Systematic error due to production spectrum distortion in the momentum bite.

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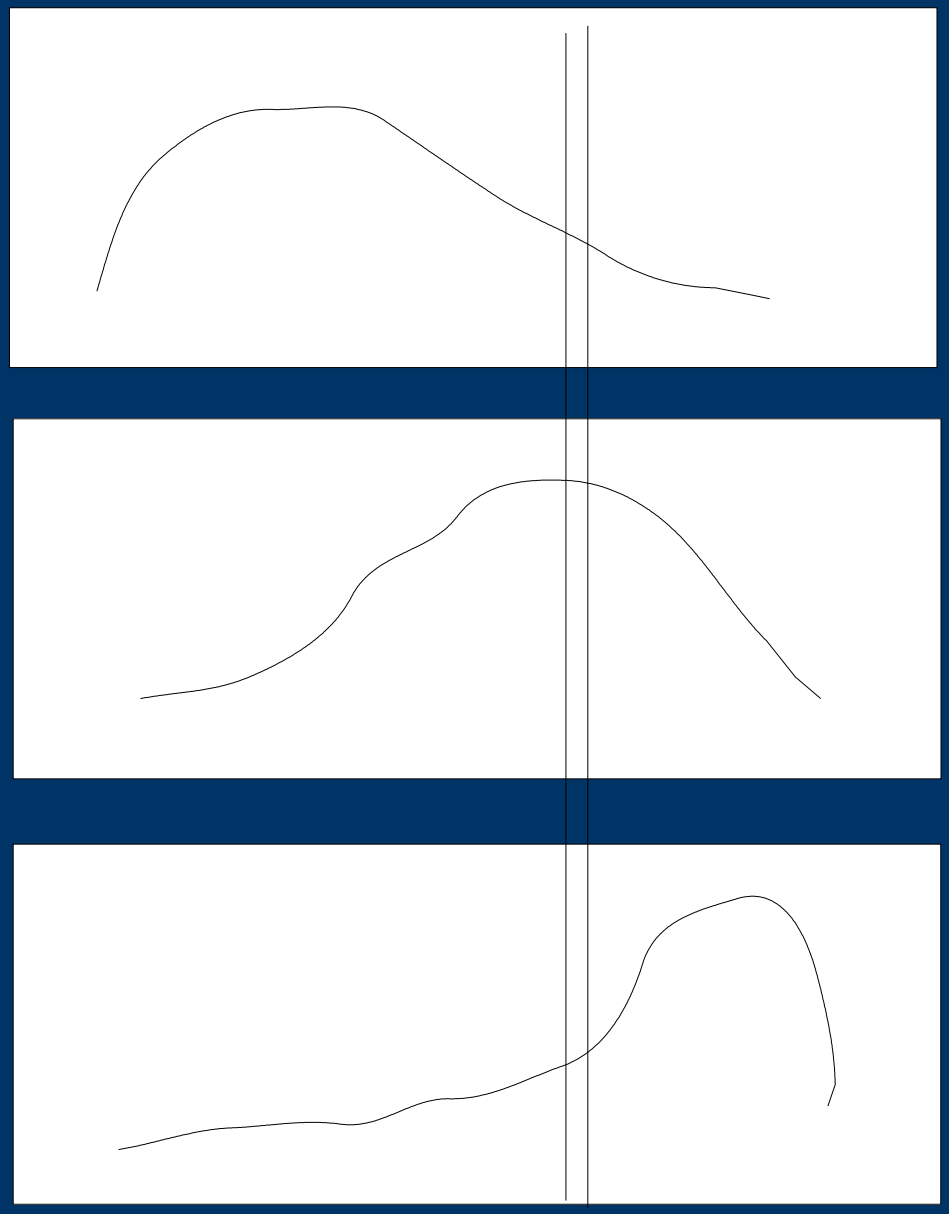
For the kaon mass measurement by RICH ring diameter if we get enough statistics to study the relative masses between the pion, kaon and proton peaks we will have to understand the systematic errors

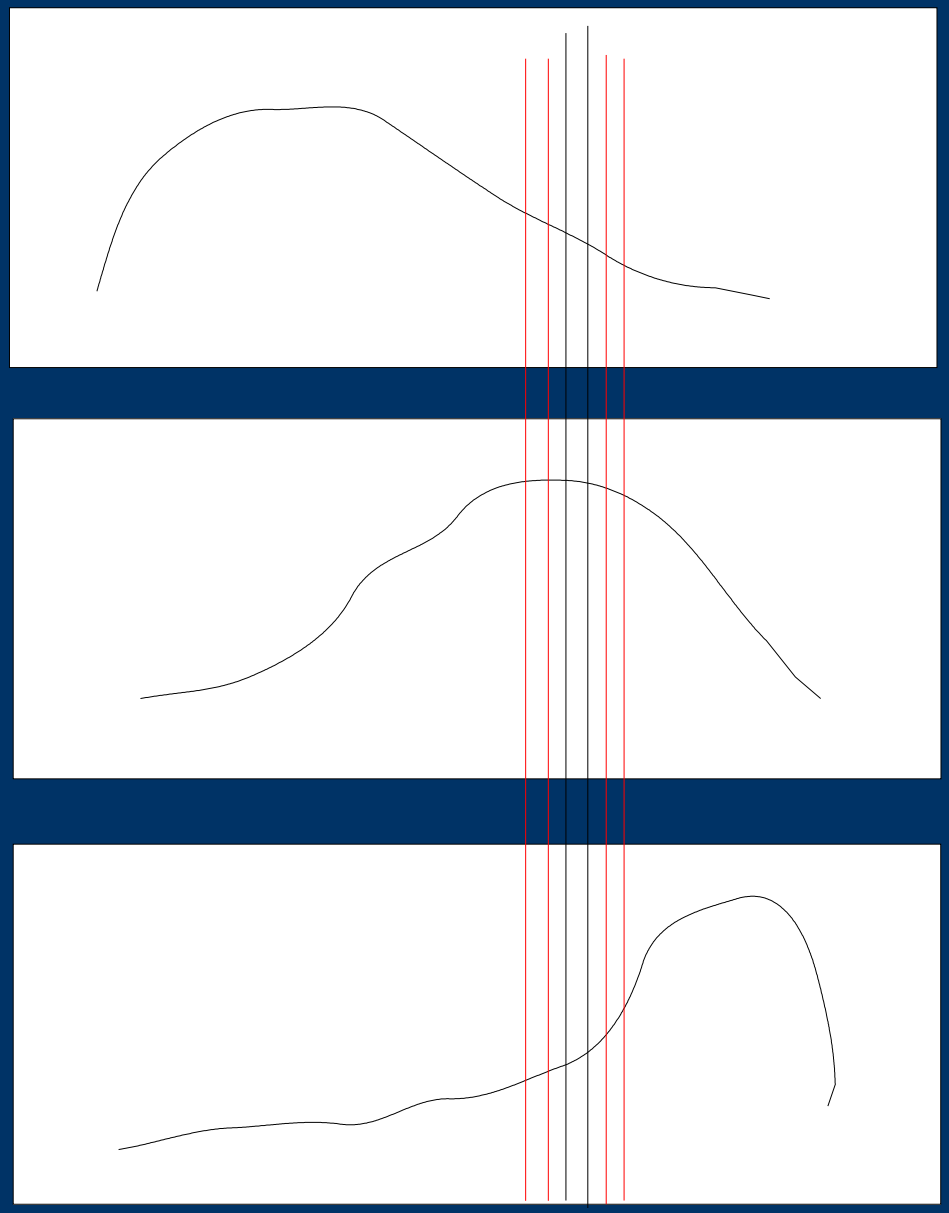
I present here the dominant source of systematic errors and the measurement needed to understand it.

For a small momentum bit, the three particles (proton, pion and kaon) production spectrum might be very different, see sketch:



In the top box the effective spectrum would be lower than the nominal; the middle box which is almost flat in the momentum bite would be consistent with the midpoint momentum of the bite; while in the bottom box the effective momentum would be on the high side of the momentum expected.

This would be the dominant systematic error. However; it can be eliminated by taking data at two other momentum settings of higher and lower momentum (shown by red lines).



Even if the width of spacing is not identically the same, just by observing the different in the spacing of the proton, pion and kaon RICH ring would tell us how the momentum bite was being distorted inside the original momentum bite.

Suggested runs:

- Suggest we have 3 momentum runs:
  - 59 GeV/c
  - 62 GeV/c
  - 56 GeV/c
- Take an equal number of events in all 3 runs
- Take an equal sample of protons, pions and kaons at each momentum.

- Since we cannot measure the momentum on an event by event basis then this data taking can be at the same time for the Magnetic Field off runs for chamber alignment.