- ECAL Silicon wafer status

- Software plans

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SOCLE 2008 @ LAPP

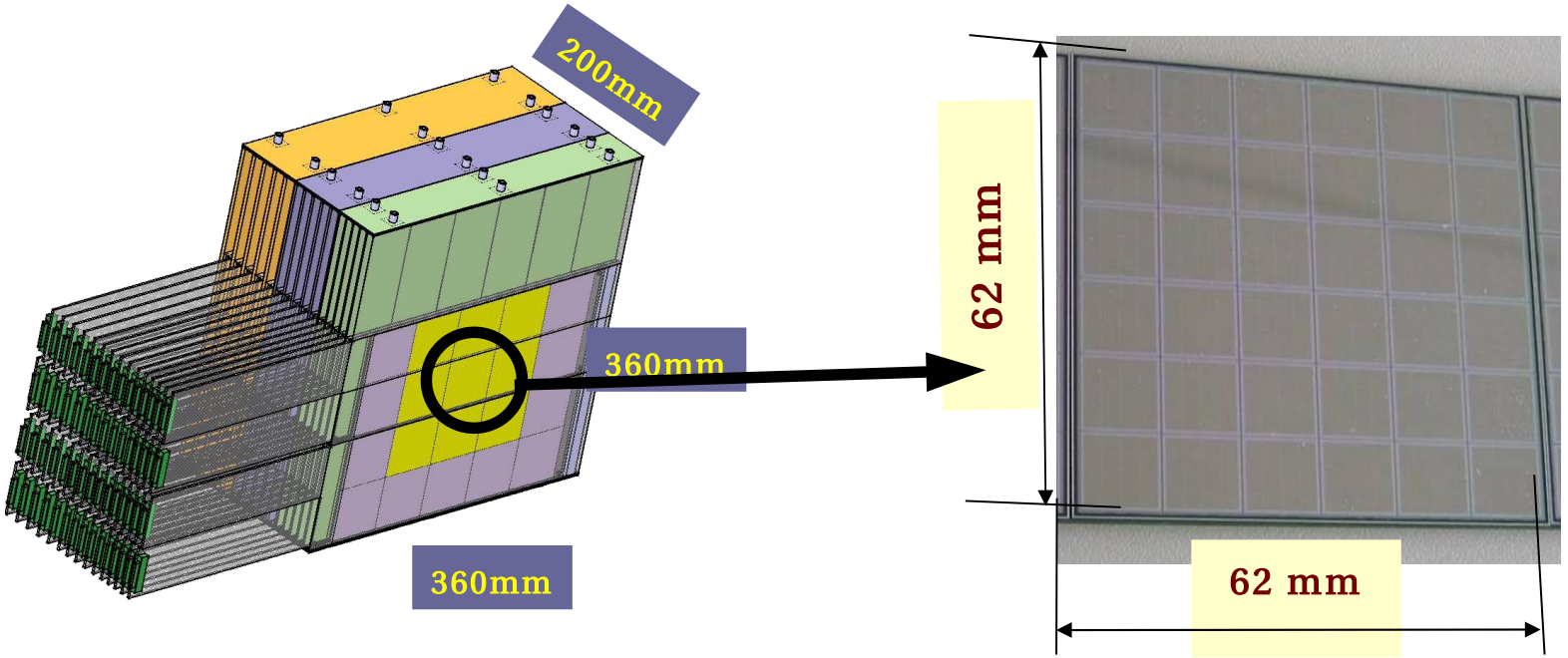
Disclaimer: I am newly arrived in this group - apologies for mistakes and omissions!

In2p3

The CALICE SiW ECAL concept envisages a very highly granular sampling calorimeter, with silicon pads as the active layers

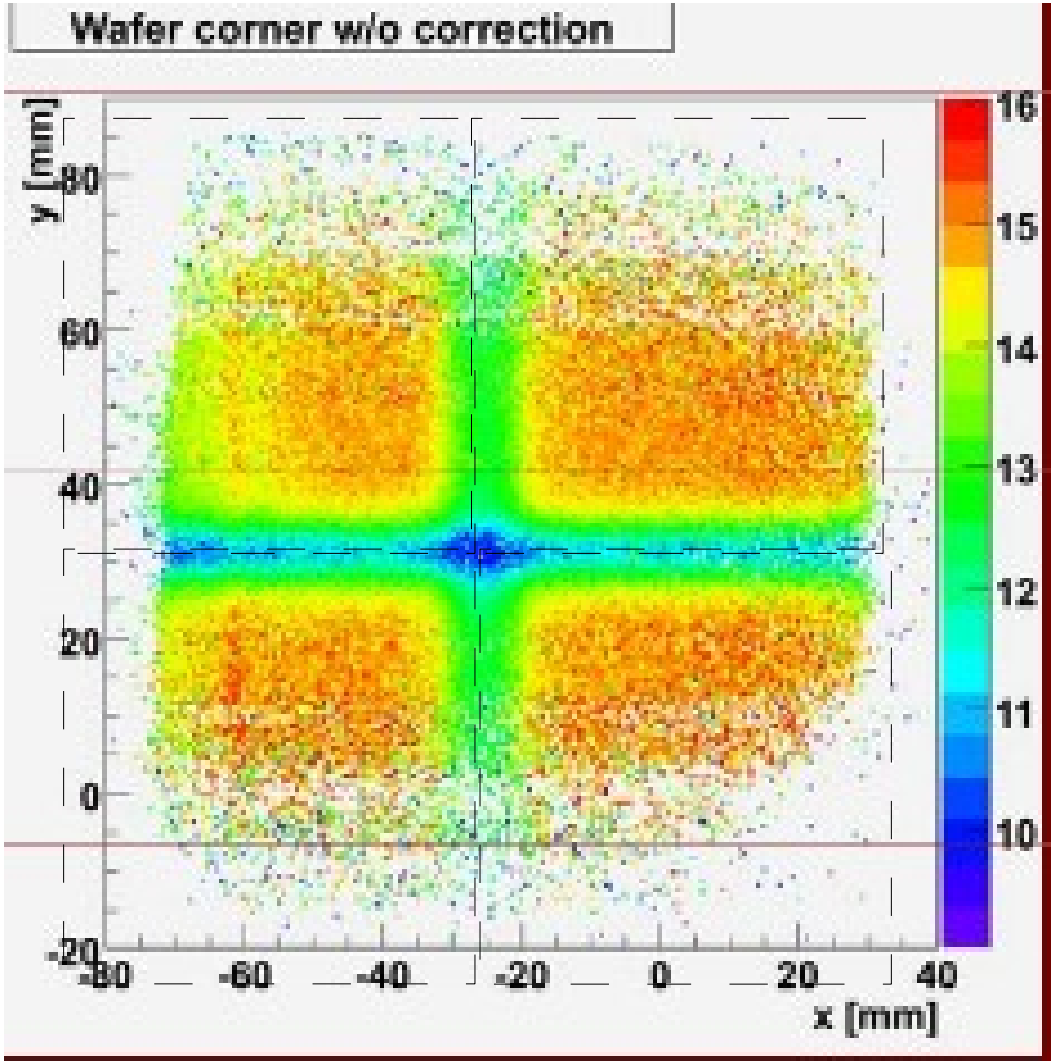
Very large area required in final detector: need cost-effective (~simple) design

CALICE SiW ECAL "Physics prototype" was built with 6x6cm^2 wafers
made up of 36 1x1cm^2 pads



This detector has been exposed to test beams during the last few years

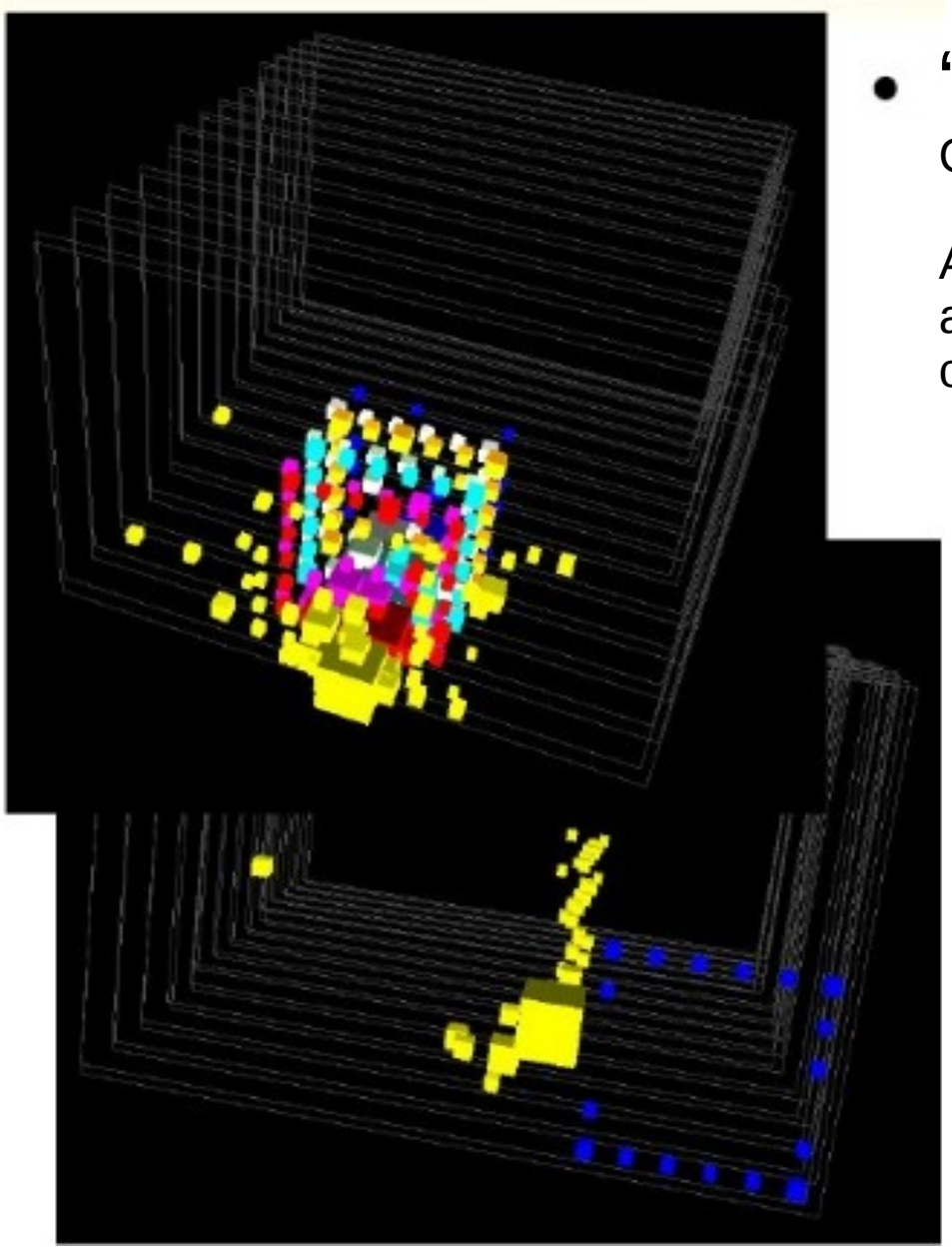
Generally, it has performed well (e.g. Cristina's talk)
In addition, we have learned several things about aspects of silicon wafer design



Inter-Wafer gaps

Mean shower energy vs. shower position shows significant (~30%) effect of the dead area between adjacent wafers

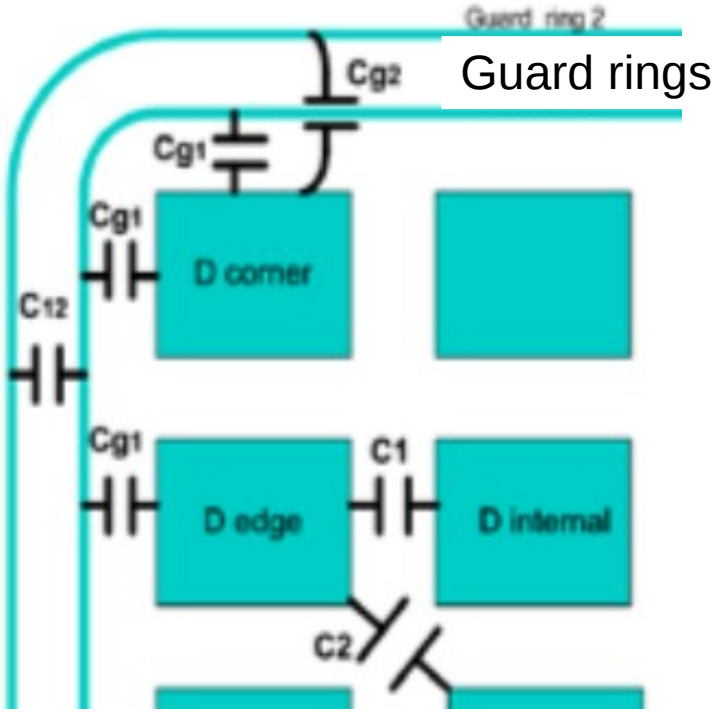
Not impossible to correct for this effect, but would prefer to minimise it as much as possible



- “Square events”

Observed in the test beam data

An effect of the “guard ring” being hit by a particle, inducing a signal on neighbouring cells.



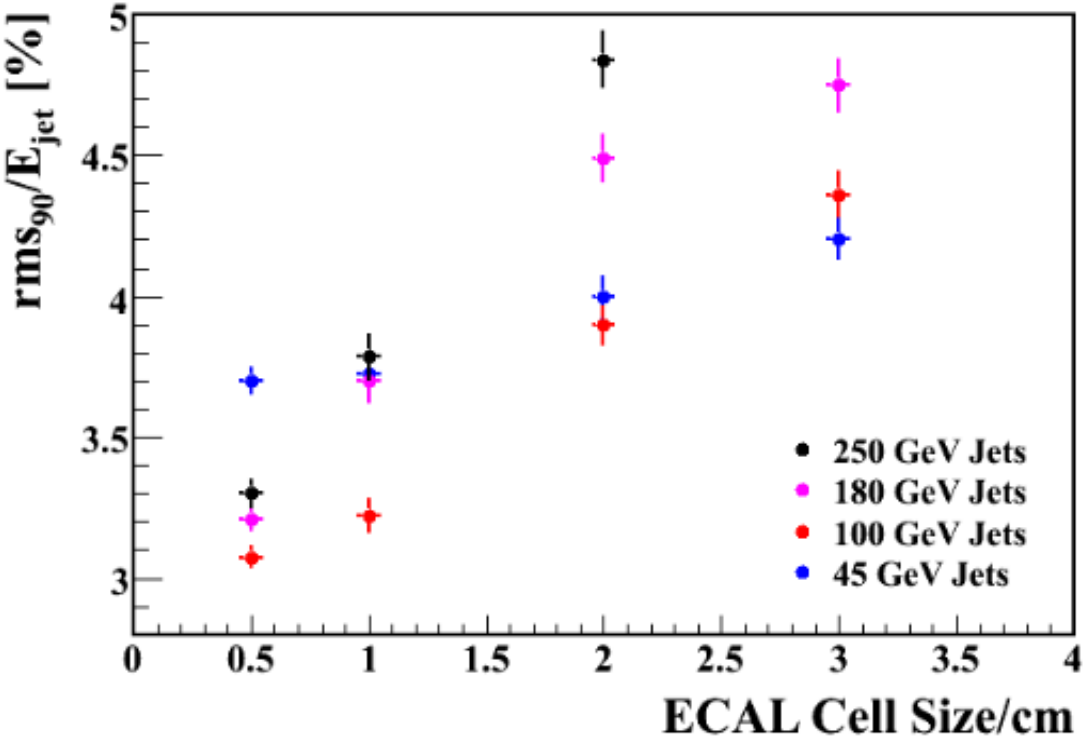
Guard rings

Interesting simulation result: PandoraPFA performance seems to gain significantly when ECAL cell size decreases 1x1 cm^2 -> 0.5x0.5 cm^2 (particularly at higher energies)

★ Start from LDCPrime with 5×5 mm^2 SiW ECAL pixel size

★ Investigate 10×10mm^2, 20×20mm^2 and 30×30mm^2

- Note: required changes in PandoraPFA clustering parameters



★ Performance is a strong function of pixel size

★ Probably rules out segmentation of >10×10mm^2 !!!!

M.Thomson
LCWS08

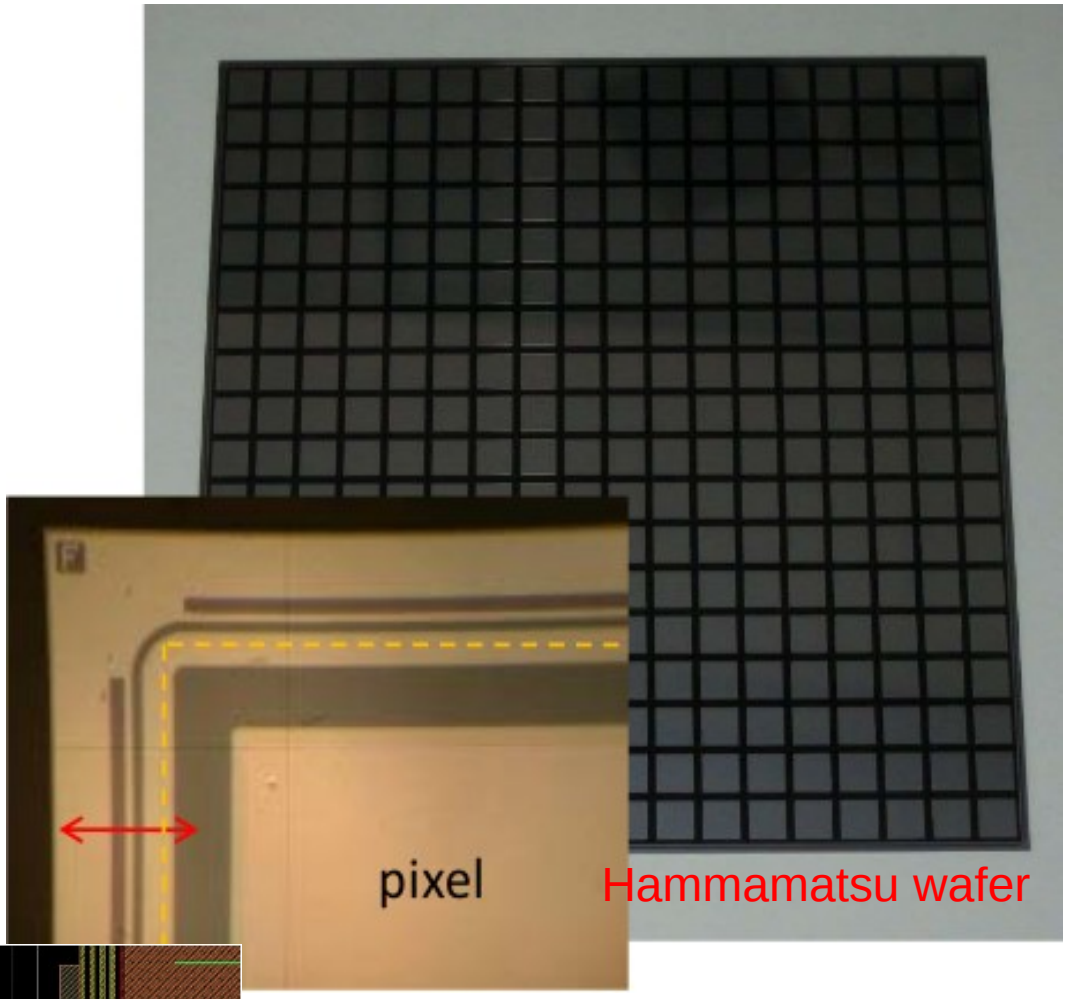
For next EUDET “technological prototype” detector, we will try to address some of these features

Go from 6x6 cm^2 -> 9x9 cm^2 wafers, with smaller pixel size 5x5 mm^2

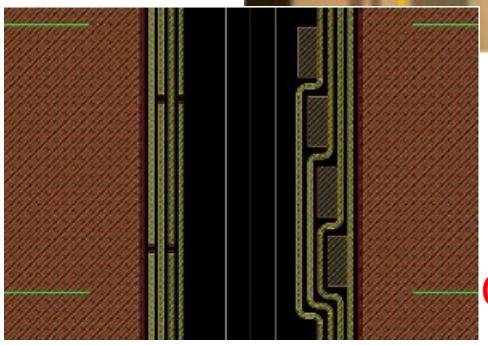
Larger wafers inherently give less significant edge effects

Smaller pixels will improve PFA performance for energetic jets (>~200GeV)

Several studies are underway to reduce/eliminate the effect of the guard rings and/or reduce dead zone at the wafer edge



Try to segment guard ring to minimise signal propogation test @ LPC early 2009

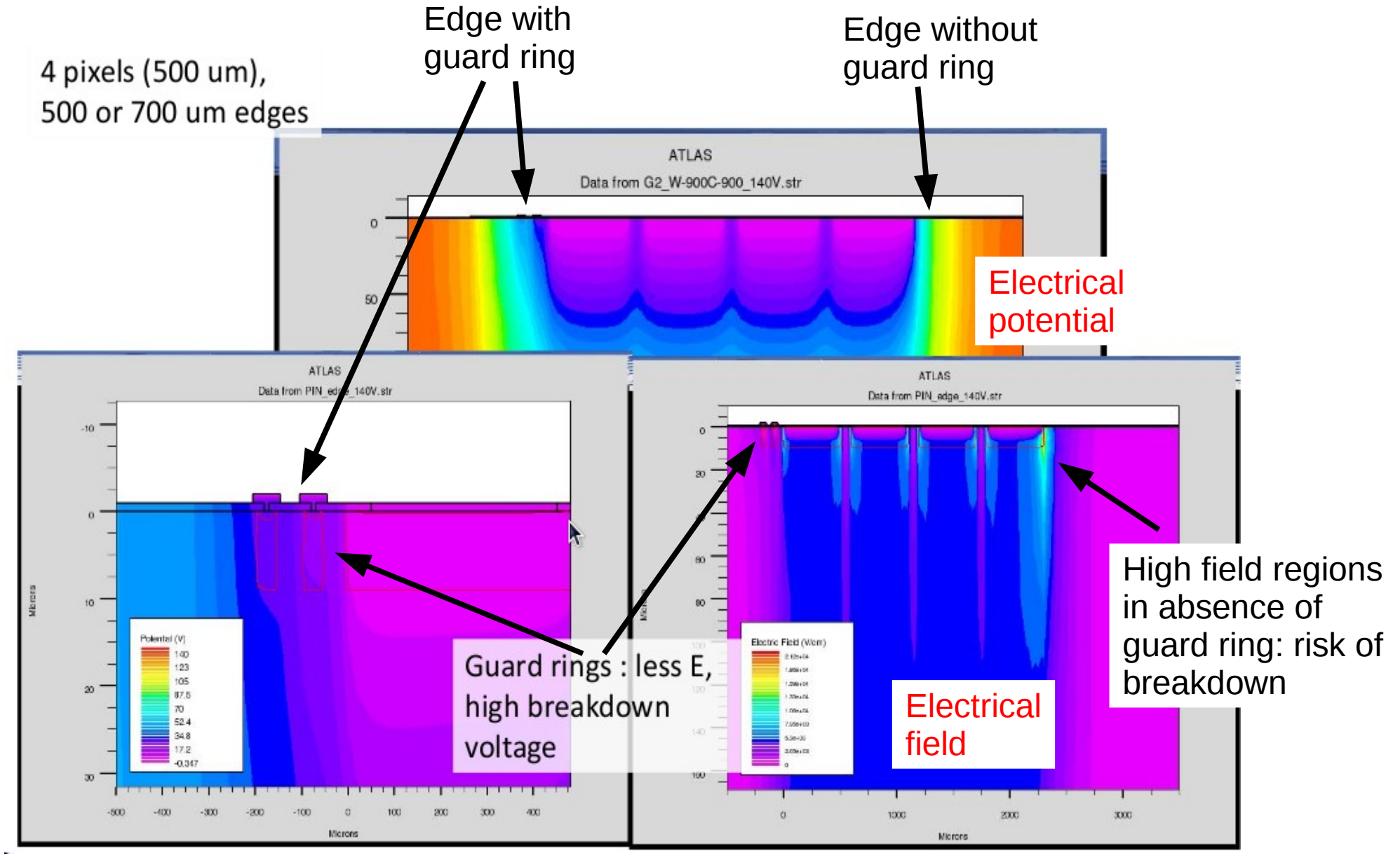


A number of test wafers have been received from Hammamatsu, tested in the laboratory, understood

40 wafers recently ordered from Hammamatsu for EUDET technological prototype (delivery in 1st half of 2009)
20 more will soon be ordered from another company

To complete the EUDET module, need 120 additional wafers (funding may be an issue here)

Simulations of guard rings etc.

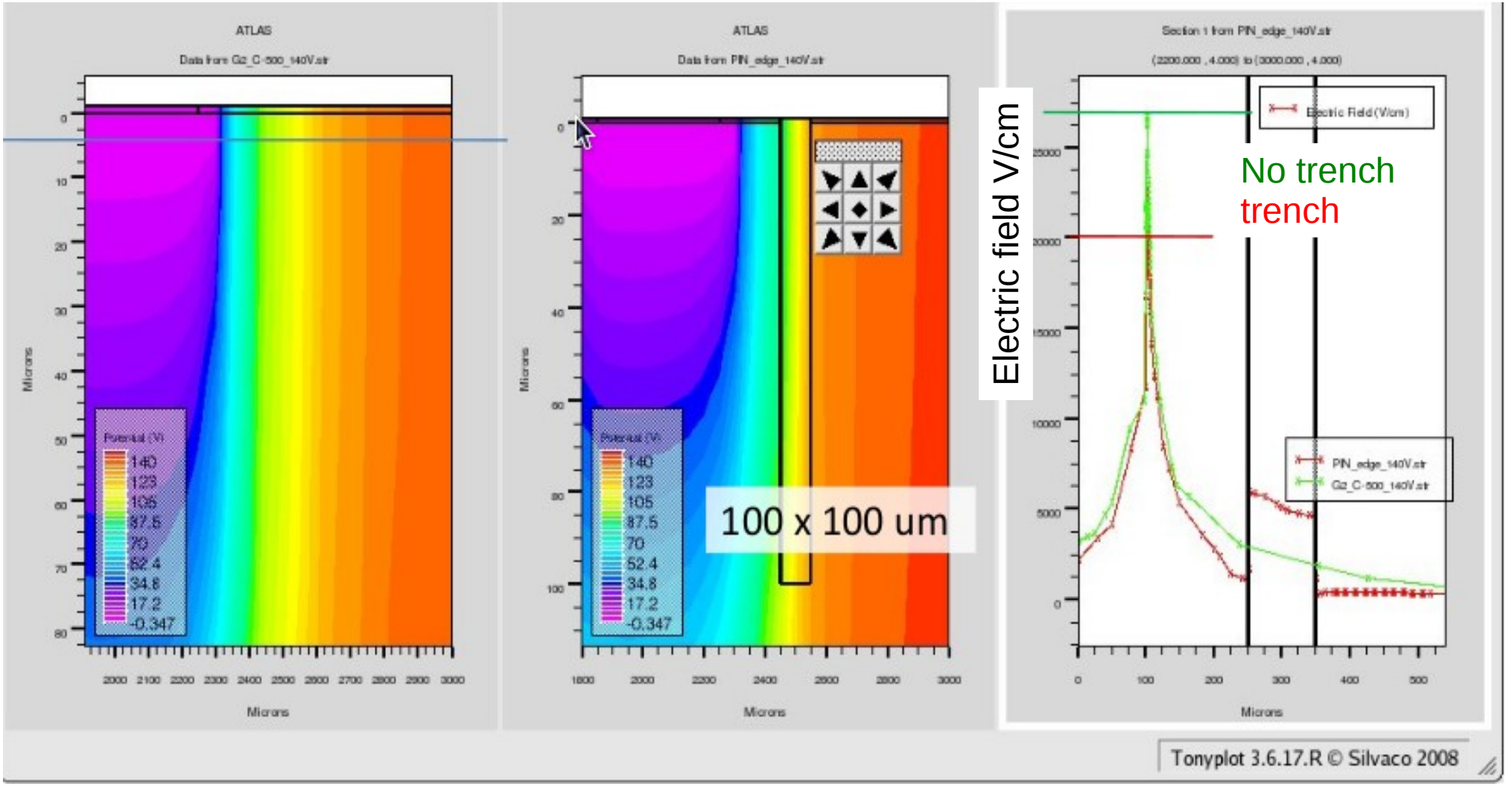


Rémi Cornat

Another idea: cut a shallow trench along edge of wafer:
Reduces maximum electric field

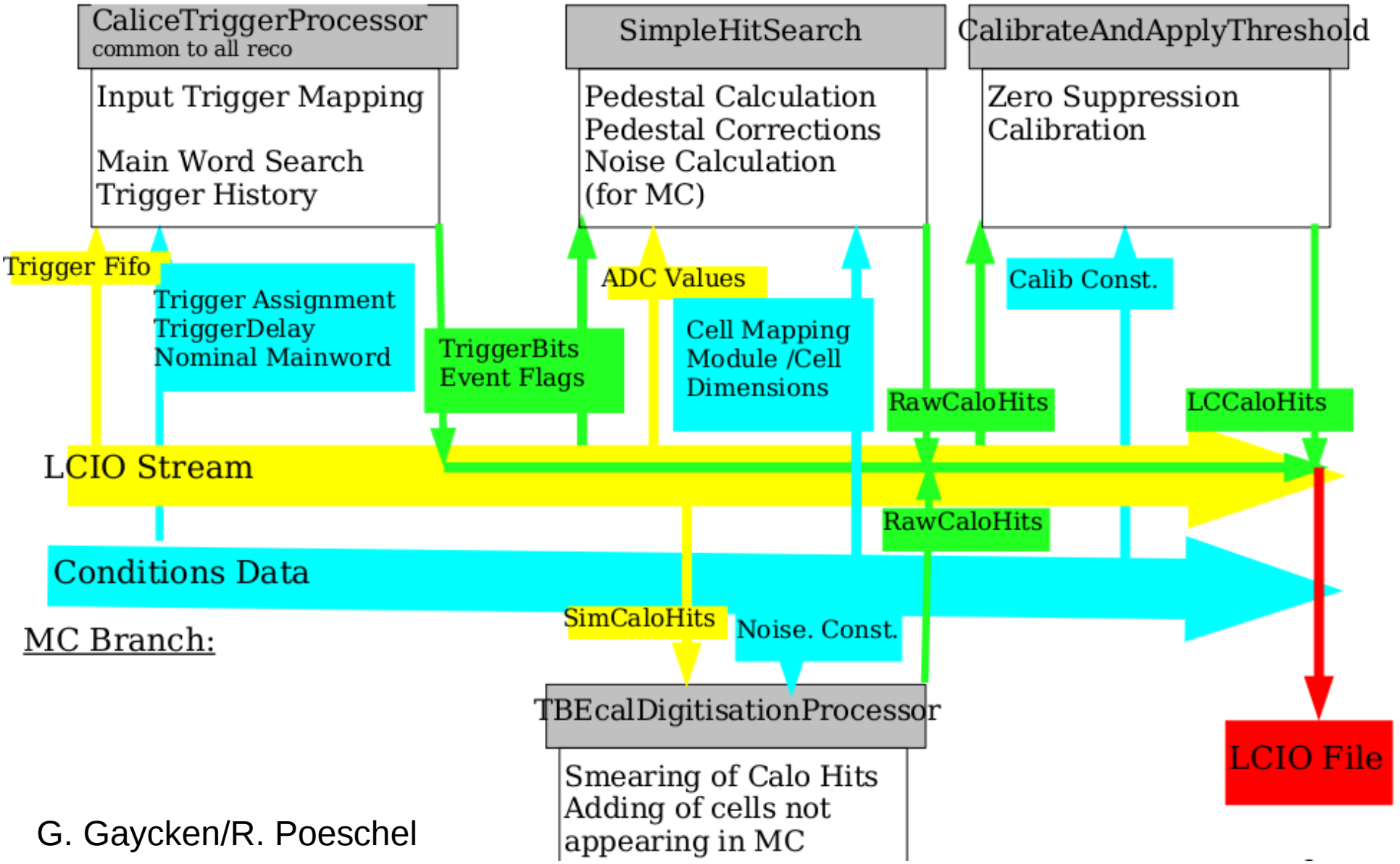
Simulation results:

No trench 100x100 micron trench electric field



Rémi Cornat

General overview of CALICE SiW software structure

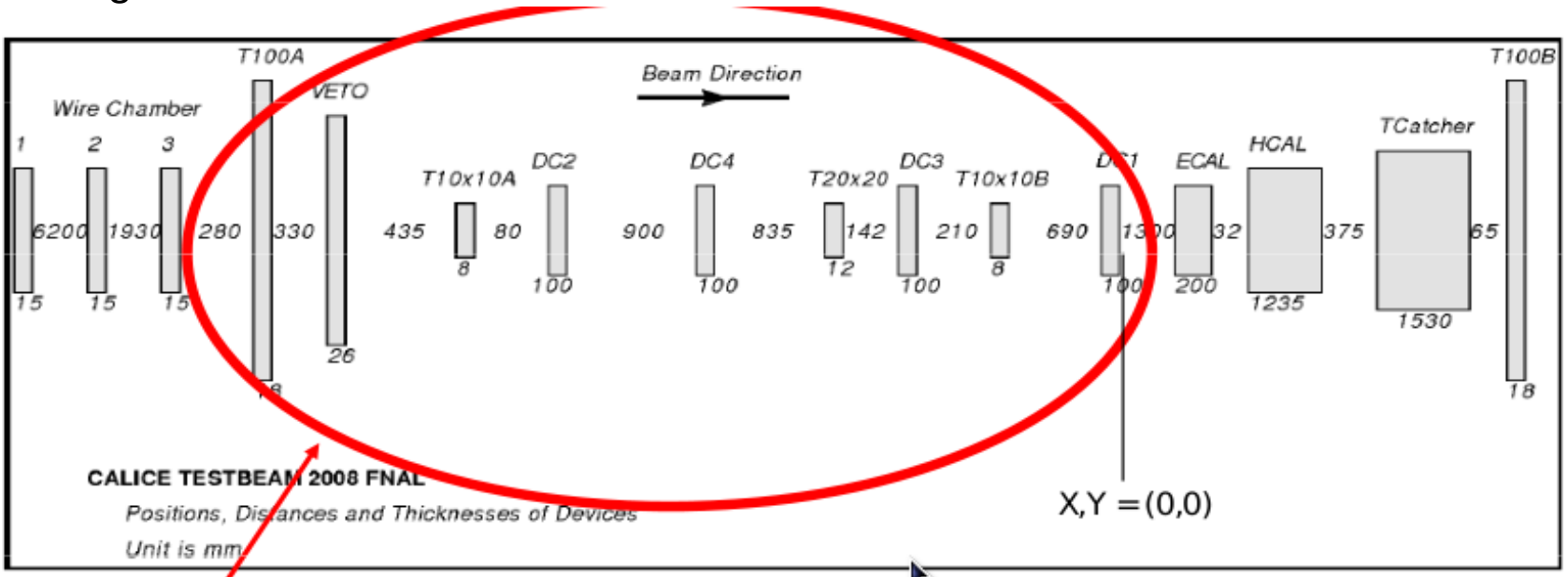


G. Gaycken/R. Poeschel

Simulation of test-beams

Detailed simulation (In Mokka) of entire test-beam system:
Calorimeters, Trigger counters, tracking detectors

e.g. the simulated test-beam for the 2008 run at FNAL:



- Drivers for most of the beam detectors are already available

F. Salvatore

Tracking software (mostly analysing the four drift chambers)

reasonably complete for 2006/07 data

Important for position and angular
resolution measurement

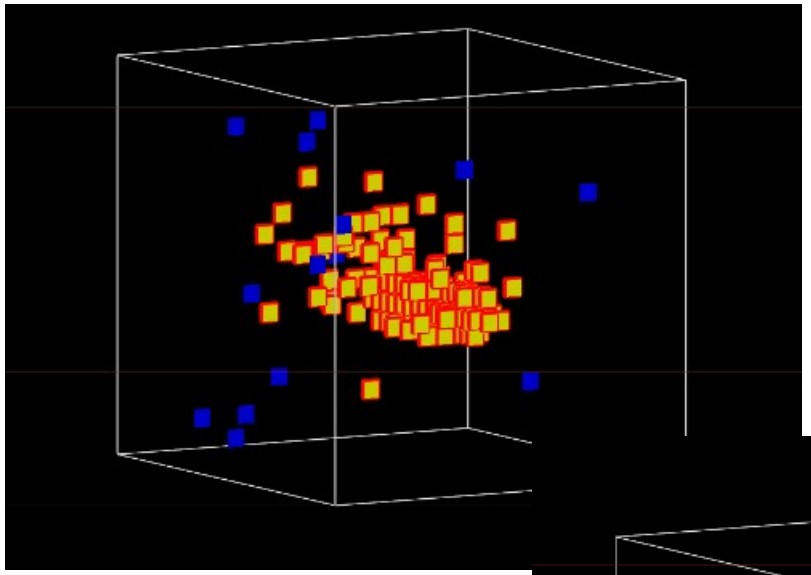
Previously mostly a UK activity,
not much work lately...

We will work in this at LLR
improve tracking software & simulation
measure and implement geometry/drift speeds/scattering for 2008 period

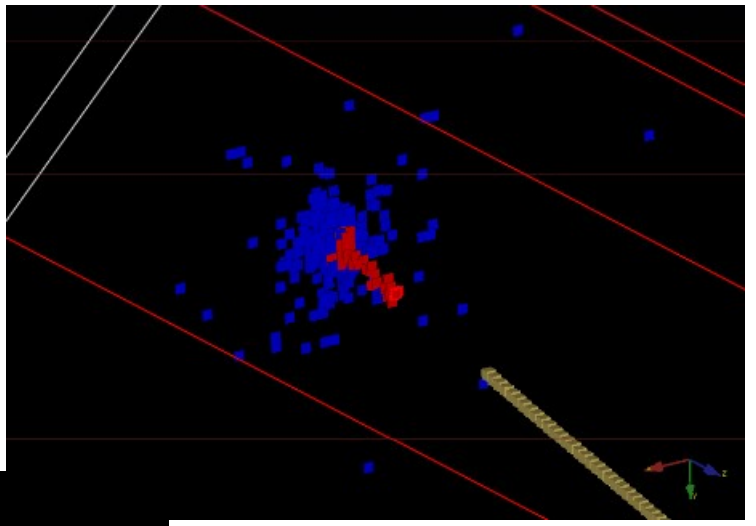
GARLIC clustering algorithm

Dedicated photon finder in ECAL

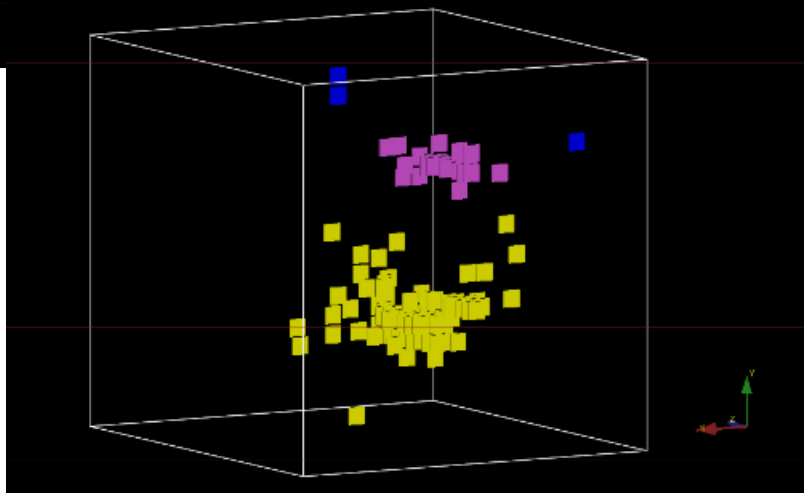
Allows study of ECAL performance in real-life situation,
after full event reconstruction/PFA



Single electron



Pion interaction



Double shower

Some events from
Testbeam data

M. Reinhard

Thank you