Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Viasat, Inc.	)	
	)	
Application for Modification of Authorization for the Viasat NGSO Satellite System	)	File No. SAT-MPL-20200526-00056

COMMENTS OF KUIPER SYSTEMS LLC

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Kuiper Systems LLC, a wholly owned subsidiary of Amazon.com Services LLC (collectively, "Amazon"), submits the following comments on the above-referenced application of Viasat, Inc. ("Viasat") seeking approval to redesign its satellite system via a modification of authority (the "Modification").[1]

I. INTRODUCTION AND SUMMARY.

In 2016, Viasat sought authorization from the Federal Communications Commission ("Commission" or "FCC") for a non-geostationary satellite orbit ("NGSO") fixed-satellite service ("FSS") constellation comprised of 24 satellites distributed among 3 orbital planes in medium earth orbit ("MEO") utilizing Ka- and V-band frequencies.[2] In 2018, Viasat filed an amendment to change its request to 20 satellites in 4 planes, which the Commission licensed.[3] Now, Viasat

[1] Viasat, Inc., Application for Modification of Authorization for the Viasat NGSO System, IBFS File No. SAT-MPL-20200526-00056 (filed May 26, 2020).
[2] Viasat, Inc., Petition for Declaratory Ruling Granting Access to the U.S. for a Non-U.S.-Licensed Nongeostationary Orbit Satellite Network, IBFS File No. SAT-PDR-20161115-00120 (filed Nov. 15, 2016) ("*Original Application*").
[3] Viasat, Inc., Amendment to Petition for Declaratory Ruling Granting Access to the U.S. for a Non-U.S.-Licensed Nongeostationary Orbit Satellite Network, IBFS File No. SAT-APL-20180927-00076 (filed Sept. 27, 2018) ("*Amendment*"). The Commission granted the amendment, noting, "[n]o party allege[d] that the ViaSat Amendment increases the potential for interference or

seeks a new constellation altogether. This Modification proposes to increase the number of satellites in Viasat's licensed constellation by a factor of more than 14—from 20 to 288. Viasat also seeks to reduce the satellites' orbital altitude from 8,200 km MEO to 1,300 km low earth orbit ("LEO") and to lower the inclinations of its orbits from 87° to 45°. Importantly, as Amazon's technical analysis demonstrates, the Modification has a significant effect on the Ka-band interference environment for other NGSO FSS systems, including the Kuiper System, which Viasat does not consider in its interference analysis. As such, the FCC should include Viasat's system modification application in the NGSO FSS processing round initiated on March 24, 2020 (the "2020 Processing Round").[4]

Additionally, the Commission should defer consideration of Viasat's modified use of V-band frequencies until a new processing round. Viasat's Modification comes more than three years after the Commission's processing round cut-off for V-band applications.[5] The effects of Viasat's system redesign on the V-band environment are independent of its effects on the Ka-band, and parties must have an opportunity to fully review these issues in the context of a future V-band processing round.

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changes proposed frequencies," and therefore it was not treated as a newly filed application under Section 25.116. *ViaSat, Inc., Petition for Declaratory Ruling Granting Access for a Non-U.S.-Licensed Non-Geostationary Orbit Satellite Network*, Order and Declaratory Ruling, 35 FCC Rcd 4324, ¶ 10 (Apr. 22, 2020) ("*Amendment Grant*").

[4] *See Satellite Policy Branch Information, Cut-Off Established for Additional NGSO FSS Applications or Petitions for Operations in the 10.7-12.7 GHz, 12.75-13.25 GHz, 13.8-14.5 GHz, 17.7-18.6 GHz, 18.8-20.2 GHz, and 27.5-30 GHz Bands*, Public Notice, 35 FCC Rcd 2881 (2020) ("*March 24, 2020 Processing Round PN*").

[5] *See Boeing Application Accepted For Filing In Part; Cut-Off Established For Additional NGSO-Like Satellite Applications Or Petitions For Operations In The 37.5-40.0 GHz, 40.0-42.40 GHz, 47.2-50.2 GHz And 50.4-51.4 GHz Bands*, Public Notice, 31 FCC Rcd 11957 (2016) ("*V-band Processing Round PN*").

II. VIASAT'S MODIFIED KA-BAND SYSTEM SHOULD BE INCLUDED IN THE CURRENT 2020 PROCESSING ROUND.

On March 24, 2020, the Satellite Division of the FCC announced that it was initiating a "new processing round for additional applications and petitions for operations in the 10.7-12.7 GHz, 12.75-13.25 GHz, 13.85-14.5 GHz, 17.7-18.6 GHz, 18.8-20.2 GHz, and 27.5-30 GHz frequency bands by non-geostationary orbit fixed-satellite service (NGSO FSS) systems."[6] Viasat filed this Modification on May 26, 2020 during the window for new applications.

Viasat's Modification has a significant interference impact on the NGSO interference environment, warranting inclusion in the 2020 Processing Round. As Viasat has acknowledged, "the Commission considers whether a modification would 'create any significant interference problems to other systems or make sharing [with] other NGSO FSS systems significantly more difficult.'"[7] Yet, Viasat inaccurately argues that its Modification "will neither create significant interference problems, nor make sharing significantly more difficult"[8] with respect to other FCC-authorized NGSO FSS systems. As detailed in Section III below, Viasat's technical analysis does

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[6] *March 24, 2020 Processing Round PN*.

[7] *Modification*, at 3 (quoting *Teledesic LLC*, Order and Authorization, 14 FCC Rcd 2261, ¶ 7 (1999) ("*Teledesic*")). This Modification, like SpaceX's Third Modification, was filed after the opening of the 2020 Processing Round. Viasat was aware that other operators would be relying upon the interference environment of authorized systems when submitting applications in the 2020 Processing Round. As with SpaceX's Third Modification, this Viasat Modification increases the number and duration of in-line events, which is a key consideration when analyzing the interference effects of a modification. *See* Space Exploration Holdings, LLC Application for Modification of Authority, IBFS File No. SAT-MOD-20200417-00037 (filed Apr. 17, 2020); *see also Space Exploration Holdings, LLC Request for Modification of the Authorization For the SpaceX NGSO Satellite System*, Memorandum Opinion and Order, 35 FCC Rcd 5649, ¶ 11 (2020) (declining to require SpaceX to accept increased interference or to attach a condition on its license specifying that increased interference will not result in band-splitting, because a dynamic analysis shows that the modification "reduces the duration of in-line events and the total percentage of time during which a given level of interference is exceeded"). Both of these modifications should thus be considered as part of the 2020 Processing Round. *See* Petition to Deny and Comments of Kuiper Systems LLC, IBFS File No. SAT-MOD-20200417-00037 (filed July 13, 2020).

[8] *Modification*, at 4.

not fully capture the Modification's effect on the interference environment. Amazon's analysis shows that this effect would be significant, warranting inclusion of the modified Viasat system in the 2020 Processing Round.

The sheer magnitude of change involved in the Modification also supports including the redesigned system in the 2020 Processing Round to preserve the anticipated NGSO FSS operating environment. The Modification contemplates a change from a 20-satellite MEO system to a 288-satellite LEO system. Licensees and applicants who filed after Viasat's initial application, such as Amazon, New Spectrum Satellite, Kepler, Mangata, O3b, and EOS Defense Systems, were aware of Viasat's public representations regarding the parameters of its system when designing their own systems. Operators in later processing rounds rely on the stability of earlier round systems, and the existing interference environment, when designing their systems.[9] This is particularly true when, as here, a processing round has been opened and all interested parties are on notice that additional NGSO applications are already on file and more are likely. Including the modified Viasat constellation in the processing round happening at the time the application was filed—the 2020 Processing Round—properly considers the impact of the redesign on the NGSO FSS operating environment relied upon by others and ensures that later-round NGSO FSS licensees are not subjected to a changing operating environment and increased interference. To do otherwise would allow earlier round operators to make significant modifications pursuant to a Commission

[9] The design and operation of one system necessarily affects the design and operation (or proposed operation) of other systems, particularly in a case where the modified system is an entirely different system than that originally authorized. Thus, the processing round framework that establishes "the need to protect existing expectations and investments and provide for additional entry" both counsels protection for those expectations for operators in the 2016 Processing Round and those applying in the 2020 Processing Round. *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, ¶ 61 (2017) ("*NGSO FSS Order*").

invitation for new applications, all while new operators were designing systems based on the interference environment prior to the new processing round.

Viasat argues that including the Modification in the 2016 Processing Round[10] "would affirmatively serve the public interest for a number of reasons,"[11] including by providing low-latency LEO broadband service to high-need areas.[12] The ability to provide broadband service does not, however, justify including Viasat's 2020 Modification in the 2016 Processing Round, given that Viasat will be able to provide that service as part of the 2020 Processing Round. Several other Ka-band applicants and licensees also plan to provide low-latency broadband service, and bestowing 2016 Processing Round status on Viasat's 2020 Modification would adversely impact those operators.

Viasat also argues that the Modification serves the public interest by allowing it "to mitigate the disproportionate impact of the default band-splitting rules [under Section 25.261]" by using satellite diversity as a mitigation technique, which it further justifies given that Section 25.261 was revised after it submitted its original application.[13] This argument relates to Viasat's desire to redesign its system and not to whether inclusion in the prior processing round would serve the public interest.[14] Moreover, the spectrum sharing and default band-splitting rules may

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[10] *See OneWeb Petition Accepted for Filing; Cut-Off Established for Additional NGSO-Like Satellite Applications or Petitions in the 10.7-12.7 GHz, 14.0-14.5 GHz, 17.8-18.6 GHz, 18.8-19.3 GHz, 27.5-28.35 GHz, 28.35-29.1 GHz, and 29.5-30.0 GHz Bands*, Public Notice, 31 FCC Rcd 7666 (2016); *see also Cut-Off Established For Additional NGSO-Like Satellite Applications Or Petitions For Operations In The12.75-13.25 GHz, 13.85-14.0 GHz, 18.6-18.8 GHz, 19.3-20.2 GHz, and 29.1-29.5 GHz Bands*, Public Notice, 32 FCC Rcd 4180 (2017).

[11] *Modification*, at 4.

[12] *Id.* at 5.

[13] *Id.*

[14] *See id.* Furthermore, a change in the regulatory regime does not itself justify a change to an incumbent satellite system if that change is not compelled in order for the operator to comply with the new rules. *See, e.g.*, *Amendment of the Commission's Rules to Establish Rules and Policies Pertaining to a Mobile Satellite Service in the 1610-1626.5/2483.5-2500 MHz Frequency Bands*,

change again as a result of a pending petition for rulemaking.[15] Allowing Viasat to redesign its system without entering the current processing round because the Commission changed Section 25.261 would create the very open-ended situation that processing rounds were established to avoid.[16] Viasat's arguments, therefore, are insufficient to allow consideration of the redesigned constellation outside of the 2020 Processing Round.

In sum, including Viasat's application in the 2020 Processing Round during which it was filed serves the public interest in regulatory certainty and would be consistent with precedent given the proposed modified system's significant impact on interference.

Memorandum Opinion and Order, 9 FCC Rcd 5936, ¶ 59 (1994) ("We have repeatedly emphasized that MSS Above 1 GHz applicants who filed by the cut-off date will be afforded an opportunity to amend their applications, if necessary, to bring them into conformance with any requirements and policies that are adopted for satellite systems in these bands. . . . However, a change that is not necessary to bring the application into conformance with our rules and which would increase frequency conflicts . . . would render the application a newly filed application to be considered in a future processing group."). Additionally, in *EchoStar Satellite Corp.*, the Commission "reject[ed] EchoStar's assertion that it did not have the 'foresight' to request 1000 megahertz of spectrum in each transmission direction in its first round application," despite claiming such spectrum was necessary, given that "[s]everal applications listed in the [processing round] Public Notice" requested such spectrum. *Echostar Satellite Corp.*, Order and Authorization, 16 FCC Rcd 14300, ¶ 5 (2001), *recon. denied*, 17 FCC Rcd 8305 (2002). The Commission also called Echostar's modification application "grossly untimely" and "note[d] that Echostar had other opportunities to seek this spectrum in a timely manner, including reconsideration of its initial authorization and filing an application in the second Ka-band processing round." *Id.* at ¶¶ 5, 6. In this case, the Notice of Proposed Rulemaking proposing the changes Viasat cites was adopted a mere month after Viasat's original application, and Viasat in fact filed comments and reply comments in that proceeding, but waited until three and a half years later to file the Modification.

[15] *See* Revision of Section 25.261 of the Commission's Rules to Increase Certainty in Spectrum Sharing Obligations Among Non-Geostationary Orbit Fixed-Satellite Service Systems, Petition for Rulemaking, RM-11855 (filed Apr. 30, 2020).

[16] *See NGSO FSS Order*, at ¶ 61 ("The purpose of the recent processing rounds was to establish a sharing environment among NGSO systems, to provide a measure of certainty in lieu of adopting an open-ended requirement to accommodate all future applicants.").

III. VIASAT'S TECHNICAL ANALYSIS IS INCOMPLETE AND SIGNIFICANTLY UNDERSTATES THE MODIFICATION'S EFFECT ON THE NGSO FSS INTERFERENCE ENVIRONMENT.

Viasat analyzed the interference impact of its modification to five other NGSO systems, including four Ka-band systems.[17] Viasat's showing is incomplete, as it analyzes only the impact of Viasat user terminal links on other NGSO systems from the 2016 Processing Round. It does not include analysis of Viasat's gateway links, nor does it show the increase in Viasat's susceptibility to interference from other NGSO FSS systems.[18] Additionally, Viasat excluded some NGSO FSS systems, such as the Kuiper System. Based on this incomplete analysis, Viasat incorrectly claims that its modification will not adversely affect the interference environment with respect to other authorized NGSO FSS networks.[19] In fact, the Modification (1) increases Viasat's susceptibility to interference, and (2) increases the interference between the Viasat system and the Kuiper System, which significantly impacts the operation of the Kuiper System.

A. Viasat's Modification causes more in-line interference events for the Kuiper System.

Amazon performed an analysis to determine the effect that the Modification has on the number of in-line interference events and the total duration of in-line events between the Viasat system and the Kuiper System. The results are shown in Figure 1.

Figure 1: Percent Change in Number and Total Duration of In-Line Events Due to Modification

Kuiper Link Type	Viasat Link Type	Number of In-line Events (Percent Change)	Total Duration of In-line Events (Percent Change)
Gateway	Gateway	254%	355%
User	Gateway	281%	414%
Gateway	User	254%	355%
User	User	281%	414%

[17] *See Modification*, at Exhibit B, 12-18.
[18] Viasat also neglected to state what earth station latitude it used in its analysis.
[19] *See Modification*, at Exhibit B, 1.

The analysis used a common in-line event threshold separation angle of 10 degrees for both the before and after Modification analysis scenarios to ensure an apples-to-apples comparison, even though Viasat's lower altitude causes a higher uplink I/N into its system and would require larger separation angles to maintain the same uplink I/N. The earth station latitude used for this analysis is 40N, near the geographic center of the contiguous United States. The results considered all eligible space stations (i.e., above the declared system minimum elevation and outside each system's GSO exclusion zone). Because the above results consider all eligible space stations and both Viasat's user terminals and gateway earth stations operate with the same minimum elevation of 25°,[20] the results are the same for Viasat user terminal links and gateway links.

Amazon also performed the analysis with a random selection of "active" satellites from each system. The results are shown in Figure 2 below.

Figure 2: Percent Change in Number and Total Duration of In-Line Events Due to Modification, Random Selection of Active Satellites

Kuiper Link Type	Viasat Link Type	Number of In-line Events (Percent Change)	Total Duration of In-line Events (Percent Change)
Gateway	Gateway	444%	705%
User	Gateway	380%	551%
Gateway	User	55%	152%
User	User	17%	72%

In cases where Viasat excluded important operational information from its application, Amazon relied on data from Viasat's ITU filings, DREBBELSAT-2 for its MEO system and DREBBELSAT-4 for its new LEO system.[21] Viasat does not state how many active co-frequency satellites may communicate with each of its earth stations. For Viasat's gateway links, Amazon

[20] *See Modification*, at Technical Annex, 2.
[21] *See* ITU-BR, DREBBELSAT-2, HOL2018-08956 (Dec. 18, 2018); ITU-BR, DREBBELSAT-4, HOL2020-32504 (June 11, 2020) (collectively, "*ITU Filings*").

extracted this value from Viasat's EPFD input files included with its ITU filing submissions.[22] Viasat's EPFD input files claim up to eight co-frequency satellites operating with each earth station for the 30cm diameter earth station uplink case.[23] However, Amazon conservatively assumed a maximum of one co-frequency satellite communicating with each earth station location for Viasat's user links because it was not appropriate to assume each user station would communicate with eight satellites. In its original application, Viasat also claimed that each satellite would be capable of 16 Ka-band transmit and receive beams (8x RHCP and 8x LHCP in each direction).[24] Amazon requests that the FCC ask Viasat to confirm that it is maintaining these original design parameters and not proposing to modify the number of beams per satellite.

While the Modification may provide Viasat more satellite selection options, the Modification also causes significantly more in-line events between the Viasat system and the Kuiper System. Viasat does not accept the burden of resolving the additional in-line interference. Rather, Viasat has proposed "as a general matter that licensees in later processing rounds should protect licensees from earlier processing rounds against interference to a specified level."[25] However, this proposal neglects to consider that here, Viasat's Modification would cause a significant increase in the number of in-line interference events with other authorized systems and 2020 Processing Round participants. It appears that Viasat expects these other systems to bear the burden of resolving these additional interference events. Even further, Viasat is on the record as

[22] Viasat declared that two co-frequency satellites may operate to a given location in its MEO system, and eight co-frequency satellites may operate to a given location in its modified LEO system. *See id.* at Table sat_per, Field nbr_op_sat (maximum number of non-geostationary satellites transmitting with overlapping frequencies to a given location within the latitude range), and Table non_geo, Field nbr_sat_td (maximum number of co-frequency tracked non-geostationary satellites receiving simultaneously).
[23] *Id.*
[24] *Original Application*, at Attachment A, 5.
[25] Reply Comments of Viasat, Inc., RM-11855, at 2 (filed June 30, 2020).

opposing the need for NGSO operators to share active satellite and beam pointing information with each other.[26] Thus, Viasat's increased flexibility would come at the expense of additional in-line interference events with other NGSO FSS operators who expected to co-exist with Viasat's currently licensed system. However, Viasat's increased flexibility should support its ability to successfully coordinate with other NGSO FSS systems as a participant in the 2020 Processing Round.

B. Viasat's Modification increases Viasat's susceptibility to interference.

To supplement Viasat's incomplete analysis, Amazon performed a similar analysis to show how Viasat's modification affects the interference between Viasat's system and the Kuiper System. The interference between Viasat gateway links and Kuiper System gateway links is shown in Figures 3 and 4 below. For this analysis, Amazon considered the largest earth stations included in the DREBBELSAT-2 and DREBBELSAT-4 ITU filings, 7m and 3m respectively.[27] Interference analysis results for Viasat user links and Kuiper System user links are shown in Annex A.

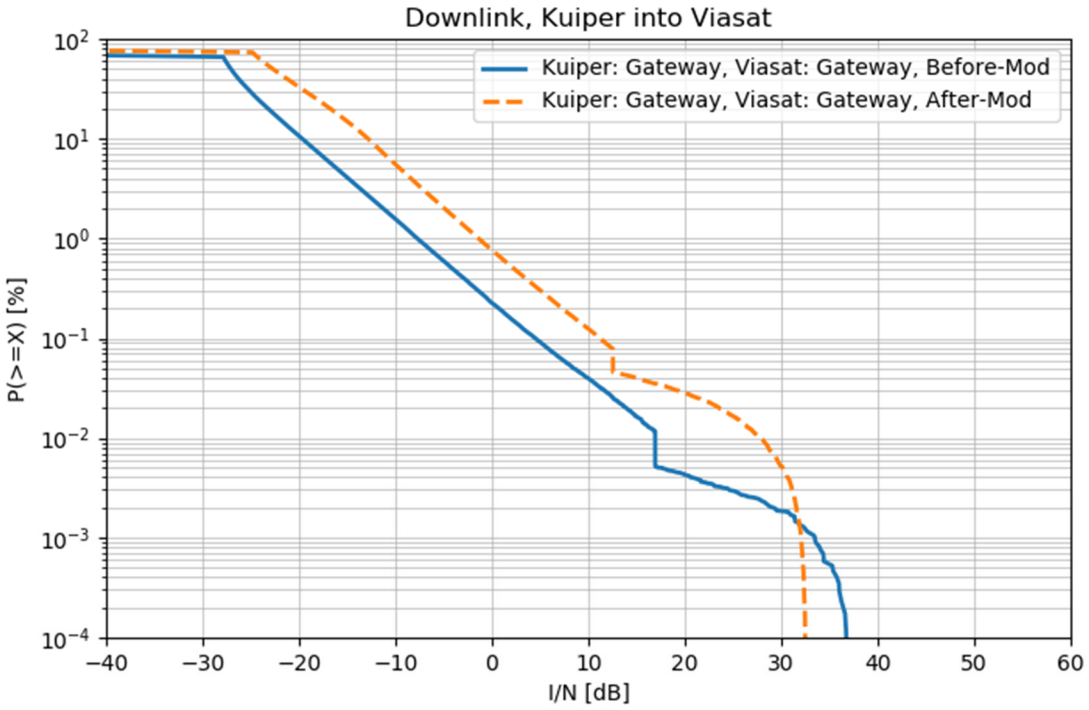
Viasat only analyzes the interference effects with Viasat in the interferer role. The Commission has stated previously that, in analyzing the interference effects of a modification, the Commission must examine both the potential for increased interference to other NGSO FSS systems as well as whether the modified system may become more susceptible to interference from

[26] *See* Consolidated Response of ViaSat, Inc., IBFS File No. SAT-PDR-20161115-00120, at 4 (filed Aug 1, 2017) ("[SpaceX] requests that ViaSat's authorization be conditioned upon a requirement to disclose real-time pointing data for these beams to other NGSO operators to let them know where ViaSat's beams are pointed at any given time. . . . In any event, there is no basis for requiring ViaSat to disclose proprietary data of this type.").
[27] *ITU Filings*.

other NGSO FSS systems.[28] Here, Amazon's analysis shows that Viasat's Modification makes its system more susceptible to interference from the Kuiper System.

Analyzing the cumulative distribution of interference-to-noise experienced by the Viasat system from the Kuiper System shows that the interference to Viasat is significantly increased due to the proposed Modification. Figure 3 shows the distribution of I/N received by Viasat earth stations from Kuiper System satellite downlinks, before (blue solid line) and after (orange dashed line) the Modification. Of note, the maximum downlink I/N received by Viasat's earth stations is reduced slightly, due to the reduction in gateway earth station diameter from 7m to 3m. However, the I/N received by Viasat's earth stations is worsened for the remaining 99.998% of the time.

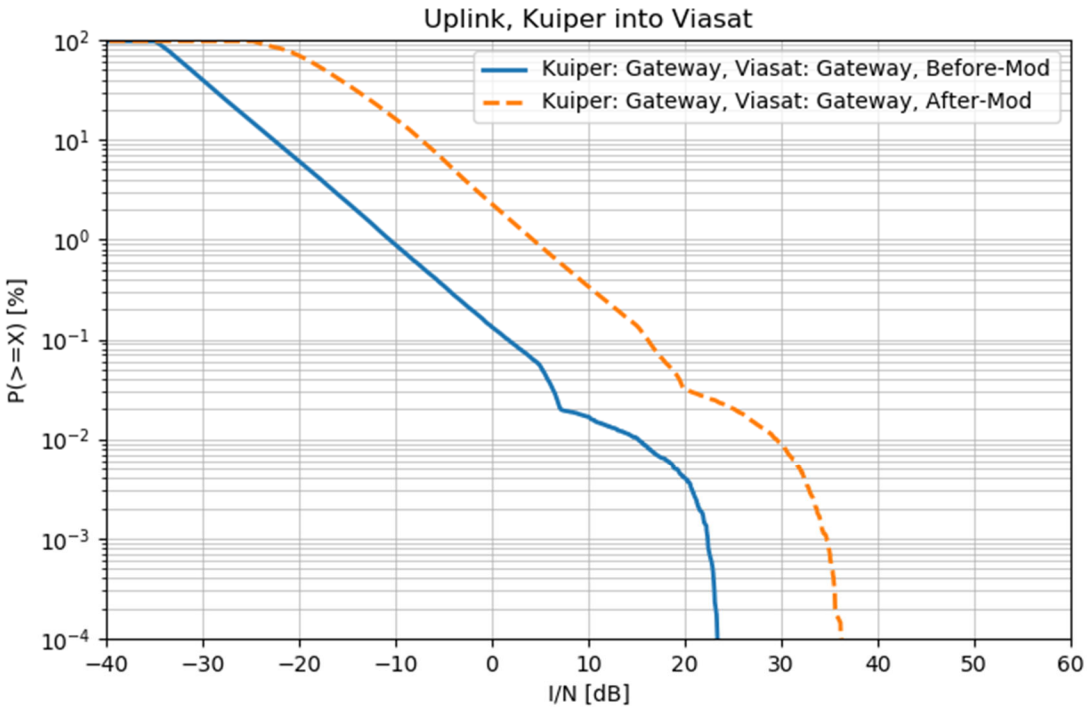
Figure 3: Distribution of I/N Received by Viasat Gateway Earth Stations from Kuiper System Satellite Downlinks, Before and After Modification



[28] *Space Exploration Holdings, Request for Modification of the Authorization for the SpaceX NGSO Satellite System*, Order and Authorization, 34 FCC Rcd 2526, ¶ 14 (2019).

Figure 4 shows the I/N received by Viasat satellites from Kuiper System gateway uplinks before (blue solid line) and after (orange dashed line) the Modification. The I/N levels received by Viasat's spacecraft are significantly increased for all time percentages. This is partly due to the reduced free-space path loss between Viasat's original 8,200 km altitude and modified 1,300 km altitude, which causes interfering signals to arrive at Viasat's spacecraft receivers up to 16 dB stronger.

Figure 4: Distribution of I/N Received by Viasat Satellites from Kuiper System Gateway Uplinks, Before and After Modification



A full synopsis of the interference impact into the Viasat system due to the Modification is summarized in Figure 5 below. Interference analysis for additional link combinations is shown in Annex A.

Figure 5: Change in Probability of Exceeding 6% ΔT/T due to Viasat Modification

Link Direction	Interferer	Victim	% Increase in Probability of Exceeding 6% ΔT/T	Figure
Downlink	Kuiper Gateway	Viasat Gateway	264%	A.1
Downlink	Kuiper Gateway	Viasat User	325%	A.2
Downlink	Kuiper User	Viasat Gateway	159%	A.3
Downlink	Kuiper User	Viasat User	192%	A.4
Uplink	Kuiper Gateway	Viasat Gateway	1602%	A.5
Uplink	Kuiper Gateway	Viasat User	2093%	A.6
Uplink	Kuiper User	Viasat Gateway	866%	A.7
Uplink	Kuiper User	Viasat User	984%	A.8

Given the significant increases in downlink and uplink interference levels received by Viasat for all time percentages into the Viasat system after the Modification, the FCC should include the Viasat Modification in the 2020 Processing Round.

C. Viasat's Modification increases interference into the Kuiper System.

Analyzing the cumulative distribution of interference-to-noise experienced by the Kuiper System from the Viasat system shows that the interference to the Kuiper System is significantly increased due to the changes in the proposed Modification.

Figure 6 shows the distribution of I/N received by Kuiper System earth stations from Viasat satellite downlinks, before (blue solid line) and after (orange dashed line) the Modification. Despite Viasat's commitment not to increase its downlink power-flux density level, there is a significant increase in interference to Kuiper System downlinks because there are many more active Viasat satellites in view.

Figure 6: Distribution of I/N Received by Kuiper System Earth Stations from Viasat Satellite Downlinks, Before and After Modification

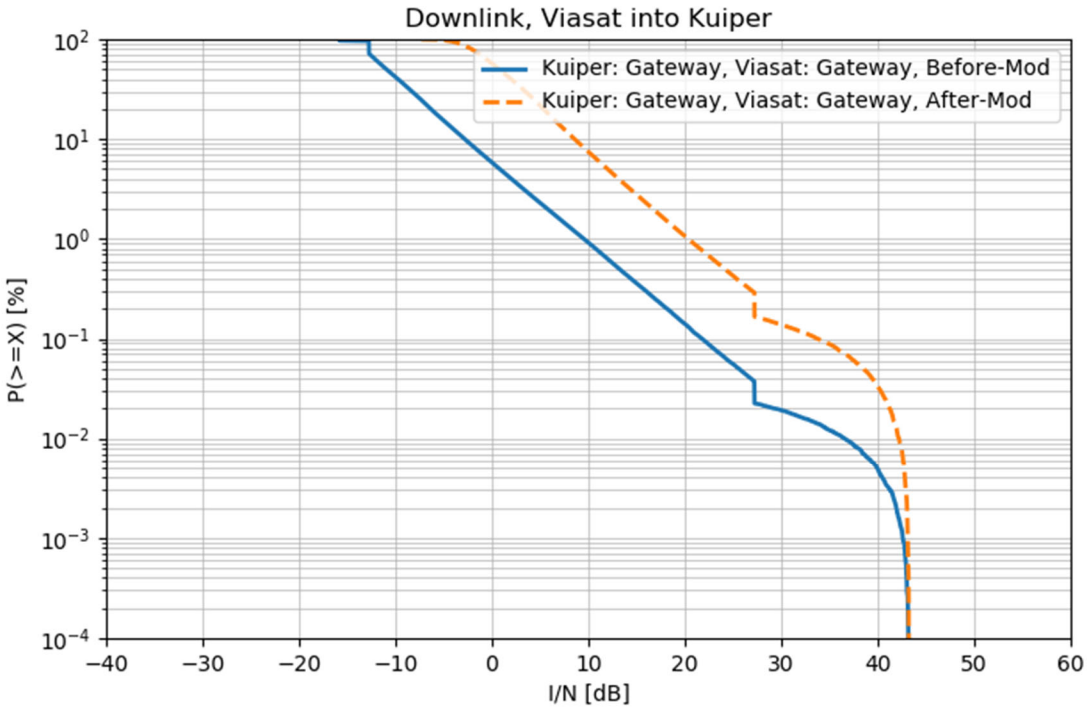
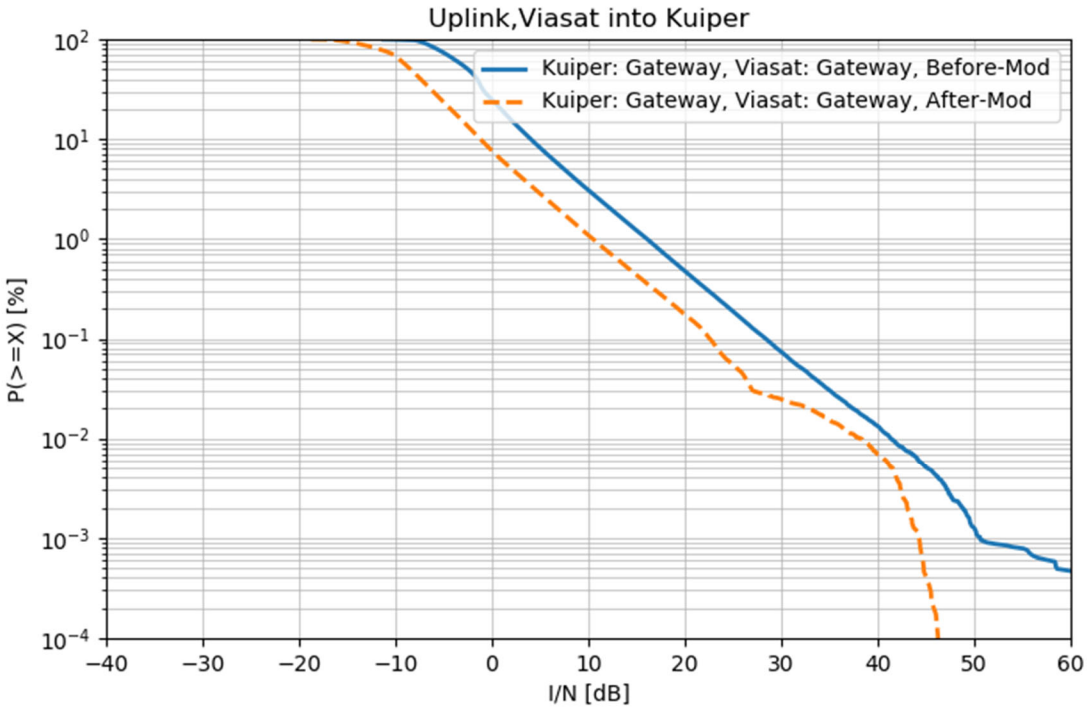


Figure 7 shows the I/N received by Kuiper System satellites from Viasat gateway uplinks before (blue solid line) and after (orange dashed line) the Modification. As Viasat did not disclose all of the necessary technical parameters in its Modification, Amazon's analysis relies on technical parameters from the Viasat ITU filings, DREBBELSAT-2 and DREBBELSAT-4.[29] Amazon used the largest earth station sizes in the ITU filings, 7m and 3m respectively, and the transmit power density values from the ITU filings, -57 dBW/Hz and -73 dBW/Hz respectively, which the Commission should confirm also apply to the Viasat application.[30]

[29] *See ITU Filings*.
[30] *See id.*

Figure 7: Distribution of I/N Received by Kuiper System Satellites from Viasat Gateway Uplinks, Before and After Modification



Similarly to the previous section, interference analysis for additional link combinations is shown in Annex A. A summary of all results is shown in Figure 8 below.

Figure 8: Change in Probability of Exceeding 6% ΔT/T due to Viasat Modification

Link Direction	Interferer	Victim	% Increase in Probability of Exceeding 6% ΔT/T	Figure
Downlink	Viasat Gateway	Kuiper Gateway	56%	A.9
Downlink	Viasat User	Kuiper Gateway	56%	A.10
Downlink	Viasat Gateway	Kuiper User	0%	A.11
Downlink	Viasat User	Kuiper User	0%	A.12
Uplink	Viasat Gateway	Kuiper Gateway	-18%	A.13
Uplink	Viasat User	Kuiper Gateway	-89%	A.14
Uplink	Viasat Gateway	Kuiper User	-8%	A.15
Uplink	Viasat User	Kuiper User	-92%	A.16

In summary, Viasat's Modification definitively worsens the interference in the first three of four interference scenarios depicted in Figures 3, 4, 6, and 7, and ten of the sixteen cases

summarized in Figures 5 and 8. Thus, the Modification not only increases the number and duration of in-line events, it also increases statistical interference levels.

D. The increase in interference events would have an operational impact to the Kuiper System.

As demonstrated above, the frequency and duration of in-line interference events increase as a result of the Modification. This, combined with Viasat's higher susceptibility to I/N from other systems' uplinks, significantly impacts Kuiper System operations. In particular, this impact manifests itself as a significant increase in the number of Kuiper System satellites that may experience in-line interference events with Viasat and which may be faced with taking action to mitigate interference.

To demonstrate the effect the Modification has on the Kuiper System's operations, Amazon performed an analysis of the number of Kuiper System satellites experiencing in-line interference with Viasat satellites, under various sharing scenarios with Viasat. Satellite availability is a key metric for an NGSO FSS operator that drives the operator's ability to meet quality-of-service objectives, including network capacity and handover efficiency. Viasat's Modification would cause a decrease in available Kuiper System satellites at a gateway, as shown in the large leftward shift in Figure 9 below. The median number of available satellites would be reduced from 27 to 16. Likewise, the Modification would decrease the number of Kuiper System satellites available for customer terminals, as shown in Figure 10 below. The median number of available satellites would be reduced from 12 to 4. This significant reduction in satellite availability is a direct consequence of two aspects of Viasat's Modification. First, the changes in the Viasat system's orbital characteristics, including altitude and inclination angle, result in a dramatically different probabilistic distribution of Viasat satellites in view and increase the I/N levels experienced by Viasat satellites. Second, according to its ITU filings, Viasat has increased the number of its

satellites operating with overlapping frequencies to a given location, thereby increasing the number of active visible Viasat satellites with which a Kuiper System earth station must contend.

Figure 9: Kuiper System Satellite Availability at 40N, Considering Kuiper System Gateway Links and Viasat Gateway Links

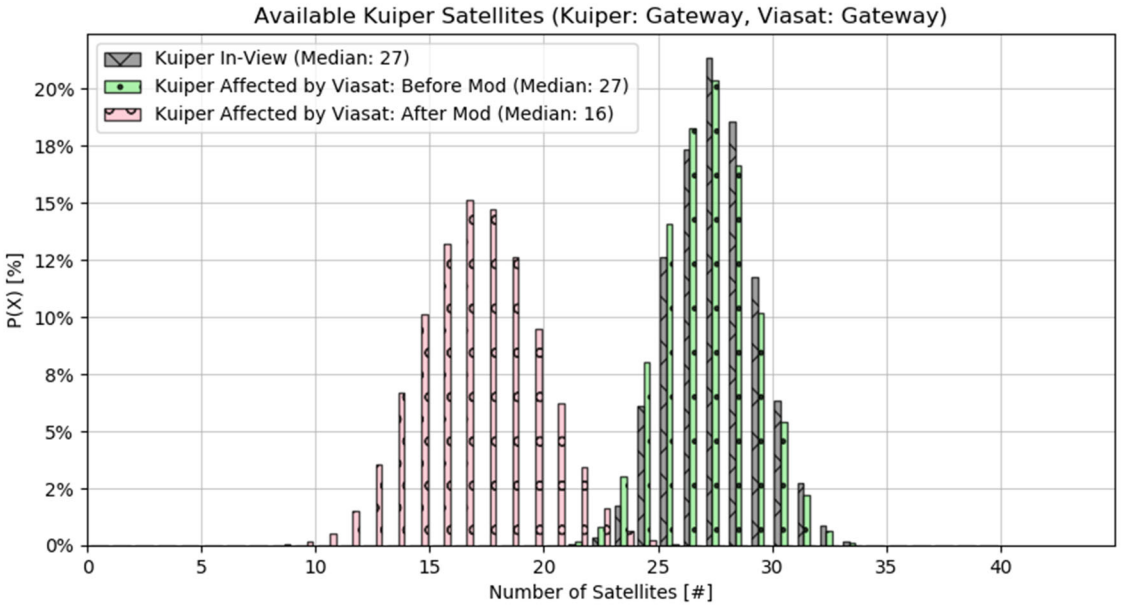
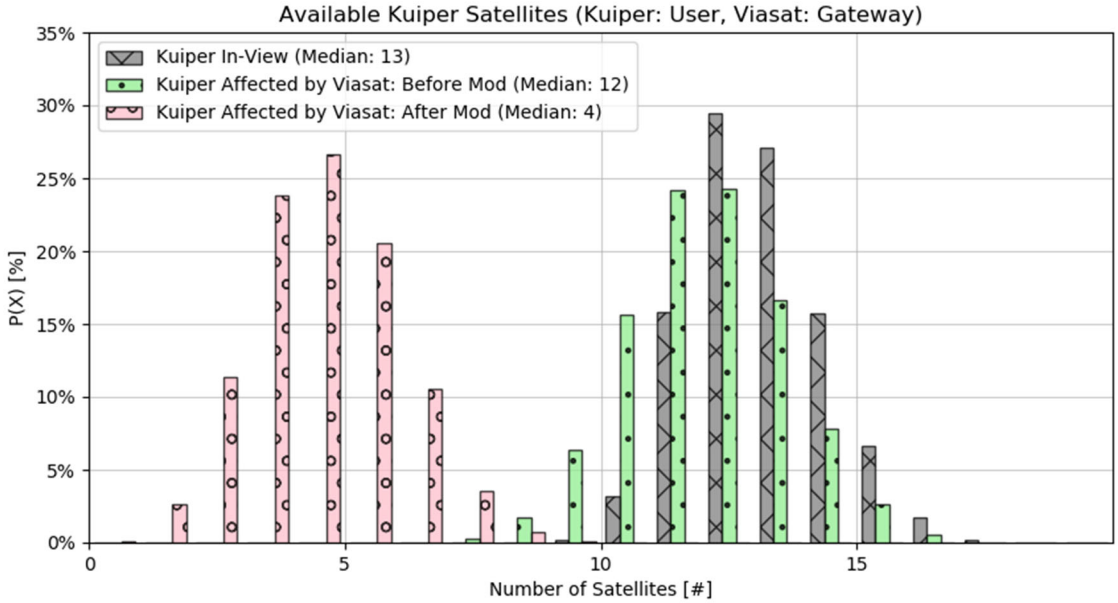


Figure 10: Kuiper System Satellite Availability at 40N, Considering Kuiper System Customer Links and Viasat Gateway Links



As the analysis above demonstrates, Viasat's Modification impacts the Kuiper System by reducing the number of Kuiper System satellites that would be available to gateways and customer terminals.

E. Viasat must consider the Kuiper System in its analysis of the Modification's impact and provide relevant interference information.

The Commission's precedent regarding the processing round treatment of modification applications turns on the effects of those modifications on the interference environment for other NGSO FSS operators.[31] Despite this fact, and despite having notice of Amazon's application for the Kuiper System, Viasat's Modification does not include an interference analysis with the Kuiper System, but does with SpaceX, OneWeb, Telesat, and O3b.[32] As the above has demonstrated, the Modification's effect on the interference environment within which the Kuiper System will operate is significant.

Additionally, other information not yet provided by Viasat could show further degradation to the interference environment. Amazon requests that the Commission require Viasat to provide its uplink EIRP levels, maximum number of satellites simultaneously communicating with each earth station, and its number of beams per spacecraft, both before and after the proposed Modification, the lack of which prevents operators, and the Commission, from fully assessing the Modification's impact on the existing interference environment.

Even without this additional information, the above analysis shows that Viasat's Modification, if placed in the 2016 Processing Round, increases the frequency with which the

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[31] *See Teledesic*, at 5 ("If the proposed modification does not present any significant interference problems and is otherwise consistent with Commission policies, it is generally granted. . . . In contrast, if the modification application were to present significant interference problems, we would treat the modification as a newly filed application and would consider the modification application in a subsequent satellite processing round.").

[32] *Modification*, at 12-18.

Kuiper System would be required to take measures to mitigate the interference, thus causing a significant impact to the Kuiper System. These effects on the Kuiper System, and on the NGSO FSS interference environment as a whole, warrant inclusion of Viasat's modified system in the 2020 Processing Round consistent with Commission precedent.

IV. THE V-BAND PORTIONS OF THE MODIFICATION MUST BE CONSIDERED WITHIN A NEW V-BAND PROCESSING ROUND.

On November 1, 2016, the Commission initiated a processing round for NGSO FSS service using V-band frequencies (the "V-band Processing Round").[33] The cut-off for applications to be included in that V-band Processing Round was March 1, 2017, more than three years before Viasat filed the Modification.[34] As part of the V-band Processing Round, the FCC granted Viasat's current V-band authorization.[35] In this Modification, Viasat seeks to entirely redesign its constellation outside a V-band processing round and retain the processing round status of the application it filed over three years ago. Viasat's Modification proposes significant changes to its V-band use after the conclusion of the initial V-band processing round, and it is not the only operator to have filed such an application.[36] As such, the public interest in the certainty of the interference environment and the possibility for the entry of new systems[37] would be best served by considering the V-band portion of Viasat's Modification in a new V-band processing round.

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[33] *V-band Processing Round Public Notice*.
[34] *Id.*
[35] *See Viasat Inc.*, Order and Declaratory Ruling, 35 FCC Rcd 4324 (2020).
[36] *See* AST&Science LLC Petition for Declaratory Ruling Granting Access to the U.S. Market for a Non-U.S.-Licensed Non-Geostationary Orbit Satellite Constellation, IBFS File No. SAT-PDR-20200413-00034 (filed Apr. 13, 2020); Mangata Networks LLC Petition for Declaratory Ruling Granting Access to the U.S. Market For the Mangata Networks System, IBFS File No. SAT-PDR-20200526-00054 (filed May 26, 2020).
[37] *NGSO FSS Order*, at ¶ 61 ("[T]reatment of later applicants to approved systems must necessarily be case-by-case based on the situation at the time, and considering both the need to protect existing expectations and investments and provide for additional entry as well as any comments filed by incumbent operators and reasoning presented by the new applicant.").

This would additionally allow interested parties and the Commission the opportunity to fully consider the potential effects of Viasat's redesign as relates to its V-band frequencies, rather than consider them within a Ka-band processing round.

V. CONCLUSION.

Viasat's Modification has a significant effect on the interference environment for other NGSO FSS systems. The Modification both increases the number and duration of in-line events with the Kuiper System and creates uncertainty within the V-band operating environment, which is best assessed in a new V-band processing round. As shown in Amazon's analysis above, Viasat's Modification does not meet the *Teledesic* standard that provides a framework for evaluating modifications. Accordingly, Amazon respectfully requests that the FCC include the Ka-band portions of Viasat system set forth in the Modification as part of the 2020 Processing Round, and that the V-band portions of the Modification be deferred to a new V-band processing round. Doing so would serve the public interest in regulatory certainty and the stability of the interference environment.

Respectfully submitted,

/s/ William Lewis

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August 31, 2020

CERTIFICATE OF SERVICE

I hereby certify that, on this 31st day of August 2020, a copy of the foregoing pleading was served via First Class mail upon:

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Amy R. Mehlman
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/s/ Leslie Gray
Leslie Gray

ANNEX A – INTERFERENCE-TO-NOISE EFFECTS OF VIASAT MODIFICATION

Figure A.1: Distribution of Received I/N Before and After Modification; Direction: Downlink; Interferer: Kuiper System Gateway Links, Victim: Viasat Gateway Links

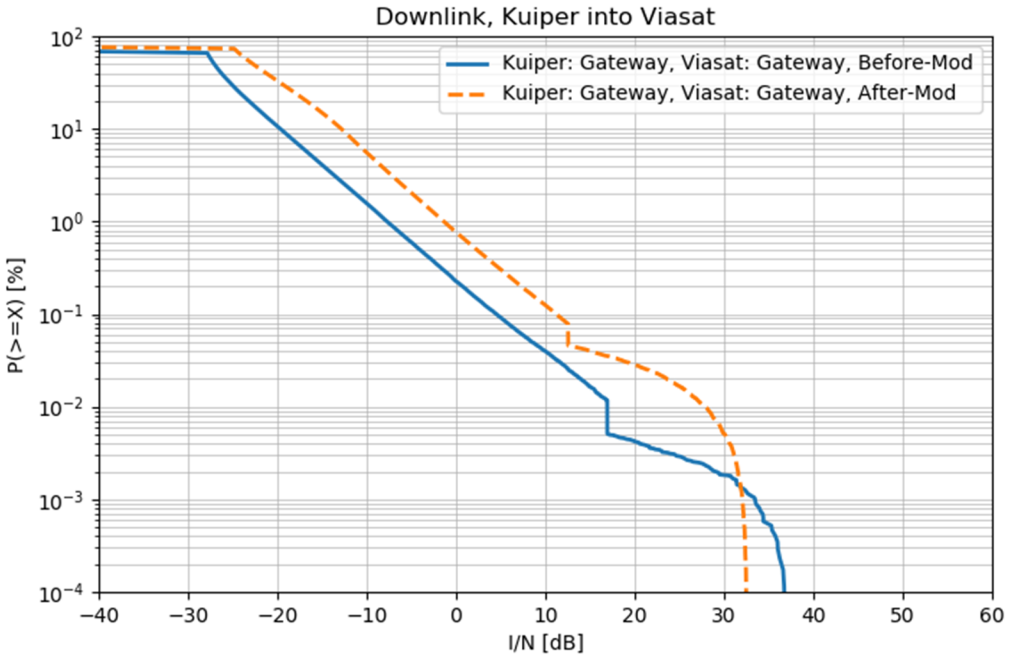

Figure A.2: Distribution of Received I/N Before and After Modification; Direction: Downlink; Interferer: Kuiper System Gateway Links, Victim: Viasat User Links

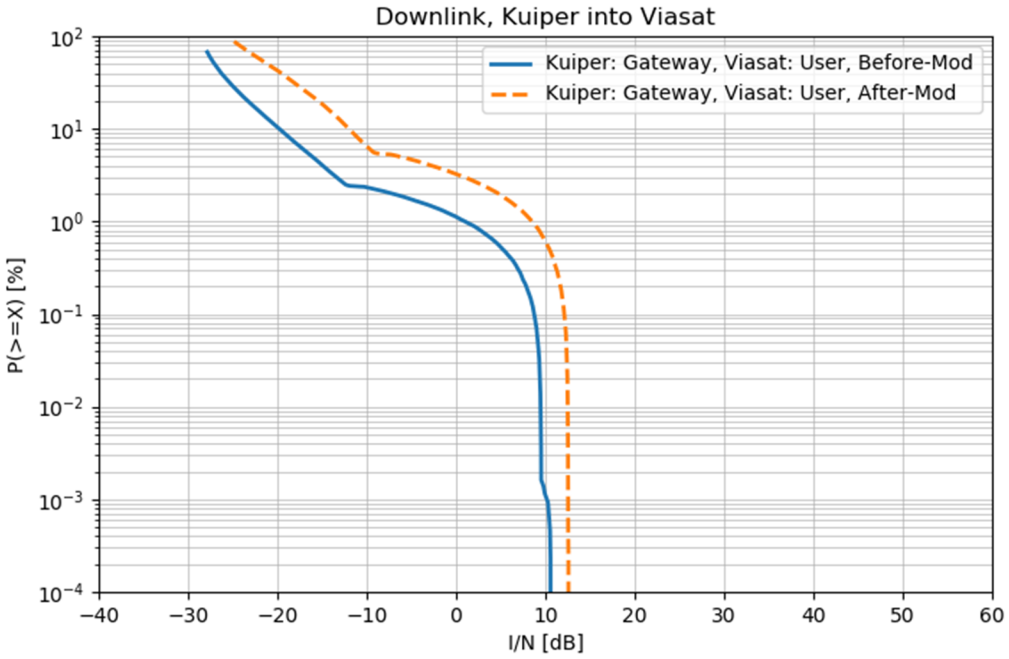

Figure A.3: Distribution of Received I/N Before and After Modification; Direction: Downlink; Interferer: Kuiper System User Links, Victim: Viasat Gateway Links

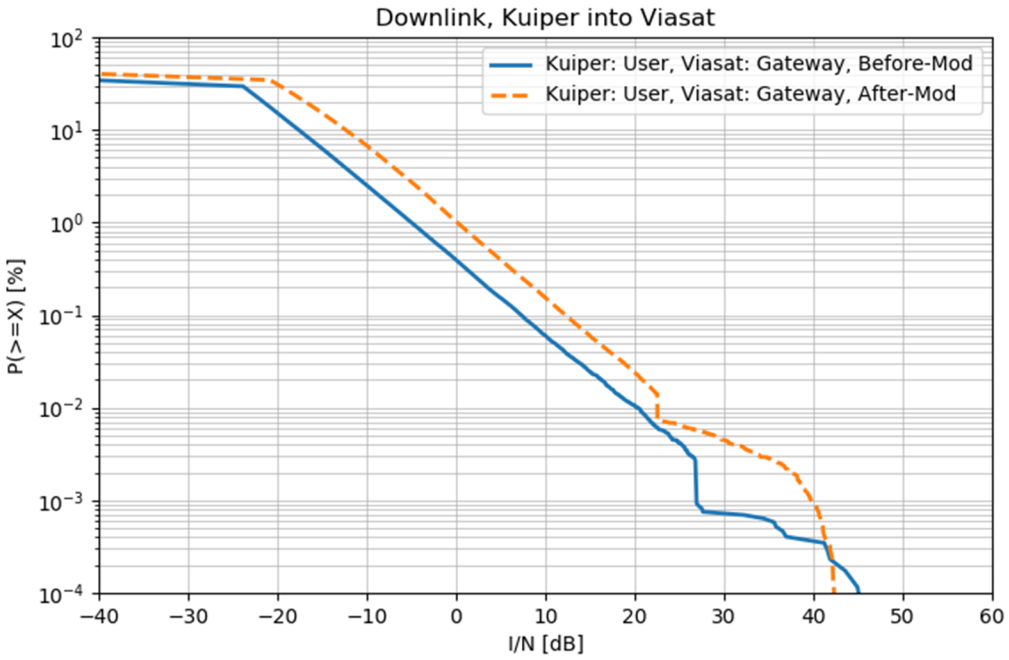

Figure A.4: Distribution of Received I/N Before and After Modification; Direction: Downlink; Interferer: Kuiper System User Links, Victim: Viasat User Links

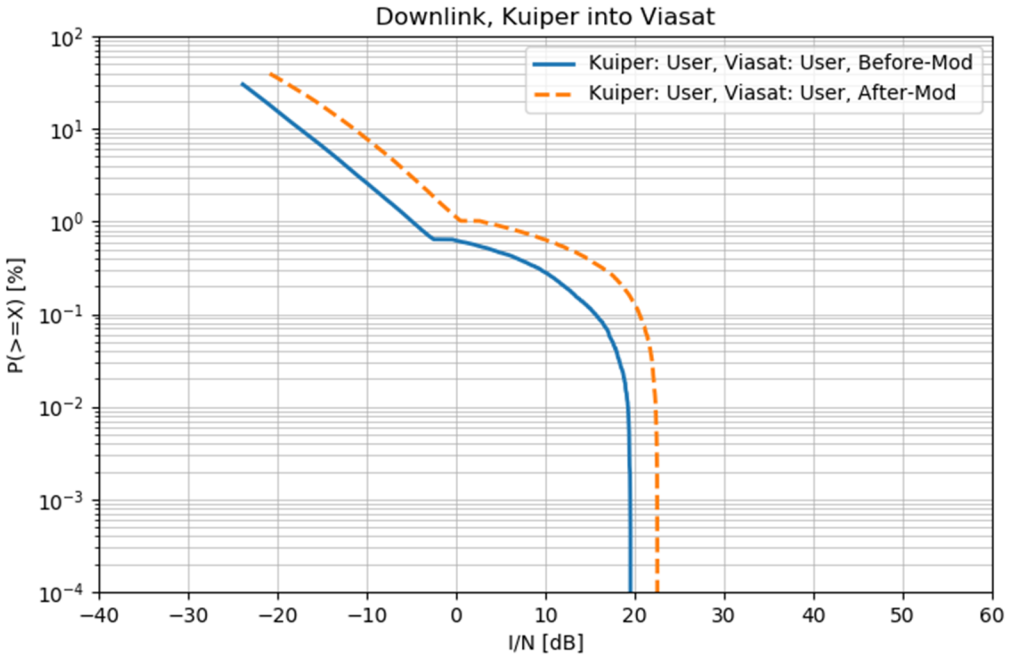

Figure A.5: Distribution of Received I/N Before and After Modification; Direction: Uplink; Interferer: Kuiper System Gateway Links, Victim: Viasat Gateway Links

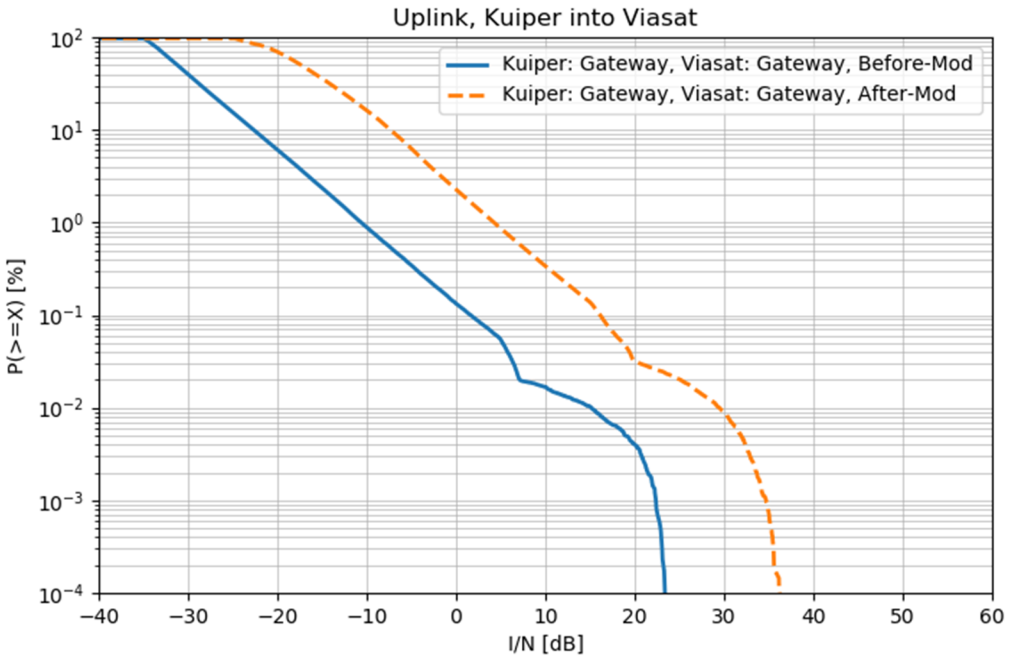

Figure A.6: Distribution of Received I/N Before and After Modification; Direction: Uplink; Interferer: Kuiper System Gateway Links, Victim: Viasat User Links

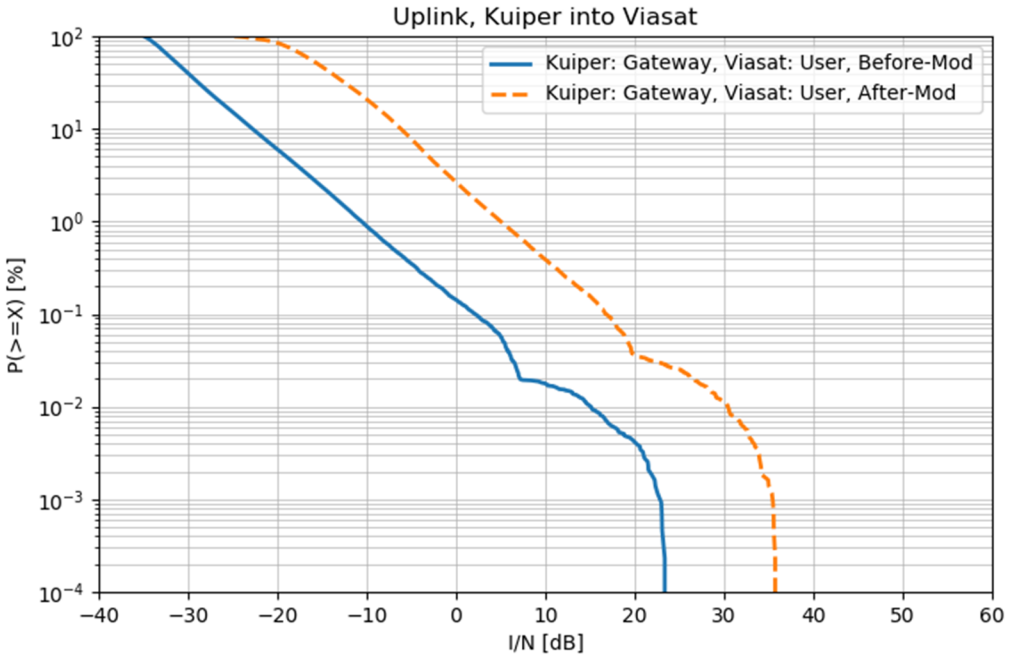

Figure A.7: Distribution of Received I/N Before and After Modification; Direction: Uplink; Interferer: Kuiper System User Links, Victim: Viasat Gateway Links

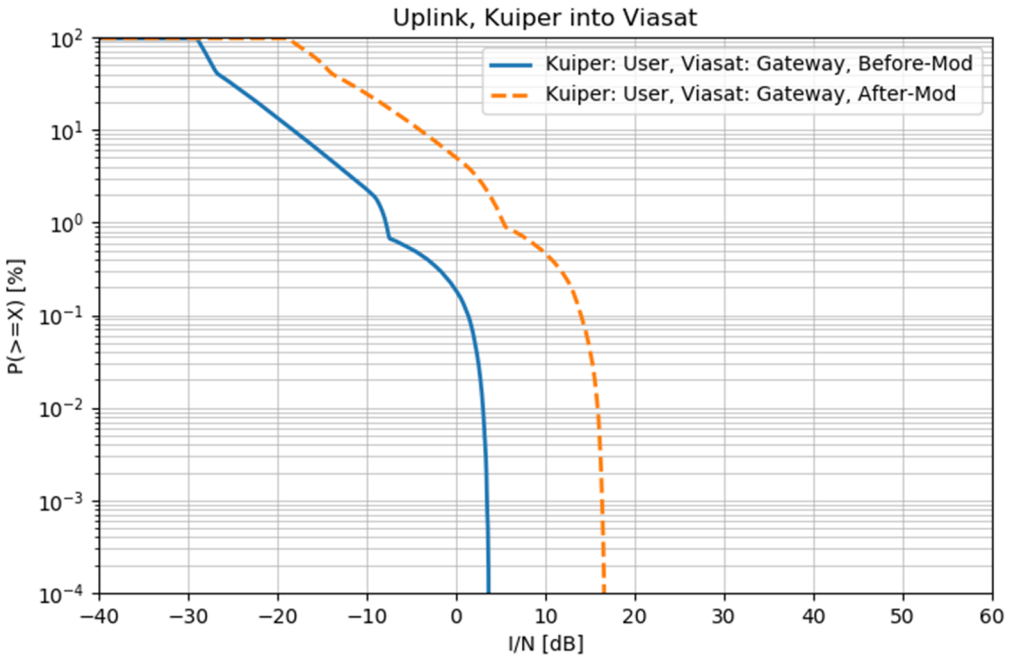

Figure A.8: Distribution of Received I/N Before and After Modification; Direction: Uplink; Interferer: Kuiper System User Links, Victim: Viasat User Links

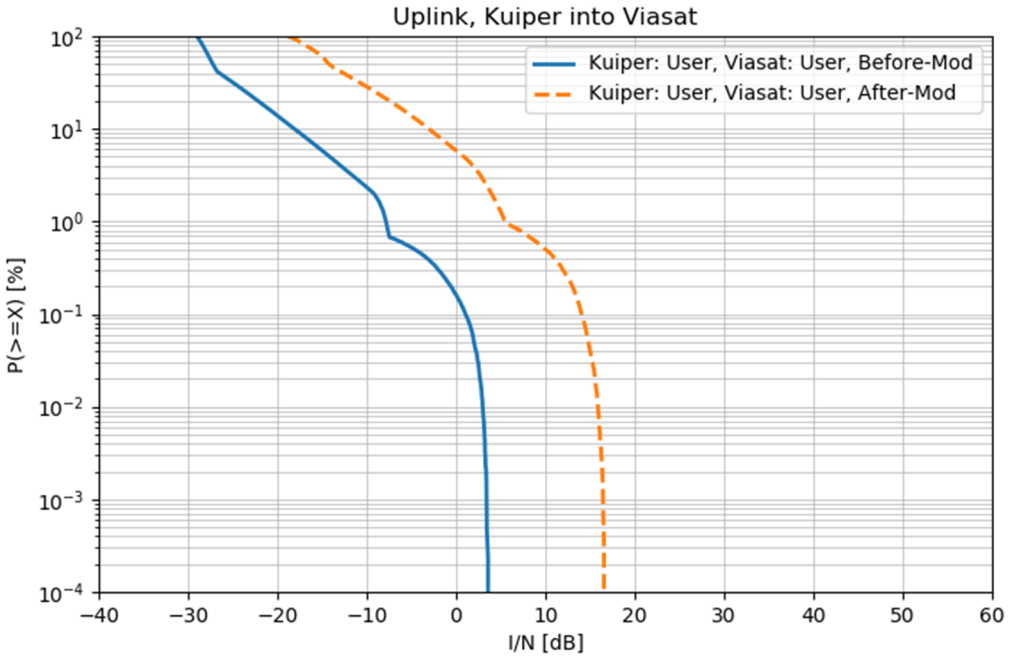

Figure A.9: Distribution of Received I/N Before and After Modification; Direction: Downlink; Victim: Kuiper System Gateway Links, Interferer: Viasat Gateway Links

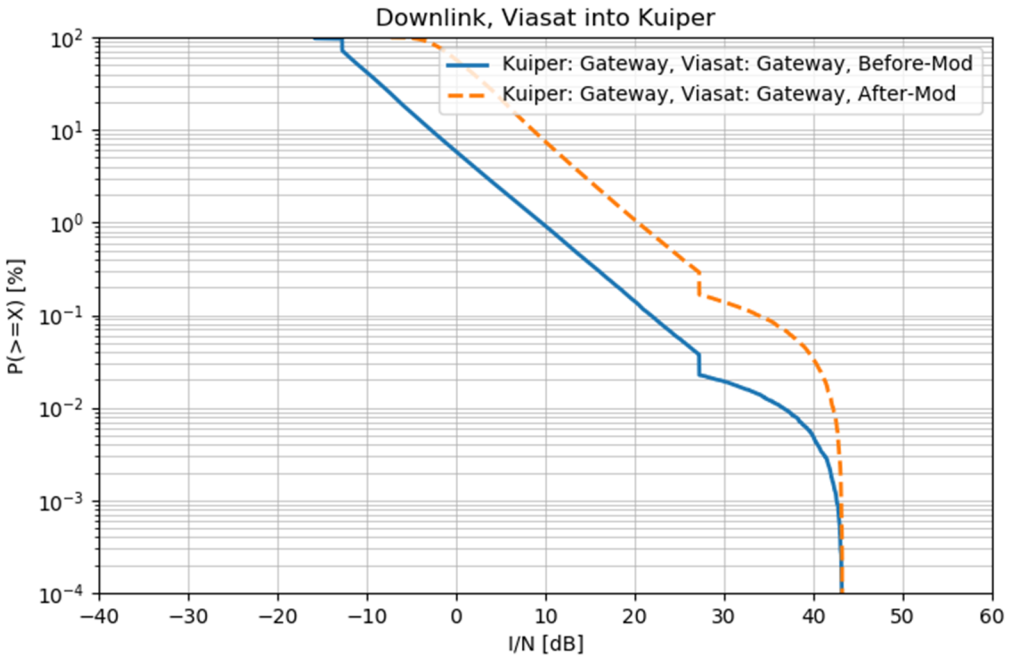

Figure A.10: Distribution of Received I/N Before and After Modification; Direction: Downlink; Victim: Kuiper System Gateway Links, Interferer: Viasat User Links

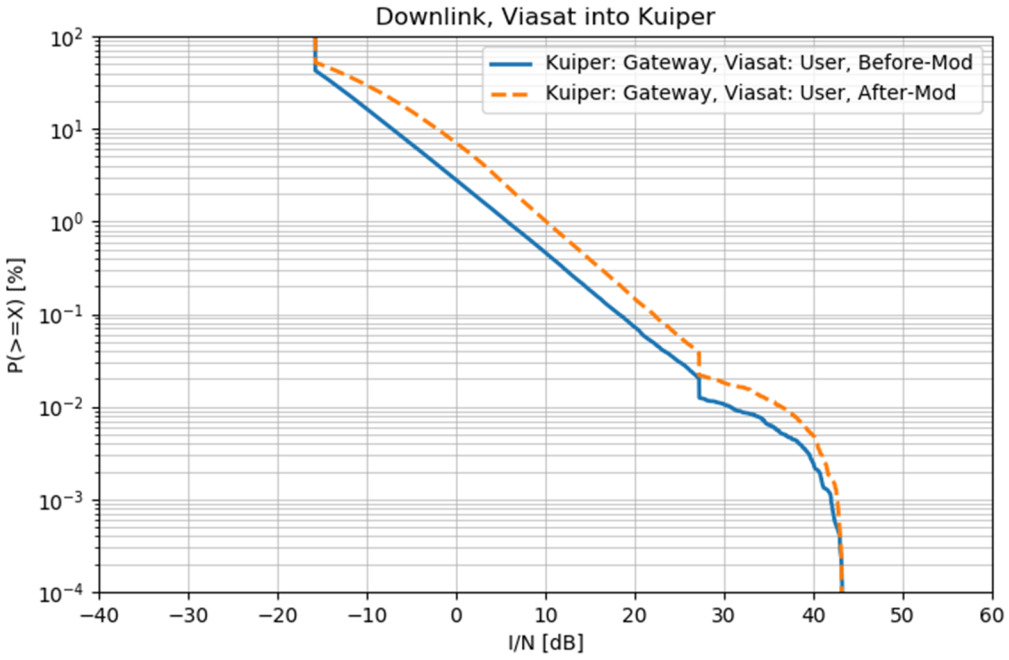

Figure A.11: Distribution of Received I/N Before and After Modification; Direction: Downlink; Victim: Kuiper System User Links, Interferer: Viasat Gateway Links

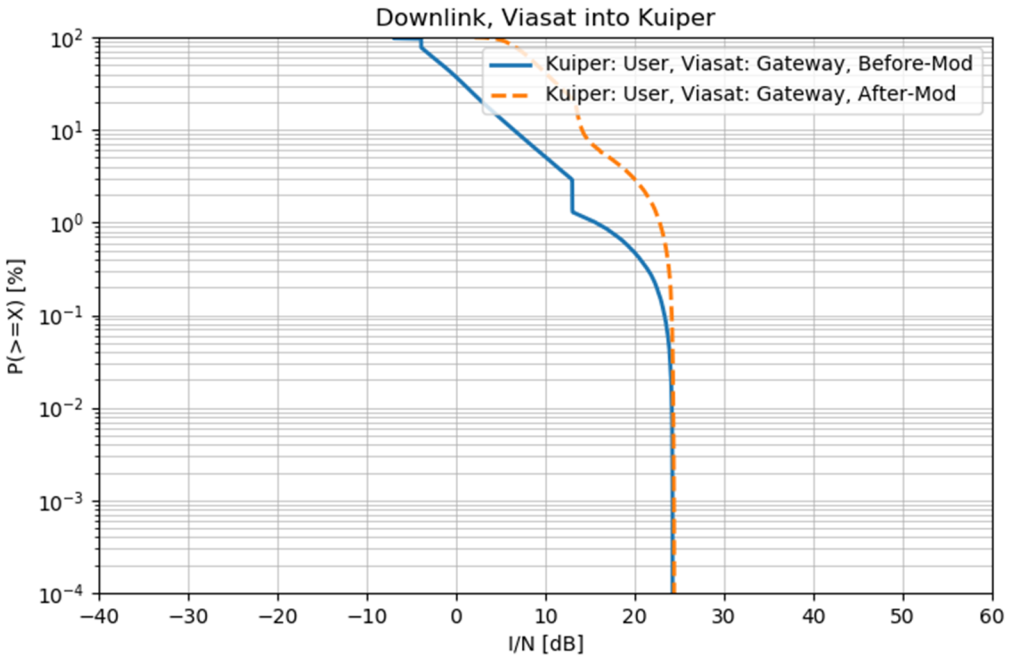

Figure A.12: Distribution of Received I/N Before and After Modification; Direction: Downlink; Victim: Kuiper System User Links, Interferer: Viasat User Links

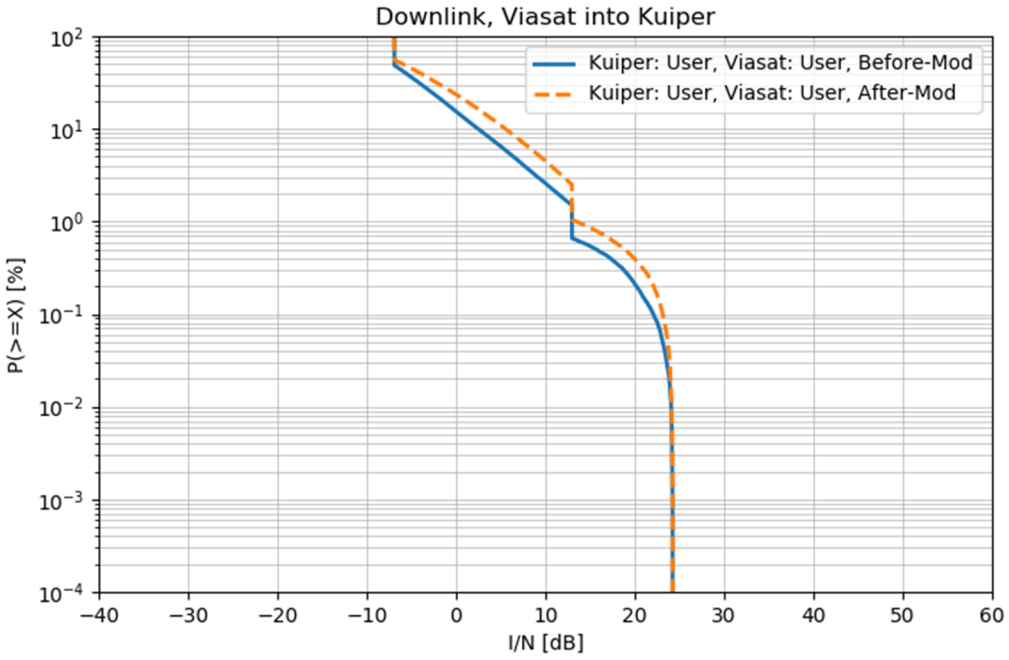

Figure A.13: Distribution of Received I/N Before and After Modification; Direction: Uplink; Victim: Kuiper System Gateway Links, Interferer: Viasat Gateway Links

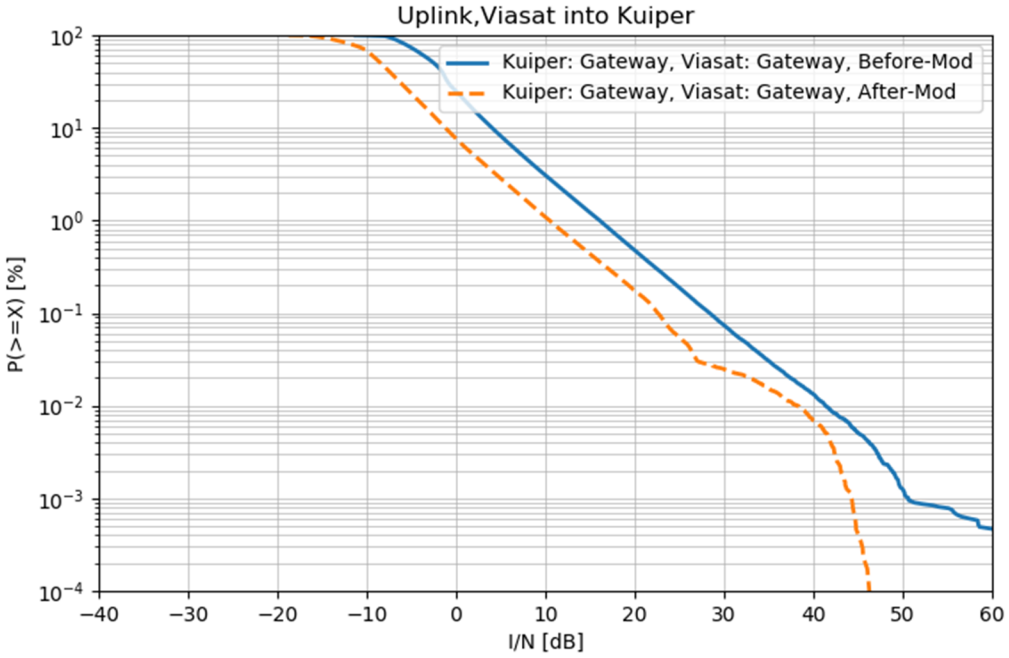

Figure A.14: Distribution of Received I/N Before and After Modification; Direction: Uplink; Victim: Kuiper System Gateway Links, Interferer: Viasat User Links

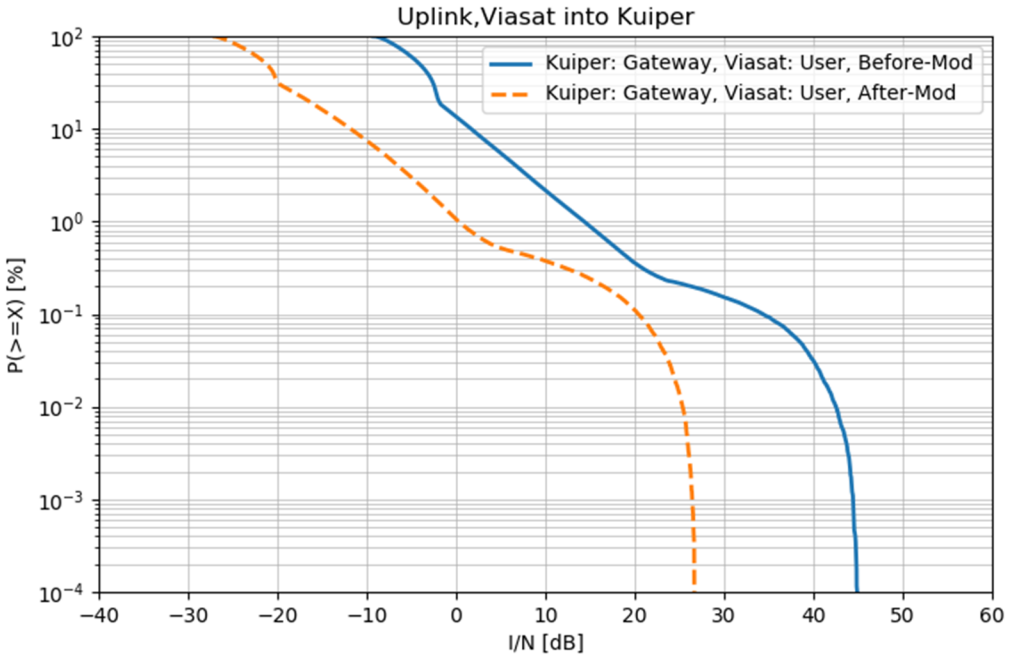

Figure A.15: Distribution of Received I/N Before and After Modification; Direction: Uplink; Victim: Kuiper System User Links, Interferer: Viasat Gateway Links

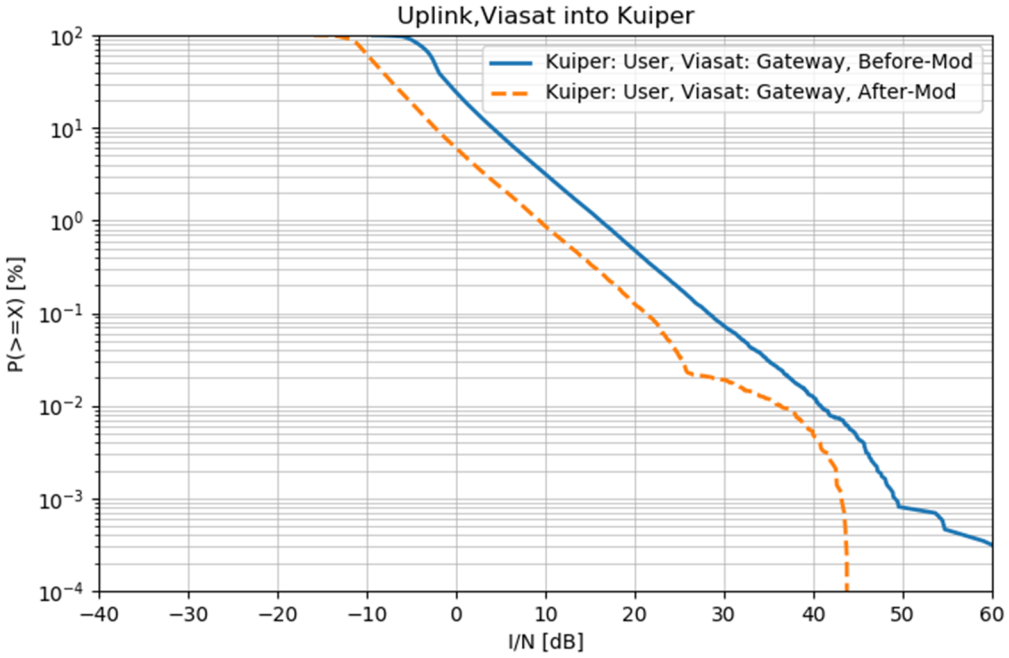

Figure A.16: Distribution of Received I/N Before and After Modification; Direction: Uplink; Victim: Kuiper System User Links, Interferer: Viasat User Links