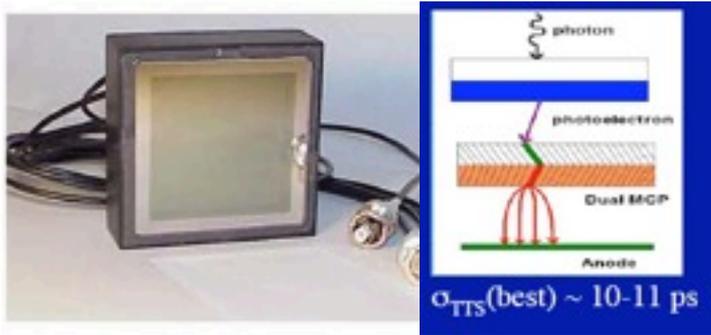


# Development of a Large Area 10 ps TOF for an EIC Detector

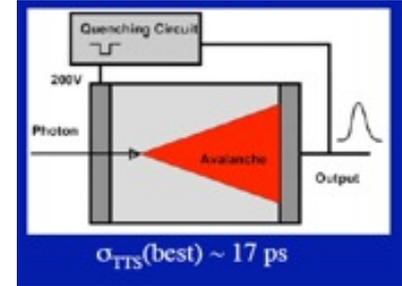
Mickey Chiu

Brookhaven National Lab

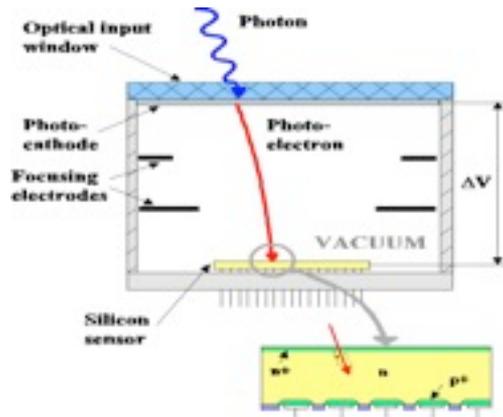
# Detector Possibilities



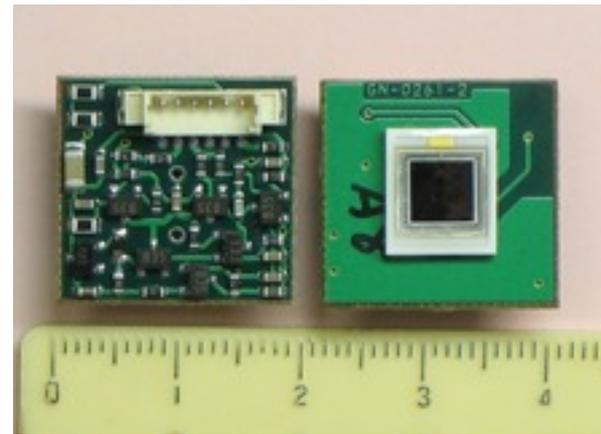
MCP-PMT



Si-PMT



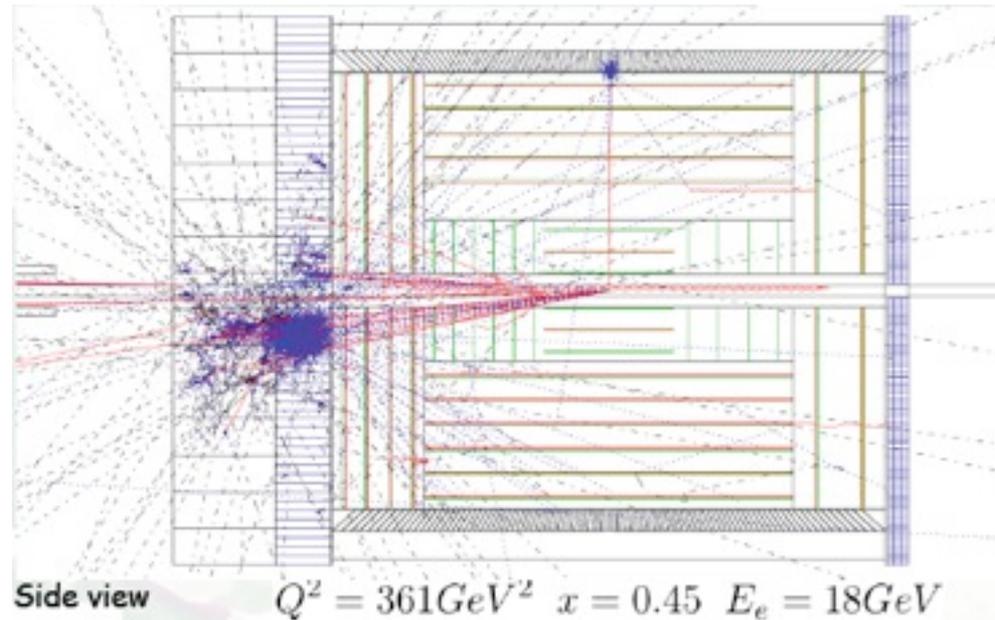
HPD



APD

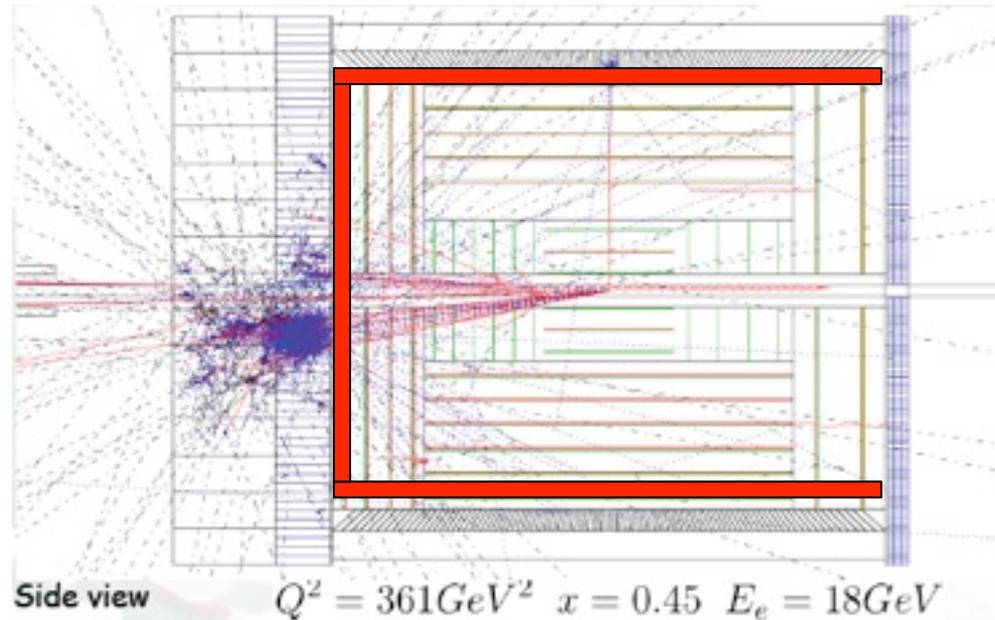
- Many groups in the world working on 10 ps or better TOF: SLAC, FNAL, ANL, UChicago (picosecond tof group), Nagoya U (SuperBelle), FP420 (LHC)
- Many different possibilities with different tradeoffs in cost, rate capability, timing capability, tiling capability.....

# Conceptual Design



- Time Zero with electron and Vertex (50  $\mu\text{m}$ )
- Many possible benefits, not all completely worked out
  - Measure hadronic final state
    - PID for flavor identified measurements, exclusive measurements, etc
    - Tagging forward particles (remnant identification)
- Possibly lower overall cost of detector since it can be made much more compactly
  - @  $R=1$  m, one can PID K/p to  $\sim 8$  GeV
- More possibilities wrt collider design (higher luminosities?)

# Conceptual Design



- Time Zero with electron and Vertex (50  $\mu\text{m}$ )
- Many possible benefits, not all completely worked out
  - Measure hadronic final state
    - PID for flavor identified measurements, exclusive measurements, etc
    - Tagging forward particles (remnant identification)
- Possibly lower overall cost of detector since it can be made much more compactly
  - @  $R=1$  m, one can PID K/p to  $\sim 8$  GeV
- More possibilities wrt collider design (higher luminosities?)

# Plan

- Test different detector technologies
  - MCP-PMT, APD's, SiPMT's, HPD
  - Collaborators: E. Kistenev, B. Morozov, S. White, C. Woody, and possibly others
  - Lab testing with fast laser and cosmics, later beam tests
- Optimize design for eRHIC detector
  - Radiator design
  - Tiling or Scaling from few channels to a real detector
- Develop Readout
  - Fast low noise electronics which can scale to large number of channels at reasonable cost
  - Collaboration with Nevis Labs
- 2 year time scale
  - Produce a working detector prototype with best of above technology, with electronics prototype, few channels
- Cost
  - ~\$250K for materials + others, \$200K more if I can hire a post-doc