



Link Synchronization for Crystal-less Camera Links

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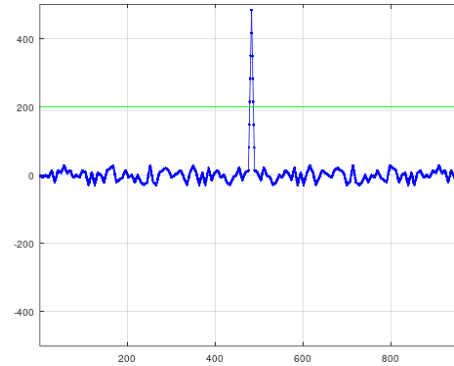
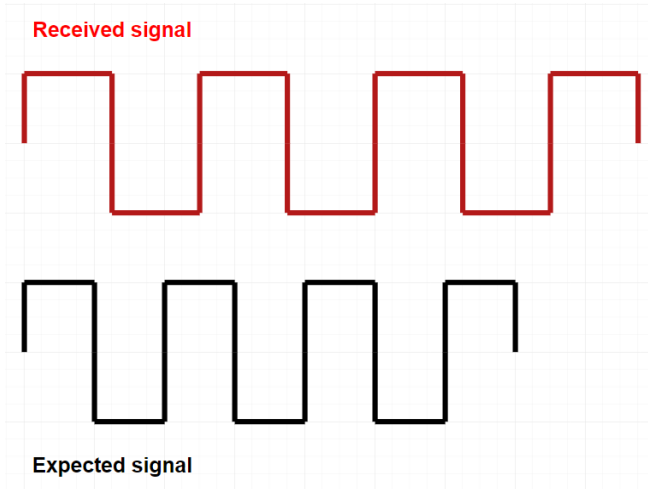
Highlight

- Link synchronization makes sure that both sides of the link is ready to start training
 - https://www.ieee802.org/3/dm/public/0524/Lo_01_0524.pdf
- Link synchronization is challenging in crystal-less camera mode.
- A synchronization method is proposed for crystal-less mode.

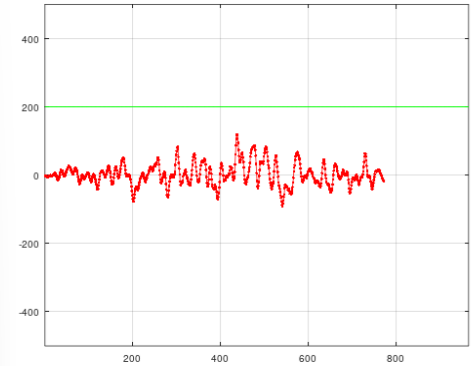
Link synchronization in 802.3ch

- A PRBS based signal “SEND_S” is used
 - A short period PRBS signal is used
 - The duration of link synchronization signal is independent of data rate
- A similar signal is used for 25G BASE-T1

Link synchronization is challenging in crystal-less mode



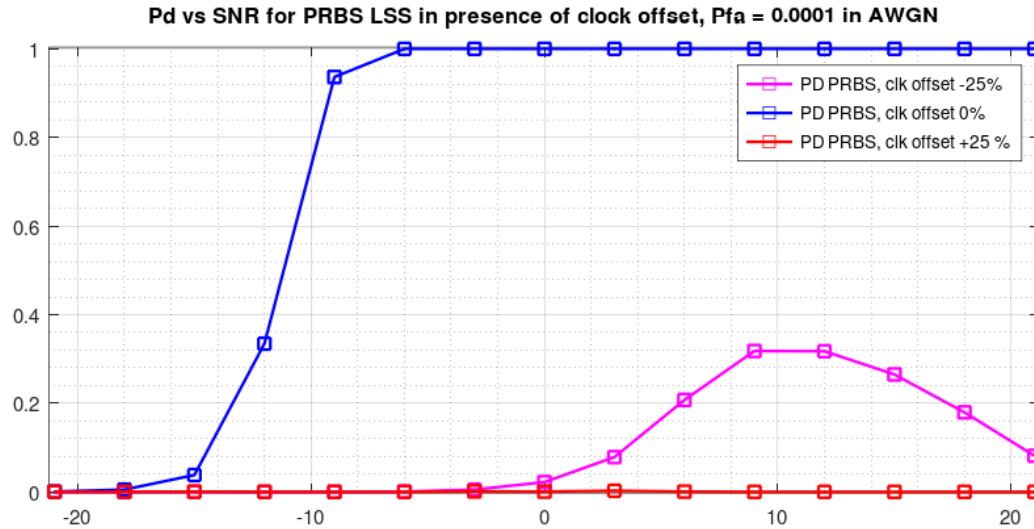
Signal is detected



Signal is not detected

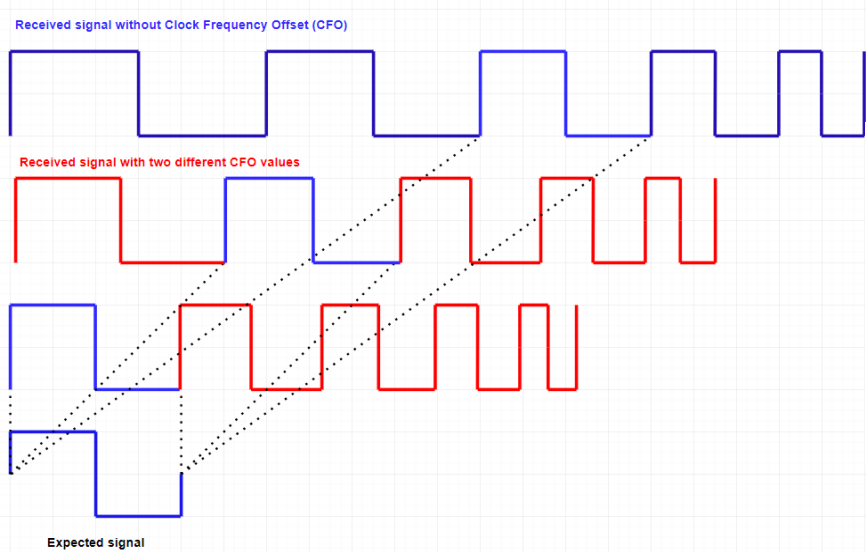
- When the frequency offset between the camera and switch is too large, the conventional matched filter detector fails to detect the link synchronization signal

PRBS signal is not suitable for link synchronization in crystal-less mode

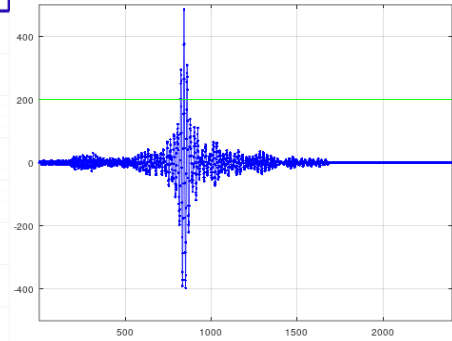


- Probability of detection versus SNR
- False alarm is constant $\sim 10^{-4}$
- AWGN channel, 15m STP cable

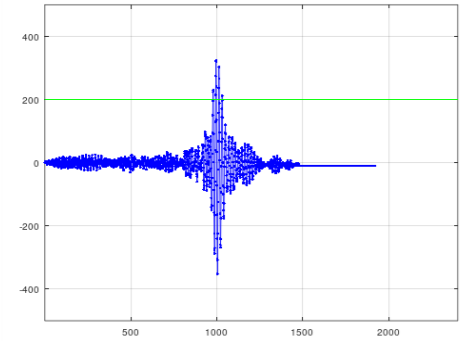
Chirp signal for link synchronization



Detector Output 0 ppm

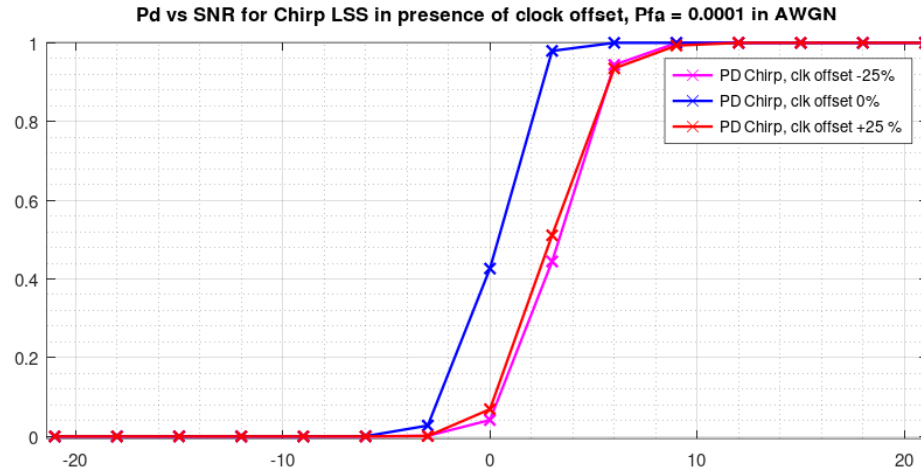


Detector Output 20% Frequency offset



Link synchronization signal is detected

The chirp signal is an effective link synchronization signal



- Probability of detection versus SNR using a chirp signal
- False alarm is constant $\sim 10^{-4}$
- AWGN added noise, 15m STP cable

Conclusion

- Link synchronization is challenging in crystal-less camera mode.
- A synchronization method has been proposed for crystal-less mode.