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## Experimental characterization of an atomic hydrogen source

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The absolute value of the mass of the neutrino remains an unsolved puzzle of particle physics. One way to measure the neutrino mass is spectroscopy of electrons from the tritium beta decay. The current best limit on the effective anti-electron neutrino mass of  $m_{\bar{\nu}} < 0.45 \text{ eV c}^{-2}$  (90 % C.L.) was published by the KATRIN collaboration in 2024. KATRIN measures the beta-decay electron spectrum from molecular tritium. The sensitivity of molecular tritium experiments is limited by the broadening due to the molecular excitation states. One approach to overcome this molecular barrier is to use atomic tritium sources for future experiments. We are currently commissioning and assembling an experimental setup (called BeATE) to characterize a commercially available hydrogen cracking system (Tectra H-flux). For this, we are testing and optimizing the performance of the system and source with protium and deuterium using different skimmers to trim the beam and reduce molecular background due to recombination at wall contacts. A Hiden DLS-10 quadrupole mass spectrometer (QMS) with a cross-beam ionizer is used as beam diagnostic tool. After first experiments with inactive hydrogen, this setup will be used to demonstrate the production of atomic tritium. In this poster, we show the current status of the characterization and development of BeATE. Furthermore, the design and implementation of a loop for the tritium supply of the setup is presented.

### Summary

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