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February 3, 2000

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FEDERAL COMMUNICATIONS COMMISSION
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VIA HAND DELIVERY

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

Re: ***Ex Parte* / Late-Filed Comments of Pegasus Communications Corporation**
ET Docket No. 98-206, RM-9147, RM-9245

Dear Ms. Salas:

Pursuant to 47 CFR § 1.1206 of the Commission's rules, Northpoint Technology, Ltd. and BroadwaveUSA, Inc. (collectively, "Northpoint") submit six copies of the attached "Technical Response to Comments of Pegasus Communications Corp." for filing in the above-referenced proceedings.

On December 30, 1999, Pegasus Communications Corporation ("Pegasus") filed comments which alleged that certain testing procedures employed by Northpoint in the Washington, D.C. area last year were invalid and that Northpoint's system would cause unacceptable interference to direct broadcast satellite ("DBS") reception. The Technical Response attached hereto refutes the arguments made by Pegasus and demonstrates specifically that:

(1) Pegasus' comments were rife with errors and inaccuracies regarding Northpoint's technology;

(2) Northpoint's testing methodology was sound and its results were valid;

0+6

(3) the choice of sites and antenna positioning that Northpoint used were appropriate for the provision of Northpoint's service without causing interference to DBS reception;

(4) Northpoint's testing was conducted under real-world conditions;

(5) there is no evidence that multipath reflections of Northpoint signals would interfere with DBS;

(6) notwithstanding Pegasus' hypotheticals that purport to show otherwise, Northpoint's technology can share spectrum with DBS; and

(7) Northpoint's interference mitigation techniques are effective and practical.

If you have any questions concerning this matter, kindly contact the undersigned.

Respectfully submitted,

Antoinette Cook Bush
Counsel for Northpoint Technology, Ltd.

Enclosure

cc: Julius Knapp
James Burtle
Tom Stanley
Bob Calaff
Harry Ng
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Bruce D. Jacobs

Technical Response

to

Comments of Pegasus Communications Corp.

February 2, 2000

Broadwave USA
Northpoint Technology, Ltd.

Introduction

On December 30, 1999, Pegasus Communications Corporation ("Pegasus") filed Comments in ET Docket 98-206 (the "Pegasus Filing"). In its filing, Pegasus made certain erroneous claims with regard to the capabilities of the terrestrial system being developed by Northpoint Technology, Ltd. and Diversified Communications Engineering, Inc. for implementation by Broadwave USA (collectively "Northpoint"). Northpoint herein responds to the errors contained in the Pegasus Filing.

Notwithstanding allegations made in the Pegasus Filing, Northpoint's exhaustive testing of its technology was validly conducted and without flaw; Northpoint's technology will not cause harmful interference to "millions of consumers" who are direct broadcast satellite ("DBS") subscribers; and Northpoint's proposed mitigation techniques are viable and practical.

Northpoint's Testing Was Not Flawed

Pegasus erroneously argued that Northpoint's testing methods were flawed, that more sensitive methods are required to reveal the presence of harmful interference to DBS reception, that the transmitter locations used for testing were atypical, that Northpoint test receivers should be unshielded and deployed in sufficient numbers near to the transmitters, and that the possible effects of multipathing should be accounted for.

Pegasus claims that Northpoint's measurement techniques were not sensitive enough, that measurement of carrier to noise ("C/N") to within 0.04 dB is required.[1] Northpoint did, in fact, use a professional demodulator that sampled the DBS signal every 10 seconds at an accuracy of within 0.01 dB.[2] These individual samples, however, are not useful by themselves to form the basis of any conclusions due to the variation in DBS signal strength caused by satellite EIRP variations or even partly cloudy conditions (see Figure 1 below for an example). These variations are more than an order of magnitude (0.5 – 1.0 dB) greater than the degree of fidelity proposed by Pegasus.[3] This data can only be considered when it is part of a set of sufficient size to attain statistical validity.

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1 Pegasus Filing at 10.

2 *See* Experimental Progress Report for WA2XMY, Diversified Communications Engineering, Inc., October, 1999 ("Washington Progress Report"). The professional demodulator records DBS signal level, Eb/No, link margin to within 0.01 dB. It also records the symbol error rate, bit error rate (BER), internal temperature and other variables.

3 This phenomenon is easily observed with the signal strength pointer (SSP) in each DBS receiver. *See* Washington Progress Report at 8-11, and Table III-10 in Appendix III thereto.

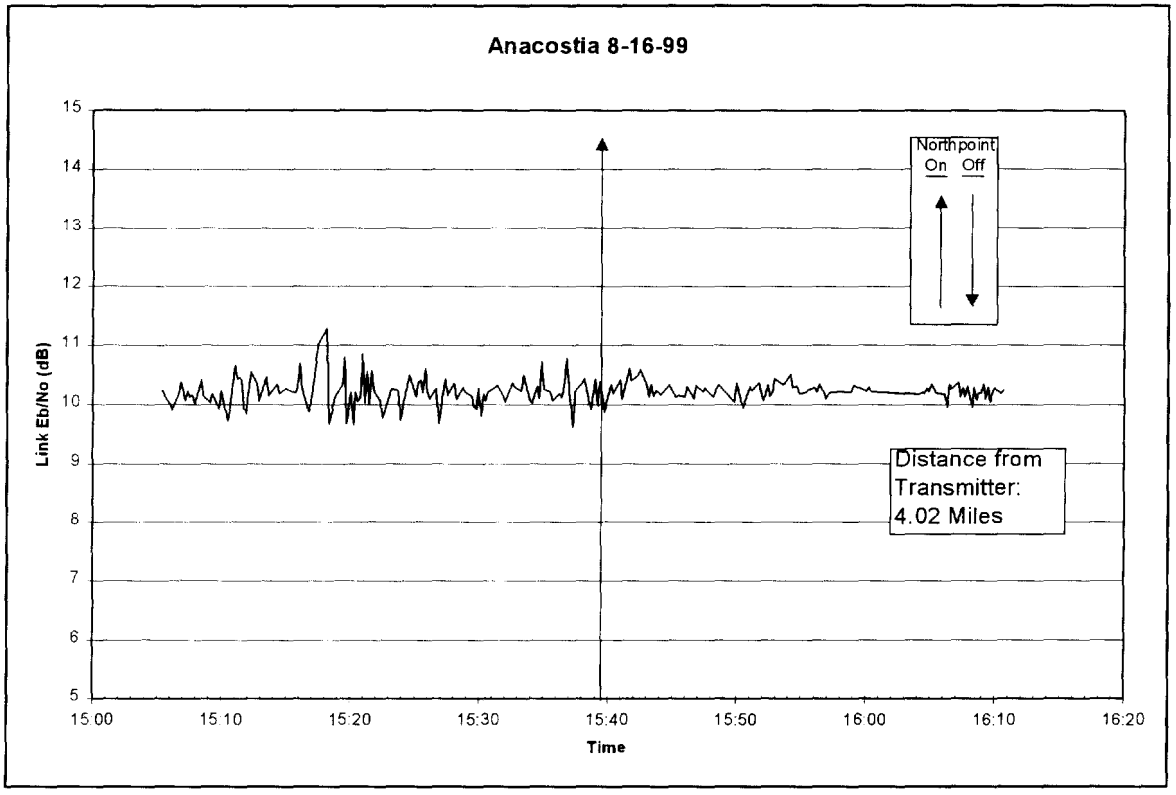

Figure 1. Professional demodulator reading taken during the Washington, D.C. test and demonstration.

Pegasus claims that Northpoint's transmitter for the Washington test was 150 meters high and that this height is unrepresentative of the sites Northpoint would construct in actual service.[4] However, in the Washington, D.C. testing, Northpoint was also transmitting from a location in the neighborhood of Ft. Lincoln, where the transmit antenna was only 40 meters above average terrain and was located in a densely inhabited residential area. Northpoint's technology does not require 150 meters of antenna altitude, only that the transmit antenna be sufficiently separated from inhabited areas or the power level maintained at a level sufficiently low to avoid harmful interference to DBS services.

Pegasus criticized the fact that the Northpoint antenna on the USA Today Building in Rosslyn was mounted on the side of the building, thereby achieving what it called favorable sidelobe and backlobe patterns.[5] Northpoint transmit antennas

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4 Pegasus Filing at 10.

5 Pegasus Filing at 11.

already have favorable sidelobe patterns, however.[6] The antenna at the USA Today site was mounted on the side of the building to avoid interference with the DBS receive antennas on the roof of the same building. The antenna at the Ft. Lincoln site was mounted on the top of a building and no harmful interference was experienced from this transmitter either. Finally, the Northpoint signal power measurements in the Washington test were in agreement with power level predictions based on free-space loss and the antenna pattern.

Pegasus argues that "Northpoint must make sure that the subject DBS receivers are unshielded and deployed in sufficiently large numbers in close proximity to the Northpoint transmitter under typical real-world conditions."[7] Northpoint conducted all of its testing under these conditions. DBS receivers used in the Washington test were unshielded. Figure 15 of the Washington Progress Report clearly shows that the measured Northpoint signal strength was in agreement with the free-space propagation predictions for each site. All but 11 sites measured in the Washington test were within close proximity (within one mile) of a Northpoint transmitter or repeater.[8] In an earlier test conducted in Austin, Texas, 18 of 29 sites were within one mile of the transmitter.[9] A report filed with the Commission by Lucent Technologies also verifies that Northpoint's testing was conducted under real-world conditions.[10]

Pegasus also argues that a substantial percentage of DBS receivers lack the type of shielding that Northpoint cited in its Washington Progress Report.[11] Although Pegasus cites no authority for this statement, it acknowledges that at least 50% of DBS subscribers will have effective shielding.[12] In fact, a national survey conducted in July shows that 86 percent of DBS dishes would be naturally shielded from Northpoint's signals.[13]

Pegasus alleges that Northpoint does not account for possible interference from reflected Northpoint signals, i.e. multipathing. To the contrary, Northpoint looked for the effects of multipathing at every site but found nothing significant in

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6 *See* Appendix IV, page 4 of the Washington Progress Report for Northpoint antenna patterns, which were developed from laboratory measurements.

7 Pegasus Filing at 12.

8 *See* Pegasus Filing at 4.

9 Austin Progress Report, December 1998, Fig. IV-3: TABLE – "Site Coordinates".

10 Habib Riazi, Lucent Technologies, Bell Labs, "On Northpoint Field Trial in Washington DC Sept - Oct 199" ("Lucent Report"), at 4.

11 Pegasus Filing at 11-12

12 Pegasus Filing at 12.

13 *See*, "Report of National Survey of DBS Satellite Dish Owners," Bennett, Petts & Blumenthal, July 20, 1999, submitted as Appendix IV to the Washington Progress Report.

either the Washington D.C. or the Austin tests.[14] Furthermore, Lucent performed its own independent field assessments of the Washington test and demonstration. Lucent's report states that "there is no evidence. . . to indicate that other propagation phenomena such as diffused and multipath reflections will have an important effect on Northpoint interference into DBS."[15]

Pegasus also alleged that Northpoint's Washington testing actually caused harmful interference but that it could not be detected because the instruments were not sensitive enough.[16] Clearly, interference that is too subtle to be detected is hardly harmful. Either DBS service has been interrupted (or seriously degraded), or it has not, and no special instruments are required to ascertain this fact. Northpoint received no reports of harmful interference by any consumer, even when testing during extreme weather events such as Hurricane Floyd.[17] Moreover, DBS operators EchoStar and DirecTV both made measurements during Northpoint testing. EchoStar alleged that harmful interference had occurred at one particular location. In response, the FCC field office investigated this allegation and did not require Northpoint to cease testing due to harmful interference.[18] Pegasus now, from afar and after the fact, cannot make a credible finding of harmful interference.

Pegasus' Hypothetical Cases Are Not Representative of Northpoint Installations

Notwithstanding that hypothetical cases may have little bearing on reality, Northpoint has successfully met the burden of showing that harmful interference from the use of its technology can be avoided. Pegasus presented three hypothetical cases that allegedly demonstrate that, without proper separation or isolation, interference could occur. It is well known that satellite-terrestrial sharing is difficult. Indeed, no one had presented a methodology to make it work before Northpoint. Thus, it is not useful to enumerate all the ways in which satellite and terrestrial sharing does not work and suggest that they are typical of the Northpoint system. They are not.

In one hypothetical example, Pegasus contended that a DBS customer in the shadow of a Northpoint transmitter would suffer harmful interference because the

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14 See Washington Progress Report, section 3(f) beginning on page 24, and also Austin Progress Report, at 23-25.

15 Lucent Report at 14 (stating that this conclusion results because the sites under consideration had profoundly different characteristics with respect to their immediate surroundings yet the analysis result did not indicate any difference with regard to such propagation phenomena).

16 Pegasus Filing at i.

17 Washington Progress Report at 19-22.

18 *See* FCC Compliance and Information Bureau Report, October 6, 1999, attached as Exhibit A.

customer's antenna would point at or near the Northpoint transmitter.[19] Pegasus' analysis on this point is faulty for several reasons. First, an antenna height of 150 meters, not 100 meters, would be required for the 38 degree elevation cited in this hypothetical example. Second, although 21 dB of vertical transmitter isolation was accounted for, over 40 dB of azimuth (horizontal) transmit isolation (and probably 3 dB of polarization isolation) was ignored. Even if the transmit isolation were properly accounted for (which it was not) a DBS dish would need to point within 1-2 degrees of the Northpoint antenna in order to have a main beam coupling with it. This could only occur if the DBS receiver were in an oval area on the ground with a radius of about 40 feet. Clearly, there could not exist a "substantial population" in such an area, and the likelihood of even one DBS customer being in such an area is quite low.[20]

Interference Mitigation Is Part of the Northpoint Design

Pegasus argues that the modification of DBS user equipment (relocating, repositioning, or upgrading DBS antennas) is impractical and unrealistic, and that DBS customers would be inconvenienced by the changes, by having Northpoint personnel climb on roofs, drill holes in houses, and run new wire through homes.[21] No such work was needed to avoid all harmful interference during the Washington experiment. In the very unlikely event that such modifications would be needed, they would not be anywhere near as inconvenient as Pegasus fears. DBS operators advise their customers that they may need to relocate their DBS antennas, and cite interference from radar detectors as the reason for doing so.[22] By claiming that "millions" of DBS customers would be inconvenienced, Pegasus overestimates by many orders of magnitude the potential for problems.

Pegasus argues that Northpoint would burden DBS customers with identifying the source of any problem caused by Northpoint. However, DBS operators maintain 24-hour customer contact centers for resolving problems. Northpoint would provide these centers with access to databases of Northpoint transmitters, enabling DBS centers to identify the source of any problems, as opposed to the customers themselves.

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19 Pegasus Filing at 14.

20 *See* Pegasus Filing at ii (citing a "substantial population" of DBS subscribers that would be affected).

21 Pegasus Filing at ii.

22 *See* EchoStar "Dish 500 Installation Instructions," at 6, attached as Exhibit B.

Finally, Pegasus argues that Northpoint, as a competitor to DBS, would have no incentive to cooperate with DBS operators to minimize interference problems.[23] As a secondary user, Northpoint will have an affirmative obligation to not cause harmful interference. Northpoint understands and accepts this responsibility and is well aware that the Commission is capable of enforcing its rules.

Summary

In summary, the Pegasus Filing is in error in several important respects. Pegasus' assertions regarding Northpoint testing are unsupported and refuted by the reported test results. The hypothetical cases that Pegasus presents serve only to identify situations that Northpoint would not include in its design. Finally, Pegasus' doubts about Northpoint interference mitigation are unfounded and its concerns of interference are greatly exaggerated.

Attachment 1 hereto enumerates specific errors and inaccuracies within the Pegasus Filing.

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[23] Pegasus Filing at 16-17.

Attachment 1

Errors and inaccuracies in the Pegasus Filing, with cites to pages therein.

1. All but 11 sites "within one mile of the Rosslyn transmitter" Page 4. This ignores the Ft. Lincoln transmitter. Six of the test sites were within one mile of the Ft. Lincoln repeater, twelve within one mile of the USA Today building, and eleven were more than a mile from either transmitter.

2. Reference to the 36-51 GHz proceeding. Page 6. Northpoint's technology was not considered in the 36-51 GHz proceeding, so a fresh analysis would be required. Moreover, there are obvious propagation differences between the 12 GHz band and the 40 GHz band. Therefore, the conclusions about sharing in the 40 GHz band cannot be applied to a different frequency band.

3. "Northpoint's system must show that its operations would result in a DBS carrier-to-interference ratio ("C/I") of greater than 30 dB in every reasonable circumstance." Page 9. Pegasus provides service by reselling the facilities-based services of DirecTV.[1] DirecTV suggests that a 28.6 dB C/I (equivalent to a 2% increase in unavailability) would be acceptable under the most stringent circumstances. Northpoint offers this level of protection to more than 99.5% of DBS customers.[2] Pegasus cannot credibly insist on different standards than those proposed by the underlying provider of its service.

4. "At page 4 of its report, Northpoint states that a C/I of *4.8 dB* or lower from its operations would result in interference to DBS service." Page 9. That reference in the Washington Progress Report should have been qualified to explain that a C/I of 4.8 dB *in clear air* is required.

5. "Northpoint should have measured received carrier levels or used similar methodologies that can accurately measure C/I ratios as high as 25 dB (resulting in no more than 0.04 dB change in Eb/No)." Page 10. Northpoint disagrees with this assessment of required C/I ratio, (see Technical Annex to Reply Comments of Northpoint Technology, April 14, 1999 in ET Docket 98-206, pages 13-18). Nor does Pegasus provide a method for measuring this small a change. At any instant in time, the received signal strength or the Eb/No may vary up to 1.0 dB, due to satellite transmitter fluctuations, clear air turbulence, or partly cloudy conditions alone. In addition to measuring the changes in SSP, Northpoint also used a

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[1] Pegasus Filing at 2.

[2] *See ex parte* presentation of October 22, 1999 to FCC International Bureau staff.

professional demodulator capable of recording received signal level and Eb/No to a fidelity of 0.01 dB.

6. "Northpoint must test the effect of its transmissions ... where the Northpoint transmitter is at a much lower relative height [to 150 meters] and much more likely to be emitting into consumers' DBS terminals." Page 10. Northpoint has already completed such tests. In the Washington, D.C. test and demonstration, a transmitter was located in Ft. Lincoln in a residential neighborhood, and was only 40 meters above the surrounding terrain.[3] Further, the Austin Test and Demonstration transmitter was at a height of 82 meters.[4]

7. "Northpoint's transmitter's antenna pattern must be measured under typical mounting conditions, including worst-case, real-world conditions, so that achievable sidelobe isolation may be determined." Page 11. Northpoint presented antenna patterns in Appendix IV, page 4 of the Progress Report. These patterns are based upon laboratory measurements of the Northpoint antenna. Moreover, the field measurements agree with predicted values, demonstrating that these sidelobes are indeed achievable.[5]

8. In "Pegasus' view, a substantial percentage of all DBS antennas, perhaps as much as 50 percent, may not have effective shielding from the types of terrestrial transmitters being proposed by Northpoint." Pages 11-12. Pegasus presents no evidence to support this opinion. A national survey found that 86% of DBS receive antennas are shielded from Northpoint's proposed signals.

9. "Even if this claim [86% of DBS users are shielded] were accurate (which Pegasus disputes), 14 percent of DBS users would have unshielded antennas, meaning that more than a million subscribers would be highly vulnerable to interference from Northpoint's system." Pages 11-12 fn. Before accounting for natural shielding, Northpoint's technology maintains a C/I ratio of over 30 dB (a level that Pegasus finds acceptable) in more than 95% of its service area.[6] With natural shielding, there will exist a C/I ratio better than 30 dB to more than

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3 *See* Washington Progress Report, Table III-2, page xvii and Figure I-4, page viii.

4 Progress Report, WA2XMY, Northpoint-DBS Compatibility field Tests, Austin, TX, December, 1998. Page 13. "The antenna height was 270 ft. AGL."

5 *See* Washington Progress Report at 25.

6 *See ex parte* presentation of October 22, 1999 to FCC International Bureau staff.

99.5% of the Northpoint service area.[7] If Pegasus' assertion were true, then all of the hypothetical DBS customers would have to live within the 0.5% of the Northpoint service area closest to the Northpoint transmitter, which they do not. Northpoint transmitters will be deployed in sparsely inhabited areas.

10. "Northpoint must make sure that the subject DBS receivers are unshielded, and deployed in sufficiently large numbers in close proximity to the Northpoint transmitter under typical real-world conditions." Page 12. All Northpoint testing has been conducted under these conditions. In the Washington Test, DBS receivers were unshielded. Figure 15 of the Washington Progress Report clearly shows that the measured Northpoint signal strength was in agreement with the free-space propagation predictions at each site. Pegasus is aware that all but 11 sites were within close proximity (within one mile) of a Northpoint transmitter or repeater in the Washington Test.[8] In the Austin Test, 18 of the 29 sites were within one mile of the transmitter.[9]

11. "Northpoint's testing also did not take into account the potential interference effects of reflected Northpoint signals". Page 12. Multipath measurements were made in both the Austin and Washington, D.C. tests, and no significant reflections were found.[10] Moreover, Lucent observed that these were exactly the conditions for which the Washington Test was designed, and successfully implemented.[11]

12. Discussion of power level changes asserting that Northpoint caused the changes described. Page 13, first full paragraph. Northpoint did not and could not cause the power level changes cited by Pegasus. Satellite EIRP fluctuations, clouds or other atmospheric phenomena probably caused the power level changes cited by Pegasus, as discussed above in point number 5. These power levels are measurements of total power in the band, as measured at an instant in time with a spectrum analyzer. The spectrum analyzer measures Carrier plus Noise plus Interference power levels (C+N+I). The spectrum analyzer fidelity is $1/6^{th}$ of a decibel. With C/N of 12 dB, interference at a C/I of 20 dB could only cause a change in total in-band power of 0.04 dB, below the fidelity of the spectrum analyzer. At

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7 *Id.*

8 *See* Pegasus Filing at 4.

9 Austin Progress Report, December, 1998, Figure IV-3: TABLE – "Site Coordinates".

10 *See* Washington Progress Report, Section 3(f), also Austin Progress Report, at 23-25.

11 Lucent Report at 13-14.

the Banniker drive location cited by Pegasus, the total power in-band diminished with Northpoint ON.

13. Three Hypothetical Scenarios. Page 14. Scenarios one and two: Based upon the information given, it is impossible to conclude that any C/I ratio exits, because Pegasus does not provide some of the key assumptions that are required, such as the elevation and azimuth and EIRP of the DBS satellite. Of course, someone can "cook up" a hypothetical situation where interference could occur. This does not mean that such a hypothetical situation will occur in the real world, or that it could not be remedied if it did occur. Scenario three is incorrect in several respects. First, an antenna height of 150 meters is required for the 38 degree elevation cited. Second, 21 dB of vertical transmitter isolation is correct, but Pegasus neglects 44 dB of azimuth (horizontal) isolation and probably 3 dB of polarization isolation as well. Such an area in the shadow of a Northpoint transmitter would be an oval-shaped area approximately 35-40 feet in radius, and it is highly unlikely even one DBS receiver would be in such an area.

CERTIFICATION

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

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

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

Dated: February 2, 2000

Exhibit A

ROUTING AND TRANSMITTAL SLIP Date 10/06/99

TO: *(Name, office symbol, room number, building, Agency/Post)*	*Initials*	*Date*
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2.		
3.		
4.		
5.		

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	As Requested		For Correction		Prepare Reply
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	Comment		Investigate		Signature
	Coordination		Justify		

REMARKS

Attached is CIB's final report regarding the test conducted on Diversified's system.

DO NOT use this form as a RECORD of approvals,concurrences,disposals clearances, and similar actions

FROM: *(Name, org. symbol, Agency/Post)*	Room
George R. Dillon	Phone

5041-102

* U.S. GPO: 1990-261-781

OPTIONAL FORM 41 (Rev. 7-76)
Prescribed by GSA
FPMR (41 CFR) 101-11.206

FEDERAL COMMUNICATIONS COMMISSION

COMPLIANCE AND INFORMATION BUREAU

BACKGROUND

On September 28, 1999, the Compliance and Information Bureau received a request from the Office of Engineering and Technology to investigate an allegation that Diversified Communications Engineering (licensee of experimental station WA2XMY), Northpoint Communications, and Broadwave Communications, hereafter Diversified, was causing harmful interference to the operation of EchoStar and DirectTV.

Harmful interference is defined in the Commission's Rules as interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with the (international) Radio Regulations. 47 C.F.R. § 2.1.

OET noted that Diversified was testing its system in the Washington D.C. area and that DirecTV and EchoStar have alleged that the test is causing harmful interference to their operations. Further, according to OET, DirecTV and EchoStar have submitted test results showing that harmful interference exists. According to OET, Diversified has set up a test at the same site used by DirecTV and EchoStar and they have concluded that no harmful interference exists.

OET stated that a condition attached to the Diversified grant provides that the FCC shall determine if harmful interference exists in the case of a dispute and requested assistance from CIB to resolve the issue.

TEST procedure

On September 29, 1999, George Dillon, James Higgins and James Walker met with Dr. Darrell Word, Saleem Tawil, Sofia Collier, Katherine Reynolds and others representing Diversified.

The test was conducted at a traffic circle at the entrance to West Potomac Park (river side) southwest of intersection of Ohio Drive SW and Independence Ave SW, Washington, DC. The testing took place from approximately 10:00 a.m. to 12:00 noon. The test consisted of turning the Diversified transmitter on and off while observing television monitors tuned to EchoStar's and DirecTV's programming. The location was selected by Diversified and Diversified stated that it was the same location at which EchoStar and Direct TV reported the interference.

Mr. James T. Higgins accompanied Ms. Reynolds to the transmitter site, which was located on the rooftop of the USA Today building in Rosslyn, VA. Also at the transmitter was operator Floyd Nelson.

Mr. Dillon and Mr. Walker observed Diversified's monitors at Potomac Park. Diversified's transmitter was switched on and off while observations were made at the Potomac Park receive site of; a receiver "s-meter"; and of the TV picture.

Power levels at the transmitter during this testing were observed to be in the range (-0.5 dBm to -1.61 dBm), as indicated by a Hewlett Packard Power meter connected to the drop side of a directional coupler at the output of the transmitter. The transmitter operator in most cases adjusted levels to keep them nominally around -1.1 to -1.3 dBm range. Mr. Tawil stated that a reading of –1.5 dBm at the drop side of the directional coupler corresponds to an effective radiated power of +12.5 dBm. Testing was conducted on 12.47 GHz, then repeated on 12.4135 GHz. According to Mr. Tawil, the modulating signal was digital video with a 24 MHz bandwidth.

The results of the "s-meter" observations are shown in the following tables. Table 1 shows the predominant "s-meter" readings. Table 2 shows the number of samples, the average value of the samples and the standard deviation of the samples. We recognize that the sample size is small.

Table 1.

Diversified transmitter	EchoStar 61.5° (transponder 18)	EchoStar 61.5° (transponder 14)	EchoStar 119° (transponder 18)	Direct TV 101° (transponder 18)
	"s-meter" readings	"s-meter" readings	"s-meter" readings	"s-meter" readings
off	91 to 92	89 to 90	86 to 87	84 to 87
on	87 to 88	87 to 89	86 to 87	83 to 87.

Table 2

EchoStar 119 Transponder 18 channel 171		Echostar 61.5 Transponder 14 Channel 218		DirecTV Transponder 18 Channel 371	
Average "s-meter" reading when Diversified transmitter was on. Ten samples.	86.30	Average "s-meter" reading when Diversified transmitter was on. Twenty-nine samples.	88.34	Average "s-meter" reading when Diversified transmitter was on. Fifteen samples.	84.47
Average "s-meter" reading when Diversified transmitter was off. Fourteen samples.	86.21	Average "s-meter" reading when Diversified transmitter was off. Twenty-nine samples.	89.52	Average "s-meter" readings when Diversified transmitter was off. Twenty-five samples.	84.88
Standard deviation of "s-meter" readings when Diversified transmitter was on	0.48	Standard deviation of "s-meter" readings when Diversified transmitter was on.	0.86	Standard deviation of "s-meter" readings when Diversified transmitter was on.	1.92
Standard deviation of "s-meter" readings when Diversified transmitter was off	0.43	Standard deviation of "s-meter" readings when Diversified transmitter was off.	0.83	Standard deviation of "s-meter" readings when Diversified transmitter was off.	1.67

Test Results.

Diversified contends that the receiver "s-meter" is a relative indication of the signal or carrier to noise ratio and ranges from "0" to "100", "100" being the most desirable. We do not know what the variation in "s-meter" readings is between different receivers. We do know, however, that for the values of "s-meter" reading that we observed that we had a very good TV picture, TASO Grade 5.

Observations of TV programming showed no detectable degradation of the picture on EchoStar 119° channel 171 or Direct TV channel 317 when Diversified turned its transmitter on. As programming was not accessible on any EchoStar 61.5° channel operating on transponder 18, the tests were repeated on transponder 14 (channel 218) and again no degradation of the picture was noted.

We did not observe any harmful interference as defined in § 2.1 during this testing.

Exhibit B

Dish 500 Installation Instructions

INTRODUCTION

These *Instructions* provide procedures for installing the Dish 500 satellite dish, a single dish aimed at the two satellites at 110° West Longitude (W. L.) and 119° West Longitude (W. L.).

ATTENTION!

Exceptions:

- *Alternate procedures* apply to some satellite receivers: Model 1000s, Model 2000s, Model 3000s, and Model 4000s. If you have one of these receivers, please see *Appendix A*.
- If you are *replacing* an existing satellite dish or multi-dish system with a Dish 500, please see *Appendix B*.
- If your receiver initially does not display the *required menu options*, please see *Appendix C*.

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WARNING VS. ATTENTION

You must be aware of certain safety issues during installation and use of this system. These *Instructions* provide various procedures and instructions. Some of these procedures could result in injury or property damage if they are improperly performed. Other procedures require additional attention.

In these *Instructions*, the following notes tell you when you need to pay attention to a safety or operational issue.

WARNING!	Designates a potential situation where the following may happen: ◆ Personal injury or death may occur. ◆ Equipment or property may be damaged.
ATTENTION!	Designates the following operational issues: ◆ Important operation or maintenance instructions follow. ◆ Additional attention is required.

FOR YOUR SAFETY

WARNING!	◆ Do not attempt to open the case of the receiver. There is risk of electrical shock, which may result in damage to the equipment and/or personal injury or death to you. There are no user-serviceable parts inside the receiver. Opening the receiver case or unauthorized modification will void the warranty.
WARNING!	◆ Do not use or install this receiver near water or in very moist conditions. The receiver may be damaged, and electrical shock or fire could occur.

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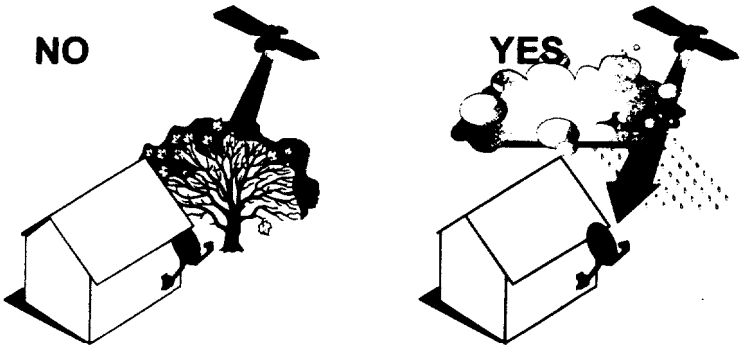

6. If necessary, repeat steps 1 through 5 until you have found the best location for the satellite dish. Mark the spot and the direction to the satellites.

MOUNTING THE SATELLITE DISH

MOUNTING LOCATIONS

When you survey your property for appropriate locations for the satellite dish, keep in mind that you can mount the satellite dish in a variety of ways: on brick, on solid siding, on wood, on a roof, or on a metal pole. Because installing the satellite dish may involve drilling into the wall or roof of your building, or digging a hole and using cement, you should be *very* confident of the location before beginning installation. Errors can be expensive and time-consuming.

CONSIDERATIONS FOR SIGNAL INTERFERENCE

The satellite dish can withstand most kinds of weather. However, extremely strong winds could damage the surface where the satellite dish is mounted. A strong wind can cause the satellite dish to exert several hundred pounds of pressure on the mounting surface, so the surface *must* be stable and strong. Such a mounting surface also helps ensure against movement of the satellite dish, which would interrupt signal reception.

In general, the stronger the signal you maintain, the better your chance of uninterrupted reception during periods of snow, rain, and heavy cloud cover. If you live in an area where snowfall is heavy you should mount the satellite dish in a place where you can reach it easily to remove snow or ice, because snow or ice could also cause signal loss.

Some radar detectors emit a signal strong enough to cause interference with satellite reception. If radar detectors are used nearby, see if they can be removed or turned off. If not, try locating the dish so as to use the house to block the radar detector.