Fast determination of instability in a non-linear Clock and Data Recovery circuit

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Why Clock and Data Recovery circuits are indispensable

- High-speed serial data streams are sent without an accompanying clock signal
- Unwanted effects of long interconnections and other stress factors on the communication link distort the transmitted data signal
- The receiver recreates a clock signal (timing information) from the received data signal
- Using the recovered clock, the digital data is extracted from the deteriorated signal and can be further processed

Close match between the simulation results and the developed theory

Fast determination of instability

- Stability = essential property of the system
- New method is 1000x faster than brute-force simulation
- Further analytical approximations lead to simple equations for a quick check!

\[
A_{e,max} \approx \frac{8 \alpha}{\pi^2} T_d \omega_0
\]

\[
\sigma_{\text{in,th}} \approx \frac{1}{2} \sqrt{\frac{\pi}{2}} A_{e,max}
\]

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