ENGINEERING EXHIBIT

Application for Modification of Digital Television Translator Construction Permit

prepared for

Ramar Communications, Inc.
K31MX-D Lubbock, TX
Facility ID 55054
Ch. 15 (digital) 15 kW

Ramar Communications, Inc. ("Ramar") is the licensee of digital television translator station K31MX-D, Lubbock TX, Facility ID 55054. K31MX-D is licensed to operate (file# 0000037494) on Channel 31 with 15 kW effective radiated power ("ERP"), nondirectional. As a result of the Special Displacement Window,[1] a Construction Permit ("CP", file# 0000054297) authorizes K31MX-D to change to Channel 15 and operate with 3 kW ERP nondirectional. *Ramar* herein seeks a minor modification of the CP to specify use of a directional antenna at 15 kW ERP. No change in authorized site or antenna height is proposed.

K31MX-D will continue to utilize the tower structure associated with FCC Antenna Structure Registration number 1248244. As proposed herein, K31MX-D will utilize a new shared, directional broadband antenna to be side-mounted on the tower rather than the nondirectional antenna which is currently authorized. No change to the overall structure height is proposed.

The proposed side-mount antenna is an RFS model SBB-16C160 having horizontal polarization. The ERP is 15 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 51 dBμ coverage contour of the proposed facility as well as those of the licensed Channel 31 and CP Channel 15 facilities, both of which overlap the proposed

[1] *"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.

facility's contour. The service area overlap demonstrates compliance with §73.3572 for a minor change.

Interference study per OET Bulletin 69[2] shows that the proposal complies with the FCC's interference protection requirements toward all digital television, television translator, LPTV, and Class A stations (existing and post-auction). **FCC processing of this proposal is requested using a 1 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

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 15 percent antenna relative field in downward elevations (pattern data shows less than 15 percent relative field at angles 15 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 0.2 $\mu W/cm^2$, which is 0.1 percent of the general population / uncontrolled maximum permissible exposure limit. This is well 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

[2]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 **0.2 km** terrain increment. Comparisons of various results of this computer program (run on a Mac processor) to the FCCs implementation of TVStudy show excellent correlation. In order to allow the upload of elevation pattern data, a response of "Yes" is provided in the accompanying Form 2100 Antenna Technical Data section question regarding whether the elevation pattern varies for reasons other than the use of mechanical beamtilt.

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.

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 from FCC Form at Time of Upload

Chesapeake RF Consultants, LLC
Joseph M. Davis, P.E. August 28, 2018
207 Old Dominion Road Yorktown, VA 23692 703-650-9600

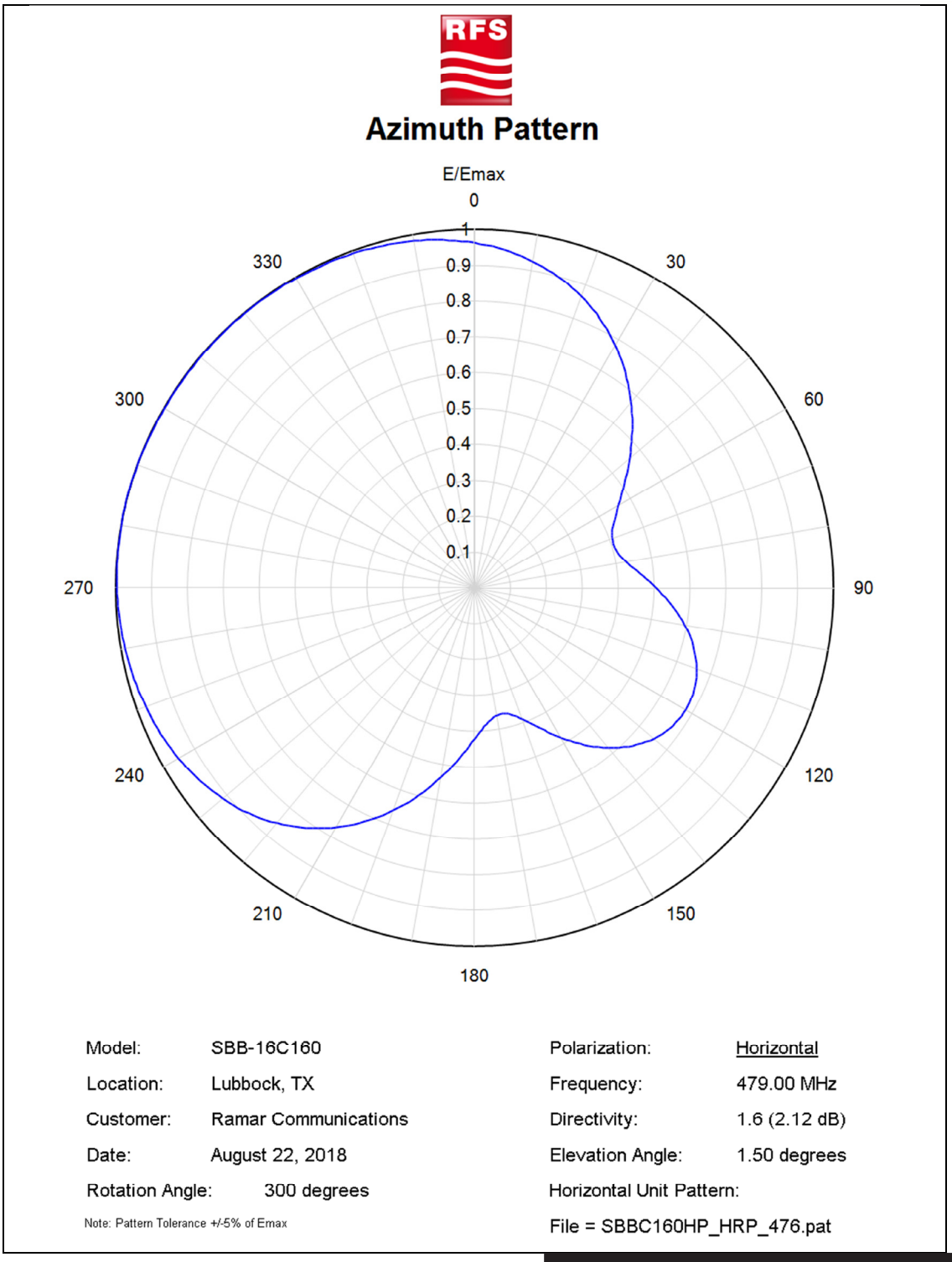

Figure 1
Antenna Azimuthal Pattern
K31MX-D Lubbock
Facility ID 55054
Ch. 15 (digital) 15 kW

prepared for
Ramar Communications, Inc.

August, 2018

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

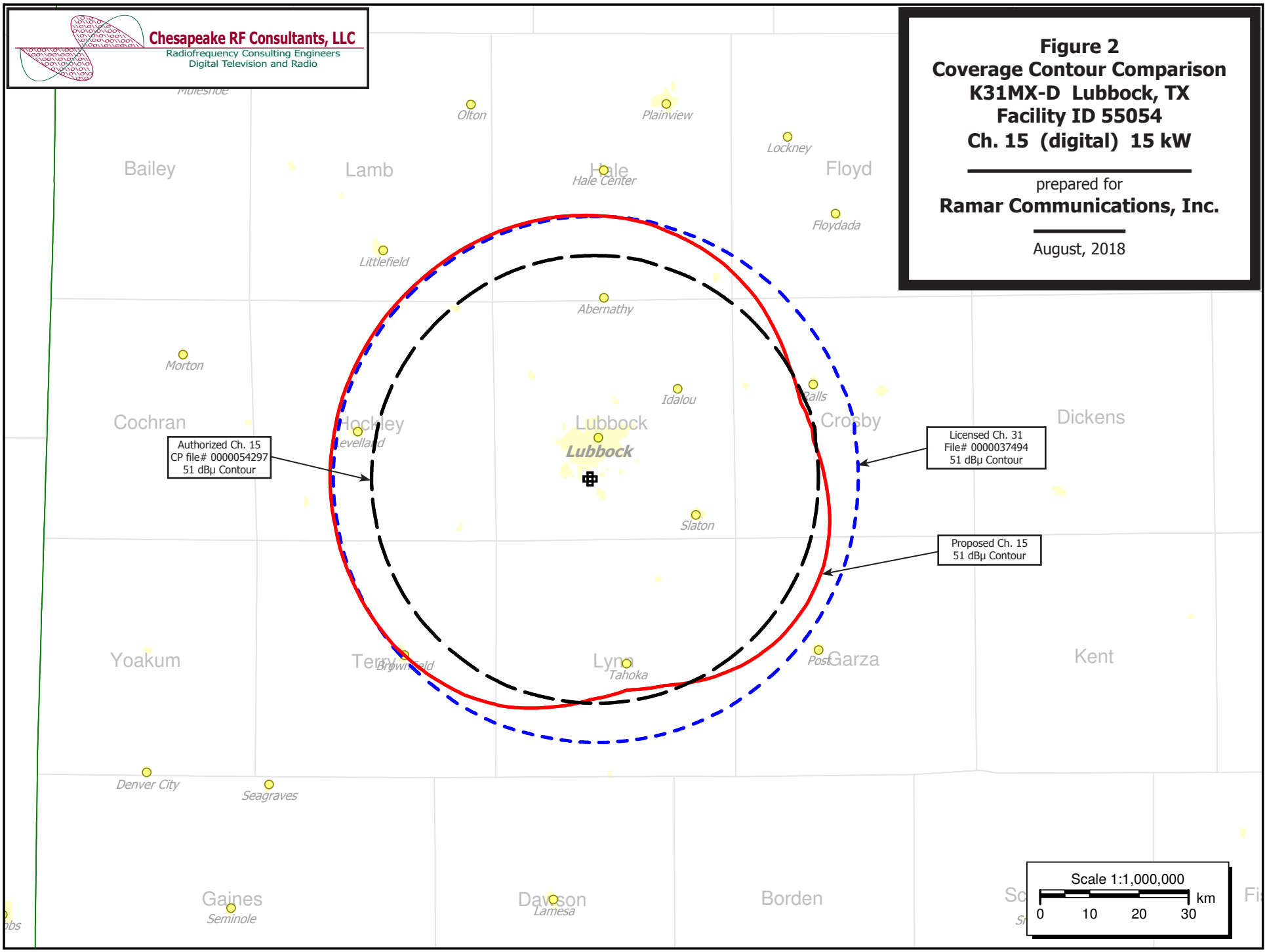
Chesapeake RF Consultants, LLC
Radiofrequency Consulting Engineers
Digital Television and Radio
Figure 2
Coverage Contour Comparison
K31MX-D Lubbock, TX
Facility ID 55054
Ch. 15 (digital) 15 kW
prepared for
Ramar Communications, Inc.
August, 2018
Authorized Ch. 15
CP file# 0000054297
51 dBµ Contour
Licensed Ch. 31
File# 0000037494
51 dBµ Contour
Proposed Ch. 15
51 dBµ Contour
Muleshoe
Olton
Plainview
Lockney
Bailey
Lamb
Hale
Hale Center
Floyd
Floydada
Littlefield
Abernathy
Morton
Idalou
Cochran
Hockley
Lubbock
Crosby
Dickens
Slaton
Yoakum
Terry
Brownfield
Lynn
Tahoka
Garza
Kent
Denver City
Seagraves
Gaines
Seminole
Dawson
Lamesa
Borden
Scale 1:1,000,000
km
0
10
20
30

Table 1 K31MX-D TVStudy Analysis of Proposal


```
tvstudy v2.2.5 (4uoc83)
Database: localhost,  Study: K31MX-D Ch-15 SBB-MOD_1.0-0.2,  Model: Longley-Rice
Start: 2018.08.27 17:05:19

Study created: 2018.08.27 17:05:19

Study build station data: LMS TV 2018-08-26

    Proposal: K31MX-D D15 LD APP Lubbock, TX
 File number: K31MX-D Ch-15 SBB 15kW ELpat
 Facility ID: 55054
Station data: User record
   Record ID: 2274
     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	K14PK-D	D14	LD	CP	HOBBS, NM	BNPDTL20101012AFA	150.0 km
No	K14KO	N14-	TX	LIC	PORTALES, NM	BLTT20050927AHI	151.2
No	K14KO	D14	LD	APP	PORTALES, NM	BDFCDTT20081222AAO	151.2
No	KAUO-LD	D14	LD	APP	AMARILLO, TX	BLANK0000058674	185.9
No	K14QN-D	D14	LD	CP	BIG SPRING, TX	BNPDTL20100107AEH	147.5
Yes	K14PZ-D	D14	LD	CP	LUBBOCK, TX	BMJADTL20100524AFT	9.7
No	K51LJ-D	D14	LD	CP	MIDLAND, TX	BDISDTL20110909ABG	171.3
No	K14OH-D	D14	LD	CP	PLAINVIEW, TX	BNPDTL20100323AIU	76.9
No	KVBA-LP	D15+	LD	APP	ALAMOGORDO, NM	BLANK0000054843	379.5
No	K15JN-D	D15	LD	CP	PORTALES, NM	BDCCDTT20120521ACD	161.6
No	K15FT-D	D15	LD	LIC	ROSWELL, NM	BLDTT20091211AEV	232.8
No	K44CJ	D15	LD	CP	TUCUMCARI, NM	BLANK0000053306	247.2
No	KTBO-TV	D15	DT	LIC	OKLAHOMA CITY, OK	BLCDT20111028AAX	463.0
No	K15HQ-D	D15	LD	LIC	SAYRE, OK	BLDTT20100802BAC	269.9
Yes	KXVA	D15	DT	LIC	ABILENE, TX	BLCDT20110520ADO	252.9
Yes	KCIT	D15	DT	LIC	AMARILLO, TX	BLANK0000004834	204.6
No	KFOX-TV	D15	DT	LIC	EL PASO, TX	BLCDT20051103AAE	470.9
Yes	K15IP-D	D15	LD	CP	LAMESA, TX	BNPDTL20100323AIM	76.6
Yes	KMLM-DT	D15	DT	CP	ODESSA, TX	BLANK0000026954	166.5
No	NEW	D15	LD	APP	ODESSA, TX	BDCCDTL20120628AAY	181.4
No	K15JR-D	D15	LD	CP	SONORA, TX	BNPDTL20100406ABU	365.1
No	KJTL	D15	DT	LIC	WICHITA FALLS, TX	BLCDT20090303ACS	300.3
No	K16EX-D	D16	LD	LIC	CLOVIS, NM	BLDTT20121217ACM	161.6
No	K16JU-D	D16	LD	CP	BIG SPRING, TX	BNPDTL20100312ACW	145.9
Yes	KPTB-DT	D16	DT	LIC	LUBBOCK, TX	BLCDT20090210AFA	7.4
No	K16KY-D	D16	LD	CP	MIDLAND, TX	BNPDTL20100323AII	170.6
No	KSAN-TV	D16	DT	LIC	SAN ANGELO, TX	BLANK0000004868	248.4
No	KXVZ-LP	N18z	TX	LIC	PLAINVIEW, TX	BLTTL20061218ABI	81.8
No	KMDF-LD	N22z	TX	LIC	MIDLAND, TX	BLTTL20081229AAD	166.4

```
No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

    Channel: D15
       Mask: Full Service
   Latitude:  33 30  8.30 N (NAD83)
  Longitude: 101 52 21.30 W
Height AMSL: 1248.8 m
       HAAT: 0.0 m
   Peak ERP: 15.0 kW
    Antenna: Ramar RFS SBB-16C160 479 Ch-15 0.0 deg
Elev Pattrn: RFS SBB-16C160 479 Ch-15
  Elec Tilt: 1.50
```

48.8 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	13.7 kW	267.4 m	55.7 km
45.0	5.61	280.2	51.7
90.0	3.87	285.9	50.1
135.0	5.65	283.5	52.0
180.0	2.62	268.9	47.1
225.0	11.5	253.7	54.0
270.0	14.9	247.0	55.0
315.0	15.0	250.9	55.2

Database HAAT does not agree with computed HAAT
Database HAAT: 0 m Computed HAAT: 267 m

Distance to Canadian border: 1722.5 km

Distance to Mexican border: 404.8 km

Conditions at FCC monitoring station: Douglas AZ
Bearing: 255.2 degrees Distance: 762.4 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:
Bearing: 338.9 degrees Distance: 793.4 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: 0.20 km

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

Interference to BMJADTL20100524AFT CP scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	K14PZ-D	D14	LD	CP	LUBBOCK, TX	BMJADTL20100524AFT	
Undesireds:	K31MX-D	D15	LD	APP	Lubbock, TX	K31MX-D Ch-15 SBB 15kW	9.7 km
	K14PK-D	D14	LD	CP	HOBBS, NM	BNPDTL20101012AFA	146.4
	K14KO	N14-	TX	LIC	PORTALES, NM	BLTT20050927AHI	158.5
	KAUO-LD	D14	LD	APP	AMARILLO, TX	BLANK0000058674	195.5
	K14QN-D	D14	LD	CP	BIG SPRING, TX	BNPDTL20100107AEH	137.8

Service area		Terrain-limited		IX-free, before		IX-free, after		Percent New IX	
81.5	1,130	78.5	719	75.5	706	75.5	706	0.00	0.00

Undesired	Total IX	Unique IX, before		Unique IX, after	
K31MX-D D15 LD APP	3.0	13		0.0	0
K14PK-D D14 LD CP	1.0	0	1.0	0.0	0
K14QN-D D14 LD CP	2.0	13	2.0	0.0	0

Interference to BLCDT20110520ADO LIC scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	KXVA	D15	DT	LIC	ABILENE, TX	BLCDT20110520ADO	
Undesireds:	K31MX-D	D15	LD	APP	Lubbock, TX	K31MX-D Ch-15 SBB 15kW	252.9 km
	KMLM-DT	D15	DT	CP	ODESSA, TX	BLANK0000026954	256.4
	KVDA	D15	DT	CP	SAN ANTONIO, TX	BLANK0000034595	354.9
	KJTL	D15	DT	LIC	WICHITA FALLS, TX	BLCDT20090303ACS	228.5
	KSAN-TV	D16	DT	LIC	SAN ANGELO, TX	BLANK0000004868	107.9

Service area		Terrain-limited		IX-free, before		IX-free, after		Percent New IX	
15365.3	185,328	15303.0	185,136	15029.6	184,987	15029.6	184,987	0.00	0.00

Table 1 K31MX-D TVStudy Analysis of Proposal

Undesired		Total IX	Unique IX, before		Unique IX, after	
K31MX-D D15 LD APP	1.0	0			0.0	0
KMLM-DT D15 DT CP	1.0	0	0.0	0	0.0	0
KVDA D15 DT CP	4.0	1	2.0	1	2.0	1
KJTL D15 DT LIC	46.1	4	41.1	4	40.1	4
KSAN-TV D16 DT LIC	229.4	144	225.3	144	225.3	144

Interference to BLANK0000004834 LIC scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	KCIT	D15	DT	LIC	AMARILLO, TX	BLANK0000004834	
Undesireds:	K31MX-D	D15	LD	APP	Lubbock, TX	K31MX-D Ch-15 SBB 15kW	204.6 km
	KTBO-TV	D15	DT	LIC	OKLAHOMA CITY, OK	BLCDT20111028AAX	393.4
	KJTL	D15	DT	LIC	WICHITA FALLS, TX	BLCDT20090303ACS	309.6

Service area		Terrain-limited		IX-free, before		IX-free, after		Percent New IX	
41608.0	382,022	40991.5	381,591	40600.3	381,287	40248.9	380,634	0.87	0.17

Undesired		Total IX	Unique IX, before		Unique IX, after	
K31MX-D D15 LD APP	355.4	653			351.4	653
KTBO-TV D15 DT LIC	52.8	34	7.0	0	6.0	0
KJTL D15 DT LIC	384.2	304	338.4	270	337.4	270

Interference to BNPDTL20100323AIM CP scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	K15IP-D	D15	LD	CP	LAMESA, TX	BNPDTL20100323AIM	
Undesireds:	K31MX-D	D15	LD	APP	Lubbock, TX	K31MX-D Ch-15 SBB 15kW	76.6 km

Service area		Terrain-limited		IX-free, before		IX-free, after		Percent New IX	
1487.1	13,518	1459.1	13,510	1459.1	13,510	1457.1	13,510	0.14	0.00

Undesired		Total IX	Unique IX, before		Unique IX, after	
K31MX-D D15 LD APP	2.0	0			2.0	0

Interference to BLANK0000026954 CP scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	KMLM-DT	D15	DT	CP	ODESSA, TX	BLANK0000026954	
Undesireds:	K31MX-D	D15	LD	APP	Lubbock, TX	K31MX-D Ch-15 SBB 15kW	166.5 km
	KXVA	D15	DT	LIC	ABILENE, TX	BLCDT20110520ADO	256.4

Service area		Terrain-limited		IX-free, before		IX-free, after		Percent New IX	
9677.7	293,290	9628.2	293,286	9613.1	293,274	9605.0	293,274	0.08	0.00

Undesired		Total IX	Unique IX, before		Unique IX, after	
K31MX-D D15 LD APP	17.1	12			8.1	0
KXVA D15 DT LIC	15.1	12	15.1	12	6.0	0

Interference to BLCDT20090210AFA LIC scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	KPTB-DT	D16	DT	LIC	LUBBOCK, TX	BLCDT20090210AFA	
Undesireds:	K31MX-D	D15	LD	APP	Lubbock, TX	K31MX-D Ch-15 SBB 15kW	7.4 km
	KSAN-TV	D16	DT	LIC	SAN ANGELO, TX	BLANK0000004868	250.6

Service area		Terrain-limited		IX-free, before		IX-free, after		Percent New IX	
10635.5	323,726	10507.4	320,728	10235.9	318,146	10186.2	318,007	0.49	0.04

Undesired		Total IX	Unique IX, before		Unique IX, after	
K31MX-D D15 LD APP	51.8	139			49.8	139
KSAN-TV D16 DT LIC	271.5	2,582	271.5	2,582	269.5	2,582

Table 1 K31MX-D TVStudy Analysis of Proposal

Interference to proposal scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	K31MX-D	D15	LD	APP	Lubbock, TX	K31MX-D Ch-15 SBB 15kW	
Undesireds:	K14KO	N14-	TX	LIC	PORTALES, NM	BLTT20050927AHI	151.2 km
	KXVA	D15	DT	LIC	ABILENE, TX	BLCDT20110520ADO	252.9
	KCIT	D15	DT	LIC	AMARILLO, TX	BLANK0000004834	204.6
	K15IP-D	D15	LD	CP	LAMESA, TX	BNPDTL20100323AIM	76.6

Service area		Terrain-limited		IX-free		Percent IX	
8707.4	322,681	8658.8	322,679	8644.8	322,675	0.16	0.00

Undesired	Total IX		Unique IX		Prcnt Unique IX	
KXVA D15 DT LIC	1.0	0	1.0	0	0.01	0.00
KCIT D15 DT LIC	11.9	4	11.9	4	0.14	0.00
K15IP-D D15 LD CP	1.0	0	1.0	0	0.01	0.00

Channel and Facility Information

Section	Question	Response
Proposed Community of License	Facility ID	55054
	State	Texas
	City	Lubbock
	LPT Channel	15

Antenna Location Data

Section	Question	Response
Antenna Structure Registration	Do you have an FCC Antenna Structure Registration (ASR) Number?	Yes
	ASR Number	1248244
Coordinates (NAD83)	Latitude	33° 30' 08.3" N+
	Longitude	101° 52' 21.3" W-
	Structure Type	GTOWER-Guyed Structure Used for Communication Purposes
	Overall Structure Height	297.2 meters
	Support Structure Height	295.7 meters
	Ground Elevation (AMSL)	977.5 meters
Antenna Data	Height of Radiation Center Above Ground Level	271.3 meters
	Height of Radiation Center Above Mean Sea Level	1248.8 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:	RFS
	Model	SBB-16C160
	Rotation	0 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?	Yes
	Uploaded file for elevation antenna (or radiation) pattern data	RFS SBB-16C160 479 Ch-15_ELpat.xml
	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	0.957	**90**	0.508	**180**	0.418	**270**	0.995
10	0.918	**100**	0.594	**190**	0.529	**280**	0.999
20	0.857	**110**	0.656	**200**	0.650	**290**	1.000
30	0.771	**120**	0.676	**210**	0.760	**300**	0.999
40	0.667	**130**	0.649	**220**	0.846	**310**	0.999
50	0.556	**140**	0.579	**230**	0.908	**320**	0.998
60	0.459	**150**	0.483	**240**	0.947	**330**	0.996
70	0.408	**160**	0.393	**250**	0.971	**340**	0.991
80	0.431	**170**	0.362	**260**	0.986	**350**	0.979

Additional Azimuths

Degree	V_A