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Scintillating active Transverse Energy Filter: a novel detector concept for angular selective background discrimination

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The Karlsruhe Tritium Neutrino (KATRIN) experiment has the goal to determine the effective electron antineutrino mass with a sensitivity of 200 meV/c^2 @90%C.L. The main spectrometer background is the strongest limit on the sensitivity. It consists presumably of low energy electrons which arrive at the detector with small angles contrary to the signal electrons. Designing an angular selective detector shows great potential in increasing the sensitivity of the KATRIN experiment.
The concept of active-transverse-energy filters (aTEFs) has been developed
by members of the KATRIN collaboration. It proposes micro-structured detector configurations that are sensitive to the angular of the detected electrons. At the moment, two different approaches are under investigation. One of it is the idea of an aTEF-detector based on a plastic scintillator that is read out by a CMOS-based single-photon-avalanche-diode (SPAD) array (scint-aTEF).
This poster gives an overview of the basic concept of a scint-aTEF. It includes design studies and presents first prototype structures manufactured via 2-photon-absorption lithography (3D-printing).

Submitted on behalf of a Collaboration?

Yes

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