

## **ENGINEERING EXHIBIT**

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

prepared for

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

K31LQ-D Sherman, TX

Facility ID 184857

Ch. 31 (digital) 4.8 kW

*Gray Television Licensee, LLC* (“Gray”) is the proposed assignee (BAPDTL-20160728AET) of digital Low Power Television station K31LQ-D, Channel 31, Sherman, TX, Facility ID 184857. K31LQ-D is authorized to operate pursuant to a Construction Permit (“CP”, BNPDTL-20100222ACX) with 5 kW effective radiated power (“ERP”), directional. *Gray* herein seeks a modification of the CP to utilize an alternate transmitting location and to specify changes of ERP, antenna height, and directional antenna pattern. The present permittee of K31LQ-D, *DTV America Corporation*, is submitting this application as a courtesy to *Gray* because the FCC’s Licensing and Management System (LMS) does not allow proposed assignees to file contingent applications.

As proposed herein, K31LQ-D will be relocated to a tower structure associated with FCC Antenna Structure Registration number 1011273, 32.3 km (20.1 miles) from the authorized K31LQ-D site. The proposed K31LQ-D facility will employ a new antenna system to be side-mounted on the tower and no change to the overall structure height is proposed. The site is located more than 121 kilometers (75 miles) from the reference coordinates of the cities listed in Appendix A of DA 09-1487.<sup>1</sup>

The proposed K31LQ-D facility will operate with a directional antenna at 4.8 kW ERP using a “full service” out of channel emission mask. A plot of the directional antenna’s

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<sup>1</sup>“Commencement of Rural, First-come, First-served digital licensing for Low Power Television and TV Translators Beginning August 25, 2009 and Commencement of Nationwide, First-come, First-served Digital Licensing for Low Power Television and TV Translator Services Beginning January 25, 2010,” Public Notice, DA 09-1487, Released June 29, 2009.

azimuthal pattern is supplied in Figure 1. Figure 2 depicts the coverage contour of the proposed facility as well as that of the CP facility. The service area overlap demonstrates compliance with §73.3572 for a minor change.

Interference study per OET Bulletin 69<sup>2</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.

The nearest FCC monitoring station is 738 km distant at Kingsville, TX. 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 kilometers of the site. The site location is beyond the border areas requiring international coordination.

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

The proposed K31LQ-D operation was evaluated for human exposure to RF energy using the procedures outlined in the Commission's OET Bulletin Number 65. The transmitting antenna is a Kathrein panel array. Figure 3 supplies a plot of the antenna's elevation pattern as provided by the manufacturer. Based on OET-65 equation (10), and considering the antenna relative field in downward elevations, the graph in Figure 4 depicts calculated power density levels attributable to the proposed K31LQ-D at locations near the tower at a height of two meters above ground level. The maximum calculated RF electromagnetic field attributable to the proposed K31LQ-D facility is 18.5 percent of the general population / uncontrolled MPE limit at any location two meters above ground level, which occurs within 35 meters of the tower's base.

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<sup>2</sup>FCC Office of Engineering and Technology Bulletin number 69, *Longley-Rice Methodology for Evaluating TV Coverage and Interference*, February 6, 2004 ("OET-69"). The implementation of OET-69 for this study followed the guidelines of OET-69 as specified therein. The default cell size of 1 km was employed. Comparisons of various results of this computer program (run on a Sun Sparc processor) to the Commission's implementation of OET-69 show excellent correlation.

Four other LPTV facilities emitters and one full power digital television station are authorized at this site. The following table supplies a summary of RF signal density calculations for the proposed K31LQ-D and the other facilities at this site. No other authorized broadcast facilities are near enough to the site to contribute significant RF levels.

**Summary of Radiofrequency Electromagnetic Field Calculations**

Facility	Channel	ERP (kW)	Polarization	Relative Field	Height (meters)	S - Calculated ( $\mu\text{W}/\text{cm}^2$ )	S - Limit ( $\mu\text{W}/\text{cm}^2$ )	Percent of Limit
K31LQ-D Sherman, TX Proposed Herein	31	4.8	H	See Graph	10	70.9	383.3	18.5%
KXII(DT) Sherman, TX Lic BLCDT-20090226ACF	12	36	C	0.2	505.6	0.4	200	0.2%
KJDA-LD Ardmore, OK Lic 0000001316	13	3	H	1.0	400	0.6	200	0.3%
K19II-D Ardmore, OK CP BPDTL-20140624ABL	19	15	H	1.0	250	8.1	335.3	2.4%
K22JQ-D Ardmore, OK CP BPDTL-20140624ABK	22	15	H	1.0	250	8.1	347.3	2.3%
K24IW-D Ardmore, OK CP BPDTL-20141023ABA	24	15	H	1.0	250	8.1	355.3	2.3%
K24IW-D Ardmore, OK Lic BLDLTL-20140224ACD	24	0.5	H	1.0	250	Use CP record above for greatest impact		---
<b>Total Calculated Signal Density:</b>								<b>26.0%</b>

- ERP: Effective Radiated Power
- Polarization: H - Horizontal; C- Circular
- Field: Elevation Pattern Relative Field Value (conservative or worst case assumed)
- Height: Height of radiation center above ground level
- S-Calc: OET Bulletin 65 calculated value of signal density at two meters above ground level
- S-Limit §1.1310 uncontrolled/general population limit for signal density

Based on this analysis and considering all broadcast facilities, the total maximum calculated RF density at two meters above ground level near the proposed site will be 26.0 percent of the FCC’s uncontrolled / general population maximum permissible exposure limit. No other television or radio broadcast facilities are authorized within sufficient distance to be a significant contributor to RF exposure at this location.

The general public will not be exposed to RF levels in excess of the FCC's guidelines. The K31LQ-D facility will reduce power or cease operation as necessary to protect persons having access to the tower or antenna from RF electromagnetic field exposure in excess of FCC guidelines. RF exposure warning signs will continue to be posted.

Environmental matters covered by this exhibit are limited to the evaluation of exposure to RF electromagnetic field. The proposed transmitting antenna will be installed on an existing antenna support structure which was constructed prior to March 16, 2001. No change in structure height is proposed.

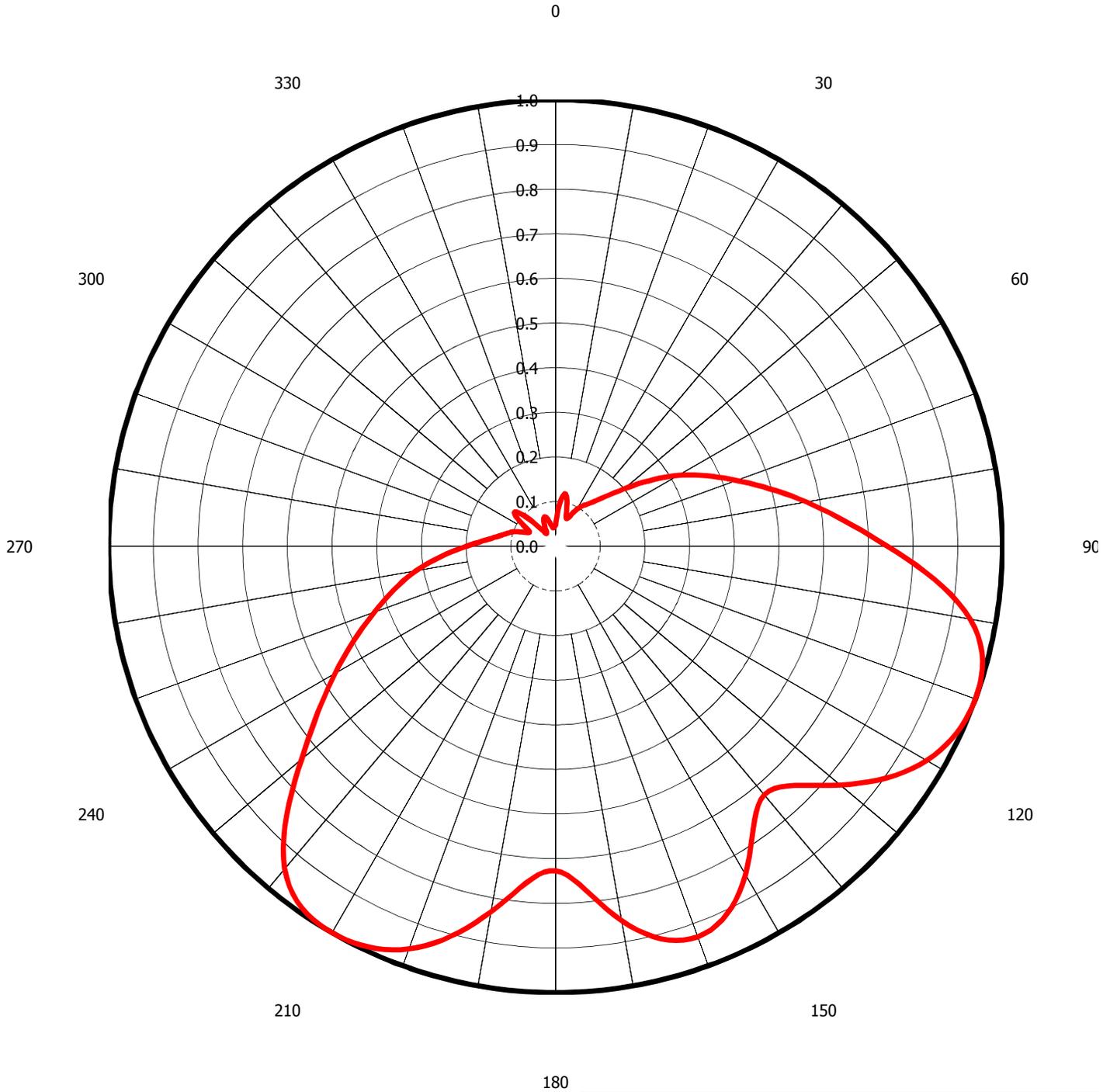
List of Attachments

Figure 1	Antenna Azimuthal Pattern
Figure 2	Coverage Contour Comparison
Figure 3	Antenna Elevation Pattern
Figure 4	Calculated RF Electromagnetic Field
Table 1	Interference Analysis Results Summary
Form 2100	Engineering Data for FCC Form 2100

**Chesapeake RF Consultants, LLC**

Joseph M. Davis, P.E.	August 8, 2016	
207 Old Dominion Road	Yorktown, VA 23692	703-650-9600

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



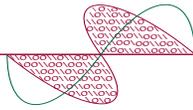
**Figure 1**  
**Antenna Azimuthal Pattern**  
**K31LQ-D Sherman, TX**  
**Facility ID 184857**  
**Ch. 31 (digital) 4.8 kW**

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prepared for  
**Gray Television Licensee, LLC**

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August, 2016

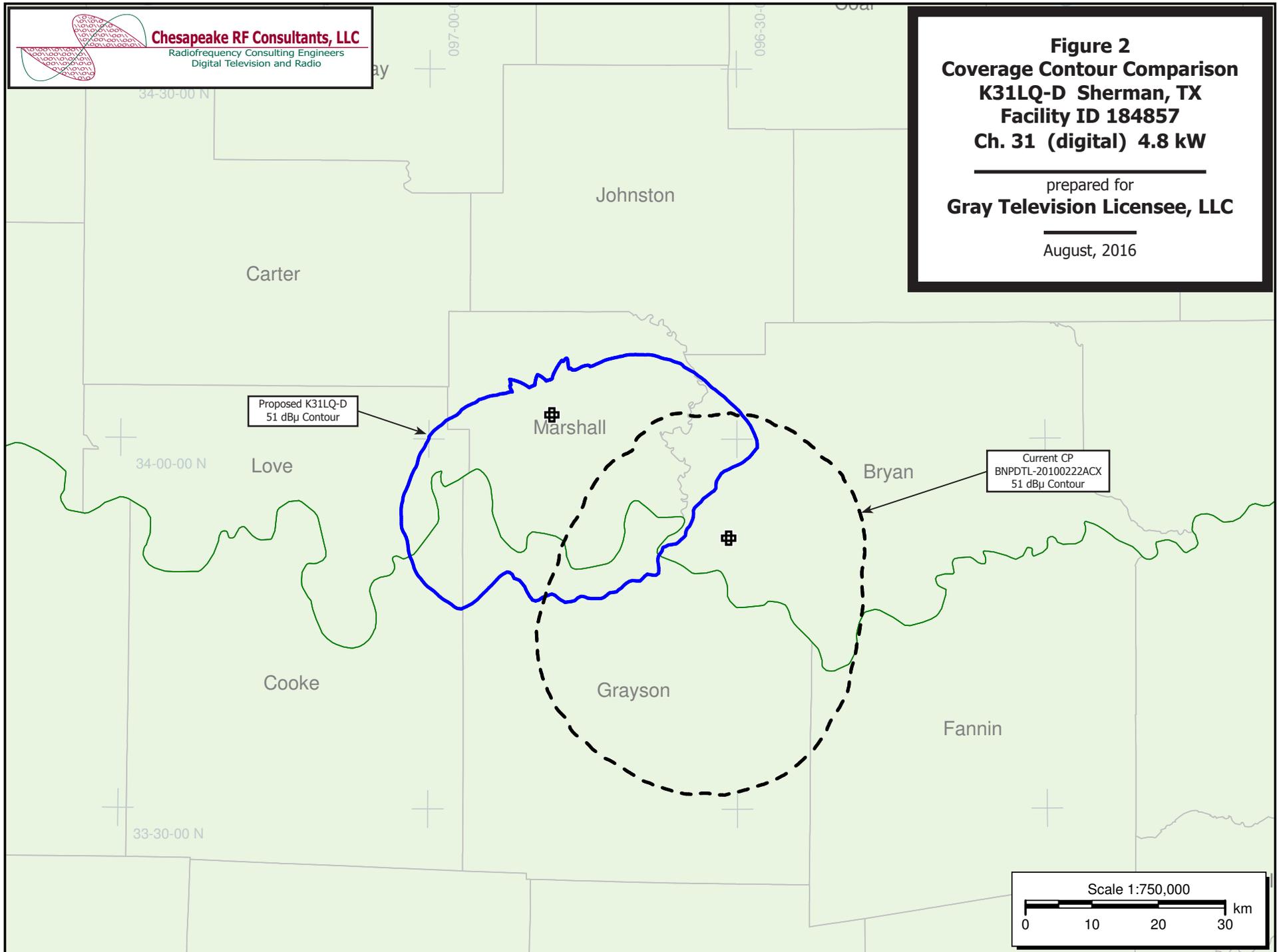


**Chesapeake RF Consultants, LLC**  
Radiofrequency Consulting Engineers  
Digital Television and Radio

**Figure 2**  
**Coverage Contour Comparison**  
**K31LQ-D Sherman, TX**  
**Facility ID 184857**  
**Ch. 31 (digital) 4.8 kW**

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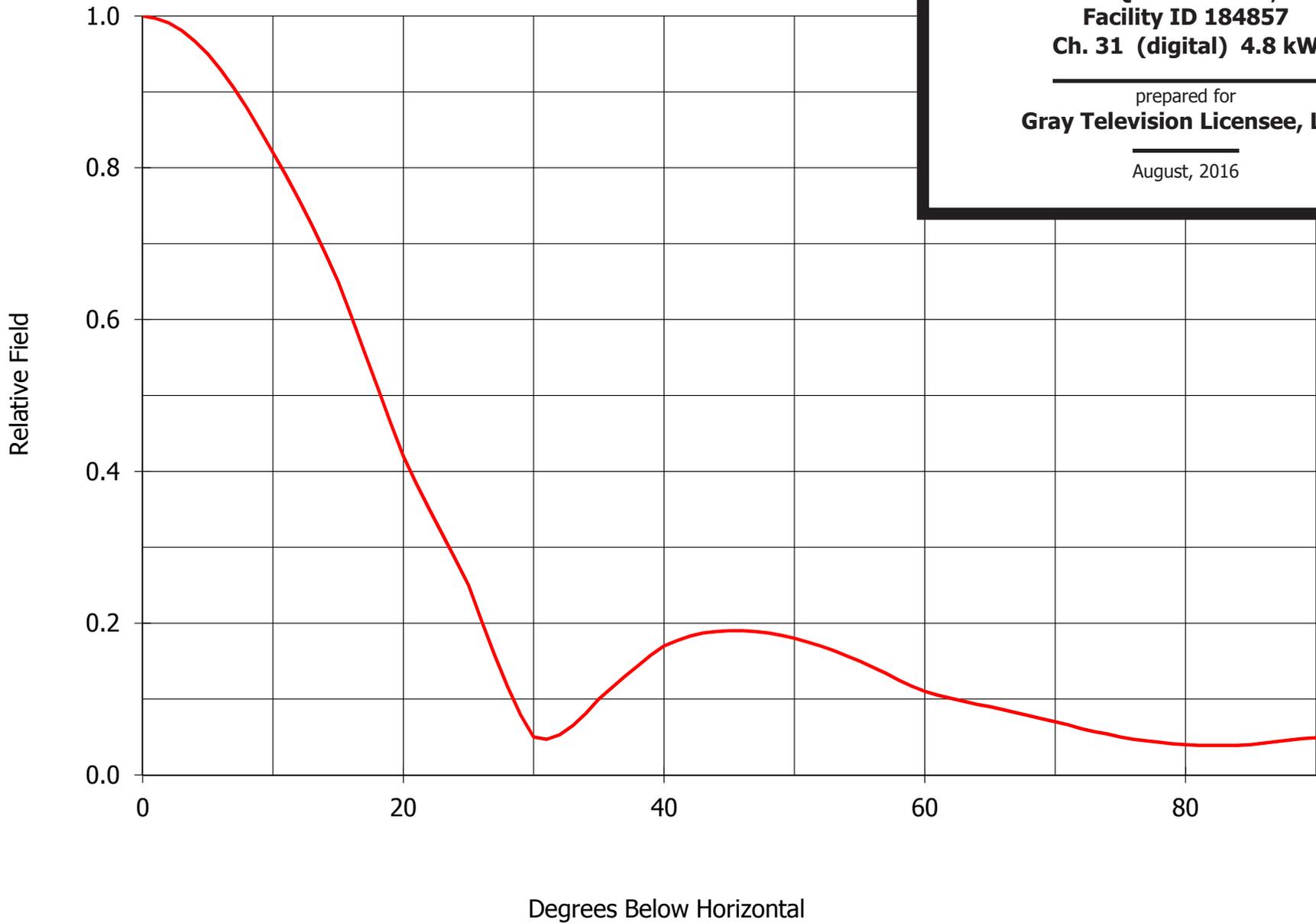
**Figure 3**  
**Antenna Elevation Pattern**  
**Kathrein Model K723147 1x2**  
**K31LQ-D Sherman, TX**  
**Facility ID 184857**  
**Ch. 31 (digital) 4.8 kW**

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**Gray Television Licensee, LLC**

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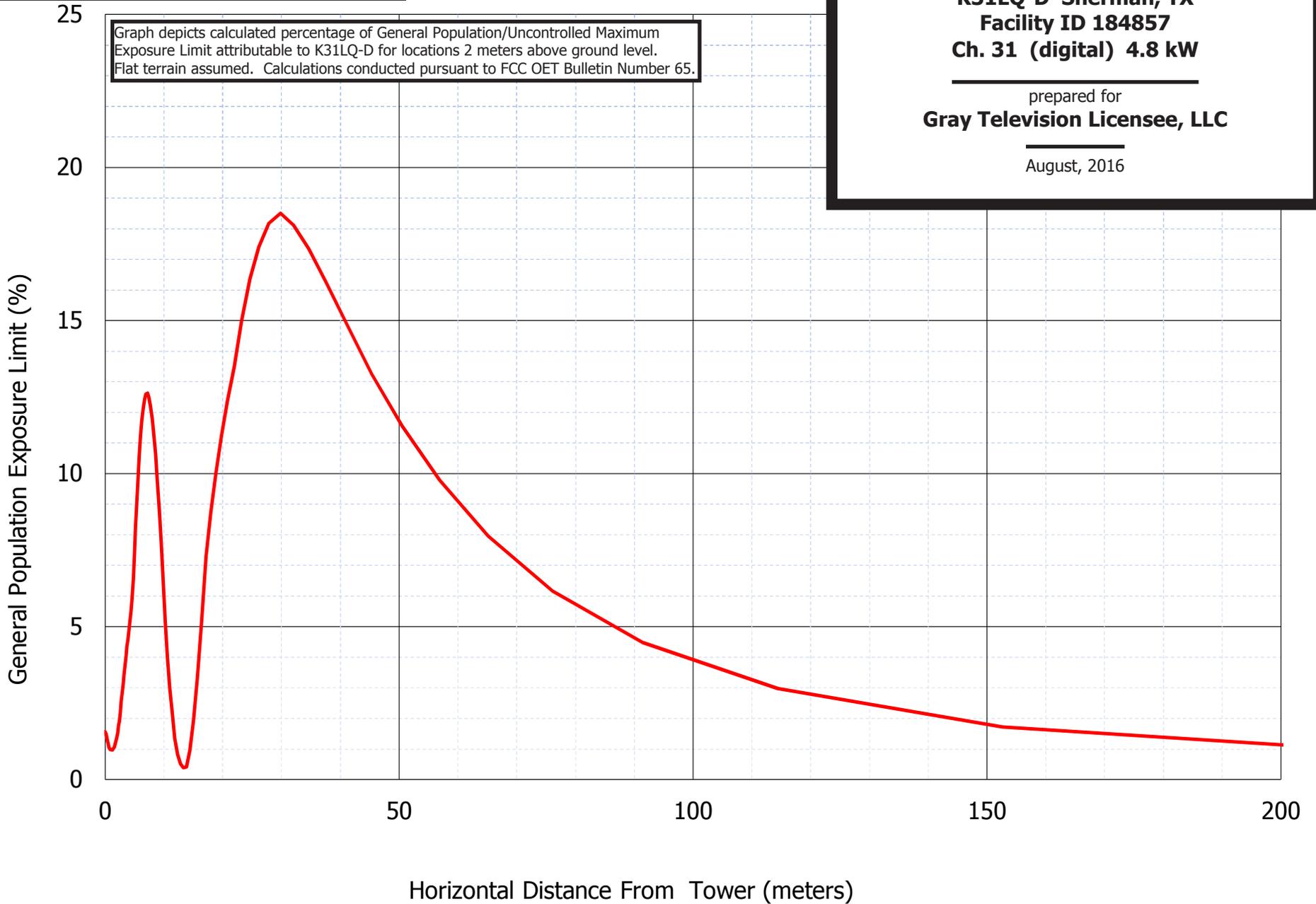
**Figure 4**  
**Calculated RF Electromagnetic Field**  
**K31LQ-D Sherman, TX**  
**Facility ID 184857**  
**Ch. 31 (digital) 4.8 kW**  

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**August, 2016**



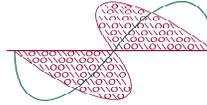
**Table 1**

**Interference Analysis Results Summary**

prepared for

**Gray Television Licensee, LLC**

K31LQ-D Sherman, TX



**Chesapeake RF Consultants, LLC**

Radiofrequency Consulting Engineers  
Digital Television and Radio

K31LQ-D USERRECORD-01 SHERMAN TX US  
 Channel 31 ERP 4.8 kW HAAT 50. m RCAMSL 00281 m FULL SERVICE MASK  
 Latitude 034-01-57 Longitude 0096-48-00  
 Dir Antenna Make usr Model KAT 723147 1X2 Beam tilt N Ref Azimuth 160.

The LMS application requires NAD-83 coordinates. FCC internal systems then convert to NAD-27 and port over to CDBS for processing. This interference analysis utilizes truncated NAD-27 coordinates to replicate FCC processing.

Ch.	Call	City/State	Dist (km)	Status	Application Ref. No.	---Population (2000 Census)---	
						Baseline	New Interference
30	K30MS-D	ARDMORE OK	28.3	CP	BNPDTL-20100930ARR	64,275	1,023 (1.59%)
30	K30MR-D	LAWTON OK	180.5	CP	BNPDTL-20100930ARF	---	none
30	KMPX	DECATUR TX	161.2	LIC	BLCDDT-20060317AGE	---	none
30	K30LD-D	WICHITA FALLS TX	156.9	LIC	BLDTL-20110406ABU	---	none
31	KWNL-CD	WINSLOW AR	334.2	LIC	BLANK-4282	---	none
31	KWNL-CD	WINSLOW AR	334.2	LIC	BLDTA-20110726AAA	---	none
31	K31HO-D	SHREVEPORT LA	306.4	LIC	BLDTL-20120831AAD	---	none
31	KSWX-LP	DUNCAN OK	118.5	LIC	BLTTL-20080818AAY	---	none
31	K31JW-D	ELK CITY OK	269.4	LIC	BLDTT-20100510ATH	---	none
31	KOET	EUFAULA OK	185.0	LIC	BLEDT-20060601BJT	598,772	6 (0.00%)
31	K31MK-D	LAWTON OK	169.7	CP	BNPDTL-20101004ACZ	---	none
31	KLHO-LD	OKLAHOMA CITY OK	160.4	LIC	BLDTL-20110112ADF	---	none
31	K31JQ-D	WOODWARD, ETC. OK	360.2	LIC	BLDTT-20101007ABO	---	none
31	K31CD-D	CANADIAN TX	394.2	LIC	BLDTT-20100520ADA	---	none
31	K31GL-D	DE SOTO TX	161.2	LIC	BLDTL-20081110AJA	---	none
31	K31MS-D	JOLLY TX	144.3	CP	BNPDTL-20100510AGK	---	none
31	K31MU-D	LINGLEVILLE-CROWLEY TX	168.7	LIC	BLDTL-20150120AIJ	---	none
31	K31MU-D	LINGLEVILLE-CROWLEY TX	175.7	CP	BLANK-1158	---	none
31	KFXK-TV	LONGVIEW TX	261.6	LIC	BLCDDT-20060705AAW	822,201	0 (0.00%)
31	K31HC-D	QUANAH TX	270.8	LIC	BLDTT-20110118AAO	---	none
31	K31LM-D	RANGER TX	255.9	CP	BNPDTL-20100304AAZ	---	none
31	K31BZ-D	WELLINGTON TX	322.0	LIC	BLDTT-20100813BHH	---	none
32	K32KG-D	LAWTON OK	169.7	CP	BNPDTL-20100210ABM	---	none
32	KDAF	DALLAS TX	166.2	LIC	BLCDDT-20010606ABJ	---	none
32	KYWF-LD	WICHITA FALLS TX	161.3	LIC	BLDTL-20121231ALV	---	none
32	K32KT-D	WICHITA FALLS TX	161.0	LIC	BLANK-1482	---	none
35	KEGG-LP	MCALESTER OK	139.2	LIC	BLTT-20051017ABG	---	none

**Channel and Facility Information**

Section	Question	Response
Proposed Community of License	Facility ID	184857
	State	Texas
	City	SHERMAN
	LPD Channel	31

**Antenna Location Data**

Section	Question	Response
Antenna Structure Registration	Do you have an FCC Antenna Structure Registration (ASR) Number?	Yes
	ASR Number	1011273
Coordinates (NAD83)	Latitude	34° 01' 58.0" N+
	Longitude	096° 48' 01.0" W-
	Structure Type	
	Overall Structure Height	516.3 meters
	Support Structure Height	487.6 meters
	Ground Elevation (AMSL)	271.2 meters
Antenna Data	Height of Radiation Center Above Ground Level	10 meters
	Height of Radiation Center Above Mean Sea Level	281.2 meters
	Effective Radiated Power	4.8 kW

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	K723147 1x2
	Rotation	160 degrees
	Electrical Beam Tilt	Not Applicable
	Mechanical Beam Tilt	Not Applicable
	toward azimuth	
	Polarization	
<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	V (Authorized Value)						
0	0.931	90	0.431	180	0.070	270	0.431
10	0.852	100	0.317	190	0.045	280	0.570
20	0.727	110	0.199	200	0.048	290	0.743
30	0.832	120	0.129	210	0.119	300	0.943
40	0.960	130	0.095	220	0.069	310	1.000
50	1.000	140	0.069	230	0.095	320	0.960
60	0.943	150	0.119	240	0.129	330	0.832
70	0.742	160	0.048	250	0.199	340	0.727
80	0.570	170	0.045	260	0.317	350	0.850

#### Additional Azimuths

Degree	V <sub>A</sub>
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