



312 File Number: **SATLOA2021061600080**

Filing Description

Question	Response
Description	Umbra SAR Constellation Block 1

Satellite Information

Question	Response
Select Orbit Type	NGSO
Space Station or Satellite Network Name	Umbra SAR Constellation
Estimated Lifetime of Satellite(s) From Date of Launch	6 Years
Will the space station(s) operate on a Common Carrier basis?	No

Operating Frequency Bands (5)

Nature of service	Description	Frequency Band(s)	Mode Type
Earth Exploration-Satellite Service		9200.0 MHz -10400.0 MHz	Transmit
Earth Exploration-Satellite Service		8025.0 MHz -8400.0 MHz	Transmit
Earth Exploration-Satellite Service		9300.0 MHz -9900.0 MHz	Transmit
Earth Exploration-Satellite Service		2200.0 MHz -2290.0 MHz	Transmit
Earth Exploration-Satellite Service		2025.0 MHz -2110.0 MHz	Receive

**Orbital
Information For
Non-
Geostationary
Satellites**

Question	Response
Total Number of Satellites in the active constellation	6
Orbit Epoch Date	06/25/2021
Celestial Reference Body	Earth

Orbital Plane 1:

Question	Response
Number of Satellites in Plane	6
Inclination Angle	97.5 degrees
Right Ascension of Ascending Node	0.0 degrees
Argument of Perigee	0.0 degrees
Orbital Period	5400.0 seconds
Apogee	555.0 km
Perigee	555.0 km
Active Service Arc Begin Angle with respect to Ascending Node	0.0 degrees
Active Service Arc End Angle with respect to Ascending Node	0.0 degrees

Mean Anomaly For Each Satellite

Satellite Number	Mean Anomaly (degrees) at the Orbit Epoch Date
1	0.0
2	0.0
3	0.0
4	0.0
5	0.0
6	0.0

Receiving Beams 1:

Question	Response
Beam ID	CCU
Receive Beam Frequency	2079.95 MHz -2080.05 MHz
Beam Type	Spot
Polarization	RHCP
Peak Gain	dBi
Antenna Pointing Error	0.01 degrees
Antenna Rotational Error	0.01 degrees
Polarization Switchable	
Polarization Alignment Relative to the Equatorial Plane	45.0 degrees
G/T at Max. Gain Point	-37.2 dB/K
Min. Saturation Flux Density	-0.1 dBW/m ²
Max. Saturation Flux Density	0.0 dBW/m ²
Co- or Cross Polar Mode	C
Service Area Description	Global

**Receiving
Channels (1)**

Channel ID	Channel Bandwidth (MHz)	Center Frequency s (MHz)	Feeder Link, Service Link or TT&C
CCU	0.1	2080.0	TT&C

Transmitting Beams 1:

Question	Response
Beam ID	TTC
Transmit Beam Frequency	2253.95 MHz -2254.05 MHz
Beam Type	Spot
Polarization	RHCP
Peak Gain	dBi
Antenna Pointing Error	0.01 degrees
Antenna Rotational Error	0.01 degrees
Polarization Switchable	
Polarization Alignment Relative to the Equatorial Plane	45.0 degrees
Max. Transmit EIRP Density	-50.0 dBW/Hz
Max. Transmit EIRP	0.0 dBW
Co- or Cross Polar Mode	C
Service Area Description	Global Note: Max EIRP is -8.4 dBW; min value allowable is 0.0

Max. Power Flux Density

	* 0° - 5°	* 5° - 10°	* 10° - 15°	* 15° - 20°	* 20° - 25°	* 25° - 90°
*	(dBW/m ²	(dBW/m ²	(dBW/m ²	(dBW/m ²	(dBW/m ²	(dBW/m ²
BW:	/BW):	/BW):	/BW):	/BW):	/BW):	/BW):
Hz	-159.7	-157.9	-156.3	-154.9	-153.6	-147.3

Transmitting Beams 2:

Question	Response
Beam ID	MD1
Transmit Beam Frequency	8025.0 MHz -8275.0 MHz

Beam Type	Spot
Polarization	RHCP
Peak Gain	dBi
Antenna Pointing Error	0.01 degrees
Antenna Rotational Error	0.01 degrees
Polarization Switchable	
Polarization Alignment Relative to the Equatorial Plane	45.0 degrees
Max. Transmit EIRP Density	-64.78 dBW/Hz
Max. Transmit EIRP	19.2 dBW
Co- or Cross Polar Mode	C
Service Area Description	Global

Max. Power Flux Density

	* 0° - 5°	* 5° - 10°	* 10° - 15°	* 15° - 20°	* 20° - 25°	* 25° - 90°
*	(dBW/m ²	(dBW/m ²	(dBW/m ²	(dBW/m ²	(dBW/m ²	(dBW/m ²
BW:	/BW):	/BW):	/BW):	/BW):	/BW):	/BW):
Hz	-166.1	-164.3	-162.7	-161.3	-160.0	-153.7

Transmitting Beams 3:

Question	Response
Beam ID	MD2
Transmit Beam Frequency	8025.0 MHz -8275.0 MHz
Beam Type	Spot
Polarization	RHCP
Peak Gain	dBi
Antenna Pointing Error	0.01 degrees
Antenna Rotational Error	0.01 degrees

Polarization Switchable	
Polarization Alignment Relative to the Equatorial Plane	45.0 degrees
Max. Transmit EIRP Density	-60.78 dBW/Hz
Max. Transmit EIRP	23.2 dBW
Co- or Cross Polar Mode	C
Service Area Description	Global

Max. Power Flux Density

	* 0° - 5° (dBW/m ² /BW):	* 5° - 10° (dBW/m ² /BW):	* 10° - 15° (dBW/m ² /BW):	* 15° - 20° (dBW/m ² /BW):	* 20° - 25° (dBW/m ² /BW):	* 25° - 90° (dBW/m ² /BW):
Hz	-162.1	-160.3	-158.7	-157.3	-156.0	-149.7

Transmitting Beams 4:

Question	Response
Beam ID	SAR1
Transmit Beam Frequency	9300.0 MHz -9900.0 MHz
Beam Type	Spot
Polarization	V
Peak Gain	dBi
Antenna Pointing Error	0.01 degrees
Antenna Rotational Error	0.01 degrees
Polarization Switchable	
Polarization Alignment Relative to the Equatorial Plane	7.4 degrees
Max. Transmit EIRP Density	-8.78 dBW/Hz
Max. Transmit EIRP	78.5 dBW

Co- or Cross Polar Mode	C
Service Area Description	Global

Max. Power Flux Density

	* 0° - 5°	* 5° - 10°	* 10° - 15°	* 15° - 20°	* 20° - 25°	* 25° - 90°
*	(dBW/m ²	(dBW/m ²	(dBW/m ²	(dBW/m ²	(dBW/m ²	(dBW/m ²
BW:	/BW):	/BW):	/BW):	/BW):	/BW):	/BW):
Hz	-200.0	-92.0	-87.8	-86.4	-85.1	-78.8

Transmitting Beams 5:

Question	Response
Beam ID	SAR2
Transmit Beam Frequency	9200.0 MHz -10400.0 MHz
Beam Type	Spot
Polarization	V
Peak Gain	dBi
Antenna Pointing Error	0.01 degrees
Antenna Rotational Error	0.01 degrees
Polarization Switchable	
Polarization Alignment Relative to the Equatorial Plane	0.0 degrees
Max. Transmit EIRP Density	-11.79 dBW/Hz
Max. Transmit EIRP	79.0 dBW
Co- or Cross Polar Mode	C
Service Area Description	Global

Max. Power Flux Density

	* 0° - 5°	* 5° - 10°	* 10° - 15°	* 15° - 20°	* 20° - 25°	* 25° - 90°
*	(dBW/m ²	(dBW/m ²	(dBW/m ²	(dBW/m ²	(dBW/m ²	(dBW/m ²
BW:	/BW):	/BW):	/BW):	/BW):	/BW):	/BW):
Hz	-200.0	-91.8	-90.2	-88.8	-87.5	-81.2

Transmitting Channels (5)

Channel ID	Channel Bandwidth (MHz)	Center Frequency s (MHz)	Feeder Link, Service Link or TT&C
MD2	250.0	8150.0	TT&C
SAR1	600.0	9600.0	Service Link
MD1	250.0	8150.0	TT&C
TTC	0.1	2254.0	TT&C
SAR2	1200.0	9800.0	Service Link

Certification Questions

Question	Response
<p>Are the applicable service area coverage requirements of 25.143(b)(2) (ii) and (iii), or 25.144(a)(3)(i), or 25.145 (c)(1) and (2), or 25.146(i)(1) and (2), or 25.148(c), or 25.225 met?</p>	<p>N/A</p>
<p>Are the applicable frequency tolerances of 25.202(e) and out-of-band emission limits of 25.202(f)(1),(2), and (3) met?</p>	<p>Yes</p>
<p>Are the cessation of emissions requirements of 25.207 met?</p>	<p>Yes</p>
<p>Are the applicable power-flux-density limits of 25.208 met, and is the appropriate technical showing provided within the application?</p>	
<p>For NGSO applications, are the applicable equivalent-power-flux-density limits of 25.208 met, and is the appropriate technical showing provided within the application?</p>	<p>N/A</p>
<p>Are the applicable full-frequency-reuse requirements of 25.210 met?</p>	
<p>If the application is for a 17/24 GHz BSS space station, will it be operated at an offset location with full power and interference protection in accordance with 25.262(b)?</p>	

Attachments

File Name	Beam	Field	Attachment Type	Description
<u>FCC Schedule S Exhibit A Umbra SAR Block 1 Antenna Patterns.pdf</u>		NGSO Antenna Gain Data	PDF file (*.pdf)	Note: MD1 is 40-deg BW pattern, MD2 is 18-deg pattern, SAR 1 and SAR 2 share the same SAR beam pattern.