IEEE P802.3az
Proposed Wake Shrinkage Values

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IEEE P802.3az Task Force Wake Shrinkage Ad Hoc

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Overview

- Wake shrinkage values are proposed and a summary is presented.
- 100BASE-TX parameters are the same as presented in law_1_0109_V3_0.pdf.
- New 1000BASE-T calculations and parameters are presented.
- 10GBASE-T parameters for Wake during SLEEP are the same as presented in law_1_0109_V3_0.pdf.
- New 10GBASE-T calculations and parameters for Wake after SLEEP are presented.

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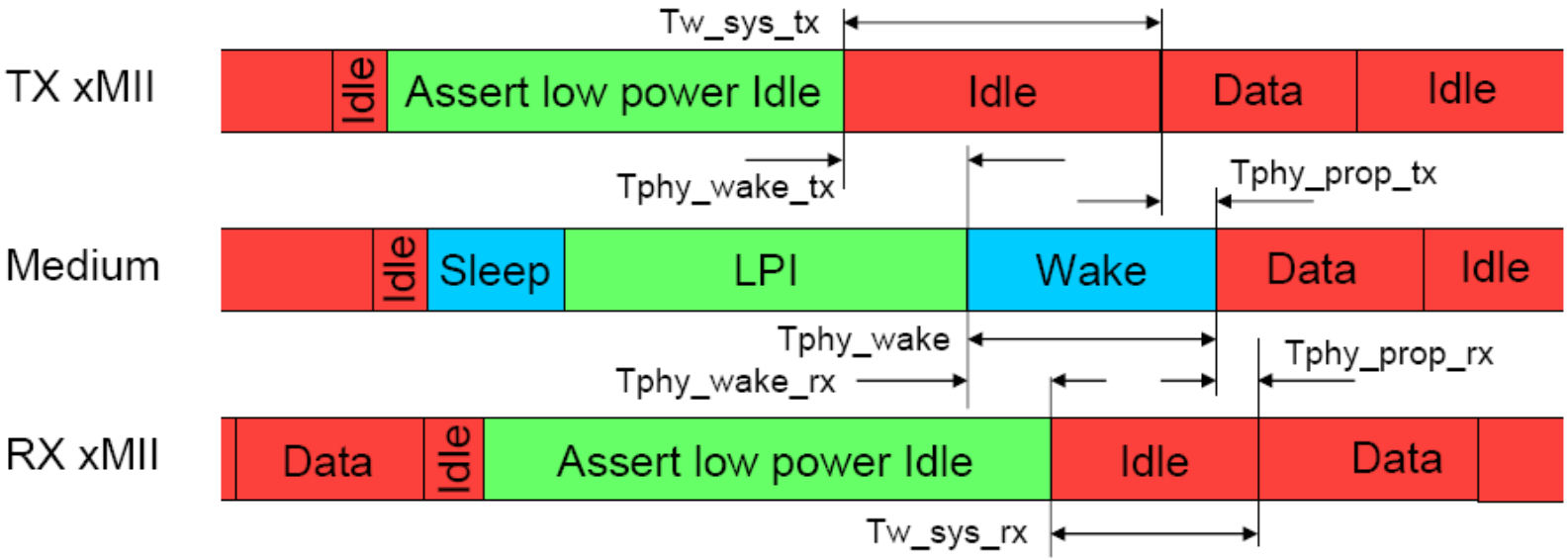
Wake Time Parameters Review

(From law_1_0109_V3_0.pdf, slide 8)



Tw_sys_tx (min) = Tw_sys_rx (min) + Tphy_shrink_tx (max) + Tphy_shrink_rx (max)
Tw_phy (min) = Tphy_wake (min) + Tphy_shrink_tx

Tw_sys_res (min) is greater of Tw_sys_tx (min) and Tw_phy (min)

Tphy_shrink_tx (max) = (Tphy_wake_tx(max) - Tphy_prop_tx (min))
Tphy_shrink_rx (max) = (Tphy_wake_rx(max) - Tphy_prop_rx (min))

Where:

- Tphy_wake_tx: xMII start of wake to MDI start of wake delay
- Tphy_prop_tx: xMII to MDI data propagation delay
- Tphy_wake_rx: MDI start of wake to xMII start of wake delay
- Tphy_prop_rx: MDI to xMII data propagation delay
- Tphy_wake: Minimum wake duration required by PHY

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1000BASE-T Tphy_wake_* Definitions

- Tphy_wake_tx
  - The time from the LPI/IDLE transition on the GMII interface to the time that the PHY outputs a detectable wake signal on the MDI interface.
- Tphy_wake_rx
  - The time from when a detectable signal is received on the MDI interface to when the PHY sends IDLE on the GMII interface.

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1000BASE-T Tphy_wake_rx

- Worst-case Tphy_wake_rx is given by (Slave wakes first):

$$Tphy\_wake\_rx = T_{sa} + T_{mz} + T_p + T_{scr} + T_p + T_{rcvr}$$

	Symbol	Timing Parameter	Value (nsec)
1	T_{sa}	Signal detect assertion time (max)	500
2	T_{mz}	lpi_wakemz_timer (max)	5000
3	T_p	Tx latency + Cable prop delay+ Rx latency (max)	878
4	T_{scr}	Scrambler acquisition time (max)	3500
5	T_p	Tx latency + Cable prop delay+ Rx latency (max)	878
6	T_{rcvr}	Receive status O.K. (max)	2500
	Total:	Tphy_wake_rx	13256

Maximum values for 2 through 6 from healey_02_0508.pdf and grimwood_02_0708.pdf

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Example 1000BASE-T Calculations

- T_{sa} is the maximum receiver signal assertion time = 0.5 us
- Tphy_wake_tx = Tphy_prop_tx + lpi_waketx_timer(max) - T_{sa}
- Tphy_shrink_tx = Tphy_wake_tx – Tphy_prop_tx - T_{sa}
  = lpi_waketx_timer(max)
  = 0.8 us

- Tphy_wake_rx = 13.3 us
- Tphy_shrink_rx = Tphy_wake_rx – Tphy_prop_rx
  = 13.3 us – Tphy_prop_rx
  = 14 us (rounding up to provide a small margin)

- Tw_phy = 16.0 us
- Tphy_wake = Tw_phy – Tphy_shrink_tx
  = 15.2 us

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Example 10GBASE-T Calculation for Wake during SLEEP Condition – Case 1

(From law_1_0109_V3_0.pdf, slide 15)

Tphy_wake_tx = Tphy_prop_tx + lpi_tx_sleep_timer + lpi_tx_alert_timer
= Tphy_prop_tx + 10 LDPC frames + 4 LDPC frames
= Tphy_prop_tx + 3.20us + 1.28us
= Tphy_prop_tx + 4.48 us

Tphy_shrink_tx = Tphy_wake_tx - Tphy_prop_tx
= Tphy_prop_tx + 4.48 us - Tphy_prop_tx
= 4.48 us

Tphy_wake_rx = Tphy_prop_rx

Tphy_shrink_rx = Tphy_wake_rx - Tphy_prop_rx
= 0us

Tw_phy = Tphy_wake + Tphy_shrink_tx
= 2.88 us + 4.48 us (lpi_tx_wake_timer 9 LDPC frames max)
= 7.36 us

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NOTE: Tphy_shrink_rx computation assumes that the receive PHY begins to send IDLE as soon as Wake is received.

Otherwise Tphy_shrink_rx = lpi_tx_wake_timer = 2.88 us

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Example 10GBASE-T Calculation for Wake after SLEEP Condition – Case 2

- Tphy_wake_tx = Tphy_prop_tx + lpi_tx_alert_timer + 1 LDPC frame
  = Tphy_prop_tx + 4 LDPC frames + 1 LDPC frame
  = Tphy_prop_tx + 1.6 us
- Tphy_shrink_tx = Tphy_wake_tx – Tphy_prop_tx
  = 1.6 us

- Tphy_wake_rx = Tphy_prop_rx
- Tphy_shrink_rx = Tphy_wake_rx – Tphy_prop_rx
  = 0 usec

- Tw_phy = Tphy_wake + Tphy_shrink_tx
  = 9 LDPC frames + 1.6 us
  = 4.48 us

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NOTE: Tphy_shrink_rx computation assumes that the receive PHY begins to send IDLE as soon as Wake is received.
Otherwise Tphy_shrink_rx = lpi_tx_wake_timer = 2.88 us

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Proposed PHY Timer Values

PHY	Tw_sys_res default (min)	Tw_phy (min)	Tphy_shrink_ tx (max)	Tphy_shrink_ rx (max)	Tw_sys_rx default (min)	Assert LPI (min)
100 BASE-TX	30 us	20.5 us	5 us	15 us	10 us	0
1000 BASE-T	16 us	16 us	0.8 us	14.0 us	1.2 us	0
10G BASE-T *Case 1*	7.36 us	7.36 us	4.48 us	2.88 us 0 us[1]	0 us 2.88 us[1]	0
10G BASE-T *Case 2*	4.48 us	4.48 us	1.6 us	2.88 us 0 us[1]	0 us 2.88 us[1]	0

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[1]Requires changes for 10GBASE-T early IDLE detection in Wake.

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Thank you