



CRAF
Committee on Radio Astronomy Frequencies

CRAF PRELIMINARY POSITIONS ON WRC-23 AGENDA ITEMS

NOVEMBER 2020

Introduction

CRAF initially identified 12 items in the WRC23 agenda related to the frequency bands allocated to the radio astronomy services in Region 1. This is a preliminary list, other items might be added following the work progress at the various ITU-R working parties.

- Agenda item 1.1: Protection of aeronautical and maritime services from IMT services.
 - Agenda item 1.2: Identification of bands for International Mobile Telecommunications (IMT)
 - Agenda item 1.4: High-altitude platform stations as IMT base stations (HIBS) in frequency bands below 2.7 GHz
 - Agenda item 1.5: Review of the band 470-960 MHz in region 1.
 - Agenda item 1.6: Regulations to facilitate radiocommunications for sub-orbital vehicles.
 - Agenda item 1.8: UAS – FSS communications.
 - Agenda Item 1.10: Possible new allocations for the aeronautical mobile service for the use of non-safety aeronautical mobile applications in 15.4-15.7 GHz and 22-22.21 GHz.
 - Agenda item 1.11: GMDSS modernization
 - Agenda item 1.13: Upgrade of the space research service (SRS) allocation to primary in the frequency band 14.8-15.35 GHz
 - Agenda item 1.14: EESS (passive) review in the 231.5-252 GHz band.
 - Agenda item 9.1a): Appropriate recognition and protection in the Radio Regulations for space weather sensors
 - Agenda item 9.1c): Study use of IMT for fixed wireless access in bands allocated to the fixed service
- Not included in this document but to be followed and added later:
- Agenda item 10 Preliminary agenda for WRC-27

Agenda item 1.1

“To consider, based on the results of the ITU-R studies, possible measures to address, in the frequency band 4 800-4 990 MHz, protection of stations of the aeronautical and maritime mobile services located in international airspace and waters from other stations located within national territories, and to review the pfd criteria in No. 5.441B in accordance with Resolution 223 (Rev.WRC-19);”

4 800-5 250 MHz		
Allocation to services		
Region 1	Region 2	Region 3
4 800-4 990	FIXED MOBILE 5.440A 5.441A 5.441B 5.442 Radio astronomy 5.149 5.339 5.443	
4 990-5 000	FIXED MOBILE except aeronautical mobile RADIO ASTRONOMY Space research (passive) 5.149	

Summary

The frequency band 4 800–4 990 MHz is allocated to some countries under No. 5.441B for IMT. The agenda item invites to study the protection of aeronautical and maritime services (Mobile) using the same band from IMT services in these countries. The pfd limits defined under No 5.441B should be reviewed.

MOD

5.441B In Angola, Armenia, Azerbaijan, Benin, Botswana, Brazil, Burkina Faso, Burundi, Cambodia, Cameroon, China, Côte d’Ivoire, Djibouti, Eswatini, Russian Federation, Gambia, Guinea, Iran (Islamic Republic of), Kazakhstan, Kenya, Lao P.D.R., Lesotho, Liberia, Malawi, Mauritius, , Mongolia, Mozambique, Nigeria, Uganda, Uzbekistan, the Dem. Rep. of the Congo, Kyrgyzstan, the Dem. People’s Rep. of Korea, Sudan, South Africa, Tanzania, Togo, Viet Nam, Zambia and Zimbabwe, the frequency band 4 800-4 990 MHz, or portions thereof, is identified for use by administrations wishing to implement International Mobile Telecommunications (IMT). 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. The use of IMT stations is subject to agreement obtained under No. 9.21 with concerned administrations, and IMT stations shall not claim protection from stations of other applications of the mobile service. In addition, before an administration brings into use an IMT station in the mobile service, it shall ensure that the power flux-density (pfd) produced by this station does not exceed $-155 \text{ dB(W/(m}^2 \cdot 1 \text{ MHz))}$ produced up to 19 km above sea level at 20 km from the coast, defined as the low-water mark, as officially recognized by the coastal State. This pfd criterion is subject to review at WRC-23. Resolution 223 (Rev.WRC-19) applies. This identification shall be effective after WRC-19. (WRC-19)

5 that the power flux-density (pfd) limits in No. 5.441B, which is subject to review at WRC-23, shall not apply to the following countries: Armenia, Brazil, Cambodia, China, Russian Federation, Kazakhstan, Lao P.D.R., Uzbekistan, South Africa, Viet Nam and Zimbabwe,

Impacted RAS bands

The primary RAS band 4990-5000 MHz is adjacent to the IMT identification in the band 4800 – 4990 MHz. The band 4950 - 4990 MHz is also protected by footnote No. 5.149 that urges administrations to take all practicable steps to protect the radio astronomy service from harmful interference. Astronomers use this frequency range to study the detailed brightness distributions of galactic and extragalactic objects.

CRAF preliminary position on agenda item 1.1

The countries listed in No. 5.441B includes Russia and South Africa with radio astronomy observatories in Region 1. However, the two countries are excluded from the pfd limits review according to Resolution 223 resolves 5. CRAF keeps monitoring of the agenda item at this stage for more information.

Agenda item 1.2

“to consider identification of the frequency bands 3 300-3 400 MHz, 3 600-3 800 MHz, 6 425-7 025 MHz, 7 025-7 125 MHz and 10.0-10.5 GHz for International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution 245 (WRC 19)”

Allocation to services		
Region 1	Region 2	Region 3
2 700-2 900	AERONAUTICAL RADIONAVIGATION 5.337 Radiolocation 5.423 5.424	
2 900-3 100	RADIOLOCATION 5.424A RADIONAVIGATION 5.426 5.425 5.427	
3 100-3 300	RADIOLOCATION Earth exploration-satellite (active) Space research (active) 5.149 5.428	
3 300-3 400 RADIOLOCATION 5.149 5.429 5.429A 5.429B 5.430	3 300-3 400 RADIOLOCATION Amateur Fixed Mobile 5.149 5.429C 5.429D	3 300-3 400 RADIOLOCATION Amateur 5.149 5.429 5.429E 5.429F
5 925-6 700	FIXED 5.457 FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B MOBILE 5.457C 5.149 5.440 5.458	

Summary

The agenda item represents the spectrum needs of IMT in the mid-band frequency ranges. CEPT has identified the 3 400–3 800 MHz band as European 5G pioneering band a few years ago and IMT has acquired licenses in several countries recently. ECC Report 281 contains the relevant compatibility studies for the adjacent frequencies including RAS. ITU-R Resolution 245 limited the sharing and compatibility studies only with the services that have primary allocation in these bands.

Impacted RAS bands

There are no primary allocations for RAS in the candidate bands. The bands 3 300–3 400 MHz and 6 425–7 025 MHz are overlapping with the radio astronomy bands 3 332–3 339 MHz, 3 345.8–3 352.5 MHz and 6 650–6 675.2 MHz protected by RR No. 5.149. The footnote urges administrations to take all practicable steps to protect the radio astronomy service from harmful interference.

Bands usage for RAS

The bands 3 332–3 339 MHz and 3 345.8–3 352.5 MHz covers two spectral lines of the CH molecule. The study of interstellar CH is of extreme importance in understanding the chemistry of

the interstellar material. The presence of CH suggests the existence of the methane molecule CH₄ which is considered one of the basic molecules for the initial stages of the formation of life.

The band 6 650–6 675.2 MHz is used for observations of methanol CH₃OH. This transition of methanol gives rise to extremely powerful cosmic maser activity, found in regions where massive stars form.

These bands are widely observed in Europe using single dishes, Merlin interferometry and VLBI.

CRAF Preliminary position on agenda item 1.2

- CRAF supports no change for the bands 3 300–3 400 MHz and 6 425–7 025 MHz,
- Compatibility studies will be required for the primary band 10.6–10.7 GHz for any new allocations to IMT in the 10–10.5 GHz for region 2.
- The RAS bands under RR No. 5.149 must be considered while evaluating the potential impact of new allocations to IMT in these bands.

Agenda item 1.4

“to 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”

Summary

The high-altitude platform stations 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. The frequency bands 1 885–1 980 MHz, 2 010–2 025 MHz and 2 110–2 170 MHz in Regions 1 were previously included in No. 5.388A for the use of HIBS. Additionally, the agenda item invites ITU-R to conduct sharing and compatibility studies for certain frequency bands below 2.7 GHz, or portions thereof, globally or regionally harmonized for IMT, i.e.:

- 694–960 MHz;
- 1 710–1 885 MHz;
- 2 500–2 690 MHz;

In the scope of the agenda item also is the study of the definition of HIBS, including possible modifications to the provisions of the Radio Regulations, as appropriate.

Impacted RAS bands:

The band 2 500–2 690 MHz is adjacent to the RAS primary band 2 690–2 700 MHz (5.340). The bands 1 718.8–1 722.2 MHz and 2 655–2 690 MHz are included under RR No. 5.149. The latter two bands are currently allocated to MFCN in CEPT and RAS observations are hardly possible.

Second harmonics spurious emissions from the systems operating in the band 694–960 MHz may fall into the important RAS bands 1 330–1 400 MHz (secondary in some CEPT countries, 5.149), 1 400–1 427 MHz (primary, passive, 5.340) 1 610.6–1 613.8 MHz and 1 660–1 670 MHz (primary, 5.149).

Bands usage for RAS:

The spectral region 2 655–2 700 MHz is important for RAS continuum measurements due to the low galactic background radiation and the excellent quality of the receivers operating at this frequency with very low noise. The band is also useful for galactic studies; i.e. the state of matter and the possibilities of the existence of blackholes in galactic nuclei, the explosive activities and the production of intense double radio sources, the formation of galaxies and quasars and many other major astrophysical subjects.

The 1 400–1 427 MHz band is one of the most important spectral windows for RAS, as it features the neutral atomic hydrogen (HI) line. Observations of redshifted HI, which is of utmost importance for modern astronomy, require the 1 330–1 400 MHz band. The entire range from 1 330–1 427 MHz is also used for Pulsar research. In the 1 660–1 670 MHz band, the OH molecule is observed.

CRAF Preliminary position on agenda item 1.4:

- Protection of the primary RAS band 2 690–2 700 MHz shall be ensured from possible new allocations for HIBS in the adjacent 2 500–2 690 MHz band.
- Protection of the bands 1 400–1 427 MHz (primary, passive, 5.340) 1 610.6–1 613.8 MHz and 1 660–1 670 MHz (primary, 5.149) as well as the band 1 330–1 400 MHz (secondary in some CEPT countries, 5.149) shall be ensured from second harmonics originating from systems operating in the band 694–960 MHz
- Consider the protection of the RAS bands 1 718.8–1 722.2 MHz and 2 655–2 690 MHz covered by RR 5.149 from any new allocations for HIBS in the bands 1 710–1 885 MHz and 2 500–2 690 MHz.
- Compatibility studies will be required for the above-mentioned bands taking into account the characteristics of HIBS and their deployment.

Agenda item 1.5

“to review the spectrum use and spectrum needs of existing services in the frequency band 470-960 MHz in Region 1 and consider possible regulatory actions in the frequency band 470-694 MHz in Region 1 on the basis of the review in accordance with Resolution 235 (WRC-15);

Summary

The agenda item invites ITU-R to review the spectrum use and study the spectrum needs of existing services within the frequency band 470–960 MHz in Region 1. The band is currently allocated to the broadcasting service on a primary basis. Several other services such as Mobile and fixed services are also allocated portions of the band on a primary basis. A proposed allocation for IMT in the band 470–694 MHz will require sharing and compatibility studies with the broadcasting services and other existing services as well.

Impacted RAS bands

In the European part of Region 1 and in Region 3 (Asia), radio Astronomy has a secondary allocation in this band according to the footnote 5.306. Whereas in the African Broadcasting Area of Region 1, the band 606–614 MHz has a primary allocation, according to RR No. 5.304. Also, according to RR No. 5.149, administrations are urged to take all practicable steps to protect the radio astronomy service in this band from harmful interference when making assignments to stations of other services.

It should also be noted that second harmonics emission from possible use of mobile systems in the band 470–694 MHz may fall into the important RAS bands 1 330–1 400 MHz (secondary, 5.149),

Bands usage for RAS:

Radio astronomy gives considerable importance to the 608–614 MHz band because without it, there would be a large gap between the 410 MHz and 1 400 MHz RAS allocations, in one of the most interesting part of the spectrum. The band is also widely used for continuum VLBI observations.

The band is important for the following observations:

- Pulsar timekeeping. The better frequency range for pulsar observations considering the SNR is 0.4–2.0 GHz. Below and above, pulsar observations are harder . Pulsar observations are also time consuming. The 610 MHz band is suitable for weak pulsar observations in conjunction with the 1.4 GHz and 408 MHz and in some cases with the 2.7 GHz RAS bands.
- Observations of linearly polarized extraterrestrial radio emissions to study the physical circumstances under which the radiation is generated. For an unambiguous determination of the change of polarization angle, observations need to be done using three frequencies (326 MHz, 610 MHz, 1.42 GHz)
- Continuum VLBI observations including continental drift, rotation of the Earth, earthquakes and space navigation

Observations of redshifted neutral atomic hydrogen (HI), which is of utmost importance for modern astronomy, require the 1 330–1 400 MHz band. The entire range from 1 330–1 427 MHz is also used for Pulsar research.

CRAF preliminary position for agenda item 1.5

- In order to strengthen the protection of the band in region 1 for radio astronomical observations, CRAF requests an upgrade for the secondary band 608–614 MHz to a primary allocation similar to the situation in region 2 and the African Broadcasting Area in region 1.
- CRAF supports sharing and compatibility studies for RAS protection for the primary allocation in the band 606–614 MHz in the African Broadcasting Area and the secondary allocation in the band 608–614 MHz for the European part in Region 1

Agenda item 1.6

“To consider, in accordance with Resolution 772 (WRC-19), regulatory provisions to facilitate radiocommunications for sub-orbital vehicles;

Summary

Sub-orbital vehicles are mainly intended to operate at higher altitudes than conventional aircraft, with a sub-orbital trajectory around earth. However, some sub-orbital vehicles are also being developed to fly through the lower levels of the atmosphere, where they are expected to operate in the same airspace as conventional aircrafts. The purpose of these flights varies between transportation, scientific research and remote sensing. Radio equipment will be installed on such vehicles to communicate with air traffic management systems and relevant ground control facilities for voice/data communications, navigation, surveillance and telemetry, tracking and command (TT&C). The purpose of this agenda item is to study the spectrum needs for communication between stations on board sub-orbital vehicles and terrestrial/space stations for these functions.

Currently there is no international demarcation at ITU between the Earth’s atmosphere and the space domain. Also, there is no formal definition of sub-orbital flights at ITU until writing this document. In Report ITU-R M.2477 Radiocommunications for sub-orbital vehicles, some definitions of sub-orbital vehicles were assumed. The technical and regulatory conditions should be studied to allow operation under the aeronautical regulations. The ITU-R Question 259/5 includes all the open matters that still need to be studied for this type of flights.

Impacted RAS bands:

Further progress on this agenda item should identify the impacted RAS bands

CRAF Preliminary position on agenda item 1.6

- To ensure any regulatory provisions under this agenda item will not affect the RAS operations.
- Support studies for the protection of any RAS bands that might be relevant to the regulatory provisions decided under this agenda item.

Agenda item 1.8

“to consider, on the basis of ITU-R studies in accordance with Resolution 171 (WRC-19), appropriate regulatory actions, with a view to reviewing and, if necessary, revising Resolution 155 (Rev.WRC-19) and No. 5.484B to accommodate the use of fixed-satellite service (FSS) networks by control and non-payload communications of unmanned aircraft systems”

Allocation to services		
Region 1	Region 2	Region 3
14.4-14.47	FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.484B 5.506 5.506B MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.509A Space research (space-to-Earth) 5.504A	
14.47-14.5	FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.509A Radio astronomy 5.149 5.504A	

Summary

The operation of Unmanned Aircraft Systems (UAS) requires Control and Non-Payload Communications (CNPC) links, to relay air traffic control communications and for the remote pilot to control the flight. Satellite networks may be used to provide these CNPC links beyond line-of-sight in particular for long distance flights of unmanned aircraft (UA).

The frequency bands mentioned in resolves 1 of Resolution 155 (Rev.WRC 19), that assignments to stations of GSO FSS networks operating in the frequency bands 10.95–11.2 GHz (space-to-Earth), 11.45–11.7 GHz (space-to-Earth), 11.7–12.2 GHz (space-to-Earth) in Region 2, 12.2–12.5 GHz (space-to-Earth) in Region 3, 12.5–12.75 GHz (space-to-Earth) in Regions 1 and 3 and 19.7–20.2 GHz (space-to-Earth), and in the frequency bands 14–14.47 GHz (Earth-to-space) and 29.5–30.0 GHz (Earth-to-space), may be used for UAS CNPC links in non-segregated airspace, provided that the conditions specified are met.

Relevant studies of the technical, operational and regulatory aspects, based on the frequency bands mentioned need to be completed in time for WRC23 taking into account the progress obtained by ICAO on the use of the FSS for the UAS CNPC links.

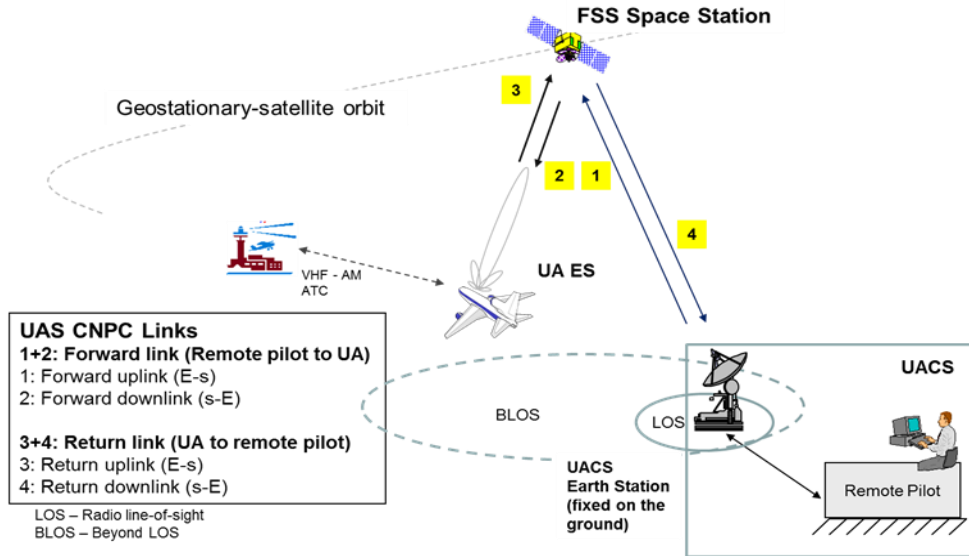


Figure from Resolution 155 Annex 1, the links 2,3 are the new proposed CNPC links for communication between UAS and FSS.

Impacted RAS bands:

The frequency band 14–14.47 GHz is adjacent to the RAS secondary allocation in the band 14.47–14.5 GHz (RR No. 5.149). A similar case has been studied for the same bands in the ECC Report 271 with the conclusion that airborne ESIMs will have to cease transmission within the RAS band when in visibility of the RAS stations

Bands usage for RAS:

The 14.47–14.5 GHz band is mainly used for spectral line observations. At 14.4885 GHz, an important formaldehyde (H₂CO) spectral line exists, which has been observed in the direction of many galactic sources. Observation of this spectral line gives valuable information on the physical conditions of the interstellar medium.

CRAF Preliminary position on agenda item 1.8

Studies will be required for the protection of the RAS secondary allocation 14.47–14.5 GHz from possible use of the band 14–14.47 GHz by earth-to-space UAS CNPC links.

Agenda item 1.10

“to conduct studies on spectrum needs, coexistence with radiocommunication services and regulatory measures for possible new allocations for the aeronautical mobile service for the use of non-safety aeronautical mobile applications, in accordance with Resolution 430 (WRC-19);”

Allocation to services		
Region 1	Region 2	Region 3
22-22.21	FIXED MOBILE except aeronautical mobile 5.149	
22.21-22.5	EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE except aeronautical mobile RADIO ASTRONOMY SPACE RESEARCH (passive) 5.149 5.532	

Allocation to services		
Region 1	Region 2	Region 3
15.4-15.43	RADIOLOCATION 5.511E 5.511F AERONAUTICAL RADIONAVIGATION	
15.43-15.63	FIXED-SATELLITE (Earth-to-space) 5.511A RADIOLOCATION 5.511E 5.511F AERONAUTICAL RADIONAVIGATION 5.511C	
15.63-15.7	RADIOLOCATION 5.511E 5.511F AERONAUTICAL RADIONAVIGATION	

Summary

The agenda item invites to study possible additional allocations for new non-safety aeronautical mobile applications for air-air, ground-air and air-ground communications of aircraft systems. The primary mobile global allocation at the band 22–22.21 GHz will be a candidate for these applications by studying possible revision or deletion of the “except aeronautical mobile” restriction in the allocation table. Additionally, a new allocation is proposed in the band 15.4–15.7 GHz, a band that is already used by aeronautical radio navigation.

Impacted RAS bands:

The frequency band 22–22.21 GHz is adjacent to the frequency band 22.21–22.5 GHz which is allocated to the RAS, the Earth exploration-satellite service (passive) and the space research service (passive) on a primary basis. The frequency band 15.4–15.7 GHz is adjacent to the frequency band 15.35–15.4 GHz which is allocated to the RAS on a primary basis (RR No. 5.340).

The band 22.01–22.21 GHz is also covered by RR No. 5.149, which urges administrations to take all practicable steps to protect the radio astronomy service.

The band 15.35–15.4 GHz is already subject to 2% data loss by the use of radiolocation services under RR No. 5.511F adjacent to this band. Any allocation must be accompanied by strict operational constraints to avoid additional data loss to the radio astronomy operations in the band.

Bands usage for RAS

The H₂O-band 22.21-22.5 GHz is one of the most important for spectroscopy for radio astronomy. While the band 15.35-15.4 GHz is an important radio astronomy band in the continuum series that provides some of the best angular resolutions for monitoring the intensity variability of the enigmatic quasars. Observations in the band is usually widened to 15.3-15.55 GHz.

CRAF Preliminary position on agenda item 1.10

Protection of the primary RAS bands 22.21–22.5 GHz and 15.35–15.4 GHz shall be ensured from possible new allocations to aeronautical services in the adjacent bands. Furthermore, the protection of the band 22.01–22.21 GHz (RR No. 5.149, also secondary in some CEPT countries) will be necessary.

Compatibility studies will be required for the above-mentioned bands taking into account the characteristics of aeronautical mobile services under this agenda item

Agenda item 1.11

“ to consider possible regulatory actions to support the modernization of the Global Maritime Distress and Safety System and the implementation of e-navigation, in accordance with Resolution 361 (Rev.WRC-19);

Summary

Following the initial discussions at CEPT, the agenda item addresses three issues for the GMDSS services;

- GMDSS modernization: To consider possible regulatory actions, based on the ITU-R studies, taking into consideration the activities of IMO, as well as information and requirements provided by IMO.
- E-navigation: To consider possible regulatory actions, including spectrum allocations based on the ITU R studies, for the maritime mobile service.
- The introduction of additional GSO satellite system into the GMDSS. The Chinese satellite network BEIDOU is candidate to be introduced into the GMDSS. The BEIDOU network is a geostationary satellite system using the frequency bands 1 610–1 626.5 MHz (Earth-to-space) and 2 483.5–2 500 MHz (space-to-Earth).

Impacted RAS bands:

For the candidate satellite system the uplink band will be overlapping with the RAS spectral lines in the primary 1 610.6–1 613.8 MHz band. It can be foreseen that in order to protect the RAS stations, the new satellite user terminals will need to implement geofencing or geolocation mechanisms around RAS observatories.

Also, second harmonics from the 2 483.5–2 500 MHz (space-to-Earth) could fall into the RAS bands, 4 990–5 000 MHz (primary, 5.149) and 4 950–4 990 MHz (secondary, 5.149); see also RR No. 5.402.

CRAF Preliminary position on agenda item 1.11

- According to the RR No. 5.372, harmful interference shall not be caused to stations of the radio astronomy service using the frequency band 1 610.6–1 613.8 MHz by stations of the radiodetermination-satellite and mobile-satellite services (RR No. 29.13 applies). Studies will be required for RAS protection from possible interference that could be caused by additional GSO systems.
- Studies will be required for the protection of the RAS band 4 950–5 000 MHz from second harmonics in the downlink band 2 483.5–2 500 MHz.
- Regulatory provisions for the GMDSS modernization and e-navigation under this agenda item will be monitored for more information.

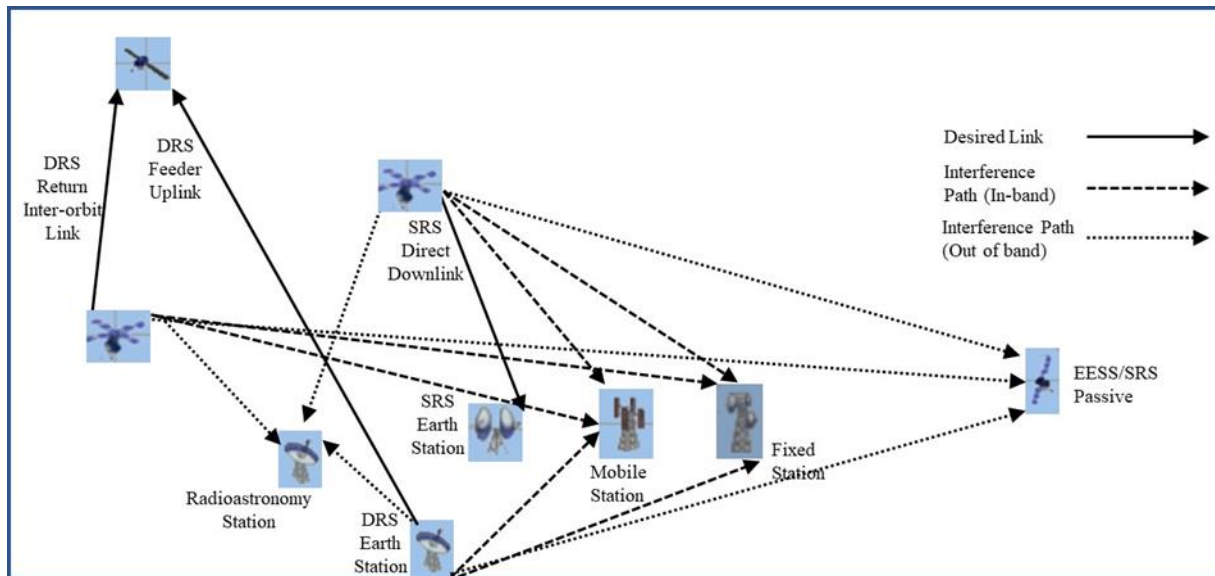
Agenda item 1.13

“to consider a possible upgrade of the allocation of the frequency band 14.8-15.35 GHz to the space research service, in accordance with Resolution 661 (WRC-19);”

Allocation to services		
Region 1	Region 2	Region 3
14.5-14.75	FIXED FIXED-SATELLITE (Earth-to-space) 5.509B 5.509C 5.509D 5.509E 5.509F 5.510 MOBILE Space research 5.509G	
14.75-14.8 FIXED FIXED-SATELLITE (Earth-to-space) 5.510 MOBILE Space research 5.509G		14.75-14.8 FIXED FIXED-SATELLITE (Earth-to-space) 5.509B 5.509C 5.509D 5.509E 5.509F 5.510 MOBILE Space research 5.509G
14.8-15.35	FIXED MOBILE Space research 5.339	
15.35-15.4	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.511	

Summary

The frequency band 14.8–15.35 GHz is currently allocated to the space research service (SRS) on a secondary basis. There is a need for broadband communication downlinks in the SRS for the purpose of transmitting future scientific data at high data transmission speeds. Also, a number of space agencies are already considering the possibility of using this frequency band for next-generation SRS satellites. Upgrading to primary status the allocation of the frequency band 14.8–15.35 GHz for the SRS could provide certainty for administrations and space agencies participating in satellite space programs. The agenda item invites ITU to study the feasibility of this upgrade with a view to ensuring protection of the impacted primary services.



Interference scenarios to RAS stations

Impacted RAS bands:

The frequency band 14.8–15.35 GHz is adjacent to the RAS primary band 15.35–15.4 GHz, which is also subject to RR No. 5.340. This is the second agenda item impacting this RAS band in addition to the aeronautical mobile agenda item 1.10

The band 15.35–15.4 GHz is already subject to 2% data loss by the use of radiolocation services under RR No. 5.511F. Possible upgrade to the SRS 14.8–15.35 GHz adjacent band must be accompanied by strict operational constraints to avoid additional data loss to the radio astronomy operations in the band.

Bands usage for RAS:

The band 15.35–15.4 GHz is an important radio astronomy band in the continuum series that provides some of the best angular resolutions for monitoring the intensity variability of the enigmatic quasars. Observations in the band is usually widened to 15.3–15.55 GHz.

CRAF Preliminary position on agenda item 1.13

- Protection of the primary RAS band 15.35–15.4 GHz shall be ensured from the possible upgrade of SRS in the adjacent band.
- Compatibility studies will be required for the protection of the RAS passive band taking into account the characteristics of SRS defined under this agenda item

Agenda item 1.14

“to review and consider possible adjustments of the existing or possible new primary frequency allocations to EESS (passive) in the frequency range 231.5-252 GHz, to ensure alignment with more up-to-date remote-sensing observation requirements, in accordance with Resolution 662 (WRC-19);”

Region 1	Region 2	Region 3
241-248	RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite 5.138 5.149	
250-252	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.563A	

Summary

Within the frequency range 231.5–252 GHz, the frequency bands 235–238 GHz and 250–252 GHz are allocated to the Earth exploration-satellite service (EESS, passive) for the use of passive microwave remote sensing systems. Some passive sensor systems under development plan to operate on some channels in the frequency range 239–248 GHz, given the specific characteristics of this frequency band for ice-cloud analysis. The agenda item shall review the existing primary allocations to the EESS (passive) in the frequency range 231.5–252 GHz in order to analyze if these allocations are aligned with the observation requirements of passive microwave sensors. It should also study the impact that any change to the EESS (passive) allocations in the frequency range 231.5–252 GHz might have on the other primary services in these frequency bands.

Impact on RAS

Resolution 662 states that that the effect on the other primary services in the frequency range 231.5–252 GHz would have to be studied while the EESS (passive) allocations are possibly adjusted. Radio astronomy has allocations in the band 241–252 GHz

CRAF Preliminary position on A.I 1.14

Studies will be required to review the impact that any change to the EESS (passive) allocations in the frequency range 231.5–252 GHz might have on RAS in this band.

CRAF supports the possibility of including the RAS if allocations to passive services are created or altered in the frequency range 231.5–252 GHz

Agenda item 9.1 A)

“In accordance with Resolution 657 (Rev.WRC-19), review the results of studies relating to the technical and operational characteristics, spectrum requirements and appropriate radio service designations for space weather sensors with a view to describing appropriate recognition and protection in the Radio Regulations without placing additional constraints on incumbent services;”

Summary

The agenda item calls for studies on technical and operational characteristics, spectrum requirements and appropriate radio service designations for space weather sensors with a view to describing appropriate recognition and protection in the Radio Regulations without placing additional constraints on incumbent services. Some of the space weather sensors share facilities with radio astronomy such as LOFAR and NENUFAR. Accordingly, new regulations to space weather receive-only service should apply for the radio astronomy services in these locations.

Impact on RAS

Some of the receive-only space weather sensors systems described in the Report ITU-R RS.2456-0 are radio-telescopes operating under the RAS, and with overlapping radio astronomy scientific objectives.

Also, some receive-only space weather applications operate in protected RAS bands with primary status (see Table 12 of Report ITU-R RS.2456).

Frequencies used by passive Space Weather Sensors	RAS bands
10 –90 MHz	13.360–13.410 MHz
110–190 MHz	25.550–25.670 MHz
322–332 MHz	37.5–38.25 MHz
408–412 MHz	150.05–153 MHz
607–613 MHz	322–328.6 MHz
1 401–1 429 MHz	406.1–410 MHz
2 645–2 745 MHz	608–614 MHz
4 970–5 020 MHz	1 400–1 427 MHz
15.3–15.5 GHz	2 690–2 700 MHz
	4 990–5 000 MHz
	15.35–15.4 GHz

CRAF Preliminary position on agenda item 9.1 A)

CRAF will contribute to any sharing studies involving the common frequency bands used by RAS and the receive-only space weather sensors for appropriate protection.

Agenda item 9.1 C)

“Study the use of International Mobile Telecommunication system for fixed wireless broadband in the frequency bands allocated to the fixed services on primary basis, in accordance with Resolution 175 (WRC-19);”

Summary

The agenda item studies the use of IMT systems for fixed broadband to assist in meeting global demands to bridge the digital divide, support the broadband agenda in developing countries and provide cost effective broadband services to rural and underserved areas. Studies should be conducted on the use of IMT systems for fixed wireless broadband in the frequency bands allocated to the fixed service on primary basis.

CRAF preliminary position on A.I 9.1 C)

As there are several frequency bands allocated to the fixed services that are adjacent or shared with RAS bands, the use of IMT systems in these bands will require compatibility studies for RAS protection in any relevant bands. CRAF is monitoring the A.I for more information on specific spectrum usage.

Agenda item 10: WRC27 agenda items

CRAF will follow the work on AI 10, to be added to the document at a later stage.