

FREQUENCY COORDINATION AND INTERFERENCE ANALYSIS REPORT

Prepared for
Denali 20020, LLC
BREWSTER, WA
Satellite Earth Station

Prepared By:
COMSEARCH
19700 Janelia Farm Boulevard
Ashburn, VA 20147
December 15, 2016

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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

AT&T Mobility Spectrum LLC - ID, MT, WY
AT&T Mobility Spectrum LLC - Washington
AT&T Mobility Wireless Ops Hldgs - WA
Accel Net, Inc.
Avista Utilities
BENTON COUNTY EMERGENCY SERVICES
BNSF Railway Company
Bain, Robert B
Bearclaw, LLC
Benton Rural Electric Association
Boeing Company
Boingo Wireless, Inc.
Bookbinder, LLC
Brigadier, LLC
CASCADE NATURAL GAS CORPORATION
CENCOM - Kitsap 911
COMMUNITY TRANSIT SNOHOMISH COUNTY PTBA
Cascadelink Inc
Cellco Partnership - Oregon
Cellco Partnership - Washington
CenturyTel of Washington, Inc.
Chickadee Wireless, Inc
City of Tacoma
City of Tacoma / Tacoma Public Utilities
Clearwire Spectrum Holdings II, LLC
Clearwire Spectrum Holdings III, LLC
Clearwire Spectrum Holdings LLC
Columbia Rural Electric Association, Inc
Cyberdyne Networks, Inc.
DAY MANAGEMENT CORPORATION
Desert Winds Wireless
Eastside Public Safety Com Agency
EcliptixNet Broadband, Inc.
Electron Hydro LLC
Ellensburg Telephone Company
Energy Northwest
Everett Clinic
Everett MSO, Inc.
First Step Internet, LLC
Fisher Broadcasting, Inc. KOMO TV

Franklin County Sheriff
 Frontier Communications Northwest Inc.
 GW Networks
 Grays Harbor Public Utility District #1
 Hermiston, City of
 Inland Cellular LLC
 J & R Electronics Inc
 Jefferson Microwave, LLC
 King Broadcasting Company - KTVB TV
 King County DOT Metro Transit Division
 King, County of
 Kootenai, County of
 Leader Communications LLC
 McDaniel Cellular Telephone Company
 Medicine Wheel Website Design, Inc.
 Mobilisa Enterprise Wireless
 NCI Datacom, Inc.
 New Cingular Wireless PCS - ID, WY
 New Cingular Wireless PCS LLC -OR Region
 New Cingular Wireless PCS LLC-Washington
 Newmax, LLC
 Noel Communications, Inc
 Northwest Open Access Network
 Northwest Pipeline GP
 Olympic Wireless, LLC
 PIERCE COUNTY COMMUNICATIONS DIVISION
 PIERCE TRANSIT
 PacifiCorp
 Pass Word, Inc.
 Pierce County
 PocketiNet Communications Inc.
 Post Falls Police Department
 Providence Toppenish Community Hospital
 Ptera Wireless, Inc.
 Public Util Dist. #1 of Snohomish County
 Public Utility District No 1 of Okanogan
 Puget Sound Energy
 Quinault Indian Nation
 Qwest Corporation
 RCC Minnesota, Inc - Washington/Oregon
 RSN Wireless, LLC
 Rendezvous Communications LLC
 Rivercom 911
 SW Networks
 Saddle Mountain Wireless Inc.
 Seattle City Light
 Seattle FCC License Sub, LLC
 Seattle SMSA Limited Partnership
 Seattle's Best Internet, LLC
 Seattle, City of
 Selahv Farms, LLC
 Skotdal Brothers LLC (c/o CSI)
 Snohomish County Emergency Radio System
 Spectrum Networks Inc. - T
 Spokane Regional Emergency Communication
 Sprint Spectrum L.P.

Sprintcom, Inc
St. Anthony Hospital
Startouch, Inc.
Stevens County Sheriff's Office
Summit Towers LLC
Sunheaven Farms, LLC
T-MOBILE LIC LLC - VOICESTREAM PCS BTA I
T-Mobile License LLC
Thurston 9-1-1 Communications
Towerstream Corp.
USCOC of Richland, Inc.
Union Pacific Railroad Company
United Telephone Co. of the Northwest
Verizon Wireless (VAW) LLC - (WA)
Verizon Wireless (VAW) LLC - Idaho
Verizon Wireless (VAW) LLC -CO/ID/MT/WY
Verizon Wireless (VAW) LLC-Portland, OR
Warden Hutterian Brethren Inc
Washington Broadband, Inc.
Washington State Dept of Natural Resourc
Washington State Patrol
Washington State of Dept of Transportat
Westcom Broadband, Inc.
Western Sub-RSA LTD Partnership
Whitman County Fire District #7
Wired or Wireless, Inc.
YAKIMA CITY WASHINGTON
Yakima MSA Limited Partnership

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: 12/15/2016
Job Number: 161128COMSGE06

Administrative Information

Status: ENGINEER PROPOSAL
Call Sign: E120043
Licensee Code: DENALI
Licensee Name: Denali 20020, LLC

Site Information BREWSTER, WA

Venue Name
Latitude (NAD 83): 48° 8' 47.0" N
Longitude (NAD 83): 119° 41' 29.0" W
Climate Zone: A
Rain Zone: 5
Ground Elevation (AMSL): 380.0 m / 1246.7 ft

Link Information

Satellite Type: Geostationary
Mode: TR - Transmit-Receive
Modulation: Digital
Satellite Arc: 53° W to 188° West Longitude
Azimuth Range: 107.8° to 253.5°
Corresponding Elevation Angles: 6.7° / 5.6°
Antenna Centerline (AGL): 3.66 m / 12.0 ft

Antenna Information

Receive - FCC32

Transmit - FCC32

Manufacturer	Vertex	Vertex
Model	6.3 meter	6.3 meter
Gain / Diameter	55.7 dBi / 6.3 m	57.5 dBi / 6.3 m
3-dB / 15-dB Beamwidth	0.26° / 0.52°	0.22° / 0.44°
Max Available RF Power (dBW/4 kHz)	-14.0	-14.0
(dBW/MHz)	10.0	10.0
Maximum EIRP (dBW/4 kHz)	43.5	43.5
(dBW/MHz)	67.5	67.5
Interference Objectives:	Long Term	-156.0 dBW/MHz 20%
	Short Term	-146.0 dBW/MHz 0.01%
		-151.0 dBW/4 kHz 20%
		-128.0 dBW/4 kHz 0.0025%

Frequency Information

Receive 11.0 GHz

Transmit 14.0 GHz

Emission / Frequency Range (MHz)	1M00G7D - 72M0G7W / 10950.0 - 11200.0	1M00G7D - 72M0G7W / 14000.0 - 14500.0
	1M00G7D - 72M0G7W / 11450.0 - 12200.0	
Max Great Circle Coordination Distance	573.2 km / 356.1 mi	253.5 km / 157.5 mi
Precipitation Scatter Contour Radius	414.0 km / 257.2 mi	100.0 km / 62.1 mi

COMSEARCH

Earth Station Data Sheet

19700 Janelia Farm Boulevard, Ashburn, VA 20147
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Coordination Values

BREWSTER, WA

Licensee Name Denali 20020, LLC
Latitude (NAD 83) 48° 8' 47.0" N
Longitude (NAD 83) 119° 41' 29.0" W
Ground Elevation (AMSL) 380.0 m / 1246.7 ft
Antenna Centerline (AGL) 3.66 m / 12.0 ft
Antenna Model Vertex 6.3 meter
Antenna Mode Receive 11.0 GHz Transmit 14.0 GHz
Interference Objectives: Long Term -156.0 dBW/MHz 20% -151.0 dBW/4 kHz 20%
Short Term -146.0 dBW/MHz 0.01% -128.0 dBW/4 kHz 0.0025%
Max Available RF Power -14.0 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Receive 11.0 GHz		Transmit 14.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)	Horizon Gain (dBi)	Coordination Distance (km)
0	0.84	106.45	-10.00	189.86	-10.00	100.00
5	0.95	102.73	-10.00	184.46	-10.00	100.00
10	0.70	97.75	-10.00	196.89	-10.00	100.00
15	1.33	92.78	-10.00	170.74	-10.00	100.00
20	1.67	87.80	-10.00	156.54	-10.00	100.00
25	0.60	82.84	-10.00	202.16	-10.00	100.00
30	0.57	77.87	-10.00	203.68	-10.00	100.00
35	0.75	72.89	-10.00	194.37	-10.00	100.00
40	1.24	67.90	-10.00	173.68	-10.00	100.00
45	1.63	62.91	-10.00	157.79	-10.00	100.00
50	1.46	57.94	-10.00	163.60	-10.00	100.00
55	1.87	52.95	-10.00	150.43	-10.00	100.00
60	1.74	47.99	-10.00	154.24	-10.00	100.00
65	2.21	42.98	-8.83	147.00	-8.83	100.00
70	2.22	38.02	-7.50	153.13	-7.50	100.00
75	2.43	33.04	-5.97	155.44	-5.97	100.00
80	2.65	28.06	-4.20	159.44	-4.20	100.00
85	2.59	23.14	-2.11	175.28	-2.11	100.00
90	2.80	18.20	0.50	183.51	0.50	100.00
95	2.89	13.33	3.88	198.25	3.88	100.00
100	2.69	8.74	8.46	222.20	8.46	100.00
105	2.37	5.12	14.26	264.88	14.26	107.03
110	2.23	4.95	14.63	400.54	14.63	167.79
115	2.24	7.95	9.49	238.28	9.49	100.00
120	2.59	10.71	6.25	213.11	6.25	100.00
125	2.69	13.56	3.69	201.49	3.69	100.00
130	1.87	17.05	1.21	205.29	1.21	100.00
135	1.06	20.41	-0.74	218.29	-0.74	100.00
140	0.44	23.46	-2.26	244.88	-2.26	117.17
145	0.28	25.93	-3.35	254.51	-3.35	126.18
150	0.00	28.31	-4.30	258.30	-4.30	130.29
155	0.00	30.17	-4.99	254.84	-4.99	128.49
160	0.00	31.76	-5.55	252.11	-5.55	127.06
165	0.00	33.03	-5.97	250.04	-5.97	125.97
170	0.00	33.96	-6.27	248.59	-6.27	125.19
175	0.00	34.52	-6.45	247.73	-6.45	124.74
180	0.00	34.71	-6.51	247.44	-6.51	124.58
185	0.00	34.52	-6.45	247.73	-6.45	124.73

COMSEARCH

Earth Station Data Sheet

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

Coordination Values

BREWSTER, WA

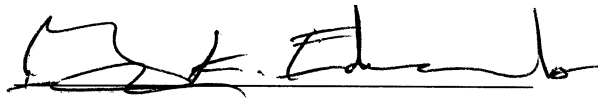
Licensee Name	Denali 20020, LLC				
Latitude (NAD 83)	48° 8' 47.0" N				
Longitude (NAD 83)	119° 41' 29.0" W				
Ground Elevation (AMSL)	380.0 m / 1246.7 ft				
Antenna Centerline (AGL)	3.66 m / 12.0 ft				
Antenna Model	Vertex 6.3 meter				
Antenna Mode	Receive 11.0 GHz			Transmit 14.0 GHz	
Interference Objectives: Long Term	-156.0 dBW/MHz	20%		-151.0 dBW/4 kHz	20%
Short Term	-146.0 dBW/MHz	0.01%		-128.0 dBW/4 kHz	0.0025%
Max Available RF Power				-14.0 (dBW/4 kHz)	

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Receive 11.0 GHz		Transmit 14.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)	Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	33.96	-6.27	248.59	-6.27	125.19
195	0.00	33.03	-5.97	250.04	-5.97	125.96
200	0.00	31.76	-5.55	252.11	-5.55	127.06
205	0.00	30.18	-4.99	254.84	-4.99	128.49
210	0.00	28.31	-4.30	258.30	-4.30	130.29
215	0.00	26.18	-3.45	262.59	-3.45	131.27
220	0.00	23.84	-2.43	267.86	-2.43	134.06
225	0.00	21.29	-1.20	274.35	-1.20	137.59
230	0.00	18.59	0.27	282.38	0.27	142.07
235	0.00	15.73	2.08	292.55	2.08	147.92
240	0.00	12.76	4.35	303.12	4.35	155.82
245	0.24	9.52	7.54	320.33	7.54	165.38
250	0.47	6.22	12.15	444.80	12.15	198.30
255	1.77	4.14	16.58	573.19	16.58	253.55
260	1.68	7.60	9.97	256.90	9.97	107.75
265	2.34	11.96	5.06	212.55	5.06	100.00
270	2.99	16.71	1.43	184.00	1.43	100.00
275	3.32	21.62	-1.37	158.19	-1.37	100.00
280	3.49	26.59	-3.62	142.98	-3.62	100.00
285	3.34	31.58	-5.49	137.43	-5.49	100.00
290	3.10	36.58	-7.08	135.35	-7.08	100.00
295	1.90	41.64	-8.49	156.69	-8.49	100.00
300	1.61	46.64	-9.72	160.06	-9.72	100.00
305	2.09	51.59	-10.00	144.47	-10.00	100.00
310	1.83	56.59	-10.00	151.56	-10.00	100.00
315	1.84	61.57	-10.00	151.21	-10.00	100.00
320	2.17	66.55	-10.00	142.53	-10.00	100.00
325	1.86	71.55	-10.00	150.57	-10.00	100.00
330	2.26	76.53	-10.00	140.59	-10.00	100.00
335	1.66	81.53	-10.00	157.01	-10.00	100.00
340	1.19	86.52	-10.00	175.45	-10.00	100.00
345	0.66	91.50	-10.00	199.11	-10.00	100.00
350	0.22	96.48	-10.00	229.42	-10.00	114.25
355	0.00	101.45	-10.00	231.37	-10.00	115.80

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: December 15, 2016