

# The Eye Pattern

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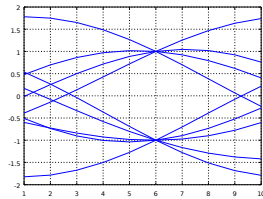
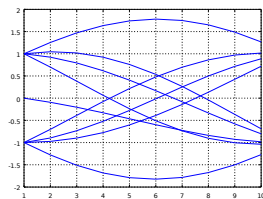
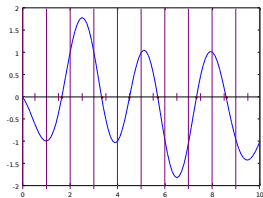
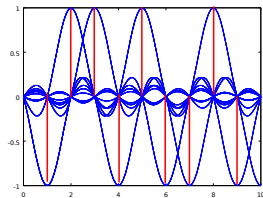
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# The Eye Pattern

- synchronized superposition of successive symbol intervals
- of the distorted waveform
- appearing at the output of the receive-filter
- prior to thresholding

# The Eye Pattern Example



# Timing Features

- Optimum sampling time
  - ▶ the width of the eye opening
  - ▶ when the eye opening is the widest
- Zero-crossing jitter
  - ▶ the timing signal is extracted from the zero-crossings of the waveform
- Timing sensitivity
  - ▶ determined by the rate at which the eye pattern is closed as the sampling time is varied

# The Peak Distortion

- An eye opening of unity
  - ▶ zero intersymbol interference
- An eye opening of zero
  - ▶ completely closed eye pattern
  - ▶ intersymbol interference is severe
  - ▶ some upper traces in the eye pattern to cross with its lower traces
- An eye opening of 0.5 or better
  - ▶ yield reliable data transmission

# The Peak Distortion $D_{peak}$

- Eye opening =  $1 - D_{peak}$ 
  - ▶ peak distortion  $D_{peak}$
  - ▶ max value assumed by the ISI over all possible transmitted sequences
  - ▶ with this evaluation divided by a normalization factor
  - ▶ the absolute value of the corresponding signal level
  - ▶ idealized for zero ISI
- Zero peak distortion - when the eye opening is unity
- Unity peak distortion - when the eye pattern is completely closed
  - ▶ determined by the rate at which the eye pattern is closed as the sampling time is varied

# Reference

[1] S. Haykin, M Moher, “Introduction to Analog and Digital Communications”, 2ed