

Federal Communications Commission  
Office of Engineering and Technology  
Laboratory Division

October 24, 2023

**TRANSMITTER MODULE EQUIPMENT AUTHORIZATION GUIDE**

**1. Introduction**

This guidance<sup>1</sup> supplements the module rule<sup>2</sup> §15.212<sup>3</sup>. A transmitter with a modular or limited modular grant<sup>4</sup> can be installed in different end-use products (also referred to as the host, host product, or host device). The host product may<sup>5</sup>not be subject to further certification. Appendix C provides fundamental guidance for when host testing is recommended, required, or further filling is necessary.

The host product must still obtain other applicable equipment authorizations not covered by the module certification. The product must comply with all the applicable rules, including those that apply to the module<sup>6</sup>. Host manufacturers (or 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 one of the following four configurations:

- **A single-modular transmitter:** a complete RF transmission assembly<sup>7</sup> 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.

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<sup>1</sup> 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.

<sup>2</sup> Referencing a rule, section (§) refers to rules in the Code of Federal Regulations Title 47 Telecommunication CFR 47.

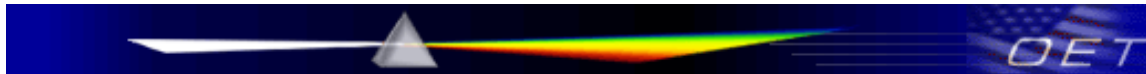
<sup>3</sup> <https://www.ecfr.gov/current/title-47/chapter-I/subchapter-A/part-15#15.212>

<sup>4</sup> FCC Public Notice DA 00-1407 established policies that allowed for Part 15 unlicensed transmitter equipment authorization certification for a modular device; DA 00-1407 is now replaced by rules in Part 15. The Second Report and Order FCC 07-56 (Docket No. 03-201) established regulations under Part 15 (§15.212 Modular Transmitters), provided clarification for modular grants, and set a new class for modular devices called split modular transmitters. FCC Public Notice DA 08-314 is a guide to help small businesses, small organizations (non-profits), small governmental jurisdictions, etc., comply with the §15.212 rules.

<sup>5</sup>The Module is not subject to further Certification when used under the conditions it was granted. The integration instructions (see attachment D03) shall define what conditions do not require additional FCC filing for the host integrator, such as mobile or portable use, without any simultaneous transmission.

<sup>6</sup> Although no additional filling is 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 cited for a violation if this were to happen..

<sup>7</sup> A module consists of a completely self-contained transmitter that is missing only an input signal and power source to make it functional. (FCC DA 08-314).



- **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 of the requirements §§15.212(a)(2) (i) through (vi) and must be certified in "similar type" host(s), as defined in 996369 D05 Split Module attachment.

## 2. 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 transmitters operating under licensed rules. Therefore, this publication covers both module transmitters certified under part 15 unlicensed and licensed rules.

Module certifications do not apply to Part 15B<sup>8</sup> unintentional radiators or Part 18 devices, and transmitter modules are not 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 15B<sup>9</sup>.

### 2.1 Module Host Environment

The manufacturer certifying a module must define the module's host environment in the integration instructions and grant comments. A guide for determining host environments is provided in Appendix B.

## 3. LIMITED MODULE APPROVAL

### 3.1 General

Limited Modula Approval (LMA) is permitted under §15.212(b) when some, but not all, of the conditions can't comply with §15.212(a)(1) for non-split modules or §15.212(a)(2) for split modules. Appendix D provides further detail for conditions for LMA.

Five limited conditions will require a PAG identified in KDB Publication 388624 PAG, as item MODLIM<sup>10</sup>. MOD:IM<sup>11</sup> PAG are for:

1. §15.212(a) (1 )(i): No RF shielding.
2. §15.212 (a) (1& 2) (ii): No buffered modulation/data inputs.
3. §15.212(a) (1&2) (iii): No voltage regulation.

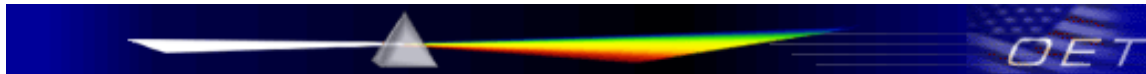
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<sup>8</sup> Certified modules under §15.212 Modular transmitters are modular transmitters consisting of a completely self-contained radiofrequency transmitter(s) and, by rule, do not apply to 15 Subpart B.

<sup>9</sup> A transmitter module, also advertised as 15B compliant, the 15B statement is irrelevant to the Host's overall FCC 15B equipment authorization requirement. In other words, even if a module is independently tested for 15B, it still requires that entire Host performs 15B testing with that module installed and operating.,

<sup>10</sup> This MODLIM PAG is for the Grantee's module and not for the host that uses the limited module

<sup>11</sup> LMA for MODLIM



4. §15.212(a) (1 & 2) (iv), When the host requires professional<sup>12</sup> antenna installation.
5. §15.212(a)(1)(v). The module cannot be tested in a stand-alone configuration.

When a module is limited and requires a MODLIM PAG, the following is required.

1. RF shielding- A C2/3 PC test plan for each specific host. Guidance as provided in Appendix C.
2. Buffered modulation/data inputs. - provide a test plan for the host integrator.
3. Voltage regulation - provide a test plan for the host integrator.
4. When the host requires professional antenna installation- provide clear instructions.
5. The module cannot be tested in a stand-alone configuration. Clear instructions that the module only applies to specific conditions provided by the host. i.e., Module host authentication, C2/3 PC for different hosts, etc., details will vary and be on a case-by-case basis.

A Grantee knows their LMA's design and shortcomings and is responsible for developing the: host integrator test plan, C2/3 test plan, or instructions. There is no specific format or template required. The information will be reviewed<sup>13</sup> when the MODLIM PAG is submitted and either approved or disapproved.

Although the test plan may be based on an FCC rule, policy, and sound engineering practices, the test plan cannot just reference a rule or policy as a requirement. It must be a detailed test plan that the Grantee established to ensure continual compliance when the modules is 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"<sup>14</sup> on the grant, if used for a specific host for RF exposure (i.e., mobile granted module use when used in a portable host) or some other established KDB critical policies, is not considered a MODLIM<sup>15</sup> PAG. Technically, when a C2/3PC 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<sup>16</sup>, see publication 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

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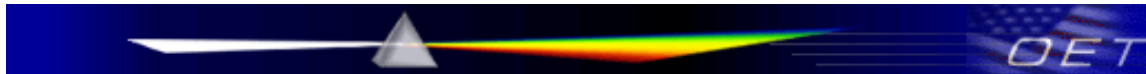
<sup>12</sup> Professional installation for MODLIM is only applicable under §15.203 Antenna requirement to allow professional installation of antennas for the host.

<sup>13</sup> MODLIM PAG will be in effect until it is clear that applications are constant and complying with the requirements.

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

<sup>15</sup>MODLIM PAG is for the listed five conditions:

<sup>16</sup> Modules must identify the conditions for the type of host that can be used with the module without further RF exposure evaluation, testing, or FCC filing. Typically and for practical reasons, a Grantee certifies a module for the least restrictive conditions based on frequency, antenna distance from persons, and the number of RF sources. For example, a module's least restrictive conditions, such as 20 cm, are typically beyond a distance for mobile use and only as a single RF source. Any other use not meeting that condition will require using publication 447498 to determine the actions and procedures necessary.



that are authorized together to include an authentication (bias lock) protocol to confirm that modules are inserted in the host that has been authorized together. 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 and provides a justification for that choice,
- the Grantee's test plan or in the integration instructions,
- the MODLIM PAG inquiry tracking number,
- and grant comments (see Section 5 below).

equipment authorization that the modular transmitter meets all the applicable part 15 requirements under the operating conditions in which the transmitter will be used."

The following provides further guidance for the MODLIM LMA.

**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 shall follow the guidance under Appendix C of this attachment.

**Voltage regulation.** Noncompliance to §15.212(a) (1&2) (iii) requires providing a test plan for operating voltage over an operating range. It represents the range of voltage regulation that the module emissions must remain compliant with its grant conditions. The Grantee can base their test on a similar test measurement to §15.31(e) test plan for the host integrator in the integration in instructions to exercise host voltage conditions.

**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 when a unique connector<sup>17</sup> on the host is not required: This is limited for carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, §15.221, or §15.236, and as perimeter protection systems and some field disturbance sensors, or for other intentional radiators which, by §§15.31(d), must be measured at the installation site<sup>18</sup>. The integration instructions shall provide detailed instructions in integration instructions to the host manufacturers of their obligation to document in their user manual the professional installer's instructions for the proper antenna arrangement.

**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<sup>19</sup>. 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).

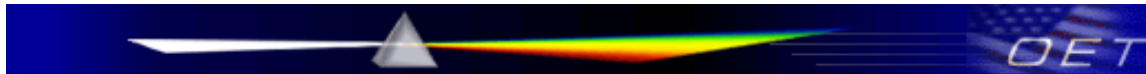
In some cases, when receiver detection is required (i.e., DFS, CBP), the certified antenna(s) must be unrestricted by the host and, when used in a host and based on current policy, requires the module to be

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<sup>17</sup> See section 8, Antennas.

<sup>18</sup> This does not apply to the module itself.

<sup>19</sup> Using a module for different RF exposure conditions than initially granted, guidance is in 447498 and not in this publication.



reviewed on a case-by-case<sup>20</sup> bases 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.

#### **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 clearly define in a professional style<sup>21</sup> the conditions for a host manufacturer to use the module without requiring additional testing, filling, or permissive changes. The host manufacturer shall refrain from using the module and contact the Grantee for clarification when the conditions 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 in violating any operating conditions if restricted by a rule for which the module is certified, and any labeling or notifications required by the host integrator for the host product. (e.g., indoor use, not used on aircraft, etc.).

#### **5. FILING REQUIREMENTS**

In addition to requirements in §2.1033, modules require:

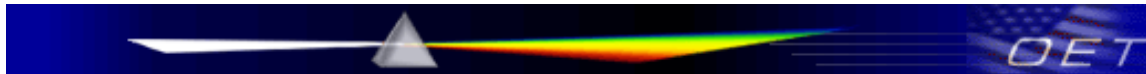
- a) All Modules
  - i) Select Form 731 the appropriate modular approval type.
  - ii) A cover letter requesting modular approval that includes an itemized list documenting compliance to the appropriate section §15.212(a)(1) for non-split modules or §15.212(a)(2) for split modules.
  - iii) Provide detailed 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). Guidance for the proper RF exposure exhibit is in Publication 4447498.
- b) 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.

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<sup>20</sup> UNII devices with DFS see 996369 D02 Module Q and A Question 2 and October 2009 workshop Modular Transmitter Basics. For modules that require Contention based Protocol, CBP will be considered for future policy on as either a MODLIM or possible case-by-case.

<sup>21</sup> Professional technical writing quality includes necessary diagrams, reference supporting documents, and rules to communicate complex and technical information correctly. Integration instructions for modules only used in the Grantee's host products are required in a format considered conventional internal manufacturing procedures.





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."

## 6. RF EXPOSURE

The following are some key matters with further guidance is also provided in Appendix B. For RF exposure compliance full guidance is provided in KDB Guidance of 447498<sup>22</sup>, RF evaluation and compliance is mandatory for all modules.

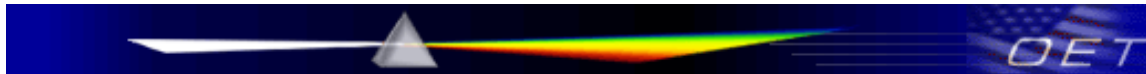
- A single RF source for use in a mobile §2.1091(b) or a fixed host device maintains a separation distance of at least 20 centimeters<sup>23</sup> between the RF source's radiating structure(s) and the body of a person. This category is the most common for initially certifying a module.
- A single RF source for use in a §2.1093(c)-portable configuration of the host device, where the distance from the body of nearby persons may be less than 20 centimeters. Any minimum separation distance requirement must be stated in the integration instructions. This category is generally used for low-power and low-duty cycle devices.
- Multiple RF sources for §2.1091(b)-mobile or §2.1093(c)-portable use, depending on the RF source power and distance within or beyond 20 centimeters of the user's body. This condition is the most restrictive and least used since it is generally limited to specific modules (by FCC ID) and hosts.
- Typically, modules are certified as single RF sources for a mobile host or low-power modules in a portable host (6a)ii), and a few, if any, for multiple RF sources.

When a host integrator needs to use the module differently than it was initially certified, an RF exposure evaluation and a C2/3 PC are required. For example, when a module is certified requiring a separation distance of 30 cm and then installed in a host whose separation distance is less, say typically 20 cm, a new RF exposure evaluation is necessary. A C2/3PC is needed because this new host's MPE limits on file (show distance separation of at least 30 cm) do not demonstrate the RF exposer value at the separation distance of 20 cm.

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<sup>22</sup> Either the Draft version 447498 01 General RF Exposure Guidance for Equipment Authorization DR05-44791 or the published version, "447498 D01 General RF Exposure Guidance v06," may also be used during this transition period (01/17/2023: UPDATES TO THE TRANSITION PERIOD UNTIL FURTHER NOTICE) as long as the 731 Form and the related granted application are submitted to the FCC on or before the end of transition period. "447498 D01 General RF Exposure Guidance v06" must be used entirely (i.e., no mixing of old and new procedures for certification application filing(s)).

<sup>23</sup> 20 cm is the defined boundary for defining mobile devices under 2.1091, however. In some cases the distance for use in a Host may exceed 20 cm. In that case the module cannot be used in a host at a distance less than distance granted unless it can demonstrate continued compliance at that distance through a C2/3PC filling.



Grantee<sup>24</sup> can only evaluate RF exposure to determine if new conditions other than those initially certified still qualify for an RF exposure test exemption per KDB 447498<sup>25</sup>. If no exemptions are permitted, RF exposure testing is required as a C2/3PC; only the Grantee can add the RF exposure test reports to the filing via C2/3PC<sup>26</sup>. For example:

- The module was certified for a mobile host with MPE limits for use in a portable host. A C2/3PC is required unless the Grantee's evaluation conditions qualify<sup>27</sup> for an RF exposure test exemption.
- Certified as a single RF source for use within 20 cm at a defined separation distance, a C2/3PC is required unless the Grantee's evaluation conditions still qualify<sup>28</sup> for an RF exposure test exemption under the conditions.
- Simultaneous transmission with other transmitters not initially certified. A C2/3PC is always required unless the Grantee's evaluation conditions qualify<sup>29</sup> for an RF exposure test exemption.
- Additional Guidance is also provided in Appendix B,

## 7. EMC CONSIDERATIONS

When the module is used as a signal source without any other transmitters operating simultaneously and used in a host for the conditions that it was initially granted, then it is recommended for the host manufacturer to use attachment D04 Module Integration Guide recommended<sup>30</sup> to conform compliance when installed in the host.

However, for simultaneous transmissions<sup>31</sup> with any other transmitters in a mobile host and the module was not initially certified with the other transmitters, an EMC evaluation test by the host integrator or the

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<sup>25</sup> If the evaluation determines the conditions still qualify for an RF exposure, the Grantee shall use the procedure defined in the appropriate 447498 01General RF Exposure Guidance for Equipment Authorization DR05-44791.pdf or the published version, "447498 D01 General RF Exposure Guidance v06," see note 25 above.

<sup>26</sup> Alternatively, the host integrator can request permission from the Grantee to allow a change ID (see KDB 249634).

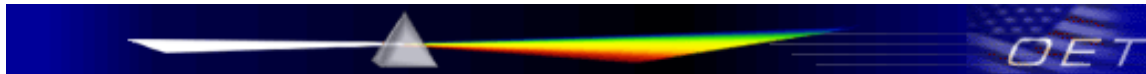
<sup>27</sup> Same comment as note 26 above.

<sup>28</sup> Same comment as note 26 above.

<sup>29</sup> Same comment as note 26 above.

<sup>30</sup> D04 Module Integration Guide recommends a "best practice" for determining if situations such as non-linear interactions or unwanted radiation of signals may occur when the module is in the host. Since D04 Module Integration Guide is not a specific rule, is why it is recommended. However, if these unwanted emissions result in harmful interference under §§15.5 and 15.29, the users must stop using the device until the interference has been resolved. If this happens, it could cause a significant issue for most manufacturers.

<sup>31</sup> Since the module was not certified with any 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),



Grantee is required (see D02 Module Q&A Question 12), The EMC evaluation is considered sufficient to confirm compliance. When the host integrator does the assessment, it only applies to a mobile host. Host integrators should consult one or both module grantees to ensure that RFX exposure for simultaneous transmission is still exempt.

## 8. ANTENNAS

For Part 15 and licensed client<sup>32</sup> modules<sup>33</sup>, the antennas shall comply with §15.212(a)(1)(iv) and §§§ 15.203, 15.204(b), and 15.204(c), and the application(s) shall provide specifications for each type: bandwidth, impedance, form factor, frequency, bandwidth, impedance, directivity and gain, and polarization, in the test report.

If 15.204 (a) and (b) for cellular user-equipment modules as Part 15 devices regarding antennas shall be followed.

A module antenna can be: (1) integrated in the module, (2) provided with the module or (3) specified in detail in the integration instructions.

When the module is not to be installed by end users and a physical antenna is not supplied<sup>34</sup> with the module, the antenna shall also be specified, mechanically and electrically, including type, form factor, frequency, bandwidth, impedance, directivity and gain, and polarization and shall be in the integration instructions (see 996369 D03 OEM Manual).

Modules certified as trace antennas or trace to an antenna design shall follow the requirements of Question 11 of 996369 D02 Module Q&A.

When a module is positioned to be installed by end users<sup>35</sup>, the host integrator must include the antenna.

A module with a permanently attached antenna on the module or requires the host manufacturer to use a permanently attached antenna is considered §15.212(a)(1)(iv) compliant. It is compliant because, in this case, no antenna other than the antenna on the module or the antenna identified in the integration instructions by the Grantee can be used. On the other hand, (except for licensed base station or licensed fixed-non-client modules) if the Grantee permits the host manufacturer to allow the host to use replaceable antennas, then that host must use a unique coupling connector. The Grantee is responsible for stating this in the integration instructions. For connector(s) on the module itself: when the module is manufactured or assembled in the host's facility (factory), and end users cannot replace or attach the antenna, this is considered unique coupling. For licensed base stations or fixed-non-client modules, the licensee is responsible for using the appropriate antenna under the terms of their license.

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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.

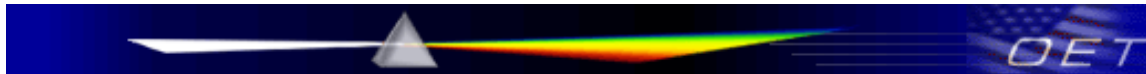
<sup>32</sup> A client operates in a master/client network under control to initiate a transmission by a base or master station or device. A non-client device, non-client fixed, or base station can transmit without an enabling signal and activate a transmission.

<sup>33</sup> Licensed client devices require §2.1093 Radiofrequency radiation exposure evaluation, as mobile or portable devices, and § 2.1091 Radiofrequency radiation exposure evaluation is required. This includes the device antenna. In addition, modules cannot currently be used for licensed CMRS handsets, as stated in 447498.

<sup>34</sup> This is not a limited module when an antenna is not provided with the module. However, precise specifications are required in the integration instructions.

<sup>35</sup> Not providing an antenna to modules inserted by end users is prohibited and is considered like any other part 15 device.





Licensed (non-client station) modules for a base station, non-client, or non-client fixed station can be certified using conducted power and antenna data. The licensee is responsible for the applicable limits under their license operation.

A module certified in a host that allows professional installation<sup>36</sup> for Part 15 modules, if permitted under §15.203, must be certified as a limited modular (see Section 3 above). The integration instructions 996369 D03 OEM Manual must fully explain the obligation to document the professional installer's instructions for the proper antenna arrangement in the host user manual.

When receiver 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 policy, requires the module to be limited. Under current policy, these are handled case-by-case by submitting an Equipment Compliance Review inquiry to confirm that the integration instructions will include strict guidance for antenna location. (See Section 3 above).

## **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 the change in ID is approved by a TCB, the host manufacturer is authorized to 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.

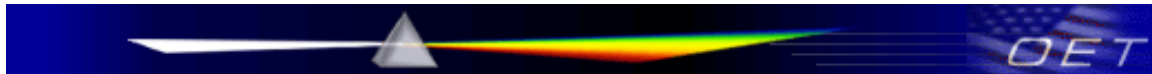
Appendix C provides some additional guidance for when permissive changes are required.

## **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

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<sup>36</sup> For licensed (non-client station) modules for a base station, non-client or non-client fixed station modules are treated similarly to professional installations but do not require it to be an LMA.



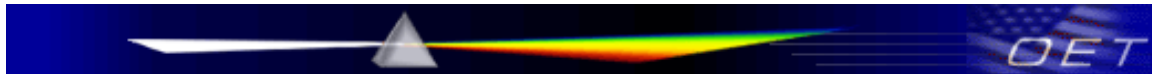
**APPENDIX A**

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

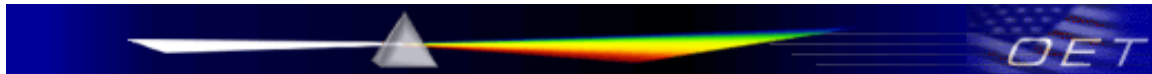
The following list is subject to change, for questions, submit an inquiry at <http://www.fcc.gov/labhelp>.

- Devices that are not transmitters and cannot qualify as modules.
- \*\* Future Equipment Class under draft applications not accepted
- A transmitter indicated as N, is either [prohibited by rule, or in some cases may require an Equipment Compliance Review Inquiry. For any questions submit an inquiry.

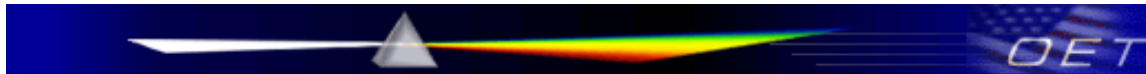
Code	Description	Module Permitted
5GM	Part 30 Mobile Transmitter	Y
5GB	Part 30 Fixed Transmitter	Y
5GT	Part 30 Transportable Transmitter	Y
6CD	15E 6 GHz Low Power Dual Client	Y
6ID	15E 6 GHz Low Power Indoor Access Point	Y
6PP	15E 6 GHz Subordinate Indoor Device	N
6XD	15E 6 GHz Low Power Indoor Client	Y
6SD	Standard Power Access Point	**
6FX	Standard Client	**
6FC	Fixed Client	**
8CC	Part 18 Consumer Device	N*
AIS	Automatic Identification Systems	N
AMP	Amplifier	N*
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*
CRR	Super-regenerative Receiver	N*
CSR	Scanning Receiver	N*
CXX	Communications RCVR for use w/ licensed Tx and CBs	N*
CYY	Communications Receiver used w/Pt 15 Transmitter	N*
DCD	Part 15 Low Power Transmitter Below 1705 kHz	Y



Code	Description	Module Permitted
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
EAD	Part 11 Emergency Alert Devices	N*
EAV	Part 15 Automatic Vehicle Identification System	Y
ETB	Part 15 Cordless Telephone Base Transceiver	Y
ETR	Part 15 Cordless Telephone Remote Transceiver	Y
ETS	Part 15 Cordless Telephone System	N*
FAP	Part 15 Anti-Pilferage Device	N*
FDS	Part 15 Field Disturbance Sensor	N
FRB	Part 95 Family Radio Base Transmitter	N
FRE	Part 95 Family Radio Ear Held Transmitter	N
FRF	Part 95 Family Radio Face-Held Transmitter	N
FRT	Part 95 Family Radio Body Worn Transmitter	N
GAT	Part 15 Auditory Assistance Device (Transmitter)	Y
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*
JAB	Part 15 Class B Digital Device	N*
JAD	Part 15 Class A Digital Device	N*
JAV	Non-Digital SDoC Devices	N*
JBC	Part 15 Class B Computing Device/Personal Computer	N*
JBP	Part 15 Class B Computing Device Peripheral	N*
LMS	Part 90 Location & Monitoring Transmitter	N
LPR	Level Probing Radar	Y
MRD	Marine Radar	N
MWR	Part 80 Marine Watch Receiver	N
NII	Unlicensed National Information Infrastructure TX	Y
PCB	PCS Licensed Transmitter	Y
PCE	PCS Licensed Transmitter held to ear	N



Code	Description	Module Permitted
PCF	PCS Licensed Transmitter held to face	N
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	N
PUF	Part 15 Unlicensed PCS portable Tx held to face	N
PUT	Part 15 Unlicensed PCS portable Tx worn on body	N
RNV	Part 80 NAVTEX Receiver	N*
SRT	Radar Transponder	N
SSA	Ship Security Alert Systems (SSAS)	N
TBC	Licensed Broadcast Station Transmitter	N
TBF	Licensed Broadcast Transmitter Held to Face	N
TBT	Licensed Broadcast Transmitter Worn on Body	N
TDC	Part 80 DSC Controller	N
TLD	Licensed LPAS Device	N
TNB	Licensed Non-Broadcast Station Transmitter	Y
TNE	Licensed Non-Broadcast Transmitter Held to Ear	N
TNF	Licensed Non-Broadcast Transmitter Held to Face	N
TNT	Licensed Non-Broadcast Transmitter Worn on Body	N
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

### 1. Host Environment Chart

The manufacturer certifying a module must define both in the integration instructions and the grant comments<sup>37</sup>, where the module belongs in the Host Environment Chart.

The Host Environment Chart is a visual summary of four quadrants, as shown in Figure B1. The horizontal boundary (blue line) refers to two rule parts for Radiofrequency Radiation Exposure:

- § 2.1091 Radiofrequency radiation exposure evaluation: mobile devices (above the blue line).
- § 2.1093 Radiofrequency radiation exposure evaluation: portable devices (below the blue line)

This boundary<sup>38</sup> is related to the separation between the RF source's radiating structure(s) and the user's body or nearby persons. For 2.1091 mobile devices, this distance must be at least 20 centimeters.

The vertical boundary (red line) refers to<sup>39</sup> the single vs. multiple RF sources that can transmit simultaneously:

- a single RF source in operation (it could be a single transmitter when other transmitters that are present are not transmitting simultaneously (left of the red line)
- multiple RF sources transmitting simultaneously (right of the red line).

All modules will require RF exposure exhibit(s) under 47 CFR 2.1033(f) for all of the conditions illustrated in the host environment chart (i.e., single/multiple source operations and applicable exposure conditions) when initially granted. A host manufacturer that wants to use a module beyond what is allowed per its grant conditions may require additional Class II or Class III<sup>40</sup> (note) C2/3PC filing and RF exposure evaluations. The following sections guide the cases of each quadrant in Fig. B1, and additional requirements related to using a module differently from the conditions for which it was initially granted. Further details, including test exemption provisions, are provided in KDB Publication 447498.

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<sup>37</sup>Grant comments require a simple statement defining the module placement in the Host Environment Chart

<sup>38</sup> More details on mobile and portable devices are provided in KDB Pub. 447498.

<sup>39</sup> A host integrator must know if their device uses multiple transmitters simultaneously. Any integrator using a module should have a basic understanding of RF wireless technology. If a host integrator does not know if the host transmitter may operate simultaneously, the most conservative assumption that all the RF sources may operate simultaneously shall be made..

<sup>40</sup> **Modules if granted as SDR can use a Class 3 filing procedure,**



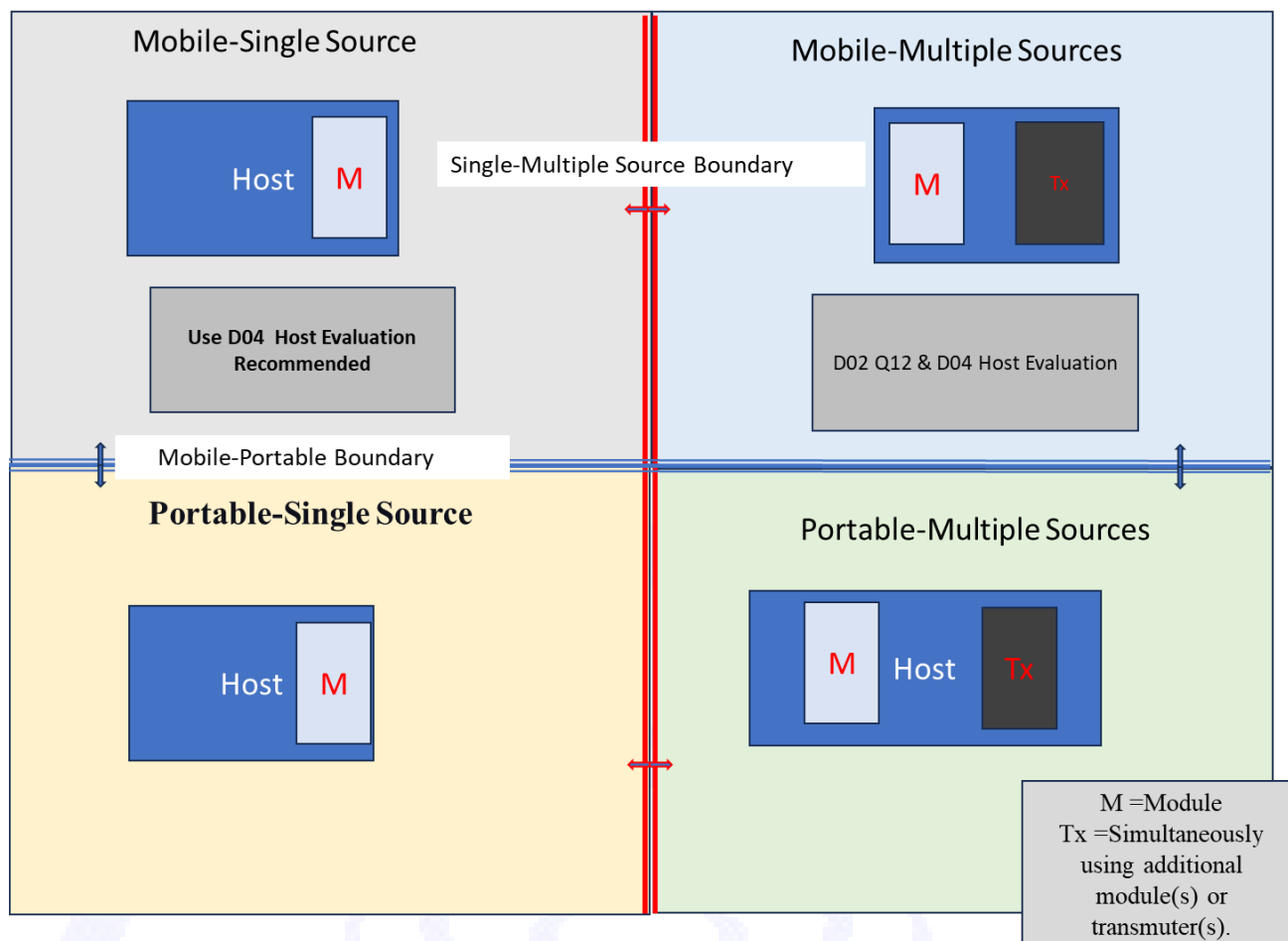
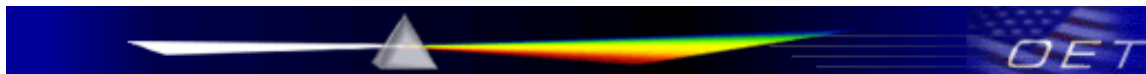


Figure B1

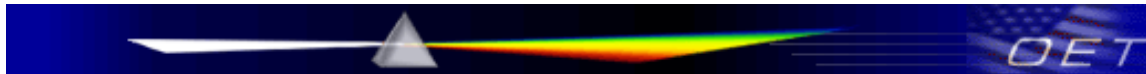
### 1.1 Mobile-Single Source (Top-left Quadrant).

A mobile-single source module used in a mobile-single source host is the most restrictive type of host environment. Still, it is the least burdensome for what a host integrator needs to do to ensure FCC compliance of their host with the module(s) installed and operating.

Albeit not required for equipment authorization, additional testing on the host after the module has been installed is recommended to mitigate the risk of incurring non-compliant conditions. Further guidance is provided in the 996369 D04 Module Integration Guide. When a product with a module is marketed and sold, it is subject to the same general operation conditions in §§ 15.5 and 15.29 as an authorized product. For instance, if the device, upon the Commission's or its representative's finding, were to cause harmful interference<sup>41</sup>, the product must stop operating and not resume until the interference has been corrected (with obvious negative consequences on the module manufacturer and host integrator).

### 1.2. Mobile-Multiple Sources (Top-Right Quadrant)

<sup>41</sup> Today's wireless spectrum is going through a significant evolution where the FCC is reallocating and sharing spectrum to keep up with the licensed and non-licensed demands. More systems and services mean more possible scenarios that can interfere, increasing the risk.



Although it is permissible for modules used with other transmitters (modules or embedded transmitters) to be certified in this quadrant for the initial application, this is not a common scenario. Additional testing for the host when integrated into a host is recommended under the Guidance provided in the D04 Module Integration Guide. Attachment 996369 D02 Q&A, question 12 does not apply to this quadrant. Question 12 s applies to EMC evaluation by a host integrator using single-source modules in a multiple-source host. See Section 2 below, Quick Guide.

### **1.3 Portable-Single Source (Bottom Left Quadrant)**

For this quadrant, there are two primary conditions permitted. The module grant is for a portable host typically used at a specific distance between the host's RF source's radiating structure(s) and the body of the user or nearby person at a distance of less than 20 cm and exempt from SAR. Otherwise, the module is granted with SAR testing, and the grant is limited to that specific host<sup>42</sup>.

### **1.4 Portable-Multiple Sources Quadrant**

For this quadrant, the module is granted for nonspecific portable hosts in the initial application along with other transmitters identified by FCC ID at less than 20 cm and exempt from SAR testing. Otherwise, SAR testing is required, and the grant is limited to that specific host.

## **2. Quick Guide Tables.**

Tables B2 for mobile granted modules and B3 for portable granted modules provide a quick reference to the KDB filling procedure and when a C2/3PC is required. The table is a matrix, with the module grant illustrated as rows and the Host environment as columns.

The notes reference the KDB filling procedure in attachment 996369 D02 Q&A, questions 12 and 13, and if a C2/3PC is required. Details for the C2/3PC on what is needed for the C2/3PC are provided using KDB publication 448498.

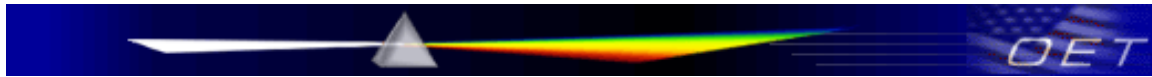
For mobile modules, two types of mobile grants are illustrated. Modules granted as single source or multiple source and for use in the host at a separation distance of 20 cm or greater, or modules that require a separation distance for use that start at a distance greater than 20 cm.

Portable modules illustrate two types of potable grants. Modules granted as a single source or multiple sources and for use in portable hosts and exempt from SAR testing at a distance defined by the grant condition, and modules that are granted for hosts not exempt from SAR require SAR testing, and the grant is limited to that specific host.

The color code supplements the notes such that a solid green, orange, or red indicates that a C2/3PC is not required; further evaluation under 996369 D02 Q&A question 12 testing is needed, or a C2/3PC is required, respectively. Multi-color indicates that what is needed will depend on the actual host environment. For example, A module granted for a specific host, used in the same host, does not require a C2/3PC but does if used in a different host.

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<sup>42</sup> A specific host is the same series or similar models having the same form factor, physical size, and component layout and construction.



Module Grant			Host			
			Mobile Single Source	Mobile Multi Source	Portable Single Source	Portable Multi Source
Mobile	Single Source	20 cm	[0]	[0] [2]	[0][4]	
		>20 cm	[0][1]	[0][1] [2]		
	Multiple Source	20 cm	[0][3]	[0][2]		
		>20 cm	[0][1]	[0][1] [2]		

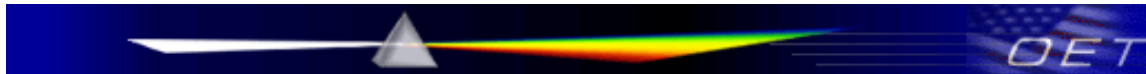
B2 Quick Guide for Mobile Granted Modules

Module Grant			Host			
			Mobile Single Source	Mobile Multi Source	Portable Single Source	Portable Multi Source
Portable	Single Source	SAR Exempt	[0]	[0] [2]	[0][4]	[0][3][5]
		SAR	[0]	[0] [2]	[0][5]	[0][3][5]
	Multiple Source	SAR Exempt	[0][3]	[0] [2]	[0][3][4]	[0][5][6]
		SAR [4]	[0][3]	[0] [2]	[0][3][5]	[0][5][6]

Table B3 Quick Guide for Portable Granted Modules

**Notes for table B2 and B3**

- [0] D04 recommended.
- [1] C2/3PC is required if host distance environment is less than module grant.
- [2] D02 Q12 evaluation for simultaneous transmission applies.
- [3] Using only one transmitter module.
- [4] A C2/3PC for specific host if distance is < than granted,
- [5] A C2/3PC If used with new specific host.
- [6] C2/2PC required when used with different transmuters.



## Appendix C

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

A Module with no shield is limited and requires a PAG "MODLIM" before it can be granted. The Grantee's<sup>43</sup> Integration Instructions must provide a test plan (required by rule 47 CFR 15.212(b)) for a Class II or Class III<sup>44</sup> filling<sup>45</sup> (herein referenced as PC), whichever is appropriate. The PC is required for every different specific host using the module. A specific host is the same series or similar models having the same form factor, physical size, and component layout and construction.

The objective of this PC is to confirm that all host's emissions remain compliant with all the applicable FCC rules.

If the transmitter's power is measured as conducted or as field strength, and if the 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 PC can only be granted once the issue is resolved.

An increase from the initial grant for conducted power shall be treated as if the initial module tested in a standalone mode was improperly granted, irrespective of whether the rise still complies with the appropriate rules.

Suppose the investigation shows that host properties caused the increased radiated emissions (including EIRP for rules specified in EIRP), and the emission is still compliant. In that case, a statement is required in the test report indicating that "an increase in strength in field strength or EIRP over the modules teste field strength is the result of being integrated into the host, and this increased emission remains compliant to the rules."

Any radiated emission out of compliance with regulations must be corrected, and the C2/3PC can only be granted once it is resolved.

It is permitted for the test plan 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:

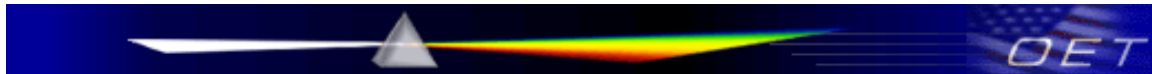
- ✓ Confirm and document the continued compliance for the fundamentals for each band under each specific rule part granted for the module.
- ✓ The test shall demonstrate each band's worst-case modulation mode(s).
- ✓ Test Band edge compliance for the widest and narrowest bandwidths per modulation type.
- ✓ Include radiated spurious emissions with the antenna connected. Testing shall be performed for each supported modulation teasing 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.

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

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

<sup>45</sup> Currently, the PC is not a PAG.



- ✓ 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:

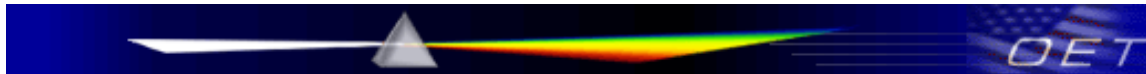
**Examples:** Wi-Fi devices that support 802.11 (up to 6e or 7 modes,) all support a plethora of OFDM, bandwidths, and data rates. Testing may be documented for a limited selection of 802.11 (g, n, or ax) modes for worst-case OFDM subcarrier or tone arrangements. The worst-case modes can be selected 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.

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







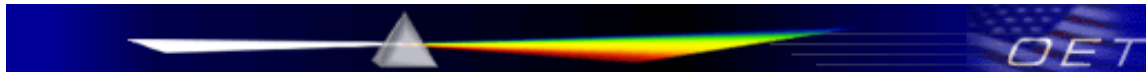
## Appendix D

### 3. 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 required.
- 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. For modules that are 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.

### 4. Limited Split Module (996369 D05 Split Module)

- a) Only the radio front end must be shielded. §15.212(2)(2)(i). If the split module cannot comply, the split module 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, the module 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 be equipped with either a permanently affixed label, etc. Same as 3.2g) §15.212(a)(1)(vi).



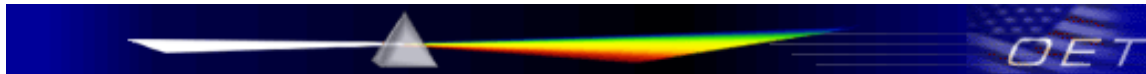
- g) The modular transmitter must comply with all the specific rules or operating requirements, same as 3.2h) §15.212(a)(1)(vii).
- h) Radiofrequency radiation exposure requirements. §15.212(a)(1)(viii) the same as 3.2i).
- i) Additional Split module requirements:
  - 1) Control information and other 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 that have been approved together.

Manufacturers must ensure that only transmitter control elements and radio front-end components that have been approved can operate together. §15.212(a)(2)(iv). All modules must comply with this condition<sup>46</sup>.



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<sup>46</sup> A description in the filling is required explaining that the control element and radio front end(s) that have been 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 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.chamnges 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 DR05-44791 or when the draft is published as 447498 D01 General RF Exposure Guidance v07. Appendix B, C and D added for clarification and additional guidance.