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| A close up of a sign  Description automatically generated | **World Radiocommunication Conference (WRC-23) Dubai, 20 November - 15 December 2023** | |  |
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| PLENARY MEETING | | **Addendum 3 to Document 111(Add.25)-E** | |
|  | | **30 October 2023** | |
|  | | **Original: Chinese** | |
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| China (People's Republic of) | | | |
| Proposals for the work of the conference | | | |
|  | | | |
| Agenda item 9.2 | | | |

9 to consider and approve the Report of the Director of the Radiocommunication Bureau, in accordance with Article 7 of the ITU Convention;

9.2 on any difficulties or inconsistencies encountered in the application of the Radio Regulations;[[1]](#footnote-1)1 and

## Experience in the application of the radio regulatory procedures

## 3.1 Articles of the Radio Regulations

### (non-geostationary satellite issues)

Introduction

Noting the difficulties and inconsistencies encountered in the application of the relevant provisions of the Radio Regulations collected and analysed in Part 2 of the Report of the Director of the Radiocommunication Bureau ([Document WRC-23/4 Addendum 2](https://www.itu.int/md/R23-WRC23-C-0004/en)), this contribution summarizes our views and proposals with respect to a number of items, focusing on experience in the application of the radio regulatory procedures (§ 3.1 - Articles of the Radio Regulations) relating to non-geostationary satellite (non-GSO) issues.

Proposals

This administration submits its views and proposals with respect to a number of items, for further discussion during the conference.

General

CHN/111A25A3/1

### 3.1.4 Splitting a non-GSO system into several filed systems

Other questions include the practice of splitting a non-GSO satellite system into several filed systems, which may affect the effectiveness of single-entry epfd limits contained in Article **22** to protect geostationary (GSO) systems or have an impact on the implementation of Resolution **76 (Rev.WRC-15)**.

**Views and proposals:** We propose that WRC-23 invite ITU-R to study the impact of the practice of splitting a non-GSO FSS system into multiple filed systems and, in particular, the verification of single-entry epfd limits contained in Article **22** of the Radio Regulations.

**Reasons:** We are concerned with the practice of splitting a non-GSO FSS system into multiple filed systems for the purpose of satisfying the single-entry epfd limits. We note that related work is being carried out under Topic J in WRC-23 agenda item 7.

CHN/111A25A3/2

### 3.1.4 Multiple orbital altitudes in a non-GSO satellite system

Where a non-GSO system has only one altitude for all satellites across all planes, the power flux-density (pfd) towards the Earth’s surface is calculated from a unique orbital longitude at varying angles of arrival to determine the pfd excess for each frequency assignment.

However, when non-GSO satellite systems have more than one altitude within the constellation, pfd calculations need to be performed for each of the different altitudes. If there is a pfd excess for one altitude, an unfavourable finding has to be given for this case, which implies that the beam would need to be split in order to represent the relationship between orbits and beams correctly, and that groups will also have to be split in order to give findings to the frequency assignments accordingly.

In some cases, non-GSO systems present complex configurations (e.g. having either varying altitude and beam configuration or a single altitude but a complex beam/orbital plane or beam/satellite configuration) which go beyond the capacity of the corresponding tables in the SNS database, and the Bureau has to treat such cases manually using other means.

In light of the increase in complexity of non-GSO filings, the Bureau has been improving internal tools to automate the pfd examination process.

**Views and proposals:** We propose to ask the administrations to submit the power level for each altitude unless they actually use the same power definition for all altitudes. The efforts made by the Bureau to improve its internal tools to automate the pfd examination process are appreciated.

**Reasons:** We believe that beam definition should be based on orbital altitude, and that pfd values and link performance are also related to orbital altitude and operating elevation angle. Therefore, the pfd examination tool should also consider supporting different power parameters for different altitudes and different orbital planes, while taking into account the impact of the minimum operating elevation angle of the non-GSO system.

CHN/111A25A3/3

### 3.1.4 Submission of multiple masks in the same frequency band

In several cases of examination under Nos. **22.5C**, **22.5D** and **22.5F**, the Bureau has found that multiple pfd or e.i.r.p. masks have been submitted to be applied in the same frequency band. Multiple masks are provided in order to model transmissions in different types of links (e.g. user links, feeder links, service links, etc.) or different earth station diameters.

The Bureau notes that

– The limits contained in Tables **22-1A** to **22-1E**, **22-2** and **22-3** are applicable to a system as a whole. Individual examination for each type of link or earth station does not allow for verification of compliance with a single-entry limit in the case where such links or earth station types are to be operated simultaneously in the same frequency band.

– The methodology contained in Recommendation ITU-R S.1503 does not allow for the combination, in the epfd calculation, either of multiple masks in the same frequency band or of multiple different operating parameters applicable to the same frequency band.

– Multiple examinations for each frequency band would require the Bureau to process, examine and publish different sets of unique epfd data and may increase the publication time.

In the light of the above, the Bureau accepts multiple e.i.r.p. or pfd masks for the same frequency range only if they apply to different orbital configurations, or different satellite orbits and satellites. The Bureau contacts those administrations requesting the application of multiple e.i.r.p. or pfd masks to the same frequency range and asks them to provide a single e.i.r.p. or pfd mask for a frequency range taking into account the emissions from all earth/space stations (various antenna sizes, antenna patterns, tracking strategies, etc.).

The Bureau invites the conference to endorse the above-mentioned practice.

**Views and proposals****:** We believe that until Recommendation ITU-R S.1503 is updated to include the handling of multiple masks in the same frequency band, the Bureau should not be accepting multiple masks, in order to avoid evaluation difficulties. We propose that the conference mandate Working Party 4A to expedite the process of revising Recommendation ITU-R S.1503 and to submit the revision with relevant solutions for approval before the end of 2025.

**Reasons:** The current Recommendation ITU-R S.1503 does not allow for the combination of multiple masks in the same frequency band in the epfd validation, nor does it allow for the combination of multiple different operating parameters applicable to the same frequency band, different masks only being allowed for different satellites. At present, if an administration submits multiple masks, BR can only perform verification separately and use the worst-case test result as the basis for the finding. In this case, the administration only needs to submit the mask for the worst interference.

CHN/111A25A3/4

### 3.1.4 Use of resources and cost recovery

On the basis of the information provided in § 3.1.4, the Bureau notes that three main elements are resource-intensive in carrying out Article **22** regulatory examinations:

1 preparation of input data for the examination of compliance with the epfd limits contained in Article **22**;

2 software developments; and

3 software maintenance.

The Bureau also notes that its workload in this area of activity has considerably increased.

The Bureau points out that the above issues have also contributed to increasing the time for processing the coordination requests for both GSO and non-GSO satellite networks beyond the regulatory time-limit of four months.

The Bureau invites the conference to consider regulatory solutions to the issue of exceptionally large and complex non-GSO satellite filings.

The Bureau invites the conference to endorse the above-mentioned practice.

**Views and proposals**: We believe that the cost-recovery fee for such submissions should be in proportion to the resources invested in the examination of exceptionally large and complex non‑GSO satellite systems. Considering that an expert group on Decision 482 has been established, it is recommended that the relevant issues be submitted to the expert group for discussion. We support the Bureau's invitation to the conference to consider regulatory solutions to the issue of the examination of exceptionally large and complex non-GSO satellites.

**Reasons:** The existing epfd limit validation method requires the Bureau first to prepare the input data and generate SRS and mask database files for epfd verification. For large-scale constellations, preparing the SRS database is a very burdensome task. Secondly, the existing Recommendation ITU-R S.1503 has been updated to version S.1503-4, but the validation software version is still 1503-2. Therefore, the Bureau needs to invest more resources in software development and maintenance. Thirdly, the existing epfd validation method is extremely inefficient for large-scale constellations and requires a large amount of computing resources and time. We have noted, however, that WP 4A is studying optimized algorithms. It is therefore hoped that the revision of Recommendation ITU-R S.1503 could be accelerated in order to improve the efficiency of epfd verification.

CHN/111A25A3/5

#### 3.1.4.7 Modifications to existing coordination requests for non-GSO satellite systems for the purpose of bringing into use

The Bureau’s experience reveals two main approaches taken by administrations to modify a non-GSO system for the purpose of bringing into use its frequency assignments：

1 Modify the original CR/C to align all orbital characteristics with the ones used for bringing into use of the corresponding frequency assignments, while maintaining the original date of protection; and

2 Modifying the original CR/C to add one satellite in one orbital plane, aligning with the orbital characteristics of the satellite used to bring the non-GSO system into use. Such requests do not contain a request to maintain the original date of protection, so a new date is given to the groups associated with the beam(s) of the new additional satellite.

With respect to the second approach, the Bureau believes that:

i) compliance with the epfd limits contained in Article **22**, for the frequency bands where they apply, should be verified for the entire system; and

ii) the question would be raised in some cases whether the practice is consistent with efficient use of orbit/spectrum resources, since it is always possible to add an orbital plane to an existing non-GSO satellite system. Therefore, it could be possible to bring into use any non-GSO system with any kind of non-GSO satellite, provided that its characteristics are added to the initial description of the system.

With respect to ii), the Bureau addresses the matter on a case-by-case basis and may refer any relevant cases to RRB for decision.

The Bureau invites the conference to confirm or otherwise this course of action.

**Views and proposals:** We support the Bureau's proposal to evaluate each case individually and refer any necessary decisions to the Board or RAG if deemed necessary.

**Reasons:** We believe that to allow the addition of a single satellite in one orbital plane for the purpose of bringing into use a constellation raises concerns in regard to efficient use of orbital resources.

CHN/111A25A3/6

#### 3.1.4.11 Modifications to coordination requests for non-GSO satellite systems submitted under the Rule of Procedure on No. 9.27

Since 2017, the Bureau has steadily received modifications of coordination requests for non-GSO satellite systems.

In this context, in considering modifications to the original constellation submissions and the impact on the original date of receipt of the filings, the Bureau has been following the guiding principles in the Rule of Procedure on No. **9.27** to deal with the modifications, i.e. coordination is not required when the nature of the change does not increase the interference to, or the protection required from, the assignments of another administration, as specified in Appendix **5** to the Radio Regulations.

In the absence of appropriate criteria or calculation methods to verify that there is no increase in interference or protection, the Bureau has been requesting that technical justifications be provided by the notifying administration in order for it to formulate and publish findings.

Calculations have been provided in the form of cumulative distribution functions of the interference level into the subsequently filed non-GSO FSS systems, expressed as an interference-to-noise (I/N) ratio for varying percentages of the time and locations.

When the modifications could potentially lead to an increase in the interference to the network to be modified, the Bureau assumes that the responsible administration commits to not claim any more protection from other non-GSO systems or very large earth stations subject to No. **9.7A** than that required with the original parameters.

**Views and proposals:** It is recommended that this issue be included in agenda item 7 or in the proposed new agenda item “non-GSO regulatory framework” and be studied in detail in the next study period.

**Reasons:** Some submissions have been modified multiple times to match their actual deployed satellite systems. Such modifications include adding completely new configurations, planes with different altitudes and frequency assignments, but also changing the numbers of satellites per plane and the characteristics of beams. If this kind of modification is encouraged, priority will be given to modifying existing filings rather than applying for a new filing. This is at odds with Article44 of the ITU Constitution which states "*that radio frequencies and any associated orbits, including the geostationary-satellite orbit, are limited natural resources and that they must be used rationally, efficiently and economically, in conformity with the provisions of the Radio Regulations, so that countries or groups of countries may have equitable access to those orbits and frequencies, taking into account the special needs of the developing countries and the geographical situation of particular countries*".  
In addition,considering the lack of appropriate criteria or calculation methods to verify that there is no increase in interference, the potentially affected administrations have difficulty evaluating the interference analysis provided by the administrations notifying modifications to coordination requests for non-GSO satellite systems. We also note the most recent work on the revision of Recommendation ITU-R S.1526-1 contained in Document 4A/691 (Chair’s Report on the May 2022 WP 4A meeting). There has been no new contribution since then. Therefore, it would be better that the relevant criteria and calculation methods be studied further under agenda item 7 or the new agenda item “non-GSO regulatory framework” in order to give them more attention and develop appropriate provisions for this kind of modification.

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1. 1 This agenda sub-item is strictly limited to the Report of the Director on any difficulties or inconsistencies encountered in the application of the Radio Regulations and the comments from administrations. Administrations are invited to inform the Director of the Radiocommunication Bureau of any difficulties or inconsistencies encountered in the Radio Regulations. [↑](#footnote-ref-1)