

SECTION 25.138(B) ANALYSIS

In this application, DIRECTV Enterprises, LLC (“DIRECTV”) seeks to add an additional Ka-band TT&C antenna to its existing ground infrastructure at its Castle Rock, CO facility to support control of the DIRECTV 15 satellite. The following analysis addresses this antenna’s compliance with the off-axis EIRP density levels set forth in Section 25.138(a)(1) of the Commission’s rules.

Section 25.138 (a) provides that an application for a blanket Ka-band earth station license will be routinely processed if it meets the following requirements:

GSO FSS earth station antenna off-axis EIRP spectral density for co-polarized signals shall not exceed the following values, within 3° of the GSO arc, under clear sky conditions:

- 18.5-25log(theta)-10log(N) dBW/40kHz..... for 2.0° <= theta <= 7°
- 2.63-10log(N)..... dBW/40kHz..... for 7° <= theta <= 9.23°
- 21.5-25log(theta)-10log(N) dBW/40kHz..... for 9.23° <= theta <= 48°
- 10.5-10log(N)..... dBW/40kHz..... for 48° <= theta <= 180°

Where:

theta is the angle in degrees from the axis of the main lobe; for systems where more than one earth station is expected to transmit simultaneously in the same bandwidth, *e.g.*, CDMA systems, N is the likely maximum number of simultaneously transmitting co-frequency earth stations in the receive beam of the satellite; N=1 for TDMA and FDMA systems.

This portion of Section 25.138 is clearly intended to ensure that the level of off-axis EIRP from the applicant’s earth station meets an agreed-upon level and thereby does not cause excessive interference to neighboring satellites spaced at 2° increments from the applicant’s satellite. For TDMA and FDMA systems, it can readily be shown that for an antenna that just meets the performance requirements of Section 25.209, an input power density of less than -10.6 dBW/40 kHz into the antenna will result in compliance with Section 25.138(a). For antennas with performance that exceeds the requirements of Section 25.209 (*i.e.*, with better off-axis gain performance), this value of input power density can be increased dB-for-dB relative to the improved off-axis performance.

The specific frequencies for the telecommand for DIRECTV 15 are 29502.5 and 29509.5 MHz and for telemetry are 20198.5 and 20199.5 MHz. The emission designator for both telecommand and telemetry is 800KF2D. An analysis of the off-axis EIRP density relative to the values called for in Section 25.138(a)(1) is shown in the table below. Note that the power density per 40 kHz was calculated by subtracting 10*log(carrier bandwidth/40 kHz) dB. Also note that a 6 dB allowance to the maximum power density into the antenna was included due to the fact that the applied-for antenna performance is fully expected to have off-axis gain performance at least 6 dB better than

the requirements of Section 25.209. The net result of this analysis is 3.8 dB of margin relative to the allowable off-axis EIRP density level specified in Section 25.138(a). Also note that faded results would be the same as the transmit power would increase dB-for-dB with the amount of fade and the maximum faded EIRP is 20 dB greater than the maximum clear sky EIRP as allowed under Section 25.138(a)(5).

Section 25.138 Analysis	
Clear Sky Satellite Control Facility EIRP (dBW) ¹	71
Satellite Control Facility (SCF) Tx Gain (dBi)	66.4
Max carrier power into SCF antenna (dBW)	4.6
Carrier Bandwidth (kHz)	800
Max power density into antenna (dBW/40 kHz)	-8.4
Antenna off-axis performance relative to Section 25.209	-6
Max power density for §25.138 compliance (dBW/40 kHz)	-4.6
Margin relative to Section 25.138(a)	3.8

1. Note that in addition to this clear sky value, a max faded value of EIRP has been included in the application.