

ENGINEERING EXHIBIT

Application for Minor Modification of Digital Low Power Television Station

prepared for

Gray Television Licensee, LLC

K18CD-D Lincoln, NE

Facility ID 21165

Ch. 18 (digital) 15 kW

Gray Television Licensee, LLC (“Gray”) is the licensee of digital Low Power Television station K18CD-D, Channel 18, Lincoln NE, Facility ID 21165. K18CD-D is licensed to operate with 15 kW effective radiated power (“ERP”), directional (BLDTL-20111118BAO). *Gray* herein seeks a Construction Permit to authorize relocation of K18CD-D and utilize a different directional antenna pattern.

As proposed herein, K18CD-D will be relocated to the tower structure associated with FCC Antenna Structure Registration number 1041792, 3.7 km (2.3 miles) from the licensed K18CD-D site. The proposed K18CD-D facility will utilize a new antenna system which will be side-mounted on the tower and no change to the overall structure height is proposed.

The proposed K18CD-D facility will operate at 15 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 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.

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.

The only authorized AM station within 3 km of the proposed site is nondirectional AM station KFOR (1240 kHz, Lincoln, NE) which is located 0.36 km distant. The distance to KFOR is greater than the 0.241 km threshold distance (one wavelength at KFOR's frequency) described in §1.30002(a), therefore notification to KFOR and consideration of AM pattern disturbance is not required.

The nearest FCC monitoring station is 149 km distant at Grand Island, NE. 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). 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 25 percent antenna relative field in downward elevations (pattern data shows less than 25 percent relative field at angles 10 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 $2.2 \mu\text{W}/\text{cm}^2$, which is 0.7 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.

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.	December 20, 2017	
207 Old Dominion Road	Yorktown, VA 23692	703-650-9600



Date **20 Dec 2017**
Call Letters **K18CD-D** Channel **18**
Location **Lincoln NE**
Customer
Antenna Type **TLP-8H**

AZIMUTH PATTERN

Gain
Calculated / Measured

1.70 (2.30 dB)
Calculated

Frequency
Drawing #

497 MHz
TLP-H

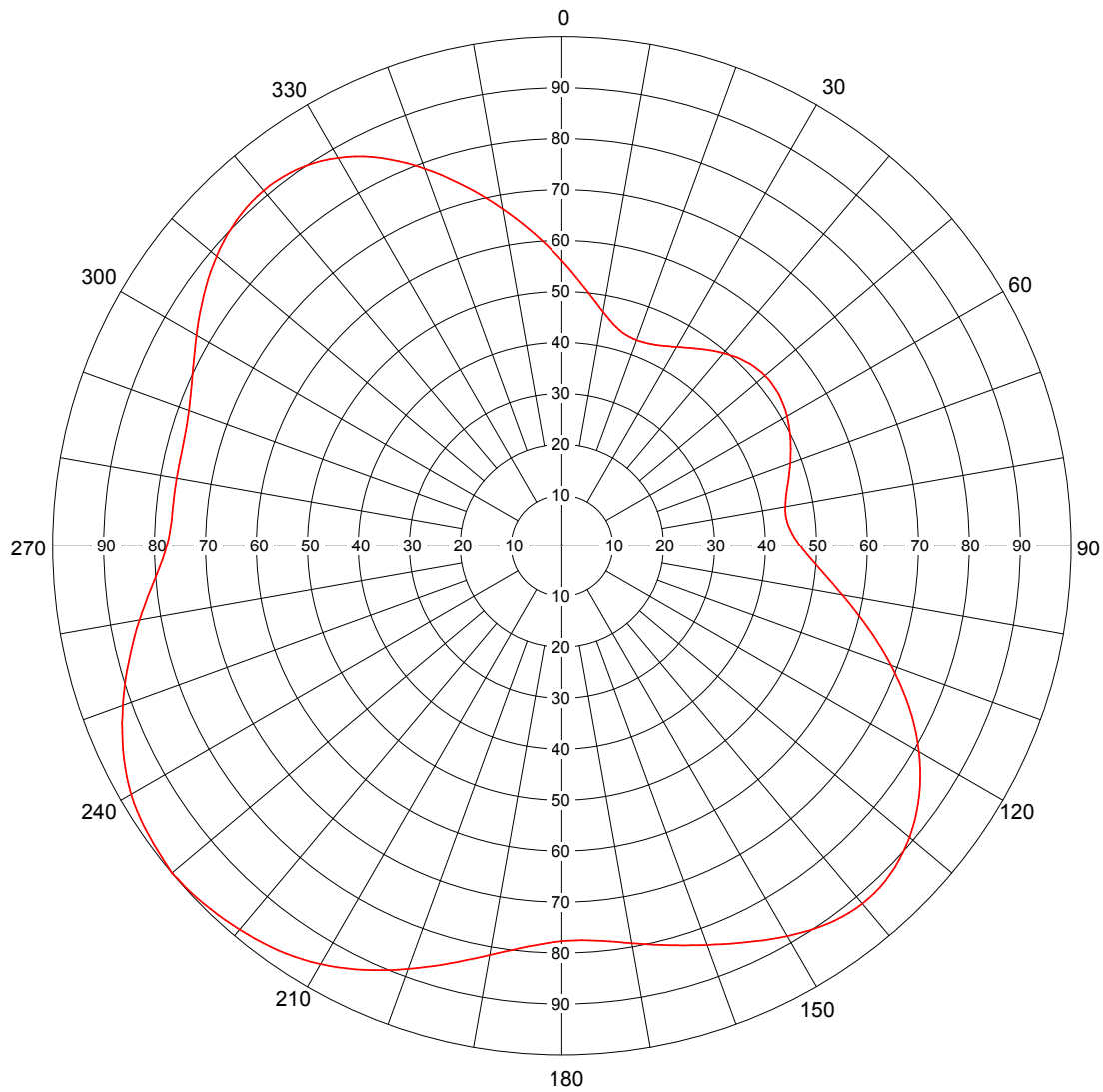


Figure 1
Antenna Azimuthal Pattern
K18CD-D Lincoln, NE
Facility ID 21165
Ch. 18 (digital) 15 kW

prepared for
Gray Television Licensee, LLC

December, 2017



prepared for
Gray Television Licensee, LLC

December, 2017

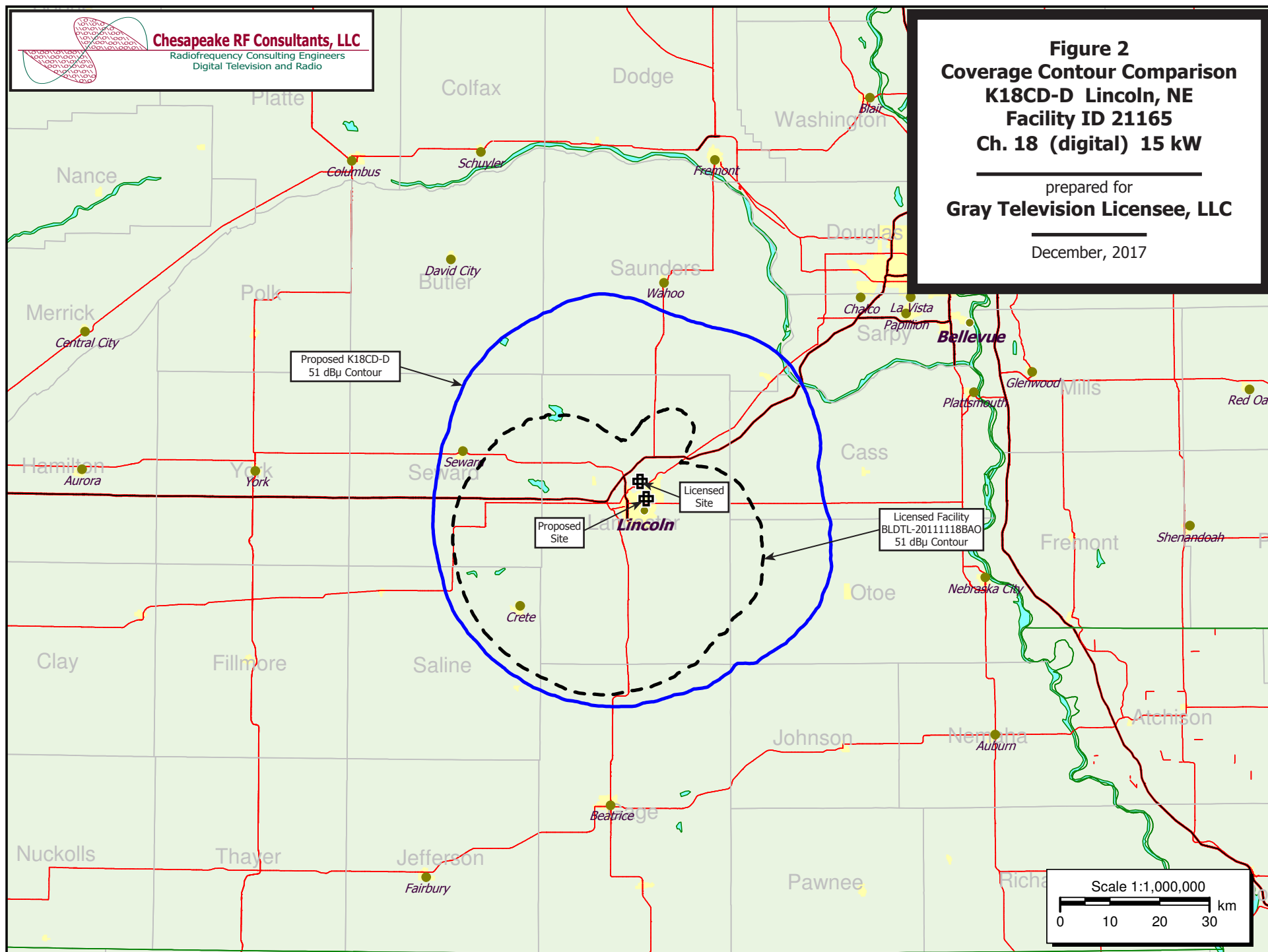


Table 1 K18CD-D OET Bulletin 69 Interference Study
(page 1 of 4)



tvstudy v2.2.4 (Z2Qqz3)
Database: localhost, Study: K18CD-D 15kW_TLP-H, Model: Longley-Rice
Start: 2017.12.20 09:15:04

Study created: 2017.12.20 09:15:04

Study build station data: LMS TV 2017-12-20 LMSTV

Proposal: K18CD-D D18 LD APP LINCOLN, NE
File number: K18CD-D 15kW_TLP-H
Facility ID: 21165
Station data: User record
Record ID: 1623
Country: U.S.

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

Stations potentially affected by proposal:

IX	Call	Chan	Svc	Status	City, State	File Number	Distance
No	KAAS-TV	D17	DT	APP	SALINA, KS	BLANK0000035657	200.6 km
No	KAAS-TV	D17	DT	LIC	SALINA, KS	BLCDT20021120AAP	200.6
Yes	KYNE-TV	D17	DT	LIC	OMAHA, NE	BLANK0000019249	76.0
Yes	KYNE-TV	D17	DT	APP	OMAHA, NE	BLANK0000035901	76.0
No	KYIN	D18	DT	LIC	MASON CITY, IA	BLEDT20090612AHJ	439.4
No	K18GU-D	D18	LD	LIC	OTTUMWA, IA	BLDTT20091229AES	360.9
No	K18KG-D	D18	LD	LIC	SPENCER, IA	BLDTL20130327AAU	304.2
No	K18LA-D	D18	LD	CP	WAKEENEY, KS	BNPDTL20100514AGU	335.7
No	K18KK-D	D18	LD	APP	COLUMBIA, MO	BLANK0000035620	417.9
Yes	KCPT	D18	DT	LIC	KANSAS CITY, MO	BLEDT20090821AAU	268.1
No	K18DH	N18	TX	LIC	BROKEN BOW, NE	BLTT19901210JL	274.4
No	K18IW-D	D18	LD	CP	RAPID CITY, SD	BPDTL20140613ABU	326.2
No	K18IW-D	D18	LD	LIC	RAPID CITY, SD	BLDTL20140228AEJ	326.3
Yes	KJII-LD	D19	LD	LIC	LINCOLN, NE	BLANK0000014079	29.0
No	KXNE-TV	D19	DT	APP	NORFOLK, NE	BLANK0000035898	165.5
No	KXNE-TV	D19	DT	LIC	NORFOLK, NE	BLEDT20090615ADS	165.5

Non-directional AM stations within 0.8 km:
KFOR 1240 L ND1 U LINCOLN, NE BL
KFOR 1240 L ND2 D LINCOLN, NE BL20160907AGB
KFOR 1240 L ND2 N LINCOLN, NE BL20160907AGB

No directional AM stations found within 3.2 km

Record parameters as studied:

Channel: D18
Mask: Full Service
Latitude: 40 49 17.00 N (NAD83)
Longitude: 96 39 44.00 W
Height AMSL: 485.9 m
HAAT: 0.0 m
Peak ERP: 15.0 kW
Antenna: DIE TLP-H 230.0 deg
Elev Pattn: Generic
Elec Tilt: 1.50

49.1 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	4.70 kW	120.9 m	41.0 km
45.0	3.87	137.6	41.2
90.0	3.29	98.9	37.2
135.0	12.3	82.2	41.5
180.0	9.06	100.4	42.4
225.0	14.8	115.5	46.3
270.0	9.03	123.0	44.5
315.0	12.1	112.0	45.0

Database HAAT does not agree with computed HAAT
Database HAAT: 0 m Computed HAAT: 111 m

Distance to Canadian border: 884.7 km

Table 1 K18CD-D OET Bulletin 69 Interference Study
(page 2 of 4)



Distance to Mexican border: 1300.5 km

Conditions at FCC monitoring station: Grand Island NE
Bearing: 274.9 degrees Distance: 148.9 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:
Bearing: 266.9 degrees Distance: 727.4 km

No land mobile station failures found

Proposal is not within the Offshore Radio Service protected area

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 BLANK0000019249 LIC scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	KYNE-TV	D17	DT	LIC	OMAHA, NE	BLANK0000019249	
Undesireds:	K18CD-D	D18	LD	APP	LINCOLN, NE	K18CD-D 15kW_TLP-H	76.0 km
	KDAO-CD	D17-	DC	CP	MARSHALLTOWN, IA	BLANK0000034815	271.2
	KAAS-TV	D17	DT	APP	SALINA, KS	BLANK0000035657	270.9
Service area		Terrain-limited		IX-free, before		IX-free, after	Percent New IX
15802.0	931,165	15762.1	930,934	15762.1	930,934	15711.5 930,358	0.32 0.06
Undesired			Total IX	Unique IX, before		Unique IX, after	
K18CD-D D18 LD APP			50.6	576		50.6 576	

Interference to BLANK0000035901 APP scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	KYNE-TV	D17	DT	APP	OMAHA, NE	BLANK0000035901	
Undesireds:	K18CD-D	D18	LD	APP	LINCOLN, NE	K18CD-D 15kW_TLP-H	76.0 km
	KDAO-CD	D17-	DC	CP	MARSHALLTOWN, IA	BLANK0000034815	271.2
	KAAS-TV	D17	DT	APP	SALINA, KS	BLANK0000035657	270.9
Service area		Terrain-limited		IX-free, before		IX-free, after	Percent New IX
17083.2	971,280	17001.0	970,781	17001.0	970,781	16909.7 966,125	0.54 0.48
Undesired			Total IX	Unique IX, before		Unique IX, after	
K18CD-D D18 LD APP			91.3	4,656		91.3 4,656	

Interference to BLEDT20090821AAU LIC scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	KCPT	D18	DT	LIC	KANSAS CITY, MO	BLEDT20090821AAU	
Undesireds:	K18CD-D	D18	LD	APP	LINCOLN, NE	K18CD-D 15kW_TLP-H	268.1 km
	KFSM-TV	D18	DT	LIC	FORT SMITH, AR	BLCDT20060530AIM	362.7
	WSEC	D18	DT	CP	JACKSONVILLE, IL	BLANK0000026289	385.5
Service area		Terrain-limited		IX-free, before		IX-free, after	Percent New IX
35353.6	2,503,198	34884.1	2,500,946	34842.8	2,500,772	34835.8 2,500,759	0.02 0.00
Undesired			Total IX	Unique IX, before		Unique IX, after	
K18CD-D D18 LD APP			7.0	13		7.0 13	
KFSM-TV D18 DT LIC			41.3	174		41.3 174	

Table 1 K18CD-D OET Bulletin 69 Interference Study
(page 3 of 4)



Interference to BLEDT20090821AAU LIC scenario 2

Desired:	Call	Chan	Svc	Status	City, State	File Number	Distance
	KCPT	D18	DT	LIC	KANSAS CITY, MO	BLEDT20090821AAU	
Undesireds:	K18CD-D	D18	LD	APP	LINCOLN, NE	K18CD-D 15kW_TLP-H	268.1 km
	KFSM-TV	D18	DT	LIC	FORT SMITH, AR	BLCDT20060530AIM	362.7
	WSEC	D18	DT	APP	JACKSONVILLE, IL	BLANK0000034851	385.5
Service area		Terrain-limited		IX-free, before		IX-free, after	Percent New IX
35353.6 2,503,198		34884.1 2,500,946		34828.9 2,500,686		34821.9 2,500,673	0.02 0.00
Undesired		Total IX		Unique IX, before		Unique IX, after	
K18CD-D D18 LD APP		7.0 13				7.0 13	
KFSM-TV D18 DT LIC		41.3 174		41.3 174		41.3 174	
WSEC D18 DT APP		13.9 86		13.9 86		13.9 86	

Interference to BLEDT20090821AAU LIC scenario 3

Desired:	Call	Chan	Svc	Status	City, State	File Number	Distance
	KCPT	D18	DT	LIC	KANSAS CITY, MO	BLEDT20090821AAU	
Undesireds:	K18CD-D	D18	LD	APP	LINCOLN, NE	K18CD-D 15kW_TLP-H	268.1 km
	KFSM-TV	D18	DT	LIC	FORT SMITH, AR	BLCDT20060530AIM	362.7
Service area		Terrain-limited		IX-free, before		IX-free, after	Percent New IX
35353.6 2,503,198		34884.1 2,500,946		34842.8 2,500,772		34835.8 2,500,759	0.02 0.00
Undesired		Total IX		Unique IX, before		Unique IX, after	
K18CD-D D18 LD APP		7.0 13				7.0 13	
KFSM-TV D18 DT LIC		41.3 174		41.3 174		41.3 174	

Interference to BLANK0000014079 LIC scenario 1

Desired:	Call	Chan	Svc	Status	City, State	File Number	Distance
	KJII-LD	D19	LD	LIC	LINCOLN, NE	BLANK0000014079	
Undesireds:	K18CD-D	D18	LD	APP	LINCOLN, NE	K18CD-D 15kW_TLP-H	29.0 km
	KDMI	D19	DT	LIC	DES MOINES, IA	BLCDT20120627AAE	250.4
	KXNE-TV	D19	DT	APP	NORFOLK, NE	BLANK0000035898	155.7
	KETV	D20	DT	LIC	OMAHA, NE	BLCDT20041222AED	47.1
Service area		Terrain-limited		IX-free, before		IX-free, after	Percent New IX
1147.4 22,340		1120.3 20,951		897.2 16,373		893.2 16,357	0.44 0.10
Undesired		Total IX		Unique IX, before		Unique IX, after	
K18CD-D D18 LD APP		10.9 45				4.0 16	
KDMI D19 DT LIC		23.0 173		10.9 48		4.0 19	
KXNE-TV D19 DT APP		5.0 13		1.0 0		1.0 0	
KETV D20 DT LIC		210.2 4,530		197.1 4,401		197.1 4,401	

Interference to BLANK0000014079 LIC scenario 2

Desired:	Call	Chan	Svc	Status	City, State	File Number	Distance
	KJII-LD	D19	LD	LIC	LINCOLN, NE	BLANK0000014079	
Undesireds:	K18CD-D	D18	LD	APP	LINCOLN, NE	K18CD-D 15kW_TLP-H	29.0 km
	KDMI	D19	DT	LIC	DES MOINES, IA	BLCDT20120627AAE	250.4
	KXNE-TV	D19	DT	LIC	NORFOLK, NE	BLEDT20090615ADS	155.7
	KETV	D20	DT	LIC	OMAHA, NE	BLCDT20041222AED	47.1
Service area		Terrain-limited		IX-free, before		IX-free, after	Percent New IX
1147.4 22,340		1120.3 20,951		897.2 16,373		893.2 16,357	0.44 0.10
Undesired		Total IX		Unique IX, before		Unique IX, after	
K18CD-D D18 LD APP		10.9 45				4.0 16	
KDMI D19 DT LIC		23.0 173		10.9 48		4.0 19	
KXNE-TV D19 DT LIC		5.0 13		1.0 0		1.0 0	
KETV D20 DT LIC		210.2 4,530		197.1 4,401		197.1 4,401	

Table 1 K18CD-D OET Bulletin 69 Interference Study
(page 4 of 4)



Interference to BLANK0000014079 LIC scenario 3

	Call	Chan	Svc	Status	City, State	File Number	Distance			
Desired:	KJII-LD	D19	LD	LIC	LINCOLN, NE	BLANK0000014079				
Undesireds:	K18CD-D	D18	LD	APP	LINCOLN, NE	K18CD-D 15kW_TLP-H	29.0 km			
	KDMI	D19	DT	APP	DES MOINES, IA	BPCDT20130205AAM	250.4			
	KXNE-TV	D19	DT	APP	NORFOLK, NE	BLANK0000035898	155.7			
	KETV	D20	DT	LIC	OMAHA, NE	BLCDT20041222AED	47.1			
Service area		Terrain-limited		IX-free, before		IX-free, after	Percent New IX			
1147.4	22,340	1120.3		20,951	896.2	16,358	892.2	16,342	0.44	0.10
Undesired				Total IX		Unique IX, before		Unique IX, after		
K18CD-D	D18	LD	APP		10.9	45		4.0	16	
KDMI	D19	DT	APP		27.0	188	11.9	63	5.0	34
KXNE-TV	D19	DT	APP		5.0	13	0.0	0	0.0	0
KETV	D20	DT	LIC		210.2	4,530	195.1	4,401	195.1	4,401

Interference to BLANK0000014079 LIC scenario 4

	Call	Chan	Svc	Status	City, State	File Number	Distance				
Desired:	KJII-LD	D19	LD	LIC	LINCOLN, NE	BLANK0000014079					
Undesireds:	K18CD-D	D18	LD	APP	LINCOLN, NE	K18CD-D 15kW_TLP-H	29.0 km				
	KDMI	D19	DT	APP	DES MOINES, IA	BPCDT20130205AAM	250.4				
	KXNE-TV	D19	DT	LIC	NORFOLK, NE	BLEDT20090615ADS	155.7				
	KETV	D20	DT	LIC	OMAHA, NE	BLCDT20041222AED	47.1				
Service area		Terrain-limited			IX-free, before		IX-free, after		Percent New IX		
1147.4 22,340		1120.3 20,951			896.2 16,358		892.2 16,342		0.44 0.10		
Undesired				Total IX		Unique IX, before		Unique IX, after			
K18CD-D D18 LD APP		10.9		45				4.0 16			
KDMI D19 DT APP		27.0		188		11.9 63		5.0 34			
KXNE-TV D19 DT LIC		5.0		13		0.0 0		0.0 0			
KETV D20 DT LIC		210.2		4,530		195.1 4,401		195.1 4,401			

Interference to proposal scenario 1

Desired:	Call K18CD-D	Chan D18	Svc LD	Status APP	City, State LINCOLN, NE	File Number K18CD-D 15kW_TLP-H	Distance
Undesireds:	KYNE-TV	D17	DT	LIC	OMAHA, NE	BLANK0000019249	76.0 km
	KCPT	D18	DT	LIC	KANSAS CITY, MO	BLEDT20090821AAU	268.1
	K18IW-D	D18	LD	CP	RAPID CITY, SD	BPDTL20140613ABU	326.2
	KJII-LD	D19	LD	LIC	LINCOLN, NE	BLANK0000014079	29.0
Service area		Terrain-limited			IX-free	Percent IX	
5674.5	327,787	5658.5	327,418		5646.5	327,356	0.21 0.02
Undesired				Total IX	Unique IX	Prcnt Unique IX	
KCPT	D18 DT LIC	8.0	35		8.0 35	0.14	0.01
KJII-LD	D19 LD LIC	4.0	27		4.0 27	0.07	0.01

Channel and Facility Information

Section	Question	Response
Proposed Community of License	Facility ID	21165
	State	Nebraska
	City	LINCOLN
	LPD Channel	18

Antenna Location Data

Section	Question	Response
Antenna Structure Registration	Do you have an FCC Antenna Structure Registration (ASR) Number?	Yes
	ASR Number	1041792
Coordinates (NAD83)	Latitude	40° 49' 17.0" N+
	Longitude	096° 39' 44.0" W-
	Structure Type	TOWER-A free standing or guyed struct
	Overall Structure Height	124.6 meters
	Support Structure Height	124.6 meters
	Ground Elevation (AMSL)	364.0 meters
Antenna Data	Height of Radiation Center Above Ground Level	121.9 meters
	Height of Radiation Center Above Mean Sea Level	485.9 meters
	Effective Radiated Power	15 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:	DIE
	Model	TLP-8H
	Rotation	230 degrees
	Electrical Beam Tilt	1.5
	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	1.000	90	0.911	180	0.521	270	0.918
10	0.977	100	0.880	190	0.511	280	0.885
20	0.917	110	0.788	200	0.477	290	0.834
30	0.842	120	0.673	210	0.446	300	0.793
40	0.776	130	0.560	220	0.468	310	0.777
50	0.768	140	0.467	230	0.560	320	0.816
60	0.779	150	0.430	240	0.688	330	0.885
70	0.828	160	0.452	250	0.810	340	0.949
80	0.885	170	0.495	260	0.891	350	0.984

Additional Azimuths

Degree	V _A
--------	----------------