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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 6 to Document 4-E** | |
| **11 August 2023** | |
| **Original: English** | |
| Director, Radiocommunication Bureau | | | |
| REPORT OF THE DIRECTOR to WRC-23 ON THE ACTIVITIES OF THE RADIOCOMMUNICATION SECTOR | | | |
| part 6  Analysis of the methods contained in the CPM report to satisfy agenda items of WRC-23 | | | |

# 1 Introduction

This part of the BR Director’s Report presents observations about potential difficulties in implementing by the Bureau some of the methods contained in the CPM Report to satisfy certain WRC-23 agenda items. Concerning WRC-23 agenda items which are not listed in this document, the Bureau has not identified any specific implementation difficulties at this stage.

The document has been developed following discussions within ITU-R, where views were expressed that it would be useful if the BR assessed the implementability of the methods contained in the CPM Report.

An additional element that triggered the development of this document was the experience of WRC‑19 work on the resolutions concerning HAPS. During the HAPS related discussions and at the request of administrations the Bureau was checking the implementability of the proposed conditions of HAPS operation. This WRC-19 experience has shown the utility of making such analysis well prior to a WRC, to avoid doing this work during the limited time of the Conference.

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# 2 Analysis of the methods contained in the CPM Report

| **AI** | **Section/**  **Method** | **CPM Report text** | **Observations/ difficulties** | **Possible solutions** |
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| 1.0 | All |  | When the Bureau can not examine a power limit or any other condition contained in a RR provision or a Resolution, because no method exists, necessary data are not notified or due to other difficulties, a commitment of the notifying administration to comply with the limit or such condition could be indicated in the notice. | To add a new data item to Annex 1 or 2 of RR Appendix **4** - a commitment of the notifying administration to comply with a power limit or a condition.  The item should reference the *provision* or *Resolution* under which the commitment is required. |
| 1.1 | 1/1.1/5.3 Methods C and D, Alternative 5 | *Alternative 5:* pfd of −117 dB(W/(m² · MHz)) produced up to 19 km above sea level at the external boundary of exclusive economic zone, as officially recognized by the coastal State, for the protection of AMS in the frequency bands 4 800-4 825 MHz and 4 835-4 950 MHz and −115 dB(W/(m² · 1 MHz)) produced up to 30 m above sea level at the external boundary of exclusive economic zone, as officially recognized by the coastal State, for the protection of MMS in the frequency band 4 800-4 990 MHz. | Difficulty to identify the borders of an exclusive economic zones (EEZ), due to the fact that there is no ITU agreed or officially recognised global map of EEZ. A number of overlapping EEZ are contested and still in discussions between the countries concerned.  BR does not have maps of “*exclusive economic zone as officially recognized by the coastal State*” either. | To indicate in Resolution **223 (Rev.WRC-23)** that BR does not make examination of this limit, OR  2. To provide BR with an ITU agreed map of exclusive economic zones or to indicate the link/reference to such map, OR  3. Each administration of No. **5.441B**, for which the pfd limit applies, should provide the map of its exclusive economic zones “as officially recognized” by the administration. |
| 1.2 | 1/1.2/5.7.3  Methods 6B and 6C | Draft new Resolution **[C12-10GHz]**:  *resolves 3bis*: that the maximum e.i.r.p. of the IMT base stations antenna shall not exceed 5 dBW for all elevation angles above 34 degrees | BR has no means to calculate the limit since the antenna diagram in the vertical plane is not required for notification by RR Appendix **4**. | 1.To make mandatory the notification of the antenna diagram of an IMT base stations in vertical plane (for non-adaptive antenna systems), OR  2. A commitment of the notifying administration to comply with this limit. |
| *resolves 4*: that, for the purposes of protecting the Earth exploration-satellite service (EESS) (passive), the unwanted emission level per IMT base station shall not exceed −43 dBW/TBD in the frequency band 10.6-10.7 GHz | BR has no means to examine the unwanted emission limit since the emission level outside the main band is not notified. | A commitment of the notifying administration to comply with this limit. |
| *resolves 5*: that, for the purposes of protecting the Earth exploration-satellite service (EESS) (passive), the unwanted emission level per IMT user equipment shall not exceed −41 dBW/TBD in the frequency band 10.6-10.7 GHz  *resolves 6*: that the power flux received at such radio astronomy stations in the band 10.68-10.7 GHz by these stations shall not exceed –167 dB(W/m2) |
| 1.3 | 1/1.3/5.3.1 Method C, Alt. C1  1/1.3/5.3.2 Method C, Alt. C2  1/1.3/5.5 Method E1,  1/1.3/5.6 Method E2 | ADD 5.A13-C1, ADD 5.B13-C2, ADD 5.X13, ADD 5.Y13-1 and 5.Y13-2, which establish pfd limits at the border of the territory of any other administration. | The proposed examples are invoking a pfd limit but there are no calculation methods, specifying the propagation model in the CPM Report for checking the conditions of these allocations. | To provide the calculation methods.  Alternatively, a Rule of Procedure needs to be developed after WRC-23 to specify the methods. |
| 1/1.3/5.3.4 For Method C, Alternative C4 | ADD 5.C13-C4, which allocates the 3 600 – 3 800 MHz band to the mobile, except aeronautical mobile, service subject to agreements with the other administrations obtained under No. **9.21**. | There are no criteria for identification of affected administrations under the No. **9.21** procedure, calculation methods and the propagation model in the CPM Report for checking the conditions of this allocation. | To provide the criteria and calculation methods.  Alternatively, a Rule of Procedure needs to be developed after WRC-23 to specify the criteria and methods. |
| 1.4 | 1/1.4/5.1.5 Methods A2, A3, and A4 | Draft new Resolution **[A14-HIBS 694-960 MHZ]:**  Example 2 for *resolve*s 6.3: for the purpose of protecting radio astronomy stations in the frequency band 1 610.6-1 613.8 MHz, the power flux density (pfd) of HIBS downlinks operating in the frequency band 805.3-806.9 MHz shall not exceed the following value in the frequency band 1 610.6-1 613.8 MHz at any radio astronomy station without agreement of the affected administrations: −194 dB(W/(m2 · 20 kHz) | BR has no means to examine the unwanted emission limit since the emission level outside the main band is not notified | A commitment of the notifying administration to comply with this limit |
| Draft new Resolution **[A14-HIBS 694-960 MHZ] (WRC-23)**: Example 3 for resolves 3; Example 1 for *resolves* 5; Example 2 for resolves 4.4 and 5; Example 1 for resolves 6.1; Example 2 for resolves 6.1 and 6.2; Example 3 for resolves 6.1. |  |  |
| 1/1.4/5.2.5 Methods B2, B3 and B4  and  1/1.4/5.3.4 Method C2 and C3 | Resolution **221 (REV.WRC-23)**: Example for *resolves* 1.1; Examples 1 and 3 for: resolves 1.2 and 1.3; Example 2 for resolves 1.2; and Examples 1, 2 and 3 in resolves 1.6. | The proposed examples are invoking a pfd limit but there are no calculation methods, specifying the propagation model, i.e., percentage of time and locations, etc.,specified in the CPM Report for checking the conditions of these resolves. | To provide the calculation methods.  Alternatively, a Rule of Procedure needs to be developed after WRC-23 to specify the methods |
| 1/1.4/5.4.5 Methods D2, D3 and D4 | Draft new Resolution **[B14-HIBS 2 500-2 690 MHz]:** Examples 1 and 3 in resolves 1.1 and 1.2; Example 2 in resolves 1.1; Examples 1 and 2 in resolves 1.3; and Examples 1 and 2 for resolves 1.4. | The proposed examples are invoking a pfd limit but there are no calculation methods, specifying the propagation model, i.e., percentage of time and locations, etc.,specified in the CPM Report for checking the conditions of these resolves. | To provide the calculation methods.  Alternatively, a Rule of Procedure needs to be developed after WRC-23 to specify the methods |
|  | Draft new Resolution **[B14-HIBS 2 500-2 690 MHz]:**  Resolves 1.5 for the purpose of protecting aeronautical-radionavigation service systems in the territory of other administrations in the frequency band 2 700-2 900 MHz, the power flux-density (pfd) level from HIBS operating in the frequency band 2 500-2 690 MHz produced at the surface of the Earth in the territory of other administrations shall not exceed the following unwanted emissions limit, unless explicit agreement of the affected administration is provided:  −156.2 dB(W/(m2 · MHz)) for θ ≤ 7°  −163 + 15 · *log10* (θ − 4) dB(W/(m2 · MHz)) for 7° < θ < 30.5°  −141 + 2.7 · *log10* (θ − 4) dB(W/(m2 · MHz)) for θ = 30.5°  −157 + 14 · *log10* (θ − 4) dB(W/(m2 · MHz)) for 30.5° < θ ≤ 40.5°  −101.5 dB(W/(m2 · MHz)) for θ > 40.5°  where θ is the angle of arrival of the incident wave above the horizontal plane, in degrees  Examples 1 and 2 for resolves 1.6 for the purpose of protecting radiolocation service systems in the territory of other administrations, in particular those systems operating in accordance with No. **5.423**, in the frequency band 2 700-2 900 MHz, the [agregate ]power flux-density (pfd) level from HIBS operating in the frequency band 2 500-2 690 MHz produced at the surface of the Earth in the territory of other administrations shall not exceed the following unwanted emissions limit, unless explicit agreement of the affected administration is provided:  −165.6 dB(W/(m2 · MHz)) for θ ≤ 37°  −165.6 + 5.5 (θ − 37) dB(W/(m2 · MHz)) for 37° < θ < 45°  −121.6 + (θ − 45) / 3 dB(W/(m2 · MHz)) for 45° < θ ≤ 90°  where θ is the angle of arrival of the incident wave above the horizontal plane, in degrees,  Example 1 for *Resolves* 1.7 for the purpose of protecting radio astronomy service stations in the frequency band 2 690-2 700 MHz, the power flux-density (pfd) level of HIBS operating in the frequency band 2 500-2 690 MHz produced at any radio astronomy observatory site shall not exceed the following unwanted emissions limit, unless explicit agreement of the affected administration is provided: −177 dB(W/(m2 · 10 MHz))  Example 2 for *Resolves* 1.7 that, to protect radio astronomy stations operating in the frequency band 2 690-2 700 MHz from unwanted emissions of HIBS operating in the frequency bands 2 500-2 690 MHz, the separation distance between the radio astronomy station and the nadir of a HIBS platform shall exceed the radio horizon for the specific operating altitude of the HIBS platform (see also No. **29.12**);  Examples 1 and 2 for *resolves 1.9:* that for the purpose of protecting MSS (space-to-Earth) and RDSS (space-to-Earth) in the frequency band 2 483.5-2 500 MHz, the use of HIBS platform in the frequency band 2 500-2 690 MHz shall comply with an unwanted emission limit of [−13 / −30] dBm/MHz in the frequency band 2 483.5-2 500 MHz | BR has no means to examine the unwanted emission limit since the emission level outside the main band is not notified | A commitment of the notifying administration to comply with this limit |
| 1.11 | 2/1.11/5.3  Methods C2, C3 | MOD **5.364**:  GMDSS stations operating in the maritime mobile-satellite services in the frequency band [1 610.00-1 610.5/1 610.18-1 618.34] [1 610.18-1 621.35] MHz shall not claim protection from stations operating in accordance with the provisions of No. **5.367**. | BR has no data item provided in the notice to identify if the notified station is used for GMDSS or not. | To add a new data item to Appendix **4** - an indication that the station is for GMDSS |
| 1.16 | 4/1.16/5.2 Method B | Annex 1, Part 2 of draft new Resolution **[A116]**  Annex 2 of draft new Resolution **[A116]** | 1) Section 2.1 of Annex 1, Part 2 of draft new Resolution **[A116]** two reference bandwidths (14 MHz an 1 MHz) are provided as two options for altitude at and above 3 km. Since methodology is comparing EIRP at different altitude it would require adjusting PFD-limit reference bandwidth from 14 MHz to 1 MHz which is also used for altitude below 3 km.  2) Section 2.3 of Annex 1, Part 2 of draft new Resolution **[A116]** contain a figure for fuselage loss, whereas the fuselage loss model presented in Annex 2 (Methodology) is defined using formulas.  3) Section 2.3 of Annex 1, Part 2 of draft new Resolution **[A116]** refers to the use free-space propagation model while Annex 2 (methodology) contains a procedure to also calculate atmospheric attenuation.  4) Section 4 Example application of the methodology in Annex 2, Part 2 of draft new Resolution **[A116]** the text below the two Tables A2-10 implies that the Bureau will give favorable finding in case at least one emission will be favourable (and another unfavourable). This is contrary to the current practice of the Bureau where findings are given by frequency assignments (i.e. unfavourable emission(s) is/are removed from the group with favourable finding).  5) ITU-R Study Group 4 recently developed a *draft new recommendation ITU-R S.[method]*, which includes the methodology for examination of A-ESIM against the pfd limits to protect the terrestrial services. | 1) Keep only one reference bandwidth of 1 MHz.  2) Align Section 2.3 of Annex 1, Part 2 of draft new Resolution **[A116]** by replacing figure with the formulas contained in Annex 2, Table A2-6.  3) Align the wording of Section 2.3 of Annex 1, Part 2 of draft new Resolution **[A116]** with propagation model used in Annex 2, e.g. *shall be obtained using free-space propagation, atmospheric loss and attenuation due to the aircraft fuselage*  4) Simplify the mention of the process of establishing findings by the Bureau by removing the text below the Tables A2-10 and removing Attachment to Annex 2. |
| 1.17 | 4/1.17/5.2 Method B1  4/1.17/5.3 Method B2  4/1.17/5.4 Method B3  4/1.17/5.5 Method B4 | Draft New Resolutions **[A117-B1]**, **[A117-B2]**, **[A117-B3]**, **[A117-B4]** | 1) The Bureau expects receiving questions with respect to the application of Nos. **22.5C, 22.5D, 22.5F** for non-GSO using space-to-space operations in the frequency bands 11.7-12.7 GHz, 17.8-18.6 GHz, 19.7-20.2 GHz, 27.5-28.6 GHz, 29.5-30 GHz.  These questions may be related both to:  a) How parameters previously submitted for Article 22 EPFD examination (in particular, A.4.b.6.a, A.4.b.7, A.14) will cover operation in space-to-space direction  b) How properly define parameters above to make sure that from operational perspective they will cover all types of transmissions including in space-to-space direction.  Current regulatory solutions in CPM Report does not contain any examples or considerations which help to address these questions.  Moreover, the Bureau notes that some proposed additional parameters may need to be cross validated with respect to parameters submitted for EPFD validation.  For example, the condition that the off-nadir angle between GSO or non-GSO FSS space station and the non-GSO space station it communicates with should be less than or equal to θMax relies on definition of θMax which is taking into account that non-GSO satellite already communicates with any earth station above 0 degree elevation. This assumption may be in contradiction with the information provided for Nos. **22.5C**, **22.5D** in RR Appendix **4 A.4.b.7.cbis** - the minimum elevation angle at which any associated earth station can transmit to or receive from a non-geostationary satellite for the frequency bands 27.5-28.6 GHz, 29.5-30 GHz and 11.7-12.7 GHz, 17.8-18.6 GHz, 19.7-20.2 GHz.  If Article 22 examination was previously carried out using **A.4.b.7.cbis** greater than 0 degrees, enabling space-to-space operation may require changing **A.4.b.7.cbis** to 0 and re-evaluating the limits.  2) *resolves* 1a) provide condition shall only operate space-to-space links when its apogee altitude is lower than the minimum operational altitude of the GSO or non-GSO FSS space station it communicates with, which may be misleading when refering to GSO satellite networks (for which the minimum operational altitude of should be derived from the definition of GSO or, if not considered appropriate, be submitted under RR Appendix 4). | 1) To consider providing technical examples or guidance for verifying that space-to-space operation will be within submitted parameters for EPFD examination.  To consider modifying definition of θMax for the bands subject to Nos. **22.5C**, **22.5D** to include previously submitted A.4.b.7.cbis in calculations or restricting non-GSO space station **main-beam** pointing to another non-GSO or GSO at elevation angle (as visible from the point on the Earth which is intersect of the line on which two communicating satellites are operating and Earth surface) below A.4.b.7.cbis.  2) Reword this condition as *shall only operate space-to-space links when its apogee altitude is lower than GSO satellite orbit height it communicates with or minimum operational altitude of non-GSO FSS space station it communicates with.* |
| 7 | 4/7/10.4.2 Method J2  4/7/10.4.2 Method J3  4/7/10.4.4 Method J4  4/7/10.4.5 Method J5 | MOD Resolution **76** (Rev.WRC‑15) | 1) 4/7/10.4.2 Method J2  MOD Resolution **76** (Rev.WRC‑15)  instructs the Radiocommunication Bureau 3 requires the Bureau to develop aggregate epfd calculation tools based on relevant ITU‑R Recommendations.  The Bureau understands that this development will be based on complete methodology either developed within ITU-R or agreed by consultation meetings and there will be no need for the Bureau to develop methodology itself using the elements of relevant ITU-R Recommendations. At the same time this methodology may need to be updated frequently taking into account specificity of particular non-GSO system or difficulties encountered by the Bureau. As such consultation meetings may be tasked to provide necessary updates to the methodology.  2) The Bureau understands that it will participate in the consultation meetings. | 1) To clarify that the Bureau will be required to implement only the tool:  *implement aggregate epfd calculation tool using the methodology once it is developed under invites the ITU Radiocommunication Sector and following the guidance provided by consultation meetings* |

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