Federal Communications Commission
Office of Engineering and Technology
Laboratory Division Public Draft Review

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Draft Laboratory Division Publications Report

Title: Split Module

Short Title: Split Module

Reason: Clarification and update for certification for split modules under 15.212

Publication 996369

Keyword/Subject: Modules, Module Certification, 15.212 , add Split Modules

First Category: Modular Approvals

Second Category: General (Module Approvals)

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

Answer:
See the guidance for transmitter module devices in the following attachments:
996369 D01 Module Certification Guide v02 provides a guide for equipment authorization applications under Section 15.212 modular transmitters

996369 D02 Module Q and A v01 provides additional guidance in a question-and-answer format

996369 D03 OEM Manual v01 provides guidance to 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.

996369 D05 Split Module v01 provides guidance for certification of split modules.

Attachment List:

996369 D01 Module Certification Guide v02r01**
996369 D02 Module Q and A v01*
996369 D03 OEM Manual v01r01**
996369 D04 Module Integration Guide v02r01**
996369 D05 Split Module v01 *

* No changes to this attachment.
**Only minor edits as shown in this document on Page 3.
*** New attachment under this draft review starting at page 4. 996369 D05 Split Module v01 can be currently used for applications and are under PAG as item TXSPLT.

996369 D01 Module Certification Guide v02r01*

- III. MODULAR TRANSMITTERS SUBJECT TO § 15.212 RULES
  - c) "A split-modular transmitter is comprised of two basic components:" to "A split-modular transmitter is comprised of two basic components (See attachment D05 Split Modules for further guidance):"

- IV. MODULAR TRANSMITTERS SUBJECT TO LICENSED RADIO SERVICES RULES
  - ~~"Split-modular approvals or limited split-modular approvals are not permitted for licensed modular devices;"~~ to "(a) Split-modular approvals or limited split-modular for licensed modular see D05 Split Modules for further guidance."

996369 D03 OEM Manual v01r01*

- 3.0 MODULAR TRANSMITTER TCB APPLICATION REVIEW
  - Note: Split modules are subject to the Pre-Approval Guidance (PAG) procedure. ~~It is recommended that applicants check using a KDB inquiry prior to a TCB PAG to determine if the Split Module approach is appropriate. Split modules require approval for authentication and software approved on case-by-case bases~~. to
  - Note: Split modules are subject to the Pre-Approval Guidance (PAG) procedure. see D05 Split Modules for further guidance.

996369 D04 Module Integration Guide v02r01*

- 2.0 GENERAL GUIDANCE
  - iv) Use the figure below change in figure first box from "~~single~~ module" to "module".

996369 D05 Split Module v01

Split Modules Certification

I. Introduction.

This attachment provides clarification to § 15.212 (a)(2) in regard to using active (non-passive) antenna subsystems as split modules for both licensed and unlicensed transmitters. This guidance modifies the previous KDB policy that did not permit split modules for licensed devices.

A split modular transmitters must be certified as a complete transmitter system consisting of a separate Transmitter Control Element (TCE), and one or more Radio Front End (RFE) components interconnected with intervening cable and/or PCB traces.

To complete the equipment certification process, split modules, unlike single modules are shall be certified and must demonstrate EMC compliance on a test board(s) that are similar to the host device(s). This is accomplished by certifying split modules based on testing in one or more "Host Environment Simulator" (HES, defined in detail in Sect, III), rather than relying only on stand-alone testing (i.e. testing without integration in a host environment). More than one HES type may be included in the initial application, or added at a later time as a C2PC.

As for with any module, split modular transmitters must also comply with all applicable EMC's RF exposure applicable rules and equipment authorization policies. Depending on the host use conditions supplemental RF exposure test data may be required as a C2PC under that module's FCC ID. See Appendixes.

A split module that cannot meet all the four key requirements of § 15.212 (a) (2) can be certified as a limited split module under § 15.212 (b) if the integration instructions clearly define the integration requirements and use conditions. An essential requirement of the split modular certification is that the host manufacturer is provided with clear guidance on how to integrate the module to ensure FCC compliance in the finished product. The integration instructions, as defined in 996369 D03 OEM Manual, are a key element for obtaining an equipment certifications, in the same way as to the requirement of providing test reports.

II. Split module Rules

15.212 (a) (2) Requirements for split modules are:

1. The RFE must be shielded. In cases where the RFE contains an antenna, the radiating parts will be located outside the RFE shield. The remainder of the module shall be shielded, so to minimize ingress RF pickup.
2. The Interface between a radio-front-end and the control element must use a minimum signaling amplitude of 150 mV peak-to-peak. Split modules can be certified as limited split modules when this requirement is not applicable for the interface between the TCE and RFEs. However, the specific connection specifications and/or cabling must be included as part of the certification application, and clearly documented in the integration instructions. These specifications shall demonstrate that proper design was set in place to prevent amplification of stray RF pickup on non-shielded sections (e.g.,

PCB traces) of the interface. This issue shall be part of the items that are vetted for the purpose of certification.

3. Split modules cannot be certified standalone and must be certified through testing in host device(s) similar to (i.e., representative of) the ones where the modules will be integrated in . Guidance is provided below in section III.
4. A secure authentication exchange method must be used between the RFE and the control element to ensure that both parts have been approved together under an FCC ID. Split modules can be certified as limited split modules when this requirement is not applicable as a secure digital signature between the TCE and RFEs . In this case the integration instructions must identify by part identification the RFE and TCE that can only be used together for an certified transmitter under that FCC ID.

III. Split module Host Environment Simulator

The concept of *host environment simulator* (HES) is introduced to represent different, similar host(s) and facilitate the certification of modules where the host integration conditions may have critical impact on compliance to certification requirements. A *Split Module* may be certified in more than one HES to represent different hosts.

The HES is a completely passive structure, designed to represent the impact of the host conducting structures and layout on the module's electromagnetic emissions in the typical integration conditions, that is when a module is installed in the host, but without any host-installed transmitters in operation.

Typically, a HES may consist of one or more PCB and conductive structures (internal and enclosing) that mimic the actual host in terms of shape, size, and positioning. The PCBs may just have an overly simplified layout consisting of only grounded and floating conducting areas, conservatively representing the host design.

As a guideline for the design of the HES, one may consider that, in general, floating conductors will lead to EM wave reflections, thus a large floating patch on a PCB, instead of actual tracks and components, will provide a worst-case scenario related to both antenna gain in EMC testing, and near-field patterns (of course, only related to the *Split Module* transmitter(s), since the HSE is a passive structure) that are relevant for RF Exposure evaluations.

IV. Use of HES for the Module Certification Process

The HES must be used for all Split Module certifications, and related filings shall include the all the HES physical details, along with an accurate description of which host(s) the HES is meant to be applied to (i.e., FCC IDs, or manufacturer's unique model identifiers, if FCC IDs are not available).

Approval of whether the HES design provides a proper representation of any given host intended for use with the module is also part of the Split Module certification process. The FCC may not accept the proposed HES design, or request modifications, as necessary.

The *Split Module* certification will be provided with grant notes that refer to the integration instructions for the host(s) for which the HES used in the certification process was designed for.

Additional hosts may be added via a C2PC application: depending on the host being added, a new HES design may be needed. This determination is also part of the review process for the C2PC application.

V. Collection of Test Data for *Split Module* Certification

Both EMC and RF exposure tests shall be performed with the *Split Module* integrated in the HES. If the *Split Module* is designed so that can integrated in the host by choosing different layouts for the *Split Module* components (e.g., different relative positions, different connecting cable lengths), then separate testing will be required for each configuration (while a single FCC ID may be retained).

Unlike Single Modules, the *Split Module* is not required to be tested without the HES, i.e., no *Split Module* testing is required in actual stand-alone conditions.

The integration of a *Split Module* in a host where simultaneous transmission may occur (i.e., when both any of the *Split Module* transmitters and any other transmitter that is installed in the host are operating at the same time) must follow the *Module* integration policy in KDB Publication 447498. Accordingly, as prescribed for single *Modules*, this may require the specification of a minimum distance between the antenna(s) of the *Module* and other antennas already present in the host. These additional constraints details for integration in simultaneous transmission conditions shall also be provided in the integration instructions.

Appendix A - General RF Exposure Considerations for Module Certification

For the purpose of *Module* certification, including split modules, the RF exposure evaluation may require specific testing (for Maximum Permissible Exposure, and/or Specific Absorption Rate) in accordance with applicable KDB Publications, such as 447498 and 996396, that are reflecting more general requirements under § 1.1307 and § 1.1310 of the Rules.

Accordingly, certification of *Modules* may also require, in some cases, specifying human RF exposure-use conditions in the integration instructions. For instance, this may entail specifying a minimum distance to be consistently maintained between the *Module* antenna and a person, and/or (for the cases where the *Module* is integrated to operate simultaneously with other transmitters in host) a minimum distance between the *Module* antenna(s) and the closest antenna in the host.

Appendix B - Qualification of Modules for Different RF Exposure Categories

In many cases, *Modules* are certified for the *mobile* category of use conditions, as defined by §2.1091. This requires that a minimum distance of 20 cm from a person is maintained, while still in compliance with § 1.1307 and § 1.1310. When use conditions lead to operations at less than 20 cm from a person, *Modules* are certified for the *portable* category of use conditions, as defined by §2.1093[1], and according to the policy in KDB 447498.

A *Module* can be certified for the §2.1091-mobile category so long as integration instructions are provided stating that any *demonstrated use case* in a host that guarantees that a minimum distance of 20 cm from a person is consistently maintained. Non-recurring conditions leading to transient exposure, in the order of one second, for instance to reach out to turning a device on or off, are acceptable.

The same *demonstrated use case* requirement must be also applied for stand-alone use, for those designs where the stand-alone use is feasible.

For a *Module* certified under the §2.1091-mobile category, any implementation that allows operations of the device closer than 20 cm from a person represents a violation of the FCC grant conditions.

Hosts that include *Modules* certified under the §2.1091-mobile category, can fulfill the integration requirements through a host design of sufficiently large size, or by providing detailed descriptive evidence that any reasonable, even unlikely, use condition will not lead to operations at less than 20 cm from a person.

Host devices equipped with proximity sensors to turn off (and not just decrease) the RF power when a person is detected at close enough distance, may also fulfil the requirements.

Any condition that is applicable to a particular host device shall be clearly detailed in the filings submitted as part of the certification application for the host.

Albeit typically rare, proximity sensors that control RF power shut-off could be installed in the Module itself. In that case the requirements on the host use conditions are greatly simplified, however the integration instructions must include information sufficient to verify the proper functioning of the sensors on the *Module*.

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[1] §2.1093 (c) provides references to § 1.1307(b)(3)(i) (A), (B), (C) for portable devices RF exposure requirements subject to routine environmental evaluation according to the policy in KDB 447498.

Devices (both hosts and *Modules*) with proximity sensors that decrease (instead of turning off) the power when a person is estimated to be closer than 20 cm, as well as any device that cannot be certified as §2.1091-mobile category device, shall be considered for certification under the §2.1093-portable category.

In general, any device that cannot be certified either as §2.1091-mobile category device, or as fixed installation, shall be considered for certification under the §2.1093-portable category.

Specific test requirements related to either a §2.1091-mobile or a §2.1093-portable certifications are provided in KDB publication 447498. Data showing how those requirements are satisfied should be fully documented in the *Module* certification filings.

As an example, one may consider a host integrator that intends to use a *Module* at a distance from persons, and/or from other transmitters operating simultaneously in the host, closer than what is allowed by the *Module* grant conditions. In that case, the *Module* grantee must first file a C2PC[2] to demonstrate compliance for the new conditions of operation. This process may then result in additional host integration instructions, including cases where the instructions are customized for a specific host (as defined uniquely by the manufacturer model, or by its FCC ID).

[2] An additional option is discussed in KDB Publication 996369, which allows the host integrator to first file a Change-of FCC ID for the *Module*, and then file a C2PC (thus no longer requiring a C2PC filed by the *Module* manufacturer).