DUAL PACKET CONFIGURATION FOR WIRELESS COMMUNICATIONS

FIELD OF THE INVENTION

The present invention relates to wireless communications, and more particularly to a dual packet configuration for use in wireless local area networks.

DESCRIPTION OF RELATED ART

The Institute of Electrical and Electronics Engineers, Inc. (IEEE) 802.11 standard is a family of standards for wireless local area networks (WLAN) in the unlicensed 2.4 and 5 Gigahertz (GHz) bands. The current 802.11b standard defines various data rates in the 2.4 GHz band, including data rates of 1, 2, 5.5 and 11 Megabits per second (Mbps). The 802.11b standard uses direct sequence spread spectrum (DSSS) with a chip rate of 11 Megahertz (MHz), which is a serial modulation technique. The 802.11a standard defines different and higher data rates of 6, 12, 18, 24, 36 and 54 Mbps in the 5 GHz band. It is noted that systems implemented according to the 802.11a and 802.11b standards are incompatible and will not work together.

A new standard is being proposed, referred to as 802.11 HRb (the “HRb proposal”), which is a high data rate extension of the 802.11b standard at 2.4 GHz. It is noted that, at the present time, the HRb proposal is only a proposal and is not yet a completely defined standard. Several significant technical challenges are presented for the new HRb proposal. It is desired that the HRb devices be able to communicate at data rates higher than the standard 802.11b rates in the 2.4 GHz band. In some configurations, it is desired that the 802.11b and HRb devices be able to coexist in the same WLAN environment or area without significant interference or interruption from each other, regardless of whether the 802.11b and HRb devices are able to communicate with each other. It may further be desired that the HRb and 802.11b devices be able to communicate with each other, such as at any of the standard 802.11b rates.

SUMMARY OF THE INVENTION

A dual packet configuration for wireless communications according to at least one embodiment of the present invention includes a first portion that is modulated according to a serial modulation and a second portion that is modulated according to a parallel modulation. In one embodiment, the serial modulation is direct sequence spread spectrum (DSSS), and the parallel modulation is orthogonal frequency division multiplexing (OFDM). In further embodiments, the first portion may include a preamble and a header, where the preamble may be short or long. The header may further include an OFDM mode bit indicating OFDM mode, and a length field indicating the duration the second portion.

For example, the first portion may be modulated in accordance with the 802.11b standard and readily received and understood by 802.11b compatible devices operating in the 2.4 GHz frequency band. Each 802.11b device receives the preamble and header and determines the duration of the dual packet from the length field, so that the 802.11b devices know how long to back off during transmission of a dual mode packet. In this manner, devices communicating with the dual mode packet configuration will not be disrupted by the 802.11b devices, and may thus coexist within the same communication area as the standard 802.11b devices.

Furthermore, devices utilizing a dual mode packet configuration according to certain embodiments may coexist with 802.11b devices in the 2.4 GHz frequency band while communicating at different or even greater data rates afforded by OFDM, such as data rates similar to the 802.11a standard. Whereas the 802.11b devices are currently limited to 11 Mbps, the dual mode devices may operate at 54 Mbps or higher depending upon the particular configuration. The OFDM mode bit indicates OFDM mode to another target OFDM device. For such OFDM embodiments, the packet configuration may include an OFDM synchronization pattern, an OFDM signal symbol and an OFDM payload. The OFDM signal symbol may further include a data rate section and a data count section for specifying the data rate the number of data bytes in the payload. In this manner, data rates the same as or similar to the 802.11a data rates may be specified between dual mode devices, such as 6, 12, 24, 36 or 54 Mbps.

In at least one embodiment, the first portion of the dual packet configuration may be based on a first clock fundamental whereas the second portion is based on a second clock fundamental. In one embodiment, for example, the first clock fundamental is approximately 22 MHz, whereas the second clock fundamental is approximately 20 MHz. The 22 MHz clock signal is the clock fundamental for the 802.11b standard to enable compatibility with 802.11b devices when operating in the 2.4 GHz band. The 20 MHz clock fundamental is typical for the OFDM modulation technique, so that an increased data rate is achieved within the 2.4 GHz band.

In alternative embodiments, the first and second portions of the dual packet configuration are both based on a single clock fundamental, such as 22 MHz. Various embodiments are contemplated for the single clock fundamental. In one embodiment, each OFDM symbol includes a guard interval with a standard number of samples for OFDM, such as 16 samples according to 802.11a. Alternatively, the guard interval includes an increased number of samples, such as 24 samples.

In yet further embodiments, each OFDM symbol in the packet configuration may include a standard number of frequency subcarriers, such as 52 frequency subcarriers according to 802.11a. Alternatively, a reduced number of frequency subcarriers may be utilized, such as 48 subcarriers. In one embodiment, each frequency subcarrier is a data subcarrier whereas in another embodiment, pilot tones are included. In yet another embodiment, each of the frequency subcarriers are initially data subcarriers and a subset of the data subcarriers is discarded and replaced with a corresponding number of pilot tones for transmission. Upon reception of the packet, the discarded data subcarriers are recreated using received data, such as, for example, application of error correction code (ECC) techniques.

A wireless communication device according to the present invention includes a transmitter and a receiver where each are configured to communicate with a dual packet configuration. The dual packet configuration includes first and second portions, where the first portion is configured according to a serial modulation technique and where the second portion is configured according to a parallel modulation technique. As described previously, the dual packet configuration may utilize DSSS modulation as the serial modulation technique and OFDM as the parallel modulation technique. The wireless communication device may include two separate clock sources if utilizing a dual packet configuration based on first and second clock fundamentals. Alternatively, a single clock source may be utilized if the first and second