

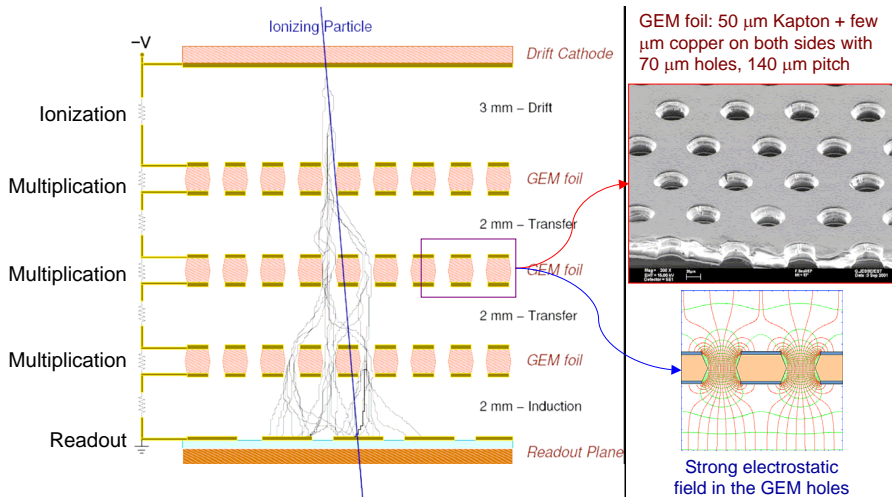
SBS GEM Detector Analysis

Ole Hansen

Jefferson Lab

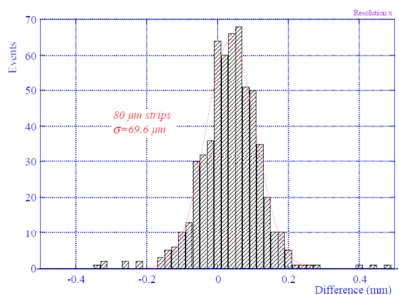
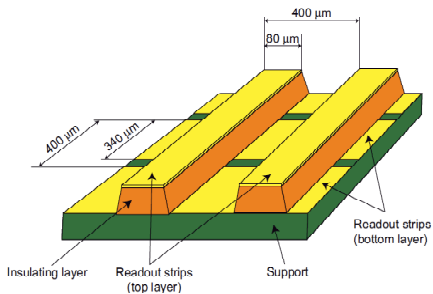
Hall A Collaboration Meeting
June 10, 2010

Principle of Operation (from E. Cisbani)



Recent technology: F. Sauli, NIM A 386, 531 (1997)

Resolution (from E. Cisbani)

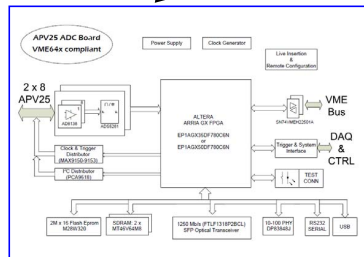
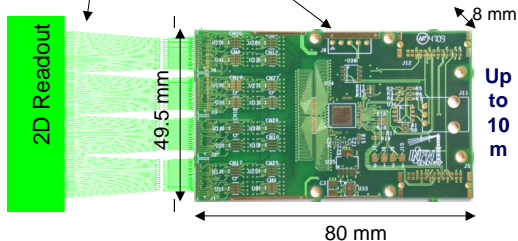


C. Altunbas *et al.*, NIM A **490**, 177 (2002)

- Take weighted average of signals on adjacent strips
- COMPASS achieved $\sigma \approx 70 \mu\text{m}$ (400 μm pitch, 80 μm strip width)

APV25 Pipelined Frontends (from E. Cisbani)

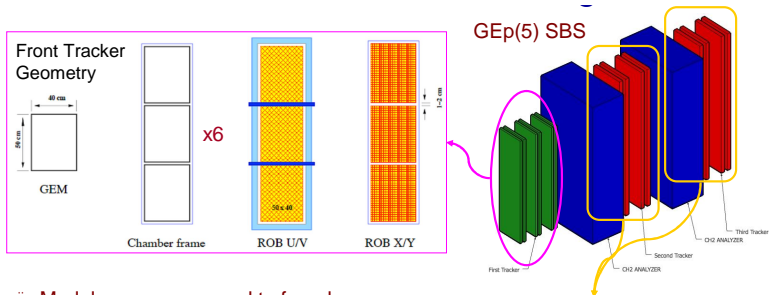
GEM \Rightarrow FEC \Rightarrow ADC+VME Controller \Rightarrow DAQ



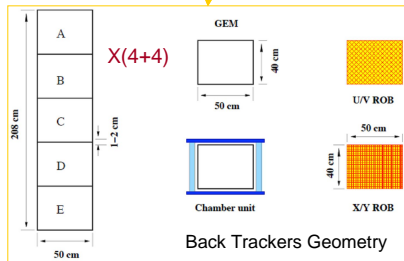
Main features:

- Use analog readout APV25 chips (wire-bonded on standard PCB, no ceramics): proven to work in COMPASS
- ZIF connector on the GEM side (no soldering on readout foil)
- Minimum electronics components (front-end + VME custom module)
- Copper connection between front-end and VME

Preliminary SBS Chamber Configuration (from E. Cisbani)



- ü Modules are composed to form larger chambers with different sizes
- ü Electronics along the borders and behind the frame (at 90°) – cyan and blue in drawing
- ü Aluminum support frame around the chamber (cyan in drawing); dedicated to each chamber configuration



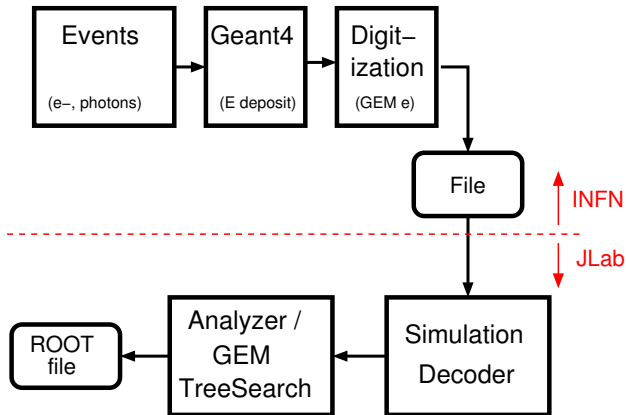
Analysis Chain

- APV25 decoder & analysis
 - ▶ Cluster finding
 - ▶ Peak fitting
- TreeSearch in coordinate projections (x, y, u, v)
- Correlation of projections via hit amplitude & timing
- 3D fit of correlated hits

Current Activities

- Development of reconstruction code
- PREX GEM analysis
 - ▶ + Real Data
 - ▶ + Cross-check with VDCs (albeit limited precision)
 - ▶ – Quirky Gassiplex readout (deadtime, accidentals, artifacts)
 - ▶ First results available (Nilanga's talk tomorrow)
- Simulations
 - ▶ Test reconstruction
 - ▶ Study tolerance to background
 - ▶ **Demonstrate tracking capability/limits for expected GEp(5) conditions**

Tracking Monte Carlo



GEM Test Run

- Planning in progress — this year?
- Study GEMs in high-rate environment (close to GEp(5) conditions)
- Commission APV25 electronics
- Test APV25 cluster analysis & fitting code
- Study tracking performance with high multiplicities?
(Requires sufficient number of planes)

Timeline

- June 2010
 - ▶ Finish simulation reconstruction software
 - ▶ Begin simulation production
- July 2010
 - ▶ Finish simulation production
 - ▶ Analyze simulation reconstruction results
 - ▶ Write simulation analysis report
 - ▶ PREX GEM analysis
- August/September 2010
 - ▶ Refine simulation & analysis
 - ▶ PREX GEM analysis
 - ▶ Specify test run setup
- Late 2010?
 - ▶ Test run