ECHOSTAR-18

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-18 satellite will operate at the 109.9° W.L. nominal orbital location and will provide Broadcasting-Satellite Service/Direct Broadcast Satellite ("BSS" or "DBS") service to parts of the continental United States ("CONUS"), Alaska, Hawaii, Puerto Rico and Cuba.

The ECHOSTAR-18 satellite will operate within 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 channels licensed to DISH on either the ECHOSTAR-10 satellite or the ECHOSTAR-11 satellite at the nominal 110° W.L. orbital location. 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. On the uplink, the satellite is capable of using all 32 ITU Region 2 BSS channels. On the downlink, the satellite is capable of using ITU Region 2 BSS channels 16 and 18 through to 32, inclusive; however channels 28, 30 and 32 will not be utilized on the uplink or downlink since these are not licensed to DISH.

The ECHOSTAR-18 satellite solely utilizes spot beams for transmission of the communications carriers. There are six uplink spot beams (operating in both circular polarizations). The six feeder link sites are located at Cheyenne, WY, Gilbert, AZ, Monee, IL, Mount Jackson, VA, New Braunfels, TX and Spokane, WA.

The ECHOSTAR-18 satellite utilizes 78 TWTAs, including spares: forty-nine 150 Watt TWTAs, twenty-four 90 Watt TWTAs and five 35 Watt TWTAs. The total number of simultaneously active TWTAs is 61. Certain TWTAs are shared with up to four individually filtered 26 MHz channels for a maximum of 169 simultaneous active channels.

The peak downlink EIRP levels of the spot beams range between 51.4 dBW and 58.9 dBW.

Spot beam operation, in both the uplink and downlink directions, achieves full frequency re-use through a combination of dual orthogonal polarizations and spatial isolation.

Spacecraft Telemetry, Tracking and Control ("TT&C") functions will take place from FCC-authorized, 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, for 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 beacon at 17,308 MHz from the ground. The satellite is capable of receiving RFAT transmissions uplinked from Cheyenne, WY, Gilbert, AZ and Monee, IL.

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

The ECHOSTAR-18 satellite's antenna gain contours for the receive and transmit beams, as required by §25.114(d)(3), are being provided to the Commission in a GIMS database container. See section A.10 herein for additional details.

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

The ECHOSTAR-18 satellite will provide a range of BSS 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., QPSK, 8PSK) and the type and degree of FEC 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 form. The representative modulation/coding schemes provided in the associated Schedule S submission are as follows:

a) QPSK; rates 5/6 and 7/8 inner coding (27 MHz bandwidth[1]);

b) 8PSK; rates 2/3 and 3/4 inner coding (25.8 MHz bandwidth).

[1] The 27 MHz carriers will be transmitted in the 26 MHz channels. These emissions can be accommodated within the useful bandwidth of the channel filters.

A.5 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 form.

The ECHOSTAR-18 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 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 and transmitted by the satellite using large-coverage horn antennas.

There are four command receivers: one operating at 17.7935 GHz (default) and two that operate at 17.303 GHz. In addition, there is one “flex” receiver that can operate anywhere within the 17.790 - 17.800 GHz band. There are three telemetry transmitters: one operating at 12.203 GHz (default) or 12.204 GHz, and one operating at 12.695 GHz or 12.696 GHz. In addition, there is one “flex” transmitter that can operate anywhere within the 12.690 - 12.700 GHz band.

A summary of the TT&C subsystem is given in Table A.5-1.

Table A.5-1: Summary of the TT&C Subsystem

Command/Ranging Frequencies	17,793.5 MHz (RHCP) 17,303 MHz (LHCP) 17,790 - 17,800 MHz (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)
Telemetry/Ranging Frequencies	12,695 MHz (RHCP) 12,696 MHz (RHCP) 12,203 MHz (LHCP) 12,204 MHz (LHCP) 12,690 - 12,700 MHz (RHCP)
Maximum Downlink EIRP	14.6 dBW (Omni antenna) 14.3 dBW (Horn antenna)

A.6 Interference Analyses (§25.214(d)(13))

The analyses of the ECHOSTAR-18 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-18 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 seven adjacent Region 2 BSS networks that were deemed to be affected (see Annex 1 to Appendix 1). The affected foreign administrations are Canada, Holland and the UK. The results are discussed below for each of these networks:

- Canada's networks at 129° W.L. and 138° W.L. are deemed to be affected. Both networks are assigned to Ciel. DISH will coordinate the operations of the ECHOSTAR-

18 satellite network with Ciel. Coordination should be straight forward given the large orbital separation between the networks and the small OEPM degradations.

- Holland's network at 125° W.L. is deemed to be affected. We can find no evidence that this network is under construction or scheduled for launch.

- The UK's BERMUDASAT-1 and BERMUDASAT-1A networks at 96.2° W.L. are deemed to be affected. Coordination should be achievable given the size of the orbital separation.

- The UK's networks at 105.5° W.L. and 133.5° W.L. are deemed to be affected. We can find no evidence that either of these networks are under construction or scheduled for launch.

Appendix 2 shows that the proposed ECHOSTAR-18 satellite network meets all of the ITU criteria in Annex 1 to Appendix 30A.

A.7 Orbital Debris Mitigation Plan (§25.114(d)(14))

A.7.1 Spacecraft Hardware Design

Space Systems/Loral ("Loral") is the manufacturer of the ECHOSTAR-18 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 of titanium debris from the hold-down and 2 milligrams of "soot" per firing.

These EEDs have flown on over 36 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-18 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 are able to withstand impact. The ECHOSTAR-18 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-18 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.7.2 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 on 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.

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 has no explosive risk 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.7.3 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-18 satellite, DISH 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 109.9° W.L. have also been reviewed.

There are currently three satellites that operate within the 110° W.L. cluster, as follows:

- ECHOSTAR-10 at 110.2° W.L.
- DIRECTV 5 at 110.1° W.L.
- ECHOSTAR-11 at 110.0° W.L.

All three satellites operate with an east-west station-keeping of ±0.05 degrees. By locating the ECHOSTAR-18 satellite at 109.9° W.L., and maintaining an east-west station-keeping tolerance of ±0.05 degrees, there will be no overlap of station-keeping volume with any of these three satellites, and hence no risk of collision.

There are no pending applications before the Commission for an additional satellite to be located at an orbital location in the immediate vicinity of 109.9° W.L. In addition, there are no non-USA networks filed with the ITU for an orbital location within ±0.15 degrees of 109.9° W.L.

Based on the preceding, DISH concludes there is no requirement to physically coordinate the ECHOSTAR-18 satellite with another satellite operator at the present time.

A.7.4 Post Mission Disposal Plan (§25.144(d)(14)(iv))

At the end of the operational life of the ECHOSTAR-18 satellite, DISH 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 is as follows:

Total Solar Pressure Area "A" = 91 m^2

"M" = Dry Mass of Satellite = 3346 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 91/3346

= 36,062 km

= 276 km above GSO (35,786 km)

Thus, the designed disposal orbit of 300 km above GSO exceeds the required minimum by a margin of 24 km. Maneuvering the satellite to the disposal orbit will require 15.2 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.

DISH will apply all available propellant accounting methodologies to track propellant usage. For the ECHOSTAR-18 satellite, these methodologies include the bookkeeping method, the pressure-volume-temperature ("PVT") method, and the propellant depletion gauge operations ("PDGO") method.

The bookkeeping method, whereby the estimated propellant used during a thruster-firing event is subtracted from the beginning of life 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 until propellant analysis shows 60 kg or less propellant remaining, after which the PDGO method will be applied after every north-south station-keeping maneuver. Combined, these methods will ensure the necessary amount of fuel is reserved to perform deorbit procedures as well as maximize fuel depletion when the ECHOSTAR-18 satellite reaches its disposal orbit.

A.8 ITU Filing for ECHOSTAR-18 (§25.114(d)(13))

All materials related to the ITU filing for ECHOSTAR-18 (to be filed as the "USABSS-41" network) are attached to this application. These consist of the following:

- SpaceCap database file (USABSS-41 AP30-30A.mdb) containing the data required by the ITU as stated in Appendix 4 of the Radio Regulations.

- Beam contour files 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-41 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/

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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 2769. The results of the analysis for non-USA networks are contained in Annex 1 to this Appendix. As shown, there are seven adjacent Region 2 BSS networks filed on behalf of three administrations: Canada, Holland and the UK. The results are discussed below for each of the affected networks:

- Canada's networks at 129° W.L. and 138° W.L. are deemed to be affected. Both networks are assigned to Ciel. DISH will coordinate the operations of the ECHOSTAR-18 satellite network with Ciel. Coordination should be straight forward given the large orbital separation between the networks and the small OEPM degradations.

- Holland's network at 125° W.L. is deemed to be affected. We can find no evidence that this network is under construction or scheduled for launch.

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

- The UK's BERMUDASAT-1 and BERMUDASAT-1A networks at 96.2° W.L. are deemed to be affected. Coordination should be achievable given the size of the orbital separation.

- The UK's networks at 105.5° W.L. and 133.5° W.L. are deemed to be affected. We can find no evidence that either of these 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 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 GIMS 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-18 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 · 4 kHz))* *for* $\theta \leq 5°$

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

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

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 power levels of the beams, the GIMS PFD tool showed that no administrations are affected. Therefore the ECHOSTAR-18 satellite network is compliant with this Section.

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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 GIMS 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-18 satellite network 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 hence the ECHOSTAR-18 satellite network is compliant with this Section.

Annex 1 to Appendix 1 to Technical Annex

ECHOSTAR-18

MSPACE Results

Admin	Orbital Position (degrees E)	Network	Max. OEPM Degradation (dB)
CAN	-129.00	CAN-BSS7	0.433
CAN	-138.00	CAN-BSS57 (138W)	0.472
G	-96.20	BERMUDASAT-1	1.294
G	-96.20	BERMUDASAT-1A	1.288
G	-105.50	USAT-S1 MOD-B	3.392
G	-133.50	USAT-S8	0.702
HOL	-125.00	NSS-BSS 125W	0.797

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 $\Delta T/T$ 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.

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.