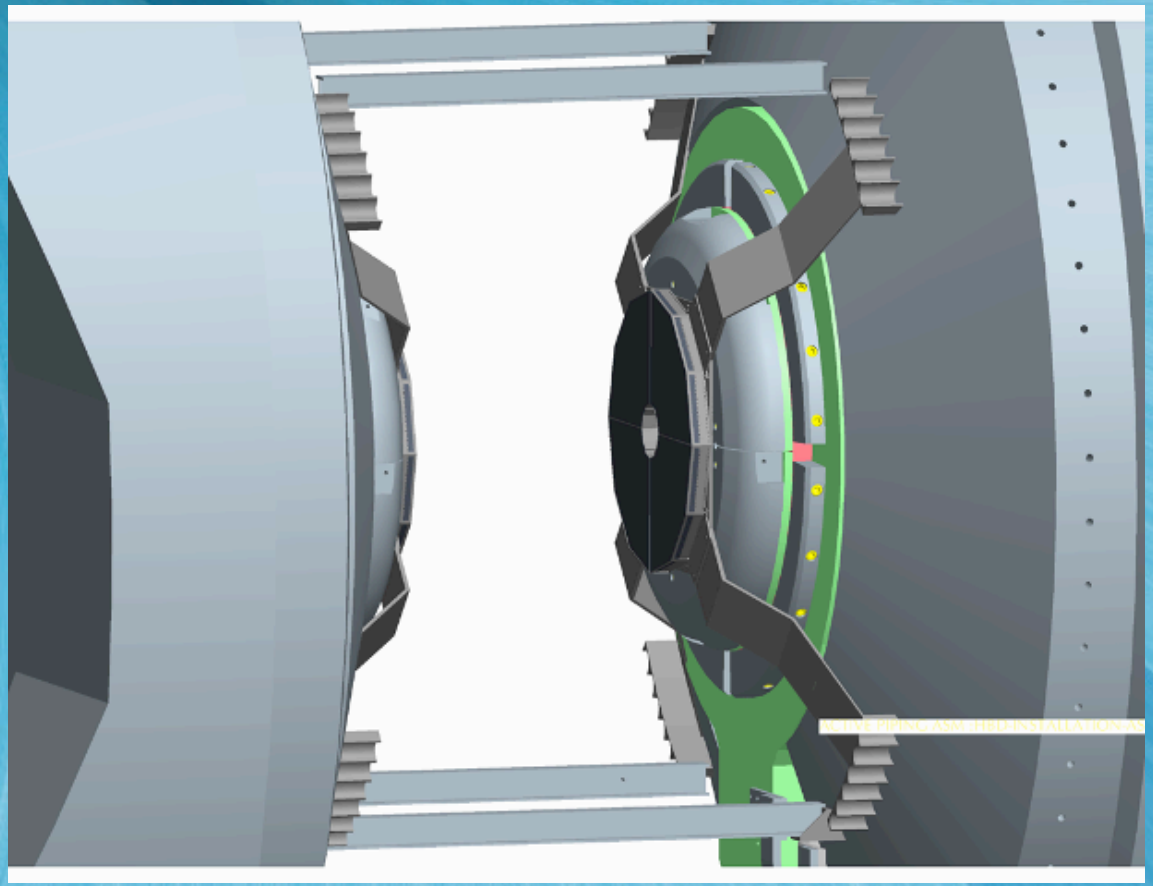
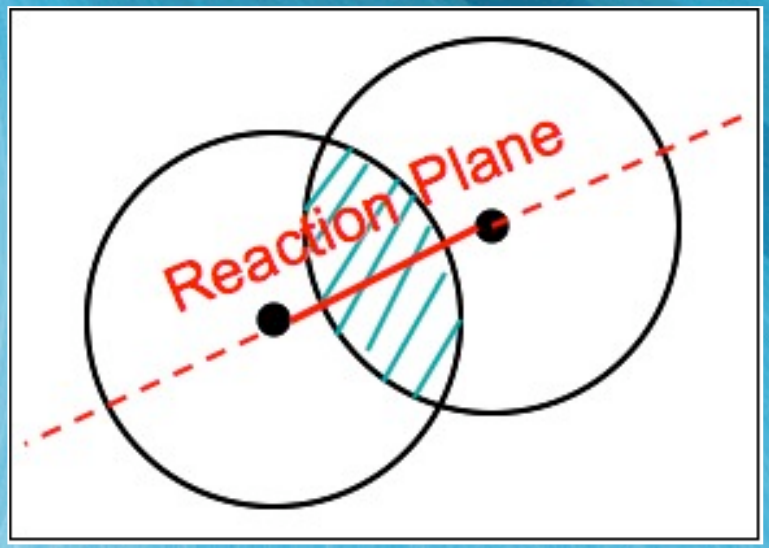
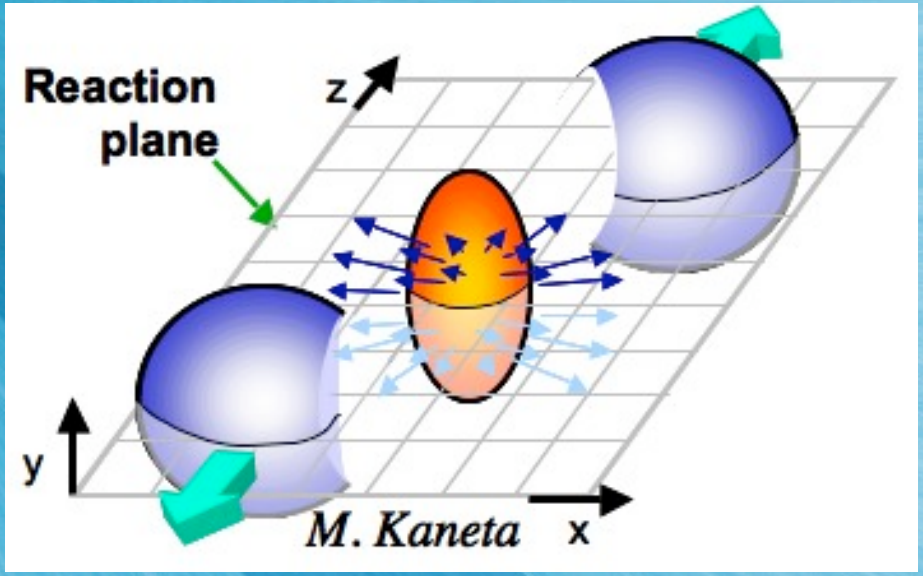
# The new PHENIX Reaction Plane Detector at RHIC



Eric Richardson
University of Maryland
For the PHENIX Collaboration
October 28, 2006

# Motivation: Flow

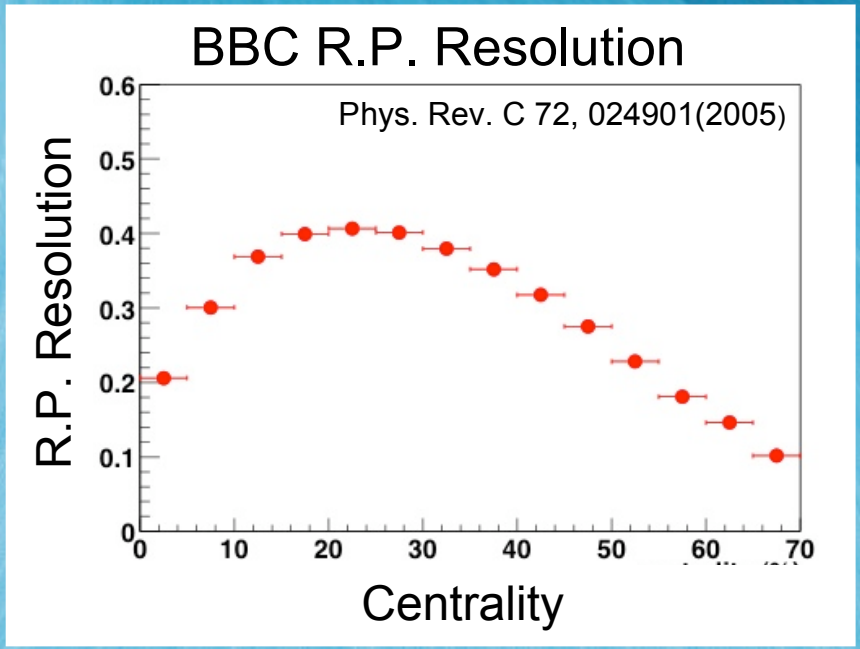


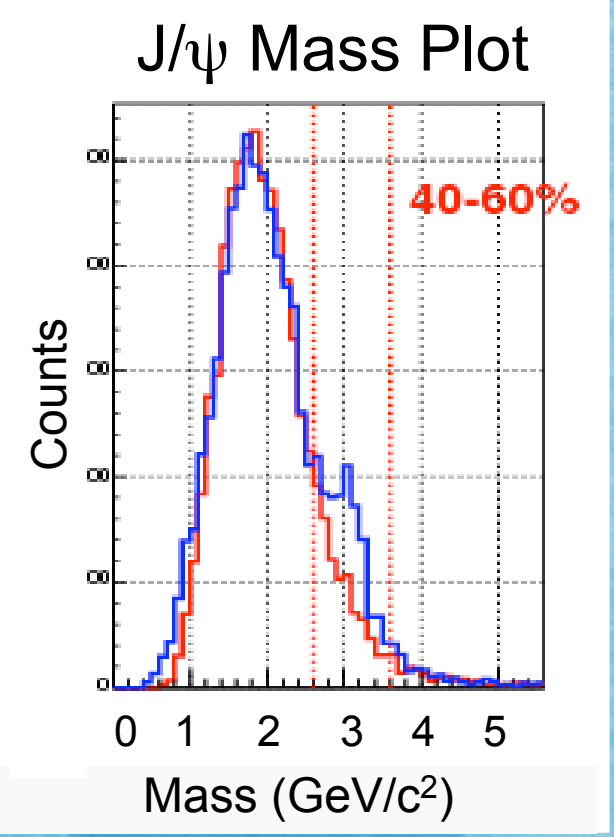




- Asymmetric distribution of produced particles in the azimuthal direction
- Caused by different pressure gradients in the colliding matter
- Growing interest in measuring the flow of electrons, photons and rare probes such as J/ψ and high $p_T$ particles which PHENIX is ideally suited to measure

# Motivation: Measurement Challenges

- Improve measurement by
  - Improving signal from statistics
  - Improving reaction plane resolution



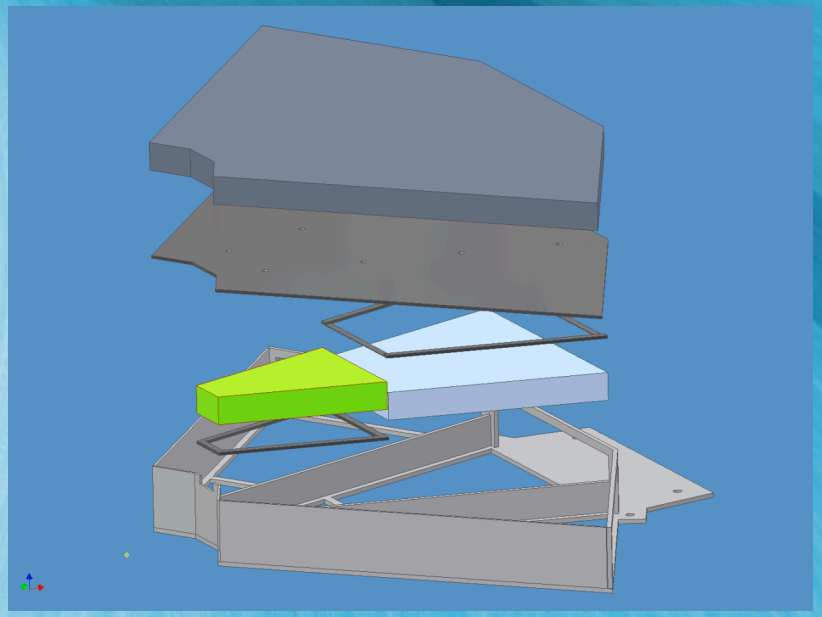




- The new Reaction Plane Detector in PHENIX will increase reaction plane resolution by a factor of 2

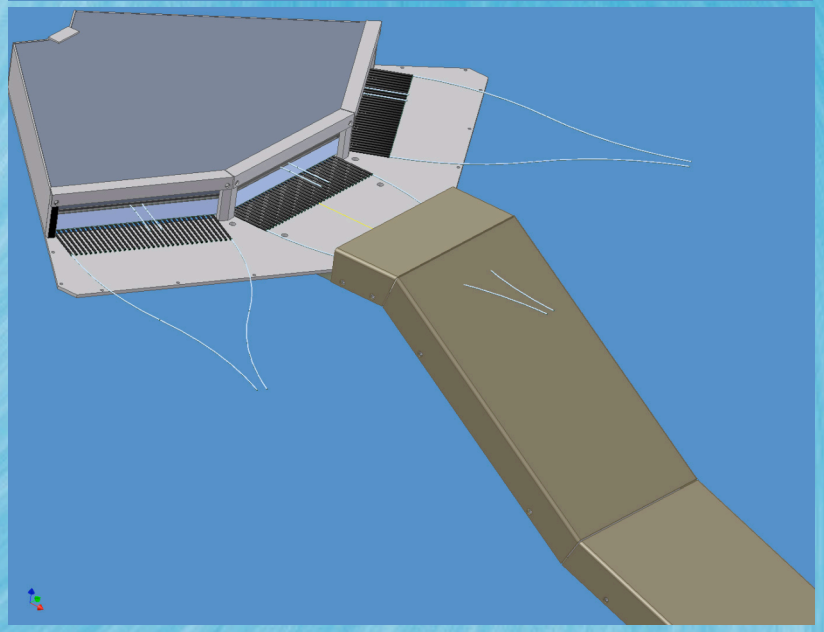
# Design Criteria

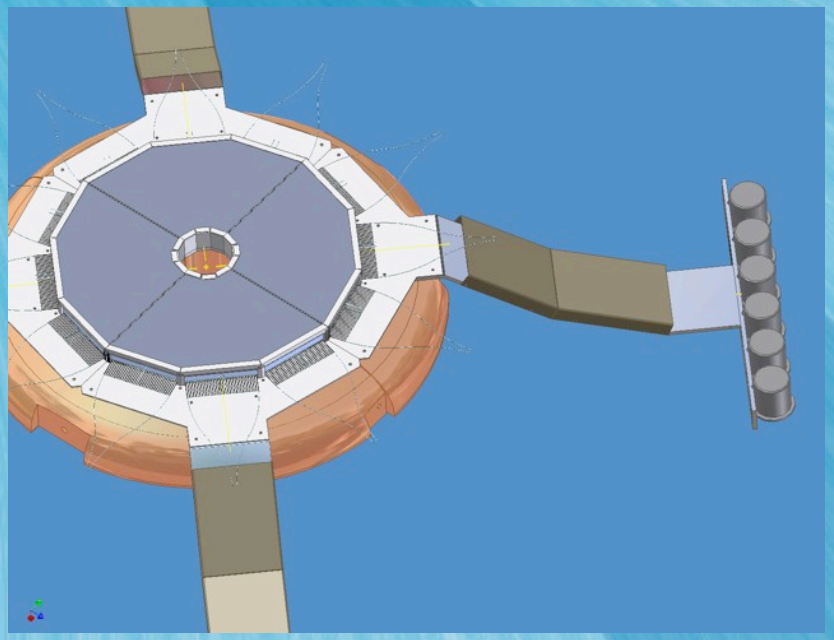
- Operate in a strong magnetic field (~1T)
- Nonmagnetic
- Physically fit in designated space
- Robust
- As inexpensive as possible

# Detector Design

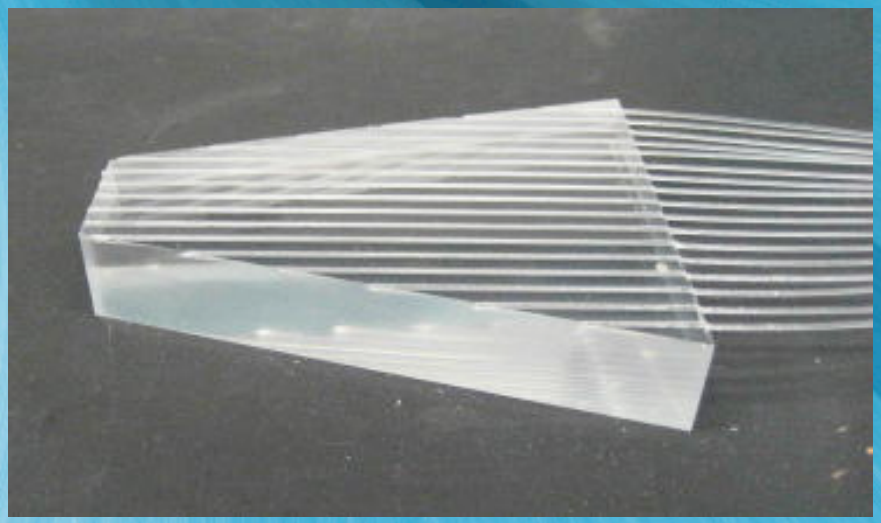


- Detector has North and South halves
- Each half divided into quadrants
- Each quadrant contains:
  - 1 Pb converter
  - 3 inner & 3 outer scintillators
  - 6 fine mesh PMT's



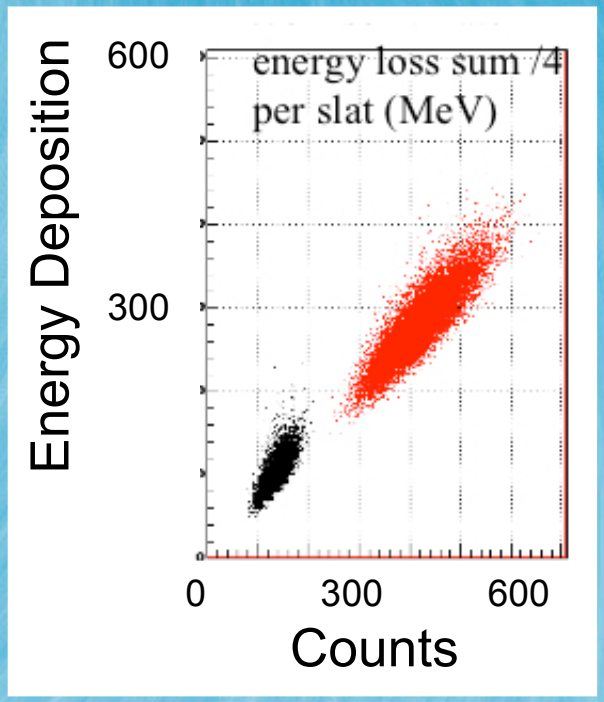


# Plastic Scintillator



- Equivalent to BC-408
- Sensitive to charged particles
- 2cm thick
- Embedded fibers at 0.5cm intervals which provide nearly uniform light collection
- Inner scintillator
  - $\eta = 1.5 \rightarrow 2.8$
- Outer scintillator
  - $\eta = 1.0 \rightarrow 1.5$

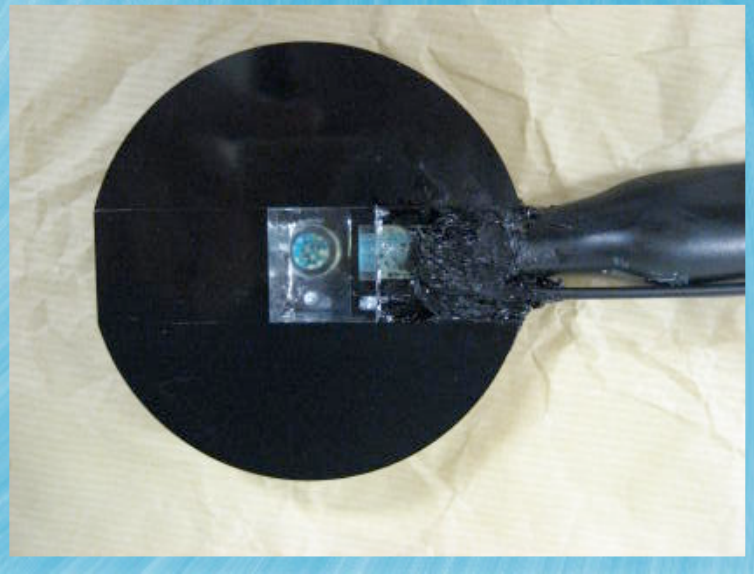
# Converter




- 2 cm thick
- 98% Pb + 2% Sb
- Improves Statistics by
  - Converting pi0's to electrons
  - Reducing low energy background

Red: With Converter
Black: Without Converter

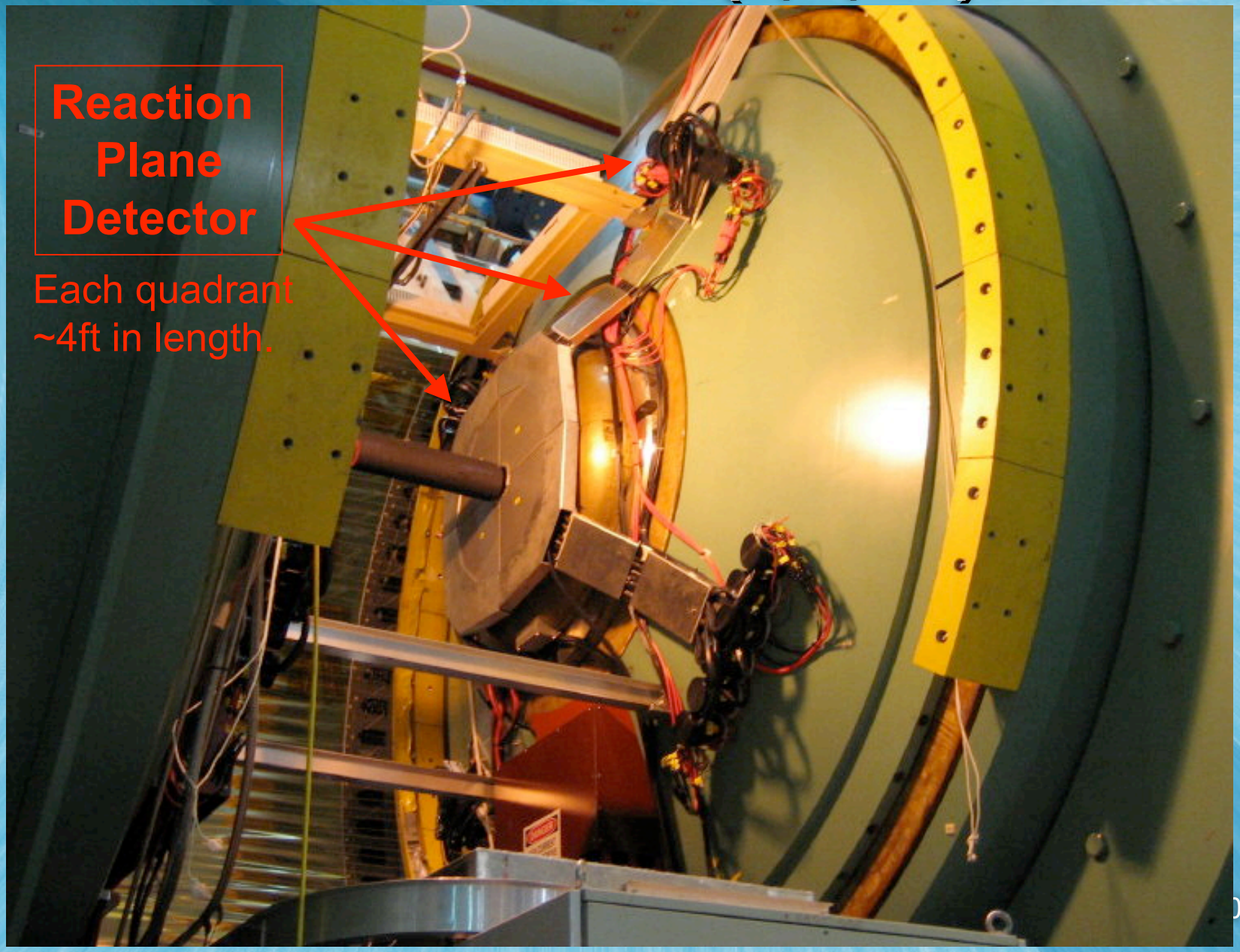
# Fiber, Prism, and PMT



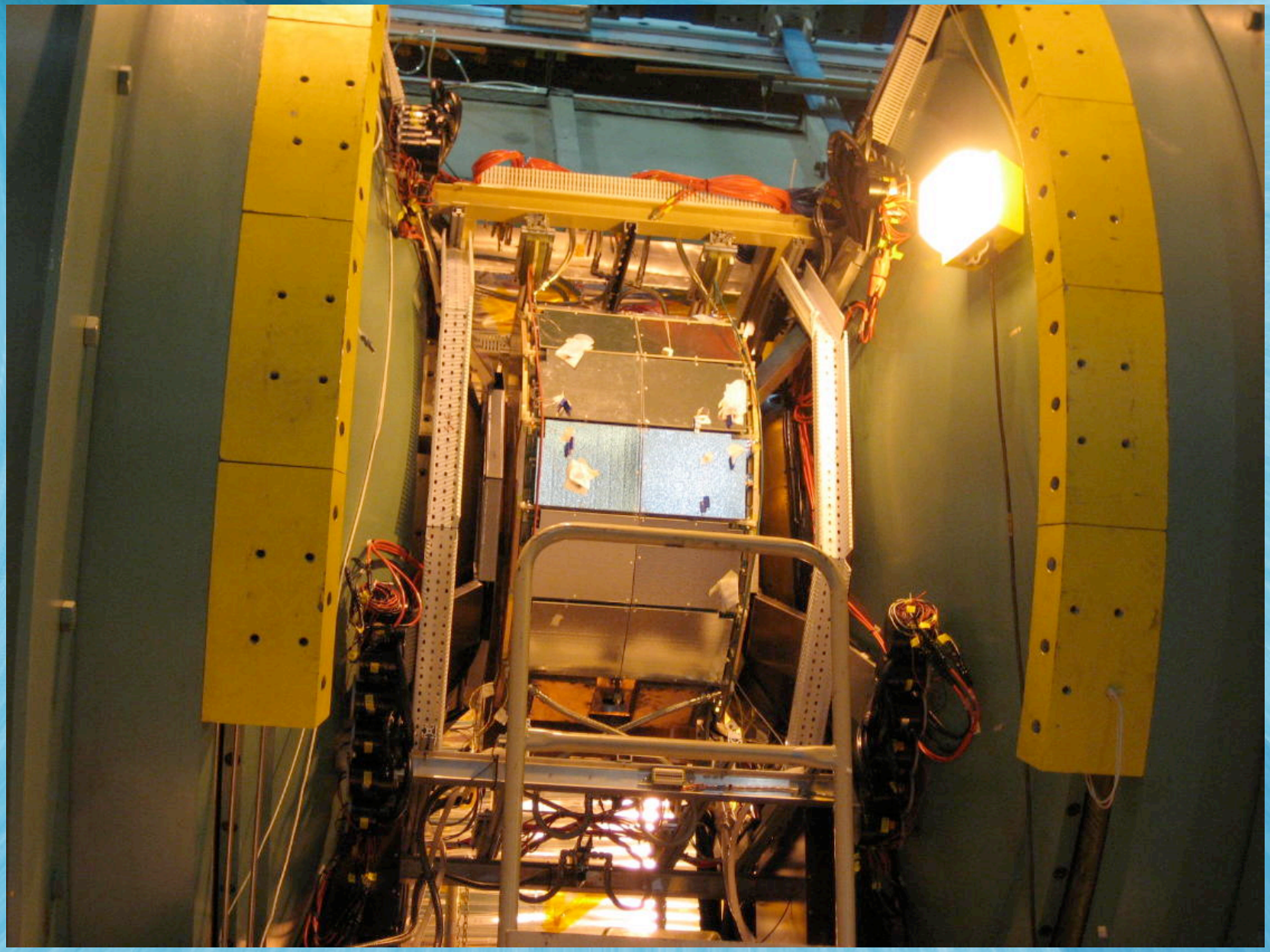
- Fibers
  - Protected with shrink tubing
- Prism
  - Directs light from fibers to PMT's
- PMT's
  - 3in fine mesh from Hamamatsu
  - Capable of operating in the high magnetic field of the PHENIX central region

# Assembly

# Installation (9/1/06)

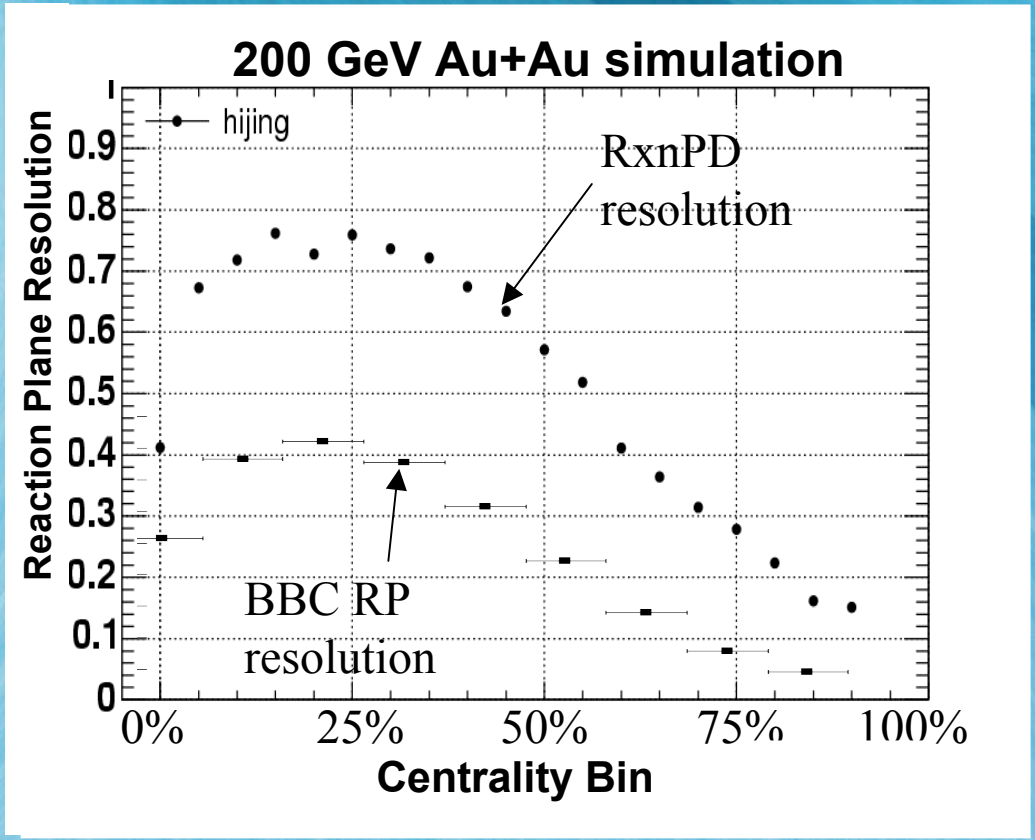


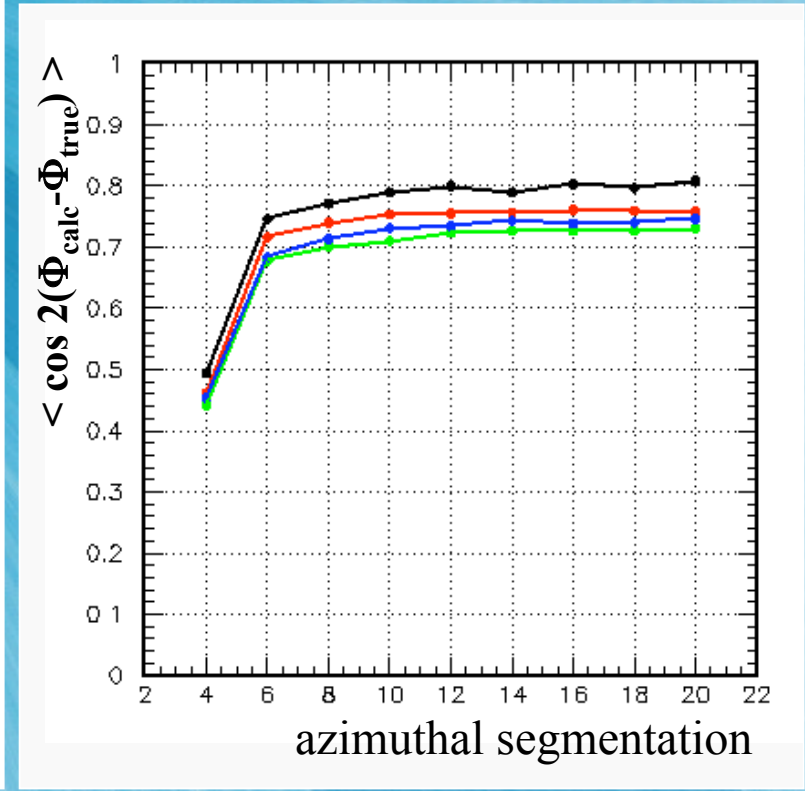
# Today



# Expected Performance

## 200GeV Au+Au simulation



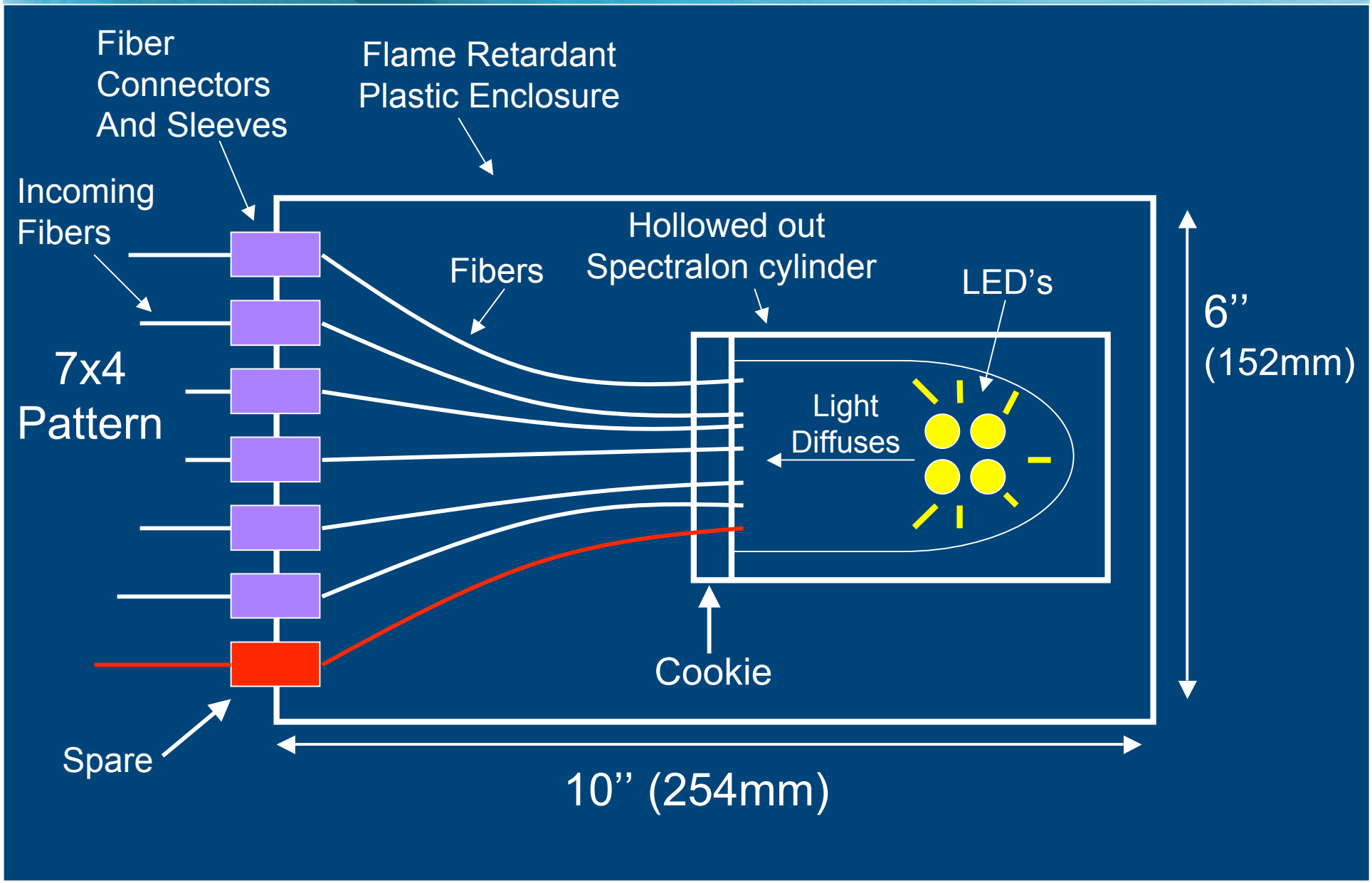

Black: Signal Hit
Red: Geant Hit
Green: Scintillator

# Future Plans

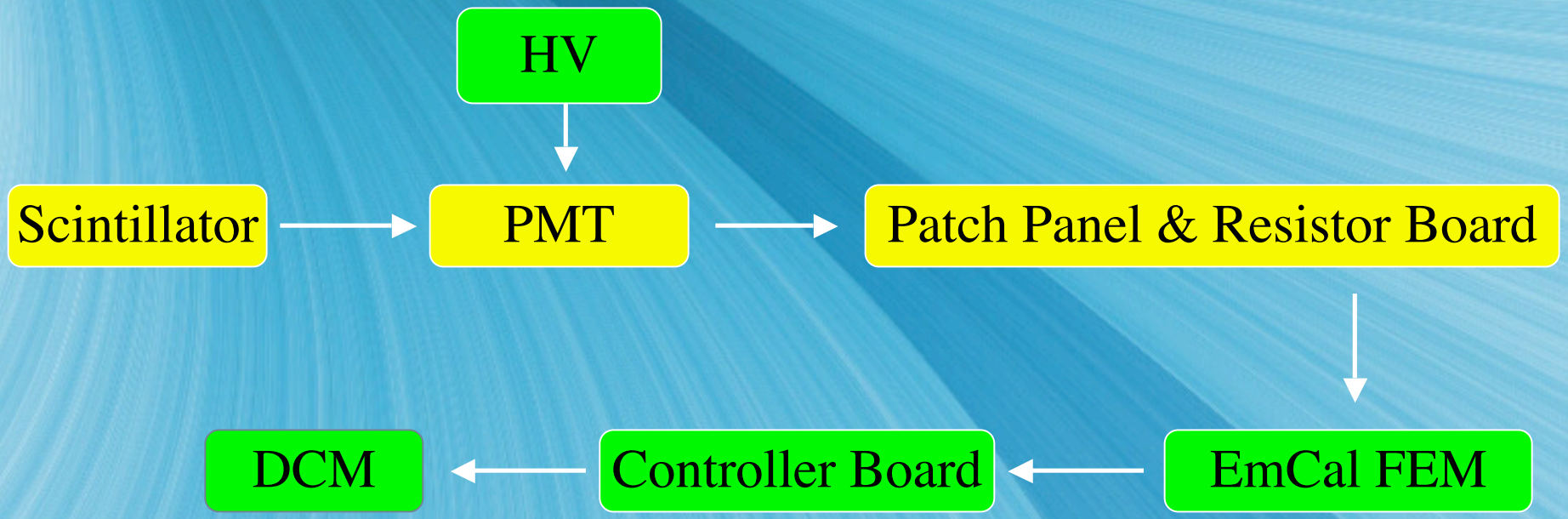
- Currently commissioning electronics
- Contingent on budget
  - Run 7 estimated to start in Dec.
  - Run will have ~15 weeks of 200Gev Au+Au
  - Expected integrated luminosity of $1.1 nb^{-1}$

# Backup Slides

# LED Calibration Box (Top View)

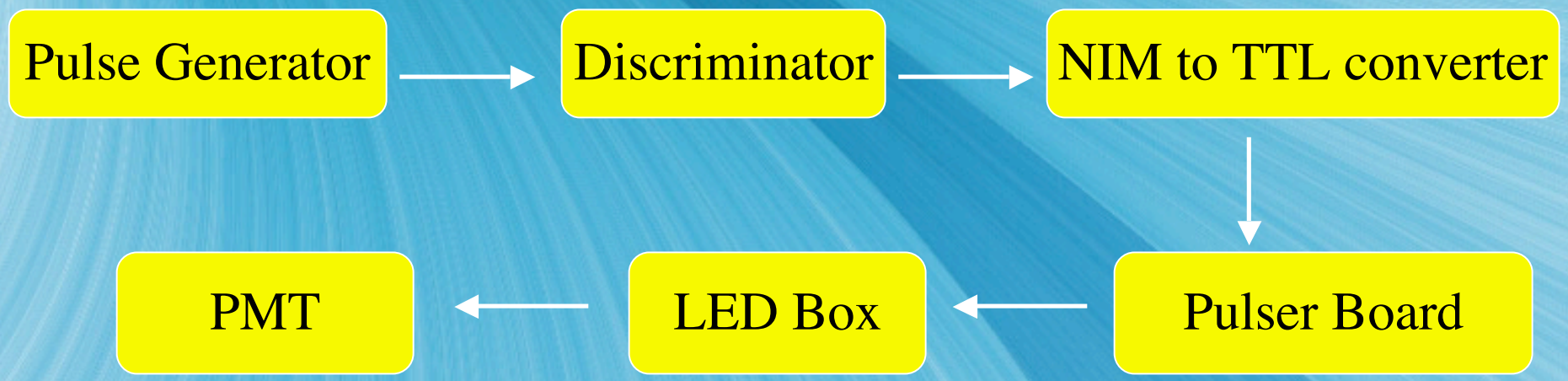


# Electronics Overview

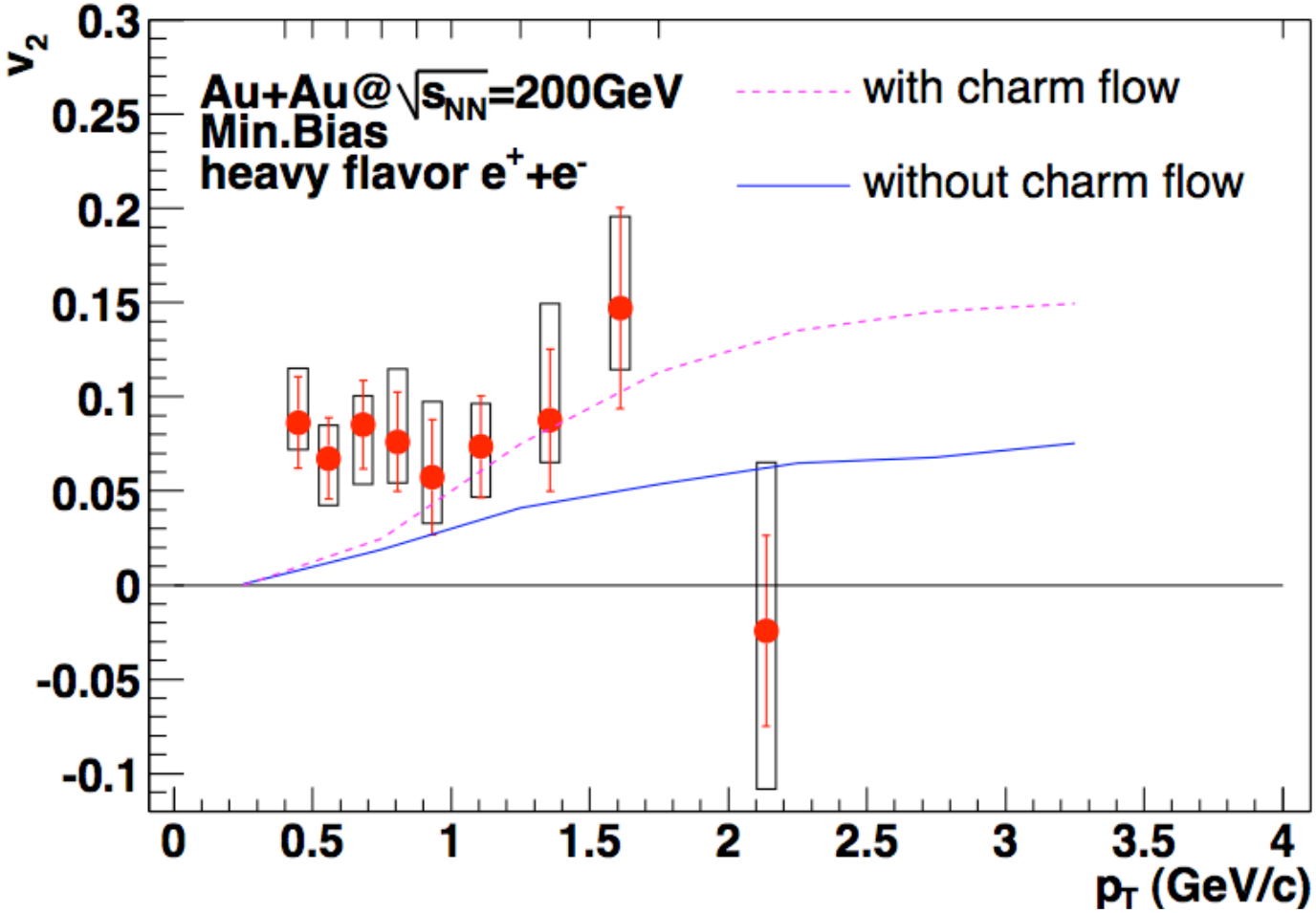


# LED Calibration System

## Still under design



# Heavy Flavor electron $v_2$




S.S. Adler, *et al.*, Phys. Rev. **C72**, 024901 (2005)