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**Working Party 4A**  
**Efficient orbit/spectrum  
utilization for FSS and  
BSS**

***Mr. Jack Wengryniuk***  
***Chairman WP 4A***





# Background

- WP 4A started as Interim Working Party 4/1 which was created in the 1970s
- Early work was focused on establishing baseline concepts like coordination techniques, reference antenna radiation patterns, permissible levels of interference, etc.
- Satellite issues exploded in the 1990s with the introduction of non-GSOs (e.g. Teledesic, Skybridge, Iridium, Globalstar, etc.)
- We are seeing another such surge in satellite interest with the advent of high throughput satellites and large non-GSO systems (e.g. Starlink, Amazon, OneWeb, Lightspeed, etc.)
- Recent years have seen considerable time devoted to WRC issues, but development of “traditional” issues has continued as well



# 1. Satellite developments from recent past WRCs

- WRC-12
  - AI 1.13 - Consideration of R1&3 BSS in 21.4-22 GHz
  - AI 7 - Considered over 30 issues including changes to: Appendix 4, modification to a variety of provisions of Articles 9 and 11, clarification of BIU, BBIU, suspension, other issues
- WRC-15
  - AI 1.6.1 - 250 MHz of FSS (E-s & s-E) in 10-17 GHz in R1
  - AI 1.6.2 - 250 MHz to FSS (E-s) in R2 and 300 MHz in R3 in 13-17 GHz
  - AI 1.7 – review of use of 5 091-5 150 MHz by NGSO MSS feeder links
  - AI 1.8 – review provisions for Earth Stations on Vessels
  - AI 1.9 - New FSS 7 150-7 250 MHz (s-to-E) and 8 400-8 500 MHz (E-s)
  - AI 7 – Considered almost 20 issues to improve existing regulations or address loopholes that had been identified
  - Res 156 – GSO ESIMs in 19.7-20.2 GHz and 29.5-30.0 GHz

## 2. Satellite developments from recent past WRCs

- WRC-19
  - AI 1.4 – Revision to orbital limitations in Annex 7 of Appendix 30
    - Resolution 559 (WRC-19) was an outgrowth of AI 1.4
  - AI 1.5 – GSO ESIMs in 17.7-19.7 GHz and 27.5-29.5 GHz
  - AI 1.6 – Allowing NGSO systems in the 40/50 GHz bands
  - AI 7 – Considered almost 20 issues including AP4 data elements, Planned band issues, non-GSO milestone process
  - 9.1.9 – New FSS allocation 51.4-52.4 GHz
- WRC-23
  - AI 1.15 – ESIMs in 12.75-13.25 GHz (AP 30B uplink)
  - AI 1.16 – Non-GSO ESIMs 20/30 GHz bands
  - AI 1.17 – Sat-Sat links in 12 GHz and 20/30 GHz bands
  - AI 1.19 – New FSS (s-E) in 17.3-17.7 GHz in R2
  - AI 7 – Will be considering 11 Topics including some carry over topics from WRC-19 and additional Planned Band issues



# 1. WP 4A “Traditional” Issue Development (Recommendations)

- In addition to conducting studies and developing CPM text for WRC agenda items, Working Party 4A has continued its work on more traditional issues
- Since 2011 the Working Party has submitted six new Recommendations for consideration by Study Group 4

2012	New Rec. ITU-R BO.1898 “Power flux-density value for the protection of receiving earth stations in the broadcasting-satellite service in Regions 1 and 3 from emissions by a station in the fixed and/or mobile services in the band 21.4-22 GHz”
	New Rec. ITU-R S.1899 “Protection criteria and interference assessment methods for non-GSO inter-satellite links in the 23.183-23.377 GHz band with respect to the space research service”
	New Rec. ITU-R BO.1900 “Reference receiving earth station antenna pattern for the broadcasting-satellite service in the band 21.4-22 GHz in regions 1 and 3”
	New Rec. ITU-R S.2029 “Statistical methodology to assess time – varying interference produced by a geostationary fixed-satellite service network of earth stations operating with MF-TDMA schemes to geostationary fixed-satellite service networks”
2014	New Rec. ITU-R BO.2063 “Alternative BSS earth station antenna radiation pattern for 12 GHz BSS bands with effective apertures in the range 55-75 cm”
2018	New Rec. ITU-R S.2112 “Guidelines to conduct bilateral coordination for explicit agreements, in the frequency band 14.5-14.75 GHz, for Regions 1 and 2 countries, or in the frequency band 14.5-14.8 GHz, for Region 3 countries, in the fixed-satellite service (Earth-to-space) not for feeder links for the broadcasting-satellite service, in order to protect all existing and planned systems of allocated services in 14.5-14.8 GHz in the territories of those administrations engaging in such agreements”

- In addition to these new Recommendations, the Working Party revised/updated another twelve existing Recommendations

## 2. WP 4A “Traditional” Issue Development (Reports)

- Since 2011, Working Party 4A has generated seventeen new ITU-R Reports that have been adopted by Study Group 4
- The new Reports have included topics such as:
  - Technical and operational requirements/guidelines for earth stations on mobile platforms operating in GSO and non-GSO FSS systems
  - Assessment of the orbital-frequency resource used by a geostationary satellite communication network
  - Broadband access by fixed-satellite systems
  - GSO FSS deployment characteristics in the 14-14.5 GHz band
  - Uplink interference issues associated with closely separated GSO FSS VSAT networks in the 27.5-30 GHz frequency band
  - Sharing between 50/40 GHz GSO networks and non-GSO systems
- In addition to these Reports, the Working Party revised/updated three other existing Reports
- While some of these Reports have been developed in support of WRC agenda item work, others address non-WRC related issues

# WP 4A Work in Progress

- There are multiple efforts currently underway within WP 4A to address existing areas where technical solutions are called for, including:
- Functional description to be used in developing software tools for determining conformity of non-geostationary-satellite orbit fixed-satellite service systems or networks in Q/V band with criteria contained in No. 22.5L of the Radio Regulations
- Revision of Recommendation ITU-R S.1503-3 - Functional description to be used in developing software tools for determining conformity of non-geostationary-satellite orbit fixed-satellite service systems or networks with limits contained in Article 22 of the Radio Regulations
- Methodology for examining the compliance of aeronautical earth stations in motion (A-ESIM) communicating with geostationary space stations in the fixed-satellite service in the 27.5-29.5 GHz band with a set of pre-established pfd limits on the Earth's surface
- Studies on the pfd scaling factor to be applied to non-GSO FSS constellations with 1 000 or more space stations operating in the 17.7-19.3 GHz band
- Methodology for evaluating and technical procedures for addressing any exceedance of aggregate equivalent power flux-density into geostationary satellite networks in the fixed-satellite service from multiple non-geostationary satellite systems in the Ku and Ka frequency bands
- Calculation method to assess the impact on link performance due to inter-system interference when an assignment to a non-geostationary FSS satellite system is involved
- Each of these areas involve complex technical discussions that have been taking place during the current study cycle, or even longer
- Given the implications of arriving at the wrong technical solution, it is extremely important to get it right the first time

# WP 4A Looking Forward

- Working Party 4A will certainly continue to work on the outstanding areas that are currently under development during the next study cycle
- WRC-23 will develop the agenda for WRC-27 and, while discussions of future agenda items for WRC-27 are currently at an early stage, it appears likely that there will be satellite issues to address
- As with all things at the ITU, the work of Working Party 4A is “input driven”, so it is really in the hands of the membership to determine what gets addressed how much time is spent on any given issue
- While it may seem that it takes considerable time to “get things done” in the ITU process, the implications of getting things wrong can be severe, which warrants a cautious approach
- It is in the best interest of all parties to thoroughly study all aspects of the issues dealt with by Working Party 4A to arrive at solutions that work for all
- It is important to bring issues as early as possible in order to arrive at solutions as early as possible