



telecommunications  
& postal services

Department:  
Telecommunications and Postal Services  
**REPUBLIC OF SOUTH AFRICA**



# RADIO FREQUENCY SPECTRUM ISSUES RELATING TO SMALL SATELLITES

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**13 December 2017**



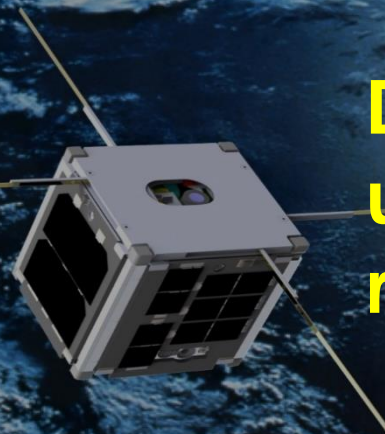
## What is a Small Satellite?

$\leq 1\text{kg?}$

10kg?


100 kg?

Do small satellites have  
unique spectrum  
requirements?





# What is a Small Satellite?



**There is no universally  
accepted definition**



Denomination	Mass (kg)	Max. bus power (W)	Max. dimensions (m)	Development time (years)	Orbit	Mission duration (years)
Minisatellite	100-500	1 000	3-10	3-10	GEO MEO LEO HEO	5-10
Microsatellite	100-500	150	1-5	2-5	LEO HEO	2-6
Nanosatellite	10-100	20	0.1-1	1-3		1-3
Picosatellite	1-10	5	0.05-0.1			1-3
Femtosatellite	0.1- 1	1	0.01-0.1	1		< 1



The genesis of small satellites with short-duration missions was in the amateur satellite service

Today these satellites are being used for a wide variety of missions and applications, including:

- ❖ remote sensing;
  - ❖ space weather research;
  - ❖ astronomy;
  - ❖ communications;
  - ❖ technology demonstration: and
  - ❖ education
- ❖ Some are even used in commercial applications
- Small satellites with short-duration missions may operate under various radiocommunication services



## ITU Radio Regulations

- ❖ International Treaty
- ❖ Seeks to ensure interference-free operation
- ❖ Principles for use of spectrum & satellite orbits
- ❖ Allocation of frequency bands
- ❖ Regulatory Procedures (notification, co-ordination, recording)

## 5 United Nations Treaties



## ITU Defined Satellite Services



*fixed-satellite service*  
*inter-satellite service*  
*space operation service*  
*mobile-satellite service*  
*broadcasting-satellite service*  
*radiodetermination-satellite service*  
*radionavigation-satellite service*  
*radiolocation-satellite service*  
*Earth exploration-satellite service*  
*meteorological-satellite service*  
*standard frequency and time signal-satellite service*  
*space research service*  
*amateur-satellite service*



# Satellite Services Used Most Frequently by Small Satellites



**Amateur-satellite**

**Space research**

**Space telecommand**

**Earth exploration**

**Space tracking**

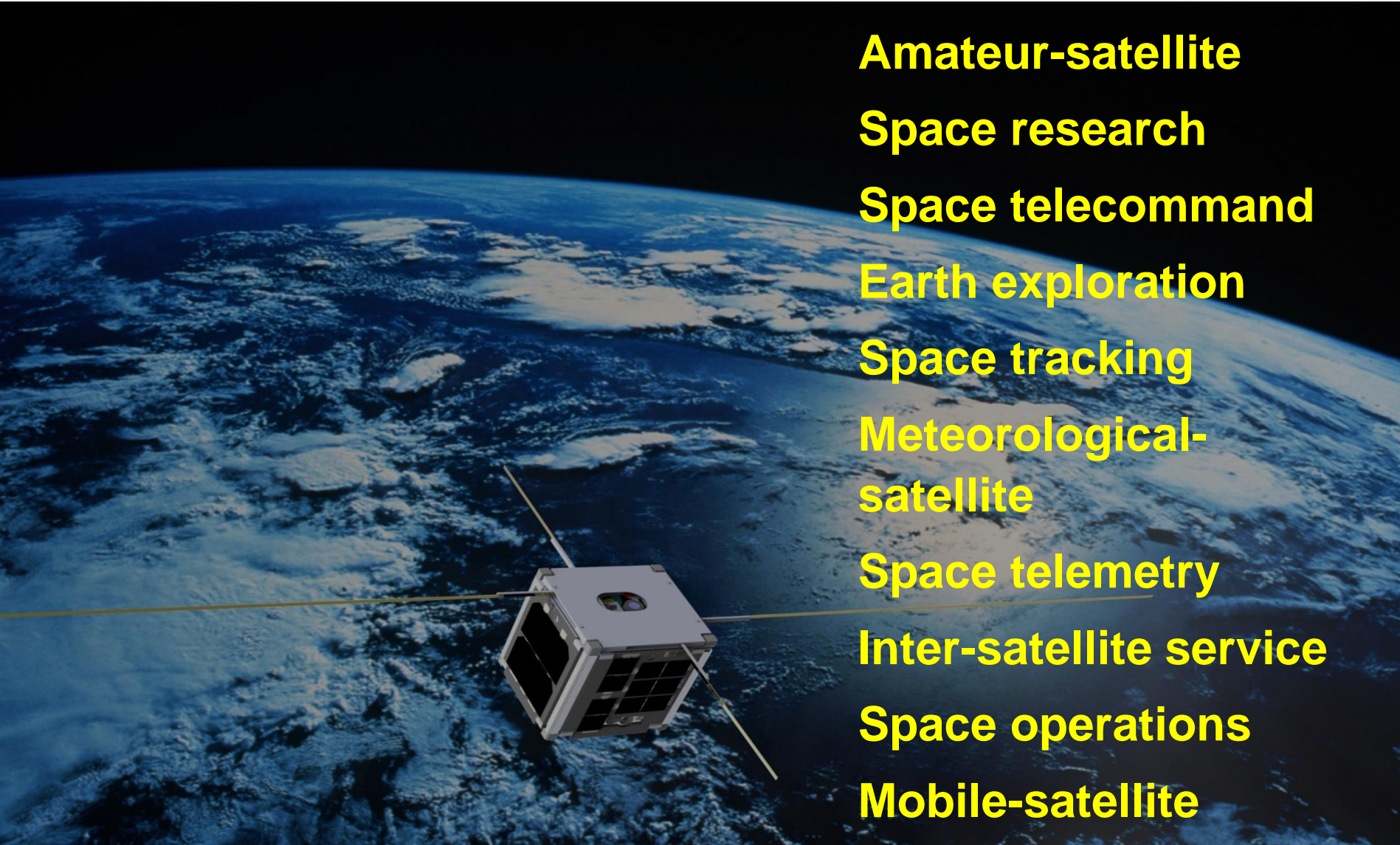
**Meteorological-  
satellite**

**Space telemetry**

**Inter-satellite service**

**Space operations**

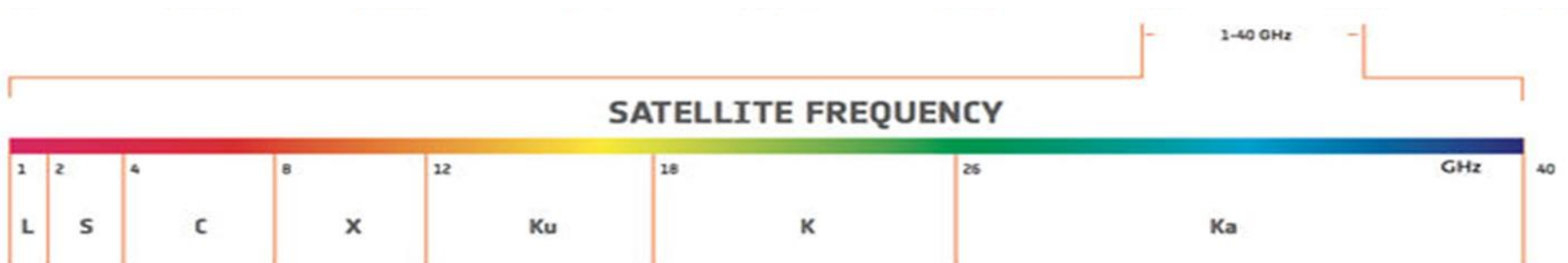
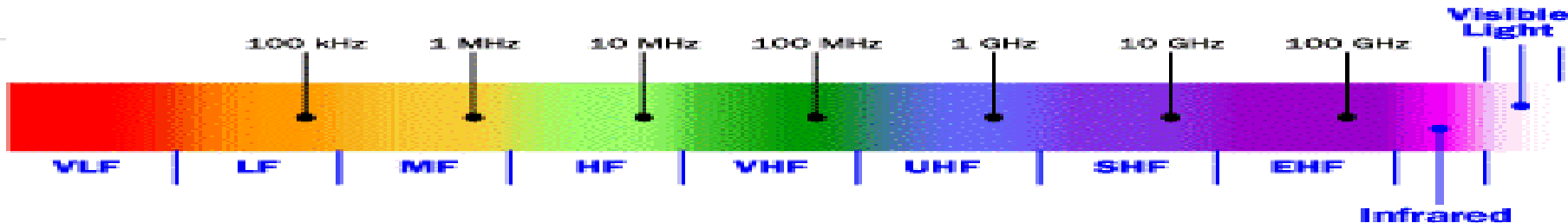
**Mobile-satellite**







# Radio Frequency Spectrum





**TT&C functions should be provided within the service in which the space station is operating**

**Non-amateur satellites have been using frequencies TT&C in frequency bands which are allocated to the amateur-satellite service**

**ITU-R WP 7B is considering allocations for TT&C**



# Frequencies Used Most Frequently by Small Satellites



**401-403 MHz EESS SOS**

**449.75-450.25 MHz SOS SRS**

**1 215-1 300 MHz EESS SRS**

**1 427 – 1 429 MHz SOS**

**2 025 – 2 110 MHz EESS SOS SRS**

**2 200 – 2 300 MHz EESS SOS SRS**

**8 025 – 8 500 MHz EESS**

**8 400 – 8 500 MHz SRS**

**8 550 – 8 650 MHz EESS SRS**

**9 300 – 9 900 MHz EESS SRS**

**10.6 – 10.7 GHz EESS SRS**

**13.25 – 13.75 GHz EESS SRS**

**22.21 – 22.5 GHz EESS SRS**

**22.55 - 23.15 GHz ISS SRS**

**23.6 – 24 GHz EESS SRS**



## ITU Radio Regulations Art 9

- ❖ Procedure for effecting coordination with or obtaining agreement of other administrations
- ❖ Advance publication of information on satellite networks or satellite systems that are not subject to coordination
- ❖ Section II – Procedure for effecting coordination



- ❖ **The majority of non-GSO small satellites operate in frequency bands not subject to ITU RR Article 9 Co-ordination Procedures**
- ❖ **Shortest regulatory limit for satellites not subject to Art 9 is approximately 9 months**
- ❖ **Small satellites typically have a 1-2 year development time & 2-3 year operational lifetime**
- ❖ **Small satellite community is interested in a relaxation of the ITU RR and easy deployment of small satellites**
- ❖ **South Africa has submitted a contribution to ITU-R WP 4A in this regard**



## Radiocommunication Study Groups



Source: Document 4A/TEMP/184

**Annex 20 to  
Document 4A/519-E  
3 November 2017  
English only**

Annex 20 to Working Party 4A Chairman's Report

### **WORKING DOCUMENT**

**SIMPLIFIED REGULATORY REGIME FOR NON-GSO SATELLITES WITH  
SHORT DURATION MISSIONS**



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**Thank You**

