

FCC APPROVAL OF HOST DEVICES WITH INTEGRATED WIRELESS MODULES



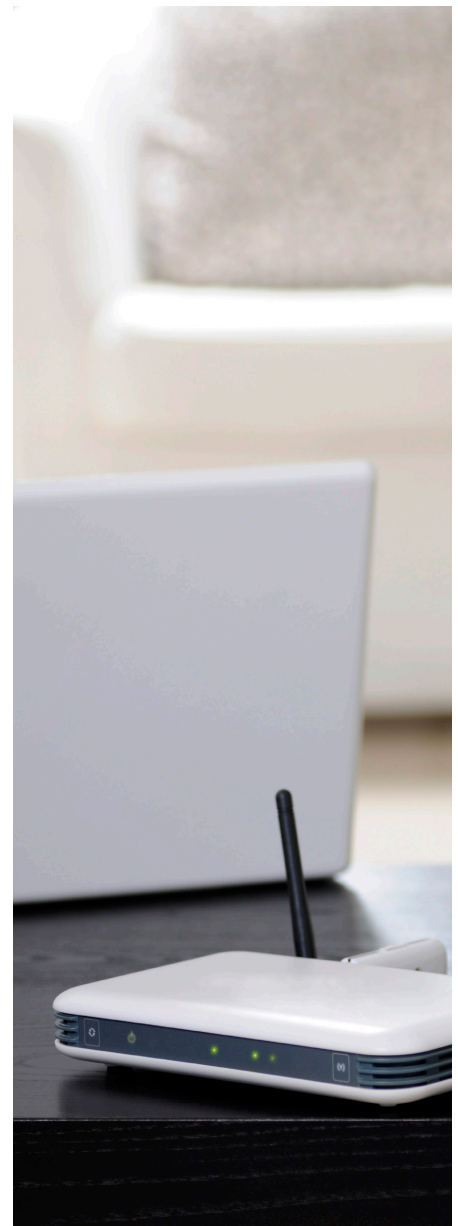
FCC Approval of Host Devices with Integrated Wireless Modules

Technological advances and the increased allocation of electromagnetic spectrum for advanced communications have produced a wave of new electronic and digital devices that communicate wirelessly. As a result, product manufacturers are increasingly abandoning wired communications interfaces in favor of wireless technologies that offer greater user mobility without compromising transmission speed and accuracy. But obtaining worldwide regulatory approval for products with integrated wireless modules is a complex process.

In the United States, the Federal Communications Commission (FCC) is the authority responsible for establishing regulations for all wireless transmitters, including wireless modules that are integrated into end host devices. Obtaining pre-market approval is the legal obligation of any party that seeks to import or sell such devices in the United States. Wireless modules utilized in an end-product are required to have their own unique approval grant and FCC identification number (FCC ID).

Unlike regulations in the European Union that allow manufacturers to issue a declaration of conformity as evidence of a product's compliance with the essential requirements of the EU's R&TTE Directive, FCC approval is mandatory for wireless modules imported or sold in the United States. Originally, the approval process required manufacturers and importers to submit an application directly to the FCC. However, beginning in 1998, the Commission adopted rules allowing FCC-approved telecommunications certification bodies (TCBs) to approve such equipment under Parts 2 and 68 of the FCC Rules.

This white paper from UL discusses the key regulatory compliance and approval issues facing manufacturers and importers of host devices with integrated wireless modules. This paper provides information on the FCC's regulations regarding the sale of integrated wireless modules in the United States, and guidance on how to efficiently navigate the FCC's regulatory approval process.





Key Factors

When considering the sale of end host devices with integrated wireless modules within the United States, manufacturers must consider a number of key factors essential for gaining FCC approval. These factors include:

- The radio communication (wireless) technology or technologies employed in the end host device
- The requirements imposed by the FCC on the module usage (or on each one of the modules in use)
- The use of an end host device in relation to the human body
- The consideration of a product family to “mix and match” wireless technologies into an end host device
- Any preference for end host device approvals or legal ownership requirements for the approval

This white paper covers each of these points in greater detail. Note that product approval requirements vary on a case-by-case basis, and that the examples presented here are offered only as guidance.

Product Approval Considerations

There are a number of considerations that determine the actual testing requirements for end host devices incorporating wireless modules. Factors such as the number and mix of wireless communications technologies employed in a product and the intended use of approved modules play a role in determining the product approval process.

The following sections describe these factors in greater detail.

Wireless Communication Technologies

The number of radio communication technologies implemented in the end host device has a significant impact on the approval requirements. U.S. approval for host devices with wireless communication technology is defined in the Code of Federal Regulations (CFR) Title 47 Telecommunications, and covers wireless technologies such as:

- Licensed band
 - GSM (850 and 1900 bands are in use in North America)
 - 3G (W-CDMA and CDMA-2000)
- Unlicensed band
 - Bluetooth®
 - WiFi
 - Zigbee
 - RFID
 - Other proprietary radio technologies and frequencies

Note that the use of more than one wireless communication technology in an end host device will introduce additional complexities into the approval process, and may also invoke additional FCC module grant restrictions (see the section, “Grant Restrictions of Certified Modules,” below).

Grant Restrictions of Certified Modules

When integrating certified wireless modules into end host devices, it is important to consider the specific FCC grant conditions for each wireless module. Those “restrictions” can be found on the original FCC grant certificate, which is publicly available. The actual grant documents can be obtained from either

a module manufacturer or directly from the FCC website.

Common module restrictions for consideration in an end host device include:

- Implementation of the module consistent with a manufacturer’s installation guideline
- Separation distance from the human body (important for RF exposure compliance, as determined in the Office of Engineering and Technology (OET) Bulletin 65, “Evaluating Compliance With FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields”)
- Co-location and simultaneous transmission restrictions with other radio technologies
- Antenna restrictions (particular types and gain factors), as noted in the FCC grant conditions for the module in use
- Module approval type (modular, limited modular or split modular approval), also noted in the FCC grant

Each of these restrictions can have a significant impact on the options available for certification of an end host device. If a product complies with the restrictions listed on a module grant(s), the approach for gaining approval comes down to a manufacturer’s preference. However, if not all conditions are met, the impact on the approval requirements can be considerable. For instance:

- *Separation distance*: If this is not in compliance with the module grant,



specific absorption rate (SAR) testing is likely to be required

- *Co-location*: If other wireless technologies are operational at the same time, additional certification testing is likely to be required
- *Antenna restrictions*: If the antenna used does not satisfy the restrictions of the module grant, additional testing is likely to be required

There are many other additional considerations that could affect product approval, for example, incorporating RF antenna matching circuitry in a host product. These considerations are best discussed with a TCB or an FCC-approved laboratory for review ahead of planning any product approval program.

In summary, failure to comply with the restrictions of a module grant effectively requires additional approval testing for an end host device.

Per DA-00-1407 (June 2006), the FCC does not encourage recertifying host products containing pre-approved wireless modules unless the rules make it essential to do so. Therefore, the existing modular approvals should be used without a new certification of a host product whenever possible.

Separation Distance

According to OET Bulletin 65, if an end host device can be operated close to the human head or body, i.e., transmitting within 20 cm of a person, SAR testing may be required, if the transmitter frequency and power output deem it applicable. If a device will always be used at distances of greater than 20 cm from

a human body, a maximum permissible exposure (MPE) calculation is required to determine the safe operating distance for users, and actual SAR measurements are not required.

Family Product Considerations

The ability to implement wireless communication functionality via modules opens the possibility for designers to develop a family of products that may contain multiple wireless technologies in a range of combinations. However, taking this “mix and match” approach to the use of modules will likely breach the co-location restrictions placed on the pre-approved module (noted above). This will likely result in the imposition of additional testing requirements on an end host device to gain certification of an entire product family.

Module Approval Type

The module (or modules) utilized within an end host device can be approved as either single-modular approval or limited single-modular approval.

Single-modular approval applies to modules that meet the FCC requirements for modular approval for installation into any host product without change.

Single-limited modular approval applies to modules that do not meet all of the FCC modular approval requirements and are therefore limited to installation into specific host products. Such limited modular approvals are required to list the applicable specific host products, and updates to an approval are required if a module will be used in other host products not listed on the original module approval.

Considerations for Host Product Approval

The FCC provides the following three options for product approval in North America:

- Verification (CFR47 – Part 2.902)
- Declaration of Conformity (CFR47 – Part 2.906)
- Certification (CFR47 – Part 2.907)

Verification and Declaration of Conformity product approval options are not applicable to end host devices that include integrated pre-approved modules. Only product certification is applicable for host products containing radio modules, and can be achieved through the following methods:

- *Full certification of host product*: Full certification according to CFR47, Part 2.907 requires full testing of a host product, and results in the issuance of a new FCC ID and grant listing. The end host device manufacturer is then legally responsible for the host product approval, including all wireless technologies integrated into the product
- *Use of existing modular approval*: As detailed in CFR47, Part 15.212, use of approved modules can reduce or limit host product testing, if the FCC ID(s) of integrated modules are used on labels for an end host device. If all the restrictions for the modular approval(s) are in compliance, a module manufacturer(s) then remains legally responsible for the approval of the wireless technology(s) integrated into a host product

By mutual agreement between the module grant owner and the end host device manufacturer, the module grant owner may update the FCC grant for a module to a Limited Modular Approval to include end host device details. The FCC ID of the module can then be used on the label for the end host device without having to recertify the host product.

Certification Process

Having considered the end host device details and the certification requirements, it is then advisable to carefully plan the certification process. Some of the key factors that can impact the time and costs associated with the product certification process include:

- Making sure appropriate procedures are used, especially for products and technologies not directly addressed in the FCC rule parts
- The confirmation process used to obtain interim procedural approval
- The FCC TCB exclusion list

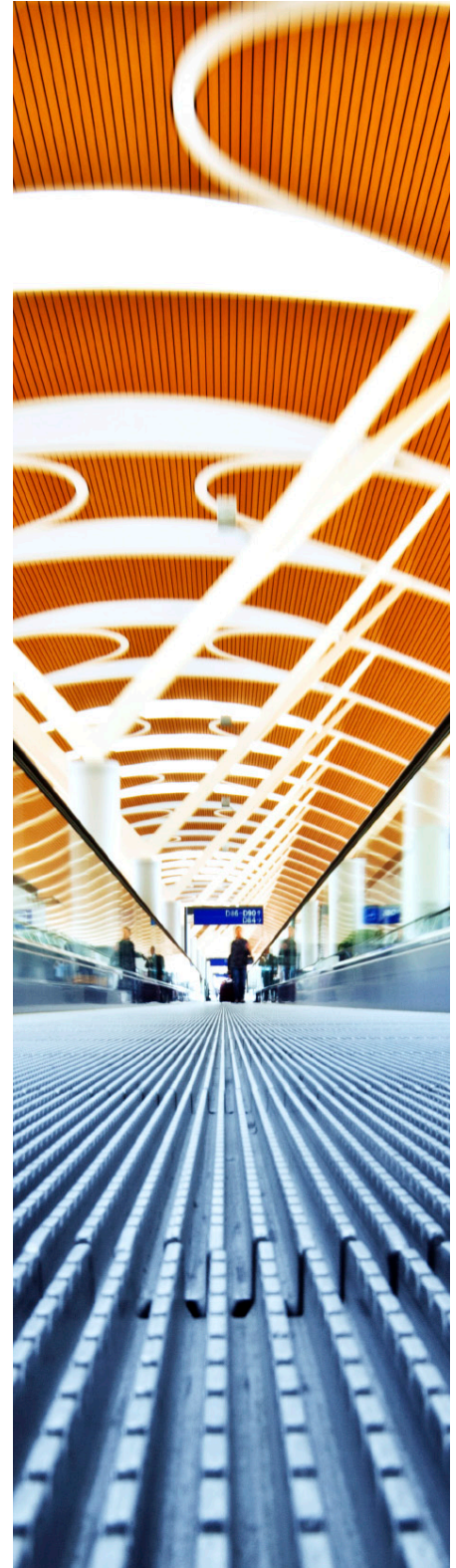
The FCC knowledge database (KDB) is a catalog of documented procedures and guidance articles that the FCC has offered to TCBs and testing laboratories to supplement the FCC rule parts. The KDB is a valuable resource in those cases where no clear procedure exists, or where some interpretation is required in connection with a rule part applicable to an end host device.

“Permit But Ask” (PBA) is a process that allows a TCB or testing laboratory to directly query the FCC in cases where there is no definitive procedure or KDB article on how to perform testing for a given end host device. The PBA process is typically used when the product to be certified uses a new technology, or is being used in a new environment.

Finally, the FCC generates an exclusion list that identifies those product types that cannot be approved by a TCB or testing laboratory, and which must be submitted directly to a FCC for application review and processing. If an end host device is on the FCC’s exclusion list, the time required to complete the approval process can increase significantly.

Once a suitable testing program has been completed, an FCC-approved laboratory will review all documentation, including test reports, bill of materials, internal photographs, user manuals, schematics, etc. Note that, if a full certification is required, the TCB will also require documentation from a module manufacturer. To avoid delays, this documentation should be requested as early as possible in the process.

Once the review has been successfully completed, the TCB will upload the documentation to the FCC website and will issue the FCC grant document. Once the FCC grant is in place, the end host device can then be legally sold and put into service in the United States.





Maintaining Compliance

The use of a wireless module in an end host device has many advantages, and can require minimal testing for the approval if installed according to an installation manual and consistent with the grant restrictions. Once a manufacturer has demonstrated compliance with applicable FCC requirements, there are a number of additional issues that should be considered, including updates to a module or end host device, and the prospect of surveillance retesting.

Updates to a Module

When a manufacturer makes changes to an approved module, consideration must be given to the impact on certification, even if the changes consist only of firmware updates. All planned changes should be reviewed by the TCB or FCC-approved laboratory, even in cases where the changes are expected to have little or

no impact on certification. Similarly, manufacturers should seek guidance from their TCB when an approved module becomes obsolete and a replacement module is being considered for inclusion in an end product.

Updates to an End Host Device

Changes to the end host device should also comply with the original certification restrictions. Changes that impact the radio characteristics (including the antenna), the module used or the enclosure will almost always require additional testing.

In such cases, the FCC offers a Permissive Change process that allows the certification of previously approved products to be updated. Depending on changes to an end host device, the Permissive Change route may require only simple verification testing to

maintain approval, or may require full certification retesting. Manufacturers are strongly urged to consult their chosen TCB for guidance on whether the Permissive Change approach might be applicable to proposed changes to an end host device.

Imposed Surveillance

CFR47, Part 2.962 requires all TCBs to annually retest a number of previously approved products equal to 5% of the total number of approvals granted by that TCB in one year. This surveillance retesting provides assurances that a product sold in the United States continues to be manufactured and to perform in a manner consistent with the product originally approved. If a product is selected for surveillance retesting, an end host device manufacturer is required to provide samples and the support necessary for the TCB to repeat the original product testing, at no testing cost to the manufacturer.



Summary

The FCC has recently undertaken efforts to minimize duplication of product approvals, and is encouraging product manufacturers to use the FCC ID and listing of wireless technology modules integrated into host products. This approach ensures that regulatory responsibility for the radio transmitter(s) in an end host device remains with the original module manufacturer.

Given the complexity of obtaining approvals for host products with integrated wireless modules, many manufacturers opt to utilize a TCB or other FCC-approved testing laboratory. TCBs provide an FCC-approved service that assesses documents before filing and requests revisions to ensure consistency with the FCC requirements, as well as uploading relevant documentation to the FCC database and issuing the FCC Grant. This approval route is usually more cost effective and less time consuming than going directly to the FCC.

For information about the “EU Approval of Host Devices with Integrated Wireless Modules” white paper, please contact Chris Guy, Head of Global Approvals, at chris.guy@ul.com.