How to interpretation an eye diagram
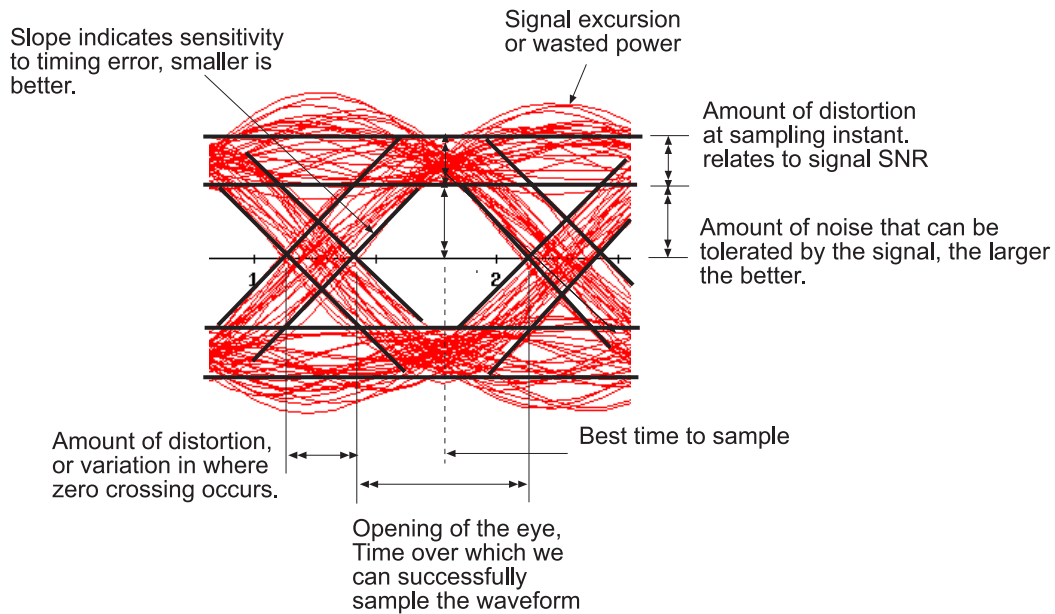

Fig 1 – Eye opening, what it means

The eye diagram is created by taking the time domain signal and overlapping the traces for a certain number of symbols. If we are sampling a signal at a rate of 10 samples per second and we want to take a look at two symbols, then we would cut the signal every 20 samples and overlap these. The overlapped signals show us a lot of useful information and this is called the eye diagram.

The open part of the signal represents the time that we can safely sample the signal with fidelity. So obviously we want an open looking eye and larger the opening (the white space in the middle) the better. For raised cosine signals, the larger the α, the wider the opening (See Fig. 2) . The opening is smallest for α = .2. So a smaller α will lead to larger errors if not sampled at the best sampling time which occurs at the center of the eye.

The horizontal band represents the amount of signal variation at the time it is sampled. This variation is seen in the sactter diaragm and is directly related to the SNR of the signal. A small band means a large SNR.

The slope of the eye determines how sensitive the signal is to timing errors. A small slope allows eye to be opened more and hence less sensitivity to timing errors. The width of the crossover represents the amount of jitter present in the signal. Small is obviously better.
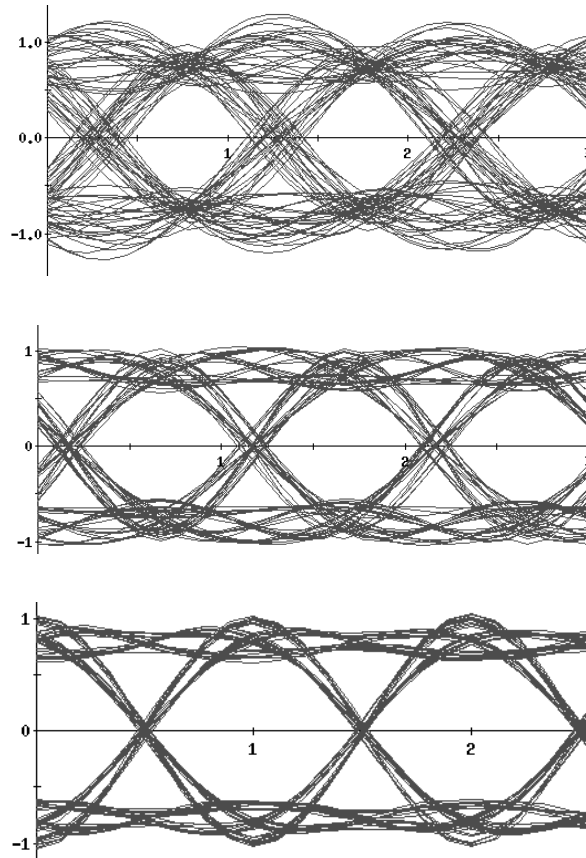
Fig 2. - Raised Cosine QPSK signal eye diagrams for alpha = .2, .4 and .6