

Scintillation and Cherenkov Light Separation in Novel Liquid Scintillators for Large Scale Neutrino Detectors

Tuesday, 18 June 2024 17:30 (2 hours)

The separate observation of Cherenkov and scintillation light in liquid scintillation media and thus the extraction of a directional signal and excellent energy and vertex resolution holds great potential in current R&D projects for large scale neutrino detectors like JUNO or Theia. This method offers promising prospects in background suppression methodologies. In particular, the ability to identify and thereby reduce the unshieldable background of solar neutrino events provides a decisive improvement of liquid scintillation detectors searching for the neutrinoless double beta decay. This potential arises from the combination of newly developed slow liquid scintillators doped with potential double beta decay candidates tellurium or xenon and state-of-the-art photon sensors. To study the fundamental properties of these novel detection media, including slow liquid scintillators, a new setup exploiting the principle of time-correlated single photon counting with cutting-edge photomultiplier tubes is under commissioning at the Technical University of Munich (TUM). The experiment enables detailed studies of the probability density function of the photon emission from the scintillation medium including both Cherenkov and scintillation light. A separation can be achieved either by direct timing, geometry with respect to the Cherenkov light direction or chromatic sorting via optical bandpass filters. On the poster the design of this novel table-top experiment is presented as well as first measurement results with several organic liquid scintillator cocktails. This work has been supported by the Cluster of Excellence PRISMA+, the Cluster of Excellence ORIGINS as well as the Collaborative Research Center Neutrinos and Dark Matter in Astroparticle Physics (SFB1258) and the DFG Research Units 2319 and 5519.

Poster prize

Yes

Given name

Meishu

Surname

Lu

First affiliation

Technical University of Munich

Second affiliation

Institutional email

meishu.lu@tum.de

Gender

Male

Collaboration (if any)

Primary authors: Dr STEIGER, Hans Th. J. (Technical University of Munich); Mr LU, Meishu (Technical University of Munich)

Co-authors: Prof. OBERAUER, Lothar J. N. (Technical University of Munich); Mr STOCK, M. Raphael (Technical University of Munich); Mr BÖHLES, Manuel (Johannes Gutenberg University Mainz); Ms FAHRENDHOLZ, Ulrike (Technical University of Munich)

Presenters: Dr STEIGER, Hans Th. J. (Technical University of Munich); Mr LU, Meishu (Technical University of Munich)

Session Classification: Poster session and reception 1

Track Classification: Neutrinoless Double Beta Decay