IEEE P802.11
Wireless LANs

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| --- |
| Delete the PMD from 11ad (Comment Resolution for TGmc) |
| Date: 16 July 2013 |
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Abstract

This document provides resolutions for CIDs:

Delete the PLCP/PMD interface. Edits are referenced to P802.11REVmc D1.4

Reference 12/1431r1, which deletes the PLCP/PMD interface from P802.11REVmc D0.5

**Introduction**

MAC clause changes:

* 3: Definitions, acronyms, and abbreviations
* 4: General description
* 6: Layer management
* 7: PHY service specification
* 8: Frame formats
* 9: MAC sublayer functional description

Annexes

* B: PICS
	+ Delete PICS for PMD
* C: ASN.1 encoding of the MAC and PHY MIB
* T: Location and Time Difference accuracy test
* W: Mesh BSS operation

The approach taken to modifying the PHY clauses is to delete the PMD sublayer and any reference to the PMD, and convert uses of PLCP to PHY.

Editing note: clause number references that include a title of an offending acronym are ignored as they will be automatically updated when the clause title is fixed.

**Comments:**

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| **CID** | **Page** | **Clause** | **Comment** | **Proposed Change** | **Resn Status** | **Resolution** |
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**MAC Modifications:**

**3. Definitions, acronyms, and abbreviations**

**3.2 Definitions specific to IEEE Std 802.11**

**REVmc editor: modify REVmc D1.4 Clause 3.2 as follows:**

**directional multi-gigabit (DMG) access point (AP)**: An AP whose radio transmitter is capable of

transmitting and receiving DMG physical layer (PHY) protocol data units

(PPDUs).

**directional multi-gigabit (DMG) frame**: A frame transmitted or received within a DMG physical layer

 (PHY) protocol data unit (PPDU).

**directional multi-gigabit (DMG) physical layer (PHY) protocol data unit**

**(PPDU):** A Clause 21 PPDU transmitted or received using the Clause 21 physical layer (PHY).

**directional multi-gigabit (DMG) station (STA)**: A STA whose radio transmitter is capable of transmitting

and receiving DMG physical layer (PHY) protocol data units (PPDUs).

**4. General description**

**4.3.17 DMG STA**

**REVmc editor: modify REVmc D1.4 Clause 4.3.17 as follows:**

**…**

A DMG STA supports the PHY signaling as described in 21.4, 21.5, 21.6, and 21.7. At a minimum, a DMG

STA supports the mandatory modulation and coding scheme (MCS) and PHY protocol data unit (PPDU)

formats described in 21.4 and 21.6. A DMG STA has PHY features that include a low-density parity check

(LDPC) encoding, a preamble making use of Golay sequences, and beamforming. The PPDUs are always

transmitted with the same channel spacing as described in Annex E.

**Clause 4.9 Reference Model**

**4.9.3 Reference model for supporting multiple MAC sublayers**

**REVmc editor: modify REVmc D1.4 Figure 4-20 as follows:**

Delete PMD Sublayer

Delete PMD SAP

Change PLCP to PHY

**REVmc editor: modify REVmc D1.4 Clause 4.9.3, P98L5 as follows:**

Multiple STAs coordinated by an MM-SME have a single PHY that is shared by the

multiple MAC sublayers. Transmission attempts of different MAC sublayers can collide internally if the

STAs share a single PHY, and a backoff procedure is invoked in this case. Since multiple STAs coordinated

by the same MM-SME share the PHY, the STAs do not directly exchange frames with each other.

**4.9.4 Reference model for multi-band operation**

**REVmc editor: modify REVmc D1.4 Figure 4-21 as follows:**

Delete PMD Sublayer and arrow to PHY Sublayer Management Entity

Delete PMD SAP

Change PLCP to PHY

(repeat for each STA)

**REVmc editor: modify REVmc D1.4 Figure 4-22 as follows:**

Delete PMD Sublayer and arrow to PHY Sublayer Management Entity

Delete PMD SAP

Change PLCP to PHY

(repeat for each STA)

**Clause 9 MAC sublayer functional description**

**REVmc editor: modify REVmc D1.4 Clause 9 as follows:**

**9.14 DMG A-PPDU operation**

…

An A-PPDU is a sequence of two or more PPDUs transmitted without IFS, preamble, and separation

between PPDU transmissions. All PPDUs within an A-PPDU shall have the ADD-PPDU parameter of the

TXVECTOR set to ADD-PPDU, except for the last PPDU in the A-PPDU that shall have this parameter set

to NO-ADD-PPDU. The value of fields within the PHY header of a PPDU belonging to an A-PPDU might

differ from other PPDUs in the same A-PPDU, including the MCS field.

**9.36.6.4 BRP phase execution**

**9.36.6.4.1 General**

**…**

A STA requests transmit beam refinement training by sending a BRP frame as follows. In the BRP Request

field, the TX-TRN-REQ field is set to 1, and the FBCK-REQ field is set to the desired feedback type. In the

PHY header, the Packet Type and the Training Length fields are set to indicate the number of AGC and

TRN-T fields appended to the packet.

**9.36.7 Beam tracking**

**…**

A beam tracking responder that receives a packet with the Beam Tracking Request field in the PHY header

equal to 1 (corresponding to the BEAM\_TRACKING\_REQUEST parameter in the RXVECTOR set to

Beam Track Requested) and the Packet Type field in the PHY header equal to 0 (corresponding to

PACKET-TYPE field in the RXVECTOR set to TRN-R-PACKET) shall follow the rules described in

21.10.2.2 and shall include a beam refinement AGC field and TRN-R subfields appended to the following

packet transmitted to the initiator. The value of TRN-LEN in the following packet from the responder to the

initiator shall be equal to the value of the TRN-LEN parameter in the RXVECTOR of the packet from the

initiator.

**…**

A beam tracking initiator may also request a beam tracking responder to perform receive beam tracking by

setting, in the PHY header of a transmitted packet, the Beam Tracking Request field to 0, the Training

Length field to a nonzero value, the Packet Type field to 0, and append an AGC field and TRN-R subfields

to the transmitted packet.

A beam tracking responder that receives a packet with the Beam Tracking Request field in the PHY header

equal to 0, the Training Length field in the PHY header equal to a nonzero value and the Packet Type field

in the PHY header equal to 0 shall follow the rules described in 21.10.2.2 and may use the beam refinement

AGC field and TRN-R subfields appended to the received packet to perform receive beam training.

**9.39 DMG dynamic tone pairing (DTP)**

**…**

Both the transmitting and receiving STAs maintain two copies of DTP configurations: the current

configuration that is in use for transmission and an updated configuration, if any, received after the current

configuration. The transmitting STA determines when to switch from the current to the updated DTP

configuration. The transmitting STA shall indicate the switch from the current configuration to the updated

configuration by toggling the DTP Indicator bit field in the PHY header. The value of the DTP Indicator

field shall be kept unchanged until the transmitting STA decides to switch to the new DTP configuration. By

receiving an ACK frame in response to a data frame from the receiving STA, the switching operation is

completed.

**REVmc editor: modify REVmc D1.4 Clause 21 as follows:**

**21. Directional multi-gigabit (DMG) PHY specification**

**21.1 DMG PHY introduction**

**21.1.1 Scope**

…

The services provided to the MAC by the DMG PHY consist of the following protocol functions:

a) A function that defines a method of mapping the PHY service data units (PSDU) into a

framing format (PPDU) suitable for sending and receiving PSDUs between two or more STAs.

b) A function that defines the characteristics and method of transmitting and receiving

data through a wireless medium between two or more STAs. Depending on the DMG MCSs, these

STAs support a mixture of DMG SC PHY, DMG OFDM PHY, DMG low-power SC PHY, and

DMG control PHY.

**21.1.2 DMG PHY functions**

The DMG PHY contains two functional entities: the PHY and the layer

management function (PLME). Each of these functions is described in detail in 21.3

to 21.11. The DMG PHY service is provided to the MAC through the PHY service primitives defined in

Clause 7.

**21.2 DMG PHY service interface**

**Table 21-1—TXVECTOR and RXVECTOR parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Value** | **TXVECTOR** | **RXVECTOR** |
| … |  |  |  |
| RSSI | The allowed values for the RSSI parameter are in the range from 0 through RSSI maximum. This parameter is a measure by the PHY of the power observed at the antennas used to receive the current PPDU. RSSIshall be measured during the reception of the PHY preamble. RSSI is intended to be used in a relative manner, and it shall be a monotonically increasing function of the received power. | N | Y |
| … |  |  |  |
| TIME\_OF\_DEPARTURE\_REQUESTED | Enumerated type:— TRUE indicates that the MAC entity requests that the PHY entity measures and reports time of departure parameters corresponding to the time when the first frame energy is sent by the transmitting port.— FALSE indicates that the MAC entity requests that the PHY entity neither measures nor reports time of departure parameters. | O | N |
| … |  |  |  |

**21.3.9 Scrambler**

…The PHY header bits, with the exception of the first seven bits for SC and OFDM and the first five bits for control PHY, are placed one after the other, bit 7 first (bit 5 first for control PHY).

…

The seed value is sent in the Scrambler Initialization field of the PHY header.

**21.5.3 Transmission**

**21.5.3.1 Header**

**21.5.3.1.1 General**

In the OFDM PHY, the preamble is followed by the PHY header. The PHY header consists of several

fields that define the details of the PPDU being transmitted. The encoding and modulation of the header is

described in 21.5.3.1.4.

**21.5.4.1.4 Time of Departure accuracy**

The Time of Departure accuracy test evaluates TIME\_OF\_DEPARTURE against aTxPHYTxStartRMS and aTxPHYTxStartRMS against TIME\_OF\_DEPARTURE\_ACCURACY\_TEST\_THRESH as defined in

Annex T with the following test parameters:

**21.6.3.2.5 Symbol blocking and guard insertion**

…If the Additional PPDU field within the PHY header is equal to 0, the final block transmitted is followed by

the same Golay sequence guard interval. If the Additional PPDU field within the PHY header is equal to 1,

the final block transmitted of the last PPDU in an A-PPDU is followed by the same Golay sequence guard

interval.

**21.6.4.1.2 Time of Departure accuracy**

The Time of Departure accuracy test evaluates TIME\_OF\_DEPARTURE against aTxPHYTxStartRMS and aTxPHYTxStartRMS against TIME\_OF\_DEPARTURE\_ACCURACY\_TEST\_THRESH as defined in

Annex T with the following test parameters:

**21.8 PHY transmit procedure**

The PHY transmit procedure is shown in Figure 21-18. In order to transmit data, a PHY-TXSTART.request

primitive shall be enabled so that the PHY entity shall be in the transmit state. Further, the PHY shall be set

to operate at the appropriate frequency through station management via the PLME, as specified in 21.12.

Other transmit parameters, such as MCS and transmit power, are set via the PHY-SAP with the PHYTXSTART.

request(TXVECTOR), as described in 21.2.2.

Transmission of the PHY preamble shall start, based on the parameters passed in the PHY-TXSTART.request primitive. The preamble format

(control PHY, SC or OFDM) depend on the MCS in the PHY\_TXSTART.request. The PHY shall calculate the length of the packet according the MCS and the length specified in the PHY\_TXSTART.request primitive,

adding padding bits if necessary.

…

Transmission of the PSDU is completed with the transmission of the last bits of the (encoded) PSDU. If no

TRN-T/R fields are specified in the PHY-TXSTART.req, the PHY shall issue PHY-TXEND after the

transmission of the last bits. If TRN-T and TRN-R are requested in the PHY-TXSTART.req, the

transmission continues with the transmission of AGC subfields and TRN-T/R subfields. The PHY issues

the PHY-TXEND.confirm primitive to the MAC after the transmission of the last TRN-T/R subfield. The packet transmission shall be completed, and the PHY

entity shall enter the receive state (i.e., PHYTXSTART shall be disabled). Each PHY-TXEND.request

primitive is acknowledged with a PHY-TXEND.confirm primitive from the PHY.





**Figure 21-18—PHY transmit procedure**





**Figure 21-19—Typical Tx state machine (Training Length=0 is assumed;**

**some optional features such as SC low-power PHY are not shown)**

**21.9 PHY receive procedure**

A typical PHY receive procedure is shown in Figure 21-20.





**Figure 21-20—PHY receive procedure**

Upon receiving the STF, the PHY measures signal strength. This activity is indicated by the PHY to the MAC through PHY\_CCA.ind(BUSY).

After the PHY-CCA.indication(BUSY) is issued, the PHY entity shall search for the CE field and begin

receiving the CE field. The PHY demodulates the header according to the PHY type determined during the reception of the CE field. If the CE field indicated a SC PHY, the receiver is capable of receiving low-power SC PHY, and

dot11LowPowerSCPHYActivated is true, then the PHY shall attempt to demodulate both a SC header and

an SC low-power header. The PHY shall decode the header and determine the MCS, length and other parameters needed for the demodulation of the packet. At the end of the data portion of the packet, the PHY shall indicate PHY\_RXEND.indication(No\_Error) primitive to the MAC. If the header indicated the presence of training field, the PHY shall continue to receive these training fields after the data portion of the packet and measure the channel. After the end of the training fields, the PHY shall indicate PHY\_CCA.indication(Idle) primitive.

**21.13 DMG PMD sublayer**

**REVmc editor: delete entire 21.13 subclause**

**Annex B**

(normative)

**Protocol Implementation Conformance Statement (PICS) proforma**

**B.4.24.2 DMG PHY features**

|  |  |
| --- | --- |
| DMG-P2 | PHY frame format |
| \*DMG-P2.1 | Control PHY format |
| \*DMG-P2.2 | SC PHY format |
| \*DMG-P2.3 | OFDM PHY format |
| \*DMG-P2.4 | Low-power SC PHY format |