

SECTION 25.138(B) ANALYSIS

In this application, DIRECTV Enterprises, LLC (“DIRECTV”) seeks to add an additional emission designator to an existing Ka-band earth station license. This emission will be used to support Radio Frequency Auto Tracking (RFAT) capabilities for the DIRECTV 14 satellite. The technical parameters requested in the application are such that the off-axis EIRP density levels set forth in Section 25.138(a)(1) of the Commission’s rules will not be met. The analysis below addresses this emission.

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 two degree 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.

Section 25.138(b) of the Commission’s rules requires that Ka-band applicants proposing to operate earth stations with off-axis EIRP in excess of the values in Section 25.138(a)(1) submit link budget analyses of the operations proposed, along with a detailed explanation of how each uplink carrier density figure is derived. It further requires applicants to submit a narrative summary indicating whether there are margin shortfalls in any of the current baseline services as a result of the addition of the applicant’s higher power service and, if so, how the applicant intends to resolve those

shortfalls. Finally, this section requires that applicants certify that all potentially affected parties (*i.e.*, GSO FSS satellite networks that are within 2, 4, and 6 degrees) acknowledge and do not object to the use of the applicant’s higher power densities.

The specific frequency for the RFAT beacon signal for DIRECTV 14 is 29997 MHz and the peak transmit power of the beacon is 73 dBW. After subtracting the main beam antenna gain of 58.3 dBi, the maximum power into the antenna for this carrier is 14.7 dBW. Note that the transmit antenna for this earth station has performance that is approximately 6 dB better than that specified in §25.209, so the maximum allowable input power to the antenna while still complying with §25.138(a) is -4.6 dBW/40 kHz. As such, this emission will exceed the level of Section 25.138(a) by 19.3 dB. As this higher power density carrier is part of the TT&C system for DIRECTV 14, there is no impact to other communications carriers or baseline services and no resultant shortfall in any other carrier performance margins.

	Beacon
Satellite Control Facility TX EIRP (dBW)	73
Free Space Loss (dB-m ²)	162.5
Gaseous Atten (dB)	0.37
Beacon PFD @ Spacecraft (dBW/m ²)	-89.9
Required PFD @ Spacecraft (dBW/m ²)	-95
Margin (dB)	5.1
Section 25.138 Analysis	
Max RFAT EIRP (dBW)	73
RFAT Tx Antenna Gain (dBi)	58.3
Max carrier power into TX antenna (dBW)	14.7
Carrier Bandwidth (kHz)	CW
Max power density into antenna (dBW/40 kHz)	14.7
Max power density for §25.138 compliance (dBW/40 kHz) ¹	-10.6
Antenna off-axis performance relative to Section 25.209	-6
Excess pwr relative to Section 25.138(a) (dB)	19.3
1. This max power density is for an antenna just meeting the requirements of Section 25.209.	

Table 1. Link Budget and Section 25.138 Analysis of RFAT Beacon For DIRECTV 14

DIRECTV has analyzed the potential impact of this Ka-band RFAT beacon emission on other potentially affected GSO FSS networks within 6° of DIRECTV 14’s licensed location of 99.235° W.L. Within 6° to the east of 99° W.L., SPACEWAY 3 is operating nominally at 95° W.L. and Jupiter 97W is authorized to operate nominally at 97° W.L.¹ Within 6° to the west of 99° W.L., AMC-15 is operating nominally at 105° W.L.

¹ Note that ICO-G is operating at 92.85° W.L., which is more than 6° away from DIRECTV 14’s licensed location.

Figure 1 below was produced based on the current authorizations for each of the potentially affected satellites mentioned above. DIRECTV confirms that it has discussed this issue with both SES and EchoStar and that neither party has objected to this higher power RFAT pointing beacon operation.

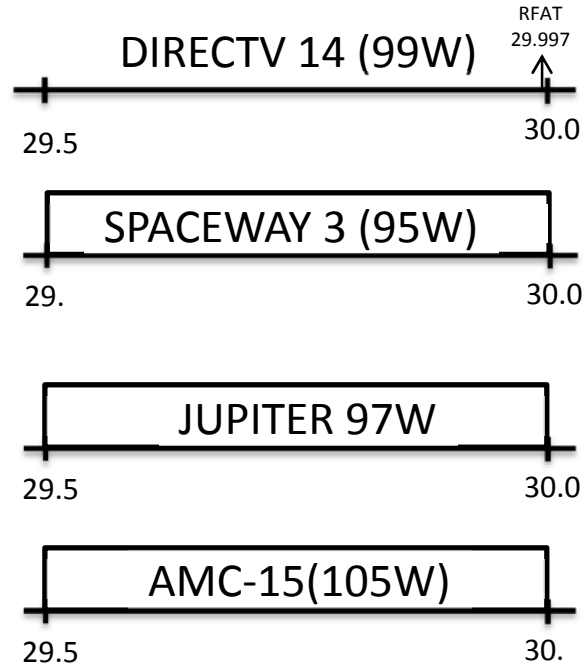


Figure 1. Relation of DIRECTV 14 RFAT signal to Potentially Affected Satellites