Contribution ID: **33** Type: **Parallel-Goldstone Boson**

Measurements of charged and neutral pion electromagnetic polarizabilities at GlueX

Electromagnetic polarizabilities are fundamental properties of composite systems such as molecules, atoms, nuclei and hadrons. Measurements of hadron polarizabilities can test effective field theories, dispersion theories, and lattice calculations, with the charged pion polarizability providing a test of fundamental symmetries at leading order. Significant progress has been made in measurements of nucleon polarizabilities, with uncertainties at $\approx \pm 0.4 \times 10^{-4} e\ fm^3$ for the proton. However experimental constraints on the charged and neutral pion polarizabilities (CPP and NPP) are much weaker, $\approx \pm 2 \times 10^{-4} e\ fm^3$ for the π^+ and no measurement for the π^0. The CPP and NPP experiments at GlueX will utilize a new technique to measure pion polarizability, Primakoff photo-production of $\pi^+\pi^-$ and $\pi^0\pi^0$ pairs on a high Z target. Details of the experimental setup and technique will be presented in the talk, including the commissioning of a muon detection system constructed for the measurement. The CPP and NPP experiments are currently scheduled to run at JLab in mid-2022.

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