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CEPT BRIEF ON AGENDA ITEM 1.12

1.12 to consider an extension of the current worldwide allocation to the earth exploration-satellite (active) service in the frequency band 9 300-9 900 MHz by up to 600 MHz within the frequency bands 8 700-9 300 MHz and/or 9 900-10 500 MHz, in accordance with Resolution 651 (WRC 12)

# ISSUE

Resolution 651 (WRC-12) invites WRC-15 to consider the possible extension of the current worldwide allocation to the EESS (active) in the frequency band 9 300-9 900 MHz by up to 600 MHz within the frequency range 8 700- 9 300 MHz and/or 9 900-10 500 MHz while ensuring protection of existing services and taking due account of the safety services allocated in the frequency band 9 000 to 9 300 MHz.

Resolution 651 (WRC-12) also invites ITU-R to conduct compatibility studies addressing

EESS (active) and existing services in the frequency bands 8 700-9 300 MHz and 9 900-10 500 MHz in order to ensure the protection of the existing services, taking into account the constraints as per No. 5.476A;

* unwanted emissions from stations operating in the EESS (active) within the frequency band 8 700-9 300 MHz into stations of the space research service operating in the frequency band 8 400-8 500 MHz;
* unwanted emissions from stations operating in the EESS (active) within the frequency band 9 900-10 500 MHz into stations of the radio astronomy service, space research service (passive) and EESS (passive) operating in the frequency band 10.6-10.7 GHz.

# CEPT position

CEPT supports the allocation of additional radio frequency spectrum of 600 MHz in the frequency bands 9 200-9 300 MHz and 9.9-10.4 GHz with a primary status to the earth exploration-satellite service (active).

CEPT supports, that stations in the earth exploration-satellite service (active) shall not cause harmful interference to, or claim protection from, stations operating in the radiodetermination services allocated in the same frequency bands. The extension band should be only used by SAR systems requiring more than 600 MHz bandwidth.

CEPT supports, that provisions for the protection of fixed and mobile services from EESS (active) need to be implemented, as appropriate.

CEPT supports, that the space research service operating in the band 8 400-8 500 MHz and the radio astronomy service operating in the band 10.6-10.7 GHz will be protected through the implementation of mitigation techniques, and, if not sufficient, through operational coordination, as described in Recommendations ITU-R RS.2065 and RS.2066.

# Background

Space-borne radars operating in the EESS (active) in the band 9 300-9 900 MHz have demonstrated their important contributions to a large number of scientific and geo-information applications which is also recognised in Resolution 673 (Rev. WRC-12). The growing demand for higher resolution radar picture raises the need to further increase the transmission bandwidth of the next generation of EESS-radars in this band because the effectively used transmission bandwidth has a direct correspondence to the achievable picture resolution.

Report ITU-R RS.2274 shows a high diversity of applications which demonstrate the need for very high resolution observations. Continuity with the current EESS allocation guarantees high image resolution combined with systematic long-term Earth observations and analyses to support understanding of Earth changes as demonstrated in Report ITU-R RS.2178 quote “One can improve prediction of the Earth system only through comprehensive, systematic Earth observation” unquote. Observing what is happening today and analysing what has happened in the past, is the key to understanding and predicting what will happen in the future.

It is important to note, that at least two different national European systems using very high resolution modes are planned to be an element of the European Copernicus program as Copernicus Contributing Mission (CCM). These systems enable Copernicus to provide very high resolution, all weather, imaging capability, not covered by the SENTINEL-1 mission. To this effect, the Draft RSPG opinion highlights, that Member States should support the primary allocation to the EESS (active) in the frequency bands 9 200-9 300 MHz and 9 900-10 400 MHz for the future development of services for the European Global Monitoring for Environment and Security Programme (Copernicus).

Studies were completed in ITU-R Study Group 7 providing justifications and explanations for spectrum requirement as well as sharing conditions with all incumbent radio services allocated in both potential frequency ranges 8 700-9 300 MHz and 9 900-10 500 MHz, considered for extension by Resolution 651 (WRC-12). Studies on unwanted (out-of-band) emissions into the space research and passive radio services, below and above the potential allocation range, were also completed.

* Spectrum requirement

The spectrum requirements for spaceborne EESS SAR applications, planned using frequency spectrum that would include the extended allocation to the EESS (active) around 9 600 MHz, are justified and published in Report ITU-R RS.2274. The amount of estimated spectrum required for the next generation of EESS (active) synthetic aperture radars (SAR) systems around 9 600 MHz is a contiguous 1 200 MHz.

* Publication of the characteristics of typical next generation EESS (active) spaceborne radars

The characteristics of a typical wideband EESS radar instrument are provided in Recommendation ITU-R RS.2043.

* General sharing conditions for EESS (active)

It is important to note, that EESS radars using the high resolution mode transmit in the direction of the measuring object only for very short time intervals, i.e. for less than seven seconds per exposure. It has been shown that the next generation of wideband spaceborne radar systems will have transmission characteristics similar to those already used in the current allocation. It is assumed that the conditions for sharing with radiolocation, fixed and other services within the existing allocation of 9 300-9 900 MHz can be widely extrapolated into the candidate extension bands.

The high resolution spotlight mode of SAR-4, with a chirp bandwidth of 1 200 MHz as described in Recommendation ITU-R RS.2043, is the only characteristics considered in sharing studies in the candidate expansion bands as defined by Agenda item 1.12 (WRC-15).

Additional sharing studies investigated the sharing conditions with incumbent radio services within the frequency ranges (above and below) considered for extension(s) and with radio services that claim protection from unwanted emissions in Resolution 651 (WRC-12). These latter services are SRS (active) and SRS (passive), EESS (passive) and RAS.

* Sharing EESS (active) with the radiodetermination service (RLS and RNS)

The frequency range 8 700-10 500 MHz is used by many different types of radars: airborne radar systems, shipborne radar systems, and beacon/ground-based radar. It is important to note that Report ITU-R RS.2094 provides results that show the compatibility between spaceborne SAR systems and radars operating in the bands 9 300-9 500 MHz and 9 800-10 000 MHz, and that EESS (active) systems have been operating in the band 9 300-9 900 MHz with no report of interference. Radar systems, characterized in Recommendation ITU-R M.1796, that operate on frequencies anywhere within the frequency range of 9 300-10 000 MHz are assumed to be compatible with EESS (active). Therefore, studies under WRC-15 Agenda item 1.12 focused on latest information on radars, identified in the 2013 revision of Recommendation ITU-R M.1796, operating in the frequency ranges 8 700-9 300 MHz and 10 000-10 500 MHz, respectively, that were not considered in previous studies.

The minimum silence period between two consecutive measurements is 1 second corresponding to a minimum distance between two consecutive points of measurement between 45 and 56 km, if the consecutive measurements are aligned with the satellite trace. If the consecutive measurements are not aligned along the satellite trace, the distance between two consecutive points would be much larger, and studies show that the interference duration would be limited to five seconds. The probability of interference outside the exposure area can be considered negligible.

The effect of pulsed interference is difficult to quantify and is strongly dependent on receiver-processor design and mode of system operation. In general, numerous features of radars can be expected to help suppress low duty-cycle pulsed interference. Techniques for suppression of low-duty-cycle pulsed interference are contained in Recommendation ITU R M.1372 (see also Recommendation ITU-R M.1461 and Report ITU-R M.2081).

* Comparison of sharing conditions of SAR-4 with previous SARs

It is shown in Report ITU-R RS.2313, that the impact of SAR system operating with a chirp bandwidth of 1200 MHz is similar to the existing SAR systems operating in the band 9 300-9 900 MHz already allocated to the EESS (active). The impact of SAR systems into radar receivers operating in the band 9 900-10 000 MHz, as were studied prior to WRC-12 in Report ITU-R RS.2094 and their conclusions are still valid for SAR systems with bandwidth up to 1 200 MHz. Studies in Report ITU-R RS.2313 took all radars into account that were identified in the 2013 revision of Recommendation ITU-R M.1796(-2), operating in the frequency bands 8 700-9 300 MHz and 10 000-10 500 MHz, and that were not considered in previous studies in Report ITU-R RS.2094.

It is also shown in this Report that the sharing conditions remain similar for any EESS SAR chirp transmission bandwidth of between 600 and 1200 MHz, and also remain similar to the sharing conditions of current EESS SAR systems in space operating at lower chirp bandwidth' in the existing EESS (active) allocation in 9 300-9 900 MHz.

* Sharing conditions in the frequency range 8 700-9 300 MHz

EESS SAR with the radionavigation service (RNS)

Impact of EESS SAR on RNS radars

According to test results described in Report ITU-R M.2081, where radio navigation radars were tested against various EESS waveforms, similar to a 1200 MHz EESS SAR, it can be concluded that EESS SAR emissions would not cause harmful interference into radio navigation radars using processing gain and operating in the band 8 700-9 300 MHz. In addition, the time duration of taking a high resolution image with the 1200 MHz EESS SAR mode is very short (about 5 sec).

On the other hand, the static analysis of the maximum interference from a high-resolution EESS SAR into a radiodetermination radar shows that the I/N at the receiver input can be as high as 31 dB. The impact of such interference into radiodetermination radars operating in the frequency band 8 700-9 300 MHz was not assessed. However, when considering a radar processing gain as explained in Recommendation ITU-R RS.1166, it can be shown that radionavigation could cope with interference from EESS SAR.

Studies in Report ITU-R RS.2313 show that in the frequency band 9 000-9 200 MHz sharing would be difficult, mainly due to the safety aspects of the affected services. The consideration of the frequency range 8 700-9 000 MHz would not allow contiguous extension to the current EESS (active) allocation.

The compatibility of EESS (active) with Search and Rescue Transponders (SART) operating under the GMDSS in the band 9 200-9 500 MHz (see No. 5.474) has been assessed. It has been shown that the EESS (active) emissions are below the trigger level of the SART transponder and therefore sharing with SART in the band 9 200-9 300 MHz is feasible.

Impact of RNS radars on EESS SAR

Compatibility studies have shown that the impact of RNS radars operating in the frequency band 9 000-9 300 MHz on EESS SAR receiver would be acceptable.

EESS SAR with the radiolocation service (RLS)

Impact of EESS SAR on RLS systems

The radiolocation systems identified by ITU-R for sharing studies which operate in the frequency band below 9 300 MHz operate also in the current allocation in the frequency band 9 300-9 900 MHz. Therefore, for comparison, simulations have also been performed with an EESS SAR system already using the current EESS frequency band 9 300-9 900 MHz. Results show that the I/N values obtained for the high resolution SAR are similar to the I/N values obtained for the existing SAR. No interference has been reported so far. Therefore, it is expected that none will be observed after the extension of the allocation to the EESS (active).

Impact of RLS systems on EESS SAR

The simulation results show that, in any case, the impact of radiolocation systems into EESS SAR is more than 13 dB below the interference protection criteria.

* Sharing conditions with the radiolocation service (RLS) in the frequency range 10.0-10.5 GHz

Impact of EESS SAR on RLS

In the particular case of main beam to main beam coupling the average I/N can reach values in the order of 60 dB which are similar to the average I/N values described in Report ITU-R RS.2094. However, these high values are obtained for very low percentages of time in the order of 0.00001%, which is less than 100 ms over 11 days. The average I/N value of -6 dB would be exceeded in less than 0.005% of the time, which is equivalent to an aggregate of 47 seconds over a full 11 days period.

Results were obtained without taking into account any processing gain, however it should be noted that with regard to pulse like interference as SAR satellite signal, such processing gain should be important and can significantly improve the results. In case of 20 dB of processing gain the average duration of interference per SAR orbit time could be reduced to less than 83 ms in the SAR exposure area and less than 1.3 ms elsewhere in the SAR visibility area.

It should also be noted that certain radar operating in the band 10-10.5 GHz as radars A7 and S3 also operate in portions of the band 9 300-9 900 MHz which is already allocated to the EESS service and in use for several years.

Impact of RLS on EESS SAR

The simulation results also show that in any case the impact of radiolocation/radionavigation systems into EESS SAR receiver is more than 13 dB below the interference protection criteria.

* Multiple SAR-4 systems and summary of studies

In case of multiple SAR-4 systems (number N) operating in the frequency band 8 700-9 300 MHz and/or 10-10.5 GHz, the resulting probabilities are to be multiplied by N to obtain the aggregate probability as the probabilities corresponding to each SAR-4 system are statistically uncorrelated.

The table summarizes the overall results of the impact of SAR system into radar receivers.

Table 1: Summary of study results

|  |  |  |  |
| --- | --- | --- | --- |
|  | 8.7-9.3 GHz | 9.3-10 GHz | 10-10.5 GHz |
| Services impacted | RNS (RLS) | RNS/RLS | RLS |
| Maximum I/N average | 26.8 dB-PG | Sharing condition already studied before WRC-12 and conclusions still applicable to SAR systems with chirp bandwidth between 600 MHz and 1200 MHz | 60 dB-PG\* |
| % of time maximum I/N average occurs (over 11 days) | 0.00001 x N |  | 0.00001 x N\*\* |
| % of time I/Nav+PG=-6dB is exceeded (over 11 days) | 0.00004 x N |  | 0.005 x N\*\* |
| % of time I/Nav=-6dB is exceeded (over 11 days) | Never |  | Much lower than 0.005xN  (depend on PG) |
| PG: radar receiver processing gain in dB (the effect of pulsed interference is difficult to quantify and is strongly dependent on radar receiver-processor design and mode of system operation. In general, numerous features of radars can be expected to help suppress low duty-cycle pulsed interference. Techniques for suppression of low-duty-cycle pulsed interference are contained in Recommendation ITU-R M.1372 (see also Recommendation ITU-R M.1461 and Report ITU-R M.2081). Report ITU-R RS.2094 show that such processing gain can be significant).  N: number of EESS SAR systems operating in the considered band | | | |

* Sharing EESS (active) with the fixed service (FS)

Sharing studies have been performed with fixed service allocated in the frequency bands 8 700-8 750 MHz and 10-10.5 GHz. Results in Report ITU-R RS.2314 show that sharing is feasible.

* EESS SAR on FS

Studies performed in Report ITU-R RS.2314 basically confirm the results obtained in ITU-R Report RS.2094, showing that fixed service would be protected. Only when the fixed service station is pointing towards high elevation angles (greater than 30°) and in four particular azimuths would the fractional degradation performance criterion of 10% be exceeded, due to main beam to main beam coupling possibilities. However, statistics provided to the ITU-R, even for countries with a number of high mountainous areas, indicate, that the FS elevation angles are below 24°.

Details on timing and corresponding geometries can be found in the new Recommendation ITU-R RS.2043.

* FS on EESS (active)

Study results shown in Report ITU-R RS.2314 show that the SAR receiver protection criterion would be met with a margin between 8 and 13 dB depending on the band, when considering a deployment of several thousands of FS links. The margin obtained is lower than the margin obtained in ITU-R report RS.2094 due to the larger number of FS links considered, the SAR mode of operation, as well as the SAR characteristics (only the best case SAR had been studied in Report ITU-R RS.2094).

Sharing between EESS (active) and FS is therefore feasible.

* Sharing EESS (active) with the mobile service (MS)

Allocations to the MS are in the band 10.0-10.5 GHz and through footnotes No. 5.468 and 5.469 as well as 5.480 and 5.481 in the upper and lower extension range, respectively. The only identified usage of these bands by MS is ENG/OB in the band 10-10.5 GHz.

* EESS (active) on MS

The studies in Report ITU-R RS.2314 show that the protection criterion for ENG/OB, which is limited to a long-term criterion would be met, due to the low percentage of emission activity of the SAR system. An additional short-term protection criterion was also considered, and would be also met with margins in the order of 22 dB, even when considering worst case azimuth and elevation angles up to 40°.

Details on timing and corresponding geometries can be found in the new Recommendation ITU-R RS.2043

* MS on EESS (active)

Study results show that the SAR receiver protection criterion would be met with a margin of 16 dB when considering a deployment of several hundreds of ENG/OB transmitting at full power.

Sharing between EESS (active) and MS is therefore feasible.

* Sharing EESS (active) with the amateur service (AR) and amateur-satellite service

The amateur service is allocated in the band 10.0-10.5 GHz and the amateur-satellite service in the band 10.45-10.5 GHz, both on secondary basis.

With regard to the amateur service, the study of impact of the EESS (active) sensor into the amateur station receivers indicates that the interference may exceed an I/N of -6 or -10 dB, but for a very limited period of time in the order of 10 times four seconds over 11 days, which in total represents 0.004% of the time. The studies of the impact of amateur transmitters into the SAR receiver show a margin of 24 dB.

With regard to the amateur-satellite service, the study of the impact of the EESS (active) sensor into the amateur-satellite receiving earth station indicates that the interference may exceed an I/N of -6 or -10 dB, but for a very limited period of time representing 0.0015% of the total simulation time of 11 days, which represents two periods of about six seconds every five to six days. The studies of the impact of the EESS (active) sensor into the amateur-satellite, as well as of the amateur-satellite or the amateur earth stations into the SAR receiver indicate very large margins.

It should be noted that two footnotes of the European allocation table refer to this topic as follows:

EU17: In the sub-bands 3 400-3 410 MHz, 5 660-5 670 MHz, 10.36-10.37 GHz, 10.45-10.46 GHz the amateur service operates on a secondary basis. In making assignments to other services, CEPT administrations are requested wherever possible to maintain these sub-bands in such a way as to facilitate the reception of amateur emissions with minimal power flux densities.

EU23: In the sub-bands 5 660-5 670 MHz (Earth-to-space), 5 830-5 850 MHz (space-to-Earth) and 10.45-10.50 GHz the amateur-satellite additionally operates on a secondary and non-interference basis to other services. In making assignments to other services, CEPT administrations are requested wherever possible to maintain these allocations in such a way as to facilitate the reception of amateur emissions with minimal power flux densities.

* Protection of the space research service (SRS) from EESS (active) unwanted emissions in the band 8 400-8 500 MHz

Besides sharing with radio services potentially affected by an extension, studies in Report ITU-R RS.2308 deal with compatibility conditions of unwanted emissions from wideband EESS systems into nearby SRS allocation in the frequency band 8 400-8 500 MHz.

Dynamic analyses show that unwanted emission attenuations in the order of 74 dB for deep space missions, or 30 dB for near Earth missions would be needed in order to meet the protection criteria given in relevant ITU-R recommendations related to SRS.

Mitigation techniques have been proposed in order to avoid any harmful interference in particular during critical events, or to mitigate the risk of damage or saturation to SRS receivers. These mitigation techniques are included in Recommendation ITU-R RS.2065. In case they are not sufficient, operational coordination will be needed between SRS and EESS operators, which mechanism is described in the same Recommendation.

* Protection of the radio astronomy service (RAS) from EESS (active) unwanted emissions in the band 10.6-10.7 GHz

The RF impact of unwanted emissions from wideband EESS (active) systems into the radio astronomy service allocated in the band 10.6-10.7 GHz has been assessed in Report ITU-R RS.2308. Unwanted emissions of such SAR systems would generate a maximum percentage of data loss in the order of 3%, assuming that the SAR performs an acquisition over the RAS station any time it is possible. When considering a more realistic operational condition, where the number of acquisition over such remote areas is limited, the 2 % protection criterion is met.

There may be a risk of damage to RAS sensitive receivers in case of main beam to main beam coupling. Direct illumination of the RAS location by the SAR system should be avoided as far as practicable. Alternatively, if the SAR system has to make an acquisition of an area where a RAS station is located, observations in the band 10.6-10.7 GHz should be avoided at the same time. In this case, the burden of "operational co-ordination" between the SAR operations and radio astronomy measurements is put on the SAR operator. This operational coordination principle is described in Recommendation ITU-R RS-2066.

* Protection of the earth exploration-satellite service (passive) from EESS (active) unwanted emissions in the band 10.6-10.7 GHz

Further affected in the band 10.6-10.7 GHz, there are two more radio services SRS (passive) and EESS (passive). As SRS (passive) systems are sensors used around other planets or radio telescope pointing to outer space, no interference to SRS (passive) would be possible from space borne SARs, thus, no study required.

The impact of unwanted emissions of SAR systems into EESS (passive) sensors used in the band 10.6-10.7 GHz has been analysed in Report ITU-R RS.2308. Due to the attenuation of unwanted emissions, as well as the difference in orbital characteristics of SAR systems compared to EESS (passive) systems, no impact is expected in EESS (passive) and no specific regulatory conditions would be required.

# List of relevant documents

## ITU Documentation

ITU-R Recommendations

Remote sensing: ITU-R RS.1029, RS.1166, RS.1280, RS.1859, RS.1861, RS.1883, RS.2017, RS.2043, RS.2065, RS.2066;

Space applications and meteorology: ITU-R SA.509, SA.609, SA.1016, SA.1020, SA.1022, SA.1157, SA.1743

Radio astronomy: ITU-R RA.517, RA.611, RA.769, RA.1513, RA.1631

Mobile, radiodetermination, amateur-satellite services: ITU-R M.628, M.629, M.824, M.1041, M.1044, M.1372, M.1461, M.1583, M.1732, M.1796, M.1824, M.1849, M.1851

Spectrum management: ITU-R SM.337, SM.1138, SM.1535, SM.1541, SM.1542;

Fixed service: ITU-R F.699, F.758, F.1108, F.1403, F.1245, F.1336;

ITU-R Reports

Mobile, radiodetermination, amateur, amateur-satellite services: ITU-R M.2050, M.2076, M.2081, M.2128

Remote sensing: ITU-R RS.2094, RS.2178, RS.2188, RS.2274, RS.2308, RS.2313, RS.2314;

## EU Documentation

* RSPG opinion in RSPG14-578 (rev1).

## CEPT Documentation

* ECC Report 018 “Sharing RAS operating in the band 10.6-10.7 GHz and other services”
* ECC Report 173 “Fixed Service in Europe – Current use and future trends post 2011”
* ERC Report 040 “Fixed Service system parameters for frequency sharing”

# Actions to be taken

No further actions are required.

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

## European Union (12 November 2014)

Under Agenda Item 1.12, Member States should support the primary allocation to the Earth Exploration Satellite Service (active) in the frequency bands 9 200-9 300 MHz and 9 900-10 400 MHz for the future development of services for the European Global Monitoring for Environment and Security Programme (Copernicus), including a limitation that this extension shall only be used for systems which needs bandwidth greater than 600 MHz.

## Regional telecommunication organisations:

APT (01 August 2015)

PACP

* Support an extension of EESS (active) by up to 600 MHz within the frequency ranges 9 200-9 300 MHz and 9 900-10 400 MHz preferably on a primary basis.
* Extension bands may only be used for those EESS (active) systems requiring more than 600 MHz for their operation that cannot be accommodated in the existing frequency band 9 300-9 900 MHz.
* Appropriate protection of the existing services currently allocated in the same frequency bands, especially the radiodetermination service and the fixed service, should be ensured according to the Radio Regulations.
* No harmful interference should be caused to the SRS in the adjacent frequency band 8 400-8 500 MHz and the RAS and EESS (passive) in the frequency band 10.6-10.7 GHz.
* Development of existing services should not be constrained by the EESS (active) allocation.
* The protection of FS stations should be ensured through a provision in the RR with a pfd hard limit.

ATU (24 July 2015)

ATU - no position

ECOWAS - Method A2

EACO - Method B1

SADC - Method B1

Sudan, Cameroon, Ghana, Ivory Cost Republic - Method D

ASMG ( 29 August 2015)

Method D

CITEL ( 21 August 2015)

Inter-American Proposal (IAP) - Method A1 Option2

* Proposing new global primary allocation to the EESS (active) in the band 9 900-10 500 MHz
* ADD footnote No. 5.A112 to ensure the newly allocated spectrum is used solely by high resolution EESS systems whose spectrum needs exceed the existing EESS allocation in the 9 300-9 900 MHz band
* MOD footnote No. 5.476A to protect the radiolocation and radionavigation services
* Suppression of Resolution 651 (WRC-12)

RCC (22 April 2015) (10 September 2015, added when available)

The RCC Administrations consider that worldwide extension of the available allocation to the EESS (active) in the frequency band 9 300-9 900 MHz up to 600 MHz would be more preferable within the frequency band 9 900-10 500 MHz, and the extension would be possible only subject to defining the conditions of providing protection for systems in other services operating in this and adjacent frequency bands.

The RCC Administrations consider that in case of additional allocation of up to 600 MHz to the EESS (active), this frequency band shall be used only by the EESS systems with the pfd limits derived from the ITU-R studies and subject to not claiming protection from the services having allocations in this frequency band.

The RCC Administrations consider that protection shall be ensured for systems in other services, specifically RLS in the frequency band 9 900-10 500 MHz as well as for radiodetermination systems in the frequency band 9 200-9 300 MHz deployed on river boats and sea ships.

Complies with Method A2 with specified pfd limits.

## International organisations

IATA (date of proposal)

ICAO (17 June 2015)

Oppose any allocation to the Earth exploration-satellite service in the frequency band 9 000-9 200 MHz unless as it has been demonstrated through agreed studies that EESS would impact on aviation use and place additional constraints on the use of the frequency band by aeronautical systems

No change to Nos. 5.337, 5.427, 5.474 and 5.475.

IMO (9 September 2014; ITU/IMO)

Protection of the maritime radionavigation service, operating in the frequency band 9 200-9 500 MHz, is essential for "safety of navigation" and "safety of life" and in accordance with Nos.1.59 and 4.10 of the Radio Regulations.

IMO requests that the band 9 200-9 500 MHz be excluded from consideration under agenda item 1.12, for Earth exploration satellite (active) service, due to the potential harmful impact on global shipping.

**NATO (**June 2015**)**

NATO Military Position

If studies show compatibility with the incumbent radio services and other services in nearby allocations are adequately protected from unwanted emissions, NATO will support an additional allocation of up to 600 MHz to complement the existing 9 300-9 900 MHz EESS allocation. The extension band should be only used by SAR systems requiring more than 600 MHz bandwidth. Based on the results of studies, NATO does not support an EESS allocation below 9 200 MHz.

SFCG (04 August 2015)

Objective

SFCG supports an extension of the current worldwide allocation to the Earth exploration-satellite (active) service in the frequency band 9 300-9 900 MHz by 600 MHz.

The SFCG objectives are met through methods A1 (Option 1 and Option 2) or B1. Methods C and D would not satisfy the need for 600 MHz as justified in Report ITU-R RS.2274.

Although the pfd mask proposed in Method B2 can be met by SARs it would unnecessarily constrain the future development of such systems.

SFCG opposes Method A2 as the proposed pfd mask in this method, in contrast to the mask in Method B2, would not allow SARs to operate in the new allocation. The proposed mask does not take into account the percentage of time associated with the short term FS protection criteria, and is therefore unnecessarily restrictive.

SFCG recognizes that the compatibility with SRS (space-to-Earth) links in the 8400-8500 MHz frequency band is ensured with the application of Recommendation ITU-R RS.2065 to be incorporated by reference.

WMO (November 2014)

If an allocation to the EESS (active) is applied in the frequency range 9 GHz frequency range, adequate protection of meteorological applications has to be ensured.

IARU (September 2014)

As noted under Agenda Item 1.6.1, the band 10.0-10.5 GHz is allocated to the amateur service on a secondary basis. It is a popular band for amateur experimentation, investigation of propagation phenomena, and point-to-point communication between networked repeater stations.

The band 10.45-10.5 GHz is allocated to the amateur-satellite service on a secondary basis. Owing to the popularity of the 10.0-10.5 GHz band for terrestrial amateur communication, increased use of this allocation for amateur satellite communication is anticipated.

The IARU requests that existing and future use of this band be taken into account and continue to be provided for. An illustration of how this can be accomplished is found in Recommendation ITU-R RS.1260-1; see no. 5.279A which applies to the use of the band 432-438 MHz by the Earth exploration-satellite service (active).

## OTHER INTERNATIONAL AND REGIONAL ORGANISATIONS

CRAF (06 September 2015)

Any additional allocation to the existing allocation can only be supported if the RAS and the SRS (passive) using radio astronomy techniques in nearby bands are adequately protected from unwanted emissions via appropriate regulations. Especially the nearby bands 10.6-10.68 GHz (RR. 5.149) and 10.68-10.7 GHz (RR 5.340) are susceptible for unwanted emissions from the proposed applications.

CRAF considers that the burden of any required co-ordination actions should rest with the satellite operator and not individual RAS observatories.

In the proposed methods protection of the RAS in the nearby bands 10.6-10.68 GHz (RR. 5.149) and 10.68-10.7 GHz (RR 5.340) is addressed in a new ITU-R Recommendation ITU-R RS.2066 to be incorporated by reference via a footnote in the RR, which includes a list of radio astronomy stations that will not be illuminated by SAR using the new allocation except with advance coordination. Illuminations of RAS sites by SAR are of general concern because the power in the radar beam is sufficient to destroy an unfiltered RAS receiver in the unlikely event of strong coupling between the SAR and radio telescope beams. The methods proposed for agenda item 1.12 have the benefit that illuminations of RAS sites by SAR using the new allocation would largely be avoided. [However, the use of existing and new allocations by a variety of SAR systems will make it impossible for RAS site operators to know when their stations were being illuminated.]

All Methods A add a primary EESS (active) allocation in the frequency band 9 900-10 500 MHz.

All Methods B add a primary EESS (active) allocation in the frequency bands 9 200-9 300 MHz and 9 900-10 400 MHz.

If an additional allocation has to be made, CRAF accepts Method B that places the radar allocation further away from the RAS bands.

CRAF disapproves Methods A, which places the radar allocation close to the 10.6-10.7 GHz RAS bands.

ESA (04 August 2015)

Supports SFCG positions

EUMETNET (November 2014)

Supports WMO positions

Eurocontrol (July 2015)

Oppose any allocation to the Earth exploration-satellite service in the frequency band 9 000 – 9 200 MHz as it has been demonstrated through agreed studies that EESS would impact aviation use, and will place constraints on the use of the frequency band by aeronautical systems.

No change to Nos. 5.337, 5.427, 5.474 and 5.475.

EBU (date of proposal)

GSMA (date of proposal)