LBEE5HY1MW　Installation Manual

FCC ID of this product is as follows.

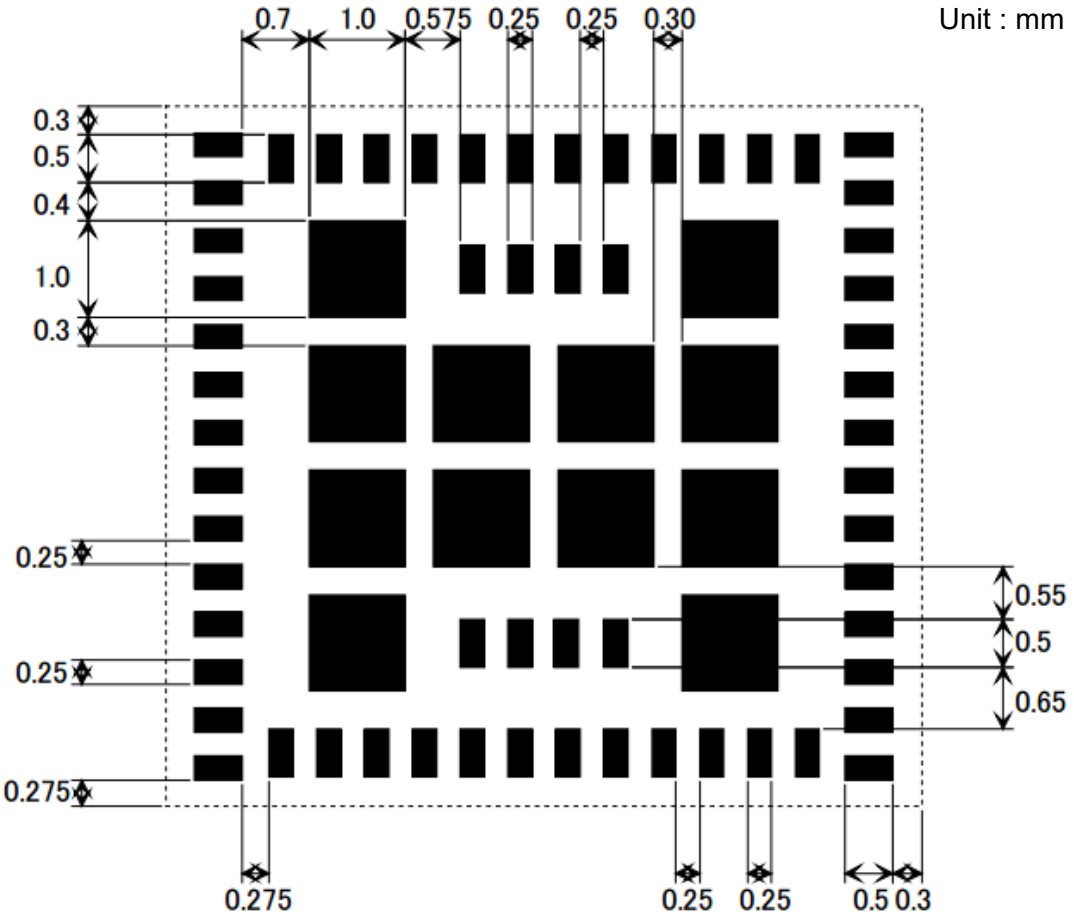
FCC ID: RF41675A

IC No. of this product is as follows.

IC: 5798A-1675A

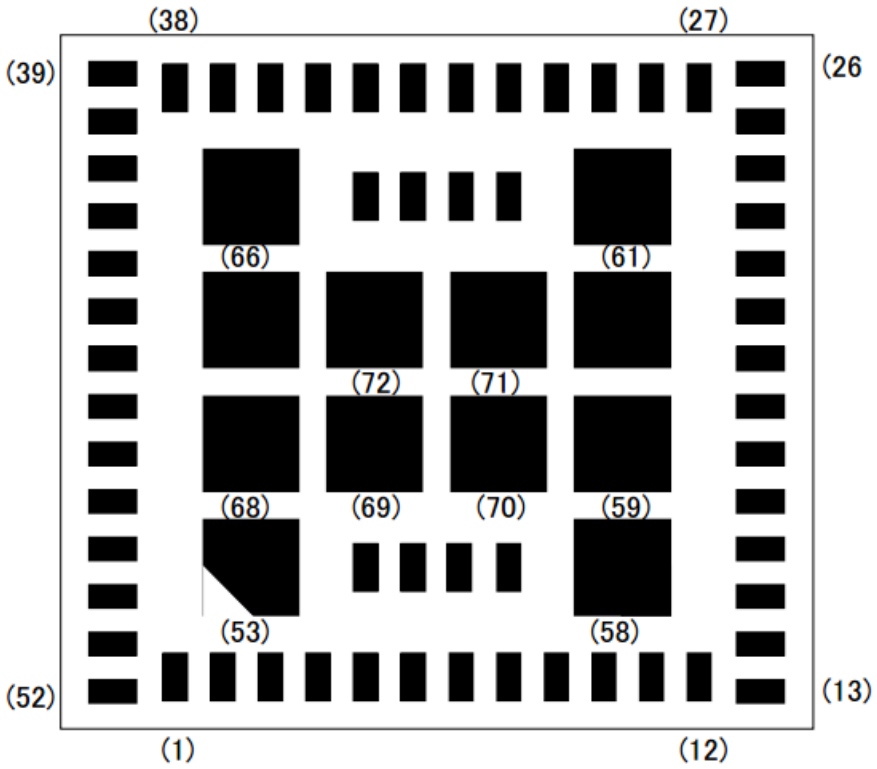
Contents

1. Land Pattern (Recommended)



* To avoid the short-circuit between the side shielding and a solder on the module land after the reflow, please locate the module land at 0.2mm away from module outline as above figure.

2. PIN Layout



Pin No.	Description	Pin No.	Description	Pin No.	Description	Pin No.	Description
1	GPIO_6	19	GND	37	I2S_CLK	55	GND
2	GPIO_0	20	SDIO_CLK	38	I2S_WS	56	GND
3	GPIO_3	21	GND	39	GND	57	JTAG_SEL
4	GPIO_5	22	VBAT_LDO	40	BT_DEV_WAKE	58	GND
5	GPIO_1	23	VBAT_SR	41	BT_HOST_WAKE	59	GND
6	GPIO_4	24	SR_PVSS	42	I2S_DI	60	GND
7	GPIO_2	25	VIN_LDO	43	NC	61	GND
8	BT_REG_ON	26	SR_PVSS	44	GND	62	BT_GPIO_4
9	WL_REG_ON	27	SR_PVSS	45	BT_UART_RXD	63	BT_GPIO_3
10	GND	28	SR_VLX	46	BT_UART_TXD	64	BT_GPIO_2
11	VIO	29	GND	47	BT_UART_RTS_N	65	BT_GPIO_5
12	GND	30	LPO_IN	48	BT_UART_CTS_N	66	GND
13	GND	31	GPIO_7	49	GND	67	GND
14	SDIO_DATA0	32	BT_PCM_IN	50	ANT	68	GND
15	SDIO_CMD	33	BT_PCM_SYNC	51	GND	69	GND
16	SDIO_DATA1	34	BT_PCM_OUT	52	GND	70	GND
17	SDIO_DATA2	35	BT_PCM_CLK	53	GND	71	GND
18	SDIO_DATA3	36	I2S_DO	54	NC	72	GND

3. Antenna

■Please perform the antenna design that followed the specifications of the antenna.

■About the signal line between an antenna and a module

It is a 50-ohm line design.

Fine tuning of return loss etc. can be performed using a matching network.

However, it is required to check "Class1 change" and "Class2 change" which the authorities define then.

The concrete contents of a check are the following three points.

1) It is the same type as the antenna type of antenna specifications.
2) An antenna gain is lower than a gain given in antenna specifications.
3) The emission level is not getting worse.

■50-ohm line(microstrip line length)

	Antenna
Antenna type	PCB antenna (Monopole antenna)
50-ohm feed line length	We test it at 0mm as a representative

Recommended antenna design

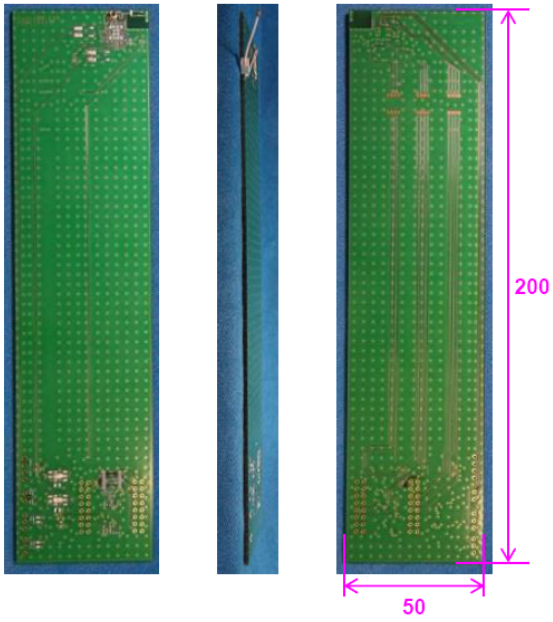
This Antenna Specification is based on Keyence's requirement..

Model name　LBEE5HY1MW

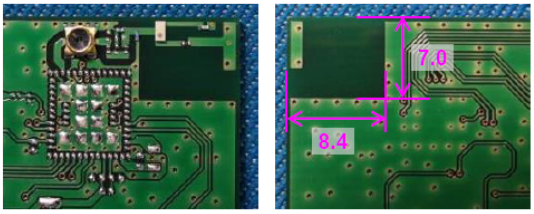
- Antenna Model Name　:　ANT16244DT
- Antenna type　:　PCB antenna (Monopole antenna)
- Antenna manufacture　:　TDK Corporation
- Antenna gain　:　+2.1 dBi @2442MHz
  +3.5 dBi @5150MHz
- Frequency　:　2400-2483.5MHz, 5150-5850MHz

Appearance

<EVB>



<Antenna area>



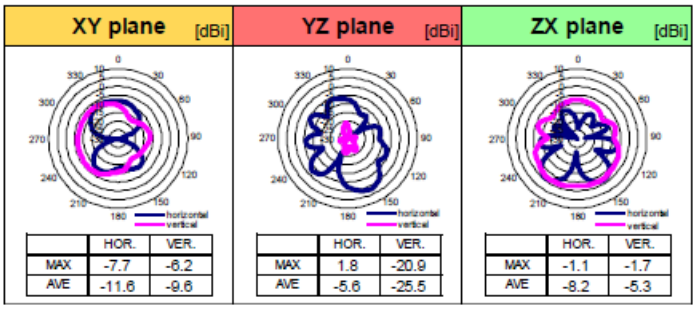
Recommended antenna characteristics

<Efficiency>

*Red color shows peak gain

LINEAR POLAMIZATION		XY-plane [dBi] hor.	XY-plane [dBi] ver.	YZ-plane [dBi] hor.	YZ-plane [dBi] ver.	ZX-plane [dBi] hor.	ZX-plane [dBi] ver.	Total [dB] Efficiency
2400 MHz	MAX.	-8.0	-5.8	1.3	-21.1	-2.1	-2.3	
	AVE.	-11.9	-9.6	-6.2	-26.1	-8.9	-5.7	-5.4
2442 MHz	**MAX.**	**-7.7**	**-6.2**	**1.8**	**-20.9**	**-1.1**	**-1.7**	
	AVE.	**-11.6**	**-9.6**	**-5.6**	**-25.5**	**-8.2**	**-5.3**	**-4.8**
2484 MHz	MAX.	-7.5	-6.6	2.1	-19.8	-0.6	-1.3	
	AVE.	-11.5	-9.7	-5.3	-24.3	-7.6	-5.0	-4.5

<Directivity>



	XY plane HOR.	XY plane VER.	YZ plane HOR.	YZ plane VER.	ZX plane HOR.	ZX plane VER.
MAX	-7.7	-6.2	1.8	-20.9	-1.1	-1.7
AVE	-11.6	-9.6	-5.6	-25.5	-8.2	-5.3

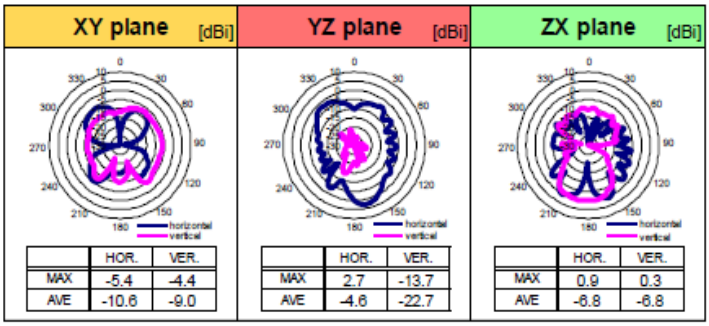
@2442MHz

<Efficiency>

*Red color shows peak gain

LINEAR POLAMIZATION		XY-plane [dBi] hor.	XY-plane [dBi] ver.	YZ-plane [dBi] hor.	YZ-plane [dBi] ver.	ZX-plane [dBi] hor.	ZX-plane [dBi] ver.	Total [dB] Efficiency
5150 MHz	MAX.	-7.5	-3.1	3.5	-14.6	0.5	0.0	
	AVE.	-13.0	-7.4	-4.4	-22.2	-6.5	-6.6	-4.7
5500 MHz	**MAX.**	**-5.4**	**-4.4**	**2.7**	**-13.7**	**0.9**	**0.3**	
	AVE.	**-10.6**	**-9.0**	**-4.6**	**-22.7**	**-6.8**	**-6.8**	**-4.7**
5850 MHz	MAX.	-7.2	-8.8	1.2	-15.3	0.3	-1.1	
	AVE.	-12.7	-11.9	-5.3	-23.9	-7.3	-7.7	-5.5

<Directivity>



	XY plane HOR.	XY plane VER.	YZ plane HOR.	YZ plane VER.	ZX plane HOR.	ZX plane VER.
MAX	-5.4	-4.4	2.7	-13.7	0.9	0.3
AVE	-10.6	-9.0	-4.6	-22.7	-6.8	-6.8

@5500MHz

4. Supply Voltage

Parameter		Min.	Typ.	Max.	Unit
Operating Temperature*1		-30	25	+85	deg.C
Supply Voltage	VBAT	3.2	3.3	4.8	V
	VIO*2 1.8V/3.3V	1.62	-	3.63	V

*1: Surface temperature of the shield case
Functionality is guaranteed but specifications require derating at extreme temperatures

*2: VIO don't influence the RF characteristic. Tolerance of 1.8V and 3.3V is ±10%.

5. Theory of Operation-Channel List

Theory of Operation-Software Security and Channel List

Frequency of operation			**Scan**	**Ad-hoc mode**
2.4GHz	11b/g/n (HT20)	2412-2462MHz	Active	Yes
	BT	2402-2480MHz	N/A	N/A
W52	11a/n ((V)HT20)	5180-5240MHz	Active	Yes
W53	11a/n ((V)HT20)	5260-5320MHz	Passive	No

* This specification is limited to use in the above frequency bands and modes.

Notes: End users cannot modify the software because F/W & driver are installed in device.

6. Theory of Output Power List

This specification is limited to use with the following output power settings.

Limited output power setting. [dBm]

- 2.4GHz WLAN

Mode	Rate	1ch	2ch	3ch	4ch	5ch	6ch	7ch	8ch	9ch	10ch	11ch
IEEE 802.11b	1M	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
	2M	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
	5.5M	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
	11M	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
IEEE 802.11g	6M	10.0	10.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	10.0	10.0
	9M	10.0	10.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	10.0	10.0
	12M	10.0	10.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	10.0	10.0
	18M	10.0	10.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	10.0	10.0
	24M	10.0	10.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	10.0	10.0
	36M	10.0	10.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	10.0	10.0
	48M	10.0	10.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	10.0	10.0
	54M	10.0	10.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	10.0	10.0
IEEE 802.11n	MCS0	10.0	10.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	10.0	10.0
	MCS1	10.0	10.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	10.0	10.0
	MCS2	10.0	10.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	10.0	10.0
	MCS3	10.0	10.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	10.0	10.0
	MCS4	10.0	10.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	10.0	10.0
	MCS5	10.0	10.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	10.0	10.0
	MCS6	10.0	10.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	10.0	10.0
	MCS7	10.0	10.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	10.0	10.0

- 5GHz WLAN

Mode	Rate	36ch	40ch	44ch	48ch	52ch	56ch	60ch	64ch
IEEE 802.11a	6M	10.0	10.0	11.0	11.0	11.0	11.0	10.0	10.0
	9M	10.0	10.0	11.0	11.0	11.0	11.0	10.0	10.0
	12M	10.0	10.0	11.0	11.0	11.0	11.0	10.0	10.0
	18M	10.0	10.0	11.0	11.0	11.0	11.0	10.0	10.0
	24M	10.0	10.0	11.0	11.0	11.0	11.0	10.0	10.0
	36M	10.0	10.0	11.0	11.0	11.0	11.0	10.0	10.0
	48M	10.0	10.0	11.0	11.0	11.0	11.0	10.0	10.0
	54M	10.0	10.0	11.0	11.0	11.0	11.0	10.0	10.0
IEEE 802.11n (HT20)	MCS0	10.0	10.0	11.0	11.0	11.0	11.0	10.0	10.0
	MCS1	10.0	10.0	11.0	11.0	11.0	11.0	10.0	10.0
	MCS2	10.0	10.0	11.0	11.0	11.0	11.0	10.0	10.0
	MCS3	10.0	10.0	11.0	11.0	11.0	11.0	10.0	10.0
	MCS4	10.0	10.0	11.0	11.0	11.0	11.0	10.0	10.0
	MCS5	10.0	10.0	11.0	11.0	11.0	11.0	10.0	10.0
	MCS6	10.0	10.0	11.0	11.0	11.0	11.0	10.0	10.0
	MCS7	10.0	10.0	11.0	11.0	11.0	11.0	10.0	10.0

LBEE5HY1MW User Manual for FCC

■Regarding FCC modular approval of LBEE5HY1MW

Model Name: LBEE5HY1MW

FCC ID: RF41675A

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.

Since this module is not sold to general end users directly, there is no user manual of module.
For the details about this module, please refer to the specification sheet of module.
This module should be installed in the host device according to the interface specification (installation procedure).

● The following information must be indicated on the host device of this module.

Contains Transmitter Module FCC ID: RF41675A

or

Contains FCC ID: RF41675A

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.

*If it cannot be described on the host product, it must be listed on both the host product manual and on the host product package or removable label.

●The following statements must be described on the user manual of the host device of this module;

FCC CAUTION
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Compliance with FCC requirement 15.407(c)
Data transmission is always initiated by software, which is the passed down through the MAC, through the digital and analog baseband, and finally to the RF chip. Several special packets are initiated by the MAC. These are the only ways the digital baseband portion will turn on the RF transmitter, which it then turns off at the end of the packet. Therefore, the transmitter will be on only while one of the aforementioned packets is being transmitted. In other words, this device automatically discontinue transmission in case of either absence of information to transmit or operational failure.

Frequency Tolerance: ±20 ppm

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

●When installing it in a mobile equipment. Please describe the following warning to the manual.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines. This equipment should be installed and operated keeping the radiator at least 20cm or more away from person's body.

●When installing it in a portable equipment. Please describe the following warning to the manual.

The available scientific evidence does not show that any health problems are associated with using low power wireless devices. There is no proof, however, that these low power wireless devices are absolutely safe. Low power Wireless devices emit low levels of radio frequency energy (RF) in the microwave range while being used. Whereas high levels of RF can produce health effects (by heating tissue), exposure of low-level RF that does not produce heating effects causes no known adverse health effects. Many studies of low-level RF exposures have not found any biological effects. Some studies have suggested that some biological effects might occur, but such findings have not been confirmed by additional research. LBEE5HY1MW has been tested and found to comply with FCC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines.

It is necessary to take a SAR test with your set mounting this module (except to use only Bluetooth V5.0(BDR/EDR/LE)).
Class II permissive change application is necessary using the SAR report.

Note)

Portable equipment: Equipment for which the spaces between human body and antenna are used within 20cm.

Mobile equipment: Equipment used at position in which the spaces between human body and antenna exceeded 20cm.

LBEE5HY1MW User Manual for ISED

PMN: LBEE5HY1MW
HVIN: LBEE5HY1MW
IC Number: 5798A-1675A

Since this module is not sold to general end users directly, there is no user manual of module.
For the details about this module, please refer to the specification sheet of module.
This module should be installed in the host device according to the interface specification (installation procedure).

● The following information must be indicated on the host device of this module.

Contains IC: 5798A-1675A

●The following statements must be described on the user manual of the host device of this module;

This device complies with Industry Canada's applicable licence-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.

*If it is difficult to describe this statement on the host product due to the size, please describe in the User's manual.

●In case of the final product which can be carried around to outdoor.

The following indication is necessary to the final product.
When the AP function is used in W52;
At the time of a channel setting of W52, please indicate "for indoor use only". During connecting, please show the channel number which connects.
And please indicate that the end user may find out "for indoor use only channel".

When the STA function is used in channel 52, 54, 58, at the time of the channel 52 or 54 or 58 setting, please indicate “for indoor use only channel”.

During connecting, please show the channel number which connects.

And please indicate that the end user may find out "for indoor use only channel".

If the antenna of the end product is removed, please describe the follow warning on the manual of the end product which contains this module.

This radio transmitter (IC Number: 5798A-1675A) identify the device by certification number or model number if Category II) 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. : 2.4GHz Monopole Gain: +2.1 dBi : 5GHz Monopole Gain: +3.5 dBi
Le présent émetteur radio (IC Number: 5798A-1675A) a été approuvé par Industrie 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, sont strictement interdits pour l'exploitation de l'émetteur. Type d’antenne : 2.4GHz Monopole Gain: +2.1 dBi : 5GHz Monopole Gain: +3.5 dBi

●If the final product use the following frequency, please note that there is a limit.

For indoor use only (5150-5250MHz band and channel 52, 54, 58)
Pour usage intérieur seulement (5150-5250MHz band and channel 52, 54, 58)

●The following statements must be described on the user manual of the host device of this module;

Data transmission is always initiated by software, which is the passed down through the MAC, through the digital and analog baseband, and finally to the RF chip. Several special packets are initiated by the MAC. These are the only ways the digital baseband portion will turn on the RF transmitter, which it then turns off at the end of the packet. Therefore, the transmitter will be on only while one of the aforementioned packets is being transmitted. In other words, this device automatically discontinue transmission in case of either absence of information to transmit or operational failure.
La transmission des données est toujours initiée par le logiciel, puis les données sont transmises par l'intermédiaire du MAC, par la bande de base numérique et analogique et, enfin, à la puce RF. Plusieurs paquets spéciaux sont initiés par le MAC. Ce sont les seuls moyens pour qu'une partie de la bande de base numérique active l'émetteur RF, puis désactive celui-ci à la fin du paquet. En conséquence, l'émetteur reste uniquement activé lors de la transmission d'un des paquets susmentionnés. En d'autres termes, ce dispositif interrompt automatiquement toute transmission en cas d'absence d'information à transmettre ou de défaillance.

*If it is difficult to describe this statement on the host product due to the size, please describe in the User's manual.

●When installing it in a mobile equipment. Please describe the following warning to the manual.

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment and meets RSS-102 of the IC radio frequency (RF) Exposure rules. This equipment should be installed and operated keeping the radiator at least 20cm or more away from person’s body.
Cet équipement est conforme aux limites d’exposition aux rayonnements énoncées pour un environnement non contrôlé et respecte les règles d’exposition aux fréquences radioélectriques (RF) CNR-102 de l’IC. Cet équipement doit être installé et utilisé en gardant une distance de 20 cm ou plus entre le radiateur et le corps humain.