Optical scintillating fibers lose their transparencies when exposed to radiation. Nearly all studies of radiation damage to optical fibers so far only characterize this darkening with a single period of irradiation. Following the irradiation, fibers undergo room temperature annealing, and regain some of their transparencies. We tested the irradiation-recovery characteristics of scintillating fibers in four consecutive cycles.

In addition, three optical scintillating fibers were irradiated at 22 Gy per minute for over 15 hours, and their transmittance were measured each minute by pulsing a light source through the fibers. Here, we report on the in-situ characterization of the transmittance vs radiation exposure, allowing future applications to better predict the lifetime of the scintillating fibers.

Optical fibers are excessively used in HEP experiments to carry scintillation light from scintillators to the photon sensors. Their response to the repeated exposure provides an important information for the experiments. The darkening and recovery curves of the optical fibers provide such information about the annealing process. The investigation of in-situ recovery mechanisms is critically important for the future experiments.

In parallel to the studies on radiation damage and recovery mechanisms, the search for radiation-hard wavelength shifting fibers should continue on all grounds. The production of the radiation-hard fibers in larger quantities should be followed by the investigation of their radiation damage and recovery properties.