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Attn: Reviewing Engineer
Federal Communications Commission
7435 Oakland Mills Road
Columbia, MD21046

The following outlines how Millennial Net's URM-G-2400 module meets the FCC's 8 requirements for modular approval.

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 URM-G-2400 device is equipped with an RF shield that physically encompasses the entire RF circuit, from the digital input all the way to the MMCX RF connector on the edge of the module. The RF shield provides not only immunity to external signals but will comply with all Part 15 limits.

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.

All data inputs to the URM-G-2400 are interfaced or controlled by the on-bord microcontroller. There are no direct connections between the external interfaces of the module and the modulation circuits within the radio. The microcontroller controls all Network/Protocol processing and buffers all externally generated data prior to transmission, as such the radio will never experience excessive data rates or over-modulation. A block diagram of the module is included in the submittal package.

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



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the design of the power supplying circuitry in the device into which the module is installed.

The URM-G-2400 contains an on-board voltage regulator which is used to provide the local power to all the on-board circuits. The operating voltage of the module is specified for $3.3 \pm 5\%$.

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 URM-G-2400 is equipped with a board mounted MMCX connector for use in attaching an external antenna. External antennas are attached via a coax cable assembly with the corresponding MMCX mating connector on one end and a Reverse Polarity SMA jack on the other end. The test report will detail the various antennas the module was tested with along with the cable used for testing.

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 URM-G-2400 is able to be tested in a standalone configuration where only power is supplied via feed wires. The module is DC powered. There are no ferrites located on the power supply feed lines.

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



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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.

The URM-G-2400 will be labeled as ‘FCC ID: R8N-URM-G-2400’ on the RF shield. Examples of the labeling used on the module and the device this is integrated into will be included in the submittal package. The users guide also outlines the labeling requirements when embedding this module.

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.

The local microcontroller contained on the URM-G-2400 module controls all parameters critical to meeting the requirements of Part 15 for the Wireless Sensor Networking application. Users who will be integrating this module into their own devices will not have the capability to operate the module outside of the Part 15 requirements.

8.) 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.

The URM-G-2400 module operates in the 2400 to 2483.5 MHz ISM band using a digitally modulated signal with a maximum peak conducted output power of less than 1mW. This operation conforms with subpart 15.247 and does not warrant



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any special installation instructions or routine environmental evaluation due to the low power, unlicensed nature of the module.

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