

ENGINEERING EXHIBIT

Digital Television Station Application for Minor Modification of Construction Permit

prepared for

Ramar Communications, Inc.

KRTN-TV Durango, CO

Facility ID 82613

Ch. 33 32 kW 83 m

Ramar Communications, Inc. (“*Ramar*”) is the licensee of digital television station KRTN-TV, Channel 33, Facility ID 82613, Durango CO. KRTN-TV is licensed (file# BLCDDT-20081029AAA) to operate with 50 kW effective radiated power (“ERP”) with a directional antenna at 122 meters height above average terrain (“HAAT”). A Construction Permit (“CP” file# 0000063327 authorizes KRTN-TV to relocate 0.32 km and operate with an ERP of 30 kW directional and 83 meters antenna HAAT. *Ramar* proposes herein to utilize a different directional antenna pattern and increase the ERP to 32 kW while maintaining the same site location and antenna height currently authorized in the CP.

The currently authorized antenna is a horizontally polarized directional RFS model RD8S. *Ramar* has installed the new antenna at the authorized site location, however it has been determined that the actual antenna is an RFS model RD-08SK. The RD-08SK antenna’s directional pattern has the same general shape but is narrower than the authorized RD8S directional pattern. Therefore, *Ramar* seeks a minor modification of the CP to specify the actual antenna, RFS model RD-08SK. The proposed ERP is increased to 32 kW, as established by the final system’s gain and available transmitter capacity.

The RFS model RD-08SK directional antenna’s azimuthal pattern is depicted in Figure 1 and the elevation pattern is provided in Figures 2 and 2A. The antenna has been side-mounted on an existing tower structure. The overall structure elevation is less than 61 meters above ground and passes the FCC’s TOWAIR program for the transmitter location, thus FCC antenna structure registration is not necessary. No change to the overall structure height resulted from the antenna installation.

Figure 3 supplies a map that demonstrates compliance with §73.625(a)(1) regarding coverage of the entire principal community. The proposed facility's predicted population exceeds 95 percent of the baseline facility's population as described in the *Incentive Auction Closing and Channel Reassignment Public Notice* ("CCRPN", DA 17-317, released April 13, 2017).

As with the presently authorized facility, the proposed KRTN-TV noise limited service contour ("NLSC") extends beyond that of the CCRPN facility along some azimuths. Interference study per FCC OET Bulletin 69¹ shows that the proposal complies with the 0.5 percent limit of new interference caused to pertinent nearby full service and Class A television stations as required by §73.616. The interference study output report is provided as Table 1.

The narrower directional antenna pattern results in a reduction of area covered by the currently authorized KRTN-TV NLSC. Figure 4 provides a coverage contour comparison map regarding the authorized and proposed KRTN-TV operation. Due to the narrower directional antenna pattern, two sliver-shaped areas of NLSC loss are created and are shaded yellow on Figure 4.

Terrain-limited coverage predictions are also provided on Figure 4. Here, the FCC's TVStudy computer program was used to determine terrain-limited coverage predictions at locations beyond the KRTN-TV proposed NLSC. The study area was set using the "fixed geography" option to match the KRTN-TV authorized NLSC. Owing to the relatively small service area and considerable terrain features in the area, a study cell size of 1.0 km and profile point spacing of 0.1 km were employed. The analysis included examination of each cell that is located beyond the proposed NLSC but within the authorized facility's NLSC. Cells in this region were counted as lost service if they are predicted to have terrain-limited service from the authorized KRTN-TV facility and not from the proposed KRTN-TV. While there are some cells in the NLSC loss region that would lose terrain-limited service from KRTN-TV, those cells are unpopulated.

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 0.1 km terrain profile increment. Comparisons of various results of this computer program (run on a Mac processor) to the FCC's implementation of TVStudy show excellent correlation.

Therefore, this analysis shows that there would be no loss of terrain-limited service population at locations beyond the proposed KRTN-TV NLSC that are within the authorized KRTN-TV NLSC.

Additionally, TVStudy analysis² shows that the net interference-free service population is increased when compared to the currently authorized KRTN-TV facility. As authorized by the current CP, the KRTN-TV interference-free service population is 65,306 persons. As proposed herein, the KRTN-TV interference-free service population increases by 4,425 persons to reach a total of 69,731 persons.

Human Exposure to Radiofrequency Electromagnetic Field (Environmental)

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 the antenna relative field in downward elevations, the graph in Figure 5 depicts calculated power density levels attributable to the proposed facility at locations near the site at a height of two meters above ground level. The maximum calculated RF electromagnetic field attributable to the proposed facility is 9.3 percent of the general population / uncontrolled maximum permissible exposure ("MPE") limit and 1.9 percent of the occupational / controlled MPE limit at any location two meters above ground level, which occurs within 25 meters of the site location.

The proposed KRTN-TV transmitting location is on Smelter Mountain overlooking Durango. There are several other broadcast transmitting facilities at this site area. To accurately consider the impact of all other facilities and the terrain variations, *Ramar* will conduct post-construction RF exposure measurements to evaluate the level of RF exposure resulting from the proposed KRTN-TV facility. As necessary, based on these results and considering all emitters, appropriate exposure abatement procedures will be established and followed, in order to comply with the FCC's exposure limits. Such abatement procedures may involve the restriction of access to certain areas and/or facility modifications to reduce RF levels.

²TVStudy analysis with 1 km cell size and 0.1 km terrain profile increment.

Considering the post-construction measurement and an appropriate abatement program, the general public and workers will not be exposed to RF levels attributable to the proposal in excess of the FCC's guidelines. RF exposure warning signs will be posted. With respect to worker safety, authorized personnel will be trained and/or supervised as necessary for access to any "controlled" areas. *Ramar* 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.

List of Attachments

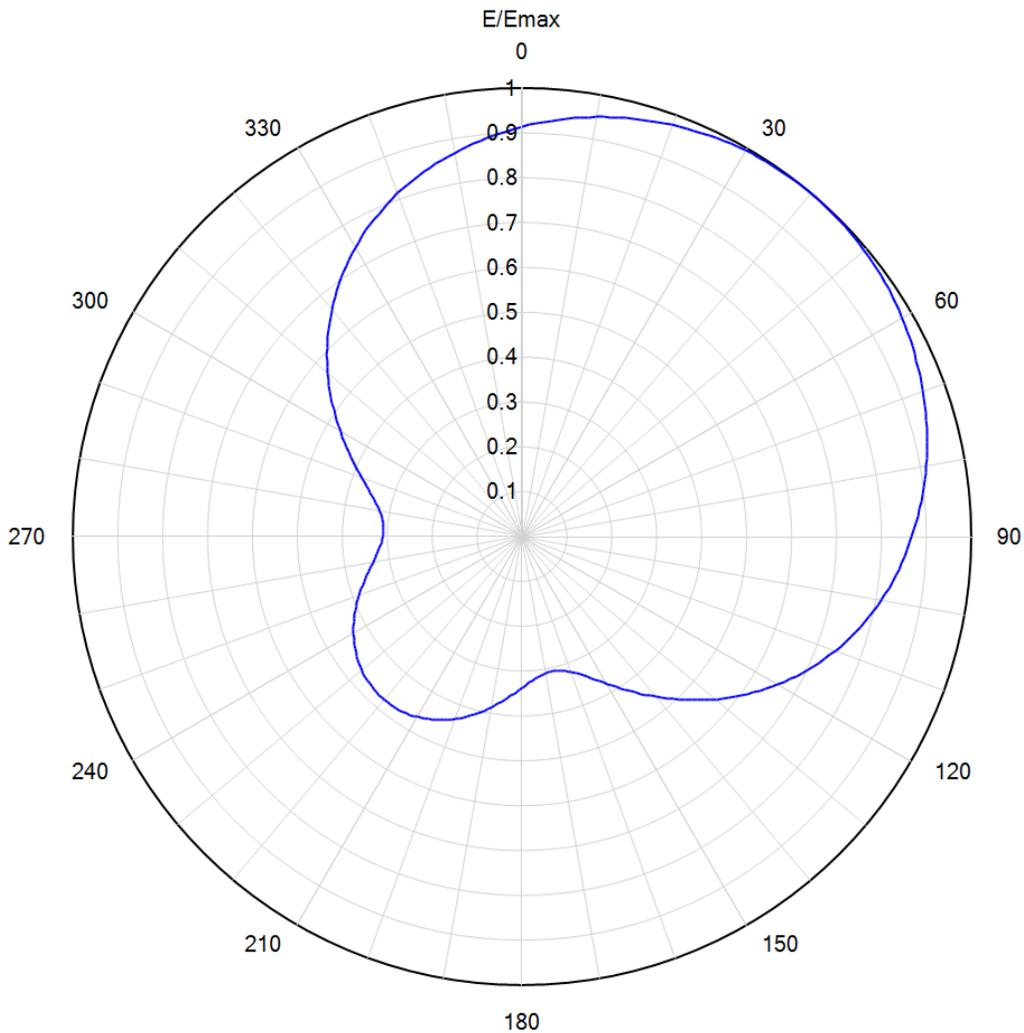
Figure 1	Antenna Azimuthal Pattern
Figure 2, 2A	Antenna Elevation Pattern
Figure 3	Proposed Coverage Contours
Figure 4	Loss Area Analysis
Figure 5	Calculated RF Electromagnetic Field
Table 1	TVStudy Analysis of Proposal
Form 2100	Saved Version of Engineering Sections from FCC Form at Time of Upload

Chesapeake RF Consultants, LLC

Joseph M. Davis, P.E. June 29, 2021
207 Old Dominion Road Yorktown, VA 23692 703-650-9600



Azimuth Pattern



Model: RD-08SK-500620-L1S
Location: Durango, CO
Customer: Ramar Communications
Date: July 18, 2019
Rotation Angle: 40 degrees

Polarization: Horizontal
Frequency: 587.00 MHz
Directivity: 2.2 (3.39 dB)
Elevation Angle: 1.50 degrees
Horizontal Unit Pattern:

Note: Pattern Tolerance +/-5% of Emax



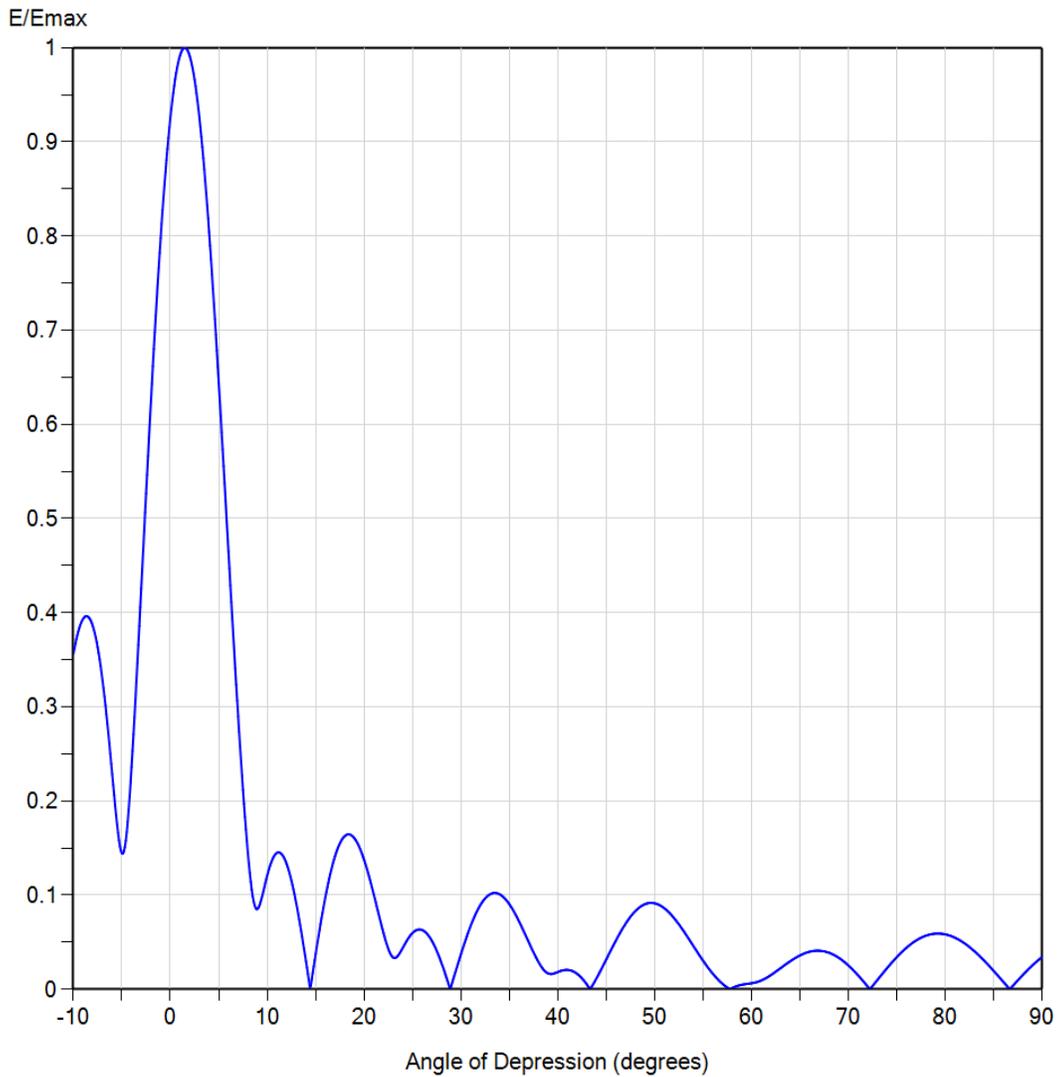
Figure 1
Antenna Azimuthal Pattern
KRTN-TV Durango, CO
Facility ID 82613
Ch. 33 32 kW 83 m

prepared for
Ramar Communications, Inc.

June, 2021



Elevation Pattern



Model: RD-08SK-500620-L1S
Polarization: Horizontal
Location: Durango, CO
Customer: Ramar Communications
Date: July 18, 2019

Frequency: 587.00 MHz
Directivity (Main Lobe): 9.3 (9.69 dBd)
Directivity (At Horizon): 8.0 (9.02 dBd)
Beam Tilt: 1.50 degrees
Azimuth Angle: 40 degrees



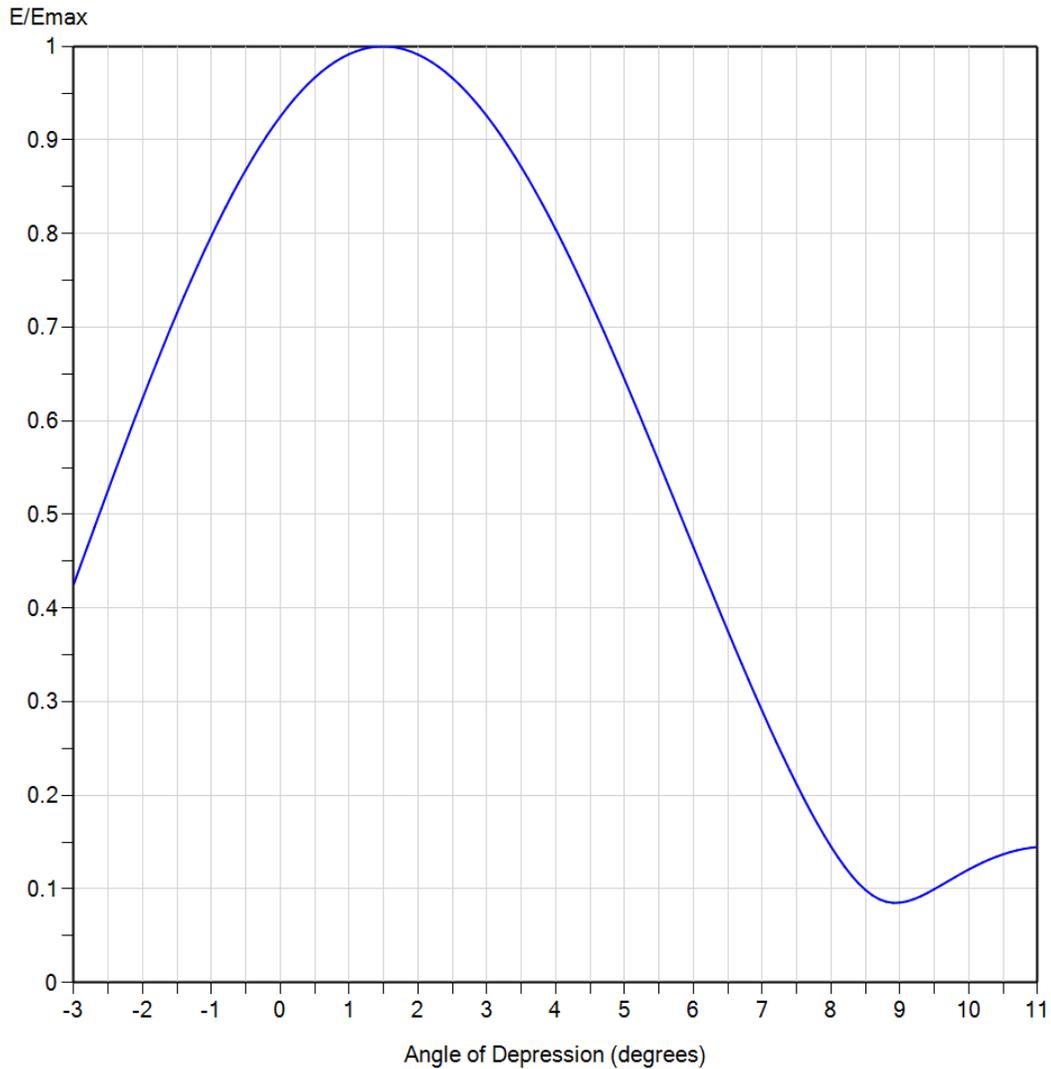
Figure 2
Antenna Elevation Pattern
KRTN-TV Durango, CO
Facility ID 82613
Ch. 33 32 kW 83 m

prepared for
Ramar Communications, Inc.

June, 2021



Elevation Pattern



Model: RD-08SK-500620-L1S
Polarization: Horizontal
Location: Durango, CO
Customer: Ramar Communications
Date: July 18, 2019

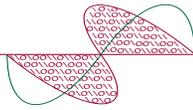
Frequency: 587.00 MHz
Directivity (Main Lobe): 9.3 (9.69 dBd)
Directivity (At Horizon): 8.0 (9.02 dBd)
Beam Tilt: 1.50 degrees
Azimuth Angle: 40 degrees



**Figure 2A - Detail
Antenna Elevation Pattern
KRTN-TV Durango, CO
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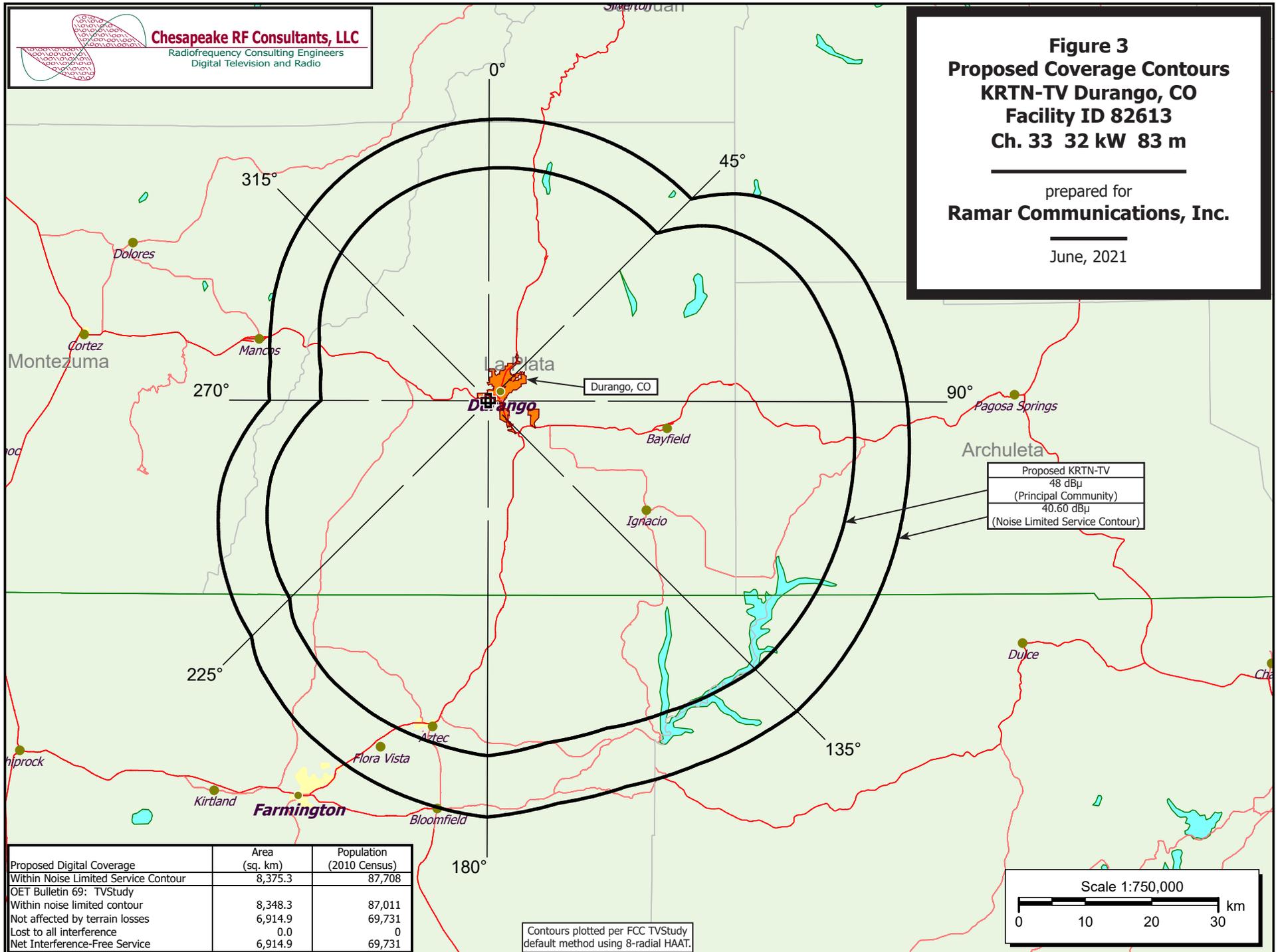


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 Digital Television and Radio

Figure 3
Proposed Coverage Contours
KRTN-TV Durango, CO
Facility ID 82613
Ch. 33 32 kW 83 m

prepared for
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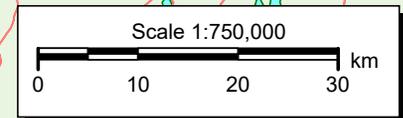
June, 2021

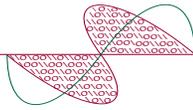


Proposed KRTN-TV
48 dBμ
(Principal Community)
40.60 dBμ
(Noise Limited Service Contour)

Proposed Digital Coverage	Area (sq. km)	Population (2010 Census)
Within Noise Limited Service Contour	8,375.3	87,708
OET Bulletin 69: TVStudy		
Within noise limited contour	8,348.3	87,011
Not affected by terrain losses	6,914.9	69,731
Lost to all interference	0.0	0
Net Interference-Free Service	6,914.9	69,731

Contours plotted per FCC TVStudy default method using 8-radial HAAT.



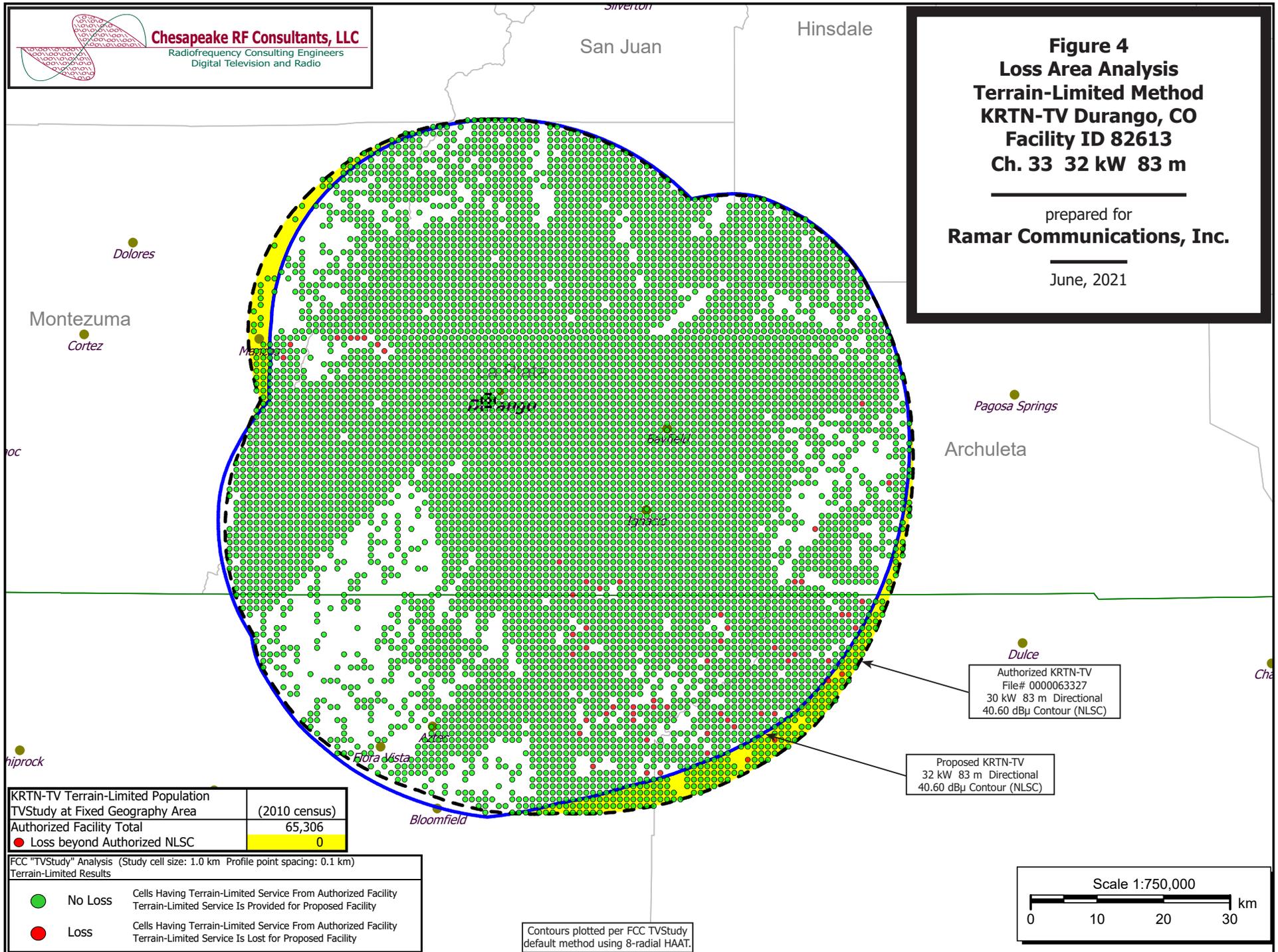


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Figure 4
Loss Area Analysis
Terrain-Limited Method
KRTN-TV Durango, CO
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June, 2021



KRTN-TV Terrain-Limited Population	(2010 census)
TVStudy at Fixed Geography Area	65,306
Authorized Facility Total	0
● Loss beyond Authorized NLSC	

FCC "TVStudy" Analysis (Study cell size: 1.0 km Profile point spacing: 0.1 km)
 Terrain-Limited Results

● No Loss	Cells Having Terrain-Limited Service From Authorized Facility Terrain-Limited Service Is Provided for Proposed Facility
● Loss	Cells Having Terrain-Limited Service From Authorized Facility Terrain-Limited Service Is Lost for Proposed Facility

Authorized KRTN-TV
 File# 0000063327
 30 kW 83 m Directional
 40.60 dBμ Contour (NLSC)

Proposed KRTN-TV
 32 kW 83 m Directional
 40.60 dBμ Contour (NLSC)

Contours plotted per FCC TVStudy
 default method using 8-radial HAAT.

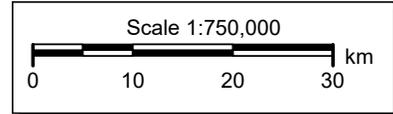




Figure 5
Calculated RF Electromagnetic Field
KRTN-TV Durango, CO
Facility ID 82613
Ch. 33 32 kW 83 m

prepared for
Ramar Communications, Inc.

June, 2021

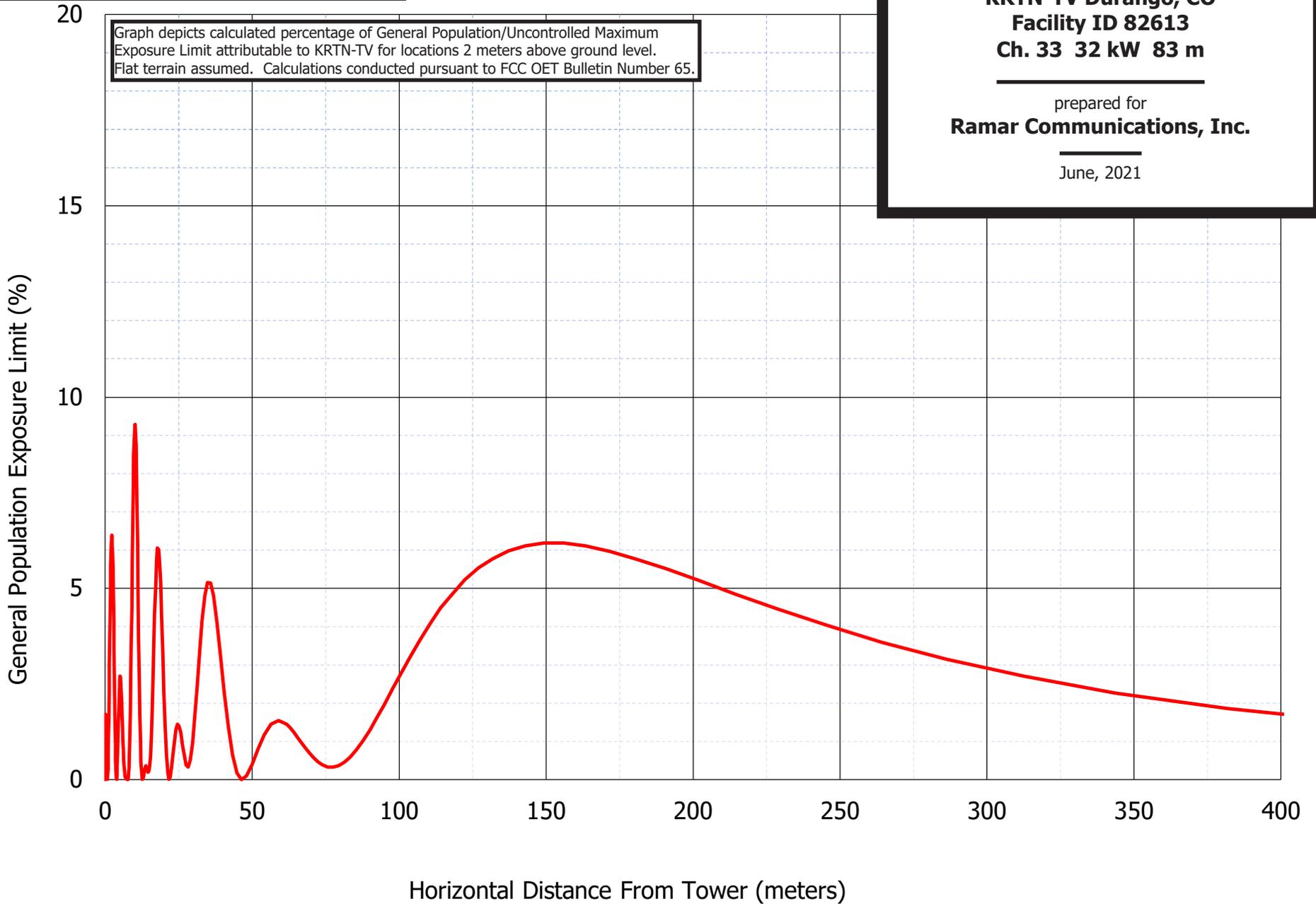


Table 1 KRTN-TV TVStudy Analysis of Proposal
(page 1 of 2)



tvstudy v2.2.5 (4uoc83)
Database: localhost, Study: KRTN-TV prop CP-Mod 1.0-0.1, Model: Longley-Rice
Start: 2021.06.29 12:17:36

Study created: 2021.06.29 12:17:36

Study build station data: LMS TV 2021-06-29

Proposal: KRTN-TV D33 DT APP DURANGO, CO
File number: KRTN-TV prop CP-Mod
Facility ID: 82613
Station data: User record
Record ID: 3738
Country: U.S.
Zone: II

Search options:
Baseline record excluded if station has CP

Stations potentially affected by proposal:

IX No	Call	Chan	Svc	Status	City, State	File Number	Distance
	KRMA-TV	D33	DT	LIC	DENVER, CO	BLANK0000073966	355.1 km

No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

Channel: D33
Latitude: 37 15 46.00 N (NAD83)
Longitude: 107 54 0.20 W
Height AMSL: 2361.9 m
HAAT: 82.5 m
Peak ERP: 32.0 kW
Antenna: RFS RD-08SK 0.0 deg
Elev Pattn: Generic
Elec Tilt: 1.50

40.6 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	26.7 kW	-115.2 m	42.1 km
45.0	31.8	-27.8	42.8
90.0	24.1	181.7	62.7
135.0	8.52	309.2	65.8
180.0	3.63	330.9	62.4
225.0	7.08	94.6	50.1
270.0	3.06	18.3	32.9
315.0	12.0	-131.7	38.7

Database HAAT does not agree with computed HAAT
Database HAAT: 82 m Computed HAAT: 83 m

Distance to Canadian border: 1304.6 km

Distance to Mexican border: 609.0 km

Conditions at FCC monitoring station: Douglas AZ
Bearing: 194.6 degrees Distance: 660.3 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:
Bearing: 35.1 degrees Distance: 391.7 km

Study cell size: 1.00 km
Profile point spacing: 0.10 km

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

Table 1 KRTN-TV TVStudy Analysis of Proposal
 (page 2 of 2)



 Interference to proposal scenario 1

Desired:	Call	Chan	Svc	Status	City, State	File Number	Distance
	KRTN-TV	D33	DT	APP	DURANGO, CO	KRTN-TV prop CP-Mod	
	Service area		Terrain-limited			IX-free	Percent IX
8348.3	87,011	6914.9	69,731	6914.9	69,731	0.00	0.00

Channel and Facility Information

Section	Question	Response
Proposed Community of License	Facility ID	82613
	State	Colorado
	City	DURANGO
	DTV Channel	33
	Designated Market Area	Albuquerque-Santa Fe
Facility Type	Facility Type	Commercial
	Station Type	Main
Zone	Zone	2

Antenna Location Data

Section	Question	Response
Antenna Structure Registration	Do you have an FCC Antenna Structure Registration (ASR) Number?	No
	ASR Number	
Coordinates (NAD83)	Latitude	37° 15' 46.0" N+
	Longitude	107° 54' 00.2" W-
	Structure Type	LTOWER-Lattice Tower
	Overall Structure Height	57 meters
	Support Structure Height	57 meters
	Ground Elevation (AMSL)	2347.9 meters
Antenna Data	Height of Radiation Center Above Ground Level	14 meters
	Height of Radiation Center Above Average Terrain	82.5 meters
	Height of Radiation Center Above Mean Sea Level	2361.9 meters
	Effective Radiated Power	32 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	RD-08SK
	Rotation	0 degrees
	Electrical Beam Tilt	1.5
	Mechanical Beam Tilt	Not Applicable
	toward azimuth	
	Polarization	Horizontal
DTV and DTS: Elevation 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	

Directional Antenna Relative Field Values (Pre-rotated Pattern)

Degree	Value	Degree	Value	Degree	Value	Degree	Value
0	0.914	90	0.868	180	0.337	270	0.309
10	0.950	100	0.813	190	0.386	280	0.322
20	0.976	110	0.743	200	0.433	290	0.380
30	0.994	120	0.659	210	0.465	300	0.467
40	1.000	130	0.565	220	0.476	310	0.565
50	0.994	140	0.467	230	0.465	320	0.659
60	0.976	150	0.380	240	0.433	330	0.743
70	0.950	160	0.322	250	0.386	340	0.813
80	0.914	170	0.309	260	0.337	350	0.868

Additional Azimuths

Degree	V _A
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**Construction
Permit
Certifications**

Section	Question	Response
<p>Post-Incentive Auction Expedited Processing</p>	<p>It will operate on the DTV channel for this station as established in the post-incentive auction channel reassignment public notice.</p>	<p>Yes</p>
	<p>It will operate post-incentive auction facilities that do not expand the noise-limited service contour in any direction beyond that established by the post-incentive auction channel reassignment public notice.</p>	<p>No</p>
	<p>It will operate post-incentive auction facilities that match or reduce by no more than five percent with respect to predicted population from those defined in the post-incentive auction channel reassignment public notice.</p>	<p>Yes</p>
	<p>The antenna structure to be used by this facility has been registered by the Commission and will not require re-registration to support the proposed antenna, OR the FAA has previously determined that the proposed structure will not adversely affect safety in air navigation and this structure qualifies for later registration under the Commission's phased registration plan, OR the proposed installation on this structure does not require notification to the FAA pursuant to 47 C.F.R. Section 17.7.</p>	<p>Yes</p>
<p>Environmental Effect</p>	<p>Would a Commission grant of Authorization for this location be an action which may have a significant environmental effect? (See 47 C.F.R. Section 1.1306)</p>	<p>No</p>
<p>Broadcast Facility</p>	<p>The proposed facility complies with the applicable engineering standards and assignment requirements of 47 C. F.R. Sections 73.616, 73.622(i), 73.623(e), 73.625, 73.1030, and 73.1125.</p>	<p>Yes</p>