Contribution ID: **173** Type: **Poster**

Possible usage of Cherenkov photons to reduce the background in a 136Xe neutrinoless double-beta decay experiment

Friday, 29 May 2015 10:13 (0 minutes)

One of the main backgrounds in the search for 129Xe nutrinoless double-beta decay ($0\nu\beta\beta$) is the signal from Compton scattering of photons with energy around the decay end point at 2.458 MeV.
One efficient method to exclude this background is by self-shielding, resulting in a waste of active volume.
Another proposed method is tagging the daughter barium nucleus, which relies on the capture and detection of single Ba ions to identify a Xe $0\nu\beta\beta$ decay. This is an extremely challenging task and, although feasible, presently suffers of very low efficiency.
Electrons in liquid xenon emit scintillation light at 175~nm, but liquid xenon is extremely transparent to ultra violet light. It is in principle possible to discriminate one particle events (Compton background) from two particle events (double-beta decay signals) by the amount of
Cherenkov radiation emitted.
The identification of the Cherenkov photons may be performed by looking at the different time structure of the signal with respect to the scintillation, by selecting photons with wavelengths larger than the typical Xenon scintillation light, and by the different emission topology.
The efficiency of this discrimination, albeit small, can be comparable to that of barium tagging.
A proof-of-principle study of this approach is presented here together with preliminary studies on possible detectors for the two light components at different wavelengths.

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Session Classification: Detector Techniques for Cosmology, Astroparticle and General Physics - Poster Session

Track Classification: S8 - Detector Techniques for Cosmology, Astroparticle and General Physics