

EXHIBIT C (COMSEARCH REPORT)

FREQUENCY COORDINATION AND INTERFERENCE ANALYSIS REPORT

Prepared for
Kuiper Systems LLC.
ALPINE, TX
Satellite Earth Station

Prepared By:
COMSEARCH
19700 Janelia Farm Boulevard
Ashburn, VA 20147
May 03, 2022

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 03/18/2022.

Company

AMA Communications, LLC
Business Only Broadband, LLC
ConocoPhillips Communications Inc.
Enterprise Products Operating, LLC
New Cingular Wireless PCS LLC - N Texas
Olympic Wireless, LLC
Resound Networks
Shell Communications Inc
T-Mobile License LLC
Texas New Mexico Power Company

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: 05/03/2022
Job Number: 220318COMSGE04

Administrative Information

Status: ENGINEER PROPOSAL
Call Sign:
Licensee Code: KUIPER
Licensee Name: Kuiper Systems LLC.

Site Information

ALPINE, TX

Venue Name:
Latitude (NAD 83): 29° 37' 1.7" N
Longitude (NAD 83): 103° 34' 3.8" W
Climate Zone: A
Rain Zone: 5
Ground Elevation (AMSL): 1025.41 m / 3364.2 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): 2.5 m / 8.2 ft

Antenna Information

Receive - FCC32

Transmit - FCC32

Manufacturer	Amazon	Amazon
Model	2.8 meter	2.8 meter
Gain / Diameter	53.5 dBi / 2.8 m	56.5 dBi / 2.8 m
3-dB / 15-dB Beamwidth	0.77° / 1.70°	0.49° / 1.17°
Max Available RF Power	(dBW/4 kHz) (dBW/MHz)	-11.9 12.1
Maximum EIRP	(dBW/4 kHz) (dBW/MHz)	44.6 68.6
Interference Objectives:	Long Term Short Term	-156.0 dBW/MHz 20% -146.0 dBW/MHz 0.01%
		-151.0 dBW/4 kHz 20% -128.0 dBW/4 kHz 0.0025%

Frequency Information

Receive 18.0 GHz

Transmit 28.0 GHz

Emission / Frequency Range (MHz)	1M00G7D - 50M0G7D / 19250.0 - 19400.0	1M00G7D - 50M0G7D / 27500.0 - 28050.0
Max Great Circle Coordination Distance	256.0 km / 159.1 mi	200.0 km / 124.3 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

ALPINE, TX

Licensee Name Kuiper Systems LLC.
Latitude (NAD 83) 29° 37' 1.7" N
Longitude (NAD 83) 103° 34' 3.8" W
Ground Elevation (AMSL) 1025.41 m / 3364.2 ft
Antenna Centerline (AGL) 2.5 m / 8.2 ft
Antenna Model Amazon 2.8 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 -11.9 (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	0.93	83.65	11.50	256.00	11.50	200.00
5	0.92	78.98	11.50	256.00	11.50	200.00
10	0.96	74.34	11.50	256.00	11.50	200.00
15	0.91	69.69	11.50	256.00	11.50	200.00
20	0.85	65.07	11.50	256.00	11.50	200.00
25	0.78	60.47	11.50	256.00	11.50	200.00
30	0.72	55.91	11.50	256.00	11.50	200.00
35	0.67	51.40	11.50	256.00	11.50	200.00
40	0.60	46.95	11.50	256.00	11.50	200.00
45	0.57	42.61	11.50	256.00	11.50	200.00
50	0.50	38.37	11.50	256.00	11.50	200.00
55	0.45	34.30	11.50	256.00	11.50	200.00
60	0.57	30.59	11.50	256.00	11.50	200.00
65	0.69	27.25	11.50	256.00	11.50	200.00
70	0.99	24.59	11.50	256.00	11.50	200.00
75	1.94	23.30	11.50	256.00	11.50	200.00
80	1.19	21.36	11.50	256.00	11.50	200.00
85	1.19	21.20	11.50	256.00	11.50	200.00
90	0.59	21.59	11.50	256.00	11.50	200.00
95	0.97	23.88	11.50	256.00	11.50	200.00
100	1.46	26.96	11.50	256.00	11.50	200.00
105	1.61	30.28	11.50	256.00	11.50	200.00
110	1.60	33.88	11.50	256.00	11.50	200.00
115	1.61	37.77	11.50	256.00	11.50	200.00
120	1.60	41.86	11.50	256.00	11.50	200.00
125	1.64	46.11	11.50	256.00	11.50	200.00
130	1.69	50.48	11.50	256.00	11.50	200.00
135	1.69	54.91	11.50	256.00	11.50	200.00
140	1.79	59.43	11.50	256.00	11.50	200.00
145	1.79	63.96	11.50	256.00	11.50	200.00
150	1.88	68.55	11.50	256.00	11.50	200.00
155	1.84	73.14	11.50	256.00	11.50	200.00
160	1.74	77.75	11.50	256.00	11.50	200.00
165	1.67	82.38	11.50	256.00	11.50	200.00
170	1.21	87.01	11.50	256.00	11.50	200.00
175	0.72	91.68	11.50	256.00	11.50	200.00
180	0.87	96.35	11.50	256.00	11.50	200.00
185	0.42	101.05	11.50	256.00	11.50	200.00

COMSEARCH

Earth Station Data Sheet

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

Coordination Values

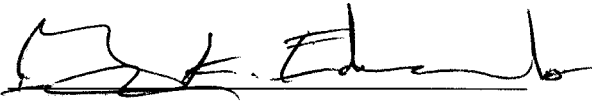
ALPINE, TX

Licensee Name Kuiper Systems LLC.
Latitude (NAD 83) 29° 37' 1.7" N
Longitude (NAD 83) 103° 34' 3.8" W
Ground Elevation (AMSL) 1025.41 m / 3364.2 ft
Antenna Centerline (AGL) 2.5 m / 8.2 ft
Antenna Model Amazon 2.8 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 -11.9 (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	0.43	105.72	11.50	256.00	11.50	200.00
195	0.40	110.38	11.50	256.00	11.50	200.00
200	0.43	115.00	11.50	256.00	11.50	200.00
205	0.43	119.60	11.50	256.00	11.50	200.00
210	0.24	124.21	11.50	256.00	11.50	200.00
215	0.00	128.80	11.50	256.00	11.50	200.00
220	0.00	133.26	11.50	256.00	11.50	200.00
225	0.00	137.62	11.50	256.00	11.50	200.00
230	0.00	141.87	11.50	256.00	11.50	200.00
235	0.00	145.94	11.50	256.00	11.50	200.00
240	0.27	149.60	11.50	256.00	11.50	200.00
245	0.43	152.94	11.50	256.00	11.50	200.00
250	0.57	155.76	11.50	256.00	11.50	200.00
255	0.61	157.94	11.50	256.00	11.50	200.00
260	0.65	159.17	11.50	256.00	11.50	200.00
265	0.67	159.31	11.50	256.00	11.50	200.00
270	0.67	158.34	11.50	256.00	11.50	200.00
275	0.66	156.38	11.50	256.00	11.50	200.00
280	0.68	153.64	11.50	256.00	11.50	200.00
285	0.75	150.30	11.50	256.00	11.50	200.00
290	0.77	146.61	11.50	256.00	11.50	200.00
295	0.76	142.66	11.50	256.00	11.50	200.00
300	0.75	138.51	11.50	256.00	11.50	200.00
305	0.72	134.23	11.50	256.00	11.50	200.00
310	0.67	129.85	11.50	256.00	11.50	200.00
315	0.62	125.38	11.50	256.00	11.50	200.00
320	0.59	120.85	11.50	256.00	11.50	200.00
325	0.65	116.26	11.50	256.00	11.50	200.00
330	0.71	111.63	11.50	256.00	11.50	200.00
335	0.65	107.00	11.50	256.00	11.50	200.00
340	0.66	102.34	11.50	256.00	11.50	200.00
345	0.66	97.67	11.50	256.00	11.50	200.00
350	0.77	92.99	11.50	256.00	11.50	200.00
355	0.84	88.32	11.50	256.00	11.50	200.00

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: May 03, 2022

Ka-Band Earth Station – Alpine, TX

Frequency Coordination Report

28 GHz



Prepared on Behalf of
KUIPER SYSTEMS, LLC

May 3, 2022



Table of Contents

1.	Summary of Results	- 1 -
2.	28 GHz Common Carrier and LTTS Coordination	- 1 -
3.	28 GHz UMFUS Coordination	- 2 -
4.	Earth Station Coordination Data	- 3 -
5.	Contact Information	- 7 -

1. Summary of Results

On behalf of KUIPER SYSTEMS, LLC, Comsearch performed a coordination notice under Section 25.203(c) and Section 25.136(a)(4) of the FCC's rules for all existing and proposed terrestrial licenses within the coordination contours of their proposed Ka-Band earth station in Alpine, TX, 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 May 3, 2022.

There are no unresolved objections from any of the incumbent 28 GHz licensees.

2. 28 GHz Common Carrier and LTTS Coordination

In accordance with FCC Rules and Regulations, the Ka-Band earth station in Alpine, TX was prior-coordinated by Comsearch. A notification letter and datasheets for this earth station were sent to the following 28 GHz common carrier fixed microwave licensees. These licensees are authorized to operate temporary fixed operations from 27.5 – 29.5 GHz on a nationwide basis or local basis.

Licensee	Authorized Geographic Area
None Identified	

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

Licensee	Authorized Geographic Area
None Identified	

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

¹ The proposed earth station will operate in the 27.5 – 30.0 GHz portion of the Ka-Band.

3. 28 GHz UMFUS Coordination

There were eight 28 GHz UMFUS licensees identified within the coordination distance of the proposed earth station. The proposed earth station will operate on frequencies that overlap Channel L1 & L2 of the UMFUS service. The total frequency allocation for Channels L1 & L2 of the UMFUS spectrum appears below.

Channel: **L1** 27.500 - 27.925 GHz
 L2 27.925 - 28.350 GHz

Licensee	Authorized Geographic Area
Central Texas Communications	Market Based
DISH Network	Market Based
McBride Spectrum Partners	Market Based
Plateau	Market Based
PVT	Market Based
T-Mobile	Market Based
Verizon	Market Based
Windstream	Market Based

No objections were received from the UMFUS incumbents within coordination distance.



4. Earth Station Coordination Data

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

Job Number: 220318COMSGE04

Administrative Information

Status: ENGINEER PROPOSAL
Call Sign:
Licensee Code: KUIPER
Licensee Name: Kuiper Systems LLC.

Site Information

ALPINE, TX
Venue Name:
Latitude (NAD 83): 29° 37' 1.7" N
Longitude (NAD 83): 103° 34' 3.8" W
Climate Zone: A
Rain Zone: 5
Ground Elevation (AMSL): 1025.41 m / 3364.2 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): 2.5 m / 8.2 ft

Antenna Information

		Receive - FCC32		Transmit - FCC32
Manufacturer		Amazon		Amazon
Model		2.8 meter		2.8 meter
Gain / Diameter		53.5 dBi / 2.8 m		56.5 dBi / 2.8 m
3-dB / 15-dB Beamwidth		0.77° / 1.70°		0.49° / 1.17°
Max Available RF Power	(dBW/4 kHz) (dBW/MHz)			-11.9 12.1
Maximum EIRP	(dBW/4 kHz) (dBW/MHz)			44.6 68.6
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)	1M00G7D - 50M0G7D / 19250.0 - 19400.0	1M00G7D - 50M0G7D / 27500.0 - 28050.0
Max Great Circle Coordination Distance	256.0 km / 159.1 mi	200.0 km / 124.3 mi
Precipitation Scatter Contour Radius	100.0 km / 62.1 mi	100.0 km / 62.1 mi

Coordination Values	ALPINE, TX			
Licensee Name	Kuiper Systems LLC.			
Latitude (NAD 83)	29° 37' 1.7" N			
Longitude (NAD 83)	103° 34' 3.8" W			
Ground Elevation (AMSL)	1025.41 m / 3364.2 ft			
Antenna Centerline (AGL)	2.5 m / 8.2 ft			
Antenna Model	Amazon 2.8 meter			
Antenna Mode	Receive 18.0 GHz			
Interference Objectives: Long Term	-156.0 dBW/MHz	20%	Transmit 28.0 GHz	20%
Short Term	-146.0 dBW/MHz	0.01%	-151.0 dBW/4 kHz	20%
	0.0025%		-128.0 dBW/4 kHz	
Max Available RF Power	-11.9 (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	0.93	83.65	11.50	256.00	11.50	200.00
5	0.92	78.98	11.50	256.00	11.50	200.00
10	0.96	74.34	11.50	256.00	11.50	200.00
15	0.91	69.69	11.50	256.00	11.50	200.00
20	0.85	65.07	11.50	256.00	11.50	200.00
25	0.78	60.47	11.50	256.00	11.50	200.00
30	0.72	55.91	11.50	256.00	11.50	200.00
35	0.67	51.40	11.50	256.00	11.50	200.00
40	0.60	46.95	11.50	256.00	11.50	200.00
45	0.57	42.61	11.50	256.00	11.50	200.00
50	0.50	38.37	11.50	256.00	11.50	200.00
55	0.45	34.30	11.50	256.00	11.50	200.00
60	0.57	30.59	11.50	256.00	11.50	200.00
65	0.69	27.25	11.50	256.00	11.50	200.00
70	0.99	24.59	11.50	256.00	11.50	200.00
75	1.94	23.30	11.50	256.00	11.50	200.00
80	1.19	21.36	11.50	256.00	11.50	200.00
85	1.19	21.20	11.50	256.00	11.50	200.00
90	0.59	21.59	11.50	256.00	11.50	200.00
95	0.97	23.88	11.50	256.00	11.50	200.00
100	1.46	26.96	11.50	256.00	11.50	200.00
105	1.61	30.28	11.50	256.00	11.50	200.00
110	1.60	33.88	11.50	256.00	11.50	200.00
115	1.61	37.77	11.50	256.00	11.50	200.00
120	1.60	41.86	11.50	256.00	11.50	200.00
125	1.64	46.11	11.50	256.00	11.50	200.00
130	1.69	50.48	11.50	256.00	11.50	200.00
135	1.69	54.91	11.50	256.00	11.50	200.00
140	1.79	59.43	11.50	256.00	11.50	200.00
145	1.79	63.96	11.50	256.00	11.50	200.00
150	1.88	68.55	11.50	256.00	11.50	200.00
155	1.84	73.14	11.50	256.00	11.50	200.00
160	1.74	77.75	11.50	256.00	11.50	200.00
165	1.67	82.38	11.50	256.00	11.50	200.00
170	1.21	87.01	11.50	256.00	11.50	200.00
175	0.72	91.68	11.50	256.00	11.50	200.00
180	0.87	96.35	11.50	256.00	11.50	200.00
185	0.42	101.05	11.50	256.00	11.50	200.00

Coordination Values	ALPINE, TX			
Licensee Name	Kuiper Systems LLC.			
Latitude (NAD 83)	29° 37' 1.7" N			
Longitude (NAD 83)	103° 34' 3.8" W			
Ground Elevation (AMSL)	1025.41 m / 3364.2 ft			
Antenna Centerline (AGL)	2.5 m / 8.2 ft			
Antenna Model	Amazon 2.8 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	-11.9 (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	0.43	105.72	11.50	256.00	11.50	200.00
195	0.40	110.38	11.50	256.00	11.50	200.00
200	0.43	115.00	11.50	256.00	11.50	200.00
205	0.43	119.60	11.50	256.00	11.50	200.00
210	0.24	124.21	11.50	256.00	11.50	200.00
215	0.00	128.80	11.50	256.00	11.50	200.00
220	0.00	133.26	11.50	256.00	11.50	200.00
225	0.00	137.62	11.50	256.00	11.50	200.00
230	0.00	141.87	11.50	256.00	11.50	200.00
235	0.00	145.94	11.50	256.00	11.50	200.00
240	0.27	149.60	11.50	256.00	11.50	200.00
245	0.43	152.94	11.50	256.00	11.50	200.00
250	0.57	155.76	11.50	256.00	11.50	200.00
255	0.61	157.94	11.50	256.00	11.50	200.00
260	0.65	159.17	11.50	256.00	11.50	200.00
265	0.67	159.31	11.50	256.00	11.50	200.00
270	0.67	158.34	11.50	256.00	11.50	200.00
275	0.66	156.38	11.50	256.00	11.50	200.00
280	0.68	153.64	11.50	256.00	11.50	200.00
285	0.75	150.30	11.50	256.00	11.50	200.00
290	0.77	146.61	11.50	256.00	11.50	200.00
295	0.76	142.66	11.50	256.00	11.50	200.00
300	0.75	138.51	11.50	256.00	11.50	200.00
305	0.72	134.23	11.50	256.00	11.50	200.00
310	0.67	129.85	11.50	256.00	11.50	200.00
315	0.62	125.38	11.50	256.00	11.50	200.00
320	0.59	120.85	11.50	256.00	11.50	200.00
325	0.65	116.26	11.50	256.00	11.50	200.00
330	0.71	111.63	11.50	256.00	11.50	200.00
335	0.65	107.00	11.50	256.00	11.50	200.00
340	0.66	102.34	11.50	256.00	11.50	200.00
345	0.66	97.67	11.50	256.00	11.50	200.00
350	0.77	92.99	11.50	256.00	11.50	200.00
355	0.84	88.32	11.50	256.00	11.50	200.00



5. Contact Information

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

Contact person:	Gary Edwards
Title:	Senior Manager, Satellite Services
Company:	Comsearch
Address:	19700 Janelia Farm Blvd., Ashburn, VA 20147
Telephone:	703-726-5662
Fax:	703-726-5599
Email:	GEdwards@Comsearch.com
Web site:	www.comsearch.com