Towards an IRL for the Scint. HCAL

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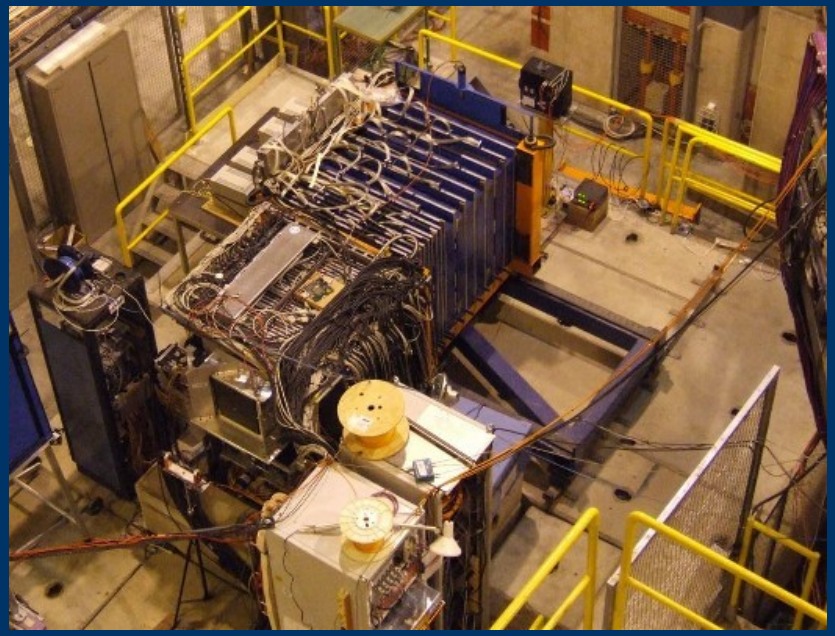
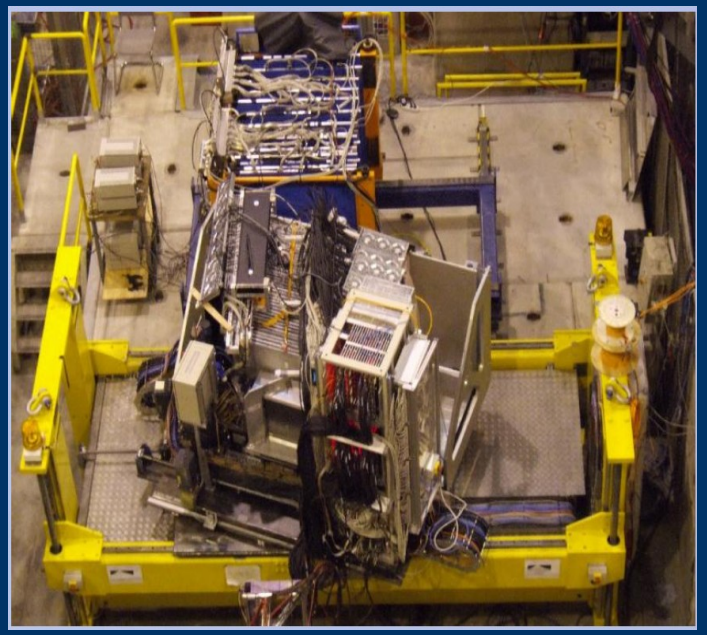
NIU/NICADD

CALICE Testbeam @ CERN



2006

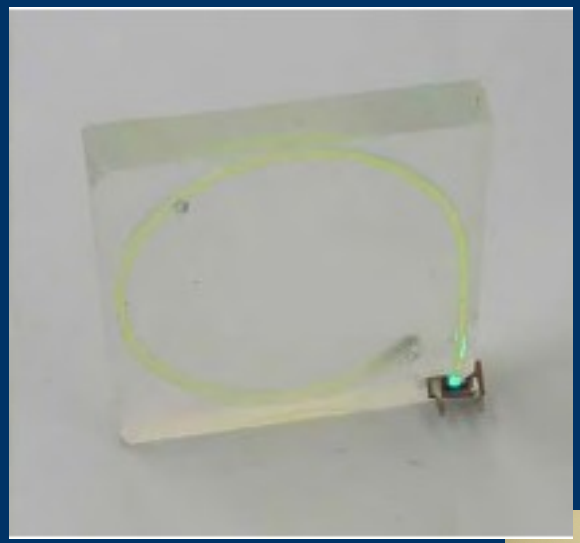


2007

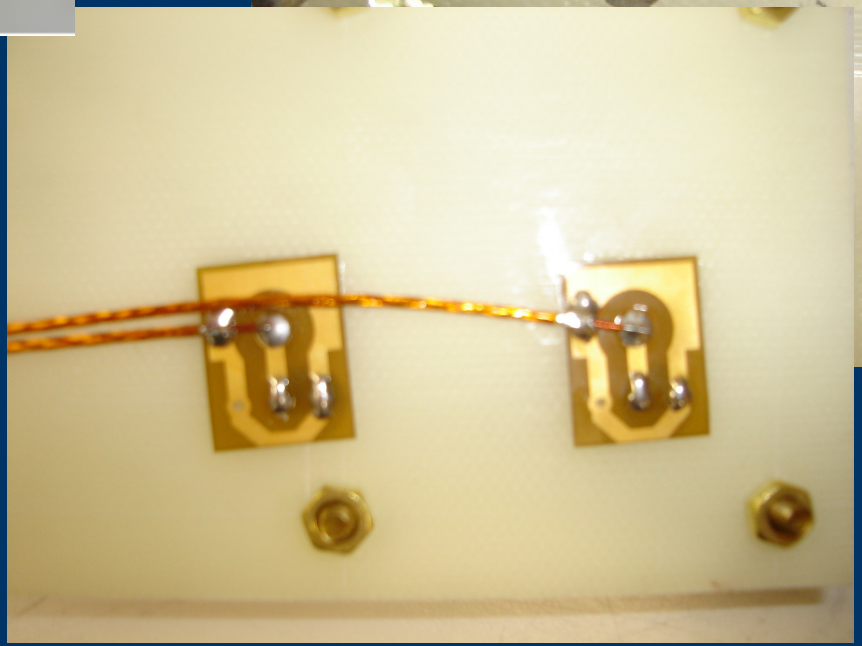
~ 19 Tbyte of data collected, available on the grid now
electron, pion, proton and beam dump muons
energies 6-180 GeV available
angle of incidence in the 0-30^0 range

2008--- Fermilab

Physics prototype

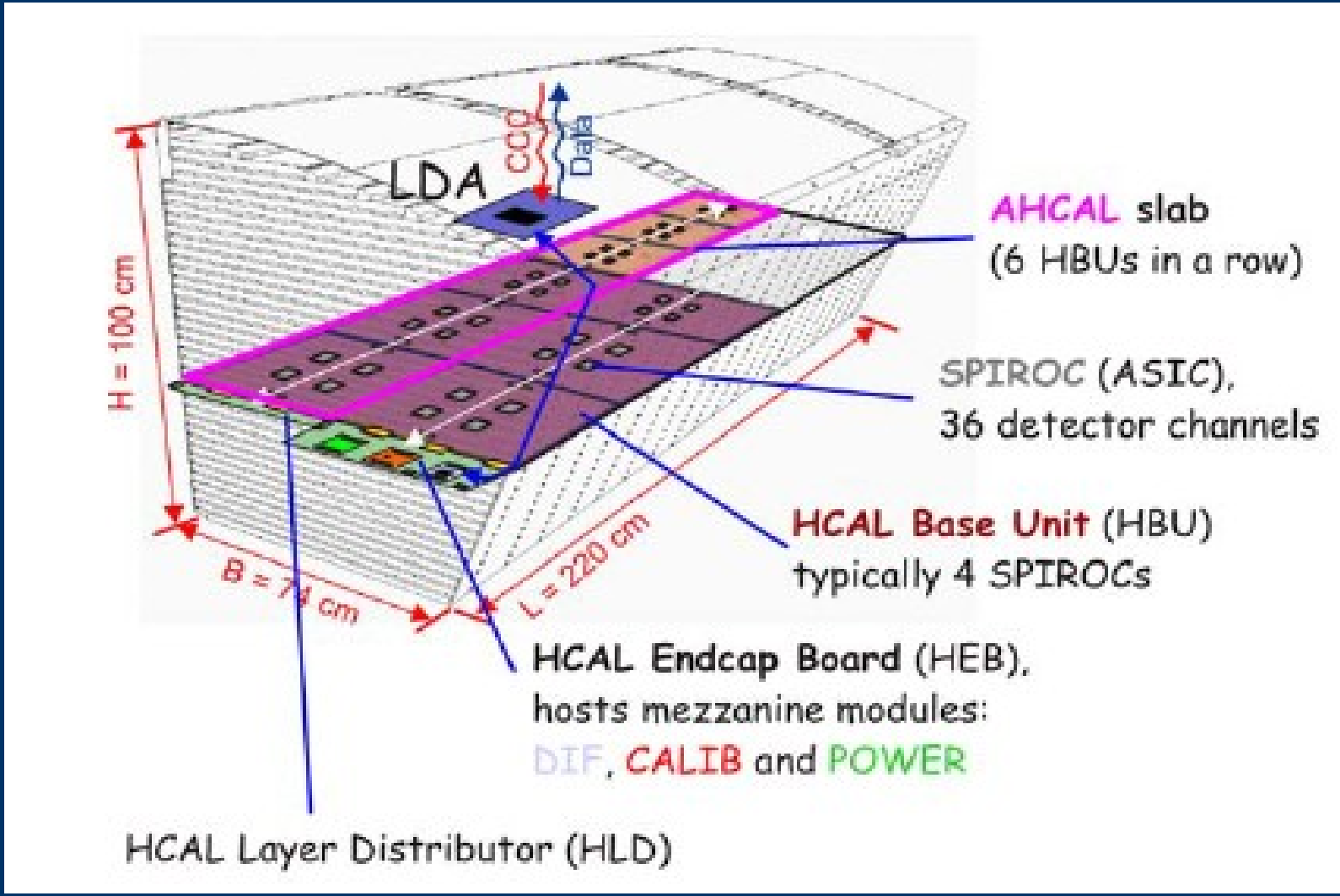


A big first step



Some scalability issues

HCAL 'Wedge'



No. of readout channels not constant as a function of the layer

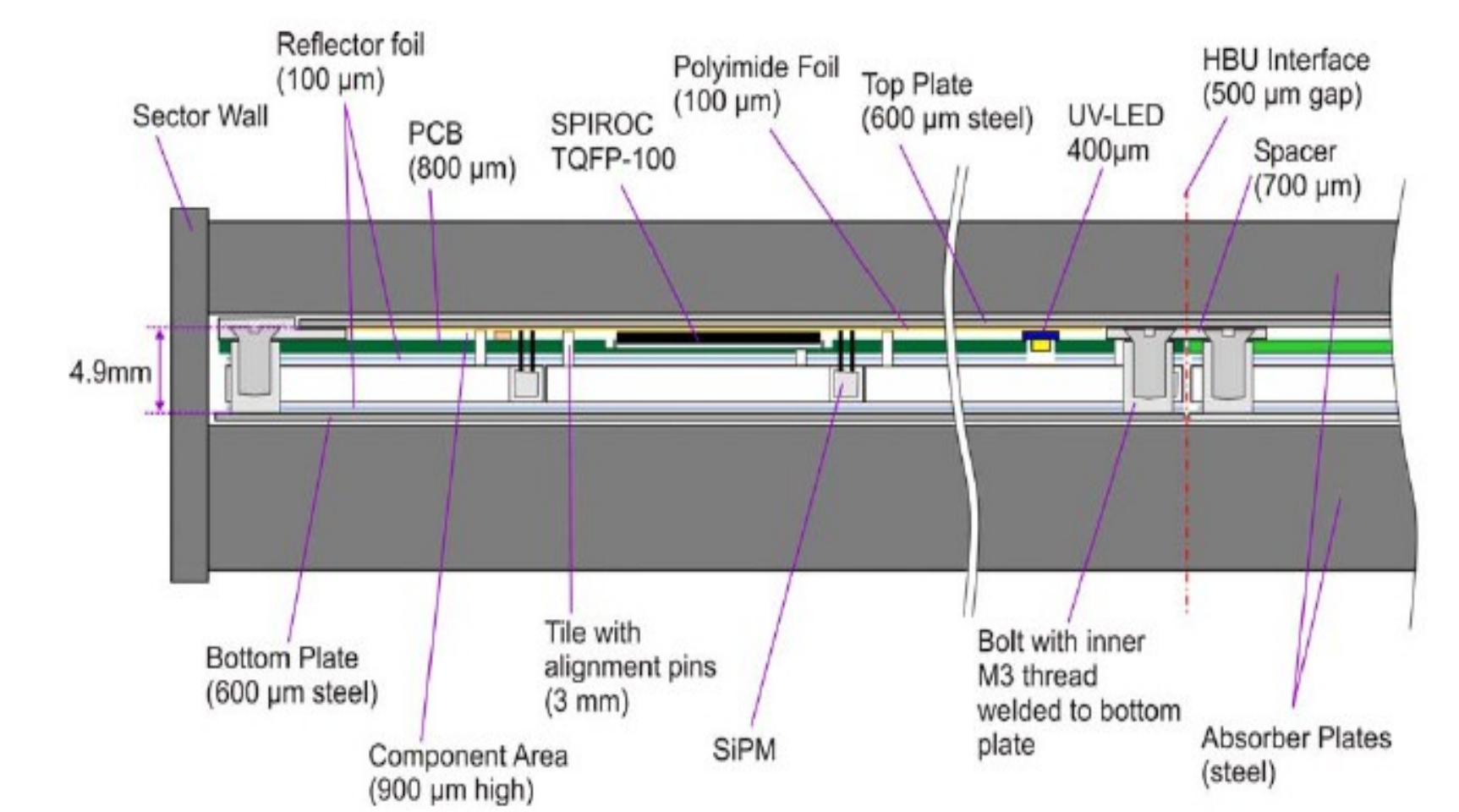
Integration Issues

- Electronics architecture and power dissipation
- Mechanical characteristics and tolerances
- Calibration system
- Interfaces

Interfaces

- Scintillator-Sensor
  - with WLS fiber
  - direct (i.e. fiber-less coupling)
- Sensor-PCB
  - in scintillator tile
  - mounted on PCB
- Scintillator-PCB
  - individual tiles
  - 'mega' tiles

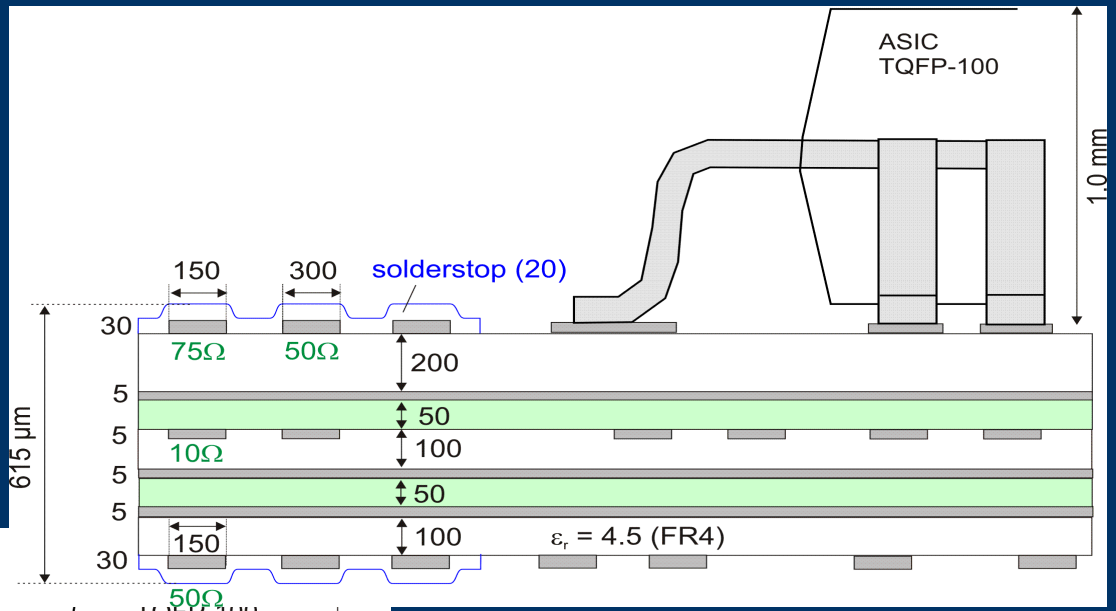
An IRL concept

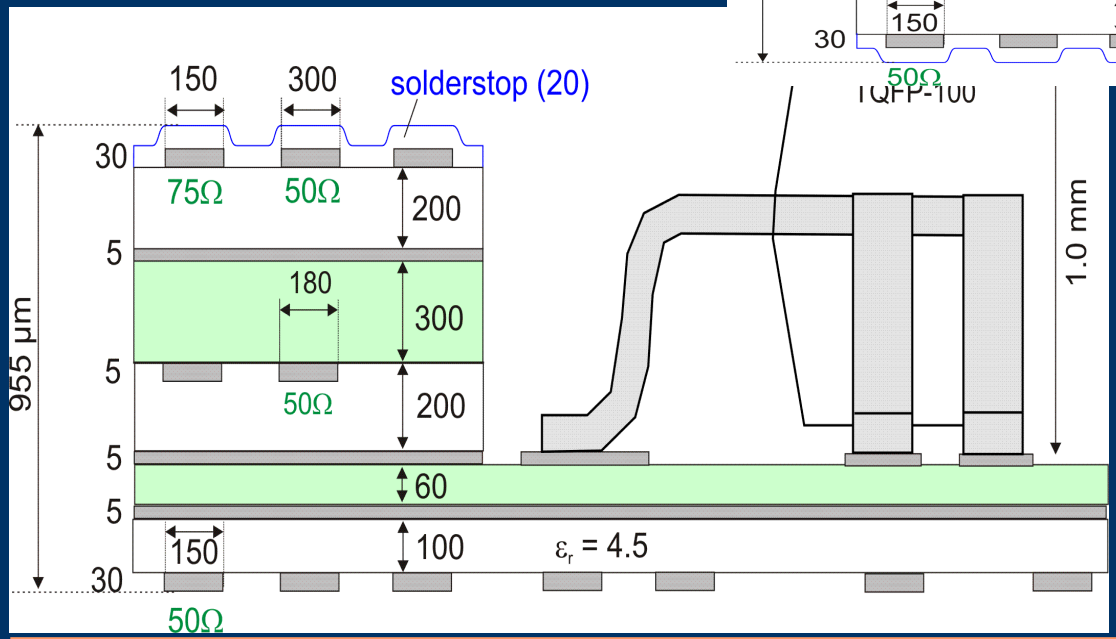


M. Reinecke (DESY)

PCB

'standard'
~1.7 mm thick

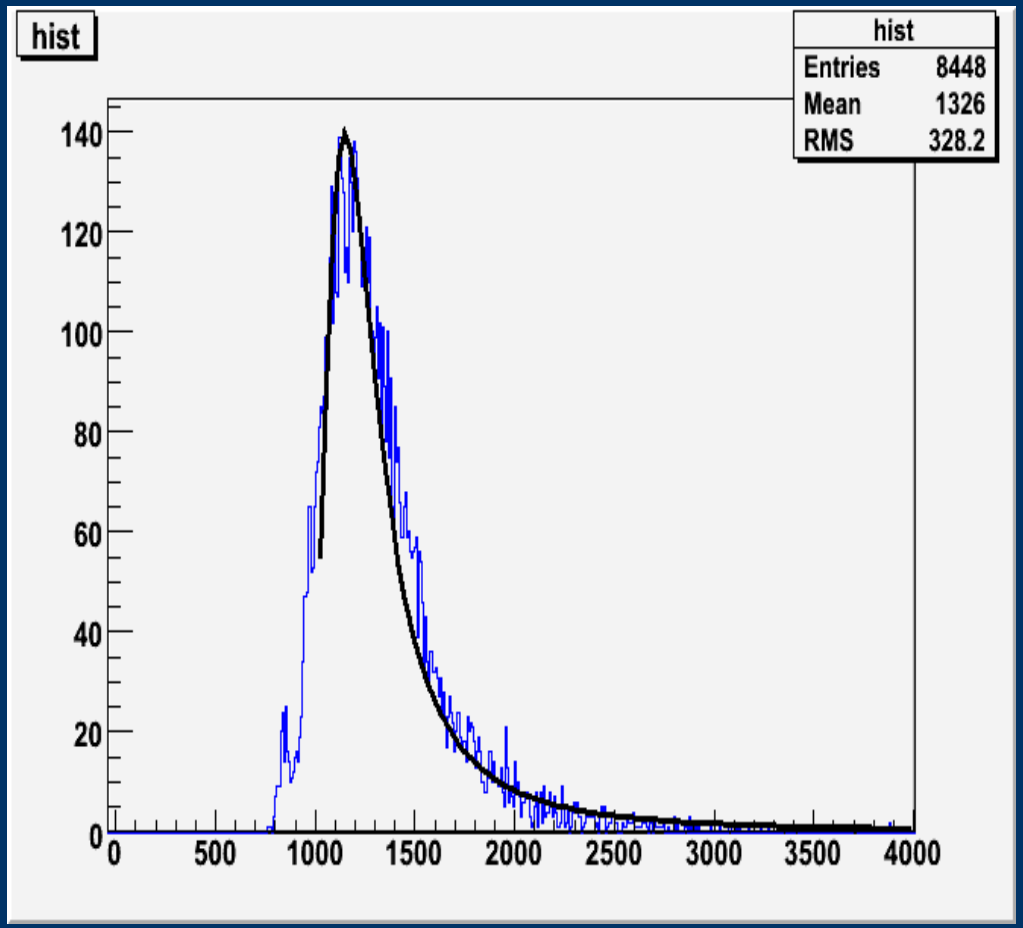




Recessed design
~1.3 mm thick

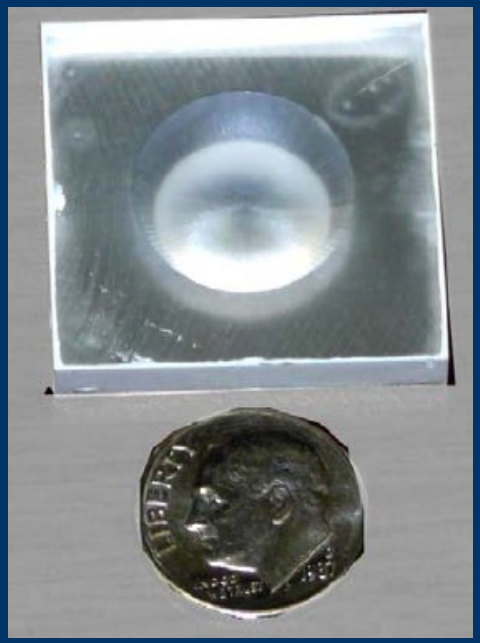
Direct or Fiber-less coupling

- Assembly simplification
- Segmentation flexibility
- Lower response
- Lower saturation
- Component testing less straightforward

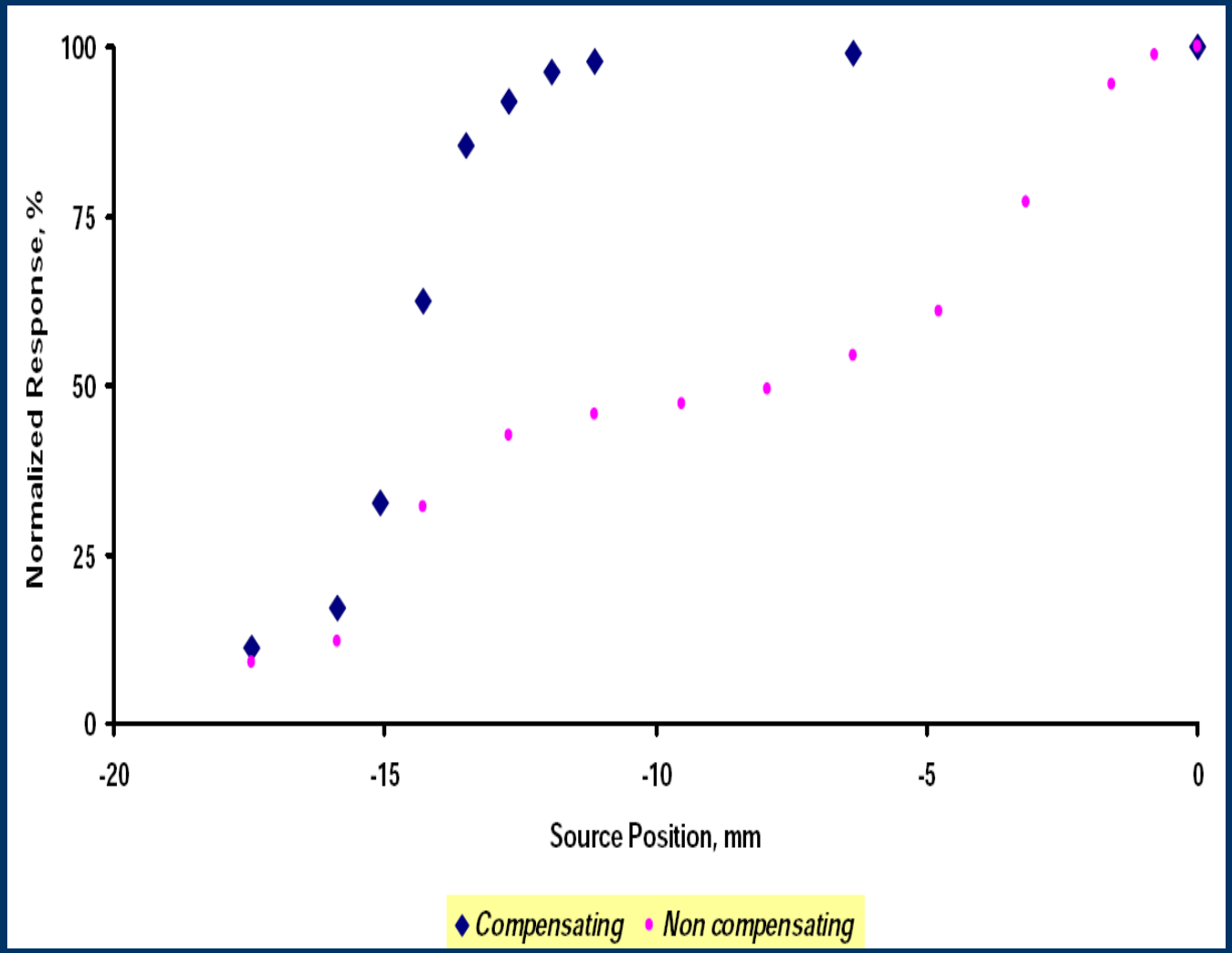


Adequate response

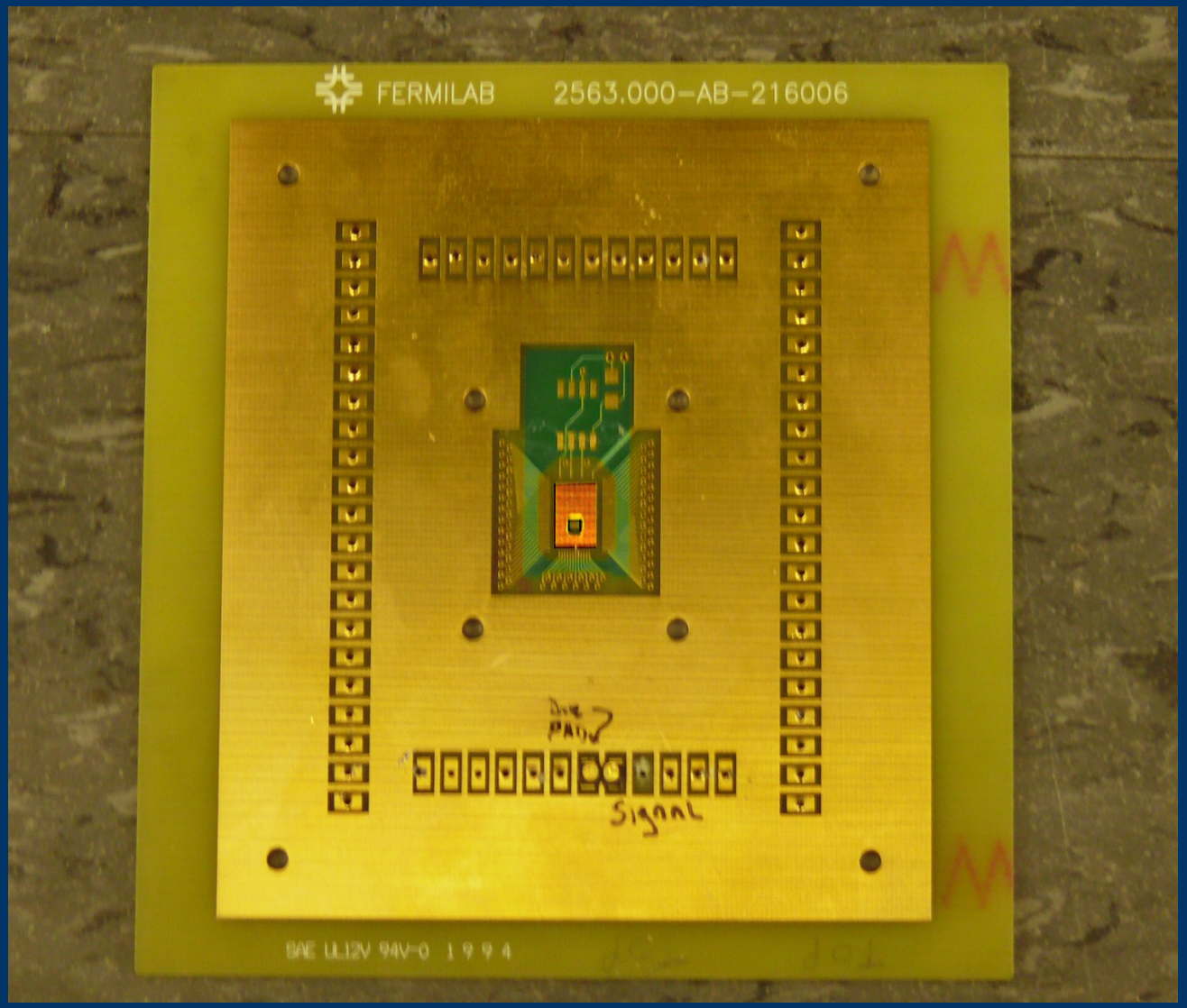
Direct Coupling



Adequate Uniformity



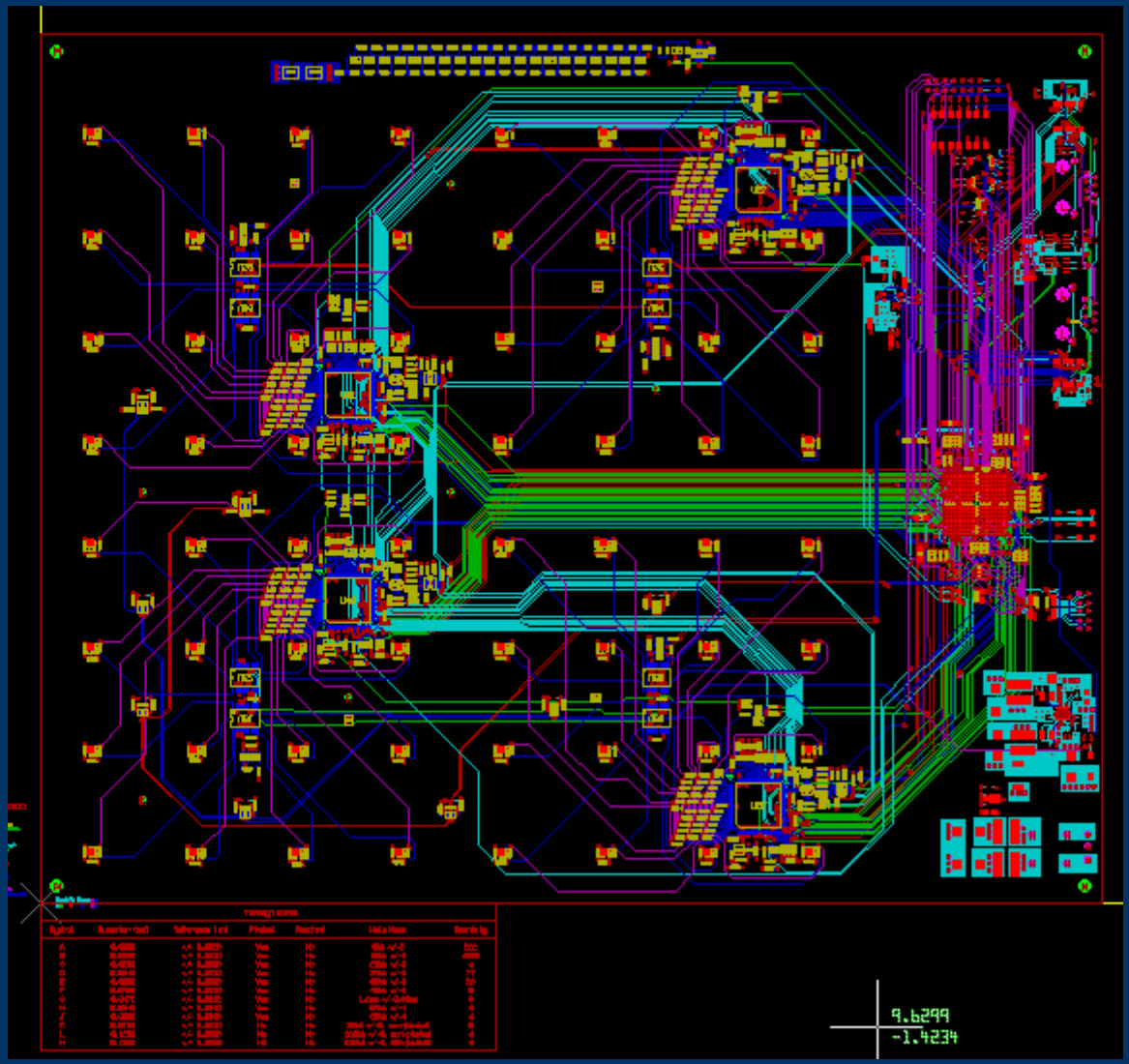
Surface mounted SiPM



Another IRL candidate

- Key features
  - 64 channel, with amplitude and timestamp
  - IRL: one digital link in, one digital link out
  - bias generation on board, with individual ch adj

  - Based on Minerva FEB
  - 4 TriP-t chips
  - 2 TriP-t ch per SiPM for extended dynamic range



P. Rubinov (FNAL)

Spacer

- Spacer board is separate

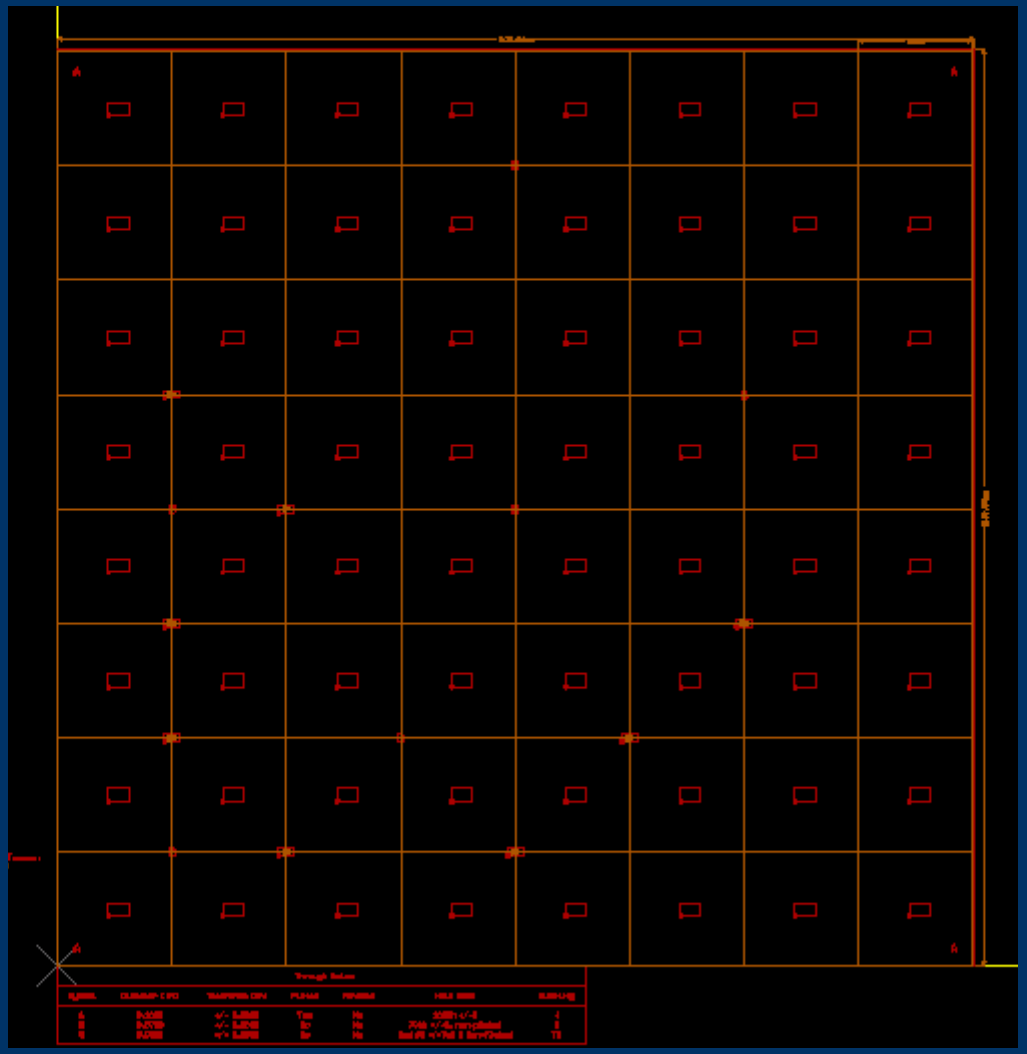
  Idea is to allow SiPMs on IRL board to be flush with scint

  Also provides reflective coating

  Could be made as part of IRL

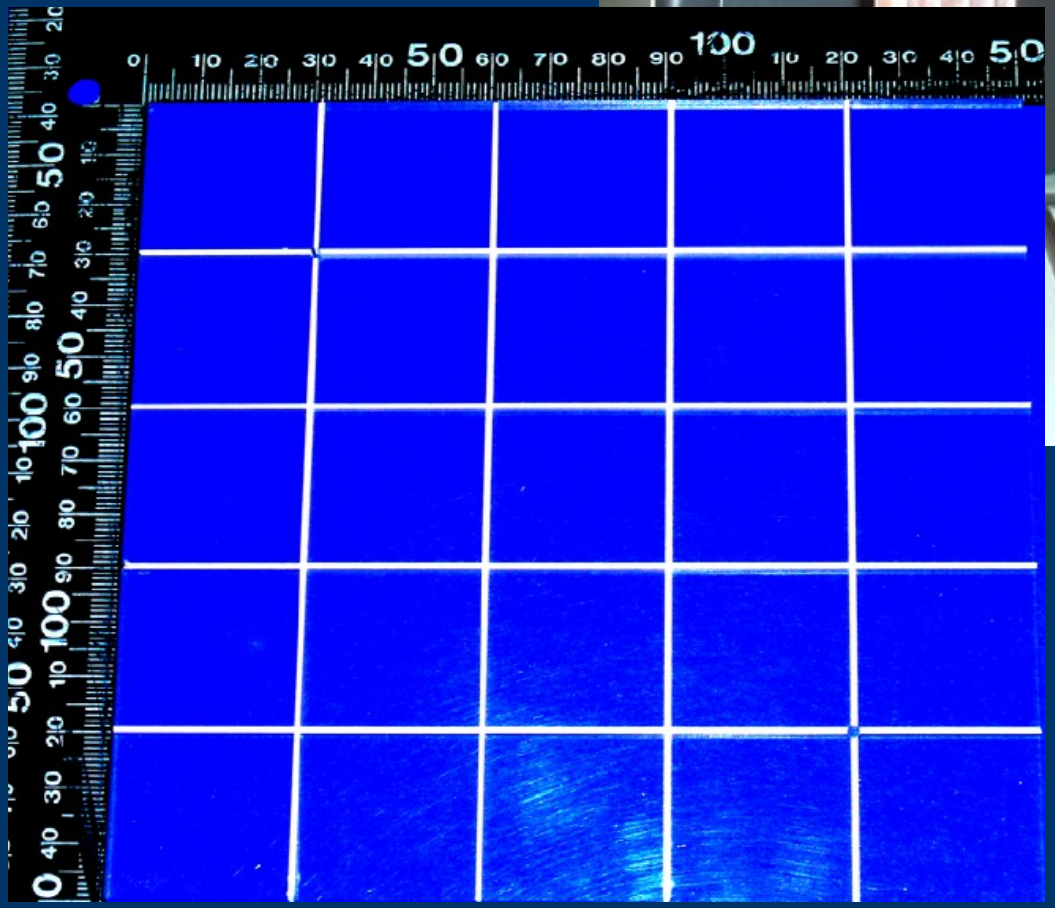
  Made separate to preserve flexibility

  IRL has a number of UV LEDs in block corners



Scintillator

V. Rusinov, ITEP

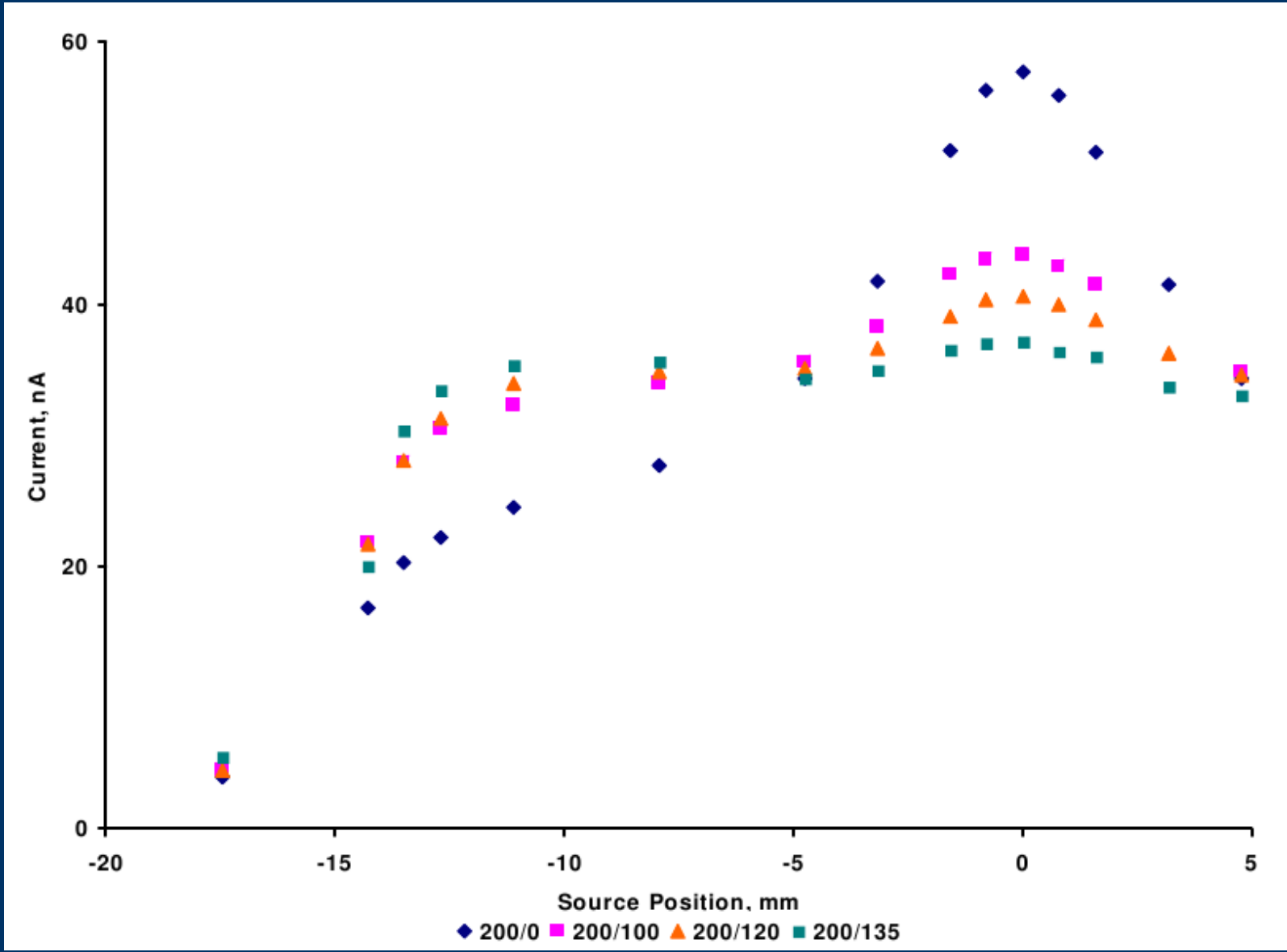


What would be the optimal assembly unit and how best to fabricate it?

Summary

- Promising paths to the integration of the readout layer for the scintillator hadron calorimeter exist
- Design and prototyping activities underway
- Interesting challenges ahead...

Digging In


60
40
20
0
Current, nA
-20
-15
-10
-5
0
5
Source Position, mm
200/0
200/100
200/120
200/135