

International Telecommunication Union (ITU)

Frequency allocation for operation
free from interference in outer space



**United Nations/Chile Conference on
Space Law and Policy:
Governance and Legal Perspectives on
Space Activities in Earth Orbit and
Beyond**

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Overview

- Why do we need regulations for the spectrum and the orbits ?
- ITU and Radio Regulations
- Steps to File a Satellite Network
- Trends and challenges



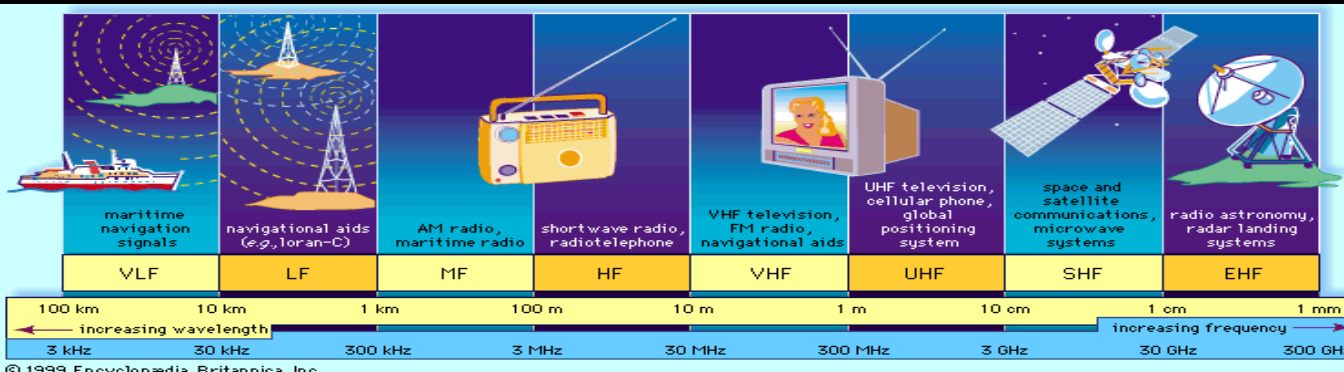
Why do we need regulations for the radio frequency spectrum and orbits ?



Usage of two limited natural resources

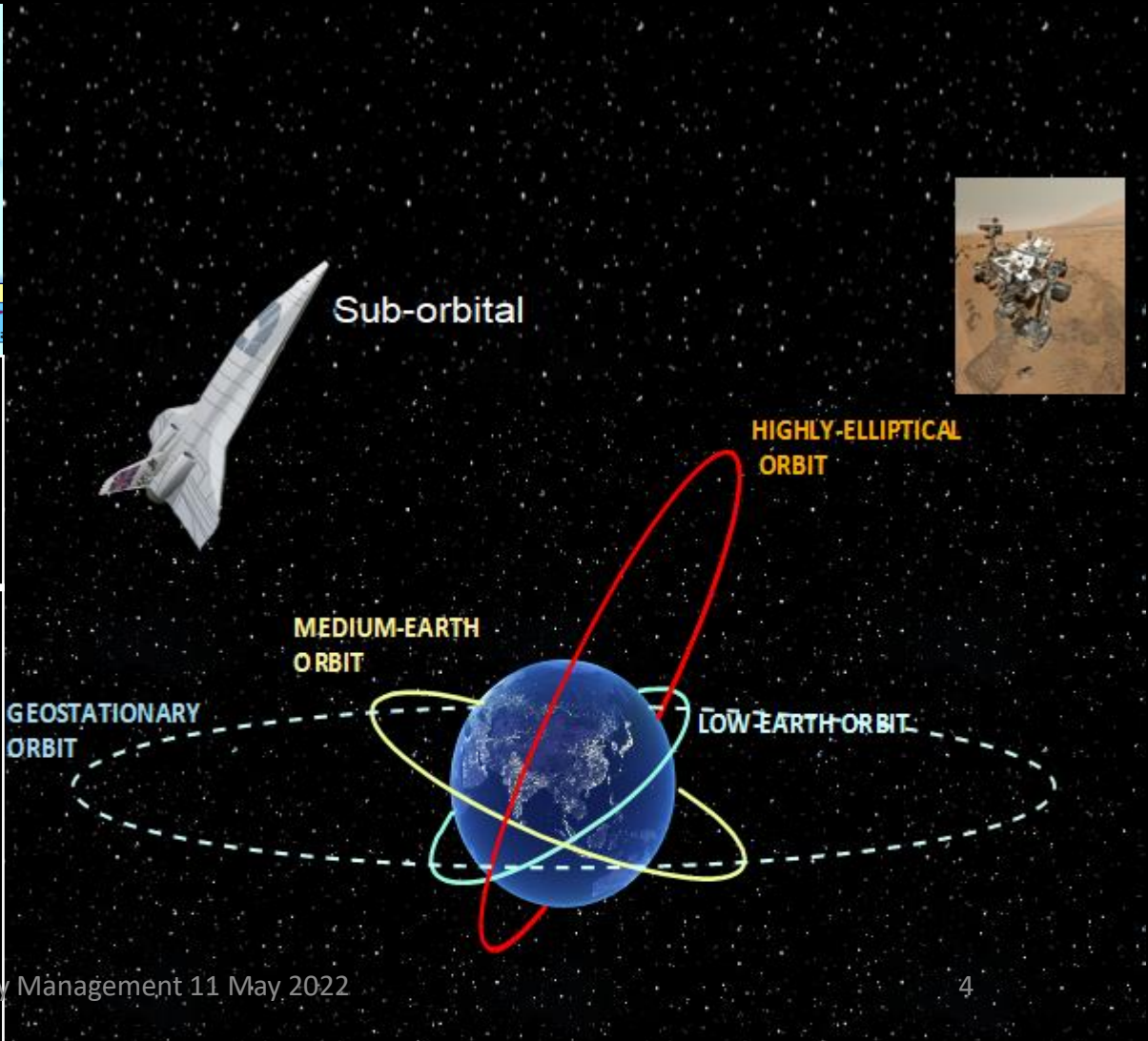
FREQUENCY SPECTRUM

+ ORBITS

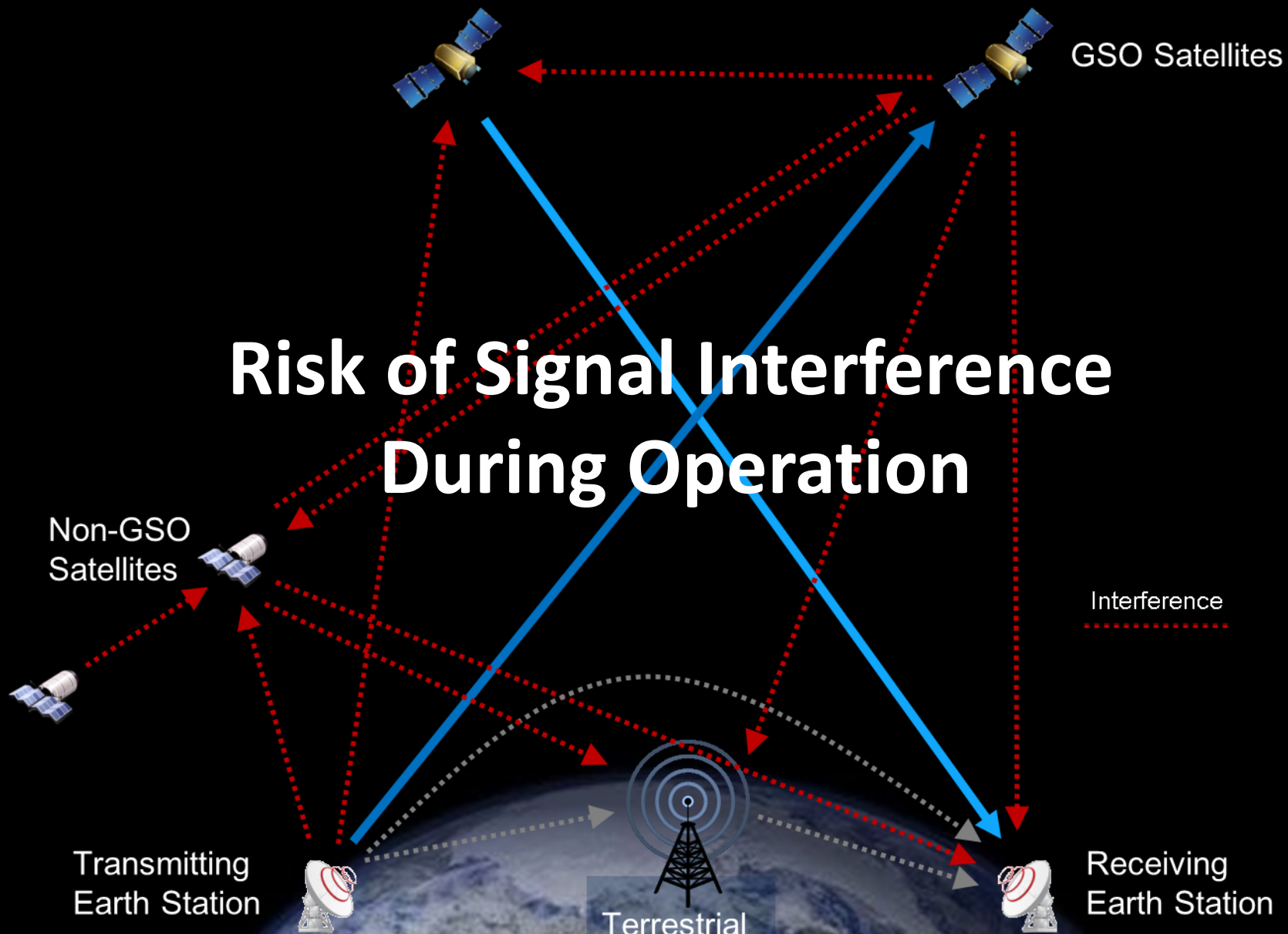


1.467 to 1.492 GHz	1.518 to 1.675 GHz	1.97 to 2.69 GHz	3.4 to 7.025 GHz	10.7 to 14.5 GHz	17.3 to 30 GHz
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Satellite Audio Broadcasting to fixed and mobile units	Civilian Mobile-Satellite Services (two-way)	Satellite television & radio broadcasting to mobiles + two-way mobile services	Fixed-Satellite television, & data services (including broadcasting)		
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Risk of Signal Interference During Operation



RADIO REGULATIONS

A solution to spectrum/orbits sharing

free of signal interference

SPACE has a global impact



An intergovernmental solution

SPACE is *not* BIG ENOUGH



Allocation and coordination process of natural resources – radio spectrum and orbits

SPACE is risky for investment



Opportunity to resolve risk of signal interference BEFORE operation
And obtain international recognition





ITU and Radio Regulations

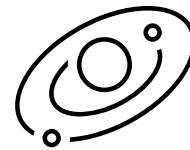


ITU CONSTITUTION (Art.1)

ITU shall **effect allocation of bands** of the radio-frequency spectrum, the allotment of radio frequencies and the **registration of radiofrequency assignments** and, for space services, of **any associated orbital position** in the geostationary-satellite orbit or of any associated characteristics of satellites in other orbits, in order to **avoid harmful interference** between radio stations of different countries

ITU Constitution (Art.44) Radio Regulations

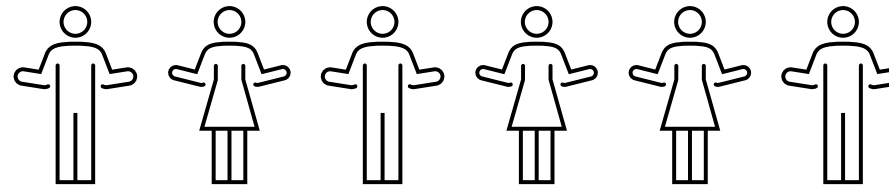
Radio frequencies & satellite orbits are limited natural resources



Rational
Use

Efficient
Use

Economical
Use



Equitable Access



The ITU is the UN
Specialized Agency for ICT
ITU-R sector is
RESPONSIBLE for



Principles of use of spectrum and orbits resources
Allocation of frequency bands to Radio Services
Procedures, Plans, operational measures

ITU instruments: Constitution, Convention, Radio Regulations, Rules of Procedures, Recommendations

The Radiocommunication Bureau is the secretariat of the ITU-R and the Radio Regulations

Radio Regulations Evolution

World Radiocommunication Conferences

GOAL: Keeping an efficient and equitable sharing of spectrum and orbits in a changing space environment

MECHANISM: **World Radiocommunication Conferences** with a technical preparation by the **ITU-R Study Groups**

WHO: Member States and Sector Members from Private sector and academia

OUTPUT: “Modification” of the Radio Regulations decided by consensus by ITU Member States





Steps to File a Satellite Network

**Mechanisms of the Radio Regulations (RR) and
the ITU Radiocommunication Bureau (BR)**





EQUITABLE ACCESS

CONTROL OF INTERFERENCE



RADIO REGULATIONS

5

Mechanisms

ALLOCATION

Frequency separation of stations of different services

POWER LIMITS

PFD to protect TERRESTRIAL services / EIRP to protect SPACE services / EPFD to protect GSO from Non-GSO

COORDINATION

between Administrations to ensure interference-free operations conditions, **when sharing orbit/spectrum**

RECORDING

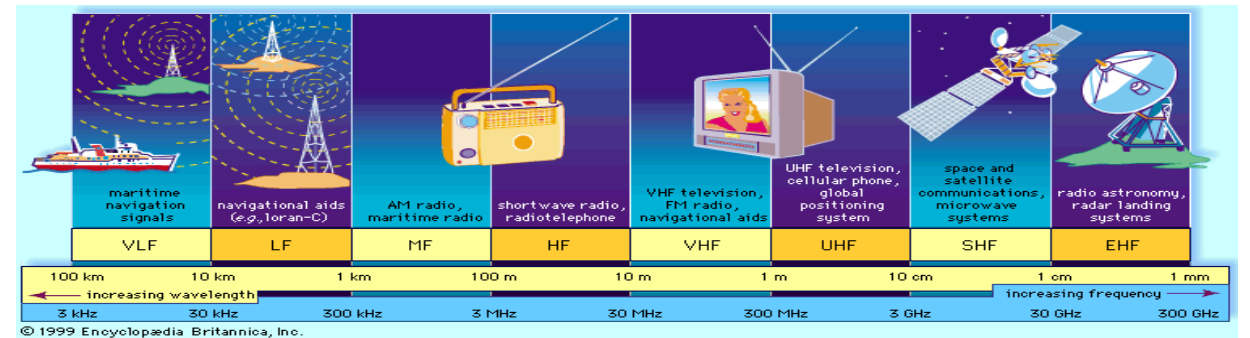
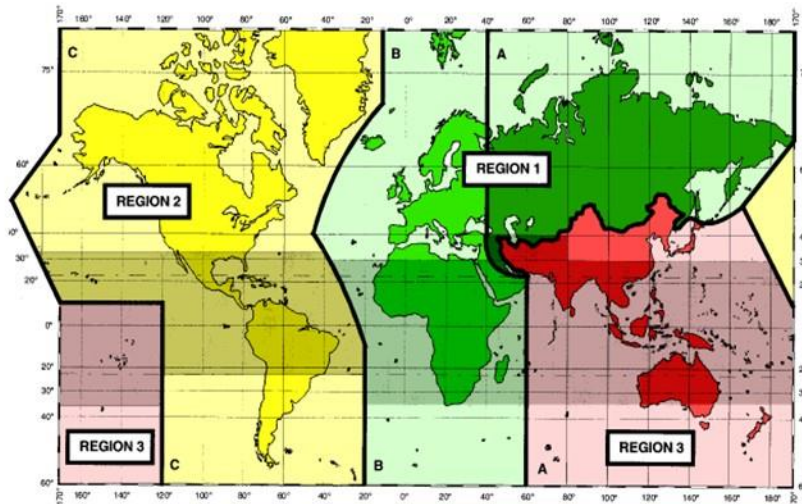
In the **Master International Frequency Register (MIFR)** International recognition of right to use spectrum/orbit

MONITORING

International monitoring system

STEP 1 : In the Table of ALLOCATION

Allocations = Services + Frequencies + Regions



RR ARTICLE 5

Table of Frequency Allocations

Allocation to services			
Region 1	Region 2	Region 3	
17.7-18.1 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.516 MOBILE	17.7-17.8 FIXED FIXED-SATELLITE (space-to-Earth) 5.517 (Earth-to-space) 5.516 BROADCASTING-SATELLITE Mobile 5.515	17.7-18.1 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.516 MOBILE	PRIMARY
			Secondary
		17.8-18.1 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.516 MOBILE 5.519	
18.1-18.4	FIXED FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B (Earth-to-space) 5.520 MOBILE 5.519 5.521		

- **Exclusive allocations** for broad international use of equipment (harmonization)
- **Shared frequency allocations** to maximize the use of spectrum (optimization)

STEP 2 : Choosing

1. COORDINATION Non-Plan APPROACH

2. PLANNING APPROACH

SHARING ORBIT/SPECTRUM RESOURCE Parking lot analogy

- First come, first served
- Priority to Rational, Efficient, Economical Use
- Rights acquired through coordination with administrations concerning actual usage
- Dense/irregular orbital distribution of space stations



- A priori Plans for future use by all countries - Member States
- Priority to Equitable Access
- Rights acquired during a Planning process at a WRC
- Predetermined orbital position & frequency spectrum
- Congestion of GSO
- Additional use possible

STEP 3 : filing process for non-Plan



Submission of Satellite Network filling

Antenna and transmission characteristics

C

Needs of Coordination

With Existing Networks



Negotiations

Modification of characteristics

to eliminate identified risk of Interference



N

Notification

Record in Master International Frequency Register

Bringing into Use

International recognition to use orbit/spectrum

Maximum 7 years

Source: Nos. 9.1, 9.5D, 9.52C, 9.43, 11.44.1, 11.25, 11.44 of Radio Regulations

ITU Frequency Management 11 May 2022



STEP 3 : filing process for Space Plans



Plan

Negotiations

Modification of characteristics
to eliminate identified risk of Interference

List
Assignments

N
Notification
Record in Master International Frequency Register

International recognition to use orbit/spectrum

Bringing into Use

Additional Systems

Submission of Satellite Network filling

Antenna and transmission characteristics

Maximum 8 years



Space Plans Procedures (GSO)

Broadcasting-Satellite Service and
feeder-link Plans (BSS Plan)

12.2 - 12.7 GHz (ITU Region 2)

17.3 - 17.8 GHz (ITU Region 2)

Fixed-Satellite Service Plans
(FSS Plan)

4'500 – 4'800 MHz

6'725 – 7'025 MHz

10.70 - 10.95 GHz

11.20 - 11.45 GHz / 12.75 - 13.25 GHz



Radio Regulations Book 2 Appendices 30/30A & 30B

Key issues for successful Frequency Coordination

More and more satellite filings to coordinate

- Carefully planning when to submit a filing within regulatory deadlines
- Doing ad-hoc study to reduce technical challenge to ensure operation

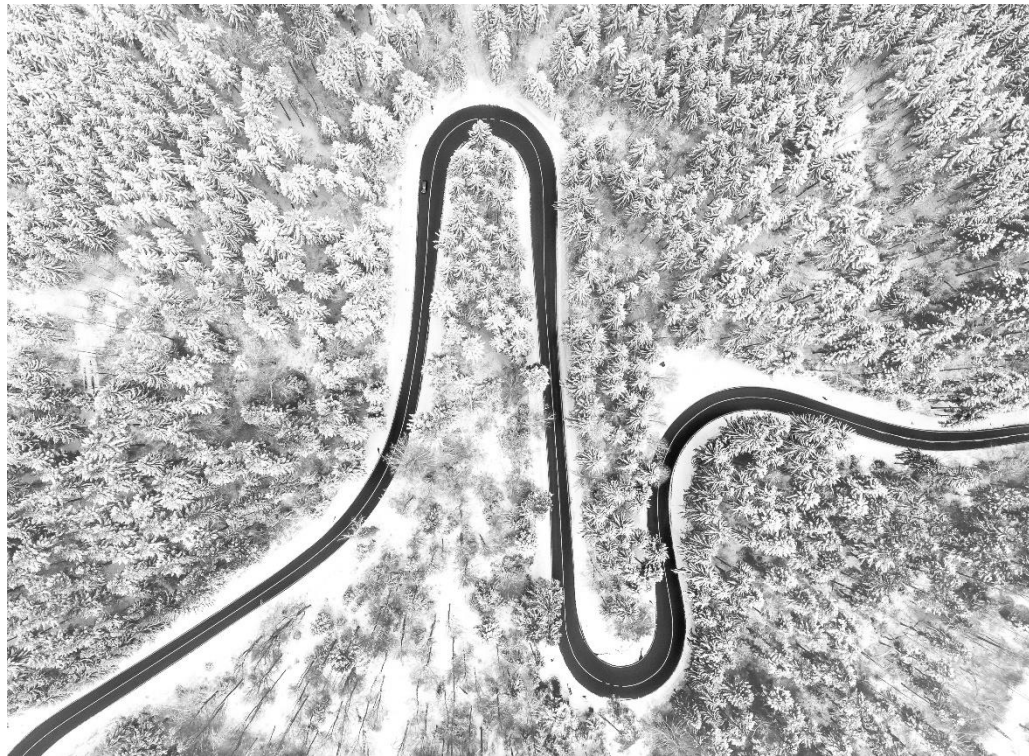
With the filings “date of reception” approach, satellite systems may not yet be in use

- “speculative” filings approach
- With application of Provision 13.6, no more “paper satellite” issue

BUT the Radio Regulations procedure is a balance between the rights and obligations of both the incumbent administration and the new administration. No administration obtains any particular priority as a result of being the first to start an ITU procedure.

What if interference occurs during operation of the satellite?

Article 15- Interference Infringement of the Constitution or Radio Regulations



- All stations are **forbidden** to carry out **unnecessary transmissions**, or the transmissions of **superfluous signals**, or the transmission of **false or misleading signals** or the transmission of **signals without identification**. (RR15.1)
- The station which is causing harmful interference **shall immediately eliminate** this harmful interference
- This assumes a legal link between the transmit station and the administration under the jurisdiction of which it is placed:
- This is the purpose of the licence (Article 18 of the Radio Regulations)



Trends and challenges in the Space Sector for the Radio Regulations



New



Broadband to the masses
Orbital Internet



Space Tourism



Asteroid Mining



And much more!
Space fosters creativity

Private investors and new technologies allowing new needs and usage of spectrum/orbit:

Mega-constellations,
small satellites,
moon/mars/asteroid exploration...

ITU and the Radio Regulations may be challenged by actors not coming from the telecom world,

but remain essential and unique mechanism to prevent signal interference, to ensure a stable environment and equitable sharing of global natural resources.

KEY POINTS TO REMEMBER



- **2 natural limited resources** to be globally shared and regulated: radiofrequency spectrum and associated orbits
- **Legal framework:** ITU Constitution/Convention, Radio Regulations, Rules of Procedures, Recommendations
- **ITU Constitution, Article 44:**
 - To avoid harmful interference
 - To ensure efficient, rational, equitable, economical use
- **5 Radio Regulations mechanisms:** Allocation, Coordination, Power Limits, Registration, Monitoring to ensure interference free operation
- Radio Regulations constantly being improved, next **WRC-23**

Contact



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