



(DRAFT COPY - Not for submission) Schedule S

312 File Number:

Filing Description

Question	Response
Description	This is a preliminary constellation of hyperspectral imaging platforms utilizing small satellite space-based technology. It combines advanced space-based sensing with robust data analysis and machine learning methods. HS data is downlinked at Ka-band.

Satellite Information

Question	Response
Select Orbit Type	NGSO
Space Station or Satellite Network Name	GHOST
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 (4)

Nature of service	Description	Frequency Band(s)	Mode Type
Earth Exploration-Satellite Service		25500.0 MHz -27000.0 MHz	Transmit
Earth Exploration-Satellite Service		2025.0 MHz -2110.0 MHz	Receive
Other Satellite Service (please specify)	Intersatellite Service	1616.0 MHz -1617.775 MHz	Transmit
Space Operation Service		400.15 MHz -401.0 MHz	Transmit

**Orbital
Information For
Non-
Geostationary
Satellites**

Question	Response
Total Number of Satellites in the active constellation	6
Orbit Epoch Date	03/21/2022
Celestial Reference Body	Earth

Orbital Plane 1:

Question	Response
Number of Satellites in Plane	2
Inclination Angle	97.5 degrees
Right Ascension of Ascending Node	30.0 degrees
Argument of Perigee	0.0 degrees
Orbital Period	5708.0 seconds
Apogee	535.0 km
Perigee	515.0 km
Active Service Arc Begin Angle with respect to Ascending Node	55.0 degrees
Active Service Arc End Angle with respect to Ascending Node	105.0 degrees

Mean Anomaly For Each Satellite

Satellite Number	Mean Anomaly (degrees) at the Orbit Epoch Date
1	0.0
2	180.0

Orbital Plane 2:

Question	Response
Number of Satellites in Plane	2
Inclination Angle	97.5 degrees
Right Ascension of Ascending Node	330.0 degrees
Argument of Perigee	0.0 degrees
Orbital Period	5708.0 seconds
Apogee	535.0 km
Perigee	515.0 km
Active Service Arc Begin Angle with respect to Ascending Node	55.0 degrees
Active Service Arc End Angle with respect to Ascending Node	105.0 degrees

Mean Anomaly For Each Satellite

Satellite Number	Mean Anomaly (degrees) at the Orbit Epoch Date
1	240.0
2	60.0

Orbital Plane 3:

Question	Response
Number of Satellites in Plane	2
Inclination Angle	97.5 degrees
Right Ascension of Ascending Node	0.0 degrees
Argument of Perigee	0.0 degrees
Orbital Period	5708.0 seconds
Apogee	535.0 km
Perigee	515.0 km
Active Service Arc Begin Angle with respect to Ascending Node	55.0 degrees
Active Service Arc End Angle with respect to Ascending Node	105.0 degrees

Mean Anomaly For Each Satellite

Satellite Number	Mean Anomaly (degrees) at the Orbit Epoch Date
1	120.0
2	300.0

Receiving Beams 1:

Question	Response
Beam ID	SCNT
Receive Beam Frequency	2045.0 MHz -2050.0 MHz
Beam Type	Steerable
Polarization	RHCP
Peak Gain	5.5 dBi
Antenna Pointing Error	0.01 degrees
Antenna Rotational Error	0.05 degrees
Polarization Switchable	
Polarization Alignment Relative to the Equatorial Plane	45.0 degrees
G/T at Max. Gain Point	-22.3 dB/K
Min. Saturation Flux Density	-94.8 dBW/m ²
Max. Saturation Flux Density	-93.9 dBW/m ²
Co- or Cross Polar Mode	C
Service Area Description	See Technical Annex, Figures D-S-U/I-28 through D-S-U/L-33

Receiving Beams 2:

Question	Response
Beam ID	SCMD
Receive Beam Frequency	2054.85 MHz -2055.15 MHz
Beam Type	Steerable
Polarization	RHCP
Peak Gain	5.5 dBi
Antenna Pointing Error	0.01 degrees
Antenna Rotational Error	0.05 degrees

Polarization Switchable	
Polarization Alignment Relative to the Equatorial Plane	45.0 degrees
G/T at Max. Gain Point	-20.2 dB/K
Min. Saturation Flux Density	-88.0 dBW/m ²
Max. Saturation Flux Density	-76.0 dBW/m ²
Co- or Cross Polar Mode	C
Service Area Description	See Technical Annex, Section II, Figures D-S-U/L-07 through D-S-U/L-15

**Receiving
Channels (2)**

Channel ID	Channel Bandwidth (MHz)	Center Frequency s (MHz)	Feeder Link, Service Link or TT&C
ACMD	0.3	2055.0	TT&C
ACTL	5.0	2047.5	Service Link

Transmitting Beams 1:

Question	Response
Beam ID	UTLM
Transmit Beam Frequency	400.48 MHz -400.52 MHz
Beam Type	Fixed
Polarization	H
Peak Gain	0.19 dBi
Antenna Pointing Error	0.0 degrees
Antenna Rotational Error	0.0 degrees
Polarization Switchable	
Polarization Alignment Relative to the Equatorial Plane	0.0 degrees
Max. Transmit EIRP Density	-41.3 dBW/Hz
Max. Transmit EIRP	4.7 dBW
Co- or Cross Polar Mode	C
Service Area Description	See Technical Annex, Section II, Section D.3 for pointing and polarization characteristics of this antenna. Service area is also described in D.3.

Max. Power Flux Density

	* 0° - 5°	* 5° - 10°	* 10° - 15°	* 15° - 20°	* 20° - 25°	* 25° - 90°
* BW:	(dBW/m ² /BW):	(dBW/m ² /BW):	(dBW/m ² /BW):	(dBW/m ² /BW):	(dBW/m ² /BW):	(dBW/m ² /BW):
4.0 kHz	-142.9	-141.2	-139.6	-138.3	-136.9	-130.7

Transmitting Beams 2:

Question	Response
Beam ID	LTLM
Transmit Beam Frequency	1616.0 MHz -1617.775 MHz
Beam Type	Fixed
Polarization	LHCP
Peak Gain	4.0 dBi
Antenna Pointing Error	0.01 degrees
Antenna Rotational Error	0.05 degrees
Polarization Switchable	
Polarization Alignment Relative to the Equatorial Plane	45.0 degrees
Max. Transmit EIRP Density	-52.0 dBW/Hz
Max. Transmit EIRP	0.0 dBW
Co- or Cross Polar Mode	C
Service Area Description	Patch antenna beam as a -3 dB BW of 100 deg. The beam is nominally directed ZENITH during use. Victim stations on the Earth will see only the back hemisphere of the antenna where the absolute gain is -10 to -50 dBi (EIRP less than -26 dBW toward Earth).

Max. Power Flux Density

	* 0° - 5°	* 5° - 10°	* 10° - 15°	* 15° - 20°	* 20° - 25°	* 25° - 90°
* BW:	(dbW/m ² /BW):	(dbW/m ² /BW):	(dbW/m ² /BW):	(dbW/m ² /BW):	(dbW/m ² /BW):	(dbW/m ² /BW):
4.0 kHz	-169.5	-167.3	-165.3	-163.7	-162.2	-155.5

Transmitting Beams 3:

Question	Response
Beam ID	KaA
Transmit Beam Frequency	25500.0 MHz -25950.0 MHz
Beam Type	Steerable
Polarization	RHCP
Peak Gain	27.4 dBi
Antenna Pointing Error	0.01 degrees
Antenna Rotational Error	0.05 degrees
Polarization Switchable	
Polarization Alignment Relative to the Equatorial Plane	45.0 degrees
Max. Transmit EIRP Density	-52.9 dBW/Hz
Max. Transmit EIRP	33.2 dBW
Co- or Cross Polar Mode	C

Service Area Description	See Technical Annex, Section II, Figures D-Ka-D/L-16 through -18 and Figures D-Ka-D/L-22 through -24. Service areas are Svalbard, Norway and Troll, Antarctica.
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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):
1.0 MHz	-130.6	-128.8	-127.2	-125.8	-124.6	-118.3

Transmitting Beams 4:

Question	Response
Beam ID	KaB
Transmit Beam Frequency	26025.0 MHz -26475.0 MHz
Beam Type	Steerable
Polarization	RHCP
Peak Gain	27.4 dBi
Antenna Pointing Error	0.01 degrees
Antenna Rotational Error	0.05 degrees
Polarization Switchable	
Polarization Alignment Relative to the Equatorial Plane	45.0 degrees
Max. Transmit EIRP Density	-52.9 dBW/Hz
Max. Transmit EIRP	33.2 dBW

Co- or Cross Polar Mode C

Service Area Description See Technical Annex, Section II, Figures D-Ka-D/L-16 through -18 and Figures D-Ka-D/L-22 through -24. Service areas are Svalbard, Norway and Troll Antarctica.

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):
1.0 MHz	-130.5	-128.8	-127.3	-125.8	-124.6	-118.4

Transmitting Beams 5:

Question	Response
Beam ID	KaC
Transmit Beam Frequency	26550.0 MHz -27000.0 MHz
Beam Type	Steerable
Polarization	RHCP
Peak Gain	27.4 dBi
Antenna Pointing Error	0.01 degrees
Antenna Rotational Error	0.05 degrees
Polarization Switchable	
Polarization Alignment Relative to the Equatorial Plane	45.0 degrees
Max. Transmit EIRP Density	-52.9 dBW/Hz

Max. Transmit EIRP	33.2 dBW
Co- or Cross Polar Mode	C
Service Area Description	See Technical Annex, Section II, Figures D-Ka-D/L-16 through -18 and Figures D-Ka-D/L-22 through -24. Service areas are Svalbard, Norway and Troll Antarctica.

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):
* 1.0 MHz	-130.5	-128.8	-127.3	-125.8	-124.6	-118.4

Transmitting Beams 6:

Question	Response
Beam ID	KaD
Transmit Beam Frequency	25500.0 MHz -25950.0 MHz
Beam Type	Steerable
Polarization	LHCP
Peak Gain	27.4 dBi
Antenna Pointing Error	0.01 degrees
Antenna Rotational Error	0.05 degrees
Polarization Switchable	
Polarization Alignment Relative to the Equatorial Plane	45.0 degrees

Max. Transmit EIRP Density	-52.9 dBW/Hz
Max. Transmit EIRP	33.2 dBW
Co- or Cross Polar Mode	X
Service Area Description	See Technical Annex, Section II, Figures D-Ka-D/L-16 through -18 and Figures D-Ka-D/L-22 through -24. Service areas are Svalbard, Norway and Troll Antarctica.

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):
1.0 MHz	-130.6	-128.8	-127.3	-125.8	-124.6	-118.4

Transmitting Beams 7:

Question	Response
Beam ID	KaE
Transmit Beam Frequency	26025.0 MHz -26475.0 MHz
Beam Type	Steerable
Polarization	LHCP
Peak Gain	27.4 dBi
Antenna Pointing Error	0.01 degrees
Antenna Rotational Error	0.05 degrees
Polarization Switchable	

Polarization Alignment Relative to the Equatorial Plane	45.0 degrees
Max. Transmit EIRP Density	-52.9 dBW/Hz
Max. Transmit EIRP	33.2 dBW
Co- or Cross Polar Mode	X
Service Area Description	See Technical Annex, Section II, Figures D-Ka-D/L-16 through -18 and Figures D-Ka-D/L-22 through -24. Service areas are Svalbard, Norway and Troll Antarctica.

Max. Power Flux Density

	* 0° - 5°	* 5° - 10°	* 10° - 15°	* 15° - 20°	* 20° - 25°	* 25° - 90°
* (dBW/m ² /BW):	(dBW/m ² /BW):	(dBW/m ² /BW):	(dBW/m ² /BW):	(dBW/m ² /BW):	(dBW/m ² /BW):	(dBW/m ² /BW):
1.0 MHz	-130.6	-128.8	-127.3	-125.8	-124.6	-118.4

Transmitting Beams 8:

Question	Response
Beam ID	KaF
Transmit Beam Frequency	26550.0 MHz -27000.0 MHz
Beam Type	Steerable
Polarization	LHCP
Peak Gain	27.4 dBi
Antenna Pointing Error	0.01 degrees
Antenna Rotational Error	0.05 degrees

Polarization Switchable	
Polarization Alignment Relative to the Equatorial Plane	45.0 degrees
Max. Transmit EIRP Density	-52.9 dBW/Hz
Max. Transmit EIRP	33.2 dBW
Co- or Cross Polar Mode	X
Service Area Description	See Technical Annex, Section II, Figures D-Ka-D/L-16 through -18 and Figures D-Ka-D/L-22 through -24. Service areas are Svalbard, Norway and Troll Antarctica.

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):
1.0 MHz	-130.6	-128.8	-127.3	-125.8	-124.6	-118.4

Transmitting Beams 9:

Question	Response
Beam ID	KaG
Transmit Beam Frequency	26756.7 MHz -26843.2 MHz
Beam Type	Steerable
Polarization	RHCP
Peak Gain	23.5 dBi
Antenna Pointing Error	0.01 degrees

Antenna Rotational Error	0.05 degrees
Polarization Switchable	
Polarization Alignment Relative to the Equatorial Plane	45.0 degrees
Max. Transmit EIRP Density	-57.4 dBW/Hz
Max. Transmit EIRP	21.2 dBW
Co- or Cross Polar Mode	C
Service Area Description	See Technical Annex, Section II, Figures D-Ka-D/L-19 through -21 and Figures D-Ka-D/L-25 through -27. Service areas are Svalbard, Norway and Troll, Antarctica.

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):
* 1.0 MHz	-135.0	-133.8	-131.6	-130.2	-129.0	-122.8

Transmitting Beams 10:

Question	Response
Beam ID	KaH
Transmit Beam Frequency	26756.7 MHz -26843.2 MHz
Beam Type	Steerable
Polarization	LHCP
Peak Gain	23.5 dBi

Antenna Pointing Error	0.01 degrees
Antenna Rotational Error	0.05 degrees
Polarization Switchable	
Polarization Alignment Relative to the Equatorial Plane	45.0 degrees
Max. Transmit EIRP Density	-57.4 dBW/Hz
Max. Transmit EIRP	21.2 dBW
Co- or Cross Polar Mode	X
Service Area Description	See Technical Annex, Section II, Figures D-Ka-D/L-19 through -21 and Figures D-Ka-D/L-25 through -27. Service areas are Svalbard, Norway and Troll, Antarctica.

Max. Power Flux Density

	* 0° - 5°	* 5° - 10°	* 10° - 15°	* 15° - 20°	* 20° - 25°	* 25° - 90°
* (dBW/m ² /BW):	(dBW/m ² /BW):	(dBW/m ² /BW):	(dBW/m ² /BW):	(dBW/m ² /BW):	(dBW/m ² /BW):	(dBW/m ² /BW):
1.0 MHz	-135.0	-133.2	-131.6	-130.2	-129.0	-122.8

Transmitting Channels (10)

Channel ID	Channel Bandwidth (MHz)	Center Frequency s (MHz)	Feeder Link, Service Link or TT&C
UTLM	0.04	400.5	TT&C
DRH	86.4	26800.0	Service Link
DLH	86.4	26800.0	Service Link
CRH	450.0	26775.0	Service Link
LTLM	1.775	1616.8875	TT&C
ALH	450.0	25725.0	Service Link
ARH	450.0	25725.0	Service Link
BLH	450.0	26775.0	Service Link
BRH	450.0	26250.0	Service Link
CLH	450.0	26250.0	Service Link

Certification Questions

Question	Response
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?	N/A
Are the applicable frequency tolerances of 25.202(e) and out-of-band emission limits of 25.202(f)(1),(2), and (3) met?	Yes
Are the cessation of emissions requirements of 25.207 met?	Yes
Are the applicable power-flux-density limits of 25.208 met, and is the appropriate technical showing provided within the application?	Yes
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?	N/A
Are the applicable full-frequency-reuse requirements of 25.210 met?	
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)?	

Attachments

File Name	Beam	Field	Attachment Type	Description
<u>Troll S-Rx-EESS-Ctrl GtoT_33.gxt</u>	SCNT	Service Area Diagram	GXT file (*.gxt)	This uplink beam controls the H.S.D Ka-band downlink data MODCOD values (ACM) and lost packet replacement requests.
<u>Troll S-Rx EESS-Ctrl Gain_32.gxt</u>	SCNT	Service Area Diagram	GXT file (*.gxt)	This uplink beam controls the H.S.D Ka-band downlink data MODCOD values (ACM) and lost packet replacement requests.
<u>Troll S-Rx EESS-Ctrl RelGain_31.gxt</u>	SCNT	Service Area Diagram	GXT file (*.gxt)	This uplink beam controls the H.S.D Ka-band downlink data MODCOD values (ACM) and lost packet replacement requests.
<u>Svalbard S-Rx EESS-Ctrl GtoT_30.gxt</u>	SCNT	Service Area Diagram	GXT file (*.gxt)	This uplink beam controls the H.S.D Ka-band downlink data MODCOD values (ACM) and lost packet replacement requests.
<u>Svalbard S-Rx EESS-Ctrl Gain_29.gxt</u>	SCNT	Service Area Diagram	GXT file (*.gxt)	This uplink beam controls the H.S.D Ka-band downlink data MODCOD values (ACM) and lost packet replacement requests.

<u>Svalbard S-Rx_EESS-Ctrl_RelGain_28.gxt</u>	SCNT	Service Area Diagram	GXT file (*.gxt)	This uplink beam controls the H.S.D Ka-band downlink data MODCOD values (ACM) and lost packet replacement requests.
<u>Troll_Ka-Mode2_EIRP_27.gxt</u>	KaG	Service Area Diagram	GXT file (*.gxt)	This Mode2 antenna data applies to Beams KaG and KaH.
<u>Troll_Ka-Mode2_Gain_26.gxt</u>	KaG	Service Area Diagram	GXT file (*.gxt)	This Mode2 antenna data applies to Beams KaG and KaH.
<u>Troll_Ka-Mode2_RelGain_25.gxt</u>	KaG	Service Area Diagram	GXT file (*.gxt)	This Mode2 antenna data applies to Beams KaG and KaH.
<u>Troll_Ka-Mode1_EIRP_24.gxt</u>	KaA	Service Area Diagram	GXT file (*.gxt)	This Mode1 antenna data applies to Beams KaA-KaF.
<u>Troll_Ka-Mode1_Gain_23.gxt</u>	KaA	Service Area Diagram	GXT file (*.gxt)	This Mode1 antenna data applies to Beams KaA-KaF.
<u>Troll_Ka-Mode1_RelGain_22.gxt</u>	KaA	Service Area Diagram	GXT file (*.gxt)	This Mode1 antenna data applies to Beams KaA-KaF.
<u>Svalbard Ka-Mode2_EIRP_21.gxt</u>	KaA	Service Area Diagram	GXT file (*.gxt)	This Mode2 antenna data applies to Beams KaG and KaH.
<u>Svalbard Ka-Mode2_Gain_20.gxt</u>	KaG	Service Area Diagram	GXT file (*.gxt)	his Mode2 antenna data applies to Beams KaG and KaH.

<u>Svalbard Ka- Mode2 RelGain 19. gxt</u>	KaG	Service Area Diagram	GXT file (*. gxt)	his Mode2 antenna data applies to Beams KaG and KaH.
<u>SantaClara S- Rx Cmd RelGain 07. gxt</u>	SCMD	Service Area Diagram	GXT file (*. gxt)	S-band Patch Antenna Beam Contours projected on Santa Clara, CA Area.
<u>Svalbard Ka- Mode1 EIRP 18.gxt</u>	KaA	Service Area Diagram	GXT file (*. gxt)	This Mode1 antenna data applies to Beams KaA-KaF.
<u>Svalbard Ka- Mode1 Gain 17.gxt</u>	KaA	Service Area Diagram	GXT file (*. gxt)	This Mode1 antenna data applies to Beams KaA-KaF.
<u>Svalbard Ka- Mode1 RelGain 16. gxt</u>	KaA	Service Area Diagram	GXT file (*. gxt)	This Mode1 antenna data applies to Beams KaA-KaF.
<u>Svalbard S- Rx Cmd GtoT 15.gxt</u>	SCMD	Service Area Diagram	GXT file (*. gxt)	S-band Patch Antenna Gain Contours projected on Svalbard Area.
<u>Svalbard S- Rx Cmd Gain 14.gxt</u>	SCMD	Service Area Diagram	GXT file (*. gxt)	S-band Patch Antenna Beam Contours projected on Svalbard Area.
<u>Svalbard S- Rx Cmd RelGain 13. gxt</u>	SCMD	Service Area Diagram	GXT file (*. gxt)	S-band Patch Antenna Beam Contours projected on Svalbard Area.
<u>Tromso S- Rx Cmd GtoT 12.gxt</u>	SCMD	NGSO Antenna Gain Data	GXT file (*. gxt)	S-band Patch Antenna Beam Contours projected on Troll, Norway Area.

<u>Tromso S- Rx_Cmd_Gain_11.gxt</u>	SCMD	Service Area Diagram	GXT file (*. gxt)	S-band Patch Antenna Beam Contours projected on Troll, Norway Area.
<u>Tromso S- Rx_Cmd_RelGain_10. gxt</u>	SCMD	Service Area Diagram	GXT file (*. gxt)	S-band Patch Antenna Beam Contours projected on Troll, Norway Area.
<u>SantaClara S- Rx_Cmd_GtoT_09.gxt</u>	SCMD	Service Area Diagram	GXT file (*. gxt)	S-band Patch Antenna Beam Contours projected on Santa Clara, CA Area.
<u>SantaClara S- Rx_Cmd_Gain_08.gxt</u>	SCMD	Service Area Diagram	GXT file (*. gxt)	S-band Patch Antenna Beam Contours projected on Santa Clara, CA Area.
