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Frequency-based decay electron spectroscopy

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Precision measurements of $\beta-$decay spectra can provide exquisitely sensitive tests of various predictions and underlying symmetry assumptions of the Standard Model (SM) of Particle Physics. Possible symmetry violations can alter the shape of β-decay spectra in characteristic ways. Beyond SM physics e.g. causes the finite masses of neutrinos that alter the $\beta-$decay spectrum of tritium in a predictable but still undetectable way. In a first step to design an experiment with a sensitivity of $40\,\mathrm{meV/c^2}$ to the neutrino mass scale the Project 8 collaboration has recently demonstrated a novel, frequency-based electron spectroscopy technique. Cyclotron Radiation Emission Spectroscopy (CRES) determines the electron's kinetic energy from the feeble cyclotron radiation emitted by an electron spiralling in a magnetic trap. I will present the basics of CRES and results obtained with mono-energetic conversion electrons from ^{83m}Kr as well as preliminary results from measurements using molecular tritium. I will discuss the prospect of CRES in the context of precision $\beta-$decay experiments of the next generation, in particular with a focus on the neutron decay spectrum.
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