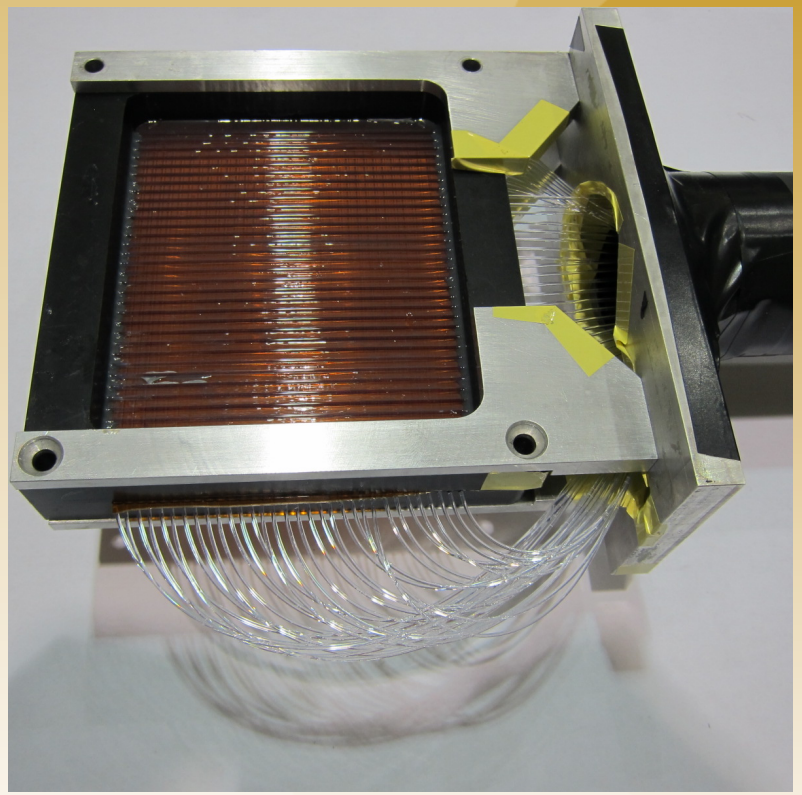
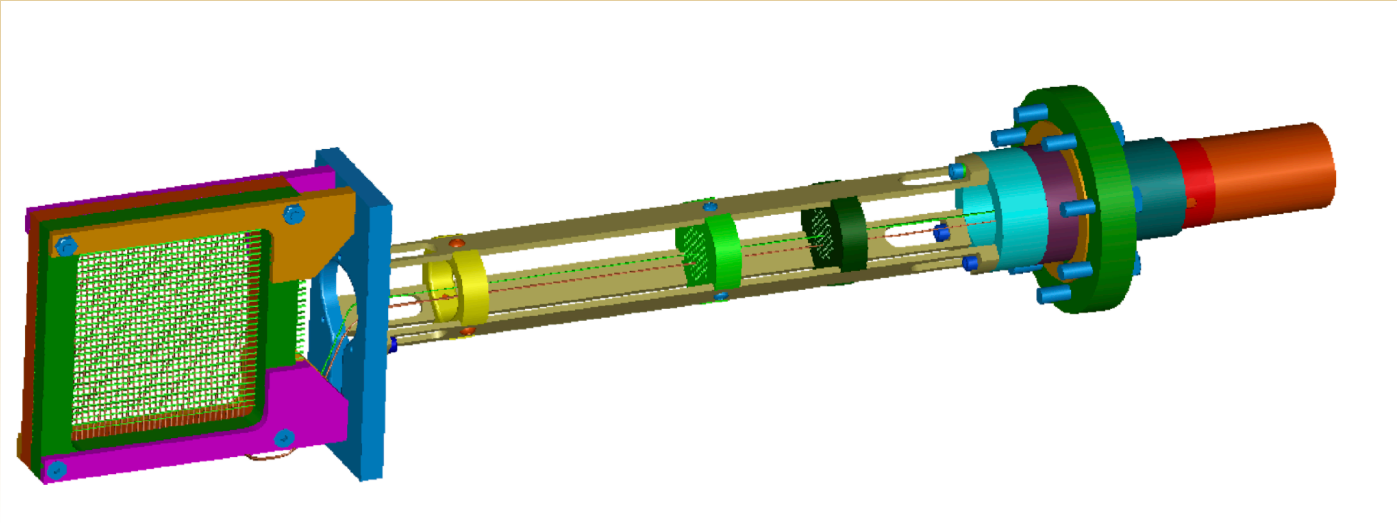
A New Tool for Optics: Scintillating Fiber Hodoscope (SciFi)



Pete Markowitz, Florida International University

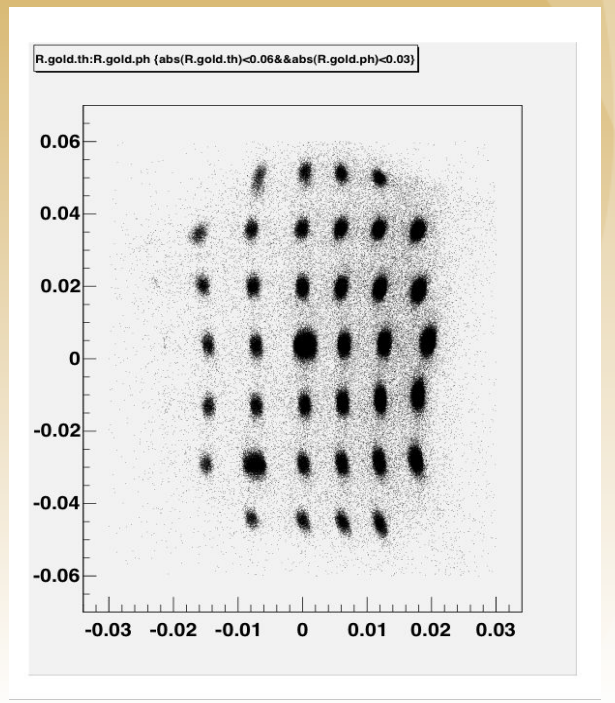
Outine

- Motivation
- Status
- Planned Operation and Use
- Testing
- Timeline & Manpower



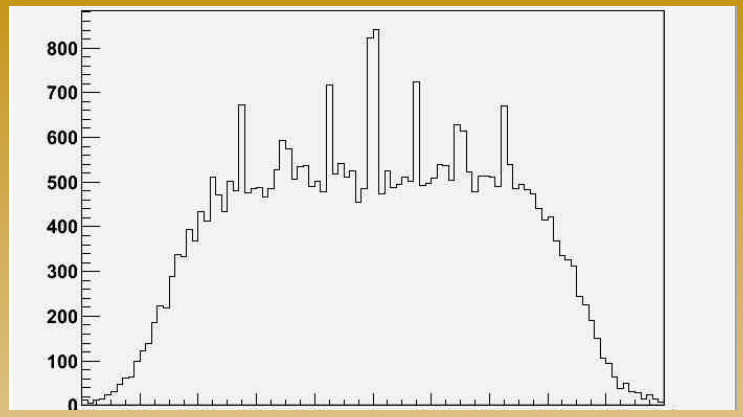
Motivation

- Traditionally sieve used to calibrate optics/angles
- Limited by: statistics, edge scattering, limited set of points, “punch through” events, positive polarity, target length

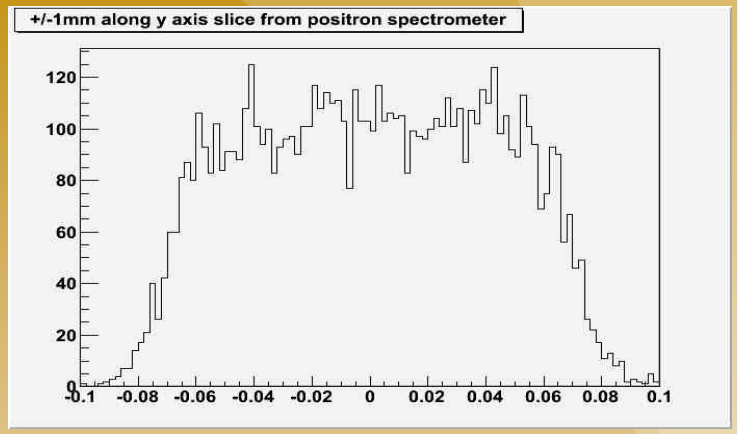


Sieve Performance

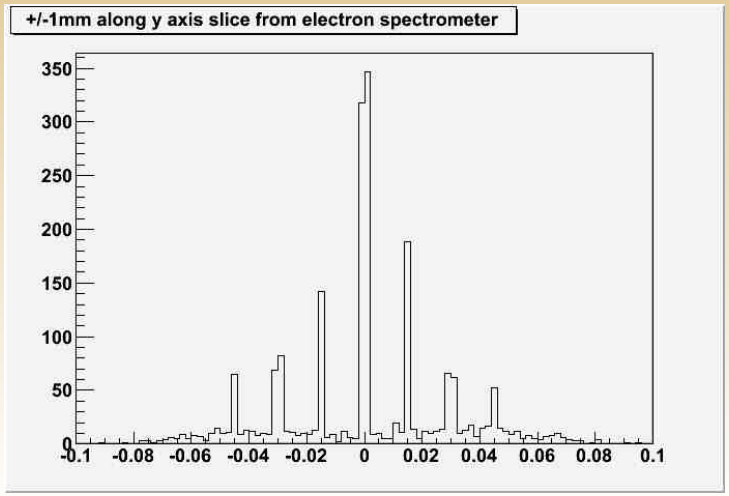
5 mm thick sieve, electrons



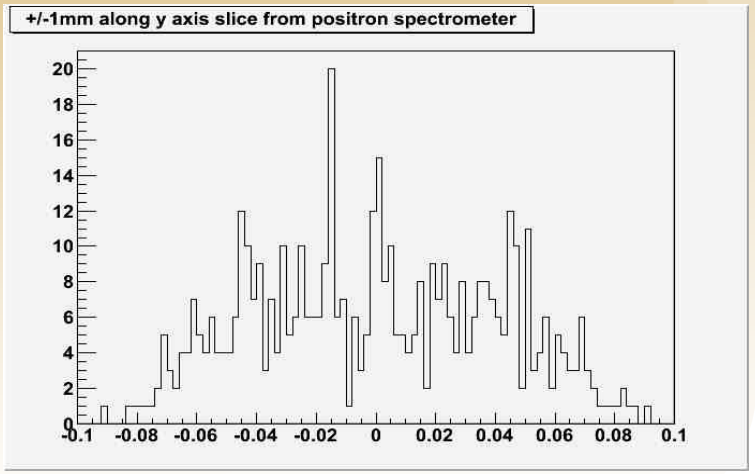
5 mm thick sieve, positrons



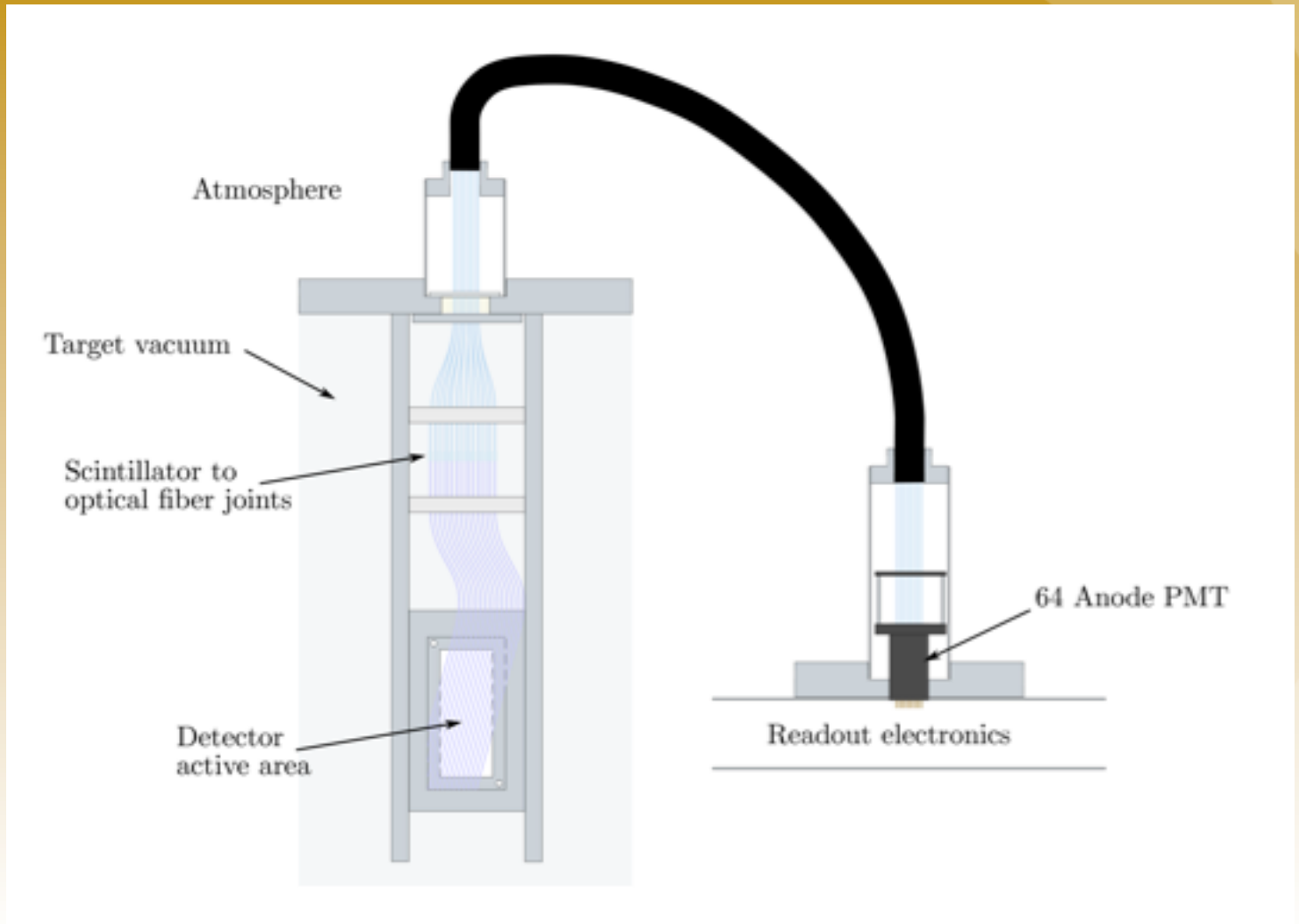
20 mm thick sieve, electrons



20 mm thick sieve, positrons

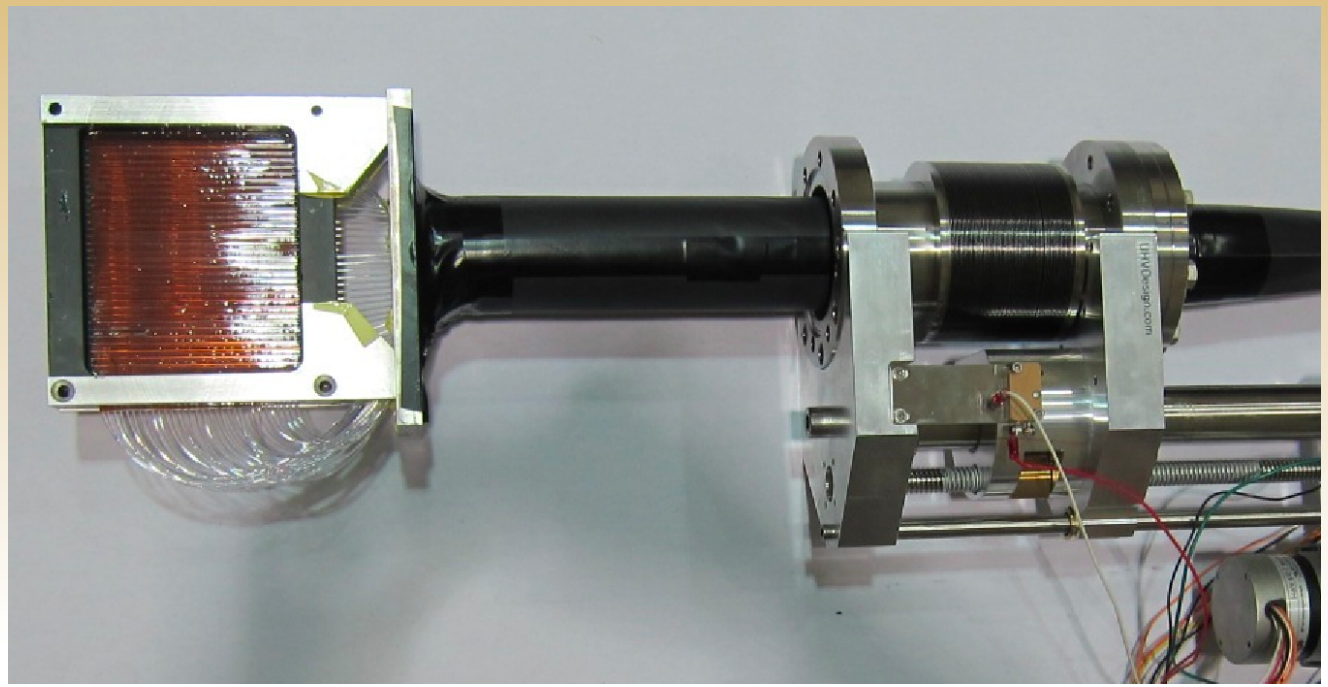


Design of detectors



Status

- Two hodoscopes, each with 2 arrays at ±90°
- 32 scintillation fibers/plane giving 1024 points
- Limited testing of first Sci Fi sees ~5 p.e.
  - No beam, single anode PMT, 2nd optical cable
- Both hodoscope heads constructed (2012, 2013)

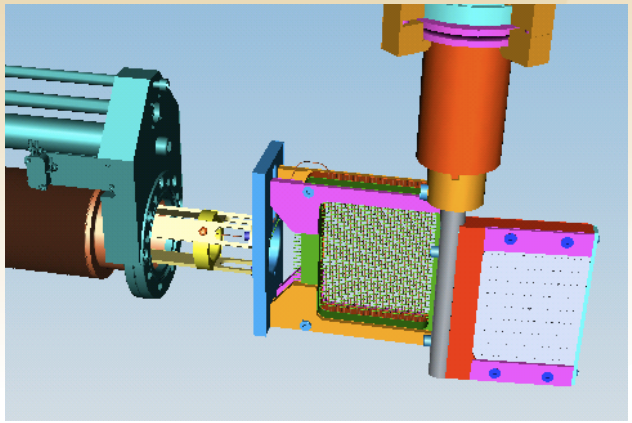


Assembled 1st Detector

Includes detector head, stepper motor, optical fiber light guide, readout electronics

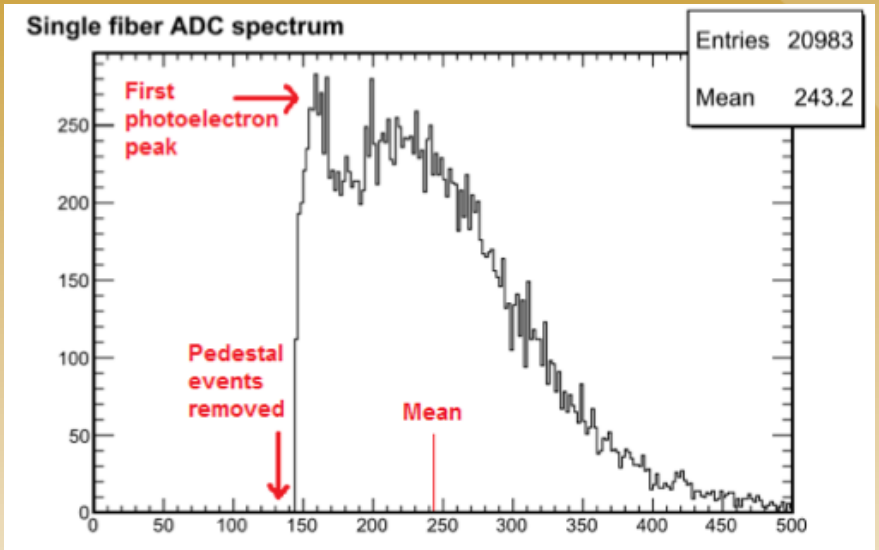
Planned Operation and Use

- Limit beam current to 1 μA, targets 15 μm W, 50 mg/cm^2 C
  - Start with single optics foil (and sieve)
  - Initially only negative polarity
  - Multiple optics foil
  - Experiment foil: analyze each of 10 foils separately
- Individual fiber rates 200-250 KHz
  - Total detector rate 6-8 MHz
  - Spectrometer rates (after magnetic field) ~ 1KHz
  - DAQ likely limited to several KHz
- Fibers themselves produce multiple scattering
  - Remove when not calibrating
  - Reinsert periodically to confirm optics



Testing Plan

- check both SciFi hodoscopes:
  - Heads
  - Cables
  - maPMTs
  - DAQ



- Cosmics, source in EEL
- On stand at backward angles in Hall with beam

Timeline

- July and August 2014 source and cosmic checkout
- Fall 2014 in Hall beam tests
- December 2014 ready for installing in vacuum extension box

Manpower

- FIU: Pete & Abel Castilla (student)
- Usual Jlab suspects (Bogdan, Alexandre, etc.)

Open issues:

- Low energy noise with beam/rates
- Control of stepper motor (GUI? Interlocks? Epics data?)
- Installation into vacuum extension box

- Optimizing optics matrix elements