

Application Note AN-00140

The FCC Road: Part 15 From Concept to Approval

Introduction

Many manufacturers have avoided making their products wireless because of uncertainty over the approval and certification process. While it is true that RF increases the effort and cost of bringing a product to market, it also can add significantly to the function and salability of a completed product. Thanks to a growing number of easily applied radio frequency (RF) devices such as those offered by Linx, manufacturers are now able to quickly and reliably add wireless functionality to their products. The issue of legal compliance for the finished product is straightforward when approached in logical steps.

Purpose of this Application Note

This application note gives a brief overview of the legal issues governing the manufacture and sale of RF products intended for unlicensed operation in the United States under CFR 47 Part 15. In the United States the Federal Communications Commission (FCC) is responsible for the regulation of all RF devices. The FCC requires any device that radiates RF energy to be tested for compliance with FCC rules. These rules are contained in the Code of Federal Regulations (CFR), Title 47. Part 15 is the section of the code that deals with devices that emit RF energy and are to be operated without an individual license.

While this application note will provide you with a basic understanding of the steps involved in certification, it is strongly recommended that you obtain a full copy of the code from your local government bookstore, the Government Printing office <<http://bookstore.gpo.gov/>>, or the FCC website <<http://wireless.fcc.gov/rules.html>>.

What Is Unlicensed Operation?

Certain bands within the RF spectrum are available for unlicensed operation. The term unlicensed is often misunderstood. The manufacturer of a product designed for “unlicensed” operation is not exempt from testing and/or certification. Indeed, both the transmitter and receiver must be tested by a qualified testing laboratory. However, once the necessary approvals are received, the end user can then operate the product without further obligation or licensing.

Steps to Part 15 Certification

Choose the Optimum Operating Frequency.

Part 15 governs a broad range of the radio spectrum ranging from below 1MHz to in excess of 32GHz. It is broken into individual sections that govern the use of specific frequencies and bands. For example, section 15.249 covers the 902–928MHz band. In this frequency range, a user is allowed to transmit any analog or digital signal they desire so long as the stipulations governing allowed output power, harmonics, and occupied bandwidth are met. Other sections are not so accommodating. For example, in the 260–470MHz band, the FCC considers not only RF factors but also the intended function and application.

In order to determine which operational frequency is best for your product, it is necessary to weigh both technical and legal issues. First, you will want to have a clear understanding of which frequencies are legally available, and then choose a specific frequency based on technical issues such as range, propagation, antenna length, power consumption, and potential interference. (If you are not familiar with these technical issues, consult with a Linx application engineer or read additional Linx application notes focusing on those issues.)

Component Selection

Once a frequency of operation has been selected, the RF section and antenna must be carefully designed and optimized to comply with the allowed power and harmonic limitations imposed by Part 15. This process is greatly simplified if you are using a Linx module, but it is still important to recognize that the antenna and layout play key roles in the product's legal operation.

Many modular RF transmitter products, including those manufactured by Linx, have the potential to output RF power in excess of Part 15 limits. This extra power helps designers overcome inefficient antenna styles and take advantage of the FCC's averaging allowance when modulation techniques such as ASK/OOK are employed. If necessary, output power may be reduced using the module's level adjust or an external attenuation pad. For further details, review Application Note AN-00150.

Another consideration in antenna selection is that Part 15.203 requires the antenna to be permanently attached or coupled with a unique or proprietary connector. While this requirement leaves room for interpretation, the FCC's intention is that a user not be able to change the radiated characteristics of the device by easily interchanging the antenna with a higher performance model.

Build Production-Ready Prototypes

After choosing a frequency for operation and a suitable RF stage, you will want to move from concept breadboard prototypes to a production-ready model as rapidly as possible.

Prescreen and Optimize

Once a wireless product is finished, its output power and harmonics should be checked to ensure that the RF stage is both optimized and Part 15 compliant. This testing requires a spectrum analyzer and calibrated antennas. If you do not have access to these instruments, consider prescreening services such as those offered by Linx. The prescreening process can result in a cost savings over formal testing and provides an opportunity to maximize product performance.

Send the Production-Ready Product to an FCC Authorized Testing Facility

Once your product is in its finished form, exactly as it will be produced, testing should be conducted by an authorized laboratory. In most cases it is not necessary to be present for testing and the laboratory will prepare the filing paperwork.

The FCC has greatly streamlined the approval process by allowing independent laboratories to issue certifications through the Telecommunication Certification Body (TCB) program.

Unless specifically requested pursuant to Section 2.1076, receivers no longer require certification. Just a quick test and issuance of a Declaration of Conformity (DoC) which should be maintained in the applicant's files. Transmitter certification is also relatively painless since many labs that are TCB certified are now allowed to issue certifications on behalf of the FCC. Full transmitter and receiver testing can cost around \$5,000, transmitter only around \$3,500, and the receiver about \$1,500. The entire process can now be rapidly completed and many labs can perform other testing at the same time, such as Class A/B.

Label the Product and Market It

Following successful completion of the approval process, products should be labeled as required by Part 2.925 and 2.926 as well as Part 15.19 or otherwise prescribed by the FCC. Further information on labeling may be obtained at <http://fjallfoss.fcc.gov/oetcf/kdb/forms/FTSearchResultPage.cfm?id=27980&switch=P>.

Summary

Bringing a product through the approval process involves cost, effort and in some cases frustration, but in the end your product will have an exciting new dimension of functionality and market appeal. By following the steps outlined in this application note and reviewing a copy of CFR 47 you will be well on your way to RF success. While complying with applicable provisions may seem unnecessarily restrictive, such regulations serve to ensure the availability of usable RF spectrum for every product.

For additional information on
FCC regulations you may wish to
contact the FCC directly.
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