

EHOSTAR-15

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

The EHOSTAR-15 satellite currently serves as an in-orbit spare at 61.65° W.L. and is nominally collocated with EHOSTAR-16 which is authorized to operate at 61.5° W.L. on channels 1 through 32, as defined by the ITU's Region 2 BSS Plan, under Commission license (for channels 3 through 32) and special temporary authorization (for channels 1 and 2).¹ EchoStar currently has Commission authorization only to conduct telemetry, tracking and command ("TT&C") operations with the EHOSTAR-15 satellite at 61.65° W.L.² EchoStar now seeks Commission authorization to operate on channels 1 through 32, as defined by the ITU's Region 2 BSS Plan, and at the 61.65° W.L. location. Such operations, however, will be limited to only those channels not used on EHOSTAR-16 or other authorized satellites at the nominal 61.5° W.L. orbital location, such that the same channel will not be used simultaneously on more than one authorized satellite at that nominal orbital location.

¹ See *EchoStar Satellite Operating Corp.*, Order and Authorization, 27 FCC Rcd 7138, ¶¶ 10-11 (IB 2012); EchoStar, Stamp Grant, File No. SAT-STA-20180706-00051 (granted Aug. 23, 2018).

On the downlink, the satellite employs a wide-area fixed beam that will serve CONUS and Puerto Rico. The satellite will be operated on select channels within the designated band in “super-high-power” mode producing a peak downlink EIRP of 58.1 dBW. Two receive spot beams are used for feeder link purposes. These spot beams are centered over EchoStar’s feeder link earth station facilities located in Cheyenne, WY and Gilbert, AZ.

A.3 TT&C Characteristics

As explained above, EchoStar currently has Commission authorization to conduct TT&C operations with the ECHOSTAR-15 satellite at 61.65° W.L. The technical characteristics of the TT&C operations have not changed and therefore TT&C technical information is not being repeated herein or in the associated Schedule S form.

A.4 ITU Filing for ECHOSTAR-15

The ECHOSTAR-15 satellite network will operate under the yet-to-be-filed USABSS-49 ITU network. The materials of the ITU filing will be submitted to the Commission separately for submission to the ITU.

A.5 Interference Analyses

The analyses of the ECHOSTAR-15 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-15 satellite network meets the ITU criteria in Annex 1 to Appendix 30, and so no coordination is required, except with respect to certain adjacent Region 2

² See SAT-AMD-20151221-00084.

BSS networks. The affected foreign administrations are the UK and the Netherlands. The results are summarized below for each of these administrations:

- The UK has four INTELSAT KUEXT 304.5 networks (*i.e.*, all four have the same name) at 55.5° W.L. and each is deemed to be affected. Annex 1 of Appendix 1 states only the worst-case OEPM degradation caused to all four networks, collectively. Intelsat does not currently operate a satellite with a BSS payload at 55.5° W.L., but nonetheless, coordination with Intelsat will be required in order to enter the USABSS-49 network into the Region 2 Plan.
- The UK's USAT-67W network is deemed to be affected. This network is required to coordinate with USA BSS networks at 61.5° W.L. There is no BSS satellite operational at 67° W.L.
- The Netherlands has two networks at 58° W.L. that are deemed to be affected. Both these networks are required to coordinate with USA BSS networks at 61.5° W.L. There is no BSS satellite operational at 58° W.L.

A.6 Orbital Debris Mitigation Plan

Orbital debris mitigation information has not materially changed since the last filing in IBFS File No. SAT-AMD-20151221-00084.

**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/

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APPENDIX 1 TO ATTACHMENT A

All interference analyses for the ECHOSTAR-15 satellite were performed against the networks that were published as of IFIC 2873. The analyses assumed the satellite transmits across all 32 BSS channels simultaneously and with each downlink channel transmitting maximally in “super-high-power” mode (*i.e.*, worst case interference assumptions).

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)*

An MSPACE analysis was performed utilizing the Region 2 BSS Plan as contained in IFIC 2873 and using the characteristics of the USABSS-49 ITU satellite network. The results of the analysis are shown in Annex 1 to this Appendix.

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

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 GIMS PFD tool was used to assess compliance with this Section. Using the antenna gain contours and maximum power level of the ECHOSTAR-15 satellite, the GIMS PFD tool showed that no administrations are affected. Therefore, the ECHOSTAR-15 satellite 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

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**.

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 assess compliance with this Section. Using the antenna gain contours and maximum power level of the ECHOSTAR-15 satellite, the GIMS PFD tool showed that the PFD limits are exceeded over a portion of 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 broadcasting-satellite service in the channel concerned. Since Canada is assigned all 32 channels in the Plan, the above PFD limits are not applicable to Canada. Accordingly, the ECHOSTAR-15 satellite network is compliant with this Section.

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.

³² Including assignments operating under No. 5.485.

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:

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

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-15 satellite causes lower PFD levels over all territories in Regions 1 and 3 than those caused by USA Original Plan networks nominally at 61.5°W and therefore the ECHOSTAR-15 satellite 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 hence the ECHOSTAR-15 satellite is compliant with this Section.

Annex 1

ECHOSTAR-15 (USABSS-49) at 61.65° W.L. MSPACE Results

Admin	Orbital Position (°W)	Network	Max. OEPM Degradation (dB)
G	55.5	INTELSAT KUEXT 304.5	1.015
G	67.0	USAT-67W	1.007
HOL	58.0	NSS-BSS 58W	3.940
HOL	58.0	NSS-BSS-G2 58W	3.008

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 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)*

The MSPACE results are provided in Annex 1 to Appendix 1.

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 analysis shows that there are no affected Region 1 or Region 3 networks. Therefore, the ECHOSTAR-15 satellite network is compliant with this Section.

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 the Region 2 Plan.