

## United States of America

### DRAFT PROPOSALS FOR THE WORK OF THE CONFERENCE

**Agenda Item 1.13:** to consider regulatory provisions and possible identification of existing frequency allocations for services which may be used by high altitude platform stations, taking into account No. **5.543A** and the results of the ITU-R studies conducted in accordance with Resolutions **122 (Rev.WRC-2000)** and **734 (WRC-2000)**;

**Background Information:** At WRC-97, the bands 47.2-47.5 GHz and 47.9-48.2 GHz (which were already allocated for the fixed service) were designated within the fixed service (FS) for High-Altitude Radio-Relay Platform Stations (HAPS). WRC-2000 confirmed this designation and under Resolution **122 (Rev.WRC-2000)** requested that studies continue on regulatory and sharing issues in these bands. While this designation does not limit the use of a band by types of services for which it is already allocated, it does give guidance to administrations wishing to implement specific service types.

WRC-2000, through Resolution **122**, requested that the ITU-R conduct studies, taking into account the requirements of other fixed service systems and other services, on the feasibility of identifying suitable frequencies for the use of HAPS in the FS in the range 18 – 32 GHz in Region 3. These studies were requested by several Region 3 countries specifically because the previously identified 47 GHz band is highly susceptible to rain attenuation, and therefore a suitable 2x300 MHz identification in a lower band was needed for HAPS in those countries. The studies are to focus particularly, but not exclusively, on the bands 27.5 – 28.35 GHz and 31.0 – 31.3 GHz. In addition, country footnote **5.537A** was adopted to permit the use of HAPS (HAPS-to-ground) in the FS allocation in the band 27.5-28.35 GHz on a non-interference, non-protected basis in certain Region 3 countries and one Region 1 country. This band, by country footnote **5.543A**, was paired with the 31-31.3 GHz band for use by HAPS (ground-to-HAPS), also on a non-interference, non-protected basis. Additionally, use of the 31 – 31.3 GHz band is subject to not causing harmful interference to Earth exploration satellite service (EESS) (passive) and radio astronomy service (RAS) services operating in the 31.3-31.8 GHz band. The footnote urged the identified administrations to utilize only the 31.0-31.15 GHz band until studies were completed.

#### 47 GHz Band

With regard to the bands 47.2-47.5 GHz and 47.9-48.2 GHz, Resolution **122 (Rev. WRC-2000)** indicated that sharing studies remain to be completed between the fixed-satellite service (FSS) and HAPS operations in the FS. Pending the completion of studies, Resolution **122** instructs the Radiocommunication Bureau “that from 22 November 1997, and pending review of the sharing studies in considering h) and review of the notification process by WRC-99, the Bureau shall accept notices in the bands 47.2-47.5 GHz and 47.9-48.2 GHz only for high altitude platform stations in the FS and for feeder links for the broadcasting-satellite service (BSS), shall continue to process notices for FSS networks (except for feeder links for the broadcasting-satellite service) for which complete information for advance publication has been received prior to 27 October 1997, and shall inform the notifying administrations accordingly.” In other words, notices received after 22 November, 1997 from non-BSS feeder link FSS networks in the 47.2-47.5 GHz and 47.9-48.2 GHz bands have not been accepted.

The studies in this band have been completed and the results are contained in Recommendation ITU-R SF.1481. With the exception of interference to and from FSS spacecraft, and border area coordination matters in the FS, the deployment of HAPS is a national issue. The issue of interference between the FSS satellite and HAPS networks – in particular, if HAPS networks in this band are not used to provide ubiquitous service and if FSS earth stations utilize antennas with diameters of at least 2.4 m or other types of antennas with similar performance – can be addressed through coordination using Articles **9** and **11** of the Radio Regulations. As a result, all portions of Resolution **122** dealing with the 47 GHz band can be suppressed, provided that reference to the use of Article **9** for HAPS is included in the Radio Regulations.

### **27 and 31 GHz Bands**

To date, all sharing studies in the 18-32 GHz range under Resolution **122** within the ITU-R have focused exclusively on the bands 27.5-28.35 GHz and 31.0-31.3 GHz.

No. **5.543A** of the Radio Regulations provides that the allocation to the FS in the band 31.0-31.3 GHz may also be used by HAPS in the ground-to-HAPS direction in certain countries. In such cases, HAPS uplinks in the band 31.0-31.3 GHz shall not cause harmful interference to, nor claim protection from, other FS systems or other co-primary services, as indicated in No. **5.543A**. In addition, the use of HAPS in the band 31.0-31.3 GHz shall not cause harmful interference to the passive services having a primary allocation in the band 31.3-31.8 GHz. The ITU-R has not yet developed Recommendations regarding the compatibility between HAPS and the EESS (passive) and RAS.

No. **5.537A** of the Radio Regulations provides that the allocation to the FS in the band 27.5-28.35 GHz may also be used by HAPS in certain countries listed in No. **5.537A**. The use of the FS allocation at 27.5-28.35 GHz by HAPS is limited to operation in the HAPS-to-ground direction and shall not cause harmful interference to, nor claim protection from, other types of FS systems or other co-primary services. The ITU-R has adopted a new Recommendation [Doc. 4/89-9/148] containing a methodology for evaluating interference from HAPS-to-ground transmissions to FSS earth-to-space transmissions; however, specific protection criteria have not yet been agreed.

The same concerns expressed at WRC-2000 by many Administrations, including the U.S., with respect to identifying HAPS use in the FS in the 18 – 32 GHz band are still valid today. Internationally the FSS is allocated on a global basis in the 17.7 – 21.2 GHz and 27.5 – 31.0 GHz bands and the FSS community has invested large amounts of resources and time in the development of global FSS systems that operate or are planned to operate in these bands. The FSS community remains very concerned about their ability to deploy already planned global FSS satellite systems in these bands without hindrance from HAPS deployment in the same bands. Additionally, there is concern regarding compatibility of HAPS with existing global FSS systems that operate in these bands. Given that the original intent of these studies was to find a suitable alternative to the 2x300 MHz of spectrum identified for FS HAPS at 47 GHz in Region 3, and the fact that the 27.5-28.35 GHz range is the only range that has been considered for the HAPS-to-ground direction for this alternative, narrowing the frequency range of consideration for potential HAPS services to a specific and common 300 MHz band within the 27.5-28.35 GHz range in all of the countries listed in No. **5.537A** would help to ease the concerns of the FSS in this regard and would bring any final allocation decision in line with the original intent of WRC-2000. Identification of a specific and common 300 MHz band within this frequency range would also facilitate the design and implementation of HAPS systems in this band.

The EESS (passive) and RAS service communities are also very concerned about the possibility of interference from HAPS FS stations in the 31–31.3 GHz band, which is adjacent to the 31.3-31.5 GHz passive band allocated on a primary basis to the EESS (passive) and SRS (passive) for remote sensing of the Earth. This passive sensing band is of vital importance in Earth observation and weather forecasting because it is the reference band used in conjunction with the unique oxygen absorption bands from 50.2–59.3 GHz. Unwanted interference in this band from out-of-band emissions from HAPS would be particularly harmful to the remote sensing use of the band. The 31.3-31.8 GHz band is also allocated to the RAS on a primary basis, and is extensively used, e.g. for studies of the Cosmic Microwave Background.

For the case of HAPS compatibility with passive services (both passive sensing and radio astronomy service), studies have indicated that certain types of HAPS systems may be compatible with these passive services. HAPS uplinks may have to operate with certain constraints in order to limit unwanted emissions; however, experimental hardware has been developed to demonstrate the feasibility of such operation. The results of these studies leading to compatible operation between HAPS and passive services should be incorporated in an ITU-R Recommendation(s). Unlike the situation presented in some cases by possible interference from unwanted emissions from satellites, problems presented by HAPS stations can be resolved in the operational phase. Therefore the interference criteria themselves need not be part of the Radio Regulations.

**Proposal:**

**USA/ /1      MOD**

**5.537A** In Bhutan, Indonesia, Iran (Islamic Republic of), Japan, Maldives, Mongolia, Myanmar, Pakistan, the Dem. People’s Rep. of Korea, Sri Lanka, Thailand and Viet Nam, the allocation to the fixed service in the band 27.5-28.35 GHz may also be used by high altitude platform stations (HAPS). The use of HAPS within the band 27.5-28.35 GHz by HAPS is limited within the territory of each Administration to a single 300 MHz sub-band. Such use of 300 MHz of the fixed service allocation by HAPS in the above countries is further limited to operation in the HAPS-to-ground direction and shall not cause harmful interference to, nor claim protection from, other types of fixed-service systems or other co-primary services. See Resolution HAPS 28-31 (WRC-03). (WRC-20003)

**Reasons:** The identification of 300 MHz of spectrum within the band 27.5-28.35 GHz, along with the 300 MHz at 31-31.3 GHz, is intended to be an alternative for the 2x300 MHz that is problematic in the specified countries due to excessive rain attenuation at 47 GHz. This proposal implements that intent by limiting use of HAPS in the named Administrations to 300 MHz within the identified 850 MHz frequency range identified at WRC-2000. The second 300 MHz band is found at 31-31.3 GHz (see proposal USA/ /2 below). This proposal also incorporates the provisions of new Resolution **HAPS 28-31 (WRC-03)** into the Radio Regulations.

USA/ 12      MOD

**5.543A** In Bhutan, Indonesia, Iran (Islamic Republic of), Japan, Maldives, Mongolia, Myanmar, Pakistan, the Dem. People's Rep. of Korea, Sri Lanka, Thailand and Viet Nam, the allocation to the fixed service in the band 31-31.3 GHz may also be used by high altitude platform stations (HAPS) in the ground-to-HAPS direction. The use of the band 31-31.3 GHz by systems using HAPS shall not cause harmful interference to, nor claim protection from, other types of fixed-service systems or other co-primary services, taking into account No. **5.545**. The use of HAPS in the band 31-31.3 GHz shall not cause harmful interference to the passive services having a primary allocation in the band 31.3-31.8 GHz, taking into account the ~~interference criteria~~ emission limits given in Recommendations ITU-R F.[1570], SA.1029 and ITU-R RA.769. ~~The administrations of the countries listed above are urged to limit the deployment of HAPS in the band 31-31.3 GHz to the lower half of this band (31-31.15 GHz) until WRC-03.~~ See Resolution **HAPS 28-31 (WRC-03)**. (WRC-20003)

**Reasons:** ITU-R studies conducted to date have demonstrated that certain HAPS system designs, operating with certain constraints, could operate on a non-interference basis and appropriately protect other systems and services. In addition, these studies have shown that HAPS can operate without the need for claiming protection. Given that HAPS applications in the FS and the adjacent services are of different status and operate in different bands, the results of studies should remain within the ITU-R and not result in specific limits within No. **5.543A**. There is, however, a need to modify No. **5.543A** to incorporate new Resolution **HAPS 28-31 (WRC-03)** into the Radio Regulations. ITU-R has agreed to the required protection levels for passive services in the referenced Recommendation.

USA/ 13      SUP

RESOLUTION 122 (REV.WRC-2000)

**Use of the bands 47.2-47.5 GHz and 47.9-48.2 GHz by high altitude platform stations (HAPS) in the fixed service and by other services and the potential use of bands in the range 18-32 GHz by HAPS in the fixed service**

**Reasons:** Studies called for in relation to HAPS at 47 GHz have been completed. The Resolution **122** application of the provisions of Article 9 is proposed for incorporation into the Radio Regulations (see USA/ 15 below). All Resolution **122** issues relating to HAPS operation in the 18-32 GHz range would be addressed in a new WRC Resolution (see USA/ 17 below).

USA/ 14      MOD

**5.552A** The allocation to the fixed service in the bands 47.2-47.5 GHz and 47.9-48.2 GHz is designated for use by high altitude platform stations. The use of the bands 47.2-47.5 GHz and 47.9-48.2 GHz by high altitude platforms in the fixed service is subject to the provisions of Nos. **9.15**, and **9.16**, and **9.22** of the Radio Regulations. ~~Resolution **122 (WRC-97)**.~~ See Resolution **HAPS 28-31 (WRC-03)**.

**Reasons:** Consequential to the suppression of Resolution **122**. While studies have been completed, HAPS systems still need to be subject to the provisions of Article **9** to ensure coordination with the FSS at 47 GHz. The reference to Resolution **HAPS 28-31** reflects the intent of WRC-2000 that the identification of 2 x 300 MHz of FS spectrum at 27.5-28.35 GHz and 31-31.3 GHz in certain countries is intended as an alternative for the HAPS designation at 47 GHz which is problematic in those countries due to excessive rain attenuation. Nos. **9.15** and **9.16**, which apply to coordinations regarding non-GSO FSS earth stations and terrestrial stations (including HAPS) need to be called out specifically in Article **5** in order to be applicable. Nos. **9.17** and **9.18**, which apply to the same cases for all but non-GSO FSS earth stations, are currently applicable without having to be called out in the Radio Regulations. No. **9.22** is a new provision (see USA/ /5 below) that is intended to address the previously unaddressed coordination case of HAPS ground-based stations appearing in the coverage area of a satellite network.

USA/ /5      **MOD**

**9.22**      ~~Not used.~~ g) for a transmitting station which is part of a high altitude platform station network in a terrestrial service, for which the requirement to coordinate is included in a footnote to the Table of Frequency Allocations referring to this provision, in respect of a satellite network or system having overlapping service areas with the high altitude platform station network and for which the coordination or notification information, as appropriate, for the satellite network or system was received by the Bureau prior to the date on which notice relating to assignments of the HAPS network was received by the Bureau.

**Reasons:** Addresses a coordination scenario (for HAPS terrestrial stations appearing in the coverage area of a satellite network) that is not currently addressed.

USA/ /6      **MOD**

<sup>9</sup>      **9.5B.1** The only terrestrial stations to be taken into account are those for which the requirement to coordinate is under Nos. **9.11**, **9.11A**, ~~and~~ **9.21**, and **9.22**.

**Reasons:** Consequential to the addition of No. **9.22** (see USA/ /5 above).

USA/ /7      **ADD**

## RESOLUTION HAPS 28-31 (WRC-03)

**Potential use of 300 MHz of spectrum within the band 27.5-28.35 GHz and 300 MHz of spectrum at 31.0-31.3 GHz by high altitude platform stations (HAPS) in the fixed service**

The World Radiocommunication Conference (Geneva, 2003),

*considering*

- a) that WRC-97 made provision for operation of HAPS, also known as stratospheric repeaters, within a 2x300 MHz portion of the fixed service allocation in the bands 47.2-47.5 GHz and 47.9-48.2 GHz;
- b) that WRC-97 adopted No. **4.15A** specifying that transmissions to or from high altitude platform stations shall be limited to bands specifically identified in Article 5;
- c) that at WRC-2000, several countries in Region 3 and one country in Region 1 expressed a need for an alternative band pairing for HAPS in a lower frequency range due to the excessive rain attenuation that occurs at 47 GHz in these countries;
- d) that, in order to accommodate the need expressed by the countries referred to in *considering c)*, WRC-03 adopted Nos. **5.537A** and **5.543A** to permit the use of HAPS in the fixed service within 300 MHz of spectrum in the band 27.5-28.35 GHz and/or in the band 31.0-31.3 GHz in certain Region 3 countries and in one Region 1 country on a non-interference, non-protection basis;
- e) that the bands 27.5-28.35 GHz and 31.0-31.3 GHz are already heavily used or planned to be used by a number of different services and a number of other types of applications in the fixed service;
- f) that the 31.3-31.8 GHz band is allocated to the radio astronomy, Earth exploration-satellite (passive) and space research (passive) services, and the 31.8-32.3 GHz band is allocated to the space research (deep space) service, and that there is a need to appropriately protect these services from unwanted emissions, taking into account No. **5.340** and the interference criteria given in Recommendations ITU-R SA.1029 and ITU-R RA.769;
- g) that technical, sharing and regulatory issues should continue to be studied in order to determine appropriate criteria for the operation of HAPS on a non-interference, non-protection basis in or within the bands referred to in *considering d)* above;
- h) that pending the completion of studies, it may be appropriate for other administrations that wish to consider deployment of HAPS systems in the fixed service within 300 MHz of spectrum at 27.5-28.35 GHz and/or in 300 MHz of spectrum at 31-31.3 GHz to have some provisional means by which to authorize such use of HAPS in their territories without being in derogation of the Radio Regulations,

*resolves*

1 to invite WRC-07 to review the results of the studies specified below with a view to considering appropriate revisions of the regulations affecting high altitude platform systems, within 300 MHz of spectrum within the bands 27.5-28.35 GHz and/or 300 MHz of spectrum at 31.0-31.3 GHz;

2 notwithstanding No. **4.15A**, in countries not identified in Nos. **5.537A** and **5.543A**, the use of HAPS within the fixed service allocations within the 27.5-28.35 GHz and 31-31.3 GHz bands shall be limited, pending the completion of the studies specified in *requests ITU-R 1* below, to 300 MHz in each band; such use shall not cause harmful interference to, nor claim protection from, other stations of services operating in accordance with the Table of Frequency Allocations of Article 5; and

further, the development of these other services shall proceed unencumbered by HAPS operating pursuant to this Resolution;

3 that any use by HAPS of the fixed service allocation at 27.5-28.35 GHz pursuant to *resolves 2* above shall be limited to operation in the HAPS-to-ground direction, and that any use by HAPS of the fixed service allocation at 31-31.3 GHz pursuant to *resolves 2* above shall be limited to operation in the ground-to-HAPS direction,

*requests ITU-R*

1 to continue to conduct studies, as a matter of urgency, and taking into account the requirements of other fixed-service systems and other services, on the feasibility of identifying a suitable and common 300 MHz segment of the band 27.5-28.35 GHz, in addition to the 300 MHz band at 31-31.3 GHz, as an alternative to the 2x300 MHz paired band at 47 GHz, for the use by HAPS in the countries listed in Nos. **5.537A** and **5.543A**;

2 to develop in an ITU-R Recommendation(s) technical sharing criteria or HAPS system design constraints that are necessary to ensure that HAPS applications in the fixed service are able to be operated successfully on a non-interference, non-protected basis,

*invites*

Administrations planning to implement HAPS systems within the band 27.5-28.35 GHz and/or in the band 31.0-31.3 GHz, whether in countries listed in Nos. **5.537A** and **5.543A** or not, to advise the Radiocommunication Bureau as soon as practicable of their intention to do so and of what specific frequencies (up to 300 MHz each within the 27.5-28.35 GHz and 31-31.3 GHz bands) are intended to be used for such systems;

*requests the Radiocommunication Bureau*

to publish within 90 days after the end of WRC-03 a list of administrations who have so advised, and thereafter to publish within 90 days updates containing the names of administrations who advise subsequently.

**Reasons:** ITU-R studies conducted to date have demonstrated that certain HAPS system designs, operating with certain constraints, could operate on a non-interference basis in the bands identified by WRC-2000 and appropriately protect other systems and services. Appropriate interference allowances would have to be developed and agreed within the ITU-R for such cases. In addition, these studies have shown that HAPS can operate without the need for claiming protection. The technical details and constraints of such systems would need to be incorporated in ITU-R Recommendations(s) to ensure that other systems and services are protected. Pending completion of the studies, it would be acceptable to allow additional provisional operation of HAPS on a non-interference, non-protected basis in 300 MHz of the 27.5-28.35 GHz band and/or in the 31-31.3 GHz band. Finally, a specific 300 MHz portion of the 27.5-28.35 GHz band needs to be identified for pairing with 31.0-31.3 GHz.