JLab GEM Tracker Test

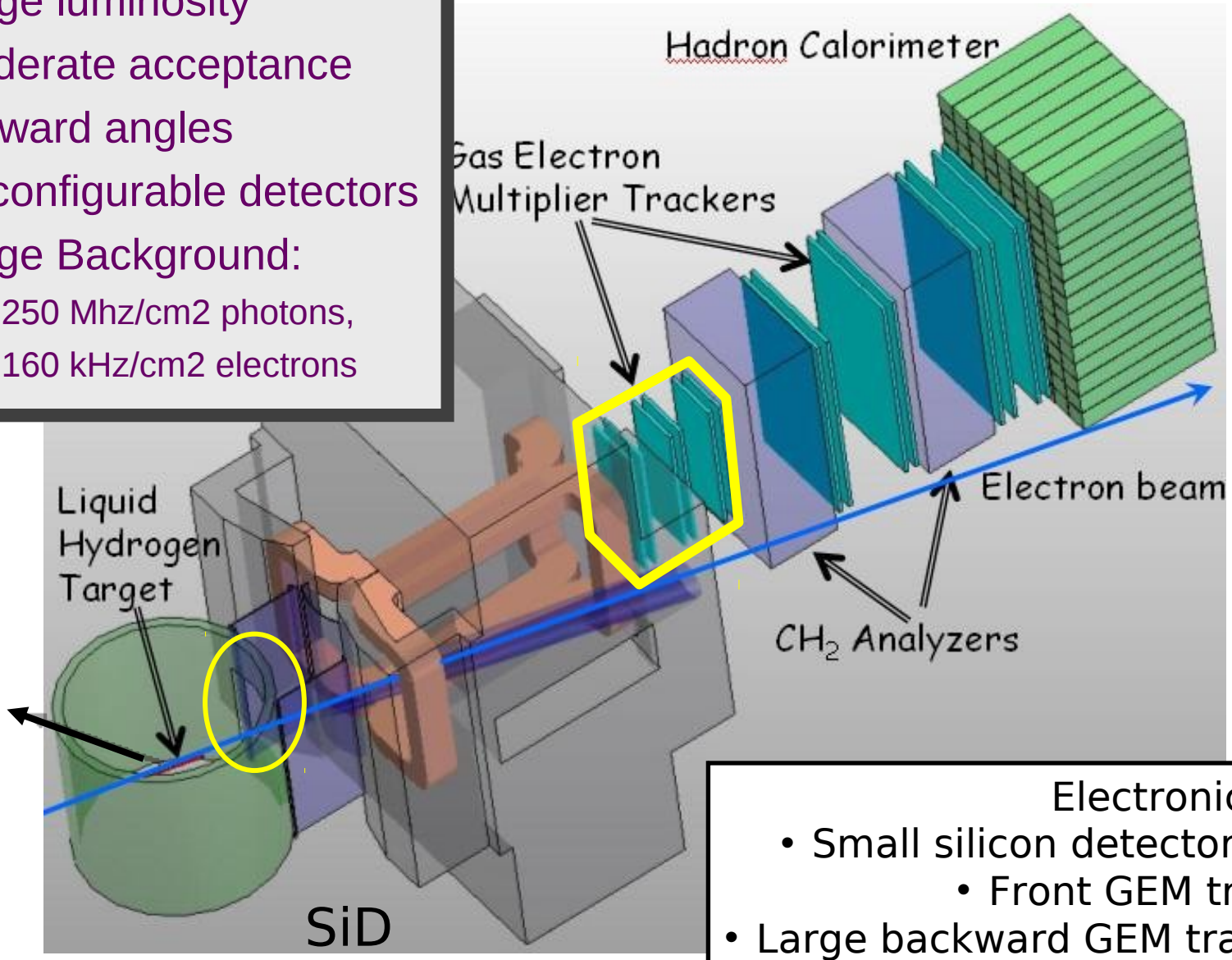
E. Cisbani

INFN-Rome Sanità Group

RD51 Mini-Week Meeting – 21-23 November 2011 - CERN

SBS Spectrometer in Hall A

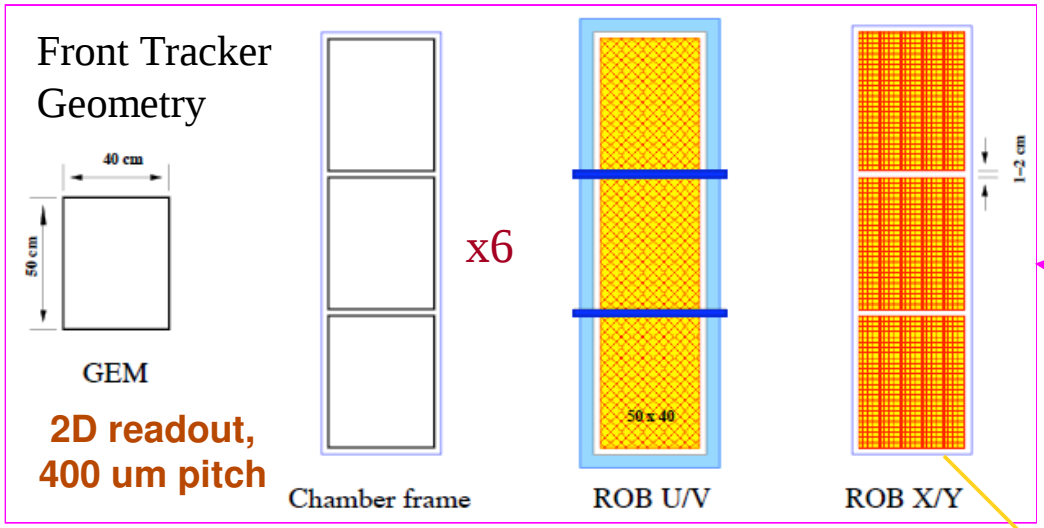
- Large luminosity
- Moderate acceptance
- Forward angles
- Reconfigurable detectors
- Large Background:
  - 250 Mhz/cm2 photons,
  - 160 kHz/cm2 electrons

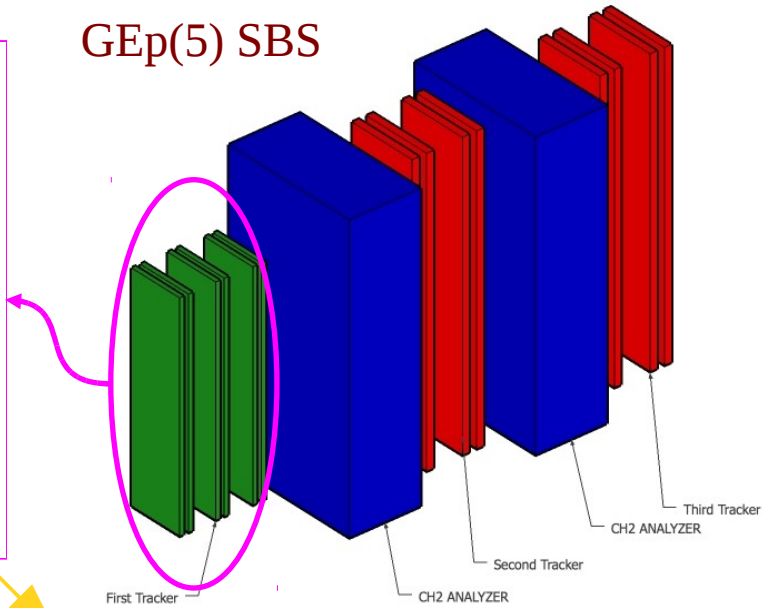


Electronics for:
- Small silicon detector (SiD)
- Front GEM tracker
- Large backward GEM trackers

100k channels

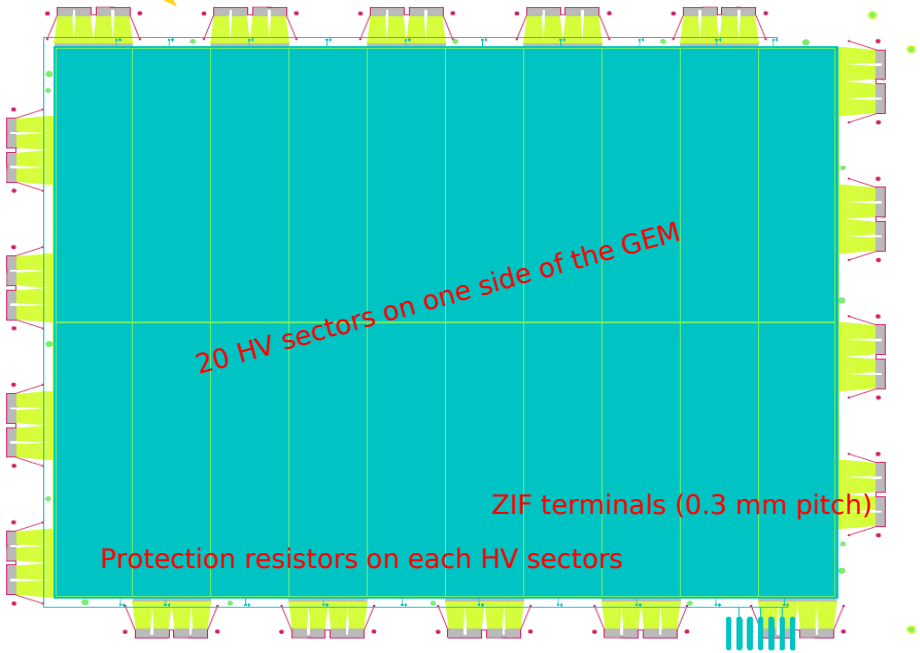
SBS Tracker Chambers configuration





- **40x50 cm2 - 3xGEM – 2D readout (400 um pitch) modules are composed to form larger chambers with different sizes.**
- **Electronics along the borders and behind the frame (at 90°) – cyan and blue in drawing**

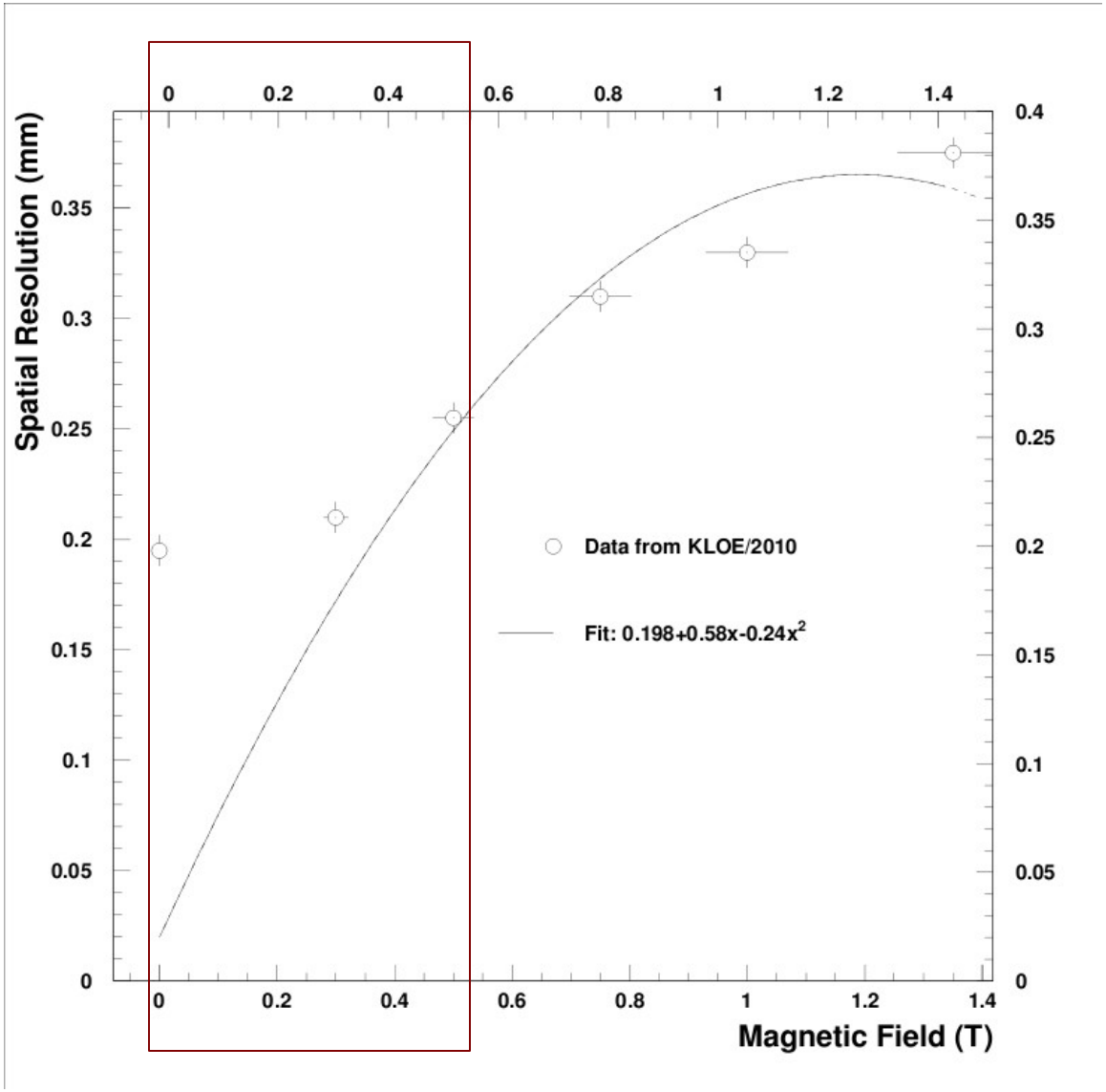
✓ **Front Tracker operates in Magnetic Fringe Field up to 200 Gauss**



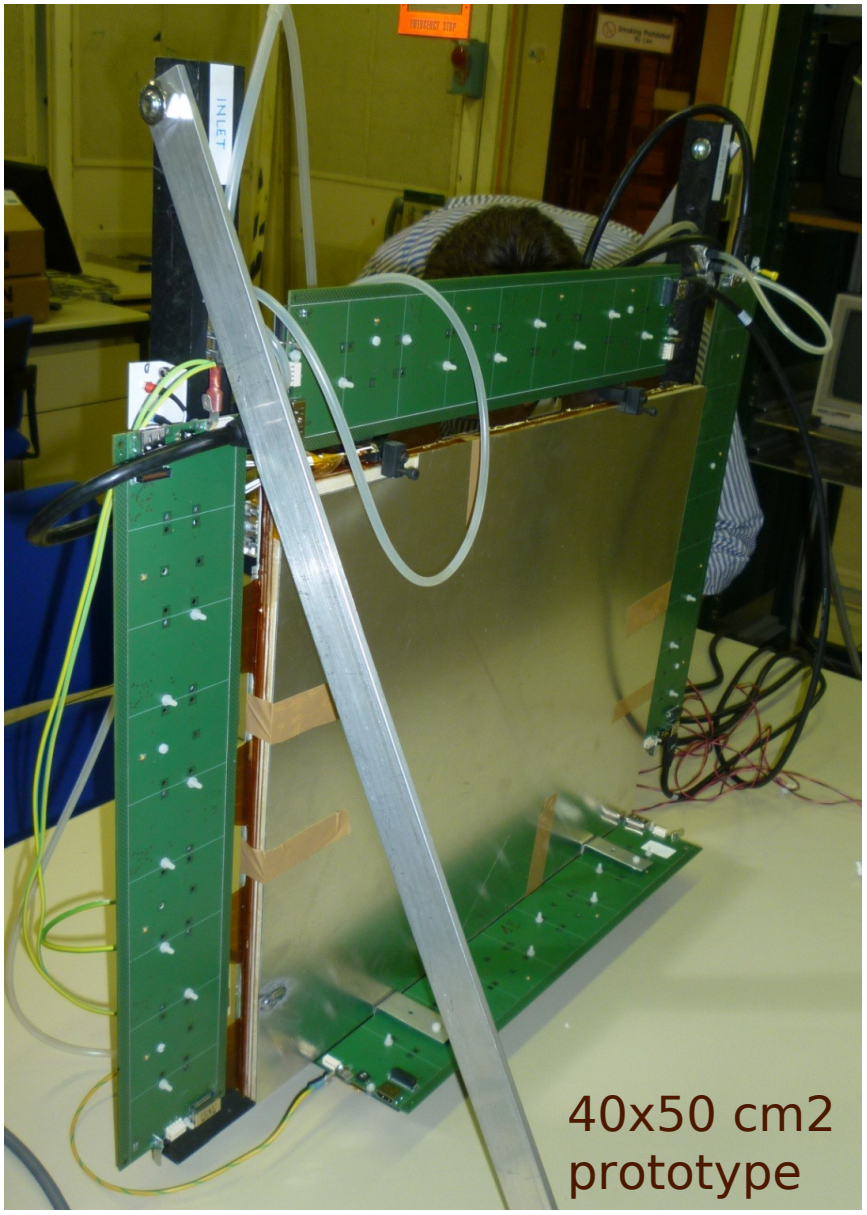
CERN Test 2011 / Purpose of the Test

- Characterize the 40x50 cm^2 module prototype in terms of:
  - Cluster width and displacement
  - Collected charge
  - Efficiency
  - Residuals*
- Study in Magnetic Field up to 500 Gauss
- Further characterization of the APV25 based electronics (field effects, noise ...)

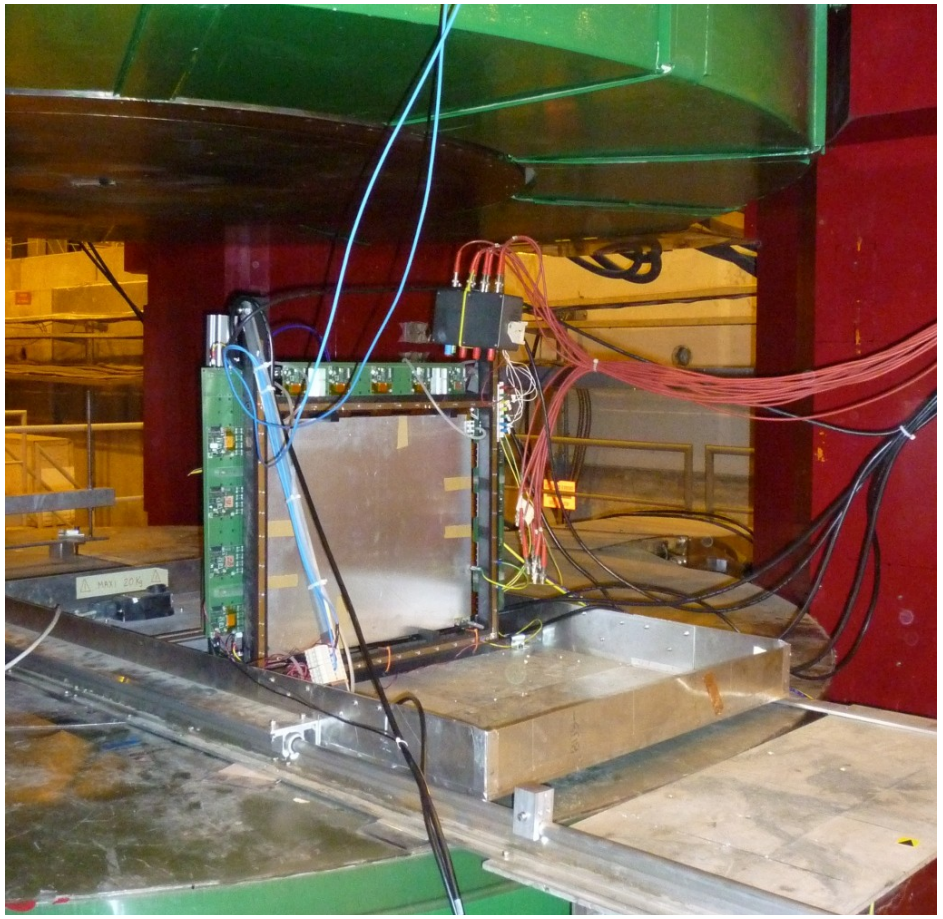
Verify assumption at low field



CERN test / June 2011



40x50 cm2
prototype



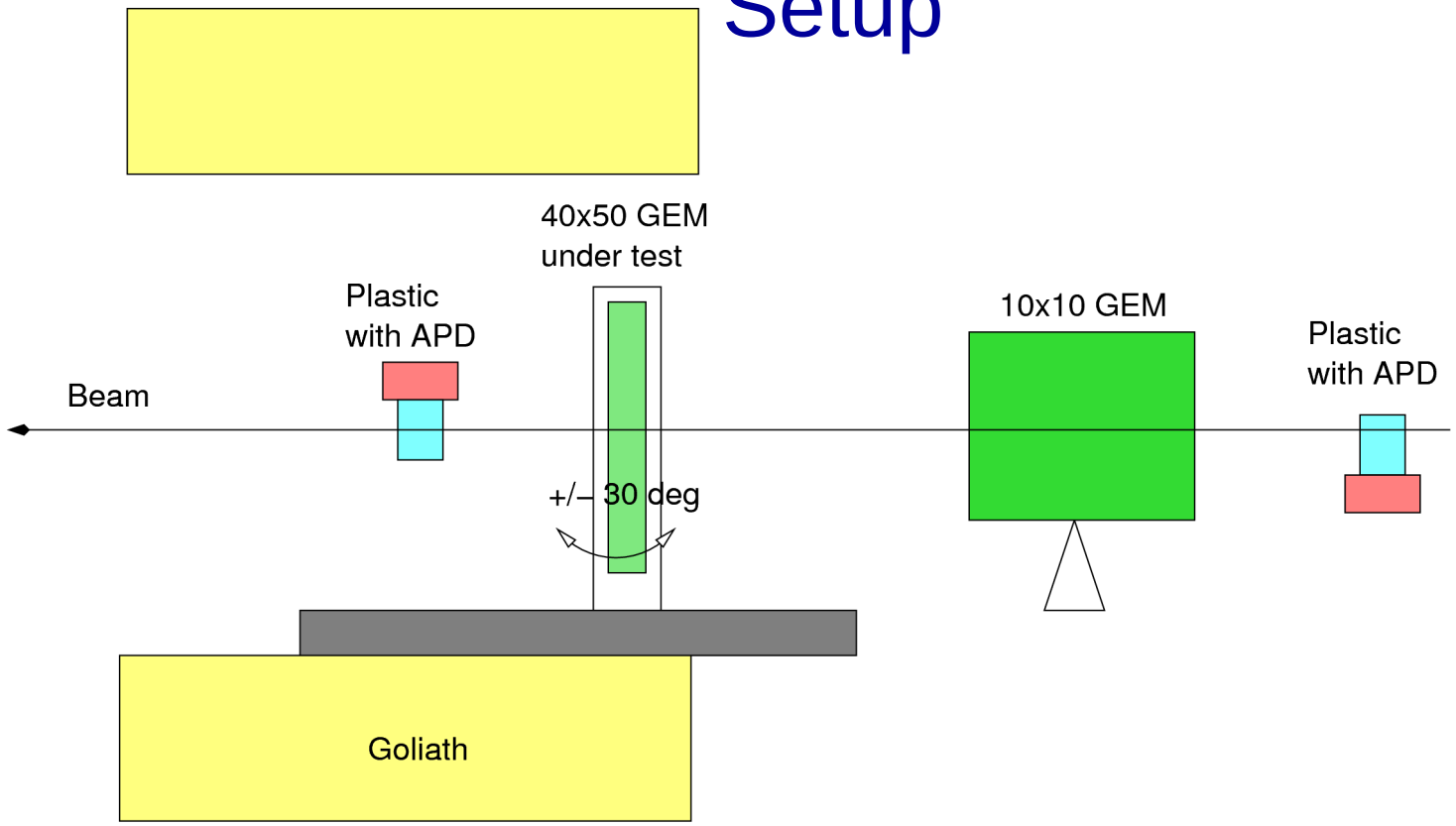
Major accident in HV handling
→ short in middle GEM foil

No chance to take good data
(and beam unavailable in
second part of the test period)

New Test in 2012

- Likely ready in April 2012, with
  - new 40x50 chamber(s) with improved support
  - additional electronics,
  - longer cables,
  - fixed HV power supply
  - Improved DAQ software
- Characterize the large GEM chamber in 50-500 Gauss uniform magnetic field

Setup



Detector Under Tests: 40x50 cm2 – 3xGEM Prototype

Ancillary Detectors:
2 APDs
RD51 GEM (or uM) ?

- Use of Goliath (up to 500 Gauss)
- Gas: Ar/CO2 70/30 (premixed)

Space requirements

- Control Room:
  - Desktop table
- Test Area:
  - 60x50 cm2 space in Goliath tray
  - 100x50 cm2 table for: low voltage and high voltage power supply and computer
  - 2 crates (VME+NIM) in ½ rack

Preliminary Plan

- 1 day: installation + detector alignment + “commissioning”
- 0.5 day: operation with stable beam – reference
- 4 days: magnetic field scan (50 – 500 Gauss, +/-)
  - 5 point x front/back
  - 4 angles (0, 10, 20, 30 deg)
  - 4 short access/day to change configuration
- 1 day intensity scan (?)
- 0.5 day: dismounting

Preferable highest energy beam, low intensity