

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

In the Matter of)	
)	
SpaceLink Corporation)	File No. SAT-MOD-2021_____
)	
Modification of Authorization for)	
EOS Space Spectrum LLC NGSO Satellite)	
System)	
)	

APPLICATION FOR MODIFICATION

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EXECUTIVE SUMMARY

With this application, SpaceLink seeks to modify its FCC authority to launch and operate a constellation of NGSO relay satellites to improve the system’s durability, utility, and performance. Specifically, SpaceLink requests FCC approval to:

- Add the 25.25-27.50 GHz band as a new receive frequency for inter-satellite service links.
- Revise the inclination of the satellites’ orbits from 25° to 0°.
- Increase the number of operational satellites in the constellation from three to four, all evenly spaced in a single orbital plane.
- Revise the channel plans of certain beams.
- Revise the power flux-density levels of certain beams.

Table 1 below compares the orbital configuration of the currently authorized SpaceLink System against the instant proposed modified system.

Parameter	Current Authorization	Proposed Modification
Total number of satellites	3	4
Orbital planes	3	1
Satellites per plane	1	4
Altitude	13,892 km	13,892 km
Inclination	25°	0°

Table 1 - Comparison of Currently Authorized and Proposed Modified System

The proposed modifications will not otherwise alter the nature of the authorized SpaceLink System. Moreover, the public interest benefits of the SpaceLink System remain compelling, and the proposed modifications herein serve to bolster these benefits. By allowing LEO operators to maintain real-time, continuous communications with their spacecraft, the SpaceLink System replaces the current “store and forward” model of downlinking LEO spacecraft data. It also improves spectral efficiency and alleviates congestion in radiofrequency bands never intended to

support the exponential growth in satellite-based services witnessed in recent years (*e.g.*, the X-band between 8025-8400 MHz). The SpaceLink System also improves space situational awareness and orbital debris mitigation by enabling users to know the exact position of their spacecraft at all times with a level of precision not possible using ground-based radars, and, if necessary, to command their satellites in real time to instantaneously initiate emergency maneuvers to avoid a potential collision (as opposed to waiting for the LEO spacecraft to pass over an earth station to receive commands).

To the extent necessary, good cause exists to waive FCC rules to facilitate favorable treatment of the instant modification application. The benefits of the SpaceLink System are incontrovertible, the system helps maintain United States leadership in commercial space, and no third party will experience harmful interference or otherwise be prejudiced by favorable action on the instant application.

Finally, outside the context of the instant modification application, the SpaceLink System is evolving with input from the company's parent, EOS, a world leader in the development of optical technologies. Most significantly, the updated SpaceLink System now employs a hybrid architecture that includes optical terminals as an alternative means for inter-satellite communication. Optical inter-satellite communications are becoming an increasingly important technology from performance, redundancy, and security perspectives, and SpaceLink will offer optical space data relay services alongside its radiofrequency services.

SpaceLink urges the Commission to grant the proposed modification expeditiously so that it can continue to develop and deploy the space data relay system.

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APPLICATION FOR MODIFICATION

SpaceLink Corporation (“SpaceLink”) by its undersigned attorneys and pursuant to Sections 308 and 309 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 308 and 309, and Section 25.117 and other relevant provisions of the Federal Communications Commission’s (“FCC” or “Commission”) rules, hereby requests authority to modify its license held by EOS Space Spectrum LLC (“EOS Space”) for a Medium Earth Orbit (“MEO”) constellation utilizing certain Ka- and V-band frequencies, Call Sign S2982 (the “SpaceLink System”).¹

By this application, SpaceLink requests authority to modify the SpaceLink System to: (i) add a new receive frequency for inter-satellite service links in the 25.25-27.50 GHz band; (ii) revise the orbital inclination of all satellites in the constellation from 25° to 0°; (iii) increase the

¹ *Audacy Corporation Application for Authority to Launch and Operate a Non-Geostationary Medium Earth Orbit Satellite System in the Fixed- and Inter-Satellite Services, Order and Authorization*, 33 FCC Red. 5554 (2018), with additional launch and operating authority granted in IBFS File No. SAT-LOA-20161115-00117 (2020) (“SpaceLink License”); *In the Matter of Electro Optics Systems Ltd.*, Transfer of Control, Grant of Authority, IBFS File No. SAT-T/C-20200124-00013, DA No. 20-240 (rel. March 26, 2020) (granting the transfer of control of Call Sign S2982 to SpaceLink Corporation’s ultimate parent, Electro Optic Systems Ltd.); Letter from Timothy Bransford, Morgan, Lewis & Bockius LLP, to Marlene H. Dortch, IBFS File No. SAT-LOA-20161115-00117 (filed Dec. 3, 2020) (notifying the Commission that SpaceLink retired the “Audacy” brand in December 2020).

number of operational satellites in the constellation from three to four, all evenly spaced in a single orbital plane; (iv) revise the channel plans of certain beams; and (v) revise the Power Flux-Density (“PFD”) levels of certain beams.

The proposed modifications will not otherwise alter the nature of the authorized SpaceLink System. After implementation of the proposed modification, the SpaceLink System will remain a MEO space data relay constellation serving Low Earth Orbit (“LEO”) systems, but with improved redundancy, reduced possibility of interference into co-frequency systems, a more straightforward deployment plan, and with radiofrequencies compatible with existing United States government relay satellites and their users. Commission approval of these changes, as well as the inclusion of optical terminals in the SpaceLink System’s relay satellites, will future-proof SpaceLink’s architecture and allow the company to fulfill its original promise of delivering continuous, real-time communications to LEO operators.

At the same time, the SpaceLink System will also improve spectral efficiency. For example, use of SpaceLink’s continuous inter-satellite communications will permit LEO operators – especially those providing earth observation and imagery services – to downlink data continuously using SpaceLink’s robust MEO architecture and established satellite bands,² thereby alleviating congestion in certain frequency bands that were originally not planned for continuous commercial use, such as the X band (8025-8400 MHz).³

² The SpaceLink system will employ dedicated and redundant feeder links and gateway earth stations and exclusively use bands already allocated on a primary or co-primary basis for satellite service (*e.g.*, the 37.5-42.0 GHz FSS band).

³ No allocation exists in the 8025-8400 MHz band for commercial Earth Exploration Satellite Service (“EESS”), but numerous operators have petitioned the FCC to use the band pursuant to a footnote in the U.S. Table

Moreover, the SpaceLink System permits LEO operators to have better situational awareness by enabling users to know the exact position of their satellites at all times with a level of precision not available using ground-based gateways or radars. In the event of an emergency, LEO operators using the SpaceLink System will have access to real-time information that may be used to commence emergency maneuvers to avoid a potential collision, reducing catastrophic damage for the operator or third parties and mitigating orbital debris.

This application identifies all changes that SpaceLink requests for the SpaceLink System. SpaceLink is also filing an updated FCC Form 312, Schedule S, and Technical Attachment to reflect the proposed changes. SpaceLink requests no additional changes to the SpaceLink System and incorporates by reference all technical parameters from the original SpaceLink License. As described herein and in complementary documents, grant of this request for modification will serve the public interest, convenience, and necessity, and does not prejudice any third party.

I. INTRODUCTION

SpaceLink is authorized by the FCC to develop and launch the SpaceLink System.⁴ The SpaceLink License authorizes the construction, deployment, and operation of three MEO relay spacecraft, using certain V-band spectrum for feeder links between the relay spacecraft and its earth stations and between the relay spacecraft themselves, and using certain Ka-band spectrum for service links between the relay spacecraft and user LEO spacecraft.⁵

of Frequency Allocations that permits non-federal EESS communications pursuant to a “case-by-case electromagnetic compatibility analysis.” 47 C.F.R. § 2.106, fn. US258.

⁴ See generally, SpaceLink License.

⁵ The SpaceLink System is authorized to use the 37.5-42.0 GHz, 47.2-50.2 GHz and 50.4-51.4 GHz bands for feeder links and the 22.55-23.18 GHz, 23.38-23.55 GHz, 24.45-24.75 GHz, 32.3-33.0 GHz, 54.25-56.9 GHz,

SpaceLink’s parent company, Electro Optic Systems Holdings, Ltd. (“EOS”) is a leading Australian technology company operating in the space and defense markets, whose shares are publicly traded on the Australian Securities Exchange.⁶ Its products incorporate advanced electro-optic applications based on EOS core technologies in operating and tracking software, laser ranging, optronics, and precision gimbal mechanisms. EOS has been actively involved in the space industry for decades. Its EOS Space Systems division is a global leader in the design, manufacture, delivery, and operation of sensors and systems for space situational awareness and space control. For over 35 years, EOS has been directing energy beams to space objects for applications including tracking, characterization, identification, communications, remote maneuver, and missile defense, and has developed a significant private database/3D map of satellites and other objects in Earth orbit. EOS has invested heavily to develop sophisticated tracking, space awareness, and communications technologies for use in space, and plans to expand those efforts still further, including through the SpaceLink License.

With EOS’ support, SpaceLink has assembled a talented team that brings together highly experienced engineers and senior executives with decades of deep industry expertise and proven success. SpaceLink has strong financial backing, significant bandwidth, and a clear roadmap to benefit from EOS’ advanced optical communications technology.

57.0-58.2 GHz, and 65.0-71.0 GHz bands for inter-satellite service (“ISS”) operations. The SpaceLink System is also authorized to use the 19.7-20.2 GHz and 29.5-30.0 GHz bands for off-nominal telemetry, tracking, and command functions. *See* fn 1, *supra*.

⁶ The FCC approved the transfer of control of the SpaceLink License to EOS on March 26, 2020. *See In the Matter of Electro Optics Systems Ltd., Transfer of Control*, Grant of Authority SAT-T/C-20200124-00013, DA No. 20-240 (rel. March 26, 2020).

As discussed in greater detail below in Section II, SpaceLink herein requests authority to modify the SpaceLink License to improve the redundancy of its constellation, reduce the possibility of interference into co-frequency systems, simplify the deployment of on-orbit and terrestrial assets, and better align its service frequencies with those of federal relay satellites that will cease operations at the end of the decade.

II. DISCUSSION

By this application, SpaceLink requests Commission authority to modify the SpaceLink System to: (i) add a new receive frequency for inter-satellite service links in the 25.25-27.50 GHz band; (ii) revise the orbital inclination of all satellites in the constellation from 25° to 0°; (iii) increase the number of operational satellites in the constellation from three to four, all evenly spaced in a single orbital plane; (iv) revise the channel plans of certain beams; and (v) revise the PFD levels of certain beams. In particular, and as described in more detail in the Schedule S and the updated Technical Attachment, SpaceLink requests the following modifications to the SpaceLink System.

First (i), SpaceLink seeks to add the 25.25-27.50 GHz as a receive/return band for ISS service links. The National Aeronautics and Space Administration's ("NASA") Tracking and Data Relay Satellite System ("TDRSS") uses the 25.25-27.50 GHz as a receive/return band for its Ka-band single access ("KaSA") service.⁷ Given that NASA plans to sunset the current TDRSS fleet without launching replacement spacecraft, SpaceLink intends to serve as a commercial alternative system providing similar and uninterrupted services to TDRSS's existing federal and commercial

⁷ NASA permits commercial customers to access TDRSS on a reimbursable cost basis. *See* 14 C.F.R. § 1215.1000.

customers.⁸ While the SpaceLink System already has authority to use TDRSS's KaSA transmit/forward band (22.55-23.18 and 23.38-23.55 GHz) for ISS service links, additional authority to use the 25.25-27.50 GHz band for receive/return services ensures that TDRSS user spacecraft can continue their operations using SpaceLink without retiring and replacing satellites.

Second (ii-iii), SpaceLink seeks authority to revise the inclination of all satellites in the constellation from 25° to 0°, and increase the number of operational satellites in the constellation from three to four, all evenly spaced in a single orbital plane. Operating four spacecraft in a single equatorial orbit has numerous advantages over operating three spacecraft in three separate inclined planes: in the proposed configuration, SpaceLink's satellites will never appear from SpaceLink's earth stations to intersect other circular equatorial orbits, thus in-line events with other equatorial operators can never occur. SpaceLink's earth stations will have minimum elevation angles of 15° and will not be situated below 19° latitude, leading to an exclusion angle of at least 3.8° in all scenarios with both the geostationary and O3b orbits. Coordination with co-frequency operators is significantly streamlined when there is no possibility of in-line events.

Another advantage of the proposed single-plane configuration is that the deployment of both space and ground assets is greatly simplified. Deploying three relay satellites into three separate 25° orbits requires either three separate launches or time- and fuel-consuming plane change maneuvers, significantly adding to the cost of the space segment and the time to operational capability. Deployment of all the satellites to a single orbit can be accomplished with a single

⁸ See Debra Werner, *NASA to Hand Off Spacecraft Communications to Industry*, SpaceNews (March 24, 2020), available at: <https://spacenews.com/nasa-to-hand-off-spacecraft-communications-to-industry/> (last visited October 23, 2021) ("*NASA to Hand Off Spacecraft Communications to Industry*").

launch vehicle and without any plane changes, vastly reducing the size and cost of the space segment and reducing the time until SpaceLink can begin providing service.

The addition of a fourth relay satellite adds resiliency to the SpaceLink System. More relay satellites means that LEO user satellites with pointing constraints are more likely to be able to access at least one relay satellite at a given time. More inter-connected relay satellites enables exponentially more routing options between a given user satellite, SpaceLink's relay satellites, and SpaceLink's earth stations. In the event of a single node outage, SpaceLink can dynamically route user data via an alternative path, maintaining system uptime and availability. Even in the worst case where an anomaly leads to the permanent loss of an entire relay satellite, SpaceLink would be able to re-space its relay satellites and continue providing continuous LEO access using only three relay satellites, a scenario not possible in the current three-satellite constellation where the loss of a single relay satellite would lead to a reduction in availability and LEO access.⁹

A fourth relay satellite adds 33% more capacity to the SpaceLink System compared to a three-satellite configuration, enabling SpaceLink to (i) downlink 33% more user data per unit time; (ii) provide service to 33% more simultaneous users; and (iii) respond more rapidly to customer service requests.

Third (iv-v), SpaceLink requests Commission approval to make a number of ancillary adjustments to the SpaceLink System. Specifically, SpaceLink seeks permission to revise the channel plans and power flux-density levels of certain beams.

⁹ Any such reduction in availability would continue until the successful launch, orbit raising maneuvers, and on-orbit testing of a replacement relay satellite.

SpaceLink proposes to reduce the power of its V-band downlink beams (GTL1 and GTR1 in Schedule S) by 3 dB and standardize the channel plan to 9×500 MHz channels. These changes result from differences between the planned design of SpaceLink’s relay satellites and their actual implementation. The current design is compliant with the Commission’s power flux-density limits,¹⁰ so by reducing the transmit power SpaceLink remains compliant with PFD limits with significant margin. Table 2 shows the differences between the current and proposed downlink beam characteristics.

Parameter	Units	Current Authorization	Proposed Modification
Beam ID	-	GTL1 / GTR1	GTL1 / GTR1
Tx frequency range	GHz	37.5-42.0	37.5-42.0
Peak gain	dBi	55.2	46.8
Max. transmit EIRP density	dBW/Hz	-30.9	-33.9
Max. transmit EIRP	dBW	65.6	62.6

Table 2: Comparison of current and proposed downlink beams.

Figure A compares the current and proposed downlink channel plans.

¹⁰ See 47 CFR § 25.208.

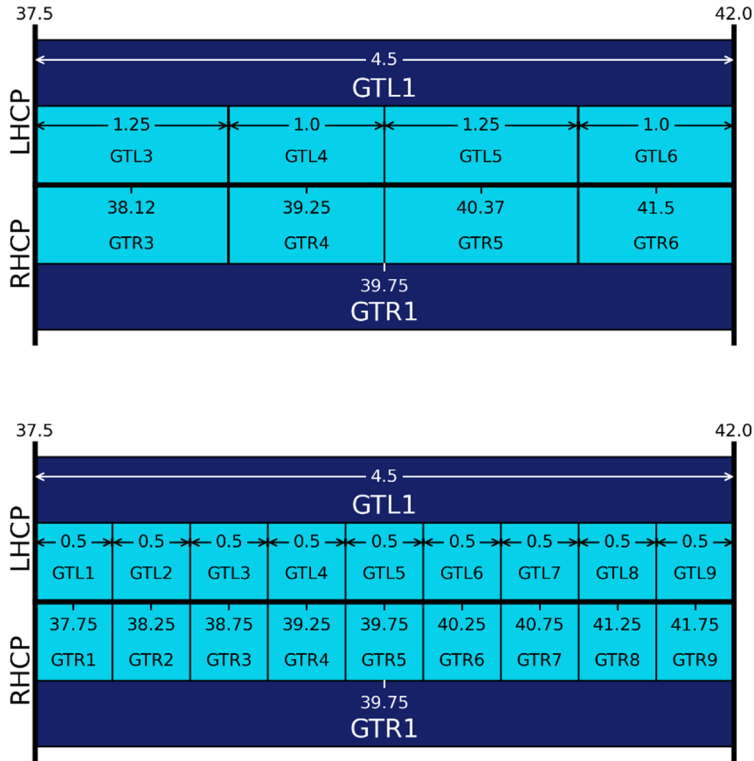


Figure A: Comparison of current (top) and proposed (bottom) downlink channel plans. Beams are in blue; channels are in cyan.

SpaceLink proposes to increase the maximum Effective Isotropic Radiated Power (“EIRP”) of its inter-satellite Ka-band beams while remaining within the Commission’s clear-sky PFD limits. Each of SpaceLink’s relay satellites will generate no more than two of these beams at any time using the same steerable high-gain parabolic reflectors as its feeder links. Increasing the EIRP enables SpaceLink to deliver data to LEO user satellites with less sensitive receivers who would otherwise be unable to access SpaceLink’s network. This furthers SpaceLink’s goal of providing anytime communications to LEO users as small as CubeSats, not just to larger satellites with more capable communications equipment. As previously stated, the proposed modification does not

exceed the Commission’s power flux-density limits in the 22.55-23.55 GHz band and thus will not cause harmful interference to co-frequency systems.¹¹

Parameter	Units	Current Authorization	Proposed Modification
Tx frequency range	GHz	22.55-23.18, 23.38-23.55	22.55-23.18, 23.38-23.55
Peak gain	dBi	43.5	43.0
Max. transmit EIRP density	dBW/Hz	-32.9	-18.7
Max. transmit EIRP	dBW	54.1	59.5

Table 3: Comparison of current and proposed service links.

Figure B compares the proposed channel plan with the current channel plan.

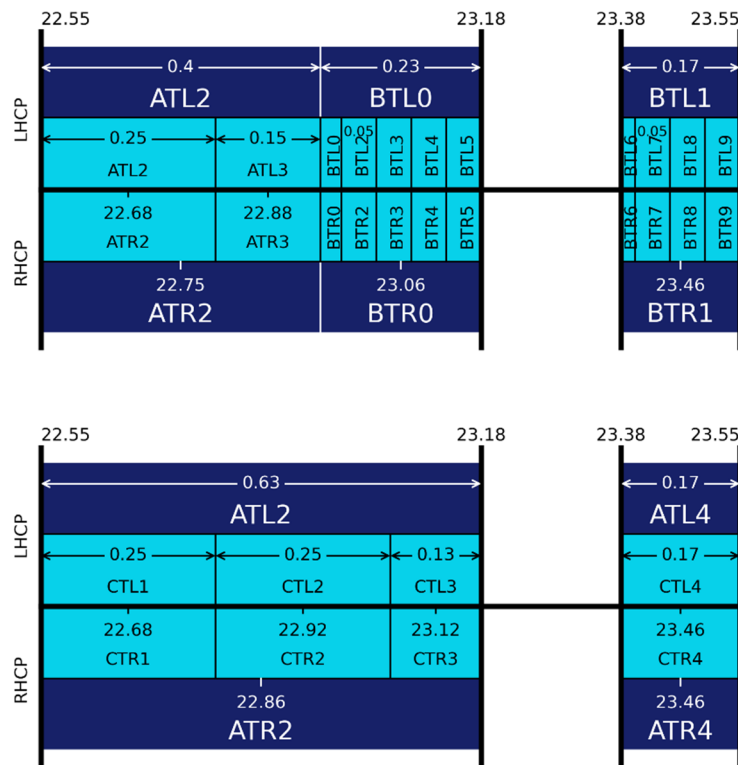


Figure B: Comparison of current (top) and proposed (bottom) Ka-band inter-satellite beam channel plans. Beams are in blue; channels are in cyan.

¹¹ See 47 CFR § 25.208.

The proposed modifications do not alter the fundamental nature of the SpaceLink System. After implementation of the proposed modification, the SpaceLink System will remain a MEO space data relay constellation serving LEO systems, but with improved resilience to failures and compatibility with existing data relay systems. At the same time, the modified SpaceLink System will have a more efficient deployment plan and will also reduce potential harmful interference into co-frequency systems.

Moreover, and as discussed below in Section IV, the demand for the SpaceLink System remains robust and continues to grow. Users will be commercial, civil, and military operators of spacecraft primarily in LEO, but also in other Earth and Lunar orbits and in interplanetary space. Many user spacecraft will gather Earth observation data and/or data of a commercial or scientific nature. Most relay traffic is expected to be between user spacecraft and their operation centers via SpaceLink-operated gateway ground stations.

Finally, SpaceLink remains committed to the FCC's longstanding goal of orbital debris mitigation. As discussed in Section A.10 of the complementary Technical Attachment, the SpaceLink System as modified herein will meet or exceed all orbital debris standards specified in the Commission's current rules.¹²

III. WAIVER REQUESTS

A. The Waiver Standard

The Commission may grant waivers “on its own motion or on petition if good cause therefore is shown.”¹³ “Good cause” has been interpreted to exist when the facts of a particular

¹² See 47 C.F.R. § 25.114(d)(14).

¹³ 47 C.F.R. §1.3.

case make strict compliance inconsistent with the public interest and when the relief requested will not undermine the policy objective of the rule in question.¹⁴ To prevail, a petitioner must demonstrate that application of the involved rule would be inequitable, unduly burdensome, or contrary to the public interest.¹⁵ The Commission may also take into account considerations of “hardship, equity, or more effective implementation of overall policy” on an individual basis.¹⁶ The courts have likewise found that “a general rule, deemed valid because its overall objectives are in the public interest, may not be in the ‘public interest’ if extended to an applicant who proposes a new service that will not undermine the policy, served by the rule that has been adjudged in the public interest.”¹⁷ Waivers are appropriate if “special circumstances warrant a deviation from the general rule and such deviation will serve the public interest.”¹⁸

The waivers sought in the instant Application will not undermine the policy objective of the involved rules – namely, protecting incumbent spectrum users and not precluding operation of later-filed NGSO FSS systems – and will further the public interest by alleviating the ongoing spectrum crisis hindering the ability of innovative space-based systems from communicating with terrestrial infrastructure by promoting shared spectrum use among current and future NGSO

¹⁴ See, e.g., *WAIT Radio v. FCC*, 418 F.2d 1153, 1157 (D.C. Cir. 1969) (“*WAIT Radio*”) (holding that the FCC may exercise its discretion to waive a rule where particular facts would make strict compliance inconsistent with the public interest), aff’d, 459 F.2d 1203 (1973), cert. denied, 409 U.S. 1027 (1972); *Northeast Cellular Tel. Co. v. FCC*, 897 F.2d 1164 (D.C. Cir. 1990) (“*Northeast Cellular*”) (holding that waiver of the Commission’s rules may be granted in instances where the particular facts make strict compliance inconsistent with the public interest if applied to the petitioner and when the relief requested would not undermine the policy objective of the rule in question).

¹⁵ 47 CFR § 1.925.

¹⁶ *WAIT Radio*, at 1159.

¹⁷ *Id.* at 1157.

¹⁸ *Northeast Cellular*, at 1166 (citing *WAIT Radio*, 418 F.2d at 1159) (explaining the necessary criteria to establish good cause for a waiver).

operations. The shared use of spectrum resources and promotion of innovative new services will benefit other NGSO operators and American consumers, as further discussed below.

B. Waiver of § 25.157

Pursuant to Section 25.157(c) of the Commission’s rules, space station applications for authority to launch and operate U.S.-licensed “NGSO-like” systems are evaluated under a “processing round” mechanism.¹⁹ The Commission has waived the processing round requirement, however, when such authorization would “not preclude additional entry.”²⁰ Furthermore, in the context of applications to modify authorized NGSO systems that were originally subject to modified processing round procedures, the Commission has generally adhered to the following policy— “[i]f the proposed modification does not present any significant interference problems and is otherwise consistent with Commission policies, it is generally granted[,]” but if the modification “presents significant interference problems, [the Bureau] would treat the modification as a newly filed application and would consider the modification application in a subsequent satellite processing round.”²¹

For the reasons set forth below, SpaceLink respectfully requests a waiver of the Commission’s processing round requirement and authority both with respect to the addition of the TDRSS frequencies, and with respect to the requested operational changes to the SpaceLink System (*i.e.* modifying orbital parameters, the addition of a new satellite, slight adjustments to

¹⁹ See 47 C.F.R. § 25.157(c), (e).

²⁰ See also *Northrop Grumman Space & Missions Systems Corporation*, File No. SAT-LOA-19970904-00080 et al., DA 09-428, Order and Authorization, 24 FCC Rcd 2330, 2342, ¶ 29, 34 (Int’l Bur. 2009) (“*Northrop Grumman Order*”); see also *Space Imaging, LLC*, IB Docket No. 02-34, Declaratory Order & Order & Authorization, 20 FCC Rcd 11964, ¶¶ 10, 11 (Int’l Bur. 2005) (“*Space Imaging Order*”).

²¹ See *Teledesic LLC*, Order and Authorization, 14 FCC Rcd 2261, 2264, ¶ 5 (IB 1999) (“*Teledesic Order*”).

PFD levels, and other operating parameters discussed in Section II above). Modifying the existing SpaceLink License does not present any significant interference problems.

1. The Request for Use of the 25.25-27.50 GHz Does Not Necessitate a Processing Round

SpaceLink requests use of the 25.25-27.50 GHz for non-conforming ISS use on a receive-only basis. As we explain below, nothing about these requests implicates the need for a processing round.

SpaceLink's requested use of the 25.25-27.50 GHz frequency range will be limited to receive-only operations and cannot reasonably be said to preclude additional entry by other systems. A request for mere receive-only access to such spectrum does not constrain future use of the band by other NGSO systems – future operators can undertake the system-specific coordination that the FCC has traditionally relied on to facilitate access to the TDRSS frequencies. SpaceLink plainly is not seeking exclusive use of the aforementioned frequencies – the company intends to work with all affected stakeholders as needed, fully recognizes the need to preserve and protect incumbent Federal operations, and solely intends to make use of the desired frequencies on an opportunistic, non-interfering basis. Furthermore, SpaceLink has no plans to initiate a petition for rulemaking to establish any formal technical/service/operating rules for applications implementing its desired use of the TDRSS frequencies. Nor is SpaceLink seeking the more fulsome set of protections and rights typically sought by those willfully participating in a processing round. The Commission has previously found that where parties have demonstrated that they are capable of

sharing co-channel frequencies and will not exclude competitive entry opportunities for others, waiving the processing round requirement is in the public interest.²²

2. The Requested Orbital and Operational Changes Do Not Necessitate A Processing Round

As is explained elsewhere in this Application, SpaceLink seeks to modify the inclination of its relay satellites, make modest revisions to certain PFD levels, and add one satellite to its relay network. Both individually and collectively, these incremental adjustments to the existing SpaceLink License do not necessitate a processing round. As is more fully explained in the Technical Attachment accompanying this filing, none of the aforementioned changes present significant interference issues.

The anticipated changes to the orbital inclination will not materially impair future competitive entry and do not present any material interference issues. Mere adjustments to the inclination of the orbital plane of the SpaceLink satellites will not have the effect of precluding other entities from entry, and grant of SpaceLink's waiver request would be consistent with the Commission's prior decisions to waive the processing round for other NGSO networks which employed a MEO configuration.²³ Moreover, the SpaceLink System enjoys meaningful operational and technological advantages that improve SpaceLink's ability to avoid in-line interference and ensure radiofrequency spectrum is preserved for future NGSO networks. Most

²² See, e.g., *Space Imaging, LLC*, IB Docket No. 02-34, Declaratory Order & Order & Authorization, 20 FCC Rcd 11964, ¶¶ 10, 11 (Int'l Bur. 2005) ("*Space Imaging Order*").

²³ See *Application of O3b Limited to Operate a Gateway Earth Station with a Non-U.S. Licenses, Non-Geostationary Orbit Ka-band Space Station System*, FCC File No. SES-LIC- 20100723-00952, Radio Station Authorization, at 4, Condition 90043 (granted Sept. 25, 2012) (noting that O3b Limited will employ satellite diversity at low to medium latitudes, which will enable it to share spectrum with other NGSO FSS systems. At higher latitudes, O3b Limited will employ a band segmentation approach to accommodate other systems if interference occurs). See also *Northrop Grumman Order*, 24 FCC Rcd at 2342, at ¶¶ 31-33; *Space Imaging Order*, 20 FCC Rcd 11964, ¶¶ 10, 11.

significantly, the already authorized “super constellations” operated or proposed by third parties are designed to provide broadband connectivity to terrestrial end users, which involves a large volume of earth stations that can mispoint and must be coordinated both amongst themselves and with terrestrial services.²⁴ The SpaceLink System involves only six planned U.S.-based gateway earth stations and no other satellite-based terrestrial infrastructure. The requested changes in orbital inclination are less complex and demanding than those implicated in other recent proceedings in which the Commission ultimately decided against applying processing round rules.²⁵ For example, in the recent *2018 SpaceX Modification Order*, the FCC affirmatively stated that the processing round requirements established under Section 25.157 of the Commission’s rules were not appropriate despite SpaceX seeking material reductions in the operating altitudes of 1,530 satellites into the increasingly congested domain of low earth orbit, despite concerns raised by O3b, Kuiper, and Viasat among others.²⁶ If the aforementioned scenario did not warrant a further processing round, the mere recalibration of orbital paths at already approved altitudes for far fewer satellites in the much less crowded realm of medium earth orbit should pass the Commission’s processing round forbearance test with flying colors. Moreover, any increase in PFD limits proposed in the instant application involves only ISS bands not subject to coordination and previously authorized

²⁴ For example, SpaceX Services, Inc., has been authorized to operate up to 1,000,000 end user terminals to support the affiliated Space Exploration Services’ Starlink constellation under a blanket license authorized on March 13, 2020. *See* IBFS File Nos. SES-LIC-20190211-00151.

²⁵ *See, e.g., Space Exploration Holdings, LLC, Request for Modification of the Authorization for the SpaceX NGSO Satellite System*, IBFS File No SAT-MOD-20181108-00083, DA 19-342, Order and Authorization, ¶ 6 (Int’l Bur. 2021) (“*2018 SpaceX Modification Order*”), wherein SpaceX was authorized to lower the altitude of 1,584 satellites from 1,150 km to 550 km.

²⁶ *See id.*, at ¶¶ 6-12.

to SpaceLink on a non-conforming, non-exclusive basis for which the processing round obligations were previously waived.²⁷

As noted above and in the Technical Attachment accompanying this application, operating four satellites in a single equatorial orbit eliminates potential interference concerns that may be present by operating three satellites in three separate inclined planes. In particular, under the proposed equatorial configuration, SpaceLink's satellites will never appear from SpaceLink's earth stations to intersect other circular equatorial orbits, thereby eliminating in-line events with other equatorial spacecraft operators. Moreover, SpaceLink's earth stations will have minimum elevation angles of 15° and will not be situated below 19° latitude, leading to an exclusion angle of at least 3.8° in all scenarios with both the geostationary and O3b orbits. This will result in much less need for coordination with co-frequency operators as in-line events will not be possible.

Finally, merely adding one additional satellite to the SpaceLink System does not warrant the imposition of a processing round. This circumstance is easily distinguished from other recent FCC actions approving expansions of satellite networks in the course of broader processing rounds in that SpaceLink merely seeks to add one satellite to its network (as opposed to thousands of them).²⁸ As originally noted by the Commission in the *Teledesic Order* a new processing round is required only if a modification would “present significant interference problems.”²⁹ There are

²⁷ Revised PFD limits for V-band frequencies involved in prior processing rounds actually decrease by 3 dB, and thus in no way present an elevated risk of interference to any third party as demonstrated in Section A.8 of the complementary Technical Attachment.

²⁸ See e.g. *WorldVu Satellites Limited, Debtor-in-Possession, Petition for Declaratory Ruling Granting Access to the U.S. Market for the OneWeb Non-Geostationary Satellite Orbit Fixed-Satellite Service V-Band System*, Order and Declaratory Ruling, IBFS File No. SAT-LOI-20170301-00031, FCC 20-117, 35 FCC Rcd 10150 (“*WorldVu Order & Declaratory Ruling*”) (authorizing OneWeb to add 1,280 additional satellites to its NGSO constellation).

²⁹ *Teledesic Order*, 14 FCC Rcd at 2264, ¶ 5.

multiple examples of NGSO constellation modification applications approved by the Commission without a new processing round, even when the number of new additional satellites added to the constellation far exceeded one as requested herein.³⁰

C. Waiver of Section 2.106, Table of Frequency Allocations

SpaceLink requests a waiver, to the extent necessary, of the U.S. Table of Frequency Allocations to make use of the 25.25-27.50 GHz range of frequencies for receive-only ISS operations.

SpaceLink requests permission to use these frequencies on a non-conforming, non-protected, non-interfering basis.

In the United States, in the non-Federal Table, the 25.25-25.5 GHz, 25.5-27 GHz, and 27-27.5 GHz bands are already allocated to the inter-satellite service on a secondary basis.³¹ However, no service rules for inter-satellite operations have been adopted within the Commission's Part 25 rules (or anywhere else for that matter). SpaceLink also acknowledges that federal agencies enjoy a co-primary allocation in these frequencies for various operations. NASA's TDRSS uses this band to provide communications relay services to other spacecraft, to downlink telemetry from the Lunar Reconnaissance Orbiter and Solar Dynamics Observatory and broadband data communications from space-borne sensors.³² In addition, the National Science Foundation ("NSF") uses this band for the radio astronomy research of various spectral-lines and continuum

³⁰ See e.g., *WorldVu Order & Declaratory Ruling*.

³¹ See 47 C.F.R. § 2.106.

³² National Telecommunications and Information Administration, Office of Spectrum Management, "Federal Spectrum Use Summary, 30 MHz – 3000 GHz," June 21, 2010 ("NTIA Federal Spectrum Use Summary"), at 71, available at: http://www.ntia.doc.gov/files/ntia/publications/spectrum_use_summary_master-07142014.pdf.

measurements,³³ and other allocated Federal uses include EESS, FS, ISS, mobile, SRS (space-to-Earth) operations, and secondary standard frequency and time signal-satellite services.

Good cause exists to waive the non-Federal Table with respect to the 25.25-27.50 GHz band. Grant of this waiver will facilitate SpaceLink's ability to serve as an alternative backhaul and capacity outlet for TDRSS end users (both U.S. government and commercial customers) that will lose connectivity when NASA sunsets the TDRSS in 2030.³⁴ In addition, approving SpaceLink's use of the 25.25-27.50 GHz will advance NASA's express policy objective "to encourage development of commercial space-based relay networks before the current TDRSS spacecraft reach the end of their lives."³⁵

No party will be prejudiced or experience interference as a result of the Commission waiving the non-Federal Table with respect to the 25.25-27.50 GHz band. Because SpaceLink proposes receive-only operations in the 25.25-27.50 GHz band, there is no potential for its operations to create interference for any spectrum user, non-federal or federal. Nevertheless, because SpaceLink's ultimate LEO satellite customers will transmit in the band, the company is proactively involved in pre-coordination with the aforementioned Federal users to ensure electromagnetic compatibility between future third parties that may seek permission to transmit.³⁶

³³ *See id.*

³⁴ *See NASA to Hand Off Spacecraft Communications to Industry.*

³⁵ *Id.*

³⁶ SpaceLink may provide regulatory and technical assistance, but its customers will ultimately need to independently obtain launch authority and coordinate their satellite systems. In May 2021 SpaceLink met with the National Telecommunications and Information Administration, United States Air Force, United States Navy, United States Space Force, the National Aeronautics and Space Administration, and National Oceanic and Atmospheric Administration to discuss SpaceLink customer compatibility and coordination.

Given that the instant waivers support the policy objective of the processing round - to preserve opportunities for competitive market entry³⁷ - and will further the public interest by allowing SpaceLink to provide valuable and innovative services that promote efficient use of spectrum without the additional delay caused by subjecting the SpaceLink System to a subsequent processing round, SpaceLink urges prompt grant of this waiver request with respect to all frequencies and operational adjustments implicated in this modification application. SpaceLink maintains that none of the aforementioned actions and requests warrant the implementation of a processing round. However, if the Commission were to implement a pertinent processing round at some later date, SpaceLink would respectfully request that it be considered the lead applicant under such circumstances.

IV. PUBLIC INTEREST STATEMENT

The SpaceLink System provides a solution for the demands and burdens that have arisen as a result of the unprecedented surge in new satellite operators. By allowing a large number of space network operators to trunk their communications through SpaceLink gateways and relays, the SpaceLink System offers an innovative means to support LEO operators currently facing coordination and cost issues to utilize and coordinate using ground stations. SpaceLink now aims to expand the benefits of its system by adding capabilities for TDRSS receive/return frequencies. Adding such capabilities will help offload traffic, alleviating burdens on TDRSS, and will benefit federal and commercial operators alike by advancing NASA's explicit objective of promoting commercial alternatives to TDRSS.³⁸ Incorporating an additional satellite into the SpaceLink

³⁷ *Space Imaging Order*, 20 FCC Rcd 11964, ¶¶ 10, 11.

³⁸ *See NASA to Hand Off Spacecraft Communications to Industry*.

System and modifying the orbital parameters will enhance the network's capacity to improve situational awareness functions for LEO operators and provide users with continuous, uninterrupted coverage.

In addition, grant of the modification will promote national security and deepen private-public partnerships in space. The U.S. Government has long recognized the need for secure space communications. The modified SpaceLink System's inter-satellite links will allow federal customers to communicate directly with end user facilities without funneling communications through remote gateways and/or terrestrial infrastructure in foreign jurisdictions. Moreover, the SpaceLink System will also bring higher throughput to customers, federal or commercial, who may have similar concerns about secure communications and therefore do not want to rely on remote gateways operated by third parties. Grant of the modification will also fulfill other U.S. Government objectives to expand the commercial space industry through private and government cooperation. For example, the White House has noted the importance of "fostering continued growth and innovation in the U.S. commercial space sector."³⁹

Finally, the proposed modification will also enhance the Commission's deconfliction objectives. The Commission has repeatedly acknowledged the importance of orbital debris mitigation as the number of satellites in orbit continues to increase. In doing so, the Commission has noted that "the successful identification of satellites and sharing of tracking data are important factors in the provision of timely and accurate assessments of potential conjunctions with other

³⁹ See *Space Policy Directive-3*, National Space Traffic Management Policy, 83 Fed. Reg. 28969, 28970 (June 18, 2018).

spacecraft.”⁴⁰ Here, the proposed modification expands the relay capability of the SpaceLink System, thereby further enabling the continuous, real-time tracking of orbital debris and supporting the “safe and reliable use of space for satellite communications and other activities.”⁴¹

⁴⁰ *In the Matter of Mitigation of Orbital Debris in the New Space Age*, IB Docket No. 18-313, Report and Order and Further Notice of Proposed Rulemaking, 35 FCC Rcd 4156, ¶ 54 (2020) (“*Mitigation R&O and FNPRM*”); *see also Mitigation of Orbital Debris in the New Space Age*, Notice of Proposed Rulemaking, IB Docket No. 18-313, 33 FCC Rcd 11352, ¶ 36 (2019).

⁴¹ *Mitigation R&O and FNPRM*, at ¶ 4.

V. CONCLUSION

As demonstrated herein and in the attached materials, the modified SpaceLink System will continue to provide innovative satellite services in the United States, is compliant with Part 25 of the Commission's Rules, and is in the public interest. Accordingly, SpaceLink respectfully requests that the Commission expeditiously grant the requested modification.

Respectfully submitted,

/s/

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