



# The International Amateur Radio Union

## Frequency coordination for Amateur Satellite Service



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Geneva, 29 November 2018



# What is the Amateur Service?

## Amateur Service

- self-training
- intercommunication & technical investigation
- duly authorized persons interested in radio technology
- no monetary interests.

## Amateur Satellite Service

- using space stations (satellites) and earth stations,
- for the same purpose as the amateur service





# What do Radio Amateurs do?

- Operate two-way radiocommunication
  - Different bands and modes
  - Competitions
- Innovations in electronics
  - packet radio
  - Automatic Packet Reporting System (APRS)
  - Antenna designs
  - Digital voice and images
  - Below the noise applications
  - Software Designed Radio (SDR)
- Disaster Communications
- Public Service



# What do Radio Amateurs do contd

- Signal & Propagation Phenomena
  - Observe, measure and record signals, beacons
  - Explore propagation modes, anomalies
- International Friendships and Understanding
- Provides Learning Opportunities
- becoming a technical human resource for industry, government and the public.
- a disciplined and self-regulating service
- >3 million licensed radio amateurs worldwide.
- continues to grow



# Radio Amateurs and Space

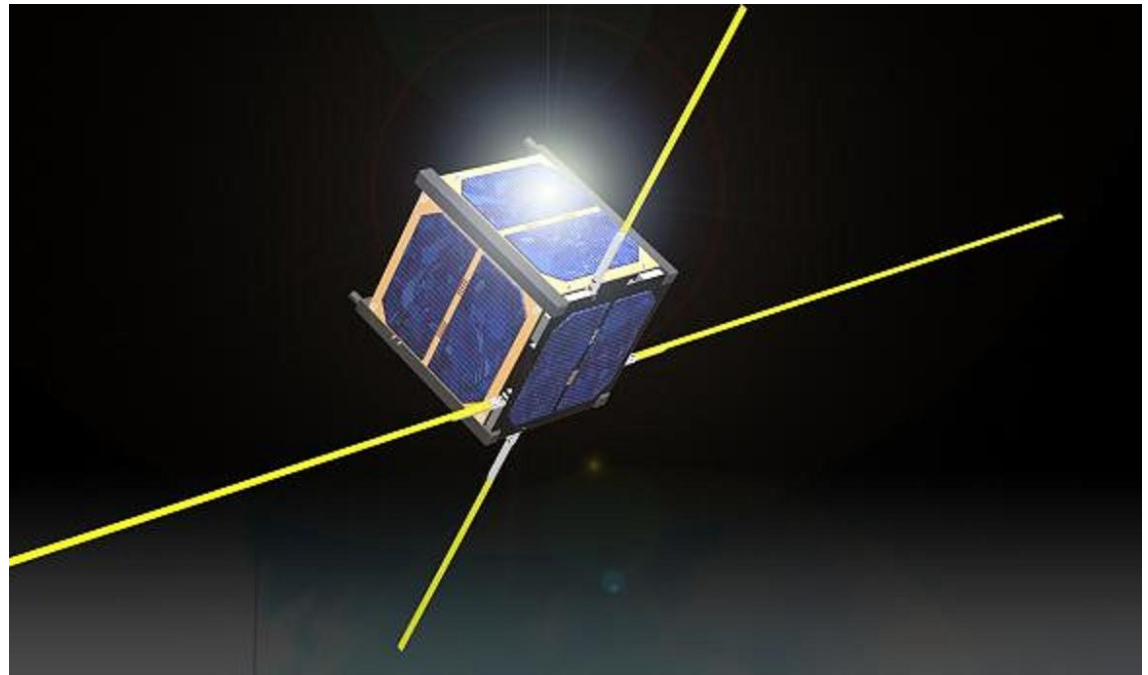
- **Orbiting Satellite Carrying Amateur Radio**
- First OSCAR in 1961
- First two-way amateur-satellite contact in 1965
- Largest OSCAR 40 in 2000 >500kg launch mass
- the longest lived OSCAR 7 from 1974
- AMSAT Organizations
- permanent part of ISS
- university student projects
- Es'HailSat: First GSO. Launched 15 Nov 18



# Currently active satellites

- 100+ satellites in the 435 MHz (70cm).
- 30+ satellites in the 145 MHz (2m) band
- 17 satellites that incorporate transponders
- Growing interest in microwave bands

**FUNcube-1**





# future satellites

- almost all are small satellites
- over 75 projects planned for 24/36 months
- most going to LEO



# PSLV 29 November 2018

- 3CAT1 (E)
- FacSat-1 (CLM)
- InnoSat-2 (MLA)
- Reaktor HelloWorld (FIN)
  
- All four are active





# SSO-A 2 December 2018

Exseed

MinXSS 2

PW-Sat 2

Fox 1C

KNACKSAT

JY1-Sat

MOVE 2

Astrocast

Visioncube

CSIM

IRVINE02

ITASAT

SNUGLITE

SNUSAT-2

SUOMI-1

RANGE A&B

K2SAT

ESEO



# Amateur satellite service allocations

- Access throughout spectrum
- Most on secondary basis



## VHF 2 meter band 144-146 MHz

- Amateur satellite is primary
- Sharing with terrestrial amateur use
- Available for amateur satellites
  - 144.000-144.025
  - 145.800-146.000



## UHF 70cm band 435-438 MHz

- Amateur satellite may operate by FN 5.282
- Not cause harmful interference



# Who can use Amateur Bands

- Licensed radio amateurs
- ITU Radio Regulations
  - Article 1.56 defines amateur service
  - Article 1.57 defines amateur satellite service
  - Article 25 sets framework for the services above



## RR 1.56 and 1.57

- **RR 1.56** *amateur service:*  
A radiocommunication service for the purpose of self-training, intercommunication and technical investigations carried out by amateurs, that is, by duly authorized persons interested in radio technique solely with a personal aim and *without pecuniary interest*
- **RR 1.57** *amateur-satellite service:*  
A radiocommunication service using space stations on earth satellites for the same purposes as those of the *amateur service*.



## RR 25

25.2A Transmissions between amateur stations of different countries **shall not be encoded** for the purpose of obscuring their meaning, except for control signals exchanged between earth command stations and space stations in the amateur-satellite service

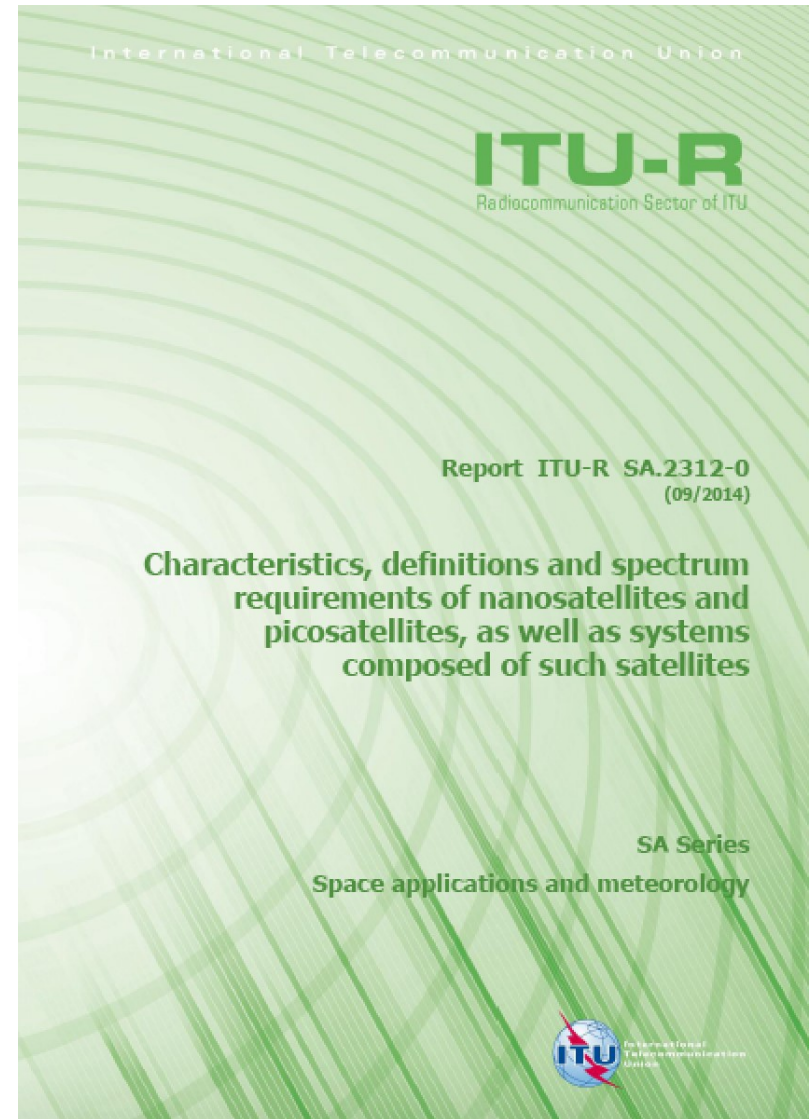
25.3 Amateur stations may be used for transmitting international communications on behalf of **third parties only in case of emergencies or disaster relief**

25.11 Administrations authorizing space stations in the amateur-satellite service shall ensure that **sufficient earth command stations** are established before launch to ensure that any harmful interference caused by emissions from a station in the amateur-satellite service can be terminated immediately.



# Report ITU-R SA.2312-0 (09/2014)

Characteristics,  
definitions and  
spectrum  
requirements of  
nanosatellites and  
picosatellites, as well  
as systems composed  
of such satellites







# Types of missions

- Educational and amateur radio missions
- Experimental and research missions
- Commercial missions



# Frequency coordination

- different bands
- All amateur satellites are equal
- Avoid interference, chaos and mission failure
- Bandplans
- Coordination
- No exclusive frequencies
- Coordination serves everyone's best interests!



# Frequency coordination

- A panel with specialist from all three regions
- Online meeting every 2/3 weeks
- Including Earth segment
- Deconflicting missions on same launch
- Coordination letter
- Follow up if necessary

**Satellite Earth station**





# Frequency coordination

Visit <http://www.iau.org/satellite.html>

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more...

## Amateur Radio Satellite Frequency Coordination

The IARU Administrative Council has appointed Hans Blondeel Timmerman, PB2T, as the IARU Amateur Satellite Advisor. A panel of experts assists him in coordinating frequencies and advising satellite builders and prospective builders.

### Advisory Panel

#### IARU Satellite Advisor

Hans Blondeel Timmerman, PB2T: [p.....@me.com](mailto:p.....@me.com)

#### Region 1

Graham Shirville, G3VZV: [g.....@btinternet](mailto:g.....@btinternet)

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#### Special Advisors

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### Next panel meeting

The IARU Satellite Frequency Coordination Panel typically meets every two to three weeks. The next panel meeting will be held on **3 December 2018**. Coordination requests for consideration in that meeting should be received NLT 1 December 2018.

### Coordination request version 39

On 3 September 2019 version 39 of the IARU Amateur Satellite Coordination Request came into effect. The previous versions can no longer be used.



# Frequency coordination

- Is mission compliant?
- Access to amateur bands
- licensed radio amateur responsible for all transmissions
- Select band(s) of operation
- Combined missions
- API through administration



## Commercial or amateur?

- [Name] is the first commercial satellite in [country]
- [Name] is the first [country] EO satellite with data available for radio amateurs



# What makes it an amateur mission?

- Use of amateur spectrum is not enough
- Licensed amateur in charge
- No pecuniary interest
- No encryption (except TC)
- self-training
- intercommunication & technical investigation



## Areas of concern

- Growing number of commercial requests, not accepting “no” as an answer
- Class of Station “EA”
- Educational vs. science
- API first or IARU coordination first?





# Back up slides



# Amateur satellite service allocations

Wavelength	Frequency band (MHz)	Applications
10 m	28 000-29 700 (primary)	This band is used primarily in conjunction with an input or output in the 144 MHz band.
2 m	144-146 (primary) Satellite: 145.794 – 146	These bands are in heavy use by numerous amateur satellites for inputs and outputs.
70 cm	435-438 (secondary) RR No. 5.282	
23 cm	1 260-1 270 (secondary) Earth-to-space only RR No. 5.282	These bands are used as alternatives to the 144 MHz and 435 MHz bands because of congestion.
13 cm	2 400-2 450 (secondary) RR No. 5.282	
9 cm	3 400-3 410 (secondary) Regions 2 and 3 only RR No. 5.282	



# Amateur satellite service allocations

Wavelength	Frequency band	Applications
5 cm	5 650-5 670 MHz (Secondary) Earth-to-space only RR No. 5.282	These bands are used for experimental amateur satellites.
	5 830-5 850 MHz (secondary) Space-to-earth only	
3 cm	10.45-10.5 GHz (secondary)	These bands are used for experimental amateur satellite communications.
1.2 cm	24-24.05 GHz (primary)	These bands are used for experimental amateur satellites.
6 mm	47-47.2 GHz (primary)	
4 mm	76-77.5 GHz (secondary)	
	77.5-78 GHz (primary)	
	78-81 GHz (secondary)	
	81.0-81.5 GHz (secondary) RR No. 5.561A	
2 mm	134-136 GHz (primary)	
2 mm	136-141 GHz (secondary)	
1 mm	241-248 GHz (secondary)	
1 mm	248-250 GHz (primary)	