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

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

TO: The Commission

REPLY COMMENTS OF ALOHA NETWORKS, INC.

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Aloha Networks, Inc. ("Aloha Networks") hereby files its reply comments in response to the *Further Notice of Proposed Rulemaking*, FCC 00-435 (September 26, 2002) (the "*Further Notice*").

I. The Need to Proactively Address ASI

As discussed in its initial comments, Aloha Networks agrees with the Commission that excessive adjacent satellite interference ("ASI") is a growing problem that the Commission should proactively address. True, ASI is at present largely controlled through the mutual cooperation of VSAT system operators. But that is largely a reflection of today's relatively limited consumer use of VSAT systems. While many VSAT systems have attempted, or are attempting, to provide two-way satellite Internet access to consumers on a large scale, there has yet to be a break-through implementation that positions VSAT systems as robust mass market competitors to the currently available terrestrial alternatives. This is due in no small part to the limited bandwidth efficiency of the Aloha-TDMA multiple access protocols used in many VSAT systems to date. Those inefficiencies in turn have resulted in increased transponder leasing costs

which have been passed on to consumers, thus preventing the widespread adoption of VSAT systems for Internet access.

All of that is likely to change in the near future. Virtually every party filing comments agrees with the Commission that the level of potential ASI is almost certainly likely to increase dramatically when the consumer satellite industry begins to experience the rapid growth that many have long predicted through the expanded provision of Internet access and other services. In that event, the current reliance on mutual cooperation will almost certainly prove inadequate to the task.

There is, however, technology currently available to address and prevent any potential increase in ASI that cannot be controlled through mutual cooperation. By spreading the transmitted Aloha signal, and increasing the simultaneous loading of the channel, bandwidth efficiency can be tremendously increased, while decreasing ASI to imperceptible levels. One example of this technology is the Spread Aloha Multiple Access (SAMA) protocol developed by Aloha Networks. Other alternative protocols such as contention-based CDMA or fast frequency hopping could also be used to provide more cost-effective Internet access while dramatically reducing ASI. And, in addition to technology in existence today, there is no doubt that adoption of proposals like those Aloha Networks advocates here will spur the development of other technologies that can efficiently address the problem

The Commission should encourage those kind of technological developments. They will eliminate whatever ASI problem exists today and hopefully foreclose the possibility of any unmanageable growth of ASI if, as is hoped, there is a dramatic increase in satellite-based Internet access with a concomitant increase in the number of VSAT terminals.

In their joint comments, Spacenet Inc. and StarBand Communications Inc. ("Spacenet/StarBand") claim that the projected growth of random access networks will not lead

to an increase in ASI, because subscribers on those networks would experience service degradation prior to the network generating any adjacent satellite interference. Therefore, the logic goes, the need to maintain high customer satisfaction levels would prevent the network from generating what Spacenet/StarBand claims to be excessive ASI.[1] The one does not follow from the other, however, as revealed by Spacenet/StarBand's own comments. Notwithstanding their customer satisfaction concerns, Spacenet/StarBand argue against the Commission's proposal to implement power reductions requirements for systems with collision probabilities in excess of one percent.[2]

The reason that Spacenet/StarBand's customer service needs do not prevent it from wanting to allow collisions in excess of one percent is that while any Aloha-based network is designed to operate around its specific collision-based limit, the networks on neighboring satellites are not. Non-Aloha networks operating on neighboring satellites have extremely low tolerance for intermittent interferences lasting multiple bit periods. Even other Aloha networks on adjacent satellites are designed to operate under their internal collision limits which have no relationship to the interfering network's collision limit. The ability of a random access network to operate in the presence of collisions that it was designed for far exceed that of neighboring networks.

Spacenet/StarBand and the Satellite Industry Association ("SIA") also expressed the more general view that there is no need for the Commission to adopt any new regulations because inter-system cooperative measures have been sufficient to date to control ASI.[3] They therefore urge the Commission to delay the adoption of any corrective action until there is

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1 *See* Comments of Spacenet Inc. and StarBand Communications, Inc. (Mar. 10, 2003) ("Spacenet/StarBand Comments") at 15.

2 *See id.* at 16.

3 *See* Spacenet/StarBand Comments at 14-16; Comments of the Satellite Industry Association, (Mar. 10, 2003) ("SIA Comments") at 2-3.

evidence that those cooperative measures among VSAT operators have become overburdened and unable to prevent ASI in a way that is discernible to the consumer.

The Commission, however, does not have the luxury of taking a wait-and-see approach. The cost to the public – and the VSAT industry – could be catastrophic. If the Commission delays any corrective action until the ASI problem has compromised the consumer's use of VSAT systems for Internet access and other services, the industry and the consumer will be materially impaired while the Commission takes the necessary time (certainly a year or more) to adopt meaningful rules to address the problem. In the interim, consumers will understandably perceive satellite-based Internet access as less reliable than terrestrial alternatives and damage – perhaps fatally – the industry's ability to emerge from its relative infancy. Thus, in order to help ensure the emergence of satellite-based Internet access as a viable competitive alternative to offerings by telephone providers and cable television systems, the Commission should act now – before problems develop – to prevent any massive and uncontrollable ASI by adopting rules which limit the power spectral density of random access networks and encourage accurate antenna pointing.

II. Reducing ASI in VSAT Systems Utilizing Aloha Random Access Techniques

As the Commission found in the *Further Notice*, VSAT networks utilizing Aloha random access techniques present unique concerns with respect to ASI.[4] To alleviate those concerns, the Commission proposes revising Section 25.134(a) of its rules along the lines previously proposed by Aloha Networks to control ASI caused by VSAT systems using Aloha techniques.[5] As discussed in its opening comments, Aloha Networks supports the Commission's general approach but believes that the Commission's modifications to Aloha Networks' proposal

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4 *See Further Notice* ¶¶ 77-80.

5 *See id.* ¶¶ 92-94.

will render the new rules less effective in controlling ASI than should be the case. In an effort to be constructive, Aloha Networks has proposed a compromise that provides for greater flexibility for system operators while offering more robust protection against ASI than that provided by the Commission's proposed rule.[6] Under Aloha Networks' compromise proposal, the probability and maximum duration of a collision would be limited to *either* 0.1% and 100ms *or* 1.0% and 10ms. Using the case of a robust neighboring video network operating at margin for illustration, a noticeable disruption every hundred seconds (100ms/0.1%) or a barely noticeable disruption every one second (10ms/1%) is far better than a noticeable disruption every 10s (100ms/1%).

Some parties filing comments in the instant proceeding have urged the Commission to reject Aloha Networks' proposal and/or have proposed less-stringent alternative approaches. Spacenet/StarBand propose allowing increased power spectral densities for probabilities of collisions less than 100%, with the increase proportional to the base 10 logarithm of the probability.[7] SIA proposes allowing a 1% probability for combined durations of collisions less than 100ms.[8] Both of these alternative proposals are seriously flawed.

Spacenet/StarBand tie their suggested power spectral density increases to the probability of collisions. This implies that the harmful effect of the interference is equalized over all probabilities. However, the proposal would just increase the allowable power spectral density for probabilities less than 1% without any justification. The implication that an infinite cumulative power spectral density is permitted for probabilities less than 1% does not acknowledge the statistical nature of random access network usage. If Spacenet/StarBand believe that these low probability high level events could occur in economically driven networks,

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6 *See* Comments of Aloha Networks, Inc., IB Docket No. 00-248 (Mar. 10, 2003) at 3-4 ("Aloha Networks Comments").

7 *See* Spacenet/StarBand Comments at 17-20.

8 *See* SIA Comments at 18-20.

then economic forces would certainly not prevent the less drastic interference levels the Commission is seeking to regulate.

SIA's proposal is similarly flawed. Allowing a 1% probability for the cumulative transmissions to equal 100ms, would allow a much greater probability for these shorter transmissions. For Aloha Networks' SAMA network packet size of 6mS, or high-rate DVB transmission with packet lengths of 80us or less, the number of collisions with durations adding up to 100ms is meaningless. Each of these shorter collisions would cause more errors than the Forward Error Correction ("FEC") Decoder could detect and would wipe out an entire packet for systems operating near their designed margins. Aloha Networks' proposal recognizes the dependence of the harmful interference on both collision probability and duration. This is why reducing the collision duration to 10ms is critical for allowing collision probabilities of 1%.

In sum, the simple fact is that the older generation of technology deployed by many current providers is prone to generating excessive ASI, as well as being incapable of providing the bandwidth efficiency that Aloha Networks' SAMA and other newer protocols provide. The Commission should be focused on protecting consumers' ability to obtain low-cost satellite Internet access, not on protecting the current generation of spectrally inefficient and interference-producing equipment providers. Only by adopting stringent regulations designed to prevent ASI can the Commission ensure that satellite-based Internet access emerges as a viable competitor to phone and cable.

III. Automatic Monitoring of Terminal Antenna Alignment

Aloha Networks believes that the accuracy of antenna alignment for large networks will only be as good as the network's antenna alignment monitoring and enforcement capability.

Aloha Networks made comments similar to those of SIA and Spacenet/StarBand in that the reception of a terminal's desired signal could be used to effectively gauge its pointing

with respect to adjacent satellites. However, Aloha Networks noted that cross-polarized pilot tones would allow safeguarding of users on the opposite polarization. Since these opposite polarization users access the same satellite, it could be left for the satellite operator to impose restrictions to safeguard its polarization isolation. However, nulling a cross polarized pilot tone would still provide better pointing accuracy than peaking a copolarized signal, even with the small (0.1 degree) deviation sometimes seen between the boresight and the null of the cross-polarized signal.

Both the SIA and Spacenet/StarBand contend that Hub measurement of cross-polarized signals is adequate to provide initial alignment accuracies during installation. SIA argues that antenna pointing accuracies of better than 3 degrees are typical, while Spacenet/StarBand put the number at better than 4 degrees. This is consistent with the 4 degree pointing error number that Aloha Networks assumed for its ASI calculation in its initial comments. These accuracies are for the initial professional installations which make use of Hub cross-polarization measurements. However, without periodic monitoring, there is no indication that these pointing accuracies can be maintained over time. Though feasible, designing an automated monitoring system around this Hub monitoring functionality would be much more complex than the proposed pilot tone method, especially for the sizes of consumer networks anticipated. Aloha Networks believes that having the automatic monitoring function is the key; whether that function is implemented by measuring pilot tones at the remote terminal or remote terminal transmissions at the Hub could be left to the individual network or satellite operator.

Since assuring clear sky operation of a terminal will not ensure adequate pointing with respect to ASI, the antenna pointing in a network should be assumed to be as accurate as its installation and monitoring capability allows. Those networks with less accurate installation and monitoring practices should have more stringent power spectral density restrictions.

IV. Professional Installation

In its initial comments, Aloha Networks opposed PanAmSat's proposal to require professional installation for all consumer terminals.[9] As Aloha Networks explained, such a requirement paints with too broad a brush: not all consumer terminals are the same, and while professional installation might be appropriate in certain cases, in others it is not. The key is to balance the cost of professional installation with the benefits it produces in the form of reduced ASI. This balancing is especially important, given the high level of costs that are involved. As Spacenet/StarBand observe, "professional installation represents approximately 15% of the total customer cost for a one-way service commitment" for a StarBand residential customer.[10] Fifteen percent can easily be the difference in cost between a commercially viable service and one that is not.

In light of the critical need to keep costs low enough to allow VSAT Internet access to emerge as a viable consumer option, the Commission should only require professional installation where its benefits in the form of reduced ASI are likely to be sufficient to outweigh its considerable cost. In other words, professional installation is only appropriate for the high spectral density systems that pose the greatest likelihood of causing interference.

In their comments Spacenet/StarBand agree "that adopting a rule to require professional installation in all cases is unnecessary and would add significant cost as well as delay, particularly to subscribers in rural/isolated parts of the country, where satellite may be their only broadband service option."[11] Spacenet/StarBand urge the Commission to leave in place "the current practice of conditioning a station authorization on providing professional

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[9] *See* Aloha Networks Comments at 8-9.

[10] Spacenet/StarBand Comments at 13 n.19.

[11] *Id.* at 13.

installation where the Commission determines that, for a specific implementation, the public interest would be served by professional installation."[12]

Aloha Networks continues to believe that the Commission should adopt a clearly-defined rule instead of continuing to follow its current case-by-case approach. Requiring professional installation for systems that exceed specified ASI thresholds would have the dual benefits of imposing the cost of professional installation only where it is necessary while at the same time providing an incentive for future networks to reduce their interference to below the ASI threshold to avoid the cost. By contrast, if the current approach is left in place, manufacturers and system operators will be left trying to guess as best they can where the Commission will and will not impose a professional installation requirement. In this environment, much of the value of a professional installation requirement is lost because it does not serve effectively to drive the development of non-interference causing terminals.

The rule regarding professional installation should incorporate the proposed antenna patterns, installation and monitoring practices, and transmitter power spectral density to determine the maximum ASI allowed to be transmitted by the terminal. Those systems that cannot guarantee an acceptable ASI level over time by adequately monitoring antenna pointing accuracy should at least use professional installers to minimize initial pointing errors and ensure a physically stable antenna installation.

Conclusion

Aloha Network believes that the success of VSAT systems for two-way Internet access and other consumer applications depends on the ability to effectively control ASI. By requiring VSAT networks to either ensure the accuracy of their terminal antenna alignment and

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[12] *Id.*

limit the probability and durations of internal collisions, or reduce their terminal power spectral density, the adjacent satellite spectrum can be effectively safeguarded.

Respectfully submitted,

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