

RADIONET3

TRIPS OF WP7

RADIO ASTRONOMICAL SPECTRUM MANAGEMENT

SUBJECT **Report from WRC-15 (2nd – 27th November)**

DATE **08 December 2015**

PLACE **Geneva, Switzerland**

PARTICIPANTS **T. Hezareh, H. van der Marel, W. van Driel**

The World Radiocommunication Conference 2015 (WRC-15) was opened on 2nd November 2015 at the ITU premises in Geneva. The following CRAF members were present at the conference:

- Talayeh Hezareh (MPIfR, Bonn, Germany)
- Hans van der Marel (ASTRON, Dwingeloo, The Netherlands)
- Wim van Driel (Paris Observatory, Paris, France)
- Ivan Thomas (Nançay Observatory, Nançay, France, registered as delegate of France)

Organisation of work

7 Committees were established by the WRC-15 to undertake relevant responsibilities during the Conference:

Committee 1: Steering Committee

Committee 2: Credentials Committee

Committee 3: Budget Control Committee

Committee 4, 5 and 6: Specified Agenda Items Committees

Committee 7: Editorial Committee

The responsibilities of Committees 4, 5 and 6 were identified as follows:

Committee 4: WRC-15 Agenda Items 1.1; 1.2; 1.3; 1.4; 1.5; 1.15; 1.16; 1.17; 1.18; 9.1.7; GFT

Committee 5: WRC-15 Agenda items 1.6; 1.7; 1.8; 1.9; 1.10; 1.11; 1.12; 1.13; 1.14; 7; 9.1.1; 9.1.2; 9.1.3; 9.1.5; 9.1.8; 9.2; 9.3

Committee 6: WRC-15 Agenda items 2; 4; 8; 9.1.4; 9.1.6; 9.2; 10

In addition, several ad hoc groups and expert groups were set up during the Conference to address the following items: 1.1 (remaining issues); 1.1 (lower UHF); 1.5; 1.9.1, 1.10.

Progress reports of Agenda Items

AI 1.1. (WG 4C): *to consider additional spectrum allocations to the mobile service on a primary basis and identification of additional frequency bands for International Mobile Telecommunications (IMT) and related regulatory provisions, to facilitate the development of terrestrial mobile broadband applications, in accordance with Resolution 233 (WRC 12)*

CRAF position:

- opposing: 608-614 MHz, 1330-1400 MHz, 1427-1518 MHz, 2700-2900 MHz, 4800-5000 MHz bands.

Agenda item was solved during the fourth week of the Conference

Final outcome:

- Lower UHF band (470-694 MHz) Region 1: No change to the RR at WRC-15 and a WRC-23 agenda item has been created addressing a review of the spectrum use of the frequency band 470-960 MHz. Parts of the band have been identified for IMT in a few countries in Region 2 and 3, where a mobile allocation already exists for the UHF band.
- L Band:
 - The bands 1427-1452 and 1492-1518 MHz have been identified for IMT worldwide.
 - The band 1452 – 1492 MHz has been identified for IMT in Regions 2 and 3. In Region 1, the IMT identification of 1452-1492 MHz is limited to some African and Middle-East countries. The band was not identified for CEPT countries because of the usage of the band, which formed the opposition from RCC. However, the primary mobile allocation and the ECC Decision(13)03 form the basis of IMT use of the band 1452-1492 MHz in CEPT.
- C-Band:
 - 3400-3600 MHz: The existing footnote allocation has been modified in a table allocation. In addition, the band has been identified in Regions 1 and 2 to IMT with a pfd limit of $-154.5 \text{ dB(W/(m}^2 \cdot 4 \text{ kHz))}$ produced at 3 metres above ground for 20% of time for the protection of FSS. Nos 9.17, 9.18 and 9.21 apply. The band is also identified for a limited number of Region 3 countries.
 - 3600-3700 MHz: the band has only been identified for a few Region 2 countries with associated provisions to protect FSS as specified above for lower part of C-band.
- Other bands: agreement has been reached on no changes in allocation table for the frequency bands : 410-450 MHz, 1 164-1 215 MHz, 1 215-1 300 MHz, 1 300-1350 MHz, 1 350 - 1 400 MHz, 1 518-1 525 MHz, 1 559-1 610 MHz, 1 695-1 710 MHz, 2 025-2 110 MHz, 2 200-2 290 MHz, 2 700-2 900 MHz, 2 900-3 100 MHz, 3 300 - 3 400 MHz (in Region 1), 3700 – 3800 MHz; 3 800 - 4 200 MHz, 4 400-4 500 MHz for Regions 1 and 2, 4 500-4 800 MHz, 4 800-4 990 MHz (in Region 1) 4 990-5 000 MHz, 5 350-5 470 MHz, 5 725-5 850 MHz, 5 850-5 925 MHz and 5 925 - 6 425 MHz.

The band 3300-3400 MHz has been identified to some African countries in Region 1 and to some countries in Regions 2 and 3. The band 4800-4990 MHz is only identified to IMT in one Region 2 and three Region 3 countries.

AI 1.3 (WG 4C): *to review and revise Resolution 646 (Rev.WRC-12) for broadband public protection and disaster relief (PPDR), in accordance with Resolution 648 (WRC-12);*

CRAF position: CRAF opposes the use of broadband PPDR within and immediately adjacent to the RAS band 406.1 – 410 MHz unless acceptable compatibility criteria for the RAS are developed and included in subsequent regulation. CRAF is of the opinion that Resolution 646 should explicitly mention the primary RAS allocation in the band 406.1 - 410 MHz.

Agenda item solved during the third week of the Conference

Final outcome:

This item led to a revision of WRC Resolution 646 on Public Protection and Disaster Relief, which encourages administrations to consider parts of the frequency range 694 – 894 MHz for PPDR in all regions, confirms the range 380-470 MHz as suitable for PPDR in Region 1 and refers to ITU-R Recommendation M.2015 for further details, including channelling arrangements for both regional and national PPDR bands. The WRC Resolution 646 includes the following text in the considerations section:

w) *that the radio astronomy service (RAS) operates on a primary basis in the 406.1-410 MHz band and there may be PPDR operations adjacent to that band.*

AI 1.5 (WG 4A): *to consider the use of frequency bands allocated to the fixed-satellite service not subject to Appendices 30, 30A and 30B for the control and non-payload communications (CNPC) of unmanned aircraft systems (UAS) in non-segregated airspaces, in accordance with Resolution 153 (WRC-12);*

CRAF Position: Due to the proximity of the proposed FSS bands to the 10.68-10.70 MHz and 14.47-14.50 MHz RAS bands, CRAF strongly opposes the use of the FSS(Earth-to-space) bands by UAS as long as no regulations have been developed to protect the existing RAS allocations.

Agenda item solved during the fourth week of the Conference

Final outcome:

This AI carried a huge political pressure from the stakeholders. Consensus was reached at the last day of the Conference for the CNPC usage for UAS. The WRC-15 made a provisional footnote allocation in number of FSS bands. ICAO is invited to start developing the necessary standard and recommended practices. Provisional allocation

will come into force after the WRC-19 approval of technical conditions of CNPC links usage of those bands. In the resolves section of the approved Resolution the following text for the protection of radio astronomy is included:

17 that, in order to protect the radio astronomy service in the frequency band 14.47-14.5 GHz, administrations operating UAS in accordance with this resolution in the frequency band 14-14.47 GHz within line-of-sight of radio astronomy stations are urged to take all practicable steps to ensure that the emissions from the UA in the frequency band 14.47-14.5 GHz do not exceed the levels and percentage of data loss given in the most recent versions of Recommendations ITU-R RA.769 and ITU-R RA.1513;

AI 1.6 (WG 5B): *to consider possible additional primary allocations:*

1.6.1 *to the fixed-satellite service (Earth-to-space and space-to-Earth) of 250 MHz in the range between 10 GHz and 17 GHz in Region 1;*

1.6.2 *to the fixed-satellite service (Earth-to-space) of 250 MHz in Region 2 and 300 MHz in Region 3 within the range 13-17 GHz; and review the regulatory provisions on the current allocations to the fixed-satellite service within each range, taking into account the results of ITU-R studies, in accordance with Resolutions 151(WRC-12) and 152(WRC-12), respectively.*

CRAF position: CRAF approves allocating the 13.4-13.75 GHz band to the FSS in the earth-space and space-earth directions, respectively. CRAF strongly opposes allocating the band 14.5-14.8 GHz in the space-earth direction, because no compatibility studies were conducted with regard to the secondary RAS allocation in the adjacent band at 14.47-14.5 GHz, that is also used for VLBI. CRAF also strongly opposes allocating the band 14.8-15.35 GHz in the space-earth direction, because this band is directly adjacent to the 15.35-15.4 GHz primary RAS allocation and because of the secondary SRS allocation in this band that is also used for VLBI.

Agenda item solved during the second week (part of 1.6.1) and fourth week (remaining part of 1.6.1 and 1.6.2) of the Conference

Final outcome:

1.6.1: The Conference agreed on an additional primary allocation of 250 MHz to the FSS (space-to-Earth) in Region 1 in the frequency band 13.40-13.65 GHz.

After long and difficult discussions the Conference agreed to an additional allocation in Region 1 (excluding Europe) in the frequency band 14.5 – 14.75 GHz and in Region 3 in the 14.5-14.8 GHz for the FSS (Earth-to-space) in a number of countries specified in the corresponding Resolutions with the following technical and operational limitations:

- antenna diameter and maximum power spectral density;
- power flux-density produced by this earth station at all altitudes up to 19 km above sea level at 22 km seaward from all coasts, defined as the low-water mark, as officially recognized by each coastal State.

- the location of earth stations shall maintain a separation distance of at least 500 km from the border(s) of other countries unless shorter distances are explicitly agreed by those administrations. No. 9.17 does not apply.

1.6.2: The Conference also agreed to an additional allocation of 250 MHz to the GSO FSS (Earth-to-space) in Region 2 in the frequency band 14.5 – 14.75 GHz and 300 MHz to the GSO FSS (Earth-to-space) in the frequency band 14.5-14.8 GHz in Region 3 in

the number of countries specified in the WRC-15 Resolutions under the same technical and operational limitations as in **1.6.1**.

AI 1.8 (WG 5C): to review the provisions relating to earth stations located on board vessels (ESVs), based on studies conducted in accordance with Resolution 909 (WRC-12);

CRAF position: Supporting no change in the Radio Regulations.

Agenda item solved during the third week of the Conference

Final outcome:

A compromise was reached by allowing ESVs with minimum antenna diameter of 1.2 m to operate in the band 5925-6425 MHz without prior agreement of any administration if located at least 330 km away from the low-water mark as officially recognised by the coastal State. Other current provisions of Resolution 902 are still applicable, no modification to the procedures applicable to Ku-band been made.

AI 1.9 (WG 5B): to consider, in accordance with Resolution 758 (WRC 12): **Issue 1.9.1** possible new allocations to the fixed-satellite service in the frequency bands 7 150-7 250 MHz (space-to-Earth) and 8 400-8 500 MHz (Earth-to-space), subject to appropriate sharing conditions; **Issue 1.9.2** the possibility of allocating the bands 7 375-7 750 MHz and 8 025-8 400 MHz to the maritime-mobile satellite service and additional regulatory measures, depending on the results of appropriate studies;

CRAF position

1.9.1: supporting no change to the Radio Regulations, due to lack of satisfactory solutions to ensure compatibility between SRS and FSS in the proposed bands.

1.9.2: supporting no change in the band 8025-8400 MHz.

Agenda item solved during the second week (part 1.9.2) and fourth week (1.9.1) of the Conference

Final outcome:

1.9.1: Because of the strong opposition from two regional groups, no new allocation to the FSS was made and no new studies will be performed.

1.9.2: WRC-15 approved a new primary allocation to the MMSS (space-to-Earth) in the 7 375-7 750 MHz band under the conditions initially proposed by CEPT.

AI 1.10 (WG 5B): *to consider spectrum requirements and possible additional spectrum allocations for the mobile-satellite service in the Earth-to-space and space-to-Earth directions, including the satellite component for broadband applications, including*

International Mobile Telecommunications (IMT), within the frequency range from 22 GHz to 26 GHz, in accordance with Resolution 234 (WRC 12)

CRAF position: No change to the Radio Regulations

Agenda item solved during the fourth week of the Conference

Final outcome:

One regional organisation and one administration insisted on the additional MSS allocation. Proponents of new MSS allocations in the frequency range 22-26 GHz tried to bring forward different solutions to solve this issue, which did not alleviate the concerns from the regional organisations (including CEPT), which therefore firmly stayed on NOC option. As a result, no new allocation was made to the MSS under 1.10 and no new studies will be performed.

AI 1.12 (WG 5A): *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);*

CRAF position: accepting allocation of 600 MHz at 9 200-9 300 MHz and 9.9-10.4 GHz for Earth Exploration Satellite Service EESS (active).

Agenda item solved during the fourth week of the Conference

Final outcome:

WRC-15 agreed new allocations to the EESS (active) in the bands 9.2-9.3 and 9.9-10.4 GHz, as proposed by CEPT. Agreement was reached on the technical limits for EESS (pfd mask) in the band 9.9-10.4 GHz for the protection of the incumbent services. The 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, which is incorporated by reference via the new 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 initiated by satellite operators.

AI 1.14 (SWG 5A): *to consider the feasibility of achieving a continuous reference time-scale, whether by the modification of coordinated universal time (UTC) or some other method, and take appropriate action, in accordance with Resolution 653 (WRC-12).*

CRAF has no position.

Agenda item solved during the third week of the Conference

Final outcome:

An agreement was reached on this contentious topic through the adoption of a new Resolution, which provides a framework for further study including wider collaboration

with relevant international bodies such as the International Bureau of Weights and Measures (BIPM), International Committee for Weights and Measures (CIPM) and General Conference on Weights and Measures (CGPM) etc. and will report on the progress of this Resolution to WRC-23. Meanwhile the current UTC (with leap seconds) as described in ITU Recommendation TF 460-6, will continue to apply.

AI 1.16 (WG 4B): *to consider regulatory provisions and spectrum allocations to enable possible new Automatic Identification System (AIS) technology applications and possible new applications to improve maritime radiocommunication in accordance with Resolution 360 (WRC-12);*

CRAF position: CRAF supports a possible new MMSS allocation (space-Earth) in (parts of) the frequency band 156 – 162 MHz as long as an attenuation of 85 dB and the pfd mask described in the CPM15-2 report as proposed by the MMSS are implemented for the nearby radio astronomy band.

Agenda item solved during the third week of the Conference

Final outcome:

A consensus was reached, in line with the proposals from CEPT, on the identification of ASM Channels, the protection of the existing AIS, the identification of the terrestrial component of the VDES and the international VDES channels.

Concerning the satellite component of the VDES, it was agreed to revise the associated Resolution 360 and to consider the issue further at WRC-19.

AI 1.18 (WG 4A): *to consider a primary allocation to the radiolocation service for automotive applications in the 77.5-78.0 GHz frequency band in accordance with Resolution 654 (WRC-12);*

CRAF position: CRAF does not approve the new allocation as long as no protection criteria for RAS are considered and reflected in appropriate regulation.

Agenda item solved during the second week of the Conference

Final outcome:

WRC-15 agreed on a primary allocation to the radiolocation service in the 77.5–78.0 GHz band for ground-based applications, including automotive radars. The associated provisions, derived from the CEPT proposal, refer to Recommendation ITU-R M.2057, which contains the technical characteristics of the automotive radars and to a new WRC Resolution providing information on the compatibility studies performed by ITU-R during the study cycle and calling for further studies to assist administrations in ensuring compatibility between new RLS applications and the incumbent services, including radio astronomy, operating in the 76-81 GHz frequency range.

***AI 10 (WG 6B):** to recommend to the Council items for inclusion in the agenda for the next WRC, and to give its views on the preliminary agenda for the subsequent conference and on possible agenda items for future conferences, in accordance with Article 7 of the Convention*

Agenda item solved during the last week of the Conference

Final report:

The total number of proposed agenda items for WRC-19 is 16, listed as follows:

1.1 to consider an allocation of the frequency band 50-54 MHz to the amateur service in Region 1 in accordance with Resolution **COM6/6 (WRC-15)**;

1.2 to consider in-band power limits for earth stations operating in the mobile-satellite service, meteorological-satellite service and Earth exploration-satellite service in the 401-403 MHz and 399.9-400.05 MHz frequency bands, in accordance with Resolution **COM6/7 (WRC-15)**;

1.3 to consider possible upgrading of the secondary allocation to the meteorological-satellite service (space-to-Earth) to a primary status and a possible primary allocation to the Earth exploration-satellite service (space-to-Earth) in the frequency band 460-470 MHz in accordance with Resolution **COM6/8 (WRC-15)**

1.4 to consider the results of studies in accordance with Resolution **COM6/9 (WRC-15)**, review, and revise if necessary, the limitations mentioned in Annex 7 of Appendix **30 (Rev.WRC-12)**, while ensuring the protection of, and without imposing additional constraints on, assignments in the Plan and the List and the future development of BSS within the Plan, and existing and planned FSS networks;

1.5 to consider the use of earth stations communicating within the fixed-satellite service, and take appropriate action, in the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5-29.5 GHz (Earth-to-space) by earth stations in motion communicating with geostationary space stations in the fixed-satellite service, in accordance with Resolution **[COM6-ESIM] (WRC-15)**;

1.6 to consider:

1.6.1 study of spectrum requirements and possible new allocations to the fixed-satellite service in the frequency bands 51.4-52.4 GHz (Earth-to-space), in accordance with Resolution **[COM6-QV FSS ALLOC 52 GHZ] (WRC-15)**;

1.6.2 the development of a regulatory framework for non-GSO FSS satellite systems that may operate in the 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), and 42.5-43.5 GHz, 47.2-50.2 GHz and 50.4-51.4 GHz (Earth-to-space) frequency bands, in accordance with Resolution **[COM6-QV FSS REGU] (WRC-15)**;

1.7 to study the spectrum requirements for telemetry, tracking and command in the space operation service for non-GSO satellites with short duration missions, to assess the suitability of existing allocations to the space operation service and if necessary, to consider new allocations, in accordance with Resolution **[COM6-SOS] (WRC-15)**; the proposed frequency bands are 150.05-174 MHz and 400.15-420 MHz;

1.8 to consider possible regulatory actions to support GMDSS modernization and to support the introduction of additional satellite systems into the GMDSS, in accordance with Resolution **359 (Rev.WRC-15)**;

1.9 to consider, based on the results of ITU-R studies:

1.9.1 regulatory actions within the frequency band 156-162.05 MHz, for autonomous maritime radio devices to protect the GMDSS and AIS in accordance with Resolution **COM6/10 (WRC-15)**;

1.9.2 modifications of the Radio Regulations, including new spectrum allocations to the maritime mobile-satellite service (Earth-to-space and space-to-Earth) preferably within the frequency bands 156.0125-157.4375 MHz and 160.6125-162.0375 MHz of Appendix 18, to enable a new VDES satellite component, while ensuring that this component will not degrade the current terrestrial VDES components, ASM, AIS operations and not impose any additional constraints on existing services in these and adjacent frequency bands as stated in *recognizing d) and e)* of Resolution **360 (Rev.WRC-15)**;

1.10 to consider spectrum requirements and regulatory provisions for the introduction and use of the global aeronautical distress and safety system (GADSS) in accordance with Resolution **COM6/11 (WRC-15)**;

1.11 to take necessary actions, as appropriate, to facilitate global or regional harmonized frequency bands to support railway radiocommunication systems between train and tracksides within existing mobile service allocations, in accordance with Resolution **COM6/12 (WRC-15)**;

1.12 to consider possible global or regional harmonized frequency bands, to the maximum extent, for the implementation of evolving Intelligent Transport Systems (ITS) under existing mobile-service allocations, in accordance with Resolution **COM6/13 (WRC-15)**;

1.13 to consider identification of frequency bands for the future development of International Mobile Telecommunications (IMT) including possible additional allocations to the mobile service on a primary basis in accordance with Resolution **[COM6-IMT ABOVE 6 GHz] (WRC-15)**; the frequency bands agreed for studies are as follows:

- 24.25-27.5 GHz, 37-40.5 GHz, 42.5-43.5 GHz, 45.5-47 GHz, 47.2-50.2 GHz, 50.4-52.6 GHz, 66-76 GHz, 81-86 GHz, which have allocations to the mobile service on a primary basis; and
- 31.8-33.4 GHz, 40.5-42.5 GHz and 47-47.2 GHz, which may require additional allocations to the mobile service on a primary basis;

1.14 to consider, on the basis of ITU-R studies in accordance with Resolution **[COM6-HAPS] (WRC-15)**, appropriate regulatory actions for high altitude platform stations (HAPS), within existing fixed-service allocations; the frequency bands approved for studies in the resolution for Region 1 include 31-50 GHz and 38-39.5 GHz.

1.15 to consider identification of frequency bands for use by administrations for the land mobile and fixed services applications operating in the frequency range 275-450 GHz, in accordance with Resolution **COM6/14 (WRC-15)**;

1.16 to consider issues related to wireless access systems including radio local area networks (WAS/RLAN) in the frequency bands between 5 150 MHz and 5 925 MHz, and take the appropriate regulatory actions, including additional spectrum allocations to the mobile service, in accordance with Resolution **[COM6-RLAN 5GHz] (WRC-15)**; The frequency bands 5150-5350 MHz, 5350-5470 MHz, 5725-5850 MHz and 5850-5925 MHz were agreed for compatibility studies.

Information of the EC financial contribution

The EU-project RadioNet3 has sponsored the travel expenses for 3 participants in the WRC-15 in the total range of 9165 EUR:

- Talayeh Hezareh (MPIfR, Bonn, Germany)
- Hans van der Marel (ASTRO, Dwingeloo, The Netherlands)
- Wim van Driel (Paris Observatory, Paris, France)