



ATBM6132 Wi-Fi + BLE Module User Manual

Document Rev. 1.0
Released: 2024-11-27
AltoBeam Inc.

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REVISION HISTORY

Revision Number	Revision Date	Changes	
		Item	Description
V1.0	2024-11-27		Official release version

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1 Overview

ATBM6132 module is a highly integrated 2.4&5GHz dual band 802.11a/b/g/n and BLE v5.0 WLAN transceiver with USB interface (USB 2.0 compliant). The ATBM6132 provides a complete solution for wireless LAN application with remarkable performance and reliability.

2 General specifications

Wi-Fi chip	AltoBeam ATBM6132-BU
Host interface	USB 2.0
Operation range	More than 150 meters in open space
RF antenna	External antenna (2.4GHz and 5GHz dual band)
Security	WPA, WPA2, WPA3 personal
Power supply requirement	3.3VDC 800mA
Operating temperature	-40 ~ +85°C ambient temperature
Storage temperature	-50~ +125°C ambient temperature
Humidity	5% to 90% maximum (non-condensing)
Dimension	Typical L71.3*W54.6 (±0.2mm)

3 RF specifications

3.1 2.4GHz Wi-Fi Specification

General Specification	
Operating frequency	2.4 to 2.4835 GHz
Standard	IEEE 802.11b/g/n 1T1R
Operation mode	STA (Station)
Modulation	802.11b (DSSS): DBPSK, DQPSK, CCK 802.11g/n (OFDM): BPSK, QPSK, 16QAM, 64QAM
Bandwidth	802.11b/g/n HT20: ≤20MHz 802.11n HT40: ≤40MHz
PHY data rates	802.11b: 1, 2, 5.5, 11Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11n HT20: MCS0 to MCS7, 6.5 to 72.2Mbps 802.11n HT40: MCS0 to MCS7, 13.5 to 150Mbps
Frequency offset	≤ ±10ppm

3.2 5GHz Wi-Fi Specification

General specification	
Operating frequency	5.15 ~ 5.25GHz; 5.25 ~ 5.35GHz; 5.47~5.725GHz; 5.725~5.85GHz
Standard	IEEE 802.11a/n 1T1R
Modulation	802.11a/n (OFDM): BPSK, QPSK, 16QAM, 64QAM
Bandwidth	802.11a/n HT20: $\leq 20\text{MHz}$ 802.11n HT40: $\leq 40\text{MHz}$
PHY data rates	802.11a: 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11n HT20: MCS0~7, 6.5 ~ 72.2Mbps 802.11n HT40: MCS0~7, 13.5 ~ 150Mbps
Frequency offset	$\leq \pm 10\text{ppm}$

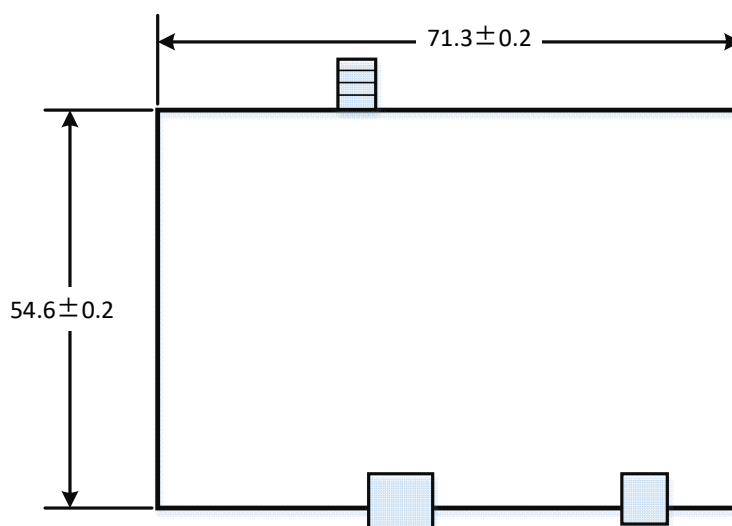
3.3 BLE Specification

Standard	Bluetooth LE v4.2
Operating frequency	2.4 to 2.4835GHz
Modulation	GFSK
PHY data rates	1Mbps

4 Mechanical Specification

4.1 Outline drawing

The typical dimension of module is 71.3mm(L)x54.6mm(W) (± 0.2 mm).



Outline drawing (Top View)

4.2 Connector

Item	Description
Power connector	5V DC power supply input
USB connector	USB interface
SMA connector (reverse polarity)	Wi-Fi antenna interface (2.4GHz/5GHz 50ohm)

5 Wi-Fi Antenna

This module needs to connect with an external Wi-Fi antenna supporting both 2.4GHz and 5GHz bands. The following figure is the PCB layout reference design of microstrip line between the module's antenna pin and IPEX antenna connector, the length of the microstrip line is required to be less than 20mm, and it should be as straight as possible. If there must be a corner, the angle is required to be greater than 120 degrees. The impedance of the microstrip line must be 50ohm for both 2.4GHz and 5GHz, and there is a complete reference ground plane under microstrip line. In order to optimize RF performance, the ground under IPEX antenna connector needs to be removed.

6 FCC warning statement

The module is a limited module and complies with the requirement of FCC Part 15.247&15.407. According to FCC Part 15 Subpart C section 15.212, the radio elements must have the radio frequency circuitry shielded.

However, due to there is no shield for this module, this module is granted as a Limited Modular Approval.

Limited Module Procedures: The ATBM6132 radio module does not include its own RF shielding. To demonstrate compliance, testing was performed with the radio in a standalone configuration.

Class II Permissive Change (C2PC) Test Plan for New Host Devices:

A C2PC is required for new host application. Only Grantees are permitted to make permissive changes.

The **full test** is required for every different specific host using the module.

Test items	Full case mode and standards		
	BLE	WIFI 2.4G	WIFI 5G
Conducted output power	☑ 15.247(b)	☑ 15.247(b)	☑ 15.407 (a)
Occupied Bandwidth	☑ 15.247(a)	☑ 15.247(a)	☑ 2.1049 &15.403(i)
Power Spectral Density	☑ 15.247(e)	☑ 15.247(e)	☑ 15.407 (a)
Band Edges	☑ 15.247(d)	☑ 15.247(d)	☑ 15.407 (b),
Conducted Band Edges	☑ 15.247(d)	☑ 15.247(d)	☑ 15.407 (b),
Radiated Band edge and Spurious Emission	☑ 15.247 (d) 15.205 15.209	☑ 15.247 (d) 15.205 15.209	☑ 15.407 (b), 15.205 15.209
AC Power Line Conducted Emissions Voltage	☑ 15.207(a)	☑ 15.207(a)	☑ 15.207(a)
Antenna Requirement	☑ 15.203 15.247 (c)	☑ 15.203 15.247 (c)	☑ 15.203 15.407 (a)
EMC	☑ 15.107 ☑ 15.109		
RF Exposure	☑ 2.1091 (Mobile or Fixed) ☑ 2.1093 (Portable)		

Conducted	Spec	Modulation	Test Mode	Freq(Mhz)	Test item
	BLE	GFSK	BLE:1Mbps	2402/2440/2480	Power + OBW+ PSD+ BE+ CSE
Radiated emission	Spec	Modulation	Test Mode	Channel	Test item
	BLE	GFSK	BLE:1Mbps	2402/2440/2480	Band edge+ RSE

Conducted	Spec	Modulation	Test Mode	BW	Freq(MHz)	Test item
	2.4G WIFI	DSSS(11b) OFDM(11g/n)	11b/11g/11n	20MHZ	2412/2437/2462	Power+OBW+PSD+BE+CSE
	2.4G WIFI	DSSS(11b) OFDM(11g/n)	11n	40MHZ	2422/2437/2452	Power+OBW+PSD+BE+CSE
Radiated emission	Spec	Modulation	Test Mode	BW	Freq(Mhz)	Test item
	2.4G WIFI	DSSS(11b) OFDM(11g/n)	11b/11g/11n	20MHZ	2412/2437/2462	Band edge+RSE
	2.4G WIFI	DSSS(11b) OFDM(11g/n)	11n	40MHZ	2422/2437/2452	RSE

Conducted	Spec	Modulation	Test Mode	BW	Freq(Mhz)	Test item
	5G WIFI	OFDM	11a/11n	20MHZ	5180/5220/5240	Power+OBW+PSD+26dB+6dB
	5G WIFI	OFDM	11a/11n	20MHZ	5260/5300/5320	Power+OBW+PSD+26dB+6dB
	5G WIFI	OFDM	11a/11n	20MHZ	5500/5580/5700	Power+OBW+PSD+26dB+6dB
	5G WIFI	OFDM	11a/11n	20MHZ	5745/5785/5825	Power+OBW+PSD+26dB+6dB
	5G WIFI	OFDM	11n	40MHZ	5190/5230	Power+OBW+PSD+26dB+6dB+DFS
	5G WIFI	OFDM	11n	40MHZ	5270/5310	Power+OBW+PSD+26dB+6dB+DFS
	5G WIFI	OFDM	11n	40MHZ	5510/5550/5670	Power+OBW+PSD+26dB+6dB+DFS
	5G WIFI	OFDM	11n	40MHZ	5755/5795	Power+OBW+PSD+26dB+6dB+DFS
Radiated emission	Spec	Modulation	Test Mode	BW	Freq(Mhz)	Test item
	5G WIFI	OFDM	11a/11n	20MHZ	5180/5220/5240	Band edge+RSE
	5G WIFI	OFDM	11a/11n	20MHZ	5260/5300/5320	Band edge+RSE
	5G WIFI	OFDM	11a/11n	20MHZ	5500/5580/5700	Band edge+RSE
	5G WIFI	OFDM	11a/11n	20MHZ	5745/5785/5825	Band edge+RSE
	5G WIFI	OFDM	11n	40MHZ	5190/5230	RSE
	5G WIFI	OFDM	11n	40MHZ	5270/5310	RSE
	5G WIFI	OFDM	11n	40MHZ	5510/5550/5670	RSE
	5G WIFI	OFDM	11n	40MHZ	5755/5795	RSE

Continued compliance in a new host

Part 15.247 for BLE & WLAN 2.4G

Rule	Description	Limit
15.247(a)(2)	6dB Bandwidth	$\geq 0.5\text{MHz}$
-	99% Bandwidth	-
15.247(b)(3)	Power Output Measurement	$\leq 30\text{dBm}$
15.247(e)	Power Spectral Density	$\leq 8\text{dBm}/3\text{kHz}$
15.247(d)	Conducted Band Edges	$\leq 20\text{dBc}$
	Conducted Spurious Emission	
15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)
15.207	AC Conducted Emission	15.207(a)

FCC Rule	Description	Limit for U-NII-1/2A/2C	Limit for U-NII-3
2.1049 & 15.403(i)	6dB, 26dB & 99% Bandwidth	-	6dB Bandwidth > 500kHz
15.407(a)	Maximum Conducted Output Power	≤ 24 dBm	≤ 30 dBm
15.407(a)	Power Spectral Density	≤ 11 dBm/MHz	≤ 30 dBm/500kHz
15.407(b)	Unwanted Emissions	15.407(b) & 15.209(a)	15.407(b)(4)(i) & 15.209(a)
15.207	AC Conducted Emission	15.207(a)	15.207(a)

Note:

- a. The highest conducted power from the original grant followed by an in-host measurement to be made showing that the conducted powers are within a reasonable margin.
- b. According to KDB 178919 D01:

Conducted power of host should be equal to or less than the maximum power of Module's.

An increase in maximum output power requires a new grant of certification (FCC ID) per § 2.1043. This includes an increase in conducted output power and/or radiated power listed on the grant.
- c. Testing shall be performed for each supported modulation testing 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.

RF Exposure Considerations:

If host product is portable device, a completely full SAR test should be evaluated.

How to make change

Please contact us for further process with AltoBeam Inc. Contact: Nan Li, E-mail: linan@altobeam.com

The host product shall be evaluated for ensuring the continuous compliance for the FCC rules that apply to the host product. Additional guidance for testing host products is provided in KDB Publication 996369 D02 and D04. This module was tested as a subsystem and its certification does not cover the FCC Part 15 Subpart B (unintentional radiator) rule requirement applicable to the final host. The host will still need to be reassessed for compliance to this portion of rule requirements.

For the host product is not installed according to this guide, the module certification will be invalid and a new grant certification will be required for the host product.

Important Note

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 to AltoBeam 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 USI, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

End Product Labeling

When the module is installed in the host device, the FCC ID label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily re-moved. If not, a second label must be placed on the outside of the final device that contains the following text: "Contains FCC ID: 2BAVS-ATBM6132"
The FCC ID can be used only when all FCC compliance requirements are met.

Antenna Installation

- (1) The antenna must be installed such that 20 cm is maintained between the antenna and users,
 - (2) The transmitter module may not be co-located with any other transmitter or antenna.
 - (3) Only antennas of the same type and with equal or less gains as shown below may be used with this module.
- Other types of antennas and/or higher gain antennas may require additional authorization for operation.

Antenna type	2.4GHz band Peak Gain (dBi)	5.2GHz band Peak Gain (dBi)	5.3GHz band Peak Gain (dBi)	5.5GHz band Peak Gain (dBi)	5.8GHz band Peak Gain (dBi)
glue stick antenna	3.02	2.34	2.66	2.4	2.57

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

Trace antenna designs

Not applicable.

Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

Federal Communication Commission Interference Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. 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 to correct the interference by one of the following measures:

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

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

List of applicable FCC rules

This module has been tested and found to comply with part 15.247 and 15.407 requirements for Modular Approval. 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.

This device is intended only for OEM integrators under the following conditions: (For module device use)

- 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.

As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This

equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.