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Engineering Statement
Minor Modification of CP for KPDD-LD
Channel 23 at Evergreen, CO
October 2021

I. Background

This Engineering Statement has been prepared on behalf of Denver Digital Television, LLC ("Denver Digital"), licensee of low-power digital station KPDD-LD. This material has been prepared in connection with an application for minor modification of construction permit.

II. Interference Study

Study has been made of all cochannel and adjacent-channel facilities in the vicinity of the proposed operation, including a detailed Longley-Rice interference study to demonstrate that the proposed operation will not cause interference to any authorized or pending proposed facilities. This study was performed using the Commission's TVStudy software.

This study was performed using a cell size of 0.5 km, and a profile increment of 0.2 km.

The results of this study indicate that the proposed facility is predicted to cause zero additional interference to any of the listed stations, beyond the allowed values of 0.5% to full-power and Class A stations, and 2.0% to low-power stations. Based on the foregoing interference study, it is believed that the proposed facility can operate without risk of interference to other stations.

Study created: 2021.10.04 16:27:13

Study build station data: LMS TV 2021-09-21

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    Proposal: KPDD-LD D23 LD APP Evergreen, CO
 File number: KPDD-CP-FIX-480W
 Facility ID: 22854
Station data: User record
   Record ID: 1312
     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	K22NW-D	D22	LD	LIC	BOULDER, CO	BLANK0000074485	39.2 km
No	K41LA-D	D22	LD	CP	CARBONDALE, CO	BLANK0000080465	164.5
No	KXRM-TV	D22	DT	LIC	COLORADO SPRINGS, CO	BLCDT20030702ABE	116.5
No	K22JM-D	D22	LD	LIC	GUNNISON, CO	BLDTL20121119AOW	176.8
No	K48ME-D	D22	LD	CP	VAIL, CO	BLANK0000071822	82.5
No	KZCS-LD	N23z	TX	LIC	COLORADO SPRINGS, CO	BLTTL20021218AAJ	116.4
No	K23LH-D	D23	LD	LIC	CORTEZ, CO	BLDTT20110331AEZ	346.2
No	K23GF-D	D23	LD	LIC	DOVE CREEK, ETC, CO	BLDTT20120615ABH	365.5
No	K23NX-D	D23	LD	LIC	GATEWAY, CO	BLANK0000072899	305.2
No	KREG-TV	D23	DT	LIC	GLENWOOD SPRINGS, CO	BLANK0000007830	164.0
No	K23OX-D	D23	LD	CP	HOLYOKE, CO	BNPDTT20090825BFQ	281.4
No	K23KN-D	D23	LD	LIC	LAS ANIMAS, CO	BLDTT20110509ADA	283.8
No	K49JX-D	D23	LD	LIC	MONTROSE, CO	BLANK0000062960	279.4
No	K23OR-D	D23z	LD	LIC	PAGOSA SPRINGS, CO	BLANK0000080596	309.8
No	K23DX-D	D23	LD	LIC	PITKIN, CO	BLDTT20101129AMF	149.0
No	K23OU-D	D23	LD	LIC	PUEBLO, CO	BLANK0000121883	166.4
No	K49JW-D	D23	LD	LIC	ROMEO, ETC., CO	BLANK0000062907	316.4
No	K45KT-D	D23	LD	CP	SARGENTS, CO	BLANK0000054028	149.5
No	KCDO-TV	D23	LD	LIC	STERLING, CO	BLCDT20100407ABE	236.2
Yes	KCDO-TV	D23	DT	LIC	STERLING, CO	BLCDT20100127ADD	137.8
No	K44CG-D	D23	LD	CP	CAPULIN, ETC., NM	BLANK0000053996	358.7
No	K23JD-D	D23	LD	LIC	COLFAX, NM	BLDTT20100716ABZ	347.2
No	K24HQ-D	D24	LD	LIC	BOULDER, CO	BLANK0000034173	39.2
No	K40IO-D	D24	LD	CP	CARBONDALE, CO	BLANK0000080471	164.5
No	KRDO-TV	D24	DT	LIC	COLORADO SPRINGS, CO	BLCDT20060329AAW	116.5
No	KMLN-LD	D24	LD	LIC	FORT COLLINS, CO	BLDTL20130709ABW	94.5
No	K24KR-D	D24	LD	LIC	JACKS CABIN, CO	BLDTT20120413ABE	156.5
No	K47LZ-D	D24	LD	LIC	SARGENTS, CO	BLANK0000063156	149.5

No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

```
    Channel: D23
       Mask: Full Service
   Latitude:  39 40 31.70 N (NAD83)
  Longitude: 105 29  4.40 W
Height AMSL: 3231.8 m
       HAAT: 0.0 m
   Peak ERP: 0.480 kW
    Antenna: SCA-CL-1469 320.0 deg
Elev Pattrn: Generic
```

49.7 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	0.063 kW	593.6 m	34.8 km
45.0	0.000	706.0	4.5
90.0	0.000	700.9	4.5
135.0	0.000	694.0	4.5
180.0	0.000	411.7	4.1
225.0	0.000	80.6	2.4

```
270.0      0.004       48.6      5.7
315.0      0.455      578.6     46.8

Database HAAT does not agree with computed HAAT
Database HAAT: 0 m   Computed HAAT: 477 m

Distance to Canadian border: 1036.4 km

Distance to Mexican border: 882.2 km

Conditions at FCC monitoring station: Grand Island NE
Bearing: 74.7 degrees   Distance: 613.8 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:
Bearing: 20.3 degrees   Distance: 56.6 km
ERP: 0.000048 kW   Field strength: -22.6 dBu, 0.0 mV/m


Study cell size: 0.50 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%

No IX check failures found.
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III. RF Exposure Study

The power density calculations shown below were made using the techniques outlined in OET Bulletin No. 65. "Ground level" calculations in this report have been made at a reference height of 2 meters above ground to provide a worst-case estimate of exposure for persons standing on the ground in the vicinity of the tower. The equation shown below was used to calculate the ground level power density figures from each antenna.

$$S(\mu W / cm^2) = \frac{33.41 \times AdjERP(Watts)}{D^2}$$

Where: *AdjERP(Watts)* is the maximum lobe effective radiated power times the element pattern factor times the array pattern factor.

D is the distance in meters from the center of radiation to the calculation point.

Power density levels produced by the proposed facility were calculated using the manufacturer's vertical plane pattern for the horizontally-polarized Scala CL-1469 antenna proposed in this application. The highest calculated power density from the proposed antenna alone occurs 14 meters from the base of the antenna support structure. At this point the power density is calculated

to be 26.1 μW/cm², which is 7.5% of 349.3 μW/cm² (the FCC maximum for uncontrolled environments at the Channel 23 frequency).

The only other broadcast facility in the vicinity is FM station KXPK, which operates from a tower located 114 meters away from the proposed KPDD-LD tower. Calculations of the power density produced by the KXPK antenna system assume a Type 2 element pattern, which is the element pattern for the Jampro JHPC-6CR(RFR.8) antenna in use by that station. The highest calculated ground level power density occurs at a distance of 9 meters from the base of the antenna support structure. At this point the power density is calculated to be 108.0 μW/cm², which is 54% of 200 μW/cm² (the FCC maximum for uncontrolled environments at the Channel 23 frequency).

These calculations show that the maximum calculated power density produced at two meters above ground level by the operations of KPDD-LD and KXPK (were their maxima to coincide, which they do not) is 61.5% of the FCC standard for uncontrolled environments.

Pursuant to OET Bulletin No. 65, all station personnel and contractors are required to follow appropriate safety procedures before any work is commenced on the antenna tower, including reduction in power or discontinuance of operation before any maintenance work is undertaken. The permittee/licensee in coordination with other users of the site must reduce power or cease operation as necessary to protect persons having access to the site, tower or antenna from radiofrequency exposure in excess of FCC guidelines.

October 5, 2021

Erik C. Swanson, P.E.

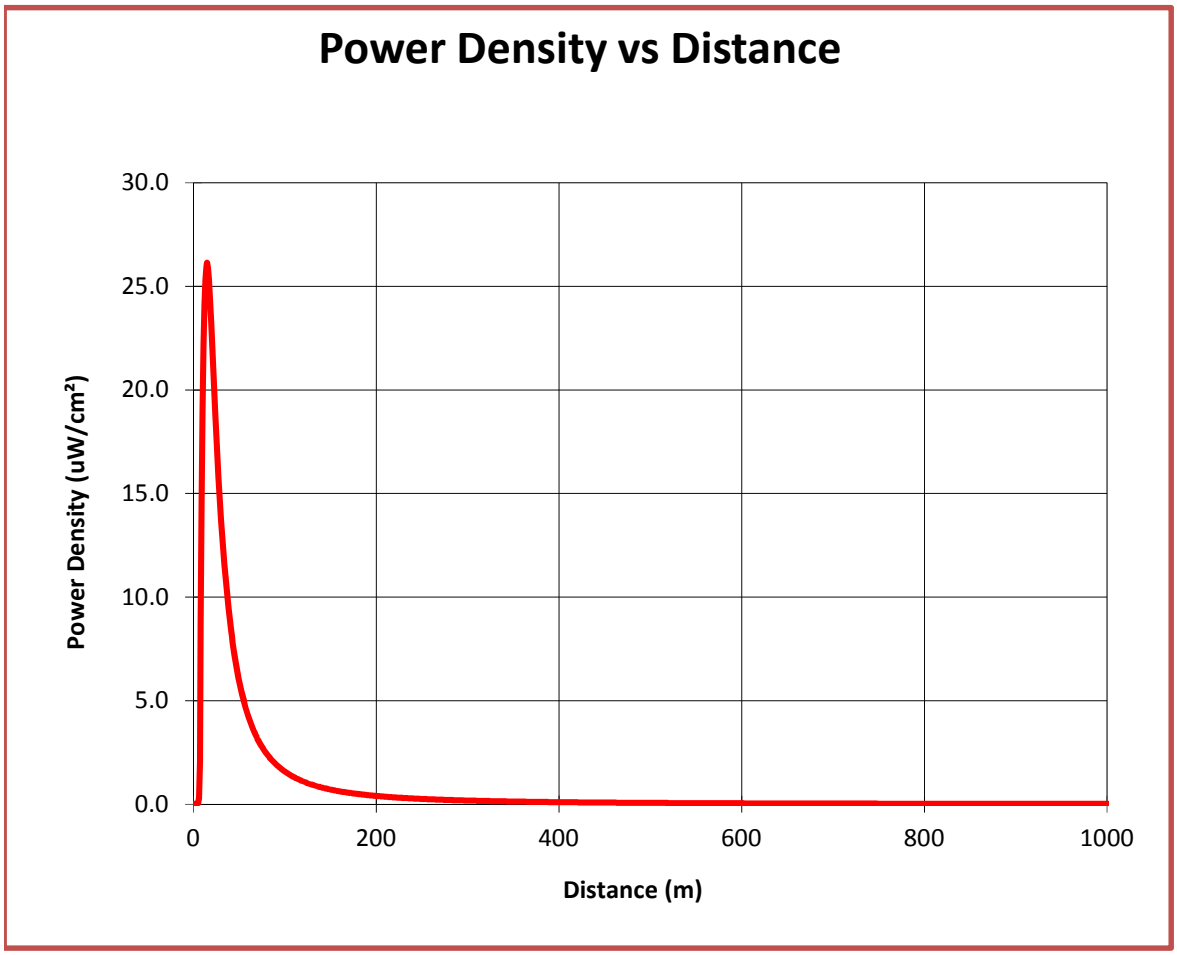
KPDD-LD Ch23 Evergreen

Ground-Level Power Density Calculations

Using Manufacturer's Vertical Plane Pattern

Antenna	CL1469			
ERP	480	Watts H (avg)		
	-	Watts V (avg)		
Antenna AGL	12.2	meters less 2m is	10.2	meters above the reference plane
MBT	0	degrees		

Calculated Maximum is	26.1	uW/cm² at	14	meters from the tower



KPDD-LD Ch23 Evergreen
Ground-Level Power Density Calculations
Using Manufacturer's Vertical Plane Pattern

Distance From Tower (meters)	Hypotenuse (meters)	Depression Angle (with MBT adjust) (degrees)	Interpolated Rel Field	Adjusted ERP (watts)	Power Density uW/cm²
0	10.20	90.00	0.010	0.0	0.02
1	10.25	84.40	0.010	0.0	0.02
2	10.39	78.91	0.010	0.0	0.01
3	10.63	73.61	0.011	0.1	0.02
4	10.96	68.59	0.019	0.2	0.05
5	11.36	63.89	0.049	1.1	0.30
6	11.83	59.53	0.133	8.5	2.03
7	12.37	55.54	0.289	40.1	8.75
8	12.96	51.89	0.391	73.4	14.58
9	13.60	48.58	0.469	105.7	19.09
10	14.28	45.57	0.531	135.4	22.17
11	15.00	42.84	0.582	162.4	24.11
12	15.75	40.36	0.626	187.9	25.31
13	16.52	38.12	0.665	212.0	25.95
14	17.32	36.08	0.699	234.7	26.14
15	18.14	34.22	0.729	254.9	25.88
16	18.97	32.52	0.754	272.9	25.32
17	19.83	30.96	0.776	289.0	24.56
18	20.69	29.54	0.795	303.2	23.67
19	21.56	28.23	0.810	315.0	22.63
20	22.45	27.02	0.825	326.6	21.65
21	23.35	25.91	0.837	336.0	20.60
22	24.25	24.87	0.849	345.6	19.64
23	25.16	23.92	0.859	354.1	18.69
24	26.08	23.03	0.868	361.4	17.76
25	27.00	22.20	0.877	369.1	16.91
26	27.93	21.42	0.886	376.4	16.12
27	28.86	20.70	0.893	382.8	15.35
28	29.80	20.02	0.899	388.2	14.61
29	30.74	19.38	0.905	392.8	13.89
30	31.69	18.78	0.910	397.4	13.22
31	32.63	18.21	0.915	402.1	12.61
32	33.59	17.68	0.920	406.0	12.02
33	34.54	17.18	0.923	409.3	11.46
34	35.50	16.70	0.928	413.0	10.95
35	36.46	16.25	0.932	416.9	10.48
36	37.42	15.82	0.936	420.3	10.03
37	38.38	15.41	0.939	423.0	9.59
38	39.35	15.03	0.942	425.7	9.19
39	40.31	14.66	0.945	428.2	8.80
40	41.28	14.31	0.947	430.6	8.44
41	42.25	13.97	0.950	432.9	8.10
42	43.22	13.65	0.952	434.9	7.78
43	44.19	13.34	0.954	436.7	7.47
44	45.17	13.05	0.956	438.5	7.18

45	46.14	12.77	0.957	439.9	6.90
46	47.12	12.50	0.959	441.3	6.64
47	48.09	12.24	0.960	442.6	6.39
48	49.07	12.00	0.962	443.9	6.16
49	50.05	11.76	0.963	445.6	5.94
50	51.03	11.53	0.965	447.2	5.74
51	52.01	11.31	0.967	448.8	5.54
52	52.99	11.10	0.969	450.4	5.36
53	53.97	10.89	0.970	451.6	5.18
54	54.95	10.70	0.971	452.6	5.01
55	55.94	10.51	0.972	453.6	4.84
56	56.92	10.32	0.973	454.6	4.69
57	57.91	10.15	0.974	455.5	4.54
58	58.89	9.97	0.975	456.4	4.40
59	59.88	9.81	0.976	456.9	4.26
60	60.86	9.65	0.976	457.4	4.13
61	61.85	9.49	0.977	457.9	4.00
62	62.83	9.34	0.977	458.4	3.88
63	63.82	9.20	0.978	458.8	3.76
64	64.81	9.06	0.978	459.3	3.65
65	65.80	8.92	0.979	459.6	3.55
66	66.78	8.79	0.979	459.9	3.45
67	67.77	8.66	0.979	460.2	3.35
68	68.76	8.53	0.979	460.4	3.25
69	69.75	8.41	0.980	460.7	3.16
70	70.74	8.29	0.980	461.0	3.08
71	71.73	8.18	0.980	461.2	2.99
72	72.72	8.06	0.980	461.4	2.92
73	73.71	7.95	0.981	461.7	2.84
74	74.70	7.85	0.981	462.1	2.77
75	75.69	7.74	0.981	462.4	2.70
76	76.68	7.64	0.982	462.7	2.63
77	77.67	7.55	0.982	463.0	2.56
78	78.66	7.45	0.982	463.3	2.50
79	79.66	7.36	0.983	463.6	2.44
80	80.65	7.27	0.983	463.9	2.38
81	81.64	7.18	0.983	464.2	2.33
82	82.63	7.09	0.984	464.5	2.27
83	83.62	7.01	0.984	464.8	2.22
84	84.62	6.92	0.984	465.0	2.17
85	85.61	6.84	0.985	465.3	2.12
86	86.60	6.76	0.985	465.5	2.07
87	87.60	6.69	0.985	465.8	2.03
88	88.59	6.61	0.985	466.0	1.98
89	89.58	6.54	0.986	466.3	1.94
90	90.58	6.47	0.986	466.5	1.90
91	91.57	6.40	0.986	466.7	1.86
92	92.56	6.33	0.986	466.9	1.82
93	93.56	6.26	0.987	467.2	1.78
94	94.55	6.19	0.987	467.4	1.75
95	95.55	6.13	0.987	467.6	1.71
96	96.54	6.06	0.987	467.8	1.68