What is a bathtub curve?

TI Precision Labs - Signal Conditioning

Prepared by Malik Barton

Presented by Nicholas Malone

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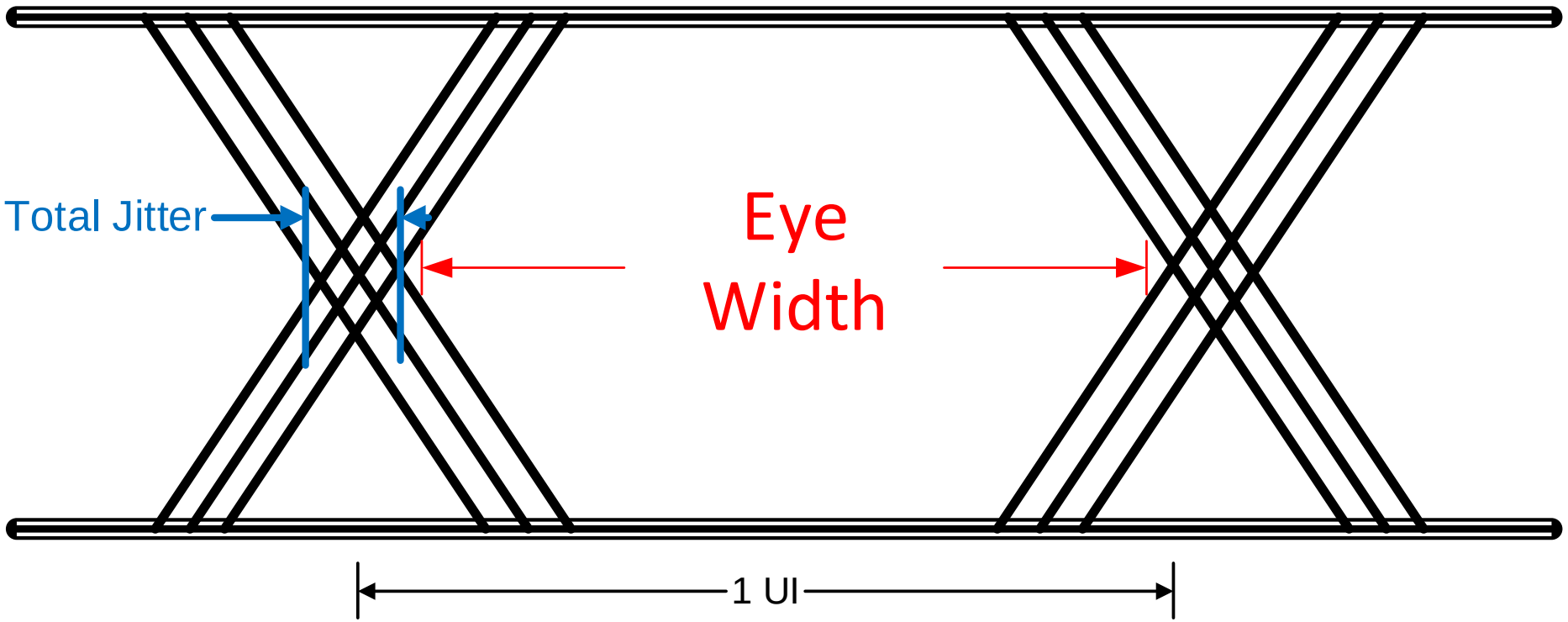
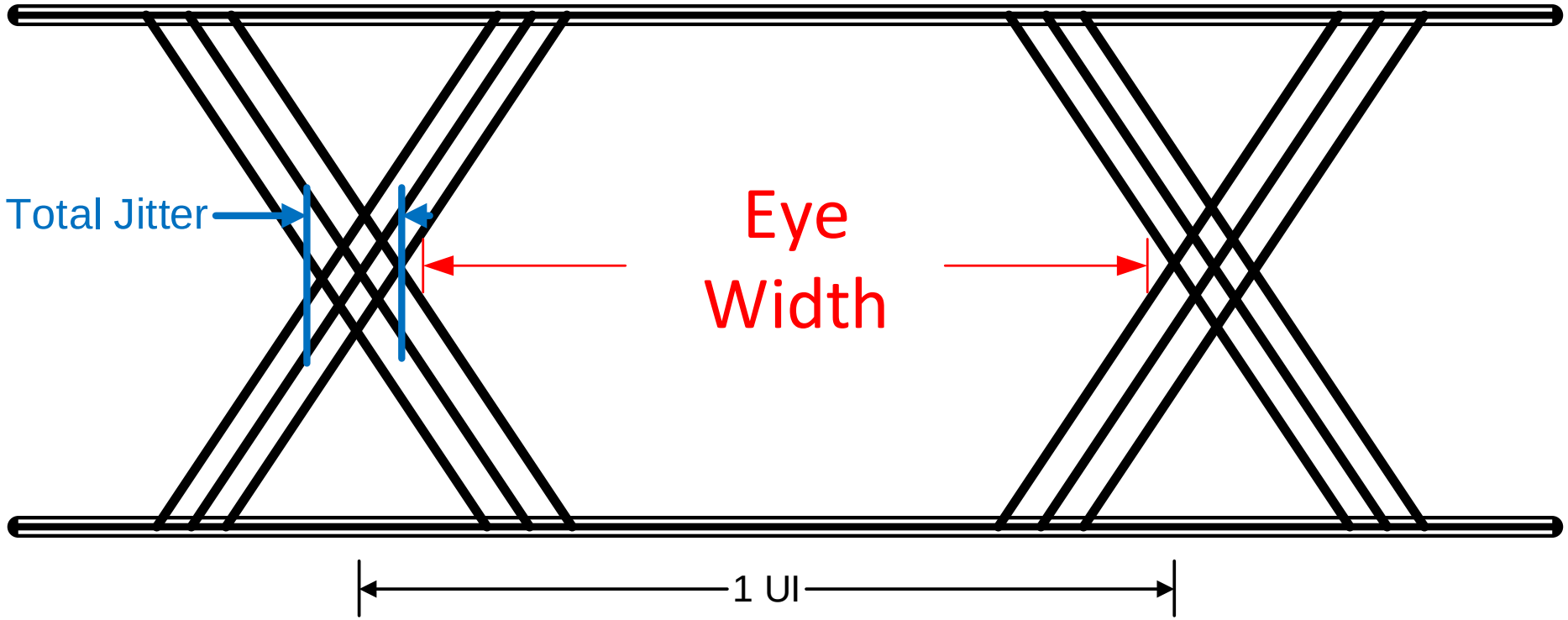
Starting from eye diagrams…

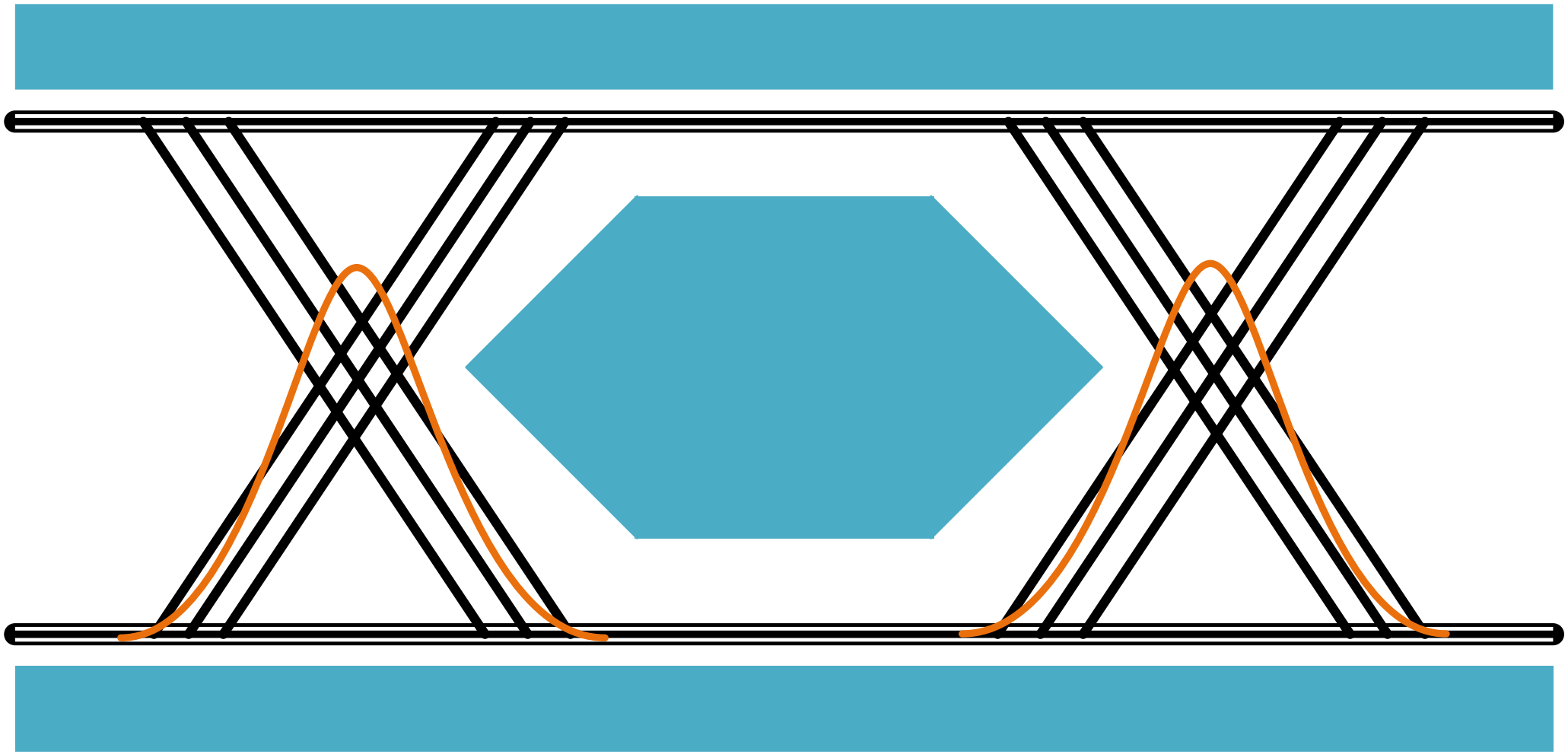


Eye diagrams and bit error rate (BER)

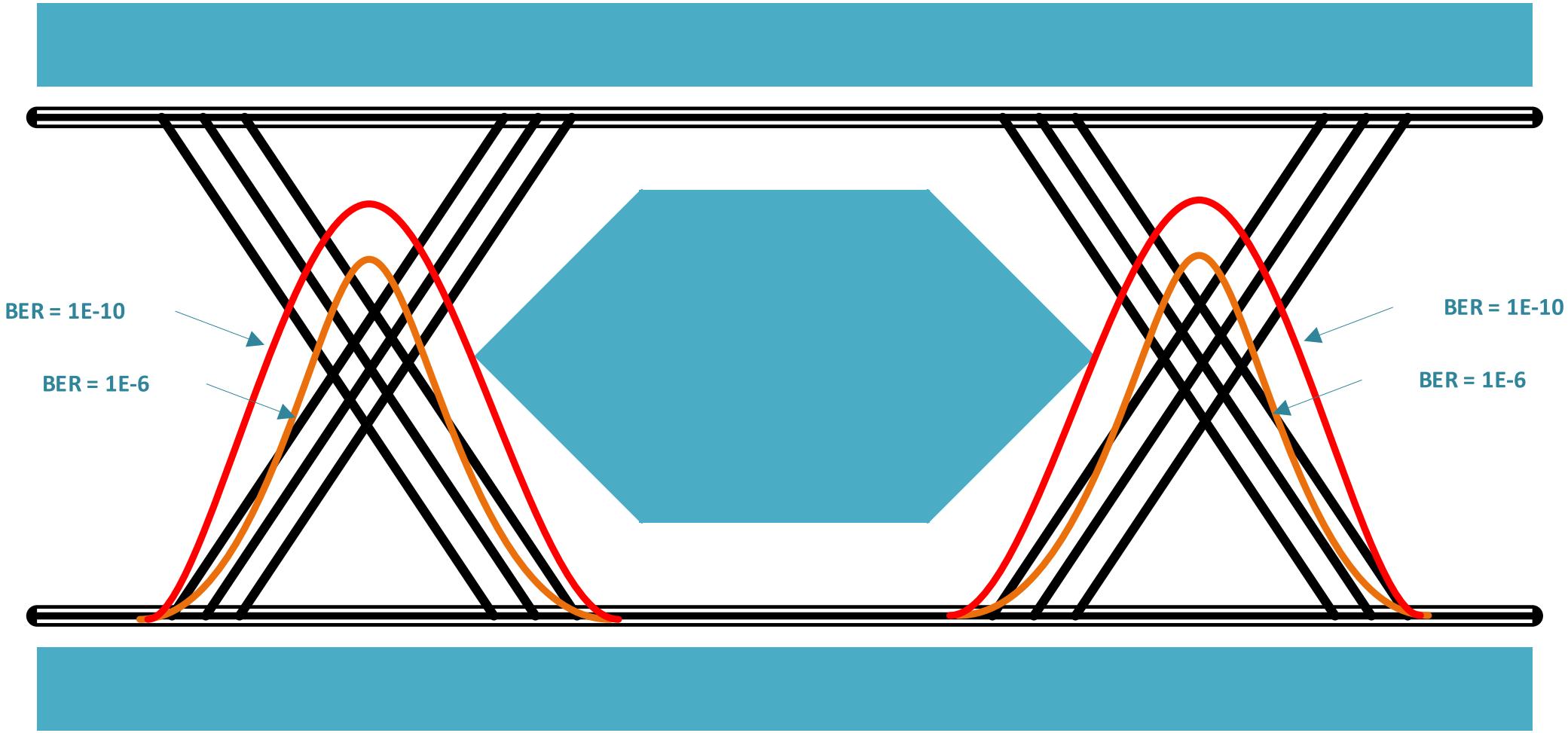


$$BER = \frac{\#\ of\ Bit\ Errors}{\#\ of\ Total\ Bits}$$

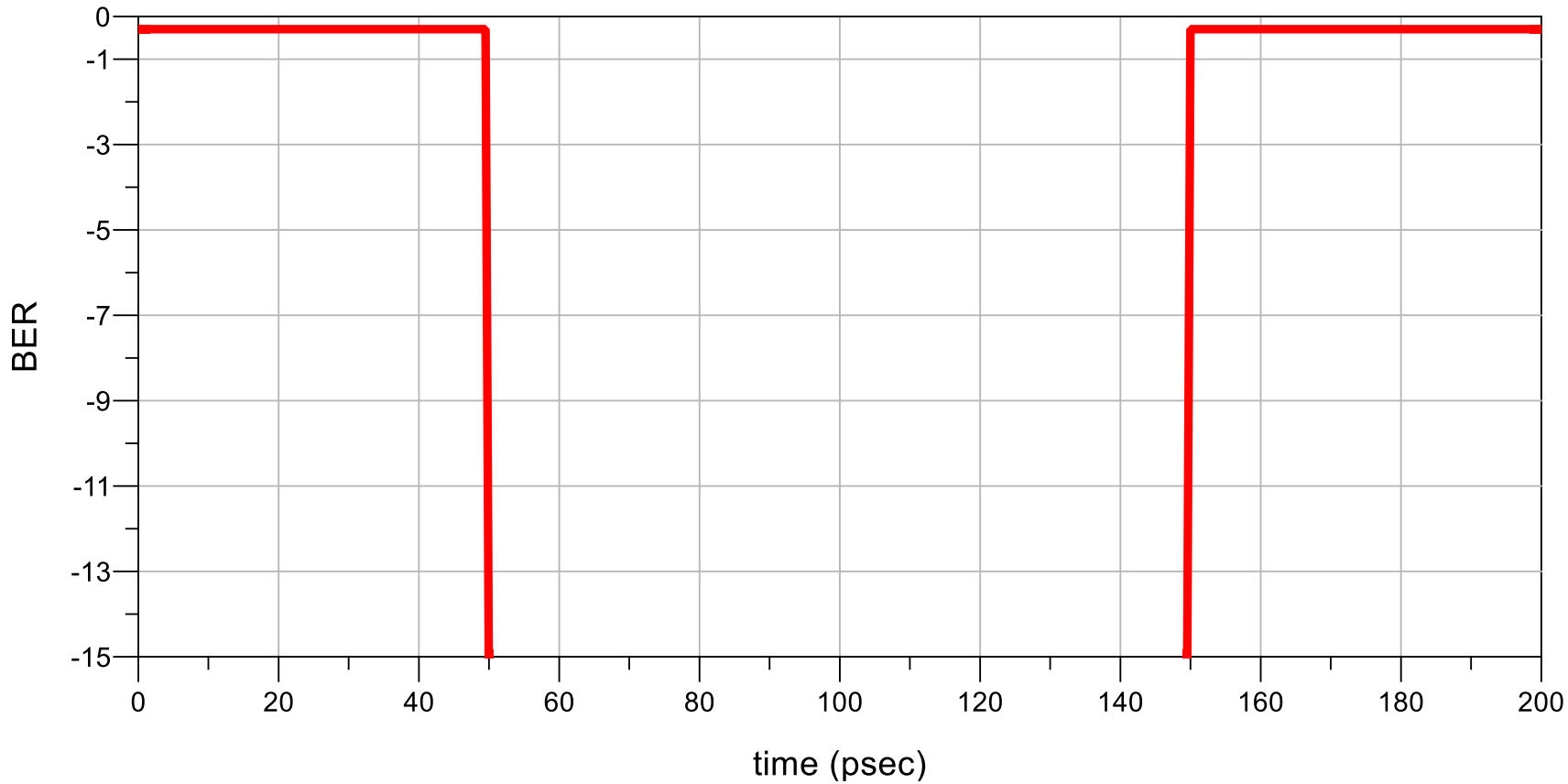
Total jitter in eye diagrams



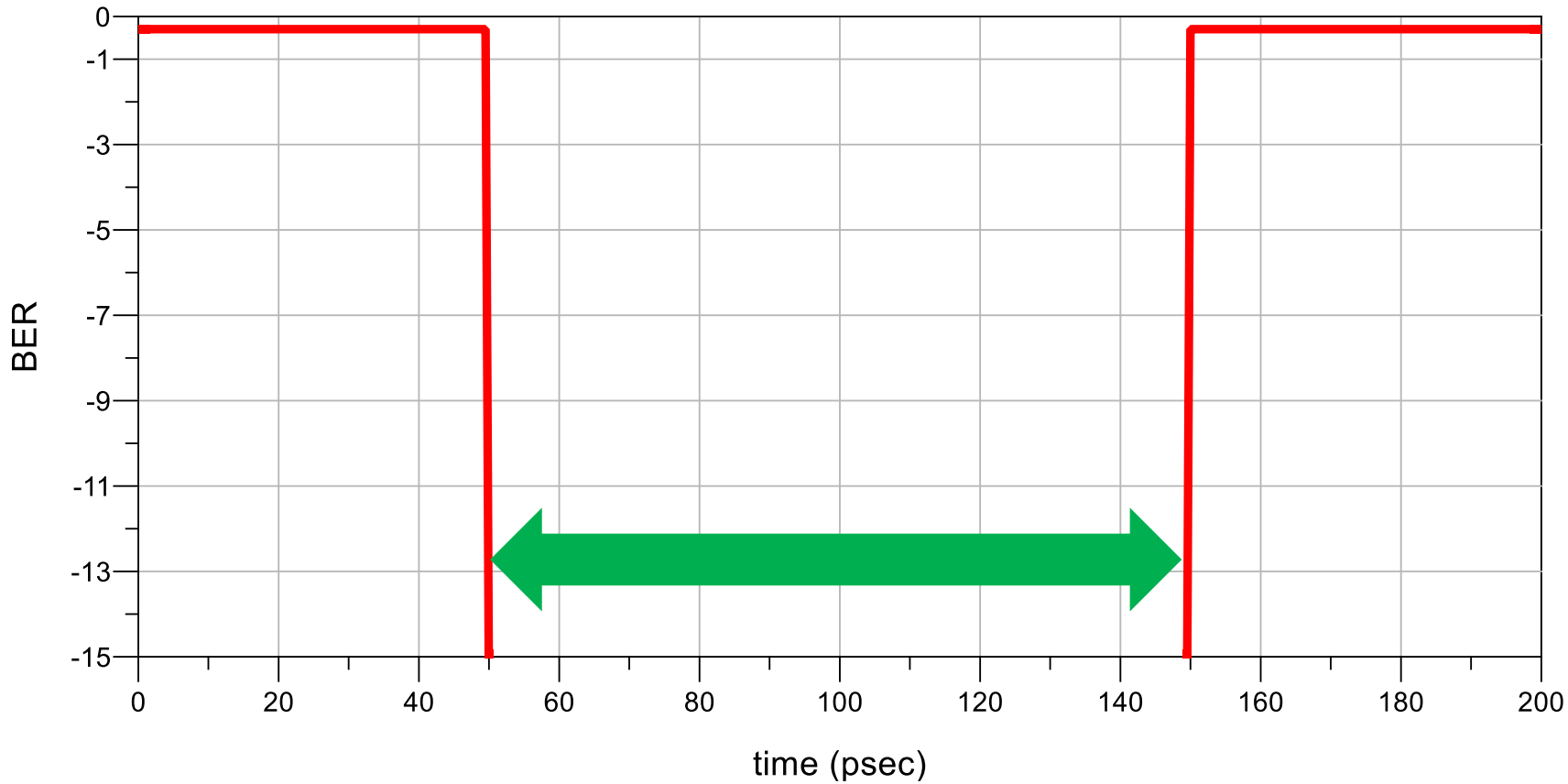
BER impacts total jitter!



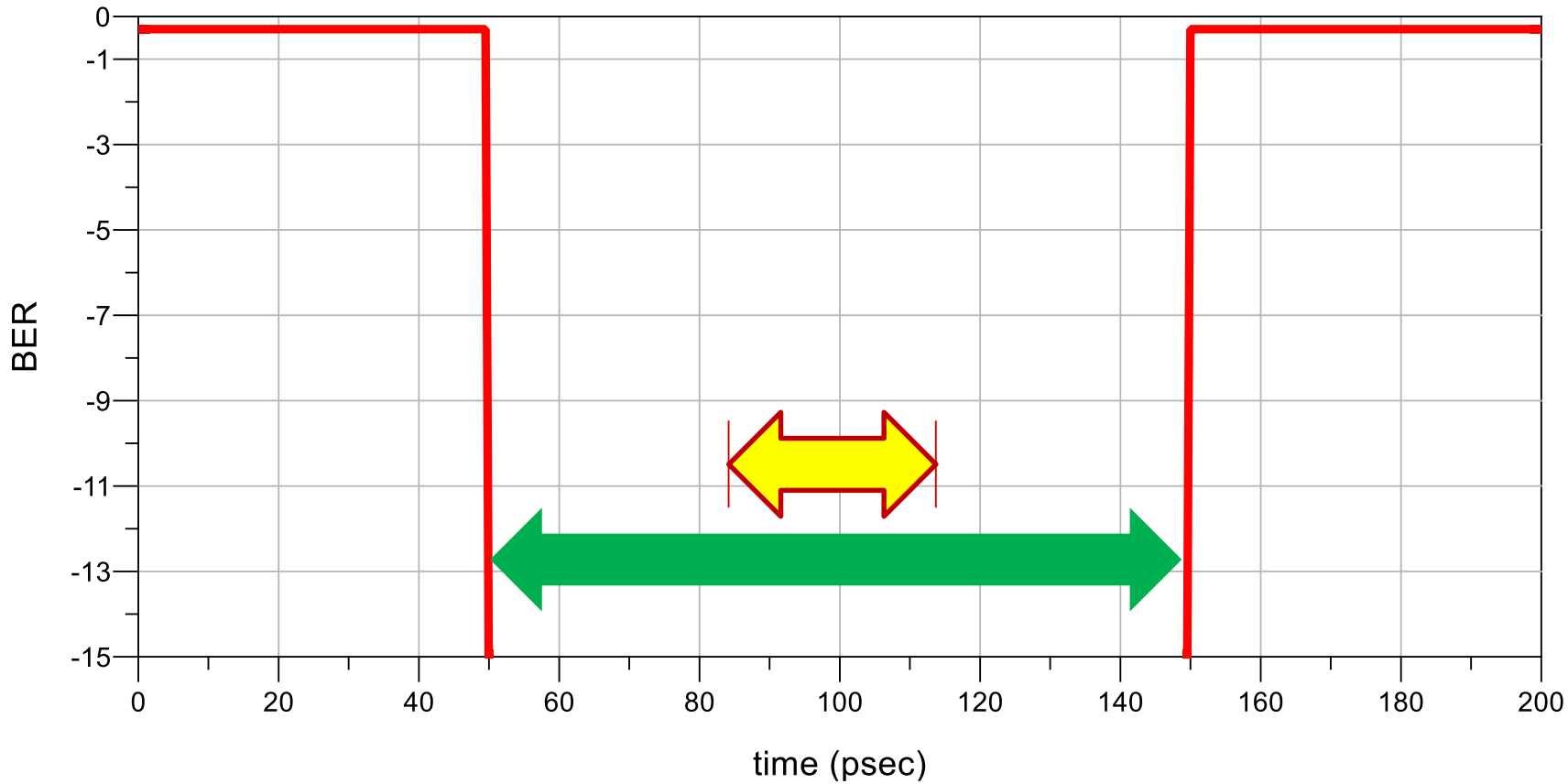
Bathtub curves simplified



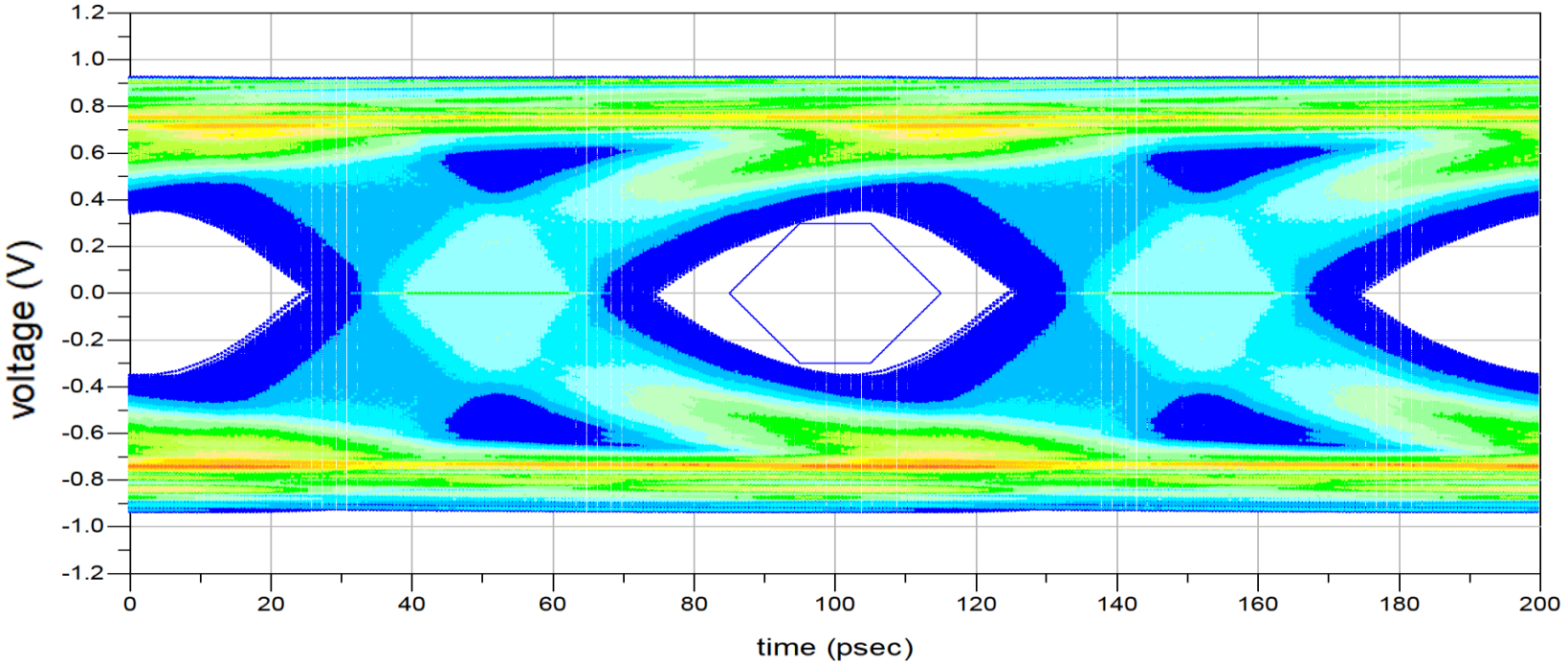
Ideal bathtub curve

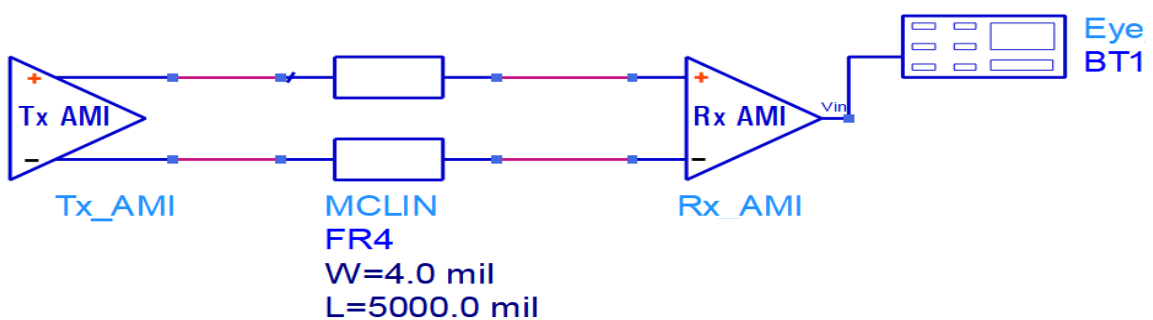


Understanding the limits



Simulated 10 Gbps example





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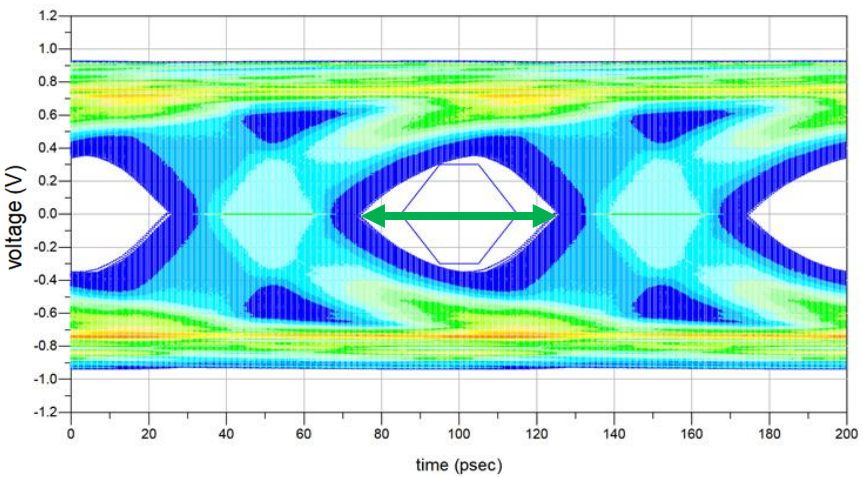
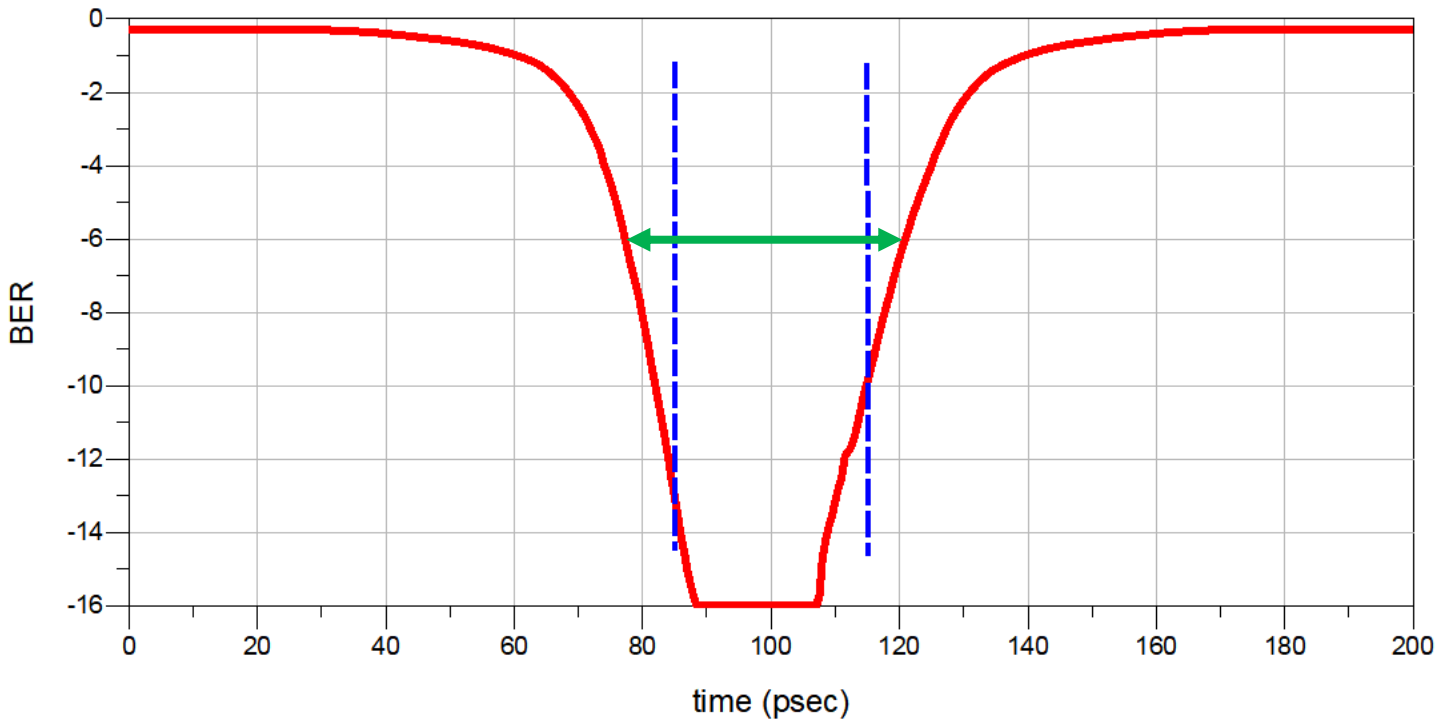
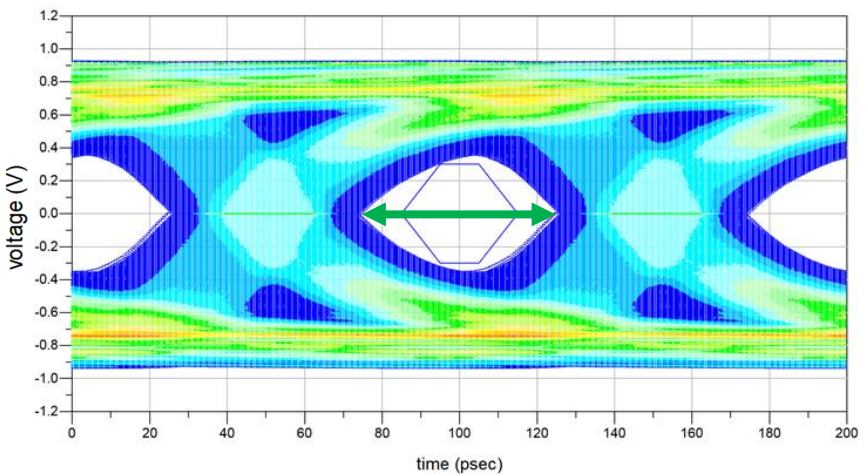
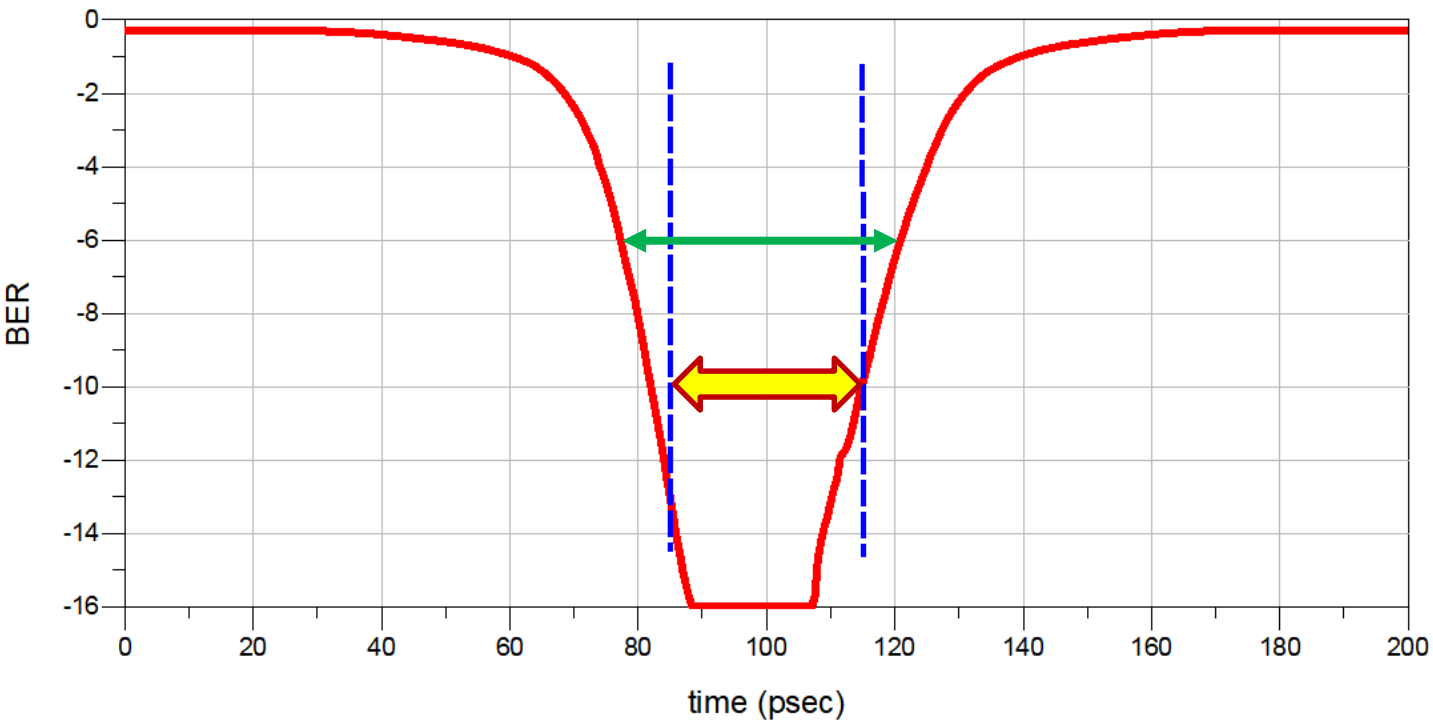
Realistic bathtub curve



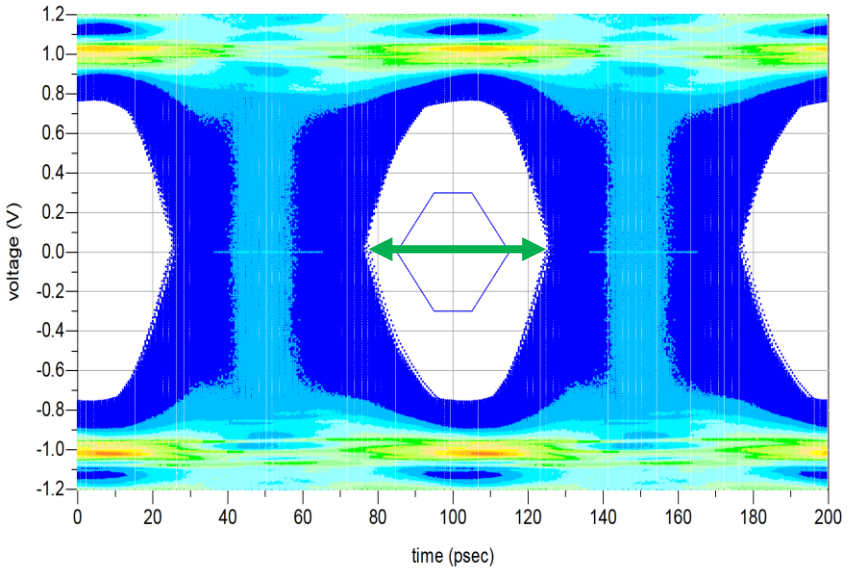


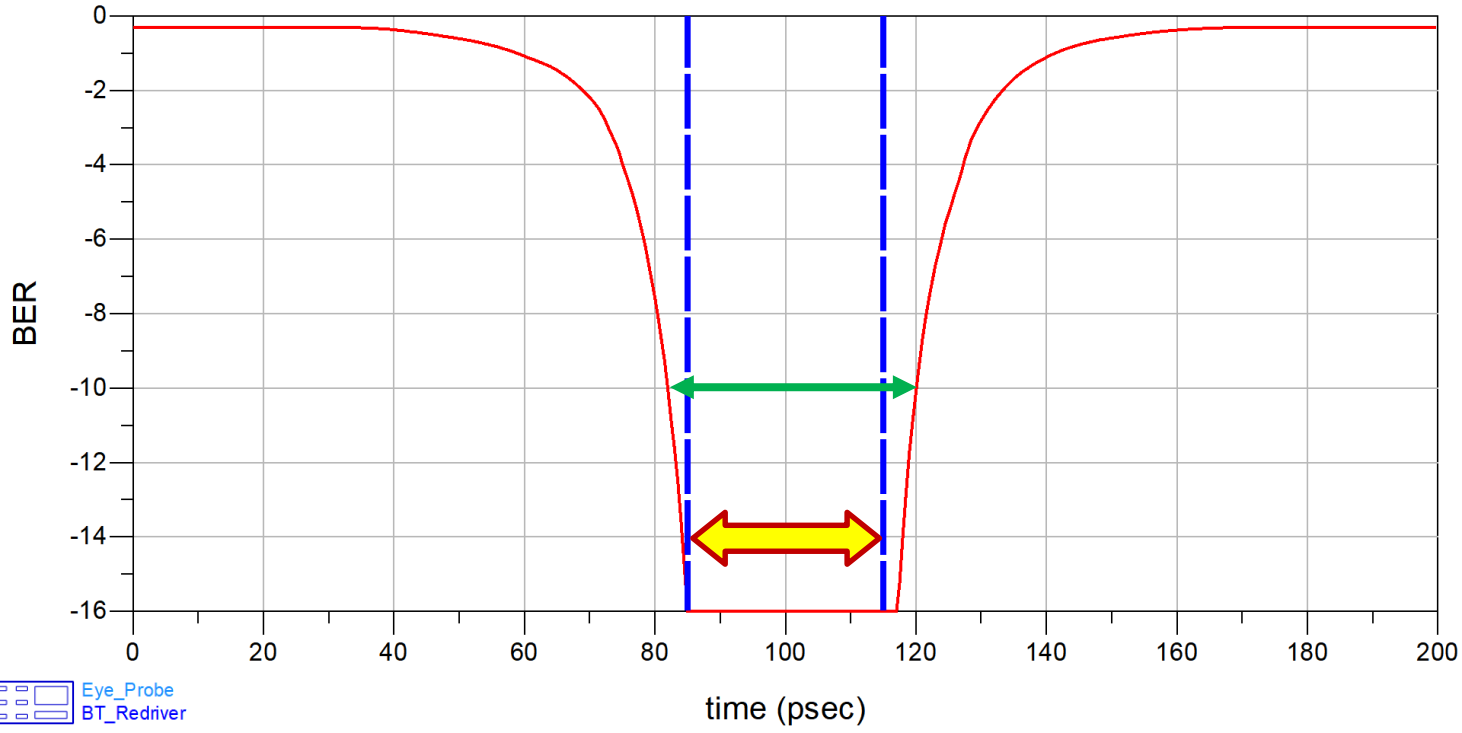
Bathtub curve can show performance limitations

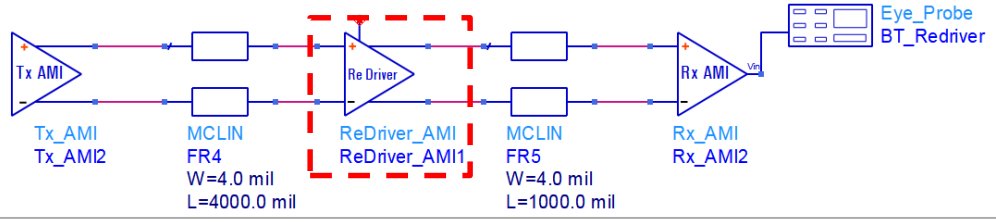




Signal conditioners improve bathtub curves







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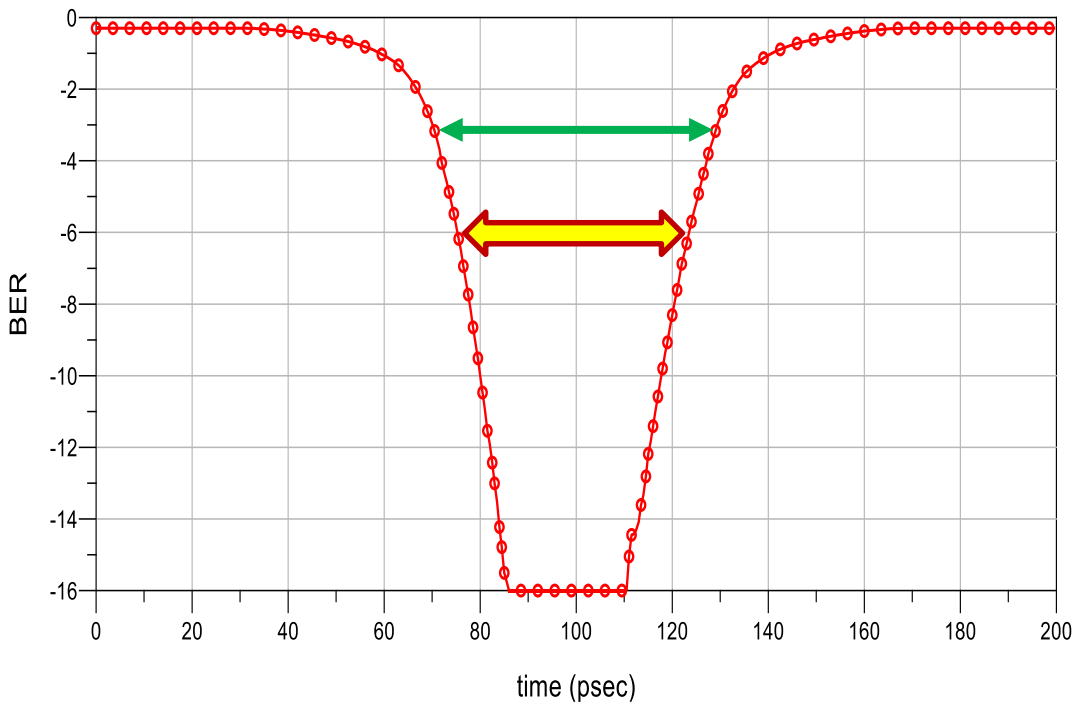
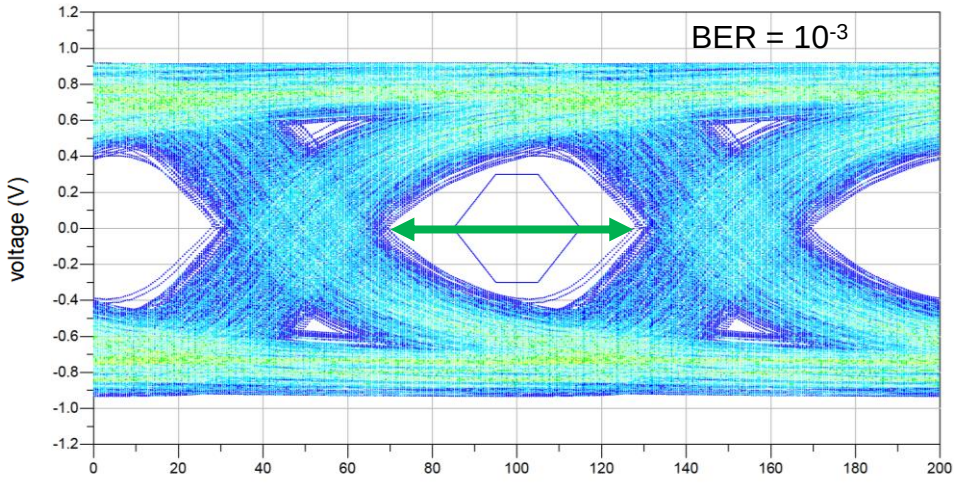
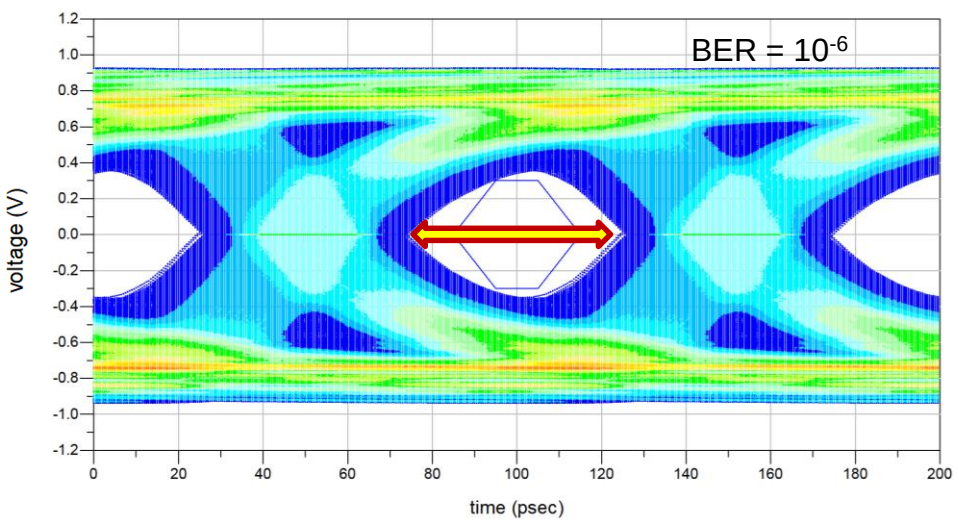
Why bathtub curve measurements matter

- Bathtub curve simulations help to validate robust system design before PCB build.







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Quiz

- How is BER calculated?
  A. BER is calculated by dividing the number of bit errors by the total amount of verified bits.
  B. BER is calculated by dividing the total amount of verified bits by the number of bit errors.
  C. BER is calculated by dividing the total jitter by the total amount of verified bits.
  D. BER is calculated by dividing the random jitter by the total jitter.

Quiz

- How is BER calculated?
  A. BER is calculated by dividing the number of bit errors by the total amount of verified bits.
  B. BER is calculated by dividing the total amount of verified bits by the number of bit errors.
  C. BER is used in a bathtub curve as a measure of the fidelity in the data stream.
  D. BER in a bathtub curve is commonly expressed by the exponent of the calculated BER.

The correct answer is A.

Quiz

- Which of these is correct about total jitter? (Check all correct statements):
  A. Tj in a signal is the sum of two components all the Dj and Rj.
  B. Tj in a signal is the sum of three components all the Dj, ISI and Rj.
  C. Tj increases as more samples are included in the measurement due to Rj.
  D. Tj can only be represented by a single value across all frequency content in the data stream.

Quiz

- Which of these is correct about total jitter?
  A. Tj in a signal is the sum of two components all the Dj and Rj.
  B. Tj in a signal is the sum of three components all the Dj, ISI and Rj.
  C. Tj increases as more samples are included in the measurement due to Rj.
  D. Tj can only be represented by a single value across all frequency content in the data stream.

The correct answer is A and C.

Quiz

- True or False: Bathtub curves are useful to determine system performance in large data streams where transient measurements may be impractical.
  a) True
  b) False

Quiz

- True or False: Bathtub curves are useful to determine system performance in large data streams where transient measurements may be impractical.

  a) True

  b) False

The correct answer is True.

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