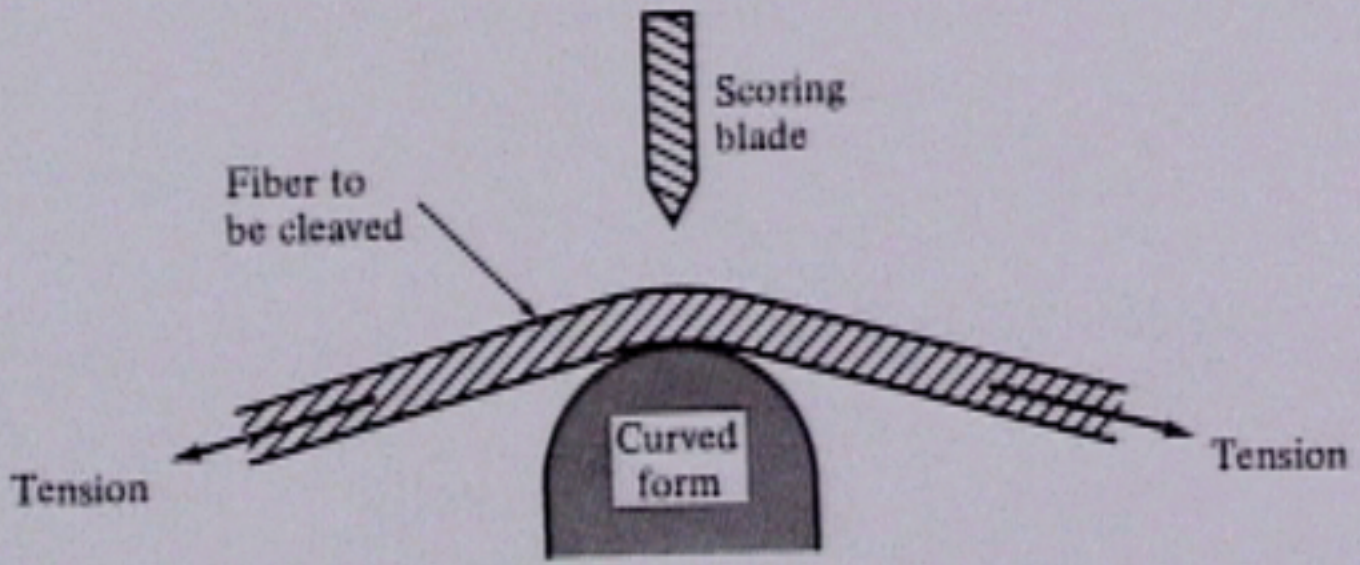
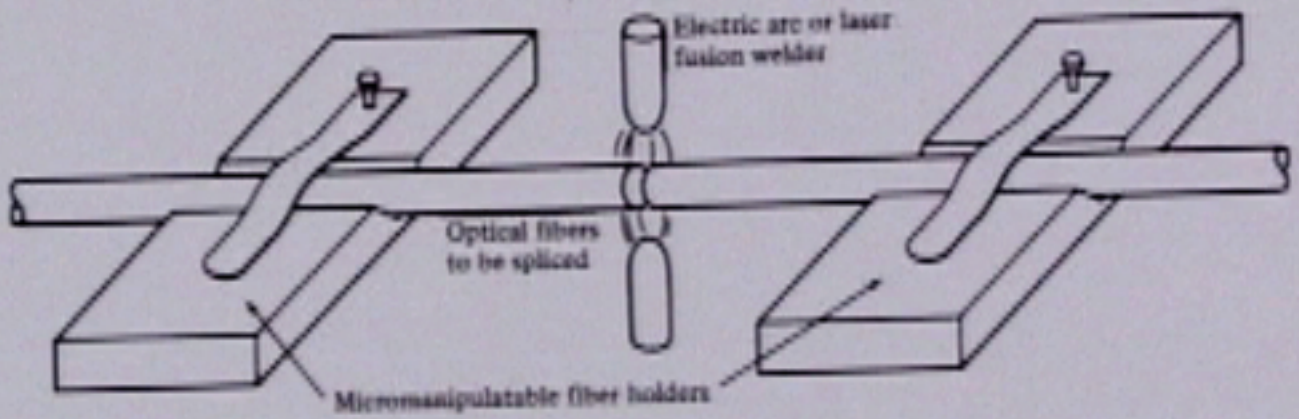
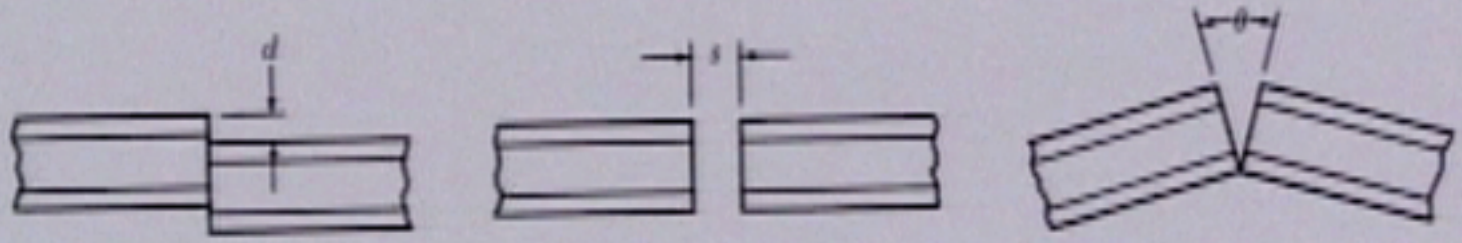
Fiber cleaving



Fusion splicing

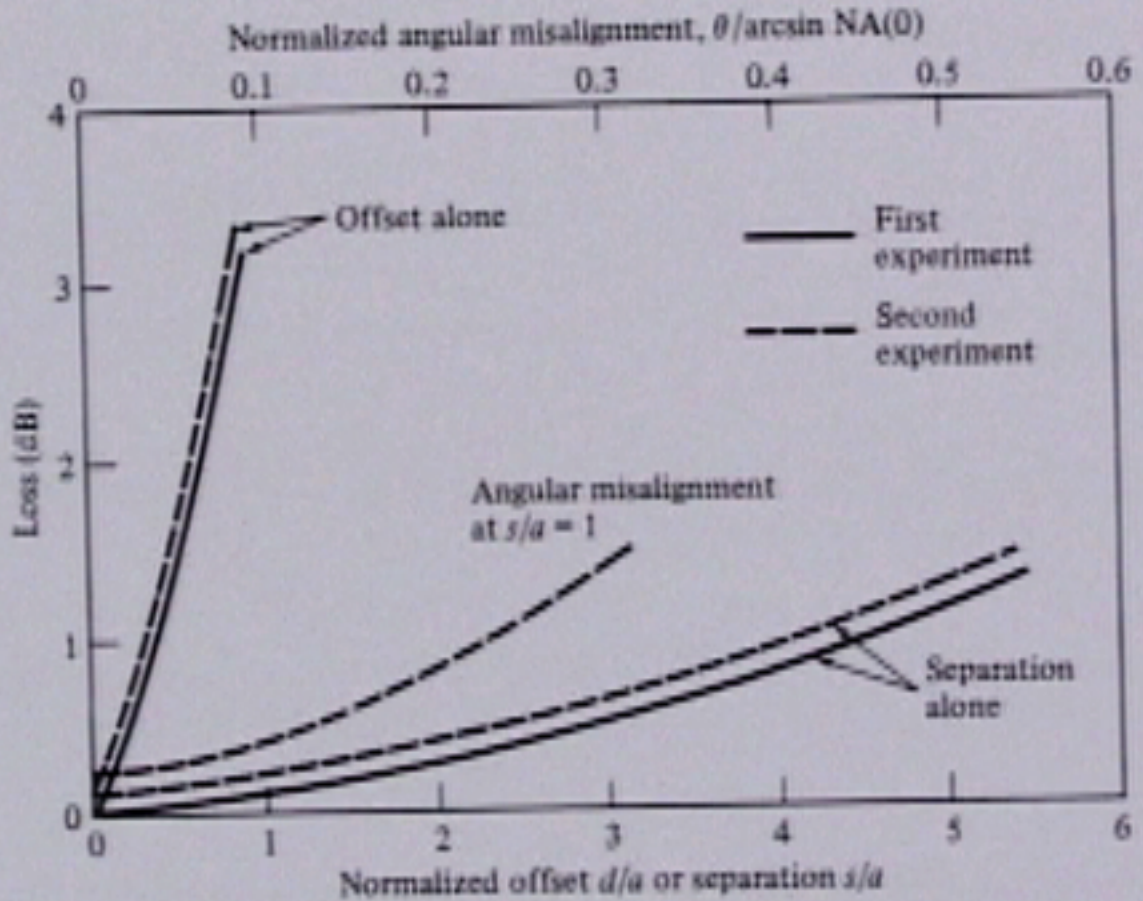


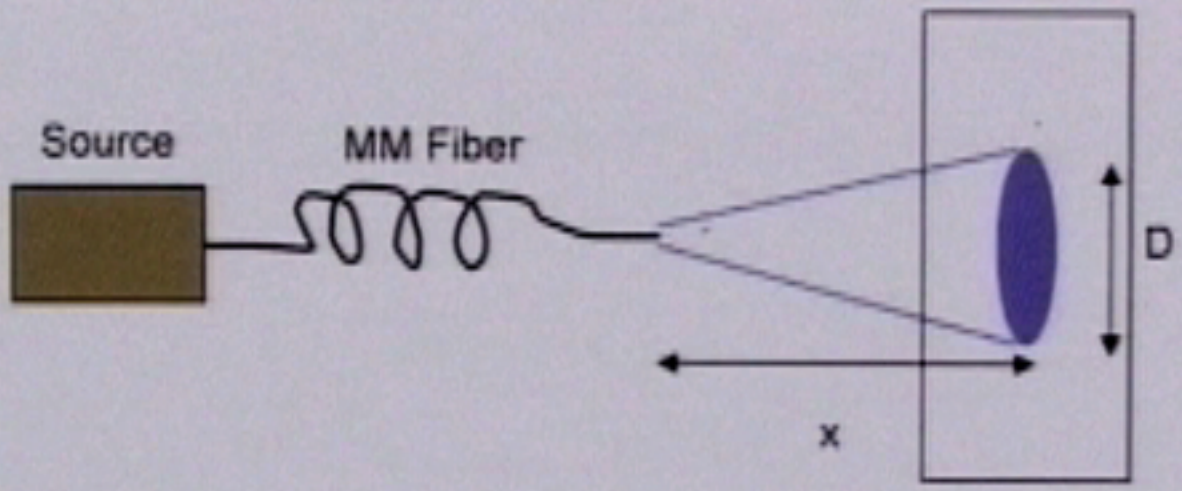
Mechanical misalignments



(a) Lateral (axial) (b) Longitudinal (end separation) (c) Angular

Comparison of misalignment effects

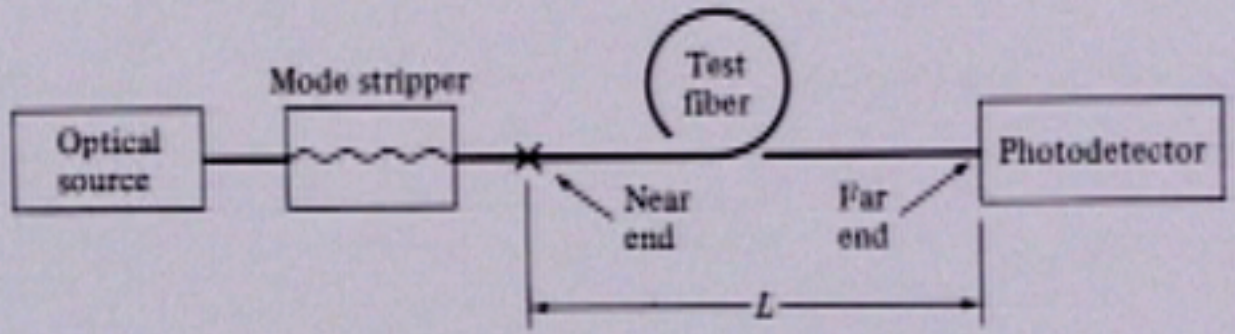


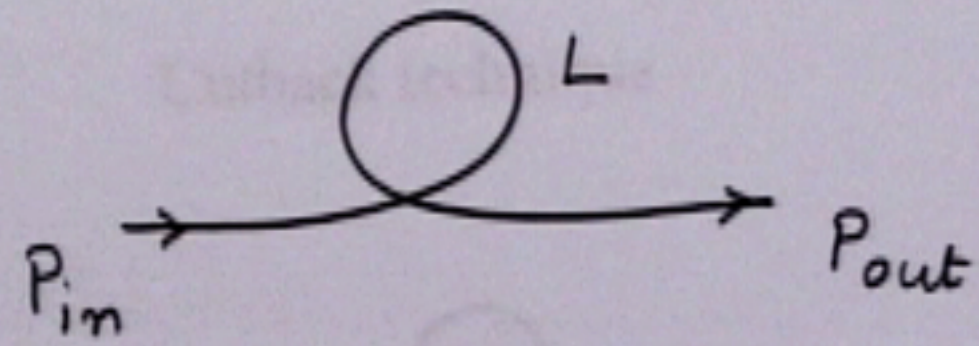


$$\theta_{max} = \tan^{-1}(D/2x)$$

$$NA = \sin(\theta_{max}) = \frac{D}{\sqrt{4x^2 + D^2}}$$

Cutback technique

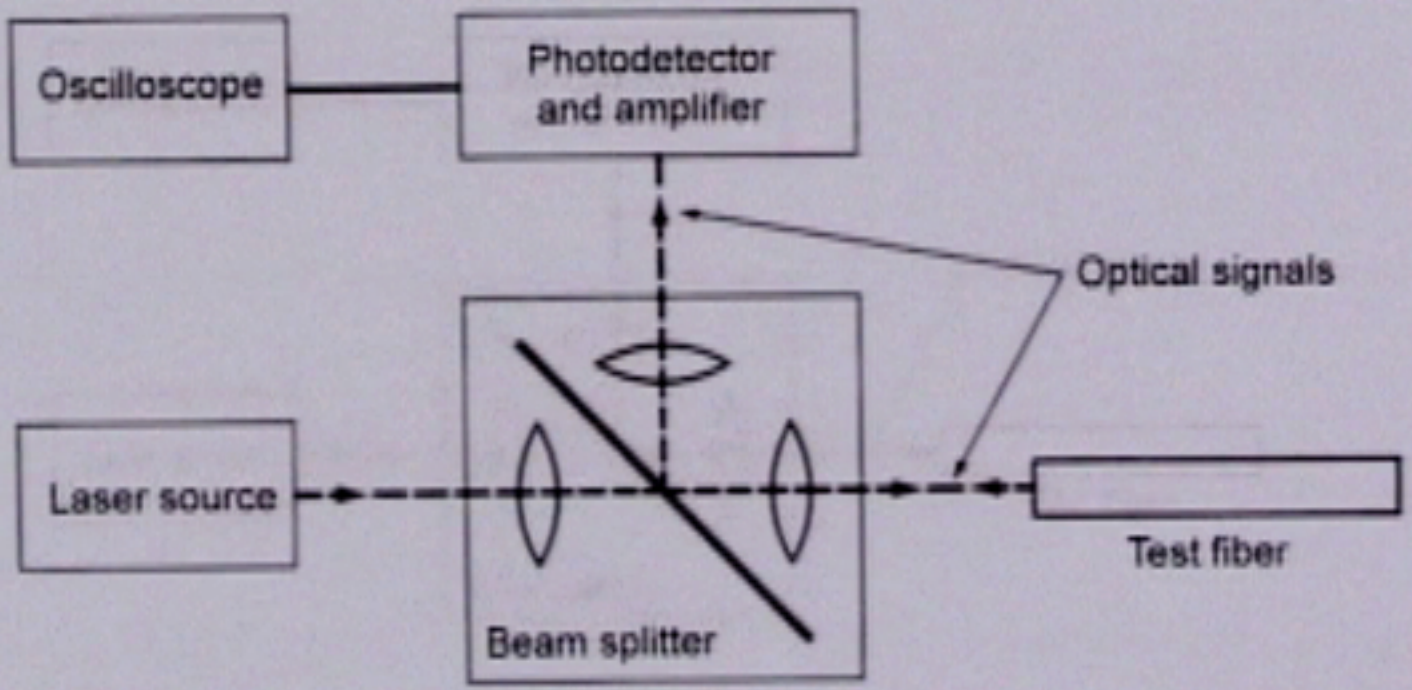




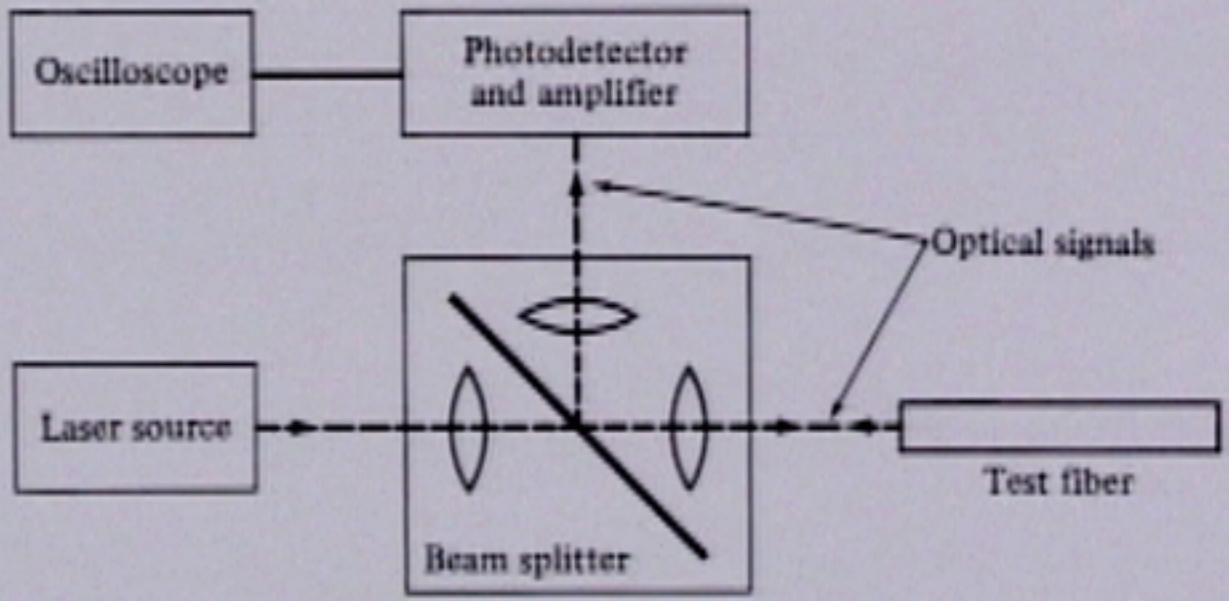
Attenuation constant in dB / km

$$\alpha = \frac{10}{L} \log_{10} \left(\frac{P_{in}}{P_{out}} \right)$$

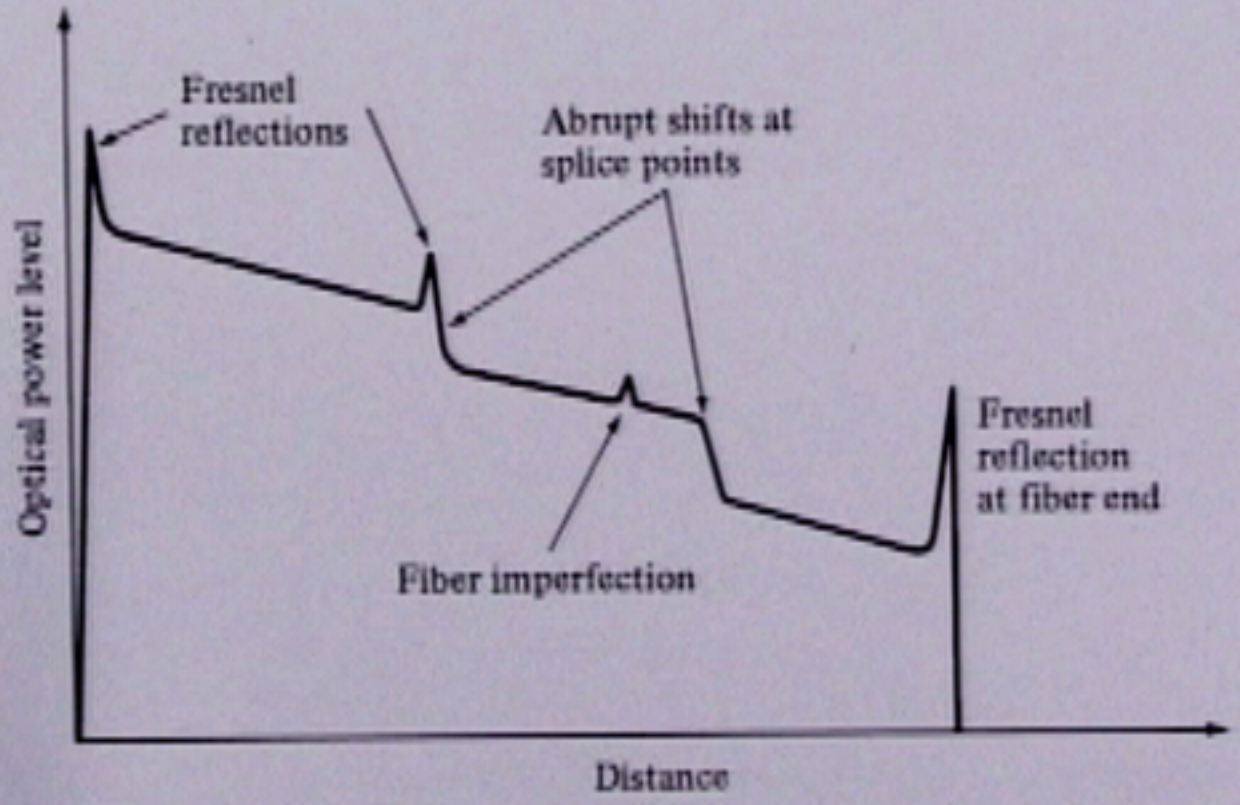
Optical Time Domain Reflectometer (OTDR)

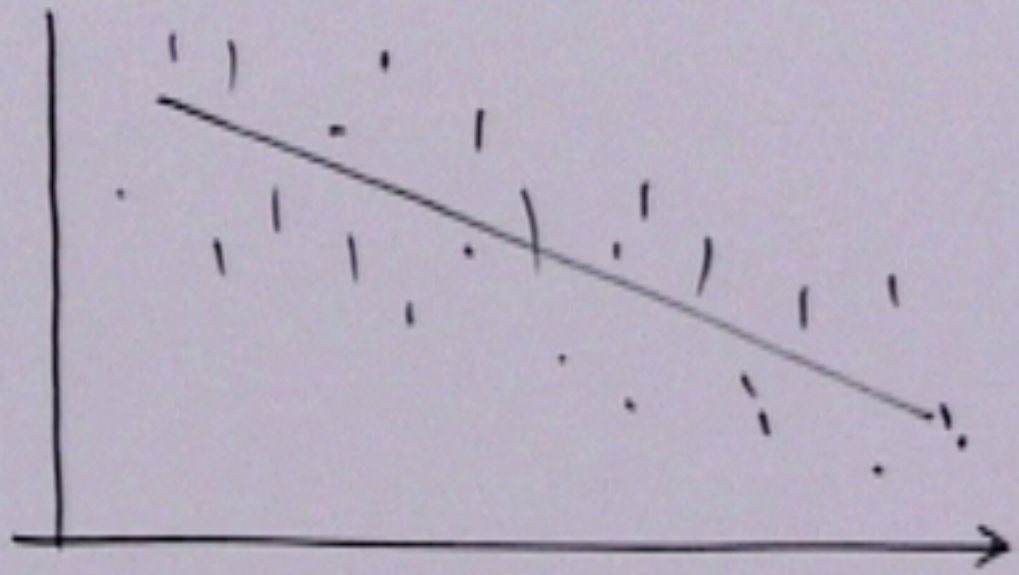


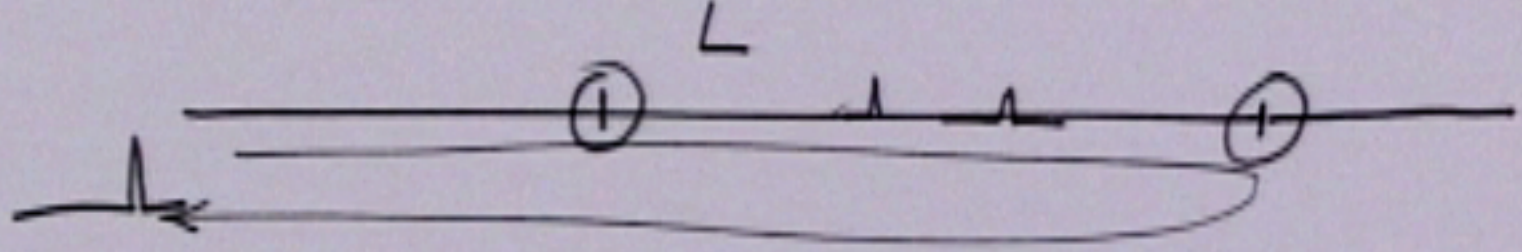
OTDR operation



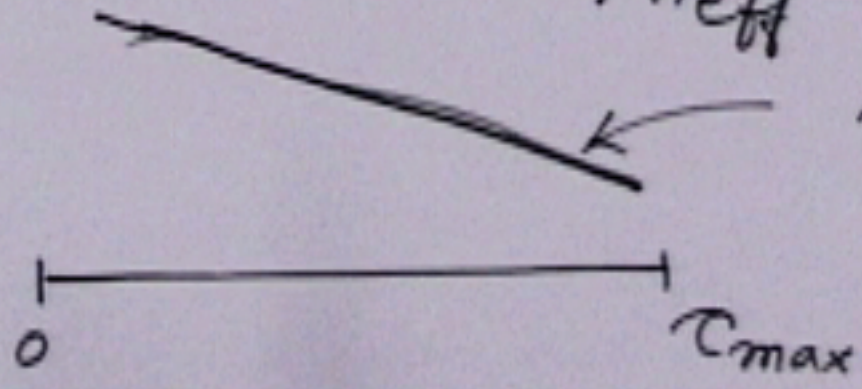
OTDR trace


Fresnel reflections
Abrupt shifts at splice points
Optical power level
Fresnel reflection at fiber end
Fiber imperfection
Distance

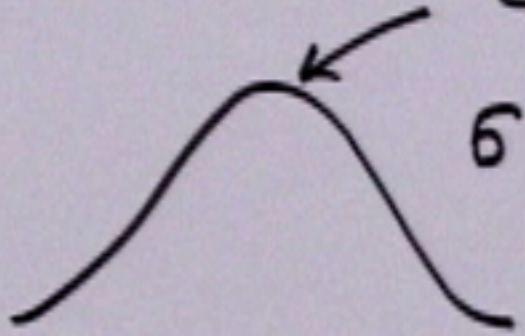

Distance



$$\tau_{max} = \frac{2L}{c/n_{eff}} \qquad PRF = \frac{1}{\tau_{max}}$$



Gaussian pulse.



$\sigma = \tau_i$

Dispersion D

Spectral width σ_λ

Pulse broadening function

with variance $= (D L \sigma_\lambda)^2$

Pulse width for reflected signal

$$\tau = \sqrt{\tau_i^2 + (D L \sigma_\lambda)^2}$$

Measurement of Dispersion