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Characterizing electron optics in the KATRIN experiment[1]
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The Karlsruhe Tritium Neutrino (KATRIN) experiment is a tritium beta decay experiment designed to make a direct, model independent measurement of the electron neutrino mass. The experimental apparatus employs strong magnetic and electric fields in regions of ultra high (10^{-11} mbar) vacuum in order to obtain precise measurements of the electron resulting from tritium decay. A potential background in such a configuration is from electric breakdown due to Penning discharge, where a charged particle confined within a Penning trap (a potential well along a magnetic field line) ionizes residual gas molecules. Using simulation tools developed to locate potential Penning traps within a given magnet and electrode configuration, it is possible to characterize and eliminate or minimize this source of background.

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