Measuring the neutrino mass

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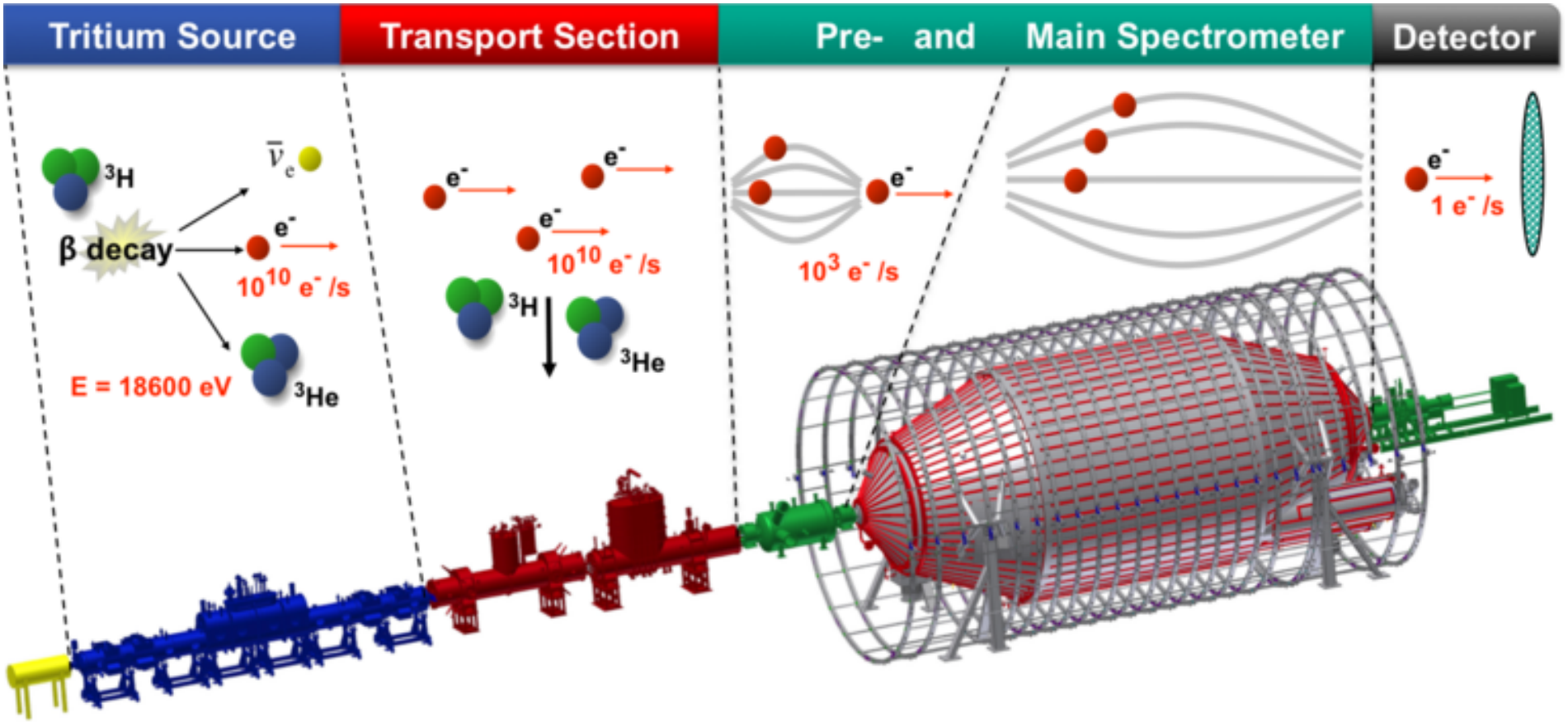
Tritium beta decay: The KATRIN experiment



Tritium decays, releasing an electron and an anti-electron-neutrino. While the neutrino escapes undetected, the electron starts its journey to the detector.

Electrons are guided towards the spectrometer by magnetic fields. Tritium has to be pumped out to provide tritium free spectrometers.

The electron energy is analyzed by applying an electrostatic retarding potential. Electrons are only transmitted if their kinetic energy is sufficiently high.

At the end of their journey, the electrons are counted at the detector. Their rate varies with the spectrometer potential and hence gives an integrated β-spectrum.

Image: KIT

Tritium beta decay: The KATRIN experiment (2)

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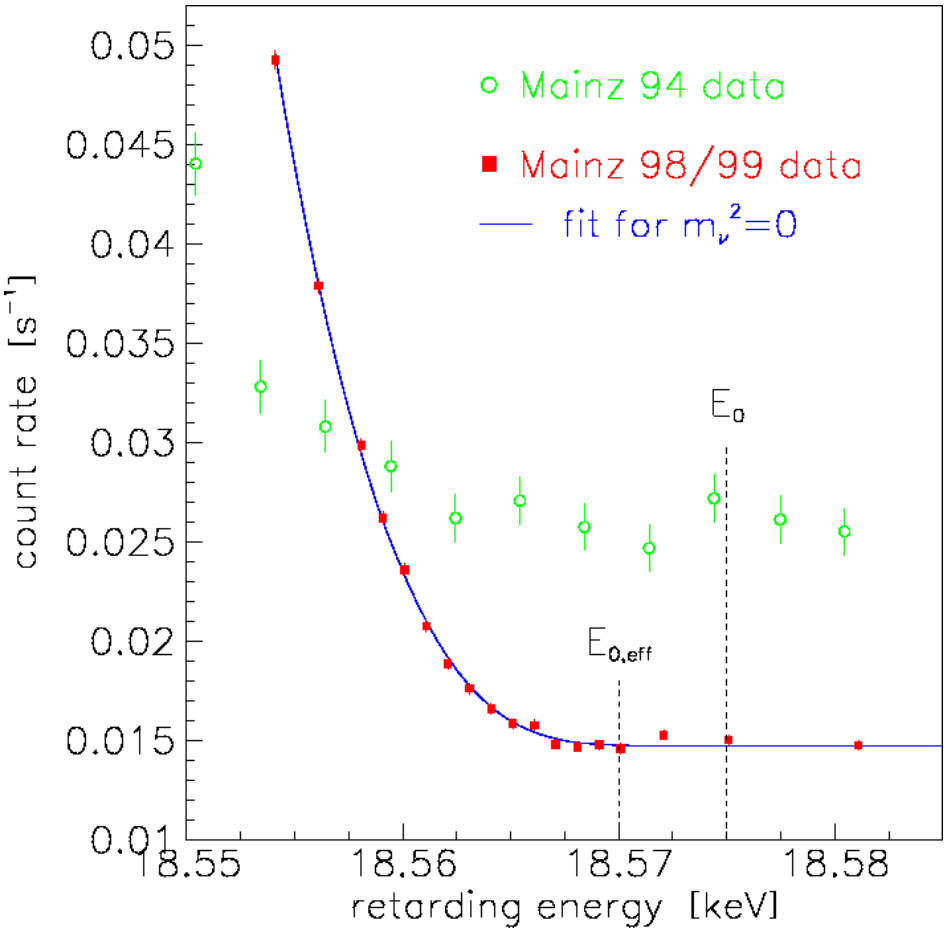
Data from the Mainz experiment



- Consistent with $m_\nu = 0$
- 95% CL upper limit:

$$m_\nu < 2.3 \text{ eV}$$

Neutrinoless double beta decay: GERDA

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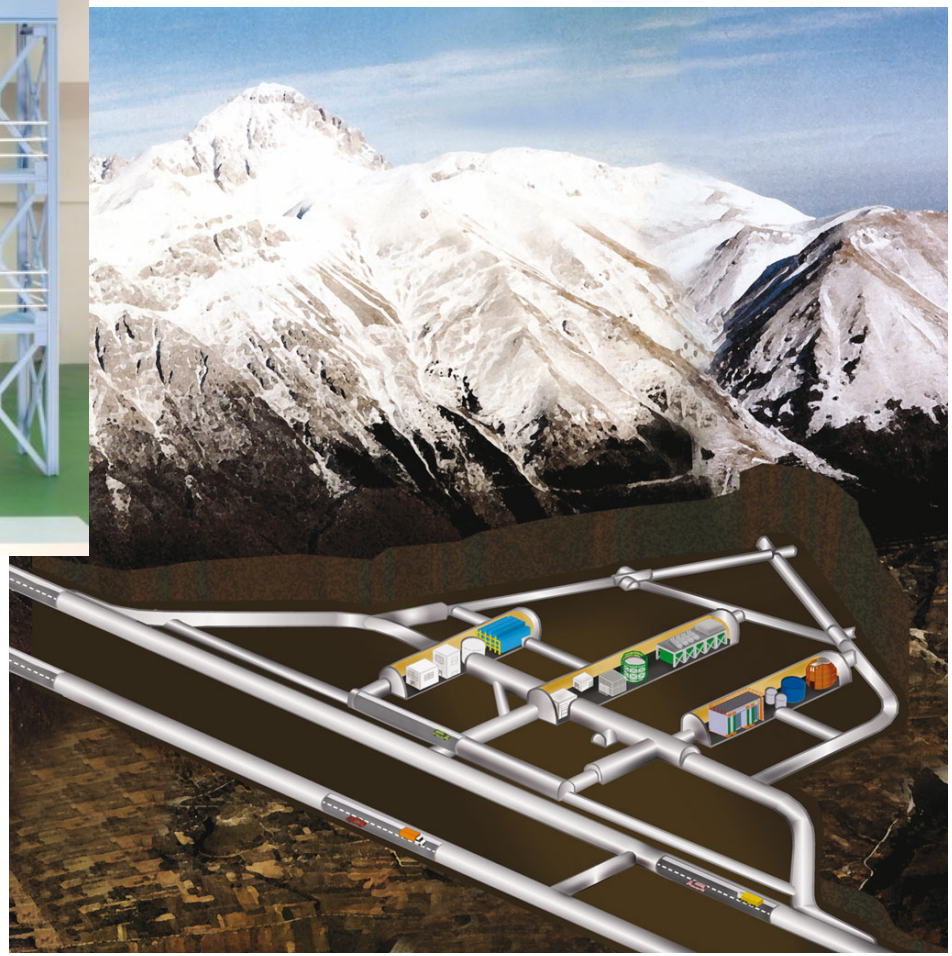
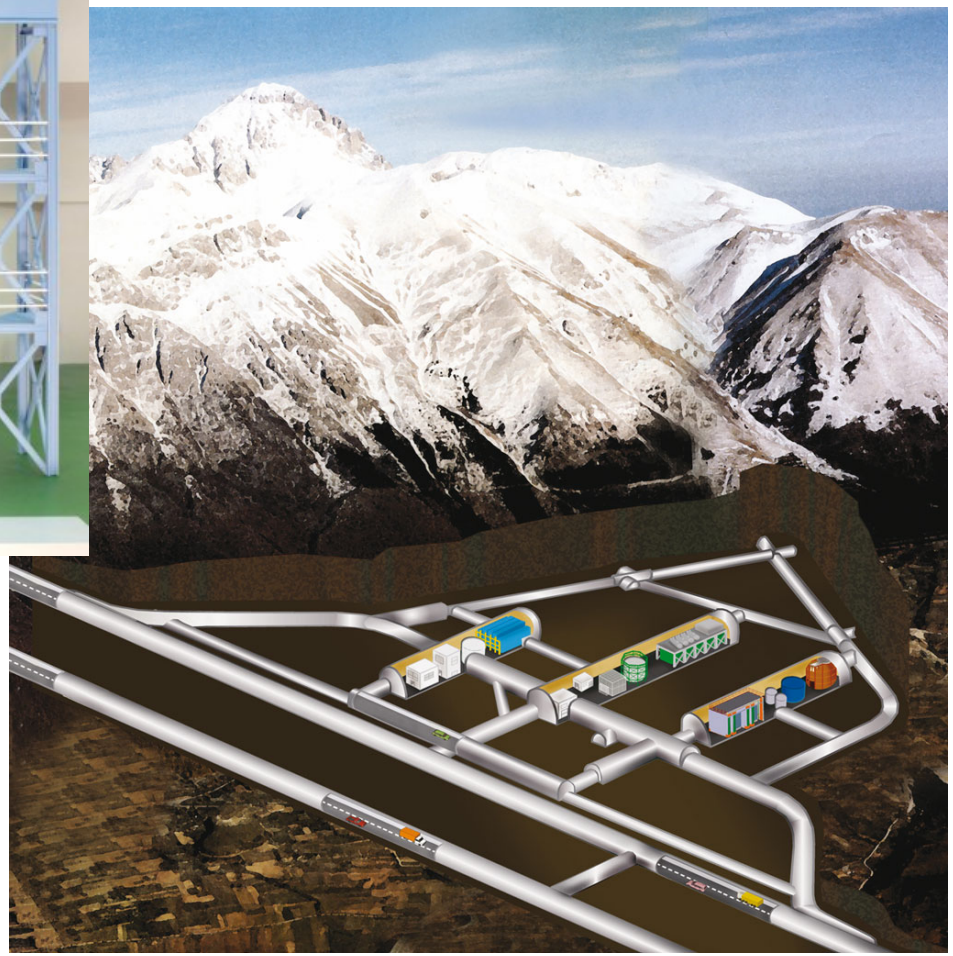
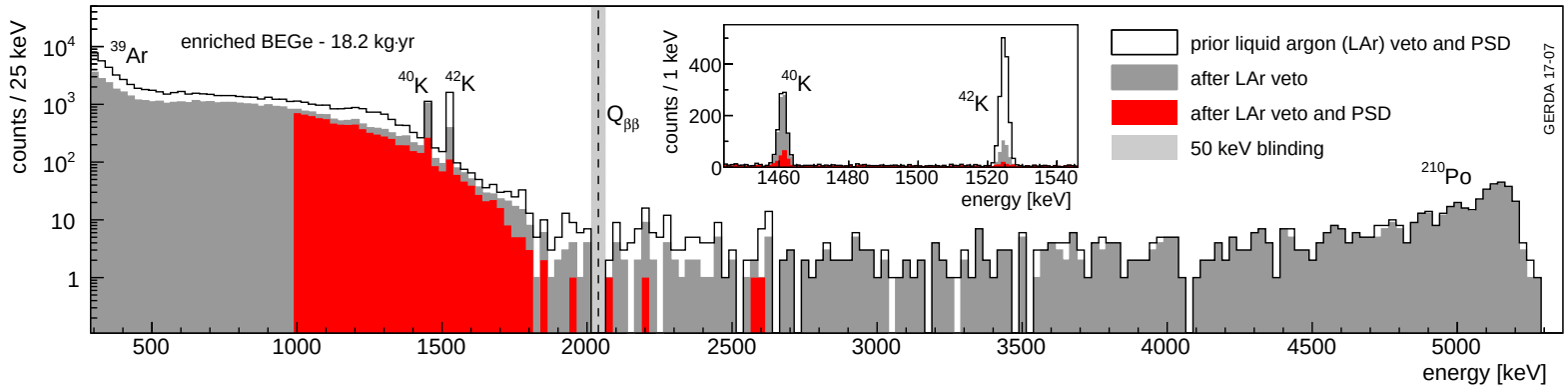
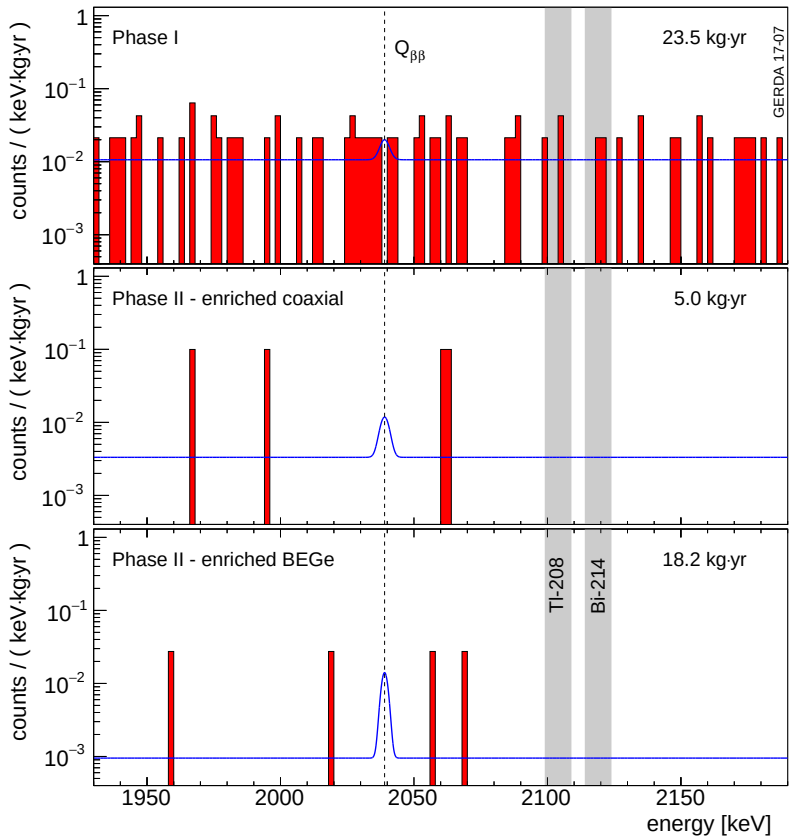


Neutrinoless double beta decay: GERDA



Neutrinoless double beta decay: GERDA





$0\nu2\beta$ decay exclusion limits (2013)