Anton Milliken

How Fiber Optics Bend Light

The purpose of this experiment was to assess physical properties of light-channeling media to explore more efficient light transmission techniques. The two physical properties I selected are the diameter of the media and the angle at which it is bent. I predicted that the smallest-diameter media would perform best with no angle, because the light would have a tighter total internal reflection.

To conduct the experiment, I constructed an integrating sphere, that would allow me to measure light numerically and would mitigate "hotspots" in the aperture of the sensor. The vinyl tubing was filled with water to simulate the core of optic fiber. My light source was a high-power 5mW type 3A green laser, which was more measurable than more common red lasers. I measured the results of light passing through tubing of three different diameters and each one bent at different angles.

My hypothesis was incorrect. The largest tubing had the greatest success at no angle, possibly because it didn't need to reflect as many times as the small tubing. If I were to redo this experiment, I would use different density "cores" and "claddings" of the media and use more angles with different light sources.

This experiment explored properties of light manipulation which can be harnessed for energy-efficient lighting strategies. A building or home could be equipped with 'light lines' that would only require a single light source channeled to where it is specifically needed, either from the sun or other efficient light source.