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Penning Trap Searches in the KATRIN Main Spectrometer[1]
KEVIN WIERMAN, University of North Carolina at Chapel Hill, KATRIN COLLABORATION — The Karlsruhe Tritium Neutrino Experiment (KATRIN) aims to make a precision measurement of the tritium beta decay spectrum with a projected sensitivity to neutrino mass of 200 meV. Meeting this goal requires low backgrounds in the beta decay endpoint region. In KATRIN, spatially confined charged particles represent a potential source of backgrounds and systematic errors. Trapping conditions can occur in KATRIN's 10m diameter main spectrometer due to the high magnetic and electrostatic fields required to momentum analyze the electrons. Backgrounds are generated by trapped particles due to scattering off residual gas in the spectrometer causing negative ions to be accelerated towards KATRIN's detector system. Additionally, systematic errors in the neutrino mass measurement can be caused by the electrostatic field generated by trapped electrons. To search for these conditions, the spectrometer was probed by a monoenergetic electron source to determine trapping probabilities as a function of the applied electric and magnetic fields.

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Kevin Wierman
University of North Carolina at Chapel Hill

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