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Attenuation Length Measurements of Custom Wavelength Shifting Fibers DYLAN ADAMS, NORM BUCHANAN, JOHN HARTON, Colorado State University — This research focuses on studying optical fibers and their applications in high-energy particle detectors. By measuring the intensity of a light signal at the site it enters the fiber, and at a distance down the fiber, we calculate the attenuation length of the fiber (distance for signal to change by factor of e). As high energy particles move through argon detectors, the argon atoms excite and subsequently emit photons at 128nm. These particles typically are from cosmic events (such as a supernova) or injected from an accelerator. Currently, photon detectors are relatively inefficient at collecting photons at this deep UV wavelength. This light, at 128 nm, excites a wavelength-shifting component (TPB, tetra-phenyl-butadiene) doped into the fibers, which emits light in the near UV visible spectrum, around 400 nm. Studying how different TPB application processes change the attenuation length of candidate fibers gives information about how the light signal is degraded from the initial argon scintillation light to the light signal read by the silicon photomultipliers (the photon detectors). So far measurements have been practiced on a bar with an external cladding, and been made on fibers doped with TPB and annealed fibers doped with TPB.

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