

Wi-Fi 7 Mini PCIe Module

AW7990-NPD



Description

AW7990-NPD is an Wi-Fi 7 BE3600 module with MediaTek MT7990AN chipset supports Wi-Fi 7 technology and feature IEEE802.11a/b/g/n/ac/ax/be compliant, 2.4GHz 2x2, 5GHz 3x3 2ss BE3600 Wi-Fi subsystem. The MT7990AN offers feature-rich wireless connectivity at high standards and delivers reliable, cost-effective throughput from an extended distance.

The optimized Wi-Fi baseband algorithms provide superb performance. The intelligent MAC design deploys a highly efficient load engine and hardware data processing accelerators, which fully offload Wi-Fi task of the host processor. The MT7976CN is designed to support standard-based features in the areas of security, quality of service, and international regulations, giving end users the greatest performance at any time and in any circumstances.



Features

WLAN

- Wi-Fi compliant
- IEEE 802.11a, b, g, n, ac, ax, be compliant
- 2.4GHz 20 and 40 MHz, 2x2
- 5GHz: 20, 40, 80 and 160 MHz, 3x3 2ss
- Dual-Band Dual Concurrent (DBDC) iFEM
- Supports up to 4096-QAM
- Data rate of up to 688Mbps for 40MHz channel in 2.4Ghz and 2882Mbps for 160MHz in 5GHz mode
- Integrated power detector to support per packet Tx power control
- Multi-user multiple input multiple output **(MU-MIMO) for Tx and Rx**
- Multi-user Orthogonal Frequency-Division Multiple Access **(MU-OFDMA) for Tx and Rx**
- Support STBC, LDPC, Tx beamformer and Rx beamformee
- Support greenfield mode, mixed mode, and legacy mode

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Features

Platform

- 32bit RISC-V MCU for Wi-Fi protocol and Wi-Fi o oad
- Embedded SRAM and ROM
- PCIe 2.0 interface

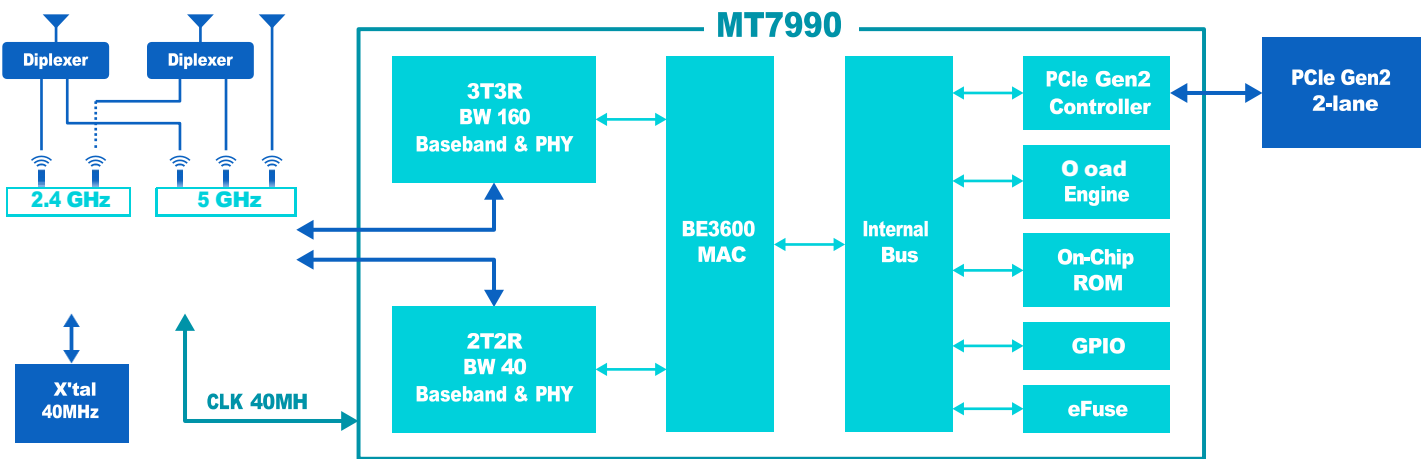
Security

- WFA, WPA, WPA2, WPA3 personal, WPS 2.0

QoS

- WFA WMM and WMM-PS

Function Diagram



Specifications

Chipset	MT7990AN with MT7976CN
Memory	8M byte
Host Interface	Mini PCIe
Operating Voltage	DC 3.3V ± 5%
Power Consumption	11.5W
Wireless	2.4GHz 2T2R 802.11 b/ g/ n/ ax/ be 5GHz 3T3R 2ss 802.11 a/ n/ ac/ ax/ be
Frequency Range	2.4GHz: 2.412~2.472GHz 5GHz: 5.15~5825GHz
Channel Spectrum Widths	Supports 20/ 40 MHz at 2.4GHz Supports 20/ 40/ 80/ 160 MHz at 5GHz
Antenna	External Antenna connector (IPEX) x3
Operating System	Linux
Environmental Temperature	Operating:-10°C to 70°C, Storage:-20°C to 90°C
Environmental Humidity	Operating: 10% to 90%, Storage: Max. 90%
Dimensions (mm)	30x51mm
Weight	TBD
Certification	TBD





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RF Performance at 2.4GHz

2.4GHz EVM Power@25°C			
Mode/Rate		Tx Power	Tolerance
CCK	1M	23.5dBm	±2dB
	11M	23.5dBm	±2dB
OFDM	6M	21dBm	±2dB
	54M	20.5dBm	±2dB
HT20	MCS0	21dBm	±2dB
	MCS7	19dBm	±2dB
HT40	MCS0	20dBm	±2dB
	MCS7	18dBm	±2dB
HE -SU40	MCS0	21dBm	±2dB
	MCS11	17.5dBm	±2dB
EHTMU-SU40	MCS0	21dBm	±2dB
	MCS13	16.5dBm	±2dB

2.4GHz Rx Sensitivity@25°C			
Mode/Rate		Typical Sensitivity	Tolerance
CCK	1M	- 99dBm	±2dB
	11M	- 90dBm	±2dB
OFDM	6M	- 96dBm	±2dB
	54M	- 78dBm	±2dB
HT20	MCS0	- 96dBm	±2dB
	MCS7	- 77dBm	±2dB
HT40	MCS0	- 93dBm	±2dB
	MCS7	- 74dBm	±2dB
HE -SU40	MCS0	- 93.5dBm	±2dB
	MCS11	- 63.5dBm	±2dB
EHTMU-SU40	MCS0	- 93.5dBm	±2dB
	MCS13	- 57.5dBm	±2dB



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RF Performance at 5GHz

5GHz EVM Power@25°C			
Mode/Rate		Tx Power	Tolerance
OFDM	6M	23dBm	±1.5dB
	54M	20.5dBm	±1.5dB
VHT20	MCS0	21.5dBm	±1.5dB
	MCS8	19dBm	±1.5dB
HE-SU20	MCS0	21.5dBm	±1.5dB
	MCS11	18.5dBm	±1.5dB
EHTMU-SU20	MCS0	21.5dBm	±1.5dB
	MCS13	17dBm	±1.5dB
VHT40	MCS0	21dBm	±1.5dB
	MCS9	19dBm	±1.5dB
HE-SU40	MCS0	21dBm	±1.5dB
	MCS11	18.5dBm	±1.5dB
EHTMU-SU40	MCS0	21dBm	±1.5dB
	MCS13	16.5dBm	±1.5dB
VHT80	MCS0	21dBm	±1.5dB
	MCS9	18dBm	±1.5dB
HE-SU80	MCS0	21dBm	±1.5dB
	MCS11	17.5dBm	±1.5dB
EHTMU-SU80	MCS0	21dBm	±1.5dB
	MCS13	16dBm	±1.5dB
VHT160	MCS0	20dBm	±1.5dB
	MCS9	16dBm	±1.5dB
HE-SU160	MCS0	20dBm	±1.5dB
	MCS11	15dBm	±1.5dB
EHTMU-SU160	MCS0	20dBm	±1.5dB
	MCS13	13dBm	±1.5dB

5GHz Rx Sensitivity@25°C			
Mode/Rate		Typical Sensitivity	Tolerance
OFDM	6M	-95dBm	±1.5dB
	54M	-77dBm	±1.5dB
VHT20	MCS0	-95dBm	±1.5dB
	MCS8	-72dBm	±1.5dB
HE-SU20	MCS0	-95dBm	±1.5dB
	MCS11	-66dBm	±1.5dB
EHTMU-SU20	MCS0	-95dBm	±1.5dB
	MCS13	-59dBm	±1.5dB
VHT40	MCS0	-92dBm	±1.5dB
	MCS9	-67dBm	±1.5dB
HE-SU40	MCS0	-93dBm	±1.5dB
	MCS11	-62dBm	±1.5dB
EHTMU-SU40	MCS0	-93dBm	±1.5dB
	MCS13	-57dBm	±1.5dB
VHT80	MCS0	-89dBm	±1.5dB
	MCS9	-64dBm	±1.5dB
HE-SU80	MCS0	-90dBm	±1.5dB
	MCS11	-60dBm	±1.5dB
EHTMU-SU80	MCS0	-90dBm	±1.5dB
	MCS13	-54dBm	±1.5dB
VHT160	MCS0	-86dBm	±1.5dB
	MCS9	-60.5dBm	±1.5dB
HE-SU160	MCS0	-87.5dBm	±1.5dB
	MCS11	-57dBm	±1.5dB
EHTMU-SU160	MCS0	-87.5dBm	±1.5dB
	MCS13	-51dBm	±1.5dB



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Pins

PCB number: AW7990-NPD			
Pinout with Dual Module Key (mPCIE)			
PIN	NET	NET	PIN
51	NC	3.3V	52
49	NC	GND	50
47	NC	NC	48
45	NC	NC	46
43	GND	LE_WANN(5G)	44
41	PCIE_RXP	LED_WWAN(2.4G)	42
39	PCIE_RXN	GND	40
37	GND	NC	38
35	GND	NC	36
33	PCIE_TXP	GND	34
31	PCIE_TXN	NC	32
29	GND	NC	30
27	GND	NC	28
25	PCIE_TXP	GND	26
23	PCIE_TXN	3.3V	24
21	GND	PERST_N	22
19	NC	NC	20
17	NC	GND	18
Mechanical Key			
15	GND	NC	16
13	PCIE_CKP	NC	14
11	PCIE_CKN	NC	12
9	GND	NC	10
7	CLKREQ_N	NC	8
5	NC	NC	6
3	NC	GND	4
1	WAKE_N	3.3V	2
Top side		Bottom side	

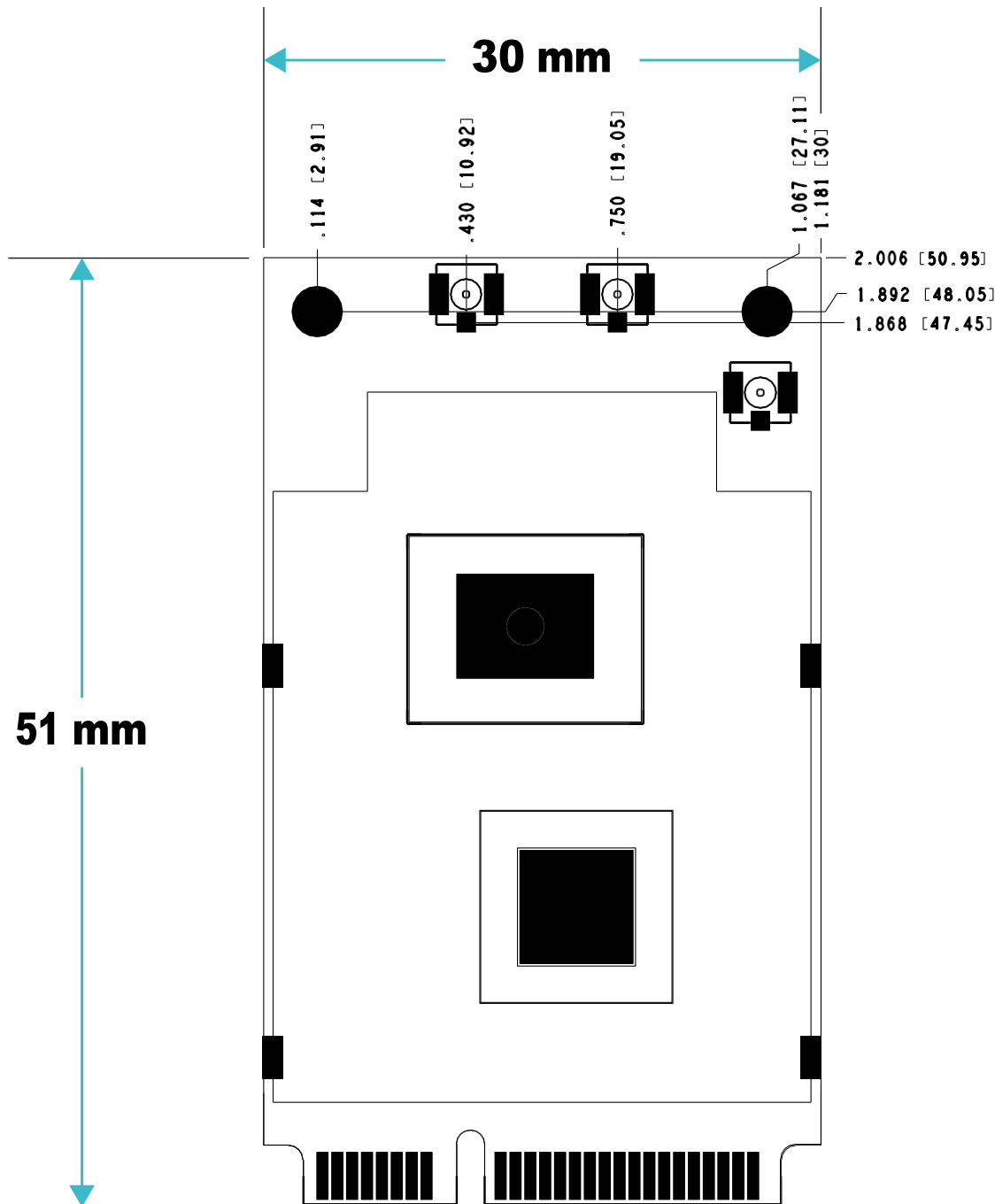




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Board Dimension





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Packing

Packing information

Using antistatic tray.

One tray for 35pcs PCBA.

One carton for 23 trays=805 PCBAs

One tray for 35pcs PCBA



23 trays in one carton



Sealing carton





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Packing

Carton label is as below:

One carton label





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FEDERAL COMMUNICATIONS 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.

CAUTION:

Any changes or modifications not expressly approved by the grantee of this device could void the user's authority to operate the equipment.

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 device meets all the other requirements specified in Part 15E, Section 15.407 of the FCC Rules.

RF Exposure warning

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users and installers must be provide with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

Information for OEMs and host integrators

The OEM or integrator is obligated to adhere to these requirements and restrictions as a condition for using the module's certification.

The OEM or integrator is responsible to perform the required additional host regulatory testing and/or obtaining the required host approvals for compliance.

Per KDB 996369 D03 v01r01 OEM Manual section 2.2 to 2.12, this module is intended for OEM integrators under the following conditions:

2.2 List of applicable FCC rules

This module has been tested for compliance to FCC Part 15 Subpart C (15.247) and Subpart E (15.407).

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) will need a separate reassessment through a class II permissive change application or new certification.





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2.4 Limited module procedures

Not applicable, this device is a single modular approval and meets FCC 47 CFR 15.212 requirement.

2.5 Trace antenna designs

Not applicable. This module has its own antenna, and does not need a host's printed board micro strip trace antenna, etc.

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. A separate SAR/Power Density 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, except as described below. The antenna must be installed such that 20 cm can be maintained between the antenna and users.



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No.	Manufacturer	Part No.	Antenna Type	Peak Gain (dBi)	Freq. Range (GHz)	Connector Type
1	AsiaRF	A245004	Dipole	4.00	2.4~2.5	SMA
				4.25	5.15 - 5.25	
				4.25	5.25 - 5.35	
				5.10	5.470 - 5.725	
				3.95	5.725 - 5.850	
2	AsiaRF	ANT010-DAU	PCB	5.20	2.4~2.5	IPEX
				5.50	5.15 - 5.25	
				5.50	5.25 - 5.35	
				5.13	5.470 - 5.725	
				4.46	5.725 - 5.850	

IMPORTANT: The final host product must have an integral antenna which is not removable by the end-user.

2.8 Label and compliance information

Label of the end product:

The final end product must be labeled in a visible area with the following: “Contains FCC ID: TKZAW7990-AED”. The grantee's FCC ID can be used only when all FCC compliance requirements are met. 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 product user manual shall include all required regulatory information/warning as shown in this manual.

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) 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. 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.

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.





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2.11 Note EMI Considerations

Note that a host manufacture is recommended to use D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional noncompliant limits due to module placement to host components or properties. For standalone mode, reference the guidance in D04 Module Integration Guide and for simultaneous mode; see D02 Module Q&A Question 12, which permits the host manufacturer to confirm compliance.

2.12 How to make changes

Only Grantees are permitted to make permissive changes, if the module will be used differently than granted conditions, please contact us to

ensure modifications will not affect compliance.

IMPORTANT NOTE: 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.

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 host integrator must follow the integration instructions provided in this document and ensure that the composite-system end product complies with the requirements by a technical assessment or evaluation to the rules and to KDB Publication 996369.

The host integrator installing this module into their product must ensure that the final composite product complies with the requirements by a technical assessment or evaluation to the rules, including the transmitter operation and should refer to guidance in KDB 996369..

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.

CAN ICES-003(B) / NMB-003(B)

Innovation, Science and Economic Development Canada(ISED) Compliance Statement

This device complies with ISED's licence-exempt RSSs. 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.





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Caution

Le present appareil est conforme aux CNR d'ISED applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) le dispositif ne doit pas produire de brouillage préjudiciable, et (2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

(i) any devices capable of operating in the band 5150–5250 MHz shall only be used indoors to reduce the potential for harmful interference to co-channel mobile satellite systems;

(ii) 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.

(iii) 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 as appropriate..

(i) tout dispositif capable de fonctionner dans la bande de 5150 à 5250 MHz ne doit être utilisé qu'à l'intérieur des bâtiments afin de réduire les risques d'interférences nuisibles avec les systèmes mobiles par satellite à canaux multiples.

(ii) pour les appareils dotés d'antennes amovibles, le gain d'antenne maximal autorisé pour les appareils dans les bandes 5250-5350 MHz et 5470-5725 MHz doit être tel que l'équipement reste conforme à la limite de p.i.r.e.;

(iii) pour les dispositifs munis d'antennes amovibles, le gain maximal d'antenne permis (pour les dispositifs utilisant la bande de 5 725 à 5 850 MHz) doit être conforme à la limite de la p.i.r.e. spécifiée, selon le cas.

Radiation Exposure Statement:

This equipment complies with ISSED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with greater than 20cm between the radiator & your body.

Déclaration d'exposition aux radiations:

Cet équipement est conforme aux limites d'exposition aux rayonnements ISSED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé à plus de 20 cm entre le radiateur et votre corps.

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

- 1) The antenna must be installed and operated with greater than 20cm 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.

Cet appareil est conçu uniquement pour les intégrateurs OEM dans les conditions suivantes: (Pour utilisation de dispositif module)

- 1) L'antenne doit être installée et exploitée avec plus de 20 cm entre l'antenne et les utilisateurs, et
- 2) Le module émetteur peut ne pas être coimplanté avec un autre émetteur ou antenne. Tant que les 2 conditions ci-dessus sont remplies, des essais supplémentaires sur l'émetteur ne seront pas nécessaires. Toutefois, l'intégrateur OEM est toujours responsable des essais sur son produit final pour toutes exigences de conformité supplémentaires requises pour ce module installé.

IMPORTANT NOTE: In the event that these conditions cannot be met (for example certain laptop configurations or colocation with





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Caution

another transmitter), then the Canada authorization is no longer considered valid and the IC 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 Canada authorization.

IMPORTANTENOTE

Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-localisation avec un autre émetteur), l'autorisation du Canadan'est plus considéré comme valide et l'ID IC ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'une autorisation distincte au Canada.

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed and operated with greater than 20cm between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains IC: IC: 9968A-AW7990AED".

Étiquetage du produit final

Ce module émetteur est uniquement autorisé à être utilisé dans un appareil où l'antenne peut être installée de manière à ce que 20 cm puissent être maintenus entre l'antenne et les utilisateurs. Le produit final doit être étiqueté dans une zone visible avec les informations suivantes: "Contient le module d'émission IC: 9968A-AW7990AED".

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 à l'utilisateur final des informations concernant la procédure d'installation ou de suppression de 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 / avertissements réglementaires requis, comme indiqué dans ce manuel.

This radio transmitter IC: 9968A-AW7990AED has been approved by Innovation, Science and Economic Development Canada 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.

This radio transmitter IC: 9968A-AW7990AED has been approved by Innovation, Science and Economic Development Canada 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.



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Caution

Le présent émetteur radio IC: 9968A-AW7990AED a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés ci dessous 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 pour tout type figurant sur la liste, sont strictement interdits pour l'exploitation de l'émetteur

No.	Manufacturer	Part No.	Antenna Type	Peak Gain (dBi)	Freq. Range (GHz)	Connector Type
1	AsiaRF	A245004	Dipole	4.00	2.4~2.5	SMA
				4.25	5.15 - 5.25	
				4.25	5.25 - 5.35	
				5.10	5.470 - 5.725	
				3.95	5.725 - 5.850	
2	AsiaRF	ANT010-DAU	PCB	5.20	2.4~2.5	IPEX
				5.50	5.15 - 5.25	
				5.50	5.25 - 5.35	
				5.13	5.470 - 5.725	
				4.46	5.725 - 5.850	

IMPORTANT: The final host product must have an integral antenna which is not removable by the end-user.

