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

In the Matter of	)	
	)	
Proposals to Permit Reducing	)	
Orbital Spacings Between	)	Report No. SPB-196
U.S. Direct Broadcast Satellites	)	

REPLY COMMENTS OF NEW SKIES SATELLITES N.V.

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SUMMARY

In addressing DBS orbital spacing, the Commission should seek to promote increased competition and innovative offerings for American consumers in the multi-channel video programming distribution ("MVPD") marketplace. To this end, the Commission should facilitate the entry of additional facilities-based DBS providers that can offer robust consumer services to all of the United States, including Alaska and Hawaii, while ensuring that existing DBS systems can remain competitive with cable operators.

In order to be competitive, independent DBS operators at new orbital locations must be able to provide consumer services similar to those provided by incumbent operators to standard 45 centimeter (cm) antennas. Such capability requires the development of operating environments for new entrants that are comparable to those enjoyed by incumbents.

In their filings, DirecTV and EchoStar have both set forth approaches for DBS reduced orbital spacing that promote the interests of incumbents and preclude the development of independent DBS competitors. Under either approach, the new satellites would effectively constitute a second, subordinate class of "tweener" space stations that, standing alone, could not be used to provide competitive DBS services to 45 cm antennas.

In contrast, with the flexibility to deploy satellites 6° from existing DBS systems, new entrants could develop competitive, independent DBS systems to serve American consumers with commercially available 45 cm dishes. The ITU coordination procedure would enable new 6°-spaced satellites to operate without causing interference to DBS incumbents, and, in particular, incumbents could use this coordination process to preserve their ability to deploy spot beams at their existing orbital locations. With the flexibility to operate with 6° separation, New Skies believes that a competitive facilities-based DBS service to the United States, including Alaska and Hawaii, could be provided from the Netherlands' orbital location at 125° W.L.

To promote additional, independent facilities-based DBS service in the United States, the Commission should continue to rely on the ITU coordination procedure, which provides a flexible, case-by-case coordination framework that ensures mutually agreeable technical solutions, permits a diversity of business plans for new entrants, protects existing systems, and maximizes benefits for American consumers. If it does initiate a rulemaking, the Commission should take advantage of its ability to treat different parts of the DBS orbital arc differently. Specifically, any such proceeding should not address orbital spacing outside the 101°-119° W.L. arc.

Finally, there is no need for the Commission to revisit its *DISCO II* procedures regarding access to the U.S. market by non-U.S. licensed satellite systems. The Commission's policies and procedures for access to the U.S. market by non-U.S. licensed satellite systems are well-established, and are working well in the Direct-to-Home ("DTH") and DBS context.

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New Skies Satellites N.V. ("New Skies") hereby replies to comments on the above-captioned public notice regarding proposals to permit reduced orbital spacings between U.S. Direct Broadcast Satellites ("DBS").[1] New Skies agrees with many other commenters who argue that the Commission, in addressing DBS orbital spacing, should seek to promote increased competition and innovative offerings for American consumers in the multi-channel video programming distribution ("MVPD") marketplace. Specifically, the Commission should facilitate the entry of additional facilities-based DBS providers that can offer robust consumer services to all of the United States, including Alaska and Hawaii, while ensuring that existing DBS systems can remain competitive with cable operators. The best way for the Commission to achieve these objectives is to continue to rely on the existing ITU coordination procedure and to take advantage of the ability to treat different parts of the DBS orbital arc differently.

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1 *International Bureau Seeks Comment on Proposals to Permit Reducing Orbital Spacings Between U.S. Direct Broadcast Satellites*, Public Notice, Report No. SPB-196, 18 FCC Rcd 25683 (2003) (DA 03-3903) ("*Public Notice*").

I. THE COMMISSION SHOULD WORK TO ACCOMMODATE ADDITIONAL FACILITIES-BASED U.S. DBS COMPETITORS WHILE PROTECTING EXISTING DBS SYSTEMS

The commenters on the *Public Notice* represent a number of different perspectives: foreign licensing administrations, potential new U.S. and non-U.S. licensed DBS competitors, a state (Hawaii), and the incumbent U.S. operators. While views on reduced spacing obviously vary, several parties recognize that the development of additional DBS competition in the United States would have beneficial effects.[2] In contrast, the incumbents – DirecTV and EchoStar -- focus on the need to protect and enhance their own service offerings, and they offer approaches to reduced spacing that promote the interests of incumbents. New Skies agrees that the Commission must protect against harm to existing DBS operations, but at the same time believes that the Commission should take an approach that will accommodate entry by additional facilities-based DBS competitors.

In order for DBS new entrants to offer the type of consumer service that will yield competitive benefits, new operators must be able to provide services similar to those available from incumbent operators to 45 centimeter (cm) antennas, the consumer-friendly dishes that virtually all subscribers in the continental United States now use for DBS reception. Such capability, however, requires the development of operating environments for new entrants that are comparable to those enjoyed by incumbents. In order to offer competitive consumer services, new entrants must be able to operate at power levels approximately equal to the levels permitted to incumbents, and these new operators must also enjoy approximately equivalent interference protection. New entrants should be able to rely on network designs similar to those utilized by incumbents, and they must be able to utilize the high order modulation and coding techniques that allow higher data rates and more

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2 *See* Comments of the Boeing Company, at 1-2, 5-6 (Jan. 23, 2004); Comments of the State of Hawaii, at 1, 5 (Jan. 23, 2004); Comments of Pegasus Development Corp., at 1 (Jan. 23, 2004).

efficient use of DBS spectrum. If these conditions are not met, new entrants are highly unlikely to be able to offer a robust, facilities-based DBS service in competition with existing operators.

In contrast, if the Commission adopts the approach recommended by New Skies, it will promote additional facilities-based entry, with attendant benefits for American consumers. For example, New Skies has undertaken coordination of the 125° W.L. orbital location, with the goal of using that location to offer competitive DBS service, and other potential DBS new entrants are likely to pursue the same goal from other orbital locations.

A. DirecTV and EchoStar Have Each Presented an Approach to Reduced Orbital Spacing That Would Hinder the Development of Independent Facilities-Based DBS Competitors in the United States

DirecTV and EchoStar have apparently reached different conclusions regarding the necessary conditions for reduced orbital spacing, and they offer contrasting approaches to modifying DBS orbital spacing without causing harmful interference to their existing operations. These competing models for reduced spacing do share one crucial commonality, however: If adopted as uniform rules, either approach would preclude the development of an additional independent, competitive, facilities-based DBS service in the United States. Under either model, DBS satellites at the new orbital locations would be subject to technical constraints that would impair the ability of any entrepreneur to offer a competitive consumer service similar to the services offered by incumbent operators.

DirecTV. In its Petition and Comments, DirecTV says that its DBS service was developed in a 9° spacing environment, and asserts that reduced spacing should not be permitted to jeopardize the growth and flexibility of its DBS system.[3] According to DirecTV, in order to protect its existing and future operations at 101° W.L., 110° W.L, and 119° W.L., any reduced-spaced DBS satellites must offer the existing systems a pre-determined protection level of 24 dB. This requirement would limit the power of these new satellites to levels significantly below the transmission levels of incumbent DBS satellites. As New Skies explains in its attached Technical Appendix, under the DirecTV approach, satellites at the new orbital locations would also have to accept a greater level of interference than those incumbent facilities.[4] As a result, the new satellites would effectively constitute a second, subordinate class of "tweener" space stations. New entrants at these orbital locations would be unable to provide standard DBS services to 45 cm antennas, or competitively offer such advanced services as high-definition television ("HDTV") and broadband Internet service. With service offerings far inferior to those of DirecTV and EchoStar, it would be highly unlikely that such entrepreneurs could compete effectively with DBS incumbents or cable companies.

EchoStar. EchoStar apparently developed its model for reduced orbital spacing during the course of its coordination negotiations regarding SES Americom's proposed DBS satellite at 105.5° W.L.[5] Unfortunately, the resulting approach appears similarly inhospitable to entrepreneurs seeking to offer DBS services in competition with incumbents. While EchoStar would not limit new 4.5°-spaced satellites to power levels as low as those proposed by DirecTV, the new satellites' equivalent isotropic radiated power ("EIRP") would still fall

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3 Petition for Rulemaking of DirecTV Enterprises, LLC, at 1-2, attached to *Public Notice* as Exhibit B ("DirecTV Petition"); Comments of DirecTV, at 1-2, 4-5 (Jan. 23, 2004).

4 New Skies Technical Appendix at Section 2.3.2 ("Technical Appendix"). In its Petition, DirecTV states that "it should not be expected that tweener satellites should or can be afforded the same operating conditions or level of protection as systems operating from the original United States Region 2 BSS Plan assignments (or modifications to these assignments) already in operation." DirecTV Petition at 16.

5 EchoStar originally opposed SES Americom's proposal to operate a DBS satellite in the United States at 105.5° W.L. Following coordination discussions and their March 2003 agreement on EchoStar's use of that satellite, EchoStar has amended its views on the feasibility of operations at 105.5° W.L. Comments of EchoStar Satellite L.L.C., at 2, 4-5 (Jan. 23, 2004) ("EchoStar Comments").

below transmission levels of existing DBS satellites.[6] As under the DirecTV approach (and as explained in the Technical Appendix), operators of these new satellites would have to accept more interference than incumbents, and would not be capable of providing the same levels of service as incumbents to 45 cm antennas.[7]

In addition, under the EchoStar approach, in order to accommodate new entrants' relatively high power levels (compared to DirecTV's proposal), these new operators would be required to exert close control over their satellite EIRP. Specifically, in order to avoid interference to adjacent incumbents, these new operators would have to ensure that their EIRP levels are always lower than the EIRP levels of existing adjacent satellites.[8] Achieving this capability could be difficult for new entrants, which would have to procure satellites with minimal EIRP variability. In addition, these new entrants would likely face substantial operational difficulties if the Commission adopted specific, pre-determined technical rules regarding coordination parameters vis-à-vis adjacent satellites. In contrast, the flexible ITU coordination process allows new entrants to adopt, through agreement with adjacent operators, the most efficient coordination solutions.[9]

These constraints and associated costs would be minimized, of course, if the provider at such orbital locations were a DBS incumbent, since an internal coordination of these satellites would be much easier to carry out than a coordination between two competing operators. EchoStar is seeking just this outcome, having contracted to use available capacity on SES Americom's proposed DBS satellite at 105.5° W.L. as well as filing to operate short-

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6 EchoStar Comments, Technical Appendix, at 8, 16.

7 Technical Appendix at Section 2.2.1.

8 *Id.* at Section 2.3.1.

9 The precise technical requirements for avoiding interference to incumbent systems would vary from case to case, and these requirements could only be formulated and implemented through ITU coordination and technical agreements. In any case, EchoStar's approach to reduced spacing could not be realized through generally applicable Commission rules.

spaced DBS satellites at 96.5° W.L. and 123.5° W.L. While New Skies does not dispute that EchoStar's operations at additional locations would improve its network performance, the EchoStar approach would at the same time deter additional facilities-based DBS entry, because the combination of lower power levels and ongoing coordination would preclude new entrants from using 4.5°-spaced satellites as a stand-alone platform for consumer services that compete with existing operators' offerings.

EchoStar's 4.5°-spacing approach not only would impede the development of additional DBS competition generally, but if extended beyond the 101°-119° W.L. arc, would also rule out *specific* sources of new facilities-based U.S. DBS service. In particular, a uniform 4.5° spacing policy would preclude provision of additional DBS service to the United States from 125° W.L., since that location is 6° from the U.S.-allotted orbital location at 119° W.L.[10] Other potential non-U.S. licensed providers of U.S. service that would be automatically excluded by uniform 4.5° spacing include a proposed Canadian system at 72.5° W.L., a Bermudan system at 96.2° W.L. and a possible Argentine system at 94° W.L.[11]

B. In Order to Develop a Viable Facilities-Based U.S. DBS Service, New Entrants Must Have the Flexibility to Deploy Satellites with 6° Separation from Existing DBS Systems

With the flexibility to deploy satellites 6° from existing DBS systems, New Skies and other potential new entrants could develop competitive, facilities-based U.S. DBS systems and offer robust consumer services similar to those provided by incumbents. As demonstrated in the Technical Appendix, new 6°-spaced satellites could operate at power levels approximately equal to incumbent satellites, without harming neighboring DBS

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10 Were the Commission to favor EchoStar's application to operate at 123.5° W.L. over the Netherlands' orbital location at 125° W.L., it would miss a critical opportunity to facilitate the development of an additional facilities-based DBS competitor.

11 *See* EchoStar Comments at 8; Comments of Government of Bermuda, Ministry of Tourism, Telecommunications & E-Commerce (Jan. 23, 2004); Comments of SES Americom, Inc., at 9 n.24 (Jan. 23, 2004).

systems. Assuming such EIRP levels, those 6°-spaced satellites would enjoy interference protection similar to that enjoyed by incumbents.[12] In addition, with 6° separation, new entrants' EIRP levels could differ from those of existing DBS systems and vary normally over time without harmful effect, and there would be no need for intensive, ongoing coordination.[13] Finally, such separation would enable new entrants (and neighboring incumbents) to utilize the high order modulation and coding techniques that permit more efficient use of DBS spectrum. In fact, as shown in the Technical Appendix, 6°-spaced DBS satellites – unlike 4.5°-spaced satellites – could achieve commercially-acceptable service availability with high order modulation and coding schemes, and those DBS satellites could thereby provide up to 33% higher data rates than their 4.5°-spaced counterparts.[14]

As a result of all of these technical and operational factors, new entrants at 6° separation would be able to provide incumbent-quality services to 45 cm antennas, including such advanced services as HDTV and interactive broadband data services. These entrepreneurs would have full operational flexibility to implement their business plans. With 6° spacing an available option, additional facilities-based DBS competition in the United States is likely to emerge.

As indicated above, New Skies believes that a competitive facilities-based DBS service to the United States could be provided from the Netherlands' orbital location at 125° W.L., 6° west of the existing operations of DirecTV and EchoStar at 119° W.L.. From this orbital location, full-CONUS DBS service, as well as a full array of services to Hawaii and Alaska, could be provided.

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12 Technical Appendix at Sections 2.2, 2.2.1.

13 *Id.* at Section 2.3.1.

14 *Id.* at Section 2.5.

As a general matter, ITU coordination and resulting technical agreements will enable new 6°-spaced satellites to operate without causing interference to DBS incumbents. At 125° W.L., New Skies will avoid harmful interference to DirecTV and EchoStar at 119° W.L. (including to existing services to Hawaii and Alaska). Through such coordination, DirecTV and EchoStar can preserve their ability to deploy spot beams at 119° W.L., and to use that location in conjunction with local-into-local service, as well as HDTV and other advanced services.

II. RATHER THAN INITIATE A RULEMAKING, THE COMMISSION SHOULD CONTINUE TO RELY ON THE ITU COORDINATION PROCEDURE

A. Continued Reliance on the ITU Coordination Procedure Provides the Best Opportunity for the Development of Additional Facilities-Based DBS Competition in the United States

Continued reliance on applicable ITU rules and policies offers the best chance of developing additional facilities-based DBS service in the United States. As explained in New Skies' Comments, the ITU coordination procedure currently governs orbital spacing and other technical and operational issues for DBS services. ITU rules and procedures provide a flexible, case-by-case coordination framework that ensures mutually agreeable technical solutions, permits a diversity of business plans, and maximizes the opportunity for American consumers to obtain the satellite services they desire. Under Appendices 30 and 30A of the ITU Radio Regulations, new entrants have the flexibility to make trade-offs in their system architectures between different degrees of separation, power levels, coding rates, and receiving antenna sizes. In addition, as the Commission has previously recognized, the ITU coordination procedure is sufficient to protect existing U.S. DBS systems.[15]

[15] *See Policies and Rules for the Direct Broadcast Satellite Service*, Report and Order, 17 FCC Rcd 11331, ¶ 130 (2002) ("*DBS Order*").

The contrasting approaches of DirecTV and EchoStar to reduced spacing, described in greater detail in Section I above, provide additional justification for continued Commission reliance on ITU coordination procedure. Rather than initiating a rulemaking and imposing uniform spacing rules on DirecTV and EchoStar, the Commission should allow those incumbents (and any other affected DBS provider) to resolve their differences through coordination negotiations and mutually-agreeable technical solutions for each short-spaced satellite between 101° W.L. and 119° W.L.

New Skies believes that ITU coordination procedure is working well in the DBS context, and the Commission should allow this process to run its course. As the Commission is aware, ITU coordination of non-U.S. licensed systems is already proceeding at 125° W.L. and elsewhere. With respect to New Skies, the Netherlands has made the required ITU network filings for New Skies' DBS satellite at 125° W.L., and has begun coordinating those proposed operations with the United States.[16]

B. A Rulemaking Is Unlikely to Alter the Ultimate Orbital Configuration Within the 101°-119° W.L. Arc, and Would Only Delay Additional DBS Competition

A Commission rulemaking is unlikely to alter the ultimate orbital configuration within the 101°-119° W.L. arc. At this time, new DBS operations at 105.5° W.L. and 114.5° W.L. are virtually certain. Filings for those slots have been submitted to the ITU,[17] and filings at other slots within this arc are highly unlikely.

Consequently, the primary effect of a Commission rulemaking on reduced spacing might be simply to delay the development of additional facilities-based DBS competition.

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16 As the Commission is also aware, New Skies has been authorized by the Netherlands to operate using the Ku-band FSS frequencies at 125 ° W.L. and has been coordinating the use of FSS spectrum with the U.S. operators and the Commission.

17 *See SES Americom, Inc., Petition for Declaratory Ruling to Serve the U.S. Market Using BSS Spectrum from the 105.5° W.L. Orbital Location*, Petition for Declaratory Ruling, SAT-PDR-20020425-00071 (filed Apr. 25, 2002); DirecTV Petition at 5.

Whatever the Commission's approach in such proceeding, a rulemaking could delay the efforts of New Skies and other potential new providers of DBS to serve American consumers. In urging the Commission to initiate a rulemaking, it appears that DirecTV – like incumbents in innumerable other FCC proceedings – is seeking to delay or prevent the arrival of new competition.[18]

III. THE COMMISSION SHOULD RECOGNIZE THAT IT MAY BE APPROPRIATE TO TREAT DIFFERENT PARTS OF THE ORBITAL ARC DIFFERENTLY

In considering requests for reduced spacing, the Commission should take advantage of its ability to treat different parts of the DBS orbital arc differently. In particular, even if the Commission were to initiate a rulemaking on reduced spacing within the 101°-119° W.L. arc (which the Commission should not do), that proceeding should not address orbital spacing outside that arc. The options for reduced spacing are greatly limited between 101° W.L. and 119° W.L. Given the configuration of the U.S.-allotted BSS orbital locations at 101° W.L., 110° W.L., and 119° W.L., the only uniform spacings within that arc that are geometrically possible are 4.5° spacing and (even less plausible from a technical standpoint) 3° spacing.

In contrast, orbital spacing outside the 101°-119° W.L. arc is much less constrained. East of 101° W.L. and west of 119° W.L, DBS orbital separations of 6° or more are possible, and there is no technical or operational rationale outside that arc for a uniform policy that would prevent such spacings. Moreover, the uniform 4.5° spacing favored by some commenters for U.S. DBS is not even geometrically possible outside the 101°-119° W.L. arc., given that that the 101° W.L. and 119° W.L. orbital locations are separated from their nearest eastern and western U.S.-allotted neighbors (61.5° W.L. and 148° W.L.) by 39.5° and 29° degrees, respectively.

18 *See* DirecTV Comments at 3-4.

For these reasons, even if the Commission were to propose a uniform spacing policy for the 101°-119° W.L. orbital arc, it should conclude that it would not apply that policy outside the 101°-119° W.L. arc. This different treatment would be consistent with applicable precedent, as the Commission has previously adopted rules and policies distinguishing between the 101°-119° W.L. arc and DBS orbital locations outside that arc. In 1995, for instance, the Commission decided to limit applicants participating in the auction of the DBS license at 110° W.L. to an attributable interest in no more than one orbital location from 101° W.L. to 119° W.L.[19]

IV. THERE IS NO NEED FOR THE COMMISSION TO REVISIT ITS *DISCO II* RULES AND POLICIES REGARDING ACCESS TO THE U.S. MARKET BY NON-U.S. LICENSED SATELLITE SYSTEMS

In its comments, EchoStar asks that the Commission "examine the potential access into the United States market from all non-U.S. DBS orbital positions."[20] To the extent that EchoStar is calling for a reexamination of the *DISCO II* rules and policies for accessing the U.S. market,[21] the Commission should reject this request. The Commission's policies and procedures for access to the U.S. market by non-U.S. licensed satellite systems are well-established, and are working well in the Direct-to-Home ("DTH") and DBS context. Pursuant to those procedures, the Commission has in the past year granted U.S. market access to non-U.S. owned and non-U.S. licensed DTH and DBS providers.[22] Consequently,

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19 *See Revision of Rules and Policies for the Direct Broadcast Satellite Service*, Report and Order, 11 FCC Rcd 9712, ¶¶ 55-77 (1995).

20 EchoStar Comments at 2, 8.

21 *See Amendment of the Commission's Regulatory Policies to Allow Non-U.S. Licensed Space Stations to Provide Domestic and International Satellite Services in the United States*, Report and Order, 12 FCC Rcd 24094 (1997).

22 *See SES Americom, Inc. and Columbia Communications Corp.*, Order and Authorization, 18 FCC Rcd 16589 (Int'l Bur. 2003); *Digital Broadband Applications Corp.*, Order, 18 FCC Rcd 9455 (Int'l Bur. 2003).

revisiting the *DISCO II* rules would serve no purpose, and would simply consume Commission and industry resources.

V. CONCLUSION

In response to requests for reduced orbital spacing for DBS, New Skies urges the Commission to work to accommodate additional facilities-based DBS providers in the United States, while ensuring that existing DBS systems can remain competitive with cable operators. In order to achieve these goals, the Commission should rely on existing ITU coordination procedure and take advantage of the ability to treat different parts of the DBS orbital arc differently.

Respectfully submitted,

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TECHNICAL APPENDIX

1. INTRODUCTION

New Skies Satellites N.V. ("New Skies") has prepared this Technical Appendix in response to the Commission's Public Notice[1] and subsequent comments on technical issues associated with reduced orbital spacing for DBS service to the United States. In this Appendix, New Skies demonstrates that a uniform 4.5° orbital spacing policy for U.S. DBS would subject new entrants to technical constraints that would prevent those operators from competing effectively with incumbent DBS systems. In this spacing environment, existing DBS systems would also suffer certain operational constraints. In contrast, as the analysis below shows, new entrants operating 6° from existing DBS systems would be able to operate at similar power levels, with similar interference protection, and would be able to provide similar data rates.

2. TECHNICAL ANALYSIS

2.1 General Approach

This Technical Appendix examines the competing approaches for DBS reduced orbital spacing presented by DirecTV[2] and EchoStar[3] in their request for rulemaking and comments on the Commission's Public Notice, respectively. Below, New Skies first addresses the DirecTV approach, which provides incumbent systems with fixed protection criteria and proposes a fixed interference level for new entrant satellites less than 9° from existing DBS satellites. New Skies then examines the EchoStar approach, which focuses on the impact of new entrants on the signal availability of incumbent system. In analyzing this impact, New Skies examines the effect of new entrants on the carrier-to-noise plus interference ratio (C/(N+I)) of incumbent systems.

New Skies has performed these analyses to highlight the differences in the technical constraints that would be faced by new entrants at 4.5° separation and new entrants at 6° separation.

2.2 DirecTV approach: fixed protection criteria for existing DBS systems

In evaluating DirecTV's approach to accommodating new DBS systems, New Skies has examined the technical constraints that would have to be imposed on new entrants in order to achieve a given carrier-to-interference (C/I) protection criteria for incumbent systems.[4] In doing so, New Skies has calculated the maximum satellite EIRP for new

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1 *International Bureau Seeks Comment on Proposals to Permit Reducing Orbital Spacings Between U.S. Direct Broadcast Satellites*, Public Notice, Report No. SPB-196, DA 03-3903 (rel. Dec. 16, 2003) ("*Public Notice*").

2 *See* Petition for Rulemaking of DIRECTV Enterprises, LLC (filed Sept. 5, 2003) (*"DirecTV Petition"*).

3 *See* Comments of ECHOSTAR SATELLITE L.L.C.(*"EchoStar Comments"*).

4 *See DirecTV Petition at 17.*

entrants under the DirecTV approach, based on the need to protect an existing DBS system at 119° W.L in 20 cities across the continental United States ("CONUS"). New Skies has performed this analysis for two scenarios, one assuming a 4.5° separation between the new entrant and the incumbent system and the other assuming a 6° separation between the new entrant and the incumbent. While New Skies neither supports nor contests DirecTV's proposal for a single entry C/I protection criteria requirement of 24 dB for the incumbent system, New Skies has utilized this proposed requirement to highlight the differences in the operational constraints for new entrants with 4.5° and 6° separation. In order to fully examine these different spacing scenarios, New Skies has also considered the protection that would be afforded to new entrants by the existing DBS system at 119° W.L.

The assumptions used in the analysis are described below:

a) Total station-keeping accuracy of 0.1°

The current practice of commercial satellite operators is to operate their satellites within a station-keeping box of ±0.05°. Assuming the worst-case scenario in which a new entrant's satellite drifts towards the edge of the station-keeping box of an incumbent's existing satellite (or vice versa), the total worst-case station-keeping accuracy is 0.1°.

b) Mis-pointing of 0.5° for the receiving earth stations

The value of 0.5° for mis-pointing errors, as proposed by the two largest DBS providers in the United States, DirecTV[5] and EchoStar,[6] has been considered in this study for the calculation of the minimum off-axis angle towards the interfering satellite.

c) Receiving antenna size of 0.45 m and its off-axis gain envelope

In considering the comments from DirecTV and EchoStar, New Skies' analysis assumes a receiving earth station size of 0.45 m for both the existing DBS systems and new entrants. The co-polar off-axis gain discrimination has been derived from the mask referenced in the ITU-R B.O. 1213 Recommendation. For cross-polar off-axis gain discrimination, as noted by EchoStar, actual antennas tend to provide greater cross-polar discrimination than the levels derived from the masks included in the ITU-R B.O. 1213 Recommendation. The calculations assume a cross-polar discrimination improved by 10 dB, compared to the co-polar discrimination.[7] This improvement figure is assumed to be the same for the 4.5° and 6° spacing cases.

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5 *See DirecTV Petition at 17.*

6 *See Technical Annex to EchoStar Comments at 10.*

7 *See Technical Annex to EchoStar Comments at 11-12.*

d) Satellite EIRP performance of existing DBS system at 119° W.L.

The satellite equivalent isotropic radiated power (EIRP) performance at various cities across CONUS is based on the operations of an existing DBS system located at 119° W.L.

e) Topocentric angle calculation

The actual topocentric angle at each of these 20 cities has been calculated.

f) Bandwidth advantage

The calculations assume that the existing system and the new entrants would operate with the same frequency and polarization plans (*i.e.*, no bandwidth advantage)

g) Calculations and results

Calculation of the maximum EIRP permitted to new entrants, in order to protect the existing DBS systems

The new entrant maximum satellite EIRP, calculated in order to achieve a total single entry C/I protection criterion of 24 dB, is as follows:

$$EIRP_{new} = EIRP_{DBS} - C/I + G_w(\theta_w) - G_{agg}(\theta_I) - BW\ Adv. \quad (1)$$

where:

$EIRP_{new}$	=	New entrant (interfering) EIRP (dBW)
C/I	=	Required single entry C/I (dB)
$EIRP_{DBS}$	=	U.S. DBS system (wanted) EIRP (dBW)
$G_w(\theta_w)$	=	Gain of wanted earth station in direction of wanted satellite (dBi)
$G_{agg}(\theta_I)$	=	Effective aggregate of co-polar and cross-polar gain of wanted earth station in the direction of interfering satellite (dBi)
BW Adv.	=	Improvement in interference due to frequency off-set advantage

$$G_{agg}(\theta_I) = 10\log(10^{(G_{CP}(\theta_I))/10} + 10^{(G_{XP}(\theta_I))/10}) \quad (2)$$

where:

$G_{CP}(\theta_I)$	=	Co-polar gain of wanted earth station in the direction of interfering space station (dBi)
$G_{XP}(\theta_I)$	=	Cross-polar gain of wanted earth station in the direction of interfering space station (dBi)

C/I Analysis (4.5° Spacing - Achieving 24 dB C/I for existing DBS system at 119°W)

Mis-pointing	0.5 °
Station-Keeping (Total)	0.1 °
USABSS satellite position	-119 °E.L
New Adj BSS satellite position	-114.5 °E.L
Geocentric orbital separation	4.5 °
Antenna size	0.45 m
Antenna Gain	34.0 dBi
Rx Antenna Sidelobe	BO_1213
Frequency	12.2 GHz

	City List	USABSS EIRP (dBW)	Topo with Mispointing & Station Keeping (°)	Req. Single Entry C/I (dB)	New Entrant Max. EIRP (dBW)
1	New York	54.06	4.24	24.00	44.79
2	Los Angeles	50.45	4.51	24.00	43.13
3	Chicago	52.59	4.33	24.00	43.97
4	Philadelphia	54.16	4.26	24.00	45.01
5	San Francisco-Oak-SJ	52.00	4.47	24.00	44.38
6	Boston	53.08	4.21	24.00	43.57
7	Dallas-Ft. Worth	53.31	4.46	24.00	45.66
8	Washinton DC	54.32	4.28	24.00	45.32
9	Detroit	52.72	4.30	24.00	43.85
10	Atlanta	55.15	4.37	24.00	46.84
11	Houston	54.08	4.48	24.00	46.52
12	Seattle-Tacoma	52.00	4.37	24.00	43.63
13	Minneapolis-St. Paul	52.22	4.33	24.00	43.62
14	Tampa	54.67	4.40	24.00	46.51
15	Cleveland	53.26	4.30	24.00	44.39
16	Miami	54.29	4.39	24.00	46.07
17	Phoenix	51.18	4.51	24.00	43.88
18	Denver	51.67	4.43	24.00	43.79
19	Sacramento	52.00	4.46	24.00	44.32
20	Pittsburgh	54.10	4.29	24.00	45.20

Table 1 : 4.5° spacing analysis to achieve C/I of 24 dB for U.S. DBS System

C/I Analysis (6° Spacing - Achieving 24 dB C/I for existing DBS system at 119°W)

Mis-pointing	0.5 °
Station-Keeping (Total)	0.1 °
USABSS satellite position	-119 °E.L
New Adj BSS satellite position	-125 °E.L
Geocentric orbital separation	6 °
Antenna size	0.45 m
Antenna Gain	34.0 dBi
Rx Antenna Sidelobe	BO_1213
Frequency	12.2 GHz

	City List	USABSS EIRP (dBW)	Topo with Mispointing & Station Keeping (°)	Req. Single Entry C/I (dB)	New Entrant Max. EIRP (dBW)
1	New York	54.06	5.80	24.00	53.82
2	Los Angeles	50.45	6.21	24.00	50.95
3	Chicago	52.59	5.93	24.00	52.59
4	Philadelphia	54.16	5.82	24.00	53.96
5	San Francisco-Oak-SJ	52.00	6.17	24.00	52.42
6	Boston	53.08	5.75	24.00	52.75
7	Dallas-Ft. Worth	53.31	6.11	24.00	53.64
8	Washinton DC	54.32	5.85	24.00	54.17
9	Detroit	52.72	5.88	24.00	52.63
10	Atlanta	55.15	5.98	24.00	55.24
11	Houston	54.08	6.12	24.00	54.43
12	Seattle-Tacoma	52.00	6.03	24.00	52.18
13	Minneapolis-St. Paul	52.22	5.95	24.00	52.25
14	Tampa	54.67	6.00	24.00	54.79
15	Cleveland	53.26	5.88	24.00	53.17
16	Miami	54.29	5.98	24.00	54.38
17	Phoenix	51.18	6.20	24.00	51.67
18	Denver	51.67	6.09	24.00	51.95
19	Sacramento	52.00	6.15	24.00	52.40
20	Pittsburgh	54.10	5.87	24.00	53.99

Table 2 : 6° spacing analysis to achieve C/I of 24 dB for U.S. DBS system

Protection afforded to the new entrants by existing systems

Taking into account the maximum satellite EIRP for the new entrants, calculated above, the protection level afforded to the new entrants by the existing system at 119° W.L. has been determined. It is assumed that the new entrants would utilize 0.45 m diameter receiving antennas under the same assumptions as described previously.

The C/I is calculated as follows:

$$C/I = EIRP_{new} - EIRP_{DBS} + G_w(\theta_w) - G_{agg}(\theta_I) + BW\ Adv \ldots\ldots (3)$$

where:

C/I	=	Single entry C/I of new entrant (dB)
$EIRP_{new}$	=	New entrant (wanted) EIRP (dBW)
$EIRP_{DBS}$	=	U.S. DBS system (interfering) EIRP (dBW)
$G_w(\theta_w)$	=	Gain of wanted earth station in direction of wanted satellite (dBi)
$G_{agg}(\theta_I)$	=	Effective aggregate of co-polar and cross-polar gain of wanted earth station in the direction of interfering satellite (dBi)
BW Adv.	=	Improvement in interference due to frequency off-set advantage

$$G_{agg}(\theta_I) = 10\log(10^{(G_{CP}(\theta_I))/10} + 10^{(G_{XP}(\theta_I))/10}) \ldots\ldots (4)$$

where:

$G_{CP}(\theta_I)$	=	Co-polar gain of wanted earth station in the direction of interfering space station (dBi)
$G_{XP}(\theta_I)$	=	Cross-polar gain of wanted earth station in the Direction of interfering space station (dBi)

C/I Analysis (4.5° Spacing - C/I for new extrants due to providing existing DBS system at 119°W a C/I of 24 dB)

Mis-pointing	0.5 °
Station-Keeping (Total)	0.1 °
USABSS satellite position	-119 °E.L
New Adj BSS satellite position	-114.5 °E.L
Geocentric orbital separation	4.5 °
Antenna size	0.45 m
Antenna Gain	34.0 dBi
Rx Antenna Sidelobe	BO_1213
Frequency	12.2 GHz

	City List	New Entrant EIRP (dBW)	USABSS EIRP (dBW)	Topo with Mispointing & Station Keeping (°)	Total C/I for New Entrant (dB)
1	New York	44.79	54.06	4.24	**5.47**
2	Los Angeles	43.13	50.45	4.51	**9.37**
3	Chicago	43.97	52.59	4.33	**6.76**
4	Philadelphia	45.01	54.16	4.26	**5.70**
5	San Francisco-Oak-SJ	44.38	52.00	4.47	**8.76**
6	Boston	43.57	53.08	4.21	**4.99**
7	Dallas-Ft. Worth	45.66	53.31	4.46	**8.71**
8	Washinton DC	45.32	54.32	4.28	**6.00**
9	Detroit	43.85	52.72	4.30	**6.27**
10	Atlanta	46.84	55.15	4.37	**7.38**
11	Houston	46.52	54.08	4.48	**8.88**
12	Seattle-Tacoma	43.63	52.00	4.37	**7.26**
13	Minneapolis-St. Paul	43.62	52.22	4.33	**6.80**
14	Tampa	46.51	54.67	4.40	**7.69**
15	Cleveland	44.39	53.26	4.30	**6.26**
16	Miami	46.07	54.29	4.39	**7.56**
17	Phoenix	43.88	51.18	4.51	**9.40**
18	Denver	43.79	51.67	4.43	**8.23**
19	Sacramento	44.32	52.00	4.46	**8.64**
20	Pittsburgh	45.20	54.10	4.29	**6.19**

Table 3 : 4.5° spacing analysis – New entrant achieved C/I

C/I Analysis (6° Spacing - C/I for new extrants due to providing existing DBS system at 119°W a C/I of 24 dB)

Mis-pointing	0.5 °
Station-Keeping (Total)	0.1 °
USABSS satellite position	-119 °E.L
New Adj BSS satellite position	-125 °E.L
Geocentric orbital separation	6 °
Antenna size	0.45 m
Antenna Gain	34.0 dBi
Rx Antenna Sidelobe	BO_1213
Frequency	12.2 GHz

	City List	New Entrant EIRP (dBW)	USABSS EIRP (dBW)	Topo with Mispointing & Station Keeping (°)	Total C/I for New Entrant (dB)
1	New York	53.82	54.06	5.80	**23.51**
2	Los Angeles	50.95	50.45	6.21	**25.01**
3	Chicago	52.59	52.59	5.93	**24.01**
4	Philadelphia	53.96	54.16	5.82	**23.59**
5	San Francisco-Oak-SJ	52.42	52.00	6.17	**24.84**
6	Boston	52.75	53.08	5.75	**23.34**
7	Dallas-Ft. Worth	53.64	53.31	6.11	**24.66**
8	Washinton DC	54.17	54.32	5.85	**23.70**
9	Detroit	52.63	52.72	5.88	**23.82**
10	Atlanta	55.24	55.15	5.96	**24.17**
11	Houston	54.43	54.08	6.12	**24.70**
12	Seattle-Tacoma	52.18	52.00	6.03	**24.36**
13	Minneapolis-St. Paul	52.25	52.22	5.95	**24.05**
14	Tampa	54.79	54.67	6.00	**24.25**
15	Cleveland	53.17	53.26	5.88	**23.81**
16	Miami	54.38	54.29	5.98	**24.19**
17	Phoenix	51.67	51.18	6.20	**24.97**
18	Denver	51.95	51.67	6.09	**24.57**
19	Sacramento	52.40	52.00	6.15	**24.80**
20	Pittsburgh	53.99	54.10	5.87	**23.78**

Table 4 : 6° spacing analysis – New entrant achieved C/I

2.2.1 Observations on results

New Skies' analysis, shown in Tables 1 through 4, indicates that if the DBS systems are separated by 6°, the new entrant is able to offer a protection criteria of 24 dB to the existing U.S. DBS system while having similar satellite and link performances, *i.e.*, limited constraints on the existing system and the new entrant. In contrast, if the DBS satellites are separated by 4.5°, the new entrant would have to accept more substantial constraints in order to offer this 24 dB protection criteria to the existing systems, *i.e.*, lower power, low coding rate, etc. As shown in Table 3, the low protection level afforded to the new entrant at 4.5° would most likely force this operator to utilize receiving antennas with a larger diameter. As a result, uniform spacing rules requiring 4.5° orbital separation would result in two separate, non-competing classes of DBS services for American consumers: (1) Existing DBS services with high satellite EIRP and small receiving antennas, and (2) new entrants with low satellite EIRP and, most likely, larger receiving antennas. While the operational constraints associated with 4.5° spacing may be acceptable for some prospective DBS operators, taking advantage of the greater operational capabilities associated with 6° separation may be the only acceptable solution for another prospective DBS provider.

It should be noted that the analysis above does not take into account the bandwidth advantage of 1.05 dB due frequency or polarization offset. If this bandwidth advantage were present, the maximum EIRP for new entrants would increase by 0.86 dB, which would result in an increase of approximately 1.7 dB in the single entry C/I performance of new entrants' systems.

2.3 <u>EchoStar approach</u>

2.3.1 Effect on C/(N+I) of existing DBS system at 119° W.L., as a result of new entrant operations with 4.5° and 6° orbital separation

In assessing the impact of a new entrant with 4.5° separation on an incumbent DBS system, it appears that EchoStar based its analysis on the impact to its link availability.[8] For a given set of link parameters, link availability depends on the margin between the C/(N+I) achieved at a given location and the required C/N. Accordingly, measuring a new entrant's effect on the existing system's C/(N+I) is similar to determining the impact on link availability at a given location.

Under the EchoStar approach, it appears that the acceptable level of interference from a new entrant is closely related to the difference in EIRP between the existing system and the new entrant at each location.[9] EchoStar explains that it initially concluded that SES Americom's proposal to operate at 105.5° W.L. was incompatible with the operation of its adjacent satellite at 110° W.L., mainly due to the assumed ΔEIRP between the EchoStar and the SES Americom satellites.[10] In its comments on the Public Notice, however, EchoStar indicates that detailed coordination discussions with SES Americom have alleviated its

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8 *See Technical Annex to EchoStar Comments at 16-18.*

9 *See Technical Annex to EchoStar Comments at 8 and 14-16.*

10 *See Technical Annex to EchoStar Comments at 16.*

concerns. According to EchoStar, it is now clear that the ΔEIRP between existing DBS satellites and new entrants' satellites will be biased in favor of the existing satellites; the EchoStar approach indicates that new entrants with 4.5° separation would be compatible with existing DBS satellites if they have EIRP levels that are as much as 2.4 dB lower than the levels for existing systems.[11]

Under the EchoStar approach, it will be critical that new DBS entrants have the ability to control their satellite EIRP levels. Specifically, in order to protect existing DBS systems from interference, new entrants will have to make sure that their EIRP levels are always lower than the EIRP levels of existing systems. However, variation in EIRP is caused by numerous factors, including antenna design, satellite transmission chain losses, and TWTA degradation over the life of the satellite. The resulting variation in new entrant EIRP causes variations in the existing system's C/(N+I), an effect that is greater where there is 4.5° separation between these operators than where there is 6° separation. Accordingly, a uniform 4.5° orbital spacing policy that lacks tight controls on new entrant EIRP levels would create uncertainty and could harm the operations of existing systems.

In order to show the sensitivity of incumbent systems' C/(N+I) to variations in new entrants' EIRP levels, New Skies provides an example below. In these calculations, only the downlink C/N and C/I are considered, since they represent the dominant portion of the link.

The C/(N+I) is calculated as follows:

$$C/(N+I) = -10\log(10^{-((C/N)/10)} + 10^{-((C/I)/10)}) \quad \ldots\ldots (5)$$

and

$$C/N = EIRP_W + Gw(\theta_w) - FSL - 10\log(OBW) - 10\log(T_{sys}) - k \quad \ldots\ldots (6)$$

where:

C/N	=	Carrier-to-noise ratio (dB)
$EIRP_W$	=	Wanted EIRP (dBW)
$G_w(\theta_w)$	=	Gain of wanted earth station in direction of wanted satellite (dBi)
FSL	=	Free space loss
OBW	=	Occupied bandwidth of the carrier
T_{sys}	=	Clear sky system noise temperature of the receiving earth station
k	=	-228.6 dB

C/I is calculated using Equations (3) and (4).

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11 *See Technical Annex to EchoStar Comments at 8 and 16.*

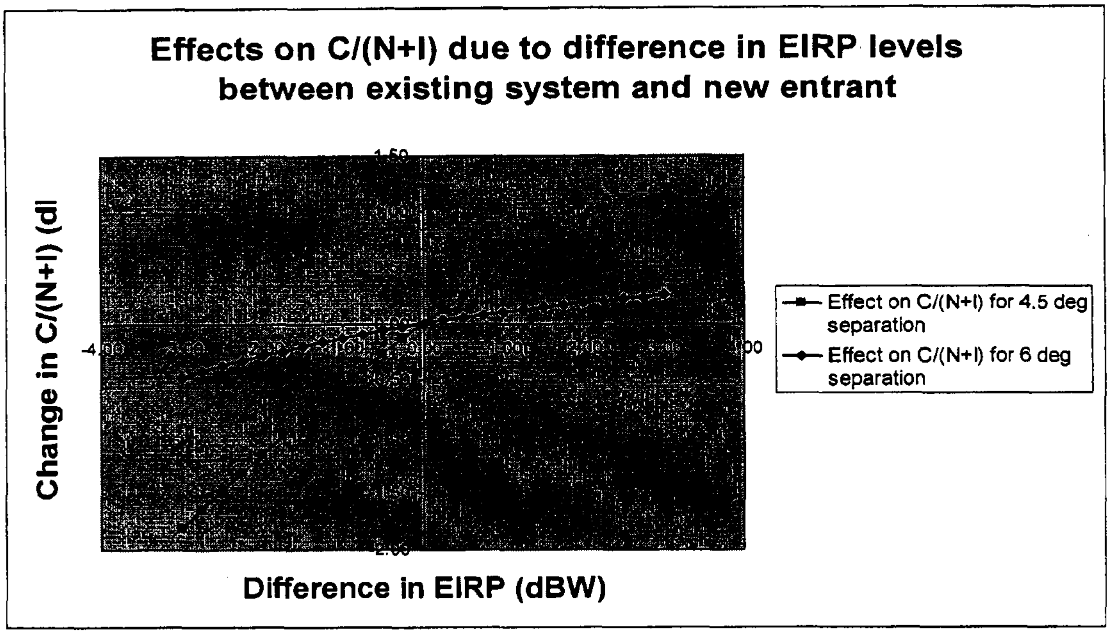

Figure 1: Effects on C/(N+I) of existing DBS system at 119° W.L. due to various ΔEIRP from new entrants

As shown in Figure 1, in a 4.5° spacing environment, the overall C/(N+I) performance of the existing DBS system is sensitive to variations in new entrant EIRP levels. This sensitivity is not nearly as great in the 6° spacing scenario.

As EchoStar points out,[12] there is a slim margin between acceptable and unacceptable conditions under 4.5° spacing. Maintaining this thin margin requires that existing operators have a continually greater EIRP level than new entrants. Because of (i) the above-described system sensitivity resulting from 4.5° spacing and (ii) the difficulty of sustaining tight control over EIRP variations, it will be very difficult to implement rules that will provide existing operators with full confidence that their system performance will not be degraded by a shift to a 4.5° spacing environment.

2.3.2 C/(N+I) achieved for new entrants, with an existing DBS system at 119° W.L.

In its technical statement, EchoStar concludes that SES Americom's proposed satellite at 105.5° W.L. would be compatible with its existing DBS system. According to EchoStar, this conclusion resulted from a revised analysis showing that SES Americom's satellite EIRP levels will always be +0.5 to +2.4 dB lower than the levels of EchoStar's existing satellites.[13] This difference in satellite EIRP level, however, will have an impact on the link performance of the new entrant. While EchoStar's technical analysis examined the

[12] *See Technical Annex to EchoStar Comments at 14-18.*

[13] *See Technical Annex to EchoStar Comments at 16.*

impact of new entrant operations on its existing satellites, EchoStar failed to present any analysis on how those new entrants would be affected by the need to maintain lower EIRP levels.

To address this issue, New Skies assessed the C/(N+I) capability of new entrants under 4.5° spacing, assuming existing system operations at 119° W.L. This analysis assumes a ΔEIRP of +2.0 dB (*i.e.*, the existing system at 119° W.L. has an EIRP 2 dB higher than the new entrant).

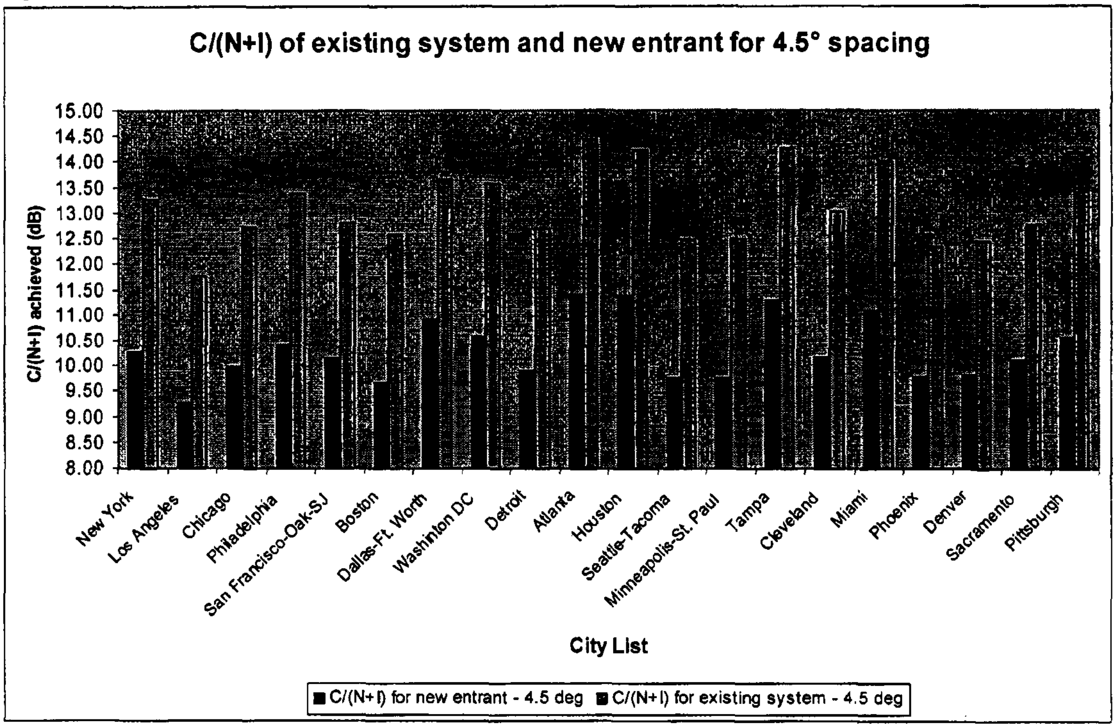

Figure 2: C/(N+I) of existing system and new entrant for 4.5° spacing

As shown above in Figure 2, under 4.5° spacing, the C/(N+I) difference between an existing system and a new entrant can be as much as 3 dB. The size of this disparity will vary, depending on the actual difference in EIRP between the new entrant and the existing DBS system.

For New Skies' comparative analysis of 6° spacing, the ΔEIRP between the new entrant and existing system is assumed to be 0 dB. This assumption is based on the fact that the off-axis gain improvement from 4.5° to 6° for a 0.45 m receiving Earth station is significantly greater than 2 dB;[14] this increased gain makes it possible to relax the constraints on the satellite EIRP of the new entrant with 6° separation, with only marginal (and acceptable) degradation of the link margin to the existing DBS system.

14 According to the co-polar off-axis gain discrimination mask referenced in the ITU-R BO.1213 Recommendation, an off-axis gain improvement in excess of 7 dB can be calculated when the spacing is changed from 4.5° to 6°.

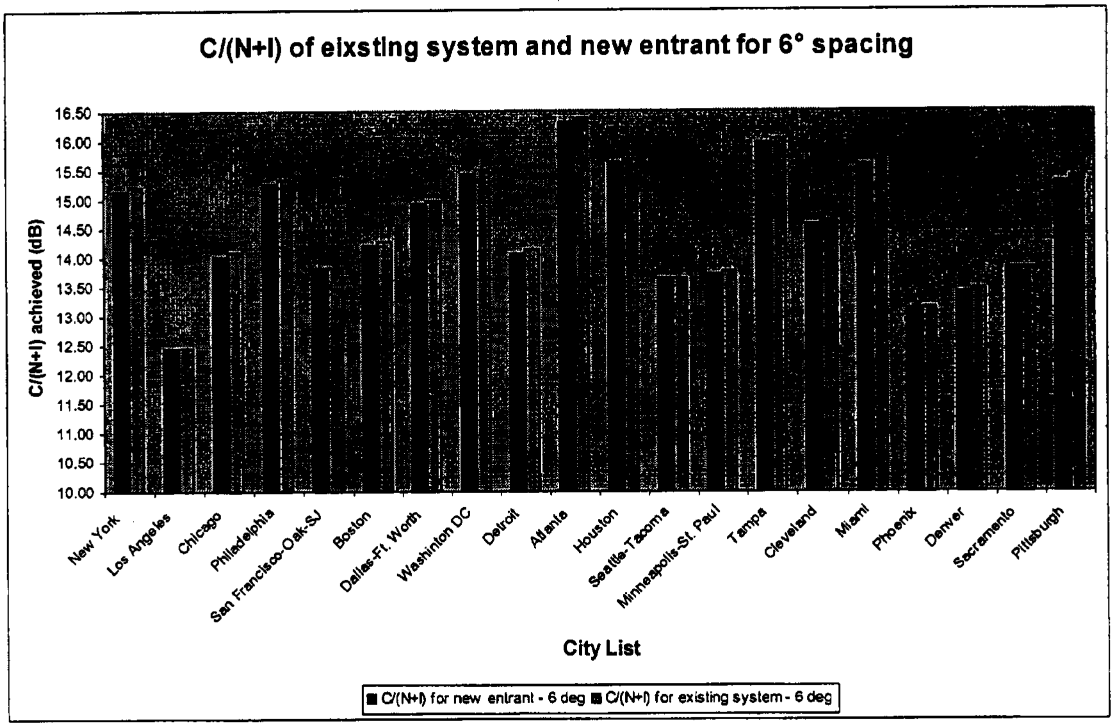

Figure 3: C/(N+I) of existing system and new entrant for 6° spacing

Clearly, as shown in Figure 3, the C/(N+I) difference between the existing system and new entrant is minimal, and it can be concluded that the new entrant and the existing DBS system would be able to offer a similar type of link performance at all locations.

The above analysis demonstrates a clear contrast between the 4.5° and 6° spacing scenarios. Under a 4.5° spacing policy, new entrants and existing operators would be subject to various technical constraints that would be unnecessary under 6° spacing.

2.4 Effects of Pointing Error

The mis-pointing of receiving antennas for existing DBS system is another factor that can alter the link performances of existing systems and new entrant operators. The comments of DirecTV[15] and EchoStar[16] make clear that antenna mis-pointing is an important factor in determining the level of interference to existing DBS systems. However, neither of these incumbents examines the effect of incumbent antenna mis-pointing on the operations of new entrants. In Figure 4 below, the effect of mis-pointing errors at a specific location, Boston, on the C/N+I of new entrants operating with 4.5° separation from existing systems is compared to the impact on the C/N+I of new entrants operating with 6° separation. This analysis considers the effect of mis-pointing on the off-axis angle towards

15 *See DirecTV Petition at 17.*
16 *See Technical Annex to EchoStar Comments at 9-10*

the interfering satellite. The new entrants' C/(N+I) is calculated using the maximum EIRP that will allow these entrants to offer a 24 dB protection level to the existing DBS system.

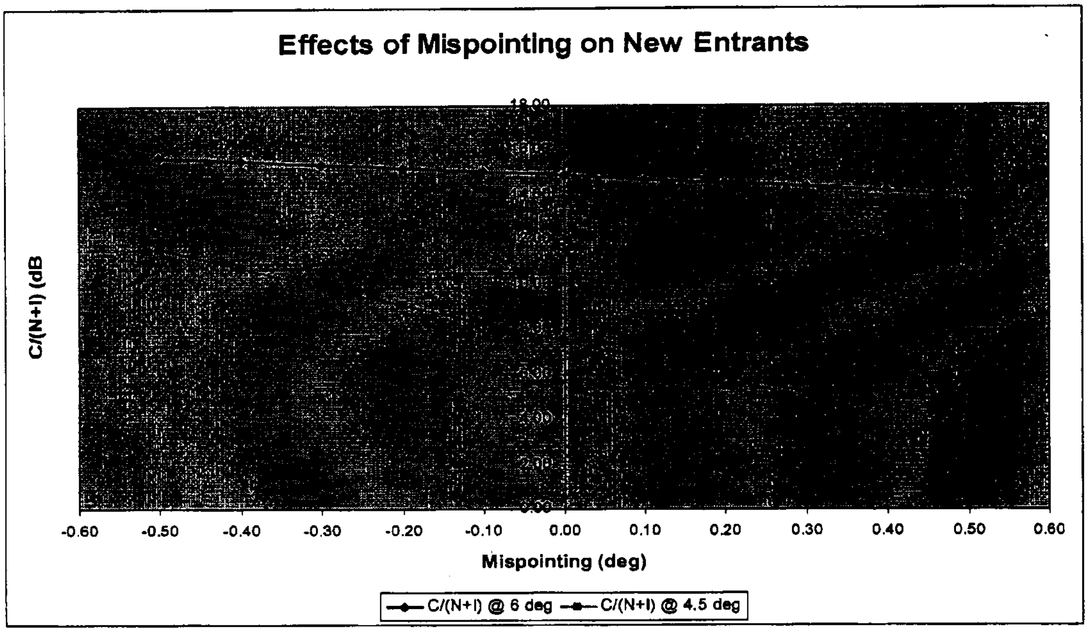

Figure 4: Effects of Mis-pointing on new entrants

As shown in Figure 4, for new entrants with 4.5° separation, the difference in C/(N+I) between the +0.5° and –0.5° mis-pointing scenarios is approximately 8 dB. In contrast, for new entrants with 6° separation, the difference in C/(N+I) between the +0.5° and –0.5° mis-pointing scenarios is only about 1.7 dB.

Given the sensitivity of 4.5° spaced new entrants to antenna mis-pointing, any rule establishing uniform 4.5° spacing would have to address this issue, likely by adopting new technical rules concerning antenna pointing. In comparison, such technical constraints would be unnecessary for new entrants and existing systems with 6° separation.

2.5 Efficiency

EchoStar states that a 4.5° spacing policy could double the number of U.S. DBS orbital locations.[17] Even if the number of orbital locations were doubled, however, such an outcome would not necessarily result in the doubling of the DBS throughput available to American consumers.

The technical analysis in this Appendix demonstrates that both existing DBS systems and new entrants operating in a 4.5° spacing environment would be subject to technical constraints. In a 4.5° spacing environment, new entrants' C/(N+I) would be limited, and the C/(N+I) of existing systems would be reduced. As a result, these

17 *See EchoStar Comments at 1-2*

operators would find it difficult to use high order modulation and coding schemes to improve throughput while at the same time maintaining the link availability.

In contrast, 6° spacing would allow existing DBS systems to meet their future growth requirements while requiring that only limited or negligible constraints be applied to new entrants. Six-degree separation would permit operators' anticipated move to high order modulation and coding schemes, and would allow for more efficient use of the limited DBS spectrum.

Below, New Skies presents the results of a preliminary analysis of the impact of 4.5° spacing on the ability of existing DBS systems and new entrants to employ high order modulation. The first part of this analysis addresses interference from a single existing DBS system to a new entrant's operations. This analysis is performed for two locations, Miami and Los Angeles. The link C/(N+I) is calculated for these locations, and the associated link availability for these sites is calculated based on Recommendation ITU-R P.618-7. Link availability is assessed for all of the different modulation and coding characteristics proposed by EchoStar and DirecTV. Finally, it is further assumed that the link can be offered only if the link availability is greater than or equal to 99.50% over Miami and greater than or equal to 99.90% over Los Angeles.[18]

The calculation to determine if the required availability is achieved at the two locations, Miami and Los Angeles, is as follows:

Rain Margin = Available C/(N+I) – Required C/N

where:

Rain Margin	= rain attenuation to achieve the required availability based on ITU-R P.618-7 Recommendation, including the degradation in the receiving antenna figure of merit (G/T) due to rain and atmospheric attenuation.
Required C/N	= The demodulator threshold requirement of the equipment
Available C/(N+I)	= Calculated using equation (5)

[18] *See 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*, Memorandum Opinion and Order and Second Report and Order, 17 FCC Rcd 9614, Appendix G, 9778-9780 (2002). In Appendix G of this order, the Commission presented DBS service availability data for thirty-two U.S. cities. For each city, the Commission provided availability data for DBS service from the primary U.S. DBS orbital locations at 101° W.L., 110° W.L., and 119° W.L., as well as from 61° W.L. and 148° W.L. In Miami, service availability from the three primary orbital locations ranged from 99.67% to 99.50%, while in Los Angeles service availability from these orbital locations ranged from 99.98% to 99.92%.

City		Available C/(N+I) (dB)	Required C/N (dB)	Availability of 99.50% achieved
Miami	QPSK - EchoStar	**11.08**	6.10	**Yes**
Miami	QPSK - DirecTV	**11.08**	7.60	**No**
Miami	8PSK - EchoStar	**11.08**	8.00	**No**

Table 5 : 4.5° spacing : Capability of new entrants over Miami

City		Available C/(N+I) (dB)	Required C/N (dB)	Availability of 99.90% achieved
Los Angeles	QPSK - EchoStar	**9.26**	6.10	**Yes**
Los Angeles	QPSK - DirecTV	**9.26**	7.60	**No**
Los Angeles	8PSK - EchoStar	**9.26**	8.00	**No**

Table 6 : 4.5° spacing : Capability of new entrants over Los Angeles

City		Available C/(N+I) (dB)	Required C/N (dB)	Availability of 99.50% achieved
Miami	QPSK - EchoStar	**14.00**	6.10	**Yes**
Miami	QPSK - DirecTV	**14.00**	7.60	**Yes**
Miami	8PSK - EchoStar	**14.00**	8.00	**Yes**

Table 7 : 4.5° spacing : Capability of existing system over Miami

City		Available C/(N+I) (dB)	Required C/N (dB)	Availability of 99.90% achieved
Los Angeles	QPSK - EchoStar	**11.75**	6.10	**Yes**
Los Angeles	QPSK - DirecTV	**11.75**	7.60	**Yes**
Los Angeles	8PSK - EchoStar	**11.75**	8.00	**Yes**

Table 8 : 4.5° spacing : Capability of existing system over Los Angeles

City	Modulation	Available C/(N+I) (dB)	Required C/N (dB)	Availability of 99.50% achieved
Miami	QPSK - EchoStar	**15.60**	6.10	**Yes**
Miami	QPSK - DirecTV	**15.60**	7.60	**Yes**
Miami	8PSK - EchoStar	**15.60**	8.00	**Yes**

Table 9 : 6° spacing : Capability of new entrants over Miami

City	Modulation	Available C/(N+I) (dB)	Required C/N (dB)	Availability of 99.90% achieved
Los Angeles	QPSK - EchoStar	**12.45**	6.10	**Yes**
Los Angeles	QPSK - DirecTV	**12.45**	7.60	**Yes**
Los Angeles	8PSK - EchoStar	**12.45**	8.00	**Yes**

Table 10 : 6° spacing : Capability of new entrants over Los Angeles

City	Modulation	Available C/(N+I) (dB)	Required C/N (dB)	Availability of 99.50% achieved
Miami	QPSK - EchoStar	**15.69**	6.10	**Yes**
Miami	QPSK - DirecTV	**15.69**	7.60	**Yes**
Miami	8PSK - EchoStar	**15.69**	8.00	**Yes**

Table 11 : 6° spacing : Capability of existing system over Miami

City	Modulation	Available C/(N+I) (dB)	Required C/N (dB)	Availability of 99.90% achieved
Los Angeles	QPSK - EchoStar	**12.46**	6.10	**Yes**
Los Angeles	QPSK - DirecTV	**12.46**	7.60	**Yes**
Los Angeles	8PSK - EchoStar	**12.46**	8.00	**Yes**

Table 12 : 6° spacing : Capability of existing system over Miami

The tables above demonstrate that, under the assumptions of this study, new entrants with 4.5° separation from existing systems will have very limited ability to offer high order modulation in conjunction with DBS service to 0.45 m antennas. Accordingly, a 4.5° spacing environment would limit the total DBS throughput that would be available to American consumers. These results would vary depending on the actual difference in EIRP between the new entrant and the existing DBS system at these orbital locations.

The above analysis also shows that a 6° separation would enable existing DBS systems and new entrants alike to move towards the use of high order modulation and coding techniques, thereby permitting advanced services such as HDTV.

Additional analysis demonstrates that a new entrant with 6° separation from existing DBS systems will be able to offer a data rate that could be up to 33% higher than the data rate available from a new DBS system with only 4.5° separation. In order to reach this conclusion, New Skies assumes that within a 4.5° spacing environment, the new entrant will only be able to offer quadrature phase shift keying (QPSK) with forward error correction (FEC) ¾, while the new entrant with 6° separation will be able to offer 8PSK with FEC 2/3.

Using the formula:

$$BW = \text{Data Rate} / (\text{Modulation scheme in bits per symbol} * \text{FEC})$$

where:

Modulation scheme in bits per symbol for QPSK is 2 and 8PSK is 3

For a given bandwidth, the difference in data rate offered by the two systems mentioned above is:

$$\text{Data Rate}_{QPSK} * (4 / 3) \div 2 = \text{Data Rate}_{8PSK} * (3 / 2) \div 3$$

$$\text{Data Rate}_{8PSK} = \text{Data Rate}_{QPSK} * (4/3)$$

2.6 Summary of Technical Analysis

Based on the results of the technical analysis in this Technical Appendix, there is no sound justification for a uniform 4.5° spacing rule. As New Skies demonstrates, a uniform 4.5° orbital spacing policy for U.S. DBS would subject new entrants to significant technical constraints that would prevent those entrants from competing effectively with existing DBS systems. In this spacing environment, even incumbent DBS systems would also be subject to certain operational constraints. In contrast, as the analysis below shows, new entrants operating 6° from existing DBS systems would be able to operate at similar power levels, with similar interference protection, and with similar data rates.

TECHNICAL CERTIFICATION

I, Eric Villette, Manager Frequency Management, New Skies Satellites N.V., hereby certify under penalty of perjury that I am the technically qualified person responsible for the preparation of the engineering information contained in the foregoing submission, that I am familiar with Part 25 of the Commission's rules, that I have either prepared or reviewed the engineering information submitted in this pleading, and that it is true and correct to the best of my knowledge and belief.

Eric Villette

Dated: February 13, 2004

Certificate of Service

I, Susan A. Washer, hereby certify that on this 13th day of February, 2004, I caused a true and correct electronic copy of the foregoing Reply Comments of New Skies Satellites N.V. to be mailed electronically or by first-class mail to:

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