

# MLC21AAM

## FCC ID : PBLMLC21AAM

### 802.11ac/abgnDual-Band



#### General Descriptions:

The MLC21AAM is a highly integrated module which has built in a 2x2 dual-band wireless LAN radio. It supports IEEE 802.11ac draft standard and provides the highest PHY rate up to 867Mbps, offering feature-rich wireless connectivity and reliable throughput from an extended distance. Optimized RF architecture and baseband algorithms provide superb performance and low power consumption. MLC21AAM integrates PA/LNA such that the number of the external components is reduced to minimum. Intelligent MAC design deploys a high efficient DMA engine and hardware data processing accelerators which offloads the host processor. The MLC21AAM supports the 802.11i security standard and implements hardware acceleration for TKIP, CCMP and WAPI.

## WLAN Base band

MLC21AAM baseband supports the following features:

11ac stage-1 feature support

20, 40, and 80MHz channels

MCS0-7 (BPSK,  $r=1/2$  through 64QAM,  $r=5/6$ )

MCS8-9 (256QAM,  $r=3/4$  and  $r=5/6$ )

VHT A-MPDU delimiter for RX and TX for single MPDU

Clear Channel Assessment (CCA) on secondary

Short Guard Interval

STBC support

Low Density Parity check (LDPC) coding

Support digital pre-distortion to enhance PA performance

Smoothing (channel estimation) extension to MIMO case

Dynamic frequency selection (DFS) radar pulse detection

## WLANRF

MLC21AAM RF supports the following features:

Integrated 2.4GHz/5GHz PA and LNA

Integrated 5GHz Balun

Support 2.4GHz/5GHz external PA and LNA

Improve the efficiency of RF PA with Digital Pre-Distortion (DPD)

Improve the power variation with TSSI compensated TX power control

## GENERAL

---

### IEEE WLAN Standard

IEEE 802.11 a/b/g/n and 802.11ac draft compliant

Support 20MHz, 40MHz, 80MHz in 5GHz band, and 20MHz, 40MHz bandwidth in 2.4GHz band

Dual-band 2T2R mode with data rate up to 867Mbps

Support 256QAM in 2.4GHz band

Support STBC, LDPC, MRC, and transmit Beamforming

Greenfield, mixed mode, legacy modes support

Frame aggregation

Integrated LNA, PA, and T/R switch.

Optional external LNA and PA support.

IEEE 802.11 d/e/h/i/k/r/w support

Security support for WFA WPA/WPA2 personal, WPS2.0, WAPI

Supports 802.11w protected managed frames

QoS support of WFA WMM, WMM PS

802.11 to 802.3 header translation offload

Supports Wi-Fi Direct

Per packet transmit power control

Wake on WLAN

## SECURITY FEATURES<sup>1</sup>

---

Support for WFA WPA/WPA2 personal, WPS2.0, WAPI

## **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.

FCC Caution: 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.

**FOR MOBILE DEVICE USAGE (>20cm/low power eg. AP routers)**

### **Radiation ExposureStatement:**

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance **20cm** between the radiator & your body.

**FOR COUNTRY CODE SELECTION USAGE (WLAN DEVICES)**

Note: The country code selection is for non-US model only and is not available to all US model. Per FCC regulation, all WiFi product marketed in US must fixed to US operation channels only.

**This module is intended for OEM integrators only. Per FCC KDB 996369 D03 OEM Manual v01 guidance, the following conditions must be strictly followed when using this certified module:**

**KDB 996369 D03 OEM Manual v01 rule sections:**

**2.2 List of applicable FCC rules**

This module has been tested for compliance to FCC Part 15

**2.3 Summarize the specific operational use conditions**

The module is tested for standalone mobile RF exposure use condition. Any other usage conditions such as co-location with other transmitter(s) or being used in a portable condition will need a separate reassessment through a class II permissive change application or new certification.

**2.4 Limited module procedures**

Not applicable.

**2.5 Trace antenna designs**

Not applicable.

**2.6 RF exposure considerations**

This equipment complies with FCC mobile radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator & your body. If the module is installed in a portable host, a separate SAR evaluation is required to confirm compliance with relevant FCC portable RF exposure rules.

**2.7 Antennas**

The following antennas have been certified for use with this module; antennas of the same type with equal or lower gain may also be used with this module. The antenna must be installed such that 20 cm can be maintained between the antenna and users.

Ant. No.	Chain No.	Antenna Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connector Type
1	Chain 0	3	2.4~2.4835	Dipole	R-SMA
		5	5.15~5.85		
2	Chain 1	3	2.4~2.4835	Dipole	R-SMA
		5	5.15~5.85		

**2.8 Label and compliance information**

The final end product must be labeled in a visible area with the following: "Contains FCC ID:PBLMLC21AAM. The grantee's FCC ID can be used only when all FCC compliance requirements are met.

**2.9 Information on test modes and additional testing requirements**

This transmitter is tested in a standalone mobile RF exposure condition and any co-located or simultaneous transmission with other transmitter(s) or portable use will require a separate class II permissive change re-evaluation or new certification.

**2.10 Additional testing, Part 15 Subpart B disclaimer**

This transmitter module is 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 final host will still need to be reassessed for compliance to this portion of rule requirements if applicable.

As long as all 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.

**IMPORTANT NOTE:** In the event that these conditions can not 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 can not 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.

#### **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 shown in this manual.

#### **OEM/Host manufacturer responsibilities**

OEM/Host manufacturers are ultimately responsible for the compliance of the Host and Module. The final product must be reassessed against all the essential requirements of the FCC rule such as FCC Part 15 Subpart B before it can be placed on the US market. This includes reassessing the transmitter module for compliance with the Radio and EMF essential requirements of the FCC rules. This module must not be incorporated into any other device or system without retesting for compliance as multi-radio and combined equipment.