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| U.S. Radiocommunication Sector  Fact Sheet | |
| **Working Party:** ITU-R WP 7D | **Document No:** USWP7D\_25Sept-doc21-RA.[above275GHz] |
| **Ref.** Doc. [7D/186](https://www.itu.int/md/R23-WP7D-C-0186/en), Annex 22 | **Date:** 8/6/2025 |
| **Document Title:** Working Documents Towards Elements of a Preliminary Draft New Report: Threshold levels for Radio Astronomy Observations above 275 GHz | |
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| **Purpose/Objective:** The purpose of this contribution is to start a new report with threshold levels for Radio Astronomy Observations above 275 GHz | |
| **Abstract:**  At the Spring WP 7D meeting, in discussion of the document 7D/186, Annex 22, it was recommended that the material be converted from a draft new recommendation to a draft new report that addresses bands found in footnote No. 5.565. This contribution is meant to enact that change, as well as identify additional needed material and address aligning bands with the footnote. | |

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| Source: Doc. [7D/186](https://www.itu.int/md/R23-WP7D-C-0186/en), Annex 22  Subject: Question 145-3/7 | Document 7D/TBD-E |
| TBD September 2025 |
| English only |
| United States of America | |
| MODIFICATIONS to WORKING DOCUMENT TOWARDS A PRELIMINARY DRAFT NEW RECOMMENDATION: | |

**Protection criteria used for Radio Astronomy Measurements above 275 GHz**

**Summary**

At the Spring WP 7D meeting, in discussion of the document found in 7D/186, Annex 22, it was recommended that the material be converted from a draft new recommendation to a draft new report instead. This contribution is meant to make that conversion, and provide initial material toward a Report on received signal values relevant to practicable steps for allowing radio astronomy operation in bands identified for radio astronomy service use above 275 GHz.

**Attachment**

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| **Radiocommunication Study Groups** | A blue logo with a black background  AI-generated content may be incorrect. |
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| Source: Document 7D/TEMP/63  Subject: Question [ITU-R 145-7](https://www.itu.int/pub/R-QUE-SG07.145) | Annex 22 to  Document 7D/186-E |
| 1 April 2025 |
| English only |
| Annex 22 to Working Party 7D Chair’s Report | |
| WORKING DOCUMENT TOWARDS A PRELIMINARY DRAFT NEW REPORT ITU-R RA.[Criteria\_5.565\_Bands] | |
|  | |
| Development of protection criteria used for Radio Astronomy Measurements above 275 GHz (Question ITU-R 145-3/7) | |

**ATTACHMENT**

**Editor’s note: Objections were expressed, that harmful interference is a sensitive definition in the RR and cannot be quantified.**

Editor’s note: Views were expressed that we should consider placing this material into a report to begin with and that the focus of bands should be those included in RR 5.565.

(202X)

[Table of Contents TBD]

1. **Introduction**

Radio astronomy operates in bands identified for the service’s use, but where criteria have not yet been developed to evaluate impacts to operation. A primary range of the spectrum in need of such criteria are the bands above 275 GHz, some of which are identified for non-exclusive use by the Radio Astronomy service but where footnote No. 5.565 specifies “all practicable steps” should be employed by administrations to allow radio astronomy operation.

This Report is intended to develop and provide guidance to administrations, under the terms of footnote No. 5.565 and in a form consistent with that used in Recommendation ITU-R RA.769-2, which provides protection criteria for the radio astronomy service in allocated bands below 275 GHz.

1. **Development of the criteria**

[Background TBD]

* 1. **Spectral line**

[TBD]

* 1. **Continuum**

[TBD]

1. **Criteria values for continuum and spectral line observations**

Tables 1 and 2 provide the developed values for identified bands above 275 GHz, for continuum and spectral line values, respectively.

Values in Tables 1 and 2 should be applied at frequencies of interest

Table 1

Protection criteria values for Radio Astronomy continuum observations, in bands listed in footnote RR 5.565(1,2)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Frequency *f*(GHz) | Assumed spectral line channel bandwidth *f* (MHz) | Minimum antenna noise temperature *TA* (K) | Receiver noise temperature *TR* (K) | System sensitivity(noise fluctuations) | | Threshold interference levels | | |
| Temperature *T* (K) | Power spectral density *PS* (dB(W/Hz)) | Input power *PH* (dBW) | pfd *SH* *f* (dB(W/m2)) | Spectral pfd *SH* (dB(W/(m2 ⋅ Hz))) |
| **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** | **(8)** | **(9)** |
| 299 | 8 000 | 25 | 50 | 1.9 x10–5 | –275.9 | –186.8 | –115.8 | –214.9 |
| 345 | 8 000 | 24 | 72 | 2.4 x10–5 | –274.8 | –185.8 | –113.6 | –212.6 |
| 405 | 8 000 | 43 | 135 | 4.4 x10–5 | –272.1 | –183.1 | –109.5 | –208.5 |
| 432 | 8 000 | 78 | 135 | 5.3 x10–5 | –271.3 | –182.3 | –108.1 | –207.2 |
| 500 | 8 000 | 115 | 135 | 6.3 x10–5 | –270.6 | –181.6 | –106.2 | –205.2 |
| 605 | 8 000 | 172 | 105 | 6.9 x10–5 | –270.2 | –181.2 | –104.1 | –203.1 |
| 675 | 8 000 | 108 | 105 | 5.3 x10–5 | –271.3 | –182.3 | –104.3 | –203.3 |
| 716 | 8 000 | 154 | 105 | 6.5 x10–5 | –270.5 | –181.5 | –102.9 | –201.9 |
| 753 | 8 000 | 178 | 230 | 10.2 x10–5 | –268.5 | –179.5 | –100.4 | –199.5 |
| 870 | 8 000 | 119 | 230 | 8.7 x10–5 | –269.2 | –180.2 | –99.9 | –199.0 |
| 940 | 8 000 | 165 | 230 | 9.9 x10–5 | –268.7 | –179.6 | –98.7 | –197.7 |
| (1) Values of quantities in columns 6-9 may be calculated by interpolation at intermediate frequencies.  (2) Quantities in columns (5)-(9) are calculated as follows:  (5): T = (TA+TR)/(2000s\*f)1/2  (6): *PS*= 10\*log(kB\*T)  (7): *PH* = 10\*log(kB\*T\*f)  (8): *SH* *f* = 10\*log(kB\*T\*f/[(c/f)2/4p]) where (c/f)2/4p = l2/4p is the area of an antenna having 0 dBi gain  (9): *SH* = 10\*log(kB\*T/[(c/f)2/4p]).  (3) Values listed in these tables should be applied in a manner consistent with the terms of footnote No. 5.565. | | | | | | | | |

Table 2

Protection criteria values for Radio Astronomy spectral line observations, in bands listed in footnote RR 5.565 (1,2,3)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Frequency *f*(GHz) | Assumed spectral line channel bandwidth *f* (kHz) | Minimum antenna noise temperature *TA* (K) | Receiver noise temperature *TR* (K) | System sensitivity(noise fluctuations) | | Threshold interference levels | | |
| Temperature *T* (K) | Power spectral density *PS* (dB(W/Hz)) | Input power *PH* (dBW) | pfd *SH* *f* (dB(W/m2)) | Spectral pfd *SH* (dB(W/(m2 ⋅ Hz))) |
| **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** | **(8)** | **(9)** |
| 299 | 1 000 | 25 | 50 | 1.7 x10–3 | –256.4 | –206.4 | –135.3 | –195.3 |
| 345 | 1 000 | 23 | 72 | 2.1 x10–3 | –255.3 | –205.3 | –133.1 | –193.1 |
| 405 | 1 000 | 43 | 135 | 4.0 x10–3 | –252.6 | –202.6 | –129.0 | –189.0 |
| 432 | 1 000 | 78 | 135 | 4.8 x10–3 | –251.8 | –201.8 | –127.7 | –187.7 |
| 500 | 1 000 | 115 | 135 | 5.6 x10–3 | –251.1 | –201.1 | –125.7 | –185.7 |
| 605 | 1 000 | 172 | 105 | 6.2 x10–3 | –250.7 | –200.7 | –123.6 | –183.6 |
| 675 | 1 000 | 108 | 105 | 4.8 x10–3 | –251.8 | –201.8 | –123.8 | –183.8 |
| 6 | 1 000 | 154 | 105 | 5.8 x10–3 | –251.0 | –201.0 | –122.4 | –182.4 |
| 753 | 1 000 | 178 | 230 | 9.1 x10–3 | –249.0 | –199.0 | –120.0 | –180.0 |
| 870 | 1 000 | 119 | 230 | 7.8 x10–3 | –249.7 | –199.7 | –119.4 | –179.4 |
| 940 | 1 000 | 165 | 230 | 8.8 x10–3 | –249.1 | –199.1 | –118.2 | –178.2 |
| (1) Values of quantities in columns 6-9 may be calculated by interpolation at intermediate frequencies.  (2) Quantities in columns (5)-(9) are calculated as follows:  (5): T = (TA+TR)/(2000s\*f)1/2  (6): *PS* = 10\*log(kB\*T)  (7): *PH* = 10\*log(kB\*T\*f)  (8): *SH**f* = 10\*log(kB\*T\*f/[(c/f)2/4p]) where (c/f)2/4p = l2/4p is the area of an antenna having 0 dBi gain  (9): *SH* = 10\*log(kB\*T/[(c/f)2/4p])  (3) Values listed in these tables should be applied in a manner consistent with the terms of footnote No. 5.565. | | | | | | | | |

1. **References and related ITU-R Recommendations and Reports**

[TBD]

1. **List of acronyms and abbreviations**

[TBD]