



University of Chicago



Goals and Technical Issues for Integration of 8" Systems

*M. Wetstein, A. Elagin, A. Vostrikov, R. Obaid, B. Adams
V. Ivanov, Z. Insepov*

LAPPD Collaboration Meeting
Dec 9 2011



Approaching Complete Detector Systems – An Incremental Approach

8” chamber

- Allows testing of individual 8” MCPs and stacks.
- Can bias each component independently.
- Allows testing of stripline anode structure.
- Does not depend on mechanical and vacuum sealing challenges.

Demountable tile

- Rapid prototyping of matched 8” MCP pairs in a resealable glass-tube body
- Test of the “look-Ma’-no-hands” design
- Test of the anode
- Easier readout of multiple channels

Testing the electronics

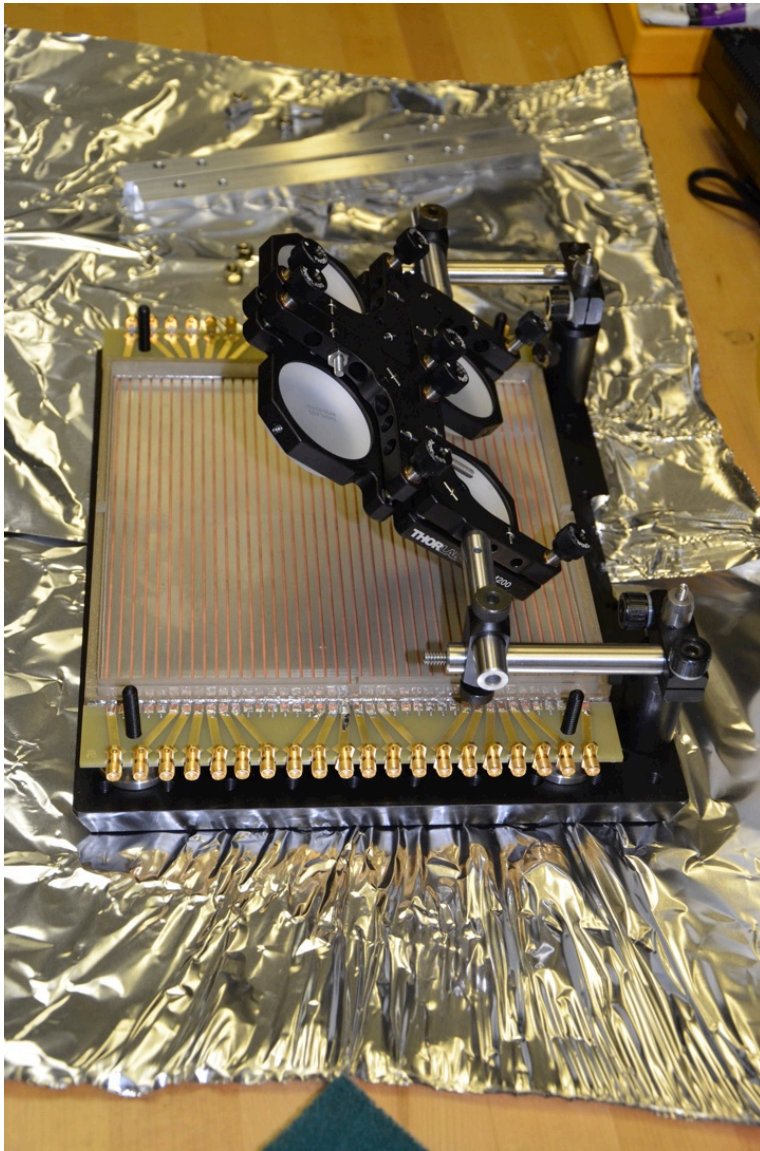
- Opportunity to test the performance of the PSEC chip on signals fed out of the 33mm and 8” chamber through SMA feed throughs.
- Allows side-by-side comparison with oscilloscopes

Integrated demountable tile with transmission line and chips

- Demountable tile can be connected to analog cards for readout of N channels. Anodes can be daisy-chained together to study “super-module” performance.
- Complete analog-to-digital system that performs close to final design.



The 8" Chamber – design



LAPPD Collaboration Meeting – Dec 9 2011



The 8" Chamber – design

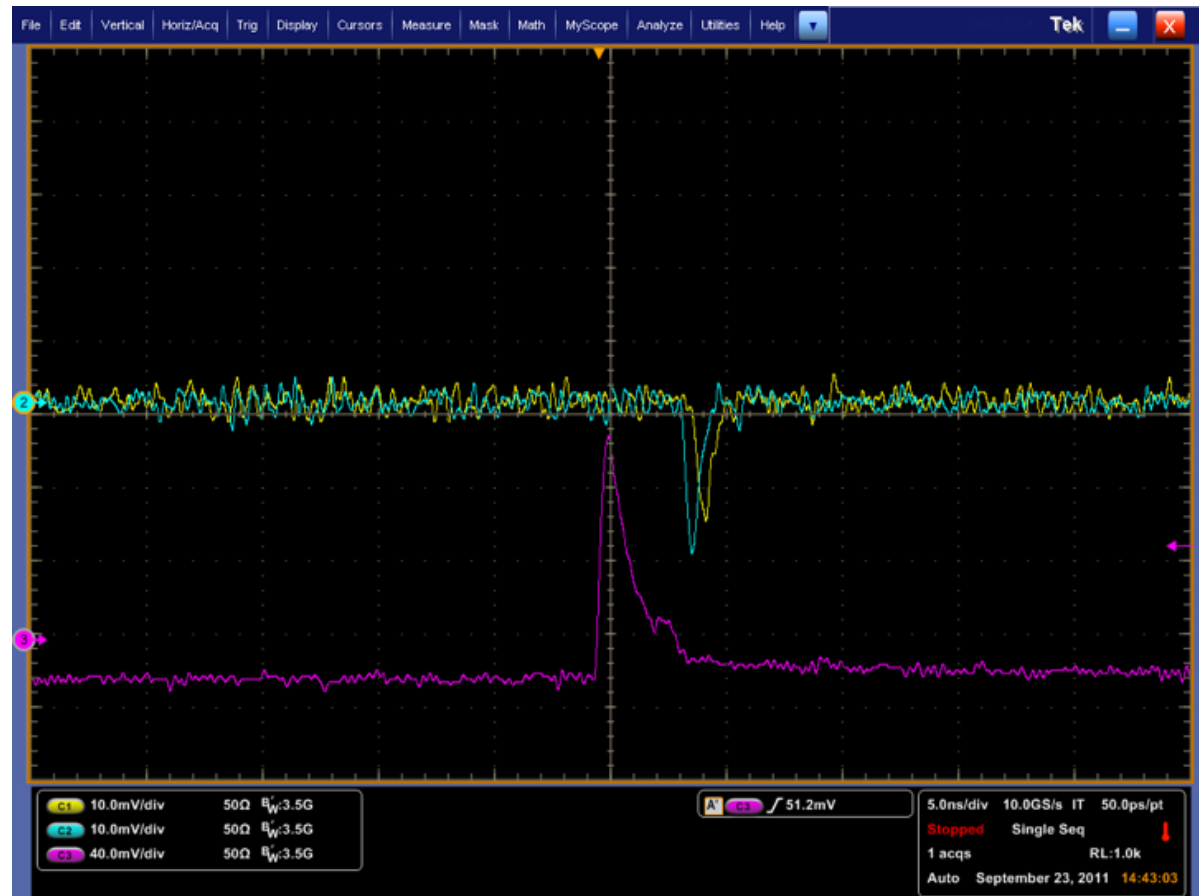


LAPPD Collaboration Meeting – Dec 9 2011

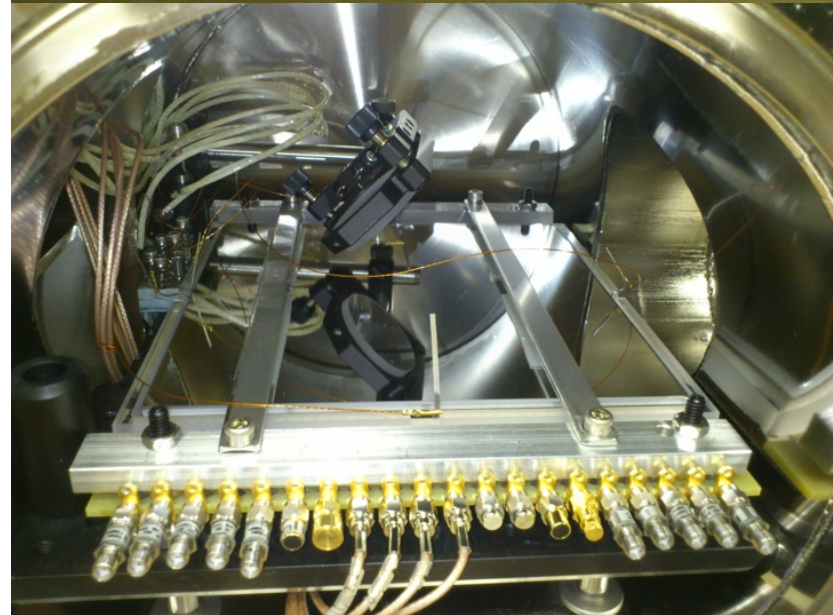
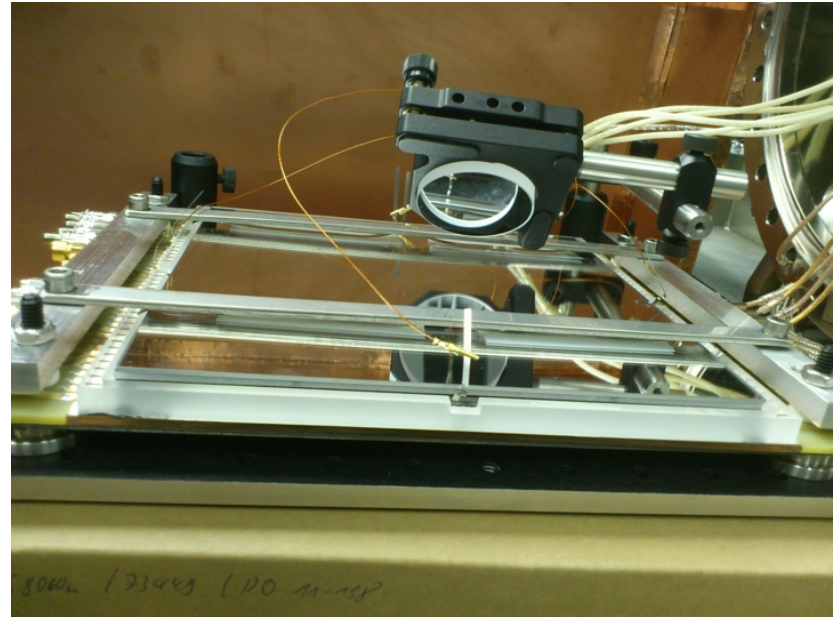
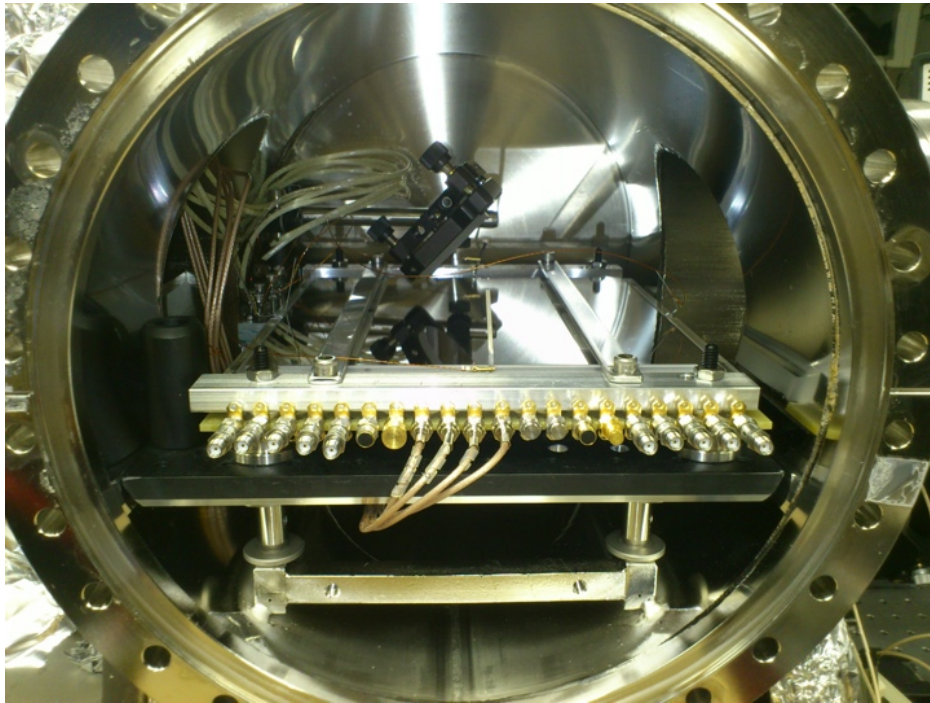


The 8" Chamber – results

- First pulses from a stack consisting of 1 8" plate and 1 33 mm MCP.
- Resistance of 8" plate was too low, had to pulse voltages to operate without runaway.

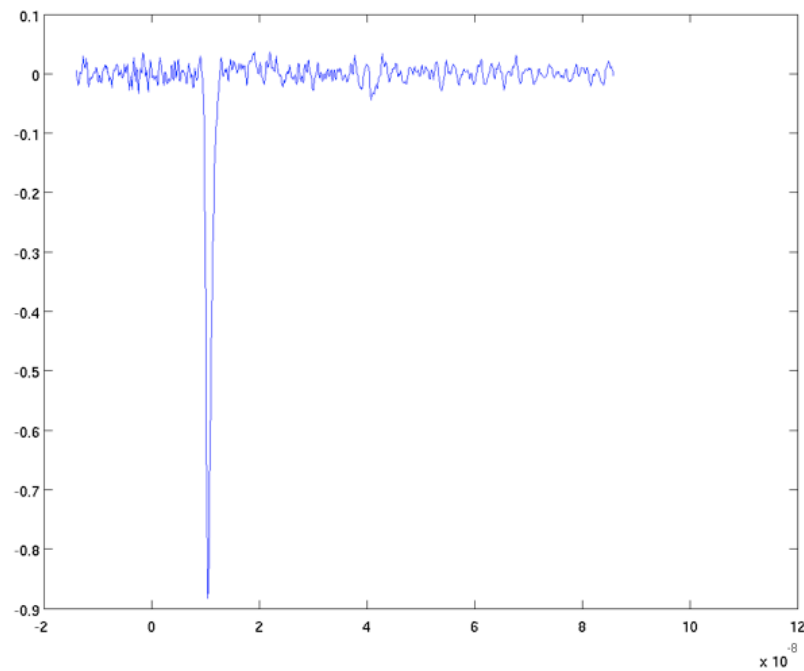
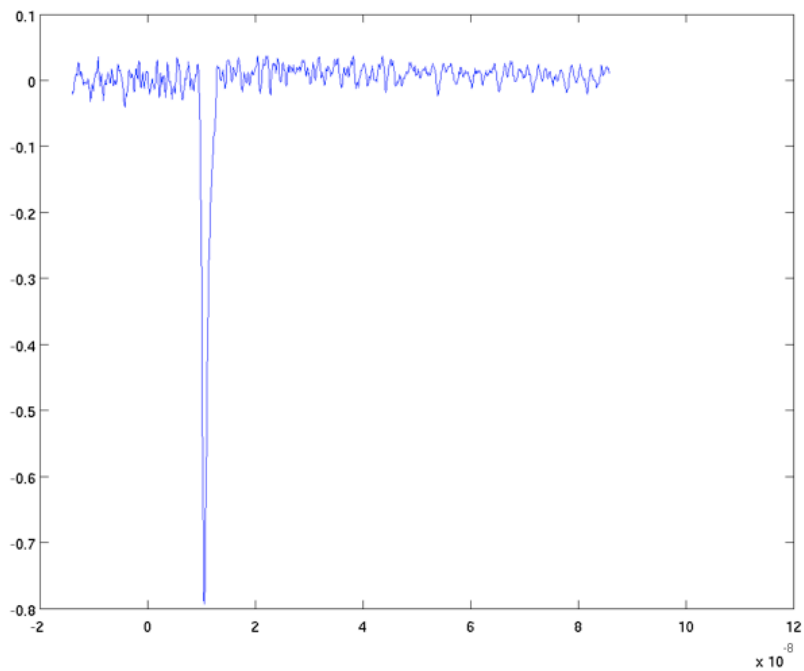


The 8" Chamber - design

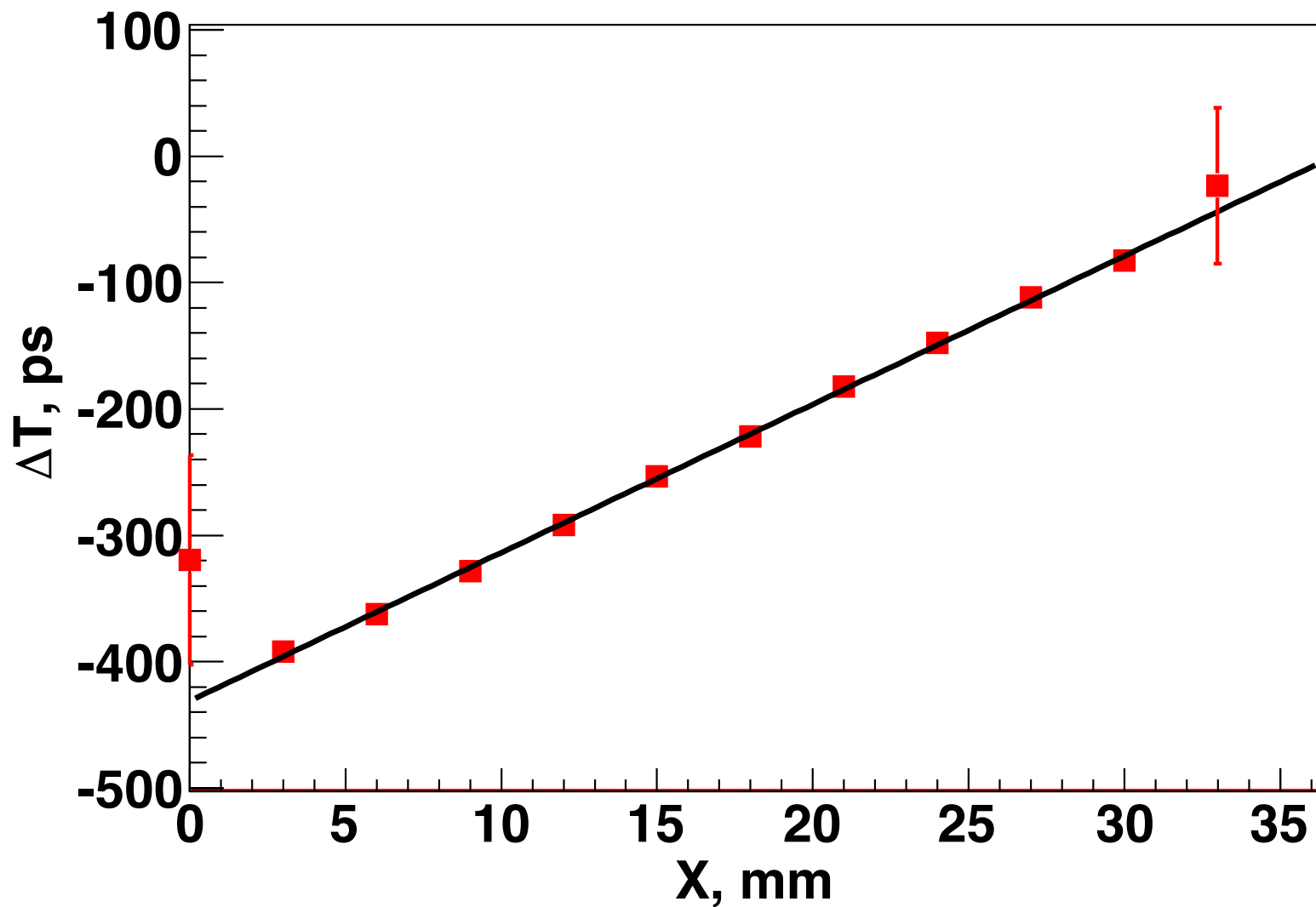


The 8" Chamber – results

New pulses from a pair of 8" MCPs!

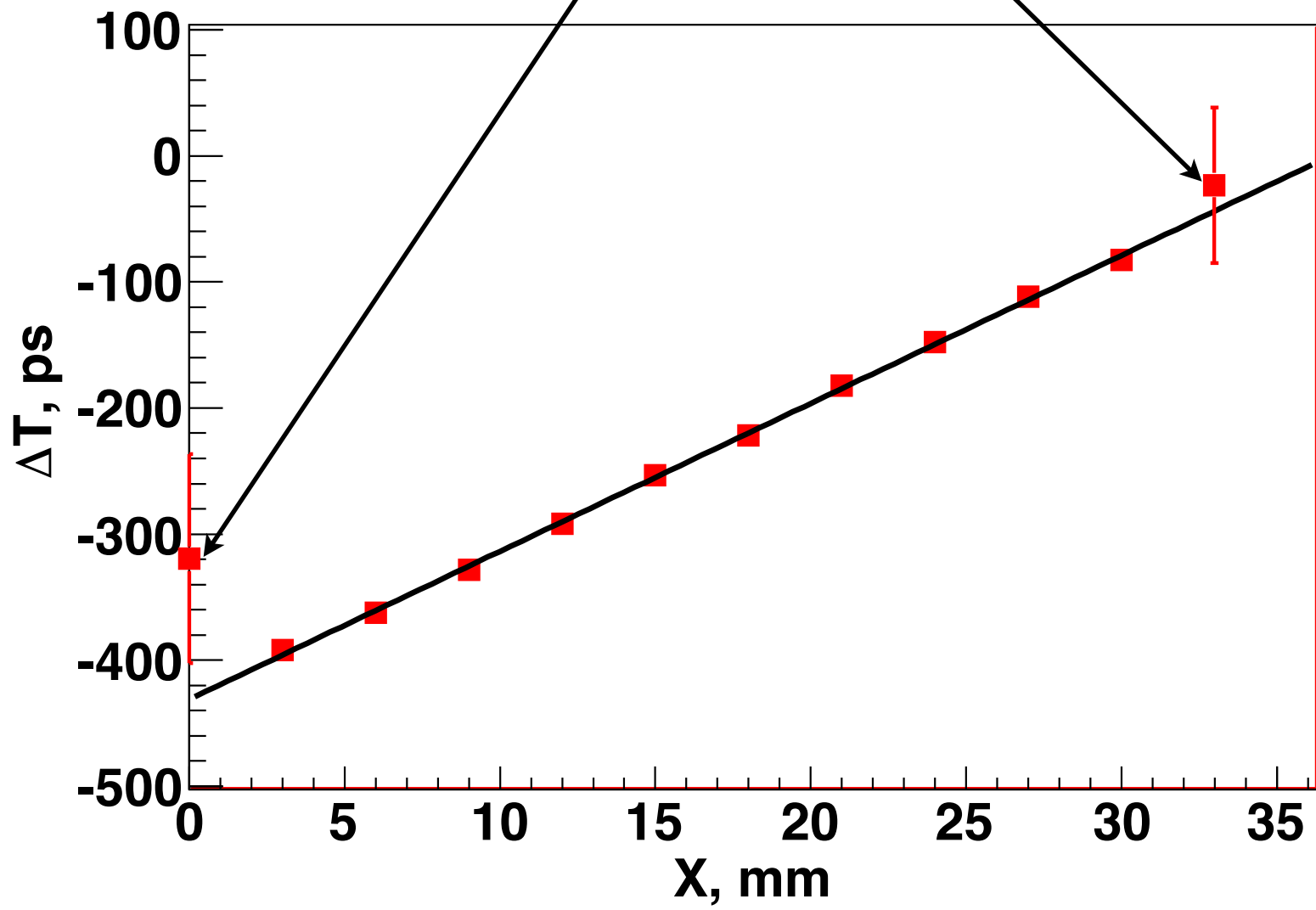


The 8" Chamber – results

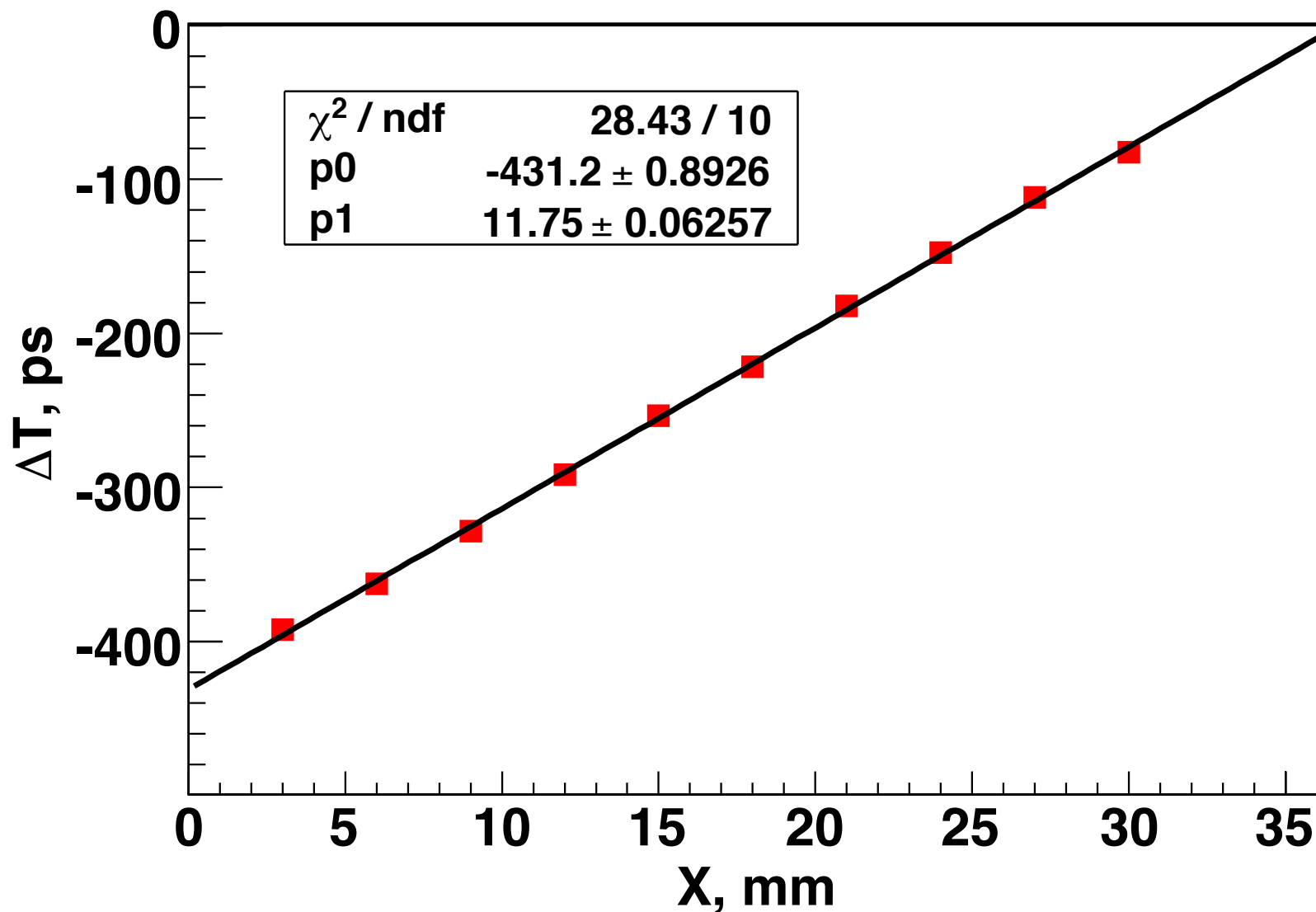


The 8" Chamber – results

edges of the mirror



The 8" Chamber – results



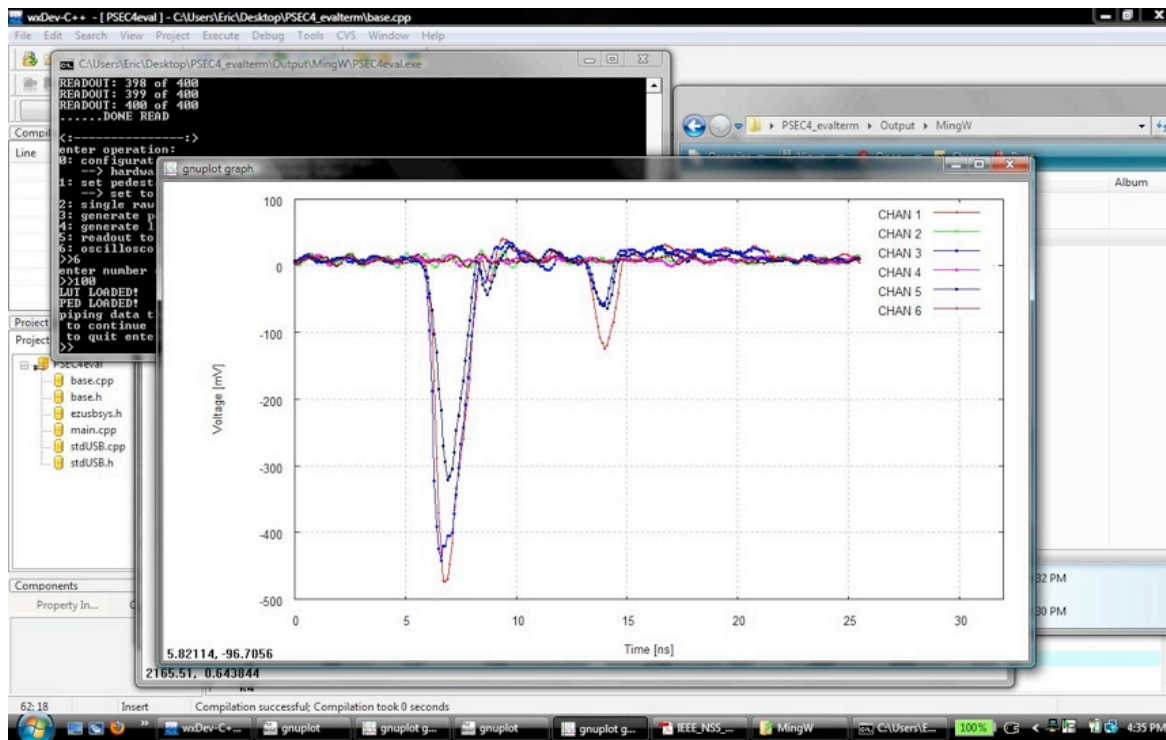
The 8" Chamber – results

speed of signal propagation ~ 12 psec/mm ~ 0.38 c

- here some information relevant to interpreting the spatial-resolution data:
- Borafloat glass has a dielectric constant of 4.6
- Entering that into the online calculator at <http://www.microwaves101.com/encyclopedia/calmstrip.cfm> with approximate dimensions for the striplines of 0.2" width, 0.15" substrate thickness (only the ratio is important), we get an effective dielectric constant of $\epsilon_{\text{eff}} = 3.37$.
- The pulse propagation velocity is $c / \sqrt{\epsilon_{\text{eff}}}$, so about 54 % the speed of light.
- Now, this simple calculation DOES NOT take into account the effect of coupling between striplines on the pulse propagation, so no panic if our data don't show the expected propagation velocity.

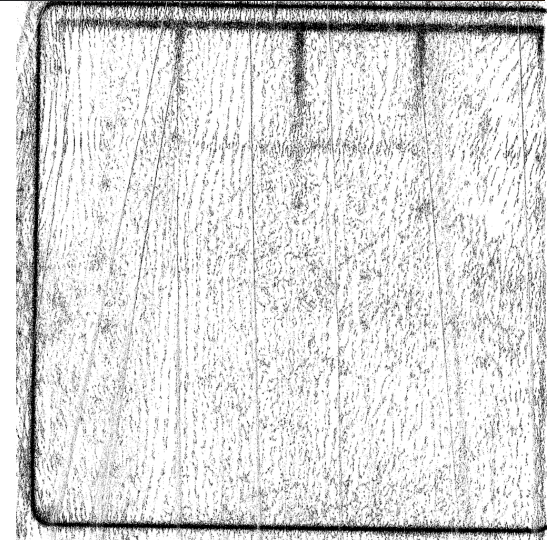
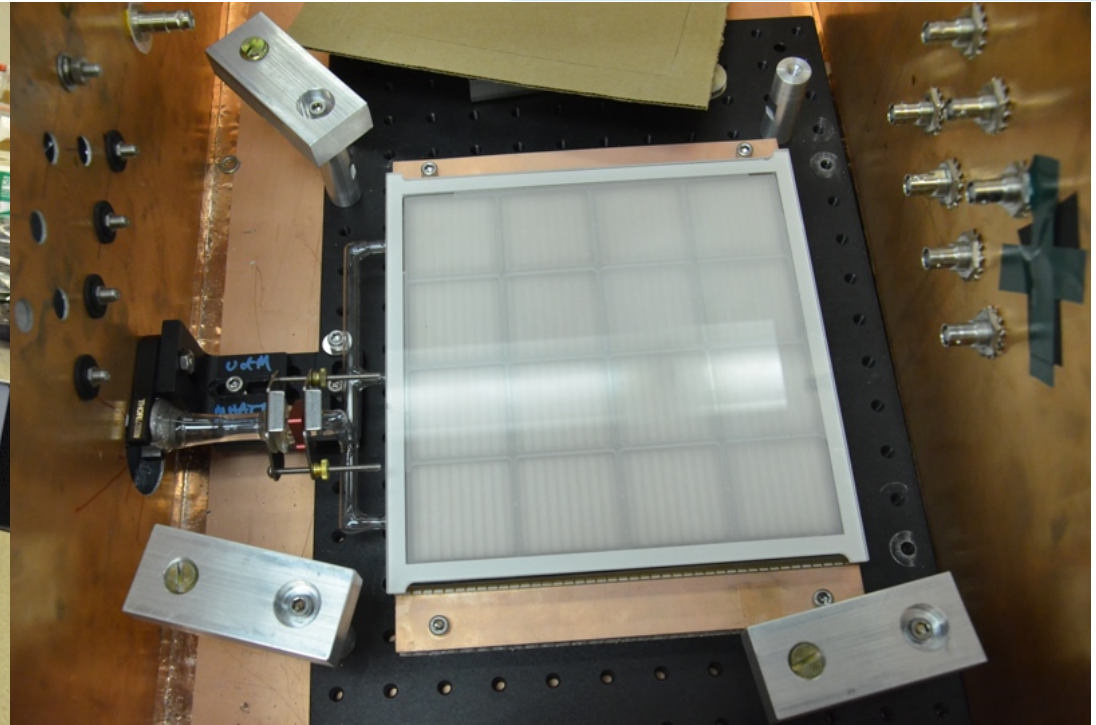
B. Adams

The PSEC chip



Recorded our first pulses...more to follow soon.

The Demountable Tile



- Were successfully able to seal one tube so far.
- Encountered some difficulties with our second tile base. Found a problem with the frit seal.
- Took us a long time, but we learned a lot about how to debug the vacuum seal.
- Need more spare parts! ...soon to come.