Proposal to make Energy detect more robust in 10GBASE-KR EEE mode.

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Supporters

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- David Koenen, HP
- Pat Thaler, Broadcom
- Matt Brown, AMCC

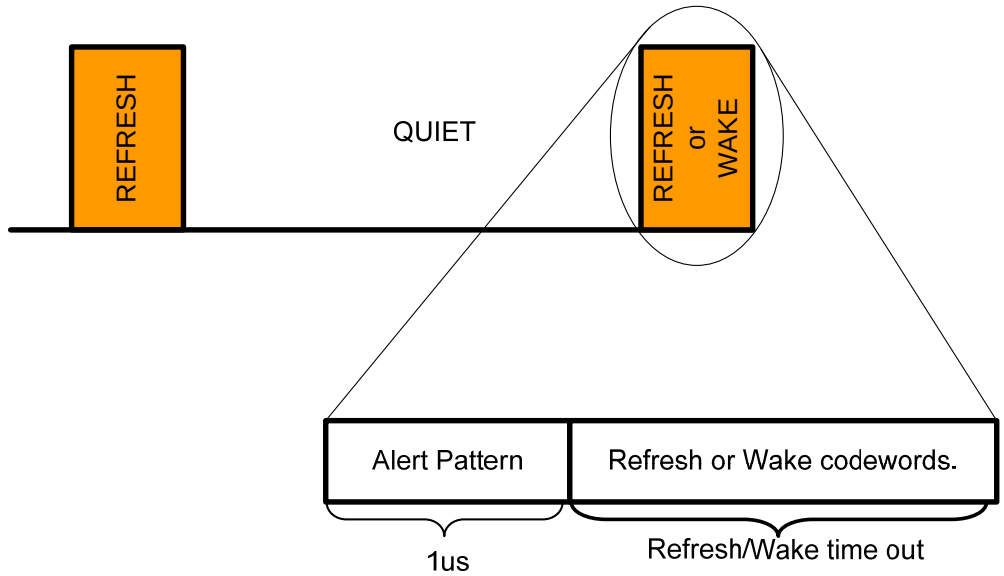
Concerns about 10GBASE-KR Energy Detect

- Presently in CL49 LPI receive state machine, the transition from RX_QUIET to RX_WAKE is enabled by energy_detect.
- Energy detect is more susceptible to noise and cross talks. This will unnecessarily make the LPI RX State machine transition out of the RX_QUIET state.
- Several comments and concerns were put forward against Draft 2.0 during the September interim.
  - Changes were made to the CL49 LPI transmit and receive state diagrams to handle this appropriately during false energy detect.
- These changes still do not address the vulnerability of the Energy Detect.
- The proposal that is presented here is an elaborated version of the discussion that Adam Healey (LSI) had with Matt Brown (AMCC) and Velu Pillai (Broadcom).

An Alert Pattern

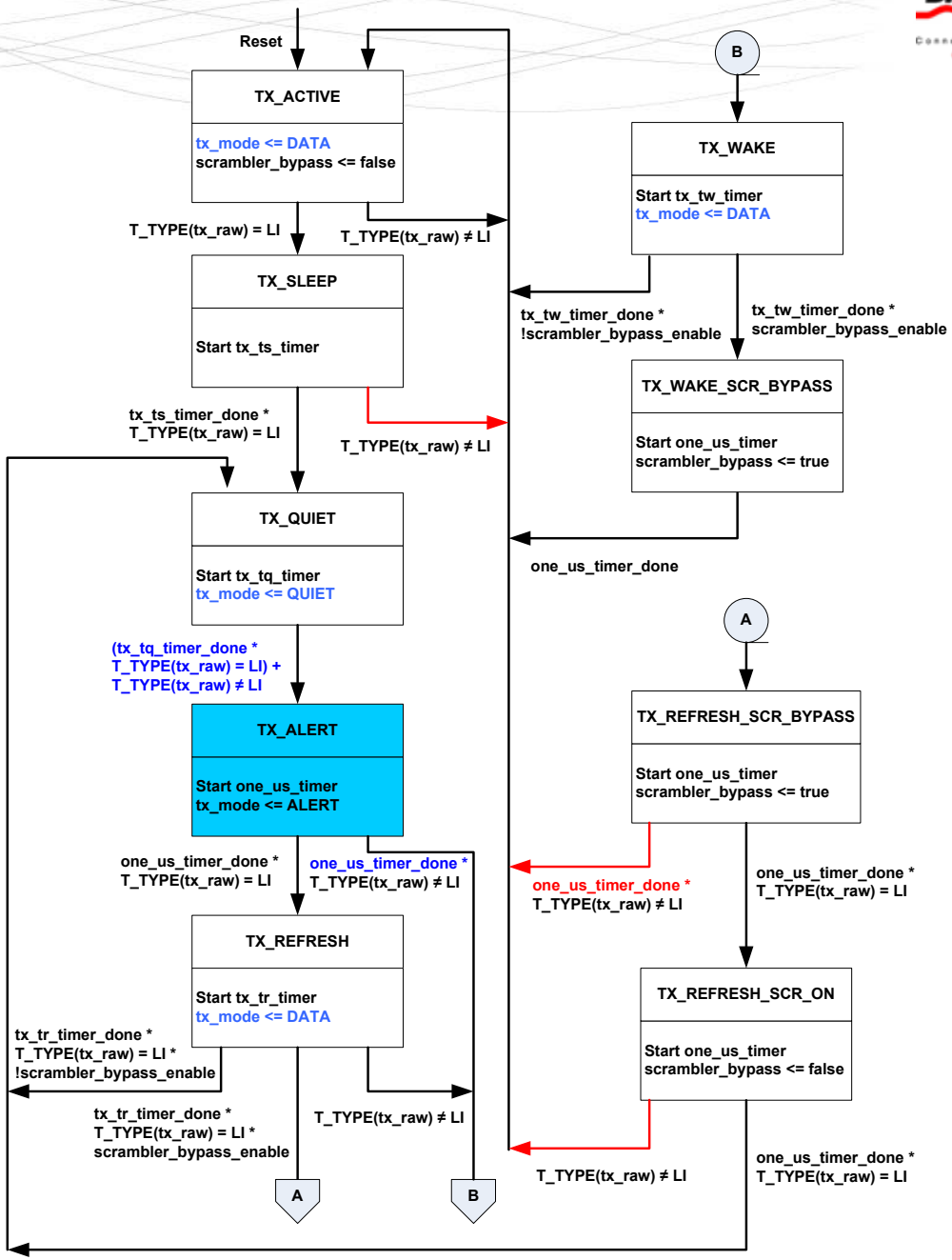
- The proposal is for the Transmitter to send out a pattern as a prequel before the refresh or wake sequence.
- During EEE mode, signal detect function may use this alert pattern to detect electrical energy at the receiver.
- The proposed alert pattern is a repeating “0xFF00 (Eight “1”s and Eight “0”s) for 1usec.
  - CL49 LPI transmit state machine already has a 1us timer (one_us_timer) defined.
  - Reduce the transmitter wake and refresh timer values by 1us, hence it does not change the total system time budgets.
  - A DC balanced pattern.

- A pictorial view of the proposal is shown here.
- An alert pattern is send out whenever the transmitter comes out QUIET.



CL49 LPI transmit state diagram changes (Fig 49-16)

- Solutions to the bugs in the Fig 49-16 (Draft 2.1). Comments are filed against these.
- Changes needed for alert pattern.



List of edits for Clause 49 and 74.

Rename "tx_quiet" to "tx_mode". That way we can avoid adding a new variable and service interface.

49.2.13.2.2 Variables

tx_mode

tx_mode may assume a value from the set {QUIET, ALERT, DATA}. When set to QUIET, the PMD will disable the transmitter as described in 72.6.5. When set to ALERT, the PMD will transmit a repeating pattern of eight ones and eight zeros as described in 72.6.2. And PMD will pass Data, when this variable is set to DATA.

To be consistent the proposal is to rename rx_quiet to rx_mode too. The value set will be {QUIET, DATA}. The LPI Receive state diagram needs modification.

Fig 49-4 and Fig 74-2: Functional block diagram:

Rename tx_quiet and rx_quiet to tx_mode and rx_mode, respectively. And modify the appropriate service interface text for tx_mode.request and rx_mode.request.

Table 49-2 – Transmitter LPI timing parameters

Parameter	Description	Value	Units
TSL	Local Sleep Time from entering TX_SLEEP state to transmit disable	5 ±1%	us
TQL	Local Quiet Time from Transmitter disabled to start of TX_REFRESH state	1.7 ±1%	ms
TUL	Local Refresh Time while in TX_REFRESH state, when scrambler_bypass_enable = FALSE	16 ±1%	us
TUL	Local Refresh Time while in TX_REFRESH state, when scrambler_bypass_enable = TRUE	14 ±1%	us
TWL	Local Wake Time from LPI de-asserted to TX_ACTIVE state	11 ±1%	us

List of edits for Clause 72 and 51.

51 Physical Medium Attachment (PMA)

Rename tx_quiet and rx_quiet to tx_mode and rx_mode, respectively. And modify the appropriate service interface text.

72.2 Physical Medium Dependent (PMD) service interface and 72.6.11. PMD LPI function

Rename tx_quiet and rx_quiet to tx_mode and rx_mode, respectively. And modify the appropriate service interface text.

72.6.2 PMD transmit function

If the optional Energy Efficient Ethernet (EEE) capability is supported (see Clause 78) then when tx_mode is set to ALERT, PMD will transmit a repeating 16-bit pattern, hexadecimal 0xFF00.

72.6.4 PMD signal detect function

The value of the SIGNAL_DETECT is defined by the training state diagram shown in Figure 72–5 when rx_mode = DATA. If EEE is supported and rx_mode = QUIET, a local PMD signal detect function shall report to the PMD service interface using the message PMD_SIGNAL.indication(SIGNAL_DETECT). During the transition from Quiet to Active, the link partner transmitter is expected to transmit a repeating 16-bit pattern, hexadecimal 0xFF00, for 1usec before the code words. PMD signal detect function may use this pattern to detect electrical energy at the receiver. For EEE, the SIGNAL_DETECT parameter can take on one of two values: OK or FAIL, indicating whether the PMD is detecting electrical energy at the receiver (OK) or not (FAIL). When SIGNAL_DETECT = FAIL, PMD_UNITDATA.indication(rx_bit) is undefined.

List of edits for Clause 72.

72.6.5 PMD transmit disable function

d) For EEE capability, the PMD_transmit_disable function shall turn off the transmitter after tx_mode is set to QUIET within a time and voltage level specified in 72.7.1.4. The PMD_transmit_disable function shall turn on the transmitter after tx_mode is set to DATA or ALERT within the time and voltage level specifiedin 72.7.1.4.

Table 72–9—Receiver characteristics for 10GBASE-KR

EEE Signal Detect deactivation time (T_{SD}) from active to LPI quiet	72.6.5	500	ns
EEE Signal Detect activation time (T_{SA}) from LPI quiet to active	72.6.5	500	ns

72.10.4.2 PMD functional specifications

Modify the appropriate service interface text for tx_mode.request and rx_mode.request.

Thank You