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KELLOGG, HUBER, HANSEN, TODD & EVANS, P.L.L.C.

MICHAEL K KELLOGG
PETER W. HUBER
MARK C. HANSEN
K. CHRIS TODD
MARK L. EVANS
STEVEN F. BENZ
NEIL M. GORSUCH
GEOFFREY M. KLINEBERG
REID M. FIGEL

SUMNER SQUARE
1615 M STREET, N.W.
SUITE 400
WASHINGTON, D.C. 20036-3209

(202) 326-7900

FACSIMILE:
(202) 326-7999

May 15, 2001

HENK BRANDS
SEAN A. LEV
EVAN T. LEO
ANTONIA M. APPS
MICHAEL J. GUZMAN
AARON M. PANNER
DAVID E. ROSS
SILVIJA A. STRIKIS
RICHARD H. STERN, OF COUNSEL

Via Hand Delivery

Magalie Roman Salas
Secretary
Federal Communications Commission
445 12th Street, S.W.
Room TW-B204
Washington, D.C. 20554

Re: ET Docket No. 98-206

Dear Ms. Salas:

Enclosed for filing please find an original and four copies of the *Comments of Northpoint Technology, Ltd., and Broadwave USA, Inc., on MITRE Corporation Report* in the above-captioned matter.

I have enclosed an additional copy for date-stamp and return in the self-addressed envelope provided. Thank you for your assistance in this matter.

Yours sincerely,


J. C. Rozendaal

Enclosure

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

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MAY 15 2001

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OFFICE OF THE SECRETARY

In the Matter of)
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Amendment of Parts 2 and 25 of the)
Commission's Rules to Permit Operation of)
NGSO FSS Systems Co-Frequency with)
GSO and Terrestrial Systems in the Ku-Band)
Frequency Range;)
)
Amendment of the Commission's Rules to)
Authorize Subsidiary Terrestrial Use of the)
12.2-12.7 GHz Band by Direct Broadcast)
Satellite Licensees and Their Affiliates; and)
)
Applications of Broadwave USA, PDC)
Broadband Corp., and Satellite Receivers,)
Ltd., to Provide a Fixed Service in the 12.2-)
12.7 GHz Band)
_____)

ET Docket No. 98-206
RM-9147
RM-9245

**COMMENTS OF NORTHPOINT TECHNOLOGY, LTD.,
AND BROADWAVE USA, INC., ON MITRE CORPORATION REPORT**

Antoinette Cook Bush
Northpoint Technology, Ltd.
400 North Capitol Street, N.W.
Suite 368
Washington, D.C. 20001
(202) 737-5711

Michael K. Kellogg
J.C. Rozendaal
Kellogg, Huber, Hansen,
Todd & Evans, P.L.L.C.
Sumner Square
1615 M Street, N.W.
Suite 400
Washington, D.C. 20036
(202) 326-7900

*Counsel for Northpoint Technology, Ltd.,
and Broadwave USA, Inc.*

May 15, 2001

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SUMMARY

Congress recently enacted a statute designed to ensure that no entity would be considered for a license to provide terrestrial service in the 12 GHz band without first demonstrating that it possessed technology capable of operating in the band without causing harmful interference to DBS. Specifically, the Local Television Act of 2000 instructed the Commission to provide for an independent technical demonstration of any terrestrial service technology proposed for use in the 12 GHz band. The Commission hired MITRE to perform the required demonstration.

MITRE's report concludes that terrestrial sharing of the 12 GHz band is feasible, thus definitively repudiating the DBS industry's persistent arguments to the contrary. After acknowledging the obvious potential for interference when two or more services share the same frequency at the same time, MITRE concludes that mitigation techniques are available to reduce or eliminate the regions of potential terrestrial interference impact upon DBS. MITRE is confident enough about the efficacy of these mitigation techniques to propose a terrestrial licensing procedure for the Commission's consideration. MITRE's willingness to propose a terrestrial licensing scheme should put to rest, once and for all, the proposition that terrestrial services will inevitably cause harmful interference to DBS.

Although Congress's mandate required Northpoint, Pegasus and Satellite Receivers to provide technology for testing on a tight timetable, only Northpoint came forward with equipment to be demonstrated. Hence, MITRE's conclusion that terrestrial/satellite sharing is possible rests entirely upon, and is valid only for, Northpoint's technology, which comprises not only specially designed hardware but also

an array of carefully coordinated mitigation techniques that enable it to avoid the interference that would otherwise be expected to arise from co-frequency operations with DBS. Each of the mitigation techniques MITRE describes (except those that take place at DBS subscriber premises) is in fact a feature of Northpoint's technology.

No other applicant has fulfilled Congress's mandate to prove via independent testing that its technology is capable of sharing the 12 GHz band with DBS, and the Commission has no sound basis for believing that anyone other than Northpoint is capable of doing so without causing harmful interference. The failure of Satellite Receivers and Pegasus to come forward with technology of their own for testing requires that their applications be dismissed. In addition, Pegasus's flagrant and repeated violations of the Commission's policies governing ex parte communications in these proceedings provide an independent basis on which to dismiss its application.

Because Northpoint, and only Northpoint, has a technology proven capable in MITRE's independent demonstration of sharing the 12 GHz band with satellite users, there can be no mutual exclusivity that might justify issuing terrestrial licenses by auction. It would be contrary both to the public interest and to Congress's mandates for quick deployment of new bandwidth-enhancing technology for the Commission to delay issuance of Northpoint's licenses now in the vague hope that some other technology might emerge that is also capable of sharing the band with DBS. Therefore, the Commission should issue terrestrial licenses to Northpoint's Broadwave USA affiliates without further ado.

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

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**COMMENTS OF NORTHPOINT TECHNOLOGY, LTD.,
AND BROADWAVE USA, INC., ON MITRE CORPORATION REPORT**

INTRODUCTION

Northpoint Technology, Ltd., and Broadwave USA, Inc. (collectively, "Northpoint") own a unique, patented technology to harvest additional bandwidth out of already licensed spectrum by providing terrestrial service in bands allocated primarily for satellite use. Last November, based on Northpoint's demonstration that its technology could share the 12 GHz band with incumbent Direct Broadcast Satellite service ("DBS") and planned Non-Geostationary Satellite Orbit Fixed Satellite Service ("NGSO FSS"), the Commission made an important threshold determination to allow ubiquitous sharing

of the 12.2-12.7 GHz frequency band (the “12 GHz band”) between terrestrial and satellite users.¹

Just weeks after the Commission’s decision, Congress enacted a statute designed to ensure that no entity would be considered for a license to provide terrestrial service in the 12 GHz band without first demonstrating that it possessed technology capable of operating in the band without causing harmful interference to DBS. Specifically, the statute required the Commission to

provide for an independent technical demonstration of any terrestrial service technology proposed by any entity that has filed an application to provide terrestrial service in the [12 GHz band] to determine whether the terrestrial service technology proposed to be provided by that entity will cause harmful interference to any direct broadcast satellite service.²

The Commission chose The MITRE Corporation (“MITRE”) to perform the required independent technical demonstration. Significantly, *only* Northpoint submitted technology and equipment to MITRE for the required demonstration.

MITRE has now completed its independent technical demonstration of Northpoint’s technology and confirmed the Commission’s conclusion that ubiquitous terrestrial sharing of the 12 GHz band using Northpoint’s technology is feasible. The MITRE Report³ validates what Northpoint has been saying for the seven long years it has

¹ First Report and Order and Further Notice of Proposed Rule Making, *Amendment of Parts 2 and 25 of the Commission’s Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range*, 16 FCC Rcd 4096, ¶¶ 21, 213, 224 (2000) (“*First Report and Order and FNPRM*”).

² Launching Our Communities’ Access to Local Television Act of 2000, Pub. L. No. 106-553, App. B, Tit. X, § 1012(a), 114 Stat. 2762, 2762A-128, 2762A-141 (“*Local Television Act of 2000*”).

³ The MITRE Corp., MITRE Technical Report, *Analysis of Potential MVDDS Interference to DBS in the 12.2-12.7 GHz Band* (FCC sponsored report, Project No. 1201FCC2-01, Apr. 2001) (“*MITRE Report*”).

been before the Commission: Northpoint's revolutionary technology really can expand the capacity available in the 12 GHz band without causing harmful interference to DBS.

Because Northpoint's technology alone has passed MITRE's rigorous independent testing, only Northpoint is qualified for a license to provide the newly authorized terrestrial service in the 12 GHz band. In view of MITRE's validation of Northpoint's technology – and only Northpoint's technology – the Commission should issue licenses to Northpoint's Broadwave USA affiliates without further delay.

DISCUSSION

I. THE MITRE REPORT CONFIRMS THAT TERRESTRIAL SERVICE CAN SHARE THE 12 GHZ BAND WITHOUT CAUSING HARMFUL INTERFERENCE TO DBS

The MITRE Report is a detailed and complicated document that runs, with its appendices, to over 200 pages. But the final paragraph of the report sums up MITRE's analysis in one key sentence: "MITRE believes that with implementation of the licensing process and other policy recommendations outlined above, *spectrum sharing between DBS and MVDDS services in the 12.2-12.7 GHz band is feasible.*"⁴ That statement confirms what Northpoint has spent the last seven years demonstrating to the Commission: Terrestrial services really can share the 12 GHz band with satellite services without causing harmful interference to DBS, provided that mitigation techniques such as those demonstrated by Northpoint are used. MITRE's conclusion should put to rest, once and for all, the DBS operators' argument that the Commission must prevent Northpoint from deploying its technology because harmful interference to their service is inevitable.

⁴ *Id.* § 6.3, at 6-8 (emphasis added).

Echostar, DirecTV, and the SBCA can pack their bags and go home. The Commission need no longer concern itself with their arguments over whether sharing of the spectrum is feasible. If there was any remaining doubt as to whether terrestrial service can safely be licensed in the 12 GHz band, the MITRE Report has removed it.

To be sure, MITRE does begin its report with the observation that terrestrial service in the 12 GHz band “poses a significant interference threat to DBS operation in many realistic operational situations.”⁵ But this is just stating the obvious. *Of course* terrestrial use of the very same frequencies used for DBS broadcasts poses a significant interference threat. *Any time* two services want to use the same wavelengths at the same time there is a significant interference threat.⁶ The obvious potential for interference under those circumstances explains the Commission’s historical reluctance to allow ubiquitous sharing of frequency bands by satellite and terrestrial users (a reluctance well documented by the DBS camp in these proceedings).⁷ Indeed, it also explains Congress’s concern that any proposed terrestrial technology be subject to an independent technical

⁵ *Id.* § 6.1, at 6-1.

⁶ In such circumstances, “the problems of radio interference are [likely] to be over-estimated, as incumbents use the system to strategically deter entry.” Thomas W. Hazlett, *The Wireless Craze, the Unlimited Bandwidth Myth, the Spectrum Auction Faux Pas, and the Punchline to Ronald Coase’s ‘Big Joke,’* Harvard J. Law & Tech. (preliminary draft at 33) (forthcoming Spring 2001) (footnote omitted) (“*Wireless Craze*”). That is, of course, precisely what the DBS operators are doing in these proceedings.

⁷ See, e.g., Echostar Comments at 4-7 (FCC filed Mar. 12, 2001); SBCA Comments at 2 (FCC filed Mar. 12, 2001); DirecTV Comments at 3-4 (FCC filed Mar. 12, 2001); Echostar Petition for Reconsideration at 5-8 (FCC filed Mar. 19, 2001); SBCA Petition for Reconsideration at 7 (FCC filed Mar. 19, 2001); cf. *Wireless Craze* at 34 (“Since the losses associated with over-utilization of spectrum will be closely monitored and carefully reported, while the losses from under-utilization will generally not be, the allocation system will be especially prone to *Type II* error [i.e., over-regulation].” (footnote omitted)).

demonstration before being considered for a license. There has never been any question that the *threat* of interference exists. The question has instead been whether any technology is available to reduce or eliminate that threat. And MITRE answers that question with a resounding “Yes!”

After acknowledging the obvious potential for interference when two or more services share the same frequency at the same time, MITRE says that “mitigation techniques” are available to “greatly reduce, or eliminate, the geographical extent of the regions of potential MVDDS interference impact upon DBS.”⁸ Most of the techniques MITRE identifies are performed at the transmitter, not at consumers’ homes. These techniques include controlling transmitter power (possibly using real-time power control), controlling transmission direction, controlling transmitter antenna height, and possibly using multiple transmitting antennas.⁹ If these off-site techniques do not completely eliminate the zone of potentially harmful interference with DBS, MITRE found that simple on-site mitigation techniques like moving the DBS receiving dish or adding a small clip-on shield can be effective.¹⁰

In fact, MITRE is confident enough about the efficacy of these mitigation techniques to propose a terrestrial licensing procedure for the Commission’s consideration.¹¹ MITRE would not propose a method for issuing terrestrial licenses if

⁸ MITRE Report at xvii.

⁹ *Id.* §§ 6.2.1-6.2.2, at 6-2 to 6-3.

¹⁰ *Id.* § 6.2.3, at 6-4 to 6-5.

¹¹ *Id.* § 6.3, at 6-5 to 6-6.

issuing licenses would result in harmful interference to DBS.¹² MITRE's proposal thus confirms that, by controlling a complex array of such system features as transmitter power and antenna height, terrestrial service can avoid the interference that would otherwise be expected to arise from co-frequency operations with DBS.

II. ONLY NORTHPOINT PROVIDED TERRESTRIAL SERVICE TECHNOLOGY TO MITRE FOR ANALYSIS

Although important, MITRE's conclusion that terrestrial/satellite sharing of the 12 GHz band is feasible does not by itself fulfill Congress's mandate. Rather than a general or theoretical investigation of spectrum sharing, Congress ordered a concrete and technology-specific demonstration that each applicant for a license possesses a terrestrial service technology that will not cause harmful interference with DBS.¹³ This makes good sense, since the only way to know for sure whether a given company's particular technology can avoid harmful interference is to test it individually. Congress also set a tight, 60-day deadline for the independent technical demonstration of the respective terrestrial service technologies proposed by those entities that had already submitted applications to provide terrestrial service in the 12 GHz band – Northpoint, PDC Broadband Corp. (“Pegasus”), and Satellite Receivers, Ltd. (“Satellite Receivers”).¹⁴

¹² With respect to the amount of permissible interference, MITRE found the Commission's original proposal of a 2.86% increase in DBS unavailability to be “very small.” *Id.* § 6.3, at 6-6. In its place, MITRE endorses a 10% “increase in unavailability” criterion. *Id.* § 6.3, at 6-6. Northpoint believes that a 20 dB C/I ratio would be sufficient to protect DBS. However, if the Commission does select an “increase in unavailability” criterion, it should take note of the independent MITRE assessment and allow an increase of at least 10%.

¹³ Local Television Act of 2000, § 1012(a), 114 Stat. at 2762A-128, 2762A-141.

¹⁴ Northpoint maintains that only Northpoint had submitted a timely bona fide application. *See, e.g.*, Northpoint Comments at 17-19 (FCC filed Mar. 12, 2001).

Only Northpoint complied with the unambiguous statutory obligation to promptly provide technology for independent demonstration. The failure of Pegasus and Satellite Receivers to come forward with technology for testing requires that their applications be dismissed. In addition, Pegasus's egregious violations of the Commission's policies governing ex parte communications in these proceedings provide an independent basis on which to dismiss its application.

A. Northpoint's Technology Succeeded in MITRE's Independent Demonstration

In response to Congress's statutory directive, only Northpoint came forward with equipment for MITRE to analyze.¹⁵ In a recent ex parte letter to Chairman Powell, even Northpoint's DBS foes acknowledged that MITRE used "*only* Northpoint's equipment."¹⁶ Hence, MITRE's conclusion that terrestrial/satellite sharing in the 12 GHz band is feasible rests entirely upon, and is valid only for, *Northpoint's* technology, which comprises not only specially designed hardware but also an array of carefully coordinated mitigation techniques that enable it to share frequencies without causing harmful interference to DBS.

MITRE identifies three general categories of mitigation measures: (1) selection of operational parameters; (2) terrestrial system design modifications; and (3) on-site corrective measures at DBS receiver locations.¹⁷ Each of the mitigation measures MITRE lists in categories (1) and (2), however, *is in fact a feature of Northpoint's*

¹⁵ See MITRE Report App. A, at A-7 to A-8 & fig. A-5.

¹⁶ Ex parte letter from James Barker, Pantelis Michalopoulos, and Margaret L. Tobey, DirecTV, Inc., et al., to Chairman Michael K. Powell, Federal Communications Commission (May 3, 2001)(emphasis in original).

¹⁷ MITRE Report § 6.2, at 6-1 to 6-2.

technology. As shown, the operational parameters that MITRE places in category (1) form an integral part of Northpoint's innovation¹⁸:

- *Keeping terrestrial transmitter power as low as possible*: Northpoint holds the patent on this technique and demonstrated it to MITRE.¹⁹
- *Using a 7-MHz frequency offset between terrestrial and DBS carriers*: Once again, Northpoint called this technique to MITRE's attention.²⁰
- *Increasing the terrestrial antenna height*: Northpoint documented this technique years ago.²¹
- *Adjusting the elevation tilt of terrestrial transmitting antenna*: Northpoint demonstrated this technique to MITRE, too.²²
- *Pointing the terrestrial transmitter away from the satellites*: Northpoint's patents cover the geometry MITRE describes.²³

Similarly, Northpoint's technology contemplates the system-design factors MITRE places in category (2)²⁴:

- *Real-time power control*: Northpoint holds the patent on this technique.²⁵
- *Use of multiple terrestrial transmitting antenna beams*: Antenna arrays of the type MITRE describes are anticipated in Northpoint's patents.²⁶
- *Circularly polarized terrestrial transmitting antennas*: Northpoint's patents also cover the polarization techniques MITRE describes.
- *Larger terrestrial receiving antennas*: Although the MITRE Report credits Pegasus with this suggestion, Northpoint documented this technique in a 1998 Commission filing.²⁷

¹⁸ *Id.* § 6.2.1, at 6-2 to 6-3.

¹⁹ *See id.* App. A, at A-14 to A-17; U.S. Patent No. 6,208,834 B1.

²⁰ *See* MITRE Report App. A, at A-18 to A-21.

²¹ Northpoint Comments, Exh. 1 – Technical Annex at 5-6 (FCC filed Mar. 2, 1999).

²² *See* MITRE Report App. A, at A-25.

²³ *See* U.S. Patent Nos. 6,169,878 B1 & 5,761,605.

²⁴ *See* MITRE Report § 6.2.2, at 6-3 to 6-4.

²⁵ *See* U.S. Patent No. 6,208,834.

²⁶ *See* U.S. Patent Nos. 5,761,605 & 6,169,878.

It was perhaps to be expected that MITRE would focus in its report on those features of Northpoint's system that were particularly effective in reducing or eliminating harmful interference with DBS, since no other entity submitted technology to MITRE for analysis. In any event, the MITRE Report represents a ringing endorsement of Northpoint's technology.²⁸

No other applicant has fulfilled Congress's mandate to prove via independent testing that its technology is capable of sharing the 12 GHz band with DBS, and the Commission has no sound basis for believing that anyone other than Northpoint is capable of doing so without causing harmful interference.²⁹

²⁷ Northpoint Reply Comments, Technical Annex at 23 (FCC filed May 5, 1998); Northpoint Comments, Exh. 1 – Technical Annex at Table 3 (FCC filed Mar. 2, 1999).

²⁸ Northpoint firmly believes, for the reasons documented repeatedly in the course of these proceedings, that the use of its technology will completely eliminate the possibility of harmful interference to DBS. In the unlikely event that *on-site* mitigation (MITRE's category (3), above) should nevertheless be necessary for a given DBS customer, Northpoint would mitigate any harmful interference at its own expense. In this regard, MITRE notes that such uncomplicated measures as relocating or clipping a small shield to the DBS receiving antenna work well. MITRE Report § 6.2.3, at 6-4. In addition, MITRE's analysis confirms that, even under the most pessimistic scenarios, on-site mitigation would be necessary for only a tiny fraction of DBS subscribers.

²⁹ MDS America, Inc. ("MDS") recently arrived on the scene claiming not only to be able to share spectrum with satellites but in fact to be operating terrestrially on a co-frequency basis with DBS in 20 or more countries. As shown in Northpoint Technology's May 9, 2001, *ex parte* filing, however, MDS's claims are utterly lacking in support in the record. The information MDS has provided to the Commission indicates that MDS is not sharing spectrum with DBS operations but merely operating on Ku-band frequencies that are not used for DBS service. *See Ex parte* letter from Michael Kellogg, counsel for Northpoint Technology, Ltd., to Magalie Roman Salas (FCC filed May 9, 2001). Although MDS may have terrestrial customers in other countries, there is no evidence that it has technology capable of operating on a co-frequency basis with DBS without causing harmful interference.

B. The Applications of Satellite Receivers and Pegasus Must Be Dismissed Due to Their Failure to Come Forward with Technology Capable of Sharing the 12 GHz Band Without Causing Harmful Interference with DBS

In sharp contrast to Northpoint, which promptly provided technology for MITRE's independent demonstration, Satellite Receivers refused even to fill out a questionnaire from MITRE describing its proposed technology. In a letter to MITRE dated January 31, 2001, Satellite Receivers proposed that instead of testing Satellite Receivers's technology, the Commission should first set the parameters for a new terrestrial service.³⁰ Satellite Receivers said it expects to operate "within those parameters" using "off-the-shelf" equipment.³¹ This proposal is flatly contrary to the statute, which requires each applicant to come forward with non-interfering technology, not for the Commission to tell others what technology to use. Satellite Receivers' failure to come forward with technology for testing disqualifies it as an applicant to provide terrestrial service in the 12 GHz band; therefore, Satellite Receivers's application should be dismissed.

Pegasus likewise failed to provide any equipment to MITRE for testing and is therefore similarly unqualified to apply for a license. Pegasus did provide partial answers to MITRE's questionnaire but did so secretly, in violation of the Commission's policy on ex parte communications with MITRE (of which more will be said below). Even the best paper submission by Pegasus, however, would have failed to comply with the statute, which unambiguously requires an independent *demonstration*.

³⁰ Letter from Nathaniel J. Hardy, Satellite Receivers, Ltd., to James W. Marshall, The MITRE Corp. (Jan. 31, 2001) (Exh. A to the February 8, 2001, ex parte filing of Northpoint Technology, Ltd., in ET Docket No. 98-206).

³¹ *Id.*

As it turns out, the meager submission Pegasus furnished demonstrates that it has no technology of its own. Obviously, no field test of Pegasus's technology could be performed since Pegasus supplied no antenna or transmitter. No actual *laboratory* tests could be performed, either, for the same reason. Instead, "MITRE had to rely on a limited set of previously measured data supplied by Pegasus" in order to model radiation patterns for Pegasus's proposed antenna configurations.³² Because of the inadequacy of the data supplied by Pegasus, MITRE's analysis of the Pegasus submission "had to be confined to cases where the MVDDS antenna lies within the horizontal plane of interest (*not* above or below it) and the elevation tilt angle is zero."³³ Even if Pegasus's data were reliable, Pegasus's two-dimensional submission would not comply with the statutory mandate.

To make matters worse, MITRE appears to have introduced an error into its calculations of the interference contours for the one scenario for which Pegasus data was available. After stating that Pegasus's data was usable only subject to the assumption that the transmitting antenna lies within the horizontal plane of interest, MITRE proceeded to calculate interference contours using the erroneous assumption that the hypothetical Pegasus transmitter was *100 meters above* the horizontal plane of interest, instead of 0 meters, as would have been required by the antenna data.³⁴ The resulting contours are invalid.

³² MITRE Report § 5.1.2, at 5-10.

³³ *Id.* (emphasis in original).

³⁴ *Id.* App. B, at B-56 to B-58.

To sum up, as both a legal matter and a practical matter, the Commission must decline to consider Satellite Receivers or Pegasus for a license to provide terrestrial service in the 12 GHz band. Only Northpoint filed timely, bona fide applications for terrestrial licenses; only Northpoint demonstrated to the Commission that it possesses the technology capable of sharing the 12 GHz band with satellite operators; only Northpoint has had its demonstration validated through the independent testing required by statute. The Commission now has abundant proof that Northpoint's unique technology can operate in the 12 GHz band on a co-frequency basis with satellite users without causing harmful interference to DBS. The Commission has *no* similar proof about any other technology proposed by any actual or potential applicant. The Commission should therefore issue licenses to Northpoint's Broadwave USA affiliates without further ado.

C. Pegasus's Application Should Be Dismissed Due to Pegasus's Violations of the Commission's Policies Governing Ex Parte Communications with MITRE and with the Commission

Pegasus's apparent lack of technology capable of sharing the 12 GHz band with satellite users is not the only reason its license application should be dismissed. Pegasus also merits dismissal due to its flagrant and repeated violations of the Commission's policies governing ex parte communications with MITRE and with the Commission in these proceedings.

The underlying ET Docket, No. 98-206, has been designated a permit-but-disclose proceeding for purposes of the Commission's ex parte rules, as have the proceedings for the individual license applications of Northpoint, Pegasus, and Satellite

Receivers.³⁵ Furthermore, at the January 24, 2001, organizational meeting for MITRE's testing program, Commission representatives indicated that communications with MITRE were to be filed on an ex parte basis in ET Docket No. 98-206 and, in addition, were to be served on other participating parties. On March 23, 2001, Rebecca Dorch of the Commission's Office of Engineering and Technology sent a letter to participating parties explicitly reaffirming the Commission's directive to serve copies of communications with MITRE on participating parties and to file them on an ex parte basis in ET Docket No. 98-206.³⁶ Accordingly, *any* communication between Pegasus and MITRE or the Commission relating to terrestrial service in the 12 GHz band should have been filed with the Commission and (in the case of communications with MITRE) served on other parties. Pegasus repeatedly disobeyed these Commission directives designed to safeguard the objectivity and fairness of the proceedings.

On or about February 1, Pegasus submitted partial answers to MITRE's questionnaire seeking a description of the terrestrial service technology Pegasus was proposing to use. Pegasus marked its submission to MITRE as "confidential." At that time, Pegasus did *not* serve a copy of its answers on participating parties, nor did it file a

³⁵ See *First Report and Order and FNPRM*, 11 FCC Rcd 4096, ¶ 344; Public Notice, *Wireless Telecommunications Bureau Seeks Comment on Broadwave Albany, L.L.C., et al., Requests for Waiver of Part 101 Rules*, DA 99-494 (FCC rel. Mar. 11, 1999); Public Notice, *Wireless Telecommunications Bureau Sets Permit-but-Disclose Status for PDC Broadband Corporation Requests for Waiver of Part 101 Rules*, DA 00-1841 (FCC rel. Aug. 14, 2000); Public Notice, *Wireless Telecommunications Bureau Sets Permit-but-Disclose Status for Satellite Receivers, Ltd., Requests for Waiver of Part 101 Rules*, DA 00-2134 (FCC rel. Sept. 20, 2000).

³⁶ Letter from Rebecca Dorch, Deputy Chief, Office of Engineering and Technology, Federal Communications Commission, to Antoinette Cook Bush, Broadwave USA, et al. (Mar. 23, 2001).

copy in ET Docket No. 98-206, nor did it seek to have the Commission enter a protective order in the proceedings.

On or about February 12, Pegasus supplemented its answers, again marking its submission as “confidential.” Once again, Pegasus neither filed an ex parte copy nor did it serve copies on participating parties, as it was required to do.

On or about March 7, Pegasus further supplemented its answers, this time marking its submission as “company-proprietary.” For at least the third time, Pegasus failed either to file an ex parte or to serve copies on participating parties or to seek a protective order.

On or about March 15, Pegasus wrote to MITRE that it was withdrawing its designation of its submissions as confidential or proprietary, thus removing the only even colorable ground for failing to file and serve the submissions. Yet Pegasus again failed to file or serve them.

Also on or about March 15, Pegasus evidently asked the Commission to take a license in its supposed technology and sent a proposed license agreement to the Commission’s Office of Engineering and Technology. Pegasus did *not* file a copy of the proposed license or a memo describing this ex parte communication in any of the relevant files.

Nearly a month later, on April 10 – after MITRE had substantially completed its analysis and just days before it submitted its report to the Commission – Pegasus at long last filed with the Commission copies of the materials sent to MITRE (but not its

communications with the Commission about licensing). However, it did so only after further prodding from the Office of Engineering and Technology.³⁷

On or about April 20, Pegasus apparently communicated with the Commission to argue that the MITRE Report should not be released to the public unless and until the Commission took a license in Pegasus's supposed technology. Pegasus filed no ex parte describing this communication in any of the relevant dockets.

In short, Pegasus has systematically violated the Commission's ex parte policies in connection both with MITRE's testing program and with Pegasus's campaign to have the Commission accept a license. Pegasus's violations are not mere technicalities; they represent a willful attempt to keep relevant information hidden from public scrutiny – and from other participants in these proceedings.

MITRE's program of independent technical demonstrations was run on a tight timetable. By keeping its February and March communications with MITRE hidden until forced to reveal them in April (when MITRE's analysis was all but complete), Pegasus prevented Northpoint and other parties from commenting on Pegasus's submissions so as to aid MITRE's analysis. For example, MITRE credits Pegasus with the idea of increasing receiver gain by using larger receiving antennas; however, Northpoint had documented that idea in a Commission filing at least three years before. If Pegasus had obeyed the Commission's explicit and unambiguous directive to make its MITRE

³⁷ Ex parte letter from Bruce D. Jacobs, Pegasus Broadband Corp., to Magalie Roman Salas, Federal Communications Commission (with attachments) (FCC filed Apr. 10, 2001).

submissions available, Northpoint could have set the record straight before MITRE gave Pegasus credit for stealing Northpoint's ideas.

With respect to Pegasus's efforts to browbeat the Commission into taking a license for its nonexistent technology and its related efforts to delay the MITRE Report until the Commission had done so, the public record remains silent. No ex parte filing reveals what Pegasus told Commission officials about why Pegasus believed a license to be appropriate or how its proposed license and the MITRE Report were supposedly linked. As a result, other parties like Northpoint were hamstrung in presenting their positions on the vitally important issue of whether Pegasus in fact has any terrestrial service technology of its own to license. Interested parties were also handicapped in responding to the delay in the release of the MITRE Report attributable to Pegasus's secret lobbying efforts.

The Commission's rules governing ex parte communications provide that a violator "may be disqualified from further participation in" the affected proceeding and "may be required to show cause why his or her claim or interest in the proceeding should not be dismissed, denied, disregarded, or otherwise adversely affected."³⁸ Pegasus's repeated and deliberate flaunting of the Commission's ex parte policies cannot be reconciled with any norm of proper administrative process. The Commission must disqualify Pegasus from further participation in proceedings relating to terrestrial use of the 12 GHz band and dismiss Pegasus's license applications.

³⁸ 47 C.F.R. § 1.1216(a).

III. THE COMMISSION SHOULD ISSUE LICENSES TO NORTHPOINT'S BROADWAVE USA AFFILIATES WITHOUT FURTHER DELAY

As Northpoint has explained elsewhere, Congress has ordered the Commission to move quickly to issue licenses for technology that will re-use existing spectrum to provide local television broadcast signals to viewers in unserved and underserved local markets.³⁹ Northpoint brought the needed technology to the Commission years ago. The MITRE Report confirms that Northpoint, and only Northpoint, has demonstrated a technology capable of sharing the 12 GHz band with satellite users. All the other applicants and would-be applicants for terrestrial licenses were no-shows at MITRE.

Under these circumstances, there can be no mutual exclusivity that might justify issuing licenses through an auction. Hence, the Commission should issue licenses to Northpoint's Broadwave USA affiliates together with such waivers as may be necessary to allow them to provide point-to-multipoint video and data service under the existing allocation for fixed service in the 12 GHz band.

Granting licenses to Northpoint now need not close the door on future technologies to squeeze still more bandwidth from the 12 GHz band. If those technologies can share the band without causing harmful interference to DBS or to Northpoint, then they, too, should be licensed. But it would be contrary both to the

³⁹ See Rural Local Broadcast Signal Act ("RLBSA"), Pub. L. No. 106-113, § 2002(c) (1999). See also H.R. Conf. Rep. No. 106-1005, at 307 (2000) ("The FCC shall take all actions necessary to complete the processing of applications for licenses or other authorizations for facilities that would provide services covered by the Satellite Home Viewers Improvement Act (Public Law 106-113, 113 Stat. 1501), specifically to deliver multi-channel video services including all local broadcast television station signals and broadband services in unserved and underserved local television markets by November 29, 2000, as required by Public Law 106 113, 113 Stat. 1501."). See also Northpoint Comments at 27-28 (FCC filed Mar. 12, 2001).

public interest and to Congress's mandates to roll out new bandwidth-enhancing technology quickly for the Commission to delay issuance of Northpoint's licenses now in the vague hope that some other technology might emerge that is also capable of sharing the band with DBS.

Northpoint has been at the Commission more than seven years seeking authorization to deploy its innovative terrestrial service technology. For more than seven years, the DBS community has tried to derail deployment with unfounded allegations that Northpoint's deployment would disrupt DBS service. MITRE has now definitively confirmed the Commission's conclusion that Northpoint's technology makes terrestrial/satellite sharing feasible in the 12 GHz band. MITRE's analysis should put the specter of harmful interference to rest once and for all. As the only applicant to have obtained the statutorily required independent validation of its technology, Northpoint is uniquely qualified for licenses to offer terrestrial service in the 12 GHz band. The Commission should issue licenses to Northpoint without further delay.

IV. ADDITIONAL COMMENTS ON TECHNICAL ISSUES

In the technical appendix to these comments, Northpoint addresses certain technical and methodological issues relating to the MITRE Report. The appendix highlights that the MITRE Report validates the many technical assertions that Northpoint has made throughout the Docket 98-206 proceeding. Importantly, MITRE validates Northpoint's technology even while using conservative assumptions and incorporating certain erroneous information supplied by the DBS industry. For example, MITRE seems to have relied on erroneous EIRP data furnished by the DBS operators regarding certain satellites: data allegedly taken from the GIMS database could not in fact be found

there.⁴⁰ Also, it appears MITRE was given the wrong code rate for DirecTV's transponders operating at 119°, resulting in an inflated estimate the zone of potential interference for that satellite.⁴¹ This error often infected the calculations of composite outage contours for multiple DirecTV satellites, thus masking the important fact that, in many terrestrial deployments, the potential interference with signals from DirecTV's transponders at 101° and 110° is so small as to require no mitigation whatsoever, according to MITRE's own proposed standards.⁴²

That MITRE concluded spectrum sharing to be feasible *despite* its unfavorable assumptions is significant: even using worst-case assumptions and errors that overstate the potential threat of interference, MITRE found the mitigation techniques proposed by Northpoint to be effective in reducing or eliminating zones of potential interference with DBS.

⁴⁰ See Technical Appendix § 3.1.

⁴¹ *Id.*

⁴² *Id.* § 3.2.

CONCLUSION

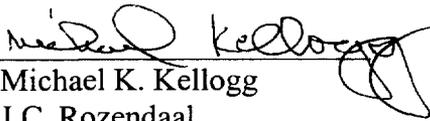
In view of MITRE's confirmation that Northpoint's technology can share the 12 GHz band without causing harmful interference to DBS operations, and in view of the failure of any other entity to provide terrestrial service technology for testing by MITRE, the Commission should grant the pending license applications of Northpoint's Broadwave USA affiliates, including their requests for waivers to permit terrestrial, point-to-multipoint video services under the existing allocation for fixed services in the 12 GHz band.

Respectfully submitted,

NORTHPOINT TECHNOLOGY, LTD.,
AND BROADWAVE USA, INC.

May 15, 2001

Antoinette Cook Bush
Northpoint Technology, Ltd.
400 North Capitol Street, N.W.
Suite 368
Washington, D.C. 20001
(202) 737-5711

By: 
Michael K. Kellogg
J.C. Rozendaal
Kellogg, Huber, Hansen,
Todd & Evans, P.L.L.C.
Sumner Square
1615 M Street, N.W.
Suite 400
Washington, D.C. 20036
(202) 326-7900

*Counsel for Northpoint Technology, Ltd.,
and Broadwave USA, Inc.*

Technical Appendix

to

Comments of Northpoint Technology, Ltd.,
and Broadwave USA, Inc.,
on MITRE Report

May 15, 2001

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1 Introduction and Summary

As required by recent legislation, the Commission contracted with the MITRE Corporation (“MITRE”) to perform a “technical demonstration of any terrestrial service technology proposed by any entity”¹ desiring to operate in the 12.2-12.7 GHz band. MITRE produced its report on April 23, 2001.

The MITRE Report concludes, “spectrum sharing between DBS and MVDDS services in the 12.2-12.7 GHz band is feasible.”² Significantly, MITRE based its conclusion solely on the technology supplied by Northpoint.³ No other entity provided technology for evaluation.⁴ Having concluded that Northpoint technology can coexist with DBS, the MITRE Report validates the many technical assertions that Northpoint has made throughout the Docket 98-206 proceeding. Importantly, MITRE validates the Northpoint technology even while using conservative assumptions and incorporating certain erroneous information supplied by the DBS industry. Correcting these errors makes MITRE’s validation of Northpoint’s technology even stronger.⁵ MITRE also recommended that waveforms other than those tested and analyzed by MITRE not be licensed without further study because of “unknown vulnerabilities.” This recommendation provides a further ground for the prompt deployment of Northpoint’s technology.

In summary, the MITRE Report validates that Northpoint technology – and only Northpoint technology – was found able to operate co-frequency with DBS.

2 The MITRE Report Validates Numerous Technical Points That Northpoint Has Made in Docket 98-206 and Validates the Commission’s Conclusion That Sharing Is Feasible

In making its determination that sharing is feasible, MITRE validated a number of long-held assertions of Northpoint in Docket 98-206.

- MITRE substantiates Northpoint’s assertion that the DBS signal is still available below the claimed “operating threshold” level at which DBS has sought

¹ Launching Our Communities’ Access to Local Television Act of 2000, Pub. L. No. 106-553, App. B, Tit. X, § 1012(a), 114 Stat. 2762, 2762A-128, 2762A-141.

² The MITRE Corp., MITRE Technical Report, *Analysis of Potential MVDDS Interference to DBS in the 12.2-12.7 GHz Band* § 6.3, at 6-8 (FCC sponsored report, Project No. 1201FCC2-01, Apr. 2001) (“MITRE Report”).

³ See *infra* sections 3 and 4.

⁴ As explained in section 4, *infra*, Pegasus provided insufficient information for a technical analysis; and provided no equipment.

⁵ See *infra* section 3.

protection.⁶ This proves that DBS has asked the FCC to protect its system when it is not exhibiting an outage.⁷

- MITRE determined that Northpoint's digital signal has less impact on a DBS digital signal than does Gaussian noise.⁸ This confirms Northpoint's prior assertion that DirecTV's rain tests were flawed.⁹
- The use of a 7-MHz frequency offset between the Northpoint signal and DBS carriers has been shown through MITRE's testing to reduce effective interference levels by 1.7 dB.¹⁰ This supports Northpoint's proposal for using measured rather than modeled signal levels when determining if mitigation is required.¹¹
- MITRE confirms that polarization isolation between linear and circular must be taken into account when predicting interference at any given point.¹² (DirecTV also acknowledged the existence of this isolation factor in its 1994 report on terrestrial sharing.)¹³
- MITRE validates the idea of using increased G/T (increased antenna gain) in response to varying terrestrial conditions.¹⁴ Although MITRE mistakenly credits Pegasus with this idea, Northpoint actually presented it to the Commission in 1998, prior to Pegasus even expressing interest in the band.¹⁵
- MITRE notes that relocation of DBS receiving antennas can effectively mitigate interference, as can the use of absorptive or reflective clip-on shielding for existing DBS antennas, and DBS receiving-antenna replacement.¹⁶ Even DirecTV has used these methods in dealing with sources of interference.¹⁷

⁶ MITRE assumes a "video quality 6" to be sufficient, which is below the QEF claimed by DBS. See MITRE Report at 6-5.

⁷ Ex Parte letter from David H. Pawlik, counsel for Northpoint, to Magalie Roman Salas, Federal Communications Commission, attached presentation of August 31, 2000, at 6 (Sept. 1, 2000).

⁸ MITRE Report at 3-18.

⁹ DirecTV, Inc., *Conclusions to Date Regarding Harmful Interference from a Proposed Northpoint Technology Terrestrial System Operating in the DBS Downlink Band, 12.2-12.7 GHz*, figure 3.4.1-1 (Jan. 27, 2000) (DirecTV used a Gaussian "noise generator" instead of the appropriate digital signal in its rain tests.).

¹⁰ MITRE Report at xvii.

¹¹ Northpoint Comments, Technical Appendix at 5 (FCC filed March 12, 2001) ("The most significant benefit of the EPFD limit approach is that it is measurable in the field.").

¹² See generally MITRE Report § 4.3.

¹³ DirecTV, Inc., Report, *Terrestrial Interference in the DBS Downlink Band* (1994).

¹⁴ MITRE Report at 5-10.

¹⁵ See, e.g., Northpoint Reply Comments, Technical Annex at 23 (FCC filed May 5, 1998).

¹⁶ MITRE Report at xix.

¹⁷ Opposition of DirecTV, Inc. at 7 n.8, *Northpoint Technology Petition for Rulemaking to Modify Section 101.147(p) of the Commission's Rules To Authorize Subsidiary Terrestrial Use of the 12.2-*

- MITRE declares that the Commission’s proposed interference budget of 2.86% increased unavailability for terrestrial operations provides excessive protection to DBS. (MITRE recommends a 10% increase be allowed, saying that 2.86% is “very small.”)¹⁸ Northpoint supports an epfd limit that is based on 20 dB C/I.

3 MITRE Determined Northpoint-DBS Sharing To Be Feasible, Even with Assumptions that Favored the DBS Industry

In reaching its determination that Northpoint-DBS sharing is feasible, MITRE relied on a number of assumptions that favored the DBS industry. While Northpoint respects MITRE’s goal of conservative analysis, Northpoint must also clarify certain errors it believes are contained in the MITRE Report that were the result of MITRE’s analysis of faulty data provided by the DBS industry. In addition, the MITRE analysis is incomplete in certain areas, and these areas are addressed in this section.

3.1 DBS provided MITRE with erroneous satellite data

The satellite data that the DBS industry provided to MITRE in its letter of March 14, 2001, had several errors. DBS claimed that certain satellite EIRP contours come “from the ITU GIMS database.”¹⁹ The relevant satellites are listed in Table 1. However, of the seven used by MITRE, three are not in fact in the current GIMS database.²⁰

Table 1: Satellite EIRP data provided to MITRE.

BSS System	US DBS System	Orbital Location	Status
BSS-1R	DirecTV	101°	Not in GIMS database
BSS-2/2A	DirecTV	101°	
BSS-1M	DirecTV	110°	Not in GIMS database
BSS 7A	DirecTV	119°	Not in GIMS database
BSS-5	Echostar	110°	
BSS-3	Echostar	119°	
BSS-6	Echostar	119°	

Since some of the names in the GIMS database are similar to those provided by DBS in its March 14 letter, Northpoint analyzed each USA BSS EIRP contour in the entire GIMS database, to see if there were any matches for the contours for BSS 1R, BSS 1M and BSS 7A provided by DBS in its March 14 letter. *There were none.* If the missing DirecTV EIRP contours ever existed in the GIMS database, they have been

12.7 GHz Band By Digital Broadcast Satellite Licensees and Their Affiliates, RM No. 9245 (FCC filed Apr. 20, 1998).

¹⁸ MITRE Report at 6-6.

¹⁹ Letter from James H. Barker and Pontelis Michalopoulos, counsel for DirecTV, Inc., and EchoStar Satellite Corp., to Jim Chadwick, The MITRE Corp. (Mar. 14, 2001) (“Mar. 14, 2001 DBS letter”).

²⁰ International Telecommunication Union, GIMS 1.61 (Apr. 2001).

deleted, and can be assumed to no longer be operating, if they ever did operate. Therefore, the MITRE analyses on these systems do not represent reality and should be ignored.

Another error was introduced by DBS in the March 14 letter. In this instance, DBS stated that DirecTV uses the 6/7 code rate for all of its systems.²¹ However, this claim contradicts information provided in the DBS January 31, 2001, response to MITRE. In answer to question 8, DirecTV states that it uses the 2/3 code rate, and that the EIRP variation for this code rate is 54.5-49.3 dBW.²² This EIRP most closely correlates to the “low power mode EIRP” provided by DBS in its March 14 letter.²³ The erroneous substitution of the 6/7 code rate for the 2/3 code rate in MITRE’s calculations has important consequences, as explained in the following section.

How Erroneous Data from DBS Caused MITRE To Exaggerate Outages for DirecTV at 119°

MITRE’s estimates of the outage for DirecTV systems operating at 119° are higher (about ten times higher) than the outage for other DirecTV systems and at variance from other estimates for this same system.²⁴ Northpoint believes the source of this discrepancy to be contradictory information about the code rate used by DirecTV at 119°. As stated above, Northpoint believes DirecTV uses the 2/3 code rate, which has a C/N requirement three decibels *lower* than that of the 6/7 code rate. When this three dB difference is accounted for, the predicted outage for DirecTV at 119° shrinks considerably. For example, when using the proper outage condition in Washington, D.C., the predicted annual outage for DirecTV at 119° shrinks to 5 hours from 24 hours. As the outage level shrinks, the predicted C/I to meet a given level of unavailability also falls when the proper outage condition is used.

In summary, the errors in the data provided by DBS led MITRE to analyze DBS systems that are not contained in the GIMS database. The confusion over the DirecTV data rate on its 119° satellite probably led MITRE to conclude the availability is much lower than it actually is. The result of this faulty DBS data provided led MITRE to analyze non-existent DBS systems and to create artificial, oversized, irrelevant contours displayed in MITRE Appendix B.

²¹ See March 14, 2001 DBS letter, answer to question 2.

²² See Letter from James H. Barker and Pontelis Michalopoulos, counsel for DirecTV, Inc., and EchoStar Satellite Corp., to Jim Chadwick, The MITRE Corp., answer to question 8 (Jan. 31, 2001) (“Jan. 31, 2001 DBS letter”).

²³ It should not go unnoticed that *in no case*, does the peak EIRP from the DBS January 31, 2001, letter match the “Peak EIRP” from the March 14, 2001 letter. The reason for this discrepancy is unknown, yet it adds to the doubt surrounding the DBS Industry data provided to MITRE. MITRE properly rejected the DBS supplied equipment in order to avoid DBS industry meddling in its testing; it is unclear why it did not seek a clarification from DBS on these EIRP discrepancies.

²⁴ See MITRE Report, Figure B-3 (DirecTV at 119° is out more than 24 hours per year, while DirecTV at 101° is out less than 2 hours per year).

3.2 Understanding the MITRE Appendix B

Armed with the knowledge contained in the previous section, one can critically examine Appendix B of the MITRE Report. MITRE's Appendix B presents contour data for a number of different cases, different satellites and different cities, in combination with a range of parameters for a terrestrial installation. *Only certain of the Appendix B figures represent optimized Northpoint deployments.* MITRE used this annex to assist it in making its determination that sharing is feasible between DBS and Northpoint. However, it is important to recognize that the contours presented do not represent installations as proposed by Northpoint or even actual "mitigation areas." In fact, as shown below, despite the fact that in almost all cases shown additional mitigation steps can be taken to improve the site's characteristics, there are few, if any, areas within these contours where mitigation is needed.

First, MITRE presents many scenarios that are not realistic Northpoint deployments; they are not optimized to minimize interference, as they would be in the hands of a skilled terrestrial engineer. MITRE evidently chose these non-optimized deployments to stand in contrast to the optimized deployments it also showed. In each case where potential terrestrial interference appears significant, steps could have been taken to implement Northpoint technology and thus make the deployment more optimal. For example, in the Washington, D.C., examples, MITRE found that turning the transmitter towards the east nearly eliminates all contours (see appendix at B-21). This configuration is nearly identical to the Northpoint deployment during the Washington, D.C., Test and Demonstration.

Second, while MITRE places contours in a graphic, with only one exception, MITRE does not say these contours represent mitigation areas – and with good reason. In almost all cases shown the impact is less than MITRE's own interference criterion of 10% increase in unavailability. This fact is difficult to detect "at a glance" because for some reason MITRE chose to depict most of its contours using units of "estimated increase in outage in hours per year" rather than in units expressing its proposed criterion "percentage increase in unavailability." This makes it difficult to immediately see whether or not a given figure depicts an installation that is compliant with the MITRE proposed criterion. For example, MITRE shows reference contours reflecting "0.3 hr/year outage" for a satellite that it states has a base outage of 24 hours per year. By MITRE's proposed standard, 0.3 hr/year outage is *insignificant*, and thus, mitigation would not be required. In this case unless a contour was seen at 2.4 hours, the allowed maximum under the MITRE standard, there would be no need for mitigation. Another difficulty with Appendix B results from the fact that, in some cases, elements of the MITRE figures are based upon faulty data provided by the DBS industry. Contours based on these data are inaccurate because the satellites they claim to depict are not operating in the manner claimed by DBS. This is the case for all depictions of DirecTV's operation at 119°.

Third, as MITRE notes, the contours do not take into account any natural shielding, which will reduce the size of the mitigation zone significantly.²⁵

Fourth, an examination of MITRE's "benchmark" case reveals how little mitigation would actually be required. Figure B-3 represents the benchmark, and provides composite contours for the three satellites at 101°, 110° and 119°. As a comparison, MITRE provides the individual contours for these satellites on pages B-4, B-5 and B-6. Examining each of these figures is illustrative of the nature of the MITRE composite figures in the rest of the Appendix.

- With respect to B-4 (satellite at 101°), by inspection, there are no contours on page B-4, indicating *no mitigation is required for the satellite at 101° anywhere in the Northpoint service area.*
- With respect to B-5 (satellite at 110°), there is only a tiny area where MITRE predicts that Northpoint would increase the outage by 0.3 hr/year or 1.5 minutes a month. By any standard, this is insignificant, and *there is no mitigation required for the satellite at 110° either.*
- With respect to B-6 (satellite at 119°), as explained in section 4.1, this satellite is not in the GIMS database, and MITRE was given the wrong data rate by DirecTV, resulting in greatly exaggerated contours. Accordingly, the contours in B-6 are simply wrong, and should not be considered. Of course, there is a correct contour for DirecTV at 119°, and Northpoint estimates it to be similar to the other DirecTV operations for which correct data was supplied.

One finds that for the "benchmark case," after subtracting the erroneous B-6 contours, in fact, there is *no mitigation area anywhere in the Northpoint service area.* The same can be said of many other MITRE graphics that are dominated by the erroneous data from DirecTV about its operations at 119°. **This is highly significant because it means that the MITRE Report proves that the vast majority of DirecTV customers will require no mitigation whatsoever.**

Fifth, MITRE reports small mitigation areas to the north of the Northpoint transmitter (*see* B-7 when Northpoint is pointed roughly south, and B-24 when pointed to the north.²⁶) However, MITRE did not describe in its report the most obvious solution to a case of this nature. If Northpoint identified an instance where it wished to deploy a

²⁵ Omission of natural shielding "undoubtedly exaggerates the sizes" of mitigation contours. MITRE Report at 5-6. MITRE goes on to say that natural shielding will correspondingly reduce the size of the Northpoint service area. However, this is not exactly correct. The relevant natural shielding, such as buildings or foliage, would be primarily on the DBS subscriber's property, where it would not affect Northpoint's transmission range. In contrast, terrain may reduce the size of the Northpoint service area, an important distinction.

²⁶ Northpoint has always been aware that pointing of its transmit antenna in different directions, including north, might be an effective deployment strategy. For this reason, we have advocated that the Commission refrain from limiting the azimuth pointing of Northpoint transmitters in any rule.

transmitter in the manner shown by MITRE, it would do so only if it could place tiny “hot spots” shown by MITRE in unpopulated terrain. Northpoint would not establish a transmitter in the manner shown in figure B-24 unless such unpopulated terrain was available as an option. Another alternative for a case like B-7 would be to provide shielding at the transmitter itself in the direction of concern. This technique was shown at the USA Today location in Northpoint’s Washington testing in August and September of 1999. In this case, Northpoint showed that it could use the USA Today building itself as a shield and demonstrated that it was possible to achieve “quasi-error free” reception of both the DirecTV and Echostar services only 15 feet behind the transmitter.

In summary, from a casual glance at Appendix B one might infer that a “contour” equals a “mitigation area,” but it does not. A proper understanding of the contours reveals that MITRE Appendix B clearly supports the conclusion that MITRE reached: sharing is feasible.

3.3 Discussion of DBS Quasi-Error Free C/N Requirement

In assessing the DBS set-top box operational threshold, MITRE attempted to establish a scale of interference risks. This was a worthwhile effort because the DBS set-top box can operate successfully over a range of conditions. The concept behind MITRE’s scale supports Northpoint’s statements in filings with the Commission that DBS has sought overprotection of its system by claiming protection when its system is not exhibiting an outage or any other discernable impairment. While the MITRE scale needs further refinement and does not account for certain aspects of the DBS system, it is a good start that can be improved upon as described below. MITRE uses the “frequency of video and audio errors viewed by an observer” to establish the picture quality on a scale of zero to nine, nine being a perfect picture, according to Table 2.²⁷

Table 2: Quality scale from MITRE Report

Assigned Quality Level (9=perfect)	Video/audio characteristics (average)
9	Perfect video/audio
8	1 video/audio error per 30 minutes
7	< 1 error per minute, but > than 1 per 30 minutes
6	< 1 error per 15 seconds, but > 1 error per minute
5	> 1 error per 15 seconds
4	Freeze framing and pixelization occurring; audio chirping and momentary blanking
3	Mostly pixelized, mostly frozen, mostly audio blanked
2	Occasional video acquisition, no audio
1	Loss of lock, no signal acquisition

²⁷ MITRE Report at 3-13, Table 3-4.

Video errors are a normal part of the MPEG encoding process

Unfortunately, MITRE did not account for the occasional pixelization or artifacting that occurs as a consequence of the manner in which DBS operates its system.²⁸ Artifacting errors occur when video is coded at a compression rate that does not fit into the transmission bandwidth assigned. Each transponder on a DBS satellite carries some six or more channels, meaning that each channel is allocated 4 Mbps or less in the multiplex stream. Since video is encoded in real time through this limited bandwidth, rapidly changing portions of the video screen can be improperly compressed at times, and artifacts are the result of the bandwidth shortfall. The frequency of these artifacts depends on the difference between the bandwidth allocated and the bandwidth required for the given transmission. The more aggressive a DBS operator is about pushing video through limited bandwidth, the more pixelization will result. The frequency of these errors can be greater for sports and fast action shows (the kind that MITRE used in its evaluation) than for “talking heads” or slow action. Had MITRE accounted for this factor, it likely would have modified the scale of “frequency of video/audio errors” used in its criterion.

MITRE also attempted to predict the point at which quasi-error-free (QEF) operation begins for the DBS set-top box. While the number selected by MITRE for QEF operation reflects quasi-error-free operation, it does not agree with ITU accepted standards for the first point of QEF operation. This difference may have resulted from MITRE using its self-developed visual quality scale to estimate QEF. It also could be the result of MITRE’s use of SPW simulations to predict bit errors followed by an incorrect extrapolation to a projected QEF point. Regardless of the reason for the difference, the QEF used by MITRE is higher than that recommended by the ITU or claimed by the DBS industry, as shown in Table 3.

Table 3: Summary of QEF Criteria (C/N, dB).

System	Code Rate	Condition	MITRE Report	ITU Accepted Values*
DirecTV	6/7	QEF	8.4	7.6
Echostar	3/4	QEF	8.1	6.1

*ITU includes 1 dB of loss from satellite non-linearity and other factors.

3.4 Discussion of C/N Requirement for DBS “Outage”

MITRE also developed C/N requirements that are slightly more conservative than accepted standards. This section identifies possible sources of difference between the MITRE assessment and others.

²⁸ Echostar explains that artifacting occurs as a normal unavoidable part of the MPEG coding process. See Exhibit A, attached.

Correction factor for noise measurement bandwidth

MITRE’s methodology for estimating C/N values uses a 20 MHz bandwidth plus a 0.2 dB adjustment factor to calculate the carrier power in 24 MHz.²⁹ However, MITRE states that its C/N values do *not* include a bandwidth correction for the noise power.³⁰ Comparing the noise in 20 MHz and 24 MHz bandwidths, we find that 0.8 dB of additional noise power is present in the actual DBS noise bandwidth of 24 MHz.³¹ Thus, each estimate should be adjusted by 0.8 dB to account for noise in the actual DBS bandwidth of 24 MHz, reducing each indicated C/N by 0.8 dB.

Correction factor for other sources of noise

To test for the C/N+I required at the outage condition, MITRE measured the DBS carrier power using a 90 cm dish, and concluded the thermal noise contribution was negligible.³² MITRE supported its conclusion with the statement that the empty-sky noise “power level did not modify the least significant digit” of the DBS carrier power measured.³³ MITRE did not say what the “least significant digit” is, but in this case, it has to be the second digit. As shown below, the thermal noise and other noise differences should have been accounted for.

For example, assume a carrier power of -112 dBW was measured with the 90 cm dish. The thermal noise can be determined by kTB, leading to a noise power level of -134 dBW. The noise level is 22 dB below the carrier power, or 1/150th of the carrier power. Therefore, the MITRE measurement technique can only provide accuracy to two digits, and the measured carrier power must be reduced by 0.1 dB to correct for the presence of thermal noise in the carrier measurement. However, in addition to thermal noise, the MITRE procedure ignores other sources of noise present, including the noise on the satellite uplink and the noise due to adjacent satellites, for an additional 0.1 dB, as noted in Table 5.

In table 4, measurements of the carrier power (line 1) and input noise level (line 2) indicate a C/N+I of 6.5 dB, (line 3). However, MITRE does not account for the factors presented in lines 5-8, resulting in the actual composite C/N+I at the outage point of 6.3 dB. The correction factor in this case is 0.2 dB, as shown in line 10.

Table 4: Example Completion of the MITRE “outage point” data analysis.

Item	Value	Units
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²⁹ MITRE Report at A-5.

³⁰ “Note that the above values are based on noise measured in a 20 MHz bandwidth, not 24 MHz.” MITRE Report, at 3-17.

³¹ $10 \cdot \log(24/20)$ dB = 0.8 dB.

³² MITRE Report, at A-5.

³³ *Id.*

	Item	Value	Units
1	Measured Carrier (C+N+I) Power	-112.7	dBW
2	Measured Input Noise Level	-118.7	dBW
3	Example indicated C/(N+I) at the quality level of 6	6.5	dB
4	<i>Factors not included in the MITRE analysis:</i>		
5	Thermal noise present (kTB)	-134.8	dBW
6	Downlink C/N (thermal)	22.1	dB
7	Uplink C/N	24.5	dB
8	C/I due to other DBS satellites	26	dB
9	Actual composite C/(N+I) present at the outage condition	6.3	dB
10	Noise measurement correction required	-0.2	dB

Each of the required adjustments materially affects the C/(N+I) estimate at the outage condition. Combining these two sources of noise (0.1 dB thermal + 0.1 dB other input noise) with the required correction for noise bandwidth (0.8 dB) indicates that the required C/N (at the outage condition) must be reduced by a total of 1.0 dB, as shown in the following table.

Table 5: C/N at the outage point.

System	Code Rate	Condition	ITU Accepted*	MITRE Report	Bandwidth Adjusted
DirecTV	6/7	MITRE "6"	-	7.3	6.3
Echostar	3/4	MITRE "6"	-	5.5	4.5
DirecTV	6/7	Freeze Frame	6.1	6.1	5.1
Echostar	3/4	Freeze Frame	5.1	5.1	4.1

*ITU includes 1 dB of satellite loss.

The MITRE conversion of Eb/No to C/N appears flawed. For example, MITRE lists a "framing efficiency" of 0.928 for Echostar.³⁴ However, this is erroneous. MITRE apparently confuses the meaning of "net data rate" in the reference documents it cites. A sync byte is used with the convolutional encoding, but it introduces (at most) a framing loss of 1 byte out of every 205 bytes, or less than 0.005 reduction in efficiency. The actual "framing efficiency" of the DVB system is then greater than 0.995, not 0.928 as MITRE suggests. This difference also contributes to the discrepancy in MITRE's conversions of Eb/No to C/N.

In summary, MITRE's approach to estimating the Eb/No may have merit, but not in the current context as presented in its report. The ITU figures represent the most conservative estimates of the requirements for C/N, and include the worst-case effects that may be introduced in the link.³⁵ However, even including its differences in

³⁴ MITRE Report at 3-5, Table 3-2.

³⁵ Jan. 31, 2001 DBS letter at 4-5.

approach, MITRE demonstrated that the DBS link is available, even below the QEF “outage condition” oft cited by DBS.

The significance of all these differences is that they favor DBS over Northpoint. In the cases discussed, MITRE has made assumptions that over estimate interference, in some cases by several dB. Given that MITRE concluded that sharing was feasible, even when using the most conservative assumptions, the correction of the factors should provide additional assurance to the Commission about its decision to authorize terrestrial use of the 12.2-12.7 GHz band.

4 Northpoint’s Technology – and Only Northpoint’s Technology – Was Used by MITRE in Making its Determination that DBS-Northpoint Sharing is Feasible

Public Law 106-553 required that each company that had an application pending to provide terrestrial service in the 12.2-12.7 GHz band provide its technology to MITRE for testing to be completed within sixty days of enactment. As indicated in Table 6, only Northpoint provided technology to MITRE, as required. Although Pegasus and Satellite Receivers have requested that the FCC provide their companies with terrestrial spectrum, none of these entities provided any terrestrial equipment to MITRE. The DBS industry confirmed this point in a recent letter to Chairman Powell stating “it was Northpoint’s transmitting equipment – and *only* Northpoint’s equipment – that was used by MITRE in making its determination.”³⁶

Table 6: Terrestrial Technology Equipment Supplied to MITRE for testing and analysis by any entity expressing a desire to operate terrestrially in the 12.2-12.7 GHz band.

Equipment Provided	MDS	Northpoint Technology	Pegasus	Satellite Receivers	Sky Tower
Transmit Antenna	None	Large sectoral horn	None	None	None
		Small sectoral horn			
Integrated Transmitter (MPEG Encoder, modulator and amplifier)	None	Integrated Transmitter (MPEG encoder, QPSK modulator, and amplifier.)	None	None	None
Additional Interference Mitigation Equipment	None	Fortel Planar Array Antenna	None	None	None

Discussion of Pegasus Written Submission to MITRE

While Pegasus made a written submission, MITRE found that the information provided was unsuitable for any analysis without significant enhancement by MITRE.³⁷

³⁶ See Letter from James H. Barker, et al., counsel for DirecTV, et al., to Chairman Michael K. Powell, at 2 (FCC filed May 3, 2001).

³⁷ MITRE Report at 5-10 (“Of the patterns supplied by Pegasus, the only ones usable in these simulations were azimuthal-plane cuts, so our Pegasus simulations had to be confined to cases where the [Pegasus]

Indeed, in order to perform any analysis whatsoever of the Pegasus submission, MITRE had to employ a six-step process of “filling in” data and actually invented several data series in order to process the limited Pegasus submission. MITRE describes the effort required to handle the material Pegasus provided on its “11-dBi small horn” thus:³⁸

We generated [the final pattern used in the MITRE analysis] from the raw data [submitted by Pegasus] as follows:

- a) converted the data to dBi.
- b) filled in the “left-backlobe gap” by assuming right-left symmetry of the pattern in the affected region.
- c) assumed the vertical cross-polarization component was 25 dB weaker than the measured horizontal component at every azimuth angle.
- d) assumed the RHC and LHC components were each 3 dB down from the measured horizontal-polarization value at every azimuth angle.
- e) assumed the 12.20- and 12.70-GHz values were identical to those measured at 12.45 GHz.
- f) Since we’ll only be . . . doing horizontal-plane calculations (in which elevation angle theta is 90 degrees) for Pegasus, we filled in the rows for all other values of theta (from 0 to 180 degrees) by copying from the values measured for theta = 90.³⁹

The result was that, even after all the filling in and fudging of additional Pegasus “data”, out of the entire 200 pages of MITRE analysis, the sum total analysis regarding Pegasus consists of three graphs with “Pegasus antenna” deployed at 100 meters above average DBS reception.⁴⁰ However, even these three graphs are, in fact, erroneous. According to MITRE, the *only* valid plane of transmission is not *100 meters above* the plane of the antenna, but *in* the plane of the antenna, (i.e. with the transmitter at zero meters above the plane of reception). Because these graphs were generated for 100 meters above, and not zero meters above average reception, these three graphs provide no valid data whatsoever.

antenna lies within the horizontal plane of interest (not above or below it) and the elevation tilt angle is zero.”)

³⁸ See http://www.fcc.gov/oet/info/mitrereport/alldata_readme.txt. Document “readme” paragraph describing the “Pegasus 11-dBi Small Horn.ZIP”

³⁹ *Id.*

⁴⁰ See MITRE Report at B-56 to B-58

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.

/S/ Robert A. Combs

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

Dated: May 15, 2001

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Reference # 000227-000039
Category Technical Support
Date Created 02/27/2000 02:18 AM
Date Updated 03/14/2001 08:48 PM
Approval Level Public



Print Answer



E-mail Answer

Pixeling/artifacting and little square blocks.

Question

Sometimes when I'm watching a sports event, my picture shows little squares or freezes. Also happens during bad or inclement weather.

Answer

The problem you are describing is called artifacting. It happens when the background picture changes faster than the foreground. Like watching a car race. The car is actually moving at 200mph, but since the camera focuses on it, the background is whizzing by while the car in the center is motionless. This is exactly opposite of the way MPEG video compression operates.

The way we can limit bandwidth use is by painting a picture using as little change in the picture as possible. This is normally the way regular TV is, (i.e.) the center of the screen changes abruptly but the background normally doesn't change. Think of a movie where the actors are walking from left to right but the bookcase behind them doesn't change. In sporting events, due to the tight focus on the players, they usually stay in the center as they run around the field, so then the background is changing at an unusually higher rate. This is known as pixeling or artifacting. Pixeling also occurs when you have a weak or low signal strength. The higher your signal strength, the less likely you will see pixels. We suggest at least a 70% signal strength for the best picture and sound quality. This is an unavoidable side effect of the MPEG system. We do allocate higher bandwidth for these types of events to soften the overall impact.

How well did this answer your question?

100% 75% 50% 25% 0%

Submit Rating

CERTIFICATE OF SERVICE

I, Shannon Thrash, hereby certify that on this 15th day of May, 2001, copies of the foregoing *Comments of Northpoint Technology, Ltd., and Broadwave USA, Inc. on the MITRE Report* were served by hand delivery* and/or first class United States mail, postage prepaid, on the following:

Magalie Roman Salas*
Secretary
Federal Communications Commission
445 12th Street, SW
Room TW-B204
Washington, D.C. 20554

Bruce Franca, Acting Chief
Rebecca Dorch, Deputy Chief
Julius Knapp
Thomas Derenge
Michael J. Marcus
Ira Kelz
James Burtle
Alan Stillwell
Office of Engineering and Technology*
Federal Communications Commission
445 12th Street, SW
Washington, D.C. 20554

Thomas J. Sugrue, Bureau Chief
Kathleen O'Brien Hamm, Deputy Chief
Thomas Stanley, Chief Engineer
Mark Rubin
D'wana Terry
Jennifer Burton
Nese Guendelsberger
Ramona Melson
Jamison Prime
Wireless Telecommunications Bureau*
Federal Communications Commission
445 12th Street, SW
Washington, D.C. 20554

Jane Mago, General Counsel
Michele Ellison
David Horowitz
Daniel Harrold
David Senzel

Office of the General Counsel*
Federal Communications Commission
445 12th Street, SW
Washington, D.C. 20554

Donald Abelson, Bureau Chief
Thomas Tycz
Christopher Murphy
Jennifer Gilsean
International Bureau*
Federal Communications Commission
445 12th Street, SW
Washington, D.C. 20554

Peter A. Tenhula*
Office of Chairman Michael Powell
Federal Communications Commission
445 12th Street, SW
Washington, D.C. 20554

Mark Schneider*
Office of Commissioner Susan Ness
Federal Communications Commission
445 12th Street, SW
Washington, D.C. 20554

Adam Krinsky*
Office of Commissioner Gloria Tristani
Federal Communications Commission
445 12th Street, SW
Washington, D.C. 20554

Bryan Tramont*
Office of Commissioner
Harold W. Furchtgott-Roth
Federal Communications Commission
445 12th Street, SW
Washington, D.C. 20554

James W. Marshall, Principal Engineer
Network & Communications Engineering
The MITRE Corporation
Mail Stop W650
1820 Dolly Madison Blvd.
McLean, VA 22102-3481

James Chadwick, Director
Communications, Navigation, &
Surveillance Division
The MITRE Corporation
Mail Stop W300
1820 Dolly Madison Blvd.
McLean, VA 22102-3481

Gary M. Epstein
James H. Barker
Latham & Watkins
1001 Pennsylvania Avenue, NW
Suite 1300
Washington, D.C. 20004-2505
Counsel for DIRECTV, Inc.

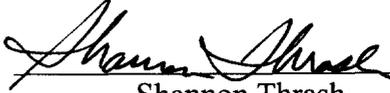
Pantelis Michalopoulos
Rhonda M. Bolton
Steptoe & Johnson LLP
1330 Connecticut Avenue, NW
Washington, D.C. 20036
Counsel for EchoStar

David C. Oxenford
Bruce D. Jacobs
Tony Lin
Shaw Pittman
2300 N Street, NW
Washington, D.C. 20037

Counsel for Pegasus Broadband Corp.

David A. Irwin
Nathaniel J. Hardy
Irwin, Campbell & Tannenwald, PC
1730 Rhode Island Avenue, NW
Suite 200
Washington, D.C. 20036-3101

Counsel for Satellite Receivers, Ltd.


Shannon Thrash
Legal Assistant