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| **World Radiocommunication Conference (WRC-19)Sharm el-Sheikh, Egypt, 28 October – 22 November 2019** |  |
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| PLENARY MEETING | **Addendum 14 toDocument 16-E** |
|  | **7 October 2019** |
|  | **Original: English** |
|  |
| European Common Proposals |
| Proposals for the work of the conference |
|  |
| Agenda item 1.14 |

1.14 to consider, on the basis of ITU-R studies in accordance with Resolution **160 (WRC‑15)**, appropriate regulatory actions for high-altitude platform stations (HAPS), within existing fixed-service allocations;

Introduction

CEPT supports, while ensuring protection of existing services and their future development including other applications of the fixed service (in accordance with Resolution **160 (WRC-15)**) and taking into account the conclusions of the sharing and co-existence studies for the bands mentioned below and, as appropriate, in the adjacent bands:

• Worldwide identifications for transmissions from high altitude platform stations (HAPS) (in the downlink direction) in the frequency band 6 440-6 520 MHz (Method 1B1 option 1 of the CPM Report)

• Worldwide identifications for transmissions to and from high altitude platform stations (in the uplink and downlink directions) in the frequency bands 31-31.3 GHz (Method 7B1 options 1A+1B of the CPM Report) and 38-39.5 GHz (Method 8B2 options 1A+1B of the CPM Report)

For the frequency bands 6 440-6 520 MHz, 31-31.3 GHz, 38-39.5 GHz, 47.2-47.5 GHz and 47.9‑48.2 GHz (Method 9B1 of the CPM Report: example 1 for modifications to No. **5.552A** and example 2 for modifications to Resolution **122 (Rev. WRC-07)**), CEPT is supporting new footnotes and associated resolutions and/or, if appropriate, modifications to the existing footnotes and associated Resolutions.

For the 27.9-28.2 GHz frequency band, worldwide identification for transmission from high altitude platform stations in the downlink direction, similarly as Method 6B1 Option 1 of the CPM Report, and including a provision that HAPS ground stations cannot claim protection from fixed-satellite service (FSS) earth stations.

CEPT is of the view that any consideration of the frequency bands 21.4-22 GHz and 24.25‑27.5 GHz in Region 2 under this agenda item shall be accompanied by appropriate protection of: inter-satellite service (ISS) in the frequency band 24.45-24.75 GHz, ISS in the frequency band 25.25-27.5 GHz, earth-exploration satellite service (EESS) (passive) in the frequency bands 21.2‑21.4 GHz, 22.21-22.5 GHz and 23.6-24 GHz, EESS and space research service (SRS) (space-to-Earth) in the frequency band 25.5-27 GHz and FSS in the frequency bands 24.75‑25.25 GHz and 27-27.5 GHz. This includes the appropriate protection of the mobile service in the frequency band 24.25-27.50 GHz as results of consideration under WRC-19 agenda item 1.13. In such case further information can be found in the Annex 10 to this European Common Proposal.

CEPT is of the view that any consideration of the frequency band 24.25-27.5 GHz in Region 2 under this agenda item should not limit the possibility to identify the band for IMT on a global level under agenda item 1.13.

Proposals are based on the above CEPT position, and on the following methods of the CPM Report:

| ECP Annex | Bands/Topics | CPM Report corresponding section (1/1.14/) | Corresponding CPM Method |
| --- | --- | --- | --- |
| Annex 1 | 6 440- 6 520 MHz | 4.1/5.1 | 1B1 option 1 |
| Annex 1 | 6 560- 6 640 MHz | 4.2/5.2 | 2A |
| Annex 2 | 27.9-28.2 GHz(including new Resolution for the frequency bands 27.9-28.2 GHz and 31-31.3 GHz) | 4.6/5.6 | 6B1 option 1 (with some modifications from CEPT – See above) |
| Annex 3 | 31.0-31.3 GHz | 4.7/5.7 | 7B1 options 1A+1B |
| Annex 4 | 38-39.5 GHz | 4.8/5.8 | 8B2 options 1A+1B  |
| Annex 5 | 47.2-47.5 GHz / 47.9-48.2 GHz | 4.9/5.9 | 9B1(example 1 for modifications to No. 5.552A and example 2 for modifications to Resolution 122 (Rev. WRC-07)) |
| Annex 6 | MOD to Article 11 | 5.10 |  |
| Annex 7 | MOD to Appendix 4 | 5.11 |  |
| Annex 8 | MOD to Appendix 7 | 5.12 |  |
| Annex 9 | SUP to Resolution 160 | 5.13 |  |
| Annex 10(only needed in case of proposals from Region 2 for HAPS identifications in the bands 21.4-22 GHz and 24.25-27.5 GHz for Region 2) | 21.4-22 GHz and 24.25-27.5 GHz in Region 2 | 4.3/5.34.4/5.44.5/5.55.11 |  |

**Proposals**

ANNEX 1

Bands 6 440-6 520 and 6 560-6 640 MHz

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. 2.1)

MOD EUR/16A14/1#49730

5 570-6 700 MHz

|  |
| --- |
| Allocation to services |
| Region 1 | Region 2 | Region 3 |
| 5 925-6 700 FIXED MOD 5.457 ADD 5.A114 FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B MOBILE 5.457C 5.149 5.440 5.458 |

MOD EUR/16A14/2#49732

5.457 In Australia, Burkina Faso, Cote d'Ivoire, Mali and Nigeria, the allocation to the fixed service in the frequency band 6 560-6 640 MHz (ground-to-HAPS direction) may also be used by gateway links for high-altitude platform stations (HAPS) within the territory of these countries. Such use is limited to operation in HAPS gateway links and shall not cause harmful interference to, and shall not claim protection from, existing services, and shall be in compliance with Resolution 150 (Rev.WRC‑19). Existing services shall not be constrained in future development by HAPS gateway links. The use of HAPS gateway links in these bands requires explicit agreement with other administrations whose territories are located within 1 000 kilometres from the border of an administration intending to use the HAPS gateway links.    (WRC‑19)

**Reasons:** Limit the footnote No. **5.457** to the frequency band 6 560-6 640 MHz without any other amendments and propose a new footnote No. **5.A114** for the frequency band 6 440-6 520 MHz with an associated new Resolution **[EUR-A114] (WRC-19)** in order to facilitate the use of HAPS downlink on a global level.

ADD EUR/16A14/3#49731

5.A114The allocation to the fixed service in the frequency band 6 440-6 520 MHz is identified for worldwide use by high-altitude platform stations (HAPS). Such use of the fixed-service allocation by HAPS is limited to operation of gateway links in the HAPS-to-ground direction and shall be in accordance with the provisions of Resolution **[EUR-A114] (WRC 19)**.    (WRC‑19)

**Reasons:** this footnote aims to facilitate the use of HAPS downlink on a global level by identifying the band for gateway links in the HAPS-to-ground direction and protect incumbent services with an associated new Resolution **[EUR-A114] (WRC-19)**.

MOD EUR/16A14/4

RESOLUTION 150 (REV. WRC‑19)

Use of the band 6 560-6 640 MHz by gateway links
for high-altitude platform stations in the fixed service

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

*…*

*k)* that while the deployment of HAPS gateway links in the band 6 560-6 640 MHz is taken on a national basis, such deployment would affect other administrations;

*…*

recognizing

*…*

resolves

1 that the antenna pattern for the HAPS gateway station in the band 6 560-6 640 MHz shall meet the following antenna beam patterns:

…

4 that for the purpose of protecting the fixed-satellite service (Earth-to-space), the aggregate power flux-density of HAPS uplinks shall be limited to a maximum of −183.9 (dBW/(m2 4 kHz)) at any point in the geostationary arc. To meet this aggregate power flux-density criterion, the maximum e.i.r.p. density value of a single HAPS gateway link towards the geostationary arc shall not exceed −59.9 dB(W/4 kHz) in any direction within ±5 degrees of the geostationary arc;

5 that for the purpose of protecting EESS passive operations over oceans, HAPS gateway stations shall maintain a minimum distance of 100 kilometres for a single HAPS gateway station and 150 kilometres for several HAPS gateway stations from coast lines;

6 that administrations planning to implement HAPS gateway links in the notification to the Bureau of the frequency assignment(s) shall submit all mandatory parameters for the examination by the Bureau for compliance with respect to *resolves* 1 to 5 above, and also the explicit agreement obtained pursuant to No. **5.457**,

invites

…

**Reasons:** Limit Resolution **150 (Rev. WRC‑19)** to the frequency band 6 560-6 640 MHz and propose a new Resolution for the frequency band 6 440-6 520 MHz.

ADD EUR/16A14/5#49734

draFt new RESOLUTION [EUR-A114] (WRC‑19)

Use of the bands 6 440-6 520 MHz by gateway links for
high-altitude platform stations in the fixed service

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

*a)* that WRC-19 identified the frequency band 6 440-6 520 MHz for worldwide use by high-altitude platform stations (HAPS), limited to the operation of gateway links in the HAPS-to-ground direction;

*b)* that for the operations of the Earth exploration-satellite service (EESS) (passive) in the band 6 425-7 075 MHz, No. **5.458** applies,

recognizing

*a)* that in the frequency band 6 440-6 520 MHz with respect to earth stations in the fixed-satellite service (Earth-to-space) and HAPS ground station receivers which operate in the fixed service, No. **9.17** applies;

*b)* that in the band 6 650-6 675.2 MHz, No. **5.149** applies;

*c)* that ITU‑R has studied technical and operational characteristics of HAPS gateway links in the fixed service in the range 6 440-6 520 MHz resulting in Report ITU‑R F.2439;

*d)* that Report ITU‑R F.2437 contains the results of interference analyses between HAPS gateway links in the fixed service and other systems/services in the range 6 440-6 520 MHz;

*e)* that the World Summit on the Information Society has encouraged the development and application of emerging technologies to facilitate infrastructure and network development worldwide with special focus on under-served regions and areas,

resolves

1 that, for the purpose of protecting the fixed service systems in territory of other administrations in the frequency band 6 440-6 520 MHz, the power flux-density level per HAPS at the surface of the Earth in territory of other administrations shall not exceed the following limits unless the explicit agreement of the affected administration is provided at the time of the notification of HAPS:

 −160 dB(W/(m² · MHz)) for 0° ≤ θ < 6°

 3.75 θ − 182.5 dB(W/(m² · MHz)) for 6° ≤ θ < 10°

 −152.5 + 25.5 log10(θ − 8) dB(W/(m² · MHz)) for 10° ≤ θ < 56°

 −109.63 dB(W/(m² · MHz)) for 56° ≤ θ ≤ 90°

where θ is the angles of arrival of the incident wave above the horizontal plane, in degrees.

To verify that the pfd produced by a HAPS does not exceed the above pfd mask, the following equation shall be used:

 

where:

 *e.i.r.p.* maximum HAPS e.i.r.p density level in dB(W/MHz) (dependent on the elevation angle θ);

 *d* distance in metres between the HAPS and the ground (dependent on the elevation angle θ);

 *pfd*(θ) power flux-density at the Earth’s surface per HAPS in dB(W/(m2 · MHz));

2 that, for the purpose of protecting the mobile service systems in territory of other administrations in the frequency band 6 440-6 520 MHz, the power flux-density level at the surface of the Earth in territory of other administrations per HAPS shall not exceed the following limits unless the explicit agreement of the affected administration is provided at the time of notification of HAPS:

 0.35 θ − 120 dB(W/(m2 · MHz)) for 0° ≤ θ < 40°

 −106 dB(W/(m2 · MHz)) for 40° ≤ θ ≤ 90°

where θ is the angles of arrival of the incident wave above the horizontal plane, in degrees.

To verify that the pfd produced by a HAPS does not exceed the above pfd mask, the following equation shall be used:



where:

 *e.i.r.p*. maximum HAPS e.i.r.p density level in dB(W/MHz) (dependent on the elevation angle θ);

 *d* distance in metres between the HAPS and the ground (dependent on the elevation angle θ);

 *pfd*(θ) power flux-density at the Earth’s surface per HAPS in dB(W/(m2 · MHz));

3 that, for the purpose of protecting fixed-satellite service space station receivers in the frequency band 6 440-6 520 MHz, the e.i.r.p. density per HAPS transmitter shall be limited to −16.1 dB(W/MHz) for off-nadir angles higher than 95°;

4 that, for the purpose of protecting EESS (passive) operations over oceans, the e.i.r.p. density of HAPS operating over oceans or over land at a distance lower than 29 km from a coast line (distance between the HAPS nadir point and the coast line) shall be limited to −34.9 dB(W/200 MHz) for off-nadir angles higher than 125°;

5 that administrations planning to implement a HAPS system in the 6 440-6 520 MHz frequency band shall notify the frequency assignments by submitting all mandatory elements of Appendix **4** to the Bureau for the examination of compliance with respect to the Radio Regulations with a view to their registration in the Master International Frequency Register,

instructs the Director of the Radiocommunication Bureau

to take all necessary measures to implement this Resolution.

**Reasons:** This new Resolution **[EUR-A114] (WRC-19)** includes regulatory mechanism to protect incumbent services in the frequency band 6 440-6 520 MHz and facilitate the use of HAPS downlink on a global level.

ANNEX 2

Band 27.9-28.2 GHz
(including new Resolution for the
frequency bands 27.9-28.2 GHz and 31-31.3 GHz)

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. 2.1)

MOD EUR/16A14/6

24.75-29.9 GHz

|  |
| --- |
| Allocation to services |
| Region 1 | Region 2 | Region 3 |
| 27.5-28.5 FIXED ADD 5.E114 FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539 MOBILE 5.538 5.540 |

ADD EUR/16A14/7#49769

5.E114 The allocation to the fixed service in the frequency band 27.9-28.2 GHz is identified for worldwide use by high-altitude platform stations (HAPS). The HAPS ground stations using the fixed-service allocation shall not claim protection from fixed-satellite service earth stations. Furthermore, the development of fixed-satellite service shall not be constrained by HAPS. Such use of the fixed-service allocation by HAPS is limited to operation in the HAPS-to-ground direction and shall be in accordance with the provisions of Resolution **[EUR-E114] (WRC 19)**.     (WRC‑19)

**Reasons:** this footnote aims to facilitate the use of HAPS downlink on a global level by identifying the band for HAPS downlink, protect incumbent services and ensure future deployment of FSS earth stations with the associated new Resolution **[EUR-E114] (WRC-19)**.

SUP EUR/16A14/8

5.537A

**Reasons:** This footnote is replaced by new footnote **5.E114** and therefore is not necessary anymore.

SUP EUR/16A14/9

RESOLUTION 145 (Rev.WRC‑12)

Use of the bands 27.9-28.2 GHz and 31-31.3 GHz by
high altitude platform stations in the fixed service

**Reasons:** This Resolution **145 (WRC-12)** is replaced by new Resolution **[EUR-E114] (WRC-19)** and therefore is not necessary anymore.

ADD EUR/16A14/10#49771

draFt new RESOLUTION [EUR-E114] (WRC‑19)

Use of the bands 27.9-28.2 GHz and 31-31.3 GHz by high altitude platform stations in the fixed service

The World Radiocommunication Conference (Sharm el-Sheik, 2019),

considering

*a)* that No**. 4.23** specifies that transmissions to or from HAPS shall be limited to the bands specifically identified in Article **5**;

*b)* that WRC-15 considered that there is a need for greater broadband connectivity in underserved communities and in rural and remote areas, that current technologies can be used to deliver broadband applications by high-altitude platform stations (HAPS), which can provide broadband connectivity and disaster recovery communications with minimal ground network infrastructure;

*c)* that HAPS deployment in the frequency band 27.9-28.2 GHz is intended to provide connectivity from the HAPS to a limited number of HAPS ground stations per beam;

*d)* that WRC-15 decided to study additional spectrum needs for fixed HAPS links to provide broadband connectivity on a global basis, including within the frequency bands 27.9‑28.2 GHz and 31‑31.3 GHz, recognizing that the existing HAPS identifications were established without reference to today’s broadband capabilities;

*e)* that ITU-R has conducted studies dealing with sharing between systems using HAPS in the fixed service and other types of systems in the fixed service in the frequency bands 27.9‑28.2 GHz and 31-31.3 GHz leading to Report ITU‑R F.[HAPS-31GHz];

*f)* that HAPS ground stations need to accept the interference created by fixed-satellite service (FSS) earth stations in the frequency band 27.9-28.2 GHz;

*g)* that ITU-R has conducted studies dealing with compatibility between systems using HAPS and the passive services in the 31.3-31.8 GHz frequency band leading to Report ITU-R F.[HAPS-31GHz];

*h)* that Report ITU-R F.2438 contains worldwide spectrum needs of HAPS systems;

*i)* that Report ITU-R F.2439 has updated deployment and technical characteristics of broadband HAPS systems to complete feasibility, sharing and compatibility studies between HAPs and other affected services;

*j)* that WRC-19 identified the frequency band 27.9-28.2 GHz for worldwide use by high-altitude platform stations (HAPS), limited to the operation of HAPS in the HAPS-to-ground direction;

*k)* that WRC-19 identified the frequency band 31-31.3 GHz for worldwide use by high-altitude platform stations (HAPS) for both HAPS-to-ground and ground-to-HAPS directions,

recognizing

*a)* that in the frequency band 27.9-28.2 GHz with respect to transmitting earth stations in the fixed-satellite service (Earth-to-space) and HAPS ground station receivers which operate in the fixed service, No. **9.17** applies;

*b)* that HAPS shall not impose undue constraints on the future development of existing services,

resolves

1 that, for the purpose of protecting the fixed wireless systems in territory of other administrations in the frequency band 27.9-28.2 GHz, the power flux-density (pfd) level per HAPS at the surface of the Earth in territory of other administrations shall not exceed the following limits under clear sky condition, unless the explicit agreement of the affected administration is provided at the time of notification of HAPS:

 3 θ − 140 dB(W/(m² · MHz)) for 0° ≤ θ < 10°

 0.57 θ − 115.7 dB(W/(m² · MHz)) for 10° ≤ θ < 45°

 −90 dB(W/(m² · MHz)) for 45° ≤ θ < 90°

where θ is the elevation angle in degrees (angles of arrival above the horizontal plane).

The pfd mask above is derived under clear-sky conditions, therefore, in order to compensate for additional propagation impairments in the boresight of any beam due to rain, the HAPS can be operated so that the e.i.r.p. of the corresponding beam (i.e. suffering the rain fade) can be increased by a value only equivalent to the level of rain fading and limited to a maximum of 20 dB above the e.i.r.p. corresponding to the pfd mask.

To verify the compliance with the proposed pfd mask the following equation shall be used:

 

where:

 *d* distance in meters between the HAPS and the ground (dependent on the elevation angle);

 *e.i.r.p.* HAPS nominal e.i.r.p. spectral density in dB(W/MHz) at a specific elevation angle;

 *pfd*(θ)power flux-density at the Earth’s surface per HAPS in dB(W/(m² · MHz));

2 that, with regard to the protection of fixed service stations with pointing elevation beyond 5°, an administration believing that unacceptable interference may still be caused shall, within four months of the date of publication of the relevant BR IFIC, provide its comments with technical justification to the notifying administration;

3 that, for the purpose of protecting the mobile service systems in territory of other administrations in the frequency band 27.9-28.2 GHz, the power flux-density level per HAPS at the surface of the Earth in territory of other administrations shall not exceed the following limits, under clear sky condition, unless the explicit agreement from the affected administration is provided at the time of notification of HAPS:

 θ − 120 dB(W/(m² · MHz)) for 0°< θ ≤ 13°

 −107 dB(W/(m² · MHz)) for 13° < θ ≤ 65°

 0.68 θ −151.2 dB(W/(m² · MHz)) for 65° < θ ≤ 90°

where θ is elevation angle in degrees (angle of arrival above the horizontal plane).

The pfd mask above is derived under clear sky conditions, therefore, in order to compensate for additional propagation impairments in the boresight of any beam due to rain, the HAPS can be operated so that the e.i.r.p. of the corresponding beam (i.e. suffering the rain fade) can be increased by a value only equivalent to the level of rain fading.

To verify the compliance with the proposed pfd mask the following equation shall be used:

 

where:

 *d* distance in metres between the HAPS and the ground (dependent on the elevation angle θ);

 *e.i.r.p*. HAPS nominal e.i.r.p. spectral density in dB(W/MHz) at a specific elevation angle;

 *pfd*(θ)power flux-density at the Earth’s surface per HAPS in dB(W/(m² · MHz));

4 that administrations wanting to deploy HAPS ground stations in the 27.9-28.2 GHz frequency band in border areas and wanting to claim protection from the fixed and mobile services for such deployments, shall seek consent from neighbouring administrations;

5 that, for the purpose of protecting the fixed-satellite service (Earth-to-space) in the 27.9‑28.2 GHz frequency band, the maximum e.i.r.p. density per HAPS downlink shall be less than −8 dB(W/MHz) in any direction for off-nadir angle higher than 85.5°, even when increasing the HAPS e.i.r.p. density to compensate for rain fade. Furthermore, HAPS operations should not impose undue constraints on the future development of the fixed-satellite service in the 27.9‑28.2 GHz and HAPS ground stations shall not claim protection from fixed-satellite service earth stations in the band 27.9-28.2 GHz;

6 that, for the purpose of protecting the fixed service systems in territory of other administrations in the frequency band 31-31.3 GHz, the power flux-density level per HAPS at the surface of the Earth in other administrations shall not exceed the following limits, under clear sky condition, unless the explicit agreement of the affected administration is provided at the time of notification of the HAPS:

 0.875 θ − 143 dB(W/(m² · MHz)) for 0° ≤ θ < 8°

 2.58 θ − 156.6 dB(W/(m² · MHz)) for 8° ≤ θ < 20°

 0.375 θ − 112.5 dB(W/(m² · MHz)) for 20° ≤ θ < 60°

 −90 dB(W/(m² · MHz)) for 60° ≤ θ ≤ 90°

where θ is elevation angle in degrees (angle of arrival above the horizontal plane).

The pfd mask above is derived under clear sky conditions, therefore, in order to compensate for additional propagation impairments in the boresight of any beam due to rain, the HAPS can be operated so that the e.i.r.p. of the corresponding beam (i.e. suffering the rain fade) can be increased by a value only equivalent to the level of rain fading and limited to a maximum of 20 dB above the e.i.r.p. corresponding to the pfd mask.

To verify the compliance with the proposed pfd mask the following equation shall be used:



where:

 *d* distance in metres between the HAPS and the ground (dependent on the elevation angle θ);

 *e.i.r.p*. HAPS nominal e.i.r.p. spectral density in dB(W/MHz) at a specific elevation angle;

 *pfd*(θ)power flux-density at the Earth’s surface per HAPS in dB(W/(m² · MHz));

7 that, in order to ensure the protection of Earth-exploration satellite services (EESS) (passive), the level of unwanted power density in the frequency band 31.3-31.8 GHz into the antenna of a HAPS ground station operating in the frequency band 31-31.3 GHz shall be limited to −83 dB(W/200 MHz) under clear sky conditions and may be increased under rainy conditions to mitigate fading due to rain, provided that the effective impact on the passive satellite does not exceed the impact under clear sky conditions;

8 that, in order to ensure the protection of EESS (passive) the e.i.r.p. density in the frequency band 31.3-31.8 GHz per HAPS, operating in the band 31-31.3 GHz, shall not exceed:

 −θ − 13.1 dB(W/200 MHz) −4.53° ≤ θ  < 22°

 −35.1 dB(W/200 MHz) 22° ≤ θ < 90°

where θ is the elevation angle in degrees (angle of arrival above the horizontal plane);

9 that, in order to ensure the protection of the radio astronomy service, the power flux-density level produced by any HAPS ground station at RAS stations locations at a height of 50 m, shall not exceed −141 dB(W/(m2 · 500 MHz)) in the band 31.3-31.8 GHz. This limit relates to the power flux-density which would be obtained under assumed propagation conditions predicted by Recommendation ITU‑R P.452 using a time percentage of 2%;

10 that, in order to ensure the protection of the radio astronomy service the power flux-density produced by unwanted emissions from HAPS downlink transmissions shall not exceed ‑171 dB(W/(m² · 500 MHz)) for continuum observations in the frequency band 31.3‑31.8  GHz at an RAS station location at a height of 50 m. This limit relates to the power flux-density which would be obtained using a time percentage of 2% in the relevant propagation model.

To verify the compliance the following formula shall be used:

 

where:

 *e.i.r.p.*nominal clear sky nominal unwanted emission e.i.r.p. density towards the RAS station at which the HAPS operates under clear-sky conditions in dB(W/500 MHz) in the RAS band;

 *Az* azimuth from the HAPS toward the RAS station;

 θ elevation angle at the HAPS towards the RAS station;

 *Att*618*p*=2% attenuation from Recommendation ITU-R P.618 corresponding to *p*=2% of the time at the radio astronomy location;

 *d* separation distance in m between the HAPS and the RAS station;

 *pfd*(θ)power flux-density at the Earth’s surface per HAPS station in dB(W/(m² · 500MHz));

 *GasAtt*(θ) gaseous attenuation for elevation angle of θ (Recommendation ITU‑R SF.1395‑0);

11 that *resolves* 9 and 10 apply at any radio astronomy station that was in operation prior to 22 November 2019 and has been notified to the Bureau in the frequency band 31.3-31.8 GHz before 22 May 2020, or at any radio astronomy station that was notified before the date of receipt of the complete Appendix **4** information for notification, for the HAPS system to which *resolves* 9 and 10 apply. Radio astronomy stations notified after this date may seek an agreement with administrations that have authorized HAPS;

12 that administrations planning to implement a HAPS system in the in the frequency bands 27.9-28.2 GHz and 31-31.3 GHz shall notify the frequency assignments by submitting all mandatory elements of Appendix **4** to the Bureau for the examination of compliance with respect to the Radio Regulations with a view to their registration in the Master International Frequency Register,

instructs the Director of the Radiocommunication Bureau

to take all necessary measures to implement this Resolution.

**Reasons:** This new Resolution **[EUR-E114] (WRC-19)** includes regulatory mechanism to protect incumbent services in the frequency bands 27.9-28.2 GHz and 31-31.3 GHz and facilitate the use of HAPS on a global level.

ANNEX 3

Band 31.0-31.3 GHz

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. 2.1)

MOD EUR/16A14/11#49778

29.9-34.2 GHz

|  |
| --- |
| Allocation to services |
| Region 1 | Region 2 | Region 3 |
| 31-31.3 FIXED 5.338A ADD 5.F114A ADD 5.F114B MOBILE Standard frequency and time signal-satellite (space-to-Earth) Space research 5.544 5.545 5.149 |

ADD EUR/16A14/12#49779

5.F114AThe allocation to the fixed service in the frequency band 31-31.3 GHz is identified for worldwide use by high-altitude platform stations (HAPS) in the HAPS-to-ground direction. Such use of the fixed-service allocation by HAPS shall be in accordance with the provisions of Resolution **[EUR-E114] (WRC‑19)**.     (WRC‑19)

**Reasons:** this footnote aims to facilitate the use of HAPS downlink on a global level by identifying the band for HAPS downlink and protect incumbent services with an associated new Resolution **[EUR-E114] (WRC-19)**.

ADD EUR/16A14/13#49781

5.F114BThe allocation to the fixed service in the frequency band 31-31.3 GHz is identified for worldwide use by high-altitude platform stations (HAPS) in the ground-to-HAPS direction. Such use of the fixed-service allocation by HAPS shall be in accordance with the provisions of Resolution **[EUR-E114] (WRC-19)**.     (WRC‑19)

**Reasons:** this footnote aims to facilitate the use of HAPS uplink on a global level by identifying the band for HAPS uplink and protect incumbent services with an associated new Resolution **[EUR-E114] (WRC-19)**.

SUP EUR/16A14/14#49780

5.543A

**Reasons:** this footnote is replaced by new footnotes **5.F114A** and **5.F114B** and therefore is not necessary anymore.

ANNEX 4

Band 38-39.5 GHz

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. 2.1)

MOD EUR/16A14/15#49789

34.2-40 GHz

|  |
| --- |
| Allocation to services |
| Region 1 | Region 2 | Region 3 |
| 38-39.5 FIXED ADD 5.G114A ADD 5.G114B FIXED-SATELLITE (space-to-Earth) MOBILE Earth exploration-satellite (space-to-Earth) 5.547 |

ADD EUR/16A14/16#49790

5.G114AThe allocation to the fixed service in the frequency band 38-39.5 GHz is identified for worldwide use by high-altitude platform stations (HAPS) in the HAPS-to-ground direction. Such use of the fixed-service allocation by HAPS shall be in accordance with the provisions of Resolution **[EUR-G114] (WRC‑19)**.     (WRC‑19)

**Reasons:** This footnote aims to facilitate the use of HAPS downlink on a global level by identifying the band for HAPS downlink and protect incumbent services with an associated new Resolution **[EUR-G114] (WRC-19)**.

ADD EUR/16A14/17#49791

5.G114BThe allocation to the fixed service in the frequency band 38-39.5 GHz is identified for worldwide use by high-altitude platform stations (HAPS) in the ground-to-HAPS direction. Such use of the fixed-service allocation by HAPS shall be in accordance with the provisions of Resolution **[EUR-G114] (WRC-19)**.     (WRC‑19)

**Reasons:** This footnote aims to facilitate the use of HAPS uplink on a global level by identifying the band for HAPS uplink and protect incumbent services with an associated new Resolution **[EUR-G114] (WRC-19)**.

ADD EUR/16A14/18#49794

draFt new RESOLUTION [EUR-G114] (WRC‑19)

Use of the band 38-39.5 GHz by high altitude platform
stations in the fixed service

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

*a)* that WRC‑15 considered that there is a need for greater broadband connectivity in underserved communities and in rural and remote areas, that current technologies can be used to deliver broadband applications by high-altitude platform stations (HAPS), which can provide broadband connectivity and disaster recovery communications with minimal ground network infrastructure;

*b)* that WRC‑15 decided to study additional spectrum needs for fixed HAPS links to provide broadband connectivity on a global basis, including within the frequency band 38-39.5 GHz, recognizing that the existing HAPS identifications were established without reference to today’s broadband capabilities;

*c)* that HAPS can provide broadband connectivity with minimal ground network infrastructure;

*d)* that ITU‑R has conducted studies dealing with compatibility between systems using HAPS and existing services in the 38-39.5 GHz frequency band leading to Report ITU‑R F.[HAPS-39GHz];

*e)* that WRC-19 identified the frequency band 38-39.5 GHz for worldwide use by high-altitude platform stations (HAPS) for both HAPS-to-ground and ground-to-HAPS directions,

recognizing

that in the frequency band 38-39.5 GHz with respect to earth stations in the fixed-satellite service (space-to-Earth) and HAPS ground station transmitters and receivers which operate in the fixed service, Nos. **9.17** and **9.18** apply,

resolves

1 that, for the purpose of protecting the fixed service systems in territory of other administrations in the frequency band 38-39.5 GHz, the power flux-density (pfd) level per HAPS at the surface of the Earth in territory of other administrations shall not exceed the following limits, under clear-sky conditions, unless the explicit agreement of the affected administration is provided at the time of notification of HAPS:

 −137 dB(W/(m² · MHz)) for θ ≤ 13°

 −137 + 3.125 (θ −  dB(W/(m² · MHz)) for 13° < θ ≤ 25°

 −99.5 + 0.5 (θ −  dB(W/(m² · MHz)) for 25° < θ ≤ 50°

 −87 dB(W/(m² · MHz)) for 50° < θ ≤ 90°

where θ is the elevation angle in degrees (angles of arrival above the horizontal plane).

The pfd mask above is derived under clear sky conditions, therefore, in order to compensate for additional propagation impairments in the boresight of any beam due to rain, the HAPS can be operated so that the e.i.r.p. of the corresponding beam (i.e. suffering the rain fade) can be increased by a value only equivalent to the level of rain fading and limited to a maximum of 20 dB above the e.i.r.p. corresponding to the pfd mask.

To verify the compliance with the proposed pfd mask the following equation shall be used:

 

where:

 *d* distance in meters between the HAPS and the ground (dependent on the elevation angle θ);

 *e.i.r.p.* HAPS nominal e.i.r.p. spectral density in dB(W/MHz) at a specific elevation angle;

 *pfd*(θ)power flux-density at the Earth’s surface per HAPS in dB(W/(m² · MHz));

2 that, with regard to the protection of fixed service stations with pointing elevation beyond 15°, an administration believing that unacceptable interference may still be caused shall, within four months of the date of publication of the relevant BR IFIC, provide its comments with technical justification to the notifying administration;

3 that, for the purpose of protecting the mobile service systems in territory of other administrations in the frequency band 38-39.5 GHz, the power flux-density level per HAPS at the surface of the Earth in territory of other administrations shall not exceed the following limits, under clear-sky conditions, unless the explicit agreement of the affected administration is provided at the time of notification of HAPS:

 −102 dB(W/(m² · MHz)) for θ ≤ 5°

 −102 + 0.25 (θ − 5) dB(W/(m² · MHz)) for 5° < θ ≤ 25°

 −97 dB(W/(m² · MHz)) for 25° < θ ≤ 90°

where θ is elevation angle in degrees (angle of arrival above the horizontal plane).

The pfd mask above is derived under clear sky conditions, therefore, in order to compensate for additional propagation impairments in the boresight of any beam due to rain, the HAPS can be operated so that the e.i.r.p. of the corresponding beam (i.e. suffering the rain fade) can be increased by a value only equivalent to the level of rain fading.

To verify the compliance with the proposed pfd mask the following equation shall be used:

 

where:

 *d* distance in meters between the HAPS and the ground (dependent on the elevation angle θ);

 *e.i.r.p.* HAPS nominal e.i.r.p. spectral density in dB(W/MHz) at a specific elevation angle;

 *pfd*(θ)power flux-density at the Earth’s surface per HAPS in dB(W/(m² · MHz));

4 that, for the purpose of protecting FSS GSO Earth station in the fixed-satellite service (space‑to-Earth) in the territory of other administrations, coordination of a transmitting HAPS is required when the power flux-density over any point of an administration’s border exceeds the following values:

 −169.9 + 1954 α² dB(W/(m² · MHz)) for 0 ≤ α < 0.136°

 −133.9 dB(W/(m² · MHz)) for 0.136° ≤ α < 1°

 −133.9 + 25 log α dB(W/(m² · MHz)) for 1° ≤ α < 47.9°

 −91.9 dB(W/(m² · MHz)) for 47.9° ≤ α ≤ 180°

where α is the minimum angle at the border between the line to the HAPS and the lines to the GSO arc in degrees.

To calculate the pfd produced by a HAPS platform, the following equation shall be used:

 

where:

 *d*  distance between the HAPS and the GSO FSS earth station (m);

 *Attgaz* attenuation due to atmospheric gases on the HAPS to GSO FSS earth station path in dB;

 *pfd* required pfd at the GSO FSS earth station location to meet the FSS protection criteria in dB(W/(m² · MHz));

 *e.i.r.p.*: maximum HAPS e.i.r.p. spectral density in the direction of the GSO FSS earth station in dB(W/MHz);

5 that, for the purpose of protecting FSS non-GSO systems in the fixed satellite service (space-to-Earth) in territory of other administrations from co-channel interference, coordination of a transmitting HAPS station is required when the distance between the sub-HAPS point and any point of an administration’s border is less than 100 km;

6 that, in making assignments to HAPS platforms in the fixed service in the frequency band 38-39.5 GHz, administrations shall protect the space research service (SRS) (space-to-Earth) in the frequency band 37-38 GHz from harmful interference by unwanted emissions, taking into account the space research service (space-to-Earth) protection level of −217 dB(W/Hz) at the input of the SRS receiver with 0.001% exceedance due to atmospheric and precipitation effects as referred in the relevant ITU-R Recommendations;

7 that administrations planning to implement a HAPS system in the 38-39.5 GHz frequency band shall notify the frequency assignments by submitting all mandatory elements of Appendix **4** to the Bureau for the examination of compliance with respect to the Radio Regulations with a view to their registration in the Master International Frequency Register,

instructs the Director of the Radiocommunication Bureau

to take all necessary measures to implement this Resolution.

**Reasons:** This new Resolution **[EUR-G114] (WRC-19)** includes regulatory mechanism to protect incumbent services in the frequency band 38-39.5 GHz and facilitate the use of HAPS on a global level.

ANNEX 5

Bands 47.2-47.5 GHz / 47.9-48.2 GHz

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. 2.1)

MOD EUR/16A14/19#50684

40-47.5 GHz

|  |
| --- |
| Allocation to services |
| Region 1 | Region 2 | Region 3 |
| 47.2-47.5 FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE MOD 5.552A |

MOD EUR/16A14/20#50685

47.5-51.4 GHz

|  |
| --- |
| Allocation to services |
| Region 1 | Region 2 | Region 3 |
| 47.9-48.2 FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE MOD 5.552A |

MOD EUR/16A14/21#49800

5.552A The allocation to the fixed service in the bands 47.2-47.5 GHz and 47.9-48.2 GHz is identified for use by high altitude platform stations. Such use of the fixed-service allocation in the frequency bands 47.2-47.5 GHz and 47.9-48.2 GHz by HAPS shall be in accordance with the provisions of Resolution **122 (Rev.WRC‑19)**.     (WRC‑19)

MOD EUR/16A14/22#50687

RESOLUTION 122 (Rev.WRC-19)

Use of the bands 47.2-47.5 GHz and 47.9-48.2 GHz by high altitude platform stations in the fixed service and by other services

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

*a)* that the band 47.2-50.2 GHz is allocated to the fixed, mobile and fixed-satellite services on a co-primary basis;

*b)* that WRC‑97 made provision for operation of high altitude platform stations (HAPS), also known as stratospheric repeaters, within the fixed service in the bands 47.2-47.5 GHz and 47.9‑48.2 GHz;

*c)* that establishing a stable technical and regulatory environment will promote the use of all co‑primary services in the band 47.2-47.5 GHz and 47.9-48.2 GHz;

*d)* that Recommendation ITU‑R F.1500 contains the characteristics of systems in the fixed service using HAPS in the bands 47.2-47.5 GHz and 47.9-48.2 GHz;

*e)* that while the decision to deploy HAPS can be taken on a national basis, such deployment may affect the territory of other administrations and operators of co‑primary services;

*f)* that ITU‑R has completed studies dealing with sharing between systems using HAPS in the fixed service and other types of systems in the fixed service in the bands 47.2-47.5 GHz and 47.9‑48.2 GHz;

*g)* that No. **5.552** urges administrations to take all practicable steps to reserve fixed-satellite service (FSS) use of the band 47.2-49.2 GHz for feeder links for the broadcasting-satellite service (BSS) operating in the band 40.5-42.5 GHz, and that ITU‑R studies indicate that HAPS in the fixed service may share with such feeder links;

*h)* that the technical characteristics of expected BSS feeder links and FSS gateway-type stations are similar;

*i)* that ITU‑R has completed studies dealing with sharing between systems using HAPS in the fixed service and the fixed-satellite service,

recognizing

*a)* that, in the long term, the bands 47.2-47.5 GHz and 47.9-48.2 GHz are expected to be required for HAPS operations;

*b)* that Recommendation ITU‑R SF.1843 provides information on the feasibility of HAPS systems in the fixed service sharing with the FSS;

*c)* that ITU‑R studies on HAPS operation in the bands 47.2-47.5 GHz and 47.9-48.2 GHz allocated to the fixed service have concluded that, in order to share with FSS (Earth-to-space), the maximum uplink transmit e.i.r.p. density of HAPS ground terminals in the bands should, in clear-sky conditions, be 6.4 dB(W/MHz) for Urban Area Coverage (UAC), 22.57 dB(W/MHz) for Suburban Area Coverage (SAC) and 28 dB(W/MHz) for Rural Area Coverage (RAC), and that these values can be increased by up to 5 dB during periods of rain;

*d)* that ITU‑R studies have established specific power flux‑density values to be met at international borders to facilitate sharing conditions for HAPS with other types of fixed service systems within a concerned country;

*e)* that FSS satellite networks and systems with earth station antenna diameters of 2.5 metres or larger operating as a gateway-type station are capable of sharing with ubiquitous HAPS terminals,

resolves

1 that to facilitate sharing with the FSS (Earth-to-space), the maximum transmit e.i.r.p. density of a ubiquitous HAPS ground terminal shall not exceed the following levels under clear-sky conditions:

 6.4 dB(W/MHz) for UAC (30° < θ ≤ 90°)

 22.57 dB(W/MHz) for SAC (15° < θ ≤ 30°)

 28 dB(W/MHz) for RAC (5° < θ ≤ 15°)

where θ is the ground terminal elevation angle in degrees;

2 that the maximum transmit e.i.r.p. density levels specified in *resolves*1 may be increased, using fading compensation techniques, by up to 20 dB during periods of rain only to compensate the rain fade;

…

4 that for the purpose of protecting fixed wireless systems in the territory of other administrations from co‑channel interference the power flux-density level per HAPS produced at the surface of the Earth in territory of other administrations shall not exceed the following limits without explicit agreement from the affected administrations:

 −141 dB(W/(m² · MHz)) for θ ≤ 3°

 −141 + 2 (θ − 3) dB(W/(m² · MHz)) for 3° < θ ≤ 13°

 −121 dB(W/(m² · MHz)) for 13° < θ ≤ 90°

where θ is the angle of the arrival above the horizontal plane in degrees. These limits relate to the power flux-density which would be obtained under clear sky conditions;

…

invites administrations

that intend to deploy HAPS systems in the fixed service in the bands 47.2-47.5 GHz and 47.9‑48.2 GHz to consider specifying the use of the bands 47.2-47.35 GHz and 47.9-48.05 GHz for ubiquitous HAPS terminals,

instructs the Director of the Radiocommunication Bureau

to take all necessary measures to implement this Resolution.

**Reasons:** Amend the existing Resolution **122 (WRC-07)** to take into account the latest technological improvement of HAPS technology.

ANNEX 6

ARTICLE 11

Notification and recording of frequency
assignments1, 2, 3, 4, 5, 6, 7, 8    (WRC‑15)

Section I − Notification

MOD EUR/16A14/23#49808

11.26 Notices relating to assignments for high-altitude platform stations in the fixed service in the bands identified in Nos. **5.A114**, **5.E114**, **5.F114A**, **5.F114B**, **5.G114A**, **5.G114B** and **5.552A** shall reach the Bureau not earlier than five years before the assignments are brought into use.     (WRC‑19)

ANNEX 7

APPENDIX 4 (REV.WRC‑15)

Consolidated list and tables of characteristics for use in the
application of the procedures of Chapter III

ANNEX 1

Characteristics of stations in the terrestrial services[[1]](#footnote-1)1

Footnotes to Tables 1 and 2

MOD EUR/16A14/24

TABLE 2

Characteristics for high altitude platform stations (HAPS) frequency assignments
in the terrestrial services

| **Item identifier** | ***1 \_ GENERAL CHARACTERISTICS OF THE HAPS*** | **Transmitting station in the bands listed in No. 5.388A for the application of No. 11.2** | **Receiving station in the bands listed in No. 5.388A for the application of No. 11.9** | **Transmitting station in the bands listed in Nos. 5.A114, 5. E114, 5F114A, 5.G114A and 5.552A for the application of No. 11.2** | **Receiving station in the bands listed in Nos.  457 , 5.F114B, 5.G114B and 5.552A for the application of No. 11.9** | **Item identifier** |
| --- | --- | --- | --- | --- | --- | --- |
| … | … | **…** | … | … | … | … |
| 1.14.d | a commitment that the e.i.r.p. density per HAPS does not exceed −16.1 dB(W/MHz) for off nadir angles higher than 95°(see draft new Resolution **[EUR-A114] (WRC-19)**)Required in the band 6 440‑6 520 MHz |  |  |  | **+** | 1.14.d |
| 1.14.e | a commitment that the e.i.r.p. density per HAPS operating over the oceans or over the land at a distance lower than 29 km from a coast line (distance between the sub-HAPS point and the coast line) does not exceed −34.9 dB(W/200 MHz) for off-nadir angles higher than 125° (see draft new Resolution **[EUR-A114] (WRC‑19)**)Required in the band 6 440-6 520 MHz |  |  |  | **+** | 1.14.e |
| … | … | **…** | … | … | … | … |
| 1.14.n | a commitment that the maximum e.i.r.p. density per HAPS does not exceed −8 dB(W/MHz) for off-nadir angles higher than 85.5° (see draft new Resolution **[EUR-E114] (WRC‑19)**)Required in the band 27.9-28.2 GHz |  |  | **+** |  | 1.14.n |
| 1.14.o | a commitment that the level of unwanted power density into the HAPS ground station antenna in the band 31.3-31.8 GHz does not exceed −83 dB(W/200 MHz) under clear-sky conditions and may be increased under rainy conditions to mitigate fading due to rain, provided that the effective impact on the passive satellite does not exceed the impact under clear sky conditions (see draft new Resolution **[EUR-E114] (WRC‑19)**)Required in the band 31-31.3 GHz |  |  | **+** |  | 1.14.o |
| 1.14.p | a commitment that the e.i.r.p. density per HAPS in the band 31.3-31.8 GHz does not exceed −θ − 13.1 dB(W/200 MHz) for angles of arrival between −4.53° and 22° and −35.1 dB(W/200 MHz) for angles of arrival between 22° and 90° (see draft new Resolution **[EUR-E114] (WRC‑19)**)Required in the band 31-31.3 GHz |  |  | **+** |  | 1.14.p |
| 1.14.q | a commitment that the power flux-density produced by unwanted emissions from HAPS ground station does not exceed −141 dB(W/(m² · 500 MHz) in the band 31.3-31.8 GHz at an RAS station location at the height of 50 m (see draft new Resolution **[EUR-E114] (WRC‑19)**)Required in the band 31-31.3 GHz |  |  | **+** |  | 1.14.q |
| 1.14.r | a commitment that the power flux-density produced by unwanted emissions from HAPS does not exceed −171 dB(W/(m² · 500 MHz) in the band 31.3-31.8 GHz at an RAS station location at the height of 50 m. (see draft new Resolution **[EUR-E114] (WRC‑19)**)Required in the band 31-31.3 GHz |  |  | **+** |  | 1.14.r |
| 1.14.s | a commitment that space research service (space-to-Earth) protection level of −217 dB(W/Hz) at the input of SRS receiver with 0.001% exceedance due to atmospheric and precipitation effects as referred to in the relevant ITU‑R Recommendations is not exceeded (see draft new Resolution **[EUR-G114] (WRC‑19)** )Required in the band 38-39.5 GHz |  |  | **+** | **+** | 1.14.s |
| 1.14.t | a commitment that the maximum power density into an ubiquitous HAPS ground station antenna in the Urban Area Coverage (UAC) shall not exceed 6.4 dB(W/MHz) for elevation angles of ground station antenna greater than 30° and less than or equal to 90° (see Resolution **122 (Rev.WRC‑19)**)Required in the bands 47.2-47.5 GHz and 47.9-48.2 GHz |  |  |  | **+** | 1.14.t |
| 1.14.u | a commitment that the maximum power density into an ubiquitous HAPS ground station antenna in the Suburban Area Coverage (SAC) shall not exceed 22.57 dB(W/MHz) for elevation angles of ground station antenna greater than 15° and less than or equal to 30° (see Resolution **122 (Rev.WRC‑19)**)Required in the bands 47.2-47.5 GHz and 47.9-48.2 GHz |  |  |  | **+** | 1.14.u |
| 1.14.v | a commitment that the maximum power density into an ubiquitous HAPS ground station antenna in the Rural Area Coverage (RAC) shall not exceed 28 dB(W/MHz) for elevation angles of ground station antenna greater than 5° and less than or equal to 15° (see Resolution **122 (Rev.WRC‑19)**)Required in the bands 47.2-47.5 GHz and 47.9-48.2 GHz |  |  |  | **+** | 1.14.v |
| 1.14.w | a commitment that the separation distance between the nadir of the HAPS and a radio astronomy station operating in the band 48.94-49.04 GHz within the territory of another administration shall exceed 50 km (see Resolution **122 (Rev.WRC‑19)**)Required in the bands 47.2-47.5 GHz and 47.9-48.2 GHz |  |  | **+** |  | 1.14.w |
|   | **COORDINATION AND AGREEMENT** |  |
| …. | … | **…** | **…** | **…** | **…** | … |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Item identifier** | ***2 \_ CHARACTERISTICS TO BE PROVIDED FOR EACH INDIVIDUAL OR COMPOSITEHAPS ANTENNA BEAM*** | **Transmitting station in the bands listed in No. 5.388A for the application of No. 11.2** | **Receiving station in the bands listed in No. 5.388A for the application of No. 11.9** | **Transmitting station in the bands listed in Nos. 5.A114, 5. E114, 5F114A, 5.G114A and 5.552A for the application of No. 11.2** | **Receiving station in the bands listed in Nos. 457 , 5.F114B, 5.G114B and 5.552A for the application of No. 11.9** | **Item identifier** |
|   | **IDENTIFICATION AND DIRECTION OF THE HAPS ANTENNA BEAM** |  |
| 2.1.a | the identification of the HAPS antenna beam | **X** | **X** | **X** | **X** | 2.1.a |
| ... | ... | **...** | **...** | **...** | **...** | ... |

| **Item identifier** | ***3 \_ CHARACTERISTICS TO BE PROVIDED FOR EACH FREQUENCY ASSIGNMENT FOREACH INDIVIDUAL OR COMPOSITEHAPS ANTENNA BEAM*** | **Transmitting station in the bands listed in No. 5.388A for the application of No. 11.2** | **Receiving station in the bands listed in No. 5.388A for the application of No. 11.9** | **Transmitting station in the bands listed in Nos.  5.A114, 5. E114, 5.F114A, 5.G114A and 5.552Afor the application of No. 11.2** | **Receiving station in the bands listed in Nos. 5.543A and 5.457, 5.F114B, 5.G114B for the application of No. 11.9** | **Item identifier** |
| --- | --- | --- | --- | --- | --- | --- |
| ... | ... | **...** | **...** | **...** | **...** | ... |
|   | **LOCATION OF THE ASSOCIATED ANTENNA(S)** |  |
|   | **For an area in which associated transmitting/receiving ground station(s) operate:** |  |  |  |  |   |
| 3.5.c.a | the geographical coordinates of a given zoneA minimum of six geographical coordinates are required, in degrees, minutes and seconds*Note* – For the fixed service in the bands 47.2-47.5 GHz and 47.9-48.2 GHz the geographical coordinates are provided for each of the UAC, SAC and if applicable RAC (see the most recent version of Recommendation ITU‑R F.1500)Required if neither a circular area (3.5.e and 3.5.f) nor a geographical area (3.5.d) are provided | **+** | **+** | **+** | **+** | 3.5.c.a |
| 3.5.d | the code of the geographical area (see the Preface)*Note* – For the fixed service in the bands 47.2-47.5 GHz and 47.9-48.2 GHz separate geographical areas are provided for each of the UAC, SAC and if applicable RAC (see the most recent version of Recommendation ITU‑R F.1500) Required if neither a circular area (3.5.e and 3.5.f) nor the geographical coordinates of a given zone (3.5.c.a) are provided | **+** | **+** | **+** | **+** | 3.5.d |
| 3.5.e | the geographical coordinates of the centre of the circular area in which the associated ground station(s) are operatingThe latitude and longitude are provided in degrees, minutes and seconds*Note* – For the fixed service in the bands 47.2-47.5 GHz and 47.9-48.2 GHz different centres of the circular area may be provided for the UAC, SAC and if applicable RAC (see the most recent version of Recommendation ITU‑R F.1500) Required if neither a geographical area (3.5.d) or geographical coordinates of a given zone (3.5.c.a) are provided  | **+** | **+** | **+** | **+** | 3.5.e |
| ... | ... | **...** | **...** | **...** | **...** | ... |
|   | **POWER CHARACTERISTICS OF THE TRANSMISSION** |  |
| 3.8 | the symbol (X, Y or Z, as appropriate) describing the type of power (see Article **1**) corresponding to the class of emission | **X** | **X** | **X** | **X** | 3.8. |
| 3.8.aa | the nominal power delivered to the antenna, in dBW, excluding the level of power control in 3.8.BA *Note* – For a receiving HAPS, the nominal power delivered to the antenna refers to the associated transmitting ground station(s) | **X** |  | **X** | **X** | 3.8.aa |
| 3.8.AB | the nominal power density1 averaged over the worst 1 MHz band delivered to the antenna | **X** |  | **X** |  | 3.8AB |
| 3.8.BA | the range of power control, in dB*Note* – For a receiving HAPS, the power control refers to its use by the associated transmitting ground station(s)In the case of a transmitting HAPS, required in the bands, 27.9-28.2 GHz, 31-31.3 GHz, 38-39.5 GHz, 47.2-47.5 GHz and 47.9-48.2 GHzIn the case of a receiving HAPS, required in the bands 47.2-47.5 GHz and 47.9-48.2 GHz | **X** |  |  | **X** | 3.8.BA |
|   | **POLARIZATION AND RECEIVING SYSTEM NOISE TEMPERATURE** |  |
| 3.9.d | the code indicating the type of polarization (see the Preface) | **X** | **X** | **X** | **X** | 3.9.d |
| 3.9.j | the reference radiation pattern of the associated ground station(s)Required in the bands 47.2-47.5 GHz and 47.9‑48.2 GHz |  |  | **+** | **+** | 3.9.j |
| 3.9.k | the lowest total receiving system noise temperature, in kelvins, referred to the output of the receiving antenna |  | **X** |  | **X** | 3.9.k |
|   | **HOURS OF OPERATION** |  |
| 3.10.b | the regular hours of operation (in hours and minutes from ... to ...) of the frequency assignment, in UTC | **X** | **X** | **X** | **X** | 3.10.b |

ANNEX 8

APPENDIX 7 (REV.WRC‑15)

Methods for the determination of the coordination area around an earth
station in frequency bands between 100 MHz and 105 GHz

ANNEX 7

System parameters and predetermined coordination distances for determination of the coordination area around an earth station

# 3 Horizon antenna gain for a receiving earth station with respect to a transmitting earth station

MOD EUR/16A14/25#49811

TABLE 7b (Rev.WRC‑19)

Parameters required for the determination of coordination distance for a transmitting earth station

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Transmitting space radiocommunication service designation | Fixed-satellite,mobile-satellite | Aero-nautical mobile-satellite (R) service | Aero-nautical mobile-satellite (R) service | Fixed-satellite | Fixed-satellite | Fixed-satellite | Fixed-satellite | Fixed-satellite | Earthexploration-satellite, space operation,space research | Fixed-satellite,mobile-satellite,meteorological- satellite | Fixed-satellite | Fixed-satellite | Fixed-satellite | Fixed-satellite 3 | Fixed-satellite | Fixed-satellite 3 |
| Frequency bands (GHz) | 2.655-2.690 | 5.030-5.091 | 5.030-5.091 | 5.091-5.150 | 5.091-5.150 | 5.725-5.850 | 5.725-7.075 | 6 440-6 520 | 7.100-7.250 5 | 7.900-8.400 | 10.7-11.7 | 12.5-14.8 | 13.75-14.3 | 15.43-15.65 | 17.7-18.4 | 19.3-19.7 |
| Receiving terrestrialservice designations | Fixed,mobile | Aeronautical radio-navigation | Aeronautical mobile (R) | Aeronautical radio-navigation | Aeronautical mobile (R) | Radiolocation | Fixed (except HAPS ground stations), mobile | Fixed (HAPS ground station) | Fixed, mobile | Fixed, mobile | Fixed, mobile | Fixed, mobile | Radiolocation radionavigation (land only) | Aeronautical radionavigation | Fixed, mobile | Fixed, mobile |
| Method to be used | § 2.1 | § 2.1, § 2.2 | § 2.1, § 2.2 |  |  | § 2.1 | § 2.1 | § 2.1 | § 2.1, § 2.2 | § 2.1 | § 2.1 | § 2.1, § 2.2 | § 2.1 |  | § 2.1, § 2.2 | § 2.2 |
| Modulation at terrestrial station 1 | A |  |  |  |  |  | A | N |  N | A | N | A | N | A | N | A | N | − |  | N | N |
| Terrestrial station interference parameters and criteria | *p*0 (%) | 0.01 |  |  |  |  |  | 0.01 | 0.005 | 0.01 | 0.01 | 0.005 | 0.01 | 0.005 | 0.01 | 0.005 | 0.01 | 0.005 | 0.01 |  | 0.005 | 0.005 |
| *n* | 2 |  |  |  |  |  | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 |  | 2 | 2 |
| *p* (%) | 0.005 |  |  |  |  |  | 0.005 | 0.0025 | 0.005 | 0.005 | 0.0025 | 0.005 | 0.0025 | 0.005 | 0.0025 | 0.005 | 0.0025 | 0.01 |  | 0.0025 | 0.0025 |
| *NL* (dB) | 0 |  |  |  |  |  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  | 0 | 0 |
| *Ms* (dB) | 26 2 |  |  |  |  |  | 33 | 37 | 10 | 33 | 37 | 33 | 37 | 33 | 40 | 33 | 40 | 1 |  | 25 | 25 |
| *W* (dB) | 0 |  |  |  |  |  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  | 0 | 0 |
| Terrestrial station parameters | *Gx* (dBi) 4 | 49 2 | 6 | 10 | 6 | 6 |  | 46 | 46 | 2 6 | 46 | 46 | 46 | 46 | 50 | 50 | 52 | 52 | 36 |  | 48 | 48 |
| *Te* (K) | 500 2 |  |  |  |  |  | 750 | 750 | 500 | 750 | 750 | 750 | 750 | 1 500 | 1 100 | 1 500 | 1 100 | 2 636 |  | 1 100 | 1 100 |
| Reference bandwidth | *B* (Hz) | 4 × 103 | 150 × 103 | 37.5 × 103 | 150 × 103 | 106 |  | 4 × 103 | 106 | 106 | 4 × 103 | 106 | 4 × 103 | 106 | 4 × 103 | 106 | 4 × 103 | 106 | 107 |  | 106 | 106 |
| Permissible interference power | *Pr*( *p*) (dBW)in *B* | −140 | −160 | −157 | −160 | −143 |  | −131 | −103 | −132 | −131 | −103 | −131 | −103 | −128 | −98 | −128 | −98 | −131 |  | −113 | −113 |
| 1 A: analogue modulation; N: digital modulation.2 The parameters for the terrestrial station associated with transhorizon systems have been used. Line-of-sight radio-relay parameters associated with the frequency band 5 725‑7 075 MHz may also be used to determine a supplementary contour with the exception that *Gx* = 37 dBi.3 Feeder links of non-geostationary satellite systems in the mobile‑satellite service.4 Feeder losses are not included.5 Actual frequency bands are 7 190-7 250 MHz for the Earth exploration-satellite service, 7 100-7 155 MHz and 7 190-7 235 MHz for the space operation service and 7 145‑7 235 MHz for the space research service.6 Maximum HAPS ground station antenna gain toward the horizon. |

MOD EUR/16A14/26#49812

TABLE 7c    (Rev.WRC‑19)

Parameters required for the determination of coordination distance for a transmitting earth station

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Transmitting spaceradiocommunication service designation | Fixed-satellite | Fixed-satellite | Fixed-satellite 2 | Fixed-satellite 3 | Spaceresearch | Earth exploration-satellite,space research | Fixed-satellite,mobile-satellite,radionavigation-satellite | Fixed-satellite 2 |
| Frequency bands (GHz) | 24.65-25.2527.0-29.5 | 27.9-28.2 | 28.6-29.1 | 29.1-29.5 | 34.2-34.7 | 40.0-40.5 | 42.5-4747.2-50.250.4-51.4 | 47.2-50.2 |
| Receiving terrestrial service designations | Fixed, mobile | Fixed (HAPS ground station) | Fixed, mobile | Fixed, mobile | Fixed, mobile, radiolocation | Fixed, mobile | Fixed, mobile,radionavigation | Fixed,mobile |
| Method to be used | § 2.1 | § 2.1 | § 2.2 | § 2.2 |  | § 2.1, § 2.2 | § 2.1, § 2.2 | § 2.2 |
| Modulation at terrestrial station 1 | N |  N | N | N |  | N | N | N |
| Terrestrial station interference parameters and criteria | *p*0 (%) | 0.005 | 0.01 | 0.005 | 0.005 |  | 0.005 | 0.005 | 0.001 |
| *n* | 1 | 1 | 2 | 1 |  | 1 | 1 | 1 |
| *p* (%) | 0.005 | 0.005 | 0.0025 | 0.005 |  | 0.005 | 0.005 | 0.001 |
| *NL* (dB) | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 |
| *Ms* (dB) | 25 | 10 | 25 | 25 |  | 25 | 25 | 25 |
| *W* (dB) | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 |
| Terrestrial station parameters | *Gx* (dBi) 4 | 50 | 0 5 | 50 | 50 |  | 42 | 42 | 46 |
| *Te* (K) | 2 000 | 350 | 2 000 | 2 000 |  | 2 600 | 2 600 | 2 000 |
| Reference bandwidth | *B* (Hz) | 106 | 106 | 106 | 106 |  | 106 | 106 | 106 |
| Permissible interference power | *Pr*( *p*) (dBW)in *B* | −111 | −134 | −111 | −111 |  | −110 | −110 | −111 |
| 1 A: analogue modulation; N: digital modulation.2 Non-geostationary satellites in the fixed-satellite service.3 Feeder links to non-geostationary-satellite systems in the mobile-satellite service.4 Feeder losses are not included.5 Maximum HAPS ground station antenna gain toward the horizon. |

ANNEX 9

SUP EUR/16A14/27#50820

RESOLUTION 160 (WRC‑15)

Facilitating access to broadband applications delivered
by high-altitude platform stations

ANNEX 10

(ONLY NEEDED IN CASE OF PROPOSALS FROM REGION 2 FOR HAPS IDENTIFICATIONS IN THE BANDS 21.4-22 GHz AND 24.25-27.5 GHz FOR REGION 2)

 EUR/16A14/28

Additional considerations for the Region 2 to protect global incumbent services

The frequency bands 24.25-27.5 GHz is core band in Europe’s 5G strategy. Therefore, the focus of the CEPT efforts regarding this band are on the facilitation of a worldwide IMT identification under agenda item 1.13. Nevertheless, any consideration of the frequency bands 21.4-22 GHz and 24.25‑27.5 GHz in Region 2 under agenda item 1.14 shall be accompanied by the appropriate protection of inter-satellite service (ISS) in the frequency band 24.45-24.75 GHz, ISS in the frequency band 25.25-27.5 GHz, EESS (passive) in the frequency bands 21.2-21.4 GHz, 22.21‑22.5 GHz and 23.6-24 GHz, EESS and SRS (space-to-Earth) in the frequency band 25.5‑27 GHz and FSS in the frequency bands 24.75-25.25 and 27-27.5 GHz.

This would lead to the additional *resolves* in an appropriate WRC Resolution dealing with the frequency bands 21.4-22 GHz and 24.25-27.5GHz in Region 2, if any, as well as consequential changes to Appendices **4** and **7** of the Radio Regulations. The text of these additional *resolves* and the changes to Appendices **4** and **7** is provided in Annex 10 of Addendum 14 to Document 16.

Text of *resolves* of WRC Resolution dealing with the frequency bands 21.4-22 GHz and 24.25-27.5 GHz in Region 2

1 that for the purpose of protecting the inter-satellite service, the e.i.r.p. density per HAPS in the frequency band 25.25-27.5 GHz, shall not exceed −70.7 dB(W/Hz) for off-nadir angle higher than 85.5°;

2 that for the purpose of protecting the inter satellite service, the e.i.r.p. density per HAPS in the frequency band 24.45-24.75 GHz, shall not exceed −19.9 dB(W/MHz) for off-nadir angle higher than 85.5°;

3 that for the purpose of protection the inter-satellite service, the e.i.r.p. density per HAPS ground station in the frequency band 25.25-27.5 GHz, shall not exceed 12.3 dB(W/MHz) under clear-sky conditions.

In addition, maximum e.i.r.p. density in the frequency band 25.25-27.5 GHz density of HAPS ground stations should not exceed 0.5 dB(W/MHz) in clear-sky conditions in the direction of geostationary arc. It is also needed to take into account possible orbit inclination of space stations between −5° and 5°.

During raining conditions the e.i.r.p. density can be increased by a value only equivalent to the level of rain fading and limited to a maximum of 20 dB.

4 that for the purpose of protecting the fixed-satellite service, the e.i.r.p. density per HAPS, in the bands 24.75-25.25 and 27-27.5 GHz, shall not exceed −9.1 dB(W/MHz) for off‑nadir angles higher than 85.5°;

5 that for the purpose of protecting the Earth exploration-satellite (passive) service in the bands 21.2-21.4 GHz and 22.21-22.5 GHz, the e.i.r.p. density in the bands 21.2-21.4 GHz and 22.21-22.5 GHz per HAPS operating in the band 21.4-22 GHz, shall not exceed:

 −0.76 θ − 9.5 dB(W/100 MHz) for −4.53° ≤ θ < 35.5°

 −36.5 dB(W/100 MHz) for 35.5° ≤ θ ≤ 90°

where:

 θ is the elevation angle (°) at the platform height:

6 that for the purpose of protecting the Earth exploration-satellite (passive) service in the frequency bands 21.2-21.4 GHz and 22.21-22.5 GHz;

*Scenario 1:* the use of the 21.4-22 GHz frequency band is limited to the HAPS-to-ground direction;

*Scenario 2:* the e.i.r.p. per HAPS CPE, in those two frequency bands, shall not exceed −33.4 dBW/100 MHz and the e.i.r.p. per HAPS gateway, in those two bands, shall not exceed −29.6 dBW/100 MHz;

7 that for the purpose of protecting the Earth exploration-satellite (passive) service in the frequency band 23.6-24 GHz, the e.i.r.p. density in the frequency band 23.6-24 GHz per HAPS operating in the frequency band 24.25-25.25 GHz, shall not exceed:

 −0.7714 θ − 16.5 dB(W/200 MHz) for −4.53° ≤ θ < 35°

 −43.5 dB(W/200 MHz) for 35° ≤ θ ≤ 90°

where:

 θ is the elevation angle in degrees (angles of arrival above the horizontal plane);

8 that for the purpose of protecting the Earth exploration-satellite (passive) service in the frequency band 23.6-24 GHz,

*Scenario 1:* the use of the 24.25-27.5 GHz frequency band is limited to the HAPS-to-ground direction;

*Scenario 2:* the e.i.r.p. spectral density of unwanted emissions within the frequency band 23.6‑24 GHz shall be limited to −46 dB(W/200 MHz) from HAPS CPE and to −39.9 dB(W/200 MHz) from HAPS gateways;

9 that with respect to HAPS, the provisions of No. **5.536A** shall not apply;

10 that in order to ensure the protection of in-band SRS/EESS satellite services in the territory of other administrations from the HAPS or from the HAPS ground station in the frequency band 25.5-27.0 GHz, the pfd of a HAPS shall not exceed the sets of values below at the SRS/EESS earth stations. The pfd limits applied to HAPS platforms are established to be met under clear sky conditions 100% of the time, at the location of the SRS/EESS earth station. For the case of the HAPS ground station towards an SRS/EESS Earth station there will be a need to consider HAPS and SRS/EESS antenna heights in order to apply attenuation using Recommendation ITU-R P.452, using the following time percentages: 1) SRS: .001%; 2) EESS NGSO: .005%; 3) EESS GSO: 20%.

**SRS**

 

where $φ$ is the angle of arrival ($φ$) of the interfering signal above the local horizontal plane at the SRS antenna.

Note: Consequential modifications of Appendix **5** should be considered.

**EESS NGSO**

 

where $φ$ is the angle of arrival ($φ$) of the interfering signal above the local horizontal plane at the EESS antenna.

**EESS GSO**

 

where $φ$ is the angle of arrival ($φ$) of the interfering signal above the local horizontal plane at the EESS antenna.

Following additional elements may also be needed dealing with 21.4-22 GHz and 24.25-27.5 GHz frequency band in Region 2, if Region 2 decides to propose these frequency bands for HAPS in Region 2.

For RR Appendix **4** (ANNEX 1, Table 2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 1.14.f | a commitment that the e.i.r.p density per HAPS in the bands 21.2-21.4 GHz and 22.21-22.5 GHz does not exceed -0.76 θ – 9.5 dB(W/100 MHz) for angles of arrival between -4.53° and 35.5° and −36.5 dB(W/100MHz) for angles of arrival between 35.5° and 90° (see draft new Resolution **[EUR-B114] (WRC‑19)**)Required in the band 21.4-22 GHz |  |  |  | **+** | 1.14.f |
| 1.14.g | a commitment that the unwanted emission power flux-density produced by HAPS does not exceed −176 dB(W/(m² · 290 MHz)) for continuum observations, and −192 dB(W/(m² ⋅ 250 kHz)) for spectral line observations in the band 22.21-22.5 GHz at an RAS station location at a height of 50 m (see draft new Resolution **[EUR-B114] WRC‑19)**)Required in the band 21.4-22 GHz |  |  |  | **+** | 1.14.g |
| 1.14.h | a commitment that the e.i.r.p. density per HAPS does not exceed −70.7 dB(W/Hz) for off-nadir angles higher than 85° (see draft new Resolution  [**[EUR-C114] (WRC‑19)**)Required in the band 27-27.5 GHz |  |  | + |  | 1.14.h |
| 1.14.i | a commitment that the e.i.r.p. density per HAPS does not exceed −19.9 dB(W/MHz) for off-nadir angles higher than 85° (see draft new Resolution **[EUR-C114] (WRC‑19)**)Required in the bands 24.45-24.75 GHz |  |  | + |  | 1.14.i |
| 1.14.j | a commitment that the e.i.r.p. density per HAPS ground station does not exceed 12.3 dB(W/MHz) under clear-sky conditions, the e.i.r.p limit can be increased by 20 dB only to compensate for rain fade (see draft new Resolution **[EUR-C114] (WRC‑19)**)Required in the bands 25.25-25.5 GHz |  |  | + |  | 1.14.j |
| 1.14.k | a commitment that the e.i.r.p. density per HAPS does not exceed −9.1 dB(W/MHz) for off-nadir angles higher than 85.5° (see draft new Resolution **[EUR-C114] (WRC‑19)**)Required in the bands 24.25-25.25 and 27-27.5 GHz |  |  | + |  | 1.14.k |
| 1.14.l | a commitment that the e.i.r.p. density per HAPS in the band 23.6-24.2 GHz does not exceed −0.7714 θ −16.5 dB(W/200 MHz) for angles of arrival between −4.53° and 35° and −43.5 dB(W/100 MHz) for angles of arrival between 35° and 90° (see draft new Resolution **[EUR-C114] (WRC‑19)**)Required in the bands 24.25-25.25 GHz |  |  | + |  | 1.14.l |
| 1.14.m | a commitment that the power flux-density produced by unwanted emissions from HAPS does not exceed −177 dB(W/(m² · 400 MHz) for continuum observations and −191 dB(W/(m² · 250 kHz) for spectral line observations in the band 23.6-24 GHz at an RAS station location at the height of 50 m (see draft new Resolution **[EUR-C114] (WRC‑19)**)Required in the bands 24.25-25.25 GHz  |  |  | + |  | 1.14.m |
| 1.14.n | a commitment that the power flux-density produced by a HAPS or HAPS ground station shall not exceed the following values at the SRS/EESS earth stations:For SRS:For EESS NGSO:For EESS GSO:where $φ$ is the angle of arrival ($φ$) of the interfering signal above the local horizontal plane at the SRS or EESS antenna.Required in the band 25.5-27.0 GHz. |  |  |  |  | 1.14n |
| 3.8.BA | the range of power control, in dB*Note* – For a receiving HAPS, the power control refers to its use by the associated transmitting ground station(s)In the case of a transmitting HAPS, required in the bands 21.4-22 GHz, 24.25-25.25 GHz, 27-27.5 GHz, … | **X** |  |  | **X** | 3.8.BA |

For RR Appendix **7** (ANNEX 7, Table 7C)

TABLE 7c    (Rev.WRC‑19)

Parameters required for the determination of coordination distance for a transmitting earth station

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Transmitting spaceradiocommunication service designation | Fixed-satellite | Fixed-satellite | Fixed-satellite 2 | Fixed-satellite 3 | Spaceresearch | Earth exploration-satellite,space research | Fixed-satellite,mobile-satellite,radionavigation-satellite | Fixed-satellite 2 |
| Frequency bands (GHz) | 24.65-25.2527.0-29.5 | 24.65-25.2527-27.527.9-28.2 | 28.6-29.1 | 29.1-29.5 | 34.2-34.7 | 40.0-40.5 | 42.5-4747.2-50.250.4-51.4 | 47.2-50.2 |
| Receiving terrestrial service designations | Fixed (except HAPS), mobile |  Fixed (HAPS ground station) | Fixed, mobile | Fixed, mobile | Fixed, mobile, radiolocation | Fixed, mobile | Fixed, mobile,radionavigation | Fixed,mobile |
| Method to be used | § 2.1 | § 2.1 | § 2.2 | § 2.2 |  | § 2.1, § 2.2 | § 2.1, § 2.2 | § 2.2 |
| Modulation at terrestrial station 1 | N |  N | N | N |  | N | N | N |
| Terrestrial station interference parameters and criteria | *p*0 (%) | 0.005 | 0.01 | 0.005 | 0.005 |  | 0.005 | 0.005 | 0.001 |
| *n* | 1 | 1 | 2 | 1 |  | 1 | 1 | 1 |
| *p* (%) | 0.005 | 0.005 | 0.0025 | 0.005 |  | 0.005 | 0.005 | 0.001 |
| *NL* (dB) | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 |
| *Ms* (dB) | 25 | 10 | 25 | 25 |  | 25 | 25 | 25 |
| *W* (dB) | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 |
| Terrestrial station parameters | *Gx* (dBi) 4 | 50 | 0 5 | 50 | 50 |  | 42 | 42 | 46 |
| *Te* (K) | 2 000 | 350 | 2 000 | 2 000 |  | 2 600 | 2 600 | 2 000 |
| Reference bandwidth | *B* (Hz) | 106 | 106 | 106 | 106 |  | 106 | 106 | 106 |
| Permissible interference power | *Pr*( *p*) (dBW)in *B* | −111 | −134 | −111 | −111 |  | −110 | −110 | −111 |
| 1 A: analogue modulation; N: digital modulation.2 Non-geostationary satellites in the fixed-satellite service.3 Feeder links to non-geostationary-satellite systems in the mobile-satellite service.4 Feeder losses are not included.5 Maximum HAPS ground station antenna gain toward the horizon. |

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. 1 The Radiocommunication Bureau shall develop and keep up-to-date forms of notice to meet fully the statutory provisions of this Appendix and related decisions of future conferences. Additional information on the items listed in this Annex together with an explanation of the symbols is to be found in the Preface to the BR IFIC (Terrestrial Services). [↑](#footnote-ref-1)