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May 17, 2024

VIA ICFS
Marlene H. Dortch
Secretary
Federal Communications Commission
45 L Street, NE
Washington, DC 20554

Re: HawkEye 360, Inc.
Response to FCC Inquiries
ICFS File No. SAT-MOD-20240403-00073

Dear Ms. Dortch:

HawkEye 360, Inc. ("HE360"), through its counsel, submits this letter responding to the inquiries of the Space Bureau ("Bureau") regarding the above-referenced application.¹ For the Bureau's convenience, provided below in italicized text are the Bureau's questions.

- 1. Please demonstrate compliance with SA.1157-1 in the frequency ranges 2290 - 2300 MHz and 8400 - 8450 MHz with calculations.*

No HE360 satellites to be launched in the future, including the Kestrel-0A spacecraft, will operate in the S-band downlink frequencies (2200-2290 MHz). Accordingly, HE360 believes that protection of the Deep Space Network (DSN) in the 2290-2300 MHz band is not applicable to this amendment application.

With respect to the 8400-8450 MHz band, the following analysis, which was also recently shared with NASA spectrum management, demonstrates that the HE360 satellites meet the X-band downlink DSN protection criteria, defined in ITU-R SA.1157-1, for all three X-band downlink channels used by the HE360 satellites. The following graphs are spectrum analyzer traces and provide supporting evidence that the out-of-band (OOB) emissions are sufficiently suppressed to meet the DSN protection criteria.

¹ See Email from Samuel Karty, FCC, to Tony Lin, Counsel for HE360 (dated April 19, 2024).

This analysis shown in Table 1 below was conducted at the lowest operational orbit of 400 km to demonstrate compliance during the entire operational mission lifetime.

	Units	X TTC			X PAY 1			X PAY 2	
CF	MHz	8291	8297	8303	8075	8165	8255	8090	8210
System PSD @8400 MHz	dBW/Hz	-133.6	-133.6	-133.6	-170.1	-170.1	-170.1	-176.8	-163.7
Flux Calc (400 km alt)	dB 1/(m ²)	-123.0	-123.0	-123.0	-120.0	-119.0	-118.0	-117.0	-116.0
PFD	dB(W/m ² *Hz)	-256.6	-256.6	-256.6	-290.2	-289.2	-288.2	-293.8	-279.7
PFD Limit	dB(W/m ² *Hz)	-255.1	-255.1	-255.1	-252.1	-251.1	-250.1	-249.1	-248.1
Margin	dB	1.5	1.5	1.5	38.1	38.1	38.1	44.7	31.6

Table 1 HE360 Satellite X-band Channels

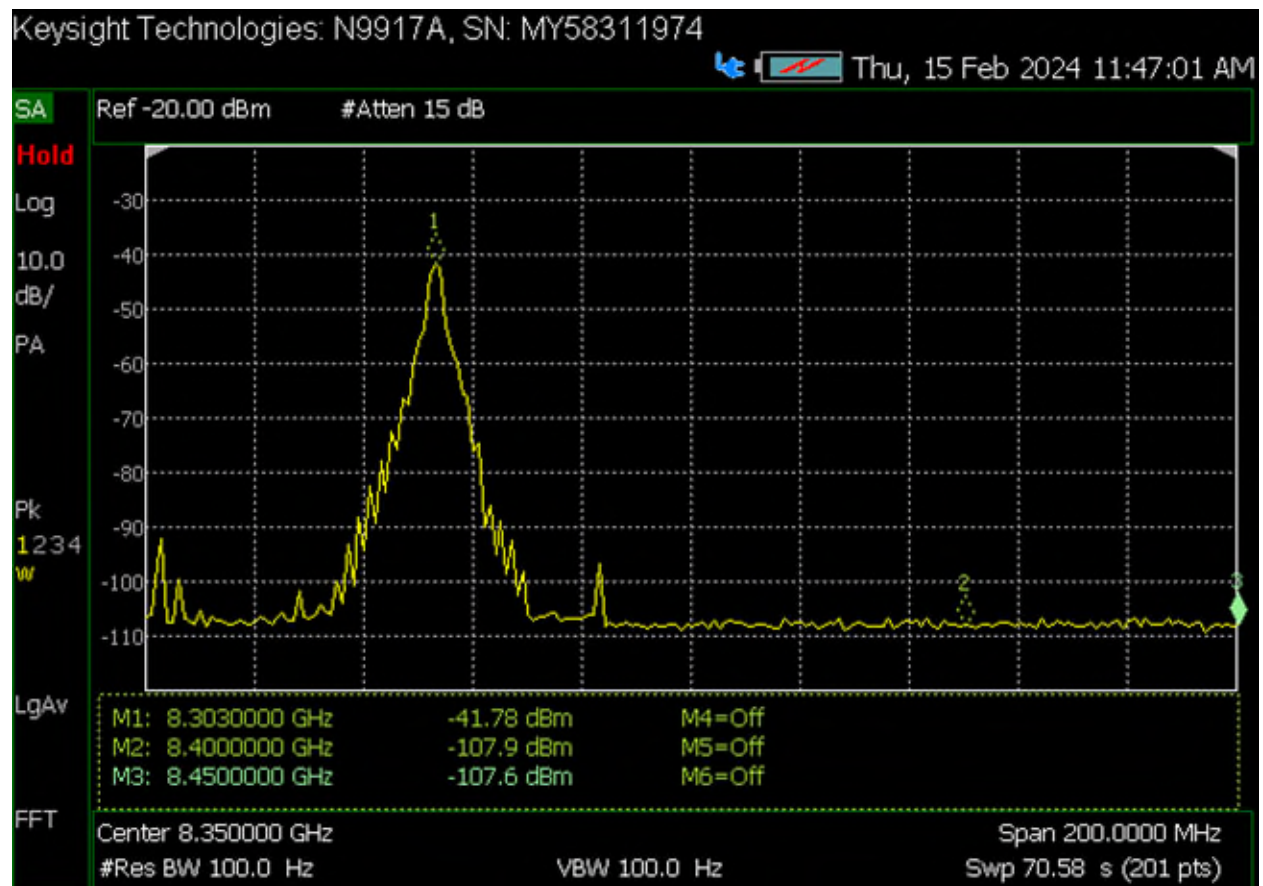


Figure 1 X-Band TT&C Downlink - Out of Band Emissions Measurement



Figure 2 X-Band Payload #1 Downlink - Out of Band Emissions Measurement



Figure 3 X-Band Payload #2 Downlink - Out of Band Emissions Measurement

The Kestrel-0A spacecraft operates on two X-band channels. For payload downlink, the Kestrel-0A spacecraft uses the same X-band Payload Downlink #1 as the HE360 constellation and, thus, complies with DSN protection criteria, as demonstrated above.

The Kestrel-0A X-band TT&C downlink, however, is still being designed. The analysis demonstrates that in order to meet the X-band DSN protection criteria the OOB emissions must be suppressed by at least 68 dB throughout the 8400-8450 MHz band in order to meet the protection criteria for the 70 m DSN dishes identified in the ITU-R SA.1014. The HE360 team is designing the equipment to this requirement. Because the design is not complete, HE360 cannot provide spectrum analyzer traces at this time to show compliance.

2. Please provide a Form 312.

PDFs of the as-filed Form 312 and Schedule S form are attached as exhibits to this letter.

3. Please provide S-Band downlink PFD showing.

As discussed above, no HE360 satellites to be launched in the future, including Kestrel-0A, will operate in the S-band downlink frequencies (2200-2290 MHz). For previously launched satellites, the relevant PFD showing is provided in prior filings. See, e.g., Application of HE360, ICFS File No. SAT-MOD-20230724-00181, Attachment 1 at pages 7-8 (filed July 24, 2023).

4. Please provide information demonstrating compliance with ITU-R SA.1810.

Recommendation ITU-R SA.1810 provides design guidelines for systems operating in the X-band frequencies. HE360's system exercises a number of the interference mitigation techniques, as encouraged by the document. For example, ITU-R SA.1810 recommends avoiding broadcast modes where possible, and that EESS satellites operating in a non-broadcasting mode should radiate only when transmitting data to one or more earth stations. Where broadcast modes are unavoidable, ITU-R SA.1810 recommends the use of a portion of the lower half of the 8025-8400 MHz band. To reduce the possibility of intersystem interference, ITU-R SA.1810 recommends consideration should also be given to other interference mitigation techniques, including polarization discrimination.

None of the satellites in the HE360 constellation, including Kestrel-0A, operate X-band downlinks in broadcast mode, and all X-band downlinks are limited to transmission when within line-of-sight of an earth station. Further, some of the payload downlinks employ dual polarization (across the spacecraft in each cluster).

Additionally, ITU-R SA.1810 recommends operators consider the phasing of the orbital parameters for sun-synchronous ("SSO") satellites with existing and planned satellites. While some of the HE360 and Kestrel-0A spacecraft will be launched into near-SSO orbits, the SSO orbit will not be maintained and the LTAN/LTDN will drift over the mission lifetime. Accordingly, this guideline is not applicable.

Further, ITU-R SA.1810 recommends that, whenever practicable, low side-lobe, high-gain satellite antennas should be used and if not practicable, isoflux antennas should be considered instead of omnidirectional antennas. The higher data-rate payload downlinks use directional antenna, and only the TT&C downlink uses an omni antenna.

To reduce the potential for adjacent channel interference, ITU-R SA.1810 recommends bandwidth efficient modulation and coding techniques be used to the extent practicable. Consistent with this guideline, HE360 employs modulations, such as QPSK, OQPSK,

and 8PSK, and coding techniques, such as Reed Solomon and Viterbi, which are bandwidth efficient and industry standards.

ITU-R SA.1810 establishes a protection criteria for earth stations above 55°N and below 55°S of $-147 \text{ dBW/m}^2/4 \text{ kHz}$ for omni antennas (such as those used for TT&C downlinks on both the Kestrel-0A and the HE360 constellation) and $-145 \text{ dBW/m}^2/4 \text{ kHz}$ for directional antennas (such as those used for payload downlinks on both the Kestrel-0A and the HE360 constellation). The following curves demonstrate compliance with the respective protection criteria for the Kestrel-0A X-band downlinks, at various orbital altitudes and using different carriers, when communicating with such earth stations. To ensure compliance, as necessary, HE360 will reduce the emissions bandwidth to meet PFD limits.

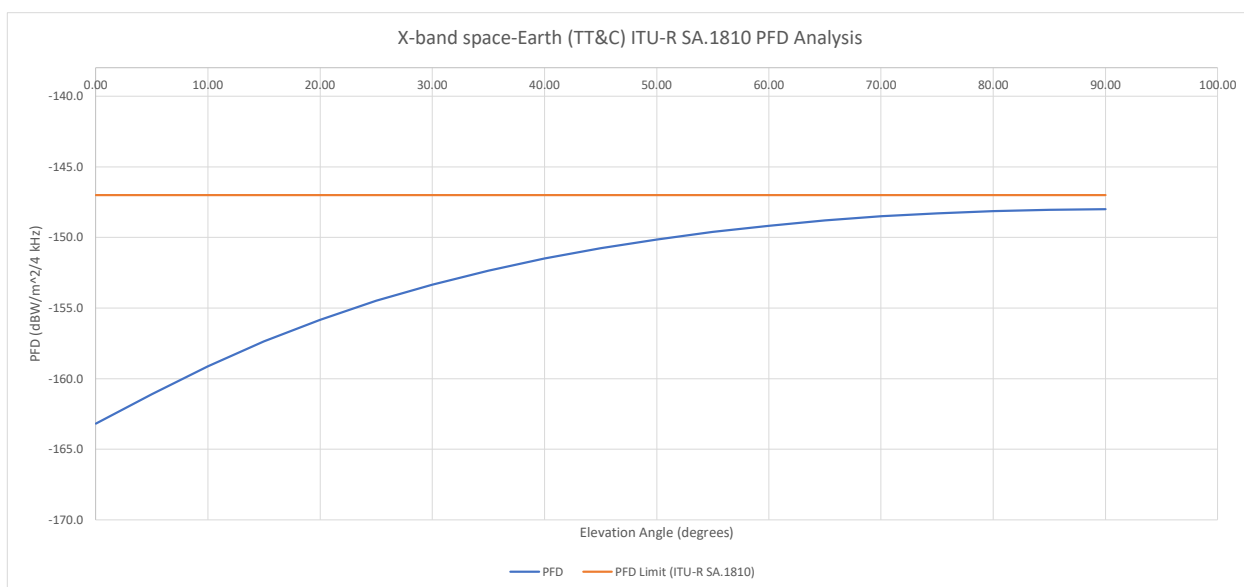


Figure 4 Kestrel-0A X-band TT&C Downlink PFD (400km Orbit altitude, 50 kHz Emission Bandwidth, -14 dBW EIRP)

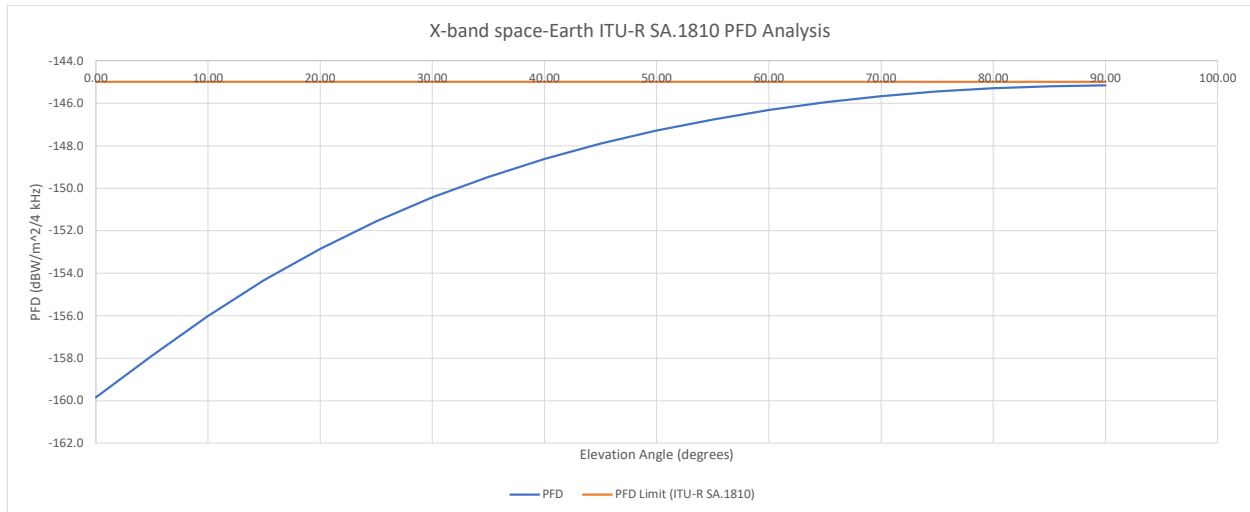


Figure 5 Kestrel-0A X-band Payload Downlink PFD (450km Orbit altitude, 8 MHz Emission Bandwidth, 11.9 dBW EIRP)

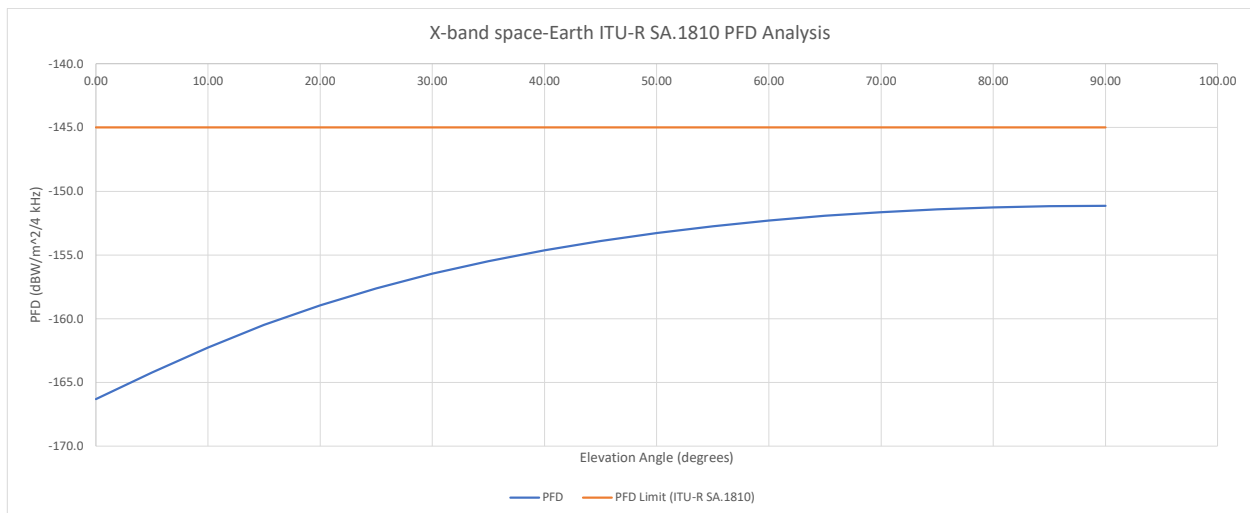


Figure 6 Kestrel-0A X-band Payload Downlink PFD (400km Orbit altitude, 40 MHz Emission Bandwidth, 11.9 dBW EIRP)

The following curves demonstrate compliance with the respective protection criteria for the HE360 constellation X-band downlinks, at various orbital altitudes and using different carriers, when communicating with earth stations above 55°N and below 55°S.

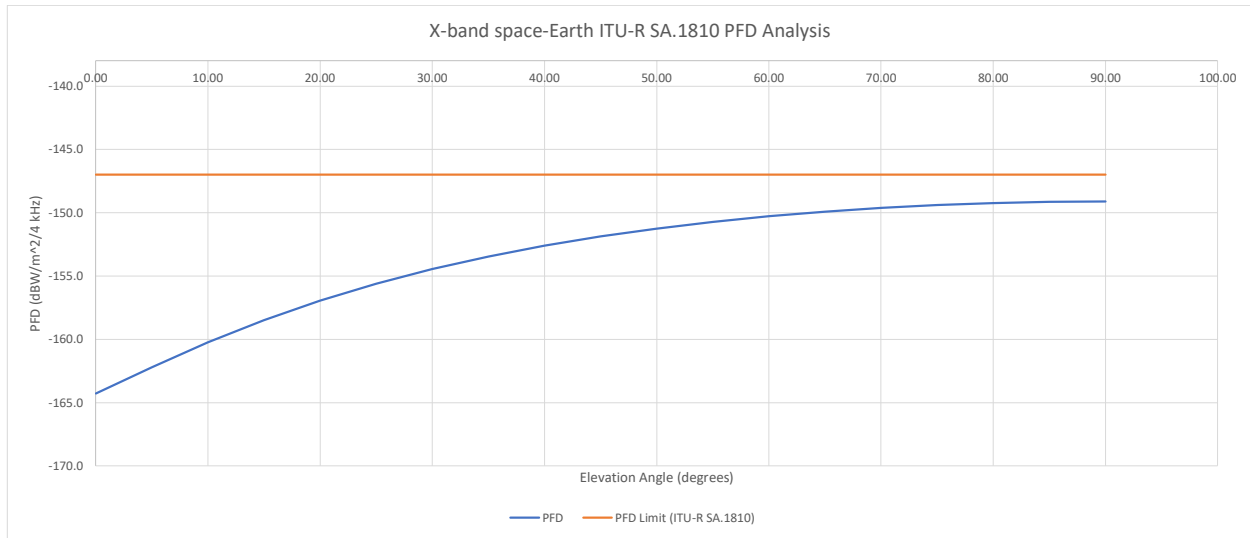


Figure 7 HE360 Constellation X-band TT&C Downlink PFD (400km Orbit altitude, 1024 kHz Emission Bandwidth, -2 dBW EIRP)

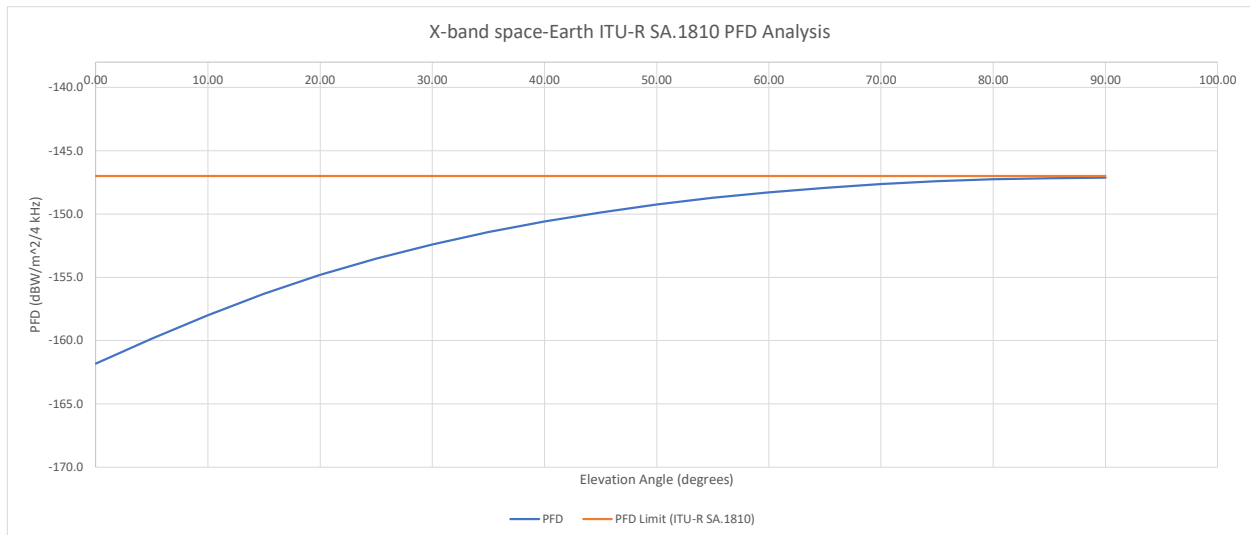


Figure 8 HE360 Constellation X-band TT&C Downlink PFD (450km Orbit altitude, 512 kHz Emission Bandwidth, -2 dBW EIRP)

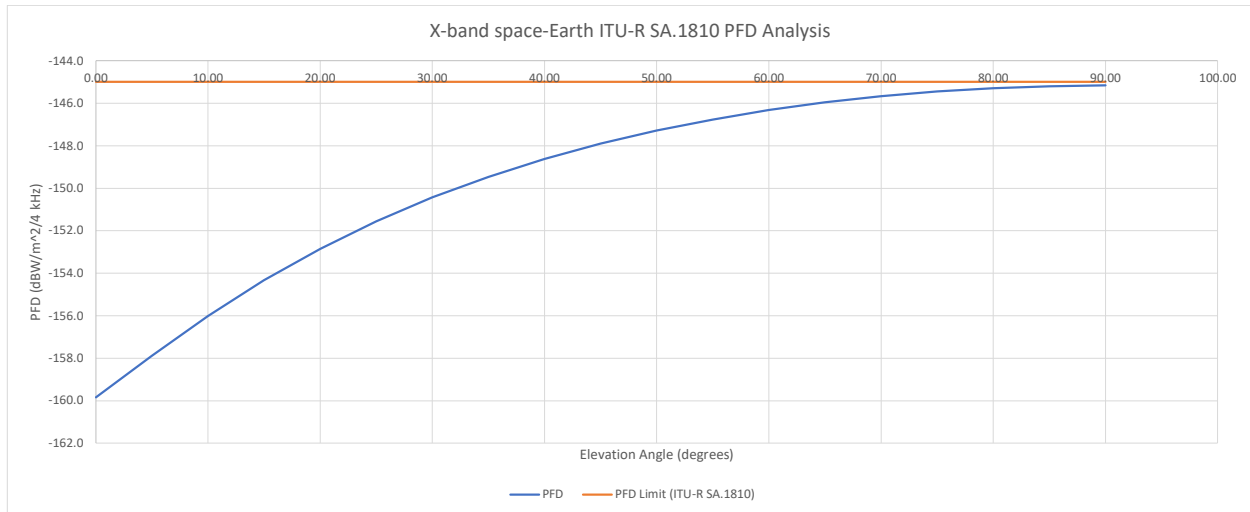


Figure 9 HE360 Constellation X-band Payload #1 Downlink PFD (450km Orbit altitude, 8 MHz Emission Bandwidth, 11.9 dBW EIRP)

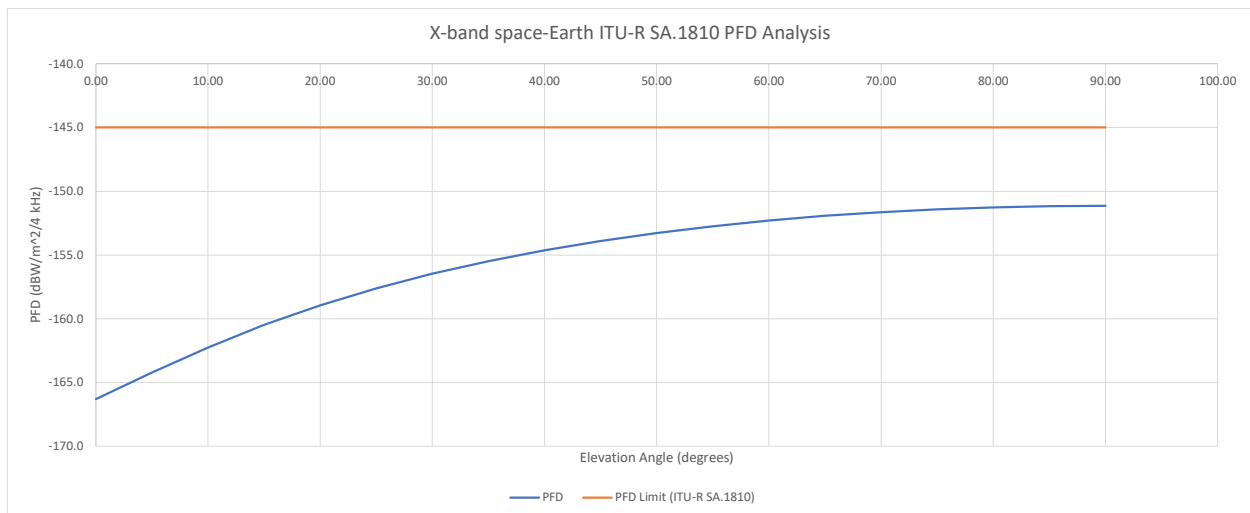


Figure 10 HE360 Constellation X-band Payload #1 Downlink PFD (400km Orbit altitude, 40 MHz Emission Bandwidth, 11.9 dBW EIRP)

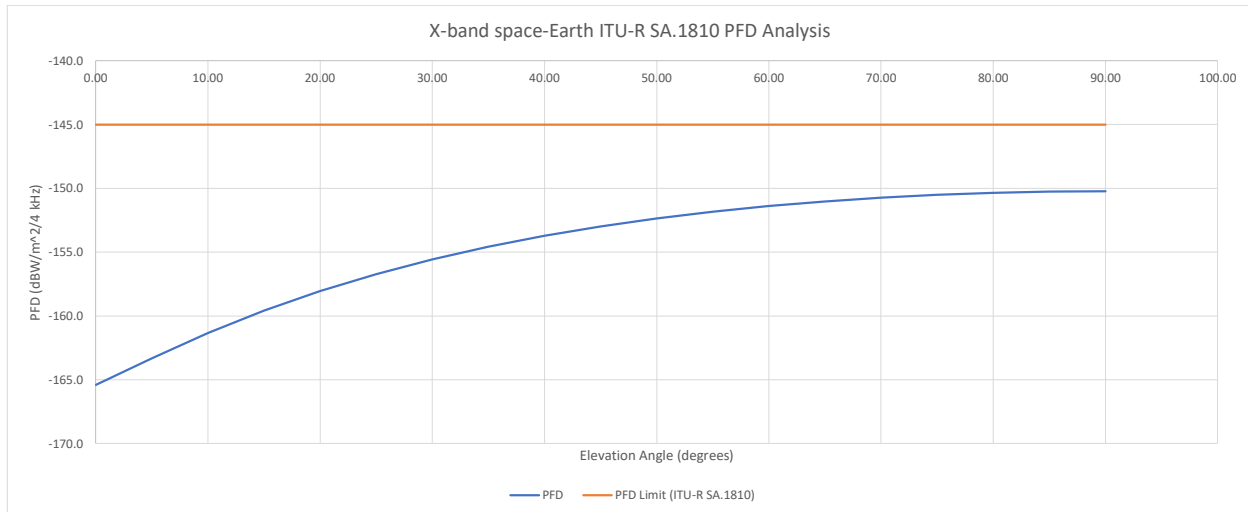


Figure 11 HE360 Constellation X-band Payload #2 Downlink PFD (400km Orbit altitude, 105 MHz Emission Bandwidth, 17 dBW EIRP)

To minimize the need for operational coordination, ITU-R SA.1810 recommends EESS satellites utilize appropriate techniques to prevent, to the extent possible, unwanted emissions exceeding the ITU-R space research service (deep-space) protection criterion in 8400-8450 MHz band, including one or more of the applicable techniques described above, on-board filtering, large geographical separation between EESS and space research service (deep-space) earth stations and/or low-sideband modulations. As discussed above, HE360 utilizes such techniques.

5. *Some of the antenna beam contours HE360 provided only show down to -8 dB. Please provide either an explanation for why they stopped, or the full showing down to -20 dB.*

The missing projection contours, *i.e.*, those beams with peak gain of less than 8 dB, are beyond the horizon and, accordingly, are not depicted in the images.

Very truly yours,

/s/Tony Lin

Tony Lin
Counsel to HawkEye 360, Inc.

Attachments

Exhibit 1

Form 312

Date & Time Filed: Apr 3 2024 12:32:23:913PM
File Number: SAT-MOD-20240403-00073

FCC APPLICATION FOR SPACE AND EARTH STATION:MOD OR AMD - MAIN FORM	FCC Use Only
FCC 312 MAIN FORM FOR OFFICIAL USE ONLY	

APPLICANT INFORMATION

Enter a description of this application to identify it on the main menu:
Demo Sat & 5-year Deorbit Mod

1-8. Legal Name of Applicant	
Name: HawkEye 360, Inc.	Phone Number: 571-203-0360
DBA Name:	Fax Number:
Street: 485 Springpark Place Suite 400	E-Mail: dennis.burnett@he360.com
City: Herndon	State: VA
Country: USA	Zipcode: 20170 -
Attention: Mr. Dennis Burnett	

9-16. Name of Contact Representative	
Name: Tony Lin	Phone Number: 202-799-4450
Company: DLA Piper, LLP	Fax Number:
Street: 500 8th St. NW	E-Mail: tony.lin@us.dlapiper.com
City: Washington	State: DC
Country: USA	Zipcode: 20004-
Attention:	Relationship: Legal Counsel

CLASSIFICATION OF FILING

17. Choose the button next to the classification that applies to this filing for both questions a. and b. Choose only one for 17a and only one for 17b. ☐ a1. Earth Station ☒ a2. Space Station	(N/A) b1. Application for License of New Station (N/A) b2. Application for Registration of New Domestic Receive-Only Station ☐ b3. Amendment to a Pending Application ☒ b4. Modification of License or Registration b5. Assignment of License or Registration b6. Transfer of Control of License or Registration ☐ b7. Notification of Minor Modification (N/A) b8. Application for License of New Receive-Only Station Using Non-U.S. Licensed Satellite (N/A) b9. Letter of Intent to Use Non-U.S. Licensed Satellite to Provide Service in the United States (N/A) b10. Other (Please specify) (N/A) b11. Application for Earth Station to Access a Non-U.S.satellite Not Currently Authorized to Provide the Proposed Service in the Proposed Frequencies in the United States.
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17c. Is a fee submitted with this application? ☒ If Yes, complete and attach FCC Form 159.
--

If No, indicate reason for fee exemption (see 47 C.F.R. Section 1.1114).

- ☐ Governmental Entity ☐ Noncommercial educational licensee
☐ Other (please explain):

17d.

Fee Classification

18. If this filing is in reference to an existing station, enter:

(a) Call sign of station:
S3042

19. If this filing is an amendment to a pending application enter both fields, if this filing is a modification please enter only the file number:

(a) Date pending application was filed: (b) File number:

SATMOD2022090600099

TYPE OF SERVICE

20. NATURE OF SERVICE: This filing is for an authorization to provide or use the following type(s) of service(s): Select all that apply:

- ☐ a. Fixed Satellite
☐ b. Mobile Satellite
☐ c. Radiodetermination Satellite
☒ d. Earth Exploration Satellite
☐ e. Direct to Home Fixed Satellite
☐ f. Digital Audio Radio Service
☒ g. Other (please specify)
Radio frequency sensing

21. STATUS: Choose the button next to the applicable status.
Choose only one.

☐ Common Carrier ☒ Non-Common Carrier

22. If earth station applicant, check all that apply.

- ☐ Using U.S. licensed satellites
☐ Using Non-U.S. licensed satellites

23. If applicant is providing INTERNATIONAL COMMON CARRIER service, see instructions regarding Sec. 214 filings. Choose one.
Are these facilities:

☐ Connected to a Public Switched Network ☐ Not connected to a Public Switched Network ☒ N/A

24. FREQUENCY BAND(S): Place an 'X' in the box(es) next to all applicable frequency band(s).

- ☐ a. C-Band (4/6 GHz) ☐ b. Ku-Band (12/14 GHz)
☒ c. Other (Please specify upper and lower frequencies in MHz.)

Frequency Lower: 1618.725 Frequency Upper: 8400 (Please specify additional frequencies in an attachment)

TYPE OF STATION

25. CLASS OF STATION: Choose the button next to the class of station that applies. Choose only one.

- ☐ a. Fixed Earth Station
☐ b. Temporary-Fixed Earth Station
☐ c. 12/14 GHz VSAT Network
☐ d. Mobile Earth Station
☐ e. Geostationary Space Station
☒ f. Non-Geostationary Space Station
☐ g. Other (please specify)

26. TYPE OF EARTH STATION FACILITY:

☐ Transmit/Receive ☐ Transmit-Only ☐ Receive-Only ☒ N/A

"For Space Station applications, select N/A."

PURPOSE OF MODIFICATION

27. The purpose of this proposed modification is to: (Place an 'X' in the box(es) next to all that apply.)

- ☒ a -- authorization to add new emission designator and related service
☐ b -- authorization to change emission designator and related service

- ☐ c -- authorization to increase EIRP and EIRP density
- ☐ d -- authorization to replace antenna
- ☒ e -- authorization to add antenna
- ☐ f -- authorization to relocate fixed station
- ☐ g -- authorization to change frequency(ies)
- ☒ h -- authorization to add frequency
- ☐ i -- authorization to add Points of Communication (satellites & countries)
- ☐ j -- authorization to change Points of Communication (satellites & countries)
- ☐ k -- authorization for facilities for which environmental assessment and radiation hazard reporting is required
- ☒ l -- authorization to change orbit location
- ☐ m -- authorization to perform fleet management
- ☐ n -- authorization to extend milestones
- ☒ o -- Other (Please specify)

ENVIRONMENTAL POLICY

28. Would a Commission grant of any proposal in this application or amendment have a significant environmental impact as defined by 47 CFR 1.1307? If YES, submit the statement as required by Sections 1.1308 and 1.1311 of the Commission's rules, 47 C.F.R. 1.1308 and 1.1311, as an exhibit to this application. A Radiation Hazard Study must accompany all applications for new transmitting facilities, major modifications, or major amendments.

☐ Yes ☒ No

ALIEN OWNERSHIP Earth station applicants not proposing to provide broadcast, common carrier, aeronautical en route or aeronautical fixed radio station services are not required to respond to Items 30-34.

29. Is the applicant a foreign government or the representative of any foreign government? ☐ Yes ☒ No
30. Is the applicant an alien or the representative of an alien? ☐ Yes ☒ No ☐ N/A
31. Is the applicant a corporation organized under the laws of any foreign government? ☐ Yes ☒ No ☐ N/A
32. Is the applicant a corporation of which more than one-fifth of the capital stock is owned of record or voted by aliens or their representatives or by a foreign government or representative thereof or by any corporation organized under the laws of a foreign country? ☐ Yes ☒ No ☐ N/A
33. Is the applicant a corporation directly or indirectly controlled by any other corporation of which more than one-fourth of the capital stock is owned of record or voted by aliens, their representatives, or by a foreign government or representative thereof or by any corporation organized under the laws of a foreign country? ☐ Yes ☒ No ☐ N/A
34. If any answer to questions 29, 30, 31, 32 and/or 33 is Yes, attach as an exhibit an identification of the aliens or foreign entities, their nationality, their relationship to the applicant, and the percentage of stock they own or vote.

BASIC QUALIFICATIONS

35. Does the Applicant request any waivers or exemptions from any of the Commission's Rules? ☒ Yes ☐ No
If Yes, attach as an exhibit, copies of the requests for waivers or exceptions with supporting documents.
36. Has the applicant or any party to this application or amendment had any FCC station authorization or license revoked or had any application for an initial, modification or renewal of FCC station authorization, license, or construction permit denied by the Commission? If Yes, attach as an exhibit, an explanation of circumstances. ☐ Yes ☒ No
37. Has the applicant, or any party to this application or amendment, or any party directly or indirectly controlling the applicant ever been convicted of a felony by any state or federal court? If Yes, attach as an exhibit, an explanation of circumstances. ☐ Yes ☒ No
38. Has any court finally adjudged the applicant, or any person directly or indirectly controlling the applicant, guilty of unlawfully monopolizing or attempting unlawfully to monopolize radio communication, ☐ Yes ☒ No

directly or indirectly, through control of manufacture or sale of radio apparatus, exclusive traffic arrangement or any other means or unfair methods of competition? If Yes, attach as an exhibit, an explanation of circumstances

39. Is the applicant, or any person directly or indirectly controlling the applicant, currently a party in any pending matter referred to in the preceding two items? If yes, attach as an exhibit, an explanation of the circumstances.

☐ Yes ☒ No

40. If the applicant is a corporation and is applying for a space station license, attach as an exhibit the names, address, and citizenship of those stockholders owning a record and/or voting 10 percent or more of the Filer's voting stock and the percentages so held. In the case of fiduciary control, indicate the beneficiary(ies) or class of beneficiaries. Also list the names and addresses of the officers and directors of the Filer.

41. By checking Yes, the undersigned certifies, that neither applicant nor any other party to the application is subject to a denial of Federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti-Drug Act of 1988, 21 U.S.C. Section 862, because of a conviction for possession or distribution of a controlled substance. *See 47 CFR 1.2002(b) for the meaning of "party to the application" for these purposes.*

☒ Yes ☐ No

42a. Does the applicant intend to use a non-U.S. licensed satellite to provide service in the United States? If Yes, answer 42b and attach an exhibit providing the information specified in 47 C.F.R. 25.137, as appropriate. If No, proceed to question 43.

☐ Yes ☒ No

42b. What administration has licensed or is in the process of licensing the space station? If no license will be issued, what administration has coordinated or is in the process of coordinating the space station?

43. Description. (Summarize the nature of the application and the services to be provided). Applicant seeks authority to modify license to launch demonstration satellite, revise CONOPs, modify altitude range, and conduct sensing operations throughout 30 MHz to 18 GHz frequency range.

43a. Geographic Service Rule Certification

By selecting A, the undersigned certifies that the applicant is not subject to the geographic service or geographic coverage requirements specified in 47 C.F.R. Part 25.

☒ A

By selecting B, the undersigned certifies that the applicant is subject to the geographic service or geographic coverage requirements specified in 47 C.F.R. Part 25 and will comply with such requirements.

☐ B

By selecting C, the undersigned certifies that the applicant is subject to the geographic service or geographic coverage requirements specified in 47 C.F.R. Part 25 and will not comply with such requirements because it is not feasible as a technical matter to do so, or that, while technically feasible, such services would require so many compromises in satellite design and operation as to make it economically unreasonable. A narrative description and technical analysis demonstrating this claim are attached.

☐ C

Application

-->

CERTIFICATION

The Applicant waives any claim to the use of any particular frequency or of the electromagnetic spectrum as against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise, and requests an authorization in accordance with this application. The applicant certifies that grant of this application would not cause the applicant to be in violation of the spectrum aggregation limit in 47 CFR Part 20. All statements made in exhibits are a material part hereof and are incorporated herein as if set out in full in this application. The undersigned, individually and for the applicant, hereby certifies that all statements made in this application and in all attached exhibits are true, complete and correct to the best of his or her knowledge and belief, and are made in good faith.

44. Applicant is a (an): (Choose the button next to applicable response.)

- ☐ Individual
☐ Unincorporated Association
☐ Partnership
☒ Corporation

- ☐ Governmental Entity
☐ Other (please specify)

45. Name of Person Signing
Dennis Burnett

46. Title of Person Signing
EVP, General Counsel

**WILLFUL FALSE STATEMENTS MADE ON THIS FORM ARE PUNISHABLE BY FINE AND / OR IMPRISONMENT
(U.S. Code, Title 18, Section 1001), AND/OR REVOCATION OF ANY STATION AUTHORIZATION
(U.S. Code, Title 47, Section 312(a)(1)), AND/OR FORFEITURE (U.S. Code, Title 47, Section 503).**

FCC NOTICE REQUIRED BY THE PAPERWORK REDUCTION ACT

The public reporting for this collection of information is estimated to average 2 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the required data, and completing and reviewing the collection of information. If you have any comments on this burden estimate, or how we can improve the collection and reduce the burden it causes you, please write to the Federal Communications Commission, AMD-PERM, Paperwork Reduction Project (3060-0678), Washington, DC 20554. We will also accept your comments regarding the Paperwork Reduction Act aspects of this collection via the Internet if you send them to PRA@fcc.gov. PLEASE DO NOT SEND COMPLETED FORMS TO THIS ADDRESS.

Remember - You are not required to respond to a collection of information sponsored by the Federal government, and the government may not conduct or sponsor this collection, unless it displays a currently valid OMB control number or if we fail to provide you with this notice. This collection has been assigned an OMB control number of 3060-0678.

THE FOREGOING NOTICE IS REQUIRED BY THE PAPERWORK REDUCTION ACT OF 1995, PUBLIC LAW 104-13, OCTOBER 1, 1995, 44 U.S.C. SECTION 3507.

Exhibit 2
Schedule S



(REFERENCE COPY) Schedule S

312 File Number: **SATMOD2024040300073**

Filing Description

Question	Response
Description	Hawkeye 360-Lite (Kestrel-0A)

**Satellite
Information**

Question	Response
Select Orbit Type	NGSO
Space Station or Satellite Network Name	HawkEye 360
Estimated Lifetime of Satellite(s) From Date of Launch	5 Years
Will the space station(s) operate on a Common Carrier basis?	No

**Operating
Frequency
Bands (7)**

Nature of service	Description	Frequency Band (s)	Mode Type
Earth Exploration-Satellite Service		8025.0 MHz -8400.0 MHz	Transmit
Earth Exploration-Satellite Service		2025.0 MHz -2110.0 MHz	Receive
Earth Exploration-Satellite Service		156.5 MHz -162.5 MHz	Receive
Earth Exploration-Satellite Service		406.0 MHz -406.1 MHz	Receive
Earth Exploration-Satellite Service		1087.7 MHz -1092.3 MHz	Receive
Other Satellite Service (please specify)	Inter-Satellite Service	1618.725 MHz -1626.5 MHz	Receive
Other Satellite Service (please specify)	Inter-Satellite Service	1618.725 MHz -1626.5 MHz	Transmit

**Orbital
Information For
Non-
Geostationary
Satellites**

Question	Response
Total Number of Satellites in the active constellation	1
Orbit Epoch Date	01/01/2024
Celestial Reference Body	Earth

Orbital Plane 1:

Question	Response
Number of Satellites in Plane	1
Inclination Angle	97.5 degrees
Right Ascension of Ascending Node	0.0 degrees
Argument of Perigee	0.0 degrees
Orbital Period	5689.0 seconds
Apogee	510.0 km
Perigee	510.0 km
Active Service Arc Begin Angle with respect to Ascending Node	-90.0 degrees
Active Service Arc End Angle with respect to Ascending Node	90.0 degrees

Mean Anomaly For Each Satellite

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

Receiving Beams 1:

Question	Response
Beam ID	ISL1
Receive Beam Frequency	1618.725 MHz -1626.5 MHz
Beam Type	Fixed
Polarization	RHCP
Peak Gain	4.5 dBi
Antenna Pointing Error	0.1 degrees
Antenna Rotational Error	0.1 degrees
Polarization Switchable	
Polarization Alignment Relative to the Equatorial Plane	45.0 degrees
G/T at Max. Gain Point	-17.3 dB/K
Min. Saturation Flux Density	-999.0 dBW/m2
Max. Saturation Flux Density	-998.0 dBW/m2
Co- or Cross Polar Mode	C
Service Area Description	Global

Receiving Beams 2:

Question	Response
Beam ID	ADSB
Receive Beam Frequency	1087.7 MHz -1092.3 MHz
Beam Type	Fixed
Polarization	H
Peak Gain	5.0 dBi
Antenna Pointing Error	1.0 degrees
Antenna Rotational Error	1.0 degrees

Polarization Switchable	
Polarization Alignment Relative to the Equatorial Plane	0.0 degrees
G/T at Max. Gain Point	-21.5 dB/K
Min. Saturation Flux Density	-122.4 dBW/m2
Max. Saturation Flux Density	-101.0 dBW/m2
Co- or Cross Polar Mode	C
Service Area Description	VISIBLE EARTH

Receiving Beams 3:

Question	Response
Beam ID	EPRB
Receive Beam Frequency	406.0 MHz -406.1 MHz
Beam Type	Fixed
Polarization	H
Peak Gain	2.0 dBi
Antenna Pointing Error	1.0 degrees
Antenna Rotational Error	1.0 degrees
Polarization Switchable	
Polarization Alignment Relative to the Equatorial Plane	0.0 degrees
G/T at Max. Gain Point	-26.5 dB/K
Min. Saturation Flux Density	-130.3 dBW/m2
Max. Saturation Flux Density	-116.0 dBW/m2
Co- or Cross Polar Mode	C
Service Area Description	VISIBLE EARTH

Receiving Beams 4:

Question	Response
----------	----------

Beam ID	DSC
Receive Beam Frequency	156.512 MHz -156.538 MHz
Beam Type	Fixed
Polarization	H
Peak Gain	2.0 dBi
Antenna Pointing Error	1.0 degrees
Antenna Rotational Error	1.0 degrees
Polarization Switchable	
Polarization Alignment Relative to the Equatorial Plane	0.0 degrees
G/T at Max. Gain Point	-27.4 dB/K
Min. Saturation Flux Density	-131.3 dBW/m2
Max. Saturation Flux Density	-113.0 dBW/m2
Co- or Cross Polar Mode	C
Service Area Description	VISIBLE EARTH

Receiving Beams 5:

Question	Response
Beam ID	AIS
Receive Beam Frequency	156.5 MHz -162.5 MHz
Beam Type	Fixed
Polarization	H
Peak Gain	2.0 dBi
Antenna Pointing Error	1.0 degrees
Antenna Rotational Error	1.0 degrees
Polarization Switchable	
Polarization Alignment Relative to the Equatorial Plane	0.0 degrees

G/T at Max. Gain Point	-27.4 dB/K
Min. Saturation Flux Density	-135.3 dBW/m2
Max. Saturation Flux Density	-107.0 dBW/m2
Co- or Cross Polar Mode	C
Service Area Description	VISIBLE EARTH

Receiving Beams 6:

Question	Response
Beam ID	TTCU
Receive Beam Frequency	2025.0 MHz -2110.0 MHz
Beam Type	Fixed
Polarization	RHCP
Peak Gain	3.4 dBi
Antenna Pointing Error	1.0 degrees
Antenna Rotational Error	1.0 degrees
Polarization Switchable	
Polarization Alignment Relative to the Equatorial Plane	45.0 degrees
G/T at Max. Gain Point	-24.6 dB/K
Min. Saturation Flux Density	-111.9 dBW/m2
Max. Saturation Flux Density	-79.6 dBW/m2
Co- or Cross Polar Mode	C
Service Area Description	VISIBLE EARTH

Receiving Beams 7:

Question	Response
Beam ID	PAYU

Receive Beam Frequency	2025.0 MHz -2110.0 MHz
Beam Type	Steerable
Polarization	RHCP
Peak Gain	6.0 dBi
Antenna Pointing Error	1.0 degrees
Antenna Rotational Error	1.0 degrees
Polarization Switchable	
Polarization Alignment Relative to the Equatorial Plane	45.0 degrees
G/T at Max. Gain Point	-22.0 dB/K
Min. Saturation Flux Density	-116.2 dBW/m2
Max. Saturation Flux Density	-79.6 dBW/m2
Co- or Cross Polar Mode	C
Service Area Description	VISIBLE EARTH

Receiving
Channels (12)

Channel ID	Channel Bandwidth (MHz)	Center Frequency s (MHz)	Feeder Link, Service Link or TT&C
AIS3	0.025	156.775	Service Link
ADSB	4.6	1090.0	Service Link
EPRB	0.1	406.05	Service Link
HTU6	0.18	2053.0	TT&C
DSC	0.025	156.525	Service Link
AIS2	0.025	162.025	Service Link
AIS1	0.025	161.975	Service Link
PU26	2.66	2049.3	TT&C
IR01	0.042	1622.6125	TT&C
PU16	0.17	2049.3	TT&C
PU36	1.33	2049.3	TT&C
AIS4	0.025	156.825	Service Link

Transmitting
Beams 1:

Question	Response
Beam ID	ISL
Transmit Beam Frequency	1618.725 MHz -1626.5 MHz
Beam Type	Fixed
Polarization	RHCP
Peak Gain	4.5 dBi
Antenna Pointing Error	1.0 degrees
Antenna Rotational Error	1.0 degrees
Polarization Switchable	
Polarization Alignment Relative to the Equatorial Plane	45.0 degrees
Max. Transmit EIRP Density	-40.7 dBW/Hz
Max. Transmit EIRP	5.54 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 /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	-142.7	-141.1	-139.6	-138.2	-137.0	-130.8

Transmitting
Beams 2:

Question	Response
Beam ID	PAYD
Transmit Beam Frequency	8025.0 MHz -8400.0 MHz

Beam Type	Steerable
Polarization	RHCP
Peak Gain	13.0 dBi
Antenna Pointing Error	1.0 degrees
Antenna Rotational Error	1.0 degrees
Polarization Switchable	
Polarization Alignment Relative to the Equatorial Plane	45.0 degrees
Max. Transmit EIRP Density	-57.1 dBW/Hz
Max. Transmit EIRP	11.9 dBW
Co- or Cross Polar Mode	C
Service Area Description	VISIBLE EARTH

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):
4.0 kHz	-157.2	-155.3	-153.5	-152.0	-150.6	-144.1

Transmitting Beams 3:

Question	Response
Beam ID	TCXD
Transmit Beam Frequency	8025.0 MHz -8400.0 MHz
Beam Type	Fixed
Polarization	RHCP
Peak Gain	7.0 dBi
Antenna Pointing Error	1.0 degrees

Antenna Rotational Error	1.0 degrees
Polarization Switchable	
Polarization Alignment Relative to the Equatorial Plane	45.0 degrees
Max. Transmit EIRP Density	-54.0 dBW/Hz
Max. Transmit EIRP	0.8 dBW
Co- or Cross Polar Mode	C
Service Area Description	VISIBLE EARTH

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):
4.0 kHz	-154.1	-152.1	-150.4	-148.8	-147.5	-141.0

Transmitting
Channels (9)

Channel ID	Channel Bandwidth (MHz)	Center Frequency s (MHz)	Feeder Link, Service Link or TT&C
PD12	80.0	8165.0	Service Link
XD22	0.1	8297.0	TT&C
PD32	8.0	8165.0	Service Link
XD52	0.01	8297.0	TT&C
XD42	0.02	8297.0	TT&C
XD12	0.3	8297.0	TT&C
PD22	40.0	8165.0	Service Link
XD32	0.05	8297.0	TT&C
IT01	0.042	1622.6125	TT&C

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?	
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>USASAT-30G-1_FCC_GIMS - RevA.mdb</u>		NGSO Antenna Gain Data	GIMS file (*.mdb)	Antenna beam projections for all relevant beams