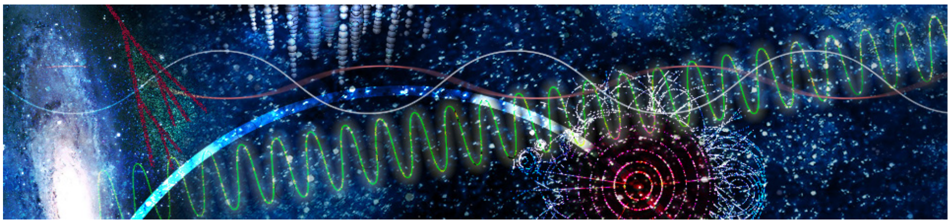

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Studies towards atomic tritium sources for future neutrino mass experiments

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 $\mathrm{m} < 0.8\,\mathrm{eVc}^{-2}$ (90% C.L.) was published by the KATRIN collaboration in 2022 KATRIN measures the beta-decay electron spectrum from molecular tritium. Due to molecular excitation states, however, the sensitivity of experiments using molecular tritium is limited to $\approx 0.1\,\mathrm{eVc}^{-2}$. One approach to overcome this molecular barrier is to use atomic tritium sources for future experiments.

For the research and development of such a source two separate systems are required: first, a setup for protium and deuterium, which will act as a test bed for systems for the development of beam cooling, beam forming and beam diagnostics. For this system we recently assembled and commissioned a highly modular and modifiable test setup to fully characterize a commercially-available hydrogen cracking system (Tectra H-flux). From this test setup we deduced a second system capable of handling tritium, which is currently in construction. With this system, we will perform first operation of a thermal hydrogen dissociation system with tritium.

In this poster we show results from inactive tests with non-radioactive gasses like protium and deuterium from the test setup. With this, an understanding of the system behavior and atomic hydrogen production was developed. Additionally, the current design and implementation status of a tritium-compatible system is presented.

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