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Efficient spectrum usage, ITU and satellite systems

A subjective perspective by
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What is efficient spectrum usage by satellite systems?

- **Many satellites?**
(requires use of large, expensive antennas which will lead to fewer earth stations for a limited number of applications)
- **Many users (earth stations)?**
(requires use of small, inexpensive antennas which requires larger orbital separation, hence fewer satellites)
- **Maximum capacity (Mbit/s provided globally)?**
(requires small spotbeams and large earth station antennas, leading to complex, expensive (and inflexible?) satellites, fewer users and fewer applications)
- **Many countries with access to orbit resources and/or operational satellites?**
(consolidation into fewer larger satellite operators, serving multiple countries, seems to be a trend and this appears to lead to more commercially efficient and profitable operation)

Shall ITU foster efficient spectrum usage?

ITU, Constitution

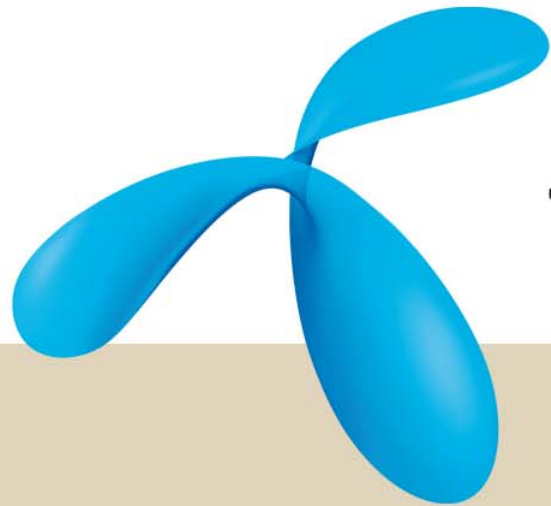
ARTICLE 44

Use of the Radio-Frequency Spectrum and of the Geostationary-Satellite and Other Satellite Orbits

- **195** *Member States shall endeavour to limit the number of frequencies and the spectrum used to the minimum essential to provide in a satisfactory manner the necessary services. To that end, they shall endeavour to apply the latest technical advances as soon as possible.*
- **196** *In using frequency bands for radio services, Member States shall bear in mind that radio frequencies and any associated orbits, including the geostationary-satellite orbit, are limited natural resources and that they must be used rationally, efficiently and economically, in conformity with the provisions of the Radio Regulations, so that countries or groups of countries may have equitable access to those orbits and frequencies, taking into account the special needs of the developing countries and the geographical situation of particular countries.*

⇒ **The (interpretation of the) objective of equitable access may in some cases contradict efficient spectrum usage**

⇒ **Is efficient spectrum usage an objective in itself or is it just a means to achieve the objective of equitable access?**



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The role of ITU

Do we want ITU?

- Satellites are expensive
- Satellites generally need to serve many countries to be economically viable
- It is desirable to have harmonized rules and regulations within the countries in the coverage of a satellite to enable efficient operation
- Interference and access to spectrum resources generally is of an international nature for satellite networks
- National legislation alone normally cannot handle satellite interests in a satisfactory manner

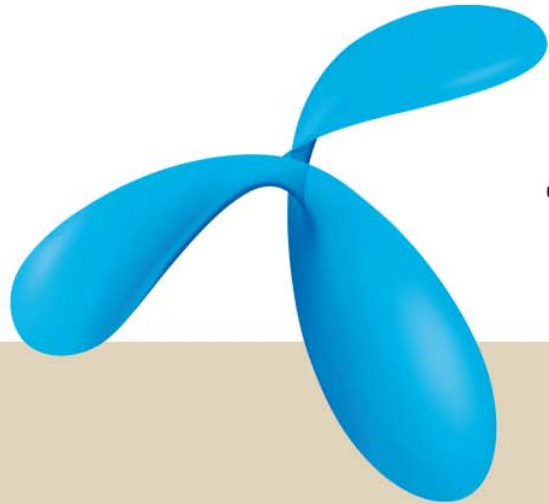
=> Satellite operators want an ITU that has an impact!

Future coordination outside ITU?

- Formally, access to spectrum capacity is obtained through application of the procedures of the Radio Regulations
- **As of today, the procedures of the Radio Regulations are generally seen to be applied**
- As the orbit resources becomes more and more congested, getting access to spectrum capacity becomes more and more difficult
- Some networks brought into use without due coordination interfere with (and are interfered by) operational systems
- In a congested situation, practical, detailed coordination is conducted;
 - only with respect to really affected networks
 - formally affected networks and “paper satellites” are less taken into account
- “Unreasonable” requirements of the Radio Regulations and the need to protect “paper satellites” may complicate rather than facilitate access to spectrum resources while providing little gain for satellite operators
- **Satellite operators may see themselves forced to conduct practical coordination directly between practical satellites, outside the Radio Regulations, with no guarantee that the objectives of ITU are observed or other (terrestrial) services are taken into account**

How can ITU retain an impact on spectrum usage?

- To ensure that spectrum usage is in line with the objectives of ITU, it should be in the interest of ITU to ensure that the Radio Regulations are such that;
 - **The procedures are seen as facilitating and assisting satellite operators**
 - **It is possible for satellite operators to implement commercial, profitable, satellite networks following the provisions of the Radio Regulations**



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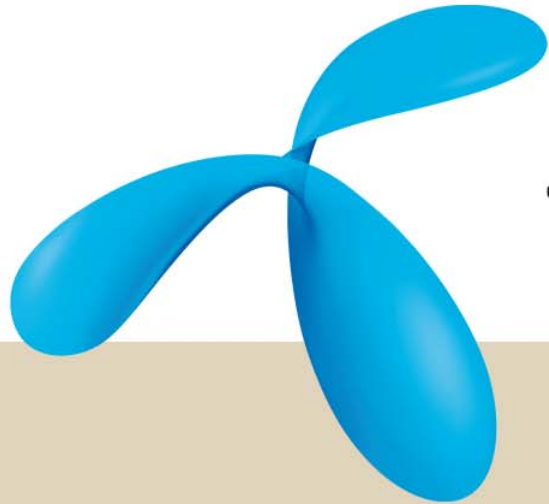
**Commercializing/pricing
spectrum access**

Is auctioning and trading of satellite spectrum resources an option?

- Gives satellite spectrum a commercial value
- Encourages overfiling, “paper satellites” and cheating (e.g. incorrect Res 49 information)
- May force satellite operators to conduct real coordination outside the procedures of ITU
- May encourage buyers of spectrum to use it more efficiently to reduce overall costs (but only if buying spectrum access becomes a significant part of the cost of the operation)
- Also enables big operators to buy spectrum and lay it dead to block competition
- Trading of spectrum could be seen as going against the objectives of efficient spectrum usage and equitable access
- Is it possible to organize auctioning of international satellite capacity?

Will filing fees foster efficient spectrum usage?

- Filings can contain significant spectrum resources and still be subject to the same fees
 - ⇒ Filing fees has no impact on the efficiency on the spectrum usage
 - Countries have one free filing per year
 - Countries with only one satellite operator at an advantage
 - Countries without a satellite operator can submit a free filing and sell it to the highest bidder
 - ⇒ Free filings are against the principle of equitable access
 - ⇒ Free filings are encouraging commercialization of access to satellite spectrum resources
- ⇒ Remove free filings?



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The Radio Regulations

and procedures for obtaining access to, and protection of spectrum resources for satellite networks

Why do we have overfiling?

- Congestion in the arc
 - ⇒ uncertain outcome of coordination
 - ⇒ Multiple filings to enhance chance of success
- Commercial value for administrations leads to more filings
- Filings to block coordination of competitors

Is overfiling a problem?

- Because of the overfiling, many satellite systems operate without having completed the coordination
- Satellite operators will discuss directly between themselves and find ways to operate
- Satellite operators have learned to live with overfiling
- Overfiling may be a serious threat to ITU's capability to influence and have an impact on access to and use of the spectrum resources

Convergence of satellite services/applications?

- Current “regular” communications satellites can, and are already today, providing a multitude of services
 - VSAT and other types of two-way data networks for fixed and mobile terminals
 - Direct-To-Home one-way services (BSS or FSS)
 - One- or two-way services for mobile applications
 - Merging e.g. BSS/FSS/MSS into one “satellite service” could appear to facilitate more efficient use of satellites and satellite spectrum
 - Over time, satellite usage in given bands have developed somewhat homogenous technical parameters
 - Some satellite applications have significantly different technical parameters than others (e.g. earth station antennas with low directivity)
 - Satellites with different technical parameters can over time exclude current satellite applications in a given frequency band
 - Coordination procedures and protection criteria will have a strong impact on the capability of satellite networks with significantly different technical parameters to claim protection from and exclude current satellite applications
- ⇒ **Any convergence of satellite services/applications requires careful consideration in respect of compatibility with existing applications and possible required consequential changes to the current procedures and protection criteria**

Should there be an expiry date for filings that are in use?

- Coordination is a time consuming process
 - Overfiling, “paper satellites”, over protection, speculative filings, ...
 - Satellites are often seen to be brought into use without having yet completed the coordination
- Building, launching and operating a satellite is a significant financial commitment
- Building up a satellite location takes several satellite generations
- The typical life of a satellite is around 15 years
- Today, Appendix 30 and 30A sets a maximum life time of 15 (+ 15) years for a satellite system that is in use
- After that date, all filing rights are lost, even if the satellite is operational
- Even if the filings are lost, the satellite will still be there and it is highly unlikely that a commercial operator can afford to cease operation
- Satellite operators are forced to make arrangements outside the provisions of the ITU
- Since the satellite is still operational, other countries cannot bring in other satellites to use this capacity
- The ITU databases will not reflect the actual situation

Applying hard expiry dates for filings that are in use will:

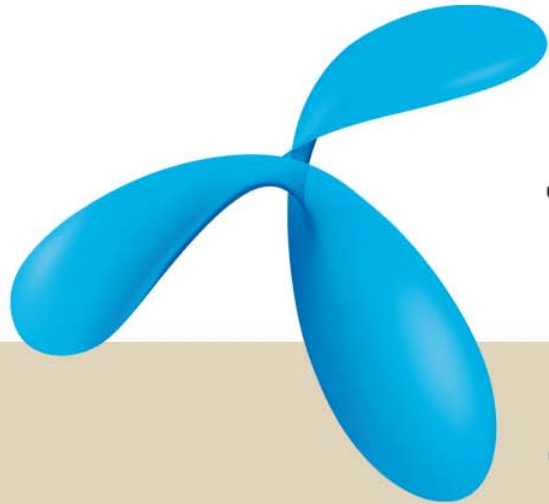
- Be detrimental for commercial satellite operation
- Not provide access to spectrum for other users
- Be a threat to ITU’s ability to observe, control and regulate use of spectrum resources for satellite networks

Explicit agreements for inclusion of a country in the service area?

- To be economically viable, satellite systems normally need to be able to provide services in several countries
 - connections between widely separated areas using large beams sometimes covering the entire visible landmasses
 - countries where services are to be provided will change over time
- It is practically impossible to obtain the explicit agreement of each and every administration within a large coverage area
- Even being included in the service area, there is no obligation to license operation within its country or protect such services
- Being included in the service area or not has absolutely no implications on the coverage of that country
- **Requiring explicit agreements for inclusion in the service area:**
 - is against the objective of enabling efficient use of the spectrum resources
 - provides no apparent benefit for the administrations involved

Is there any value in “planning” frequency bands and what is the impact on spectrum efficiency?

- All countries have guaranteed access
- A lot of spectrum resources are tied up in the Plans
- Plans are limited to national coverage and service area
- It is not economically feasible at any given time to have one satellite for every country in the world
- Multinational operation is normally required to enable profitable operation
- Multinational operation by any country cannot be done within the national assignment/allotment and requires coordination of additional filings
- Assignments/allotments in a Plan will have no value in respect of equitable access to spectrum capacity that enables commercially viable operation
- Real, commercial operation will in most cases have to take place outside the Plans
- The Plan will complicate coordination of filings for multinational operation
- Planning a frequency band (as it is done today);
 - Is going against allowing equitable access to commercially viable spectrum capacity
 - Leads to significantly reduced spectrum use efficiency
 - Is a threat to ITU's capability to keep track of, or have an impact on, real usage of the bands



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Other improvements (?)

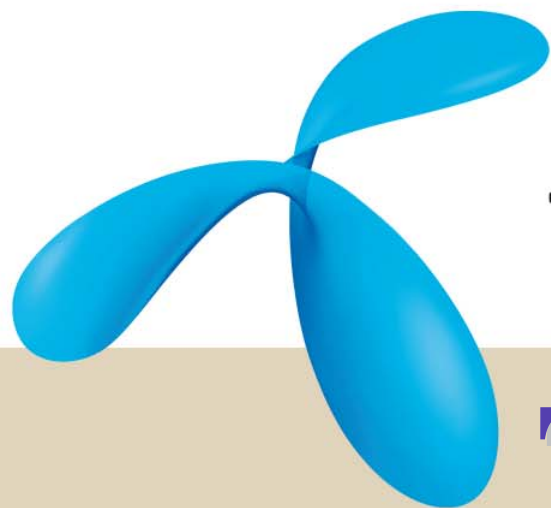
“Unplanned” satellite spectrum

- Remove API for networks subject to coordination?
 - adds no value
 - to avoid speculative APIs aimed at blocking access for other satellite networks
- Remove unnecessary coordination and the advantage of using speculative parameters to block coordination?
 - No way to enter into coordination outside the coordination arc
 - pfd limits to get out of coordination inside the coordination arc if the power levels are insignificant
- Ensure that “paper satellites” cannot be used to unduly block introduction of real satellite networks?
 - Facilitate operation on a “non-interference, non protected” basis
 - Use of Article 15 in the case of claims of interference
 - No automatic deletion of assignments based upon non-documented claims from one side, without the opportunity for the other side to give its views

The “planned” bands

Procedures should ease and facilitate coordination of networks beyond the assignments/allotments in the Plans?

- Implicit agreement for inclusion in the service area?
 - Removal of RR 23.13C?
- Implicit coordination agreements (as of today)?
- No time limitations for assignments in the List?
- Allow coordination to continue beyond expiry date in the case of operational networks?
 - Entering into the List with outstanding coordination agreements (both with respect to the List and the Plan)
 - Expiry of filings associated with bringing into use, but not entering into the List
 - Notification submissions accepted at the same time as submissions for entering into the List
- pfd limits to get out of coordination inside the coordination arc if the power levels are insignificant?



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Thank you!