

Regulatory matters concerning authorization of Small Sats

“Some Common Misunderstandings
about the FCC and Licensing”

Sankar Persaud/FCC

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Common Misunderstandings about the FCC and Licensing

- The FCC knows everything
- The IARU authorizes amateur use
- If its OK for use on the ground, its OK for use in space
- If NASA (or DoD, or other funding agency) does it, its OK for an FCC licensee to do it

Misunderstanding 1: The FCC knows everything

- The FCC maintains databases for some of the stations it licenses—but not all.
- For other stations—international stations, government stations, and some licensed stations, interference is addressed through coordination processes, so that potential victims of interference can identify affected stations, and sources of interference to an applicant's station.
- Effective coordination processes depend on FCC applicants following licensing processes on a timely basis.

Misunderstanding Number 2: The IARU authorizes use of amateur frequencies

- The International Amateur Radio Union coordinates Amateur Satellite operations on behalf of its constituents
- IARU is not an authorizing agency— authorization is for individual countries— (in the U.S.) this means the FCC
- Completion of IARU coordination is one step, but not the final step, in seeking an authorization

Misunderstanding 3: OK on the ground, OK in space

- Example: Provisions for unlicensed use don't extend into space
- Example: Iridium or Orbcomm earth station modem used on a satellite
- Lesson: When using commercial off the shelf equipment, look carefully at the differences between terrestrial and space-based operations and their respective licensing and coordination processes

Misunderstanding 4: If NASA (or DoD or...) says yes, so will the FCC

- Not a bad rule of thumb; FCC considers NASA orbital debris processes very useful, but may have additional requirements or concerns (e.g. insurance in some cases) for some missions.
- Spectrum allocations distinguish between federal government and non-federal government stations, so permitted frequencies sometimes differ. It may not be OK to use frequencies that federal government stations use.
- Coordination with Federal Government (through NTIA) is how spectrum issues get resolved.

Responsible Agencies

- Non-government stations (including commercial, private, academic, amateur, state/local governments, etc.) are regulated by the **Federal Communications Commission (FCC)**
 - <http://www.fcc.gov>
- Federal (government stations) are regulated by the **National Telecommunications and Information Administration (NTIA)**
 - <http://www.ntia.doc.gov/>

FCC Rules

- The FCC rules are contained in Title 47 of the Code of Federal Regulations
 - Relevant rule parts:
 - Part 25: *Satellite Communications*
 - Part 5: *Experimental Radio Service*
 - Part 97: *Amateur Radio Service*

Commercial Operations

- § 25.102 Station authorization required.
 - (a) No person shall use or operate apparatus for the transmission of energy or communications or signals by space or earth stations except under, and in accordance with, an appropriate authorization granted by the Federal Communications Commission.

Amateur Satellite Authorization process

- Applicant (the amateur operator) must file a notification with the International Bureau of the FCC of their intention to operate on amateur radio frequencies. This requirement is set forth in Section 97.207(g) of the Commission's rules (47 CFR 97.207(g)).

The notification rule requires the license grantee of each space station to make written notifications to the International Bureau, FCC, Washington, DC 20554. The first of these notifications is a pre-space notification, made within 30 days after the date of launch vehicle determination, but no later than 90 days before integration of the space station into the launch vehicle.

Amateur Satellite Authorization process cont.

- Required information:
 - IARU coordination letter
 - Detailed technical description of the design and operation of the space station
 - SpaceCap file (for ITU submission)
 - Orbital Debris and Risk Assessment (ODAR)
- To be filed with the FCC, International Bureau.

**Note - All of the above information is
required, no exceptions**

Regulations Covering Amateur Satellite Space Stations

- § 97.207(c): Most used frequency bands for space stations: 144-146 MHz, 435-438 MHz and 2400-2450 MHz
- § 97.207(g): rules regarding Amateur space station notification: pre-space, in-space, and post-space notifications.

Amateur Satellite Space Station Notification

- Pre-space notification:
 - Must be made within 30 days after the date of launch vehicle determination, but no later than 90 days before integration of the space station into the launch vehicle.
 - If any material item described in this notification changes before launch, a replacement notification must be filed no later than 90 days before integration of the space station into the launch vehicle.
 - In-space notification:
 - required no later than 7 days following initiation of space station transmission. This notification must also update the information contained in the pre-space notification.
 - Post-space notification:
 - required no later than 3 months after termination of space station transmission.
- To be filed with the FCC, International Bureau

FCC Rules Regarding Amateur Operators and Pecuniary Interests

- § 97.113 Prohibited Transmissions

No amateur station shall transmit communications in which the station licensee or control operator has a pecuniary interest, including communications on behalf of an employer...

Experimental Operations

- Regulated under Part 5 of the FCC rules
- Stations operating in the Experimental Radio Service will be permitted to conduct the following type of operations:
 - **Experimentation in scientific or technical radio research**
 - **Communications essential to a research project**

§ 5.71 License Period

- The regular license period for stations in the Experimental Radio Service is either 2 or 5 years.
- Experimental licenses are administered by the FCC's Office of Engineering and Technology
- FCC/OET coordinates satellite applications with the FCC's International Bureau.

Experimental Authorization process

- Required information:
 - Detailed technical description of the design and operation of the space station
 - IARU coordination letter – if amateur frequencies will be used
 - SpaceCap file (for ITU submission)
 - if amateur frequencies will be used
 - May be needed if the transmission falls outside the U.S. (will be decided on a case by case basis)
 - **Orbital Debris and Risk Assessment (ODAR)**
- The detailed technical description and Orbital Debris and Risk Assessment (ODAR) are to be filed with the FCC, Office of Engineering and Technology, Experimental Licensing Branch. <https://apps.fcc.gov/oetcf/els/index.cfm>
- The IARU coordination letter and the SpaceCap file are to be filed with the FCC, International Bureau.

Coordination Requirements

- Satellite downlink signals can cross country borders; therefore, coordination of frequency use becomes an international matter
 - Coordination through the International Telecommunication Union (ITU)
 - International Amateur Radio Union (IARU)

Orbital Debris

- Orbital debris mitigation is a significant regulatory concern when it comes to licensing
 - CubeSats are usually not maneuverable
 - Depending on altitude, natural orbit decay will take years
 - Concerns for LEO operators, ISS
 - Atmospheric re-entry risk – arises with high melting point materials – liability insurance

Orbital Debris Cont.

As part of the notification under Section 97.207(g), (amateur) and Part 5 (experimental) an applicant will need to provide information about the orbital debris mitigation plans for the spacecraft to ensure that these plans comply with the FCC's rules and policies governing orbital debris.

- Environmental Protection of the Geostationary-Satellite Orbit, [ITU-R S1003-1](#)
- NASA [Orbital Debris Reference Documents](#)
 - <http://www.orbitaldebris.jsc.nasa.gov/library/references.html>
- FCC Orbital Debris mitigation documents can be found online at <http://www.fcc.gov/ib/sd/ssr/>