

User Manual

Radxa Dragon Q6A

Model: RS701

Document Version: UM-1.0

Product: Radxa Dragon Q6A (RS701)

Document Class: Product usage instructions and FCC compliance statements

Document Information

1. Revision History

Version	Date	Description
UM-1.0	Initial release	First issue. Includes product description, interface description, operating instructions and FCC compliance statements.

2. Document Scope

This manual applies to the Radxa Dragon Q6A single board computer (Model: RS701). It describes the functional blocks, external interfaces and basic operation of the product, and provides the FCC radio and electromagnetic compatibility statements. This manual is supplied to the end user together with the product and forms part of the host product compliance documentation.

3. Terminology and Sources

Item	Description
SoC naming	The main processor is designated QCS6490 in the product block diagram. Some schematic sheet names use the form QCM6490. This manual consistently uses QCS6490 for the processor platform.
Wireless module FCC ID	2BC6T-RS701
Specification basis	All specifications listed in this manual follow the final production configuration and the corresponding test reports.

4. Table of Contents

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1. Safety Instructions

Read and observe the following safety requirements before using this product. Failure to comply may result in equipment damage, data loss or personal injury.

1.1 Power Requirements

- This product is powered through the USB Type-C port or the 12V DC input connector. The rated input is 12V DC.
- Power supply requirement: 12V DC; minimum 18 W (12V/1.5A), and not less than 24 W (12V/2A) when USB 3.1 and PCIe peripherals are fully loaded.
- Use a power adapter that meets local safety certification requirements and provides sufficient output capability. An under-rated adapter may cause repeated system restarts or damage to the storage media.
- Do not use a power source whose output voltage exceeds the rated value, and do not reverse the supply polarity.

1.2 Electrostatic Discharge (ESD) Protection

- This product is supplied as a bare circuit board and is sensitive to electrostatic discharge. Discharge your body before handling it; wearing an anti-static wrist strap or first touching a grounded metal object is recommended.
- Do not touch the chip pins, connector contacts or board-mounted components directly with your hands.

1.3 Temperature and Cooling

- The main processor generates significant heat under high load. Do not operate at full load for extended periods in a closed or high-temperature environment.
- For prolonged high-load operation, install a heat sink or fan.
- Operating temperature range: 0 ~ 60 °C (ambient).

1.4 Wireless and Antenna

- The wireless function is provided by an on-board Wi-Fi / Bluetooth module operating in the 2.4 GHz and 5 GHz bands, with antennas connected through the on-board RF ports.
- Use only the approved antenna types and connection methods consistent with the module certification. Unauthorized changes to the antenna type, gain or routing may cause RF parameters to exceed limits and void the certification.
- To satisfy RF exposure requirements, a minimum separation distance of 20 cm must be maintained between the radiator and the human body during installation and operation.

1.5 Operation and Maintenance

- Insert or remove the memory card, camera and display cables only with the power disconnected.
- Do not install or remove the heat sink, or short-circuit any circuit node, while the product is powered.

- Do not place the product in a damp, dusty, flammable, explosive or strongly electromagnetically disturbed environment.
- This product is a development and evaluation single board computer without a complete enclosure and is not suitable for use in locations accessible to children.

1.6 Compliance Notice

- 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 is restricted for use only with certified wireless modules and approved antenna configurations.

2. Product Overview

2.1 Introduction

The Radxa Dragon Q6A (RS701) is a single board computer based on the QCS6490 platform. It integrates memory, storage, display, camera, Gigabit Ethernet, wireless connectivity, audio and extensive expansion interfaces, and is intended for embedded development, edge computing, intelligent terminals and multimedia applications.

2.2 Board View

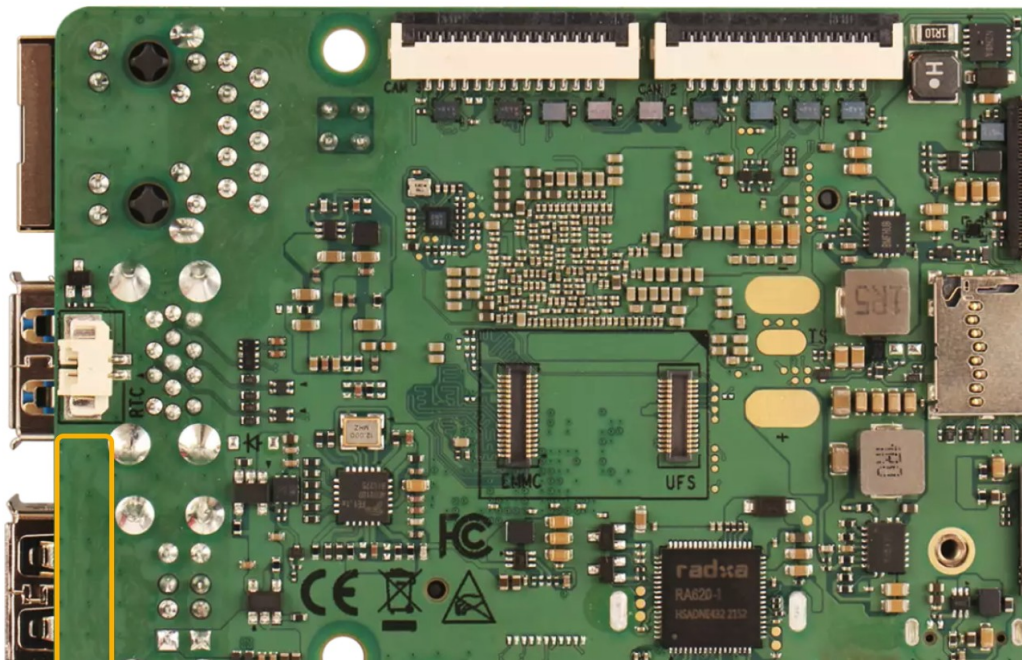


Figure 2-1 Board top view (label position refers to the accompanying Label & Label Location drawing)

2.3 Main Specifications

Item	Specification
Product name	Radxa Dragon Q6A
Model	RS701
Main processor	QCS6490
Memory	LPDDR5, 32-bit; available capacities: 4 GB / 6 GB / 8 GB / 12 GB / 16 GB
Storage	eMMC module: 16 GB / 32 GB / 64 GB; UFS module: 128 GB / 256 GB / 512 GB
Power input	12V DC (USB Type-C input or 12V connector input)
Power supply requirement	12V DC; minimum 18 W (12V/1.5A), recommended ≥ 24 W (12V/2A) under full load
Ethernet	Gigabit Ethernet $\times 1$ (10/100/1000 Mbps, RTL8125B controller, PCIe interface)
Wireless	Wi-Fi 6 (IEEE 802.11 a/b/g/n/ac/ax), dual band 2.4 GHz / 5 GHz, and Bluetooth 5.4,

	connected to the main processor through a USB 2.0 interface; FCC ID: 2BC6T-RS701
Antenna ports	J4 (ANT_WIFI/BT), J9 (ANT_BT)
Display output	HDMI ×1 (RA620, DP to HDMI), 4-lane eDP, 4-lane MIPI DSI
USB	USB 3.1 OTG Type-A ×1, USB 2.0 HOST Type-A ×3 (FE1.1S hub), USB Type-C (12V power input)
Camera	CAM1 / CAM2 / CAM3, 3 ports total (1× 4-lane MIPI CSI + 2× 2-lane MIPI CSI); connectors J7 / J14 / J16
Expansion	M.2 M-Key 2230 (PCIe Gen3 ×2), 40-pin GPIO (SPI / GPIO / I ² C, 2.54 mm)
Memory card	TF card slot (SDIO 3.1)
Audio	WCD9380 audio codec, supports headphone and microphone array
Real-time clock	RS4C411ZAE with 32.768 kHz crystal
Operating temperature	0 ~ 60 °C (ambient)

3. Interfaces

The following table lists the external interfaces of the product together with their main purpose and associated devices. Interface positions are indicated by the board silkscreen and the accompanying Label & Label Location drawing.

Interface	Associated device / bus	Description
Power input (USB Type-C / 12V connector)	CH224D, SY81012VDC	System power input. The Type-C path negotiates power through a protocol IC and steps down to provide the main system supply.
HDMI	RA620 (DP 2-lane to HDMI)	Connects an HDMI monitor or television and outputs audio and video.
USB 3.1 OTG Type-A ×1	USB0 3.0	Supports host/device modes; usable for firmware download, ADB/EDL debugging and data transfer.
USB 2.0 HOST Type-A ×3	FE1.1S 4-port hub (USB1 2.0)	Connects keyboards, mice, USB flash drives and similar peripherals.
RJ45 Ethernet	RTL8125B (PCIe Gen3 ×1)	Gigabit Ethernet connection (10/100/1000 Mbps).
Antenna ports J4 / J9	Wireless module RF ports	J4 corresponds to ANT_WIFI/BT and J9 to ANT_BT, used to connect the supplied antennas.
M.2 M-Key 2230	PCIe Gen3 ×2	Accepts an M.2 2230 expansion module.
CAM1 / CAM2 / CAM3 (connectors J7 / J14 / J16)	MIPI CSI (1× 4-lane, 2× 2-lane)	Connects MIPI camera modules; 3 ports in total.
eDP display interface	4-lane eDP	Connects an eDP LCD panel.
MIPI display interface	4-lane MIPI DSI	Connects a MIPI DSI LCD panel.
40-pin GPIO	SPI / GPIO / I ² C	2.54 mm header for peripheral expansion and debugging.
TF card slot	SDIO 3.1	Accepts a TF memory card for storage expansion and boot medium detection.
Headphone / microphone	WCD9380 (SoundWire)	Audio input and output.

3.1 Boot and Storage

- The product supports booting from multiple media. The boot priority is: USB > microSD > NVMe SSD > eMMC module > UFS module.
- When the button is used to enter forced download mode, the device enters USB boot mode, in which firmware download and USB boot have the highest priority and other boot modes are disabled.
- Insert or remove the TF card only with the power disconnected.

4. Crystals and Clock Configuration

The board uses four discrete crystals. Their designators, frequencies and associated circuits are listed below. This table is consistent with the product schematic and describes the clock source configuration of the product.

Designator	Frequency	Associated circuit / purpose
Y1	32.768 kHz	Real-time clock (RTC), used with RS4C411ZAE
Y2	25 MHz	Gigabit Ethernet controller RTL8125B
Y3	12 MHz	USB 2.0 hub controller FE1.1S
Y4	76.8 MHz	System power management IC PMK7325

Note: the four crystals listed above are all the discrete crystals on the board. Their

quantity, designators and frequencies are fully consistent with the product schematic.

5. Installation and Use

5.1 Unpacking Inspection

- Confirm the package contents: main board ×1 and quick start guide ×1.
- Inspect the board for physical damage and confirm that connectors, headers and components are not deformed or detached.
- If damage is found, do not apply power and contact your supplier.

5.2 Connecting Peripherals

1. Connect an HDMI monitor to the HDMI connector, or connect an LCD panel cable to the eDP / MIPI DSI connector.
2. Connect a keyboard and mouse to the USB ports.
3. For wired networking, connect a network cable to the RJ45 Ethernet connector (10/100/1000 Mbps).
4. For wireless operation, connect the supplied antennas to the J4 / J9 RF ports. Connect antennas only with the power disconnected.
5. For additional storage, insert a TF card or install an M.2 2230 module.

5.3 Power-On and Boot

1. Connect the power adapter to the USB Type-C connector or the 12V input connector.
2. The system boots automatically once power is applied. Do not disconnect power or plug or remove peripherals during the power-on sequence.
3. Boot messages can be displayed through the HDMI output.
4. If the system does not boot, refer to Chapter 6 for troubleshooting.

5.4 Software and Firmware Updates

- Refer to the software documentation supplied with the product or the official distribution channel for obtaining and flashing firmware and system images.
- Keep the power supply stable while updating firmware; a power interruption may prevent the device from booting.
- The RF parameters of the wireless module are programmed at the factory to match the target sales region and cannot be modified by the end user.

5.5 Shutdown

- Perform a normal shutdown through the operating system.
- Disconnect the power only after the system has fully stopped.
- Do not disconnect power while the system is running or data is being written.

6. Maintenance and Troubleshooting

6.1 Routine Maintenance

- Periodically remove dust from the board and heat sink surface. Always disconnect power and discharge static electricity before cleaning.
- Use anti-static packaging for storage and avoid heavy pressure, bending and damp environments.
- Do not clean the board with organic solvents.

6.2 Troubleshooting

Symptom	Possible cause	Action
No response after power is applied	Insufficient adapter output; faulty power connection	Replace with a compliant 12V adapter and check that the connector is firmly seated.
System repeatedly restarts	Insufficient power; overheating due to inadequate cooling	Replace the adapter; improve cooling and retest.
No display output	Display or cable connection problem; mismatched display interface	Reseat the HDMI or display cable; confirm the display device matches the interface used.
USB peripheral not recognized	Insufficient peripheral power; hub port conflict	Use a different USB port; use an externally powered hub.
Wireless function unavailable	Antenna not connected; wireless function not enabled	Confirm J4 / J9 antenna connections are reliable and check the wireless switch and driver status in the system.
TF card / M.2 module not recognized	Inserted or removed while powered; module specification does not match the interface	Reseat with the power disconnected; confirm the module specification matches the interface.
Clock or time is not retained	RTC backup power not connected	Check the RTC backup battery or supercapacitor connection.

6.3 After-Sales and Technical Support

If the problem persists after the steps above, contact technical support and provide the product model, the observed symptom and the operating environment.

Technical support email: support@radxa.com

7. FCC Compliance Statements

7.1 FCC WARNING

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.

7.2 15.105 Information to the user — 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.

7.3 Test Modes and Additional Testing Requirements

The wireless module integrated in this device is authorized only for certain FCC rule parts. FCC rules outside the scope of the module grant, including the Part 15 Subpart B requirements for unintentional radiators, are the responsibility of the host product manufacturer. When this device is used as a finished product, a Part 15 Subpart B compliance evaluation must still be completed with the wireless module installed.

8. RF Exposure Statement

Radiation Exposure Statement:

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.

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.

This module is designed to comply with the FCC statement, FCC ID: 2BC6T-RS701.

8.1 Antenna Requirements

- Only antenna types, connection methods and mounting positions approved by the module certification may be used.
- Antennas are connected through the on-board RF ports J4 (ANT_WIFI/BT) and J9 (ANT_BT). The antenna routing, connector type and antenna gain must not be changed without authorization.
- Any change to the antenna configuration must be evaluated by the module grantee and the corresponding change procedure must be followed.

9. Wireless Module Warning Statements, Integration and Labeling

9.1 Applicable Rules

The wireless module integrated in this product meets the requirements of FCC Part 15C (15.247).

9.2 Module Warning Statements

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.

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.

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

FCC ID: 2BC6T-RS701

9.3 Operating Conditions

- The module communicates with the main processor through a USB 2.0 interface.
- The module is used only with the supplied antennas, which are connected through the on-board RF ports.
- The use condition is mobile (a separation distance of at least 20 cm between the device and the human body).
- The module must not be co-located or operated in conjunction with any other antenna or transmitter.

9.4 Labeling and Compliance Information

The finished product incorporating this module must display the following in a visible location, as a physical label or an e-label:

Contains FCC ID: 2BC6T-RS701

- The marking must be applied to an external surface or a user-visible area of the finished product. The specific position is shown in the accompanying Label & Label Location drawing.
- The marking must be legible, firmly affixed and resistant to wear so that it remains identifiable over the expected service life of the product.
- If the finished product cannot carry the marking directly, the information must be provided in the user manual and on the product packaging or an e-label.

9.5 Additional Host Product Testing Requirements

- The final host product must still complete a Part 15 Subpart B compliance evaluation with the wireless module installed.
- During host integration it is recommended to perform RF design evaluation and testing in accordance with the module integration guide, to avoid limit exceedances caused by non-linear effects arising from module placement relative to host components.
- Where simultaneous transmission of multiple transmitters must be evaluated, compliance must be confirmed in accordance with the applicable requirements.

9.6 Changes and Contact

Permissive changes to the module may only be made by the grantee. To change the module operating conditions or integration method, contact the module grantee:

Technical support email: support@radxa.com

11. Requirement per KDB996369 D03

11.1 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 11.9 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).

11.2 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: Yes, the module contains 2 IPEX connected antenna with a maximum antenna gain of 2.4GHz:1.47dBi, 5.1GHz:1.51dBi, 5.8GHz:1.39dBi

11.3 Limited module procedures

If a modular transmitter is approved as a "limited module," then the module manufacturer is responsible 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.

11.4 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.

11.5 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-RS701

11.6 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: Yes, the module contains 2 IPEX connected antenna with a maximum antenna gain of 2.4GHz:1.47dBi, 5.1GHz:1.51dBi, 5.8GHz:1.39dBi

11.7 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-RS701"

11.8 Information on test modes and additional testing requirements

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:Radxa Dragon Q6A , Radxa can increase the utility of our modular transmitters by providing instructions that simulates or characterizes a connection by enabling a transmitter.

11.9 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 circuitry), 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 module is only FCC authorized for the specific rule parts listed on the grant. The OEM integrator is responsible for testing their end-product for any additional compliance requirements required with this module installed. If the final product contains circuits of other FCC PART 15 Subparts, the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

11.10 Note EMI Considerations

Note that a 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

For standalone mode, reference the guidance in D04 Module Integration Guide and for simultaneous mode⁷; see D02 Module Q&A Question 12, which permits the host manufacturer to confirm compliance.

Explanation: The customer is an independent module and has been implemented in accordance with D04.

11.11 How to make changes

Since . only Grantees are permitted to make permissive changes, it is recommended that module manufactures provide contact information and some guidance to host providers in the integration instructions if they expect their module will be used differently than granted.

Explanation: Contact Information: We have provided our technical support contact (email:support@radxa.com) for host manufacturers to reach us regarding any proposed changes to the module's operational conditions or integration method.

— End of manual —