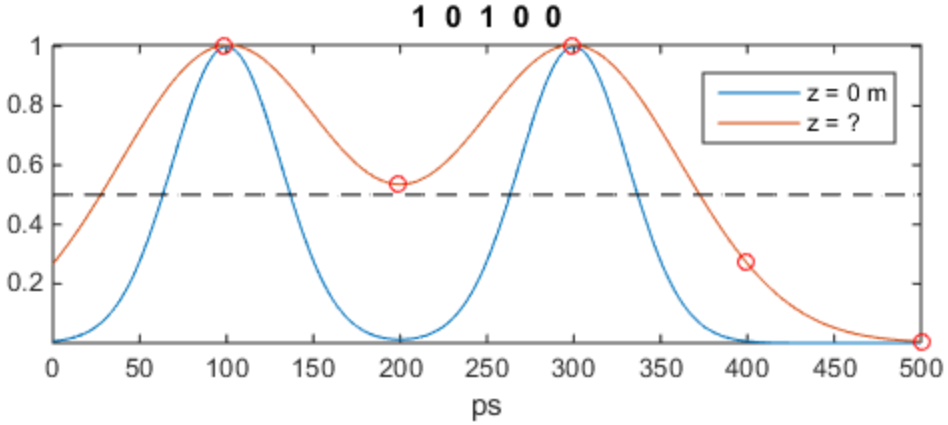
# Laser Physics problem for chapter 9

Consider a 10 Gbit/s optical communications link consisting of a directly modulated laser, a standard single mode fiber and a photodiode; where one bit corresponds to one pulse of light. The laser has 5 GHz of bandwidth and produces chirpless gaussian pulses at a wavelength of 1550 nm. The fiber has a dispersion parameter of 18 ps/(nm*km) and a refractive index of 1.4 at that wavelength; and the photodiode can only detect the intensity of the optical field. As the pulses propagate through the fiber, they get broader due to dispersion. When the full width at half maximum (FWHM) of the pulses reaches 145% of the bit period, the receiver can no longer distinguish between 1s and 0s and errors occur; as seen in figure the figure below. What is the maximum link distance for error-free transmission?




*Miguel Iglesias Olmedo*