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

Split Modules Certification

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I. Introduction.

This attachment clarifies § 15.212 (a)(2) regarding using active antenna systems as split modules for both licensed and unlicensed transmitters.

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 PCB traces.

To complete the equipment certification process, unlike single modules, split modules must demonstrate EMC compliance on a passive test board that provides a good representation of the host device's impact on the RF emissions of the module. Certification is accomplished by certifying split modules based on testing in one or more "Host Environment Simulators" (HES, defined in detail in Sect III). Rather than relying only on stand-alone testing (i.e., testing without integration in a host environment or with a fixture representing the 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 any module, split modular transmitters must also comply with all applicable EMC and RF exposure rules and equipment authorization policies. As discussed in the Appendixes, supplemental RF exposure test data may be required to process a C2PC for a module depending on the host use conditions.

A split module that cannot meet all the requirements of § 15.212 (a) (2) can be certified as a limited split module under § 15.212 (b). There is no specific format or template required for this filing. The Grantee can devise a strategy to be approved through a Pre-Approval Guidance (KDB Publication 388624 PAG item MODLIM) inquiry. Providing clear guidance on integrating the module to ensure FCC compliance in the host is an essential requirement of the modular certification. As defined in 996369 D03 for obtaining an equipment certification, these integration instructions are as crucial as test reports.

II. Split module Rules

Per 15.212 (a) (2), the requirements for split modules are:

1. The RFE must be shielded, so to minimize ingress RF pickup. If the RFE contains an antenna, the radiating parts will be located outside the RFE shield, while the remainder of the module shall be shielded.
2. The Interface between a RFE 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 an "Host Environment Simulator" (HES) that is a passive structure representative of the host device(s) where the split module will be integrated in. Specific 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 the same FCC ID. The authentication solutions shall be designed to ensure that end users cannot operate RFE and TCE that are not certified together[1]. Split modules that are not designed to be user removable and replaceable, can also be certified as limited split modules when there is no secure authentication. In this case the integration instructions must indicate the part identification for the RFE and TCE that can only be used together, so to validate the certification under that FCC ID.

III. Split module Host Environment Simulator

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

The HES is an entirely passive structure designed to represent the impact of the host conducting elements and layout on the module's electromagnetic emissions in typical integration conditions. That is when a module is installed in the host without host-installed transmitters (i.e., only for standalone integration conditions, not simultaneous transmissions).

Typically, a HES may consist of one or more PCB and conductive structures that mimic the actual host in terms of shape, size, and positioning. The PCBs may 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 sizeable floating patch on a PCB, instead of actual tracks and components, will provide a worst-case scenario related to both antenna gain for EMC testing. And near-field patterns that are relevant for RF Exposure evaluations (of course, only associated with the impact on the *Split Module* transmitter(s) since the HSE is a passive structure).

IV. Use of HES for the Module Certification Process

The HES must be used for all Split Module certifications. Related filings shall include all of 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). When unique model identifiers or FCC IDs are unavailable, a detailed description of the host platform (manufacturer, size/dimension, and type) shall is required, i.e., clamshell laptop with dimensions 20 x 30 cm +/- 2 cm.

[1] Proprietary, or even an open-source protocol can be used between TCE and RFE. In either case, the authentication exchange shall include a secret key or method to validate that TCE and RFE(s) are certified together. This secret key shall only be known to the grantee to prevent anyone else bypassing the security protocol and operating with mismatched TCE and RFE(s).

Approval of whether or not 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. Approval for the HES requires Pre-Approval Guidance (KDB Publication 388624 PAG item MODHES)..

Grant notes are required to refer to the integration instructions for the host(s) for which the HES was designed in the certification process.

A C2PC application is required fur additional hosts, which may include a new HES design. This new HES design is also part of the review process that requires Pre-Approval Guidance (KDB Publication 388624 PAG item MODHES) 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 required to be tested with the HES, i.e., Split Module testing is needed using a HES as described in Section IV.

The integration of a Split Module in a host where simultaneous transmission may occur (i.e., when any of the Split Module transmitters and any other transmitter installed in the host are operating simultaneously) 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 and details for integration in simultaneous transmission conditions shall also be provided in the integration instructions.