

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

In the Matter of	)	
	)	
Isotropic Networks, Inc.	)	File No. SES- _____
	)	
Authorization to Operate Fixed Gateway	)	Call Sign: _____
Earth Stations	)	

APPLICATION

Isotropic Networks, Inc. (“Isotropic”) seeks authorization to operate two individually licensed gateway earth stations.¹ The first gateway is in Murdock, Nebraska, and the second gateway is in Truth or Consequences, New Mexico. Each would communicate with the FCC-authorized Hispasat Amazonas Nexus satellite at 61.0° W.L. using the 17.85-18.8 GHz (space-to-Earth) and 27.5-28.6 GHz (Earth-to-space) bands.² Granting this application is in the public interest. If able to enlist the two requested gateways, the Amazonas Nexus satellite can provide advanced broadband services to enterprises, the government, small businesses, and residential customers across North America.

An earth station license applicant may certify compliance with a space station authorization to avoid submitting and prosecuting duplicative licensing information. In 2020, the Commission decided that “[a]n earth station applicant certifying that it will comply with the applicable terms and conditions of the authorization of any space station with which it communicates need not provide technical demonstrations or other information that is

¹ See *About Us*, Isotropic, <https://bit.ly/3V2OB3i> (last visited Oct. 3, 2022).

² See Hispamar Satellites, S.A., Stamp Grant, IBFS File No. SAT-PPL-20210510-00062 (granted Mar. 10, 2022).

duplicative or unnecessary due to the certification.”³ Isotropic certifies that it will comply with the applicable terms and conditions of the authorization for FCC call sign S3086 (the Amazonas Nexus satellite). Isotropic also submits further earth station specific information, as follows.

Earth station details. Attachment 1 captures each gateway’s geographic location, antenna details, and site-selection criteria.

Compatibility analysis. The 27.5-28.35 GHz band is shared between the upper microwave flexible use service and fixed-satellite service. When seeking authority for this spectrum, an earth station applicant does not need to afford further protections to co-frequency terrestrial interests if it satisfies certain earth station siting criteria.⁴ Attachment 2 demonstrates Isotropic’s compliance with this siting criteria.

Radiation hazard analysis. An earth station applicant shall analyze whether the proposed transmitting earth stations satisfy limits on human exposure to radiofrequency energy.⁵ Isotropic meets the limits and provides the supporting calculations in Attachment 3.

Comsearch reports. Terrestrial and satellite services may share the 17.8-18.3 and 27.5-28.35 GHz bands. To ensure compatibility in this spectrum, the earth station applicant completes coordination before submitting its application. The relevant coordination reports appear in Attachment 4 and demonstrate Isotropic has satisfied this requirement.

³ 47 C.F.R. § 25.115(a)(1)(ii). *See generally Further Streamlining Part 25 Rules Governing Satellite Services*, Report and Order, 35 FCC Rcd 13285 ¶¶ 37-42 (2020). The certification does not apply to fixed-satellite service operation in bands subject to 47 C.F.R. § 25.136. As a result, Isotropic provides additional earth station specific information in the present application, including UMFUS compatibility analysis.

⁴ *See* 47 C.F.R. § 25.136(a).

⁵ *See* 47 C.F.R. § 25.115(p) (“The licensee[s] and grantees shall ensure compliance with the Commission’s radio frequency exposure requirements in §§ 1.1307(b), 2.1091, and 2.1093 of this chapter, as appropriate.”).

FAA notification. An earth station applicant must notify the Federal Aviation Administration if (1) the proposed antenna height will exceed 200 feet above ground level; (2) the proposed antenna will be located on or near an airport or heliport; (3) the FAA requests notification.⁶ Isotropic's antennas are exempt from this requirement because the antennas do not exceed 200 feet above ground level, are not located on or near an airport or heliport, and the FAA has not requested notification for these antennas' construction.

Technical certification. Attachment 5 includes the technical certification supporting Isotropic's rule compliance.

* * *

Authorizing the proposed gateways serves the public interest. Grant of this application will allow Isotropic to deploy the gateways required for the operation of the Amazonas Nexus satellite, which will replace the Amazonas 2 satellite approaching its end of life. The Amazonas Nexus satellite will provide advanced broadband services to enterprises, government, small business, and residential customers across North America. It will also support a variety of applications, including broadband access, aeronautical services for in-flight connectivity, and residential and business voice-over-internet protocol. The system deployment will increase Hispasat's satellite broadband capacity, bringing additional competition for broadband connectivity, including the support of next-generation communications services such as 5G, machine-to-machine, and the Internet of Things, to the United States marketplace, especially in rural and underserved areas.

The Amazonas Nexus satellite is one of the first fully digital satellites. Its wide beams and multiple user spot beams would offer customers an unsurpassed ability to efficiently and

⁶ See 47 C.F.R. § 17.7.

flexibly modify their high data rate networks for fixed data, aeronautical, and maritime connectivity, for example, in real time in response to changing bandwidth demands. But these benefits are not realizable in the United States without the proposed gateways delivering critical internet service connection. Further, the immediate availability of this space segment to the U.S. fixed-satellite service market would continue to stimulate lower prices, improve service quality, increase service options, and foster technology innovation. In light of these reasons, above certification, and supporting technical information, Isotropic requests expedited authorization of the proposed gateways.

Respectfully submitted,

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October 29, 2022

ATTACHMENT 1
(Earth Station Information)

Site	Antenna Diameter	Latitude	Longitude
Murdock, Nebraska	one antenna (9.2 meters)	40° 54' 49.4" N	96° 15' 20.0" W
Truth or Consequences, New Mexico	one antenna (9.2 meters)	32° 59' 47.0" N	106° 59' 2.8" W

These site locations were selected for the following reasons, among others:

- stable geography in area selected (no floods, high winds, fires, or earthquakes);
- room to expand site for future growth;
- no operational radiofrequency coordination issues;
- unobstructed line-of-site to satellite; and
- access to reliable utility power, fiber tier 1 network, and internet-service providers.

ATTACHMENT 2
(UMFUS Compatibility)

This exhibit demonstrates that the proposed 27.5-28.35 GHz band fixed-satellite service (“FSS”) gateway earth station satisfies the relevant siting criteria. It concludes that this gateway does not need to afford further interference protections for co-frequency upper microwave flexible use service (“UMFUS”) deployments.

FSS licensees may deploy such gateways when meeting the following four conditions.¹

1. One U.S. county may not house more than three co-frequency FSS gateways.
2. An FSS gateway generating a power flux-density (“PFD”) greater than or equal to -77.6 dBm/m²/MHz at 10 meters above ground level (“-77.6 dBm/m²/MHz”), together with the similar area of any other authorized gateway, may not cover more than certain population amounts.²
3. The -77.6 dBm/m²/MHz PFD contour may not include any major event venue, urban mass transit route, passenger railroad, cruise ship port, or certain roads (Interstate, Other Freeway and Expressway, or Other Principal Arterial).
4. The FSS operator must coordinate with existing UMFUS operators located within a PFD contour greater than or equal to -77.6 dBm/m²/MHz.

Isotropic satisfies each condition. No more than three FSS gateways will operate in Cass County, Nebraska, which has a population of 26,598 people (as of the 2020 census) and will host the proposed gateway. Isotropic’s -77.6 dBm/m²/MHz PFD contour covers 309 people of the permissible total 450 people. The PFD contour does not contain any major event venue, urban mass transit route, passenger railroad, cruise ship port, Interstate, Other Freeway and Expressway, or Other Principal Arterial. Coordination with existing UMFUS operators is complete.³ The Commission, therefore, should authorize the proposed gateway and not impose additional interference protection for UMFUS licensees.

¹ See 47 C.F.R. § 25.136(a)(4). The Commission has offered additional guidance on how to present 27.5-28.35 GHz earth station showings. *See generally International Bureau Issues Guidance on Siting Methodologies for Earth Stations Seeking to Operate in the 24.75-25.25 GHz, 27.5-28.35 GHz, 37.5-40 GHz, 47.2-48.2 GHz, and 50.4-51.4 GHz Frequency Bands to Demonstrate Compliance with Section 25.136*, Public Notice, 35 FCC Rcd 6347 (IB 2020) (“Guidance”).

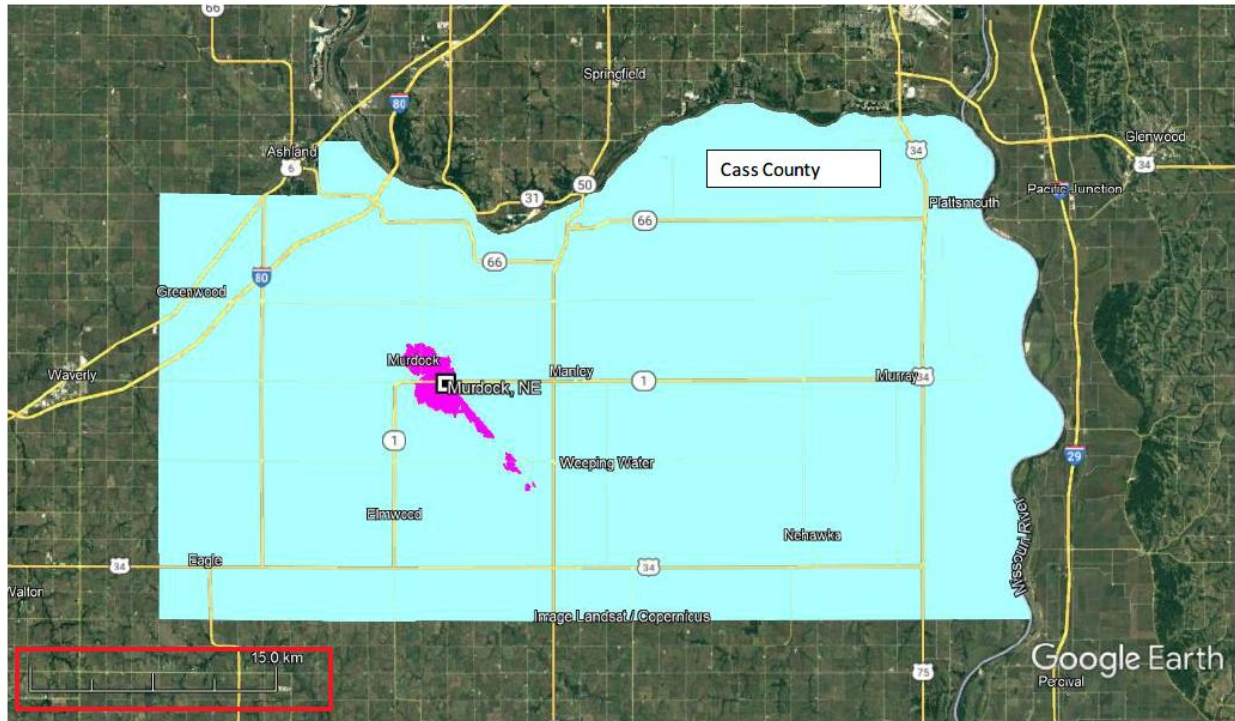
² See 47 C.F.R. § 25.136(a) at Table 1 to Paragraph (A)(4)(ii) (permitting the PFD contour to cover 0.1 percent of the population in a county with more than 450,000 people; 450 people in a county with 6,000-450,000 people; and 7.5 percent of the population in a county with fewer than 6,000 people).

³ See Comsearch Report.

1. 47 C.F.R. § 25.136(a)(4)(i) (no more than three co-frequency FSS gateways in one county)

Figure 1 depicts the proposed gateway's location in the county and the PFD contour.

Figure 1. Isotropic Gateway Location



The relevant FCC database shows no 27.5-28.35 GHz FSS filings in the county. As no more than two other authorized gateways are operating in the 27.5-28.35 GHz band in this the county, this gateway satisfies the numeric restriction.

2. 47 C.F.R. § 25.136(a)(4)(ii)–(iv) (ensuring PFD contour coverage compliance)

Isotropic generated its gateway's -77.6 dBm/m²/MHz PFD contour to verify compliance with the relevant PFD contour coverage requirements in the following sub-sections.⁴

⁴ Isotropic used Comsearch software to generate the radial horizon gain values from the terrain data and antenna envelope pattern.

Figure 2 depicts the -77.6 dBm/m²/MHz PFD contour developed using the Table 1 technical parameters.⁵ The contour does not exceed -77.6 dBm/m²/MHz at 10 meters above ground level anywhere outside of the contour specified in this application.

Table 1. Isotropic Gateway Parameters⁶

Field	Value	Units
County	Cass, Nebraska	N/A
Latitude	40° 54' 49.4" N	N/A
Longitude	96° 15' 20.0" W	N/A
Antenna Diameter	9.2	m
Antenna Gain	65.5	dB(i)
3 dB / 15 dB Beamwidth	0.08 / 0.18	degrees
Antenna Input Density ⁷	-62.7	dB(W/Hz)
EIRP Density	38.8	dB(W/4KHz)
Polarization Discrimination	>30	dB
Maximum Transmit EIRP	62.8	dBW/MHz
Antenna Pattern	47 C.F.R. § 25.209	N/A

The contour considers distance and terrain blockage loss with atmospheric absorption consistent with the ITU-R P.452 propagation model.⁸ Aerial imagery shows generally open farmland with agricultural buildings, houses, and residential tracts. Terrain and clutter losses are insignificant, however, due to the antenna height being above the clutter heights. The site does not employ shielding.

Figure 2 illustrates Isotropic's PFD contour in Google Earth (shapefile attached in KMZ format) and confirms the contour satisfies the Guidance.

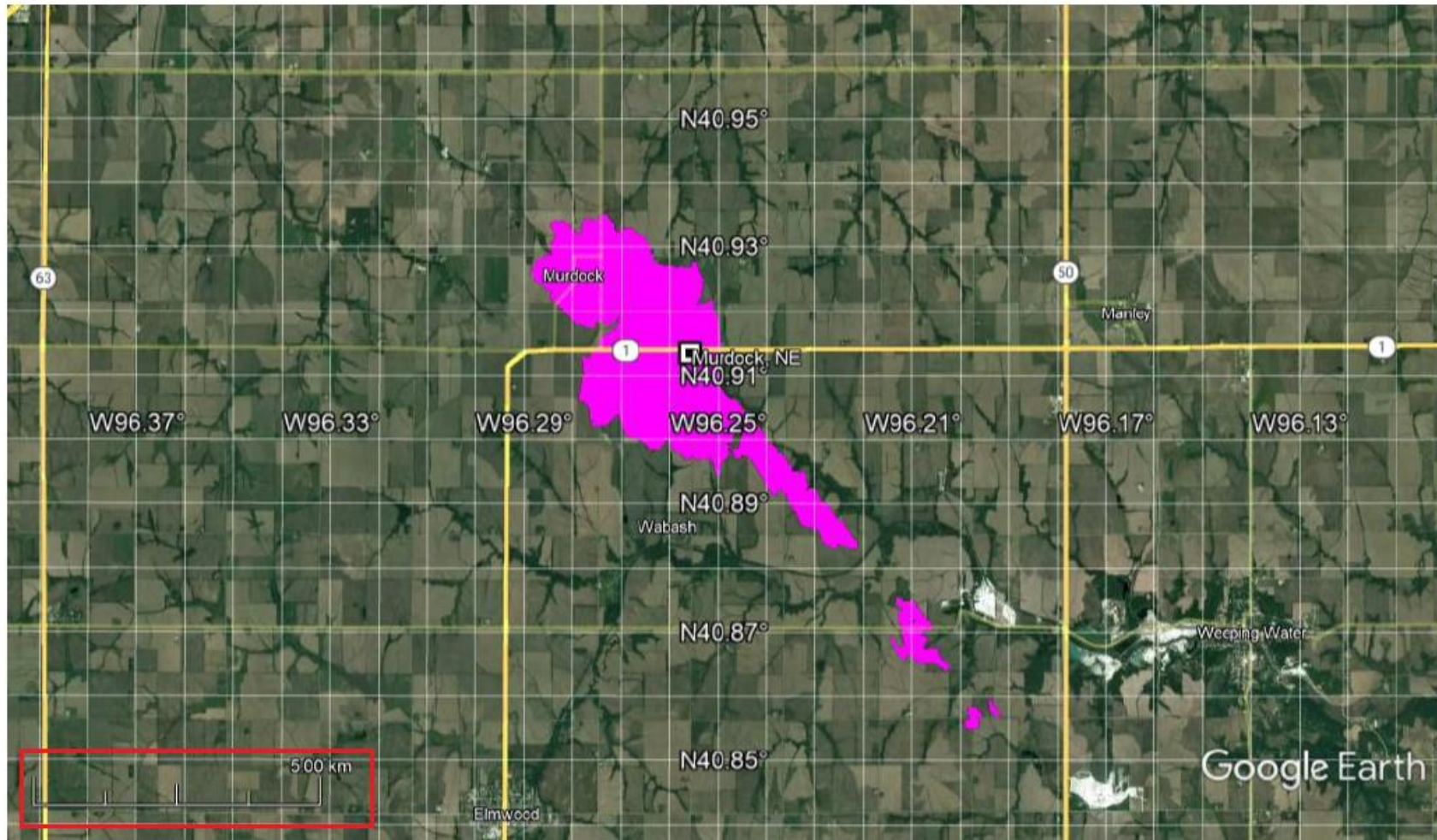
⁵ Isotropic's analysis relies on measured antenna gain patterns.

⁶ Isotropic's analysis is based the antenna pointing angles toward the point of communication. The satellite arc is 61° E to 61° W, the azimuth range is 132.8° E to 132.8° W, and the corresponding elevation angles are 30.6° E to 30.6° W.

⁷ The input power density is the same for all atmospheric conditions; therefore, Isotropic's operations during clear sky conditions will be the same as worst-case operating scenarios. See Guidance at 3 (computing PFD contours and protection zones at bullet 5).

⁸ Isotropic used Atoll Wireless Network Engineering software to calculate the signal coverage with the Rec. ITU-R P.452 propagation model, including the time percentage p=50%.

Figure 2. Gateway PFD Contour

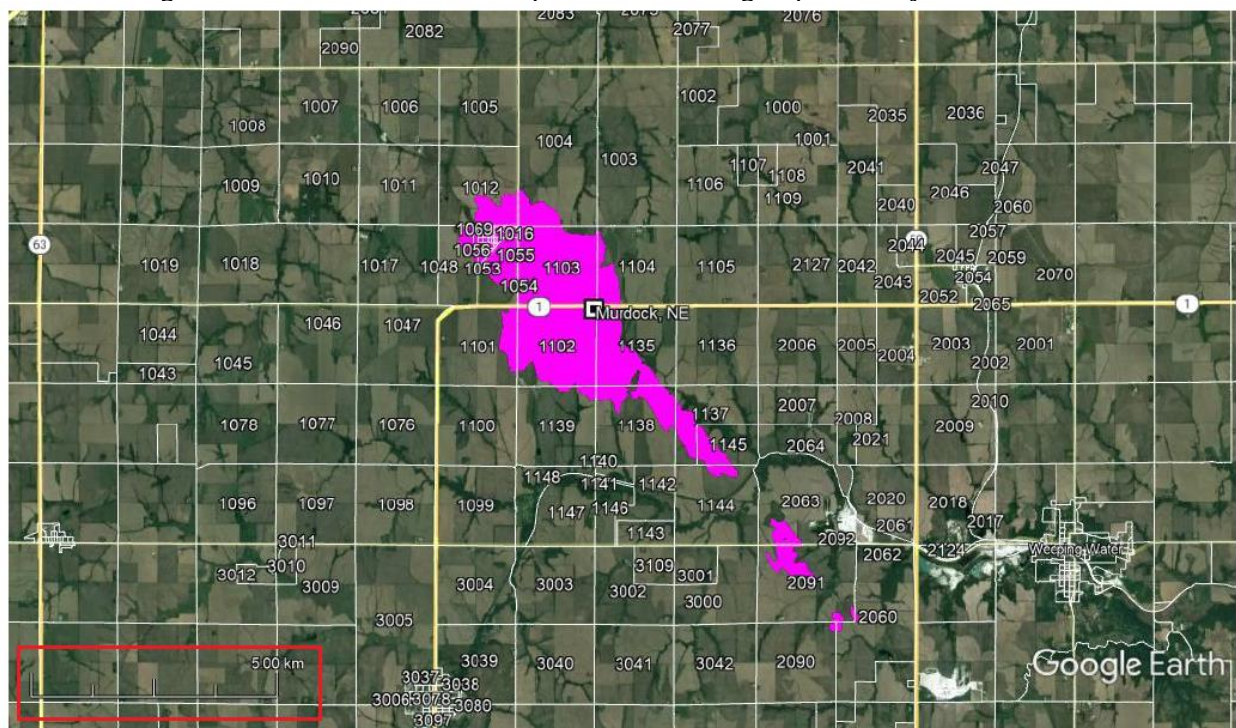


3. 47 C.F.R. 25.136(a)(4)(ii) (covering only certain population total in -77.6 dBm/m²/MHz PFD contour)

The 2020 U.S. Census Bureau data indicates that Cass County's population totals 26,598 people.⁹ Given this population count, the maximum persons permitted within the FSS gateway's -77.6 dBW/m²/MHz PFD contour is 450 people. The Isotropic gateway's PFD contour covers 309 people using 2020 U.S. Census Bureau data and the actual area method.¹⁰ This number is less than the 450 limit. The Isotropic gateway's PFD contour, therefore, does not exceed the aggregate population coverage allowance.

The following figures and tables show how Isotropic made this determination. Figure 3 shows the census blocks that the PFD contour fully or partially covers. Table 2 shows the total population, fractional area coverage, and fractional population coverage for each fully and partially covered census block. Table 3 shows the total population covered in each county that the PFD contour overlaps. Figure 4 shows the PFD contour covers only one county.

Figure 3. Census Block and Population Coverage of Gateway PFD Contour



⁹ See *Cass County, Nebraska*, U.S. Census Bureau, <https://bit.ly/3RDqxks> (last visited Oct. 29, 2022).

¹⁰ See Guidance at 4 (determining estimated aggregate population coverage at bullet 2).

Table 2. PFD Contour Population Coverage (Census Block)

Census Block ID	County Name	Block Population 2020	Block Area (mi ²)	Block PFD Coverage (mi ²)	Affected Population
310259658001004	Cass	25	1.98466183	0.15360338	2
310259658001012	Cass	13	1.00343961	0.19084213	2
310259658001013	Cass	14	0.00467713	0.00467713	14
310259658001014	Cass	14	0.00472154	0.00472154	14
310259658001015	Cass	15	0.01260894	0.01260894	15
310259658001016	Cass	0	0.00946899	0.00946899	0
310259658001048	Cass	3	0.49420574	0.06397522	0
310259658001049	Cass	0	0.01179420	0.01179420	0
310259658001050	Cass	5	0.00419372	0.00419372	5
310259658001051	Cass	9	0.00460302	0.00460302	9
310259658001052	Cass	17	0.00485763	0.00485763	17
310259658001053	Cass	18	0.01120343	0.01098481	18
310259658001054	Cass	0	0.37304407	0.20776025	0
310259658001055	Cass	0	0.00202658	0.00202658	0
310259658001056	Cass	7	0.00245983	0.00245983	7
310259658001057	Cass	5	0.00478012	0.00478012	5
310259658001058	Cass	1	0.00186052	0.00186052	1
310259658001059	Cass	5	0.00461801	0.00461801	5
310259658001060	Cass	19	0.00460455	0.00460455	19
310259658001061	Cass	15	0.00239650	0.00239650	15
310259658001062	Cass	9	0.00239804	0.00239804	9
310259658001063	Cass	7	0.00230728	0.00230728	7
310259658001064	Cass	12	0.00237090	0.00237090	12
310259658001065	Cass	11	0.00427281	0.00427281	11
310259658001066	Cass	13	0.00413416	0.00413416	13
310259658001067	Cass	4	0.00465514	0.00465514	4
310259658001068	Cass	7	0.00236687	0.00236687	7
310259658001069	Cass	4	0.00246102	0.00246102	4
310259658001070	Cass	3	0.00231285	0.00231285	3
310259658001071	Cass	11	0.00238676	0.00238676	11
310259658001072	Cass	0	0.00057549	0.00057549	0
310259658001073	Cass	15	0.00417677	0.00417677	15
310259658001074	Cass	7	0.00412863	0.00412863	7
310259658001075	Cass	11	0.00463666	0.00463666	11
310259658001101	Cass	14	0.99342074	0.12810836	2
310259658001102	Cass	14	0.99996052	0.92360083	13
310259658001103	Cass	11	1.00113501	0.93663624	10
310259658001104	Cass	9	1.00166188	0.15911162	1
310259658001135	Cass	13	1.00419894	0.45206262	6
310259658001137	Cass	0	0.65890010	0.12782214	0
310259658001138	Cass	10	1.00017859	0.23644655	2
310259658001139	Cass	20	0.99756035	0.03584234	1

310259658001144	Cass	1	1.04891120	0.04072015	0
310259658001145	Cass	0	0.38403403	0.10754392	0
310259658001149	Cass	10	0.00236960	0.00236960	10
310259658001150	Cass	2	0.00228261	0.00228261	2
310259659002060	Cass	3	1.43538662	0.00915257	0
310259659002063	Cass	0	1.20055655	0.07124600	0
310259659002090	Cass	7	1.00627884	0.00714109	0
310259659002091	Cass	0	1.21094080	0.11697887	0
				Total	309

Table 3. PFD Contour Population Coverage (County)

State	County	County Population	Allowable Population Coverage	Covered Population
NE	Cass	26,598	450	309

4. 47 C.F.R. § 25.136(a)(4)(iii) (avoiding coverage of major event venue, urban mass transit route, passenger railroad, cruise ship port, Interstate, Other Freeway and Expressway, or Other Principal Arterial in -77.6 dBm/m²/MHz PFD contour)

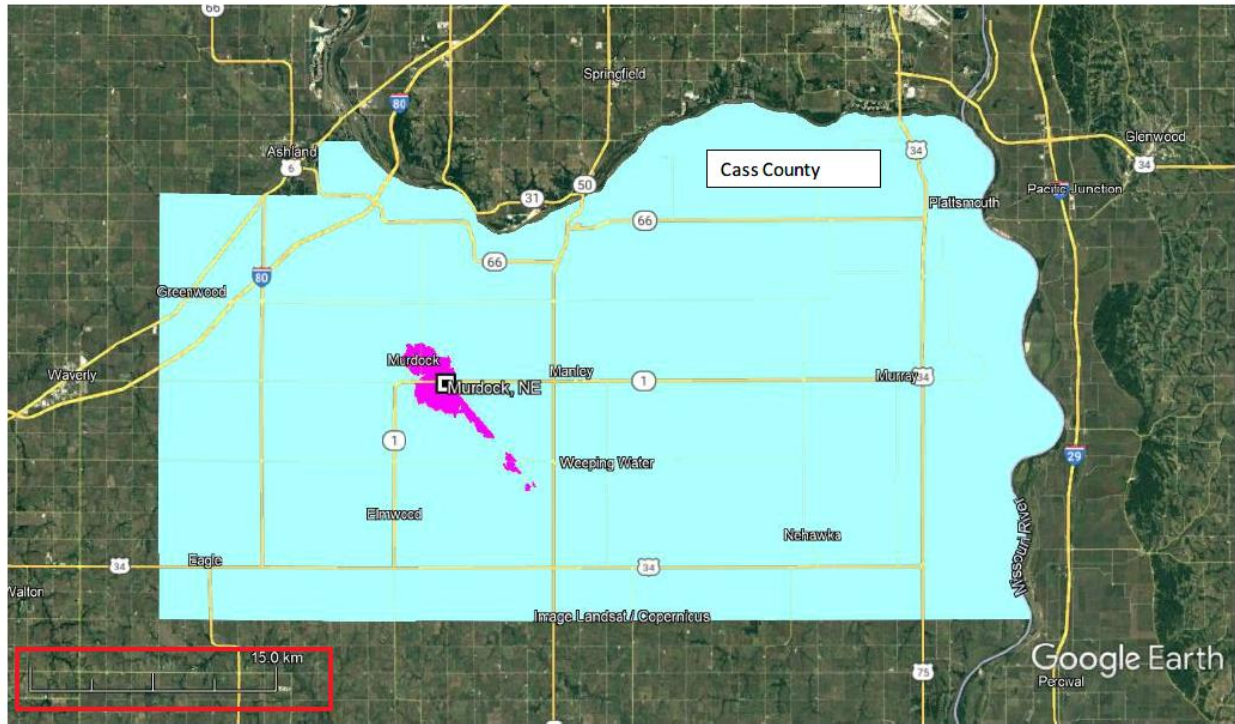
The Isotropic gateway's PFD contour does not include any major event venue, urban mass transit route, passenger railroad, or cruise ship port. For this analysis, Isotropic used Google Earth and visual analysis and shapefile data available on data.gov and the U.S. Census Bureau website.

As illustrated in Figure 4, the PFD contour does not overlap any of the restricted infrastructure. The PFD contour also does not cross any Interstate, Other Freeway and Expressway, or Other Principal Arterial, as defined by the Federal Highway Administration Office of Planning, Environment, and Realty Executive Geographic Information System.¹¹ Further, Isotropic consulted the state Department of Transportation functional classifications to confirm that the contour does not intersect any Other Freeway and Expressway or Other Principal Arterials.¹² The proposed gateway, therefore, meets this siting criterion.

¹¹ See *Planning, Environment, Realty (HEP) HEPGIS*, U.S. Department of Transportation Federal Highway Administration, <https://hepgis.fhwa.dot.gov/fhwagis/> (last visited Oct. 29, 2022).

¹² See Guidance at 5 (defining roadways at bullet 2).

Figure 4. -77.6 dBm/m²/MHz PFD contour overlaid with major roadways and passenger railroads



5. 47 C.F.R. § 25.136(a)(4)(iv) (coordinating with existing UMFUS operators located within a PFD contour greater than or equal to -77.6 dBm/m²/MHz)

The attached Comsearch report establishes that Isotropic has completed coordination with existing UMFUS operators, as required.¹³

¹³ See also 47 C.F.R. § 101.103(d).

ATTACHMENT 3
(Radiation Hazard Analysis)

Introduction

Consistent with OET Bulletin 65, this radiation hazard analysis demonstrates that Isotropic's 9.2m gateway antenna satisfies FCC limits for human exposure to radiofrequency ("RF").¹

OET Bulletin 65 and section 1.1310 of the Commission's rules specify two maximum permissible exposure ("MPE") limits.² The occupational/controlled MPE limit is 5 milliwatts per centimeter squared averaged over any six minute period.³ The general population/uncontrolled MPE limit is 1 milliwatt per centimeter squared averaged over any thirty minute period.⁴

Isotropic calculated the (i) power over the sub-reflector and antenna surface and (ii) near-field and far-field power density for the main and off-axis beams and confirms compliance with both MPE tiers' limits for all regions.

Occupational/controlled exposure. This population will not experience harmful radiation levels, as determined by the Commission. The results for the worst-case scenario (near-field, main-beam power density) support this conclusion.

General population/uncontrolled exposure. This population will not experience harmful radiation levels, as determined by the Commission. The results for the worst-case scenario (near-field, off-axis power density) support this conclusion. Furthermore, gateways will be deployed in occupational/controlled exposure environments within access-controlled, locked facilities and will be inaccessible to the general population.

I. 9.2-meter Antenna

The relevant input parameters and calculations appear in the following two tables.

Input Parameter	Unit	Value
Aperture Diameter	meters	9.2
Aperture Surface Area	meters ²	66.48
Nominal Frequency (GHz)	GHz	28.3

¹ See FCC OET Bulletin 65, Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields (Aug. 1997) ("OET Bulletin 65"). Isotropic is aware of and will comply with the recently modified rules for radiofrequency exposure that are relevant to fixed earth stations. See *generally Proposed Changes in the Commission's Rules Regarding Human Exposure to Radiofrequency Electromagnetic Fields et al.*, Second Report and Order et al., 34 FCC Rcd 11687 (2019).

² See 47 C.F.R. § 1.1310.

³ See OET Bulletin 65 at Appendix A, Table 1(A).

⁴ See *id.* at Appendix A, Table 1(B).

Input Parameter	Unit	Value
Nominal Wavelength	meter	0.0106
Aperture Efficiency	Percentage	53
Frequency	GHz	28.3
Total Transmit Power	W	500
Waveguide Loss from Transmitter to Feed	dB	1.12
Total Feed Input Power	W	386
Minimum Elevation Angle	degrees	10
Nominal Wavelength	meters	0.0106
Antenna Gain	dBi	65.5
Near Field Limit	meters	1996
Far Field Limit	meters	4791

Calculated Variables	Unit	Value	Variable	OET Ref
Wavelength	meter	0.0106	$\lambda = \frac{c}{f}$	
Area of Reflector	meters ²	66.476	$A = \pi r^2$	
Antenna Gain	dBi	65.5	$G_{dBi} = 10 * \log_{10}(G)$	
Near-Field Distance	meters	1996	$R_{nf} = \frac{D^2}{4\lambda}$	(12)
Far-Field Distance	meters	4791	$R_{ff} = \frac{0.6D^2}{\lambda}$	(16)
Power over Antenna Surface	mW/cm ²	2.325	$S_{surface} = \frac{4P}{A}$	(11)
Near-Field Power Density (Main Beam)	mW/cm ²	1.232	$S_{nf} = \frac{16\eta P}{\pi D^2}$	(13)
Near-Field Power Density (Off-Axis)	mW/cm ²	0.0123	$S_{nf} = \frac{16\eta P}{100\pi D^2}$	(13) ⁵
Far-Field Max Power Density (Main Beam)	mW/cm ²	0.475	$S_{ff} = \frac{PG}{4\pi R^2}$	(18)

⁵ See *id.* at 30 (“For off-axis calculations in the near-field and in the transition region it can be assumed that, if the point of interest is at least one antenna diameter removed from the center of the main beam, the power density at that point would be at least a factor of 100 (20 dB) less than the value calculated for the equivalent distance in the main beam see Reference [15]).”).

Calculated Variables	Unit	Value	Variable	OET Ref
Far-Field Max Power Density (Off-Axis)	mW/cm ²	5.322E-07	$S_{ff\ off-axis} = \frac{PG_{ff}}{4\pi R^2}$	(18) ⁶

Results

This radiation hazard analysis demonstrates that both the occupational and general populations will not experience harmful radiation levels.

In a controlled area accessible to the occupational population, the peak near-field power density is 1.232 mW/cm² and peak far-field power density is 0.475 mW/cm². Neither exceeds the MPE limit of 5 mW/cm² averaged over a period of six minutes.

In an uncontrolled area accessible to the general population, the off-axis near-field power density is 0.0123 mW/cm² and off-axis far-field power density is 5.322E-07 mW/cm². Neither exceeds the MPE limit of 1 mW/cm² averaged over a period of thirty minutes.

Further Safety Precautions

The following safety precautions will further mitigate harmful radiation levels, particularly for the general population. Each gateway site will be located on greater than one acre, which will include a 100' X 100' compound with 8' security fencing, video surveillance, crewed gate, and 12' access gate. Isotropic will provide 24x7x365 monitoring of all communications activities at these sites. Staffing will include on-call technicians. Isotropic will provide preventive and corrective maintenance for antenna and radiofrequency equipment. In case of an on-site service emergency, Isotropic will supply remote hands and eyes on site for all indoor and outdoor equipment for resolution on-site if required.

⁶ See *id.* (“For practical estimation of RF fields in the off-axis vicinity of aperture antennas, use of the antenna radiation pattern envelope can be useful. For example, for the case of an earth station in the fixed-satellite service, the Commission’s Rules specify maximum allowable gain for antenna sidelobes not within the plane of the geostationary satellite orbit, such as at ground level. . . . Use of the gain obtained from these relationships in simple far-field calculations, such as Equation 18, will generally be sufficient for estimating RF field levels in the surrounding environment, since the apparent aperture of the antenna is typically very small compared to its frontal area.”).

ATTACHMENT 4
(Comsearch Reports)

FREQUENCY COORDINATION AND INTERFERENCE ANALYSIS REPORT

Prepared for
IsoTropic Networks, Inc.
MURDOCK, NE
Satellite Earth Station

Prepared By:
COMSEARCH
19700 Janelia Farm Boulevard
Ashburn, VA 20147
May 12, 2022

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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 03/18/2022.

Company

AMG Nebraska FT ISP, LLC
AMG Technology Investment Group LLC
Bennington Public Schools
Business Only Broadband, LLC
City of Columbus
City of Council Bluffs
City of La Vista
City of Lincoln, NE-NRIN
Council Bluffs City of
Council Bluffs Water Works
Farmers Telephone Company
Last Mile Network Consulting Group LLC
NE Colorado Cellular, Inc.
Olympic Wireless, LLC
Omaha Public Power District
Platte County
Pottawattamie, County of
Skybeam Acquisition Corporation
Sprint Spectrum LLC
Sprintcom, Inc
T-Mobile License LLC
Union Pacific Railroad Company
Western Iowa Wireless

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: 05/12/2022
Job Number: 220318COMSGE11

Administrative Information

Status: ENGINEER PROPOSAL
Call Sign:
Licensee Code: ISOTRP
Licensee Name: IsoTropic Networks, Inc.

Site Information

MURDOCK, NE
Venue Name:
Latitude (NAD 83): 40° 54' 49.4" N
Longitude (NAD 83): 96° 15' 20.0" W
Climate Zone: A
Rain Zone: 2
Ground Elevation (AMSL): 375.23 m / 1231.1 ft

Link Information

Satellite Type: Geostationary
Mode: TR - Transmit-Receive
Modulation: Digital
Satellite Arc: 61° W to 61° West Longitude
Azimuth Range: 132.8° to 132.8°
Corresponding Elevation Angles: 30.6° / 30.6°
Antenna Centerline (AGL): 5.49 m / 18.0 ft

Antenna Information

	Receive - FCC32	Transmit - FCC32
Manufacturer	CPI	CPI
Model	KXKa	KXKa
Gain / Diameter	63.6 dBi / 9.2 m	65.5 dBi / 9.2 m
3-dB / 15-dB Beamwidth	0.11° / 0.22°	0.08° / 0.18°
Max Available RF Power	(dBW/4 kHz) (dBW/MHz)	-26.7 -2.7
Maximum EIRP	(dBW/4 kHz) (dBW/MHz)	38.8 62.8
Interference Objectives:	Long Term Short Term	-156.0 dBW/MHz -146.0 dBW/MHz
	20% 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)	6M00D7W - 70M4D7W / 17700.0 - 20200.0	6M00D7W - 70M4D7W / 27500.0 - 29500.0
Max Great Circle Coordination Distance	150.3 km / 93.4 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

MURDOCK, NE

Licensee Name IsoTropic Networks, Inc.
Latitude (NAD 83) 40° 54' 49.4" N
Longitude (NAD 83) 96° 15' 20.0" W
Ground Elevation (AMSL) 375.23 m / 1231.1 ft
Antenna Centerline (AGL) 5.49 m / 18.0 ft
Antenna Model CPI 9.2 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 -26.7 (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	0.86	126.16	-10.00	100.00	-10.00	100.00
5	0.87	122.16	-10.00	100.00	-10.00	100.00
10	1.15	118.15	-10.00	100.00	-10.00	100.00
15	1.42	114.04	-10.00	100.00	-10.00	100.00
20	1.49	109.80	-10.00	100.00	-10.00	100.00
25	1.52	105.51	-10.00	100.00	-10.00	100.00
30	1.53	101.18	-10.00	100.00	-10.00	100.00
35	1.40	96.82	-10.00	100.00	-10.00	100.00
40	1.42	92.46	-10.00	100.00	-10.00	100.00
45	1.58	88.09	-10.00	100.00	-10.00	100.00
50	1.47	83.73	-10.00	100.00	-10.00	100.00
55	1.38	79.39	-10.00	100.00	-10.00	100.00
60	1.48	75.05	-10.00	100.00	-10.00	100.00
65	1.52	70.74	-10.00	100.00	-10.00	100.00
70	1.25	66.54	-10.00	100.00	-10.00	100.00
75	1.15	62.38	-10.00	100.00	-10.00	100.00
80	0.93	58.33	-10.00	100.00	-10.00	100.00
85	0.97	54.30	-10.00	100.00	-10.00	100.00
90	1.05	50.36	-10.00	100.00	-10.00	100.00
95	1.05	46.61	-9.71	100.00	-9.71	100.00
100	0.99	43.08	-8.86	100.00	-8.86	100.00
105	0.82	39.87	-8.02	105.43	-8.02	100.00
110	0.60	37.06	-7.22	116.88	-7.22	100.00
115	0.52	34.56	-6.46	122.61	-6.46	100.00
120	0.27	32.71	-5.87	141.85	-5.87	100.00
125	0.20	31.32	-5.40	149.55	-5.40	100.00
130	0.00	30.74	-5.19	150.25	-5.19	100.00
135	0.00	30.70	-5.18	150.30	-5.18	100.00
140	0.00	31.38	-5.42	149.56	-5.42	100.00
145	0.00	32.74	-5.88	148.14	-5.88	100.00
150	0.23	34.51	-6.45	143.46	-6.45	100.00
155	0.31	36.94	-7.19	135.29	-7.19	100.00
160	0.41	39.76	-7.99	125.98	-7.99	100.00
165	0.34	43.05	-8.85	129.14	-8.85	100.00
170	0.22	46.60	-9.71	135.09	-9.71	100.00
175	0.38	50.20	-10.00	122.76	-10.00	100.00
180	0.40	54.04	-10.00	121.57	-10.00	100.00
185	0.41	58.00	-10.00	120.49	-10.00	100.00

COMSEARCH

Earth Station Data Sheet

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

Coordination Values

MURDOCK, NE

Licensee Name	IsoTropic Networks, Inc.		
Latitude (NAD 83)	40° 54' 49.4" N		
Longitude (NAD 83)	96° 15' 20.0" W		
Ground Elevation (AMSL)	375.23 m / 1231.1 ft		
Antenna Centerline (AGL)	5.49 m / 18.0 ft		
Antenna Model	CPI 9.2 meter		
Antenna Mode	Receive 18.0 GHz		
Interference Objectives: Long Term	-156.0 dBW/MHz	20%	Transmit 28.0 GHz
Short Term	-146.0 dBW/MHz	0.01%	-151.0 dBW/4 kHz 20%
Max Available RF Power		-26.7 (dBW/4 kHz)	-128.0 dBW/4 kHz 0.0025%

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	0.40	62.08	-10.00	121.54	-10.00	100.00
195	0.47	66.20	-10.00	116.44	-10.00	100.00
200	0.50	70.40	-10.00	114.38	-10.00	100.00
205	0.54	74.65	-10.00	112.54	-10.00	100.00
210	0.55	78.93	-10.00	111.86	-10.00	100.00
215	0.52	83.24	-10.00	113.13	-10.00	100.00
220	0.50	87.56	-10.00	114.00	-10.00	100.00
225	0.53	91.89	-10.00	113.08	-10.00	100.00
230	0.54	96.21	-10.00	112.58	-10.00	100.00
235	0.56	100.52	-10.00	111.48	-10.00	100.00
240	0.59	104.82	-10.00	110.19	-10.00	100.00
245	0.54	109.07	-10.00	112.47	-10.00	100.00
250	0.53	113.28	-10.00	113.13	-10.00	100.00
255	0.53	117.44	-10.00	113.11	-10.00	100.00
260	0.52	121.52	-10.00	113.35	-10.00	100.00
265	0.48	125.50	-10.00	115.71	-10.00	100.00
270	0.49	129.37	-10.00	115.08	-10.00	100.00
275	0.52	133.11	-10.00	113.15	-10.00	100.00
280	0.51	136.63	-10.00	113.71	-10.00	100.00
285	0.44	139.86	-10.00	118.43	-10.00	100.00
290	0.37	142.76	-10.00	124.04	-10.00	100.00
295	0.30	145.26	-10.00	128.61	-10.00	100.00
300	0.23	147.25	-10.00	134.02	-10.00	100.00
305	0.21	148.69	-10.00	135.03	-10.00	100.00
310	0.00	149.26	-10.00	136.18	-10.00	100.00
315	0.00	149.30	-10.00	136.18	-10.00	100.00
320	0.00	148.62	-10.00	136.18	-10.00	100.00
325	0.25	147.49	-10.00	132.08	-10.00	100.00
330	0.26	145.51	-10.00	131.59	-10.00	100.00
335	0.35	143.10	-10.00	125.26	-10.00	100.00
340	0.47	140.28	-10.00	116.11	-10.00	100.00
345	0.61	137.12	-10.00	109.58	-10.00	100.00
350	0.72	133.68	-10.00	104.96	-10.00	100.00
355	0.76	129.99	-10.00	103.00	-10.00	100.00

Ka-Band Earth Station – Murdock, NE (9.2 m)

Frequency Coordination Report

28 GHz



Prepared on Behalf of
IsoTropic Networks, Inc.

May 10, 2022



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3.	28 GHz UMFUS and LMDS Coordination	- 2 -
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5.	Contact Information	- 7 -

1. Summary of Results

On behalf of ISOTROPIC NETWORKS, INC., 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 Murdock, NE, 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 10, 2022.

No objections were received 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 Murdock, NE 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 Murdock, NE 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 – 29.5 GHz portion of the Ka-Band.

3. 28 GHz UMFUS and LMDS Coordination

There were eleven 28 GHz UMFUS licensees and three LMDS 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 and the 29.1 – 29.25 GHz LMDS channels. 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
Alta (LMDS and UMFUS)	Market Based
GeoLinks (LMDS)	Market Based
LICT Wireless Broadband Company (UMFUS)	Market Based
McBride Spectrum Partners (UMFUS)	Market Based
Nex-Tech Wireless (UMFUS)	Market Based
Rock Port Telephone (UMFUS)	Market Based
T-Mobile (UMFUS)	Market Based
Townes Tele-Communications (UMFUS)	Market Based
US Cellular (UMFUS)	Market Based
Venture Wireless (LMDS and UMFUS)	Market Based
Verizon (UMFUS)	Market Based
Windstream (UMFUS)	Market Based

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



4. Earth Station Coordination Data

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

Job Number: 220318COMSGE11

Administrative Information

Status: ENGINEER PROPOSAL
Call Sign:
Licensee Code: ISOTRP
Licensee Name: IsoTropic Networks, Inc.

Site Information

MURDOCK, NE
Venue Name:
Latitude (NAD 83): 40° 54' 49.4" N
Longitude (NAD 83): 96° 15' 20.0" W
Climate Zone: A
Rain Zone: 2
Ground Elevation (AMSL): 375.23 m / 1231.1 ft

Link Information

Satellite Type: Geostationary
Mode: TR - Transmit-Receive
Modulation: Digital
Satellite Arc: 61° W to 61° West Longitude
Azimuth Range: 132.8° to 132.8°
Corresponding Elevation Angles: 30.6° / 30.6°
Antenna Centerline (AGL): 5.49 m / 18.0 ft

Antenna Information

		Receive - FCC32		Transmit - FCC32	
Manufacturer		CPI		CPI	
Model		KXKa		KXKa	
Gain / Diameter		63.6 dBi / 9.2 m		65.5 dBi / 9.2 m	
3-dB / 15-dB Beamwidth		0.11° / 0.22°		0.08° / 0.18°	
Max Available RF Power	(dBW/4 kHz) (dBW/MHz)			-26.7 -2.7	
Maximum EIRP	(dBW/4 kHz) (dBW/MHz)			38.8 62.8	
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)	6M00D7W - 70M4D7W / 17700.0 - 20200.0	6M00D7W - 70M4D7W / 27500.0 - 29500.0
Max Great Circle Coordination Distance	150.3 km / 93.4 mi	100.0 km / 62.1 mi
Precipitation Scatter Contour Radius	100.0 km / 62.1 mi	100.0 km / 62.1 mi

Coordination Values	MURDOCK, NE		
Licensee Name	IsoTropic Networks, Inc.		
Latitude (NAD 83)	40° 54' 49.4" N		
Longitude (NAD 83)	96° 15' 20.0" W		
Ground Elevation (AMSL)	375.23 m / 1231.1 ft		
Antenna Centerline (AGL)	5.49 m / 18.0 ft		
Antenna Model	CPI 9.2 meter		
Antenna Mode	Receive 18.0 GHz		
Interference Objectives: Long Term	-156.0 dBW/MHz	20%	Transmit 28.0 GHz -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	-26.7 (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	0.86	126.16	-10.00	100.00	-10.00	100.00
5	0.87	122.16	-10.00	100.00	-10.00	100.00
10	1.15	118.15	-10.00	100.00	-10.00	100.00
15	1.42	114.04	-10.00	100.00	-10.00	100.00
20	1.49	109.80	-10.00	100.00	-10.00	100.00
25	1.52	105.51	-10.00	100.00	-10.00	100.00
30	1.53	101.18	-10.00	100.00	-10.00	100.00
35	1.40	96.82	-10.00	100.00	-10.00	100.00
40	1.42	92.46	-10.00	100.00	-10.00	100.00
45	1.58	88.09	-10.00	100.00	-10.00	100.00
50	1.47	83.73	-10.00	100.00	-10.00	100.00
55	1.38	79.39	-10.00	100.00	-10.00	100.00
60	1.48	75.05	-10.00	100.00	-10.00	100.00
65	1.52	70.74	-10.00	100.00	-10.00	100.00
70	1.25	66.54	-10.00	100.00	-10.00	100.00
75	1.15	62.38	-10.00	100.00	-10.00	100.00
80	0.93	58.33	-10.00	100.00	-10.00	100.00
85	0.97	54.30	-10.00	100.00	-10.00	100.00
90	1.05	50.36	-10.00	100.00	-10.00	100.00
95	1.05	46.61	-9.71	100.00	-9.71	100.00
100	0.99	43.08	-8.86	100.00	-8.86	100.00
105	0.82	39.87	-8.02	105.43	-8.02	100.00
110	0.60	37.06	-7.22	116.88	-7.22	100.00
115	0.52	34.56	-6.46	122.61	-6.46	100.00
120	0.27	32.71	-5.87	141.85	-5.87	100.00
125	0.20	31.32	-5.40	149.55	-5.40	100.00
130	0.00	30.74	-5.19	150.25	-5.19	100.00
135	0.00	30.70	-5.18	150.30	-5.18	100.00
140	0.00	31.38	-5.42	149.56	-5.42	100.00
145	0.00	32.74	-5.88	148.14	-5.88	100.00
150	0.23	34.51	-6.45	143.46	-6.45	100.00
155	0.31	36.94	-7.19	135.29	-7.19	100.00
160	0.41	39.76	-7.99	125.98	-7.99	100.00
165	0.34	43.05	-8.85	129.14	-8.85	100.00
170	0.22	46.60	-9.71	135.09	-9.71	100.00
175	0.38	50.20	-10.00	122.76	-10.00	100.00
180	0.40	54.04	-10.00	121.57	-10.00	100.00
185	0.41	58.00	-10.00	120.49	-10.00	100.00

Coordination Values	MURDOCK, NE		
Licensee Name	IsoTropic Networks, Inc.		
Latitude (NAD 83)	40° 54' 49.4" N		
Longitude (NAD 83)	96° 15' 20.0" W		
Ground Elevation (AMSL)	375.23 m / 1231.1 ft		
Antenna Centerline (AGL)	5.49 m / 18.0 ft		
Antenna Model	CPI 9.2 meter		
Antenna Mode	Receive 18.0 GHz		
Interference Objectives: Long Term	-156.0 dBW/MHz	20%	Transmit 28.0 GHz -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	-26.7 (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	0.40	62.08	-10.00	121.54	-10.00	100.00
195	0.47	66.20	-10.00	116.44	-10.00	100.00
200	0.50	70.40	-10.00	114.38	-10.00	100.00
205	0.54	74.65	-10.00	112.54	-10.00	100.00
210	0.55	78.93	-10.00	111.86	-10.00	100.00
215	0.52	83.24	-10.00	113.13	-10.00	100.00
220	0.50	87.56	-10.00	114.00	-10.00	100.00
225	0.53	91.89	-10.00	113.08	-10.00	100.00
230	0.54	96.21	-10.00	112.58	-10.00	100.00
235	0.56	100.52	-10.00	111.48	-10.00	100.00
240	0.59	104.82	-10.00	110.19	-10.00	100.00
245	0.54	109.07	-10.00	112.47	-10.00	100.00
250	0.53	113.28	-10.00	113.13	-10.00	100.00
255	0.53	117.44	-10.00	113.11	-10.00	100.00
260	0.52	121.52	-10.00	113.35	-10.00	100.00
265	0.48	125.50	-10.00	115.71	-10.00	100.00
270	0.49	129.37	-10.00	115.08	-10.00	100.00
275	0.52	133.11	-10.00	113.15	-10.00	100.00
280	0.51	136.63	-10.00	113.71	-10.00	100.00
285	0.44	139.86	-10.00	118.43	-10.00	100.00
290	0.37	142.76	-10.00	124.04	-10.00	100.00
295	0.30	145.26	-10.00	128.61	-10.00	100.00
300	0.23	147.25	-10.00	134.02	-10.00	100.00
305	0.21	148.69	-10.00	135.03	-10.00	100.00
310	0.00	149.26	-10.00	136.18	-10.00	100.00
315	0.00	149.30	-10.00	136.18	-10.00	100.00
320	0.00	148.62	-10.00	136.18	-10.00	100.00
325	0.25	147.49	-10.00	132.08	-10.00	100.00
330	0.26	145.51	-10.00	131.59	-10.00	100.00
335	0.35	143.10	-10.00	125.26	-10.00	100.00
340	0.47	140.28	-10.00	116.11	-10.00	100.00
345	0.61	137.12	-10.00	109.58	-10.00	100.00
350	0.72	133.68	-10.00	104.96	-10.00	100.00
355	0.76	129.99	-10.00	103.00	-10.00	100.00



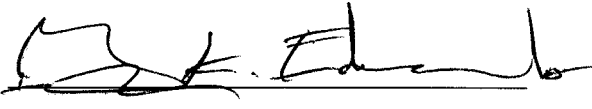
5. Contact Information

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

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 12, 2022

ATTACHMENT 5
(Technical Certification)

I, David Gardner, hereby certify, under penalty of perjury, that I am the technically qualified person responsible for the preparation of the engineering information contained in the technical portions of the foregoing application and the related attachments, that I am familiar with Part 25 of the Commission's rules, and that the technical information is complete and accurate to the best of my knowledge and belief.

/s/ David Gardner

David Gardner
Director, Astrosciences
ISOTROPIC NETWORKS, INC.
2492 Crest Drive
Lake Geneva, WI 53147
+1 262-248-9600 Ext. 1108

October 29, 2022