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July 25, 2022

VIA ELECTRONIC FILING

Marlene H. Dortch, Secretary
Federal Communications Commission
45 L Street N.E.
Washington, D.C. 20554

Re: Application for Special Temporary Authority for Call Sign E210107

Dear Ms. Dortch:

Per FCC Rule 25.120,¹ Skylo Technologies, Inc. ("Skylo") hereby requests Special Temporary Authority ("STA") for 60 days to operate mobile earth stations under blanket authority as requested in Skylo's pending license application, IBFS File No. SES-LIC-20210505-00772 (Call Sign E210107) (the "Application").

Skylo requests that the technical and operational parameters of the STA mirror those specified in the Application. For convenience, Skylo reproduces the Application in its entirety, including supplemental information, and attaches it here as Attachment A.

Please do not hesitate to contact me if you have any questions.

Best regards,

A handwritten signature in black ink, appearing to read "Henry Gola".

Henry Gola
Counsel for Skylo Technologies, Inc.

Enclosure

¹ See 47 C.F.R. § 25.120(b)(3).

Date & Time Filed: May 4 2021 9:25:25:636PM
File Number: SES-LIC-INTR2021-01786
Callsign/Satellite ID:

APPLICATION FOR EARTH STATION AUTHORIZATIONS FCC 312 MAIN FORM FOR OFFICIAL USE ONLY	FCC Use Only
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APPLICANT INFORMATION

Enter a description of this application to identify it on the main menu:

Blanket Authorization

1-8. Legal Name of Applicant

Name:	Skylo Technologies, Inc	Phone Number:	(510) 402-3383
DBA Name:		Fax Number:	
Street:	312 North San Mateo Drive Suite 200	E-Mail:	pvenkat@skylo.tech
City:	San Mateo	State:	CA
Country:	USA	Zipcode:	94401 -
Attention:	Priya Venkat		

9-16. Name of Contact Representative

Name:	Andrew Nuttall	Phone Number:	(517) 574-0100
Company:	Skylo Technologies, Inc	Fax Number:	
Street:	268 Lambert Ave	E-Mail:	nuttall@skylo.tech
City:	Palo Alto	State:	CA
Country:	USA	Zipcode:	94306-
Attention:		Relationship:	Engineer

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. a. ☒ a1. Earth Station (N/A) a2. Space Station	b. ☒ b1. Application for License of New Station ☒ b2. Application for Registration of New Domestic Receive–Only Station (N/A) b3. Amendment to a Pending Application (N/A) b4. Modification of License or Registration (N/A) b5. Assignment of License or Registration (N/A) b6. Transfer of Control of License or Registration (N/A) 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 ☒ b10. Other (Please specify) ☒ 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. ☒ b12. Application for Database Entry (N/A) b13. Amendment to a Pending Database Entry Application (N/A) b14. Modifiction of Database Entry
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 BGB – Mobile Satellite Earth Stations Blanket Authorization	

18. If this filing is in reference to an existing station, enter: (a) Call sign of station: Not Applicable	19. If this filing is an amendment to a pending application enter: (a) Date pending application was filed: (b) File number of pending application: Not Applicable Not Applicable
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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)	
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: 1525 Frequency Upper: 1660.5

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
(N/A) e. Geostationary Space Station
(N/A) f. Non-Geostationary Space Station
☐ g. Other (please specify)

26. TYPE OF EARTH STATION FACILITY: Choose only one.

- ☒ Transmit/Receive ☐ Transmit-Only ☐ Receive-Only ☐ 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.)

Not Applicable

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?
If Yes, attach as an exhibit, copies of the requests for waivers or exceptions with supporting documents.

☐ Yes ☒ No

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, 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	☐ Yes ☒ No
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? United Kingdom on the Approved Space Station List

43. Description. (Summarize the nature of the application and the services to be provided).
(If the complete description does not appear in this box, please go to the end of the form to view it in its entirety.)

(If the complete description does not appear in this box, please go to the end of the form to view it in its entirety.)

Skylo seeks a blanket license for the operation of up to 1,000,000 mobile earth stations that will communicate with MSS satellites.

Combined Exhibit

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

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
Priya Venkat

46. Title of Person Signing
General Counsel

47. Please supply any need attachments.

Attachment 1:

Attachment 2:

Attachment 3:

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).

SATELLITE EARTH STATION AUTHORIZATIONS
FCC Form 312 – Schedule B:(Technical and Operational Description)
FOR OFFICIAL USE ONLY

Location of Earth Station Site

E1: Site Identifier:	SKYLO BLANKET CPE-1	E5. Call Sign:	
E2: Contact Name	ANDREW NUTTALL	E6. Phone Number:	(517) 574-0100
E3. Street:	268 Lambert Avenue	E7. City:	Palo Alto
		E8. County:	Santa Clara
E4. State	CA	E9. Zip Code	94306
E10. Area of Operation:	CONUS, AK, HI, USVI, PR		
E11. Latitude:	0 °0 '0.0 "		
E12. Longitude:	0 °0 '0.0 "		
E13. Lat/Lon Coordinates are:	☐ NAD-27	☐ NAD-83	☒ N/A
E14. Site Elevation (AMSL):	0.0 meters		

E15. If the proposed antenna(s) operate in the Fixed Satellite Service (FSS) with geostationary satellites, do(es) the proposed antenna(s) comply with the antenna gain patterns specified in Section 25.209(a) and (b) as demonstrated by the manufacturer's qualification measurement? If NO, provide as a technical analysis showing compliance with two-degree spacing policy.	☐ Yes ☐ No ☒ N/A
E16. If the proposed antenna(s) do not operate in the Fixed Satellite Service (FSS), or if they operate in the Fixed Satellite Service (FSS) with non-geostationary satellites, do(es) the proposed antenna(s) comply with the antenna gain patterns specified in Section 25.209(a2) and (b) as demonstrated by the manufacturer's qualification measurements?	☒ Yes ☐ No ☐ N/A
E17. Is the facility operated by remote control? If YES, provide the location and telephone number of the control point.	☒ Yes ☐ No

E18. Is frequency coordination required? If YES, attach a frequency coordination report as	☐ Yes ☒ No
E19. Is coordination with another country required? If YES, attach the name of the country(ies) and plot of coordination contours as	☐ Yes ☒ No
E20. FAA Notification – (See 47 CFR Part 17 and 47 CFR part 25.113(c)) Where FAA notification is required, have you attached a copy of a completed FCC Form 854 and or the FAA's study regarding the potential hazard of the structure to aviation? FAILURE TO COMPLY WITH 47 CFR PARTS 17 AND 25 WILL RESULT IN THE RETURN OF THIS APPLICATION.	☐ Yes ☒ No

POINTS OF COMMUNICATION

Satellite Name: SKYTERRA 1 SKYTERRA 1 101.3 W.L. If you selected OTHER, please enter the following:
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E21. Common Name:	E22. ITU Name:
E23. Orbit Location:	E24. Country:

Satellite Name:ISAT List ISAT List If you selected OTHER, please enter the following:	
E21. Common Name:	E22. ITU Name:
E23. Orbit Location:	E24. Country:

POINTS OF COMMUNICATION (Destination Points)

E25. Site Identifier: SKYLO BLANKET CPE-1	
E26. Common Name:	E27. Country:USA

ANTENNA

Site ID	E28. Antenna Id	E29. Quantity	E30. Manufacturer	E31. Model	E32. Antenna Size<meters>	E41/42. Antenna GainTransmint and/or Recieve (____dBi at ____GHz)
SKYLO BLANKET CPE-1	CPE-1	1000000	SKYLO	n/a	0.2	8.0 dBi at 1.64

E28. Antenna Id	E33/34. Diameter Minor/Major (meters)	E35. Above Ground Level (meters)	E36. Above Sea Level (meters)	E37. Building Height Above Ground Level (meters)	E38. Total Input Power at antenna flange (Watts)	E39. Maximum Antenna Height Above Rooftop (meters)	E40. Total EIRP for al carriers (dBW)
CPE-1	0.2/0.2	0.0	0.0	0.0	1.6	0.0	10.0

FREQUENCY

E28. Antenna Id	E43/44. Frequency Bands (MHz)	E45. T/R Mode	E46. Antenna Polarization(H,V,L,R)	E47. Emission Designator	E48. Maximum EIRP per Carrier (dBW)	E49. Maximum ERIP Density per Carrier (dBW/4kHz)
CPE-1	1525 1559	R	Right Hand Circular	15K0GXD	10.0	4.25

E50. Modulation and Services (If the complete description does not appear in this box, please go to the end of the form to view it in its entirety.)

NB-IoT M2M Data Traffic Single Carrier QPSK

CPE-1	1626.5 1660.5	T	Right Hand Circular	15K0GXD	10.0	4.25
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E50. Modulation and Services (If the complete description does not appear in this box, please go to the end of the form to view it in its entirety.)

NB-IoT M2M Data Traffic Single Carrier QPSK

FREQUENCY COORDINATION

E28. Antenna Id	E51. Satellite Orbit Type	E52/53. Frequency Limits(MHz)	E54/55. Range of Satellite Arc E/W Limit	E56. Earth Station Azimuth Angle Eastern Limit	E57. Antenna Elevation Angle Eastern Limit	E58. Earth Station Azimuth Angle Western Limit	E59. Antenna Elevation Angle Western Limit	E60. Maximum EIRP Density toward the Horizon (dBW/4kHz)
CPE-1	Geostationary	1525 1559	60.0/ 160.0	242.5	48.8	101.8	19.3	-5.9
	Geostationary	1626.5 1660.5	60.0/ 160.0	242.5	48.8	101.8	19.3	-5.9

REMOTE CONTROL POINT LOCATION

E61. Call Sign NOTE: Please enter the callsign of the controlling station, not the callsign for which this application is being filed.		E65. Phone Number (517) 574-0100	
E62. Street Address 268 Lambert Avenue			
E63. City Palo Alto		E67. County Santa Clara	
		E64/68. State/Country CA/ USA	E66. Zip Code 94306

FCC NOTICE REQUIRED BY THE PAPERWORK REDUCTION ACT

The public reporting for this collection of information is estimated to average 0.25 – 24 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-PER, 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.

APPLICATION FOR BLANKET LICENSED EARTH STATIONS

I. OVERVIEW

In this application, Skylo Technologies Inc (“Skylo”) seeks a blanket license authorizing operation of up to 1,000,000 earth stations that end-user customers will utilize to communicate through the Inmarsat 4-F3 satellite located at 97.6° W and the Skyterra 1 satellite located at 101.3° W. These earth stations will transmit in the 1.6265-1.6605 GHz band and receive in the 1.525-1.559 GHz band. The Commission’s rules specifically contemplate blanket licensing for earth stations operating in these frequency bands¹. Skylo seeks authority to deploy and operate these earth stations throughout the contiguous United States, Alaska, Hawaii, Puerto Rico, and the U.S. Virgin Islands. As a subset of these frequencies falls in the public safety bands, Skylo operations will conform to the Table of Frequency Allocations and not operate in the public safety bands.

Below, we show that grant of this application would serve the public interest. Then, we provide technical information to supplement the information provided on Form 312.

¹ See 47 C.F.R. § 25.115(d).

II. GRANT OF THIS APPLICATION WOULD SERVE THE PUBLIC INTEREST

Skylo was founded by a team focused on bringing low cost, ubiquitous, narrow band connectivity to the 15B devices coming online globally by 2024, with a significant percentage of these being in areas that do not have cellular coverage. Granting this application would serve the public interest by helping to enable a low latency, 3GPP standards-based, narrow band deployment of the Internet of Things (NB-IoT) throughout the United States, territories and surrounding waters by authorizing Skylo mobile User Terminals (UT) that can bring millions of connected sensors and across a range of Industrial IoT applications to provide connectivity between these devices and user platforms.

The global growth in IoT demand is projected to grow to over 24 billion devices by the end of the decade. However, cellular coverage is predicted to geographically expand at a fraction of that, if at all. And, most broadband providers are focused on higher ARPU, higher density areas, where 5G deployments and fiber are prevalent. Skylo Technologies is focused on those solutions that have been traditionally analog, looking to bring digitization and the power of data to increase efficiency, yield, and reduce operational costs. We have a tried and tested end-to-end solution in key verticals, such as maritime, agriculture, and logistics, where simple tracking, messaging and sensor integration are providing valuable insights to users. For example:

1. Skylo Technologies can be used on fishing vessels, far outside of cellular or VHF radio coverage, helping to monitor and measure fish catch reporting, and providing a virtual tether to family back on land. This not only helps with sustainable catch reporting, but

also allows fleet owners complete visibility of their boats to ensure safe navigation in domestic waters with simple geofence solutions.

2. External sensors, such as soil pH can be integrated to measure the health of farmlands, helping to match the crop with soil. Additionally, by measuring soil moisture, we can match water levels, ensuring precise use of this precious resource. Tractor owners can monitor their equipment at all times and benefit from cloud-compute resources available to them at a fractional cost of legacy solutions. Skylo is a proud and active participant of the FCC Agriculture Task Force to support our nation's farmers.
3. Trucking is one of the backbones of the United States, with the U.S. having the most paved roads globally. However, there are still thousands of miles of roads that don't have cellular coverage - largely in rural and remote areas. With the increase in e-commerce and the need to match demand & supply in real-time, logistics companies require cost-effective & reliable data over 100% of the routes. Skylo is able to bring NB-IoT connectivity to the truck and connected sensors therein and the truckers, providing more than just visibility into location. Our cost-effective solution can provide a two-way, constant communication to drivers without the need for a large or complex install on their vehicle, alerting others in the event of a breakdown, or simply sending a message with important status updates. Integrating external sensors can help with the transport of vital temperature-regulated drugs, such as COVID vaccines.

Skylo is field proven and is providing a self-install, cost effective solution to provide connectivity to the billions of devices coming online by the end of the decade. Our users and the developer community for IoT are constantly building new use cases with our APIs, and leveraging our end

to end, full stack solution, akin to the early days of the Internet. The Skylo Solution will deliver affordable 3GPP standards-based NB-IoT connectivity across the entirety of the US. This application seeks authority for an affordable, portable, end user terminal for ubiquitous connectivity. To this extent, Skylo recently renewed its experimental license through June 1, 2022 to continue testing the functionality of its device. The grant of a full commercial license will allow Skylo to connect rural communities in need of the Skylo Service. Accordingly, an expeditious grant of this application would greatly serve the public interest.

Accordingly, an expeditious grant of this application would serve the public interest.

Respectfully submitted,

Skylo Technologies Inc

By: /s/ Priya Venkat
Priya Venkat
General Counsel

Skylo Technologies Inc
268 Lambert Ave
Palo Alto, CA 94306

Email: pvenkat@skylo.tech

TECHNICAL ANNEX

In this Technical Annex, Skylo provides additional information on the proposed operations of its blanket-licensed earth stations to supplement the data provided in Schedule B to Form 312 filed with this narrative application.

A. Power and Gain Figures

The proposed user terminal is a flat, phased array capable of steering its beams toward the xxx satellites. The highest transmit power (10.0 W) occurs at maximum slant, while the lowest transmit power (3.16 W) occurs at boresight. The highest EIRP for all carriers is 10 dBw with a minimum 4 dBw to meet BER. Highest antenna gain is 8 dBi with the minimum required to meet BER at 2dBi. For purposes of Form 312 accompanying this application, In every case, Skylo has supplied the higher transmit power figures and lower gain figures in order to present worst-case conditions.

B. Frequencies to be used

The terminal uses 2 MHz of spectrum as defined in the application. The specific Mobile Satellite Service frequencies will be in the following ranges:

DIRECTION	FREQUENCY START (MHZ)	FREQUENCY STOP (MHZ)
Earth to Space	1626.5	1660.5
Space to Earth	1525	1559

C. Radiation Hazard Exhibit

RF Exposure Analysis of Skylo-1 Terminal

1. Introduction

This report analyzes the non-ionizing radiation levels of the 0.2M Skylo-1 earth station (ES) terminal.

The FCC's Office of Engineering Technology's (OET) Bulletin No. 65 specifies there are two separate tiers of exposure limits that are dependent upon the situation in which the exposure takes place and/or the status of the individuals who are subject to the exposure. The two tiers are General Population/Uncontrolled environment and an Occupational/Controlled environment. Because the environment is controlled and any potential exposure is of a transitory nature, the limits for Occupational/Controlled exposures are assumed to apply. Accordingly, this analysis discusses only the Maximum Permissible Exposure (MPE) limit for those types of exposures, which is a power density equal to 5 mW/cm^2 averaged over a six-minute period.

2. Earth Station Terminal Description

The ES terminal transmits bursts of information at designated times that are assigned to the terminal by the network. The length and carrier frequency of each transmission burst depend on the ES terminal's traffic requirements. In normal operation, the ES terminal transmits burst traffic to the network with a normal duty cycle of less than 2%.

The ES terminal is an M2M terminal which operates at low transmit power and very low duty cycle. It operates using the NB-IoT protocol, which is a solicit and respond protocol, meaning the ES terminal is not capable of transmitting unless it has been signaled by the base station or core network. The ES terminal is not commercially enabled to operate in continuous transmission modes. The ES terminal performs local watchdog monitoring and is able to self reset and heal operational failures, additionally the ES terminal can be remotely deactivated over its satellite connection.

3. Explanation of Analysis

The below analysis uses OET Bulletin 65 for continuous transmission. However, within Skylo's network, the terminals will transmit in short bursts of data periodically rather than continuous transmission.

4. Results & Conclusions

The ES terminals satisfy Commission requirements as the terminals do not exceed the MPE limit of 1 mW/cm² averaged over thirty-minute period when operated in the network as designed. In particular, a fail-safe feature greatly reduces the chance of human exposure between the feed and the reflector surface: a small blockage in this area is sufficient to cause transmissions to cease. If the down link (receive signal) is interrupted by an object in this area, the uplink (transmit signal) is shut down in less than 10 seconds and the receiver down link recovery time is 10 seconds. The uplink will remain off until the blockage is removed and the downlink recovery is complete. This feature, coupled with the terminal's non-continuous operation, ensures that the general population will not be exposed to harmful levels of radiation that exceed Commission standards.

The most likely duty cycle, 1%, meets the Occupational/Controlled MPE limit (5 mW/ cm² over 6-minute period) for each antenna.

This radiation hazard analysis demonstrates the Skylo ES terminals will not result in exposure levels exceeding the allowable radiation exposure limits.

5. Radiation Hazard Analysis

The following tables present the results from the radiation hazard analysis for the Skylo ES antenna. Yellow shaded values indicate calculated fields.

Table 1. Skylo-1 Antenna

Parameter	Unit	1% Duty Cycle (for normal operations)	2% Duty Cycle (for normal operations)
Diameter of antenna	m	0.2	0.2
Frequency	GHz	1.64	1.64
λ (wavelength)	m	0.183	0.183
Far Field length	m	0.131	0.131
Near Field length	m	0.0547	0.0547
Efficiency, η		0.133	0.133
Transmitter Gain	dBi	3	3
Max Transmitter power (at slant)	W	10.00	10.00
Min Transmitter power (at boresite)	W	3.16	3.16
Duty Cycle	%	1	2
Min Transmitter Gain (at slant)	dBi	3	3
Physical Area of the Aperture Antenna	m ²	0.023	0.023
Power Density in Far Field (Boresight Direction)	mW/cm ²	0.0865	0.173
Power Density in Near Field	mW/cm ²	0.125	0.249
Power Density at Antenna Surface	mW/cm ²	0.545	1.09
Power Density in Transition Region	mW/cm ² /R _t	0.00395	0.00791

Definition of terms

The terms are used in the formulas here are defined as follows:

S_{surface}	= maximum power density at the antenna surface
S_{nf}	= maximum near-field power density
S_{t}	= power density in the transition region
S_{ff}	= power density (on axis)
R_{nf}	= extent of near-field
R_{ff}	= distance to the beginning of the far-field
R_{t}	= distance to point of interest between near-field and far-field regions in cm
P	= 10 W power fed to the antenna in Watts
A	= 0.04 m ² physical area of the aperture antenna
G	= 3 dBi antenna gain relative to an isotropic radiator
D	= 0.2 m diameter of antenna in meters
F	= 1.64 GHz frequency in GHz
λ	= 0.183 m wavelength in meters
η	= 0.133 aperture efficiency
D_c	= 0.01 duty cycle of 1%

Antenna Surface. The maximum power density directly in front of an antenna (e.g., at the antenna surface) can be approximated by the following equation:

$$\begin{aligned}
 S_{\text{surface}} &= (4 * D_c * P) / A \\
 &= (4 * 0.01 * 10 \text{ W}) / 0.04 \text{ m}^2 \\
 &= 0.316 \text{ mW/cm}^2
 \end{aligned}$$

Near Field Region. In the near-field or Fresnel region, of the main beam, the power density can reach a maximum before it begins to decrease with distance. The extent of the near field can be described by the following equation (D and λ in same units):

$$\begin{aligned}
 R_{\text{nf}} &= D^2 / (4 * \lambda) \\
 &= (0.2 \text{ m})^2 / (4 * 0.183 \text{ m}) \\
 &= 0.0547 \text{ m}
 \end{aligned}$$

The magnitude of the on-axis (main beam) power density varies according to location in the near field. However, the maximum value of the near-field, on-axis, power density can be expressed by the following equation:

$$\begin{aligned}
 S_{\text{nf}} &= (16 * D_c * \eta * P) / (\pi * D^2) \\
 &= (16 * 0.01 * 0.133 * 10 \text{ W}) / (\pi * (0.2 \text{ m})^2) \\
 &= 0.042 \text{ mW/cm}^2
 \end{aligned}$$

Transition Region. Power density in the transition region decreased inversely with distance from the antenna, while power density in the far field (Fraunhofer region) of the antenna decreased inversely with the square of the distance. The transition region will then be the region extending from R_{nf} to R_{ff} . If the location of interest falls within this transition region, the on-axis power density can be determined from the following equation:

$$\begin{aligned}
 S_{\text{t}} &= (S_{\text{nf}} * R_{\text{nf}}) / R_{\text{t}} \\
 &= (0.042 \text{ mW/cm}^2 * 5.47 \text{ cm}) / R_{\text{t}} (\text{cm}) \\
 &= (0.0023 \text{ mW/cm}) / R_{\text{t}} (\text{cm}) \quad \text{where } R_{\text{t}} \text{ is the location of interest in centimeters}
 \end{aligned}$$

Far-Field Region. The power density in the far-field or Fraunhofer region of the antenna pattern decreased inversely as the square of the distance. The distance to the start of the far field can be calculated by the following equation:

$$\begin{aligned}
 R_{\text{ff}} &= (0.6 * D^2) / \lambda \\
 &= (0.6 * (0.2 \text{ m})^2) / 0.183 \text{ m} \\
 &= 0.131 \text{ m}
 \end{aligned}$$

The power density at the start of the far-field region of the radiation pattern can be estimated by the equation:

$$\begin{aligned}
 S_{\text{ff}} &= (D_c * P * G) / (4 * \pi * R_{\text{ff}}^2) \\
 &= (0.01 * 10 \text{ W} * 2) / (4 * \pi * (0.131 \text{ m})^2) \\
 &= 0.0292 \text{ mW/cm}^2
 \end{aligned}$$

From: [David Marshack](#)
To: [Jae Lim](#)
Cc: [Kerry Murray](#)
Subject: [EXTERNAL]: Re: SES-LIC-20210505-00772; Call Sign: E210107
Date: Thursday, September 2, 2021 5:09:05 PM

You don't often get email from david@rkf-eng.com. [Learn why this is important](#)

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Jae

Looks like you've already begun to dig in. Thanks so much for that.

I don't know how we missed the antenna gain value. I can confirm that your value is correct.

Please let me know if you have any future questions.

Thanks,

David

David Marshack | Managing Director & COO
RKF Engineering Solutions, LLC
7500 Old Georgetown Road, Suite 1275
Bethesda, MD 20814-6198
Mobile: +1.301.980.9723 | david@rkf-eng.com

From: Jae Lim <Jae.Lim@fcc.gov>
Sent: Thursday, September 2, 2021 3:23 PM
To: David Marshack <david@rkf-eng.com>
Cc: Kerry Murray <Kerry.Murray@fcc.gov>
Subject: SES-LIC-20210505-00772; Call Sign: E210107

Hi David,

You didn't provide antenna gain for 1525-1559 MHz.

I calculated [8.22 dBi @1.525 GHz](#).

Please let me know if you agree.

Thanks.

Jae Lim
FCC/IB

Supplement to

APPLICATION FOR BLANKET LICENSED EARTH STATIONS

This supplement to Skylo's pending application for blanket licensed earth stations (SES-LIC-20210505-00772, Call Sign E210107) provides information pertaining to operations of mobile earth stations in the NVNG and mobile-satellite service bands and addresses compliance with limits on emissions for protection of aeronautical radionavigation-satellite services (47 C.F.R. §25.287 and, §25.216 respectively).

The following additions to the technical annex are provided below.

D. Requirements pertaining to operations of mobile stations in the NVNG and mobile-satellite service bands¹

The Skylo system is designed to operate at 1525-1559 MHz (space-to-Earth) and 1626.5-1660.5 MHz (Earth-to-space). As these frequency bands overlap the spectrum providing maritime distress and emergency communications, the Skylo system has been developed to comply with the specifications of FCC rule §25.287 providing priority and preemptive access to maritime distress and safety communications. Skylo's network uses a NB-IoT protocol system that operates in accordance with 3GPP defined practices which are inherently compliant with §25.287.

Skylo's terminals operate in a continuous monitoring mode. Additionally, Skylo terminals are not intended for use as a part of a maritime distress or safety communication system. As such, the terminal is designed to operate in compliance §25.287. Refer to the table below for the applicable sections:

¹ 47 C.F.R. §25.287.

47 CFR §25.287	COMPLIANCE
(a)(1)	Yes
(a)(2)	N/A - not for emergency comms.
(a)(3)	Yes
(a)(4)	Yes
(a)(5)	N/A - continuous monitoring
(a)(6)	Yes
(a)(7)	Yes
(a)(8)	N/A - not for emergency comms.
(b)(1)	Yes
(b)(2)	Yes
(b)(3)	Yes
(b)(4)	Yes
(b)(5)	N/A - continuous monitoring
(b)(6)	N/A - continuous monitoring
(b)(7)	Yes
(b)(8)	Yes
(b)(9)	N/A - not for emergency comms.
(b)(10)	N/A - not for emergency comms.

Table 1: Applicable 47 CFR §25.287 parts listing

Specifically, Skylo’s transmissions:

- Are assigned a priority level which give precedence to maritime distress and safety communications - refer to §25.287(a)(1), b(1), (b)(2);
- Uniquely identify each transmit terminal. All remote terminals, called Skylo Hub devices, are controlled by a Skylo Base Station (located within the satellite network Land Earth Station (LES)) that acts as a centralized land-based network control device that provides access to authorized terminals and prohibits unauthorized users – refer to §25.287(a)(3), (a)(4), (b)(3);
- The Skylo Base Station provides a channel and time burst plan to all Skylo Hub devices - refer to §25.287(b)(4);
- As part of TDM network, each terminal constantly monitors its network to determine its access to the network - refer to §25.287(a)(4);

- All Skylo Hub devices are designed to inhibit transmission in case of not correctly receiving Skylo Base Station signals or in case of receiving shut off commands from the Base Station - refer to parts §25.287(a)(7), (a)(8); and,
- By virtue of the TDM resource allocation plan, all Skylo Base Stations are capable of inhibiting remote Skylo Hub devices that are not part of the resource allocation plan. In addition, Skylo Base Stations are capable of issuing shut off commands by virtue of the plan - refer to §25.287(b)(7), (b)(8).

E. Compliance with limits on emissions for protection of aeronautical radionavigation-satellite services²

The proposed terminal was tested in accordance with procedures established in ANSI C63.25-2015, clause 5.7. and has been found to be in compliance with the limits on emissions for protection of aeronautical radionavigation-satellite services in applicable portions of FCC rule §25.216. Refer to the table below for the applicable sections:

47 CFR §25.216	COMPLIANCE
(a)	N/A - in service after 2002
(b)	N/A - in service after 2002
(c)	Yes
(d)	N/A – in service after 2002; not for emergency comms.
(e)	N/A - Out of band
(f)	Yes
(g)	N/A - Out of band
(h)	Yes
(i)	Yes
(j)	Yes

Table 2 : Applicable 47 CFR §25.216 parts listing

The figure below provides out of band emissions compliance details:

² Refer to FCC 47 C.F.R. §25.216

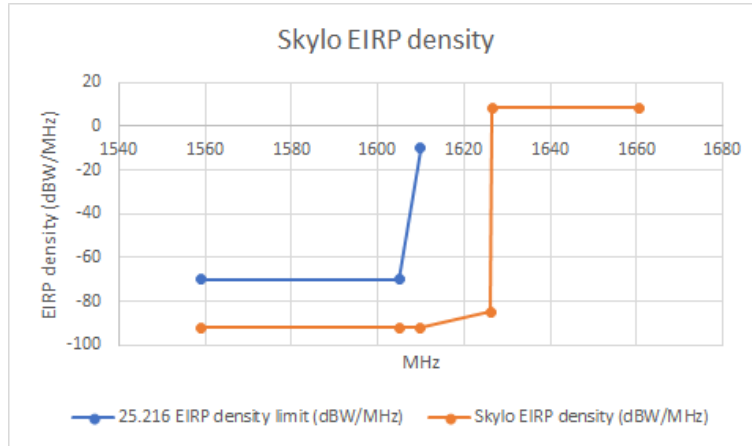


Figure 3: Skylo EIRP Density

Addendum respectfully submitted,

Skylo Technologies Inc

By: /s/ Priya Venkat

Priya Venkat

General Counsel

Skylo Technologies Inc

268 Lambert Ave