Advanced extraction of the deuteron charge radius from electron-deuteron scattering data [1]

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High precision muonic deuterium spectroscopic measurements found a significantly smaller ($\sim 6\sigma$) deuteron charge radius (r_d) compared to the radius obtained from spectroscopy of ordinary deuterium atoms and the CODATA-2014 world-average value. In order to solve this puzzle, the DRad experiment was proposed to measure the unpolarized elastic $e-d$ scattering cross section in a very low momentum transfer squared region ($Q^2 = 2 \times 10^{-4} - 5 \times 10^{-2}$ $(\mathrm{GeV/c})^2$), with a sub-percent proposed precision. The designed setup of the experiment will be largely based on that of the PRad-II experiment (Jefferson Lab PR12-20-004), with an addition of a low energy Si-based cylindrical recoil detector.

To extract the charge radius of the proton, r_p, from the electron-proton scattering data, the PRad collaboration at Jefferson Lab has developed a rigorous framework for finding the best functional forms - the fitters - for a robust extraction of r_p from a wide variety of sample functions for the range and uncertainties of the PRad data. We utilize and further develop this framework for searching for the best fitter candidates as well as a procedure for testing the robustness of extraction of the deuteron charge radius, r_d, from parametrizations based on elastic electron-deuteron scattering data. This study has been published in the journal of Physical Review C. In this talk, we will present this work and discuss possible improvements.

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