October 11, 2018

By Electronic Filing

Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: Viasat Petition for Declaratory Ruling for U.S. Market Access
(IBFS File Nos. SAT-PDR-20161115-00120 & SAT-APL-20180927-00076);
Streamlined Licensing Procedures for Small Satellites (IB Dkt. No. 18-86)

Dear Ms. Dortch:

Pursuant to 47 C.F.R. § 1.1206, Hughes Network Systems, LLC ("Hughes") submits this response to Viasat, Inc.'s ("Viasat") September 27th *ex parte* letter in the above- referenced proceedings regarding its proposed Ka-band inter-satellite, or satellite-to-satellite, links ("ISLs") between non-geostationary satellite orbit ("NGSO") satellites in medium earth orbit ("MEO") and geostationary satellite orbit ("GSO") satellites.[1]

Viasat Ignores Fundamental Differences Between Its Proposed ISLs and Earth Station Operations Permitted Under FCC Rules

In its letter, ViaSat seeks to recast its proposed ISLs as "technically … no different than, and … just as compatible with adjacent GSO spacecraft as, [earth stations aboard aircraft, or "ESAAs"] — an established use of the Ka band that has been long authorized, and which is the subject of the ESIM order."[2] Viasat, however, ignores fundamental differences between its proposed ISLs and ESAAs permitted under the Commission's rules. Notably, Viasat proposes ISL transmissions from MEO satellites orbiting at much higher altitudes (approximately 8,200 km above the Earth versus approximately 13 km for ESAAs) and speeds (approximately 18,700 km/hr versus approximately 1,000 km/hr for ESAAs).[3] Indeed, the Commission's recent *ESIM Order* expressly declined to find that earth stations on stratospheric platforms, operating at much lower altitudes (*i.e.*, approximately 50 km above the Earth) than MEO satellites, categorically

[1] *See* Letter from John P. Janka & Elizabeth R. Park, Counsel to Viasat, to Marlene H. Dortch, Secretary, FCC, IBFS File No. SAT-PDR-20161115-00120 & IB Dkt. No. 18-86 (filed Sept. 27, 2018).

[2] *See id.* at 1-2.

[3] A satellite, as described in Viasat's technical annex, with an apogee and perigee of 8,200 km and an orbital period of 17,517.2 seconds, will travel at a speed of 18,732.9 km/hr. By comparison, the speed of sound at 30,000 feet is 1,091 km/hr, above the speed anticipated for most aircraft.

qualify as ESAAs.[4] Thus, contrary to Viasat's suggestion, MEO satellites orbiting at much higher altitudes cannot be presumed to be technically the same as ESAAs from an interference perspective.

Moreover, even if the FCC could overlook such fundamental differences, a waiver would be required to permit Viasat's non-conforming ISL operations on an unprotected, non-harmful interference basis.[5] Viasat, however, has not requested, or shown good cause for, such a waiver and has not proposed to operate ISLs on an unprotected, non-harmful interference basis.

Viasat Does Not Propose ISL Compliance with ESAA Requirements

Despite its claim equating MEO-to-GSO ISLs with ESAA-to-GSO uplinks, Viasat offers no assurance that its proposed ISLs will comply with the same FCC rules that apply to Ka-band ESAAs for interference protection of other systems. Specifically, Viasat does not propose compliance with the coordination requirements of Sections 25.140(a)(3)(iii) and 25.220(d)(1)(ii).[6] These rules collectively require coordination with adjacent satellites within six degrees of the target GSO satellite for non-conforming or non-routine earth station operations exceeding applicable EIRP limits.[7] As discussed below, Viasat's proposed compliance with Ka-band off-axis EIRP density limits provides insufficient interference protection, and thus should be viewed at best as non-conforming operations requiring additional interference protection measures. Accordingly, the coordination requirements of Sections 25.140(a)(3)(iii) and 25.220(d)(1)(ii) should apply to Viasat's non-conforming operations.

Viasat also does not propose compliance with the coordination requirements of new Section 25.228(g)(3) (formerly, Section 25.227(a)(15)) of the Commission's rules. Under the rule, all ESAA operators are required to coordinate with any potentially affected operations for any ESAA operations in foreign airspace where the foreign administration has not adopted ESAA requirements.[8] Thus, to the extent that Viasat seeks treatment of its proposed ISLs as technically the same as ESAA operations, the coordination requirements of new Section 25.228(g)(3) also should apply to Viasat's proposed ISLs, at least with respect to transmissions from MEO satellites orbiting over foreign airspace where there are no ESAA requirements.

---

[4] *See Amendment of Parts 2 and 25 of the Commission's Rules to Facilitate the Use of Earth Stations in Motion Communicating with Geostationary Orbit Space Stations in Frequency Bands Allocated to the Fixed Satellite Service*, Report and Order and Further Notice of Proposed Rulemaking, FCC 18-138, ¶ 65 (Sept. 27, 2018) ("*ESIM Order*").

[5] *See Amendment of the Commission's Space Station Licensing Rules and Policies*, First Report and Order and Further Notice of Proposed Rulemaking, 18 FCC Rcd 10760, ¶ 124 (2003).

[6] *See* 47 C.F.R. §§ 25.140(a)(3)(iii) and 25.220(d)(1)(ii).

[7] *See id.*

[8] *See ESIM Order* ¶ 41, App. B (Final Rules) (adopting new Section 25.228(g)(3), which incorporates and expands requirements of former Section 25.227(a)(15)).

Viasat's Proposed ISL Compliance with Off-axis EIRP Limits Is Insufficient to Protect GSO Satellites

Furthermore, Viasat's proposed compliance with off-axis equivalent isotropically radiated power ("EIRP") density limits applicable to Ka-band ESAAs is insufficient to protect GSO satellites. Such EIRP limits are intended to protect adjacent GSO satellites in a two-degree spacing environment from earth station operations[9] that, as discussed above, are fundamentally different from MEO satellite transmissions. Specifically, due to MEO satellites orbiting at much higher speeds than ESAAs, maintaining the EIRP density of MEO satellite transmissions toward a target GSO satellite, and away from adjacent GSO satellites, requires substantially more complex and demanding tracking capabilities, as well as more dramatic and as-yet untested adjustments over shorter periods of time.

Additionally, a MEO satellite, orbiting approximately 8,200 km above the Earth, will be much closer to, or much farther away, from its target GSO satellite than an ESAA, operating near the surface of the Earth, is from its target satellite. This distance will continually vary depending upon where the satellite is within its orbit, posing different problems as it moves closer to, or away from, the target GSO satellite. As a MEO satellite moves closer to the target GSO satellite, it may be necessary to compensate for decreased path loss toward adjacent satellites by lowering the EIRP density toward those satellites. As the MEO satellite moves farther from the target GSO satellite, the angle of separation between a target GSO satellite and adjacent satellites will be substantially narrower than the angle observed from earth, thus requiring further off-axis EIRP reductions.

Two cases in particular require operational constraints to protect adjacent GSO satellites, as discussed in an International Telecommunication Union ("ITU") working document addressing use of NGSO-to-GSO links:[10]

(1) harmful interference to other GSO satellites resulting from NGSO satellites operating at a high altitude (compared to earth stations on or near the Earth's surface) and approaching closer to the target GSO satellite; and

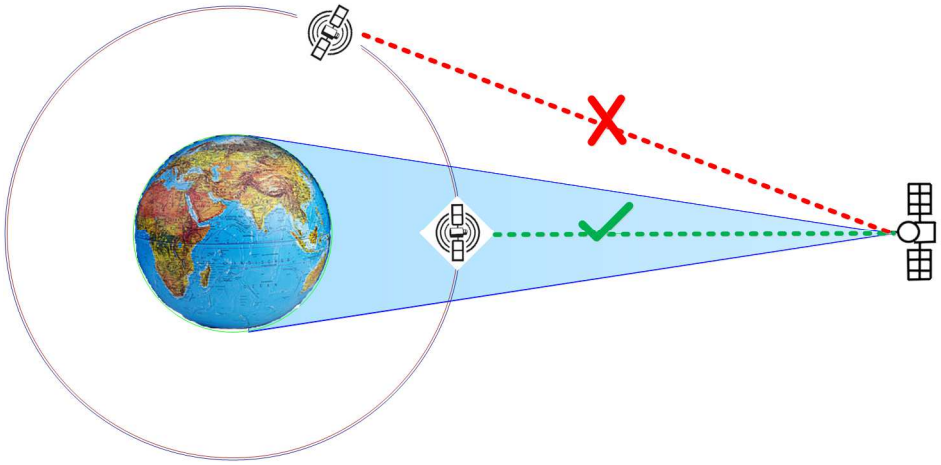
(2) harmful interference to other GSO satellites resulting from trans-horizon links from NGSO satellites moving away from the target GSO satellite and outside the target GSO satellite's "cone of coverage"—the volume defined with the target GSO satellite as the vertex and the satellite's geographic coverage area as the base, illustrated in Figure 1 below.[11]

[9] *See id.* ¶ 14.

[10] *See* Working Document Towards a Preliminary Draft New Report ITU-R S.[NGSO-to-GSO] (Document 4A/826 Annex 22), *Technical feasibility of NGSO-to-GSO Satellite Links* (July 25, 2018).

[11] *See id.* at 8 § 5.

Figure 1
Illustration of "cone of coverage" (in blue, marked by green checkmark)[12]



Although the ITU working document suggests some additional mitigation techniques for further studies to address the interference scenarios noted above, Viasat has not proposed or addressed any of these techniques to ensure GSO interference protection.

Based upon the foregoing, Hughes urges the Commission to reject ViaSat's proposed Ka-band ISL operations or, alternatively, defer consideration until ITU studies are completed and/or Viasat accepts additional license conditions to ensure GSO interference protection.

Respectfully submitted,

/s/ Jennifer A. Manner
Jennifer A. Manner
Senior Vice President, Regulatory Affairs

Brennan T. Price
Senior Principal Engineer, Regulatory Affairs

cc: Jose Albuquerque
Chip Fleming
Kathyrn Medley
Stephen Duall
Sankar Persaud

[12] *See id.* at 3, Fig. 1.