



February 26, 2014

Roger Noel
Chief, Mobility Division
Wireless Telecommunications Bureau
FCC
445 12 St SW
Washington DC 20554

Re: FCC §20.21(e)(10) Equivalent Protections Request

Dear Mr. Noel,

Please accept this letter as a formal request to the Wireless Telecommunications Bureau to grant ClearRF's direct connect signal booster, *FCC ID XS7WRE2710*, Equivalent Protections under FCC §20.21(e)(10), for the following two Network Protection Standards: (1) §20.21(e)(8)(i)(B) stating that Consumer Boosters must be able to provide equivalent uplink and downlink gain wherein by equivalent is defined as within 9 dB in KDB publication 935210 D03 paragraph 7.3; and (2) §20.21(e)(8)(i)(C)(2)(iii) stating that Mobile Booster maximum gain in the uplink and downlink shall not exceed 15 dB when directly connected.

The ClearRF XS7WRE2710 provides equivalent protections to the Network Protection Standard based on the following. The WRE2710 direct connect signal booster is specifically designed to be connected via coaxial cable to a machine-to-machine cellular modem, router or module (M2M device). In this configuration, the booster amplifier is at point blank range to the M2M device so there is minimal mobile station coupling loss (MSCL). The FCC 13.21 rules do not clearly account for signal boosters designed for use with M2M devices where the booster amplifier is directly cabled to the M2M device's antenna port (not intended to be connected to a cell phone). This is particularly important when considering the power out capabilities of the M2M device connected to the amplifier and how the network controls the output power of the device.

The ClearRF design provides an optimal uplink gain to overcome the MSCL present in the installation along with the antenna feeder cable loss. The M2M device has sufficient output power to nearly reach the FCC §20.21(e)(8)(i)(D) 30 dBm limit on its own, making it unnecessary to apply much gain to the uplink (especially in weak signal areas where the M2M device will be transmitting at maximum power out). Applying gain to the uplink unnecessarily will only result in exceeding the 30 dBm power out limit. The additional gain may also force the booster amplifier into saturation and cause network interference (i.e. M2M Port: 27 dBm + 15 dB Gain = 42dBm)! The XS7WRE2710 provides more protection to the network when only a minimal amount of gain is applied to the uplink and the power out of the M2M device is controlled by itself and the network.

The downlink is designed to provide an optimal signal level to the receiver to maximize data rates and connectivity with the network. The downlink actual power out is far below that of other booster amplifiers such as inside and outside donor antenna designs. The ClearRF amplifiers also have a patent pending, passive-bypass circuit, that allows complete shutdown of the amplifier when gain is not necessary, loss of power or if a fault is detected. When this occurs, the booster's downlink and uplink circuit is completely removed from the antenna path with respect to the M2M device transmitter.

The XS7WRE2710 amplifier is designed to provide up to 25 dB of gain on the downlink and up to 10 dB on the uplink. The reason for the asymmetric design is because the M2M device transmitter only needs enough gain to overcome losses to the antenna and remain under the 30 dBm maximum output power limit. The downlink needs more gain to optimize E_c/I_o , and increase RSSI to maximize the data rate and keep a solid lock on the base station signal. The receiver is the weak link in the M2M device. In many cases 15 dB is not enough gain to get the full potential network speed. 25 dB of gain provides enough gain to maximize the potential of the M2M devices such that the uplink budget will be exceeded before the M2M device loses service, making the uplink the limiting factor. The 25 dB of downlink gain does not in any way affect the network or cause interference. In fact, the amplifier only affects the M2M device it is connected to, since it is isolated by a cable.

Depending on interpretation; if there is a 9 dB gain symmetry limit, the booster can only provide 9 dB of downlink gain when in the poorest signal areas, since it will be transmitting at maximum and at zero uplink gain, to remain below the 30 dBm limit. The 15 dB limit is also irrelevant to the network or any OTA device when considering the downlink to a directly connected device. This is strictly a design consideration. Using low noise amplifiers and high end PCB materials, our amplifiers can provide a huge benefit, without the risk of associated noise or interference issues, by going beyond the 15 dB limit when used with M2M devices. Therefore, a FCC gain limit on the downlink for direct connect devices is not necessary, since there is no affect to the spectrum.

In summary, the intent of the FCC Report and Order 13.21 and more specifically Part 20.21, is to eliminate the potential for interference from signal boosters to wireless networks, based upon 3 typical interference issues:

- Adjacent Channel Noise
 - The XS7WRE2710's 25 dB downlink gain will not increase Adjacent Channel Noise in the spectrum. It is directly connected to a device and is isolated from the network. The minimal uplink gain will reduce the chance of any noise in the uplink.
- Oscillation
 - The XS7WRE2710 provides oscillation detection and protection and passed all pertinent tests under the new rules.
- Base Station Receiver Overload
 - The XS7WRE2710's minimal uplink gain, automatic shutdown and patent pending passive bypass protect base station receivers from an overload. These features have passed all the pertinent tests under the new rules.

In addition, the XS7WRE2710 meets all aspects of the FCC's Network Protection Standard:

1. Automatically self-monitors certain operations and shuts down if not in compliance with our new technical rules;
2. Automatically detects and mitigates oscillations in the uplink and downlink bands;
3. Powers down or shuts down automatically when a device is not needed, such as when the device approaches the base station with which it is communicating;
4. Designed so that these features cannot be easily defeated; and
5. Incorporates interference avoidance for wireless subsystems.

In summary, the ClearRF XS7WRE2710 M2M signal booster undoubtedly meets and exceeds the Network Protection Standard set forth by the FCC, and is clearly the archetype for which the equivalent protection standard was intended. Therefore, we request the Wireless Telecommunications Bureau to grant equivalent protections to the XS7WRE2710 design, as it relates to §20.21(e)(8)(i)(B) and §20.21(e)(8)(i)(C)(2)(iii).

Respectively,



Shawn Taylor
Chief Operating Officer
ClearRF LLC