

## **ENGINEERING EXHIBIT**

### **Application for Minor Modification of Digital Low Power Television Station Construction Permit**

prepared for

#### **Gray Television Licensee, LLC**

KKTM-LD Altus, OK

Facility ID 130241

Ch. 21 2.1 kW Directional

*Gray Television Licensee, LLC* (“*Gray*”) is the licensee of analog television translator station KKTM-LP, Channel 17, Altus OK, Facility ID 130241 (file# BLTTL-20041001AFP). As a result of the Special Displacement Window,<sup>1</sup> a Construction Permit (“CP” file# 0000054101) authorizes KKTM-LP to operate on Channel 21 as KKTM-LD at 15 kW effective radiated power (“ERP”) and a nondirectional antenna. *Gray* herein seeks a minor modification of the CP to specify a different transmitting location, reduced ERP, and a directional antenna for the Channel 21 displacement facility.

The proposed facility will employ a new antenna system to be side-mounted on an existing water tank structure, located 0.8 km (0.5 mile) from the site associated with the licensed Channel 17 and authorized Channel 21 facilities. No change to the overall structure height is proposed. Pursuant to §17.7(e)(3), FAA notification and Antenna Structure Registration<sup>2</sup> are not required as the proposed antenna will not extend above the top of the existing water tank structure.

The proposed antenna is a Kathrein model 750 10325 2x1x2. The horizontally ERP is 2.1 kW and the vertically polarized ERP is 0.82 kW 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 coverage contour of the proposed facility as well as those of the licensed Channel 17 and authorized Channel 21 facilities, demonstrating compliance with §73.3572 for a minor change.

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<sup>1</sup>“*Incentive Auction Task Force and Media Bureau Announce Post-Incentive Auction Special Displacement Window April 10, 2018, through May 15, 2018, and Make Location and Channel Data Available,*” Public Notice, DA 18-124, released February 9, 2018.

<sup>2</sup> See §17.4(a).

Interference study per OET Bulletin 69<sup>3</sup> shows that the proposal complies with the FCC's interference protection requirements toward all digital television, television translator, LPTV, 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.

### **Human Exposure to Radiofrequency Electromagnetic Field (Environmental)**

The proposed facility 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 25 percent antenna relative field in downward elevations (pattern data shows 25 percent or less relative field at angles 35 to 90 degrees below the antenna), the calculated power density attributable to the proposed facility at locations near the transmitter site at a height of two meters above ground level is  $3.7 \mu\text{W}/\text{cm}^2$ , which is 1.1 percent of the general population / uncontrolled maximum permissible 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.

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, water tank, 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.

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<sup>3</sup>FCC 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 TVStudy show excellent correlation.

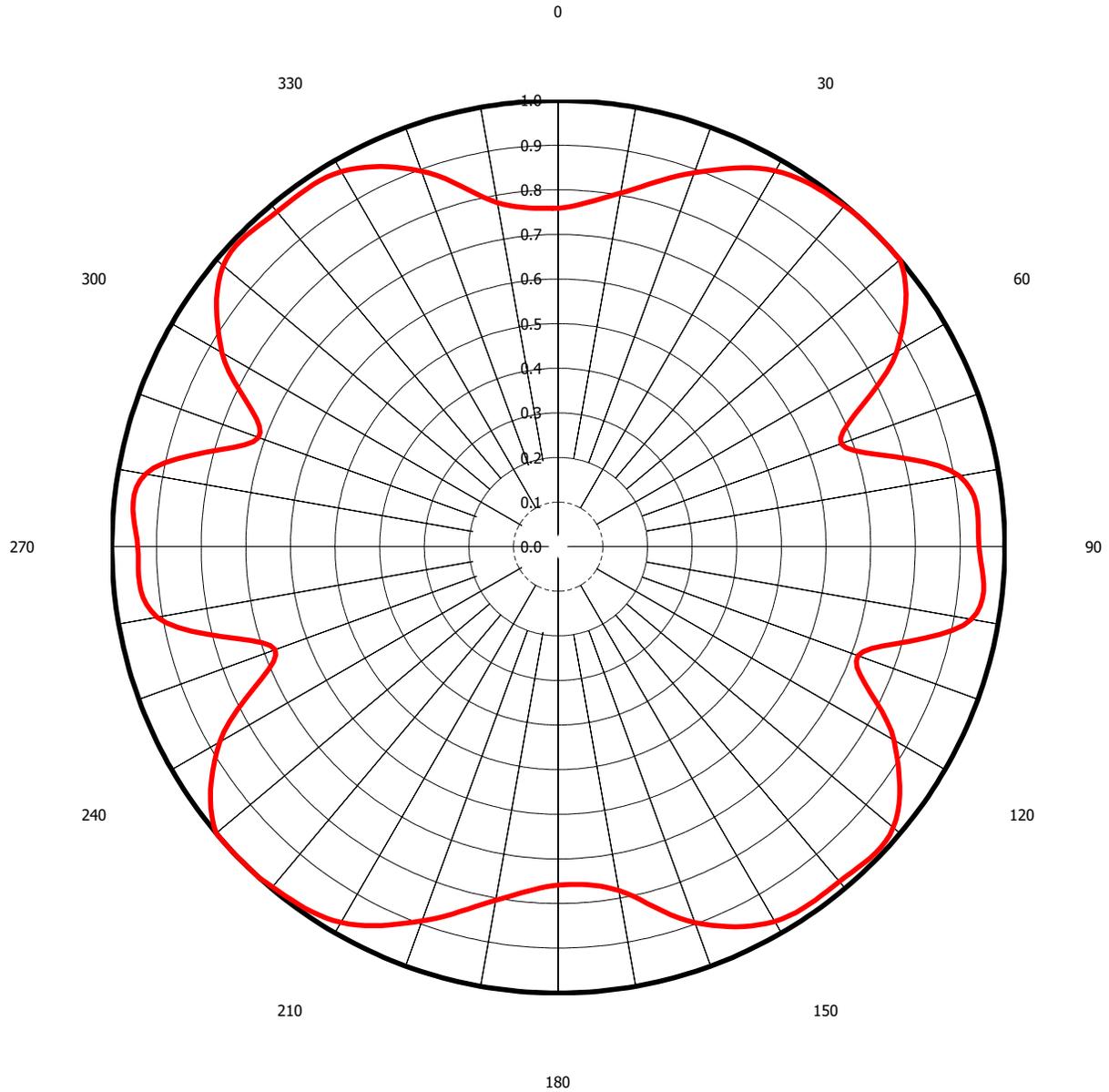
List of Attachments

- 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.      September 24, 2021  
207 Old Dominion Road      Yorktown, VA 23692      703-650-9600

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



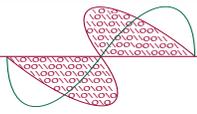
**Figure 1**  
**Antenna Azimuthal Pattern**  
**KKTM-LD Altus, OK**  
**Facility ID 130241**  
**Ch. 21 2.1 kW Directional**

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prepared for  
**Gray Television Licensee, LLC**

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September, 2021

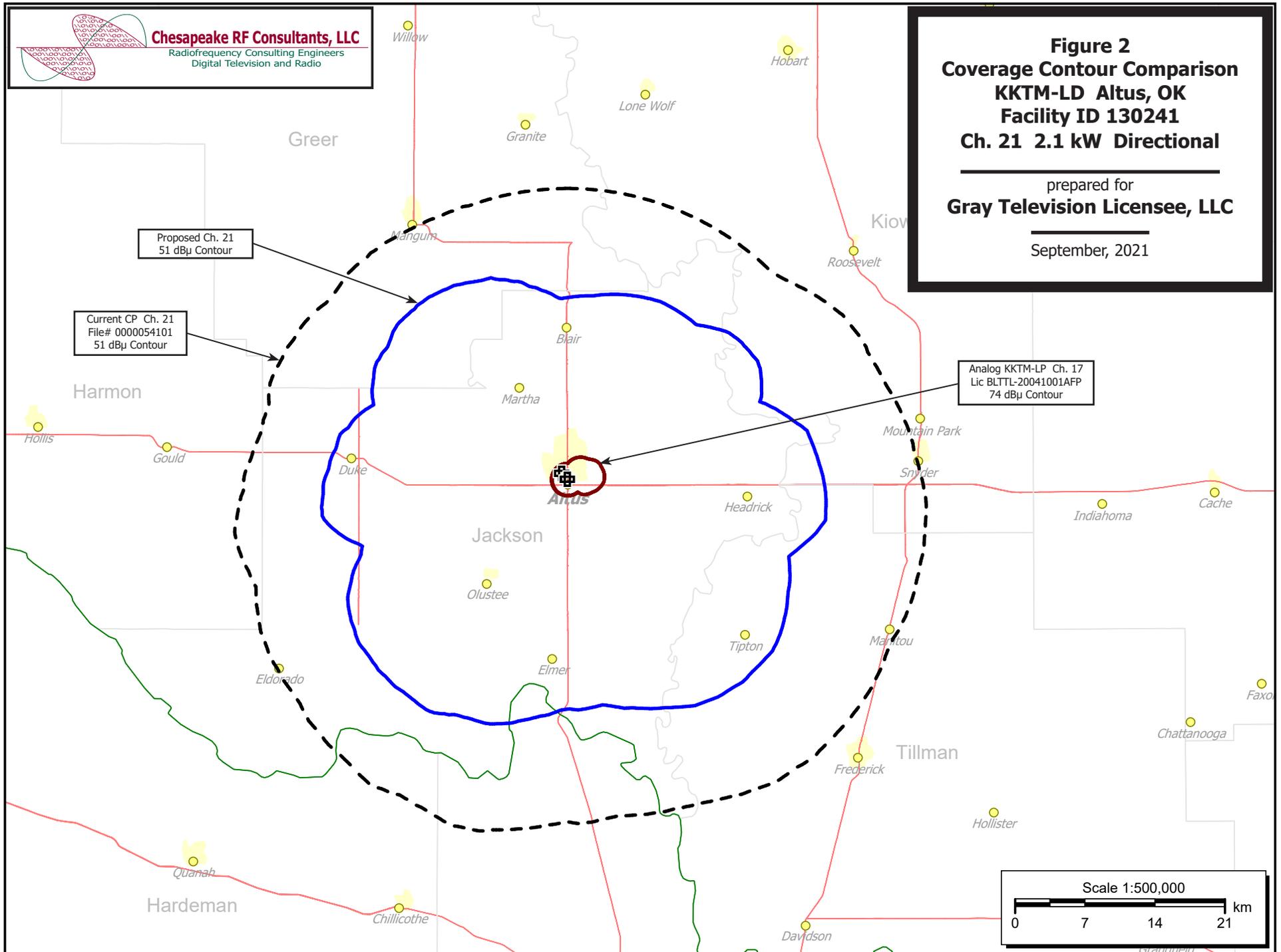


**Chesapeake RF Consultants, LLC**  
Radiofrequency Consulting Engineers  
Digital Television and Radio

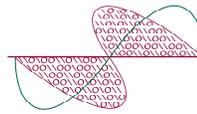
**Figure 2**  
**Coverage Contour Comparison**  
**KKTM-LD Altus, OK**  
**Facility ID 130241**  
**Ch. 21 2.1 kW Directional**

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September, 2021



**Table 1 KKTM-LD TVStudy Analysis of Proposal**  
(page 1 of 3)



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

tvstudy v2.2.5 (4uoc83)

Database: localhost, Study: KKTM-LP 21-prop, Model: Longley-Rice  
Start: 2021.09.24 15:25:25

Study created: 2021.09.24 15:25:25

Study build station data: LMS TV 2021-09-23

Proposal: KKTM-LP D21 LD APP ALTUS, OK  
File number: KKTM-LP 21-prop  
Facility ID: 130241  
Station data: User record  
Record ID: 3887  
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	K47KI-D	D20	LD	LIC	DUNCAN, OK	BLANK0000072559	153.4 km
No	K25LQ-D	D20	LD	LIC	ELK CITY, OK	BLANK0000063621	79.0
No	K20JB-D	D20	LD	LIC	HOLLIS, OK	BLDPT20100802AZJ	44.1
No	KBZC-LD	D20	LD	LIC	Oklahoma city, OK	BLANK0000112197	198.6
No	KVII-TV	D20	DT	CP	AMARILLO, TX	BLANK0000150916	245.1
No	K20KS-D	D20	LD	CP	MCCLEAN, TX	BNPDTL20100406AC0	135.0
No	K39GH-D	D20	LD	CP	QUANAH, TX	BLANK0000053926	60.6
No	KTXS-TV	D20	DT	CP	SWEETWATER, TX	BLANK0000035779	258.4
No	KTXS-TV	D20	DT	LIC	SWEETWATER, TX	BLCDT20080815ABJ	258.4
No	K20DN-D	D20	DC	LIC	WICHITA FALLS, TX	BLANK0000001589	110.7
No	K20LC-D	D20	LD	CP	WICHITA FALLS, TX	BNPDTL20090825BQN	110.7
No	KHBS	D21	DT	LIC	FORT SMITH, AR	BLCDT20031121AMR	427.7
No	KDCK	D21	DT	LIC	DODGE CITY, KS	BLEDT20030423ABG	361.1
No	KAKE	D21	LD	LIC	WICHITA, KS	BLCDT20100308ABF	384.6
Yes	K21JN-D	D21	LD	LIC	ERICK, OK	BLDPT20100802AZU	65.5
No	K21PC-D	D21	LD	LIC	GERONIMO, OK	BLANK0000158410	88.1
Yes	K21MP-D	D21	LD	LIC	LAWTON, OK	BLANK0000055044	97.6
No	KUOT-CD	D21	DC	LIC	OKLAHOMA CITY, OK	BLANK0000069721	188.9
No	K21MT-D	D21	LD	LIC	SEILING, OK	BLANK0000058911	164.4
No	K21IT-D	D21	LD	LIC	WEATHERFORD, OK	BLDPT20100225ABG	108.8
No	KXAB-LP	D21+	LD	CP	ABILENE, TX	BLANK0000152023	247.7
No	KZFB-LP	D21z	LD	CP	Amarillo, TX	BLANK0000152110	215.3
Yes	K21IR-D	D21	LD	LIC	CHILDRESS, TX	BLDPT20100907ACP	85.3
No	KDTX-TV	D21	DT	LIC	DALLAS, TX	BLANK0000075181	317.0
No	KWDA-LD	D21	LD	LIC	DALLAS, TX	BLDPTL20110711AGT	313.2
No	K42CF-D	D21	LD	CP	GRUVER, TX	BLANK0000053124	256.4
No	KDKW-LD	D21	LD	CP	LUBBOCK, TX	BLANK0000058681	259.4
No	K21LA-D	D21	LD	CP	MCCLEAN, TX	BNPDTL20100406ACP	135.0
No	K21GU	D21z	LD	CP	MIDLAND, TX	BLANK0000071620	383.5
No	K21KJ-D	D21	LD	LIC	MINERAL WELLS, TX	BLDPTL20140612AAS	255.6
No	K21LV-D	D21	LD	LIC	PERRYTON, TX	BLDPT20120622ADI	210.3
No	KEUS-LD	D21	LD	LIC	SAN ANGELO, TX	BLANK0000107845	366.0
No	KANG-LD	D21	LD	LIC	SAN ANGELO, TX	BLANK0000107844	366.0
No	K21NW-D	D21	LD	LIC	TULIA, TX	BLANK0000076189	220.0
No	K22MA-D	D22	LD	LIC	ELK CITY, OK	BLANK0000058430	79.0
No	K47LS-D	D22	LD	LIC	HOLLIS, OK	BLANK0000058437	44.1
No	KTOU-LD	D22	LD	LIC	OKLAHOMA CITY, OK	BLANK0000150102	186.6
No	K39AN-D	D22	LD	CP	NEW MOBEETIE, TX	BLANK0000053931	150.0
No	K22JR-D	D22	LD	LIC	TURKEY, TX	BLDPT20101115FOB	165.3
No	KAUZ-TV	D22	DT	LIC	WICHITA FALLS, TX	BLCDT20090724ACR	110.9
No	DK25IC	N25+	TX	APP	LAWTON, OK	BLPTL20070212ACG	87.4

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

**Table 1 KKTM-LD TVStudy Analysis of Proposal**  
 (page 2 of 3)



Mask: Full Service  
 Latitude: 34 38 53.40 N (NAD83)  
 Longitude: 99 20 25.00 W  
 Height AMSL: 466.4 m  
 HAAT: 0.0 m  
 Peak ERP: 2.10 kW  
 Antenna: KAT 750 10325 2x1x2 0.0 deg  
 Elev Pattnr: Generic

49.5 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	1.21 kW	29.2 m	19.3 km
45.0	2.09	32.4	22.5
90.0	1.86	56.4	27.9
135.0	2.02	62.8	29.4
180.0	1.21	54.8	25.5
225.0	2.09	56.7	28.6
270.0	1.86	44.8	25.3
315.0	2.02	38.1	23.9

Database HAAT does not agree with computed HAAT  
 Database HAAT: 0 m Computed HAAT: 47 m

Distance to Canadian border: 1595.2 km

Distance to Mexican border: 575.5 km

Conditions at FCC monitoring station: Grand Island NE  
 Bearing: 6.3 degrees Distance: 702.0 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:  
 Bearing: 321.2 degrees Distance: 799.5 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%

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 Interference to BLDTT20100802AZU LIC scenario 1

Desired:	Call	Chan	Svc	Status	City, State	File Number	Distance
	K21JN-D	D21	LD	LIC	ERICK, OK	BLDTT20100802AZU	
Undesireds:	KKTM-LP	D21	LD	APP	ALTUS, OK	KKTM-LP 21-prop	65.5 km
	K25LQ-D	D20	LD	LIC	ELK CITY, OK	BLANK0000063621	46.4
	K20JB-D	D20	LD	LIC	HOLLIS, OK	BLDTT20100802AZJ	46.3
	K21IR-D	D21	LD	LIC	CHILDRESS, TX	BLDTT20100907ACP	92.3
	K21LA-D	D21	LD	CP	MCCLEAN, TX	BNPDTL20100406ACP	84.6
	K22MA-D	D22	LD	LIC	ELK CITY, OK	BLANK0000058430	46.4
	K47LS-D	D22	LD	LIC	HOLLIS, OK	BLANK0000058437	46.3

Service area	Terrain-limited	IX-free, before	IX-free, after	Percent New IX
3032.4	8,770	2989.5	8,759	2971.5
		2971.5	8,759	2947.5
				8,729
				0.81
				0.34

Undesired	Total IX	Unique IX, before	Unique IX, after
KKTM-LP D21 LD APP	33.0	30	24.0
K25LQ-D D20 LD LIC	2.0	0	0.0
K20JB-D D20 LD LIC	10.0	0	0.0
K21IR-D D21 LD LIC	2.0	0	0.0
K21LA-D D21 LD CP	5.0	0	4.0
K22MA-D D22 LD LIC	3.0	0	1.0
K47LS-D D22 LD LIC	10.0	0	0.0

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 Interference to BLANK0000055044 LIC scenario 1

**Table 1 KKTM-LD TVStudy Analysis of Proposal**  
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	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	K21MP-D	D21	LD	LIC	LAWTON, OK	BLANK0000055044	
Undesireds:	KKTM-LP	D21	LD	APP	ALTUS, OK	KKTM-LP 21-prop	97.6 km
	K47KI-D	D20	LD	LIC	DUNCAN, OK	BLANK0000072559	57.3
	K21JN-D	D21	LD	LIC	ERICK, OK	BLD TT20100802AZU	144.5
	K21PC-D	D21	LD	LIC	GERONIMO, OK	BLANK0000158410	21.5
	KUOT-CD	D21	DC	LIC	OKLAHOMA CITY, OK	BLANK0000069721	112.5
	K21IT-D	D21	LD	LIC	WEATHERFORD, OK	BLD TT20100225ABG	106.7
	KDTX-TV	D21	DT	LIC	DALLAS, TX	BLANK0000075181	254.7
	KAUZ-TV	D22	DT	LIC	WICHITA FALLS, TX	BLCDT20090724ACR	82.2

Service area	Terrain-limited	IX-free, before	IX-free, after	Percent New IX
7052.9	182,345	6894.7	180,459	0.09

Undesired	Total IX	Unique IX, before	Unique IX, after
KKTM-LP D21 LD APP	11.0	0	6.0
K47KI-D D20 LD LIC	155.9	714	117.7
K21JN-D D21 LD LIC	6.0	0	2.0
K21PC-D D21 LD LIC	101.5	240	62.3
KUOT-CD D21 DC LIC	144.2	614	115.1
K21IT-D D21 LD LIC	52.0	69	30.0
KDTX-TV D21 DT LIC	23.1	5	5.0
KAUZ-TV D22 DT LIC	4.0	0	4.0

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Interference to BLD TT20100907ACP LIC scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	K21IR-D	D21	LD	LIC	CHILDRRESS, TX	BLD TT20100907ACP	
Undesireds:	KKTM-LP	D21	LD	APP	ALTUS, OK	KKTM-LP 21-prop	85.3 km
	KZFB-LP	D21z	LD	CP	Amarillo, TX	BLANK0000152110	153.3
	K21GU	D21z	LD	CP	MIDLAND, TX	BLANK0000071620	314.6

Service area	Terrain-limited	IX-free, before	IX-free, after	Percent New IX
2325.6	7,241	2315.5	7,241	0.09

Undesired	Total IX	Unique IX, before	Unique IX, after
KKTM-LP D21 LD APP	2.0	0	2.0
KZFB-LP D21z LD CP	1.0	0	1.0

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Interference to proposal scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	KKTM-LP	D21	LD	APP	ALTUS, OK	KKTM-LP 21-prop	
Undesireds:	K21JN-D	D21	LD	LIC	ERICK, OK	BLD TT20100802AZU	65.5 km
	K21MP-D	D21	LD	LIC	LAWTON, OK	BLANK0000055044	97.6

Service area	Terrain-limited	IX-free	Percent IX
2008.4	26,983	1987.3	0.04

Undesired	Total IX	Unique IX	Prct Unique IX
K21JN-D D21 LD LIC	6.0	4	0.30
K21MP-D D21 LD LIC	12.0	6	0.60

**Channel and Facility Information**

Section	Question	Response
Facility ID	130241	
State	Oklahoma	
City	ALTUS	
LPD Channel	21	

**Primary station proposed to be rebroadcast:**

Facility Id	Call Sign	City	State
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**Antenna Location  
Data**

Section	Question	Response
<b>Antenna Structure Registration</b>	Do you have an FCC Antenna Structure Registration (ASR) Number?	No
	ASR Number	
<b>Coordinates (NAD83)</b>	Latitude	34° 38' 53.4" N+
	Longitude	099° 20' 25.0" W-
	Structure Type	TANK-Any type of tank, water, gas, etc.
	Overall Structure Height	45.7 meters
	Support Structure Height	45.7 meters
	Ground Elevation (AMSL)	429.8 meters
<b>Antenna Data</b>	Height of Radiation Center Above Ground Level	36.6 meters
	Height of Radiation Center Above Mean Sea Level	466.4 meters
	Effective Radiated Power	2.1 kW

**Antenna  
Technical Data**

Section	Question	Response
<b>Antenna Type</b>	Antenna Type	Directional Custom
	Do you have an Antenna ID?	No
	Antenna ID	
<b>Antenna Manufacturer and Model</b>	Manufacturer:	KAT
	Model	750 10325 2x1x2
	Rotation	0 degrees
	Electrical Beam Tilt	Not Applicable
	Mechanical Beam Tilt	Not Applicable
	toward azimuth	
	Polarization	Elliptical
<b>Elevation Radiation Pattern</b>	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	Value	Degree	Value	Degree	Value	Degree	Value
0	0.759	90	0.942	180	0.759	270	0.942
10	0.805	100	0.939	190	0.805	280	0.939
20	0.892	110	0.715	200	0.893	290	0.715
30	0.973	120	0.869	210	0.973	300	0.870
40	0.997	130	0.980	220	0.996	310	0.980
50	1.000	140	0.980	230	1.000	320	0.980
60	0.876	150	0.970	240	0.876	330	0.971
70	0.675	160	0.897	250	0.675	340	0.896
80	0.912	170	0.783	260	0.912	350	0.783

**Additional Azimuths**

Degree	V <sub>A</sub>
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