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| Summary: | | |
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| Proposal: | | |
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DRAFT CEPT BRIEF ON 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

# ISSUE

Resolution 160 (WRC-15) resolves to invite ITU-R:

1. study additional spectrum needs for gateway and fixed terminal links for HAPS to provide broadband connectivity in the fixed service taking into account:

the existing identifications and deployments of HAPS systems;

the deployment scenarios envisioned for HAPS broadband systems and related requirements such as in remote areas;

the technical and operational characteristics of HAPS systems, including the evolution of HAPS through advances in technology and spectrally-efficient techniques, and their deployment;

1. study the suitability of using the existing identifications in recognizing c), on a global or regional level, taking into account the regulatory provisions, such as geographical and technical restrictions associated with existing HAPS identifications based on the study performed in resolves to invite ITU-R 1;
2. study appropriate modifications to the existing footnotes and associated resolutions in the identifications in recognizing c) in order to facilitate the use of HAPS links on a global or regional level, limited to the currently identified frequency bands and, where the use of an identification is not technically feasible for HAPS use, consider the possible removal of the unsuitable identification;
3. to study, in order to meet any spectrum needs which could not be satisfied under resolves to invite ITU-R 2 and 3, for the use of gateway and fixed terminal links for HAPS, the following frequency bands already allocated to the fixed service on a primary basis, not subject to Appendices 30, 30A, and 30B in any region:

on a global level: 38-39.5 GHz, and

on a regional level: in Region 2, 21.4-22 GHz and 24.25-27.5 GHz,

further resolves

1. that the studies referred to in resolves to invite ITU-R 3 and 4 include sharing and compatibility studies to ensure protection of existing services allocated in the frequency ranges identified and, as appropriate, adjacent band studies, taking into account studies already performed in ITU-R.
2. that modifications studied under resolves to invite ITU-R 3 shall not consider the use of HAPS links in the frequency bands subject to Appendix 30B;
3. to develop ITU-R Recommendations and Reports, as appropriate, on the basis of the studies called for in resolves to invite ITU-R 1, 2, 3, and 4 above,

# Preliminary CEPT position

* CEPT supports studies under this Agenda item in accordance with Resolution 160 (WRC-15) while taking into account in particular:

the developments and requirements in HAPS in the fixed service and the associated spectrum sharing aspects

the need to ensure there is protection in place in order not to limit the possibility to use and develop existing services including other applications of the fixed service in the frequency bands identified and, as appropriate, in the adjacent bands.

the need to ensure that new sharing and compatibility studies are taking into account the outcome of studies already performed in ITU-R, where relevant, to support HAPS identification, in particular when considering the possible modifications of country footnotes HAPS identification into general HAPS identification.

* CEPT is finalising studies on spectrum needs for broadband connectivity HAPS applications and results so far show that current HAPS identifications would not satisfy the overall spectrum requirements for HAPS connectivity applications.
* 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.

# Background

As noted in the outcome of meeting of CPM19-1 (ITU administrative circular [CA/226](https://www.itu.int/dms_pub/itu-r/md/00/ca/cir/R00-CA-CIR-0226!!MSW-E.docx)), the studies under WRC-19 Agenda item 1.14 should take into account that the band 38.0-39.5 GHz is also being studied under WRC-19 Agenda items 1.6 and 1.13 and the band 24.25-27.5 GHz is under study under AI1.13.

Recent improvements in aerial platforms, lithium batteries, lightweight composite materials, solar technology, and spectral efficiency are creating the potential for realizable, large-scale HAPS systems. These technological innovations and the growing urgency to expand the availability of broadband have led to a call for review of the current regulatory environment for HAPS. As the ITU-R has recognized, stations operating in the stratosphere are high enough to provide services to a large footprint but also low enough to provide low latency services and coverage in more densely populated areas.

Expanding broadband access (both coverage and capacity) is the foremost challenge for telecommunications policymakers throughout the world. Broadband has become the centre of our society and the key ticket to, and catalyst for, opportunity, education, health, growth, and prosperity. Therefore, it is important to ensure all citizens have access to broadband services. With sufficient capacity, HAPS can provide broadband connectivity over a large geographical region with throughput also suitable for dense user coverage.

Recent test deployments of stations delivering broadband from approximately 20 km above ground have demonstrated the potential of such stations for providing connectivity to underserved communities with minimal ground-level infrastructure and maintenance. HAPS can therefore be effective tools, among others, to help close the digital divide in remote communities, particularly those with challenging terrain or climate.

HAPS can take several different forms – some examples of proposed HAPS based systems are given in section 3 below.

## High altitude platform description

### HAPS Platform Heavier Than Air (HTA)

The fixed wing HAPS consists of a solar-electric powered autonomous aircraft. HAPS aircraft incorporate a rechargeable power system that uses solar-electric power to fly during the day and charge high capacity secondary batteries for discharge at night time. The HAPS aircrafts have demonstrated continuous flight over multiple days. Recent advancements in battery technology provide much better energy storage capacity per gram as well as more re-charge cycles per flight than current systems. This will enable substantial improvement of flight endurance to multiple weeks and month in the future.

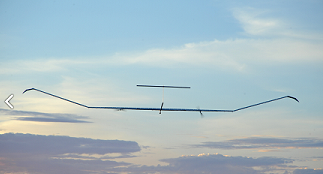
 

Figure 1: Examples of HTA HAPS

### HAPs Platform Lighter-Than-Air (LTA)

The Lighter-Than-Air (LTA) HAPS consist in an autonomous Airship using buoyancy to provide lift and solar-electric power to maintain its position against stratospheric winds. A typical HAPS-LTA can provide day-and-night permanent mission that can last several months.



Figure 2: Examples of LTA HAPS

## BROADband HAPS applications

### Broadband HAPS for connectivity applications

The aim of HAPS broadband connectivity is to provide internet access to users located in remote and rural areas on a medium to long term basis. It can be direct to home access (see section 3.3.1), or it can be a link to an access point (see section 3.3.2). HAPS broadband capability can also provide backhauling connectivity for mobile networks in remote areas.

### Broadband HAPS for specific applications

Broadband HAPS for specific applications is designed to focus on multiple usage cases. Some foreseen specific applications of broadband HAPS communications are:

* Natural disaster relief missions, where communication for coordination and situation awareness across help and humanitarian aid organisations is needed.
* Fire detection, monitoring and firefighting missions to ensure communication between actors.
* Law enforcement with communication needs across local actors and regional headquarters.
* Exploration missions with communication needs between exploration teams and regional home base.

## broadband haps deployement scenario

### Direct connectivity to the end users

The service is provided to end users directly through HAPS.



Figure 3: Illustration of direct connectivity scenario

### Backhauling scenario

HAPS which are connected to internet gateways are providing backhaul to ground infrastructure.

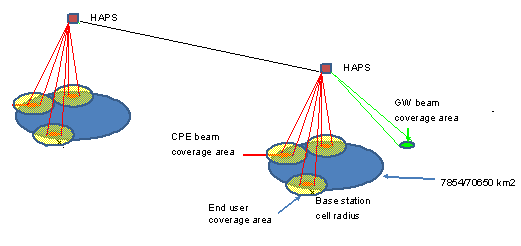


Figure 4: Illustration of backhauling scenario

## Broadband haps spectrum requirements

### Broadband HAPS connectivity application spectrum requirements

Initial studies within CEPT based on different approaches and incorporated in document 5C/292 Annex 12, have derived an overall reference capacity in the order of 30 Gbps per HAPS for the forward link. These studies show that the current HAPS identifications will not satisfy the throughput requirements expressed for both user and gateway links. Those studies are based on assumptions that could be impacted by sharing analyses with incumbent services. Therefore, studies under Resolves 4 of Resolution 160 (WRC-15) would need to be performed.

Several system designs have been analysed within CEPT to provide 30 Gbps for the forward links and their minimum spectrum needs are summarised in the following Table 1 (other systems proposed by administrations outside CEPT are also currently considered within ITU-R WP5C):

Table 1: Minimum Spectrum Needs for several system designs

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | Required bandwidth | | | |
|  |  | GW => HAPS | HAPS => CPE | CPE => HAPS | HAPS => GW |
| System 2 | MHz | 1800 | 900 | 240 | 480 |
| System 3 | MHz | 2727 | 938 | 117 | 341 |
| System 4a | MHz | 1114 | 576 | 213 | 371 |
| System 4b | MHz | 1188 | 134 | 56 | 297 |

### Broadband HAPS for specific applications spectrum requirements

Studies within CEPT, incorporated in document 5C/292 Annex 12, show that 120 Mbps per HAPS for the forward link as well as for the return link will be sufficient to cover the broadband HAPS specific applications needs except the needs for the download of the HAPS sensors measurements data (high resolution video, optical and radar images, etc.) for which an additional capacity of 100 Mbps is needed for the HAPS to GW link.

This study is based on the broadband PPDR capacity demand which is addressed in the Report ITU-R M.2377-0 (Annex 7[[1]](#footnote-1)).

The broadband HAPS for specific applications minimum spectrum requirements has been analysed and is provided in the following Table 2.

Table 2: Minimum Spectrum requirements for broadband HAPS for specific applications

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| System 1 | Forward | | Return | | Downlink  (HAPS sensors measurements data) |
|  | GW => HAPS | HAPS => CPE | CPE => HAPS | HAPS => GW | HAPS => GW |
| MHz | 60 | 15 | 15 | 60 | 50 |

### Inter-HAPS links

No additional spectrum requirements are foreseen at this stage for inter-HAPS.

## CONSIDERATIONS TO ACCOMODATE THE SPECTRUM NEEDS

WP 5C is currently considering various solutions to accommodate the spectrum needs for both broadband HAPS specific applications and for broadband HAPS connectivity applications. These solutions are described in document 5C/292 Annex 12. At its last October 2017 meeting, CPG/PTA received some inputs containing some thoughts on how to accommodate HAPS spectrum needs. These various considerations are described in the Annex to this CEPT Brief. It should be noted that this annex is informative and does not reflect any CEPT position.

## Technical and regulatory studies in Existing identified bands for haps

### 6 440-6 520 MHz (HAPS to ground) and 6 560-6 640 MHz (ground to HAPS)

#### Current Radio Regulation in the band 6 640-6 520 MHz and 6 560-6 640 MHz

For countries listed in footnote 5.457[[2]](#footnote-2), the allocation to the fixed service in the bands 6 440-6 520 MHz (HAPS-to-ground direction) and 6 560-6 640 MHz (ground-to-HAPS direction) is identified for high-altitude platform stations (HAPS). Such use is limited to gateway links within the territory of these countries, and in accordance with Resolution 150 (Rev.WRC-12), defining operating conditions in order to protect incumbent services in these bands, and shall not claim protection from existing services.

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.

The frequency bands 6 440-6 520 MHz and 6 560-6 640 MHz are worldwide allocated on a primary status to the fixed, the mobile and the fixed satellite (Earth-to-space) services. In Region 2 (except a limited list of countries), the band 5 925-6 700 MHz may be used for aeronautical mobile telemetry for flight testing by aircraft stations. Such use shall be in accordance with Resolution 416 (WRC-07) and shall not cause harmful interference to, nor claim protection from, the fixed-satellite and fixed services.

In the band 6 425-7 075 MHz, passive microwave sensor measurements are carried out over the oceans. In the band 7 075-7 250 MHz, passive microwave sensor measurements are carried out. Administrations should bear in mind the needs of the Earth exploration-satellite (passive) and space research (passive) services in their future planning of the bands 6 425-7 075 MHz and 7 075-7 250 MHz.

#### Sharing with Fixed Service (FS)

1. to be completed at a future PT-A meeting

#### Sharing with Mobile Service (MS)

1. to be completed at a future PT-A meeting

#### Sharing with Fixed-Satellite Service (FSS)

1. to be completed at a future PT-A meeting

#### Sharing with Earth exploration-satellite (passive) and space research (passive) services over the oceans.

1. to be completed at a future PT-A meeting

### 27.9-28.2 GHz (HAPS to ground) and 31-31.3 GHz (ground to HAPS)

#### Current Radio Regulation in the band 27.9-28.2 GHz and 31-31.3 GHz

HAPS has an identification at 27.9-28.2 GHz, which is allocated to the fixed, fixed satellite (Earth‑to-space) and mobile service on a primary basis. Additionally, No. 5.540 makes a secondary allocation to the fixed satellite service (space-to-Earth) for beacon transmissions intended for up-link power control at 27.501-29.999 GHz. The HAPS identification in No. 5.537A permits use within the territory of a number of countries. Such use is limited to operation in the HAPS-to-ground direction and requires HAPS systems to avoid causing harmful interference to, and precludes HAPS systems from claiming protection from, other fixed service systems or co-primary services.

The 31.0-31.3 GHz band is allocated to the fixed and mobile service on a primary basis, and the standard frequency and time signal satellite service and space research service on a secondary basis. Pursuant to RR No. 5.543A, the same countries mentioned above are permitted to use this band for HAPS in the ground-to-HAPS direction. Such use may not cause harmful interference to, nor claim protection from, other types of fixed service systems or mobile service systems[[3]](#footnote-3). HAPS must also avoid harmful interference to the radio astronomy service and EESS (passive), which have primary allocations in the 31.3-31.8 GHz band. No. 5.340 applies in 31.3-31.5 GHz for all Regions and in 31.5-31.8 GHz for Region 2. Resolution 145 (Rev.WRC-12) ensures protection of the adjacent radio astronomy service by placing a pfd limit on the HAPS ground station antenna, while adding mandatory coordination and agreement with considered neighbouring administrations. In order to ensure protection of EESS (passive), levels of unwanted power density applying to HAPS ground stations are given in No 5.543A.

#### Sharing with Fixed Service (FS) in the bands 28 GHz and 31 GHz

1. to be completed at a future PT-A meeting

#### Sharing with Mobile Service (MS) in the bands 28 GHz and 31 GHz

1. to be completed at a future PT-A meeting

#### Sharing with Fixed-Satellite Service (FSS) in the band 28 GHz

1. to be completed at a future PT-A meeting

#### Compatibility with EESS (passive) and RAS in 31.3- 31.8 GHz

1. to be completed at a future PT-A meeting

CEPT notes that further studies are required for the protection of passive services in the 31.3 – 31.8 GHz band;

For HAPS operating in the uplink, studies need to demonstrate feasibility of compliance with the level given in No. 5.543A for the protection of EESS (passive)

If HAPS systems are intended to be operated in the downlink, studies are necessary to determine the relevant conditions for the protection of EESS (passive) and radio astronomy.

### 47.2-47.5 GHz and 47.9-48.2 GHz

#### Current Radio Regulation in the band 47.2-47.5 GHz and 47.9-48.2 GHz

HAPS has a worldwide identification at 47.2-47.5 GHz and 47.9-48.2 GHz, which are allocated to the fixed, satellite (Earth-to-space) and mobile services on a co-primary basis. The use of the bands 47.2-47.5 GHz and 47.9‑48.2 GHz is subject to the provisions of Resolution 122 (Rev.WRC-07), which establishes maximum transmit e.i.r.p. levels, antenna beam patterns and pfd levels for HAPS operations.

#### Sharing with Fixed Service (FS) in the bands

1. to be completed at a future PT-A meeting

#### Sharing with Mobile Service (MS) in the bands

1. to be completed at a future PT-A meeting

#### Sharing with Fixed-Satellite Service (FSS)

1. to be completed at a future PT-A meeting

### Conclusion on the suitability of using existing identified bands for HAPS

1. to be completed at a future PT-A meeting

## technical and regulatory Studies in possible new bands for haps

### Worldwide (38-39.5 GHz)

1. to be completed, if necessary, at a future PT-A meeting when conclusions on the suitability of existing bands will be known

### Region 2 (21.4-22 GHz and 24.25-27.5 GHz)

1. to be completed, if necessary, at a future PT-A meeting when conclusions on the suitability of existing bands will be known

# List of relevant documents

ITU-Documentation (Recommendations, Reports, other)

* ITU-R Agenda Item 1.14 work plan

Annex 16 to Doc. 5C/292

* ITU-R Agenda Item 1.14 draft CPM text

Annex 15 to Doc. 5C/292

* New draft ITU-R Recommendations/Reports under development

Annex 12 to Doc. 5C/292: PDN Report ITU-R F.[HAPS Spectrum Needs]

Annex 14 to Doc. 5C/292: PDN Recommendation ITU-R F.[Broadband HAPS characteristics]

Annex 20 to Doc. 5C/292: Working document for sharing and compatibility studies in the 6 440-6 520 MHz and 6 560-6 640 MHz frequency ranges

Annex 21 to Doc. 5C/292: Working document for sharing and compatibility studies in the 21.4-22 GHz frequency range

Annex 22 to Doc. 5C/292: Working document for sharing and compatibility studies in the 24.25-27.5 GHz frequency range

Annex 23 to Doc. 5C/292: Working document for sharing and compatibility studies in the 27.9-28.2 GHz and 31.0-31.3 GHz frequency ranges

Annex 24 to Doc. 5C/292: Working document for sharing and compatibility studies in the 38-39.5 GHz frequency range

Annex 25 to Doc. 5C/292: Working document for sharing and compatibility studies in the 47.2-47.5 and 47.9-48.2 GHz frequency range

Annex 26 to Doc. 5C/292: Working document on the methodologies of sharing and compatibility studies for HAPS in the bands considered under Resolution 160, agenda item 1.14 (WRC-19)

* Existing ITU-R Recommendations/Reports

ITU-R P.1409

ITU-R F.1500, F.1501, F.1569, F.1570, F.1601, F.1607, F.1608, F.1609, F.1612, F.1764, F.1819, F.1820, F.1891, F.2011, ITU-R F.2240

ITU-R SF.1481, SF.1843.

Annex 18 to Doc 5C/292- Preliminary draft revision of Recommendation ITU-R F.1509-3 - Technical and operational requirements that facilitate sharing between point-to-multipoint systems in the fixed service and the inter-satellite service in the band 25.25-27.5 GHz

Annex 17 to Doc 5C/292- Preliminary draft revision of Recommendation ITU-R F.1249-4 - Technical and operational requirements that facilitate sharing between point-to-point systems in the fixed service and the inter-satellite service in the band 25.25-27.5 GHz

CEPT and/or ECC Documentation (Decisions, Recommendations, Reports)

* ECC Report 156

EU Documentation (Directives, Decisions, Recommendations, other), if applicable

# Actions to be taken

Follow developments and studies in ITU-R to understand the additional spectrum requirements, technical characteristics and deployments scenarios for HAPS in the fixed service.

Contribute to the ITU-R studies including those called under Resolves 4 of Resolution 160 (WRC-15) with a view to assess the feasibility of new HAPs requirements while maintaining an adequate sharing environment between HAPS and other services/applications.

To further review and, if agreed, endorse the studies regarding the spectrum requirements of HAPS broadband applications.

To monitor, review and, if agreed, endorse the studies ongoing in WP5C to accommodate the spectrum needs for HAPS specific and connectivity applications.

Promote CEPT view that any consideration of the frequency band 24.25-27.5 GHz under this Agenda item should not limit the possibility to identify the band for IMT on a global level under AI 1.13.

To establish CEPT view on the definition of HAPS given in No.1.66A in light of latest HAPS characteristics being proposed.

# information from outside CEPT (examples of these are below)

## European Union (date of proposal)

## Regional telecommunication organisations

APT (July 2017)

APT Members support the ITU-R studies undertaken in accordance with Resolution 160 (WRC-15) to study spectrum needs for High Altitude Platform Stations (HAPS), taking into account existing frequency bands that have already been identified for HAPS in the Radio Regulations and appropriate regulatory actions.

APT Members also support sharing and compatibility studies between HAPS and other services to ensure protection of services to which frequency bands are allocated without any constraint to these services in accordance with Resolution 160 (WRC-15).

ATU (September 2017)

The APM19-2 agreed to:

* Note that technological developments and advancements, such as power mechanisms and materials, and the need for ubiquitous broadband have given new implementation scenarios and impetus for HAPs.
* Support the introduction of technologies that seek to provide broadband connectivity in unserved and underserved regions and therefore support the sharing and compatibility studies provided that these studies demonstrate that HAPS and existing and planned services (including the services in the bands under consideration under AI 1.13 and 1.6 and adjacent bands) can co-exist.
* Note the sharing studies as presented in Input 10 - APM19-2 Facebook contribution on AI 1.14 (HAPS), in respect to the co-existence between HAPS and existing and planned services, including the services in the bands under consideration under AI 1.13 and 1.6 and adjacent bands.
* Support appropriate regulatory actions to facilitate the use of HAPS, including modifying regulatory provisions in currently identified bands and identifications in candidate bands
* Invite developers of HAPS to test and do trials in African areas with heavy-rain in order to test the robustness of the systems with respect to high attenuation (due to rain-fade).

Arab Group (April 2017)

ASMG doesn’t support any additional identifications to applications of HAPS irrespective of results of ongoing studies under AI 1.6 and AI 1.13.

CITEL (December 2017)

Preliminary views (PV)

* Brazil, Ecuador

Brazil supports studies in accordance to Resolution 160 (WRC-15). Provided that these studies demonstrate sharing and compatibility with existing services and candidate applications are feasible, and future development of existing services is considered, Brazil supports appropriate regulatory actions, including addressing additional spectrum needs for HAPS.

* Bahamas, Canada

These administrations support the introduction of technologies that seek to provide broadband connectivity in un-served and underserved regions and therefore support the study of broadband HAPS systems by ITU-R according to Resolution 160 (WRC-15). Should studies demonstrate that sharing is feasible between HAPS systems and systems of the services in currently identified and candidate bands, these administrations support the adoption of appropriate regulatory provisions for HAPS to satisfy Resolution 160 (WRC-15). These regulatory provisions could include modifications to the regulatory requirements in existing frequency bands already identified for HAPS, as well as possible additional spectrum identifications in the candidate frequency bands, in accordance with Resolution 160 (WRC-15).

* Mexico

Mexico supports the development of technologies to provide broadband connectivity in marginalized or underserved regions. With a view to satisfy this Agenda Item, Mexico supports sharing and compatibility studies between broadband HAPS systems and the fixed service within the framework of Working Group ITU-R 5C, in accordance with Resolution 160 (WRC-15).

On condition that the compatibility studies demonstrate feasibility of sharing between HAPS and the fixed service, Mexico supports the adoption of appropriate regulatory measures to satisfy Resolution 160 (WRC-15) including additional identifications in candidate bands that are allocated to the fixed service.

* United States of America

In order to facilitate the use of HAPS links on a global or regional level, the United States supports studies, in accordance with Resolution 160 (WRC-15), and appropriate WRC-19 action based on the results of these studies, including possible modifications to the existing provisions on HAPS identifications in the Radio Regulations and possible new HAPS identifications in the fixed service bands at 21.4-22 GHz and 24.25- 27.5 GHz in Region 2, and 38-39.5 GHz globally.

* Uruguay

Uruguay supports the studies carried out within the framework of Resolution 160 (WRC-15). While these studies demonstrate the feasibility of sharing and compatibility with existing services and do not impose restrictions on their future development, Uruguay supports the adoption of the pertinent regulatory measures, including the eventual need for additional spectrum for HAPS.

RCC (September 2017)

The RCC Administrations support the need to justify spectrum requirements for gateway station and fixed terminal links for HAPS to provide broadband connectivity in the fixed service taking into account frequency bands which have been already identified for HAPS.

The RCC Administrations support necessary modifications to existing RR Article 5 footnotes and related WRC Resolutions to facilitate HAPS development at global or regional level.

The RCC Administrations consider that in the case of modification to conditions for use of frequency bands authorized for HAPS or identification of new frequency bands for gateway station and fixed terminal links for HAPS, the protection and the possibility of further development shall be ensured for existing services, including other applications of fixed service, having allocations in these and adjacent frequency bands.

## International organisations

IATA (date of proposal)

ICAO (16 September 16)

If agreed ITU-R studies demonstrate there is no adverse impact on aeronautical systems including those used for the safe operation of the platform on which the HAPS resides, then support the use of fixed service allocations for HAPS provided that any regulatory actions taken within the existing allocations to the fixed service noted in Resolution 160 (WRC-15) do not constrain the potential future use of those HAPS fixed links as part of aeronautical communication systems (e.g., VSAT enhancement).

IMO (date of proposal)

SFCG (September 2017)

Assuming that the ITU-R studies show a need for identification of additional spectrum for HAPS for Region 2, SFCG does not support the identification of frequency bands in 21.4-22 GHz and 24.25-27.5 GHz for HAPS unless acceptable sharing conditions are agreed upon that do not adversely impact the space research, Earth exploration-satellite, or inter-satellite services.

As with AI 1.13, a particularly critical situation concerns the band 25.25-27.5 GHz which is expected to be heavily used globally for data downlinks by many future EESS and SRS satellite missions for data downlinks. Within this band, inter-satellite links must also remain protected. This band is indicated as a candidate band for HAPS identification only for Region 2.

Identification of the band 24.25- 27.5 GHz for HAPS under this agenda item must also be supported by studies showing the 21.2-21.4 GHz and 23.6-24.0 GHz EESS (passive) bands will be adequately protected from the HAPS unwanted emissions.

EUMETNET (February 2017)

EUMETNET fully endorses the position of WMO given below.

WMO (February 2017)

WMO does not oppose new HAPS band identifications provided that studies show a need for identification of additional spectrum for HAPS and that protection of ISS, EESS (space-to-Earth), and EESS (passive) is ensured and that guarantees are given on the long-term usage and future deployment of receiving EESS earth stations (in particular in the 25.5-27 GHz band).

The protection of EESS (passive) would require appropriate unwanted emission limits in Resolution 750 (rev. WRC-15).

Furthermore, WMO would appreciate the development of a solution to ensure the effective operation of the ground-based radiometers in the 22-28 GHz frequency band.

## Regional organisations

ESA (October 2017)

ESA supports SFCG position.

EUMETSAT (October 2017)

EUMETSAT supports the SFCG and WMO position.

Eurocontrol (date of proposal)

## OTHER INTERNATIONAL AND REGIONAL ORGANISATIONS

EBU (date of proposal)

GSMA (date of proposal)

CRAF (June 2017)

Considering the frequency band 31.0-31.3 GHz (fixed uplink) any modification to the HAPS system characteristics already defined in existing ITU-R Recommendations will lead to new compatibility studies with the passive band 31.3 - 31.5 GHz. The frequency band 38-39.5 GHz considered in Region 1 for studies regarding this agenda item is not of concern to CRAF. However, CRAF supports the RAS operations in other regions as well and requests compatibility studies to ensure the protection of RAS in Region 2 from unwanted emissions of HAPS links. No changes should be made to the RR unless acceptable sharing and compatibility criteria are developed to ensure the protection of RAS.

NATO (December 2017)

NATO Military Assessment

* From a military perspective, care must be taken to ensure the adequate protection of critical space assets and to avoid encroachment into NJFA and military used frequency bands including the 38 - 39.5 GHz band currently used or planned for use by NATO.

NATO Position

* No position at this stage.

1. BROADBAND HAPS SUPPORTING INFORMATION

This annex presents some thoughts on how to accommodate the spectrum needs for both broadband HAPS specific applications and for broadband HAPS connectivity applications, as received at last October 2017 CPG PTA meeting.

They are presented for information in order to support further studies under agenda item 1.14 but should not be interpreted as a CEPT position.

* 1. Preliminary options to accommodate the spectrum needs for broadband HAPS specific applications

Within WP5C the following hypotheses are proposed and discussed to accommodate the spectrum needs for HAPS specific applications. They will be refined in the course of the upcoming sharing studies of ITU-R WP 5C:

* This option is based under the assumption that existing identifications at 6, 28 and 31 GHz would be extended worldwide with technical conditions to be refined in sharing studies to accommodate the need of broadband HAPS specific applications and taking into account the necessary protection requirements of all incumbent services concerned.

Table 3

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | Forward | | Return | |
|  |  | GW => HAPS | HAPS => CPE | CPE => HAPS | HAPS => GW |
| Broadband HAPS specific | Minimum bandwidth requirement | [60 MHz] | The spectrum needs for the HAPS to GW link is sufficient to cover also the HAPS to CPE links | The spectrum needs for the GW to HAPS link is sufficient to cover also the CPE to HAPS links | [110 MHz] |
| Potential  targeted bands | [60 MHz within most appropriate portion of 31-31.3 GHz band] | The spectrum needs for the HAPS to GW link is sufficient to cover also the HAPS to CPE links | The spectrum needs for the GW to HAPS link is sufficient to cover also the CPE to HAPS links | [60 MHz within most appropriate portions of 27.9-28.2 GHz and 50 MHz within 6 440-6 520 MHz bands] |

Note: the result of all sharing studies will enable to amend this potential scenario and therefore this table should be reviewed when those sharing study will be finalized and agreed

* 1. Preliminary options to accommodate the spectrum needs for broadband HAPS connectivity applications

This section provides preliminary options on how to progress in accommodating the spectrum needs for broadband HAPS connectivity applications in the various candidate frequency bands.

The following hypotheses are proposed for that purpose, they will be refined in the course of the upcoming sharing studies:

* This option is based under the assumption that existing identifications at 6, 28 and 31 GHz would be extended worldwide with technical conditions to be refined in sharing studies to accommodate the need of broadband HAPS connectivity applications and taking into account the necessary protection requirements of all incumbent services concerned.
* It is supposed that additional candidates at 21, 26 and 38-39.5 GHz, having more bandwidth than this HAPS spectrum needs, may be arranged to minimize interferences with existing services subject to conditions to be defined in sharing studies. This includes for example operation of HAPS in the reverse direction of transmission compared to satellite applications.

Table 3

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | Forward | | Return | |
|  | | GW => HAPS | HAPS => CPE | CPE => HAPS | HAPS => GW |
| Broadband HAPS connectivity (System 2) | Minimum bandwidth requirement | [1 800 MHz] | [900 MHz] | [240 MHz] | [480 MHz] |
| Preliminary ideas for Region 1 and 3  (Only 1/3 of the spectrum needs can be met so 9.6 Gbps) | [600 MHz within 38-39.5 GHz (1)] | [300 MHz in 27.9-28.2 GHz  (only 1/3 of needs is available)] | [80 MHz within 38.0-39.5 GHz (1)] | [160 MHz within most appropriate portions of 31-31.2 GHz] |
| Preliminary ideas for Region 2 | [1.5 GHz within 38-39.5 GHz (1)  +  300 MHz within 47.2-47.5 or 47.9-48.2 GHz (1)] | [900 MHz within most appropriate portions of 24.25-27.5 GHz] | [240 MHz within most appropriate portion s of 24.25-27.5 GHz] | [480 MHz within 21.4-22.0 GHz] |
| Broadband HAPS connectivity for system 3 | Minimum bandwidth requirement | TBD | TBD | TBD | TBD |
| Preliminary ideas | TBD | TBD | TBD | TBD |
| Broadband HAPS connectivity for System 4a\* | Minimum bandwidth requirement | [1114 MHz] | [576 MHz] | [213 MHz] | [371 MHz] |
| Preliminary ideas | [1114 MHz within 38-39.5] | [300 MHz within 31-31.3 GHz  +  200 MHz within 38-39.5 GHz] | [213 MHz within 38-39.5 GHz] | [300 MHz within  27.9-28.2 GHz] |
| Broadband HAPS connectivity for System 4b\* | Minimum bandwidth requirement | [1188] | [134] | [56] | [297] |
| Preliminary ideas | [1188 MHz within 38-39.5 GHz] | [134 MHz within 31-31.3 GHz] | [56 MHz within 38-39.5 GHz] | [297 MHz in 27.9-28.2 GHz] |
| (1)This includes for example operation of HAPS in the reverse direction of transmission compared to satellite applications.  \* Other frequency arrangements could be considered taking into account the frequency band 47/48 GHz for example. | | | | | |

Note: the result of all sharing studies will enable to amend this potential scenario and therefore this table should be reviewed when those sharing studies will be agreed.

1. See ECC Report 199 for more details on broadband PPDR spectrum requirements within CEPT. [↑](#footnote-ref-1)
2. Australia, Burkina Faso, Cote d'Ivoire, Mali and Nigeria [↑](#footnote-ref-2)
3. The space research service is also subject to these protections in the following countries: Armenia, Georgia, Kyrgyzstan, Tajikistan and Turkmenistan. [↑](#footnote-ref-3)