

FREQUENCY COORDINATION AND INTERFERENCE ANALYSIS REPORT

Prepared for
General Dynamics Satellite Comm Services
WAHIAWA, HI
Satellite Earth Station

Prepared By:
COMSEARCH
19700 Janelia Farm Boulevard
Ashburn, VA 20147
January 04, 2017

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1. CONCLUSIONS

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. Further, there will be no restrictions of its operation due to interference considerations.

2. SUMMARY OF RESULTS

A number of great circle interference cases were identified during the interference study of the proposed earth station. Each of the cases, which exceeded the interference objective on a line-of-sight basis, was profiled and the propagation losses estimated using NBS TN101 (Revised) techniques. The losses were found to be sufficient to reduce the signal levels to acceptable magnitudes in every case.

3. SUPPLEMENTAL SHOWING

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 11/28/2016.

Company

Cellco Partnership - Hawaii
Clearwire Hawaii Partners Spectrum LLC
Coral Wireless Licenses, LLC
HONOLULU CITY & COUNTY DEPT OF INFO TECH
Hawaii State
Hawaiian Telcom, Inc.
Honolulu Board of Water Supply
MID PACIFIC COMMUNICATIONS INC
New Cingular Wireless PCS LLC - Hawaii
Oceanic Time Warner Cable LLC
T-MOBILE LIC LLC - VOICESTREAM PCS BTA I
T-Mobile License LLC
Trex Broadband
US Internet Wireless
Verizon Wireless VAW LLC - (Hawaii)
Wavecom Solutions Corporation

4. EARTH STATION COORDINATION DATA

This section presents the data pertinent to frequency coordination of the proposed earth station that was circulated to all carriers within its coordination contours.

COMSEARCH

Earth Station Data Sheet

19700 Janelia Farm Boulevard, Ashburn, VA 20147
(703)726-5500 <http://www.comsearch.com>

Date: 01/04/2017
Job Number: 161128COMSGE10

Administrative Information

Status ENGINEER PROPOSAL
Call Sign E980049
Licensee Code GENDYN
Licensee Name General Dynamics Satellite Comm Services

Site Information

WAHIAWA, HI

Venue Name
Latitude (NAD 83) 21° 31' 8.6" N
Longitude (NAD 83) 158° 1' 0.6" W
Climate Zone C
Rain Zone 4
Ground Elevation (AMSL) 324.5 m / 1064.6 ft

Link Information

Satellite Type Low Earth Orbit
Mode TR - Transmit-Receive
Modulation Digital
Minimum Elevation Angle 5.0°
Azimuth Range 0.0° to 360°
Antenna Centerline (AGL) 5.49 m / 18.0 ft

Antenna Information

Receive - FCC32

Transmit - FCC32

Manufacturer	Scientific Atlanta	Scientific Atlanta
Model	495600-311	495600-311
Gain / Diameter	54.0 dBi / 3.0 m	57.4 dBi / 3.0 m
3-dB / 15-dB Beamwidth	0.78° / 1.70°	0.23° / 0.45°
Max Available RF Power (dBW/4 kHz) (dBW/MHz)		(1) -14.8 (2) -16.7 9.2 7.3
Maximum EIRP (dBW/4 kHz) (dBW/MHz)		42.6 40.7 66.6 64.7
Interference Objectives:	Long Term -153.0 dBW/MHz 20%	-151.0 dBW/4 kHz 20%
	Short Term -141.0 dBW/MHz 0.01%	-128.0 dBW/4 kHz 0.0025%

Frequency Information

Receive 18.0 GHz

Transmit 28.0 GHz

Emission / Frequency Range (MHz) 6M25G7W - 14M0G7W / 19400.0 - 19600.0
(1) 6M25G7W / 29100.0 - 29300.0
(2) 14M0G7W / 29100.0 - 29300.0

Max Great Circle Coordination Distance 142.1 km / 88.3 mi 100.0 km / 62.1 mi
Precipitation Scatter Contour Radius 100.0 km / 62.1 mi 100.0 km / 62.1 mi

COMSEARCH

Earth Station Data Sheet

19700 Janelia Farm Boulevard, Ashburn, VA 20147
(703)726-5500 <http://www.comsearch.com>

Coordination Values

WAHIAWA, HI

Licensee Name General Dynamics Satellite Comm Services
Latitude (NAD 83) 21° 31' 8.6" N
Longitude (NAD 83) 158° 1' 0.6" W
Ground Elevation (AMSL) 324.5 m / 1064.6 ft
Antenna Centerline (AGL) 5.49 m / 18.0 ft
Antenna Model Scientific-Atlanta 3 meter
Antenna Mode Receive 18.0 GHz Transmit 28.0 GHz
Interference Objectives: Long Term -153.0 dBW/MHz 20% -151.0 dBW/4 kHz 20%
Short Term -141.0 dBW/MHz 0.01% -128.0 dBW/4 kHz 0.0025%
Max Available RF Power -14.8 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Receive 18.0 GHz		Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)	Horizon Gain (dBi)	Coordination Distance (km)
0	0.76	73.01	2.60	142.10	11.50	100.00
5	0.84	71.45	2.60	142.10	11.50	100.00
10	0.98	70.07	2.60	142.10	11.50	100.00
15	1.00	68.76	2.60	142.10	11.50	100.00
20	1.15	67.72	2.60	142.10	11.50	100.00
25	1.31	66.87	2.60	142.10	11.50	100.00
30	1.59	66.33	2.60	142.10	11.50	100.00
35	1.94	66.07	2.60	142.10	11.50	100.00
40	2.02	65.75	2.60	142.10	11.50	100.00
45	2.12	65.64	2.60	142.10	11.50	100.00
50	2.30	65.81	2.60	142.10	11.50	100.00
55	2.07	65.77	2.60	142.10	11.50	100.00
60	2.28	66.35	2.60	142.10	11.50	100.00
65	2.18	66.83	2.60	142.10	11.50	100.00
70	2.23	67.63	2.60	142.10	11.50	100.00
75	2.25	68.58	2.60	142.10	11.50	100.00
80	1.98	69.44	2.60	142.10	11.50	100.00
85	2.05	70.76	2.60	142.10	11.50	100.00
90	1.73	71.93	2.60	142.10	11.50	100.00
95	1.79	73.51	2.60	142.10	11.50	100.00
100	1.67	75.10	2.60	142.10	11.50	100.00
105	1.39	76.72	2.60	142.10	11.50	100.00
110	1.34	78.58	2.60	142.10	11.50	100.00
115	1.22	80.49	2.60	142.10	11.50	100.00
120	1.11	82.49	2.60	142.10	11.50	100.00
125	0.99	84.55	2.60	142.10	11.50	100.00
130	1.05	86.68	2.60	142.10	11.50	100.00
135	0.82	88.81	2.60	142.10	11.50	100.00
140	0.62	90.98	2.60	142.10	11.50	100.00
145	0.40	93.19	2.60	142.10	11.50	100.00
150	0.00	95.44	2.60	142.10	11.50	100.00
155	0.00	97.61	2.60	142.10	11.50	100.00
160	0.00	99.73	2.60	142.10	11.50	100.00
165	0.00	101.80	2.60	142.10	11.50	100.00
170	0.00	103.78	2.60	142.10	11.50	100.00
175	0.00	105.68	2.60	142.10	11.50	100.00
180	0.00	107.47	2.60	142.10	11.50	100.00
185	0.00	109.14	2.60	142.10	11.50	100.00

COMSEARCH

Earth Station Data Sheet

19700 Janelia Farm Boulevard, Ashburn, VA 20147
(703)726-5500 <http://www.comsearch.com>

Coordination Values

WAHIAWA, HI

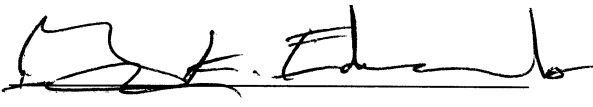
Licensee Name General Dynamics Satellite Comm Services
Latitude (NAD 83) 21° 31' 8.6" N
Longitude (NAD 83) 158° 1' 0.6" W
Ground Elevation (AMSL) 324.5 m / 1064.6 ft
Antenna Centerline (AGL) 5.49 m / 18.0 ft
Antenna Model Scientific-Atlanta 3 meter
Antenna Mode Receive 18.0 GHz Transmit 28.0 GHz
Interference Objectives: Long Term -153.0 dBW/MHz 20% -151.0 dBW/4 kHz 20%
Short Term -141.0 dBW/MHz 0.01% -128.0 dBW/4 kHz 0.0025%
Max Available RF Power -14.8 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Receive 18.0 GHz		Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)	Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	110.67	2.60	142.10	11.50	100.00
195	0.00	112.05	2.60	142.10	11.50	100.00
200	0.00	113.27	2.60	142.10	11.50	100.00
205	0.00	114.31	2.60	142.10	11.50	100.00
210	0.00	115.16	2.60	142.10	11.50	100.00
215	0.00	115.81	2.60	142.10	11.50	100.00
220	0.00	116.25	2.60	142.10	11.50	100.00
225	0.00	116.48	2.60	142.10	11.50	100.00
230	0.00	116.49	2.60	142.10	11.50	100.00
235	0.00	116.28	2.60	142.10	11.50	100.00
240	0.00	115.86	2.60	142.10	11.50	100.00
245	0.00	115.23	2.60	142.10	11.50	100.00
250	0.00	114.40	2.60	142.10	11.50	100.00
255	0.00	113.38	2.60	142.10	11.50	100.00
260	0.00	112.18	2.60	142.10	11.50	100.00
265	0.00	110.81	2.60	142.10	11.50	100.00
270	0.00	109.29	2.60	142.10	11.50	100.00
275	0.33	107.43	2.60	142.10	11.50	100.00
280	0.00	105.86	2.60	142.10	11.50	100.00
285	0.00	103.97	2.60	142.10	11.50	100.00
290	0.00	101.99	2.60	142.10	11.50	100.00
295	0.00	99.94	2.60	142.10	11.50	100.00
300	0.00	97.82	2.60	142.10	11.50	100.00
305	0.00	95.65	2.60	142.10	11.50	100.00
310	0.00	93.45	2.60	142.10	11.50	100.00
315	0.00	91.22	2.60	142.10	11.50	100.00
320	0.00	88.99	2.60	142.10	11.50	100.00
325	0.00	86.77	2.60	142.10	11.50	100.00
330	0.00	84.56	2.60	142.10	11.50	100.00
335	0.28	82.47	2.60	142.10	11.50	100.00
340	0.27	80.36	2.60	142.10	11.50	100.00
345	0.62	78.46	2.60	142.10	11.50	100.00
350	0.56	76.49	2.60	142.10	11.50	100.00
355	0.57	74.64	2.60	142.10	11.50	100.00



5. CERTIFICATION

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.

BY: 

Gary K. Edwards
Senior Manager
COMSEARCH
19700 Janelia Farm Boulevard
Ashburn, VA 20147

DATED: January 04, 2017

Ka-Band Earth Station – Wahiawa, HI

Frequency Coordination Report

28 GHz



Prepared on Behalf of
General Dynamics
Satellite Comm Services

January 4, 2017



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Summary of Results

On behalf of General Dynamics Mission Systems, Comsearch performed a coordination notice for all existing and proposed terrestrial licenses within the coordination contours of their proposed Ka-Band earth station in Wahiawa, Hawaii, which will transmit at 28 GHz¹. Prior-notification letters were sent to the licensees and a copy of the notification data is provided in section four of this report. The earth station coordination was finalized on January 3, 2017.

No objections were received from any of the incumbent 28 GHz licensees.

28 GHz Common Carrier and LTTS Coordination

In accordance with FCC Rules and Regulations, the Ka-Band earth station in Wahiawa, Hawaii was prior-coordinated by Comsearch. A notification letter and datasheet for this earth station were sent to the following 28 GHz common carrier fixed microwave licensees on November 28, 2016. These licensees are authorized to operate on frequencies that overlap the frequency range of the proposed earth station.

Licensee	Frequency Range	Authorized Geographic Area
Frontier	27.5 – 29.5 GHz	Continental US
Hawaii Telecom	29.1 – 29.5 GHz	Statewide: Hawaii
Princeton Scientific Capital Management	28.5 – 29.5 GHz	Discrete link in Honolulu, Hawaii

A notification letter and datasheet for the Ka-Band earth station in Wahiawa, Hawaii were also sent to the following 28 GHz local television transmission licensee on November 28, 2016. This licensee is authorized to operate temporary fixed operations from 27.5 – 29.5 GHz on a nationwide basis.

Licensee	Authorized Geographic Area
Information Super Station, LLC	Continental US

¹ The proposed earth station will operate in the 29.1 – 29.3 GHz portion of the Ka-Band.



No objections were received from the common carrier or local television transmission service incumbents.

28 GHz LMDS Coordination

The proposed earth station will operate on frequencies that overlap Block A of 28 GHz LMDS services. The total frequency allocation for Block A of the LMDS spectrum appears below.

Block A: 27.500-28.350 GHz
29.100-29.250 GHz
31.075-31.225 GHz

Licensee	Market	Market Name	Status	Termination Date
BTA Associates, LLC	BTA192	Honolulu, HI	Terminated	6/1/2012
BTA Associates, LLC	BTA222	Kahului-Wailuku-Lahaina, HI	Terminated	6/1/2012

No active LMDS services were found within the coordination contour of the earth station.



Earth Station Coordination Data

This section presents the data pertinent to the proposed Ka-Band earth station in Wahiawa, Hawaii. This data was circulated to all incumbent licensees in the shared 28 GHz frequency ranges.



General Dynamics Satellite Comm Services
Ka-Band Earth Station – Wahiawa, HI
Frequency Coordination Report
28 GHz

Date: 01/04/2017
 Job Number: 161128COMSGE10

Administrative Information

Status: ENGINEER PROPOSAL
 Call Sign: E980049
 Licensee Code: GENDYN
 Licensee Name: General Dynamics Satellite Comm Services

Site Information

WAHIAWA, HI

Venue Name:
 Latitude (NAD 83): 21° 31' 8.6" N
 Longitude (NAD 83): 158° 1' 0.6" W
 Climate Zone: C
 Rain Zone: 4
 Ground Elevation (AMSL): 324.5 m / 1064.6 ft

Link Information

Satellite Type: Low Earth Orbit
 Mode: TR - Transmit-Receive
 Modulation: Digital
 Minimum Elevation Angle: 5.0°
 Azimuth Range: 0.0° to 360°
 Antenna Centerline (AGL): 5.49 m / 18.0 ft

Antenna Information

Receive - FCC32

Transmit - FCC32

Manufacturer		Scientific Atlanta		Scientific Atlanta
Model		495600-311		495600-311
Gain / Diameter		54.0 dBi / 3.0 m		57.4 dBi / 3.0 m
3-dB / 15-dB Beamwidth		0.78° / 1.70°		0.23° / 0.45°
Max Available RF Power	(dBW/4 kHz)		(1) -14.8	(2) -16.7
	(dBW/MHz)		9.2	7.3
Maximum EIRP	(dBW/4 kHz)		42.6	40.7
	(dBW/MHz)		66.6	64.7
Interference Objectives:	Long Term	-153.0 dBW/MHz	20%	-151.0 dBW/4 kHz 20%
	Short Term	-141.0 dBW/MHz	0.01%	-128.0 dBW/4 kHz 0.0025%

Frequency Information

Receive 18.0 GHz

Transmit 28.0 GHz

Emission / Frequency Range (MHz)	6M25G7W - 14M0G7W / 19400.0 - 19600.0	(1) 6M25G7W / 29100.0 - 29300.0 (2) 14M0G7W / 29100.0 - 29300.0
Max Great Circle Coordination Distance	142.1 km / 88.3 mi	100.0 km / 62.1 mi
Precipitation Scatter Contour Radius	100.0 km / 62.1 mi	100.0 km / 62.1 mi



**General Dynamics Satellite Comm Services
Ka-Band Earth Station – Wahiawa, HI
Frequency Coordination Report
28 GHz**

Coordination Values

WAHIAWA, HI

Licensee Name	General Dynamics Satellite Comm Services		
Latitude (NAD 83)	21° 31' 8.6" N		
Longitude (NAD 83)	158° 1' 0.6" W		
Ground Elevation (AMSL)	324.5 m / 1064.6 ft		
Antenna Centerline (AGL)	5.49 m / 18.0 ft		
Antenna Model	Scientific-Atlanta 3 meter		
Antenna Mode	Receive 18.0 GHz		Transmit 28.0 GHz
Interference Objectives: Long Term	-153.0 dBW/MHz	20%	-151.0 dBW/4 kHz 20%
	Short Term	-141.0 dBW/MHz	0.01%
	0.0025%		-128.0 dBW/4 kHz
Max Available RF Power		-14.8 (dBW/4 kHz)	

Receive 18.0 GHz

Azimuth (°)	Transmit 28.0 GHz		Receive 18.0 GHz			
	Horizon Elevation (°)	Antenna Discrimination (°)	Horizon Gain (dBi)	Coordination Distance (km)	Horizon Gain (dBi)	Coordination Distance (km)
0	0.76	73.01	2.60	142.10	11.50	100.00
5	0.84	71.45	2.60	142.10	11.50	100.00
10	0.98	70.07	2.60	142.10	11.50	100.00
15	1.00	68.76	2.60	142.10	11.50	100.00
20	1.15	67.72	2.60	142.10	11.50	100.00
25	1.31	66.87	2.60	142.10	11.50	100.00
30	1.59	66.33	2.60	142.10	11.50	100.00
35	1.94	66.07	2.60	142.10	11.50	100.00
40	2.02	65.75	2.60	142.10	11.50	100.00
45	2.12	65.64	2.60	142.10	11.50	100.00
50	2.30	65.81	2.60	142.10	11.50	100.00
55	2.07	65.77	2.60	142.10	11.50	100.00
60	2.28	66.35	2.60	142.10	11.50	100.00
65	2.18	66.83	2.60	142.10	11.50	100.00
70	2.23	67.63	2.60	142.10	11.50	100.00
75	2.25	68.58	2.60	142.10	11.50	100.00
80	1.98	69.44	2.60	142.10	11.50	100.00
85	2.05	70.76	2.60	142.10	11.50	100.00
90	1.73	71.93	2.60	142.10	11.50	100.00
95	1.79	73.51	2.60	142.10	11.50	100.00
100	1.67	75.10	2.60	142.10	11.50	100.00
105	1.39	76.72	2.60	142.10	11.50	100.00
110	1.34	78.58	2.60	142.10	11.50	100.00
115	1.22	80.49	2.60	142.10	11.50	100.00
120	1.11	82.49	2.60	142.10	11.50	100.00
125	0.99	84.55	2.60	142.10	11.50	100.00
130	1.05	86.68	2.60	142.10	11.50	100.00
135	0.82	88.81	2.60	142.10	11.50	100.00
140	0.62	90.98	2.60	142.10	11.50	100.00
145	0.40	93.19	2.60	142.10	11.50	100.00
150	0.00	95.44	2.60	142.10	11.50	100.00
155	0.00	97.61	2.60	142.10	11.50	100.00
160	0.00	99.73	2.60	142.10	11.50	100.00
165	0.00	101.80	2.60	142.10	11.50	100.00
170	0.00	103.78	2.60	142.10	11.50	100.00
175	0.00	105.68	2.60	142.10	11.50	100.00
180	0.00	107.47	2.60	142.10	11.50	100.00
185	0.00	109.14	2.60	142.10	11.50	100.00



**General Dynamics Satellite Comm Services
Ka-Band Earth Station – Wahiawa, HI
Frequency Coordination Report
28 GHz**

Coordination Values	WAHIAWA, HI		
Licensee Name	General Dynamics Satellite Comm Services		
Latitude (NAD 83)	21° 31' 8.6" N		
Longitude (NAD 83)	158° 1' 0.6" W		
Ground Elevation (AMSL)	324.5 m / 1064.6 ft		
Antenna Centerline (AGL)	5.49 m / 18.0 ft		
Antenna Model	Scientific-Atlanta 3 meter		
Antenna Mode	Receive 18.0 GHz		Transmit 28.0 GHz
Interference Objectives: Long Term	-153.0 dBW/MHz	20%	-151.0 dBW/4 kHz 20%
Short Term	-141.0 dBW/MHz	0.01%	-128.0 dBW/4 kHz
	0.0025%		
Max Available RF Power	-14.8 (dBW/4 kHz)		

Transmit 28.0 GHz		Receive 18.0 GHz				
Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Horizon Gain (dBi)	Coordination Distance (km)	Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	110.67	2.60	142.10	11.50	100.00
195	0.00	112.05	2.60	142.10	11.50	100.00
200	0.00	113.27	2.60	142.10	11.50	100.00
205	0.00	114.31	2.60	142.10	11.50	100.00
210	0.00	115.16	2.60	142.10	11.50	100.00
215	0.00	115.81	2.60	142.10	11.50	100.00
220	0.00	116.25	2.60	142.10	11.50	100.00
225	0.00	116.48	2.60	142.10	11.50	100.00
230	0.00	116.49	2.60	142.10	11.50	100.00
235	0.00	116.28	2.60	142.10	11.50	100.00
240	0.00	115.86	2.60	142.10	11.50	100.00
245	0.00	115.23	2.60	142.10	11.50	100.00
250	0.00	114.40	2.60	142.10	11.50	100.00
255	0.00	113.38	2.60	142.10	11.50	100.00
260	0.00	112.18	2.60	142.10	11.50	100.00
265	0.00	110.81	2.60	142.10	11.50	100.00
270	0.00	109.29	2.60	142.10	11.50	100.00
275	0.33	107.43	2.60	142.10	11.50	100.00
280	0.00	105.86	2.60	142.10	11.50	100.00
285	0.00	103.97	2.60	142.10	11.50	100.00
290	0.00	101.99	2.60	142.10	11.50	100.00
295	0.00	99.94	2.60	142.10	11.50	100.00
300	0.00	97.82	2.60	142.10	11.50	100.00
305	0.00	95.65	2.60	142.10	11.50	100.00
310	0.00	93.45	2.60	142.10	11.50	100.00
315	0.00	91.22	2.60	142.10	11.50	100.00
320	0.00	88.99	2.60	142.10	11.50	100.00
325	0.00	86.77	2.60	142.10	11.50	100.00
330	0.00	84.56	2.60	142.10	11.50	100.00
335	0.28	82.47	2.60	142.10	11.50	100.00
340	0.27	80.36	2.60	142.10	11.50	100.00
345	0.62	78.46	2.60	142.10	11.50	100.00
350	0.56	76.49	2.60	142.10	11.50	100.00
355	0.57	74.64	2.60	142.10	11.50	100.00

Contact Information

For questions or information regarding the 28 GHz Frequency Coordination Report, please contact:

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