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Satellite Allocation Issues

Panel-4 Discussions on WRC-15 Agenda items 1.6, 1.7, 1.8, 1.9, 1.10

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Satellite Allocation Issues

- **AI 1.6.1** – Consider primary FSS allocation (Earth-to-space and space-to-Earth) of 250 MHz in the range between 10 GHz and 17 GHz in Region 1.
- **AI 1.6.2 –** Consider primary FSS allocation (Earth-to-space) of 250 MHz in Region 2 and 300 MHz in Region 3 within the range 13-17 GHz.
- **AI 1.7** - Review the use of 5 091-5 150 MHz by FSS (Earth-to-space), limited to feeder links of the NGSO MSS.
- **AI 1.8** - Review the provisions relating to earth stations located on board vessels (ESVs).
- **AI 1.9.1** – Consider allocations to FSS in 7 150-7 250 MHz (space-to-Earth) and 8 400-8 500 MHz (Earth-to-space).
- **AI 1.9.2** – Consider allocations of 7 375-7 750 MHz and 8 025-8 400 MHz to the maritime mobile satellite service (MMSS), with additional regulatory measures.
- **AI 1.10** – Consider MSS allocations, including the satellite component of broadband/IMT, in the 22-26 GHz range.

Agenda Item 1.6.1

- *Consideration of a primary FSS allocation (Earth-to-space and space-to-Earth) of 250 MHz in the range between 10 GHz and 17 GHz in Region 1.*
- **Issues:**
  - Compatibility analysis performed between the FSS (downlink) and EESS (passive) indicated that sharing between the two services in the 10.6-10.68 GHz band is not feasible.
  - WRC-97 allocated the 500 MHz bandwidth 13.25-13.75 GHz to EESS (active) and space research (active) service on a primary basis. Past WRC study cycles, in which sharing between EESS (active) and FSS (Earth-to-space) have been examined, have shown limited compatibility if both services operate in the same frequency band.
  - An analysis to assess the potential for interference between the near-Earth data relay service (DRS) missions and potential FSS systems in the 13.4-13.75 GHz band showed compatibility issues between the two systems.

Agenda Item 1.6.1

- *Consideration of a primary FSS allocation (Earth-to-space and space-to-Earth) of 250 MHz in the range between 10 GHz and 17 GHz in Region 1.*
- **Issues, cont.:**
  - An analysis performed to assess the potential for interference between the near-Earth data relay service (DRS) missions and potential FSS systems in the 14.5-14.8 GHz band showed compatibility issues between the two systems.
  - An analysis performed to assess the potential for interference between the near-Earth data relay service (DRS) missions and potential FSS systems in the 14.8-15.35 GHz band showed compatibility issues between the two systems.

Agenda Item 1.6.1

- *Consideration of a primary FSS allocation (Earth-to-space and space-to-Earth) of 250 MHz in the range between 10 GHz and 17 GHz in Region 1.*
- **Issues, cont.:**
  - In the 14.5-15.35 GHz band, static analyses show the proposed FSS Earth-to-space allocation may cause interference to the AMS/MS systems.
    - Large (up to 578 Km, not accounting for terrain) separation distances may be required around AMS/MS systems for FSS sharing with AMS/MS in the 14.5-15.3 GHz band.
  - In the 15.4-17.3 GHz band, static analyses show that the proposed FSS Earth-to-space allocation may cause interference to the radiolocation systems.
    - Large (up to 420 Km, not accounting for terrain) separation distances may be required around the radiolocation systems for FSS sharing in the 15.4-17 GHz band.

Agenda Item 1.6.1

- Resolution: **151 (WRC-12)**
- ITU-R Responsible Group: **WP 4A**, next meeting: **5-13 Feb 2014**
- Latest information: **Doc. 4A/343, Annexes 10, 12, 27**
- **Ongoing Studies to Satisfy the AI:**
  - **10-10.5 GHz - FSS/FS; FSS/RAS**
  - **10.5–10.6 – FSS/RLS**
  - **10.6–10.68 GHz – FSS/EESS (passive); FSS/FS; FSS/RAS**
  - **13.25-13.4 GHz – FSS/EESS (active); FSS/ARNS; FSS earth stations/ARNS**
  - **13.4-13.75 GHz – FSS/RLS; FSS earth stations/RLS; FSS/SRS**
  - **14.5-14.8 GHz – FSS/BSS feeder links; FSS/FS; FSS/AMS; FSS/MS; FSS/SRS; FSS/radio astronomy**
  - **14.8-15.35 GHz – FSS/FS; FSS/SRS; FSS/AMS; FSS/MS;15.4 – 15.7 GHz – FSS/radiolocation**
  - **15.7-16.6 GHz – FSS/radiolocation**

Agenda Item 1.6.1

- **Working Document toward Draft CPM Text**
  - **Draft CPM text describes testing and results to date.**
  - **No methods have been determined yet.**

Agenda Item 1.6.2

- *Consideration of a primary FSS allocation (Earth-to-space) of 250 MHz in Region 2 and 300 MHz in Region 3 within the range 13-17 GHz.*
- **Issues:**
  - Past WRC study cycles, in which sharing between EESS (active) and FSS (Earth-to-space) have been examined, have shown limited compatibility if both services operate in the same frequency band.
  - In the 14.5-14.8 GHz band~~s~~, appropriate measures need to be taken with regard to the AP **30A** Plans and List to ensure the integrity and full protection of the 14.5-14.8 GHz band.

Agenda Item 1.6.2

- *Consideration of a primary FSS allocation (Earth-to-space) of 250 MHz in Region 2 and 300 MHz in Region 3 within the range 13-17 GHz.*
- **Issues, cont.:**
  - In the 14.5-15.35 GHz band, static analyses show the proposed FSS Earth-to-space allocation may cause interference to the AMS/MS systems.
    - Large (up to 578 Km, not accounting for terrain) separation distances may be required around AMS/MS systems for FSS sharing with AMS/MS in the 14.5-15.3 GHz band.
  - In the 15.4-17.3 GHz band, static analyses show that the proposed FSS Earth-to-space allocation may cause interference to the Radiolocation systems.
    - Large (up to 420 Km, not accounting for terrain) separation distances may be required around the Radiolocation systems for FSS sharing with Radiolocation in the 15.4-17 GHz band.

Agenda Item 1.6.2

- Resolution: **152 (WRC-12)**
- ITU-R Responsible Group: **WP 4A**, next meeting: **5-13 Feb 2014**
- Latest information: **Doc. 4A/343, Annexes 11, 12, 27**
- **Ongoing Studies to Satisfy the AI:**
  - **13.25-13.4 GHz – FSS/EESS (active); FSS/ARNS**
  - **13.4-13.75 GHz – FSS/radiolocation; FSS/SRS (active); FSS/RNS**
  - **14.5-14.8 GHz – FSS/BSS feeder links; FSS/FS; FSS/AMS; FSS/MS; FSS/SRS**
  - **14.8-15.35 GHz – FSS/FS; FSS/SRS; FSS/AMS; FSS/MS;**
  - **15.4-15.7 GHz – FSS/radiolocation**
  - **15.7-16.6 GHz - FSS/radiolocation**

Agenda Item 1.6.2

- **Working Document toward Draft CPM Text**
  - **Draft CPM text describes testing and results to date.**
  - **No methods have been determined yet.**

WRC-15 Agenda item 1.7

- *To review the use of the band 5 091-5 150 MHz by the fixed-satellite service (Earth-to-space) (limited to feeder links of the non-geostationary mobile-satellite systems in the mobile-satellite service) in accordance with Resolution **114 (Rev.WRC-12)***

Issues:

- At WRC-95, 5 091-5 150 MHz, the extension band for MLS, was allocated on a co-primary basis to the FSS for MSS feeder links, subject to review by a future competent WRC;
- The rate of installation of new MLS systems has declined worldwide;
- MSS systems require access to the 5 091-5 150 MHz band in the long term;
- Coordination of future MLS systems with FSS feeder links can be accommodated using the existing procedures of the RR.

WRC-15 Agenda item 1.7

- **Resolution: 114 (Rev.WRC-12)**
- **ITU-R Responsible Group: WP 4A, next meeting: 5-13 February 2014**
- **Latest information: Doc. 4A/343 Annexes 28 and 29**

Ongoing studies to satisfy the Agenda item

- **No studies are required**
  - Since no new Aeronautical Radionavigation Service (ARNS) systems have been identified by ICAO for use in this band, the allocated services in the band can coordinate their future use through existing methods contained in the Radio Regulations. The objective is to create and maintain a long term stable sharing environment among the allocated services in the band.

Working document towards Draft CPM text

- Methods to satisfy the agenda item

Method A: proposes that the use of the band 5 091-5 150 MHz by systems of the FSS be maintained as a primary allocation;

– that each of the conditions on this allocation given in RR No. **5.444A** (i.e. after 1 January 2016 no new FSS feeder link assignments shall be made, and after 1 January 2018 the FSS will become secondary to the ARNS) be suppressed;

– that use of the band 5 091-5 150 MHz by FSS feeder links shall be made in accordance with Resolution **114 (Rev.WRC-15)** be added to footnote **5.444A**;

– that coordination between FSS earth stations and ARNS ground stations is required under certain circumstances to ensure that the ARNS is protected from harmful interference, and that RR Appendix **7** be used in determining the coordination area; and

– that flexibility for AM(R)S be improved while ensuring protection of the FSS.

Agenda Item 1.8

- *Review the provisions relating to earth stations on board vessels (ESVs).*
- **Issues:**
  - WRC-03 introduced provisions relating to ESVs in certain frequency bands shared with terrestrial services, assuming specific technical characteristics (e.g. size of terminal, power density of emissions, etc.), but some current ESVs have different characteristics that may result in less interference
  - The WRC-03 decisions were also based on other specific assumptions (e.g. number of ESVs in operation, number of passes/unit time), and ESVs with different technical characteristics may require those other underlying assumptions to be revisited
  - The current ESV technical characteristics need to be agreed and how, or if, these characteristics change other underlying assumptions need to be understood
  - Depending on the above, current coordination distances may be decreased, increased, or remain unchanged.

Agenda Item 1.8

- Resolution: **909 (WRC-12)**
- ITU-R Responsible Group: **WP 4A**, next meeting: **5-13 Feb 2014**
- Latest technical information: **Doc. 4A/343, Annex 24**
- Latest Draft CPM text: **Doc. 4A/343, Annex 31**
  - Early draft with considerable development still required

Ongoing Studies to Satisfy the AI:

- Can the current set of fixed coordination distances be replaced by distance vs ESV EIRP?
- What is the relationship between ESV technical characteristics and other underlying assumptions?
- Do current trends in ESV technology and deployment require current coordination distances to be changed?

Agenda Item 1.9.1

- *Allocations to FSS in 7 150-7 250 MHz (space-to-Earth) and 8 400-8 500 MHz (Earth-to-space).*
- **Issues:**
  - In the 7 150-7 190 MHz band, static analyses show that the proposed FSS space-to-Earth allocation may cause interference to the SRS deep-space spacecraft during the near-Earth operations phase.
  - In the 7 190 – 7 235 MHz band, dynamic analyses shows that sharing with SRS near-Earth uplink is not feasible without specific regulatory provisions limiting FSS emissions.
  - In the 8 400-8 450 MHz band, the NGSO/GSO FSS earth stations might interfere with the deep-space SRS earth station receivers depending on the distances between the earth stations. Large (up to 675 KM) separation distances may be required for FSS sharing with FS in 8 400-8 500 MHz

Agenda Item 1.9.1

- Resolution: 758 **(WRC-12)**
- ITU-R Responsible Group: **WP 4A**, next meeting: **5-13 Feb 2014**
- Latest information: **Doc. 4A/343, Annexes 16, 33**
- **Ongoing Studies to Satisfy the AI:**
  - **7 150-7 250 MHz -** FSS sharing with the space research service (SRS) (deep-space) (7 150-7 190 MHz); FSS sharing with SRS (near-Earth) (7 190-7 235 MHz); FSS sharing with the Earth exploration satellite service; FSS sharing with the Space operation service; FSS sharing with fixed and mobile services.
  - **8 400-8 500 MHz -** FSS sharing with SRS (deep-space) (8 400-8 450 MHz); FSS sharing with SRS (near-Earth) (8 450-8 500 MHz); FSS sharing with fixed and mobile services.

Agenda Item 1.9.1

- **Working Document toward Draft CPM Text**
  - **No CPM methods identified yet.**

Agenda Item 1.9.2

- *Allocations to MMSS in 7 375-7 750 MHz (space-to-Earth) and 8 025-8 400 MHz (Earth-to-space).*
- **Issues:**
  - Band 7 375-7 750 MHz:
    - Protection of terrestrial receivers in the fixed and mobile services from MMSS satellite emissions → possible use of pfd limits in RR Article 21?
    - Sharing between MMSS satellite networks and FSS and MetSat satellite networks in the space-to-Earth direction → possible use of coordination methods under RR Article 9?
  - Band 8 025-8 400 MHz:
    - Protection of terrestrial receivers in the fixed and mobile services from MMSS transmitting earth stations → possible use of coordination methodology (RR No. 9.17 and Appendix 7)?
    - Protection of EESS receiving earth stations from MMSS transmitting earth stations → possible use of predetermined separation distances?
    - Sharing between MMSS satellite networks and FSS and MetSat satellite networks in the Earth-to-space direction → possible use of coordination methods under RR Article 9?
    - Compatibility between out-of-band emissions of MMSS transmitting earth stations and SRS receiving earth stations (band 8 400-8 450 MHz) also has to be studied.

Agenda Item 1.9.2

- Resolution: 758 **(WRC-12)**
- ITU-R Responsible Group: **WP 4C**, next meeting: **13-19 February 2014**
- Latest information: **Doc. 4C/239, Annex 5**
- **Ongoing Studies to Satisfy the AI:**
  - **7 375-7 750 MHz -** MMSS sharing with the fixed and mobile (except aeronautical) services, the FSS (s-E) and the meteorological-satellite service (s-E) (7 450-7 550 MHz).
  - **8 025-8 400 MHz -** MMSS sharing with the fixed and mobile (except aeronautical) services, the FSS (E-s), the Earth exploration-satellite service (s-E) and the meteorological-satellite service (E-s) (8 175-8 215 MHz); MMSS compatibility with SRS (deep space, 8 400-8 450 MHz).
- Latest draft CPM text: **Doc. 4C/239, Annex 10**
  - Method 1: There would be no allocation to the MMSS within the 7 375-7 750 MHz and 8 025-8 400 MHz bands and therefore no change to the Radio Regulations.
  - Method 2: to be defined

Agenda Item 1.10

- *Allocations to MSS in the 22-26 GHz range*
- **Issues:**
  - Spectrum requirements
    - Studies to determine the amount of MSS spectrum shortfall, if any.
  - Sharing studies
    - Considering the wide range envisaged by WRC-12 in adopting this agenda item, studies are considered based on the inputs of administrations.
    - Almost all sub-bands within the 22-26 GHz range have been considered in sharing studies but a number of studies concluded negatively on the feasibility of sharing between MSS and one or more already allocated services.
    - Further analyses are expected to obtain a more accurate picture of the sharing situation.

Agenda Item 1.10

- Resolution: 234 **(WRC-12)**
- ITU-R Responsible Group: **WP 4C**, next meeting: **13-19 February 2014**
- Latest information: **Doc. 4C/239, Annexes 6 and 7**

Ongoing Studies to Satisfy the AI:

- **Spectrum requirements (Annex 6) –** Initial considerations are provided in Annex 6 of Document 4C/239 but no consolidated values are available yet.
- **Sharing studies (Annex 7) -** MSS sharing with the fixed service has been studied extensively in the 22-26 GHz range (for MSS downlinks, initial pfd masks have been derived; for MSS uplinks, preliminary separation distances have been computed). Sharing studies between MSS and ISS or SRS have shown incompatibilities.

- Latest draft CPM text: **Doc. 4C/239, Annex 12**
  - Method 1: There would be no allocation to the MSS within the 22.0-26.0 GHz band and, therefore, no change to the Radio Regulations, and the requirements can be met in other allocations.
  - Methods 2, 3,… : to be defined