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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 4 to Document 142-E** | |
|  | | **29 October 2023** | |
|  | | **Original: English** | |
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| United States of America | | | |
| Proposals for the work of the conference | | | |
|  | | | |
| Agenda item 1.4 | | | |

1.4to consider, in accordance with Resolution **247 (WRC‑19)**, the use of high-altitude platform stations as IMT base stations (HIBS) in the mobile service in certain frequency bands below 2.7 GHz already identified for IMT, on a global or regional level;

Background

The work under WRC‑23 agenda item 1.4 includes studying sharing and compatibility in the frequency bands 694-960 MHz, 1 710-1 885 MHz, and 2 500-2 690 MHz, as well as appropriate modifications to the existing footnote No. **5.388A** of the Radio Regulations (RR) and associated Resolution **221 (Rev.WRC-07)** in order to facilitate the use of high-altitude platform stations as IMT base stations (HIBS) with the most recent radio interface technologies of IMT for the frequency bands 1 885-1 980 MHz, 2 010-2 025 MHz, and 2 110-2 170 MHz in Regions 1 and 3 and in the frequency bands 1 885-1 980 MHz and 2 110-2 160 MHz in Region 2.

WRC-2000 identified through RR No. **5.388A** the frequency bands 1 885-1 980 MHz, 2 010-2 025 MHz and 2 110-2 170 MHz in Regions 1 and 3 and the frequency bands 1 885-1 980 MHz and 2 110-2 160 MHz in Region 2 that may be used by high altitude platform stations as base stations to provide International Mobile Telecommunications-2000 (IMT-2000), in accordance with Resolution **221 (Rev.WRC-07)**. Furthermore, Resolution **221 (Rev.WRC-07)** provides the technical conditions that must be met by these high-altitude platform stations to protect the various services allocated in these bands, including terrestrial IMT-2000 stations, from emissions from co-channel interference caused by a HAPS operating as an IMT-2000 base station in neighbouring countries.

HIBS are high-altitude platform stations as IMT base stations intended to be used as part of terrestrial IMT networks, as an application of the mobile service, and may use the same frequency bands with ground-based IMT base stations to provide mobile broadband connectivity. The user equipment to be served by the high-altitude IMT base stations are proposed to be the same as the ground-based IMT base stations. Currently the user equipment supports a variety of frequency bands identified for IMT, including frequency bands below 2.7 GHz. RR No. **1.66A** defines a high-altitude platform station as a station located on an object at an altitude of 20 to 50 km and at a specified, nominal, fixed point relative to the Earth. RR No. **4.23** limits transmissions to or from high altitude platform stations to bands specifically identified in RR Article **5**.

WRC‑23 agenda item 1.4 addresses the issues regarding technical and operational features of HIBS, including sharing and compatibility studies with other services in the frequency bands below 2.7 GHz, identified for IMT. It is important to ensure the protection of these in-band and adjacent band services, and not impose any additional technical or regulatory constraints in their existing and planned deployments, as provided in Resolution **247 (WRC-19)**. Furthermore, sharing and compatibility studies must consider all HIBS deployment scenarios and frequency arrangements, following band plans in Recommendation ITU‑R M.1036. Those studies need to evaluate cross-border interference between countries using terrestrial IMT networks and need to present the possible harmful impact of HIBS usage in each band identified.

Band 2 (1 710-1 885 MHz, 2 010-2 025 MHz, 2 110-2 170 MHz)

The studies that the ITU‑R conducted between proposed HIBS systems and IMT terrestrial systems operating in the frequency band 1 710-1 885 MHz show that separation distances larger than 300 km between the HIBS coverage centre and a ground based IMT network are required to protect IMT terrestrial networks from proposed HIBS co-channel operation in the 1 710-1 885 MHz frequency band. The ITU‑R studies conducted with the fixed service operating in the frequency band show that the protection criteria is exceeded at a distance of up to 300 km for point-to-point systems.

An ITU‑R study indicates that sharing between the airborne AMS and HIBS operating in the frequency range 1 780-1 850 MHz requires separation distances between 725 km and 1 135 km, depending on the airborne AMS system. The required separation distance between the proposed HIBS nadir and the ground-based AMS systems varies between 135 km and 490 km, depending on the ground-based AMS system. Fuselage loss was not considered in the sharing studies as the fuselage loss for the frequency band 1 780-1 850 MHz was not identified by the contributing group nor in any of the ITU‑R Recommendations/Reports.

The United States makes the following proposals for the 1 710-1 885 MHz band under agenda item 1.4 to allow for the operation of HIBS in the band, while ensuring protection of existing AMS systems, as provided below with the addition of *resolves* 1.4 and 2*bis* to the CITEL IAP on this band.

ARTICLE 5

Frequency allocations

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

MOD USA/142A4/1

1 710-2 170 MHz

|  |  |  |
| --- | --- | --- |
| Allocation to services | | |
| Region 1 | Region 2 | Region 3 |
| 1 710-1 930 FIXED  MOBILE 5.384A MOD 5.388A 5.388B  5.149 5.341 5.385 5.386 5.387 5.388 | | |

**Reasons:** The identification of additional frequency bands below 2.7 GHz for HIBS has the potential to support the expansion of coverage and connectivity for existing ground-based IMT networks. The technical studies show when sharing and compatibility with other services is feasible, and when some additional measures may be required, as provided in the text of the revision of Resolution **221 (Rev.WRC-07)**.

MOD USA/142A4/2

5.388A The frequency band 1 710-1 885 MHz is identified for use by high altitude platform stations as International Mobile Telecommunications (IMT) base stations (HIBS). This identification does not preclude the use of this frequency band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. Resolution **221 (Rev.WRC-23)** shall apply. Such use of HIBS in the frequency bands 1 710-1 785 MHz in Regions 1 and 2, and 1 710-1 815 MHz in Region 3 is limited to reception by HIBS.     (WRC-23)

MOD USA/142A4/3

RESOLUTION 221 (Rev.WRC‑23)

**Use of high-altitude platform stations as International Mobile Telecommunications base stations (HIBS) in the frequency band 1 710-1 885‑ MHz**

The World Radiocommunication Conference (Dubai, 2023),

considering

*a)* that there is growing demand for access to mobile broadband, requiring more flexibility in the approaches to expand the capacity and coverage provided by International Mobile Telecommunications (IMT) systems;

*b)* that high-altitude platform stations (HAPS) as IMT base stations (HIBS) would be used as part of terrestrial IMT networks, and may use the same frequency bands as ground-based IMT base stations in order to provide mobile-broadband connectivity to underserved communities, and in rural and remote areas;

*c)* that HIBS would offer a new means of providing IMT services with minimal network infrastructure as they are capable of providing service to a large footprint together with a dense coverage;

*d)* that the use of HIBS is optional for administrations, and that such use should not have any priority over other terrestrial IMT use;

*e)* that the mobile station to be served, whether by HIBS or ground-based IMT base stations, is the same, and currently supports a variety of the frequency bands identified for IMT;

*f)* that under certain deployment scenarios HIBS could operate at an altitude down to 18 km;

*g)* that some sensitivity studies have shown that the difference of interference from HIBS at altitude between 18 km and 20 km would be negligible;

*h)* that ITU‑R has addressed sharing and compatibility between HIBS and some existing systems of primary allocated services, and adjacent services, in the bands 1 710-1 885 MHz;

;

*i)* that the conclusion of the compatibility studies between HIBS operating above 1 710 MHz and meteorological satellite (MetSat) operations in the adjacent frequency band 1 670-1 710 MHz has been assuming that the use of HIBS in the frequency band 1 710-1 785 MHz is limited to reception by HIBS;

*j)* that spectrum needs, usage and deployment scenarios, and typical technical and operational characteristics for HIBS are provided in the WDPDN Report ITU‑R M.[HIBS‑CHARACTERISTICS],

considering further

that without appropriate protection measures, IMT stations may experience unacceptable interference effects due to the aggregate interference from HIBS and other services,

recognizing

*a)* that HAPS is defined in No. **1.66A** as a station located on an object at an altitude of 20 to 50 km and at a specified, nominal, fixed point relative to the Earth;

*b)* that the frequency band 1 710-1 885 MHz is included in No. **5.388A** for the use of HIBS;

*c)* that the frequency band 1 710‑1 885 MHz, or parts thereof, is identified for IMT in accordance with Nos. **5.384A** and **5.388**;

*d)* that this frequency band is allocated to the fixed and mobile services on a co-primary basis,

resolves

:

1 that administrations wishing to implement HIBS shall comply with the following:

1.1 in some countries (see No. **5.388B**), for the purpose of protecting fixed and mobile services, including IMT mobile stations, in their territories from co-channel interference caused by HIBS in accordance with No. **5.388A** in neighbouring countries, the limits of No. **5.388B** shall apply;

1.2 for the purpose of protecting the mobile service, including IMT terrestrial systems, in the territory of neighbouring administrations in the frequency band 1 710-1 885 MHz, the following limits shall apply:

– the power flux-density (pfd) level from HIBS produced at the surface of the Earth in the territory of other administrations shall not exceed the following limit for the protection of IMT mobile stations, unless explicit agreement of the affected administration is provided:

−111 dB(W/(m2 · MHz)) for 0° < θ ≤ 90°

where θ is the angle of arrival of the incident wave above the horizontal plane, in degrees;

– the pfd level from HIBS produced at the surface of the Earth in the territory of other administrations shall not exceed the following limit for the protection of IMT base stations, unless explicit agreement of the affected administration is provided:

−144.55 dB(W/(m2 · MHz)) for  0° ≤ θ < 11°

−144.55 + 0.45 (θ − 11) dB(W/(m2 · MHz)) for 11° ≤ θ < 80°

−113.55 dB(W/(m2 · MHz)) for 80° ≤ θ ≤ 90°

where θ is the angle of arrival of the incident wave above the horizontal plane, in degrees;

1.3 for the purpose of protecting fixed-service systems in the territory of other administrations in the frequency band 1 710-1 885 MHz, the power flux-density (pfd) level from HIBS produced at the surface of the Earth in the territory of other administrations shall not exceed the following limits, unless explicit agreement of the affected administration is provided:

−150 dB(W/(m2 · MHz)) for 0° < θ ≤ 2°

−150 + 1.78 (θ − 2) dB(W/(m2 · MHz)) for  2° < θ ≤ 20°

−118 + 0.215 (θ − 20) dB(W/(m2 · MHz)) for  20° < θ ≤ 48°

−112 dB(W/(m2 · MHz)) for 48° < θ ≤ 90°

where θ is the angle of arrival of the incident wave above the horizontal plane, in degrees;

1.4 for the protection of AMS systems operating in the frequency band 1 780-1 850 MHz from unacceptable interference, administrations planning to implement HIBS in that frequency band shall effect coordination with all affected administrations prior to implementation of HIBS unless otherwise agreed between the administrations concerned. An administration will be deemed affected if the HIBS will operate within 1 135 km of its borders. HIBS shall not cause harmful interference to or claim protection from systems in the aeronautical mobile service;

2 that administrations intending to implement HIBS system shall notify, in accordance with Article **11**, the frequency assignments to transmitting and receiving HIBS stations by submitting all mandatory elements of Appendix **4** to the Radiocommunication Bureau for the examination of compliance with the conditions specified in the *resolves* above;

2*bis* that administrations notifying the use of HIBS in the frequency band 1 710-1 885 MHz shall at the time of submission of the detailed filing in Appendix **4**, also provide a commitment to the Radiocommunication Bureau to undertake to immediately eliminate unacceptable interference to incumbent services or reduce it to an acceptable level should such interference occur,

resolves further

that, HIBS may operate in the frequency band 1 710‑1 885 MHz with an altitude from 18 to 20 km, on the condition that HIBS shall not cause harmful interference nor claim protection from existing and planned primary services,

invites administrations

to adopt appropriate frequency arrangements for HIBS in order to consider the benefits of harmonized utilization of the spectrum for HIBS and protection of existing services and systems operating on a primary basis taking into account the *resolves* above and the relevant ITU‑R Recommendations and Reports,

instructs the Director of the Radiocommunication Bureau

to take all necessary measures to implement this Resolution.

**Reasons:** The identification of additional frequency bands below 2.7 GHz for HIBS has the potential to support the expansion of coverage and connectivity for existing ground-based IMT networks. The technical studies show when sharing and compatibility with other services is feasible, and when some additional measures may be required, as provided in the text of the revision of Resolution **221 (Rev.WRC-07)**.

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