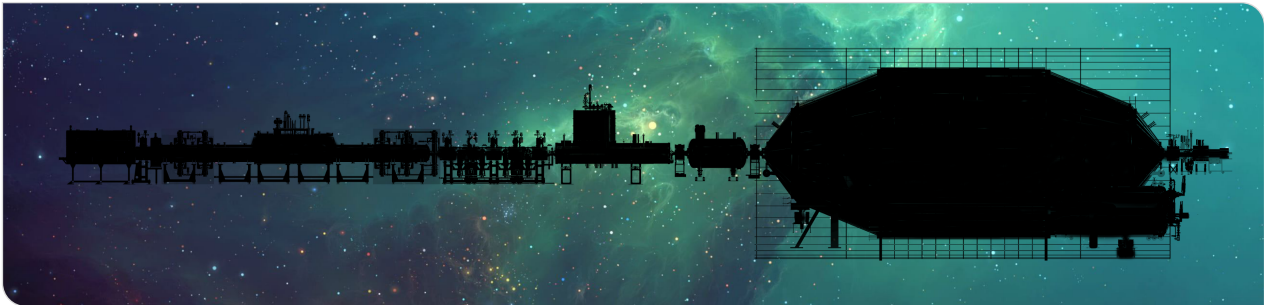


Results from KATRIN – neutrino mass and BSM physics searches

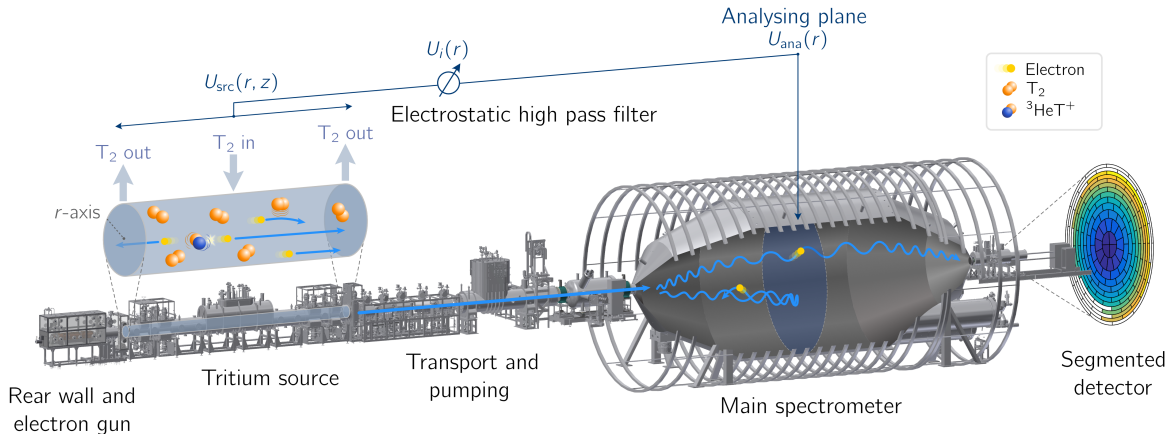
MU-days 2021

Leonard Köllenberger | Wednesday 24th November 2021



The Karlsruhe Tritium Neutrino experiment

- **Goal:** Improve sensitivity of kinematic nu-mass measurement from 2 eV to 0.2 eV (5 years of data)
- Data-taking started in Spring 2019



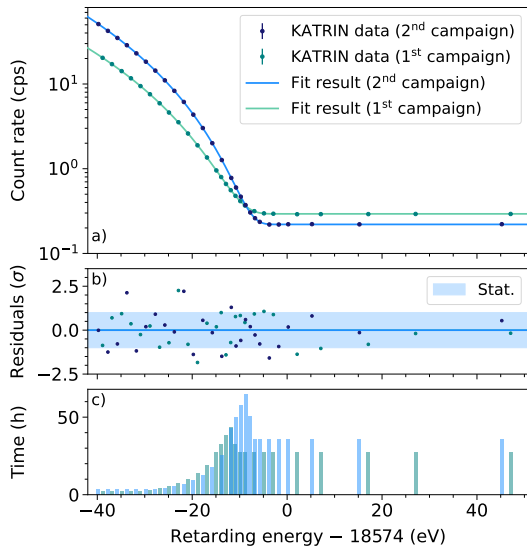
Neutrino mass measurements

- Precise measurement near the endpoint of the tritium β -decay spectrum
- Comprehensive analysis of first year of KATRIN data (two measurement campaigns in 2019)
- First **sub-eV sensitivity** on the effective neutrino mass
- New best limit from combined analysis:

$$\Rightarrow m_\nu \leq 0.8 \text{ eV (90 \% CL)}$$

\Rightarrow [arxiv:2105.08533](https://arxiv.org/abs/2105.08533), in press

- Ongoing analysis of 2020 data sets with improved statistics and systematics



Beyond the standard model – eV-scale sterile neutrinos

- Extended spectrum model by adding a branch for a 4th, sterile neutrino

$$\Rightarrow R_{\beta}(E, m_{\nu}^2, m_4^2, |U_{e4}|^2) = (1 - |U_{e4}|^2) \cdot R_{\beta}(E, m_{\nu}^2) + |U_{e4}|^2 \cdot R_{\beta}(E, m_4^2)$$

- Kink-like signature from sterile neutrino m_4^2
- Search for eV-scale sterile neutrinos up to $m_4^2 = 1600 \text{ eV}^2$
- First KATRIN exclusion published in 2021
→ [PhysRevLett.126.091803](https://arxiv.org/abs/2109.00034)
- Analysis of 2019 data completed (forthcoming publication)

⇒ KATRIN can already probe interesting regions in the sterile parameter space

