

# FREQUENCY COORDINATION AND INTERFERENCE ANALYSIS REPORT

Prepared for  
**HUGHES NETWORK SYSTEMS LIMITED**  
**DULUTH, MN**  
**Satellite Earth Station**

Prepared By:  
COMSEARCH  
19700 Janelia Farm Boulevard  
Ashburn, VA 20147  
March 03, 2017

## TABLE OF CONTENTS

1. CONCLUSIONS .....	3
2. SUMMARY OF RESULTS .....	4
3. SUPPLEMENTAL SHOWING .....	5
4. EARTH STATION COORDINATION DATA.....	6
5. CERTIFICATION.....	10

## 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 02/15/2017.

Company

Access Equipment & Communications, Inc  
BNSF Railway Company  
Clearwire Spectrum Holdings III, LLC  
Compudyne Inc.  
Fixed Wireless Holdings, LLC  
Nextera Communications  
Regents of the University of Minnesota  
Saint Louis, County of  
Sprint Spectrum L.P.  
T-Mobile License LLC

## **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: 03/03/2017  
Job Number: 170215COMSGE08

### Administrative Information

Status ENGINEER PROPOSAL  
Call Sign E150078  
Licensee Code HUNESY  
Licensee Name HUGHES NETWORK SYSTEMS LIMITED

### Site Information DULUTH, MN

Venue Name  
Latitude (NAD 83) 46° 49' 37.8" N  
Longitude (NAD 83) 92° 7' 49.9" W  
Climate Zone A  
Rain Zone 2  
Ground Elevation (AMSL) 417.07 m / 1368.3 ft

### Link Information

Satellite Type Geostationary  
Mode TR - Transmit-Receive  
Modulation Digital  
Satellite Arc 97.1° W to 97.1° West Longitude  
Azimuth Range 186.8° to 186.8°  
Corresponding Elevation Angles 35.9° / 35.9°  
Antenna Centerline (AGL) 5.49 m / 18.0 ft

### Antenna Information

#### Receive - FCC32

#### Transmit - FCC32

Manufacturer	ASC Signal	ASC Signal
Model	KA 8.1M	KA 8.1M
Gain / Diameter	62.0 dBi / 8.1 m	65.3 dBi / 8.1 m
3-dB / 15-dB Beamwidth	1.00° / 2.00°	0.10° / 0.23°
Max Available RF Power (dBW/4 kHz)		-38.0
(dBW/MHz)		-14.0
Maximum EIRP (dBW/4 kHz)		27.3
(dBW/MHz)		51.3
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%

### Frequency Information

#### Receive 18.0 GHz

#### Transmit 28.0 GHz

Emission / Frequency Range (MHz) 100KG7W - 250MG7D / 18300.0 - 19300.0  
100KG7W - 250MG7D / 19700.0 - 20200.0 100KG7W - 250MG7D / 27850.0 - 30000.0

Max Great Circle Coordination Distance 145.0 km / 90.1 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

### DULUTH, MN

Licensee Name HUGHES NETWORK SYSTEMS LIMITED  
Latitude (NAD 83) 46° 49' 37.8" N  
Longitude (NAD 83) 92° 7' 49.9" W  
Ground Elevation (AMSL) 417.07 m / 1368.3 ft  
Antenna Centerline (AGL) 5.49 m / 18.0 ft  
Antenna Model ASC Signal 8.1 meter  
Antenna Mode Receive 18.0 GHz Transmit 28.0 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 -38.0 (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	0.34	143.84	-10.00	125.87	-10.00	100.00
5	0.32	144.34	-10.00	127.28	-10.00	100.00
10	0.34	144.27	-10.00	126.15	-10.00	100.00
15	0.00	143.26	-10.00	136.18	-10.00	100.00
20	0.22	142.22	-10.00	134.85	-10.00	100.00
25	0.39	140.61	-10.00	122.53	-10.00	100.00
30	0.33	138.35	-10.00	126.92	-10.00	100.00
35	0.29	135.74	-10.00	128.87	-10.00	100.00
40	0.00	132.65	-10.00	136.18	-10.00	100.00
45	0.39	129.74	-10.00	122.57	-10.00	100.00
50	0.28	126.32	-10.00	129.96	-10.00	100.00
55	0.00	122.66	-10.00	136.18	-10.00	100.00
60	0.00	119.01	-10.00	136.18	-10.00	100.00
65	0.00	115.25	-10.00	136.18	-10.00	100.00
70	0.00	111.41	-10.00	136.18	-10.00	100.00
75	0.00	107.50	-10.00	136.18	-10.00	100.00
80	0.00	103.53	-10.00	136.18	-10.00	100.00
85	0.00	99.53	-10.00	136.18	-10.00	100.00
90	0.00	95.50	-10.00	136.18	-10.00	100.00
95	0.00	91.45	-10.00	136.18	-10.00	100.00
100	0.00	87.41	-10.00	136.18	-10.00	100.00
105	0.00	83.37	-10.00	136.18	-10.00	100.00
110	0.00	79.34	-10.00	136.18	-10.00	100.00
115	0.00	75.35	-10.00	136.18	-10.00	100.00
120	0.00	71.40	-10.00	136.18	-10.00	100.00
125	0.00	67.50	-10.00	136.18	-10.00	100.00
130	0.00	63.68	-10.00	136.18	-10.00	100.00
135	0.00	59.95	-10.00	136.18	-10.00	100.00
140	0.00	56.34	-10.00	136.18	-10.00	100.00
145	0.00	52.87	-10.00	136.18	-10.00	100.00
150	0.00	49.58	-10.00	136.18	-10.00	100.00
155	0.00	46.52	-9.69	137.04	-9.69	100.00
160	0.00	43.72	-9.02	138.91	-9.02	100.00
165	0.00	41.26	-8.39	140.70	-8.39	100.00
170	0.00	39.19	-7.83	142.31	-7.83	100.00
175	0.00	37.58	-7.37	143.65	-7.37	100.00
180	0.00	36.49	-7.05	144.59	-7.05	100.00
185	0.00	35.98	-6.90	145.04	-6.90	100.00



# COMSEARCH

## Earth Station Data Sheet

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

### Coordination Values

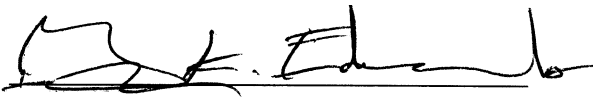
### DULUTH, MN

Licensee Name HUGHES NETWORK SYSTEMS LIMITED  
Latitude (NAD 83) 46° 49' 37.8" N  
Longitude (NAD 83) 92° 7' 49.9" W  
Ground Elevation (AMSL) 417.07 m / 1368.3 ft  
Antenna Centerline (AGL) 5.49 m / 18.0 ft  
Antenna Model ASC Signal 8.1 meter  
Antenna Mode Receive 18.0 GHz Transmit 28.0 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 -38.0 (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	0.30	35.77	-6.84	137.07	-6.84	100.00
195	0.51	36.24	-6.98	121.45	-6.98	100.00
200	0.61	37.42	-7.33	116.43	-7.33	100.00
205	0.63	39.18	-7.83	114.18	-7.83	100.00
210	0.52	41.50	-8.45	117.27	-8.45	100.00
215	0.29	44.26	-9.15	131.20	-9.15	100.00
220	0.26	47.18	-9.84	131.69	-9.84	100.00
225	0.27	50.33	-10.00	130.38	-10.00	100.00
230	0.00	53.83	-10.00	136.18	-10.00	100.00
235	0.22	57.24	-10.00	134.28	-10.00	100.00
240	0.35	60.85	-10.00	124.91	-10.00	100.00
245	0.36	64.62	-10.00	124.17	-10.00	100.00
250	0.28	68.51	-10.00	130.15	-10.00	100.00
255	0.29	72.44	-10.00	128.88	-10.00	100.00
260	0.28	76.42	-10.00	129.50	-10.00	100.00
265	0.00	80.47	-10.00	136.18	-10.00	100.00
270	0.00	84.50	-10.00	136.18	-10.00	100.00
275	0.24	88.54	-10.00	132.68	-10.00	100.00
280	0.00	92.59	-10.00	136.18	-10.00	100.00
285	0.00	96.63	-10.00	136.18	-10.00	100.00
290	0.23	100.69	-10.00	133.66	-10.00	100.00
295	0.00	104.65	-10.00	136.18	-10.00	100.00
300	0.00	108.60	-10.00	136.18	-10.00	100.00
305	0.00	112.50	-10.00	136.18	-10.00	100.00
310	0.60	116.53	-10.00	109.79	-10.00	100.00
315	0.62	120.31	-10.00	108.89	-10.00	100.00
320	0.50	123.90	-10.00	114.50	-10.00	100.00
325	0.31	127.30	-10.00	128.01	-10.00	100.00
330	0.38	130.65	-10.00	122.64	-10.00	100.00
335	0.41	133.77	-10.00	120.55	-10.00	100.00
340	0.49	136.65	-10.00	114.63	-10.00	100.00
345	0.55	139.20	-10.00	112.10	-10.00	100.00
350	0.43	141.20	-10.00	119.38	-10.00	100.00
355	0.32	142.73	-10.00	127.36	-10.00	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: March 03, 2017