Contribution ID: **168** Type: **oral**

Cerium-doped Fused-silica Fibers

Monday, 22 May 2017 14:36 (18 minutes)

We report on current research and development activities on cerium-doped fused-silica optical fibers intended for use in high-energy calorimetry, particle tracking, beam monitoring, dosimetry, and myriad other applications outside particle physics. We have partnered with the specialty fibers industry leader Polymicro Technologies and produced several scintillating and wavelength shifting fibers with an eye towards achieving exceptional radiation-hardness above and beyond what is available today. We present results from beam tests on light yield, pulse shape, attenuation length, and light propagation speeds. We also discuss the results from extensive gamma irradiation tests and the lessons learned.

Summary

We have been working on developing radiation-hard fibers for particle physics applications in the last three years. There are at least two major reasons for this R&D: plastic scintillators degrade quickly after a few MRads and cannot be used for extended periods in the forward/endcap detectors in hadron colliders where integrated dose rapidly exceeds ˜2-5 MRads. We would like to find a solution where we can safely use “scintillation” in these difficult regions. The second reason is to develop a scintillator that does not contain hydrogen. In high-energy hadron calorimetry, the comparison of scintillation light from hydrogenous and non-hydrogenous scintillators is a measure of the energy fraction that is carried away by ˜MeV neutrons. This fraction fluctuates significantly and event-by-event shower measurement will eliminate this contribution from the energy measurement. This is akin to the simultaneous measurement of hadronic showers with clear (Cherenkov) and scintillating fibers where the fluctuation in electromagnetic fraction (˜pi-zero component) of the shower is measured event-by-event (so-called dual readout technique). Cerium-doped fused-silica fiber is ideal “non-hydrogenous scintillator” for triple-readout calorimeter for ultimate hadronic energy measurement.

Primary author: Prof. AKCHURIN, Nural (Texas Tech University)

Co-authors: DAMGOV, Jordan (Texas Tech University); KUNORI, Shuichi (Texas Tech University); LEE, Sung--Won (Texas Tech University); XU, Zhen (Texas Tech University); WANG, Zhixing (Texas Tech University)

Presenter: Prof. AKCHURIN, Nural (Texas Tech University)

Session Classification: R1-Calorimeters(1)

Track Classification: Calorimeters