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The full weak charge density distribution of ^{48}Ca from parity violating electron scattering ZIDU LIN, CHARLES HOROWITZ, Indiana Univ - Bloomington — The ground state neutron density of a medium mass nucleus contains fundamental nuclear structure information and is at present relatively poorly known. We explore if parity violating elastic electron scattering can provide a feasible and model independent way to determine not just the neutron radius but the full radial shape of the neutron density and weak charge density of a nucleus. We expand the weak charge density of ^{48}Ca in a model independent Fourier Bessel series and calculate the statistical errors in the individual coefficients that might be obtainable in a model parity violating electron scattering experiment. We find that it is feasible to determine roughly six Fourier Bessel coefficients of the weak charge density of ^{48}Ca within a reasonable amount of beam time. To conclude, Parity violating elastic electron scattering can determine the full weak charge density of a medium mass nucleus in a model independent way. This weak density contains fundamental information on the size, surface thickness, shell oscillations, and saturation density of the neutron distribution in a nucleus. The measured weak charge density, together with the previous known charge density, will provide a detailed picture of where the neutrons and protons are located in an atomic nucleus.

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