#### **ITUEvents**

Trends in non-planned satellite filings Volume and complexity

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# Evolution of number of submissions for satellite networks/systems





# Submission of the requests for coordination





#### Non-GSO submissions not subject to coordination (API) subject to coordination (CR/C)





# Non-GSO CR/Cs without and with the number of configurations accounted





### **Complexity of API**





## Non-GSO systems complexities impacting their processing - validation

- Additional validation relating to the non-GSO satellite systems
  - Validation of appropriate submission of the frequency bands subject and not subject to coordination in APIs or coordination requests
  - Validation of orbital parameters (correlation between LAN and RAAN, correlation between period/sunsynchronous indication and orbital altitude/inclination angle)
- Additional validation relating to the data required for Article **22** examination
  - Submission of multiple masks in the same frequency band
  - Complexity of the submitted data (different scenarios for different frequency bands/orbital planes)
- Administrations often submit large amounts of descriptions in the form of notes from administrations, for which the Bureau has to analyse, examine and translate for publication in the special sections
  - New functionalities are implemented to minimize the need for "paper" notes. For example, GIMS capture of nonstandard antenna patterns, non-GSO service area with excluded countries
- Validation of the non-GSO satellite systems with hundreds of orbital planes, thousands of groups and millions of emissions and publication in the special sections



### Non-GSO systems complexities impacting their processing - examination

- Non-GSOs with tens of thousands of satellites to more than 485 000 satellites with multiple configurations (up to 5) are impacting Article 21 and Article 22 analysis
- WRC-19 decision for **9.11A** identification at network level (i.e. to maintain the list of affected networks)
- Article **21** limits in 17.7-19.3 GHz with scaling factor in **21.16.6**:
  - 6 cases requesting qualified favorable findings following decision of WRC-19 to request ITU-R studies
  - Yet there are cases receiving unfavorable findings
- More submissions in the frequency bands where coordination with terrestrial services is required (Nos. **9.14**, **9.21**) in the frequency bands 1.5 GHz, 1.6 GHz, 2.4 GHz etc.
  - Requires complex long simulations to identify affected administrations
- Modifications to maintain the date of protection by applying RoP on No. 9.27
  - **14** cases received in 2019-2023. Average treatment time 1 year
  - For 2 cases the Bureau has to repeat simulations to verify claims from administrations on no increase of interference
  - With respect to commitment not to claim more protection for modified frequency assignments as compared to the level of protection required for original assignments, a mechanism need to be established to easily identify original assignments.



## Review of findings under Resolution 85 and Article 22 examination

- ITU-R Recommendation S.1503-2 remain a tool for review under Resolution 85.
- Very limited number of cases requesting continuous application of Resolution 85 in application WRC-15 decision as described in Circular Letter CR/414:
  - All related to the modelling of steerable beams in 19.7-20.2 GHz
- Some specific cases encountered by the Bureau:
  - Submission of multiple masks in the same frequency band. For example:
    - PFD masks in the same frequency band for different modes of operation TT&C, Feeder-link, Service link
    - EIRP masks in the same frequency band for different antennas or types of earth station
    - The Bureau has to clarify with Administration a single mask to be used in the analysis
  - Rare mismatch between exclusion zone method and type of the mask (space station reference exclusion zone is provided but PFD-mask is using earth station-based reference alpha-angle)
  - Such cases are decreasing as the Bureau is advancing the examination queue
- Growing number of cases with significant constellation size and large variation on orbit parameters:
  - Timestep numbers calculation need to account that large constellation will produce confident statistics much faster due to the density of space stations in the sky
  - Potential risk that existing EPFD software, due to its limitations, may simply not run for extreme cases



### Limitations of existing EPFD software

- Functional limitations of existing EPFD software:
  - For non-GSO systems having different types of orbits (by inclination, altitude) WCGA does not analyze all types of orbits
  - No possibility to verify additional specific geometries for administration to minimize the risk that EPFD limits will not be met at certain geometries
- Performance limitations
  - Poor optimization for multithreaded computation, no distributed computing functionalities
  - 32-bit architecture limitation on the size of the mask
  - Not scaled for large constellations with tens of thousands of satellites. Running EPFD analysis for such cases results in significant performance hit
- Additional tools are required:
  - Visualizing input data (PFD/EIRP masks) work in progress
  - Cross-check between PFD/EIRP masks and emission characteristics to flag a potential mismatch
  - Study Group 4 adopted new revision ITU-R Recommendation S.1714-1. New tool implementing recommendation is
    significantly simplifying the review of coordination requirements under No. 9.7B. Tool is used internally, will be released
    soon

