27-Apr-2010

To:
Federal Communications Commission
Authorization and Evaluation Division
7435 Oakland Mills Road
Columbia, MD

Subject: **Unrestricted Certification under Part90Z (3650-3700MHz)** for FCC ID: KA336WAN1, KA336WAN2

Dear Sir or Madam:

The purpose of this letter is to provide the requested technical information in support of Solectek's Class 2 Permissive Change application, per Section 2 of FCC OET's publication *552295 D01 CBT Guidance for 3650 3700 Band v01r01.*

2.1. Unrestricted Protocol Description
Address the key requirements for operation using unrestricted contention based protocol. Please note that this requires recognizing other systems (both similar to yours and different from yours) that operate on a co-channel. Indicate the strategy for sharing the spectrum in terms of: Does the system use spectrum sensing to determine if the other devices are transmitting and then find ways to share the bandwidth, or Have some other strategy?

Solectek's system uses a frame-by-frame "listen before talk" protocol to recognize the presence of other systems and to modify its transmit behavior. The "listen" portion of the protocol is performed just prior to the transmission of each new 5 or 10 mS frame. During a quiet, interframe gap, spectrum sensing is employed to detect the presence of other systems operating at the same frequency. If a signal is detected above a configured threshold, the base station will suspend transmission. Once the system has waited an additional, configurable backoff period, and if the channel is clear, the Base Station will transmit its queued data.

2.2. Threshold detection to determine occupancy

2.2.1. Describe how your system determines if another system is using the spectrum. At what detection level – relative to 0 dBi receive antenna gain (busy channel threshold) does the device determine if another system is operating on the spectrum?

During the quiet period between each frame, the Base Station enables the radio receive chain and measures the RF energy present on the operating channel. This is converted into a software variable, in units of dBm (relative to a 0dBi antenna), and compared against the threshold setting. If the actual value is greater than the threshold, then the Base Station concludes there is another system operating on the channel.

2.2.2. How long does the system observe to determine if the channel is busy – at the initial time and in between communications?

The system measures the channel between each 5 or 10mS frame for 64uS.

2.2.3. What is the bandwidth being monitored versus bandwidth occupied for all modes of operation?

The monitoring system and operating system share the same RF transceiver circuitry, thus the monitoring bandwidth is the same as the occupied bandwidth for all modes of operation.

2.2.4. How much variability is provided to the system operator to adjust busy channel detection threshold?

The operator can adjust the threshold between -91 and -70 dBm

2.2.5. What is the operating system threshold (receive threshold) compared to the monitoring threshold (busy channel threshold)?

The operating threshold ("receive sensitivity") varies according to the operating modulation and bandwidth of the system and can be anywhere between -91 and -71dBm. We have designed the threshold system adjustment range to cover the operating receive sensitivity range.

2.2.6. What additional checks does the system perform to determine if the spectrum is being used before initiating a transmission?

Besides the spectrum sensing before each frame, there are no additional checks.

2.2.7. Does the master and the client perform the threshold detection? If master only performs the detection how does it determine if the client may interfere with the other system (hidden node detection mechanism)?

The fixed-node WiMAX system uses a Master (Base Station) located at central high point to perform threshold detection. The Base Station is connected to client devices through predominantly radio line-of-sight links. Client devices are aimed with directional antennas back to the Base Station. With this configuration, the risk of hidden node effects and thus the possibility of having a client-based interference scenario is almost non-existent.

2.3. Action taken when occupancy is determined

2.3.1. What action does your system take when it determines occupancy? Does it vacate the channel or does it have some back-off and retry strategy? What is the impact of traffic on the spectrum sensing or avoidance performance?

The system uses a back-off and re-sense strategy. If occupancy is detected, the system immediately suspends transmission, waits a configurable back-off period, and then re-senses the channel. If the channel is clear, the frame is transmitted.

2.3.2. If you use other means, please describe how the device determines the existence of other systems and what steps it takes to either share the channel or avoid its use.

N/A

2.3.3. Describe any mechanism that would limit a transmission from a remote station if only the master detects occupancy (hidden node avoidance mechanism).

All remote station transmit activity is co-ordinated and scheduled from the master Base Station. If the master has sensed channel occupancy all transmit operations, on both master and remote stations are immediately suspended.

2.4. Opportunities for other transmitters to operate

2.4.1. When describing occupancy profile, clarify any differences between start-up acquisition mode of spectrum and operational modes.

The described behavior of the system is operational immediately upon power-up and prior to any frames being transmitted.

2.4.2. In operational mode, how long does the system transmit before stopping giving others a reasonable time to transmit before continuing?

The system senses the channel before transmission of each 5 or 10mS frame. Our default back-off counter is (4) frame times, which allows others to complete transmissions before attempting to sense the channel again. The backoff counter is adjustable between 1 and 16 frame times.

2.4.3. Does the system (master and / or client) listen prior to every transmission? If no, explain.

Yes, the master listens prior to every transmission.

2.4.4. Describe how the operational spectrum usage (on air time) is dependant on system load conditions (no load, typical and overload). For example, if a station does not have any information to transmit describe any regular or recurring transmission that may take place?

On seeing a clear channel, with no load, the Base Station will transmit on a small portion of each 5 or 10mS frame to handle administrative activity. As load increases, both the Base Station and Client will begin to occupy the frame with transmission activity. At capacity and beyond, the entire 5 or 10mS frame will be occupied and the system will seek to transmit a frame every 5 or 10 mS, if the channel is clear.

2.4.5. Describe if there are any limitations imposed by the contention protocol on what applications are used (i.e. limitations on Quality of Service).

In the presence of other co-channel systems, the shared nature of the channel will reduce available capacity. The system scheduler will continue to prioritize traffic based upon QoS requirements and reduced capacity.

2.4.6. Describe how applications or configuration of services can affect spectrum usage. To describe your occupancy sharing capability you can assume that two systems on a co-channel are the same (your systems being described). How would they share the spectrum?

Two co-channel systems, operating on a frame-by-frame "listen before talk" scheme will create a division of channel capacity. The sharing of capacity will be dynamic as network load varies between the two systems. As one system reduces usage due to decreasing network load, it frees time for the second system to support an increase in load. Statistically, this dynamic system results in equal access to both systems.

Sincerely,

David Gell
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