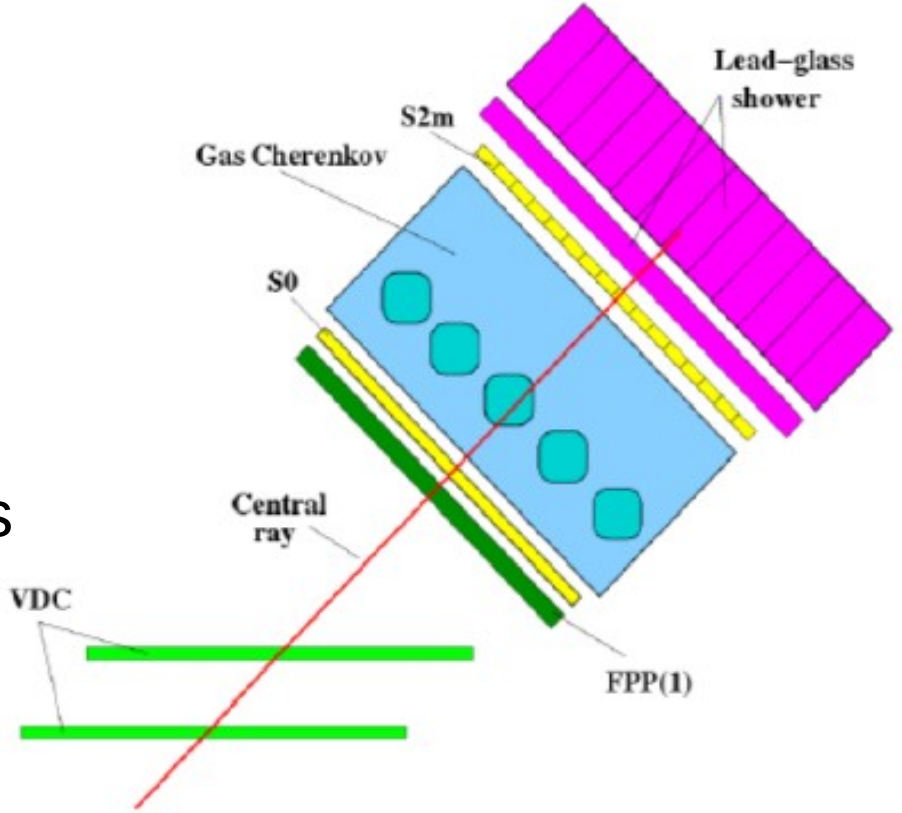
Usage of Straw Chamber in HRS tracking

Longwu Ou

- VDC is main tracking detector in HRS
  - Used to measure hit position and track direction at focal plane
  - Optimized for precision measurement of single tracks
  - Multi-cluster events in at least one plane cause u-v matching ambiguity and bad track reconstruction

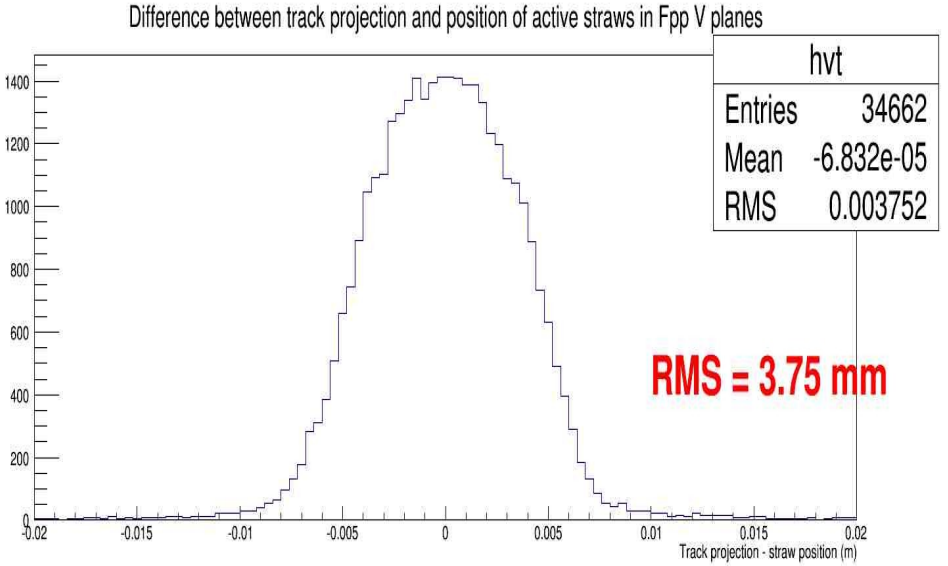


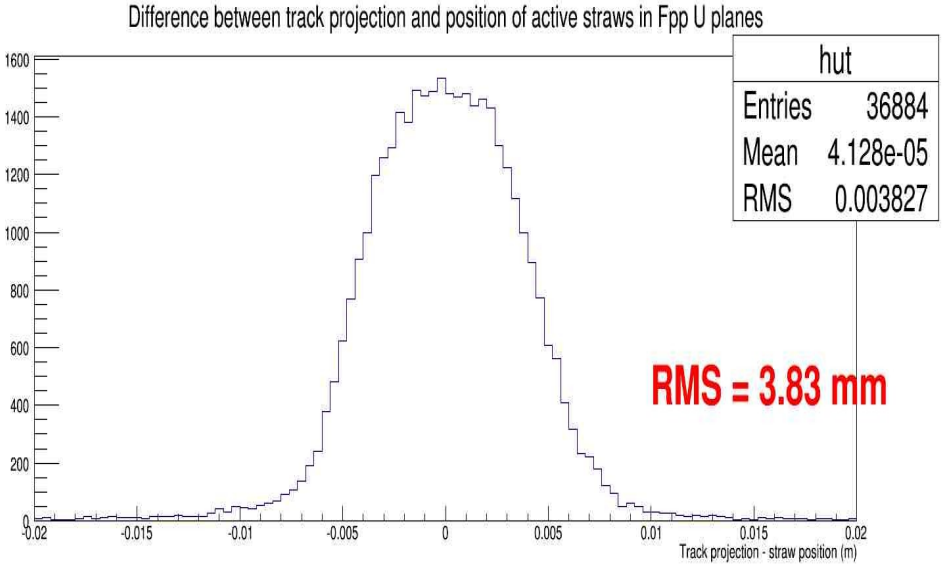
Track Reconstruction Efficiency of HRS

- A significant fraction (a few percent) of events have more than one cluster in VDC and could not be reconstructed
  - Large systematic uncertainty of track reconstruction efficiency
- GMp experiment aims to precisely measure e-p elastic cross section
  - Reliable reconstruction of multi-cluster events are needed to reduce uncertainty of track reconstruction efficiency to 0.5 percent
  - An additional chamber will allow us to reduce a number of non-reconstructed events by a factor of 10 and insure an accurate measurement of the absolute cross section
  - Straw chamber is added as a third tracker for GMp experiment

Calibration of Straw Chamber

- Structure of straw chamber:
  - Three V planes and three U planes, each compose of straws of 1cm diameter
- Calibration of straw chamber with “gold events”: electron events with exactly one cluster in all VDC planes
  - Track projection are compared with position of active straw in each planes of straw chamber
  - A resolution of about 4mm are achieved





Analysis of Multi-Cluster Events with Straw Chamber

- Select events with one cluster in bottom VDC and Fpp but more than one clusters in top VDC
- Reconstruct track using clusters in bottom VDC and Fpp (disregarding clusters in top VDC)
- Reconstructed track is then used to calculate target and kinematic variables

Fraction of one cluster events in VDC:
$N_{single}/N_{total}=21790/23831=0.914$