Preliminary 2Pi0 channel analysis at GlueX

Alexandra Berger[1]
[1]University of Glasgow, UK

Quantum Chromodynamics (QCD) is the theory of the strong force and gives rise to a spectrum of hadrons. Hadrons such as $q\bar{q}$ and qqq states have been observed but others, such as the gg (glueball) or the $q\bar{q}g$ (hybrid) state are not forbidden. A gg pair can share the same quantum numbers as a $q\bar{q}$ meson, resulting in the 'mixing' of their respective states making the observed physical particle a superposition of pure glueball and pure meson state.

The $\pi^0\,\pi^0$ 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 and mass dependent fits, encouraging preliminary moment and partial wave analysis results have been obtained. Future work hopes to clarify these results and allow for a comparison between different parametric and non-parametric moment attainment methods.