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|  | ASIA-PACIFIC TELECOMMUNITY | Document No: |
| **The 6th Meeting of the APT Conference Preparatory****Group for WRC-23 (APG23-6)** | **APG23-6/OUT-14** |
| 14 – 19 August 2023, Brisbane, Australia | 18 August 2023 |

Working Party 1

**APT VIEW and Preliminary APT Common Proposal on WRC-19 Document 550**

**Studies on WRC-19 Document 550:**

The following text set out in the Annex to [WRC-19 Document 550](https://www.itu.int/md/R16-WRC19-C-0550/en) was approved and included in the minutes of the meeting as a decision of the conference ([WRC-19 Document 573](https://www.itu.int/md/R16-WRC19-C-0573/en))

***Verification of No. 21.5 for the notification of IMT stations operating in the frequency band 24.45-27.5 GHz which use an antenna
that consists of an array of active elements***

*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. (Responsible Group: WP 5D)*

# 1. Background

At WRC-19, two contributions ([WRC-19 Documents 12!A13](https://www.itu.int/md/R16-WRC19-C-0012/en), [128](https://www.itu.int/md/R16-WRC19-C-0128/en)) in relation to RR No. **21.5** were submitted. This topic was extensively discussed under WRC-19 agenda item 1.13 and the results of discussions were included in WRC-19 [Document 550](https://www.itu.int/md/R16-WRC19-C-0550/en). The text set out in the annex to the [Document 550](https://www.itu.int/md/R16-WRC19-C-0550/en) was approved as a decision of the conference and included in the minutes of twelfth plenary meeting (WRC-19 Document [573](https://www.itu.int/md/R16-WRC19-C-0573/en)).

This outcome of WRC-19 on RR No. **21.5** was brought to the attention of CPM23-1 that requests study be performed in ITU-R. This does not specifically request action or reporting to WRC-23 so is not included in the topics under WRC-23 agenda item 9.1 in Annex 7 to [CA/251](https://www.itu.int/md/R15-CPM19.02-R-0001/en). However, ITU-R WP 5D, as the responsible group, is invited to carry out the requested study as a matter of urgency and to report the results of the study to the Director of the Radiocommunication Bureau to be considered as the Director deems appropriate.

The topic of RR No. **21.5** had been extensively discussed in this study cycle in WP 5D. At the 37th WP 5D meeting, the Note from the Chairmen of Study Group 4 and 5 in Document [5D/407](https://www.itu.int/md/R19-WP5D-C-0407/en) was considered as the guidance of its future work. At its 44th meeting, WP 5D finalized the [final note](https://www.itu.int/dms_ties/itu-r/md/19/wp5d/c/R19-WP5D-C-1776%21H7%21MSW-E.docx) to the Director of the Radiocommunication Bureau. The final note is a very short version which indicates no consensus was reached on several aspects and approaches regarding the studies called for in WRC-19 Document 550 and refers to the Annex 4.5 to the WP 5D Chairman’s Report (Document [5D/1555](https://www.itu.int/md/R19-WP5D-C-1555/en)) which contains a compilation of input documents received.

The studies of the RR No. 21.5 issue is contained in the section 4.3.2 in the [Part 1](https://www.itu.int/dms_pub/itu-r/md/23/wrc23/c/R23-WRC23-C-0004%21A1%21MSW-E.docx) of Report of the Director on the activities of the Radiocommunication Sector (WRC-23 Document [4](https://www.itu.int/md/R23-WRC23-C-0004/en)).

The objective of Article **21** is to ensure terrestrial and space services sharing frequency bands above 1 GHz to operate in a satisfactory manner.

# 2. Documents

* Input Documents APG23-6/[INP-29](https://www.apt.int/sites/default/files/2023/08/APG23-6-INP-29_Japan_WP1_PACP_WRC-23_Agenda_Items.docx) (J), [INP-76](https://www.apt.int/sites/default/files/2023/08/APG23-6-INP-76_Singapore_WP1_PACP_WRC-23_Agenda_Items.docx) (SNG), [INP-78](https://www.apt.int/sites/default/files/2023/08/APG23-6-INP-78_Multicountry_PACP_on_WRC-19_document_550_RR__21.5..docx) (NZL, KOR), [INP-80(Rev.1)](https://www.apt.int/sites/default/files/2023/08/APG23-6-INP-80R1_Australia_WP1_PACP_WRC-23_Agenda_Items_and_WRC-19_Document_550.docx) (AUS), [INP-103](https://www.apt.int/sites/default/files/2023/08/APG23-6-INP-103_China_WP1_PACP_WRC-23_Agenda_Items.docx) (CHN)
* Information Documents APG23-6/[INF-02](https://www.apt.int/sites/default/files/2023/06/APG23-6-INF-02_WMO_Position_on_WRC-23_Agenda.docx) (WMO), [INF-10](https://www.apt.int/sites/default/files/2023/07/APG23-6-INF-10_Brief_on_RR_No._21.5.docx) (DG Chair), [INF-28](https://www.apt.int/sites/default/files/2023/08/APG23-6-INF-28_GSOA_Positions_on_WRC-23_Agenda_Items_0.docx) (GSOA), [INF-40](https://www.apt.int/sites/default/files/2023/08/APG23-6-INF-40_GSMA_Views_WRC-23_for_mobile.docx) (GSMA Hong Kong), [INF-45](https://www.apt.int/sites/default/files/2023/08/APG23-6-INF-45_Status_of_RCC_preparation_to_WRC-23.pdf) (RCC), [INF-46](https://www.apt.int/sites/default/files/2023/08/APG23-6-INF-46_Status_of_CEPT_preparation_for_WRC-23_and_RA-23.pdf) (CEPT), [INF-55](https://www.apt.int/sites/default/files/2023/08/APG23-6-INF-55_ATU_Preparation_for_RA_and_WRC-23_0.docx) (ATU)

# 3. Summary of discussions

## **3.1 Summary of APT Members’ views**

### **3.1.1 Australia - Document APG23-6/**[**INP-80(Rev.1)**](https://www.apt.int/sites/default/files/2023/08/APG23-6-INP-80R1_Australia_WP1_PACP_WRC-23_Agenda_Items_and_WRC-19_Document_550.docx)

* For the verification of IMT stations using Active Antenna Systems (AAS) and operating in the 24.25-27.5 GHz band, Australia supports using a total radiated power within a defined reference bandwidth to capture the “power delivered to the antenna of a station” in RR No.21.5. Australia is considering a reference bandwidth of 50 MHz, 100 MHz or 200 MHz.
* Australia does not support change to the Radio Regulations to address [WRC-19 Document 550](https://www.itu.int/md/R16-WRC19-C-0550/en). Australia opposes continuation of this work in the WRC-27 study cycles.
* Australia proposes a Preliminary APT Common Proposal as follows:



### **3.1.2 China (People’s Republic of) - Document APG23-6/**[**INP-103**](https://www.apt.int/sites/default/files/2023/08/APG23-6-INP-103_China_WP1_PACP_WRC-23_Agenda_Items.docx)

* China is of the view that all transmitter units in an AAS of an IMT station shall be treated as “a transmitter” of RR No. **21.5** when these units are operating at same frequency band. These units shall be treated as an independent transmitting antenna in a frequency assignment notification.
* China proposes when notifying a frequency assignment of a mobile service station that uses an antenna which consists of an array of active elements in the frequency range 24.45-29.5 GHz, the Item Identifier 8AA shall be the value of an integrated power delivered by all transmitter units of that antenna (AAS) over the notified necessary bandwidth. Practically, China proposes the “Total Radiated Power (TRP[[1]](#footnote-1)) of that antenna (AAS) over the notified necessary bandwidth can be used to fill the Item Identifier 8AA.
* For verification of RR No. **21.5** issue, China proposes that the value filled in Item Identifier 8AA shall directly check against the limits stipulated in the RR No. **21.5**.
* For update of Table 21-2 issue, China is of the view that the consistence should be ensured in Radio Regulations when the frequency bands are shared by terrestrial service and satellite service with equal rights.

### **3.1.3 Japan - Document APG23-6/**[**INP-29**](https://www.apt.int/sites/default/files/2023/08/APG23-6-INP-29_Japan_WP1_PACP_WRC-23_Agenda_Items.docx)

Japan is of the view that:

* For the notification of IMT AAS stations, the total radiated power (TRP) (i.e., the integral of the power transmitted from all antenna elements in different directions over the entire radiation sphere) should be filled in the Item Identifier 8AA in Table 1 of Appendix **4** of RR.
* For the verification of the notified IMT AAS stations, the following equation should be applied when assessing conformity with the “+10 dBW” limit stipulated in RR No. **21.5**.

$$P\_{ }- 10log\_{10}\left(\frac{BW}{200}\right)\leq 10 dBW$$

where *P* is the value of TRP in dBW notified in the Item Identifier 8AA and BW is the necessary bandwidth of the IMT station’s emission in MHz notified in the Item Identifier 7AB in Table 1 of Appendix 4 of RR, respectively. In the above equation, the value of “200” MHz is introduced to avoid a restriction of IMT AAS stations that uses a large channel bandwidth beyond 200 MHz.

* At WRC-23, discussion should focus on the frequency band 24.45-27.5 GHz, and the approach described in the above two bullets should be agreed to address the notification and verification of IMT AAS stations in that frequency band. The agreement should be reflected in the RR, accordingly.
* After the agreement in the frequency band 24.45-27.5 GHz, discussion can be extended to IMT AAS stations using other frequency bands shared with the space services (Earth-to-space).
* Furthermore, considering potential future technology innovation of IMT AAS stations employing beyond +10 dBW per 200 MHz bandwidth, but reduced interference to satellite receivers, an additional measure that allow for notification of such IMT AAS stations should be considered (e.g., EIRP mask as a function of vertical angel above the horizon).

### **3.1.4 New Zealand and Korea (Republic of) - Document APG23-6/**[**INP-78**](https://www.apt.int/sites/default/files/2023/08/APG23-6-INP-78_Multicountry_PACP_on_WRC-19_document_550_RR__21.5..docx)

* New Zealand and Republic of Korea do not support change to the Radio Regulations to address WRC-19 Document 550 and do not support the continuation of this discussion into the next study cycle or at WRC-27 (e.g. with a new Agenda Item).
* New Zealand and Republic of Korea maintain the view that only the 24.25 – 27.5 GHz is within scope of WRC-19 Document 550 and proposals / solutions should not extend nor address other frequency bands outside of the 24.25 – 27.5 GHz frequency range.
* New Zealand and Republic of Korea are of the view that the sharing and compatibility studies performed for WRC-19 Agenda Item 1.13 should not be revisited nor should those assumptions be used as a basis for the addressing WRC-19 Document 550. All the necessary conditions are within Resolution **242 (WRC-19)**.
* It is noted that the consigning APT Members also maintain their views and positions previously submitted to APG meetings / and have submitted separate inputs to APG23-6 with their additional views.
* New Zealand and Republic of Korea propose the following Preliminary APT Common Proposal:



* Regarding the way or working in APG23-6, it is suggested that the proposals/views remain in the section 4, “**APT View(s)**” of the APT OUTPUT, if APG23-6 agree. If APG23-6 does not agree then APT Views should be developed in a way to maximize the commonality among APT member’s view. If some of above views are not included in the section 4, the remaining parts should be included in section 6, “**Issue for Consideration Meeting at WRC-23 (if any)**” for further consideration during APT Coordination meeting (see also [APG23-6/INP-09](https://aus01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.apt.int%2Fsites%2Fdefault%2Ffiles%2F2023%2F07%2FAPG23-6-INP-09_TMP_and_OUT_Template_for_PACP.docx&data=05%7C01%7CCraig.Scott2%40mbie.govt.nz%7C93597801c5d04f7381e608db8be7f005%7C78b2bd11e42b47eab0112e04c3af5ec1%7C0%7C0%7C638257601569799172%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000%7C%7C%7C&sdata=KygkeMHSHqT%2Bfr3lC%2B6MxLuZaDlfg%2F4RPBpYealLBEU%3D&reserved=0)).

### **3.1.5 Singapore (Republic of) - Document APG23-6/**[**INP-76**](https://www.apt.int/sites/default/files/2023/08/APG23-6-INP-76_Singapore_WP1_PACP_WRC-23_Agenda_Items.docx)

* For the application of No. **21.5** to IMT stations using AAS in the 26 GHz, to ensure satellite protection while not constraining the use of IMT, Singapore supports the use of total radiated power (TRP) with an appropriate reference bandwidth.
* Singapore supports the application of a bandwidth adjustment factor, to take account of IMT base stations that use higher and lower bandwidth than the reference bandwidth. As a first step, the outcome of the work should address the verification of compliance with No. **21.5** for the notification of IMT AAS stations. Singapore also supports consideration of possible revisions using other metrics to the RR Article 21, to clarify the application of No. **21.5** for stations with AAS antennas.

## **3.2 Summary of issues raised during the meeting**

* Some APT Members are of the view that the reference bandwidth needs to be further discussed at WRC-23.
* Some APT Members are of the view that frequency range 27.5-29.5 GHz should be considered in issues on WRC-19 Document 550.
* Some APT Members oppose any work on this topic in WRC-27 study cycle.
* Some APT Members support using a total radiated power within a specific reference bandwidth to capture the “power delivered to the antenna of a station” in No. **21.5**. Some APT Members are considering a reference bandwidth of 50MHz, 100MHz or 200 MHz.
* Some APT Members are of the view that administrations may choose the power from a single transmitter or TRP when notifying an IMT station using AAS for item 8AA.
* Some APT Members are of the view that update to Table **21-2** is needed in order to keep consistency with the Radio Regulations.
* The following text was developed by the Drafting Group as a potential PACP. However, consensus was not reached during the meeting.

“*APT Members support NOC to RR to address the issues contained in WRC-19 Document 550 expecting consensus to be reached on the substance/objective of WRC-19 Doc 550 at WRC-23*

*In addition to the existing provisions and procedures in the RR, including Article* ***21*** *for verification and notification of stations regarding conducted power, APT Members are also of the view that TRP as the equivalent value of the power delivered to the antenna in the frequency assignment notification of IMT station using AAS can be used. For the verification of RR No.* ***21.5*** *regarding IMT stations in the 24.45-27.5 GHz frequency band, APT Members are considering using the data item 8AA against the limit stipulated in RR No.* ***21.5*** *with a reference bandwidth when provided in TRP.*

*Based on this issue being resolved at WRC-23, APT Members oppose establishing an agenda item on this topic for WRC-27.*”

# 4. APT View(s)

The APT has considered the studies on WRC-19 Document 550 but has not developed a Preliminary APT Common Proposal on the matter. However, the APT has agreed on the following view(s).

* APT Members are of the view that possible and practical alternative approaches/solutions merit to be considered.
* APT Members are of the view that appropriate regulatory provisions/measures for the operation of terrestrial IMT and space services and their future development in a balanced and fair manner are necessary.
* APT Members are of the view that change to RR No. **21.5** may not be necessary at this stage to address the issues raised in Document 550 of WRC-19.

# 5. Preliminary APT Common Proposal

None

# 6. Issues for Consideration at APG Coordination Meeting at WRC-23 (if any)

APT Members are encouraged to consider the issues raised during the APG23-6 meeting (Section 3.2), as well as considering the views of other regional organizations, to provide a possible solution/method on this matter at WRC-23.

# 7. Views from Other Organisations

## **7.1 Regional Groups**

### **7.1.1 CEPT - Document APG23-6/**[**INF-46**](https://www.apt.int/sites/default/files/2023/08/APG23-6-INF-46_Status_of_CEPT_preparation_for_WRC-23_and_RA-23.pdf)

*Note: The term AAS is used here as a shortcut for “stations in the mobile service, including IMT stations, and the fixed service that use an antenna that consists of an array of active elements”*

* Proposed short-term approach at WRC-23 for notification and verification of AAS in the frequency range 24.45-29.5 GHz

For the purpose of verification of RR No. **21.5** in the notification of stations in the mobile service, including IMT stations, and stations in the fixed service, that use an antenna that consists of an array of active elements in the frequency range 24.45-29.5 GHz, CEPT is of the view that the “power delivered by a transmitter to the antenna of a station” in RR No.**21.5** can be considered as the “total radiated power” (TRP), which is defined as the integral of the power transmitted from all antenna elements in different directions over the entire radiation sphere (noting it is mathematically equivalent to the sum of conducted powers from all internal transmitters, minus ohmic losses).

The limit 8AA <= 10dBW for notification of base stations that use an antenna that consists of an array of active elements. The following other fields would have to be documented in every notification:

9G = maximum gain of the AAS

8B = 8AA + 9G

7AB = necessary bandwidth of the IMT transmission (current 50, 100, 200 or 400 MHz)

The European Common Proposal proposes to implement the short-term solution at WRC-23 through revision to RR Article **21**, in particular a new provision **21.5B** applicable to AAS in the frequency range 24.45-29.5 GHz, and to merge entries in Table 21-2 for the frequency band 24.45-29.5 GHz.

* Review of RR No.**21.5** and possible actions to be considered by a subsequent WRC

CEPT is considering whether the same approach as for the interim solution could be applied in frequency bands used for reception by space stations, though not excluding alternative solutions. Any solution should ensure that it does not impact the protection of satellite reception.

* Issue C

CEPT considers to develop the updates of Table 21-2 of RR Article **21** to include the following frequency bands, where reception by space stations is to be protected when these bands are shared with equal rights with the fixed and mobile services:

* 24.45-27.5 GHz, 40-40.5 GHz, 42.5-43.5 GHz, 45.5-47 GHz, 47.2-48.2 GHz, 66-71 GHz, which are identified for IMT and might be used by stations with AAS, and
* 43.5-45.5 GHz, 48.2-50.2 GHz, 50.4-51.4 GHz

CEPT will assess whether the limit in No.**21.5** has to be adapted for the frequency band above 29.5 GHz (see above).

### **7.1.2 RCC - Document APG23-6/**[**INF-45**](https://www.apt.int/sites/default/files/2023/08/APG23-6-INF-45_Status_of_RCC_preparation_to_WRC-23.pdf)

* Issue A – Notification of IMT station with AAS

Temporarily, unless modified by WRC-23, **Item 8AA** in Table 1 of RR Appendix 4 “the power delivered to the antenna” for notification of the IMT stations with AAS **shall be** the value of the “**total radiated power**” (TRP), defined as in Resolution 243 (WRC-19) and Resolution 750 (Rev. WRC-19).

* Issue B – Verification of notifying IMT station with AAS

Keep **unchanged the limit** of power level in RR Article 21 **No. 21.5** with **adjustment factor** regarding the bandwidth of IMT station with AAS.

### **7.1.3 ATU - Document APG23-6/**[**INF-55**](https://www.apt.int/sites/default/files/2023/08/APG23-6-INF-55_ATU_Preparation_for_RA_and_WRC-23_0.docx)



## **7.2 International Organisations**

### **7.2.1 WMO - Document APG23-6/**[**INF-02**](https://www.apt.int/sites/default/files/2023/06/APG23-6-INF-02_WMO_Position_on_WRC-23_Agenda.docx)

* WMO supports the approach to ensure that no impact will occur in the band 25.5–27 GHz on EESS (space-to-Earth) operations due to the future deployment of co-frequency IMT systems that use an antenna that consists of an array of active elements. Regarding the notification of such IMT systems, WMO supports that a temporary approach be developed for the notification and verification of IMT stations with an array of active elements with respect to RR No **21.5** in the frequency band 25.5–27 GHz before an appropriate competent WRC decision is taken.

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1. The concept of TRP can be referred to as “*the integral of the power transmitted from all antenna elements in different directions over the entire radiation sphere*” in Resolution **243 (WRC-19)** and Resolution **750 (Rev.WRC-19)** [↑](#footnote-ref-1)