Guide to

FCC Certification

for Part 15C Wireless Transmitters

Provided by

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1516 Centre Circle, Downers Grove, IL 60515
630-495-9770 | www.elitetest.com

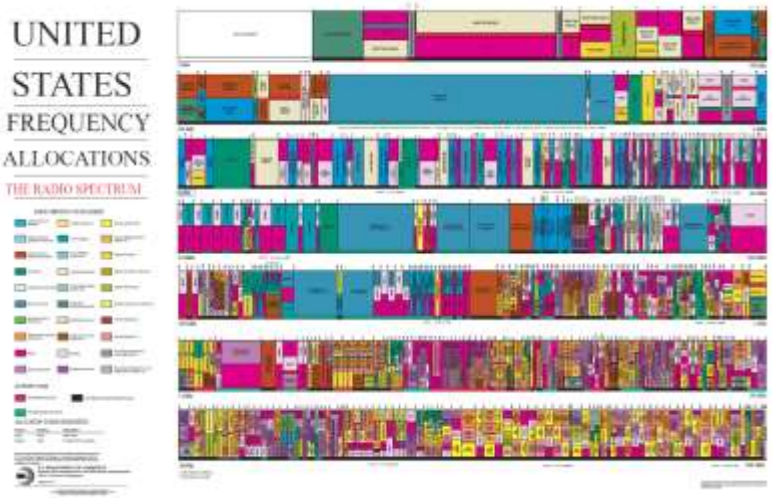
Complete EMC & Environmental Stress Testing

Table of Contents

1 Introduction

The radio frequency spectrum is a finite and sovereign natural resource. Finite in the sense that only a portion of it can be used in a practical way for wireless communications. In these more useful frequency bands only a limited number of wireless devices can operate concurrently at the same frequency before they begin to interfere with one another.

To help deal with co-channel and adjacent channel interference, wireless technology has evolved with signal spreading modulation and coding techniques, software and hardware filtering, transmit and receive diversity, as well as frequency hopping and other agile channel selection methods. These advancements have enabled the dramatic growth of wireless communications. But because the demand for RF bandwidth has kept up with and even to some extent outpaced technology, it's still necessary to regulate the assignment of spectrum and set rules for device operations so that all users are afforded fair access.



Spectrum is a national resource that is independently managed by government agencies in each country around the world. In the United States, the Federal Communications Commission (FCC) is tasked with regulating and managing wireless radio frequency communications. The FCC assigns frequency bands to specific users then establishes the technical requirements for the devices that operate at those bands to optimize the use of resources and limit the interference potential to all.

1 Introduction

To help enable the effective use of spectrum through wireless communications the FCC has established a transmitter certification scheme.

Transmitter equipment authorization “certification” includes an examination of the technical characteristics of wireless devices and verifies operations are within the framework of the rules.

Certification also assures that devices are properly identified and that the end users and general public are notified of the transmitter’s suitability for operation.

While the FCC assigns spectrum, defines rules and regulations, and manages enforcement, the actual product evaluation and certification of wireless transmitters is performed by third party certification authorities called Telecommunication Certification Bodies or “TCBs”.

A TCB is generally a test laboratory or a business associated with a test lab having extensive experience and knowledge of electromagnetic compatibility (EMC) and radio frequency testing.

To be a TCB, a test laboratory must establish a separate certification organization accredited under the international standard for certification bodies, ISO 17065. Through the accreditation process TCBs establish their credentials for understanding the technology and familiarity with rules that govern the operation of wireless transmitters.

Since 2000, Elite Electronic Engineering has been designated by the FCC as a TCB and given the authority to certify wireless transmitters.

Elite

Wireless Test Laboratory and Telecommunication Certification Body (TCB)

Elite is also a transmitter certification body for Industry Canada and is a Notified Body for the European Union R&TTE Directive.

Industry Canada Industrie Canada

Canada

CE

1 Introduction

Wireless transmitter certification can be looked at as being two parallel evaluations.

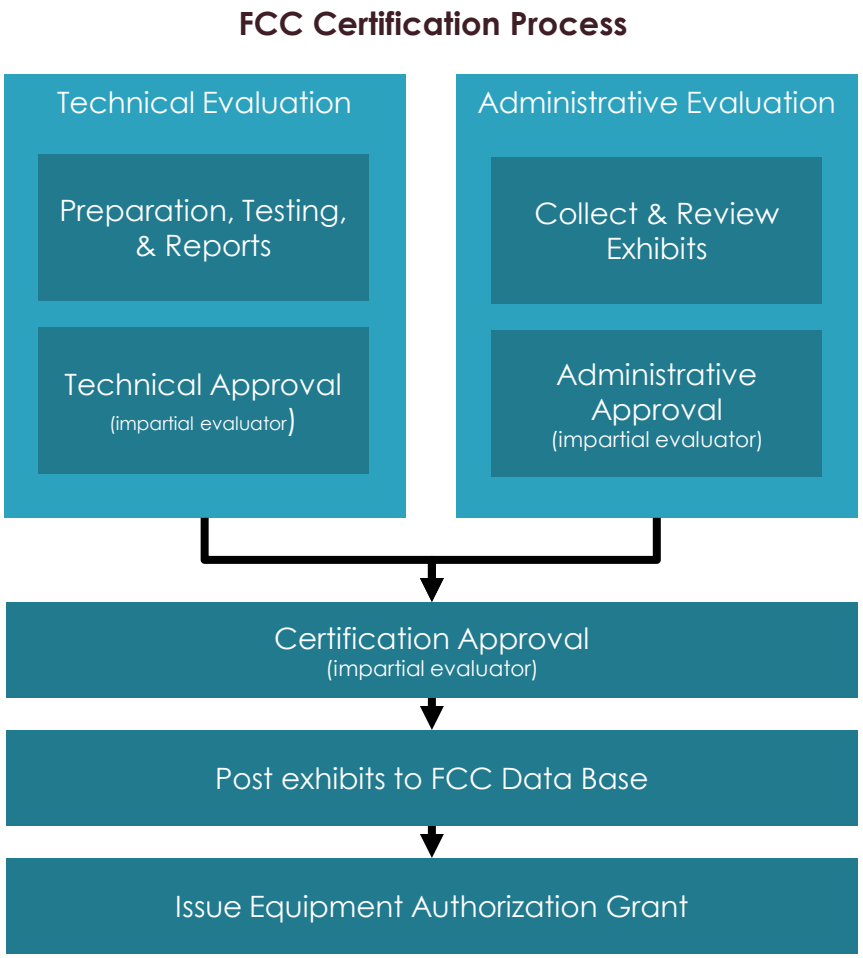
The first part is a **technical evaluation** that involves testing the transmitter per the technical requirements, followed by a report to describe the findings, and then a separate impartial technical review that evaluates the performance of the device relative to the technical rules.

The other part is an **administrative evaluation** which involves the review and approval of document "exhibits" that are required to substantiate and support the certification.

When both the technical and administrative evaluations are finished, a separate impartial certification specialist confirms that the evaluations have been completed in full then proceeds with the final approval and then grants the device certification.

From there, the certification exhibits are posted to the FCC website database after which the equipment authorization grant "certification" can be issued to the manufacturer or grantee.

This is an important and required process for bringing a wireless device into the US market. No radio frequency transmitting devices are permitted to be made available for public use or marketed unless they have a equipment authorization certification grant. *



* Certain licensed applications, i.e. broadcast transmitters, have a site specific license that includes the device transmitters.

2 Technical Evaluation

In this guide, we will describe the process for certification in two stages. First, the **technical evaluation** steps will be presented followed by the steps for the **administrative evaluation.**

Although FCC certification applies to many different FCC rule parts, i.e. Part 90, Part 22, Part 27, this discussion will focus only on low power (less than 1 Watt) intentional transmitters regulated in CFR Title 47 Part 15C.

> Step 1 (Tech Eval) - Confirm Rule Part & Requirements

Well in advance of any testing and before the technical review, a wireless designer should identify the applicable rules and technical requirements that apply to the device, its application, and for the frequency range selected.

All low power transmitters authorized under Part 15C, actually operate over licensed frequency bands. These licensed bands are assigned to specific users and applications. They include emergency responders, private business radios, cellular phone operators, TV and radio stations, radio astronomers, and many others.

In order to prevent interference to licensed users, all Part 15C transmitters have to operate within the constraints specified in the FCC rule parts. The rules set specific frequencies for operation and draw limits for transmit power, spurious emissions, occupied bandwidth, duty cycle, and various other transmit characteristics.

The rules for Part 15C transmitters also prevent interference to users on restricted bands such as the military, commercial aviation, and other important government agencies.

It's critical to fully understand the compliance requirements for wireless communication in order to avoid complications and to successfully and quickly deploy a compliant transmitter. Manufacturers should seek early regulatory guidance from a knowledgeable certification specialist and consider performing some level of pre-compliance testing to validate and optimize device performance before formal certification steps begin.

Transmitters must be tested in specific operating modes, at defined frequencies, modulations, data rates, and enabled with special transmit messaging.

The exact configuration requirements depends on the applicable rule part and transmitter technology. Contact Elite for guidance on rule part selection, understanding regulations, and test setup details.

The following steps will help guide you to prepare for transmitter testing.

2 Technical Evaluation

> Step 2 (Tech Eval) - Prepare Transmitter for Testing

In general, a single sample of the transmitter is required for compliance testing. However, it's required to operate a device in its normal mode of communication as well as in several other conditions. The specific requirements depend on the type of transmitter and applicable rule parts. The following examples are representative of the operating conditions that are commonly required for Part 15C compliance tests. Contact Elite specialists to review your device configuration and other steps to prepare for testing.

15.231 ex. Remote Keyless Entry, Door openers
Transmit in its normal mode of operation
Transmit continuously with all modulations


15.249 ex. industrial automation, remote controls
Transmit in its normal mode of operation.
Transmit continuously with all modulations
Transmit at specified frequencies Low, and/or Mid, and/or High as per 15.31(m)

15.247 (DTS) ex. WiFi, BLE, Zigbee
Transmit in its normal mode of operation.
Transmit continuously with modulation at low, mid, and high channels as per 15.31(m)
Transmit at all applicable data rates, bandwidth settings, and modulations

15.247 (FHSS)
Transmit in its normal mode of operation.
Transmit continuously without hopping at low, mid, and high channels as per 15.31(m)
Transmit at all applicable data rates, bandwidth settings, and modulations

15.247 (FHSS & DTS Hybrids) ex. Bluetooth
Transmit in its normal mode of operation.
Transmit continuously without hopping at low, mid, and high channels as per 15.31(m)
Transmit at all applicable data rates, bandwidth settings, and modulations

2 Technical Evaluation

> Step 2 (Tech Eval) - Prepare for Testing: Antennas, Receivers, and AC Mains

Depending on the type of product features associated with the transmitter, other test preparation may be required. Preparation may be required to configure device power and to test all applicable antenna options. Also, in some cases receiver testing is necessary.

Antenna Types

- Monopole
- Dipole
- Patch
- PIFA
- Inverted F
- Slot
- Slotted waveguide
- Others
- Yagi
- Loop
- Log Periodic
- Parabolic
- Corner Reflector
- Array
- Horn
- Others

For transmitters with several antenna options, testing is required for each antenna type to be used with the device. Each different type of antenna should be listed on the grant as being approved for use with the transmitter. Be certain each antenna has a unique connector (per 15.203).

If there are similar antenna types having different gain characteristics then only one representative antenna type is required for testing but it must be the version having the highest gain.

Receivers

Superheterodyne receivers that tune between 30MHz-960MHz are required to be tested for:

- Part 15.109 radiated emissions
- Part 15.111 antenna port emissions

For either or both measurements, it's necessary to tune the receiver to a low, and/or mid, and/or high receive channel per 15.31(m).

Receivers separately powered from the AC Mains may also require conducted AC mains emissions testing (as noted to the right).

Superregentive receivers that tune between 30MHz-960MHz will also require testing noted for superhet receivers, but likely at a single tuned frequency.

AC Mains Port

- Direct Connection- If the transmitter receives power directly from the AC Mains then conducted emissions measurements are required at the mains terminals. Ensure the transmitter is prepared for 60Hz mains power.
- Indirect Connection- If the transmitter receives power indirectly through an AC/DC adapter, a USB connection, or host device then conducted emissions are measured at the AC Mains side of the device providing power. The manufacturer/client should provide a typical adapter, USB connector and adapter, or host suitable for connection to the AC Mains.
- Battery Powered- If the device includes an integral rechargeable battery then the manufacturer/client should provide the charger with a connection to the AC mains. Tests are then made on the AC mains side of the charger.

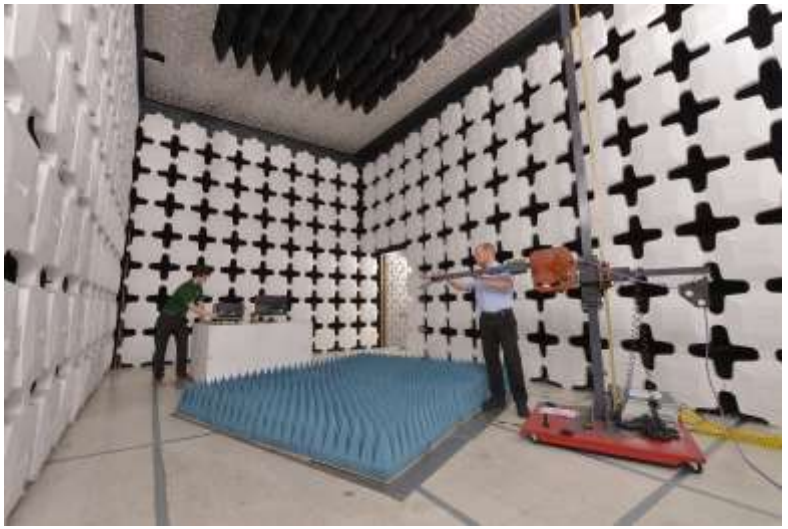
2 Technical Evaluation

> Step 3 (Tech Eval) - Perform Tests & Submit Reports

Wireless transmitter testing takes place in an absorber lined shielded enclosure (a 3 or 10 meter chamber) as well as in open free space. Some testing also occurs in a temperature controlled chamber.

The duration and cost for testing depends on the type of transmitter, receiver, and the required modes of operation. Typically, anticipate 7-14 days to schedule a start date and to prepare the transmitter for testing. Next, plan 2-3 days of testing for a single 15.231 transmitter and up to 3-4 days for a single 15.247 digitally modulated transmitter (ex. 2.4Ghz WiFi 802.11b/g/n). At Elite, test reports are usually delivered within 10 business days.

If submitting test results to Elite's TCB from a lab other than Elite, confirm the lab is accredited to ISO 17025. Recent changes to FCC rules now only allow test data from accredited labs.



Transmitters that are hand held, body worn, or operate within 20cm of a person may require an evaluation for hazards from RF exposure and Specific Absorption Rate (SAR). A SAR test report is required to be submitted as an exhibit for technical evaluation. Maximum Permissible Exposure (MPE) requirements may apply for transmitters that operate at distances greater than 20cm with power levels above limits based on transmit frequency. Contact Elite for MPE calculations or SAR testing.

3 Administrative Evaluation

In parallel with the technical evaluation, it's suggested to proceed with the second part of the certification process, the **administrative evaluation**.

The purpose of the administrative evaluation is to ensure that the product is properly identified so it can be easily associated with the manufacturer or the organization responsible for placing it on the market.

The administrative evaluation checks that the organization responsible for the transmitter is known to and registered with the FCC. The administrative evaluation also looks at the information collected on the transmitter and confirms submitted documents meet the FCC's criteria of acceptance. Once collected, the TCB will upload the transmitter information into the FCC database where it becomes a publicly viewable record of compliance.

The rigor associated with a third party TCB administrative evaluation provides the assurance that all transmitters operating in the market are using their share of spectrum properly and in a manner that will facilitate the operation of all like transmitters and increase the likelihood of successful coexistence of all users.

The next sections will describe in greater detail the steps required to register for certification and then describe the exhibits and documents that are required for submittal to the TCB.

Administrative Exhibits

Company Information & Documents
- ✓ FRN Number
- ✓ Grantee Code
- ✓ Certification Agreement
- ✓ Application
- ✓ Confidentiality Agreements
- ✓ Agent Agreements

Product Information Exhibits
- ✓ Technical Description
- ✓ Block Diagram
- ✓ Schematics
- ✓ Bill of Materials
- ✓ Internal/External Photos
- ✓ Test Setup Photos
- ✓ FCC ID Label & Placement
- ✓ User/Operators Manual
- ✓ Test Reports

3 Administrative Evaluation

> Step 1 (Admin Eval) - Company Registration & Grantee Information

One of the very first steps in the certification process is to register with the FCC as a business entity responsible for placing a wireless transmitter in the US market.

Step 1-A Obtain or confirm the FRN Number.

First time certification filers will need to obtain a FCC Registration Number, or FRN. This registration process is relatively simple and is performed on-line at the FCC website. There is no fee associated with obtaining a FRN. This process must be completed by the organization that will be listed on the certification.

If you have an FRN but need to modify information associated with it or if you need to locate your FRN, the website provides search and update utility to assist.

https://apps.fcc.gov/coresWeb/publicHome.do

https://apps.fcc.gov/eas/RegisterGrantee.do

Step 1-B Obtain or confirm the Grantee Code

First time certification filers will need to obtain a Grantee Code through the FCC on-line registration website. You will need your FRN number to obtain a Grantee Code and there is a nominal fee charged.

The grantee code is permanently assigned, valid only for the grantee in the code assignment, and should be used for all subsequent certifications. Any changes in registration or transfer of ownership should be reported to the FCC so that a new grantee code can be assigned or modified.

The grantee code is the first 3 (or 5) characters of a products FCC ID number and it identifies the organization associated with certification. In addition, grantees are assigned a Grantee Code Number (GCN#), which will be required for updates to grantee code information as well as for other transactions with the FCC.

http://transition.fcc.gov/oet/ea/granteecode_info.html

3 Administrative Evaluation

> Step 2 (Admin Eval) - Certification Agreement

The next step is to complete a certification agreement.

The **Certification Agreement** describes the process and rules by which the client must abide during the certification evaluation and for the entire time that the certified product is being marketed. A signed copy of the certification agreement must be included with every submission.

The terms of the certification agreement are set by the FCC and by the provisions of Elite's ISO 17065 certification quality system.

Key Provisions in Elite's **Certification Agreement** include:

- Devices shall be produced to the same specification as originally evaluated.
- Elite may rescind a certification within 30 days for administrative errors.
- After 30 days, the FCC may revoke a certification (per FCC 2.939).
- Changes to a certified device must be notified to Elite.
- Grantee cannot reference Elite or the FCC as endorsing the certified product.
- Client shall notify Elite of any compliance related complaints.
- Surveillance samples must be provided when requested.
- All client information posted to the FCC website is publicly accessible.
- Proprietary information can be designated as confidential.

Elite

Certification Agreement

COMPLETE EMC/ENVIRONMENTAL TESTING AND CONSULTING

Client: [Client name here] Date: [date sent]

[Client address]
[Client address]
[Client address]

This **CERTIFICATION AGREEMENT** (" Agreement") is made effective as of [date], by and between Elite Electronic Engineering, Inc. (ELITE) and [Clients name here] (Client) (collectively referred to as "the Parties").

In consideration of the mutual covenants in this Agreement, ELITE or its subcontractors will perform evaluation for certification, as mutually agreed, to determine if Client's device(s) (hereinafter "Devices") identified in the application and exhibits for certification are in compliance with the laws, regulations and technical standards specified by:

a) the United States Code of Federal Regulations Title 47
and, or
b) the Industry Canada Radio Standard Specifications
(hereinafter "Certification Regulations") for such Devices, and are thereby eligible for certification by ELITE.

1. General

1.1 This Agreement is for the purpose of certification, as mutually agreed, and applies to all certifications for the Devices, which will be performed in accordance with the Certification Regulations. This Agreement is limited to its express terms, specifications and conditions. It supersedes any prior or contemporaneous oral or written communications, memoranda or other understanding made between the Parties, unless otherwise specified herein.

1.2 ELITE retains full discretion to determine if the Devices are compliant with the Certification Regulations. In the event that certification is not issued for the aforementioned Devices, ELITE agrees to advise Client in writing of the reasons therefor.

1.3 This Agreement may not be assigned to or acquired by any other person, firm, or corporation without ELITE's written authorization.

1.4 The Client agrees to apply the certification only to Devices produced to the same specifications as the sample that Elite found to be in compliance with the Certification Requirements with only modifications allowed per Section 3 of this Agreement.

2. Scope of Performance

2.1 The scope of performance between the Parties is set forth in the quotation for proposed services provided by ELITE and accepted by Client. The application and exhibits for certification identifies the Devices for which certification is sought, and CFR 47 and/or the applicable Industry Canada RSS lists the applicable Certification Regulations to which such Devices are to be evaluated for certification. The client shall comply with the relevant provisions of the certification program.

2.2 Upon ELITE's reasonable request, Client shall supply ELITE, at no charge, with all technical documentation and materials required for the evaluation of such Devices and Support Equipment (as defined in Section 5.2). Technical documentation and materials include, but are not limited to, any relevant operating instructions, schematics, block diagrams, or photographs. Client shall provide all technical documentation to ELITE in electronic format, i.e. floppy disk, CD-ROM, or e-mail file attachment or as mutually agreed by the Parties. Client shall supply a copy of records (including internal audit reports) and appropriate personnel required for evaluation (e.g. testing, inspection, assessment, surveillance, reassessment) and resolution of complaints.

Page 1 of 8

www.elitetest.com/engineering-services/certification-services

3 Administrative Evaluation

> Step 3 (Admin Eval) - Certification Application

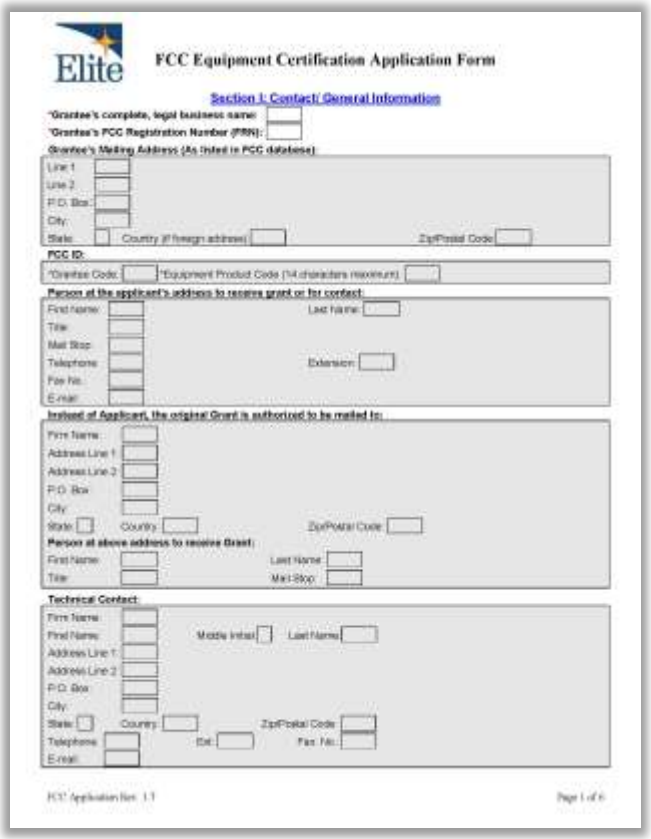
Along with the certification agreement, a **Certification Application** must be submitted with every new certification. A new application is also required for any Class II (or III) permissive change.

The application form collects information on the grantee, person to be named on the grant, authorized representatives, the test laboratory, and on the product being certified.

The application form identifies the client's requests for exhibit confidentially and for the deferral of the certificate release. It also identifies if the grant will apply to a new certification, permissive change, modular certification, composite device, or for a software defined radio.

The application form is used to create the equipment authorization grant (certificate). It must be signed by the applicant or by an agent authorized by the grantee.

The application also requires an attestation by the grantee or agent that neither is subject to denial of Federal Benefits, including FCC certification, because of prior conviction for possession or distribution of a controlled substance. For more information, review the US Department of Justice Section 5301 The Anti-Drug Abuse Act of 1988.


Elite

FCC Equipment Certification Application Form

Section 1: Contact/ General Information

'Grantee's complete, legal business name:

'Grantee's FCC Registration Number (FRN):

Grantee's Mailing Address (As listed in FCC database)

Line 1

Line 2

P.O. Box

City

State Country (if foreign address) Zip/Postal Code

FCC ID:

'Grantee Code 'Equipment Product Code (14 characters maximum)

Person at the applicant's address to receive grant or for contact:

First Name Last Name

Title

Mail Stop

Telephone Extension

Fax No.

E-mail

Invoice of Applicant, the original Grant is authorized to be mailed to:

Firm Name

Address Line 1

Address Line 2

P.O. Box

City

State Country Zip/Postal Code

Person at above address to receive Grant:

First Name Last Name

Title Mail Stop

Technical Contact:

Firm Name

First Name Middle Initial Last Name

Address Line 1

Address Line 2

P.O. Box

City

State Country Zip/Postal Code

Telephone Ext Fax No.

E-mail

FCC Application Rev 1.7 Page 1 of 6

www.elitetest.com/engineering-services/certification-services

3 Administrative Evaluation

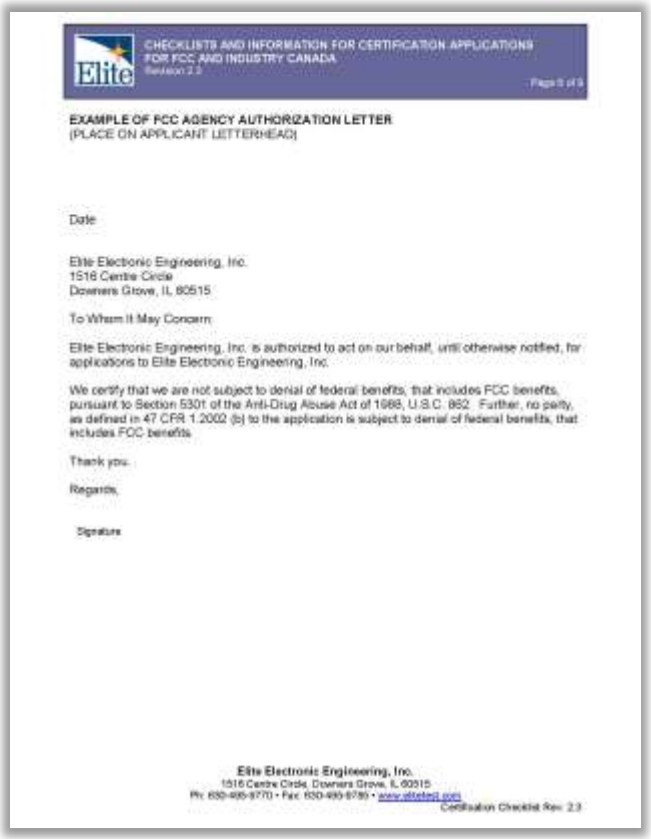
> Step 4 (Admin Eval) - Agency Authorization Letter

An **Agency Authorization Letter** must be provided if the person signing the Certification Application is different than the person listed as the Grantee holder.

Instances where an agency authorization letter is required include:

- Application and document signatories are different than individual identified with the grantee code.
- When using an agent who is not a direct employee of the grantee company to prepare documentation and exhibits.

Elite provides an example of the letter that can be copied to the applicants letterhead and signed.



CHECKLISTS AND INFORMATION FOR CERTIFICATION APPLICATIONS FOR FCC AND INDUSTRY CANADA

EXAMPLE OF FCC AGENCY AUTHORIZATION LETTER
(PLACE ON APPLICANT LETTERHEAD)

Date

Elite Electronic Engineering, Inc.
1516 Centre Circle
Downers Grove, IL 60515

To Whom It May Concern:

Elite Electronic Engineering, Inc. is authorized to act on our behalf, until otherwise notified, for applications to Elite Electronic Engineering, Inc.

We certify that we are not subject to denial of federal benefits, that includes FCC benefits, pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, U.S.C. 862. Further, no party, as defined in 47 CFR 1.2002 (b) to the application is subject to denial of federal benefits, that includes FCC benefits.

Thank you.

Regards,

Signature

Elite Electronic Engineering, Inc.
1516 Centre Circle, Downers Grove, IL 60515
Ph: 630-489-9770 • Fax: 630-489-9780 • www.eliteinst.com
Certification Checklist Rev. 2.3

3 Administrative Evaluation

> Step 5 (Admin Eval) - Confidentiality Letter

The client's exhibits are required to be posted to the FCC website database and when uploaded these exhibits are accessible to the general public. Some documents are considered manufacturer proprietary intellectual property (IP) and the FCC allows IP to be uploaded but inaccessible to the public. This lock-out feature is elected by the grantee through a confidentially request made on the application and provided with a separate "Request of Confidentially" letter.

The FCC rules offer two levels of confidential treatment, permanent and short-term. Permanent confidentiality is available for schematics, block diagrams, parts lists, tune-up procedure, and operational or technical descriptions. Unique exceptions are available for permanent confidentiality applied to internal photos and user manuals through a permit-but-ask procedure.

Short-term confidentiality can be applied to those documents not generally available for permanent confidentially, i.e. Internal/external photos, test setup photos, and operator manuals. The documents can be held from public access for a maximum of 180 days as long as device is not being marketed.

Short-Term Confidentiality can be requested for a maximum of 180 days from the date of the grant. If the Short-Term Confidentiality has expired, a request to re-instate Short-Term Confidentiality must be submitted as an exceptional circumstance inquiry request. Also, if you market before the requested STC timeframe is over, you must notify the Elite or the FCC to lift the short-term confidentiality.

Elite provides an example of the letter (right) that can be copied to the applicants letterhead and signed.

CHECKLISTS AND INFORMATION FOR CERTIFICATION APPLICATIONS FOR FCC AND INDUSTRY CANADA

EXAMPLE OF FCC/IC CONFIDENTIALITY LETTER
(PLACE ON APPLICANT LETTERHEAD)

Date: _____

Subject: Confidentiality Request for _____ (Insert FCC ID and/or IC ID) _____

Pursuant to FCC 47 CRF 0.457(d) and 0.459 and IC RSP-100, Section 10, the applicant requests that a part of the subject FCC application be held confidential.

Type of Confidentiality Requested		Exhibit
☐ Short Term	☐ Permanent	Block Diagrams
☐ Short Term		External Photos
☐ Short Term	☐ Permanent*	Internal Photos
☐ Short Term	☐ Permanent	Operation Description/Theory of Operation
☐ Short Term	☐ Permanent	Parts List & Placement/BOM
☐ Short Term	☐ Permanent	Tune-Up Procedure
☐ Short Term	☐ Permanent	Schematics
☐ Short Term		Test Setup Photos
☐ Short Term	☐ Permanent*	User's Manual

*Note: _____ (Insert Explanation as Necessary) _____

_____ (Insert Company Name) _____ has spent substantial effort in developing this product and it is one of the first of its kind in industry. Having the subject information easily available to "competition" would negate the advantage they have achieved by developing this product. Not protecting the details of the design will result in financial hardship.

Permanent Confidentiality:
The applicant requests the exhibits listed above as permanently confidential be permanently withheld from public review due to materials that contain trade secrets and proprietary information not customarily released to the public.

Short-Term Confidentiality:
The applicant requests the exhibits selected above as short term confidential be withheld from public view for a period of ___ (specify number of days not to exceed 180) ___ days from the date of the Grant of Equipment Authorization and prior to marketing. This is to avoid premature release of sensitive information prior to marketing or release of the product to the public. Applicant is also aware that they are responsible to notify ELITE ELECTRONIC ENGINEERING, INC. in the event information regarding the product or the product is made available to the public. ELITE ELECTRONIC ENGINEERING, INC. will then release the documents listed above for public disclosure pursuant to FCC Public Notice DA 04-1705.

NOTE for Industry Canada Applications:
The applicant understands that until such time that IC distinguishes between Short Term and Permanent Confidentiality, either type of marked exhibit above will simply be marked Confidential when submitted to IC.

Sincerely,

By: _____ (Signature/Title) _____ (Print name)

Elite Electronic Engineering, Inc.
1516 Centre Circle, Downers Grove, IL 60515
Ph: 630-495-9770 • Fax: 630-495-9780 • www.eliteeng.com

Certification Checklist Rev: 2.3

4 Administrative Evaluation

Product Information

In addition to the agreements, application, and confidentially requests the client/applicant is required to submit a series of technical exhibits describing the wireless device.

Each of the product technical exhibits must be submitted to Elite as separate files. These files are reviewed by an Elite certification specialist and then placed on the FCC certification database.

Exhibits must be 6MB or less. Files larger than 6MB can be divided into 6MB or less sections. Acceptable exhibit formats include Adobe PDF.

Administrative Exhibits

Product Information Exhibits

- ✓ Technical Description
- ✓ Block Diagram
- ✓ Schematics
- ✓ Bill of Materials
- ✓ Internal/External Photos
- ✓ Test Setup Photos
- ✓ FCC ID Label & Placement
- ✓ User/Operators Manual
- ✓ Test Reports

4 Administrative Evaluation

> Step 6 (Admin Eval) - Technical Description Exhibit

The technical description should provide a brief overview of the device in its intended application and outline the basic operations with primary focus on the RF transmission circuitry. It should identify the transmitter type, i.e. a coherent narrowband transmitter, or digital modulated, frequency hopping, or ultra-wide bandwidth type technology. It should describe the ground system and antenna.

In many cases the radio catalogue sheet will contain the majority of the information and explanation required for this exhibit. As applicable, the information listed on the right should be included in the technical description. The technical description is used during the evaluation to compare the actual device findings to the stated description.

The Technical Description exhibit may be held confidential if included in the Confidentiality Request.

TECHNICAL DESCRIPTION (theory of operation)

Radio Characteristics

Radio module name and type
Output Power (conducted)
Lowest/highest Frequency
Number of Channels
Channel Bandwidth
Channel Spacing
Transmitter duty cycle
Actuation (manual/auto)
Hop dwell time & Pseudo-Random table
Modulation types
Data rates
Frequency deviation
Grounding systems

Antenna System

Antenna type
Gain
Connector type
Mounting location from transmitter
Antenna cable length and loss
Spacing distance from operator

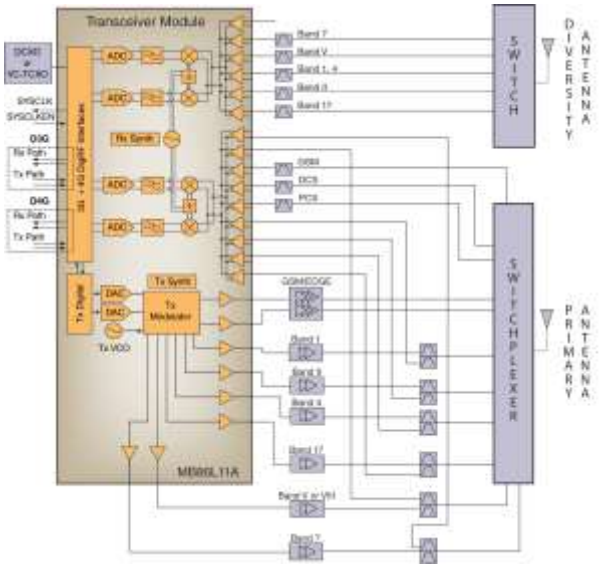
Receivers

Receiver type, i.e super-het
High/Low Freq
Local Oscillator Frequency
Sensitivity
Number of Channels

4 Administrative Evaluation

> Step 7 (Admin Eval) - Block Diagram and Schematics

Two key technical exhibits are the block diagram and schematics. These documents are required to provide the technical reviewer a basic understanding of the device operation and to facilitate the assessment of it's suitability and compliance with the applicable rule parts. Generally it's necessary to illustrate any frequency determining or frequency stabilizing circuits and device parameters.



- Block Diagram Exhibit - Illustrate the frequency of all oscillators in the transmitter portion of the device, signal path and frequency of each block, and tuning ranges for each block.
- Schematic Exhibit- Include drawings for ALL circuitry and devices that are used to provide or stabilize frequency, suppress spurious emissions, limit modulation or power. Components and component values must be legible and pages must be titled. This exhibit should be one single PDF document.
- Bill of Materials Exhibit- For Part 15C certifications, a bill of materials or parts list is optional.

The exhibits also serve to establish a record of the device configuration at the time of certification. Any changes that occur to the device after certification may be subject to a reassessment following the process for a Class II permissive change.

Note that block diagrams, schematics, and bill of material exhibits may be designated as confidential information. Confidential exhibits are still required to be submitted but they will not be accessible to the public on the FCC website database.

4 Administrative Evaluation

> Step 8 (Admin Eval) - Photographs

Provide detailed color photos of the following:

Internal photographs of the transmitter- Top and bottom of each circuit board

- Illustrate the placement of the PCB in the chassis
- Circuity with and without shields
- Circuitry with and without any insulating covers

External photographs of the transmitter-

- Illustrate the overall appearance of the device
- Device with antenna used, if any
- Controls available to the user

Test Setup Photographs-

- Show any peripherals or accessories connected or installed at the time of testing
- Include a description of the peripherals/accessories in the test report

4 Administrative Evaluation

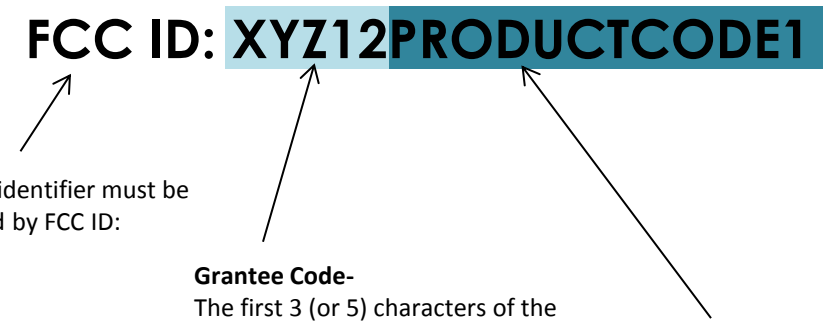
> Step 9 (Admin Eval) - Create an FCC Identifier (FCC ID Number)

FCC Identifier (FCC ID Number)

All certified transmitters are required to have an FCC Identifier, also known as an FCC ID Number or just the FCC ID. The FCC ID shall consist of the grantee code assigned by the FCC followed by a unique product code assigned by the grantee.

Correctly Formatted FCC ID Numbers
FCC ID: XYZ12A
FCC ID: XYZ12-A
FCC ID: XYZ12-1
FCC ID: XYZ12123456789012345
FCC ID: XYZ12-1234567890123
FCC ID: XYZ12-234-678-012-4

Incorrectly Formatted FCC ID Numbers
XYZ12A
FCC ID: XYZ12-a
FCC ID: XYZ12-&
FCC ID: XYZ12123456789012345
FCC ID: XYZ12@1234567890123



The FCC identifier must be preceded by FCC ID:

Grantee Code-
The first 3 (or 5) characters of the FCC identifier are the grantee code. Legacy grantee codes are 3 characters. New grantee codes are 5 characters.

Product Code-
The equipment product code is created by the grantee

- Only Arabic numerals and/or capital letters are allowed.
- A dash or hyphen (-) is allowed.
- No other characters, spaces, or lower case letters are allowed
- The total of all numerals, letters and dashes shall not exceed 14
- The product code must be unique for each certified product

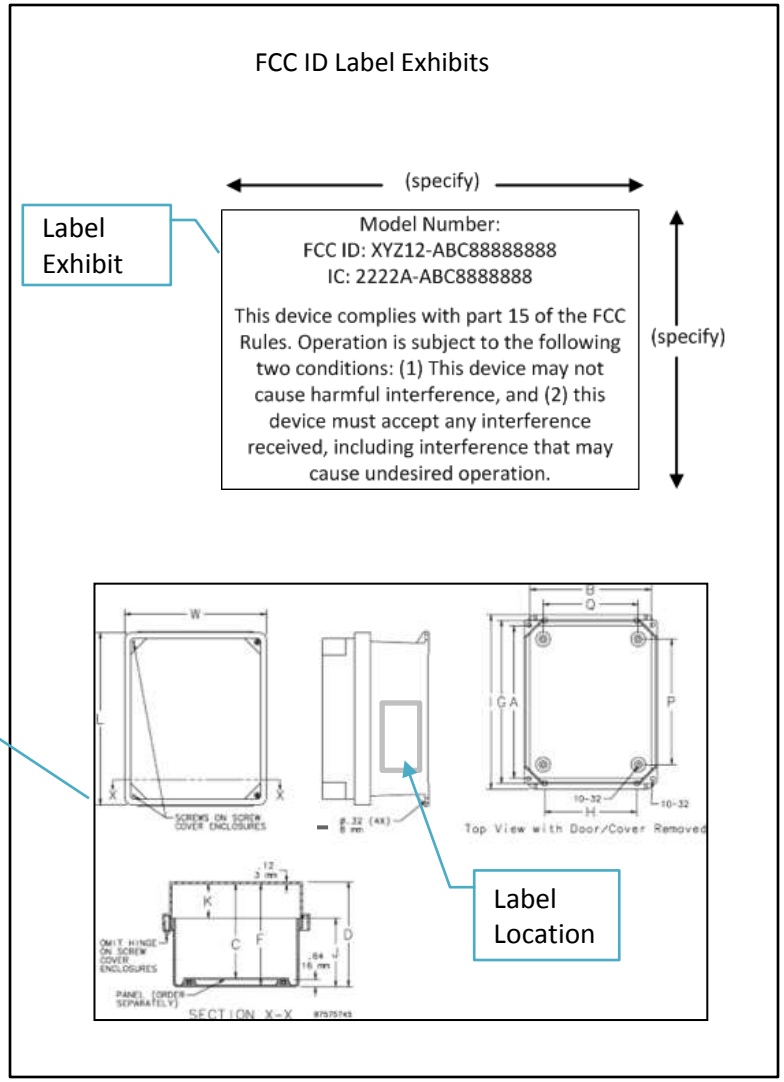
4 Administrative Evaluation

> Step 10 (Admin Eval) - FCC ID Label Exhibits

There are two label exhibits that must be prepared and submitted for review. The first is a drawing or photo of the label itself illustrating the FCC ID, company name, and compliance statement with a reference to basic dimensions.

The second exhibit can be a drawing or photo that describes the placement of the label on the transmitter.

The label and label placement can be submitted as separate items or the details can be placed on a single document, as is illustrated here.



4 Administrative Evaluation

> Step 10 (Admin Eval) - FCC ID Label Exhibit Details

Label requirements- **General**

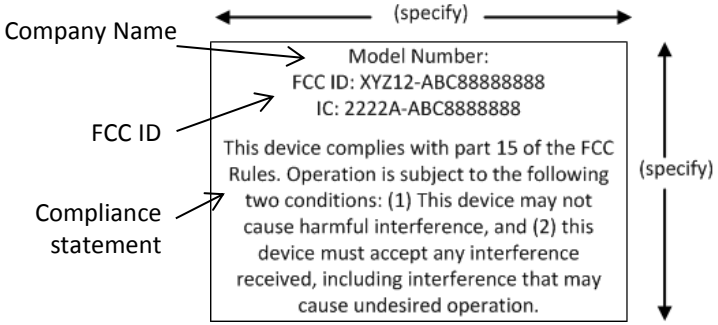
- In nearly all cases both the FCC ID and company name must be included on the device or be presented as an electronic label.

Label requirements- **Font Type and Size**

- Any font type and size is suitable so long as it is legible.
- Text size of 6 to 8 point is recommended.
- Text size is not required to be larger than 8 point.
- If the device is unquestionably too small for the FCC ID to be readable (smaller than 4-6 points), the FCC ID may be placed in the user manual.
- However, it must be determined that the device itself is too small – the label area allocated to the FCC ID may not be reduced because of over crowded identification of other product and regulatory information.
- Justification for placing the FCC ID in the manual must be submitted with the initial application for certification for review and approval.

Label requirements- **Compliance Statement**

- If the device is “palm-sized” (8 x 10 cm) or larger then the compliance statement shall be included on the label.
- If the device is smaller than 8cm x 10cm then the compliance statement may be removed from the label but must be included in the user manual.
- Alternatively, for uniquely small devices or special circumstances the compliance statement can be placed on the container in which the device is marketed



Small devices can be limited to just the FCC ID and company name.
The compliance statement can be placed in user manual.

Note: Labels above illustrate FCC and Industry Canada ID numbers

4 Administrative Evaluation

> Step 10 (Admin Eval) - FCC ID Label Exhibit Details

Label requirements- **Affixing the Label**

- The label can be a stand alone substrate, i.e. vinyl, plastic, metal
- The label can be etched, engraved, stamped, or silkscreened
- It can be indelibly printed or otherwise permanently marked.
- Attached by welding, riveting, or a permanent adhesive.
- Must not be readily detachable
- The manner in which the label is affixed shall be described.

Label requirements- **Label Materials**

- Generally any material may be used, so long as the label material and printed information is designed to last the expected lifetime of the equipment.
- Paper labels are not allowed because stick-on paper is not considered permanent.

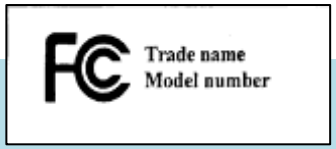
Label requirements- **Other Statements and Logos**

- It is typically not necessary to include the FCC Logo on a certified transmitter, in fact if the authorization does not require a logo then it should not placed.
- The FCC Logo will only be required if the certified transmitter can also operate as a composite device in a mode where its equipment authorization must include Declaration of Conformity (DoC). See below for DoC logo details.

Embossed FCC ID and compliance statement

DoC Label (assembled from parts)

DoC Label



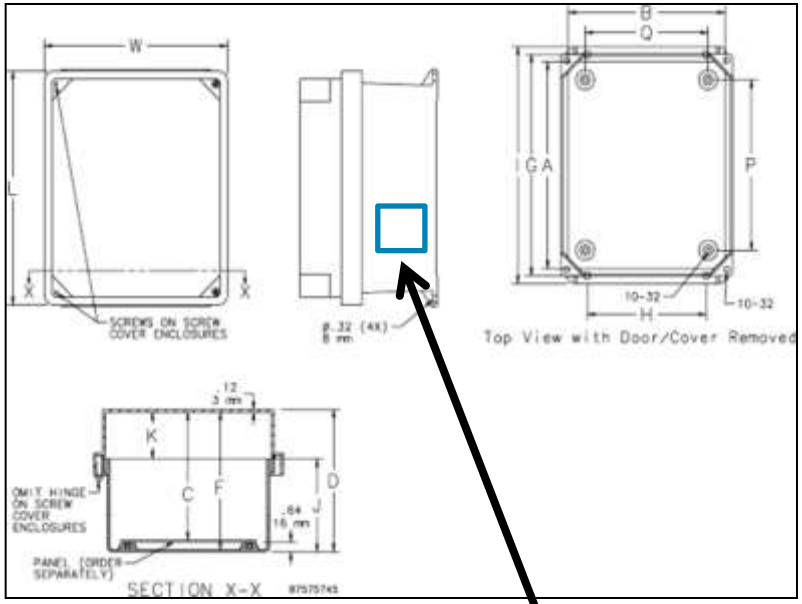
This logo is required if the transmitter operates in a mode where it is considered a personal computer and authorized under DoC based on assembly using separately authorized components, and the resulting product is not separately tested.

4 Administrative Evaluation

> Step 10 (Admin Eval) - FCC ID Label Placement

Label requirements- **Label Location**

- Must be visible to the user, at least at the time of purchase or first use.
- Must not be on a detachable part of the device like a battery cover or any other part that can be separated from the main transmitter housing and lost.
- Can be in an enclosed space so long as the label is viewable to the user at the time of purchase. For example, it can be located in a battery compartment but the device will have to be shipped without batteries and in a manner that when the user assembles the batteries into the device that they will clearly see the label.
- The enclosed space label location must not require any special tools for access.



Label Location on exterior of enclosure

4 Administrative Evaluation

> Step 10 (Admin Eval) - FCC ID Label Exhibit Details

FCC ID “e-label”

Wireless transmitters with integrated displays can present the required label information electronically (e-label) in lieu of a physical label or nameplate.

The FCC ID and/or the Declaration of Conformity (DoC) logo (if applicable) can be displayed along with any other information required by specific rule to be provided on the surface of the product unless such information is permitted to be included in the user’s manual or other packaging inserts.

e-label users must be able to access the information without requiring special access codes, permissions or supplemental plug-ins, and within no more than three steps of a device’s menu.

Specific instructions on how to access the information must be provided in the users manual or other instructions, or can be made accessible on the product website. Documentation on the web-based instructions must be provided. These access instructions must be provided as one of the labeling exhibits.

Products subject to both certification and Declaration of Conformity or certification and Verification can use the e-label guidance by displaying both the FCC ID and an image of the FCC DoC Logo, or FCC ID and product identification as required by the rules.

e-labeled products must be shipped with a physical label and required information on the product at the time of sale (or import/marketing).

A removable adhesive label or a label on a protective bag is acceptable so long as it is removed by the customer after purchase.

4 Administrative Evaluation

> Step 11 (Admin Eval) - User/Operators Manual Exhibit

The following information (as a minimum) is required to be included in the users guides or instruction manuals.

- ✓ Compliance statement per 15.19(3)
- ✓ Modifications to the device per 15.21
- ✓ RF Hazards (if applicable)
- ✓ Antenna separation distances
- ✓ Special instructions on use and assembly of equipment
- ✓ Composite modes with digital devices may need the 15.105 statement

- When applicable, the grantee must include information concerning minimum separation distances from radiating structures and how to properly install antennas.
- Where special accessories such as shielded cables and/or special connectors are required for compliance, the manuals shall include accessory installation instructions on the first page.
- If the certified transmitter can also operate in a mode as a Class A or B digital device then include the compliance statement as noted in FCC 15.105.
- Other compliance statements may be required depending on the operating modes and applications. See list (right).
- All user information can be provided in a printed manual, computer disk, or over the Internet.

Rule Part 15.19(3) compliance statement:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Rule Part 15.21 statement:

Any changes/modifications to this equipment not approved by (insert grantee name) could void the user's authority to operate the equipment.

Additional Specific User Manual Instructions

- ✓ Kits for TV interface & cable. 15.25(d);
- ✓ TV interface devices. 15.115 (c)(5);
- ✓ Digital cable ready products 15.123
- ✓ External power amplifiers 15.204(d)(2)
- ✓ Cordless phones. 15.214(c) & (d)(3) 15.233(b)(2)(ii), 15.233(h)
- ✓ Professionally installed systems. 15.247(c)(1)(iii);
- ✓ Operations at 92-95GHz. 15.257(a)(4)
- ✓ Unlicensed PCS. 15.311

4 Administrative Evaluation

> Step 12 (Admin Eval) - Test Reports Exhibits

The compliance test reports shall be provided as a separate exhibit. Provide all applicable reports including the Part 15C radio testing along with any SAR testing or MPE calculations.

As a minimum the reports should include the following information:

- ✓ Identify procedures used
- ✓ Measurement dates
- ✓ Location of test lab
- ✓ Model and serial numbers for test items
- ✓ Sample calculations to illustrate how measurement results were converted for comparison to technical requirements.
- ✓ Justification for testing modifications or omissions.


Elite

Engineering Test Report No. 1403566-01

Measurement of RF Emissions from a GALAXY II Gateway Transceiver

For: Badger Meter, 4545 W Brown Deer Road, Milwaukee, WI 53223

P.O. Number: 276832
Date Tested: September 22, 2014 through September 26, 2014
Test Personnel: Mark Longinotti
Test Specification: FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Section 15.247 for Frequency Hopping Spread Spectrum Intentional Radiators Operating within the band 902-928MHz
Industry Canada RSS-GEN
Industry Canada RSS-210

Test Report By: Mark Longinotti, EMC Engineer

Requested By: Andy Davis, Badger Meter

Approved By: Raymond J. Klouda, Registered Professional Engineer of Illinois – 44804

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DOWNERS GROVE, IL 60515
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FAX: 630 - 495 - 9781
www.elitetest.com

4 Administrative Evaluation

> Step 13 (Admin Eval) - Modular Certification

The FCC provides an equipment authorization certification for modular transmitters. A single-modular transmitter is a self-contained physically delineated component that can demonstrate compliance independent of the host operating conditions, and complies with all eight of the following requirements

1. The radio elements must have the radio frequency circuitry shielded.
2. The module must have buffered modulation/data inputs to ensure that the device will comply with the Part 15 requirements with any type of input signal.
3. The module must contain power supply regulation on the module.
4. The module must contain a permanently-attached antenna, or contain a unique antenna connector, and be marketed or operated only with specific antenna(s).
5. The module must demonstrate compliance in a stand-alone configuration.
6. The module must be labelled with its permanently fixed FCC ID label, or use an electronic display.
7. The module must comply with all specific rules applicable to the transmitter. The grantee must provide comprehensive instructions to explain compliance requirements.
8. The module must comply with RF Exposure requirements. For any transmitters intended for use in portable devices, SAR compliance must be demonstrated to be independent of the host device.

A certification exhibit that describes compliance with all eight requirements shall be provided for the administrative review. Contact Elite for information on other types of modular approval, i.e. Limited modular and split modular certifications.

5 Certification Approval

Once the technical and administrative approvals are complete, the compliance file is evaluated by a impartial certification specialist who performs the final **Certification Approval**.

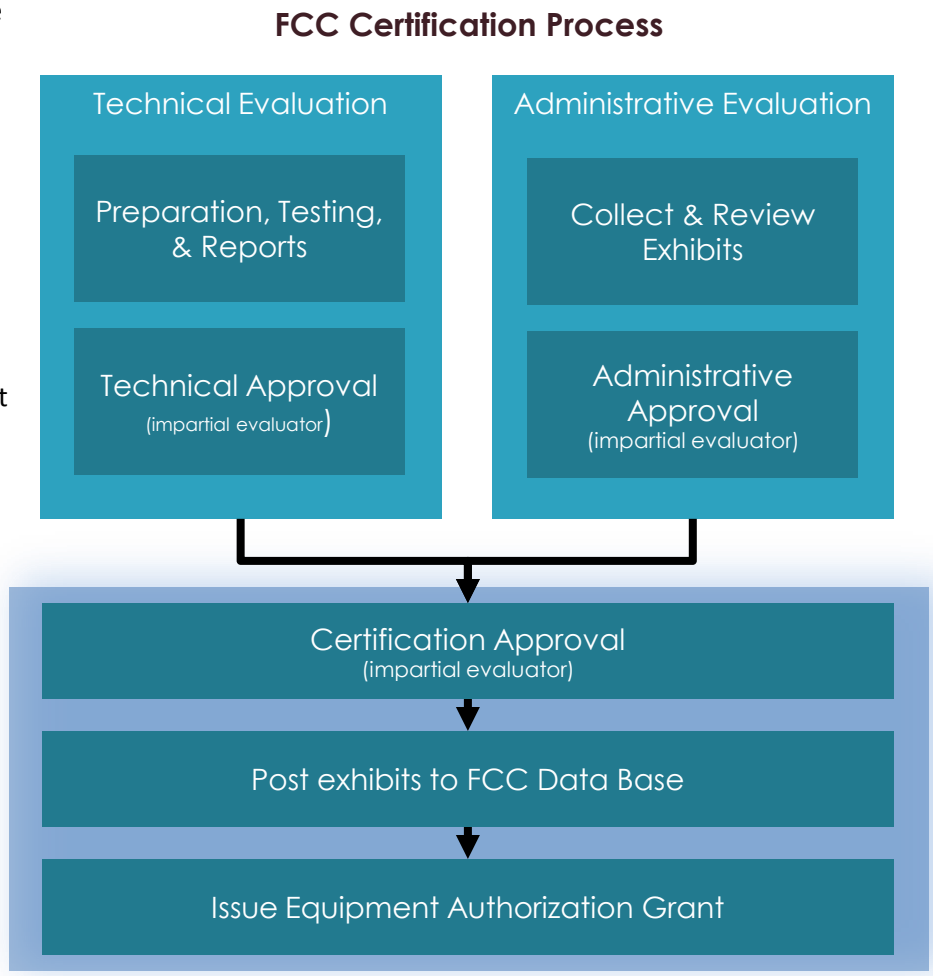
From there, the exhibits are posted to the FCC data base and the certificate is generated. At this point the wireless device can be marketed and sold.

Remember certifications can be rescinded within 30 days to address administrative errors and that the FCC always has the right to revoke any certification.

Also, certified devices are subject to surveillance testing and a device will need to be submitted to Elite upon request.

Any changes to the certified device should be communicated to Elite to determine if a permissive change process is required.

Class I permissive changes will require retesting for output power and spurious emissions, but do not need to be formally processed. Class II and III permissive changes require a formal permissive change evaluation.



6 Time Line

At Elite, our business is providing services that help our clients be successful in their markets. We can help speed the compliance process but the time-to-market for wireless transmitters depends on the client preparedness, device complexity, and compliance testing performance. By working closely with clients we can often expedite certifications and complete the work in as little as 6 to 8 weeks, or less.

We also provide compliance services for Canada, the European Union, and nearly all markets around the world.

Gain an advantage by starting your process early with Elite.

7 Final Comments

Contact Elite today to get moving quickly on your path to certification and market access. Keep in mind that we regularly complete Canadian, EU- CE Mark, and global compliance work along with the FCC tests and certification. This complete service saves time, cost, and adds convenience . We can help speed your effort from start to finish in all areas of regulatory and compliance tests and certification.

For more information on this topic contact the following Elite staff:

Steve Laya, Sales & Marketing Manager, 630-495-9770 x 119, sglaya@elitetest.com

John Schmit, Inside Sales Manager, 630-495-9770 x 125, jbschmit@elitetest.com

Robert Bugielski, Sales Engineer, NCE, 630-495-9770 x 168, rbugielski@elitetest.com

Dan Crowder, FCC/CE Mark Team Leader, 630-495-9770 x 101, decrowder@elitetest.com

www.elitetest.com/contact-us

8 Documents

The following documents provide additional information on the certification process:

- Elite Certification Application
- Elite Certification Agreement
- Elite Certification Checklist
- FCC Grantee Code 204515 D01 Grantee Code v01r01
- FCC Transmitter Module Equipment Authorization Guide Publication Number: 996369
- FCC Confidentiality Request Procedures 726920 D01 v01r01
- FCC Electronic Labeling guidance 784748 D02 e labelling v01
- FCC Guidelines for Labelling and User Information for Devices Subject to Part 15 and Part 18 784748 D01 v08
- FCC Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247

- Contact Elite for copies of these documents.