Radiocommunication Bureau (BR)

Circular Letter   8 April 2024
CR/503

To Administrations of Member States of the ITU

Subject:	**The use of transmitted power defined using averaging bandwidth in accordance with Recommendation ITU-R SF.675 for calculations of power flux-density and equivalent isotropically radiated power limits in Articles 5, 21 and 22 of the Radio Regulations**

Footnote 2 to Tables A, B, C and D of Annex 2 to Appendix **4** of the Radio Regulations (RR) as modified by WRC-12 indicates to use the most recent version of Recommendation ITU-R SF.675 to calculate the maximum power spectral density of carriers. To determine the maximum power spectral density of different types of carriers, it recommends considering the maximum possible number of carriers occupying a given averaging bandwidth. The maximum power density is averaged over the worst 4 kHz for carriers below 15 GHz and 1 MHz for carriers at or above 15 GHz.

It is important that administrations follow this footnote when providing RR Appendix **4** data items for examinations of power limits to lead to findings in compliance with the provisions of the Radio Regulations.

Regarding this requirement, the Bureau observed that, for a large number of emissions contained in submissions having a necessary bandwidth less than the averaging bandwidth, the maximum power density is based on a single carrier occupying the averaging bandwidth. This is contrary to real systems where multiple carrier operations could be envisaged, particularly considering that the frequency assignment group bandwidth far exceeds the necessary bandwidth of an emission for those above-mentioned cases.

In the Director's Report (see Section 3.2.5.2.2 of Revision 1 to Addendum 2 to Document WRC-15/4), the Radiocommunication Bureau informed WRC-15 on the requirement for administrations to use Recommendation ITU-R SF.675 to calculate the maximum power spectral density and submit the data in accordance with RR Appendix **4**.

WRC-15 suggested that this detailed issue be referred to the appropriate ITU-R Study Group for further consideration.

During the ITU-R Study Cycles 2015-2023, the Bureau presented contributions on this matter explaining the problem and providing status reports to Working Parties of ITU-R Study Groups 4 and 7.

At the same time, the Bureau took additional steps to gradually align power flux-density (pfd) calculation method which uses the maximum power definition in accordance with Recommendation ITU-R SF.675. These steps are detailed below.

Implementation of space validation rules

New validation rules were implemented in the Space Validation software (v. 8.0.5), and subsequently transferred into the BRSIS Validation software, to issue a warning when an inconsistency between the defined peak power and the power spectral density is detected at the time of preparation of the notice forms for submission of a request for coordination or a notification. These new validation rules have been released in BR IFIC 2842 (04.04.2017).

The goal of these validation checks was to help and remind administrations to use the most recent version of Recommendation ITU-R SF.675 in their calculations of maximum power densities.

With the new space Validation rules already implemented for almost 7 years, administrations would have been accustomed to the requirement to use Recommendation ITU-R SF.675 in the calculation of maximum power densities.

New version of GIBC software

A new version of GIBC software (v9.1) was released in BR IFIC 2985/29.11.2022, implementing the new calculation method aligned with Recommendation ITU-R SF.675. An option was added to the GIBC PFD/EIRP GSO, GIBC PFD/EIRP NGSO modules to calculate the transmitted power using Recommendation ITU-R SF.675.

The detailed steps of the new calculation method aligned with Recommendation ITU-R SF.675 are given in Annex 1.

With this additional option, administrations can check the compliance with pfd and equivalent isotropically radiated power (e.i.r.p.) limits in Articles **5**, **21** and **22** of the Radio Regulations using a calculation method based on deriving the maximum power value in accordance with Recommendation ITU-R SF.675.

Introduction of online examination tool "e-Examination"

The new online examination tool "e-Examination" was introduced in the e-Submission online platform on 1st October 2023 in order to assist users to verify if their satellite networks or earth stations uploaded in e-Submission are in compliance with pfd and e.i.r.p. limits specified in the Radio Regulations.

All pfd and e.i.r.p. limits calculations carried out in e-Examination are using, by default, calculation method based on deriving the maximum power value in accordance with Recommendation ITU-R SF.675.

Although e-Examination results are only for informational purposes and definitive regulatory findings will be established by the Bureau during its examination under No. **9.35/11.31** of the Radio Regulations, additional information provided by the e-Examination tool can help administrations to review the characteristics of their frequency assignments to minimize the risk of receiving unfavorable findings during the Bureau examinations.

Detailed information and guidelines on the e-Examination tool can be found here:

https://www.itu.int/en/ITU-R/space/support/Pages/e-Examination-guide.aspx

Effective date of application of the calculation method aligned with Recommendation ITU-R SF.675

With the above measures taken to gradually implement the new calculation method aligned with Recommendation ITU-R SF.675, the Bureau will start applying this new method for all the frequency assignments received from 1st May 2024.

The same method will apply to frequency assignments subject to coordination that are received for notification on or after 1st May 2024, even if the corresponding frequency assignments were submitted for coordination before this date.

The regulatory examination of all frequency assignments received prior to 1st May 2024 will be carried out using the legacy method in Annex 1.

Support and Contacts

The Bureau remains at your disposal, via the brmail@itu.int address, for any clarification or assistance you may require on matters related to this circular letter.

For any questions related to GIBC software, please address them the brsas@itu.int.

Mario Maniewicz
Director

Attachment: Annex 1

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- Administrations of ITU Member States
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ANNEX 1

Method to derive transmission power values in accordance with Recommendation ITU-R SF.675

Introduction

The method below is used to derive transmission power values in accordance with Recommendation ITU-R SF.675. It takes as inputs the reference bandwidth and characteristics of emission.

Requirements

The following items are used for descriptions in this Annex.

Parameter name	RR Appendix 4 item	Field name in SNS database as defined in the Preface to the BRIFIC (Space services)	Notion in formulas
Maximum power spectral density of emission, dBW/Hz	C.8.b.3.b	*pwr_ds_max*	PSD_{max}
Maximum peak power of emission, dBW	C.8.b.3.a	*pep_max*	P_{max}
Reference bandwidth (4 kHz, 1 MHz, etc.) Refers to reference bandwidth in the provisions of the Radio Regulations	-	-	B_{ref}
Emission bandwidth (Hz)	Derived from C.7.a	Derived from *design_emi*	B
Averaging bandwidth (Hz) Defined in Footnote 2 to Tables A, B, C and D of Annex 2 to Appendix **4**	-	-	B_{avg}
Transmitted power to be used in calculations, dBW (B_{ref})	-	-	P_{used}

Procedure

1   Find averaging bandwidth (B_{avg}).

    If the center frequency of the frequency assignment is below 15 GHz, $B_{avg} = 4\ kHz$

    Otherwise $B_{avg} = 1\ MHz$

2   Calculate transmitted power P_{used} in B_{ref}

In case $B_{avg} = B_{ref}$ (additional measure in accordance with Recommendation ITU-R SF.675):

$$P_{used} = PSD_{max} + 10 \ \log B_{ref}$$

In case $B_{avg} < B_{ref}$ (legacy method applied previously):

If $B \geq B_{ref}$ then

$$P_{used} = Min\big(PSD_{max} + 10 \ \log B_{ref} ; \ P_{max}\big)$$

If $B < B_{ref}$ then

$$P_{used} = P_{max}$$

In case $B_{avg} > B_{ref}$ (no cases currently):

If $B \geq B_{ref}$ then

$$P_{used} = PSD_{max} + 10 \ \log B_{ref}$$

If $B < B_{ref}$ then

$$P_{used} = P_{max}$$