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

In the Matter of	)	
EchoStar Satellite Operating Corporation	)	File No. SAT-LOA-2011_____
Application for Authority to Launch and Operate the EchoStar 16 Satellite at 61.5° W.L.	)	
and	)	
Application to Modify Authority at 61.5° W.L. to Substitute Channels 23 and 24 for Channels 1 and 2	)	
and	)	
Application for Special Temporary Authority to Operate on Channels 1 and 2 at 61.5° W.L.	)	

APPLICATION

Pursuant to Sections 308, 309 and 319 of the Communications Act of 1934, as amended, and Part 25 of the Commission's rules, EchoStar Satellite Operating Corporation ("EchoStar") files this application (A) for authority to launch and operate the EchoStar 16 satellite on the Direct Broadcast Satellite ("DBS") channels already licensed to EchoStar at the 61.5° W.L. orbital location;[1] (B) to modify its authority at 61.5° W.L. by swapping the channels on which it

[1] EchoStar currently operates over all 32 DBS channels at the 61.5° W.L. orbital location and holds a standard authorization for 30 of the 32 channels. Specifically, EchoStar holds standard authority to operate over channels 1-22 and 25-32. Originally, channels 2-22 (even) were licensed to Direct Broadcasting Satellite Corporation. Application of Direct Broadcasting Satellite Corp., *Memorandum Opinion and Order*, 8 FCC Rcd. 7959 (1993). Those 11 channels were then assigned to EchoStar's predecessor-in-interest. *See* Application of Direct

is authorized to operate from channels 1-22 and 25-32, to channels 3-32; [2] and (C) to operate on channels 1 and 2 at the nominal 61.5° W.L. orbital location under Special Temporary Authority ("STA").[3]

The modification of EchoStar's authority at 61.5° W.L. to exchange EchoStar's assigned channels 1 and 2 for the unassigned channels 23 and 25 (the "swap") will increase satellite operational efficiencies and will better protect any future third party that may use the unassigned channels at 61.5° W.L. from adjacent channel interference. Specifically, the swap will eliminate one of the two edges of the current unassigned channel cluster where there is spectrum overlap with the assigned channel cluster. This is because, under this proposal, channel 1 will not overlap with any DBS channel licensed to EchoStar. Since this is a like-for-like exchange, it does not implicate the moratorium on applications for new DBS spectrum.

I. INTRODUCTION AND BACKGROUND

EchoStar is a leading satellite services provider. EchoStar uses its six owned or leased in-orbit satellites, among other things, to provide DBS and Fixed-Satellite Service capacity to its customer, DISH Network L.L.C. ("DISH Network"), which is the operator of the DISH Network television service, the nation's third largest subscription television service with over 14.1 million subscribers. EchoStar currently operates the EchoStar 3, EchoStar 12, and EchoStar 15 satellites

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Broadcasting Satellite Corp. for Assignment of Direct Broadcast Satellite Orbital Positions and Channels, *Order*, 11 FCC Rcd. 10494 (1996). Channels 1-21 (odd) were assigned to EchoStar by Rainbow DBS, and channels 25-32 were assigned by Dominion in 2006. *See* Rainbow DBS Company, LLC, *Memorandum Opinion and Order*, 20 FCC Rcd. 16868 (2005); Stamp Grant, EchoStar Satellite Operating Corporation, File No. SAT-ASG-20070608-00081 (granted Sept. 27, 2007), respectively.

[2] 47 U.S.C. §§ 308, 309, 319; 47 C.F.R. Part 25.

[3] EchoStar also currently uses the remaining two channels, channels 23 and 24, under Special Temporary Authority. *See* Stamp Grant, EchoStar Satellite Operating Corporation, File No. SAT-STA-20110525-00096 (granted May 25, 2011) (STA valid until October 13, 2011) ("EchoStar 15 STA").

in the 61.5º W.L. orbital cluster. The EchoStar 3 satellite, launched in 1998, has experienced failures in a number of its traveling wave tube amplifiers ("TWTAs"), and concomitant reduction in the number of transponders available for use. The satellite is, moreover, naturally approaching the end of its useful life. EchoStar 12 was designed to allow access to only 13 of the frequencies at the 61.5° W.L. orbital slot (specifically, channels 1-23 (odd) and channel 24). EchoStar now seeks to launch and operate an additional satellite at the 61.5° W.L. orbital location.

EchoStar 16 will further supplement the service provided from 61.5º W.L. and ensure the continued full utilization of the DBS spectrum at that orbital location. As the Commission is aware, EchoStar had intended to replace EchoStar 3 with the AMC-14 satellite in 2008; that satellite, however, failed to launch properly and did not reach its intended orbit.[4] Instead, EchoStar replaced EchoStar 3 with EchoStar 15. EchoStar seeks authority to launch and operate the EchoStar 16 satellite at the 61.5º W.L. orbital location to supplement EchoStar 12 and EchoStar 15. The EchoStar 16 satellite is a state-of-the art satellite manufactured by Space Systems/Loral on its 1300 platform and is scheduled to be launched in 2012. EchoStar 16 will operate in the 12.2-12.7 GHz band using: (1) a single large downlink broadcast beam encompassing the continental United States ("CONUS") and Puerto Rico ("CONUS-plus beam"),[5] and (2) 71 downlink spot beams, 67 of which serve local markets in CONUS. EchoStar

[4] *See* Letter from Pantelis Michalopoulos, Counsel for EchoStar Corporation, to Marlene H. Dortch, Secretary, FCC, *filed in* File No. SAT-STA-20070926-00133 (Mar. 25, 2008).

[5] Like other satellites operating from 61.5° W.L., reception from the satellite will be at low elevation angles in certain western parts of CONUS.

requests herein a waiver for certain downlink beams that do not meet the 30 dB cross-polarization requirement. Six uplink spot beams will be operated in the 17.3-17.8 GHz bands.[6]

The CONUS-plus capability of EchoStar 16 will serve the public interest by increasing the capacity of EchoStar's customer, DISH Network, to provide high definition ("HD") programming to subscribers, and its advanced spot-beam technology will enhance DISH Network's ability to provide local-into-local stations across the country.[7] The requested authorization will continue to ensure improved services are available to DISH Network's subscribers.

II. THE PUBLIC INTEREST WARRANTS GRANT OF THIS APPLICATION

Grant of this application will serve the public interest because it will allow EchoStar and its customer DISH Network to expand and improve the video programming services offered to American consumers.

This state-of-the-art satellite will permit EchoStar to utilize fully the 61.5º W.L. orbital location. Competitive developments have placed a strain on the limited bandwidth available to DBS operators and have made it imperative to maximize the available capacity from licensed spectrum. DISH Network must be able to provide all local broadcast stations into all 210 local markets as a result of its certification as a qualified carrier under the Satellite Television Extension and Localism Act of 2010 and the Commission's carry-one, carry-all requirements.[8] DISH Network also remains subject to a demanding HD must-carry schedule imposed on

[6] EchoStar will file separately a request for STA to test the satellite at 61.5º W.L. after launch and before commencement of operations.

[7] *See* File No. SAT-STA-20100615-00134, Narrative at 2 (filed June 15, 2010).

[8] *See* 47 U.S.C. § 338(a)(1); 47 C.F.R. § 76.66.

satellite carriers by the Commission. The grant of the requested authorities will allow DISH Network to meet this schedule.[9]

The competitive and regulatory need for more satellite capacity requires satellite operators constantly to increase throughput. Within a finite spectrum assignment, however, power must be allocated to increasing throughput. This means that less power remains available to preserve the quality of reception and link availability that customers have come to expect. Consequently, DISH Network needs satellite capacity capable of providing additional power to respond to consumer demand and competitive pressures without sacrificing reception quality. EchoStar 16 will aid in the effort to achieve this result. The operation of EchoStar 16 at 61.5º W.L. may also permit EchoStar 3, EchoStar 12, or EchoStar 15 to deploy to other orbital locations to act either as in-orbit spares in the event of satellite equipment difficulties, or as supplemental capacity.

EchoStar 16 also will better enable EchoStar's customer DISH Network to continue to provide meaningful competition to terrestrial providers – both cable operators and telephone companies. By increasing competition in the multichannel video programming distributor ("MVPD") market, consumers will benefit through greater choice, more services, and lower rates.

III. THIS APPLICATION IS LEGALLY AND TECHNICALLY COMPLETE

EchoStar hereby submits all of the technical information required by Part 25 of the Commission's Rules in the accompanying Technical Annex (Attachment A), Form 312, and Schedule S, including an orbital debris mitigation plan. Because the satellite will operate on the

[9] Carriage of Digital Television Broadcast, *Memorandum Opinion and Order and Second Further Notice of Proposed Rulemaking*, 23 FCC Rcd. 5351 (2008).

channels already assigned to and used by EchoStar at 61.5° W.L., this application is not subject to the "freeze" on new DBS applications currently in place.[10]

EchoStar intends to operate all the transponders on this DBS satellite on a non-broadcast, non-common carrier basis.[11] Ultimately, the capacity will be used by DISH Network to provide multichannel video programming services across the United States. DISH Network's services will be offered to consumers on a subscription basis.

Waiver Requested. The operation of the EchoStar 16 satellite is consistent with the technical requirements of Part 25 of the rules in all but one respect – the cross-polarization isolation over Bermuda, the Caribbean, and Mexico is 27 dB, which is less than the minimum 30 dB required by Section 25.215 of the Commission's rules.[12] Accordingly, EchoStar hereby requests a waiver of Section 25.215 of the rules to the extent required.

Commission rules may be waived if there is good cause to do so.[13] Here, there is good cause, and the International Bureau has already granted similar waivers when the impact on neighboring satellite networks is negligible and the only party suffering increased interference is the satellite operator itself.[14] As the Bureau explained in one case, "[l]icensees may use cross-

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[10] *See* Public Notice, Direct Broadcast Satellite (DBS) Auction Nullified: Commission Sets Forth Refund Procedures for Auction No. 52 Winning Bidders and Adopts a Freeze on All New DBS Service Applications, FCC 05-213, at 2 (rel. Dec. 21, 2005) ("*DBS Freeze*").

[11] *See* 47 C.F.R. §§ 25.114(c)(11), 25.114(d)(11).

[12] 47 C.F.R. § 25.215 ("Space station antennas operating in the Direct Broadcast Satellite Service must be designed to provide a cross-polarization isolation such that the ratio of the on-axis co-polar gain to the cross-polar gain of the antenna in the assigned frequency band shall be at least 30 dB within its primary coverage area.").

[13] *See id.* § 1.3; *WAIT Radio v. FCC*, 418 F.2d 1153 (D.C. Cir. 1969).

[14] DIRECTV Enterprises LLC, *Order and Authorization*, 20 FCC Rcd. 15778 ¶ 7 (2005) ("*DIRECTV 5 Order*") (waiving Section 25.215 when the cross-polarization isolation of DIRECTV 5's DBS antennas was typically 27 dB over the satellite's primary coverage area); *see also* EchoStar Satellite Operating Corporation, *Order and Authorization*, 21 FCC Rcd. 14780 ¶ 8

polarization isolation different from that specified for the Region 2 BSS Plan if they demonstrate that such a difference does not result in interference to other operational or planned systems, including U.S. licensed systems."[15]

This is the case here. All beams on EchoStar 16 have cross-polarization performance that meets or exceeds 30 dB over most of the broadcast coverage area. There are three regions outside of CONUS, however, where the cross-polarization may reach, in the worst case, 27 dB. The slight 3.0 dB shortfall creates insubstantial amounts of self-interference that have already been factored into the link budgets submitted with Schedule S.

The shortfall will create negligible interference to adjacent DBS satellites. The only U.S. satellite networks that may be affected by EchoStar 16 are assigned to, or filed on behalf of, EchoStar. None of those satellites, however, provide service to Bermuda, the Caribbean, or Mexico, where the shortfall will occur. Therefore, there will be no interference to those satellites. EchoStar will coordinate with the Mexican Administration regarding any negligible interference with the QuetzSat-77 network. The 3dB difference of cross-polarization isolation would increase QuetzSat-77's OEPM degradation by 0.003 dB, which is considered negligible.

Accordingly, consistent with past precedent, a waiver of Sections 25.210(i)(1) and 25.215 of the Commission's rules is warranted here.

(2006); Star One S.A., *Order*, 19 FCC Rcd. 16334 ¶ 12 (2004); New Skies Satellites N.V., *Order*, 17 FCC Rcd. 10369 ¶ 19 (2002).

[15] *DIRECTV 5 Order*, 20 FCC Rcd. at 15779 ¶ 7.

IV. REQUEST TO MODIFY AUTHORIZATION TO PERMIT PERMANENT OPERATION OVER DBS CHANNELS 23 AND 24 AND TO OPERATE UNDER SPECIAL TEMPORARY AUTHORITY OVER CHANNELS 1 AND 2

A. Swap of Assigned Frequency Channels

EchoStar hereby requests a minor technical change to its authorization: the swap of the unassigned DBS channels 23 and 24 with its assigned channels 1 and 2. Specifically, EchoStar requests swapping the channels it holds under its permanent authorization at the nominal 61.5° W.L. orbital location from channels 1-22 and 25-32, to channels 3-32. EchoStar also requests STA to operate channels 1 and 2.

As the Commission has said in approving other channel exchanges or swaps in DBS assignments, this is "a minor change [that] does not entail the use of any additional orbit/spectrum resources."[16] As a result of the swap, EchoStar will continue operating the same number of channels as it does currently, and equivalent channels will remain available for assignment once the DBS freeze is lifted. As explained below, the only substantive difference will be more efficient operation of EchoStar's existing channel assignments and easier coordination for any operator subsequently assigned channels 1 and 2.

The proposed channel swap will better serve the Commission's policy in favor of efficient spectrum use through improved efficiency for EchoStar's operations and easier coordination for any subsequent operator assigned channels 1 and 2. The swap will improve the technical efficiency of EchoStar's operations from the 61.5° W.L. slot by positioning all of EchoStar's channels in a single block.

[16] Application of United States Satellite Broadcasting Company, Inc. for Modification of Construction Permit for Direct Broadcast Satellite System, *Memorandum Opinion and Order*, 5 FCC Rcd. 7576 ¶ 3 (1990).

Assuming the permanent authorization for the final two channels is assigned to another provider, the proposed channel swap will also ensure that the third party's channels will no longer be bordered on both sides by overlapping DBS spectrum licensed to EchoStar. As the Commission is well aware, adjacent DBS channels overlap significantly under the applicable Region 2 International Telecommunication Union Broadcasting-Satellite Service plan. This would allow the new licensee and EchoStar alike to more easily protect these operations from one another than would be the case if EchoStar retained channels 23 and 24. This proposed swap would also decrease the potential harmful interference and ease coordination for the new operator both in terms of causing interference to other satellite operators or dealing with interference from other operators. [17]

The channel swap should not be subject to the DBS freeze because it does not increase EchoStar's assignment or change the orbital location and affects no other provider. It is essentially a minor modification that is akin to request for a replacement satellite, and EchoStar is not seeking to "add frequencies or [an] orbital location."[18] Consequently, there will be no change in the number of channels available for assignment by the Commission.

Should the Commission find that the DBS freeze is applicable to this request, EchoStar requests a waiver to the extent necessary to accomplish the channel swap. The Commission may waive its rules for good cause shown, particularly where strict compliance with a rule is inconsistent with the public interest when taking "into account considerations of hardship, equity, or more effective implementation of overall policy,"[19] especially when deviation on an

[17] Moreover, the channel swap is not subject to the DBS freeze because as the Commission explains, "[t]he freeze does not apply to applications for replacement satellites . . . or requests for special temporary authority." *DBS Freeze* at 2.

[19] 47 C.F.R. § 1.3; *WAIT Radio v. FCC*, 418 F.2d 1153, 1159 (D.C. Cir. 1969).

individual basis does not require "evisceration of a rule by waivers."[20] The increased efficiencies and ease of coordination, discussed above, provide more than adequate good cause. And, as discussed above, these public benefits accrue without circumventing the Commission's underlying policy in effecting the DBS freeze.

B. Continued Use of the Remaining Channels Under STA

In granting the spectrum swap described above, EchoStar also requests that its current STA for channels 23 and 24 at the nominal 61.5° W.L. orbital location be modified to apply to channels 1 and 2 instead of 23 and 24 as part of this application. Modification of this STA in conjunction with the relief requested above will ensure that the Commission policies – that spectrum not remain fallow and freeze on DBS assignments – remain in balance.

As EchoStar has previously described to the Commission, the nominal 61.5° W.L. DBS orbital location has a somewhat unique history.[21] In stark contrast to the other assigned DBS orbital locations, two channels have remained unassigned and unlicensed. In fact, these channels "are the only two remaining unassigned DBS channels in the 12 GHz band that are assigned to the United States that can provide service to most of the contiguous United States."[22]

The future of these unassigned channels is, however, also subject to the uncertainty surrounding the *Northpoint* decision that vacated the Commission's DBS auction rules, and the DBS freeze implemented by the Commission in response to that decision.[23] As a result, a new licensee will not be in a position to provide services from these channels for a number of years.

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[20] *Id*.

[21] *See* Stamp Grant, File No. SAT-STA-20110303-00048 (granted Apr. 19, 2011).

[22] Rainbow DBS Company, LLC and EchoStar Satellite L.L.C., *Memorandum Opinion and Order,* 20 FCC Rcd. 16868 ¶ 29 (2005) ("*Rainbow 1 Assignment Order*").

[23] *Northpoint Technology Ltd. v. FCC*, 412 F.3d 145 (D.C. Cir. 2005); *see also DBS Freeze*. The DBS freeze does not apply to "applications for replacement satellites." *Id.* at 2.

In fact, while the Commission initiated a proceeding in 2006 to establish the mechanism by which these channels could be ultimately licensed and operated, that proceeding is still pending.[24]

In an effort to ensure that such valuable spectrum does not lie fallow, the Commission has provided authorization to DBS providers to operate on these channels for thirteen years subject to different conditions. The Commission initially granted EchoStar's predecessor-in-interest STA to operate on channels 23 and 24, as well as 8 channels assigned to Dominion Video Satellite, Inc. and 11 channels assigned to Rainbow DBS Company, LLC ("Rainbow") on March 21, 1998.[25] Rainbow subsequently operated on channels 23 and 24 pursuant to STA for a two-year period[26] before EchoStar's predecessor-in-interest acquired the Rainbow 1 satellite and regained authority in 2005.[27] On January 1, 2008, EchoStar's predecessor-in-interest assigned the STA to EchoStar as part of a *pro forma* corporate reorganization under which EchoStar

[24] *See* Amendment of the Commission's Policies and Rules for Processing Applications in the Direct Broadcast Satellite Service in the United States, *Notice of Proposed Rulemaking*, 21 FCC Rcd. 9443 (2006).

[25] *See* Direct Broadcasting Satellite Corporation, Application for Special Temporary Authority to Operate a Direct Broadcast Satellite Over Channels 1-21 (odd) and 23-32 (odd and even) at 61.5º W.L., *Memorandum Opinion and Order*, 13 FCC Rcd. 6392 (1998) ("*EchoStar 1998 STA Grant*"). For a full description of the regulatory history of these channels, see File No. SAT-STA-20090821-00092, Narrative at n.4 (granted Dec. 1, 2009).

[26] Rainbow received STA (the "Rainbow STA") to operate on the unassigned channels in 2003. EchoStar Satellite Corporation and Rainbow DBS Company LLC, *Order and Authorization*, 18 FCC Rcd. 19825 (2003) ("*Rainbow STA Order*").

[27] The Rainbow STA was assigned to EchoStar Satellite L.L.C. ("ESLLC") in October 2005 as part of the sale of the Rainbow 1 satellite to EchoStar. *See* Stamp Grant, File No. SAT-STA-20050926-00183 (granted Sept. 30, 2005); *see also Rainbow 1 Assignment Order*. The STA was then assigned from ESLLC to an affiliate, EchoStar Satellite Operating Corporation ("old ESOC") in September 2006. *See* Application for Pro Forma Assignment of Licenses from EchoStar Satellite L.L.C. to EchoStar Satellite Operating Corporation, File No. SAT-ASG-20051129-00256 (granted Sep. 13, 2006).

Communications Corporation spun off its wholly-owned subsidiary, EchoStar.[28] Since then, the Commission has repeatedly renewed EchoStar's STA for the two channels. The EchoStar 15 satellite currently operates on the unassigned channels 23 and 24 subject to STA.[29]

The Commission has highlighted repeatedly "the importance of ensuring that spectrum can continue to serve the public rather than lying fallow unnecessarily, even on a temporary basis."[30] During the past thirteen years, the flexibility provided by this much-needed capacity has proven instrumental to DBS providers. EchoStar therefore requests that its current STA for channels 23 and 24 at the nominal 61.5° W.L. orbital location be modified to apply to channels 1 and 2 instead of 23 and 24 as part of this application. As part of this requested modification, EchoStar agrees to abide by the same conditions for channels 1 and 2 that are currently in place for channels 23 and 24.

V. ITU COST RECOVERY

EchoStar is aware that as a result of the actions taken at the 1998 Plenipotentiary Conference, as modified by the ITU Council in June 2001, processing fees are now charged by the ITU for satellite network filings. As a consequence, Commission applicants are responsible for any and all fees charged by the ITU. EchoStar affirms it is aware of, and unconditionally accepts, this requirement and its responsibility to pay any ITU cost recovery fees for the ITU filings associated with this application. Invoices for such fees may be sent to the contact representative listed in the accompanying FCC Form 312.

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[28] *See* Public Notice, Policy Branch Information Actions Taken, DA 07-4655 (rel. Nov. 16, 2007) (consenting to the transfer of several authorizations as part of the spin-off).

[29] *See* EchoStar 15 STA.

[30] *Rainbow STA Order* ¶ 8; *see also EchoStar 1998 STA Grant* ¶ 7 ("furthering the Commission's objective to make efficient use of available spectrum").

VI. CONCLUSION

For the foregoing reasons, EchoStar respectfully requests that the Commission promptly grant this application for launch and operating authority for the EchoStar 16 satellite as in the public interest, convenience and necessity.

Respectfully submitted,

_____/s/_____

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ECHOSTAR-16

ATTACHMENT A

Technical Information to Supplement Schedule S

A.1 Scope

This attachment contains the information required by § 25.114(c) and other sections of Part 25 of the Commission's rules that cannot be entered into the Schedule S software.

A.2 General Description of Overall System Facilities, Operations and Services (§ 25.114(d)(1))

The ECHOSTAR-16 satellite will operate at the 61.5° W.L. nominal orbital location and will provide Broadcasting-Satellite Service ("BSS") services to the continental United States ("CONUS") and Puerto Rico.[1] ECHOSTAR-16 also has coverage capabilities for Bermuda, Mexico, and parts of the Caribbean.

EchoStar plans to initially operate the ECHOSTAR-16 satellite together with two other EchoStar satellites within the 61.5° W.L. orbital cluster. See Section A.8.3 of this document for details of the specific positions of these EchoStar satellites.

The ECHOSTAR-16 satellite will operate in the 17.3-17.8 GHz BSS feeder uplink band (ITU Appendix 30A) and the 12.2-12.7 GHz BSS downlink band (ITU Appendix 30), using the

[1] Note that service to Hawaii and Alaska is not possible using ECHOSTAR-16 from the 61.5° W.L. orbital location owing to the fact that Hawaii and Alaska are not visible from the 61.5° W.L. orbital location.

channels licensed to EchoStar at the 61.5° W.L. nominal orbital location, or otherwise operated under Special Temporary Authorization ("STA") from the Commission. The channel center frequencies are identical to that prescribed in the ITU's Region 2 BSS Plan. The bandwidth of each channel is 26 MHz.

At the nominal 61.5° W.L. orbital location, EchoStar has licenses for 30 of the 32 available channels.[2] In addition, EchoStar may operate on the two additional channels subject to STA from the Commission. Moreover, like other EchoStar satellites, the ECHOSTAR-16 satellite has been constructed with the capability to be operated at other EchoStar licensed Direct Broadcast Satellite ("DBS") orbital locations in order to provide operational flexibility for the future. For these reasons, the satellite is capable of operating on all 32 available DBS channels.[3]

The ECHOSTAR-16 satellite has two types of downlink beams:

1) A CONUS+ beam that serves all of CONUS and Puerto Rico; and

2) 71 spot beams. 67 of these beams serve local markets within CONUS. The remaining 4 spot beams provide coverage of Puerto Rico, Bermuda, Mexico, and parts of the Caribbean.

The satellite can be operated in one of three modes:

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[2] EchoStar is currently licensed by the Commission at the 61.5° W.L. orbital location for even-numbered channels 1-22 and 25-32. EchoStar requests modification of its authority by swapping the channels on which it is authorized to operate, from channels 1-22 and 25-32 to channels 3-32. Correspondingly, EchoStar requests authority to operate on channels 1 and 2 at 61.5° W.L. under STA. This will allow EchoStar to more efficiently use the spectrum at 61.5° W.L. and provide better services to its customer, DISH Network L.L.C. and ultimately to end users.

[3] The associated Schedule S for ECHOSTAR-16 describes all 32 channels.

A) A combination of using the CONUS+ beam and the spot beams simultaneously. In this mode, channels 1-17 are used with the CONUS+ beam, while channels 18-32 are used with the spot beams;

B) CONUS+ mode with 16 channels operating in boost mode (2 x 151 Watt traveling wave tube amplifiers ("TWTAs")); and

C) CONUS+ mode with 32 channels operating in normal mode (151 Watt TWTA).

Six uplink spot beams are used to allow for the frequency re-use necessary when the downlink spot beams are in operation. The six feeder link sites are located at Cheyenne, WY; Gilbert, AZ; Monee, IL; Mount Jackson, VA; New Braunfels, TX; and Spokane, WA. When the satellite is operated in Mode B) or Mode C), the feeder links are provided from Cheyenne, WY and/or Gilbert, AZ.

The ECHOSTAR-16 satellite includes 96 TWTAs: fifty-five 151 Watt TWTAs, thirty-six 90 Watt TWTAs and five 35 Watt TWTAs. In Mode B), the peak downlink Effective Isotropic Radiated Power ("EIRP") produced by the CONUS+ beam is 57.8 dBW. In Mode C), the CONUS+ beam produces a peak EIRP of 55.1 dBW. The peak downlink EIRP levels of the spot beams range between 54.1 dBW and 61.1 dBW.

For the CONUS+ beam, full frequency re-use is achieved through the use of dual orthogonal polarizations. Spot beam operation collectively achieves full frequency re-use through a combination of dual orthogonal polarizations and spatial isolation.

Spacecraft Telemetry, Tracking, and Control ("TT&C") functions will be proportional by use of EchoStar's fully redundant TT&C earth station and satellite control facilities located in Cheyenne, WY and Gilbert, AZ. The TT&C transmissions will take place at the edges of the 17.3-17.8 GHz uplink band and 12.2-12.7 GHz downlink band, at all phases of the mission.

A radio frequency autotrack ("RFAT") system is used to provide highly accurate downlink spot beam pointing. This involves the transmission of a radio frequency ("RF") beacon at 17,799.75 MHz from the ground (Cheyenne, WY); this beacon is received by the satellite and used to control the pointing of the satellite antennas.

A.3 Predicted Space Station Antenna Gain Contours (§ 25.114(d)(3))

The ECHOSTAR-16 satellite's antenna gain contours for the receive and transmit beams, as required by § 25.114(d)(3), are given in GXT format. However, because of the large number of beams involved and the known problems of the Schedule S software in handling a large number of beams, the GXT files have not been embedded in the Schedule S form, but are being provided separately to the Commission.

A.4 Services to be Provided (§ 25.114(d)(4))

The ECHOSTAR-16 satellite will provide a range of DBS services to millions of small and inexpensive, subscriber receive-only earth terminals.

There will be one wideband digitally modulated signal transmitted in each of the active transponders, supporting a range of information data rates depending on the order of the modulation (e.g., Quadrature Phase Shift Keying ("QPSK"), 8 Phase Shift Keying ("8PSK")) and the type and degree of forward error coding used. Representative link budgets, which include details of the transmission characteristics, performance objectives, and earth station characteristics, are provided in the associated Schedule S. The representative modulation/coding schemes provided in the associated Schedule S are as follows:

a) QPSK, Turbo rate 5/6 inner coding (27 MHz bandwidth)

b) 8PSK, Turbo rate 2/3 inner coding (25.8 MHz bandwidth)

A.5 Satellite Transponder Frequency Responses (§ 25.114(c)(4)(vii))

The typical receiver and transmitter frequency responses of each RF channel, as measured between the receive antenna input and transmit antenna, fall within the limits shown in Table A.5-1. In addition, the frequency tolerances of § 25.202(e) and the out-of-band emission limits of § 25.202(f) (1), (2) and (3) will be met.

Table A.5-1: Typical Receiver and Transmitter Filter Responses

Frequency offset from channel center	Gain relative to channel center frequency (dB)		Comments
	Receive	Transmit	
CF±6 MHz	0.35	0.43	In-Band Value does not exceed these p-p values
CF±7.7 MHz	0.45	0.56	
CF±9.6 MHz	0.61	0.90	
CF±12 MHz	1.52	2.55	
CF±13 MHz	2.93	4.12	
CF±16.5 MHz	-3.0		Out-of-Band Attenuation is not less than these values
CF±20.0 MHz		-3.0	
CF±27.0 MHz		-25.0	
CF±29.1 MHz	-30.0		

A.6 TT&C Characteristics
(§ 25.114(c)(4)(i) and § 25.114(c)(9))

The information provided in this section complements that provided in the associated Schedule S.

The ECHOSTAR-16 TT&C sub-system provides for communications during pre-launch, transfer orbit and on-station operations, as well as during spacecraft emergencies. The TT&C sub-system will operate within, and specifically at the edges of, the uplink and downlink frequency ranges during all phases of the mission.

During transfer orbit and on-station emergencies, the TT&C signals will be received and transmitted by the satellite using a combination of wide-angle antennas on the satellite that create a near omni-directional gain pattern. During normal on-station operation the TT&C signals will be received by the satellite using a large-coverage horn antenna on the Earth (+Z) face of the spacecraft and transmitted from the satellite using the CONUS+ communications downlink antennas.

There are three command receivers: one operating at 17.307 GHz and two that can operate at 17.7955 GHz. There are two dual-frequency telemetry transmitters, each capable of selecting from one of two center frequencies.

A summary of the TT&C subsystem performance is given in Table A.6-1.

Table A.6-1: Summary of the on-station TT&C Subsystem Performance

Command Modulation	FM
Command/Ranging Frequencies	17,307.0 MHz (Left Hand Circular Polarization, "LHCP") 17,795.5 MHz (Right Hand Circular Polarization, "RHCP")
Uplink Flux Density (Minimum)	Omni Rx antenna: -83 dBW/m^2 (Command) -78 dBW/m^2 (Ranging) Horn Rx antenna: -93 dBW/m^2 (Command) -87 dBW/m^2 (Ranging)
Peak Deviation (Command/Ranging)	± 400 kHz
Telemetry/Ranging Frequencies	12,694.0 MHz or 12,695.0 MHz (RHCP) 12,696.5 MHz or 12,697.5 MHz (RHCP)
Maximum Downlink EIRP	16.9 dBW (Omni antenna; -Z) 14.4 dBW (Omni antenna; +Z) 14.2 dBW (Communications antenna)
Telemetry/Ranging Modulation Index: 1 sub-carrier 2 sub-carriers 3 sub-carriers	 1.0 ± 0.2 radians 0.7 ± 0.2 radians 0.58 ± 0.2 radians

A.7 Interference Analyses (§ 25.214(d)(13))

The analyses of the ECHOSTAR-16 satellite network with respect to the limits in Annex 1 to Appendices 30 and 30A are given in Appendices 1 and 2 to this document. The results of these analyses are discussed below.

Appendix 1 shows that the ECHOSTAR-16 satellite network meets the ITU criteria in Annex 1 to Appendix 30, except for § 4.2.3(c) of Article 4 of Appendix 30/30A. There are a number of adjacent Region 2 BSS networks that were deemed to be affected (see Annex 1 to Appendix 1). The affected foreign administrations are Mexico, Holland, Russia, and the United Kingdom; all non-USA affected networks are modifications to the Region 2 Plan. The results are discussed below for each of these administrations:

- Mexico's QUETZSAT-77 network at the 77° W.L. location is deemed to be affected. The network is assigned to QuetzSat. EchoStar will coordinate the operations of the ECHOSTAR-16 satellite network with QuetzSat. Coordination should be straightforward given the large orbital separation between networks and the small OEPM degradation.

- The Netherlands' networks at 58° W.L. and 59° W.L. are deemed to be affected. We can find no evidence that either of these networks is under construction or scheduled for launch.

- The United Kingdom has "USAT" networks at 66.3° W.L. and 68.5° W.L. We can find no evidence that the network at 66.3° W.L. is under construction or scheduled for launch. With respect to the 68.5° W.L. orbital location, EchoStar and SES have an existing coordination agreement to which the parties will add the ECHOSTAR-16 satellite . Moreover, because SES' anticipated the network for 68.5° W.L. will be directed for service to South America and will be 7 degrees away from the proposed ECHOSTAR-16 satellite, EchoStar does not anticipate any substantive interference concerns.

- The United Kingdom's INTELSAT KUEXT 304.5 network at 55.5° W.L. is deemed to be affected. None of the affected beams of this United Kingdom network has been brought into use. The lone INTELSAT KUEXT 304.5 beam that has been brought into use is unaffected by the ECHOSTAR-16 network.

- Russia's INTERSPUTNIK-47.5W-B network at 47.5° W.L. is deemed to be affected. We can find no evidence that this network is under construction or scheduled for launch, although it is expected that coordination could be achieved given the large orbital separation between the networks.

Appendix 2 shows that the proposed ECHOSTAR-16 satellite network meets all of the ITU criteria in Annex 1 to Appendix 30A.

A.8 Orbital Debris Mitigation Plan (§ 25.114(d)(14))

A.8.1 Spacecraft Hardware Design

Space Systems/Loral ("Loral") is the manufacturer of the ECHOSTAR-16 satellite. Loral has assessed the launch, orbit raising, deployment, and normal operations portions of the mission and determined that no debris will be released by the spacecraft except for the following case. The only portion of the mission in which portions of the spacecraft are separated from the main spacecraft body is during deployment. Separation and deployment mechanisms are intended to contain the debris generated when activated. There are several reflector deployment hold-down electro-explosive devices ("EED"s) that have the potential to expel a small amount of debris — up to 3 milligrams ("mg") of titanium debris from the hold-down and 2 mg of "soot" per firing. These EEDs have flown on over 35 spacecraft and had no failures. The assessment found no other sources for debris throughout the mission.

To protect the spacecraft from small body collisions, including debris less than one centimeter in diameter, the design of the ECHOSTAR-16 spacecraft allows for individual faults without losing the entire spacecraft. All critical components are built within the structure and shielded from external influences. Items that cannot be built within the spacecraft nor shielded (such as antennas) are either redundant or able to withstand impact. The ECHOSTAR-16 spacecraft can be controlled through both the large-coverage horn antenna and the wide angle antennas. The likelihood of all antennas being damaged during a small body collision is minimal. The wide angle antennas on the spacecraft are similar to open waveguides that point towards the Earth (there is one set on each side of the spacecraft; either set could be used to successfully de-orbit the spacecraft). These wide angle antennas would continue to operate even if struck and bent.

The ECHOSTAR-16 satellite has separate TT&C and propulsion subsystems that are necessary for end-of-life disposal. The spacecraft TT&C system is extremely rugged with regard to meteoroids smaller than 1 cm, by virtue of its redundancy, shielding, separation of components, and physical characteristics. The command receivers and decoders and telemetry encoders and transmitters are located within a shielded area and are redundant and physically separated. A single rugged thruster and shielded propellant tank provides the energy for orbit raising. Otherwise, there are no single points of failure in the system.

A.8.2 Accidental Explosion Assessment (§ 25.144(d)(14)(ii))

Loral has reviewed failure modes for all equipment to assess the possibility of an accidental explosion onboard the spacecraft. In order to ensure that the spacecraft does not explode in orbit, the satellite controller will take specific precautions. All batteries and fuel tanks are monitored for pressure or temperature variations. Alarms in the Satellite Control Center ("SCC") inform controllers of any variations. Additionally, long term trending analysis will be performed to monitor for any unexpected trends.

Operationally, batteries will be operated utilizing the manufacturer's automatic recharging scheme. Doing so will ensure that charging terminates normally without building up additional heat and pressure. As this process occurs wholly within the spacecraft, it also affords protection from command link failures (on the ground).

In order to protect the propulsion system, fuel tanks will all be operated in a blow down mode. At the completion of orbit raising, the pressurant will be isolated from the fuel system. This will cause the pressure in the tanks to decrease over the life of the spacecraft. This will also protect against a pressure valve failure that might otherwise cause the fuel tanks to become over pressurized.

In order to ensure that the spacecraft raises no risk of explosion after it has been successfully de-orbited, all stored energy onboard the spacecraft will be removed. Upon successful de-orbit of

the spacecraft, all propulsion lines and latch valves will be vented and left open. All battery chargers will be turned off and batteries will be left in a permanent discharge state. These steps will ensure that no buildup of energy can occur resulting in an explosion in the years after the spacecraft is de-orbited.

A.8.3 Safe Flight Profiles (§ 25.144(d)(14)(iii))

In considering current and planned satellites that may have a station-keeping volume that overlaps the ECHOSTAR-16 satellite, EchoStar has reviewed the lists of FCC-licensed satellite networks, as well as those that are currently under consideration by the FCC. Networks for which a request for coordination has been submitted to the ITU within ±0.15 degrees of 61.5° W.L. have also been reviewed.

EchoStar currently operates three satellites within the 61.5° W.L. cluster, as follows:

- ECHOSTAR-15 at 61.55° W.L.
- ECHOSTAR-3 at 61.45° W.L.
- ECHOSTAR-12 at 61.35° W.L.

At the time of launch of the ECHOSTAR-16 satellite, it is expected that only EchoStar-12 and EchoStar-15 will be in the vicinity of 61.5° W.L., assuming that the Commission grants all necessary relocation authority for EchoStar 3. Subject to receiving Commission authority, these two satellites will be located within the cluster as follows.

- ECHOSTAR-15 at 61.65° W.L.
- ECHOSTAR-12 at 61.35° W.L.

By locating the ECHOSTAR-16 satellite at 61.5° W.L., and maintaining an east-west station-keeping tolerance of ±0.05° for all three EchoStar satellites, there will be no overlap in the station-keeping volume of any of these satellites, and no risk of collision.

There are no pending applications before the Commission for additional satellites to be located at an orbital location in the immediate vicinity of 61.5° W.L. There are no non-USA networks filed with the ITU within ±0.15 degrees of 61.5° W.L.

Therefore, EchoStar concludes that there is no requirement to physically coordinate the ECHOSTAR-16 satellite with another satellite operator at the present time.

A.8.4 Post Mission Disposal Plan (§ 25.144(d)(14)(iv))

At the end of the operational life of the ECHOSTAR-16 satellite, EchoStar will maneuver the satellite to a disposal orbit with a minimum perigee of 300 km above the normal GSO operational orbit. This proposed disposal orbit altitude exceeds the minimum required by § 25.283, which is calculated below.

The input data required for the calculation are as follows:

Total Solar Pressure Area "A" = 110 m^2
"M" = Dry Mass of Satellite = 3228 kg
"C_R" = Solar Pressure Radiation Coefficient = 1.5

Using the formula given in § 25.283, the Minimum Disposal Orbit Perigee Altitude is calculated as follows:

= 36,021 km + 1000 x C_R x A/m
= 36,021 km + 1000 x 1.5 x 110/3228
= 36,072 km
= 286 km above GSO (35,786 km)

Thus, the designed disposal orbit of 300 km above GSO exceeds the required minimum by a margin of 14 km. Maneuvering the satellite to the disposal orbit will require 14.5 kg of propellant, and this quantity of fuel, taking account of all fuel measurement uncertainties, will be reserved to perform the final orbit raising maneuvers.

EchoStar will apply all available propellant accounting methodologies to track propellant usage. For ECHOSTAR-16, these methodologies include the bookkeeping method, the pressure-volume-temperature ("PVT") method, and the propellant depletion gauge operations ("PDGO") method for FS1300 class satellites.

The bookkeeping method, whereby the estimated propellant used during a thruster-firing event is subtracted from the beginning of life ("BOL") propellant mass, will be applied after every thruster-firing event. The PVT method, which uses current state pressure and temperature telemetry received from the satellite to estimate the remaining propellant, will be applied once a month. The PDGO method uses propellant temperature measurements taken while tank heaters are activated to determine more accurately the amount of oxidizer and fuel in tanks at the end of mission life. The PDGO method will be applied annually on all FS1300 class satellites until propellant analysis shows 60 kg or less propellant remaining, after which the PDGO method will be applied after every north south stationkeeping maneuver. Combined, these methods will ensure the necessary amount of fuel is reserved to perform deorbit procedures as well as maximize fuel depletion when ECHOSTAR-16 reaches its disposal orbit.

A.9 ITU Filing for ECHOSTAR-16 (§ 25.114(d)(13))

All materials related to the ITU filing for ECHOSTAR-16 (to be filed as the "USABSS-37" network) are attached to this application. These consist of the following:

- SpaceCap database file (USABSS-37 AP30-30A.mdb) containing the data required by the ITU as stated in Appendix 4 of the Radio Regulations.

- Contour data files in .gxt format for all transmit and receive beams, including both co-polar and cross-polar, diagrams of the estimated gain towards the geostationary orbit for all beams and their service area definitions. These are combined into a single database file (USABSS-37 Beams.mdb) that can be read by ITU software (e.g., GIMS and MSPACE).

CERTIFICATION OF PERSON RESPONSIBLE FOR PREPARING ENGINEERING INFORMATION

I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in this application, 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 application and that it is complete and accurate to the best of my knowledge and belief.

/s/

Stephen D. McNeil
Telecomm Strategies Canada, Inc.
Ottawa, Ontario, Canada
(613) 270-1177

APPENDIX 1 TO ATTACHMENT A

Analysis of ANNEX 1 of Appendix 30

1 Limits for the interference into frequency assignments in conformity with the Regions 1 and 3 Plan or with the Regions 1 and 3 List or into new or modified assignments in the Regions 1 and 3 List

Does not apply to the Region 2 Plan.

2 Limits to the change in the overall equivalent protection margin for frequency assignments in conformity with the Region 2 plan

With respect to § 4.2.3 c) of Article 4, an administration in Region 2 is considered as being affected if the overall equivalent protection margin[28] corresponding to a test point of its entry in the Region 2 Plan, including the cumulative effect of any previous modification to that Plan or any previous agreement, falls more than 0.25 dB below 0 dB, or, if already negative, more than 0.25 dB below the value resulting from:

– *the Region 2 Plan as established by the 1983 Conference; or*

– *a modification of the assignment in accordance with this Appendix; or*

– *a new entry in the Region 2 Plan under Article 4; or*

– *any agreement reached in accordance with this Appendix.* *(WRC-03)*

The MSPACE analysis was performed utilizing the Region 2 BSS Plan as contained in IFIC 2694. The results of the analysis are contained in Annex 1 to this Appendix. As shown, the affected foreign administrations are Mexico, Holland, Russia and the United Kingdom. The results are discussed below for each of these administrations:

- Mexico's QUETZSAT-77 network at the 77° W.L. location is deemed to be affected. The network is assigned to QuetzSat. EchoStar will coordinate the operations of the ECHOSTAR-16 satellite network with QuetzSat. Coordination should be straight forward given the large orbital separation between networks.

[28] For the definition of the overall equivalent protection margin, see § 1.11 of Annex 5.

- Holland's networks at 58° W.L. and 59° W.L. are deemed to be affected. We can find no evidence that either of these networks are under construction or scheduled for launch.
- The United Kingdom has "USAT" networks at 66.3° W.L. and 68.5° W.L. We can find no evidence that any of the networks are under construction or scheduled for launch.
- The United Kingdom's INTELSAT KUEXT 304.5 at 55.5 ° W.L. is deemed to be affected by the ECHOSTAR-16 network. None of the affected beams of the United Kingdom's network have been brought into use. The INTELSAT KUEXT 304.5 beam that has been brought into use is unaffected by the ECHOSTAR-16 network.
- Russia's INTERSPUTNIK-47.5W-B network at 47.5° W.L. is deemed to be affected. We can find no evidence that this network is under construction or scheduled for launch although it is expected that coordination could be achieved given the large orbital separation between the networks.

3 Limits to the change in the power flux-density to protect the broadcasting-satellite service in Regions 1 and 2 in the band 12.2-12.5 GHz and in Region 3 in the band 12.5-12.7 GHz

With respect to § 4.2.3 a), 4.2.3 b) or 4.2.3 f) of Article 4, as appropriate, an administration in Region 1 or 3 is considered as being affected if the proposed modification to the Region 2 Plan would result in exceeding the following power flux-density values, at any test point in the service area of its overlapping frequency assignments:

-147 dB(W/(m^2 · 27 MHz))	for $0° \le \theta < 0.23°$
$-135.7 + 17.74 \log \theta$ dB(W/(m^2 · 27 MHz))	for $0.23° \le \theta < 2.0°$
$-136.7 + 1.66\ \theta^2$ dB(W/(m^2 · 27 MHz))	for $2.0° \le \theta < 3.59°$
$-129.2 + 25 \log \theta$ dB(W/(m^2 · 27 MHz))	for $3.59° \le \theta < 10.57°$
-103.6 dB(W/(m^2 · 27 MHz))	for $10.57° \le \theta$

where θ is the minimum geocentric orbital separation in degrees between the wanted and interfering space stations, taking into account the respective East-West station-keeping accuracies. *(WRC-03)*

The closest Regions 1 and 3 BSS network is the Russian INTERSPUTNIK-47.5W-B network at 47.5°W, which is greater than 10.57 degrees from the 61.5° W.L. location, therefore the –103.6 dB(W/(m^2 . 27 MHz)) PFD level applies for this network and all other Regions 1 and 3 networks. The GIMs Appendix 30 pfd tool was used to assess compliance with this Section. Using the antenna gain contours and power levels of the beams the GIMS pfd tool showed that no administrations are affected. Therefore the ECHOSTAR-16 satellite network is compliant with this Section.

4 Limits to the power flux-density to protect the terrestrial services of other administrations[29], [30], [31]

With respect to § 4.2.3 d) of Article 4, an administration in Region 1, 2 or 3 is considered as being affected if the consequence of the proposed modification to an existing assignment in the Region 2 Plan is to increase the power flux-density arriving on any part of the territory of that administration by more than 0.25 dB over that resulting from that frequency assignment in the Region 2 Plan at the time of entry into force of the Final Acts of the 1985 Conference. The same administration is considered as not being affected if the value of the power flux-density anywhere in its territory does not exceed the limits expressed below.

With respect to § 4.1.1 d) or § 4.2.3 d) of Article 4, an administration in Region 1, 2 or 3 is considered as being affected if the proposed new assignment in the Regions 1 and 3 List, or if the proposed new frequency assignment in the Region 2 Plan, would result in exceeding a power flux-density, for any angle of arrival, at any point on its territory, of:

-148 $dB(W/(m^2 \cdot 4\ kHz))$ *for* $\theta \leq 5°$

$-148 + 0.5\ (\theta - 5)\ dB(W(m^2 \cdot 4\ kHz)$ *for* $5° < \theta \leq 25°$

-138 $dB(W/(m^2 \cdot 4\ kHz))$ *for* $25° < \theta \leq 90°$

where θ represents the angle of arrival. *(WRC-03)*

The GIMS pfd tool was used to determine the administrations whose terrestrial services may be affected by the ECHOSTAR-16 satellite network. Using this tool, the results show that the pfd limit is exceeded in Canada only. However, 4.2.3 d) of Article 4 of Appendix 30 states that the above pfd limits apply to countries not having frequency assignments in the BSS service in the channel concerned. Since Canada is assigned all 32 channels in the Plan, and therefore will not be deploying co-frequency terrestrial services, these limits do not need to be met on its territory.

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[29] See § 3.18 of Annex 5.

[30] In the band 12.5-12.7 GHz in Region 1, these limits are applicable only to the territory of administrations mentioned in Nos. 5.494 and 5.496.

[31] See Resolution 34.

5 (Not used.)

6 Limits to the change in the power flux-density of assignments in the Regions 1 and 3 Plan or List to protect the fixed-satellite service (space-to-earth) in the band 11.7-12.2 GHz[32] in Region 2 or in the band 12.2-12.5 GHz in Region 3, and of assignments in the Region 2 plan to protect the fixed-satellite service (space-to-earth) in the band 12.5-12.7 GHz in Region 1 and in the band 12.2-12.7 GHz in Region 3

With respect to § 4.2.3 e), an administration is considered as being affected if the proposed modification to the Region 2 Plan would result in an increase in the power flux-density over any portion of the service area of its overlapping frequency assignments in the fixed-satellite service in Region 1 or 3 of 0.25 dB or more above that resulting from the frequency assignments in the Region 2 Plan at the time of entry into force of the Final Acts of the 1985 Conference.

With respect to § 4.1.1 e) or 4.2.3 e) of Article 4, an administration is considered as not being affected if the proposed new or modified assignment in the Regions 1 and 3 List, or if a proposed modification to the Region 2 Plan, gives a power flux-density anywhere over any portion of the service area of its overlapping frequency assignments in the fixed-satellite service in Region 1, 2 or 3 of less than:

$-186.5 \quad dB(W/(m^2 \cdot 40\ kHz))$	$for \quad 0° \le \theta < 0.054°$
$-164.0 + 17.74 \log \theta \quad dB(W/(m^2 \cdot 40\ kHz))$	$for \quad 0.054° \le \theta < 2.0°$
$-165.0 + 1.66\ \theta^2 \quad dB(W/(m^2 \cdot 40\ kHz))$	$for \quad 2.0° \quad \le \theta < 3.59°$
$-157.5 + 25 \log \theta \quad dB(W/(m^2 \cdot 40\ kHz))$	$for \quad 3.59° \le \theta < 10.57°$
$-131.9 \quad dB(W/(m^2 \cdot 40\ kHz))$	$for \quad 10.57° \le \theta$

where θ is the minimum geocentric orbital separation in degrees between the wanted and interfering space stations, taking into account the respective East-West station-keeping accuracies.

The ECHOSTAR-16 satellite causes lower PFD levels over all territories in Regions 1 and 3 than those caused by USA Original Plan networks at 61.5° W.L. and therefore the satellite is compliant with this Section.

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[32] Including assignments operating under No. 5.485.

7 Limits to the change in equivalent noise temperature to protect the fixed-satellite service (earth-to-space) in Region 1 from modifications to the Region 2 plan in the band 12.5-12.7 GHz

With respect to § 4.2.3 e) of Article 4, an administration of Region 1 is considered as being affected if the proposed modification to the Region 2 Plan would result in:

– *the value of ΔT/T resulting from the proposed modification is greater than the value of ΔT/T resulting from the assignment in the Region 2 Plan as of the date of entry into force of the Final Acts of the 1985 Conference; and*

– *the value of ΔT/T resulting from the proposed modification exceeds 6%,*

using the method of Appendix 8 (Case II). *(WRC-03)*

From a review of the available ITU space network databases, there are no assignments registered in the Earth-to-space direction in the frequency band 12.5-12.7 GHz. Therefore, no Region 1 space stations can be affected and the ECHOSTAR-16 satellite network is compliant with this Section.

Annex 1 to Appendix 1 to Technical Annex

ECHOSTAR-16

MSPACE Results

Admin	Orbital Position (degrees E)	Network	Max. OEPM Degradation (dB)
USA	-148	USABSS-9	0.308
MEX	-77	QUETZSAT-77	0.317
G	-68.5	USAT-S4	0.514
G	-68.5	USAT-S4 MOD-B	0.892
G	-66.3	USAT-S5	1.753
G	-66.3	USAT-S5 MOD-A	1.753
USA	-61.7	USAEH001	0.806
USA	-61.5	USABSS-8	7.762
USA	-61.5	USABSS-17	6.321
USA	-61.5	USABSS-33	2.525
USA	-61.3	USAEH001	0.736
HOL	-59	NSS-BSS 59W	2.079
HOL	-58	NSS-BSS 58W	4.118
G	-55.5	INTELSAT KUEXT 304.5	1.424
RUS	-47.5	INTERSPUTNIK-47.5W-B	0.716

APPENDIX 2 TO ATTACHMENT A

Analysis of ANNEX 1 of Appendix 30A

1 (SUP - WRC-2000)

2 (SUP - WRC-2000)

3 Limits to the change in the overall equivalent protection margin with respect to frequency assignments in conformity with the Region 2 feeder-link plan[33] (WRC-2000)

With respect to the modification to the Region 2 feeder-link Plan and when it is necessary under this Appendix to seek the agreement of any other administration of Region 2, except in cases covered by Resolution 42 (Rev.WRC-03), an administration is considered as being affected if the overall equivalent protection margin[34] *corresponding to a test point of its entry in that Plan, including the cumulative effect of any previous modification to that Plan or any previous agreement, falls more than 0.25 dB below 0 dB, or, if already negative, more than 0.25 dB below the value resulting from:*

– *the feeder-link Plan as established by the 1983 Conference; or*

– *a modification of the assignment in accordance with this Appendix; or*

– *a new entry in the feeder-link Plan under Article 4; or*

– *any agreement reached in accordance with this Appendix except for Resolution 42 (Rev.WRC-03).* *(WRC-03)*

See the results described under Section 2 of the Appendix 30, Annex 1 Analysis.

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[33] With respect to § 3, the limit specified relates to the overall equivalent protection margin calculated in accordance with § 1.12 of Annex 3.

[34] For the definition of the overall equivalent protection margin, see § 1.11 of Annex 5 to Appendix 30.

4 Limits to the interference into frequency assignments in conformity with the Regions 1 and 3 feeder-link Plan or with the Regions 1 and 3 feeder-link List or proposed new or modified assignments in the Regions 1 and 3 feeder-link list (WRC-03)

Does not apply to the Region 2 Plan.

5 Limits applicable to protect a frequency assignment in the bands 17.3-18.1 GHz (Regions 1 and 3) and 17.3-17.8 GHz (Region 2) to a receiving space station in the fixed-satellite service (earth-to-space)

An administration in Region 1 or 3 is considered as being affected by a proposed modification in Region 2, with respect to § 4.2.2 a) or 4.2.2 b) of Article 4, or an administration in Region 2 is considered as being affected by a proposed new or modified assignment in the Regions 1 and 3 feeder-link List, with respect to § 4.1.1 c) of Article 4, when the power flux-density arriving at the receiving space station of a broadcasting-satellite feeder-link would cause an increase in the noise temperature of the feeder-link space station which exceeds the threshold value of ΔT/T corresponding to 6%, where ΔT/T is calculated in accordance with the method given in Appendix 8, except that the maximum power densities per hertz averaged over the worst 1 MHz are replaced by power densities per hertz averaged over the necessary bandwidth of the feeder-link carriers. *(WRC-03)*

The following table shows the results of Δ T / T calculations for the closest Regions 1 and 3 feeder link space stations, based on the Region 1 and 3 Plan and List. As shown the Δ T / T's are well below the allowed 6% level. Therefore the ECHOSTAR-16 satellite network is in conformity with this Section.

Closest Region 1 or 3 Feeder Link Space Station			E/S Lat (°N)	E/S Long (°E)	Range (km)	E/S Gain towards Victim Satellite (dBi)	Victim Satellite Rx System Noise Temp (K)	Calculated ΔT/T (%)
Network Name	Orbital Position	Peak Receive Antenna Gain (dBi)						
INTERSPUTNIK-47.5W-B	-47.5	37	38.8	-78.6	38210	-0.8	600	0.21%
MCO-BSS-40.5W	-40.5	35.9	33.3	-111.8	38588	-5.1	600	0.06%
GMB30200	-37.2	47.69	33.3	-111.8	38800	-6.7	600	0.61%
IRL21100	-37.2	48.08	33.3	-111.8	38788	-6.7	600	0.66%
NGR11500	-37.2	38.47	33.3	-111.8	38788	-6.7	600	0.07%
DBL-G4-37.2W	-37.2	35	33.3	-111.8	38788	-6.7	330	0.06%
AND34100	-37	48.88	33.3	-111.8	38800	-6.8	600	0.78%
GUI19200	-37	42.29	33.3	-111.8	38800	-6.8	600	0.17%
POR__100	-37	47.17	33.3	-111.8	38800	-6.8	600	0.53%
MTN__100	-36.8	37.55	33.3	-111.8	38813	-6.9	600	0.06%
SMR31100	-36.8	48.88	33.3	-111.8	38813	-6.9	600	0.77%

6 Limits applicable to protect a frequency assignment in the band 17.8- 18.1 GHz (Region 2) to a receiving feeder-link space station in the fixed-satellite service (earth-to-space) (WRC-03)

Does not apply to Region 2 Plan.