

FREQUENCY COORDINATION AND INTERFERENCE ANALYSIS REPORT

Prepared for
HUGHES NETWORK SYSTEMS LIMITED
SANTA CLARA, CA
Satellite Earth Station

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

The following companies reported potential great circle interference conflicts that did not meet the objectives on a line-of-sight basis. When over-the-horizon losses are considered on the interfering paths, sufficient blockage exists to negate harmful interference from occurring with the proposed transmit-receive earth station.

Company

Pacific Bell Tel Com dba AT&T California
T-Mobile License LLC

No other carriers reported potential interference cases.

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

AT&T Corp.
Alameda County Water District
Alameda County of California
Another ISP, LLC
Antioch, City of
CBS Broadcasting Inc
CBS Communication Services Inc
CBS Radio East Inc.
CONTRA COSTA COUNTY COMMUNICATIONS DEPT.
California, State of
Central Valley Concrete, Inc.
City & County of San Francisco PUC
City of Dublin
City of Oakland
City of Pittsburg, CA Police Dept
City of San Jose
City of Vallejo
Clearwire Spectrum Holdings II, LLC
Clearwire Spectrum Holdings III, LLC
Comcast Cablevision Corp of California
Conterra Ultra Broadband, LLC
Contra Costa Water District
County of Sacramento - ECS-Network
County of San Mateo
Dublin San Ramon
Eastern Contra Costa Transit
Ether Web Network, Inc.
Etheric Networks, Inc.
Fixed Wireless Holdings, LLC
GTE Mobilnet of California LTD Partnersh
Gatespeed Broadband, Inc.
Global Data Link, Inc
Good Samaritan Hospital
Harris Corporation (Virginia)
Interwest Management Services Inc.
John Muir Health
KBWB License LLC
KGO Television, Inc.
KTVU, Fox Television Stations Inc.
M.U.T. Licensing, LLC

MODERN SYSTEMS RESEARCH, INC.
MODESTO, CITY OF
Marin, County of
Merced County Office of Education
Modesto Irrigation District
Monterey Bay Aquarium
Monterey County Superintendent of School
Monterey, County of
NBC Telemundo License Co. - KNTV
Napa, City of
New Cingular Wireless PCS LLC - N CAL
Nextlink Wireless, LLC
Nextweb Inc
OTA BROADCASTING (SFO), LLC
Oakland Police Department
Olympic Wireless, LLC
PERALTA COMMUNITY COLLEGE DISTRICT
Pacific Bell Tel Com dba AT&T California
Pacific Gas and Electric Company
Proxim Wireless Corporation
REMEC Broadband Wireless
Razzo Link, Inc
Regents of the University of California
River Delta Wireless
SACRAMENTO, CITY OF
SAN JOSE WATER COMPANY
SANTA CLARA UNIVERSITY
STOCKTON, CITY OF
Sacramento County
Sacramento Television Stations, Inc
Sacramento Valley Limited Partnership
San Francisco, City and County of
San Joaquin County
San Jose Water Company
San Jose, City of (ECOMM)
Softcom Internet Communications, Inc.
Sprint PCS
Sprint Spectrum L.P.
Sprint Spectrum LP DBA Sprint PCS
Sprint Telephony PCS, L.P.
Stanford University
Stockton, Port of
Sutro Tower Inc.
T-Mobile License LLC
TLink Broadband Services
The Internet Connection Inc
The Internet Store, Inc.
Towerstream Corp.
Unimas San Francisco LLC
Union Pacific Railroad Company
Unwired LTD
Velociter Wireless, Inc.
Verizon Wireless (VAW) LLC-N CA/NV
Vista Broadband Networks, Inc.
Walmart Global eCommerce
Webpass Inc.

Webperception, LLC
WiLine Networks Inc.
Wiline Spectrum Holdings LLC
Wirelessco L.P.

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: 170215COMSGE05

Administrative Information

Status ENGINEER PROPOSAL
Call Sign E150087
Licensee Code HUNESY
Licensee Name HUGHES NETWORK SYSTEMS LIMITED

Site Information SANTA CLARA, CA

Venue Name
Latitude (NAD 83) 37° 21' 54.5" N
Longitude (NAD 83) 121° 57' 41.0" W
Climate Zone A
Rain Zone 4
Ground Elevation (AMSL) 16.1 m / 52.8 ft

Link Information

Satellite Type Geostationary
Mode TR - Transmit-Receive
Modulation Digital
Satellite Arc 97.1° W to 97.1° West Longitude
Azimuth Range 142.6° to 142.6°
Corresponding Elevation Angles 39.4° / 39.4°
Antenna Centerline (AGL) 3.66 m / 12.0 ft

Antenna Information

| | | Receive - FCC32 | | Transmit - FCC32 | |
|--------------------------|--------------------------|------------------|-------|------------------|---------|
| Manufacturer | | ASC Signal | | ASC Signal | |
| Model | | 5.6m | | 5.6m | |
| Gain / Diameter | | 58.6 dBi / 5.6 m | | 62.0 dBi / 5.6 m | |
| 3-dB / 15-dB Beamwidth | | 1.00° / 2.00° | | 0.14° / 0.32° | |
| Max Available RF Power | (dBW/4 kHz) (dBW/MHz) | | | -20.5 3.5 | |
| Maximum EIRP | (dBW/4 kHz) (dBW/MHz) | | | 41.5 65.5 | |
| 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 - 250MG7W / 18300.0 - 19300.0 100KG7W - 250MG7W / 19700.0 - 20200.0 | 100KG7W - 250MG7W / 27850.0 - 30000.0 |
| Max Great Circle Coordination Distance | 142.0 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

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Coordination Values

SANTA CLARA, CA

Licensee Name HUGHES NETWORK SYSTEMS LIMITED
Latitude (NAD 83) 37° 21' 54.5" N
Longitude (NAD 83) 121° 57' 41.0" W
Ground Elevation (AMSL) 16.1 m / 52.8 ft
Antenna Centerline (AGL) 3.66 m / 12.0 ft
Antenna Model ASC Signal 5.6 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 -20.5 (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 | 0.00 | 127.87 | -10.00 | 136.18 | -10.00 | 100.00 |
| 5 | 0.00 | 124.80 | -10.00 | 136.18 | -10.00 | 100.00 |
| 10 | 0.00 | 121.54 | -10.00 | 136.18 | -10.00 | 100.00 |
| 15 | 0.00 | 118.14 | -10.00 | 136.18 | -10.00 | 100.00 |
| 20 | 0.00 | 114.62 | -10.00 | 136.18 | -10.00 | 100.00 |
| 25 | 0.00 | 110.99 | -10.00 | 136.18 | -10.00 | 100.00 |
| 30 | 0.00 | 107.29 | -10.00 | 136.18 | -10.00 | 100.00 |
| 35 | 0.00 | 103.53 | -10.00 | 136.18 | -10.00 | 100.00 |
| 40 | 0.00 | 99.73 | -10.00 | 136.18 | -10.00 | 100.00 |
| 45 | 0.00 | 95.89 | -10.00 | 136.18 | -10.00 | 100.00 |
| 50 | 0.00 | 92.04 | -10.00 | 136.18 | -10.00 | 100.00 |
| 55 | 0.00 | 88.18 | -10.00 | 136.18 | -10.00 | 100.00 |
| 60 | 0.00 | 84.32 | -10.00 | 136.18 | -10.00 | 100.00 |
| 65 | 0.00 | 80.49 | -10.00 | 136.18 | -10.00 | 100.00 |
| 70 | 0.00 | 76.68 | -10.00 | 136.18 | -10.00 | 100.00 |
| 75 | 0.00 | 72.92 | -10.00 | 136.18 | -10.00 | 100.00 |
| 80 | 0.00 | 69.21 | -10.00 | 136.18 | -10.00 | 100.00 |
| 85 | 0.00 | 65.59 | -10.00 | 136.18 | -10.00 | 100.00 |
| 90 | 0.00 | 62.05 | -10.00 | 136.18 | -10.00 | 100.00 |
| 95 | 0.00 | 58.64 | -10.00 | 136.18 | -10.00 | 100.00 |
| 100 | 0.00 | 55.38 | -10.00 | 136.18 | -10.00 | 100.00 |
| 105 | 0.00 | 52.30 | -10.00 | 136.18 | -10.00 | 100.00 |
| 110 | 0.00 | 49.44 | -10.00 | 136.18 | -10.00 | 100.00 |
| 115 | 0.00 | 46.83 | -9.76 | 136.83 | -9.76 | 100.00 |
| 120 | 0.00 | 44.54 | -9.22 | 138.35 | -9.22 | 100.00 |
| 125 | 0.00 | 42.61 | -8.74 | 139.70 | -8.74 | 100.00 |
| 130 | 0.00 | 41.10 | -8.35 | 140.82 | -8.35 | 100.00 |
| 135 | 0.00 | 40.06 | -8.07 | 141.62 | -8.07 | 100.00 |
| 140 | 0.00 | 39.52 | -7.92 | 142.05 | -7.92 | 100.00 |
| 145 | 1.25 | 38.25 | -7.57 | 100.00 | -7.57 | 100.00 |
| 150 | 0.00 | 40.01 | -8.05 | 141.66 | -8.05 | 100.00 |
| 155 | 0.22 | 40.82 | -8.27 | 139.04 | -8.27 | 100.00 |
| 160 | 0.26 | 42.28 | -8.65 | 134.77 | -8.65 | 100.00 |
| 165 | 0.25 | 44.22 | -9.14 | 134.77 | -9.14 | 100.00 |
| 170 | 0.26 | 46.50 | -9.69 | 132.49 | -9.69 | 100.00 |
| 175 | 0.25 | 49.11 | -10.00 | 132.48 | -10.00 | 100.00 |
| 180 | 0.25 | 51.97 | -10.00 | 131.83 | -10.00 | 100.00 |
| 185 | 0.27 | 55.05 | -10.00 | 130.57 | -10.00 | 100.00 |

COMSEARCH

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19700 Janelia Farm Boulevard, Ashburn, VA 20147
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Coordination Values

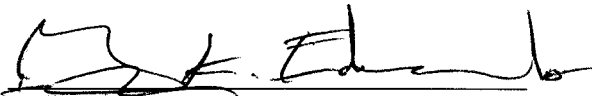
SANTA CLARA, CA

| | | | | |
|------------------------------------|--------------------------------|-------|-------------------|---------|
| Licensee Name | HUGHES NETWORK SYSTEMS LIMITED | | | |
| Latitude (NAD 83) | 37° 21' 54.5" N | | | |
| Longitude (NAD 83) | 121° 57' 41.0" W | | | |
| Ground Elevation (AMSL) | 16.1 m / 52.8 ft | | | |
| Antenna Centerline (AGL) | 3.66 m / 12.0 ft | | | |
| Antenna Model | ASC Signal 5.6 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 | | | -20.5 (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 | 58.31 | -10.00 | 129.07 | -10.00 | 100.00 |
| 195 | 0.32 | 61.72 | -10.00 | 127.12 | -10.00 | 100.00 |
| 200 | 0.34 | 65.26 | -10.00 | 125.82 | -10.00 | 100.00 |
| 205 | 0.35 | 68.89 | -10.00 | 124.87 | -10.00 | 100.00 |
| 210 | 0.35 | 72.61 | -10.00 | 124.91 | -10.00 | 100.00 |
| 215 | 0.38 | 76.39 | -10.00 | 122.93 | -10.00 | 100.00 |
| 220 | 0.35 | 80.22 | -10.00 | 125.00 | -10.00 | 100.00 |
| 225 | 0.34 | 84.08 | -10.00 | 126.08 | -10.00 | 100.00 |
| 230 | 0.35 | 87.95 | -10.00 | 124.94 | -10.00 | 100.00 |
| 235 | 0.37 | 91.83 | -10.00 | 123.54 | -10.00 | 100.00 |
| 240 | 0.38 | 95.71 | -10.00 | 122.63 | -10.00 | 100.00 |
| 245 | 0.37 | 99.57 | -10.00 | 123.99 | -10.00 | 100.00 |
| 250 | 0.34 | 103.39 | -10.00 | 125.88 | -10.00 | 100.00 |
| 255 | 0.30 | 107.16 | -10.00 | 129.10 | -10.00 | 100.00 |
| 260 | 0.24 | 110.86 | -10.00 | 132.92 | -10.00 | 100.00 |
| 265 | 0.23 | 114.50 | -10.00 | 133.87 | -10.00 | 100.00 |
| 270 | 0.00 | 117.95 | -10.00 | 136.18 | -10.00 | 100.00 |
| 275 | 0.00 | 121.36 | -10.00 | 136.18 | -10.00 | 100.00 |
| 280 | 0.00 | 124.62 | -10.00 | 136.18 | -10.00 | 100.00 |
| 285 | 0.00 | 127.70 | -10.00 | 136.18 | -10.00 | 100.00 |
| 290 | 0.00 | 130.56 | -10.00 | 136.18 | -10.00 | 100.00 |
| 295 | 0.00 | 133.17 | -10.00 | 136.18 | -10.00 | 100.00 |
| 300 | 0.29 | 135.70 | -10.00 | 128.95 | -10.00 | 100.00 |
| 305 | 0.63 | 137.95 | -10.00 | 108.69 | -10.00 | 100.00 |
| 310 | 0.38 | 139.26 | -10.00 | 122.80 | -10.00 | 100.00 |
| 315 | 0.00 | 139.94 | -10.00 | 136.18 | -10.00 | 100.00 |
| 320 | 0.00 | 140.48 | -10.00 | 136.18 | -10.00 | 100.00 |
| 325 | 0.00 | 140.50 | -10.00 | 136.18 | -10.00 | 100.00 |
| 330 | 0.00 | 139.99 | -10.00 | 136.18 | -10.00 | 100.00 |
| 335 | 0.00 | 138.97 | -10.00 | 136.18 | -10.00 | 100.00 |
| 340 | 0.00 | 137.48 | -10.00 | 136.18 | -10.00 | 100.00 |
| 345 | 0.00 | 135.58 | -10.00 | 136.18 | -10.00 | 100.00 |
| 350 | 0.00 | 133.31 | -10.00 | 136.18 | -10.00 | 100.00 |
| 355 | 0.00 | 130.72 | -10.00 | 136.18 | -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