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

In the Matter of	)	
	)	
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;	)	ET Docket No. 98-206 RM-9147 RM-9245 DA 01-933
	)	
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 Corporation, and Satellite Receivers, Ltd. to Provide a Fixed Service in the 12.2-12.7 GHz Band	)	

COMMENTS OF DIRECTV, INC. ON THE MITRE REPORT

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COMMENTS OF DIRECTV, INC. ON THE MITRE REPORT

DIRECTV, Inc.[1] ("DIRECTV") hereby offers its comments on the independent report of the MITRE Corporation ("MITRE"), "Analysis of Potential MVDDS Interference to DBS in the 12.2-12.7 GHz Band" (April 2001) (the "MITRE Report") in response to the Commission's Public Notice.[2] The analysis contained in the MITRE Report provides significant new evidence that the Commission has erred in concluding preliminarily that "it is feasible to correct or avoid

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1 DIRECTV is a wholly-owned subsidiary of DIRECTV Enterprises, Inc., a licensee in the DBS service and a wholly-owned subsidiary of Hughes Electronics Corporation.

2 *Public Notice*, "Comments Requested on The MITRE Corporation Report on Technical Analysis of Potential Harmful Interference to DBS from Proposed Terrestrial Services in the 12.2-12.7 GHz Band (ET Docket 98-206)," DA 01-933 (rel. April 23, 2001).

harmful interference situations" between new proposed terrestrial Multichannel Video Distribution and Data Service ("MVDDS") systems and the operators of direct broadcast satellite ("DBS") systems in the 12.2-12.7 GHz band (the "12 GHz Band").[3] As DIRECTV has requested, this finding should be reconsidered and rescinded.[4]

I. INTRODUCTION & SUMMARY

As the Commission is well aware, the U.S. DBS operators have strongly and consistently claimed that the introduction of proposed mass-market terrestrial point-to-multipoint operations into the 12 GHz Band – the "mission critical" downlink spectrum for DBS operations – would create harmful interference to millions of existing and future DBS consumers. The principal MVDDS proponent, Northpoint Technology, Ltd. ("Northpoint"), has claimed otherwise.

To assist the Commission in determining the relative merits of these claims, and in recognition of the tremendous stakes involved (namely, the receipt of DBS service by at least 40 million viewers), Congress created Section 1012 of the Commerce, Justice, State and Judiciary Appropriations Act ("CJSJAA"), entitled "Prevention of Interference to Direct Broadcast Satellite Services."[5] Section 1012 required the Commission to retain an independent testing entity to conduct an "independent technical demonstration of any terrestrial service technology that has

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3 ET Docket No. 98-206, First Report and Order and Further Notice of Proposed Rulemaking (rel. Dec. 8, 2000) ("First Report and Order"), at ¶ 167. *See also id.* at ¶ 213.

4 *See* Petition for Reconsideration of DIRECTV, Inc., ET Docket No. 98-206 (Mar. 19, 2001) ("DIRECTV Petition"). *See also* EchoStar Satellite Corporation's Petition for Reconsideration, Et Docket No. 98-206 (Mar. 19, 2001); Petition for Reconsideration of the Satellite Broadcasting & Communications Ass'n, ET Docket No. 98-206 (Mar. 19, 2001).

5 H.R. 5558, enacted on December 21, 2000 as part of Pub. L. No. 106-553.

filed an application to provide terrestrial service" in the 12 GHz Band, in order "to determine whether the terrestrial service technology proposed to be provided by that entity will cause harmful interference to any direct broadcast satellite service."[6] The Commission chose MITRE to conduct the required testing. In the comments that follow, DIRECTV offers its initial reactions to the MITRE Report.[7]

First, DIRECTV notes that the MITRE Report provides absolute confirmation of the DBS operators' predictive modeling and analyses of both Northpoint and DBS operator field tests, all of which demonstrated harmful interference similar in magnitude to the "significant" interference observed by MITRE.

Second, DIRECTV highlights other ways in which the MITRE Report affirms many principles and policy recommendations advocated by the DBS operators, as well as offers useful insights into the problems of proposed MVDDS/DBS sharing with which DIRECTV agrees.

Third, DIRECTV discusses a few areas in which MITRE's analysis or conclusions are deficient, mostly in instances where MITRE, due to the narrow scope of its charter, simply neglected to consider certain other factors or information that affect the proposed MVDDS/DBS sharing analysis. For example, MITRE has not considered the effect of NGSO FSS systems upon proposed MVDDS/DBS sharing at 12 GHz, or how such three-way sharing by ubiquitous services in the 12 GHz Band will compound the "significant" interference threat posed by proposed MVDDS system operations in the band.

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6 CJSJAA, § 1012(a).

7 DIRECTV is still analyzing the MITRE Report and may offer supplemental comment.

Fourth, DIRECTV addresses mitigation techniques touched upon in the MITRE Report. Indeed, DIRECTV's most fundamental objection to the MITRE Report is any suggestion that mitigation of MVDDS interference might be pursued at a DBS customer's premises, or more broadly, that suitable methods of mitigating proposed MVDDS system interference are even feasible at 12 GHz. The MITRE Report has concluded that, given the "significant interference" that will be generated by a proposed MVDDS system at 12 GHz, "MVDDS/DBS bandsharing appears feasible *if and only* if suitable mitigation measures are applied."[8] The MITRE Report proceeds, however, to ask whether the limited benefits of the mitigation techniques it outlines are outweighed by their costs and inadequacies.[9]

The costs of introducing proposed MVDDS operations into the 12 GHz Band greatly outweigh the benefits. DIRECTV does not believe that, in the final analysis, "suitable" measures to mitigate potential MVDDS system interference can be legally, practically or economically applied. And this means, therefore, that MVDDS/DBS bandsharing is *not* feasible.

Finally, DIRECTV notes additional topics suggested by the MITRE Report that merit further study. These topics should be considered before any further action is taken with respect to the creation of the proposed MVDDS at 12 GHz, or the licensing of particular MVDDS systems.

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8 MITRE Report at xvii, 6-1.

9 *Id.* at xvii, 6-1.

II. THE MITRE REPORT CONFIRMS THE FUNDAMENTAL CONCLUSION OF DBS OPERATOR STUDIES AND ANALYSES THAT A PROPOSED NORTHPOINT MVDDS SYSTEM WILL GENERATE HARMFUL INTERFERENCE INTO THE DBS SERVICE

The MITRE Report *validates entirely* the studies and analyses of the DBS operators regarding the harmful interference that will be generated by a proposed Northpoint MVDDS system into DBS operations. Originally conceptualizing its proposed system as a complement to the DBS service,[10] but now positioning itself as a competitor, Northpoint for years argued that its system is an "innovation" that uses the 12 GHz Band "*without causing harmful interference* to the ten existing and planned [DBS and NGSO FSS] satellite operators in that band."[11] The U.S. DBS operators have vigorously disputed this claim, and have filed with the Commission a variety of analyses of Northpoint's experimental test results, as well as reports of the DBS operators' own tests, that indicate that the proposed Northpoint system in fact will cause harmful interference into the DBS service.

The very first conclusion of the MITRE Report settles the dispute once and for all, stating that "MVDDS sharing of the 12.2-12.7 GHz band currently reserved for DBS poses *a significant*

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10 Even when Northpoint was "pitching" its service as complementary to DBS, every high-power DBS operator providing commercial service that examined Northpoint's technology vigorously opposed the introduction of Northpoint operations into the DBS downlink band. *See* ET Docket No. 98-206, Comments of DIRECTV (Mar. 2, 1999), at 23-32 & Technical Appendix B; Comments of EchoStar (Mar. 2, 1999), at 8-15 & Technical Appendix B; Comments of USSB (Mar. 2, 1999), at 4-12; *see also* Comments of the Satellite Broadcasting and Communications Association ("SBCA") (Mar. 2, 1999), at 3-7.

11 Comments of Northpoint Technology, Ltd. and Broadwave USA, Inc., ET Docket No. 98-206 (March 12, 2001) ("Northpoint Comments"), at 2 (emphasis added).

interference threat to DBS operation in many realistic operational situations."[12] This finding meshes precisely with the consistently reiterated position of the DBS operators.

In recent weeks, Northpoint has been attempting to distance itself from this key finding of the MITRE Report, claiming publicly that the report "makes clear that only Northpoint demonstrated a system that was able to share effectively with DBS," and that it is something called "generic" MVDDS that MITRE found to be an interference threat, not Northpoint's transmitting equipment.[13] These are demonstrably false assertions and blatant mischaracterizations of MITRE's tests and findings. In fact, it was *Northpoint's* transmitting equipment – and *only* Northpoint's equipment – that was actually tested by MITRE in making its determination that terrestrial operations pose a "significant interference threat." The primary MVDDS interference evaluated during MITRE testing was Northpoint system interference.[14] At a minimum, then, the proposed Northpoint MVDDS system clearly poses a significant interference threat to DBS operations.

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12 MITRE Report at xvi, 6-1 (emphasis added).

13 *See, e.g*, Press Release, "Northpoint Technology Passes FCC Mandated Independent testing – Only Company to Do So" (released April 24, 2001) ("MITRE concluded significant interference could result from generic terrestrial operations. From the report it was clear that only Northpoint demonstrated a system that was able to share effectively with DBS.") (statement of Sophia Collier); Northpoint *Ex Parte* Letter (April 27, 2001) (annotation at xvi).

14 *See, e.g.*, MITRE Report at § 3.2 (entitled "Testing of DBS Set-Top Boxes in the Presence of *Northpoint MVDDS Interference*") (emphasis added).

III. THE MITRE REPORT AFFIRMS MANY PRINCIPLES AND POLICY RECOMMENDATIONS OF THE DBS OPERATORS, AND OFFERS ADDITIONAL USEFUL INSIGHTS, AS WELL

The MITRE Report also validates many of the fundamental principles and recommendations that the DBS operators have urged are necessary for the Commission to guide its analysis of proposed MVDDS/DBS sharing issues, as well as offering additional recommendations and observations with which DIRECTV agrees and supports. These include:

- **MITRE affirms the use of relative increase in unavailability as a preferred interference criterion.**

DIRECTV has long argued that degradation of DBS signal unavailability performance must be utilized to express the concept of harmful interference into the DBS service.[15] This concept has been recognized internationally, and was used to establish the protection criteria for limiting the amount of interference to which DBS systems will be subject from new NGSO FSS systems that will be introduced into the 12 GHz Band.[16] This approach is directly applicable to the proposed MVDDS/DBS interference situation. The criteria should once again be premised upon (1) limiting the increase in BSS operational unavailability caused by the interference

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15 *See, e.g.*, DIRECTV, Inc., ET Docket No. 98-206, "Further Response to Northpoint Ex Parte Filings" (Sept. 20, 2000) ("DIRECTV Further Response"), at 6-13; DIRECTV, Inc., ET Docket No. 98-206, "Conclusions to Date Regarding Harmful Interference From a Proposed Northpoint Technology Terrestrial System Operating in the DBS Downlink Band, 12.2-12.7 GHz" (Jan. 27, 2000) ("DIRECTV January 2000 *Ex Parte*"), at 31-33; Reply Comments of DIRECTV, Inc., ET Docket No. 98-206 (Apr. 14, 1999), at 6-17; Comments of DIRECTV, Inc., ET Docket No. 98-206 (Mar. 2, 1999), at 24 & Technical Appendix B at 508.

16 *See* DIRECTV Reply Comments at 8; Reply Comments of EchoStar Satellite Corporation, ET Docket No. 98-206 (Apr. 5, 2001), at 22; DIRECTV January 2000 *Ex Parte* at 5.

generated from all sources of interference (satellite or terrestrial) to a maximum of 10%, and (2) protecting BSS reception under clear sky propagation conditions.[17]

Although Northpoint repeatedly has sought to denigrate or minimize the use of signal unavailability performance as the touchstone for evaluating the impact of proposed MVDDS interference on the DBS service,[18] the Commission already has acknowledged its utility,[19] and the MITRE Report confirms its appropriateness here.[20] MITRE has agreed with DIRECTV that a parameter quantifying the relative increase in DBS system unavailability caused by proposed MVDDS system interference is "particularly advantageous" for use as an interference measure in addressing the subject of proposed MVDDS/DBS sharing.[21] This measure is desirable not only because it "prevents large increases in absolute unavailability where initial unavailability is small," as MITRE observes,[22] but is also, as DIRECTV has shown, relatively insensitive to changes in link parameters, including changes to the rain model, small changes in satellite EIRP, or changes in DBS receive antenna pointing error.[23]

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17 *See, e.g.,* DIRECTV Reply Comments at 8; ; DIRECTV and EchoStar *Ex Parte* Letter (Nov. 8, 2000); DIRECTV January 2000 *Ex Parte* at 5.

18 *See, e.g.*, Reply Comments of Northpoint Technology, Inc. (Apr. 14, 1999), at 7-11.

19 *See* First Report and Order at ¶¶ 268-270.

20 MITRE built a mathematical model of the DBS link using information and data obtained through its testing process or from external sources. This model clearly showed that DBS signal availability is affected by the addition of MVDDS interference. All of the discussion in Section 5 of the MITRE Report, "Interference Assessment," and in the plots shown in Appendix B, describe the impact on DBS system operations of MVDDS interference in terms of viewing time lost as a direct result of this interference.

21 MITRE Report at 6-6.

22 *Id.*

23 *See* Reply Comments of DIRECTV, Inc., ET Docket No. 98-206 (Apr. 5, 2001) ("DIRECTV Reply Comments"), Appendix C.

It is also important to note that the size of the interference zone calculated by MITRE when using a relative increase in unavailability impact criterion is strikingly similar in size to the interference zones that have been calculated previously by the DBS operators. The MITRE calculation for Washington, DC using a proposed MVDDS transmitting antenna directed at an azimuth angle of 180° is shown on page B-8 of the MITRE Report. A similar calculation was provided in a presentation by DIRECTV to the Commission more than fifteen months ago.[24]

Finally, although the MITRE Report correctly acknowledges the need for interference into the DBS service to be limited to a 10% unavailability degradation, MITRE has erred in its policy recommendation allocating the entire 10% margin of unavailability to proposed MVDDS systems.[25] While this error is understandable, given MITRE's charter of examining only proposed MVDDS/DBS interference, the Commission must also factor into its analysis the fact that DBS providers must also share the 12 GHz Band with NGSO FSS systems. DIRECTV discusses this point in more detail in Section IV below.

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24 *See* DIRECTV *Ex Parte* Slide Presentation (Jan. 24, 2000), Slide G2.3, "Interference Zones, Protect All Orbit Slots; Vienna, VA Transmitter Site, 180° Transmitter Azimuth Angle." Note that the MITRE Report 2.86% contour extends out about 4 to 5 kilometers in each case from the proposed MVDDS system transmitter. The DIRECTV contour is more round in shape because it shows interference into receivers utilizing many more orbital slots than the 3 considered by MITRE.

25 *See* MITRE Report at 6-6.

- **If MVDDS/DBS sharing is to be considered, MITRE affirms the need to protect *all* DBS subscribers, both present and future.**

DIRECTV has emphasized the importance of protecting its existing and future subscribers from proposed MVDDS system interference on an *ongoing* basis.[26] This protection should not simply vanish after a brief 18-month period after the installation of a MVDDS transmitter, as the Commission has proposed[27] and as Northpoint has advocated.[28]

Significantly, MITRE has recognized the importance of DIRECTV's position, and recommends that DBS subscribers be protected "for as long as the MVDDS transmitter operates."[29] MITRE also points out that proposed MVDDS system antenna backlobes can interfere with a DBS antenna main beam, and states that these regions, no matter how small, should not be exempted from interference protection.[30] DIRECTV agrees. No DBS subscriber should be subject to harmful interference from a proposed MVDDS system.

- **If MVDDS/DBS sharing is to be considered, MITRE affirms the need for further study to ensure protection of "any DBS satellite in the geostationary arc."[31]**

DIRECTV also has consistently advocated the principle that protection must be extended to all potential BSS orbital locations capable of U.S. coverage.[32] For the DBS service to succeed,

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26 *See, e.g.*, DIRECTV Comments at 12-14 (explaining principle that equal protection must be afforded to all present and future DBS customers).

27 *See* First Report and Order at ¶¶ 274-75.

28 Northpoint Comments at 33.

29 MITRE Report at xix, 6-6-6-7.

30 *Id.* at xx, 6-8.

31 *Id.* at xx, 6-7.

32 *See, e.g.*, DIRECTV Comments at 17.

the Commission must ensure that every subscriber and potential subscriber is able to receive DBS signals from any DBS operator. DBS providers can be located over a very wide range of the geostationary arc. In addition to the eight U.S. DBS assigned locations in the BSS Plan ranging from 61.5° to 175° W.L., Canada has assignments at 70.5°, 72.5°, 82°, 91°, 129°, and 138°; Mexico at 69°, 78°, 127°, and 136°; and Argentina at 94°. All of these locations are being used or may be used to provide DBS service to U.S. subscribers (assuming systems can be coordinated). Furthermore, additional assignments may be created in the arc through future BSS Plan modifications. Thus, with such a wide range of assignments and the possibility of future modified assignments, the Commission must ensure that the entire geostationary arc (above some realistic minimum elevation angle) is protected to ensure the continued growth and development of DBS service.

Again, the MITRE Report provides supports for this principle. MITRE recognizes that "DBS receivers operating with new and different satellites could be at risk in unforeseen ways,"[33] and recommends further study of the issue. DIRECTV agrees with the need for further study, but reiterates that the entire geostationary arc must be protected. All primary DBS service subscribers must be protected from harmful interference from a proposed secondary MVDDS system, regardless of orbital position, and regardless of whether the orbital position is being used today.

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[33] MITRE Report at xix, 6-7.

- **If MVDDS/DBS sharing is to be considered, MITRE recognizes that protection for future DBS system technologies requires further consideration of "new DBS waveforms."[34]**

This is an important recognition by MITRE that growth within the DBS industry will involve technological advances that will include new transmission waveforms. As DIRECTV has noted repeatedly, interference protection must clearly be extended to present and future DBS systems. Not doing so will undermine the future growth and development of these systems, as well as their ability to compete with other MVPD services, most notably dominant cable operators.[35] Accordingly, new DBS waveforms must be protected, and the mechanisms found to protect them may well be different from those envisioned today. Any approach to proposed MVDDS/DBS interference protection must recognize and account for these facts.

- **If MVDDS/DBS sharing is to be considered, MITRE recognizes that new MVDDS waveforms "create an unknown vulnerability."**

Thus, MITRE recommends that new MVDDS waveforms other than those tested by MITRE "should not be licensed without further study."[36] DIRECTV strongly agrees, but notes that other entities have discussed not only different MVDDS waveforms but also different system elements for implementing such secondary services. These must also be studied before any proposed MVDDS system is licensed.

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34 *Id.* at xx, 6-7.

35 *See* DIRECTV Comments at 16-17.

36 MITRE Report at xix, 6-7.

- **If MVDDS/DBS sharing is to be considered, MITRE recommends that "other causes of unavailability" also should be taken into account.**[37]

DIRECTV of course agrees. The most significant source of "other causes of unavailability" will be the presence of NGSO FSS systems in the 12 GHz Band.

In this regard, as DIRECTV has repeatedly stated, it is important that the combination of NGSO FSS and MVDDS interference not exceed the aggregate 10% increase in unavailability from all sources of interference, satellite or terrestrial. Recent ITU actions regarding interference from NGSO systems were explicitly premised on a decision by the ITU about the level of performance and availability of service needed by DBS systems, and the corresponding amount of decrease in this availability that DBS operators can be asked to accept. If the interference into DBS from all sources, including potential MVDDS technologies, were to exceed that 10% unavailability increase, the DBS performance and reliability goals that are explicitly set forth in the recent ITU decisions could not be achieved.[38]

In addition, the presence of constant MVDDS interference will exacerbate the effects of solar noise on the DBS link. This phenomenon, explicitly recognized by MITRE,[39] occurs at certain times of the year when the sun contributes significantly to the overall noise level in the DBS satellite receiver. DBS receivers can currently tolerate such events when MVDDS interference is not present, but may not be able to maintain this quasi-error free operation (excellent picture and sound quality) when MVDDS interference is added to the mix.

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37 *Id.* at xx, 6-7.

38 *See, e.g.*, DIRECTV Reply Comments at 7-15.

39 MITRE Report at xx, 6-7.

- **MITRE agrees that DBS customers may not know that the cause of a particular service outage, or the reason for its duration, is MVDDS interference.**

DIRECTV has repeatedly highlighted the invidious nature of proposed Northpoint MVDDS system interference, and at least two separate harmful interference effects on DBS operators. The first type of harmful interference effect is the direct interruption of DBS subscribers' reception of satellite signals, regardless of weather conditions. Sufficiently high levels of interference can cause very high bit error rates in the receiver, which, at a minimum, will disrupt the video and audio decoder circuits in the DBS set-top box and can prevent the demodulator[40] from locking onto the satellite signal altogether. Such high interfering signal levels are likely to be suffered by DBS receivers in the immediate vicinity of the proposed MVDDS transmitters, or by a DBS receiver experiencing strong multipath effects in the MVDDS service area.

The second type of harmful interference problem is less obvious, but is more pervasive and no less destructive over time to the reliability of DBS service. Because of the substantial "clear weather" signal margins necessary to help DBS operators ensure high-quality service, the added presence of a proposed MVDDS system signal may not always cause visible disruption to digital DBS signals during such clear weather. However, if a proposed Northpoint MVDDS system were actually deployed, the interference that would be created in the 12 GHz Band over time would lower these clear weather margins and would significantly increase the number and length of downlink rain outages.

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40 The demodulator is that part of the DBS set-top box that directly translates the received signal from the DBS satellite to a digital bit stream. This digital bit stream is then further

Because of these two harmful interference effects, DIRECTV has noted that reliance on customer complaints to determine the presence or absence of harmful interference in tests performed to date is grossly misleading, and an incorrect basis upon which to conclude that proposed MVDDS/DBS sharing is feasible. Furthermore, from the standpoint of exploring meaningful mitigation of proposed MVDDS system interference, a customer complaint-driven mitigation process occurs far too late to prevent grave damage to customer perception of DBS service reliability and performance.[41]

Northpoint has attempted to dismiss the assumption that a DBS subscriber may not be able to pinpoint the cause of proposed MVDDS system interference as unrealistic.[42] MITRE's independent assessment says otherwise, and lends further strong support to the DBS operators' position on this point. MITRE recommends that, if MVDDS sharing is to be considered, "mitigation [of MVDDS interference] should be done proactively, regardless of the presence or absence of [DBS customer] complaints" precisely because "*DBS customers may not know what is causing a particular outage, or the reason for its duration.*[43] DIRECTV has been making this very point for years.[44]

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processed by the set-top box to produce video, audio, and other program information along with program control information.

41 *See, e.g.*, DIRECTV Reply Comments at 17-18 (customer complaint mitigation standard advocated by Northpoint is "clearly unacceptable because customers will be unable to trace the source of degraded DBS system performance").

42 *See, e.g.*, Northpoint Technology Ltd., and Broadwave USA, Inc., Opposition to Petitions for Reconsideration for First Report and Order, ET Docket No. 98-206 (Apr. 24, 2001), at 6-7.

43 MITRE Report at xx, 6-8 (emphasis added).

44 *See, e.g.*, Comments of DIRECTV, Inc., ET Docket No. 98-206 (Mar. 2, 1999).

- **If MVDDS/DBS sharing is to be considered, any mitigation of MVDDS interference must "be accomplished prior to a license being granted for MVDDS operation."[45]**

As set forth above, the nature of the interference generated by a proposed Northpoint MVDDS system is such that a customer complaint-oriented interference mitigation regime will not be effective. Moreover, as DIRECTV discusses in Section V below, any permissible mitigation of proposed MVDDS/DBS system interference must take the form of either operational controls or revised MVDDS system design parameters. Under no circumstances can mitigation at a DBS customer's premises be required. For these reasons, this global aspect of MITRE's proposed licensing process, which emphasizes putting maximum effort into avoiding harmful interference *before* proposed MVDDS operations begin, makes sense in concept, and should be adopted if such services are introduced at 12 GHz.

This is especially so since other proposed MVDDS systems may offer more hope of meeting criteria that would protect DBS operations, at least in theory. Apart from its efforts to fabricate something called "generic" MVDDS interference, even Northpoint does not seriously dispute that its proposed system was the primary subject of MITRE's testing. And MITRE's tests highlight the degree to which Northpoint's proposed MVDDS system generates "significant interference" into DBS systems. Given the concerns that the entire 12 GHz satellite service sector (NGSO FSS and GSO BSS alike) has expressed regarding the Northpoint frequency-sharing approach, it is not wise to tailor service rules around it. The comments of AT&T and other parties in this proceeding indicate that other frequency reuse approaches may be available that are different from that proposed by Northpoint – approaches that would meet the "2.86%" sharing

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[45] MITRE Report at xxi, 6-8.

criterion and the 10% aggregate cap on service unavailability degradation, and not require the so-called mitigation zones that attend Northpoint's proposal.

AT&T, Pegasus, Satellite Receivers and MDS America have not offered any specifics about such a proposed system design, nor have they provided any test data or demonstration that such a system is indeed possible. Nevertheless, designing service rules around one particular frequency-reuse approach that remains unproven is an activity fraught with danger. To date, no party to this proceeding – including Northpoint – has demonstrated an MVDDS system capable of adequately protecting the DBS service.

That is why proper and protective sharing criteria must be developed as the first step in creating any secondary MVDDS service at 12 GHz. Then and only then should various sharing approaches be tested against the criteria. And only after it has proven that an MVDDS system using one or more of these approaches can fully meet the criteria, should that system be considered for licensing in accordance with the single city demonstration phase that DIRECTV has advocated.[46]

- **If MVDDS/DBS sharing is to be considered, MITRE recommends that interference limits be calculated on a site-specific/location-specific basis, taking into account all varieties of DBS subscriber equipment currently in use.**[47]

The first step of MITRE's proposed MVDDS licensing process involves computations being made on a location-specific basis, using data for DBS satellites in view from that locale, and

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46 *See, e.g.*, DIRECTV Reply Comments at 22-23.

47 MITRE Report at 6-5-6-6.

for links that have the worst baseline unavailability but still meet some minimum availability performance.[48]

Although DIRECTV disagrees with the MITRE-proposed level of allowable interference, and prefers an equivalent power flux density ("epfd")-based limit rather than a C/I-based limit,[49] the concept of location-specific protection and limits is a very important one in this sharing situation.[50] To this extent, DIRECTV supports this aspect of MITRE's proposed MVDDS licensing approach if such services are to be introduced at 12 GHz.

- **MITRE's test results confirm DBS operators' observations that interference into cities with lower satellite EIRPs will be affected more severely than Washington, DC, the site of many of the tests that Northpoint claims support the feasibility of proposed MVDDS/DBS sharing.**

The MITRE Report also highlights the extent to which the test location where Northpoint (the primary MVDDS proponent) staged the field demonstration from which it has drawn many of its interference conclusions, Washington, DC, is one where harmful interference effects to DBS subscribers would not be as pronounced. The MITRE Report test results predict, using the metric of hours per year of outage, that cities with lower satellite EIRPs will be much more

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48 *See id.* at 6-5.

49 In the event that proposed MVDDS/DBS sharing is ever implemented, DIRECTV has recommended that epfd be used as the interference limit parameter. Although the carrier to interference (C/I) power ratio can also be used as the interference limit parameter for the generation of contours, as MITRE has done, epfd is preferred because of the multiple links requiring protection at any proposed MVDDS transmitter site. In particular, each link will generate its own required C/I ratio for protection. The carrier "C" will in general be different for each link. As such, it will be cumbersome to reduce the C/I ratios of multiple links to absolute interference powers so that they can be directly compared. If instead a maximum interference epfd is calculated for each link, then the epfd values can be directly compared. *See* DIRECTV Comments at 18-19.

50 *See* DIRECTV Comments at 20-26.

severely affected by proposed MVDDS system interference than Washington, DC. In these cities, there is less satellite EIRP to protect the DBS receivers from harmful MVDDS interference. This fact was stated in the DBS Oxon Hill Report,[51] and has now been confirmed by MITRE, which observes: "[N]ine alternative *locales* are considered. DBS receivers in those locales all seem more susceptible to MVDDS interference than they are in Washington, DC, at least in the scenarios considered."[52]

- **MITRE's test results confirm the DBS operators' observation, disputed by Northpoint, that the proposed MVDDS system interference threat is worse at lower frequencies of the DBS receive system.**

When DIRECTV measured proposed Northpoint MVDDS system interference during its own field testing, it noted increased sensitivity at lower frequencies of the DBS receive system.[53] DIRECTV noted that this phenomenon could be attributable to increased sensitivity of the DBS receive antenna backlobes at lower frequencies.[54] Northpoint dismissed DIRECTV's explanation as one that "cannot be true," and instead attributed DIRECTV's observation to an alleged "error in transmitter operation."[55]

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51 *See* DIRECTV, Inc. and EchoStar Satellite Corp., "Report of Interference Impact on DBS Systems from Northpoint Transmitter Operating at Oxon Hill Maryland, May 22 to June 7, 2000," ET Docket No. 98-206 (July 25, 2000) ("DBS Oxon Hill Report"), at 8-9 (discussing fact that "cities with lower satellite EIRPs will experience even higher levels of unavailability").

52 MITRE Report at 5-9 (emphasis in original).

53 *See* DBS Oxon Hill Report at iv.

54 *Id.*

55 *See* Northpoint's "Evaluation and Analysis of DBS-Terrestrial Compatibility Testing at Oxon Hill, MD," ET Docket No. 98-206 (July 31, 2000), at 6-7. Northpoint's statements show how little Northpoint understands the DBS receive system in particular, or RF transmission in general. Lower frequencies have wider beamwidths. Therefore, it is

The MITRE Report once again corroborates the DBS operators' observations during field testing, illustrating the same increased sensitivity at lower frequencies of the DBS receive system. To see this, one needs only to compare the Interference Prediction plots in the MITRE Report found on pages B-32 (12.2 GHz) and B-33 (12.7 GHz) with the benchmark plot on page B-3 (12.45 GHz). With all other parameters identical, the interference zone of the 12.2 GHz plot extends to 7.0 km, while the benchmark plot of 12.45 GHz extends to 6.5 km. The interference zone of the 12.7 GHz plot extends to 5.25 km.

- **The MITRE report casts doubt on Northpoint's claim that natural shielding is a useful mitigation technique.**[56]

Northpoint has often alleged that natural shielding will be a panacea for the interference caused by its proposed MVDDS system. Significantly, however, the MITRE Report saw no reason to take natural shielding into account as a significant interference-mitigating factor, noting that "[i]f natural shielding were considered, [Northpoint system interference contours] would certainly enclose smaller areas. However, the same is probably even *more* true of the MVDDS service boundaries."[57] In other words, natural shielding, if it is present, will do more to reduce MVDDS system coverage than it will help in mitigating interference into DBS service. MITRE also notes that the real-world effects of "reflection, scattering and diffraction" tend to illuminate the "'shadows' cast by obstacles" and thereby reduce the effectiveness of any natural shielding.[58]

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reasonable to attribute the increased interference predicted and measured at lower frequencies to more spillover around the reflector, and therefore, higher backlobe gain.

56 *See* MITRE Report at 5-6.

57 *Id.*

58 *Id.*

- **The MITRE Report provides additional evidence that the use of planar DBS antennas is not a suitable mitigation technique.**

Northpoint has consistently advocated the use of Fortel planar array antennas in place of DBS dish antennas. By contrast, DIRECTV has apprised the Commission that it is extremely familiar with and has been evaluating these flat antennas for years, and has found that, in general, these antennas' overall performance remains significantly below that of parabolic antennas.[59]

MITRE's experience with planar antennas during its testing is consistent with DIRECTV's experience. According to the MITRE test results, "The amplitude of these grating lobes is slightly higher than the spillover lobes of the reflectors. The cross polarization amplitude is comparatively high."[60] Additionally, MITRE states, "The use of Fortel planar array antennas has also been proposed, although the prominent grating lobes evident on the measured radiation pattern shown in section 4 could pose a problem."[61] To the extent the Commission has proposed the use of planar DBS antennas as a mitigation technique that will mitigate proposed MVDDS system interference, the MITRE Report serves as confirmation of the DBS operator view that the Commission's faith in this technique is misplaced.

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59 *See, e.g.*, DIRECTV *Ex Parte* Slide Presentation (Aug. 10, 2000) (slide addressing alleged benefits of using a planar array in disrupted areas).

60 MITRE Report at 4-13, § 4.2.4.

61 *Id.* at 6-4, § 6.2.3.

IV. EVEN THE "SIGNIFICANT INTERFERENCE" DOCUMENTED BY THE MITRE REPORT UNDERESTIMATES THE MAGNITUDE OF THE PROPOSED MVDDS SYSTEM INTERFERENCE THREAT

Although DIRECTV is still studying the MITRE Report, there are a few areas where DIRECTV believes that MITRE neglected to consider certain additional factors or information. Some of these issues can be attributed either to the narrow scope of MITRE's charter or simply to the very tight time constraints under which MITRE performed its testing. Nevertheless, these factors, which exacerbate the "significant" interference threat already confirmed by MITRE's analysis, must be considered by the Commission.

A. MITRE's Unavailability Analysis Does Not Take Into Account The Prospect Of Three-Way Bandsharing At 12 GHz Among Ubiquitously Deployed DBS, NGSO FSS And Proposed MVDDS Systems

The most prominent weakness in the MITRE Report is its implicit assumption that only proposed MVDDS systems and DBS systems will be sharing the 12 GHz Band. The MITRE Report does not even mention the fact that ubiquitously deployed NGSO FSS systems are also planned for operation in the 12 GHz Band, and thus, MITRE recommends that "MVDDS should cause no more than a 10% increase in DBS system unavailability time."[62]

As mentioned, DIRECTV agrees that relative increase in unavailability is the appropriate measure of proposed MVDDS/DBS interference at 12 GHz, but because MITRE's charter was focused only on the implications of MVDDS operations at 12 GHz, MITRE has not accounted for the presence of *other* sources of interference in the 12 GHz Band – most notably, the interference that will be generated by the introduction of NGSO FSS systems. As recognized by

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62 MITRE Report at 5-15.

the United States in the recent deliberations involving NGSO FSS and DBS systems at WRC 2000, DBS systems cannot tolerate more than a 10% increase in unavailability without significantly degrading the very high availability that is a standard feature of DBS service. That is why the 10% increase in DBS system unavailability time must account for *all* sources of DBS interference *in the aggregate*.

In this regard, the sharing environment envisioned is one that will already include NGSO FSS systems, which will raise a DBS system's noise floor. As proposed MVDDS systems are introduced into the operating environment, MITRE acknowledges that these systems also will raise the effective noise floor of the DBS system,[63] but does not add the two sources of interference together, which is a fundamental step in accurately depicting the complete interference environment at 12 GHz. It is up to the Commission to complete the analysis.

MITRE does agree in the abstract that the interference analysis for proposed MVDDS systems at 12 GHz should take into account "other causes of unavailability."[64] Although the MITRE Report does not address the issue (because MITRE was not asked to do so), given that NGSO FSS systems will be the most prominent other causes of DBS unavailability at 12 GHz, and only to the extent that MVDDS systems may ultimately be licensed at 12 GHz, DIRECTV strongly urges the Commission once again to limit MVDDS systems in this band to a 2.86% increase in unavailability that corresponds to the allowable interference of a single NGSO system. In no event should the combined unavailability of NGSO FSS and proposed MVDDS systems be permitted to exceed 10% in the aggregate.

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63 *Id.* at 5-12.

64 *Id.* at xx, 6-7.

B. Because Of The MITRE Report's Failure To Consider Three-Way Sharing At 12 GHz, The C/I Values Suggested Do Not Adequately Protect DBS

Table 5-2 of the MITRE Report lists the C/I values required in various cities to satisfy an increase in unavailability of less than 10% for the DIRECTV 5 satellite at 119° W.L.[65] While this table provides useful information, as mentioned, the sharing environment in the 12 GHz Band must accommodate NGSO FSS system interference, as well – meaning that it would be wrong for the Commission to allocate the entire 10% of unavailability degradation to proposed MVDDS systems as MITRE has done.

Indeed, the Commission already has acknowledged this point, proposing, "[i]n the interest of providing DBS subscribers with a high degree of protection," that the percentage of DBS unavailability that a proposed MVDDS system be permitted to cause any DBS provider be "the same as a single NGSO system, *i.e.*, 2.86%."[66] This is the correct path. From the perspective of a DBS operator or subscriber, it does not matter whether the loss in DBS signal availability is generated by interference from an NGSO FSS system or a proposed MVDDS system – it is the same, and it is cumulative. As the DBS operators have pointed out previously,[67] ITU actions

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65 *See* MITRE Report at 5-16.

66 First Report and Order at ¶ 268.

67 *See* DIRECTV and EchoStar, *Ex Parte* Letter to Magalie Roman Salas (Nov. 8, 2000).

regarding interference into the DBS downlink band were explicitly premised on a determination of the level of performance and quality of service to be achieved by DBS operators, and a corresponding determination of the decrease in performance and service quality that can be tolerated. Those efforts culminated in a 10% cap on the increase in DBS signal unavailability resulting from the aggregate interference to which DBS providers and subscribers can be subjected.[68]

In the context of assuming that NGSO FSS operators would be the sole interference source, the amount of degradation attributable to a single system was determined at the ITU to be 2.86%.[69] This same threshold is and should be applicable to an MVDDS operator at 12 GHz to ensure that there is no additional interference with DBS operations.

Accordingly, the Commission should add two columns of additional information to MITRE's Table 5-2: one column to show the C/I required to cause an increase in unavailability of no more than 2.86%, and another column providing C/I values for Quasi-error free (QEF) DBS operation, for 2.86% increase in unavailability,[70] as follows:

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68 *Id.*; *see* 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 (Jan. 27, 2000)" ("DIRECTV January 2000 Ex Parte"), at 31-33.

69 *See* DIRECTV January 2000 Ex Parte at 33.

70 The C/I values necessary to cause an increase in unavailability of no more than 2.86% were determined graphically from Figure 5-2 of the MITRE report. The C/I values for QEF operation were obtained by simply adding 1.1 dB to the VQ6 value, as shown in Table 3-6 of the MITRE report. *See* MITRE Report at 3-18. On this latter point, DIRECTV understands why MITRE chose VQ6 as an A/V quality level, given its "repeatability and the reduction of time in test execution that it offered." MITRE Report at A-8, § A.4.4. However, DIRECTV believes that Quasi-Error Free ("QEF") operation remains the appropriate A/V quality level for BSS systems. Significantly, MITRE does not disagree, and does not advocate the VO6 level "as either acceptable or unacceptable

Location	Minimum $[CI_{MV}]_0$ (dB) VQ6 $V \leq 10\%$	Minimum $[CI_{MV}]_0$ (dB) VQ6 $V \leq 2.86\%$	Minimum $[CI_{MV}]_0$ (dB) QEF $V \leq 2.86\%$
Boston, MA	23.8	29.1	30.2
Chicago, IL	23.7	29.1	30.2
Denver, CO	27.3	33.0	34.1
Fargo, ND	25.7	31.2	32.3
Houston, TX	22.4	27.7	28.8
Los Angeles, CA	22.1	27.4	28.5
Miami, FL	21.9	27.2	28.3
Phoenix, AZ	21.6	27.0	28.1
Seattle, WA	25.5	31.0	32.1
Washington, DC	22.9	28.1	29.2

It is obvious from the table above that the 20 dB C/I ratio that has on occasion been advocated by Northpoint is not even adequate to limit the increase in DBS unavailability to 10% at VQ6, let alone 2.86% at QEF. This is true for every city tested by MITRE. It is also interesting to note here that Northpoint originally touted much lower C/I ratios as sufficient to protect the DBS service. Northpoint has stated, for example, that "C/I ratio contours of 4.8 and 6 dB . . . . were determined as acceptable protection levels by the tests conducted at Kingsville."[71] It should be

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to the consumer. Rather it is a convenient point to identify in a short range between perfect quality and loss of lock in the vicinity of the mean of that range." *Id.*

71 Delawder Communications, Inc., "Engineering Report" (June 26, 1998).

readily apparent by now that Northpoint has an inadequate understanding as to what C/I ratios are required to protect DBS.

C. MITRE Overlooks the Fact That A Secondary Service Cannot Jeopardize Any Level Of DBS Link Unavailability

The MITRE Report asks rhetorically (i) whether DBS satellites with weak coverage should be protected, and (ii) if so, how weak can the coverage of these satellites be, and at what level should they be protected. In answer, MITRE recommends that only DBS satellites with baseline unavailabilities of 100 hours/year or less, when operating without MVDDS interference into a DBS antenna with a G/T of 11.2 dB/K, should be protected.[72]

DIRECTV objects to this assertion to the extent that it suggests that a secondary service such as proposed MVDDS could or should ever be permitted to degrade the operations of primary DBS service, even in scenarios where DBS coverage is weak. No aspect of primary DBS operations should suffer harmful interference due to the introduction of proposed MVDDS services.

V. MITRE's DISCUSSION OF MVDDS MITIGATION OPTIONS HIGHLIGHTS THE FACT THAT MVDDS/DBS BAND SHARING IS NOT FEASIBLE

DIRECTV categorically rejects any suggestion by MITRE that mitigation of MVDDS interference might be pursued at a DBS customer's premises, or more broadly, that suitable

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[72] MITRE Report at xx, 6-7.

mitigation methods of mitigating proposed MVDDS system interference are even feasible at 12 GHz. Importantly, the MITRE Report has concluded that, given the "significant interference" that will be generated by a proposed MVDDS system at 12 GHz, "MVDDS/DBS bandsharing appears feasible *if and only* if suitable mitigation measures are applied."[73]

As discussed below, DIRECTV does not believe, that, in the final analysis, "suitable" measures to mitigate potential MVDDS system interference can be legally, practically or economically applied. And this means, therefore, that MVDDS/DBS bandsharing is *not* feasible.

In this regard, DIRECTV has reviewed in detail the discussion of mitigation measures provided in the MITRE Report, which are broken down into three categories: (i) the use of possible MVDDS operational parameters, (ii) possible system design changes, and (iii) corrective measures at DBS receiver locations.[74] To the extent that the Commission were to proceed some day with the licensing of MVDDS systems, DIRECTV generally agrees that most of the mitigation measures proffered by MITRE in the first two categories should be considered, but these techniques must each be fully proven before being implemented. These include:

- keeping MVDDS transmitter power as low as possible;
- using a 7 MHz offset between MVDDS and DBS carriers;
- increasing MVDDS transmitting antenna height;
- pointing MVDDS transmitting antennas away from DBS satellites (rather than toward them, as proposed by Northpoint);

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73 *Id.* at xvii, 6-1.

74 *Id.* at xvii-xix, 6-1-6-5.

- using real-time power control to reduce MVDDS transmitter power as necessary to protect DBS downlinks during rain;
- using circularly polarized MVDDS antennas; and
- using larger MVDDS receiving antennas.

However, DIRECTV is extremely skeptical that most of these techniques can be practically deployed.

The most obvious example is MITRE's recommendation of raising the height of Northpoint's proposed thousands of transmitting towers to anywhere from 100 to 200 meters above the level of surrounding DBS receive antennas.[75] DIRECTV agrees that this suggestion is a technically sound one, but notes that New York's Trump Tower is 202 meters tall – the point being that this method of mitigation will prove highly problematic in the real world.

Similarly, DIRECTV is skeptical that real-time power control could be a realistic or practical method of mitigation. Indeed, this skepticism seems to be shared by MITRE:

> *Real-time power control*, which would reduce MVDDS transmit power as necessary to protect DBS downlinks from degradation during rain, has sometimes been proposed as a technique for controlling MVDDS-to-DBS interference. However, this might require an elaborate monitoring system. Worse, it would inevitably degrade MVDDS operation at the very times when it might be needed most (*i.e.*, when DBS downlinks were shut down by heavy rain).[76]

In sum, if a terrestrial MVDDS is to be created at 12 GHz, mitigation techniques must be confined to operational and MVDDS system design measures, understanding that what is known

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75 *See id.* at xvii.

76 *Id.* at 6-3 (emphasis in original).

and what has been proposed to date regarding such measures casts much doubt on their ultimate efficacy in reducing harmful MVDDS interference. Clearly, much more experimentation and study would need to be done in order for the Commission to conclude that such mitigation techniques could possibly reduce "significant" MVDDS interference into DBS systems to the point where sharing at 12 GHz could be characterized as feasible.

What *cannot* be permitted is any type of mitigation at a DBS subscriber's premises. The suggestions that a DBS customer must swap out his or her 18-inch DBS antenna for a larger or inferior planar one; use unattractive and unwieldy clip-on shielding; replace his or her set-top box; or be forced to relocate their DBS receive antennas are non-starters. The success of DBS in the United States has been directly related to the consumer-friendly nature of the service, including small, unobtrusive 18-dish antennas and an installation procedure in which every effort is made to keep the process as simple and as problem free as possible. Adding the burden of DBS customer site visits to ascertain interference levels, then the additional site visits by equipment installers to move, modify or replace DBS equipment, and the re-wiring of DBS signal feeds for hundreds of thousands of current and future DBS customers is an intolerable condition for DBS operators and their subscribers. The measures proposed at the DBS customer's premises vitiate the very consumer and competitive benefits that the Commission has attempted to promote with respect to DBS service.

Furthermore, mitigation at a DBS customer's premises to accommodate a secondary MVDDS service, which by definition would be obligated *not* to harm subscribers' receipt of the primary service, cannot be legally required. DBS subscribers in many instances already must use careful placement of their receive antennas to ensure a clear line of sight to DBS satellites – given

the presence of foliage or other natural or man-made obstructions and the location of the satellites, there is often only a single spot that permits a good DBS signal to be received. Adding another parameter to the placement process in order to avoid harmful MVDDS interference will necessarily mean that a certain percentage of DBS subscribers must choose between tolerating harmful interference into their DBS service or receiving no DBS service at all.

DBS customers, as primary service subscribers, should not be put to this choice. The same is true of being forced to use clip-on shielding or larger dishes. To the extent possible, the Commission should attempt to preserve the DBS service that the agency has aggressively promoted – an easy-to-use, high quality service for the reception of video, audio and data programming. Introducing massive complications at the DBS subscriber's premises to accommodate a secondary terrestrial service will have a chilling effect on the sale of DBS services that will not serve the interests of the public or of MVPD competition.

The MITRE report recognizes that, ultimately, the Commission must perform the tradeoff between the "significant" interference generated by a proposed Northpoint MVDDS system and the cost and effectiveness of any mitigation measures required to reduce such interference to an acceptable level:

> The question remains: Do the potential costs of applying the necessary mitigatory measures, together with the impact of the residual MVDDS-to-DBS interference that might remain after applying such measures, outweigh the benefits that would accrue from allowing MVDDS to coexist with DBS in this band?"[77]

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[77] MITRE Report at 6-1.

Even if the full panoply of mitigation measures mentioned by MITRE were adopted by the Commission (which, as discussed, will not be possible for a variety of reasons), MITRE notes that "residual" MVDDS interference will still be present. Based upon the evidence to date, DIRECTV believes that a thorough evaluation by the Commission of the cost, complexity, practicality and ultimate efficacy of the mitigation measures mentioned in the MITRE Report will require the sharing question to be answered in the negative.

VI. THE MITRE REPORT SUGGESTS ADDITIONAL AREAS THAT SHOULD BE STUDIED BEFORE THERE IS FURTHER CONSIDERATION OF AUTHORIZING MVDDS OPERATIONS AT 12 GHz

The MITRE Report highlights the need to undertake additional inquiry into several topics that can or should significantly affect the Commission's analysis of proposed MVDDS/DBS sharing issues. Several of these topics are mentioned below.

A. The Commission Must Consider The Effects Of Combining NGSO FSS System Interference With Proposed MVDDS System Interference

DIRECTV has previously pointed out that the sharing of spectrum the Commission seeks to accomplish at 12 GHz between DBS systems, new NGSO FSS satellite systems, and proposed terrestrial MVDDS systems, all of which will be ubiquitously deployed throughout the country, is wholly unprecedented and utterly inconsistent with the Commission's analyses of analogous terrestrial/satellite sharing issues in other services. As mentioned, MITRE did not consider NGSO sharing issues because its charter was specifically focused on proposed MVDDS/BSS sharing.

The Commission cannot separately compartmentalize the exploration of NGSO FSS/DBS sharing questions and proposed MVDDS/DBS sharing questions. Interactions between the DBS

service and these two proposed services, and the combined interference effects, should be fully studied before the Commission proceeds with the creation of MVDDS at 12 GHz.

B. Other Causes Of Unavailability Should Be Examined And Incorporated Into The Interference Analysis

If MVDDS/DBS sharing is to be considered, MITRE has recommended that "other causes of unavailability" also should be taken into account.[78] While the primary additional cause of unavailability at 12 GHz will be the introduction of NGSO FSS systems into the band, MITRE notes that "other sources of outage should be considered [in the total interference budget] if they are significant and if their effect is known and documented," and that sun outages are an example.[79] Before MVDDS operations are introduced at 12 GHz, the Commission should systematically study and understand the impact on DBS performance of other significant causes of unavailability at 12 GHz, including the impact on DBS performance during solar transit events.

C. The Commission Must Perform Further Study of Interference Issues Relating to Actual MVDDS System Deployments, Including: Multipath Effects; Rain Scattering and Diffraction Effects; Multiple Transmitter Configurations and Transmitter Spacing

None of these effects has yet been studied, either by the Commission or by MITRE, and all can greatly exacerbate the effects of proposed MVDDS system interference. For example, DIRECTV has repeatedly pointed out that interfering MVDDS signal levels can grow to levels up to four times their nominal levels due to the effects of multipath.[80] Such effects must be studied, understood and accounted for before MVDDS is introduced at 12 GHz.

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78 MITRE Report at xx, 6-7.

79 *Id.*

80 *See, e.g.*, Reply Comments of DIRECTV, Inc., ET Docket No. 98-206 (Apr. 14, 1999), at 25.

D. More Analysis Must Be Conducted On The Scope Of DBS System Operations That Must Be Protected

MITRE's testing concentrated on evaluating the interference potential of proposed MVDDS systems on certain DBS operating modes, satellites and locations. This was necessary and useful in order to provide some kind of meaningful representation of the interference environment and the resulting impact on modern DBS systems within the timeframe of the test. The DBS operators provided much of the DBS equipment tested. However, many of the different DBS operating modes, satellites, receive antennas and equipment were either not tested or evaluated because, for example, some modes are not currently being transmitted, or satellites have not yet been launched.

It is very important for the Commission to protect all valid operating modes in which a DBS operator can operate, and DBS providers are entitled to such protection as primary service providers. Both DBS receive equipment and DBS satellites have a range of configurations that allow for a very powerful and flexible system. Configurations can and are changed to accommodate system growth (increase capacity), improve availability performance, provide critical back-up modes for on-orbit failures, and the like.

DIRECTV has proposed that all of these various configurations be represented by link budgets that would be used in the process of developing the specific interference epfd limits that need to be met at each MVDDS site. The list below, although not exhaustive, provides examples of the various modes in which the components of the DBS system can operate:

Spacecraft Location in Geosynchronous Orbit

Spacecraft Configuration

- Low and high power settings on transmitters

- CONUS or spot beam antenna coverage patterns

Communications Link Configuration

- Modulation type (such as QPSK or 8PSK)
- Type and puncture rate of the inner FEC code (2/3, 3/4, 6/7, 7/8 and so on)
- Type and error correction capability of the outer FEC code (*e.g.*, Reed Solomon error correction code parameters)

DBS Receiver Configuration

- Type of receive antenna (for example, 45 cm "classic," multiple satellite antennas, larger antennas for MDU or fringe area reception)

As requested by DIRECTV, each DBS operator must have the opportunity to provide a set of link budgets and other related parameters that represent the realistic and possible configurations of at least the elements described above.

VII. CONCLUSION

DIRECTV has requested that the First Report and Order be reconsidered with respect to its conclusion that spectrum sharing between proposed MVDDS systems and DBS systems at 12 GHz is feasible. The MITRE Report provides dramatic additional support for DIRECTV's reconsideration request.

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Dated: May 15, 2001

CERTIFICATE OF SERVICE

I hereby certify that this 15th day of May 2001, a true and correct copy of the foregoing was served via hand delivery upon the following:

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