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Question: What is the FCC guidance for equipment authorization of transmitter module devices, and equipment that incorporates transmitter modules?

Answer: The attached document 996369 D01 Module Certification Guide v01 provides a guide for equipment authorization applications for Section 15.212\* Modular transmitters.

\*Currently, applications for single or limited single licensed modules may be permitted. See attachment below.

**Attachment List:**

[996369 D01 Module Certification Guide v01](#)

## Transmitter Module Equipment Authorization Guide

### I. Introduction:

A transmitter with a modular grant<sup>1</sup> can be installed in different end-use products (referred to as a host, host product, or host device) by the grantee or other equipment manufacturer, and each host is not required to obtain a separate certification for that specific transmitter module.

A modular grant is obtained by requesting certification for equipment as a modular device, or requesting a permissive change to convert an equipment certification from a non-modular to a modular device grant - in both instances using the FCC Form 731 application procedures (Section 2.1033, etc.). An applicant for a modular filing must indicate on the Form 731 the appropriate modular approval type, and submit the following additional exhibits: a cover letter requesting modular approval that includes an itemized list documenting compliance with the Section 15.212 rules, and includes clear and specific instructions describing the conditions, limitations and procedures for third-parties to use and/or integrate the module into a host device.

For modular approvals, the device description and grant conditions on the authorization must state the appropriate modular type and, if applicable, the limiting conditions in the 731 remarks section. Absent conformity with these specific requirements, a host product incorporating a certified device cannot take advantage of the pre-existing certification of the component transmitter module.

Modular approvals are for tangible clearly delineated devices that operate when installed within, or attached to a host in one of the following four physical configurations:

1. **Single-modular transmitter<sup>2</sup>**: a complete RF transmission system capable of demonstrating compliance with rules and policies independent of any host<sup>3</sup>.
2. **Limited single-modular transmitter**: a single-modular transmitter that complies with the Section 15.212(a)(1) modular rules only when constrained to specific operating host(s) and/or associated grant condition(s).

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<sup>1</sup> FCC Public Notice DA 00-1407 initially established policies that allowed for Part 15 unlicensed transmitter equipment authorization certification for a modular device. The Second Report and Order FCC 07-56 (Docket 03-201) established rules under Part 15 (Section 15.212 Modular Transmitters), provided clarification for modular grants, and established a new class for modular devices called split modules. FCC Public Notice DA 08-314 is another compliance guide to help small businesses; small organizations (non-profits) and small governmental jurisdictions, etc. comply with the Section 15.212 rules.

<sup>2</sup> Also called self-contained transmitter module (FCC DA 08-314).

<sup>3</sup> The definition is given in item 3 of FCC DA 08-314, a module generally consists of a completely self-contained transmitter that is missing only an input signal and power source to make it functional. A module is designed to be incorporated into another device, such as a personal computer, personal digital assistant (PDA) or utility meter.

3. **Split-modular transmitter:** a RF transmission system that complies with the requirements for a single-modular transmitter that is separated into a radio front-end section and a control-element section which can demonstrate compliance for a range of similar type hosts.
4. **Limited split-modular transmitter:** a split-modular transmitter that complies with the definition and technical rules for split modules only when constrained to specific operating host(s) and/or associated grant condition(s).

A modular grant for a device eliminates the need for a host product to obtain its own separate certification for the specific transmitter component; however, a host product is still required to comply with all other applicable equipment authorizations for other FCC regulations, requirements and equipment functions not associated with the transmitter module portion. Such requirements can include, for example, those for other transmitter components within the host product, and those for unintentional radiator (Part 15B) functions, such as a digital device, computer peripheral, radio receiver, etc.

This also includes the non-transmitter functions on the transmitter module. For example, Bluetooth and WiFi transmitter modules containing a receiver and possibly digital logic functions which are subject to other separate equipment authorizations (i.e., Verification, or Declaration of Conformity). To ensure compliance with all non-transmitter functions the host manufacturer is responsible to ensure compliance with the module(s) installed and fully operational. For example, if a host was previously authorized as an unintentional radiator under the Declaration of Conformity procedure without a transmitter certified module and then a module is added, the host manufacturer is responsible to ensure that the module installed and operational is compliant with Part 15B unintentional radiator requirements. Since this may depend on the details of how the module is integrated with the host, the grantee (party responsible for the module grant) shall provide guidance to the host manufacturer for compliance with Part 15B<sup>4</sup> requirements.

Single or limited-single modules and the RF front-end section of a split or limited-split module must be a separate physical assembly that can be installed into (or attached) to a host as a separate sub-assembly. It can be soldered, cabled, wired, or use plug-in connectors, as a daughter-board sub-assembly for incorporation within the host. A module cannot be solely the implementation of a design specification. Only the control-element section of a split-module device may comprise software certified as companion code to a specific RF front end (section).

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<sup>4</sup> In some cases a transmitter with equipment authorization may be both a module and Class B personal computer peripheral, separately authorized under a Declaration of Conformity or a grant of certification and marketed as both. When used inside a host that is not end-user accessible/replaceable the transmitter can only be permitted as a module. In the case that the transmitter is end-user accessible/replaceable and also a Class B personal computer peripheral then the host manufacturer may have the option to treat it as certified component and market it as an integrator of separately authorized components.

A host using a module component which has a modular grant (1) can be marketed and sold with the module built inside which does not have to be end-user accessible/replaceable or (2) can be end-user plug-and-play replaceable.<sup>5</sup>

An important element in the Form 731 exhibits is the comprehensive quality of the instructions for the subsequent associated parties (grantee, OEM, integrator, or end-user) to clearly understand the conditions and limitations for authorized uses of the modular transmitter. Modules can provide great flexibility for third parties without requiring additional compliance demonstrations; however, additional requirements may require separate equipment authorization for compliance demonstration such as for RF exposure and hearing-aid compatibility, for devices with specific antennas, or specific host/enclosure configurations. A transmitter module grantee is responsible for including the necessary details for ensuring compliance for RF exposure requirements and the associated usage conditions for portable, mobile and fixed-mount equipment configurations.

## II. Part 15 Modules - Subject to Section 15.212 Rules:

**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 requirements of the Section 15.212(a)(1) and summarized below. See Section 15.212 for more detailed information, and Section 2.901 (and subsections that follow) for general certification requirements.

- i The radio elements must have the radio frequency circuitry shielded. Physical/discrete and tuning capacitors may be located external to the shield but must be on the module assembly.
- ii 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.
- iii The module must contain power supply regulation on the module.
- iv The module must contain a permanently-attached antenna, or contain a unique antenna connector, and be marketed or operated only with specific antenna(s), per Sections 15.203, 15.204(b), 15.204(c), 15.212(a), 2.929(b).
- v The module must demonstrate compliance in a stand-alone configuration.
- vi The module must be labelled with its permanently fixed FCC ID label, or use an electronic display (See KDB Publication 997198 about labelling requirements).
- vii The module must comply with all specific rules applicable to the transmitter. The grantee must provide comprehensive instructions to explain compliance requirements.
- viii The module must comply with RF Exposure requirements. For any transmitters intended for use in portable devices, SAR compliance must be

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<sup>5</sup> If an authorized transmitter that is not certified as a modular device is used within a host, it must be user accessible and plug-and-play replaceable. If an authorized transmitter is not accessible and is not plug-and-play replaceable, then the host requires a separate certification under a new FCC ID.

demonstrated to be independent of the host device. See KDB Publication 447498 item 2 as a guide to determine if a transmitter can be tested without being limited to a host device. If SAR can only be demonstrated in specific host types or platforms, then the module type must be limited.

- B. Limited single-modular transmitter** is a transmitter that does not meet all eight requirements listed in Section 15.212(a)(1) and compliance can be demonstrated only for specific host and applicable operating conditions in which the transmitter will be used. For example, manufacturers have flexibility with respect to requirements such as module shielding, buffered modulation/data inputs and power supply regulation. Compliance with these requirements will be necessary when contained in specific hosts. The responsible party must demonstrate how it will retain control over the final installation of the device, such that compliance of the product is ensured.

A limited modular approval is subject to conditions such as the host device(s) into which the module can be installed; documented requirements for professional installation; the antenna separation distance from persons; or, the locations where a device may be used (e.g., outdoor only).

- C. Split-modular transmitter** is comprised of two basic components: (1) the “radio front end” or radio elements and (2) the transmitter control element (may be firmware/software element). Split transmitter modules must comply with the single modular requirements of Section 15.212(a) (1) summarized in A above, with the exception of (i) and (v); plus the additional split-transmitter module requirements of Section 15.212(a) (2) as summarized below:

- i Only the radio front end must be shielded. The physical crystal and tuning capacitors may be located external to the shielded radio elements. The interface between the split sections of the modular system must be digital with a minimum signaling amplitude of 150 mV peak-to-peak.
- ii Control information and other data may be exchanged between the transmitter control elements and radio front end.
- iii The sections of a split-modular transmitter are installed for testing on a host platform that is representative of the platform(s) intended for use. It is the responsibility of the applicant to demonstrate the appropriateness of the test platform for compliance to a widespread range of common host platforms and not restricted to a specific host. For example, this may be demonstrated on an open (not within a specific host enclosure) reference design board to demonstrate compliance independent of the host environment. Consequently, when compliance is tested with the module enclosed in a specific host, then the split module must be limited.
- iv The radio front end and transmitter control element must be certified as amalgamated elements by the responsible party. The responsible party must

demonstrate the authentication method to guarantee that only this coupling will operate the radio. Manufacturers may use means including, but not limited to, coding in hardware and electronic signatures in software to meet these requirements, and must describe the methods in their application for equipment authorization.

**D. Limited split-modular** is a transmitter that does not meet all the requirements of a split-modular device. As in the case for limited single-modular devices, compliance can be demonstrated under specific host and applicable operating conditions in which the transmitter will be used. Currently TCBs are not permitted to certify split or limited split transmitters - see current TCB exclusion list KDB Publication 628591.

### **III. Module devices in licensed radio services:**

Licensed transmitter modules are not subject to specific modular approval rules as are Part 15 intentional radiators. However, applications for single or limited-single modules may apply the basic concepts of Section 15.212 of the FCC rules (in accordance with the preceding paragraphs), and use good engineering practices to demonstrate compliance. Licensed modular devices must also be compliant to all specific applicable licensed rule parts..

Split-module grants (split or limited-split) are not permitted for licensed service devices.

### **IV. RF exposure considerations:**

Modules intended to be used in portable exposure conditions and restricted to a specific host are always considered limited single or limited split-modules. See KDB Publication 447498 item 2) for testing guidance to determine SAR test requirements for host platform restrictions. When these modules also allow end-user installation in host products with pre-installed antennas, some type of bi-directional authentication function must be utilized to ensure that only the combinations approved can be used together.

Modular approval for devices operating in mobile or fixed exposure conditions are not automatically considered to be limited modular approvals; however, restrictions for specific host or particular product configurations may entail limited modular conditions for other reasons.

See KDB Publication 616217 to determine conditions for a module to be used in various laptop and netbook configurations with minimal subsequent evaluations in qualified hosts.

### **V. Multiple transmitter modules used in a host:**

Combining multiple modular approved transmitters within a host is only permitted for a module granted to cover such configurations, and all required test data must demonstrate compliance for any simultaneous transmission configurations. Each module must have

its own FCC ID. A transmitter module with the provision to transmit simultaneously can be granted as an original grant or Class II permissive change by following the applicable simultaneous transmission test procedures. Additional tests may be necessary to modify simultaneous transmission restrictions through permissive changes.

## **VI. Permissive changes (for original responsible party):**

Changes from a non-modular to modular certification and from a full modular to a limited modular certification are permitted under the conditions that the changes meet the requirements for a permissive change in Section 2.1043 (see also KDB Publication 178919), and the module approval requirements discussed above.

The original grantee may submit new test data to modify the existing limitations of the grant as permitted under the permissive change rules (Section 2.1043). For example, modifying simultaneous transmission restrictions for EMC and RF exposure can be done under a Class II permissive change, typically for specific end-use or product configurations. Evaluation requirements include:

- All transmitters must have the required simultaneous transmission test data.
- Simultaneous transmission evaluation requirements for RF exposure are described in KDB Publication 616217 for laptop and netbook computers, KDB Publication 648474 for mobile-phone handsets and KDB Publication 447498 for other mobile and portable devices.

## **VII. Related KDB Publications:**

- See KDB Publications 616217 and 447498 to determine SAR and simultaneous transmission test requirements for laptop and netbook configurations to minimize subsequent evaluations for use in other hosts
- See KDB Publication 997198 for labeling requirements - see section on Module Labeling.
- See KDB Publication 178919 D01 Permissive Change Policy.
- See KDB Publication 442812 SDR Apps (Application) Guide

## **VII. Additional frequently asked questions and answers related to modules:**

**Question 1:** What options are available for parties other than the grantee or responsible party to apply or make changes to an existing modular grant?

Answer 1: Other parties can:

1. Obtain a new certification for the entire host equipment under a new FCC ID. The new party can then file a Class II permissive change to remove or change, amend or modify limited conditions. For example, Class II permissive changes can be filed to include additional transmitters, or restrictions to specific hosts, or to include additional hosts.

## 2. Certify the device as a new module.

In this case it is permissible to upload original relevant module test reports that accurately represent test results under the conditions being used in the new applications.

When original results are used, the new applicant must provide a statement that the original test reports accurately represent test results under the new conditions. This statement must list for each original test report, the associated FCC ID, specific test report identifiers, and a description explaining why the report accurately represents test results under the new conditions. All exhibits for uploaded original test reports must represent the new device in its entirety. Reference to only a section of an original test report, or uploading a section of an original test report is not permitted. Thus the original test report exhibit must be the same in its entirety, as the test report contained in the original filing.

Additional test reports can be provided to demonstrate full compliance under any new conditions of use. This includes testing to demonstrate new grant conditions without limited conditions (imposed on the original module) or limitations, but with additional capabilities.

For example:

- Limitations on simultaneous transmission conditions may be modified to include additional transmitters or;
- Restrictions to a specific host may be changed to include additional hosts.

## 3. Change in ID certification (Section 2.933).

This requires an applicant to file for a change in ID certification, i.e., to document re-use of an existing module. The party that filed the change in ID may subsequently file a Class II permissive change to modify or amend any grant limited conditions established previously, per requirements discussed above.

**Question 2:** How are UNII modules with DFS capability handled?

Answer 2: All DFS UNII modular approvals are processed to be limited modules, because specific antennas will affect DFS radar detection. The module is limited to the specific host / antenna used for the DFS compliance tests.

**Question 3:** Can unlicensed Part 15 transmitter modules and antennas be marketed separately?

Answer 3: Yes, the radio component portion of a transmitter module and its associated antennas each may be marketed separately, but only if the module and antenna

incorporates an authentication protocol to ensure that only authorized modules and authorized antennas work together.

**Question 4:** Can transmitter modules and associated antennas be sold separately when the certification authentication protocol is performed by the host?

Answer 4: It is permissible to utilize the host to provide compliance for the authentication requirement between the authorized module and antenna. The module shall not transmit until the host authentication ensures that the proper certified antenna is present. The grantee is responsible for providing the certification authentication protocol and must provide clear instructions to the host manufacturer how to integrate the code within the host for the module to remain compliant.

**Question 5:** Can an applicant obtain a limited modular approval for a transmitter that operates under specific host conditions and be installed by end users?

Answer 5: Yes, for user-installed limited module radios in a host (laptops, etc), a two-way certification authentication protocol or two-way BIOS lock implementation is required to ensure compliance. This ensures the module verifies that the proper laptop is used and the laptop verifies that the proper module is used.

The Grant condition must state: "This device must utilize a BIOS lock mechanism which ensures that it only operates with the hosts as specified in the Certification filing." This ensures that the module verifies the proper host (laptop) is used, and the host verifies that the proper module is used. For guidance on RF Exposure Considerations, see above.

**Question 6:** Can end users install transmitter modules into a laptop that has an integrated antenna built into the laptop screen or on the motherboard?

Answer 6: Yes. However, since the antenna is built into the laptop screen or on the motherboard and can not be tested as a stand-alone module it is a limited module. This requires two-way certification authentication protocol. See Answer 5 above. For guidance on RF safety considerations see IV) RF safety considerations (above).

**Question 7:** Can a module be a reference design layout intended as a portion of a host and manufactured onto the host board during assembly?

Answer 7: No, this is considered to be a reference design, not physical discrete component, and is not permitted.

**Question 8:** Can a module be a Software Defined Radio (SDR)?

Answer 8: A physical, tangible module may be granted as software defined radio if it meets all the security requirements imposed by Section 2.944, in addition to the requirements for a modular transmitter. See KDB Publication 442812 and the attachment 442812 SDR Apps (Application) Guide.