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January 6, 2000

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EX PARTE OR LATE FILED

Ms. Magalie Roman Salas, Secretary
Federal Communications Commission
The Portals
445 12th Street, S.W.
12th Street Lobby, Counter TW-A325
Washington, DC 20554

Re: Ex Parte Communication in
ET Docket No. 98-206; RM-9147; RM-9245

Dear Ms. Salas:

On November 10, 1999, Skybridge LLC made an ex-parte filing (the "Skybridge Letter") in response to a September 9, 1999 ex-parte filing by Northpoint Technology, Ltd. In its filing, Skybridge states that "Northpoint operations in the 12 GHz band would be flatly inconsistent with the Commission's statutory objective of making advanced telecommunications services available to all Americans."[1] Skybridge's reason for this statement appears to be that Skybridge would be required to coordinate with Northpoint in a small portion of its service area; Skybridge erroneously asserts that such coordination is not technically feasible. The attached technical annex (Exhibit A) fully refutes Skybridge's erroneous assertion that NGSOs cannot share the Ku-band with Northpoint. The fact is that NGSOs can share the Ku-band with Northpoint.

In its filing, Skybridge seeks to speak for all NGSOs, notwithstanding the fact that the majority of NGSOs do not share system characteristics with Skybridge. As to its own system, Skybridge does not provide any technical support for its statements regarding incompatibility with the Northpoint system.[2]

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1 Skybridge Letter at 2.

2 Indeed, Northpoint has brought this lack of technical support to Skybridge's attention. See Letter from Bob Combs to Diane Gaylor, dated December 2, 1999, a copy of which is attached hereto as Exhibit B. As of today, Skybridge has not responded to this letter from Mr. Combs.

Northpoint does not wish to engage in a "winner take all" debate with any proposed NGSO system as to whose system has the best business plan or best serves the public interest. Both terrestrial and satellite systems have valuable roles to play in creating ubiquitous digital infrastructure for the United States. It should be well understood that there is no one universal solution, access method or single service that satisfies all needs. Northpoint's terrestrial multi-channel video offering and consumer oriented asymmetric data services do not serve the same market as the data and local loop replacement offerings of Skybridge or other NGSO systems.

In this regard it is important to note that Skybridge is requesting the use of 3,650 MHz of the U.S. spectrum resources, with which it will have the capacity to serve approximately 1 - 2% of the U.S. population.[3] While the Skybridge system undoubtedly has merit, this merit is not so significant that it should preclude other services from operating, particularly when those services, like Northpoint, which is seeking 500 MHz -- less than 14% of the spectrum sought by Skybridge -- and will have the capacity to serve a majority of the U.S. population.[4] For this reason, Northpoint urges the FCC to develop service rules that will allow both NGSO systems and Northpoint to share spectrum. In this manner, the Commission will afford U.S. consumers the opportunity to choose services from either or both types of systems. The critical question for the Commission is not whether to license Northpoint OR Skybridge (and the other NGSOs), but how to best promote competition and serve the public interest by accommodating both Northpoint AND Skybridge (and the other NGSOs).

The Commission is currently conducting a rulemaking concerning the Ku-band which will add new services in up to 3.65 GHz of spectrum that is currently used for fixed services, fixed satellite service and direct broadcast satellite.[5] This rulemaking presents a puzzle whose best solution should be to maximize this substantial spectrum resource by allowing as many new services to be deployed that can technically be accommodated without causing harmful interference to existing services or one another.

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[3] Skybridge has stated that it has a worldwide capacity of 15 – 20 million customers and that approximately 1/3 of its capacity will be available in North America . See www.skybridgesatellite.com/system/index.htm (visited January 6, 2000). Assuming 30% of the North American capacity is devoted to Canada and Mexico, Skybridge's U.S. capacity is 3.5 – 4.6 million customers. As a percentage of the U.S population of 270 million, this equals 1.3 – 1.7%.

[4] Northpoint has applied for licenses to operate in every television market within the United States and will offer digital multi-channel video and asymmetric broadband services. It is estimated that greater than 75% of the U.S population or greater than 200 million persons will be able to receive Northpoint services.

[5] See ET Docket No. 98-206.

Skybridge Can Be Fully Accommodated In Proposed Spectrum Outside of the 12.2 – 12.7 GHz Band

While Skybridge seeks to block Northpoint from operating in the 500 MHz from 12.2 – 12.7 GHz, it is important to recognize that Skybridge itself has never demonstrated its own need to operate in this part of the spectrum. In fact, Skybridge can fully provide its proposed service without using the 12.2 – 12.7 GHz band at all.

Skybridge has applied to use 3,650 MHz of spectrum, 1,000 MHz of which it proposes to use for its service links. At the same time, it has represented that each of its satellites can reuse 100% of the frequencies that are used by its other satellites In fact, Skybridge satellites probably do not have the transponder capacity to do this, as explained in the attached technical annex.[6]

Ubiquitous Deployment of Northpoint and NGSO FSS Systems is Feasible

It is important to note that there are seven satellite systems in addition to Skybridge and Northpoint which seek to be accommodated in the Ku-band. The challenge for the Commission is how to fit all of these applicants and services into the proposed spectrum in a manner that is both technically feasible and provides the greatest amount of service to the public. As shown in Northpoint's technical filings, Northpoint can operate co-channel with most of the proposed NGSO systems in 99.9% of the Northpoint service area without any form of interference mitigation.[7] These NGSO systems can also operate without impairment co-channel with Northpoint such that even rooftop co-location of NGSO receivers and Northpoint transmitters is possible for four of the systems, bringing co-channel operation to 100% of the mutual service areas.[8] Of all the proposed NGSO designs, Skybridge is the least compatible with Northpoint. However, even Skybridge can be compatible with reasonable mutual accommodation.[9] Since Northpoint occupies only a portion of the proposed NGSO FSS spectrum, and frequency diversity is 100% effective in mitigating interference without a loss of capacity, the use of interference mitigation methods will allow for ubiquitous deployment of both NGSO FSS and Northpoint, without undue constraint on any system. Finally, as discussed in the technical annex attached hereto, the Northpoint PFD limit will not impose an undue constraint on the development of NGSO FSS systems because all proposed NGSO FSS systems meet the PFD

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6 See attached technical annex at 16.

7 Technical Annex to Comments of Northpoint Technology in ET Docket No. 98-206, filed March 2, 1999 at 26.

8 Rooftop co-location would be possible for both Boeing systems as well as the Denali and Virgo systems.

9 The other system that is less compatible with Northpoint is Hughes Link, which, like Skybridge is also a low elevation system. Hughes Link is more compatible with Northpoint than Skybridge but less so than the other five, higher elevation, systems Boeing (2), Teledesic, Virgo and Denali.

limit.[10] However, given Skybridge's aversion to sharing with Northpoint and the fact that Skybridge can accomplish its full service in the 11.7 – 12.2 GHz portion of the Ku-band, band segmentation may be in order. A simple and efficient solution to the whole sharing scenario would be to allocate the service links of low elevation systems such as Skybridge to the 11.7 – 12.2 GHz band and allow higher elevation service links to operate in 12.2 – 12.7 GHz with Northpoint.

Response to Skybridge's Erroneous Statements Regarding Northpoint Business Plan

By its discussion of Northpoint's business plan, Skybridge invites Northpoint to comment on Skybridge's own plans. In this regard, Northpoint might discuss the many uncertainties that Skybridge faces. However, Northpoint does not believe these matters are worthy points to make in a proceeding that should be primarily technical so it will confine itself to correcting new erroneous statements made by Skybridge about the Northpoint system.[11]

Northpoint's Service to Rural Areas

Skybridge says that Northpoint plans to "skim the cream" and only serve "urban areas." To prove this assertion Skybridge points to the fact that Northpoint's Broadwave affiliates will operate in "television markets." It is true that Northpoint Technology, through its 69 Broadwave affiliates, filed applications to serve all television markets in the United States. Apparently, Skybridge does not understand that all areas of the country are assigned to a "television market", and therefore all "television markets" are not limited to the "densely populated" urban areas Skybridge describes. The inability of satellites to provide local television in all but the largest of television markets was the basis of much of the recent Satellite Home Viewer Act controversy. By contrast, low cost terrestrial services like Northpoint have the economic ability and the technical capacity to carry all local signals in all local markets. This is why Congress provided in the new Satellite Home Viewer Act that applicants such as Northpoint that can share spectrum and provide local signals should be given expedited treatment at the Commission.

In each market where Northpoint's Broadwave affiliates operate they will build dedicated infrastructure that will provide locally based broadband and multi-channel video service. This infrastructure will in fact provide substantial service in rural areas.

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10 Even Skybridge meets the PFD limit at its nominal power level. See attached technical annex at 6.

11 Much of Skybridge's discussion of Northpoint's business plan was made previously in its comments on Northpoint's Request for Waiver. See Comments of Skybridge, L.L.C. in DA 99-494, filed April 12, 1999. Northpoint responded to Skybridge's comments in that proceeding on April 22, 1999. See Reply Comments of Northpoint in DA 99-494.

Northpoint Will Offer Low Cost Cable Competition and Broadband in Urban America

Skybridge presents Northpoint's plans to serve urban America, including the largest markets as if this were revelation of a flaw. Millions of Americas live in urban areas and so do millions of people who suffer from the so-called digital divide. Additional low cost, high capacity digital infrastructure in urban areas should be considered as a very positive development and one that Skybridge should not be allowed to block.

According to the Commission's recent multi-channel video report,[12] most of the U.S. lacks locally based multi-channel video competition such as will be provided by Northpoint's Broadwave affiliates. Further, unlike DBS services who compete on variety and quality, Northpoint's Broadwave affiliates plan to also compete on price, offering a basic digital cable offering for approximately $17.95 per month a substantial improvement in both price and quality to current offerings of analog cable for an average of $38 per month. This lower price represents a significant savings for lower income persons. This multi-channel video offering combined with Northpoint's asymmetric broadband service will create true competition to cable. The presence of price competition will restrain the current monopoly cable providers in their ability to raise prices – which will benefit all multi-channel video consumers, not just customers of Northpoint's Broadwave affiliates.

Northpoint's Broadband Plans

Skybridge acknowledges that Northpoint has a plan for deployment of two way services utilizing the 12 GHz band as a broadband channel asymmetrically linked with telephone or other narrow band wireless spectrum using Northpoint's frequency-linking protocol. However, in an effort to draw an unfavorable comparison with Northpoint's two-way system and it own plans, Skybridge calls this asymmetric design "rudimentary."[13] Skybridge's statement about Northpoint's broadband service is peculiar in light of the fact that Skybridge's own system is also based on an asymmetric linking of forward and return paths that are connected to the telephone infrastructure. In order to provide local service to end users Skybridge will require partnerships with local providers. By contrast, Northpoint's service will be provided directly to consumers.

Northpoint Cannot Deploy in the Other Bands Identified by Skybridge

In its letter, Skybridge once again suggests that Northpoint be moved to another band outside of the spectrum where NGSO systems propose to operate, identifying the MMDS,

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[12] In the Matter of Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming, 13 FCC Rcd 24284 (1998).

[13] Skybridge Letter at 3, fn .4.

LMDS and DEMS bands as candidates for Northpoint's operation. Northpoint is not compatible with current services deployed in these other bands as shown in the attached technical annex.[14]

Northpoint will be used to create a new multi-channel video provider in the 12 GHz band. The 12 GHz band is excellent for this purpose because consumers have already voted with their dollars to make 12 GHz a multi-channel video band. Just as it makes sense to license new over the air television stations in bands where other television stations operate and where consumers already own equipment, it also makes sense to allow consumers additional competitive choices for their reception dishes in the 12 GHz band where digital television has first taken root. In this regard, the Northpoint system can be deployed using existing equipment in the Ku-band and, therefore, providing service in any other band would make the equipment cost prohibitively expensive for consumers.

Summary

Rigorous analysis conclusively shows that ubiquitous deployment of Northpoint and NGSO FSS systems is feasible. Skybridge's generalized claims of incompatibility are clearly false. The Northpoint PFD limit does not pose an undue constraint on the development of NGSO FSS systems. Further, ubiquitous deployment of NGSO FSS systems is feasible with mitigation methods already employed in the designs of all NGSO FSS systems. Frequency diversity is 100% effective in mitigating interference because Northpoint occupies only a portion of the proposed NGSO FSS spectrum. If segmentation of the band is in order, then NGSO FSS LEO systems should be assigned spectrum outside of the Northpoint band, since Skybridge can be fully accommodated in that proposed spectrum.

Sincerely yours,

Antoinette Cook Bush
Brian D. Weimer
Counsel to Northpoint

[14] See attached technical annex at 3-4.

cc: Chairman William Kennard
Commissioner Harold Furchtgott-Roth
Commissioner Susan Ness
Commissioner Michael K. Powell
Commissioner Gloria Tristani
Donald Abelson (IB)
Kim Baum (IB)
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Michael Pollak (WTB)
Tom Stanley (WTB)
Thomas Sugrue (WTB)
Thomas Tycz (IB)
Jeffrey Olson (Skybridge)

Exhibit A

Technical Annex

1. Introduction

This technical annex explains and resolves the technical sharing issues between NGSO FSS systems and the Northpoint system in the 12.2 - 12.7 GHz band. Some parties have asserted, without any proof, that these two systems are incompatible. These services are in fact compatible, as the record in ET Docket 98-206 and this annex demonstrate.

As an initial matter, technical points made by Northpoint are undisputed in the 12 GHz NPRM.[1] In place of rigorous analysis, Skybridge in its Nov. 10, 1999 letter relies on generalizations and erroneously concludes that sharing between Northpoint and any NGSO FSS system is impractical. It is important to note that Skybridge makes bald assertions on behalf of all NGSO systems.[2] In fact, the NGSO systems that have been proposed for the Ku band have a wide range of designs. Northpoint is the only party to have provided detailed technical analysis in ET Docket 98-206. This analysis conclusively demonstrates that sharing is feasible, without undue constraints on either NGSO FSS systems or Northpoint.

Protection of Northpoint is accomplished via a power flux density ("PFD") limit which, above five degrees in elevation, is identical to the PFD limit proposed at WRC-97.[3] This PFD limit does not unduly constrain NGSO operations. Despite a wide range of proposed designs (including LEO, HEO, and MEO systems) all but one of the proposed NGSO FSS systems already meet this PFD limit. The only system that does not is Skybridge. None of the NGSO FSS proponents claimed they could not meet the Northpoint PFD limit above five degrees. Skybridge can meet it with minor changes that do not affect its operation.

Finally, NGSO FSS operations are unaffected by Northpoint, because these NGSO FSS systems have an inherently flexible design. Sharing with Northpoint would not require NGSO FSS systems to add capability or satellites to their designs. They can share with Northpoint using the proven interference mitigation techniques of satellite diversity or frequency diversity, neither of which imposes undue constraints on the development of NGSO FSS systems.

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1 Notice of proposed rulemaking in ET Docket 98-206.

2 Ex Parte Communication from Skybridge L.L.C. in ET Docket 98-206, dated November 10, 1999, (the "Skybridge Letter") pages 3, 5, 8 and 10.

3 For further details concerning Northpoint's proposed PFD limit, see comments of Northpoint regarding Commission Release number DA 99-2733 (in ET Docket No. 98-206), filed December 20, 1999.

2. Generalizations Cannot Substitute for Rigorous Analysis

In the Skybridge Letter, Skybridge has re-stated certain erroneous and generalized claims with respect to sharing between Northpoint and NGSO FSS systems. In its filing, Skybridge asserts that the "Commission and the ITU have both recognized on numerous occasions the intractable problems in sharing between high-density, point-to-multipoint terrestrial services and ubiquitous satellite earth stations."[4] The Commission should not be misled by Skybridge's attempt to apply conclusions reached by the ITU and the Commission in wholly different contexts to the issue of sharing between Northpoint and NGSO FSS systems. As Skybridge and the Commission are both fully aware, the Northpoint system is not like any FS system previously studied by the Commission or the ITU and, consequently, a fresh analysis of the sharing issues is required.

ITU studies do not reject Northpoint as Skybridge claims

Skybridge claims that ITU studies have found Northpoint infeasible. This statement is wholly without support and completely inaccurate. No ITU studies of the Northpoint system have been completed, so it is impossible for ITU proceedings to have ruled out Northpoint or declared that it is infeasible.

In fact, the ITU studies of sharing between FS systems and NGSO FSS systems only consider sharing between NGSO FSS systems and high-powered FS point-to-point systems that operate primarily in the band 10.7 - 11.7 GHz, and not in the 12.2-12.7 GHz band. These indiscriminately pointed, high powered, point to point microwave systems, are a type of FS system possessing vastly different characteristics than Northpoint as the following table shows:

Table 1. Comparison of Typical 11 GHz Microwave and Northpoint Terrestrial Systems

Characteristic	Units	Typical Microwave	Northpoint
Transmit EIRP	dBW	45	-17.5
Transmit 3 dB Beamwidth	degrees	2	110
Modulation		Analog	Digital
Required BER	BER	10^{-8} or higher	10^{-6}
Transmit Distance	km	10 - 50 (per link)	<16
Noise Floor	Kelvin	1000-5000	300
Required Availability	%	99.95	99.7
Fade Margin Required (to meet availability)[5]	dB	30	3

[4] Skybridge Letter, page 5.

[5] The fade margin and availability are given at edge of coverage for Northpoint. The availability is higher everywhere inside the edge of coverage.

Without regard to the manifest differences as presented above and in previously filed materials available to Skybridge both from Northpoint filings in ET Docket 98-206, and with ITU information documents[6] Skybridge attempts to apply the results of studies of unlike point to point systems to Northpoint – NGSO sharing.

Recognizing the importance of qualifying results as to the limited range of systems actually studied, all ITU conclusions concerning NGSO FSS and FS sharing have the explicit proviso that all sharing scenarios are limited to studies of high-power terrestrial point-to-point systems. This is explicitly recognized in the report of the Conference Preparatory Meeting.[7] The CPM Report further states that absent mitigation, sharing between ubiquitous satellite and high powered point to point systems can be difficult co-frequency. This conclusion, however, has no bearing on Northpoint – NGSO FSS sharing because it explicitly applies only to systems that are unlike Northpoint.

Prior Commission action did not contemplate Northpoint low-power systems.

Skybridge points to domestic proceedings in the 18/24 and 28 GHz bands as examples of the "intractable" sharing environment.[8] In the 18/24 GHz band, the FS system at issue (Digital Electronic Message Service) has a power 50 dB higher than Northpoint. In that case, the studies cannot apply to Northpoint for obvious reasons. In the 28 GHz band, the sharing situation was also quite different. The 28 GHz band is an uplink band for satellites. The issue in the 28 GHz band was not interference into satellite systems, but into the terrestrial system. Therefore, neither the 18/24 GHz proceeding nor the 28 GHz provides a basis upon which to conclude whether Northpoint can share the Ku-band with NGSO FSS systems. Again, a fresh analysis is required and is supplied by Northpoint herein.

Northpoint Is Incompatible With Current Services Deployed in Other Bands Identified By Skybridge For Northpoint Deployment

The reason that Northpoint must operate at 12 GHz and not in the bands identified in the Skybridge Letter is that the Northpoint system is designed to be compatible with downlink directional transmissions from satellites systems, not omni-directional higher power terrestrial systems. In fact, Northpoint's use of directional transmission and reception equipment allows it to share with satellites, including non-

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6 See, e.g., JTG 4-9-11/88, Characteristics of a Ku Band Terrestrial Point-to-Multipoint System and JGT 4-9-11/125, Preliminary Analysis of Provisional Power Flux Density Limits for NGSO FSS Systems to Protect Terrestrial Point-To Multipoint Services in the Bands near 12 GHz.

7 See Section 3.1.4.1.1 (a) of the Conference Preparatory Meeting on Technical, Operational and Regulatory/Procedural Matters to be Considered by the 2000 World Radio Communication Conference (the "CPM Report"). The only systems studied for FS/NGSO FSS sharing in the 10.7 – 12.75 GHz band were high power point-to-point microwave services.

8 Skybridge Letter, page 5 (referring to LMDS proceeding [11 FCC Rcd 19005 (1996)] and DEMS proceeding [13 FCC Rcd 15147 (1998)]).

geostationary satellites. As shown in the table below the bands referenced in the Skybridge Letter are used for services that operate at 30-50 dB higher power than Northpoint. Omni-directional transmissions from terrestrial systems at higher power than Northpoint will certainly cause harmful interference to Northpoint type systems (as well as satellite systems) and, therefore, preclude Northpoint's deployment in those bands. Since these three bands have all been recently established, it is unlikely that they will be cleared for Northpoint's use.

System	Frequency	Typical System Power (dBm)	Typical Northpoint Power (dBm)
MMDS	2.5 GHz	60	12.5
DEMS	24 GHz	50-60	12.5
LMDS	28 GHz	50-70	12.5

3. NGSO Systems are Designed to Share – And They Easily Can Share With Northpoint

In the 12 GHz band, NGSO FSS systems were designed for and have inherent flexibility in sharing with other services. This includes purported compatibility with space services, GSO FSS, NGSO FSS, space research service, BSS, as well as terrestrial services such as the radiolocation and radionavigation services and the fixed service. This includes ubiquitous sharing among GSO FSS, BSS and NGSO FSS systems in the same bands.[9]

Notwithstanding the purported ability of NGSO FSS systems to share spectrum in the Ku-band, Skybridge asserts that this same flexibility cannot be used for sharing with Northpoint. Northpoint, the only party to provide a detailed technical analysis in ET Docket 98-206, has demonstrated that NGSO FSS and Northpoint sharing is feasible, without imposing undue burdens on either system, and no party has presented any technical criticism of the Northpoint analysis.

One significant example of this flexibility, often overlooked in ET Docket 98-206, is the ability to use a wide range of frequencies for service links. Most of the NGSO FSS systems proposed at least 1000 MHz for service links.[10] As the Commission is fully aware, applicants for space station licenses frequently request far more spectrum than they need or even realistically want. It is highly unlikely that Skybridge or any of the other NGSO FSS applicants would reject an offer by the Commission to license all applicants with a fraction of the requested spectrum. Indeed, in the 2 GHz mobile

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9 See, e.g., Appendix C of Amendment to Application of SkyBridge L.L.C for Authority to Launch and Operate the SkyBridge Satellite System, File Nos. 48-SAT-P/LA-97, 89-SAT-AMEND-97, and 130-SAT-AMEND-98 dated January 8, 1999. ("Skybridge Application"). See also Comments of Skybridge in ET Docket 98-206, March 2, 1999.

10 The exceptions being Virgo (1500 MHz) and Hughes Net (500 MHz)

satellite service proceeding, many applicants sought to obtain a license to use all available 70 MHz of spectrum for their systems.[11] The Commission recently has proposed granting as little as 5 MHz to each system and nearly all applicants have wholeheartedly embraced these proposals by the Commission. The point is this: the Commission need not worry about Northpoint and Skybridge sharing spectrum in the Ku-band. If Skybridge continues to cling to its unfounded fears that Northpoint will cause harmful interference to Skybridge, the Commission can license Skybridge to use the 11.7-12.2 GHz band (and even 500 MHz is likely to be more spectrum than Skybridge actually needs) and license Northpoint to use the 12.2-12.7 GHz band. This flexibility in using frequencies has significant benefits for sharing with services that only use a portion of the service link spectrum, as will be seen in the next section.

4. Protection of Northpoint from NGSO FSS systems

Skybridge claims that there is no technical basis for the Northpoint PFD limit in Northpoint's Comments on the CPM Report, and that the Northpoint PFD limit would cost billions of dollars in increased NGSO system costs. These are completely false statements. There is substantial and sound engineering basis for the Northpoint PFD limit. Moreover, this PFD limit does not pose an undue constraint on the development of NGSO FSS systems, as all of the proposed NGSO FSS systems meet the Northpoint PFD limit.

The criteria to protect Northpoint from NGSO FSS transmissions are based upon the need to maintain robust link availability and the following principles:[12]

a. NGSO FSS should not cause a loss of signal in clear air,
b. NGSO FSS should not cause an unacceptable increase in system unavailability.

These are the same requirements that were agreed to between NGSO FSS and the BSS for protection of BSS operations. In light of the fact that Northpoint and BSS receive equipment are fundamentally identical, the same principles should be applied here. A loss of signal in clear air would occur if the C/(N+I) ratio falls below the critical value of 5.0 dB.[13] At edge of coverage, the Northpoint composite C/N is 7.9 dB in clear air, with 2.9 dB of link margin.[14] An I/N of 0 dB would cause a 3 dB loss of link margin, causing an outage in clear air. In terms of an unacceptable increase in

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11 See generally ET Docket 95-18.

12 I/N of 0 dB for no more than 0.001% of time, I/N of –13 dB for no more than 10% of the time. See Technical Annex to Comments of Northpoint Technology on ET Docket 98-206, filed March 2, 1999 (the "Comments Technical Annex"), page 20.

13 This is a function of the receive equipment, and this value has been repeatedly validated by DBS as well as by Northpoint in field-testing.

14 See Comments Technical Annex page 6.

unavailability, the Northpoint link budget allows for long term C/I of 20 dB, equivalent to an I/N of 12.1 dB. This criterion is manifested in a long term I/N of -13 dB for no more than 20% of the time. However, dynamic analysis reveals that if the short-term criterion is met, then the long-term criterion is also satisfied.[15] Therefore, *these criteria have a sound engineering basis* and have repeatedly been verified through testing. Skybridge and other NGSO FSS proponents supported these same criteria for the BSS, which uses essentially the same receive equipment. Therefore, the Skybridge assertion that these criteria are " wholly unsupported"[16] is completely inaccurate.

In its defense of the provisional PFD limits identified in the CPM Report, Skybridge asserts that the "JTG 4-9-11 PFD limits were agreed to with strong U.S. support to protect FS service in the band."[17] However, these limits protect FS systems that primarily operate in the 10.7 - 11.7 GHz band. In fact, it appears that the only system characteristics submitted for the band 11.7 - 12.7 GHz from the U.S. (or from any Region 2 country for that matter) were the Northpoint system characteristics. As noted above, the CPM text explicitly states that the ITU studied only systems that are wholly unlike Northpoint. Therefore, the Skybridge assertion that the CPM PFD limit is sufficient to protect U.S. interests in the band is false.

Northpoint PFD limit does not hinder NGSO FSS use of the Northpoint Band

Skybridge asserts that "to accommodate Northpoint's plan, a constellation redesign involving a substantial increase in the number of satellites of each NGSO system, in order to increase the minimum elevation angle of the satellites while still providing global service."[18] This assertion is simply wrong: All the proposed NGSO FSS systems (except Skybridge) meet the Northpoint PFD limit. The PFD limit to protect Northpoint (see curve 2 in Figure 1 below)[19] was developed using the above mentioned short-term criterion, and protects Northpoint systems with elevation angle as high as 1 degree, the maximum elevation angle anticipated at the edge of coverage. The Northpoint PFD limit is nearly identical to the provisional PFD limits proposed at WRC-97 (see curve 1 in Figure 1 below). The only difference is a tightening of the PFD below five degrees in elevation, from -148 to -158 dBW/ m^2/4 kHz.

All of the NGSO FSS systems proposed for the Ku-band already meet this PFD limit with existing designs, except for Skybridge.[20] Skybridge exceeds the PFD

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15 Comments Technical Annex , page 25 (graphic).

16 See Skybridge Letter, page 9.

17 Skybridge Letter, page 9.

18 Skybridge Letter, page 10.

19 See also Comments Technical Annex, page 27

20 Hughes Link states the maximum PFD on the ground is –157.6 dBW/m2/4 MHz. Previous analysis revealed that this value is true for the edge of beam, but is 3 dB higher for the center of

limit by only 3 dB, over less than a 3 degree span. Further, Skybridge can meet the PFD limit through its existing design, without impact to its ability to serve customers.

Also plotted in Figure 1 below is the Skybridge PFD for the worst-case Skybridge configuration. As can be clearly seen Skybridge exceeds the Northpoint PFD mask approximately 3-4 dB. This would only be when Skybridge is operating at maximum power, and only at minimum elevation angle. This excess power is only below four degrees in elevation, and is not needed to serve the Skybridge customer, as customers are served at or above 10 degrees.[21] There is a need to attenuate the excess of 3-4 dB, which can be accomplished through any of several different means, each within the capability of the Skybridge system design. Two different methods to meet the specified PFD limit would be beam forming and beam pointing.

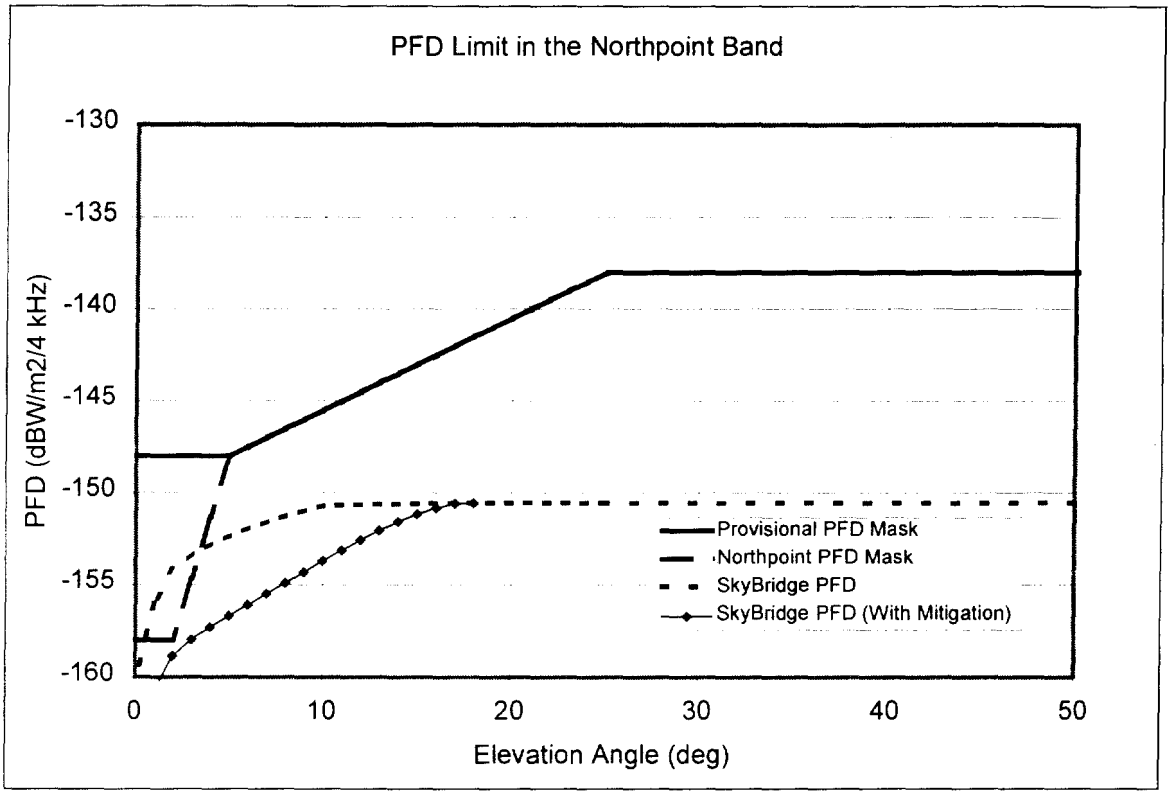

Figure 1. PFD Mask for Northpoint

Skybridge can Meet Northpoint PFD Mask with Existing Design– Skybridge claims that increasing NGSO FSS elevation angles is not a solution because it

beam. However, Hughes stipulates that it will meet the above PFD limit, and this is only 0.4 dB above the Northpoint PFD limit.

21 See Application of Skybridge, January 8, 1999, page A-14, A-23.

would place additional and unwarranted burdens on NGSO FSS systems.[22] Skybridge also claims that an increase in the elevation angle would require increasing the number of satellites and would "involve billions of dollars of increased construction and launch costs."[23] Skybridge provides no technical support whatsoever for these statements. However, Skybridge's concern appears to be that it would not be able to serve its customers below a certain elevation angle, unless it radically changed its design. This concern is misplaced.

There are several different alternatives available for Skybridge to meet the Northpoint PFD limit; none of these solutions affects Skybridge's ability to serve its customers. Either beam pointing or beam forming solutions would provide non-impacting solutions for coexistence.

Beam pointing solution

The first method involves a change in beam pointing. In order for Skybridge to serve its customers at edge coverage (10% elevation angle to satellite), it is not necessary to point the center of beam at the edge of coverage. Detailed analysis shows that Skybridge would only exceed the Northpoint PFD limit for the highest power operations when pointing the center of a beam at elevation angles between 10 and 18 degrees (see curve labeled "Skybridge PFD" in figure 1 above). If Skybridge simply maintains pointing of the beam center at an elevation angle of 18 degrees, then it can meet the Northpoint PFD limit (see curve labeled "Skybridge PFD with mitigation" in Figure 1 above). Figure 1 clearly shows that Skybridge maintains PFD of -155 $dBW/m^2/4$ kHz for elevation angles above 8 degrees, which is the required PFD for its system.[24] As it does not propose to serve customers below 10 degrees in elevation, it can serve all customers, even when pointing the beam center at 18 degrees in elevation. Therefore, there is no impact on Skybridge in utilizing this method.

Beam forming solution

A second and completely different method of minimizing the power density at elevation angles below five degrees would be through beam forming of the transmit antenna. Skybridge has the capability to meet the Northpoint PFD limit with its phased array antenna design through beam forming.[25] This beam forming is based upon the need to maintain a circle-shaped footprint on the ground at a constant power level. Since beam forming is already a part of the Skybridge antenna design, it is a matter of

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22 Skybridge Letter, Page 10.

23 Id.

24 See pages B-1 through B-8 of Skybridge Application. This figure includes rain attenuation.

25 The beam forming nature of these footprints can clearly be seen in the Skybridge Application at pages A-27 through 29. See also page 11 of the Skybridge Application, "each Skybridge beam is shaped..."

making minor adjustments to the transmit pattern, and only at very low service elevation angles.[26] The matter of attenuating 3-4 dB off boresight is trivial by comparison with the need for radical beam forming already used by Skybridge. Since it would only be used with the conjunction of maximum AP-3 power and low elevation angles, it would be employed less than 1% of the time. These adjustments are minor and would have no impact on Skybridge's ability to provide service to it's customers.

Therefore, there are at least two different alternatives available for Skybridge to meet the Northpoint PFD limit. Moreover, both of these solutions are non-impacting on Skybridge operations because they can be implemented in its existing design and, therefore, do not constitute an undue burden on Skybridge. These methods would only need to be used in cases of maximum power as stated on Skybridge's AP-3 application, which may never be used. As Skybridge states its nominal operating power is 4 dB lower, it probably would not need to make any changes in its operations. Therefore, Northpoint can have complete protection from NGSO FSS systems without placing an undue burden on either Northpoint or the NGSO FSS systems if the Northpoint PFD limit is implemented.

5. NGSO FSS Systems are Compatible with Northpoint Operations

Skybridge claims that Northpoint would cause harmful interference into NGSO FSS systems and that the Northpoint "impact on NGSO FSS systems would be devastating."[27] In this regard, Northpoint presented detailed technical analysis of all NGSO FSS systems proposed for the Northpoint band, conclusively demonstrating there is no impact to NGSO FSS systems.[28] Northpoint is the only party to have provided any technical analysis of this nature in the 12 GHz proceeding. This analysis shows that while there is a possible mitigation zone for some NGSO FSS systems in the Northpoint band, this mitigation zone does not unduly constrain the development of NGSO FSS systems. The reason is that this mitigation zone is small, and only exists in a portion of the NGSO FSS service link band. NGSO FSS systems can use frequency diversity to mitigate this interference, at no impact to their operations.

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26 Skybridge proposes to employ steerable phased array transmit antennas. These antennas are beam forming by design. The gain of the phased array antenna, as well as the shape of the transmitted beam, are continuously varied as the satellite moves in space. This is the so-called isoflux gain. See Skybridge Application, page B-1. The beam forming nature of these footprints can also clearly be seen in Figures on pages A-27 through A-29.

27 Skybridge Letter, page 5.

28 Comments Technical Annex, pages 20-37, appendices C, D & E.

Interference criteria for protection of NGSO FSS

In the Ku-band NPRM, the Commission requested input on criteria to protect NGSO FSS systems.[29] Only Northpoint provided input on this topic, and no party objected or commented on these proposed criteria. Moreover, no party offered a different set of criteria for protection from terrestrial services. The following table shows the interference criteria.

Table 2. Interference criteria for NGSO FSS[30]

I/N Level (Clear Air)	Percent of Time
0 dB	0.01
-12.2	20

NGSO FSS operations in the Northpoint service area

In the 11.7 - 12.2 GHz band, there would be no Northpoint operations and, therefore, there is no mitigation zone in this band for any NGSO FSS system. In the 12.2 – 12.7 GHz band, the analysis shows that five of the proposed systems (Denali, Boeing IDS, Boeing BDS, Teledesic and Virgo) can operate in fully 99.9% of the Northpoint service area without any further interference mitigation by either party.[31] These are MEO and HEO NGSO FSS systems. With minimal mutual accommodation including localized shielding, 100% of the Northpoint service area can be used, (even rooftop co-location of Northpoint transmitters and NGSO FSS receivers is possible).[32] The remaining systems (Hughes Link and Skybridge) also can operate in the band 11.7 - 12.2 GHz. In the 12.2 – 12.7 GHz band, there is a *potential* for interference in 1.5% of the Northpoint service area for Hughes Link and 8.25% for Skybridge.[33] Of the two systems, Skybridge is by far the "dirtiest" system in terms of sharing. Therefore, if compatibility can be demonstrated for Skybridge, it follows that it is demonstrated for all proposed NGSO FSS systems.

Skybridge operations in the Northpoint band

Figure 2 shows the results of the worst-case dynamic analysis interference into Skybridge for distances of 1-4 km from the Northpoint transmitter at 30 degrees north latitude.[34] The interference is better for all more northerly latitudes. This analysis

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29 Notice of Proposed Rulemaking in ET Docket No. 98-206 at Paragraph 96.

30 Comments Technical Annex, page 32.

31 Id.

32 In the case of Teledesic, some additional mitigation, such as described herein, may be required.

33 See Comments Technical Annex, page 32.

34 Id. at 33.

is for azimuth angle to the Northpoint transmitter of 40 degrees. The interference is better for all other azimuth angles. The 1 km distance is the upper bound, as the Northpoint PFD falls off inside of 1 km due to transmit antenna discrimination. The total area where there is a potential for interference is less than 8% of the Northpoint service area. One other point with respect to Figure 2 is that an outage to Skybridge would occur 10% of the time, or less. This would be much like obscura, which NGSO FSS systems must contend with on an everyday basis and which they combat with satellite diversity.

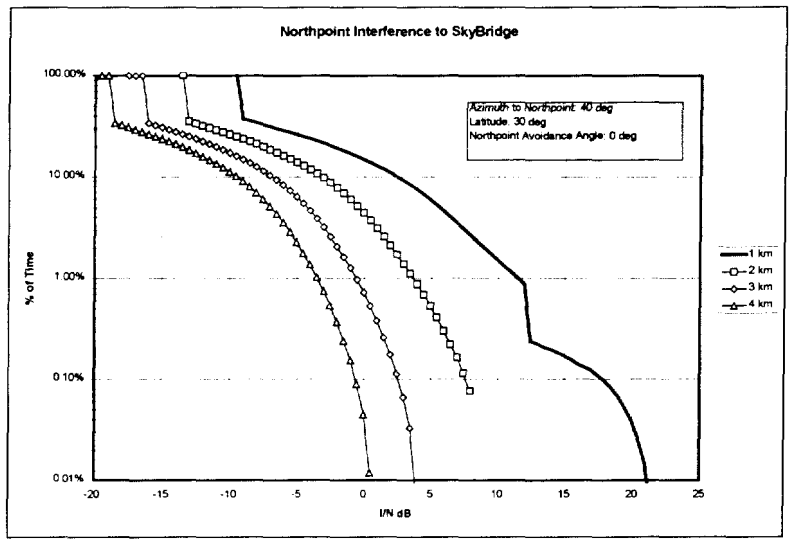

Figure 2. Interference into SkyBridge

However, there would be no interference in the band 11.7 - 12.2 GHz band. User terminals in the (at most) 8% of the Northpoint service area where interference might occur would have unrestricted access to the band 11.7 - 12.2 GHz, and the remaining 92% would have access to the entire 11.7 - 12.7 GHz band.[35]

Higher powered operations of Northpoint

Skybridge makes the misleading claim that its "user terminals would receive interference over 100% of the Northpoint service area".[36] This claim is based on a hypothetical case where the Northpoint system has a power level of 45 dBm, or 1800 times higher than the nominal 12.5 dBm. Skybridge ignores a fundamental fact: if the Northpoint power level were higher, then the service area would be correspondingly larger as well. Even if the Northpoint power level is increased, outside of a few kilometers there is sufficient antenna rejection towards the horizon. Therefore, the

35 As will be shown later, the entire Skybridge constellation can function at 100% capacity with only 500 MHz of service link spectrum.

36 Skybridge Letter, page 7.

proportion of the mitigation area will grow slower than the size of the service area, and for higher powered Northpoint operations, the size of the mitigation zone will actually be smaller than 8%, not 100% as Skybridge claims.

Putting these obvious flaws in the Skybridge logic aside, the Northpoint power level is limited by the need to protect DBS customers. As fully explained in the Comments of Northpoint Technology on the Ku-band NPRM, a range of parameters has been specified to permit flexibility in Northpoint operations. This in no way would significantly alter the sharing environment. As an example, Northpoint would be able to use a higher power level when transmitters are located in uninhabited areas, such as on mountaintops, over large bodies of water, or similar circumstances where no DBS (or FSS) customers could exist. For all possible Northpoint power levels, and transmit parameters, the Northpoint signal strength in the inhabited areas would be approximately the same, yielding a similar sharing environment.

Mitigation of interference into NGSO FSS

Several methods may be employed to mitigate possible interference inside this coordination area: satellite diversity, frequency diversity and natural shielding and terrain blockage. None of these methods would constitute an undue burden on any NGSO FSS system.

Natural shielding and terrain blockage mitigate interference from terrestrial sources

Natural shielding, a key feature of terrestrial transmissions, will protect a significant number of NGSO FSS systems from terrestrial transmissions. According to a survey performed by Bennett, Petis and Blumenthal in July of 1999, 86% of DBS dish placements have natural shielding from Northpoint.[37] Although this particular study identified natural shielding for DBS equipment placement, similarities exist in the placement of all satellite receive antennas. Some NGSO FSS customers will receive protection from Northpoint transmissions because of natural shielding. The benefits of natural shielding should not be underestimated.

Satellite diversity mitigation

Skybridge is designed to automatically switch satellites when blockage from buildings or other obscura are encountered.[38] Interference from Northpoint will be automatically handled in the same way by the Skybridge system. Interference from Northpoint would occur at low elevation angles, which is why those NGSO systems that operate at high elevation angles have much greater degree of protection. Therefore, interference from

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37 Complete copy of the survey available upon request.

38 Obscura such as trees, mountains, buildings will affect each NGSO receive system differently, since obscura will vary significantly with every location and installation.

Northpoint would be much like obscura, which NGSO systems must contend with on a continual basis. NGSO FSS systems combat obscura with the use of satellite diversity. Skybridge has strongly urged the Commission to require that all NGSO systems adopt satellite diversity as a means of mitigating interference.[39] Northpoint concurs with Skybridge's view in this regard. Satellite diversity will fully protect all NGSO systems from Northpoint in clear air.[40] In all-weather conditions, satellite diversity will fully protect the Skybridge system outside of a radius of two kilometers (1.25 miles). Only in conditions of link impairment due to rain would another means of mitigating interference be required.

Frequency diversity mitigation

One additional method for mitigating interference would be the use of frequency diversity. This effective method was presented in the Comments of Northpoint Technology. NGSO FSS use of frequency diversity to operate in the band 12.2 - 12.7 GHz has a straightforward implementation, and does not affect NGSO operations. It is a simple matter to assign those few customers in the Northpoint coordination area to the 11.7 - 12.2 GHz band rather than the 12.2 – 12.7 GHz band. This can be accomplished by several means, either by a data base entry for each customer or in real-time. Skybridge uses a "first listen" terminal operation and "personalized resource allocation plans."[41] The gateway stations perform the operational frequency management functions, and manage handovers, at least 100 per day for each customer.[42] The user terminal does not transmit unless it hears a reference signal in the service link band from the gateway, via the satellite.[43] This would apply for obscura as well as for interference. Clearly, if there were interference in the 12.2 - 12.7 GHz band, the user terminal would hear a reference signal in the lower band.

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39 Reply Comments of Skybridge in Ku-band NPRM proceeding, dated April 14, 1999, page 64.

40 See Comments Technical Annex, page 35. With satellite diversity the short-term NGSO criteria is met, preventing a loss of signal in clear air.

41 See http://www.skybridgesatellite.com/system/cont_44.htm, last visited January 6, 2000. ("In order to implement its frequency sharing technique, the satellite resources (i.e., spot-beams) are managed centrally and personalized resource allocation plans are transmitted to each gateway and satellite. In this way, the gateways and satellites are pre-programmed to hand-over traffic. The user terminals do not contain maps of their non-operating zones, operating only on a "first listen" basis. A user terminal will not transmit toward a satellite unless it first receives a signal from its gateway via the satellite.")

42 With average in-view time of 12 minutes, 120 satellite handovers are required per day. See also Comments Technical Annex, page 34 (footnote).

43 Skybridge Application, page A-12.

The user terminal will then advise the gateway on which frequency it is receiving the reference signal and the traffic will be routed to that user in the 11.7 - 12.2 GHz band. As Skybridge proposes personalized resource allocation, the claim that frequency diversity would complicate the resource management is false.

Skybridge objections to use of frequency diversity are without merit

Skybridge provided comments on Northpoint's proposed Alternate Beam Assignment or ABA in their filing to the Commission August 4, 1999, and in the November 10, 1999 Skybridge Letter. As an initial matter, Skybridge has no technical objection to channel assignment as a feasible mitigation method; they agree that "this might be technically feasible."[44] Skybridge concerns are limited to the following:

1. Skybridge contends that intermodulation products from out-of-band Northpoint emissions would prevent Skybridge operations in the 11.7 – 12.2 GHz band.
2. Skybridge claims that frequency limitations (from self-interference) preclude implementation of frequency diversity.
3. Skybridge declares that frequency diversity would decrease its flexibility and limit its ability to share with other NGSO FSS systems.

Each of these claims is made without technical substantiation and can be proven false.

Out-of-band Interference–Skybridge claims that "complex filters...capable of isolating *at RF* the Northpoint signals by at least 60 to 100 dB."[45] Skybridge has not provided its analysis or a ground station specification sheet so that others may analyze their claims. However, their assertion that 60 to 100 dB of attenuation would be required is clearly false on its face. The peak I/N into Skybridge would be only 23 dB. Even if all 16 Northpoint carriers are included, the total out of band energy would only be at I/N = 35 dB. In any case, Skybridge receivers will need to filter out such emissions from adjacent Skybridge signals, as well as existing high power point-to-point terrestrial systems. Therefore, no such filters are especially required for Northpoint.

Self Interference Limitation Will Not Hinder Use of Frequency Diversity–To maximize the throughput in a given cell, and hence in all cells, Skybridge would need to optimize the number of carriers into each cell. Self-interference would limit the number of carriers that can be used in adjacent cells from a single satellite. The

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44 See Opposition of Skybridge L.L.C in the Matter of Application of SkyBridge L.L.C. For Authority to Launch and Operate a Global Network of Low Earth Orbit Communication Satellites Providing Broadband Services in the Fixed Satellite Service, File Nos SAT-AMD-19980630-00056; SAT-AMD-19990108-00004, dated August 4, 1999, ("Skybridge Opposition") page 23.

45 Skybridge Letter, page 8, (footnote).

Skybridge Ku-band footprint provides at least 20 dB of isolation between non-adjacent cells.[46] Therefore, only adjacent cells need to be concerned with self-interference.

To begin this analysis, divide the 1000 MHz into 39 distinct 22.6 MHz carriers on 25.6 MHz centers.[47] To avoiding self-interference and maximize throughput, assign each cell a set of frequencies to be used by a given satellite. With a maximum of 24 beams, a minimum of eight times frequency re-use is possible in this optimized frequency plan. Skybridge has the ability for twelve times frequency reuse.[48] The optimal Skybridge downlink would use three distinct frequency patterns for each satellite (see table 3 below and the attached Figure 3).

Table 3. Optimal Skybridge frequency assignment plan

	11.7 GHz – 12.2 GHz							12.2 GHz - 12.7 GHz					
	Carrier Number												
Frequency Pattern A	1	4	7	10	13	16	19	22	25	28	31	34	37
Frequency Pattern B	2	5	8	11	14	17	20	23	26	29	32	35	38
Frequency Pattern C	3	6	9	12	15	18	21	24	27	30	33	36	39

Each Skybridge satellite would have the option of using up to any of 13 different frequencies in a cell without causing self-interference to adjacent cells. This would be the optimal frequency assignment. Note carefully that half of these frequencies would be out of the Northpoint band. With a 20.48 Mbps carrier on 13 frequencies and 2 polarizations, the total downlink capacity to any given cell from a single satellite would be 532 Mbps. This could only be increased at the sacrifice of reducing capacity into all neighboring cells, or by adding downlink from other satellites visible to the cell. The latter would clearly be preferred over reducing capacity. From this analysis, it is clear that there will always be frequencies available outside of the Northpoint band in each Skybridge cell.

Skybridge Flexibility is Not Decreased–Skybridge offers no substantiation for its position that ABA will decrease its flexibility. Its claim that "some carriers over some regions could not be used"[49] is true. However, Skybridge does not and cannot assert that its satellite will use 100% of all frequencies all the time. It does not have the capacity to do so, as demonstrated in the following section.

Skybridge satellites have capacity for only 50% of the spectrum it proposes to use. Skybridge can actually provide its entire service in the 11.7 – 12.2 GHz band *only*. Although Skybridge does not provide the average or peak number of carriers

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46 Skybridge Application pages A-27 through A-29.

47 Allowing 3 MHz guard band. A larger guard band is unnecessary and wasteful. A smaller guard band will allow up to 44 carriers.

48 See Skybridge Application, page A-7, (footnote).

49 Skybridge Opposition, page 25.

per beam, power limitations would limit the average number of carriers to six carriers per beam.[50] In addition, intermodulation distortion also would limit the number of carriers per beam, probably in the 4-6 carrier range, depending on TWTA rating and backoff. With six carriers per beam, and three beam patterns, Skybridge could provide its entire service in the lower 18 frequencies, hence the lower 500 MHz.[51] Put differently, the Skybridge system design limits itself to using a maximum of 50% of the 1000 MHz requested in its application.

Accordingly, the Skybridge assertion that all "or part of some of the cells ... will have to use frequencies in the 12.2 - 12.7 GHz band *only*"[52] is clearly false. Moreover, Northpoint has demonstrated that Skybridge can provide its entire service in the lower 11.7 – 12.2 GHz band. Skybridge could still have access to the band 12.2 – 12.7 GHz for the (at least) 92% of their customers outside the coordination zone. However, a better NGSO deployment would restrict LEO operations outside of the 12.2 – 12.7 GHz band, and allow HEO and MEO operations in the 12.2 – 12.7 GHz band, because such systems can be fully deployed in harmony with Northpoint.

The fact is that all carriers can be used over most regions, and that neither system capacity nor flexibility will be reduced. The following table demonstrates the percent of frequencies available to all NGSO FSS systems. The mitigation zone defines the maximum extent where 50% of the 1000 MHz could be used. In the unaffected area, 100% of the 1000 MHz can be used.

System	Skybridge	Hughes Link
1. Maximum Size of Mitigation Zone	8.3%	1.6%
2. % Frequency Available in Mitigation Zone	50%	50%
3. Unaffected Area	91.8%	98.4%
4. % Frequency Available in Unaffected Area	100%	100%
5. % Total Frequencies Available	95.9%	99.2%

In the case of Skybridge, half of the carriers can be used in all of the regions all of the time. The other half of the carriers can be used in 92% of the regions all of the time, and thus 96% of the frequencies are available to Skybridge at all times. Clearly, using the frequency diversity method imposes no burden on Skybridge, since Skybridge has only satellite capacity to use 50% of the frequencies, and each satellite can

50 Payload peak power is 2500 Watts, according to Skybridge Application, January 8, 1999, page A-44. Transmitter poser consumption is 4.4 Watts per carrier, at 60% TWTA efficiency, with 18 beams x 6 carriers per beam x 2 polarizations = 1584 Watts, which does not include the power needed for the gateway downlinks, communication system overhead.

51 Doing so requires the system to be properly balanced in its use of satellite and spectrum resources, but this is clearly in Skybridge's interest, and all parties agree that maximizing the use of the spectrum is in the public interest.

52 Skybridge Letter, Page 8

re-use the same spectrum. NGSO FSS proponents state that frequency re-use among its satellites is one of the principal benefits of NGSO FSS systems.

Sharing with other NGSO FSS systems is not affected by frequency diversity

Frequency diversity does not affect the use of satellite diversity, and therefore coordination with Northpoint does not restrict coordination among NGSO FSS systems. Skybridge claims that "multiple NGSO FSS systems will be sharing the band, and Northpoint's proposal will place constraints on the assigning of frequencies to the users."[53] No technical substantiation is provided for this statement and Skybridge cannot support its assertion that Northpoint would impose some "devastating burden". In coordination with other NGSO FSS systems, Skybridge proposes to use satellite diversity, not frequency diversity. The use of satellite diversity in no way restricts the choice of frequencies used to serve customers. Likewise, the use of frequency diversity in no way restricts which satellite should serve a given cell. Therefore, as these are completely independent mitigation techniques, they can be used independently, and do not impose a burden on satellite operators.

6. Conclusion

Northpoint can be ubiquitously deployed without causing harmful interference to NGSO FSS. As demonstrated by rigorous technical analysis, the Northpoint PFD limit does not impose an undue burden upon NGSO FSS systems. The use of the band 12.2 - 12.7 GHz by NGSO FSS should be subject to meeting the Northpoint PFD limit. Most NGSO systems meet it automatically. Only Skybridge may exceed the Northpoint PFD limit by a small amount in certain circumstances. Skybridge can alter its system to meet the Northpoint PFD limit without impact to its operations.

Northpoint low power operations in the 12.2 – 12.7 GHz band are fundamentally different from other terrestrial operations and generalized claims of incompatibility cannot substitute for rigorous analysis. The analysis contained herein conclusively shows that Northpoint operations in a portion of the NGSO FSS service link band would not unduly constrain NGSO development. The proven mitigation method of frequency diversity allows for ubiquitous operations for NGSO FSS, even within the mitigation area. Satellite diversity can also be used. These methods are already designed into NGSO FSS systems and have no impact upon NGSO operations.

The extent of this flexibility is seen as Skybridge only has sufficient satellite resources to use 50% of the 1000 MHz of spectrum at any time. Therefore, the Skybridge service link requirement can easily be accommodated in the band 11.7 - 12.2 GHz. If Skybridge continues to cling to wild assertions of incompatibility, it leads to the

[53] Skybridge Letter, page 8.

conclusion that LEO operations should be limited to the lower portion of the Ku-band (i.e., 11.7 – 12.2 GHz).

Figure 3. Optimal Skybridge frequency pattern (from Skybridge application), page A-23.

2. Satellite Footprint and Antenna Gain Contours

The Satellite coverage footprint with 10° minimum elevation angles at the earth station sites is illustrated in Figure IV-10. The 350 km radius spot-beams are shown.

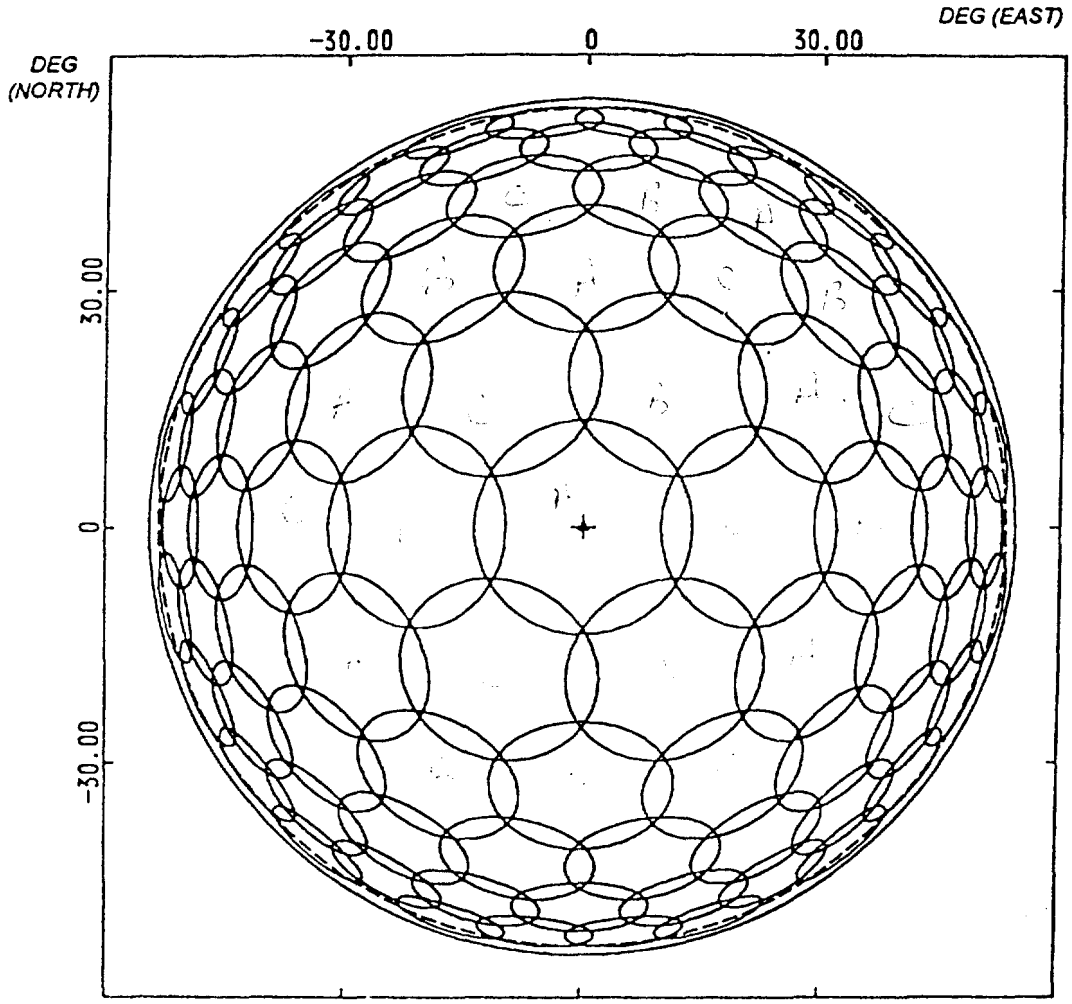

Figure IV-10: Satellite Coverage Footprint Showing 350 km Radius Spot-Beams

Exhibit B

FILE

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Creating Cable Competition with Northpoint Technology

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December 2, 1999

Diane Gaylor
Paul, Weiss, Rifkind, Wharton & Garrison
1615 L Street N.W
Washington D.C 20036-5694

Dear Ms. Gaylor,

Per our conversation earlier this week, I have reviewed your letter to the Federal Communications Commission of November 10, 1999, wherein your office has made several assertions of a technical nature on behalf of Skybridge. The first assertion is that there will be insufficient NGSO FSS spectrum to implement frequency diversity in sharing with FS systems in the band 12.2 – 12.7 GHz. The second assertion is that Northpoint noise from the 12.2 – 12.7 GHz band could interfere with Skybridge reception in the 11.7 – 12.2 GHz band. These and other assertions are made without technical support. Northpoint would like to assess these claims and cannot do so without the following additional technical and operational parameters of the Skybridge system:

1. Engineering evaluations of sharing between Northpoint and Skybridge that would support the above mentioned claims.

2. Earth station specifications:
   - Receiver sensitivity,
   - Third order intercept,
   - LNB noise figure,
   - RF & IF filter characteristics, filter roll off specifications
   - IF frequency.

3. Space station operational characteristics (A forward link carrier is defined as having a useful bit rate of 20.48 Mbps on page A-35 of the January 8th, 1999 application of Skybridge):
   - Maximum number of forward link carriers per beam and per satellite (each polarization),
   - Average number of forward link carriers per beam and per satellite (each polarization).

As this information would have been used to generate your recent letter of November 10, 1999, I anticipate that you would have no trouble producing this information and placing it in the public record. Thank you for your attention to this matter.

Sincerely,

/S/

Robert Combs
Director, System Development
Broadwave USA

cc: Jeffrey H. Olson

BroadwaveUSA™

Creating Cable Competition with Northpoint Technology

CERTIFICATION

I, Robert A. Combs, am Director, System Development for Broadwave USA, Inc. I have an ME in Communication Systems Engineering from the University of Virginia, and a BS in Aerospace Engineering from the University of Texas (Austin). I am familiar with the technical and operational characteristics of the Northpoint system.

I certify that I am the technically qualified person responsible for the preparation of the technical material in this filing. The contents are complete and accurate to the best of my knowledge.

Robert A. Combs
Director, System Development
Broadwave USA, Inc.

Dated: January 6, 2000