

WPEQ-405AX

WiFi 6 (802.11ax) 4x4 MU-MIMO

5GHz Single Band Mini PCIe Module



802.11ax with MU-MIMO 4x4 Solution

The first WiFi-6 (802.11ax) Qualcomm based AP solution on module formfactor from SparkLAN.

WPEQ-405AX, is based on QCN9074 chipset solution. This is a true enterprise based wireless module that powers 4T4R (4x4) MU-MIMO, in 5Ghz Single band mode, hitting a theoretical speed of up to 4.8Gbps with 160MHz support.

Unlike typical Qualcomm reference design around QCN9074 (PN02.1), WPEQ-405AX shrink the traditional 50mmx50mm M.2 E-Key design to a more popular Mini PCIe Full size formfactor of just 50mm x 30mm, run at 3.3V voltage. Provides a greater versatility to use on more common seen design.

WPEQ-405AX performs both AP and STA functionality with 4 spatial streams, although recommended more for hardware AP applications as it supports 4096-QAM, OFDMA technology, makes it perfect for heavy lifting applications such as Enterprise grade AP, UTM, public & transportation Hotspot, and other industrial capable Access Points.

Embedded Application

Applications include Multimedia Router and AP solution., etc.

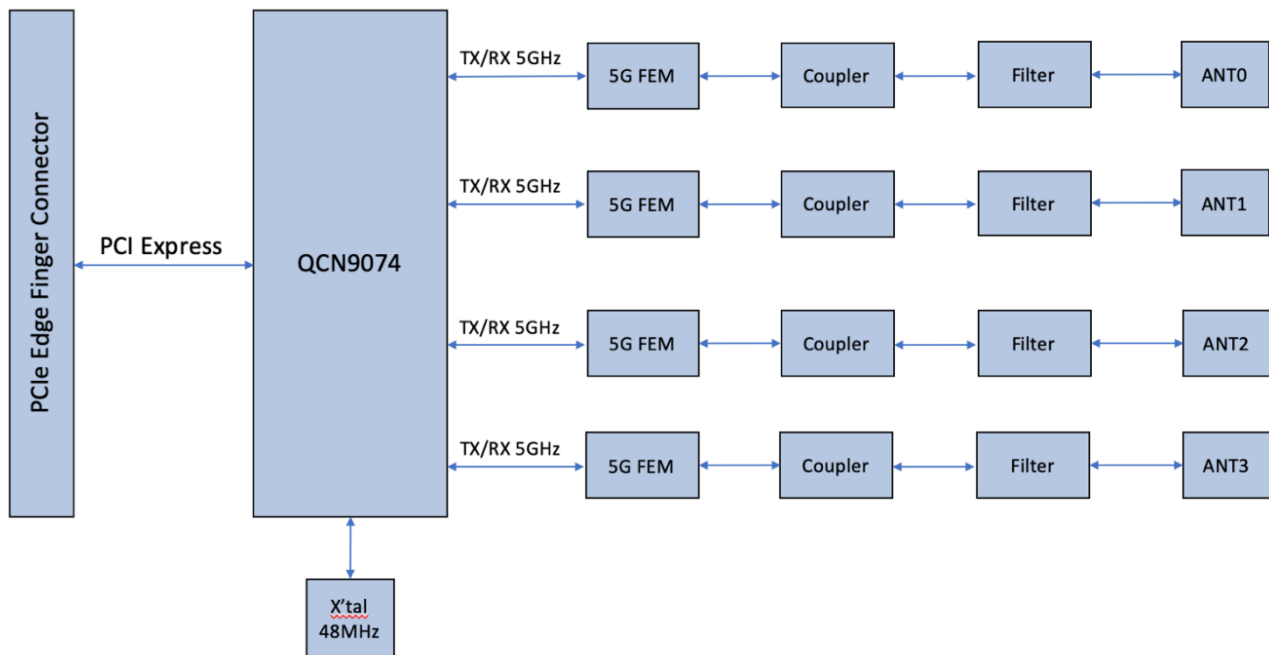
Key Feature

- 5GHz, 4x4 MU-MIMO OFDMA Technology, up to 4804Mbps physical data rate
- Single Band 5GHz 4x4 Wi-Fi 6 (802.11ax)
- 4 spatial streams (4SS)
- Perfect for AP solutions
- Support standard full size Mini PCIe module

Specification

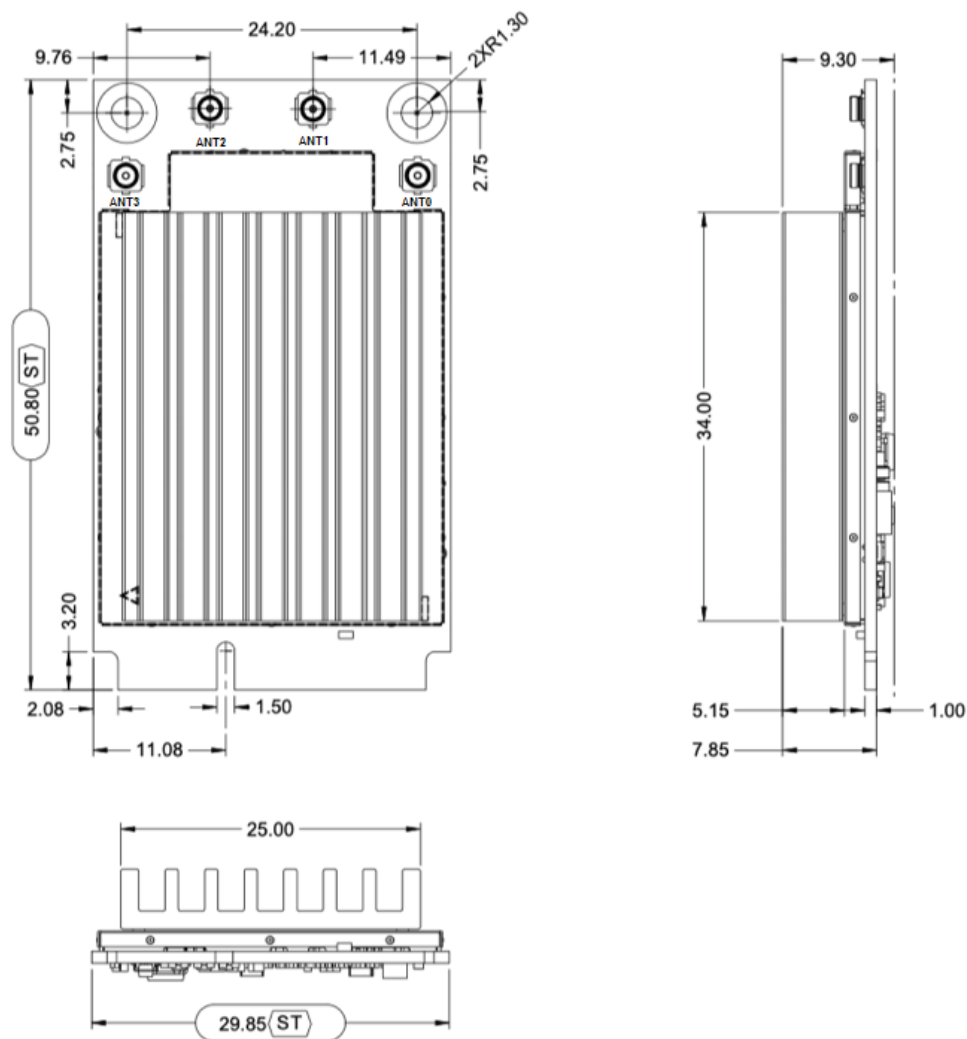
Standards	IEEE 802.11ax/ac/a/n (4T4R)
Chipset	Qualcomm Atheros QCN9074
Data Rate	802.11a: 54Mbps 802.11n: MCS0~15 802.11ac: MCS0~9 802.11ax: HE0~11
Operating Frequency	IEEE 802.11ax/ac/a/n ISM Band: 5.150GHz~5.850GHz *Subject to local regulations
Interface	WLAN: PCIe
Form Factor	Mini PCIe
Antenna	4 x IPEX MHF1 connectors
Modulation	Wi-Fi : 802.11n: OFDM (BPSK, QPSK, 16-QAM, 64-QAM) 802.11a: OFDM (BPSK, QPSK, 16-QAM, 64-QAM) 802.11ac: OFDM (BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM) 802.11ax: OFDMA (BPSK, QPSK, DBPSK, DQPSK, 16-QAM, 64-QAM, 256-QAM, 1024-QAM, 4096-QAM)
Power Consumption	TX mode: 1954mA(Max.) RX mode: 819mA(Max.)
Operating Voltage	DC 3.3V
Operating Temperature Range	-20°C ~ +70°C (TBD)
Storage Temperature Range	-20°C ~ +90°C
Humidity (Non-Condensing)	5%~90% (Operating) 5%~90% (Storing)
Dimension L x W x H (in mm)	50.80mm(±0.3mm) x 29.85mm(±0.3mm) x 9.30mm(±0.3mm) (TBD)
Weight (g)	TBD g
Driver Support	Linux (Open Source)
Security	64/128-bits WEP, WPA, WPA2, 802.1x

Block Diagram

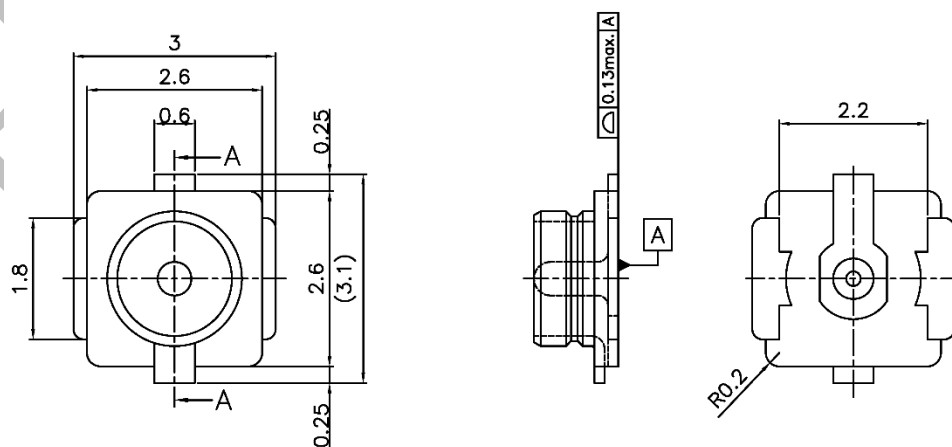


Preliminary

Mechanical Dimension (mm)



MHF1 connector spec.



Unit: mm

Pin Assignment (TBD)

The following section illustrate signal pin-outs for the module connector.

TOP			
Pin#	Pin Name	Type	Description
1	WAKE#	—	Open Drain active Low signal. When the add-in card supports wakeup, this signal is used by the add-in card to request that the system return from a sleep/suspended state to service a function initiated wake event. When the add-in card supports the OBFF mechanism, this signal is used by the system to indicate OBFF or CPU Active State transitions.
3	NC	—	No connect
5	NC	—	No connect
7	PCIE_CLKREQ_L	OD	PCIe clock request
9	GND	G	Ground connections
11	REFCLK-	I	PCIe differential clock input- Negative
13	REFCLK+	I	PCIe differential clock input- Positive
15	GND	G	Ground connections
17	NC	—	No connect
19	NC	—	No connect
21	GND	G	Ground connections
23	PCIE_TDN	O	PCIe Transmit data-Negative
25	PCIE_TDP	O	PCIe Transmit data-Positive
27	GND	G	Ground connections
29	GND	G	Ground connections
31	PCIE_RDN	I	PCIe receive data-Negative
33	PCIE_RDP	I	PCIe receive data-Positive
35	GND	G	Ground connections
37	GND	G	Ground connections
39	VDD_3V3_SIP	P	VDD system power supply input
41	VDD_3V3_SIP	P	VDD system power supply input
43	GND	G	Ground connections
45	PCIE_L1_TXM	—	WLAN PCIe L1 transmit output differential signals
47	PCIE_L1_TXP	—	WLAN PCIe L1 transmit output differential signals
49	PCIE_L1_RXM	—	WLAN PCIe L1 receive input differential signals
51	PCIE_L1_RXP	—	WLAN PCIe L1 receive input differential signals

BOTTOM			
Pin#	Pin Name	Type	Description
2	VDD_3V3	P	VDD system power supply input
4	GND	G	Ground connections
6	NC	—	No connect
8	NC	—	No connect
10	NC	—	No connect
12	NC	—	No connect
14	NC	—	No connect
16	NC	—	No connect
18	GND	G	Ground connections
20	W_DISABLE1#(NA)	I	
22	PCIE_PERST_L	I	PCIe host indication to reset the device. Active low.
24	NC	—	No connect
26	GND	G	Ground connections
28	NC	—	No connect
30	NC	—	No connect
32	NC	—	No connect
34	GND	G	Ground connections
36	USB_D-	I/O	USB serial differential data Negative
38	USB_D+	I/O	USB serial differential data Positive
40	GND	G	Ground connections
42	LED_WWAN#	O	
44	LED_WLAN#	O	
46	NC	—	No connect
48	NC	—	No connect
50	GND	G	Ground connections
52	VDD_3V3_SIP	P	VDD system power supply input

Note: power (P), ground (G), open-drain (OD), input (I), output (O), Do Not Connect (DNC), No Connection (NC)

Installation

- Connect the Module to the PCIe slot of the computer.
- Install Wi-Fi driver driver.
- After the Wi-Fi Driver is installed , click the Network icon on the Windows, then search the network , and connect the Wireless Network you want.

Federal Communication Commission Interference Statement:

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 or more 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 your authority to operate the equipment.

RF exposure statements

This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

This equipment 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 26 centimeters between the radiator and your body or nearby persons.

CFR 47 SUBPART E (15.407) has been investigated. It is applicable to the modular transmitter.

The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.

This radio transmitter RYK-WPEQ405AX has been approved by Federal Communications Commission to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Unique antenna connector (RP-SMA) must be used on the Part 15 authorized transmitters used in the host product.

Antenna Type	Antenna Model	Maximum Gain (dBi)		Remark
		2.4 GHz	5GHz	
Dipole	AD-103AG	2.02 dBi	2.03 dBi	
Dipole	AD-302N	3.14 dBi	2.74 dBi	
Dipole	AD-303N	3.14 dBi	3.24 dBi	

Length of Antenna cable:150mm Connector type of Antenna cable: I-PEX/MHF4 to RP-SMA(F)

If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: “Contains Transmitter Module FCC ID: RYK-WPEQ405AX” Or “Contains FCC ID: RYK-WPEQ405AX”

The modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and 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. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

Industry Canada statement:

This device complies with Industry Canada license-exempt RSSs. Operation is 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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- 1) l'appareil ne doit pas produire de brouillage;
- 2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Caution:

- 1) The device for operation in the band 5150–5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems;
- 2) For devices with detachable antenna(s), the maximum antenna gain permitted for devices in the bands 5250-5350 MHz and 5470-5725 MHz shall be such that the equipment still complies with the e.i.r.p. limit;
- 3) For devices with detachable antenna(s), the maximum antenna gain permitted for devices in the band 5725-5850 MHz shall be such that the equipment still complies with the e.i.r.p. limits specified for point-to-point and non-point-to-point operation as appropriate; and

Avertissement:

- 1) Le dispositif fonctionnant dans la bande 5150-5250 MHz est réservé uniquement pour une utilisation à l'intérieur afin de réduire les risques de brouillage préjudiciable aux systèmes de satellites mobiles utilisant les mêmes canaux;
- 2) Le gain maximal d'antenne permis pour les dispositifs avec antenne(s) amovible(s) utilisant les bandes 5250-5350 MHz et 5470-5725 MHz doit se conformer à la limitation P.I.R.E.;
- 3) Le gain maximal d'antenne permis pour les dispositifs avec antenne(s) amovible(s) utilisant la bande 5725-5850 MHz doit se conformer à la limitation P.I.R.E. spécifiée pour l'exploitation point à point et non point à point, selon le cas.

Radiation Exposure Statement:

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 26cm between the radiator & your body.

Déclaration d'exposition aux radiations:

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 26 cm de distance entre la source de rayonnement et votre corps.

This radio transmitter (IC: 6158A-WPEQ405AX has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio (IC: 6158A-WPEQ405AX a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés cidessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

Antenna Type	Antenna Model	Maximum Gain (dBi)		Remark
		2.4 GHz	5GHz	
Dipole	AD-103AG	2.02 dBi	2.03 dBi	
Dipole	AD-302N	3.14 dBi	2.73 dBi	
Dipole	AD-303N	3.14 dBi	3.24 dBi	

If the ISED certification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains IC: 6158A-WPEQ405AX".

Si le numéro de certification ISDE n'est pas visible lorsque le module est installé à l'intérieur d'un autre appareil, alors l'extérieur de l'appareil dans lequel le module est installé doit également afficher une étiquette faisant référence au module inclus. Cette étiquette extérieure peut utiliser un libellé comme celui-ci: " Contient IC: 6158A-WPEQ405AX".

Plaque signalétique du produit final:

Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante:
"Contient des IC: 6158A-WPEQ405AX ".

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.

Manuel d'information à l'utilisateur final

L'intégrateur OEM doit être conscient de ne pas fournir des informations à l'utilisateur final quant à la façon d'installer ou de supprimer ce module RF dans le manuel de l'utilisateur du produit final qui intègre ce module. Le manuel de l'utilisateur final doit inclure toutes les informations réglementaires requises et avertissements comme indiqué dans ce manue

Must use the device only in host devices that meet the FCC/ISED RF exposure category of mobile, which means the device is installed and used at distances of at least 26cm from persons.

The end user manual shall include FCC Part 15 /ISED RSS GEN compliance statements related to the transmitter as show in this manual.

Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15 B, ICES 003.

Host manufacturer is strongly recommended to confirm compliance with FCC/ISED requirements for the transmitter when the module is installed in the host.

Must have on the host device a label showing Contains FCC ID: 6158A-WPEQ405AX,
Contains IC: 6158A-WPEQ405AX

The use condition limitations extend to professional users, then instructions must state that this information also extends to the host manufacturer's instruction manual.

If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

l'hôte doit utiliser l'instrument uniquement dans des dispositifs qui répondent à la fcc / (catégorie d'exposition rf mobile, ce qui signifie le dispositif est installé et utilisé à une

distance d'au moins 26 cm de personnes.

le manuel de l'utilisateur final doit inclure la partie 15 / (fac rss gen déclarations de conformité relatives à l'émetteur que de montrer dans ce manuel.

le fabricant est responsable de la conformité de l'hôte, le système d'accueil avec le module installé avec toutes les autres exigences applicables du système comme la partie 15 b, ics - 003. accueillir le fabricant est fortement recommandé de confirmer la conformité avec les exigences de la fcc / (émetteur lorsque le module est installé dans l'hôte.

le dispositif d'accueil doivent avoir une étiquette indiquant contient FCC ID: RYK-WPEQ405AX, contient IC : 6158A-WPEQ405AX