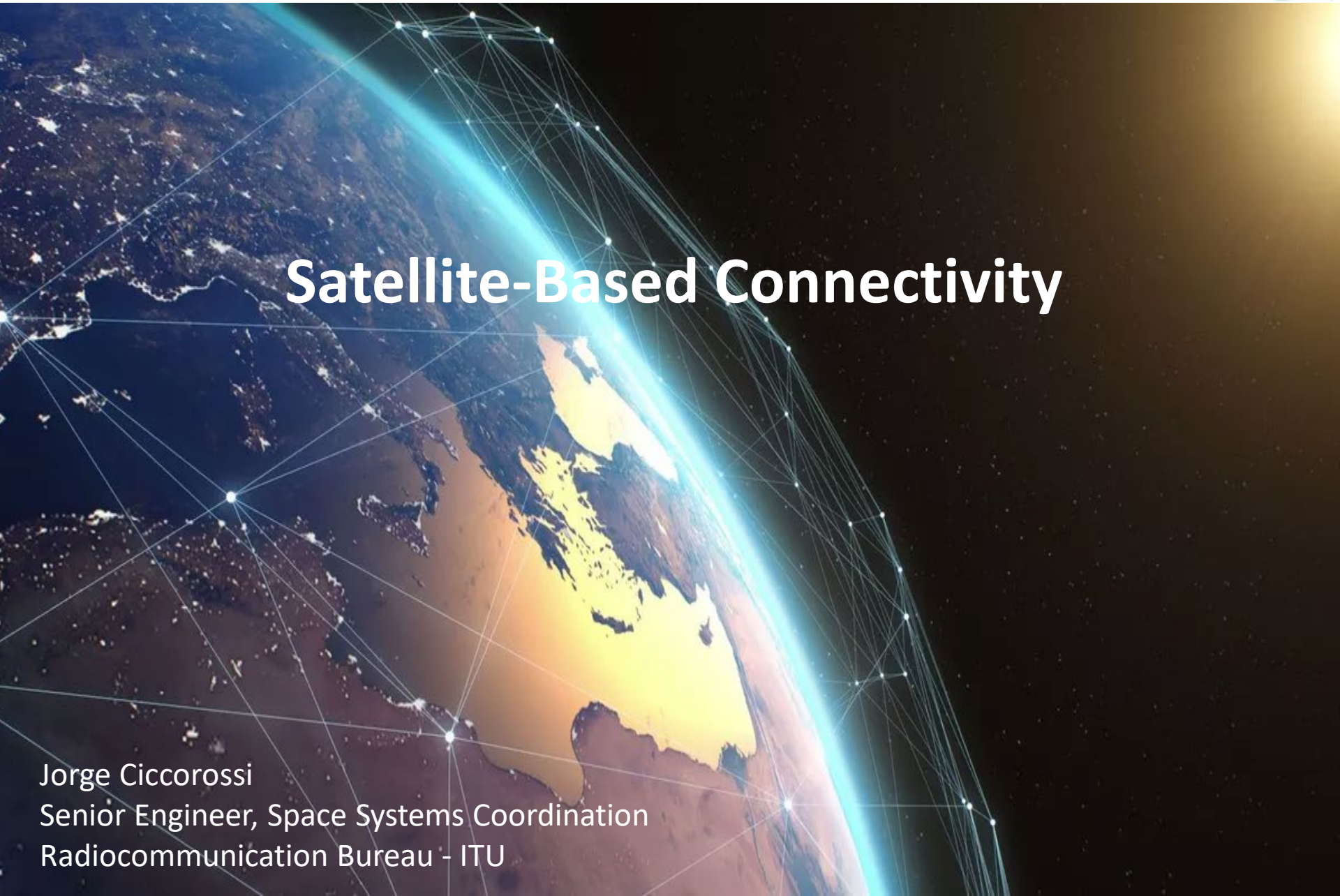
14th meeting of the Expert Group on Telecommunication/ICT Indicators (EGTI)
CICG – Geneva – 20 September 2023



Satellite-Based Connectivity

Jorge Ciccorossi
Senior Engineer, Space Systems Coordination
Radiocommunication Bureau - ITU

Topics:

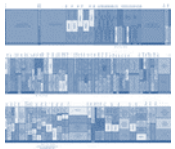
- ITU-R and Space Services
- Current satellite systems and their RFI environment
- Key elements for Success
- Broadband GSO and NGSO Satellite Systems Characteristics
- Possible Satellite Indicators
- Latest Innovations in Satellite Technologies
- Trends
- Conclusions

Facts and Figures on Space Services - 2023

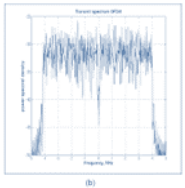
60 years of Space Regulation

72 Members States with access to Space Resources

+1900 Satellite Networks Operating



6 THz Global Spectrum Coordinated and Recorded



99.94% Spectrum Free of Harmful Interference Reported to ITU

< 0.1 % Interference Variation per year

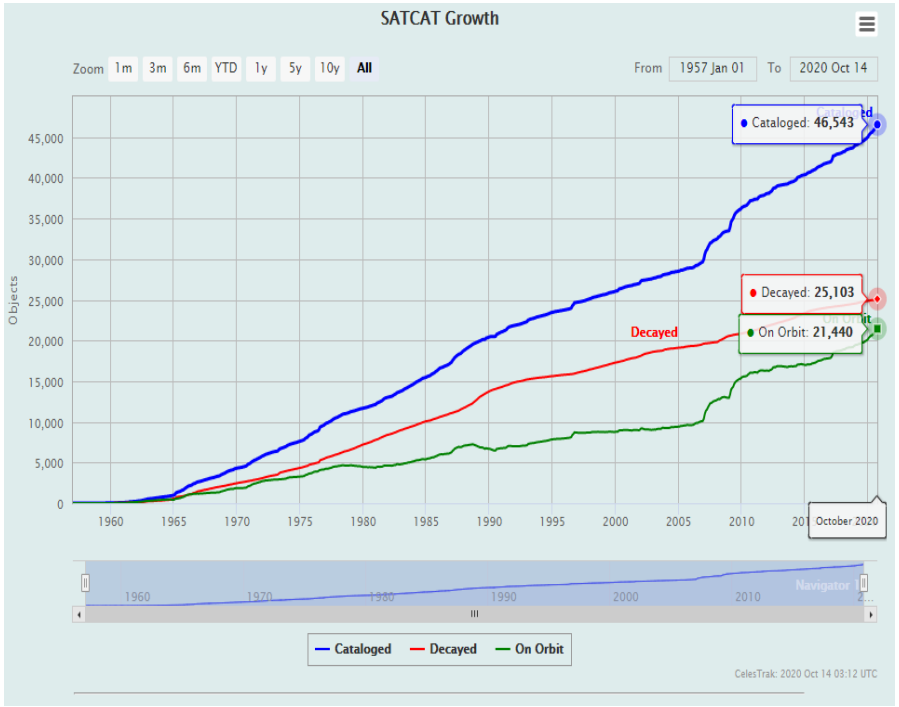
$ Space Economy

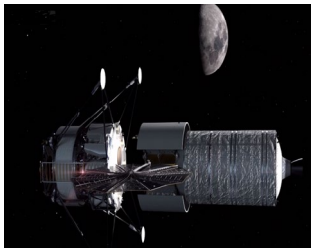
400 Billions Today

Source: spacefoundation.org

1.1 Trillions by 2040

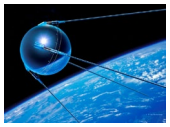
Source : Morgan and Stanley

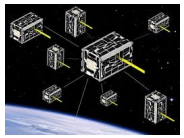




Multicountry Projects to the Moon and Beyond

NGSO Large Constellations for Broadband Applications

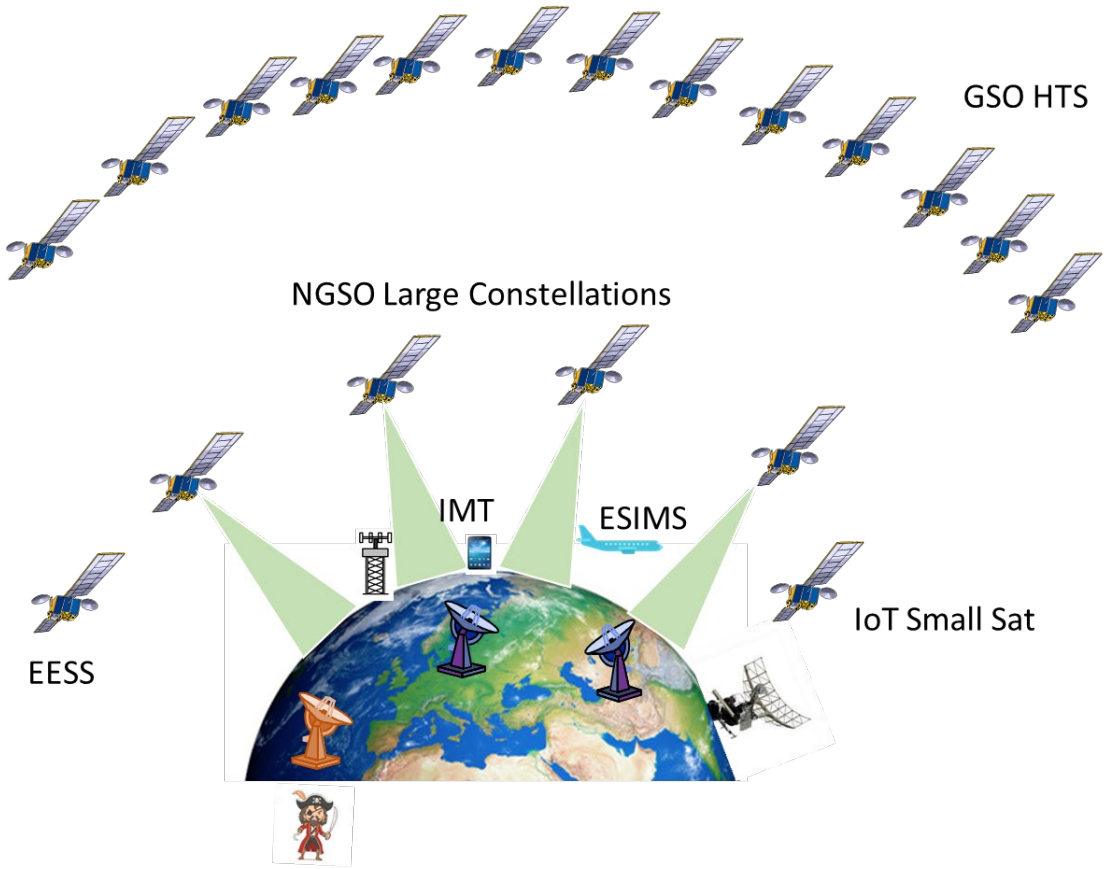




Sputnik-1 (URRS) Telstar-1 (USA) HTS GSO SmallSats

1957 2023

Radio Frequency Interference (RFI) Environment :



1351 GSO recorded and operating

615 NGSO recorded and operating

+ in coordination

+ emerging small sat (IoT, EESS)

+ Terrestrial

FSS HTS with ubiquitous deployments

Mobility → IMT , MSS and ESIMS

Scientific Services (EESS, RAS)

RNSS used intensively

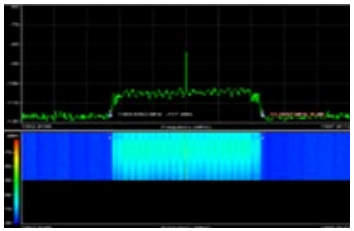
More…

Key Elements for Success:

- ❑ International Space Regulations
- ❑ Spectrum Management
- ❑ National Policies
- ❑ Monitoring, Measurements:

“ if we cannot measure it, we cannot manage it “

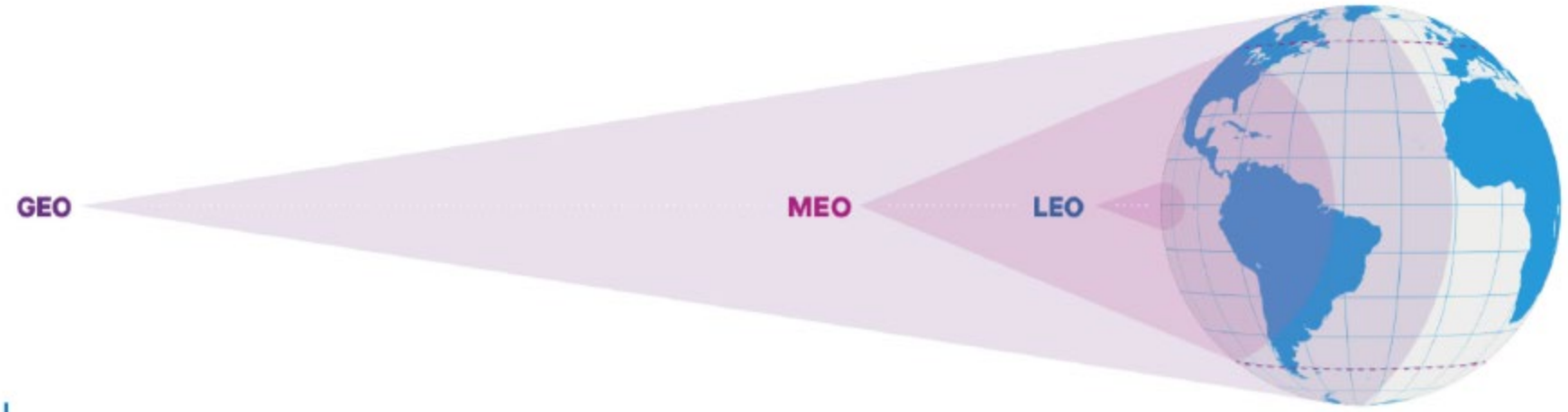
Actual Spectrum Occupancy and RFI



KPI

Satellite Systems Characteristics

- Geostationary Orbit (GSO) → 35786 km
- Medium Earth Orbit (MEO) → 5000-20000 km
- Low Earth Orbit (LEO) → 500 – 1200 Km
- Very Low Earth Orbit (VLEO) → 200-500 Km



Satellite Systems Characteristics

	GSO	MEO	LEO
Latency *	High	Medium	Low
Earth Coverage	Very large	Large	Small/Spots
Min.No. Satellites	3	6	Hundreds
Typical Services	FSS, BSS, MSS	FSS, RNSS	FSS, MSS, EESS
Typical Frequencies	L, S, C, Ku, Ka	L, S, Ka	L, S, X, Ku, Ka
Advantages	High Throughput Cost effective . Well established.	High Throughput	High Throughput Low Latency Low Power-Small Satellite and Terminals
Applications	Broadcasting VSATs networks Backhaul	Corporate Gateways End Users (RNSS)	BroadBand. Narrowband - IoT Objects tracking
Examples	Intelsat, SES, Viasat Eutelsat, JSAT	O3B GPS, Galileo, Glonass, Compass	Starlink, Oneweb, Kuiper, Telesat, Iridium,Globalstar Maxar

* total latency depends on ground infrastructure

Possible Satellite Indicators :

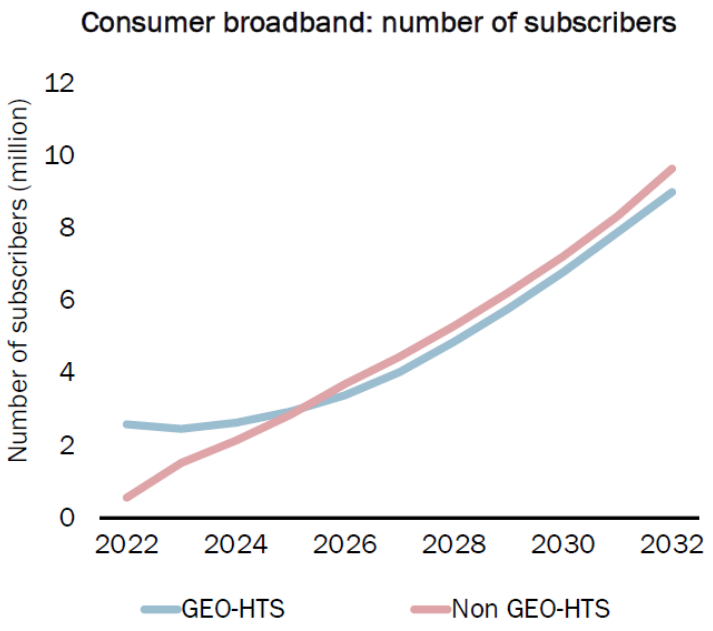
1. Number of VSATs in the Fixed Satellite Service (per C, KU and Ka bands)
2. Number of Broadcasting Satellite Service and DTH terminals (per Ku, Ka bands)
3. Feederlinks for GSO (per C, KU and Ka bands)
4. Feederlinks for NGSO (per C, KU and Ka bands)
5. Authorized terminals in the Mobile Satellite Service (L, Ku, Ka)
6. Number of GSO Satellites (L, S, C, Ku, Ka) with landing rights
7. Number of NGSO satellites (L, S, C, Ku, Ka) with landing rights
8. Total GSO Capacity authorized (in GHz) per service and band
9. Total NGSO Capacity authorized (in GHz) per service and band
10. Number of satellites launched by your country and associated service (FSS, BSS, MSS EESS, Amateur, etc)

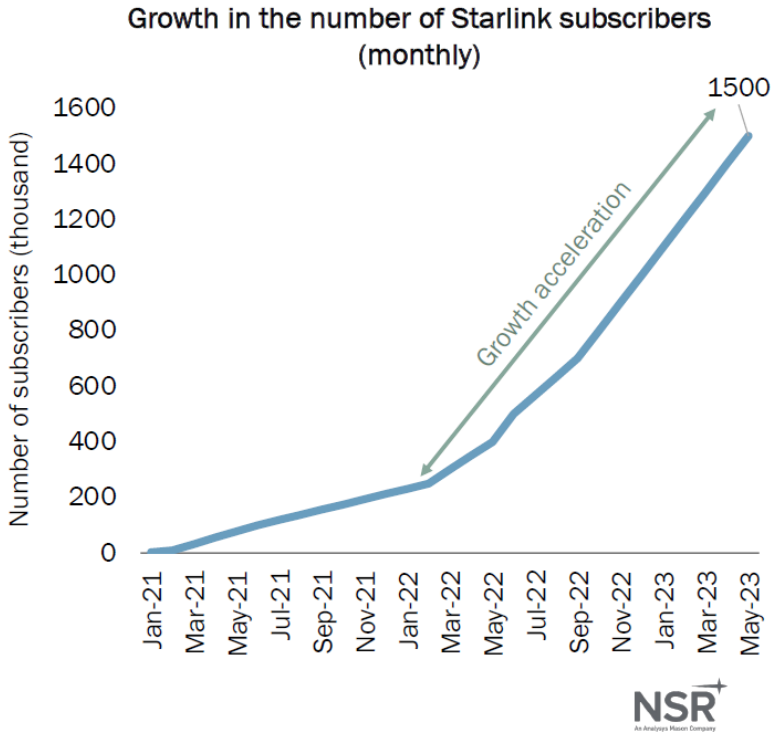
Latest Innovations in Satellite Technologies :

- Mobility applications on land, sea and air (Ku and Ka bands) by GSO and NGSO constellations
- Satellite Direct to Device
- Broadband NGSO Large Constellations and HTS GSO satellites in Ku and Ka bands.
- MSS NGSO constellations for Internet of Things
- SmallSats Earth Exploration Satellite Service (Imagery applications)
- RNSS from LEO to increase resilience to interference

Trends (1/2)

- Higher speeds delivered to end user
- Expected pricing reduction (benefit of NGSO/GSO competition → Higher Satellite Capacity Supply)
- Increasing number of subscribers to NGSO





Trends (2/2)

- **Smaller Satellites, Smaller and flat User Terminals**

- **More Mobility**

aero

maritime

land

- **Launchers: shorter order to launch timelines**

Conclusions:

- GSO and NGSO Satellite Systems can leverage broadband connectivity reaching unserved and underserved areas in both developing and developed countries.
- Access to Space has No Boundaries
- Increasing supply of satellite capacity


Thank You !