FREQUENCY COORDINATION AND INTERFERENCE ANALYSIS REPORT

Prepared for
SOLO SATELLITE COMMUNICATIONS
Indian Wells, Ca
Satellite Earth Station

Prepared By:
COMSEARCH
19700 Janelia Farm Boulevard
Ashburn, VA 20147
February 20, 2014

An interference study considering all existing, proposed and prior coordinated microwave facilities within the coordination contours of the proposed earth station demonstrates that this site will operate satisfactorily with the common carrier microwave environment. Operation will be restricted to the following.

9M00G7W - 36M0G7W / 6247.0 - 6283.0 Band edges
9M00G7W - 36M0G7W / 6307.0 - 6343.0 Band edges
9M00G7W - 36M0G7W / 6367.0 - 6403.0 Band edges

Pursuant to Part 25.203(c) of the FCC Rules and Regulations, the satellite earth station proposed in this application was coordinated by Comsearch using computer techniques and in accordance with Part 25 of the FCC Rules and Regulations.

Coordination data for this earth station was sent to the below listed carriers with a letter dated 02/20/14.

Company

ABC Holding Company Inc.
AT&T COMMUNICATIONS OF CALIFORNIA, INC.
AT&T COMMUNICATIONS OF MOUNTAIN STATES
AT&T California
AirSites2000, LLC
BNSF Railway Company
CNG Communications, Inc.
California, State of
Calvary Chapel of Costa Mesa
Cellco Partnership - California
City of Yuma
Coachella Valley Water District
DRS Technical Services
Entravision Holdings, LLC
Federal Communications Commission
Gila Electronics of Yuma, Inc
Los Angeles SMSA Ltd. Partnership
MHO Networks
MOBILE RELAY ASSOCIATES INC
Metropolitan Water Dist of So California
New Cingular Wireless PCS - Los Angeles
New Cingular Wireless PCS LLC -San Diego
Nextel License Holdings 4 Inc.
Nextel of California Inc.
ORANGE, COUNTY OF, CA
Regional 3Cs
Riverside, County of
San Bernardino County of California

San Diego County Water Authority
San Diego Gas & Electric Company
San Diego, County of
Skyriver Communications
Southern California Edison Company
Southern California Gas Company
Southern California Regional Rail Auth.
Sparkplug Southwest, LLC
T-Mobile License LLC
TV MICROWAVES CO
Time Warner Cable LLC
Turn Wireless, LLC
University of California,HPWREN
Verizon California Inc.
Verizon Wireless (VAW) LLC (CA)
Verizon Wireless(VAW) LLC-AZ/CO/NM/NV/UT
WWC License L.L.C. - California
WWC License LLC - AZ/CO/NM/NV/UT

The following section presents the data pertinent to frequency coordination of the proposed earth station that was circulated to all carriers within its coordination contours. A copy was forwarded to the FCC field office in Columbia, MD.

COMSEARCH
An Andrew Company
19700 Janelia Farm Blvd.
Ashburn, Va 20147
(703)-726-5500 Fax: (703)-726-5600
http://www.comsearch.com

February 20, 2014

Re: SOLO SATELLITE COMMUNICATIONS
INDIANS WELLS, CA - TENNIS GARDEN
Temporary Transmit-Only Earth Station
Operation Dates: 03/03/2014 - 03/21/2014
Job Number: 140220COMSTC01

Dear Frequency Coordinator:

On behalf of SOLO SATELLITE COMMUNICATIONS, we are forwarding the attached coordination data for a Temporary Transmit-Only Earth Station to be located at the site referenced above.

This earth station will transmit only on the satellite(s) and frequency or frequencies as described in the attached data. Please do not report cases involving 4 GHz facilities or problems involving non-active paths or frequencies outside the specified range.

If there are any questions concerning this coordination notice, please contact Comsearch.

Sincerely,

COMSEARCH

Timothy O. Crutcher
Principal Frequency Coordinator

Enclosure(s)

COMSEARCH

Earth Station Data Sheet

19700 Janelia Farm Boulevard, Ashburn, VA 20147
(703)726-5665 http://www.comsearch.com

Date:	02/20/2014
Job Number:	140220COMSTC01

Administrative Information

Status	TEMPORARY (Operation from 03/03/2014 to 03/21/2014)
Licensee Name	SOLO SATELLITE COMMUNICATIONS

Site Information — INDIANS WELL, CA

Venue Name	TENNIS GARDEN
Latitude (NAD 83)	33° 43' 21.0" N
Longitude (NAD 83)	116° 18' 27.0" W
Climate Zone	A
Rain Zone	4
Ground Elevation (AMSL)	44.09 m / 144.7 ft

Link Information

Satellite Type	Geostationary
Mode	TO - Transmit-Only
Modulation	Digital
Satellite Arc	58° W to 95° West Longitude
Azimuth Range	108.9° to 144.9°
Corresponding Elevation Angles	17.6° / 44.6°
Antenna Centerline (AGL)	3.66 m / 12.0 ft

Antenna Information — Transmit

Manufacturer	Gigasat
Gain / Diameter	45.6 dBi / 3.7 m
3-dB / 15-dB Beamwidth	1.00° / 2.00°

		9M00G7W	36M0G7W
Max Available RF Power	(dBW/4 kHz)	-13.5	-14.1
	(dBW/MHz)	10.5	9.9
Maximum EIRP	(dBW/4 kHz)	32.1	31.5
	(dBW/MHz)	56.1	55.5

Interference Objectives:	Long Term	-154.0 dBW/4 kHz	20%
	Short Term	-131.0 dBW/4 kHz	0.0025%

Frequency Information — Transmit 6.1 GHz

Emission / Frequency Range (MHz)

9M00G7W - 36M0G7W / 6247.0 - 6283.0 Band edges
9M00G7W - 36M0G7W / 6307.0 - 6343.0 Band edges
9M00G7W - 36M0G7W / 6367.0 - 6403.0 Band edges

Max Great Circle Coordination Distance	170.8 km / 106.1 mi
Precipitation Scatter Contour Radius	100.0 km / 62.1 mi

Coordination Values	**INDIANS WELL, CA**
Licensee Name	SOLO SATELLITE COMMUNICATIONS
Latitude (NAD 83)	33° 43' 21.0" N
Longitude (NAD 83)	116° 18' 27.0" W
Ground Elevation (AMSL)	44.09 m / 144.7 ft
Antenna Centerline (AGL)	3.66 m / 12.0 ft
Antenna Mode	Transmit 6.1 GHz
Interference Objectives: Long Term	-154.0 dBW/4 kHz 20%
Short Term	-131.0 dBW/4 kHz 0.0025%
Max Available RF Power	-13.5 (dBW/4 kHz)

			Transmit 6.1 GHz	
Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	108.00	-10.00	134.19
5	0.00	103.26	-10.00	134.19
10	0.00	98.50	-10.00	134.19
15	0.00	93.74	-10.00	134.19
20	0.00	88.97	-10.00	134.19
25	0.00	84.21	-10.00	134.19
30	0.00	79.45	-10.00	134.19
35	0.00	74.70	-10.00	134.19
40	0.00	69.96	-10.00	134.19
45	0.00	65.23	-10.00	134.19
50	0.00	60.53	-10.00	134.19
55	0.00	55.86	-10.00	134.19
60	0.00	51.23	-10.00	134.19
65	0.00	46.65	-9.72	133.70
70	0.00	42.14	-8.62	136.78
75	0.00	37.74	-7.42	140.30
80	0.00	33.47	-6.12	144.32
85	0.00	29.40	-4.71	148.89
90	0.00	25.64	-3.22	153.98
95	0.00	22.32	-1.72	159.40
100	0.00	19.69	-0.36	164.54
105	0.00	18.04	0.59	169.85
110	0.00	17.65	0.83	170.77
115	0.00	18.61	0.26	168.54
120	0.00	20.72	-0.91	162.42
125	0.00	23.68	-2.36	157.05
130	0.00	27.21	-3.87	151.73
135	0.00	30.88	-5.24	147.14
140	0.00	34.39	-6.41	143.39
145	2.33	36.09	-6.93	100.00
150	2.71	38.81	-7.72	100.00
155	3.47	40.88	-8.29	100.00
160	3.91	42.77	-8.78	100.00
165	2.57	45.78	-9.52	100.00
170	1.94	48.25	-10.00	100.00
175	2.39	50.15	-10.00	100.00
180	2.08	52.92	-10.00	100.00
185	4.82	54.00	-10.00	100.00

Coordination Values	**INDIANS WELL, CA**
Licensee Name	SOLO SATELLITE COMMUNICATIONS
Latitude (NAD 83)	33° 43' 21.0" N
Longitude (NAD 83)	116° 18' 27.0" W
Ground Elevation (AMSL)	44.09 m / 144.7 ft
Antenna Centerline (AGL)	3.66 m / 12.0 ft
Antenna Mode	Transmit 6.1 GHz
Interference Objectives: Long Term	-154.0 dBW/4 kHz 20%
Short Term	-131.0 dBW/4 kHz 0.0025%
Max Available RF Power	-13.5 (dBW/4 kHz)

			Transmit 6.1 GHz	
Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Horizon Gain (dBi)	Coordination Distance (km)
190	7.45	55.76	-10.00	100.00
195	8.05	58.98	-10.00	100.00
200	5.61	63.59	-10.00	100.00
205	6.73	66.82	-10.00	100.00
210	6.36	70.68	-10.00	100.00
215	6.91	74.37	-10.00	100.00
220	6.99	78.24	-10.00	100.00
225	5.39	82.34	-10.00	100.00
230	3.76	86.29	-10.00	100.00
235	2.62	90.06	-10.00	100.00
240	2.02	93.74	-10.00	100.00
245	1.67	97.37	-10.00	100.00
250	0.78	100.82	-10.00	100.00
255	0.66	104.31	-10.00	102.82
260	0.48	107.72	-10.00	111.59
265	0.29	111.02	-10.00	126.77
270	0.00	114.15	-10.00	134.19
275	0.00	117.28	-10.00	134.19
280	0.00	120.27	-10.00	134.19
285	0.00	123.09	-10.00	134.19
290	0.20	125.85	-10.00	134.19
295	0.23	128.27	-10.00	131.85
300	0.30	130.46	-10.00	126.20
305	0.71	132.64	-10.00	100.46
310	0.77	134.18	-10.00	100.00
315	0.59	135.10	-10.00	105.82
320	0.46	135.63	-10.00	113.46
325	0.43	135.81	-10.00	115.53
330	0.34	135.49	-10.00	122.68
335	0.26	131.46	-10.00	129.62
340	0.23	126.84	-10.00	131.38
345	0.22	122.18	-10.00	132.39
350	0.00	117.45	-10.00	134.19
355	0.00	112.74	-10.00	134.19

I HEREBY CERTIFY THAT I AM THE TECHNICALLY QUALIFIED PERSON RESPONSIBLE FOR THE PREPARATION OF THE FREQUENCY COORDINATION DATA CONTAINED IN THIS APPLICATION, THAT I AM FAMILIAR WITH PARTS 101 AND 25 OF THE FCC RULES AND REGULATIONS, THAT I HAVE EITHER PREPARED OR REVIEWED THE FREQUENCY COORDINATION DATA SUBMITTED WITH THIS APPLICATION, AND THAT IT IS COMPLETE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

Timothy O. Crutcher

Timothy O. Crutcher
Frequency Planner
COMSEARCH
19700 Janelia Farm Boulevard
Ashburn, VA 20147

DATED: February 20, 2014

Analysis of Non-Ionizing Radiation for a 3.7-Meter Earth Station System

This report analyzes the non-ionizing radiation levels for a 3.7-meter earth station system. The analysis and calculations performed in this report comply with the methods described in the FCC Office of Engineering and Technology Bulletin, No. 65 first published in 1985 and revised in 1997 in Edition 97-01. The radiation safety limits used in the analysis are in conformance with the FCC R&O 96-326. Bulletin No. 65 and the FCC R&O specifies that there are two separate tiers of exposure limits that are dependant on the situation in which the exposure takes place and/or the status of the individuals who are subject to the exposure. The Maximum Permissible Exposure (MPE) limits for persons in a General Population/Uncontrolled environment are shown in Table 1. The General Population/Uncontrolled MPE is a function of transmit frequency and is for an exposure period of thirty minutes or less. The MPE limits for persons in an Occupational/Controlled environment are shown in Table 2. The Occupational MPE is a function of transmit frequency and is for an exposure period of six minutes or less. The purpose of the analysis described in this report is to determine the power flux density levels of the earth station in the far-field, near-field, transition region, between the subreflector or feed and main reflector surface, at the main reflector surface, and between the antenna edge and the ground and to compare these levels to the specified MPEs.

Table 1. Limits for General Population/Uncontrolled Exposure (MPE)

Frequency Range (MHz)	Power Density (mW/cm^2)
30-300	0.2
300-1500	Frequency (MHz)*(0.8/1200)
1500-100,000	1.0

Table 2. Limits for Occupational/Controlled Exposure (MPE)

Frequency Range (MHz)	Power Density (mW/cm^2)
30-300	1.0
300-1500	Frequency (MHz)*(4.0/1200)
1500-100,000	5.0

Table 3. Formulas and Parameters Used for Determining Power Flux Densities

Parameter	Symbol	Formula	Value	Units
Antenna Diameter	D	Input	3.7	m
Antenna Surface Area	$A_{surface}$	$\pi D^2 / 4$	10.75	m^2
Feed Flange Diameter	D_{fa}	Input	19.0	cm
Area of Feed Flange	A_{fa}	$\pi D_{fa}{}^2/4$	283.53	cm^2
Frequency	F	Input	6390	MHz
Wavelength	λ	300 / F	0.046952	m
Transmit Power	P	Input	350.00	W
Antenna Gain (dBi)	G_{es}	Input	45.6	dBi
Antenna Gain (factor)	G	$10^{Ges/10}$	36307.8	n/a
Pi	π	Constant	3.1415927	n/a
Antenna Efficiency	η	$G\lambda^2/(\pi^2D^2)$	0.59	n/a

1. Far Field Distance Calculation

The distance to the beginning of the far field can be determined from the following equation:

Distance to the Far Field Region

$$R_{ff} = 0.60\ D^2 / \lambda = 174.9\ m \quad (1)$$

The maximum main beam power density in the far field can be determined from the following equation:

On-Axis Power Density in the Far Field

$$S_{ff} = G\ P / (4\ \pi\ R_{ff}^2) = 33.041\ W/m^2 = 3.304\ mW/cm^2 \quad (2)$$

2. Near Field Calculation

Power flux density is considered to be at a maximum value throughout the entire length of the defined Near Field region. The region is contained within a cylindrical volume having the same diameter as the antenna. Past the boundary of the Near Field region, the power density from the antenna decreases linearly with respect to increasing distance.

The distance to the end of the Near Field can be determined from the following equation:

Extent of the Near Field

$$R_{nf} = D^2 / (4\ \lambda) = 72.9\ m \quad (3)$$

The maximum power density in the Near Field can be determined from the following equation:

Near Field Power Density

$$S_{nf} = 16.0\ \eta\ P / (\pi\ D^2) = 77.133\ W/m^2 = 7.713\ mW/cm^2 \quad (4)$$

3. Transition Region Calculation

The Transition region is located between the Near and Far Field regions. The power density begins to decrease linearly with increasing distance in the Transition region. While the power density decreases inversely with distance in the Transition region, the power density decreases inversely with the square of the distance in the Far Field region. The maximum power density in the Transition region will not exceed that calculated for the Near Field region. The power density calculated in Section 1 is the highest power density the antenna can produce in any of the regions away from the antenna. The power density at a distance R_t can be determined from the following equation:

Transition Region Power Density

$$S_t = S_{nf}\ R_{nf} / R_t = 7.713\ mW/cm^2 \quad (5)$$

4. Region between the Feed Assembly and the Antenna Reflector

Transmissions from the feed assembly are directed toward the antenna reflector surface, and are confined within a conical shape defined by the type of feed assembly. The most common feed assemblies are waveguide flanges, horns or subreflectors. The energy between the feed assembly and reflector surface can be calculated by determining the power density at the feed assembly surface. This can be determined from the following equation:

Power Density at the Feed Flange

$$S_{fa} = 4000\ P / A_{fa} \quad (6)$$
$$= 4937.771\ mW/cm^2$$

5. Main Reflector Region

The power density in the main reflector is determined in the same manner as the power density at the feed assembly. The area is now the area of the reflector aperture and can be determined from the following equation:

Power Density at the Reflector Surface

$$S_{surface} = 4\ P / A_{surface} \quad (7)$$
$$= 130.207\ W/m^2$$
$$= 13.021\ mW/cm^2$$

6. Region between the Reflector and the Ground

Assuming uniform illumination of the reflector surface, the power density between the antenna and the ground can be determined from the following equation:

Power Density between Reflector and Ground

$$S_g = P / A_{surface} \quad (8)$$
$$= 32.552\ W/m^2$$
$$= 3.255\ mW/cm^2$$

7. Summary of Calculations

Table 4. Summary of Expected Radiation levels for Uncontrolled Environment

Region		Calculated Maximum Radiation Power Density Level (mW/cm^2)	Hazard Assessment
1. Far Field (R_{ff} = 174.9 m)	S_{ff}	3.304	Potential Hazard
2. Near Field (R_{nf} = 72.9 m)	S_{nf}	7.713	Potential Hazard
3. Transition Region ($R_{nf} < R_t < R_{ff}$)	S_t	7.713	Potential Hazard
4. Between Feed Assembly and Antenna Reflector	S_{fa}	4937.771	Potential Hazard
5. Main Reflector	$S_{surface}$	13.021	Potential Hazard
6. Between Reflector and Ground	S_g	3.255	Potential Hazard

Table 5. Summary of Expected Radiation levels for Controlled Environment

Region		Calculated Maximum Radiation Power Density Level (mW/cm^2)	Hazard Assessment
1. Far Field (R_{ff} = 174.9 m)	S_{ff}	3.304	Satisfies FCC MPE
2. Near Field (R_{nf} = 72.9 m)	S_{nf}	7.713	Potential Hazard
3. Transition Region ($R_{nf} < R_t < R_{ff}$)	S_t	7.713	Potential Hazard
4. Between Feed Assembly and Antenna Reflector	S_{fa}	4937.771	Potential Hazard
5. Main Reflector	$S_{surface}$	13.021	Potential Hazard
6. Between Reflector and Ground	S_g	3.255	Satisfies FCC MPE

It is the applicant's responsibility to ensure that the public and operational personnel are not exposed to harmful levels of radiation.

8. Conclusions

Based on this analysis it is concluded that the FCC RF Guidelines have been exceeded in the specific regions of Tables 4 and 5. The applicant proposes to comply with the Maximum Permissible Exposure (MPE) limits of 1 mW/cm2 for the Uncontrolled areas and the MPE limits of 5 mW/cm2 for the Controlled areas by one or more of the following methods:

Means of Compliance Uncontrolled Areas

The area around this antenna will be roped off while this system is in operationn. The general public will not have access to areas within ½ diameter from the edge of the antenna.

Since one diameter removed from the main beam of the antenna or ½ diameter removed from the edge of the antenna the RF levels are reduced by a factor of 100 or 20 dB. None of the areas exceeding the MPE levels will be accessible by the general public.

Radiation hazard signs will be posted while this earth station is in operation.

The applicant will ensure that no buildings or other obstacles will be in the areas that exceed the MPE levels.

Means of Compliance Controlled Areas

The earth station's operational personnel will not have access to the areas that exceed the MPE levels while the earth station is in operation.

The transmitters will be turned off during antenna maintenance.