

Capella-4 Satellite Power Flux Density Calculations in the 8025-8400 MHz Band

This attachment pertains to Capella Space Corp.'s modification request to add another satellite (Capella-4) to its current FCC experimental authorization for the Capella-3 satellite (FCC File No. 0029-EX-CM-2020).

The ITU Radio Regulations provide the following limits, including emissions from a reflecting satellite, for all conditions and for all methods of modulation:

- $-150 \text{ dB(W/m}^2\text{)}$ in any 4 kHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;
- $-150 + 0.5*(d-5) \text{ dB(W/m}^2\text{)}$ in any 4 kHz band for angles of arrival d (in degrees) between 5 and 25 degrees above the horizontal plane;
- $-140 \text{ dB(W/m}^2\text{)}$ in any 4 kHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.¹

In addition, Space Frequency Coordination Group (“SFCG”) Recommendation 14-3R10 (use of the 8025-8400 MHz band by EESS) establishes that EESS satellites using directional antennas should be designed to limit the PFD on the Earth’s surface in all areas with latitudes above 55 degrees or below -55 degrees to less than $-145 \text{ dB(W/m}^2\text{)}$ for a reference bandwidth of 4 kHz.² As shown in Figures A.5-1 and A.5-2 below, Capella will comply with all of these PFD limits.

¹ ITU Radio Regs. Article 21, tbl.21-4 (2016).

² Space Frequency Coordination Group, *Use of the 8025-8400 MHz Band by Earth Exploration Satellites*, Recommendation SFCG 14-3R10, *Recommends* 6 (June 14, 2016).

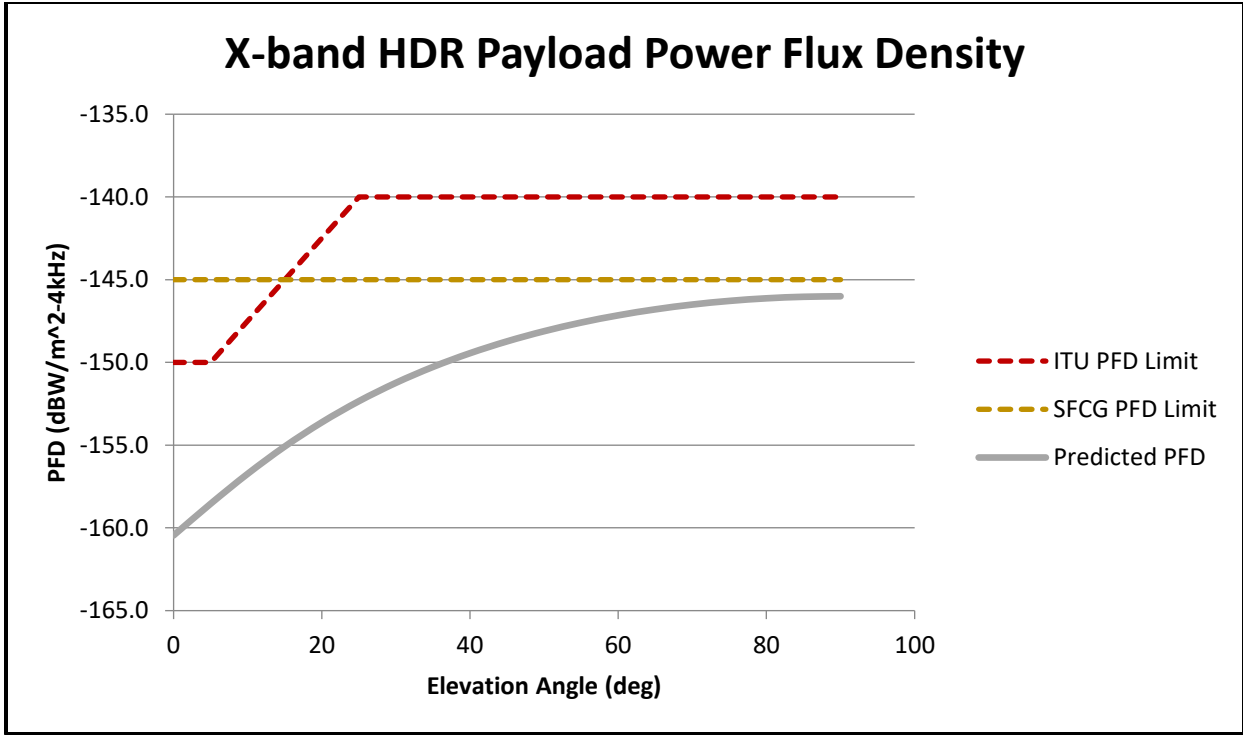


Figure A.5-1. Capella X-Band Payload Downlink PFD at Earth Surface

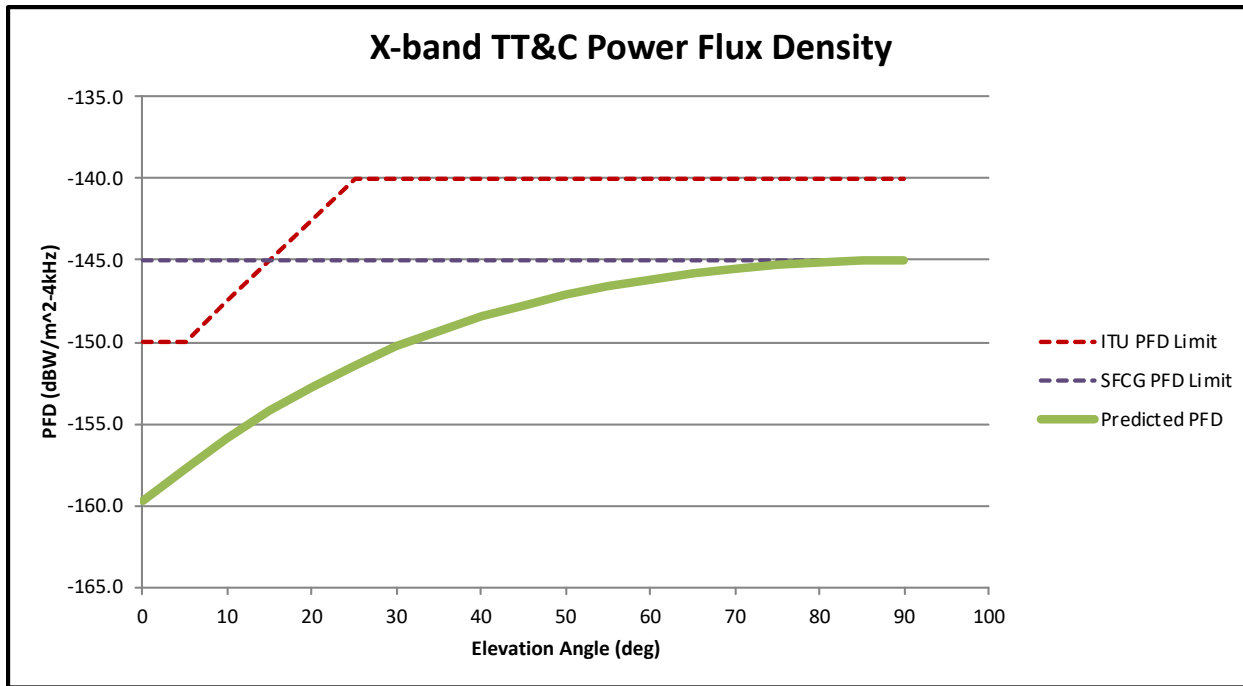


Figure A.5-2. Capella X-Band Payload Downlink PFD at Earth Surface

In addition, ITU Radio Regulation No. 22.5 specifies that the maximum PFD produced at the geostationary satellite orbit (“GSO”) by any EESS space station in the 8025-8400 MHz band shall not exceed $-174 \text{ dB(W/m}^2\text{)}$ in any 4 kHz band, to ensure compatibility with operations in the fixed-satellite service (Earth-to-space) and the meteorological-satellite service (Earth-to-space). As demonstrated below in Tables A.5-1 and A.5-2, the PFD produced by the transmissions from the Capella satellites does not exceed the limit established in ITU Radio Regulation No. 22.5, even in the worst-case hypothetical scenario.

Item	Value	Units	Notes
TX Freq	8212.5	MHz	
X-Band Downlink Bandwidth	250	MHz	
X-Band Downlink EIRP	26.00	dBW	
TX Output PSD	-57.98	dBW/Hz	
TX Output PSD (4 kHz)	-21.96	dBW	
Pointing Loss	0	dB	
Capella LEO Altitude	625	km	Worst-case, highest orbit altitude
GEO Altitude	35786	km	
Distance to GEO	35161	km	
Path Loss	-201.65	dB	
RX Pwr Flux Density (4 kHz)	-184.03	dBW/m ²	
Requirement	-174	dBW/m ²	Per ITU Radio Regulation No. 22.5
Margin	10.03	dB	

Table A.5-1. Capella X-Band Payload Downlink PFD at GEO

Item	Value	Units	Notes
TX Freq	8027	MHz	
X-Band TT&C Bandwidth	1.4	MHz	
X-Band TT&C EIRP	4.50	dBW	
TX Output PSD	-56.96	dBW/Hz	
TX Output PSD (4 kHz)	-20.94	dBW	
TX Pointing Loss	0	dB	
Capella LEO Altitude	625	km	worst-case, highest orbit altitude
GEO Altitude	35786	km	
Distance to GEO	35161	km	
Path Loss	-201.45	dB	
RX Pwr Flux Density (4 kHz)	-183.01	dBW/m ²	
Requirement	-174	dBW/m ²	Per ITU Radio Regulation No. 22.5
Margin	9.01	dB	

Table A.5-2. Capella X-Band TT&C Downlink PFD at GEO