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| **Radiocommunication Study Groups** |  |
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| Source: Document 4A/TEMP/167  Reference: Document 4A/320 | **Annex 12 to Document 4A/368-E** |
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| **English only** |
| Annex 12 to Working Party 4A Chairman’s Report  WORKING DOCUMENT TOWARDS A POSSIBLE REDUCTION OF THE COORDINATION ARC APPLICABLE TO FSS GEOSTATIONARY SATELLITE NETWORKS OPERATING IN SOME CONGESTED PORTIONS OF THE 4/6 GHz AND 14/10/11/12 GHz FREQUENCY BANDS | |

Working Party 4A (WP 4A) discussed a document proposing a reduction of the coordination arc applicable to FSS geostationary satellite networks operating in some congested portions of the 4/6 GHz and 14/10/11/12 GHz (see the Attachment to this document).

Views were expressed that work on this matter should continue and the possibility of conducting an operational assessment was suggested. Such assessment should consider not only satellite networks filed with the ITU, as done in the Attachment, but also consider the subset of those with frequency assignments that have been brought into use as some of the networks in the larger set may never be brought into use.

It was also pointed out that the concept of coordination arc was originally introduced in order to mitigate the backlog that existed in the past with respect to the processing by the BR of submitted coordination requests. Since no backlog of coordination requests currently exists, a view was expressed that a reduction in the values of the coordination arc would not be necessary.

It was noted during the discussions that RR No. **9.41** could still be applied to ensure that administrations with satellite networks outside a reduced coordination arc could still request to be included in the coordination process provided that the ΔT/T criterion is exceeded. However, it was also observed that a reduction of the coordination arc could have undesirable effects in connection with the application of RR No. **9.41**, such as: (i) number of requests for inclusion or exclusion in coordination under RR No. **9.41** would increase and this would bring additional workload to the BR; (ii) there would be an additional burden on administrations to perform the ΔT/T calculation to avoid the possibility of not acting within the four-month period referred to in RR No. **9.41** and therefore not being included in the coordination process. As part of this discussion, a request was made to the BR asking for some statistics to be compiled, for the next meeting of WP 4A, on the number of requests for inclusion in coordination that are submitted under RR No. **9.41**.

It should be noted that the course of action proposed in this document is merely regulatory measures to reduce the current difficulties encountered in coordination of the satellite networks in the frequency bands mentioned above.

Administrations are encouraged to consider this issue in their preparations for the next meeting of WP 4A.

**Attachment:** 1

Attachment  
  
Reduction of the coordination arc applicable to FSS geostationary satellite networks operating in some congested portions of the 4/6 GHz  
and 14/10/11/12 GHz frequency bands

# 1 Introduction

In certain portions of the 6/4 GHz band[[1]](#footnote-1) as well as of the 10/11/12/14 GHz band[[2]](#footnote-2), a new GSO FSS satellite network is likely required to effect coordination with a large number of other satellite networks with orbital separations in the range of 2º to 4º or even with less than 2º separation. The need to co-exist and ensure appropriate protection to all these satellite networks implies that coexistence with and protection of satellite networks with larger separation angles will automatically result and coordination with such networks is actually unnecessary.

One of the consequences of this situation is that many of the coordinations triggered by the current coordination arcs of 10º (6/4 GHz) and 9º (14/10/11/12 GHz) are never conducted because neither of the parties involved feels an actual need for it to be done. The burden of having to conduct coordination with satellite networks which are closer to the incoming network is already heavy enough to discourage operators and administrations to devote scarce resources to conduct coordination exercises that are clearly unnecessary.

This document reviews the current use of the geostationary orbit in 6/4 GHz and 14/10/11/12 GHz and concludes that it may be appropriate to reduce the coordination arc in the portions where congestion is more acute and where each satellite network will be limited by its immediate neighbours and therefore coordination with satellite networks that are further away in the orbit becomes superfluous.

# 2 Satellite networks in 6/4 GHz and 14/10/11/12 GHz

To assess the number of coordinations likely to be triggered in the 6/4 GHz band, a query to the ITU BR SNS database identified the satellite networks with frequency assignments in the range 3 700-4 200 MHz. Satellite networks including this frequency range are found in 498 distinct orbital locations, some of them separated by only 0.1º. In most of these orbital locations there are multiple satellite networks, often filed by different administrations.

This means that the average orbital separation between neighbouring orbital locations with filings in the 3 700-4 200 MHz band is about 0.72º [[3]](#footnote-3). Moreover, within the current coordination arc of ±10º a new satellite network will on average have to coordinate with satellite networks at about 28 other orbital locations and many of these locations will include networks from multiple administrations.

Similarly, a query of the SNS for the band 14-14.5 GHz reveals that there are 527 distinct orbital locations with satellite networks with frequency assignments within this range. This means that the average orbital separation between neighbouring orbital locations with filings in the 14-14.5 GHz band is about 0.68º [[4]](#footnote-4).

Therefore, within the current coordination arc of ±9º a new satellite network will on average have to coordinate with satellite networks at about 26 other orbital locations and many of these locations will include networks from multiple administrations.

# 3 Proposed changes

In view of the assessment described in section 2 above, it is concluded that the coordination arc of ±10º for satellite networks using the 6/4 GHz band is excessive. If the coordination arc is reduced to ±5º any new satellite network will on average still have to coordinate with satellite networks at 14 other orbital locations and coordination with satellite networks outside the 5º arc becomes unnecessary. Any constraints that may have to be imposed on the new comer in order to protect networks outside ±5º will already have been imposed by the significant number of networks within ±5º.

Similarly, it is concluded from section 2 above that the coordination arc of ±9º for satellite networks using the 14/10/11/12 GHz band is also excessive. If the coordination arc is reduced to ±4º any new satellite network will on average still have to coordinate with satellite networks at 12 other orbital locations and coordination with satellite networks outside the 4º arc becomes unnecessary. Again, protection of the satellite networks within ±4º of the new satellite network ensure that satellite networks outside ±4º will also be protected.

Although the reasoning above was based on average values, a closer look at the distribution of satellite networks along the geostationary orbit reveals that the values of the orbital interval between adjacent satellite networks are limited to a small range. Actually, both for 6/4 GHz and 14/10/11/12 GHz, more than 90% of these orbital intervals do not exceed 1º. This means that adoption of the ±5º arc for satellite networks using the 6/4 GHz or of the ±4º arc for satellite networks using the 14/10/11/12 GHz band will still require that any new satellite network coordinate with several other satellite networks.

For satellite networks using the band 3 700-4 200 MHz the distribution of orbital spacing between adjacent orbital locations is shown in Table 1. It is concluded from Table 1 that almost 59% of these orbital intervals are 0.5º or less and more than 90% of the intervals are 1º or less.

The maximum orbital spacing is 4º which occurs only once, between 150ºW and 154ºW. Even in this extreme situation, a hypothetical satellite network at 152ºW would have to coordinate with satellite networks from five different administrations with satellite networks at 147.6ºW, 148ºW, 150ºW, 154ºW, 155ºW and 156ºW. Coordination constraints imposed on the new satellite network by satellite networks at these six orbital locations would provide adequate protection to satellite networks outside the ±5º coordination arc.

Table 1

Distribution of the orbital separation (δ) between adjacent orbital locations with satellite networks  
including the frequency range 3 700-4 200 MHz

|  |  |  |
| --- | --- | --- |
| Orbital Separation (δ) | Number of Occurrences | Percentage (%) |
| 0< δ <0.5 | 124 | 24.91 |
| 0.5 | 169 | 33.94 |
| 0.5< δ <1.0 | 36 | 7.23 |
| 1.0 | 121 | 24.30 |
| 1.0< δ <1.5 | 6 | 1.20 |
| 1.5 | 6 | 1.20 |
| 1.5< δ <2.0 | 3 | 0.60 |
| 2.0 | 27 | 5.42 |
| 2.5 | 4 | 0.80 |
| 3.0 | 1 | 0.20 |
| 4.0 | 1 | 0.20 |
| Total Number of Intervals | 498 | 100 |

For satellite networks using the band 14-14.5 GHz the distribution of orbital spacing between adjacent orbital locations is shown in Table 2. It is concluded from Table 2 that about 59% of these orbital intervals are 0.5º or less and more than 92% of the intervals are 1º or less.

The maximum orbital spacing is 3º which occurs only once, between 140 ºW and 143 ºW. Even in this extreme situation, a hypothetical satellite network at 141.5ºW would have to coordinate with satellite networks from six different administrations with satellite networks at 138 ºW, 139 ºW, 140 ºW, 143 ºW and 144 ºW. Coordination constraints imposed on the new satellite network by satellite networks at these five orbital locations would provide adequate protection to satellite networks outside the ±4º coordination arc.

The distributions in Tables 1 and 2 are quite similar as many satellite networks include both the 6/4 GHz and the 14/10/11/12 GHz frequency ranges. For both distributions the mode is the interval of 0.5º while intervals of 1º and the aggregate of those of less than 0.5º have about the same frequency of occurrence.

Table 2

Distribution of the orbital separation (δ) between adjacent orbital locations with satellite networks  
including the frequency range 14-14.5 GHz

|  |  |  |
| --- | --- | --- |
| Orbital separation (δ) | Number of occurrences | Percentage (%) |
| 0< δ <0.5 | 136 | 25.81 |
| 0.5 | 177 | 33.59 |
| 0.5< δ <1.0 | 44 | 8.35 |
| 1.0 | 131 | 24.86 |
| 1.0< δ <1.5 | 5 | 0.95 |
| 1.5 | 5 | 0.95 |
| 1.5< δ <2.0 | 2 | 0.34 |
| 2.0 | 25 | 4.74 |
| 2.5 | 1 | 0.19 |
| 3.0 | 1 | 0.19 |
| Total Number of Intervals | 527 | 100 |

It is further noted that the proposed reduction in the size of the coordination arc will eliminate coordination requirements that are often either not fulfilled[[5]](#footnote-5) or carried out as a mere formality. Satellite networks in 6/4 GHz which are more than 5º apart or in the 14/10/11/12 GHz which are more than 4º are already significantly constrained by other closer by satellite networks. Therefore, coordination between satellite networks that are far apart will either confirm the constraints imposed by closer networks or will lead to lighter constraints that are not applicable as they will be overcome by the former constraints.

# 4 Possible consequential changes to the Radio Regulations

As a result of the discussion above, the possibility of modifying Table 5.1 in Appendix 5 of the Radio Regulations should be considered (see Annex 1).

Annex 1

TABLE 5-1     (WRC‑07)

Technical conditions for coordination  
(see Article 9)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Reference of Article 9 | Case | Frequency bands (and Region) of the service for which coordination is sought | Threshold/condition | Calculation  method | Remarks |
| No. **9.7** GSO/GSO | A station in a satellite network using the geostationary-satellite orbit (GSO), in any space radiocommunication service, in a frequency band and in a Region where this service is not subject to a Plan, in respect of any other satellite network using that orbit, in any space radio­communication service in a frequency band and in a Region where this service is not subject to a Plan, with the exception of the coordination between earth stations operating in the opposite direction of transmission | 1) 3 400-4 200 MHz 5 725-5 850 MHz (Region 1) and 5 850-6 725 MHz 7 025-7 075 MHz | i) Bandwidth overlap, and  ii) any network in the fixed-satellite service (FSS) and any associated space operation functions (see No. **1.23**) with a space station within an orbital arc of ±5° of the nominal orbital position of a proposed network in the FSS |  | With respect to the space services listed in the threshold/condition column in the bands in 1), 2), 3), 4), 5), 6), 7) and 8), an adminis­tration may request, pursuant to No. **9.41**, to be included in requests for coordination, indicating the networks for which the value of Δ*T*/*T* calculated by the method in § 2.2.1.2 and 3.2 of Appendix **8** exceeds 6%. When the Bureau, on request by an affected administration, studies this information pursuant to No. **9.42**, the calculation method given in § 2.2.1.2 and 3.2 of Appendix **8** shall be used |
| 2) 10.95-11.2 GHz 11.45‑11.7 GHz  11.7-12.2 GHz  (Region 2) 12.2-12.5 GHz  (Region 3) 12.5‑12.75 GHz (Regions 1 and 3) 12.7‑12.75 GHz (Region 2) and  13.75‑14.5 GHz | i) Bandwidth overlap, and  ii) any network in the FSS or broadcasting-satellite service (BSS), not subject to a Plan, and any associated space operation functions (see No. **1.23**) with a space station within an orbital arc of ±° of the nominal orbital position of a proposed network in the FSS or BSS, not subject to a Plan |

1. 3 400-4 200 MHz (space-to-Earth), 5 725-5 850 MHz (Earth-to-space) in Region 1, 5 850-6 725 MHz (Earth-to-space), 7 025‑7 075 MHz (space-to-Earth) and (Earth-to-space). [↑](#footnote-ref-1)
2. 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, 12.2-12.5 GHz (space-to-Earth) in Region 3, 12.5-12.75 GHz (space-to-Earth) in Regions 1 and 3, 12.7-12.75 GHz (Earth-to-space) in Region 2, and 13.75-14.5 GHz (Earth-to-space) [↑](#footnote-ref-2)
3. Note that the average orbital separation between any two satellite networks is smaller than that because the separation of 0º between collocated satellite networks was not included in the computation of this average value. [↑](#footnote-ref-3)
4. See 3 above. [↑](#footnote-ref-4)
5. Recording is possible through the application of RR No. **11.32A** or No. **11.41**. [↑](#footnote-ref-5)