Mario de Aranzeta
Engineer
Timco Engineering Inc.

To: Steve Dayhoff
email: sdayhoff@fcc.gov

Re: FCC ID MQXB900SS-500
Ref # 21428
731 Confirm #: EA102749

1. Please describe how the device meets the Modular Transmitter definition as explained in FCC Public Notice DA 00-1407 dated June 26, 2000.

I've attached page 2, 3, and 4 of this note which supplements the information submitted with the test report
(page 4).

2. Please provide RF Exposure MPE calculations for each of the 3 antennas tested. Give the dBi gain and description for each antenna type.

I've included these as pages 5, 6, and 7 attached.

Sincerely,

Mario de Aranzeta
Timco Engineering

a) In order to be considered a transmitter module, the device must be a complete RF transmitter, i.e., it must have its own reference oscillator (e.g., VCO), antenna, etc. The only connectors to the module, if any, may be power supply and modulation/data inputs.

This module is a complete transceiver and has a permanently attached antenna. The only connector has power and data I/O combined on it.

b) Compliance with FCC RF Exposure requirements may, in some instances, limit the output power of a module and/or the final applications in which the approved module may be employed.

See MPE calculations on following pages.

1. The modular transmitter must have its own RF shielding. This is intended to ensure that the module does not have to rely upon the shielding provided by the device into which it is installed in order for all modular transmitter emissions to comply with Part 15 limits. It is also intended to prevent coupling between the RF circuitry of the module and any wires or circuits in the device into which the module is installed. Such coupling may result in non-compliant operation.

The module makes use of two RF shields one over the VCO and a second over the entire top (component side) of the module. The bottom shielding is accomplished by the ground plane of the bottom layer of the PCB.

2. The modular transmitter must have buffered modulation/data inputs (if such inputs are provided) to ensure that the module will comply with Part 15 requirements under conditions of excessive data rates or over-modulation.

The microprocessor has buffered I/O lines see exhibits 8a and 8b for data sheets from the manufacturer.

3. The modular transmitter must have its own power supply regulation. This is intended to ensure that the module will comply with Part 15 requirements regardless of the design of the power supplying circuitry in the device into which the module is installed.

U10 and U11 are on board regulator IC's. See schematics.

4. The modular transmitter must comply with the antenna requirements of Section 15.203 and 15.204(c). The antenna must either be permanently attached or employ a "unique" antenna coupler (at all connections between the module and the antenna, including the cable). Any antenna used with the module must be approved with the module, either at the time of initial authorization or through a Class II permissive change. The "professional installation" provision of Section 15.203 may not be applied to modules.

The module is being sold with one of three antennas that will be permanently attached.

5. The modular transmitter must be tested in a stand-alone configuration, i.e., the module must not be inside another device during testing. This is intended to demonstrate that the module is capable of complying with Part 15 emission limits regardless of the device into which it is eventually installed. Unless the transmitter module will be battery powered, it must comply with the AC line conducted requirements found in Section 15.207. AC or DC power lines and data input/output lines connected to the module must not contain ferrites, unless they will be marketed with the module (see Section 15.27(a)). The length of these lines shall be length typical of actual use or, if that length is unknown, at least 10 centimeters to insure that there is no coupling between the case of the module and supporting equipment. Any accessories, peripherals, or support equipment connected to the module during testing shall be unmodified or commercially available (see Section 15.31(i)).

The module was tested stand alone. The module uses no ferrites on its power or I/O lines. It is not being marketed with ferrites. See test setup photo.

6. The modular transmitter must be labeled with its own FCC ID number, and, if the FCC ID 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 Transmitter Module FCC ID: XYZMODEL1" or "Contains FCC ID: XYZMODEL1." Any similar wording that expresses the same meaning may be used. The Grantee may either provide such a label, an example of which must be included in the application for equipment authorization, or, must provide adequate instructions along with the module which explain this requirement. In the latter case, a copy of these instructions must be included in the application for equipment authorization.

A copy of the label is included as one of the exhibits.

7. The modular transmitter must comply with any specific rule or operating requirements applicable to the transmitter and the manufacturer must provide adequate instructions along with the module to explain any such requirements. A copy of these instructions must be included in the application for equipment authorization. For example, there are very strict operational and timing requirements that must be met before a transmitter is authorized for operation under Section 15.231. For instance, data transmission is prohibited, except for operation under Section 15.231(e), in which case there are separate field strength level and timing requirements. Compliance with these requirements must be assured.

A copy of the users manual is included with the test report. This module is a 15.247 device and the test report data and users manual contains any and all timing or other requirements.

The modular transmitter must comply with any applicable RF exposure requirements. For example, FCC Rules in Sections 2.1091, 2.1093 and specific Sections of Part 15, including 15.319(i), 15.407(f), 15.253(f) and 15.255(g), require that Unlicensed PCS, UNII and millimeter wave devices perform routine environmental evaluation for RF Exposure to demonstrate compliance.

In addition, spread spectrum transmitters operating under Section 15.247 are required to address RF Exposure compliance in accordance with Section 15.247(b)(4). Modular transmitters approved under other Sections of Part 15, when necessary, may also need to address certain RF Exposure concerns, typically by providing specific installation and operating instructions for users, installers and other interested parties to ensure compliance.

On following pages are the MPE calculations.

RF EXPOSURE STATEMENT

Notice in Installation Manual:

FCC Radiation Exposure Statement

This device is a low power transceiver. When the device is in use it sends out radio frequency (RF) signals. In August 1996, the Federal Communications Commission (FCC) adopted RF exposure guidelines with safety levels for wireless devices. This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment, when installed as directed. This equipment should be installed and operated with fix-mounted antennas that are installed with a minimum of 21 centimeters of separation distance between the antenna and all persons' body during normal operations.

RF Exposure Calculations:

The following information provides the **minimum** separation distance for the highest gain antenna provided with **the Adcon Telemetry MQXB900SS-500**, as calculated from **FCC OET 65 Appendix B, Table 1B** Guidelines for General Population/Uncontrolled Exposure. This calculation is based on the highest EIRP possible from the system, considering maximum power and antenna gain, and considering a 0.61 mW/cm^2 uncontrolled exposure limit.

Antenna Information:

Manufacturer:	Cushcraft	Frequency Range:	896-980MHz
Model:	PC904N	Gain:	6dBd
Type:	4 element Yagi		

$$R = \sqrt{(Po*G) / (4*Pi*S)}$$

R = Minimum safe distance from antenna

S = Exposure Limit (from FCC OET 65, appendix B, Table 1 part B)
= f / 1500
= 915 / 1500
= 0.61 mW/cm^2 at 915MHz

Po = Peak RF energy
= 500 mW

G = antenna gain (numeric)
G(isotropic) = **6dBd** + 2.15 = 8.15 dBi
G(numeric) = 10^(G(dBi)/10)
= 6.531

Formula derived from OET BULLETIN 65 (edition 97-01) Section 2, equation 3

$$R = \sqrt{(500 * 6.531) / (4 * Pi * 0.61)}$$

R = **20.64 centimeters**

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RF Exposure Calculations:

The following information provides the **minimum** separation distance for the highest gain antenna provided with **the Adcon Telemetry MQXB900SS-500**, as calculated from **FCC OET 65 Appendix B, Table 1B** Guidelines for General Population/Uncontrolled Exposure. This calculation is based on the highest EIRP possible from the system, considering maximum power and antenna gain, and considering a 0.61 mW/cm^2 uncontrolled exposure limit.

Antenna Information:

Manufacturer:	Cushcraft	Frequency Range:	896-960 MHz
Model:	S8963B	VSWR:	1.5: 1
Type:	Omni directional	Gain:	3 dBd

$$R = \sqrt{(Po*G) / (4*Pi*S)}$$

Formula derived from OET BULLETIN 65 (edition 97-01) Section 2, equation 3

R = Minimum safe distance from antenna

S = Exposure Limit (from FCC OET 65, appendix B, Table 1 part B)
= f / 1500
= 915 / 1500
= 0.61 mW/cm^2 at 915MHz

Po = Peak RF energy
= 500 mW

G = antenna gain (numeric)
G(isotropic) = **3dBd** + 2.15 = 5.15 dBi
G(numeric) = 10^(G(dBi)/10)
= 3.273

$$R = \sqrt{(500 * 3.273) / (4 * Pi * 0.61)}$$

R = **14.61 centimeters**

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RF Exposure Calculations:

The following information provides the **minimum** separation distance for the highest gain antenna provided with **the Adcon Telemetry MQXB900SS-500**, as calculated from **FCC OET 65 Appendix B, Table 1B** Guidelines for General Population/Uncontrolled Exposure. This calculation is based on the highest EIRP possible from the system, considering maximum power and antenna gain, and considering a 0.61 mW/cm^2 uncontrolled exposure limit.

Antenna Information:

Manufacturer:	Bondale Electronics (Hong Kong)	Center Frequency:	917 MHz
Model:	RA-10102	SWR:	2.0:1 or less
Type:	Omnidirectional	Gain:	0 dBd

$$R = \sqrt{(Po*G) / (4*Pi*S)}$$

R = Minimum safe distance from antenna

S = Exposure Limit (from FCC OET 65, appendix B, Table 1 part B)
= f / 1500
= 915 / 1500
= 0.61 mW/cm^2 at 915MHz

Po = Peak RF energy
= 500 mW

G = antenna gain (numeric)
G(isotropic) = **0dBd** + 2.15 = 2.15 dBi
G(numeric) = 10^(G(dBi)/10)
= 1.641

Formula derived from OET BULLETIN 65 (edition 97-01) Section 2, equation 3

$$R = \sqrt{(500 *1.641 / (4 * Pi * 0.61)}$$

R = **10.34 centimeters**

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