azimuth (Degrees)	Elevation (Degrees)	Satellite Name
102.0	152.0	45.1	
102.8	153.2	45.5	SPACEWAY 1
103.0	153.5	45.6	AMC 1
104.0	155.0	46.0	
105.0	156.6	46.3	AMC 15
105.0	156.6	46.3	AMC 18
106.0	158.1	46.7	
107.0	159.7	47.0	
107.3	160.2	47.1	ANIK F1R
108.0	161.3	47.3	
109.0	162.9	47.6	WILDBLUE 1
110.0	164.6	47.9	DIRECTV 5
110.0	164.6	47.9	EHOSTAR 8
110.0	164.6	47.9	EHOSTAR 10
111.0	166.2	48.1	
111.1	166.4	48.1	ANIK F2
112.0	167.9	48.3	
113.0	169.6	48.5	SATMEX 6
114.0	171.3	48.6	
115.0	173.0	48.8	XM 4
116.0	174.7	48.9	
116.8	176.1	48.9	SATMEX 5
117.0	176.4	48.9	
118.0	178.1	49.0	
119.0	179.9	49.0	AMC 16
119.0	179.9	49.0	DIRECTV 7S
119.0	179.9	49.0	EHOSTAR 7
120.0	181.6	49.0	
121.0	183.3	48.9	GALAXY 23
121.0	183.3	48.9	EHOSTAR 9
122.0	185.0	48.9	
123.0	186.8	48.8	GALAXY 10R
124.0	188.5	48.7	
125.0	190.2	48.5	

Figure 5.1-1 Proposed Earth Station Location

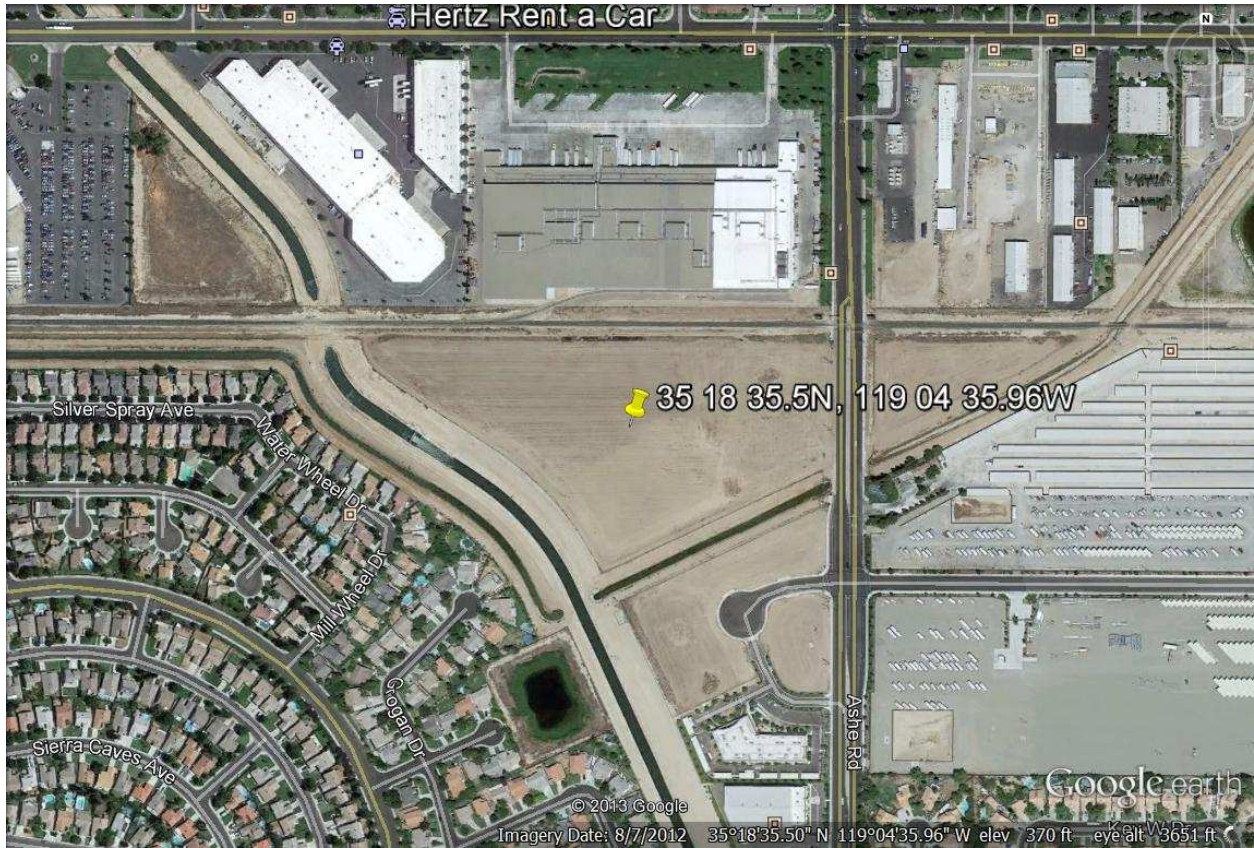


Table 3.1-1
Interference Case Summary
BAKERSFIELD, CALIFORNIA

Case #	Path ID		Band (GHz)	Distance (km)	Azimuth (°)	ES	ES	LOS Loss (dB)	OH Loss		Revised Margin	
						Disc (°)	Gain (dBi)		20% (dB)	0.01% (dB)	20% (dB)	0.01% (dB)
1	LOCATION A	LOCATION B	18.0	11.0	15.6	100.0	-10.0	39.9	0.0	0.0	39.9	16.9
2	LAB012	LAB014	18.0	7.3	111.3	25.0	-3.0	35.5	0.0	0.0	35.5	12.5
3	LA-RPTR	LA-295	18.0	46.7	162.3	45.4	-9.4	33.7	0.0	0.0	33.7	10.7
4	SV00009A RB	SV00016A KB	18.0	24.7	48.8	69.9	-10.0	33.0	12.9	7.8	20.1	2.2
5	FORT TEJON	GRAPEVINE PK	18.0	51.3	160.7	44.8	-9.3	27.6	88.3	34.9	CLEAR	CLEAR
6	125TH & ROSA	O & M	18.0	82.5	126.7	26.4	-3.5	27.2	76.0	27.7	CLEAR	CLEAR
7	7TH STANDARD	ROSEDALE	18.0	18.5	323.0	116.8	-10.0	24.1	0.0	0.0	24.1	1.1
8	LAB048	LAB034	18.0	13.7	342.9	126.0	-10.0	23.0	0.0	0.0	23.0	CLEAR
9	MT VERNON	4530 MING	18.0	14.8	42.2	75.8	-10.0	20.7	0.0	0.0	20.7	CLEAR
10	SV00039A MIS	LA-167	18.0	128.6	154.2	41.7	-8.5	20.5	79.0	37.7	CLEAR	CLEAR
11	LAB030	LAB022	18.0	12.0	55.8	63.6	-10.0	19.3	0.0	0.0	19.3	CLEAR
12	CA-LOS1632B	CA-LOS6198B	18.0	141.2	153.2	41.2	-8.4	19.3	77.2	36.9	CLEAR	CLEAR
13	CA-LOS1562A	CA-LOS5542A	18.0	134.3	160.6	44.7	-9.3	18.8	79.4	37.1	CLEAR	CLEAR
14	LAB014B	LAB016B	18.0	1.4	97.5	30.7	-5.2	18.8	0.0	0.0	18.8	CLEAR
15	4640L	5250L	18.0	143.6	152.9	41.0	-8.3	18.8	78.2	37.6	CLEAR	CLEAR
16	CA-LOS1576A	CA-LOS6687A	18.0	143.7	153.0	41.1	-8.3	16.5	78.1	37.3	CLEAR	CLEAR
17	CA-LOS1576A	CA-LOS6687A	18.0	143.7	153.0	41.1	-8.3	16.5	78.1	37.3	CLEAR	CLEAR
18	CASTRO PEAK	WESTLAKE VIL	18.0	138.5	168.7	47.4	-9.9	15.7	66.8	55.7	CLEAR	CLEAR
19	LA-500	LA-375-19	18.0	25.3	89.7	35.7	-6.8	14.7	0.0	0.0	14.7	CLEAR
20	LAB016B	LAB014B	18.0	1.1	325.0	117.9	-10.0	13.1	0.0	0.0	13.1	CLEAR
21	LA-465-09	CV-011-01	18.0	9.6	328.1	119.4	-10.0	12.9	0.0	0.0	12.9	CLEAR
22	PANAMA	4530 MING	18.0	2.4	135.5	30.5	-5.1	11.6	0.0	0.0	11.6	CLEAR
23	LAB039	LAB031	18.0	12.9	44.7	73.6	-10.0	11.4	0.0	0.0	11.4	CLEAR
24	WWTP2	FIRE STN 5	18.0	9.6	79.6	43.4	-8.9	10.3	0.0	0.0	10.3	CLEAR
25	MEADOWS 62	FIRE HQ	18.0	13.2	6.0	108.7	-10.0	10.1	0.0	0.0	10.1	CLEAR
26	CONTROL FIVE	CIVIC CENTER	18.0	15.2	42.1	75.9	-10.0	10.0	0.0	0.0	10.0	CLEAR
27	VALLEY WIRE	TELEPLEX	18.0	3.2	183.8	48.8	-10.0	10.0	0.0	0.0	10.0	CLEAR
28	LA-295	LA-354	18.0	45.2	162.4	45.4	-9.4	9.8	0.0	0.0	9.8	CLEAR
29	ISLAND	LESD DOA	18.0	135.3	329.9	120.3	-10.0	9.3	53.7	12.1	CLEAR	CLEAR
30	ISLAND	LESD DOA	18.0	135.3	329.9	120.3	-10.0	9.3	53.7	12.1	CLEAR	CLEAR
31	SHAFTER 32	SHAFTER	18.0	28.2	319.9	115.0	-10.0	9.0	21.0	15.1	CLEAR	CLEAR
32	SC08503AHNFR	SC10575ZHWHY4	18.0	124.3	334.7	122.6	-10.0	8.4	51.1	8.0	CLEAR	CLEAR
33	LAB018	LAB019	18.0	2.8	320.4	115.3	-10.0	8.2	0.0	0.0	8.2	CLEAR
34	LAB019	LAB018	18.0	3.8	50.2	68.6	-10.0	8.1	0.0	0.0	8.1	CLEAR

Antenna Type: FCC Reference 32-25LOG(THETA)

Uplink Power: -0.5 dBW/4 kHz

Satellite Arc: 70.0 W to 125.0 W

Objectives: Long Term: -151.0 dBW/4 kHz Short Term: -128.0 dBW/4 kHz

Table 3.1-1
Interference Case Summary
BAKERSFIELD, CALIFORNIA

Case #	Path ID	Band (GHz)	Distance (km)	Azimuth (°)	ES		LOS Loss (dB)	OH Loss		Revised Margin		
					Disc (°)	Gain (dBi)		20% (dB)	0.01% (dB)	20% (dB)	0.01% (dB)	
35	WHITING COMM	DOWNTOWN	18.0	15.2	42.1	76.0	-10.0	7.9	0.0	0.0	7.9	CLEAR
36	WHITING COMM	DOWNTOWN	18.0	15.2	42.1	76.0	-10.0	7.9	0.0	0.0	7.9	CLEAR
37	WHITING COMM	DOWNTOWN	18.0	15.2	42.1	76.0	-10.0	7.9	0.0	0.0	7.9	CLEAR
38	WHITING COMM	DOWNTOWN	18.0	15.2	42.1	76.0	-10.0	7.9	0.0	0.0	7.9	CLEAR
39	CLUMECK	OAT	18.0	137.6	157.8	43.4	-8.9	7.7	81.1	40.2	CLEAR	CLEAR
40	4530 MING	PANAMA	18.0	4.0	33.3	83.9	-10.0	7.6	0.0	0.0	7.6	CLEAR
41	LEBEC 56	GRAPEVINE	18.0	56.4	160.2	44.6	-9.2	6.9	101.4	47.7	CLEAR	CLEAR
42	FIRE HQ	LANDCO 66	18.0	11.3	7.7	107.2	-10.0	6.4	0.0	0.0	6.4	CLEAR
43	SN73XC005	SN70XC129	18.0	113.7	210.5	51.6	-10.0	6.3	93.2	49.8	CLEAR	CLEAR
44	CA-LOS1634A	CA-LOS5460A	18.0	138.8	157.0	43.1	-8.8	5.9	79.8	38.1	CLEAR	CLEAR
45	LAB015	LAB019	18.0	6.6	86.6	38.0	-7.5	5.9	0.0	0.0	5.9	CLEAR
46	VY-964-01	LA-460-01	18.0	16.2	155.8	42.5	-8.7	5.8	0.0	0.0	5.8	CLEAR
47	CAMPUS CSU	OAT MTN	18.0	129.0	157.0	43.1	-8.9	5.1	86.5	44.8	CLEAR	CLEAR
48	MT VERNON	DOWNTOWN	18.0	14.8	42.2	75.8	-10.0	4.4	0.0	0.0	4.4	CLEAR
49	MT ADELAI2	BKSFLD 11	18.0	32.6	65.8	54.9	-10.0	4.2	0.0	0.0	4.2	CLEAR
50	LA-591-05	LA-333-02	18.0	134.5	163.8	45.9	-9.5	3.2	77.1	36.5	CLEAR	CLEAR
51	CASTRO	WESTLAKE	18.0	138.4	168.8	47.5	-9.9	3.2	78.0	30.1	CLEAR	CLEAR
52	CA-VTA0114C	CA-VTA0110B	18.0	120.2	184.2	48.8	-10.0	2.5	84.8	40.5	CLEAR	CLEAR
53	KYS	ODY	18.0	146.2	154.4	41.8	-8.5	2.5	72.4	31.7	CLEAR	CLEAR
54	KYS	ODY	18.0	146.2	154.4	41.8	-8.5	2.5	72.4	31.7	CLEAR	CLEAR
55	KYS	ODY	18.0	146.2	154.4	41.8	-8.5	2.5	72.4	31.7	CLEAR	CLEAR
56	SHAFTER 32	SHAFTER	18.0	28.2	319.8	115.0	-10.0	2.3	21.0	15.0	CLEAR	CLEAR
57	CA-LOS0109A	CA-LOS0160C	18.0	128.7	157.0	43.1	-8.9	2.2	86.4	44.4	CLEAR	CLEAR
58	900 OLD RIVR	1520 20TH ST	18.0	5.2	321.7	116.0	-10.0	2.2	0.0	0.0	2.2	CLEAR
59	VY-077-01	VY-444-02	18.0	3.9	20.2	95.9	-10.0	2.1	0.0	0.0	2.1	CLEAR
60	LAB009	LAB008	18.0	18.2	116.0	24.5	-2.7	1.8	0.0	0.0	1.8	CLEAR
61	SITE 2	TELEPLEX	18.0	18.0	17.0	98.8	-10.0	1.4	0.0	0.0	1.4	CLEAR
62	9500 MING	4530 MING	18.0	4.5	320.1	115.1	-10.0	1.3	0.0	0.0	1.3	CLEAR
63	4530 MING	9500 MING	18.0	4.0	33.3	83.9	-10.0	1.2	0.0	0.0	1.2	CLEAR
64	ROSEDALE 67	CONTROL FIVE	18.0	10.1	310.3	109.4	-10.0	1.1	0.0	0.0	1.1	CLEAR
65	LAB032	LAB026	18.0	8.9	36.5	81.0	-10.0	0.7	0.0	0.0	0.7	CLEAR
66	CONTROL FIVE	ROSEDALE 67	18.0	15.2	42.1	75.9	-10.0	0.5	0.0	0.0	0.5	CLEAR
67	1520 20TH ST	900 OLD RIVR	18.0	9.1	34.6	82.8	-10.0	0.1	0.0	0.0	0.1	CLEAR
68	KPMR STUDIO	KCOY STUDIO	18.0	133.8	251.3	71.3	-10.0	-0.0	77.2	36.5	CLEAR	CLEAR

Antenna Type: FCC Reference 32-25LOG(THETA)
Uplink Power: -0.5 dBW/4 kHz
Satellite Arc: 70.0 W to 125.0 W
Objectives: Long Term: -151.0 dBW/4 kHz Short Term: -128.0 dBW/4 kHz