Version:	V1.50
Title:	Freeballooning Wireless Module Manual
Subtitle	Manual for FCC compliance for Wireless Module

This document serves as a manual with FCC requirements for the freeballooning wireless module. Additional details on system operation can be found in the “DOC_00xxx_EDM Freeballooning Wireless System Theory of Operation Version 1.01a”

Version	Date	Notes
1.00	01/11/2023	Initial Release
1.10	02/20/2023	Updated sections on antennas, rf connections, module labeling, testing specifications
1.20	05/01/2023	Added details on antenna installation to justify lack of unique connectors
1.30	06/10/2023	Added more details on module labeling and antenna installation. Added cover letter requesting professional installation
1.40	06/25/2023	Added details on RF exposure, and collocation of antennas

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1. Applicable FCC Rules:

1.1. FCC Part 15 Subpart C, Section 15.247.

2. Operational Use Conditions (if applicable):

2.1. There is no power supply on the module and so the carrier board must have a conditioned power supply that meets the following specifications:

2.1.1. Input power shall be conditioned DC where transients induced in the system or by lightning are handled by the carrier board.

2.1.2. The operating voltage shall be +3VDC to +3.6VDC.

2.1.3. The maximum transient voltage supplied to device shall be no more than 4.1V for <10 milliseconds. 80% derating for 3.3V, upper bound

2.1.4. The minimum transient voltage supplied to device shall be no less than 2.6V for <10 milliseconds. 80% derating for 3.3V, lower bound

2.2. All IOs that are exposed to the carrier board are not protected via buffering or isolation in any way. The carrier board must ensure proper buffering and isolation is provided to signals that are routed from the board-board connector to the carrier board. Unused IO should be left open circuited.

2.3. Only use certified antennas described in this document and LTA Research and Exploration defined installation teams and processes when installing a module + RF cabling + RF antenna in an end application.

3. RF Exposure, Radio Collocation, and Installation Restrictions:

3.1. Use of this module is not authorized for portable configurations

3.2. Integration of the module into any enclosure requires approval of LTA

3.3. This module is approved only for integration into specific enclosures where separation distance between antennas and users is >20cm

3.4. Minimum installation distance between antennas of this system and other systems is 4.5m. This module is not approved for collocation with other radios; separate authorization may be required when module antennas are located near other antennas of other transmitters which operate simultaneously

4. Antennas Approved for Use with this Module:

Approved antennas list:

Manufacturer	*Antenna*	*Description*	*Type*	*Peak Gain (dBI)*	*Impedance (Ω)*	*Connector Type*	*Notes*
TE Connectivity	TRAB8903N	Phantom Radome	Omnidirectional	3	50	NMO	1
TE Connectivity	TRAB8903NP	Phantom Radome	Omnidirectional	3	50	N-TYPE	2

Notes:

1. Antenna was tested for compliance.
2. Antenna is approved by similarity with equivalent or lesser gain

5. Module RF Connector Information

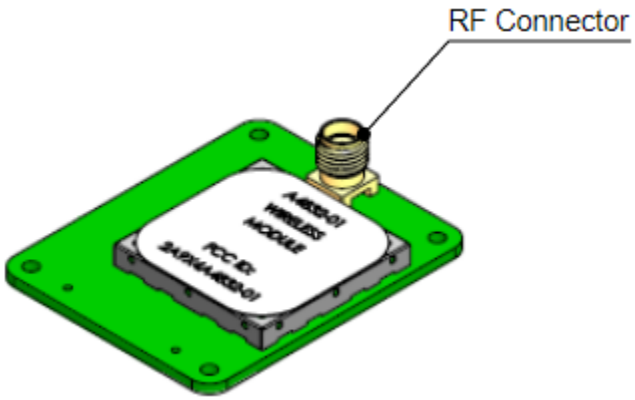

Figure 1: Module RF Connector

5.1. Connector Type: Surface Mount SMA Jack; Female Socket
5.2. Manufacturer: Amphenol RF
5.3. Manufacturer P/N: 132134-10

6. Module Cabling

6.1. Cabling is not sufficiently long at any location to require additional power output to compensate
6.2. Module will connect to the following cabling
  6.2.1. Internal harness:
    6.2.1.1. Type: RG195 Coaxial Cable
    6.2.1.2. Quantity: 10 Locations
  6.2.2. External Harness
    6.2.2.1. Type: RG142 Coaxial Cable
    6.2.2.2. Quantity: 1 Location

6.2.3. A statement signifying “the device, antenna assembly, and the antenna are not to be removed or handled by individuals unapproved by LTA” shall be clearly visible on the outside of the enclosure.
6.2.4. End product will only be accessed and/or removed by a Licensed A&P.
6.2.5. If the antenna needs to be removed, the same procedures for installing will be used to track name and time.

7. Label and Compliance Information

7.1. The module must be properly labeled with the text “FCC ID: 2A9X4A4832-01”
7.1.1. Module label design and dimensions are given in Figure 2
7.1.2. Module label location on module is given in Figure 3
7.2. The following statements must be included on the exterior of the finished product
7.2.1. “Contains FCC ID: 2A9X4A4832-01”
7.2.2. *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 any interference that may cause undesired operation.*
7.2.3. External label design and dimensions are given in Figure 4
7.2.4. External label location on module is given in Figure 5

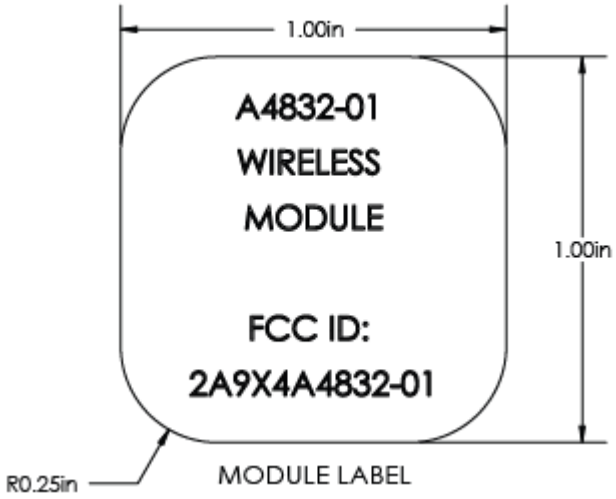

Figure 2: Module Label

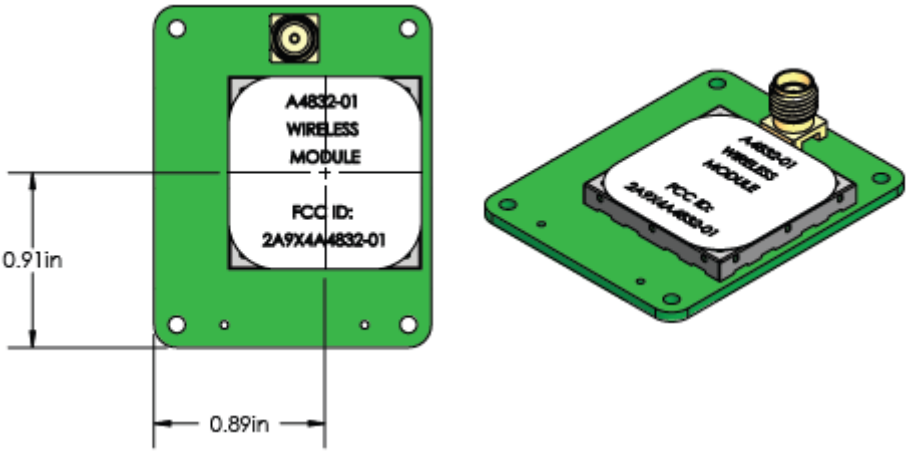

Figure 3. Module Label Location

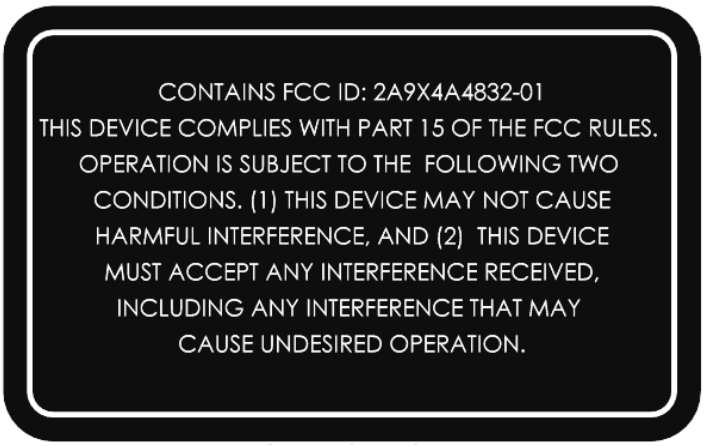

Figure 4. External Product Label

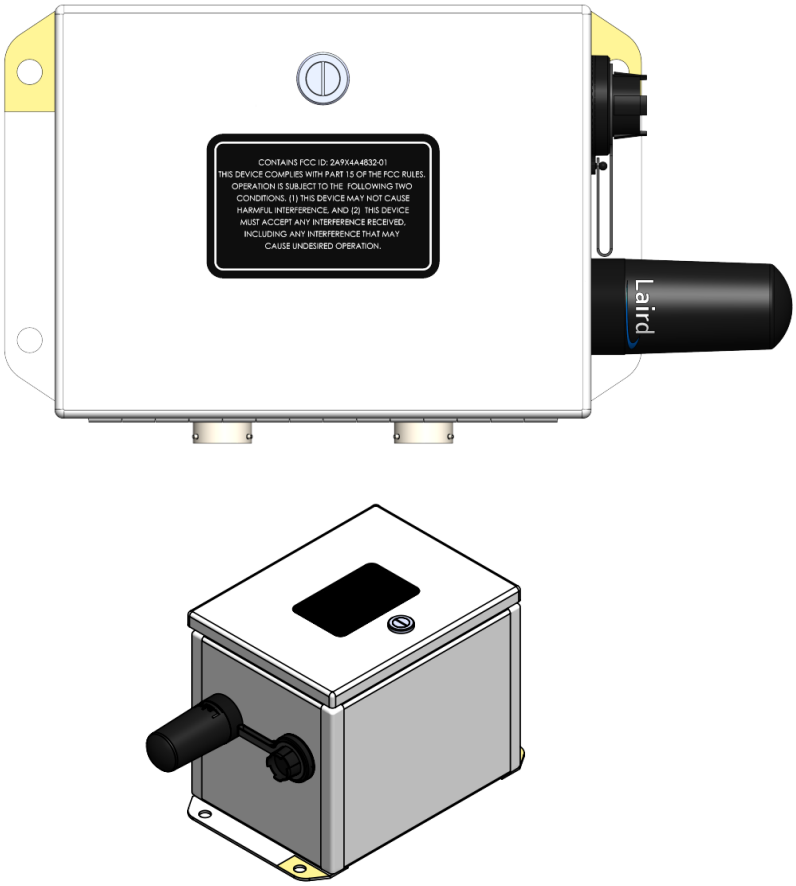

Figure 5. External Product Location

8. Manual Statements

8.1. The product contains FCC ID: 2A9X4A4832-01

8.2. 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 expense.

8.3. Class A Justification

8.3.1. This module is not intended for any sale to the general public. It is not intended for use in the home. This module is intended to be used by only LTA Research LLC. Therefore, Class A designation is justified.

9. Information on test modes and additional testing requirements

9.1. The modular transmitter has been fully tested by the original module certification holder (LTA Research and Exploration, LLC, grantee code 2A9X4) on the required number of channels, modulation types, and modes. It should not be necessary for the host installer to re-test all the available transmitter modes or settings. It is recommended that the host product manufacturer (the installer of the modular transmitter) perform some investigative measurements to confirm that the resulting composite system does not exceed the spurious emissions limits or band edge limits.

9.2. The testing should check for emissions that may occur due to the intermixing of emissions with the other transmitters, digital circuitry, or due to physical properties of the host product (enclosure). This investigation is especially important when integrating multiple modular transmitters where the certification is based on testing each of them in a stand-alone configuration. It is important to note that host product manufacturers should not assume that because the modular transmitter is certified that they do not have any responsibility for final product compliance.

9.3. If the investigation indicates a compliance concern, the host product manufacturer is obligated to mitigate the issue. Host products using a modular transmitter are subject to all the applicable individual technical rules as well as to the general conditions of operation in Sections 15.5, 15.15, and 15.29 to not cause interference. The operator of the host product will be obligated to stop operating the device until the interference has been corrected.

10. Additional testing, Part 15 subpart B disclaimer

The final host/module combination must be evaluated against the FCC Part 15B for unintentional radiators, in order to be properly authorized for operation as a Part 15 digital device.

The host integrator installing this module into their product must ensure that the final

composite product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operation and should refer to guidance in KDB 996369. For host products including a certified modular transmitter, the frequency range of investigation of the composite system is specified by rule in Sections 15.33(a)(1) through (a)(3), or the range applicable to the digital device, as shown in Sections 15.33(b)(1), whichever is the higher frequency range of investigation.

When testing the host product, all the transmitters must be operating. The transmitters can be enabled by using publicly available drivers and turned on, so the transmitters are active. In certain conditions, it might be appropriate to use a technology-specific call box (test set) where accessory 50 devices or drivers are not available. When
testing for emissions from the unintentional radiator, the transmitter shall be placed in the receive mode or idle mode, if possible. If receive-mode only is not possible, then the radio shall be passive (preferred) and/or active scanning. In these cases, this would need to enable activity on the communication BUS (i.e., PCIe, SDIO, USB) to ensure the unintentional radiator circuitry is enabled. Testing laboratories may need to add attenuation or filters depending on the signal strength of any active beacons (if applicable) from the enabled radio(s).

The product under test is set into a link/association with a partnering device, as per the normal intended use of the product. To ease testing, the product under test is set to transmit at a high duty cycle, such as by sending a file or streaming some media content.

11. FCC Warning

11.1. Note: This warning will also be included in the finished product manual

WARNING: The Federal Communications Commission warns that changes or modifications of the radio module within this device not expressly approved by LTA Research and Exploration, LLC could void the user's authority to operate the equipment.

Any changes or modifications 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.