

Scintillator-based Hadron Calorimeter R&D for the ILC

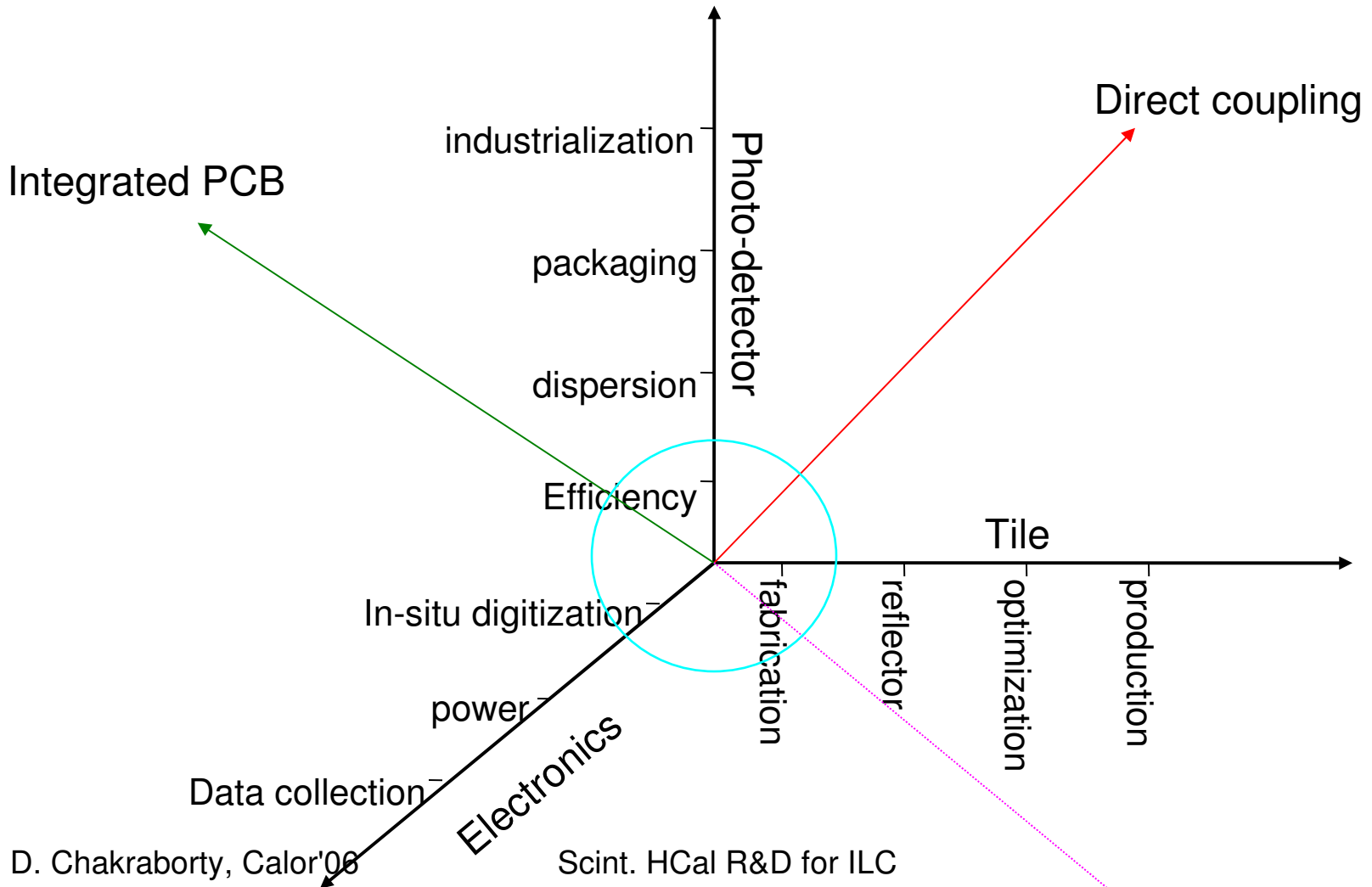
Dhiman Chakraborty

NIU/NICADD



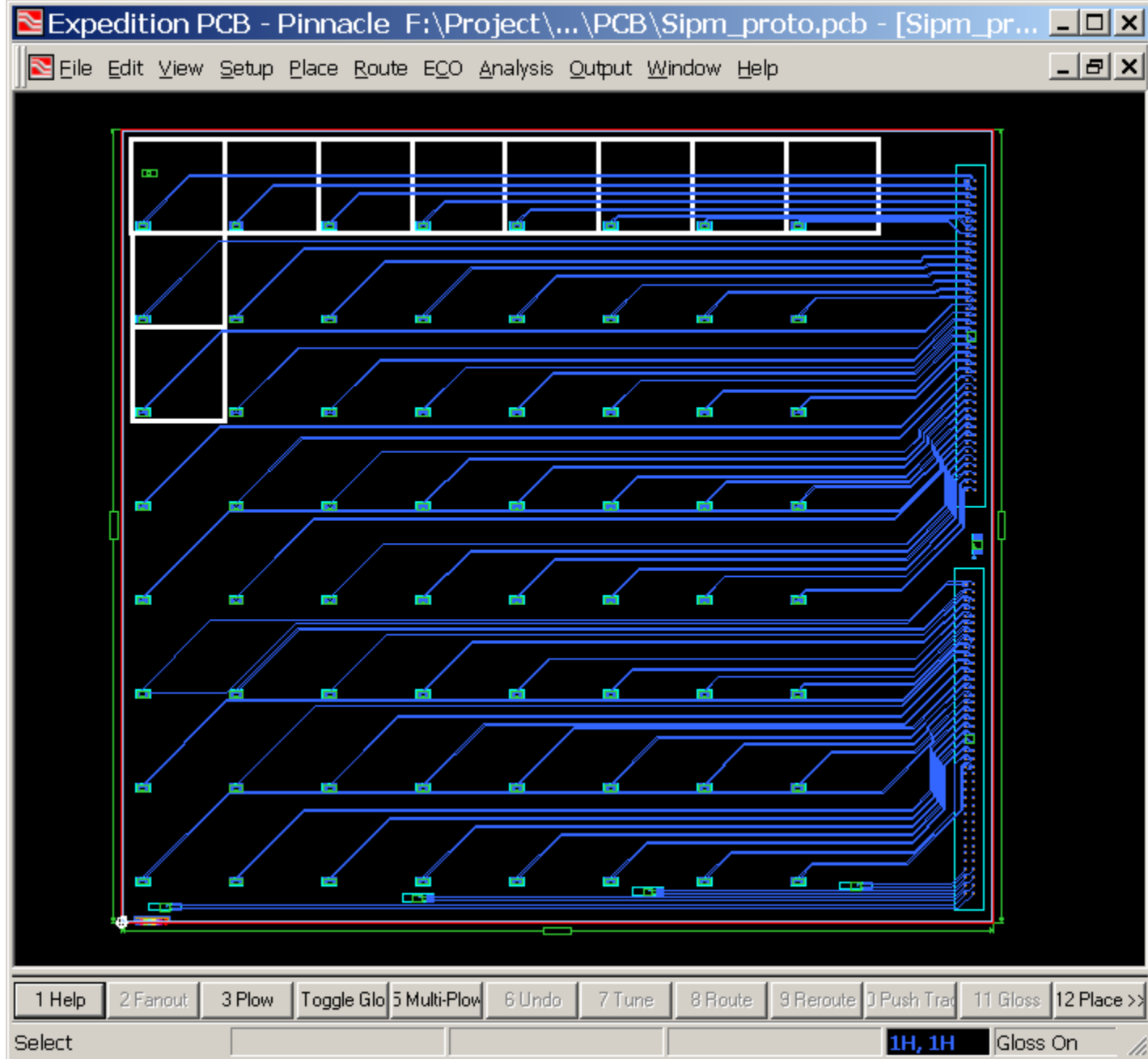
June 5-9, 2006 Chicago, USA

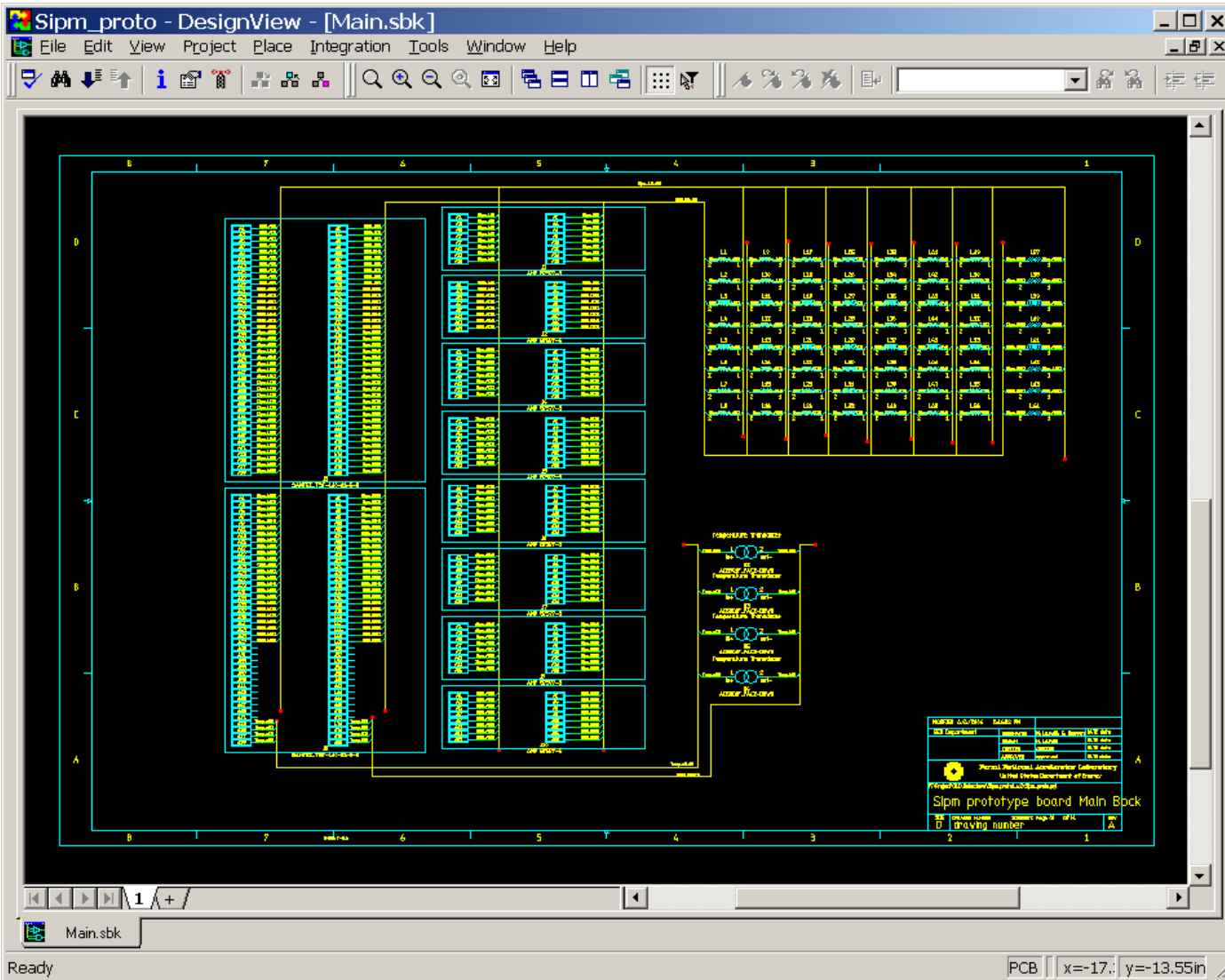
R&D Grid



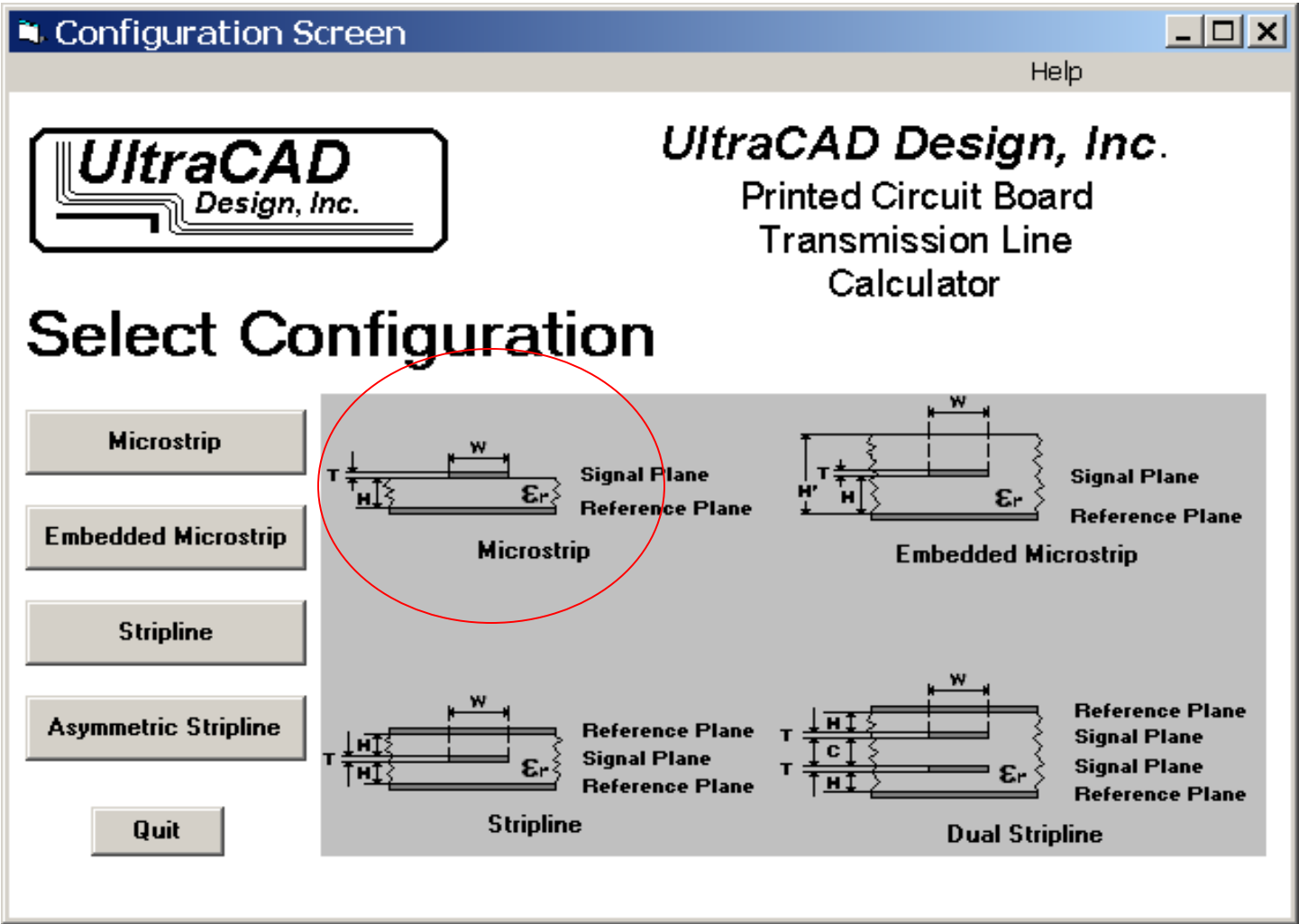
Status and plans

- Must take a staged approach due to funding constraints
- Start with:
 - analog signals (signal, x-talk etc.)
 - tile-SiPM-board interface
- Just begun PCB design (thanks to M. Larwill, Fermilab)
- Very first attempt at fiberless readout (direct coupling between scintillator & photosensor)

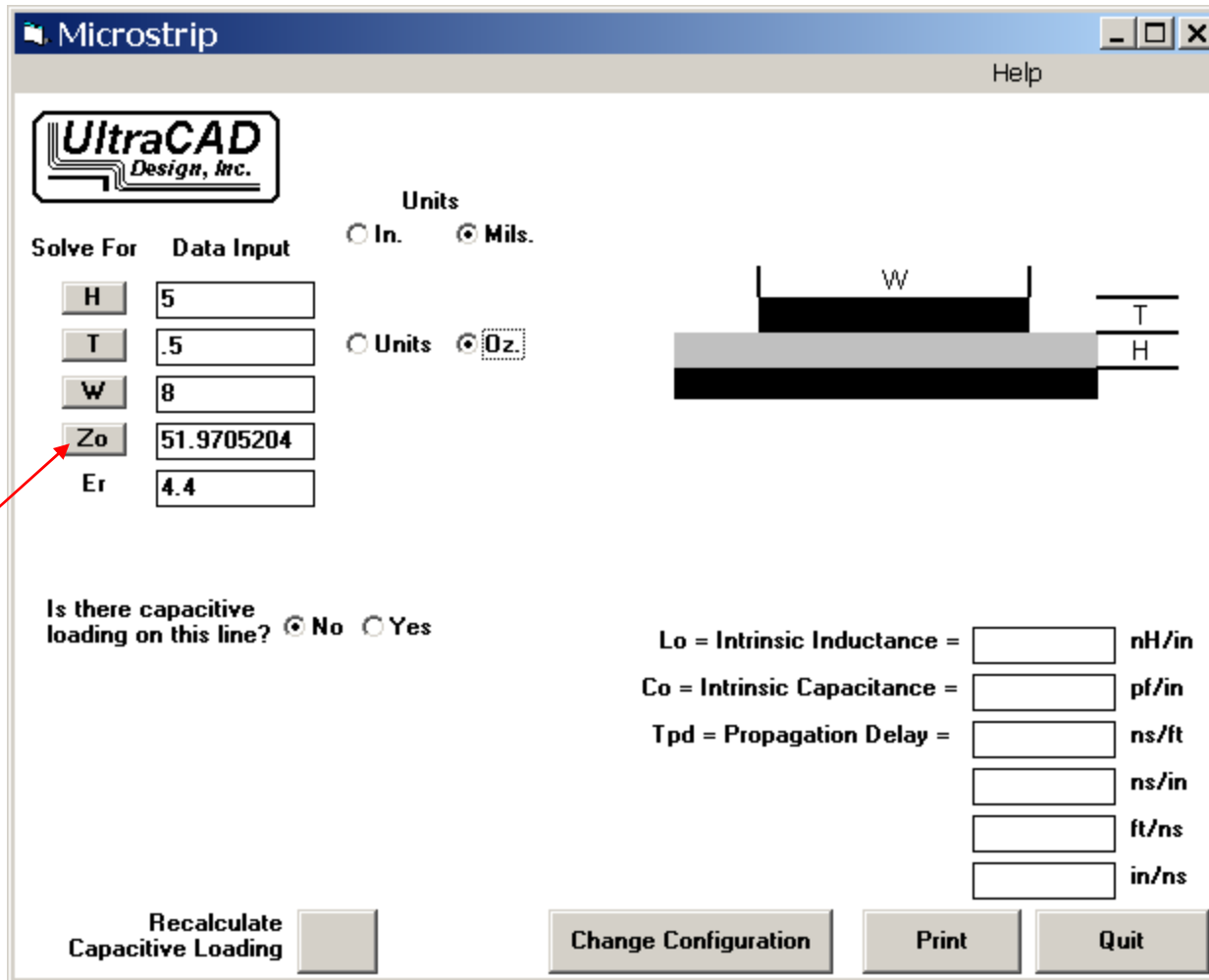




Schematic with 2 possible connectors.



Different options for the transmission line.



- 51 ohms when using 8 mil trace , half ounce copper and 5 mil thick height.

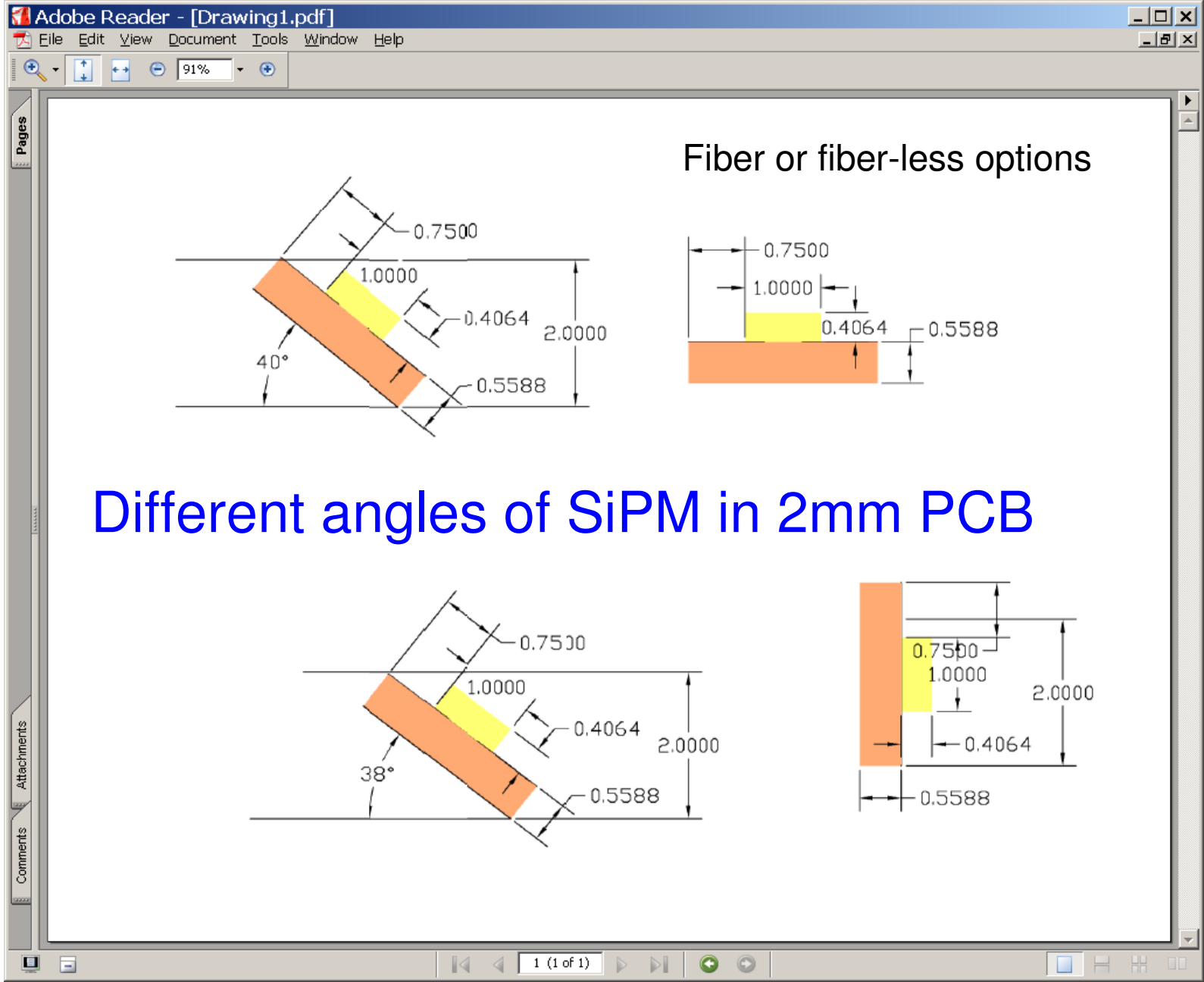
Pros & cons of direct coupling

- Advantages

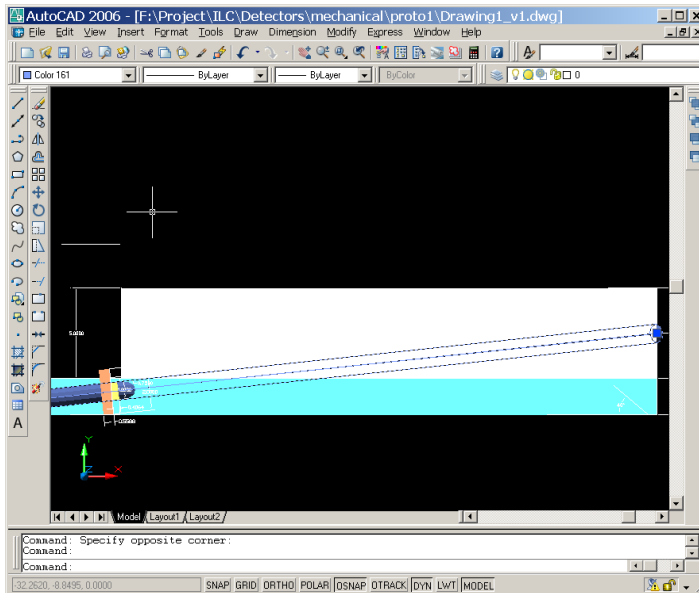
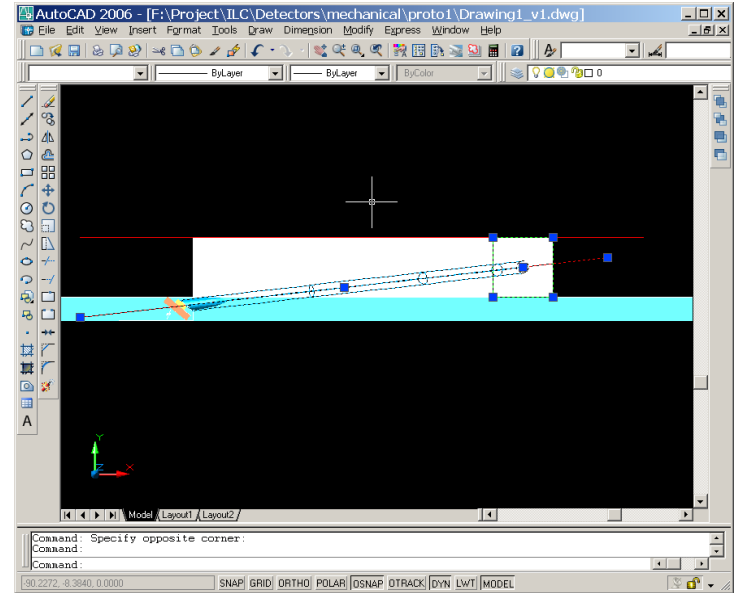
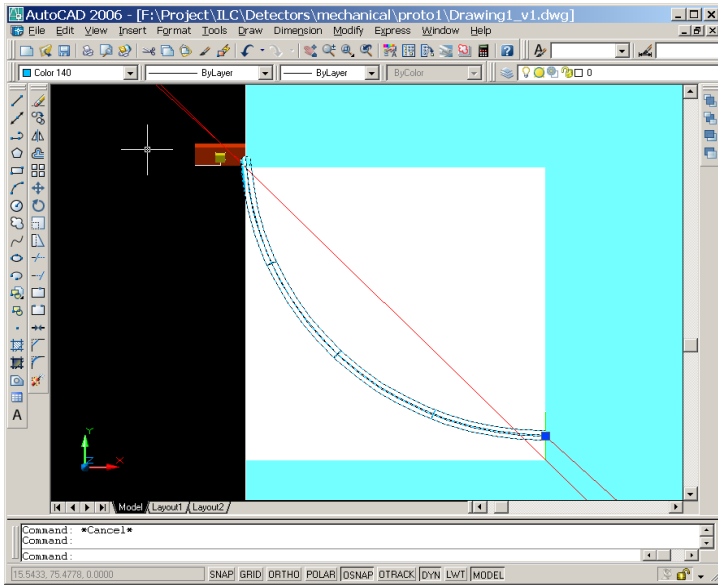
- By eliminating the WLS fiber, greatly simplifies large scale production & assembly.

- Challenges

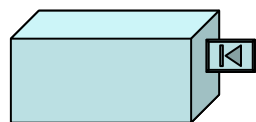
- Need photosensors with better blue sensitivity (availability improving).
- Getting enough light (seems feasible).



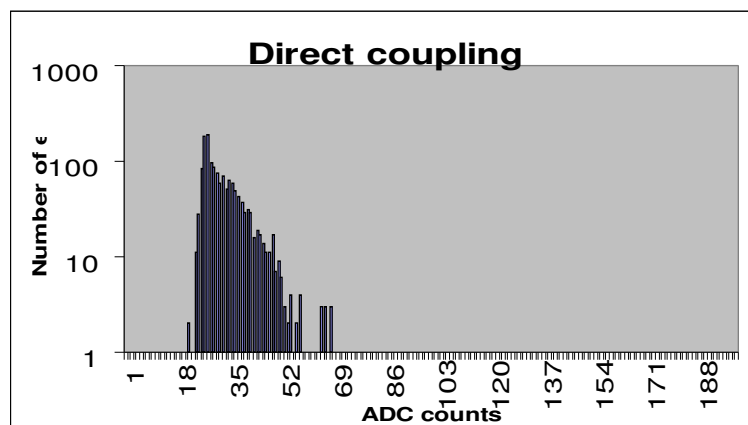
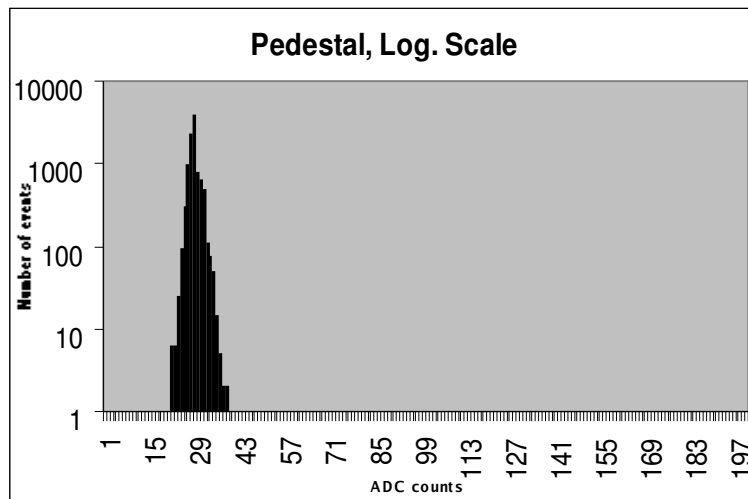
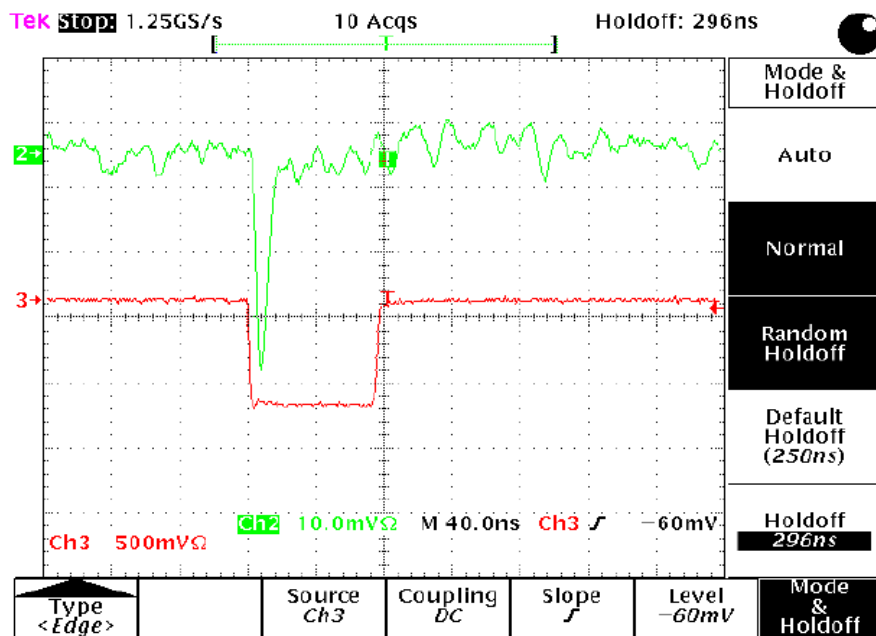
Different angles of SiPM in 2mm PCB



Direct read-out of scintillation light by SiPM(CPTA), 2*2 cm², 5 mm thick, extruded scintillator, CR events



Sensitive area is 1*1 mm²



Not great just yet, but considering how crude the current setup is, the idea is certainly worth pursuing further.

Summary

- SiPMs make finely segmented scintillating cells a viable and very attractive option for hadron calorimetry at the ILC (refer to earlier talks at this conference).
- Integrated PCB with on-board ASIC is on the horizon.
- Direct (fiberless) coupling option looks promising.
- R&D towards a scalable scintillator HCal design has begun and needs to be pursued vigorously.