IEEE P802.11
Wireless LANs

Draft text for the Higher Speed Extension of the Standard

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Abstract

Draft text is provided for the high speed extension of the 2.4 GHz standard. The text specifies additional data rates of 5.5 and 11 Mbit/s to the Direct Sequence standard. The specified modulation method for the high rate extension is Complementary Code Keying (CCK).

1. Extension of the Direct Sequence Spread Spectrum Physical Layer Specification for the 2.4 GHz ISM Band

1.1 Introduction

This clause describes the high speed extension of the physical layer for the Direct Sequence Spread Spectrum (DSSS) system (clause 15 in the standard). The Radio Frequency LAN system is initially aimed at the 2.4 GHz ISM band as provided in the USA according to Document FCC 15.247, in Europe by ETS 300-328 and other countries according to clause 15.4.6.2.

Above the 1 Mbit/s and 2 Mbit/s data payloads as described in clause 15, the extension of the DSSS system provides for 5.5 and 11 Mbit/s payload data rates. To provide the higher rates, 8 chip Complementary Code Keying (CCK) is employed as the modulation scheme. The chipping rate will be 11 MHz, which is the same as the current DSSS system, thus providing the same channel bandwidth.

The higher speed system is interoperable with the 1 and 2 Mbit/s DSSS systems. It can use the same PLCP peamble and PLCP header as the 1 and 2 Mbit/s system and thus can make use of the rate switching capabilities as provided in the standard. To optimize data throughput at the higher rates an optional short PLCP preamble is provided. The short preamble is not interoperable with the 1 and 2 Mbit/s DSSS systems. For interoperability with FH systems an optional FH interoperable PLCP Frame format is defined.

1.1.1 Scope

This clause describes the extension of the physical layer services provided to the 802.11 wireless LAN MAC by the 2.4 GHz Direct Sequence Spread Spectrum system. The clause will only describe deviations from the 802.11 spec for DSSS.

To be conformant to the higher speed standard, both the 5.5 and 11 Mbit/s data rates are mandatory in addition to the 1 and 2 Mbit/s rates which, in this document, are referred to as the current standard.

The specification also provides an optional short preamble and header for the higher rates and an optional FH interoperable Frame format.

1.2 5.5 and 11 Mbit/s DSSS Physical Layer Convergence Procedure Sublayer

1.2.1 Introduction

This clause provides a convergence procedure for the 5.5 and 11 Mbit/s specification in which MPDUs are converted to and from PPDUs. During transmission, the MPDU shall be prepended with a PLCP preamble and header to create the PPDU. Three different preambles and headers are defined: the mandatory supported long preamble and header as defined in the current 1 and 2 Mbit/s DSSS specification, an optional short preamble and header, and an optional FH interoperable preamble and header. At the receiver, the PLCP preamble and header are processed to aid in demodulation and delivery of the MPDU.

1.2.2 Physical Layer Convergence Procedure Frame Format

The format for the PPDU including the long DSSS PLCP preamble, the long DSSS PLCP header and the MPDU do not differ from the current standard. The only exceptions are the added rates in the rate Signal

Field and the use of a bit in the Service field used to resolve an ambiguity in packet length in octets when the length is expressed in whole microseconds.

In addition an optional short DSSS PLCP preamble and header is defined. The short preamble and header can be used to minimize overhead and thus maximize the data throughput. The frame format of the PPDU with short preamble and header is depicted in figure 201.

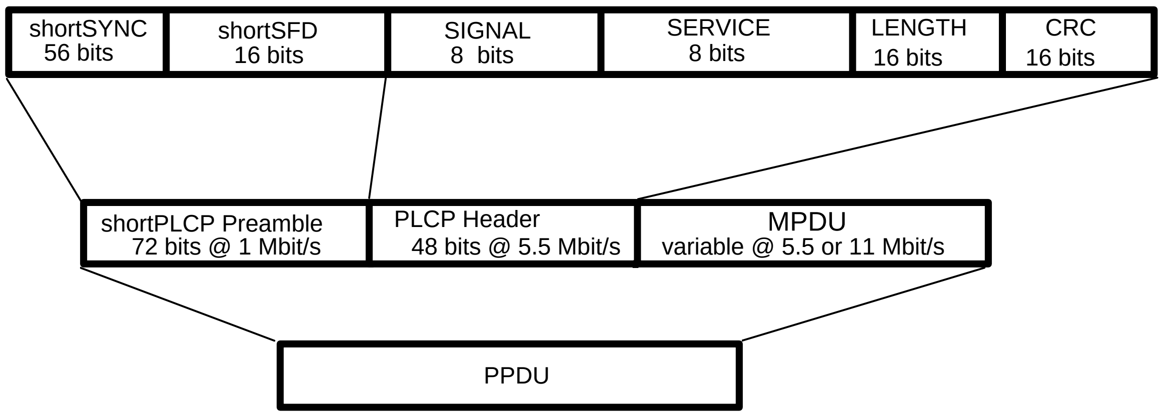

Figure 201, short PLCP Frame Format

Usage of the short preamble and header is optional. A transmitter using the short PLCP will be not interoperable with a receiver which is not capable of receiving this short PLCP. However coexistence is to a maintained. To be interoperable with a receiver that is not capable of receiving a short preamble and header, the transmitter must use the long PLCP preamble and header.

Figure 202 shows the optional Frequency Hopping interoperability format for the PPDU. This includes the standard FH PLCP preamble, the FH PLCP header, an 8 microsecond gap, followed by the short preamble and header and the MPDU. The FH interoperability mode uses the FH preamble and header to establish the channel the signal will be radiated on and the rate it will use. When in this mode, the HR DS channel will be chosen as the closest DS channel from the set of: 1, 3, 5, 7, 9, and 11 (plus 13 in Europe). The receiver IF which will process the high rate DSSS data must be wide enough in bandwidth to encompass the FH preamble. When operating on the lowest TBD or the highest TBD FH channels, the HR DS will not be used and all FH transmissions will occur at the 1 or 2 Mbit/s rates. These channels are too far away from the available DS channels to be processed within the IF bandwidth.

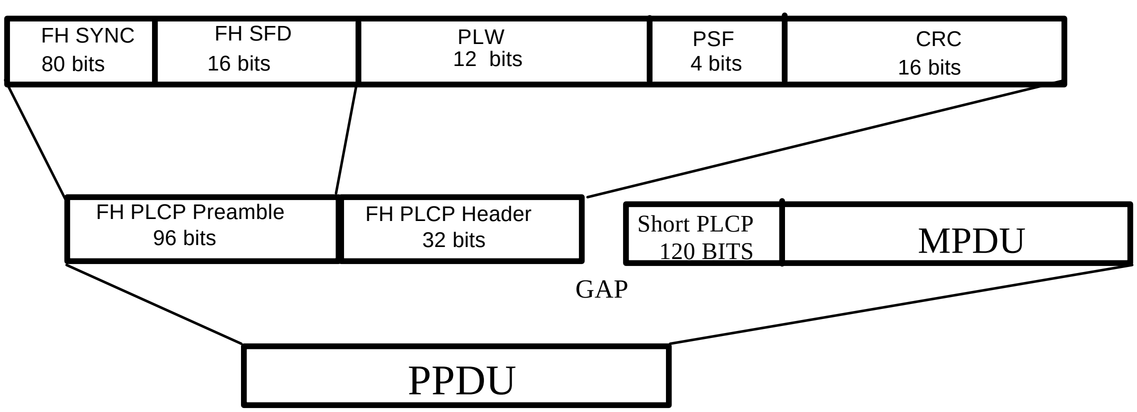

Figure 202, FH interoperable PLCP Frame Format

In the following PLCP field definition clauses, the definitions for the long (i.e. original) PLCP fields are described first. Subsequently, the definitions of the short PLCP and the FH interoperable PLCP are defined. The names for the short PLCP fields are preceded with the term short. The names of the FH interoperable fields are preceded with the term FH.

1.2.3 Long PLCP Field Definitions

As in the current standard the entire long PLCP preamble and header shall be transmitted using the 1 Mbit/s DBPSK modulation described in clause 15.2.3. All transmitted bits shall be scrambled using the feedthrough scrambler described in clause 15.2.4. The definitions do not differ from the current standard. The possible values in the Signal Field (SIGNAL) are, however, extended and a bit in the service field is used to extend the length field.

1.2.3.1 Long PLCP 802.11 Signal Field (SIGNAL)

The 8 bit 802.11 Signal Field indicates to the PHY the modulation which shall be used for transmission (and reception) of the MPDU. The data rate shall be equal to the Signal Field value multiplied by 100kbit/s. The extended DSSS PHY supports four mandatory modulation services given by the following 8 bit words, where the LSB shall be transmitted first in time:

a) 0Ah (MSB to LSB) for 1 Mbit/s DBPSK
b) 14h (MSB to LSB) for 2 Mbit/s DQPSK
c) 37h (MSB to LSB) for 5.5 Mbit/s CCK
d) 6Eh (MSB to LSB) for 11 Mbit/s CCK

The DSSS PHY rate change capability is described in clause 1.2.3.2. This field shall be protected by the CCITT CRC-16 frame check sequence described in clause 15.2.3.6 .

1.2.3.2 Long PLCP Service Field (SERVICE)

The 8 bit IEEE 802.11 Service field shall be reserved for future use except that the LSB bit shall be used to suppliment the LENGTH field described in 1.2.3.3. This field shall be transmitted LSB first in time and shall be protected by the CCITT CRC-16 frame check sequence described in 15.2.3.6.

1.2.3.3 Long PLCP Length Field (LENGTH)

The PLCP length field shall be an unsigned 16 bit integer which indicates the number of microseconds (16 to 2^{16}-1 as defined by aMPDUMaxLngth) required to transmit the MPDU. The transmitted value shall be determined from the LENGTH parameter in the TXVECTOR issued with the PHY-TXSTART.request primitive described in clause15.2.3.6 . The length field provided in the TXVECTOR is in octets and is converted to microseconds for inclusion in the PLCP LENGTH field. The Length field is calculated as follows: Since there is an ambiguity in the number of octets that will be described by a length in microseconds for any data rate over 8 Mbit/s, an extra bit will be placed in the service field to indicate when the larger potential number is correct.

a) 5.5Mbit/s CCK Length = #octets * 8/5.5, rounded up to the next integer.
b) 11Mbit/s CCK Length = #octets * 8/11 , rounded up to the next integer and the service field LSB bit shall indicate a ‘0’ if the rounding took less than 8/11 or a ‘1’ if the rounding took more than 8/11.

At the receiver, the number of octets in the MPDU is calculated as follows:

a) 5.5Mbit/s CCK #octets = Length * 5.5/8, rounded down to the next integer
b) 11Mbit/s CCK #octets = Length * 11/8 , rounded down to the next integer, minus 1 if the service field LSB bit is a '1'.

The LSB (least significant bit) shall be transmitted first in time. This field shall be protected by the CCITT CRC-16 frame check sequence described in clause 15.2.3.6.

1.2.3.4 Long PLCP CRC field.

The long CRC field shall be the same as described in clause 15.2.3.6. The CRC is computed over the SIGNAL, SERVICE and LENGTH fields.

1.2.3.5 Long PLCP Data Modulation and Modulation Rate Change

The PLCP preamble shall be transmitted using the 1 Mbit/s DBPSK modulation. The 802.11 SIGNAL field shall indicate the modulation which shall be used to transmit the MPDU. The transmitter and receiver shall initiate the modulation indicated by the 802.11 SIGNAL field starting with the first symbol (1bit for DBPSK , 2 bits for DQPSK, 4 bits for 5.5 Mbit/s, 8 bits for 11Mbit/s (with the symbol rate increased by a factor 11/8 to 1.375 MHz for the high rates)) of the MPDU. The MPDU transmission rate shall be set by the DATARATE parameter in the TXVECTOR issued with the PHY-TXSTART.request primitive described in clause 15.4.5.3.

1.2.4 Short PLCP Field Definitions

The entire short PLCP preamble shall be transmitted using the 1 Mbit/s DBPSK modulation indicated in clause 1.2.3 . The short PLCP header shall be transmitted using 5.5 Mbit/s CCK modulation as described in clause 1.4.1.2.

All transmitted bits shall be scrambled using the feedthrough scrambler described in clause 15.2.4

1.2.4.1 Short PLCP Synchronization (shortSYNC)

The short PLCP synchronization field shall consist of 56 scrambled all zeros. The preamble is used for energy or carrier detection (CCA as described in clause 15.4.8.4), antenna diversity (if desired) and receiver synchronization.

1.2.4.2 Short PLCP Start Frame Delimiter Field (shortSFD)

The shortSFD shall be 16 bit field and be the bit reverse of the field of the SFD in the long PLCP preamble (clause 15.2.3.1). The field is 05CFh (MSB to LSB). The LSB shall be transmitted first in time.

1.2.4.3 Short PLCP Signal Field (Signal)

The 8 bit 802.11 Signal Field of the short header indicates to the PHY the modulation which shall be used for transmission (and reception) of the MPDU. The extended DSSS PHY operating with a short preamble and header supports two mandatory modulation services given by the following 8 bit words, where the LSB shall be transmitted first in time:

a) 37h (MSB to LSB) for 5.5 Mbit/s CCK
b) 6Eh (MSB to LSB) for 11 Mbit/s CCK

1.2.4.4 Short PLCP Service Field (SERVICE)

The SERVICE field in the short header shall be the same as the SERVICE field described in clause 1.2.3.2

1.2.4.5 Short PLCP Length Field (LENGTH)

The LENGTH field in the short header shall be the same as the LENGTH field described in clause 1.2.3.3

1.2.4.6 Short CCITT CRC-16 Field (shortCRC)

The CRC in the short header shall be the same as the CRC field as defined in clause 15.2.3.6. The CRC-16 is calculated over the SIGNAL, SERVICE, and LENGTH fields.

1.2.4.7 Short PLCP Data Modulation and Modulation Rate Change

The PLCP preamble shall be transmitted using the 1 Mbit/s DBPSK modulation. The short PLCP header shall be transmitted using the 5.5 Mbit/s CCK modulation. The 802.11 SIGNAL field shall indicate the modulation which shall be used to transmit the MPDU. The transmitter and receiver shall initiate the modulation indicated by the 802.11 SIGNAL field starting with the first symbol of the 4 bits for 5.5 Mbit/s CCK, 8 bits for 11 Mbit/s CCK. The MPDU transmission rate shall be set by the DATARATE parameter in the TXVECTOR issued with the PHY-TXSTART.request primitive described in clause 15.4.4.1.

1.2.5 FH PLCP field definitions

The FH PLCP field definitions are generally the same as found in clause 14.3.2 except for the PHY Signaling field (PSF).

1.2.5.1 PLCP Signaling Field (PSF)

The first bit (#0) of the PSF which is reserved in clause 14.3.2.2.2 will be used to indicate that a high rate transmission will follow. This bit is nominally 0 for transmissions compliant to the clause 14 standards. When raised to a 1, it will signal that a high rate short preamble will follow. The remainder of the bits will indicate the rate which should be used to calculate the end of the packet. Table 201 below shows the rate mapping of the PSF bits.

b0	b1	b2	b3		Indicated rate
0	X	X	X		Rates 1 - 4.5 Mbps per existing text
1	0	0	0		5.5 Mbps
1	0	0	1		11 Mbps
1	0	1	0		16.5 Mbps
1	0	1	1		22 Mbps
1	1	0	0		27.5 Mbps
1	1	0	1		33 Mbps
1	1	1	0		38.5 Mbps
1	1	1	1		44 Mbps

Table 201. Data Rates in Modified PLCP Signaling Field

1.2.6 PLCP Transmit and Receive Procedure

1.2.6.1 PLCP Transmit Procedure

The transmit procedures for a transmitter not using the short PLCP preamble and header are described in the sections 15.2.7 and 15.2.8 and will not change apart from the ability to transmit 5.5 and 11 Mbit/s.

The transmit procedure for a transmitter employing the short PLCP preamble and header is in essence the same. The decision for using a long or short PLCP is not prescribed in this standard. The decision can be taken on a per frame basis by the Modem Management entity or can be set at network installation.

The transmit procedure for a transmitter employing the FH PLCP preamble and header is for the sending station to follow the rules for CS/CCA in 14.3.3.1.2. When this transmission is to be a high rate transmission, it will set the signal and Length fields appropriately and will radiate the FH preamble and header on the assigned frequency channel. Following the PLCP transmission, the transmitter will shut down for an 8 microsecond gap followed by the short high rate preamble and header. These will be radiated on a frequency channel determined by:

The channel set will be the set of: 1, 3, 5, 7, 9, 11 of the DS channel set

The channel will be the closest one of this set to the FH channel center. Where there is a choice of two DS channels, the lower one will be the one chosen. Therefore, the chosen channel will be within +4.9/-5 MHz of the channel center of the FH channel. If the FH channel is more than 5 MHz from any of these DS channel choices, the high rate will not be used.

1.2.6.2 PLCP Receive Procedure

The receive procedure for a receiver configured to receive a long PLCP preamble and header is described in section 15.2.8. A receiver conformant to this extension of the standard is capable of receiving 5.5 Mbit/s and 11 Mbit/s in addition to 1 and 2 Mbit/s.

If a PPDU with a short preamble and header is being transmitted the receiver configured to receive a long PLCP preamble and header will also react as described in the section 15.2.8. The receiver will detect energy or a carrier, perform the CCA procedure and defer if necessary. The short preamble is a DSSS signal which can be sensed by the carrier sense mechanism. The shortSFD will normally not be detected and the receiver defers until the energy or carrier sense drops, thus providing coexistence capabilities between the systems

The receiver configured to receive a short PLCP preamble and header shall perform CCA and synchronize on the short preamble (56 microseconds) in order to be able to detect the shortSFD. After detection of the shortSFD the receiver shall be enabled to receive 5.5 Mbit/s in order to process the rest of the header. After this, the receive procedure is the same as described in section 15.2.8. The modulation rate change mechanism is described in clause 1.2.4.6.

The receiver configured to receive a short PLCP shall also be capable of receiving a PPDU with a long PLCP preamble or header. The detection of the long PLCP preamble can be based on the data content of the preamble (scrambled all 1’s compared to scrambled all 0’s) or on the absence of the shortSFD after 56 microseconds. Once it has detected the long PLCP, the receiver can follow the receive procedure as described in section 15.2.8.

1.3 DSSS Physical Layer Management Entity (PLME)

1.3.1 PLME_SAP Sublayer Management primitives

Table 202 lists the MIB attributes which may be accessed by the PHY sublayer entities and intra layer of higher Layer Management Entities (LME). Only values to agPhyRateGroup are added for 5.5 and 11 Mbit/s. The values 02h up to 16h are mandatory to be conformant to this extended specification.

AgPhyRateGroup		
aSupportedDataRatesTx	02h, 04h, 0Bh, 16h	Static
aSupportedDataRatesRx	02h, 04h, 0Bh, 16h	Static

Table 202, MIB Attribute Default Values / Ranges

1.4 DSSS Physical Medium Dependent Sublayer

1.4.1 General

The modulation spreading scheme for 5.5 and 11Mbit/s is 8 chip Complementary Code Keying (CCK. The power spectrum is the same as the 1 and 2 Mbit/s schemes described in clause 15. As a result of this most Phy Medium Dependent specifications are not changed. CCK modulation at 5.5 and 11 Mbit/s uses the same spectrum mask, operating channels, powerlevels, turnaround times, slot time and CCA mechanism. Different is (of course) the specification of the modulation scheme and the parameters associated with it.

1.4.1.1 Extension of PMD_SAP Service Primitive Parameters

Parameter	Associate Primitive	Value
TXD_UNIT	PMD_DATA.request	One(1), Zero(0): DBPSK di bit combinations 00,01,11,10: DQPSK 00h-0Fh : CCK (5.5 Mbit/s) 00h-FFh : CCK (11 Mbit/s)
RXD_UNIT	PMD_DATA.indicate	One(1), Zero(0): DBPSK di bit combinations 00,01,11,10: DQPSK 00h-0Fh : CCK (5.5 Mbit/s) 00h-FFh : CCK (11 Mbit/s)

Table 203, Extension to the List of Parameters for the PMD Primitives

1.4.1.2 Modulation for Channel Data Rates of 5.5 and 11 Mbit/s

The extended Direct Sequence specification defines two additional data rates. The modulation scheme for 5.5 Mbit/s and 11 Mbit/s is Complementary Code Keying (CCK).

1.4.1.2.1 Spreading Codes

The spreading code length is 8 and based on complementary codes. The chipping rate is 11 MHz. The symbol duration shall be exactly 8 complex chips long.
The following formula shall be used to derive the CCK code words that shall be used for spreading both 5.5 and 11 Mbit/s:

$$c = \{e^{j(j_1+j_2+j_3+j_4)}, e^{j(j_1+j_3+j_4)}, e^{j(j_1+j_2+j_4)}, -e^{j(j_1+j_4)}, e^{j(j_1+j_2+j_3)}, e^{j(j_1+j_3)}, -e^{j(j_1+j_2)}, e^{jj_1}\}$$

The terms: ϕ1, ϕ2, ϕ3, and ϕ4 are defined in clause 1.4.1.2.4 for 5.5 Mbit/s and clause 1.4.1.2.5 for 11 Mbit/s.

This formula creates 8 complex chips (LSB to MSB) that are transmitted LSB first.

This is a form of the generalized Hadamard transform encoding where j_1 is added to all code chips, j_2 is added to all odd chips, j_3 is added to all odd pairs of chips and j_4 is added to all odd quads of code chips.

The phases j_1 modify the phase of all chips of the sequence and will be DQPSK encoded for 5.5 and 11 Mbit/s. This will take the form of rotating the whole symbol by the appropriate amount relative to the phase of the preceding symbol. Note that the MSB chip of the symbol defined above is the chip that indicates the symbol's phase and it is transmitted last.

1.4.1.2.2 Cover code

The 4th and 7th chips are rotated 180 degrees by a cover sequence to optimize the sequence correlation properties. This can be seen by the minus sign on the 4th and 7th terms in the equation in clause 1.4.1.2.1.

1.4.1.2.3 5.5 Mbit/s modulation

At 5.5 Mbit/s 4 bits (d0 to d3; d0 first in time) are transmitted per symbol..

The data bits d0 and d1 encode j_1 based on DQPSK. The DQPSK encoder is specified in Table 204. (In the tables, +jω shall be defined as counterclockwise rotation.). The phase change for j_1 is relative to the phase j_1 of the preceding symbol. For the case of the preamble to header transition, the phase change for j_1 is relative to the phase of the preceding DBPSK (1 Mbit/s) symbol. See the definition in clause 15.4.6.3 for the reference phase of this Barker symbol. A "+1" chip in the Barker code shall represent the same carrier phase as a "+1" chip in the CCK code.

All odd numbered symbols of the short Header or MPDU shall be given an extra 180 degree (π) rotation in addition to the standard DQPSK modulation as shown in the table. The symbols of the short Header or MPDU shall be numbered starting with "0" for the first symbol for the purposes of determining odd and even symbols. That is, the short Header or MPDU starts on an even numbered symbol.

Dibit pattern (d(0),d(1)) d(0) is first in time	Even Symbols Phase Change (+jω)	Odd Symbols Phase Change (+jω)
00	0	π
01	π/2	3π/2 (-π/2)
11	π	0
10	3π/2 (-π/2)	π/2

Table 204, DQPSK Encoding Table

The data dibits d2, and d3 CCK encode the basic symbol as specified in table 205. This table is derived from the formula above by setting $j_2 = (d2*\pi) + \pi/2$, $j_3 = 0$, and $j_4 = d3*\pi$. In the table d2 and d3 are in the order shown and the complex chips are shown LSB to MSB (left to right) with LSB transmitted first.

d2, d3									
00	:	$1j$	1	$1j$	-1	$1j$	1	$-1j$	1
01	:	$-1j$	-1	$-1j$	1	$1j$	1	$-1j$	1
10	:	$-1j$	1	$-1j$	-1	$-1j$	1	$1j$	1
11	:	$1j$	-1	$1j$	1	$-1j$	1	$1j$	1

Table 205, 5.5 Mbit/s CCK Encoding Table

1.4.1.2.4 11 Mbit/s modulation

At 11 Mbit/s, 8 bits (d0 to d7; d0 first in time) are transmitted per symbol.

The first dibit (d0,d1) encodes j_1 based on DQPSK. The DQPSK encoder is specified in Table 204 above. The phase change for j_1 is relative to the phase j_1 of the preceding symbol. In the case of rate change, the phase change for j_1 is relative to the phase j_1 of the preceding CCK symbol or relative to the phase of the preceding DBPSK (1 Mbit/s) symbol. See the definition in clause 15.4.6.3 for the reference phase of the Barker symbols used at 1 Mbit/s. A “+1” in the Barker code shall represent the same carrier phase as a “+1” in the CCK code. All odd numbered symbols of the MPDU are given an extra 180 degree (π) rotation in addition to the DQPSK modulation as shown in table 204. Symbol numbering starts with “0” for the first symbol of the short Header or MPDU.

The data dibits: (d2,d3), (d4,d5), (d6,d7) encode j_2, j_3, and j_4 respectively based on QPSK as specified in table 206. Note that this table is binary, not Grey, coded.

Dibit pattern (d(i),d(i+1)) d(i) is first in time	**Phase**
00	0
01	$\pi/2$
10	π
11	$3\pi/2$ $(-\pi/2)$

Table 206, QPSK Encoding Table

1.4.1.3 Transmit Spurious frequencies and modulation accuracy

The transmit characteristics shall be the same as defined in section 15.4.7

1.4.1.4 Receiver Minimum Input Level Sensitivity

The Frame Error Rate (FER) shall be less than 8×10^{-2} at an MPDU length of 1024 octets for an input level of -80 dBm measured at the antenna connector. This FER shall be specified for 11 Mbit/s CCK modulation. The test for the minimum input level sensitivity shall be conducted with the energy detection threshold set less than or equal to -80 dBm.

1.4.1.5 Receiver Adjacent Channel Rejection

Receiver adjacent channel rejection requirement is the same as defined in clause 15.4.8 with the exception that the data rate is 11 Mbit/s.

1.5 Clear Channel Assessment

The DSSS PHY shall provide the capability to perform Clear Channel Assessment (CCA) according to at least one of the following three methods:

CCA Mode 1: Energy above threshold (ED). CCA shall report a busy medium upon detecting any energy above the ED threshold.

CCA Mode 2: Carrier or modulation sense only (CS). CCA shall report a busy medium only upon the detection of a DSSS signal. This signal may be above or below the ED threshold.

CCA Mode 3: Carrier or modulation sense with energy above threshold (ED and CS). CCA shall report a busy medium upon the detection of a DSSS signal with energy above the ED threshold.

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 are 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.

Clear Channel shall be indicated by PHY-CCA.indicate of class IDLE.

The PHY MIB attribute aCCAModeSuprt shall indicate the appropriate operation modes. The PHY shall be configured through the PHY MIB attribute aCurrentCCAMode.

The CCA shall be TRUE (Idle) if there is no energy detect or carrier sense. The CCA parameters are subject to the following criteria:

a). If the valid signal is detected *during its preamble* within the CCA assessment window, the energy detection threshold for 98 % probability of detection shall be less than or equal to

-80 dBm for TX power > 100 mW

-76 dBm for 50 mW < TX power <= 100 mW

-70 dBm for TX power <= 50 mW.

b) With a valid signal (according to the CCA mode of operation) present at the receiver antenna within 5 µs of the start of a MAC slot boundary, the CCA indicator shall report channel busy before the end of the slot time.

c) In the event that a correct PLCP Header is received, the DSSS 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 continue to indicate a busy medium for the intended duration of the transmitted packet.

d) After detection of the carrier in the short preamble by a receiver not capable of processing the short preamble, CCA busy is raised. When no SFD is detected CCA shall be kept busy until an energy drop of 10 dB. Thus, during the whole message (which is known to be a 802.11 message but not understood by the receiver) the receiving modem will defer the medium. After the energy drop the modem will be in slot sync again.

Conformance to DSSS PHY CCA shall be demonstrated by applying a DSSS compliant signal, above the appropriate ED threshold (a), such that all conditions described in (b), (c) and (d)above are demonstrated.