What is fiber optics?

Fiber optics is the science of transmitting data, voice, and images by the passage of light through thin, transparent fibers.

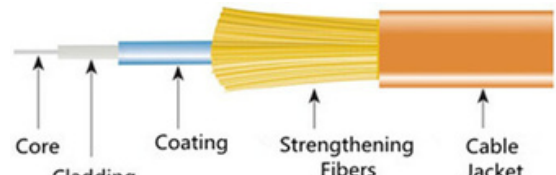
Fiber optics (optical fibers) are long, thin strands of very pure glass about the diameter of a human hair. They are arranged in bundles called optical cables that carry information between two places using entirely optical (light-based) technology.

So how do these tiny strands of glass transmit light?

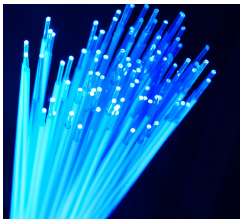
If you look closely at a single optical fiber, you will see that it has the following parts:

- **Core:** the thin glass center of the fiber where the light travels.
- **Cladding:** the outer optical material surrounding the core that reflects the light back into the core.
- **Buffer coating:** Plastic coating that protects the fiber from damage and moisture.

Each tiny photon (particle of light) travels down a fiber optic cable by bouncing repeatedly off the walls of the core.



Fiber Optic Cable Construction



Experiment

The LED key chain provides you with a high intensity light (photon) source to send a signal down the fiber optic cable. The cable in this kit is actually a plastic cable made from polymethyl-methacrylate (PMMA), more commonly known as Plexiglas or Lucite.

This particular cable is commonly used for architectural lighting and for this experiment will make it much easier for you to see the light transmitted.

Place the LED lens tightly against the end of the cable where the fibers are flush with the black protective coating.

Turn on your LED light source and observe the other end of the cable where the fiber strands are exposed. You will notice that the light is transmitted out the ends of the fibers, but if you look from the side you will observe little or no light.

Can you tie your cable in a single knot? Does it affect the light coming out the other end?

You might expect a beam of light, traveling in a clear glass pipe, simply to leak out of the edges. But if light hits glass at a really shallow angle, it reflects back in again — as though the glass were really a mirror.

This phenomenon is called total internal reflection. It's one of the things that keeps light inside the pipe. And because the cladding does not absorb any light from the core, the light wave can travel great distances.

To access the video demonstration and additional teaching materials, scan the QR code below!

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