

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

In the Matter of	)	
	)	
Astro Digital US, Inc.	)	File No. SAT-AMD-_____
	)	
Amendment of Application for Authority to	)	Call Sign: S3014
Launch and Operate a Non-Geostationary	)	
Satellite Orbit System in the Earth-	)	
Exploration Satellite Service	)	

AMENDMENT APPLICATION

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Dated: June 30, 2022

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APPLICATION

Astro Digital US, Inc. (“Astro Digital”) hereby amends its partially granted space station license application (“Application”)¹ to reflect technical and business updates to its satellite system and service. The changes reflect the company’s pivot from an Earth-imaging constellation and service to a “mission-as-a-service” provider. Through its constellation, Astro Digital will provide turnkey mission planning, licensing, and flight operation services for customers. By standardizing mission logistics on an established and proven spacecraft and operational system, Astro Digital seeks to make government, commercial and scientific access to space more timely and cost-effective for others.

Given the number of changes to the Astro Digital system over time, this amendment application provides the full, baseline technical specifications² for the remaining twenty-five

¹ See Stamp Grant, Astro Digital, IBFS File No. SAT-MOD-20210319-00036 (granted May 28, 2021) (“May 2021 Grant”); Stamp Grant, Astro Digital, IBFS File No. SAT-AMD-20200528-00064 (granted in part Oct. 9, 2020) (“October 2020 Grant”); Stamp Grant, Astro Digital, IBFS File No. SAT-LOA-20170508-00071 (granted in part Aug. 1, 2018) (“August 2018 Grant”); Stamp Grant, Astro Digital, IBFS File No. SAT-LOA-20170508-00071 (granted in part Dec. 14, 2017) (December 2017 Grant); *see also* Application of Astro Digital, IBFS File No. SAT-LOA-20170508-00071 (filed May 8, 2017) (“Initial Application”).

² Astro Digital is also submitting a Schedule S to reflect the technical parameters for the remaining twenty-five satellites. The previously submitted Schedule S provides information on

satellites in the Astro Digital constellation that have not yet been authorized.³ The baseline specifications include the Astro Digital communications system for TT&C and data downlinks for all future missions and the Corvus Micro form factor. While each of the specific future missions will differ, the missions generally will support or involve demonstrations, tests, or commercial operations regarding: imaging or other sensing activities; development of new technologies supporting the advancement of satellite imaging capabilities, such as on-board computing or optical transmissions.⁴ None of the future missions will involve transmitting radiofrequency payloads on spectrum other than the baseline communications frequencies. Accordingly, Astro Digital believes approval of the communications system for the constellation would be appropriate.⁵

the five authorized satellites. *See* August 2018 Grant at Schedule S, *available at* https://licensing.fcc.gov/myibfs/download.do?attachment_key=1228987.

³ Accordingly, some of the information provided duplicates information previously submitted. To the extent there are any inconsistencies with previously submitted information, the information in this application, with respect to the twenty-five satellites that have not yet been authorized, should be treated as accurate.

⁴ For future missions that do not fall into the identified categories, Astro Digital may separately seek other licensing approvals, including through the small satellite streamlined licensing process or the experimental licensing processing, as appropriate. Astro Digital is aware of the requirement to obtain a satellite imaging license from the National Oceanic and Atmospheric Administration (“NOAA”) for satellite imaging activities and, in all cases, will work with NOAA to ensure that the correct party, whether Astro Digital or its customer, possesses the necessary NOAA license.

⁵ *See In the Matter of Kuiper Systems, LLC Application for Authority to Deploy and Operate a Ka-band Non-Geostationary Satellite Orbit System*, Order and Authorization, IBFS File No. SAT-LOA-20190704-00057, FCC 20-102 (rel. July 30, 2020) (approving radiofrequency assignment for 3,236 satellites pending submission of future orbital debris mitigation plan); *Space Exploration Holdings, LLC*, Memorandum Opinion, Order and Authorization, IBFS File Nos. SAT-LOA-20161115-00118, SAT-LOA-20170726-00110, FCC 18-38 (rel. Mar. 29, 2018) (approving radiofrequency assignment for 4,425 satellites pending submission of future orbital debris mitigation plan).

Because future missions may have different mission profiles from an orbital debris perspective, Astro Digital will submit supplemental orbital debris information and request additional FCC authority at the appropriate time.

I. Background

On May 8, 2017, Astro Digital submitted a space station application seeking to deploy its satellite constellation comprised of thirty operational satellites providing Earth-Exploration Satellite Service (“EESS”), *i.e.*, the Landmapper constellation. On December 14, 2017, the International Bureau (“Bureau”) granted Astro Digital authority to launch and operate one satellite,⁶ and on August 1, 2018, the Bureau granted similar authority for up to five total satellites.⁷ Subsequently, the Bureau approved various technical and other changes to the authorized satellites.⁸ The five authorized Astro Digital satellites have since been launched,⁹ and now the company requests authority to launch and operate the remaining twenty-five satellites that were initially requested.¹⁰

Astro Digital expects that each of the 25 satellites in its mission-as-a-service fleet (hereafter the “Astro Digital Constellation”) will use only frequency bands, identified below, which have been previously approved in prior grants, *i.e.* the UHF, S-band, and Ka-band

⁶ See December 2017 Grant.

⁷ See August 2018 Grant.

⁸ See May 2021 Grant; October 2020 Grant.

⁹ See, *e.g.*, Letter from Chris Biddy, CEO, Astro Digital, to Marlene H. Dortch, Secretary, FCC, IBFS File No. SAT-LOA-20170508-00071 (filed June 29, 2020); *see also* Letter from Chris Biddy, CEO, Astro Digital, to Marlene H. Dortch, Secretary, FCC, IBFS File No. SAT-LOA-20170508-00071 (filed Dec. 14, 2020).

¹⁰ See August 2018 Grant (granting right to operate five of the thirty requested satellites and deferring action on Astro Digital’s request to operate the remaining twenty-five satellites).

frequencies. Accordingly, no new frequency bands are requested in this amendment application.¹¹

II. Discussion

By this Application, Astro Digital seeks authority to amend its license application with respect to its pending request for 25 additional satellites. The amendment includes technical and other changes that reflect the company's pivot from an Earth-imaging constellation and service to a mission-as-a-service provider.

Astro Digital seeks to deliver a holistic and seamless solution for its customers to fulfill space missions in a timely and cost-effective manner by providing customers with a turnkey system for space missions. From manufacturing to licensing, Astro Digital provides a comprehensive and robust business solution to achieve mission goals efficiently.

Specifically, Astro Digital business models addresses the technical, infrastructure, financial, and regulatory challenges of customer missions, not only through development of hardware but also through the related, ancillary matters, including early mission design, launch procurement, export, and satellite licensing. While each mission will be tailored for each specific customer and Astro Digital will have contractual obligations for the operation of customer payloads, Astro Digital at all times will operate and control the satellite bus, including the ability to shut off all payloads.

By standardizing the logistics of spacecraft manufacturing and deployment on behalf of customers through innovative processes and mission-proven experience, Astro Digital removes the primary difficulties with any space mission and increases accessibility to space for

¹¹ As discussed below in Section II.2, Astro Digital seeks to expand the previously authorized channel width of the S-band uplink.

educational, commercial, and government customers alike. For the reasons stated above, Astro Digital submits that grant of this application is in the public interest.

Each Astro Digital satellite will consist of a satellite carrying one or more payloads, which Astro Digital will operate on behalf of its customers. Astro Digital's satellite bus can be adapted to host a variety of payload types. As discussed above, while each of the specific missions may differ, Astro Digital expects that the primary payloads will be scientific sensors and demonstrations of technology that support the sensing systems, such as on-board processing used to enhance sensed data. Accordingly, the Astro Digital Constellation should be treated as an EESS system.¹²

Each satellite will utilize a standardized, flight-proven Corvus satellite bus and the same standardized communications frequency bands.¹³ Recognizing that specific (non-RF) payloads¹⁴ may be different in future missions, Astro Digital requests that the Commission nonetheless approve Astro Digital's baseline radiofrequency operations in advance to facilitate frequency coordination and minimize mission delay. To the extent necessary, Astro Digital will supplement the record or seek authorization to modify the satellite to reflect any changes in approved parameters. Thus, in general, Astro Digital would in most situations expect to submit a mission-specific ODAR.

A. Orbital Parameters

¹² See *infra* Section III.C (requesting waivers for use of frequency bands allocated for EESS to the extent necessary).

¹³ Astro Digital intends to use two different satellite buses: the Corvus Micro form factor and the Corvus XL form factor. Information regarding the Corvus Micro form factor is included in the attached ODAR. Astro Digital will provide information regarding the Corvus XL form factor, as necessary, for future missions.

¹⁴ See *infra* note 15.

Each satellite will be launched within the following range of orbital parameters:

Target deployment orbital altitude: 525 km $\pm$ 25 km, circular

Orbit type: Sun-synchronous orbit

Inclination: 97.5 degrees $\pm$ 0.5 degrees

The Landmapper constellation is providing “space as a service” using rideshare opportunities to make launch service cost effective. As such, the actual orbital parameters will vary based upon actual rideshare opportunities contracted. In the accompanying Schedule S, a constellation of 25 satellites was defined in 5 planes of 5 satellites in circular orbit with orbit altitude of 525 km. The orbital planes are spaced evenly in RAAN and the spacecraft in each orbit are spaced evenly in mean anomaly. The tolerances for the orbital parameters provided in the Schedule S are listed below:

- Orbit Altitude: $\pm$ 25 km
- Inclination: $\pm$ 0.5 degrees
- RAAN: $\pm$ 18 degrees
- Mean Anomaly: $\pm$ 36 degrees

B. Radiofrequency Parameters

Each satellite in the Astro Digital Constellation will use the frequencies identified in Table 1. All of the frequency bands have been previously approved and coordinated in prior applications for use with Astro Digital’s five authorized satellites. The proposed uses for the remaining 25 satellites are also consistent with previously proposed and authorized uses.¹⁵

¹⁵ See, e.g., May 2021 Grant. As discussed above, Astro Digital does not plan to seek authority to add new radiofrequency payloads on future satellites. For completeness, Astro Digital notes that its five previously authorized satellites were authorized to operate in the 402.88-402.92 MHz band (Earth-to-space).

Frequency Band	Direction	Use
UHF		
400.48-400.52 MHz	space-to-Earth	LEOP and TT&C
S band		
2025-2110 MHz ¹⁶	Earth-to-space	TT&C data flow control
Ka band		
25.5-27.0 GHz	space-to-Earth	data downlink

Table 1. Baseline Communications Frequencies

Provided in Exhibit C is a table identifying the ground stations that Astro Digital intends to use with the Astro Digital Constellation and the relevant frequency bands. Consistent with Astro Digital’s current license condition requirements, Astro Digital will maintain an updated list of coordinated earth stations in the license application docket.¹⁷

Additionally, Astro Digital affirms it meets the requirements regarding frequency tolerance and out of band emissions.¹⁸ Further, Astro Digital confirms that all downlink transmissions can be turned on and off by ground telecommand, thereby achieving cessation of emissions from the satellite.¹⁹

1. 400.48-400.52 MHz (space-to-Earth)

a. Technical Specifications

Astro Digital requests authorization to use the UHF frequencies for telemetry. The satellite’s primary telemetry transmitter will operate at a maximum data rate of 38.4 kbps and

¹⁶ Astro Digital previously coordinated the use of a 300 kHz channel centered on 2056.0 MHz. However, Astro Digital is able to modify the specific frequency channel in the S-band frequencies, as necessary to facilitate coordination of the remaining 25 satellites in its constellation.

¹⁷ See May 2021 Grant, Condition 17 (“Astro Digital must provide the FCC with a list of such earth stations and any operating condition as a result of coordination with the Federal agencies within ten business days of completing coordination.”); *see also* Letter from Chris Biddy, Astro Digital, to Marlene H. Dortch, FCC, (Mar. 16, 2021).

¹⁸ 47 C.F.R. § 25.202.

¹⁹ 47 C.F.R. § 25.207.

have a maximum transmission bandwidth of 40 kHz. Astro Digital has previously coordinated the use of the UHF frequencies with relevant Federal operators. Pursuant to those discussions, Astro Digital intends to maintain a minimum distance of 4000 kilometers from the NASA International Space Station (NORAD Designation 25544 or international spacecraft ID 1998-067A) during its UHF downlink sessions with a cooperating ground station. Astro Digital will also ensure that its operations will not exceed the long-term interference criteria specified in Table 2 (Type C) of Recommendation ITU-R RS.1263-2 to protect DoC/NOAA radiosondes operations in the U.S. and its Possessions. Further, Astro Digital is able to modify the specific frequency channel in the band as necessary to facilitate coordination.

b. Compliance with U.S. Table of Frequency Allocations

The 400.15-401 MHz band (space-to-Earth) band is allocated internationally and in the U.S for federal and non-federal mobile-satellite and space research use on a primary basis as well as for federal and non-federal space operation use on a secondary basis.²⁰ Accordingly, Astro Digital's use of these frequencies for telemetry is consistent with the table of allocations.

c. UHF Processing Round

Astro Digital is aware that the FCC established an October 15, 2019, cut-off deadline for requests to operate, *inter alia*, in the 400.15-401 MHz band for the provision of Mobile-Satellite

²⁰ This band is also allocated to meteorological aids and meteorological-satellite service and to the space research service in the space-to-space direction for communications with manned space vehicles.

Service.²¹ As the FCC has acknowledged, Astro Digital’s application, which was originally filed in 2017, is a part of this processing round.²²

In any event, Astro Digital’s proposed use of this band for space operations on a secondary basis is limited and not mutually exclusive with other operations on a long-term basis. Accordingly, the request to use these frequencies should not be treated as inconsistent with the 400.15-401 MHz processing round.

2. 2025-2110 MHz (Earth-to-space)

a. Technical Specifications

Astro Digital requests authorization to use the previously authorized S-band uplinks for the remaining twenty-five satellites in the constellation for TT&C and data flow control.²³ The primary command receiver will operate at a maximum data rate of 250 kbps and have a maximum emission bandwidth of 300 kHz. Two patch antennas located on the NADIR and Zenith surfaces of the spacecraft (-Z and +Z, respectively) will be summed together so that both antennas can simultaneously receive signals. Both patch antennas utilize RHCP.

Astro Digital previously coordinated the use of the S-band TT&C uplink with relevant Federal operators and those coordinated satellites operate on a single 300 kHz channel centered at 2056.0 MHz. The technical information provided in the appendix and Schedule S is based on this representative channel. However, Astro Digital is able to modify the specific frequency channel in the band as necessary to facilitate coordination. Thus, for example, Astro Digital

²¹ See *Cut-off Established for Additional NVNG MSS Applications or Petitions for Operations in the 399.9-400.05 MHz and 400.15-401 MHz Bands*, Public Notice, DA 19-779 (rel. Aug. 15, 2019).

²² See *Satellite Policy Branch Information*, Public Notice, DA 20-184 (Feb. 21, 2020).

²³ October 2020 Grant; May 2021 Grant.

could operate on a center frequency channel of 2055 MHz if necessary to facilitate coordination with other operators.

The S-band uplink for data flow control will be used to set the Ka-band high speed downlink modulation and coding parameters during earth station contact as well as re-request any previously detected dropped packets. The data flow control will operate at a maximum data rate of 26 Mbps and have a maximum transmission bandwidth of 5 MHz. Based on prior pre-coordination discussions, Astro Digital intends to transmit at a center frequency of 2047.5 MHz.

b. Compliance with U.S. Table of Frequency Allocations

The 2025-2110 MHz band is allocated to space operations, space research, and EESS, *inter alia*, in all ITU regions. In the United States, space operations are limited to Federal operators, and space research and EESS use by commercial operators is subject to conditions as may be applied on a case-by-case basis and the limitation that any use may not cause harmful interference to authorized operations.²⁴ As discussed above, the Astro Digital Constellation should be treated as an EESS system,²⁵ and accordingly, the use of this band is consistent with the International Table of Frequency Allocations. Nonetheless, as discussed in the waiver section below, Astro Digital requests a waiver of the U.S. Table of Frequency Allocations to the extent necessary.

3. 25.5-27 GHz (space-to-Earth)

a. Technical Specifications

²⁴ See 47 C.F.R. § 2.106 n.US347.

²⁵ Alternatively, the Astro Digital satellites could be treated as part of a space research system given the nature of the missions.

Astro Digital requests authorization to use the previously authorized 25.5-27 GHz band for data downlink.²⁶ The high-speed downlink transmitter operating in the downlink direction from 25.5-27 GHz will operate at a maximum data rate of 2.4 Gbps and have a maximum emission bandwidth of 450 MHz. In the Schedule S, Astro Digital has identified six representative channels. The satellites' corresponding data flow control receiver operates in the 2025-2110 MHz band (Earth-to-space).²⁷

Astro Digital will ensure that power flux-density (“PFD”) from operations does not exceed the limits in Section 25.208(p), Table 21-4 of the ITU Radio Regulations, and the limits and guidelines in Recommendation ITU-R SA.1862. For purposes of calculating compliance with the PFD limits at the Earth’s surface, Astro Digital has assumed a worst-case operating orbital altitude of 300 km.

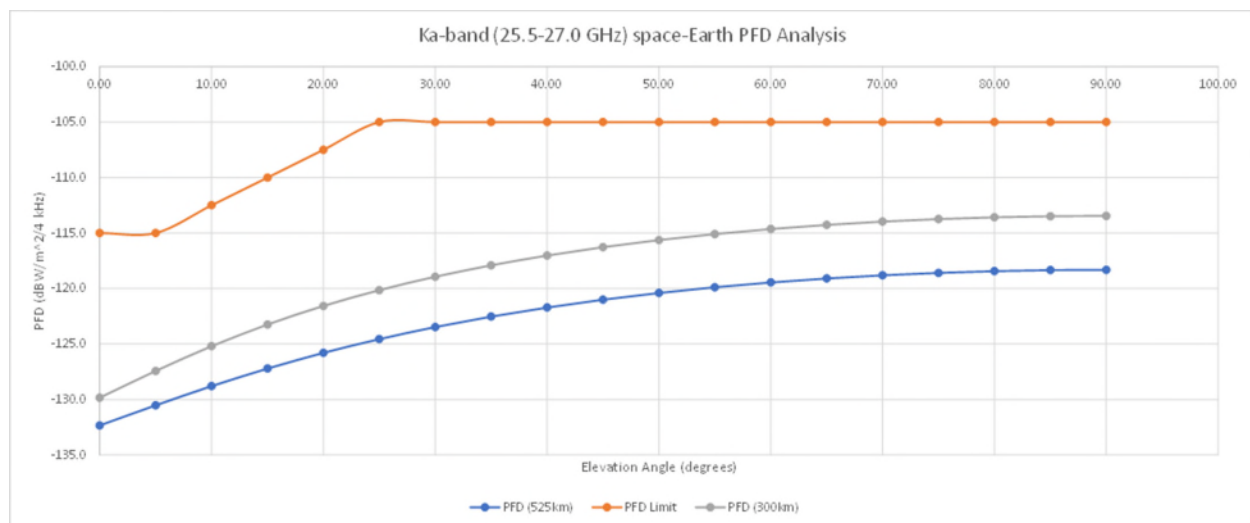


Figure 1. PFD vs Elevation Angle

²⁶ October 2020 Grant; May 2021 Grant.

²⁷ See *supra* Section II.2.

b. Compliance with U.S. Table of Frequency Allocations

The 25.5-27 GHz band is allocated internationally and in the U.S for EESS and space research on a primary basis for non-Federal use, subject to conditions as may be applied on a case-by-case basis.²⁸ Astro Digital's primary data downlink and corresponding data flow control uplink (operating in the S-band frequencies) at present will be used at the ground stations specified in Exhibit C.²⁹

As discussed above, the Astro Digital Constellation should be treated as an EESS system,³⁰ and accordingly, the use of this band is consistent with the International Table of Frequency Allocations. Nonetheless, as discussed in the waiver section below, Astro Digital requests a waiver of the U.S. Table of Frequency Allocations to the extent necessary.³¹

C. Upcoming Mission

The next upcoming mission, named Conejo, is scheduled for launch in Q4 2023. The Conejo mission is a technology demonstration of an on-board quantum computing system that has potential application for EESS systems, as well as other systems. The fully self-contained system will utilize the Astro Digital Corvus Micro as an on-orbit host. The AD Corvus Micro will receive configuration commands via the vehicle's TT&C system and relay them to the technology demonstration payload. Technology demonstration payload data will be routed through the high-speed Ka-band downlink. There will be no RF emitters directly from the technology demonstration payload. There is no propulsion system, and Astro Digital expects

²⁸ See 47 C.F.R. § 2.106 n.US258.

²⁹ In the future, Astro Digital may seek to use these data downlinks at additional ground stations and will properly coordinate any such proposed use.

³⁰ Alternatively, the Astro Digital satellites could be treated as part of a space research system given the nature of the missions.

³¹ See *infra* Section III.2.

passive reentry within 6 years consistent with analysis on similar vehicle configurations and missions. The mission lifetime is one year. The attached ODAR is based on this mission.

III. Waiver Requests

A. Modified Processing Round Rules

Consistent with Astro Digital’s initial application and for completeness,³² Astro Digital requests that this application be processed pursuant to the first-come, first-served procedure adopted for “GSO-like satellite systems” under Section 25.158 of the Commission’s rules.³³ To the extent necessary to allow for such processing, Astro Digital also requests waiver of Sections 25.156 and 25.157 of the Commission’s rules, which stipulate the processing of “NGSO-like satellite systems” under a modified processing round framework.³⁴

The Commission previously granted Astro Digital a waiver of the modified processing round requirement,³⁵ as well as with respect to numerous other EESS or similar operators.³⁶ Astro Digital is not requesting use of any frequency bands not already authorized for Astro Digital’s use.

Astro Digital is capable of sharing the S-band and Ka-band spectrum with current and future systems operating in the same frequency bands. Spectrum sharing in the proposed

³² See Stamp Grant, Astro Digital, IBFS File No. SAT-LOA-20170508-00071 (granted in part Aug. 1, 2018).

³³ 47 C.F.R. § 25.158.

³⁴ 47 C.F.R. §§ 25.156 and 25.157.

³⁵ See, e.g., Stamp Grant, Astro Digital, IBFS File No. SAT-LOA-20170508-00071 (granted in part Aug. 1, 2018); Stamp Grant, Astro Digital, IBFS File No. SAT-LOA-20170508-00071 (granted in part Dec. 14, 2017).

³⁶ See e.g., Stamp Grant, Planet Labs Inc., IBFS File No. SAT-MOD-20200615-00076 (granted Mar. 18, 2021); see also *DigitalGlobe, Inc.*, 20 FCC Rcd. 15696, 15701 (2005) (“*DigitalGlobe Order*”).

frequencies will be possible because Astro Digital's satellites and satellites in other similar systems transmit/receive only in short periods of time while visible to a receiving/transmitting Earth station. For harmful interference to occur, satellites belonging to different systems would have to travel through the antenna beam of the relevant Earth station and transmit at exactly the same time. In such an unlikely event, the resulting interference can still be avoided by coordinating the satellite transmissions so that they do not occur simultaneously. Accordingly, there is no mutual exclusivity between Astro Digital's satellites and other NGSO EESS systems using the same frequency band. Astro Digital will also comply with technical requirements in Part 2 of the Commission's rules and applicable ITU rules and complete coordination with the Federal operators as required.³⁷

Because the purpose of the modified processing round is to preserve opportunities for competitive entry in frequency bands where licensing the first applicant to operate in the band would prevent subsequent applicants from using the spectrum, grant of the waiver would not undermine the rules.³⁸ Accordingly, waiving Sections 25.156 and 25.157 will not undermine the policy objectives of these rules, and the waiver request is justified here.

B. Default Service Rules

³⁷ See *Space Imaging, LLC, Declaratory Order and Order and Authorization*, 20 FCC Rcd 11964 ¶¶ 26-31 (2005) ("*Space Imaging Order*"); *DigitalGlobe Order* ¶¶ 1, 15; see also Stamp Grant, Planet Labs Inc., IBFS File No. SAT-MOD-20170713-00103 (granted Jul. 18, 2019); Stamp Grant, Skybox Imaging, Inc., IBFS File No. SAT-LOA-20120322-00058 (granted Sept. 9, 2012); Stamp Grant, Spire Global Inc., IBFS File No. SAT-LOA-20151123-00078 (granted in part Mar. 18, 2016).

³⁸ See, e.g., *Space Imaging Order* ¶ 10.

Consistent with Astro Digital’s initial application and for completeness,³⁹ Astro Digital requests a waiver of the default service rules under Section 25.217(b) of the Commission’s rules.⁴⁰ The Commission has not adopted band-specific rules for the services Astro Digital proposes to provide. Additionally, the Commission has previously granted a waiver of the default service rules to NGSO EESS and other similar applicants based on the fact that the operators are required to comply with technical requirements in Part 2 of the Commission’s rules and applicable ITU rules.⁴¹ In these cases, the Commission concluded that, because the cited requirements had been sufficient to prevent harmful interference, there was no need to impose additional technical requirements on operations in that band and, therefore, granted the waiver requests. These same reasons warrant waiver of the default service rules here.

C. U.S. Table of Frequency Allocations

1. 2025-2110 MHz (Earth-to-space)

The 2025-2110 MHz band is allocated to Space Operations, space research, and EESS, *inter alia*, in all ITU regions. In the United States, Space Operations are limited to Federal operators, and space research and EESS use by commercial operators is subject to conditions as may be applied on a case-by-case basis and the limitation that any use may not cause harmful interference to authorized operations.⁴² As discussed above, the Astro Digital Constellation

³⁹ See Stamp Grant, Astro Digital, IBFS File No. SAT-LOA-20170508-00071 (granted in part Aug. 1, 2018).

⁴⁰ 47 C.F.R. § 25.217.

⁴¹ See *Space Imaging Order* ¶¶ 26-31; *DigitalGlobe Order* ¶¶ 1, 15; see also Loft Orbital Solutions, Inc., IBFS File No. SAT-LOA-20190807-00072 at Narrative, 14-15 (granted Oct. 8, 2020); Loft Orbital Solutions, Inc., IBFS File No. SAT-AMD-20200527-00063 at Narrative, 8-9 (granted Oct. 8, 2020).

⁴² See 47 C.F.R. § 2.106 n.US347.

should be treated as an EESS system,⁴³ and use of this band for TT&C and data flow control can and will be coordinated ensuring that operations will not cause harmful interference.⁴⁴

Accordingly, Astro Digital's constellation may use this frequency band consistent with the U.S. Table of Frequency Allocations. Nonetheless, to the extent necessary, Astro Digital requests a waiver of the U.S. Table of Frequency Allocations in the event the Commission concludes that Astro Digital's system is not an EESS system.

2. 25.5-27 GHz (space-to-Earth)

The 25.5-27 GHz band is allocated internationally and in the U.S for EESS and space research on a primary basis for non-Federal use, subject to conditions as may be applied on a case-by-case basis.⁴⁵ As discussed above, the Astro Digital Constellation should be treated as an EESS system,⁴⁶ and use of this band for data downlink can and will be coordinated ensuring that operations will not cause harmful interference. Therefore, Astro Digital's use of its assigned Ka-band frequencies for EESS is consistent with its authorization and allocation of the band. Nonetheless, to the extent necessary, Astro Digital requests a waiver of the U.S. Table of Frequency Allocations for use of these bands.

IV. Orbital Debris Considerations

Astro Digital confirms that its proposed system will not undergo any planned release of debris during its normal operations. In addition, all separation and deployment mechanisms, and

⁴³ Alternatively, the Astro Digital satellites could be treated as part of a space research system given the nature of the missions.

⁴⁴ Astro Digital's use of the S-band frequencies is also consistent with the space operations allocation outside the United States.

⁴⁵ See 47 C.F.R. § 2.106 n.US258.

⁴⁶ Alternatively, the Astro Digital satellites could be treated as part of a space research system given the nature of the missions.

any other potential source of debris, will be retained by the spacecraft. Astro Digital has also assessed the probability of the space station becoming a source of debris by collision with small debris or meteoroids of less than one centimeter in diameter that could cause loss of control and prevent post-mission disposal. Astro Digital has taken steps to limit the effects of such collisions through shielding, the placement of components, and the use of redundant systems.

Astro Digital has assessed and limited the probability of accidental explosions during and after completion of mission operations through a failure-mode verification analysis. As part of the satellite manufacturing process, Astro Digital has taken steps to ensure that debris generation will not result from the conversion of energy sources on board the satellite into energy that fragments the satellite. All sources of stored energy onboard the spacecraft will have been depleted or safely contained when no longer required for mission operations or post-mission disposal.

Astro Digital has assessed and limited the probability of the space station becoming a source of debris by collisions with large debris or other operational spacecraft. Astro Digital will work closely with its launch providers to ensure that the satellite is deployed in such a way as to minimize the potential for in-plane collision. This specifically includes minimizing the potential for collision with crewed spacecraft.

Astro Digital participates in a sharing agreement with the 18th Space Control Squadron, USAF to better coordinate collision avoidance measures and receive conjunction threat reports. Astro Digital's satellites will carry onboard GPS receivers that provide for precise orbital position determination. Astro Digital also receives from the 18th SPCS updated two-line element sets, or "TLEs," which facilitate the identification and tracking of its satellites. The 18th SPCS will be able to reach Astro Digital's satellite operations team that is accessible twenty-four hours

per day/seven days per week to ensure that Astro Digital can take immediate action to coordinate any collision avoidance measures the company is able to make.

Attached to this Application is an ODAR for the Conejo mission. Astro Digital will submit a supplementary ODAR and seek amendment or modification of its license, as necessary, for future missions.

V. ITU Compliance

Astro Digital has previously provided ITU Advance Publication Information and other submissions for its system. Astro Digital is preparing the necessary updates to those ITU filings and will submit those documents to the FCC.

VI. Conclusion

For the reasons stated above, Astro Digital submits that the public interest would be served by grant of the application.

Respectfully submitted,

/s/ Chris Biddy

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Dated: June 30, 2022

Exhibit A
Technical Certification

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

/s/ Jan King

Jan King
Chief Scientist
Astro Digital US, Inc.
3171 Jay Street
Santa Clara, CA 95054

Dated: June 30, 2022

Exhibit B

Ownership Information

Astro Digital US, Inc. (“Astro Digital”) is a privately held corporation.

The following individuals hold 10% or more of the equity and/or voting interest in Astro Digital:

Chris Biddy

3171 Jay Street

Santa Clara, CA 95054

~21.5% equity and voting interest on a fully diluted basis

~24.0% equity and voting interest on a non-fully diluted basis

Michael Wilson

3171 Jay Street Santa Clara, CA 95054

~13.4% equity and voting interest on a fully diluted basis

~14.9% equity and voting interest on a non-fully diluted basis

Astro Digital Officers:

Name	Title	Citizenship
Chris Biddy	Chief Executive Officer	USA
Michael Wilson	Chief Financial Officer	USA

Astro Digital Board of Directors:

Name	Citizenship
Chris Biddy	USA
Michael Wilson	USA
Daniel Alper	USA

Exhibit C

Ground Stations

Location	Earth-to-Space Frequency	Space-to-Earth Frequency
Santa Clara, CA	UHF*	UHF
Tromso, Norway	S-band/UHF*	UHF
New Zealand	S-band	UHF
Milan, Italy	S-band/UHF*	UHF
Unst, UK	S-band	UHF
Cork, Ireland	S-band	UHF
Deadhorse, Alaska	S-band	UHF
Fairbanks, Alaska	None	UHF
Windham, NY	None	UHF
Puertollano, Spain	UHF*	UHF
Pretoria, South Africa	S-band	UHF
Littleton, CO	UHF*	UHF
Svalbard, Norway	S-band	Ka-Band
Troll, Antarctica	S-band	Ka-Band

*The UHF uplink frequencies are and will be used for communications with the previously authorized Astro Digital satellites.¹

¹ See Stamp Grant, Astro Digital, IBFS File No. SAT-MOD-20210319-00036 (granted May 28, 2021). The Littleton, Santa Clara, Tromso, and Svalbard (Ka-band) Earth stations have been previously coordinated with federal operators for use with the five authorized Astro Digital satellites. See, e.g., Letter from Chris Biddy, Astro Digital, to Marlene H. Dortch, FCC, (Mar. 16, 2021); Stamp Grant, Astro Digital, IBFS File No. SES-LIC-20200310-00229 (granted June 29, 2021).