Isolation of the φ-meson from $e\,p \rightarrow e\,p\,K^{+}\,K^{-}$ events

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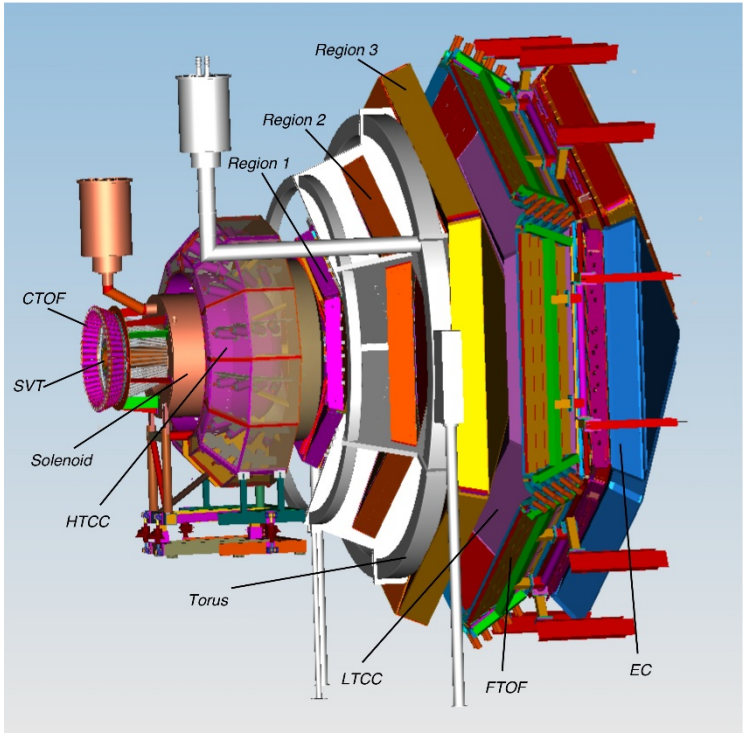
Introduction

- We are interested in exotic meson states going $\rightarrow K^+ K^- \pi$, to complement GLueX results (Sebastian Cole)
- The reaction we are interested in:

$$e\,p \rightarrow e\,p\,K^+\,K^-$$

- Evaluating data from the CLAS12 detector and compiling multiple events together.
- We start with a known meson state $\varphi \rightarrow K^+ K^-$
- Adding π later



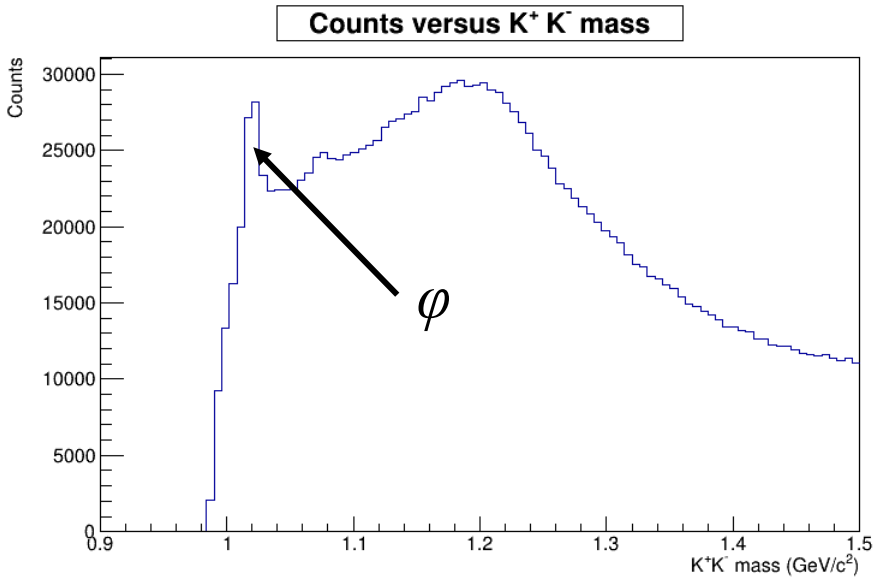
CLAS12 Detector

Programs and procedures

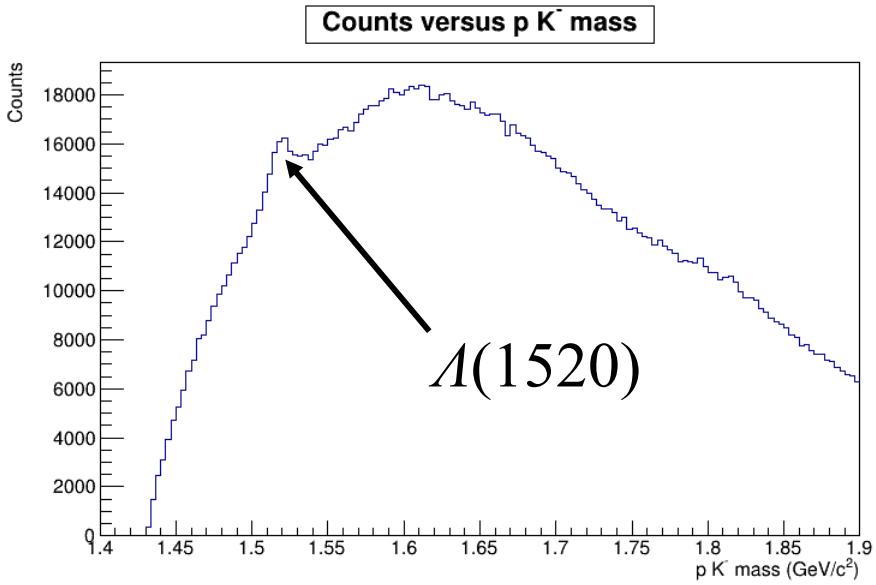
- ROOT (from CERN) to visualize, plot, and fit data
- C++ as the main language for reading data files and interacting with ROOT libraries
- Data compiled from 112 runs

$\varphi \rightarrow K^+ K^-$

- The peaks are not well defined.



$\Lambda(1520) \rightarrow p\ K^-$

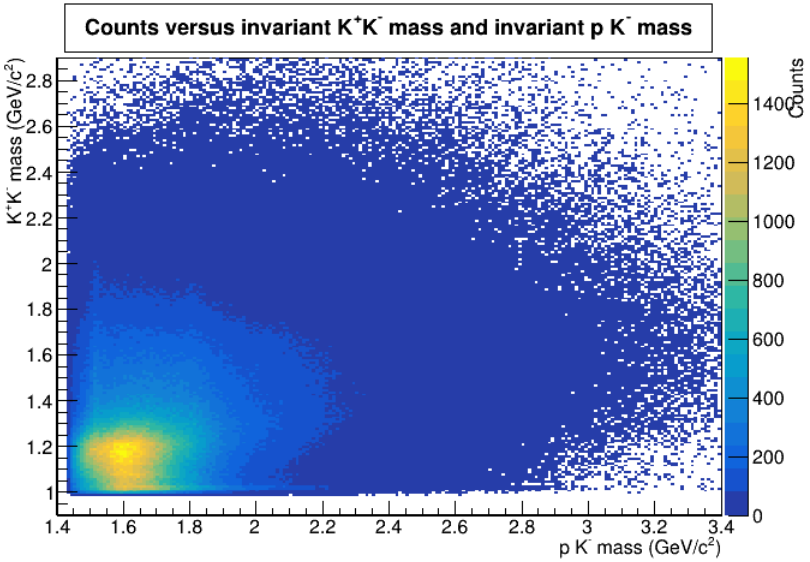


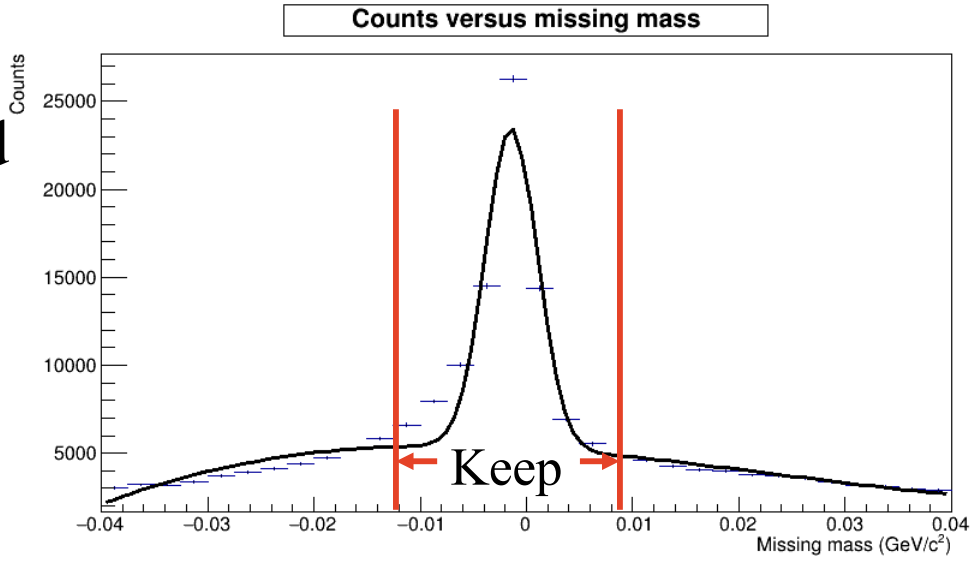
ASU

- There is not a lot of information displayed as we should see horizontal and vertical stripes for different meson states, so the graph needs to be cleaned.
- Looking at the reaction:

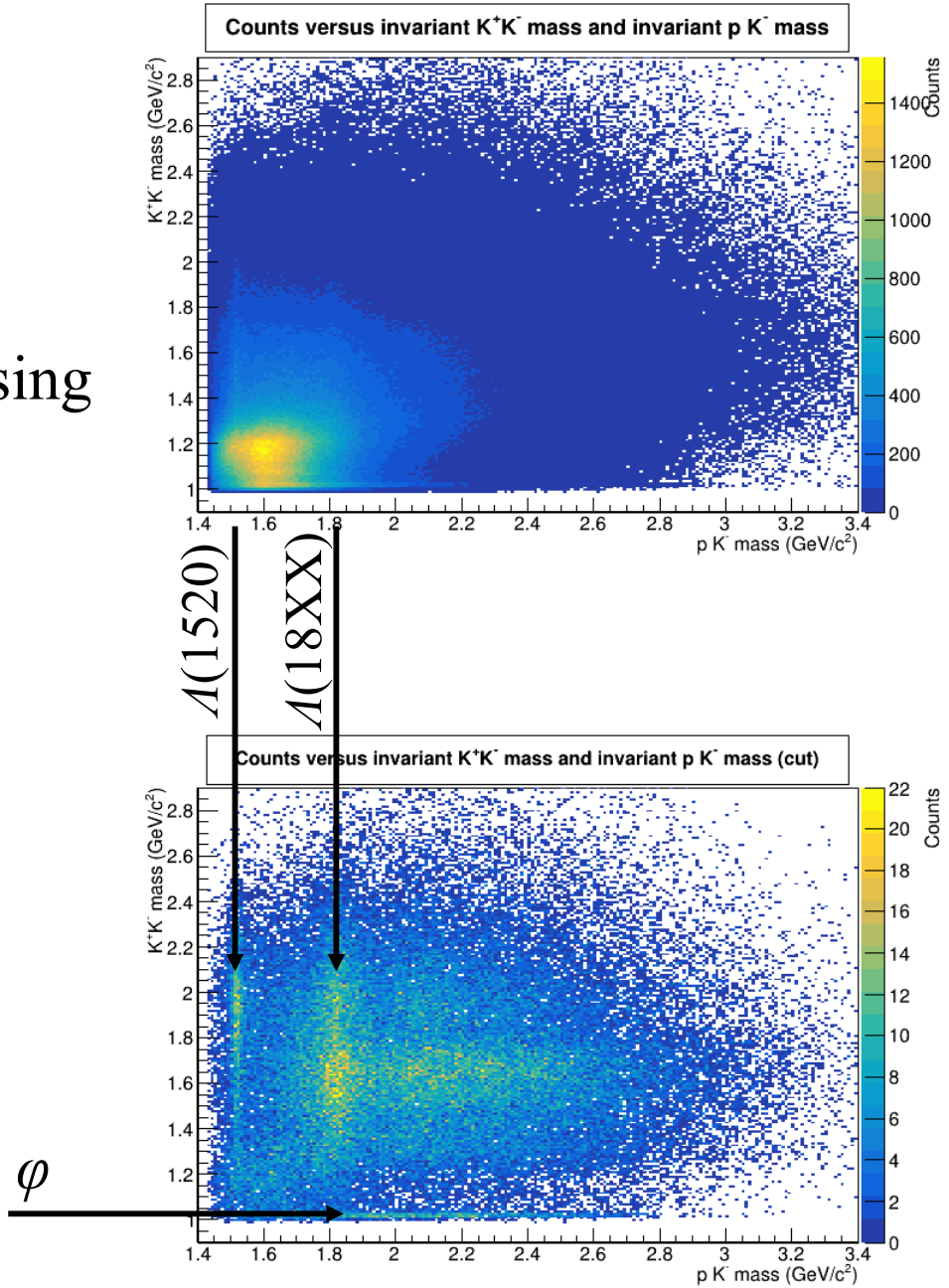
$$e\,p \rightarrow e\,p\,K^{+}\,K^{-}\,X$$

- Where X is not seen (missing)
- X should be zero, so we fit its plot with a Gaussian and take three standard deviations away from the mean cutting anything outside the red lines.

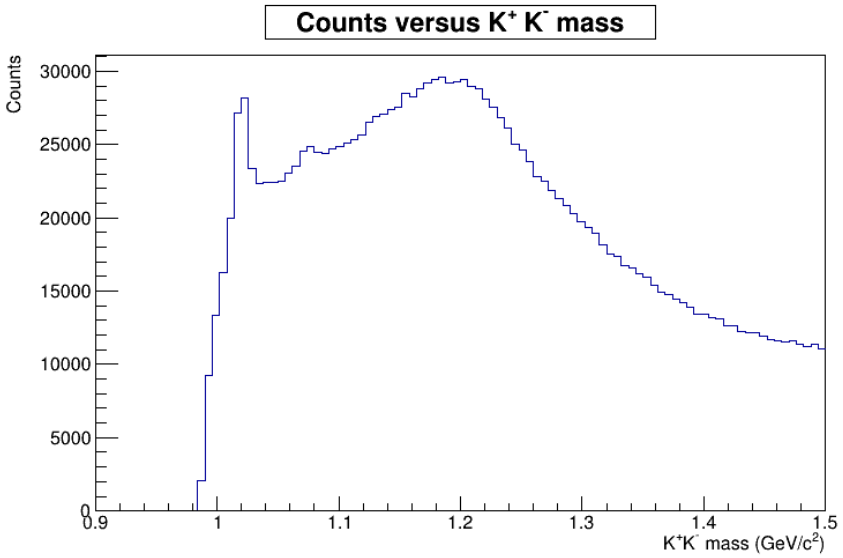


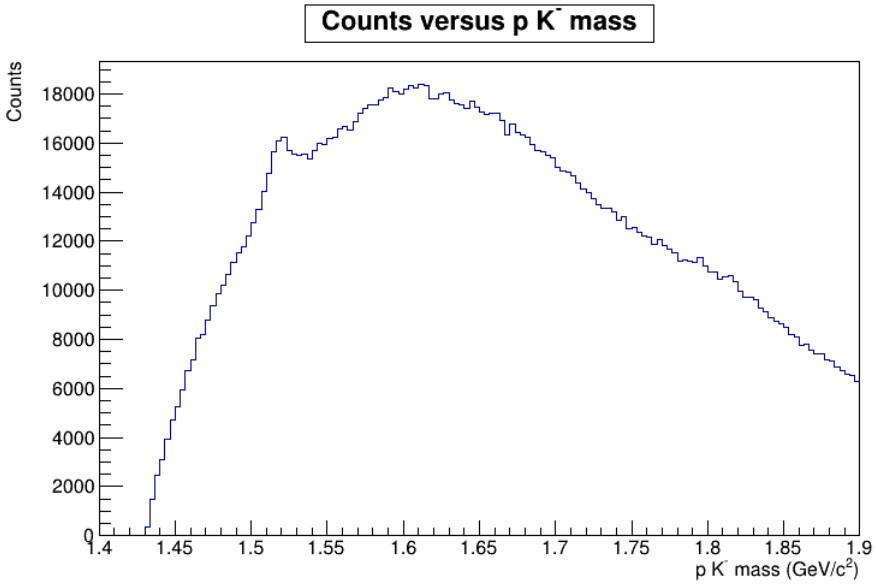


- After the cut from the missing mass. Individual particles can be distinguished from each other.
- Lambda 18XX stands for Lambda 1800 1810 1820 1830

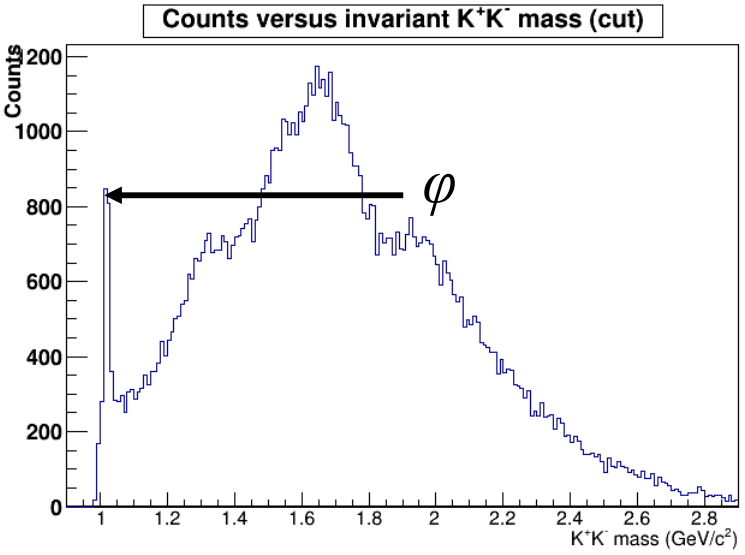


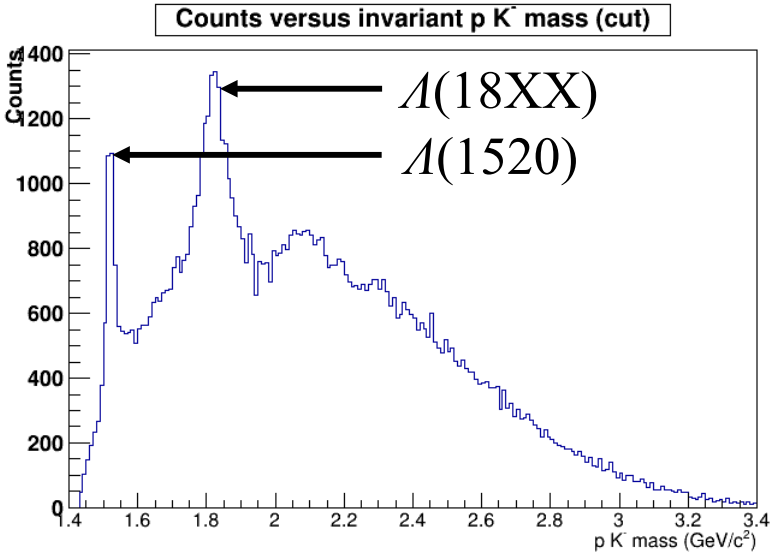
Before cut





After cut





- We can now see distinguished peaks ☺

Future directions

- Add π^0 from $\pi^0 \rightarrow \gamma\ \gamma$
- Add photon interactions into the code
- Want $\eta'_1 \rightarrow K^*\ K$, where $K^* \rightarrow K\ \pi^0$