**Before the**
**FEDERAL COMMUNICATIONS COMMISSION**
**Washington, DC 20554**

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| In the Matter of | ) | |
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| LOGOS SPACE SERVICES, INC. | ) | File No. SAT-LOA-2024_____ |
| | ) | |
| Application to Construct, Launch, and Operate a Non-Geostationary Orbit System in the Fixed-Satellite Service | ) | Call Sign:_____ |

# APPLICATION


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## APPLICATION

Logos Space Services, Inc. ("Logos"), respectfully requests Federal Communications Commission ("Commission") authority to launch and operate a non-geostationary orbit ("NGSO") Fixed-Satellite Service ("FSS") network in the Ka-, Q/V-, and E-bands (the "Logos Network"). A completed Form 312, accompanying Schedule S, Technical Annex, and Ownership Exhibit are associated with this Legal Narrative, consistent with the information required by the Commission's rules (the "Application").[1]

## I. DEPLOYMENT OF THE LOGOS NETWORK WILL SERVE THE PUBLIC INTEREST BY PROVIDING RESILIENT CONNECTIVITY FOR AMERICAN BUSINESSES OF ALL SIZES, WHEREVER THEY ARE LOCATED

Satellite-enabled connectivity services have long been recognized as beneficial solutions for consumers in rural, remote, and hard-to-access regions. As satellite technology has evolved, however, more and more enterprise customers have come to embrace the benefits of always-on, always-visible satellite connectivity. From cities to suburbs to faraway remote destinations, satellite services have engendered a new age of resiliency and security for businesses across the

[1] 47 C.F.R. § 25.114.

United States and globally. Recognizing that enterprise is distinct from the needs of individual users and direct-to-home services, the Logos Network is purpose-built to deliver the promise of space for the exacting demands of the enterprise user, wherever they may be located.

Enterprise customers—whether a large multinational corporation or a storefront on Main Street—depend on robust, resilient connectivity solutions to help their businesses run. These businesses depend on connectivity solutions for more than just Internet access; they are necessary for taking payments, keeping inventory, enabling security systems, and other behind-the-scenes operations that let companies focus on the services they actually deliver to customers. Enterprise solutions must be robust, dependable, secure, and reinforced. For many businesses, they must also be closed private networks, distinct from publicly available access points, to ensure the confidentiality of the business data that flows over them.

As a result, the global enterprise connectivity market—already valued in the billions of dollars—continues to experience significant growth as companies place increasing demands on bandwidth and security, and adopt cloud-based solutions *en masse* across sectors.[2] This expansion is expected to continue as businesses continuously undertake digital transformation initiatives to respond to modern market demands and pressures.[3]

Logos seeks to address this rapidly expanding segment of the telecommunications market by offering robust, high-capacity connectivity solutions to enterprise customers. The United States is home to some of the largest, most complex enterprises in the world. These enterprises depend on reliable connectivity to support essential operations. In the petroleum, mining, and logistics

[2] *See, e.g.*, *Enterprise Telecom Services Market Size – By Services*, Global Market Insights (June 2023), available at https://www.gminsights.com/industry-analysis/enterprise-telecom-services-market.

[3] *Id.*

industries (to name a few), a significant portion of the companies' assets and resources are located in rural or remote regions at any given time. The Logos Network ensures that enterprises can cover these outlying assets as well as those in urban and suburban areas with compute architecture solutions. The Logos Network is also designed to provide enhanced security features for specialized access critical to enterprise operations, eliminating the need for cumbersome and costly firewalls, virtual private networks, or even air gap procedures, by extending customer networks through MPLS or ethernet switching. When requested by a customer, the Logos Network can provide IP transit as an additional service. Most importantly, enterprise customers can bundle those connectivity solutions with the ability to rapidly and dependably scale, as necessary, to address new assets and sites.

The Logos Network offers customers truly resilient network connectivity at reasonable cost. Terrestrial networks can be vulnerable to disruption by natural or manmade disasters or other unforeseen events, especially where there is damage to physical infrastructure and multiple providers share the same pipe. The Logos Network offers customers a "diverse path," ensuring enterprise customers remain connected in the event of an outage or disruption affecting the primary transport from their facilities. The incorporation of the Logos Network into customer connectivity solutions provides customers secure, purpose-built path diversity to safeguard critical operations against disruption or disconnection.

Moreover, the Logos Network will provide in-space data relay for other satellite networks operating in compatible lower-altitude orbits. Through space-to-space communications, the Logos Network can reduce latency and increase capacity availability for other operators by providing a means of offloading data that would otherwise occupy the primary network until it could downlink at an authorized ground site.

For all the reasons set forth herein, including those identified in Section V.A below, granting the Application will strongly serve the public interest. From extending satellite-based connectivity to enterprise customers wherever they may be, to improving the resiliency and diversity of existing communications architectures, the Logos Network offers substantial benefits to customers in the United States and around the world.

## II. LOGOS SPACE SERVICES, INC.

Founded in 2024, Logos is a California-based company focused on providing resilient, high performance satellite-based connectivity services to enterprise customers. In today's business environment, enterprise customers require robust and dependable connectivity solutions to support critical operations, from data-intensive applications to cloud computing and real-time communication platforms. The Logos Network is engineered to meet these demands, offering secure, resilient connectivity wherever and however businesses operate.

## III. SYSTEM DESCRIPTION

### A. Space Segment

The Logos Network consists of 3,960 satellites deployed in seven shells between 860 km and 925 km altitude.[4] The constellation will be deployed in phases. The first phase, consisting of 1,092 satellites, will provide sufficient coverage and capacity for Logos to roll out its initial service offering to enterprise customers. Logos will then deploy the remainder of the constellation, densifying each orbital shell, and progressively increasing the capacity and throughput of the Logos Network. Multiple shells may be deployed concurrently based on service coverage and customer priorities. Deployments will be structured to ensure the most efficient system is operating on orbit at all times, including to support frequency re-use, and spectrum sharing and

[4] *See* Technical Annex, Section B-1.

interference avoidance with co-frequency systems.

The orbital characteristics of the Logos Network are outlined in Table 1 below and are described in more detail in the accompanying Technical Annex.

*Table 1 the Logos Network Constellation Design*

| Shell | Altitude (km) | Inclination | Planes | Satellites per Plane | Satellites per Shell |
|---|---|---|---|---|---|
| M-1 | 925 | 28° | 13 | 19 | 247 |
| M-2 | 900 | 56° | 20 | 41 | 820 |
| M-3 | 890 | 31° | 25 | 50 | 1,250 |
| M-4 | 860 | 46° | 25 | 50 | 1,250 |
| P-1 | 880 | 90° | 1 | 25 | 25 |
| P-2 | 880 | 85° | 8 | 23 | 184 |
| P-3 | 870 | 67° | 8 | 23 | 184 |
| **TOTAL** | | | | | **3,960** |

### B. Frequency Plan

The Logos Network will operate in the radiofrequency bands outlined in Table 2 below. Satellite downlink transmissions can be turned on and off by ground telecommand in compliance with Commission rules.[5]

[5] *See generally* Technical Annex; 47 C.F.R. § 25.207.

*Table 2 Frequency Bands, Direction, and Use*

| Frequency Band | Link Direction | Use |
|---|---|---|
| 2025-2110 MHz[6] | Earth-to-space | TT&C Uplink |
| 2200-2290 MHz[7] | space-to-Earth | TT&C Downlink |
| 20.2-23.55 GHz | Earth-to-space | Data and Customer Uplink |
| 25.5-27.0 GHz | Earth-to-space<br>space-to-Earth | Standard Frequency and Time Signal-Satellite Service Uplink<br>Data and Customer Downlink |
| 37.5-42.5 GHz | space-to-Earth | Data and Customer Downlink |
| 47.0-50.2 GHz | Earth-to-space<br>space-to-Earth | Data and Customer Uplink<br>Data and Customer Downlink |
| 50.4-51.4 GHz | Earth-to-space<br>space-to-Earth | Data and Customer Uplink<br>Data and Customer Downlink |
| 57.0-74.0 GHz | space-to-space | Inter-satellite Links |

Using this spectrum, the Logos Network will deliver (1) FSS, (2) inter-satellite service, and (3) standard frequency and time signal-satellite service ("SFTS") solutions to enterprise customers across the United States and around the world. The Technical Annex provides additional details of the Logos operations in these bands.[8]

## IV. THE LOGOS NETWORK CAN EFFECTIVELY SHARE SPECTRUM USING ADVANCED ARCHITECTURES AND CAPABILITIES

The Logos Network has been designed to promote and facilitate spectrum sharing in every band requested in this Application. The Logos Network architecture is designed around core components—high elevation angles, narrow pencil-beams, satellite diversity, dynamic

[6] Space Operations in the 2025-2110 MHz band will be conducted outside the United States only.

[7] Space Operations in the 2200-2290 MHz band will be conducted outside the United States only.

[8] *See* Technical Annex, Sections B & C.

channelization, and software defined network ("SDN") orchestration—which enable Logos to prevent, avoid, and mitigate in-line interference events with co-frequency systems. Logos thus seeks to operate in requested Q/V-band frequencies pursuant to Section 25.261 of the Commission's rules and should be considered on a case-by-case basis as part of the 2021 V-band processing round.

Logos further seeks to operate in certain Ka- and Q/V-band frequencies pursuant to Article 4.4 of the ITU Radio Regulations. In these bands, Logos will operate on a non-conforming, non-interference, and unprotected basis. As discussed herein, authorizing the Logos Network on the above bases would strongly serve the public interest.

### A. Sharing with Other V-band Systems Pursuant to Section 25.261

Both internationally and domestically, NGSO FSS operators are expected to coordinate their shared use of spectrum.[9] Where a coordination agreement cannot be reached between operators, certain default rules govern the relationship between the systems. Having previously diverged from the international date-priority regime, the Commission first revised its spectrum sharing rules in 2017 to facilitate "more accommodation, more sharing, and ultimately, more competition" among the new generation of larger, more spectrally-efficient NGSO FSS systems.[10] The new "sharing" regime imposed three requirements for NGSO FSS operators seeking authorization or market access in "commonly authorized frequency" bands:

1. NGSO FSS systems must utilize directional antennae;
2. Operators must coordinate in good faith; and
3. In the absence of a coordination agreement, NGSO FSS systems must divide the relevant commonly authorized frequency band whenever the increase in system

[9] ITU Radio Regulations, Article 9; 47 C.F.R. § 25.261.

[10] *See Update to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters*, Report and Order and Further Notice of Proposed Rulemaking, 32 FCC Rcd 7809 ¶ 50 (2017) ("2017 NGSO FSS Order").

> noise temperature of a receiver, ΔT/T, exceeds six percent due to interference from emissions originating in the other system.[11]

Following the initial deployments of the first new generation NGSO FSS systems and the commencement of the second cycle of processing round procedures, the Commission both refined and expanded the NGSO FSS sharing regime. In 2023, the Commission adopted a report and order that clarified the Section 25.261(c) "default sharing" rule only applies between systems in the same processing round.[12] The Commission also adopted new procedures to govern spectrum sharing between systems of two different processing rounds, including a requirement that before commencing operations in the United States, a later-round NGSO FSS system must either (1) certify that it has completed coordination agreements with each operational NGSO FSS system in the prior processing round, or (2) where coordination has not been completed, submit a showing that it will not cause harmful interference to such system.[13]

The Logos Network is designed to operate in full compliance with the Commission's spectrum sharing requirements, including Section 25.261. As demonstrated in the accompanying Technical Annex and Schedule S, the Logos Network is designed around several advanced techniques to facilitate sharing with other co-frequency systems. These techniques include:

- Narrow pencil-beam technology
- Satellite diversity
- High elevation angle operations
- Radio frequency nulling
- Planned and coordinated beam coverages

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[11] *See* 47 C.F.R. § 25.261.

[12] *Revising Spectrum Sharing Rules for Non-Geostationary Orbit, Fixed-Satellite Service Systems*, Report and Order and Further Notice of Proposed Rulemaking, 38 FCC Rcd 3699 ¶ 11 (2023) ("2023 NGSO FSS Sharing Order").

[13] *Id*., ¶¶ 13-14.

- Dynamic channelization
- Fine-grained raster support
- Software defined network

Utilizing each of these techniques individually and in combination, the Logos Network can prevent, avoid, and mitigate in-line interference events with other co-frequency systems, either in support of or in the absence of a coordination agreement. As an enterprise-focused system, Logos also maintains a significant amount of control over all aspects of its network, providing the company an additional layer of flexibility to coordinate use with other operators.

Like other NGSO FSS systems, the Logos Network employs a high degree of satellite densification and diversity to ensure that a customer anywhere in the United States (and globally) would be in view of multiple satellites at any given time, and that at least one of those satellites could serve that customer, even if there was an in-line interference event to be solved for. Herein lies the critical difference between consumer- and enterprise-focused NGSO systems. The consumer-facing system will typically be designed to ensure that a customer antenna situated in any meaningfully-populated place on the ground for some period of time (say 30-50 ms), will be *covered* by a beam from that network—*i.e.*, that antenna will be able to receive and send transmissions to that satellite anywhere in the beam footprint. The enterprise-centric Logos Network, by contrast, will have *visibility* of every possible location from orbit, but its very narrow pencil-beams will only transmit to the specific places where a Logos user terminal has been installed and the signal from the terminal been authenticated. The deployment of these extremely narrow beam patterns significantly restricts the geographic area exposed to signal propagation, thereby decreasing the likelihood of harmful interference into neighboring systems.

This is facilitated in large part by Logos's state-of-the-art SDN,[14] which administers the entire Logos ecosystem in accordance with Commission rules and coordination agreements between Logos and other co-frequency systems within the relevant geographic area. The SDN controller will be able to schedule the frequencies, channels, and power levels used at each professionally-installed terminal to prevent, avoid, or mitigate harmful interference into neighboring systems. By leveraging an extensive range of available frequencies, the SDN controller can dynamically select the most suitable frequencies in any given direction at any point in time, thereby maximizing spectral efficiency while reducing the risk of harmful interference.

The SDN relies on real-time data, autonomously collected from public sources to optimize spectrum usage and prevent harmful interference into other systems. The SDN's knowledge base is continuously enriched through integration with external databases, such as the Commission's International Communications Filing System, terrain databases, and other pertinent data sources. This persistent enrichment ensures the SDN remains informed of the latest conditions and regulatory requirements, thereby enabling the system to offer robust protection for other services while facilitating maximal spectral reuse.

Given the current status of the V-band processing rounds, as discussed in Section V.A below, the Logos Network will easily be able to share spectrum with other V-band systems pursuant to Section 25.261 of the Commission's rules. The Logos Network's proposed spectrum use, demonstrated techniques for sharing spectrum, and commitment to good faith coordination establish that the Logos Network will not disrupt the investments or expectations of other V-band

[14] *See* Technical Annex, Section B-3.

applicants. The Commission should therefore consider this Application on a case-by-case basis as part of the 2021 V-band processing round.

### B. Protecting Conforming Operations Pursuant to ITU Article 4.4

Article 4.4 of the ITU Radio Regulations ("Article 4.4") permits licensing administrations to assign frequencies "in derogation" of the International Table of Frequency Allocations so long as the user does "not cause harmful interference to, and shall not claim protection from harmful interference caused by" a station operating in accordance with the Radio Regulations.[15] In 2023, the Commission amended the Part 25 rules to allow consideration of applications requesting authority to operate in frequency bands not allocated to such services in the International Table of Frequency Allocations, provided the application included a supporting request for waiver of the relevant allocation.[16] The Commission reiterated that to support a request for waiver, the applicant must not only demonstrate "good cause" as required under Commission rules, but also that it will operate consistent with Article 4.4 and not cause harmful interference to or claim protection from harmful interference caused by any authorized stations operating in conformance with the International Table of Frequency Allocations.[17]

In Section V.C below, Logos requests waiver of certain international allocations to permit the Logos Network to utilize segments of the Ka- and Q/V-bands on a "non-conforming" basis pursuant to Article 4.4. Logos affirms that all of the same techniques utilized for spectrum sharing pursuant to Section 25.261 described in Section IV.A and the Technical Annex, will also be used

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[15] ITU Radio Regulations, Article 4.4.

[16] *In the Matter of Expediting Initial Processing of Satellite and Earth Station Applications*, Report and Order and Further Notice of Proposed Rulemaking, IB Docket Nos. 22-411 & 22-271, ¶ 27 (Sept. 22, 2023).

[17] *Id.*

to prevent and avoid harmful interference into any authorized stations operating in conformance with the International Table of Frequency Allocations. Logos further affirms that it will not claim protection from any such system acting in accordance with its authorization.

## V. WAIVER REQUESTS

Logos respectfully requests waiver of certain Commission rules to facilitate the consideration of this Application and the expeditious deployment of the Logos Network. The Commission may waive its rules if there is "good cause" to do so.[18] In general, good cause exists if "special circumstances warrant a deviation from the general rule" and "such deviation would better serve the public interest than would strict adherence to the rule," including "more effective implementation of overall policy."[19] Further, in determining whether waiver is appropriate, the Commission may take into account "considerations of hardship, equity, or more effective implementation of overall policy."[20] For the reasons stated below, there is good cause for the Commission to waive its rules, as requested herein.

### A. Administrative Processing Rules – Sections 25.155(b) and 25.157(c)

#### *1. V-band (37.5-42.5 GHz, 47.0-50.2 GHz, and 50.4-51.4 GHz)*

The Commission should waive Sections 25.155(b) and 25.157(c) to permit consideration of the relevant portions of this Application in the 2021 V-band processing round on a case-by-case basis.[21] Section 25.157 specifies the processing round procedures for NGSO systems, requiring

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[18] *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).

[19] *See, e.g., GE American Communications, Inc.*, 16 FCC Rcd 11038, at 11041 ¶ 9 (IB 2001) (quoting *WAIT Radio*, 418 F.2d at 1159).

[20] *Id.*

[21] 47 C.F.R. §§ 25.155(b), 25.157(c); *see also* 2017 NGSO FSS Order, ¶ 61.

that applicants be designated as "lead" applicants to initiate a new processing round, or "competing" applicants when filing an application in response to a public notice accepting the lead application for filing.[22] Section 25.155(b) provides that an application may only be considered in a processing round if it is filed by the "cut-off" date specified in the public notice.[23] These administrative rules are intended to provide applicants a "measure of certainty" before they commit significant resources towards the deployment of complex satellite networks.[24]

Understanding there are exceptions to every rule, the Commission also recognized there may be scenarios where it is appropriate to consider applications filed after the "cut-off" date alongside those filed in response to the public notice.[25] These so-called "late-filed" applications are identified and evaluated on a "case-by-case" basis based on "the situation at the time" and with consideration of both the need to "protect existing expectations and investments" of existing applicants in the round and the need to "provide for additional entry" in accordance with the Commission's policy of facilitating efficient use of spectrum and competition.[26]

In 2023, after reviewing and updating the rules pertaining to spectrum sharing in the context of the most recent processing rounds, the Commission affirmed that it still retains the discretion to accept NGSO FSS applications filed after the "cut-off" date and treat them "as if [they] had been filed within the processing round window and therefore given equal access to spectrum, through the default spectrum-splitting procedure, with timely filed applications" and

[22] 47 C.F.R. § 25.157.

[23] 47 C.F.R. § 25.155(b).

[24] 2017 NGSO FSS Order, ¶ 61.

[25] *Id.*

[26] *Id.*; *see generally* 47 U.S.C. § 151.

that it would do so based on a demonstration of good cause under the Commission's long-standing waiver provisions.[27]

Such good cause exists here. After almost a decade, the V-band remains significantly underutilized and underdeveloped by NGSO systems. Logos seeks authority to deploy the Logos Network in line with systems initially filed in 2021. Consideration of the Application as part of the 2021 V-band processing round will fairly "protect existing expectations and investments" of the current applicants while promoting competition and encouraging more efficient use of the band for the benefit of American enterprise.[28]

Since the start of the modern processing round era, sixteen operators have sought authorization to deploy increasingly complex and expansive V-band systems.[29] Yet to date, no NGSO FSS service is being provided to customers by way of this spectrum. In fact, the development of this band has fallen so far behind that almost three quarters of the 2017 V-band processing round licensees have already surrendered or forfeited their authorizations, or are in the midst of bankruptcy proceedings.[30] Of the three remaining licensees, one recently filed for an

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[27] 2023 NGSO FSS Sharing Order, ¶ 12.

[28] *See* 2017 NGSO FSS Order, ¶ 61.

[29] The 2017 and 2021 V-band processing round applicants, in alphabetical order, are: AST&Science LLC ("AST"), Astra Space Operations, Inc. ("Astra"), Audacy Corp. ("Audacy"), The Boeing Company ("Boeing"), Hughes Network Systems, LLC ("Hughes"), Inmarsat, Inc. ("Inmarsat"), Intelsat License, LLC ("Intelsat"), Kuiper Systems LLC ("Kuiper"), Mangata Networks LLC ("Mangata"), O3b Limited ("O3b"), OneWeb Satellites Limited ("OneWeb"), SN Space Systems Ltd. ("SN Space"), Space Exploration Holdings, LLC ("SpaceX"), Telesat Canada ("Telesat"), Theia Holdings A, Inc. ("Theia"), and Viasat, Inc. ("Viasat").

[30] *See* Letter from Bruce Olcott to Marlene H. Dortch, ICFS File Nos. SAT-LOA-20170301-00028, et al. (Sept. 15, 2023) (Boeing surrender of V-band authorization); Letter of Suzanne Malloy to Marlene H. Dortch, ICFS File No. SAT-AMD-20170301-00026 (Aug. 31, 2022) (O3b surrender of V-band authorization); Public Notice, DA No. 21-1505 (IB 2021) (Telesat surrender of V-band authorization); Public Notice, 37 FCC Rcd 14862 (IB 2022) (Audacy authorization declared null and void for failure to maintain performance bond). *See also* Letter from Michael

extension of its first deployment milestone;[31] the others are likely to follow suit or be forced to forfeit their authorizations in accordance with Commission rules.[32]

The second V-band processing round—which followed quickly after the first—has done no more to put the spectrum to use. Commenced in August 2021, twelve applicants submitted requests for authorization to utilize V-band spectrum as part of the round—three designated as "Lead," with nine "Competing" applicants filed at the November "cut-off" date.[33] Almost exactly three years to the day since announcing the second V-band round, the Commission issued the only authorization to date: a partial grant for five satellites—roughly two percent of the satellites sought in the application.[34] As for the remaining applications, only one application has been accepted for

Fuqua to Marlene H. Dortch, ICFS File Nos. SAT-LOA-20161115-00121 and SAT-AMD-20170301-00029 (June 10, 2024) (noting that Theia is involved in bankruptcy proceedings).

[31] *See Space Exploration Holdings, LLC Application to Modify Authorization for the SpaceX V-band NGSO Satellite System*, ICFS File No. SAT-MOD-20240813-00183 (filed Aug. 13, 2024) (pending). SpaceX also previously reduced the size of its V-band constellation by approximately 4,000 satellites. *See* Space Exploration Holdings, LLC, *SpaceX V-band Gen2 Mod*, Stamp Grant with Conditions, ICFS File No. SAT-MOD-20230322-00062 (reissued Nov. 9, 2023).

[32] 47 C.F.R. §§ 25.164(b)(1), 25.165.

[33] The "Lead" applicants in the 2021 V-band processing round are: AST, Mangata, and Viasat. The "Competing" applicants are: Astra, Boeing, Hughes, Inmarsat, Intelsat, Kuiper, OneWeb, SN Space, and Telesat.

[34] *AST&Science LLC Application to Launch and Operate a Non-Geostationary Orbit V-band System*, Order and Authorization, DA 24-756 (Aug. 2, 2024).

filing,[35] another has been surrendered,[36] and one withdrawn.[37] Yet, the participants of the 2021 V-band processing round have gone quiet; their individual application dockets are devoid of any significant comments, requests for action, or expressed urgency to the Commission to process the long-pending applications before them.

The processing round mechanism is only intended to provide "a *measure* of certainty" to applicants in place of an open-ended requirement to accommodate all systems.[38] It creates a snapshot in time where each operator gets to know every system that will share spectrum with it (including those it must protect in earlier rounds), and on what basis. Thus, the measures provide operators *who are ready* to bring spectrum resources to bear a well-deserved head start vis-à-vis later entrants, but they are by no means meant to fossilize the market.

In fact, the Commission rules seek to ensure that innovation can continue, and future applicants can seek entry into the market. By retaining its discretion to evaluate applications for good cause, the Commission can appropriately balance its twin goals of providing a measure of regulatory certainty to applicants, with the equally important objective of ensuring competitive

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[35] *Space Station Applications Accepted for Filing*, Public Notice, Report No. SAT-01760 (Sept. 22, 2023). The three lead applications were placed on public notice either before the 2021 V-band Processing Round PN or as part of the 2020 Ku/Ka-band public notice. *See Cut-Off Established For Additional NGSO-Like Satellite Systems In The 37.5-40.0 GHz, 40.0-42.0 GHz, 47.2-50.2 GHz, AND 50.4-51.4 GHz BANDS* Public Notice, 36 FCC Rcd 12148 (IB 2021) ("2021 V-band Processing Round PN"). Very few comments or pleadings have been filed regarding these applications since the start of the 2021 V-band processing round (not counting the generic SpaceX Gen2 conditions letter that has been filed into every pending docket before the Commission since January 2023).

[36] Letter from Bruce Olcott to Marlene H. Dortch, ICFS File Nos. SAT-LOA-20170301-00028, et al. (Sept. 15, 2023) (Boeing surrender of V-band authorization); *Satellite Licensing Division Action Taken*, Public Notice, Report No. SAT-10766, DA No. 23-952 (withdrawing 2021 Boeing V-band application).

[37] *Satellite Licensing Division and Satellite Programs and Policy Division Actions Taken*, Public Notice, DA No. 23-644 (July 28, 2023) (Inmarsat withdrawal of V-band application).

[38] 2017 NGSO FSS Order, ¶ 61 (emphasis added).

opportunities for future entrants.[39] Thus, as with all waivers for good cause, the Commission evaluates a request for waiver of the processing round rules on the basis of: (1) the special circumstances that warrant deviation from the general rule, and (2) how such deviation better serves the public interest.[40]

As demonstrated above, the substantially changed circumstances in the V-band processing rounds themselves provide good cause for the Commission to waive Sections 25.155(b) and 25.157(c) and consider the relevant portions of this Application as part of the 2021 V-band processing round. Almost the entire cohort of 2017 V-band processing round applicants are gone, and the three that remain have, or are at risk of having, their systems substantially reduced. Similarly, in the 2021 V-band processing round, only five satellites in the entire round have been authorized, while most applications have not yet been accepted for filing. Given this nascent state of development across the V-band, consideration of the Application as a part of the 2021 V-band processing round will not disrupt existing or planned systems.

Moreover, in balancing the "expectations and investments" of the current applicants in the processing round against the benefits of a new entrant, there does not appear to be a substantial risk of harm to the earlier-filed applicants should the Commission consider the Application as part of the 2021 V-band processing round. As demonstrated in Section IV above and the Technical Annex, Logos has designed its system to operate in the V-band environment, sharing spectrum equally with the other co-frequency systems pursuant to Section 25.261, without disrupting the "existing expectations and investments" of the current applicants.

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[39] *See id*.

[40] *See* 47 C.F.R. § 1.3.

Finally, Logos will coordinate with previously-authorized systems and currently-pending applicants in good faith.[41] The existing applicants, similarly hold the "expectation" that they will coordinate with all other systems, as required by Commission and ITU rules, and this expectation is already factored into the architecture of their systems. It is therefore significant that the number and size of systems has varied substantially since the start of the 2017 V-band processing round, as systems have surrendered, forfeited, and withdrawn from the process. The addition of the Logos Network will not disrupt these expectations as it does not add any more satellites or networks than there were at the high-point of this process: i.e., the "cut-off" date of the 2021 V-band processing round. Thus, there is no substantial change to the expectations of the previously-filed applicants by permitting the parallel consideration of the Application within the 2021 V-band processing round. As such, Logos respectfully requests waiver of Sections 25.155(b) and 25.157(c) to permit consideration of the relevant portions of this Application in the 2021 V-band processing round on a case-by-case basis.

*2. Ka-band (20.2-23.55 GHz and 25.5-27.0 GHz)*

Logos requests waiver of Sections 25.155(b) and 25.157(c) as the rules apply to its request to utilize the 20.2-23.55 GHz (Earth-to-space) and 25.5-27.0 GHz (Earth-to-space and space-to-Earth) bands. First, the 20.2-23.55 GHz band is not subject to an existing processing round. Good cause for waiver exists as Logos is seeking authorization to utilize the 20.2-23.55 GHz band (Earth-to-space) on a non-conforming basis pursuant to Article 4.4, and therefore, does not expect to receive protection from co-frequency systems operating in conformance with the Table of

[41] 47 C.F.R. § 25.261.

Frequency Allocations.[42] Logos will protect systems operating in conformance with the International Table of Frequency Allocations.[43]

Logos further requests waiver of the processing round rules as they apply to its use of the 25.5-27.0 GHz band. The 25.5-27.0 GHz band is not subject to an existing processing round and is lightly used for commercial operations. Logos seeks authority to operate a conforming SFTS service (Earth-to-space) and a non-conforming, reverse diplex FSS service (space-to-Earth) in the band. SFTS (Earth-to-space) is allocated on a secondary basis in the band internationally and in the United States. Good cause exists to waive the processing round rules as the Logos Network can coordinate its use of the band with other co-frequency systems and its use will not prevent future entry into the band.[44] Moreover, Logos accepts that in the uplink (Earth-to-space) it must protect but will not receive protection from higher allocated services operating in accordance with the Table of Frequency Allocations and that it must cease transmissions upon any reports of interference from such systems. Logos also accepts that in the downlink (space-to-Earth) Logos shall not cause interference into and shall not claim protection from any systems operating in conformance with the Table of Frequency Allocations.[45]

### B. Consideration of Applications – Section 25.156(d)(4)

Logos requests waiver of Section 25.156(d)(4) as it applies to its request to provide intersatellite service links in the 57.0-74.0 GHz band. Section 25.156(d)(4) provides that "applications…for inter-satellite link authority will be treated like an application separate from its associated service band" and each request "will be considered pursuant to the procedure for

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[42] ITU Radio Regulation, Article 4.4. *See infra* Section V.C.

[43] *See supra* Section IV.B.

[44] *See id*.; *see also* Technical Annex, Section C.

[45] *See supra* Section IV.B.

applications for GSO-like operations or NGSO-like operation, as applicable."[46] Logos's use of the 57.0-74.0 GHz band will not unreasonably preclude additional entry by other operators and therefore should be processed on a first-come-first-serve basis pursuant to Section 25.158.[47] Grant of this waiver would be consistent with precedent, where the Commission has previously determined that it would be more efficient to condition use of this spectrum on a case-by-case basis rather than initiate a new processing round.[48] As described in the Section V.C below, Logos can accommodate future entry and will cooperate fully with any future co-frequency systems authorized to utilize this band.

### C. Table of Frequency Allocations – Section 2.106

Logos requests waiver of the International and U.S. Table of Frequency Allocations,[49] as described below, to permit use of certain frequencies on a non-conforming basis. Waivers relating to the Table of Frequency Allocations are generally granted "when there is little potential for interference into any service authorized under the Table of Frequency Allocations and when the

[46] 47 C.F.R. § 25.156(d)(4).

[47] 47 C.F.R. § 25.158; *see*, *e.g.*, Planet Labs PBC, Order, ICFS File No. SAT-MOD-20220421-00042, DA 23-799, Attachment to Grant, Condition 13 (Aug. 31, 2023) (confirming that use of spectrum does not preclude other operators from using the spectrum under the same sharing conditions, and thus warranting waiver of Sections 25.156 and 25.157 in favor of processing under Section 25.158); *see also* Planet Labs Inc., Stamp Grant with Conditions, ICFS File No. SAT-MOD-20200615-00076 (granted Mar. 18, 2021).

[48] *See, e.g.*, *The Boeing Company, Application for Authority to Launch and Operate a Non-Geostationary Satellite Orbit System in the Fixed-Satellite Service*, Order and Authorization, FCC 21-115, ¶ 21 (2021); *Audacy Corporation, Application for Authority to Launch and Operate a Non-Geostationary Medium Earth Orbit Satellite System in the Fixed- and Inter-Satellite Service*, Order and Authorization, 33 FCC Rcd 5554, 5562, ¶ 21 (2018). Both Boeing and Audacy have since surrendered or forfeited, respectively, their authorizations.

[49] 47 C.F.R. § 2.106.

nonconforming operator accepts any interference from authorized services."[50] As demonstrated in further detail in the Technical Annex, Logos's use of the requested frequencies on a non-conforming basis will not cause harmful interference to primary operations operating in conformance with the Table of Frequency Allocations (via PFD and EPFD limit compliance). Logos will coordinate with commercial and government operators in accordance with the Commission's and ITU rules and regulations. Grant of the following waivers for use of the requested frequencies on a non-conforming basis will enable the Logos Network to provide a more efficient and secure network to enterprise customers. Accordingly, grant of the requested waivers to allow non-conforming use of the requested frequencies, as described below, is warranted.

*1. 20.2-23.55 GHz*

The 20.2-21.2 GHz band is allocated internationally and to Federal users in the United States for FSS (space-to-Earth) on a primary basis, but it is not allocated for FSS (Earth-to-space) either internationally or in the United States. Logos seeks waiver to utilize these bands in the reverse direction (Earth-to-space) on a non-conforming basis.[51] Logos will not cause interference to, and will accept interference from, systems operating in conformance with the Table of Frequency Allocations.

The 21.2-23.55 GHz band is not allocated internationally or in the United States for FSS. Logos seeks waiver to conduct FSS in the band (Earth-to-space) on a non-conforming basis. Logos will not cause interference to, and will accept interference from systems operating in conformance

[50] See *Application of Fugro-Chance, Inc*., Order and Authorization, 10 FCC Rcd 2860, ¶ 2 (1995).

[51] In its 2023 Order amending the Part 25 rules, the Commission amended Section 25.112 to allow the consideration of waiver requests for authority to operate a space station in a frequency band that is not allocated internationally for such operations under the ITU Radio Regulations. *Expediting Initial Processing of Satellite and Earth Station Applications*, Report and Order and Further Notice of Proposed Rulemaking, IB Docket No. 22-411, FCC 23-73, ¶ 27 (2023).

with the Table of Frequency Allocations. Logos will take all practical steps to protect radio astronomy in the band from harmful interference.[52]

*2. 25.5-27.0 GHz*

The 25.5-27.0 GHz band is allocated internationally and to Federal users in the United States for Earth exploration satellite service (space-to-Earth), inter-satellite service (space-to-space), space research service (space-to-Earth), fixed and mobile services on a primary basis and SFTS (Earth-to-space) on a secondary basis, but it is not allocated for FSS (space-to-Earth) either internationally or in the United States. Logos seeks waiver to utilize these bands for FSS (Earth-to-space) on a non-conforming basis. Logos will not cause interference to, and will accept interference from, systems operating in conformance with the Table of Frequency Allocations.

*3. 37.5-40.0 GHz*

The 37.5-40.0 GHz band is allocated internationally and in the United States for FSS (space-to-Earth) on a co-primary basis. FSS operations in the band are limited to individually licensed earth stations pursuant to Footnote NG63 of the Table of Frequency Allocations and Section 25.202(a)(1)(ii) of the Commission's rules.[53] Logos seeks waiver to ubiquitously deploy professionally-installed, enterprise-grade earth stations in the 37.5-40.0 GHz band.

Since the Logos Network provides an exclusively enterprise-level service, speed-to-deployment and safeguarding certain customer identifiable information are of the utmost importance. One of the central offerings of the Logos Network is dedicated networks and specialized access for business. Enterprise customers, for a variety of reasons, often prefer not to disclose all of the access points for their networks and may need to expediently add or relocate

[52] 47 C.F.R. § 2.106 n.5.149, n.US342.

[53] 47 C.F.R. §§ 2.106 n.NG63, 25.202(a)(1)(ii).

access points within the network to respond to situational occurrences. Unfortunately, individual licensing of each earth station within the band does not permit Logos, or its customers, to deploy such secure and responsive networks.

Good cause exists to waive this restriction on individual licensing, consistent with precedent.[54] As with individually licensed earth stations, all Logos terminals will be professionally installed, with their locations and positioning selected based on the most current publicly available information regarding co-frequency NGSO, Fixed Service, and UMFUS stations at the time of installation. As described in Section IV.A and the Technical Annex, the SDN controller will have full operational control over these ground terminals, enabling Logos to proactively and where appropriate, independently, resolve or mitigate potential in-line interference events through various design and operational strategies. For example, Logos will maintain a database of the locations of each terminal and the SDN will be able to schedule the frequencies, channels, and power levels used at each terminal to mitigate the likelihood of unwanted interference into neighboring systems. Since the SDN relies on real-time data, it will be able to dynamically leverage the operational mitigation techniques based on the given situation and avoid or mitigate potential interference.

*4. 42.0-42.5 GHz*

The 42.0-42.5 GHz band is allocated internationally for FSS (space-to-Earth) on a primary basis. In the United States, the band is allocated to the Fixed Service on a primary basis but is not allocated for FSS. Logos seeks waiver to conduct FSS in the band (space-to-Earth) on a non-

[54] *See*, *e.g.*, 2017 NGSO FSS Order, ¶ 21 (concluding that certain mitigation techniques, "including the ability to switch to alternative frequencies if interference were to occur," provide sufficient safeguards to permit blanket licensing without causing harmful interference to terrestrial operators and reversing rules that previously prohibited such deployment).

conforming basis. As demonstrated in the Technical Annex, Logos will take all practical steps to protect radio astronomy in the adjacent band from harmful interference.[55] Logos will comply with PFD limits in the band, and therefore will not cause interference to, and will accept interference from, systems operating in conformance with the Table of Frequency Allocations.

*5. 47.0-50.2 GHz and 50.4-51.4 GHz*

The 47.0-47.2 GHz band is not allocated internationally or in the United States for FSS. Logos seeks waiver to conduct FSS in the band (Earth-to-space; space-to-Earth) on a non-conforming basis. Logos will not cause interference to and will accept interference from systems operating in conformance with the Table of Frequency Allocations.

The 47.2-50.2 GHz and 50.4-51.4 GHz bands are allocated internationally and in the United States for FSS (Earth-to-space) on a primary basis. Logos seeks waiver to also utilize the band in the reverse direction (space-to-Earth) on a non-conforming basis. Logos will not cause interference to and will accept interference from systems operating in conformance with the Table of Frequency Allocations. Logos will take all practical steps to protect radio astronomy in the band from harmful interference.[56]

Logos also seeks waiver of Section 25.136 in the 47.2-48.2 GHz and 50.4-51.4 GHz bands.[57] Good cause exists to waive the limitation to individually licensed earth stations for all the reasons stated in Section V.C.3 above.

[55] 47 C.F.R. § 2.106 n.US211; *see also* Technical Annex, Section C-5.

[56] 47 C.F.R. § 2.106 n.US342.

[57] *See* 47 C.F.R. § 25.136(d), (e).

*6. 58.2-59.0 GHz, 59.0-65.0 GHz, and 71.0-74.0 GHz*

The 58.2-59.0 GHz band is allocated internationally and in the United States for Earth-Exploration Satellite Service (passive), Space Research (passive), Fixed Service, and Mobile Service on a primary basis, but is not allocated for inter-satellite service (space-to-space). The 59.0-65.0 GHz band is allocated internationally and to Federal users in the United States for inter-satellite service (space-to-space) on a primary basis but is not allocated for non-Federal inter-satellite service (space-to-space) in the United States. The 71.0-74.0 GHz band is allocated internationally and in the United States for FSS (space-to-Earth) on a primary basis but is not allocated for inter-satellite service (space-to-space).

Pursuant to Section 25.279 of the Commission's rules, any satellite communicating with other space stations may use frequencies in the inter-satellite service as indicated in § 2.106, but are not precluded from utilizing frequencies allocated to another service, such as the FSS or Earth-Exploration Satellite Service, which include space-to-space operations.[58] Logos affirms that it will coordinate its use of the bands with all Federal and commercial users operating in conformance with the Table of Frequency Allocations.[59] Out of an abundance of caution, and only to the extent necessary, Logos seeks waiver to conduct inter-satellite service in the 58.2-59.0 GHz, 59.0-65.0 GHz,[60] and 71.0-74.0 GHz bands on a non-conforming basis.

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[58] 47 C.F.R. § 25.279(a); *see also* 47 C.F.R. § 2.1 (defining "Fixed-Satellite Service" as "A radiocommunication service between earth stations at given positions, when one or more satellites are used…which may also be operated in the inter-satellite service…" and "Earth Exploration-Satellite Service" as "A radiocommunication service between earth stations and one or more space stations, which may include links between space stations…").

[59] 47 C.F.R. § 25.279(b).

[60] The 57.0-58.2 GHz and 59.0-59.3 GHz bands are currently restricted to inter-satellite service for GSO systems. 47 C.F.R. § 2.106 n.5.556A. Accordingly, Logos does not plan to implement these frequencies at this time.

### D. Substantial Completion – Section 25.112(a)(1)

To the extent necessary and out of an abundance of caution, Logos requests waiver of Section 25.112(a) of the Commission's rules. Section 25.112(a)(1) provides that an application will be deemed "unacceptable for filing and will be returned to the applicant" if it, among other potential defects, lacks "completeness of answers to questions [or] informational showings."[61] The Commission's rules provide that an application found defective under Section 25.112(a)(1) may be accepted if accompanied by an appropriate waiver request.[62]

The satellites of the Logos Network are currently in the design phase, and thus, the specific details of the orbital debris mitigation plan are not fully known with certainty. Logos will furnish a compete orbital debris mitigation plan once selection and critical design review is complete. Thus, this Application may be considered "substantially complete" under the Commission's standards, as it is clear that Logos has offered a non-frivolous, substantial proposal, and that the omission of this specific detail at this time does not detract from the ability of the Commission or other interested parties to evaluate the proposal on the merits.

### E. PFD Limits – Section 25.208(r)

Section 25.208 establishes the power flux density and in-band filed strength limits for emissions from a space station under certain conditions.[63] As described in the attached Technical Annex, Logos proposes to comply with the applicable Power Flux Density ("PFD") limits set forth in the ITU Radio Regulations in certain bands where the Commission rules derogate from international limits.[64]

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[61] 47 C.F.R. § 25.112(a)(1).

[62] 47 C.F.R. § 25.112(b)(1).

[63] 47 C.F.R. § 25.208.

[64] Technical Annex, Section C-1.

In the 37.5-40.0 GHz band, Logos seeks waiver to operate in conformance with Article 21 of the Radio Regulations, which permits a PFD level that is 12 dB higher than the PFD limits specified in Section 25.208(r) of the Commission's rules.[65] The Technical Annex provides detailed analysis on this proposal, where Logos intends to utilize this band for downlink transmissions to customer terminals.[66] Specifically, the downlinks within this band will maintain a nominal PFD of -108 dBW/m²/MHz for elevation angles above 45 degrees, ensuring adherence to the PFD limit set by Article 21.

The operational characteristics of terrestrial deployments within this band are typically comprised of small terminals angled towards the horizon. Coupled with the Logos terminals' skyward orientation and narrow, targeted pencil-beams to transmit data to these terminals, the slight PFD increase permitted under international levels will not interfere with co-frequency systems, even in worst-case scenarios. Moreover, the Logos Network will dynamically adjust its power levels to maintain a consistent PFD for transmissions above the 45-degree elevation angle used for regular operations. This adaptive power control is guided by the Signal-to-Interference-plus-Noise Ratio ("SINR") metrics received from ground-based devices. Whenever these devices report a Signal-to-Noise Ratio ("SNR") at or below the prescribed PFD limit, the Logos Network can optimize transmission power to further avoid the potential for harmful interference to co-frequency systems.

Thus, there is good cause to grant waiver of the Commission's PFD limits in Section 25.208(r) to permit Logos to operate in accordance with the ITU PFD limits contained in Article

[65] *See* Int'l Telecomm. Union, Radio Regulations Art. 21 (2024) ("Article 21"); 47 C.F.R. § 25.208(r).

[66] *Id.* at Sections C-1.3, C-2.1.

21. The operational parameters of the Logos Network, combined with the architectural design of terrestrial networks, effectively mitigate against the risk of harmful interference to neighboring systems even when the Logos Network is transmitting at the marginally higher ITU power level. Waiver would therefore enable the Logos Network to operate as a globally harmonized system, in conformance with international standards and best practices.[67]

### F. Limitations of Schedule S - Section 25.114(c)

To the extent necessary and out of an abundance of caution, Logos requests a limited waiver of Section 25.114(c) of the Commission's rules, which requires submission of certain technical information using Schedule S.[68] While completing the form, Logos discovered that it could not accurately describe certain aspects of its system due to limitations in Schedule S itself. In particular, Logos encountered an error after entering approximately 1,300 channels that prevented further channel entries. Following troubleshooting, the Commission requested that Logos provide the remaining channels in a spreadsheet. While some of the channels have been input into the Schedule S, to reduce the likelihood of errors between submission methods, a complete list of the channels has been included as Attachment C to the Technical Annex.

The Logos Network will operate at different orbital altitudes between 860 km and 925 km with a range of antenna gains, resulting in a large number of possible combinations of transmit and receive antenna gain contours. In lieu of providing every possible contour for a representative satellite at each altitude as contemplated by Section 25.114(c)(4)(vi)(B), Logos has provided the contours for satellites at the lowest and highest relevant operating altitudes along with the lowest and highest antenna gains. Moreover, the technical characteristics for the beams described in

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[67] *See*, *e.g.*, FCC "Best Practices for National Spectrum Management," International Affairs, available at: https://www.fcc.gov/general/best-practices-national-spectrum-management.

[68] 47 C.F.R. § 25.114(c).

Schedule S and the accompanying Attachment C to the Technical Annex were generated for the lowest (and therefore highest PFD) altitude requested. Certain parameters may very slightly for satellites at different altitudes. Logos reasonably believes that this approach illustrates the full range of values, given the minimal differences among the plots.

There is good cause for waiver because the Application does not undermine the purpose of Section 25.114(c), where relevant. As noted above, Logos's departure from the rule arises from the limitations of Schedule S and the Commission's online systems. Logos reasonably believes that it has provided all relevant information to allow the Commission to conduct an accurate assessment of the Logos Network; and to the extent necessary, Logos will provide additional information on request. Accordingly, grant of this limited waiver is appropriate and serves the public interest.

## VI. THE LOGOS APPLICATION MEETS ALL ELIGIBILITY AND OPERATIONAL CRITERIA

### A. Legal and Technical Qualifications

The information set forth in this Legal Narrative, the Technical Annex, Schedule S, and the accompanying FCC Form 312 demonstrates compliance with the requirements of Section 25.146 and the other applicable sections of Part 25 of the Commission's rules. Logos affirms that it does not have any other application for an NGSO-like satellite system on file with the Commission, or any licensed-but-unbuilt NGSO-like system, in any frequency band involved in this application.

Logos's current ownership structure appears in the Attachment to this Application.

### B. Milestone and Bond

Pursuant to Sections 25.164(b) and 25.165 of the Commission's rules, Logos will comply with the satellite launch milestone applicable to authorized NGSO satellite systems and corresponding bond requirement, respectively.[69]

### C. ITU Compliance

Pursuant to Section 25.111 of the Commission's rules, Logos acknowledges the Commission will submit filings to the ITU on Logos's behalf and that Logos is responsible for any and all fees charged by the ITU for such filings.[70] Logos will provide the Commission with the appropriate electronic files for submission to the ITU under separate cover, including Logos's ITU Cost Recovery Letter.

[69] 47 C.F.R. §§ 25.164(b), 25.165.

[70] *See* 47 C.F.R. § 25.111.

## VII. CONCLUSION

For all the reasons set forth herein, Logos respectfully requests prompt action by the Commission on the Application.

Respectfully submitted,

*/s/ Milo Medin*


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October 30, 2024

## ATTACHMENT (OWNERSHIP INFORMATION)

Logos Space Services, Inc. ("Logos") is a California-based company formed under the laws of Delaware. The following are shareholders with 10% or more of the equity and/or voting stock in Logos:

Name: Milo Medin
Address: 550 Allerton Street
Redwood City, CA 94063
Ownership: 93.75% voting and equity interest

The following individuals are the directors of Logos:

| Name | Citizenship |
|---|---|
| Milo Medin | USA |
| Thomas Tull | USA |

The following individuals are the officers of Logos:

| Name | Title | Citizenship |
|---|---|---|
| Milo Medin | President, Chief Executive Officer, Chief Financial Officer, Treasurer, Secretary | USA |

All of the directors and officers of Logos may be reached at the following address:

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Redwood City, CA 94063