

# User Manual

This WiFi product uses Intel wireless module and Haonuo electronic antenna, please refer to the specifications below for details.

Type	Brand	Remark
Module	Intel •	Reference page 2-11
Antenna	Haonuo Electronics Co., LTD	



# 1 Electrical Specifications

This section provides information about the electrical specifications for the product module. The specification covers the module hardware interface signals.

## 1.1 2230 and 1216 form-factor pinouts

There are two pinout lists, one for the platform side, and one for the module side. Note that some signals are crossed (such as UART Rx on platform side is connected to TX on the module side).

**Note:** The module pinout is based on the *PCIe®\_M.2\_Electromechanical\_Spec*, with few changes to the pinout in order to support Intel SKL platform.

**Table 1-1 Key A-E 2230 platform and module pinout (M.2 revision for 2015)**

Pin #	Pin Name Platform Pinout	Pin Name Module Pinout	Voltage on Card Side	WLAN, Bluetooth®, or WiGig	Connection on Platform/Usage
1	GND	GND			
2	3.3 V	3.3 V	3.3 V	All	
3	USB_D+	USB_D+	3.3 V	Bluetooth®	
4	3.3 V	3.3 V	3.3 V	All	
5	USB_D-	USB_D-	3.3 V	Bluetooth®	
6	LED1	LED1	3.3v	WLAN, WiGig	On relevant SKUs
7	GND	GND			
8	Connector key	Connector key			
9	Connector key	Connector key			
10	Connector key	Connector key			
11	Connector key	Connector key			
12	Connector key	Connector key			
13	Connector key	Connector key			
14	Connector key	Connector key			
15	Connector key	Connector key			
16	LED2	LED2	3.3v	Bluetooth®	On relevant SKUs
17	NC	NC	NA		
18	GND	GND			
19	NC	NC	NA		
20	NC	NC	NA		
21	NC	NC	NA		
22	NC	NC	NA		
23	NC	NC	NA		
24	Connector Key	Connector Key			

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Pin #	Pin Name Platform Pinout	Pin Name Module Pinout	Voltage on Card Side	WLAN, Bluetooth®, or WIGig	Connection on Platform/Usage
25	Connector Key	Connector Key			
26	Connector Key	Connector Key			
27	Connector Key	Connector Key			
28	Connector Key	Connector Key			
29	Connector Key	Connector Key			
30	Connector Key	Connector Key			
31	Connector Key	Connector Key			
32	NC	NC	NA		
33					
34	NC	NC	NA		
35	PETp0	PERp0	PCIe* PHY	WLAN	PCIe* PHY signals; use PHY levels and not digital pins
36	NC	NC	NA		
37	PETn0	PERn0	PCIe* PHY	WLAN	PCIe* PHY signals; use PHY levels and not digital pins
38	CLINK RESET (0)(0/3.3 v)	CLINK RESET (1)(0/3.3 v)	3.3 v	WLAN	Also support 1.8 v electrical levels on this signal
39	GND	GND			
40	CLINK DATA	CLINK DATA	CLINK PHY (1 v)	WLAN	CLINK PHY
41	PERp0	PETp0	PCIe* PHY	WLAN	
42	CLINK CLK	CLINK CLK	CLINK PHY (1 v)	WLAN	CLINK PHY
43	PERn0	PETn0	PCIe* PHY	WLAN	
44	COEX3(I/O) (0/1.8v)	COEX3(I/O) (0/1.8 v)	1.8 v	WLAN + Bluetooth®	Should be coming from LTE card
45	GND	GND			
46	COEX2(I/O) (0/1.8v)	COEX2(I/O)(0/1.8v)	1.8 v	WLAN + Bluetooth®	Should be coming from LTE card
47	REFCLKP0	REFCLKP0	PCIe* PHY	WLAN	
48	COEX1 (I/O)(0/1.8 v)	COEX1 (I/O)(0/1.8v)	1.8 v	WLAN + Bluetooth®	Should be coming from LTE card
49	REFCLKN0	REFCLKN0	PCIe PHY	WLAN	
50	SUSCLK (32 kHz) (0)(0/3.3 v)	SUSCLK (32 kHz) (1)(0/3.3 v)	3.3 v	WLAN + Bluetooth®	Not used by WsP
51	GND	GND			

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Pin #	Pin Name Platform Pinout	Pin Name Module Pinout	Voltage on Card Side	WLAN, Bluetooth®, or WIGig	Connection on Platform/Usage
52	PERST0# (O)(0/3.3 V)	PERST0# (I)(0/3.3 V)	3.3 V	WLAN	Also support 1.8 V electrical levels on this signal
53	CLKREQ0# (IO)(0/3.3 V)	CLKREQ0# (IO)(0/3.3 V)	3.3 V	WLAN	Also support 1.8 V electrical level on this signal
54	W_DISABLE2# (O)(0/3.3 V)	W_DISABLE2# (I)(0/3.3 V)	3.3 V	Blue tooth	Also support 1.8 V electrical levels on this signal
55	PEWAKE0# (IO)(0/3.3 V)	PEWAKE0# (IO)(0/3.3 V)	3.3 V	WLAN	Also support 1.8 V electrical level on this signal
56	W_DISABLE1# (O)(0/3.3 V)	W_DISABLE1# (I)(0/3.3 V)	3.3v	WLAN	Also support 1.8 V electrical level on this signal
57	GND	GND			
58	I2C DATA (IO)/UART_RX (I)(0/1.8 V)	I2C DATA (IO)/UART_TX (O)(0/1.8 V)	1.8 V	WLAN + Blue tooth	This pin was dedicated for I2C in M.2 1.0 but actually not used in StP.  In new M.2 for 2015 it is used, serve as ISM UART, and its voltage level is 1.8 V
59	PETp1	PERp1	PCIe * PHY	WIGig	PCIe * PHY signals; use PHY level and not digital pins
60	I2C CLK/UART_TX (O)(0/1.8 V)	I2C CLK/UART_RX (I)(0/1.8 V)	1.8 V	WLAN + Blue tooth	This pin was dedicated for I2C in M.2 1.0 but actually not used in StP.  In new M.2 for 2015 it is used, serve as ISM UART, and its voltage level is 1.8 V
61	PETn1	PERn1	PCIe * PHY	WIGig	PCIe * PHY signals; use PHY level and not digital pins
62	ALERT#/UART_CTS (I)(0/1.8 V)	ALERT#/UART_RTS (O)(0/1.8 V)	1.8 V	WLAN + Blue tooth	This pin was dedicated for I2C in M.2 1.0 but actually not used in StP.  In new M.2 for 2015 it is used serve as ISM UART, and its voltage level is 1.8 V
63	GND	GND			

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Pin #	Pin Name Platform Pinout	Pin Name Module Pinout	Voltage on Card Side	WLAN, Bluetooth®, or WIGig	Connection on Platform/Usage
64	NFC_RESET#/UART_RT_RTS (0)(0/1.8 V)	NFC_RESET#/UART_CTS (1)(0/1.8 V)	1.8 V	WLAN + Bluetooth®	This pin was dedicated for I2C in M.2 1.0 but actually not used in StP. In new M.2 for 2015 it is used, serves as I2S UART, and its voltage level is 1.8 V
65	PERp1	PETp1	PCIe* PHY	WIGig	
66	PERST1# (0)(0/3.3 V)	PERST1# (1)(0/3.3 V)	3.3 V	WIGig	
67	PERn1	PETn1	PCIe* PHY	WIGig	
68	CLKREQ1# (10)(0/3.3 V)	CLKREQ1# (10)(0/3.3 V)	3.3 V	WIGig	
69	GND	GND			
70	PEWAKE1# (10)(0/3.3 V)	PEWAKE1# (10)(0/3.3 V)	3.3 V	WIGig	
71	REFCLKP1	REFCLKP1	PCIe* PHY	WIGig	
72	3.3 V	3.3 V			
73	REFCLKN1	REFCLKN1	PCIe* PHY	WIGig	
74	3.3 V	3.3 V			
75	GND	GND			

**Table I-2 1216 platform module pinout (M.2 revision for 2015)**

Pin #	Pin Name platform pinout	Pin Name module pinout	Voltage on Card Side	WLAN, Bluetooth®, or WIGig	Connection on Platform/Usage
1	UIM_POWER_SRC/GPIO1	UIM_POWER_SRC/GPIO1	NA		Signal not used; leave NC in platform side
2	UIM_POWER_SNK	UIM_POWER_SNK	NA		Signal not used; leave NC in platform side
3	UIM_SWP	UIM_SWP	NA		Signal not used; leave NC in platform side
4	3.3 V	3.3 V			
5	3.3 V	3.3 V			
6	GND	GND			
7	NFC_RESET#	NFC_RESET#	NA		Signal not used; leave NC in platform side
8	ALERT#	ALERT#	NA		Signal not used; leave NC in platform side
9	I2C_CLK	I2C_CLK	NA		Signal not used; leave NC in platform side

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Pin #	Pin Name platform pinout	Pin Name module pinout	Voltage on Card Side	WLAN, Bluetooth®, or WIGig	Connection on Platform/Usage
10	I2C_DATA	I2C_DATA	NA		Signal not used; leave NC in platform side
11	COEX1	COEX1	1.8 V	WLAN + Bluetooth®	Should be coming from LTE card
12	COEX2	COEX2	1.8 V	WLAN + Bluetooth®	Should be coming from LTE card
13	COEX3	COEX3	1.8 V	WLAN + Bluetooth®	Should be coming from LTE card
14	SYSCLK/GNSS 0	SYSCLK/GNSS 0	NA		Signal not used; leave NC in platform side
15	TX_BLANKING/GNSS1	TX_BLANKING/GNSS1	1.8v		Should be coming from LTE card
16	RESERVED/VDDID18	RESERVED/VDDIO18	Optional; 1.8 V, otherwise leave NC		Used to be a reserved signal, can be served as VDDIO1.8 V to the module. Requires alignment with the module vendor
17	GND	GND			
18	RESERVED/ISH 2_UART_TXD (O)(0/1.8 V)	RESERVED/ISH 2_UART_RXD (I)(0/1.8 V)	NA		Signal not used; leave NC in platform side
19	RESERVED/ISH 2_UART_RXD (I)(0/1.8 V)	RESERVED/ISH 2_UART_TXD (O)(0/1.8 V)	NA		Signal not used; leave NC in platform side
20	GND	GND			
21	RESERVED/ISH 1_UART_RTS (O)(0/1.8 V)	ISH1_UART_CTS (I)(0/1.8 V)	1.8 V	WLAN + Bluetooth®	This pin was reserved, now used for ISH-UART 1.8 V
22	RESERVED/ISH 1_UART_CTS (I)(0/1.8 V)	ISH1_UART_RTS (O)(0/1.8 V)	1.8 V	WLAN + Bluetooth®	This pin was reserved, now used for ISH-UART 1.8 V
23	GND	GND			
24	RESERVED/ISH 1_UART_TXD (O)(0/1.8 V)	ISH1_UART_RXD (I)(0/1.8 V)	1.8 V	WLAN + Bluetooth®	This pin was reserved, now used for ISH-UART 1.8 V
25	RESERVED/ISH 1_UART_RXD (I)(0/1.8 V)	ISH1_UART_TXD (O)(0/1.8 V)	1.8 V	WLAN + Bluetooth®	This pin was reserved, now used for ISH-UART 1.8 V
26	GND	GND			
27	SUSCLK (32 kHz)	SUSCLK (32 kHz)	3.3 V	WLAN + Bluetooth®	Not supported on WsP
28	W_DISABLE1#	W_DISABLE1#	3.3v	WLAN	Also support 1.8 V electrical levels on this signal
29	PEWAKE #	PEWAKE #	3.3 V	WLAN	Also support 1.8 V electrical levels on this signal

## Electrical Specifications

Pin #	Pin Name platform pinout	Pin Name module pinout	Voltage on Card Side	WLAN, Bluetooth®, or WIGig	Connection on Platform/Usage
30	CLKREQ#	CLKREQ#	3.3 V	WLAN	Also support 1.8 V electrical levels on this signal
31	PERST#	PERST#	3.3 V	WLAN	Also support 1.8 V electrical levels on this signal
32	GND	GND			
33	REFCLKN0	REFCLKN0	PCIe* PHY	WLAN	PCIe* PHY signal use PHY levels and not digital pins
34	REFCLKP0	REFCLKP0	PCIe* PHY	WLAN	PCIe* PHY signal use PHY levels and not digital pins
35	GND	GND			
36	PERn0	PETn0	PCIe* PHY	WLAN	PCIe* PHY signal use PHY levels and not digital pins
37	PERp0	PETp0	PCIe* PHY	WLAN	PCIe* PHY signal use PHY levels and not digital pins
38	GND	GND			
39	PETn0	PERn0	PCIe* PHY	WLAN	PCIe* PHY signal use PHY levels and not digital pins
40	PETp0	PERp0	PCIe* PHY	WLAN	PCIe* PHY signal use PHY levels and not digital pins
41					
42	CLINK_CLK	CLINK_CLK	CLINK PHY (1 V)	WLAN	CLINK PHY
43	CLINK_DATA	CLINK_DATA	CLINK PHY (1 V)	WLAN	CLINK PHY
44	CLINK_RESET	CLINK_RESET	3.3 V	WLAN	Works also supports 1.8 V electrical levels on this signal
45	SDIO_RESET# (0)	SDIO_RESET# (1)	NA		Signal not used; leave NC1 platform side
46	SDIO_WAKE# (1)	SDIO_WAKE# (0)	NA		Signal not used; leave NC1 platform side
47	SDIO_DATA3 (IO)/WIGIG_UART_TXD (0)	SDIO_DATA3 (IO)/WIGIG_UART_RXD (1)	NA		Signal not used; leave NC1 platform side
48	SDIO_DATA2 (IO)/WIGIG_UART_RXD (1)	SDIO_DATA2 (IO)/WIGIG_UART_TXD (0)	NA		Signal not used; leave NC1 platform side
49	SDIO_DATA1 (IO)/WIGIG_UART_CTS (1)	SDIO_DATA1 (IO)/WIGIG_UART_RTS (0)	NA		Signal not used; leave NC1 platform side
50	SDIO_DATA0 (IO)/WIGIG_UART_TS_R0	SDIO_DATA0 (IO)/WIGIG_UART_TS (1)	NA		Signal not used; leave NC1 platform side



## Electrical Specifications

Pin #	Pin Name platform pinout	Pin Name module pinout	Voltage on Card Side	WLAN, Bluetooth®, or WIGig	Connection on Platform/Usage
51	SDIO_CMD (IO)	SDIO_CMD (IO)	NA		Signal not used; leave NC in platform side
52	SDIO_CLK (O)	SDIO_CLK (I)	NA		Signal not used; leave NC in platform side
53	UART_WAKE# (3.3 V)	UART_WAKE# (3.3 V)	3.3 V	Bluetooth®	Also support 1.8 V electrical levels on this signal. On relevant SKUs
54	LPSS_UART_RTS	LPSS_UART_CTS	1.8 V	Bluetooth®	On relevant SKUs
55	LPSS_UART_RXD	LPSS_UART_TXD	1.8 V	Bluetooth®	On relevant SKUs
56	LPSS_UART_TXD	LPSS_UART_RXD	1.8 V	Bluetooth®	On relevant SKUs
57	LPSS_UART_CTS	LPSS_UART_RTS	1.8 V	Bluetooth®	On relevant SKUs
58	PCM_SYNC/I2S_WS	PCM_SYNC/I2S_WS	1.8 V	Bluetooth®	On relevant SKUs
59	PCM_OUT/I2S_SD_OUT	PCM_IN/I2S_SD_IN	1.8 V	Bluetooth®	On relevant SKUs
60	PCM_IN/I2S_SD_IN	PCM_OUT/I2S_SD_OUT	1.8 V	Bluetooth®	On relevant SKUs
61	PCM_CLK/I2S_SCK	PCM_CLK/I2S_SCK	1.8 V	Bluetooth®	On relevant SKUs
62	GND	GND			
63	W_DISABLE2#	W_DISABLE2#	3.3 V	Bluetooth®	Also support 1.8 V electrical levels on this signal
64	LED2#	LED2#	3.3 V	Bluetooth®	On relevant SKUs
65	LED1#	LED1#	3.3 V	WLAN	On relevant SKUs
66	RESERVED/ISH2_UART_CTS (I)(0/1.8 V)	RESERVED/ISH2_UART_RTS (O)(0/1.8 V)	NA		Signal not used; leave NC in platform side
67	RESERVED/ISH2_UART_RTS (O)(0/1.8 V)	RESERVED/ISH2_UART_CTS (I)(0/1.8 V)	NA		Signal not used; leave NC in platform side
68	GND	GND			
69	USB_D-	USB_D-	3.3 V	Bluetooth®	
70	USB_D+	USB_D+	3.3 V	Bluetooth®	
71	GND	GND			
72	3.3 V	3.3 V			
73	3.3 V	3.3 V			
74	GND	GND			
75	GND	GND			



## Electrical Specifications

Pin #	Pin Name platform pinout	Pin Name module pinout	Voltage on Card Side	WLAN, Bluetooth®, or WIGig	Connection on Platform/Usage
76	GND	GND			

## 1.2 Pinout variations

### 1.2.1 No Bluetooth® SKU

When the product is used as Wi-Fi only, the following changes in the pinout apply:

- Don't leave Bluetooth® USB signals of Windstorm Peak N.C. Keep Bluetooth® USB signals connected to USB host on the platform side, or connect the USB signals of Windstorm Peak to GND through pull down.
  - **Rationale:** Prevent extra current due to keeping USB N.C (a known Windstorm Peak issue).
- Keep W\_Disable2# connected to GND.
  - **Rationale:** Keep Bluetooth® in reset.
- Other pinout connection stay the same as in the Wi-Fi and Bluetooth® case.

### 1.2.2 No Intel® AMT

For platforms that do not use Intel® AMT, the CLINK signals should be left not connected on the platform side.

## 1.3 Peak current consumption

Table 1-3 Peak current consumption

Name	Description	Value [mA]	Notes
Peak current	Peak current from 3.3 V supply, including Wi-Fi and Bluetooth®, Averaged over 25 usecase.	1.1A	
	Peak current from 3.3 V supply, including Wi-Fi and Bluetooth®, Averaged over 1 min.	700mA	

## 1.4 M.2 power and ripple limits

The following guideline is an addendum to the M.2 electrical spec regarding power supply rise sequence. The rise time of the power (0 V to 3.3 V) must not exceed 10 mSec, and must not have glitches or ramps. Figure 3-1 shows examples of the correct rise flow.

Figure 3-1 Power supply rise flow



### 3.4.1 Power supply ripples

There must not be a glitch higher than 0.3 V on the power supply. Any glitch that is higher than 0.3 V might be interpreted by the module as a *power-on reset*, which will cause the card to lose stored data and reboot.

During platform low-power modes, such as S3 (stand-by state) glitches, will lead to connection failure.

### 3.4.2 Platform state transitions

Platform designers should carefully design the transition from platform *on* state to platform *stand-by* state and vice versa, so that the power supply will remain stable and have no glitches.

**Table 3-4 M.2 power supply and ripple limits**

Platform Power Rail Requirements	
Power feed Range	3.3 V +/-0.165 V
Power rise time	<10 msec
Maximum ripple	200 mVPP, frequency 10-500 kHz
Allowed power rail noise	300 mVpp

## 1.5 M.2 ground (GND)

All ground pins are connected on the M.2 module to a common ground plane. The platform designer should connect all M.2 GND pins to the platform system GND.



## 2 Mechanical Specifications

**Note:** The module's mechanical specifications adhere to the *PCIe\* M.2 Electromechanical Spec.*

### 2.1 Weight

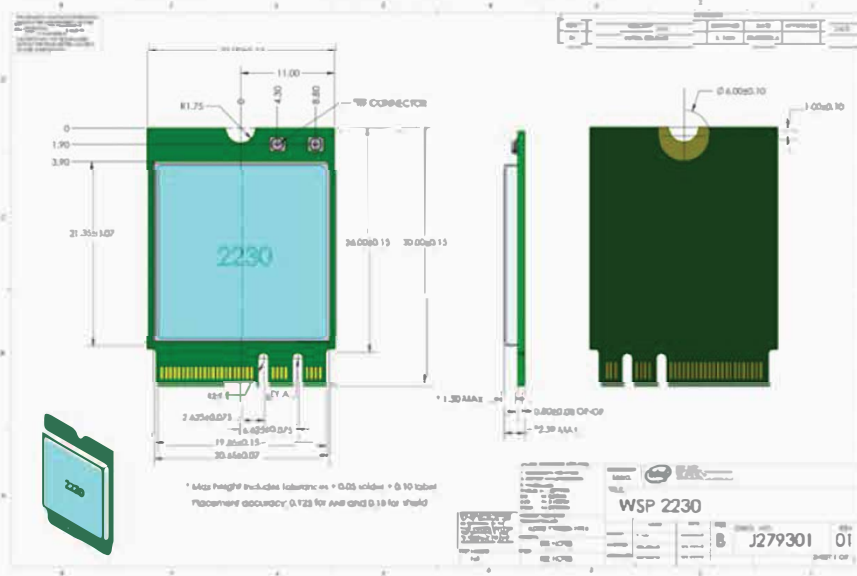
**Table 2-1** Weight of WsP module

Product SKU	Size (mm x mm)	Weight (g)
Windstorm Peak 2230	2230	2.57 +/- 0.02
Windstorm Peak 1216	1216	0.59 +/- 0.01

### 2.2 M.2 2230 mechanical specification

Figure 2-1 shows the dimensions for type 2230.

**Figure 2-1** Windstorm Peak M.2 SKU dimensions (Type 2230 A-E)



Please take attention that changes or modification not expressly approved by the party responsible for compliance 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 equipment complies with FCC/IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

**(1) Operational use conditions**

\*\*\*if your module has professional users use condition limitations, please keep below sentence here Module has professional users use condition limitations, Host product manufacturer please ensure giving such warning like "Product is limited to professional users use" in your product's instruction.

**(2) Antenna used**

Antenna Type	Brand/ manufacturer	Model No.	Max. Antenna Gain
PIFA	Haonuo Electronics Co.,LTD	/	3dBi

**(3) Notice to Host Product Manufacturer**

Any deviation(s) from the defined parameters of the antenna trace, as described by this instruction, host product manufacturer must notify us that you wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by us, or you (host manufacturer) can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

**(4) Labelling Instruction for Host Product Integrator**

Please notice that 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 FCC ID: 2AZSCEC-3816S " any similar wording that expresses the same meaning may be used.

§ 15.19 Labelling requirements shall be complied on end user device.

Labelling rules for special device, please refer to §2.925, § 15.19 (a)(5) and relevant KDB publications. For E-label, please refer to §2.935.

**(5) Installation Notice to Host Product Manufacturer**

The OEM integrator is responsible for ensuring that the end-user has no manual instruction to remove or install module.

The module is limited to installation in mobile application, a separate approval is required for all other operating configurations, including portable configurations with respect to §2.1093 and difference antenna configurations.

**(6) Antenna Change Notice to Host manufacturer**

If you desire to increase antenna gain and either change antenna type or use same antenna type certified, a Class II permissive change application is required to be filed by us, or you (host manufacturer) can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

**(7) FCC other Parts, Part 15B Compliance Requirements for Host product manufacturer**

This modular transmitter is only FCC authorized for the specific rule parts listed on our grant, 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.

Host manufacturer in any case shall ensure host product which is installed and operating with the module is in compliant with Part 15B requirements.

Please note that For a Class B or Class A digital device or peripheral, the instructions furnished the user manual of the end-user product shall include statement set out in §15.105 Information to the user or such similar statement and place it in a prominent location in the text of host product manual. Original texts as following:

**For Class B**

*Note: 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.*

**For Class A**

*Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.*