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Orbit-Spectrum International Regulatory Framework

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ITU HQ Geneva,
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SPUTNIK

launched on 4th October 1957

Only 6 years later: the Extraordinary Administrative Radio Conference allocated frequency bands for space radiocommunication purposes.

Geneva,
7 October -
8 November
1963

Satellites today…

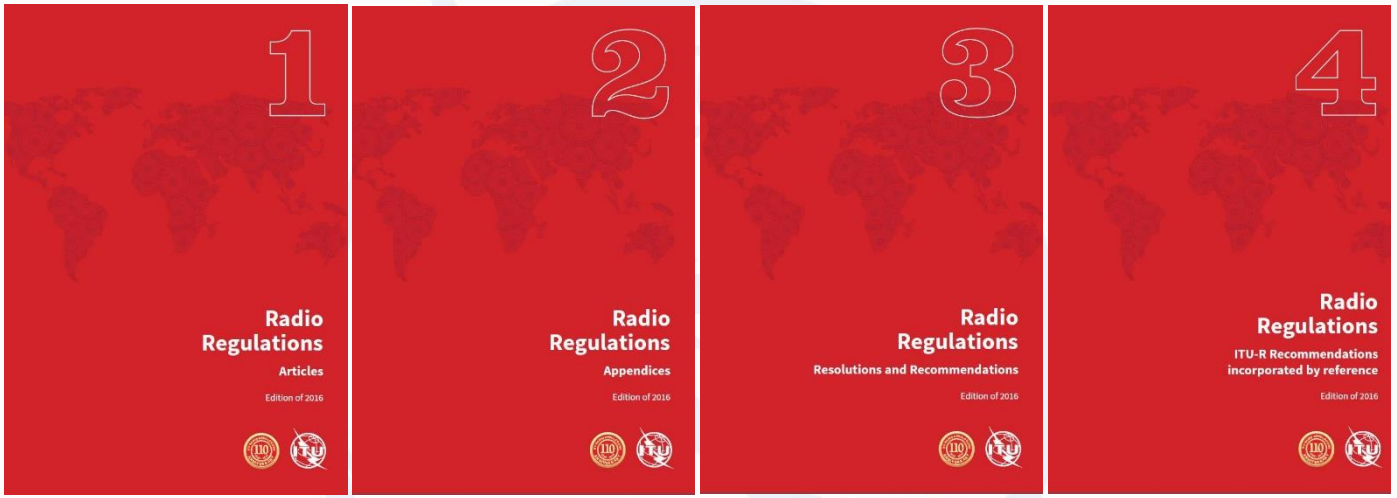
Current economical value of the Global Space Economy

2017 revenues worldwide: 348 billions USD

79% of it or 268.6 billions USD is from the satellite industry

Source: 2018 State of the Satellite Industry (Satellite Industry Association)

RADIO REGULATIONS



TODAY

More than 2000 pages of Radio Regulations regularly reviewed by World Radiocommunication Conferences

38 Conferences since 1906

International treaties

1967 “Outer Space Treaty”

Treaty on Principles Governing the Activities of States in Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies

1968 “Rescue Agreement”

Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space

1972 “Liability Convention”

Convention on International Liability for Damage Caused by Space Objects

1975 “Registration Convention”

Convention on Registration of Objects Launched into Outer Space

1979 “Moon Treaty”

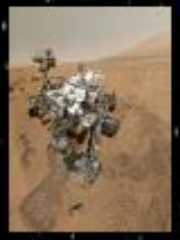
Agreement Governing the Activities of States on the Moon and Other Celestial Bodies

WHERE DO SATELLITES OPERATE ...

GEO
35,786 km above equator

Molniya

Highly Elliptical Orbit – 40 000 km in apogee



MEO
8 000 - 20 000 km

LEO
400 - 2 000 km

GNSS

International Space Station

HIGHLY-ELLIPTICAL ORBIT

MEDIUM-EARTH ORBIT

GEOSTATIONARY ORBIT

LOW-EARTH ORBIT

Sub-orbital

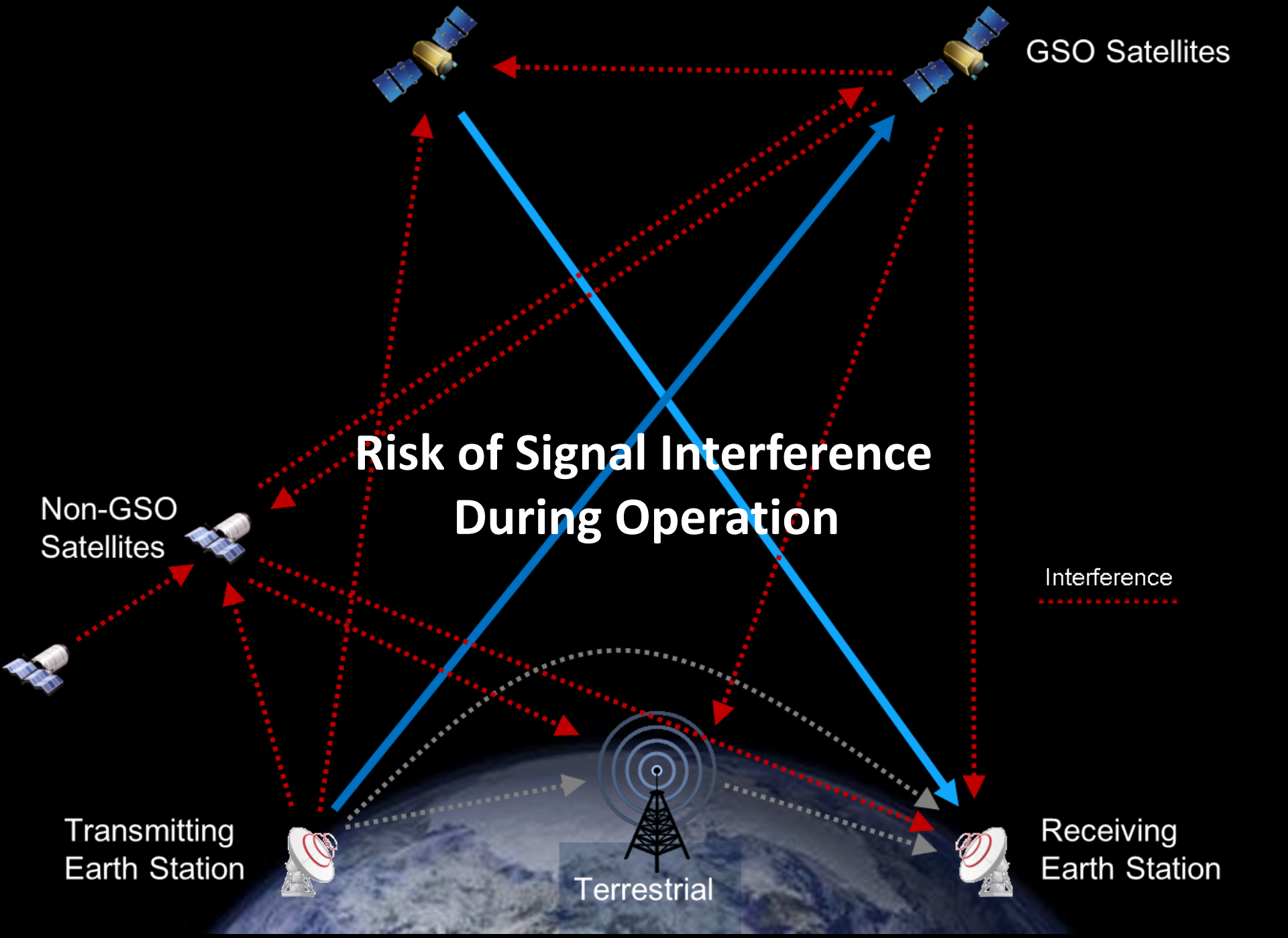
Geostationary-satellite orbit

Frequency spectrum

Examples of frequency bands commonly used for satellite applications

Band	*Uplink frequency*	*Downlink frequency*	*Regulatory service*
L	1.6 GHz	1.5 GHz	MSS
S	2 GHz	2 GHz	MSS/SOS
C	6 GHz	4 GHz	FSS
X	8 GHz	7 GHz	FSS
Ku	13-14 GHz	10-12 GHz	FSS/BSS
Ka	30 GHz	20 GHz	FSS/BSS/MSS

→ RR Article 5 allocates regulatory services to frequency bands.


GSO Satellites
Risk of Signal Interference
During Operation
Non-GSO
Satellites
Interference
Transmitting
Earth Station
Terrestrial
Receiving
Earth Station

Legal framework

- ITU Constitution
  - Article 1: the Union shall in particular:
  - effect **allocation of bands** of the radio-frequency spectrum, the allotment of radio frequencies and the **registration** of radio-frequency 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
  - coordinate efforts **to eliminate harmful interference** between radio stations of different countries and to improve the use made of the radio-frequency spectrum for radiocommunication services and of the geostationary-satellite and other satellite orbits

Legal framework

- ITU Constitution
  - Article 44 – Use of the Radio-Frequency Spectrum and of the Geostationary-Satellite and Other Satellite Orbits
    - Orbit/spectrum resources are **limited natural resources**
    - They must be used **rationally, efficiently and economically**
    - **Equitable access**
  - Article 45 – Harmful Interference
    - **Not to cause harmful interference**
    - Both Member States and operating agencies

Legal framework

- Radio Regulations
  - **Intergovernmental treaty** governing the use of spectrum/orbit resources by Member States
  - Define the **rights and obligations of Member States** in respect of the use of these resources
  - Recording of a frequency assignment in the **Master Register (MIFR)** provides international recognition
  - **Updated every 4 years** by World Radiocommunication Conferences (WRC)
  - **Complemented by Rules of Procedure** adopted by Radio Regulations Board (RRB)

Regulatory and technical solutions

To ensure equitable access and control interference by

ALLOCATION

Frequency separation of stations of different services

POWER LIMITS

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

MONITORING

International monitoring system

COORDINATION

between Administrations to ensure interference-free operations conditions

RECORDING

In the Master International Frequency Register (MIFR)

- International recognition -

Regulatory and technical solutions

Two approaches for recording in MIFR

Coordination Approach

Based on requirements as they come

Non-plan Services

Planning Approach

A priori planning for future use

Plan Services

Rational, Efficient, Economical Use

Equitable Access

Percentage of spectrum assigned to satellite networks which was free from reported harmful interference in 2017

99.96%

Key points

Use of frequencies in space is regulated by the Radio Regulations
This Treaty is regularly reviewed to accompany technical evolutions

Please contact the BR if you have any questions

BRMAIL@ITU.INT

Thank you

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