

SECTION 25.203 COORDINATION ANALYSIS AND INFORMATION

In this application, DIRECTV Enterprises, LLC (“DIRECTV”) seeks authority to operate a 17/24 GHz BSS earth station antenna at DIRECTV’s Northwest Uplink facility (“NWUF”). Because satellite and terrestrial wireless licensees operate on a co-primary basis in a portion of the 24.75-25.15 GHz band in which this earth station will transmit, the Commission has established specific coordination rules, including a threshold below which no coordination is necessary. As demonstrated below, DIRECTV’s proposed operations would fall below that threshold even under worst-case assumptions, and therefore no coordination is required. DIRECTV also provides additional information that could be used should coordination become necessary in the future.

A. No Coordination Is Required

Under Section 25.203(l) of the Commission’s rules, feeder link earth stations operating in the 25.05-25.25 GHz band can only be licensed in Economic Areas (“EA”) where no existing terrestrial fixed service (“FS”) licensee has been authorized, and feeder link operations must be coordinated with FS licensees in nearby areas if the power flux-density (“PFD”) of the feeder link transmitted signal is equal to or greater than $-114 \text{ dBW/m}^2/\text{MHz}$ at the boundary of the FS licensed area.¹

The proposed earth station is located in Yakima County, WA, which is in EA 169. According to the Commission’s ULS database, there are no FS licensees in that EA authorized to operate in the relevant band. The closest FS licenses to operate in the 24.75-25.15 GHz band were issued for the Seattle-Everett, WA SMSA (call signs WMF854 and WMT323) which includes King and Snohomish counties, and the Portland, OR-WA SMSA (call signs WMF842 and WMT321) which includes Clark, Multnomah, Washington, and Clackamas counties.² Shown in Figure 1 below is a map illustrating the location of DIRECTV’s NWUF and showing the shortest distances from that location to the boundaries of the two closest counties in these SMSAs (King and Clark counties, respectively).

¹ See 47 C.F.R. § 25.203(l).

² The Wireless Telecommunications Bureau has determined that these four licenses automatically terminated for failure to demonstrate substantial service as of June 1, 2012. See *FiberTower Spectrum Holdings LLC*, 27 FCC Rcd. 13562 (WTB 2012). The licensee has sought full Commission review of that determination, which remains pending.

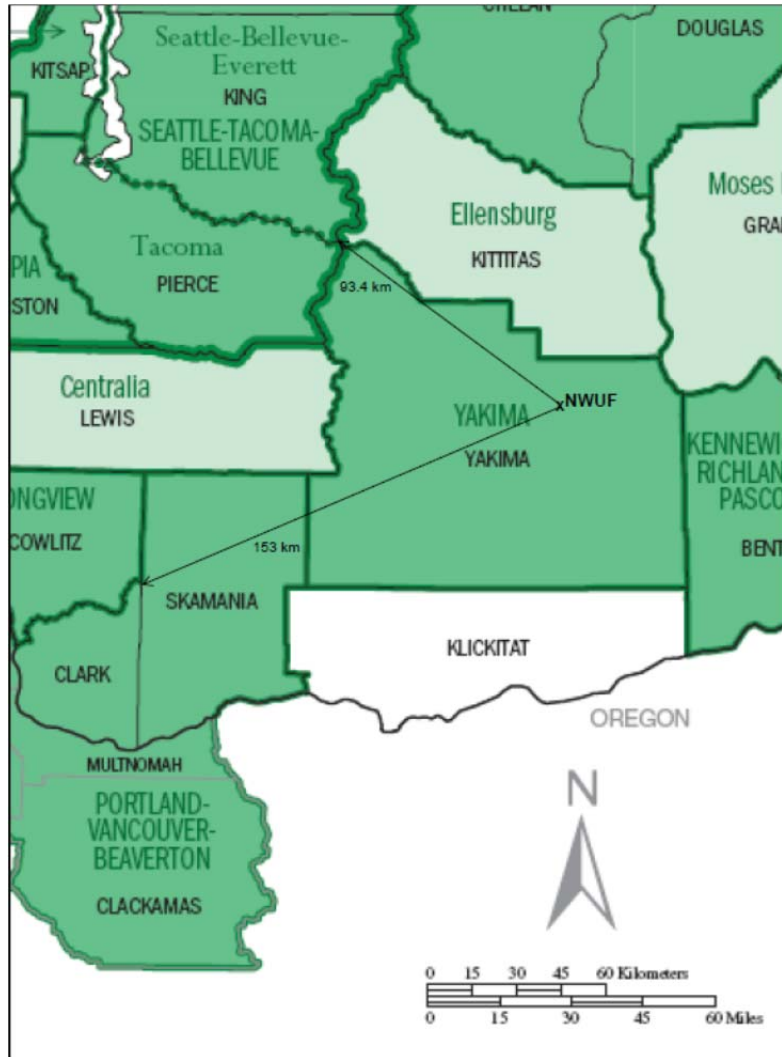


Figure 1. Map of Area Surrounding NWUF

Presented in Table 1 below is a worst case analysis of the NWUF feeder link PFD at the closest boundaries of King and Clark counties based on the distances shown in the map above. Note that this worst case analysis assumes free space path loss, as specified in Section 25.203(1)(2). This analysis also assumes a maximum transmit power of 75.7 dBW per 36 MHz carrier from NWUF, as specified in the application. The analysis demonstrates that even under these worst case assumptions, the PFD from the proposed earth station's transmissions would fall below the coordination threshold of $-114 \text{ dBW/m}^2/\text{MHz}$, with 3.0 dB of margin for King County and with 7.2 dB of margin for Clark County. As such, pursuant to Section 25.203(1), there is no need for DIRECTV to coordinate the operations of its NWUF earth station with the FS operators licensed in these neighboring SMSAs.

24 GHz BSS Feeder Link Antenna Parameters	King County	Clark County
Max EIRP/carrier (dBW)	75.7	75.7
Antenna size (m)	3.5	3.5
Antenna on-axis gain (dBi)	56.7	56.7
Max power into antenna (dBW)	19.0	19.0
Bandwidth normalizing factor for 36 MHz carrier (dB)	15.6	15.6
Max power density into antenna (dBW/MHz)	3.4	3.4
Max gain towards the horizon (dBi) (§25.209)	-10.0	-10.0
Max EIRP density towards the horizon (dBW/MHz)	-6.6	-6.6
Min distance to EA border (km)	93.4	153.0
Spreading loss over min distance to EA border (dB-m ²)	110.4	114.7
Max PFD at EA border (dBW/m ² /MHz)	-117.0	-121.2
Margin in FS protection (dB)	3.0	7.2

Table 1. Calculation of NWUF Feeder Link PFD at License Area Borders

B. Coordination Data

In order to facilitate future coordination should any terrestrial FS system seek authority to operate in closer proximity to the NWUF facility, DIRECTV provides the additional information set forth in Table 2 below. Also set forth immediately below is an explanation of how the information in Table 2 corresponds to certain subsections of Section 25.203.

Section 25.203(c)(2)(iv) calls for antenna gain pattern(s) in the plane of the main beam. Given that the intent of this subsection is to establish potential off-axis EIRP levels that could affect terrestrial systems deployed in the future, a conservative estimate of the gain pattern should be used. The 3.5-meter feeder link antenna that is the subject of this application is compliant with Section 25.209, as stated in the Form 312 accompanying this application. The antenna off-axis gain envelope of that section is well understood and easily referenced for future coordinations. It was also the basis used by DIRECTV in deriving the coordination distances provided in Table 2.

Section 25.203(c)(2)(vi) calls for a horizon elevation plot. Section 25.203(b) states that this plot “may also be submitted in tabular numerical format at 5° azimuthal increments instead of graphical format.” Accordingly, Table 2 provides this data in numerical format in the column labeled “Horizon Elevation Angle.”

Section 25.203(c)(2)(vii) calls for antenna horizon gain plots determined in accordance with Section 25.251 for the satellite longitude range specified in Section 25.203(c)(2)(v). Section 25.251, in turn, provides that technical aspects of coordination should be based on Appendix 7 of the ITU Radio Regulations. DIRECTV used the method set forth in Annex 3 of Appendix 7, titled “Antenna Gain Towards The Horizon For An Earth Station Operating With A Geostationary Satellite,” to determine the angular separation between the earth station pointing direction and the azimuth of interest. This angular separation is listed in Table 2 in the column

labeled “Antenna Disc. Angle.” This angular separation was then used with the antenna gain mask of Section 25.209, rather than the antenna gain pattern assumed in Appendix 7 of the Radio regulations, to establish gain along the azimuth of interest, and this gain is shown in the column labeled “Antenna Gain.” Here again, as permitted under Section 25.203(b), DIRECTV supplied this information in tabular rather than graphical form.

Section 25.203(c)(2)(xii) calls for a plot of great circle coordination distances and rain scatter coordination distance contours. Again providing this information in tabular rather than graphical form, the data is set forth in the rightmost column labeled “Coordination Distance.” Because Section 25.203(l)(2) specifies that free space propagation conditions should be assumed in calculating PFD at the license area boundary of a 24 GHz fixed service licensee, DIRECTV did not submit additional data that include the effect of rain scatter.

**Table 2. DIRECTV 17/24 GHz Earth Station
Frequency Coordination Data**

Earth Station Name, State	Moxee, WA
Latitude (DMS) (NAD83)	46 33 55.1 N
Longitude (DMS) (NAD83)	120 23 56.0 W
Ground Elevation AMSL (Ft/m)	1043.4 / 318.0
Antenna Centerline AGL (Ft/m)	8.2 / 2.5
Transmit Antenna Type	FCC Section 25.209 compliant
25 GHz Gain (dBi) / Diameter (m)	56.7 / 3.5
Modulation	Digital
Emission / Transmit band (MHz)	36M0G7W / 24750.00-25150.00
Max. Available RF Power (dBW/MHz)	3.4
Max. EIRP (dBW/MHz)	60.1
Max Permissible Interference Power	-114 dBW/m ² /MHz
Range of Satellite Arc (Geostationary)	
Degrees Longitude	70.0W / 140.0W
Azimuth Range (Min/Max)	121.0 / 206.0
Corresponding Elevation Angles	17.7 / 33.1

Table of Earth Station Coordination Distances

Earth Station Name, State	Moxee, WA
Latitude (DMS) (NAD83)	46 33 55.1 N
Longitude (DMS) (NAD83)	120 23 56.0 W
Ground Elevation AMSL (Ft/m)	1043.4 / 318.0
Antenna Centerline AGL (Ft/m)	8.2 / 2.5
Max Permissible Interference Power	-114 dBW/m ² /MHz

Azimuth (Deg)	Horizon Elevation Angle (Deg)	Antenna Disc. Angle (Deg)	Antenna Gain (dBi)	Coordination Distance (Km)
0	3.38	119.63	-10.00	66.13
5	3.60	115.16	-10.00	66.13
10	3.60	110.34	-10.00	66.13
15	3.28	105.48	-10.00	66.13
20	4.09	100.68	-10.00	66.13
25	3.76	95.82	-10.00	66.13
30	2.74	90.96	-10.00	66.13
35	3.08	86.13	-10.00	66.13
40	2.95	81.30	-10.00	66.13
45	2.78	76.48	-10.00	66.13
50	2.58	71.68	-10.00	66.13
55	2.25	66.92	-10.00	66.13
60	2.04	62.17	-10.00	66.13
65	1.87	57.45	-10.00	66.13
70	1.85	52.74	-10.00	66.13
75	1.60	48.13	-10.00	66.13
80	1.38	43.59	-8.98	74.37
85	1.21	39.13	-7.81	85.09
90	1.04	34.80	-6.54	98.49
95	0.87	30.65	-5.16	115.45
100	0.71	26.77	-3.69	136.74
105	0.66	23.21	-2.14	163.45
110	0.57	20.27	-0.67	193.60
115	0.47	18.22	0.49	221.26
120	0.50	17.24	1.09	237.08
125	0.94	17.23	1.09	237.08
130	2.01	18.04	0.60	224.08
135	2.81	20.08	-0.57	195.84
140	2.40	23.02	-2.05	165.16
145	1.21	26.45	-3.56	138.80
150	1.18	28.66	-4.43	125.57
155	0.81	30.94	-5.26	114.13
160	0.77	32.61	-5.83	106.88
165	1.36	33.36	-6.08	103.85
170	1.89	33.79	-6.22	102.19
175	2.52	33.74	-6.20	102.42
180	2.92	33.53	-6.14	103.13
185	2.99	33.27	-6.05	104.21
190	2.84	32.86	-5.92	105.78
195	2.68	32.09	-5.66	108.99
200	2.50	31.13	-5.33	113.21
205	2.29	30.82	-5.22	114.66
210	2.19	31.12	-5.32	113.34

Earth Station Name, State	Moxee, WA
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Antenna Centerline AGL (Ft/m)	8.2 / 2.5
Max Permissible Interference Power	-114 dBW/m ² /MHz

Azimuth (Deg)	Horizon Elevation Angle (Deg)	Antenna Disc. Angle (Deg)	Antenna Gain (dBi)	Coordination Distance (Km)
215	2.42	31.81	-5.56	110.25
220	2.15	33.63	-6.17	102.78
225	2.11	35.79	-6.84	95.15
230	1.94	38.50	-7.64	86.78
235	0.72	42.31	-8.66	77.16
240	1.41	45.05	-9.34	71.35
245	1.14	48.66	-10.00	66.13
250	0.00	52.85	-10.00	66.13
255	0.00	56.57	-10.00	66.13
260	0.00	60.40	-10.00	66.13
265	0.00	64.34	-10.00	66.13
270	0.00	68.35	-10.00	66.13
275	0.00	72.43	-10.00	66.13
280	0.00	76.55	-10.00	66.13
285	0.00	80.70	-10.00	66.13
290	0.00	84.88	-10.00	66.13
295	0.00	89.06	-10.00	66.13
300	0.00	93.25	-10.00	66.13
305	0.00	97.43	-10.00	66.13
310	0.00	101.59	-10.00	66.13
315	0.00	105.73	-10.00	66.13
320	0.56	109.96	-10.00	66.13
325	0.96	114.14	-10.00	66.13
330	1.60	118.38	-10.00	66.13
335	1.63	122.37	-10.00	66.13
340	2.17	126.49	-10.00	66.13
345	2.04	130.20	-10.00	66.13
350	3.14	129.42	-10.00	66.13
355	3.96	124.81	-10.00	66.13