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January 14, 2002

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OFFICE OF THE SECRETARY

VIA HAND DELIVERY

EX PARTE

Ms. Magalie Roman Salas
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

Re: Ex Parte Communication in ET Docket 98-206, RM-9147; RM-9245; Applications of Broadwave USA et al., PDC Broadband Corporation, and Satellite Receivers, Ltd., to provide a fixed service in the 12.2-12.7 GHz Band; Requests of Broadwave USA et al. (DA 99-494), PDC Broadband Corporation (DA 00-1841), and Satellite Receivers, Ltd. (DA 00-2134) for Waiver of Part 101 Rules.

Dear Ms. Salas:

In its comments in ET Docket 98-206, Skybridge LLC ("Skybridge") proposes various limits on the operations of terrestrial systems in the band 12.2 – 12.7 GHz. In a recent ex parte letter to the Commission, Skybridge revises its proposals relating to the imposition of hard limits on power flux density ("PFD") and equivalent power flux density ("EPFD") for terrestrial systems.[1] Northpoint objects to these new Skybridge proposals, which would severely constrain Northpoint without providing a corresponding benefit to NGSO FSS.[2]

As a preliminary matter, Northpoint wishes to emphasize that the protection of DBS operations already imposes severe restrictions on Northpoint's system parameters. For example, Northpoint's effective isotropic radiated power ("EIRP") in a typical urban area would be about -17.5 dBW per 24 MHz carrier, assuming an EPFD based upon a 20 dB C/I ratio.[3]

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[1] Ex parte letter from Jeffrey H. Olson, Paul, Weiss, Rifkind, Wharton & Garrison, to Magalie Roman Salas, Secretary, Federal Communications Commission, ET Docket No. 98-206 et al. (FCC filed Nov. 15, 2001) ("Skybridge Nov. 15 Ex Parte").

[2] The interference avoidance method to be used for Northpoint-NGSO FSS sharing is "frequency diversity" which requires only that the Skybridge user have an available frequency outside the 12.2 – 12.7 GHz band to avoid interference.

[3] See Comments of Northpoint Technology, Ltd. , Technical Appendix, Annex B, Table 5: "Methodology for determining mitigation zone, with conceptual Washington D.C. deployment of Northpoint."ET Docket 98-206 et al. (FCC filed Mar. 12, 2001).

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However, Skybridge's proposed hard limits for PFD and EPFD would require Northpoint to significantly reduce EIRP. Each reduction of EIRP of three decibels would halve the service area of the Northpoint transmitter, and would therefore double the number of required Northpoint transmitters. Doubling the number of Northpoint transmitters would have a number of negative consequences, including increasing the cost and complexity of the Northpoint system beyond the point where it is commercially viable. Because Skybridge's proposals would severely constrain or prevent the deployment of Northpoint, the Commission should reject them and adopt other, more flexible criteria for sharing between terrestrial and NGSO FSS operations.

As demonstrated below, the Skybridge proposals are intended to protect less than 0.4% of Skybridge receivers for less than 0.1% of the time. Instead of the complicated Skybridge proposal, Skybridge could avoid any interference from terrestrial systems by employing frequency diversity – a technique that it already intends to use to share with the other satellite systems. In the rare case (less than 0.4% of the area for less than 0.1% of the time) that the Skybridge proposed EPFD limits, would be exceeded, Skybridge could simply swap out the inexpensive LNB (Low Noise Block) at its customer's receive antenna to eliminate interference. Thus, there are simple alternatives that do not restrict the deployment of either NGSO FSS or Northpoint.

Skybridge Proposal #1: Limit the Northpoint PFD to -120 dB(W/m2/MHz) over 90 % of the Northpoint service area.

Skybridge proposes a limit on the Northpoint PFD of -120 dB(W/m^2/MHz), that may not be exceeded in 90% of the Northpoint service area. Skybridge further asks the FCC to define "service area" such that Northpoint "will not be permitted to claim that a given location is within the service area of more than one transmitter."[4] Finally Skybridge states that if the Commission were to limit Northpoint to a "single linear" polarization, the PFD limit would be either -120 dB(W/m^2/MHz), not to be exceeded in more than 20% of the service area, or -117 dB(W/m^2/MHz), not to be exceeded in more than 10% of the service area.[5] As discussed below, Skybridge provides no engineering basis for its proposal. Nor could Northpoint feasibly operate under Skybridge's proposed PFD limit.

No Engineering Basis for Skybridge Proposal

Remarkably, Skybridge presents no engineering rationale for its proposed limit. Skybridge nowhere describes any protection requirements that justify the PFD to be limited over 80 or 90 percent of the Northpoint service area, much less provide any analysis to support such stringent limits. The only justification Skybridge presents is a bald assertion that its ability to perform frequency diversity must be protected. As

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4 Skybridge Nov. 15 Ex Parte, Attachment, at 3.

5 *Id.* at 2.

Northpoint has shown, this will be accomplished if less than 50 percent of the Skybridge service area (not Northpoint service area) is free from harmful interference.[6] In its Nov. 15 ex parte, Skybridge does not even attempt to rebut Northpoint's long-standing and well documented calculations on this point.[7] Therefore, there is no need to impose any "percent of area" PFD limit on Northpoint. In the absence of an engineering basis for the proposed limit, there is no reason to consider Skybridge's proposal further.

Skybridge's proposal is flawed in numerous other respects, as well. To take just one example, a PFD cannot be used to estimate a level of interference for an NGSO FSS receiver, because the gain of the satellite receive antenna in the direction of the potential interferer is constantly changing. This basic fact may explain why Skybridge failed to provide any engineering analysis in support of its PFD proposal.

Northpoint Cannot Feasibly Operate Under Skybridge's Proposed PFD Limit

A more fundamental problem is that Northpoint cannot meet the "percent of area" PFD limit without drastically reducing power and therefore reducing coverage below an economically viable level. Skybridge in effect admits that it is aware the Northpoint cannot possibly meet its proposed limit. By Skybridge's own calculations, Northpoint's system will typically exceed the PDF limit of -120 dB(W/m^2/MHz) over *20%* of the service area.[8] When Commission staff quite sensibly asked why Skybridge was proposing that the limit not be exceeded over *10%* of the service area, rather than 20%, Skybridge answered that if Northpoint were to alter the polarization of its signal, then Skybridge would expect an increase in interference of up to 3 dB. According to Skybridge, this 3 dB difference can be seen "alternatively as a 10% difference in the service area."[9]

Reducing EIRP Does Not Affect PFD As Skybridge Supposes

As discussed below and illustrated in figure 1, however, reducing Northpoint EIRP and shrinking the service area does not substantially change the percentage of the service area impacted by the PFD. Even a 6 dB reduction in power would not sufficiently reduce the percentage of the service area that is above -120 dB(W/m^2/MHz) to meet Skybridge's proposed limit.

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[6] Comments of Northpoint Technology, Ltd., Technical Annex, Section 4, ET Docket 98-206 et al (FCC filed Mar. 2, 1999).

[7] The calculations appear in ET Docket 98-206 in the Technical Appendices to Northpoint's Comments March 2, 1999, and March 12, 2001, and to Northpoint's Reply Comments dated April 5, 2001, copies of which are attached to this letter.

[8] Skybridge Nov. 15 Ex Parte, Attachment, at 1.

[9] *Id.* at 2.

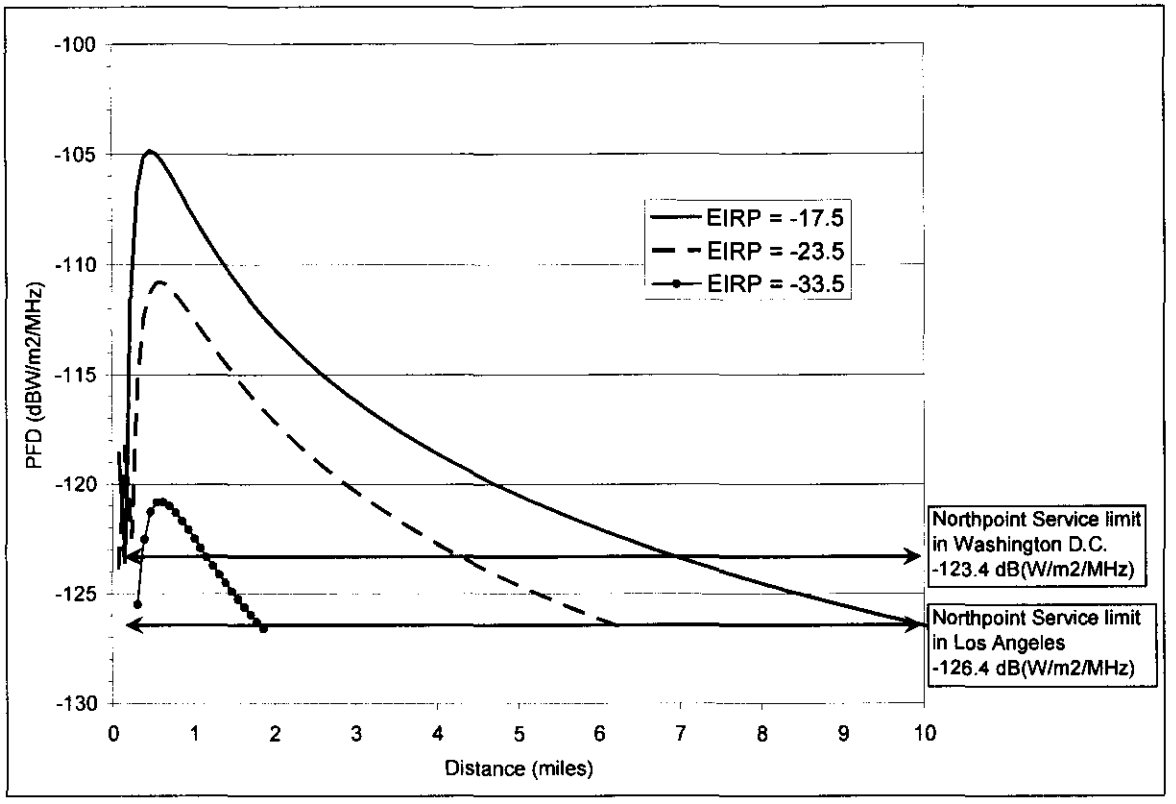

Figure 1. The PFD for Northpoint system at 150 m HAAT.

For example, in Los Angeles, the Northpoint PFD at the edge of coverage (10 miles) is -126.4 dB(W/m^2/MHz).[10] This figure is just 6 dB below the PFD that Skybridge is requesting.[11] In Washington, D.C., the situation is worse, as Northpoint would have only a 3 dB window in which to deploy its system. As shown by the solid line in Figure 1, the Northpoint PFD is -120 dB(W/m^2/MHz) at a distance of approximately 5 miles, which represents more than 20% of the theoretical Northpoint service area.[12]

In Figure 1, the dashed line shows that a reduction in EIRP of 6 dB would reduce the service distance to less than 5 miles in Washington, D.C. However, the area with a PFD greater than -120 dB(W/m^2/MHz) would still be approximately 25% of the Northpoint service area, at a distance of nearly 3 miles. Thus, reducing EIRP does not reduce the percentage of the Northpoint service area in excess of the proposed limit.

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[10] The isotropic signal strength is a minimum of -156.4 dBW per 24 MHz carrier, equal to a PFD of -126 dB(W/m^{2}MHz). This is true at the edge of coverage in Los Angeles. For edge of coverage in another part of the country – in Washington D.C., for example – the isotropic signal strength requirement is 3 dB higher to overcome the additional rain fade.

[11] On the East Coast and points in between, the edge of coverage Northpoint PFD is between -126 and -120 dB(W/m^2/MHz).

[12] The theoretical Northpoint service area is given for a flat-earth, unobstructed terrain. In practice, the service area for any Northpoint transmitter is reduced 10-40% or more by terrain, foliage or other obstructions.

Because reducing the EIRP does not appreciably change the percentage of the area in excess of the proposed limit, one must reduce the EIRP such that the *maximum* PFD is below about -120 dB(W/m^2/MHz) in order to comply with Skybridge's proposed 90% PFD criterion. As indicated by the dotted line in the Figure 1, the resulting EIRP is approximately -33.5 dBW. At this EIRP, the Northpoint service radius is approximately 1.5 miles. Therefore, Skybridge's proposal is completely unworkable.

Skybridge Proposal #2: **Limit the Northpoint EPFD to –132.1 dB(W/m^2/4 kHz) in 100% of the Northpoint Service area, and related EPFD Limit in 99.7% of the Northpoint Service Area.**

Skybridge also proposes an EPFD of -132.1 dB(W/m^2/4 kHz), not to be exceeded into any operational NGSO FSS receiver, or 100% of the Northpoint service area.[13] Skybridge asserts this EPFD corresponds to an interference level of -68 dBm, at the output of the Skybridge antenna. Skybridge claims that its receiver LNB (low noise block) will "saturate" if the noise level exceeds this value.

Skybridge has never provided any engineering support for its number, has cited no evidence in support of it, and has not placed its receiver design in the record for interested parties to review. In addition, it is well known in the DBS industry that LNBs that operate at 12 GHz saturate not at -68 dBm, but at -62 dBm, *six decibels higher than Skybridge is claiming.* In addition, it is likely that improvements in LNB performance would further raise this value by the time Skybridge deploys its system, *if it ever does so.* Therefore, Northpoint seriously questions the need to protect a Skybridge receiver from saturation at the -68 dBm value, and the Commission should exercise extreme caution before basing any requirement on this value.

Even assuming, *arguendo,* that the -68 dBm figure is correct, however, there is no need for Skybridge's requirement. As discussed below, even without the requirement, Skybridge would be protected from saturation over 99.6% of Northpoint's service area. In the unlikely event that Skybridge should locate one of its receivers in the tiny zone where the –68 dBm figure might be reached, saturation would still occur for less than 0.1% of the time because the Skybridge antenna is constantly tracking its satellite, and rarely, if ever, would look directly at a Northpoint transmitter.

To begin this analysis, we shall relate the EPFD in a 4 kHz band to the PFD in a 1 MHz band. The relation between the EPFD and the PFD is such that when the receive discrimination towards the interferer is zero, the EPFD is equal to the PFD. Therefore, given that the discrimination is zero, a simple bandwidth conversion shows that an EPFD of -132.1 in a 4 kHz band is equivalent to an EPFD of -108 dBW/m2 in a 1 MHz band.

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[13] Skybridge Nov. 15 Ex Parte, Attachment, at 3. In addition, Skybridge proposes a separate limit of -135.1 in 99.7% of the Northpoint service area. The fundamental issues behind these two proposals are the same and treated as one proposal for discussion here.

Interference Limited in Space

In the typical Northpoint installation, as shown in Figure 2, the peak Northpoint EPFD is about -105 dB(W/m^2/MHz). This is 3 dB greater than the Skybridge proposal. Accordingly, Skybridge would require a 3 dB reduction in Northpoint EIRP As stated above, a 3 dB reduction in Northpoint EIRP is incompatible with Northpoint deployment.

When one considers other possible Northpoint installations, such as a deployment at a height of 50 meters, one finds that the maximum possible EPFD could exceed the Skybridge proposal by up to 10 dB, as shown in Figure 3.[14] Outside of a distance of 0.5 miles, however, even this deployment would meet the Skybridge proposal. If the Northpoint service radius were eight miles, the area of concern would represent less than 0.4% of the Northpoint service area.

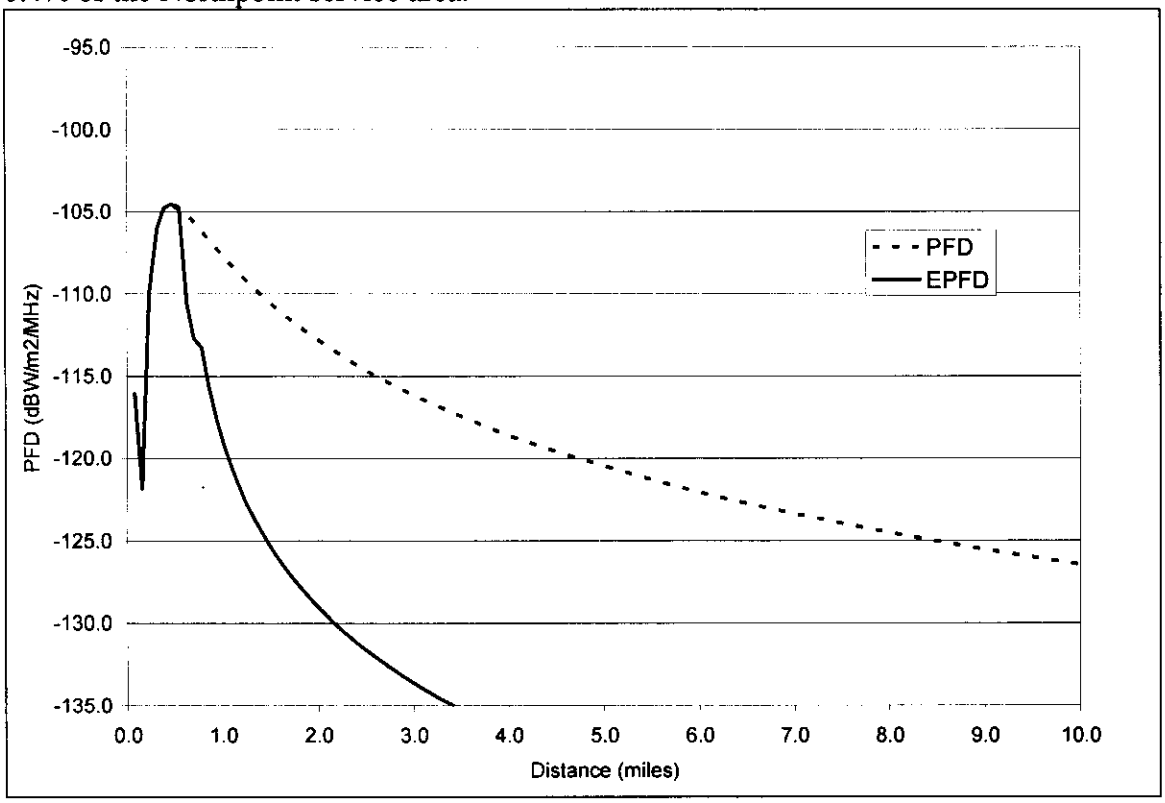

Figure 2. Maximum theoretical PFD and EPFD into SB receiver for Northpoint transmitter at 150 meters, EIRP = -17.5 dBW, mechanical beam tilt = 0 degrees.

[14] Yet, Northpoint could easily exist with DBS under these conditions.

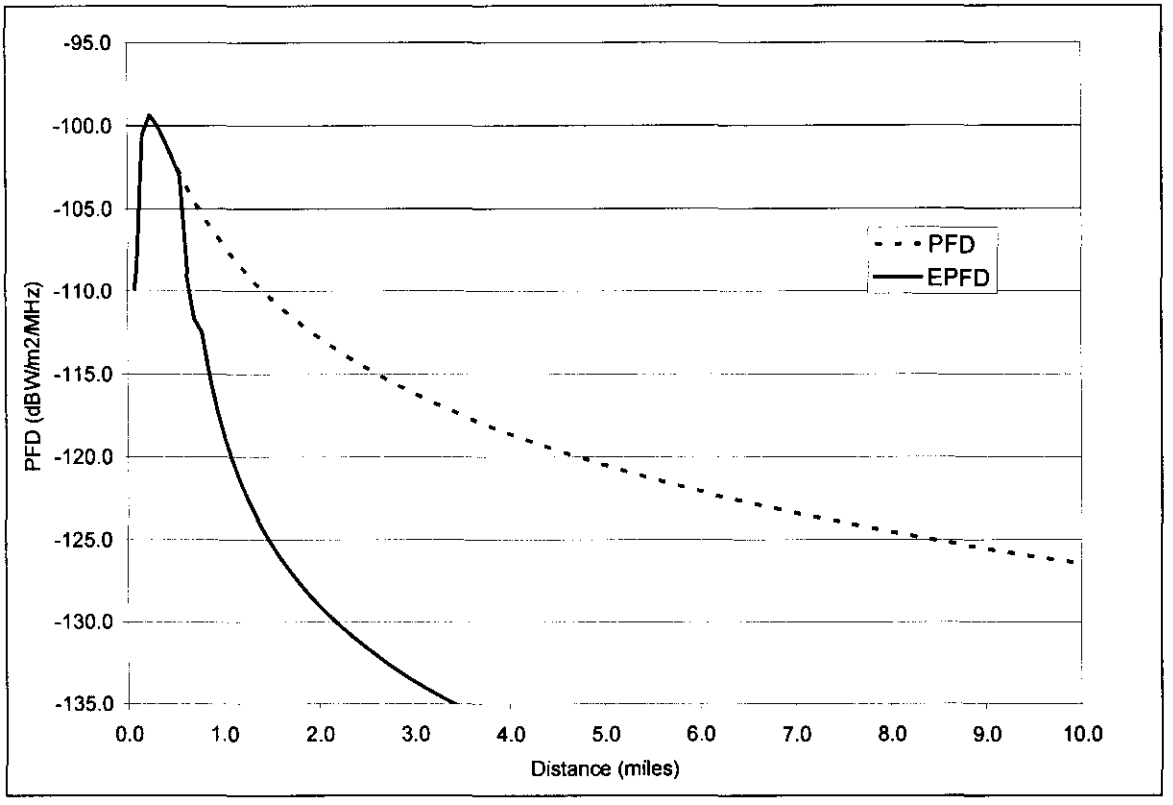

Figure 3. Maximum theoretical PFD and EPFD into Skybridge receiver for NP transmitter at 50 meters, EIRP = -17.5 dBW, mechanical beam tilt = 3 degrees.

Interference Limited in Time

Figures 2 and 3 and the discussion above demonstrate that the maximum theoretical EPFD into a Skybridge receiver is limited in space to less than 0.4% of the Northpoint service area. Yet this level of interference is *limited in time as well.* In fact, the peak interference level could occur less than 0.1% of the time, as shown in Figure 4.[15] As noted above, this is because the Skybridge antenna is constantly tracking its satellite, and rarely, if ever, would look directly at a Northpoint transmitter.[16]

[15] See Technical Annex to Comments of Northpoint Technology (1999), attached as annex 1.

[16] It is worth noting that if a Skybridge receiver were located within 0.5 miles of a tower or building hosting a Northpoint transmitter, Skybridge would have severe obscura problems regardless of whether a Northpoint receiver were present.

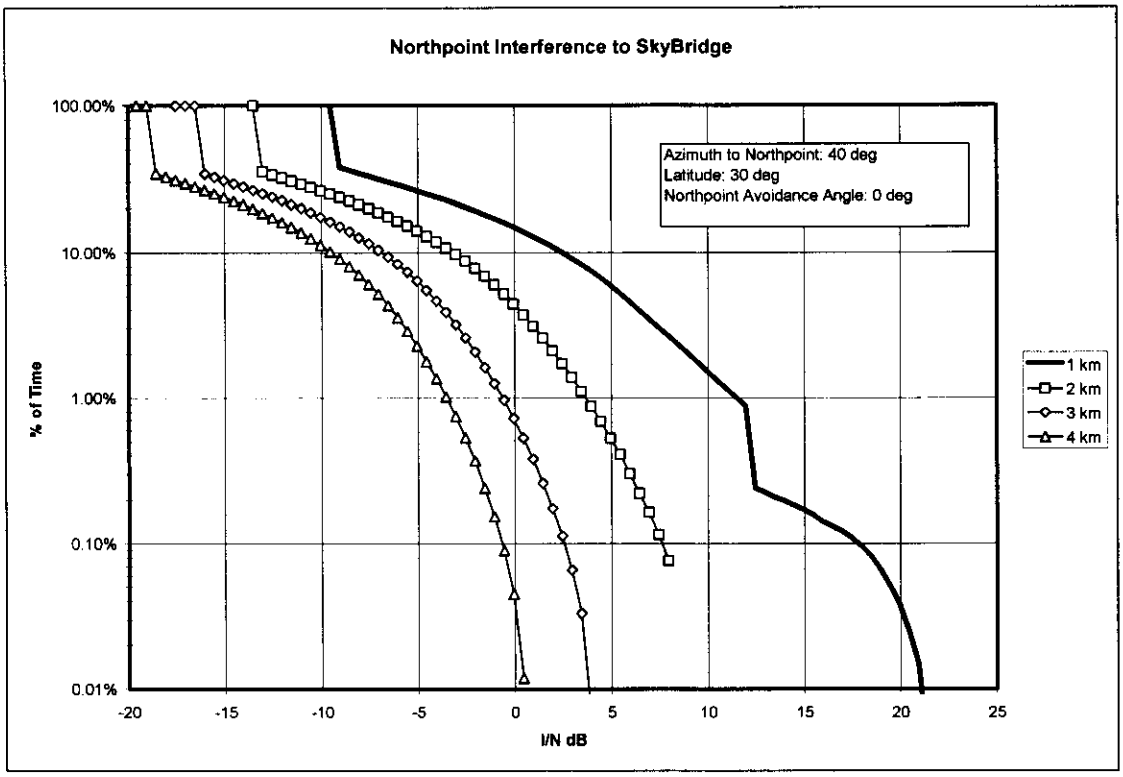

Figure 4. Peak level of interference would occur at most, less than 0.1% of the time.

Another unacceptable consideration is that Skybridge requests the Commission enforce these limits not just at ground level but wherever a Skybridge receiver might exist.[17] Under this proposal, Skybridge might place its receiver directly adjacent to an existing Northpoint transmitter, and then request that Northpoint reduce its power or cease operations to accommodate the new Skybridge receiver. Such a rule would be inconsistent with the co-primary status afforded both terrestrial transmitters and NGSO FSS in the 12.2-12.7 GHz band.

Alternatives to the Skybridge Proposal Do Not Constrain Either Northpoint or NGSO FSS

Skybridge acknowledges that it will use frequency diversity to avoid interference from terrestrial (and other) systems. In the instance of sharing with Northpoint, Skybridge would use the band 11.7 – 12.2 GHz wherever interference might exist from a Northpoint transmitter. In reply comments to the FNPRM, Northpoint wrote that if in some rare case interference from a Northpoint transmitter needed to be avoided:[18]

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[17] Ex parte letter to from Jeffrey H. Olson to Magalie Roman Salas, FCC, at 4, ET Docket 98-206 et al. (FCC filed July 10, 2000) (calling for an aggregate power limit "at the input of any NGSO customer receiver" of an EPFD of -132.1 dB(W/m2/4 kHz)).

[18] Reply Comments of Northpoint Technology, Technnical Appendix at 1, ET Docket 98-206 et al. (FCC filed Apr. 5, 2001)

> The NGSO receive low noise block (LNB) ... could simply be replaced by a simpler LNB with a noise bandwidth of 500 MHz, spanning the band 11.7 - 12.2 GHz, where actual NGSO FSS operations would be conducted for that customer, and thus filtering out Northpoint emissions in the upper band. It is simply a matter of substituting one inexpensive LNB for another.[19]

In fact, 500 MHz LNBs for the Northpoint band are available for under $30 retail cost. DBS and other operations in the band 11.7 – 12.2 GHz are common throughout the Americas, so low cost LNB's are available now in that band.[20] A 500 MHz LNB would be less expensive than a 1000 MHz LNB.

Thus, given that an inexpensive solution exists, the choice the Comission must make is straightforward. Either adopt a Skybridge proposal for an EPFD limit that must be met "wherever" a Skybridge receiver exists, or alternatively, allow Skybridge to simply use receivers with an LNB that would not be affected by Northpoint. In the first case, Northpoint operations would be severely constrained. In the latter, the cost is negligible, and neither Northpoint nor NGSO FSS operations would be constrained.

Eighteen copies of this letter are enclosed: two for inclusion in each of the above-referenced files. Please contact me if you have any questions.

Sincerely,

Robert Combs
Director of System Development

Attachments:

A. Excerpts from Technical Annex to 1999 Northpoint Comments
B. Excerpts from Technical Appendix to 2001 Northpoint Comments
C. Excerpts from Technical Appendix to 2001 Northpoint Reply Comments

cc: Thomas Tycz
Jennifer Gilsenan
Paul Locke
Julius Knapp
Thomas Derenge

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[19] The 500 MHz LNBs for the Northpoint band are available for under $30 retail cost. A 500 MHz LNB would be less expensive than a 1000 MHz LNB.

[20] In fact, the only DBS service currently available to Latin America is in the band 11.7 – 12.2 GHz.

A

Technical Annex
to
Comments of Northpoint Technology

[Excerpt: Pages 31-37]

Bob Combs & Associates
Telecommunications Consulting
March 2, 1999

4 NORTHPOINT INTERFERENCE INTO NGSO FSS

In this section, interference from Northpoint into NGSO FSS is analyzed. In section 4.1, assumptions are identified. The worst-case I/N values, for interference into NGSO FSS systems from Northpoint, are developed in Section 4.2. In section 4.3, dynamic analysis is used to determine the interference levels, at various percentages of time, for the Skybridge system. In section 4.4, various methods for mitigating interference are examined.

4.1 Assumptions

Table 18. Interference into NGSO FSS - Northpoint Assumptions

Parameter	Value	Units
Frequency	12.5	GHz
Atmospheric Loss	None	
Transmit Power	-25	dBW
Receiver Azimuth to Transmitter	0 to 180	deg
Transmitter Height above ground level	150	meters
Station Latitudes	30	deg
Radiation Pattern in Elevation	Figure 1	
Radiation Pattern in Azimuth	Figure 2	
Polarization Loss	Rec. F.1245 (Note 7)	

The NGSO FSS systems studied in this analysis were identified in Appendix 4. All information contained in the tables was taken from recent filings to the FCC, or derived from information therein.

4.1.1 Interference Criteria for NGSO FSS Systems

A fixed transmitter is a time-varying source of interference into NGSO FSS systems, much like rain attenuation. Making the assumption that interference and rain are independent, and occur for small percentages of the time (< 1%), then the joint probability of rain and interference is very small, and can be ignored. In this case, rain margin can be used to mitigate interference. This assumption is supported by current ITU-R efforts to define interference criteria for time-varying sources of interference into FSS systems in general. Although the carrier power also typically varies as a function of time, the noise power is constant.

If one assumes that a loss of signal in clear air occurs at I/N values of 0 dB, then this can be used as a trigger for short term interference. For link degradation due to increased noise, an I/N of -12.2 dB increases the noise only 6%. Thus, in this analysis the following interference criteria are assumed:

Table 19. Interference criteria for NGSO FSS

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

It is true that different modulation techniques, such as CDMA, provide much higher levels of protection against interference noise, and therefore these values would be conservative. It is not asserted that NGSO FSS systems coming into the band should be afforded protection from terrestrial services. Indeed, to do so would unduly constrain the development of terrestrial services in the band.

4.2 Static Analysis

Interference into NGSO FSS systems was calculated using Equation 3, repeated here:

$$I/N = P + 10*\log(B/b) + Gtx(theta1) - pathloss(x) + Grx(theta2) - gas - N \qquad \text{(Equation 3)}$$

Where:

P	: Transmit Power and includes polarization isolation according to Rec. ITU-R F.1245 (note7),
B	: Victim receiver bandwidth,
b	: Northpoint system transmit bandwidth of 24 MHz,
Gtx(theta1)	: Gain of transmitter according to radiation pattern in the azimuth and elevation
x	: range from Northpoint transmitter,
Grx(theta2)	: gain of the victim receiver in the direction of the Northpoint transmitter,
gas	: 0 (Gaseous absorption is negligible),
N	: Victim noise level, dBW per Appendix E.

The results are presented in Appendix D— Coordination area contours for all NGSO FSS systems., and summarized in Table 20. The total area (km^2), and percent of the Northpoint service area are given where I/N values exceed 0 dB.

Table 20. Summary of Appendix 3, Coordination Area for NGSO FSS Systems

System	Area (km^2)	% of Northpoint Service Area	Peak I/N
Skybridge	19.46	8.25%	23.0
Hughes NET	10.87	4.61%	36.5
Hughes LINK	3.72	1.58%	33.7
Teledesic	1.34	0.57%	22.2
Denali	0.16	0.07%	27.4
Boeing IDS	0.13	0.06%	21.2
Boeing BDS	0.13	0.06%	28.0
Virgo	0.12	0.05%	18.7

As can be seen in Table 20, loss of a significant portion of the service area is possible for the Skybridge, Hughes Net and Hughes Link systems. In contrast, for Teledesic, Denali, Boeing IDS & BDS and Virgo NGSO FSS satellite systems, there is potential for interference in only a very small area near the transmitter. Dynamic analysis in the next section will reveal the percent time of interference into Skybridge. In section 4.4, methods for mitigating interference are discussed.

4.3 Dynamic Analysis

Interference from Northpoint into the Skybridge system was simulated, according to the assumptions in Table 21. Simulation duration was 4 days at 1 second intervals (345,000 points). Principle assumptions about the Skybridge satellite system are as listed in Appendix E. The distance from the Northpoint transmitter was varied from 1 to 4 kilometers. At 1 kilometer, the Northpoint isotropic signal level is at a maximum value.

Table 21. Dynamic Analysis Assumptions for Interference into NGSO FSS

System	Parameter	Value	Units
	Frequency	12.5	GHz
	Atmospheric Loss	Per ITU Model	
	U.S. Standard Atmosphere		
Skybridge			
	Radiation Pattern	39-25log	
	Peak Gain	30.8, 36	dBi
	Distance from Northpoint Transmitter	0 - 4	km
	Azimuth to Northpoint Transmitter	40	deg
	Station Latitude	30	deg
	Target Satellite Selection	Highest Elevation Satellite	
	GSO Arc Avoidance	Yes	
Northpoint			
	Transmitter Power	-17.5	dBW
	Radiation Pattern	Per section 1	
	Transmitter Height above average terrain	150	meters
	Polarization Isolation[22]	Rec. F.1245 note 7	
	Peak Gain	10	dBi

The results of the dynamic analysis into Skybridge are presented in Figure 21, taken for a worst-case azimuth for Skybridge of 40 degrees. As illustrated, for distances outside 4 km, both the short and long term limits are met.

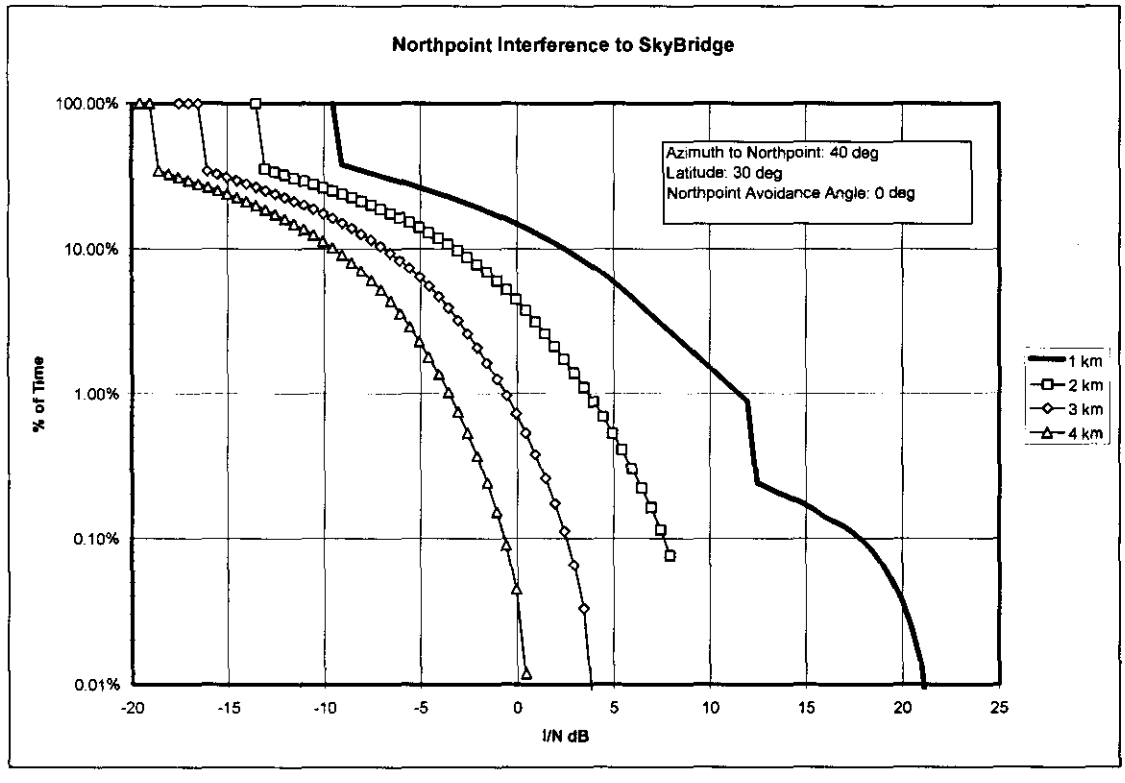

Figure 21 . Interference into SkyBridge

[22] Polarization isolation per Rec. ITU-R F.1245 note 7 is taken in the main beam of the Northpoint Transmitter, the first side-lobe of the transmitter is at 120 degrees off- boresight.

Noting from Figure 21 that if the short-term limit is met, then the long-term limit is also met, it can be concluded that the interference area for Skybridge only encompasses the area where peak I/N values exceed 0 dB. (This phenomenon is also recognized for time-varying interference from NGSO systems into GSO systems.) Although more detail on the operational characteristics of the other NGSO FSS systems is required to perform a dynamic analysis, it can be assumed that the conclusions hold true about NGSO FSS systems in general.

4.4 Interference Mitigation for NGSO FSS Systems

It was shown in section 4.3 that only the peak I/N need to be considered to determine the size of the coordination area. Moreover, in section 4.2, it was shown that the size of the coordination area is very small for Boeing, Denali, and Virgo. For these systems, the coordination area is so small that it is unlikely there would be any NGSO FSS customers in the coordination area.

Before any discussion of NGSO FSS mitigation techniques, it should be pointed out that the Northpoint design includes a number of mitigation techniques designed expressly to share with satellite systems. These methods (as discussed in sections 1.1 and 2.2) include:

- Directional Transmission
- Maximum Altitude Transmit Antenna Placement
- Transmit Beam Tilting
- Antenna Radiation Discrimination
- Natural Shielding and Terrain Blockage

Varieties of methods are also available to NGSO FSS operators to minimize interference and coexist with Northpoint, such as:

- *Alternate Beam Assignment*—The use of alternate frequencies in the coordination area completely eliminates interference in the coordination area, at no loss in service capability for NGSO FSS.

- *Satellite Diversity,* the use of *higher gain receive antennas*, and *increasing elevation angle* can also reduce the size of the coordination zone.

4.4.1 Alternate Beam Assignment

Alternate Beam Assignment— The use of alternate frequencies in the coordination zone completely eliminates interference in the coordination area. All NGSO FSS systems have applied for over 1000 MHz in the downlink direction, and thus NGSO FSS systems propose to operate service links from 10.7 to 12.7 GHz. NGSO FSS systems will provide service to a given area with multiple beams of the same satellite. In fact, this re-use of the spectrum is crucial to providing efficient use of the spectrum by NGSO FSS. Even with five times frequency re-use (to avoid adjacent cell interference), each satellite will be able to serve each cell with up to eight beams across the (at least) 1000 MHz proposed to be allocated to NGSO FSS.

NGSO FSS systems *must* have sophisticated network management software to handle traffic loading and handovers between satellites.[23] As a matter of course, up to 100 times a day, or more, network management will assign each NGSO FSS customer to a specific frequency, and to a specific satellite. These assignments will need to consider many factors, including local obscura, GSO arc avoidance, and satellite elevation to name but a few. The location of all NGSO FSS customers is known to NGSO FSS operators. It is therefore a simple matter to assign those few customers in the Northpoint coordination area to a frequency outside of 12.2 - 12.7 GHz.

[23] For example, SkyBridge and other LEO systems with an average of 15 minutes in-view time, must make a minimum of 100 satellite handovers per day, even in ideal conditions.

The implementation of this interference mitigation technique does not impact NGSO FSS systems. The size of the largest coordination zone for NGSO FSS is less than 10% of the Northpoint service area. Even if this figure were as large as 50%, NGSO FSS operators would not be impacted, as more than 50% of the NGSO FSS spectrum is allocated outside of the 12.2 - 12.7 GHz band.

Therefore, NGSO FSS systems have the option of serving their customers in the coordination area from outside of the 12.2 - 12.7 GHz band. As previously stated, these coordination areas are small. Even if they were as much as 50% of the service area, this would be a viable no-impact solution to prevent interference into NGSO FSS systems from terrestrial systems. The sophisticated network management software responsible for assigning frequencies and managing handovers on an operational basis can be programmed to serve customers in the Northpoint coordination area from frequencies outside of the 12.2 - 12.7 GHz range.

4.4.2 Satellite Diversity

NGSO FSS systems also have the option of using satellite diversity to mitigate interference. Each point in the U.S. typically has more than one satellite in view at all times and usually more than two satellites in view, thus having the option of using satellite diversity to mitigate interference. This method is also minimal impact, as NGSO FSS systems must perform already handovers, at least 100 per day for LEO systems.

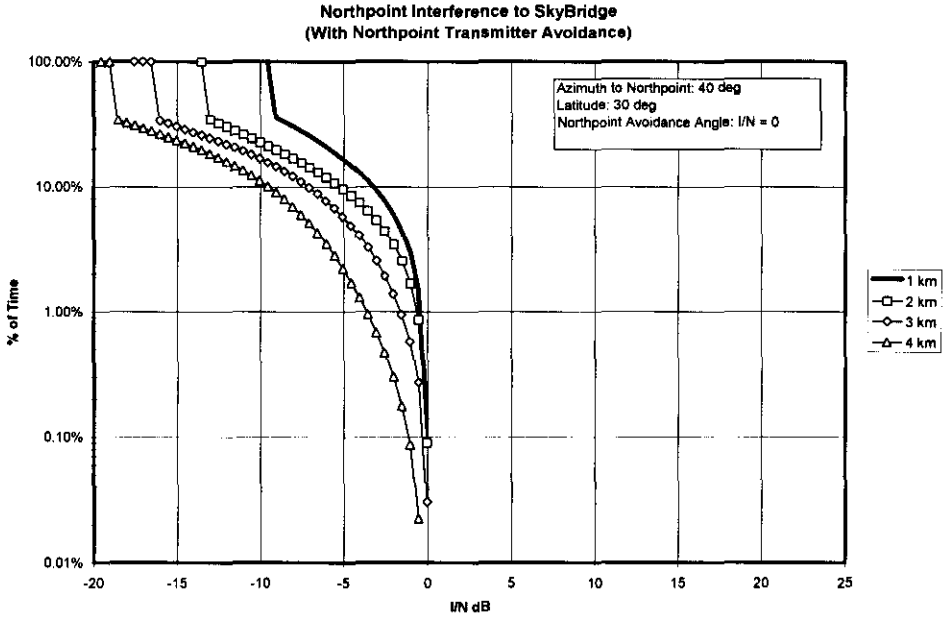

Figure 22 . Interference into SkyBridge using Satellite Diversity

As seen in Figure 22, I/N interference at values greater than 0 dB can be avoided using satellite diversity. However, the low side-lobe levels of the Skybridge receive antenna does not provide enough signal rejection to minimize interference inside of a 2 km radius. Therefore, satellite diversity can be used to mitigate interference, but in the case of Skybridge, primarily outside of a 2 km radius. However, as discussed further in Section 4.4.3, the use of a higher gain receive antenna within the coordination area will help mitigate interference for Skybridge.

4.4.3 Increase Antenna Gain

Increasing antenna gain in the coordination area can mitigate interference and shrink the size of the coordination area. Increase in antenna gain has the following effects: (1) Increased carrier power reduces the effect of background noise, and (2) decreased side-lobe levels reduces the amount of background noise. The results are seen in Table 22. Effect of increased antenna gain on NGSO FSS coordination area.

Table 22. Effect of increased antenna gain on NGSO FSS coordination area.

System	Area (km^2)	% of Northpoint Service Area
Skybridge	6.45	2.7%
Hughes NET	5.04	2.1%
Hughes LINK	2.0	0.85%
Teledesic	0.7	0.30%

Increasing antenna gain reduces the coordination area but does not eliminate it.

4.4.4 Increase Minimum Elevation Angle (In conjunction with increased receiver gain)

Increase in minimum elevation angle can also mitigate interference. This method significantly reduces the size of the coordination area when used in conjunction with increased antenna gain.

Table 23. Effect of 20 degree minimum elevation angle on NGSO FSS coordination area.

System	Area (km^2)	% of Northpoint Service Area
Skybridge	1.8	0.76%
Hughes NET	1.4	0.59%
Hughes LINK	0.26	0.11%

4.5 Conclusions

It was shown in this section that coordination between NGSO FSS systems and Northpoint is required.[24] The size of the coordination area varies among the proposed systems, from about 200 meters in the case of Denali, Virgo and Boeing to about 4 kilometers for Hughes and Skybridge. A 200 meter coordination area is unlikely to be populated with NGSO FSS customers, as Northpoint transmitters will typically be placed on towers, hills and tall buildings.

Terrestrial interference into NGO-FSS systems is time varying, and as such the dynamic atmospheric margin can be used to mitigate interference. Interference criteria for NGSO FSS systems are proposed, and these are similar to criteria used for NGSO FSS systems in other bands. Dynamic analysis was used to verify that the coordination area is limited by the short-term criteria, and that if the short-term criterion is met, the long-term criterion will also be met.

This is not to assert that NGSO FSS systems coming into the band should be afforded protection from terrestrial services. Indeed, to do so would unduly constrain the development of terrestrial services in the band.

However, coordination between terrestrial systems and NGSO FSS will allow ubiquitous operation of NGSO FSS services. Varieties of interference mitigation techniques are available to NGSO FSS operators. These techniques can be employed at low-cost and no-impact to service and availability. The most promising of these techniques is *Alternate Beam Assignment*, which eliminates interference.

[24] Even with the variety of interference mitigation techniques employed by Northpoint.

With *Alternate Beam Assignment*, NGSO FSS systems have the option of serving the customers in the coordination area with a beam not affected by Northpoint. The coordination area is small, (i.e. between 0.05% and 10% of the service area). Even if they were as much as 50% of the service area, *Alternate Beam Assignment* would be a viable no-impact solution. Other mitigation techniques, such as *satellite diversity*, the use of *higher gain antennas*, and *increasing elevation angle*, were examined. These techniques can also reduce the size of the coordination zone.

Therefore, it can be concluded that Northpoint is compatible with NGSO FSS systems, although coordination is required. Interference can be mitigated on a no-impact basis to allow ubiquitous operation of all types of NGSO FSS systems.

B

Technical Appendix to

Comments of Northpoint Technology, Ltd.

on the

Further Notice of Proposed Rulemaking

in ET Docket No. 98-206

[Excerpt: Pages 19-21]

March 12, 2001

A linear polarized wave can be converted to circular polarization if it passes through a circular polarizing filter, such as a grid of quarter-wave plates.[43] By inspection, the DSS antenna does not consist of a polarizing filter. A linearly polarized wave can also be rotated by atmospheric phenomenon, (Faraday rotation), but this is limited to a few degrees at frequencies above a few GHz.[44] Therefore, a three dB isolation from linear into circular polarization should be continue to be taken into account in the interference budget.

2.5 Other Regulatory Issues

Mitigation of interference–Northpoint supports the methods for interference mitigation cited by the Commission in paragraph [X]. Our first solution for solving interference issues would be to properly point a DBS subscriber's dish. As shown in Section [TBD], this can provide up to a 50% decrease in outage, or more.

Coordination between Northpoint and NGSO FSS–There is no need to coordinate between these systems, nor is there a need to notify NGSO FSS operators of the location and height of Northpoint transmitters. Northpoint will make available upon request this database, but it would be overly burdensome to require Northpoint to constantly update holders of paper satellites or satellite operators with this information.

Adjacent Northpoint license holders– Northpoint agrees to let adjacent licensees develop their own sharing and protection criteria.

Technical requirements for Northpoint receive antennas–Northpoint disagrees with the proposal that its receive antennas have a minimum unidirectional gain of 34 dBi. The requirement for Northpoint receive antennas is unnecessary. The only reason to have such a rule is to prevent us from trying to protect a smaller dish from interference. We have agreed that the NGSO FSS PFD limit protects us, and we see no public benefit to such a rule. It should not be part of the regulations.

Technical requirements for Northpoint transmit antennas–The Commission suggests that Northpoint transmit antennas generally point south. This requirement is unnecessary since the EPFD fully protects DBS

3. Northpoint Sharing with NGSO FSS

In comments to the first NPRM in this docket, Northpoint proposed that the FCC adopt certain PFD limits to protect Northpoint from NGSO FSS operations. The Commission proposes to adopt these PFD limits, and we agree with this decision.

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[43] *See* L.V. Blake, *Antennas*, at 329 (Artech House, 1984).

[44] *See* 2 *Antenna Handbook* § 12-10 (Y. T. Lo, ed., Van Nostrand Reihold, 1998).

To protect NGSO FSS, the Commission proposes to limit Northpoint to 12.5 dBm EIRP in urban areas, with a few exceptions. The choice of 12.5 dBm is not an appropriate standard. Limiting Northpoint to 12.5 dBm is unnecessary and would disserve the public; it will lead to a 50% increase in the number of Northpoint transmitters in urban areas, without benefit to any system.[45]

This EIRP limit rule unnecessarily restricts the Northpoint system. As noted in paragraph 234, the Commission considered and rejected suggestions that would unnecessarily constrain the design of NGSO systems, because they did not provide any benefit, as the EPFD limit completely defined the protection requirements for DBS. This is the same issue, because the terrestrial EPFD can completely define the protection requirements.

To establish a rule limiting the EIRP of terrestrial systems to 12.5 dBm would preclude improvements in technology (such as antenna technology), which would allow terrestrial systems to increase their reliability and coverage at no "increase in unavailability" to the DBS systems, or at no impact to NGSO FSS. As another example, the Commission states: "We believe that reducing PFD limits for satellites that may transmit at low-earth angles is preferable to establishing a minimum elevation angle for downlinks in the 12.2-12.7 GHz band because those limits would allow low-earth-orbit (LEO) systems to operate at a greater range of angles to the earth."[46] In another example, the Commission considered and rejected similar constraints on NGSO FSS for sharing with DBS ("we find that imposing an additional GSO arc avoidance requirement would be an unnecessary constraint on the design of NGSO FSS systems").[47] In the case of NGSO FSS sharing with DBS, no such criteria were adopted. Instead, single-entry EPFD limits were adopted.

We believe the Northpoint EPFD limits to protect DBS will also provide sufficient protection to NGSO FSS. The EPFD and the PFD are related by the following equation:

$$EPFD = PFD + (Gr(\phi) - Grmax).$$

In words, the EPFD is equal to the PFD, plus the isolation in the antenna towards the interferer. In the case of DBS, the isolation ranges between 34 and 50 dB. Hence, the Northpoint EPFD can be equated to the PFD values that may only be exceeded in a tiny fraction of the populated portion of the Northpoint service area. The PFD levels are consistent with analysis presented by Northpoint in ET Docket 98-206.[48]

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[45] For example, in the Washington DC conceptual deployment enclosed, 12 out of 25 transmitters have EIRP of greater than 12.5 dBm, some as high as 9.5 dBm.

[46] First Report and Order and FNPRM ¶ 279.

[47] *Id.* ¶ 234.

[48] *See generally* Technical Annex to Comments of Northpoint Technology (filed March 2, 1999).

Table 7: PFD values associated with Northpoint EPFD

Location in U.S.	PFD (dBW/m^2 – 40 kHz)
Southeastern U.S. (FL, GA, AL, MS, LA)	-122.7 to -106.7
Southern U.S. (NM, TX, OK, AR, TN, SC, NC)	-123.7 to -108.7
Northeastern U.S. (ND-KS-VA-ME)	-126.5 to -110.5
Western U.S. (CA-AZ-CO-MT-WA)	-129.0 to -113.0

These PFD levels are would be exceeded in far less than 0.5% of the Northpoint service area, in an urban environment. Thus, the EPFD is a practical limit on the interference power into NGSO FSS.

Because these power levels are consistent with other analysis presented, it is functionally equivalent to the 12.5 dBm limit suggested by the Commission. However, the Northpoint EPFD will allow Northpoint EIRP greater than 12.5 dBm, without increasing interference into NGSO FSS systems. This could occur the following conditions:

- Near a large unpopulated area;
- Transmitters located at heights above average terrain (HAAT) greater than 300 feet; or
- Improvements in transmit antenna technology.

Thus the Commission should not adopt an urban EIRP limit for Northpoint, because the EPFD limit will provide sufficient protection to NGSO FSS systems.

C

Technical Appendix to

Reply Comments of Northpoint Technology, Ltd.

on the

Further Notice of Proposed Rulemaking

in ET Docket No. 98-206

[Excerpt: Pages 12-23]

April 5, 2001

Northpoint will cause interference with Canadian BSS operations.[45] This concern is unfounded. The Commission has estimated that the potential mitigation area for DBS is prescribed to within 1-3 km of a Northpoint transmitter.[46] More generally, the same measures that will protect US DBS systems will likewise protect Canadian satellite operators. Therefore, there is no reason for the Commission to refrain from issuing conditional licenses to Northpoint within 56 km of the U.S. – Canadian border.

2 Northpoint – NGSO FSS Sharing

With regard to NGSO FSS sharing of spectrum with Northpoint, it should be noted as a threshold matter that the Commission is proposing that NGSO FSS be allocated more than 3,000 MHz in contrast to Northpoint's allocation for 500 MHz. Thus, NGSO FSS has over six times more spectrum than Northpoint – including 2,500 MHz in which Northpoint will not be operating – in which to identify sharing solutions. Another important factor that must be considered is the public interest in deploying new services promptly. Northpoint is ready to deploy now, something that cannot be said of any NGSO FSS system. Thus, service rules must be crafted that will facilitate Northpoint's prompt deployment, rather than constrain it with unnecessary restrictions to accommodate the current concepts of satellite operators proffering a series of ever-changing NGSO FSS business plans. Although NGSO FSS are fully capable of mitigating interference in a mitigation zone without undue burden on their systems, the theme in the Boeing and Skybridge comments is that the FCC should still burden Northpoint, using less than one-sixth of the spectrum used by NGSO FSS, with massive, unsupported and unnecessary

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[45] *Id.*

[46] FNPRM ¶ 214.

restrictions that would add significant cost and in some cases actually preclude Northpoint's deployment.

Northpoint has no objection to NGSO FSS services and is prepared to share with them, if, indeed, any of them are ever deployed. As described below, Northpoint supports the Skybridge proposal for an out-of-band emission mask. Northpoint favors the high altitude design offered by Virtual Geosatellite, but is also prepared to share with NGSO FSS systems of other designs.

2.1 In-band Limits Proposed by NGSO FSS Do Not Merit Consideration

Skybridge and Boeing both propose a slate of requirements for in-band and out-of-band transmissions, in addition to alluding to a vague requirement for "transmitter density" limits. Of these proposals, only the out-of-band limits should be considered. The other NGSO FSS proposals provide no benefit to NGSO FSS or to the public and serves only to hinder Northpoint operations.

2.1.1 Additional in-band limits are unnecessary and provide no benefit to NGSO FSS

Skybridge and Boeing suggestions for in-band EPFD limits should be rejected by the Commission.[47] The basis for this rejection, as the Commission correctly concludes in the FNPRM, is that Northpoint "transmitters will not threaten the viability of NGSO FSS downlink operations."[48] NGSO FSS legitimate needs can be satisfied without in-band limits on Northpoint operations.

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[47] Boeing Comments at 25; Skybridge Comments at 35.

[48] FNPRM ¶ 225.

As described in detail below, additional limits are unnecessary, as all NGSO FSS systems are able to use frequency diversity to share spectrum with other systems.[49] (Quite simply, if there were interference in the Northpoint band, NGSO FSS could easily use other frequencies.) Only Boeing claims to be unable to implement frequency diversity,[50] but its application clearly contradicts this assertion, as explained below. No NGSO FSS proponent presents analysis as to why it cannot operate given the terrestrial EPFD limits Northpoint has proposed to protect DBS. Finally, since no in-band limits are required, there is no need to develop protection criteria as suggested by Boeing.[51]

Skybridge asserts that Northpoint and NGSO FSS systems tend to transmit towards each other, and this gives rise to a potential for interference.[52] In fact, as discussed in a previous Northpoint submission, Skybridge's statement is misleading. There is no tendency for interference events; they would be rare.[53] Moreover, Northpoint and NGSO FSS proponents have both demonstrated that the mitigation area where alternate frequencies would be required is small relative to the Northpoint service area.[54] Thus, the legitimate needs of Skybridge can easily be met through frequency diversity.

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[49] In any case, development of EPFD limits for all possible NGSO FSS systems would be an unfeasible task due to ever-changing NGSO FSS designs and plans.

[50] Boeing Comments at 6.

[51] *Id.* at 19.

[52] Skybridge Comments at 22.

[53] Interference to NGSO FSS could only occur on a rare transient basis. NGSO FSS receivers must point at the Northpoint transmitter for Northpoint to cause a loss of signal for NGSO FSS. Because NGSO FSS receivers constantly track their satellites, and the satellites would rarely be behind, such interference could only occur infrequently. Thus, frequency diversity would only need to be employed infrequently. *See* Northpoint 1999 Technical Annex to Comments at 35.

[54] Ex parte letter of Virtual Geosatellite and Northpoint Technology, Ltd., at 2 (FCC filed March 8, 2000) ("compatible manner in most circumstances"); Ex parte submission of Northpoint Technology, Ltd., at 1 of Technical Annex (FCC filed July 6, 2000) (Boeing admits the mitigation zone is less than 1.6% of the Northpoint service area).

With respect to Boeing references to harmful interference, Boeing provides no new or credible information in the comment phase. Each previous Boeing analysis, including previously proposed sharing criteria, and even the methods used by Boeing were fully rebutted in the record.[55] Although Boeing claims that the average case for the Northpoint mitigation zone is within 2.1 kilometers of a Northpoint transmitter, it also makes the incredible assertion that Northpoint could also interfere with its system from a distance of 50 km.[56] This assertion is ridiculous. A 50 km distance would be beyond the radio horizon of Northpoint transmitters, and no interference could occur. This is typical of the quality of the Boeing analysis of the Northpoint system.

Skybridge also asserts that using frequency diversity can significantly constrain NGSO FSS systems and affect the load balancing of the carriers.[57] However, Skybridge provides no analysis to support its assertions. It cites to a contribution to the ITU stating that dynamic channel assignment (DCA) is a bad idea. But the FCC has not proposed DCA, which is a French supported frequency diversity plan for sharing among NGSO and high-powered FS stations. Frequency diversity is simple to implement and is not a burden on NGSO FSS. The carrier loading problems asserted by Skybridge are nonexistent with frequency diversity, because carrier loading can only be affected if more than 50% of Skybridge customers use frequencies outside of the Northpoint band. The record shows this is not possible.[58] In fact, the only actual technical analysis in the record supports the opposite conclusion – there is no tendency for interference

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[55] *See* Ex parte submission of Northpoint Technology, Ltd., *Response to the Boeing Company*, (FCC filed March 22, 2000); *see also* Ex parte submission of Northpoint Technology, Ltd. (FCC filed July 6, 2000).

[56] Boeing Comments at 25.

[57] Skybridge Comments at 27.

[58] Northpoint 1999 Technical Annex to Comments at 35.

into NGSO FSS from Northpoint.[59] Similarly, Skybridge asks the FCC to protect it from "saturation" of its receivers. Saturation of NGSO FSS receivers is not an issue, as explained below.

2.1.2 All NGSO FSS systems are able to use frequency diversity to mitigate interference– including Boeing

Boeing is the only NGSO FSS system to assert that it is incapable of using frequency diversity, Boeing claims that it cannot "serve some customers in the 11.7 - 12.2 GHz band and other customers in the 12.2 - 12.7 GHz band."[60] Since Boeing now claims that its system can only operate in one of these bands, the solution would be to restrict Boeing operations to one or the other of these bands (preferably the lower band) eliminating any sharing issues.

However, as clearly set forth in its application, the Boeing system provides two carriers in each 1800 km footprint beam. One of these carriers operates in the band 11.7 - 12.2 GHz, and the other in the 12.2 - 12.7 GHz band.[61] There are no pending modifications to Boeing's application. However, if Boeing were to amend its application so that it is only using 500 MHz, it should restrict itself to the band 11.7 - 12.2 GHz.[62]

Thus, either Boeing operates (as stated on its application) in both bands in all cells, or it should modify its application and operate in only one of these bands. In the first case, Boeing is fully able to implement frequency diversity, and serve – unfettered – customers in the 11.7 - 12.2 GHz band. In the other case, Boeing would only use the band 11.7 - 12.2 GHz, and thus has no

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[59] *See generally* Northpoint 1999 Technical Annex to Comments.

[60] Boeing Comments at 6. Its system design requires that "all customers in each satellite beam be served using the same frequency band."

[61] *See* Ex parte of Boeing, *IDS Downlink Frequency Plan* (FCC filed March 30, 2000) (showing that each spot beam, such as "Spot 1" has two carriers in each of the upper and lower 500 MHz bands).

need to concern itself with in-band limits on Northpoint. In either case, should it ever actually be deployed, Boeing would be fully able to serve its customers without any in-band limits on Northpoint.

2.1.3 Saturation of NGSO FSS receivers is not an issue

Skybridge argues that its operations in 11.7 - 12.2 GHz would be jeopardized by "saturation" of its receivers, which its says could occur in a small portion of the Northpoint service area. Skybridge asserts that it would require "agile" receivers to avoid such saturation, and that its receivers saturate at -68 dBm.[63] Skybridge provides no support for its claimed saturation level, and Northpoint doubts that such a saturation level is realistic today; it is surely unrealistic for future NGSO FSS systems.

Saturation is not an issue in this proceeding. The NGSO receive low noise block (LNB), which Skybridge asserts would have a noise bandwidth of 1000 MHz covering the band 11.7 - 12.7 GHz band, could simply be replaced by a simpler LNB with a noise bandwidth of 500 MHz, spanning the band 11.7 - 12.2 GHz, where actual NGSO FSS operations would be conducted for that customer, and thus filtering out Northpoint emissions in the upper band. It is simply a matter of substituting one inexpensive LNB for another.[64]

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[62] Noting that doing so would again halve the Boeing throughput, which is already woefully low compared to other satellite and terrestrial systems. *See* Ex parte submission of Northpoint Technology Ltd., *Response to the Boeing Company*, at 18-21 (FCC filed Mar. 22, 2000).

[63] Skybridge Comments at 35-36.

[64] 500 MHz LNBs for the Northpoint band are available for under $30 retail cost. A 500 MHz LNB would be less expensive than a 1000 MHz LNB.

2.1.4 Skybridge proposal for a 90% limit is completely arbitrary and unnecessary

Skybridge proposes that a PFD limit of -120 dB(W/m^2/MHz) be used to define a mitigation area,[65] and proposes this limit be adopted over 90% of the Northpoint service area.[66] Skybridge provides no technical justification why this PFD limit be used as the criterion to define a mitigation area. The Skybridge proposal that a PFD for 90% of the Northpoint service area is arbitrary and unnecessary.[67] Northpoint has demonstrated that frequency diversity will not encumber NGSO FSS as long as frequency diversity is used in less than 50% of the NGSO FSS cell.[68] The Skybridge proposal to limit Northpoint operations would hinder Northpoint operations without benefit to NGSO FSS or any service.

2.1.5 Limits on Northpoint "transmitter density" are impractical and unnecessary

Boeing and Skybridge[69] assert that the Commission must also develop a further restriction on Northpoint "transmitter density."[70] Notwithstanding the fact that neither Boeing nor Skybridge presents a specific proposal, or defines "transmitter density," the Commission should reject this idea, for the same reasons recited above. NGSO FSS systems need no in-band limits of any kind in the band 12.2 - 12.7 GHz for operation in the band 11.7 - 12.2 GHz. Finally, the record clearly shows that Northpoint can only affect a tiny fraction of the NGSO FSS systems operating in the band 12.2 - 12.7 GHz.[71]

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[65] The mitigation area is the area where mitigation would be required for co-frequency operations. Skybridge calls this the "red zone." *See* Skybridge Comments at vi.

[66] *See id.* at 34.

[67] Skybridge (at page 34 of its comments) misquotes Northpoint when it says that Northpoint can meet this limit.

[68] *See* Northpoint 1999 Technical Annex to Comments.

[69] Boeing's investment in Skybridge makes it a Skybridge partner. It is doubtful that Boeing will build a $6 billion competing system. Skybridge's and Boeing's respective comments should be considered as coming from a single system operator.

[70] Boeing Comments at 14; Skybridge Comments at 29

[71] *See* Northpoint 1999 Technical Annex to Comments.

2.2 Northpoint Agrees that Out-of-Band Limits are Appropriate

Northpoint agrees with Skybridge and Boeing that out-of-band (OOB) limits are appropriate.[72] Northpoint supports the Skybridge proposal contained in its July 10, 2000 letter, which was also supported by Boeing.[73]

In the band	Attenuate the signal by*
12.188 - 12.2 GHz	25 dB
12.164 – 12.188 GHz	35 dB
Below 12.164 GHz	43 + 10* log (power in watts)

*Relative to the power of a given Northpoint carrier

However, Skybridge now asserts that a maximum 24 MHz bandwidth limitation should be imposed.[74] This would be unnecessary. Skybridge provides no evidence how changing the maximum authorized bandwidth would benefit its system; its proposal for OOB limits bears no relationship to the maximum bandwidth. Imposing a maximum smaller than 500 MHz would provide no benefit to NGSO FSS systems, and might hamper future Northpoint operations.[75]

2.3 Coordination Rules Among NGSO FSS and Northpoint and Additional Comprehensive Filings are Unnecessary

Boeing suggests that the FCC must adopt coordination rules between NGSO FSS and Northpoint.[76] Northpoint readily agrees to make available upon the request of any NGSO FSS or DBS operator a database of its system transmitter EIRP, antenna patterns, locations and orientations. Providing this information will satisfy Skybridge or any other NGSO FSS

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[72] Boeing Comments at 29, Ex parte letter of Skybridge (FCC filed July 10 2000).

[73] Boeing Comments at 29.

[74] Skybridge Comments at 39.

[75] Northpoint currently plans to deploy its system with a 24 MHz nominal bandwidth. However, system enhancements may require future authorized bandwidths different from 24 MHz, and as noted by the FCC, sufficient regulatory flexibility is required for those services that might be offered by Northpoint (FNPRM ¶ 289).

[76] Boeing Comments at 30.

operator's legitimate needs. However, as demonstrated above, NGSO FSS have sufficient flexibility to operate without additional burdensome coordination with Northpoint.

Skybridge proposes that Northpoint file with the Commission "comprehensive technical showings."[77] Northpoint has already provided the most complete technical submissions in the current record on NGSO FSS and Northpoint sharing. Further submissions by Northpoint are unnecessary.

2.4 Additional Mitigation Techniques Suggested by NGSO FSS Would Only Inhibit Growth of Northpoint at No Benefit to NGSO FSS

Northpoint already employs interference mitigation techniques that benefit NGSO FSS. These were identified in Northpoint's 1999 Technical Annex to Comments at 34. The FCC agrees that these methods, originally intended to protect DBS, also will afford protection to other satellite services.[78]

2.5 PFD Limit to Protect Northpoint Must Be a Hard Limit

Some proponents argue that instead of a hard PFD limit, a "soft" or operational PFD limit should be adopted that NGSO FSS systems could exceed under certain circumstances.[79] These NGSO proponents argue that their systems will not interfere with Northpoint and therefore, the FCC should not require a hard limit. Skybridge even goes so far as to suggest that the FCC allow its system to cause interference into Northpoint receivers, after which it would take steps to reduce its power.[80] This is completely unacceptable.

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[77] Skybridge Comments, Ex. A at 51.

[78] FNPRM ¶ 225.

[79] Boeing Comments at 35; Skybridge Comments at 44.

[80] Skybridge Comments at 44-45.

First, Skybridge in its July 10, 2000 ex parte letter proposed the PFD limit set forth in the FCC order. As fully documented in the proceeding, this hard PFD limit protects Northpoint only from outages in clear air.[81] The PFD limit provides no protection from increased outage due to increase in background noise.[82] Northpoint cannot tolerate outages in clear air, nor should Northpoint be required to do so in any case.

All NGSO FSS systems can meet the proposed Northpoint limit. Boeing claims its system does not meet the limit,[83] but offers no technical evidence whatsoever to support that assertion. In fact, Boeing's claim of inability to meet this limit has been fully refuted by Northpoint in the proceeding.[84]

Similarly, the Northpoint PFD limit does not impose an undue burden on Skybridge, which admits that its system would exceed the proposed PFD limit under certain unidentified but supposedly rare and unusual circumstances.[85] Skybridge acknowledges that it does not provide service below 10° in elevation, and therefore PFD limits below 5° have no impact on its performance.[86] In addition to the methods cited by the FCC in the FNPRM (paragraph 279), a number of other non-impacting methods exist whereby Skybridge could meet the PFD limit required to protect Northpoint.[87]

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[81] The PFD provides protection for I/N = 0 dB. A higher I/N could cause an outage in clear air for Northpoint subscribers.

[82] Northpoint 1999 Technical Annex at 22 ("It is assumed that long term increases in noise temperature are negligible.")

[83] Boeing Comments at 36. The Boeing figure does not show the Boeing PFD for elevation angles below 10°.

[84] Ex parte submission of Northpoint Technology Ltd., *Response to the Boeing Company*, at 24 (FCC filed March 22, 2000).

[85] Skybridge Comments at 46.

[86] *See generally* Ex parte submission to FCC of Northpoint Technology Ltd., Technical Annex,, at 6-9 (FCC filed January 6, 2000).

[87] *See id.*

2.6 NGSO and Northpoint are both Co-Primary Services with DBS

Skybridge whines that the Commission's proposals are irrational and persists in asserting that Northpoint is secondary and the NGSO FSS is primary, and the Commission was more generous to Northpoint than it was to NGSO FSS. The most acute example of this was the Skybridge assertion that DBS "would receive far greater protection from *co-primary* NGSO FSS systems than from *secondary*" Northpoint systems.[88] Skybridge continues at length with arguments that compare NGSO FSS apples with Northpoint oranges.

However, Skybridge is in error on all counts of its assertions: Northpoint is co-primary, not secondary, and DBS would not receive greater protection from NGSO FSS than Northpoint. Northpoint would operate under the existing allocation to the fixed service, a *primary* service, not a secondary service.[89] Both NGSO and Northpoint are obligated to avoid harmful interference to DBS.

3 Conclusion

Northpoint is ready to deploy its system promptly and initiate needed services in the public interest, convenience and necessity. Northpoint is able to prevent interference that is actually noticeable and harmful to DBS customers, by mitigating interference beyond the EPFD level derived from a 20 dB C/I. Moreover, the record shows that DBS operators have in the past supported such an allowable level for sharing with terrestrial systems. The Commission should promptly license Northpoint and avoid placing unnecessary, oppressive burdens on Northpoint at the request of speculative NGSO FSS systems that currently exist only on paper, but that would

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[88] *See* Skybridge Comments at 14.

[89] *See* FNPRM, ¶213 ("We conclude that MVDDS can operate in the 12.2-12.7 GHz band under the existing primary allocation [to the Fixed service].")

have access to over six times the amount of spectrum that Northpoint does (3000 MHz vs. 500 MHz), and that will be able to fully protect their operations via frequency diversity.