

ENGINEERING STATEMENT  
ON BEHALF OF  
THE BOARD OF REGENTS OF THE  
MONTANA UNIVERSITY SYSTEM  
IN SUPPORT OF MODIFICATION OF CONSTRUCTION  
PERMIT (FCC FILE NO. 0000025189) TO  
INCREASE EFFECTIVE RADIATED POWER FOR  
KUKL-TV KALISPELL, MONTANA  
CHANNEL 15 27.6 KW (MAX) ERP 830 METERS HAAT  
OCTOBER 2017

COHEN, DIPPELL AND EVERIST, P.C.  
CONSULTING ENGINEERS  
RADIO AND TELEVISION  
WASHINGTON, D.C.

COHEN, DIPPELL AND EVERIST, P. C.

City of Washington              )  
                                        )  
                                        ) ss  
District of Columbia              )

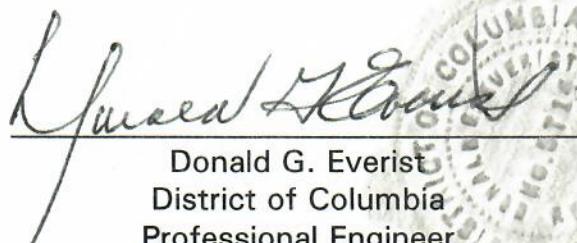
Donald G. Everist, being duly sworn upon his oath, deposes and states that:

He is a graduate electrical engineer, a Registered Professional Engineer in the District of Columbia, and is President, Secretary and Treasurer of Cohen, Dippell and Everist, P.C., Consulting Engineers, Radio - Television, with offices at 1420 N Street, N.W., Suite One, Washington, D.C. 20005;

That his qualifications are a matter of record in the Federal Communications Commission;

That the attached engineering report was prepared by him or under his supervision and direction and

That the facts stated herein are true of his own knowledge, except such facts as are stated to be on information and belief, and as to such facts he believes them to be true.

  
\_\_\_\_\_  
Donald G. Everist  
District of Columbia  
Professional Engineer  
Registration No. 5714  


Subscribed and sworn to before me this 23<sup>rd</sup> day of October, 2017.



  
\_\_\_\_\_  
Carolyn L. Lyons  
Notary Public

My Commission Expires: 2/28/2018

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KUKL-TV (CH.15), KALISPELL, MONTANA

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This engineering statement has been prepared on behalf of The Board of Regents of the Montana University System (“MUS”). The purpose of this engineering statement is to support its application for a permit to construct new digital television (“DTV”) facilities on Channel 15 to serve the community of Kalispell, Montana, and the surrounding area. This application is a modification of the outstanding construction permit (FCC File No. 0000025189) and proposes an increase in ERP for the channel assigned in the Incentive Auction.

Channel 15 will continue as a noncommercial educational broadcast station to serve Kalispell, Montana.

MUS proposes to construct and to operate a noncommercial educational broadcast station on DTV Channel 15 with an average effective radiated power (“ERP”) of 27.6 kW maximum directional (elliptical polarization) and a height above average terrain (“HAAT”) of 830 meters (2723 feet).

KCFW-TV Tower

MUS has an agreement with the current tower owner, Bluestone License Holdings, Inc., licensee of KCFW-TV (“KCFW”) to change the DTV antenna. The proposed new DTV antenna will be exchanged for the existing side-mounted antenna, therefore, the overall structure height will remain unchanged. The transmitter site is located in a very rural area on Blacktail Mountain near Lakeside, Montana. The Antenna Structure Registration No. is 1000780. Exhibit E-1 shows a vertical sketch of the tower.

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KUKL-TV (CH.15), KALISPELL, MONTANA

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The geographic coordinates of the existing tower are:

North Latitude: 48° 00' 48.2"

West Longitude: 114° 21' 54.5"

NAD 27

North Latitude: 48° 00' 48"

West Longitude: 114° 21' 58"

NAD 83

Equipment Data

Antenna: ERI, Type ETU-2U2-ESC1-15 (or equivalent) elliptically polarized directional antenna with 0.5° electrical beam tilt. The azimuth and vertical plane patterns and other exhibits required by Section 73.625(c) are included in Exhibit E-2.

Transmission Line: 175 feet (53.3 m) of Andrew, Heliax, Type HJ7-50 1-5/8" 50 ohm air dielectric line (or equivalent) with an attenuation of 0.466 dB/100 ft.

Power Data

Transmitter output ("TPO"):	2.0 kW	3.01 dBk
At filter output		

Transmission Line Efficiency/(Loss):	82.9%	(-0.816 dB)
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Input power to the antenna:	1.658 kW	2.196 dB
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Antenna power gain maximum:	Horizontal 16.67	12.22 dB
	Vertical 5.00	6.99 dB

Effective Radiated Power (ERP)

Maximum, Main Lobe:	Horizontal 27.6 kW	14.416 dBk
	Vertical 8.29 kW	9.186 dBk

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Elevation Data  
(unchanged)

Vertical dimension of Channel 15 side-mounted antenna	2.4 meters 7.9 feet
Elevation of site above mean sea level	2035.8 meters 6679.1 feet
Overall height above ground of existing tower structure and appurtenances (including lightning protection)	73.1 meters 239.8 feet
Overall height above mean sea level of existing tower and appurtenances (including lightning protection)	2108.8 meters 6918.6 feet
Center of radiation of Channel 15 antenna above ground	47.2 meters 154.8 feet
Center of radiation of Channel 15 antenna above mean sea level	2083 meters 6833.9 feet
Antenna height above average terrain	830 meters 2723 feet

NOTE: Slight height differences result due to conversion to metric.

Interference Analysis

A study of predicted interference caused by the proposed KUKL operation on Channel 15 digital operation has been performed using the Longley-Rice program for which the source data has been posted by the Commission on its website at <http://www.fcc.gov/oet/tvstudy>. Comparison of service/interference areas and population indicates this model closely matches the FCC's digital TVStudy 2.2 evaluation program. Best efforts have been made to use data and calculation identical to the FCC's program. The model employs the Longley-Rice propagation methodology and

evaluates in grid cells of approximately 1 sq. km. Using one-second terrain data sampled approximately every 1.0 km at one-degree azimuth intervals with 2010 census centroids, all studies are based upon data in the Commission's current Licensing and Management System ("LMS") database update of the FCC's engineering database. Exhibit E-3 provides the allocation analysis results.

Coverage

The average elevation data for 3.2 to 16.1 km along each radial have been determined from the USGS one-second terrain data base. The F(50,90) 48dBu and 38.8 dBu (dipole adjusted 41 dBu) DTV coverage contours have been computed from reference to the propagation data curves for Channels 14-69, as published by the FCC in Figure 10b and Figure 10c, Section 73.699 of the FCC Rules and Regulations. Utilizing the formula in Section 73.625(b)(2) of the Rules for the effective heights, it is found that the depression angle,  $A_h$ , varies from 0.61 to 0.92 degrees. Since the relative vertical field of the antenna pattern is greater than 90% of the maximum at these depression angles, the maximum power was used in determining the distance to the DTV contours.

Table I includes at every 10° in azimuth beginning with True North, the average elevation from 3.2 to 16.1 km, and the distances to the 41 dBu and 38.8 dBu F(50,90) coverage contours. The antenna height above average terrain is based on the eight cardinal radials. Exhibit E-4 shows that the predicted 48 dBu F(50,90) coverage contour encompasses the community of license. Exhibit E-4 also provides the proposed 38.8 dBu F(50,90) coverage contour.

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RF Safety-FCC Rule, Section 1.1307 of the FCC Rules

Pursuant to OET Bulletin No. 65 dated August 1997, non-broadcast stations are all exempt from RFF evaluations.

The RFF contribution of the proposed KUKL-TV operation will be calculated using the following formula:

$$S = \frac{33.4(F^2) \text{ Total ERP}}{R^2}$$

where:

S = power density in  $\mu\text{W}/\text{cm}^2$

F = relative field factor

Total ERP = ERP Horizontal Polarization + ERP Vertical Polarization

R = RCAGL - 2 meters

ERP = RMS ERP in watts for DTV Stations

There are no AM stations within 3.22 km of the existing tower site. There are two FM stations, KLKM(FM) and KALS(FM) operating on the tower. In addition digital television facilities, KCFW-TV and KAJJ-CD are operating from this tower. According to CDBS, there are no other broadcast stations operating within 100 meters of the site.

No adverse technical effect is anticipated by the substituted DTV operation to any other FCC licensed facility. If required, the licensee will install filters or take other measures as necessary to resolve the problem.

The radio frequency field ("RFF") contribution of the proposed operation operates is as follows.

Based on the elevation pattern from the manufacturer's antenna data, a maximum downward field of 0.220 in the range of 20° to 90° would create a maximum field level of 28.4  $\mu\text{W}/\text{cm}^2$  in the vicinity of the base of the tower.

The limit for an uncontrolled environment is 319  $\mu\text{W}/\text{cm}^2$  and for a controlled environment is 1597  $\mu\text{W}/\text{cm}^2$  for the UHF Channel 15.

**The proposed operation contributes less than nine percent RFF level for an uncontrolled environment two meters above the ground at the proposed site or approximately two percent RFF level for a controlled environment two meters above ground at the existing site.**

The licensee indicates that access to the site is approximately 10 miles on an unimproved road from a main highway. The unimproved road is not regularly traveled. A gate prevents vehicle access. Therefore, it is believed this site qualifies under Situation B of OET Bulletin 65 as discussed below:

From Pages 77 and 78, guidance for such a situation is provided from the FCC publication entitled, "*Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields, OET Bulletin 65, Edition 97-01, August 1997*", "*Appendix B, Summary of 1986 Mass Media Bureau, Public Notice on RF Compliance*".

A portion is abstracted as follows:

Situations

(B) High RF levels are produced at ground level in a remote area not likely to be visited by the public.

- If the area of concern is marked by appropriate warning signs, an applicant may assume that there is no significant effect on the human environment with regard to exposure of the general public. It is recommended that fences also be used where feasible.

Therefore, members of the public and personnel working around the existing tower site would not be exposed to RFF levels exceeding the FCC standards. With respect to work performed on the tower, the licensee will establish procedure to ensure for the proposed facility that workers are not exposed to RFF levels above those prescribed by FCC, by reducing or turning off the power, as appropriate.

Although the proposed RFF contribution will be far less than 5% for controlled environment, if the application is granted and prior to construction, MUS represents that it will attempt to create a comprehensive RF safety plan, if necessary, with the buyer of this site for the site's compliance with the Commission's RF safety rules.

The tower site is located inside a chain link fence with a locked gate to prevent unauthorized access to the tower.

#### Environmental Assessment

An environmental assessment ("EA") is categorically excluded under Section 1.1306 of the FCC Rules and Regulations as the tower was constructed prior to the requirements specified in WT Docket No. 03-128 and the licensee indicates that:

- (a)(1) The existing tower is not located in an officially designated wilderness area.
- (a)(2) The existing tower is not located in an officially designated wildlife preserve.
- (a)(3) The proposed facilities will not affect any listed threatened or endangered species or habitats.

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- (a)(3)(ii) The proposed facilities will not jeopardize the continued existence of any proposed endangered or threatened species or likely to result in the destruction or adverse modification of proposed critical habitats.
- (a)(4) The proposed facilities located on a tower which was built prior to the adoption of WT Docket No. 03-128 and is grandfathered and has not affected any known districts, sites, buildings, structures, or objects significant in American history, architecture, archaeology, engineering, or culture.
- (a)(5) The existing tower is not located near any known Indian religious sites.
- (a)(6) The existing tower is not located in a flood plain.
- (a)(7) The addition of a new side-mounted DTV antenna on an existing guyed tower will not involve a significant change in surface features of the ground in the vicinity of the tower.
- (a)(8) It is not proposed to equip the tower with high intensity white lights unless required by the FAA.
- (b) Workers and the general public on the ground will not be subjected to RFF levels in excess of the current FCC guidelines contained in OET Bulletin No. 65, Edition 97-01, dated August 1997 and Supplement A.

ABOVE MEAN SEA LEVEL

ABOVE GROUND

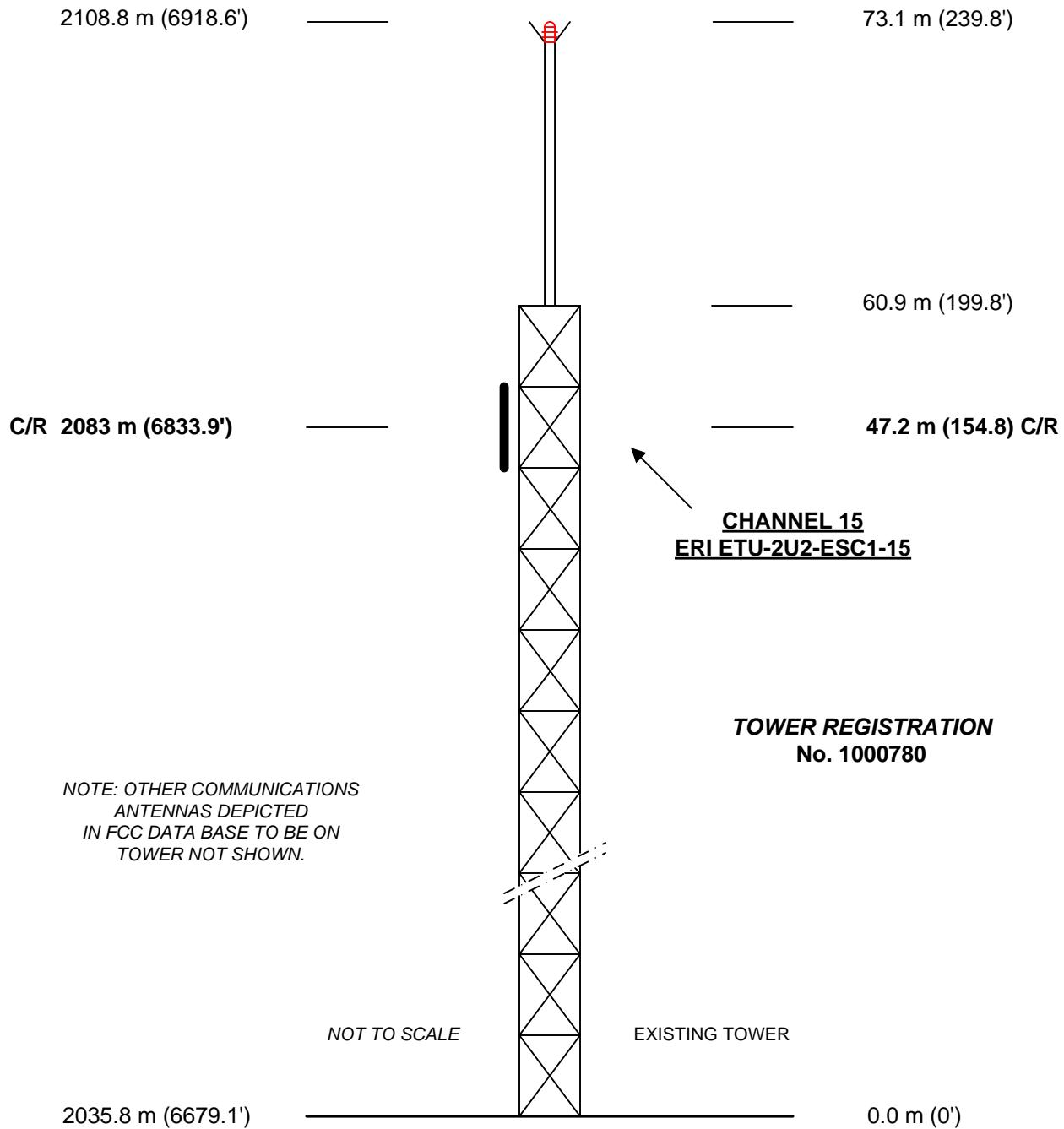


EXHIBIT E - 1  
VERTICAL SKETCH  
FOR THE REPACKED OPERATION OF  
**KUKL-TV, KALISPELL, MONTANA**  
CHANNEL 15 27.6 kW MAX ERP 830 METERS HAAT  
OCTOBER 2017

EXHIBIT E-2  
ANTENNA MANUFACTURER DATA

# **Preliminary Specification for ETU Series Side Mounted UHF Elliptically Polarized Panel Television Antenna**

**KUKL (DT), RF Channel 15  
Montana State University, Kalispell, MT**

**May 15, 2017**

**Antenna Model:  
ETU-2U2-ESC1-15**

**Specification Number  
20170501-282**

Electronics Research, Inc. 7777 Gardner Road Chandler IN 47610-9219 USA  
+1 812 925-6000 (tel) +1 812 925-4030 (fax)

Your Single Source for Broadcast Solutions™ Call Toll-free at 877 ERI-LINE Visit Online at [www.eriinc.com](http://www.eriinc.com)

**Preliminary Specification for  
ETU Series Side Mounted  
UHF Elliptically Polarized  
Panel Television Antenna**

**Electrical Characteristics:**

<b>Channel:</b>	15		
<b>Frequency:</b>	476 MHz to 482 MHz		
<b>Service:</b>	ATSC		
<b>Azimuth Pattern Number:</b>	Horizontal Polarization	ETU-2PC1-H	
	Vertical Polarization	ETU-2PC1-V	
<b>Elevation Pattern Number:</b>	Horizontal Polarization	ETU-2U2-H	
	Vertical Polarization	ETU-2U2-V	
<b>Azimuth Directivity:</b>	Horizontal Polarization	2.50	(3.98 dB)
	Vertical Polarization	2.50	(3.98 dB)
<b>Elevation Directivity:</b>	Horizontal Polarization	8.67	(9.38 dBD)
	Vertical Polarization	8.67	(9.38 dBD)
<b>Peak Power Gain:</b>	Horizontal Polarization	16.67	(12.22 dBD)
	Vertical Polarization	5.00	(6.99 dBD)
<b>Gain at Horizontal:</b>	Horizontal Polarization	16.38	(12.14 dBD)
	Vertical Polarization	4.91	(6.91 dBD)
<b>Vertical/Horizontal Ratio:</b>	0.30		
<b>Electrical Beam Tilt:</b>	0.50 Degrees		
 <b>RF Input:</b>	1-5/8-inch EIA flange male		
<b>Input Power Rating (maximum):</b>	kW Average Power, 8VSB		
<b>Antenna VSWR (maximum):</b>	1.10 Over 6 MHz Channel		

**Preliminary Specification for  
ETU Series Side Mounted  
UHF Elliptically Polarized  
Panel Television Antenna**

**Mechanical Characteristics:**

Mounting Configuration: (*Tower interface supplied by others)	Side Mount*		
Height of Antenna:	7.9 feet	(2.4 meters)	
Height of Center of Radiation:	3.9 feet	(1.2 meters)	
Deicing:	Unpressurized element radome		
Radome Height:	9.8 inches	(250 millimeters)	
Radome Color:	Aviation Orange		
Climbing Device:	Not Applicable		
Calculated Weight <sup>1</sup> :	No Ice	420.0 lbm	(190.5 kg)
Windload Data <sup>2</sup> :	EPA No Ice	46.0 sq.ft.	(4.3 sq.m.)

This antenna is designed to be supported by a structure that can resist the antenna base reactions and which provides a support that is rigid in the three translational and three rotational degrees of freedom.

1 Please note, the listed weights and effective wind areas are based on the PRELIMINARY design of the antenna. Final As-Built values for the antenna are typically within +/-10% of the Preliminary design values, and will be provided in the technical manual that accompanies the antenna. Specified loads include the antenna, beacon and lightning spurs only. Custom mounting brackets/adapters and/or antenna input section are NOT included.

2 Loads calculated in accordance with the ANSI/TIA-222 standard.

**NOTE: The purchaser or their representative shall be required to contact the tower owner, state and/or local building officials for specific design requirements and suitable parameters for a particular structure. Any variation from the parameters shown above must be communicated to ERI for comprehensive assessment.**

**Broadcast Antenna System**  
**Power Analysis**

**KUKL (DT)**

**RF Channel: 15**

**Montana State University**

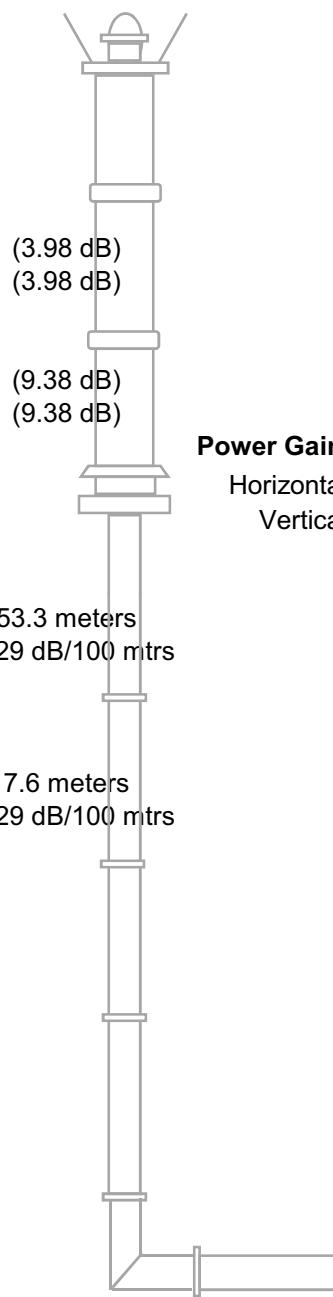
**Kalispell, MT**

**ETU-2U2-ESC1-15**

**Antenna Parameters**

**Azimuth Directivity:**

Horizontal: 2.50  
Vertical: 2.50



(3.98 dB)  
(3.98 dB)

(9.38 dB)  
(9.38 dB)

**Transmission Line**

**Power Gain:**

Horizontal: 16.67 numeric (12.22 dBd)  
Vertical: 5.00 numeric (6.99 dBd)

**Vertical Run:**

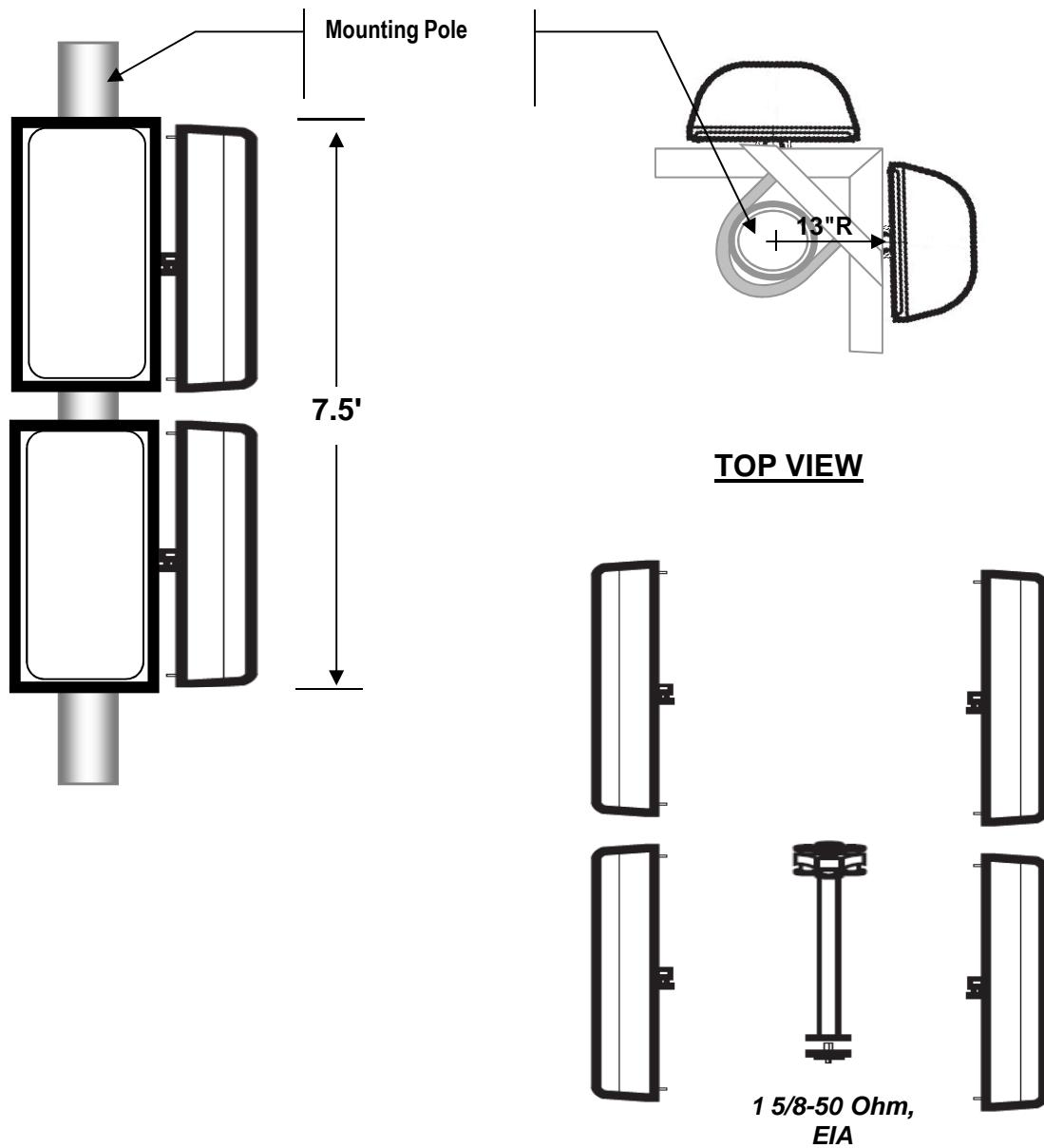
Type: 1-5/8-inch Air HELIAX  
Length: 175 feet 53.3 meters  
Attenuation: 0.466 dB/100 feet 1.529 dB/100 mtrs

7.6 meters

**Horizontal Run:**

Type: 1-5/8-inch Air HELIAX  
Length: 25 feet 7.6 meters  
Attenuation: 0.466 dB/100 feet 1.529 dB/100 mtrs

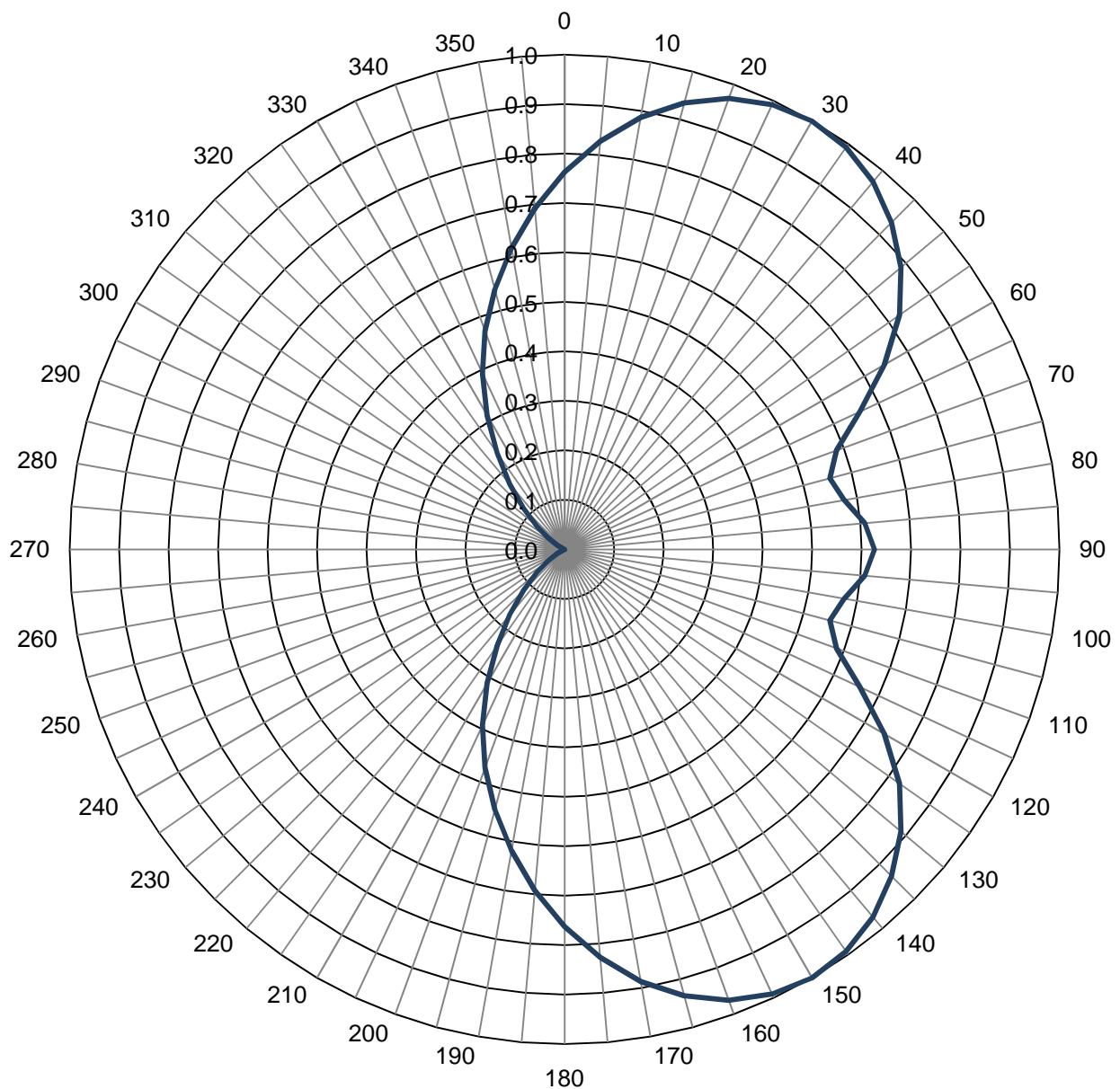
Typical Mounting Configuration Shown. Actual Configuration May Vary.



**SCHEMATIC DIAGRAM**

**Azimuth Pattern**

Type:	ETU-2PC1-H	Polarization:	Horizontal
Directivity:	2.50 numeric	Frequency:	15 (ATSC)
Peak(s) at:	(3.98 dB)	Location:	Kalispell, MT
NOTE: Pattern shape and directivity may vary with channel and mounting configuration.			

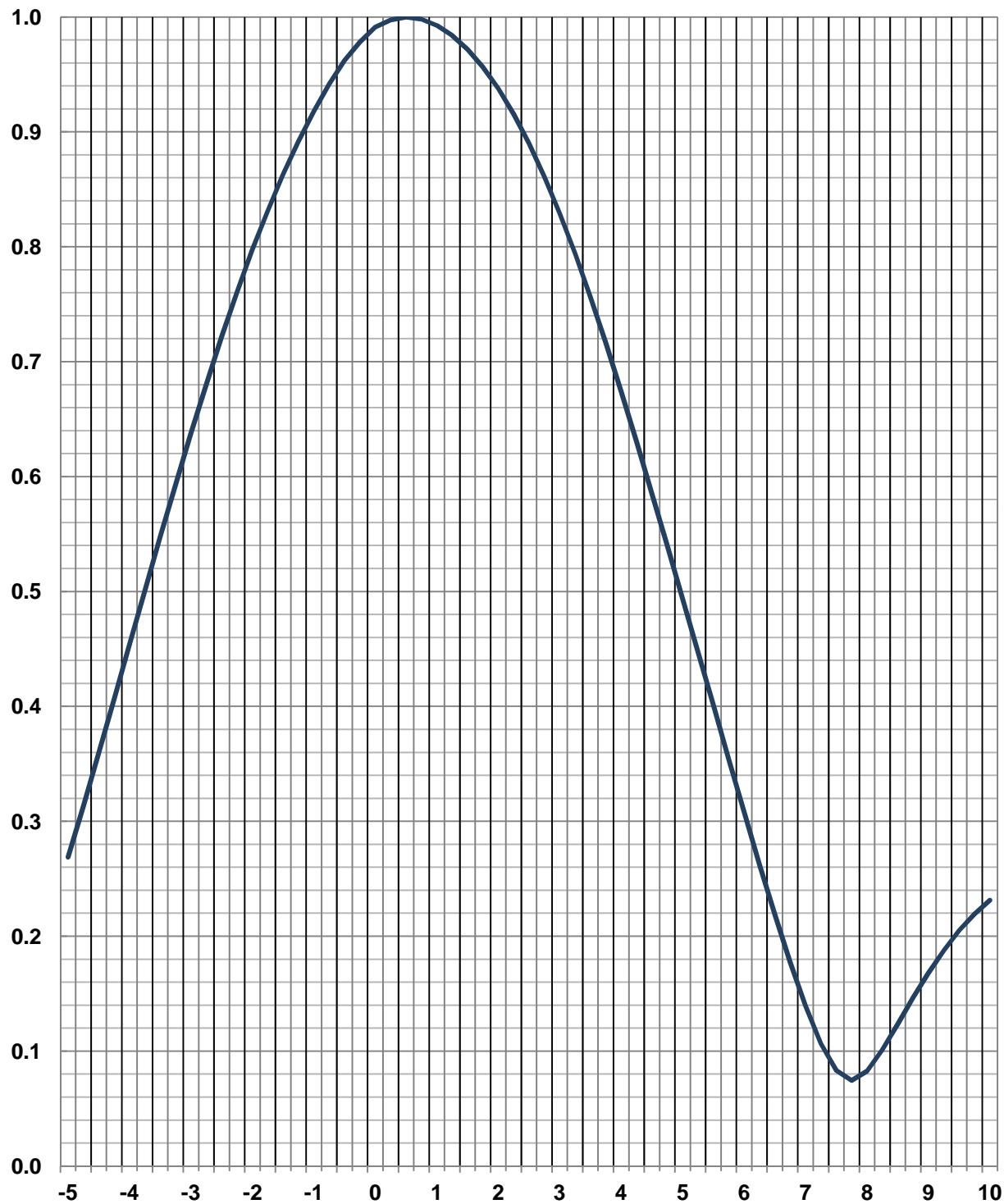
**Relative Field**

**Tabulated Data for Azimuth Pattern**Type: ETU-2PC1-H

Angle	Field	dB	Angle	Field	dB	Angle	Field	dB	Angle	Field	dB
0	0.763	-2.35	100	0.574	-4.82	200	0.470	-6.56	300	0.017	-35.39
2	0.790	-2.05	102	0.562	-5.01	202	0.440	-7.13	302	0.025	-32.04
4	0.816	-1.77	104	0.555	-5.11	204	0.408	-7.79	304	0.035	-29.12
6	0.841	-1.50	106	0.556	-5.10	206	0.376	-8.50	306	0.046	-26.74
8	0.864	-1.27	108	0.566	-4.94	208	0.344	-9.27	308	0.058	-24.73
10	0.887	-1.04	110	0.585	-4.66	210	0.313	-10.09	310	0.073	-22.73
12	0.907	-0.85	112	0.610	-4.29	212	0.282	-11.00	312	0.089	-21.01
14	0.926	-0.67	114	0.641	-3.86	214	0.253	-11.94	314	0.107	-19.41
16	0.943	-0.51	116	0.675	-3.41	216	0.224	-13.00	316	0.127	-17.92
18	0.958	-0.37	118	0.711	-2.96	218	0.197	-14.11	318	0.149	-16.54
20	0.970	-0.26	120	0.746	-2.55	220	0.172	-15.29	320	0.172	-15.29
22	0.981	-0.17	122	0.780	-2.16	222	0.149	-16.54	322	0.197	-14.11
24	0.989	-0.10	124	0.812	-1.81	224	0.127	-17.92	324	0.224	-13.00
26	0.995	-0.04	126	0.841	-1.50	226	0.107	-19.41	326	0.253	-11.94
28	0.999	-0.01	128	0.865	-1.26	228	0.089	-21.01	328	0.282	-11.00
30	1.000	0.00	130	0.887	-1.04	230	0.073	-22.73	330	0.313	-10.09
32	0.999	-0.01	132	0.907	-0.85	232	0.059	-24.58	332	0.344	-9.27
34	0.995	-0.04	134	0.926	-0.67	234	0.046	-26.74	334	0.376	-8.50
36	0.989	-0.10	136	0.943	-0.51	236	0.035	-29.12	336	0.408	-7.79
38	0.981	-0.17	138	0.958	-0.37	238	0.025	-32.04	338	0.440	-7.13
40	0.970	-0.26	140	0.970	-0.26	240	0.017	-35.39	340	0.470	-6.56
42	0.958	-0.37	142	0.981	-0.17	242	0.010	-40.00	342	0.500	-6.02
44	0.943	-0.51	144	0.989	-0.10	244	0.005	-46.02	344	0.529	-5.53
46	0.926	-0.67	146	0.995	-0.04	246	0.000	---	346	0.559	-5.05
48	0.907	-0.85	148	0.999	-0.01	248	0.000	---	348	0.588	-4.61
50	0.887	-1.04	150	1.000	0.00	250	0.000	---	350	0.618	-4.18
52	0.864	-1.27	152	0.999	-0.01	252	0.000	---	352	0.648	-3.77
54	0.841	-1.50	154	0.995	-0.04	254	0.000	---	354	0.677	-3.39
56	0.812	-1.81	156	0.989	-0.10	256	0.000	---	356	0.706	-3.02
58	0.780	-2.16	158	0.981	-0.17	258	0.000	---	358	0.735	-2.67
60	0.746	-2.55	160	0.970	-0.26	260	0.000	---	360	0.763	-2.35
62	0.711	-2.96	162	0.958	-0.37	262	0.000	---			
64	0.675	-3.41	164	0.943	-0.51	264	0.000	---			
66	0.641	-3.86	166	0.926	-0.67	266	0.000	---			
68	0.610	-4.29	168	0.907	-0.85	268	0.000	---			
70	0.585	-4.66	170	0.887	-1.04	270	0.000	---			
72	0.566	-4.94	172	0.865	-1.26	272	0.000	---			
74	0.556	-5.10	174	0.841	-1.50	274	0.000	---			
76	0.555	-5.11	176	0.816	-1.77	276	0.000	---			
78	0.562	-5.01	178	0.790	-2.05	278	0.000	---			
80	0.574	-4.82	180	0.763	-2.35	280	0.000	---			
82	0.588	-4.61	182	0.735	-2.67	282	0.000	---			
84	0.603	-4.39	184	0.706	-3.02	284	0.000	---			
86	0.615	-4.22	186	0.677	-3.39	286	0.000	---			
88	0.623	-4.11	188	0.648	-3.77	288	0.000	---			
90	0.626	-4.07	190	0.618	-4.18	290	0.000	---			
92	0.623	-4.11	192	0.588	-4.61	292	0.000	---			
94	0.615	-4.22	194	0.559	-5.05	294	0.000	---			
96	0.603	-4.39	196	0.529	-5.53	296	0.005	-46.02			
98	0.588	-4.61	198	0.500	-6.02	298	0.010	-40.00			

**Elevation Pattern**

Type:	ETU-2U2-H	Polarization:	Horizontal
Directivity:		Frequency:	15 (ATSC)
Main Lobe:	8.67 numeric (9.38 dB)	Location:	Kalispell, MT
Horizontal:	8.52 numeric (9.30 dB)	Beam Tilt:	0.50 degrees

**Relative Field**

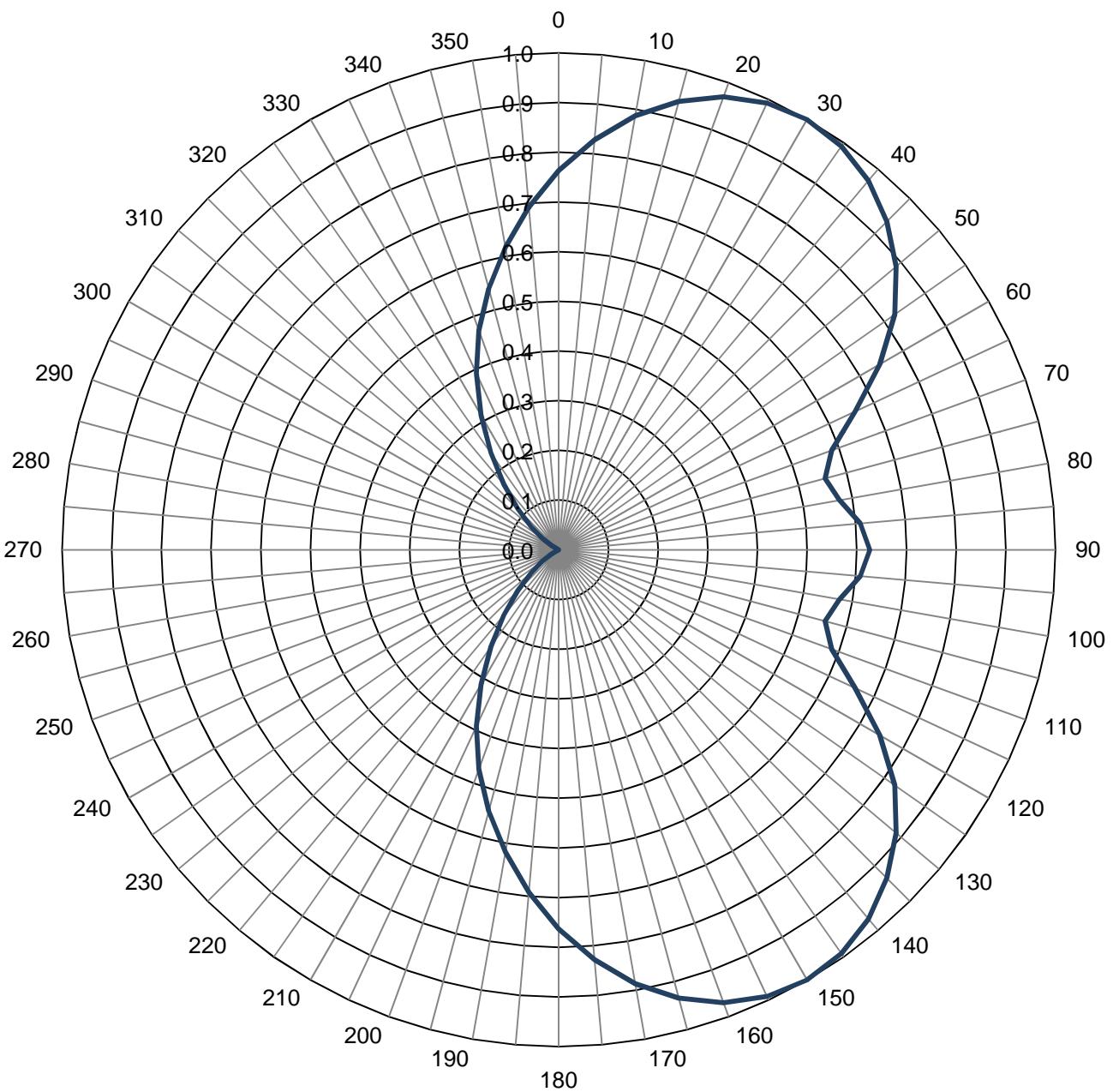
## Tabulated Data for Elevation Pattern

Type: ETU-2U2-H      -5 to 10 degrees in 0.25 degree increments.  
                                   10 to 90 degrees in 0.50 degree increments.

Angle	Field	dB												
-5.00	0.269	-11.41	7.25	0.107	-19.44	29.00	0.064	-23.93	53.50	0.090	-20.91	78.00	0.036	-28.90
-4.75	0.314	-10.07	7.50	0.083	-21.61	29.50	0.048	-26.41	54.00	0.084	-21.48	78.50	0.035	-29.19
-4.50	0.360	-8.89	7.75	0.075	-22.56	30.00	0.033	-29.71	54.50	0.079	-22.08	79.00	0.033	-29.53
-4.25	0.406	-7.82	8.00	0.083	-21.66	30.50	0.022	-33.11	55.00	0.073	-22.71	79.50	0.032	-29.87
-4.00	0.454	-6.86	8.25	0.101	-19.90	31.00	0.024	-32.47	55.50	0.068	-23.36	80.00	0.031	-30.23
-3.75	0.501	-6.01	8.50	0.124	-18.17	31.50	0.035	-29.14	56.00	0.063	-24.05	80.50	0.030	-30.57
-3.50	0.548	-5.23	8.75	0.146	-16.70	32.00	0.049	-26.29	56.50	0.058	-24.79	81.00	0.028	-30.93
-3.25	0.593	-4.54	9.00	0.168	-15.49	32.50	0.062	-24.21	57.00	0.053	-25.58	81.50	0.027	-31.31
-3.00	0.638	-3.91	9.25	0.188	-14.53	33.00	0.073	-22.73	57.50	0.048	-26.41	82.00	0.026	-31.67
-2.75	0.680	-3.34	9.50	0.205	-13.76	33.50	0.082	-21.71	58.00	0.043	-27.33	82.50	0.025	-32.04
-2.50	0.722	-2.83	9.75	0.220	-13.17	34.00	0.089	-21.04	58.50	0.038	-28.34	83.00	0.024	-32.43
-2.25	0.760	-2.38	10.00	0.231	-12.71	34.50	0.093	-20.63	59.00	0.034	-29.47	83.50	0.023	-32.77
-2.00	0.797	-1.97	10.50	0.247	-12.15	35.00	0.095	-20.46	59.50	0.029	-30.75	84.00	0.022	-33.11
-1.75	0.831	-1.60	11.00	0.252	-11.97	35.50	0.094	-20.56	60.00	0.025	-32.22	84.50	0.021	-33.47
-1.50	0.863	-1.28	11.50	0.247	-12.14	36.00	0.090	-20.90	60.50	0.020	-33.89	85.00	0.020	-33.81
-1.25	0.892	-0.99	12.00	0.233	-12.66	36.50	0.084	-21.50	61.00	0.016	-35.81	85.50	0.020	-34.11
-1.00	0.918	-0.74	12.50	0.210	-13.55	37.00	0.076	-22.41	61.50	0.013	-37.86	86.00	0.019	-34.42
-0.75	0.942	-0.52	13.00	0.181	-14.84	37.50	0.066	-23.65	62.00	0.010	-39.66	86.50	0.018	-34.70
-0.50	0.962	-0.34	13.50	0.147	-16.64	38.00	0.054	-25.32	62.50	0.010	-40.18	87.00	0.018	-34.94
-0.25	0.978	-0.19	14.00	0.111	-19.12	38.50	0.042	-27.58	63.00	0.011	-39.09	87.50	0.017	-35.19
0.00	0.991	-0.08	14.50	0.075	-22.55	39.00	0.030	-30.49	63.50	0.014	-37.33	88.00	0.017	-35.39
0.25	0.997	-0.02	15.00	0.047	-26.52	39.50	0.022	-33.19	64.00	0.017	-35.55	88.50	0.017	-35.60
0.50	1.000	0.00	15.50	0.048	-26.32	40.00	0.024	-32.51	64.50	0.020	-34.02	89.00	0.016	-35.76
0.75	0.998	-0.02	16.00	0.074	-22.57	40.50	0.034	-29.32	65.00	0.023	-32.69	89.50	0.016	-35.86
1.00	0.993	-0.07	16.50	0.106	-19.53	41.00	0.048	-26.41	65.50	0.026	-31.60	90.00	0.016	-35.97
1.25	0.984	-0.14	17.00	0.135	-17.38	41.50	0.062	-24.14	66.00	0.029	-30.66			
1.50	0.972	-0.25	17.50	0.161	-15.86	42.00	0.076	-22.36	66.50	0.032	-29.90			
1.75	0.956	-0.39	18.00	0.183	-14.77	42.50	0.090	-20.95	67.00	0.035	-29.22			
2.00	0.938	-0.56	18.50	0.199	-14.02	43.00	0.102	-19.84	67.50	0.037	-28.66			
2.25	0.915	-0.77	19.00	0.211	-13.52	43.50	0.113	-18.93	68.00	0.039	-28.20			
2.50	0.890	-1.01	19.50	0.218	-13.24	44.00	0.123	-18.22	68.50	0.041	-27.81			
2.75	0.861	-1.30	20.00	0.220	-13.15	44.50	0.131	-17.65	69.00	0.042	-27.49			
3.00	0.829	-1.63	20.50	0.218	-13.21	45.00	0.138	-17.21	69.50	0.043	-27.25			
3.25	0.794	-2.00	21.00	0.214	-13.40	45.50	0.143	-16.89	70.00	0.044	-27.05			
3.50	0.757	-2.42	21.50	0.208	-13.64	46.00	0.147	-16.66	70.50	0.045	-26.90			
3.75	0.716	-2.90	22.00	0.201	-13.94	46.50	0.149	-16.53	71.00	0.046	-26.80			
4.00	0.674	-3.42	22.50	0.193	-14.28	47.00	0.150	-16.48	71.50	0.046	-26.76			
4.25	0.630	-4.01	23.00	0.185	-14.67	47.50	0.149	-16.51	72.00	0.046	-26.74			
4.50	0.585	-4.65	23.50	0.176	-15.07	48.00	0.148	-16.61	72.50	0.046	-26.78			
4.75	0.540	-5.35	24.00	0.169	-15.46	48.50	0.145	-16.77	73.00	0.046	-26.84			
5.00	0.494	-6.13	24.50	0.162	-15.83	49.00	0.142	-16.98	73.50	0.045	-26.94			
5.25	0.447	-6.99	25.00	0.155	-16.22	49.50	0.137	-17.26	74.00	0.044	-27.05			
5.50	0.401	-7.94	25.50	0.147	-16.65	50.00	0.132	-17.59	74.50	0.044	-27.21			
5.75	0.354	-9.02	26.00	0.139	-17.13	50.50	0.126	-17.97	75.00	0.043	-27.37			
6.00	0.308	-10.23	26.50	0.130	-17.71	51.00	0.121	-18.38	75.50	0.042	-27.58			
6.25	0.262	-11.62	27.00	0.120	-18.43	51.50	0.114	-18.84	76.00	0.041	-27.81			
6.50	0.219	-13.20	27.50	0.108	-19.35	52.00	0.108	-19.32	76.50	0.040	-28.05			
6.75	0.177	-15.02	28.00	0.094	-20.53	52.50	0.102	-19.82	77.00	0.038	-28.31			
7.00	0.139	-17.11	28.50	0.079	-22.04	53.00	0.096	-20.35	77.50	0.037	-28.59			

**Azimuth Pattern**

Type:	ETU-2PC1-V	Polarization:	Vertical
Directivity:	2.50 numeric (3.98 dB)	Frequency:	15 (ATSC)
Peak(s) at:		Location:	Kalispell, MT
NOTE: Pattern shape and directivity may vary with channel and mounting configuration.			

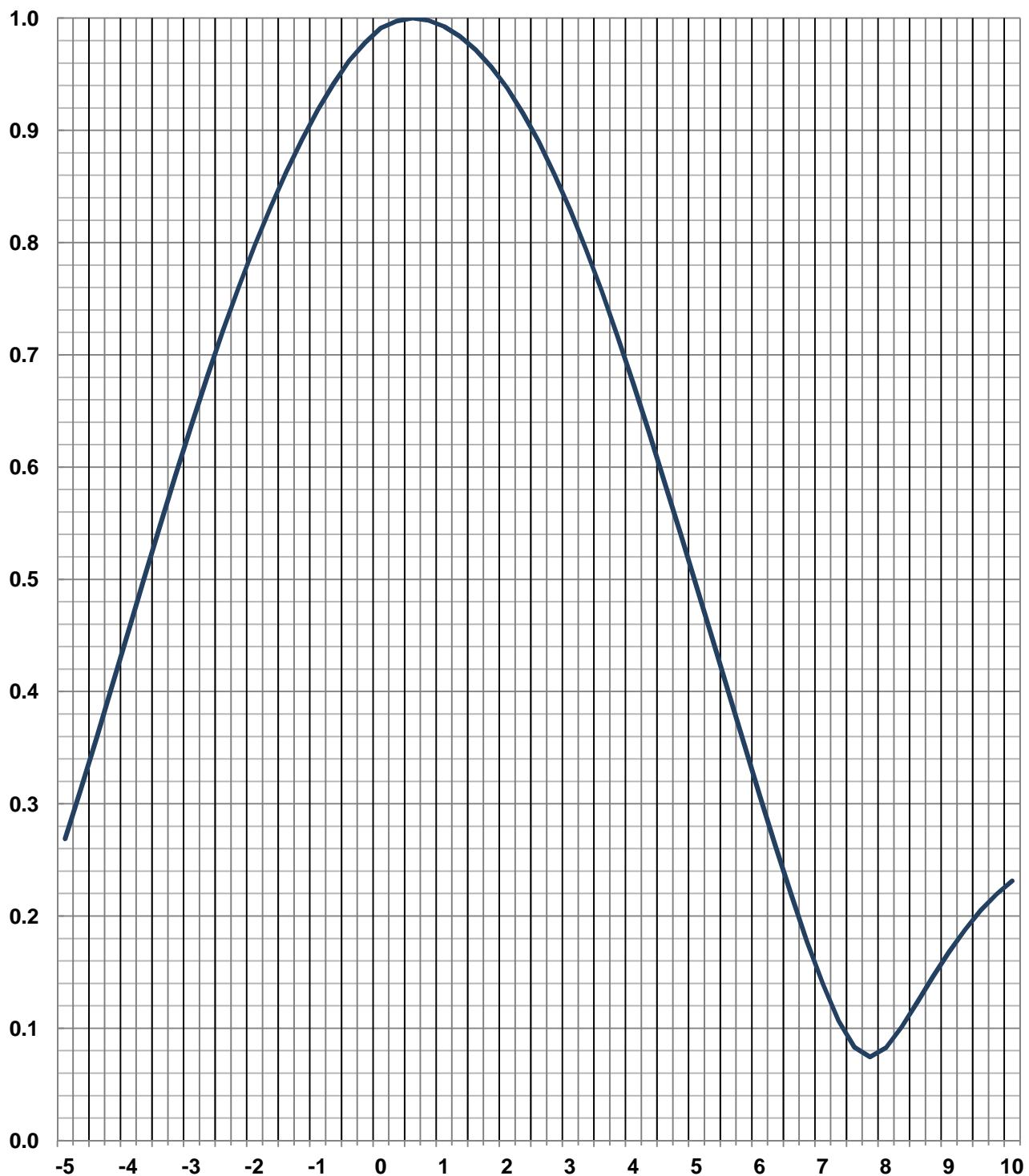
**Relative Field**

**Tabulated Data for Azimuth Pattern**Type: ETU-2PC1-V

Angle	Field	dB	Angle	Field	dB	Angle	Field	dB	Angle	Field	dB
0	0.763	-2.35	100	0.574	-4.82	200	0.470	-6.56	300	0.017	-35.39
2	0.790	-2.05	102	0.562	-5.01	202	0.440	-7.13	302	0.025	-32.04
4	0.816	-1.77	104	0.555	-5.11	204	0.408	-7.79	304	0.035	-29.12
6	0.841	-1.50	106	0.556	-5.10	206	0.376	-8.50	306	0.046	-26.74
8	0.864	-1.27	108	0.566	-4.94	208	0.344	-9.27	308	0.058	-24.73
10	0.887	-1.04	110	0.585	-4.66	210	0.313	-10.09	310	0.073	-22.73
12	0.907	-0.85	112	0.610	-4.29	212	0.282	-11.00	312	0.089	-21.01
14	0.926	-0.67	114	0.641	-3.86	214	0.253	-11.94	314	0.107	-19.41
16	0.943	-0.51	116	0.675	-3.41	216	0.224	-13.00	316	0.127	-17.92
18	0.958	-0.37	118	0.711	-2.96	218	0.197	-14.11	318	0.149	-16.54
20	0.970	-0.26	120	0.746	-2.55	220	0.172	-15.29	320	0.172	-15.29
22	0.981	-0.17	122	0.780	-2.16	222	0.149	-16.54	322	0.197	-14.11
24	0.989	-0.10	124	0.812	-1.81	224	0.127	-17.92	324	0.224	-13.00
26	0.995	-0.04	126	0.841	-1.50	226	0.107	-19.41	326	0.253	-11.94
28	0.999	-0.01	128	0.865	-1.26	228	0.089	-21.01	328	0.282	-11.00
30	1.000	0.00	130	0.887	-1.04	230	0.073	-22.73	330	0.313	-10.09
32	0.999	-0.01	132	0.907	-0.85	232	0.059	-24.58	332	0.344	-9.27
34	0.995	-0.04	134	0.926	-0.67	234	0.046	-26.74	334	0.376	-8.50
36	0.989	-0.10	136	0.943	-0.51	236	0.035	-29.12	336	0.408	-7.79
38	0.981	-0.17	138	0.958	-0.37	238	0.025	-32.04	338	0.440	-7.13
40	0.970	-0.26	140	0.970	-0.26	240	0.017	-35.39	340	0.470	-6.56
42	0.958	-0.37	142	0.981	-0.17	242	0.010	-40.00	342	0.500	-6.02
44	0.943	-0.51	144	0.989	-0.10	244	0.005	-46.02	344	0.529	-5.53
46	0.926	-0.67	146	0.995	-0.04	246	0.000	---	346	0.559	-5.05
48	0.907	-0.85	148	0.999	-0.01	248	0.000	---	348	0.588	-4.61
50	0.887	-1.04	150	1.000	0.00	250	0.000	---	350	0.618	-4.18
52	0.864	-1.27	152	0.999	-0.01	252	0.000	---	352	0.648	-3.77
54	0.841	-1.50	154	0.995	-0.04	254	0.000	---	354	0.677	-3.39
56	0.812	-1.81	156	0.989	-0.10	256	0.000	---	356	0.706	-3.02
58	0.780	-2.16	158	0.981	-0.17	258	0.000	---	358	0.735	-2.67
60	0.746	-2.55	160	0.970	-0.26	260	0.000	---	360	0.763	-2.35
62	0.711	-2.96	162	0.958	-0.37	262	0.000	---			
64	0.675	-3.41	164	0.943	-0.51	264	0.000	---			
66	0.641	-3.86	166	0.926	-0.67	266	0.000	---			
68	0.610	-4.29	168	0.907	-0.85	268	0.000	---			
70	0.585	-4.66	170	0.887	-1.04	270	0.000	---			
72	0.566	-4.94	172	0.865	-1.26	272	0.000	---			
74	0.556	-5.10	174	0.841	-1.50	274	0.000	---			
76	0.555	-5.11	176	0.816	-1.77	276	0.000	---			
78	0.562	-5.01	178	0.790	-2.05	278	0.000	---			
80	0.574	-4.82	180	0.763	-2.35	280	0.000	---			
82	0.588	-4.61	182	0.735	-2.67	282	0.000	---			
84	0.603	-4.39	184	0.706	-3.02	284	0.000	---			
86	0.615	-4.22	186	0.677	-3.39	286	0.000	---			
88	0.623	-4.11	188	0.648	-3.77	288	0.000	---			
90	0.626	-4.07	190	0.618	-4.18	290	0.000	---			
92	0.623	-4.11	192	0.588	-4.61	292	0.000	---			
94	0.615	-4.22	194	0.559	-5.05	294	0.000	---			
96	0.603	-4.39	196	0.529	-5.53	296	0.005	-46.02			
98	0.588	-4.61	198	0.500	-6.02	298	0.010	-40.00			

**Elevation Pattern**

Type:	ETU-2U2-V	Polarization:	Vertical
Directivity:		Frequency:	15 (ATSC)
Main Lobe:	8.67 numeric (9.38 dB)	Location:	Kalispell, MT
Horizontal:	8.52 numeric (9.30 dB)	Beam Tilt:	0.50 degrees

**Relative Field**

## Tabulated Data for Elevation Pattern

Type:

ETU-2U2-V

-5 to 10 degrees in 0.25 degree increments.

10 to 90 degrees in 0.50 degree increments.

Angle	Field	dB												
-5.00	0.269	-11.41	7.25	0.107	-19.44	29.00	0.064	-23.93	53.50	0.090	-20.91	78.00	0.036	-28.90
-4.75	0.314	-10.07	7.50	0.083	-21.61	29.50	0.048	-26.41	54.00	0.084	-21.48	78.50	0.035	-29.19
-4.50	0.360	-8.89	7.75	0.075	-22.56	30.00	0.033	-29.71	54.50	0.079	-22.08	79.00	0.033	-29.53
-4.25	0.406	-7.82	8.00	0.083	-21.66	30.50	0.022	-33.11	55.00	0.073	-22.71	79.50	0.032	-29.87
-4.00	0.454	-6.86	8.25	0.101	-19.90	31.00	0.024	-32.47	55.50	0.068	-23.36	80.00	0.031	-30.23
-3.75	0.501	-6.01	8.50	0.124	-18.17	31.50	0.035	-29.14	56.00	0.063	-24.05	80.50	0.030	-30.57
-3.50	0.548	-5.23	8.75	0.146	-16.70	32.00	0.049	-26.29	56.50	0.058	-24.79	81.00	0.028	-30.93
-3.25	0.593	-4.54	9.00	0.168	-15.49	32.50	0.062	-24.21	57.00	0.053	-25.58	81.50	0.027	-31.31
-3.00	0.638	-3.91	9.25	0.188	-14.53	33.00	0.073	-22.73	57.50	0.048	-26.41	82.00	0.026	-31.67
-2.75	0.680	-3.34	9.50	0.205	-13.76	33.50	0.082	-21.71	58.00	0.043	-27.33	82.50	0.025	-32.04
-2.50	0.722	-2.83	9.75	0.220	-13.17	34.00	0.089	-21.04	58.50	0.038	-28.34	83.00	0.024	-32.43
-2.25	0.760	-2.38	10.00	0.231	-12.71	34.50	0.093	-20.63	59.00	0.034	-29.47	83.50	0.023	-32.77
-2.00	0.797	-1.97	10.50	0.247	-12.15	35.00	0.095	-20.46	59.50	0.029	-30.75	84.00	0.022	-33.11
-1.75	0.831	-1.60	11.00	0.252	-11.97	35.50	0.094	-20.56	60.00	0.025	-32.22	84.50	0.021	-33.47
-1.50	0.863	-1.28	11.50	0.247	-12.14	36.00	0.090	-20.90	60.50	0.020	-33.89	85.00	0.020	-33.81
-1.25	0.892	-0.99	12.00	0.233	-12.66	36.50	0.084	-21.50	61.00	0.016	-35.81	85.50	0.020	-34.11
-1.00	0.918	-0.74	12.50	0.210	-13.55	37.00	0.076	-22.41	61.50	0.013	-37.86	86.00	0.019	-34.42
-0.75	0.942	-0.52	13.00	0.181	-14.84	37.50	0.066	-23.65	62.00	0.010	-39.66	86.50	0.018	-34.70
-0.50	0.962	-0.34	13.50	0.147	-16.64	38.00	0.054	-25.32	62.50	0.010	-40.18	87.00	0.018	-34.94
-0.25	0.978	-0.19	14.00	0.111	-19.12	38.50	0.042	-27.58	63.00	0.011	-39.09	87.50	0.017	-35.19
0.00	0.991	-0.08	14.50	0.075	-22.55	39.00	0.030	-30.49	63.50	0.014	-37.33	88.00	0.017	-35.39
0.25	0.997	-0.02	15.00	0.047	-26.52	39.50	0.022	-33.19	64.00	0.017	-35.55	88.50	0.017	-35.60
0.50	1.000	0.00	15.50	0.048	-26.32	40.00	0.024	-32.51	64.50	0.020	-34.02	89.00	0.016	-35.76
0.75	0.998	-0.02	16.00	0.074	-22.57	40.50	0.034	-29.32	65.00	0.023	-32.69	89.50	0.016	-35.86
1.00	0.993	-0.07	16.50	0.106	-19.53	41.00	0.048	-26.41	65.50	0.026	-31.60	90.00	0.016	-35.97
1.25	0.984	-0.14	17.00	0.135	-17.38	41.50	0.062	-24.14	66.00	0.029	-30.66			
1.50	0.972	-0.25	17.50	0.161	-15.86	42.00	0.076	-22.36	66.50	0.032	-29.90			
1.75	0.956	-0.39	18.00	0.183	-14.77	42.50	0.090	-20.95	67.00	0.035	-29.22			
2.00	0.938	-0.56	18.50	0.199	-14.02	43.00	0.102	-19.84	67.50	0.037	-28.66			
2.25	0.915	-0.77	19.00	0.211	-13.52	43.50	0.113	-18.93	68.00	0.039	-28.20			
2.50	0.890	-1.01	19.50	0.218	-13.24	44.00	0.123	-18.22	68.50	0.041	-27.81			
2.75	0.861	-1.30	20.00	0.220	-13.15	44.50	0.131	-17.65	69.00	0.042	-27.49			
3.00	0.829	-1.63	20.50	0.218	-13.21	45.00	0.138	-17.21	69.50	0.043	-27.25			
3.25	0.794	-2.00	21.00	0.214	-13.40	45.50	0.143	-16.89	70.00	0.044	-27.05			
3.50	0.757	-2.42	21.50	0.208	-13.64	46.00	0.147	-16.66	70.50	0.045	-26.90			
3.75	0.716	-2.90	22.00	0.201	-13.94	46.50	0.149	-16.53	71.00	0.046	-26.80			
4.00	0.674	-3.42	22.50	0.193	-14.28	47.00	0.150	-16.48	71.50	0.046	-26.76			
4.25	0.630	-4.01	23.00	0.185	-14.67	47.50	0.149	-16.51	72.00	0.046	-26.74			
4.50	0.585	-4.65	23.50	0.176	-15.07	48.00	0.148	-16.61	72.50	0.046	-26.78			
4.75	0.540	-5.35	24.00	0.169	-15.46	48.50	0.145	-16.77	73.00	0.046	-26.84			
5.00	0.494	-6.13	24.50	0.162	-15.83	49.00	0.142	-16.98	73.50	0.045	-26.94			
5.25	0.447	-6.99	25.00	0.155	-16.22	49.50	0.137	-17.26	74.00	0.044	-27.05			
5.50	0.401	-7.94	25.50	0.147	-16.65	50.00	0.132	-17.59	74.50	0.044	-27.21			
5.75	0.354	-9.02	26.00	0.139	-17.13	50.50	0.126	-17.97	75.00	0.043	-27.37			
6.00	0.308	-10.23	26.50	0.130	-17.71	51.00	0.121	-18.38	75.50	0.042	-27.58			
6.25	0.262	-11.62	27.00	0.120	-18.43	51.50	0.114	-18.84	76.00	0.041	-27.81			
6.50	0.219	-13.20	27.50	0.108	-19.35	52.00	0.108	-19.32	76.50	0.040	-28.05			
6.75	0.177	-15.02	28.00	0.094	-20.53	52.50	0.102	-19.82	77.00	0.038	-28.31			
7.00	0.139	-17.11	28.50	0.079	-22.04	53.00	0.096	-20.35	77.50	0.037	-28.59			

**EXHIBIT E-3**

**ALLOCATION STUDY**

tvstudy v2.2.3 (Dxtpx3)  
Database: localhost, Study: KUKL-App, Model: Longley-Rice  
Start: 2017.10.19 18:38:10

Study created: 2017.10.19 18:35:58

Study build station data: LMS TV 2017-10-13 (20)

Proposal: KUKL-TV D15 DT CP KALISPELL, MT

File number: PowerIncrease

Facility ID: 169027

Station data: User record

Record ID: 91

Country: U.S.

Zone: II

No protected stations found.

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

Latitude: 48 0 48.00 N (NAD83)

Longitude: 114 21 58.00 W

Height AMSL: 2083.0 m

HAAT: 830.0 m

Peak ERP: 27.6 kW

Antenna: ERI-ETU-2U2-HSC1-46 (ID 105734) 0.0 deg

Elev Patrnr: Generic

Elec Tilt: 0.5

38.8 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	16.1 kW	704.3 m	91.8 km
45.0	23.8	918.1	101.3
90.0	10.8	1085.0	97.8
135.0	23.8	760.2	96.9
180.0	16.1	828.7	95.3
225.0	0.414	657.8	63.0
270.0	0.008	708.5	37.9
315.0	0.414	909.5	67.2

Database HAAT does not agree with computed HAAT

Database HAAT: 830 m Computed HAAT: 822 m

\*\*Proposal service area extends beyond baseline plus 1.0%  
Proposal service area population is more than 95.0% of baseline

\*\*Proposal is within coordination distance of Canadian border  
Distance to Canadian border: 109.8 km

Distance to Mexican border: 1700.3 km

Conditions at FCC monitoring station: Ferndale WA  
Bearing: 282.9 degrees Distance: 612.0 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:  
Bearing: 137.0 degrees Distance: 1135.3 km

No land mobile station failures found

Study cell size: 2.00 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%

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#### Interference to proposal, scenario 1

Desired:	Call	Chan	Svc	Status	City, State	File Number	Distance
	KUKL-TV	D15	DT	CP	KALISPELL, MT	PowerIncrease	
Undesireds:	KHQ-TV	D15	DT	LIC	SPOKANE, WA	BLCDT20100406AAP	224.1 km
	Service area			Terrain-limited		IX-free	Percent IX
21785.6	124,505	16236.3	115,844	16112.1	115,844	0.76	0.00
Undesired			Total	IX	Unique IX	Prcnt Unique IX	
KHQ-TV	D15	DT	LIC	124.2	0	0.76	0.00

TABLE I  
COMPUTED COVERAGE DATA  
FOR THE PROPOSED DTV OPERATION OF  
KUKL-TV, KALISPELL, MONTANA  
CHANNEL 15 27.6 KW ERP 830 METERS HAAT  
OCTOBER 2017

<u>Radial N ° E, T</u>	<u>Average Elevation</u>	<u>Effective Height</u>	<u>Depression Angle</u>	<u>Radiated Power</u>	<u>Effective</u>	
					<u>48 dBu</u>	<u>38.829 dBu</u>
0	1378.7	704.3	0.735	16.1	74.6	91.8
10	1331.2	751.8	0.760	21.7	77.9	95.8
20	1283.7	799.4	0.783	26.0	80.3	98.9
30	1236.1	846.9	0.806	27.6	81.9	100.9
40	1188.6	894.4	0.828	26.0	82.4	101.6
50	1146.3	936.7	0.848	21.7	81.9	100.9
60	1109.3	973.8	0.864	15.4	79.8	98.5
70	1072.2	1010.8	0.881	9.4	76.6	94.8
80	1035.1	1047.9	0.897	9.1	77.1	95.3
90	998.0	1085.0	0.912	10.8	79.3	97.8
100	1070.2	1012.8	0.882	9.1	76.4	94.5
110	1142.4	940.6	0.850	9.4	75.2	93.1
120	1214.5	868.5	0.816	15.4	77.6	95.9
130	1286.7	796.3	0.782	21.7	78.8	97.1
140	1315.2	767.8	0.768	26.0	79.6	97.9
150	1299.9	783.1	0.775	27.6	80.5	98.9
160	1284.7	798.3	0.783	26.0	80.3	98.8
170	1269.5	813.5	0.790	21.7	79.2	97.6
180	1254.3	828.7	0.797	16.1	77.1	95.3
190	1292.3	790.7	0.779	10.5	73.3	90.4
200	1330.3	752.7	0.760	6.1	68.7	84.7
210	1368.3	714.7	0.741	2.7	62.5	77.3
220	1406.2	676.8	0.721	0.8	53.8	68.0
230	1419.6	663.4	0.713	0.1	42.5	56.2
240	1408.3	674.7	0.719	0.0	23.3	37.5
250	1397.1	685.9	0.725	0.0	23.3	37.6
260	1385.8	697.2	0.731	0.0	23.2	37.8
270	1374.5	708.5	0.737	0.0	23.0	37.9

## COHEN, DIPPELL AND EVERIST, P.C.

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**FOR THE PROPOSED DTV OPERATION OF**  
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**CHANNEL 15 27.6 KW ERP 830 METERS HAAT**  
**OCTOBER 2017**

<u>Radial</u> N ° E, T	<u>Average Elevation</u> meters	<u>Effective Height</u> meters	<u>Depression Angle</u> degrees	<u>Radiated Power</u> kW	Effective	
					<u>48 dBu</u>	<u>Distance to Contour 38.829 dBu</u>
280	1329.9	753.1	0.760	0.0	11.9	38.5
290	1285.2	797.8	0.782	0.0	11.9	39.0
300	1240.5	842.5	0.804	0.0	12.1	39.4
310	1195.8	887.2	0.825	0.1	45.5	59.7
320	1196.3	886.7	0.825	0.8	57.0	71.7
330	1241.9	841.1	0.803	2.7	64.5	80.0
340	1287.5	795.5	0.781	6.1	69.5	85.8
350	1333.1	749.9	0.759	10.5	72.5	89.4

COHEN, DIPPELL AND EVERIST, P.C. Consulting Engineers Washington, D.C.

