Before the
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554

In the Matter of	)	
	)	
2000 Biennial Regulatory Review --	)	
Streamlining and Other Revisions of Part 25 of	)	IB Docket No. 00-248
the Commission's Rules Governing the Licensing	)	
of, and Spectrum Usage by, Satellite Network	)	
Earth Stations and Space Stations	)	

To: The Commission

Comments of Spacenet Inc. and StarBand Communications Inc. In Response to Further Notice of Proposed Rulemaking

Mark P. Bresnahan
Vice President& General Counsel
Lesley Cooper
Senior Counsel
Spacenet Inc.
1750 Old Meadow Road
McLean, VA 22102
(703) 848-1000

John Chang
General Counsel
StarBand Communications Inc.
1760 Old Meadow Road
McLean, VA 22102
(703) 245-6430

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Spacenet Inc. and StarBand Communications Inc. (Spacenet/StarBand) welcome this opportunity, pursuant to Sections 1.415, 1.419 and 1.421 of the Commission's Rules, to respond to the Further Notice of Proposed Rulemaking ("FNPRM") [1] in this proceeding. Consistent with Spacenet/StarBand's initial Comments and Reply Comments, we remain strongly supportive of the Commission's goals in initiating this proceeding: "[to] encourage innovation, significantly reduce the filing burdens on applicants and licensees, expedite the process of issuing licenses, accelerate the provision of service to the public, and promote service in rural and unserved areas."[2] The public interest in expediting the availability of a variety of innovative services, including

[1] *In re 2000 Biennial Regulatory Review-- Streamlining and Other Revisions of Part 25 of the Commission's Rules Governing the Licensing of, and Spectrum Usage by, Satellite Network Earth Stations and Space Stations,* Further Notice of Proposed Rulemaking, 17 FCC Rcd. 18585 (2002).

[2] *See In re 2000 Biennial Regulatory Review – Streamlining and Other Revisions of Part 25 of the Commission's Rules Governing the Licensing of, and Spectrum Usage by, Satellite Network*

specifically broadband services, to all Americans, no matter where they might live or work, would be significantly advanced by streamlining and simplifying application processing for satellite networks comprised of antennas that are less than 1.2 meters in diameter. As the Commission has observed, the enormous growth in satellite service subscribership during the past four years continues to drive down costs to consumers of hardware and service. Furthermore, the small size of the antennas, together with low or no-cost installation, presents consumers with a realistic competitive alternative to multichannel video services and other sources of high-speed Internet connections.[3]

Spacenet Inc. is a subsidiary of Gilat Satellite Networks Ltd. ("Gilat"), a leading global provider of telecommunications solutions based on very small aperture antenna terminal ("VSAT") satellite network technology. Gilat and its subsidiaries deliver affordable satellite-based, end-to-end enterprise networking and rural telephony solutions to customers across six continents, including interactive broadband data services. Spacenet is one of the largest providers of VSAT network solutions in the United States, counting among its many customers governmental entities, health care service providers, businesses of all types with a national or regional presence, and industrial sectors such as energy, that require reliable, secure two-way data communications with remote/isolated areas to safely and efficiently perform high-risk activities, such as oil exploration.

Earth Stations and Space Stations, Notice of Proposed Rulemaking, 15 FCC Rcd. 25128 (2000), ¶ 1 ("Notice").

[3] For example, the number of Direct Broadcast Satellite subscribers has almost tripled between June 1998 and June 2002. *In re Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming,* Ninth Annual Report, MB Docket No. 02-145, 2002 WL 31890210, ¶ 7 (Dec. 31, 2002); *In re Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming,* Fifth Annual Report, CS Docket No. 980102, 1998 WL 892964 (Dec. 23, 1998).

StarBand is a joint venture with Gilat and other investors that was the first national satellite provider of two-way,[4] always-on, high-speed Internet connections to consumers and small businesses. StarBand remains the only two-way consumer-oriented broadband satellite service available throughout all fifty states, Puerto Rico and the Virgin Islands.[5]

As both the FNPRM and the original Notice observe, satellite-based service providers have made great strides in technological innovation that have improved quality and reliability of service as well as spectrum efficiency. The result has been a consistent ability rapidly to add new subscribers and continue to increase service options. These industry accomplishments are due in no small part to an FCC regulatory scheme that is technology-neutral and relies on flexible guidelines to preserve technical and operational integrity. Spacenet/StarBand believe, however, that certain of the FNPRM proposals appear to rely on evaluation of some Part 25 rules based on an incomplete or inaccurate record. That process has prompted the Commission to seek comment on some proposals that would needlessly impose additional and substantial new regulations on VSAT network operators. These Comments provide the Commission with additional data and analysis to support a decision to either relax rules, or, at a minimum, keep the existing rules in place, rather than adopt additional regulatory requirements in order to resolve speculative concerns that are fully addressed by the existing rules.

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[4] StarBand distinguished itself as an innovator in relying from its start solely on its satellite network to provide both upstream and downstream data paths.

[5] StarBand bundles its two-way Internet access service with reception of DBS multichannel video services via a single sub-meter antenna throughout all 48 contiguous United States (CONUS). Due to satellite performance constraints, sites outside CONUS require a 1.2 meter antenna to support StarBand's Internet access service.

In this respect, it is helpful to bear in mind that this proceeding was initiated pursuant to the Commission's statutory obligation to perform a biennial review of its rules. Specifically, Section 161 of the Communications Act, 47 U.S.C. § 161. states:

> In every even-numbered year (beginning with 1998), the Commission---
>
> (1) shall review all regulations issued under this chapter in effect at the time of the review that apply to the operations or activities of any provider of telecommunications service; and
>
> (2) shall determine whether any such regulation is no longer necessary in the public interest as the result of meaningful economic competition between providers of such service…The Commission shall repeal or modify any regulation it determines to be no longer necessary in the public interest.

As discussed at length by the United States Court of Appeals for the D.C. Circuit,[6] Congress intended the Commission to regularly review its rules in order to determine, based on the proceeding's record, whether the existing rules should be maintained, or whether the presence of competition supports repealing or modifying the rule to promote deregulation. Section 161 does not appear to authorize or contemplate a third option of adopting rules that will increase regulation.

Summary of Comments

Spacenet/StarBand's response to the FNPRM will focus on 1) revising existing antenna gain patterns for VSAT networks using sub-meter antennas by increasing the off-axis angle for measuring the antenna gain pattern in the GSO orbital plane;

2) supplementing and clarifying the record with respect to the pointing error issue;

[6] *See Fox Television Stations, Inc. v. FCC,* 280 F.3d 1027 (D.C. Cir.), modified in part on rehg, 293 F.3d 537 (D.C. Cir. 2002). While that decision focused on § 202(h) of the Act, relating to biennial review of broadcast ownership rules, the Court recognized the direct relationship between the Commission's statutory mandate under that provision and Section 11 of the Telecommunications Act of 1996, later codified as 47 U.S.C. § 161. *280 F.3d at 1033-34.*

3) opposing adoption of specific rules governing random access techniques, but in the alternative, proposing a paradigm that will prove more effective; and 4) responding to SIA proposals that would impose additional new regulations on earth station applicants.

- Our earlier comments suggested, and we continue to believe, that a shift to a greater off-axis angle for measuring the antenna gain pattern in the GSO plane is justified and manageable. Spacenet/StarBand conclude that the Commission's deregulatory decision to increase the off-axis angle for measuring the antenna gain pattern in the GSO plane to 1.8°, while accounting for nominal pointing error, achieves an equivalent goal. We propose, however, to represent the interaction between an increase in the off-axis angle and pointing accuracy by a measurement formula of 1.8° - x, where "x" represents pointing error exceeding 0.3°. Pointing error is a legitimate concern of the industry and the Commission if the off-axis angle is increased to 1.8°. The Spacenet/StarBand formulation represents a realistic and workable limitation on pointing error for VSAT remote earth stations that will accommodate the revised off-axis antenna gain evaluation angle.

- There are a number of factors that are potential influences on pointing error. A number of Part 25 provisions collectively address key influences on VSAT installation in an effective, flexible and technology-neutral way. Additional regulation is a solution in search of a problem, and would impose substantial new technical and operational costs on VSAT providers without yielding any public interest benefits. The new regulatory requirements proposed by the FCC-- use of a pilot signal to prevent satellite access if a submeter antenna is not correctly pointed, use of a specific Location Identifier System to identify interference sources from a central location, and requiring standardized professional installation-- all would impose unnecessary new regulatory burdens. Consistent with the biennial review process, we do, however, support adoption of a provision with a technology-neutral requirement that, in the event of interference, VSAT network operators be capable of efficiently, reliably and expeditiously identifying the source of interference.

- Spacenet maintains that the public interest would not be served by adopting stringent new regulation of random access techniques. There is no factual support for deciding to regulate a process that effectively serves as a model of collaborative spectrum use. As VSAT networks have rapidly expanded, particularly during the past decade, there have been no reported incidents of harmful or unacceptable interference caused by the random access techniques that have become enshrined as industry practices. Both the satellite station licensees and the VSAT network providers are directly invested in meeting the demands of a growing customer base through a continued partnership to maintain high service quality and minimize interference. The central business need to attract and maintain customers in an increasingly competitive market for broadband services

has proven the most effective type of incentive to adopt random access techniques that are best-designed to avoid interference. Nonetheless, should the Commission feel compelled to adopt a specific rule in this area, Spacenet/StarBand propose a more flexible, graduated approach than the FNPRM proposal, that will also be more effective in decreasing the probability of transmission collisions.

- We agree with the Commission that the Satellite Industry Association proposals related to processing of applications for VSAT network earth stations are unworkable and would undermine the streamlining goals of this proceeding. In particular, SIA's proposed coordination procedures would transform an aspect of the application process from what is now a very troublesome stumbling block into an insurmountable mountain. We urge the Commission to maintain existing procedures that require the "home satellite provider" to submit only a single affidavit evidencing completion of the requisite coordination. Moreover, we believe that streamlining the application process by adopting the more flexible approach of establishing measurement of the off-access angle through use of 1.8° -x, where "x" represents the nominal pointing error in excess of 0.3°, will also eliminate the need for additional coordination requirements.

The Public Interest Would be Served By Adopting The Less Stringent Approach of Increasing the Off-Axis Angle for Measuring Antenna Gain Pattern Performance In the GSO Orbital Plain

Spacenet/StarBand support the Commission's conclusion that increasing the angle for evaluation of off-axis antenna gain performance would facilitate implementation of routine licensing of Ku-band antennas smaller than 1.2 meters. The Commission favors increasing the off-axis angle for evaluation of the antenna gain envelope within the GSO orbital plane to 1.8°.[7] That proposal is, however, conditioned on devising a formula that will take into account any intermittent deviations from pointing accuracy.[8] To proceed with an increase in the off-axis angle without increasing the risk of harmful interference, the Commission seeks comment on a mechanism to accommodate an increase in the off-axis angle while accounting for the

[7] Spacenet/StarBand believe that Ka-band and Ku-band systems should be treated equally in terms of off-axis compliance and the Spacenet/StarBand proposal presented for Ku-band submeter antennas should be applied to Ka-band submeter antennas as well.

[8] *See* FNPRM, ¶¶ 31 to 41.

occurrence of any pointing error. To illustrate the type of solution contemplated, the Commission proposes to devise a rule using as the basic framework a simple formula:

"1.8° - x" where "x" represents the pointing error

The Commission requests statistical data establishing the degree of pointing error that the "average earth station antenna" is capable of achieving without causing unacceptable levels of interference. The Spacenet/StarBand sub-meter antenna pointing accuracy analysis in Attachment A shows that the proposed off-axis angle of 1.8° has a built-in pointing accuracy of 0.4° that can and is being achieved by sub-meter VSAT networks today. Spacenet/StarBand and other licensees have sub-meter installations licensed pursuant to 47 C.F.R. § 25.209 that are authorized to start measurement of antenna performance at an off-axis angle of approximately 1.8°. Such VSAT licensees have successfully installed and operate large networks of submeter antennas without causing unacceptable levels of interference.[9] Spacenet/StarBand would define "x" conservatively to represent the applicant's nominal pointing error in excess of 0.3°.

Spacenet/StarBand propose a pointing error floor stricter than Attachment A's conclusion that a pointing error of 0.4° is readily achievable by today's earth station technology. First, Spacenet/StarBand believe that since the transition to routine processing will eliminate the current level of technical analysis given to each application as it is processed, it is prudent to err on the side of caution. Second, the Commission's application processing practices for applications filed under Section 25.209 appear to indicate a level of comfort with a nominal pointing error of 0.3°. If, as a practical matter, 0.3° has become the "routine" for both the

[9] Examples of sub-meter Ku-band transmit/receive licenses with off-axis antenna compliance with the Commission's "29 – 25 Log □ dBi at approximately 1.8 degrees off-axis are the Channel Master 89 x 62 cm and 0.96 meter antenna, Spacenet license call signs E000035 and E000132 respectively, and the Prodelin 0.98 meter, Hughes Network Systems call signs E000166 and E970067.

Commission and industry in considering pointing error for submeter antennas, adopting that standard is supportable because it has been found workable by all interested parties.

Spacenet/StarBand believe this proposal clearly places the responsibility for antenna pointing accuracy where it belongs: with the earth station licensee. The Spacenet/StarBand proposal is also consistent with the public interest objectives of encouraging innovation in small earth station technology, reducing significantly the filing burdens on VSAT applicants and licensees, and expediting the routine license grant of networks using submeter antennas.

Lack of Any Documented Instances of Interference Caused by Pointing Error Demonstrates that the Current Part 25 Rules Are Effective, and the Need to Impose Additional Regulation In This Area is Based on Unsupported Speculation

As part of its proposal to increase the starting point of the off-axis angle at 1.8°, the Commission also seeks comment on whether additional rules are needed to better safeguard against the possibility of submeter antennas causing harmful interference to adjacent satellite systems and terrestrial wireless operations. PanAmSat's proposals responsive to this issue are specifically referenced. While the Commission does not believe that, at this time, there is sufficient support to adopt all of PanAmSat's proposals, the FNPRM does propose to adopt one or more additional regulations for submeter antennas in the Ku-band to avoid increasing the potential for harmful interference. Spacenet/StarBand, joined by Hughes Network Systems and SES Americom, are already on record in this proceeding as opposing all the PanAmSat proposals because PanAmSat advocates adoption of onerous new rules to micromanage antenna pointing of submeter antennas.[10] The current provisions of Part 25 that promote accurate antenna pointing have a long and consistent record of effectiveness. [11]

[10] *See, e.g., Ex Parte Presentation of March 18, 2002,* Part 25 Streamlining Proceeding, IB Docket 00-248. Attachment B.
[11] *See, e.g.,* 47 C.F.R. §§ 25.271(-c), 25.272(d), 25.273(a) and 25.274.

PanAmSat appears to have based its proposals on an inaccurate understanding of antenna pointing practices within the VSAT industry. Specifically, PanAmSat contends that pointing of the VSAT antenna relies solely on the off-axis co-polarization antenna gain performance. As detailed in Attachment B, however, it is clear instead that the VSAT industry practice is to optimize link performance and minimize interference by aligning the peak gain of the VSAT antenna toward the intended satellite to minimize cross-polarized signals received from the VSAT at the hub earth station.[12]

Apparently based on incomplete information as to current VSAT industry practices, the Commission requests comment on a variety of proposals that purport to minimize the possibility of pointing error. Specifically, the Commission seeks comment on new regulations that propose to: 1) require VSAT networks to use a "pilot tone" for antenna alignment; 2) implement a Location Identification System ("LIS") that would provide site-specific information regarding the source of harmful interference; and 3) require professional installation of submeter dishes with adoption of uniform qualifications defining a "professional installer."[13] As discussed above, each of these approaches are already contemplated by the Commission's Rules, but wisely in a more flexible form that accommodates the differing proprietary technologies VSAT networks use to meet their obligations to maintain accurate pointing of submeter earth stations. Imposing any of these additional regulations would require the VSAT industry to invest

[12] VSAT antennas can be very accurately aligned to minimize the cross-polarization signal from the VSAT, which is coincident with the co-polarization peak. Specifically the *ex parte* presentation states: "As shown in the attached antenna gain pattern for the Spacenet and StarBand 89 x 62 cm antenna, the antenna cross-polarization gain performance has a steep null coincident with the co-polarization peak. During the antenna installation process, the VSAT antenna cross-polarization gain is measured and minimized to align the null with the desired satellite and polarization. This method of installing VSAT antennas sufficiently minimizes the potential for adjacent satellite interference." *See* Attachment B.

[13] *See* FNPRM, ¶¶ 46 - 52.

substantial technical, operational and monetary resources to comply with very specific new criteria to meet regulatory objectives that the VSAT industry has successfully achieved under the current regulatory scheme. Adoption by the Commission of new rules to micromanage compliance with technical and operational requirements would constitute a significant departure from the Commission's established policies of using flexible requirements to encourage technical innovation, expanded service offerings, and greater operational efficiencies.[14] Any decision to adopt these new rules is especially unjustified in the absence of any facts demonstrating that the existing rules are not accomplishing their stated purpose.[15]

It is unnecessarily burdensome, not technology neutral and inhibits innovation to require installation by a pilot tone in order to ensure that only accurately pointed submeter antennas are capable of transmitting. Existing rules require remote terminals to be accurately pointed before commencing transmission, and there is no evidence to suggest this mandate imposed upon VSAT providers has not been successfully met.[16] Different service providers have implemented a variety of technology platforms to comply with that requirement, but they do comply—and that should satisfy the Commission. For example, Spacenet/StarBand platforms use a technique that

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[14] *See, In re Policies and Rules for the Direct Broadcast Satellite Serivce,* Report and Order, 17 FCC Rcd. 11,331,¶148 (2002); *In re Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems,* First Report and Order and Memorandum Opinion and Order, 16 FCC Rcd. 17222, ¶ 24 (2001); *In re Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band,* Notice of Inquiry, ET Dkt No. 02-380, 2002 WL 31842408 (Dec. 20, 2002).

[15] Adoption of greater regulation absent any factual showing that the existing rules are inadequate to prevent harmful interference would be unsupportable in the context of any rulemaking proceeding. That is even more troublesome in the context of this proceeding, where a more regulatory scheme would be adopted pursuant to the Commission's biennial review mandate to eliminate or lessen unnecessary regulatory burdens, and to further the Commission's stated goals to expedite licensing and accelerate the provision of service to the public.

[16] *See, e.g.,* 47 C.F.R. § 25.273(a).

enables the assigned operational satellite to uniquely identify the outbound carrier through use of digital information embedded in the transmission stream. As a result, the VSAT can easily verify that the submeter antenna is receiving its assigned outbound transmission. The submeter antenna is unable to transmit until the verification process has been completed.

Similarly, the existing rule requiring identification of the source of any unacceptable interference within a VSAT system has led to the common practice of embedding site-specific identification information in the digital transmission. There is no need to require installation of a single, standardized location and identification system, as proposed. VSAT network operators such as Spacenet/StarBand that use contention access schemes rely on digital information embedded in the transmission stream that allows the network hub earth station to uniquely identify transmissions from each remote terminal. Such location information was not available during the 1980's in the analog video transmissions when the "Captain Midnight" interference incident referenced in the FNPRM occurred.

Today's VSAT network inbound (remote-to-hub) transmissions are based on proprietary transmission schemes rather than a single industry standard. Avoiding a regulation mandating a single technical standard has served as a visible catalyst for technological innovation and substantial investment in research and development.[17] Adoption of the LIS proposal would effectively penalize the VSAT industry for developing competing and innovative technologies to

[17] When compliance with the ATIS regulations, as set forth in Section 25.281 of the Commission's Rules, was required as of March 1, 1991, most satellite video transmissions were performed using analog FM modulated carriers. Now, many video transmissions use digital video encoders and digital modulation transmission with standardized Digital Video Broadcasting (DVB) or proprietary formats such as Hughes' DSS and Motorola's DigiCipher. Therefore, the Commission might consider amending Section 25.181 of its Rules to also include a technology-neutral means of ascertaining the remote sources of network interference to accommodate satellite video transmissions that do not use an analog transmission format.

comply with the Commission requirement to incorporate the capability to locate and identify remote terminals into system design. And it would do so with no evidence that the current structure which encourages innovation fails to meet the Commission's policy objective of enabling identification of the source of any harmful interference.

Finally, the Commission seeks comment on whether to impose a professional installation requirement for all Ku-band antennas less than 1.2 meters and C-band antennas less than 4.5 or 3.7 meters in diameter. Comment is also sought on the relative costs and benefits of a professional installation requirement, and whether a process or definition should be developed that establishes a uniform meaning of "professional installation."[18] Spacenet/StarBand believe that adopting a rule to require professional installation in all cases is unnecessary and would add significant additional cost as well as delay, particularly to subscribers in rural/isolated parts of the country, where satellite may well be their only broadband service option.[19] Rather, Spacenet/StarBand support the current practice of conditioning a station authorization on providing professional installation where the Commission determines that, for a specific implementation, the public interest would be served by professional installation. However, Spacenet/StarBand also believe that if a licensee is able to develop and demonstrate to the Commission a system that is capable of very accurate antenna pointing without professional installation, then the Commission should remove the professional installation provision and permit applicants to demonstrate that a professional installation condition is unnecessary.

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[18] *See* FNPRM,¶ 49.

[19] For a StarBand residential customer, professional installation represents approximately 15% of the total customer cost for a one-year service commitment. Numerous pricing plans for one or more years spread the cost of professional installation over more than one year, but a one-year customer commitment is typical.

The record of this proceeding contains no factual basis for a determination that interference has been generated that can be directly attributed to unqualified professional installers. Ultimately, the earth station licensee is responsible for interference caused by incorrect installation of submeter antennas.[20] Therefore Spacenet/StarBand believe that it is unnecessary to generate new costs and bureaucratic structures by initiating a certification program for professional installers, or convening an industry standards group to define uniform measurement equipment and techniques. Instead, Spacenet/StarBand support the current practice of requiring each earth station licensee to be responsible for defining the training and certification programs required for their own professional installers.[21]

It Would Not Be in the Public Interest for the Commission to Initiate Regulation of TDMA/Aloha Random Access Techniques

Spacenet/StarBand and Hughes Network Systems are the nation's primary interactive VSAT providers. Both of these VSAT providers have long relied upon the TDMA/Aloha random access technique to prevent or limit interference among multiple remote earth stations and prevent interference with adjacent satellite networks. In the FNPRM, the Commission concluded that VSAT networks should be allowed to use contention protocols such as TDMA/Aloha because these random access techniques enable VSATs to maximize network traffic, thereby realizing high levels of spectrum efficiency. The Commission further concluded that because the probability of transmission collisions is so small and, when they do occur, the resulting interference is so brief as to be imperceptible to the subscriber, the TDMA/Aloha technique is unlikely to produce harmful interference. Nonetheless, because Section 25.134 of

[20] As discussed above, however, a submeter antenna that is incorrectly pointed will be unable to transmit.
[21] *See* 47 C.F.R § 25.271.

the Commission's Rules sets absolute limits on power density 100% of the time, that provision could be read to preclude use of contention protocols as access techniques.

As Spacenet/StarBand, Hughes Network Systems, Loral Space & Communications, Ltd, PanAmSat Corporation, and SES Americom have all argued, it is unnecessary to regulate TDMA/Aloha access schemes because the existing regulations governing satellite interference provide an adequate process for resolving interference issues.[22] Satellites and the VSAT networks they serve have strong, market-based incentives to maintain high service quality and avoid interference. Subscribership must continue to grow and every effort must be made to retain existing customers or both satellite and VSAT networks will fail. There have been no documented incidents of harmful interference caused by random access techniques because there are powerful incentives for all stakeholders to make collaborative use of the bands they share. As transponder loading approaches a level where there is a possibility of interference and service degradation, VSAT and satellite providers cooperate in obtaining additional bandwidth. The VSAT network subscribers would experience service degradation prior to any adjacent satellite interference. The facts demonstrate that TDMA/Aloha has been a success as traffic on satellite networks has increased.

Nonetheless, the Commission has expressed concern. Because it anticipates a substantial increase in Internet traffic on VSAT networks, the Commission suggests there is a need to regulate random access techniques before interference becomes a problem. These speculative concerns contradict a solid record of the satellite and VSAT industries working together to accommodate significant subscriber and traffic growth without causing harmful interference. The Commission should rethink its intention to initiate regulation of TDMA/Aloha because it is

[22] *See, July 16, 2002 Ex Parte Presentation,* Part 25 Streamlining Proceeding, IB Docket 00-248.

premised on speculation, while a decision to refrain from such regulation would be premised on this proceeding's factual record and in accordance with the biennial review's statutory mandate to eliminate unnecessary rules and lessen regulatory burdens.

The Commission proposes to implement power reduction regulations for systems with collision probabilities greater than 1 percent[23] while concluding that current systems operating with a 5 percent collision probability are not causing unacceptable interference.[24] If implemented, the Commission's latest proposal would require a power reduction of 3 dB or greater for most TDMA/Aloha networks, which is more stringent than the NPRM's proposal abandoned by the Commission in this FNPRM as overly burdensome and likely to deprive VSAT networks of technical viability. Additionally, this proposal would unnecessarily lower current VSAT network throughput to reduce collisions that the Commission concludes are not causing unacceptable interference. Implementation of such a regulation would force TDMA/Aloha VSAT network operators to prematurely lease additional transponders to compensate for reduced throughput on the inbound channel, thereby eliminating many of the superior spectrum efficiencies that distinguish TDMA/Aloha from other random access techniques.

Implementation of the FNPRM proposal for regulation of TDMA/Aloha regulation would also impede broadband deployment by creating perverse incentives to make inefficient spectrum

[23] *See* FNPRM, ¶ 36 (Commission power reduction proposal for TDMA/Aloha systems with collision probability of greater than 1%).
[24] *See* FNPRM, ¶ 85 ("the probability of two remote earth station transmissions causing a collision on the same frequency within a VSAT network is less than 5 percent in most VSAT networks using Aloha"), FNPRM,¶ 86 ("The Bureau also determined that use of Aloha, as implemented at this time, does not cause harmful interference to other satellite systems.").

use and raising VSAT network implementation costs, thereby reducing the ability of satellite broadband to compete effectively with terrestrial broadband providers.

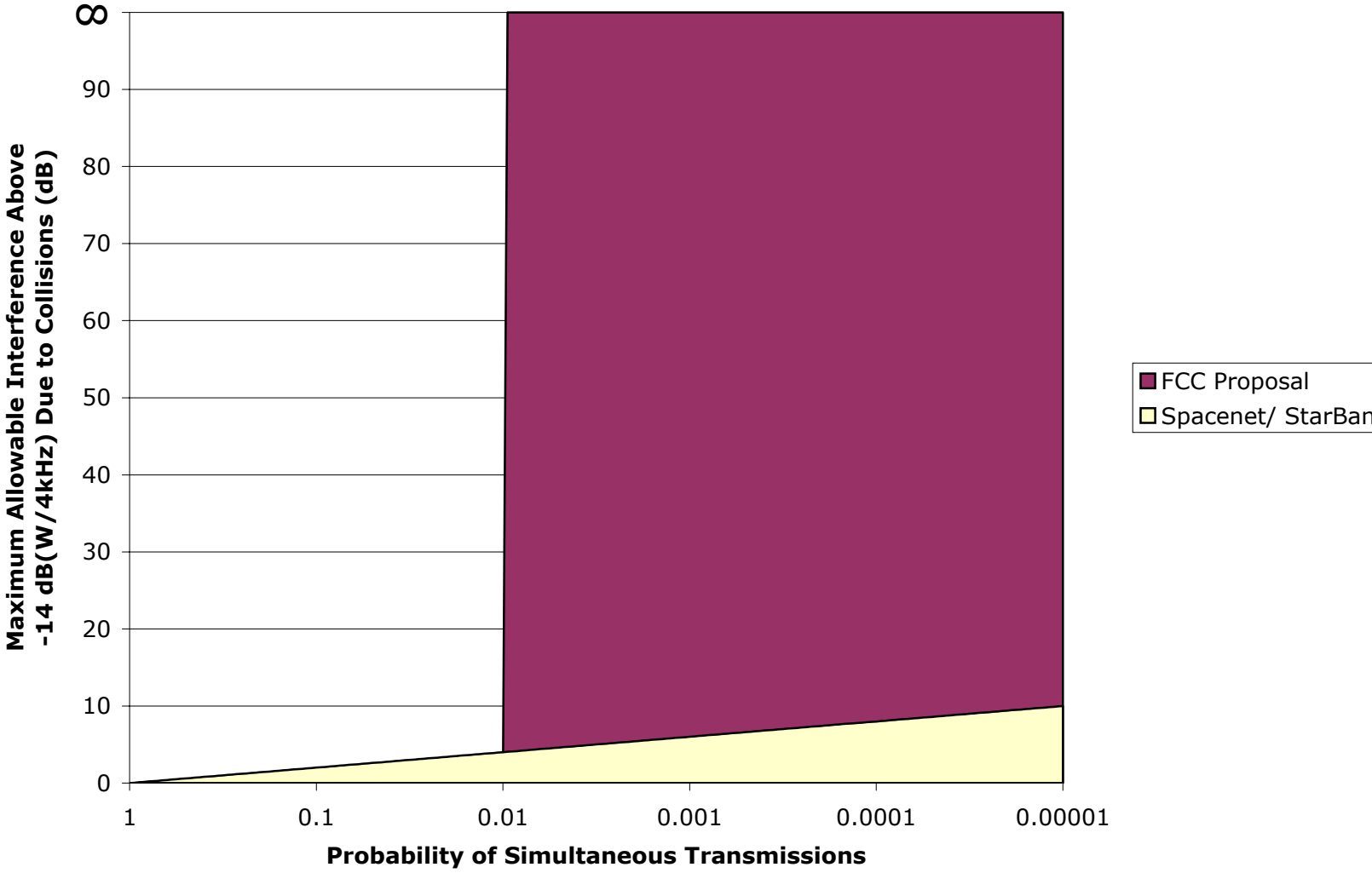
As stated previously in this proceeding, Spacenet/StarBand believe that regulation of the TDMA/Aloha access scheme is not necessary. This position is amply supported by the extensive technical analyses in the record provided by Spacenet/StarBand and virtually the entire satellite industry, as well as the Commission's own conclusion that TDMA/Aloha access schemes do not cause interference. However, if the Commission feels compelled to initiate regulation of TDMA/Aloha access schemes, Spacenet/StarBand propose an alternative to the FNPRM proposal. The Spacenet/StarBand proposal incorporates the collision probability as a variable rather than a single probability reference to provide a graduated approach that more accurately reflects TDMA/Aloha access scheme performance. Under the Spacenet/StarBand proposal,

> *Each earth station individually satisfies the power density limits of Section 25.134(a.);*
>
> *The maximum transmitter power spectral density of a digital modulated carrier into any GSO FSS earth station antenna shall not exceed the lesser of –14 dB(W/4kHz) or 14 + 2 x K – 10 Log_{10} { N(K) } dB(W/4kHz), where N(K) is the smallest number of simultaneously transmitting co-channel earth stations in the same satellite receiving beam such that the probability of an event with greater than N(K) simultaneous transmitters is less than 10^{-K} for integer values of K greater than or equal to one; and*
>
> *The maximum duration of any single collision is less than 100 milliseconds.*

Figure 1 provides a comparison of the Spacenet/StarBand and Commission proposals. Observe that the graduated Spacenet/StarBand proposal does not penalize TDMA/Aloha VSAT networks implemented with a lower collision probability and supports current network implementations, which the Commission has concluded do not cause interference. The graph

also highlights that the Spacenet/StarBand proposal directly ties a graduated upper bound to the collision probability.

Figure 1 - Comparison of TDMA/Aloha Proposals for Allowable Interference Power Above Antenna Input Power Limit



The Spacenet/StarBand proposal would provide VSAT network engineers sufficient flexibility to develop products with increased spectrum efficiency and reduced costs through innovations in TDMA/Aloha access scheme technology, while maintaining the interference environment at levels that have already been determined to be acceptable by the Commission. It is clearly in the public interest for any Commission regulation to promote technology advancements within acceptable interference levels that will ultimately result in greater spectrum efficiency, lower prices to the customer and greater broadband deployment. The Spacenet/StarBand proposal accomplishes these goals.

SIA's Proposal for Sub-meter Ku-band Antenna Coordination Should Not Be Given Further Consideration

As the Commission has correctly observed, SIA's proposals to revise sub meter Ku-band antenna coordination are overly complex, would defeat streamlining efforts by increasing the universe of "routine" applications, and would increase the burdens of coordination with space station licensees with which VSAT applicants already must contend. A VSAT applicant today obtains a coordination statement from its "home satellite," and any further coordination with adjacent satellites is the responsibility of the "home satellite"-- not the VSAT system licensee. Spacenet/StarBand urge that the Commission give no further consideration to SIA's coordination proposals, and maintain existing coordination procedures.

Clarification of the Maximum Hub EIRP Standard

In the FNPRM, the Commission requested Hughes Network Systems, SIA and Spacenet/StarBand comment on a basis for their request to clarify the maximum VSAT network hub earth station EIRP standard of 78.3 dBW in 47 C.F.R. § 25.134(a) as being on a per carrier basis rather than on an aggregate basis.[25] Spacenet/StarBand has been unable to determine the basis for the current earth station 78.3 dBW EIRP limit, aggregate or per carrier, and believes other regulations sufficiently define operational limits on a per unit bandwidth basis for interference modeling purposes. For adjacent satellite interference in the C-band and Ku-band networks, the maximum antenna input power spectral density standards in 47 C.F.R. §§ 25.134 and 25.212, combined with the off-axis antenna gain performance standards of 47 C.F.R. § 25.209 are sufficient to define the acceptable operating interference environment.[26] The Commission correctly codifies power- related interference parameters on a per unit bandwidth basis in these regulations rather than on an aggregated EIRP basis. Interference modeling of link performance is based on the interference power within the link specific desired carrier bandwidth being received by a demodulator.[27] The success of VSAT networks has increased the need to transmit many outbound carriers from the same VSAT network hub to support the growing

[25] *See* FNPRM, ¶¶ 119 -20.

[26] The maximum antenna input power spectral density regulations in 47 C.F.R. §§ 25.134 and 25.212 combine with the maximum off-axis antenna gain regulations in 47 C.F.R. § 25.209 to create a maximum off-axis EIRP spectral density standard. An example of this for Ku-band digital services: the -14 dBW/4kHz antenna input standard of Section 25.134(a) is combined with the close-in off-axis antenna gain standard of 29 – 25 $Log_{10}(\square)$ dBi in Section 25.209(a) to provide a maximum off-axis EIRP spectral density standard of 15 - 25 $Log_{10}(\square)$ dBW/4kHz. A combined method is used for Ka-band in 47 C.F.R. § 25.138.

[27] Interference effects can be easily determined when standards are provided on power spectral density basis. This enables the actual noise power to be calculated provided the receiver noise bandwidth. For example, the noise contribution to a link with a receiver with noise bandwidth of 400 kHz and a standard provided on a 4 kHz basis can be determined by adding 20 dB to the standard provided on a 4 kHz basis (10 Log_{10} [1,000 kHz / 4 kHz] = 24 dB).

customer base. The increase in outbound carrier quantity will increase the hub earth station aggregate EIRP, potentially above the 78.3 dBW standard, but since the off-axis EIRP spectral density levels will be maintained within limits in 47 C.F.R. §§ 25.134, 212 and 209, the expected interference environment will be maintained. Clarifying the EIRP limit as a per carrier basis will facilitate more cost effective use of VSAT network hub resources.

Conclusion

For the reasons stated herein, Spacenet/StarBand urge the Commission to expedite adoption of rules that will permit routine licensing of VSAT networks of submeter antennas. Spacenet/StarBand also request that the Commission avoid adoption of an unnecessarily restrictive new regulatory regime to accomplish the public interest goals of this biennial review proceeding.

Respectfully submitted,

___/s/ Mark P. Bresnahan
Mark P. Bresnahan
Vice President & General Counsel
Lesley Cooper, Senior Counsel
Spacenet Inc.
1750 Old Meadow Road
McLean, VA 22102

/s/ John Chang
John Chang
General Counsel
StarBand Communications Inc.
1750 Old Meadow Road
McLean, VA 22102

March 10, 2003

ATTACHMENT A

This Attachment provides an engineering analysis of the submeter antenna pointing accuracy in support of revision of Section 25.209 to enable routine licensing of antennas less than 1.2 meters in diameter. The exhibit will first address the issue of interleaved satellites and satellites that do not meet the Commission's station keeping regulations as this issue effects the revision of the off-axis angle for Ku-band submeter antennas and the requisite pointing accuracy for an acceptable interference environment.

Interleaved and non-Two Degree Satellites and the Topocentric Angle

The Commission requested comment on the use of interleaved satellites and satellites that do not meet the Commission's station keeping regulations.[28] Spacenet/StarBand believes the occurrence non-US licensed satellites spaced at less than two geocentric degrees should not be an issue that would hinder regulation revision for FSS Ku-band earth station antenna off-axis angle to allow routine licensing of antenna smaller than 1.2 meters. Table 1 lists currently active FSS Ku-band satellites that reside within the orbital longitudes used to provide satellite links within the United States and the Americas ("Domestic Arc") and reveals:

1. Only one orbital position contains co-located service at 72 degrees west longitude ("WL") where the Argentinean Nahuel 1 satellite services the southern hemisphere and SES Americom's AMC 6 satellite services the northern hemisphere.[29]

2. The preponderance of United States licensed satellites.

3. The clustering of non-US satellites at the low end and at the upper end of the Domestic Arc where future non-US satellites, such as Satmex 6 (Mexico - schedule for 109.2° WL) and Anik F2 (Canada - scheduled for 111.1° WL) will occupy orbital locations that are not adjacent to US satellites.

4. Only non-US licensed satellites Satmex 5 (116.8° WL) and Anik E1 (118.7° WL) are spaced closer than two degrees.

[28] *See* FNPRM at paragraph 36.

[29] Geographical separation provides sufficient isolation to support northern and southern hemisphere frequency and polarization re-use. Nahuel 1 is assigned to 71.8° WL and AMC 6 to 72° WL and thus "co-located."

It is within the control of the non-US licensed satellite operators to manage an interference environment associated with the Commission's two degree spacing policy and station keeping regulations and within the Commission's control to granting "ALSAT"[30] status. Spacenet/StarBand does not believe that interleaved satellites and regulation of station keeping should preclude revision of Section 25.209 to accommodate routine licensing of FSS Ku-Band antennas less than 1.2 meters using two geocentric degrees as the satellite spacing basis for submeter consideration. This single case of closer than two degree spacing in the domestic arc involving non-US satellites should not burden US submeter earth station applicants for FSS Ku-band licenses. If this remains a Commission concern, a new designation should be created for submeter authorized satellites that is a sub-set of the "ALSAT" designation. For example an "ALSAT-S" designation could allow submeter earth station licensees to operate on all FSS Ku-band satellites, except those spaced at less than two degrees. Spacenet/StarBand believes that US licensed satellites and earth station licensees should not be penalized for the rare non-US satellite spacing of less than two geocentric degrees and consideration of co-located satellites in submeter antenna use is not relevant due to the geographical separation required for all earth station interference models.

[30] US licensee authorization.

Table 1 – Active FSS Ku-Band Satellites in the Domestic Arc

72 to 129 degrees west longitude – source: www.lyngsat.com

Orbital Location (WL)	Satellite Name	Eastern Separation (degrees)	Western Separation (degrees)	Country	Satellite Operator Web Site
71.8°	Nahuel 1	n/a	0.2 to AMC 6 2.2 to SBS 6	Argentina	www.nahuelsat.com.ar
72.0°	AMC 6	0.2	2.0	USA	www.ses-americom.com
74.0°	SBS 6	2.0	5.0	USA	www.panamsat.com
79.0°	AMC 5	5.0	6.0	USA	www.ses-americom.com
85.0°	AMC 2	6.0	2.0	USA	www.ses-americom.com
87.0°	AMC 3	2.0	2.0	USA	www.ses-americom.com
89.0°	Telstar 4	2.0	2.0	USA	www.loralskynet.com
91.0°	Galaxy 11	2.0	2.0	USA	www.panamsat.com
93.0°	Telstar 6	2.0	2.0	USA	www.loralskynet.com
95.0°	Galaxy 3C	2.0	2.0	USA	www.panamsat.com
97.0°	Telstar 5	2.0	2.0	USA	www.loralskynet.com
99.0°	Galaxy 4R	2.0	2.0	USA	www.panamsat.com
101.0°	AMC 4	2.0	2.0	USA	www.ses-americom.com
103.0°	AMC 1	2.0	2.0	USA	www.ses-americom.com
105.0°	Gstar 4	2.0	2.3	USA	www.ses-americom.com
107.3°	Anik F1	2.3	3.8	Canada	www.telesat.ca
111.1°	Anik E2	3.8	5.7	Canada	www.telesat.ca
116.8°	Satmex 5	5.7	1.9	Mexico	www.satmex.com
118.7°	Anik E1	1.9	4.3	Canada	www.telesat.ca
123.0°	Galaxy 10R	4.3	6.0	USA	www.panamsat.com
129.0°	Telstar 7	6.0	n/a	USA	www.loralskynet.com

Antenna Pointing Accuracy Definition and Standard

An excerpt from the Electronics Industry Association's reference for the earth station antenna pointing accuracy definition and standard is provided below:[31]

> *Section 3.2 Pointing Accuracy*
>
> Definition: Pointing accuracy is the precision with which an antenna can be held (for fixed position antenna) or steered under specified operating conditions.
>
> The pointing error is a measure of the pointing accuracy (about a nominal position) and is defined as the space angle difference between the command vector and the actual position of the antenna communication RF axis.
>
> Standard: The pointing accuracy shall be specified as an RMS value.

Pointing Error Budget and Off-Axis Angle

The pointing accuracy of an earth station antenna is determined by many technical characteristics of the antenna, the procedure utilized to align the antenna and the satellite orbital characteristics. Geostationary satellites are maintained at +/-0.05 degrees of their assigned orbital location as per Section 25.210. The other two contributors are particular to the network operator's implementation and frequently contain proprietary procedures and therefore are not easily quantifiable for disclosure in an open proceeding or for the purposes of regulation.

Although the mean satellite location error is zero, the Commission requires FSS satellites to be maintained to within +/- 0.05 degrees of its orbital assignment. The worst case error of 0.05 degrees is used for the satellite location inaccuracy of both the desired and adjacent satellite (table line items A and B). The third row of the table provides the nominal antenna pointing accuracy from 0.1 to 0.5 degrees in 0.1 degree steps for varying degrees of antenna pointing

[31] EIA 411 Electrical and Mechanical Characteristics of Earth Station Antennas for Satellite Communications, Section 3.2 Pointing Accuracy.

system accuracy. The fourth row calculates the total RMS pointing error as per the EIA pointing error definition.

The Commission agreed with the Spacenet/StarBand analysis presented in NPRM comments that geostationary satellites spaced at two geocentric degrees nominally appear to earth stations at the surface of earth to be separated by more than the geocentric two degrees of orbital spacing.[32] Line item E of the table uses the mean topocentric satellite separation angle of 2.2 degrees presented in the Spacenet/StarBand NPRM comments.

The last row of the table calculates the resulting off-axis angle by subtracting the RMS antenna pointing error from the mean topocentric satellite separation angle. For example, for the case where the mean antenna pointing accuracy is 0.41 degrees the resulting off-axis angle is 1.79 degrees.

A Spacenet/StarBand VSAT antenna off-axis co-polarization and cross-polarization gain performance pattern, presented in the *ex parte* of Exhibit A for a StarBand sub-meter VSAT antenna, shows the antenna cross-polarization gain performance has a steep null coincident with the co-polarization peak. During the Spacenet/StarBand antenna installation process, the VSAT antenna cross-polarization gain is measured and minimized to align the null with the desired satellite and polarization. This method of installing VSAT antennas sufficiently minimizes the potential for adjacent satellite interference. The steep cross-polarization null and today's VSAT technology support a pointing accuracy of 0.4 degrees or better to be achieved.

[32] *See* FNPRM at paragraph 37 and Spacenet/StarBand March 26, 2001 Comments at pages 12 to 14. The topocentric satellite separation angle is the angle experienced by earth stations at the surface of the earth.

Table 1 – VSAT Antenna Pointing Error Budget

Item No.	Parameter Description	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
A	Adjacent Satellite Location	0.05	0.05	0.05	**0.05**	0.05	0.05
B	Desired Satellite Location	0.05	0.05	0.05	**0.05**	0.05	0.05
C	Nominal Antenna Pointing Accuracy	0.10	0.20	0.30	**0.40**	0.50	0.60
D	Total RMS Point Error of A, B & C	0.12	0.21	0.31	**0.41**	0.50	0.60
E	Topocentric Satellite Separation	2.20	2.20	2.20	**2.20**	2.20	2.20
F	Resulting Off-Axis Angle for Antenna Gain Evaluation (E – D)	2.08	1.99	1.89	**1.79**	1.70	1.60

Conclusion

This analysis indicates that submeter Ku-band antennas that with a nominal pointing accuracy of 0.4 degrees can begin compliance with the near-in Section 25.209(a) off-axis gain mask, so called "29 – 25 $Log_{10}(\square)$ dBi", at 1.8° and maintain an acceptable interference environment.

ATTACHMENT B

Proceeding: *00-248* **Type Code:** *NO* **Date Received/Adopted:** *03/18/02* **Date Released/Denied: Document Type:** *NOTICE* **Total Pages:** *5* **File Number/Community: DA/FCC Number: Filed on Behalf of:** Hughes, Spacenet, StarBand, SES Americom **Filed By:** *Lathain & Watkins* **Attorney/Author Name:** *Dori K. Bailey* **Document Date: Complete Mailing Address:** *555 Eleventh Street, N. W. Suite 1000 Washington, DC 20004* NOTICE

March 18, 2002

BY ELECTRONIC FILING

William F. Caton
Acting Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

EX PARTE PRESENTATION

Re: Part 25 Streamlining Proceeding, lB Docket 00-248

Dear Mr. Caton:

The undersigned companies respond to the *ex parte* filing made by PanAmSat Corporation ("PanAmSat") on November 20, 2001 in this docket.[33] PanAmSat's filing provides notice of a meeting held with Commission staff concerning proposed rules that would implement certain proposals that PanAmSat made in its initial comments in this proceeding and that a number of commenters opposed as unnecessary. Specifically, PanAmSat proposes that, for antennas with dimensions less than 1.2 meters in the geostationary orbital plane, (i) network system equipment design must inhibit transmit capability of remote units until appropriate instruction is received from the central operations center, (ii) network system equipment design must allow transmit capability to be disabled remotely from a central operations center at all times and the equipment design must inhibit the remote terminal from being able to override the "transmit disable" function, and (iii) network system design shall include a means by which interference can be traced to individual remote stations.[34]

As stated in the Hughes Reply Comments in this proceeding,[35] these proposals are unnecessary because existing Commission Rules already require earth station network operators to do exactly what PanAmSat is proposing.[36] These existing rules have proven

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[33] *Ex parte* letter of PanAmSat Corporation, IB Docket No. 00-248, dated November 20, 2001.

[34] *Id*.

[35] Joint Reply Comments of Hughes Network Systems, Hughes Communications, Inc. and Hughes Communications Galaxy, Inc., IB Docket No. 00-248, dated May 7, 2001, at 20-21 ("Hughes Reply Comments").

[36] *See, e.g.,* 47 C,F.R. §25.271(c) (requiring the earth station operator at the control point to immediately suspend operation of a remote station upon notification by another licensee of harmful interference); 47 C.F.R. 25.272(d) (requiring the earth station operator to obtain permission from the satellite network control center before transmitting to the satellite and to immediately take whatever measures are needed to eliminate adjacent transponder interference); 47 C.F.R. §25.273(a) (prohibiting transmissions unless the specific transmission is first authorized by the satellite network control center);

to be effective in minimizing the potential for adjacent satellite interference. More than one hundred thousand sub-meter Ku-band antennas have been deployed under the existing rules, and PanAmSat has not shown that the existing rules are an inadequate means of regulating the deployment and use of those antennas.

Furthermore, as noted by Starband/Spacenet in their Reply Comments in this proceeding, "PanAmSat has not presented any evidence to support its proposals."[37] This is not surprising given that Hughes, Spacenet and StarBand install their respective sub meter antennas in a manner that minimizes the potential for adjacent satellite interference. Specifically, Hughes, Spacenet and StarBand reduce the potential for interference by minimizing the cross-polarization signal from their respective very small aperture terminal ("VSAT") antennas. As shown in the attached antenna gain pattern for the Spacenet and StarBand 89 x 62 cm antenna, the antenna cross-polarization gain performance has a steep null coincident with the co-polarization peak. During the antenna installation process, the VSAT antenna cross-polarization gain is measured and minimized to align the null with the desired satellite and polarization. This method of installing VSAT antennas sufficiently minimizes the potential for adjacent satellite interference.

Specifically, the attached antenna gain pattern shows the "first null" of the co-polarization gain pattern occurring at approximately 2.5 degrees off-axis from the boresight (direction of peak co-polarization gain and cross-polarization null). Since the nominal angular satellite separation is 2.2 degrees as viewed from the earth's surface in the United States, a null at this offset provides very good isolation toward geostationary satellites spaced at increments of two geocentric degrees and greater.

In addition to the lack of any need or evidentiary support for the PanAmSat proposals, the Commission should not adopt these proposals because they are inconsistent with general Commission policies. The Commission's existing rules are broad and do not mandate the use of one specific technology or one system architecture over another. In contrast, the PanAmSat proposals are extremely detailed and architecturally specific and implementation may require the use of a particular technology.

The PanAmSat proposals also are impractical and burdensome from both a technical and economic perspective. For instance, the proposed identification process would be extremely burdensome for both the earth station operators and the satellite operators. Certain VSAT network architectures permit earth stations to transmit intermittently and on different frequencies. The PanAmSat proposal would require the VSAT network system operator to track a large quantity of data identifying which stations were transmitting and the specific time of the transmitting signal, and

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47 C.F.R. §25.274 (providing procedures to be followed in the event of harmful interference).

[37] Reply Comments of Spacenet Inc. and StarBand Communications Inc., IB Docket No. 00-248, dated May 7, 2001, at 23 ("Spacenet/StarBand Reply Comments").

presumably maintain that data for some period of time. As stated by Spacenet/StarBand, "[l]ogging this data would require storage equivalent to a substantial [percentage] of the total throughput of the system," and therefore would be impractical to implement.[38]

In addition to the aforementioned technical burden, the PanAmSat proposals would require a significant outlay of resources to redesign existing networks that have not been shown to cause adjacent satellite interference. The Commission should not adopt more restrictive rules when PanAmSat has provided no basis for its proposals and has not demonstrated how the Commission's current rules are inadequate. Significantly, no other satellite operator has supported PanAmSat's proposals.

Moreover, minimizing the potential for adjacent satellite interference is a matter that is being addressed between satellite operators and network earth station operators on a commercial basis — both at the contractual and operational level. The market place is working and the Commission's Rules are working. Thus, there is no need for the Commission to implement new regulations for a purported problem that does not exist. Rather, the Commission should continue to allow the industry to address this issue on a commercial basis.

Finally, Hughes, Spacenet and StarBand have deployed more than one hundred thousand terminals and are continuing to build out existing networks based on the current rules. Any regulation that requires the development of new technology or architecture would hinder the deployment of highly efficient, technology advanced sub-meter antennas that provide high-speed satellite based broadband services, resulting in limited consumer alternatives to cable (cable modem) and telephone (DSL) services and eliminating all broadband service offerings for rural and other underserved areas that do not have access to terrestrial services. Rather than streamlining the Commission's rules and promoting growth, the PanAmSat proposals would constrain the use of existing earth station technology, require the development of new system architectures, and impose unnecessary additional equipment costs on end-users. Additional regulation of the satellite broadband industry is not necessary, would be burdensome to deployment, is not consistent with Commission policy,[39] and would be contrary to the mandate of Section 706 of the Telecommunications Act of l996.[40]

Respectfully submitted,

Hughes Network Systems

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[38] Spacenet/StarBand Reply Comments at 23.

[39] Satellite News (http://www.satnews.eom/stories2/Soct200l-2.html) October 5,2001, Digital Broadband Migration is Essential For Nation's Survival. Says FCC's Powell. Excerpt: FCC, Powell said, has been taking a proactive approach to broadband deployment. But he said it should be the consumers who determine how the broadband landscape would play out. But he promised that FCC "should guard against regulatory excess."

[40] *See* Pub. L. 10-104, Title VII, § 706, Feb. 8, 1996, 110 Stat. 153, reproduced in the notes under 47 U.S.C. § 157.

By: /s/ Joslyn Read
Joselyn Read
Assistant Vice President
Hughes Network Systems
11717 Exploration Lane
Germantown, MD 20876
(301) 428-5500

Spacenet Inc.

By: /s/ Lesley B. Cooper
Lesley B. Cooper
Senior Counsel
Spacenet Inc.
1750 Old Meadow Road
McLean, VA 22101
(703) 848-1188

StarBand Communications Inc.

By: /s/ John Chang
John Chang
Senior Counsel
StarBand Communications Inc.
1760 Old Meadow Road
McLean, VA 22102
(703) 245-6432

SES Americom

By: /s/ Nancy J. Eskenazi
Nancy J. Eskenazi
Associate General Counsel
SES Americom
4 Research Way
Princeton, NJ 08540
(609) 987-4187

Spacenet 89 x 62 cm Antenna Transmit Azimuth Off-Axis Gain Pattern

Solid line in figure is normalized co-polarization gain pattern. Dotted line is normalized cross-polariation gain pattern. FCC co-polarization off-axis gain mask per Section 25.209(a) is shown.