Radxa CM3I

A Feature Rich Industrial Embedded SoM

Revision 1.2

2023-09-27

Radxa Computer

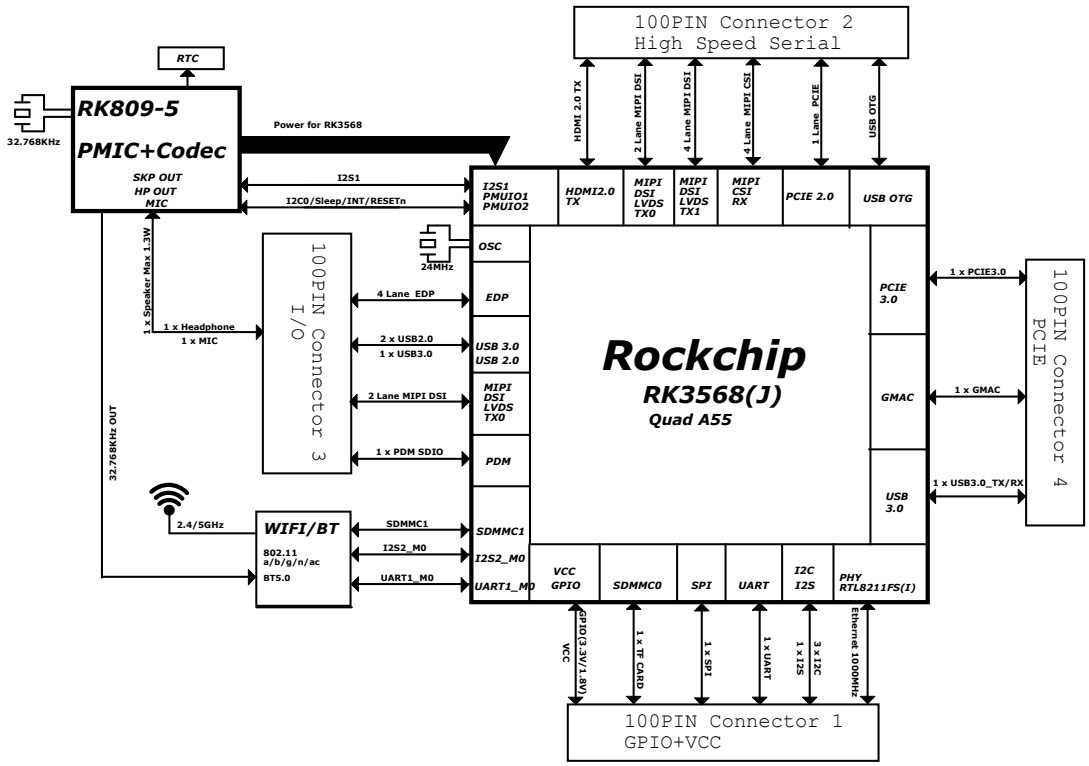
Contents

1 Revision Control Table

Version	Date	Changes from previous version
1.0	24/07/2022	First version
1.1	20/09/2022	Update Images and SKU
1.2	27/09/2023	Update Specification

2 Introduction

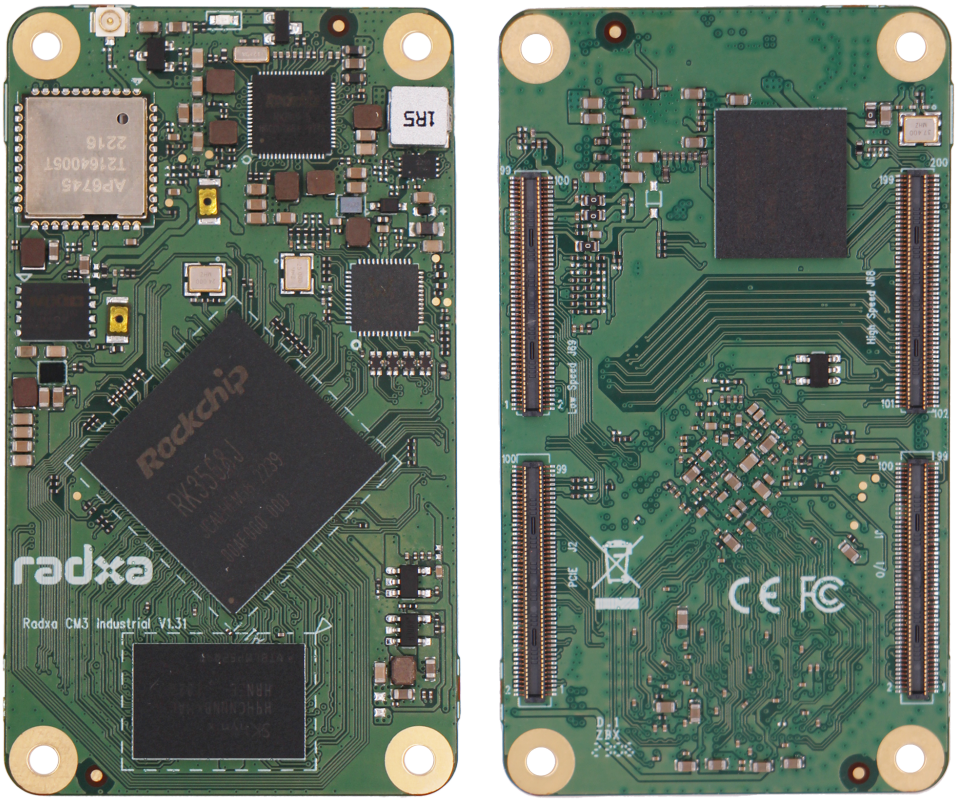
The Radxa CM3I is a System on Module (SoM) based on a the Rockchip RK3568(J) System on Chip (SoC). The Radxa CM3I integrates the Central Process Unit (CPU), Power Management Unit (PMU), DRAM memory, flash storage and wireless connectivity (WiFi 5 and BT 5.0) in a small form factor of just 70mm x 40mm. The Radxa CM3I offers a cost-efficient solution out of the box for many different applications. The figure below shows the CM3I block diagram.



The Radxa CM3I is available in various LPDDR4 RAM and eMMC size configurations, check the Model and SKU section for the specific models.

The Radxa CM3I accelerates the customer’ s product development by providing a powerful SoM in a very small form factor. The customer can quickly put the prototype into production by developing a simple carrier board.

Notice that the carrier board reference design files are provided at Radxa Github. In addition, Radxa offers a CM3I IO board to help customers to quickly show a basic use of the SoM.



3 Specification

Specification	
Form factor:	70 mm × 40 mm
Processor:	Rockchip RK3568(J), Quad core Cortex-A55 (ARM v8) 64-bit SoC @ **2.0GHz**
GPU:	ARM G52-2EE GPU - OpenGL® ES1.1 / 2.0 / 3.0 / 3.1 / 3.2 - OpenCL® 2.1 - Vulkan® 1.1
NPU:	NPU supporting INT8 / INT16 / FP16 / BFP16, computing power is up to 1TOPs@INT8
Memory:	1GB, 2GB, 4GB or 8GB LPDDR4 (depending on variant)
Storage:	Optional 4GB / 8GB / 16GB / 32GB, up to 256GB Onboard eMMC Compatible with eMMC 5.1 1x SPI Flash 1x SDMMC0

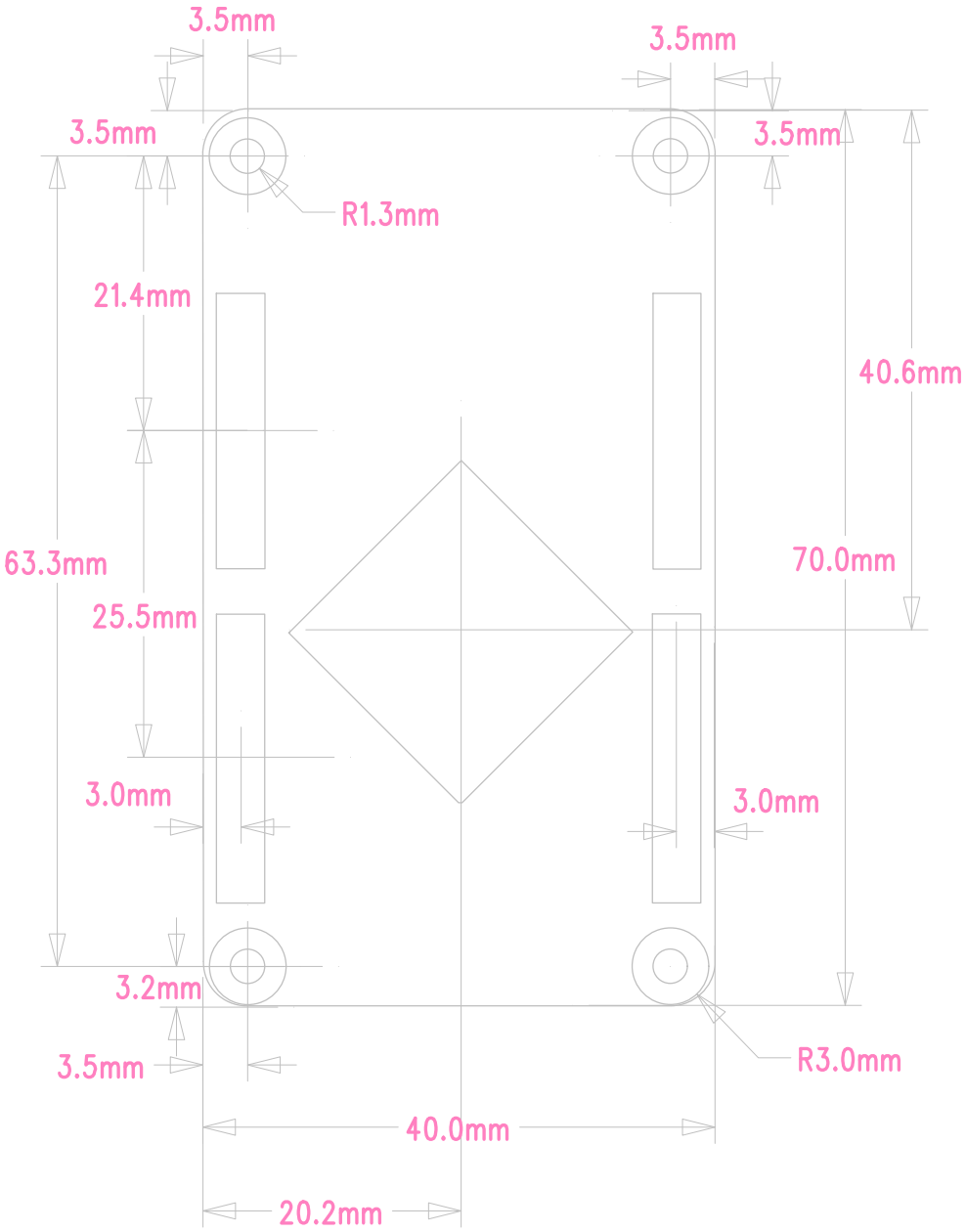
Multimedia:	• VP9 / H.265 / H.264 decode 4K@60fps • H.264 / H.265 encoder 1080pK@60fps
Camera:	• 1x 4-lane MIPI CSI RX or 2x 2-lane MIPI CSI RX • 1x 4-lane MIPI_D/C PHY RX
Display:	• 1x HDMI TX up to 4096X2160@60Hz • 1x eDP four lanes, 2.7Gps per lane • 2x MIPI DSI four lanes, 1.6Gbps per lane • 1x LVDS four lanes(muxed with MIPI DSI0)
Connectivity:	• Optional wireless LAN, 2.4GHz and 5.0GHz IEEE 802.11b/g/n/ac wireless, Bluetooth 5.0, BLE with external antenna support • 1x Onboard Gigabit Ethernet PHY, 1x Gigabit Ethernet MAC • 1x SDMMC2 • 2× USB 2.0 port (highspeed) • 1x USB 3.0 HOST port (5Gbps), 1 x USB 3.0 OTG port (5Gbps) • 1× PCIe2.0 1-lane Host, Gen 2 (5Gbps) • 1x PCIe3.0 2-lane(1x2, 1x1+1x1) Host, Gen 3 (16Gbps) • 3x SATA ports, one shared with USB 3 HOST, one shared with PCIe, one shared with USB 3 OTG • Up to 8x UART • Up to 4x SPI • Up to 2x CAN • Up to 4x I2C
Audio:	• I2S • PDM, support mic array • SPDIF_TX
Input power:	5V DC
Connector	4x 100P 0.4mm pitch B2B connector
Operation temperature	• J0 model(RK3568): 0° to 60° Celsius degree • J1 model(RK3568J): -40° to 85° Celsius degree

4 Software

- Debian/Ubuntu Linux support
- Android 11/12 support

Please check Radxa Download for third party images support.

5 Dimension


3.5mm
3.5mm
3.5mm
3.5mm
R1.3mm
21.4mm
40.6mm
63.3mm
70.0mm
25.5mm
3.0mm
3.0mm
3.2mm
3.5mm
R3.0mm
40.0mm
20.2mm

6 Availability

Radxa guarantees availability Radxa CM3I until at least September 2033.

7 Model and SKU

Operation temperature	Wireless	RAM	eMMC	SKU
0°C to 60°C	No	1G	-	RM118-D1E0J0W0
			8G	RM118-D1E8J0W0
			16G	RM118-D1E16J0W0
			32G	RM118-D1E32J0W0
		2G	-	RM118-D2E0J0W0
			8G	RM118-D2E8J0W0
			16G	RM118-D2E16J0W0
			32G	RM118-D2E32J0W0
		4G	-	RM118-D4E0J0W0
			8G	RM118-D4E8J0W0
			16G	RM118-D4E16J0W0
			32G	RM118-D4E32J0W0
			64G	RM118-D4E64J0W0
			128G	RM118-D4E128J0W0
		8G	-	RM118-D8E0J0W0
			8G	RM118-D8E8J0W0
			16G	RM118-D8E16J0W0
			32G	RM118-D8E32J0W0
			64G	RM118-D8E64J0W0
			128G	RM118-D8E128J0W0
	Yes	1G	-	RM118-D1E0J0W1
			8G	RM118-D1E8J0W1
			16G	RM118-D1E16J0W1
			32G	RM118-D1E32J0W1
		2G	-	RM118-D2E0J0W1
			8G	RM118-D2E8J0W1
			16G	RM118-D2E16J0W1
			32G	RM118-D2E32J0W1
		4G	-	RM118-D4E0J0W1
			8G	RM118-D4E8J0W1
			16G	RM118-D4E16J0W1
			32G	RM118-D4E32J0W1
			64G	RM118-D4E64J0W1
			128G	RM118-D4E128J0W1
		8G	-	RM118-D8E0J0W1
			8G	RM118-D8E8J0W1
			16G	RM118-D8E16J0W1
			32G	RM118-D8E32J0W1
			64G	RM118-D8E64J0W1
			128G	RM118-D8E128J0W1

Operation temperature	Wireless	RAM	eMMC	SKU
-40°C to 85°C	No	1G	-	RM118-D1E0J1W0
			8G	RM118-D1E8J1W0
			16G	RM118-D1E16J1W0
			32G	RM118-D1E32J1W0
		2G	-	RM118-D2E0J1W0
			8G	RM118-D2E8J1W0
			16G	RM118-D2E16J1W0
			32G	RM118-D2E32J1W0
		4G	-	RM118-D4E0J1W0
			8G	RM118-D4E8J1W0
			16G	RM118-D4E16J1W0
			32G	RM118-D4E32J1W0
			64G	RM118-D4E64J1W0
			128G	RM118-D4E128J1W0
		8G	-	RM118-D8E0J1W0
			8G	RM118-D8E8J1W0
			16G	RM118-D8E16J1W0
			32G	RM118-D8E32J1W0
			64G	RM118-D8E64J1W0
			128G	RM118-D8E128J1W0
	Yes	1G	-	RM118-D1E0J1W13
			8G	RM118-D1E8J1W13
			16G	RM118-D1E16J1W13
			32G	RM118-D1E32J1W13
		2G	-	RM118-D2E0J1W13
			8G	RM118-D2E8J1W13
			16G	RM118-D2E16J1W13
			32G	RM118-D2E32J1W13
		4G	-	RM118-D4E0J1W13
			8G	RM118-D4E8J1W13
			16G	RM118-D4E16J1W13
			32G	RM118-D4E32J1W13
			64G	RM118-D4E64J1W13
			128G	RM118-D4E128J1W13
		8G	-	RM118-D8E0J1W13
			8G	RM118-D8E8J1W13
			16G	RM118-D8E16J1W13
			32G	RM118-D8E32J1W13
			64G	RM118-D8E64J1W13
			128G	RM118-D8E128J1W13

8 Support

For support please see the hardware documentation section of the Radxa Wiki website and post questions to the Radxa forum.

FCC WARNING

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.

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 and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

15.105 Information to the user.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

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.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator and your body.

Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

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

The availability of some specific channels and/or operational frequency bands are country dependent and are firmware programmed at the factory to match the intended destination.

The firmware setting is not accessible by the end user.

The final end product must be labelled in a visible area with the following:

“Contains Transmitter Module FCC ID:2BC6T-RADXACM3I”

Requirement per KDB996369 D03

2.2 List of applicable FCC rules

List the FCC rules that are applicable to the modular transmitter. These are the rules that specifically establish the bands of operation, the power, spurious emissions, and operating fundamental frequencies. DO NOT list compliance to unintentional-radiator rules (Part 15 Subpart B) since that is not a condition of a module grant that is extended to a host manufacturer. See also Section 2.10 below concerning the need to notify host manufacturers that further testing is required.3

Explanation: This module meets the requirements of FCC part 15C(15.247).FCC Part 15.407

2.3 Summarize the specific operational use conditions

Describe use conditions that are applicable to the modular transmitter, including for example any limits on antennas, etc. For example, if point-to-point antennas are used that require reduction in power or compensation for cable loss, then this information must be in the instructions. If the use condition limitations extend to professional users, then instructions must state that this information also extends to the host manufacturer's instruction manual. In addition, certain information may also be needed, such as peak gain per frequency band and minimum gain.

Explanation: The EUT only have one FPC antenna, Yes, the module contains a permanently attached antenna, The antenna gain is BT/2.4G WIFI: 1.65dBi, 5G WiFi is 1.41dBi, The conditions of use of the prototype are fixed.

2.4 Limited module procedures

If a modular transmitter is approved as a "limited module," then the module manufacturer isresponsible for approving the host environment that the limited module is used with. The manufacturer of a limited module must describe, both in the filing and in the installation instructions, the alternative means that the limited module manufacturer uses to verify that the host meets the necessary requirements to satisfy the module limiting conditions.

A limited module manufacturer has the flexibility to define its alternative method to address the conditions that limit the initial approval, such as: shielding, minimum signaling amplitude, buffered modulation/data inputs, or power supply regulation. The alternative method could include that the limited module manufacturer reviews detailed test data or host designs prior to giving the host manufacturer approval.

This limited module procedure is also applicable for RF exposure evaluation when it is necessary to demonstrate compliance in a specific host. The module manufacturer must state how control of the product into which the modular transmitter will be installed will be maintained such that full compliance of the product is always ensured. For additional hosts other than the specific host originally granted with a limited

module, a Class II permissive change is required on the module grant to register the additional host as a specific host also approved with the module.
Explanation: The module is a single module.

2.5 Trace antenna designs

For a modular transmitter with trace antenna designs, see the guidance in Question 11 of KDB Publication 996369 D02 FAQ – Modules for Micro-Strip Antennas and traces. The integration information shall include for the TCB review the integration instructions for the following aspects: layout of trace design, parts list (BOM), antenna, connectors, and isolation requirements.

a) Information that includes permitted variances (e.g., trace boundary limits, thickness, length, width, shape(s), dielectric constant, and impedance as applicable for each type of antenna);

b) Each design shall be considered a different type (e.g., antenna length in multiple(s) of frequency, the wavelength, and antenna shape (traces in phase) can affect antenna gain and must be considered);

c) The parameters shall be provided in a manner permitting host manufacturers to design the printed circuit (PC) board layout;

d) Appropriate parts by manufacturer and specifications;

e) Test procedures for design verification; and

f) Production test procedures for ensuring compliance.

The module grantee shall provide a notice that any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify the module grantee that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the grantee, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

Explanation: No, The module has no tracking antenna design, is FPC antenna.

2.6 RF exposure considerations

It is essential for module grantees to clearly and explicitly state the RF exposure conditions that permit a host product manufacturer to use the module. Two types of instructions are required for RF exposure information: (1) to the host product manufacturer, to define the application conditions (mobile, portable – xx cm from a person's body); and (2) additional text needed for the host product manufacturer to provide to end users in their end-product manuals. If RF exposure statements and use conditions are not provided, then the host product manufacturer is required to take responsibility of the module through a change in FCC ID (new application).

Explanation: This module complies with FCC RF radiation exposure limits set forth for an uncontrolled environment, This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body." This module is designed to comply with the FCC statement,
FCC ID: 2BC6T-RADXACM3I

2.7 Antennas

A list of antennas included in the application for certification must be provided in the instructions. For modular transmitters approved as limited modules, all applicable professional installer instructions must be included as part of the information to the host product manufacturer. The antenna list shall also identify the antenna types (monopole, PIFA, dipole, etc. (note that for example an “omni-directional antenna” is not considered to be a specific “antenna type”)).

For situations where the host product manufacturer is responsible for an external connector, for example with an RF pin and antenna trace design, the integration instructions shall inform the installer that unique antenna connector must be used on the Part 15 authorized transmitters used in the host product. The module manufacturers shall provide a list of acceptable unique connectors.

Explanation: The EUT only have one FPC antenna, Yes, the module contains a permanently attached antenna, The antenna gain is BT/2.4G WIFI: 1.65dBi, 5G WiFi is 1.41dBi

2.8 Label and compliance information

Grantees are responsible for the continued compliance of their modules to the FCC rules. This

includes advising host product manufacturers that they need to provide a physical or e-label stating “Contains FCC ID” with their finished product. See Guidelines for Labeling and User Information for RF Devices – KDB Publication 784748.

Explanation: The host system using this module, should have label in a visible area indicated the following texts: "Contains FCC ID: 2BC6T-RADXACM3I

2.9 Information on test modes and additional testing requirementss

Additional guidance for testing host products is given in KDB Publication 996369 D04 Module Integration Guide. Test modes should take into consideration different operational conditions for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.

The grantee should provide information on how to configure test modes for host product evaluation for different operational conditions for a stand-alone modular transmitter in a host, versus with multiple, simultaneously transmitting modules or other transmitters in a host.

Grantees can increase the utility of their modular transmitters by providing special means, modes, or instructions that simulates or characterizes a connection by enabling a transmitter. This can greatly simplify a host manufacturer’s determination that a module as installed in a host complies with FCC requirements.

Explanation: WiFiRanger, A LinOra Company can increase the utility of our modular transmitters by providing instructions that simulates or characterizes a connection by enabling a transmitter.

2.10 Additional testing, Part 15 Subpart B disclaimer

The grantee should include a statement that the modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) 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. If the grantee markets their product as being Part 15

Subpart B compliant (when it also contains unintentional-radiator digital circuity), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

Explanation: The host shoule be evaluated by the FCC Subpart B.

This product uses FPC antenna, with a maximum antenna gain is BT/2.4G WIFI: 1.65dBi, 5G WiFi is 1.41dBi