

Figure 153D—ERP-PBCC-22 and ERP-PBCC-33 cover code mapping

When the clock is switched from 11 MHz to 16.5 MHz, the clock switching structure in Figure 153E is used.

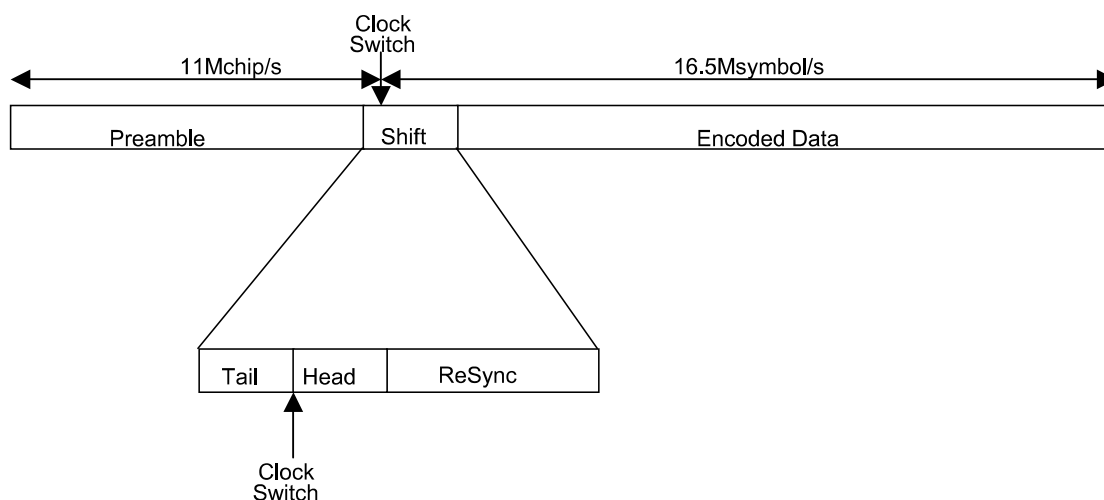


Figure 153E—33 Mbit/s clock switching

The tail is 3 clock cycles at 11 Mchip/s and the head is 3 clock cycles at 16.5 Msymbol/s (QPSK). The resync is 9 clock cycles at 16.5 Msymbol/s. The total clock switching time (tail and head and resync) is 1 μ s. The tail bits are 1 1 1, the head bits are 0 0 0, and the resync bits are 1 0 0 1 1 1 0 1. The modulation is BPSK, which is phase synchronous with the previous symbol.

19.3.3.3 ERP-OFDM format

PLCP modulation and rate change for the ERP-OFDM frame format follows 17.3.7.

19.3.3.4 Long & short DSSS-OFDM PLCP format

The scrambler of 18.2.4 is used to scramble the DSSS-OFDM PLCP header, and the scrambler in 17.3.5.4 is used to scramble the data symbols in the OFDM segment.

19.3.3.4.1 Overview of the DSSS-OFDM PLCP PSDU encoding process

This subclause contains the definitions and procedure for forming the PSDU portion of the DSSS-OFDM PLCP. Figure 153F shows an expanded view of the DSSS-OFDM PSDU. The PSDU is composed of four major sections. The first is the long sync training sequence that is used for acquisition of receiver parameters by the OFDM demodulator. The long sync training sequence for DSSS-OFDM is identical to the long training symbols described in 17.3.3. The second section is the OFDM SIGNAL field that provides the demodulator information on the OFDM data rate and length of the OFDM data section. The SIGNAL field for DSSS-OFDM is identical to the SIGNAL field described in 17.3.4. After the SIGNAL field is the data section of the PSDU. This is identical to the modulation procedure described in 17.3.2.1 in steps (c) through (m). After the data section, the PSDU for DSSS-OFDM appends a signal extension section to provide additional processing time for the OFDM demodulator. This signal extension is a period of no transmission as described in 19.3.3.4.5.

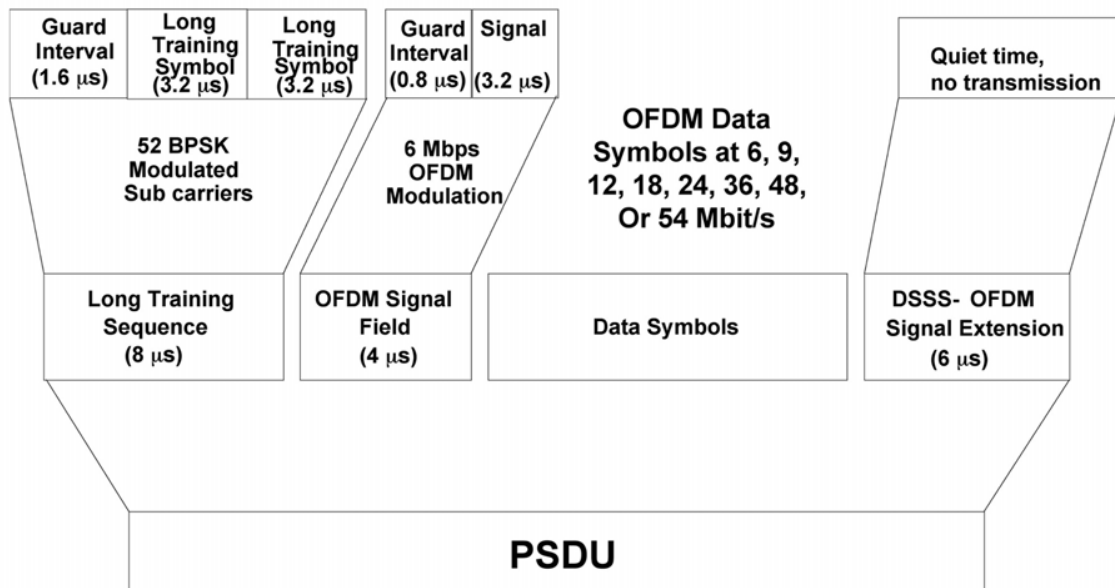


Figure 153F—DSSS-OFDM PSDU

19.3.3.4.2 Long sync training sequence definition

The Long Sync Training Sequence is defined in 17.3.3.

19.3.3.4.3 OFDM signal field definition

The DSSS-OFDM Signal Field is defined in 17.3.4. Note that the length conveyed by the SIGNAL field is calculated as described in 17.3.4. That is, the length conveyed by this field does not include the signal extension described in 19.3.3.4.5.

19.3.3.4.4 Data symbol definition

The same process as steps (c) through (m) of 17.3.2.1 is used to encode the data symbols' portion of the DSSS-OFDM PSDU.

19.3.3.4.5 DSSS-OFDM signal extension

The DSSS-OFDM Signal Extension shall be a period of no transmission of 6 μ s length. It is inserted to allow more time to finish the convolutional decoding of the OFDM segment waveform and still meet the 10 μ s SIFS requirement of the ERP.

19.3.4 PLCP transmit procedure

The transmit procedure will depend on the data rate and modulation format requested. For data rates of 1, 2, 5.5, 11, 22, and 33 Mbit/s, the PLCP transmit procedure shall follow 18.2.5. For the ERP_OFDM rates of 6, 12, and 24 and the rates of 9, 18, 36, 48, and 54 Mbit/s, the PLCP transmit procedure shall follow 17.3.11.

The transmit procedures for the optional DSSS-OFDM mode using the long or short PLCP preamble and header are the same as those described in 18.2.5, and they do not change apart from the ability to transmit a higher rate PSDU using DSSS-OFDM.

19.3.5 CCA

The PLCP shall provide the capability to perform a clear channel assessment (CCA) and report the results of the assessment to the MAC. The CCA mechanism shall detect a “medium busy” condition for all supported preamble and header types. That is, the CCA mechanism shall detect that the medium is busy for the PLCP PPDU specified in 17.3.3 and 18.2.2. The CCA mechanism performance requirements are given in 19.4.6.

The ERP shall provide the capability to perform CCA according to the following method:

CCA Mode (ED and CS): A combination of carrier sense (CS) and energy above threshold. CCA shall have a mechanism for carrier sense that will detect all mandatory Clause 19 sync symbols. This CCA's mode's carrier sense shall include both Barker code sync detection and OFDM sync symbol detection. CCA shall report busy at least while a PPDU with energy above the ED threshold is being received at the antenna.

The energy detection status shall be given by the PMD primitive, PMD_ED. The carrier sense status shall be given by PMD_CS. The status of PMD_ED and PMD_CS is used in the PLCP convergence procedure to indicate activity to the MAC through the PHY interface primitive, PHY-CCA.indicate. A busy channel shall be indicated by PHY-CCA.indicate of class BUSY. A clear channel shall be indicated by PHY-CCA.indicate of class IDLE.

19.3.6 PLCP receive procedure

This describes the procedure used by receivers of the ERP. An ERP receiver shall be capable of receiving 1, 2, 5.5, and 11 Mbit/s PLCPs using either the long or short preamble formats described in Clause 18 and shall be capable of receiving 6, 12, and 24 Mbit/s using the modulation and preamble described in Clause 17. The PHY may also implement the ERP-PBCC modulation at rates of 5.5, 11, 22, and 33 Mbit/s; the ERP-OFDM modulations at rates of 9, 18, 36, 48, and 54 Mbit/s; and/or the DSSS-OFDM modulation rates of 6, 9, 12, 18, 24, 36, 48, and 54 Mbit/s. The receiver shall be capable of detecting the preamble type (ERP-OFDM, Short Preamble, or Long Preamble) and the modulation type. These values shall be reported in the RXVECTOR (see 19.2).

Upon the receipt of a PPDU, the receiver shall first distinguish between the ERP-OFDM preamble and the single carrier modulations (long or short preamble). In the case where the preamble is an ERP-OFDM preamble, the PLCP Receive Procedure shall follow the procedure described in 17.3.12. Otherwise, the receiver shall then distinguish between the long preamble and short preamble as specified in 18.2.2. The receiver shall then demodulate the SERVICE field to determine the modulation type as specified in 19.3.2.1 or 19.3.2.2. For short preamble and long preamble using ERP-DSSS, ERP-CCK, or ERP-PBCC modulations, the receiver shall then follow the receive procedure described in 18.2.6.

A receiver that supports DSSS-OFDM is capable of receiving all rates specified in Clause 15 and all mandatory rates in Clause 17 and Clause 18. If the SIGNAL field indicates 3 Mbit/s, the receiver shall attempt to receive a DSSS-OFDM packet. The remaining receive procedures for a DSSS-OFDM-capable receiver are the same as those described in 18.2.6, and they do not change apart from the ability to receive DSSS-OFDM in the PSDU. If DSSS-OFDM is being received, the receiver shall handle the modulation transition requirements as described in 19.7.2. The receiver shall then follow the receive procedure described in 17.3.12.

19.4 ERP PMD operating specifications (general)

Subclauses 19.4.1 through 19.4.7 provide general specifications for the ERP PMD sublayers. These specifications are based on 17.3.8 except where noted.

19.4.1 Regulatory requirements

All systems shall comply with the local regulatory requirements for operation in the 2.4 GHz band. For the USA, refer to FCC 15.247, 15.249, 15.205, and 15.209. For Europe, refer to ETS 300-328. For Japan, refer to MPHPT article 49-20.

19.4.2 Operating channel frequencies

The ERP shall operate in the frequency ranges specified in 18.4.6.2, as allocated by regulatory bodies in the USA, Europe, and Japan. OFDM operation in channel 14 may not be allowed in Japan. The channel numbering and the number of operating channels shall follow Table 105 of 18.4.6.2.

19.4.3 Transmit and receive in-band and out-of-band spurious emissions

The ERP shall conform to in-band and out-of-band spurious emissions as set by the appropriate regulatory bodies for the 2.4 GHz band.

19.4.4 Slot time

The slot time is 20 μ s, except that an optional 9 μ s slot time may be used when the BSS consists of only ERP STAs capable of supporting this option. The optional 9 μ s slot time shall not be used if the network has one or more non-ERP STAs associated. For IBSS, the Short Slot Time subfield shall be set to 0, corresponding to a 20 μ s slot time.

19.4.5 SIFS value

The ERP shall use a SIFS of 10 μ s.

19.4.6 CCA performance

The CCA shall indicate TRUE if there is no CCA “medium busy” indication. The CCA parameters are subject to the following criteria:

- a) When a valid signal with a signal power of -76 dBm or greater at the receiver antenna connector is present at the start of the PHY slot, the receiver's CCA indicator shall report the channel busy with probability CCA_Detect_Probability within a CCA_Time. CCA_Time is SlotTime – RxTxTurnaroundTime. CCA_Detect_Probability is the probability that the CCA does respond correctly to a valid signal. The values for these parameters are found in Table 123E. Note that the CCA Detect Probability and the power level are performance requirements.

- b) In the event that a correct PLCP header is received, the ERP PHY shall hold the CCA signal inactive (channel busy) for the full duration, as indicated by the PLCP LENGTH field. Should a loss of carrier sense occur in the middle of reception, the CCA shall indicate a busy medium for the intended duration of the transmitted PPDU.

Table 123E—CCA parameters

Parameter	Slot time = 20 μ s	Slot time = 9 μ s
SlotTime	20 μ s	9 μ s
RxTxTurnaroundTime	5 μ s	5 μ s
CCA_Time	15 μ s	4 μ s
CCA_Detect_Probability	> 99%	>90%

19.4.7 PMD transmit specifications

The PMD transmit specifications shall follow 17.3.9 with the exception of the transmit power level (17.3.9.1), the transmit center frequency tolerance (17.3.9.4), and the symbol clock frequency tolerance (17.3.9.5). Regulatory requirements may have an effect on the combination of maximum transmit power and spectral mask if the resulting signals violate restricted band emission limits.

19.4.7.1 Transmit power levels

The maximum transmit power level shall meet the requirements of the local regulatory body. For examples, see Table 115 in 18.4.7.1.

19.4.7.2 Transmit center frequency tolerance

The transmit center frequency tolerance shall be ± 25 PPM maximum. The transmit center frequency and symbol clock frequency shall be derived from the same reference oscillator (locked).

19.4.7.3 Symbol clock frequency tolerance

The symbol clock frequency tolerance shall be ± 25 PPM maximum. The transmit center frequency and symbol clock frequency shall be derived from the same reference oscillator (locked oscillators). This means that the error in PPM for the carrier and the symbol timing shall be the same.

19.5 ERP operation specifications

This subclause describes the receive specifications for the PMD sublayer. The receive specification for the ERP-OFDM modes shall follow 17.3.10 with the exception of the receiver maximum input level (17.3.10.4) and the adjacent channel rejection (17.3.10.2). The receive specifications for the ERP-DSSS modes shall follow 18.4.8 with the exception of the receiver maximum input level (18.4.8.2).

19.5.1 Receiver minimum input level sensitivity

The packet error rate (PER) of the ERP-OFDM modes shall be less than 10% at a PSDU length of 1000 bytes for the input levels of Table 91 of 17.3.10. Input levels are specific for each data rate and are measured at the antenna connector. A noise figure (NF) of 10 dB and an implementation loss of 5 dB are assumed. The PER of the ERP-DSSS modes shall be as specified in 18.4.8.1.

19.5.2 Adjacent channel rejection

Adjacent channels at 2.4 GHz are defined to be at ± 25 MHz spacing. The adjacent channel rejection shall be measured by setting the desired signal's strength 3 dB above the rate-dependent sensitivity specified in Table 91 of 17.3.10 and raising the power of the interfering signal until 10% PER is caused for a PSDU length of 1000 bytes. The power difference between the interfering and the desired channel is the corresponding adjacent channel rejection. The interfering signal in the adjacent channel shall be a conformant OFDM signal, unsynchronized with the signal in the channel under test. For an OFDM PHY, the corresponding rejection shall be no less than specified in Table 91 of 17.3.10.

The alternative adjacent channel rejection of Table 91 shall not be required for the ERP.

The adjacent channel rejection of the ERP-DSSS modes shall follow 18.4.8.3.

19.5.3 Receive maximum input level capability

The PER shall be less than 10% at a PSDU length of 1000 bytes for an input level of -20 dBm measured at the antenna connector for any supported modulation signal or data rate (i.e., 1, 2, 5.5, 6, 9, 11, 12, 18, 22, 24, 33, 36, 48, 54 Mbit/s).

19.5.4 Transmit spectral mask

The transmit spectral mask for the ERP-OFDM modes shall follow 17.3.9.2 and is shown in Figure 124 therein. The transmit spectral mask for the ERP-DSSS modes shall follow 18.4.7.3 and is shown in Figure 149 therein.

19.6 ERP-PBCC operation specifications

The ERP-PBCC receiver specifications shall follow 18.4.8 except as noted.

These optional modes provide systems the ability to achieve data rates of 22 and 33 Mbit/s in modes that are fully backwards compatible with Clause 15 and Clause 18 BSSs without requiring additional coordination or protection mechanisms. In addition, the 22 Mbit/s ERP-PBCC mode is spectrally identical to Clause 18 BSSs. Four optional ERP-PBCC modulation formats and data rates are specified for the ERP. They shall be based on Packet Binary Convolutional Coding (PBCC) 5.5, 11, 22, and 33 Mbit/s modulations. The rates of 5.5 and 11 Mbit/s are described in 18.4.6.6.

19.6.1 Receiver minimum input level sensitivity

For the 22 Mbit/s ERP-PBCC mode, the frame error ratio shall be less than 8×10^{-2} at a PSDU length of 1024 octets for an input level of -76 dBm measured at the antenna connector. For the 33 Mbit/s ERP-PBCC mode, the corresponding input level shall be -74 dBm.

19.6.2 Receiver adjacent channel rejection

The adjacent channel rejection shall be equal to or better than 35 dB, with an FER of 8×10^{-2} using ERP-PBCC modulation and a PSDU length of 1024 octets. The adjacent channel rejection shall be measured using the following method. Input an ERP-PBCC modulated signal of the same rate at a level 6 dB greater than specified in 19.6.1. In an adjacent channel (25 MHz separation as defined by the channel numbering), input a signal modulated in a similar fashion, which adheres to the transmit mask specified in 18.4.7.3, to a level 41 dB above the level specified in 19.6.1. The adjacent channel signal shall be derived from a separate signal source. It shall not be a frequency-shifted version of the reference channel. Under these conditions, the FER shall be no worse than 8×10^{-2} .

19.7 DSSS-OFDM operation specifications

This optional mode provides systems the ability to use OFDM in a mode that is fully compatible with Clause 15 and Clause 18 BSSs without requiring additional coordination. That is, it does not need a protection mechanism. This compatibility requires the use of Clause 18 long and short preambles and inclusion of a signal extension field to match SIFS spacing of Clause 18 systems. By reusing the Clause 18 preambles, this optional mode ensures that the Clause 18 CCA and short inter-frame spacing interval (SIFS) function properly when ERP and NonERP STAs interoperate. When this option is enabled, the same rates shall be supported in both ERP-OFDM and DSSS-OFDM. The DSSS-OFDM PMD transmit and receive specifications shall follow the related ERP-OFDM specifications in 19.5.

19.7.1 Overview

This optional extension of the DSSS system builds on the payload data rates of 1, 2, 5.5, and 11 Mbit/s, as described in Clause 18, to provide 6, 9, 12, 18, 24, 36, 48, and 54 Mbit/s payload data rates while reusing the preambles (short and long) described by Clause 18. The capability described in this subclause is called DSSS-OFDM. This optional capability complements the Extended Rate OFDM mode described in Clause 19 by combining OFDM modulation with DSSS preambles. As a result, for DSSS-OFDM, the PPDU format described in 18.2.2 is relatively unchanged. The major change is to the format of the PSDU. The Clause 18 single carrier PSDU is replaced by a PSDU that is very similar to the PSDUs described in Clause 17. This subclause highlights the differences. In addition, 19.7.2 specifies the radio and physical layer behavior of the transition from the Barker symbol-modulated preamble and the OFDM-modulated data for PSDU.

19.7.2 Single carrier to multicarrier transition requirements

The spectrum mask for the DSSS-OFDM waveform shall meet the requirements as shown in Figure 124 of 17.3.9.6.2.

The single carrier signal segment of the packet shall have a coherent relationship with the multicarrier (OFDM) segment of the packet. All characteristics of the signal shall be transferable from one symbol to the next, even when transitioning to the OFDM segment. This enables high-performance, coherent receiver operation across the whole packet. This requirement is no different in nature than that stated in Clause 15, Clause 17, and Clause 18. The distinction being that those clauses use a signaling scheme that is either just single carrier or just multicarrier. In contrast, for this mode, both single carrier and multicarrier signaling are used within the context of a single packet.

This section specifies the coherent relationship between the single carrier segment and the OFDM segment, so that the receiver has the opportunity to track through the transition without any forced parameter reacquisition. The single carrier preamble and header provide all parametric information required for demodulation of the OFDM segment to within conventional estimation-in-noise accuracy. Although multicarrier sync features are provided for convenience at OFDM segment onset, if and how to use the multicarrier sync for reacquisition is an implementer's decision. Multicarrier sync is not necessary. The packet is coherent throughout.

As shown in Figure 153G, the ideal transition would provide a constant carrier frequency and phase, a constant power, a constant spectrum, and a constant timing relationship. Constant in this context means that the same clock crystal that sets the frequencies and timing of each part is the same through the transition. This allows the frequency and timing tracking loops to work undisturbed through the transition. The following subparagraphs establish the ideal transition characteristics for the transmit signal. An additional paragraph specifies the required implementation fidelity or accuracy.

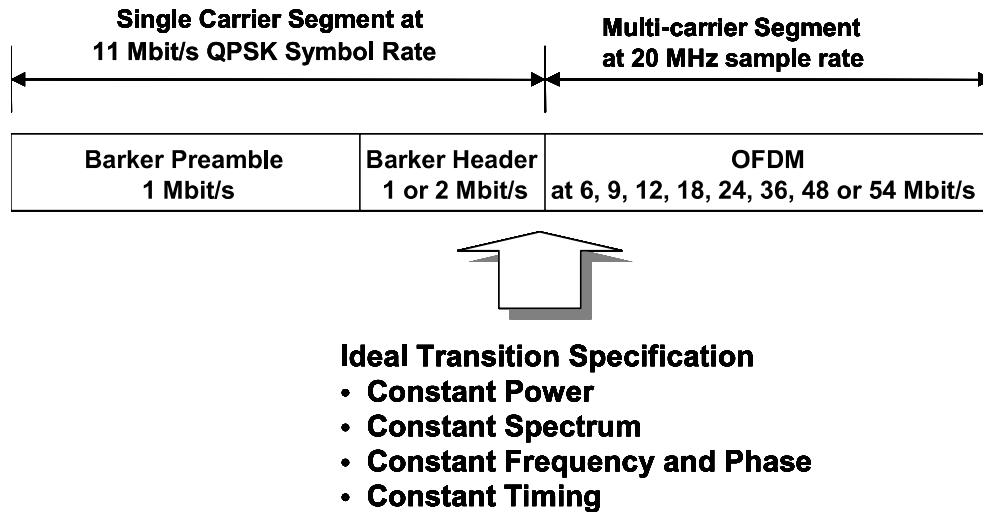


Figure 153G—Single carrier to multicarrier transition definition

19.7.2.1 Spectral binding requirement

The spectral binding requirement allows the receiver's estimate of the channel state information to be transferred from the single-carrier packet segment to the multicarrier packet segment. This requirement establishes a coherent relationship between the end-to-end frequency responses of the single carrier and multicarrier segments.

During reception of the single carrier preamble and header, the receiver may estimate the channel impulse response. In practice, this could be accomplished through Barker code correlation. The channel impulse response contains end-to-end frequency response information about the linear distortion experienced by the signal due to filters and multipath. This distortion can be mitigated with an equalizer or other commonly known techniques.

The channel impulse response estimate generated during the single carrier packet segment will include the single carrier's pulse-shaping, filter frequency response used to control the single carrier's transmit spectrum and transmit impulse response. The single carrier's pulse-shaping filter may be distinct from the shaping technique used for the multicarrier segment.

The spectral binding requirement states that the linear distortions experienced by the single carrier signal and the linear distortions experienced by the multicarrier signal have a known relationship. This relationship is defined by this specification and shall be manifested by all compliant transmit radios. This will allow any receiver to exploit channel information derived during the single carrier segment and reuse the channel information during the multicarrier segment, if desired.

Three elements have been itemized for this specification to achieve spectral binding. All three elements are necessary to achieve spectral binding, and they are discussed in the next three subclauses. The first element focuses on distortions common to both the single carrier packet segment and the multicarrier packet segment. The second element deals with pulse-shaping unique to the OFDM packet segment. The third element deals with pulse-shaping unique to the single carrier packet segment. The multicarrier pulse shape discussion precedes the single carrier's pulse shape discussion because it is believed this will be a more comfortable progression, due to similar multicarrier pulse-shaping considerations contained in Clause 17.

19.7.2.1.1 Common linear distortions

Separate from the single carrier and the multicarrier pulse shaping, transmit signal generation will be designed to provide linear distortion continuity to the receiver's demodulation algorithms. The common linear distortion requirement is illustrated in Figure 153H, where it is shown that the processing at the receiver assumes that the dominant linear distortions are induced on all waveform segments. The receiver observes the composite linear distortion due to imperfect transmit radio filters, due to multipath filtering, and due to imperfect receive radio filters. In general, the receiver is unable to decompose the distortion into separate physical components and is only able to observe the aggregate effect. This specification constrains only the linear distortions in the transmit radio, because that is what is necessary to ensure interoperability. The soft switch that appears in Figure 153H is a conceptual element to implement the transition, as described below.

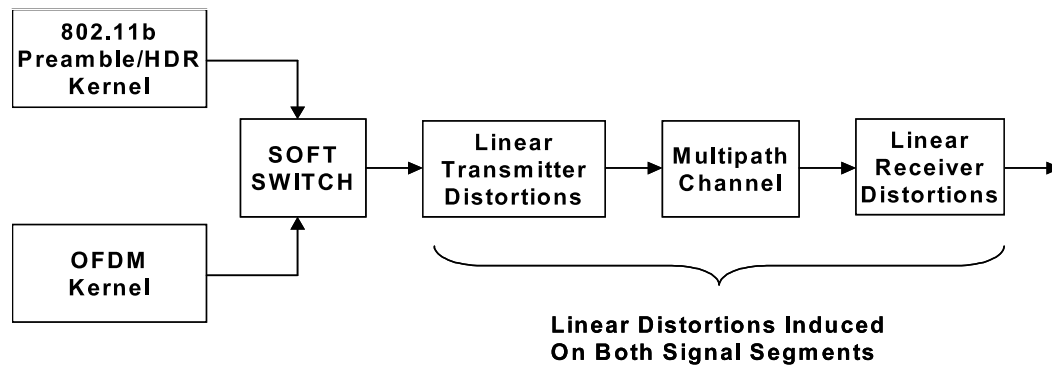


Figure 153H—Linear distortions common to the single carrier and multicarrier signal segments

In short, this common linear distortion requirement states that the dominant filters in the transmit radio will stay invariant and common to all waveform segments. Once the receiver has determined the end-to-end impulse response, channel information is assumed to be common to both the single carrier signal and the multicarrier signal. This will enable receiver design of linear-distortion mitigation techniques that do not require a reacquisition after transitioning to OFDM.

19.7.2.1.2 Symbol shaping unique to the DSSS-OFDM segment

OFDM spectral shaping may be achieved using two mechanisms: (1) Time-domain convolution filtering may be used to shape the spectrum. (2) Time-domain window tapering of OFDM symbol onset and termination may be used to shape the spectrum. This second mechanism can be viewed as frequency domain convolution. The first mechanism shall be common to both the OFDM and single carrier if it is a dominant distortion mechanism. The second mechanism may be unique to the OFDM segment, because it does not affect the frequency response of the 52 subcarriers.

The first spectral shaping mechanism using time-domain convolution filtering shall be common to both the single carrier and multicarrier segments for the reasons described in the preceding section. The receiver should not see intrapacket frequency response discontinuities.

Convolution filtering may be budgeted in various ways. One option would be to use a single filter that both the single carrier and multicarrier segments use. Another option would be to use two different physical filter realizations, one for the single carrier segment and a second for the multicarrier segment, say, for reason of distinct sample rates or bit precision. With this second implementation option, the designer shall ensure the frequency response of the filter is common to both packet segments.

The second shaping mechanism, which uses frequency-domain convolution through time-domain subcarrier onset-and-termination shaping, may be unique to the OFDM segment. This unique technique is acceptable because it does not modify the required frequency response of the 52 subcarriers.

Spectral shaping by tapering the OFDM symbol onset-and-termination using a time-domain window is described in Clause 17 and is equally germane to Clause 19 systems. For convenience, one of the relevant figures from Clause 17 is repeated here as Figure 153I. Clause 17 suggested that the tapering transition duration is 0.1 μ s.

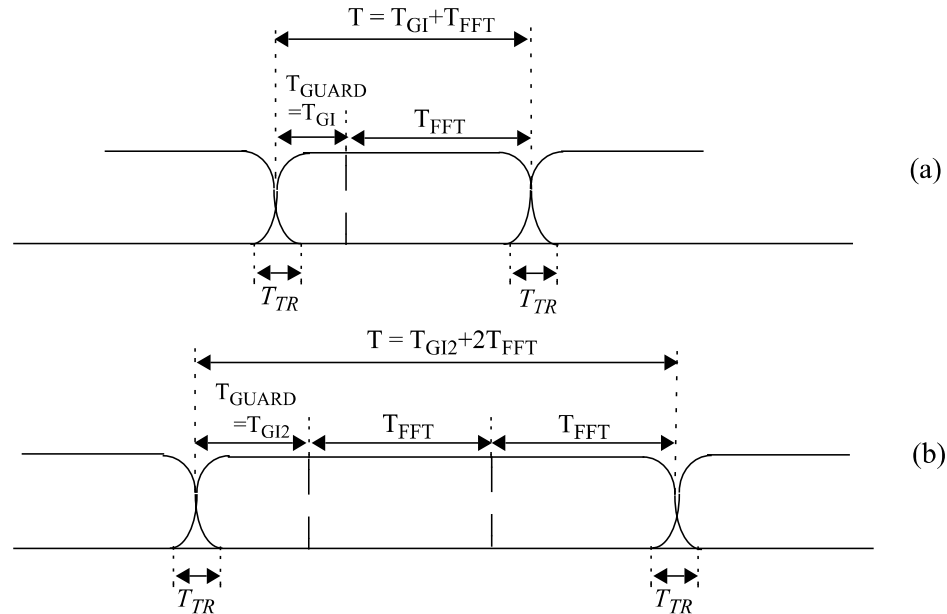


Figure 153I—Spectral shaping achieved by OFDM symbol onset and termination shaping

The effect of time-domain windowing on a single subcarrier's power spectrum is shown in Figure 153J for two cases. The first case is rectangular time-domain windowing of an OFDM symbol. The second case is for the Clause 17 suggested time-domain windowing of an OFDM symbol with a 0.1 μ s transition. Note the difference in frequency-dependent amplitude roll-off. Adding the 52 frequency-bin-centered individual subcarrier power spectral densities generates the composite 52 subcarrier power spectrum.

This type of OFDM spectrum control does not affect the relative amplitudes and phases of the individual subcarriers. Instead, it affects each subcarrier's power spectral density. Consequently, this type of spectrum control has a benign effect on the relative spectrums of single carrier and the multicarrier packet segments, which is why it can be unique.

To achieve the design goal, the implementer may budget spectral shaping in the transmit radio. Some of the spectral shaping may be achieved using time-domain convolution filtering, and some may be achieved through time-domain windowing of the OFDM. In any case, the transmit implementation shall provide frequency response coherency.

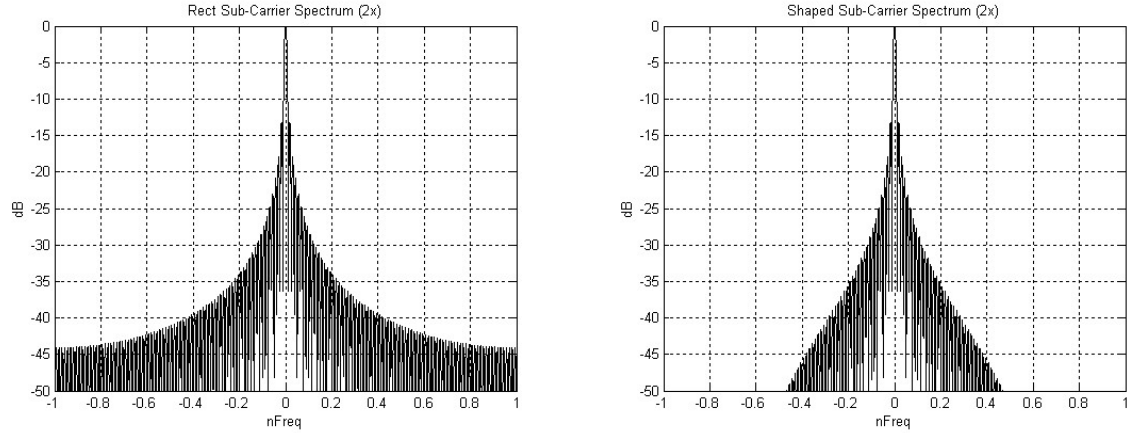


Figure 153J—Subcarrier spectra for rectangular windowing and Clause 17 suggested windowing

19.7.2.1.3 Pulse shaping unique to the single carrier segment

This section describes the pulse-shaping requirements of the single carrier segment of the DSSS-OFDM packet. To establish frequency response coherency, it is necessary to specify the frequency response of the single carrier signal that establishes a coherent relationship to the frequency response of the OFDM.

The frequency response of the single carrier pulse is patterned after the tandem OFDM. The pattern is the OFDM signal as described in Clause 17, with an example provided in Annex G. The ideal OFDM signal has a flat amplitude response and zero-phase offset across 52 subcarriers. Clause 17 establishes the ideal frequency-response relationship among the 12 short SYNC subcarriers, 52 long SYNC subcarriers, the 52 SIGNAL field subcarriers, and the 52 data field subcarriers. Similarly, the ideal relationship to the single carrier frequency response is defined.

Relative to the ideal OFDM, the single carrier part of the DSSS-OFDM signal shall have the pulse shape established herein. In a particular implementation, it is acceptable to deviate from this ideal, but only in a manner that is common to both the single carrier signal and the multicarrier signal across the passband of the OFDM signal. This requirement provides the required frequency response coherency.

The frequency response of the single carrier pulse is patterned after the OFDM that will be transmitted in tandem. The single carrier pulse is derived from a time-windowed sinc function as shown in Figure 153K and Equation (39). The sinc function is the time response of an ideal brickwall filter. The brickwall filter is set equal to the bandwidth of an ideal OFDM signal. In particular, the bandwidth of the brickwall filter has been set to 52 times the Clause 17 subcarrier spacing of 20/64 MHz, or 312.5 KHz.

$$h_{IdealBW}(t) = f_W \frac{\sin(\pi f_W t)}{\pi f_W t} = f_W \text{sinc}(f_W t) \quad (39)$$

where

$$f_W = 52(20/64) \text{ MHz}$$

The infinite duration impulse response of the brickwall filter should be windowed to something practical. A continuous time version of the Hanning window may be used. The Hanning window and an overlay of the sinc function are shown in Equation (40) and Figure 153L.

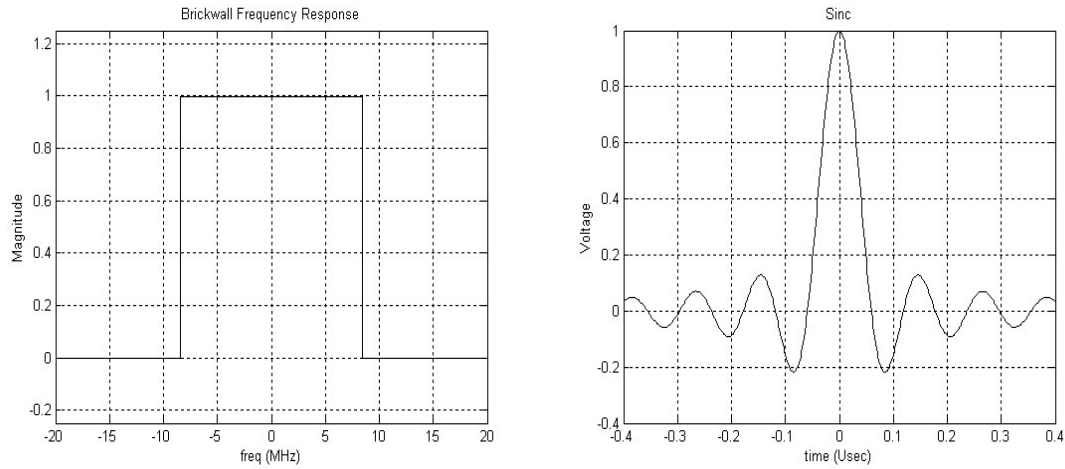


Figure 153K—The foundational brickwall filter

$$h_{\text{Window}}(t) = 0.5 \left[1 + \cos \left(2\pi \frac{t}{T_{\text{SPAN}}} \right) \right] \quad (40)$$

where

$$T_{\text{SPAN}} = 0.8 \text{ usecs}$$

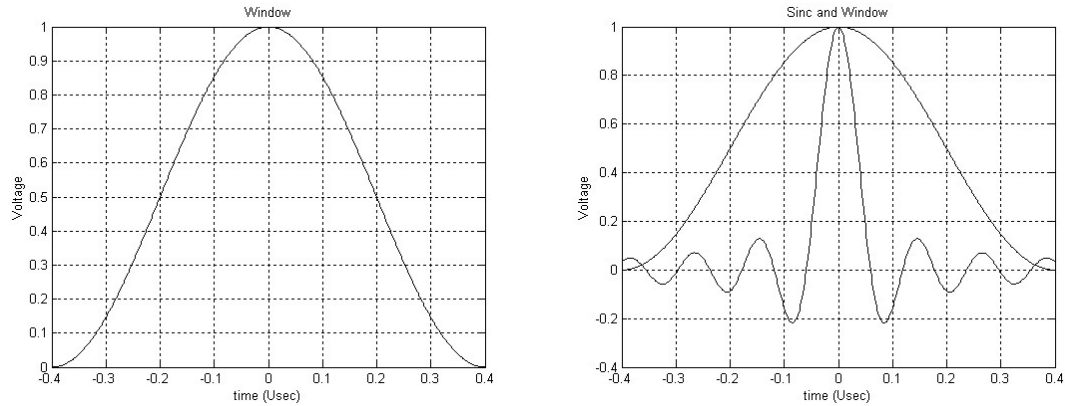


Figure 153L—The continuous time Hanning window

The pulse specified for use with the single carrier packet segment is obtained by application of the window as shown in Equation (41) and Figure 153M. Notice that its duration is equal to a Clause 17 short sync cycle, only 0.8 μ s.

$$p(t) = h_{\text{Window}} h_{\text{IdealBW}}(t) \quad (41)$$

The frequency response of the derived pulse is shown in Figure 153N. This pulse generates a single carrier signal that has a spectrum nearly equal to that of the OFDM signal. This means that the receiver will experience essentially no change in receive signal power behavior even in the presence of multipath. At the point of the outermost subcarrier in the OFDM signal, the single carrier spectrum is down only about 4 dB. This is deemed adequate because the single carrier preamble-header is long in duration compared to the Clause 17 sync duration. Plenty of time is available to generate channel impulse response information that is sufficiently accurate.

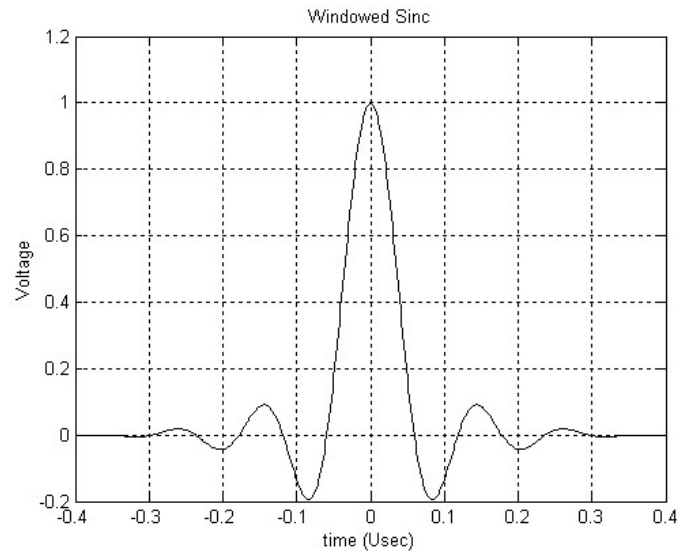


Figure 153M—The specified pulse

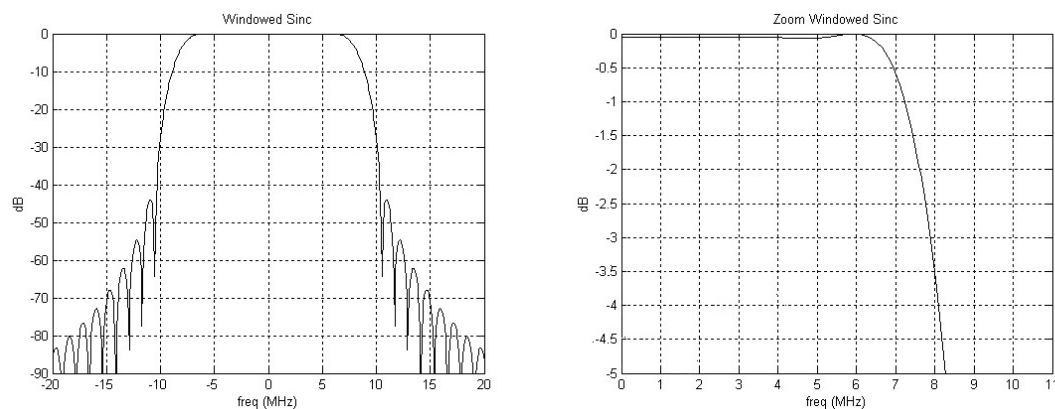


Figure 153N—The single carrier frequency response

In summary, the specified single carrier pulse provides frequency response coherency between the single carrier and multicarrier segments of the packet. This does not mean that the spectrums are identical between segments. Rather, it means the ideal frequency responses of both are known. Beyond this, all linear distortion is common to both. It is not necessary to use this single carrier pulse during Clause 15 or Clause 18 packet transmissions.

19.7.2.2 Sample-power matching requirement

The transmit signal power shall be equal for the single carrier and multicarrier signal segments. The point of comparison is shown in Figure 153O. The power measurement will be over the single carrier header and over the OFDM data symbols.

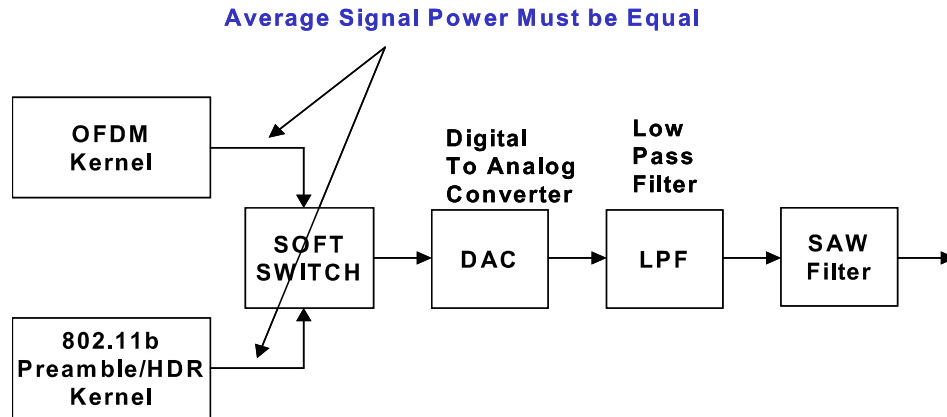


Figure 153O—Comparing signal power

19.7.2.3 Transition time alignment

This section describes how the single carrier signal and the multicarrier signal are time aligned. The single carrier signal uses a chip rate of 11 MHz. The OFDM signal uses a fundamental sample rate of 20 MHz. The signals are easily aligned by first aligning the 11 MHz clock and the 20 MHz clock on 1 μ s boundaries as shown in Figure 153P.

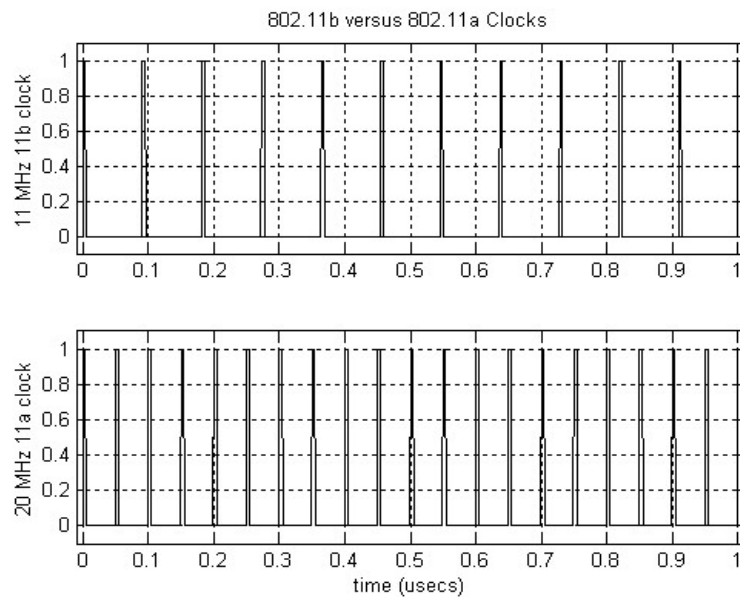


Figure 153P—Aligning the 11 MHz and 20 MHz clocks

The 11 Barker chips of the preamble and header are transmitted aligned with this timing epoch. The first Barker chip is transmitted synchronous to the epoch, and then the remaining 10 chips follow. This is repeated over the duration of the preamble and header.

The peak of the continuous-time single carrier pulse shall be aligned to this epoch as shown in Figure 153Q.

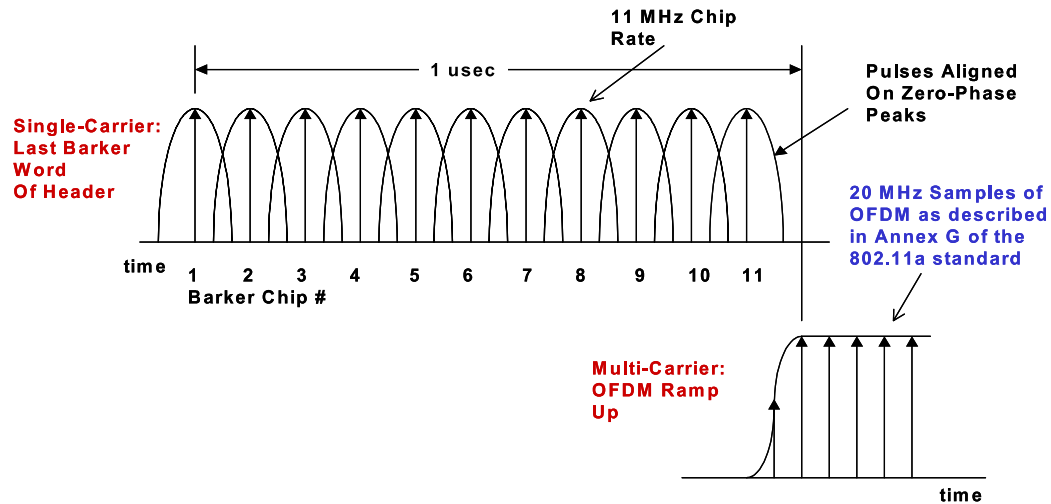


Figure 153Q—Single carrier to OFDM time alignment

The first full-strength OFDM sample is sent on the 1 μs -epoch boundary, as illustrated in Figure 153Q. Tapering may precede this. The peak corresponds to the first full-strength sample described in Annex G.

19.7.2.4 Single carrier termination

The single carrier segment of a packet should terminate in nominally 0.1 μs with the same type shaping described for Clause 17. This is depicted in Figure 153R. It is not necessary to completely flush the single carrier pulse-shaping filter. This minimizes the transition time overhead. This is informative as the basic requirement is to meet the spectral mask defined in 17.3.9.2.

This termination may be performed explicitly in the baseband processor, or it may be provided by filters in the transmit radio.

19.7.2.5 Transition carrier frequency requirement

The carrier frequency shall be coherent across the packet segments. This effect is depicted in Figure 153S.

19.7.2.6 Transition carrier phase requirement

The carrier phase shall be coherent across the single carrier to multicarrier transition. This coherency shall be differentially established relative to the phase of the last Barker symbol transmitted (the last 11 single carrier chips). The OFDM segment symbols shall be transmitted with one of four phases relative to the phase of OFDM symbols as described in Clause 17. These phases include 0, 90, 180, or 270 degrees, depending on the phase of the last Barker symbol. The phase of the first OFDM symbol (as referenced by the pilot tones) shall be 45 degrees more than the phase of the last Barker symbol. “More than” implies a clockwise rotation as shown in Figure 153U.

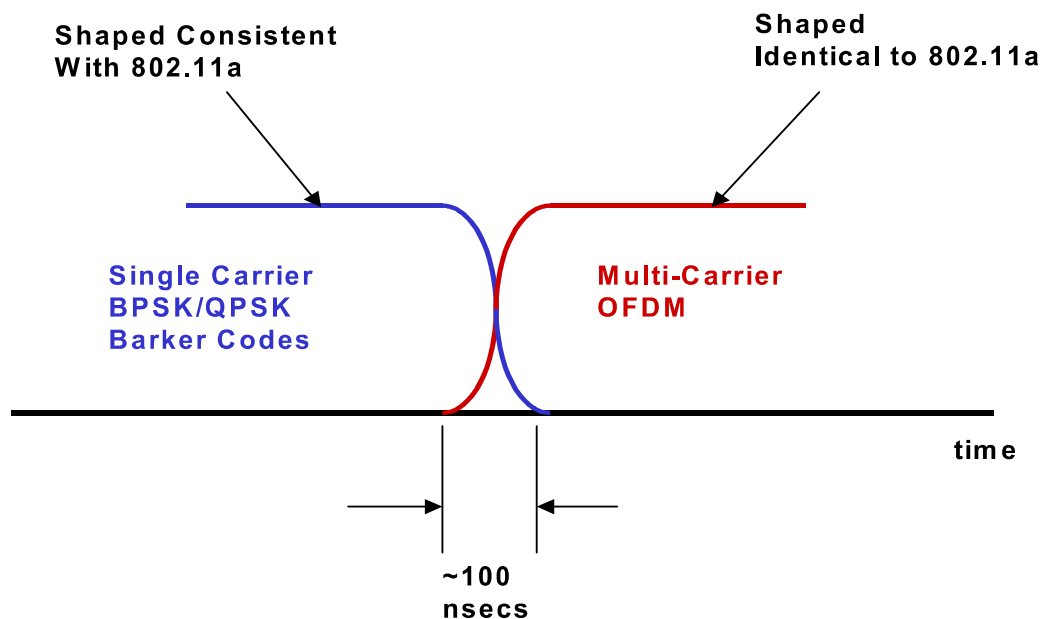


Figure 153R—Single carrier termination requirement

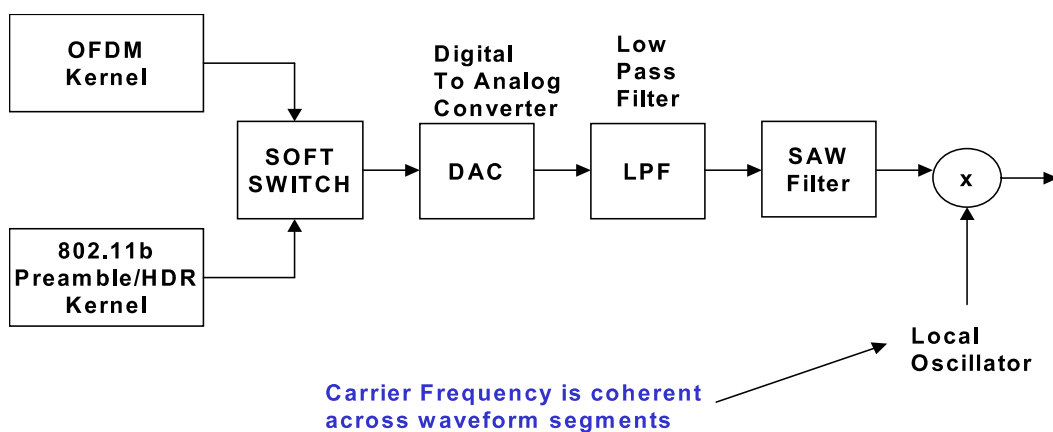


Figure 153S—Carrier frequency coherency shall be maintained

In a transmit implementation using I/Q signaling, it is common to maximally energize in the I-and-Q channels concurrently for BPSK or QPSK signaling. The analog stages of the transmit radio tend to perform best with this configuration. To achieve this effect, typically the BPSK or QPSK I-and-Q alignment of the Barker symbols are at 45 degrees, 135 degrees, -135 degrees, and -45 degrees, as shown in Figure 153T. This Barker symbol alignment is used to establish the phase of the OFDM signal.

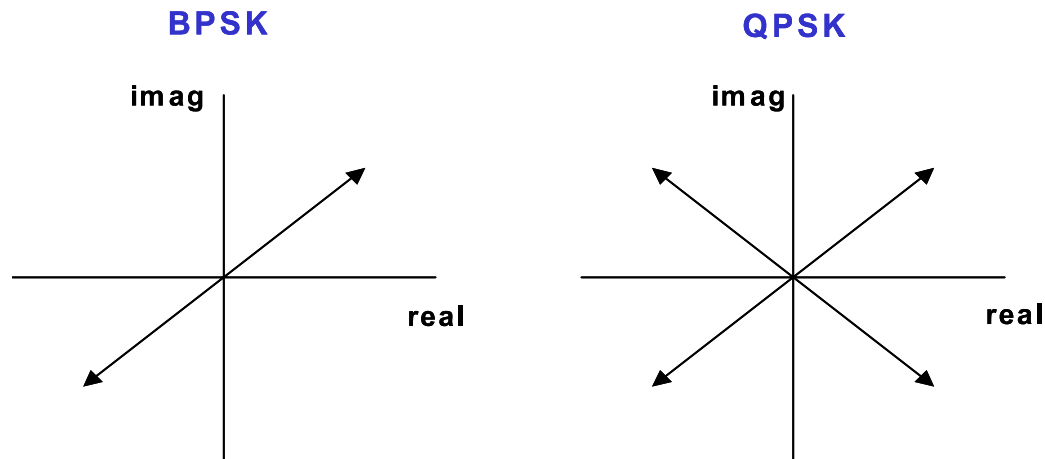


Figure 153T—BPSK and QPSK signaling with the I/Q channels maximally energized

Figure 153U is a series of diagrams illustrating the phase relationship between the last Barker symbol (not the last chip) in the IEEE 802.11g header and subsequent OFDM symbols. For example, if the phase of the last Barker symbol is in the first quadrant at 45 degrees, then the phase of the OFDM symbols will be transmitted as described in Annex G unmodified. However, if the phase of the last Barker symbol is in the second quadrant (135 degree phase), then the phase of the OFDM symbols will be rotated by +90 degrees relative to the phase of the samples in Annex G. If the phase of the last Barker symbol is in the third quadrant (-135 degree phase), then the phase of the OFDM symbols will be rotated by +180 degrees relative to the phase of the samples in Annex G. If the phase of the last Barker symbol is in the fourth quadrant (-45 degree phase), then the phase of the OFDM symbols will be rotated by +270 degrees relative to the phase of the samples in Annex G.

If the transmitter generates the Barker symbols at some other angular relationship to the I/Q axes, then the OFDM symbols shall be transmitted at a phase 45 degrees more than the phase of the last 11-chip Barker symbol.

19.7.2.7 Transmit modulation accuracy requirement

The preceding subclauses establish transmit modulation requirements without mention of required accuracy. The accuracy is as described in 17.3.9.7.

The required accuracy for a given transmit packet is data rate dependent. The packet accuracy is set by the data rate of the OFDM portion of the packet. The preamble and header will be transmitted with the same fidelity requirement as the fidelity requirement levied on the OFDM portion of the packet. For the single carrier portion of the packet, the EVM is interpreted as normalized mean-squared error (NMSE).

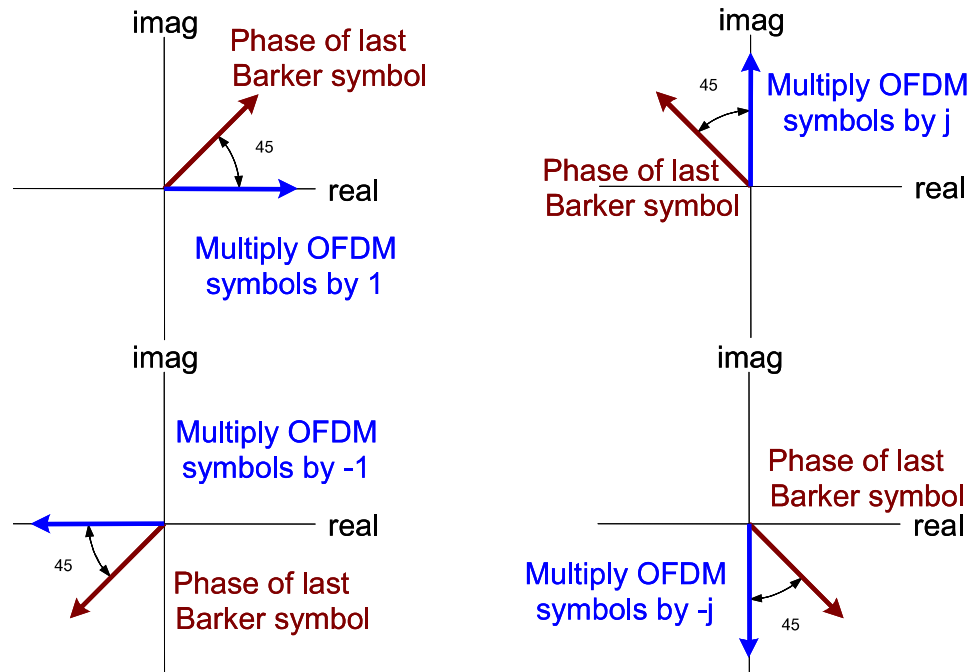


Figure 153U—The phase of the first OFDM segment symbol is established by the last Barker symbol

19.8 ERP PLME

19.8.1 PLME SAP

Table 123F lists the additional MIB attributes that may be accessed by the PHY sublayer entities and the intralayer of higher layer management entities (LMEs). These attributes are accessed via the PLME-GET, PLME-SET, PLME-RESET, and PLME-CHARACTERISTICS primitives defined in 10.4.

19.8.2 MIB

High Rate PHY MIB attributes are defined in Annex D with additions from this amendment, and with specific values defined in Table 123F.

19.8.3 TXTIME

The value of TXTIME is calculated for each modulation type based on parameters in the TXVECTOR. For the 1, 2, 5.5, and 11 Mbit/s modes with DSSS, CCK, and PBCC modulation formats, the value shall be calculated as described in 18.3.4.

Table 123F—MIB attribute default values/ranges

Managed Object	Default Value/Range	Operational Semantics
dot11 PHY Operation Table		
dot11PHYtype	ERP (X'06')	Static
dot11CurrentRegDomain	Implementation dependent	Static
dot11TempType	Implementation dependent	Static
dot11 PHY Antenna Table		
dot11CurrentTxAntenna	Implementation dependent	Dynamic
dot11DiversitySupport	Implementation dependent	Static
dot11CurrentRxAntenna	Implementation dependent	Dynamic
dot11 PHY Tx Power Table		
dot11NumberSupportedPowerLevels	Implementation dependent	Static
dot11TxPowerLevel1	Implementation dependent	Static
dot11TxPowerLevel2	Implementation dependent	Static
dot11TxPowerLevel3	Implementation dependent	Static
dot11TxPowerLevel4	Implementation dependent	Static
dot11TxPowerLevel5	Implementation dependent	Static
dot11TxPowerLevel6	Implementation dependent	Static
dot11TxPowerLevel7	Implementation dependent	Static
dot11TxPowerLevel8	Implementation dependent	Static
dot11CurrentTxPowerLevel	Implementation dependent	Dynamic
dot11 Phy DSSS Table		
dot11CurrentChannel	Implementation dependent	Dynamic
dot11 Reg Domains Supported Table		
dot11RegDomainsSupportedValue(s)	Implementation dependent	Static
dot11 PHY Antennas List Table		
dot11SupportedTxAntenna	Implementation dependent	Static
dot11SupportedRxAntenna	Implementation dependent	Static
dot11DiversitySelectionRx	Implementation dependent	Dynamic
dot11 Supported Data Rates Tx Table		
dot11SupportedDataRatesTxValue	X'02' = 1 Mbit/s X'04' = 2 Mbit/s X'0B' = 5.5 Mbit/s X'16' = 11 Mbit/s X'0C' = 6 Mbit/s X'12' = 9 Mbit/s X'18' = 12 Mbit/s X'24' = 18 Mbit/s X'2C' = 22 Mbit/s X'30' = 24 Mbit/s X'42' = 33 Mbit/s X'48' = 36 Mbit/s X'60' = 48 Mbit/s X'6C' = 54 Mbit/s	Static

Table 123F—MIB attribute default values/ranges (continued)

Managed Object	Default Value/Range	Operational Semantics
dot11 Supported Data Rates Rx Table		
dot11SupportedDataRatesRxValue	X'02' = 1 Mbit/s X'04' = 2 Mbit/s X'0B' = 5.5 Mbit/s X'16' = 11 Mbit/s X'0C' = 6 Mbit/s X'12' = 9 Mbit/s X'18' = 12 Mbit/s X'24' = 18 Mbit/s X'2C' = 22 Mbit/s X'30' = 24 Mbit/s X'42' = 33 Mbit/s X'48' = 36 Mbit/s X'60' = 48 Mbit/s X'6C' = 54 Mbit/s	Static
dot11 HRDSSS PHY Table		
dot11ShortPreambleOptionImplemented	True	Static
dot11PBCCOptionImplemented	Implementation dependent	Static
dot11ChannelAgilityPresent	Implementation dependent	Static
dot11ChannelAgilityEnabled	False/Boolean	Dynamic
dot11 PHY ERP Table		
dot11ERP-PBCCOptionImplemented	False/Boolean	Static
dot11DSSS-OFDMOptionImplemented	False/Boolean	Static
dot11DSSS-OFDMOptionEnabled	False/Boolean	Dynamic
dot11ShortSlotTimeOptionImplemented	False/Boolean	Static
dot11ShortSlotTimeOptionEnabled	False/Boolean	Dynamic

19.8.3.1 ERP-OFDM TXTIME calculations

The value of the TXTIME parameter returned by the PLME-TXTIME.confirm primitive shall be calculated using the ERP-OFDM TXTIME calculation as shown in Equation (42).

$$\text{TXTIME} = T_{\text{PREAMBLE}} + T_{\text{SIGNAL}} + T_{\text{SYM}} \times \text{Ceiling}((16 + 8 \times \text{LENGTH} + 6) / N_{\text{DBPS}}) + \text{Signal Extension} \quad (42)$$

where

T_{PREAMBLE} , T_{SIGNAL} , and T_{SYM} are defined in Table 79 in 17.3.2.3,

N_{DBPS} is the number of data bits per symbol and is derived from the DATARATE parameter in Table 78 in 17.3.2.2,

Ceiling is a function that returns the smallest integer value greater than or equal to its argument value, Signal Extension is 6 μs .

19.8.3.2 ERP-PBCC TXTIME calculations

The value of the TXTIME parameter returned by the PLME-TXTIME.confirm primitive shall be calculated according to the following:

For PBCC 5.5 and 11 Mbit/s, see 18.3.4.

For ERP-PBCC-22 Mbit/s, use Equation (43).

$$\text{TXTIME} = \text{PreambleLength} + \text{PLCPHeaderTime} + \text{Ceiling}(((\text{LENGTH} + \text{PBCC}) \times 8) / \text{DATARATE}) \quad (43)$$

For ERP-PBCC-33 Mbit/s, use Equation (44).

$$\begin{aligned} \text{TXTIME} = & \text{PreambleLength} + \text{PLCPHeaderTime} \\ & + \text{Ceiling}(((\text{LENGTH} + \text{PBCC}) \times 8) / \text{DATARATE}) + \text{ClkSwitchTime}. \end{aligned} \quad (44)$$

where

LENGTH and DATARATE are values from the TXVECTOR parameter of the corresponding PLME-TXTIME request primitive,

“PBCC” has a value of 1 if the SIGNAL value from the TXVECTOR parameter specifies ERP-PBCC and has a value of 0 otherwise,

PreambleLength is 144 μs if the PREAMBLE_TYPE value from the TXVECTOR parameter indicates “LONGPREAMBLE” or 72 μs if the PREAMBLE_TYPE value from the TXVECTOR parameter indicates “SHORTPREAMBLE”,

PLCPHeaderTime is 48 μs if the PREAMBLE_TYPE value from the TXVECTOR parameter indicates “LONGPREAMBLE” or 24 μs if the PREAMBLE_TYPE value from the TXVECTOR parameter indicates “SHORTPREAMBLE”,

LENGTH is in units of octets,

DATARATE is in units of Mbit/s,

ClkSwitchTime is defined as 1 μs ,

Ceiling is a function that returns the smallest integer value greater than or equal to its argument value.

19.8.3.3 DSSS-OFDM TXTIME calculations

The value of the TXTIME parameter returned by the PLME-TXTIME.confirm primitive shall be calculated according to Equation (45):

$$\begin{aligned} \text{TXTIME} = & \text{PreambleLengthDSSS} + \text{PLCPHeaderTimeDSSS} \\ & + \text{PreambleLengthOFDM} + \text{PLCPSignalOFDM} \\ & + 4 \times \text{Ceiling}((\text{PLCPServiceBits} + 8 \times (\text{NumberOfOctets}) + \text{PadBits}) / N_{\text{DBPS}}) + \text{SignalExtension} \end{aligned} \quad (45)$$

where

PreambleLengthDSSS is 144 μs if the PREAMBLE_TYPE value from the TXVECTOR parameter indicates “LONGPREAMBLE,” or 72 μs if the PREAMBLE_TYPE value from the TXVECTOR parameter indicates “SHORTPREAMBLE”,

PLCPHeaderTimeDSSS is 48 μs if the PREAMBLE_TYPE value from the TXVECTOR parameter indicates “LONGPREAMBLE,” or 24 μs if the PREAMBLE_TYPE value from the TXVECTOR parameter indicates “SHORTPREAMBLE”,

Ceiling is a function that returns the smallest integer value greater than or equal to its argument value;

PreambleLengthOFDM is 8 μs ,

PLCPSignalOFDM is 4 μs ,

PLCPServiceBits is 16 bits;

NumberOfOctets is the number of data octets in the PSDU,
PadBits is 6 bits,
SignalExtension is 6 μ s,
 N_{DBPS} is the number of data bits per OFDM symbol.

19.8.4 ERP-OFDM PLCP PSDU definition

The DSSS PHY characteristics in Table 123G shall be used for the ERP for the purposes of MAC timing calculations.

The slot time shall be 20 μ s, unless the BSS consists only of ERP STAs that support the Short Slot Time option. STAs indicate support for a short slot time by setting the Short Slot Time subfield to 1 when transmitting Association Request and Reassociation Request MMPDUs. If the BSS consists of only ERP STAs that support the Short Slot Time option, an optional 9 μ s slot time may be used. APs indicate usage of a 9 μ s slot time by setting the Short Slot Time subfield to 1 in all Beacon, Probe Response, Association Response, and Reassociation MMPDU transmissions as described in 7.3.1.4. STAs shall use short slot if the BSS indicates short slot.

Table 123G—Extended Rate PHY characteristics

Characteristic	Value
aSlotTime	Long = 20 μ s, short = 9 μ s
aSIFSTime	10 μ s
aCCATime	<15 μ s for long slot time or <4 μ s for Short Slot Time, see 19.4.6
aRxTxTurnaroundTime	<5 μ s
aTxRxTurnaroundTime	<10 μ s
aTxPLCPDelay	Implementation dependent as long as the requirements of aRxTxTurnaroundTime are met.
aRxPLCPDelay	Implementation dependent as long as the requirements of aSIFSTime and aCCATime are met.
aRxTxSwitchTime	<<1 μ s
aTxRampOnTime	Implementation dependent as long as the requirements of aRxTxTurnaroundTime are met.
aTxRampOffTime	Implementation dependent as long as the requirements of aSIFSTime are met.
ATxRFDelay	Implementation dependent as long as the requirements of aRxTxTurnaroundTime are met.
ARxRFDelay	Implementation dependent as long as the requirements of aSIFSTime and aCCATime are met.
aAirPropagationTime	<<1 μ s
aMACProcessingDelay	<2 μ s
aPreambleLength	20 μ s
aPLCPHeaderLength	4 μ s
aMPDUMaxLength	4095
aCWmin(0)	31

Table 123G—Extended Rate PHY characteristics (continued)

Characteristic	Value
aCWmin(1)	15
ACWmin	The set aCWmin()
aCWmax	1023

19.9 Extended Rate PMD sublayer

19.9.1 Scope and field of application

This subclause describes the PMD services provided to the PLCP for the ERP.

19.9.2 Overview of service

The ERP sublayer accepts PLCP sublayer service primitives and provides the actual means by which data are transmitted or received from the medium. The combined functions of the Extended Rate PMD sublayer primitives and parameters for the receive function result in a data stream, timing information, and associated received signal parameters being delivered to the PLCP sublayer. A similar functionality is provided for data transmission.

19.9.3 Overview of Interactions

The primitives associated with the PLCP sublayer to the ERP fall into two basic categories, as follows:

- a) Service primitives that support PLCP peer-to-peer interactions
- b) Service primitives that have local significance and that support sublayer-to-sublayer interactions

19.9.4 Basic service and options

All of the service primitives described in this subclause are considered mandatory, unless otherwise specified.

19.9.4.1 PMD_SAP peer-to-peer service primitives

Table 123H indicates the primitives for peer-to-peer interactions.

Table 123H—PMD_SAP peer-to-peer services

Primitive	Request	Indicate	Confirm	Response
PMD_Data	X	X		

19.9.4.2 PMD_SAP sublayer-to-sublayer service primitives

Table 123I indicates the primitives for sublayer-to-sublayer interactions.

Table 123I—PMD_SAP sublayer-to-sublayer services

Primitive	Request	Indicate	Confirm	Response
PMD_TXSTART	X			
PMD_TXEND	X			
PMD_ANTSEL	X			
PMD_TXPWRLVL	X			
PMD_MODULATION	X			
PMD_PREAMBLE	X			
PMD_RATE	X			
PMD_RSSI		X		
PMD_SQ		X		
PMD_CS		X		
PMD_ED		X		

19.9.4.3 PMD_SAP service primitive parameters

Table 123J shows the parameters used by one or more of the PMD_SAP service primitives.

Table 123J—List of parameters for the PMD primitives

Parameter	Associated primitive	Value	Description
TXD_UNIT	PMD_DATA.request	0 to $(2^n)-1$, where n is the number of bits per symbol for the modulation and rate specified in PMD_MODULATION.request and PMD_RATE.request primitives.	This parameter represents a single block of data, which, in turn, is used by the PMD to be encoded into a transmitted symbol.
RXD_UNIT	PMD_DATA.indicate	0 to $(2^n)-1$, where n is the number of bits per symbol for the modulation and rate specified in PMD_MODULATION.request and PMD_RATE.request primitives.	This parameter represents a single symbol that has been demodulated by the PMD entity.
MODULATION	PMD_MODULATION.request	ERP-DSSS, ERP-CCK, PBCC, ERP-PBCC, ERP-OFDM, DSSS-OFDM	The MODULATION parameter specifies to the PMD layer, which ERP modulation format is for transmission of the PSDU portion of the PPDU.
PREAMBLE	PMD_PREAMBLE.request	0 for long, 1 for short	PREAMBLE selects which of the ERP preamble types is used for PLCP transmission, when applicable. It is not applicable to ERP-OFDM format.

Table 123J—List of parameters for the PMD primitives (continued)

Parameter	Associated primitive	Value	Description
ANT_STATE	PMD_ANTSEL.request	1 to 256	ANT_STATE selects which of the available antennas is used for transmission. The number of available antennas is determined from the MIB table parameters.
TXPWR_LEVEL	PMD_TXPWRLVL.request	1–8 (max of 8 levels)	TXPWR_LEVEL selects which of the optional transmit power levels should be used for the current PPDU transmission. The number of available power levels is determined from the MIB table parameters.
RATE	PMD_RATE.request	X'0A' for 1 Mbit/s X'14' for 2 Mbit/s X'37' for 5.5 Mbit/s X'6E' for 11 Mbit/s X'DC' for 22 Mbit/s X'21' for 33 Mbit/s X'75' for 12 Mbit/s BPSK X'E7' for 24 Mbit/s QPSK X'4B' for 48 Mbit/s 16 QAM X'AA' for 72 Mbit/s 64QAM	RATE selects which of the ERP data rates is used for PSDU transmission. Note that the OFDM rates are the raw, uncoded rates as in 17.3.7 and 17.5.5 and represent the rates existing at this interface.
RSSI	PMD_RSSI.indicate	8 bits of RSSI (256 levels)	The RSSI is a measure of the RF energy received. Mapping of the RSSI values to actual received power is implementation dependent. See 19.9.5.10.
SQ	PMD_SQ.indicate	8 bits of SQ	This parameter is a measure of the signal quality received by the ERP during the PLCP preamble and header. It is not applicable to ERP-OFDM format. See 19.9.5.11.

Table 123J—List of parameters for the PMD primitives (*continued*)

Parameter	Associated primitive	Value	Description
CS	PMD_CS.indicate	0 for DISABLED1 for ENABLED	The PMD_CS (preamble detect) primitive in conjunction with the PMD_ED provides the CCA status through the PLCP layer PHY?CCA primitive. PMD_CS indicates a binary status of ENABLED or DISABLED. PMD_CS is ENABLED upon detection of Barker code or OFDM sync signals. PMD_CS is DISABLED otherwise.
ED	PMD_ED.indicate	0 for DISABLED1 for ENABLED	The PMD_ED (energy detect) primitive, along with the PMD_SQ, provides CCA status at the PLCP layer through the PHY?CCA primitive. PMD_ED indicates a binary status of ENABLED or DISABLED. PMD_ED is ENABLED when the RSSI indicated in the PMD_RSSI is greater than the detection threshold. PMD_ED is DISALBED otherwise.

19.9.5 PMD_SAP detailed service specification

The following subclauses describe the services provided by each PMD primitive.

19.9.5.1 PMD_DATA.request

This primitive is the same as that defined in 17.5.5.1 and 18.4.5.1 except that the parameter TXD_UNIT is expanded in scope to reflect the supported modulation formats of ERP as defined in 19.9.4.3.

19.9.5.2 PMD_DATA.indicate

This primitive is the same as that defined in 17.5.5.2 and 18.4.5.2 except that the parameter RXD_UNIT is expanded in scope to reflect the supported modulation formats of ERP as defined in 19.9.4.3.

19.9.5.3 PMD_MODULATION.request

This primitive is the same as that defined in 18.4.5.3 except that the parameter MODULATION is expanded in scope to reflect the supported modulation formats of ERP as defined in 19.9.4.3.

19.9.5.4 PMD_PREAMBLE.request

This primitive is the same as that defined in 18.4.5.4, including the definition of the parameter PREAMBLE. This primitive is not used in association with transmission of ERP-OFDM modulations.

19.9.5.5 PMD_TXSTART.request

This primitive is the same as that defined in 17.5.5.3 and 18.4.5.6.

19.9.5.6 PMD_TXEND.request

This primitive is the same as that defined in 17.5.5.4 and 18.4.5.7.

19.9.5.7 PMD_ANTSEL.request

This primitive is the same as that defined in 18.4.5.8, including the definition of the parameter ANT_STATE.

19.9.5.8 PMD_TXPRWLVL.request

This primitive is the same as that defined in 17.5.5.5, including the definition of the parameter TXPWR_LEVEL.

19.9.5.9 PMD_RATE.request

This primitive is the same as that defined in 17.5.5.6 and 18.4.5.10, except that the parameter RATE is expanded in scope to reflect the supported ERP transmission rates as defined in 19.9.4.3.

19.9.5.10 PMD_RSSI.indicate

This primitive is the same as that defined in 17.5.5.7 and 18.4.5.11, including the parameter RSSI. This primitive is used to aid in link optimization algorithms such as roaming decisions.

19.9.5.11 PMD_SQ.indicate

This primitive is the same as that defined in 18.4.5.12, including the parameter SQ. This primitive is not used in association with reception of ERP-OFDM modulations. This primitive is used to aid in link optimization algorithms such as roaming decisions.

19.9.5.12 PMD_CS.indicate

This primitive is the same as that defined in 18.4.5.13, except that its use is expanded for use with all ERP modulation types as described in 19.3.5.

19.9.5.13 PMD_ED.indicate

This primitive is the same as that defined in 18.4.5.14, except that its use is expanded for use with all ERP modulation types as described in 19.3.5.

Annex A

(normative)

Protocol implementation conformance statement (PICS) proforma

A.3 Instructions for completing the PICS proforma

A.3.1 General structure of the PICS proforma

Change the fifth paragraph in A.3.1 as shown:

The PICS proforma for a station consists of A.4.1 through A.4.4 inclusive, and at least one of A.4.5, A.4.6, ~~or~~ A.4.7, A.4.8, A.4.9, or A.4.12 corresponding to the PHY implemented.

A.4 PICS Proforma

A.4.3 IUT Configuration

Insert the following row at the bottom of the table in A.4.3:

Item	IUT configuration	References	Status	Support
*CF9	Extended Rate PHY layer	19	O.2	Yes ☐ No ☐ N/A ☐

A.4.4 MAC protocol

A.4.4.1 Mac Protocol capabilities

Insert the following rows at the bottom of the table in A.4.4.1:

Item	Protocol items	References	Status	Support
PC16	Set dot11ShortPreambleOptionImplemented to 1	7.3.1.4	CF9:M	Yes ☐ No ☐ N/A ☐
PC17	Set PBCC subfield as described in reference	7.3.1.4	CF9:M	Yes ☐ No ☐ N/A ☐
PC18	Set DSSS-OFDM subfield as described in reference	7.3.1.4	CF9:M	Yes ☐ No ☐ N/A ☐
PC19	Set channel agility subfield as described in reference	7.3.1.4	CF9:M	Yes ☐ No ☐ N/A ☐
PC20	Set Short Slot Time subfield as described in reference	7.3.1.4	CF9:M	Yes ☐ No ☐ N/A ☐
PC21	Monitor each received short time slot subfield and take action as described in reference	7.3.1.4	CF9:M	Yes ☐ No ☐ N/A ☐
PC22	Transmit the ERP Information element in each transmitted Beacon or Probe Responses in the format and with content as described in reference	7.3.1.4	CF9:M	Yes ☐ No ☐ N/A ☐
PC23	Receive the ERP Information element and employ a protection mechanism when required prior to transmitting information using ERP-OFDM modulation	7.3.1.4	CF9:M	Yes ☐ No ☐ N/A ☐
PC24	Determine the value of aCWmin based on the characteristic rate set as described in the reference	9.2.12	CF9:M	Yes ☐ No ☐ N/A ☐
PC25	Transmit control response frames at the largest basic rates less than equal to the rate received and with the same PHY options or use the highest mandatory rate if no basic rate meets the above criterion	9.6	CF9:M	Yes ☐ No ☐ N/A ☐
PC26	Transmit broadcast or multicast frames at a rate in the basic rate set	9.6	CF9:M	Yes ☐ No ☐ N/A ☐
PC27	Transmit unicast frames at any supported rate selected by a rate switching mechanism as long as it is supported by the destination STA	9.6	CF9:M	Yes ☐ No ☐ N/A ☐
PC28	Do not transmit at a data rate higher than the greatest rate in the OperationalRateSet	9.6	CF9:M	Yes ☐ No ☐ N/A ☐
PC29	Use ERP Information element to control use of protection mechanism as described in the reference	9.10	CF9:M	Yes ☐ No ☐ N/A ☐
PC30	Updated NAV is long enough to cover frame and any response	9.10	CF9:M	Yes ☐ No ☐ N/A ☐
PC31	Support transmission of CTS-to-self sequence as described in the references	7.2.12, 9.2.11, 9.7	CF9:O	Yes ☐ No ☐ N/A ☐
PC32	Support reception of CTS-to-self sequence as described in the references	7.2.12, 9.2.11, 9.7	CF9:M	Yes ☐ No ☐ N/A ☐
PC33	Update NAV	9.10	CF9:M	Yes ☐ No ☐ N/A ☐

Insert new subclause A.4.11:

A.4.11 ERP Physical Layer functions

Item	PHY features	References	Status	Support
*ERP1	Transmit and Receive ERP-DSSS data rates 1 and 2 Mbit/s and ERP-CCK data rates 5.5 and 11 Mbit/s	19.3.2	CF9:M	Yes ☐ No ☐ N/A ☐
ERP1.1	Transmit and receive ERP-OFDM data rates of 6, 12, and 24 Mbit/s	19.3.2	CF9:M	Yes ☐ No ☐ N/A ☐
ERP1.2	Transmit and receive ERP-OFDM data rate of 9	19.3.2	ERP1:O	Yes ☐ No ☐ N/A ☐
ERP1.3	Transmit and receive ERP-OFDM data rate of 18	19.3.2	ERP1:O	Yes ☐ No ☐ N/A ☐
ERP1.4	Transmit and receive ERP-OFDM data rate of 36	19.3.2	ERP1:O	Yes ☐ No ☐ N/A ☐
ERP1.5	Transmit and receive ERP-OFDM data rate of 48	19.3.2	ERP1:O	Yes ☐ No ☐ N/A ☐
ERP1.6	Transmit and receive ERP-OFDM data rate of 54	19.3.2	ERP1:O	Yes ☐ No ☐ N/A ☐
*ERP2	Transmit and receive ERP-PBCC data rate of 22 Mbit/s	19.3.2	CF9&HRDS9.1&HRDS9.2:O	Yes ☐ No ☐ N/A ☐
ERP2.1	Transmit and receive ERP-PBCC data rate of 33 Mbit/s	19.3.2	ERP2:O	Yes ☐ No ☐ N/A ☐
*ERP3	Transmit and receive DSSS-OFDM data at same rates as ERP-OFDM	19.3.2	CF9:O	Yes ☐ No ☐ N/A ☐
ERP4	Support of ERP3 required PPDU formats as described in reference	19.3.2	CF9:O	Yes ☐ No ☐ N/A ☐
ERP5	Able to transmit and receive long and short DSSS as well as OFDM preambles	19.3.2	CF9:M	Yes ☐ No ☐ N/A ☐

Item	PHY features	References	Status	Support
ERP6	Set SERVICE field bits for DSSS-OFDM, ERP-PBCC, locked clocks, and length extension (b0, b2, b3, b5, b6, and b7)	19.3.2.1	CF9:M	Yes ☐ No ☐ N/A ☐
ERP7	Set b1 & b4 of long and short preamble PPDU SERVICE field to zero	19.3.2.1	CF9:M	Yes ☐ No ☐ N/A ☐
ERP8	b2 shall be set to 1 in all long and short preamble PPDU SERVICE fields	19.3.2.1	CF9:M	Yes ☐ No ☐ N/A ☐
ERP9	Set bits b5, b6, and b7 of the long and short preamble PPDU SERVICE fields as described in the reference	19.3.2.1, 19.3.2.1.2	CF9:M	Yes ☐ No ☐ N/A ☐
ERP10	Use Clause 15 or Clause 18 rates when using protection mechanisms	9.10	CF9:M	Yes ☐ No ☐ N/A ☐
ERP11	SIGNAL field set to 3 Mbit/s in all long and short DSSS-OFDM PPDU formats as described in the reference	19.3.2.4	ERP3:M	Yes ☐ No ☐ N/A ☐
ERP12	Calculate DSSS-OFDM length with signal extension	19.3.2.4.1	ERP3:M	Yes ☐ No ☐ N/A ☐
ERP13	Set ERP-PBCC encoder in state 0 at beginning of PPDU	19.3.3.2	ERP2:M	Yes ☐ No ☐ N/A ☐
ERP14	Set phase of ERP-PBCC relative to header	19.3.3.2	ERP2:M	Yes ☐ No ☐ N/A ☐
ERP15	Use same pulse shape for 22 and 33 Mbit/s	19.3.3.2	ERP2:M	Yes ☐ No ☐ N/A ☐
ERP16	Add signal extension of 6 μ s	19.3.2.3	CF9:M	Yes ☐ No ☐ N/A ☐
ERP17	Simultaneous CCA on long preamble Barker, short preamble Barker, and OFDM	19.3.5	CF9:M	Yes ☐ No ☐ N/A ☐

Item	PHY features	References	Status	Support
ERP18	CCA with energy detect above threshold and carrier sense	19.3.5	CF9:M	Yes ☐ No ☐ N/A ☐
ERP19	Decode as DSSS-OFDM if signal field indicates 3 Mbit/s	19.3.6	ERP3:M	Yes ☐ No ☐ N/A ☐
ERP20	Able to automatically detect format of long preamble Barker, short preamble Barker, and OFDM and receive appropriately	19.3.6	CF9:M	Yes ☐ No ☐ N/A ☐
ERP21	Comply with local regulatory frequency allocation requirements	19.4.1	CF9:M	Yes ☐ No ☐ N/A ☐
ERP22	Use frequency plan for 2.4 GHz	19.4.2	CF9:M	Yes ☐ No ☐ N/A ☐
ERP23	Comply with regulatory spurious emissions regulations	19.4.3	CF9:M	Yes ☐ No ☐ N/A ☐
ERP24	Slot time requirements	19.4.4	CF9:M	Yes ☐ No ☐ N/A ☐
ERP25	Implement Short Slot Time option	19.4.4	CF9:O	Yes ☐ No ☐ N/A ☐
ERP26	Use 10 μ s SIFS time	19.4.6	CF9:M	Yes ☐ No ☐ N/A ☐
ERP27	Comply with regulatory transmit power requirements	19.4.7.1	CF9:M	Yes ☐ No ☐ N/A ☐
ERP28	± 25 PPM frequency tolerance	19.4.7.2	CF9:M	Yes ☐ No ☐ N/A ☐
ERP29	Use locked clocks	19.4.7.2, 19.4.7.3	CF9:M	Yes ☐ No ☐ N/A ☐
ERP30	Tolerate input level of -20 dBm	19.5.3	CF9:M	Yes ☐ No ☐ N/A ☐
ERP31	Use specified transmit mask	19.5.4	CF9:M	Yes ☐ No ☐ N/A ☐
ERP32	Meet sensitivity for all supported data rates	19.5.1	CF9:M	Yes ☐ No ☐ N/A ☐
ERP33	Reject adjacent channels as in Table 91 in 17.3.10.1 or in 18.4.8.3 as appropriate	19.5.2	CF9:M	Yes ☐ No ☐ N/A ☐

Item	PHY features	References	Status	Support
ERP34	Coherent transition of ERP-DSSS to OFDM	19.7.2, 19.7.2.7	ERP3:M	Yes ☐ No ☐ N/A ☐
ERP35	Same signal shaping of ERP-DSSS and OFDM	19.7.2.1	ERP3:M	Yes ☐ No ☐ N/A ☐
ERP36	Transmit power equal for ERP-DSSS and OFDM segments	19.7.2.2	ERP3:M	Yes ☐ No ☐ N/A ☐
ERP37	Align transition time	19.7.2.3	ERP3:M	Yes ☐ No ☐ N/A ☐
ERP38	Set transition phase to 45 degrees	19.7.2.3	ERP3:M	Yes ☐ No ☐ N/A ☐
ERP39	Calculate ERP-OFDM TXTime	19.8.3.1	CF9:M	Yes ☐ No ☐ N/A ☐
ERP40	Calculate ERP-PBCC TXTime	19.8.3.2	ERP2:M	Yes ☐ No ☐ N/A ☐
ERP41	Calculate DSSS-OFDM TXTIME	19.8.3.3	ERP3:M	Yes ☐ No ☐ N/A ☐
ERP42	Revert to 20 ms slot time when establishing association with a long slot time STA	7.3.1.4	CF9:M	Yes ☐ No ☐ N/A ☐
ERP43	Support TXVECTOR and RXVECTOR as described in reference	9.2	CF9:M	Yes ☐ No ☐ N/A ☐
ERP44	Terminate single carrier segment smoothly	19.7.2.4	ERP3:M	Yes ☐ No ☐ N/A ☐

Annex C

(normative)

Formal description of MAC operation

C.2 Data type and operator definitions for the MAC state machines

Change Package macsorts 3120_d\Frame_4(31) in C.2 as shown:

Package macsorts

```

/* ... Frame Sort Axioms continued */
setTs(f, tm) == SubStr(f, 0, 24) // mkOS(fix(tm), 1) //
mkOS((fix(tm) / 256), 1) // mkOS((fix(tm) / 65536), 1) //
mkOS((fix(tm) / 16777216), 1) //
mkOS((fix(tm) / 4294967296), 1) //
mkOS((fix(tm) / 4294967296) / 256), 1) //
mkOS((fix(tm) / 4294967296) / 65536), 1) //
mkOS((fix(tm) / 4294967296) / 16777216), 1) //
SubStr(f, 32, Length(f) - 32); );
for all stat in StatusCode(
  status(f) == SubStr(f, 26, 2);
  setStatus(f, stat) ==
    SubStr(f, 0, 26) // stat // SubStr(f, 28, Length(f) - 28);
  authStat(f) == SubStr(f, 28, 2); );
for all rea in ReasonCode( reason(f) == SubStr(f, 24, 2); );
for all alg in AuthType( AuthType(f) == SubStr(f, 24, 2); );
for all u in TU(
  beaconInt(f) == octetVal(f(32)) + (octetVal(f(33)) * 256);
  listenInt(f) == octetVal(f(26)) + (octetVal(f(27)) * 256); );
for all sta in AssocId(
  Ald(f) == octetVal(f(28)) + (octetVal(f(29)) * 256);
  setAld(f, sta) == SubStr(f, 0, 28) // mkOS(sta mod 256, 1) //
  mkOS(sta / 256, 1) // SubStr(f, 30, Length(f) - 30); );
for all kid in KeyIndexRange(
  keyId(f) == octetVal(f(27)) / 64;
  setKeyId(f, kid) == Modify(f, 27, mkOS(kid * 64)); );
endnewtype Frame;

```

3120_d\Frame_4(31)

```

*****
* ReasonCode sort
*****
newtype ReasonCode inherits Octetstring operators all;
adding literals unspec_reason, auth_not_valid, deauth_lv_ss,
inactivity, ap_overload, class2_err, class3_err,
disas_lv_ss, assoc_not_auth;
axioms
unspec_reason == mkOS(1, 2); auth_not_valid == mkOS(2, 2);
deauth_lv_ss == mkOS(3, 2); inactivity == mkOS(4, 2);
ap_overload == mkOS(5, 2); class2_err == mkOS(6, 2);
class3_err == mkOS(7, 2); disas_lv_ss == mkOS(8, 2);
assoc_not_auth == mkOS(9, 2);
endnewtype ReasonCode;

```

```

*****
* StatusCode sort
*****
newtype StatusCode inherits Octetstring operators all;
adding literals successful, unspec_fail, unsup_cap,
reasoc_no_asoc, fail_other, unsupt_alg, auth_seq_fail,
chlng_fail, auth_timeout, ap_full, unsup_rate, no_short_preamble,
no_Pbcc, no_agility, no_short_slot, no_dsss_ofdm;
axioms
successful == mkOS(0, 2); unspec_failure == mkOS(1, 2);
unsup_cap == mkOS(10, 2); reasoc_no_asoc == mkOS(11, 2);
fail_other == mkOS(12, 2); unsupt_alg == mkOS(13, 2);
auth_seq_fail == mkOS(14, 2); chlng_fail == mkOS(15, 2);
auth_timeout == mkOS(16, 2); ap_full == mkOS(17, 2);
unsup_rate == mkOS(18, 2);
no_short_preamble == mkOS(19, 2);
no_Pbcc == mkOS(20, 2); no_agility == mkOS(21, 2);
no_short_slot == mkOS(24, 2); no_dsss_ofdm == mkOS(25, 2);
endnewtype StatusCode;

```

Change Package macsorts 3122_dMgmtFields(31) in C.2 as shown:

3122_dMgmtFields(31)

Package macsorts

```

*****
*      ElementID sort
*****/
newtype ElementID inherits Octetstring operators all;
adding literals eSsld, eSupRates, eFhParms, eDsParms,
eCfParms, eTim, elbParms, eCtext, eERP, eExtSupRates;
axioms
eSsld == mkOS(0, 1); /* service set identifier (0:32) */
eSupRates == mkOS(1, 1); /* supported rates (1:8) */
eFhParms == mkOS(2, 1); /* FH parameter set (5) */
eDsParms == mkOS(3, 1); /* DS parameter set (1) */
eCfParms == mkOS(4, 1); /* CF parameter set (6) */
eTim == mkOS(5, 1); /* Traffic Information Map (4:254) */
elbParms == mkOS(6, 1); /* IBSS parameter set (2) */
eCountry == mkOS(7, 1); /* Country Information (8:254) */
eHopParm == mkOS(8, 1); /* FH Hopping Parameters (4) */
eHopTable == mkOS(9, 1); /* FH Hopping Table (6:254) */
eRequest == mkOS(10, 1); /* Request (3:254) */
eCtext == mkOS(16, 1); /* challenge text (128, see 8.1.2.2) */
eERP == mkOS(42, 1); /* ERP Information element */
eExtSupRates == mkOS(50, 1); /* Extended Supported Rates (1:255) */
endnewtype ElementID;

```

```

*****
*      Capability field bit assignments sort
*****/
newtype Capability inherits Bitstring operators all;
adding literals cEss, clbss, cPollable, cPollReq, cPrivacy, cShortPreamble,
cPBCC, cChannelAgility, cShortSlot, cDsssOfdm;
axioms
cEss == S8(1,0,0,0,0,0,0,0) // 0x00; /* ESS capability */
clbss == S8(0,1,0,0,0,0,0,0) // 0x00; /* IBSS capability */
cPollable == S8(0,0,1,0,0,0,0,0) // 0x00; /* CF-pollable (sta), PC present (ap) */
cPollReq == S8(0,0,0,1,0,0,0,0) // 0x00; /* not CF poll req (sta), PC polls (ap) */
cPrivacy == S8(0,0,0,0,1,0,0,0) // 0x00; /* WEP required */
cShortPreamble == S8(0,0,0,0,0,1,0,0) // 0x00; /* Short Preamble */
cPBCC == S8(0,0,0,0,0,0,1,0) // 0x00; /* PBCC */
cChannelAgility == S8(0,0,0,0,0,0,0,1) // 0x00; /* Channel Agility */
cShortSlot == 0x00 // S8(0,1,0,0,0,0,0,0); /* Short Slot Time */
cDsssOfdm == 0x00 // S8(0,0,0,0,1,0,0,0); /* DSSS-OFDM modulation */
endnewtype Capability;

```

```

*****
*      IBSS parameter set sort
*****/
newtype lbssParms inherits Octetstring operators all;
adding operators
atimWin : lbssParms -> TU
setAtimWin : lbssParms, TU -> lbssParms;
axioms
for all ib in lbssParms( for all u in TU(
  atimWin(ib) == octetVal(ib(0)) + (octetVal(ib(1)) * 256);
  setAtimWin(ib, u) == mkOS(u mod 256, 1) // mkOS(u / 256, 1); ));
endnewtype lbssParms;

```

Replace the diagram sta_tx_idle_2e(9) with the following:

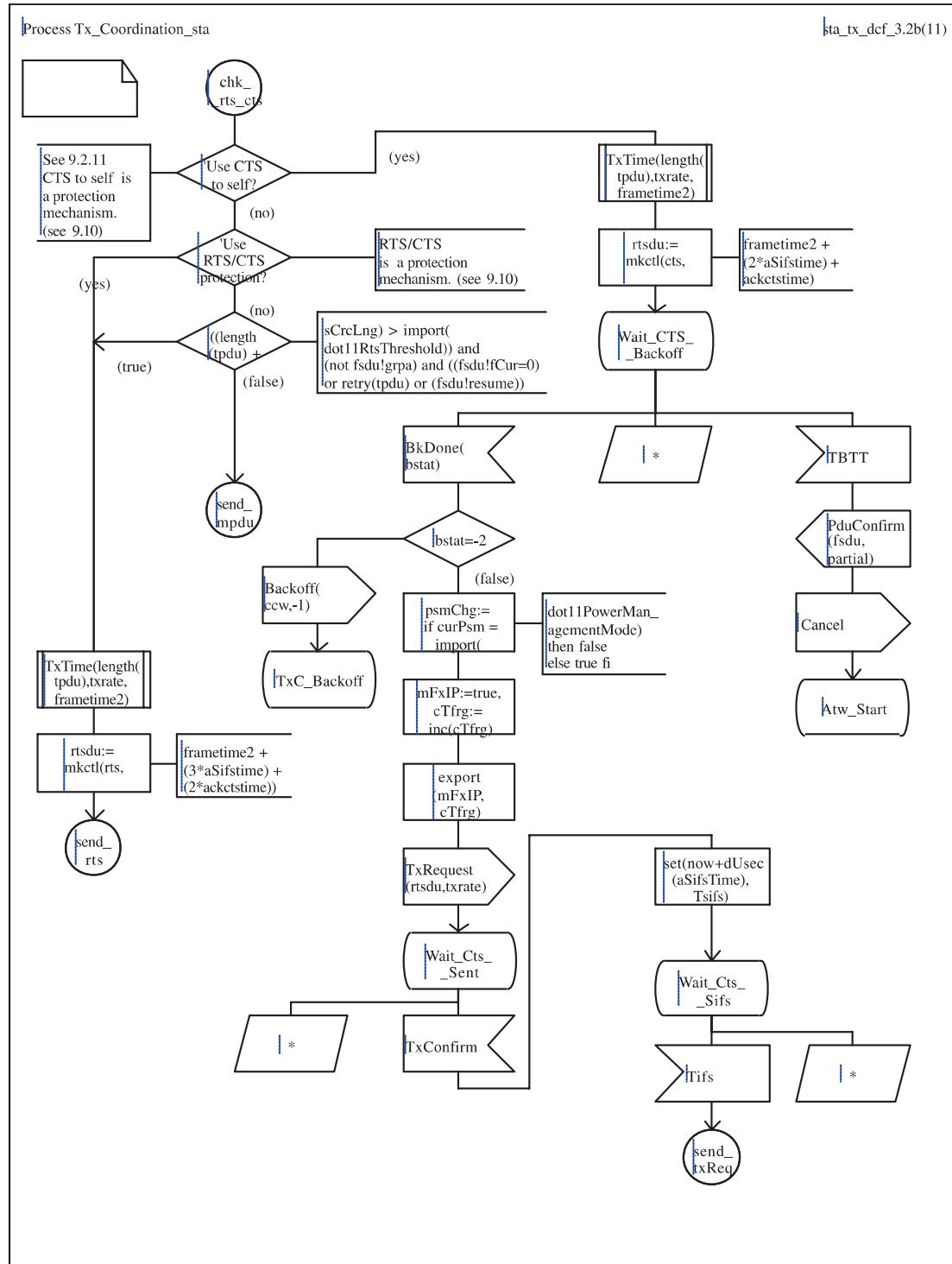
```

stateDiagram-v2
    [*] --> TxC_Idle
    TxC_Idle --> TxC_Idle : Pdu_Request (fsdu)
    TxC_Idle --> TxC_Idle : CfPoll (endRx, )
    TxC_Idle --> TxC_Idle : TBTT
    TxC_Idle --> TxC_Idle : Tx_CfAck (endRx, )
    TxC_Idle --> TxC_Idle : Backoff (0,0)
    TxC_Idle --> TxC_Idle : chk_rts_cts

    TxC_Idle --> TxC_Idle : tx_c_req
    TxC_Idle --> TxC_Idle : rx_poll
    TxC_Idle --> TxC_Idle : Tx_C_Cfp
    TxC_Idle --> TxC_Idle : Atw_Start
    TxC_Idle --> TxC_Idle : BkDone (dcfcnt)
    TxC_Idle --> TxC_Idle : tpdu:=fsdu!pdus(fsdulCur)
    TxC_Idle --> TxC_Idle : fsdu!sqf:=seqnum
    TxC_Idle --> TxC_Idle : seqnum:=if seqnum=4095 then 0 else seqnum+1 fi
    TxC_Idle --> TxC_Idle : fsdu!eol:=now + import(dot11MaxTransmitMsdLifetime)
    TxC_Idle --> TxC_Idle : tpdu:=setSeq(tpdu, fsdu!sqf)
    TxC_Idle --> TxC_Idle : tpdu:=fsdu!pdus(fsdulCur)
    TxC_Idle --> TxC_Idle : send_frag
    TxC_Idle --> TxC_Idle : 'txrate:=selected tx data rate'
    TxC_Idle --> TxC_Idle : TxTime(sAckCtsLng/8, txrate, ackctime)
    TxC_Idle --> TxC_Idle : Txtime(length(fsdulpdus(fsdulCur+1)), txrate, frametime)
    TxC_Idle --> TxC_Idle : tpdu:=setDurId(tpdu, aSifsTime + ackctime + if (fsdu!fTot = (fsdu!fCur+1)) then 0 else ((2*aSifsTime)+ ackctime + frametime) fi)
    TxC_Idle --> TxC_Idle : tpdu:=setPwrMgt(tpdu, import(dot11PowerManagement_Mode))

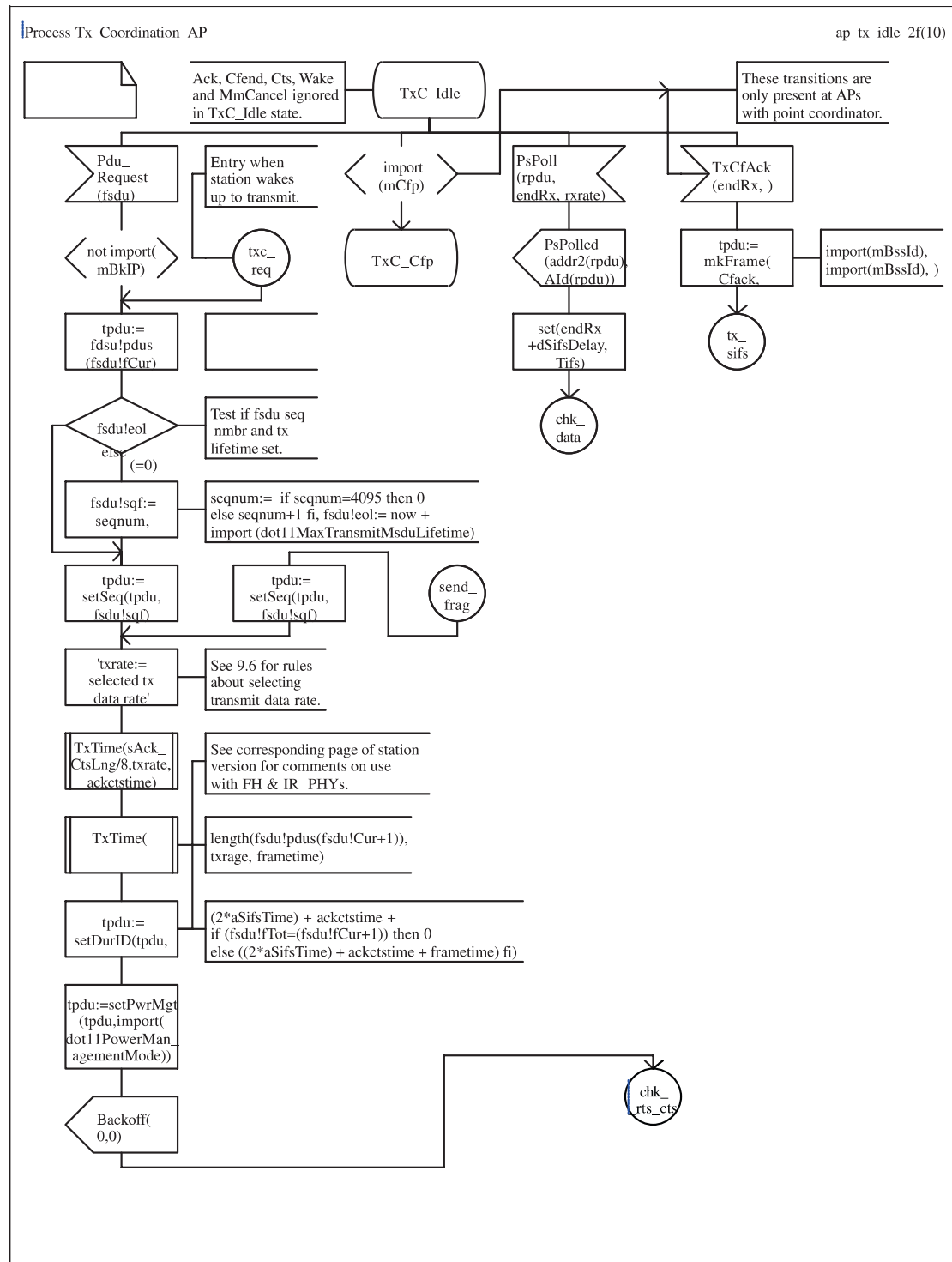
    Note over TxC_Idle: These transitions are only present at CF-pollable stations.
    
```

Insert the following after the diagram sta_tx_dcf_3.1d(10):

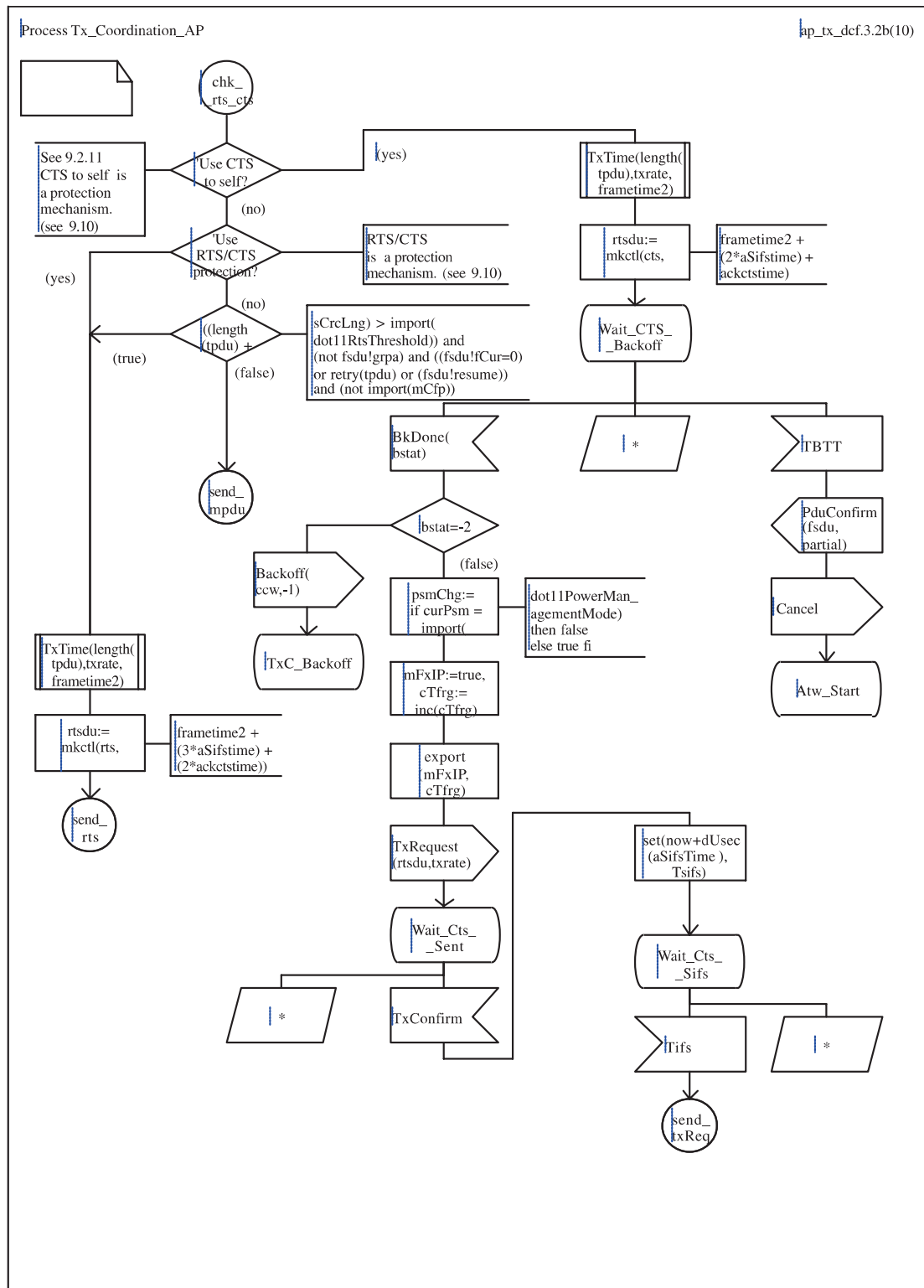


C.4 State machines for MAC access point

Replace the diagram *ap_tx_idle_2e(9)* with the following:



Insert the following after the diagram *ap_tx_dcf_3.1e(9)*:



Annex D

(normative)

ASN.1 coding of MAC and PHY MIB

Change the following attribute definitions:

```
dot11PHYType OBJECT-TYPE
    SYNTAX INTEGER { fhss(1), dsss(2), irbaseband(3), ofdm(4), hrdsss(5), erp(6) }
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "This is an 8-bit integer value that identifies the PHY
        type supported by the attached PLCP and PMD. Currently
        defined values and their corresponding PHY types are:

        FHSS 2.4 GHz = 01, DSSS 2.4 GHz = 02, IR Baseband = 03,

        OFDM 5GHz = 04, HRDSSS = 05, ERP = 06 "

    ::= { dot11PhyOperationEntry 1 }

dot11RTSThreshold OBJECT-TYPE
    SYNTAX INTEGER (0..2347)
    MAX-ACCESS read-write
    STATUS current
    DESCRIPTION
        "This attribute shall indicate the number of octets in an
        MPDU, below which an RTS/CTS handshake shall not be
        performed, except as RTS/CTS is used as a cross modulation
        protection mechanism as defined in 9.10. An RTS/CTS
        handshake shall be performed at the beginning of any frame
        exchange sequence where the MPDU is of type Data or
        Management, the MPDU has an individual address in the
        Address1 field, and the length of the MPDU is greater than
        this threshold. (For additional details, refer to Table 21
        in 9.7.) Setting this attribute to be larger than the
        maximum MSDU size shall have the effect of turning off the
        RTS/CTS handshake for frames of Data or Management type
        transmitted by this STA. Setting this attribute to zero
        shall have the effect of turning on the RTS/CTS handshake
        for all frames of Data or Management type transmitted by
        this STA. The default value of this attribute shall be
        2347."

    ::= { dot11OperationEntry 2 }

dot11SupportedDataRatesTxIndex OBJECT-TYPE
    SYNTAX Integer32 (1..8255)
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "Index object that identifies which data rate to access. Range is
        1..8255."
```

```
::= { dot11SupportedDataRatesTxEntry 1 }
```

```
dot11SupportedDataRatesRxIndex OBJECT-TYPE
```

```
SYNTAX Integer32 (1..8255)
```

```
MAX-ACCESS not-accessible
```

```
STATUS current
```

```
DESCRIPTION
```

```
"Index object that identifies which data rate to access. Range is 1..  
8255."
```

```
::= { dot11SupportedDataRatesRxEntry 1 }
```

In “Major sections” of Annex D, insert the following text to the end of the “PHY Attributes” section:

```
--dot11PhyERPTable ::= {dot11phy 14}
```

Insert the following into the IEEE 802.11 MIB in Annex D, between the section entitled “End of dot11 Hopping Pattern TABLE” and the section entitled “conformance information”:

```
-- *****
```

```
-- * dot11PhyERPEntry TABLE
```

```
-- *****
```

```
dot11PhyERPTable OBJECT-TYPE
```

```
SYNTAX SEQUENCE OF Dot11PhyERPEntry
```

```
MAX-ACCESS not-accessible
```

```
STATUS current
```

```
DESCRIPTION
```

```
"Entry of attributes for dot11PhyERPEntry. Implemented  
as a table indexed on ifIndex to allow for multiple  
instances on an Agent."
```

```
::= { dot11phy 14 }
```

```
dot11PhyERPEntry OBJECT-TYPE
```

```
SYNTAX Dot11PhyERPEntry
```

```
MAX-ACCESS not-accessible
```

```
STATUS current
```

```
DESCRIPTION
```

```
"An entry in the dot11PhyERPEntry Table.  
ifIndex - Each 802.11 interface is represented by an  
ifEntry. Interface tables in this MIB module are indexed  
by ifIndex."
```

```
INDEX {ifIndex}
```

```
::= { dot11PhyERPTable 1 }
```

```
Dot11PhyERPEntry ::= SEQUENCE {
```

```
dot11ERPBBCCOptionImplemented TruthValue,
```

```
dot11ERPBBCCOptionEnabled TruthValue,
```

```
dot11DSSSFDMOptionImplemented TruthValue,
```

```
dot11DSSSFDMOptionEnabled TruthValue,
```

```
dot11ShortSlotTimeOptionImplemented TruthValue,
```

```
dot11ShortSlotTimeOptionEnabled TruthValue }
```

```
dot11ERPBBCCOptionImplemented OBJECT-TYPE
```

```
SYNTAX TruthValue  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION
```

```
"This attribute, when true, shall indicate that the ERP-  
PBCC modulation option as defined in 19.6 is imple-  
mented. The default value of this attribute is false."
```

```
::= {dot11PhyERPEntry 1 }
```

```
dot11ERPBBCCOptionEnabled OBJECT-TYPE
```

```
SYNTAX TruthValue  
MAX-ACCESS read-write  
STATUS current  
DESCRIPTION
```

```
"This attribute, when true, shall indicate that the ERP-  
PBCCOption as defined in 19.6 is enabled. The default  
value of this attribute is false."
```

```
::= {dot11PhyERPEntry 2 }
```

```
dot11DSSSOFDMAOptionImplemented OBJECT-TYPE
```

```
SYNTAX TruthValue  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION
```

```
"This attribute, when true, shall indicate that the  
DSSS-OFDM option as defined in 19.7 is implemented. The  
default value of this attribute is false."
```

```
::= {dot11PhyERPEntry 3 }
```

```
dot11DSSSOFDMAOptionEnabled OBJECT-TYPE
```

```
SYNTAX TruthValue  
MAX-ACCESS read-write  
STATUS current  
DESCRIPTION
```

```
"This attribute, when true, shall indicate that the  
DSSS-OFDM option as defined in 19.7 is enabled. The  
default value of this attribute is false."
```

```
::= {dot11PhyERPEntry 4 }
```

```
dot11ShortSlotTimeOptionImplemented OBJECT-TYPE
```

```
SYNTAX TruthValue  
MAX-ACCESS read-write  
STATUS current  
DESCRIPTION
```

```
"This attribute, when true, shall indicate that the  
Short Slot Time option as defined in 7.3.1.4 is imple-  
mented. The default value of this attribute is false."
```

```
::= {dot11PhyERPEntry 5 }
```

```

dot11ShortSlotTimeOptionEnabled OBJECT-TYPE
    SYNTAX TruthValue
    MAX-ACCESS read-write
    STATUS current
    DESCRIPTION
        "This attribute, when true, shall indicate that the
        Short Slot Time option as defined in 7.3.1.4 is enabled.
        The default value of this attribute is false."

    ::= { dot11PhyERPEntry 6 }

-- *****

-- * End of dot11PhyERPEntry TABLE

-- *****

```

Insert a new compliance group to the compliance statements just before the section “OPTIONAL-GROUPS”:

```

GROUP dot11PhyERPComplianceGroup
    DESCRIPTION
        "Implementation of this group is required when object
        dot11PHYType has the value of ERP. This group is mutu-
        ally exclusive with the groups dot11PhyIRComplianceGroup
        and dot11PhyFHSSComplianceGroup."

```

Insert the following text into the IEEE 802.11 MIB in Annex D, after the definition of the dot11PhyFHSSComplianceGroup2 Object Group:

```

dot11PhyERPComplianceGroup OBJECT-GROUP
    OBJECTS {dot11CurrentChannel,
        dot11ShortPreambleOptionImplemented,
        dot11ChannelAgilityPresent,
        dot11ChannelAgilityEnabled,
        dot11DSSSOFDMAOptionImplemented,
        dot11DSSSOFDMAOptionEnabled,
        dot11PBCCOptionImplemented,
        dot11ERPBPBCCOptionImplemented,
        dot11ShortSlotTimeOptionImplemented,
        dot11ShortSlotTimeOptionEnabled }
    STATUS current
    DESCRIPTION
        "Attributes that configure the ERP."

    ::= { dot11Groups 24 }

```