Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
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Kuiper Systems LLC	)	Call Sign _____
	)	
Application for Blanket-Licensed Fixed Earth Stations	)	File No. SES-LIC-_____
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APPLICATION FOR BLANKET-LICENSED FIXED EARTH STATIONS

On July 30, 2020, the Commission authorized Amazon[1] to deploy a non-geostationary satellite orbit ("NGSO") system to provide service using certain Fixed-Satellite Service ("FSS") and Mobile-Satellite Service ("MSS") Ka-band frequencies (the "Kuiper System").[2] As the basis for that authorization, the Commission determined that the Kuiper System would serve the public interest by expanding the availability of high-speed broadband service to individual, government, and business customers.[3] Since then, Amazon has committed to invest at least $10 billion to develop the Kuiper System, and Amazon continues to advance toward its goal of providing affordable, high-quality connectivity to customers and communities around the world. Amazon

[1] Kuiper Systems LLC ("Kuiper") is a wholly owned subsidiary of Amazon.com Services LLC (collectively "Amazon").

[2] *See Kuiper Systems LLC, Application for Authority to Deploy and Operate a Ka-band Non-Geostationary Satellite Orbit System*, Order and Authorization, 35 FCC Rcd 8324 (2020) ("*Kuiper System Authorization*"). *See also Kuiper Systems LLC, Request for Modification of the Authorization for the Kuiper NGSO Satellite System*, Order and Authorization, ICFS File No. SAT-MOD-20211207-00186, DA 23-114 (rel. Feb. 8, 2023) ("*Kuiper System Modified Authorization*").

[3] *Kuiper System Authorization* ¶ 9.

has just successfully launched its first prototype satellites and it will begin deploying additional satellites in 2024.[4]

With this application, Amazon seeks blanket authority to operate fixed earth stations for customers ("Customer Terminals" or "CTs") to communicate with the Kuiper System throughout the United States and its territories. This narrative provides the technical and operational characteristics of Amazon's CTs, demonstrates that they will comply with the Commission's rules, and explains why authorizing these CTs will serve the public interest. Amazon provides further technical information in support of this application on FCC Form 312 and Schedule B.[5]

I. INTRODUCTION AND BACKGROUND

Amazon strives to be Earth's most customer-centric company. In keeping with that mission, Amazon will offer a range of CT options that provide its customers choice and flexibility—allowing customers to balance performance and affordability by choosing the CT that best suits their needs. To do so, they can select among three CT form factors: (1) an ultra-compact model, which will provide speeds of up to 100 megabits per second (Mbps); (2) a standard model, which will deliver up to 400 Mbps; and (3) a larger, high-throughput model, designed for enterprise users and capable of delivering speeds of up to 1 gigabit per second (Gbps). Each of these models will communicate with the Kuiper System in the frequency bands 28.35-28.6 GHz, 28.6-29.1 GHz

[4] *See* Thomas Kohnstamm, *Everything you need to know about Project Kuiper, Amazon's satellite broadband network*, About Amazon (Oct. 9, 2023), https://www.aboutamazon.com/news/innovation-at-amazon/what-is-amazon-project-kuiper.

[5] Because the Commission does not require applications in the Ka-band to specify a maximum number of customer terminals, Amazon has entered a value of "0" in the accompanying Form 312, Schedule B, Item E29. This value is entered merely to satisfy form-validation requirements, and is not intended to establish a maximum number of units that Amazon may deploy. *See Comprehensive Review of Licensing and Operating Rules for Satellite Services*, Second Report and Order, 30 FCC Rcd 14713 ¶ 291 (2015).

and 29.5-30.0 GHz (Earth-to-space); and 17.8-18.6 GHz, 18.8-19.4 GHz and 19.7-20.2 GHz (space-to-Earth), consistent with the *Kuiper System Modified Authorization*.[6]

II. GRANT OF THE APPLICATION WILL SERVE THE PUBLIC INTEREST

When the Commission originally authorized the Kuiper System, it concluded that "grant of Kuiper's application would advance the public interest" because the Kuiper System was "designed to increase the availability of high-speed broadband service to consumers, government, and businesses."[7] The same public interest considerations support grant of this CT application. Granting this application will allow Amazon's Kuiper System to deliver satellite broadband communications services to millions of unserved and underserved consumers and businesses, as well as government users.[8]

The unique benefits promised by Amazon's innovative CT design further support this public interest finding. The CTs will utilize a Ka-band electronically steerable phased array antenna based on a new architecture capable of delivering high-speed, low-latency broadband in a form factor that is smaller and lighter than legacy antenna designs. The ultra-compact and standard CTs use overlaid antenna element structures to allow transmit and receive elements to share the same radiating surface, reducing the size and weight of the entire terminal and allowing Amazon

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[6] *See Kuiper System Modified Authorization* ¶ 3. The Commission's rules allow for blanket license applications for NGSO FSS earth stations in these bands. *See* 47 C.F.R. § 25.115(f)(2) (allowing blanket license applications in each of the relevant frequency bands). Amazon acknowledges that the Commission's rules specify that blanket licensing in the 17.8-18.3 GHz band is on an unprotected basis with respect to the Fixed Service, *see id.*, as further described below. Amazon also intends to use the 17.7-17.8 GHz band for space-to-Earth customer links, but only outside the U.S. *See Kuiper System Modified Authorization* ¶ 37.

[7] *Kuiper System Authorization* ¶ 3.

[8] *See, e.g.*, *Inquiry Concerning Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion*, Fourteenth Broadband Deployment Report, 36 FCC Rcd 836, ¶ 2 (2021) (noting that 14.5 million Americans lack access to fixed terrestrial broadband with benchmark download and upload speeds of 25 Mbps and 3 Mbps, respectively).

to offer customers a high-performance terminal at an affordable price. Below, Table 1 provides technical specifications for each CT model.

Table 1: Description of Ultra Compact, Standard, and Enterprise CT Models

	Type I Ultra-Compact	Type II Standard	Type III High-Throughput
Description	Ultra-compact and affordable design.	Affordable high-performance design for residential and small business customers.	Larger, high-throughput design for the most demanding needs.
Size	7 in. x 7 in.	11 in. x 11 in.	19 in. x 30 in.
Speed	Up to 100 Mbps	Up to 400 Mbps	Up to 1 Gbps

Amazon has invested heavily in creating customer terminal designs that are smaller, more affordable, and higher performance than legacy designs. Combining high performance with industry-leading affordability will allow Amazon to serve more customers, including the unserved and underserved, thus helping to close the digital divide. For these reasons, grant of this application will serve the public interest.

III. SPECTRUM USE AND SHARING

Consistent with the *Kuiper System Modified Authorization*, the CTs will operate in the frequencies listed in Table 2. The Commission's rules allow blanket licensing in these bands.[9] Amazon will adhere to all International Telecommunication Union ("ITU") requirements and the Commission's rules governing NGSO Ka-band customer terminals. Amazon will also operate the CTs consistently with the terms and conditions of its space station authorization, including by adhering to the conditions of that authorization governing spectrum sharing with other services and operators sharing these frequencies.[10]

[9] 47 C.F.R. § 25.115(f)(2).

[10] *See Kuiper System Modified Authorization* ¶¶ 31-32, 35, 38-42.

Table 2: Kuiper CT Frequencies

Link Type	Frequencies (GHz)[11]
Broadband Uplink (Earth-to-space)	28.35-28.6
	28.6-29.1
	29.5-30.0
Broadband Downlink (space-to-Earth)	17.8-18.6
	18.8-19.4
	19.7-20.2

Amazon recognizes that the Earth-to-space operations of its CTs are secondary to geostationary orbit ("GSO") FSS in the 28.35-28.6 GHz and 29.5-30.0 GHz frequency bands.[12] Amazon will not claim interference protection from GSO FSS in these bands and certifies that it will comply with the applicable equivalent power flux-density ("EPFD") limits in ITU Radio Regulations Article 22 and Resolution 76 to ensure its proposed transmissions do not cause unacceptable interference to GSO FSS.[13] Amazon's operations are licensed as NGSO FSS, and may operate on a primary basis in the 28.6-29.1 GHz band.[14] Amazon will ensure the operations in the downlink frequency bands listed in Table 2 follow relevant spectrum sharing requirements in the Commission's rules as well as the terms of the *Kuiper System Modified Authorization*.[15]

[11] *See* 47 C.F.R. § 2.106; *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 (2017) ("*NGSO FSS Order*"); *id*. at 7850-51 Appendix B ("*Ka-band Plan*").

[12] *See* 47 C.F.R. § 2.106; *Ka-band Plan*.

[13] *See* 47 C.F.R. §§ 2.106, 25.115(f)(1), 25.146(a)(2); *Ka-band Plan*; ITU Radio Regulations Article 22 and Resolution 76 (WRC-15). *See also Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range*, First Report and Order and Further Notice of Proposed Rulemaking, 16 FCC Rcd 4096, 4129-30 ¶ 77 (2000) ("*2000 NGSO FSS Order*") (concluding that compliance with EPFD limits "will adequately protect GSO FSS networks").

[14] *See* 47 C.F.R. § 2.106; *NGSO FSS Order*; *Ka-band Plan*.

[15] Before operating in these bands, Amazon will complete coordination with U.S. Federal systems. *See* 47 C.F.R. § 2.106 n.US334; *Kuiper System Modified Authorization* ¶ 43.

These include compliance with relevant power flux-density and EPFD limits to protect fixed service ("FS") and GSO FSS operations in these bands.[16]

IV. TECHNICAL SUPPLEMENTS

The following data supplements the data provided in Schedule B to Form 312.[17]

A. Minimum Elevation Angle

Amazon's CTs will communicate only with satellites above a minimum elevation angle of 35 degrees in any azimuth direction.

B. Power and Gain Figures

The CTs will consist of a flat phased array with electronically steerable beams capable of tracking satellites within their field of view. Table 3 includes power and gain figures for each CT:

Table 3: Power and Gain[18] Figures

	Type I Ultra-Compact	Type II Standard	Type III High-Throughput
Antenna Gain dBi (Tx)	31	34	38
Antenna Gain dBi (Rx)	30.1	31.4	37
Max EIRP Density (dBW/Hz)	-35.0	-29.5	-24.2
Boresight EIRP (dBW)	35	40.5	45.8

[16] To share with FS, Amazon will meet the PFD limits in ITU Radio Regulations Article 21. *See Kuiper System Modified Authorization* ¶¶ 34-35. To share with GSO FSS, Amazon certifies it will comply with the applicable EPFD limits in ITU Radio Regulations Article 22 and Resolution 76.

[17] To the extent relevant, Amazon hereby incorporates the technical information submitted with its space station applications. *See* Application of Kuiper Systems LLC for Authority to Deploy and Operate a Ka-band Non-Geostationary Satellite Orbit System, ICFS File No. SAT-LOA-20190704-00057 (filed July 4, 2019); Application of Kuiper Systems LLC for Modification of Authorization for the Kuiper System, ICFS File No. SAT-MOD-20210806-00095 (filed Aug. 6, 2021). Additionally, the Commission's earth station licensing rules predicated on antenna performance standards do not apply to this application. *See, e.g*, *Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range*, Report and Order, 16 FCC Rcd 4096 ¶ 240 (2000) (declining to adopt reference patterns for use in licensing NGSO FSS user terminals).

[18] Maximum un-steered gain.

V. CONCLUSION

As of 2022, 2.7 billion people remained unconnected to the internet worldwide, and the rate of connecting the unconnected is slowing.[19] In the United States alone, by some estimates, approximately 42 million people lack a broadband connection.[20] The digital divide is often widest in rural and low-income areas, where high-speed broadband coverage is most limited.[21] Even for those with connectivity, the available options can fail to provide the affordable and high-speed service necessary for activities like distance learning, remote work, or telehealth.[22] Closing this connectivity gap requires innovative technological solutions like Amazon's cutting-edge customer terminal designs—which will bring high speed and affordable options to broad swaths of unserved and underserved Americans. Prompt grant of this application will accelerate the deployment of the Kuiper System and its ability to expand broadband access for consumer, business, and government users across the United States.

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[19] *See Internet surge slows, leaving 2.7 billion people offline in 2022*, Press Release, International Telecommunication Union (Sept. 16, 2022), https://www.itu.int/en/mediacentre/Pages/PR-2022-09-16-Internet-surge-slows.aspx.

[20] *See* John Busby et al, *BroadbandNow Estimates Availability for all 50 States; Confirms that More than 42 Million Americans Do Not Have Access to Broadband*, BroadbandNow (May 5, 2021), https://broadbandnow.com/research/fcc-broadband-overreporting-by-state.

[21] *See* U.S. Government Accountability Office, GAO-22-104611, *Broadband: National Strategy Needed to Guide Federal Efforts to Reduce Digital Divide*, at 5-6 (2022), available at https://www.gao.gov/assets/gao-22-104611.pdf (noting that 17% of rural Americans lack access to fixed broadband speeds of 25 Mbps and that high-speed coverage is more limited in low-income areas).

[22] *See id.* at 6 ("Some observers have noted that FCC's benchmark speed of 25/3 Mbps for fixed broadband may be too slow for many residential situations, for example, where there are multiple users and devices in a household.").

Respectfully submitted,

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