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

In the Matter of	
AMENDMENT OF THE COMMISSION'S POLICIES AND RULES FOR PROCESSING APPLICATIONS IN THE DIRECT BROADCAST SATELLITE SERVICE	IB Docket No. 06-160
FEASIBILITY OF REDUCED ORBITAL SPACING FOR PROVISION OF DIRECT BROADCAST SATELLITE SERVICE IN THE UNITED STATES	Report No. SPB-196

REPLY COMMENTS OF DIRECTV, INC.

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Dated: January 25, 2007

SUMMARY

In the initial round of comments in this proceeding, the two operators of U.S. Direct Broadcast Satellite ("DBS") systems documented the dramatic effect that interference caused by the introduction of proposed short-spaced "tweener" DBS satellite systems would have on the DBS service currently enjoyed by tens of millions of American subscribers. For example, if tweener systems were allowed to operate as proposed in their applications, a substantial number of current DIRECTV subscribers – up to 50% in some areas – would lose service entirely due to interference, while the remainder would suffer a significant decrease in signal availability. As proposed, tweener entry would also give foreign tweener systems – and the administrations that license them – veto power over U.S. DBS innovation, including the wave of new portable and mobile applications that are just coming to market. U.S. DBS operators also demonstrated that many of the public interest benefits that purportedly would arise from tweener entry are illusory. Accordingly, they argued that the Commission should closely scrutinize any proposal to create a "third way" for tweener entry that would by-pass the protections of the well-established international spectrum coordination process, which is incorporated into the Commission's existing rules.

Not surprisingly, tweener proponents view matters differently. They assert in their comments that their systems could bring many public interest benefits, and they propose regimes that would entitle them to serve the U.S. market without reaching coordination agreements with U.S. DBS operators.

These two positions are not equally valid. While U.S. DBS operators provided a substantial technical showing of the potential harms that tweener systems could cause,

tweener proponents provided very little support for or analysis of their "third way" proposals. Indeed, upon closer examination, those proposals reveal themselves to be technically unsound, logistically unworkable, and fundamentally unwise. For example:

- ***Mispointing.*** Tweener proponents argue that the Commission should simply ignore mispointing of receive antennas, because increased interference from a tweener toward which a receive antenna is mispointed will be cancelled out by the decreased interference from a tweener on the other side. This is nonsense, and established satellite operators ought to know better. Because of the non-linear characteristics of all antenna patterns, the net effect of mispointing will ***never*** be offset in the manner they describe – and the net effect grows larger as orbital spacing is reduced. In fact, DIRECTV's data shows that antenna mispointing is a critical factor in the interference analysis – and it is one that the Commission has used in its analysis of interference to DBS systems in the past.

- ***C/I ratio.*** Tweener proponents argue that ensuring a 19 dB C/I level from each tweener should be sufficient to protect U.S. DBS systems. This argument is based on misapplication of an ITU Recommendation for Fixed-Satellite Service ("FSS") systems, which have very different operational characteristics from DBS systems. By contrast, in replanning the Broadcasting-Satellite Service ("BSS") in Europe and Asia, the ITU Radio Regulations called for a single entry C/I of 28 dB. Curiously, tweener proponents fail to mention this more relevant ITU precedent, and the fact that SES's BSS/DTH service in Europe routinely operates at C/I levels of 23 dB and higher. In addition, given that there will likely be two tweeners adjacent to each U.S. DBS location, this proposal actually amounts to an aggregate C/I of only 16 dB – even assuming no antenna mispointing.

- ***Unavailability.*** Tweener proponents argue that they should be allowed to enter the U.S. market if they impose no more than an additional 10% increase in unavailability on U.S. DBS systems. Yet they fail to take into account the fact that two other services (one satellite, one terrestrial) already each have the right to impose a 10% increase in unavailability on DBS. The cumulative effects of these sequential degradations would yield a 46.4% increase in unavailability.

- ***Negotiating timeline.*** Tweener proponents propose truncated negotiating schedules of 120 to 180 days before turning to the Commission to resolve a coordination "impasse." Yet they cite no precedent for cutting off international negotiations in this manner, and no reason to believe that the complex spectrum sharing they propose could be worked out in the proposed timeframe – especially with service to tens of millions of subscribers hanging in the balance. Moreover, to the extent there have been delays in coordination to date, it has been due to the inactivity of the tweener proponents and not any "stonewalling" by U.S. operators.

- ***Other "burden sharing."*** Tweener proponents believe that U.S. DBS operators should re-engineer their future *and existing* systems in order to "share the burden" of tweener entry. By this, they mean not simply that U.S. operators should accept increased interference. They also expect that U.S. operators will lower the power levels of their own satellites so as to decrease interference to tweeners. Moreover, argue tweener proponents, U.S. operators should also deploy new antennas and set-top boxes to each of their tens of millions of subscribers in order to better accommodate tweener operations. This would not only place an inordinate economic burden on U.S. systems, but would also impose upon U.S. consumers the inconvenience of having equipment replaced even though it still performs as designed.

- ***"Benefits" of tweener entry.*** Tweener proponents argue that tweener entry will promote spectral efficiency and new entry, and analogize reduced spacing for DBS to the transition in the early 1980's to two-degree spacing for FSS. In reality, tweener systems would largely expropriate capacity gains made possible by billions of dollars invested in U.S. DBS technology, and are unlikely to provide any better platform for entry than would systems in other frequency bands that would not threaten to disrupt service for tens of millions of Americans. Moreover, there is no lesson to be drawn from the transition of a nascent FSS industry serving a fairly small number of commercial clients that can be applied to a well-established DBS market serving ubiquitous consumer terminals.

In short, none of the proposals made by tweener proponents can be taken seriously, much less used as a basis for adopting an entirely new regulatory regime for the DBS service. Indeed, if tweeners entered the U.S. market under the rules they propose and a U.S. DBS system thereafter managed to improve its service level, those tweener systems would have the right to modify their operations to bring the U.S. DBS operator back to the levels proposed for their "protection." This would not only endanger innovations in portable and mobile DBS applications being rolled out today, but also eviscerate all incentive for future innovation.

Having nurtured the DBS service from infancy to industry leader, it is inconceivable that the Commission would now adopt a "third way" regime that would permanently set back U.S. DBS operators.

TABLE OF CONTENTS

Page

SUMMARY i

I. Tweener Proponents' "Third Way" Proposals are Technically Unsound, Logistically Unworkable, and Fundamentally Unwise 2

A. The Proposals 5

B. Tweener Proposals Are Technically Flawed 6

1. The Commission Cannot Ignore Receive Antenna Mispointing 7

2. SES's C/I Proposal Ignores Critical Evidence and Is Thus Unreasonable 13

3. Cumulative Effects Make Increase in Unavailability an Inappropriate Protection Criterion 16

4. SES's "Tiered" Approach Would Not Provide Adequate Protection to U.S. DBS Services 18

C. Tweener Proposals Are Logistically Unworkable 19

D. Tweener Proposals Represent Unwise Public Policy 23

1. Tweener Proponents Implicitly Dictate Harmful and Expensive Changes to U.S. DBS Operations 24

2. Tweeners Would Freeze U.S. DBS Performance at Present Levels 27

3. Tweener Operations Will Not Promote Spectral Efficiency or New Entry 29

4. This Case Is Not Comparable to the Transition to Two-Degree Orbital Spacing for Nascent FSS Operations 30

II. The Commission Should Pursue Better Alternatives to Tweener Systems 33

III. DBS Licensing Issues 35

CONCLUSION 37

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REPLY COMMENTS OF DIRECTV, INC.

DIRECTV, Inc. ("DIRECTV") hereby replies to the five sets of comments[1] filed by other parties in response to the Commission's notice of proposed rulemaking related to short-spaced "tweener" satellite systems in the Direct Broadcast Satellite ("DBS") service.[2] Perhaps not surprisingly, the two existing U.S. DBS operators see little benefit and great potential for harm from tweener systems, and therefore no reason to create a "third way" for tweener entry outside of the well-established international coordination process. Conversely, and no less surprisingly, tweener proponents assert many benefits from tweener operations and a desire for rules that would enable them to serve the U.S. market without reaching agreement with U.S. DBS operators and with only limited safeguards for protecting existing systems serving tens of millions of U.S. subscribers.

[1] Comments of EchoStar Satellite L.L.C. ("EchoStar Comments"); Comments of ManSat Ltd. ("ManSat Comments"); Comments of SES Americom, Inc. ("SES Comments"); Comments of Spectrum Five LLC ("Spectrum Five Comments"); Letter from William G. Francis, Director of Telecommunications, Bermuda Department of Telecommunications, to Marlene H. Dortch (dated Dec. 7, 2006) ("Bermuda Comments").

[2] *See Amendment of the Commission's Policies and Rules for Processing Applications in the Direct Broadcast Satellite Service*, 21 FCC Rcd. 9443 (2006) ("*Tweener NPRM*").

These two positions are not equally valid. The dangers of tweener entry are well documented in the comments – the purported benefits are not. Moreover, the performance characteristics that tweener proponents foresee for their systems – and the burdens they would place on U.S. DBS systems – simply are not realistic from either a technical or practical perspective. The record provides no basis for the Commission to override the well-established international coordination regime that has been designed to accommodate legitimate new entry while protecting legacy systems and their subscribers against unacceptable interference.

I. Tweener Proponents' "Third Way" Proposals are Technically Unsound, Logistically Unworkable, and Fundamentally Unwise

As the Commission pointed out in the *Tweener NPRM*, the existing DBS rules can accommodate short-spaced systems that are able to show that they can operate satisfactorily without causing unacceptable interference to existing DBS systems.[3] Consistent with these rules and its international obligations, DIRECTV has engaged in coordination discussions whenever approached by another DBS system, including tweener proponents in this proceeding.

Under these international norms, the U.S. DBS industry has thrived for over a decade. U.S. DBS operators have introduced advanced compression, modulation, and coding technologies that have greatly increased the spectral efficiency of their systems. They have introduced spot beam technology to achieve the frequency reuse necessary to support local-into-local services. And most recently, they have begun to introduce a number of options for subscribers to receive live television in mobile platforms such as aircraft, cars, and boats. Just this month, DIRECTV announced its SatGo receiver, which

[3] *See Tweener NPRM*, ¶ 29. *See also* 47 C.F.R. §§ 25.148(f), 25.114(d)(13)(ii).

will provide viewers with high quality live television in a portable unit – usable for casual viewing but also designed to support public safety personnel in times of crisis. All of these developments have been predicated upon the assumption that the flexibility achievable with nine-degree orbital spacing would either continue or at a minimum that the interference environment would be protected through the international coordination process.

Yet as currently proposed – and not coordinated – tweener systems would cause harmful interference to millions of existing subscribers across the country. For example, as DIRECTV showed in its initial comments, up to half of its subscribers could lose service in certain portions of the country if tweeners were authorized to operate at the power levels they have applied for, while the remainder would suffer a significant decrease in signal availability.[4] Conversely, DIRECTV showed that, even at those requested power levels, tweener systems would not be able to provide claimed levels of service to small receive antennas.[5] DIRECTV also discussed the implications of tweener entry on future DBS innovation, with foreign tweener systems and their licensing administrations acting as gatekeepers for the development of U.S. systems. DIRECTV thus urged the Commission to consider very carefully before adopting any approach that would grant market entry in the absence of coordination between tweener and U.S. DBS systems. EchoStar, the other U.S. DBS operator, echoed many of these sentiments.[6]

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[4] Comments of DIRECTV, Inc. at 13-21 ("DIRECTV Comments").

[5] Specifically, the ratio of the carrier-to-interference ("C/I") levels for these tweener systems would be lower than the aggregate interference ratio for co-channel signals adopted by WRC-2000 to protect the new digital BSS assignments for purposes of replanning the BSS band in Regions 1 and 3 (*i.e.*, C/I of 21 dB), with smaller antennas most affected. *See id.* at 10 (citing ITU Radio Regulations, Appendix 30, Annex 5, § 3.4).

[6] EchoStar Comments at 5-9.

Similarly, Bermuda's Department of Telecommunications supports continued reliance upon the international spectrum coordination process and operator-to-operator negotiations to handle tweener entry.[7]

By contrast, the tweener proponents (ManSat, SES, and Spectrum Five) assert that the international coordination process for DBS systems is outdated, based on outmoded technology, and thus gives incumbent operators no incentive to engage in timely and constructive negotiations.[8] While ManSat nonetheless has been coordinating its tweener system at 96.5° W.L. with affected DBS systems and believes that reasonable agreements can be reached,[9] both SES and Spectrum Five propose specific procedural and substantive rules for a "coordination by rule" approach. Such an approach would, after a truncated negotiation period, override coordination by establishing a baseline to which U.S. systems would be forced to compromise their systems in case of an impasse. Wholly apart from their baseline proposals, tweener proponents also assert that the Commission should require U.S. DBS systems to *"share the burden"* of tweener entry by modifying existing and future system parameters to better accommodate short-spaced systems. For example, tweener proponents believe that U.S. DBS satellites should operate at lower power, and that U.S. DBS operators should retrofit millions of receive antennas and set-top boxes ("STBs").

As discussed below, these proposals are all deeply flawed. Because they are technically flawed, each of them would place at risk the high-quality DBS service that

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[7] Bermuda Comments at 2-3.

[8] *See, e.g.*, ManSat Comments at 8; SES Comments at 13-14; Spectrum Five Comments at 2-3.

[9] ManSat Comments at 7.

tens of millions of American consumers have come to expect and rely upon for news, information, and entertainment. Because they are procedurally flawed, they would replace a well-understood and established coordination process with truncated negotiation procedures that would strike anyone who has ever participated in coordination before as fanciful. And because they are conceptually flawed, they would impose burdens on U.S. DBS operators and their subscribers that simply are not justified. The Commission should not lightly create such a third way where the downside risk is so clear and dramatic and the potential benefits are uncertain at best.[10]

A. The Proposals

For SES, the tweener entry process starts after the Commission awards a tweener authorization. At that point, the tweener proponent would negotiate with affected DBS systems, seeking to find a mutually satisfactory operating arrangement. If the parties have not reached agreement after six months, the tweener proponent would submit its interference analysis to the Commission, and would be entitled to authorization in the absence of coordination if the proponent could demonstrate that its operations (1) would not degrade the affected network's C/I ratio below 19 dB for CONUS/CONUS coordination,[11] <u>or</u> (2) would not increase the affected network's unavailability by more than 10%, <u>or</u> (3) would not decrease the affected network's availability below 99.90%.[12]

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[10] Unfortunately, the International Bureau has already taken a first step down this path by granting such a conditional authorization to Spectrum Five. *See Spectrum Five, LLC*, 21 FCC Rcd. 14023 (Int'l Bur. 2006) ("*Spectrum Five Order*"). DIRECTV has filed an application for review of this order by the full Commission.

[11] SES's proposal would leave the C/I level to which spot beams could be degraded "to be agreed upon by the operators in the course of coordination" – essentially a default to the current system. SES Comments at 18 n.23.

[12] *Id*. at 18.

The Commission would have two months to act on the application (with any further delay automatically extending the performance milestones of the underlying tweener authorization).

For its part, Spectrum Five proposes a process in which a tweener proponent would initiate discussions by providing affected U.S. DBS operators with detailed link parameters for its proposed system, and those U.S. operators would have sixty days to respond. If the parties could not reach agreement within a total of 120 days from initiation of negotiations, both operators would provide a report to their respective administrations, which could then become involved in the negotiations. However, like SES, Spectrum Five advocates an override option in the absence of successful coordination, whereby a tweener would be entitled to market entry if it could show that it would cause no more than a 10% increase in unavailability relative to a 99.9% objective (or a 10% increase to actual unavailability where the existing availability is below 99.9%).[13] (In other words, Spectrum Five proposes to degrade existing U.S. DBS service below the 99.9% level of availability that it expects its own tweener system to achieve throughout the country – including Miami, an area where unavailability is high due to atmospheric attenuation.[14])

B. Tweener Proposals Are Technically Flawed

Although there are any number of lesser problems with the tweener proponents' proposals, three technical flaws in particular are worthy of note. First, both SES and Spectrum Five would have the Commission completely ignore mispointing of consumer

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[13] Spectrum Five Comments at 4-5.

[14] *Id*., Technical Exhibit at 4.

receive antennas in assessing the effect of their proposed systems on U.S. DBS service. As shown in DIRECTV's initial comments, such mispointing has a very pronounced effect on the interference experienced by subscribers and is critical in any analysis of tweener impact. Second, SES derived its proposed minimum C/I levels from an ITU Recommendation applicable to FSS operations, ignoring the section of the ITU Radio Regulations directly applicable to BSS operations that calls for dramatically more protection. Significantly, the C/I levels proposed by SES are far less than the BSS/DTH operations of its affiliate in Europe enjoy. Third, because of the cumulative effect of systems adding interference to the DBS band, the increase in unavailability caused by tweener entry is not an appropriate metric for protecting existing DBS operations.

1. The Commission Cannot Ignore Receive Antenna Mispointing

SES and Spectrum Five claim that the effects of receive antenna mispointing should not be considered when calculating the interference from tweeners into DBS terminals. Although they supply no technical analysis to support this position, they argue that such mispointing "will result in the antenna receiving increased interference from a satellite on one side of the desired satellite, but proportionally reduced interference from the satellite on the other side," and that "[a]s a result, the increased interference from one side is cancelled out by the decreased interference from the other side, so that the effect of the mispointing on the overall C/I calculation is nullified."[15]

[15] SES Comments, Technical Appendix at 4. *See also* Spectrum Five Comments, Technical Exhibit at 10 (asserting its belief that "subscriber pointing error effects are almost negligible" because "with a given subscriber antenna pointing error, the interference from one adjacent satellite increases while the interference from the other adjacent satellite decreases, the overall result will be a slight decrease in the C/I (approximately 0.3 dB) assuming all satellites have the same PFD").

This position is directly at odds with SES's arguments in its own tweener proceeding, where it supported the use of antenna mispointing as a component in the interference analysis.[16] Indeed, the Commission recognized mispointing as a necessary consideration in analyzing the effects of entry by the terrestrial fixed service known as Multichannel Video Distribution and Data Service ("MVDDS") on DBS operations, and incorporated that factor into its methodology.[17]

Neither SES nor Spectrum Five supplied any technical analysis to support their mispointing position, almost certainly because any such analysis would demonstrate that effects of mispointing are *not* negligible. To claim otherwise represents a basic misunderstanding of how mispointing affects any antenna, including DBS subscriber antennas. As shown in DIRECTV's initial comments, mispointing has a dramatic effect on DBS signal availability – to the point where the introduction of non-coordinated, high-power tweeners could cause total disruption in service across the country for subscribers with antennas mispointed by just one degree.[18]

To begin with, SES and Spectrum Five completely disregard the fact that any mispointing at all will – by definition – decrease the received signal power "C" from the target DBS satellite. Obviously, any decrease in C will necessarily decrease the resultant C/I.

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[16] *See, e.g.*, Letter from Karis A. Hastings to Marlene H. Dortch, Rep. No. SPB-196/File No. SAT-PDR-20020425-00071, Attachment (dated June 7, 2006) (assuming 0.5° mispointing).

[17] *See Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range*, 17 FCC Rcd. 9614, 9746 (2002) ("*MVDDS Order*"). The Commission assumed a 0.5 dB effect from DBS antenna mispointing, which translates to just over 0.75° mispointing away from the desired satellite when applied to the ITU-R BO.1213 reference pattern.

[18] DIRECTV Comments at 15.

More fundamentally, the tweener proponents fail to recognize that the off-axis gain of earth station antennas in use today varies in a non-linear fashion with off-axis angle (θ). For example, the Commission's reference pattern for FSS antennas varies as 25*log(θ) from 1º to 48º, excepting a plateau in the reference pattern between 7º and 9.2º.[19] The international reference pattern used for the Regions 1 and 3 replan, and now commonly used for small receive antennas in general (ITU-R BO.1213), varies as the square of θ for small off-axis angles (*i.e.*, across what is considered the main beam, which for a 45 cm antenna is about 5º), and varies as 25*log(θ) for angles beyond the main beam and less than about 23º. Because of this non-linear behavior of the off-axis gain, increased interference from mispointing in one direction (*i.e.*, towards Tweener A) *is never* offset exactly by an equivalent decrease in interference from mispointing in the other direction (*i.e.*, away from Tweener B), and the disparity grows as orbital separation becomes smaller.[20]

A diagram of the ITU-R BO.1213 co-polarization antenna pattern visually confirms this fact. Figure 1 shows the change in the relative gain of a 45 cm antenna as the signal moves further off-axis.

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[19] *See* 47 C.F.R. § 25.209.

[20] In addition, SES is incorrect in asserting that mispointing is only an issue in the "very small percentage of cases" in which the antenna is mispointed precisely along the geostationary arc. SES Comments at 15. Indeed, except in the very small percentage of cases in which the antenna is mispointed exactly perpendicular to the geostationary arc, some portion of the mispointing is, by definition, toward one adjacent satellite or the other.

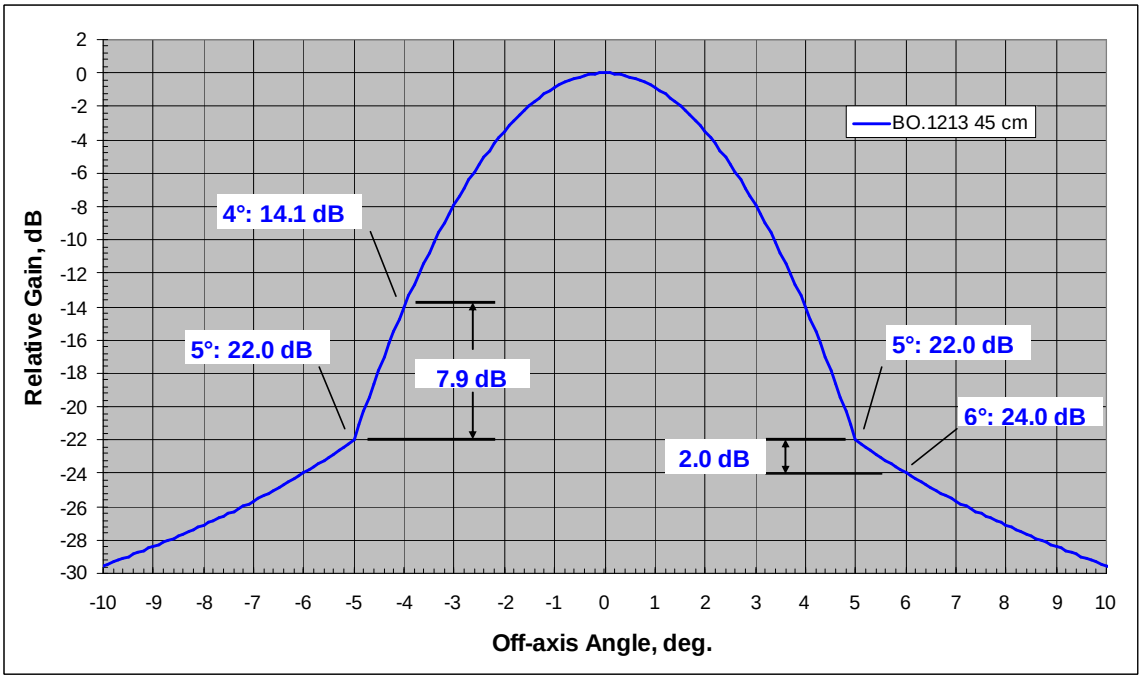

Figure 1. ITU-R BO.1213 Relative Co-pol Gain for 45 cm Antenna

Starting at 5º off-axis -- which is the approximate topographic angle from an antenna on the Earth's surface to a tweener spaced 4.5º away from the target satellite – the discrimination is 22.0 dB on both sides. Mispointing of 1º results in a 4º off-axis angle to one tweener (14.1 dB discrimination) and 6º off-axis angle to the other (24.0 dB discrimination). In other words, the mispointing toward one tweener worsens C/I by 7.9 dB while mispointing away from the other tweener improves C/I by 2 dB. This is hardly the offsetting effect SES and Spectrum Five assert.

The effect of mispointing can be further illustrated by analyzing a generalized case in which an antenna compliant with the ITU-R BO.1213 reference pattern is trying to receive a signal from a U.S. DBS satellite located at 101° W.L. in the presence of foreign tweener satellites at 105.5° W.L. and 96.5° W.L. For purposes of this generalized analysis, we assume that the signals of the desired satellite and the tweeners are received at the antenna at the same power level, that the topographic angle from the victim receive

antenna to the interfering satellites is the same given no mispointing, and that the satellites all maintain their locations perfectly (*i.e.*, station keeping of 0.0°). As shown in Table 1 below, even in this generalized case, antenna mispointing has a very profound effect on total C/I of the target satellite.[21]

	0.0° Mispointing			0.5° Mispointing			1.0° Mispointing		
Location	**C/I from Tw'er A**	**C/I from Tw'er B**	**Total C/I**	**C/I from Tw'er A**	**C/I from Tw'er B**	**Total C/I**	**C/I from Tw'er A**	**C/I from Tw'er B**	**Total C/I**
101 W.L.	20.6	20.6	**17.6**	16.7	22.0	**15.6**	12.5	22.7	**12.1**

Table 1. Generalized Effects of Mispointing for a U.S. DBS Satellite at 101° W.L.

Using real-world parameters rather than idealized generalities demonstrates an even more dramatic effect from mispointing. Table 2 below shows the effect of mispointing in the top ten U.S. markets for the case of DIRECTV 4S operating at 101.2° W.L. in the presence of tweeners operating at 105.5° W.L. and 96.5° W.L. with the characteristics of USAT-S1 MOD-A and IOMBSS-1, respectively, and assuming the standard 0.05° station keeping tolerance.

[21] Note that Total C/I includes both co-pol and cross-pol interference.

		0.0° Mispointing				0.5° Mispointing				1.0° Mispointing		
Rank	DMA	C/I from USAT	C/I from IOMB SS	Total C/I		C/I from USAT	C/I from IOMB SS	Total C/I		C/I from USAT	C/I from IOMB SS	Total C/I
1	New York	17.9	17.7	**14.8**		14.0	19.0	**12.8**		10.0	19.6	**9.5**
2	Los Angeles	17.5	19.8	**15.5**		13.5	21.1	**12.8**		9.4	21.6	**9.2**
3	Chicago	18.2	21.5	**16.6**		14.3	22.8	**13.7**		10.2	23.4	**10.0**
4	Philadelphia	17.7	17.7	**14.7**		13.8	19.0	**12.7**		9.8	19.6	**9.4**
5	San Francisco	16.9	19.7	**15.1**		13.0	21.0	**12.3**		8.9	21.6	**8.7**
6	Boston	19.0	18.6	**15.8**		15.1	19.9	**13.9**		11.2	20.6	**10.7**
7	Dallas-Ft. Worth	17.1	22.5	**16.0**		13.1	23.7	**12.8**		9.0	24.2	**8.9**
8	Washington DC	17.6	18.8	**15.1**		13.7	20.1	**12.8**		9.6	20.7	**9.3**
9	Detroit	16.7	21.1	**15.4**		12.8	22.4	**12.3**		8.7	23.0	**8.5**
10	Atlanta	18.8	24.5	**17.8**		14.8	25.8	**14.5**		10.7	26.3	**10.6**

Table 2. Particularized Effects of Mispointing on DIRECTV 4S

This analysis demonstrates the significant effects of antenna mispointing. Taking New York as an example, the table shows that for an antenna mispointed by 0.5° to the west, the interference from USAT gets worse by 3.9 dB while the interference from IOMBSS gets better by only 1.3 dB, as compared to the reference case (*i.e.*, 0° mispointing). Far from being "nullified," ***the total C/I with just 0.5° mispointing is a full 2 dB worse than the reference case.*** The asymmetry is even more pronounced for the 1.0° mispointing case, where the total C/I decreases by more than 5 dB (from 14.8 dB to 9.5 dB). And of course, the effects of mispointing come on top of the inherent interference caused by tweener operations – as reflected by the low C/I levels even where the receive antenna is perfectly pointed toward the target DBS satellite.

Clearly, mispointing cannot be ignored in any analysis of tweener interference. Tweener proponents' bald and unsupported assertion that this critical input should be intentionally overlooked speaks volumes about the lack of rigor they would have the Commission apply to the technical issues in this docket.

2. SES's C/I Proposal Ignores Critical Evidence and Is Thus Unreasonable

In support of their own tweener applications, both SES and Spectrum Five have argued that C/I is the appropriate benchmark for analyzing the impact of tweener systems on U.S. DBS operations.[22] It is surprising, then, that Spectrum Five failed to propose any criteria involving C/I whatsoever. Although SES made a proposal involving C/I, the protection level it chose is completely (and demonstrably) unreasonable. While SES claims support for its proposal from an ITU Recommendation, SES conveniently ignores the section of the ITU Radio Regulations relevant to digital BSS services – which would provide far more protection to U.S. systems.

SES proposes that a tweener system should be granted market entry in the absence of coordination if, *inter alia*, the proponent can demonstrate that its satellite will not decrease an affected U.S. DBS network's C/I to less than 19 dB. The sole support cited by SES for this C/I benchmark is an ITU Recommendation that applies to single-entry interference protection of *FSS* (*not* DBS) systems.[23] This is an inappropriate benchmark for a number of reasons. First, as discussed in the Plenexis Report, FSS systems have very different operational characteristics from DBS systems.[24] For

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[22] SES urged the Commission to focus "on a parameter that measures the true impact of adjacent satellites on a DTH system, independent of [operational differences]: the interference level received by that system, expressed relative to the desired signal strength (*i.e.*, the carrier-to-interference ratio, or 'C/I')." Letter from Phillip L. Spector to Marlene H. Dortch, Rep. No. SPB-196/SAT-PDR-20020425-00071, at 3 (dated Aug. 18, 2004). Similarly, Spectrum Five asserted that "[t]he basic issue is whether the resulting C/Is as a consequence of interference from the Spectrum Five network are reasonable and do not cause unreasonable levels of interference. These can best be determined through a coordination negotiation involving actual system parameters." Consolidated Response of Spectrum Five, File Nos. SAT-LOI-20050312-00062 and -00063, Technical Appendix at 1 (dated June 1, 2005).

[23] SES Comments at 18-19 (citing "Carrier-to-interference calculation between networks in the fixed-satellite service," Rec. ITU-R S.741-2).

[24] DIRECTV Comments, Appendix B, Test Report at 5-8 ("Plenexis Report").

example, while U.S. DBS systems operate at high power with fully occupied transponders, FSS systems operate at lower power and/or are not fully occupied.

Second, the Recommendation upon which SES seeks to rely takes into account only a single adjacent satellite, when the record is clear that tweeners would be located on both sides of each full-CONUS U.S. DBS slot. This is no small oversight, as can be demonstrated by once again considering the generalized case of a DBS satellite located at 101° W.L. in the presence of tweener satellites at 105.5° W.L. and 96.5° W.L., all of which maintain their locations perfectly and provide service to perfectly pointed receive antennas. If the C/I from each of the hypothetical tweener satellites is 19 dB, the resulting aggregate C/I is just 16 dB. Moreover, if we assume that the receive antenna is mispointed by just 0.75° toward the tweener in the single-entry case, the resulting C/I is reduced to just 12.8 dB.[25] Applying the same assumption for a double-entry case reduces C/I still further, to 12.2 dB. SES failed to discuss these consequences of its C/I proposal, much less defend them.

SES's decision to cite an ITU Recommendation for single-entry cases involving FSS systems is an especially odd choice, given that the ITU has promulgated a different set of parameters specifically applicable to multiple-entry cases involving DBS systems – *i.e.*, the aggregate interference ratio for co-channel signals adopted by WRC-2000 to protect the new digital BSS assignments for purposes of replanning the BSS band in Regions 1 and 3. As discussed in DIRECTV's comments, that replanning process took

[25] Mispointing of 0.75° has been used for purposes of this hypothetical because it corresponds to a 0.5 dB loss in the link budget, which was the assumption the Commission adopted in evaluating interference from MVDDS systems in this same band. *See* footnote 19, *supra*. Of course, DIRECTV has submitted data demonstrating that actual mispointing can be expected to be much higher in many cases. *See* DIRECTV Comments, Appendix A.

eight years and three World Radio Conferences, during which industry and government experts painstakingly reviewed the technical evidence on digital satellite transmissions to small receive antennas in order to arrive at appropriate network characteristics and regulatory procedures for sharing the BSS band and the geostationary arc. At the end of the day, the driving criteria for protection levels were a single-entry C/I objective of 28 dB and an aggregate C/I level of 21 dB.[26] This single-entry level is ***eight times higher*** than what SES proposes for protection of U.S. DBS operators, further demonstrating the fact that FSS and DBS systems are not comparable for these purposes.

Perhaps most tellingly of all, at no point in its filing does SES acknowledge the fact – as demonstrated in the report prepared for DIRECTV by Plenexis – that SES Global's BSS/DTH operations in Europe typically enjoy an aggregate C/I level ***more than four times as high*** as the 16 dB level its proposal would provide for U.S. DBS operators – even assuming no antenna mispointing.[27] In fact, those levels even exceed the protection from aggregate interference afforded in the Region 1 and 3 replanning process.

SES has not explained why, where the ITU Radio Regulations call for a much more favorable protection ratio for directly comparable services in Regions 1 and 3, it is appropriate or wise to degrade U.S. DBS operations to 19 dB C/I level (or 16 dB in the aggregate). Nor has it explained why it chose to use an inapposite FSS Recommendation when Appendix 30 of the ITU Radio Regulations is directly on point. And it has not

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[26] *See* ITU Radio Regulations, Appendix 30, Annex 5, § 3.4. The replanning process originally called for an aggregate C/I objective of 23 dB, but WRC-2000 opted for a slightly lower protection level. *Id.*

[27] *See* Plenexis Report at 5-8 (showing aggregate C/I levels of 23.3 dB to 32.3 dB for almost all cases, taking all sources of satellite interference into account).

explained why U.S. DBS operators should be made to accept significantly more interference from adjacent satellites than SES's affiliate tolerates in its own European operations. In short, SES has not explained why the Commission should take its proposed C/I criterion seriously in any respect.

3. Cumulative Effects Make Increase in Unavailability an Inappropriate Protection Criterion

Although both SES and Spectrum Five have previously taken the position that C/I is the best tool for analyzing the effects of tweener entry, they each now propose a regime that would allow entry so long as a proposed tweener system did not increase signal unavailability for subscribers of affected U.S. DBS systems by more than 10%.[28] They justify this position by noting that the Commission has in the past allowed other services to enter the DBS band if they operate below this threshold, concluding that a 10% increase in unavailability would not be considered harmful interference.[29]

Yet even granting that premise, it is surely wrong to argue that, if one reduction of 10% is acceptable, *subsequent additional* reductions of 10% are likewise acceptable. Tweener interference comes on top of two other potential interference sources in the band – non-geostationary orbit Ku-band satellite systems ("Ku-NGSO") and terrestrial MVDDS.[30] Each of these services is entitled to impose a 10% increase in unavailability on U.S. DBS systems, even before tweeners further complicate the interference environment. The Commission has already licensed one MVDDS and one Ku-NGSO

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[28] SES Comments at 18; Spectrum Five Comments at 4-5.

[29] SES Comments at 19; Spectrum Five Comments at 5-6.

[30] *See Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range*, 16 FCC Rcd. 4096 (2000) ("*Ku-NGSO Order*"); *MVDDS Order*, *supra* note 19.

system to serve every portion of the United States.[31] The addition of a tweener system on each side of a U.S. DBS location would yield a total of four interferers in the band. If each of the four systems were sequentially to increase unavailability of a DBS operator's signal by 10%, their combined operations would yield a total degradation amounting to a 46.4% increase in unavailability.[32]

Perhaps SES and Spectrum Five concern themselves only with the effect of interference from a single new tweener because they have each applied for a single tweener location. The Commission, however, does not have that luxury and cannot similarly turn a blind eye to the cumulative effects of allowing sequential erosion of DBS signal availability.[33] Moreover, although the percentage change remains constant, the increase in the actual duration of unavailability is greatest where the existing unavailability is already high. In other words, it is precisely those areas of the country

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[31] The Commission first auctioned MVDDS in February 2004, and then offered the few remaining licenses in December 2005. *See* Public Notice, "Multichannel Video Distribution and Data Service Spectrum Auction Closes," 19 FCC Rcd. 1834 (Int'l Bur. 2004); Public Notice, "Auction of Multichannel Video Distribution and Data Service Licenses Closes," 20 FCC Rcd. 19807 (Int'l Bur. 2005). It also recently licensed a Ku-NGSO operator. *Virtual Geosatellite, LLC*, 21 FCC Rcd. 14687 (Int'l Bur. 2006).

[32] Sequentially increasing unavailability by 10% for each of four systems starting from a baseline of X% results in an aggregate increase of $(1.1)^4$X%, or 1.4641X%. Of course, there is nothing to prevent licensing of one or more additional Ku-NGSO systems. Adding a fifth interferer would increase unavailability by 61% (*i.e.*, for five systems each adding 10% unavailability, the total is $(1.1)^5$X% or 1.61051X%). Moreover, it would appear that each successive generation of tweener satellites would be entitled to degrade U.S. DBS system performance still further, taking yet another 10% increase in unavailability with each replacement satellite.

[33] Spectrum Five asserts that "[i]ncumbent DBS operators have generally supported an approach based on unavailability in the past." Spectrum Five Comments at 4 (citing *MVDDS Order*, ¶ 60). However, Spectrum Five neglects to mention that such support was based on allowing no more than a 10% *aggregate* increase in unavailability from *all* sources, and included additional protections (such as a requirement that there be no loss of video picture continuity under clear sky conditions). *See MVDDS Order*, ¶ 60 and n.124.

that already have the most outages that would suffer the largest increase in additional outage time.[34]

But that is not all. Unlike the cases of MVDDS and Ku-NGSO, where a 10% increase to "actual unavailability" was the baseline, SES and Spectrum Five both argue that tweener systems should be entitled to consume any and all margin above a 99.9% baseline, no matter how great a percentage increase in unavailability this might represent. For example, in a market where a U.S. DBS system has invested to achieve a current availability of 99.95%, a tweener system could impose an immediate doubling of unavailability (*i.e.*, from 0.05% to 0.1%). Moreover, under Spectrum Five's proposal, the tweener system could then continue to increase unavailability an additional 10% beyond this initial degradation (for a total increase in unavailability of 120%). Thus, in many cases, the actual increase in unavailability will be far greater than the 10% level these tweener proponents facially espouse.

4. SES's "Tiered" Approach Would Not Provide Adequate Protection to U.S. DBS Services

The Commission should not misled by SES's "tiered" proposal. Under this plan, a tweener system need not meet the least disruptive of the three protection criteria. Instead, it is free to pick and choose whichever criterion is most advantageous to the tweener – and therefore most disruptive to the existing U.S. DBS system. In other words, a tweener system will only meet 19 dB C/I where that parameter would result in a greater than 10% reduction in unavailability and drive availability below 99.9%. Similarly, it would only rely upon the 10% reduction in unavailability criterion where doing so would

[34] For example, ignoring the effects of antenna mispointing, a subscriber receiving 99.9% availability at present would see that level decreased to 99.85% in the presence of four such interferers, while a subscriber receiving 99.7% availability at present would be degraded to 99.56%.

drive C/I below 19 dB and availability below 99.9%. This "mix-and-match" approach would ensure that U.S. DBS systems receive the least protection that any one of the criteria would afford in a given part of the country.

Allowing each tweener operator to choose the *most* disruptive approach would greatly exacerbate the interference concerns discussed above. To put this in context, take the example of service in Los Angeles from DIRECTV 4S at 101º W.L. At present, without interference from tweeners, service availability is approximately 99.925%. If a single tweener began operating at 105.5º W.L. with a C/I of 19 dB into DIRECTV 4S, availability would decrease to 99.896% – an increase in unavailability of approximately 38% – assuming no receive antenna mispointing. If a second tweener began operating at 96.5º W.L., also with a C/I of 19 dB into DIRECTV 4S and with no mispointing, availability would decrease to 99.847% – an increase in unavailability of over 100% from the original baseline. And if a modicum of receive antenna mispointing (*i.e.*, 0.75º) were added into this scenario, availability would decrease to 97.575% – ***an increase in unavailability of more than 3100%***. SES's inclusion of criteria allowing no more than 10% increase in unavailability and no less than 99.9% availability would not prevent this outcome.

C. Tweener Proposals Are Logistically Unworkable

Putting aside the technical misconceptions embodied in their proposals, SES and Spectrum Five have also set out negotiation timelines that are not reasonable and would place both the Commission and U.S. DBS operators in an untenable position. By making it next to impossible for satellite operators to resolve their own differences, these

timelines would inevitably require the Commission to resolve every DBS/tweener negotiation from here on out.

At the outset, neither SES nor Spectrum Five seems to appreciate the difficulty of the issues at stake here. Arranging for the introduction of high-power, co-frequency, co-coverage satellites operating in close proximity is no simple matter – especially where the risk of serious interference to an installed based of tens of millions of subscribers is involved. If it is to deal with interference issues seriously, *any* process for accommodating tweener operations – whether through international coordination or otherwise – must involve an iterative process in which each side exchanges information with the other on the particulars of its operational characteristics in a search for mutually acceptable parameters. As SES has consistently pointed out in its own tweener proceeding, the operator-to-operator coordination process "has significant advantages over adoption of one-size-fits-all rules" because it "provides critical flexibility to accommodate technical innovations and new service offerings."[35] It is a presumptively reasonable process to evaluate the relevant data and reach an appropriate outcome.

SES and Spectrum Five now claim, in essence, that because resolving complex sharing issues can be difficult and time-consuming, the coordination system itself is broken and must be replaced. Yet for decades, operators and administrations have resolved similarly complex issues through coordination. There is no reason to believe

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[35] Letter from Karis A. Hastings to Marlene H. Dortch, Rep. No. SPB-196/File No. SAT-PDR-20020425-00071, at 2 (dated June 7, 2006). *See also* Comments of SES Americom, Inc., Rep. No. SPB-196/File No. SAT-PDR-20020425-00071/RM No. 10804, at ii (dated Jan. 23, 2004) ("The ITU criteria and coordination procedures for DBS systems – already incorporated in the Commission Rules – should continue to be used to address the technical feasibility of, and to implement, reduced spacing. The Commission has held that these procedures ensure adequate protection of existing systems, while permitting new entry.").

that the issues involved with tweeners are so unique that coordination is inappropriate in this case alone.

Even if coordination *were* somehow uniquely inappropriate in the tweener context, SES's and Spectrum Five's proposals for overriding that process are completely unrealistic. If indeed operators are to be given the chance to resolve sharing issues without Commission intervention (the stated goal of all commenters in this proceeding), allowing six months or less for the resolution of issues that usually (and justifiably) take much longer to sort through will not accomplish this goal.

Spectrum Five, for its part, envisions a negotiation process lasting only 120 days before the parties refer the matter to their respective administrations. Spectrum Five provides no justification for this timetable or any basis for anticipating that it is at all realistic in light of the challenges facing the coordinating parties. Perhaps this is a function of Spectrum Five's inexperience with the coordination process. In fact, at no time has Spectrum Five ever contacted DIRECTV's technical personnel to initiate that process – not in November 2004 when the Netherlands made an ITU filing on its behalf, not in March 2005 when it applied for access to the U.S. market, and not in May 2005 when the International Bureau officially gave clearance for operator-to-operator discussions (including contact information for DIRECTV). Indeed, Spectrum Five has not even contacted DIRECTV in the two months since it was granted market access *subject to coordination* with affected U.S. DBS systems. It is, of course, grossly inappropriate for a party that has literally failed to pick up the phone for more than two years to insist on expedition in any respect. Moreover, given the wide-ranging and

radical list of proposals Spectrum Five has put forth in this proceeding,[36] there is no reason to expect that negotiations could be wrapped up in a summary fashion.

SES has at least begun the process of discussing its tweener proposal with U.S. DBS operators, though it has not pursued those discussions with DIRECTV for over two years. Its proposed timetable is only slightly less truncated than the one proposed by Spectrum Five. SES would allow 180 days for the parties to negotiate, and thereafter refer the matter to the Commission – which would then have only 60 days to act.[37] SES argues that such tight timeframes must be imposed because tweener systems have only one year after licensing in which to meet their first performance milestone by signing a satellite construction contract.[38] This argument turns logic on its head.[39] Such undue haste would not be necessary if tweener systems were required to coordinate *before* being licensed, as DIRECTV has argued and as the Commission itself has said is required under existing rules.[40] It is SES's insistence on placing the cart before the horse – and not anything inherent in the international spectrum management process or the

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[36] In the Technical Exhibit to its comments, Spectrum Five proposes, among other things, that: (1) DBS and 17/24 GHz BSS systems be assigned to opposite sides of each nominal orbital location (which Spectrum Five acknowledges would require a change in the Region 2 Plan); (2) all operators observe tighter station keeping requirements; (3) all DBS systems be required to use uplink spot beams; and (4) all DBS downlinks be limited to a power flux-density of no more than -110 dBW/MHz/m^2. *See* Spectrum Five Comments, Technical Exhibit at 2, 9-10.

[37] Presumably, the tweener filing would be in the form of a proposed modification to its system authorization. The 60-day period allotted for Commission action would have to include time for concluding that the tweener submission is acceptable for filing, placing it on public notice, and allowing thirty days for comment and additional time for the tweener proponent to respond – which would leave little, if any, time for actual consideration and action by the Commission.

[38] SES Comments at 14.

[39] Indeed, such an approach is not unlike the Queen of Hearts' preference: "Sentence first – verdict afterwards." Lewis Carroll, *Alice's Adventures in Wonderland*, Chapter XII.

[40] *See Tweener NPRM*, ¶ 41.

Commission's rules – that artificially creates the constraint that SES seeks to use as a bootstrap for its proposed timetable.

Neither SES nor Spectrum Five cites any precedent for limiting the time allowed for international coordination to run its course – and DIRECTV is aware of no such precedent. Such a regime would be particularly inappropriate here, given the novel and complex issues presented and the potential for disrupting service to tens of millions of American consumers if a rushed process leads to unforeseen consequences. Moreover, given the fact that the responsibility for any lack of progress in coordination negotiations to date lies squarely with the tweener proponents themselves, there is no reason to impose an unrealistic timetable on U.S. DBS operators and the Commission.

D. Tweener Proposals Represent Unwise Public Policy

In addition to being technically flawed and logistically unworkable, the tweener proposals would be fundamentally unwise public policy that would impose substantial costs on U.S. DBS operations. The result would not be a significant increase in DBS capacity or opportunities for new entry, but rather an expropriation of resources made possible by – and currently being used by – U.S. DBS operators. With an installed base of tens of millions of subscribers whose service could be marginalized or even preempted, the DBS service of today is not at all comparable to the FSS service of the early 1980's, when the Commission last implemented a reduced spacing initiative. In these circumstances, imposing the tweener proponents' "third way" proposals would not serve the public interest.

1. Tweener Proponents Implicitly Dictate Harmful and Expensive Changes to U.S. DBS Operations

Although they tread lightly around the details, tweener proponents clearly envision a regime that would impose significant new monetary and operational burdens on U.S. DBS systems. The most obvious impact is the additional interference tweener systems would create, which in and of itself threatens to degrade or even disrupt entirely the service to millions of current subscribers. But tweener proponents have additional expectations for U.S. DBS operators to "share the burden" of reduced orbital spacing.

For example, ManSat and Spectrum Five refer obliquely to their expectation that U.S. DBS operators would need to design replacement satellites that are compatible with the reduced spacing environment.[41] This would appear to be shorthand for any number of ways in which one satellite can accommodate another – the principal one of which is a reduction in power. SES's proposal also contemplates this result. SES asserts that its proposed protection criteria should "apply uniformly to any coordination dispute" and "should not distinguish between incumbent systems and new entrants."[42] In other words, SES appears to suggest that tweener systems are entitled not only to operate at 19 dB C/I or with 99.9% availability throughout the country,[43] but also to insist that U.S. DBS systems alter their operations as necessary to ensure these performance levels are achieved. And insist they must. As shown in Table 3, even if they were allowed to operate at the harmful power levels they have requested and were to use the 52 cm

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[41] *See* ManSat Comments at 9; Spectrum Five Comments, Technical Exhibit at 3.

[42] SES Comments at 19-20.

[43] SES's third criterion, a 10% increase in unavailability, would not be applicable because a new tweener system would have no baseline unavailability established against which to assess the effect of adjacent satellites.

receive antenna SES postulates, tweener systems could not achieve these operational levels over much of the country in the presence of *existing* DIRECTV and EchoStar satellites – especially taking mispointing into consideration.[44]

		0° MP	0.5° MP	0° MP	0.5° MP	0° MP	0.5° MP
DMA Rank	City	45 cm (dB)	45 cm (dB)	52 cm (dB)	52 cm (dB)	60 cm (dB)	60 cm (dB)
1	New York	15.0	12.4	18.1	16.8	19.4	18.5
2	Los Angeles	17.4	14.8	19.9	18.6	21.1	20.2
3	Chicago	16.1	13.6	18.9	17.7	20.2	19.4
4	Philadelphia	15.4	12.8	18.4	17.1	19.8	18.9
5	San Francisco	16.2	13.2	18.7	17.3	19.9	18.9
6	Boston	13.7	11.2	17.0	15.7	18.4	17.4
7	Dallas-Ft. Worth	18.2	15.7	20.7	19.4	21.8	21.0
8	Washington DC	16.2	13.6	19.1	17.8	20.4	19.6
9	Detroit	16.1	13.2	19.0	17.6	20.3	19.3
10	Atlanta	17.1	14.8	19.7	18.6	20.9	20.2

Table 3. Aggregate C/I values (with and without mispointing) into USAT-S1 MOD-A from DIRECTV 4S and EchoStar 8 National Beams

Thus, the only way for a tweener to achieve the C/I level that SES proposes would be for U.S. DBS operators to power down their existing satellites – almost all of which are already part of the Region 2 Plan and therefore entitled to protection at their current power levels. Putting aside the recursive problems this would create[45] and the general undermining of the international spectrum management process, such a regime would result in a double hit to U.S. DBS operations – both an increase in interference and a decrease in operating power. The result can only be inferior service for U.S. consumers.

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[44] Moreover, if SES were allowed to operate its tweener at its requested power level, the resulting C/I for DIRECTV would fall below the 19 dB C/I benchmark SES has proposed. *See* Table 2, *supra.*

[45] Unfortunately, if a U.S. DBS system lowers its power to improve performance of a tweener system, its own performance would be compromised below the levels of protection to which it would be entitled under SES's proposal. This would necessitate a decrease in power by the tweener to compensate, which would then require a further decrease in power by U.S. DBS systems, and so on. The result is a recursive process of downwardly spiraling power levels until neither system can serve anyone.

A presumed decrease in satellite power is not all the tweener proponents have in mind. They also expect that, in order to accommodate reduced spacing, U.S. DBS operators will develop and deploy new antenna and STB technologies.[46] DIRECTV is constantly working on improvements to the products and services made available to its subscribers, and there is to some degree a natural evolution over time as consumers upgrade their systems. However, there are also millions of subscribers who still have the original 45 cm receive antenna and STB they were provided in the first few years of DIRECTV's existence, and see no reason to switch them out. Were DIRECTV forced to transition these subscribers against their will to new technologies with degraded availability in order to avoid having their screens go dark from tweener interference, the price would be prohibitive both monetarily and in terms of consumer disruption and dissatisfaction. This would not only anger subscribers (and rightly so), it would also harm the reputation of U.S. DBS operators and place them at a severe competitive disadvantage to other MVPDs – all to accommodate tweener systems that have no subscribers and no public interest justification.[47]

Tolerating increased interference is just the beginning of the "accommodations" tweeners would require of U.S. DBS operators.[48] As the list is fleshed out, it becomes

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[46] *See, e.g.*, ManSat Comments at 9.

[47] ManSat asserts that disruptions from system upgrades could be minimized by phasing them in over the six-year period before any tweener system is due to be launched. *Id.* at 9. However, DBS systems are actually required to launch their first satellite within *four* years of authorization – a period that is already running for Spectrum Five. *See* 47 C.F.R. § 25.148(b); *Spectrum Five Order*, ¶ 45. This is hardly sufficient to achieve turnover of a DBS satellite fleet or tens of millions of subscribers' equipment.

[48] SES asserts that U.S. DBS operators' reliance on nine-degree spacing "rings hollow in light of Commission statements dating back to 1998 that recognize the likelihood of reduced orbital spacing." SES Comments at 10. However, SES overlooks the fact that the rules for such reduced spacing require that a proposed tweener system either fall below ITU coordination triggers or complete coordination with affected operators. In either case, existing expectations would be protected.

ever more obvious that authorizing tweeners in the manner they envision would not serve the public interest.

2. Tweeners Would Freeze U.S. DBS Performance at Present Levels

As DIRECTV noted in its initial comments, if tweener systems granted market access through a "third way" regime are entered into the Region 2 Plan, both the operators of those systems and the foreign administrations that have licensed them will be in a position to act as gatekeepers over future improvements and innovations in U.S. DBS technology.[49] The tweener proponents' proposals for "protecting" existing U.S. DBS systems would have a similar effect by virtually ensuring the stagnation of incumbent system performance levels. This is because, to the extent a U.S. DBS operator took steps to improve its performance in the presence of tweener systems, the regimes proposed by SES and Spectrum Five would give tweener operators the right to simply absorb those improvement for their own benefit and drag the U.S. DBS operator back to its previous state.

For example, DIRECTV could spend hundreds of millions of dollars to build more powerful satellites or replace every subscriber's receive antenna with a larger one in order to increase C/I and availability. Alternatively, it could revert to using a less efficient coding technology, which would increase availability but decrease spectral efficiency. In any of these cases, tweeners would be entitled to take back whatever improvement DIRECTV managed to achieve and drive DIRECTV's performance levels

[49] DIRECTV Comments at 17-18.

back to the proffered baseline.[50] Thus, perversely, the "protection" criteria SES and Spectrum Five propose would actually act as a ceiling on the performance levels of U.S. DBS systems and eliminate any incentive to develop or deploy innovative technology that would create or require superior performance.

This has immediate real-world consequences. DIRECTV has continually invested in new technology and thereby steadily improved its system performance to support ever-better service for consumers. It has, for example, worked with third-party vendors to introduce a number of options for subscribers to receive live television in mobile platforms such as aircraft, cars, and boats, creating jobs and spawning a new industry niche.[51] Just this month, DIRECTV announced its SatGo receiver (see below), which incorporates a television, set top box, and antenna into one conveniently portable design so that subscribers can enjoy digital-quality television when camping, tailgating, RVing, sitting by the dock or even watching at home. Moreover, SatGo will be able to support public safety personnel in times of crisis. Had SatGo been available in the aftermath of Hurricane Katrina, for example, emergency personnel could have had instant access to news, information, and government bulletins – even in the complete absence of terrestrial television infrastructure. All of these innovations and this nascent industry would be threatened by

[50] Thus, for example, if DIRECTV originally had a C/I of 21 dB which was reduced to 19 dB by interference from a tweener system, and thereafter gave every subscriber a 60 cm antenna so as to restore a 21 dB C/I, the tweener system would be entitled to increase its power to a level that would return DIRECTV to 19 dB C/I – nullifying the investment in deploying larger dishes.

[51] *See* DIRECTV Comments at 19-20 (discussing mobile offerings of KVH Industries, Boeing, and JetBlue Airways).

the tweener proposals in this docket. This, DIRECTV submits, would not serve the public interest.

3. Tweener Operations Will Not Promote Spectral Efficiency or New Entry

The tweener proponents' filings speak at length about the ways in which such systems would purportedly serve the public interest, chief among which are (1) promoting spectral efficiency,[52] and (2) providing an avenue for new entry into the MVPD market.[53] Neither claim withstands scrutiny.

First, as discussed in DIRECTV's initial comments, the capacity tweeners offer is not costless. It has been made possible by billions of dollars invested in technology by U.S. DBS operators, which has made those systems some of the most spectrally efficient the world has ever known. Authorizing tweener systems absent coordination would not "create" additional capacity, it would merely reallocate capacity from U.S. systems to non-U.S. systems. In this way, tweeners would eat into the capacity available for existing systems, diminishing their current capabilities and constraining the extent to which they will be able to innovate in the future.

Second, there is no reason to believe that tweener systems will be used to support new entry. Although SES extols the virtues of delivering new content for new operators, it has already leased "the entire communications capacity (including all spare capacity)" on its proposed tweener at the 105.5° W.L. orbital location to EchoStar – foreclosing the

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[52] SES Comments at 8-9; ManSat Comments at 6; Spectrum Five Comments at 3.

[53] SES Comments at 4-8; ManSat Comments at 9; Spectrum Five Comments at 3.

opportunity for new entry from that slot.[54] For its part, Spectrum Five has been licensed for a tweener system composed entirely of spot beams, intended to support the provision of local broadcast programming to subscribers. Such a system could be used as an adjunct to an existing service with CONUS coverage, but it is hard to imagine how it could support new entry on its own.[55]

Tweeners authorized under a "third way" have the potential to inject substantial interference into the DBS band and restrict future innovations, yet will not introduce any public interest benefits to offset these adverse consequences. DIRECTV submits that providing a new method for entry in the absence of coordination would not serve the public interest.

4. This Case Is Not Comparable to the Transition to Two-Degree Orbital Spacing for Nascent FSS Operations

ManSat states in its comments that it has been coordinating its tweener system with U.S. DBS operators, and believes that reasonable agreements can be achieved through that process.[56] However, its attempt to analogize reduced orbital spacing for DBS satellites to the Commission's transition to two-degree orbital spacing for C- and Ku-band FSS satellites is misplaced.[57] In the early 1980's, when the Commission adopted reduced spacing for FSS operations, the satellite industry was in its infancy.

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[54] DIRECTV Comments at 27 (citing Satellite Service Agreement for AMC-14, Article 1.A (Aug. 13, 2003) (http://www.sec.gov/Archives/edgar/data/1001082/000103570403000773/d10018exv10w2.txt)).

[55] Moreover, it is not even clear that either DIRECTV or EchoStar would have reason to make use of such capacity. DIRECTV currently provides local-into-local service in 142 DMAs while EchoStar serves 174 DMAs, and DIRECTV expects to launch two new spacecraft with sufficient capacity to carry over 1500 local channels.

[56] ManSat Comments at 7.

[57] *Id*. at 4-5. SES also seeks to compare reduced orbital spacing for DBS with the Commission's adoption of a two-degree spacing policy. SES Comments at 9.

There were only three Ku-band and twelve C-band domestic satellites in operation, serving only several thousand earth stations.[58] Satellite services focused almost exclusively on the needs of business and enterprise users, with the means to afford equipment changes in their operations and a familiarity with periodic equipment upgrades. A ubiquitous, consumer-oriented service such as DBS, with an emphasis on simple and hassle-free services, was simply unknown at that time. Accordingly, the factors that led the Commission to adopt reduced orbital spacing in the FSS bands are inapposite to proposals for reduced orbital spacing in the DBS band. For example:

- Although demand for satellite services was rapidly growing in the early 1980's, the Commission found that capacity from alternative frequency bands, more efficient transmission techniques, and the use of higher capacity satellites "will not be economically practical for widespread use during the next few years."[59] By contrast, today the viability of the Ka-band for MVPD services has been demonstrated by DIRECTV, and the 17/24 GHz BSS band will become available in April 2007.

- The Ku-band transition could be accomplished "immediately at little cost to users," while the C-band transition would not worsen the interference situation if accompanied by a 3 dB improvement in antenna sidelobe performance, a 10 dB improvement in antenna cross-polarization isolation, and a standardized transponder frequency plan phased in over several years.[60] By contrast, upgrading tens of millions of DBS receive antennas in the field would cost over a billion dollars and untold consumer inconvenience, and there is no opportunity for additional improvement through adoption of a DBS transponder frequency plan because one already exists.

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[58] *Licensing of Space Stations in the Domestic Fixed-Satellite Service and Related Revisions of Part 25 of the Rules and Regulations*, 54 Rad. Reg. 2d (P&F) 577, ¶ 49 (1983) ("*Two-Degree Spacing Order*"); *Assignment of Orbital Locations to Space Stations in the Domestic Fixed-Satellite Service*, 94 F.C.C.2d 129, ¶ 3 (1983). Indeed, the National Cable Television Association was a notable commentator in the *Two-Degree Spacing Order* proceeding because of the large number of small receive-only antennas used by the cable industry – approximately 6000 antennas of 4.5 to 5 meters in diameter. *Two-Degree Spacing Order*, ¶ 28.

[59] *Id*., ¶ 14.

[60] *Id*., ¶¶ 4, 19.

- Although some parties argued that reduced orbital spacing could preclude the use of spot beam satellites in the FSS bands, the Commission did not address those concerns because no concrete proposal was before it at the time.[61] By contrast, spot beam satellites are one of the most important innovations ever implemented in the DBS industry and a cornerstone of local-into-local services. The Commission cannot simply ignore the effect of tweener entry on spot beam operations.

- All Ku-band applicants at the time favored two-degree spacing, and there was nearly unanimous support for reducing C-band spacing to three degrees immediately and an acknowledgment of the ultimate feasibility of two-degree spacing in the band.[62] By contrast, the existing DBS operators strenuously oppose the reduction of orbital spacing in the absence of coordination of tweener operations.

It is also instructive to compare the relative impact of decreased spacing as a function of FSS and DBS antenna characteristics. C-band antennas in use in the early 1980's were relatively large, and even the smaller ones (*i.e.*, 4.5-meter diameter) had a half-power beam width on the order of 0.8º.[63] Accordingly, the ratio of the reduced orbital spacing to the half-power beam width was 2.5 (*i.e.*, 2º/0.8º). Many DBS antennas, by contrast, are one-tenth this size (0.45 meters) with half-power beam widths on the order of 3.8º, resulting in a reduced orbital spacing to half-power beam width ratio of 1.2 (*i.e.*, 4.5º/3.8°).[64] This ratio is informative because it shows the relative proximity of an immediately adjacent satellite in terms of the receive antenna beam width. The smaller

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[61] *Id.*, n.23.

[62] *Id.*, ¶ 3.

[63] The half-power beam width of an antenna is determined by the angle between the points at which points of the main lobe receive a 3 dB weaker signal (*i.e.,* half power) compared the peak EIRP of the main lobe. It is recognized by the Commission as an important factor in satellite coordination. *See, e.g., 2000 Biennial Regulatory Review – Streamlining and Other Revisions of Part 25 of the Commission's Rules Governing the Licensing of, and Spectrum Usage by, Satellite Network Earth Stations and Space Stations*, 20 FCC Rcd. 5666, ¶ 154 (2005) (for shared frequency band, NTIA "coordination requires the half-power beam width of the earth station").

[64] The half-power beam width for a 0.6-meter antenna is on the order of 2.9°, resulting in a ratio of 1.55 (*i.e.*, 4.5°/2.9°).

the ratio, the more likely it is that significant interference will occur. Moreover, while C-band antennas were generally professionally installed (and thus had fairly little mispointing, on the order of 0.5º or less), many DBS antennas have been installed by individual consumers, and as DIRECTV documented in its initial comments, pointing errors can be considerable (up to 2° or more) – more than sufficient to place the tweener satellite within the half-power beam width of the consumer receive antenna.

For all of these reasons, the situation in the FSS bands in 1983 is not at all comparable to the situation in the DBS band in 2007, and thus the Commission's response to proposals for reduced orbital spacing must be different now than it was then.

II. The Commission Should Pursue Better Alternatives to Tweener Systems

In the four years since SES filed its petition, tweeners have become the answer to a question no longer being asked. Satellite operators and programmers have many more DTH options available to them today – and they come without the risk of disrupting service to tens of millions of consumers who currently rely upon U.S. DBS systems to deliver their video services. In the last two years, DIRECTV has proven the viability of the Ka-band for delivery of high-quality DTH services, including high definition programming. EchoStar has incorporated standard and extended Ku-band assets into its service offering, demonstrating their viability as well. And in less than three months, 400 MHz of spectrum will become available in the 17/24 GHz bands under a new allocation for BSS services.[65]

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[65] *See Redesignation of the 17.7-19.7 GHz Frequency Band, Blanket Licensing of Satellite Earth Stations in the 17.7-20.2 GHz and 27.5-30.0 GHz Frequency Bands, and the Allocation of Additional Spectrum in the 17.3-17.8 GHz and 24.75-25.25 GHz Frequency Bands for Broadcast Satellite-Service Use*, 15 FCC Rcd. 13430, 13476-82 (2000).

Yet SES argues that these alternatives are inferior to DBS spectrum for three reasons.[66] First, SES asserts that DBS equipment is readily available and less expensive than is the case for these other bands. While this might have been the case previously, now that DIRECTV has begun deploying Ka-band equipment in large quantities, those concerns are no longer valid, and continued development in the band will continue to drive equipment availability up and prices down still further. At most, this is a short-term issue – and since the first tweener system was licensed less than two months ago with a four-year launch milestone, it may be a non-issue in the timeframe tweener operators apparently contemplate for launching their services.

Second, SES asserts that rain fade is a more significant problem for Ka-band and 17/24 GHz BSS systems than it is for DBS systems operating at lower frequencies. As DIRECTV has proven, although rain fade is higher in Ka-band as a statement of physics, it does not dictate the performance of a DTH system with proper engineering – especially if the system already anticipates using a receive antenna larger than those deployed with legacy DBS systems, and that will be able to use advanced modulation and coding techniques to achieve more than double the capacity in a given bandwidth from the beginning.

Third, SES asserts that a nationwide competitor will require total bandwidth of approximately 9-10 Gbps to compete effectively by providing a full suite of programming comparable to that offered by U.S. DBS operators. Interestingly, DIRECTV has become the world's leading DBS operator with total bandwidth of just over 7 Gbps – about 80% of what SES believes to be required. Yet even granting SES's

[66] SES Comments at 5-7.

assumption, such bandwidth can come from a combination of Ka-band and 17/24 GHz BSS assets as easily as it can from a combination of DBS and 17/24 GHz BSS assets. In fact, the former might even have certain advantages for equipment design, given the proximity of the two frequency bands.

If all things were equal, SES's assertions could conceivably justify the use of DBS spectrum rather than Ka-band or 17/24 GHz BSS spectrum. But all things are not equal in this case. Rather, to authorize tweeners without coordination is to risk causing immense damage to existing DBS subscribers and future innovation, without a real possibility of commensurate consumer benefits. Put into context, the arguments raised by SES cannot overcome the clear public interest danger that creation of a "third way" for tweener entry would create.

III. DBS Licensing Issues

In its initial comments, DIRECTV supported extension of the license term for DBS satellites from 10 years to 15 years.[67] Both parties that commented on this issue also supported a 15-year license term.[68] All three commenters agree that a longer license term would better match the useful life of satellites being built today – the same rationale the Commission cited for extending FSS licenses to 15 years.[69] Given that the statutory provision that previously limited DBS license terms to no more than 10 years has been lifted, there is no reason not to make this change.

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[67] DIRECTV Comments at 31.

[68] *See* EchoStar Comments at 15; Bermuda Comments at 3.

[69] *See Amendment of the Commission's Space Station Licensing Rules and Policies*, 17 FCC Rcd. 3847, 3895-96 (2002).

The Commission should apply this revision to existing DBS space station licenses, such that they are automatically extended by five years. This was the approach the Commission took when it extended the license term for existing FSS satellites from 10 years to 15 years so that they would be consistent with the license terms of new satellites granted under the revised rules.[70] The Commission reasoned that this modification would not be administratively burdensome because FSS space stations numbered only several dozen.[71] By comparison, the number of DBS space stations numbers less than two dozen, presenting even less potential burden.

In addition, DIRECTV joins EchoStar and Spectrum Five in opposing the adoption of any limitation on aggregation of full-CONUS satellite spectrum.[72] Satellite operators face capacity constraints that have become ever greater as the demand for programming – including bandwidth-intensive applications such as high definition television – has become more prevalent. The only way to respond to these market pressures is to secure more capacity – which requires the use of additional spectrum and orbital assets. A spectrum cap would arbitrarily hamstring the ongoing process of upgrading satellite services so that they can offer U.S. consumers an ever greater array of options and a viable alternative to incumbent terrestrial alternatives. Conversely, DIRECTV has demonstrated that the Ka band is suitable for DTH services, and additional spectrum in the 17/24 GHz BSS band will become available for new entrants as of April 2007. Accordingly, there is no basis in the record to conclude that a spectrum

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[70] *See Amendment of the Commission's Space Station Licensing Rules and Policies*, 18 FCC Rcd. 10760, 10860-61 (2003).

[71] *Id.*

[72] EchoStar Comments at 15-17; Spectrum Five Comments at 9.

cap is required to ensure opportunities for new competitors, but every reason to believe that such a cap would place unnecessary and harmful constraints on existing operators. The Commission should not adopt such a limitation.

CONCLUSION

The record in this proceeding clearly demonstrates the potential interference threat that tweener systems pose to U.S. DBS operations, and counsels extreme caution in formulating any "third way" for tweener entry in the absence of coordination. The record just as clearly does not support any of the specific "third way" alternatives proposed by tweener proponents, which are technically, practically, and conceptually flawed. Accordingly, there is no basis for establishing a regime that would override the well-established coordination process that has allowed DBS service to flourish in this country for over a decade.

Respectfully submitted,

DIRECTV, INC.

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January 25, 2007

ENGINEERING CERTIFICATION

The undersigned hereby certifies to the Federal Communications Commission as follows:

(i) I am the technically qualified person responsible for the engineering information contained in the foregoing Reply Comments,

(ii) I am familiar with Part 25 of the Commission's Rules, and

(iii) I have either prepared or reviewed the engineering information contained in the foregoing Reply Comments, and it is complete and accurate to the best of my knowledge and belief.

Signed:

/s/

David Pattillo

January 25, 2007

Date