Contribution ID: **160** Type: **Oral presentation**

Low-temperature studies of the scintillation of pure cesium iodide for cryogenic scintillator detectors

Monday 18 September 2017 18:00 (15 minutes)

The search for particle dark matter is one of the most active fields in physics, with many experiments using different methods to search for possible dark matter candidates. Direct-detection experiments look for rare interactions between some detector mass and these dark matter particles. The DAMA/LIBRA experiment utilizes thallium-doped sodium iodide (NaI(Tl)) crystals at room temperature to search for dark matter direct-detection, and have claimed an annual modulation signal for dark matter [1].

There has been recent interest in the use of cesium iodide (CsI) as a doped or undoped scintillator as a target material in cryogenic scintillator detectors [2]. Cryogenic scintillaton detectors compare light and phonon signals from particle interactions to discriminate between nuclear and electron recoils. Pure CsI is an interesting target because of its chemical similarity to NaI(Tl) for comparison with the DAMA/LIBRA experiment.

Using an optical cryostat installed at Queen's University in Kingston, Ontario, Canada, we can observe cryogenic scintillators with room temperature photomultiplier tubes, providing a simple apparatus to measure light yield at low temperatures. Utilizing the multiple photon counting coincidence method [3], we can measure the light output of the CsI crystal to nanosecond precision over a large, millisecond timescale to completely capture individual scintillation events. We present the evolution of the light yield, scintillation time constants and alpha/gamma quenching factor of CsI from 300K to 3.4K. We observe a promising high light yield at low temperature, and an alpha/gamma quenching factor surprisingly greater than one for temperatures lower than 100K.

[1] DAMA Collaboration, R. Bernabei et al. Eur. Phys. J. C 73 (2013)

[2] G. Angloher et al. Astropart. Phys. 84 (2016)

[3] H. Kraus, V. Mikhailik, D. Wahl, NIM A 553 (2005)

Authors: CLARK, Mike (Queen's University); DI STEFANO, Philippe (Queen's University)

Presenter: CLARK, Mike (Queen's University)

Session Classification: Applications

Track Classification: S04_Application 2 (Orals)