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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 14-E** |
|  | **9 October 2019** |
|  | **Original: English** |
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| Canada |
| 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

No. **1.66A** of the ITU Radio Regulations define a high-altitude platform station (HAPS) as “a station on an object at an altitude of 20 to 50 km and at a specified, nominal, fixed point relative to the Earth”.

Advances in aeronautics and transmission technologies have significantly improved the capabilities of HAPS to provide effective connectivity solutions and meet the growing demand for high capacity broadband networks, particularly in currently underserved areas. Recently conducted full-scale test flights have shown that solar-powered platforms in the upper-atmosphere can now be used to carry payloads that offer reliable and cost-effective connectivity, and a growing number of applications for the new generation of HAPS are being developed. The technology appears particularly well suited to provide backhaul for terrestrial networks and facilitate emergency response in case of natural disaster.

Agenda item 1.14 was adopted by **WRC-15** to consider, in accordance with Resolution **160 (WRC‑15)**, regulatory actions to facilitate deployment of HAPS for broadband applications. Resolution **160 (WRC-15)** resolves to invite ITU-R to study additional spectrum needs of HAPS, as well as considering changes of regulatory provisions in existing HAPS identifications.

Canada proposes that the allocation to the fixed service in the frequency bands 27.9-28.2 GHz and 31-31.3 GHz be identified for worldwide use by HAPS, while protecting incumbent services with introduction of an associated new Resolution. Canadian proposal is in close alignment with Option 1 of Methods 6B1 and 7B1, having made further improvements to the associated Methods as presented in the CPM Report.

ARTICLE 5

Frequency allocations

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

MOD CAN/14A14/1#49766

24.75-29.9 GHz

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| --- |
| 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 |

**Reasons:** To add a footnote to the fixed service allocation in support of a HAPS identification in the 27.9-28.2 GHz band and to suppress the existing HAPS related footnote.

ADD CAN/14A14/2#49767

5.E114The allocation to the fixed service in the band 27.9-28.2 GHz is identified for worldwide use by high-altitude platform stations (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 **[CAN-1/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 [**CAN-1/E114] (WRC-19)**.

SUP CAN/14A14/3#49768

5.537A

**Reasons:** This footnote is replaced by new footnote RR No. **5.E114** and therefore is not necessary anymore.

MOD CAN/14A14/4#49778

29.9-34.2 GHz

|  |
| --- |
| Allocation to services |
| Region 1 | Region 2 | Region 3 |
| 31-31.3 FIXED 5.338A ADD 5.F114 MOBILE Standard frequency and time signal-satellite (space-to-Earth) Space research 5.544 5.545 5.149 |

**Reasons:** To add a footnote to the fixed service allocation in support of a HAPS identification in the 31-31.3 GHz band and to suppress the existing HAPS related footnote.

ADD CAN/14A14/5#49779

5.F114The allocation to the fixed service in the band 31-31.3 GHz is identified for worldwide use by high-altitude platform stations (HAPS). Such use of the fixed-service allocation by HAPS shall be in accordance with the provisions of Resolution **[CAN-1/E114] (WRC‑19)**.     (WRC‑19)

**Reasons:** To add the text of the footnote allowing HAPS to operate in the fixed service allocation in the 31-31.3 GHz band on a worldwide basis.

SUP CAN/14A14/6#49780

5.543A

**Reasons:** This footnote is replaced by new footnote RR No. **5.F114** and therefore is not necessary anymore.

SUP CAN/14A14/7#49775

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:** The Resolution **145 (WRC-12)** is replaced by new Resolution **[CAN-1/E114] (WRC‑19)** and therefore is not necessary anymore.

ADD CAN/14A14/8#49771

DRAFT NEW RESOLUTION [CAN-1/E114] (WRC‑19)

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

The World Radiocommunication Conference (Sharm el-Sheikh, 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 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 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 bands 27.9-28.2 GHz and 31‑31.3 GHz leading to Report ITU‑R F.[HAPS-31GHz];

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

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

*h)* 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,

recognizing

that in the 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,

resolves

1 that for the purpose of protecting the fixed wireless systems in territory of other administrations in the 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 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 θis the elevation angle in degrees (angles of arrival above the horizontal plane). These limits relate to the power flux density which would be obtained under clear-sky conditions with assumed free-space propagation. These limits were derived by taking into account the impact of gaseous attenuation and polarization loss;

2 that for the purpose of protecting the mobile service systems in territory of other administrations in the 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 unless the explicit agreement of the affected administrations 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 θis the elevation angle in degrees (angles of arrival above the horizontal plane). These limits relate to the power flux density which would be obtained under clear-sky conditions with assumed free-space propagation. These limits were derived by taking into account the impacts of polarization, gaseous attenuation and body loss for user equipment;

3 that for the purpose of protecting the fixed satellite service (Earth-to-space) in the band 27.9‑28.2 GHz, 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°;

4that for the purpose of protecting the fixed service systems in territory of other administrations in the band 31-31.3 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 unless the explicit agreement from the affected administration:

 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). These limits relate to the power flux density which would be obtained under clear-sky conditions with assumed free-space propagation. These limits were derived by taking into account the impact of gaseous attenuation and polarization loss;

5 that in order to ensure the protection of EESS (passive), the level of unwanted power density in the band 31.3-31.8 GHz into the antenna of a HAPS ground station operating in the 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;

6 that in order to ensure the protection of EESS (passive) the e.i.r.p. density in the 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 θis the elevation angle in degrees (angles of arrival above the horizontal plane);

7 that in order to ensure the protection of the radio astronomy service, the power flux density level produced by any HAPS ground station operating in the band 31-31.3 GHz, at the RAS stations 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.452-16 using a time percentage of 2%;

8 that in order to ensure the protection of the radio astronomy service, the power flux density, produced by unwanted emissions from HAPS downlink transmissions in the band 31-31.3 GHz, shall not exceed −171 dB( W/(m² · 500 MHz)) for continuum observations in the band 31.3-31.8 GHz at an RAS station location at a height of 50m. This limit relates to the power flux density which would be obtained using a time percentage of 2% in the relevant propagation model;

9 that *resolves* 7 and 8 apply at any radio astronomy station that was in operation prior to 22 November 2019 and has been notified to the Bureau in the 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* 7 and 8 apply. Radio astronomy stations notified after this date may seek an agreement with administrations that have authorized HAPS;

10 that administrations planning to implement a HAPS system in the 27.9-28.2 GHz and 31-31.3GHz bands shall notify the frequency assignments by submitting all mandatory elements of Appendix **4** to the Bureau for the examination of compliance with respect to *resolves*1 through 9 above 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 [CAN-1/E114] (WRC-19) includes regulatory mechanism to protect incumbent services in the bands 27.9-28.2 GHz and 31-31.3 GHz and facilitate the use of HAPS on a global level.

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