

**Before the
Federal Communications Commission
Washington, DC 20554**

In the Matter of)	
)	
Spire Global, Inc.)	File No.
)	
Petition for Declaratory Ruling Granting)	
Access to the U.S. Market for Spire MINAS)	
Satellites)	

PETITION FOR DECLARATORY RULING

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Spire Global, Inc. (“Spire”), pursuant to Section 25.137 of the Federal Communication Commission’s (“FCC’s” or “Commission’s”) Rules,¹ hereby files this Petition for Declaratory Ruling (“PDR”) requesting access to the U.S. market for Spire’s Luxembourg-licensed MINAS low-earth orbit (“LEO”), non-geostationary orbit (“NGSO”) satellites, which (i) are technically identical to the LEMUR-2 satellites previously licensed by the Commission and (ii) will be a part of the “LEMUR-2 System.”²

¹ See 47 C.F.R. § 25.137.

² See Application of Spire Global, Inc., File No. SAT-LOA-20151123-00078 (filed Nov. 23, 2015) (“Initial Application”); Amendment Application of Spire Global, Inc., File No. SAT-AMD-20161114-00107 (filed Nov. 14, 2016) (“Phase IB/IC Amendment Application”); Amendment Application of Spire Global, Inc., File No. SAT-AMD-20180102-00001 (filed Jan. 2, 2018) (“Phase II Amendment Application”). These applications have been granted in part and deferred in part. See Stamp Grant, Spire Global, Inc., File No. SAT-LOA-20151123-00078 (granted in part and deferred in part Mar. 18, 2016, as corrected Mar. 24, 2016); Stamp Grant, Spire Global, Inc., File No. SAT-LOA-20151123-00078 (granted in part and deferred in part June 16, 2016); Stamp Grant, Spire Global, Inc., File No. SAT-LOA-20151123-00078 (granted in part and deferred in part Oct. 14, 2016); Stamp Grant, Spire Global, Inc., File No. SAT-AMD-20161114-00107 (granted in part and deferred in part Apr. 7, 2017); Stamp Grant, Spire Global, Inc., File No. SAT-AMD-20161114-00107 (granted in part and deferred in part May 18, 2017); Stamp Grant, Spire Global, Inc., File No. SAT-AMD-20161114-00107 (granted in part and deferred in part July 13, 2017); Stamp Grant, Spire Global, Inc., File No. SAT-AMD-20180102-00001 (granted in part and deferred in part Nov. 29, 2018) (“Phase II License Grant”). The instant application incorporates by reference the remaining information provided by Spire in its Initial Application, Phase IB/IC Amendment Application, and Phase II Amendment Application. **At this time, Spire does not request market access for its Singapore-licensed COLUGO satellites.**

I. Introduction and Summary

Spire seeks authority to deploy up to 872 MINAS satellites (in the aggregate);³ however, the number of simultaneously operational LEMUR-2 and MINAS satellites in the LEMUR-2 System will not exceed 175. The MINAS satellites are technically identical to the LEMUR-2 satellites, which have been previously authorized by the Commission.⁴

The high revisit times of the satellite system will enable the provision of critical near real-time Automatic Identification System (“AIS”) and Application Specific Messages (“ASM”) data of interest to shipping companies, harbor operators, governments, vessel traffic service data providers, and financial services companies. In addition, grant of this application will foster the development of a low-cost competitive AIS and ASM satellite constellation. Therefore, grant of this application serves one of the Commission’s primary objectives of “promoting fair and vigorous competition in the satellites communications market.”⁵

Spire recently completed the National Oceanic and Atmospheric Administration’s (“NOAA’s”) first Commercial Weather Data Pilot program contract, where Spire was the only operator that provided “space-based, radio-occultation data for the purpose of demonstrating data quality and potential value to NOAA’s weather forecasts and warnings.”⁶ The weather data quality was as good or better than the existing COSMIC-1 government weather satellites.

³ The MINAS satellites will be deployed at orbital altitudes from 385 to 650 km and inclinations ranging from equatorial to polar sun-synchronous (98 degrees).

⁴ See *supra* note 2.

⁵ *Amendment of Part 25 of the Commission's Rules to Establish Rules and Policies Pertaining to the Second Processing Round of the Non-Voice, Non-Geostationary Mobile Satellite Service*, Notice of Proposed Rulemaking, 11 FCC Rcd 19841 ¶ 10 (1996).

⁶ Press Release, The White House, *Harnessing the Small Satellite Revolution to Promote Innovation and Entrepreneurship in Space* (Oct. 21, 2016), <https://www.whitehouse.gov/the-press-office/2016/10/21/harnessing-small-satellite-revolution-promote-innovation-and> (“[T]he National Oceanic and Atmospheric Administration (NOAA) awarded the first Commercial Weather Data Pilot program contracts to smallsat-constellation operators GeoOptics, Inc. and Spire Global, Inc. to provide space-based, radio-occultation data for the purpose of demonstrating data quality and potential value to NOAA’s weather forecasts and warnings.”); see also *id.* (noting also that the White House Office of Science and Technology Policy will “promote and support both government and private use of small satellites for remote sensing, communications, science, and the exploration of space”).

Approval of the MINAS satellites will allow Spire to roll out a full-scale meteorological constellation, delivering key inputs into the world's weather models.

In addition, grant of this application will enable Spire to provide a state-of-the-art, low-cost satellite service providing aircraft monitoring to help aircraft carriers meet regulatory mandates, including those promulgated by the Federal Aviation Administration, and to help complete a critical part of the U.S. Next Generation Air Transportation System. To Spire's knowledge, only one other operator is currently planning to provide such a service. Therefore, grant of this application also serves the objective of promoting fair and vigorous competition in the provision of this service.

Finally, Spire's hosted payload service will provide added benefits to the quickly growing low-Earth orbit ("LEO") market. Educational, government, and other commercial entities will have easier and quicker access to space as Spire will be deploying new satellites frequently. These entities, some of which may be financially constrained, will be able to deploy their innovative space technologies for a fraction of the cost. By utilizing Spire's MINAS small satellite ("smallsat") platform, these entities will also minimize the amount of spacecraft deployed into LEO and the burden on NTIA and others in coordinating active radiofrequency links.

Spire is not seeking any changes to its LEMUR-2 Phase I, IB, IC, and II satellites, which were previously authorized by the Commission.

II. Deployments Requested

Spire requests authority to deploy up to 872 MINAS satellites (in the aggregate) over its license term; however, the number of simultaneously operational LEMUR-2 and MINAS satellites on orbit will not exceed 175.

Spire can only provide deployment parameters for the first eight MINAS satellites, which have already been deployed.⁷ However, given the potential long lead time for the instant application and state of the LEO launch market for secondary payloads, Spire is not capable of providing launch parameters for the rest of its MINAS satellites at this time. However, it notes that these MINAS satellites (similar to the LEMUR-2 Phase I, Phase IB/IC, and Phase II satellites) will only deploy at orbital altitudes from 385 to 650 km and inclinations ranging from equatorial to polar sun-synchronous (98 degrees).

Potential orbits will include deployments from the International Space Station (“ISS”) and orbits above and in the same inclination as the ISS from spacecraft first docking at the ISS if, and only if, approved by the ISS program (“Above Station Deployments”). For each Above Station Deployment, Spire will supplement the record with documentation evidencing the National Aeronautics and Space Administration’s approval of each Above Station Deployment.⁸

In support of the instant application and above deployment plan, Spire is providing its previously submitted Orbital Debris Risk Mitigation Plan (see Exhibit B) and an ODAR (see Exhibit C), which have been approved by the Commission.⁹

III. The Public Interest Will Be Served by Authorizing the MINAS Satellites to Serve the U.S. Market

The Commission has an established framework for considering requests for non-U.S. licensed space stations to access the U.S. market. In evaluating requests for such authority, the Commission considers the effect on competition in the United States; spectrum availability;

⁷ See Letter from George John, Lead Legal & Regulatory Counsel, Spire Global, Inc., to Marlene H. Dortch, Secretary, FCC, SAT-AMD-20180102-00001 (filed Mar. 13, 2019).

⁸ See, e.g., Letter from Jenny Barna, Launch Manager, Spire Global, Inc., to Marlene H. Dortch, Secretary, FCC, File No. SAT-LOA-20151123-00078 (filed Aug. 19, 2016); see also, e.g., Letter from Jonathan Rosenblatt, General Counsel, Spire Global, Inc., to Marlene H. Dortch, Secretary, FCC, File No. SAT-LOA-20151123-00078 (filed Sept. 30, 2016).

⁹ See Phase II License Grant (allowing up to 100 Phase II satellites).

eligibility and operational requirements; and concerns related to national security, law enforcement, foreign policy, and trade.¹⁰ Operators seeking U.S. market access for non-U.S. licensed space stations need to provide the same information concerning legal and technical qualifications as must be provided by applicants for space station licenses issued by the FCC.¹¹

Spire's request for authority to operate the MINAS satellites in the U.S. market is supported by the considerations identified above, and thus it is in the public interest to allow Spire to provide services in the United States. In addition, as demonstrated below, Spire is legally and technically qualified to use the MINAS satellites to serve the U.S. market.

A. Effect on Competition in the United States

An applicant seeking access to the U.S. market for a non-U.S. licensed satellite system is entitled to a presumption in favor of U.S. market access if the applicant is licensed by a World Trade Organization ("WTO") member country to provide satellite services covered by the WTO Basic Telecommunications Agreement (the "WTO Agreement").¹² As noted above, the MINAS satellites are authorized by Luxembourg, a member of the WTO. In addition, Spire seeks authority to provide only satellite services that are covered by the WTO Agreement.¹³ Therefore, Spire is entitled to a presumption that market entry for the MINAS satellites will satisfy the

¹⁰ See *Amendment of the Commission's Regulatory Policies to Allow Non-U.S. Licensed Space Stations to Provide Domestic and International Satellite Service in the United States*, 12 FCC Rcd 24094 ¶ 29 (1997) ("DISCO II Order"), on reconsideration, 15 FCC Rcd 7207 ¶ 5 (1999).

¹¹ See *Amendment of the Commission's Space Station Licensing Rules and Policies; Mitigation of Orbital Debris*, First Report and Further Notice of Proposed Rulemaking in IB Docket No. 02-34, and First Report and Order in IB Docket No. 02-54, 18 FCC Rcd 10760 ¶ 288 (2003). Some of the Commission's application policies for authorizing non-U.S. licensed space stations are codified in Section 25.137 of the Commission's rules, 47 C.F.R. § 25.137.

¹² See *DISCO II Order* ¶ 39 ("We adopt our proposal to apply a presumption in favor of entry in considering applications to access non-U.S. satellites licensed by WTO Members to provide services covered by the U.S. commitments under the WTO Basic Telecom Agreement. Specifically, we will presume that satellite systems licensed by WTO Members providing WTO-covered services satisfy the competition component of the public interest analysis.").

¹³ Spire does not seek authority to provide direct-to-home, Digital Audio Radio Service, or Direct Broadcast Satellite Service in the United States.

competition component of the public interest analysis. Accordingly, Spire is not required to make an “effective competitive opportunities” showing.¹⁴

B. Spectrum Availability

The Commission also considers spectrum availability as a factor in determining whether grant of authorization to a foreign-licensed satellite to serve the U.S. market is in the public interest.¹⁵ In doing so, the Commission evaluates whether grant of access would create the potential for harmful interference with U.S.-licensed satellite and terrestrial systems.

Table 1 below shows the frequency bands that Spire is seeking authority to use for its MINAS satellites.

Table 1 - MINAS Active Frequencies

Frequency	Use
8025-8400 MHz (space-to-Earth)	Primary data downlink TT&C downlink
2200-2290 MHz (space-to-Earth)	Data downlink
2020-2025 MHz (space-to-Earth)	Data downlink
401-402 MHz (space-to-Earth)	TT&C downlink
2025-2110 MHz (Earth-to-space)	Primary data uplink TT&C uplink
449.75-450.25 MHz (Earth-to-space)	TT&C uplink
402-403 MHz (Earth-to-space)	TT&C uplink
399.9-400.05 MHz (Earth-to-space)	TT&C uplink

¹⁴ 47 C.F.R. § 25.137(a)(2).

¹⁵ See *DISCO II Order* ¶ 149 (“We adopt our proposal to consider spectrum availability as a factor in determining whether allowing a foreign satellite to serve the United States is in the public interest.”).

As discussed in pre-coordination with the U.S. Federal agencies, Spire prefers to have its operations in the following frequency bands: (i) primary data and TT&C downlink in 8025-8400 MHz, (ii) UHF TT&C downlink in 401-402 MHz,¹⁶ (iii) primary data and TT&C uplink in 2025-2110 MHz, and (iv) UHF TT&C uplink in 402-403 MHz.¹⁷

For its MINAS satellites, Spire will adhere to all coordination requirements (listed in its FCC licenses) and agreements reached for its LEMUR-2 satellites. Spire further demonstrates in Schedule S and the below sub-sections that the MINAS satellites would not create the potential for harmful interference to U.S.-licensed satellite and terrestrial systems.

Granting U.S. market access to the MINAS satellites, therefore, would be consistent with the Commission's spectrum availability policies for non-U.S. licensed satellites.

i. Primary Data and TT&C Downlink Band (8025-8400 MHz (space-to-Earth))

The 8025-8400 MHz band is allocated for EESS (space-to-Earth) on a primary basis across all ITU regions and to non-Federal operators in the U.S.¹⁸ Spire wishes to use this band for primary data and TT&C data downlink transmissions.

The following sub-sections show that Spire's MINAS satellites comply with the ITU and U.S. requirements associated with this band.

¹⁶ Spire's request to use 401-402 MHz (space-to-Earth) was granted in the Phase II License Grant. Spire is seeking authority to use 401-402 MHz so that it can operate in conformance with the ITU and various domestic (in foreign locations where Spire has ground stations) tables of frequency allocations. Spire believes it can provide even more separation in 401-402 MHz from NOAA's Data Collection Platform ("DCP") Geostationary Satellite Orbit ("GSO") satellites than where it is currently authorized in 402-403 MHz.

¹⁷ Spire's request to use 402-403 MHz (Earth-to-space) was granted in the Phase IB/IC and Phase II license grants. Spire requests to maintain its TT&C uplink operations in 402-403 MHz as many of its ground stations are already fitted to operate in this frequency band and Spire can meet the current and proposed ITU-R recommendations protecting the DCP GSO operations in the band.

¹⁸ See 47 C.F.R. § 2.106 n.US258.

a. Power Flux Density at the surface of the Earth in the 8025-8400 MHz band

Section 25.208 of the FCC's rules does not contain Power Flux Density ("PFD") limits at the earth's surface produced by emissions from non-geostationary satellite orbit EESS space stations operating in the 8025-8400 MHz band.¹⁹ However, Table 21-4 of the ITU Radio Regulations states that the PFD at the Earth's surface produced by emissions from an EESS space station in the 8025-8400 MHz band, including emissions from a reflecting satellite, for all conditions and for all methods of modulation, shall not exceed the following values:²⁰

- -150 dB(W/m²) in any 4 kHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;
- -150 + 0.5(d-5) dB(W/m²) in any 4 kHz band for angles of arrival d (in degrees) between 5 and 25 degrees above the horizontal plane; and
- -140 dB(W/m²) in any 4 kHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

The PFD is calculated as follows:

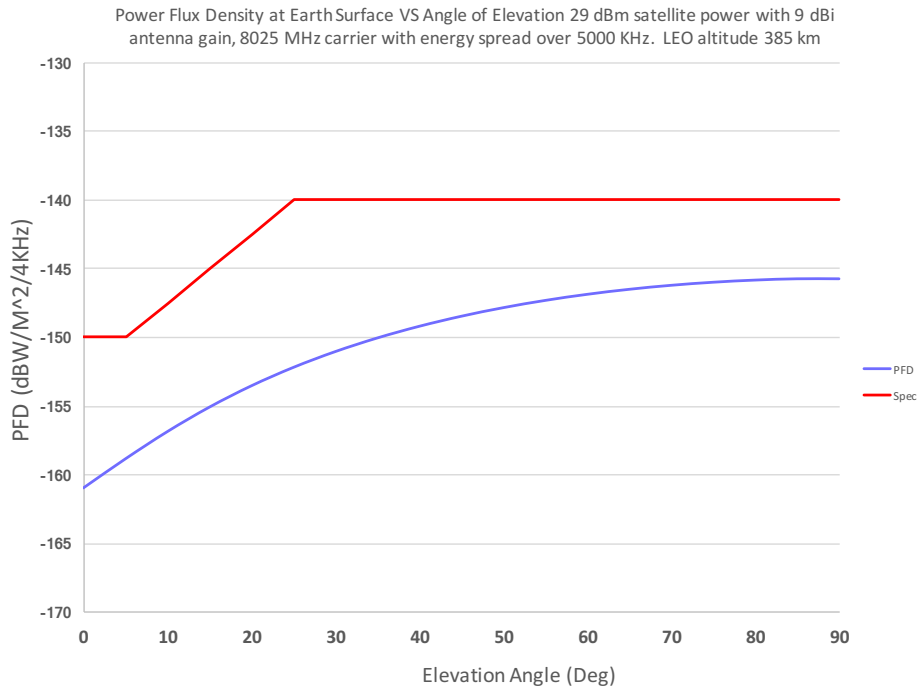
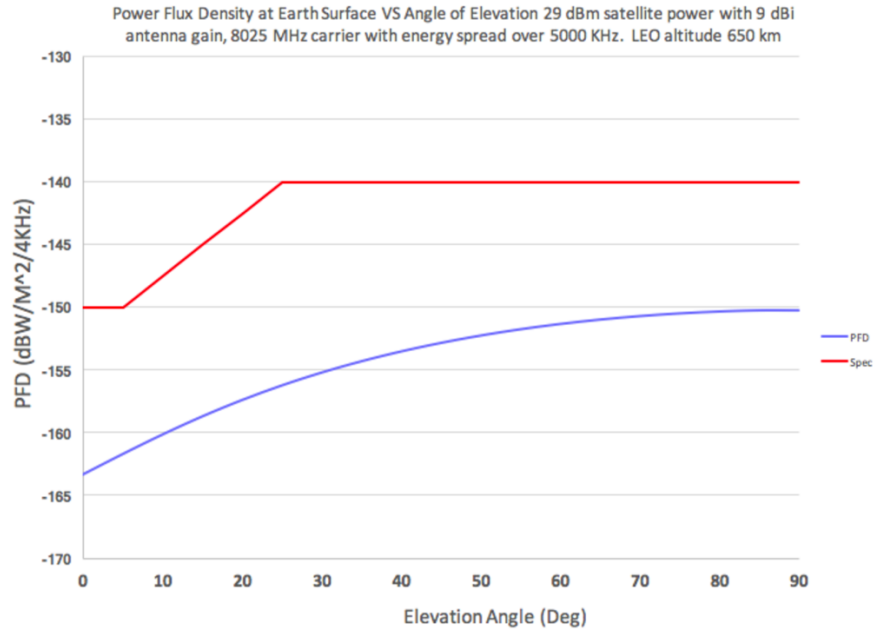
$$\text{PFD [dBW/m}^2\text{/4 kHz]} = \text{EIRP (dBW)} - 11 - 20\log_{10}(\text{D}) - 10\log_{10}(\text{BW}) + 36$$

where EIRP is the Maximum EIRP of the transmission,
D is the distance between the satellite and affected surface area in km, and
BW is the bandwidth of the transmission in MHz.

Spire's satellites meet the ITU requirements as demonstrated in the following charts.

¹⁹ See 47 C.F.R. § 25.208.

²⁰ See ITU Radio Regulations, Article 21, Table 21-4.



a. PFD at the GSO in the 8025-8400 MHz band

ITU Radio Regulations No. 22.5 specifies that in the 8025-8400 MHz band, which is shared by EESS (space-to-Earth), Fixed-Satellite Service (Earth-to-space), and the MetSat (Earth-to-space), the maximum PFD produced at the GSO by any EESS space station shall not exceed $-174 \text{ dBW/m}^2/4 \text{ kHz}$.²¹ The calculation below shows that the PFD produced by the transmission from a MINAS satellite would not exceed that limit even in the worst hypothetical case.

Using the worst case (*i.e.*, highest altitude) orbit of Spire's intended constellation (650 km), the distance to the geostationary orbit would be 35,136 km. At this orbital distance, for an antenna pointed towards the GSO having a maximum EIRP of 3 dBW in a 5 MHz bandwidth, the PFD at the GSO would be approximately $-190 \text{ dBW/m}^2/4 \text{ kHz}$.

b. PFD at the surface of the Earth in the 8400-8450 MHz band

ITU-R Recommendation SA-1157 specifies a maximum allowable interference power spectral flux-density level at the earth's surface of -221 dB(W/Hz) to protect ground receivers in the deep-space research band operating in the 8400-8450 MHz frequencies.²² Spire uses a combination of baseband digital filtering and hardware radio frequency filtering to achieve the ITU recommended protection for its out-of-band emissions in this frequency band. Additionally, Spire will not have (and is not seeking authority for) any transmissions above 8325 MHz, further protecting the adjacent deep-space research band.

c. Interference between EESS systems operating in the 8025-8400 MHz band

Interference between the MINAS satellites and those of other systems is unlikely because EESS systems operating in the 8025-8400 MHz band only transmit in short periods of time while

²¹ See ITU Radio Regulations, Article 22.5 § 4.

²² See Recommendation ITU-R SA.1157-1 (Protection criteria for deep-space research) (2006).

visible from dedicated receiving earth stations. For interference to occur, satellites belonging to different systems would have to travel through the antenna beam of the receiving earth station and transmit at the same time. In this unlikely event, the interference could be avoided through coordination of the satellite transmissions and ensuring that they do not occur simultaneously. Spire will coordinate its satellite operations with other EESS operators in this band.

As the band is congested, Spire has already commenced coordination discussions with Federal and non-Federal operators in this band and hopes to quickly come to sharing agreements with these operators. Spire has also helped create the Commercial Smallsat Spectrum Management Association (“CSSMA”).²³ Along with other initiatives, CSSMA’s members look to pre-coordinate their applications in these bands. Summaries of Spire’s use of these bands and technical characteristics have been sent to all CSSMA members who have a license grant in these bands with the Commission.

d. ITU-R SA.1810 (system design guidelines for EESS operating in the band 8025-8400 MHz)

Recommendation ITU-R SA.1810 puts forth various guidelines that EESS operators should follow for when designing EESS systems that will operate in the 8025-8400 MHz band. Spire confirms that its EESS system design for its 8025-8400 MHz operations will adhere to these guidelines.

ii. Primary Data and TT&C Uplink Band (2025-2110 MHz (Earth-to-space))

The 2025-2110 MHz band is allocated for EESS (Earth-to-space) on a primary basis across all ITU regions and to non-Federal operators in the U.S. (subject to such conditions as

²³ See generally *Commercial Smallsat Spectrum Management Association*, www.cssma.space (last viewed Feb. 21, 2019). CSSMA is a trade association comprised of the world’s leading smallsat companies. CSSMA seeks to create the conditions for a coordinated, transparent, and expedited spectrum coordination process among commercial smallsat spectrum users, government users, and other satellite and terrestrial users, and to advocate and represent the members’ views on spectrum management and other policy matters that affect the smallsat community.

may be applied on a case-by-case basis).²⁴ Further, transmissions from the satellites operating in this band shall not cause harmful interference to Federal and non-Federal stations operating in accordance with the U.S. Table of Frequency Allocations.²⁵ Spire will coordinate with Federal and non-Federal operators in this band to ensure compliance with this requirement.

C. National Security, Law Enforcement, Foreign Policy, and Trade Issues

The Commission has stated that the issues of national security, law enforcement, foreign policy, and trade, which it considers in evaluating requests for market access for non-U.S. licensed satellites, are likely to arise only in “rare circumstances.”²⁶ Further, the Commission defers to the expertise of the Executive Branch in identifying and interpreting issues of this nature.²⁷ Spire’s request for authority to operate the MINAS satellites in the U.S. market raises no such issues. Thus, this element of the Commission’s DISCO II Order public interest analysis is satisfied.

D. Eligibility and Operational Requirements

Pursuant to Section 25.137 of the Commission’s rules, the entity filing a PDR for U.S. market access must provide the legal and technical information for its non-U.S. licensed space stations that is required by Part 25 of the Commission’s rules, including Section 25.114.²⁸

i. Legal and Technical Qualifications

Section 25.114(d)(14)(v) of the Commission’s rules states that, “[f]or non-U.S.-licensed space stations, the requirement to describe the design and operational strategies to minimize

²⁴ See 47 C.F.R. § 2.106 n.US347; see also *Orbital Imaging Corporation*, Order and Authorization, 14 FCC Rcd 2997 ¶ 8 (1999).

²⁵ See *id.*

²⁶ *DISCO II Order* ¶ 180 (“We emphasize, however, that we expect national security, law enforcement, foreign policy and trade policy concerns to be raised only in very rare circumstances. Contrary to the fears of some commenters, the scope of concerns that the Executive Branch will raise in the context of applications for earth station licenses is narrow and well defined.”).

²⁷ See *id.*

²⁸ See 47 C.F.R. § 25.137(b); see also *DISCO II Order* ¶ 189.

orbital debris risk can be satisfied by demonstrating that debris mitigation plans for the space station(s) for which U.S. market access is requested are subject to direct and effective regulatory oversight by the national licensing authority.”²⁹

The MINAS satellites are technically identical to the LEMUR-2 satellites previously authorized by the Commission. Spire resubmits its Orbital Debris Assessment Report and Risk Mitigation Plan.³⁰

ii. Waiver Requests

The Commission may waive any of its rules if there is “good cause” to do so.³¹ In general, waiver is appropriate if: (i) special circumstances warrant a deviation from the general rule and (ii) such deviation would better serve the public interest than would strict adherence to the general rule.³² Generally, the Commission will grant a waiver of its rules in a particular case if the relief requested would not undermine the policy objective of the rule in question and would otherwise serve the public interest.³³ Spire submits that good cause exists to waive the rules below with respect to each frequency band in which Spire is seeking authority for its MINAS satellites to operate.

a. Modified Processing Round Rules

Spire requests that this application be processed pursuant to the first-come, first-served procedure adopted for “GSO-like satellite systems” under Section 25.158 of the Commission’s rules.³⁴ Spire incorporates by reference the waiver requests of Sections 25.156 and 25.157 of the

²⁹ § 25.114(d)(14)(v).

³⁰ See Exhibit B; Exhibit C.

³¹ See 47 C.F.R. § 1.3; *Northeast Cellular Tel. Co. v. FCC*, 897 F.2d 1164 (D.C. Cir. 1990); *WAIT Radio v. FCC*, 418 F.2d 1153 (D.C. Cir. 1969).

³² See *Northeast Cellular*, 897 F.2d at 1166.

³³ See *WAIT Radio*, 418 F.2d at 1157.

³⁴ See 47 C.F.R. § 25.158.

Commission's rules³⁵ as provided in its Initial Application and Phase IB/IC Amendment Application.³⁶

b. Default Service Rules

The Commission has not adopted band-specific rules for the services Spire proposes to provide. Spire incorporates by reference a waiver of the default service rules under Section 25.217(b) of the Commission's rules³⁷ as provided in its Initial Application.³⁸

c. U.S. Table of Frequency Allocations

Downlink bands (2200-2290 MHz (space-to-Earth) data downlink, 2020-2025 MHz (space-to-Earth) data downlink, and 401-402 MHz (space-to-Earth) TT&C downlink)

Spire does not request a waiver of the U.S. Table of Frequency Allocations for its conforming use of the 401-402 MHz (space-to-Earth) with its MINAS satellites. This band is allocated for non-Federal space-to-Earth Space Ops on a primary basis.³⁹

Spire requests a waiver of the U.S. Table of Frequency Allocations to use the 2200-2290 MHz (space-to-Earth) and 2020-2025 MHz (space-to-Earth) with its MINAS satellites on a non-conforming, non-harmful interference basis.⁴⁰ For its MINAS satellites, Spire incorporates by reference the waiver requests as provided in its Initial Application and Phase IB/IC Amendment Application regarding its use of these frequency bands.⁴¹

³⁵ See 47 C.F.R. § 25.157.

³⁶ See Initial Application, Exhibit A at 21-22; Phase IB/IC Amendment Application, Exhibit A at 16-23.

³⁷ See 47 C.F.R. § 25.217(b).

³⁸ See Initial Application, Exhibit A at 22-23.

³⁹ See 47 C.F.R. § 2.106.

⁴⁰ See 47 C.F.R. §§ 2.102(a), 2.106. As a companion to Section 2.106, Spire also seeks waiver of 47 C.F.R. § 2.102(a). As the Commission recently stated, waiver of Section 2.102(a) is necessary to authorize the requested operations that are not in conformance with the Table of Frequency Allocations. See *Iridium Order* ¶ 21 n.77 (granting on its own motion waiver of Section 2.102(a) to permit Iridium Constellation LLC's ("Iridium's") proposed MSS (Earth-to-space) use of very high frequency ("VHF") bands in which there is no MSS allocation for the relevant use (domestic or international)). For convenience, all subsequent references to requests for waiver of the U.S. Table of Frequency Allocations refer to both Sections 2.102(a) and 2.106 of the Commission's rules.

⁴¹ See Initial Application, Exhibit A at 24; Phase IB/IC Amendment Application, Exhibit A at 13-14.

Spire seeks to maintain its S-band downlink operations due to the latency requirements of its products and, secondarily, to enable flexibility in coordination due to the crowded nature of the X-band, possible limitation of operations above certain latitudes, and because X-band ground stations will take time to deploy.

Further, Spire also seeks to maintain its UHF-band downlink operations because these wide beamwidth links remain necessary to check out and stabilize smallsats.

Uplink bands (449.75-450.25 MHz (Earth-to-space) TT&C uplink, 402-403 MHz (Earth-to-space) TT&C uplink, and 399.9-400.05 MHz (Earth-to-space) TT&C uplink)

Spire does not request a waiver of the U.S. Table of Frequency Allocations for its conforming use of the 449.75-450.25 MHz (Earth-to-space) with its MINAS satellites. This band is allocated, through footnotes 5.286 and US87, for non-Federal Earth-to-space Space Ops.⁴²

Spire does not request a waiver of the U.S. Table of Frequency Allocations for its conforming use of the 399.9-400.05 MHz (Earth-to-space) with its MINAS satellites. This band is allocated, through footnotes US319 and US320, for non-Federal Earth-to-space NVNG MSS operations.⁴³

Spire requests a waiver of the U.S. Table of Frequency Allocations to use the 402-403 MHz (Earth-to-space) with its MINAS satellites on a non-conforming, non-harmful interference basis.⁴⁴ For its MINAS satellites, Spire incorporates by reference the waiver request as provided in its Phase IB/IC Amendment Application regarding its use of this frequency band.⁴⁵

⁴² See 47 C.F.R. § 2.106 nn.5826, US87.

⁴³ See 47 C.F.R. § 2.106; see also Phase IB/IC Amendment Application, Exhibit A at 16-23.

⁴⁴ See 47 C.F.R. §§ 2.102(a), 2.106.

⁴⁵ See Phase IB/IC Amendment Application, Exhibit A at 16.

Spire has listed these multiple uplinks to increase the flexibility it has to coordinate spectrum use with existing users and to operate in accordance with both the ITU and domestic (in foreign locations where Spire has ground stations) tables of frequency allocations.

d. Schedule S

Contemporaneously herewith, Spire is filing a new Schedule S to cover its MINAS satellites.

Due to the limitations of the Commission's Schedule S software, Spire clarifies some of its responses provided in the Schedule S and, to the extent necessary, seeks waiver of Section 25.114(c) of the Commission's rules, which requires certain information to be filed in the Schedule S. In many cases, the Schedule S and Form 312 are not formulated to readily accommodate non-traditional satellite systems, such as Spire's innovative smallsat system, and the information requested may be inapplicable, irrelevant, and/or burdensome to produce. The following bullets clarify some of Spire's Schedule S inputs.

- The orbital planes are representative of Spire's desired constellation configuration. Spire can only provide deployment parameters in Orbital Plane ID 14 for the first eight MINAS satellites, which have already been deployed. As mentioned, given the potential long lead time for the instant application and state of the LEO launch market for secondary payloads, Spire is filing its PDR application early and is not capable of providing launch parameters for the MINAS satellites at this time. However, it notes that these satellites (similar to the Phase I, Phase IB/IC, and Phase II satellites) will only deploy at orbital altitudes from 385 to 650 km and inclinations ranging from equatorial to polar sun-synchronous (98 degrees).

- The “Right Ascension of Ascending Node” and “Argument of Perigee” in each of the orbital planes is listed as “0 degrees,” which is what the Schedule S software required Spire to input.
- The “NGSO Antenna Gain Contour Plots” are attached as PDFs on a per beam basis and include all orbits sought (but not all satellites on all orbits because they would not change from satellite to satellite within an orbit). ISS deployments are shown at 400 km, and Above Station Deployments are shown at 450 km, which are the most likely deployment scenarios.
- There is a primary and backup radio in each UHF frequency band, so that increases the number of beams, which is why some beams are labeled “P” (primary) and some beams are labeled “B” (backup).

In sum, strict application of the rules here is unnecessary to serve the purposes of the rules, which is to ensure that the Commission has all the relevant information to evaluate the application. Because Spire has provided all relevant information in this Narrative and Schedule S, waiver of the certain Schedule S requirements is appropriate.⁴⁶

IV. Hosted Payload Service

Spire offers a hosted payload service, accommodating payloads from educational, government, and commercial customers.⁴⁷ This service will allow Spire customers to deploy space-based sensors with unprecedented speed and for fractions of the cost of buying their own satellite bus, launch slots, and ground station network.

These hosted payloads will be in approximately 1/3 of the MINAS satellite bus. In many cases a MINAS satellite will have no hosted payloads; however, when one of these satellites has

⁴⁶ See 47 C.F.R. § 1.3; *see, e.g.*, Stamp Grant, ViaSat, Inc., SAT-LOI-20140204-00013 (granted Jun. 18, 2014) (waiving Schedule S requirements because they were found to be unnecessary for the space station application).

⁴⁷ *See, e.g., Government and Military*, Spire, <https://spire.com/en/solutions/government-amp-military> (last viewed Feb. 21, 2016).

a hosted payload, its mass may change. The MINAS satellite will have a nominal launch mass configuration of 4.5 kg (without hosted payload), but the mass may be up to 6 kg maximum (with a hosted payload). Recognizing that additional mass will increase orbital lifetime, Spire has designed a third solar drag panel that will help lower orbital lifetime. Spire will deploy the third solar drag panel on any satellites that exceed 4.5 kg and will eventually roll out the third drag panel across all future satellites. Surface area of any hosted payload is within the envelope of the MINAS satellite. Exhibit C (updated ODAR) includes information on both nominal and maximum mass configurations, which envelopes a Spire satellite both with and without hosted payloads.

Spire understands that a hosted payload will need to be (i) separately licensed by the International Bureau under the Part 25 rules⁴⁸ or by the Office of Engineering and Technology under the Part 5 rules (if appropriate)⁴⁹ by Spire or its customer, (ii) licensed via amendment to this application by Spire, (iii) licensed through the NTIA by a government customer, or (iv) licensed by a foreign administration. In some cases, such as a test payload for an optical communication link, no license may be necessary.⁵⁰ In any event, when Spire has sufficient details relating to a hosted payload, Spire will work with the Commission to license such payload under the appropriate mechanism.

V. Ownership Information Change

In Exhibit D, Spire has updated its ownership information.

⁴⁸ See generally 47 C.F.R. Part 25.

⁴⁹ See generally 47 C.F.R. Part 5.

⁵⁰ FCC has consistently held that these optical transmissions fall outside its jurisdiction over radio communications. See, e.g., *TRW, Inc.*, 16 FCC Rcd 14407 ¶ 20 (IB 2001) (“Optical beam communications are not considered a type of radio communication since they operate at frequencies above 300 GHz, and they are not within the jurisdiction of the Communications Act.”); *Hughes Communications, Inc.*, 16 FCC Rcd 14310 ¶ 16 (IB 2001) (same); *Teledesic LLC*, 14 FCC Rcd 2261 ¶ 14 (IB 1999) (“Because optical ISLs do not involve wire or radio frequency transmissions, the Commission does not have jurisdiction over the use of optical ISLs.”).

VI. Conclusion

As explained above and in the attached materials, Spire fully satisfies the Commission's requirements under the *DISCO II Order* for U.S. market access, and the MINAS satellites fully comply with Part 25 of the Commission's rules. Therefore, Spire respectfully requests that the Commission issue a Declaratory Ruling authorizing the MINAS satellites, which are part of the LEMUR-2 System, access to the U.S. market.

Respectfully submitted,

/s/ George John

George John
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Dated: March 21, 2019

Attachment 1 (Technical Certification)

I, Jeroen Cappaert, hereby certify, under penalty of perjury, that I am the technically qualified person responsible for the preparation of the engineering information contained in the technical portions of the foregoing application and the related attachments, that I am familiar with Part 25 of the Commission's rules, and that the technical information is complete and accurate to the best of my knowledge and belief.

/s/ Jeroen Cappaert
Jeroen Cappaert
Chief Technology Officer
Spire Global, Inc.

Dated: March 21, 2019