EXHIBIT 1

DESCRIPTION OF PROPOSED MODIFICATION
(Response to Question 43, FCC Form 312)

Pursuant to 47 C.F.R. § 25.117, Hughes Network Systems, LLC ("Hughes") submits this application for modification of its license to launch and operate EchoStar XXIV (also known as "HNS 95W" or "Jupiter 3") (Call Sign S3017), a Ka- and Q/V-band geostationary satellite orbit ("GSO") fixed-satellite service ("FSS") satellite, at the 95.2° W.L. orbital location.[1] Specifically, Hughes seeks minor changes in power levels and telemetry, tracking, and command ("TT&C") frequencies, consistent with the technical design and specifications of the satellite. The proposed modification serves the public interest by facilitating deployment of a next-generation satellite, planned for launch in 2021, and commencement of new, competitive broadband service, at estimated download speeds of up to 100 Mbps, to consumers throughout the continental United States and the Americas.

I. Description of Proposed Technical Changes

Hughes seeks modification to: (i) specify frequencies at 29.997 GHz (Earth-to-space) and 41.999 GHz (space-to-Earth), respectively, for uplink and downlink tracking beacons; and (ii) increase equivalent isotropically radiated power ("EIRP"), EIRP density, and power flux density ("PFD") levels specified in prior application filings. The proposed EIRP, EIRP density, and PFD changes include the following:

[1] *See* Hughes, *Stamp Grant*, IBFS File Nos. SAT-MOD-20190212-00011 *et al.* (June 13, 2019) ("*Jupiter 3 Modification Grant*").

- Increased EIRP and EIRP density levels for the Ka and Q/V band downlink beams (e.g., for Beam Group UT1L, the EIRP increased from 65.1 to 69 dBW in 500 MHz and the EIRP density increased from -24.9 dBW/Hz to -17.2 dBW/Hz)
- Updated PFD analyses to take the worst case pfd level of any of the beams in the user beam group (e.g., Beam Group UT1L) at a given elevation angle and use the increased EIRP density levels for the Ka and Q/V band downlink beams. The maximum pfd levels increased due to the increase in maximum EIRP levels.

These technical changes are reflected in the accompanying Schedule S. Pursuant to 47 C.F.R. § 25.117(c), Hughes certifies that, except for the proposed technical changes, the information provided in prior application filings remains materially unchanged.

A. Tracking Beacon Operations

In addition to the center frequencies currently authorized for TT&C operations, EchoStar XXIV is designed to use an uplink tracking beacon at 29.997 GHz and a downlink tracking beacon at 41.999 GHz. The uplink tracking beacon at 29.997 GHz will be used to maintain the antenna pointing accuracy of the satellite's spot beam antennas. The downlink tracking beacon will continuously transmit at 41.999 GHz, and will be used for pointing of the gateway earth station antennas and rain-fade monitoring over the coverage area of the satellite's gateway beams. Consistent with 47 C.F.R. § 25.202(g), these beacons will operate at the band edges.

The proposed beacon operations are expected to use several earth stations, including at the following U.S. locations:

Station	Polarization
Englewood CO	RHCP
Abilene, TX	RHCP
San Antonio, TX	LHCP
Brownsville, TX	RHCP

Station	Polarization
Casper, WY	LHCP
Minot, ND	RHCP
Midland, TX	LHCP

B. Compliance with Applicable Power Limits and Two-degree Spacing Requirements

The proposed FSS operations, as modified herein, will remain in compliance with all applicable EIRP density and PFD limits, as well as the Commission's two-degree spacing requirements. Thus, the proposed technical changes will have no significant impact on the interference environment.[2]

Specifically, the PFD at the Earth's surface produced by Ka-band emissions from the EchoStar XXIV satellite in the 18.3-19.3 GHz, 19.7-20.2 GHz, and 40.0-42.0 GHz bands will not exceed applicable PFD limits specified in Sections 25.140(a)(3)(iii) and 25.208 of the Commission's rules, as well as Article 21 of the ITU Radio Regulations.[3]

Pursuant to 47 C.F.R. § 25.140(a)(3)(iii), Hughes certifies that the proposed FSS downlink operations in the conventional Ka-band will not generate PFD at the Earth's surface in excess of -118 dBW/m^2/MHz and that associated uplink operations will not exceed applicable EIRP density envelopes specified in 47 C.F.R. § 25.218(i), unless Hughes coordinates any non-conforming operations with US-authorized GSO satellites (those authorized through the US or with market access) within six degrees of its assigned 95.2° W.L. orbital location.[4] Accordingly,

[2] With respect to sharing with NGSO systems, Hughes will comply with the Commission's requirements for sharing with NGSO MSS feeder links authorized in the 29.3-29.5 GHz band and with NGSO FSS systems licensed in the 18.8-19.3 and 28.6-29.1 GHz bands. *See* 47 C.F.R. § 25.258; *see also Jupiter 3 Modification Grant*, Attachment at 2-3 (adopting Condition Nos. 8 & 10).

[3] *See* 47 C.F.R. §§ 25.140(a)(3)(iii), 25.208; ITU Radio Regulations, Art. 21.

[4] *See also Jupiter 3 Modification Grant,* Attachment at 2 (adopting Condition No. 5).

the proposed FSS operations in the conventional Ka-band will be compatible with other authorized satellite operations in a two-degree spacing environment.

Additionally, pursuant to 47 C.F.R. § 25.140(a)(3)(vi), the proposed FSS operations in other authorized Ka-band spectrum (*i.e.,* excluding the conventional Ka-band) will be compatible with other authorized satellite operations in a two-degree spacing environment, as demonstrated below:

(1) Currently there are no authorized Ka-band GSO satellites operating in the 27.5-27.85 GHz band within two degrees of the 95.2º W.L. orbital location, and the only authorized Ka-band GSO satellite operating in the 18.8-19.3 GHz, 27.85-28.35 GHz, and 28.6-29.1 GHz bands within this arc is EchoStar XIX, which is licensed to Hughes.[5]

(2) All Ka-band downlink transmissions will not exceed a PFD limit of -118 dBW/m^2/MHz (applicable to conventional Ka-band transmissions under 47 C.F.R. § 25.140(a)(3)(iii)), and associated Ka-band uplink transmissions will not exceed off-axis EIRP density limits specified in 47 C.F.R. § 25.218(i) (applicable to conventional Ka-band transmissions), unless coordinated with US-authorized GSO satellites (those authorized through the US or with market access) operating within six degrees of the 95.2º W.L. orbital location.[6] Because these limits ensure two-degree compatibility in the conventional Ka-band, such limits also may be fairly assumed to ensure two-degree compatibility in Ka-band spectrum immediately adjacent to the conventional Ka-band.

Similarly, pursuant to 47 C.F.R. § 25.140(a)(3)(vi), the proposed FSS operations in all authorized Q/V-band spectrum will be compatible with other satellite operations in a two-degree spacing environment, as demonstrated below:

(1) Currently there are no authorized Q/V-band satellites operating in the 40.0-42.0 GHz, 47.2-50.2 GHz, and 50.4-51.4 GHz bands within two degrees of the 95.2º W.L. orbital location.

[5] Hughes previously certified, pursuant to 47 C.F.R. § 25.140(a)(2), that EchoStar XIX operations will accommodate EchoStar XXIV operations to avoid interference between both satellites. *See* Hughes, Application for Modification, IBFS File No. SAT-MOD-20190212-00011, Attachment A (Technical Annex) at 4 (Feb. 12, 2019).

[6] *See also Jupiter 3 Modification Grant,* Attachment at 2 (adopting Condition No. 5).

(2) To demonstrate two-degree compatibility, the transmission parameters of the EchoStar XXIV satellite are assumed as both the wanted and victim transmissions. Table 2 below provides a summary of the uplink and downlink transmission parameters. These parameters are derived from the EchoStar XXIV clear-sky link budgets. The interference calculations assume a 1 dB advantage for topocentric-to-geocentric conversion, all wanted and interfering carriers are co-polarized, and all earth station antennas conform to a sidelobe pattern of 29-25 log(θ). The C/I calculations are performed on a per Hz basis. These tables take into account the modified EIRP levels in this application and add carriers to address the user beams that operate in the 40-42 GHz band.

Table 2: EchoStar XXIV Q/V-band Transmission Parameters

Carrier ID	Emission Designator	Bandwidth (MHz)	Tx E/S Gain (dBi)	Uplink EIRP (dBW)	Downlink EIRP (dBW)	Rx E/S Gain (dBi)	C/I Criterion (dB)
1	500MG7W	500	69.6	76.1			17
2	250MG7W	250			55.7	68.5	17
3	125MG7W	125			52.7	68.5	17
4	3M67G7W	3.67			37.4	68.5	17
5	1M22G7W	1.22			32.6	68.5	17
6	612KG7W	0.612			29.6	68.5	17
7	125MG7W	125			52.7	43	17
8	250MG7W	250			55.7	43	17

(3) Table 3 below provides the results of the interference calculations in terms of the C/I margins. These results show that the C/I margins are positive in all cases.

Table 3: Summary of the C/I Margins (dB)

		Interfering Carriers							
	Carrier ID	1	2	3	4	5	6	7	8
Wanted Carriers	1	45.7							
	2		44.6	44.6	44.6	44.6	44.6	44.6	44.6
	3		44.6	44.6	44.6	44.6	44.6	44.6	44.6
	4		44.6	44.6	44.6	44.6	44.6	44.6	44.6
	5		44.6	44.6	44.6	44.6	44.6	44.6	44.6
	6		44.6	44.6	44.6	44.6	44.6	44.6	44.6
	7		19.1	19.1	19.1	19.1	19.1	19.1	19.1
	8		19.1	19.1	19.1	19.1	19.1	19.1	19.1

II. The Proposed Modification Is Consistent with Commission Policy and Serves the Public Interest

Commission approval of the proposed technical changes is consistent with its established policy of leaving satellite design decisions to operators in order to promote competition, operational flexibility, and technical innovation.[7] Accordingly, the Commission consistently has approved satellite modifications "when a proposed modification presents no significant interference problem and conforms to the Commission's rules and policies."[8] Indeed, as noted in Section I above, the proposed EchoStar XXIV operations, as modified, will remain in compliance with the Commission's applicable power limits, two-degree spacing requirements, and other technical rules, including Sections 25.202(g), 25.140(a)(3), 25.208, and 25.218(i), thus raising no significant interference risk.

Additionally, the proposed operations will serve the public interest by providing substantial additional capacity for new broadband service to government, small business, and residential consumers throughout the continental United States and the Americas. The additional available capacity, in turn, will further enable Hughes to provide broadband at download speeds of up to 100 Mbps, and support increased efficiencies in providing cost-effective, resilient broadband service. EchoStar XXIV, by virtue of its capacity and high-speed capabilities, will join Hughes' expanding fleet of satellites to offer a true competitive broadband alternative across the country and abroad.

[7] *See New ICO Services G.P.,* Memorandum Opinion and Order, 21 FCC Rcd 14603, ¶ 5 (IB 2006).

[8] *Id.*

III. Conclusion

Based on the foregoing, the proposed modification is consistent with the Commission's rules and policies, and serves the public interest without creating any significant interference risk. Accordingly, the Commission should promptly grant this application.