

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

In the Matter of)
)
ECHOSTAR CORPORATION) File No. SAT-A/O-2010____-____
)
Application for Authority to Operate)
EchoStar 4 at 86.5° W.L.)
)
)
)

APPLICATION FOR AUTHORITY TO OPERATE A DBS SATELLITE

Pursuant to Sections 308 and 309 of the Communications Act of 1934, as amended,¹ and Part 25 of the Commission’s rules,² EchoStar Corporation (“EchoStar”) respectfully requests authority to operate the EchoStar 4 satellite on the Direct Broadcast Satellite (“DBS”) frequencies already licensed to EchoStar at the 86.5° W.L. orbital location.³ EchoStar has separately requested Special Temporary Authority (“STA”) (1) to move the EchoStar 4 satellite from the 77° W.L. orbital location, where it is currently stationed as a Mexican-licensed satellite, to 86.5° W.L.,⁴ and (2) to operate the EchoStar 4 satellite at 86.5° W.L.⁵

¹ 47 U.S.C. §§ 308, 309.

² 47 C.F.R. §§ 25.114, 25.148, 25.125, 25.180.

³ EchoStar has authorization to construct, launch and operate a satellite system at 86.5° W.L. EchoStar Satellite L.L.C. Application to Construct, Launch and Operate a Direct Broadcast Satellite at the 86.5° W.L. Orbital Location, *Order and Authorization*, 21 FCC Rcd. 14045 (2006) (“86.5° W.L. Order”).

⁴ See File No. SAT-STA-20100920-00199 (filed Sept. 20, 2010). In addition, EchoStar has filed applications for STA to operate four TT&C earth stations with EchoStar 4 during the relocation from 77° W.L. to 86.5° W.L., and to broadcast operations with earth stations from

Operation of EchoStar 4 at 86.5° W.L. will serve the public interest as it will ensure the ability of DISH Network L.L.C. (“DISH”) to retransmit High-Definition (“HD”) local-into-local broadcast programming in many markets across the country. EchoStar 4’s use of the 86.5° W.L. orbital location also will make additional DBS capacity available to consumers from the currently unused DBS spectrum at that orbital location, and will do so years earlier than contemplated by EchoStar’s license. This significant acceleration will be accomplished without loss of any services from 77° W.L. since two other satellites are stationed at that Mexican orbital location.

I. TECHNICAL INFORMATION

The technical information for the proposed operation that is required by Section 25.114 of the Commission’s Rules, 47 C.F.R. § 25.114, is set forth in the accompanying technical narrative (Attachment A), FCC Form 312, and Schedule S, all of which are incorporated into this application by reference. Before EchoStar 4 became a Mexican-licensed satellite, it was licensed in the United States at 148° W.L. following the Commission’s review of its technical data and EchoStar’s qualifications as a licensee.⁶

EchoStar 4 at 86.5° W.L. *See* File Nos. SES-STA-20101006-01256, SES-STA-20101006-01264, SES-STA-20101006-01255, SES-STA-20101006-01254.

⁵ *See* File Nos. SAT-STA-20100920-00198 (filed Sept. 20, 2010) (“180-day STA”); SAT-STA-20100920-00197 (filed Sept. 20, 2010) (“30-day STA”).

⁶ Continental Satellite Corp. EchoStar Satellite Corp; DirectSat Corp.; Orbital Broadcasting Co.; Tempo Satellite, Inc.; Direct Broadcast Satellite Corp. For Construction Permits for New Direct Broadcast Satellite Systems, *Memorandum Opinion and Order*, 4 FCC Rcd. 6292 (1989).

II. THE APPLICATION IS CONSISTENT WITH ALL APPLICABLE RULES

The application is consistent with all applicable Commission rules, and EchoStar is not requesting any rule waivers. The proposed operation does not implicate the geographic service requirements of Section 25.148(c) of the Commission's rules, 47 C.F.R. § 25.148(c), since service to Alaska and Hawaii is not technically feasible from the 86.5° W.L. orbital location.⁷ EchoStar also plans to operate the EchoStar 4 satellite in inclined orbit mode. As contemplated in the Commission's rules, 47 C.F.R. § 25.280, EchoStar will give the Commission proper notice after the last north-south station keeping maneuver. All the prerequisites for inclined orbit operations as set forth in the Commission's rules, 47 C.F.R. § 25.280(b), will be satisfied.

This application is not subject to the Commission's 2005 moratorium on DBS applications since it is not a request for a new space station, but rather one for authorization to operate an existing satellite at an orbital location that is licensed to EchoStar.⁸

III. GRANT OF THIS APPLICATION IS IN THE PUBLIC INTEREST

The authority requested in this application is in the public interest as it will bring into early use the DBS spectrum at 86.5° W.L. The move of EchoStar 4 will specifically permit

⁷ *Id.* § 25.148(c); *see also* 86.5° W.L. Order ¶ 19 (“Given the very low elevation angles to the 86.5° W.L. orbital location from Alaska and Hawaii, it is very unlikely that service to these states from EchoStar-86.5W would be technically feasible. Therefore, we will not require EchoStar-86.5W to provide service to Alaska and Hawaii from the 86.5° W.L. orbital location.”).

⁸ *See* Public Notice, *Direct Broadcast Satellite (DBS) Auction Nullified: Commission Set 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) (“This freeze is limited to applications for new space stations or for new requests for market access by foreign-licensed space stations. The freeze does not apply to applications for replacement satellites, modifications to existing satellite licenses, or requests for special temporary authority, unless such applications seek authority to operate on frequencies and/or orbital locations not previously authorized for operation by that licensee.”).

EchoStar to commence operations from that slot years earlier than contemplated by EchoStar's license for 86.5° W.L.⁹

EchoStar and its customer DISH currently plan to use EchoStar 4 to provide HD local channels to a number of markets, which have not yet been conclusively identified. Under the current plan, these local channels will be simulcast from EchoStar 4 at 86.5° W.L. and from another one of DISH or EchoStar's satellites at 129° W.L., 77° W.L. 72.7° W.L. or 61.5° W.L. The purpose of this simulcast will be to ensure service for consumers who would experience line-of-sight or elevation-angle associated problems from these other orbital locations. Ultimately, subject to Commission approval, DISH and EchoStar plan to move an additional satellite, EchoStar 8, to 86.5° W.L.

EchoStar 4 will be able to operate at 86.5° W.L. until replaced by another satellite. In that respect, EchoStar notes that the predicted end of life for EchoStar 4, consistent with the estimated fuel consumption of the satellite while operating in inclined orbit mode and other considerations, is in 2015.

Nor will the relocation of EchoStar 4 from 77° W.L. result in an interruption of service since the EchoStar 8 and EchoStar 1 satellites are still stationed at 77° W.L.¹⁰

⁹ See 86.5° W.L. Order ¶ 1 (2006). As a condition of the *Order and Authorization*, the Commission mandated that EchoStar file a modification application specifying its end-of-life planned operations for the satellite and submitting an orbital debris mitigation statement. *Id.* ¶ 28(e). Authority to launch and operate the satellite will "be granted if the information submitted demonstrates that EchoStar's orbital debris mitigation plans are in the public interest." *Id.* On December 29, 2008, EchoStar submitted such a modification application, which remains pending. See File No. SAT-MOD-20081229-00239 (filed Dec. 29, 2008). For the EchoStar 4 satellite, an orbital debris mitigation plan was submitted with the 180-day STA application, and is also included in the technical annex to this application.

¹⁰ See Stamp Grant, File No. SAT-T/C-20090217-00026, Call Sign S2439 (granted Sept. 17, 2010) (EchoStar 8); Stamp Grant, File No. SAT-T/C-20090217-00027, Call Sign S2739 (granted Sept. 17, 2010) (EchoStar 1). Pursuant to an exchange of letters between the

The satellite's operation at 86.5° W.L. also will not result in any harmful interference, as shown by the attached technical narrative.¹¹ Notably, while the satellite will remain in an inclined orbital position at 86.5° W.L., the Commission has previously found that "the use of an inclined geosynchronous satellite orbit does not affect a satellite's interference potential with other satellites."¹² The International Telecommunication Union has similarly found that the use of an inclined geosynchronous satellite orbit does not affect a satellite's interference potential.¹³

IV. THE PROPOSED RELOCATION IS PERMITTED BY THE U.S.-MEXICO LETTER EXCHANGE

EchoStar 4 is currently a Mexican-licensed satellite operating at the 77° W.L. orbital location. The satellite's move to that slot was made subject to an exchange of letters between the Commission and the Mexican Administration.¹⁴ EchoStar 4's stay at 77° W.L. is further governed by the license granted to EchoStar's partner, QuetzSat, S. de R.L. de C.V. ("QuetzSat"), to use the nominal 77° W.L. orbital location, and by agreements among EchoStar, SES Global Latin America, S.A. ("SES"), and QuetzSat.¹⁵

Commission and the Mexican Administration, "EchoStar 1 and EchoStar 8 spacecraft will operate at the 77° W.L. orbital location subject to Mexican authority." *Id.* at Annex A, 2.

¹¹ Attachment A, Technical Information to Supplement Schedule S.

¹² AT&T Corp. Application for the Modification of the TELSTAR 303 Domestic Fixed-Satellite, *Order and Authorization*, 11 FCC Rcd. 10570 ¶ 4 (1996).

¹³ Hughes Communications Galaxy, Inc., *Order*, 9 FCC Rcd. 2155 ¶ 4 (1994).

¹⁴ See EchoStar Satellite LLC Application for Special Temporary Authority to Conduct Telemetry, Tracking, and Command Operations during the Relocation of EchoStar 4 to the 77° W.L. Orbital Location, *Order and Authorization*, 21 FCC Rcd. 4077 at Appendix A (2006) ("77° W.L. Order").

¹⁵ See Satellite Relocation and Use Agreement for the 77° W.L. Orbital Location, ("77° W.L. Agreement"), *filed in* File No. SAT-STA-20080616-00121, Attachment 3 (granted Oct. 31, 2008) ("EchoStar 8 STA Application").

Under these documents, while at 77° W.L., EchoStar 4 is under the direct control of QuetzSat, which is allowed to use the nominal 77° W.L. orbital location pursuant to the February 2, 2005 BSS Concession.¹⁶ The eventuality of moving EchoStar 4 from 77° W.L. was contemplated with specificity in the letters exchanged between the U.S. and Mexican Administrations. These letters provide a clear roadmap and confirm that Commission action on the relocation of the satellite is not contingent on any prior Mexican action. The U.S. letter states: “Any operations of the EchoStar 4, other than at the 77° W.L. orbital location, will be subject to issuance of a new authorization by the FCC.”¹⁷

The U.S. letter further states the following:

[I]n the event that there are any provisions in the Concession, or any provisions in the Mexican laws and regulations governing the telecommunications operations of EchoStar that would preclude or otherwise limit the exercise of EchoStar’s contractual rights within the time frames specified in the EchoStar/SES Agreement, the FCC would appreciate the opportunity to consult with SCT prior to any exercise of such licensing authority or application of such law or regulation by SCT.¹⁸

In response, the Mexican letter acknowledges those provisions and states the following:

[T]he application of our laws and regulations, including the international obligations of our administration, in regard to the occupation of position 77° W.L. is governed by the license that has been granted to the company QuetzSat Therefore, in this case there are no provisions in the license, in our laws or in our regulation[s] that may be applied to directly hinder or limit EchoStar from exercising its contractual rights with SES. With respect to notifications, consultations and correspondence between

¹⁶ BSS Concession, *filed in* EchoStar 8 STA Application, Attachment 2.

¹⁷ 77° W.L. Order, Appendix A at 8.

¹⁸ *Id.*, Appendix A at 9.

our agencies, we take note of the contact information for the FCC and confirm the corresponding contact information for the SCT.¹⁹

Thus, the existing letter exchange requires no further action from the Mexican Administration. EchoStar, moreover, understands that QuetzSat has notified the Mexican Administration of the impending departure of EchoStar 4 from 77° W.L., and that the Mexican Administration does not object to the satellite's move. In fact, EchoStar already has submitted a letter from the Mexican Administration to QuetzSat, which acknowledges receipt of the notice of the move of EchoStar 4 from 77° W.L., and specifies that removal of the satellite from the concession requires payment of an administrative fee, and proof of payment of that fee on the part of QuetzSat.²⁰

V. WAIVER PURSUANT TO SECTION 304 OF THE ACT

In accordance with Section 304 of the Communications Act of 1934, as amended, 47 U.S.C. § 304, EchoStar hereby waives any claim to the use of any particular frequency or of the electromagnetic spectrum as against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise.

VI. CONCLUSION

For the foregoing reasons, EchoStar respectfully requests the grant of its application for authority to operate EchoStar 4 at 86.5° W.L.

¹⁹ *Id.*, Appendix A at 16.

²⁰ See Letter from Pantelis Michalopoulos, Counsel to EchoStar Corporation to Marlene H. Dortch, Secretary, FCC (dated Nov. 10, 2010) *filed in* File Nos. SAT-STA-20100920-00197, SAT-STA-20100920-00198, SAT-STA-20100920-00199; Call Sign S2621.

Respectfully submitted,

EchoStar Corporation

Pantelis Michalopoulos
Christopher R. Bjornson
L. Lisa Sandoval
Step toe & Johnson LLP
1330 Connecticut Avenue, N.W.
Washington, D.C. 20036
(202) 429-3000
Counsel for EchoStar Corporation

_____/s/_____
Alison Minea
Corporate Counsel
EchoStar Corporation
1110 Vermont Avenue, NW, Suite 750
Washington, D.C. 20005
(202) 293-0981

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EHOSTAR-4

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 the FCC § 25 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 EHOSTAR-4 satellite will operate at the 86.5° W.L. orbital location and will provide BSS services to CONUS and Mexico by means of two broad beams, to be referred to as the CONUS beam and the Mexican beam. The satellite was designed to provide 32 channels in medium power mode or 16 channels in high power mode.

The satellite will be biased such that the beams are steered towards the south in order to protect the operations of Telesat Canada at the nominal 82° W.L. and 91° W.L. orbital locations. The coverage of the CONUS beam will be a function of this biasing. The Mexican beam's reflector is "gimbaled" and it will be pointed further south in order to provide service to Mexico. The CONUS beam will be operated in normal-mode only with a peak downlink EIRP of 54.9 dBW. The Mexican beam can be operated either in normal-mode or high-powered-mode, the latter with a peak downlink EIRP of 57.6 dBW.

EchoStar will use its two main feeder link earth station facilities with the EHOSTAR-4 satellite. These are located in Cheyenne, WY and Gilbert, AZ. Spacecraft TT&C functions will

take place from EchoStar's primary TT&C earth station and satellite control facility located in Cheyenne, WY and the back-up facility located in Gilbert, AZ.

The satellite will be operated with an east-west station-keeping tolerance of ± 0.05 degrees and will be operated in an inclined orbit.

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

The ECHOSTAR-4 antenna gain contours for the receive and transmit beams, as required by § 25.114(d)(3), are given in GXT format and embedded in the associated Schedule S submission. These contours reflect the planned biasing of the satellite and the adjustment of the Mexican beam's reflector.

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

The ECHOSTAR-4 satellite will provide a range of DBS services to millions of small and inexpensive subscriber receive-only earth terminals.

Representative link budgets, which include details of the transmission characteristics, performance objectives and earth station characteristics, are provided in the associated Schedule S submission.

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 below.

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

Offset from Channel Center Frequency (MHz)	Receiver Filter Response (dB)	Transmitter Filter Response (dB)
±5	> -0.5	> -0.4
±7	> -0.7	> -0.5
±9	> -1.0	> -0.8
±11	> -1.5	> -1.7
±12	> -2.0	> -3.6
±17.5	< -18	< -8
±20.2	< -38	< -18
±27.2	< -50	< -35

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

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

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

Parameter	Performance
On-Station Command Frequency	17,308 MHz
Uplink Flux Density	Between -90 and -75 dBW/m ²
Uplink Polarization	Linear (Vertical)
On-Station Telemetry Frequencies	12,200.5 MHz 12,202.5 MHz 12,698.5 MHz
Maximum Downlink EIRP	15.0 dBW
Downlink Polarization	Linear (Vertical)

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

The ECHOSTAR-4 satellite network will operate on an unprotected, non-harmful interference basis, until fully coordinated. In the event operations of the ECHOSTAR-4 satellite network cause harmful interference into these of any other networks, EchoStar will either cease operations, or reduce transmission levels appropriately, immediately upon notification of such interference.

The analyses of the proposed ECHOSTAR-4 satellite network with respect to the limits in Annex 1 to Appendices 30 and 30A are provided for illustrative purposes in Appendices 1 and 2 to this document. The results of these analyses are discussed below.

Appendix 1 shows that the proposed ECHOSTAR-4 satellite network meets the ITU criteria in the 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 the Bahamas, Canada, Cuba, Dominican Republic, Haiti, Jamaica, Mexico, Peru, Russia and the United Kingdom. Each of the affected networks is discussed below:

- The affected networks of the Bahamas, Cuba, Dominican Republic, Haiti, Jamaica and Peru are all original Plan networks. None of these networks is currently operational, nor can we find any evidence that any of these networks are under construction or scheduled for launch.
- The Canadian networks at the nominal 82° W.L. and 91° W.L. locations are deemed to be affected. The Canadian networks are assigned to Telesat Canada. EchoStar and Telesat Canada have executed a coordination agreement for the operation of the ECHOSTAR-4 satellite at 86.5° W.L. Telesat Canada has informed EchoStar as to the maximum downlink EIRP levels that the ECHOSTAR-4 satellite can cause over Canadian territory. The beams of the ECHOSTAR-4 satellite will be biased towards the south specifically to protect the Canadian networks to these protection levels.
- Mexico's networks at the nominal 77° W.L. location are deemed to be affected. The Mexican networks are assigned to QuetzSat. EchoStar will coordinate the operations of the ECHOSTAR-4 satellite network with QuetzSat. Coordination should be straight forward given the 9.5 degree orbital separation.
- Russia's 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. In the event that the network is progressed, it is expected that coordination could be achieved given the large orbital separation and the small OEPM degradation caused to the network.

- The United Kingdom has five networks at 86.5°W.L. We can find no evidence that any of the networks are under construction or scheduled for launch.

In addition, there are two USA networks that are deemed to be affected: USABSS-9 at 148° W.L. and USABSS-15 at 110° W.L. Both of these networks receive small OEPM degradations and both are assigned to EchoStar's affiliate, DISH Network.

- Based on the preceding, EchoStar concludes that operation of the ECHOSTAR-4 satellite will not cause harmful interference, or even unacceptable interference, into any adjacent operational satellite network. As previously indicated to the FCC, no coordination has been initiated with the Administrations that have responded to the ITU in reference to the original USABSS-27 filing, including UK-Gibraltar and the Cuba filings. Cuba would have to coordinate through the ITU Geneva since the United States cannot contact Cuba directly. EchoStar is in the planning process of initiating these coordination efforts.

Appendix 2 shows that the proposed ECHOSTAR-4 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

The EchoStar-4 satellite was designed and manufactured by Lockheed Martin and was launched in 1998. The satellite will not undergo any planned release of debris during its operation. EchoStar and the satellite manufacturer have assessed and limited the probability of the satellite becoming a source of debris by collisions with small debris or meteoroids of less than one centimeter in diameter that could cause loss of control and prevent post-mission disposal. Such probability has been limited through component placement and the use of redundant systems.

The ECHOSTAR-4 satellite has separate TT&C and propulsion subsystems that are necessary for end-of-life disposal. The spacecraft TT&C system, vital for orbit raising, is extremely rugged with regard to meteoroids smaller than 1 cm, by virtue of its redundancy, shielding, separation of components and physical characteristics. An omni-directional antenna and wide angle horn system are used principally during orbit raising. 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))

EchoStar has assessed and limited the probability of accidental explosions during and after completion of mission operations. A Failure Mode Verification Analysis has also been conducted, and the probability of accidental explosions has been limited through extensive monitoring of ECHOSTAR-4 satellite's batteries and fuel tanks for pressure and temperature. Furthermore, bipropellant mixing is prevented by the use of valves that prevent backwards flow in propellant lines and pressurization lines. Excessive battery charging or discharging is limited by a monitoring and control system which will automatically limit the possibility of fragmentation. Corrective action, if not automatically undertaken, will be immediately undertaken by the spacecraft operator to avoid destruction and fragmentation. Thruster temperatures, impulse and thrust duration are carefully monitored, and any thruster may be turned off via redundant valves. At the end of the satellite's life, all energy sources will be depleted. Specifically, the batteries will be left in a permanent state of discharge, chemical propulsion systems will be depleted, and the electrical propulsion system will be disabled.

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-4 satellite, EchoStar has reviewed the lists of FCC licensed satellite

networks, as well as those that are currently under consideration by the FCC. In addition, networks for which a request for coordination has been submitted to the ITU within ± 0.15 degrees of 86.5° W.L. have also been reviewed.

There are no operational satellites in the immediate vicinity of 86.5° W.L., nor are there any pending applications before the Commission to use a slot in the immediate vicinity of 86.5° W.L.

Canada has made ITU submissions for two 17/24 GHz networks at 86.5° W.L. and the UK has made ITU submissions for five BSS networks at 86.5° W.L. EchoStar can find no evidence that any of these networks are under construction or scheduled for launch.

Based on the preceding, EchoStar concludes there is no requirement to physically coordinate the ECHOSTAR-4 satellite with another satellite operator at the present time.

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

Upon mission completion, the ECHOSTAR-4 will be maneuvered to a disposal orbit at least 300 km above its operational geostationary orbit¹. EchoStar will reserve 11 kg of fuel to achieve the disposal orbit at the end of the satellite's life. The fuel reserve was calculated using two methods. The first method applied was the pressure-volume temperature method, which uses tank pressure and temperature information to determine remaining propellant. The second method applied was the bookkeeping method, which evaluates the flow rate at average pressure and total thruster on-time of orbital maneuvers to determine the amount of propellant used. EchoStar has assessed fuel gauging uncertainty and has provided an adequate margin of fuel to address such uncertainty.

¹ The ECHOSTAR-4 satellite was launched in 1998. Pursuant to the Second Report and Order, a calculation of the satellite's disposal orbit according to the IADC formula is not required. *See* Second Report and Order at ¶81 (“we will grandfather all on orbit GEO spacecraft that were launched as of the release of the *Notice* in this proceeding”).

**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 (TECHNICAL INFORMATION TO SUPPLEMENT
SCHEDULE S)**

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 margin²⁸ 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 2673. The CONUS beam was assumed to operate with a peak downlink EIRP of 54.9 dBW, while the Mexican beam was assumed to transmit with a peak downlink EIRP of 57.6 dBW. The results of the analysis are contained in Annex 1 to this Appendix. As shown, the affected foreign administrations are Bahamas, Canada, Cuba, Dominican Republic, Haiti, Jamaica, Mexico, Peru, Russia and the UK. The results are discussed below for each of these administrations:

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

- The affected networks of the Bahamas, Cuba, Dominican Republic, Haiti, Jamaica and Peru are all original Plan networks. None of these networks are currently operational. The ECHOSTAR-4 satellite network will operate on an unprotected, non-harmful interference basis. In the event operations of the ECHOSTAR-4 satellite network cause harmful interference into these and any other network, EchoStar will either cease operations, or reduce transmission levels appropriately, immediately upon notification of such interference.
- The Canadian networks at the nominal 82°W.L. and 91°W.L. locations are deemed to be affected. The Canadian networks are assigned to Telesat Canada. EchoStar and Telesat Canada have executed a coordination agreement for the operation of the ECHOSTAR-4 satellite at 86.5°W.L. The beams of the ECHOSTAR-4 satellite will be biased towards the south specifically to protect the Canadian networks to the protection levels required by Telesat Canada.
- Mexico's networks at the nominal 77°W.L. location are deemed to be affected. The Mexican networks are assigned to QuetzSat. EchoStar will coordinate the operations of the ECHOSTAR-4 satellite network with QuetzSat. Coordination should be straight forward given the 9.5 degree orbital separation.
- Russia's 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.
- The UK has five networks at 86.5°W.L. We can find no evidence that any of the networks are under construction or scheduled for launch.

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:

$-147 \text{ dB}(W/(m^2 \cdot 27 \text{ MHz}))$	<i>for $0^\circ \leq \theta < 0.23^\circ$</i>
$-135.7 + 17.74 \log \theta \text{ dB}(W/(m^2 \cdot 27 \text{ MHz}))$	<i>for $0.23^\circ \leq \theta < 2.0^\circ$</i>
$-136.7 + 1.66 \theta^2 \text{ dB}(W/(m^2 \cdot 27 \text{ MHz}))$	<i>for $2.0^\circ \leq \theta < 3.59^\circ$</i>
$-129.2 + 25 \log \theta \text{ dB}(W/(m^2 \cdot 27 \text{ MHz}))$	<i>for $3.59^\circ \leq \theta < 10.57^\circ$</i>
$-103.6 \text{ dB}(W/(m^2 \cdot 27 \text{ MHz}))$	<i>for $10.57^\circ \leq \theta$</i>

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 86.5°W.L. location, therefore the $-103.6 \text{ dB(W/(m}^2 \cdot 27 \text{ MHz))}$ 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-4 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:

$$\begin{array}{ll}
 -148 \text{ dB(W/(m}^2 \cdot 4 \text{ kHz))} & \text{for } \theta \leq 5^\circ \\
 -148 + 0.5 (\theta - 5) \text{ dB(W(m}^2 \cdot 4 \text{ kHz))} & \text{for } 5^\circ < \theta \leq 25^\circ \\
 -138 \text{ dB(W/(m}^2 \cdot 4 \text{ kHz))} & \text{for } 25^\circ < \theta \leq 90^\circ
 \end{array}$$

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-4 satellite network. The GIMS pfd tool showed that no Administrations are affected and therefore the ECHOSTAR-4 satellite is compliant with this Section.

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 GHz³² 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:

$$\begin{array}{ll} -186.5 \text{ dB}(W/(m^2 \cdot 40 \text{ kHz})) & \text{for } 0^\circ \leq \theta < 0.054^\circ \\ -164.0 + 17.74 \log \theta \text{ dB}(W/(m^2 \cdot 40 \text{ kHz})) & \text{for } 0.054^\circ \leq \theta < 2.0^\circ \\ -165.0 + 1.66 \theta^2 \text{ dB}(W/(m^2 \cdot 40 \text{ kHz})) & \text{for } 2.0^\circ \leq \theta < 3.59^\circ \\ -157.5 + 25 \log \theta \text{ dB}(W/(m^2 \cdot 40 \text{ kHz})) & \text{for } 3.59^\circ \leq \theta < 10.57^\circ \\ -131.9 \text{ dB}(W/(m^2 \cdot 40 \text{ kHz})) & \text{for } 10.57^\circ \leq \theta \end{array}$$

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 GIMS pfd tool was used to verify compliance with this Section. All Regions 1 and 3 FSS satellites are greater than 10.57° from the 86.5°W.L. location, therefore the -131.9 dB (W/(m² .

³² Including assignments operating under No. 5.485.

40 kHz)) level applies. The results of the GIMS analysis shows that no administrations are affected. Therefore the ECHOSTAR-4 satellite network is compliant with this Section.

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 $\Delta T/T$ resulting from the proposed modification is greater than the value of $\Delta T/T$ 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 $\Delta T/T$ 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-4 satellite network is compliant with this Section.

Annex 1 to Appendix 1 to Technical Annex

EHOSTAR-4

MSPACE Results

Admin	Orbital Position (degrees E)	Network	Max. OEPM Degradation (dB)
BAH	-87.20	BAHIFRB1	20.052
JMC	-92.30	CRBBAH01	0.678
JMC	-92.30	CRBBLZ01	3.205
JMC	-92.30	CRBJMC01	0.286
JMC	-92.70	JMC00002	0.481
CUB	-89.20	CUB00001	5.145
DOM	-83.30	DOMIFRB2	1.784
HTI	-83.30	HTI00002	3.069
PRU	-85.80	PRU00004	0.358
CAN	-82.00	CAN-BSS1	1.320
CAN	-91.10	CAN-BSS2	1.837
MEX	-77.00	MEX-TDH1	1.272
MEX	-76.80	MEX-TVD1	0.954
MEX	-77.20	MEX-TVD2	0.660
MEX	-77.00	QUETZSAT-77	1.511
USA	-148.00	USABSS-9	0.275
USA	-110.00	USABSS-15	0.396
G	-86.50	USAT-S3	31.342
G	-86.50	USAT-S3 MOD-A	29.861
G	-86.50	USAT-S3 MOD-B	30.076
G	-86.50	USAT-S3 MOD-C	29.990
G	-86.50	USAT-S3 MOD-D	29.861
RUS	-47.50	INTERSPUTNIK-47.5W-B	0.296

**APPENDIX 2 TO
ATTACHMENT A (TECHNICAL INFORMATION TO SUPPLEMENT
SCHEDULE S)**

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 plan³³** (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 margin³⁴ 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 Appendix 30 Annex 1 Analysis.

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 $\Delta T/T$ corresponding to 6%, where $\Delta T/T$ 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 $\Delta T / T$ 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 $\Delta T / T$'s are well below the allowed 6% level. Therefore the ECHOSTAR-4 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 $\Delta T/T$ (%)
Network Name	Orbital Position	Peak Receive Antenna Gain (dBi)						
INTERSPUTNIK-47.5W-B	-47.5	37	33.3	-111.8	40296	-10	600	0.01%
MCO-BSS-40.5W	-40.5	35.9	33.3	-111.8	40921	-10	600	0.01%
IRL21100	-37.2	48.08	33.3	-111.8	41222	-10	600	0.15%
NGR11500	-37.2	38.47	33.3	-111.8	41222	-10	600	0.02%
DBL-G4-37.2W	-37.2	35	33.3	-111.8	41222	-10	300	0.01%
AND34100	-37	48.88	33.3	-111.8	41241	-10	600	0.18%
GMB30200	-37	47.69	33.3	-111.8	41241	-10	600	0.13%
GUI19200	-37	42.29	33.3	-111.8	41241	-10	600	0.04%
POR_100	-37	47.17	33.3	-111.8	41241	-10	600	0.12%
MTN_100	-36.8	37.55	33.3	-111.8	41259	-10	600	0.01%
SMR31100	-36.8	48.88	33.3	-111.8	41259	-10	600	0.18%

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.