



PUBLIC NOTICE

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GUIDANCE ON OBTAINING LICENSES FOR SMALL SATELLITES

The purpose of this Public Notice is to provide guidance concerning FCC licensing of spectrum for use by non-Federal small satellites, including satellites that fall within the categories of pico-satellites, nano-satellites and cubesats. The advent of such small satellite designs has brought with it dramatically lower launch costs, enabling a larger range of organizations to directly launch satellites. Institutions such as universities and research organizations that previously found it cost prohibitive to launch their own satellite can now participate in the exploration of space. Many of these participants may be unfamiliar with the spectrum licensing, scheduling and other requirements attendant on satellites. This Public Notice seeks to alert affected parties of these requirements and thus aid small satellite operators in the planning necessary for a successful launch operation.

Overview: Operators of non-Federal satellites employing radio communications must be licensed by the FCC. International regulations may also apply to such launches. Scheduling aspects associated with small satellites may be restrictive and require obtaining necessary licenses well in advance of a launch.

The Commission's rules set forth three different procedures for licensing satellites. The Commission's Part 25 rules are the primary vehicle for satellite licensing, and are used for licensing a wide range of satellite operations, including commercial communication and remote sensing satellites. The Commission's Part 5 rules cover experimental operations. The Commission's Part 97 rules cover amateur radio service satellite operations.¹

Currently, many small satellite missions involve experimental operations – *i.e.* scientific and research missions, including missions conducted under government contract – and many operate in amateur frequency bands. These satellites are therefore licensed under Parts 5 or 97 of our

¹ The Commission's Part 97 rules do not provide for the issuance of a specific amateur satellite license document, but instead require a licensed amateur operator to provide information to the Commission prior to launch of the satellite. This information is used to meet obligations under International Telecommunication Union (ITU) regulations and to assess the applicant's orbital debris mitigation plans. Thus, for purposes of amateur satellite operations, this Public Notice discusses the relevant information filing requirements under our rules.

rules. Because of the significant interest in small satellites in the amateur and research communities, the primary focus of this Public Notice is on such operations, although certain guidance in this Public Notice is also applicable to Part 25 licensing.

We address specific satellite authorization issues in greater detail, below.

Who is eligible? Both amateur and experimental licenses require that the licensee limit its operations to specified categories, and/or meet eligibility criteria. Amateur radio transmissions are primarily for the purpose of exchanging messages with other amateur stations, and our rules prohibit “communications in which the station licensee or control operator has a pecuniary interest, including communications on behalf of an employer....”² For experimental licenses, the scope of permitted services includes experimentation under contractual agreement with the United States Government, and communications essential to a research project.³

What Frequencies Can Be Used? For amateur radio service satellite operations, available frequencies are identified in Section 97.207(c) of the rules. For experimental operations, there are no specific bands identified in the rules, and operations are on a temporary, non-interference basis, *i.e.*, the operations can neither cause interference nor claim protection from interference. Common frequencies authorized for small satellite operations to date have been for the 145-148 MHz, 420-450 MHz, 902-928 MHz (ISM), and 2.390-2.450 GHz bands.

Who Should Apply? For amateur radio service satellite operations, the amateur satellite control operator. This operator should have the ability to remove the satellite from a launch manifest and disable space station operations.

For experimental operations, the applicant should be the party that ultimately controls decisions about the satellite’s mission objectives, design, construction, tendering of the satellite to a launch service provider or designated launch integrator, and operations of the satellite once on orbit. This is in most cases a university or research institution, but may also be a commercial venture seeking to test equipment for developmental purposes.

How Does One Apply? For permitted amateur satellite operations, a licensed amateur operator⁴ should submit a pre-launch notification not later than 30 days after the date of launch vehicle determination, but no later than 90 days before integration of the space station⁵ into the launch

² 47 C.F.R. § 97.113(c). *See generally* 47 C.F.R. §§ 97.111-97.117, 97.207.

³ *See* 47 C.F.R. § 5.3 (listing permitted operations in the Experimental Radio Service); *see also* 47 C.F.R. §§ 5.51, 5.63(a)-(c).

⁴ For more information about how to obtain an amateur operator license see: http://wireless.fcc.gov/services/index.htm?job=service_home&id=amateur.

⁵ As used in this Public Notice, the term “space station” has the meaning given in the ITU Radio Regulations, *i.e.*, one or more transmitters or receivers or combination of transmitters and receivers necessary for carrying on a radiocommunication service, and located on an object which is beyond, is intended to go beyond, or has been beyond, the major portion of the Earth’s atmosphere. *See* ITU Radio Regulations S1.61 and S1.64. We note that this definition is significantly broader than how the term is commonly used (*e.g.* a habitable spacecraft such as the International Space Station).

vehicle.⁶ These notifications should be submitted via mail to the: International Bureau, FCC, Washington, DC 20554. In order to facilitate processing, applicants may also provide this material via email to: amsat.spacecap@fcc.gov.

For experimental licenses, all applicants must first obtain an FCC Registration Number which can be done online at <https://fjallfoss.fcc.gov/coresWeb/publicHome.do>. An applicant should then submit its license application through the Office of Engineering and Technology's (OET) Experimental Licensing system: (<https://apps.fcc.gov/oetcf/els/index.cfm>); or, for operations lasting less than six months in duration, an applicant should apply for Special Temporary Authority (STA) and use the website link available at <https://apps.fcc.gov/oetcf/els/forms/STANotificationPage.cfm>.

Although the experimental licensing rules do not specify required time frames for submitting applications, OET strongly recommends submission of an application not later than 30 days after the date of launch vehicle determination, and in no event later than 90 days before integration of the space station into the launch vehicle.

What Information is Required to Apply?

For Amateur pre-launch notifications:

- a. A draft "Appendix 4" notification for submission to the International Telecommunications Union (ITU) Radio Regulations. The draft notification should be prepared using the ITU software "SpaceCap," which can be downloaded from the following link: <http://www.itu.int/en/ITU-R/software/Pages/spacecap.aspx>.
- b. A letter from the International Amateur Radio Union (IARU) indicating completion of coordination.

For experimental licenses:

- a. Technical information including frequency, power, emission, latitude and longitude coordinates of the launch site or test operations.
- b. Proposed launch schedule including launch date, requested grant date and any critical go/no go dates relevant to the licenses.
- c. An overview of the proposed testing.
- d. A 24-hour contact for interference issues.
- e. Description of the anticipated orbital parameters or range of orbital parameters (altitude, inclination) in which the satellite will operate.
- f. A list of any earth stations with which the satellite will communicate.
- g. If the applicant is also requesting a license to operate an earth station, it should provide the frequency, power, emission, lat/long information for the earth station as part of their application. If the applicant is planning to communicate

⁶ Applicants are cautioned that small space stations may be integrated into the launch vehicle months in advance of scheduled launch and the launch operator may require a grant of license prior to integration. The FCC will also accept notifications prior to launch vehicle determination, provided that the notification specifies a sufficiently definite range of orbital parameters to allow us to evaluate the applicant's proposed space station operations.

- with an earth station licensed to another company, or operated outside the United States, its territories and possessions, then the technical parameters should be included in an exhibit to the application for reference purposes only.
- h. If the satellite will operate in bands allocated to the amateur satellite service, but will provide no amateur service, the information required in connection with an amateur pre-launch notification and the results of any notification to or coordination with the IARU.
 - i. On a case-by-case basis determined by the FCC, which will depend in part upon the geographic scope of the proposed operations, the information required in connection with an amateur pre-launch notification.

For all small satellite licenses (Part 25, Amateur, and Experimental):
Information concerning orbital debris mitigation.⁷

In preparing this information, many applicants find useful the materials developed by the National Aeronautics and Space Administration (NASA) for assessment of NASA missions. These materials include the NASA Debris Assessment Software, as well as NASA handbooks and standards for debris assessment, and are available at <http://orbitaldebris.jsc.nasa.gov/>. An orbital debris assessment report prepared consistent with NASA standards is generally sufficient to meet FCC requirements.⁸ However, applicants should be aware of and address the following:

1. For satellites that will maneuver at altitudes used by inhabitable orbital objects, the applicant should indicate whether any measures have been taken to coordinate operations with the operator of such object.
2. Although most small satellites can be expected to burn up entirely upon re-entry, if the satellite is constructed with high melting point materials some components may survive re-entry and present a casualty risk. Satellite designers are urged and expected to follow a “design to demise” approach in choosing materials.⁹

⁷ See 47 C.F.R. §§ 5.63(e), 25.114(d)(13)(i), 97.207(g)(1).

⁸ For several specific examples, see <https://apps.fcc.gov/els/GetAtt.html?id=125551&x=.%20https://apps.fcc.gov/els/GetAtt.html?id=127590&x=>.

⁹ In the event an assessment of the spacecraft re-entry finds surviving materials presenting a casualty risk other than zero, the applicant should provide in its application a detailed discussion of the need for use of high melting point materials, demonstrating that mission objectives cannot be met with an alternative spacecraft design. The FCC considers insurance arrangements as a relevant consideration if the satellite will be disposed of by atmospheric re-entry, with portions of the satellite expected to survive re-entry. Therefore, the application should also identify steps taken or to be taken to obtain an insurance policy listing the United States as an insured party or additional insured party, and demonstrating that the policy will provide adequate coverage. Consistent with NASA Standards, the FCC staff considers objects surviving re-entry with less than 15J energy as not presenting a cognizable casualty risk.

What are the Post-Launch Requirements? For both amateur and experimental operations, the licensee/operator should file a further notification following launch, and not later than 7 days after expected commencement of transmissions, indicating the status of the satellite (transmissions commenced, etc.). In addition, no later than three months after termination of space station transmissions, the licensee/operator should file a notification of such termination.¹⁰

All experimental licenses are granted on a non-interference basis, *i.e.*, the licensed operations can neither cause interference nor claim protection from interference.

What is the Duration of a License? Experimental licenses are granted for either two or five years. Experimental Special Temporary Authorizations are valid for a six-month period from date of grant and are renewable. Most Part 25 licenses are valid for fifteen years. Operation of an amateur radio service satellite is authorized only so long as the operator's amateur license remains current. For communications associated with new launches/missions, the licensee must obtain a new license.

When is Coordination with Federal Governmental Agencies Necessary? An applicant's proposed satellite operations may affect spectrum used by Federal Government entities. OET will determine whether coordination with the National Telecommunication and Information Administration is necessary and will conduct such coordination as part of the application review process. This coordination may result in the license being subject to special conditions. Frequency bands commonly used for small satellite operations that are allocated for Federal use include 420-450 MHz, 902-928 MHz, 2.390-2.395 GHz, and 2417-2450 GHz.

What if I Have Further Questions? For additional information, contact: Joseph Hill at 202-418-2215 or via email at joseph.hill@fcc.gov (Amateur Service) or Walter Johnston at 202-418-0807 (Experimental Service) or via e-mail at walter.johnston@fcc.gov.

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¹⁰ Experimental licenses will include a condition to this effect. For amateur satellite operations, see 47 C.F.R. § 97.207(v)(2)-(3).