

** GRANTED IN PART / DEFERRED IN PART **

S2946 SAT-LOA-20151123-00078 IB2015002274
Spire Global, Inc.
LEMUR Phases I & II



File # SAT-LOA-20151123-00078
Call Sign S2946 Grant Date 10/14/16
(or other identifier)
Term Dates See conditions
From 10/14/16 To:
Approved: Stephen J. Duall

Approved by OMB
3060-0678

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Callsign/Satellite ID: S2946

* with conditions

Stephen J. Duall
Chief, Satellite Policy Branch


APPLICATION FOR SATELLITE SPACE 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:
Draft Satellite Application

1-8. Legal Name of Applicant			
Name:	Spire Global, Inc.	Phone Number:	415-356-3400
DBA Name:		Fax Number:	
Street:	33 Norfolk Street	E-Mail:	jonathan.rosenblatt@spire.com
City:	San Francisco	State:	CA
Country:	USA	Zipcode:	94103 -
Attention:	Jonathan Rosenblatt		

ATTACHMENT TO GRANT
 Spire Global, Inc.
 IBFS File No. SAT-LOA-20151123-00078

IBFS File No(s):	SAT-LOA-20151123-00078 ¹	<p>GRANT IN PART / DEFER IN PART – With Conditions</p>  <p>International Bureau Satellite Division</p>
Licensee/Grantee:	Spire Global, Inc.	
Call Sign:	S2946	
Satellite Name:	LEMUR-2 constellation, Phase I satellites ²	
Orbital Location: (required station-keeping tolerance)	NGSO at altitudes between 350 km and 720 km (see scope of grant below)	
Administration:	United States of America	
Nature of Service:	Earth Exploration Satellite Service	
Scope of Grant:	<p>Authority to construct, deploy, and operate 28 technically identical non-geostationary satellites for what the applicant describes as “Phase I” deployment, as follows:</p> <ul style="list-style-type: none"> • Up to 28 satellites initially deployed to orbital altitudes of no greater than 650 kilometers;³ • Alternatively, up to eight satellites of the 28 authorized may be launched via a Falcon-9 launch vehicle as part of the SHERPA/Formasat-5 mission for deployment into a 450 km x 720 km orbit at an inclination of 97.4 degrees. 	
Service Area(s):	Global. See Schedule S Tech Report at Item S6	
Frequencies:	2020-2025 MHz (space-to-Earth) 161.9625-161.9875 MHz and 162.0125-162.0375 MHz (Automatic Identification System (AIS)) 1575.42 MHz and 1227.60 MHz (center frequencies, GPS reception) 402-403 MHz (Earth-to-space) (space-to-Earth (data back up only)) Telemetry, Tracking, and Command frequencies: 402-403 MHz band (Earth-to-space and space-to-Earth)	

¹ The application was placed on Public Notice as accepted for filing on January 22, 2016. *See Policy Branch Information, Applications Accepted for Filing*, Public Notice, Report No. SAT-01130 (IBFS File No. SAT-LOA-20151123-00078). On March 18, 2016, the application was granted in part to authorize Spire to construct, deploy and operate nine technically identical satellites, with action on additional satellites deferred. *See Policy Branch Information, Satellite Space Applications Actions Taken*, Public Notice, DA 16-314, Report No. SAT-01145 (IBFS File No. SAT-LOA-20151123-00078). Those nine satellites were launched aboard a Cygnus cargo capsule on an Atlas V launch vehicle on March 22, 2016. Letter from Trey Hanbury, Counsel to Spire Global, to Marlene H. Dortch, FCC (dated May 23, 2016). Four were successfully deployed from the ISS on May 18, 2016. *Id.* Four were successfully deployed from the Cygnus capsule into 409 km x 395 km orbital altitude on June 18, 2016. Letter from Tony Lin, Counsel to Spire Global, to Marlene H. Dortch, FCC (dated June 29, 2016). One satellite failed to deploy from the Cygnus capsule and was destroyed upon reentry of the Cygnus capsule into the Earth’s atmosphere. *Id.* In light of the failed deployment, we are revising the total number of satellites authorized to 28, instead of 29. On June 16, 2016, the application was granted in part to authorize an additional 20 satellites operating in orbits between 400 and 550 km. *See Policy Branch Information, Actions Taken*, Public Notice, DA 16-688, Report No. SAT- -01168 (IBFS File No SAT-LOA-20151123-00078). The 550 km altitude stated in that action was a typographical error. The grant was intended to encompass four satellites originally authorized under an experimental license and launched on September 28, 2015, into a 650 km circular orbit. That typographical error is corrected by this grant.

² In its application, Spire also requested to operate additional satellites for what it describes as “Phase II”, in the 8025-8400 MHz frequency band. We defer action on this portion of Spire’s application.

³ As of the date of this grant, Spire had deployed 12 of these 20 satellites: 4 on September 28, 2015 on a PSLV launch; and 8 of 9 launched on March 22, 2016, as part of a Cygnus cargo supply mission to the International Space Station.

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Operations under this grant must comport with the legal and technical specifications set forth by the applicant or petitioner and with Federal Communication Commission's rules not waived herein. This grant is also subject to the following conditions:

1. Spire must prepare the necessary information, as may be required, for submission to the International Telecommunication Union (ITU) to initiate and complete the advance publication, coordination, due diligence, and notification process for these space stations, in accordance with the ITU Radio Regulations. Spire will be held responsible for all cost-recovery fees associated with ITU filings. No protection from interference caused by radio stations authorized by other administrations is guaranteed unless coordination and notification procedures are timely completed or, with respect to individual administrations, by successfully completing coordination agreements. Any radio station authorization for which coordination has not been completed may be subject to additional terms and conditions as required to effect coordination of the frequency assignments of other administrations. *See* 47 CFR § 25.111(b).

2. Spire must take all steps within its control to ensure that the launch provider, SpaceX, and the SHERPA operator, SpaceFlight Inc., abort the separation of the SHERPA deployer from the SpaceX Falcon 9 launch vehicle in the event that a SpaceX Formosat-5 launch mission anomaly precludes lowering the Falcon 9 second stage from the Formosat-5 720 km circular release orbit to the specified 450 x720 km SHERPA release orbit.

3. Upon receipt of a conjunction warning from the Joint Space Operation Center or other source, Spire must review the warning and take all possible steps to assess and, if necessary, to mitigate collision risk, including, but not limited to: contacting the operator of any active spacecraft involved in such warning; sharing ephemeris data and other appropriate operational information with any such operator; modifying spacecraft attitude and/or operations.⁴

4. Deployment into an orbit with an inclination of 51.6 degrees, plus or minus 0.1 degree, other than directly from the ISS, is only authorized for four satellites to be launched on the OA-5 Cygnus re-supply mission and is subject to the following:

- a. Deployment into an orbit that, if from below the ISS altitude, is not less than 15 km below and 15 km in front of ISS and, if above the ISS altitude, is to an orbit acceptable to NASA, which is currently defined as a co-elliptic orbit above the ISS semi-major axis with a relative perigee greater than 45km;
- b. Deployment above the ISS altitude may proceed only if it is confirmed in a manner acceptable to NASA that, following launch and docking operations, there is sufficient fuel on Cygnus to execute both the planned satellite deployment and planned Cygnus disposal operations;

⁴ ORBCOMM License Corp. (ORBCOMM) filed a Petition to Dismiss, Deny or Hold in Abeyance certain portions of the Spire application on February 22, 2016. ORBCOMM objected to Spire's proposed operations using altitudes and orbital planes that would intersect with the authorized 47 degree-inclined 715 kilometer operational orbits for its ORBCOMM Generation 2 satellites. ORBCOMM Petition at 1. Spire's application was granted in part on June 16, 2016, but Spire's request to deploy at altitudes above 650 km was deferred. *See Policy Branch Information, Actions Taken*, Public Notice, DA 16-688, Report No. SAT- 01168, June 17, 2016. With respect to any burdens on Orbcomm from additional collision avoidance maneuvers involving Spire satellites, we find that, based on the additional information provided by parties, the status of discussions between Spire and ORBCOMM, and on the conditions placed on this authorization, we can proceed with grant of Spire's request to deploy eight satellites as part of the SHERPA/Formosat-5 mission. With respect to burdens on Orbcomm potentially resulting from any collisions among the multiple satellites that are planned to be deployed from the SHERPA deployer, that issue will be addressed in a separate action on the pending application for the SHERPA mission, IBFS File No. SAT-STA-20150821-00060, and this grant is without prejudice to any determination on the pending SHERPA application.

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5. Spire's request for a waiver of the United States Table of Frequency Allocations, 47 CFR § 2.106, is GRANTED. Operations in the 402-403 MHz frequency band (Earth-to-space and space-to-Earth (data back up only)) and the 2020-2025 MHz frequency band (space-to-Earth) shall be on a non-conforming, non-harmful interference basis. Spire must immediately terminate non-conforming operations upon notification of harmful interference.

6. Based upon information provided by the National Telecommunication and Information Administration (NTIA) as part of the frequency coordination process, future non-federal licenses for additional satellites will only be exceptionally considered for requests of downlink operations in the band 402-403 MHz, and Spire shall have no expectations that future licenses will be approved. Spire and DOC/NOAA shall work jointly to explore mitigation strategies to avoid interference to NOAA missions. For future missions, transition of TT&C links out of the 402-403 MHz band is recommended. Spire is not authorized to use downlinks in the 402-403 MHz band to the following earth stations: Anchorage, AK, Boca Raton, FL, Ellicott, CO, Naalehu, HI. Spire shall coordinate new ground station locations operating in 402-403 MHz with DOC/NOAA by providing the location of such stations for DOC/NOAA's review for interference concerns and approval prior to downlinking to those ground stations.

7. Spire must maintain a U.S. point of contact available by telephone 24 hours per day, seven days per week, with the authority and ability to terminate operations authorized herein. The telephone number for this U.S. point of contact must be provided to NTIA (bmitchell@ntia.doc.gov) and DOC/NOAA (alfredo.mistichelli@noaa.gov and kellen.gibson@noaa.gov).

8. The maximum bandwidth of any transmission in the 402-403 MHz frequency band is limited to 15 kHz, and all transmissions in these frequencies shall be within a 200 kHz frequency band centered on 402.7 MHz, i.e., within the 402.6-402.8 MHz frequency band, except as necessary for a period immediately following (i) the deployment of the satellites or (ii) a satellite software reset, resulting in satellite transmissions returning to the default transmission channels, in both cases to allow for the retuning of transmissions, or unless otherwise agreed in a Memorandum of Agreement with DOC/NOAA.

9. This authorization will become null and void if, at any time during the license term, there are no Spire satellites operating.

10. Spire is subject to milestone and bond obligations imposed as conditions to a previous grant of authority to operate up to nine NGSO satellites in the 2020-2025 MHz frequency band. *See supra*, note 1. We find that, following the discharge of the bond requirement associated with this previous grant, warehousing concerns are addressed in this situation through the imposition of condition 9 above.

11. Within 30 days after deployment of each satellite pursuant to this authorization, Spire must file a notification with the Commission specifying its apogee and perigee altitudes and orbital inclination.

12. The license term expires on October 31, 2020.


13. Spire's request for a waiver of Section 25.114(c) of the Commission's rules, 47 CFR § 25.114(c), to the extent described in its application with respect to certain information to be provided in the Schedule S, IS GRANTED. We find that a waiver is warranted for the requirement for orbital information on the Schedule S for each satellite because the information Spire provided in its Narrative is sufficient to fulfill the relevant informational requirements.

Licensee/grantee is afforded thirty (30) days from the date of release of this action to decline the grant as conditioned. Failure to respond within this period will constitute formal acceptance of the grant as conditioned.

This action is taken pursuant to Section 0.261 of the Commission's rules on delegated authority, 47 CFR § 0.261, and is effective upon release.

Station licenses are subject to the conditions specified in Section 309(h) of the Communications Act of 1934, as amended, 47 U.S.C. § 309(h).

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Action Date:	October 14, 2016	
Term Dates	From: October 14, 2016	To: see conditions
Approved:	 Stephen J. Duall Chief, Satellite Policy Branch	

9-16. Name of Contact Representative

Name:	Trey Hanbury	Phone Number:	202-637-5534
Company:	Hogan Lovells US LLP	Fax Number:	
Street:	555 13th Street, NW	E-Mail:	trey.hanbury@hoganlovells.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.

a.

- (N/A) a1. Earth Station
 a2. Space Station

b.

- b1. Application for License of New Station
(N/A) 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
- b9. Letter of Intent to Use Non-U.S. Licensed Satellite to Provide Service in the United States
 b10. Replacement Satellite Application - no new frequency bands
 b11. Replacement Satellite Application - new frequency bands (Not eligible for streamlined processing)
 b12. Petition for Declaratory Ruling to be Added to the Permitted List
(N/A) b13. Other (Please specify)

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):

17c. Fee Classification CLW – Space Station (Non-Geostationary)

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:

Not Applicable

(b) File number of pending application:

Not Applicable

TYPE OF SERVICE

<p>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:</p> <p><input type="checkbox"/> a. Fixed Satellite</p> <p><input type="checkbox"/> b. Mobile Satellite</p> <p><input type="checkbox"/> c. Radiodetermination Satellite</p> <p><input checked="" type="checkbox"/> d. Earth Exploration Satellite</p> <p><input type="checkbox"/> e. Direct to Home Fixed Satellite</p> <p><input type="checkbox"/> f. Digital Audio Radio Service</p> <p><input checked="" type="checkbox"/> g. Other (please specify)</p>	
<p>21. STATUS: Choose the button next to the applicable status. Choose only one.</p> <p><input type="radio"/> Common Carrier <input checked="" type="radio"/> Non-Common Carrier</p>	<p>22. If earth station applicant, check all that apply.</p> <p>Not Applicable</p>
<p>23. If applicant is providing INTERNATIONAL COMMON CARRIER service, see instructions regarding Sec. 214 filings. Choose one. Are these facilities:</p> <p><input type="radio"/> Connected to a Public Switched Network <input type="radio"/> Not connected to a Public Switched Network <input checked="" type="radio"/> N/A</p>	
<p>24. FREQUENCY BAND(S): Place an "X" in the box(es) next to all applicable frequency band(s).</p> <p><input type="checkbox"/> a. C-Band (4/6 GHz) <input type="checkbox"/> b. Ku-Band (12/14 GHz)</p> <p><input checked="" type="checkbox"/> c. Other (Please specify upper and lower frequencies in MHz.)</p> <p>Frequency Lower: 402 Frequency Upper: 8400 (Please specify additional frequencies in an attachment)</p>	

TYPE OF STATION

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

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

26. TYPE OF EARTH STATION FACILITY: Not Applicable

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
Exhibit E

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?	<input type="radio"/> Yes <input checked="" type="radio"/> No
30. Is the applicant an alien or the representative of an alien?	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> N/A
31. Is the applicant a corporation organized under the laws of any foreign government?	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> 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?	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> 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?	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> 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. Exhibit C

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

Applicant seeks authority to deploy a satellite system, providing maritime monitoring, meteorological monitoring, and earth imaging services.

Exhibit A

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

Exhibit D

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
Jonathan Rosenblatt

46. Title of Person Signing
General Counsel

47. Please supply any need attachments.

1: Exhibit B

2:

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).

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