

May 2010
FM Translator K295AV
Walla Walla, Washington Channel 295D
NIER Study for License Application

Facilities Constructed

FM translator K295AV has been constructed as authorized in BPFT-20100315ACB, on Channel 295D (106.9 MHz) with an effective radiated power of 240 Watts. The translator will operate with separate vertically-polarized and horizontally-polarized antennas.

The construction permit bears a condition #1, which states:

The permittee/licensee shall, upon completion of construction and during the equipment test period, make proper radiofrequency electromagnetic (RF) field strength measurements throughout the transmitter site area to determine if there are any areas that exceed the FCC guidelines for human exposure to RF fields. If necessary, a fence must be erected at such distances and in such a manner as to prevent the exposure of humans to RF fields in excess of the FCC Guidelines (OET Bulletin No. 65, Edition 97-01, August 1997). The fence must be a type which will preclude casual or inadvertent access, and must include warning signs at appropriate intervals which describe the nature of the hazard. Any areas within the fence found to exceed the recommended guidelines must be clearly marked with appropriate visual warning signs.

Owing to the vertical plane patterns of the log-periodic antennas used for this installation, and to the fact that apart from co-located K201DX the next-nearest broadcast user is located some 1900 feet distant, post-construction measurements are not believed to be necessary in this instance.

NIER Calculations

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.

$$S(mW / cm^2) = \frac{33.40981 \times AdjERP(Watts)}{D^2}$$

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.

Calculations of the power density produced by the K295AV antenna system have been made using the manufacturer's vertical plane patterns for the Scala CL-FM(V) and CL-FM(H) antennas which

Hatfield & Dawson Consulting Engineers

have been installed for use.

The highest calculated ground level power density from the vertically-polarized element occurs 5 meters from the base of the tower. At this point the power density is calculated to be $93.2 \mu\text{W}/\text{cm}^2$, which is 46.6% of $200 \mu\text{W}/\text{cm}^2$ (the FCC standard for uncontrolled environments).

The highest calculated ground level power density from the horizontally-polarized element occurs 6 meters from the base of the tower. At this point the power density is calculated to be $63.1 \mu\text{W}/\text{cm}^2$, which is 31.6% of $200 \mu\text{W}/\text{cm}^2$ (the FCC standard for uncontrolled environments).

In support of this license application, attached are graphs of the calculated ground-level power density from the two K295AV antenna elements, including detail of the calculations out to a distance of 100 meters from the antenna support structure, beyond which distance the results are increasingly negligible.

FM translator K201DX Walla Walla is also located at this transmitter site, but with a low ERP of just 10 watts from an antenna located 28 meters above ground. A worst-case calculation assuming that K201DX radiates 100% power straight down produces a result of just $1.0 \mu\text{W}/\text{cm}^2$, which is 0.5% of $200 \mu\text{W}/\text{cm}^2$ (the FCC standard for uncontrolled environments).

These calculations show that the maximum calculated power density produced at two meters above ground level by the proposed operation of K295AV and the present operation of K201DX (were their maxima to coincide, which they do not) is $157.3 \mu\text{W}/\text{cm}^2$, which is 78.7% of $200 \mu\text{W}/\text{cm}^2$ (the FCC standard for uncontrolled environments).

K295AV Walla Walla
Horizontally-polarized component

Antenna ERP

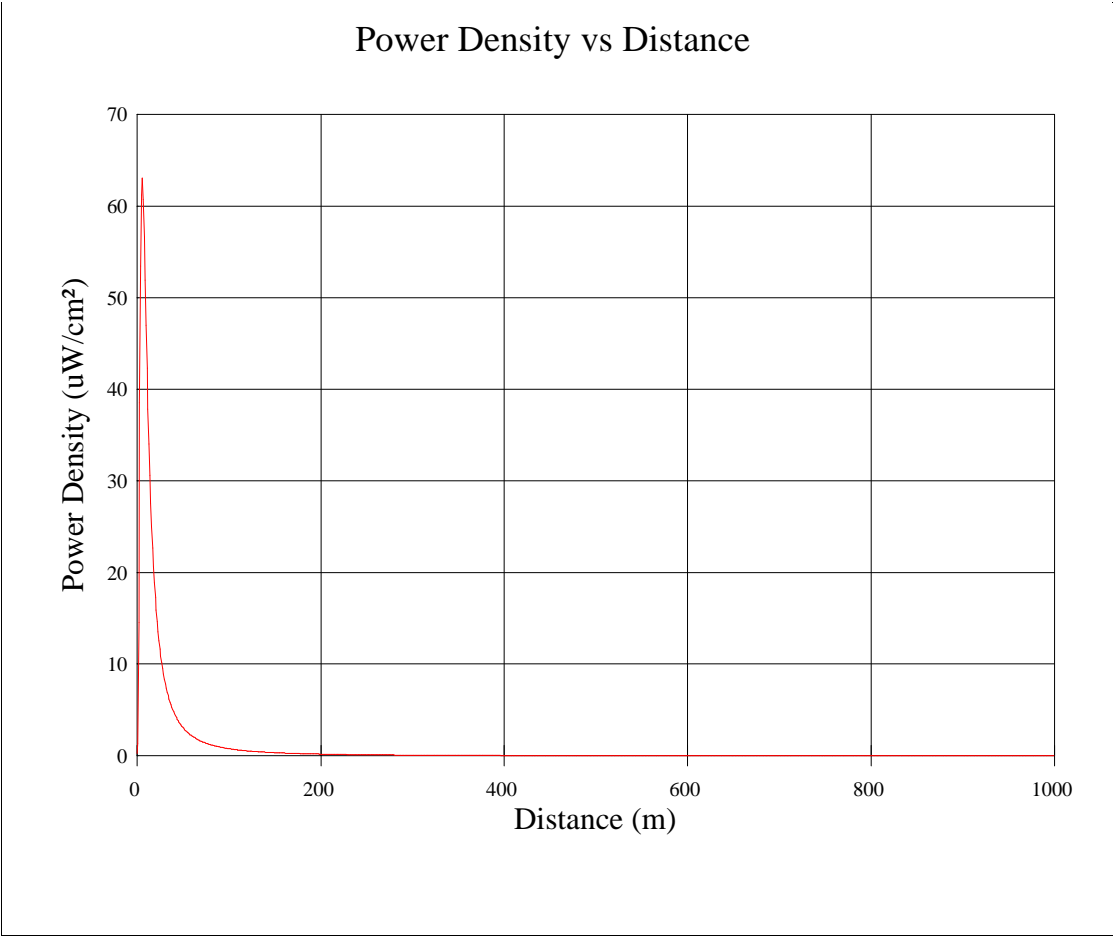
CLFMH240 Watts H (avg)
0 Watts V (avg)

Antenna AGL

7 meters less 2m is5 meters above the reference plane

Maximum is

63.08 uW/cm² at6 meters from the tower



Distance From Tower in meters	Length of Hypotenuse in meters	Depression Angle	Interp Rel Field	Adjusted ERP in watts	Calculated Power Density in uW/cm²
0	5.00	90.00	0.0300	0.22	0.29
1	5.10	78.69	0.0657	1.04	1.33
2	5.39	68.20	0.2296	12.66	14.58
3	5.83	59.04	0.4045	39.26	38.58
4	6.40	51.34	0.5229	65.62	53.47
5	7.07	45.00	0.6180	91.66	61.25
6	7.81	39.81	0.6927	115.17	63.08
7	8.60	35.54	0.7485	134.45	60.70
8	9.43	32.01	0.7929	150.90	56.65
9	10.30	29.05	0.8283	164.68	51.90
10	11.18	26.57	0.8558	175.77	46.98
11	12.08	24.44	0.8780	185.01	42.34
12	13.00	22.62	0.8934	191.57	37.87
13	13.93	21.04	0.9077	197.72	34.05
14	14.87	19.65	0.9184	202.44	30.60
15	15.81	18.43	0.9275	206.47	27.59
16	16.76	17.35	0.9355	210.05	24.97

17	17.72	16.39	0.9429	213.37	22.70
18	18.68	15.52	0.9489	216.08	20.69
19	19.65	14.74	0.9535	218.22	18.89
20	20.62	14.04	0.9578	220.16	17.31
21	21.59	13.39	0.9616	221.94	15.91
22	22.56	12.80	0.9650	223.48	14.67
23	23.54	12.26	0.9677	224.74	13.55
24	24.52	11.77	0.9704	226.00	12.56
25	25.50	11.31	0.9731	227.28	11.68
26	26.48	10.89	0.9756	228.42	10.89
27	27.46	10.49	0.9775	229.34	10.16
28	28.44	10.12	0.9794	230.20	9.51
29	29.43	9.78	0.9804	230.70	8.90
30	30.41	9.46	0.9811	231.00	8.34
31	31.40	9.16	0.9817	231.28	7.84
32	32.39	8.88	0.9824	231.61	7.38
33	33.38	8.62	0.9832	231.98	6.96
34	34.37	8.37	0.9839	232.34	6.57
35	35.36	8.13	0.9846	232.67	6.22
36	36.35	7.91	0.9853	232.99	5.89
37	37.34	7.70	0.9859	233.29	5.59
38	38.33	7.50	0.9865	233.57	5.31
39	39.32	7.31	0.9871	233.84	5.05
40	40.31	7.13	0.9876	234.10	4.81
41	41.30	6.95	0.9881	234.34	4.59
42	42.30	6.79	0.9886	234.57	4.38
43	43.29	6.63	0.9891	234.80	4.19
44	44.28	6.48	0.9896	235.01	4.00
45	45.28	6.34	0.9900	235.21	3.83
46	46.27	6.20	0.9904	235.41	3.67
47	47.27	6.07	0.9908	235.60	3.52
48	48.26	5.95	0.9911	235.75	3.38
49	49.25	5.83	0.9913	235.86	3.25
50	50.25	5.71	0.9916	235.97	3.12
51	51.24	5.60	0.9918	236.08	3.00
52	52.24	5.49	0.9920	236.18	2.89
53	53.24	5.39	0.9922	236.28	2.79
54	54.23	5.29	0.9924	236.38	2.69
55	55.23	5.19	0.9926	236.47	2.59
56	56.22	5.10	0.9928	236.55	2.50
57	57.22	5.01	0.9930	236.64	2.41
58	58.22	4.93	0.9931	236.72	2.33
59	59.21	4.84	0.9933	236.80	2.26
60	60.21	4.76	0.9935	236.88	2.18
61	61.20	4.69	0.9936	236.95	2.11
62	62.20	4.61	0.9938	237.02	2.05
63	63.20	4.54	0.9939	237.09	1.98
64	64.20	4.47	0.9941	237.16	1.92
65	65.19	4.40	0.9942	237.23	1.86
66	66.19	4.33	0.9943	237.29	1.81
67	67.19	4.27	0.9945	237.35	1.76
68	68.18	4.21	0.9946	237.41	1.71
69	69.18	4.14	0.9947	237.47	1.66
70	70.18	4.09	0.9948	237.52	1.61
71	71.18	4.03	0.9949	237.58	1.57
72	72.17	3.97	0.9950	237.62	1.52
73	73.17	3.92	0.9951	237.65	1.48
74	74.17	3.87	0.9951	237.67	1.44
75	75.17	3.81	0.9952	237.69	1.41
76	76.16	3.76	0.9952	237.72	1.37

77	77.16	3.72	0.9953	237.74	1.33
78	78.16	3.67	0.9953	237.76	1.30
79	79.16	3.62	0.9954	237.79	1.27
80	80.16	3.58	0.9954	237.81	1.24
81	81.15	3.53	0.9955	237.83	1.21
82	82.15	3.49	0.9955	237.85	1.18
83	83.15	3.45	0.9956	237.87	1.15
84	84.15	3.41	0.9956	237.89	1.12
85	85.15	3.37	0.9956	237.91	1.10
86	86.15	3.33	0.9957	237.93	1.07
87	87.14	3.29	0.9957	237.95	1.05
88	88.14	3.25	0.9957	237.96	1.02
89	89.14	3.22	0.9958	237.98	1.00
90	90.14	3.18	0.9958	238.00	0.98
91	91.14	3.14	0.9959	238.01	0.96
92	92.14	3.11	0.9959	238.03	0.94
93	93.13	3.08	0.9959	238.05	0.92
94	94.13	3.04	0.9960	238.06	0.90
95	95.13	3.01	0.9960	238.08	0.88
96	96.13	2.98	0.9960	238.09	0.86
97	97.13	2.95	0.9960	238.11	0.84
98	98.13	2.92	0.9961	238.12	0.83
99	99.13	2.89	0.9961	238.14	0.81
100	100.12	2.86	0.9961	238.15	0.79

K295AV Walla Walla

Vertically-polarized component

Antenna ERP

CLFMV

0 Watts H (avg)

240 Watts V (avg)

Antenna AGL

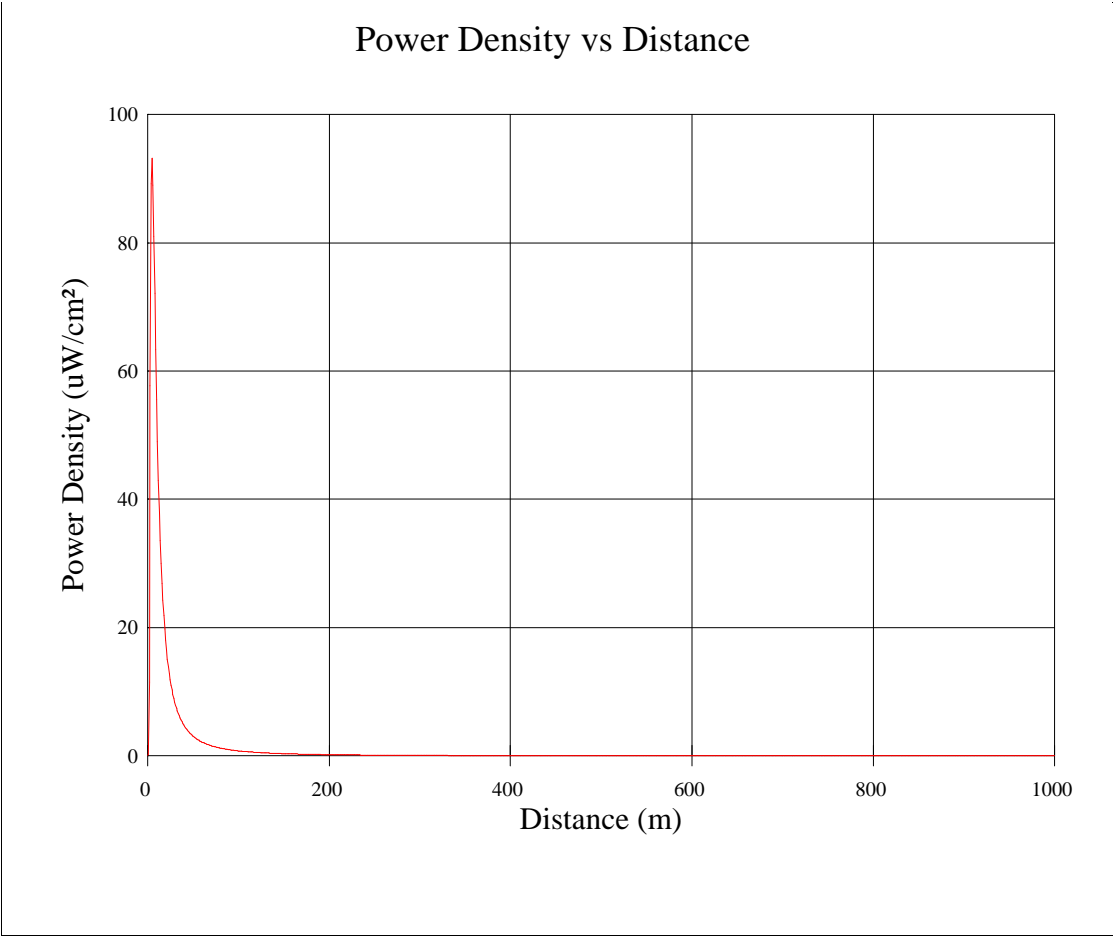
5 meters less 2m is

3 meters above the reference plane

Maximum is

93.19 uW/cm² at

5 meters from the tower



Distance From Tower in meters	Length of Hypotenuse in meters	Depression Angle	Interp Rel Field	Adjusted ERP in watts	Calculated Power Density in uW/cm²
0	3.00	90.00	0.0100	0.02	0.09
1	3.16	71.57	0.0169	0.07	0.23
2	3.61	56.31	0.1367	4.48	11.52
3	4.24	45.00	0.3600	31.10	57.73
4	5.00	36.87	0.5275	66.77	89.24
5	5.83	30.96	0.6286	94.84	93.19
6	6.71	26.57	0.7068	119.91	89.02
7	7.62	23.20	0.7656	140.68	81.04
8	8.54	20.56	0.8105	157.68	72.16
9	9.49	18.43	0.8435	170.75	63.39
10	10.44	16.70	0.8695	181.45	55.62
11	11.40	15.26	0.8912	190.61	48.99
12	12.37	14.04	0.9056	196.83	42.98
13	13.34	12.99	0.9171	201.84	37.88
14	14.32	12.09	0.9270	206.22	33.61
15	15.30	11.31	0.9356	210.08	29.99
16	16.28	10.62	0.9432	213.50	26.92

17	17.26	10.01	0.9499	216.56	24.28
18	18.25	9.46	0.9532	218.07	21.88
19	19.24	8.97	0.9562	219.42	19.81
20	20.22	8.53	0.9588	220.64	18.02
21	21.21	8.13	0.9612	221.75	16.46
22	22.20	7.77	0.9634	222.76	15.10
23	23.19	7.43	0.9654	223.68	13.89
24	24.19	7.13	0.9672	224.54	12.82
25	25.18	6.84	0.9689	225.32	11.87
26	26.17	6.58	0.9705	226.05	11.03
27	27.17	6.34	0.9720	226.73	10.26
28	28.16	6.12	0.9733	227.36	9.58
29	29.15	5.91	0.9746	227.95	8.96
30	30.15	5.71	0.9757	228.49	8.40
31	31.14	5.53	0.9768	229.01	7.89
32	32.14	5.36	0.9779	229.49	7.42
33	33.14	5.19	0.9788	229.95	7.00
34	34.13	5.04	0.9797	230.38	6.61
35	35.13	4.90	0.9804	230.69	6.25
36	36.12	4.76	0.9809	230.94	5.91
37	37.12	4.64	0.9815	231.18	5.61
38	38.12	4.51	0.9819	231.41	5.32
39	39.12	4.40	0.9824	231.63	5.06
40	40.11	4.29	0.9828	231.84	4.81
41	41.11	4.18	0.9833	232.03	4.59
42	42.11	4.09	0.9837	232.22	4.38
43	43.10	3.99	0.9840	232.40	4.18
44	44.10	3.90	0.9844	232.57	3.99
45	45.10	3.81	0.9847	232.73	3.82
46	46.10	3.73	0.9851	232.89	3.66
47	47.10	3.65	0.9854	233.04	3.51
48	48.09	3.58	0.9857	233.18	3.37
49	49.09	3.50	0.9860	233.32	3.23
50	50.09	3.43	0.9863	233.45	3.11
51	51.09	3.37	0.9865	233.58	2.99
52	52.09	3.30	0.9868	233.70	2.88
53	53.08	3.24	0.9870	233.82	2.77
54	54.08	3.18	0.9873	233.93	2.67
55	55.08	3.12	0.9875	234.04	2.58
56	56.08	3.07	0.9877	234.15	2.49
57	57.08	3.01	0.9879	234.25	2.40
58	58.08	2.96	0.9882	234.35	2.32
59	59.08	2.91	0.9884	234.44	2.24
60	60.07	2.86	0.9886	234.54	2.17
61	61.07	2.82	0.9887	234.62	2.10
62	62.07	2.77	0.9889	234.71	2.04
63	63.07	2.73	0.9891	234.79	1.97
64	64.07	2.68	0.9893	234.87	1.91
65	65.07	2.64	0.9894	234.95	1.85
66	66.07	2.60	0.9896	235.03	1.80
67	67.07	2.56	0.9897	235.10	1.75
68	68.07	2.53	0.9899	235.17	1.70
69	69.07	2.49	0.9900	235.24	1.65
70	70.06	2.45	0.9902	235.31	1.60
71	71.06	2.42	0.9903	235.38	1.56
72	72.06	2.39	0.9905	235.44	1.51
73	73.06	2.35	0.9906	235.50	1.47
74	74.06	2.32	0.9907	235.56	1.43
75	75.06	2.29	0.9908	235.62	1.40
76	76.06	2.26	0.9910	235.68	1.36

77	77.06	2.23	0.9911	235.74	1.33
78	78.06	2.20	0.9912	235.79	1.29
79	79.06	2.17	0.9913	235.84	1.26
80	80.06	2.15	0.9914	235.89	1.23
81	81.06	2.12	0.9915	235.94	1.20
82	82.05	2.10	0.9916	235.99	1.17
83	83.05	2.07	0.9917	236.04	1.14
84	84.05	2.05	0.9918	236.09	1.12
85	85.05	2.02	0.9919	236.13	1.09
86	86.05	2.00	0.9920	236.18	1.07
87	87.05	1.97	0.9921	236.22	1.04
88	88.05	1.95	0.9922	236.27	1.02
89	89.05	1.93	0.9923	236.31	1.00
90	90.05	1.91	0.9924	236.35	0.97
91	91.05	1.89	0.9924	236.39	0.95
92	92.05	1.87	0.9925	236.43	0.93
93	93.05	1.85	0.9926	236.47	0.91
94	94.05	1.83	0.9927	236.50	0.89
95	95.05	1.81	0.9928	236.54	0.87
96	96.05	1.79	0.9928	236.58	0.86
97	97.05	1.77	0.9929	236.61	0.84
98	98.05	1.75	0.9930	236.65	0.82
99	99.05	1.74	0.9931	236.68	0.81
100	100.04	1.72	0.9931	236.71	0.79