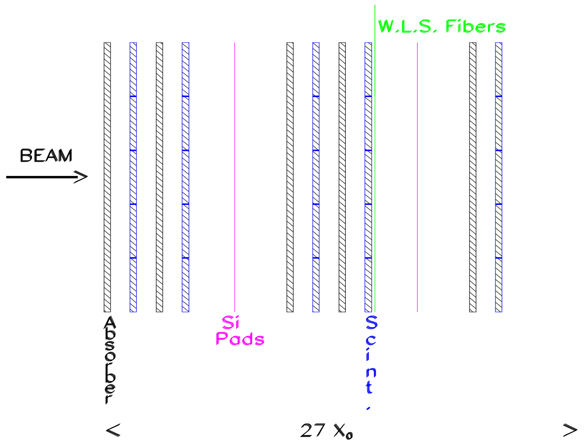
Status of LCcal
The new E.M. Calorimeter
Prototype R&D Project

Como, LNF, Padova (INFN: LCcal, DESY PRC 00/02)

Prototype Pb/Sc + Si:



- Light optimization
- Si-pad detector
- Mechanical layout
- Geant 4 Simulation

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Light optimization

Scintillation light transported with WLS fibers

- 3 mm scintillator planes
- separation in 5×5 cm^2 tiles obtained by grooves
- two possible paths for the fiber inside the scintillator
- start light output measurement
- join the HCAL-project/INTAS-proposal
- first idea:
  scintillator planes/fibers provided by industry

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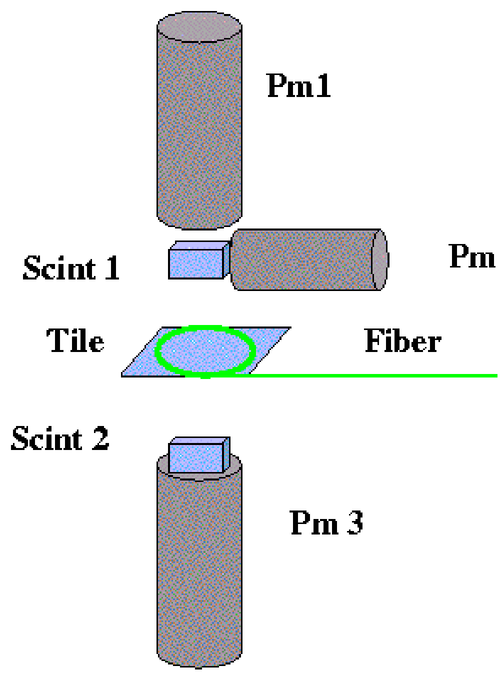
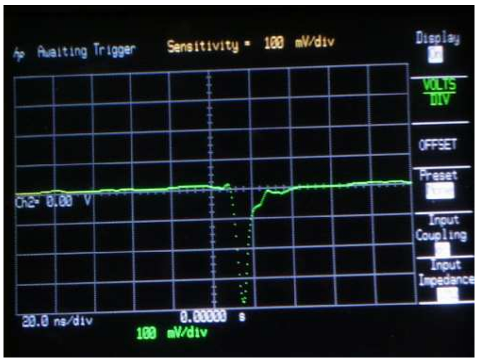
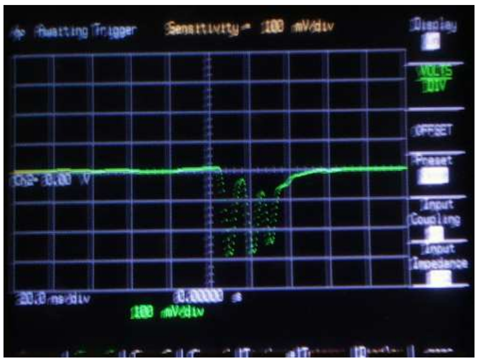
Light output measurement

Test setup



- cosmic rays crossing tile
- fraction R of events seen by the fiber
- assuming Poisson distribution
  $\Rightarrow N_{ph\ e^-} = -ln(1-R)$
- cross check: $ph\ e^-$ resolved in time





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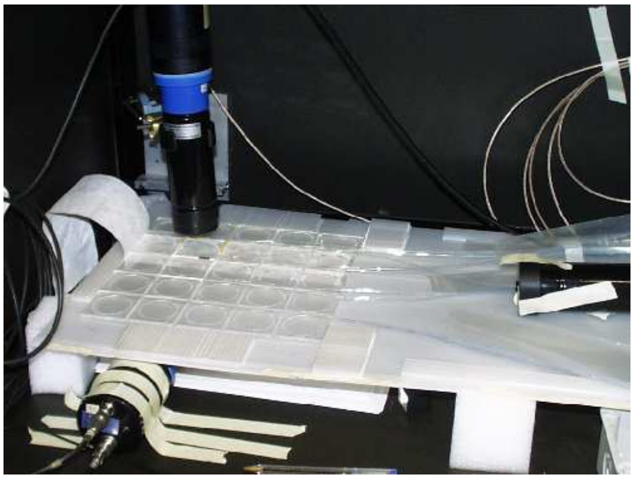
Poli Hi Tech plate



- unsatisfactory results:
  $R \sim 0.5 \Rightarrow N_{ph\ e^-} < 1$
- need optimization studies:
  fiber type (Poli Hi Tech vs Kuraray...)
  scintillator vs fiber optical contact
  fiber geometry
  P.M. spectral Q.E. (standard vs green extended)
- work started
- imply delay

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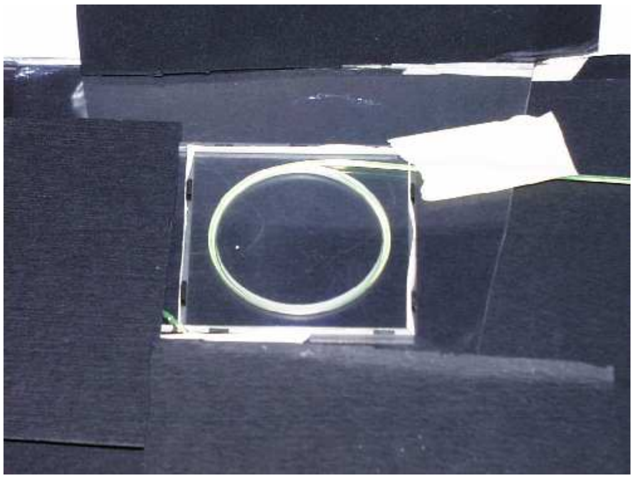
Padova single tile
σ tail geom.
3 mm scintillator

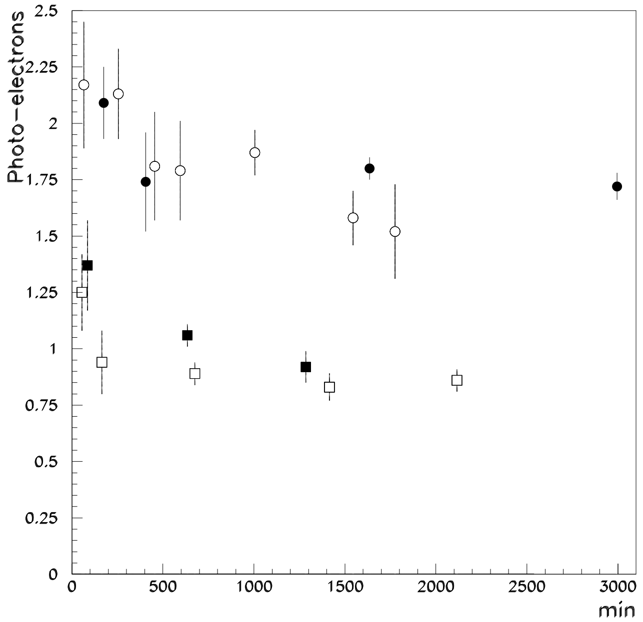


Results

standard PM: Q.E.$\sim$ 10% for 520 nm

Fiber	Poli Hi Tech	Kuraray Y11
$N_{ph\ e^-}$	.9	1.3 (.9 $\div$ 1.7)

Time dependence?



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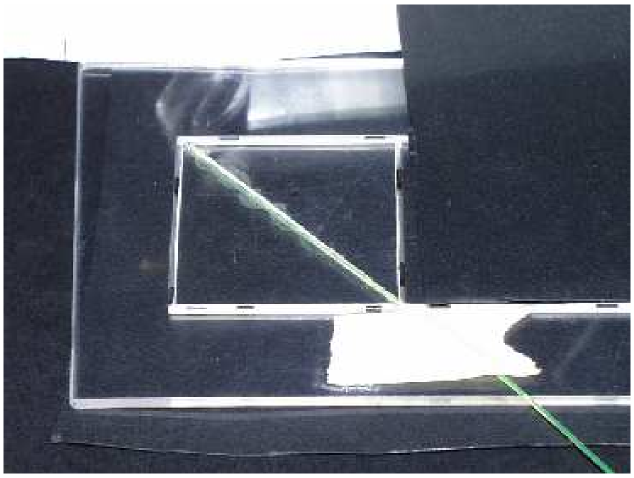
Padova single tile
diagonal + opt. contact
3 mm scintillator



Results

Fiber	Poli Hi Tech	Kuraray Y11
$N_{ph\ e^-}$	1.65	2.55
	1.3 (no opt. contact)	
		1.25 (no mirror)

Concluding remarks

- optimisation study is worth
- many options still to be investigated
- possibility of a quick test at CERN
- expected time: $\sim$ 2 months

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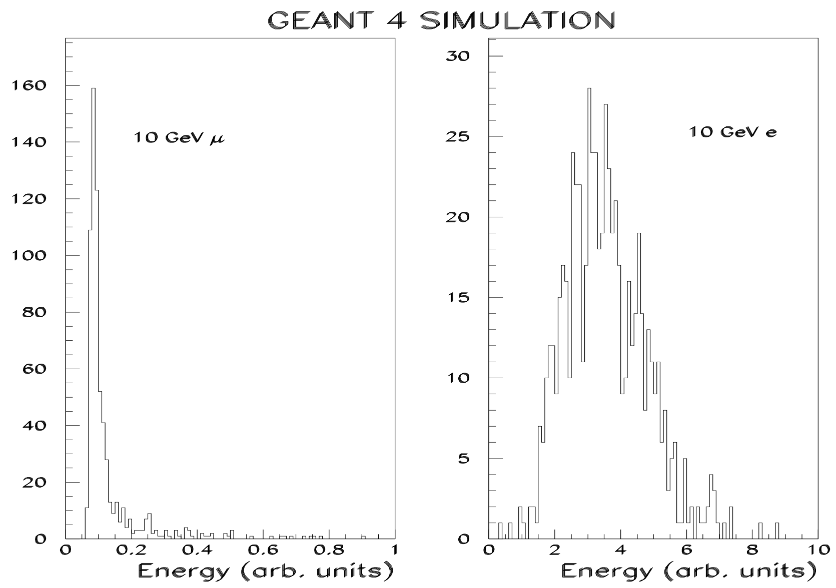
SI Planes

- mask design defined (and approved) in production
- 10 cm wafer $\Rightarrow$ detector: 6×7 pads ($0.9 \times 0.9\text{cm}^2$)
- conductive glue contact through pcb
- pcb design defined
- 3 planes with 3×2 detectors (due to budget)
- large signal: up to 60 m.i.p. on 2^{nd} plane



- R-O chip: VA HDR9c from IDEAS

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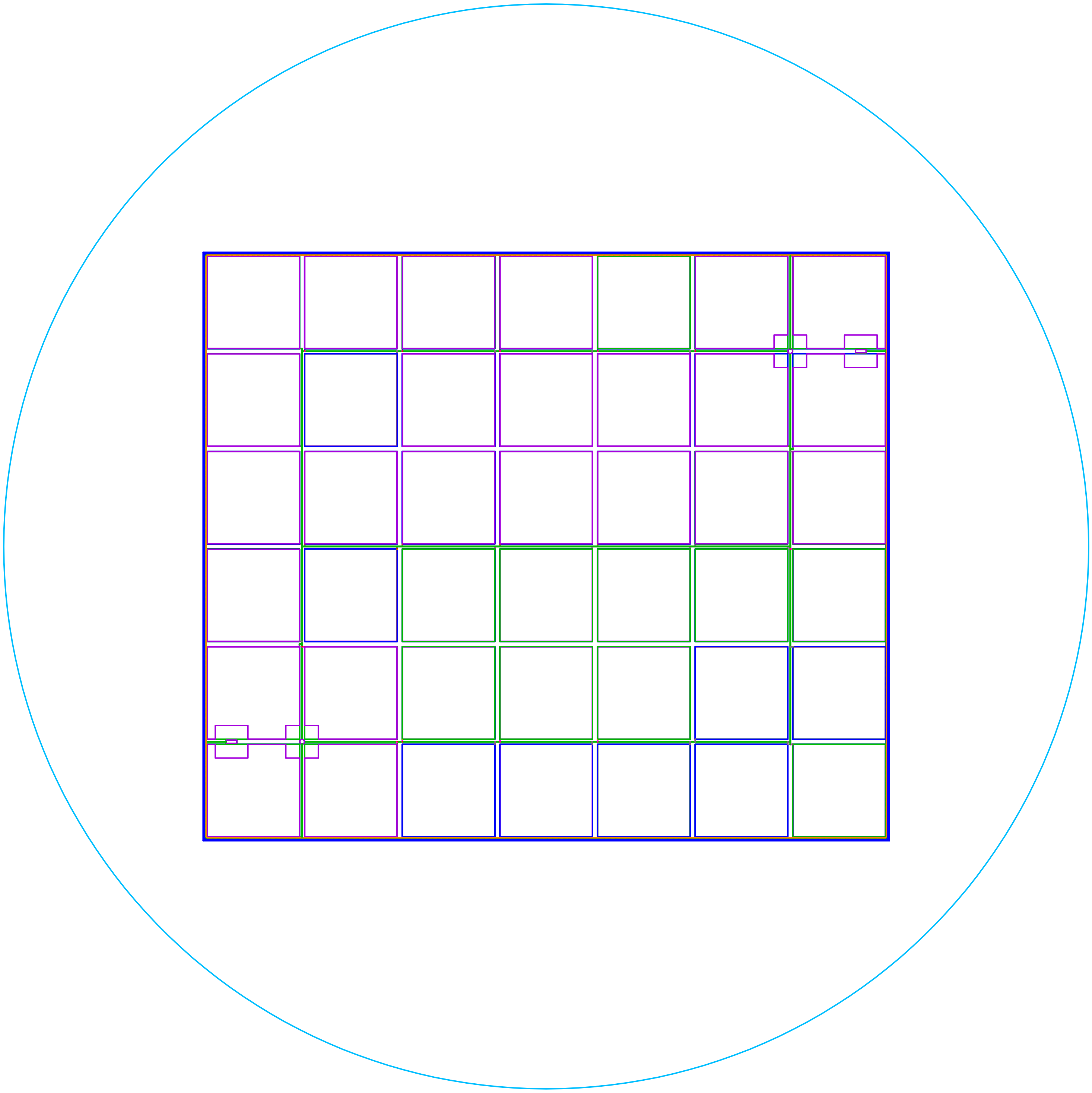

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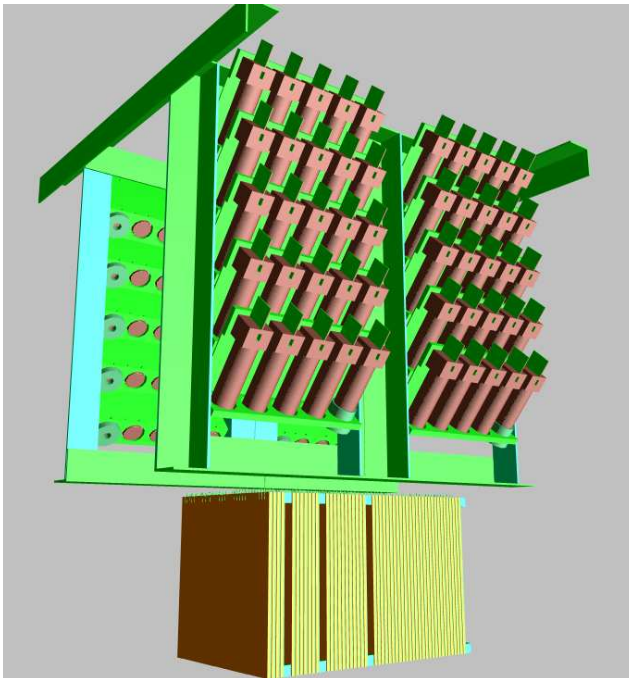
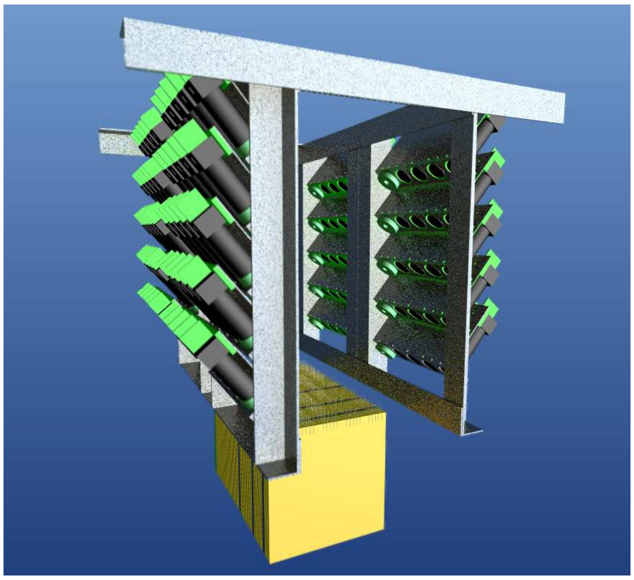
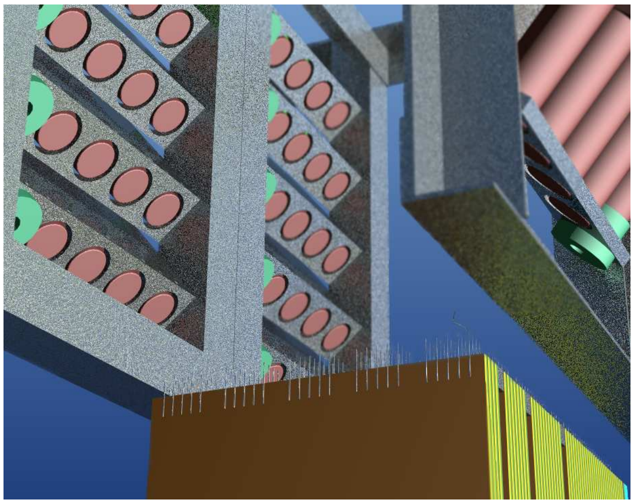
Mechanical layout





(no lateral space problems for a prototype)



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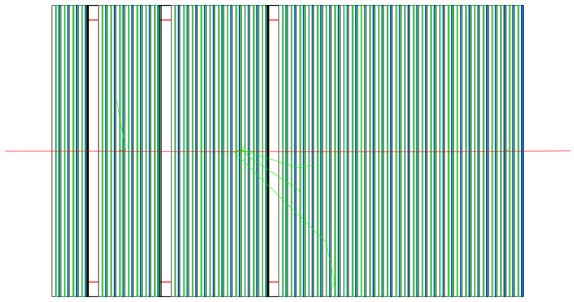
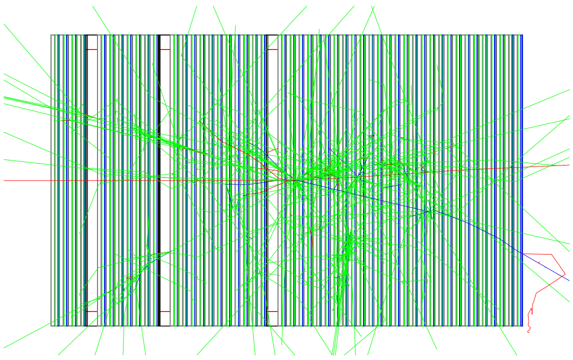
GEANT4 Simulation

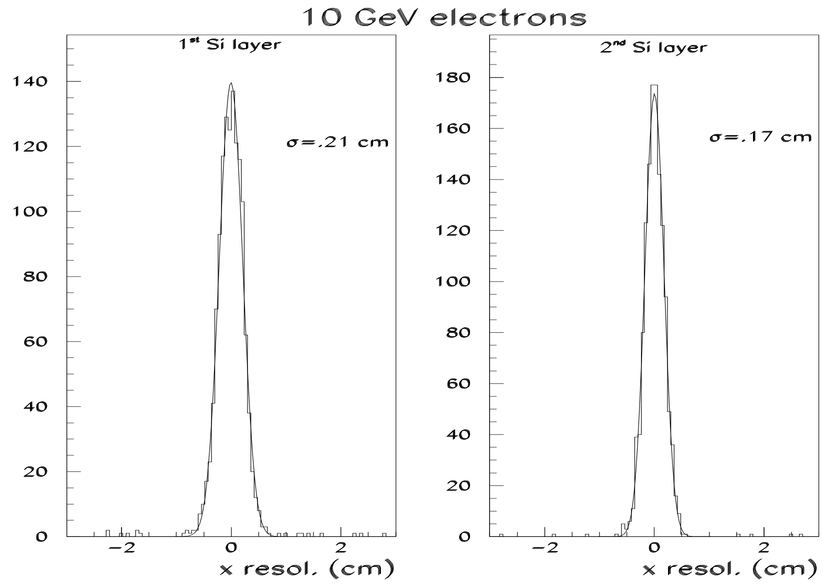
- sampling (Pb+ Scintillator) structure
- Silicon layers

μ



π





- Light transmission simulation to be interfaced

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Summary

- The project for a reasonable cost Ecal for TESLA is going on

- Light optimization studies preferred w.r.t. strict schedule

- HCAL project can help
(in particular if INTAS approved)

- Silicon part of the project requires a lot of work but proceeds reasonably

- Next year plans as proposed so far:
high energy tests (DESY+CERN)
W Absorber

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