



Contribution ID: 103

Type: **Poster**

## Development of an active transverse energy filter (aTEF) for background reduction at the KATRIN experiment

*Saturday, November 26, 2022 4:00 PM (2 hours)*

The KATRIN experiment at the Karlsruhe Institute of Technology (KIT) aims at the direct measurement of the electron neutrino mass with  $0.2\text{eV}/c^2$  sensitivity. The high luminosity windowless gaseous molecular tritium source together with the magnetic adiabatic collimation of the electrostatic (MAC-E) filter technique allows for precision endpoint spectroscopy of the tritium beta decay. The analyses of the first and second tritium campaign yield an upper limit of  $m\nu < 0.8\text{eV}$  (90% C.L.) (Nature Physics 18 (2022) 160).

Despite the advances in lowering the background rate, e.g. by implementation of the shifted-analysing-plane mode (Eur. Phys. J. C 82 (2022) 258), further background reduction measures are required.

The background is assumed to mainly consist of electrons released in the spectrometer, either from the de-excitation of highly-excited Rydberg atoms or from autoionizing states, which originate from alpha-decays in the spectrometer walls. Their kinetic energy at the detector is indistinguishable from tritium beta decay electrons, but they feature a much narrower pitch angle distribution.

We introduce research and development of the active transverse energy filter (aTEF, arXiv:2203.06085) as a concept that allows to discriminate electrons at the detector based on their pitch angle and can differentiate between signal and background electrons in KATRIN.

The contribution will present our proof of principle of microchannel plate-based passive and active transverse energy filters as well as our first Si-PIN-diode based prototypes and their angular-dependent detection properties in a dedicated test setup.

The work of the speaker is supported by BMBF under contract number 05A20PMA and Deutsche Forschungsgemeinschaft DFG (Research Training Group GRK 2149) in Germany.

### Category

Particle / Astroparticle / Cosmology (Experiment)

**Authors:** Mrs SCHNEIDEWIND, Sonja (University of Münster); Mr GAUDA, Kevin (University of Münster); Mr SALOMON, Richard (University of Münster); Prof. DREXLIN, Guido (Karlsruhe Institute of Technology (KIT)); Dr FULST, Alexander (University of Münster); Mr GÖNNER, Christian (University of Münster); Dr HANNEN, Volker (University of Münster); Mr KÖNIG, Tim (University of Münster); Dr LOKHOV, Alexey (University of Münster and Karlsruhe Institute of Technology (KIT)); Mr OELPMANN, Patrick (University of Münster); Mr ORTJOHANN, Hans-Werner (University of Münster); Prof. PERNICE, Wolfram (University of Münster and University of Heidelberg); Mr PÖLLITSCH, Lukas (University of Münster); Prof. ROBERTSON, Robert Graham Hamish (University of Washington); Mr STAPPERS, Maik (University of Münster); Prof. WEINHEIMER, Christian (University of Münster)

**Presenter:** Mrs SCHNEIDEWIND, Sonja (University of Münster)

**Session Classification:** Poster session

**Track Classification:** Physics Posters