

Users Manual of WCHA41M

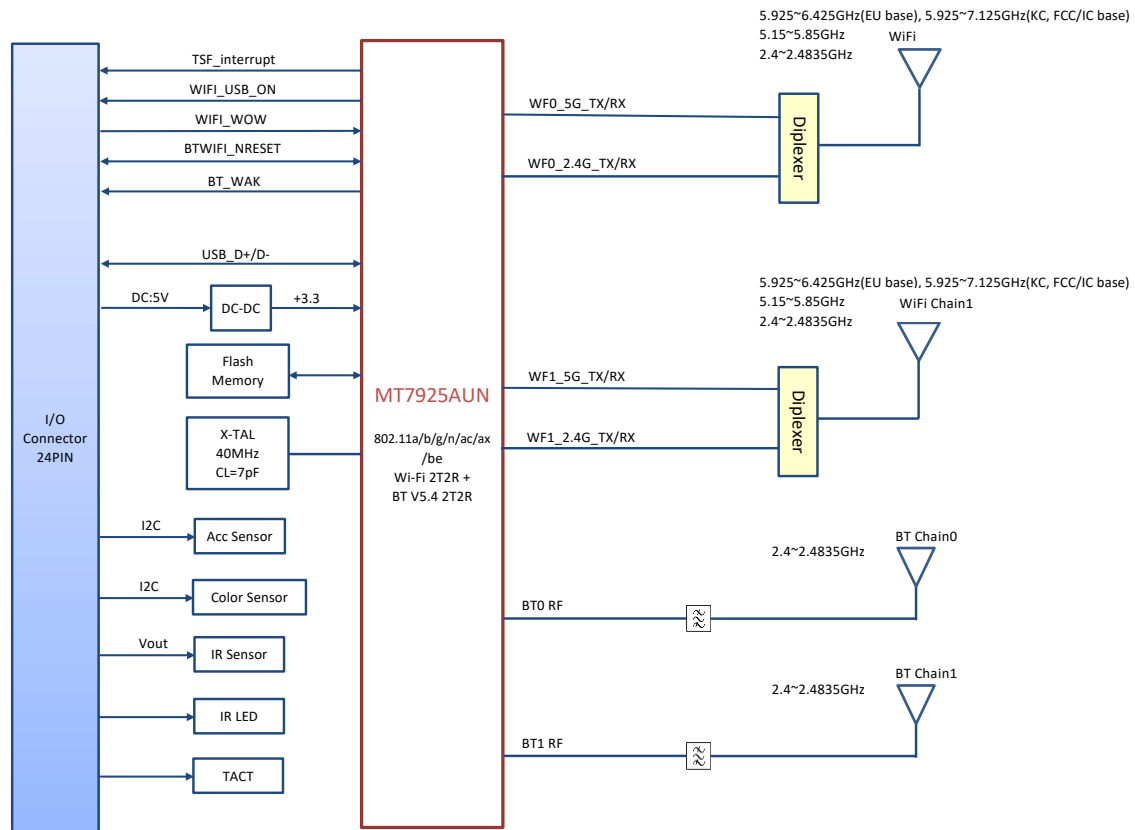
1. Introduction

WCHA41M is a Wi-Fi / Bluetooth Combo module compliant with IEEE802.11 a.b.g.n.ac.ax.be MAC/baseband/radio and Bluetooth v5.4 with BLE (BT Low Energy). This module is for Samsung products.

2. Main chipset information

Item	Vendor	Part Number
IEEE802.11 a.b.g.n.ac.ax.be	Media Tek	MT7925AUN

3. Block Diagram



4. Operating Condition

Parameter	Min	Typ.	Max	Unit
Operating voltage	4.5	5	5.5	V
Operating temperature	-10	-	50	°C

5. Product Details

- Data Modulation

DSSS:CCK,BPSK,QPSK for 802.11b

OFDM:BPSK,QPSK,16QAM,64QAM,256QAM,1024QAM,4096QAM for 802.a.b.g.n.ac.ax.be

FHSS:GFSK,OQPSK, 8DPSK, $\pi/4$ DPSK for Bluetooth

- Frequency Range

2.4GHz: 2400-2483.5MHz

5GHz: 5150-5850MHz

6GHz: 5925-6425MHz(EU),5925-7125(except EU)

-Features

- Compliant with IEEE 802.11 a/b/g/n/ac/ax/be standards
- Supports 20MHz, 40MHz bandwidth in the 2.4GHz band
- Supports 20MHz, 40MHz, 80MHz, 160MHz bandwidth in the 5GHz and 6GHz bands
- Dual-band 2T2R mode
- USB 3.0 data rate up to 800Mbps (MT7925AUN)
- Supports MU-MIMO RX
- Supports MU-OFDM TX/RX
- Supports DBDC (Dual-Band Dual Concurrent) operation
- Supports STBC, LDPC, and Beamforming
- Supports Greenfield mode, mixed mode, and legacy mode
- Supports IEEE 802.11 d/e/h/i/k/mc/r/v/w amendments
- Security support for WPA, WPA/WPA2/WPA3 Personal/Enterprise, WPS 2.0, and FIPS
- Supports WPA WMM and WMM PS for QoS
- Integrated LNA, PA, and T/R switch
- Supports external LNA and PA (optional)
- Bluetooth v5.4 with BLE v4.2 (Low Energy Bluetooth)
- Supports BT/BLE dual mode
- Integrated BALUN and PA with 13dBm (Class 1) transmit power
- Receiver sensitivity: GFSK -95dBm, DQPSK -94dBm, 8-DPSK -88dBm, BLE1Mbps -98dBm, BLE 2Mbps -95dBm
- Supports BT/Wi-Fi coexistence
- Supports 7 BT links and 16 BLE links
- Supports SCO and eSCO link retransmission
- Supports Wideband Speech and hardware-accelerated SBC (Subband Codec) for A2DP streaming
- Supports Packet Loss Concealment (PLC) for improved voice quality
- Supports LE Synchronous Channels
- Supports LC3, including mono and stereo
- Supports Secure Connections with AES128 and ECC256
- Channel quality-driven data rate adaptation
- Channel assessment for AFH and WB RSSI
- Includes 2 BT controllers

6. Pin Definition

No.	Define	Description
1	IR_RX	IR Receiver
2	TSF_interrupt	WiFi_time_sync
3	GND	Ground
4	WIFI_USB_ON	WiFi_USB_suspend
5	WIFI_WOW	WiFi wake host
6	BTWIFI_NRESET	WiFi reset
7	BT_WAKE	BT wake host
8	GND	Ground
9	USB_D-	USB_D-
10	USB_D+	USB_D+
11	A5V_PW_WIFI	Supply voltage 5V
12	A5V_PW_WIFI	Supply voltage 5V
13	LED	Light emitting diode
14	I2C_SCL	I2C digital serial clock input
15	I2C_SDA	I2C digital serial data output
16	KEY1	Key
17	GND	Ground
18	MIC_on/off	Power on/off for MIC
19	DMIC_CLK	MIC I2C digital serial clock input
20	DMIC_DATA	MIC I2C digital serial data output
21	MIC_GND	MIC Ground
22	IR_OUT1	IR LED1
23	IR_OUT2	IR LED2
24	A3.3V_PW_Sensor	Supply voltage 3.3V

[Regulation statement]

US FCC statement

RF Software restrictions

1. Contention-Based Protocol, as demonstrated in the FCC test report, is permanently embedded in the module and is not host-dependent and can't be changed by anyone.
2. Operation of transmitters in the 5.25-5.35GHz, 5.47-5.725GHz, 5.85-5.895GHz, and 5.925-7.125GHz bands in this Modular device will only associate and connect with a low-power indoor access point or subordinate device and never directly connect to other client devices. This feature is included in its firmware and can't be changed by anyone.
3. Operation of transmitters in the 5.25-5.35GHz, 5.47-5.725GHz, 5.85-5.895GHz, and 5.925-7.125GHz bands in this Modular device will always initiate transmission under the control of a low-power indoor AP or subordinate except for brief transmissions before joining a network. These short messages will only occur if the client has detected an indoor AP or subordinate operating on a channel. These brief messages will have a timeout mechanism such that if it does not receive a response from an AP it will not continually repeat the request.
4. That transmissions will be lower or equal to the power advertised by the indoor low-power access point or subordinate and never above the maximum output power allowed by the FCC grant for equipment class 6XD.

The module has been certified for integration into products only by OEM integrators under the following condition:

- The antenna(s) must be installed such that a minimum separation distance of at least 20cm is maintained between the radiator(antenna) and all persons at all times.
- The transmitter module must not be co-located or operating in conjunction with any other antenna or transmitter except in accordance with FCC and ISED Canada multi-transmitter product procedures.

The device operates strictly as a client in DFS channels (with passive scan). It does not support ad-hoc, Wi-Fi Direct Group Owner, Hotspot, or any other peer-to-peer modes that may initiate a network in DFS channels (UNII2-2A and UNII2-2C band).

The following statements apply to the module and also need to be included in the user manual for the host device:

This device complies with Part 15 of the FCC's 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 undesirable 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 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.
- The OEM integrator is responsible for ensuring the end-user has no manual instruction to remove or install module.
- The module is limited to installation in mobile or fixed applications.

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.

To comply with rf exposure requirements the host device shall be installed to ensure that a minimum separation distance of at least 20cm is maintained between the radiator(antenna) and all persons at all times.

FCC Wi-Fi 6E statement

1. FCC regulations restrict the operation of this device to indoor use only.
2. The operation of this device is prohibited on oil platforms, cars, trains, boats, and aircraft, except that operation of this device is permitted in large aircraft while flying above 10,000 feet.
3. Operation of transmitters in the 5.925-7.125 GHz band is prohibited for control of or communications with unmanned aircraft systems.

This module cannot be installed in a weatherized enclosure and cannot operate from battery but only power sources.

The host device must be connected to a power source as it has no battery.

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 with CFR 47 FCC Part 15 C (15.247, DTS and DSS) and CFR 47 FCC Part 15 E (NII). It is applicable to the modular transmitter

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.

Further operation restrictions on the host product include:

*Prohibited for control of or Communications with unmanned aircraft systems.

This radio transmitter FCC ID: A3LWCHA41M / ISED 649E-WCHA41M has been approved by Federal Communications Commission and ISED Canada to operate with the integrated Metal antenna and Chip antenna. Use of any other antenna is strictly prohibited without filing an application for a new system-specific FCC ID. Or ISED certification number.

2.4 Limited module procedures.

The module complies with FCC Part 15.247 / Part 15.407 and applies for single module approval.

For ISED, the device is subject to low-power client devices under RSS-248 Issue 3 and is required to apply for LMA approval. When the device is integrated into a new host product, notice to ISED from host manufacturer is required for Class IV permissive changes and the HMN shall be provided.

2.5 Trace antenna designs Not applicable.

The antenna is integrated into the module and cannot be modified. See section 2.3.

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

Note 1: Use of other antenna types or the same type of antenna with higher gain than listed above must perform additional testing and appropriate permissive change approval.

Note 2: Additional testing/submission (C2PC) will be required if the device does not meet the antenna and RF exposure requirements.

Note 3: Contact Samsung for additional guidance, if choose to use different antenna types or higher/lower gain antennas in the end system.

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

-Antenna Type & Antenna Gain:

BT&BLE:

Antenna	Frequency (MHz)	Antenna Type	MAX Antenna Gain (dBi)	MIM Antenna Gain (dBi)
0	2402-2480	Chip Antenna	-1.19	-2.02
1	2402-2480	Chip Antenna	-0.51	-1.64

Note: The antennas are permanently attached and can't be replaced.

2.4G WIFI:

Antenna	Frequency (MHz)	Antenna Type	MAX Antenna Gain (dBi)	MIM Antenna Gain (dBi)
0	2412 ~ 2472	Chip Antenna	-0.38	-1.37
1	2412 ~ 2472	Chip Antenna	-1.88	-2.38

Note: The antennas are permanently attached and can't be replaced.

5G WIFI:

Frequency Band	Antenna 0 Gain Max (dBi)	Antenna 0 Gain Min (dBi)	Antenna 1 Gain Max (dBi)	Antenna 1 Gain Min (dBi)	Antenna Type
UNII 1	-0.44	-1.01	-1.24	-1.75	Chip Antenna
UNII 2A	-0.44	-1.60	-1.24	-1.87	
UNII 2C	-1.84	-2.46	0.19	-1.24	
UNII 3	-1.95	-2.94	0.19	-0.10	

Note: The antennas are permanently attached and can't be replaced.

6G WIFI:

Frequency Band	Antenna 0 Gain Max (dBi)	Antenna 0 Gain Min (dBi)	Antenna 1 Gain Max (dBi)	Antenna 1 Gain Min (dBi)	Antenna Type
UNII 5	-0.50	-2.89	0.37	-0.31	Chip Antenna
UNII 6	-0.70	-0.89	0.13	-0.27	
UNII 7	-0.04	-0.89	0.34	-0.70	

UNII 8	-0.04	-0.73	0.34	-1.07	
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Note: The antennas are permanently attached and can't be replaced.

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following: "Contains FCC ID: A3LWCHA41M".

This FCC ID can be used only when all FCC compliance requirements are met.

If the ISED certification number on the module 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: 649E-WCHA41M" any similar wording that expresses the same meaning may be used. This Canadian certification number can be used only when all ISED Canada compliance requirements are met.

2.9 Information on test modes and additional testing requirements

This transmitter has been tested in a standalone mobile RF exposure condition. Any co-located or simultaneous transmission with other transmitters in a host system needs to be assessed following FCC KDB 996369 D04 and may need a class II permissive change 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) or ISED ICES-003 rule requirements applicable to the final host. The final host will still need to be reassessed for compliance with this portion of rule requirements if applicable. If all conditions above are met, further transmitter tests 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 cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization and ISED certification is no longer considered valid and the modular approvals 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 separate FCC authorization and ISED Canada certification.

2.11 Note EMI Considerations

The 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 non-compliant limits due to module placement to host components or properties.

It is recommended that the spot checks for the module plus host include validation of the Contention Based Protocol (CBP) thresholds required by FCC Part 15.407 and RSS_248.

2.12 How to make changes

This module is stand-alone modular. 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.

FCC Wi-Fi 6E statement

1. FCC regulations restrict the operation of this device to indoor use only.

2. The operation of this device is prohibited on oil platforms, cars, trains, boats, and aircraft, except that operation of this device is permitted in large aircraft while flying above 10,000 feet.

3. Operation of transmitters in the 5.925-7.125 GHz band is prohibited for control of or communications with unmanned aircraft systems.

This module cannot be installed in a weatherized enclosure and cannot operate from battery but only power sources.

The host device must be connected to a power source as it has no battery.

Canada IC statement

IC approval

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

(1) This device may not cause interference.

(2) This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique 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'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Caution: Any changed or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Attention: Toute changé ou modifications non expressément approuvés par la partie responsable de la conformité pourraient annuler l'utilisateur `autorité de faire fonctionner cet équipement.

The host device must be designed for indoor use only and the manual shall clearly indicate "Indoor Use Only".

Le dispositif hôte doit être conçu pour une utilisation intérieure uniquement et le manuel doit indiquer clairement « Utilisation intérieure uniquement ».

The device meets the exemption from the routine evaluation limits in section 6.6 of RSS 102 and compliance with RSS-102 RF exposure, users can obtain Canadian information on RF exposure and compliance.

Le dispositif rencontre l'exemption des limites courantes d'évaluation dans la section 6.6 de RSS 102 et la conformité à l'exposition de RSS-102 RF, utilisateurs peut obtenir l'information canadienne sur l'exposition et la conformité de RF.

This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

Cet émetteur ne doit pas être Co-placé ou ne fonctionnant en même temps qu'aucune autre antenne ou émetteur. Cet équipement devrait être installé et actionné avec une distance minimum de 20 centimètres entre le radiateur et votre corps.

The antenna is integrated onto the module. End users should not have access to modify or replace the antenna.

L'antenne est intégrée au module. Les utilisateurs finaux ne devraient pas avoir accès à modifier ou remplacer l'antenne.

- Devices shall not be used for control of or communications with unmanned aircraft systems.
 - Devices shall not be used on oil platforms.
 - Devices shall not be used on aircraft
 - Except for very low-power devices, devices shall not be used on automobiles, trains, maritime vessels.
 - Client devices shall not be capable of initiating a network.
 - Low-power indoor access points, indoor subordinate devices, low-power client devices, and very low-power devices operating in the 5925-6425 MHz band, that may be used on large aircraft as defined in the Canadian Aviation Regulations, while flying above 3,048 metres (10,000 feet).
 - Devices shall not connect directly to another standard client device or low-power client device
 - Devices may transmit brief messages to an access point after detecting a signal confirming that the access point is operating on a particular frequency in order to join the access point's network
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- Les dispositifs ne doivent pas être utilisés pour contrôler ou communiquer avec des systèmes d'aéronefs sans pilote.
 - Les dispositifs ne doivent pas être utilisés sur des plateformes pétrolières.
 - Les dispositifs ne doivent pas être utilisés sur les aéronefs
 - Sauf pour les dispositifs à très faible puissance, les dispositifs ne doivent pas être utilisés sur les automobiles, les trains, les navires maritimes.
 - Les appareils clients ne doivent pas être capables d'initier un réseau.
 - Points d'accès intérieurs à faible puissance, appareils intérieurs subordonnés, appareils clients à faible puissance et appareils très à faible puissance fonctionnant dans la bande 5925-6425 MHz, qui peuvent être utilisés sur de grands aéronefs tels que définis dans le Règlement de l'aviation canadien, au-dessus de 3 048 mètres (10 000 pieds).
 - Les appareils ne doivent pas se connecter directement à un autre appareil client standard ou à un appareil client à faible puissance
 - Les appareils peuvent transmettre de brefs messages à un point d'accès après avoir détecté un signal confirmant que le point d'accès fonctionne sur une fréquence particulière afin de rejoindre le réseau du point d'accès.

Notice to OEM integrator

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 20cm from people.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter except as permitted by ISED multi-transmitter policies.

The end user manual shall include FCC Part 15 /ISED RSS GEN compliance statements related to the transmitter as shown in this manual (FCC/IC statement).

Host manufacturer is responsible for compliance with the host system with module installed with all other applicable requirements for the system such as Part 15 B, ICES-003. Host manufacturers are strongly recommended to confirm compliance with FCC/ISED requirements for the transmitter when the module is installed in the host.

The use condition limitations extend to professional users, then instructions must state that this information also extends to the host manufacturer's instruction manual. This module is stand-alone modular. 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 must consult with module manufacturer for the installation method in end system.

Any company of the host device which install this modular should perform the test of radiated & conducted emission and spurious emission etc. according to FCC Part 15C/FCC Part 15E/ISED RSS: 15.247 & 15.407 & 15.209 & 15.207 & RSS-247/ RSS-248, 15B class B & ICES-003 requirement, only if the test result comply with FCC Part 15C/FCC Part 15E/ISED RSS: 15.247 & 15.407 & 15.209 & 15.207 & RSS-247 & RSS-248 & RSS-Gen & RSS 102, 15B class B & ICES-003 requirement. Then the host can be sold legally.

This modular transmitter is only FCC authorized for the specific rule parts (47CFR Part 15.247/15.407) 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.

Installer should put it in the manual:

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

Host manufacturers are 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: A3LWCHA41M or IC: 649E-WCHA41M.

Both FCC ID and IC ID are not to be placed on the host at the same time and only hosts going into the US can use the FCC ID and only hosts going into Canada can use the IC ID.

L'appareil doit être utilisé uniquement avec des appareils hôtes conformes à la catégorie d'exposition RF mobile FCC/ISED, ce qui signifie que l'appareil est installé et utilisé à une distance d'au moins 20 cm des personnes.

Cet émetteur ne doit pas être co-situé ou fonctionner en conjonction avec toute autre antenne

ou émetteur sauf dans la mesure autorisée par les politiques ISED multiémetteur.

Le manuel d'utilisation doit inclure les déclarations de conformité à la partie 15 de la FCC/ISED RSS GEN relatives à l'émetteur, telles qu'elles sont présentées dans ce manuel (déclaration FCC/ICanada).

Le fabricant de l'hôte est responsable de la conformité du système hôte au module installé, conformément à toutes les autres exigences applicables, telles que la partie 15 B de l'ICES-003. Il est fortement recommandé au fabricant de l'hôte de confirmer la conformité de l'émetteur aux exigences FCC/ISED lors de l'installation du module dans l'hôte.

Les limites des conditions d'utilisation s'appliquent également aux utilisateurs d'affaires ; les instructions doivent donc préciser que ces informations s'appliquent également au manuel d'instructions du fabricant de l'hôte.

Ce module est modulaire et autonome. Si le produit final implique des conditions de transmission simultanées multiples ou des conditions de fonctionnement différentes pour un émetteur modulaire autonome dans un hôte, le fabricant de l'hôte doit consulter le fabricant du module pour connaître la méthode d'installation dans le système final.

Toute entreprise du dispositif hôte qui installe ce module doit effectuer l'essai d'émission rayonnée et conduite et d'émission fausse, etc. conformément à la FCC Partie 15C/FCC Partie 15E/ISED RSS: 15.247 & 15.407 & 15.209 & 15.207 & RSS-247/RSS-248, 15B classe B & ICES-003 exigence, seulement si le résultat de l'essai est conforme à la FCC Partie 15C/FCC Partie 15E/ISED RSS: 15.247 & 15.407 & 15.209 & 15.207 & RSS-247 & RSS-248 & RSS-Gen & RSS 102, 15B classe B & ICES-003 exigence. Ensuite, l'hôte peut être vendu légalement.

Cet émetteur modulaire est homologué par la FCC uniquement pour les parties spécifiques de la réglementation (47CFR Partie 15.247/15.407) mentionnées dans la certification. Le fabricant du produit hôte est responsable de la conformité à toute autre réglementation FCC applicable à l'hôte et non couverte par la certification de l'émetteur modulaire.

Les personnes chargées de l'installation devraient figurer dans le manuel:

Les dispositifs fonctionnant dans la bande de 5 150 à 5 250 MHz sont réservés uniquement pour une utilisation à l'intérieur afin de réduire les risques de brouillage préjudiciable aux systèmes de satellites mobiles utilisant les mêmes canaux.

Il est fortement recommandé au fabricant de l'hôte de confirmer la conformité de l'émetteur aux exigences de la FCC/ISED lors de l'installation du module.

L'appareil hôte doit porter une étiquette indiquant « Contient l'identifiant FCC: A3LWCHA41M » ou « IC: 649E-WCHA41M ».

Les identifiants FCC et IC ne doivent pas être apposés simultanément sur l'hôte. Seuls les hôtes qui se rendent aux États-Unis peuvent utiliser l'identifiant FCC, et seuls ceux qui se rendent au Canada peuvent utiliser l'identifiant IC.