

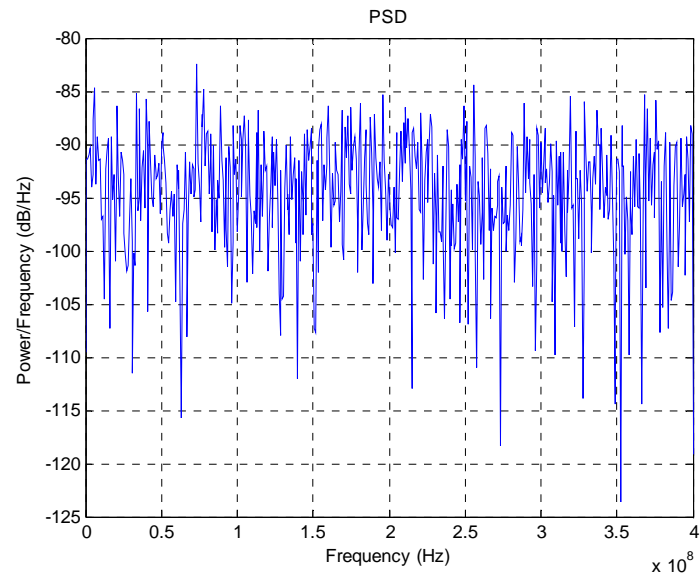
Periodic Training Sequence Issues for 40G/2.5/5GBASE-T

IEEE 802.3bq / bz – July 2015

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Spectrum

- ▶ Insufficient statistics to train Equalizers and Cancellers during PTS
- ▶ DC imbalance & spectral nulls
- ▶ Problem for decimated/shared adaptation loops:
 - e.g. DC offset of >10%
 - Nulls > 35dB



Specification Issues

▶ Location

- Not described in 113.4.2.5.15 Startup sequence.
- Functional spec on periodic training is written in 113.3.5 LPI signaling
 - specifically 113.3.5.3 Refresh period signaling.
 - Does it only apply to PHYs that support EEE?

▶ Contradiction

- 113.4.2.5.16 – states scramblers start free-running at the PCS_Test state
- 113.3.5.3 – states scramblers start free-running at PMA_PBO_Exch state

▶ Timing (based on 113.3.5.3)

- Not synchronized. Does not occur at a pre-established time.
 - Switch causes the link partner to lose PCS synchronization
 - local device will need to update/retrain cancellers
 - Master requests PBO -> slave switches -> master must resync, and slave will retrain its echo/next canceller so it can detect Infocfields.
 - Slave requests PBO -> master switches -> slave must resync, and master will retrain its echo/next canceller so it can detect Infocfields.
 - Possible to miss Infocfield messages for transition to PMA_Coeff_Exch state.

Timing Budget

▶ Link Training Timing Budget

- Added later to 10GBASE-T by vendors using non-Periodic Training
- Adjustment needed for additional sync and retraining?

Table 113–12—Recommended startup sequence timing

Master	Recommended maximum time (ms)	Recommended average time (ms)	Slave
SILENT plus (PMA_Training_Init_M state AND en_slave_tx = 0)	350	315	SILENT
(PMA_Training_Init_M state AND en_slave_tx = 1) plus PMA_PBO_Exch state	480	432	PMA_Training_Init_S state plus PMA_PBO_Exch state
PMA_Coeff_Exch state	100	90	PMA_Coeff_Exch state with timing_lock_OK=0
	520	468	Total for PMA Coeff Exch state
PMA_Fine_Adjust state	650	585	PMA_Fine_Adjust state
Total	2000	1800	

802.3bz 2.5G/5G

▶ Specification

- Same issues as 802.3bq
- Missing auto-negotiation bit(s) for 2.5G and 5G

▶ PTS is not needed for 2.5/5G

- 10GBASE-T demonstrated link training at and above 100 meters w/o PTS.