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| U.S. Radiocommunications Sector  Fact Sheet | |
| **Working Party:** ITU-R WP 5D | **Document No:** USWP5D-50/21 |
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| Document Title: WORKING DOCUMENT ON STUDIES FOR THE REGULATORY CONSIDERATIONS TO PROTECT TERRESTRIAL IMT SYSTEMS UNDER WRC-27 AGENDA ITEM 1.13 | |
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| **Purpose/Objective:** provide edits to the Working Doc on IMT protection under AI 1.13 (Doc 5D/792 Chapter 4 - Annex 4.6). | |
| **Abstract:** 5D is the Group responsible to determine applicable measures to ensure protection of IMT from DC-MSS-IMT systems within the context of AI 1.13. This document proposes edits to the Working Doc on IMT protection. | |

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| **Radiocommunication Study Groups** | A blue logo with a black background  AI-generated content may be incorrect. |
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| WORKING DOCUMENT ON STUDIES FOR THE REGULATORY CONSIDERATIONS TO PROTECT TERRESTRIAL IMT SYSTEMS UNDER WRC-27 AGENDA ITEM 1.13 | |
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The United States is pleased to hereby provide specific edits to Doc 5D/792 Chapter 4 - Annex 4.6, i.e. working document on IMT protection for AI 1.13.

The edits are provided in track changes, and only relevant parts of the Working Doc are reproduced for brevity, as the full document is long. The track changes already existing in the doc have been accepted to favor readability.

**4 Methodologies** **to determine protection threshold for terrestrial IMT networks**

***[Editor’s Note: Several proposed methodologies are presented in this section. Further discussions are needed to reduce/consolidate these methods.]***

[[Annex 4.15 to WP 5D Chair’s Report](https://www.itu.int/dms_ties/itu-r/md/23/wp5d/c/R23-WP5D-C-0413!H4-N4.15!MSW-E.docx)]

**4.1 Possible Approaches**

*Note: Any action relating to implementation of further resolves of the Resolution 253 (WRC-23) is pending until the time that necessary information on the functionality of DC-MSS-IMT is formally provided by WP 4C. That also requires to have clear indication of modelling and potential interference management techniques of DC-MSS-IMT systems that will be provided by WP4C.*

There are multiple options to define the pfd limit which need further consideration:

**[1)** **Pfd per satellite**

*Editor’s note: Concerns were raised by a number of administrations regarding the applicability of PFD per satellite to define the possible measures for protection of terrestrial IMT systems. However, there was no agreement on the deletion of this option. Therefore, it will be retained in square brackets until information on the technical characteristics of DC-MSS-IMT systems/networks will be provided by WP 4C.*

Defining pfd per satellite requires to assess the aggregation factor, based on typical MSS/D2D deployment. [It has to be noted that for MSS/D2D, a given area can only be covered by one spot in a given block of spectrum, thus making easier to assess the aggregation factor in particular for high arrival angles.]

Defining pfd per satellite will make easier for the BR and the administrations to check/control the conformity. In addition, it avoids having to make assumptions on the number of systems which could be actively transmitting in visibility of the border (i.e. avoiding to assume the aggregation factor over different systems).

However, the pfd per satellite limits is not suitable for the DC-MSS-IMT system application requirement related to the DC-MSS-IMT satellite station unwanted emissions need further consideration]

**2a) Aggregate pfd per system to protect UEs**

From a technical point of view,UE victims can potentially receive interference from multiple satellites within one DC-MSS-IMT system. Consequently, starting from an agreed IMT protection criterion, it is possible to define an aggregate pfd limit that DC-MSS-IMT systems will have to respect. The aggregate pfd level is then correlated to the way that the considered DC-MSS-IMT systems are operated. Consequently, when conducting sharing studies, it is essential to take into account accurate modelling of DC-MSS-IMT operations, as well as studying options of potential interference management techniques (pending conclusions of the sharing studies) that may be used in operations..

2b) Aggregate pfd per system to protect BSs when they use TDD

When the victim is a BS using TDD (i.e. possibility of frequency overlap with DC-MSS-IMT downlink frequencies), the pfd formula has to become an epfd formula because of the fact the BS has a directional antenna. Consequently, there is a need to define epfd limits that DC-MSS-IMT systems will have to respect.

**3a) Aggregate pfd for multiple systems when protecting UEs**

UE victims can potentially receive interference from multiple DC-MSS-IMT systems operating in the same frequency bands. An aggregate mask could then take into account the presence of multiple systems and apportion accordingly.

**3b) Aggregate epfd for multiple systems when protecting base stations when they use TDD**

Epfd was used in RR to protect GSO satellite systems and Radio Astronomy receivers from the aggregate interference due to non-GSO satellite constellations when victims have directional antennas.

Aggregate epfd could be used to protect IMT base stations in case of potential aggregate interference from multiple DC-MSS-IMT systems.

Epfd and aggregate epfd are metrics to protect IMT from satellite networks considering the aggregate interference from various satellites within a satellite system/constellation and potential aggregate interference from multiple DC-MSS-IMT systems.

These limits are defined only based on IMT protection criteria and IMT characteristics and different DC-MSS-IMT systems need to make sure the limits are met however their systems are or whatever interference mitigation techniques they use.

Further notes:

Views expressed about the potential aggregate interference from multiple DC-MSS-IMT systems:

– It has to be validated in terms of its applicability and likelihood. Working Party 5D welcomes studies at upcoming meetings.

– Is not of global nature depending on the BS location and orbital parameters of the constellation, the number of visible satellites contributing to the interference will vary, and also potentially corresponds to niche cases, e.g. small landlocked countries.

**4.1.1 Issue of limits compliance verification**

Currently, there are two options with respect to ensuring compliance with applicable aggregate limits:

* No ITU verification methodology is needed in order to verify compliance of a system with aggregate limits. Administrations who submit the envisaged new DC-MSS-IMT filings will commit to respect the limits and that will suffice
* A methodology is needed

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Study X (USA) – Considerations on regulatory measures

The IMT protection criterion to be adopted in the general framework for 1.13 should be in line with the general IMT protection criterion currently being discussed and debated in 5D, i.e. -6 dB linked to a yet to be determined % of time. That said, individual countries, based on bilateral discussions with neighbouring countries, are free to adopt different limits.

With respect to the modelling of DC-MSS-IMT systems, WP4C is the responsible WG. Consequently, 5D should respect guidance from 4C on that matter, including in regards to multi-system aggregation considerations.

Additionally, the approach of a per satellite PFD seems impractical, especially given the varying nature of the DC-MSS-IMT systems and the varying mitigation techniques employed.

Lastly, Administrations will be responsible to ensure that their DC-MSS-IMT operators comply with applicable provisions adopted at WRC-27, and there is no need for any methodology to be developed in ITU-R. Developing an ITU-R methodology that considers mitigation techniques of the individual systems and that checks all country borders worldwide is completely impractical.