



MOTOROLA Solutions

Canopy PMP320 Extended Frequency Range Protocol Enhancement

Recommendations for Unrestricted Certification for 3650-3700MHz

Slave (Subscriber Module) Protocol Description: Either slave device, ABZ89FT7633 or ABZ89FT7636 (Subscriber Modules) under the control of master device, ABZ89FT7632 (Access Point).

Note: Subscriber Modules cannot under any circumstances become master devices.

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Unrestricted Certification under Part 90Z (3650-3700 MHz Band).

Detailed information regarding the proposed protocol for the Canopy PMP320 product frequency band enhancement. The following is a detailed description of the channel sharing mechanisms for the PMP 320 product which is already certified for Part 90Z restricted operation.

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?

The Customer Premise Equipment (CPE) meets the requirements for unrestricted operation because it must receive an enabling signal from the master every frame period (2.5, 5, or 10ms) prior to any transmissions.

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?

Not Applicable – Channel occupancy determined by the master, ABZ89FT7632 (Access Point).

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

Not Applicable – Channel occupancy determined by the master, ABZ89FT7632 (Access Point).

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

The bandwidth used for all channel occupancy measurements is the same bandwidth being used for system operation. This is configurable for values that range from 3.5MHz to 10MHz.

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

Not Applicable – System parameters are determined by the master, ABZ89FT7632 (Access Point).

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

Not Applicable – System parameters are determined by the master, ABZ89FT7632 (Access Point).

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

Not Applicable – Channel occupancy determined by the master, ABZ89FT7632 (Access Point).

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

The Motorola system employs either a standard WiMAX media access layer or a proprietary media access layer that utilizes a TDD/TDMA scheduled transmission which is synchronously framed.

The Customer Premise Equipment (CPE) cannot transmit until they are allocated bandwidth from the Access Point. If the Access Point detects co-channel signals then the uplink MAP (in the case of WiMAX) or the scheduled slot allocation is not granted to the subscriber so the CPE cannot transmit.

In this system, since permission to transmit is granted by the AP, there is no hidden node problem like that experienced by purely contention based protocols (Wi-Fi using CSMA/CA in the Distributed Coordination Function mode). The AP is typically also installed in a high location where it is most likely to receive co-channel interference and is most susceptible to detection.

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?

Traffic load will not affect channel occupancy detection performance since the same number of uplink data slots is committed regardless of system activity level. The same performance will be obtained whether the system is lightly loaded or at maximum capacity because of the reservation of uplink data traffic slots.

Upon detection, the Access Point will cease transmission for a configurable number of frames as discussed in the system protocol description. During this period the Access Point will cease to transmit uplink MAP data and will not allocate bandwidth to CPE devices so the subscriber units will also clear the channel.

2.3.3 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.

Not Applicable – Channel occupancy determined by the master, ABZ89FT7632 (Access Point).

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

The Motorola system employs either a standard WiMAX media access layer or a proprietary media access layer that utilizes a TDD/TDMA scheduled transmission which is synchronously framed.

The Customer Premise Equipment (CPE) cannot transmit until they are allocated bandwidth from the Access Point. If the Access Point detects co-channel signals then the uplink MAP (in the case of WiMAX) or the scheduled slot allocation is not granted to the subscriber so the CPE cannot transmit.

In this system, since permission to transmit is granted by the AP, there is no hidden node problem like that experience by other purely contention based protocols (i.e. Wi-Fi). The AP is typically also installed in a high location where it is most likely to receive co-channel interference and is most susceptible to detection.

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.

Not Applicable – System operational modes controlled by the master, ABZ89FT7632 (Access Point).

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

Not Applicable – System operational modes controlled by the master, ABZ89FT7632 (Access Point).

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

Not Applicable - The Customer Premise Equipment (CPE) cannot transmit until allocated bandwidth from the master, ABZ89FT7632 (Access Point).

2.4.4 Describe how the operational spectrum usage (on air time) is dependent 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?

Not Applicable - The Customer Premise Equipment (CPE) cannot transmit until allocated bandwidth from the master, ABZ89FT7632 (Access Point).

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).

The system imposes no limitations on the embedded contention protocol. The same numbers of detection slots are committed regardless of traffic load and are given the highest level of priority. The other QoS mechanisms in the system are unaffected by this embedded contention protocol.

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?

Not Applicable - The Customer Premise Equipment (CPE) cannot transmit until allocated bandwidth from the master, ABZ89FT7632 (Access Point).