

(h1) Given the difference in distances traveled and the speed (calculated from the index of refraction of the core), how long does it take the zig-zag ray to travel the length of the fiber?

$$v = \frac{c}{n} = \frac{c}{1.46}$$

$$t' = \frac{L'}{v} = \frac{1.00715 \text{ km} \cdot 1.46}{3 \times 10^5 \frac{\text{km}}{\text{s}}} = 49.0 \mu\text{s}$$

(h2) How long does it take a ray traveling parallel to the axis to travel the length of the fiber?

$$t = \frac{L}{v} = \frac{10 \text{ km} \cdot 1.46}{3 \times 10^5 \frac{\text{km}}{\text{s}}} = 48.7 \mu\text{s}$$

(h3) What is the difference in the travel times, Δt , of the two rays?

$$\Delta t = 3.5 \times 10^{-8} \text{ sec}$$

(h4) Suppose we are sending a series of pulses [square waves, corresponding to digital info sent as a series of 1's and 0's], and the pulses are $1 \mu\text{s}$ apart.

How does this time difference, Δt , compare to the time between pulses?

Is Δt ~~larger~~ smaller the same as the time between pulses?

How many times larger/smaller than the time between pulses?

$$\frac{1 \mu\text{s}}{3.5 \times 10^{-8} \text{ s}} = 2.87$$

(i) What does your answer to (h4) tell you about the problem of modal distortion?

that this modal distortion is not a problem if the pulses are μs apart (i.e. Mbps rate)

BUT if we want Gigabytes per sec — we can't do it.

continues over

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