

ENGINEERING EXHIBIT

Digital Low Power Television Station Application for Minor Modification of Licensed Facility prepared for

Gray Television Licensee, LLC
K19MZ-D Arriba, CO
Facility ID 186847
Ch. 19 1 kW Directional

Gray Television Licensee, LLC (“Gray”) is the proposed assignee (file# 0000177508) of digital Low Power Television station K19MZ-D, Channel 19, Facility ID 186847, Arriba CO. K19MZ-D is licensed to operate at 3 kW effective radiated power (“ERP”) with a directional antenna (file# 0000158117). *Gray* herein seeks a minor modification Construction Permit to relocate K19MZ-D and to utilize a different directional antenna pattern at decreased ERP and increased antenna height.

As proposed herein, K19MZ-D will employ an antenna to be side-mounted on the tower structure associated with FCC Antenna Structure Registration number 1037564, located 34.2 km (21.3 miles) from the licensed site. No change to the overall structure height is proposed.

The proposed antenna is a Kathrein model 75010210 (single panel) having horizontal polarization. The proposed ERP is 1 kW using a “stringent” out of channel emission mask. A plot of the directional antenna’s azimuthal pattern is supplied in Figure 1. Figure 2 depicts the coverage contour of the proposed facility as well as that of the licensed facility, demonstrating compliance with §73.3572 for a minor change.

Interference study per OET Bulletin 69¹ shows that the proposal complies with the FCC’s interference protection requirements toward all digital television, television translator, LPTV, and

¹FCC Office of Engineering and Technology Bulletin number 69, *Longley-Rice Methodology for Evaluating TV Coverage and Interference*, February 6, 2004 (“OET-69”). This analysis employed the FCC’s current “TVStudy” software with the default application processing template settings, 1 km cell size, and 1 km terrain increment. Comparisons of various results of this computer program (run on a Mac processor) to the FCC’s implementation of

Class A stations. The results, summarized in Table 1, show that any new interference does not exceed the FCC's interference limits (0.5 percent to full power and Class A stations, and 2.0 percent to secondary stations) to any facility.

Human Exposure to Radiofrequency Electromagnetic Field (Environmental)

The proposed operation was evaluated for human exposure to RF energy using the procedures outlined in the FCC's OET Bulletin Number 65. Based on OET-65 equation (10) and considering 25 percent antenna relative field in downward elevations (antenna elevation pattern data shows 25 percent relative field or less for angles 30-90 degrees below the horizontal), the calculated signal density near the tower at two meters above ground level attributable to the proposed facility is $1.4 \mu\text{W}/\text{cm}^2$, which is 0.4 percent of the general population/uncontrolled maximum permitted exposure limit. This is well below the five percent threshold limit described in §1.1307(b) regarding sites with multiple emitters, categorically excluding the applicant from responsibility for taking any corrective action in the areas where the proposal's contribution is less than five percent.

The general public will not be exposed to RF levels attributable to the proposal in excess of the FCC's guidelines. RF exposure warning signs will continue to be posted. With respect to worker safety, the applicant will coordinate exposure procedures with all pertinent stations and will reduce power or cease operation as necessary to protect persons having access to the site, tower, or antenna from RF electromagnetic field exposure in excess of FCC guidelines. This exhibit is limited to the evaluation of exposure to RF electromagnetic field. No increase in structure height is proposed.

Engineering Exhibit
Gray Television Licensee, LLC (K19MZ-D)
(page 3 of 3)



List of Attachments

Figure 1	Antenna Azimuthal Pattern
Figure 2	Coverage Contour Comparison
Table 1	TVStudy Analysis of Proposal
Form 2100	Saved Version of Engineering Sections of FCC Form at Time of Upload

Chesapeake RF Consultants, LLC

Joseph M. Davis, P.E.	July 27, 2022	
207 Old Dominion Road	Yorktown, VA 23692	703-650-9600

**Azimuth Pattern - Relative Field
(True North)**

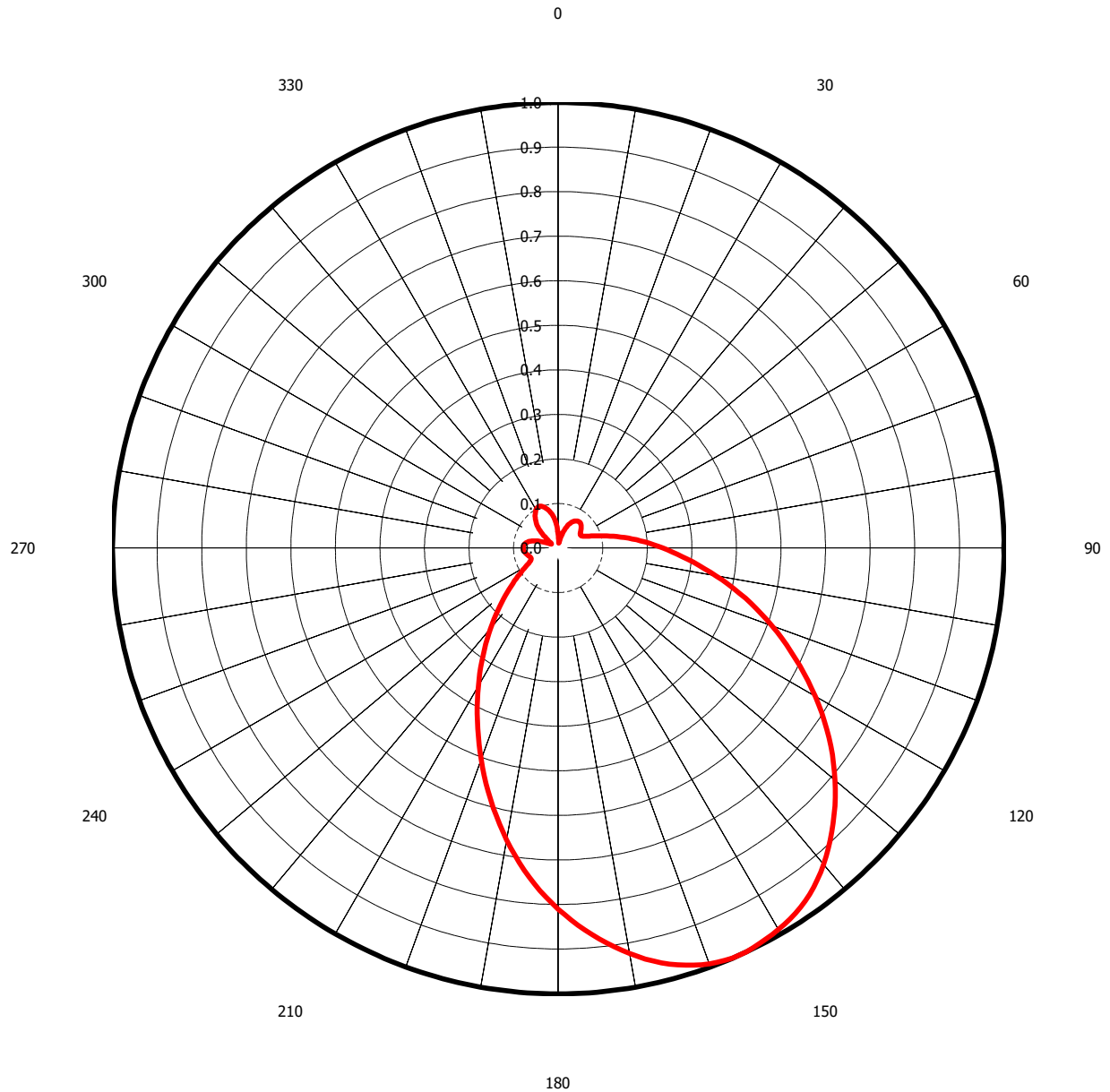


Figure 1
Antenna Azimuthal Pattern
K19MZ-D Arriba, CO
Facility ID 186847
Ch. 19 1 kW Directional

prepared for
Gray Television Licensee, LLC

July, 2022



Chesapeake RF Consultants, LLC
Radiofrequency Consulting Engineers
Digital Television and Radio

Figure 2
Coverage Contour Comparison
K19MZ-D Arriba, CO
Facility ID 186847
Ch. 19 1 kW Directional

prepared for
Gray Television Licensee, LLC

July, 2022

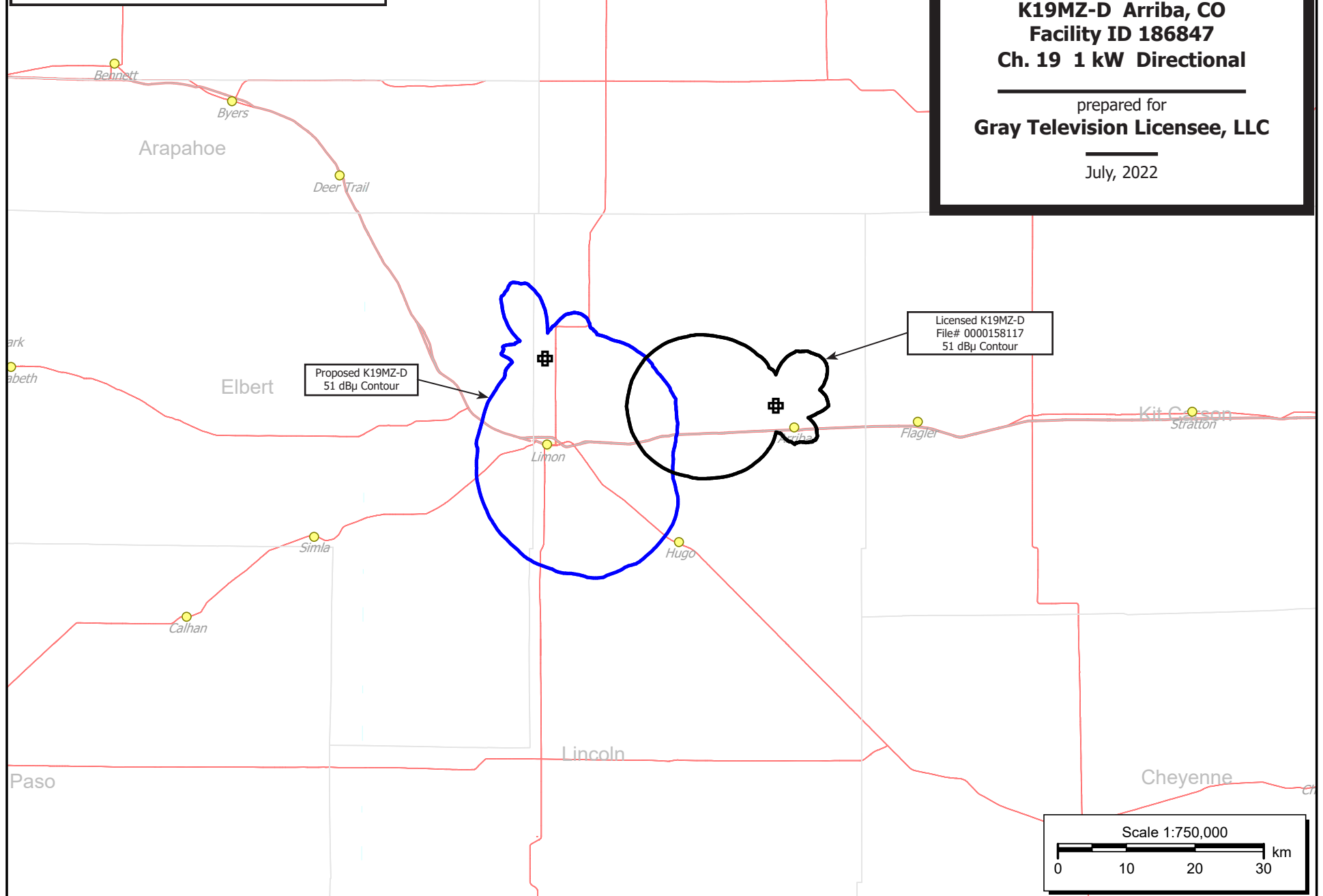


Table 1 K19MZ-D TVStudy Analysis of Proposal (page 1 of 2)



tvstudy v2.2.5 (4uoc83)
Database: localhost, Study: K19MZ-D 1037564 prop, Model: Longley-Rice
Start: 2022.07.27 10:19:19

Study created: 2022.07.27 10:19:19

Study build station data: LMS TV 2022-07-27

Proposal: K19MZ-D D19 LD APP ARRIBA, CO
File number: K19MZ-D 1037564 prop
Facility ID: 186847
Station data: User record
Record ID: 4544
Country: U.S.

Build options:
Protect pre-transition records not on baseline channel

Search options:
Baseline record excluded if station has CP

Stations potentially affected by proposal:

IX	Call	Chan	Svc	Status	City, State	File Number	Distance
No	K18MS-D	D18	LD	LIC	AKRON, CO	BLANK0000117623	112.7 km
No	KZCS-LD	D18z	LD	LIC	COLORADO SPRINGS, CO	BLANK0000185638	122.9
No	KPXC-TV	D18	DT	LIC	DENVER, CO	BLANK0000071556	130.5
No	K18LL-D	D18	LD	LIC	EADS, ETC., CO	BLANK0000001779	126.5
No	K18FO-D	D18	LD	LIC	IDALIA, CO	BLDTT20110120ABQ	111.1
No	K18FN-D	D18	LD	LIC	PEETZ, CO	BLDTT20110928AKM	173.0
No	K18NB-D	D18	LD	LIC	WRAY, CO	BLANK0000117480	146.5
No	K19FH-D	D19	LD	LIC	ASPEN, CO	BLDTT20121119AGZ	270.7
No	K19DY-D	D19	LD	LIC	CANON CITY, CO	BLANK0000138251	164.7
No	K19DY-D	N19	TX	LIC	CANON CITY, CO	BLT20001027AAF	164.7
No	KRMA-TV	D19	LD	LIC	DENVER, CO	BLANK0000064177	182.5
No	KSBS-CD	D19	DC	LIC	DENVER, CO	BLANK0000068957	137.8
No	KSBS-CD	D19	DC	CP	DENVER, CO	BLANK0000190351	137.9
No	K19KN-D	D19	LD	LIC	EADS, ETC., CO	BLANK0000001775	126.5
No	K19HC-D	D19	LD	LIC	HOEHNE, CO	BLDTT20090720AAK	257.0
No	K19EG-D	D19	LD	LIC	HOLYOKE, CO	BLDTT20110613AAO	169.8
No	K19MN-D	D19	LD	LIC	LAKE GEORGE, CO	BLANK0000116870	126.1
No	K19HG-D	D19	LD	LIC	REDSTONE, CO	BLDTT20091221ABC	303.3
No	K19LA-D	D19	LD	LIC	ROCKY FORD, CO	BLANK0000107351	146.3
No	K19IX-D	D19	LD	LIC	ROMEO, CO	BLDTT20130107ABJ	346.0
No	K19LW-D	D19	LD	LIC	STERLING, CO	BLANK0000117467	146.1
No	K19ML-D	D19	LD	LIC	WRAY, CO	BLANK0000117481	146.5
No	KWKS	D19	DT	LIC	COLBY, KS	BLED20070601ATA	201.3
No	KAMR-TV	D19	DT	LIC	AMARILLO, TX	BLCDT20080519ACZ	477.9
No	DDKCHY-LP	D19+	LD	APP	CHEYENNE, WY	BLANK0000071845	221.6
No	K19FX-D	D19	LD	LIC	LARAMIE, WY	BLDTT20111129FFV	258.8
No	K20NI-D	D20	LD	LIC	AKRON, CO	BLANK0000117637	112.7
No	KDNF-LD	D20	LD	LIC	ARVADA, CO	BLANK0000065360	132.3
No	KXTU-LD	D20	LD	LIC	COLORADO SPRINGS, CO	BLANK0000185269	122.7
No	KRMT	D20	DT	LIC	DENVER, CO	BLANK0000154349	132.3
No	K20HM-D	D20	LD	LIC	IDALIA, CO	BLDTT20110613AAG	111.1
No	K20MP-D	D20	LD	LIC	LAMAR, CO	BLANK0000107354	176.5
No	K20FS-D	D20	LD	LIC	PEETZ, CO	BLDTT20110114AAR	173.0

No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

Channel: D19
Mask: Stringent
Latitude: 39 22 34.30 N (NAD83)
Longitude: 103 41 42.90 W
Height AMSL: 1803.7 m
HAAT: 0.0 m
Peak ERP: 1.00 kW
Antenna: KAT 75010210 1x1 155.0 deg
Elev Pattn: Generic

Table 1 K19MZ-D TV Study Analysis of Proposal
(page 2 of 2)



49.3 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	0.001 kW	143.8 m	7.6 km
45.0	0.005	103.7	9.4
90.0	0.057	99.7	16.0
135.0	0.762	95.5	29.2
180.0	0.650	145.2	32.4
225.0	0.035	98.4	14.4
270.0	0.006	38.0	5.8
315.0	0.004	123.1	9.3

Database HAAT does not agree with computed HAAT
Database HAAT: 0 m Computed HAAT: 106 m

Distance to Canadian border: 1069.6 km

Distance to Mexican border: 881.7 km

Conditions at FCC monitoring station: Grand Island NE
Bearing: 67.3 degrees Distance: 479.2 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:
Bearing: 303.5 degrees Distance: 158.7 km
ERP: 0.000488 kW Field strength: -31.0 dBu, 0.0 mV/m

No land mobile station failures found

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

Desired:	Call	Chan	Svc	Status	City, State	File Number	Distance
	K19MZ-D	D19	LD	APP	ARRIBA, CO	K19MZ-D 1037564 prop	
Undesireds:	K19DY-D	D19	LD	LIC	CANON CITY, CO	BLANK0000138251	164.7 km
	KSBS-CD	D19	DC	LIC	DENVER, CO	BLANK0000068957	137.8
	K19KN-D	D19	LD	LIC	EADS, ETC., CO	BLANK0000001775	126.5
	KWKS	D19	DT	LIC	COLBY, KS	BLEDT20070601ATA	201.3
Service area		Terrain-limited		IX-free		Percent IX	
1063.5		3,738		992.2		1.96 1.82	
Undesired		Total IX		Unique IX		Prcnt Unique IX	
KSBS-CD D19 DC LIC		18.8		68		1.67 1.82	
K19KN-D D19 LD LIC		1.0		0		0.00 0.00	
KWKS D19 DT LIC		2.0		0		0.10 0.00	

Interference to proposal scenario 2

Desired:	Call	Chan	Svc	Status	City, State	File Number	Distance
	K19MZ-D	D19	LD	APP	ARRIBA, CO	K19MZ-D 1037564 prop	
Undesireds:	K19DY-D	D19	LD	LIC	CANON CITY, CO	BLANK0000138251	164.7 km
	KSBS-CD	D19	DC	CP	DENVER, CO	BLANK0000190351	137.9
	K19KN-D	D19	LD	LIC	EADS, ETC., CO	BLANK0000001775	126.5
	KWKS	D19	DT	LIC	COLBY, KS	BLEDT20070601ATA	201.3
Service area		Terrain-limited		IX-free		Percent IX	
1063.5		3,738		1000.1		1.18 1.82	
Undesired		Total IX		Unique IX		Prcnt Unique IX	
KSBS-CD D19 DC CP		9.9		68		0.88 1.82	
K19KN-D D19 LD LIC		1.0		0		0.00 0.00	
KWKS D19 DT LIC		2.0		0		0.20 0.00	

**Channel and
Facility
Information**

Section	Question	Response
Facility ID	186847	
State	Colorado	
City	ARRIBA	
LPD Channel	19	

Antenna Location Data

Section	Question	Response
Antenna Structure Registration	Do you have an FCC Antenna Structure Registration (ASR) Number?	Yes
	ASR Number	1037564
Coordinates (NAD83)	Latitude	39° 22' 34.3" N+
	Longitude	103° 41' 42.9" W-
	Structure Type	GTOWER-Guyed Structure Used for Communication Purposes
	Overall Structure Height	77.4 meters
	Support Structure Height	75.9 meters
	Ground Elevation (AMSL)	1763.2 meters
Antenna Data	Height of Radiation Center Above Ground Level	40.5 meters
	Height of Radiation Center Above Mean Sea Level	1803.7 meters
	Effective Radiated Power	1 kW

**Antenna
Technical Data**

Section	Question	Response
Antenna Type	Antenna Type	Directional Custom
	Do you have an Antenna ID?	No
	Antenna ID	
Antenna Manufacturer and Model	Manufacturer:	Kathrein
	Model	750 10210 1x
	Rotation	155 degrees
	Electrical Beam Tilt	Not Applicable
	Mechanical Beam Tilt	Not Applicable
	toward azimuth	
	Polarization	Horizontal
Elevation Radiation Pattern	Does the proposed antenna propose elevation radiation patterns that vary with azimuth for reasons other than the use of mechanical beam tilt?	No
	Uploaded file for elevation antenna (or radiation) pattern data	
	Out-of-Channel Emission Mask:	Stringent

Directional Antenna Relative Field Values (Pre-rotated Pattern)

Degree	Value	Degree	Value	Degree	Value	Degree	Value
0	1.000	90	0.069	180	0.103	270	0.063
10	0.966	100	0.068	190	0.089	280	0.106
20	0.871	110	0.077	200	0.057	290	0.186
30	0.742	120	0.077	210	0.013	300	0.292
40	0.585	130	0.061	220	0.029	310	0.435
50	0.429	140	0.028	230	0.060	320	0.588
60	0.294	150	0.021	240	0.074	330	0.742
70	0.186	160	0.061	250	0.073	340	0.873
80	0.110	170	0.090	260	0.061	350	0.967

Additional Azimuths

Degree	V _A
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