

ENGINEERING STATEMENT
APPLICATION FOR DISPLACEMENT
OF AN EXISTING LPTV TELEVISION TRANSLATOR
FOR STATION K47IR-D LICENSED TO
VIRGINIA, MINNESOTA
FROM CHANNEL 47 TO CHANNEL 22
CHANNEL 22 .055 KW 593.4 METERS RC/AMSL

APRIL 2018

Preparer Contact Information:

Chris Drovdal
Chief Engineer – KQDS FOX 21 Television
2001 London Rd.
Duluth, Minnesota 55812
218-728-1622
cdrovdal@kqdsfox21.tv

Introduction

This engineering statement supports the displacement application for a construction permit filed on behalf of KQDS Acquisition Corp., licensee of television translator station K47IR, licensed to Virginia, Minnesota (Facility ID: 128844). K47IR is displaced from its currently licensed Channel 47 to the proposed Channel 22 due to the Incentive Auction and the recent notification by T-Mobile. T-Mobile has advised that it requires the station to terminate its operation by August 3, 2018. This displacement application has a companion special temporary authority ("STA") application that accompanies this request.

K47IR's displacement application due to the Incentive Auction requests a construction permit for digital translator television facilities for Channel 22 with an effective radiated power ("ERP") of .055 kW directional at a radiation center above mean sea level ("RCAMSL") of 593.4 meters. The K47IR channel modification is located at the same transmitter site and specifying the same radiation center. No other changes are proposed.

Tower Location

The geographic coordinates of the proposed transmitter site are as follows:

North Latitude: 47° 29' 18"

West Longitude: 92° 31' 12"

NAD-27

The antenna registration number is 1027749. The application will specify the ASRN NAD-83 coordinates which are:

North Latitude: 47° 29' 17.1"

West Longitude: 92° 31' 14.3"

NAD-83

Elevation Data

Antenna Location Site Elevation Above Mean Sea Level	540.1 meters (1772 feet)
Height of Radiation Center Above Ground Level	53.3 meters (175 feet)
Height of Radiation Center Above Mean Sea Level	593.4 meters (1946.9 feet)
Overall Tower Height Above Ground Level	82.3 meters (270 feet)

Equipment Data

Transmitter:	Type-approved
Transmission Line:	86.9 meters (285 ft) of Andrew, Type HJ7-50A, 1-5/8", 50 ohm or equivalent with 72.97% efficiency, 0.488 dB/100 feet loss
Antenna:	DIELECTRIC TLP-12B-22 with maximum gain of 13.12 dB and 1.00 degree of electrical beam tilt

Power Data

Transmitter output:	0.0037 kW	-24.317 dBk
Transmission line efficiency/loss:	72.97%	1.391 dB
Input power to the antenna:	0.0027 kW	-25.685 dBk
Antenna gain:	20.50	13.12 dB
Effective Radiated Power:	.055 kW	-12.595 dBk
Emission Mask:	Simple	

Note: Conversion to dB may result in slight difference.

As indicated above, the transmitter with a typical output power (simple emission mask) of 3.7 Watts will deliver 2.7 Watts to the input of the antenna. The antenna having a maximum gain of 13.12 dB and an electrical beam tilt of 1.00 degrees will produce a maximum ERP of 55 Watts. The antenna elevation pattern and associated information are provided in Exhibit E-2. A coverage map (Exhibit E-3) provides the normally protected contour of the proposed Channel 22 facility. Exhibit E-4 provides the normally protected contour of the proposed and licensed operations.

Other Broadcast Facilities

A brief analysis was completed to determine the presence of stations in the vicinity of the K47IR tower using the April 5th, 2018, data contained within the Commission's Consolidated Database System ("CDBS"). Within 500 meters of the proposed site, three authorized FM radio stations were identified, no authorized DTV and NTSC television stations, no other low-power analog television and no digital television translator stations were found aside from K47IR. There are two AM facilities within 3.2 km of the existing tower. Although no adverse technical affects are expected due to the proposed changes, the licensee will take measures to resolve any problems proven to be related to the changes proposed in this application.

Interference Analysis

A study of predicted interference caused by the proposed K47IR operation on Channel 22 digital operation has been performed using the TVStudy 2.2.4 evaluation program for which the source data has been posted by the Commission on its website at <http://www.fcc.gov/oet/tvstudy>. The model employs the Longley-Rice propagation methodology and evaluates in grid cells of approximately 1 sq. km. Using one-second terrain data sampled approximately every 1.0 km at one-degree azimuth intervals with 2010 census centroids, all studies are based upon data in the current LMS database update of the FCC's engineering database. A Longley-Rice study was performed with the proposed K47IR operating

on Channel 22 low-power digital facilities and all relevant stations listed in the FCC database as of April 5th, 2018. The study results and the included stations are listed in Table I.

Other Licensed and Broadcast Facilities

No adverse technical effect is anticipated by the proposed DTV operation to any other FCC licensed facility. If required, the licensee will install filters or take other measures as necessary to resolve the problem.

FCC Rule, Section 1.1307

Pursuant to OET Bulletin No. 65 dated August 1997, these non-broadcast stations are all exempt from RFF evaluations for the following reason:

<u>Station</u>	<u>Licensed Under Part No.</u>	<u>Reason for Exemption</u>
	Part 74, Subpart F	Subpart F Exempt
	Part 90	Antenna Height > 10 meters
	Part 90	ERP < 1000 watts
	Part 74, Subpart F	Subpart F Exempt

The RFF contribution of each station will be calculated using the following formula:

$$S = \frac{33.4(F^2) \text{ Total ERP}}{R^2}$$

where:

S = power density in $\mu\text{W}/\text{cm}^2$

F = relative field factor

Total ERP = ERP Horizontal Polarization + ERP Vertical Polarization

R = RCAGL - 2 meters

ERP = RMS ERP in watts for DTV Stations

The proposed 55 Watt directional operation will utilize a Dielectric, Type TLP12-B-22 antenna (or equivalent) described above with a center of radiation aboveground of 53.3 meters. The proposed antenna will be side-mounted on an existing tower with an overall height of 82.3 meters above ground.

The proposed operation of K47IR is less than 100 watts maximum ERP; therefore, based upon the current OET Bulletin No. 65, Edition 97-01 dated August 1997 and Supplement A, this proposal is exempt from demonstrating compliance with the FCC radiofrequency field ("RFF") guidelines under Part 74, Subpart G, and the RFF element of Section 1.1307 of the FCC Rules.

Authorized personnel and rigging contractors will be alerted to the potential zone of high field levels on the tower, and if necessary, the station will operate with reduced power or terminate the operation of the transmitter as appropriate when it is necessary for authorized personnel or contractors to perform work on or near the tower. Workers and the general public, therefore, will not be subjected to RFF levels in excess of the current FCC guidelines.

Environmental Assessment

An environmental assessment ("EA") is categorically excluded under Section 1.1306 of the FCC Rules and Regulations as the tower was constructed prior to the requirements specified in WT Docket No. 03-128 and the licensee indicates:

- (a)(1) The existing tower is not located in an officially designated wilderness area.
- (a)(2) The existing tower is not located in an officially designated wildlife preserve.
- (a)(3) The proposed facilities will not affect any listed threatened or endangered species or habitats.
- (a)(3)(ii) The proposed facilities will not jeopardize the continued existence of any proposed endangered or threatened species or likely to result in the destruction or adverse modification of proposed critical habitats.
- (a)(4) The proposed facilities located on a tower which was built prior to the adoption of WT Docket No. 03-128 and is grandfathered and has not affected

any known districts, sites, buildings, structures, or objects significant in American history, architecture, archaeology, engineering, or culture.

(a)(5) The existing tower is not located near any known Indian religious sites.

(a)(6) The existing tower is not located in a flood plain.

(a)(7) The installation of the DTV facilities on an existing tower will not involve a significant change in surface features of the ground in the vicinity of the tower.

(a)(8) It is not proposed to equip the tower with high intensity white lights unless required by the FAA.

(b) Workers and the general public will not be subjected to RFF levels in excess of the current FCC guidelines contained in OET Bulletin No. 65, Edition 97-01, dated August 1997 and Supplement A.

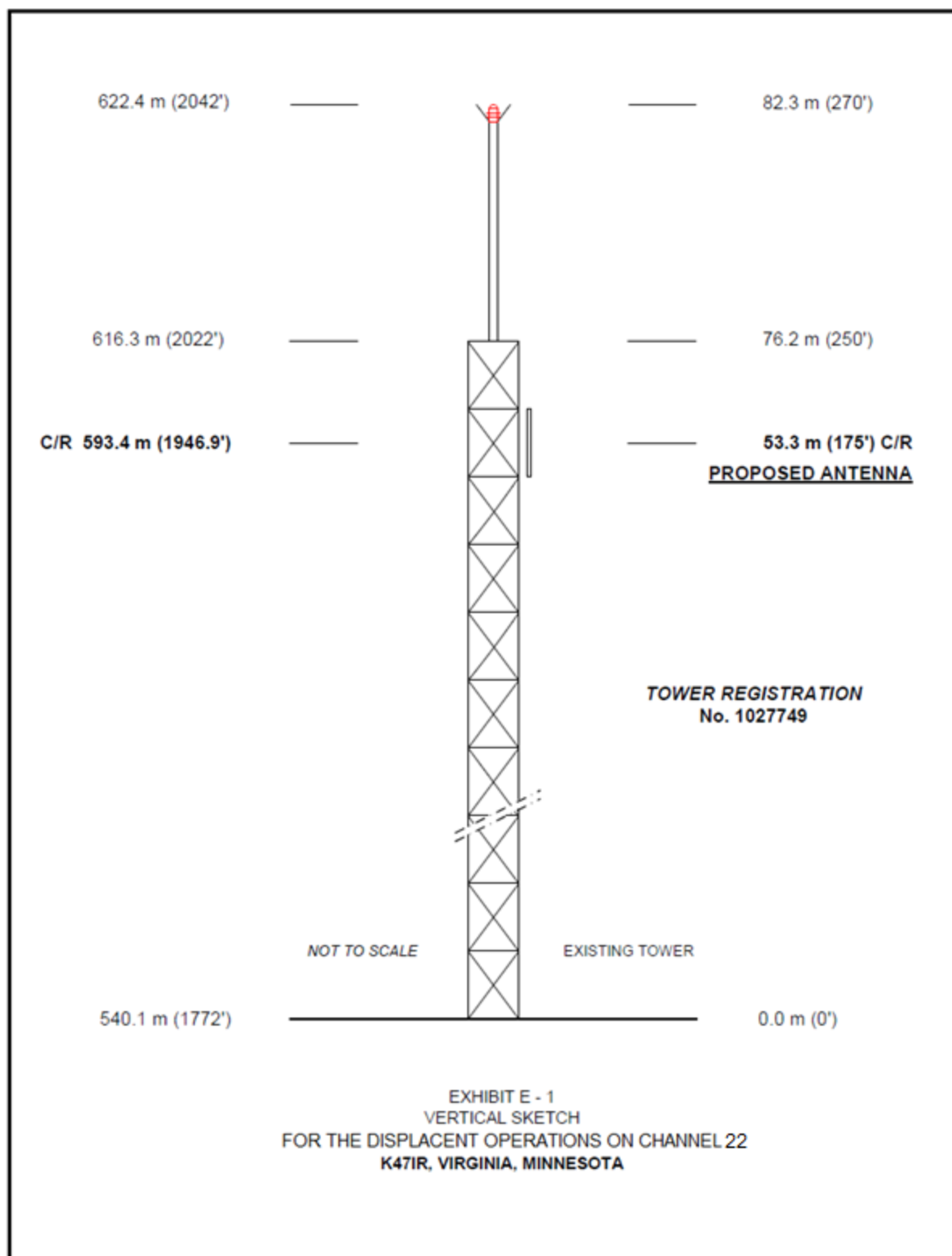


EXHIBIT E2 – Antenna Polarization and Elevation Pattern Data



Antenna Model: **TLP-12B**

Proposal Number: C-71112
 Date: 4-Apr-18
 Customer: KQDS
 Location: Virginia, MN

Electrical Specifications

Polarization: Horizontal
 Azimuth Pattern: Directional
 Antenna Input: 1-5/8" 50 Ohm EIA/DCA
 VSWR: Channel 22.00 : 1
 Bandwidth: 6 MHz
 Rated Input Power: 5 kW (6.99 dBk) Maximum Average Power

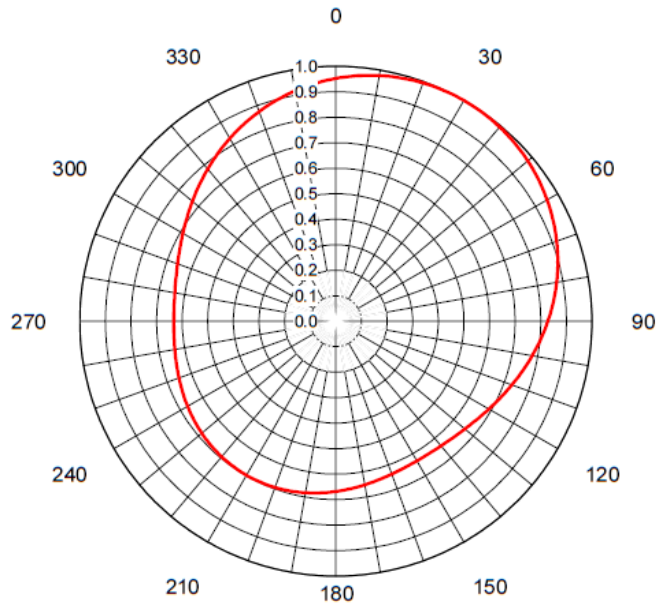
Mechanical Specifications

Mounting: Side Mounted
 Environmental Protection: Slot Cover
 Height: 24.7 ft (7.5m)
 Weight: 125 lb (0.1t) Excludes Mounts
 Effective Projected Area: 22 ft² (2m²) TIA/EIA-222-F Basic Wind Speed: **75 m/h (120.7 km/h)**

Channel Specifications

Call	CH	Freq	Hpol ERP	TPO	Peak Main Lobe Hpol Gain	Peak at Horizontal Hpol Gain
K47IR	22	521 MHz	0.055 kW -(12.60 dBk)	0.003 kW -(24.61 dBk)	20.50 (13.12dB)	17.58 (12.45dB)

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AZIMUTH PATTERN Horizontal Polarization

In Free Space

Proposal No. C-71112
Date 4-Apr-18
Call Letters K471R
Channel 22
Frequency 521 MHz
Antenna Type TLP-12B
Gain 1.64 (2.15dB)
Calculated

Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value
0	0.953	36	0.998	72	0.910	108	0.740	144	0.635	180	0.668	216	0.696	252	0.649
1	0.956	37	0.997	73	0.906	109	0.736	145	0.634	181	0.670	217	0.696	253	0.647
2	0.959	38	0.997	74	0.901	110	0.731	146	0.634	182	0.672	218	0.695	254	0.646
3	0.961	39	0.996	75	0.897	111	0.727	147	0.633	183	0.673	219	0.695	255	0.644
4	0.964	40	0.995	76	0.893	112	0.722	148	0.633	184	0.675	220	0.694	256	0.643
5	0.967	41	0.993	77	0.889	113	0.718	149	0.633	185	0.676	221	0.693	257	0.642
6	0.969	42	0.992	78	0.884	114	0.714	150	0.633	186	0.678	222	0.692	258	0.641
7	0.972	43	0.991	79	0.880	115	0.709	151	0.633	187	0.679	223	0.691	259	0.639
8	0.974	44	0.989	80	0.875	116	0.705	152	0.633	188	0.681	224	0.691	260	0.638
9	0.976	45	0.988	81	0.871	117	0.701	153	0.633	189	0.682	225	0.689	261	0.637
10	0.979	46	0.986	82	0.866	118	0.697	154	0.634	190	0.683	226	0.688	262	0.636
11	0.981	47	0.984	83	0.862	119	0.693	155	0.634	191	0.685	227	0.687	263	0.636
12	0.983	48	0.983	84	0.857	120	0.690	156	0.635	192	0.686	228	0.686	264	0.635
13	0.984	49	0.981	85	0.852	121	0.686	157	0.636	193	0.687	229	0.685	265	0.634
14	0.986	50	0.979	86	0.847	122	0.682	158	0.636	194	0.688	230	0.683	266	0.634
15	0.988	51	0.976	87	0.843	123	0.679	159	0.637	195	0.689	231	0.682	267	0.633
16	0.989	52	0.974	88	0.838	124	0.675	160	0.638	196	0.691	232	0.681	268	0.633
17	0.991	53	0.972	89	0.833	125	0.672	161	0.639	197	0.691	233	0.679	269	0.633
18	0.992	54	0.969	90	0.828	126	0.669	162	0.641	198	0.692	234	0.678	270	0.633
19	0.993	55	0.967	91	0.823	127	0.666	163	0.642	199	0.693	235	0.676	271	0.633
20	0.995	56	0.964	92	0.818	128	0.663	164	0.643	200	0.694	236	0.675	272	0.633
21	0.996	57	0.961	93	0.813	129	0.660	165	0.644	201	0.695	237	0.673	273	0.633
22	0.997	58	0.959	94	0.808	130	0.658	166	0.646	202	0.695	238	0.672	274	0.634
23	0.997	59	0.956	95	0.803	131	0.655	167	0.647	203	0.696	239	0.670	275	0.634
24	0.998	60	0.953	96	0.798	132	0.653	168	0.649	204	0.696	240	0.668	276	0.635
25	0.999	61	0.949	97	0.794	133	0.651	169	0.650	205	0.697	241	0.667	277	0.635
26	0.999	62	0.946	98	0.789	134	0.648	170	0.652	206	0.697	242	0.665	278	0.636
27	0.999	63	0.943	99	0.784	135	0.646	171	0.653	207	0.697	243	0.663	279	0.637
28	1.000	64	0.940	100	0.779	136	0.645	172	0.655	208	0.698	244	0.662	280	0.639
29	1.000	65	0.936	101	0.774	137	0.643	173	0.657	209	0.698	245	0.660	281	0.640
30	1.000	66	0.933	102	0.769	138	0.641	174	0.658	210	0.698	246	0.658	282	0.641
31	1.000	67	0.929	103	0.764	139	0.640	175	0.660	211	0.698	247	0.657	283	0.643
32	1.000	68	0.925	104	0.759	140	0.639	176	0.662	212	0.698	248	0.655	284	0.645
33	0.999	69	0.921	105	0.754	141	0.637	177	0.663	213	0.697	249	0.653	285	0.646
34	0.999	70	0.918	106	0.750	142	0.636	178	0.665	214	0.697	250	0.652	286	0.648
35	0.999	71	0.914	107	0.745	143	0.635	179	0.667	215	0.697	251	0.650	287	0.651

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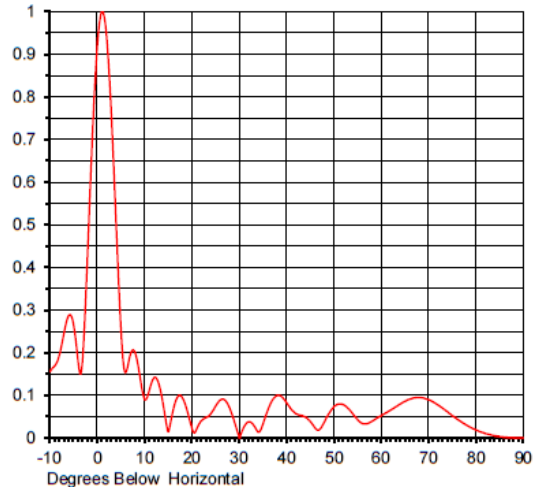
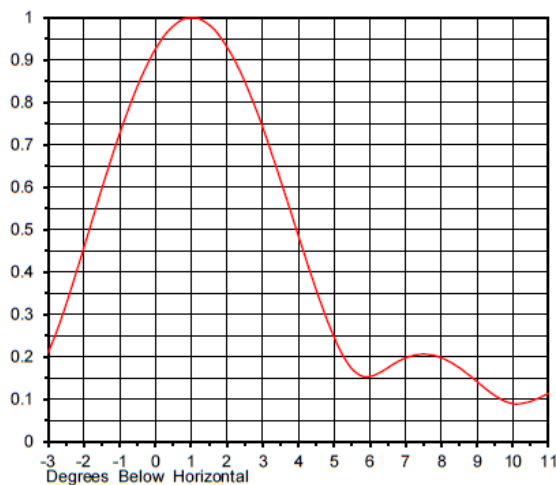


ELEVATION PATTERN

Proposal No. C-71112
 Date 4-Apr-18
 Call Letters K47IR
 Channel 22
 Frequency 521 MHz
 Antenna Type TLP-12B

RMS Directivity at Main Lobe 12.5 (10.97 dB)
 RMS Directivity at Horizontal 10.7 (10.29 dB)
 Calculated

Beam Tilt 1.00 deg
 Pattern Number 12L125100



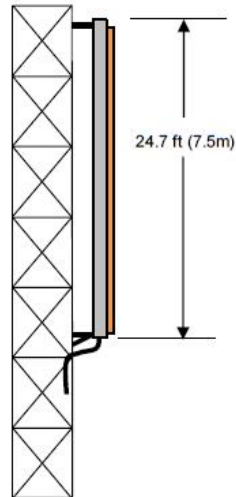
Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field
-10.0	0.156	10.0	0.090	30.0	0.000	50.0	0.074	70.0	0.090
-9.0	0.170	11.0	0.114	31.0	0.027	51.0	0.080	71.0	0.084
-8.0	0.197	12.0	0.142	32.0	0.038	52.0	0.078	72.0	0.077
-7.0	0.250	13.0	0.125	33.0	0.030	53.0	0.069	73.0	0.069
-6.0	0.288	14.0	0.070	34.0	0.014	54.0	0.056	74.0	0.061
-5.0	0.262	15.0	0.015	35.0	0.034	55.0	0.042	75.0	0.052
-4.0	0.171	16.0	0.066	36.0	0.066	56.0	0.034	76.0	0.044
-3.0	0.211	17.0	0.097	37.0	0.090	57.0	0.034	77.0	0.037
-2.0	0.459	18.0	0.093	38.0	0.100	58.0	0.039	78.0	0.030
-1.0	0.727	19.0	0.062	39.0	0.096	59.0	0.046	79.0	0.024
0.0	0.926	20.0	0.021	40.0	0.082	60.0	0.053	80.0	0.019
1.0	1.000	21.0	0.022	41.0	0.067	61.0	0.059	81.0	0.014
2.0	0.931	22.0	0.041	42.0	0.057	62.0	0.066	82.0	0.010
3.0	0.742	23.0	0.048	43.0	0.053	63.0	0.073	83.0	0.008
4.0	0.486	24.0	0.058	44.0	0.048	64.0	0.080	84.0	0.005
5.0	0.247	25.0	0.076	45.0	0.038	65.0	0.086	85.0	0.003
6.0	0.154	26.0	0.089	46.0	0.023	66.0	0.091	86.0	0.002
7.0	0.198	27.0	0.088	47.0	0.021	67.0	0.094	87.0	0.001
8.0	0.198	28.0	0.068	48.0	0.039	68.0	0.095	88.0	0.000
9.0	0.142	29.0	0.035	49.0	0.059	69.0	0.093	89.0	0.000
								90.0	0.000

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MECHANICAL SPECIFICATIONS



Proposal No. C-71112
 Date 4-Apr-18
 Call Letters K47IR
 Channel 22
 Frequency 521 MHz
 Antenna Type TLP-12B

Preliminary Specifications

Side Mounted

With ice TIA/EIA-222-F

Height AGL 200 ft (61 m)
 Basic Wind Speed 75 m/h (120.7 km/h)

Design Ice 0.5 in (1.3 cm)
 Wind Speed w/ice 50 m/h (km/hr)

Mechanical Specifications

		without ice	with ice	
Height	H2	24.7 ft (7.5m)		
Height of Center of Radiation	H3	12.4 ft (3.8m)		
Force Coeff. x Projected Area	CaAc	22 ft ² (2m ²)	25.4 ft ² (2.4m ²)	Mounts Excluded
Weight	W	125 lb (0.1t)	235 lb (0.1t)	Mounts Excluded

Antenna designed in accordance with AISC specifications for design of structural steel as prescribed by TIA/EIA-222-F

Prepared by: JBC

Date: 4-Apr-18

ME:

EE:

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Summary

Proposal No.	C-71112
Date	4-Apr-18
Call Letters	K47IR
Channel	22
Frequency	521 MHz
Antenna Type	TLP-12B

Antenna

	Hpol
ERP:	0.055 kW -(12.60 dBk)
Peak Gain*	20.50 (13.12 dB)

Antenna Input Power	0.003 kW -(25.71 dBk)
---------------------	----------------------------

Transmission Line

Type:	Flexline Air	Attenuation:	(1.10 dB)
Size:	1-5/8"	Efficiency:	77.6%
Impedance:	50 Ohm		
Length:	225 ft	68.6 m	

Transmitter Output

0.003 kW -(24.61 dBk)

Transmitter filter losses not included

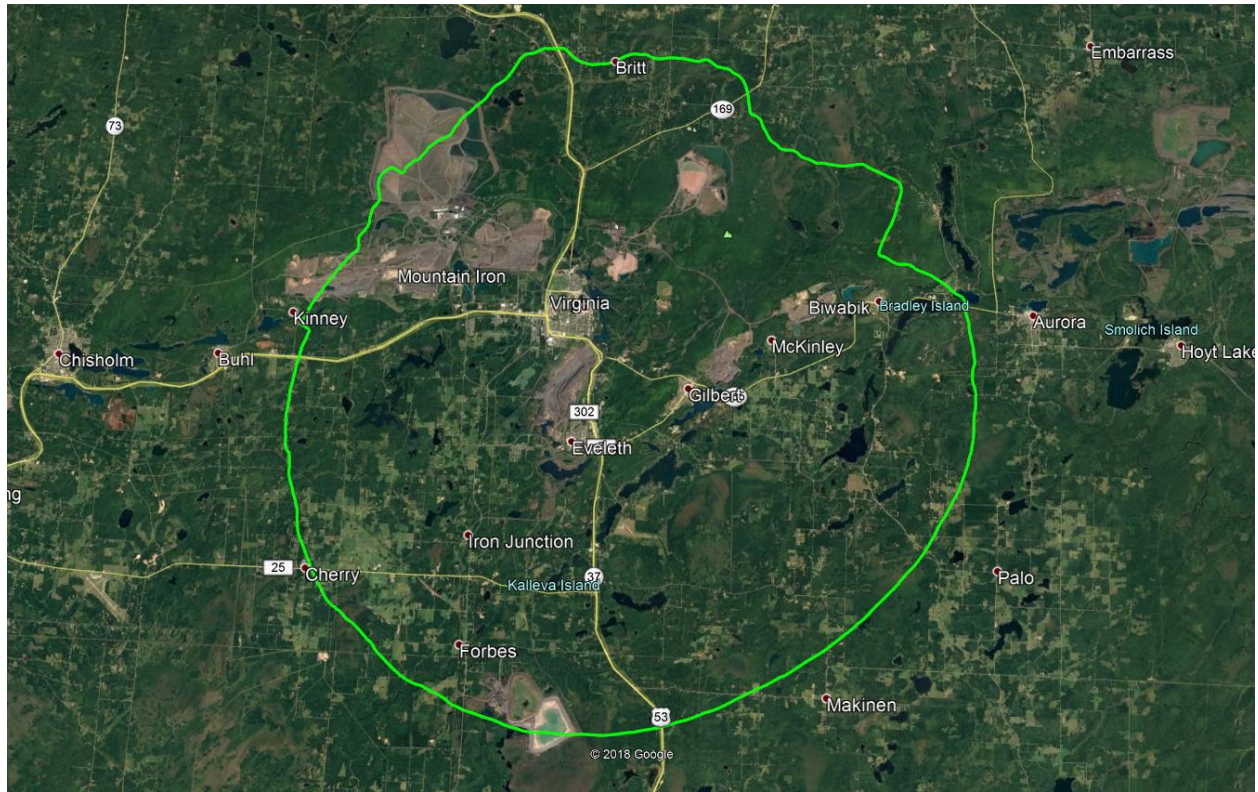
* Directivity and Gain are with respect to half wave dipole. The gain includes feed system losses

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K47IR-D VIRGINIA, MINNESOTA

EXHIBIT E3 – MAP SHOWING THE NOMALLY PROTECTED CONTOUR OF THE PROPOSED CHANNEL 22 FACILITY



CREATED USING TV STUDY .KML OUTPUT FILE

Map Scale |← 7.5mi. →|

APRIL 2018

FOR THE PROPOSED DISPLACEMENT OPERATION OF

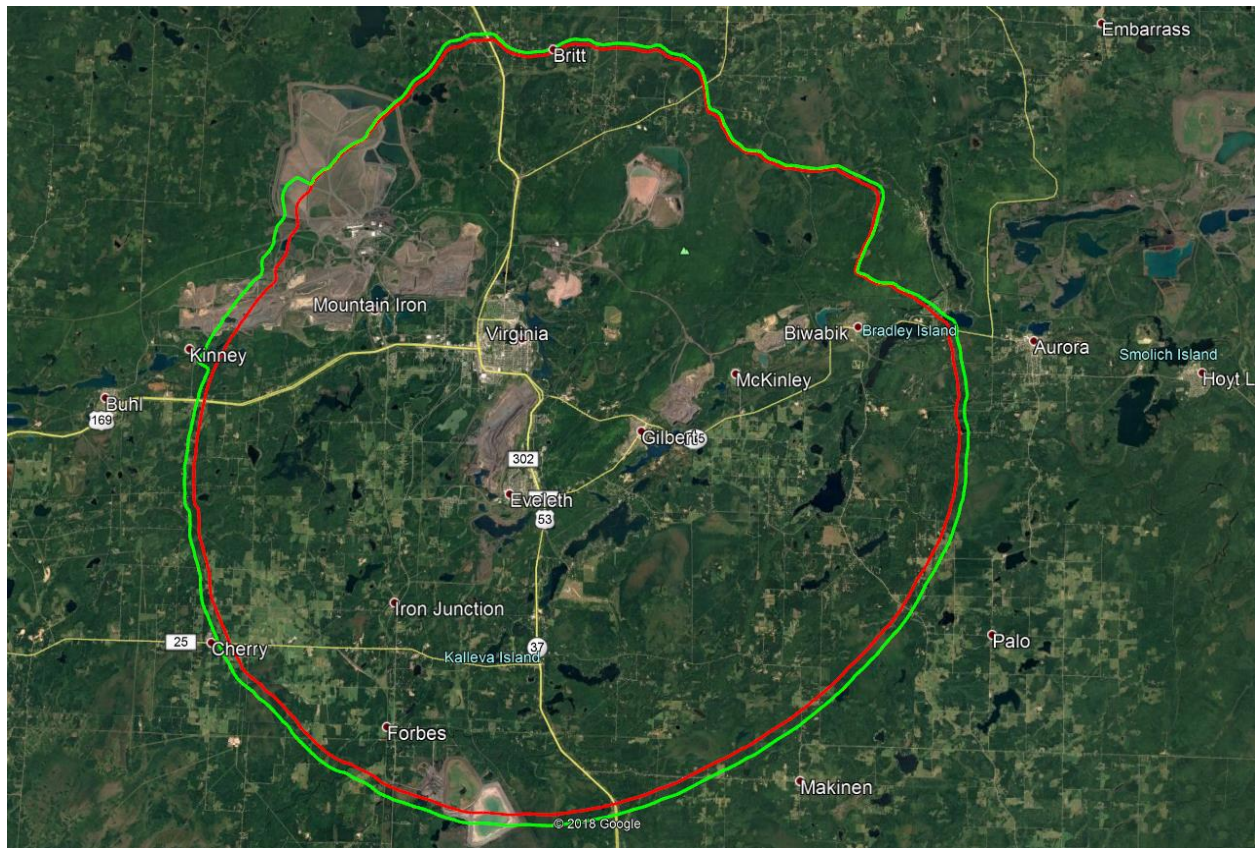
K47IR-D, VIRGINIA, MINNESOTA

CHANNEL 22 .055 kW ERP 593.4 METERS RC/AMSL

49.6 dBu F(50,90)

K471R-D VIRGINIA, MINNESOTA

EXHIBIT E4 - COMPARISON OF PROPOSED CH22 49.6 dBu F(50,90) AND LICENSED CHANNEL 47 51 dBu F(50,90) NOISE-LIMITED CONTOUR



Green Contour = Proposed Channel 22 49.6 dBu F(50, 90)

Map Scale |← 7.5mi. →|

Red Contour = Current License Channel 47 51 dBu F(50, 90)

CREATED USING TV STUDY .KML OUTPUT FILE

APRIL 2018

FOR THE PROPOSED DISPLACEMENT OPERATION OF

K471R-D, VIRGINIA, MINNESOTA

CHANNEL 22 .055 kW ERP 593.4 METERS RC/AMSL

49.6 dBu F(50,90)

TABLE I

tvstudy v2.2.4 (Z2Qqz3)

Database: localhost, Study: BLANK0000016416 (K47IR-D on 22), Model: Longley-Rice

Start: 2018.04.05 11:04:11

Study created: 2018.04.05 11:04:11

Study build station data: LMS TV 2018-04-05 (12)

Proposal: K47IR-D D22 (D47-) LD LIC VIRGINIA, MN

File number: BLANK0000016416

Facility ID: 128844

Station data: LMS TV 2018-04-05 (12)

Record ID: 25076f91571f5d140157b8c40b6d3927

Country: U.S.

Build options:

Protect pre-transition records not on baseline channel

Search options:

Non-U.S. records included

K47IR-D VIRGINIA, MINNESOTA

Stations potentially affected by proposal:

IX	Call	Chan	Svc Status	City, State	File Number	Distance
No	K15GT-D	N15-	TX LIC	HIBBING, MN	BLTT20040909ABE	34.8 km
No	K21KY-D	D21	LD LIC	BIGFORK/MARCELL, MN	BLDTT20111107ALH	88.3
No	K21KZ-D	D21	LD CP	DULUTH, MN	BNPDTL20090902AAE	108.7
No	K21KR-D	D21	LD CP	DULUTH, MN	BNPDTL20090825AQR	83.6
No	K21HX-D	D21	LD LIC	WALKER, MN	BLDTT20140224ACZ	161.3
No	K47NW-D	D22	LD APP	INTERNATIONAL FALLS, MN	BLANK0000049130	134.5
No	WUCW	D22	DT LIC	MINNEAPOLIS, MN	BLCDT20060405AAI	273.8
No	K49LO-D	D22	LD APP	RED LAKE, MN	BLANK0000049606	192.6
No	K22KO-D	D22	LD CP	GRAND FORKS, ND	BNPDTL20100505AJU	354.2
No	K23KZ-D	D23	LD LIC	BIGFORK/MARCELL, MN	BLDTT20111107ALI	88.3
No	K23MQ-D	D23	LD CP	DULUTH, MN	BNPDTL20100428ABY	68.0
No	K29EB-D	N29-	TX LIC	GRAND RAPIDS, MN	BLTT20021011AAW	68.0

No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

Channel: D22-

Mask: Simple

Latitude: 47 29 17.10 N (NAD83)

Longitude: 92 31 14.30 W

Height AMSL: 593.4 m

HAAT: 0.0 m

Peak ERP: 0.055 kW

Antenna: (replication) 0.0 deg

K47IR-D VIRGINIA, MINNESOTA

Elev Pattn: Generic

Elec Tilt: 0.50

49.6 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	0.050 kW	124.4 m	17.2 km
45.0	0.054	118.8	17.1
90.0	0.037	158.6	18.5
135.0	0.021	174.5	16.7
180.0	0.023	169.3	16.7
225.0	0.025	164.9	16.8
270.0	0.020	159.1	15.4
315.0	0.030	131.3	15.2

Database HAAT does not agree with computed HAAT

Database HAAT: 0 m Computed HAAT: 150 m

Proposal 24.56 dBu contour does not cross Canadian border

Distance to Canadian border: 82.2 km

Distance to Mexican border: 2108.3 km

Conditions at FCC monitoring station: Allegan MI

Bearing: 134.1 degrees Distance: 748.0 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:

Bearing: 235.9 degrees Distance: 1302.1 km

K47IR-D VIRGINIA, MINNESOTA

Study cell size: 1.00 km

Profile point spacing: 1.00 km

Maximum new IX to full-service and Class A: 0.50%

Maximum new IX to LPTV: 2.00%

Interference to proposal scenario 1

	Call	Chan	Svc Status	City, State	File Number	Distance
Desired:	K47IR-D	D22-	LD LIC	VIRGINIA, MN	BLANK0000016416	

Service area		Terrain-limited		IX-free		Percent IX	
878.8	24,222	828.4	24,024	828.4	24,024	0.00	0.00