

ENGINEERING EXHIBIT

Application for Minor Modification of Digital Television Translator Station

prepared for

Gray Television Licensee, LLC

K21JK-D Montrose, CO

Facility ID 168357

Ch. 21 (digital) 11.6 kW

Gray Television Licensee, LLC (“Gray”) is the licensee of digital Television Translator station K21JK-D, Channel 21, Montrose CO, Facility ID 168357. K21JK-D is licensed to operate with 13 kW effective radiated power (“ERP”), directional (BLDTL-20081107AEK). *Gray* herein seeks a Construction Permit to authorize a different directional antenna pattern, a slight decrease in ERP, and corrections to the site coordinates and ground elevation.

As proposed herein, K21JK-D will operate at its existing antenna location and height. A coordinate correction of 30 seconds longitude is specified to correspond to the actual antenna location (0.73 km from the licensed coordinates). The existing antenna supporting structure is not registered as the overall structure height is less than 61 meters above ground and passes the FCC’s TOWAIR program for the tower location. The proposed K21JK-D facility will employ a replacement antenna system and no change to the overall structure height is proposed.

The proposed K21JK-D facility will operate at 11.6 kW ERP using a “full service” out of channel emission mask. A plot of the directional antenna’s azimuthal pattern is supplied in Figure 1. Figure 2 depicts the 51 dBμ coverage contour of the licensed and proposed facilities, demonstrating compliance with §74.787(b) 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,

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

and 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 except with respect to 18.85 percent interference that would be caused to the K21GT-D Construction Permit facility ("CP" BPD TT-20130318AFP), Ch. 21, Dove Creek CO. The K21GT-D CP expired on April 3, 2016 and protection to that facility is no longer necessary.²

The nearest FCC monitoring station is 768 km distant at Douglas AZ. This exceeds by a large margin the threshold minimum distance specified in §73.1030(c)(3) that would suggest consideration of the monitoring station. The site is not located within the areas requiring coordination with "quiet" zones specified in §73.1030(a) and (b). There are no authorized AM stations within 3.2 kilometers of the site. The site location is beyond the border areas requiring international coordination.

Human Exposure to Radiofrequency Electromagnetic Field

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 10 percent antenna relative field in downward elevations (pattern data shows less than 10 percent relative field at angles 40 to 90 degrees below the antenna), the calculated signal density near the tower at two meters above ground level attributable to the proposed facility is $1.3 \mu\text{W}/\text{cm}^2$, which is 0.4 percent of the general population/uncontrolled maximum permitted exposure limit. This is 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.

terrain increment. Comparisons of various results of this computer program (run on a Mac processor) to the FCC's implementation of TVStudy show excellent correlation.

² The proposal is predicted to cause zero percent interference to the licensed K21GT-D facility (BLD TT-20120615ABE).

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. Environmental matters covered by this exhibit are limited to the evaluation of exposure to RF electromagnetic field.

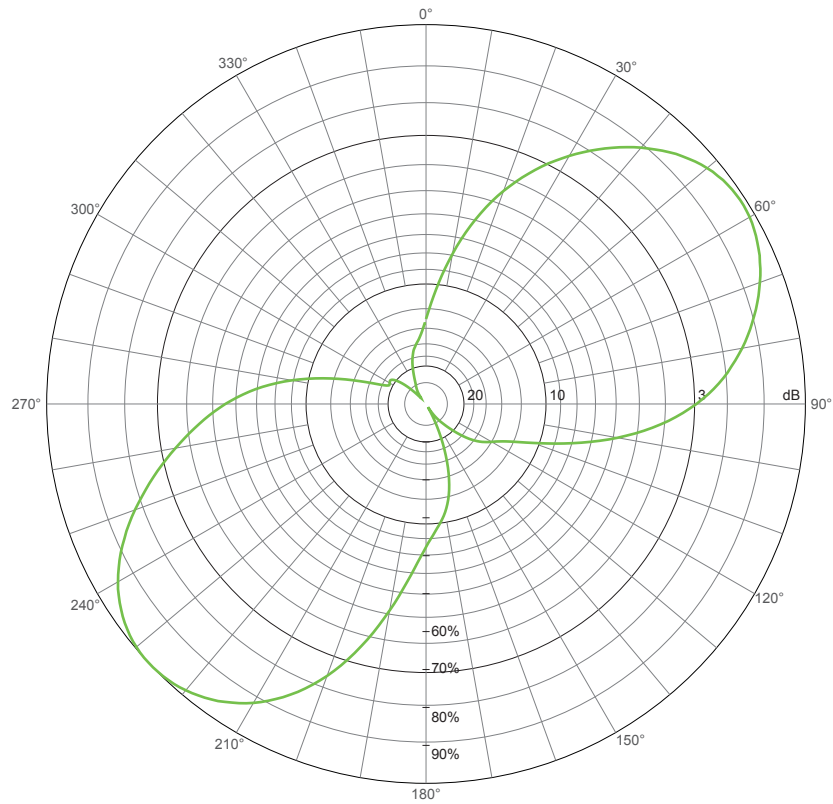
List of Attachments

Figure 1	Antenna Azimuthal Pattern
Figure 2	Coverage Contour Comparison
Table 1	Interference Analysis Results Summary
Form 2100	Saved Version of Engineering Sections from FCC Form at Time of Upload

Chesapeake RF Consultants, LLC

Joseph M. Davis, P.E.	July 13, 2018	
207 Old Dominion Road	Yorktown, VA 23692	703-650-9600

Azimuthal Pattern (polar-linear)



Antenna, Order No. 75010455
Panels per Bay: 2

Frequency: 515 MHz
Azimuthal Directivity: 4.5 dB
Directivity: 13.8 dBd

No.	Azimuth [°]	Radius [mm]	Offset [mm]	Power	Phase [°]
1	60	300	0	1	0
2	230	300	0	1	0

KATHREIN

DTV Pros Jim Heard

KKCO

Date: 2018.05.18

KKCO Translators ch 21 and 23

Kathrein USA mj

Page: 7

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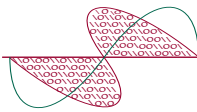
Figure 1

**Antenna Azimuthal Pattern
K21JK-D Montrose, CO
Facility ID 168357
Ch. 21 (digital) 11.6 kW**

prepared for
Gray Television Licensee, LLC

July, 2018





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

Figure 2
Coverage Contour Comparison
K21JK-D Montrose, CO
Facility ID 168357
Ch. 21 (digital) 11.6 kW

prepared for
Gray Television Licensee, LLC

July, 2018

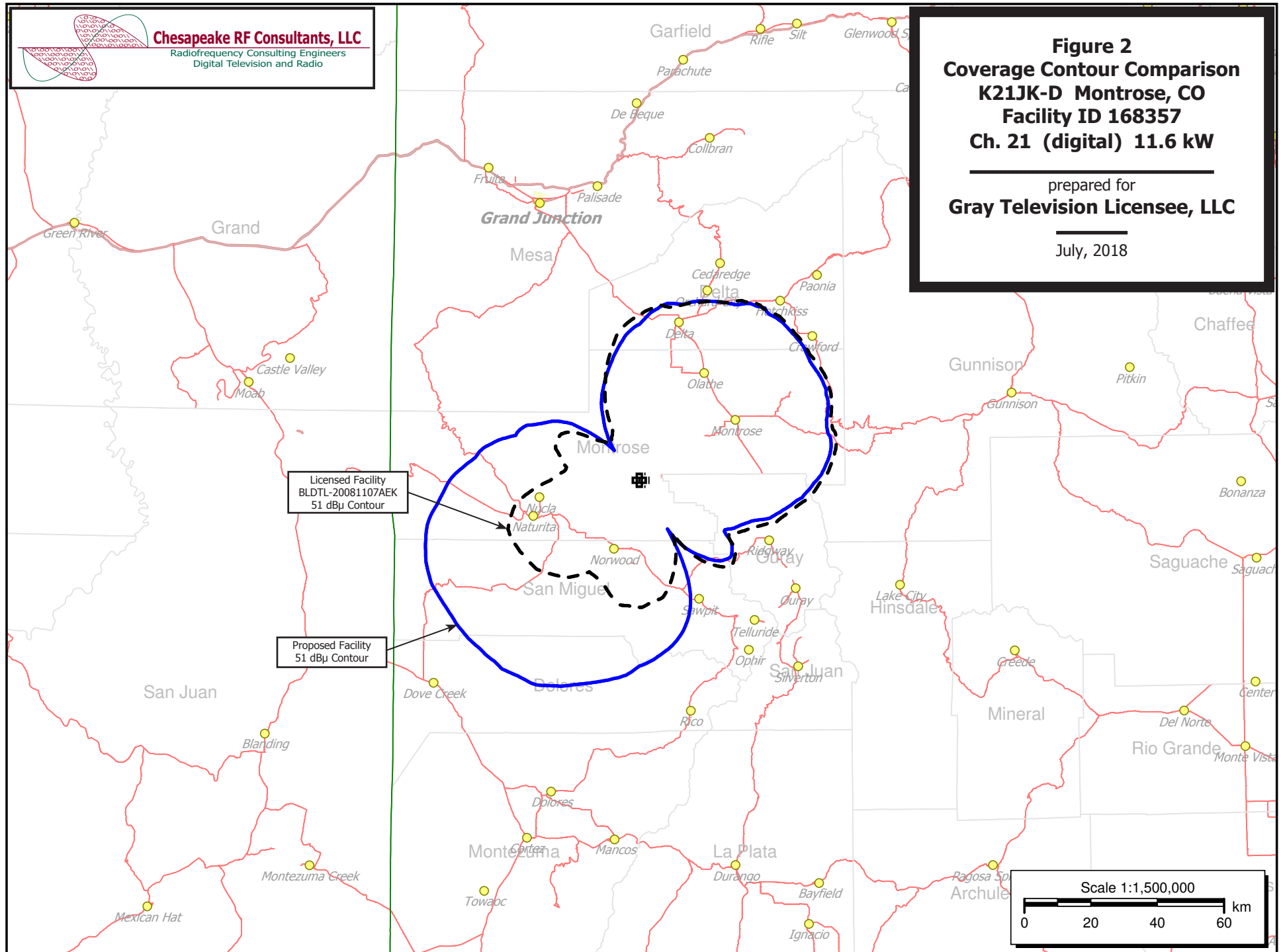


Table 1 K21JK-D OET Bulletin 69 Interference Study
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tvstudy v2.2.5 (4uoc83)
Database: localhost, Study: K21JK-D KAT 11.6kW all, Model: Longley-Rice
Start: 2018.07.13 13:34:53

Study created: 2018.07.13 13:34:53

Study build station data: LMS TV 2018-07-11

Proposal: K21JK-D D21 LD APP MONTROSE, CO
File number: K21JK-D KAT 11.6kW
Facility ID: 168357
Station data: User record
Record ID: 2214
Country: U.S.

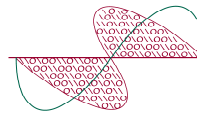
Build options:
Protect pre-transition records not on baseline channel

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	K19CE	N19z	TX	LIC	MONTROSE, CO	BLTT20040602ABQ	49.3 km
No	KSZG-LD	D20	LD	LIC	ASPEN, CO	BLDTL20091027AAO	153.8
No	K48NK-D	D20	LD	APP	CORTEZ, ETC, CO	BLANK0000054231	105.7
No	KRMU	D20	DT	LIC	DURANGO, CO	BLDDT20041012AIM	120.0
No	KJCT-LP	D20	LD	LIC	GRAND JUNCTION, CO	BLDTL20150129AAO	81.6
No	K20JW-D	D20	LD	CP	JACKS CABIN, CO	BPDTT20150123AHB	129.1
No	K20JW-D	D20	LD	LIC	JACKS CABIN, CO	BLDTT20091125AFK	129.1
No	K49AH-D	D20	LD	APP	SILT, CO	BLANK0000054123	142.5
No	K10PB-D	D20	LD	CP	MONTEZUMA CRK/ANETH, UT	BLANK0000054271	151.1
No	K49ET-D	D21	LD	APP	MANY FARMS, AZ	BLANK0000053898	220.6
No	K21HF-D	D21	LD	LIC	ASPEN, CO	BLDTT20121119AHA	155.9
No	K46FM-D	D21	LD	APP	BAYFIELD, CO	BLANK0000053897	140.7
No	K21LC-D	D21	LD	LIC	CORTEZ, CO	BLDTT20140102ATL	107.4
No	KDEO-LD	D21	LD	CP	DENVER, CO	BLANK0000049532	300.8
Yes	K21GT-D	D21	LD	CP	DOVE CREEK, ETC, CO	BPDTT20130318AFP	120.4
Yes	K21GT-D	D21	LD	LIC	DOVE CREEK, ETC, CO	BLDTT20120615ABE	87.4
No	KFCT	D21	DT	LIC	FORT COLLINS, CO	BLCDT20070920ACM	388.9
Yes	K21EF-D	D21	LD	LIC	PITKIN, CO	BLDTT20101129AMG	149.7
No	KGHB-CD	D21z	DC	CP	PUEBLO, ETC., CO	BLANK0000034455	317.7
No	KYNM-CD	D21	DC	LIC	ALBUQUERQUE, NM	BLANK0000001606	378.3
No	K46KV-D	D21	LD	CP	FARMINGTON, NM	BLANK0000052018	180.0
No	K21FD-D	D21	LD	LIC	TAOS, ETC., NM	BLDTT20091113ABQ	317.4
No	K34GN-D	D21	LD	CP	BICKNELL & TEASDALE, UT	BLANK0000052685	288.4
No	K21KC-D	D21	LD	LIC	BLUFF, ETC, UT	BLDTT20140520AIH	166.0
No	K21JY-D	D21	LD	LIC	BOULDER, UT	BLDTT20100806AAB	284.9
No	K21IB-D	D21	LD	LIC	CIRCLEVILLE, UT	BLDTT20110823ACN	351.8
No	K21HZ-D	D21	LD	LIC	EMERY, UT	BLDTT20080125ABR	268.2
No	K21IQ-D	D21	LD	LIC	ESCALANTE, UT	BLDTT20110425ACL	302.4
No	K21JW-D	D21	LD	LIC	FERRON, UT	BLDTT20100107ABS	269.3
No	K21KM-D	D21	LD	LIC	FISHLAKE RESORT, UT	BLDTT20100803AAY	309.2
No	K21ID-D	D21	LD	LIC	FREMONT, UT	BLDTT20090203AAI	299.0
No	K47AB-D	D21	LD	CP	GARFIELD, ETC., UT	BLANK0000053210	327.2
No	K21JV-D	D21	LD	LIC	GREEN RIVER, UT	BLDTT20100107ABN	186.8
No	K21IF-D	D21	LD	LIC	HANKSVILLE, UT	BLDTT20091104AAD	217.6
No	K21KI-D	D21	LD	LIC	HATCH, UT	BLDTT20120827AAJ	371.9
No	K21DY-D	D21	LD	LIC	HEBER CITY, UT	BLDTT20110331ADX	375.7
No	K46JB-D	D21	LD	CP	HENRIEVILLE, UT	BLANK0000053002	342.6
No	K21JX-D	D21	LD	LIC	HUNTINGTON, UT	BLDTT20100107ABL	265.7
No	K45FV-D	D21	LD	CP	KOOSHAREM, UT	BLANK0000053297	315.7
No	K40KN-D	D21	LD	CP	MAYFIELD, UT	BLANK0000053346	317.3
No	K21IW-D	D21	LD	LIC	MEXICAN HAT, UT	BLDTT20091222AMC	194.8
Yes	K21IX-D	D21	LD	LIC	MONTEZUMA CRK/ANETH, UT	BLDTT20091222AMD	151.1
No	K21IC-D	D21	LD	LIC	MOUNT PLEASANT, UT	BLDTT20080722ABE	307.1
No	K21FT-D	D21	LD	LIC	MYTON, UT	BLDTT20120113ABA	318.1
No	K21IU-D	D21	LD	LIC	NAVAJO MTN.SCH.,ETC., UT	BLDTT20091222AMA	267.4
No	K21JZ-D	D21	LD	LIC	NEPHI, UT	BLDTT20110722AAD	359.2
No	K21IV-D	D21	LD	LIC	OLJETO, UT	BLDTT20091222AMB	234.6
No	K48KK-D	D21	LD	APP	ORANGEVILLE, UT	BLANK0000053572	273.3
No	K45LF-D	D21	LD	CP	PANGUITCH, UT	BLANK0000053050	376.2

Table 1 K21JK-D OET Bulletin 69 Interference Study
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No	K21EZ-D	D21	LD	LIC	PRICE, UT	BLDTT20111006ACV	289.0
No	K44DU-D	D21	LD	CP	RICHFIELD, ETC., UT	BLANK0000053319	337.3
No	K43MZ-D	D21	LD	CP	RURAL SEVIER COUNTY, UT	BLANK0000053278	312.5
No	K21FL-D	D21	LD	LIC	SALINA & REDMOND, UT	BLDTT20080826ADD	325.0
No	K25JK-D	D21	LD	APP	SCIPPIO, HOLDEN, UT	BLANK0000053600	355.3
No	K21II-D	D21	LD	LIC	TROPIC, ETC., UT	BLDTT20100607ADN	345.7
No	NEW	D22	LD	APP	ASPEN, CO	BNPDTL20090825BXF	155.9
No	K22LR-D	D22	LD	LIC	COLLBRAN, CO	BLDTT20141217ABM	105.1
No	K22CU-D	D22	LD	LIC	CORTEZ, ETC, CO	BLDTT20090522ACH	105.7
No	K22JN-D	D22	LD	LIC	GRAND JUNCTION, CO	BLDTL20121205ABT	95.8
No	K22JM-D	D22	LD	LIC	GUNNISON, CO	BLDTL20121119AOW	115.7
No	K22LF-D	D22	LD	CP	AZTEC, NM	BDCCDTT20120521ACI	169.0
No	K38DA-D	D22	LD	APP	AZTEC, NM	BLANK0000053883	169.0
No	K48AW-D	D22	LD	APP	SHIPROCK, NM	BLANK0000053892	173.4
No	K25FZ	N25+	TX	LIC	GRAND JUNCTION, CO	BLTT19990706JH	95.8

No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

Channel: D21
Mask: Full Service
Latitude: 38 18 55.00 N (NAD83)
Longitude: 108 12 17.40 W
Height AMSL: 3101.0 m
HAAT: 0.0 m
Peak ERP: 11.6 kW
Antenna: KAT 4x2 75010455 20180518 Ch-21 0.0 deg
Elev Pattn: Generic
Elec Tilt: 1.20

49.5 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	0.582 kW	605.5 m	49.1 km
45.0	9.91	566.6	66.0
90.0	5.90	348.7	54.9
135.0	0.116	476.4	36.2
180.0	1.65	732.4	58.1
225.0	11.5	783.2	72.2
270.0	3.25	573.1	59.1
315.0	0.034	212.5	21.0

Database HAAT does not agree with computed HAAT

Database HAAT: 0 m Computed HAAT: 537 m

Distance to Canadian border: 1187.6 km

Distance to Mexican border: 726.0 km

Conditions at FCC monitoring station: Douglas AZ

Bearing: 190.3 degrees Distance: 768.8 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:

Bearing: 50.8 degrees Distance: 323.6 km

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%

Table 1 K21JK-D OET Bulletin 69 Interference Study
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Interference to BPDTT20130318AFP CP scenario 1

**IX: 18.85% interference caused

(Note: BPDTT-20130318AFP expired on 04/03/2016 and does not require protection)

	Call	Chan	Svc	Status	City, State	File Number	Distance				
Desired:	K21GT-D	D21	LD	CP	DOVE CREEK, ETC, CO	BPDTT20130318AFP					
Undesireds:	K21JK-D	D21	LD	APP	MONTROSE, CO	K21JK-D KAT 11.6kW	120.4 km				
	K21LC-D	D21	LD	LIC	CORTEZ, CO	BLDTT20140102ATL	124.9				
	K21KC-D	D21	LD	LIC	BLUFF, ETC, UT	BLDTT20140520AIH	61.6				
Service area		Terrain-limited			IX-free, before	IX-free, after	Percent New IX				
1586.7	2,681	1514.7	2,642		1490.4	2,636	1315.4	2,139	11.74	18.85	
Undesired				Total IX		Unique IX, before		Unique IX, after			
K21JK-D	D21	LD	APP	184.1		497		175.0		497	
K21LC-D	D21	LD	LIC	24.3		6		13.2		6	
K21KC-D	D21	LD	LIC	3.0		0		0.0		0	

Interference to BLDTT20120615ABE LIC scenario 1

Desired:	Call K21GT-D	Chan D21	Svc LD	Status LIC	City, State DOVE CREEK, ETC, CO	File Number BLDTT20120615ABE	Distance			
Undesireds:	K21JK-D	D21	LD	APP	MONTROSE, CO	K21JK-D KAT 11.6kW	87.4 km			
	K21LC-D	D21	LD	LIC	CORTEZ, CO	BLDTT20140102ATL	82.3			
	K22CU-D	D22	LD	LIC	CORTEZ, ETC, CO	BLDTT20090522ACH	80.4			
Service area		Terrain-limited			IX-free, before	IX-free, after	Percent New IX			
1442.5	2,202	1304.4	2,154		1244.6	2,138	1237.5	2,138	0.57	0.00
Undesired				Total IX		Unique IX, before		Unique IX, after		
K21JK-D	D21	LD	APP	37.5		0		7.1		0
K21LC-D	D21	LD	LIC	58.8		16		52.8		16
K22CU-D	D22	LD	LIC	7.1		0		1.0		0
								0.0		0

Interference to BLDTT20101129AMG LIC scenario 1

Desired:	Call K21EF-D	Chan D21	Svc LD	Status LIC	City, State PITKIN, CO	File Number BLDTT20101129AMG	Distance		
Undesireds:	K21JK-D	D21	LD	APP	MONTROSE, CO	K21JK-D KAT 11.6kW	149.7 km		
	K20JW-D	D20	LD	CP	JACKS CABIN, CO	BPDTT20150123AHB	27.4		
	K21GT-D	D21	LD	CP	DOVE CREEK, ETC, CO	BPDTT20130318AFP	268.0		
	Service area		Terrain-limited		IX-free, before		IX-free, after	Percent New IX	
	313.4	186	269.4	182	269.4	182	265.3	182	1.49 0.00
Undesired				Total IX	Unique IX, before		Unique IX, after		
K21JK-D	D21	LD	APP	4.0	0		4.0	0	

Interference to BLDTT20091222AMD LIC scenario 1

Desired:	Call K21IX-D	Chan D21	Svc LD	Status LIC	City, State MONTEZUMA CRK/ANETH, UT	File Number BLDTT20091222AMD	Distance
Undesireds:	K21JK-D	D21	LD	APP	MONTROSE, CO	K21JK-D KAT 11.6kW	151.1 km
	K21GT-D	D21	LD	CP	DOVE CREEK, ETC, CO	BPDTT20130318AFP	62.8
	K21KC-D	D21	LD	LIC	BLUFF, ETC, UT	BLDTT20140520AIH	23.4
Service area		Terrain-limited		IX-free, before		IX-free, after	Percent New IX
43.8	263	40.8	158	37.8	146	37.8 146	0.00 0.00
Undesired				Total IX	Unique IX, before		Unique IX, after
K21JK-D	D21	LD	APP	1.0	0	0.0	0
K21GT-D	D21	LD	CP	1.0	0	0.0	0
K21KC-D	D21	LD	LIC	2.0	12	2.0 12	

Table 1 K21JK-D OET Bulletin 69 Interference Study
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Interference to BLDTT20091222AMD LIC scenario 2

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	K21IX-D	D21	LD	LIC	MONTEZUMA CRK/ANETH, UT	BLDTT20091222AMD	
Undesireds:	K21JK-D	D21	LD	APP	MONTROSE, CO	K21JK-D KAT 11.6kW	151.1 km
	K21GT-D	D21	LD	LIC	DOVE CREEK, ETC, CO	BLDTT20120615ABE	64.9
	K21KC-D	D21	LD	LIC	BLUFF, ETC, UT	BLDTT20140520AIH	23.4
Service area		Terrain-limited		IX-free, before		IX-free, after	Percent New IX
43.8 263		40.8 158		36.8 146		36.8 146	0.00 0.00
Undesired		Total IX		Unique IX, before		Unique IX, after	
K21JK-D D21 LD APP		1.0 0				0.0 0	
K21GT-D D21 LD LIC		2.0 0		2.0 0		1.0 0	
K21KC-D D21 LD LIC		2.0 12		2.0 12		2.0 12	

Interference to proposal scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	K21JK-D	D21	LD	APP	MONTROSE, CO	K21JK-D KAT 11.6kW	
Undesireds:	KJCT-LP	D20	LD	LIC	GRAND JUNCTION, CO	BLDTL20150129AAO	81.6 km
	K20JW-D	D20	LD	CP	JACKS CABIN, CO	BPDTT20150123AHE	129.1
	K21GT-D	D21	LD	CP	DOVE CREEK, ETC, CO	BPDTT20130318AFP	120.4
Service area		Terrain-limited		IX-free		Percent IX	
9162.5 59,593		7541.3 58,197		7456.9 58,187		1.12 0.02	
Undesired		Total IX		Unique IX		Prcnt Unique IX	
KJCT-LP D20 LD LIC		59.2 10		58.2 10		0.77 0.02	
K21GT-D D21 LD CP		26.2 0		25.2 0		0.33 0.00	

Interference to proposal scenario 2

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	K21JK-D	D21	LD	APP	MONTROSE, CO	K21JK-D KAT 11.6kW	
Undesireds:	KJCT-LP	D20	LD	LIC	GRAND JUNCTION, CO	BLDTL20150129AAO	81.6 km
	K20JW-D	D20	LD	CP	JACKS CABIN, CO	BPDTT20150123AHE	129.1
Service area		Terrain-limited		IX-free		Percent IX	
9162.5 59,593		7541.3 58,197		7482.1 58,187		0.79 0.02	
Undesired		Total IX		Unique IX		Prcnt Unique IX	
KJCT-LP D20 LD LIC		59.2 10		59.2 10		0.79 0.02	

Channel and Facility Information

Section	Question	Response
Proposed Community of License	Facility ID	168357
	State	Colorado
	City	MONTROSE
	LPD Channel	21

Antenna Location Data

Section	Question	Response
Antenna Structure Registration	Do you have an FCC Antenna Structure Registration (ASR) Number?	No
	ASR Number	
Coordinates (NAD83)	Latitude	38° 18' 55.0" N+
	Longitude	108° 12' 17.4" W-
	Structure Type	LTOWER-Lattice Tower
	Overall Structure Height	60 meters
	Support Structure Height	60 meters
	Ground Elevation (AMSL)	3045 meters
Antenna Data	Height of Radiation Center Above Ground Level	56 meters
	Height of Radiation Center Above Mean Sea Level	3101 meters
	Effective Radiated Power	11.6 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:	KAT
	Model	4x2 750 10455
	Rotation	0 degrees
	Electrical Beam Tilt	1.2
	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:	Full Service

Directional Antenna Relative Field Values (Pre-rotated Pattern)

Degree	V _A (Authorized Value)	Degree	V _A (Authorized Value)	Degree	V _A (Authorized Value)	Degree	V _A (Authorized Value)
0	0.224	90	0.713	180	0.377	270	0.529
10	0.401	100	0.513	190	0.553	280	0.359
20	0.598	110	0.300	200	0.763	290	0.168
30	0.755	120	0.200	210	0.910	300	0.111
40	0.882	130	0.137	220	0.985	310	0.089
50	0.967	140	0.063	230	0.997	320	0.020
60	0.985	150	0.016	240	0.938	330	0.052
70	0.936	160	0.162	250	0.817	340	0.103
80	0.846	170	0.290	260	0.671	350	0.157

Additional Azimuths

Degree	V _A
57	0.987
227	1.000