Application Note
SHF 4005 A, BPG 44, BPG 44 E

Adjustment of the eye length

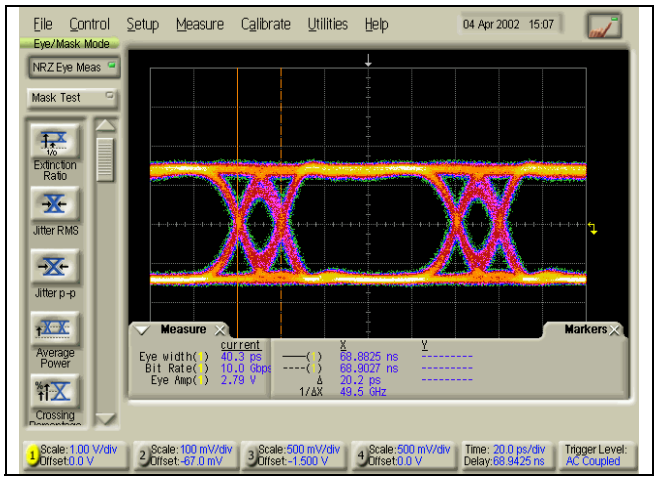
Some designs of multiplexer circuits and pattern generators use a D-Type Flip-Flop (DFF) requiring a full bit rate clock signal (40GHz for a 40GBit/s data signal) to reshape the output signal. This design method ensures that the time interval between subsequent crossing points in the eye diagram is identical, i.e. all individual eyes within a multiplexed signal have the same length as measured in picoseconds. On the face of it, this is an advantage, but on considering the wider implications, it can be seen that fixing the eye length to an exact 50% of two consecutive eyes may represent a disadvantage.

SHF multiplexers and pattern generators produce such high quality output eye diagrams that there is no need to use a DFF at the outputs to improve the signal quality, with all the attendant expense of a full bit rate clock frequency. The inherent quality of the signal allows more flexibility in dealing with the output signal.

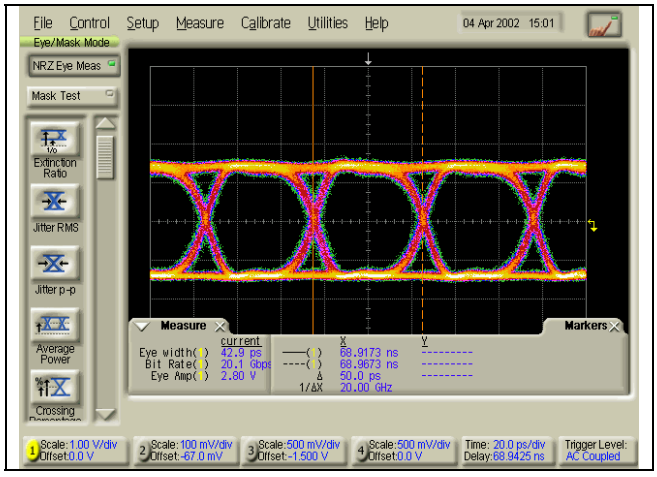
To utilize this flexibility, all SHF multiplexers and pattern generators contain an accessible control to adjust the eye length by varying a respective bias voltage inside a multiplexer. Most applications just require identical successive eyes and nothing else. Fine: this is the default setting made in the factory, as shown in Figures 1b) and 2b). But the ability to move the crossing point on the x-axis is a powerful feature in setting up and tuning systems which are build with components which slightly degrade the output eye length.

Consider attaching an optical modulator to a pattern generator. The response of the modulator tends to affect the signal – a perfect input signal can easily be degraded by the modulator, leading to a poor optical output signal. Moving the crossing point of the input signal allows for compensation of the imperfect modulator properties. The output signal of the pattern generator (i.e. the input to the modulator) would not then look “perfect”, but the optical output of the modulator would optimized to be “perfect”.

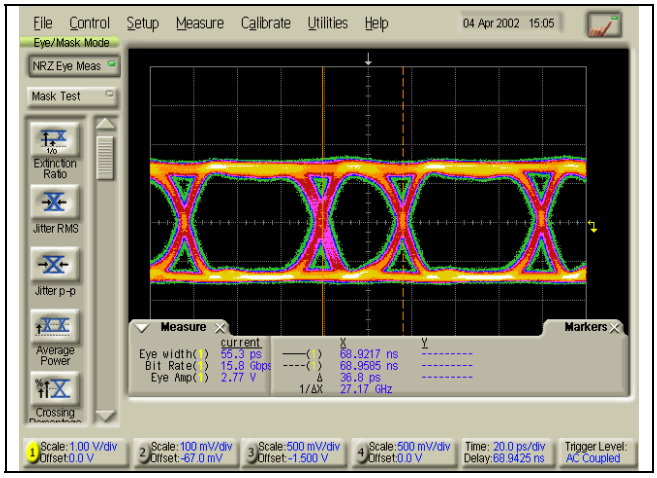
It is of course the easiest thing in the world to assume that linking together a chain of high quality components will result in an overall perfect operation. However, experience shows us that not only components need to have a high quality, but they also have to be matched to each other to ensure the best possible performance. Being able to change the eye length in SHF instruments is a useful extra feature in setting up systems for optimum performance.



a) lower limit



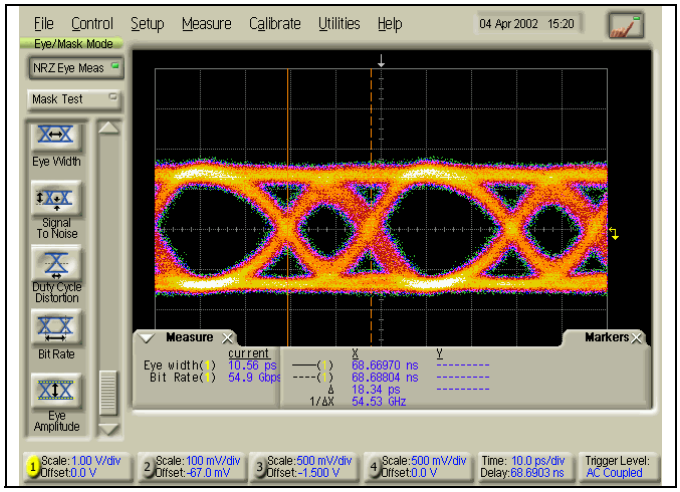
b) 50:50



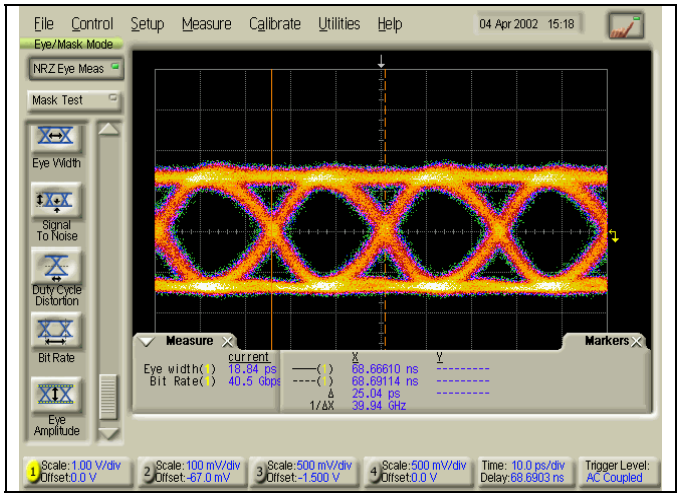
c) upper limit

Figure 1

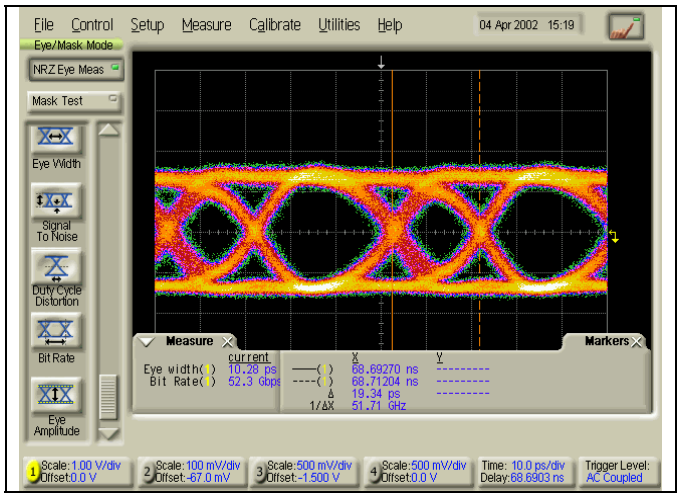
Figure 1, with a bit rate of 20 GBit/s, and Figure 2, with a bit rate of 40 GBit/s, show the wide range of adjustment that is possible with this feature.



a) lower limit



b) 50:50



c) upper limit

Figure 2