Annex: AVL 1.2m compliance with EPFD↑ limits

Figure 1 illustrates the 1.2-meter AVL antenna pattern in azimuth and elevation coordinates (left plot). The GSO arc and O3b arc are superimposed in az/el coordinates when the antenna boresight is pointing toward an O3b satellite located at 100°W (for example). The AVL antenna is located at 38°N, 95°W (for example). The colormap and associated scale shows the antenna gain (units in dBi) as a function of azimuth and elevation angles. The antenna gain data that intersects with the GSO arc is used to determine the gain in the direction of the GSO arc. The EPFD↑ limit is −162 dBW/m^2/40 kHz. The spreading loss determined by the equation

$$spreading\ loss\ (dB) = 10log_{10}(4\pi d^2)$$

where *d* is the distance to a point on the GSO arc from the location on the Earth of the transmitting earth station. With the spreading loss, input power spectral density and antenna gain in the direction of the GSO arc, the EPFD↑ can be determined. The plot of the right side of Figure 1 illustrates the EPFD↑ produced at the GSO arc from the 1.2-meter AVL antenna.

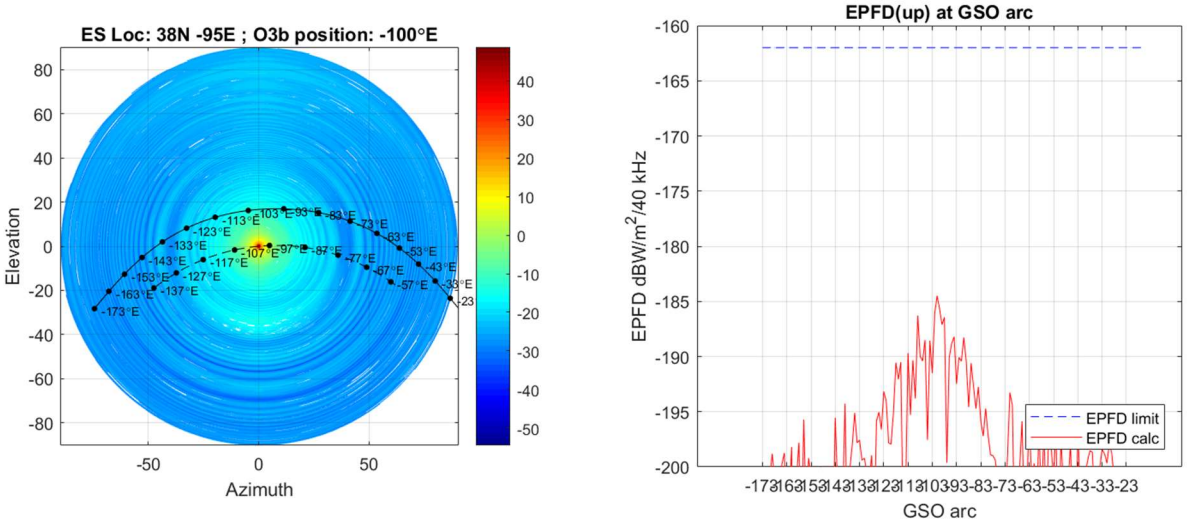

Figure 1. 1.2-meter AVL antenna gain and EPFD↑ at the GSO arc

As seen in Figure 1, the 1.2-meter AVL operations are compliant with the EPFD↑ limits with a margin of about 23 dB. Since this is a tracking antenna following an O3b satellite, the EPFD↑ limits are confirmed in the same way as demonstrated above for all pointing directions of an eligible O3b satellite.

Extending the above analysis to a set of test points distributed over the United States is shown in Figure 2. This plot illustrates a heatmap of the EPFD↑ margin for the 1.2-meter AVL antenna operating from anywhere in the United States. The margin varies between approximately 19 dB and slightly above 24 dB which confirms the antenna can be operated from anywhere in the United States and comply with the EPFD↑ limits.

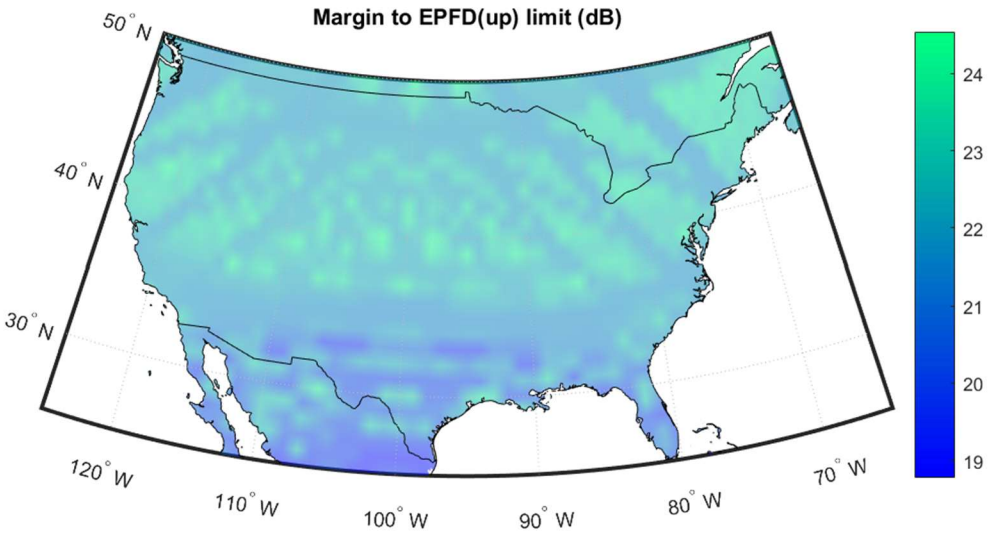

Figure 2. Margin to the EPFD↑ limits for the 1.2-meter AVL antenna operating anywhere in the US