

ANNEX 4 TO CHAPTER 3

(relative to the current Radio Regulations)

Examples of modifications to TABLE S21-4 (continued)

Frequency band	Service*	Limit in dB(W/m ²) for angle of arrival (δ) above the horizontal plane			Reference bandwidth
		0°-5°	5°-25°	25°-90°	
10.7-11.7 GHz	Fixed-satellite (space-to-Earth), <u>geostationary-satellite orbit</u>	-150 ⁺⁴	$-150 + 0.5(\delta - 5)^{+4}$	-140 ⁺⁴	4 kHz
<u>10.7-11.7 GHz</u>	<u>Fixed-satellite (space-to-Earth), non-geostationary-satellite orbit</u>	<u>-126</u>	<u>$-126 + 0.5(\delta - 5)$</u>	<u>-116</u>	<u>1 MHz</u>
11.7-12.5 GHz (Region 1) <u>12.5-12.75 GHz (Region 1 countries listed in Nos. S5.494 and S5.496)</u> 11.7-12.275 GHz (Region 3) 11.7-12.27 GHz (Region 2) 12.2-12.7 GHz (Region 2)	Fixed-satellite (space-to-Earth), non-geostationary-satellite orbit	-148 ⁺⁵ <u>-124</u>	$-148 + 0.5(\delta - 5)^{+5}$ <u>$-124 + 0.5(\delta - 5)$</u>	-138 ⁺⁵ <u>-114</u>	4 kHz <u>1 MHz</u>
12.2-12.575 GHz ⁷ (Region 3) 12.5-12.75 GHz ⁷ (Region 1 and Region 3-countries listed in Nos. S5.494 and S5.496)	Fixed-satellite (space-to-Earth), <u>geostationary-satellite orbit</u>	-148 ⁺⁴	$-148 + 0.5(\delta - 5)^{+4}$	-138 ⁺⁴	4 kHz
15.43-15.63 GHz No change	Fixed-satellite (space-to-Earth)	-127	5°-20°: -127 20°-25°: $-127 + 0.56(\delta - 20)^2$	25°-29°: -113 29°-31°: $-136.9 + 25 \log(\delta - 20)$ 31°-90°: -111	1 MHz

17.7-19.3 GHz ^{7, 8}	Fixed-satellite (space-to-Earth) Météorological- satellite (space-to- Earth)	-115 ^{2a} or -125⁺² -115-X¹²	-115 + 0.5(δ - 5) ^{2a} or -125 + (δ - 5)⁺² -115-X((10+X)/20) (δ - 5)¹²	-105 ^{2a} or -105 ¹²	1 MHz
19.3-19.7 GHz 22.55-23.55 GHz 24.45-24.75 GHz 25.25-27.5 GHz	Fixed-satellite (space-to-Earth) Earth exploration- satellite (space-to-Earth) Inter-satellite	-115	-115 + 0.5(δ - 5)	-105	1 MHz

MOD¹² **S21.16.6**

~~These values shall apply provisionally only to emissions of space stations on non-geostationary satellites in networks operating with a large number of satellites, that is systems operating with more than 100 satellites (see Resolution 131 (WRC 97)).~~^(WRC 97)

The function X is defined as a function of the number, N, of satellites in the non-GSO FSS constellation as follows:

$$\text{— for } N \leq 50 \quad X = 0 \quad \text{(dB)}$$

$$\text{— for } 50 < N \leq 288 \quad X = \frac{5}{119}(N - 50) \quad \text{(dB)}$$

$$\text{— for } N > 288 \quad X = \frac{1}{69}(N + 402) \quad \text{(dB)}$$

In the band 18.8-19.3 GHz, these limits apply to emissions of a space station on a non-geostationary FSS satellite for which complete coordination or notification information, as appropriate, has been received by the Radiocommunication Bureau after 17 November 1995, and which was not operational by that date.

ADD^{2a}**S21.16.6bis**

These limits apply to emissions of a space station on a meteorological-satellite and on a geostationary FSS satellite. These limits also apply to emissions of a space station on a non-geostationary FSS satellite in the bands 18.8-19.3 GHz for which complete coordination or notification information has been received by the Radiocommunication Bureau by 17 November 1995, or are in operation by that date (WRC-2000).

Reasons: The above regulatory text reflects the date-specific provisions currently in Resolution 131 (WRC-97).

Reasons: The above regulatory text maintains the original limits for non-GSO FSS systems in the band 18.8-19.3 GHz that were notified or operational prior to the end of WRC-95 per the decision in Resolution 131 (WRC-97). In the band 17.7-18.8 GHz, the new limits would apply to all non-GSO systems irrespective of the date of receipt of information or date of bringing into operation.

NOC
13 **S21.16.7**

SUP
14 **S21.16.8**

SUP
15 **S21.16.9**

ANNEX 5 TO CHAPTER 3

Example of possible modifications to Resolutions 130 and 538

RESOLUTION 130 (WRC-972000)

Use of non-geostationary systems in the fixed-satellite service in certain frequency bands

The World Radiocommunication Conference (~~Geneva, 1997~~Istanbul, 2000),

considering

- a)* that the International Telecommunication Union has, among its purposes, "to promote the extension of the benefit of the new telecommunication technologies to all the world's inhabitants" (No. 6 of the Constitution of the International Telecommunication Union (Geneva, 1992));
- b)* that it is desirable, in this respect, to promote systems capable of providing universal service;
- c)* that new telecommunication services need advanced and reliable networks permitting high-capacity communications;
- d)* the need to encourage the development and implementation of new technologies;
- e)* that systems based on the use of new technologies associated with both geostationary (GSO) and non-geostationary (non-GSO) satellite constellations are capable of providing the most isolated regions of the world with high-capacity and low-cost means of communication;

- f) that there should be equitable access to the radio-frequency spectrum and orbital resources in a mutually acceptable manner that allows for new entrants in the provision of services;
- g) that all Member States would benefit from the implementation of proposed systems in the allocated spectrum and from avoidance of monopolization or exclusive use of an allocation by a single system;
- h) that the operation of such systems requires a suitable amount of spectrum in appropriate frequency bands;
- i) that decisions on this matter should permit the operation of as many systems as possible;
- j) that, ~~in spite of the urgency attached to the development of such systems,~~ technical, operational and regulatory issues should be studied in order to achieve the most efficient use of the spectrum that may be available for these systems;
- k) that there is a need for the provision of services on a competitive basis between GSO fixed-satellite service (FSS) and non-GSO FSS systems as well as between non-GSO FSS and non-GSO FSS systems;
- l) that the Radio Regulations must be sufficiently flexible to accommodate the introduction and implementation of innovative technologies as they evolve, and allow the further development and implementation of any proposed system in conformity with their provisions,

considering further

- a) that the ITU-R has conducted further technical, operational and regulatory studies ~~are required~~ in order to determine ~~further~~ the conditions under which sharing of the frequency bands 10-30 GHz which are allocated to the FSS and where ~~Resolution 46 (Rev.WRC-97) No. S9.11A~~ does not apply is feasible between GSO and non-GSO systems, between non-GSO systems and between non-GSO and terrestrial systems and other space systems;
- ~~b) that it is likely that non-GSO FSS systems communicated to the Radiocommunication Bureau will not be brought into use before the WRC-99;~~
- eb) that the diverging interpretations arising from No. S22.2 result in an ambiguous regulatory status for both existing and future GSO and non-GSO systems in the FSS in the bands where this provision applies, with consequential risks for both types of systems;
- dc) that the harmonious development of non-GSO and GSO systems in the FSS requires that these ambiguities be resolved with no further delay in all bands subject to this provision;
- ed) that in resolving these ambiguities in the bands referred to in *resolves* 1 below, the GSO arc must be protected to ensure continued use of existing FSS systems and the development of new GSO technologies and systems in both non-planned bands and bands where plans exist;
- fe) that these ambiguities can may be resolved in certain frequency bands by adopting power flux-density (pfd) limits which ~~would~~ apply to non-GSO FSS systems to protect GSO FSS systems, and by including in Article S22 limits on the power radiated by non-GSO FSS systems in order adequately to protect GSO FSS systems in the frequency bands and sharing situations where ~~Resolution 46 (Rev.WRC-97) No. S9.11A~~ does not apply;
- gf) that in certain frequency bands which are currently used or planned to be used extensively by GSO FSS systems, ~~provisional~~ power flux-density limits applicable to non-GSO FSS systems have been developed;

~~hg)~~ that non-GSO FSS systems have been proposed in some of these bands which could meet these limits and would not require specific protection from existing and future GSO FSS systems, provided that minimum constraints are applied to GSO FSS systems, such as off-axis earth station e.i.r.p. limits;

~~ih)~~ that in the bands where the limits referred to in *considering further ef), fg)* and ~~gh)~~ would apply, there ~~is would be~~ no need for a coordination procedure between non-GSO FSS and GSO systems, with the exception of coordination between earth stations operating in opposite directions of transmission and coordination with earth stations using very large antennas;

~~ji)~~ that there ~~would be~~ is a need for a coordination procedure between non-GSO systems in the FSS and between non-GSO FSS systems and non-GSO systems in other services and for specific sharing criteria associated with this procedure, taking into consideration various types of non-GSO systems, including those in highly elliptical orbits;

~~kj)~~ the need to protect other co-primary services having allocations in the frequency bands referred to in *considering further a)* above and the need to assess further the sharing conditions between non-GSO FSS systems and these services;

~~lk)~~ that there is a need for further studies on sharing conditions in frequency bands other than the 10-30 GHz frequency bands, where ~~Resolution 46 (Rev. WRC 97) No. S9.11A does not apply and Article S22 does not include limits for non-GSO FSS systems, may also be necessary~~ on the basis of the requirements that may emerge,

noting

- 1 that information relating to GSO and non-GSO systems in the FSS in the 10-30 GHz bands has been communicated to the Bureau;
- 2 that some of these systems are in operation and others will be operated in the near future and, consequently, difficulties may be experienced in modifying their characteristics;
- 3 the need to protect existing and future terrestrial and space services and systems;
- 4 that No. S22.2 is an operational provision which is to be applied between administrations, and does not require any specific action or finding by the Bureau,

recognizing

that the geostationary-satellite orbit and its associated spectrum are a uniquely valuable resource and that equitable access to this resource needs to be protected for all countries in the world,

resolves

- 1 that, as of 22 November 1997, in the frequency bands specified in Tables S22-1A, S22-1B, S22-1C and S22-2 of Article S22, ~~and in Tables 1 and 2 in Annex 1 to this Resolution,~~ non-GSO FSS systems ~~shall apply the procedures of Section I of Article S9, Nos. S9.17 and S9.17A/Sections I and III of Article 11 and the procedures of Article S11/13, and the non-GSO FSS systems for which complete notification or coordination information, as appropriate, has been received by the Bureau after 21 November 1997 shall be subject to the provisional-power limits in Article S22, as revised by this Conference and in Annex 1 to this Resolution;~~

CPM Comment: WRC-2000 may be in a position to determine that resolves 1 is no longer required after WRC-2000 because:

- *Articles 11 and 13 have been suppressed.*
- *Sections I and III of S9, S9.17 and S9.17A apply to all non-GSO FSS not subject to S9.11A.*

- *The limits in Article S22 are enabled by the fact they appear in Article S22 itself.*

~~2 — that these limits shall be applied provisionally until the end of WRC 99, and that non-GSO FSS systems for which complete notification information has been received by the Bureau after 21 November 1997 shall be subject to the power limits in Article S22, as revised, if appropriate, by WRC 99;~~

CPM Comment: WRC-2000 may be in a position to determine that resolves 2, a transitional measure until WRC-2000 is no longer required after WRC-2000.

~~3 — that, as of 22 November 1997, in applying No. S22.2, administrations may consider these provisional power limits as corresponding to permissible levels of interference from a non-GSO system into a GSO system, irrespective of the dates of receipt by the Bureau of the complete notification information relating for the non-GSO system and of the complete coordination information for the GSO network;~~

CPM Comment: WRC-2000 may be in a position to determine that resolves 3, a transitional measure until WRC-2000 is no longer required after WRC-2000.

~~4 — that, as of the end of WRC 99, an administration operating a non-GSO FSS system which is in compliance with the limits in Article S22, as revised, if appropriate, by WRC 99, shall be considered as having fulfilled its obligations under No. S22.2 with respect to any GSO network, irrespective of the dates of receipt by the Bureau of the complete notification information for the non-GSO system and of the complete coordination information for the GSO network;~~

CPM Comment: If WRC-2000 elects to move this fundamental provision to Article S22, resolves 4 may be able to be suppressed.

~~5 — that, as of the end of WRC 99, in the frequency bands specified in No. S22.29 and § 2.4 of Annex 1 to this Resolution, GSO FSS systems for which complete coordination information has been received by the Bureau after the end of WRC 99 shall be subject to the limits in Article S22 and in § 2.1, 2.2 and 2.3 of Annex 1 to this Resolution, as revised, if appropriate, by WRC 99;~~

CPM Comment: WRC-2000 may be in a position to determine that resolves 5 is no longer required after WRC-2000; the limits in Article S22 are enabled by the fact they appear in Article S22 itself.

~~6 — that, as of 22 November 1997, in the frequency bands specified in No. S22.29 and Tables 1 and 2 of Annex 1 to this Resolution, non-GSO systems shall not claim protection from GSO networks in the FSS operating in accordance with the Radio Regulations, irrespective of the dates of receipt by the Bureau of the complete notification information for the non-GSO FSS systems and of the complete coordination information for the GSO networks;~~

OR

6 that, as of 22 November 1997, in the frequency bands specified in No. S22.29 and Tables S22-1A, S22-1B, S22-1C and S22-2 Tables 1 and 2 of Annex 1 to this Resolution, non-GSO systems shall not claim protection from GSO networks in the FSS operating in accordance with the Radio Regulations, irrespective of the dates of receipt by the Bureau of the complete notification information for the non-GSO FSS systems and of the complete coordination information for the GSO networks;

CPM Comment: If WRC-2000 determines that resolves 6 may be suppressed, WRC-2000 may also need to determine whether, in view of considering further g) above, retaining resolves 6 in Resolution 130 or Article S5 would require the establishment of minimum constraints on GSO FSS systems (such as earth station off-axis power limits). If, in the alternative, WRC-2000 determines that resolves 6 is an essential measure that is not dependent on the establishment of minimum

constraints on GSO FSS systems, the resolves (suitably modified) will need either to be reflected in appropriate fashion in footnotes of Article S5 or retained in Resolution 130 (MOD WRC-2000).

~~6.1 that, between 22 November 1997 and the end of WRC 99, if an administration operating or bringing into use a GSO FSS system before the end of WRC 99 considers that a non-GSO FSS system proposed by another administration might cause unacceptable interference into its GSO system, then:~~

~~6.1.1 the administration operating the GSO system shall send to the administration operating the non-GSO FSS system the technical details upon which its disagreement is based,~~

~~6.1.2 in the bands from 10.7 GHz to 14.5 GHz, the administration operating the non-GSO FSS system shall resolve the difficulties,~~

~~6.1.3 in the bands 17.8-18.6 GHz (space to Earth), 19.7-20.2 GHz (space to Earth), 27.5-28.6 GHz (Earth to space) and 29.5-30.0 GHz (Earth to space), the administrations concerned shall make every possible effort to resolve the difficulties by means of mutually acceptable adjustments to their networks;~~

OR

6.1 that, between 22 November 1997 and the end of WRC-2000, if an administration operating or bringing into use a GSO FSS system before the end of WRC-2000 considers that a non-GSO FSS system proposed by another administration might cause unacceptable interference into its GSO system, then:

6.1.1 the administration operating the GSO system shall send to the administration operating the non-GSO FSS system the technical details upon which its disagreement is based,

6.1.2 in the bands from 10.7 GHz to 14.5 GHz, the administration operating the non-GSO FSS system shall resolve the difficulties,

6.1.3 in the bands 17.8-18.6 GHz (space-to-Earth), 19.7-20.2 GHz (space-to-Earth), 27.5-28.6 GHz (Earth-to-space) and 29.5-30.0 GHz (Earth-to-space), the administrations concerned shall make every possible effort to resolve the difficulties by means of mutually acceptable adjustments to their networks;

CPM Comment: If WRC-2000 determines that resolves 6.1, 6.1.1, 6.1.2, and 6.1.3 are transitional measures until WRC-2000, these provisions may be able to be suppressed. If, however, administrations have invoked the provisions of resolves 6.1, WRC-2000, in addressing this situation, may determine that it is necessary to retain or modify resolves 6.1, 6.1.1, 6.1.2, and 6.1.3.

~~7 that, if an administration bringing into use a GSO FSS system after the end of WRC 99 considers that a non-GSO FSS system proposed by another administration and which complies with the limits in Article S22, as revised, if appropriate, by WRC 99, might cause unacceptable interference into its GSO system, the administrations concerned shall make every possible effort to resolve the difficulties by means of mutually acceptable adjustments to their networks;~~

CPM Comment: If WRC-2000 determines that resolves 7 is adequately covered by RR No. S9.4, resolves 7 may be able to be suppressed. Because an administration bringing a GSO FSS system into use may not be in a position to know if the non-GSO FSS system proposed by the other administration complies with the applicable WRC-2000 power limits under the time-table established in RR No. S9.3, WRC-2000 may find it appropriate to retain a suitably modified resolves 7.

~~8 that, as of 22 November 1997, non-GSO systems in the FSS in the frequency bands referred to in resolves 1 above, shall, for coordination with other non-GSO FSS systems, be subject to application of the provisions of § 2.1 of Section II of Resolution 46 (Rev.WRC-97) No. S9.12,~~

CPM Comment: If WRC-2000 elects to move this fundamental provision into footnotes of Article S5, resolves 8 may be suppressed.

requests ITU-R

1⁺ taking into account *considering further a)*, to conduct, as a matter of urgency, and complete, in time for consideration by WRC-9902/03, 1.3 the studies relating to the sharing criteria to be applied during the coordination between non-GSO FSS systems and the need for coordination between terrestrial services and non-GSO systems in the FSS and in other space services, with a view to promoting efficient use of spectrum/orbit resources and equitable access to these resources by all countries;

~~1.1 the appropriate technical, operational and regulatory studies to review the regulatory conditions relating to the coexistence of non-GSO and GSO systems in the FSS, in order to ensure that they do not impose undue constraints on the development of non-GSO and GSO FSS systems;~~

~~1.2 the development of a methodology for calculating the power levels produced by non-GSO FSS systems and the compliance of these levels with the limits referred to in resolves 1 and 2 above;~~

2⁺ taking into account *considering further lk)*, ~~to undertake the development to conduct the~~ appropriate technical, operational and regulatory studies towards the possible adoption of power limits or other frequency sharing mechanisms among GSO, non-GSO and terrestrial systems in the frequency bands other than those referred to in resolves 1 above and where non-GSO FSS systems are likely to be implemented and GSO systems are used or expected to be used extensively,

CPM Comment: WRC-2000 may find it advisable to repeat requests 1.1 (with conforming modifications) following requests 2, as a new requests 3.

instructs the Radiocommunication Bureau

as of the end of WRC-992000, to review and, if appropriate, revise, any finding previously made on the compliance with the limits contained in Article S22 of a non-GSO FSS system for which complete notification or coordination information, as appropriate, has been received between 22 November 1997 and the end of WRC-200099. This review shall be based on the values in Article S22, as revised, ~~if appropriate,~~ by WRC-992000.

~~† See Annex 2 for further details concerning specific aspects of these studies in relation to frequency sharing between systems in the non-GSO FSS and the GSO FSS.~~

SUP ~~ANNEX 1 TO RESOLUTION 130 (WRC 97)~~

Provisional limits

SUP ~~ANNEX 2 TO RESOLUTION 130 (WRC 97)~~

**ITU-R studies on frequency sharing
between non-GSO FSS and GSO FSS**

RESOLUTION 538 (WRC-972000)

**Use of the frequency bands covered by Appendices S30/30
and S30A/30A by non-geostationary-satellite
systems in the fixed-satellite service**

The World Radiocommunication Conference (~~Geneva, 1997~~Istanbul, 2000),

considering

- a) that provisional limits have been revised ~~established~~ and included in Article S22 ~~and in the Annex to this Resolution~~ to ensure that the interference caused by non-geostationary-satellite (non-GSO) systems in the fixed-satellite service (FSS) into assignments operated in conformity with the Appendices S30 and S30A Plans is maintained within negligible levels;
- b) that the integrity of the above-mentioned Plans and their future modifications is to be ensured;
- c) that non-GSO systems should not be entered into those Plans and therefore should not apply the procedures associated with the Plans and should not be protected by those procedures;
- d) that WRC-97 ~~this Conference~~ has decided to introduce in Article S5 a new allocation to the FSS in the frequency bands 11.7-12.5 GHz in Region 1, 12.2-12.7 GHz in Region 2 and 11.7-12.2 GHz in Region 3, limited to non-GSO FSS systems,

resolves

†

- †.1 that, as of 22 November 1997, a non-GSO FSS system operating in the frequency bands covered by Appendices S30 and S30A shall comply with the provisional limits specified in Article S22 and in the Annex to this Resolution; 1.2 that such a system shall, as of the end ~~WRC 99~~, comply with the limits specified in Article S22, as revised, if appropriate, by WRC-992000, irrespective of the date of receipt of the complete notification information relating to the non-GSO FSS system;

~~1.3 that as of 22 November 1997, in applying No. S22.2, administrations may consider these provisional power limits as corresponding to permissible levels of interference from a non-GSO system into a GSO system, irrespective of the dates of receipt by the Radiocommunication Bureau of the complete notification information for the non-GSO system and for the GSO network;~~

CPM Comment: WRC-2000 may be in a position to determine that resolves 1.3, a transitional measure until WRC-2000 is no longer required after WRC-2000.

~~1.4 that as of the end of WRC 99, an administration operating a non-GSO FSS system in the band 17.8-18.1 GHz (space to Earth) which is in compliance with the limits appearing in Article S22 as revised, if appropriate, by WRC 99, shall be considered as having fulfilled its obligations under No. S22.2 with respect to any GSO network operating in the Earth to space direction, irrespective of the dates of receipt by the Bureau of the complete notification information for the non-GSO system and of the complete coordination or notification information, as appropriate, for the GSO network;~~

CPM Comment: If WRC-2000 elects to move this fundamental provision to Article S22, resolves 1.4 may be able to be suppressed. It may also be appropriate to extend this provision to all the bands subject to Resolution 538 (WRC-97), since RR No. S22.2 now applies to both GSO FSS and GSO BSS protection from non-GSO systems.

~~1.5 that between 22 November 1997 and the end of WRC 99, if an administration operating or bringing into use a GSO system before the end of WRC 99 considers that a non-GSO FSS system proposed by another administration might cause unacceptable interference into its GSO system, then:~~

- ~~— the administration operating the GSO system shall send to the administration operating the non-GSO FSS system the technical details upon which its disagreement is based;~~
- ~~— the administration operating the non-GSO FSS system shall resolve the difficulties, taking into account especially degradation of picture and sound quality or signal availability with regard to GSO systems in operation;~~

OR

~~1.5₂ that between 22 November 1997 and the end of WRC-2000₉₉, if an administration operating or bringing into use a GSO system before the end of WRC-2000₉₉ considers that a non-GSO FSS system proposed by another administration might cause unacceptable interference into its GSO system, then:~~

- ~~– the administration operating the GSO system shall send to the administration operating the non-GSO FSS system the technical details upon which its disagreement is based;~~
- ~~– the administration operating the non-GSO FSS system shall resolve the difficulties, taking into account especially degradation of picture and sound quality or signal availability with regard to GSO systems in operation;~~

CPM Comment: If WRC-2000 determines that resolves 1.5 is a transitional measure until WRC-2000, this provision may be able to be suppressed. If, however, administrations have invoked the provisions of resolves 1.5, WRC-2000, in addressing this situation, may determine that it is necessary to retain or modify resolves 1.5.

~~1.6 that, as of 22 November 1997, a non-GSO FSS system operating in the frequency bands covered by Appendices S30 and S30A shall apply the procedures of Section I of Article S9, and Nos. S9.17 and S9.17A Sections I and III of Article 11, and the procedures of Article S11/13;~~

CPM Comment: WRC-2000 may be in a position to determine that resolves 1.6 is no longer required after WRC-2000 because:

- *Articles 11 and 13 have been suppressed; and*
- *Sections I and III of S9, S9.17 and S9.17A apply to all non-GSO FSS not subject to S9.11A.*

~~1.7 that, as of 22 November 1997, such a system shall be subject, for the coordination with non-GSO systems, to the application of the provisions of § 2.1 of Section II of Resolution 46 (Rev. WRC-97) No. S9.12;~~

CPM Comment: If WRC-2000 elects to move this fundamental provision into footnotes of Article S5, resolves 1.7 may be suppressed.

~~1.8 that, as of 22 November 1997, such a system shall apply, using an equivalent power flux density threshold of 185.3 dB(W/m²/4 kHz) for 99.7% of the time, calculated with the reference 90 cm diameter antenna pattern provided in Annex 5 of Appendix S30 for Regions 1 and 3, the provisions of No. S9.8/Article 7 of Appendix S30 with respect to assignments which appear in Article 11 of Appendix S30 with the symbols AE or PE;~~

CPM Comment: WRC-2000 may be in a position to determine that resolves 1.8 is no longer required after WRC-2000 because this provision was intended to provide the protection of 90 cm antennas corresponding to the "old" assignments in the pre-1997 Appendix 30 Plan in Regions 1 and 3. Since the antenna diagram used to protect BSS antennas is now expected to be the same for all Regions and diameters, this specific provision is no longer required.

~~2 that non-GSO FSS systems in the frequency bands referred to in resolves 1 above shall not be operated before the end of WRC-99,~~

CPM Comment: WRC-2000 may be in a position to determine that resolves 2, a transitional measure until WRC-2000, is no longer required after WRC-2000.

requests ITU-R

SUP a), b), c) and d)

CPM Comment: Alternative to requests ITU-R, WRC-2000 may consider extending the scope of ITU-R studies under the Resolution to other bands allocated to the BSS and associated feeder links if required. For these studies, frequency overlap with bands in Resolution 130 (WRC-2000) should be avoided.

instructs the Radiocommunication Bureau

as of the end of WRC-992000, to review and, if appropriate, revise, any finding previously made on the compliance with the limits contained in Article S22 of a non-GSO FSS system for which complete coordination and notification information, as appropriate, has been received between 22 November 1997 and the end of WRC-200099. This review shall be based on the values in Article S22, as revised, if appropriate, by WRC-200099.

SUP

~~ANNEX TO RESOLUTION 538 (WRC-97)~~

Provisional limits

ANNEX 6 TO CHAPTER 3

**Example of possible modifications to Footnotes
in Article S5 (Resolutions 130 and 538)**

REGULATORY/PROCEDURAL TEXT FOR WRC-2000 AGENDA ITEM 1.13

Section 3.1.2.4.1 notes that as a result of the need to modify Resolutions 130 and 538, consequential changes will be required to footnotes in Article S5 that make reference to these Resolutions.

1 Example modifications to footnotes based on Resolution 130 (WRC-97) and Resolution 538 (WRC-97)

Option 1A Example modifications to footnotes to reflect *resolves* 6 and 8 from Resolution 130 (WRC-97) and *resolves* 1.7 from Resolution 538 (WRC-97)

Depending on the revisions to Resolution 130 (WRC-97) that are made by WRC-2000, it may be necessary to reflect *resolves* 6 and 8 from that Resolution in modifications to pertinent footnotes. Similarly, depending on the revisions to Resolution 538 (WRC-97) that are made by WRC-2000, it may be necessary to reflect the *resolves* (1.7) from that Resolution in modifications to pertinent footnotes.

Resolves 8 from Resolution 130 and *resolves* 1.7 from Resolution 538 concerning coordination under Resolution 46/No. S9.12 are needed to allow non-GSO FSS systems to coordinate with other non-GSO FSS systems. *Resolves* 6 from Resolution 130 concerning non-GSO FSS systems not claiming protection from GSO networks in the FSS may be needed to implement the intent of WRC-97 and so that the BR or administrations operating GSO FSS systems will not be required under the Radio Regulations to consider interference complaints from administrations operating non-GSO systems.

The following are examples of possible modifications to Nos. S5.441, 484A, 487A, and 516 to reflect these *resolves*:

MOD S5.441 The use of the bands 4 500-4 800 MHz (space-to-Earth), 6 725-7 025 MHz (Earth-to-space) by the fixed-satellite service shall be in accordance with the provisions of Appendix S30B. The use of the bands 10.7-10.95 GHz (space-to-Earth), 11.2-11.45 GHz (space-to-Earth) and 12.75-13.25 GHz (Earth-to-space) by geostationary-satellite systems in the fixed-satellite service shall be in accordance with the provisions of Appendix S30B. The use of the bands 10.7-10.95 GHz (space-to-Earth), 11.2-11.45 GHz (space-to-Earth) and 12.75-13.25 GHz (Earth-to-space) by a non-geostationary-satellite systems in the fixed-satellite service ~~shall be in accordance with the provisions of Resolution 130 (WRC-97)~~ is subject to the

application of the provisions of No. S9.12 for coordination with other non-geostationary-satellite systems in the fixed-satellite service.

Non-geostationary-satellite systems in the fixed-satellite service shall not claim protection from geostationary-satellite networks in the fixed-satellite service operating in accordance with the Radio Regulations.

MOD S5.484A

The use of the bands 10.95-11.2 GHz (space-to-Earth), 11.45-11.7 GHz (space-to-Earth), 11.7-12.2 GHz (space-to-Earth) in Region 2, 12.2-12.75 GHz (space-to-Earth) in Region 3, 12.5-12.75 GHz (space-to-Earth) in Region 1, 13.75-14.5 GHz (Earth-to-space), 17.8-18.6 GHz (space-to-Earth), 19.7-20.2 GHz (space-to-Earth), 27.5-28.6 GHz (Earth-to-space), 29.5-30 GHz (Earth-to-space) by ~~a non-geostationary—and geostationary~~ satellite systems in the fixed-satellite service is subject to application of the provisions of Resolution 130 (WRC 97). The use of the band 17.8-18.1 GHz (space-to-Earth) by non-geostationary fixed-satellite service systems is also subject to the provisions of Resolution 538 (WRC 97) No. S9.12 for coordination with other non-geostationary-satellite systems in the fixed-satellite service. Non-geostationary-satellite systems in the fixed-satellite service shall not claim protection from geostationary-satellite networks in the fixed-satellite service operating in accordance with the Radio Regulations.

MOD S5.487A

Additional allocation: in Region 1, the band 11.7-12.5 GHz, in Region 2, the band 12.2-12.7 GHz and, in Region 3, the band 11.7-12.2 GHz, are also allocated to the fixed-satellite service (space-to-Earth) on a primary basis, limited to non-geostationary systems and subject to the application of the provisions of Resolution 538 (WRC 97) No. S9.12 for coordination between non-geostationary-satellite systems in the fixed-satellite service. Non-geostationary-satellite systems in the fixed-satellite service shall not claim protection from GSO networks in the broadcasting-satellite service operating in accordance with the Radio Regulations.

MOD S5.516

The use of the band 17.3-18.1 GHz by geostationary-satellite systems in the fixed-satellite service (Earth-to-space) is limited to feeder links for the broadcasting-satellite service. For the use of the band 17.3-17.8 GHz in Region 2 by feeder links for the broadcasting-satellite service in the band 12.2-12.7 GHz, see Article S11. The use of the bands 17.3-18.1 GHz (Earth-to-space) in Regions 1 and 3 and 17.8-18.1 GHz (Earth-to-space) in Region 2 by non-geostationary-satellite systems in the fixed-satellite service is subject to the application of the provisions of Resolution 538 (WRC 97) No. S9.12 for coordination between non-geostationary-satellite systems in the fixed-satellite service. Non-geostationary-satellite systems in the fixed-satellite service shall not claim protection from geostationary-satellite networks in the fixed-satellite service operating in accordance with the Radio Regulations.

Reasons: As a result of changes to Resolutions 130 and 538, these modifications to footnotes contained in Article S5 will be needed, including the incorporation of the appropriate *resolves* from these Resolutions.

- Option 1B** **Example modifications to footnotes to reflect possible modifications to Resolution 130 (WRC-97) and Resolution 538 (WRC-97) that include suppression of *resolves* 6 and transfer of *resolves* 8 from Resolution 130 (WRC-97) and *resolves* 1.7 from Resolution 538 (WRC-97)**
- MOD S5.441** The use of the bands 4 500-4 800 MHz (space-to-Earth), 6 725-7 025 MHz (Earth-to-space) by the fixed-satellite service shall be in accordance with the provisions of Appendix S30B. The use of the bands 10.7-10.95 GHz (space-to-Earth), 11.2-11.45 GHz (space-to-Earth) and 12.75-13.25 GHz (Earth-to-space) by geostationary-satellite systems in the fixed-satellite service shall be in accordance with the provisions of Appendix S30B. The use of the bands 10.7-10.95 GHz (space-to-Earth), 11.2-11.45 GHz (space-to-Earth) and 12.75-13.25 GHz (Earth-to-space) by non-geostationary-satellite systems in the fixed-satellite service ~~shall be in accordance with the provisions of Resolution 130 (WRC-97)~~ is subject to the application of the provisions of No. S9.12 for the coordination with other non-geostationary-satellite systems in the fixed-satellite service. The provisions of Resolution 130 (WRC-2000) apply.
- MOD S5.484A** The use of the bands 10.95-11.2 GHz (space-to-Earth), 11.45-11.7 GHz (space-to-Earth), 11.7-12.2 GHz (space-to-Earth) in Region 2, 12.2-12.75 GHz (space-to-Earth) in Region 3, 12.5-12.75 GHz (space-to-Earth) in Region 1, 13.75-14.5 GHz (Earth-to-space), 17.8-18.6 GHz (space-to-Earth), 19.7-20.2 GHz (space-to-Earth), 27.5-28.6 GHz (Earth-to-space), 29.5-30 GHz (Earth-to-space) by non-geostationary ~~and geostationary~~ satellite systems in the fixed-satellite service is subject to application of the provisions of Resolution 130 (WRC-97). The use of the band 17.8-18.1 GHz (space to Earth) by non-geostationary fixed-satellite service systems is also subject to the provisions of Resolution 538 (WRC-97) No. S9.12 for the coordination with other non-geostationary-satellite systems in the fixed-satellite service. The provisions of Resolutions 130 (WRC-2000) and 538 (WRC-2000) apply.
- MOD S5.487A** *Additional allocation:* in Region 1, the band 11.7-12.5 GHz, in Region 2, the band 12.2-12.7 GHz and, in Region 3, the band 11.7-12.2 GHz, are also allocated to the fixed-satellite service (space-to-Earth) on a primary basis, limited to non-geostationary systems and subject to the application of the provisions of ~~of Resolution 538 (WRC-97)~~ No. S9.12 for the coordination with other non-geostationary-satellite systems in the fixed-satellite service. The provisions of Resolution 538 (WRC-2000) apply.
- MOD S5.516** The use of the band 17.3-18.1 GHz by geostationary-satellite systems in the fixed-satellite service (Earth-to-space) is limited to feeder links for the broadcasting-satellite service. For the use of the band 17.3-17.8 GHz in Region 2 by feeder links for the broadcasting-satellite service in the band 12.2-12.7 GHz, see Article S11. The use of the bands 17.3-18.1 GHz (Earth-to-space) in Regions 1 and 3 and 17.8-18.1 GHz (Earth-to-space) in Region 2 by non-geostationary-satellite systems in the fixed-satellite service is subject to the application of the provisions of Resolution 538 (WRC-97) No. S9.12 for the coordination with other non-geostationary-satellite systems in the fixed-satellite service. The provisions of Resolution 538 (WRC-2000) apply.

2 Example modifications to footnotes S5.488 and S5.491 to reflect relevant RRB Rule of Procedure

2.1 Limitations concerning subregional systems contained in S5.488 and S5.491

It was noted that footnotes **S5.488** and **S5.491** currently restrict the use by FSS (space-to-Earth) of certain bands in the 12 GHz range to national and subregional systems. In 1998, the Radio Regulations Board adopted a Rule of Procedure on subregional systems, which states that "In the case where a service area covers a territory under the jurisdiction of other administrations, it shall be limited to the territories of the administrations concerned and it shall be notified by one of the participating administrations on behalf of other administrations."

These limitations lead to significant burden to the administrations and the Bureau, and unnecessary constraints on the development of GSO and non-GSO FSS systems, without clear advantage since those administrations associated with the sub-regional system keep the same rights as those which do not associate.

2.2 Application of these footnotes to non-GSO FSS systems

Concerning the application of these two footnotes to non-GSO FSS systems, a Rule of Procedure was adopted by the RRB in April 1998. The Board considered that these provisions should be waived in the case of non-GSO FSS systems in order to align them with the decisions of WRC-97 allowing the development of such systems in these bands.

Concerning the need specified by **S5.488** for previous agreement from administrations which services may be affected, the limitations introduced by WRC-97 in Articles **S21** and **S22** are intended to preclude that such services be affected. Therefore, this restriction does not appear to be applicable to non-GSO FSS systems.

2.3 Possible options

The possible options available with respect to footnotes **S5.488** and **S5.491** are therefore the following:

Option 2A – NOC

Under this option, footnotes **S5.488** and **S5.491** would be maintained unchanged. This would maintain significant burden to the administrations and the Bureau, and unnecessary constraints on the development of global, regional and subregional GSO and non-GSO FSS systems in Regions 2 and 3, without clear advantage. Some administrations considered that there would be a national regulatory risk in changing these provisions.

Option 2B – Exemption of non-GSO FSS systems from the scope of S5.488 and S5.491

Under this option, **S5.488** and **S5.491** may be amended as provided in the example below so as to align the regulatory situation with the Rule of Procedure adopted by the RRB in April 1998 with respect to non-GSO FSS systems. This would allow non-GSO FSS systems, which are by essence global systems, to avoid the constraints resulting from these two footnotes and would align these provisions with the decisions of WRC-97 allowing the development of such systems in these bands.

S5.488 The use of the bands 11.7-12.2 GHz by geostationary-satellite networks in the fixed-satellite service in Region 2 and 12.2-12.7 GHz by the broadcasting-satellite service in Region 2 is limited to national and subregional systems. The use of the band 11.7-12.2 GHz by geostationary-satellite networks in the fixed-satellite service in Region 2 is subject to previous agreement between the administrations concerned and those having services, operating or planned to operate in accordance with the Table, which may be affected (see Articles S9 and S11). For the use of the band 12.2-12.7 GHz by the broadcasting-satellite service in Region 2, see Appendix S30.

S5.491 *Additional allocation:* in Region 3, the band 12.2-12.5 GHz is also allocated to the fixed-satellite (space-to-Earth) service on a primary basis, The use of this allocation by geostationary-satellite networks is limited to national and sub-regional systems. The power flux-density limits in Article S21, Table S21-4 shall apply to this frequency band. The introduction of the service in relation to the broadcasting-satellite service in Region 1 shall follow the procedures specified in Article 7 of Appendix S30, with the applicable frequency band extended to cover 12.2-12.5 GHz.

Option 2C – Exemption of both GSO and non-GSO FSS systems from the scope of S5.488 and S5.491

Under this option, S5.488 and S5.491 may be amended as provided in the example below, so as to eliminate all restrictions to national and subregional systems for the FSS in the corresponding bands. Concerning the need specified by S5.488 for previous agreement from administrations which services may be affected, it is to be noted that it might also be waived for GSO FSS systems if pfd limits were to be introduced in Article S21 (see also Section xxx, PP-98) to ensure the protection of terrestrial services. This would have the advantage of avoiding any unnecessary constraints on the development of both GSO and non-GSO FSS systems in the corresponding bands in both Regions 2 and 3.

S5.488 The use of the bands ~~11.7-12.2 GHz the fixed-satellite service in Region 2 and~~ 12.2-12.7 GHz by the broadcasting-satellite service in Region 2 is limited to national and subregional systems. The use of the band 11.7-12.2 GHz by geostationary-satellite networks in the fixed-satellite service in Region 2 is subject to previous agreement between the administrations concerned and those having services, operating or planned to operate in accordance with the Table, which may be affected (see Articles S9 and S11). For the use of the band 12.2-12.7 GHz by the broadcasting-satellite service in Region 2, see Appendix S30.

S5.491 *Additional allocation:* in Region 3, the band 12.2-12.5 GHz is also allocated to the fixed-satellite (space-to-Earth) service on a primary basis, ~~limited to national and sub-regional systems.~~ The power flux-density limits in Article S21, Table S21-4 shall apply to this frequency band. The introduction of the service in relation to the broadcasting-satellite service in Region 1 shall follow the procedures specified in Article 7 of Appendix S30, with the applicable frequency band extended to cover 12.2-12.5 GHz.

3 Example modification to footnote RR No. S5.516 (in addition to modification in No. 1B above) and to footnote RR No. S5.520 if WRC-2000 decides to include limits in the frequency bands 17.3-17.8 GHz (Earth-to-space) in Region 2 and 18.1-18.4 GHz (Earth-to-space) in Regions 1, 2, and 3*

WRC-2000 may determine to impose limits in the bands 17.3-17.8 GHz (Earth-to-space) in Region 2 and 18.1-18.4 GHz (Earth-to-space) in Regions 1, 2 and 3, on the condition that the use of earth stations within non-GSO FSS systems in these bands is limited to gateway stations, in order to limit the number of such stations. This condition could be reflected from a regulatory point of view by imposing a limitation on the minimum antenna diameter (e.g. 4.5 metres). Should WRC-2000 decide to include limits in these frequency bands under this condition, there would be a need to reflect this decision in Article S5 as follows:

MOD S5.516 The use of the band 17.3-18.1 GHz by geostationary-satellite systems in the fixed-satellite service (Earth-to-space) is limited to feeder links for the broadcasting-satellite service. For the use of the band 17.3-17.8 GHz in Region 2 by feeder links for the broadcasting-satellite service in the band 12.2-12.7 GHz, see Article S11. The use of the bands 17.3-18.1 GHz (Earth-to-space) in Regions 1, 2 and 3 and ~~17.8-18.1 GHz (Earth-to-space) in Region 2~~ by non-geostationary-satellite systems in the fixed-satellite service is subject to the application of the provisions of Resolution 538 (WRC-97) No. S9.12 for the coordination with other non-geostationary-satellite systems in the fixed-satellite service. In Region 2, such use is limited to earth station antennas greater than 4.5 metres. The provisions of Resolution 538 (WRC-2000) apply.

MOD S5.520 The use of the band 18.1-18.4 GHz by geostationary-satellite systems in the fixed-satellite service (Earth-to-space) is limited to feeder links for the broadcasting-satellite service. The use of this band by non-geostationary systems in the fixed-satellite service (Earth-to-space) is limited to earth station antennas greater than 4.5 metres and is subject to the application of the provisions of S9.12 for the coordination with other non-geostationary-satellite systems in the fixed-satellite service (Earth-to-space and space-to-Earth).

4 Example modification to footnote RR No. S5.516 (in addition to modification in No. 1A above) if WRC-2000 decides to limit the 17.3-17.8 GHz (Earth-to-space) band in Region 2 to geostationary FSS operations*

If WRC-2000 determines that in Region 2 the band 17.3-17.8 GHz should continue to be limited to geostationary FSS operations, then the following is an example of a possible additional modification to No. S5.516. This modification encompasses the modification to No. S5.516 in No. 1A above.

* Refer to sections 3.2.2 and 3.2.3 for discussion concerning these bands.

MOD S5.516

The use of the band 17.3-18.1 GHz by geostationary-satellite systems in the fixed-satellite service (Earth-to-space) is limited to feeder links for the broadcasting-satellite service. For the use of the band 17.3-17.8 GHz in Region 2 by feeder links for the broadcasting-satellite service in the band 12.2-12.7 GHz, see Article S11. The use of the bands 17.3-18.1 GHz (Earth-to-space) in Regions 1 and 3 and 17.8-18.1 GHz (Earth-to-space) in Region 2 by non-geostationary-satellite systems in the fixed-satellite service is subject to the application of the provisions of Resolution 538 (WRC-97) No. S9.12 for coordination between non-geostationary-satellite systems in the fixed-satellite service. Non-geostationary-satellite systems in the fixed-satellite service shall not claim protection from geostationary-satellite networks in the fixed-satellite service operating in accordance with the Radio Regulations. The use of the band 17.3-17.8 GHz in Region 2 by systems in the fixed-satellite service (Earth-to-space) is limited to geostationary-satellites.

5 Example modification to footnote RR No. S5.520 if WRC-2000 determines that the 18.1-18.4 GHz (Earth-to-space) band in Regions 1, 2, and 3 should be limited to geostationary FSS operations

If WRC-2000 determines that the band 18.1-18.4 GHz should be limited to geostationary FSS operations in the Earth-to-space direction in Regions 1, 2, and 3, then the following is an example of a possible modification to RR No. S5.520.

MOD S5.520

The use of the band 18.1-18.4 GHz by the fixed-satellite service (Earth-to-space) is limited to feeder links for the broadcasting-satellite service using the geostationary-satellite orbit.

ANNEX 47 TO CHAPTER 3

Examples of possible modifications to Section VI of Article S22

Three options were identified for how the off-axis e.i.r.p. issue should be considered. The following text includes examples of possible modifications to Section VI of Article S22 for each of these options. In case of option 2 the example is intended for GSO FSS earth stations, recognizing that the current provisions of Section VI of Article S22 are suspended until the review of these limits by WRC-2000 (RR S22.VI.1)¹¹.

¹¹ S22.VI.1 The provisions of this section are suspended pending the review of the values in Nos. S22.26, S22.27 and S22.28 by WRC-992000.

Option 1

Suppress the current Section VI of Article S22 of the Radio Regulations. Thus no FSS earth station off-axis e.i.r.p. limitations would be included in the Radio Regulations.

SUPPRESS current Section VI of Article S22.

Option 2

Example of off-axis e.i.r.p. limits in Section VI of Article S22 for GSO FSS earth stations in some Earth-to-space frequency bands 12.75-13.25 GHz, 13.75-14 GHz, 14-14.5 GHz and 29.5-30 GHz.

It is noted that the current Section VI of Article S22 is not restricted to GSO FSS earth stations. Further studies are required to the applicability of values in Section VI to non-GSO FSS earth stations (see § 3.1.2.2.6).

REPLACE current Section VI of Article S22 by the following text.

**Section VI – GSO Earth station off-axis power limitations in
the fixed-satellite service¹¹**

MOD S22.26 § 9 The level of equivalent isotropically radiated power (e.i.r.p.) emitted by an earth station within a geostationary-satellite network shall not exceed the following values for any off-axis angle ϕ which is ~~2.53~~²° or more off the main-lobe axis of an earth station antenna:

Off-axis angle	Maximum e.i.r.p. density
2.53 ² ° $\leq \phi \leq 7^\circ$	(3942 -25 log ϕ) dB(W/40 kHz)
7° $< \phi \leq 9.2^\circ$	1821 dB(W/40 kHz)
9.2° $< \phi \leq 48^\circ$	(425 -25 log ϕ) dB(W/40 kHz)
48° $< \phi \leq 180^\circ$	03 dB(W/40 kHz)

MOD S22.27 For FM-TV emissions with energy dispersal, the limits in No. S22.26 above may be exceeded by up to 3 dB provided that the off-axis total e.i.r.p. of the transmitted FM-TV carrier does not exceed the following values:

Off-axis angle	Maximum e.i.r.p.
2.53 ² ° $\leq \phi \leq 7^\circ$	(5356 -25 log ϕ) dBW
7° $< \phi \leq 9.2^\circ$	3235 dBW
9.2° $< \phi \leq 48^\circ$	(5659 -25 log ϕ) dBW
48° $< \phi \leq 180^\circ$	1417 dBW

MOD S22.28 FM-TV carriers which operate without energy dispersal should be modulated at all times with programme material or appropriate test patterns. In this case, the off-axis total e.i.r.p. of the emitted FM-TV carrier shall not exceed the following values:

Off-axis angle	Maximum e.i.r.p.
2.53 ² ° $\leq \phi \leq 7^\circ$	(5356 -25 log ϕ) dBW
7° $< \phi \leq 9.2^\circ$	3235 dBW

$9.2^\circ < \varphi \leq 48^\circ$ (5659-25 log φ) dBW

$48^\circ < \varphi \leq 180^\circ$ 1417 dBW

- NOC S22.29** The e.i.r.p. limits given in Nos. **S22.26**, **S22.27** and **S22.28** are applicable in the following frequency bands allocated to the fixed-satellite service (Earth-to-space):
- 12.75-13.25 GHz
13.75-14 GHz
14-14.5 GHz.
- ADD S22.30** The e.i.r.p. limits given in Nos. **S22.26**, **S22.27** and **S22.28** do not apply to earth station antennas ready to be in service¹² prior to 2 June 2000 nor to earth stations associated with a satellite network in the fixed-satellite service for which complete coordination or notification information has been received before 2 June 2000.
- ADD S22.30.1**¹² "Ready to be in service" relates to the case where antennas have been installed but the start of service has been delayed due to *force majeure*.
- ADD S22.31** Telecommand and ranging carriers transmitted to geostationary satellites in the fixed-satellite service in normal mode of operation (i.e. earth station transmitting telecommand and ranging carriers to a directive receiving antenna on the space station) may exceed the levels given in **S22.26** by no more than 16 dB in the frequency bands 12.75-13.25 and 13.75-14.5 GHz. In all other modes of operation, and in case of *force majeure*, telecommand and ranging carriers transmitted to geostationary satellites in the fixed-satellite service are exempted from the levels given in **S22.26**.
- ADD S22.32** § 10 The level of equivalent isotropically radiated power (e.i.r.p.) density emitted by an earth station within a geostationary-satellite network in the 29.5-30.0 GHz frequency band shall not exceed the following values for any off-axis angle φ which is 3° or more off the main-lobe axis of an earth station antenna:
- | Off-axis angle | Maximum e.i.r.p. density* |
|-------------------------------------|-------------------------------------|
| $3^\circ \leq \varphi \leq 7^\circ$ | (28-25 log φ) dB(W/40 kHz) |
| $7^\circ < \varphi \leq 9.2^\circ$ | 7 dB(W/40 kHz) |
| $9.2 < \varphi \leq 48^\circ$ | (31-25 log φ) dB(W/40 kHz) |
| $48^\circ < \varphi \leq 180^\circ$ | 1 dB(W/40 kHz) |
- ADD S22.33** The e.i.r.p. limits given in **S22.32** do not apply to earth station antennas ready to be in service prior to [XXXX] nor to earth stations associated with satellite networks in the fixed-satellite service which have been brought into use before 2 June 2000.

* The above values are 6 dB higher than the corresponding values in Recommendation ITU-R S.524-5 (Doc. 4/66).

- ADD S22.34** Telecommand and ranging*** carriers transmitted to geostationary satellites in the fixed-satellite service in normal mode of operation (i.e. earth station transmitting telecommand and ranging carriers to a directive receiving antenna on the space station) may exceed the levels given in S22.32 by no more than 10 dB** in the frequency band 29.5-30.0 GHz.
- In all other modes of operation, and in case of *force majeure*, telecommand and ranging carriers transmitted to geostationary satellites in the fixed-satellite service are exempted from the levels given in S22.32.
- ADD S22.35** For GSO systems in which the earth stations are expected to transmit simultaneously in the same 40 kHz band, e.g. for the GSO systems employing CDMA, the maximum e.i.r.p., values in S22.32 should be decreased by $10 \cdot \log(N)$ dB, where N is the number of earth stations which are in the receive satellite beam of the satellite to which these earth stations are communicating and which are expected to transmit simultaneously on the same frequency.
- ADD S22.36** Earth stations operating in the 29.5-30 GHz frequency band should be designed in such a manner that 90% of their peak off-axis e.i.r.p. density levels do not exceed the values given in S22.32. Further study is needed to determine the off-axis angular range over which these exceedances would be permitted, taking into account the interference level into adjacent satellites. The statistical processing of the off-axis e.i.r.p. density peaks should be dealt with using the method given in Recommendation ITU-R S.732.
- ADD S22.37** The values given in S22.32 are maximal values under clear-sky conditions. In case of systems employing uplink power control, these levels include any additional margins above the minimum clear-sky level necessary for the implementation of uplink power control. During rain faded conditions, the levels in S22.32 may be exceeded by earth stations when implementing uplink power control.
- ADD S22.38** FSS earth stations operating in the 29.5-30 GHz band, which have lower elevation angles to the GSO will require higher e.i.r.p. levels relative to the same terminals at higher elevation angles to achieve the same power flux-densities at the GSO due to the combined effect of increased distance and atmospheric absorption. Earth stations with low elevation angles may exceed the levels given in S22.32 by the following amount:
- | Elevation angle to GSO (ϵ) | Increase in e.i.r.p. density (dB). |
|---------------------------------------|------------------------------------|
| $\epsilon \leq 5^\circ$ | 2.5 |
| $5 < \epsilon \leq 30^\circ$ | $0.1(25 - \epsilon) + 0.5$ |
- ADD S22.39** The values in S22.32 applicable to the off-axis angle range from 48° to 180° is intended to account for spillover effects.

*** Measurement of the distance to the satellite.

** Further studies are required to confirm the value of 10 dB.

Option 3

Example of incorporation by reference of an ITU-R Recommendation, when available, to specify off-axis e.i.r.p. limits in Section VI of Article S22 for FSS earth stations in some Earth-to-space frequency bands that are specified in Resolution 130.

SUPPRESS Section VI of Article S22.

MOD S22.26 § 9 The level of equivalent isotropically radiated power (e.i.r.p.) emitted by an earth station shall not exceed the following values for any off-axis angle ϕ which is 2.5° or more off the main-lobe axis of an earth station antenna: included in an appropriate Recommendation.

ANNEX 8 TO CHAPTER 3

1 Example procedure for assuring compliance with aggregate EPFD limits

When an administration operating a GSO network in accordance with the Radio Regulations identifies EPFD levels from non-GSO systems in excess of the "aggregate" limits given in Annex 1 of Resolution WWW:

- a) The affected administration shall immediately send a letter, by fax or other mutually agreed electronic means, to the administrations concerned and request immediate corrective action. It shall provide the necessary evidence identifying the excess interference and the source of such interference. A copy of the request shall be sent to the BR.
- b) Upon receipt of the request, the interfering administrations shall acknowledge receipt within [X] days and immediately reduce emissions, equitably, to the required levels pending final determination of solutions to the problem. A copy of the acknowledgement and confirmation of the action taken shall be sent to the BR.
- c) The non-GSO parties concerned work together thereafter in order to find a permanent solution to the problem, within an additional [30] days.
- d) If after [30] days a solution cannot be found, then any of the parties may request the assistance of the BR.
- e) The BR will study the matter and report its conclusion to the parties involved, recommending its solution to the problem within an additional [30] days. The affected administration may elect to accept the higher level of interference received.
- f) If an interfering administration fails to respond within the [X]-day period in Step 3, the affected administration shall send a reminder fax requesting response within an additional [X] days.
- g) If any administration fails to respond within that period, the affected administration may request the assistance of the Bureau, who will promptly send a fax to the concerned administrations.
- h) See 3.1.6.1 for the case the administration fails to respond to the BR's request for cooperation.

2 Example procedure for assuring compliance with operational limits

When an administration operating a GSO network in accordance with the Radio Regulations identifies EPFD levels from non-GSO systems in excess of the "operational limit" given in Table S22-4, as determined by the use of ITU-R agreed measurement techniques or until such ITU-R agreed measurement techniques are available by use of the actual earth station monitoring capability:

- a) That administration first attempts to identify the source of the excess EPFD.
- b) If the source of the excess EPFD is readily identifiable, the administration may proceed to Step 8 below.
- c) In case, after Step 1, an administration is unable to determine the source of interference, it shall send a request for cooperation to all administrations responsible for non-GSO systems using over-lapping frequency bands, providing all relevant details. A copy of the request shall be sent to the BR.
- d) The requested administrations shall acknowledge receipt immediately and dispatch to the requesting administration within [y] days, with a copy to the BR, the information which may be used to identify the source of the problem.
- e) If an administration fails to respond within [y] days, the affected administration shall follow up with a reminder by fax with a request for response within an additional [y] days.
- f) If the administration still fails to respond, the affected administration may request the assistance of the BR, in which case the BR shall immediately send a fax to the administration responsible for the non-GSO system, requesting action within an additional [z] days.
- g) See 3.1.6.2 for the case where the administration fails to respond to the BR's request for information.
- h) Once the sources of the excess EPFD are identified, the affected administration sends a letter, by fax or other mutually agreed electronic means, to the administrations concerned and requests immediate corrective action. It shall provide the necessary evidence identifying the amount of excess interference and the source of such interference. A copy of the request shall be sent to the BR.
- i) Upon receipt of the request, the interfering administration shall immediately reduce emissions to the required levels pending final determination of solutions to the problem and, within [y] days, so advise the administration whose network is affected. A copy of the acknowledgement and confirmation of the action taken shall be sent to the BR.
- j) See comments in 3.1.6.2 on the possibility of arriving at an alternative solution.
- k) The BR will study the matter within an additional [30] days, and report its conclusion to the parties involved, recommending its solution to the problem.

ANNEX 9 TO CHAPTER 3

Additional data items required in Appendix S4 for the EPFD calculations**1 Section A.4b****ADD**

In addition, if the stations operate in a frequency band subject to the provisions of Resolution 130 (WRC-97) or Resolution 538 (WRC-97):

- 6) new data elements required to characterize properly the orbital operation of the non-GSO satellite systems:
 - a) for each range of latitudes provide:
 - the maximum number of non-GSO satellites operating their downlinks co-frequency to any location; and
 - the associated latitude range;
 - b) the minimum height of the space station above the surface of the Earth at which any satellite will be used to provide a service;
 - c) where the space station uses station keeping to maintain a repeating ground track, the time in seconds that it takes for the constellation to return to its starting position, i.e. such that all satellites are in the same location with respect to the Earth and each other;
 - d) an indicator identifying if the space station should be modelled with a specific precession rate of the ascending node of the orbit instead of the J_2 term;
 - e) for a space station that is to be modelled with a specific precession rate of the ascending node of the orbit instead of the J_2 term, the precession rate in degrees/day, measured counter-clockwise in the equatorial plane;
 - f) the longitude of the ascending node for the j -th orbital plane, measured counter-clockwise in the equatorial plane from Greenwich meridian to the point where the satellite makes its south-to-north crossing of the equatorial plane ($0^\circ \leq \Omega_j < 360^\circ$) (NOTE 1);
 - g) the time at which the satellite is at the location defined by Ω_j (NOTE 1);
 - h) the longitudinal tolerance of the longitude of the ascending node.

NOTE 1 - Currently non-GSO space stations are referenced by the "right ascension of ascending node" (A.4b5 Ω_j) to the first point of Aries. However, for the evaluation of EPFD a reference to a point on the Earth is used and hence the "longitude of the ascending node" is required.

2 Section A.4b

- ADD**
- 7) new data elements required to characterize properly the performance of the non-GSO satellite systems:
- a) the maximum number of non-GSO satellites receiving simultaneously [co-frequency] from the associated earth stations within a given cell;
 - b) the average number of associated earth stations operating co-frequency per square kilometre within a cell;
 - c) the average distance between co-frequency cells;
 - d) for the exclusion zone about the geostationary orbit provide:
 - the type of zone;
 - the width of the zone in degrees.

3 Section A.14**ADD A.14 Spectrum masks**

For stations operating in a frequency band subject to the provisions of Resolution 130 (WRC-97) or Resolution 538 (WRC-97):

- a) for each e.i.r.p. mask used by the non-GSO space station provide:
 - the type of mask;
 - the mask identification code;
 - the mask pattern defined in terms of the power in the reference bandwidth for a series of off-axis angles with respect to a specified reference point;
 - the lowest frequency for which the mask is valid;
 - the highest frequency for which the mask is valid;
- b) additionally for each associated earth station e.i.r.p. mask provide:
 - the minimum elevation angle at which any associated earth station can transmit to a non-GSO satellite;
 - the minimum separation angle between the GSO arc and the associated earth station beam-axis at which the associated earth station can transmit towards a non-GSO satellite;
- c) for each pfd mask used by the non-GSO space station provide:
 - the mask identification code;
 - the mask pattern of the power flux-density defined in three dimensions;
 - the lowest frequency for which the mask is valid;
 - the highest frequency for which the mask is valid.

4 Section C.9

ADD

- d)* For stations operating in a frequency band subject to the provisions of Resolution 130 (WRC-97) or Resolution 538 (WRC-97), provide:
- the type of mask;
 - the mask identification code.