



*Radiocommunication Bureau*

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Circular Letter  
CCRR/25

24 September 2004

## To Administrations of Member States of the ITU

**Subject:** Draft Rules of Procedure

### To the Director General

Dear Madam/Sir,

Please find enclosed proposals for suppression or modification of some current Rules of Procedure. The majority of these proposals are related to decisions of WRC-03. These proposals are presented in 4 Annexes as follows:

- Annex 1:** Modification of the Rule of Procedure relating to No. **9.27** of Article **9** of the Radio Regulations;
- Annex 2:** Modification of the Rule of Procedure relating to No. **11.31** of Article **11** of the Radio Regulations;
- Annex 3:** Modification of the Rule of Procedure (Part **B**, Section **B3**) relating to the calculation of probability of harmful interference between space networks (C/I ratios).
- Annex 4:** Modification of the Rule of Procedure relating to No. **11.32** of Article **11** of the Radio Regulations and suppression of the Rule of Procedure relating to No. **5.392** of Article **5** of the Radio Regulations.

In accordance with No. **13.17** of the Radio Regulations, these proposals are made available to administrations for comment before being submitted to the RRB pursuant to No. **13.14**.

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To enable the Radiocommunication Bureau to prepare, translate and post on the ITU website the consolidated submission to the RRB in time for the 35<sup>th</sup> Meeting, scheduled for 6-10 December 2004, any comments that you may wish to submit should reach the Bureau no later than **15 November 2004**. All e-mail comments should be sent to: [brmail@itu.int](mailto:brmail@itu.int).

Yours faithfully,

V. Timofeev  
Director, Radiocommunication Bureau

**Annexes: 4**

Distribution:

- Administrations of Member States of the ITU
- Members of the Radio Regulations Board
- Director and Heads of Department of the Radiocommunication Bureau

ANNEX 1

**Rules concerning**

**ARTICLE 9 of the RR**

**Coordination of frequency assignments (Article 9, Section II)**

**9.27**

**1 Frequency assignments to be taken into account in the coordination procedure**

Frequency assignments to be taken into account in the coordination procedure are mentioned in § 1 to 5 of Appendix 5 (see also Rules of Procedure concerning No. 9.36 and Appendix 5).

1.1 ~~As stated under the Rules of Procedure concerning No. 9.1~~ The period between the date of receipt by the Bureau of relevant information under Nos. 9.1 and or 9.2 for a satellite network and the date of bringing into use of the assignments of the satellite network in question shall in no circumstance exceed ~~five~~ seven years as referred to in No. ~~11.44~~ 9.1 ~~plus any extension up to two years granted according to the procedure of Nos. 11.44B to 11.44H.~~ Consequently, frequency assignments not complying with these time limits will no longer be taken into account under the provisions of No. 9.27 and Appendix 5. (See also Nos. ~~9.1, 9.2, 11.43A, 11.44, 11.48~~ and Resolution 49 (~~WRC-97/Rev.WRC-032000~~), as applicable) and Resolution 57 (WRC-2000)).

**2 Modification of characteristics of a satellite network during coordination**

2.1 After an administration informs the Bureau of a modification of characteristics of its network, it is essential to establish its proper coordination requirements with respect to other administrations, i.e. with which administration(s), and for which of their network(s), the modified part of the network needs to effect coordination before it can be notified for recording.

2.2 The guiding principles for dealing with modifications are:

- general obligation to effect coordination before notification (No. 9.6), and
- the fact that coordination is not required when the nature of the change is such as not to increase the interference to or from, as the case may be, the assignments of another administration, as specified in Appendix 5.

2.3 Based on these principles, and provided that the appropriate coordination trigger limit is exceeded, the modified part of the network will need to effect coordination with respect to space networks that are to be taken into account for coordination:

- a) with ~~dates of receipt (2D-DateR)\*~~ before the original ~~date of submission~~ 2D-Date (D1) of the subject network; and

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\* The 2D-Date is the date from which an assignment is taken into account as defined in §1.e of Appendix 5 of the Radio Regulations.

b) with ~~2D-Date~~ date of receipt after the original date of submission (D1) of the modified network but before the date of receipt\*\* of the modification (D2), where the nature of the change is such as to increase the interference to or from, as the case may be, the assignments of those networks which were received in the period between D1 and D2. In case of GSO networks referred to in No. 9.7 including those to which the coordination arc approach (frequency bands 1), 2), ~~3), 4)~~ and ~~35)~~ of No. 9.7 of Table 5-1 of Appendix 5) have been applied, the increase of interference will be measured in terms of  $\Delta T/T$ .

2.3.1 Where the coordination requirements of the modification involve any network under b) above, the modified assignments will have as their ~~2D-Date (DR)~~ the date of receipt ~~submission~~ of the modification (i.e. ~~DR = D2~~). Otherwise, they will retain their original ~~date of receipt~~ 2D-Date (DR) (i.e. ~~DR = D1~~).

2.3.2 In case of successive modifications of the same part of the network, if the next modification (compared with the previous modification) does not increase the interference to or from a particular network not included in the coordination requirements under b) above, that particular network will not be included in the coordination requirements of that next modification.

2.3.3 If it is not possible to verify that there is no increase of interference (e.g. in the absence of appropriate criteria or calculation methods), the ~~date of receipt~~ 2D-Date (DR) ~~date~~ of the modified assignments will be same as their date of receipt (i.e. D2).

2.4 After having examined the modified network as described in § 2.3 above, the Bureau shall publish the modification, including its coordination requirements, in the appropriate Special Section for comments by administrations within the usual 4-month period. Initial characteristics are thus replaced by the published modified characteristics, and only the latter will be taken into account in subsequent applications of No. 9.36.

## NOC

### 3 Modification to characteristics of an earth station

#### Reasons:

- *WRC-03 decisions to modify Nos. 9.1 and 11.44 and Appendix 5 and to suppress Nos. 11.44B to 11.44I.*
- *To more precise use of the terms “date of receipt” and “2D-Date”, the latter representing the date from which an assignment is to be taken into account in accordance with Appendix 5.*

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\*\* Concerning the date of receipt, see the Rule of Procedure on Receivability.

ANNEX 2

**Rules concerning**

**ARTICLE 11 of the RR**

**MOD**

**11.31**

1 Provision No. 11.31.2 requires that the “other provisions” mentioned in No. 11.31 should be identified and included in the Rules of Procedure. This chapter intends to answer the above problem.

The regulatory examination under No. 11.31 includes the following<sup>6</sup>:

- conformity with the Table of Frequency Allocations, including its footnotes and any Resolution or Recommendation which is referred to in such a footnote;
- the successful application of No. 9.21, when mention is made of that provision in a footnote (see also Rules of Procedure relating to Nos. 9.21; ~~11.31.1~~ and 11.37);
- all “other” mandatory provisions that are contained in Articles 21 to 57, in Appendices to the Radio Regulations and/or in Resolutions (~~except Resolution 49 (Rev.WRC-2000) for which there is a separate procedure as contained in the Rules of Procedure concerning No. 11.44~~) that are relevant to the service in the frequency band in which a station of that service operates.

**NOC §§2, 2.1 and 2.2**

2.3 *Aeronautical mobile service:* There are mandatory provisions only for the frequency bands that are allocated exclusively to the aeronautical mobile service. These provisions (obligatory channelling arrangement, permitted classes of emission, power limits) are contained in Appendices 26 and 27. The provisions of No. 43.4 also falls into this category of mandatory regulatory provisions, i.e. the prohibition of using the exclusive frequency allocations to the aeronautical mobile service for any kind of public correspondence.

2.4 *Maritime mobile service:* Most of them are related to the frequency bands that are allocated exclusively to the maritime mobile service (obligatory channelling arrangements, permitted classes of emission, power limits, etc.); however many of them are also applicable to the non-exclusive allocations to the maritime mobile service. A summary of the provisions that are applicable to the frequency assignments subject to notification is given in the Table below:

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<sup>6</sup> With respect to the application of this provision to assignments of the BSS submitted under Resolution 33 (Rev.WRC-97) see comments under Rules of Procedure concerning No. 23.13.

	Provision No.
Power limits	52.56, 52.104 52.117, 52.127 (Region 1 only), 52.143, 52.144, 52.172 52.184-52.186, 52.188, 52.202 <del>0</del> (Region 1 only) 52.219, 52.220, 52.227
Class of emission	52.2, 52.3, 52.17, 52.37 52.55, <del>52.98</del> , 52.101, 52.177, 52.183, 52.188, 52.198, 52.217
Mandatory sub-division	52.10 (Region 1 only), 52.13, 52.39 and 52.40 Appendix 17

## NOC §§2.5, 2.5.1, 2.5.2 and 2.6

2.6.1 conformity with the power limits for earth stations as stipulated in provisions Nos. 21.8, 21.10 and 21.12, 21.13, 21.13A account being taken of Nos. 21.9 and 21.11<sup>8</sup>, and in provisions 22.26 to 22.28 or 22.32 (as appropriate) under the conditions specified in 22.30, 22.31 and 22.34 to 22.39, where the earth stations are subject to those power limitations (see also § A.16 of Appendix 4);

### NOC §2.6.2

2.6.3 conformity with the limits of power flux-density from space stations produced at the Earth's surface as indicated in the Table 21-4 (No. 21.16), as well as with the (epfd<sub>↓</sub>) limits in Tables 22-1A to ~~22-1DE~~ (No. 22.5C), taking into account, as appropriate, the provisions of Nos. 21.17 and 22.5CA;

### NOC §2.6.4

2.6.5 conformity with limit of equivalent power flux-density (epfd<sub>↓</sub>) from earth stations produced at the GSO (epfd<sub>↑</sub>) as indicated in the Table 22-2 (No. 22.5D);

### NOC 2.6.6, 3

## 4 (Number not used)

## NOC §5

6 The No. 11.31 examination relative to the successful application of No. 9.21 shall be made on the basis of the information on the status of the coordination agreement available to the Bureau in the Form of Notice (~~see Rules of Procedure relating to No. 11.31.1~~).

## NOC §7

**Reasons:** Although WRC-03 did not modify No. 11.31 itself, it introduced modification to other provisions which necessitated the review of this Rule of procedure. This revision also corrects some typographical errors that existed in the currently published version of this RoP. Specifically, the following additional information is provided:

1) With respect to the changes in §1 of the Rule: these are consequential changes due to the fact that the RoP on 11.31.1 has been deleted;

<sup>8</sup> See Rules of Procedure relating to No. 21.11.

- 2) *With respect to the changes in §2.4 of the Rule: the suppression of the reference to 52.98 is due to the fact that provision No. 52.98 was suppressed by WRC-03; the modification of the reference 52.200 to 52.202 is an editorial correction;*
- 3) *With respect to the changes in 2.6.1 of the Rule: reference to the new provision 21.13A as adopted by WRC-2003.*
- 4) *With respect to the changes in 2.6.3 of the Rule: reference to the new Table 22-11E as adopted by WRC-2003.*
- 5) *With respect to the changes in 2.6.5 of the Rule: an editorial correction.*
- 6) *With respect to the changes in §6 of the Rule: editorial reformulation due to the fact that the referenced RoP on 11.31.1 has been deleted.*

ANNEX 3

**PART B**

**SECTION B3**

**Rules concerning calculation methodology for calculation of probability  
of harmful interference between space networks (C/I ratios)**

*Reasons for modifying the Rules:*

- *Processing of satellite network filings under provision No. 11.32A of Radio Regulations requires the assessment of probability of harmful interference between frequency assignments of satellite networks. This assessment is done by performing Carrier-to-Interference (C/I) calculation in accordance with the Rule of Section B3 of the Rules of Procedure, and is quite demanding in terms of resources and time.*
- *For efficient processing under No. 11.32A, a high level of automation is needed. To cover all possible combinations of the wanted and interfering signals and have meaningful and usable output results, some additional definitions and assumptions are required as described and explained below in this proposed revision of these Rules.*

**1 Introduction**

In application of the provisions of No. 11.32A when, as a consequence of continuing disagreement (Nos. 9.63 to 9.65) between two (or a limited number of) administrations, the notifying administration requests the Radiocommunication Bureau, an examination of the probability of harmful interference under No. 11.32A is carried out. For the calculation method and criteria to be used for the interference assessment as well as the Findings to be formulated with respect to coordination of their networks under No. 9.7, the Bureau shall proceed as follows.

**2 Probability of harmful interference**

The Bureau, in performing its mandatory tasks relating to the application of the above-mentioned provisions, shall proceed as follows:

2.1 Recommendation ITU-R S.741-2, shall be used to examine the subject assignments with respect to the provisions of No. 11.32A.

2.2 The Bureau shall ~~use request the administrations concerned to provide~~ the mutually agreed criteria provided by the administrations concerned for accepted interference in the format appearing in Table 2 of Recommendation ITU-R S.741-2, or, in the absence of such information, the Bureau shall use the single entry limits defined in Table 2 of § 3.2 below, which is derived from Table 2 of Recommendation ITU-R S.741-2, together with the information submitted in accordance with Appendix 4.

*Reasons:* - *Since, the above-mentioned “mutually agreed criteria” is not an element of Appendix 4, this information should only be used when it is provided.*

- *As indicated above and in § 3.2 below, Table 2 of this Rules of Procedure is a simplification of Table 2 of Recommendation ITU-R S.741-2. Table 2 of this Rules is needed in order to take into account the information submitted to the Bureau by administrations in accordance with Appendix 4 and the consequential carrier type definition in § 3.1 below.*



- 2.2.1 In the case where this information is provided by the administrations concerned:
- a) The probability of harmful interference is considered to be negligible if the *C/I* calculation shows that the applicable criteria for a particular examination between two networks concerned are satisfied. The finding in Column 13A3 shall thus be favourable.
  - b) The probability of harmful interference is considered not to be negligible, if the *C/I* calculation shows that the applicable criteria for a particular examination between two networks concerned are not satisfied. The finding in Column 13A3 shall be unfavourable.
- 2.2.2 In the case where this information is not provided by the administrations concerned:
- a) The probability of harmful interference is considered to be negligible if the interference is less than the single entry interference limits indicated in Table 2 of Recommendation ITU-R S.741-2. The finding in Column 13A3 shall be favourable.
  - b) The probability of harmful interference is considered not to be negligible, if the interference is greater than the single entry interference limits indicated in Table 2 of the above-mentioned Recommendation. The finding in Column 13A3 shall be unfavourable.

### 3 Methodology

To perform the above-mentioned compatibility analysis the following methodology will be used.

The methodology is based on Recommendation ITU-R S.741-2. A set of carrier-to-interference (*C/I*) calculations are performed following the geometrical considerations of Recommendation ITU-R S.740 and an interference adjustment factor is calculated as shown below to take into consideration the frequency offset situations as well as the difference in the bandwidths between the wanted and the interfering carriers. These *C/I* values are then compared with the required *C/I* values derived from the criteria appearing in Table 2 of § 3.2 Recommendation ITU-R S.741 shown below which contains a set of single entry interference criteria to protect different types of carriers from noise like or slowly swept interference (caused by TV-FM modulated with energy dispersal). In the case of required *C/I* values agreed by administrations and communicated to the Bureau, the calculated *C/I* values will be compared with these mutually agreed *C/I* values.

Thereafter, a set of margins *M* (*C/I* calculated – *C/I* required) are derived. It should be noted that to evaluate the *C/I* required for each test point<sup>†</sup>, a set of carrier-to-noise ratios (*C/N*) objectives are used ~~calculated~~ (performance) and a *K* value, generally of either 12.2 or 14.0 dB, is added in accordance with the above-mentioned Table 2 of § 3.2 below of Recommendation ITU-R S.741. It should also be noted that these values correspond to a maximum permissible interference of 6% or 4% of the total noise power *N* of the protected assignments (performance). The *C/N* objectives, submitted to the Bureau in accordance with Appendix 4 (Annex 2 item C.8.e.1) by the administration responsible for the satellite network under examination, will be used to assess the probability of harmful interference received by this satellite network. To assess the probability of harmful interference generated by this satellite network into other satellite networks, *C/N* objectives submitted by responsible administrations for those other networks will be used only if they are lower than the corresponding calculated *C/N* values for those networks. Otherwise, those calculated *C/N* values will be used. If no *C/N* objectives were submitted by responsible administrations (this was not required in the past) those calculated *C/N* values will be used.

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<sup>†</sup> ~~A set of a maximum of 20 test points defining the service area shall be provided by the administrations. Otherwise, the Bureau will use a set of randomly chosen test points within the service area of the satellite networks likely to be affected (including those test points already communicated).~~

*Reasons:* - *The need to provide a maximum number of 20 test-points within the service area is no longer required (see § 1 of Attachment 1 of this Rule of Procedure).*

- *It is necessary to include in the Rules of procedure the consideration of the C/N objectives now submitted by administrations in accordance with Appendix 4. Nevertheless, to deal with cases submitted before this data element became mandatory, calculated C/N values are also still necessary.*

- *For the incoming satellite network under examination, the C/N objectives submitted under Appendix 4 Annex 2 Item C.8.e.1 are used since they shall exist. Otherwise the submitted notice is incomplete and is not receivable. For cases where Submitted C/N  $\leq$  Calculated C/N, this will ensure a protection only to the level requested by the responsible Administration and not unnecessarily above it. For cases where Submitted C/N  $>$  Calculated C/N, it is up to this Administration to accept the resulting excess of interference received by its incoming network if it consider this level of protection as an unnecessary overprotection of its own network.*

- *For other satellite networks potentially affected by the incoming satellite network under examination, the use of submitted C/N objectives in all cases is not appropriate, since, when the submitted C/N objectives are higher than the corresponding calculated C/N values, this may result in a non-realistic situation of harmful interference undue for the incoming satellite network under examination. Fortunately, only a very small percentage of frequency assignments will be in this situation. It is proposed to use for those other satellite networks (potentially affected by the incoming satellite network under examination) the calculated C/N values when those values are lower than the submitted C/N objectives. As an alternative approach, considering that most of the other frequency assignments of the same network are generally not in this situation and considering that calculated C/N values are also based on practical assumptions (see § 1 of Attachment 1 of this Rule of Procedure), it might be preferable, in order to avoid unfavourable conclusions based on non-realistic situations, to simply ignore for those other satellite networks the frequency assignments having calculated C/N value lower than submitted C/N objective.*

- *For cases where no submitted C/N objectives exist, some statistics indicate that more than 10% of those cases present calculated C/N values higher than 25 dB. Therefore in order to avoid unfavourable conclusions based on those non-realistic situations, it might be necessary to introduce an upper boundary value of e.g. 25 dB (more than 96 % of the submitted C/N objectives are lower than 25 dB) to the calculated C/N value. But this might also required further technical studies.*

In respect of C/N ratio calculations, Table 2 of Recommendation ITU-R S.741-2 (see below) defines “C/N” as a “ratio (dB) of carrier to total noise power which includes all internal system noise and interference from other systems”. Therefore, and to comply with this definition, an additional margin of 0.46 dB for cases involving wanted analogue TV emissions and 1.87 dB for other wanted emissions will be added to the margins calculated on the basis of the internal system noise values provided by the concerned administrations. Attachment 2 contains the calculation methodology used for deriving the above-mentioned additional margin.

### **3.1 Interfering cases**

Table 1 below presents a summary of the different interfering situations to be dealt with when performing C/I calculations.

TABLE 1

**Interferencing cases**

<b>Desired Interfering</b>	<b>Digital</b>	<b>Analogue (TV-FM)</b>	<b>Analogue (other than TV-FM)</b>	<b>Other</b>
<b>Digital</b>	Use <i>C/I</i> plus interference adjustment factor <sup>1</sup> (I)	Use <i>C/I</i> plus interference adjustment factor <sup>1</sup> (II)	Use <i>C/I</i> plus interference adjustment factor <sup>1</sup> (III)	<u>Use <i>C/I</i> plus interference adjustment factor<sup>1</sup></u> (XI)
<b>Analogue (TV-FM)</b>	Use <i>C/I</i> plus interference adjustment factor <sup>2+</sup> (IV)	<u>Co-frequency:</u> use <i>C/I</i> plus interference adjustment factor <sup>1</sup> (X) <u>Non co-frequency:</u> use relative protection ratio mask <sup>3</sup> (Rec. ITU-R S.483) (V)	Use <i>C/I</i> plus interference adjustment factor <sup>2+</sup> (VI)	<u>Use <i>C/I</i> plus interference adjustment factor<sup>2</sup></u> (XII)
<b>Analogue (other than TV-FM)</b>	Use <i>C/I</i> plus interference adjustment factor <sup>2+</sup> (VII)	Use <i>C/I</i> plus interference adjustment factor <sup>2+</sup> (VIII)	<del>Use <i>C/I</i> plus B</del> Use <i>C/I</i> plus interference adjustment factor <sup>2</sup> (IX)	<u>Use <i>C/I</i> plus interference adjustment factor<sup>2</sup></u> (XIII)
<b>Other</b>	<u>Use <i>C/I</i> plus interference adjustment factor<sup>2</sup></u> (XIV)	<u>Use <i>C/I</i> plus interference adjustment factor<sup>2</sup></u> (XV)	<u>Use <i>C/I</i> plus interference adjustment factor<sup>2</sup></u> (XVI)	<u>Use <i>C/I</i> plus interference adjustment factor<sup>2</sup></u> (XVII)

<sup>1</sup> Interference adjustment factor for cases I, II, III, X and XI is the same (see § 2.1.1 of Attachment 1).

<sup>2+</sup> ~~S~~Interference adjustment factor for cases IV, VI to IX and XII to XVII is the same (see § 3.5 below).

<sup>3</sup> See § 3.1 of Attachment 1 below.

*Reason: Addition of interference cases not previously covered by this Rule of Procedure.*

The selection of an interference case defined in Table 1 above requires the identification of the type of each carrier. Taking into account the information submitted to the Bureau by administrations in accordance with Appendix 4 (i.e. the class of emission as defined in Annex 2 item C.7.a), the Bureau shall use the following carrier type definition:

**- Analogue (TV/FM):**

When the Class of Emission (item C.7.a of Annex 2 to Appendix 4) is defined with "F" for the first character and with "F" or "W" for the third character.

**- Analogue (other than TV/FM):**

When the first character of the Class of Emission is "F" and the third character is anything other than "F" or "W".

- **Digital:** When the first character of the Class of Emission is "G".
- **Other:** When the first character of the Class of Emission is anything other than "F" or "G".

*Reason: Explanation on how Appendix 4 information is taken into account.*

### 3.2 Margin M, C/I, C/N algorithms

The algorithms described in Attachment 1 shall be used to evaluate compliance with the mutually accepted interference criteria or with the single entry limits established in Table 2 of Recommendation ITU-R S.741.

Table 2 provided below takes into account the information submitted to the Bureau by administrations in accordance with Appendix 4 and the carrier type definition in § 3.1 above and is a simplification of Table 2 of Recommendation ITU-R S.741-2.

TABLE 2  
**Single entry interference (SEI) protection criteria**

<b>Interfering carrier type</b>  <b>Desired carrier type</b>	<b>Analogue (TV/FM) or Other</b>	<b>DIGITAL</b>	<b>Analogue (other than TV/FM)</b>
<b>Analogue (TV/FM)</b>	<u>C/N + 14 (dB)</u>		
<b>Digital</b>	<u>If <math>DeNeBd \leq InEqBd</math> then</u> <u><math>C/N + 9.4 + 3.5 \log(\delta) - 6 \log(i/10)</math> (dB)</u> <u>(i.e., <math>C/N + 5.5 + 3.5 * \log(DeNeBd \text{ in MHz})</math>)</u> <u>Otherwise if <math>DeNeBd &gt; InEqBd</math> then</u> <u>C/N + 12.2 (dB)</u>	<u>C/N + 12.2 (dB)</u>	
<b>Analogue (other than TV/FM)</b>	<u><math>13.5 + 2 \log(\delta) - 3 \log(i/10)</math> (dB)</u> <u>(i.e., <math>11.4 + 2 \log(DeNeBd \text{ in MHz})</math>)</u>	<u>C/N + 12.2 (dB)</u>	
<b>Other</b>	<u><math>13.5 + 2 \log(\delta) - 3 \log(i/10)</math> (dB)</u> <u>(i.e., <math>11.4 + 2 \log(DeNeBd \text{ in MHz})</math>)</u>	<u>C/N + 14 (dB)</u>	

Where:

C/N: ratio (dB) of carrier to total noise power which includes all internal system noise and interference from other systems

DeNeBd: Necessary bandwidth of desired carrier (Appendix 4 Annex 2 item C7a)

InEqBd: Equivalent bandwidth of interfering carrier (equal to Total Power to Power Density ratio (see Appendix 4 Annex 2 items C8a1 and C8a2 resp.))

$\delta$ : ratio of desired signal bandwidth to peak-to-peak deviation of the TV carrier caused by the energy dispersal signal (a peak-to-peak deviation of 4 MHz is used in all cases).

*i*: pre-demodulation interference power in the desired signal bandwidth expressed as a percentage of the total pre-demodulation noise power (a value of 20 is used in all cases).

Reason: See reason in § 2.2 above.

### 3.3 Single channel per carrier (SCPC) cases

When dealing with composite interference from a number of narrow-band carriers such as a transponder loaded with SCPC carriers the assumption is made, in the absence of more detailed data from administrations, that the interfering satellite has its transponder fully loaded with SCPC carriers and the individual carriers can be replaced with one wideband carrier which has a total power equal to the sum of the powers of the individual SCPC carriers. The protection ratios given in Recommendation ITU-R S.671 are used to protect SCPC transmissions interfered with by analogue television carriers only modulated with energy dispersal signals.

TABLE 2

(Recommendation ITU-R S.741)

#### Single entry interference (SEI) protection criteria for FSS carriers

FSS carrier	ITU-R Recommendations for SEI	Type of interference	Single entry (SEI) Protection criteria	
			API before 1987 <sup>+</sup>	API after 1987
FDM-FM CFDM-FM	Rec. ITU-R S.466	Any	600 pW0p	800 pW0p
TV-FM	Rec. ITU-R S.483	Noise like	$C/N + 14$ (dB)	$C/N + 14$ (dB)
Digital	Rec. ITU-R S.523	Noise like	$C/N + 14$ (dB)	$C/N + 12.2$ (dB)
SCPC-FM	<sup>2</sup>	Noise like	$C/N + 14$ (dB)	$C/N + 12.2$ (dB)
SCPC-FM	Rec. ITU-R S.671	Slowly swept	$13.5 + 2 \log(\delta)$	$3 \log(i/10)$ (dB)
Digital narrow band: — with coding	Rec. ITU-R S.671	Slowly swept	$C/N + 9.4 + 3.5 \log(\delta)$	$6 \log(i/10)$ (dB)
— without coding	Rec. ITU-R S.671	Slowly swept	$C/N + 6.4 + 3 \log(\delta)$	$8 \log(i/10)$ (dB)

API: ~~Advanced Publication of Information of networks~~

$C/N$ : ~~ratio (dB) of carrier to total noise power which includes all internal system noise and interference from other systems~~

$\delta$ : ~~ratio of desired signal bandwidth to peak to peak deviation of the TV carrier caused by the energy dispersal signal~~

*i*: ~~pre demodulation interference power in the desired signal bandwidth expressed as a percentage of the total pre-demodulation noise power~~

<sup>+</sup> ~~Not applicable.~~

<sup>2</sup> ~~The criteria for noise like interference are being used for the purposes of coordination.~~

Reason: See reason in § 2.2 above.

### 3.4 Interference between analogue FDM-FM signals (Case (IX) in Table 1 above)

When dealing with FDM-FM carriers, and to find out the resulting margin, the  $C/I$  ratio is calculated and compared with the required  $C/I$ . However a  $C/N + K$  type protection criteria is developed based on the equations of Recommendation ITU-R SF.766 which are required to calculate the  $B$  factor (interference reduction factor). In the absence of detailed information for the calculation of the  $B$  factor, the interference adjustment factor described in § 3.5 below shall be used.

*Reason: Interference adjustment factor described in § 3.5 below is proposed here, since it is used for other general cases of interference between analogue carriers (with the exception of the specific case of interference between analogue TV/FM carriers).*

### 3.5 Other interference cases

For cases (IV), (VI), (VII), ~~and (VIII)~~, IX and (XI) to (XVII) in Table 1 above, the interference adjustment factor mentioned in § 3 above shall be used. In calculating this factor consideration shall be given to the third paragraph of § 3.4 of Annex 1 to Recommendation ITU-R S.741-2.

### ~~3.6 Additional information to be provided by the administrations concerned~~

~~In addition to the data provided under Appendix 4 and in order to permit the Bureau to carry out this examination, the mutually agreed criteria for the acceptable interference, the modulation characteristics and a set of test points (maximum 20) defining the service area shall be requested from the administrations concerned.~~

*Reason: See reasons in § 2.2 and § 3 above.*

## ATTACHMENT 1

### Calculation algorithms ( $M$ , $C/I$ , $C/N$ )

#### 1 Margin algorithm

To compute the margins, it is necessary first to determine the ~~minimum desired~~ required

$\left(\frac{C}{I}\right)_m$  value, which is a function of the  $C/N$  and the  $K$  factor:

$$\left(\frac{C}{I}\right)_m = \left(\frac{C}{N}\right) + K$$

where:

$\left(\frac{C}{I}\right)_m$ : ~~minimum desired~~ required  $C/I$  value (dB)

$\left(\frac{C}{N}\right)$ :  $C/N$  objective or calculated value of  $C/N$  (dB) (see the 3<sup>rd</sup> paragraph of § 3 above)

$K$ : factor used in computing the ~~minimum desired~~ required  $C/I$  (dB). Generally, this will be either 14.0 or 12.2, depending on the modulation characteristics of the desired signals (see Recommendations ITU-R S.483 and ITU-R S.523).

Since  $\left(\frac{C}{I}\right)_m$  and  $\left(\frac{C}{I}\right)_a$  will vary depending on the geographical location within the service area each test point, ~~the both values~~ margin is also ~~are~~ computed: at

- At the geographical locations of the associated specific Earth Stations, if any, or,
- In case of associated typical Earth Stations, at the test point located within the service area  
where the  $\left(\frac{C}{I}\right)_a$  value is minimum each test point.

The margin is the difference between the calculated  $C/I$  value and the ~~minimum desired~~ required  $C/I$  value:

$$M = \left(\frac{C}{I}\right)_a - \left(\frac{C}{I}\right)_m$$

where:

$M$ : Margin (dB)

$\left(\frac{C}{I}\right)_a$  : adjusted value of  $C/I$ , taking into account the interference adjustment factor (dB)

$\left(\frac{C}{I}\right)_m$  : is the ~~minimum desired~~ required  $C/I$  value (dB) computed above.

*Reason: Previous approach was based on the selection of a test-point, among 20 within the service area, where the calculated required  $C/I$  value is minimum and then to calculate the Margin at this worst-case test-point. Since this previous approach could not correspond to the worst-case Margin in all cases and since constant  $C/N$  objectives are now submitted by administrations throughout the service area, it is proposed to identify the worst-case location within the service area where interference from the interfering satellite network is maximum (i.e.  $C/I$  value minimum), unless this is a case of an associated specific Earth Station.*

Therefore, substituting, we have:

$$M = \left(\frac{C}{I}\right)_a - \left(\frac{C}{N}\right) - K$$

## 2 The $\left(\frac{C}{I}\right)_a$ algorithm for interfering situations

The basic  $C/I$  is adjusted as follows:

$$\left(\frac{C}{I}\right)_a = \left(\frac{C}{I}\right)_b - I_a$$

where:

- $\left(\frac{C}{I}\right)_a$  : adjusted value of  $C/I$ , taking into account the interference adjustment factor (dB)
- $\left(\frac{C}{I}\right)_b$  : basic calculated value of  $C/I$ , before taking into account the interference adjustment factor (dB)
- $I_a$  : interference adjustment factor (dB).

The adjusted  $C/I$  values will be determined separately for the uplink and downlink, keeping in mind that the interference adjustment factor may be different for the uplink and for the downlink.

The overall  $C/I$  will also be computed. If there are uplink calculations only (i.e., no downlink for the desired or interfering signal, or both, or no downlink frequency overlap between the desired and interfering signals), the values of the overall  $C/I$  are simply the uplink values of  $C/I$ . Similarly, if there are downlink calculations only (i.e., no uplink for the desired or interfering signal, or both, or no uplink frequency overlap between the desired and interfering signals), the values of the overall  $C/I$  are simply the downlink values of  $C/I$ . However, if the desired and interfering signals have both an uplink and a downlink, the overall  $C/I$  will be computed for each downlink test point using the *worst case* uplink  $C/I$  and the individual downlink  $C/I$  values:

$$\left(\frac{C}{I}\right)_T = -10 \log_{10} \left[ 10^{-\frac{\left(\frac{C}{I}\right)_u}{10}} + 10^{-\frac{\left(\frac{C}{I}\right)_d}{10}} \right]$$

where:

- $\left(\frac{C}{I}\right)_T$  : overall value of  $C/I$  for a particular downlink test point (dB)
- $\left(\frac{C}{I}\right)_u$  : worst-case uplink  $C/I$  at any uplink test point (dB)
- $\left(\frac{C}{I}\right)_d$  : downlink  $C/I$  for a particular downlink test point (dB).

## 2.1 Determination of interference adjustment factor

### 2.1.1 Interference from noise-like digital carriers (interference adjustment factor 1)

The current version of Recommendation ITU-R S.741-2 covers the case of co-frequency interference from noise-like digital carriers. For non-co-frequency interference an interference adjustment factor (or bandwidth advantage factor) will be assumed as a result of the work of Working Party 4A concerning the methodology to treat cases of frequency offset carriers through the application of a factor  $A$  defined below (mentioned as  $I_a$  in § 2 above).

For the case of frequency offset between carriers, the resultant  $C/I$  can be determined by the following equation:

$$C/I = 10 \log (c/i) - A$$

where  $A$  is the bandwidth advantage factor (dB).



The factor  $A$  is the ratio of the interfering carrier power contained in the desired signal bandwidth to the total interfering carrier power under the assumption that the interfering carrier has uniform power spectral density across its occupied bandwidth.

### 2.1.2 Interference from noise-like analogue carriers (interference adjustment factor 2)

For these cases, the resultant  $C/I$  can be determined by using the equation in § 2.1.1 above where the factor  $A$  is the ratio of the interfering carrier power contained in the desired signal bandwidth to the interfering carrier power with the approximation that the power spectral density of the interfering carrier is constant over the bandwidth of the desired carrier and is equal to the maximum value (see the third paragraph of § 3.4 of Annex 1 to Recommendation ITU-R S.741-2).

## 3 The $C/N$ algorithm

The algorithm for  $C/N$  requires the computation of the value of  $N$ , as follows:

$$N = -228.6 + 10 [\log_{10}(T_R) + 6 + \log_{10}(BW)]$$

where:

$N$ : value of noise (dBW)

$T_R$ : receiving system noise temperature (K)

$BW$ : bandwidth (MHz).

The value of  $N$  is determined once for the uplink (if there is an uplink) and once for the downlink (if there is a downlink) for the desired system.

Once  $N$  is determined,  $C/N$  will be computed at each uplink test point (if there is an uplink) and each downlink test point (if there is a downlink):

$$\left(\frac{C}{N}\right) = C - N$$

where:

$C$ : carrier (dBW)

$N$ : noise (dBW) computed above.

The overall  $C/N$  is also computed. If there is an uplink only, the values of the overall  $C/N$  are simply the uplink values of  $C/N$ . Similarly, if there is a downlink only, the values of the overall  $C/N$  are simply the downlink values of  $C/N$ . However, if there is both an uplink and a downlink, the overall  $C/N$  is computed for each downlink test point using the *worst case* uplink  $C/N$  and the individual downlink  $C/N$  values:

$$\left(\frac{C}{N}\right)_T = -10 \log_{10} \left[ 10^{-\frac{(C/N)_u}{10}} + 10^{-\frac{(C/N)_d}{10}} \right]$$

where:

$\left(\frac{C}{N}\right)_T$ : overall value of  $C/N$  for a particular downlink test point (dB)

$\left(\frac{C}{N}\right)_u$ : worst-case uplink  $C/N$  at any uplink test point (dB)

$\left(\frac{C}{N}\right)_d$  : downlink  $C/N$  for a particular downlink test point (dB).

### 3.1 Determination of relative protection ratio for case (V) in Table 1 above (TV-FM) into (TV-FM)

When dealing with a non-co-frequency interfering situation from a TV-FM carrier into another TV-FM carrier, the Radiocommunication Bureau is using the protection ratio masks defined in the Rules of Procedure relating to § 3.5.1 and § 3.8 of Annex 5 to Appendix 30 for the same case of interference, as it appears in Recommendation ITU-R S.483. The ~~is resulting~~ protection ratio relaxation is applied to the  $K$  factor of 14.0 dB established by Recommendation ITU-R S.483.

*Reason: Addition of a more specific reference to protection ratio masks which are already implemented by the Bureau for the same case of interference, i.e. between non co-frequency analogue TV-FM to analogue TV-FM carriers.*

NOC, except for a change of references from ITU-R S.741 to ITU-R S.741-2.

## ATTACHMENT 2

### Additional margins to be taken into consideration

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ANNEX 4

**Rules concerning  
ARTICLE 11 of the RR**

**MOD**

**11.32**

**NOC Sections 1, 2, 3, 4, and 5**

**6 Examination of frequency assignments to an inter-satellite link of a geostationary space station communicating with a non-geostationary space station**

**SUP** the entire text of Section 6 of the Rule (i.e. §§ 6.1, 6.2, 6.2.1, 6.2.2 and 6.3) and replace it by:

6.1 The Board noted the specific nature of inter-satellite links where one end of the link is on a GSO space station and the other on a non-GSO space station. Under Article 9 (No. 9.7) of the RR there is a requirement to effect coordination for frequency assignments of GSO networks, but there is no similar requirement for assignments of non-GSO networks. It is thus unclear whether coordination under Section II of Article 9 applies:

- a) to both ends of the inter-satellite link, i.e. to the GSO as well as to the non-GSO station of the link, thus rendering the entire link coordinated (as is the case in all other forms of coordination); or
- b) only to the GSO station of the inter-satellite link, leaving the other end uncoordinated; or
- c) to none of the stations of the inter-satellite link, leaving the entire inter-satellite link uncoordinated (as is the case when coordination does not apply, e.g. non-GSO networks).

6.2 In view of the above, the Board decided that, until WRC clarifies this matter, assignments in inter-satellite links between GSO and non-GSO space stations shall be treated as follows :

6.2.1 The general description of the inter-satellite link shall be sent to the Bureau for advance publication in accordance with Sub-Section IA of Article 9.

6.2.2 These assignments shall not be subject to coordination procedure under Section II of Article 9.

6.2.3 At notification stage, no finding shall be given under 11.32 (Column 13A2) and symbol “K” will be inserted in Column 13B2 with the following meaning:

“K”: this frequency assignment to an inter-satellite link of a geostationary space station communicating with a non-geostationary space station is not taken into account by the Bureau in its examination under No. 11.32.

6.3 For cases for which the API has already been published in accordance with Sub-Section IB of Article 9, the responsible administration may:

- a) submit the appropriate Appendix 4 data and request a new publication of the API under Sub-Section **IA** of Article **9**, or
- b) request the publication of the detailed information relating to the inter-satellite link in a CR/C special section, in which case the Bureau shall not give findings under No. **9.35** nor establish coordination requirements under No. **9.36**,

to be followed by notification stage as in paragraph 6.2.3 above.

- 6.4 Cases already recorded in the Master Register by the Bureau shall not be reviewed under this Rule.
- 6.5 This Rule applies to links between GSO and non-GSO satellites in all frequency bands allocated to inter-satellite service as well as to other space services in the space-to-space direction.

*Effective date of application of this Rule: [11 December 2004][1 January 2005]*

## **SUP**

### **5.392**

*Reasons: In his Report to WRC-03, the Director of the Bureau pointed out to the uncertainties with respect to the obligation to effect coordination under Article 9 of the RR with respect to satellite-to-satellite links between GSO and non-GSO satellites and requested the Conference to consider the appropriate course of action for recording of assignments for such inter-satellite links (§ 3.3.2 of Addendum 3 to WRC-03 Document 4 refers). Unfortunately, due to the heavy workload, WRC-03 did not address this issue and it remains unresolved. Until a future WRC considers the matter, the Rule clarifies it for administrations and the Bureau in the sense that coordination procedure does not apply to assignments for space-to-space links between GSO and non-GSO satellites. Like in other cases of space services assignments to which coordination does not apply, publication of the expanded version of API under Sub-Section IA of Article 9 is proposed, to provide more detailed characteristics of the intended use so that administrations can arrange for interference-free use between themselves. For the same purpose, this is complemented by a possibility to publish details in coordination special section but for information only for cases where the API special section has already been published in accordance with Sub-Section IB of Article 9. The Director of the BR will report this matter to WRC-07. The general nature of this Rule makes the Rule on No. 5.392 unnecessary.*