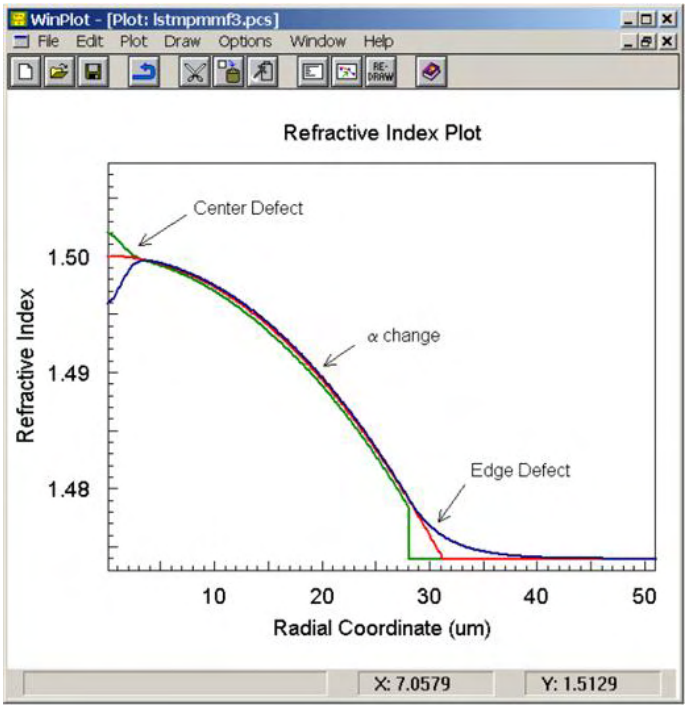
Refractive Index Profile Distortions and Multimode Fiber Links Performance - Cambridge 81-Fibers Statistical Model

Tools Used: ModeSYS

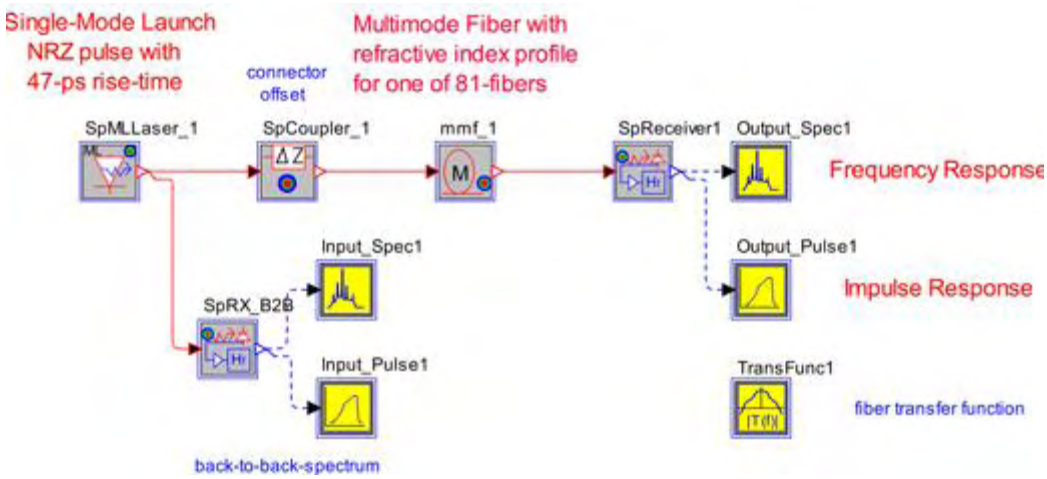
The goal of multimode graded-index fiber manufactures is to get a fiber refractive index profile as close as possible to ideal parabolic profile that theoretically provides the highest bandwidth. However, various index profile defects of fiber preform (center defects as tips and dips, deviation of power-law parameter alpha from 2, core/cladding interface defects, bulges, etc.) can significantly reduce the modal bandwidth and, hence, degrade its performance. The characteristics of multimode fiber links may vary greatly from one link to another.

In this example we demonstrate how ModeSYS can be applied to use this statistical approach based on so-called Cambridge 81- fibers model. The approach of Cambridge model is to consider a set of pre-determined index defects that are believed to be representative for installed base of multimode FDDI-grade fibers, and to calculate fiber characteristics for those different distorted index profiles.

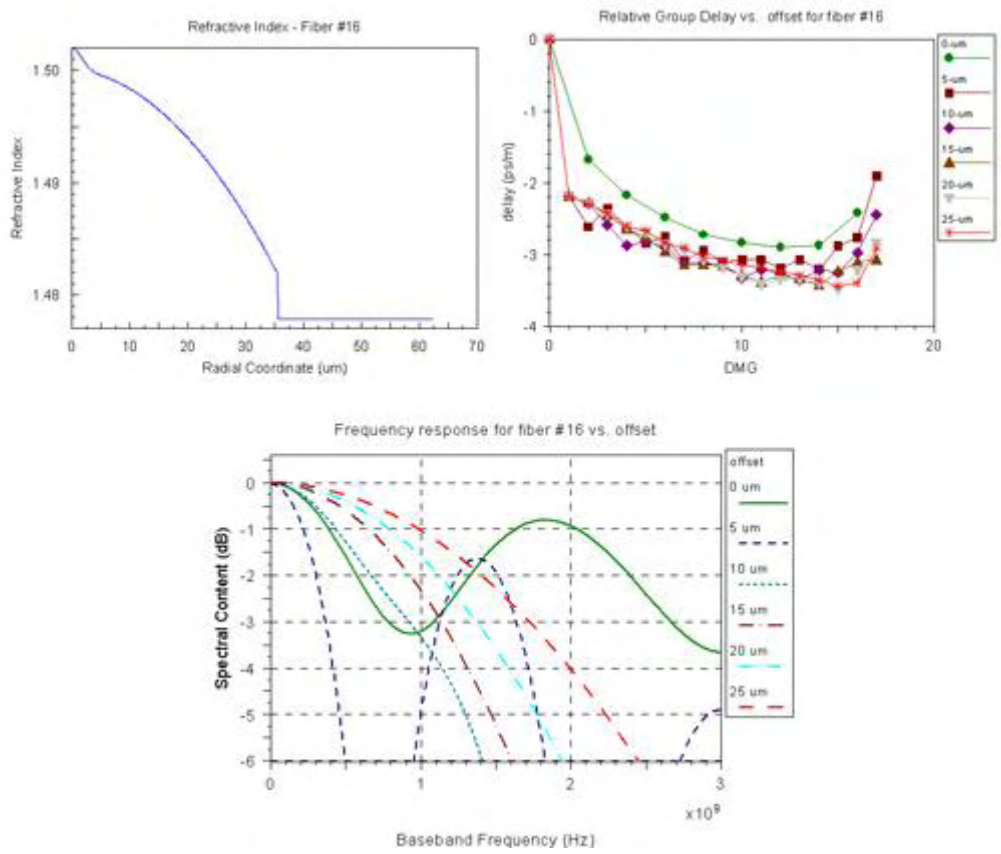
Figure below demonstrates the index profile with different distortions:



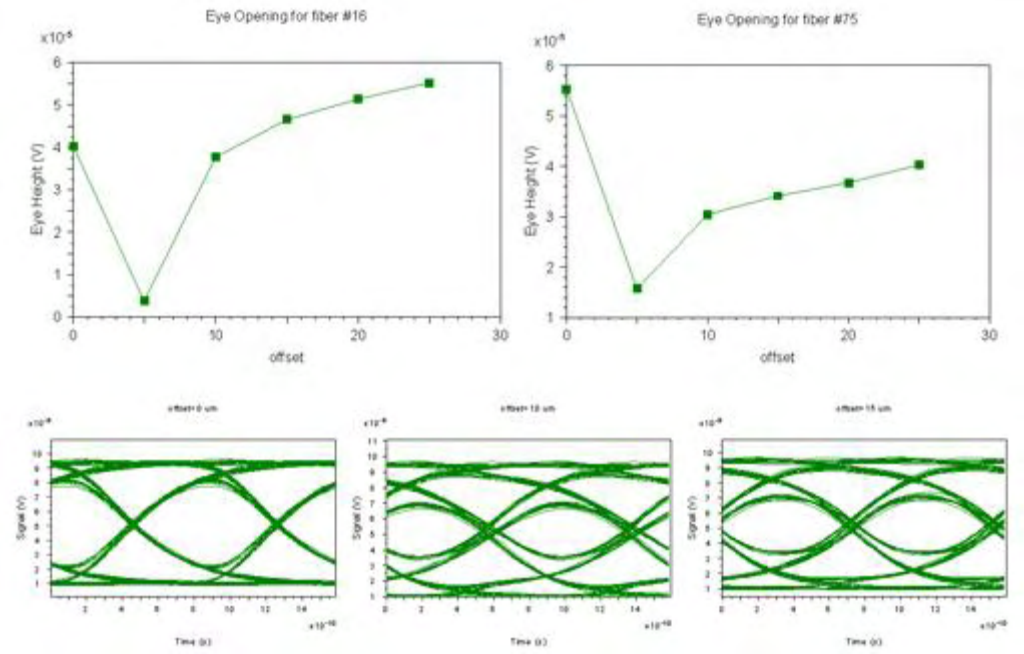
The figure below shows the layout of the topology in ModeSYS:



The refractive index profile of a sample fiber (# 16) with with tip in the center and sudden drop at core-cladding interface is shown on the upper left of the following diagram, upper right is the plot of relative group delays for the same fiber at different launch offsets and at the bottom is the frequency response for the same fiber at different launch offsets:



The plot below shows eye opening for the link with the same fiber (# 16) at different launch offsets. The received eye diagrams at various offsets are also shown below:



The figure below show the results of a parameter scan for all 81 fibers at zero offset. On the left are modal delays for all fibers; and on the right are the frequency responses for all 81 fibers: