

ENGINEERING EXHIBIT

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

Gray Television Licensee, LLC
KJNM-LD Cassville, MO
Facility ID 184462
Ch. 20 15 kW Nondirectional

Gray Television Licensee, LLC (“Gray”) is the licensee of digital Low Power Television station KJNM-LD, Channel 20, Facility ID 184462, Cassville, MO. KJNM-LD is licensed to operate at 12 kW effective radiated power (“ERP”) with a nondirectional antenna (file# 0000244680). *Gray* herein seeks a minor modification Construction Permit to increase KJNM-LD’s ERP.

The proposed facility will continue to employ the licensed antenna which is side-mounted on the tower structure associated with FCC Antenna Structure Registration number 1004009. No change in site location, antenna height, or overall structure height is proposed.

The KJNM-LD antenna is a Dielectric model DLP-12B/VP having elliptical polarization. The proposed ERP is 15 kW horizontally polarized and 4.5 kW vertically polarized using a “full service” out of channel emission mask.

Figure 1 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. Since the proposed 51 dBμ contour encompasses that of the licensed facility, no service loss area will be created. The population within the 51 dBμ contour increases to 150,817 persons (2010 census), which is a 9.4 percent increase beyond the 137,875 persons within the licensed KJNM-LD facility’s 51 dBμ contour.

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 Class A stations. FCC processing of this proposal is requested using a 1.0 km cell size and 0.2 km terrain profile increment. 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 20 percent antenna relative field in downward elevations (pattern data shows 20 percent or less relative field at angles 10 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, 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.

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 0.2 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.

Engineering Exhibit
Gray Television Licensee, LLC (KJNM-LD)
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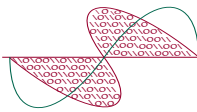


List of Attachments

Figure 1	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.	May 17, 2024	
207 Old Dominion Road	Yorktown, VA 23692	703-650-9600



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

Figure 1
Coverage Contour Comparison
KJNM-LD Cassville, MO
Facility ID 184462
Ch. 20 15 kW Nondirectional

prepared for
Gray Television Licensee, LLC

January, 2024

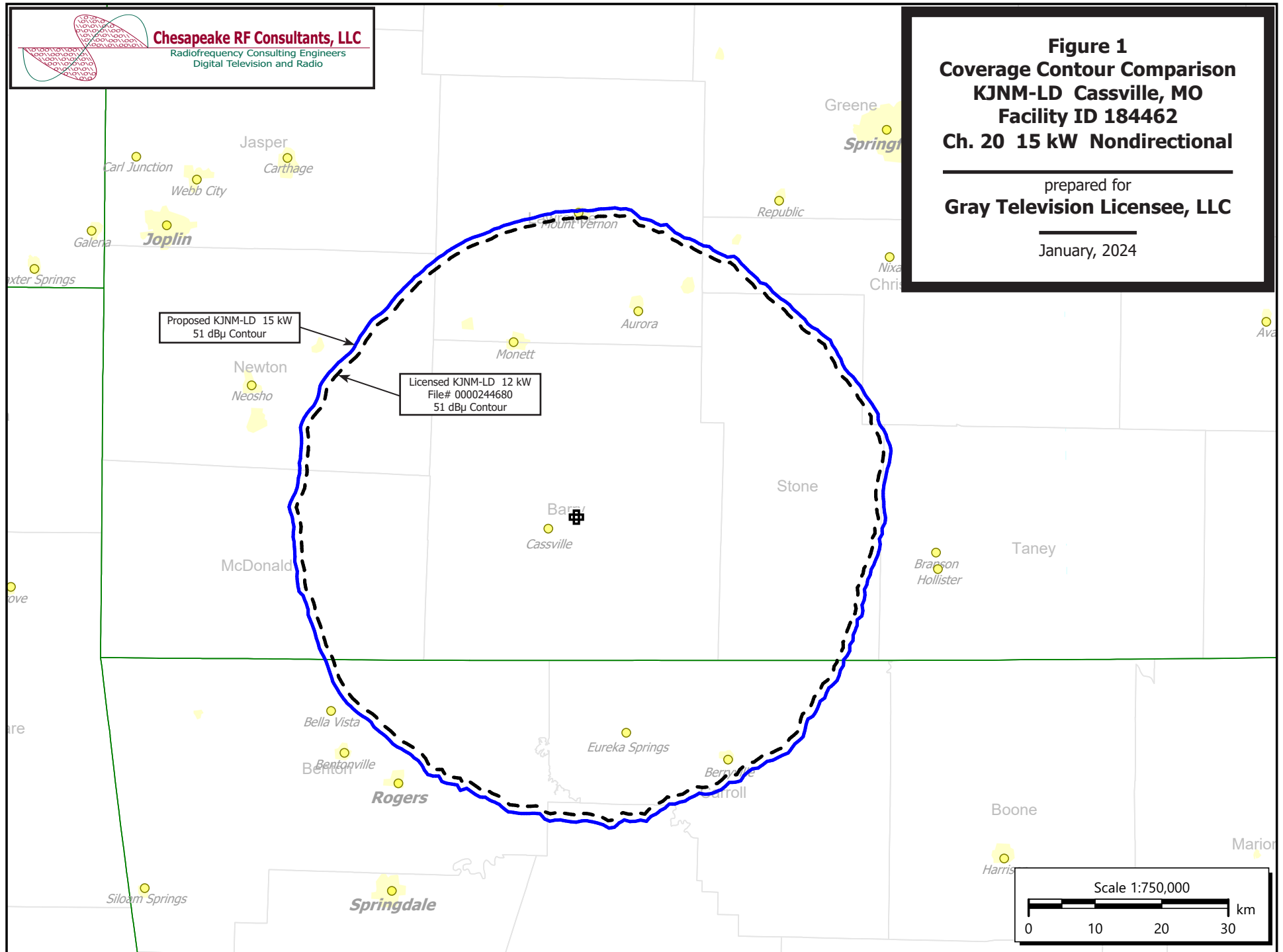


Table 1 KJNM-LD TVStudy Analysis of Proposal (page 1 of 4)



tvstudy v2.2.5 (4uoc83)
Database: localhost, Study: KJNM-LD prop 15kW_1.0-0.2, Model: Longley-Rice
Start: 2024.05.17 15:21:02

Study created: 2024.05.17 15:21:02

Study build station data: LMS TV 2024-05-16

Proposal: KJNM-LD D20 LD APP Cassville, MO
File number: KJNM-LD prop 15kW
Facility ID: 184462
Station data: User record
Record ID: 401
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	KUFS-LD	D19	LD	LIC	FORT SMITH, AR	BLANK0000220257	196.3 km
Yes	KYTV	D19	DT	LIC	SPRINGFIELD, MO	BLANK0000172336	94.8
No	KHEF-LD	D20	LD	LIC	FORT SMITH, AR	BLANK0000217458	146.7
No	KTEJ	D20	DT	LIC	JONESBORO, AR	BLEDT20110818AAQ	287.0
No	KLRA-CD	D20	DC	LIC	LITTLE ROCK, AR	BLANK0000004217	242.0
No	KTMJ-CD	D20	DC	LIC	TOPEKA, KS	BLANK0000122285	318.0
No	KFDR	D20	DT	LIC	JEFFERSON CITY, MO	BLCDT20110121ACA	270.6
No	KEFN-CD	D20z	DC	LIC	ST. LOUIS, MO	BLANK0000146089	385.2
No	W20DW-D	D20	LD	LIC	CLARKSDALE, MS	BLANK0000199038	374.8
No	K20OH-D	D20	LD	CP	ARDMORE, OK	BLANK0000168880	399.6
Yes	KQCW-DT	D20	DT	CP	MUSKOGEE, OK	BLANK0000211781	182.0
Yes	KQCW-DT	D20	DT	LIC	MUSKOGEE, OK	BMLCDT20130823ACR	206.2
No	KBZC-LD	D20	LD	LIC	OKLAHOMA CITY, OK	BLANK0000112197	351.0
No	KHBS	D21	DT	LIC	FORT SMITH, AR	BLCDT20031121AMR	196.1
No	K21JS-D	D21	LD	LIC	HARRISON, AR	BLANK0000194711	73.3
No	KGCS-LD	D21	LD	LIC	JOPLIN, MO	BLANK0000078095	80.6
No	KRFT-LD	D21	LD	LIC	SPRINGFIELD, MO	BLANK0000156037	77.2
No	KTAJ-TV	D21	DT	LIC	ST. JOSEPH, MO	BLCDT20060703AAK	266.0

No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

Channel: D20
Mask: Full Service
Latitude: 36 41 32.10 N (NAD83)
Longitude: 93 49 16.90 W
Height AMSL: 542.1 m
HAAT: 0.0 m
Peak ERP: 15.0 kW
Antenna: Omnidirectional
Elev Pattn: Generic
Elec Tilt: 1.00

49.4 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	15.0 kW	138.5 m	47.8 km
45.0	15.0	125.9	47.0
90.0	15.0	144.5	48.3
135.0	15.0	157.9	49.2
180.0	15.0	135.2	47.6
225.0	15.0	105.0	45.2
270.0	15.0	97.1	44.3
315.0	15.0	96.3	44.2

Database HAAT does not agree with computed HAAT
Database HAAT: 0 m Computed HAAT: 125 m

Table 1 KJNM-LD TVStudy Analysis of Proposal
(page 2 of 4)



Distance to Canadian border: 1087.9 km

Distance to Mexican border: 1042.5 km

Conditions at FCC monitoring station: Grand Island NE
Bearing: 321.1 degrees Distance: 616.5 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:
Bearing: 294.5 degrees Distance: 1062.8 km

No land mobile station failures found

Study cell size: 1.00 km
Profile point spacing: 0.20 km

Maximum new IX to full-service and Class A: 0.50%
Maximum new IX to LPTV: 2.00%

Interference to BLANK0000172336 LIC scenario 1

Desired:	Call KYTV	Chan D19	Svc DT	Status LIC	City, State SPRINGFIELD, MO	File Number BLANK0000172336	Distance				
Undesireds:	KJNM-LD	D20	LD	APP	Cassville, MO	KJNM-LD prop 15kW	94.8 km				
	KFSM-TV	D18	DT	CP	FORT SMITH, AR	BLANK0000216674	184.6				
	WGEM-TV	D19	DT	CP	QUINCY, IL	BLANK0000235415	341.1				
	WPSD-TV	D19	DT	LIC	PADUCAH, KY	BLANK0000116960	350.6				
	KFDR	D20	DT	LIC	JEFFERSON CITY, MO	BLCDT20110121ACA	185.8				
Service area		Terrain-limited			IX-free, before	IX-free, after	Percent New IX				
49985.5	1,095,450	49192.6	1,084,027		48861.4	1,077,769	48714.8	1,073,415	0.30	0.40	
Undesired				Total IX		Unique IX, before		Unique IX, after			
KJNM-LD	D20	LD	APP	147.6		4,354		146.5		4,354	
KFSM-TV	D18	DT	CP	8.1		95		7.0		95	
WGEM-TV	D19	DT	CP	112.0		2,685		83.7		2,424	
WPSD-TV	D19	DT	LIC	198.1		3,309		181.9		3,107	
KFDR	D20	DT	LIC	41.3		430		29.2		371	

Interference to BLANK0000172336 LIC scenario 2

Desired:	Call KYTV	Chan D19	Svc DT	Status LIC	City, State SPRINGFIELD, MO	File Number BLANK0000172336	Distance		
Undesireds:	KJNM-LD	D20	LD	APP	Cassville, MO	KJNM-LD prop 15kW	94.8 km		
	KFSM-TV	D18	DT	LIC	FORT SMITH, AR	BLCDT20060530AIM	184.6		
	WGEM-TV	D19	DT	CP	QUINCY, IL	BLANK0000235415	341.1		
	WPSD-TV	D19	DT	LIC	PADUCAH, KY	BLANK0000116960	350.6		
	KFDR	D20	DT	LIC	JEFFERSON CITY, MO	BLCDT20110121ACA	185.8		
Service area		Terrain-limited		IX-free, before		IX-free, after	Percent New IX		
49985.5	1,095,450	49192.6	1,084,027	48862.4	1,077,796	48715.9	1,073,442	0.30	0.40
Undesired				Total IX	Unique IX, before	Unique IX, after			
KJNM-LD	D20	LD	APP	147.6	4,354	146.5	4,354		
KFSM-TV	D18	DT	LIC	7.0	68	7.0	68	6.0	68
WGEM-TV	D19	DT	CP	112.0	2,685	83.7	2,424	83.7	2,424
WPSD-TV	D19	DT	LIC	198.1	3,309	181.9	3,107	181.9	3,107
KFDR	D20	DT	LIC	41.3	430	29.2	371	29.2	371

Interference to BLANK0000211781 CP scenario 1

Desired:	Call	Chan	Svc	Status	City, State	File Number	Distance
	KQCW-DT	D20	DT	CP	MUSKOGEE, OK	BLANK0000211781	

Table 1 KJNM-LD TVStudy Analysis of Proposal
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Undesireds:	KJNM-LD	D20	LD	APP	Cassville, MO	KJNM-LD prop 15kW	182.0 km
	KAUT-TV	D19	DT	LIC	OKLAHOMA CITY, OK	BLANK0000121785	171.0
	KHBS	D21	DT	LIC	FORT SMITH, AR	BLCDDT20031121AMR	138.8

Service area	Terrain-limited	IX-free, before	IX-free, after	Percent New IX
40145.4 1,393,181	39008.0 1,375,495	38189.8 1,363,610	38007.1 1,359,883	0.48 0.27

Undesired	Total IX	Unique IX, before	Unique IX, after
KJNM-LD D20 LD APP	194.6 3,748		182.7 3,727
KAUT-TV D19 DT LIC	163.5 2,500	163.5 2,500	162.5 2,500
KHBS D21 DT LIC	654.7 9,385	654.7 9,385	643.8 9,364

Interference to BLANK0000211781 CP scenario 2

Desired:	Call	Chan	Svc	Status	City, State	File Number	Distance
	KQCW-DT	D20	DT	CP	MUSKOGEE, OK	BLANK0000211781	
Undesireds:	KJNM-LD	D20	LD	APP	Cassville, MO	KJNM-LD prop 15kW	182.0 km
	KAUT-TV	D19	DT	CP	OKLAHOMA CITY, OK	BLANK0000127590	171.0
	KHBS	D21	DT	LIC	FORT SMITH, AR	BLCDDT20031121AMR	138.8

Service area	Terrain-limited	IX-free, before	IX-free, after	Percent New IX
40145.4 1,393,181	39008.0 1,375,495	38166.7 1,363,432	37984.1 1,359,705	0.48 0.27

Undesired	Total IX	Unique IX, before	Unique IX, after
KJNM-LD D20 LD APP	194.6 3,748		182.7 3,727
KAUT-TV D19 DT CP	186.6 2,678	186.6 2,678	185.5 2,678
KHBS D21 DT LIC	654.7 9,385	654.7 9,385	643.8 9,364

Interference to BLANK0000211781 CP scenario 3

Desired:	Call	Chan	Svc	Status	City, State	File Number	Distance
	KQCW-DT	D20	DT	CP	MUSKOGEE, OK	BLANK0000211781	
Undesireds:	KJNM-LD	D20	LD	APP	Cassville, MO	KJNM-LD prop 15kW	182.0 km
	KAUT-TV	D19	DT	LIC	OKLAHOMA CITY, OK	BLANK0000238925	171.0
	KHBS	D21	DT	LIC	FORT SMITH, AR	BLCDDT20031121AMR	138.8

Service area	Terrain-limited	IX-free, before	IX-free, after	Percent New IX
40145.4 1,393,181	39008.0 1,375,495	38189.8 1,363,610	38007.1 1,359,883	0.48 0.27

Undesired	Total IX	Unique IX, before	Unique IX, after
KJNM-LD D20 LD APP	194.6 3,748		182.7 3,727
KAUT-TV D19 DT LIC	163.5 2,500	163.5 2,500	162.5 2,500
KHBS D21 DT LIC	654.7 9,385	654.7 9,385	643.8 9,364

Interference to BMLCDDT20130823ACR LIC scenario 1

Desired:	Call	Chan	Svc	Status	City, State	File Number	Distance
	KQCW-DT	D20	DT	LIC	MUSKOGEE, OK	BMLCDDT20130823ACR	
Undesireds:	KJNM-LD	D20	LD	APP	Cassville, MO	KJNM-LD prop 15kW	206.2 km
	KAUT-TV	D19	DT	LIC	OKLAHOMA CITY, OK	BLANK0000121785	153.5
	KHBS	D21	DT	LIC	FORT SMITH, AR	BLCDDT20031121AMR	127.0

Service area	Terrain-limited	IX-free, before	IX-free, after	Percent New IX
23612.7 1,127,752	23108.2 1,123,658	22745.8 1,119,257	22740.8 1,118,811	0.02 0.04

Undesired	Total IX	Unique IX, before	Unique IX, after
KJNM-LD D20 LD APP	10.0 452		5.0 446
KAUT-TV D19 DT LIC	32.9 183	32.9 183	31.9 183
KHBS D21 DT LIC	329.5 4,218	329.5 4,218	325.5 4,212

Interference to BMLCDDT20130823ACR LIC scenario 2

Desired:	Call	Chan	Svc	Status	City, State	File Number	Distance
	KQCW-DT	D20	DT	LIC	MUSKOGEE, OK	BMLCDDT20130823ACR	
Undesireds:	KJNM-LD	D20	LD	APP	Cassville, MO	KJNM-LD prop 15kW	206.2 km

Table 1 KJNM-LD TVStudy Analysis of Proposal
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KAUT-TV	D19	DT	CP	OKLAHOMA CITY, OK	BLANK0000127590	153.5
KHBS	D21	DT	LIC	FORT SMITH, AR	BLCDT20031121AMR	127.0
Service area		Terrain-limited		IX-free, before		IX-free, after
23612.7	1,127,752	23108.2	1,123,658	22743.8	1,119,252	22738.8 1,118,806
						Percent New IX
						0.02 0.04
Undesired			Total IX	Unique IX, before		Unique IX, after
KJNM-LD D20 LD APP		10.0	452			5.0 446
KAUT-TV D19 DT CP		34.9	188	34.9 188		33.9 188
KHBS D21 DT LIC		329.5	4,218	329.5 4,218		325.5 4,212

Interference to BMLCDT20130823ACR LIC scenario 3

Desired:	Call KQCW-DT	Chan D20	Svc DT	Status LIC	City, State MUSKOGEE, OK	File Number BMLCDT20130823ACR	Distance
Undesireds:	KJNM-LD	D20	LD	APP	Cassville, MO	KJNM-LD prop 15kW	206.2 km
	KAUT-TV	D19	DT	LIC	OKLAHOMA CITY, OK	BLANK0000238925	153.5
	KHBS	D21	DT	LIC	FORT SMITH, AR	BLCDT20031121AMR	127.0
Service area		Terrain-limited		IX-free, before		IX-free, after	Percent New IX
23612.7	1,127,752	23108.2	1,123,658	22745.8	1,119,257	22740.8 1,118,811	0.02 0.04
Undesired				Total IX	Unique IX, before	Unique IX, after	
KJNM-LD	D20	LD	APP	10.0	452	5.0	446
KAUT-TV	D19	DT	LIC	32.9	183	31.9	183
KHBS	D21	DT	LIC	329.5	4,218	325.5	4,212

Interference to proposal scenario 1
6.25% interference received

Desired:	Call KJNM-LD	Chan D20	Svc LD	Status APP	City, State Cassville, MO	File Number KJNM-LD prop 15kW	Distance
Undesireds:	KYTV	D19	DT	LIC	SPRINGFIELD, MO	BLANK0000172336	94.8 km
	KTEJ	D20	DT	LIC	JONESBORO, AR	BLEDT20110818AAQ	287.0
	KFDR	D20	DT	LIC	JEFFERSON CITY, MO	BLCDT20110121ACA	270.6
	KQCW-DT	D20	DT	CP	MUSKOGEE, OK	BLANK0000211781	182.0
Service area		Terrain-limited			IX-free	Percent IX	
6820.9	166,003	6566.7	160,372		6293.1	150,356	4.17 6.25
Undesired				Total IX	Unique IX	Prcnt Unique IX	
KYTV	D19	DT	LIC	138.0	2,997	73.1	1,903 1.11 1.19
KTEJ	D20	DT	LIC	1.0	125	0.0	0 0.00 0.00
KFDR	D20	DT	LIC	10.0	271	3.0	109 0.05 0.07
KQCW-DT	D20	DT	CP	195.4	7,849	131.5	6,785 2.00 4.23

Interference to proposal scenario 2
4.12% interference received

	Call	Chan	Svc	Status	City, State	File Number	Distance	
Desired:	KJNM-LD	D20	LD	APP	Cassville, MO	KJNM-LD prop 15kW		
Undesireds:	KYTV	D19	DT	LIC	SPRINGFIELD, MO	BLANK0000172336	94.8 km	
	KTEJ	D20	DT	LIC	JONESBORO, AR	BLEDT20110818AAQ	287.0	
	KFDR	D20	DT	LIC	JEFFERSON CITY, MO	BLCDT20110121ACA	270.6	
	KQCW-DT	D20	DT	LIC	MUSKOGEE, OK	BMLCDT20130823ACR	206.2	
Service area		Terrain-limited			IX-free	Percent IX		
6820.9	166,003	6566.7	160,372		6373.4	153,757	2.94 4.12	
Undesired				Total IX	Unique IX	Prcnt Unique IX		
KYTV	D19	DT	LIC	138.0	2,997	118.0	2,564	1.80 1.60
KTEJ	D20	DT	LIC	1.0	125	0.0	0	0.00 0.00
KFDR	D20	DT	LIC	10.0	271	3.0	109	0.05 0.07
KQCW-DT	D20	DT	LIC	70.2	3,817	51.3	3,384	0.78 2.11

**Channel and
Facility
Information**

Section	Question	Response
Facility ID	184462	
State	Missouri	
City	Cassville	
LPD Channel	20	

Antenna Location
Data

Section	Question	Response
Antenna Structure Registration	Do you have an FCC Antenna Structure Registration (ASR) Number?	Yes
	ASR Number	1004009
Coordinates (NAD83)	Latitude	36° 41' 32.1" N+
	Longitude	093° 49' 16.9" W-
	Structure Type	TOWER-A free standing or guyed struct
	Overall Structure Height	96.9 meters
	Support Structure Height	91.4 meters
	Ground Elevation (AMSL)	456.5 meters
Antenna Data	Height of Radiation Center Above Ground Level	85.6 meters
	Height of Radiation Center Above Mean Sea Level	542.1 meters
	Effective Radiated Power	15 kW

**Antenna
Technical Data**

Section	Question	Response
Antenna Type	Antenna Type	Non-Directional
	Do you have an Antenna ID?	
	Antenna ID	
Antenna Manufacturer and Model	Manufacturer:	Dielectric
	Model	DLP-12B/VP
	Rotation	
	Electrical Beam Tilt	1.0
	Mechanical Beam Tilt	Not Applicable
	toward azimuth	
	Polarization	Elliptical
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