

SPECIFICATIONS

PRODUCT NAME : 802.11 a/b/g/n/ac Wi-Fi Module

MODEL NAME : ETWFFTBC01

H/W version : v100

*** This device is not operate simultaneously to 2.4 G and 5G band.**

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1. Features

ETWFFTBC01 is the module for IEEE 802.11a/b/g/n/ac wireless LAN .

ETWFFTBC01 is based on RealTek RTL8812BU solution.

- IEEE 802.11 a/b/g/n/ac Dual Band WLAN infrastructure
- Size : 70.0mm x 20.0mm x 10.3mm
- Dual band 2T2R mode with data rate up to 866Mbps
- Single and dual band antenna Support
 - One PCB Printed, and One External antenna support for WLAN
- Host Interface : USB2.0
- Security : WAPI, WEP, WPA, WPA2, WMM, AES, WEP, TKIP, CKP
- Application: DTV, DVR, HD DVD Player, Blue-ray Disk Player, STB
- Support WiFi Direct
- Support WOWL

2. Absolute Maximum Ratings

Caution : The specifications in Table 1 define levels at which permanent damage to the device can occur. Function operation is not guaranteed under these conditions.

Operating at absolute maximum conditions for extend periods can adversely affect the long-term reliability of the device.

Parameter	Min	Max	Unit
Storage Temperature	-10	+80	°C
Storage Humidity (40°C)	-	90	%

< Table 1 >

. Other conditions

1) Do not use or store modules in the corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are contained.

Also, avoid exposure to moisture.

2) Store the modules where the temperature and relative humidity do not exceed 5 to 40°C and 20 to 60%.

3) Assemble the modules within 6 months.

Check the soldering ability in case of 6 months over.

3. Operating Conditions

Parameter	Min	Typ	Max	Unit
Ambient Temperature	0	-	60	°C
Ambient Humidity (40°C)	-	-	85	%
Supply Voltage	3.15	3.3	3.45	Vdc

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4. Electrical Specifications for Wi-Fi

4-1. RF Characteristics for IEEE802.11b (11Mbps mode unless otherwise specified)

Items	Contents			
Specification	IEEE802.11b			
Mode	DSSS/CCK			
Channel frequency	2400 ~ 2483.5 MHz			
Data rate	1, 2, 5.5, 11Mbps			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level	12	15	18	dBm
Spectrum Mask				
1 st side lobes (to fc \pm 11MHz)	-	-	-30	dBr
2 nd side lobes (to fc \pm 22MHz)	-	-	-50	dBr
Modulation Accuracy (EVM)	-	-	35	%
Power On/Off ramp	-	-	2.0	usec
Freq. Tolerance	-20	-	20	ppm
Chip Clock Freq. Tolerance	-20	-	20	ppm
RX Characteristics	Min.	Typ.	Max.	Unit
Minimum Input Level Sens. (FER \leq 8%)		-	-82	dBm
Maximum Input Level (FER \leq 8%)	-10	-	-	dBm

* Normal Condition : 25°C, VDD=3.3V

* Channel frequency varies by regulatory domain.

Refer to the product documentation for specific details for each regulatory domain

* The maximum power setting will vary by channel and according to individual country regulations.

Refer to the product documentation for specific details.

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4-2. RF Characteristics for IEEE802.11g (54Mbps mode unless otherwise specified)

Items	Contents			
Specification	IEEE802.11g			
Mode	OFDM			
Channel frequency	2400 ~ 2483.5 MHz			
Data rate	6, 9, 12, 18, 24, 36, 48, 54Mbps			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level	11	14	17	dBm
Spectrum Mask				
at fc \pm 11MHz	-	-	-20	dBr
at fc \pm 20MHz	-	-	-28	dBr
at fc $\geq \pm$ 30MHz	-	-	-40	dBr
Constellation Error (EVM)	-	-	-25	dB
Freq. Tolerance	-20	-	20	ppm
Chip Clock Freq. Tolerance	-20	-	20	ppm
RX Characteristics	Min.	Typ.	Max.	Unit
Minimum Input Level Sens. (PER \leq 10%)	-	-	-68	dBm
Maximum Input Level (PER \leq 10%)	-20	-	-	dBm

* Normal Condition : 25°C, VDD=3.3V

* Channel frequency varies by regulatory domain.

Refer to the product documentation for specific details for each regulatory domain

* The maximum power setting will vary by channel and according to individual country regulations.

Refer to the product documentation for specific details.

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4-3. RF Characteristics for IEEE802.11gn (MCS7 mode unless otherwise specified)

Items	Contents			
Specification	IEEE802.11n – 2.4GHz			
Mode	OFDM			
Channel frequency	2400 ~ 2483.5 MHz			
Data rate	6.5, 13, 19.5, 26, 39, 52, 58.5, 65Mbps			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (HT20 / HT40 : MCS7)	10	13	16	dBm
Spectrum Mask (HT20)				
at fc ±11MHz	-	-	-20	dBr
at fc ±20MHz	-	-	-28	dBr
at fc ±30MHz	-	-	-40	dBr
Constellation Error (EVM)	-	-	-27	dB
Freq. Tolerance	-20	-	20	ppm
Chip Clock Freq. Tolerance	-20	-	20	ppm
RX Characteristics	Min.	Typ.	Max.	Unit
Minimum Input Level Sens. (HT20, PER ≤ 10%)	-	-	-65	dBm
Minimum Input Level Sens. (HT40, PER ≤ 10%)	-	-	-62	dBm
Maximum Input Level (PER ≤ 10%)	-20	-	-	dBm

• Normal Condition : 25 °C, VDD=3.3V

* Channel frequency varies by regulatory domain.

Refer to the product documentation for specific details for each regulatory domain

* The maximum power setting will vary by channel and according to individual country regulations.

Refer to the product documentation for specific details.

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4-4. RF Characteristics for IEEE802.11a (54Mbps mode unless otherwise specified)

Items	Contents			
Specification	IEEE802.11a			
Mode	OFDM			
Channel frequency	5150~5250MHz, 5725 ~ 5850 MHz			
Data rate	6, 9, 12, 18, 24, 36, 48, 54Mbps			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level	9	12	15	dBm
Spectrum Mask				
at $f_c \pm 11\text{MHz}$	-	-	-20	dBr
at $f_c \pm 20\text{MHz}$	-	-	-28	dBr
at $f_c \geq \pm 30\text{MHz}$	-	-	-40	dBr
Constellation Error (EVM)	-	-	-25	dB
Freq. Tolerance	-20	-	20	ppm
Chip Clock Freq. Tolerance	-20	-	20	ppm
RX Characteristics	Min.	Typ.	Max.	Unit
Minimum Input Level Sens. (PER \leq 10%)	-	-	-67	dBm
Maximum Input Level (PER \leq 10%)	-30	-	-	dBm

* Normal Condition : 25℃, VDD=3.3V

* Channel frequency varies by regulatory domain.

Refer to the product documentation for specific details for each regulatory domain

* The maximum power setting will vary by channel and according to individual country regulations.

Refer to the product documentation for specific details.

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4-5. RF Characteristics for IEEE802.11n (MCS7 mode unless otherwise specified)

Items	Contents			
Specification	IEEE802.11n – 5GHz			
Mode	OFDM			
Channel frequency	5150~5250MHz, 5725 ~ 5850 MHz			
Data rate	6.5, 13, 19.5, 26, 39, 52, 58.5, 65Mbps			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level ²⁾ (HT20/HT40:MCS7)	8	11	14	dBm
Spectrum Mask (HT20)				
at $f_c \pm 11\text{MHz}$	-	-	-20	dBr
at $f_c \pm 20\text{MHz}$	-	-	-28	dBr
at $f_c \pm 30\text{MHz}$	-	-	-40	dBr
Constellation Error (EVM)	-	-	-27	dB
Freq. Tolerance	-20	-	20	ppm
Chip Clock Freq. Tolerance	-20	-	20	ppm
RX Characteristics	Min.	Typ.	Max.	Unit
Minimum Input Level Sens. (HT20, PER $\leq 10\%$)	-	-	-65	dBm
Minimum Input Level Sens. (HT40, PER $\leq 10\%$)	-	-	-62	dBm
Maximum Input Level (PER $\leq 10\%$)	-30	-	-	dBm

* Normal Condition : 25°C, VDD=3.3V

* Channel frequency varies by regulatory domain.

Refer to the product documentation for specific details for each regulatory domain

* The maximum power setting will vary by channel and according to individual country regulations.

Refer to the product documentation for specific details.

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4-6. RF Characteristics for IEEE802.11ac (MCS8/9 mode unless otherwise specified)

Items		Contents			
Specification		IEEE802.11ac – 5GHz			
Mode		OFDM			
Channel frequency		5150~5250MHz, 5725 ~ 5850 MHz			
Data rate		6.5,13,19.5,26,39,52,58.5,65,78Mbps			
TX Characteristics		Min.	Typ.	Max.	Unit
Power Level	VHT20(MCS8), VHT40(MCS9)	8	11	14	dBm
	VHT80(MCS9)	7	10	13	dBm
Spectrum Mask (HT20)					
at $f_c \pm 11\text{MHz}$		-	-	-20	dB
at $f_c \pm 20\text{MHz}$		-	-	-28	dB
at $f_c \pm 30\text{MHz}$		-	-	-40	dB
Constellation Error (EVM)	VHT20(MCS8)	-	-	-30	dB
	VHT40(MCS9)	-	-	-32	dB
	VHT80(MCS9)	-	-	-32	dB
Freq. Tolerance		-20	-	20	ppm
Chip Clock Freq. Tolerance		-20	-	20	ppm
RX Characteristics		Min.	Typ.	Max.	Unit
Minimum Input Level Sens. (VHT20,PER ≤ 10%)		-	-	-57	dBm
Minimum Input Level Sens. (VHT40,PER ≤ 10%)		-	-	-54	dBm
Minimum Input Level Sens. (VHT80,PER ≤ 10%)		-	-	-51	dBm
Maximum Input Level (PER ≤ 10%)		-30	-	-	dBm

* Normal Condition : 25℃, VDD=3.3V.

* Channel frequency varies by regulatory domain.

Refer to the product documentation for specific details for each regulatory domain

* The maximum power setting will vary by channel and according to individual country regulations.

Refer to the product documentation for specific details.

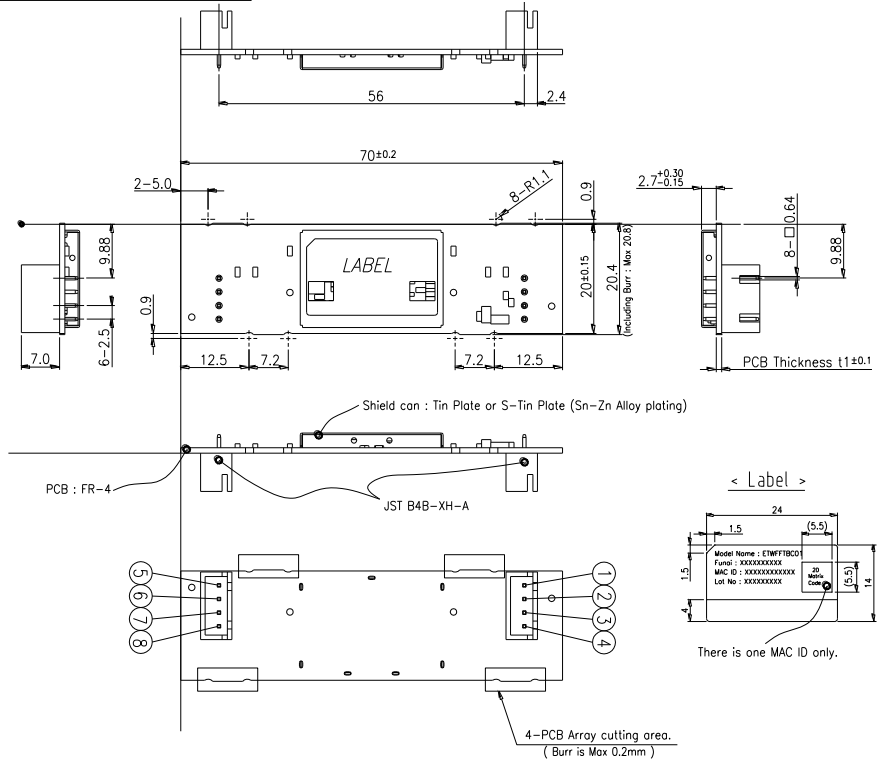
5. Outline Drawing

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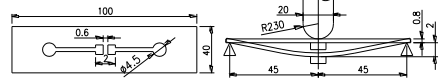
All parts which supply to LG Innotek must not contain prohibited substances including RoHS Hazardous substances and for more details refer to LG Innotek's "Manual for management of hazardous substances in Product"
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DIMENSIONAL TOLERANCE ~ up to 6 ±0.3 over 6 up to 30 ±0.5 over 30 up to 120 ±0.5 UNLESS OTHERWISE SPECIFIED	C H A N G E S	REV NO.	DATE (YY MM DD)	SIGNATURE	CHANGE CONTENTS

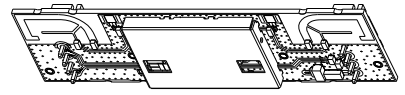
RELEASING THIS DRAWING WITHOUT PERMISSION OF LG Innotek SHOULD BE ACCUSED ACCORDING TO THE LAWS AND COMPANY RULES



- Notes
- Refer to the tolerance table, Radii are 0.5 unless otherwise specified.
 - Lot No. shall be conformed to LGIT standard specification.
 - As long as the outer appearance doesn't affect the performance of the product, it can be changed without prior notice.
 - PCB Warpages are max. 0.6mm.
 - Caution for handling.
 - Don't touch the circuit components.
 - Don't drop the wifi module 50cm high. (Allowed 1 time for 50cm high Max)
 - Don't twist the wifi module.
 - Reliability for PCB bending.
 - Requirement : No apparent damage
 - Test method : Solder the sample PCB, bend down to 2mm.
 - Fig



3D View



RELATED P/N THIRD ANGLE PROJECT	SCALE 1:1	UNIT mm	DESIGN '19. 05. 20 <i>Kapsoul Lee.</i>	TITLE Outline Drawing
			CHECKED '19. 05. 20 <i>Jehyuk Moon</i>	PART NO
			APPROVED '19. 05. 20 <i>Seokdong Choi</i>	MODEL ETWFFTBC01
				DWG NO

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FCC Information

This device complies with part 15 of the FCC Results. Operation is subject to the following two conditions :

- (1) This Device may not cause harmful interface, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for CLASS B digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try correct the interference by one or more of the following measures:

- 1.1. Reorient or relocate the receiving antenna.
- 1.2. Increase the separation between the equipment and receiver.
- 1.3. Connect the equipment into an outlet on a circuit different from that to which receiver is connected.
- 1.4. Consult the dealer or experienced radio/TV technician for help.

WARNING

Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

“CAUTION : Exposure to Radio Frequency Radiation.

Antenna shall be mounted in such a manner to minimize the potential for human contact during normal operation. The antenna should not be contacted during operation to avoid the possibility of exceeding the FCC radio frequency exposure limit.

IC Information

This device complies with Industry Canada license-exempt RSS standard(s). Operation in subject to The following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil est conforme avec Industrie Canada RSS standard exempts de licence(s), Son utilisation est soumise à Les deux conditions suivantes: (1) cet appareil ne peut pas provoquer d'interférences et (2) cet appareil doit accepter Toute interférence, y compris les interférences qui peuvent causer un mauvais fonctionnement du dispositif.

*** This device is going to be operated in 5 150 MHz ~ 5 250 MHz frequency range, it is restricted in indoor environment only.**

Information for OEM Integrator

This device is intended only for OEM integrators under the following conditions:

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- 2) The transmitter module may not be co-located with any other transmitter or antenna.

End product labelling

The label for end product must include

“Contains FCC ID: YZP-ETWFFTBC01, Contains IC: 7414C-ETWFFTBC01”.

“ CAUTION: Exposure to Radio Frequency Radiation.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20cm between the radiator and your body. This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users.”

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Requirement per KDB996369 D03
2.2 List of applicable FCC rules

List the FCC rules that are applicable to the modular transmitter. These are the rules that specifically establish the bands of operation, the power, spurious emissions, and operating fundamental frequencies. DO NOT list compliance to unintentional-radiator rules (Part 15 Subpart B) since that is not a condition of a module grant that is extended to a host manufacturer. See also Section 2.10 below concerning the need to notify host manufacturers that further testing is required.³

Explanation: This module meets the requirements of FCC part 15C(15.247).

2.3 Summarize the specific operational use conditions

Describe use conditions that are applicable to the modular transmitter, including for example any limits on antennas, etc. For example, if point-to-point antennas are used that require reduction in power or compensation for cable loss, then this information must be in the instructions. If the use condition limitations extend to professional users, then instructions must state that this information also extends to the host manufacturer's instruction manual. In addition, certain information may also be needed, such as peak gain per frequency band and minimum gain, specifically for master devices in 5 GHz DFS bands.

Explanation: The EUT has a PCB Antenna, , and the antenna use a permanently attached antenna which is not replaceable.

2.4 Limited module procedures

If a modular transmitter is approved as a "limited module," then the module manufacturer is responsible for approving the host environment that the limited module is used with. The manufacturer of a limited module must describe, both in the filing and in the installation instructions, the alternative means that the limited module manufacturer uses to verify that the host meets the necessary requirements to satisfy the module limiting conditions.

A limited module manufacturer has the flexibility to define its alternative method to address the conditions that limit the initial approval, such as: shielding, minimum signaling amplitude, buffered modulation/data inputs, or power supply regulation. The alternative method could include that the limited module manufacturer reviews detailed test data or host designs prior to giving the host manufacturer approval.

This limited module procedure is also applicable for RF exposure evaluation when it is necessary to demonstrate compliance in a specific host. The module manufacturer must state how control of the product into which the modular transmitter will be installed will be maintained such that full compliance of the product is always ensured. For additional hosts other than the specific host originally granted with a limited module, a Class II permissive change is required on the module grant to register the additional host as a specific host also approved with the module.

Explanation: The module is not a limited module.

2.5 Trace antenna designs

For a modular transmitter with trace antenna designs, see the guidance in Question 11 of KDB Publication 996369 D02 FAQ – Modules for Micro-Strip Antennas and traces. The integration information shall include for the TCB review the integration instructions for the following aspects:

layout of trace design, parts list (BOM), antenna, connectors, and isolation requirements.

- a) Information that includes permitted variances (e.g., trace boundary limits, thickness, length, width, shape(s), dielectric constant, and impedance as applicable for each type of antenna);
- b) Each design shall be considered a different type (e.g., antenna length in multiple(s) of frequency, the wavelength, and antenna shape (traces in phase) can affect antenna gain and must be considered);
- c) The parameters shall be provided in a manner permitting host manufacturers to design the printed circuit (PC) board layout;
- d) Appropriate parts by manufacturer and specifications;
- e) Test procedures for design verification; and
- f) Production test procedures for ensuring compliance.

The module grantee shall provide a notice that any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify the module grantee that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the grantee, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

Explanation: Yes, The module with trace antenna designs, and This manual has been shown the layout of trace design,, antenna, connectors, and isolation requirements.

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2.6 RF exposure considerations

It is essential for module grantees to clearly and explicitly state the RF exposure conditions that permit a host product manufacturer to use the module. Two types of instructions are required for RF exposure information: (1) to the host product manufacturer, to define the application conditions (mobile, portable – xx cm from a person's body); and (2) additional text needed for the host product manufacturer to provide to end users in their end-product manuals. If RF exposure statements and use conditions are not provided, then the host product manufacturer is required to take responsibility of the module through a change in FCC ID (new application).

Explanation: This module complies with FCC RF radiation exposure limits set forth for an uncontrolled environment, This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body." This module is designed to comply with the FCC statement, FCC ID is: YZP-ETWFFTBC01.

2.7 Antennas

A list of antennas included in the application for certification must be provided in the instructions. For modular transmitters approved as limited modules, all applicable professional installer instructions must be included as part of the information to the host product manufacturer. The antenna list shall also identify the antenna types (monopole, PIFA, dipole, etc. (note that for example an "omni-directional antenna" is not considered to be a specific "antenna type").

For situations where the host product manufacturer is responsible for an external connector, for example with an RF pin and antenna trace design, the integration instructions shall inform the installer that unique antenna connector must be used on the Part 15 authorized transmitters used in the host product. The module manufacturers shall provide a list of acceptable unique connectors.

Explanation: The EUT has a PCB Antenna, , and the antenna use a permanently attached antenna which is unique.

2.8 Label and compliance information

Grantees are responsible for the continued compliance of their modules to the FCC rules. This includes advising host product manufacturers that they need to provide a physical or e-label stating "Contains FCC ID" with their finished product. See Guidelines for Labeling and User Information for RF Devices – KDB Publication 784748.

Explanation:The host system using this module, should have label in a visible area indicated the following texts: "Contains FCC ID: YZP-ETWFFTBC01.

2.9 Information on test modes and additional testing requirements

Additional guidance for testing host products is given in KDB Publication 996369 D04 Module Integration Guide. Test modes should take into consideration different operational conditions for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.

The grantee should provide information on how to configure test modes for host product evaluation for different operational conditions for a stand-alone modular transmitter in a host, versus with multiple, simultaneously transmitting modules or other transmitters in a host.

Grantees can increase the utility of their modular transmitters by providing special means, modes, or instructions that simulates or characterizes a connection by enabling a transmitter. This can greatly simplify a host manufacturer's determination that a module as installed in a host complies with FCC requirements.

Explanation: Topband can increase the utility of our modular transmitters by providing instructions that simulates or characterizes a connection by enabling a transmitter.

2.10 Additional testing, Part 15 Subpart B disclaimer

The grantee should include a statement that the modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuitry), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

Explanation: The module without unintentional-radiator digital circuitry, so the module does not require an evaluation by FCC Part 15 Subpart B. The host should be evaluated by the FCC Subpart B.