

#### Input Contribution XX

# **Input Contribution to EACO**

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GSOA

# RR No. 21.5

# Applicability of RR 21.5 limit to stations using AAS antennas and update to Table 21-2

#### Part A: Description

"ITU R is invited to study, as a matter of urgency, the applicability of the limit specified in No. **21.5** of the Radio Regulations to IMT stations, that use an antenna that consists of an array of active elements, with a view to recommend ways for its possible replacement or revision for such stations, as well as any necessary updates to Table **21-2** related to terrestrial and space services sharing frequency bands. Furthermore, the ITU-R is invited to study, as a matter of urgency, verification of No. **21.5** regarding the notification of IMT stations that use an antenna that consists of an array of active elements, as appropriate." (WRC-19 doc. 550);

RR No **21.5** reads as follows:

**21.5** 3) The power delivered by a transmitter to the antenna of a station in the fixed or mobile services shall not exceed +13 dBW in frequency bands between 1 GHz and 10 GHz, or +10 dBW in frequency bands above 10 GHz, except as cited in No. **21.5A**. (WRC-2000)

# Part B: Key Elements - the notables

This matter was raised in the context of WRC-19 Al1.13 and it is about whether No. **21.5** applies to IMT stations and, if so, which power limits (e.g. Table **21-2**) apply to IMT stations. GSOA is concerned that some parties are interpreting the application of these limits to array type IMT stations in such a way that it would allow a significant increase in the power radiated towards the GSO arc, to a level that would cause harmful interference to satellites.

The following issues can be distinguished in the discussion around No. **21.5**:

Issue A: This will encompass the following elements, set out in WRC-19 document 550:

- the applicability of the limit specified in No. **21.5** of the Radio Regulations to IMT stations that use an antenna that consists of an array of active elements
- to recommend ways for the possible replacement or revision of No. **21.5** for such stations

<u>Issue B</u>: Furthermore, the ITU-R is invited to study, as a matter of urgency, verification of No. **21.5** regarding the notification, under the provision of RR 2020 Edition, of IMT stations that use an antenna that consists of an array of active elements, as appropriate.

<u>Issue C</u>: Any necessary updates to Table **21-2** related to terrestrial and space services shared frequency bands.

Discussions and proposals in WP 5D are currently grouped into two approaches. One approach is focussed on a TRP approach with a reference bandwidth, and another approach based on application of the RR **21.5** limit to the conducted power delivered by a single radiating element.

A Note has been developed between the Chairmen of SG4 and SG5 (document 4A/167 or 5D/407), which provides guidance on the matter. One important guidance given in this document is that "**The preliminary results reached in WP 5D should not impact the protection of satellite services.**". Based on this Note, it may also be noted that Active Antenna System (AAS) are being considered for use in mobile systems operating in bands which are not identified for IMT and are being considered for use in fixed service systems

#### Part C: Current Status of Band

[insert text]

# Part D: Conclusion of the results of studies, if any

#### Conducted power delivered by single transmitter does not protect space services

Power limits defined in Article 21 are intended to protect satellite receivers from interference from terrestrial stations, by limiting the aggregate interference from fixed/mobile stations (including IMT stations) in a satellite uplink beam.

No. **21.5** power limits should apply consistently to all stations in the fixed or mobile service including IMT stations to protect satellite reception, in satellite uplink frequency bands for reception by space stations where the frequency bands are shared with equal rights with the fixed or mobile services. By comparison, the power limit of No. **21.3** (+55 dBW) would not be an effective limit to protect satellite reception noting that 55 dBW is a typical EIRP for VSAT terminals.

The No. **21.5** limit uses the parameter "power delivered by a transmitter to the antenna", which leads to some ambiguity when applying the limits to antennas that use an array of active antennas. One interpretation is that Article 21 limits assume that each radiating element is an "antenna", and hence would apply the limit of No. **21.5** (+10 dBW) to each radiating element. As an example of the impact of such an interpretation, the studies conducted before WRC-19 regarding IMT in the 40 GHz band assumed radiated power per antenna element of 5 dBm (-25 dBW). If the RR **21.5** limit were to be applied to each radiating element, that would allow an IMT base station to operate with radiated power 35 dB higher than was assumed in the ITU-R studies, which would significantly exceed the satellite protection criteria.

Therefore, such an approach will harm satellite services and are in contradiction with the guidance from the Chairmen of Study Group 4 and Study Group 5 in 5D/407.

# A TRP metric based on a reference bandwidth of 200 MHz provides flexibility for terrestrial services and protection for satellites

In the WRC-19 studies, the assumed TRP for IMT base stations in the 26 GHz band was 25.1 dBm per polarisation (i.e. -1.9 dBW for both polarisations combined, expressed in dBW) with an assumed bandwidth of 200 MHz. Hence applying the No. **21.5** limit of 10 dBW to such a station (with reference bandwidth equal to 200 MHz) would not constrain the power and would in fact allow an increase in TRP

by up to 11.9 dB while still meeting the No **21.5** limit. The WRC-19 studies also showed that for the assumed IMT characteristics, interference received by a satellite is approximately 12 dB lower than the criterion<sup>1</sup>. Hence, a TRP approach based on a 200 MHz bandwidth with 10 dBW maximum power would allow some flexibility for an increase on the EIRP level of base stations, either through an increase of the power level (up to RR 21.5 limit) or through an antenna array with a higher number of elements but limits the allowable increase in power to the level which meets the satellite interference criteria.

However, assuming instead a smaller reference bandwidth would not protect satellite services. For example, a reference bandwidth of 1 MHz means that the TRP in 1 MHz of the same base station is -24.9 dBW/MHz and hence the TRP could increase by 34.9 dB compared with the assumed parameters from the ITU-R Task Group 5/1 studies, while meeting the No. **21.5** limit of +10 dBW. This would mean harmful interference, approximately 22.5 dB higher than the satellite receiver criterion.

#### Applicable frequency bands and update to Table 21-2

GSOA supports an update of Table **21-2** to include frequency bands for reception by space stations (Earth-to-space) where the frequency bands are shared with equal rights with the fixed or mobile services (including for IMT stations) and not yet included in Table **21-2**.

GSOA has reviewed the RR 2020 edition and identified, at this stage, the following frequency bands that should be added to Table 21-2:

- FSS allocations in 24.65-25.25 GHz (Region 1), 24.75-25.25 GHz (Region 2), 42.5-43.5 GHz, 47.2-50.2 GHz, 50.4-51.4 GHz and 81-86 GHz.
- MSS allocations in 43.5-47 GHz, 66-71 GHz, and 81-84 GHz.
- ISS allocations in [TBC] GHz

# Part E: Options and Associated Implications

#### Part F: Proposed African Common View and/or Position

RR21.5 power limits should apply to all stations in the fixed or mobile service including IMT stations consistently with the intention of the provision to protect satellite reception, in frequency bands for reception by space stations where the frequency bands are shared with equal rights with the fixed or mobile services.

GSOA supports necessary modifications to Article **21** to enable the application of Article 21 to Active Antenna Systems (AAS) for stations in the fixed or mobile service including IMT stations, in frequency bands for reception by space stations where the frequency bands are shared with equal rights with the fixed or mobile services. For the 26 GHz band, GSOA supports use of the Total Radiated Power (TRP) for AAS antennas and a limit of 10 dBW in a 200 MHz bandwidth. For other frequency bands where AAS antennas could be deployed, limits also need to be developed and GSOA supports same limits as for the 26 GHz band. GSOA also supports an update of Table **21-2** to include frequency bands for reception by

<sup>&</sup>lt;sup>1</sup> For higher frequency bands, studies showed similar margins as compared to 26 GHz band, therefore similar limits as proposed for 26 GHz would be adequate.

space stations (Earth-to-space) where the frequency bands are shared with equal rights with the fixed or mobile services (including for IMT stations). The absence of limits should not be interpreted as there would not be any need for a limit to protect satellite front end receivers in space.

Part G: Recommendations and Way Forward

Part H: Other Regional Groups and international organizations preliminary positions or positions