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**Engineering Statement
Minor Modification of K21HQ-D
Channel 21 at Glendo, WY
Dec 2023**

I. Background

This Engineering Statement has been prepared on behalf of Central Wyoming College, licensee of low-power station K21HQ-D Glendo. This material has been prepared in connection with an application for minor modification of the licensed facility.

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 conducted using a study cell size of 1.0 km and a terrain extraction increment of 1.0 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: 2023.12.06 11:16:07

Study build station data: LMS TV 2023-12-04

Proposal: K21HQ-D D21 LD APP GLENDO, WY
File number: K21HQ-MOD
Facility ID: 127144
Station data: User record
Record ID: 1564
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	KRMT	D20	DT	LIC	DENVER, CO	BLANK0000154349	272.7 km
No	KFNB	D20	DT	LIC	CASPER, WY	BLCDT20090225AAN	138.6
No	K21NZ-D	D21	LD	LIC	ANTON, CO	BLANK0000117520	278.6
No	K21HF-D	D21	LD	LIC	ASPEN, CO	BLD TT20121119AHA	351.1
No	KDEO-LD	D21	LD	LIC	DENVER, CO	BLANK0000107032	258.1
No	KFCT	D21	DT	LIC	FORT COLLINS, CO	BLCDT20070920ACM	156.4
No	K21FF-D	D21	LD	LIC	HOLYOKE, CO	BLD TT20110502ABE	276.0
No	KGHB-CD	D21z	DC	LIC	PUEBLO, ETC., CO	BLANK0000072765	409.6
No	K21OV-D	D21	LD	LIC	REDSTONE, CO	BLANK0000163793	365.5
No	K21OI-D	D21	LD	LIC	MCCOOK/CULBERTSON, NE	BLANK0000112406	393.7
No	KNBN	D21	DT	CP	RAPID CITY, SD	BLANK0000035769	266.5
No	KNBN	D21	DT	LIC	RAPID CITY, SD	BLCDT20090206ACK	266.5
No	K49LJ-D	D22	LD	CP	CASPER, WY	BLANK0000035784	135.4
No	K49LJ-D	D22	LD	APP	CASPER, WY	BLANK0000199283	135.4

No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

Channel: D21
Mask: Simple
Latitude: 42 2 43.10 N (NAD83)
Longitude: 104 57 27.80 W
Height AMSL: 1492.0 m
HAAT: 0.0 m
Peak ERP: 1.20 kW
Antenna: Omnidirectional
Elev Pattn: Generic
Elec Tilt: 1.75

49.5 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	1.20 kW	92.6 m	30.9 km
45.0	1.20	87.3	30.3
90.0	1.20	6.2	19.3
135.0	1.20	24.4	19.3
180.0	1.20	-49.8	19.3
225.0	1.20	-25.4	19.3
270.0	1.20	35.7	20.8
315.0	1.20	51.8	24.9

Database HAAT does not agree with computed HAAT
Database HAAT: 0 m Computed HAAT: 28 m

Distance to Canadian border: 772.9 km

Distance to Mexican border: 1149.0 km

Hatfield & Dawson Consulting Engineers

Conditions at FCC monitoring station: Grand Island NE
Bearing: 100.8 degrees Distance: 557.6 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:
Bearing: 186.1 degrees Distance: 215.4 km
ERP: 1.20 kW Field strength: -15.4 dBu, 0.0 mV/m

No land mobile station failures found

Study cell size: 1.00 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%

No IX check failures found.

III. Nearby AM Stations

There are no AM stations close enough to the proposed operation to require notification.

IV. 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.

$$S(\mu W / cm^2) = \frac{33.4 \times AdjERP(Watts)}{D^2}$$

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 for an elevation of 2 meters above ground, based on the manufacturer's vertical plane pattern for the horizontally-polarized Kathrein/Scala SL8 antenna proposed in this application. The highest calculated power density from the proposed antenna alone occurs at a point 8 meters from the base of the antenna support structure. At this point the power density is calculated to be 4.9 $\mu W/cm^2$, which is 1.4% of 341 $\mu W/cm^2$ (the FCC maximum for uncontrolled environments at the Channel 21 frequency).

These calculations show that the maximum calculated power density produced at two meters above ground level by the proposed operation alone is less than 5% of the applicable FCC exposure limit at all locations between 1 and 500 meters from the base of the antenna support structure. Section 1.1307 of the Commission's Rules exempts applications for new facilities or modifications to existing facilities from the requirement of preparing an environmental assessment when the calculated emissions from the applicant's proposed facility are predicted to be less than 5% of the applicable FCC exposure limit. Therefore, the proposed facility is in compliance with Section 1.1301 *et seq* and no further analysis of RF exposure at this site is required in this application.

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.

December 6, 2023

Erik C. Swanson, P.E.

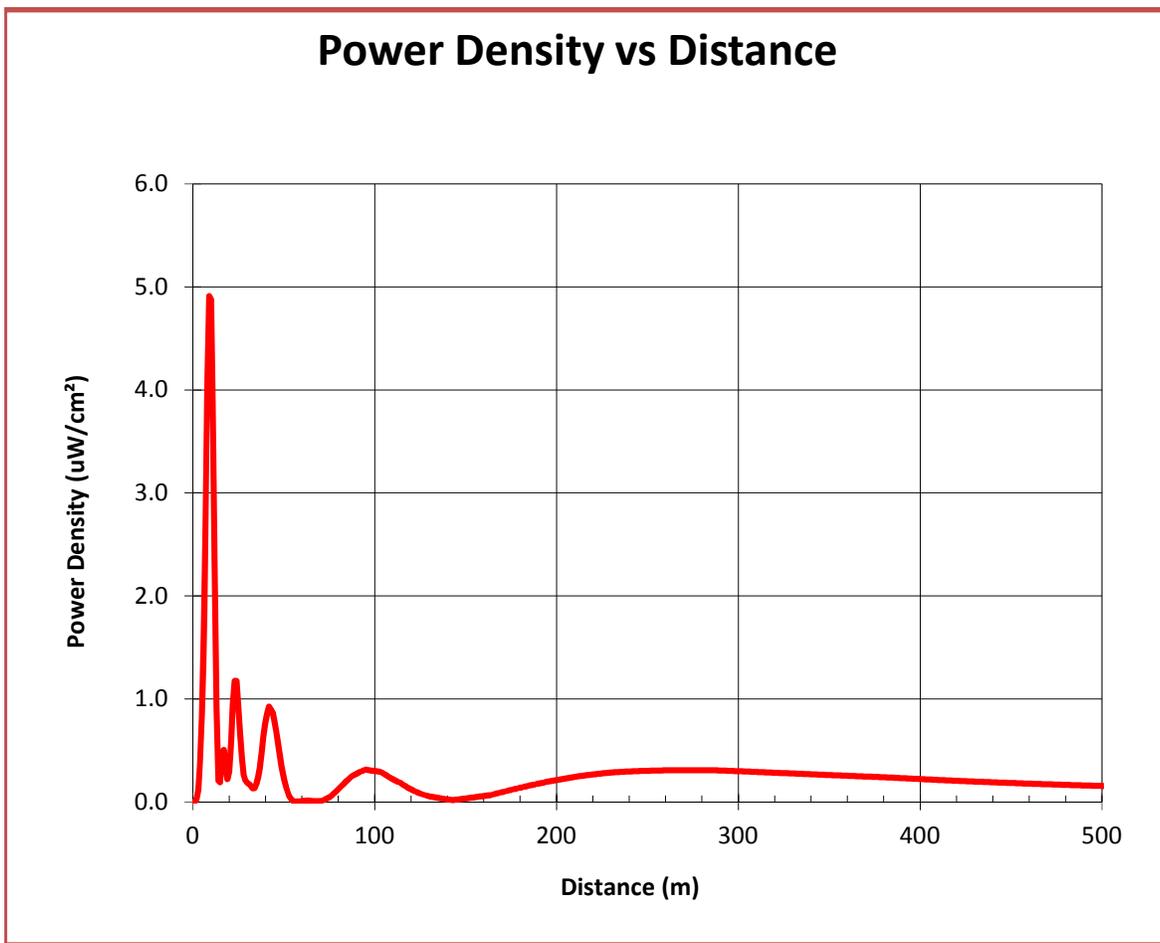
K21HQ-D Glendo

Ground-Level Power Density Calculations

Using Manufacturer's Vertical Plane Pattern

Antenna	SL8		
ERP	1,200	Watts H (avg)	
	-	Watts V (avg)	
Antenna AGL	22	meters less 2m is	20 meters above the reference plane
MBT	0	degrees	

Calculated Maximum is 4.9 $\mu\text{W}/\text{cm}^2$ at 8 meters from the tower



K21HQ-D Glendo
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/cm ²
0	20.00	90.00	0.001	0.0	0.00
1	20.02	87.14	0.015	0.3	0.02
2	20.10	84.29	0.035	1.4	0.12
3	20.22	81.47	0.060	4.3	0.35
4	20.40	78.69	0.092	10.2	0.82
5	20.62	75.96	0.133	21.1	1.66
6	20.88	73.30	0.174	36.4	2.79
7	21.19	70.71	0.213	54.3	4.04
8	21.54	68.20	0.238	68.2	4.91
9	21.93	65.77	0.242	70.2	4.88
10	22.36	63.43	0.220	57.8	3.86
11	22.83	61.19	0.173	35.8	2.30
12	23.32	59.04	0.111	14.8	0.91
13	23.85	56.98	0.054	3.5	0.20
14	24.41	55.01	0.053	3.4	0.19
15	25.00	53.13	0.081	7.9	0.42
16	25.61	51.34	0.091	9.9	0.51
17	26.25	49.64	0.080	7.7	0.37
18	26.91	48.01	0.063	4.8	0.22
19	27.59	46.47	0.075	6.8	0.30
20	28.28	45.00	0.108	14.0	0.58
21	29.00	43.60	0.141	23.8	0.95
22	29.73	42.27	0.161	31.1	1.18
23	30.48	41.01	0.165	32.7	1.17
24	31.24	39.81	0.152	27.6	0.95
25	32.02	38.66	0.131	20.4	0.67
26	32.80	37.57	0.107	13.6	0.42
27	33.60	36.53	0.087	9.2	0.27
28	34.41	35.54	0.078	7.3	0.21
29	35.23	34.59	0.076	6.9	0.18
30	36.06	33.69	0.074	6.6	0.17
31	36.89	32.83	0.072	6.2	0.15
32	37.74	32.01	0.068	5.6	0.13
33	38.59	31.22	0.070	5.9	0.13
34	39.45	30.47	0.082	8.0	0.17
35	40.31	29.74	0.100	12.0	0.25
36	41.18	29.05	0.124	18.5	0.36
37	42.06	28.39	0.150	26.9	0.51
38	42.94	27.76	0.173	36.0	0.65
39	43.83	27.15	0.194	45.1	0.78
40	44.72	26.57	0.208	51.8	0.86
41	45.62	26.00	0.219	57.5	0.92
42	46.52	25.46	0.220	58.1	0.90
43	47.42	24.94	0.220	58.1	0.86
44	48.33	24.44	0.211	53.4	0.76

45	49.24	23.96	0.202	48.8	0.67
46	50.16	23.50	0.185	41.0	0.55
47	51.08	23.05	0.169	34.2	0.44
48	52.00	22.62	0.148	26.4	0.33
49	52.92	22.20	0.128	19.7	0.23
50	53.85	21.80	0.107	13.8	0.16
51	54.78	21.41	0.086	8.9	0.10
52	55.71	21.04	0.066	5.2	0.06
53	56.65	20.67	0.048	2.7	0.03
54	57.58	20.32	0.030	1.1	0.01
55	58.52	19.98	0.014	0.2	0.00
56	59.46	19.65	0.017	0.3	0.00
57	60.41	19.33	0.019	0.4	0.00
58	61.35	19.03	0.022	0.6	0.01
59	62.30	18.73	0.026	0.8	0.01
60	63.25	18.43	0.030	1.1	0.01
61	64.20	18.15	0.035	1.4	0.01
62	65.15	17.88	0.036	1.6	0.01
63	66.10	17.61	0.034	1.4	0.01
64	67.05	17.35	0.032	1.2	0.01
65	68.01	17.10	0.030	1.1	0.01
66	68.96	16.86	0.030	1.0	0.01
67	69.92	16.62	0.031	1.1	0.01
68	70.88	16.39	0.031	1.2	0.01
69	71.84	16.16	0.032	1.3	0.01
70	72.80	15.95	0.036	1.6	0.01
71	73.76	15.73	0.047	2.7	0.02
72	74.73	15.52	0.059	4.1	0.02
73	75.69	15.32	0.070	5.8	0.03
74	76.66	15.12	0.080	7.7	0.04
75	77.62	14.93	0.092	10.1	0.06
76	78.59	14.74	0.105	13.2	0.07
77	79.56	14.56	0.118	16.6	0.09
78	80.52	14.38	0.130	20.4	0.10
79	81.49	14.21	0.143	24.4	0.12
80	82.46	14.04	0.154	28.6	0.14
81	83.43	13.87	0.166	32.9	0.16
82	84.40	13.71	0.176	37.3	0.17
83	85.38	13.55	0.187	41.9	0.19
84	86.35	13.39	0.197	46.6	0.21
85	87.32	13.24	0.207	51.5	0.23
86	88.29	13.09	0.217	56.5	0.24
87	89.27	12.95	0.225	61.0	0.26
88	90.24	12.80	0.232	64.6	0.26
89	91.22	12.67	0.238	68.2	0.27
90	92.20	12.53	0.245	71.8	0.28
91	93.17	12.40	0.251	75.5	0.29
92	94.15	12.26	0.257	79.1	0.30
93	95.13	12.14	0.263	82.8	0.31
94	96.10	12.01	0.268	86.5	0.31
95	97.08	11.89	0.270	87.7	0.31
96	98.06	11.77	0.272	88.6	0.31