```
bdata = max(bdata, -2^(m-1));
idx_n = find(bdata < 0);
rdata = bdata;
rdata(idx_n) = 2^m + rdata(idx_n);
rdata = bitand(rdata, 2^m - 1);


% FixFixed-point to floating-point formal definition
% Parameters Parameters:
%       rdata rdata: Row data in fixfixed-point
%       m     m    : Word length # of bits
%       n     n    : Integer part # of bits, including sign
%       fdata fdata: FloatFloating-point format

function fdata = fix2float(rdata, m, n)

% Sign extension
bdata = bitand(rdata, 2^m - 1);
idx_n = find(bitand(bdata, 2^(m-1)) ~= 0);
bdata(idx_n) = bdata(idx_n) - 2^m;


% Fix to float conversion
fdata = bdata / (2^(m - n));
```

114.3.5 ~~Clock Tolerance~~

~~The symbol transmission rate of the PHY shall be 325.00 MHz ± 0.025%.~~

114.4 OAM channel

The optional OAM (Operations, Administration and Management) channel ~~is a requirement for some applications markets (e.g., automotive original equipment manufacturers). The OAM channel~~ provides a mechanism to reliably exchange messages between ~~management entity (ME)~~ Management Entity peers ~~residing in~~ attached to link partners. The OAM message exchange does not impact the normal data transmission GMII to GMII. Moreover, OAM message exchange is not affected by EEE operation.

The format of OAM messages ~~are~~ is not specified in this ~~standard but may be specified for specific applications~~standard. OAM message exchange occurs in the Physical Coding Sublayer (PCS), as part of the Physical Header Data (PHD)~~.~~ .

~~The channel includes a handshake protocol that provides status on transmitted messages. This status is used to monitor the delivery of OAM messages to the link partner. The handshake protocol and PHY specifications for the OAM channel make assumptions on the use of OAM registers to assure predictable operation, that need to be properly implemented by the management entity.~~

The OAM channel ~~is a peer-to-peer communication capability. The channel~~ utilizes OAM transmit and receive registers accessible via the MDIO as well as capabilities specified in the following channel descriptions. All MDIO accessible registers ~~and bits in the following description~~ are specified in clauses 45.2.3.48~~. A comprehensive specification of the OAM channel follows~~ and 45.2.3.49.

114.4.1 ~~OAM message description~~

~~OAM message are written by the local ME into the OAM transmit registers. Upon transmission request, the message is copied to the corresponding fields of the PHD as described in Table 114.4.6. The PHD fields are listed in Table 114–3~~

~~The fields PHD.OAM.PHYT and PHD.OAM.MERT are used by the local PHY to notify the remote PHY and ME of the status of OAM messages. PHD.OAM.PHYT in a transmitted OAM message indicates the value of PHD.OAM.MSGT of the last message received by the local PHY. PHD.OAM.MERT contains the value of PHD.OAM.MSGT of the last message acknowledged by the local ME.~~

~~After PHY reset, all bits of the PHD fields reserved for OAM channel implementation are set to 0 until the first OAM message is transmitted by the local PHY. All transmitted PHDs includes that null message until transmission of a new OAM message is requested. Similarly, PHD.OAM information is repeated until a new OAM message is requested to be transmitted. This repeated transmission provides resilience to corruption of a transmitted PHD.~~

114.4.2 ~~OAM channel handshake mechanism~~

~~The OAM handshake mechanism ensures the integrity of the OAM message. The channel uses the OAM MDIO transmit registers to compose messages for transmission, PHY registers used to support OAM message transmission, and MDIO receive registers to store a received. Status information primarily resides in four control bits (TXREQ, TXMSGT, PHYT and MERT) in the OAM TX control register.~~

114.4.2.1 ~~OAM transmission~~

The OAM channel uses several control bits (MSGT, MERT, PHYT) for message identification, message delivery notification and for flow control.

114.4.3 OAM message transmission protocol

~~Whenever~~ When the Management Entity ~~attached~~ connected to the local PHY ~~wishes~~ needs to transmit a new ~~message,~~ message it shall proceed ~~as follows~~following the next steps:

1) ~~Step 1:~~ Wait until TXO_REQ bit ~~15~~ of register 3.500 ~~("TXREQ")~~ is zero, which indicates that the OAM ~~Tx~~ transmit registers are free and that a new OAM message can be ~~accepted by the local PHY for transmission~~written.
2) ~~Step 2:~~ Write the 128 user data bits of the OAM message into ~~OAM_DATA1~~ register 3.501 through ~~OAM_DATA8 transmit registers~~3.508.

~~Step 3: Write the TX_OAM_CTRL register. This includes the 12-bit TXOAM_HDR field and the TXREQ bit equal to one to request transmission. The TXOAM_HDR field can be used as a message header by the application specific OAM protocol.~~

~~In response to TX_REQ changing from zero to one, the local PHY accepts the new message for transmission. TXOAM_HDR is copied to PHD.OAM.HDR, and OAM_DATA1 is copied to PHD.OAM.DATA1 and subsequent OAM_DATAx registers to the corresponding PHD.OAM.DATAx.~~

~~The PHD.OAM.MERT, PHD.OAM.PHYT bits are set as specified by the OAM transmit state diagram. The PHY sets TXREQ to 0, and simultaneously, toggles the TXMSGT bit and sets PHD.OAM.MSGT to the resulting value. MSGT can be read by the local ME to learn the PHD.OAM.MSGT value of the requested OAM message. (When read, the message may be awaiting transmission, be in the process of transmission, or may have been delivered to the link partner.)~~

~~The PHYT and MERT bits of TXOAM_CTRL indicate the most recent values received from link partner OAM messages as specified by the OAM receive state diagram.~~

~~The fields PHD.OAM.PHYT and PHD.OAM.MERT are used by the local PHY to notify the remote ME of the status of the receive link. In particular, the field PHD.OAM.PHYT contains the value of the PHD.OAM.MSGT bit in the last message received by the local PHY that is stored in RXOAM_CTRL register RXMSGT bit. The field PHD.OAM.MERT contains the value of the RXMSGT bit of the last message acknowledged by the local ME.~~

114.4.3.1 ~~OAM channel status~~

~~The status of each direction of the OAM channel can be inferred at the transmission side from the values of the TXREQ, PHYT, MERT and TXMSGT control bits of the TXOAM_CTRL register. As many as three OAM messages can exist simultaneously in each direction of the OAM channel: the OAM transmit registers, the PHD.OAM bits and the OAM receive registers.~~

~~Table 114–4 specifies all the possible status values of the OAM channel. These are defined by four TXOAM_CTRL control bit values. The control bit can be either 0 or 1, the symbol ~ denotes logical not operator. Message K is the current OAM message from the local PHY to the remote link partner PHY by using the PHD.OAM fields of the PHD. Its associated toggle bit takes value a as indicated by the bit MSGT bit of the TXOAM_CTRL register, (see 4th column of Table 114–4). Correspondingly, message K-1 denotes the previous message transmitted from the local PHY to the remote PHY. Its associated toggle bit takes value ~a. Finally, message K+1 corresponds to the OAM message being composed or yet to be requested for transmission.~~

114.4.4 ~~OAM reception~~

~~Reading the receive OAM registers provides the reception portion of the OAM handshake. The receive process locks the OAM receive registers until the message has been acknowledged by the local ME.~~

~~The Management Entity attached to the local PHY shall process a new received message as follows:~~

~~Step 1: Read the content of the RXOAM_CTRL register. If RXVALis one, it indicates that a new OAM message has been received from the remote link partner PHY. If RXVAL is zero, it indicates that a new OAM messages has not been received from the remote link partner since the last time OAM_DATA8 was read.~~

~~Step 2: Read the 128-bits of OAM_DATA message from registers OAMDATA1 to OAMDATA8. Acknowledgment by the local ME of the message is defined as reading the OAMDATA8 register, the local PHY sets the bit RXVAL to zero when OAMDATA8 is read. So, it is critical that the local ME reads the OAMDATA8 register last. The reading of OAMDATA8 also updates the value of the TXOAM_CTRL MERT bit to the value of RXMSGT as specified by the receive OAM state diagram.~~

3) Write the OAM message data type to TXO_TYPE bits of register 3.500, setting bit TXO_REQ to one at the same time to request the transmission of the new message.

When the local PHY accepts the message for transmission it shall no1tify it to the local Management Entity by setting to zero bit TXO_REQ of register 3.500. Simultaneously it shall also perform the following operations:

1) It shall toggle bit TXO_MSGT bit of 3.500 register, and copy the new toggled value to PHD.OAM.MSGT field of the PHD.
2) It shall copy the rest of the message to the PHD. Bits TXO_TYPE of register 3.500 shall be copied to PHD.OAM.TYPE field of the PHD. Contents of registers 3.501 through 3.508 shall be copied to PHD.OAM.DATA1 through PHD.OAM.DATA8 fields of the PHD.

Table 114–4—List of all possible OAM channel status

TXREQ	PHYT	MERT	MSGT	Message K+1 Status	Message KStatus	Message K-1 Status
0	a	a	a	Not sent	Sent ACK by remote PHY ACK by remote ME	Sent ACK by remote PHY ACK by remote ME
0	~a	~a	a	Not sent	Sent ACK by remote PHY ACK by remote ME	Sent ACK by remote PHY ACK by remote ME
0	a	~a	a	Not sent	Sent ACK by remote PHY ACK by remote ME	Sent ACK by remote PHY ACK by remote ME
0	~a	a	a	Not sent	Sent ACK by remote PHY ACK by remote ME	Sent ACK by remote PHY ACK by remote ME
1	a	a	a	Written by local ME Pending transmis-sion by local PHY	Sent ACK by remote PHY ACK by remote ME	Sent ACK by remote PHY ACK by remote ME
1	~a	~a	a	Written by local ME Pending transmis-sion by local PHY	Sent ACK by remote PHY ACK by remote ME	Sent ACK by remote PHY ACK by remote ME
1	a	~a	a	Written by local ME Pending transmis-sion by local PHY	Sent ACK by remote PHY ACK by remote ME	Sent ACK by remote PHY ACK by remote ME
1	~a	a	a	Written by local ME Pending transmis-sion by local PHY	Sent ACK by remote PHY ACK by remote ME	Sent ACK by remote PHY ACK by remote ME

The local PHY shall not accept a new message for transmission until the previous OAM message has been accepted by the remote PHY. This happens when PHD.OAM.PHYT field of the last correctly received PHD is equal to PHD.OAM.MERT field of the PHD being transmitted by the local PHY.

Upon PHY reset, all the fields in the PHD dedicated to OAM channel implementation and all the bits in the MDIO OAM transmit registers shall be set to 0.

The fields PHD.OAM.MSGT, PHD.OAM.TYPE and PHD.OAM.DATAx of the PHD shall always maintain the values corresponding to the last message accepted by the local PHY for transmission, or the reset value if either OAM is not enabled or no message has been accepted for transmission since the last PHY reset.

114.4.5 OAM message reception protocol

When the local PHY receives a new message on a correctly received PHD and the OAM receive registers are free, it shall copy the content of the new message to the OAM receive registers. It shall also perform the following operations:

1) It shall set to one RXO_VAL bit of register 3.509 to indicate the presence of a new message in the OAM receive registers to the Management Entity attached to the PHY.
2) It shall copy the value of MSGT bit of the new receive OAM message to the PHD.OAM.PHYT field of the transmit PHD to indicate the remote PHY that the new message has been copied to the OAM receive registers and is available for processing by the Management Entity attached to the PHY.

When the Management Entity connected to the local PHY needs to read a new OAM message it shall proceed following the next steps:

1) Wait until RXO_VAL bit of register 3.509 is one, which indicates that a new OAM message is present on the OAM receive registers. When RXO_VAL is one, the management Entity will capture the RXO_MSGT and RXO_TYPE bits of the new OAM message, as they are also stored in register 3.509.
2) Read the rest of the message which is stored in registers 3.510 to 3.517. To guarantee the integrity of the OAM message register 3.517 should be the last register to be accessed by the Management Entity. This is because the read of register 3.517 triggers the read acknowledge of the Message to the remote partner, and the local PHY might update the OAM receive registers with a new OAM message right after register 3.517 is read.

When the local Management Entity processes the message by first reading register 3.509 having bit RXO_VAL set to one, and then reading register 3.517, the local PHY shall notify it to the remote PHY by copying the MSGT bit of the message that has been read by the Management Entity to PHD.OAM.MERT field of the transmit PHD.

Upon PHY reset, fields PHD.OAM.PHYT, PHD.OAM.MERT and all the bits of the OAM receive registers shall be reset to zero.

The field PHD.OAM.PHYT of the PHD shall always maintain the value corresponding to the last message copied to the OAM receive registers, or zero when OAM is disabled or no message has been copied to OAM receive registers since last PHY reset.

The field PHD.OAM.MERT of the PHD shall always maintain the value corresponding to the last message processed by the Management Entity, or zero when OAM is disabled or no message has been processed by the Management Entity since last PHY reset.

114.4.6 OAM channel state diagrams descriptions

114.4.6.1 OAM Tx control state ~~-~~diagram

The OAM transmit state diagram that governs PHY OAM transmission shall be implemented as shown in Figure 114–82.

Upon reset, disconnection of the PMA from the PMD or determination of an unreliable PHD ~~communicat3.503.50ion~~ communication link, OAM Tx registers are reset (OAMTX_RESET state). Moreover, the transmitted PHD shall have all the fields reserved for OAM messages transmission set to 0.

Once the transmission and reception of PHD blocks is reliable (rcvr_hdr_lock = OK), and OAM channel is enabled, the local PHY waits for a new OAM message transmission request from the local ~~ME~~Management Entity. Meanwhile, whenever a new PHD block is correctly received from the remote PHY, the local PHY

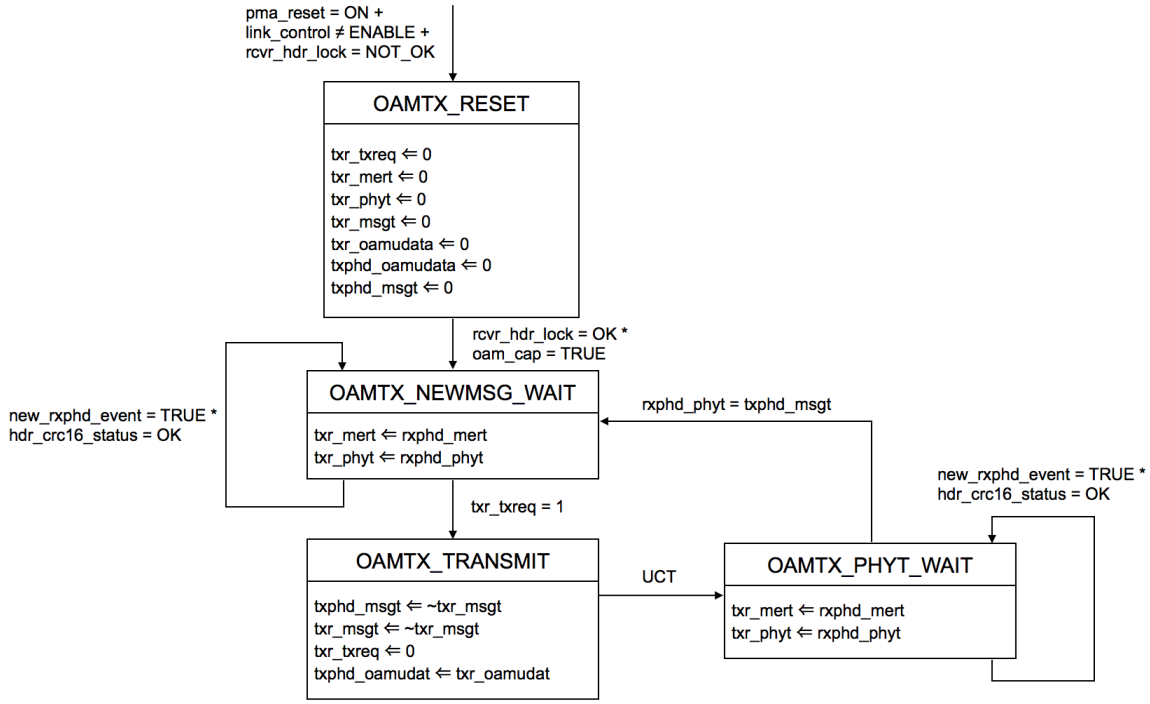

Figure 114–82—PHY OAM Tx control state diagram

shall update the value of TXO_MERT bit of ~~PHY MERTof the TXOAM_CTRL~~ register 3.500 with that of the received PHD.OAM.MERT bit and ~~PHYT~~ TXO_PHYT bit of register 3.500 with that of the received PHD.OAM.PHYT bit. By doing so, the local PHY notifies the attached ~~ME~~ Management Entity of the status of current and previous transmissions. This corresponds to OAMTX_NEWMSG_WAIT state.

As soon as the first OAM message transmission is requested by the local ~~ME~~ Management Entity (~~txr_txreq =~~ txr_txreq = 1), the local PHY accept it, entering the OAMTX_TRANSMIT state. This causes the content of ~~the eight OAM_DATAx~~ transmit registers 3.501 to 3.508 and the 12-bit ~~TXOAM_HDR~~ TXO_TYPE field of ~~the TXOAM_CTRL~~ register ~~are transmitted within~~ 3.500 to be copied to the corresponding PHD.OAM.DATAx and PHD.OAM.~~HDR~~ TYPE fields of the transmitted PHD. ~~Additionally~~Simultaneously, ~~the~~ bit PHD.OAM.MSGT ~~bit~~ is toggled ~~as the transmission~~ and copied to bit TXO_MSGT of ~~a new OAM message within the PHD begins. Once the OAM message has been accepted for transmission~~register 3.500, ~~the local PHY shall toggle TXOAM_CTRL register bit MSGT~~ and ~~set the TXREQ~~ bit TXO_REQ of register 3.500 is cleared to ~~0~~zero. Thus, the local PHY indicates to the attached ME the MSGT assigned to the message and also that the OAM Tx registers are free to accept a new message.

From then on, the local PHY shall keep transmitting the same OAM message within the PHD until the remote PHY acknowledges its reception (OAMTX_PHYT_WAIT state). Simultaneously, whenever a new PHD block is correctly received from the remote PHY, the local PHY shall update the value of ~~PHYT~~ TXO_PHYT and ~~MERT~~ TXO_MERT of ~~the TXOAM_CTRL~~ register 3.500 with ~~received~~ the value of fields PHD.OAM.PHYT and PHD.OAM.MERT of the received PHD. As soon as the OAM message that is being currently transmitted within the PHD is acknowledged by the remote PHY, the local PHY can accept a new OAM message for transmission. The transition from state OAMTX_PHYT_WAIT to state OAMTX-

_NEWMSG_WAIT occurs when the field PHD.OAM.PHYT of the received PHD takes the same value as that of the field PHD.OAM.MSGT of the transmitted PHD (~~rxphd_phyt =~~ rxphd_phyt = txphd_msgt)~~.~~ .

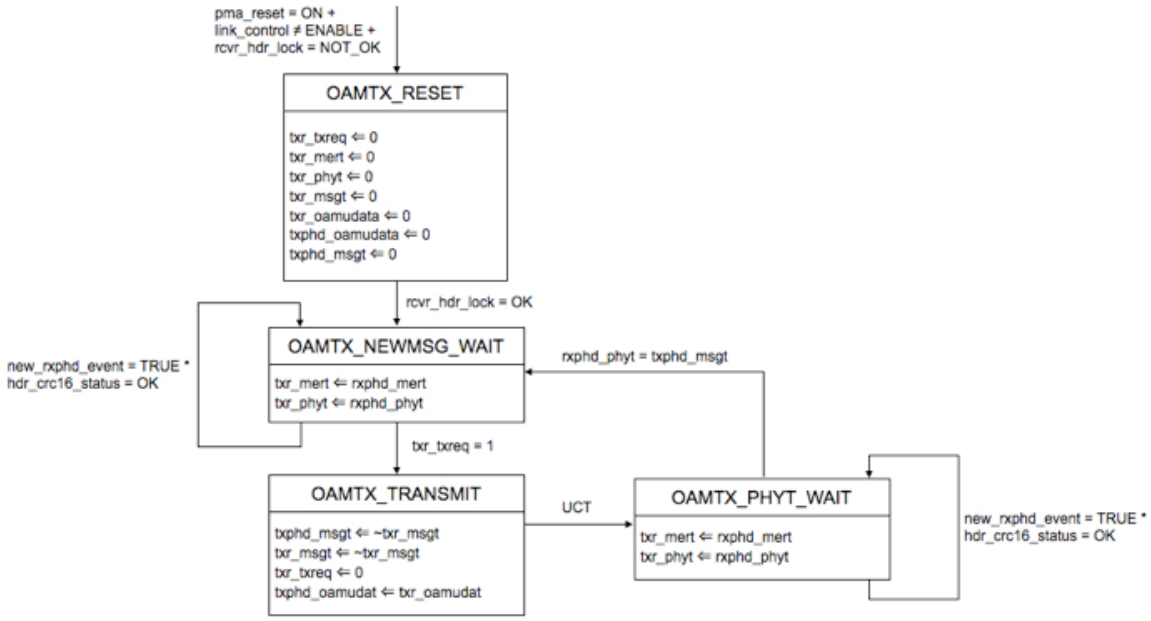

Figure 114–83—PHY OAM Tx control state diagram

~~The~~ All the variables used in the state diagram ~~of Figure 114–82~~ that have not been previously introduced are defined ~~as follows~~in 114.4.6.2.

~~pma_reset~~

~~Allows reset of all the PMA functions. It is set by the PMA reset. PMA reset function is intended to be executed whenever one of power on or reset from management entity conditions occurs. All state diagrams take the open-ended pma_reset branch upon execution of PMA Reset.~~

~~Values:~~ ~~ON: reset is asserted~~
~~OFF: reset is de-asserted~~

~~link_control~~

~~Controls the connection of the PMA to the PMD. This control variable is foreseen for an eventual coexistence of the PHY with an autonegotiation sub-system.~~

~~Values:~~ ~~DISABLE: isolates the PMA from the PMD~~
~~ENABLE: connects the PMA to the PMD (both transmitter and receiver)~~

114.4.6.2 OAM Tx control state variables

oam_cap

Controls the enable of OAM channel functionality. This variable is set to TRUE when PHD.CAP.OAM of both transmit and receive PHD is TRUE. Otherwise it is FALSE.

Values: TRUE: both local and remote PHY have OAM ability and OAM functionality is enabled in both PHYs
FALSE: either local or remote PHY do not have OAM ability or it is disabled

txr_txreq

Value of ~~TXOAM_CTRL_TXREQ bit~~TXO_REQ bit of register 3.500. It indicates whether the local ME is requesting the transmission of a new OAM message.

Values: 0: there is no message transmission request from the local ME
1: the local ME has written a new message into the OAM ~~Tx~~ transmit registers ~~and is~~ and
is requesting the local PHY to transmit it

txr_msgt

Value of ~~TXOAM_CTRL_TXMSGT bit~~TXO_MSGT bit of register 3.500. This bit is ~~written by the OAM Tx~~ updated in OAMTX_TRANSMIT state ~~.~~to reflect the toggle bit of the message being ~~(or last)~~ sent by the local PHY~~.~~.

Values: It alternates between values 0 and 1

txr_phyt

Value of TXO_PHYT bit ~~TXOAM_CTRL_PHYT bit~~of register 3.500. This bit is ~~written by the OAM Tx~~ updated in OAMTX_TRANSMIT state ~~.~~to reflect the identifier of the last message that has been acknowledged by the remote PHY.

Values: It alternates between values 0 and 1

txr_mert

Value of TXO_MERT bit ~~TXOAM_CTRL_MERT~~of register 3.500. This bit is ~~written by the OAM Tx~~ updated in OAMTX_TRANSMIT state ~~.~~to reflect the identifier of the last message that has been acknowledged by the remote ME.

Values: It alternates between values 0 and 1

txr_oamudat

OAM message data written in OAM transmit registers 3.501 to 3.508 and to ~~be transmitted. It is the concatenation~~ field TXO_TYPE of ~~the OAM_DATA1 through OAM_DATA8 transmit registers~~register 3.500.

Values: Any value

txphd_msgt

Identifier of the message being transmitted by the local PHY. It corresponds to field PHD.OAM.MSGT of the PHD.

Values: It alternates between values 0 and 1

txphd_oamudat

Content of the PHD fields PHD.OAM.~~HDR~~ TYPE and PHD.OAM.DATAx being transmitted by the local PHY.

Values: Any value

rxphd_phyt

Content of the field PHD.OAM.PHYT of the last PHD that has been correctly received by the local PHY.

Values: It alternates between values 0 and 1

rxphd_mert

Content of the field PHD.OAM.MERT of the last PHD that has been correctly received by the local PHY.

Values: It alternates between values 0 and 1

~~new_rxphd_event~~

~~Variable set by the PCS receiver to indicate the arrival of a new PHD block from the link partner~~

~~Values:~~ ~~TRUE: indicates the event of a new PHD received from link partner. The value TRUE extends one receive symbol period~~
~~FALSE: indicates no new PHD was received~~

~~revr_hdr_lock~~

~~Variable set by the PMA receiver to indicate whether reliable transmission (i.e. reliable reception by the link partner) and reception of PHD are detected~~

~~Values:~~ ~~OK: PHD transmission and reception are reliable~~
~~NOT_OK: PHD transmission or reception is unreliable~~

~~hdr_crc16_status~~

~~Result of the CRC16 evaluation for a received PHD from the link partner; this variable is assigned for each received PHD block.~~

~~Values:~~ ~~OK: the received PHD block is correct by CRC16 verification~~
~~NOT_OK: the received PHD block is not correct determined by CRC16 verification~~

114.4.6.3 OAM Rx control state diagram

The OAM receive state diagram that governs PHY OAM reception shall be implemented as is shown in Figure 114–84.

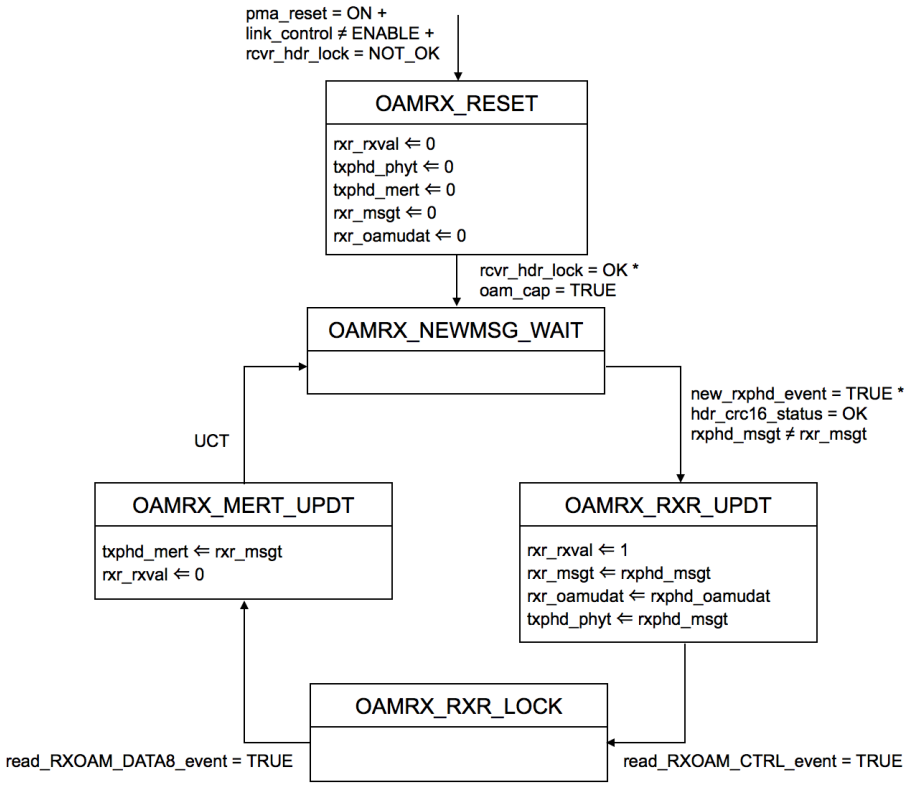

Figure 114–84—PHY OAM Rx control state diagram

Upon reset, disconnection of the PMA from the PMD or determination of an unreliable PHD, OAM ~~Rx~~ receive registers are reset (OAMRX_RESET state). Moreover, ~~transmit~~ bits ~~set to received OAM values values~~ PHD.OAM.MERT and PHD.OAM.PHYT shall also be set to ~~0~~zero.

Once the transmission and reception of PHD blocks is reliable (~~rcvr_hdr_lock =~~ rcvr_hdr_lock = OK), the local PHY waits until the field PHD.OAM.MSGT of a correctly received PHD block takes a value that is different from that of the RXO_MSGT bit ~~TXOAM_CTRL bit MSGT~~of register 3.509. This indicates that a new OAM message has been received from the remote PHY. As soon as this event occurs, transition from state OAMRX_NEWMSG_WAIT to state OAMRX_RXR_UPDT takes place.

In the state OAMRX_RXR_UPDT, the content of the fields PHD.OAM.DATAx and PHD.OAM.~~HDR~~ TYPE of the received PHD are and stored in ~~the corresponding OAM_DATAx~~ OAM receive ~~registers,~~ registers 3.510 to 3.517 and ~~the 12-bit RXOAM_HDR~~ field RXO_TYPE of ~~RXOAM_CTRL is also valid~~register 3.509. ~~The RXMSGT~~ Simultaneously bit RXO_VAL of ~~RXOAM_CTRL~~ register 3.509 is set to ~~the received PHD~~ one, and field RXO_MSGT of register 3.509 is updated with value of field PHD.OAM.MSGT ~~field, which is used for message identification. The local PHY also sets~~ of the

~~RXOAM_CTRL register bit RXVAL to 1 to indicate that a new OAM message from the link partner is available~~received PHD. Additionally, the local PHY shall notify the remote ~~link partner~~ PHY of the reception of the message by ~~assigning~~ setting the field PHD.OAM.PHYT of the transmit PHD to the value of ~~the received PHD~~ PHD.OAM.MSGT ~~field~~ of the received PHD (txphd_phyt ⇐ rxphd_msgt).

~~OAMRX_RXR_UPDT is exited when the RXOAM_CTRL register is read (read_RXOAM_CTRL_event = TRUE). The RXVAL bit being equal to one indicates to the local ME that a new message is available in the OAM Rx registers. The local PHY locks these registers (transition to OAMRX_RXR_LOCK state) until the OAM Rx OAMDATA8 register is read (read_OAMDATA8_event = TRUE). This event is the acknowledgment by the local ME of OAM message reception. It is critical that this is the last~~

~~This event occurs (read_RxTBD8_event = TRUE), is the indication to the local PHY that the message has been successfully received by the attached ME. Thus, state OAMRX_MERT_UPDT sets the RXOAM_CTRL register bit RXVAL to 0 indicating that no valid message is stored in the OAM Rx registers. Moreover, the local PHY shall notify of the receipt of the message by the local ME by assigning the transmit PHD PHD.OAM.MERT to the value of the received PHD.OAM.MSGT (txphd_mert ⇐ rxr_msgt).~~

OAMRX_RXR_UPDT state exits when register 3.509 is read (read_OAMCTRL_event = TRUE). The RXO_VAL bit being equal to one indicates to the local Management Entity that a new message is available in the OAM receive registers. The local PHY locks these registers (transition to OAMRX_RXR_LOCK state) until register 3.517 is read (read_OAMDATA8_event = TRUE). This event is the acknowledgment by the local Management Entity that the OAM message has been successfully received. Thus, state OAMRX_MERT_UPDT sets bit RXO_VAL of register 3.509 to zero indicating that no valid message is stored in the OAM receive registers. Moreover, the local PHY shall notify the reception of the message by the local management entity by assigning field PHD.OAM.MERT of the transmit PHD to the value of RXO_MSGT bit of register 3.509 (txphd_mert ⇐ rxr_msgt).

The local PHY then ~~again~~ waits for a new message to be received (OAMRX_NEWMSG_WAIT)~~.~~ .

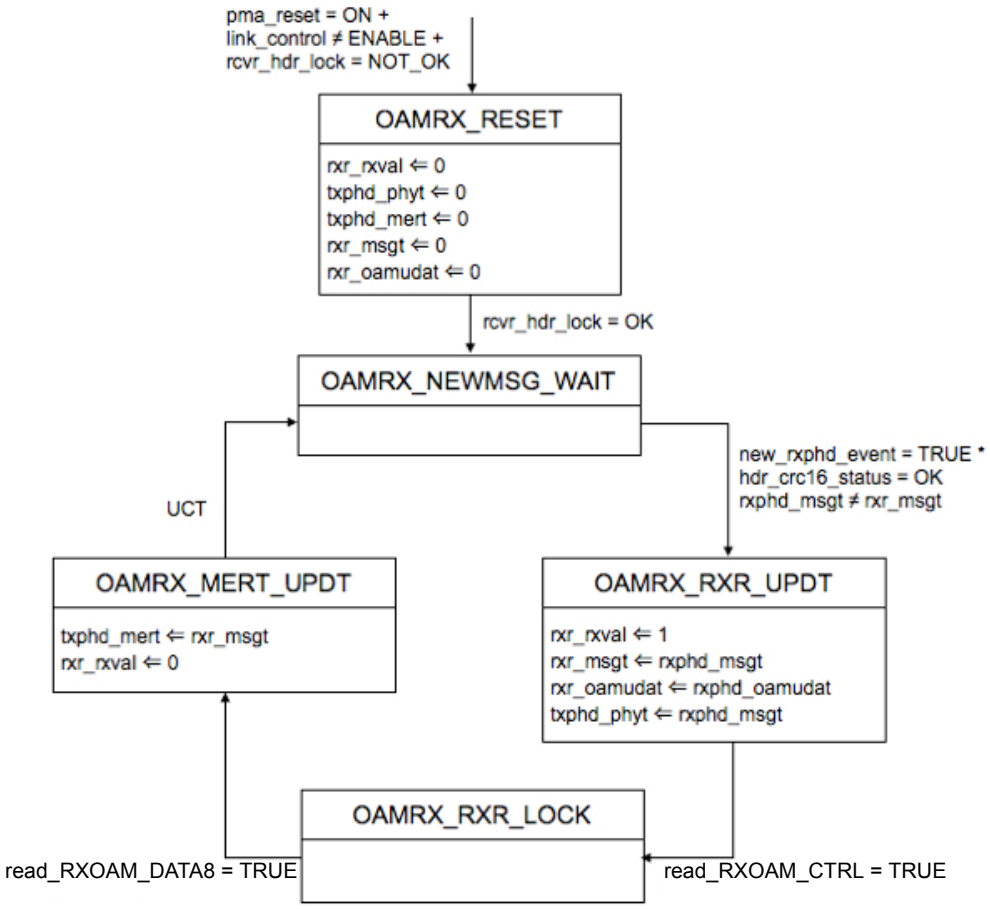

Figure 114–85—PHY OAM Rx control state diagram

~~The~~ All the variables used in the state diagram ~~Figure 114–84~~ that have not been previously introduced ~~as follows.~~ are defined in 114.4.6.4

114.4.6.4 OAM Rx control state variables

rxr_rxval

Value of ~~RXOAM_CTRL~~ RXO_VAL bit of register ~~bit RXVAL~~ 3.509. This ~~bits~~ bit indicates the presence of a valid message in the OAM ~~Rx~~ receive registers.

Values: 1: there is a valid message in the ~~Rx~~ receive registers, which is pending ~~processing by~~processing ~~by~~ by the local ~~ME~~Management Entity

0: there is no valid message in the ~~Rx~~ receive registers

rxr_msgt

Value of ~~RXOAM_CTRL~~ RXO_MSGT bit of register ~~bit MSGT~~ 3.509. This bit is the toggle bit identifier of the message contained in the ~~Rx~~ OAM receive registers.

Values: It alternates between values 0 and 1

rxr_oamudat

The received OAM message data. It is the ~~concatenation~~ content of registers 3.510 to 3.517.

and field RXO_TYPE of ~~the OAM_DATA1 through OAM_DATA8 receive registers~~register 3.509.
Values: Any value

txphd_phyt
Value of the PHD field PHD.OAM.PHYT being transmitted by the local PHY. It indicates to the remote PHY the ~~PHD.OAM.MSGT~~ toggle bit identifier of the last valid message written to the ~~Rx~~ receive registers.
Values: It alternates between values 0 and 1

txphd_mert
Content of the PHD field PHD.OAM.MERT being transmitted by the local PHY. It informs the remote PHY ~~which is~~ the toggle bit identifier of the last message that has been received by the local ~~ME~~Management Entity.
Values: It alternates between values 0 and 1

rxphd_msgt
Value of the PHD field PHD.OAM.MSGT of the last valid received PHD. It contains the toggle bit identifier of the OAM message carried in that PHD.
Values: It alternates between values 0 and 1

rxphd_oamudat
Content of fields PHD.OAM.~~HDR~~ TYPE and PHD.OAM.DATAx of the last PHD correctly received by the local PHY. It is the payload of the OAM message.
Values: Any value

read_RXOAM_CTRL_event
Event to indicate that the OAM receive register ~~RXOAM_CTRL~~ 3.509 has been read.
Values: TRUE: register ~~RXOAM_CTRL~~ 3.509 has been read
FALSE: register ~~RXOAM_CTRL~~ 3.509 has not been read

read_RXOAM_DATA8_event
Event to indicate that the OAM receive register ~~OAM_DATA8~~ 3.517 has been read.
Values: TRUE: register ~~RXOAM_DATA8~~ 3.517 has been read
FALSE: register ~~RXOAM_DATA8~~ 3.517 has not been read

114.5 Energy Efficient Ethernet (EEE)

Each PHY ~~that supports EEE~~ shall advertise its EEE capability ~~when it is connected~~ to ~~a~~ the link ~~by setting~~ partner in the ~~1 bit~~ field PHD.CAP.LPI ~~of the Physical Header Data~~ as one (~~PHD~~see Table 114–2) ~~to 1,~~ when the local PHY implements EEE and it is enabled (see ~~Table 114–3~~45.2.3.50.4). EEE functionality shall be enabled when both link partners indicate PHD.CAP.LPI = 1. PHD.CAP.LPI = 1 advertisement indicates to the link partner that the local PHY can generate Transmit Blocks according to LPI mode of operation and it is able to accept Transmit Blocks from the link partner that conform to LPI operation~~.~~.

If the link partner PHY does not advertise EEE capability (PHD.CAP.LPI = 0), then the link will always operate in normal mode in both transmit and receive directions even if "Assert LPI" encoding is detected on the GMII. Therefore, when two link partners do not agree on enabling LPI capability, the PCS encoding will be transparent ~~allowing~~ carrying the LPI signaling GMII to GMII, but the PHY will not enter quiet mode.

As shown in ~~Figure 114–87~~Figure 114–86, 1000BASE-H LPI mode consists of alternating refresh and quiet periods. Refresh is provided by transmitting all the pilot and physical header sub-blocks; and quiet is provided by suspending transmission of the payload data sub-blocks. In quiet periods, the local PHY may turn off much of the PCS, PMA and PMD transmitter. No ~~(or minimal)~~ optical power is injected into the fiber during these periods of quiet resulting in reduced power consumption. Quiet shall not be entered or exited in the middle of a payload data sub-block~~.~~.