Contribution ID: **6** Type: **Talks**

2Pi0 Moment and Partial Wave Analysis

Tuesday 9 December 2025 12:00 (30 minutes)

Quantum Chromodynamics (QCD) is the theory of the strong force and gives rise to a spectrum of hadrons. Hadrons such as qq773; and qqq states have been observed but others, such as the gg (glueball) or the qq773;g (hybrid) state are not forbidden. A gg pair can share the same quantum numbers as a qq773; meson, resulting in the ‘mixing’of their respective states; the observed physical particle is a superposition of pure glueball and pure meson states.
The pi;8304; pi;8304; channel provides a window into these states, and others, due to a high level of statistics and quantum number restraints ensuring the even spin number of the intermediate particle. Through this channel an analysis sensitive to quantum number of the lowest lying glueball at J^{PC} = 0⁽⁺⁺⁾ and possible ‘mixed’J^{PC} = 2⁽⁺⁺⁾ state become possible, as well as an analysis of other states which require clearer branching fractions and differential cross sections to compare with theoretical predictions.
Using data obtained as part of the GlueX collaboration at the Thomas Jefferson National Accelerator Facility, alongside sPlot analysis techniques, encouraging preliminary moment and partial wave analysis results have been obtained using a combination of parametric and non-parametric moment models. Future work will study the systematics of different fit methods in detail.

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Session Classification: GlueX/CLAS: Moments