Moxa 802.11a/b/g/n/ac

WAPC003 User's Manual

www.moxa.com

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WAPC003 User's Manual

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Introduction

The following topics are covered in this chapter:

- **Overview**
- **Specifications**

Overview

WAPC003 module is designed to provide wireless communication for Moxa industrial wireless products. It communicates via 2.4GHz/5GHz channels. The WAPC003 uses the IPQ4029 SoC Wireless chipset from Qualcomm Atheros.

Specification

Features	WAPC003
Chipset	Qualcomm Atheros IPQ4029
Baseband Processor (BBP)	- DSSS with DBPSK, DQPSK, CCK - OFDM with BPSK, QPSK, 16QAM, 64QAM - 802.11b: CCK @ 11/5.5 Mbps, DQPSK @ 2 Mbps, DBPSK @ 11 Mbps - 802.11a/g: 64QAM @ 54/48 Mbps, 16QAM @ 36/24 Mbps, QPSK @ 18/12 Mbps, BPSK @ 9/6 Mbps - 802.11n: 64QAM @ 300 Mbps to BPSK @ 6.5 Mbps (multiple rates supported) - 802.11ac: 256QAM @ 867Mbps to BPSK @ 6.5 Mbps (multiple rates supported)
security engine	- 64-bit and 128-bit WEP encryption, WPA/WPA2/WPA3 Personal and Enterprise (IEEE 802.1X/RADIUS, TKIP and AES)
Connectors	Defined BTB connector is using 2x60 pins header
Power requirement	3.3V +/-10%
Dimension	58mm x 80mm x 1.6mm
Operating Temperature	-40 to +75 ℃ (installed properly inside the enclosure of the final products)
Storage Temperature:	-40 to +85℃ (installed properly inside the enclosure of the final products)
Operates in 2.4 and 5 GHz frequency bands. (frequency range)	2.412 to 2.484 GHz 5.180 to 5.240 GHz 5.260 to 5.320 GHz 5.500 to 5.700 GHz 5.745 to 5.825 GHz
TX Transmit Power:	802.11b: • Typ. 26±1.5 dBm @ 1, 2, 5.5, 11 Mbps 802.11g: • Typ. 26 ±1.5 dBm @ 6, 9, 12 Mbps • Typ. 25±1.5 dBm @ 18, 24, 36 Mbps • Typ. 24±1.5 dBm @ 48 Mbps • Typ. 23±1.5 dBm @ 54 Mbps 802.11n (2.4 GHz): • Typ. 26±1.5dBm @ MCS0, MCS1, MCS8, MCS9 20 MHz • Typ. 25±1.5dBm @ MCS2 to MCS4, MCS10 to MCS12 20 MHz • Typ. 24±1.5dBm @ MCS5, MCS13 20 MHz • Typ. 23±1.5dBm @ MCS6, MCS 14, MCS15 20 MHz • Typ. 22±1.5dBm @ MCS7 20 MHz

	802.11ac (2.4GHz) • Typ. 26±1.5dBm @ MCS0, MCS0*2 20 MHz • Typ. 22±1.5dBm @ MCS8, MCS8*2 20 MHz 802.11a • Typ. 23±1.5 dBm @ 6, 9, 12Mbps • Typ. 22±1.5 dBm @ 18, 24, 36, 48 Mbps • Typ. 21±1.5 dBm @ 54 Mbps 802.11n • Typ. 23±1.5 dBm @ MCS0 to MCS2 20MHz • Typ. 22±1.5 dBm @ MCS3, MCS8 to MCS10 20 MHz • Typ. 21±1.5 dBm @ MCS4 to MCS6, MCS11 to MCS14 20MHz • Typ. 20±1.5 dBm @ MCS7, MCS15 Mbps 802.11ac • Typ. 23±1.5 dBm @ MCS0 to MCS2, MCS0*2 to MCS2*2 20 MHz • Typ. 22±1.5 dBm @ MCS3, MSC4, MCS3*2, MSC4*2 20 MHz • Typ. 21±1.5 dBm @ MCS5, MCS6, MCS5*2 20 MHz • Typ. 20±1.5 dBm @ MCS7, MCS8, MCS6*2, MCS7*2 20 MHz • Typ. 19±1.5 dBm @ MCS8*2 20 MHz
RX Receive Sensitivity:	802.11b: • -97 dBm @ 1 Mbps • -93 dBm @ 2 M bps • -92 dBm @ 5.5 M bps • -89 dBm @ 11 M bps 802.11g: • -91 dBm @ 6 Mbps • -90 dBm @ 9 Mbps • -89 dBm @ 12 Mbps • -86 dBm @ 18 Mbps • -83 dBm @ 24 Mbps • -80 dBm @ 36 Mbps • -76 dBm @ 48 Mbps • -74 dBm @ 54 Mbps 802.11n (2.4 GHz): • -91 dBm @ MCS8 20 MHz • -90 dBm @ MCS0 20 MHz • -89 dBm @ MCS9 20 MHz • -87 dBm @ MCS1, MCS10 20 MHz • -85 dBm @ MCS2 20 MHz • -83 dBm @ MCS11 20 MHz • -82 dBm @ MCS3 20 MHz • -80 dBm @ MCS12 20 MHz • -78 dBm @ MCS4 20 MHz

	• -76 dBm @ MCS13 20 MHz • -75 dBm @ MCS14 20 MHz • -74 dBm @ MCS5, MCS15 20 MHz • -72 dBm @ MCS6 20 MHz • -71 dBm @ MCS7 20 MHz 802.11a (4,920 & 4,98 0 MHz): • -90 dBm @ 6 Mbps • -88 dBm @ 9 Mbps • -87 dBm @ 12 Mbps • -85 dBm @ 18 Mbps • -83 dBm @ 24 Mbps • -79 dBm @ 36 Mbps • -75 dBm @ 48 Mbps • -72 dBm @ 54 M bps 802.11n • -91 dBm @ MCS8 20 MHz • -90 dBm @ MCS0 20 MHz • -88 dBm @ MCS9 20 MHz • -87 dBm @ MCS1 20 MHz • -86 dBm @ MCS10 20 MHz • -84 dBm @ MCS2 20 MHz • -83 dBm @ MCS11 20 MHz • -81 dBm @ MCS3 20 MHz • -80 dBm @ MCS12 20 MHz • -78 dBm @ MCS4 20 MHz • -75 dBm @ MCS13 20 MHz • -74 dBm @ MCS5, MCS14 20 MHz • -73 dBm @ MCS15 20 MHz • -72 dBm @ MCS6 20 MHz • -71 dBm @ MCS7 20 MHz 802.11ac • -91 dBm @ MCS0*2 20 MHz • -90 dBm @ MCS0 20 MHz • -88 dBm @ MCS1*2 20 MHz • -86 dBm @ MCS1, MCS2*2 20 MHz • -84 dBm @ MCS2 20 MHz • -83 dBm @ MCS3*2 20 MHz • -81 dBm @ MCS3 20 MHz • -79 dBm @ MCS4*2 20 MHz • -78 dBm @ MCS4 20 MHz • -75 dBm @ MCS5*2 20 MHz • -74 dBm @ MCS5 20 MHz • -73 dBm @ MCS6*2, MCS7*2 20 MHz • -72 dBm @ MCS6 20 MHz • -70 dBm @ MCS7 20 MHz

	• -68 dBm @ MCS8*2 20 MHz • -66 dBm @ MCS8 20 MHz

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Getting Started

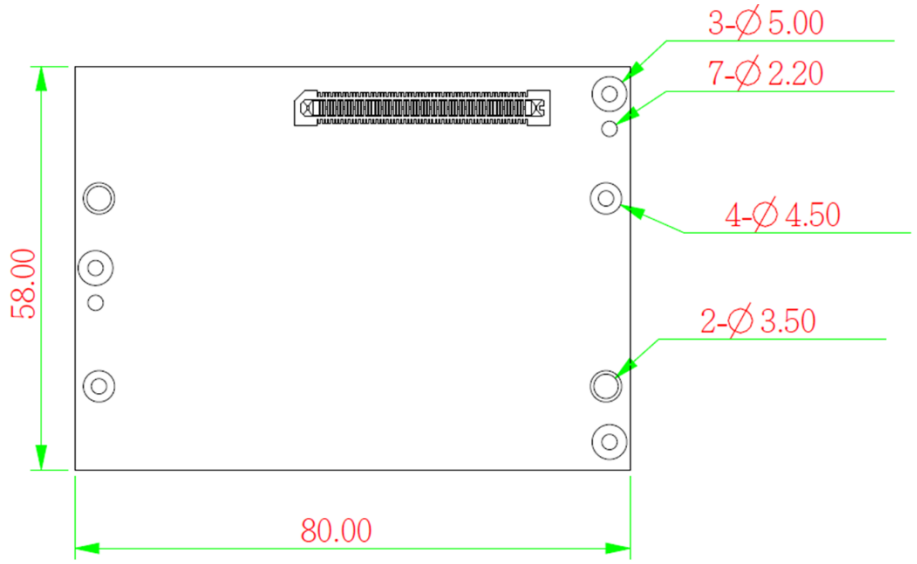
This chapter covers the module layout, and block diagram, hardware installation of the WAPC003. Software installation is covered in the next chapter.

The following topics are covered:

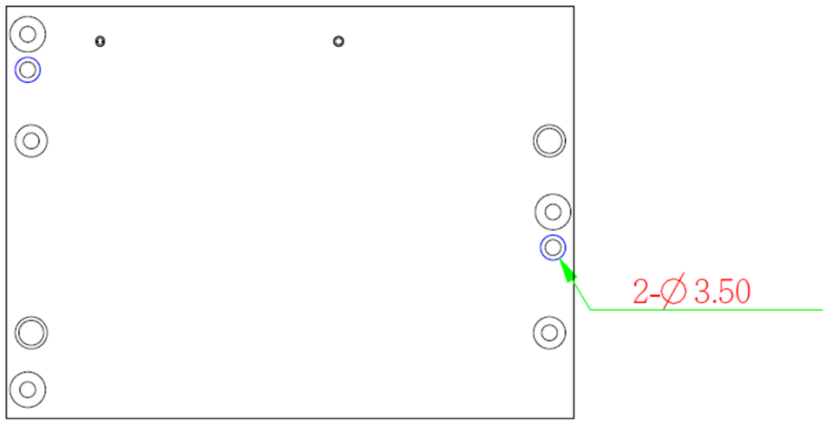
- **Module Layout**
- **Block Diagram**
- **Hardware Installation**
- **Software Installation**

Module Layout

Top

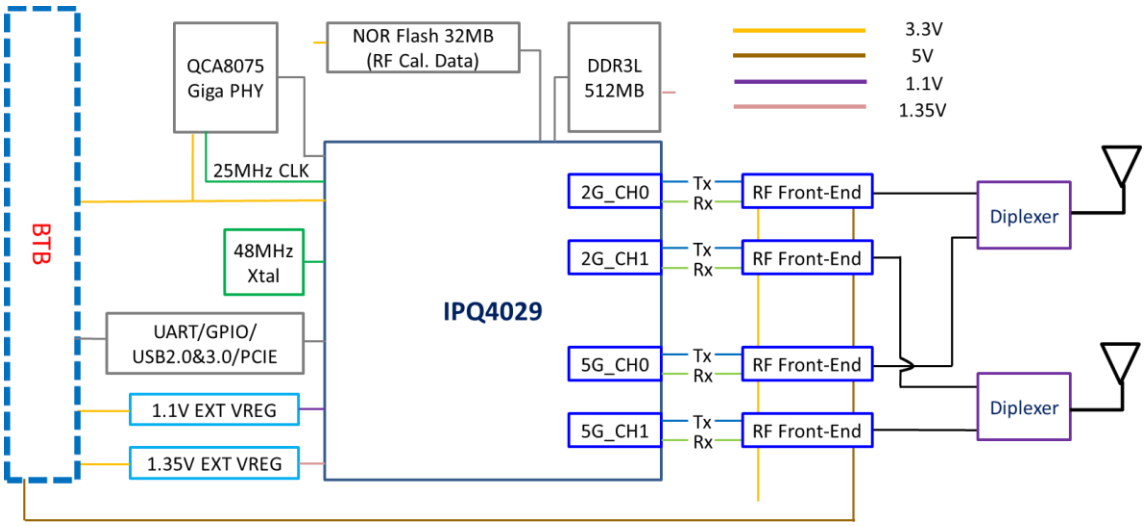


Bottom

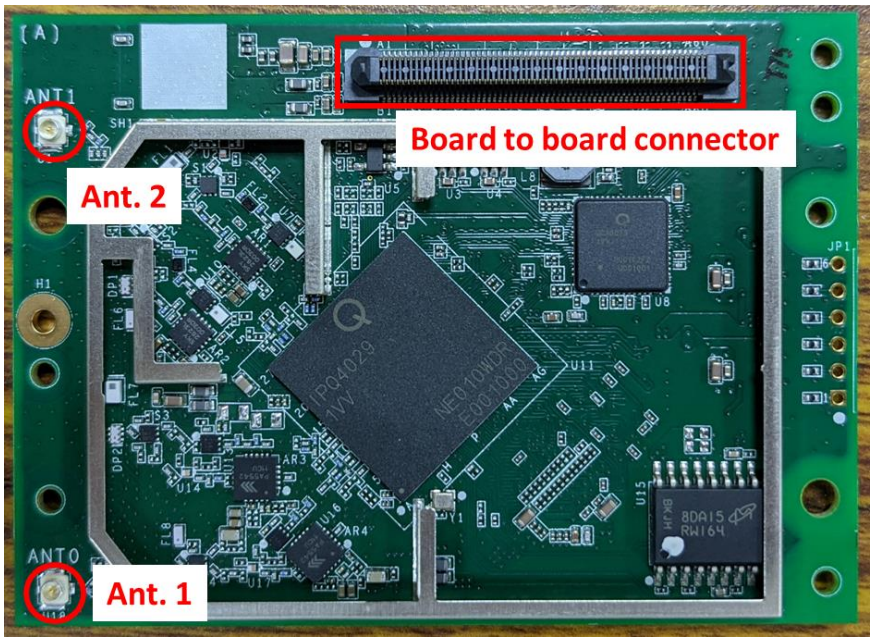


Block Diagram

Below is a block diagram of the WAPC003.



Connector Locations



PCI Bus Connector PIN Assignments

5V	B1	A1	3.3V
5V	B2	A2	3.3V
5V	B3	A3	3.3V
5V	B4	A4	3.3V
GND	B5	A5	3.3V
GND	B6	A6	GND
USB2_DM	B7	A7	GND
USB2_DP	B8	A8	System Reset
GND	B9	A9	SYS_RST_O
GND	B10	A10	INTn_I2C
PCIE_REFCLK-	B11	A11	100/10M_3
PCIE_REFCLK+	B12	A12	1000M_3
GND	B13	A13	100/10M_4
GND	B14	A14	1000M_4
PCIE_RX-	B15	A15	SW Reset
PCIE_RX+	B16	A16	GND
GND	B17	A17	GND
GND	B18	A18	PCIE_WAKEUP
PCIE_TX-	B19	A19	GND
PCIE_TX+	B20	A20	PCIE_CLK_REQ_N
GND	B21	A21	GND
GND	B22	A22	PCIE_RST
EMMC_D0	B23	A23	GND
GND	B24	A24	PCIE_W_DISABLE_L
EMMC_D1	B25	A25	GND
GND	B26	A26	GND
EMMC_D2	B27	A27	I2C_SCK_0
GND	B28	A28	GND
EMMC_D3	B29	A29	I2C_SDA_0
GND	B30	A30	GND
EMMC_D4	B31	A31	I2C_SCK_1
GND	B32	A32	GND
EMMC_D5	B33	A33	I2C_SDA_1
GND	B34	A34	GND
EMMC_D6	B35	A35	UART_RXD_0
GND	B36	A36	UART_TXD_0
EMMC_D7	B37	A37	UART_DTR_0
GND	B38	A38	UART_DSR_0
SDIO_CMD	B39	A39	GND
GND	B40	A40	UART_TXD_1
SDIO_CLK	B41	A41	UART_RXD_1

GND	B42	A42	UART_DTR_1
SDIO_CD	B43	A43	UART_DSR_1
GND	B44	A44	GND
GND	B45	A45	GND
XN3_3	B46	A46	XN4_3
XP3_3	B47	A47	XP4_3
GND	B48	A48	GND
GND	B49	A49	GND
XN3_2	B50	A50	XN4_2
XP3_2	B51	A51	XP4_2
GND	B52	A52	GND
GND	B53	A53	GND
XN3_1	B54	A54	XN4_1
XP3_1	B55	A55	XP4_1
GND	B56	A56	GND
GND	B57	A57	GND
XN3_0	B58	A58	XN4_0
XP3_0	B59	A59	XP4_0
GND	B60	A60	GND

Hardware Installation

The WAPC003 can be installed into Moxa wireless system board series.

Step for Installation

1. Install the WAPC003 module on the system board. Apply pressure to both bus connectors and gently press the board onto the stack. The board should slide into the matching bus connectors. Do not attempt to force the board, as this can lead to bent/broken pins.
2. Screw on the WAPC003 module.
3. Screw on the all the necessary chassis.

Software Installation

After physically installing the WAPC003, your operating system must be configured to recognize the new system board.

Step for Installation

1. Apply power to the system board.
2. Connect system board and PC with Ethernet cable.
3. Open a browser and type: 192.168.127.253 to open the system login webpage.
4. Login the webpage with default password: moxa in order to verify that all of the hardware is install properly.

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 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

To assure continued compliance, (example - use only shielded interface cables when connecting to computer or peripheral devices) any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this 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.

IMPORTANT NOTE

This module is restricted to mobile configuration. To comply with FCC RF exposure compliance requirements, the antenna used for this transmitter must be installed to provide a separation distance of at least 50 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. This transmitter module must not be co-located or operating in conjunction with any other antenna or transmitter

CAUTION

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

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 50 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "**Contains FCC ID: SLE-WAPC003** "

Information for the OEMs and Integrators

The following statement must be included with all versions of this document supplied to an OEM or integrator, but should not be distributed to the end user.
1) This device is intended for OEM integrators only.
2) Please see the full Grant of Equipment document for other restrictions.

This radio transmitter FCC ID: SLE-WAPC003 has been approved by FCC to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type 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.

Antenna List

Item	Manufacturer	Model name	Type	2.4GHz Gain	5GHz Gain
1	MOXA	ANT-WDB-ANM-0306	Dipole	3	6
2	MOXA	ANT-WDB-ANM-0502	Dipole	5	2
3	MOXA	ANT-WDB-ARM-02	Dipole	2	2
4	MOXA	ANT-WDB-ARM-0202	Dipole	2	2
5	MOXA	ANT-WSB-AHRM-05-1.5m	Dipole	5	-
6	MOXA	MAT-WDB-CA-RM-2-0205	Dipole	2	5
7	MOXA	MAT-WDB-DA-RM-2-0203-1m	Dipole	2	3
8	MOXA	MAT-WDB-PA-NF-2-0708	Panel	7	8
9	MOXA	ANT-WDB-PNF-1011	Panel	10	11
10	MOXA	ANT-WDB-ONM-0707	Dipole	7	7
11	MOXA	ANT-WDB-ONF-0709	Dipole	7	9
12	MOXA	ANT-WSB5-PNF-16	Panel	-	16
13	MOXA	ANT-WSB-PNF-12-02	Panel	12	-

Canada, Innovation, Science and Economic Development Canada (ISED) Notices

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:
This device may not cause interference.
This device must accept any interference, including interference that may cause undesired operation of the device.

Avis du Canada, Innovation, Sciences et Développement économique Canada (ISED)

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.

Radio Frequency (RF) Exposure Information

The radiated output power of the Wireless Device is below the Innovation, Science and Economic Development Canada (ISED) radio frequency exposure limits. The Wireless Device should be used in such a manner such that the potential for human contact during normal operation is minimized.

This device has also been evaluated and shown compliant with the ISED RF Exposure limits under mobile exposure conditions. (antennas are greater than 50 cm from a person's body).

Informations concernant l'exposition aux fréquences radio (RF)

La puissance de sortie rayonnée du dispositif sans fil est inférieure aux limites d'exposition aux radiofréquences d'Innovation, Sciences et Développement économique Canada (ISED). Le dispositif sans fil doit être utilisé de manière à minimiser le potentiel de contact humain pendant le fonctionnement normal.

Cet appareil a également été évalué et montré conforme aux limites d'exposition RF ISED dans des conditions d'exposition mobiles. (Les antennes sont à plus de 50 cm du corps d'une personne).

This radio transmitter **IC: 9335A-WAPC003** 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.

Cet émetteur radio **IC: 9335A-WAPC003** a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antennes énumérés ci-dessous avec le gain maximal admissible et impédance d'antenne requise pour chaque type d'antenne indiqué. Types d'antennes n'est pas inclus dans cette liste, ayant un gain supérieur au gain maximal indiqué pour ce type, sont strictement interdits pour une utilisation avec cet appareil.

Caution:

i.) 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;

Mise en garde:

i.) le dispositif destiné à fonctionner dans la bande 5150–5250 MHz est destiné uniquement à une utilisation en intérieur afin de réduire le risque de brouillage préjudiciable causé par les systèmes mobiles à satellites dans le même canal;

Caution:

i.) the device for operation in the band **5250–5350** MHz is "for indoor use only".

Mise en garde:

i.) le dispositif destiné à fonctionner dans la bande 5250–5350 MHz est "pour usage intérieur uniquement".

The user manual for LE-LAN devices shall contain instructions related to the restrictions mentioned in the above sections, namely that:

i. 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;

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; and

iv. where applicable, antenna type(s), antenna models(s), and worst-case tilt angle(s) necessary to remain compliant with the e.i.r.p. elevation mask requirement set forth in section 6.2.2.3 shall be clearly indicated

「帯*: W52/53* 屋内使用限定 ただし登録局に接続される場合は除く」*"Band: W52/53 indoor usage only *except for connection to the registered station"*

NCC警語:

經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。
前項合法通信，指依電信法規定作業之無線電通信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

本模組於取得認證後將依規定於模組本體標示審驗合格標籤，並要求最終產品平台廠商(OEM Integrator)於最終產品平台(End Product)上標示" 本產品內含射頻模組，其 NCC 型式認證號碼為: CCXXxxYYyyyZzW

應避免影響附近雷達系統之操作。