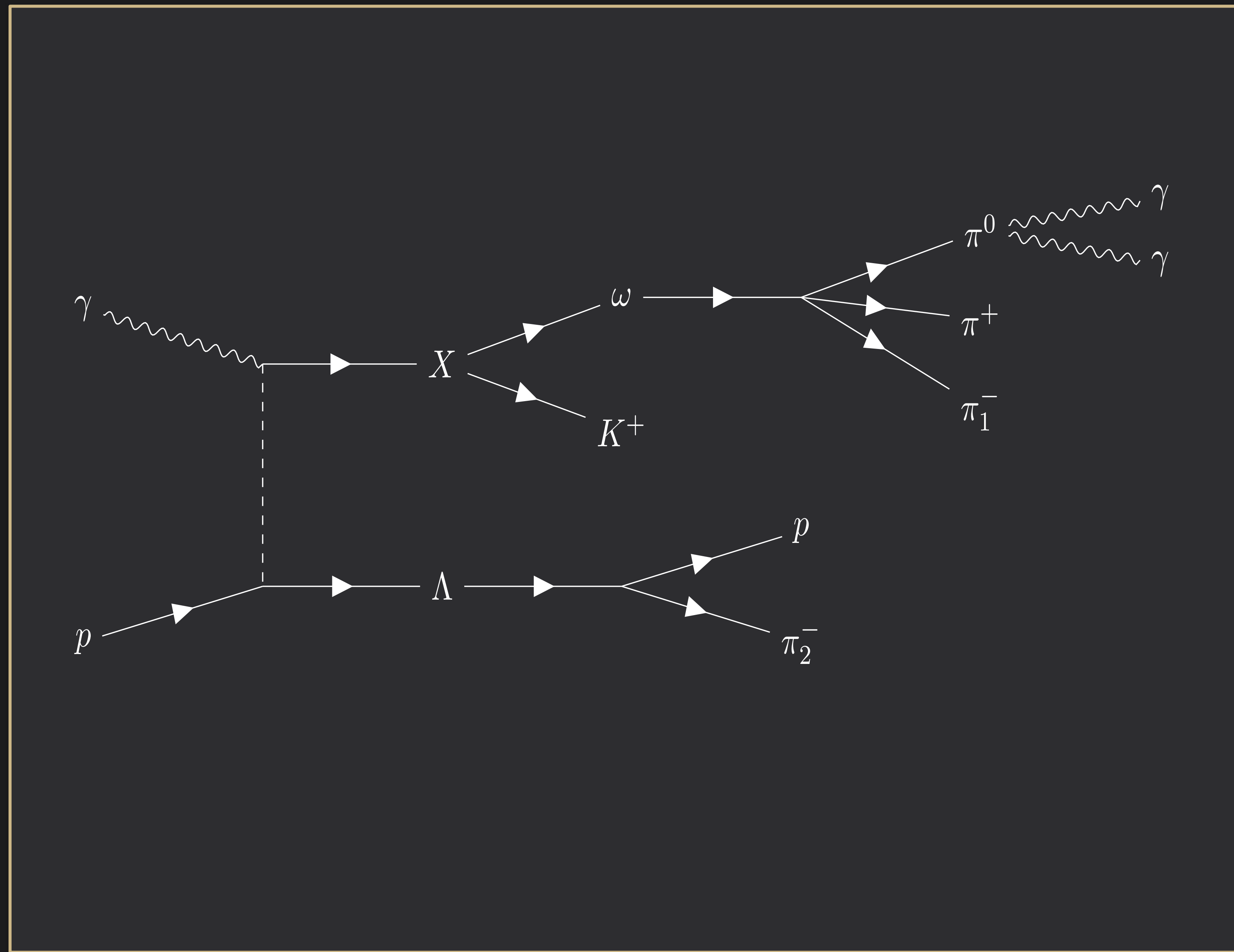
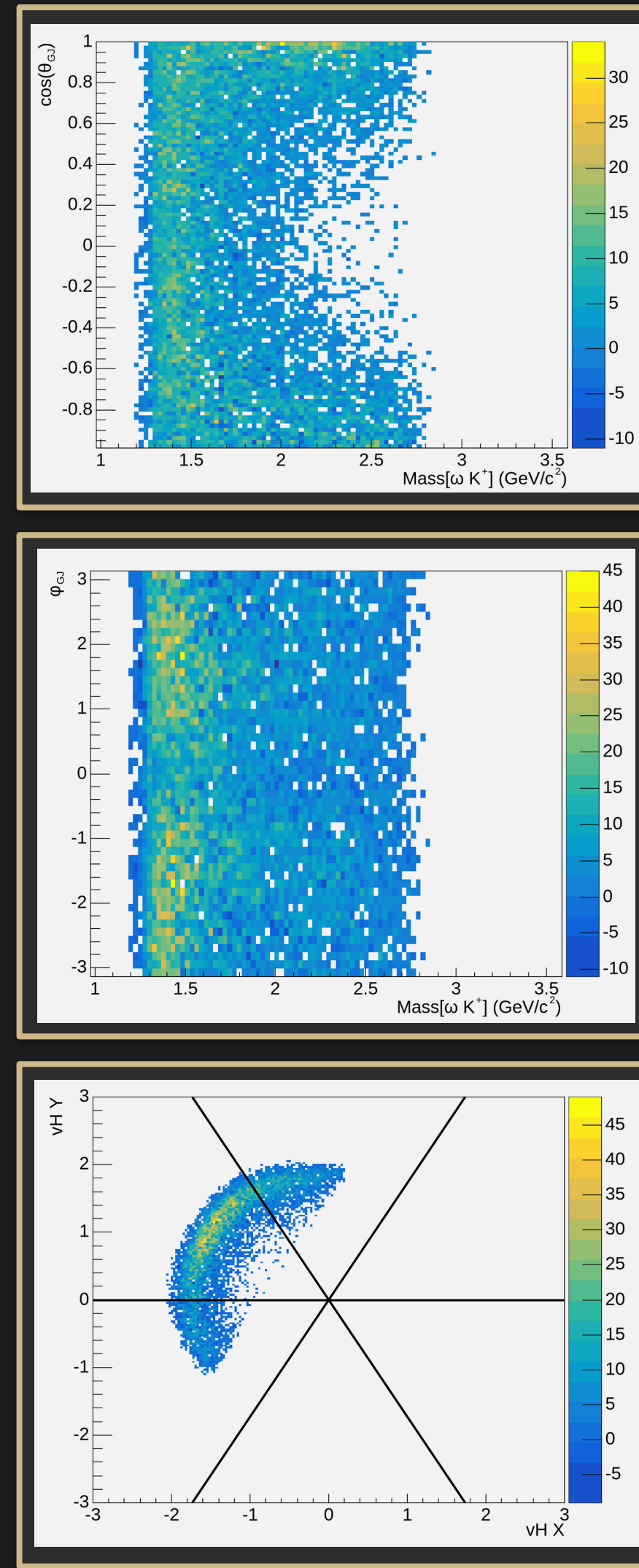


A Survey of the $\omega K^+ \Lambda$ System in Photoproduction Data from GlueX

Richard Brunner — Florida State University

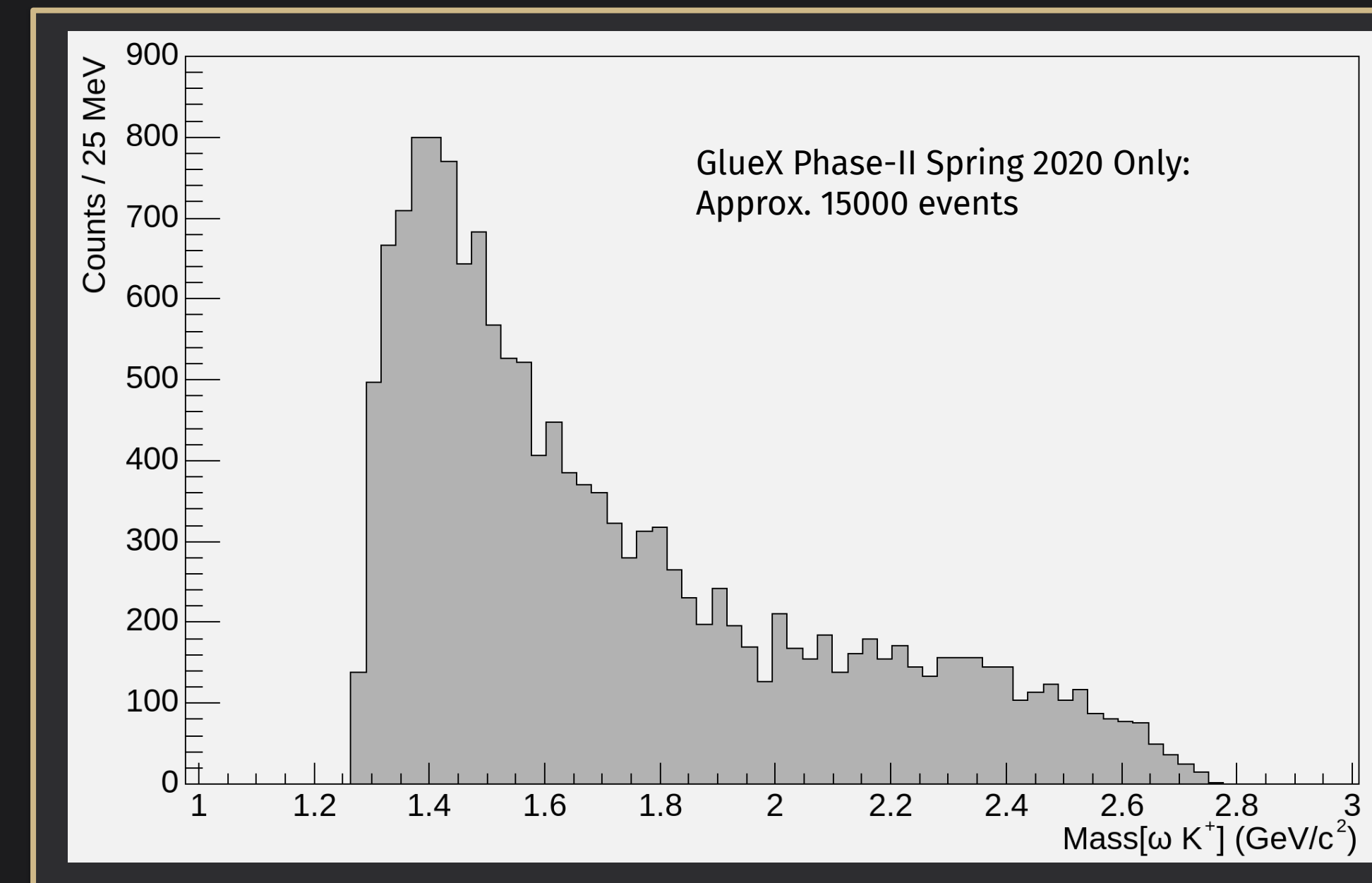


Analysis Results

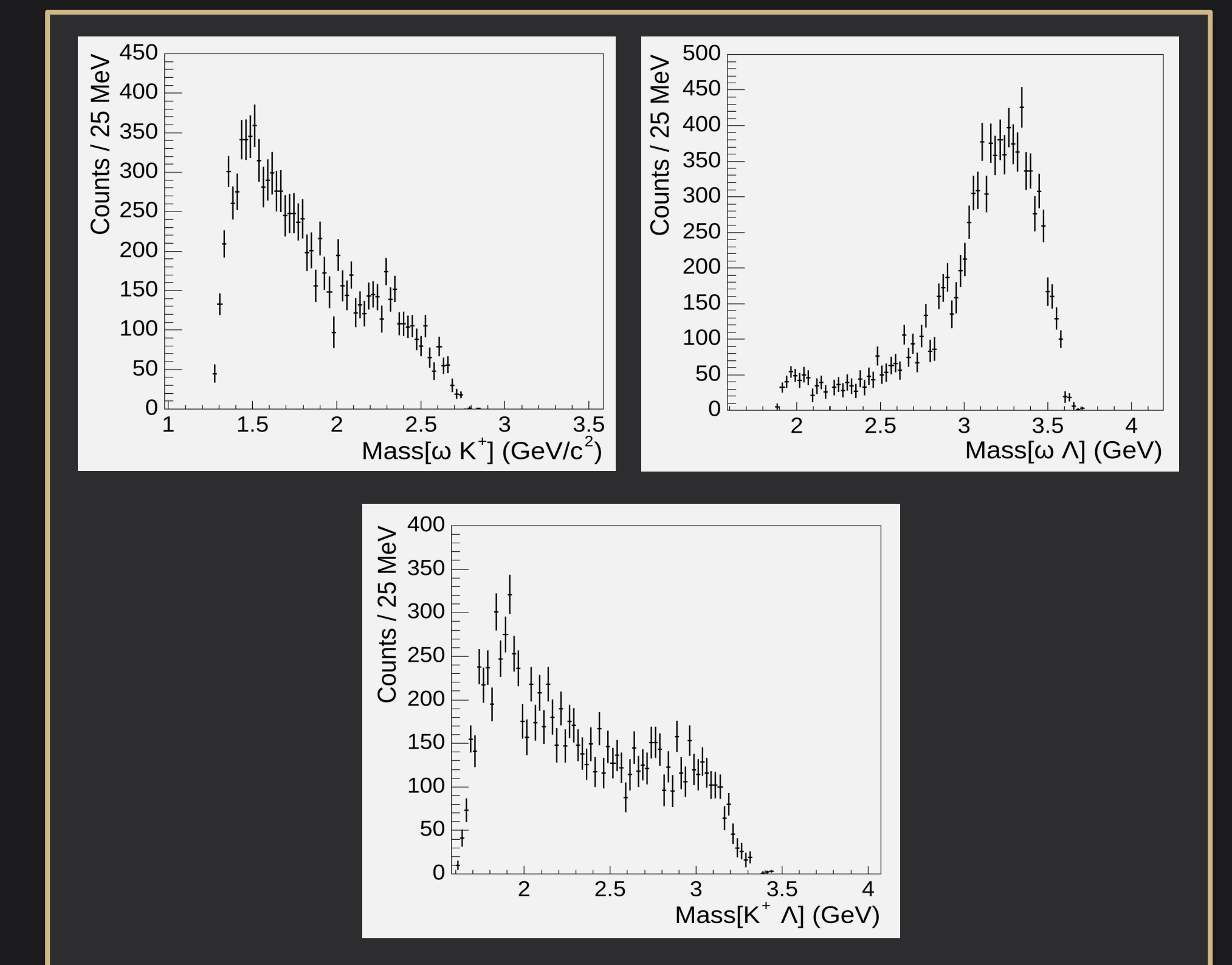


The full analysis uses GlueX Phase-I data together with the Spring 2020 and Spring 2023 GlueX Phase-II data sets.

The results shown here use the Spring 2020 sample, providing a direct comparison to initial studies of the DIRC detector performance. All displayed distributions include the non-DIRC event selections.



DIRC Study Results



The DIRC is designed to improve K/pi separation for detected tracks near 3.5 GeV/c. Initial studies using the recommended DIRC selection procedure reduce the selected ωK^+ yield by roughly 50%, while producing little visible improvement in particle identification.

Further investigation is needed to determine whether this behavior arises from the selection implementation, detector performance, or analysis-specific kinematics.

Hybrid Mesons

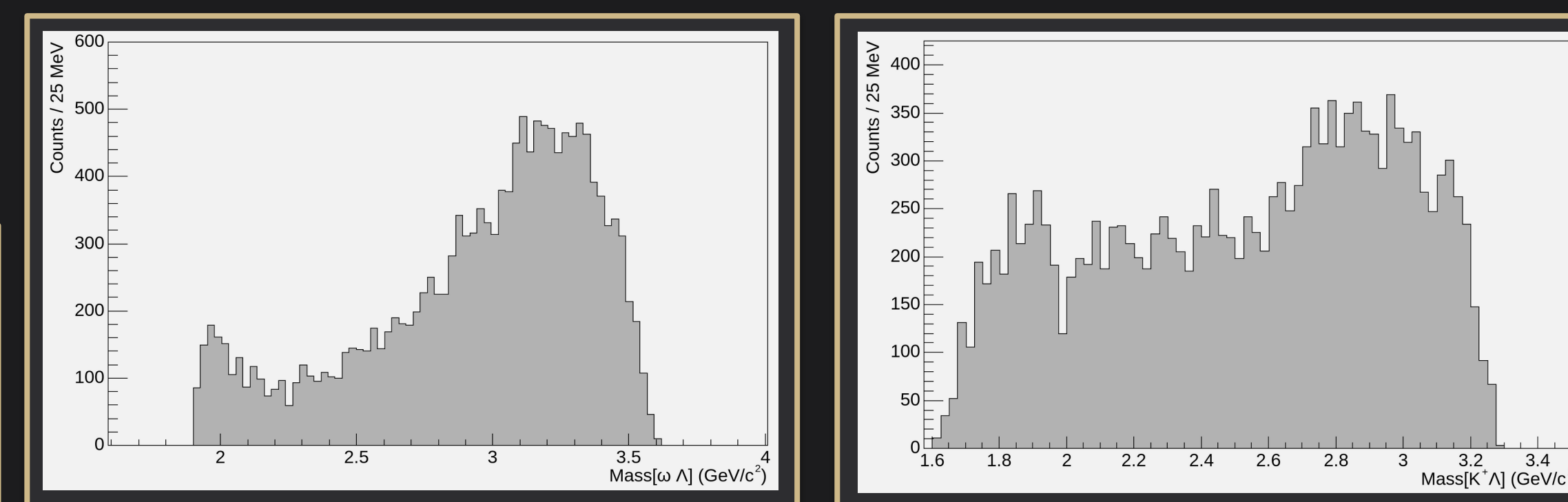
Lattice QCD predicts a rich spectrum of light and strange mesons, including states that remain experimentally unresolved. Hybrid mesons, which contain explicit gluonic excitation, are especially compelling because they lie outside the conventional $q\bar{q}$ meson picture.

The ωK^+ subsystem in $\gamma p \rightarrow \omega K^+ \Lambda$ provides a possible channel for studying strange hybrid candidates, including states analogous to a K_1^{hyb} that may decay to ωK^+ .

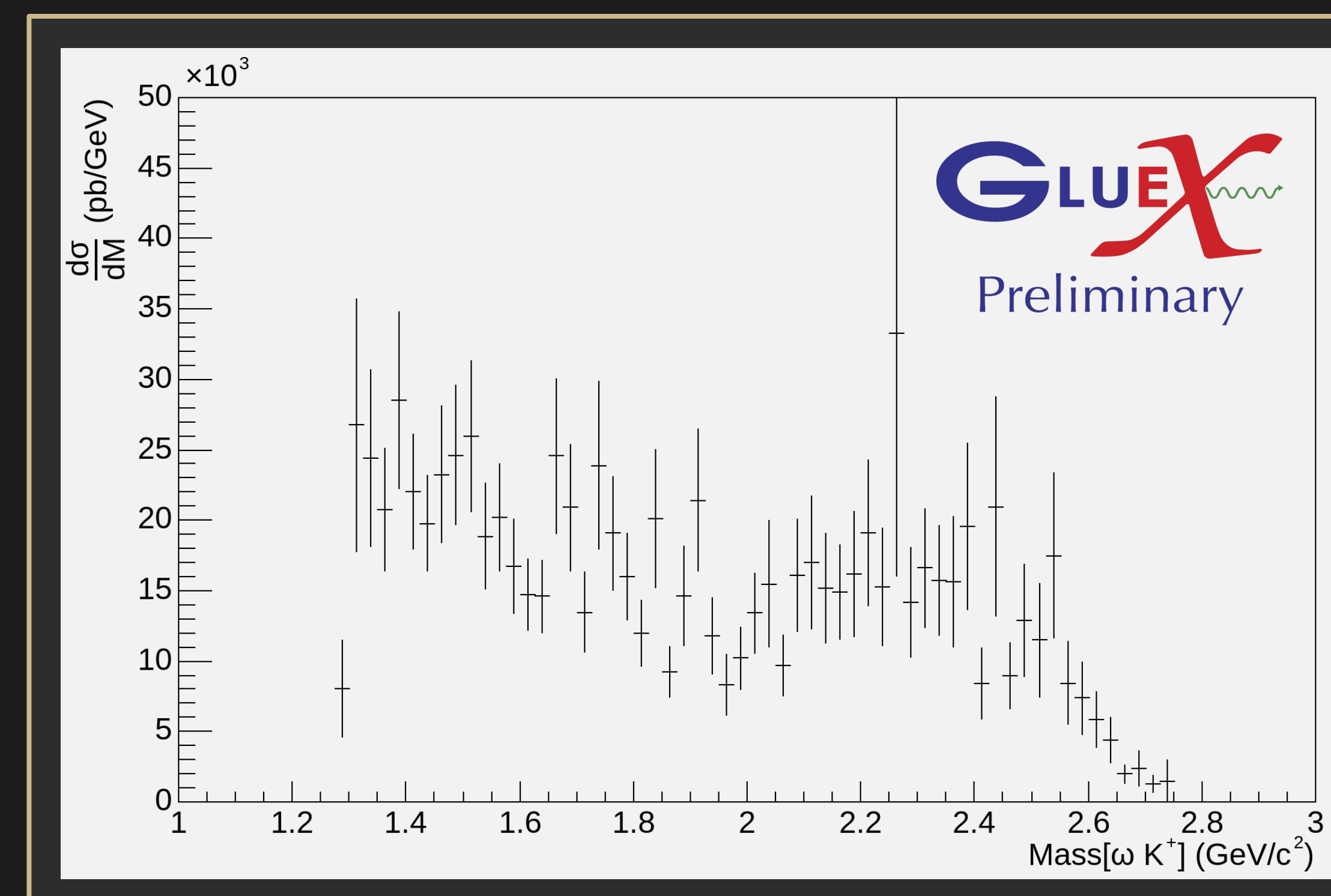
Event Selection

In addition to standard kinematic and statistical selection criteria, two background-reduction methods are applied: ω sideband subtraction and a Λ flight-significance requirement.

The Λ flight-significance cut exploits the displaced Λ decay vertex, providing a detached-vertex analogue of a proton z-vertex selection.

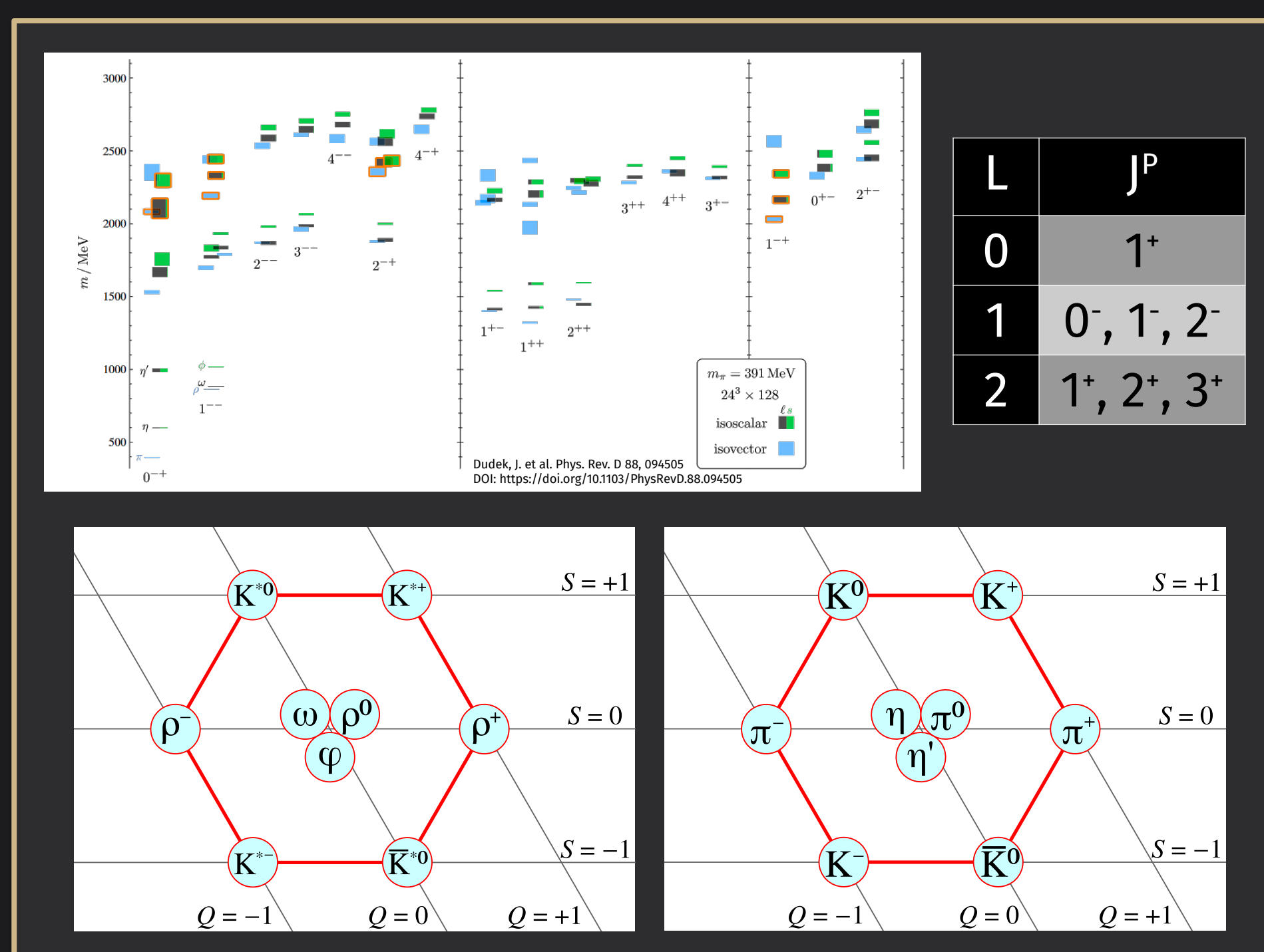


Cross Section



Summary & Outlook

- Approximately 31,000 ωK^+ events are extracted from GlueX Phase-I and Phase-II data, forming the largest photoproduction study of this subsystem to date.
- A preliminary differential cross section has been obtained, with further systematic studies needed before finalizing the result.
- Additional DIRC studies are also required to understand the observed yield loss and assess its impact on future analyses.



Selection Overview	
Confidence Level	CL > 10 ⁻⁵
PID	TOF, DIRC*
Prompt Peak	\Delta t_B < 2 ns
Λ Flight Significance	Significance > 0.5
Photon Shower Quality	Q > 0.5
4-Momentum Transfer	t_{\omega K^+} < 1 GeV ²
Λ Mass Selection	1.1 GeV < m_{\Lambda} < 1.135 GeV
Coherent Peak, Best Combo Selected	

