

E04-108: GEp-III

Hall C Strikes Back

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Outline

GEp-III: Polarization-Based Measurement of G_E^p/G_M^p

- ▶ Overview
- ▶ Introduction
 - * *Motivation*
 - * *Methodology*
- ▶ Status & Developments
 - * *Focal Plane Polarimeter*
- ▶ Summary

GEp-III: Overview

Measurement of Proton Form Factor Ratio G_E^p/G_M^p

▶ 3 Kinematic Points: $Q^2 = 4.8, 7.5 \text{ \& } 9 \text{ GeV}^2$

* *two new, one reference*

▶ Elastically Scattering e^- off p

▶ Polarization-Based

* *polarized e^- beam, unpolarized p target*

▶ Expected to Run Late 2006

* *likely with 2γ experiment E04-019*

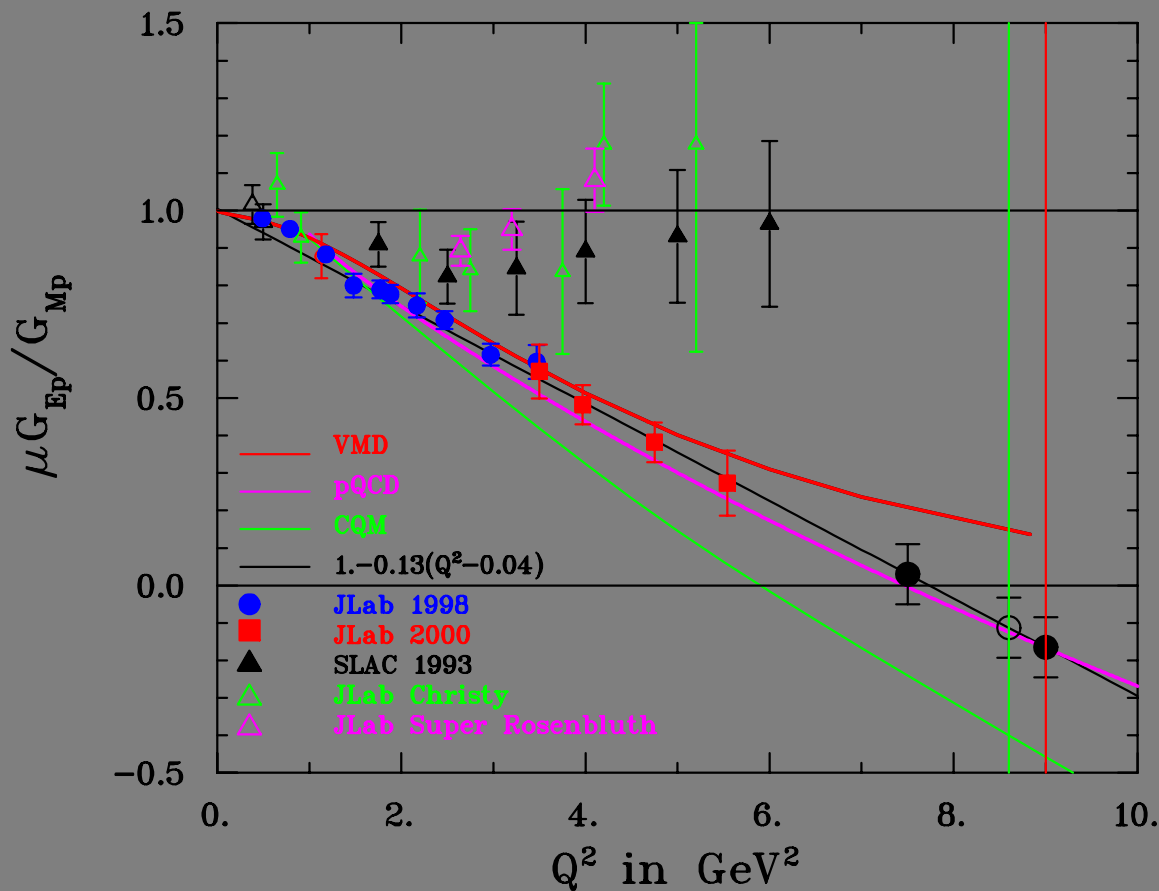
▶ Significant New Equipment

* *BigCal lead glass calorimeter (e^-)*

* *Focal Plane Polarimeter for HMS (p^+)*

GEp-III: Motivation

Natural Progression after two Hall A Experiments:

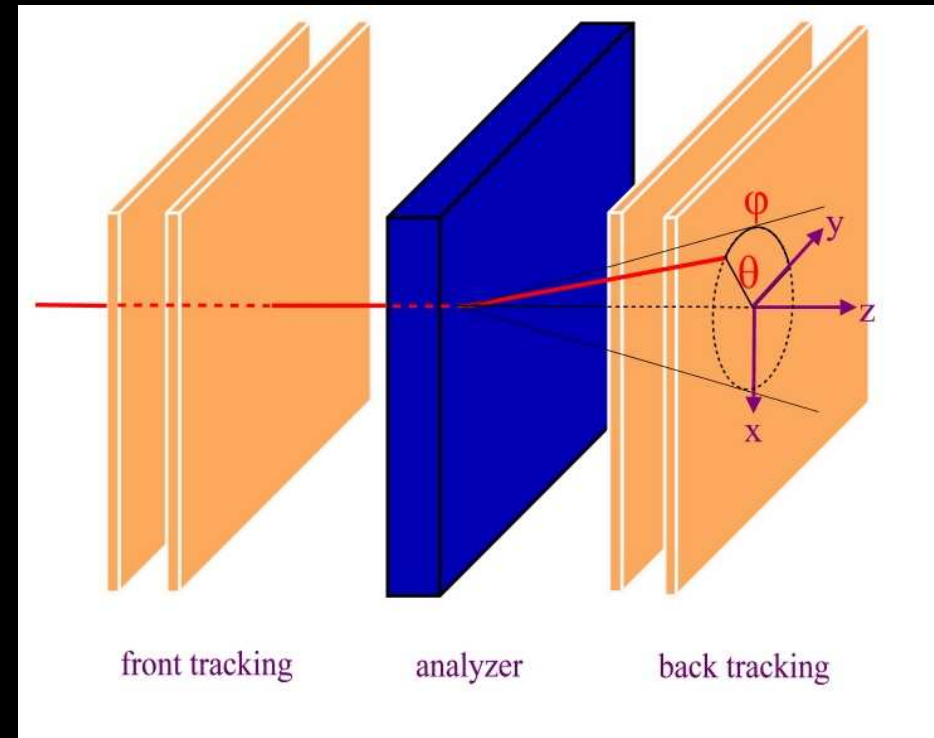


- ▶ Higher Energy Kinematics
 - * $Q^2 = 7.5, 9 \text{ GeV}^2$
- ▶ Not Previously Measured via Polarization
- ▶ Additional Data on Pol-Unpol Discrepancy

GEp-III: Methodology

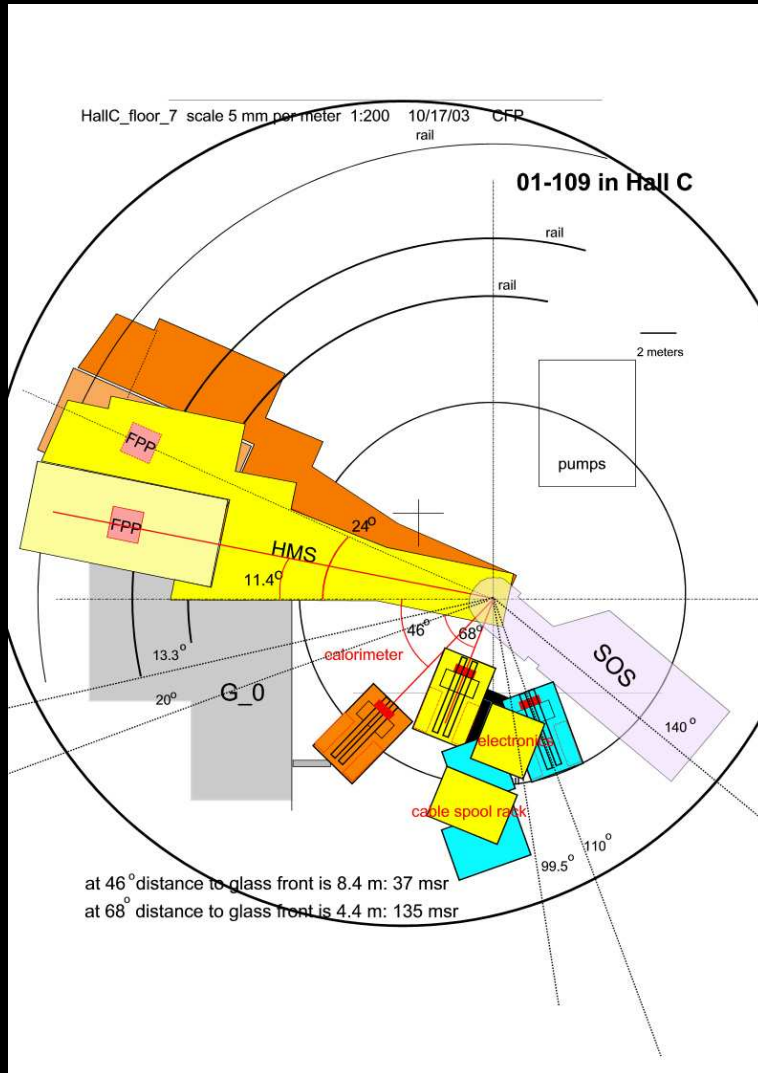
Polarized Elastic Scattering

- ▶ Polarized e^- Beam, Unpolarized p Target
 - * possibly coincidence measurement
- ▶ Induced Recoil Polarization in Ejected p
 - * measured in polarimeter
- ▶ Extract G_E^p / G_M^p
 - * helicity dependence of transverse polarization



GEp-III: Setup & Equipment

Detect Scattered e^- and Ejected \vec{p}



▶ BigCal Calorimeter

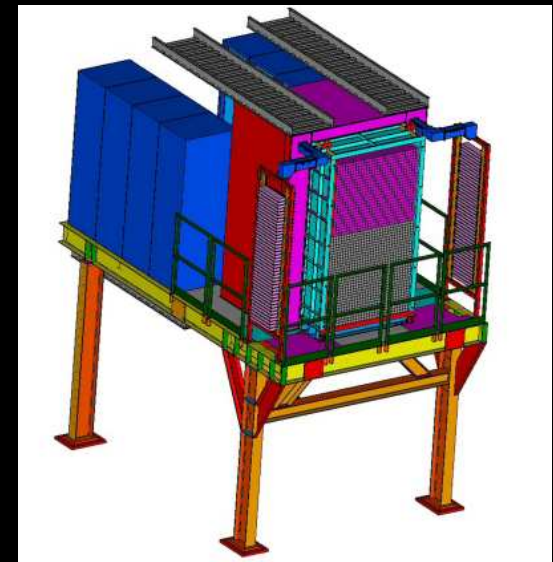
- * *detect scattered beam e^-*
- * *new*

▶ HMS with Focal Plane Polarimeter

- * *HMS detects ejected proton*
- * *FPP measures p polarization*
- * *new, replaces Cerenkov*

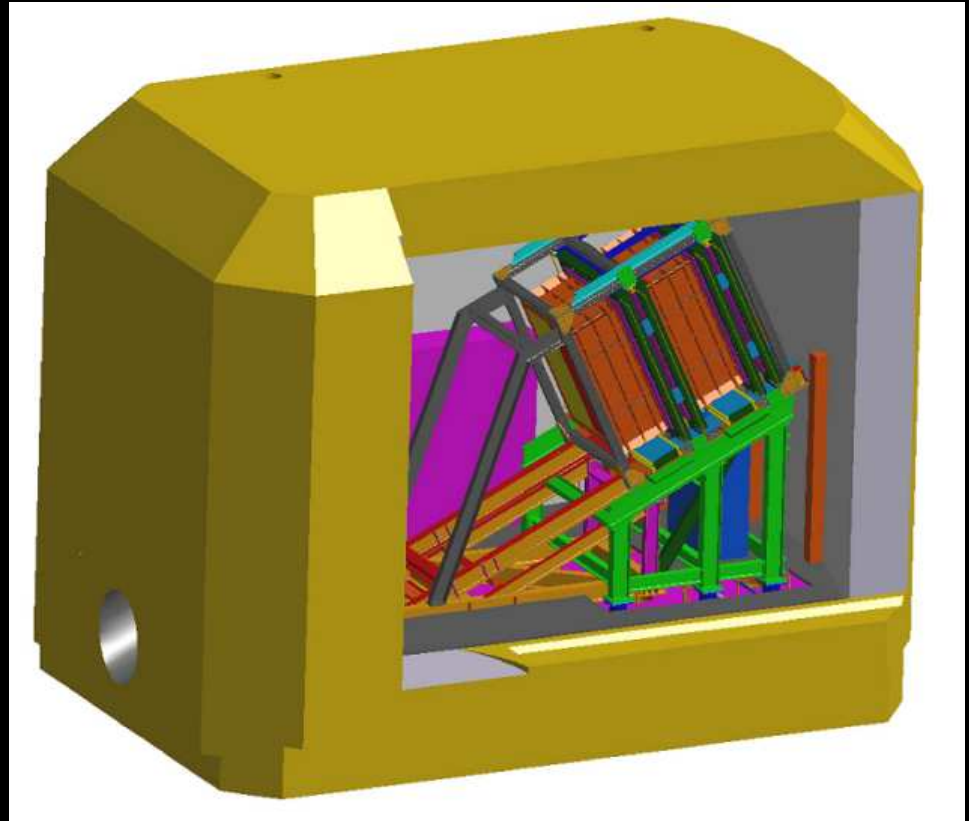
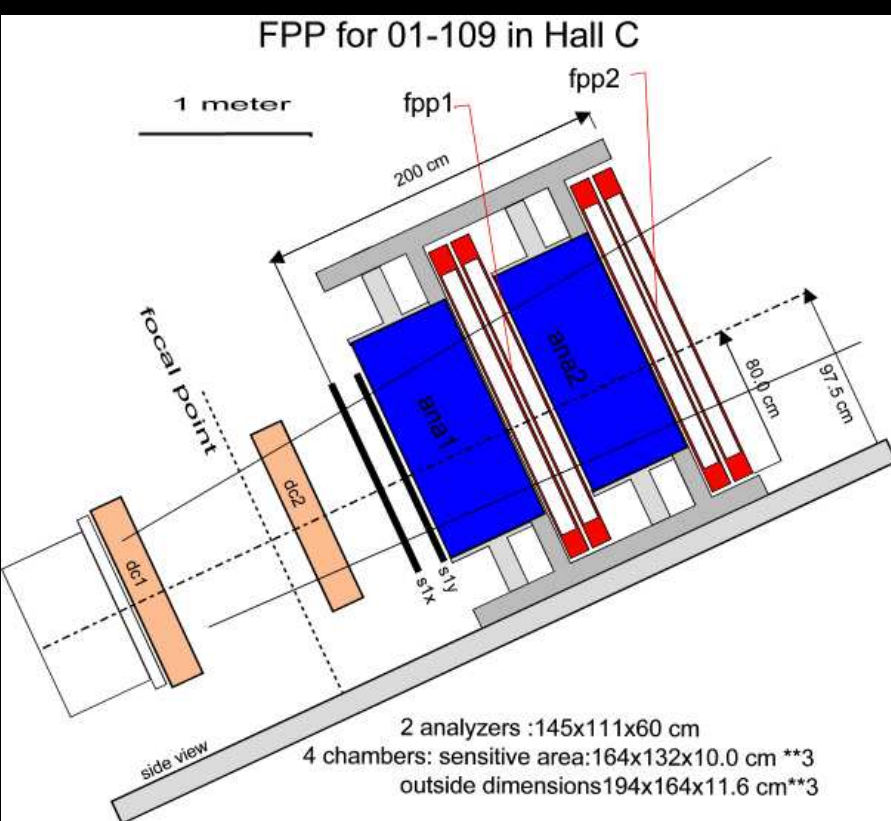
▶ Multiple Angles for Both

BigCal



- ▶ Event Time, Energy & Position
- ▶ Assembly Completed
- ▶ Final Cabling after Hall A G_E^n
- ▶ Testing in Progress

GEp-III: Focal Plane Polarimeter



- ▶ Replaces HMS Cerenkov Detector
- ▶ Two Successive Polarimeters, Each with CH_2 Analyzer & two 3-Layer Drift Chambers
- ▶ Requires 3x Distinct Tracking

GEp-III: Focal Plane Polarimeter

Current Status of Focal Plane Polarimeter

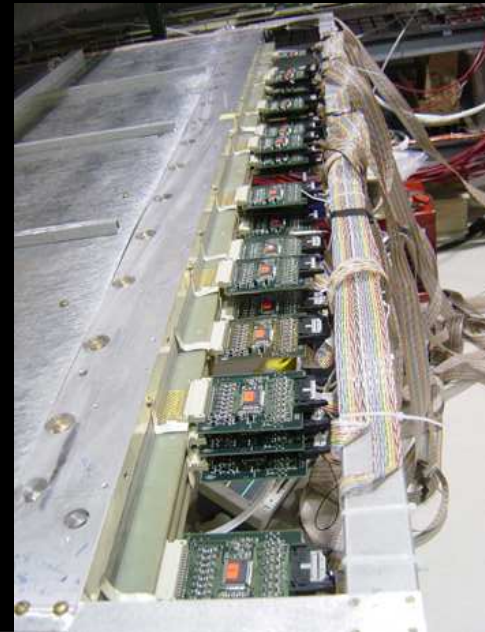
- ▶ Frame for Drift Chambers Completed
- ▶ CH₂ Analyzer & Support Structure Designed



GEp-III: Focal Plane Polarimeter

Current Status of Focal Plane Polarimeter

- ▶ Frame for Drift Chambers Completed
- ▶ CH₂ Analyzer & Support Structure Designed
 - * *awaiting requisitioning*
- ▶ DC Construction Progressing Well (Dubna)
 - * *2 chambers ready to ship, final 2 this summer*
 - * *prototype being tested on site*
- ▶ Initial FPP Software Complete
 - * *integrated into engine*
 - * *simplified version for test*



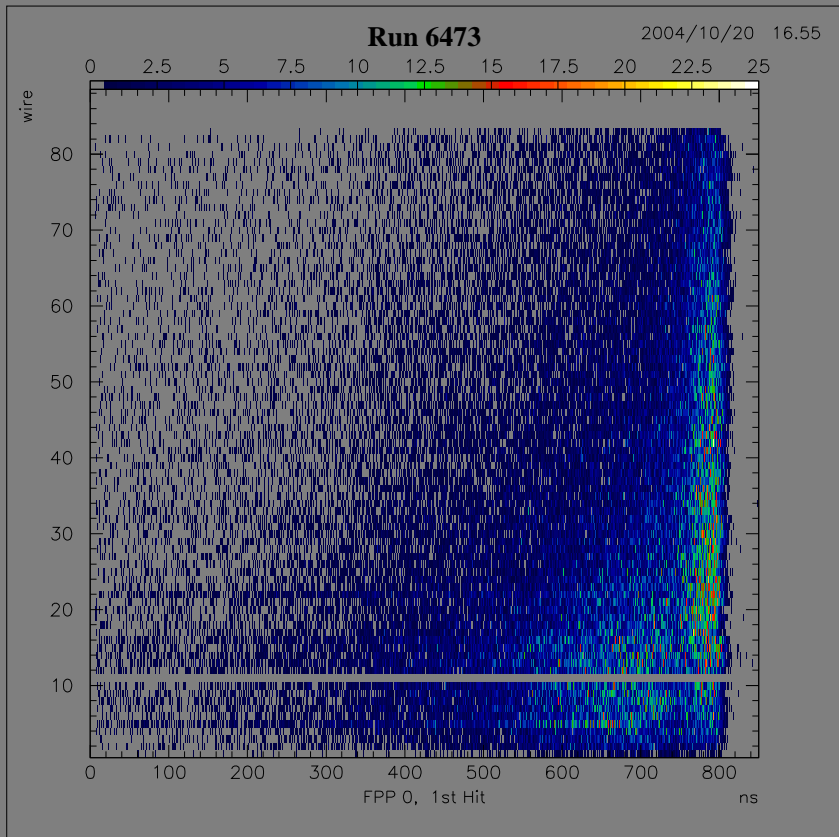
FPP DC Prototype Testing in EEL



- ▶ Testing for Function and Specs
- ▶ 2 Spare SOS Chambers for Reference
- ▶ Gen01 VETO Paddles as Cosmics Trigger
- ▶ Currently Inert Ar/CO₂ Gas, Ar/Ethane Soon
 - * *TOSP, Installation*
- ▶ FPP DC Looks Good

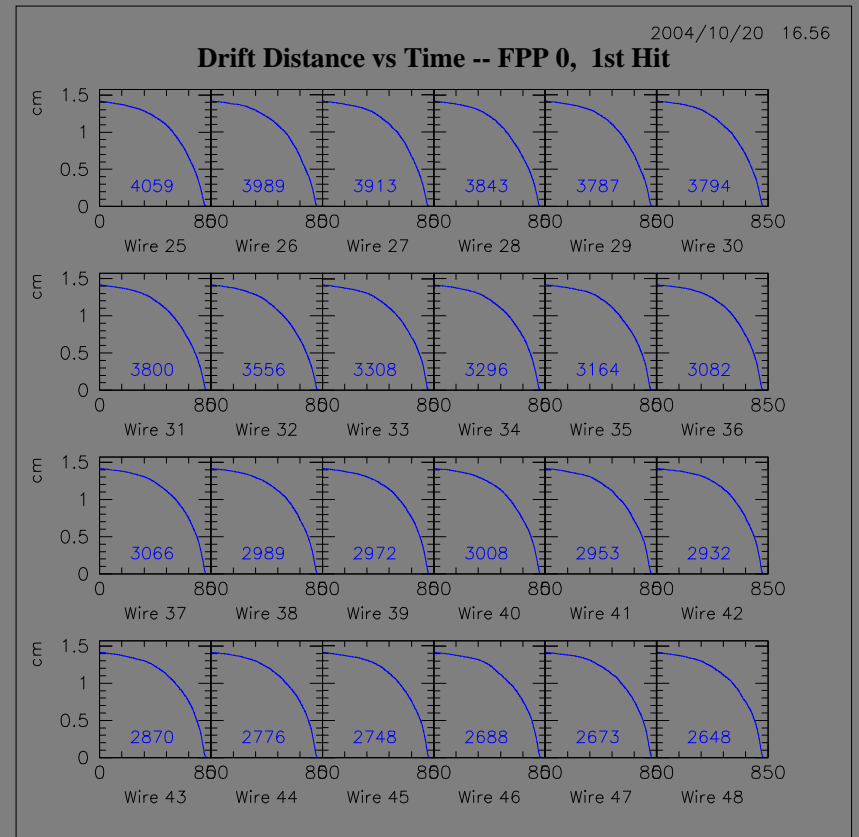
FPP DC Prototype Testing in EEL

Time Distribution of Hits



common STOP timing

Time to Drift Distance Mapping



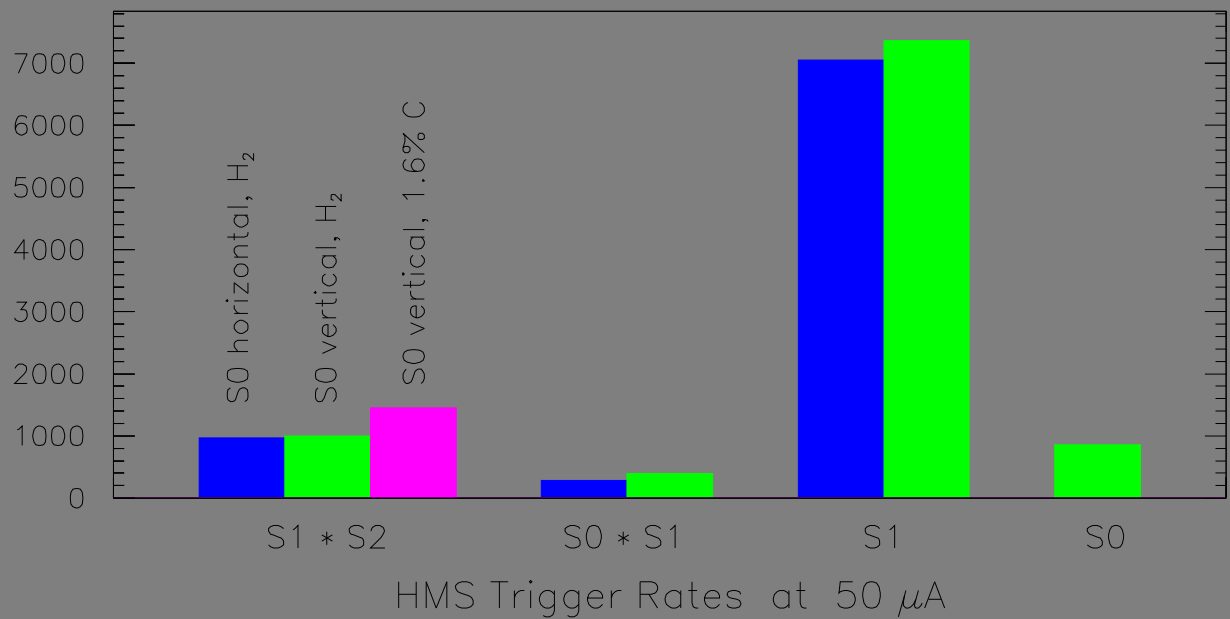
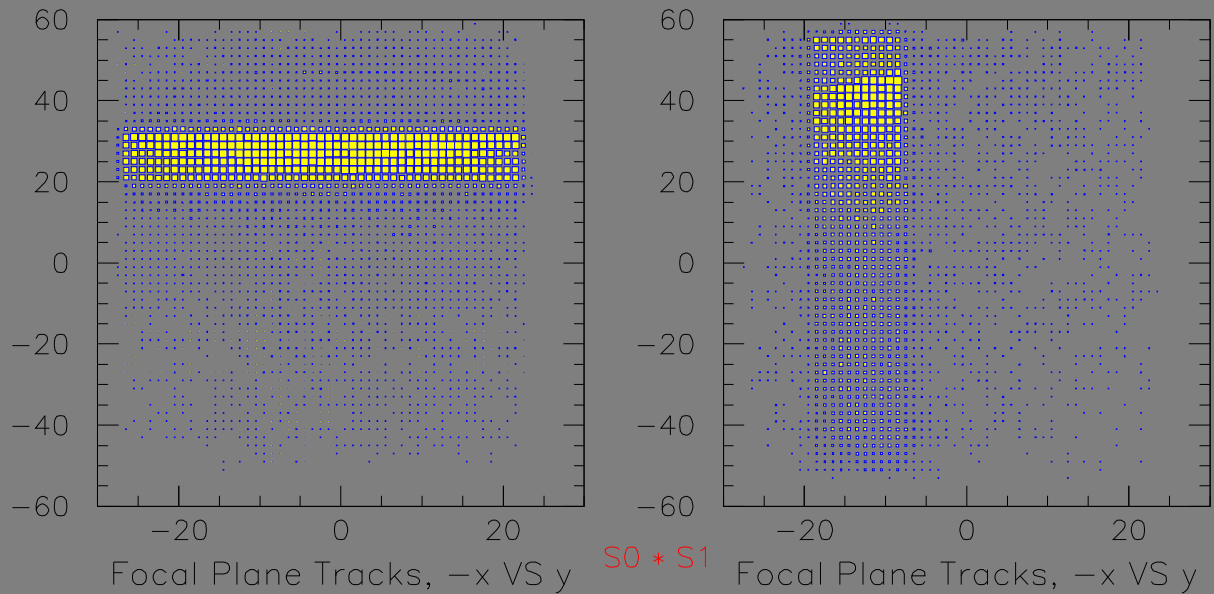
inert Ar/CO₂ Gas

GEp-III: New Developments

Trigger Requirements

- ▶ June '04 Test: Large Background in BigCal
 - * *want coincidence trigger BigCal–HMS*
- ▶ Special Tracking Excludes Normal HMS Trigger
 - * *need trigger for good particles **entering***
 - * *HMS Hodoscope 2 downstream of FPP*
- ▶ Rate with Hodoscope 1 Only is too High
- ▶ Need new “Hodoscope 0”
 - * ***upstream** of Hodoscope 1*
 - * *using trigger $h0 \cdot h1$*
 - * *Test in December '04*

Gep-III Trigger Test: elastic ep



Summary

GEp-III will Provide Important New Data

- ▶ Highest Q^2 Polarized Data
- ▶ Further Illuminate Pol–Unpol Discrepancy

Major New Equipment

- ▶ BigCal
 - * *already planned for in other experiments*
- ▶ HMS Focal Plane Polarimeter
 - * *exciting new options for Hall C*

Well on Track