# Argonne Laser Test Stand and DAQ Status and Plans

Ed May (HEP)

LAPD Collaboration Meeting

Oct 15, 2009

# Outline

People

Pictures

Mission

Methods 1

Methods 2

Pictures of Devices

Sample Results

     Gain/Charge resolution/Calibration

     XY uniformity

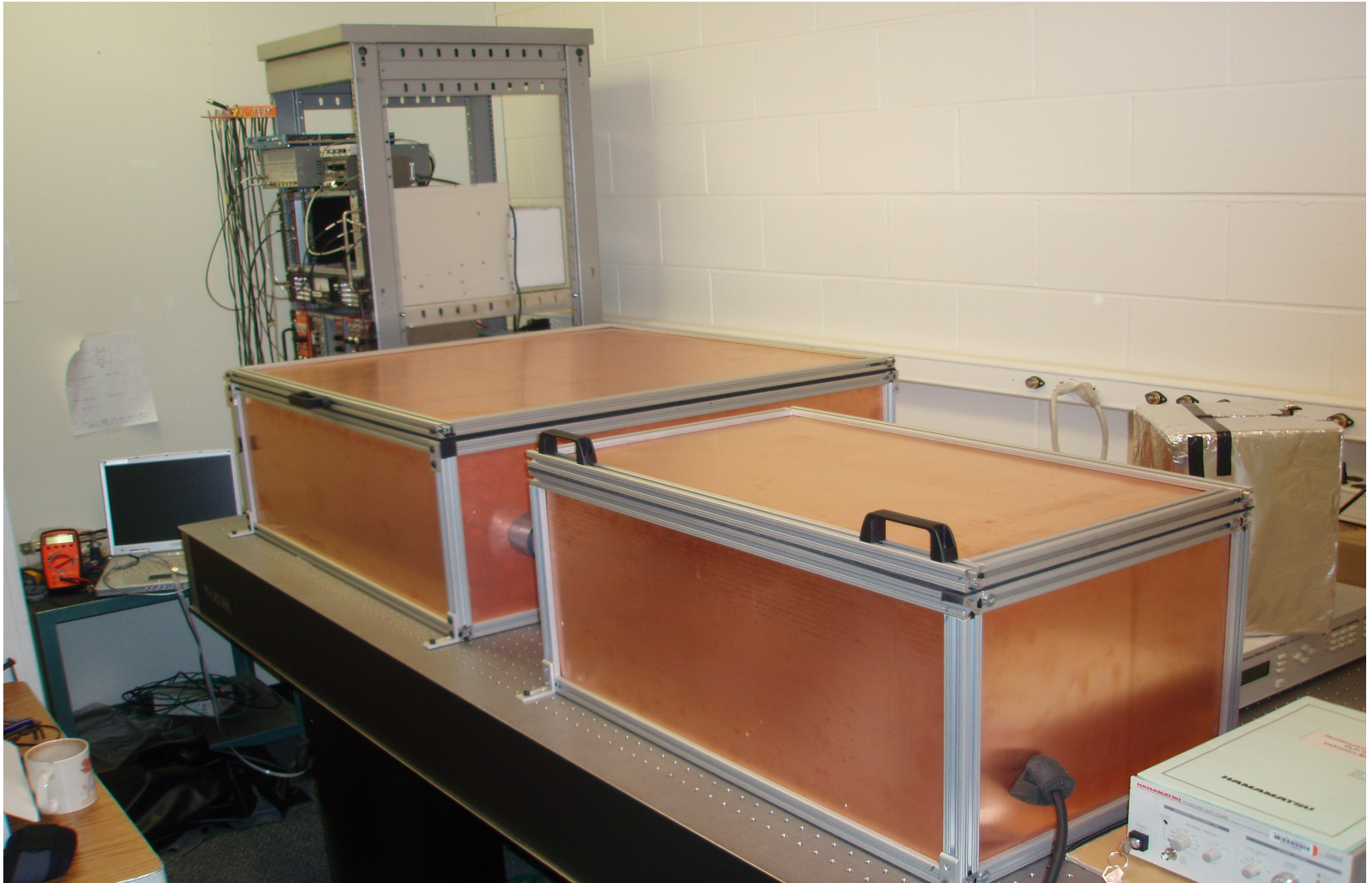     Time resolution v. light

Future

# People

People who have developed and or worked with Laser Lab:

Gary Drake, John Anderson, and Camden Ertley(student)
Ed May, Eugene Yurtsev(student), and Paul Drake(student)
Jean-Francois Genat, Tyler Natoli(student)
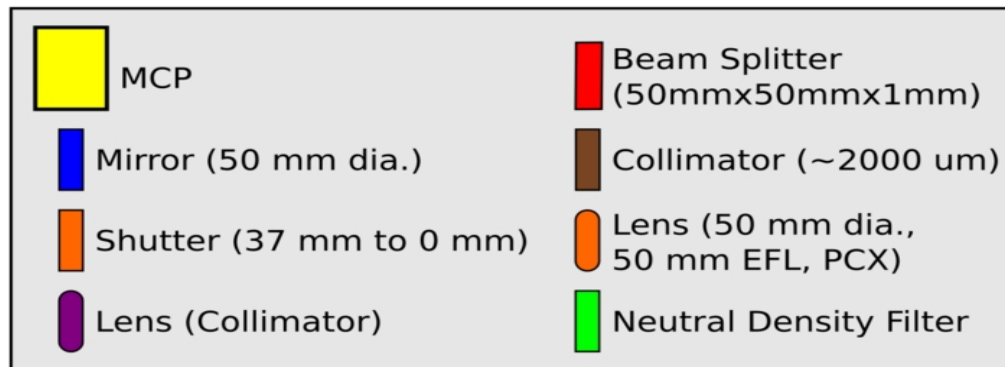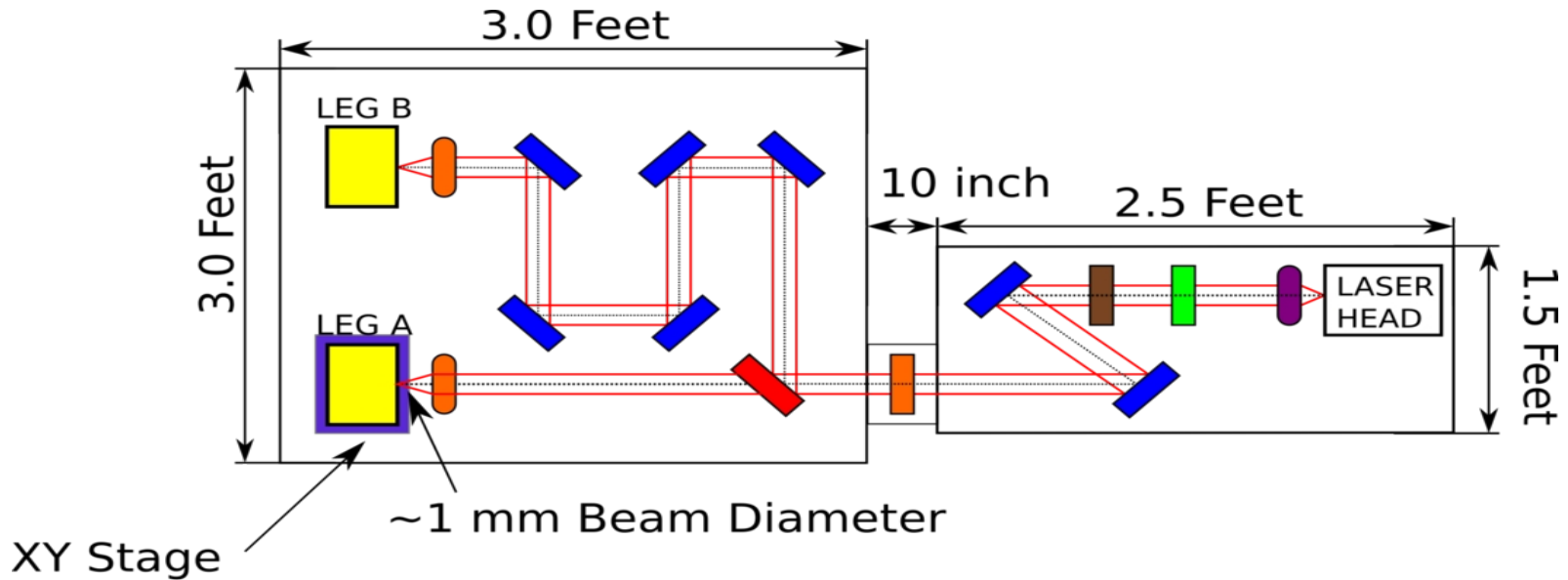
# What is the Laser Lab

# Schematic

# Laser box interior

# Detector Box

# Mission

- Measure properties of photo-detectors
  - Gain
  - Time and Amplitude linearity and resolution,
  - Spatial resolution and uniformity
  - Rate effects,
  - Light level and  wave-length dependance.
- Can not do Quantum efficiency measurement
- Used in conjunction with setup for and analysis of Fermilab test-beam data collection.
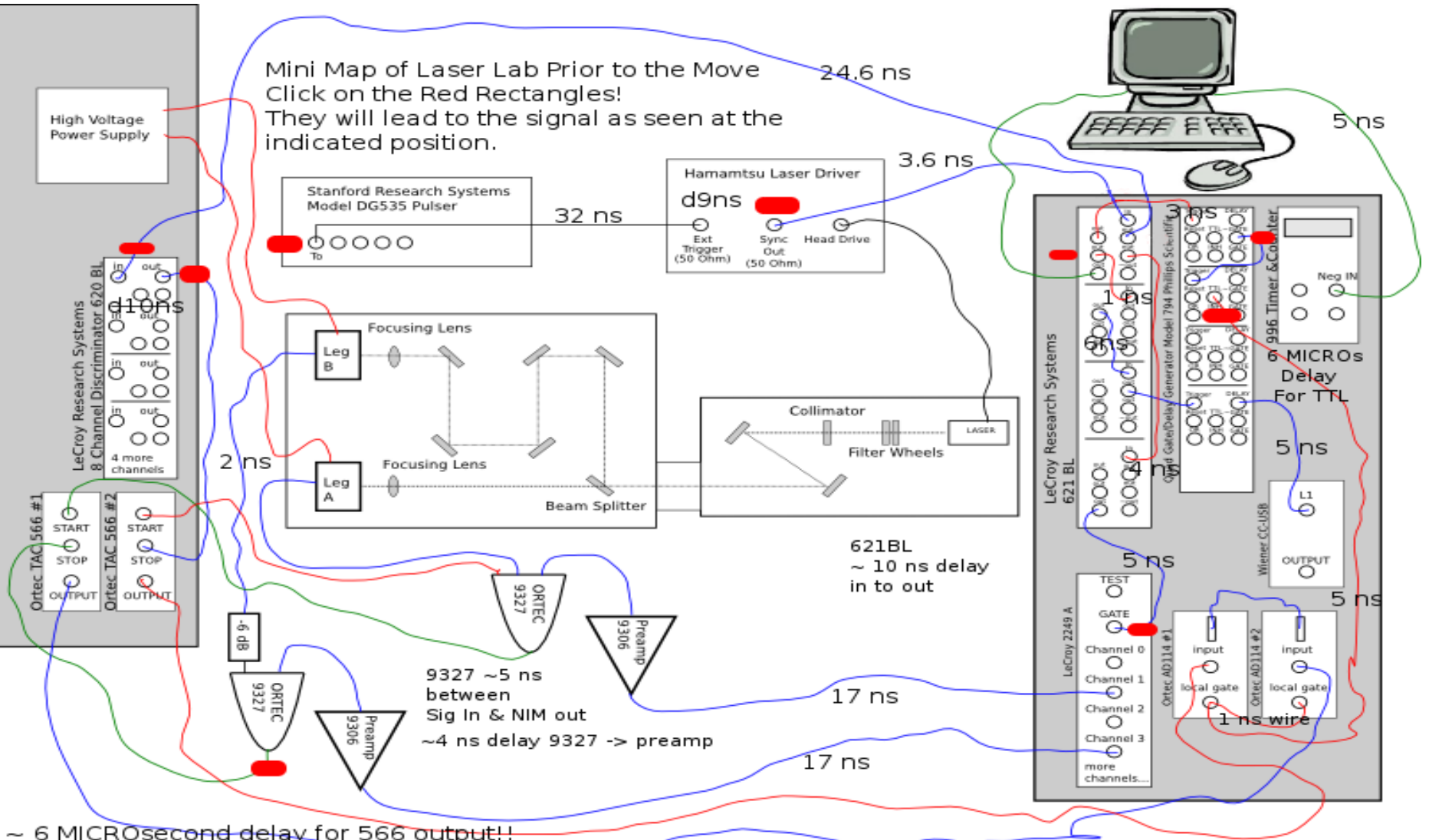
# Methods

- Based on using a precision light source and high resolution time and amplitude measurements
- Hamamatsu PicoSecond Light Pulser Laser model PLP-10
- Low noise HV source (Bertan 380N)
- Ortec high-bandwidth preamps and constant-fraction discriminators. Models 9306 1GHz preamp and 9327 1GHz amp/discriminator
- Amplitude (charge) digitization (Lecroy 2249A)
- High resolution time digitization: Ortec Model 566 TAC and AD114 13K ADC
- 3 complete and independent amplitude and time channels ($$$)
- Readout via CAMAC to Linux via USB i/f (Wiener CC-USB controller)
- Computer control of 3 high precision translation stages (Newport ESP300)
- Computer control of light level via rotatable neutral density filter

# Student's view of the system
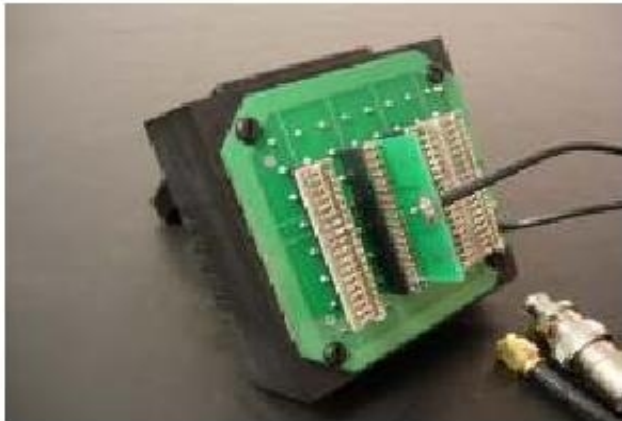
# Methods (continued)

- DAQ software (C/C++) based on vendor supplied USB driver for CAMAC. Controls stepping of light level and position for scans.
- Data stored ad simple CSV files. (i.e. anybody can read)
- Interactive data analysis and presenter based on JAS3(java) or JHEPWORK(jython).
- Capable of acquiring data at 5-10KHz.
- System capable of 1GHz bandwith, 8 picoSec rms time resolution, 0.25 picoCoul charge snsitivity.
- Alternate DAQ via UoC HEP Tektronics 15GHz bandwidth scope to capture wave form data. (Acquiring data and data analysis somewhat slower)
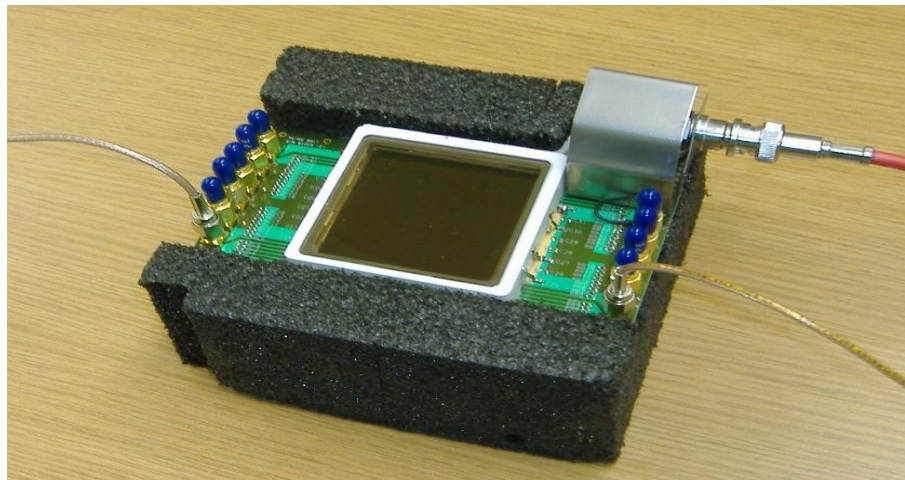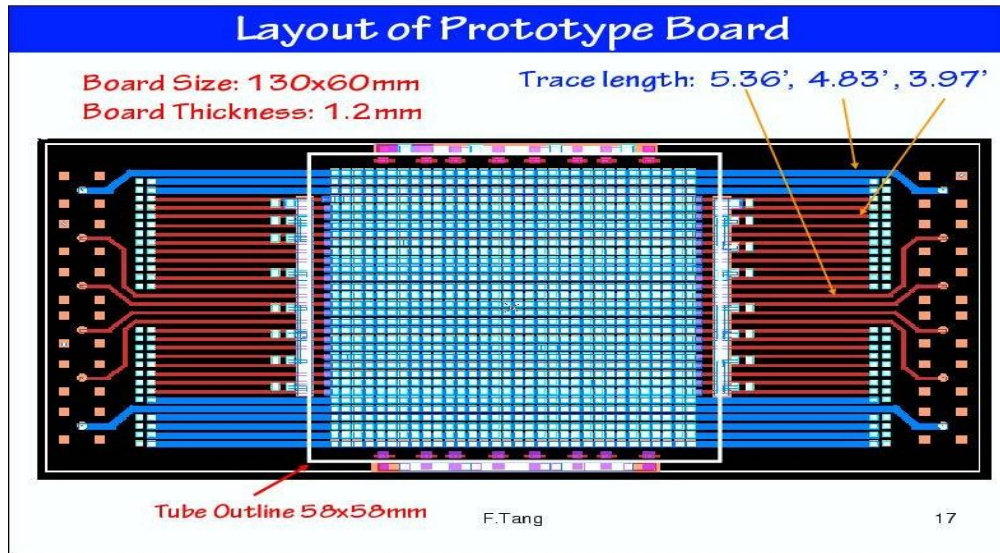- Electronic (web based) logbook based on ELOG (Sefan Ritt)

# Devices

Commercial MCP
Model #: 85011-501
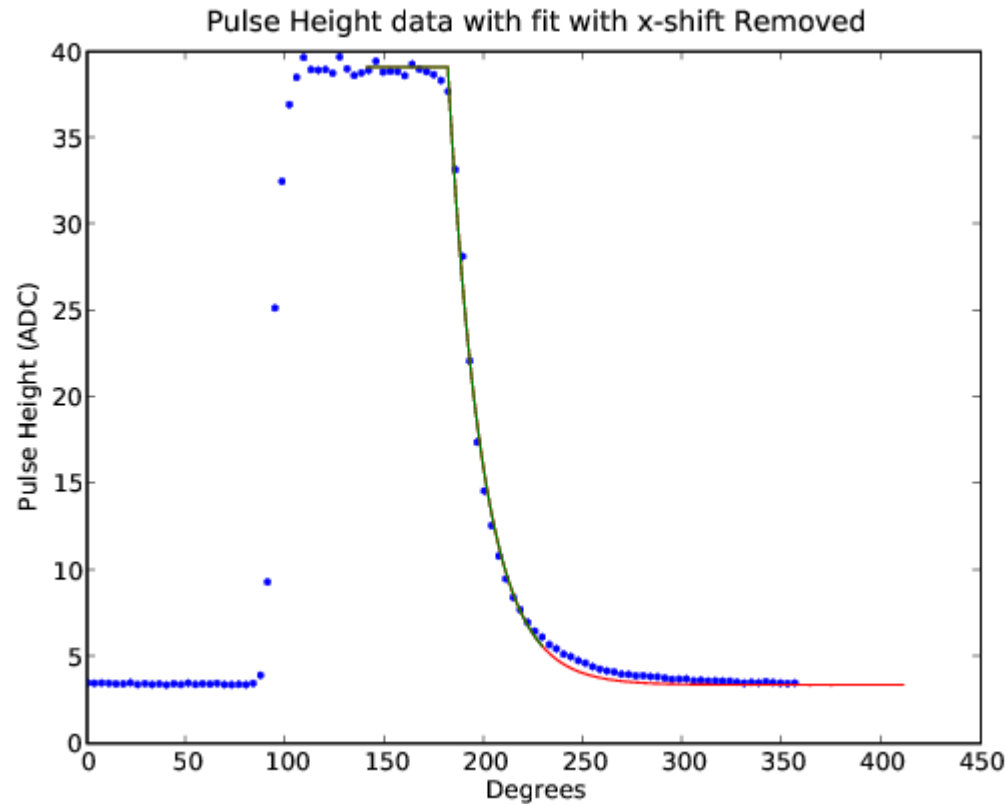SN: 12110309

# 10u and 20u 1024 anode MCP with transmission line readout



Layout of Prototype Board

Board Size: 130x60mm
Board Thickness: 1.2mm

Trace length: 5.36', 4.83', 3.97'

Tube Outline 58x58mm

F.Tang

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# Can you understand your equipment e.g. neutral density filter wheel



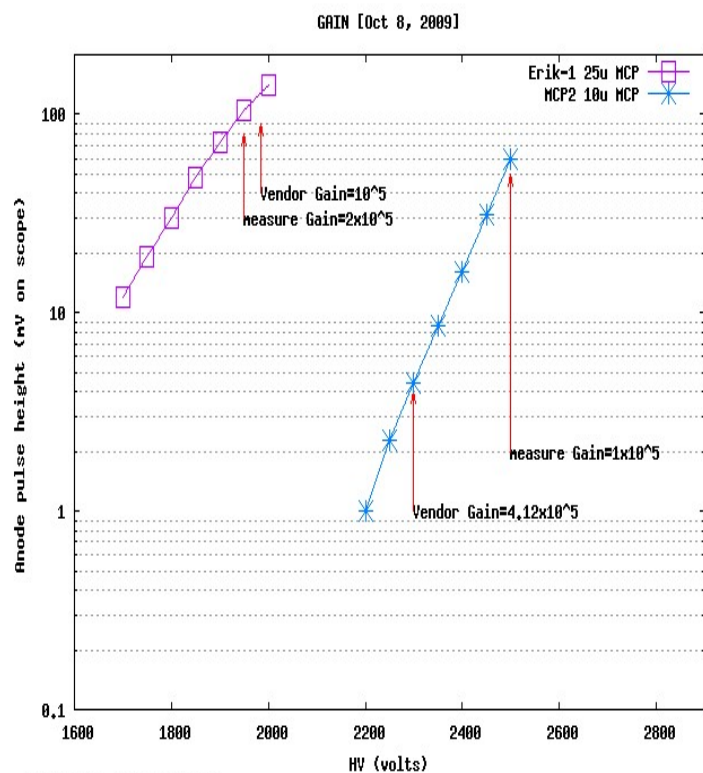Pulse Height data with fit with x-shift Removed
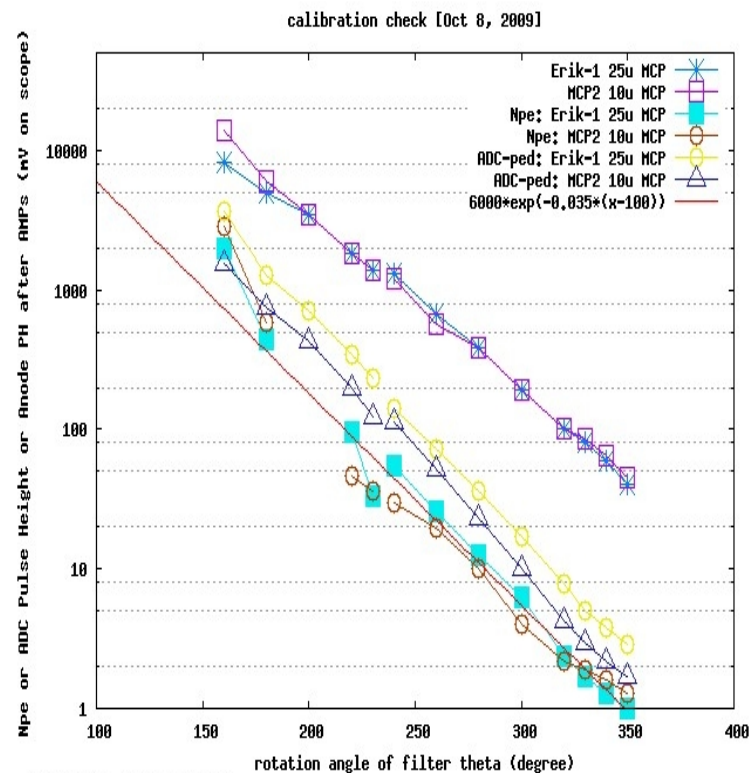
# Sample Results:
# PH distribution showing 1pe,2pe… at low light levels
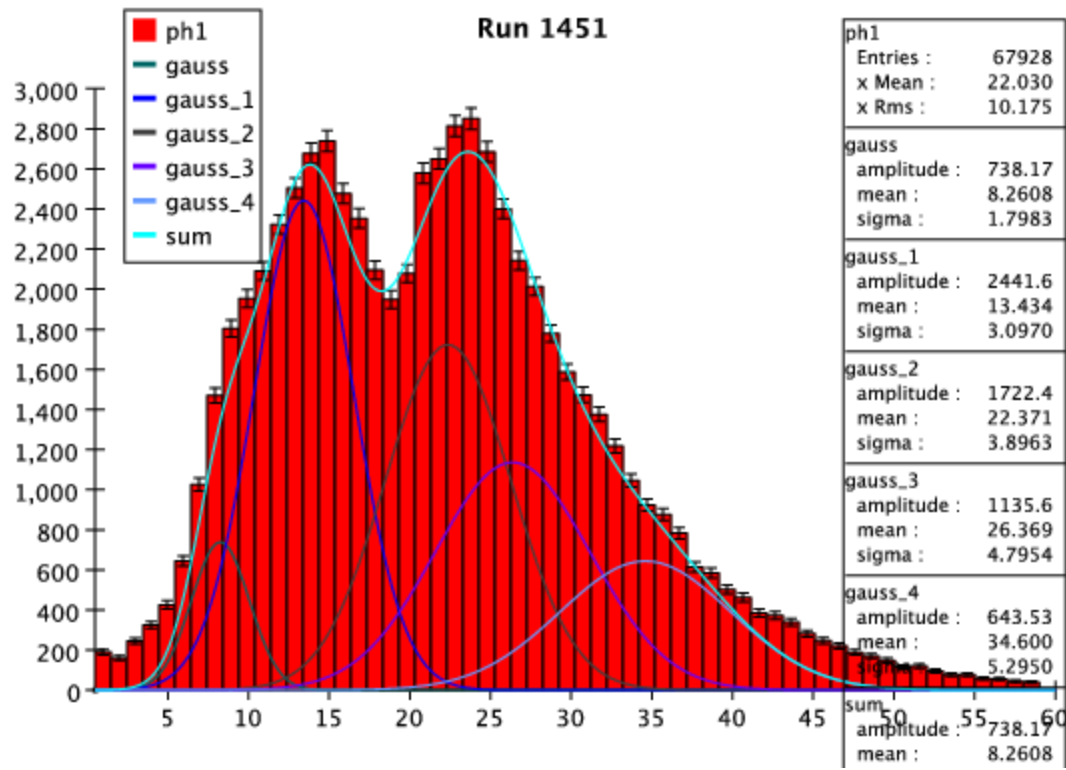
# Getting the Gain and a Light Level Calibration.

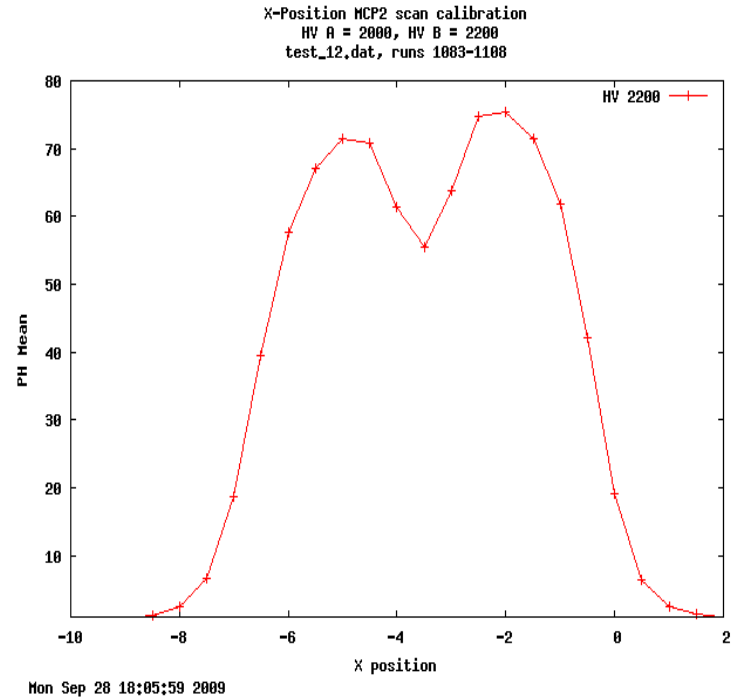# Uniformity in X and Y
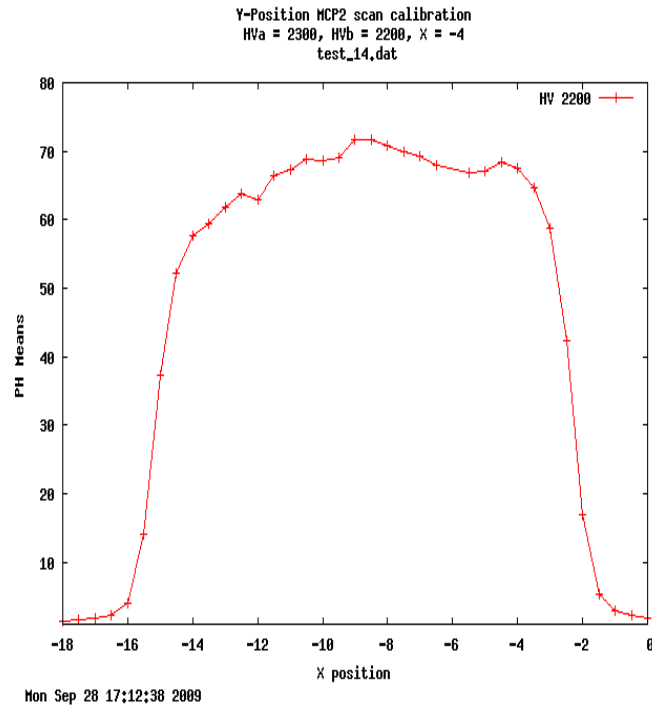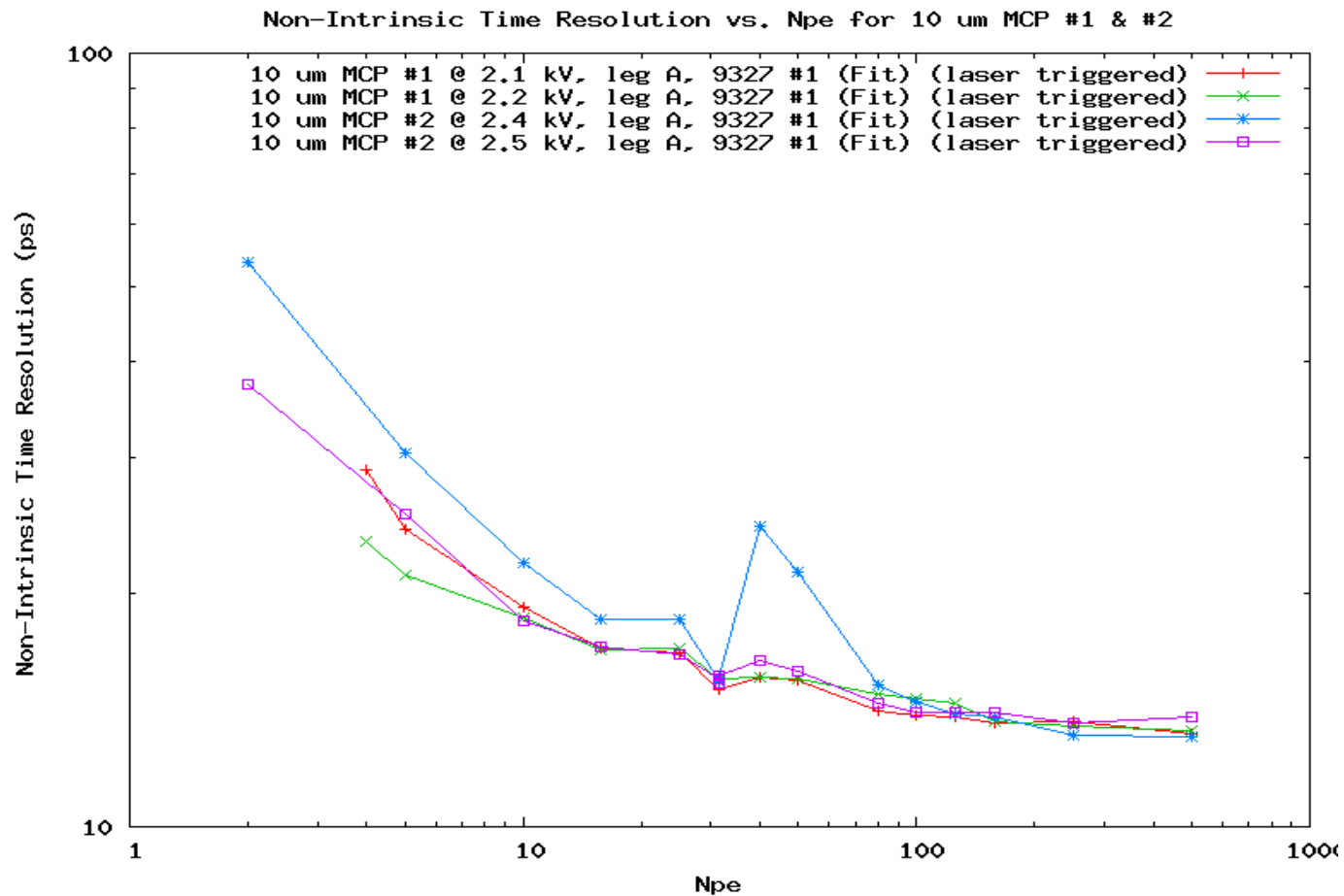
# What about time resolution?



Non-Intrinsic Time Resolution vs. Npe for 10 um MCP #1 & #2

10 um MCP #1 @ 2.1 kV, leg A, 9327 #1 (Fit) (laser triggered)
10 um MCP #1 @ 2.2 kV, leg A, 9327 #1 (Fit) (laser triggered)
10 um MCP #2 @ 2.4 kV, leg A, 9327 #1 (Fit) (laser triggered)
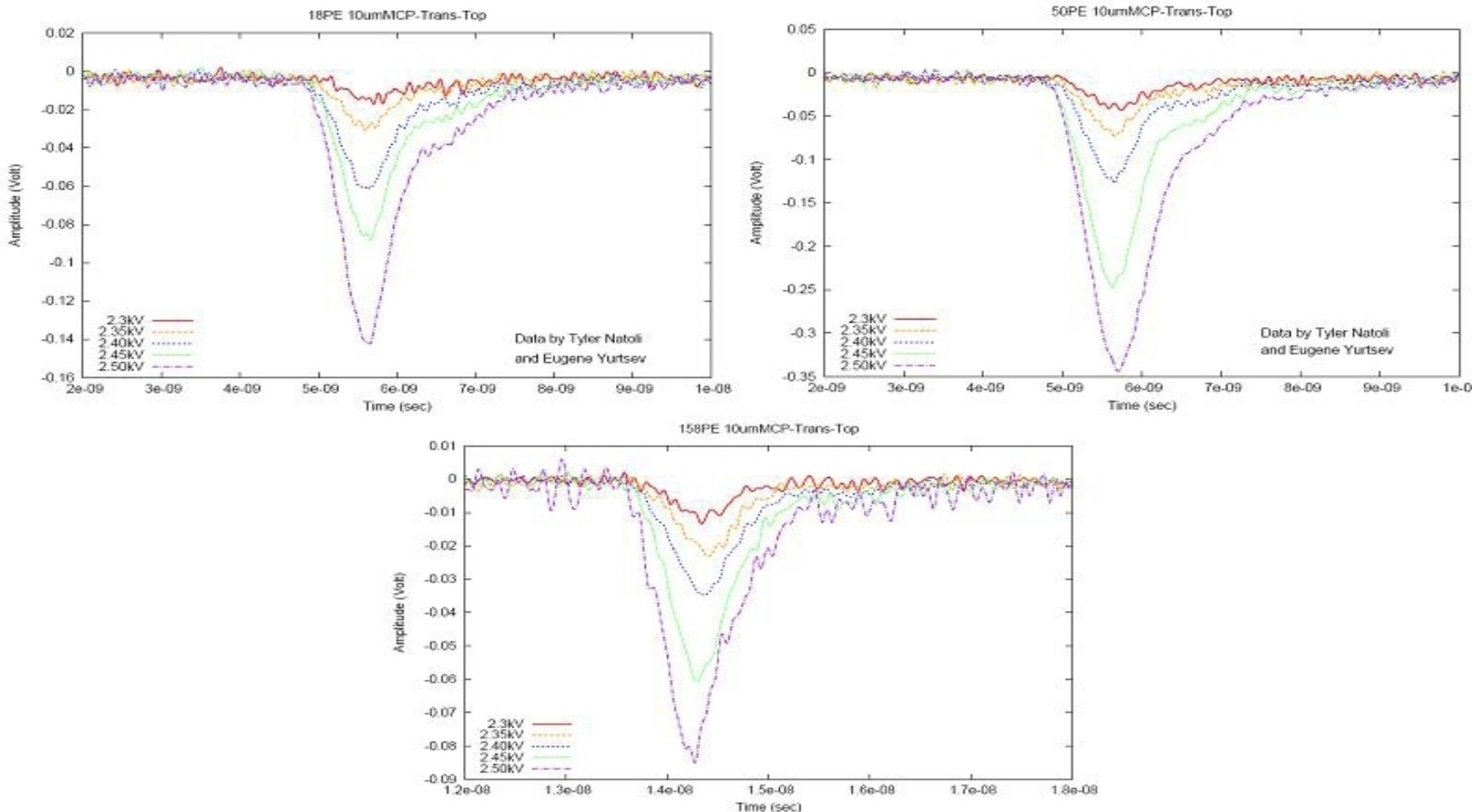10 um MCP #2 @ 2.5 kV, leg A, 9327 #1 (Fit) (laser triggered)
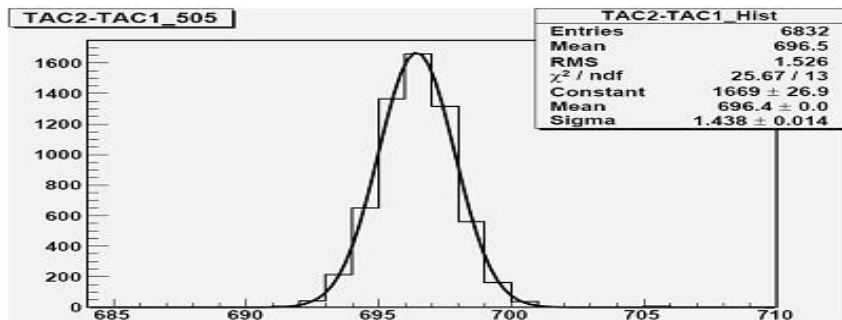
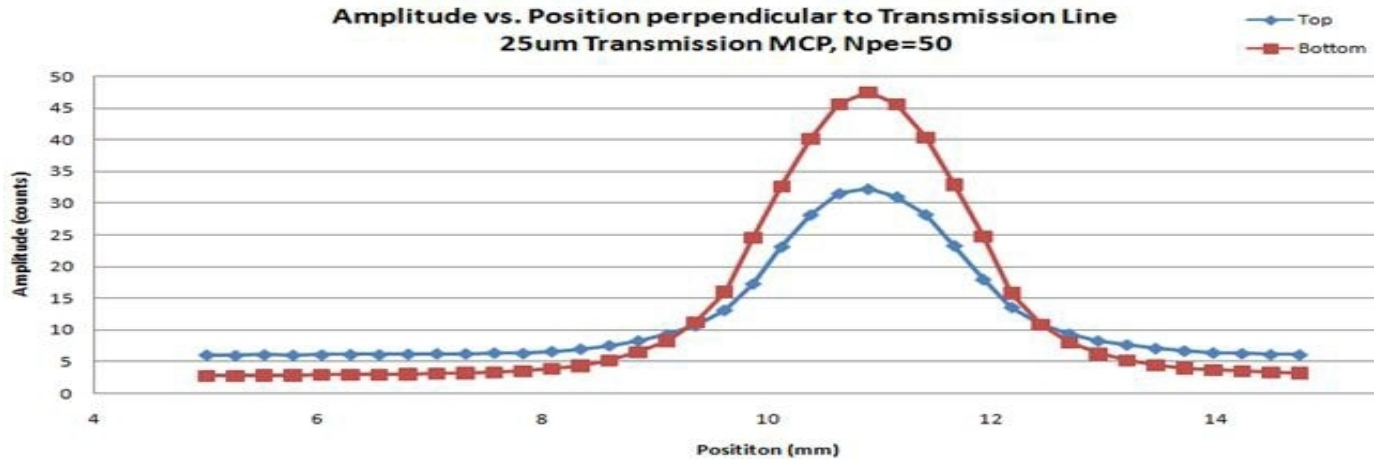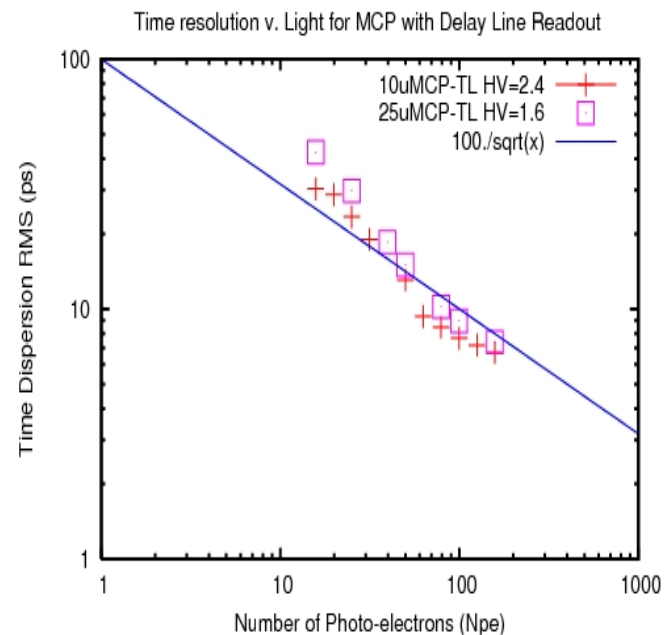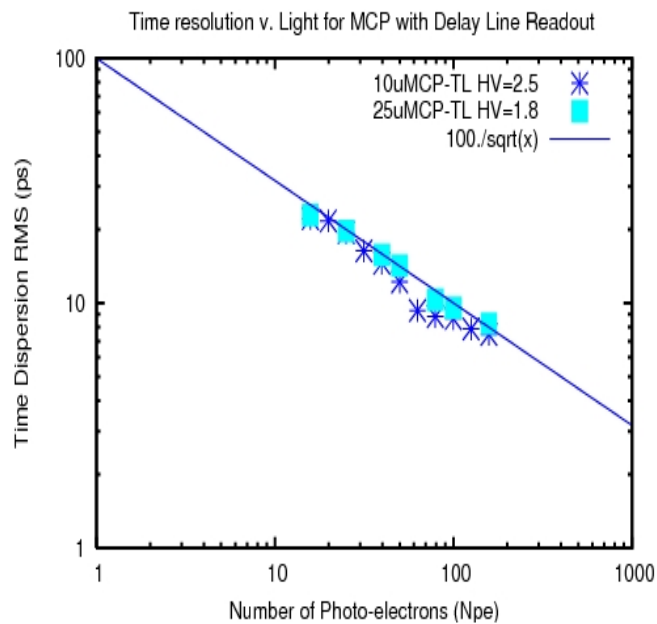# What are the contributions to Observed time resolution?
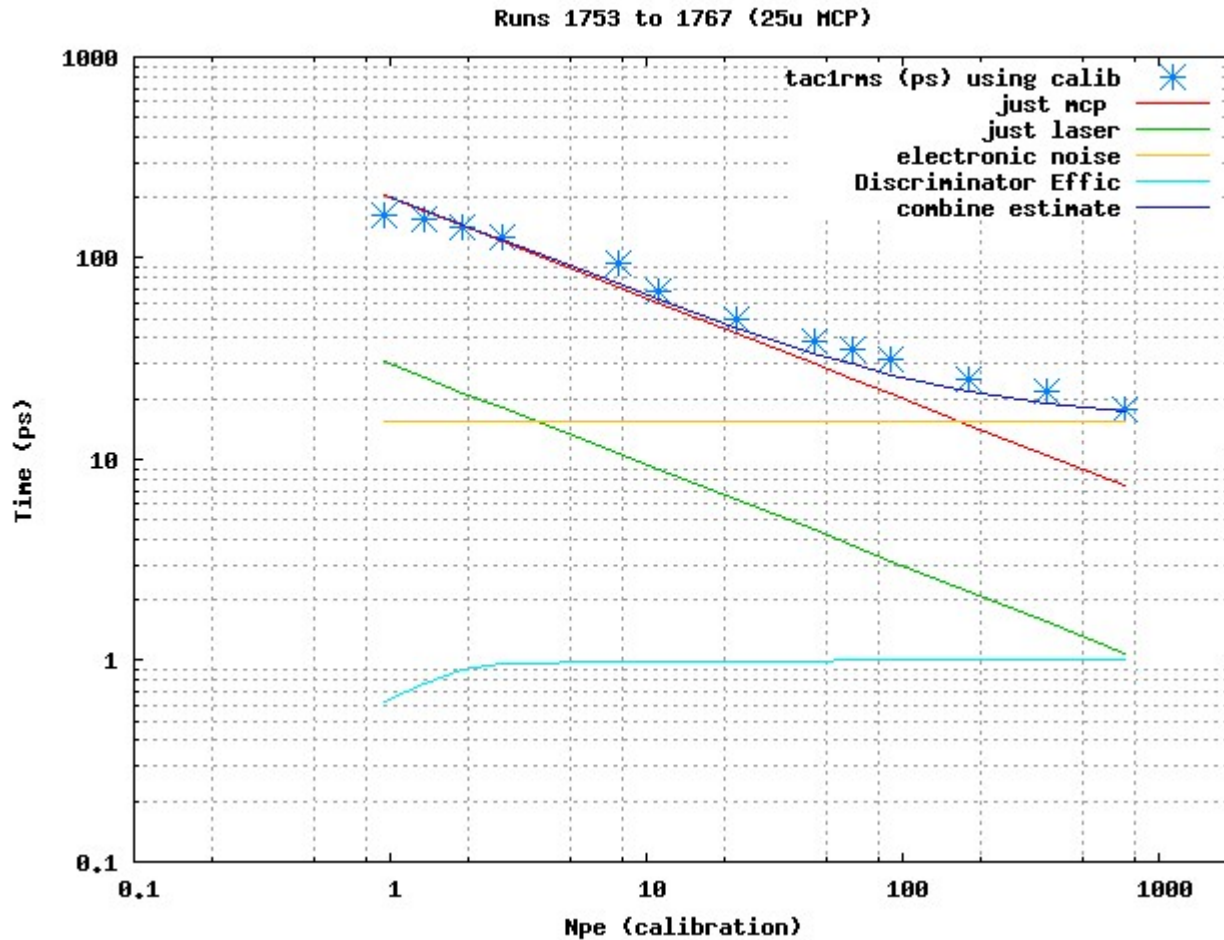
# Pulses from transmission line readout recorded by 15GHz Scope

# Spatial Dependance and Resolution with transmission line readout
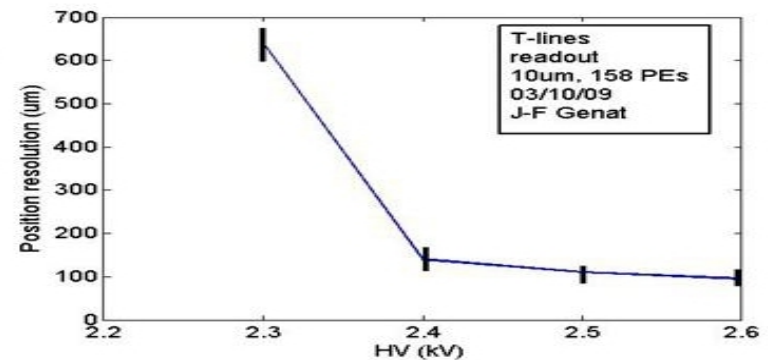
# Time Resolution using Transmission Line Readout

# Future

- Computer control of HV ( eg USB)

- Get high sensitivity ( ie better charge resolution) ADC based on Fermilab Rabbit system (capable of 10 Femto Coul)

- Get commercial 1 GHz 4 channel Waveform Digitizer ( eg CAEN VME or USB based) for routine measurements.

- Issues surrounding the development/implementation of a DAQ system for readout out of the UofC/Hawaii multi GHz bandwidth waveform digitizer.

- Issues surrounding the measures of sealed 8"x8" prototypes.