

# Future FDIRC tests in SLAC cosmic ray telescope

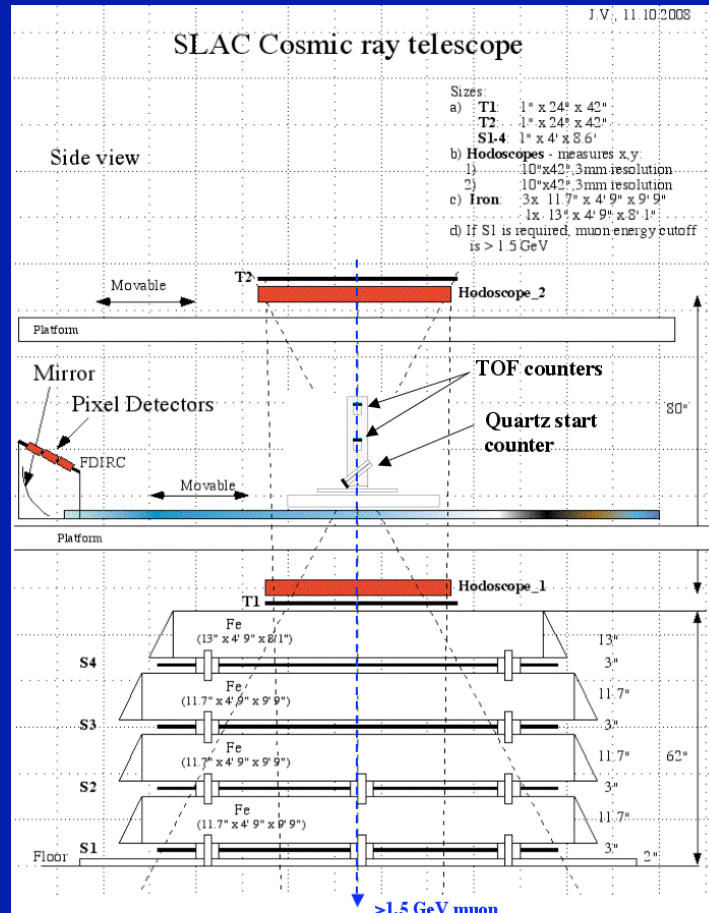
J. Va'vra, SLAC

# Content

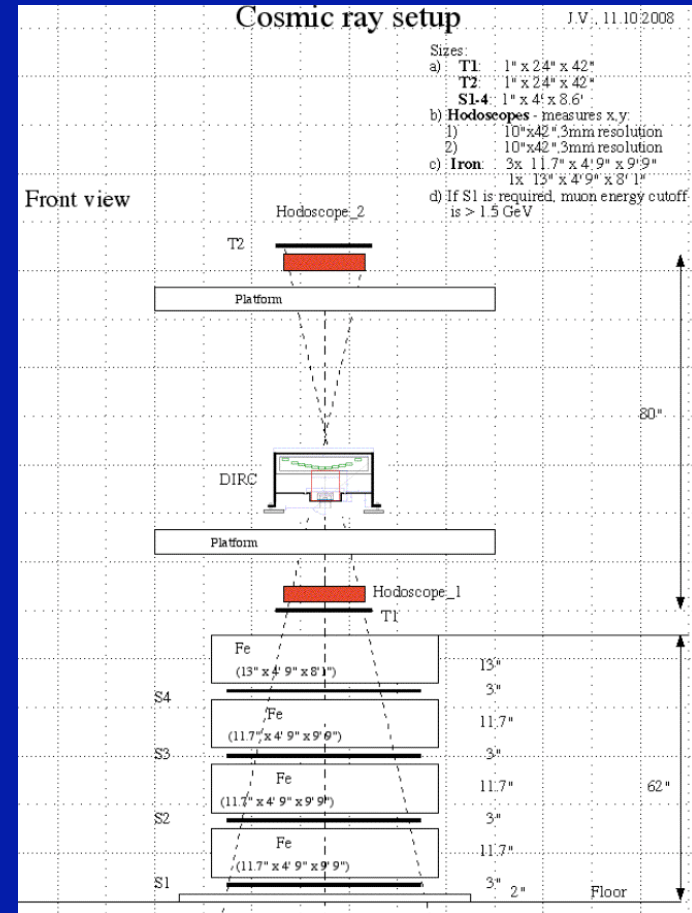
- **Status of the cosmic ray telescope.**
- **FDIRC - update on a new electronics**
- **First tests of TARGET chip at SLAC**

# SLAC cosmic ray telescope

Side view:



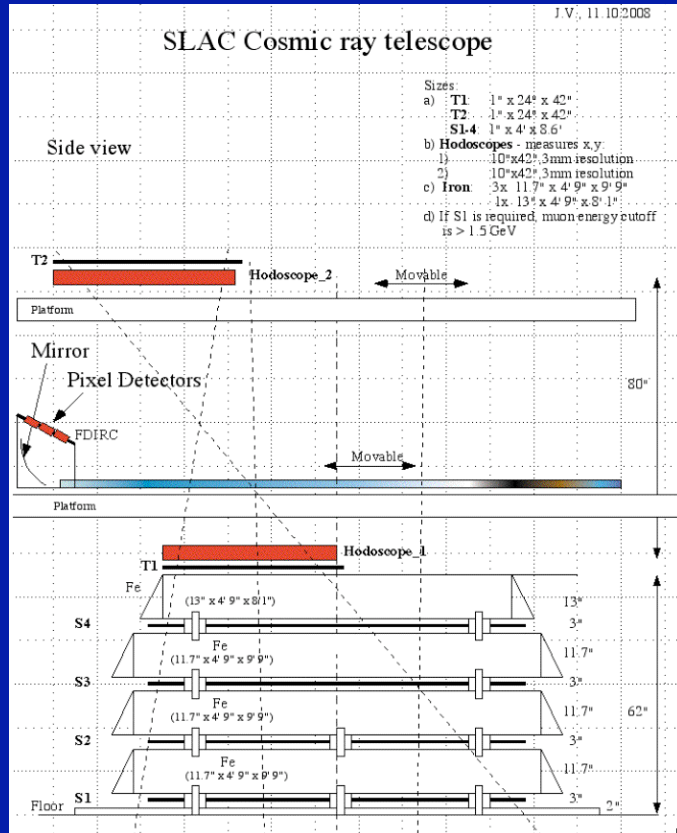
Front view:



- ~ 4 feet of iron (an old TPC magnet) => ~ 1.5 GeV muon energy cutoff
- Tracking resolution: ~1 mrad.
- Status: telescope hardware re-started; working on the FDIRC and TOF hardware.

# SLAC cosmic ray telescope

Side view:

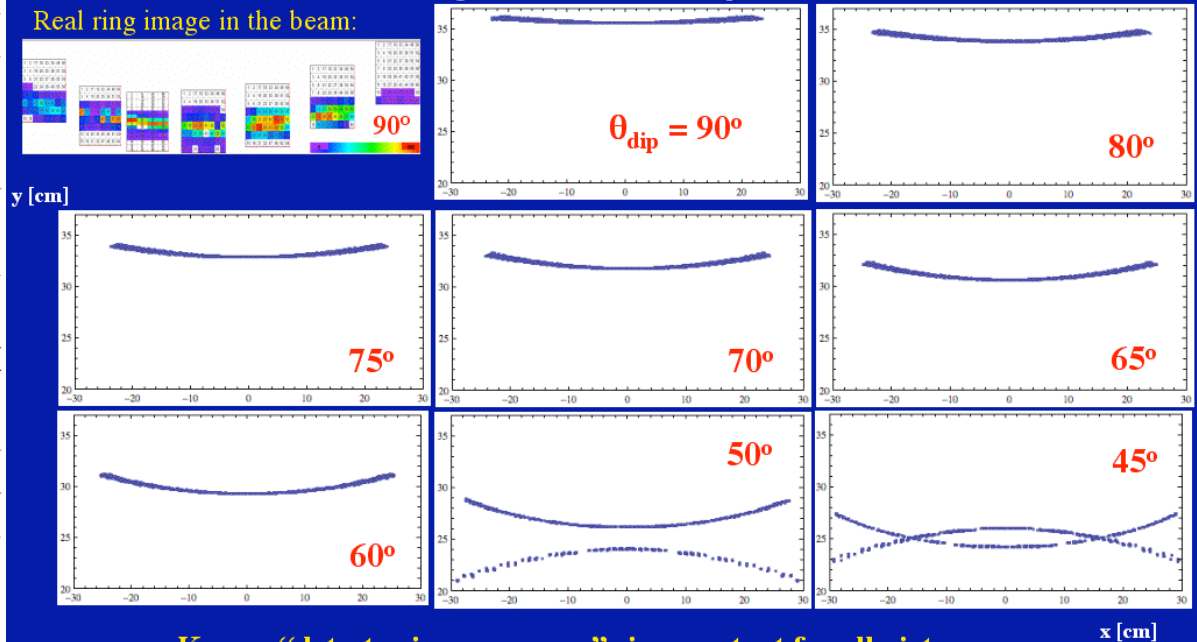


Mathematica:

Ring image for FDIRC prototype with:  
no wedge, spherical mirror, flat detector plane (vary  $\theta_{dip}$ )

Calculated images in the flat detector plane located in the mirror's focus:

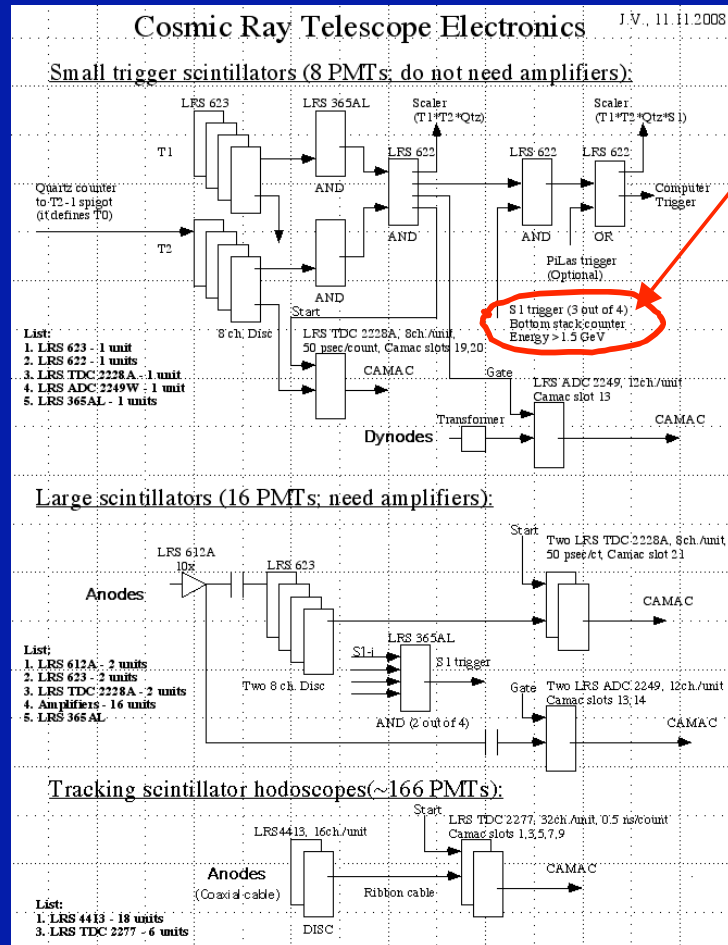
Real ring image in the beam:



- Keep a "detector image canvas" size constant for all pictures

- Will start with a nominal position:  $\theta_{dip} \sim 90^\circ \pm 10^\circ$  (range given by a MaPMT acceptance)
- Need to shift the detector plane to reach smaller dip angles ( $\sim 1.8$  cm/ $10^\circ$  dip angle).
- With some modification we could reach, perhaps,  $\theta_{dip} \sim 75^\circ$ .

# SLAC cosmic ray telescope



## DAQ:

- cPCI ceate:
- cPCI CPU - master, fiber optics transievers talk to boards on H-8500 MaPMTs
- Communicate with the rest of CAMAC via CC-USB controllers

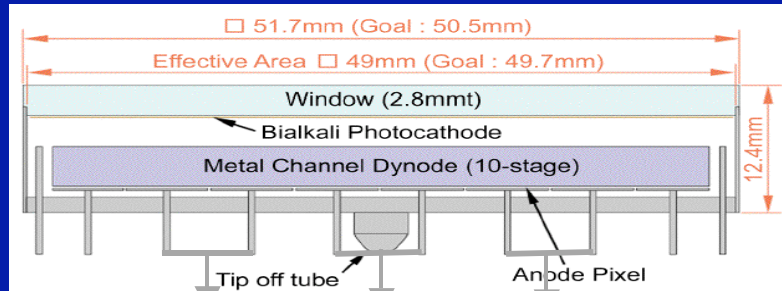
- **Status: cosmic ray telescope is running; however, need to include the Quartz counter into the trigger & setup a PiLas laser & DAQ (will be made by Andrew Wong).**

# FDIRC electronics chain

G. Varner, Larry Ruckman, Andrew Wong

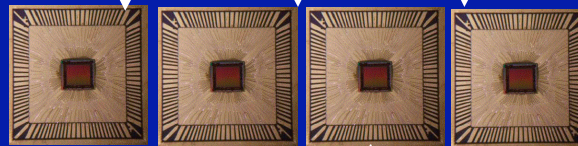
**H-8500**

**MaPMT:**



64 pixels, 8x8

**BLAB2 ASIC:**



64 Amplifiers/MaPMT,  
**Amp. gain ~ 40x**

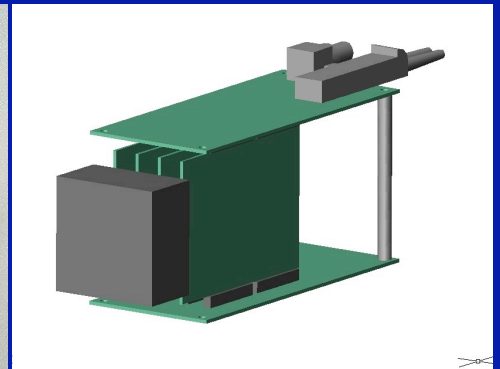
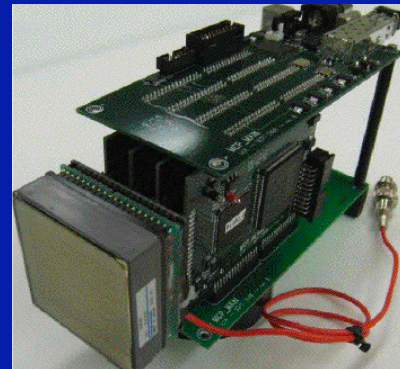
Waveform sampling electronics:  
**4 BLAB2 chips / MaPMT, ~ 450 pixels !!**  
**Waveform sampling rate: ~ 2.5 GSa/s**  
**Timing resolution goal:  $\sigma_{\text{final}} \sim 150$  ps**

**FPGA array**

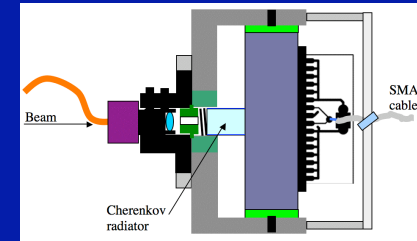
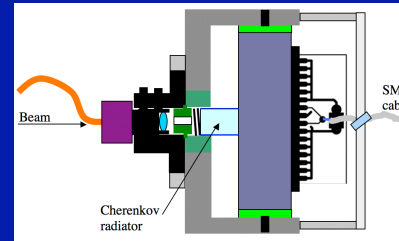
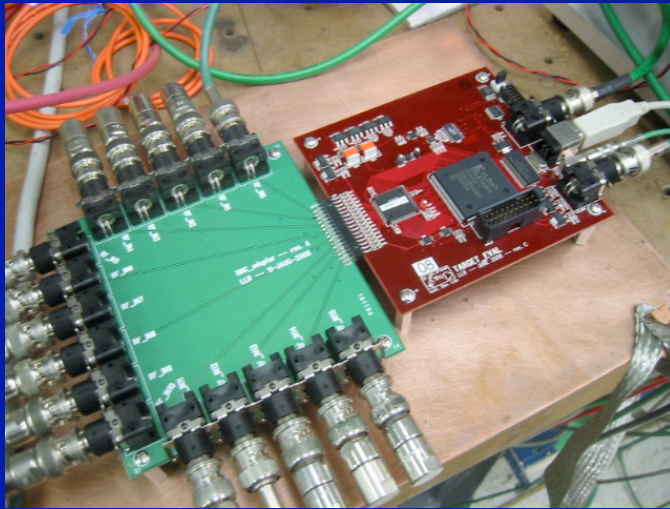
## Status:

- 1 H-8500 at U.of Hawaii - debugging of electronics.
- 2 H-8500's are at SLAC - installed.
- 5 H-8500's - plan to get them from CERN.

Initial package:



# Initial tests of Target chip & MCP-PMT



- “Oscilloscope-like” software running on my MAC
- Pulses from a Photonis MCP-PMT
- Light source: PiLas laser diode
- HPK amplifier with a gain of 63x
- Maximum sampling speed: 2.5 GSa/s
- **Plan: run two TOF counters in tandem, collect some events and try to develop a strategy for waveform-based timing between two MCP-PMTs, and compare them to Ortec 9327 CFD results.**
- TARGET chip DAQ software: Andrew Wong
- Acknowledgement for help to: G. Varner, Larry Ruckman, and David Aston

