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Precision atomic masses for neutrinoless double-beta-decay and double-electron-capture[1] EDMUND MYERS, MATTHEW REDSHAW, BRIANNA MOUNT, Florida State University — As currently understood, the definitive observation of neutrinoless double-beta-decay will imply that neutrinos are their own antiparticles (Majorana particles), while measurements of the decay rate, or limits on the rate, provide information on absolute neutrino mass. Large-scale neutrinoless double-beta-decay detectors, proposed or under development, such as EXO, CUORE, GERDA, MAJORANA, etc. should be sensitive to a linear combination of neutrino masses, the "effective Majorana mass of the electron neutrino", below 0.1 eV/c^2. The signature of neutrinoless double-beta decay is a sharp peak in the total electron-energy spectrum at the Q-value of the decay – the mass-energy difference between the parent and daughter atoms. Using precision, cryogenic mass spectrometry, with one or two multiply-charged ions in a Penning trap, we have now measured the atomic masses of ^{136}Xe, ^{130}Te, ^{130}Xe, ^{76}Ge, ^{76}Se to a fractional precision of 2 x 10^{-10} or better, corresponding to Q-values with uncertainties below 25 eV. This is more than sufficient precision for the proposed large-scale experiments. Progress on mass measurements of ^{74}Ge and ^{74}Se, relevant to resonance-enhanced neutrinoless double-electron capture in ^{74}Se, will also be reported.

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