Probing the strange meson spectrum via the vector-pseudoscalar channel γp → ηφp

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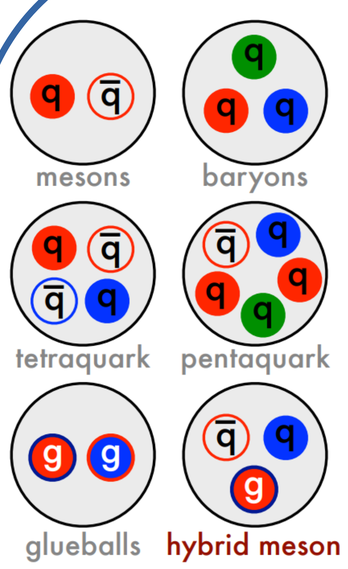
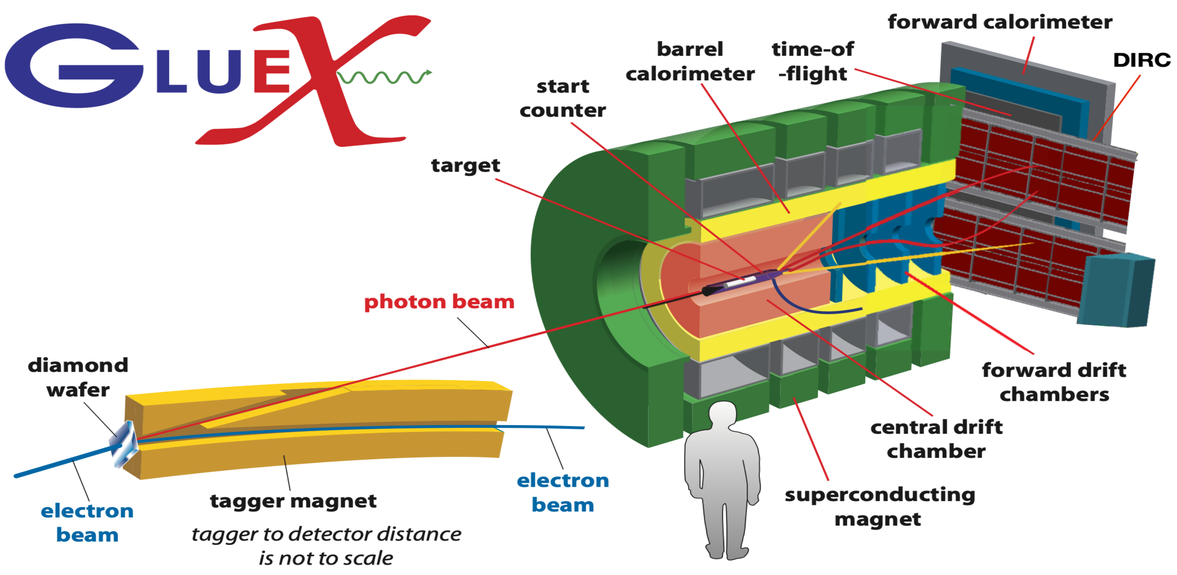
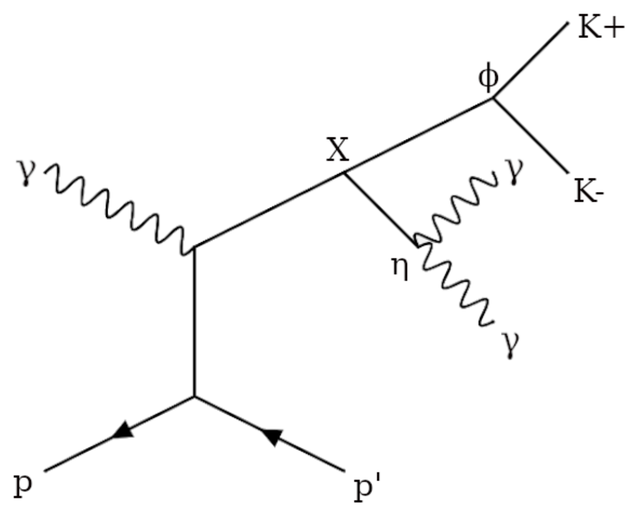


The GlueX experiment in Hall D was commissioned to perform light meson spectroscopy. Many hadron states predicted by QCD calculations have not yet been experimentally confirmed. This is especially true for particles that contain heavier quark flavours, such as the strange.

A very interesting set of states are the hybrid mesons. They contain a gluon degree of freedom in addition to the standard quark-antiquark pair. Finding valent glue would be a big experimental confirmation of our current understanding of QCD.



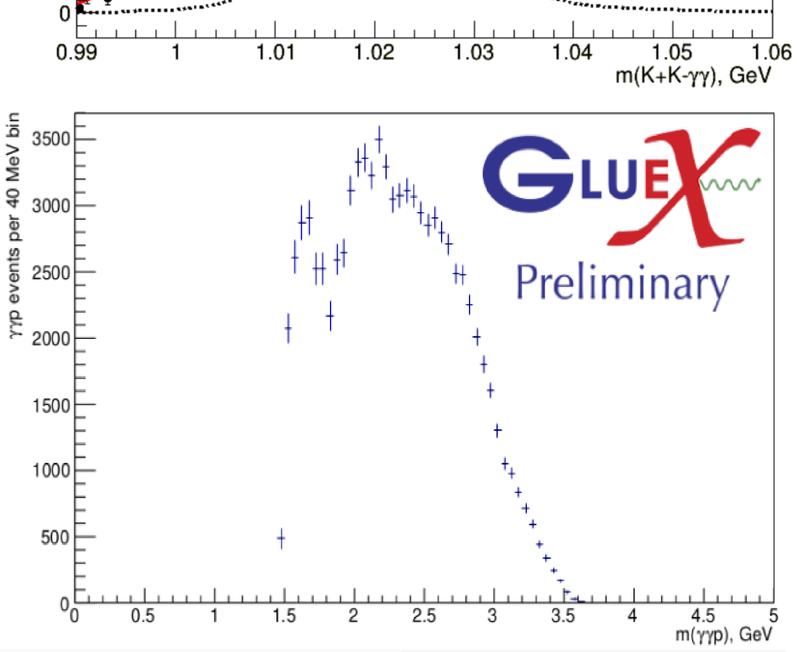
The experiment uses a linearly polarised 9 GeV photon beam. The GlueX detector is able to reconstruct exclusive many-particle final states with good acceptance and high resolution.

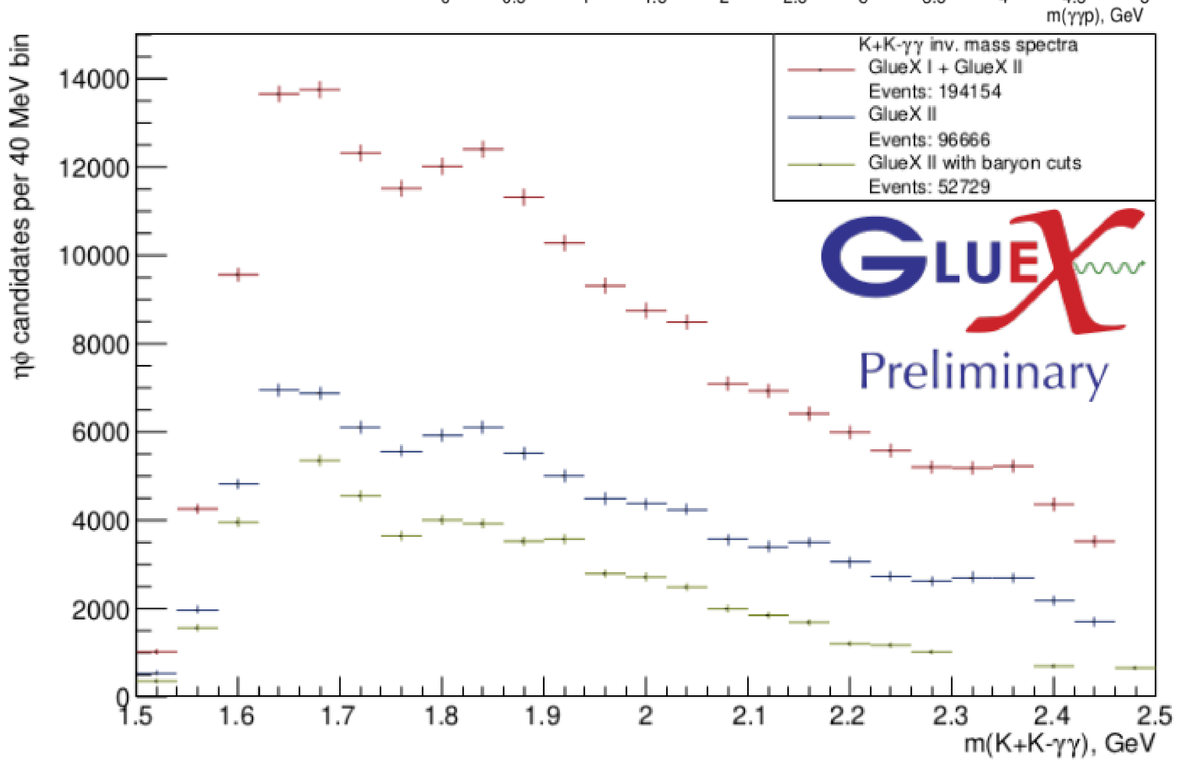


The channel γp to ηφp, whose t-channel diagram can be seen above, has high strangeness content, making it a good candidate for producing hidden strange states. We focus on the final state $K^+K^-\gamma\gamma p$ due to its high branching ratio.

We perform background subtraction using the sPlot technique. An example of the fit for φ yield is shown. The same sort of fit is performed for the η and the results are combined.

Background subtraction is unable to remove all background channels – we can see the N(1535) resonance in the ηp invariant mass spectrum. Further cuts are required to clean up the sample.





Three states can be expected to be seen in this channel – φ(1680), φ(1850), and hybrid candidate Y(2175). Suggestive structures appear in the background subtracted invariant mass spectrum for the first two, but partial wave analysis will be needed to confirm.