

**Federal Communications Commission
Office of Engineering and Technology
Laboratory Division**

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Draft Laboratory Division Publications Report

Title: Modules, Module Certification, 15.212

Short Title: Modules, Module Certification, 15.212

Reason:

- **996369 D01 Module Certification Guide v04r01:** Revised section 8 for guidance on Antennas specifically for licensed client modules.
- **996369 D02 Module Q&A v02r01:** Question 1 has been clarified to be more specific.
- **D01 & D02** also underwent grammatical inconsequential non-policy changes.

Update Section 8 for Antennas of D01 & Clarification of Question 1 of D02 and

Publication: 996369

Keyword/Subject: Modules, Module Certification, 15.212

Question: What is the FCC guidance for authorizing transmitter module devices and equipment incorporating transmitter modules?

Answer:

See the guidance for transmitter module devices in the following attachments:

996369 D01 Module Certification Guide v04r01 guides equipment authorization applications under Section 15.212 modular transmitters.

996369 D02 Module Q and A v02r01 provides additional guidance in a question-and-answer format.

996369 D03 OEM Manual v01r01 guides grantees (applicants) seeking to certify a modular transmitter (module) and the key elements to be reviewed by a Telecommunication Certification Body (TCB) during the certification process.

996369 D04 Module Integration Guide v02 provides guidance to host product manufacturers.

996369 D05 Split Module v01 guides the certification of split modules.

Attachment List:

[996369 D01 Module Certification Guide v04](#) * section 8 updated
[996369 D02 Module Q&A v02](#) * question 1 edited for clarification
[996369 D03 OEM Manual v01r01](#) **
[996369 D04 Module Integration Guide V02](#) **
[996369 D05 Split Module v01](#) **

* These attachments are being posted as a draft for comment in this document.

** These attachments are not being posted for public comment in this document and are published in KDB 996369

996369 D01 Module Certification Guide v04r01

Federal Communications Commission
Office of Engineering and Technology
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Date DD, 2024

TRANSMITTER MODULE EQUIPMENT AUTHORIZATION GUIDE

1. Introduction

This guidance¹ provides Grantees² of modules and host integrators³ with information on certified transmitter modules and supplements the module rule §15.212. A transmitter with a modular or limited modular grant can be installed in different end-use products (also referred to as the host, host product, or host device). The host product may not be subject to further certification for that transmitter.

While the host product must still obtain other applicable equipment authorizations not covered by the module certification, significant time and cost savings can be gained. The host product must comply with all the relevant rules, including those that apply to the module.⁴ Host manufacturers (referred to as host integrators) can save time and costs for equipment authorization compared to certifying the same transmitter multiple times when used in different products. A module can be certified in the following four configurations:

- **A single-modular transmitter:** a complete RF transmission assembly.⁵ They are designed to be incorporated into the host. The Grantee of the module must demonstrate compliance to all requirements of §15.212(a)(1) (i) through (viii) independently of any host in a standalone configuration.
- **A limited single-modular transmitter:** a single-modular transmitter that complies with some, but not all, of the §15.212(a)(1) (i) through (vii) requirements.
- **A split-modular transmitter:** an RF transmission assembly separated into a radio front-end(s) and a control-element section that can demonstrate compliance for a range of "similar type" hosts, as defined in the 996369 D05 Split Module attachment.
- **A limited split-modular transmitter:** a split-modular transmitter that cannot comply with some but not all the requirements of §15.212(a)(2) (i) through (iv) and must be certified in "similar type" host(s), as defined in 996369 D05 Split Module attachment.

¹ This KDB publication is written for an audience familiar with FCC equipment authorization rules under the Code of Federal Regulations Title 47 Telecommunication and the FCC's Office of Engineer's Knowledge Data Base (KDB) procedures.

² Grantees of modules refer to the entity that receives an FCC certification grant for a transmitter module.

³ Host integrators refer to the entity that uses a certified module in its product, also known as the host product.

⁴ Although no additional filing may be required when the module is used according to its grant condition, the statement "Including the rules that apply to the module" means that a host manufacturer is responsible for complying with all rules with the module installed. Since the rule does not require further testing, it is recommended that host manufacturers use the 996369 D04 Module Integration Guide to verify that the host and the module remain compliant with all the applicable rules when operating in a host. Host manufacturers should also note that the general regulations §§15.5 and 15.29 state that no device can cause harmful interference. Host manufacturers would still be responsible for resolving the interference and possibly cited for a violation if this happened.

⁵ A module consists of a completely self-contained transmitter that needs only an input signal and power source to be functional (FCC DA 08-314).

1. MODULE OVERVIEW

Under §15.212 rules, a certified module is only allowed for part 15 transmitters. For equipment authorization, by policy, the procedures in this Knowledge Data Base (KDB) Publication also apply to some transmitters operating under licensed rules. Therefore, this publication covers both module transmitters certified under unlicensed part 15 and licensed rules⁶.

Module certifications do not apply to Part 15B⁷ Unintentional radiators, Part 18 devices, and transmitter modules may not be permitted for specific equipment classes, as listed in Appendix A.

Any host product using a module must also obtain the applicable part 15B equipment authorization for any unintentional radiator part and any additional transmitters not certified as a module with the module installed, even if the module is advertised as authorized under part 15B⁸.

2. LIMITED MODULAR APPROVAL

2.1 General

Limited Modular Approval (LMA) is permitted under §15.212(b) when some, but not all, of the conditions do not comply with §15.212(a)(1) for non-split modules or §15.212(a)(2) for split modules.

Five limited conditions will require a Pre-Approval Guidance (PAG) identified in KDB Publication 388624 PAG as item MODLIM.⁹ And only for the following five items:

1. **§15.212 (a) (1)(i): No RF shielding.** A Class 2 or Class 3 Permissive Change (C2/3 PC¹⁰) test plan for each specific host. Guidance is provided in Appendix C.
2. **§15.212 (a) (1&2) (ii): No buffered modulation/data inputs.** The Grantee must provide a test plan for the host integrator.
3. **§15.212 (a) (1&2) (iii): No voltage regulation.** The Grantee must provide a test plan for the host integrator.
4. **§15.212 (a) (1&2) (iv): Host professional¹¹ Antenna installation.** When the host requires professional antenna installation, provide clear instructions for an experienced professional installer to install it.
5. **§15.212 (a)(1)(v): The module cannot be tested in a stand-alone configuration.** Clear instructions that the module only applies to specific conditions the host provides, i.e., module

⁶ Past KDBs and this KDB refer to modules certified under unlicensed rules as “Licensed-service modules.” or “Licensed-service modules.

⁷ Certified modules under §15.212 Modular transmitters are modular transmitters consisting of a completely self-contained radiofrequency transmitter(s) and, by rule, do not apply to 15 Subpart B.

⁸ A transmitter module, also advertised as 15B compliant, does not absolve the Host from its overall FCC 15B equipment authorization requirement. This means the entire Host system must undergo 15 B testing, even if a module is independently tested for 15B. The module can be set to a non-transmit mode for the 15 B testing. Testing the host system with a radio module in transmit mode for composite operation is covered in KDB 996369 D04.

⁹ This MODLIM PAG applies to the Grantee’s module and not to the host that uses the limited module.

¹⁰ A Class 2 or Class 3 Permissive Change is an equipment authorization procedure under FCC rules §2.1043 used to modify and update the FCC compliance records and information. This document indicates this procedure as a C2/3 PC.

¹¹ Professional installation for MODLIM is only applicable under §15.203 Antenna requirement to allow professional installation of antennas for the host.

host authentication and C2/3 PC are required for different hosts, etc. Details will vary case-by-case.

A Grantee knows their LMA's design and shortcomings and is responsible for developing the host-appropriate method to overcome the limitation for the integrator and, if applicable, a C2/3 PC test plan or the instructions to overcome the limitation. No specific format or template is required. The information will be reviewed.¹² when the MODLIM PAG is submitted, approved, or disapproved. Appendix D guides submitting an LMA PAG.

Although the test plan may be based on an FCC rule, policy, or sound engineering practices, it cannot just reference a rule or policy as a requirement. The grantee must establish a detailed test plan¹³ that ensures continual compliance when the modules are integrated into a host. For example, simply stating that the host must comply with §§15.31(e) or use the KDB 996369 D04 Module Integration Guide is insufficient.

The word "limited."¹⁴ on the module grant, if used for a specific host for RF exposure (i.e., mobile granted module uses when used in a portable host) or some other established KDB critical policies, is not considered a MODLIM¹⁵ and PAG. Technically, when a C2/3 PC is used to add RF exposure testing, the module is compliant with §15.212(a)(1)(viii) for that specific host. It is not a question of not complying with RF exposure but how it complies. For guidance on using a module for compliance with RF exposure, see publications 447498.

In addition, limited modules are not permitted for any application where end users can insert a module into any open host platform unless the module is certified and tested by the Grantee with specific hosts that are authorized together to include an authentication (BIOS lock) protocol for authentication to confirm that modules inserted into the host have been approved for use with that host". See Question 5 of 996369 D02 Module Q and A.

The module 731 application (s) for a limited module shall include:

- The cover letter requires a statement that the module is limited, listing the reason from §15.212(a)(1) (i) through (viii) or §15.212(a)(2) (i) through (iv) is or is not provided and providing a justification if as why it is limited.
- The Grantee's test plan for the host integrator or in the integration instructions,
- and appropriate grant comments to address the limitation (see Section 5.2 below).

The equipment authorization of the module is based on the condition that the modular transmitter, when installed in a host, meets all the applicable FCC requirements under the operating conditions in which the transmitter will be used.

2. 2 MODLIM LMA. The following provides further guidance for the MODLIM LMA.

¹² MODLIM PAG will be in effect until most applications consistently comply with this requirement.

¹³ 47 CFR 15.212(b) requires that limited modular approval can only be granted for single or split modular transmitters if the manufacturer can demonstrate by alternative means in the application for equipment authorization that the modular transmitter meets all the applicable part 15 requirements under the operating conditions in which it will be used. Therefore, a grantee, in designing a limited model, is responsible for providing a test plan for the host integrator to account for this limitation.

¹⁴ The word "limited" on the grant has been used for other KDB policies to identify additional concerns than those listed above. Most are on a case-by-case basis and generally for RF exposure. Although these other limitations may require other PAGs or inquiries, they are not MODLIM PAGs.

¹⁵MODLIM PAG is for the listed five conditions:

2.2.1 Limited modules with no RF shielding. It will require that the specific host demonstrate compliance with a C2/3PC. The C2/3PC test plan required by the grantee may follow the guidance under Appendix C of this attachment.

2.2.2 No buffered modulation/data inputs. The modular transmitter must have buffered modulation/data inputs¹⁶ to ensure that the module's emissions remain compliant as granted if the data inputs exceed excessive data rates or are in an abnormal or faulty condition.

2.2.3 Voltage Regulation. Noncompliance to §15.212(a) (1&2) (iii) requires providing a test plan for operating voltage over an operating range. This represents the operating conditions and voltage regulation range for which the module emissions must remain compliant. The Grantee can base their test on a similar test measurement to §15.31(e) test plan to exercise host voltage conditions.

2.2.4 Antenna LMA for Professional Host Installation. §15.212(a)(1&2) (iv) as LMA allows a module to be used in a host when professional installation is needed as permitted by §15.203 and a unique connector¹⁷ on the host is not used. This is limited to carrier current devices or devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, §15.221, or §15.236, as well as perimeter protection systems and some field disturbance sensors or for other intentional radiators that, by §§15.31(d), must be measured at the installation site.¹⁸ The integration instructions shall provide detailed instructions to the host manufacturers regarding their obligation to document the professional installer's instructions for the proper antenna arrangement in their user manual. The instructions shall be included as an exhibit in the module's host integration manual as filled for the certification.

2.2.5 Module Can Not Be Tested in a Stand-Alone Configuration. Suppose a module cannot comply (§15.212(a)(1)(v)) in a stand-alone configuration or §15.212(a)(2)(iii) for other than RF exposure conditions. In that case, the module may qualify for limited module certification by testing in various hosts but limited to these types of hosts. This LMA is not to be confused with the policy to allow a module initially granted for RF exposure conditions as a mobile device and then through a C2/3PC to demonstrate RF exposure compliance in a specific host as a portable device.¹⁹ This LMA can be used when the Grantee is the host manufacturer for a series of similar host models to allow the host and the module to share compliance responsibilities. (e.g., shielding, buffered modulation/data inputs, power supply regulation).

In some cases, when receiver threshold detection is required (i.e., DFS, CBP), the certified antenna(s) must be unrestricted by the host and, when used in a host and based on current policy, requires the module to be reviewed on a case-by-case base by submitting an equipment compliance review inquiry (publication KDB 951290) to confirm that the integration instructions will include strict guidance for antenna location for receiver detection.

¹⁶ The requirement for buffered modulation/data inputs is for those cases where the inputs can affect the electrical parameters of the transmitter output. (e.g., modulation index, carrier bandwidth, power, etc.) Data buffering, for the sake of data flow, timing control, or data control, is not a requisite for meeting the requirements of this rule part. The module guarantee ensures that any input will not change the module's compliance and operate outside the module's granted condition.

¹⁷ See section 8.1.3 below.

¹⁸ This does not apply to the module itself.

¹⁹ It's important to note that the guidance on using a module for different RF exposure conditions than initially granted is detailed in 447498, not in this publication.

4. INTEGRATION INSTRUCTIONS

Section §15.212(a)(1)(vii) requires the module Grantee to provide clear integration instructions for host manufacturers to use the module in the host legally. Attachment 996369 D03 OEM Manual v01 guides what must be included in the application for equipment authorization. The integration instructions must be written in a plain professional style.²⁰ The conditions for a host manufacturer to use the module without requiring additional testing, filling, or permissive changes are as follows: The host manufacturer shall refrain from using the module and contact the Grantee for clarification if the integration instructions are unclear.

The instructions shall describe all the applicable rule restrictions plus the RF exposure requirements for portable, mobile, and fixed-mount operation. The integration instructions must prohibit a host from utilizing a module to violate operating conditions, labeling, or notifications (e.g., indoor use, not used on aircraft, etc.).

5. FILING REQUIREMENTS

In addition to requirements in §2.1033, modules require:

5.1 All Modules

- i) Select Form 731, the appropriate modular approval type.
- ii) A cover letter requesting modular approval that includes an itemized list documenting compliance to the appropriate section §15.212(a)(1) for non-split modules or §15.212(a)(2) for split modules.
- iii) Provide detailed integration instructions (manual) describing host manufacturers' conditions, limitations, and procedures (see 96369 D03 OEM Manual for guidance).
- iv) For split modular transmitters, details are provided in D05 Split Module guidance.
- v) All modules shall exhibit the appropriate RF exposure as required by §2.1033(f). Publication 4447498 guides the proper RF exposure exhibit.

5.2 Additional requirements or LMA under PAG MODLIM:

- i) In the cover letter (5a) ii), state why the module is limited and the conditions that cannot be complied with (see Section 3 above).
- ii) Provide the limited module test plan or the specific LMA instruction in the integration instructions.
- iii) MODLIM PAG, inquiry tracking number.
- iv) Grant comments.
 - 1. "This Module is limited, requiring the host integrator to perform additional testing as provided by the manufacturer's integration instructions for: <provided reason>." Or.
 - 2. "This Module is limited, requiring the host integrator to file a Class II or Class III permissive change for each specific host per the test plan defined in the module integration instructions."

²⁰ The quality of professional technical writing is of the utmost importance. It should include necessary diagrams, reference supporting documents, and rules to communicate to the host manufacturer in an appropriate format for manufacturing and ensuring host compliance with FCC rules.

6. RF EXPOSURE

All host manufacturers are responsible for using modules, multiple modules, or modules with embedded transmitters to comply with the FCC's radiofrequency radiation exposure rules, § 2.1091 and § 2.1093. KDB Publication 447498 guides RF exposure requirements for module certification and host compliance. A host product using a module, multiple modules, or modules with embedded transmitters must maintain a separation distance or greater between the host's RF source's radiating structure(s) and any user's body or nearby persons, as required by the RF exposure assessment.²¹ This requirement does not differ from any product that contains transmitters that are not certified modules.²²

When a host integrates one module or modules certified together, the Grantee's integration instructions shall clearly state the required separation distance.²³ This allows the host integrator to use the module without additional evaluation, testing, or filling, given that all other imposed conditions or restrictions are also followed.

A host integrator using a module closer than the granted separation distance invalidates using the module's certification for that host. In this case, the host integrator must request that the module Grantee amend the grant if feasible²⁴, through a C2/C3 PC. As an alternative, the Grantee may allow the host integrator to take responsibility for the module as a Change in ID²⁵ and do the C2/C3 PC themselves. Using the module closer to the granted separation distance than what the integration instructions allow without amending the filling is a violation.²⁶

Using a module in a host operating simultaneously with other modules or transmitters not originally certified together requires addressing this new RF exposure situation. What the host or Grantee needs to address will depend on the specific situation and the types of modules and transmitters involved. The guidance for addressing this situation is in KDB 447498 and attachment 996369 D02 Module Q and A, questions 13, a, b, and c.

²¹ Assessed means evaluated for RF exposure compliance, tested, documented, and granted, with appropriately filled certification exhibits as required by KDB 447498.

²² All RF devices (products) must adhere to the environmental RF exposure conditions outlined in CFR Title 47 part 1, subpart I, and particularly § 1.1307(b) and part 2, subpart J, particularly § 2.1091 and § 2.1093. This requirement applies to all devices, whether they are authorized products, not using certified modules, or using certified modules. Compliance with these conditions is a legal obligation for importing, marking, and selling RF devices in the US to ensure users' compliance with RF exposure conditions.

²³ The separation distance is stated in the integration instructions and the grant comments. If not provided in the integration instructions, the host integrator must contact the Grantee or obtain the official grant and grant comments by searching the FCC ID at <https://www.fcc.gov/oet/ea/fccid>.

²⁴ In some cases, the module may not be used or is impractical at the separation distance desired by the host integrator.

²⁵ See KDB 249634 for Change in ID guidance.

²⁶ A typical example is an imported product with a label stating Contains FCC ID XXX-YYY. Customs inspectors cannot confirm through <https://www.fcc.gov/oet/ea/fccid> that the device is authorized since the record only demonstrates the module, not the imported product. After conferring with the FCC and finding that the module is certified as a mobile module and the product is portable, the product will be denied entry into the US and returned, destroyed, or sieged.

7. EMC CONSIDERATIONS

When the module is used as one module or modules certified together without other transmitters operating simultaneously and used in a host for the conditions initially granted, the host manufacturer may use attachment D04 Module Integration Guide²⁷ to confirm EMC compliance.

However, for simultaneous transmissions²⁸ With any other transmitters in a mobile host not certified together, the policy requires an EMC evaluation test by the host integrator or the Grantee (see D02 Module Q&A Question 12); an EMC evaluation by the host integrator is sufficient to confirm compliance.

8. ANTENNAS

8.1 Part 15 Modules:

Testing for part 15 modules shall use ANSI C63.10-2020,²⁹ as incorporated by reference in § 15.38 for testing guidance.

8.1.1 Part 15 Modules with Antennas on the Module.

For Part 15 Modules, when the antenna is provided on the module, the module must meet the requirements of § 15.212(a)(1)(iv) for compliance with §§ 15.203, 15.204 (b), and (c) for each variant of the module if different antennas are used. Each variant must be tested for the specific Part 15 transmitter rules. After certification, if a need arises to change the antenna type, a C2/3 PC is required.

8.1.2 Part 15 Modules that include a list of antennas.

When a physical antenna is not integrated with the module, the module must undergo testing and meet the requirements of § 15.212(a)(1)(iv) for compliance with §§ 15.203, 15.204 (b), and (c) and be certified for the highest gain antenna for each type of antenna to be used. When relying on the module's certification for installation/integration into another product, these are the only antennas that can be used with that module. For some rule parts, the lowest gain antenna must be defined accurately when threshold detection is demonstrated as part of the application filling, such as DFS³⁰ and CBP.³¹ After certification, changing to a different antenna type requires a C2/3 PC.

²⁷ The D04 Module Integration Guide is recommended since the current rules do not require additional evaluation and rely on sound engineering practice by host integrators. D04 Module Integration Guide is essentially a guide for sound engineering practice.

²⁸ Since the module was not certified with other transmitters for simultaneous transmission, the Grantee would typically require a C2/3PC or new FCC ID. However, the current KDB policy permits, by D02 Q&A Q12, that the host manufacturer only needs to do an evaluation (i.e., no C2/3PC required when no emission exceeds the limit of any individual device (including unintentional radiators) as a composite (i.e., §2.947). The host manufacturer must fix any failure. This KDB policy may be subject to change in the future. The evaluation test shall be performed with all devices operating, including unintentional (15B) radiators, for both the standalone and simultaneous cases. If the evaluation testing confirms that no emissions exceed the limit of any individual transmitter or unintentional radiator (i.e., §2.947), no additional C2/3PC is required. If any emission exceeds an applicable limit, the host manufacturer must take corrective actions to bring the device into compliance.

²⁹ 47 CFR 15.37(s): Before October 30, 2025, ANSI C63.10-2013 or ANSI C63.10-2020 is required. However, after this date, ANSI C63.10-2020 becomes mandated.

³⁰ DFS: Dynamic Frequency Selection is required for devices operating in the 5.25-5.35 GHz and 5.47-5.725 GHz bands. See Publication Number: 905462 Rule Part 15.401 U-NII, U-NII, DFS Test Procedures.

³¹ CBP: A contention-based protocol for specific devices operating in the 6 GHz U-NII 5-8 bands is required. See 47 CFR § 15.403. Also, see KDB Publication Number: 987594.

The grantee shall specify a list of the antennas that can be used with the host by manufacturer, model designation, or part number and specifications that include the mechanical and electrical characteristics, including type, form factor, frequency, bandwidth, impedance, directivity, gain, and polarization, based upon testing performed during original certification. After certification, adding a different antenna type requires a C2/3 PC.

The guidance of KDB Publication Number 996369 D02 Question 11 for trace antenna designs shall be followed.

8.1.3 Host End User Unique connector.

A unique connector³² is required when the end user can replace the antenna except for limited modules where the host qualifies for professional³³ Antenna installation under § 15.203.

8.1.3.1 If the module is used in the host, a unique connector must be used if the end users can access it to replace a broken antenna.

8.1.3.2 If the module is integrated into the host, even if the end users cannot access the module's connector, the integration instructions shall state clearly that the host antenna connector must be unique if the end users can replace the host antenna. The instructions should state that the FCC certification is invalid if a non-unique connector is used on the host.

The only exception would be for the module to qualify and be granted under PAG as a limited module for professional installation³⁴ under § 15.203, the module must be granted as limited: see section 3.1 item 4 above," Host professional antenna installation as a PAG."

8.1.3.3 In all cases above (8.1.3.1 -8.1.3.3), host end-products must only use approved antennas.

8.2 Licensed-service modules/ KDB Publication Number 996369 policy permits Licensed-service modules³⁵ to obtain a certification. By policy, antenna requirements³⁶ for the filing differ depending on whether the module is a licensed³⁷ client module or licensed base station module/master module.

³² The term "unique connector" used for this guidance refers to the requirements of § 15.203, which is required for all Part 15 transmitters that allow broken antennas to be replaced. This publication does not change or provide additional guidance on what is and is not considered a unique connector for Part 15 transmitters.

³³ Professional installation is permitted under § 15.203 for host products that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or for other intentional radiators, which must be measured by § 15.31(d) at the time of installation. When this applies to host integration, the module is limited, and it is noted that the current PAG policy requires a PAG. The measurements and instructions for the professional installation must be clearly described and filled in. Integration instructions must clearly

³⁴ The Grantee for the module shall provide clear instructions that professional installation is required and information for the installer to ensure that the proper antenna is employed so that rule requirements are not exceeded.

³⁵ KDBs issued or revised before 996369 D01 Module Certification Guide v04r01 may refer to "Licensed-service modules" as "Licensed-service modules."

³⁶ Licensed service modules differ from licensed end products, and the responsibility for compliance in a host product depends on the quality of the grantee's adequate integration instructions.

³⁷ A client device cannot initiate or be configured to initiate a transmission. A base station or master station can initiate a transmission. As a condition of certification, a base station or master device must be approved as a master device on the bands for operation in the U.S. It must operate under the grant conditions. Client devices associated with base or master stations and approved as client devices that operate under the control of an approved master device can be operated without an individual operator's license under authorization as subscribers per 47 CFR 1.903(c). They may also have the capability, under FCC policy, to function in other regulatory domains under FCC geolocation policies (see Publication Number: 594280).

A client module is a device that operates in a master/client network and does not initiate a transmission unless controlled by a base or master device. Base stations or master devices can initiate transmissions.

8.2.1 Base Station or Master Module

For base stations or master modules, the integration instructions are not required to provide detailed antenna information because licensees are responsible for using an appropriate antenna such that all emissions comply with the terms of the license³⁸ and with § 1.1310 Radiofrequency radiation exposure limits. Module testing for compliance shall follow the test methods of C63.26-2015, the American National Standard for Compliance Testing of transmitters used in Licensed Radio Services.³⁹ These standards guide testing RF power, out-of-band emissions, frequency stability, and other regulatory requirements as the rules require. Radiated emissions testing can be limited to measurement requirements specified by § 2.1053 (i.e., cabinet/case radiation) for measurements utilizing the appropriate policy. All other pertinent technical data (i.e., OBW, fundamental emission power, unwanted emissions) may be collected via conducted testing when justified. However, it is the responsibility of the module manufacturer to determine the appropriate methods from C63.26-2015 for testing the application method, such as radiated, conducted, substitution, or combination.

8.2.2 Client-Licensed-service modules

There are two categories of client-licensed service modules: Modules that utilize an integrated antenna and modules without an antenna.

8.2.2.1 Client-licensed-service modules with integrated antennas on the Module

When conducted measurements cannot be performed by the module manufacturer that utilizes integrated antennas, a radiated test configuration is performed to measure all the rule part compliance-related technical parameters, including the required testing or documentation necessary for compliance with RF exposure under 47 CFR § 2.1091 and 47 CFR § 2.1093. Testing and compliance shall follow C63.26-2015 subclause 5.5.2 and related subclauses. This shall include all the module variants if different antenna types are used when initially granted. If test reports include conducted measurements⁴⁰ with integrated antennas, the test report shall document any special modifications or necessities warranted that justify performing the conducted testing. After certification, changing to a different antenna type requires a C2/3 PC.

8.2.2.2 Client-licensed-service modules without antennas

Antenna information is required for licensed client devices when the module grantee does not provide the antenna(s). The grantee must provide antenna information to ensure compliance with the host operating conditions under which the module is granted. For example, sufficient information is required depending

³⁸ The FCC license grants the use of a specific portion of the radio frequency spectrum in a geographical area. This process, distinct from equipment authorization, is a critical regulatory step. Equipment authorization is the permission to market and sell a device after it has been tested. It is important to note that equipment authorization is not always a prerequisite for using the device unless it falls under the category of unlicensed or, in some cases, licensed by rule devices. *See* 47 CFR § 2.805.

³⁹ C63.26-2015 does not consider test methods for requirements specific to ground-based maritime and aviation transmitters, whether they are radars, satellite equipment, fixed microwave equipment, or broadcast transmitters. Modules for those services must strictly adhere to the essential applicable rule parts and the underlying regulatory requirements.

⁴⁰ The significant proliferation of portable and mobile devices, which utilize integrated/embedded transmit and receive antenna configurations, has extended the need for radiated testing for licensed devices. This expansion is crucial as it demonstrates compliance to all technical requirements, no longer limited to just cabinet/case radiation, thereby emphasizing the importance of your role in this process.

on the transmitter rule and the module use conditions. This shall include the highest antenna gain.⁴¹ for any antenna type or series of types and any additional antenna information particular to the applicable rule. Also, if applicable, the lowest gain may need to be specified.⁴²

When trace antennas are used, a complete board trace antenna design specification from the module guarantee is required.

The module grantee is responsible for ensuring that the level of technical detail in the Grantee's integration instructions for the antenna information is adequate to meet all the applicable rules under the operating conditions in which the module will be granted and permitted to be used.

Unlike the procedures for devices that operate under Part 15, a list of specific antenna types is not required for the filing. In addition, a unique connector is not needed for a user-replaceable antenna unless required by the applicable licensed rule,

9. PERMISSIVE CHANGES

Only Grantees are permitted to make permissive changes. See KDB 178919 Permissive changes.

A host manufacturer that wants to make permissive changes must have the Grantee make the changes or request permission from the original Grantee to file a change-in-ID (see KDB 249634). After a TCB approves the change-in-ID, the host manufacturer can make permissive changes.

Changes from a non-modular to modular certification and from a full-modular to a limited-modular certificate are permitted if the changes meet the requirements in §2.1043 (also see KDB Publication 178919) and the modular approval requirements discussed above.

Appendix C provides some additional guidance for when permissive changes are required.

10. REFERENCES

- KDB Publication 178919 Permissive Change Policy
- KDB Publication 388624 Pre-Approval Guidance procedures and list
- KDB Publication 442812 SDR Apps (Application) Guide
- KDB Publication 447498 RF exposure in equipment authorizations
- KDB Publication 594280 Software Configuration control
- KDB Publication 616217 RF exposure for laptop and tablet computers
- KDB Publication 784748 Labeling requirements

⁴¹ the gain is no higher at other frequencies

⁴² This applies to any current or future rule requiring contention-based protocol. See, for example, 47 CFR Part 90 Subpart Z and 47 CFR § 15.407.

APPENDIX A

MODULES PERMITTED (Y) OR NOT PERMITTED (N) BY EQUIPMENT CLASS CODE

The following list is subject to change; for questions, submit an inquiry at <http://www.fcc.gov/labhelp>.

- * Devices that are not transmitters and cannot qualify as modules.
- ** Can only be granted with an accepted PIA for geolocation accuracy.
- N^{NA} indicates that this device is not a transmitter.
- N⁻ is prohibited by rule.
- N⁺ is not permitted by policy. In some cases, N⁺ has no history of grants as modules, and an inquiry review with justification may be considered.

Code	Description	Module Permitted
5GM	Part 30 Mobile Transmitter	Y
5GB	Part 30 Fixed Transmitter	Y
5GT	Part 30 Transportable Transmitter	Y
6CD	15E 6 GHz Low Power Dual Client	Y
6ID	15E 6 GHz Low Power Indoor Access Point	Y
6PP	15E 6 GHz Subordinate Indoor Device (not permitted by rule)	N ⁻
6XD	15E 6 GHz Low Power Indoor Client	Y
6SD	Standard Power Access Point. It can only be granted with an acted PIA for geolocation accuracy.	Y
6FX	Standard Client	Y
6FC	Fixed Client Can only be granted with an acted PIA for geolocation accuracy.	Y
6VL	Very Low Power 6 GHz device	Y
8CC	Part 18 Consumer Device *	N ^{NA}
AIS	Automatic Identification Systems*	N ^{NA}
AMP	Amplifier *	N ^{NA}
B2I	Part 20 Industrial Booster (CMRS)	N ⁺
B2P	Part 20 Provider-Specific Consumer Booster (CMRS)	N ⁺
B2W	Part 20 Wideband Consumer Booster (CMRS)	N ⁺
B9A	Part 90 Class A Industrial Booster (non-SMR)	N ⁺
B9B	Part 90 Class B Industrial Booster (non-SMR)	N ⁺
BOS	All other signal boosters other than 20.21/90.219	N ⁺
BPL	Access Broadband Over Powerline System*	N ⁺
CBD	Citizens Band Category A and B Devices	Y
CBE	Citizens Band End User Devices	Y
CRD	Part 15 Radar Detector*	N ^{NA}
CRR	Super-regenerative Receiver*	N ^{NA}
CSR	Scanning Receiver*	N ^{NA}

Code	Description	Module Permitted
CXX	Communications RCVR for use w/ licensed Tx and CBs*	N ^{NA}
CYY	Communications Receiver used w/Pt 15 Transmitter*	N ^{NA}
DCD	Part 15 Low Power Transmitter Below 1705 kHz	Y
DSC	Part 15 Security/Remote Control Transmitter	Y
DSR	Part 15 Remote Control/Security Device Transceiver	Y
DSS	Part 15 Spread Spectrum Transmitter	Y
DTS	Digital Transmission System	Y
DWM	Part 15 Wireless Microphone	N ⁺
DXX	Part 15 Low Power Communication Device Transmitter	Y
EID	Part 11 Emergency Alert Devices*	N ^{NA}
EAV	Part 15 Automatic Vehicle Identification System	N ⁺
ETB	Part 15 Cordless Telephone Base Transceiver	N ⁺
ETR	Part 15 Cordless Telephone Remote Transceiver	N ⁺
ETS	Part 15 Cordless Telephone System	N ⁺
FAP	Part 15 Anti-Pilferage Device	N ⁺
FDS	Part 15 Field Disturbance Sensor	Y
FRB	Part 95 Family Radio Base Transmitter	N ⁺
FRE	Part 95 Family Radio Ear Held Transmitter	N ⁺
FRI	Part 95 Family Radio Face-Held Transmitter	N ⁺
FRT	Part 95 Family Radio Body Worn Transmitter	N ⁺
GAT	Part 15 Auditory Assistance Device (Transmitter)	N ⁺
GEP	406 MHz EPIRB	N ⁺
GHF	Part 80 HF Transmitter (GMDSS)	N ⁺
GHH	Part 80 VHF Handheld Transmitter (GMDSS)	N ⁺
GMF	Part 80 MF Transmitter (GMDSS)	N ⁺
GVH	Part 80 VHF Transmitter (GMDSS)	N ⁺
HID	Part 15 TV Interface Device*	N ^{NA}
JAB	Part 15 Class B Digital Device*	N ^{NA}
JAD	Part 15 Class A Digital Device*	N ^{NA}
JAV	Non-Digital SDoC Devices*	N ^{NA}
JBC	Part 15 Class B Computing Device/Personal Computer*	N ^{NA}
JBP	Part 15 Class B Computing Device Peripheral*	N ^{NA}
LMS	Part 90 Location & Monitoring Transmitter	N ⁺
LPR	Level Probing Radar	Y
MRD	Marine Radar	N ⁺
MWR	Part 80 Marine Watch Receiver	N ^{NA}
NII	Unlicensed National Information Infrastructure TX	Y

Code	Description	Module Permitted
PCB	PCS Licensed Transmitter	Y
PCE	PCS Licensed Transmitter held to ear	Y
PCF	PCS Licensed Transmitter held to face	Y
PCT	PCS Licensed Transmitter worn on body	Y
PLB	Personal Locator Beacons	N ⁺
PUB	Part 15 Unlicensed PCS Base Station	Y
PUE	Part 15 Unlicensed PCS portable TX held to the ear	Y
PUF	Part 15 Unlicensed PCS portable TX held to face	Y
PUT	Part 15 Unlicensed PCS portable TX worn on the body	Y
RNV	Part 80 NAVTEX Receiver*	N ^{NA}
SRT	Radar Transponder	N ⁺
SSA	Ship Security Alert Systems (SSAS)	N ^{NA}
TBC	Licensed Broadcast Station Transmitter	Y
TBF	Licensed Broadcast Transmitter Held to Face	Y
TBT	Licensed Broadcast Transmitter Worn on Body	Y
TDC	Part 80 DSC Controller	N ^{NA}
TLD	Licensed LPAS Device	N ^{NA}
TNB	Licensed Non-Broadcast Station Transmitter	Y
TNE	Licensed Non-Broadcast Transmitter Held to Ear	N ⁺
TNF	Licensed Non-Broadcast Transmitter Held to Face	Y
TNT	Licensed Non-Broadcast Transmitter Worn on Body	Y
UWB	Ultra-Wideband Transmitter	Y
VRD	Part 95 Vehicular Radar Systems	Y
WBT	Wideband Transmitter	Y
WG1	White Space Device with Geo-location- Mode 1	Y
WG2	White Space Device with Geo-location- Mode 2	Y
WGF	White Space Device with Geo-location- Fixed	Y

Appendix B

The Host Environment Chart

Host Environment Chart This section has been removed. Detailed RF exposure guidance relies entirely on KDB 447498 and Q12 and Q13 in KDB 996369-D02.

Appendix C

Module with no shield Class II or Class III Permissive Change (C2/3 PC) Guidance

A Module with no shield is limited and requires a PAG "MODLIM" before it can be granted. The Grantee's⁴³ Integration Instructions must provide a test plan (required by rule 47 CFR 15.212(b)) for a Class II or Class III.⁴⁴ filling⁴⁵ (herein referenced as C2/C3 PC), whichever is appropriate. The C2/C3 PC is required for every different specific host using the module. A particular host is the same series or similar models having the same form factor, physical size, and component layout and construction.

This C2/C3 PC aims to confirm that all hosts' emissions comply with applicable FCC rules.

If the transmitter's power is measured as conducted or as field strength, and if the C2/C3 PC investigation indicates that the module's power has increased from the original filing test report, the manufacturer, lab, and TCB must investigate to determine if the initial module tested in a standalone module was improperly granted. The module may require a new FCC ID. An inquiry can be submitted to review a specific case, but the C2/C3 PC can only be given once the issue is resolved.

An increase in measured field strength or EIRP over the module's tested field strength is the result of host installation, such as signal reflections, and this increased field strength or EIRP value remains compliant with the rules. In that case, a statement is required in the test report indicating that "an increase in field strength or EIRP."⁴⁶

Any radiated emission that does not comply with regulations must be corrected, and the C2/3PC can only be granted once the issue is resolved.

The test plan is permitted to allow for test reduction based on a

"worst-case scenario." The manufacturer can use sound engineering judgment and justification to identify a 'worst-case' data rate and bandwidth setting for test reduction.

The test plan shall confirm and demonstrate compliance with the following:

- ✓ Confirm and document the continued compliance for the fundamentals for each band under each specific rule part granted for the module.
- ✓ The test shall demonstrate each band's worst-case modulation mode(s).
- ✓ Test Band edge compliance for the widest and narrowest bandwidths per modulation type.
- ✓ Include radiated spurious emissions with the antenna connected. Testing shall be performed for each supported modulation testing 15.31(m). In all cases, a test of each modulation is required for channels over the frequency range defined in 15.33(a) for unlicensed transmitters and 2.1057(a) for licensed transmitters.
- ✓ Confirm and demonstrate with the radiated test that no additional parasitic, non-compliant emissions exist due to ingress (parasitic oscillations, radiation of stray signals within a host, etc.) are present.
- ✓ These tests can be based on C63.10 and C63.26 as guidance:

Examples: Wi-Fi devices that support 802.11 (Wi-Fi 6 or Wi-Fi 7 modes) all support a plethora of OFDM, bandwidths, and data rates. Testing may be documented for a limited selection of 802.11 (g, n, or

⁴³ A host integrator can file a change in ID to become the Grantee for previously certified modules and then file PC for each host.

⁴⁴ Modules, if granted as SDR, can use this test plan under a Class 3 filling procedure,

⁴⁵ Currently, the PC is not a PAG.

⁴⁶ The test report indicates either field strength or EIRP, not both.

ax) modes for worst-case OFDM subcarrier or tone arrangements. The worst-case modes can be selected from the radio module's initial test report.

The widest bandwidth, highest aggregate power, and highest power spectral density should be tested. If these conditions do not all combine in the same mode, then multiple modes require testing until the modes with these three parameters have been tested and confirmed.

Compliance testing is necessary if the manufacturer does not identify the worst-case settings for each modulation and data rate.

Appendix D

1. PAG requirements for LMA

- a) The MODLIM PAG is for a limited module under §15.212(b) when shielding, buffered modulation/data inputs, and power supply regulation cannot comply.
- b) Shielding of radio elements is required under §15.212(a)(1)(i), and if the module cannot comply, the module can qualify as a limited module, and a PAG MODLIM is required. The integration instructions must specify that a C2/3PC is needed.
- c) The module must have buffered modulation/data inputs §15.212 (a)(1)(ii), and if the module cannot comply, the module can qualify as a limited module, and a PAG MODLIM is required.
- d) If voltage regulation is required under §15.212(a)(1)(iii), and if the module cannot comply, the module can qualify as a limited module, and a PAG MODLIM is required.
- e) Antenna and transmission system requirements of §15.212(a)(1)(iv) for §15.203, §15.204(b) and §15.204(c). Professional installation procedures can be extended to host professional installers. Modules used in host professional installation can qualify as an LMA when the details are defined in the filing and integration instructions 996369 D03 OEM Manual v01 as a PAG item MODLIM.
- f) Tested in a stand-alone configuration under §15.212(a)(1)(v). If the module cannot comply with a stand-alone configuration, the module can qualify for limited module certification by testing in the Host under LMA under PAG item MODLIM.
- g) The modular transmitter must be equipped with either a permanently affixed label §15.212(a)(1)(vi) or, if the small size meets §2.925(f) and capable of electronically displaying its FCC identification. All modules must comply with this condition and cannot be used as a condition for obtaining LMA.
- h) The modular transmitter must comply with all the specific rules or operating requirements §15.212(a)(1)(vii), and this requirement cannot be used as a condition for obtaining limited module certification.
- i) §15.212(a)(1)(viii) subject to the radio frequency radiation exposure requirements. All modules must comply with this condition and cannot be used as a condition for obtaining LMA.

2. Limited Split Module (996369 D05 Split Module)

- a) Only the front end of the radio must be shielded. §15.212(2)(2)(i).. If the split module cannot comply, it can qualify as a limited split module, and a PAG MODLIM is required, the same as 3.2a).
- b) The module must have buffered modulation/data inputs. §15.212 (a)(1)(ii).. If the split module cannot comply, it can qualify as a limited split module, and a PAG MODLIM is required, the same as 3.2b).
- c) Voltage regulation is required under §15.212(a)(1)(iii). If the split module cannot comply, the module can qualify as a limited split module, and a PAG MODLIM is required, the same as 3.2c).
- d) Antenna and transmission system requirements §15.212(a)(1)(iv) can qualify for the Limited Split module the same as 3.2d).
- e) The sections of a split modular transmitter must be tested and installed in hosts that can be considered representative of the ones intended for use. §15.212(a)(2)(iii). See 996369 D05 Split Module for guidance on the definition of similar hosts. If the module cannot comply with a representative host configuration, the module may qualify for limited split module certification for a specific host.
- f) The modular transmitter must have a permanently affixed label, etc. Same as 3.2g) §15.212(a)(1)(vi).

- g) The modular transmitter must comply with all the specific rules or operating requirements, same as 3.2h) §15.212(a)(1)(vii).
- h) Radiofrequency radiation exposure requirements. §15.212(a)(1)(viii) the same as 3.2i).
- i) Additional Split module requirements:
 - 1) Control information and other data may be exchanged between the transmitter control elements and the radio front end. §15.212(a)(2)(ii). Control information is not a requirement but permitted, i.e., for authentication to comply with §15.212(a)(2)(iv), ensure that only transmitter control elements and radio front-end components have been approved together.

Manufacturers must ensure that only approved transmitter control elements and radio front-end components can operate together. §15.212(a)(2)(iv). requires that all modules comply with this condition⁴⁷.

⁴⁷ A description in the filling is required explaining that the control element and radio front end(s) approved together can operate together when used as a certified module.

Change notices:

10/23/2015: 996369 D01 Module Equip Auth Guide v01r04 has been changed to 996369 D01 Module Equip Auth Guide v02.

1. The module Q&A section of 996369 D01 Module Equip Auth Guide v01r04 has been moved to a separate attachment 996369 D02 Module Q&A.
2. Questions 12 and 13 are added to 996369 D02 Module Q&A about misc.—multi-transmitter operations.
3. Question 14 added USB dongles as an example integrated within end products.
4. Clause: I modified it by moving the first bulleted list to the end of the clause.
5. Footnote 1 amended to remind that DA-00-1407 is obsolete because it is superseded by §15.212.
6. Change notation from PBA to PAG.
7. Misc. basic editorial cleanups.
8. Clause numbering was adjusted after adding a number for the integration instructions clause.
9. Clause IX added about host product considerations.

04/24/2023, 996369 D01 Module Equip Auth Guide v02 has been changed to 996369 D01 Module Equip Auth Guide v03. v03. changes allow Split modules allowed for licensed devices, added PAG approval procedure for limited modules, List of Equipment Classes as Appendix A for modules not permitted, additional clarification on RF exposure referencing for publication 447498 D01 General RF Exposure Guidance for Equipment Authorization or when the draft is published as 447498 D01 General RF Exposure Guidance v07. Appendices B, C, and D were added for clarification and guidance.

04/16/2024: The 996369 D01 Module Equip Auth Guide v04 replaces 996369 D01 Module Equip Auth Guide v03. Version V04 corrects multiple typos, clarifies items, replaces section 6 Guidance for RF exposure, and removes Appendix B. Guidance for Grantees and Host's integrators related to RF exposure. RF exposure guidance is provided in KDB Guidance of 447498.

mm/dd/2024: The 996369 D01 Module Equip Auth Guide v04r01 replaces 996369 D01 Module Equip Auth Guide v04. Version V04r01 revised section 8 for guidance on Antennas specifically for licensed client modules. The previous version, V04, was revised and required licensed client modules to be treated like Part 15 Modules. After considering comments from the TCB module committee, version V04 was revised to version V04r01, which aligns with how limited client modules have been certified in the past.

**Federal Communications Commission
Office of Engineering and Technology
Laboratory Division**

Month DD, 2024

MODULE FREQUENTLY ASKED QUESTIONS

Question 1: What options are available for parties other than the original grantee to apply for changes to an existing modular grant?

Answer 1: When using a module in a host device, the actual end-use configurations often require changes in the authorization of the device that has been granted as a module. The following options are available for certified modules for a new party other than the grantee of the original certified module:

- a) Application for a Change of the FCC ID (Section 2.933).
 - 1) A new party must obtain written permission from the original grantee before applying for a change in FCC ID. This permission must be filed as a cover letter with the change in the FCC ID application. It should be signed or endorsed by an authorized representative of the original grantee. See KDB 249634.
 - 2) After a change in FCC ID filing, the new party may subsequently file a Class II permissive change to amend the grant authorized by the Commission under § 2.1043 and expand the operating environments not covered in the original grant. However, it is essential to note that the original grantee may be willing to file the permissive change in some cases, making the change in FCC ID unnecessary.
- b) New Certification Application, i.e., approved under a new FCC ID:
 - 1) If a new party wants to use a certified module but requires changes, it has two additional options other than a Change in FCC ID: (1) obtaining a new certification with a new FCC ID for a complete product utilizing the module as a part or subassembly;⁴⁸ Alternatively, (2) the new party can obtain a separate independent module certification under a new FCC ID (not a change in ID).
 - 2) The new certification of the complete product or separate independent module must fully comply with all the applicable rules and filing procedures. In the second option, as a new module, the new party must also explain why a change in ID is not used. In either case, it is essential to note that no vested or transferable grant conditions⁴⁹ from the original module certification are conveyed to the new product or module for the new party⁵⁰.

⁴⁸ Part or subassembly refers to when a product's original certified module is used within a product as a component, system on a chip, or subassembly, i.e., not as a module integrated into a host and using the module's FCC certification.

⁴⁹ Unlike § 2.933 Change in equipment identification, which does not require resubmission of all test data. A new certification with a new FCC ID, all exhibits are required under § 2.1033 Application for certification.

⁵⁰ The new party is fully responsible for its new product or separate module, whichever is applicable. For any changes by the original module grantee, the new party is responsible under § 2.907 to ensure that their product or module remains identical (see § 2.908) to the sample tested for the new product or module under the new FCC ID and any permissive changes permitted by 2.1043 under that FCC ID.

- 3) The complete product certification shall include all required exhibits, including test reports, schematics, cover letters, affidavits, and operational descriptions as appropriate for both cases.
- 4) When the part or subassembly in the new device or the independent module is such, the originally granted module's conducted antenna port test data (e.g., conducted power, bandwidth, frequency tolerance, conducted antenna port emissions) is unchanged. Reference to this original certification test data is permitted to demonstrate the new device's results. The test report must provide a statement to identify which data items from the original module certification test report⁵¹, the associated FCC ID, and a statement that the data accurately represents the operation of the new device.
- 5) The new device, which utilizes the module as a component, requires new radiated emission testing and the original RF exposure evaluation or SAR test.

Question 2: How are U-NII modules with Dynamic Frequency Selection (DFS)/radar detection capability handled?

Answer 2: U-NII modular devices with radar detection are typically filed as limited modules covering the specific receive antennas used with the device. The performance of radar detection is affected by the received antennas, and therefore, the module approval is limited to the specific host/antenna used for the DFS compliance tests. However, standalone module approval can be obtained for devices with radar detection capability on a case-by-case basis. Further, the U-NII devices must comply with the additional guidance in KDB Publication 443999.

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 may be marketed separately, but only if the module and antenna incorporate an authentication protocol to ensure that only authorized modules and authorized antennas work together.

Question 4: Can Part 15 transmitter modules and associated antennas be sold separately when the host performs the certification authentication protocol?

Answer 4: It is permissible to rely on the host to provide compliance with the authentication requirement between the certified module and the associated antenna. The certified module shall not transmit until the host authentication ensures the properly certified antenna is present. The grantee is responsible for providing the authentication protocol and must give clear instructions to the host manufacturer on integrating the code within the host to ensure compliance.

Question 5: Can a grantee obtain limited modular approval for a transmitter that operates under specific host conditions and is installed by end users?

Answer 5: Yes, for user-installed limited module transmitters in a host (e.g., tablet and laptop computers), a two-way certification authentication protocol or BIOS lock implementation is required to

⁵¹ The referenced data can only be from the original FCC ID's certified test report.

ensure compliance. This ensures that the module verifies that the proper host is used and the host verifies that the appropriate module is used.

The Grant condition must state: “This device must use a BIOS lock mechanism which ensures that it only operates with hosts as specified in the certification filing.” This ensures that the module verifies that the proper host is used and the host verifies that the appropriate module is used. For guidance on RF Exposure considerations, see KDB Publication 996369 D01.

Other options for a BIOS lock mechanism may be considered, but the FCC must agree to the method before TCB approval.

Question 6: Can end users install transmitter modules into a laptop computer with 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 the module cannot be tested as a stand-alone module, it can only be approved as a limited module. Further, the approval requires a two-way certification authentication protocol between the host and the module. See answer five above.

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

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

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

Answer 8: A physically delineated, tangible module may be approved as an SDR if it meets all the security requirements imposed by Section 2.944 and the requirements for a modular transmitter. The host manufacturer or the OEM integrator must not be able to modify the module's RF parameters or configuration options through software. See KDB Publication 442812 and the attachment for additional information.

Question 9: What are the requirements for using a certified device inside another enclosure or another device without having to re-certify the device in the new enclosure or device under a new FCC ID?

Answer 9: If the transmitter is certified as a module, it may be integrated or used inside another device. No further approval is required when the module is used by the FCC grant conditions and any limitations or usage conditions required by the manufacturer's instructions, as discussed in this publication and labeled as discussed in KDB Publication 784748.

For further guidance on changing the enclosure or permitting the use of a certified device not approved as a module, see KDB Publication 178919.

In both cases above, compliance with all grant conditions must be observed. For example, adherence to the grant condition states this transmitter cannot be co-located with other transmitters or used within a certain distance from a user's body or nearby persons. In addition, other electronic functions not associated with the certified module or certified transmitter may require additional equipment authorization.

Question 10: To qualify as a module, must the shielding enclose the entire module or just the RF circuitry? Is it acceptable if the module can meet the technical standards in a standalone configuration without shielding?

Answer 10: To qualify as a module, the RF circuitry must be shielded even if the module meets the limits in a standalone configuration without any shielding. The shielding design must fully encompass the RF circuitry, including shielding the top, all sides, and the bottom of the RF section. The bottom may be a shielding ground plane. It must be expressly designed as an effective shield made of sheet metal, metal mesh, or metallic ink-coated material. Any holes in the shield must be significantly smaller than the wavelength of the radiation being blocked to effectively approximate an unbroken conducting surface.

The shielding of the RF section helps prevent RF coupling when installed in a host. Other circuitry, such as flash memory, a temperature sensor, input voltage regulators, input data buffering circuits, etc., may not be RF and, therefore, need not be shielded. However, the grantee must use good engineering judgment to reduce any possible RF coupling that might affect a host.

Question 11: Can a module be certified where the host device uses a microstrip trace on the host's printed circuit board to an antenna connector or a trace antenna on the host circuit board?

Answer 11: The following provisions apply to unlicensed and licensed device modular approvals.

A modular transmitter may be certified when the connection to the antenna is made through a host's printed board microstrip trace layout to an external connector, trace antenna, or component (chip) antenna on a printed circuit board (herein referenced as "trace design"). This can include passive parts for antenna attenuation padding, impedance matching, or providing test ports. Other components, such as amplifiers and active drivers, are not considered a trace layout and must be contained in the module.

The certification application shall include detailed engineering reference dimensions for the trace design and the required OEM instructions (see KDB Publication 996369 D01) for all trace designs approved with the module. In particular, the integration instructions shall include the following:

- a) Trace layout and dimensions, including specific designs for each design:
 - 1) Layout of trace design, parts, antenna, connectors, and isolation requirements.
 - 2) Each type of antenna must clearly describe the Boundary limits of size, thickness, length, width, shape(s), dielectric constant, and impedance.
 - 3) Different antenna lengths and shapes affect radiated emissions, and each design shall be considered a different type; e.g., antenna length in multiple(s) of frequency wavelength and antenna shape (traces in phase) can affect antenna gain and must be considered.
 - 4) A Gerber file (or equivalent) for PC layout should provide the above data.
- b) Test procedures for design verification.
- c) Production test procedures are used to ensure compliance.

Only trace designs approved with an original grant or through permissive change can be used by an OEM. PCB circuit designs have an increased potential for design mishandling and are susceptible to cross-talk and increased unintentional radiation. The applicant must provide compliance test data for all marketed or used antenna circuit trace designs. Different antenna lengths and trace layouts can affect radiated emissions, and each design shall be considered a different type.

To demonstrate compliance, when not limited to a specific host, each trace design (type) shall use a standalone reference PCB test board design representative of the worst-case boundary limits (as constrained by the design rules documented in the integration instructions).

The most recent test procedures and guidance must be followed for SAR consideration, as discussed in KDB Publication 996369 D01 and all the relevant KDB publications, particularly the conditions defined in KDB Publication 447498.

It is recommended that the grantee agree with the host manufacturer to build the device according to any necessary instructions to ensure compliance.

Grant comment: “This module can only be used when installed in a host device that follows the required instructions for using a trace reference design.”

The integration instructions must state that this module’s FCC certification is only valid when the manufacturer/integrator adheres to the trace reference design guidance provided in this integration instruction.

Suppose the trace reference design information in the operational description is confidential. In that case, the grantee must provide a procedure for integrators to access sufficient information, even if adequately redacted, to protect intellectual property and sensitive content.

Question 12: Aside from RF exposure evaluation considerations (which are covered in, e.g., Question 13), is there guidance for multiple certified *transmitters with a modular grant of certification (hereafter referred to as Modules)* when integrated into a host and transmitting simultaneously in the same or different bands?

Answer 12: The host manufacturer or integrator (hereafter referred to as the host responsible party for compliance with the Equipment Authorization rules applicable to the host device by Clause IX in KDB Publication 996369 D01) is responsible for compliance with the appropriate FCC rules and Equipment Authorization published procedures for all the transmitters in the host, both operating individually and simultaneously. This includes compliance for summing all emissions from all outputs occupying the same or overlapping frequency ranges, as defined by the applicable rules.

For EMC/radio-parameter compliance purposes, an evaluation may be done by the grantee *host responsible party*.

The *host responsible party* integrator must perform EMC testing of the Module in simultaneous transmission operations while integrated into the host. It is unnecessary to file the result of these simultaneous transmission test data if no emissions with increased amplitude and/or on different frequencies are detected compared to what is reported in the modular grant (that refers to single-transmitter operations testing). This comparison is considered acceptable if:

- any detected variations are within the overall tolerance of the test equipment used by the *host responsible party*,

and

- compliance would still be demonstrated for the overall tolerance of the test equipment used by the host responsible party (this is to prevent purposely the use of an excessively high tolerance test equipment).

For instance, if the *Module* EMC emissions, as reported in the grant of certification, are 0.5% below the compliance limit (or equivalent value in dB) for a particular frequency, and the *host responsible party instrumentation tolerance is shown to be 1%*, then the *host responsible party cannot claim that the*

module's operation in the host is compliant.

Suppose additional emissions from the simultaneous transmission operations are present (within the provision discussed above). In that case, the *host responsible party must account for those emissions in the equipment authorization documentation. In the case of a host authorized via SDoC, the pertinent document of record shall include the additional compliance data and be retained according to 47 CFR §2.906.*

For hosts that utilize the certification Equipment Authorization procedure, the proper test report exhibit(s) shall be updated following a Class II permissive change related to the host certification filing. An exception to this requirement is for hosts certified as Unintentional Radiators under Part 15 B. For these cases, per KDB 447498, the certification of the unintentional radiator does not require filing an RF exposure report. Therefore, since no change in the RF exposure exhibits is made, the Class 2 Permissive Change is unnecessary.

Question 13: As described in the following three questions, what are the RF exposure procedures to be followed when integrating transmitters with a modular grant of Equipment Authorization via the certification procedure (hereafter referred to as *Modules*) in hosts that lead to conditions of operation different from those for which the *Module* was certified?

More specifically, three cases are being considered:

QUESTION 13A). A transmitter *Module* certified as a 2.1091-mobile configuration is integrated into a host, and by its design, the host will continuously operate the *Module* in stand-alone conditions, i.e., without any other transmitter in the host (if any) operating while the *Module* is transmitting. What are the *Module* integration requirements if the host design and operations require that the host be classified as a 2.1093 portable device?

ANSWER 13A): The *module's* 2.1091 mobile configuration implies less restrictive conditions than those for the 2.1093 portable case. Therefore, in this case, additional testing, modifications, and/or evaluation are needed to allow the *Module* to operate in a host device under the more restrictive 2.1093 portable configuration conditions.

This may be accomplished through a *Module* Class II permissive change filing, demonstrating that the *Module* meets the 2.1093-portable requirements as integrated into the host. In some cases, the *Module* as designed may meet the 2.1093-portable requirements, even if it was certified as 2.1091-mobile. For instance, this could be the case when the RF power is sufficiently low. In other cases, the *Module* may need modifications (hardware and/or firmware), typically to reduce the RF power, and/or inserted within the host layout so that the 2.1093-portable requirements are met, for example, due to a sufficient distance from the host outer enclosure.

Permissive changes for the *Module* can be filed only by the *Module* grantee. In the alternative, the *host responsible party* may first request to obtain a change of FCC ID for the *Module* and subsequently file for the appropriate Class II permissive change that pertains to the specific host installation for the module with the newly obtained FCC ID.

Finally, another option for the host responsible party is to consider certification for the entire host device. In contrast, the modular transmitters are just considered “components,” thus, without referring to the modular certification that was previously obtained. Accordingly, as for any other component present in the host, equipment authorization compliance is to be determined about the testing of the entire host device, per all applicable rule parts.

QUESTION 13B): For a single host certified as a 2.1091-mobile device, what are the procedures for integrating Modules that may transmit simultaneously with other RF devices (regardless of whether they are modular transmitters) present in the host?

ANSWER 13B):

The host responsible party needs to perform a new RF Exposure MPE evaluation (which may also include determining test exemption conditions, as applicable) for all the combinations of simultaneous transmissions allowed by design or for a demonstrated worst-case scenario.

Consistently with this evaluation, a minimum compliance boundary (i.e., a minimum distance required between a person's body and the radiating structures in the host) will be established. Generally, the compliance boundary may not be isotropic, i.e., larger than 20 cm in some directions. For this reason, the MPE evaluation is required along the three principal axes of each radiating structure integrated into the host. Symmetry considerations may be used to reduce the amount of testing.

If the compliance boundary resulting from the evaluation just described is less or equal to each established for the *Module* certifications and all directions, the review shall be reported in the RF exposure exhibit of the host certification filings.

When *Modules* are operated in simultaneous transmission within a host, and the host is certified via SDoC, the documents of record retained by the manufacturer and subject to FCC inspection upon request per 47 CRF 2.906 shall contain the details of the evaluations performed to ensure compliance with *Modules* operating in simultaneous transmission.

If the compliance boundary exceeds those established in the *Module* certifications, a Class II permissive change for the pertinent *Module* (s) will be required. The applicable permissive change options, consistent with the rules, are the same as described in ANSWER 13A above. The host manufacturer always has the option to apply for their own FCC ID either for a *Module* or for the entire host.

QUESTION 13C). What are the procedures for integrating *Modules* that may transmit simultaneously into a single host certified as a 2.1093 portable device?

ANSWER 13C). As discussed in ANSWER 13B, when *Modules* are operated in simultaneous transmission within a host and the host is certified via SDoC, the documents of record retained by the manufacturer and subject to FCC inspection upon request per 47 CRF 2.906 shall contain the details of the evaluations performed to ensure compliance with *Modules* operating in simultaneous transmissions.

The host responsible party needs to perform a new RF Exposure evaluation to establish compliance with all the combinations of simultaneous transmissions that are allowed by design or for a demonstrated worst-case scenario. This may also include the determination of test exemption conditions, as applicable.

In some cases, this compliance evaluation may be accomplished through a simplified procedure (as opposed to a complete RF exposure testing of the host device) that requires only the knowledge of the maximum Total Exposure Ratio (TER, based on SAR or power density, as applicable) for each *Module*, and the relative distances between the radiating structures of each *Module* and every other transmitter (*Module* or not) installed in the host. This procedure is illustrated in KDB Publication 447498 and is based on the "SAR to Peak Location Separation Ratio" (SPLSR) test exemption formula.

In summary, the SPLSR condition is evaluated for each *Module* integrated into the host. So long as the *Module* and its distance from any other transmitter meet the SPLSR formula requirements, no further testing is required (however, the details of this evaluation shall be reported as an exhibit in the RF

exposure section of the host certification filings).

If the SPLSR condition is not met for any particular module, the installation position in the host may need to be changed so that a larger distance is imposed from other transmitters. If that is not possible or sufficient, the *Module* may require modifications to reduce the RF power (and therefore the maximum SAR or TER). These modifications shall be reported via a Class II permissive change, and the related discussion in ANSWER 13A) also applies here. When more than one *Module* is integrated into a host, each *Module* and any related permissive change is considered and filed separately.

Finally, if the SPLSR procedure (including any *Module* modification) is not sufficient to demonstrate compliance, the *host responsible party* is required to certify the host by providing a complete RF exposure evaluation without relying on the information obtained from the individual certification of the *Modules* that are being integrated into the host.

Question 14: Can a host manufacturer integrate a non-modular transmitter (e.g., a USB dongle) into a non-accessible enclosure and label the device with the FCC identifier, such as “This product contains transmitter FCC ID XXXYYZZZ?”

Answer 14: This is acceptable under the following conditions:

- a) The host manufacturer must adhere to all guidance provided in KDB Publication 996369, including RF exposure requirements,
- b) The transmitter is also approved as a computer peripheral under DoC or certification and must use a standard computer peripheral connector (e.g., USB),
- c) No modifications are made to the transmitter (i.e., the device integrated is identical to what is approved),
- d) Only antennas already approved with the device are used, and by all grant conditions and installation requirements,
- e) The host manufacturer performs verification testing to ensure that the device still complies (See Clause IX in KDB Publication 996369 D01),
- f) The host manufacturer provides appropriate Part 15 user information, including any applicable RF exposure warnings.

Note that the host manufacturer requires a new certification and filing if any of the preceding conditions cannot be met.

Change Notice:

10/23/2023: 996369 D02 Module Q and A v01 has been changed to 996369 D02 Module Q and A v02. The overall document has undergone editorial changes. Q&A 11 has been modified to clarify the procedures, and Q12 and Q13 have been rewritten.

mm/dd/2024: 96369 D02 Module Q and A v02 has been changed to 996369 D02 Module Q and A v02r01. Question 1 has been clarified to be more specific. The overall document has undergone some general grammatical changes.