

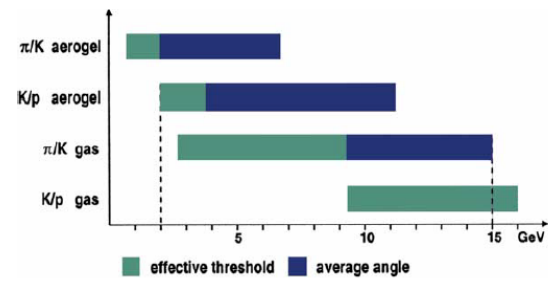
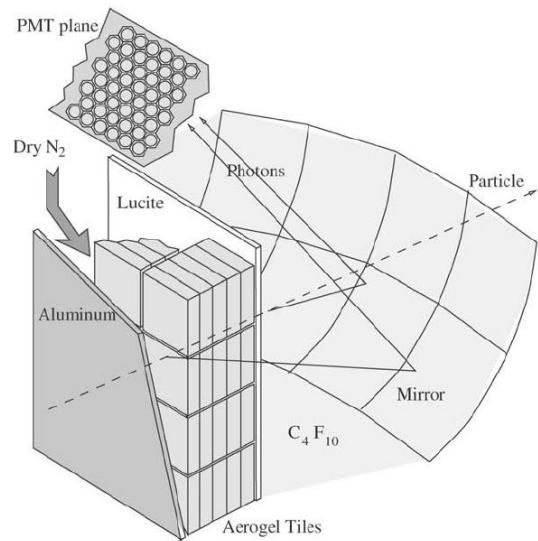
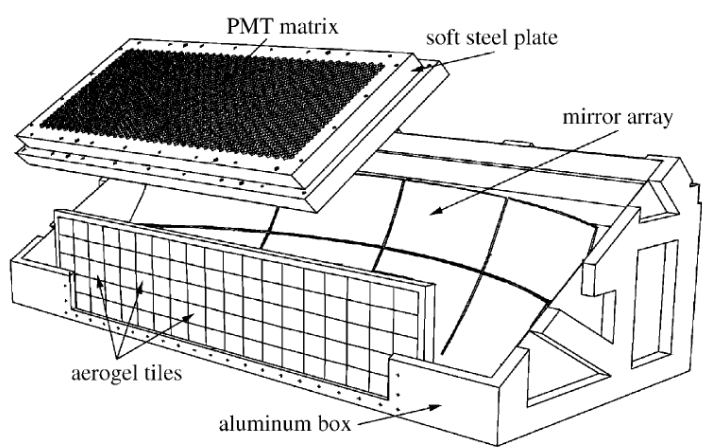
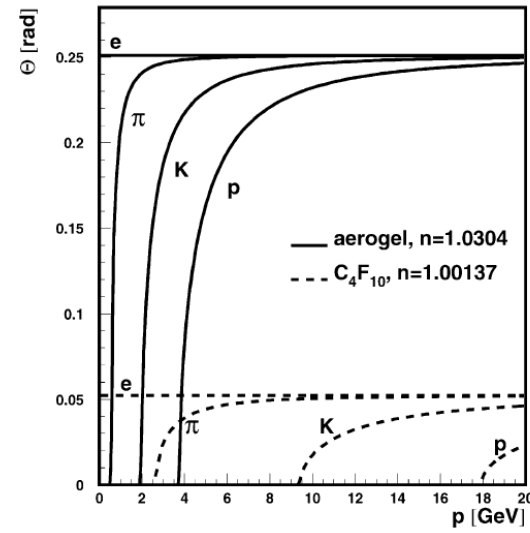
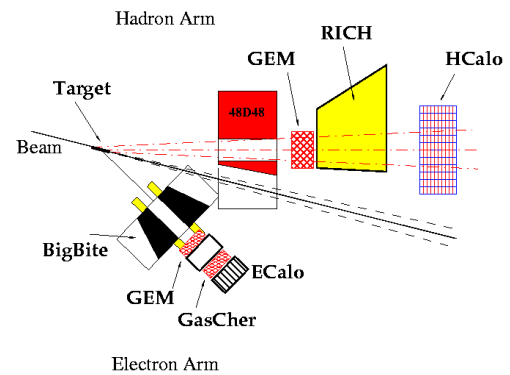
RICH Detector for SBS

Andrew Puckett, UConn

2/5/2014

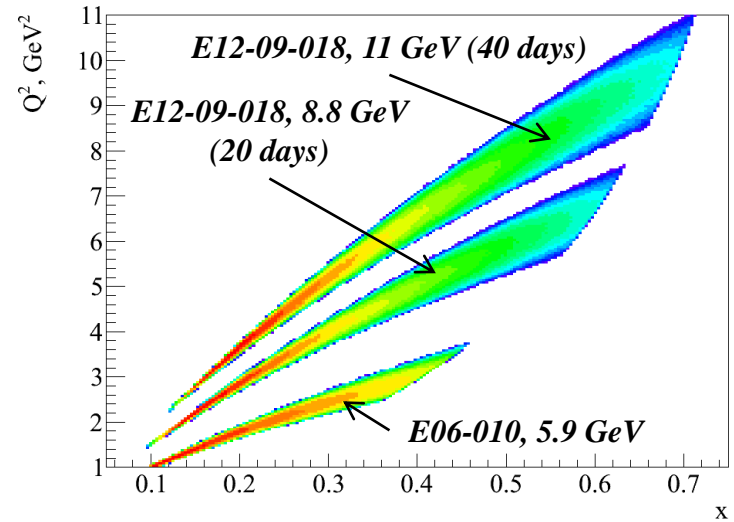
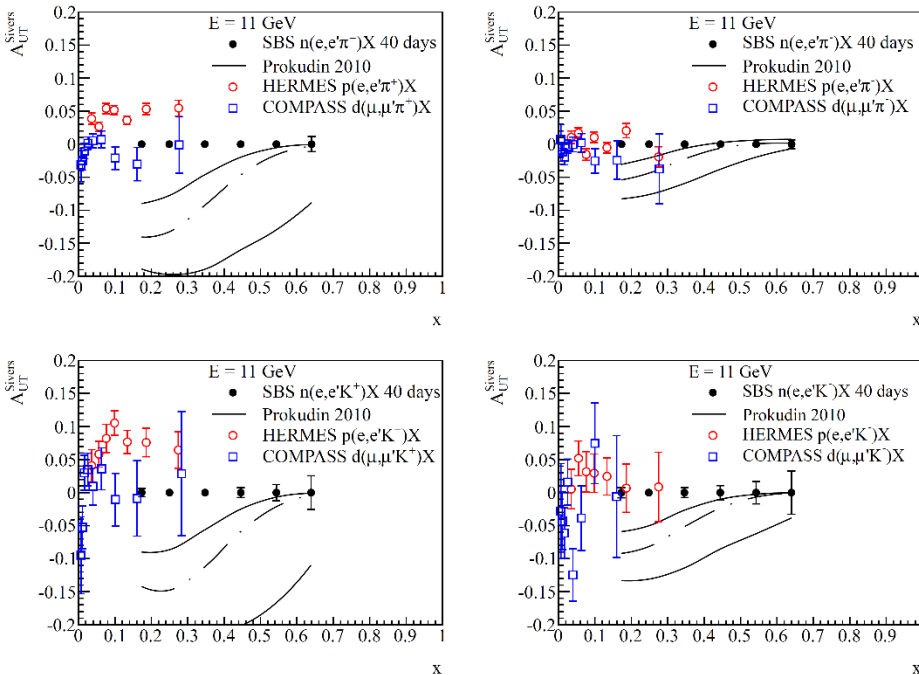
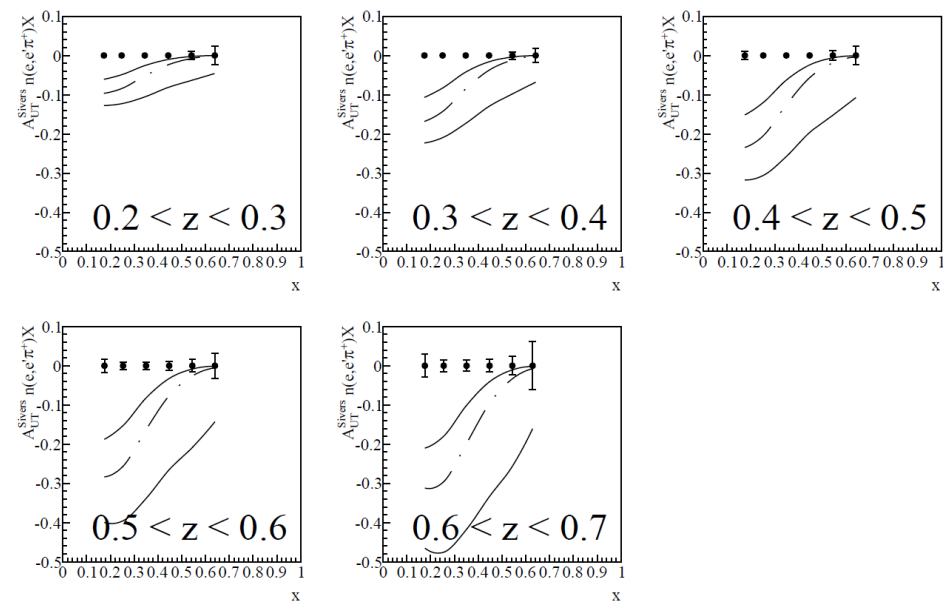
RICH Detector for SBS

- Approved experiment E12-09-018 (SIDIS/neutron transversity/TMDs) requires efficient/pure hadron PID
- Proposed solution: Re-use HERMES RICH detector
 - Dual-radiator (aerogel+heavy gas) design allows $\pi/K/p$ separation at 4σ level from 2-15 GeV
 - Two identical detector halves
 - Acceptance (per half) has $\sim 3:1$ vertical/horizontal aspect ratio, roughly matched to SBS acceptance
- Status:
 - One detector half (box, aerogel, mirrors, PMT matrix, PMTs) plus aerogel radiator from the second half in storage at UVA since ~ 2009
 - UConn group (A. Puckett, E12-09-018 co-PI) assumes responsibility/seeks funding for RICH preparation
 - Shipment to UConn for testing and preparation for Hall A experiments is in the planning stage
 - Detailed GEANT4 simulations in progress to optimize layout for SBS



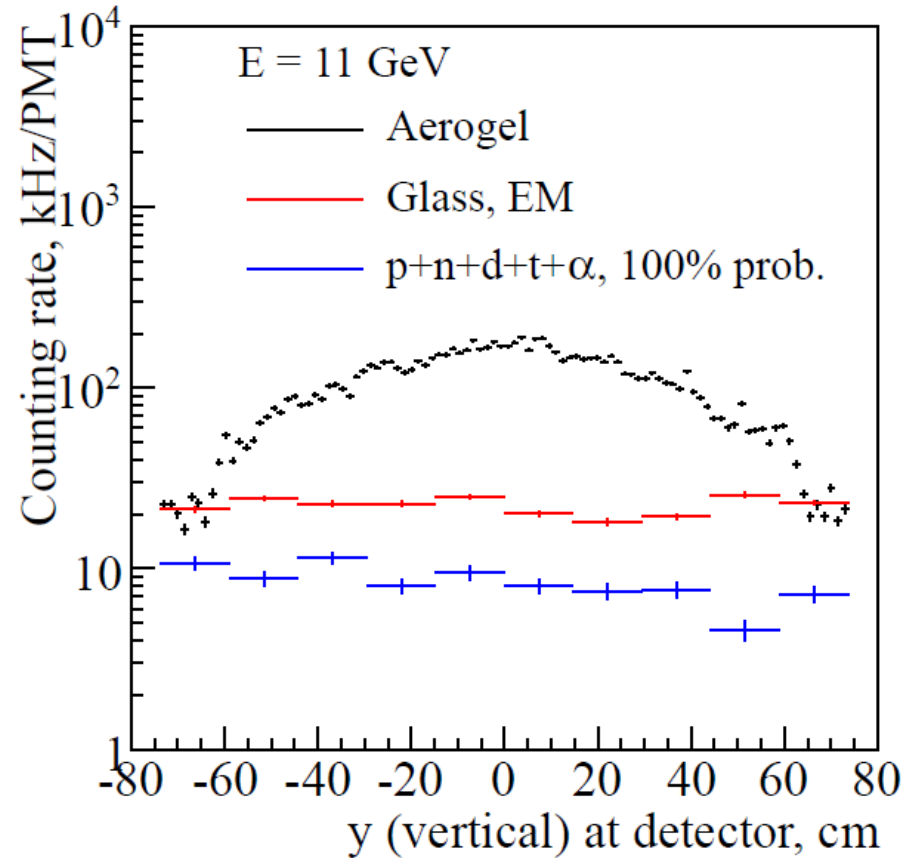
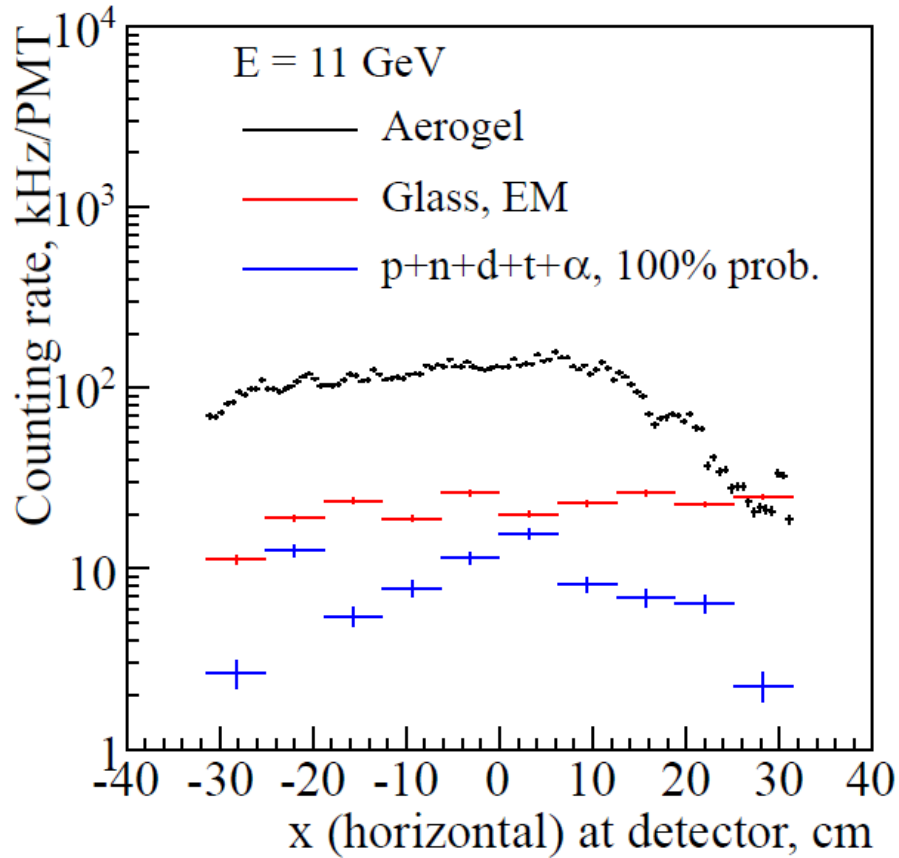
Neutron transversity in SIDIS

- JLab E12-09-018—approved for 64 beam-days by JLab PAC38, A- scientific rating
- Transverse target single-spin asymmetries in ${}^3\text{He}(e,e'h)X$ ($h=\pi^\pm, 0, K^\pm$)
 - Collins and Sivers effects
 - Precision input to global TMD extraction
- ~100X higher statistical figure-of-merit for neutron than HERMES proton data
- First precision measurements in a multi-dimensional kinematic binning



- Data at two beam energies provide a range of Q^2 at fixed x
- RICH preparation effort starting at UConn

π^\pm, K^\pm neutron Sivers asymmetries compared to HERMES, COMPASS, and Jefferson Lab



- Above: RICH background rates in E12-09-018 from GEANT3
- ~ 100 kHz/PMT
- 0.1% occupancy for 10 ns (offline) timing window