

Kuiper Systems LLC
Application for Experimental Radio Service
Request for Special Temporary Authority
Narrative Statement

Pursuant to Sections 5.51, 5.54(a)(1), and 5.61 of the rules¹ of the Federal Communications Commission (“Commission”), Kuiper Systems LLC, a wholly owned subsidiary of Amazon.com Services LLC (“Amazon”), hereby respectfully requests Special Temporary Authority to operate with the parameters described in the STA granted by the Commission on July 5, 2024 for call sign WX9XHA (the “Brewster STA”),² incorporated herein by reference, with the following modifications: (1) add an emission designator 1G00D7W to WX9XHA’s authorized³ operation in 27.5-28.5 GHz and 29.0-30.0 GHz; (2) increase the maximum Effective Isotropically Radiated Power (“EIRP”) of WX9XHA’s authorized⁴ Continuous Wave (“CW”) transmissions only at 27.5, 29.55, and 30 GHz in order to conduct In-Orbit Testing (“IOT”) and Passive Intermodulation (“PIM”) measurements within the permitted scope of services specified in Sections 5.3(e), (h), (j), and (k); and (3) remove or modify conditions 10 and 11. In support of its request, Amazon provides the following additional information required by Section 5.61:

(1) Name, address, phone number (also email address and facsimile number, if available) of the applicant.

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(2) Explanation of why an STA is needed.

In the Brewster STA, Amazon sought special temporary authority to conduct IOT of its satellite transponders on its already authorized non-geostationary (“NGSO”) satellite constellation of identical space stations⁵ to perform IOT measurements. Amazon now seeks a similar STA modified to enable measurement of the earth station’s transmitter PIM, a rare non-linearity appearing at higher EIRP values and when the bandwidth is maximized. In addition, Amazon seeks

¹ 47 C.F.R. §5.51, 5.54(a)(1), 5.61.

² Call Sign WX9XHA, ELS File No. 0898-EX-ST-2024.

³ *Id.*

⁴ *Id.*

⁵ *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).

to evaluate the design trade-offs between throughput and PIM. The transmissions will also be used to characterize the antenna transmissions': a) compliance with 47 C.F.R. Part 25, b) link performance specifications, and c) antenna PIM. These measurements form part of Amazon's program to develop high-speed, innovative, satellite-delivered services to unserved/underserved customers worldwide. Accordingly, grant of the requested experimental authority would serve the public interest, convenience, and necessity. If the instant request is granted, Amazon respectfully requests that the Brewster STA be cancelled.

(3) Description of the operation to be conducted and its purpose.

The description of the operation, locations, and antennas are the same as in the narrative submitted with the Brewster STA and incorporated here by reference. In addition, Amazon requests that the operational envelope for antennas TR1 and TR2 be expanded as follows:

- 1) Operate using an EIRP of 67 dBW (vs. previous 63 dBW) when transmitting CW emissions at frequencies of 27.5, 29.55, and 30 GHz;
- 2) Operate with an emission designator of 1G00D7W in the 27.50-28.50 and 29.00-30.00 GHz frequency bands, in addition to previously authorized emissions designators of 500MD7W and 900MD7W.

Amazon seeks 1) and 2) to assess PIM, which is a rare non-linearity that appears at higher EIRP values and when the earth station's bandwidth is maximized. Regarding 1), CW at higher EIRPs can create electronic saturations, which create PIM conditions. Regarding 2), the technical operational bandwidth of the earth station can extend up to 1 GHz, which is the power at which saturation and PIM occur. Furthermore, using the full bandwidth allows Amazon to better evaluate throughput delivery and any degradation caused by PIM. Evaluating the performance of the antenna under 1) and 2) will help Amazon fully characterize its antenna operations to deliver robust, high throughput connectivity to the public. Because the presence of the PIM is rare, Amazon will use these higher EIRP and bandwidths only during limited test times.

(4) Time and dates of proposed operation.

Amazon seeks to commence testing on September 30, 2024 and respectfully requests that the instant request for STA be granted for a period of 180 days. Testing and measurement periods will occur during normal working hours, and the transmitters will be active for limited periods of time (i.e., not continuously transmitting). Amazon recognizes that experimental operations must not cause harmful interference to authorized facilities, and will maintain a 24hr/7day "stop-buzzer" contact to address any complaint of interference and cease operations.

(5) Frequency band, emission designator and EIRP.

Table 1 below shows the transmission characteristics for the additional 1G00D7W emission, as well as the updated EIRP for CW transmissions.

Table 1. Experimental frequencies, emissions and EIRP characteristics

Frequency Band (GHz)	Frequency Tolerance	Antenna	Emission Designator	EIRP	
				Min/Max (W)	Min/Max (dBW)
27.50, 29.55, 30.00	± 10 ppm	TR1, TR2	1H00N0N	19,952.6/5,011,872.3	43/67
27.50-28.50, 29.00-30.00			1G00D7W	19,952.6/1,995,262.3	43/63

Amazon also requests that the instant STA be granted without conditions 10 and 11 as they appear in the Brewster STA grant or with modified such conditions. Conditions 10 and 11 of the Brewster STA specify EIRP and EIRP limits for the TR1 and TR2 antennas.⁶ The conditions appear to be based on *off-axis EIRP and EPFD* calculations that Amazon provided on June 6, 2024,⁷ in response to a request for information from OET staff. However, conditions 10 and 11 do not actually specify that the limits apply to the off-axis EIRP from the Amazon antennas. Additionally, the EPFD calculations provided by Amazon considered a worst-case off-axis angle towards the GSO arc. Amazon’s antennas have the capability to flexibly increase EIRP when pointed further from the GSO arc while still meeting the EPFD limits. Restricting the Amazon antenna EIRP levels based on the worst-case geometry would impact Amazon’s ability to perform needed testing. Amazon requests that conditions 10 and 11 be removed or modified to state that “Operation of the fixed 2.4m and 2.8m Amazon antennas in the 27.5-28.5 GHz and 29.0-30.0 GHz bands shall comply with the EPFD limits specified in Article 22 of the ITU Radio Regulations.”

(6) Radiofrequency (“RF”) exposure compliance

Amazon’s IOT antennas are located on private property on a rooftop with controlled access, preventing any exposure risk to the general population. Occupational workers will be properly trained on how to limit their exposure levels. In addition, signs will be installed to provide information on exposure risks.

⁶ Condition 11 also specifies EIRP and EIRP limits for the TR3 antenna. However, Amazon is not seeking to modify condition 11 as it pertains to the TR3 antenna.

⁷ Exhibit of Amazon’s response (<https://apps.fcc.gov/els/GetAtt.html?id=351596&x=>) to FCC correspondence 85669 (<https://apps.fcc.gov/els/GetAtt.html?id=349588&x=>).