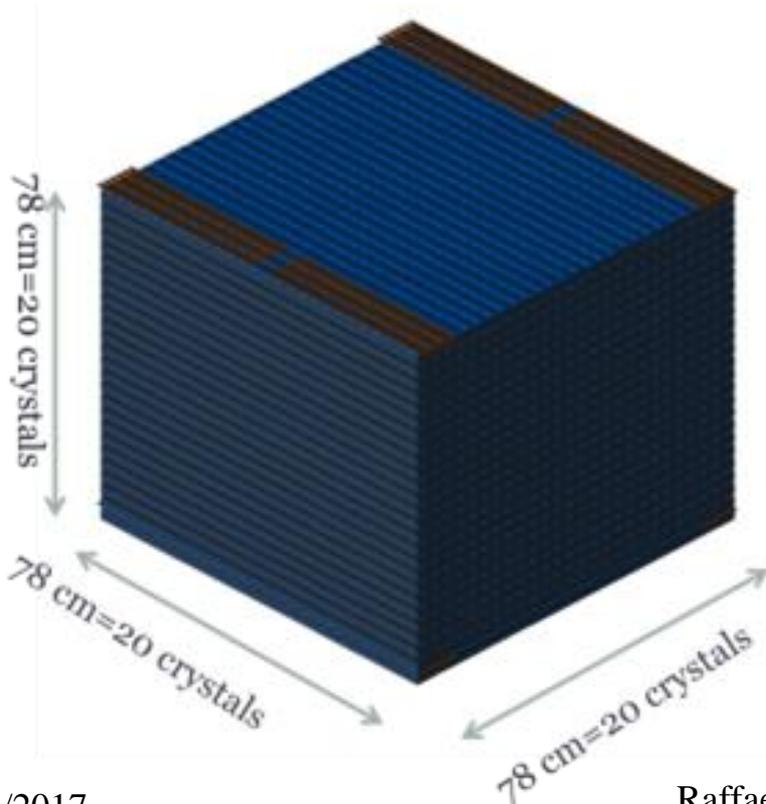


TIC – Current mechanical structure and a few ideas on how to proceed from here

Baseline Calorimeter

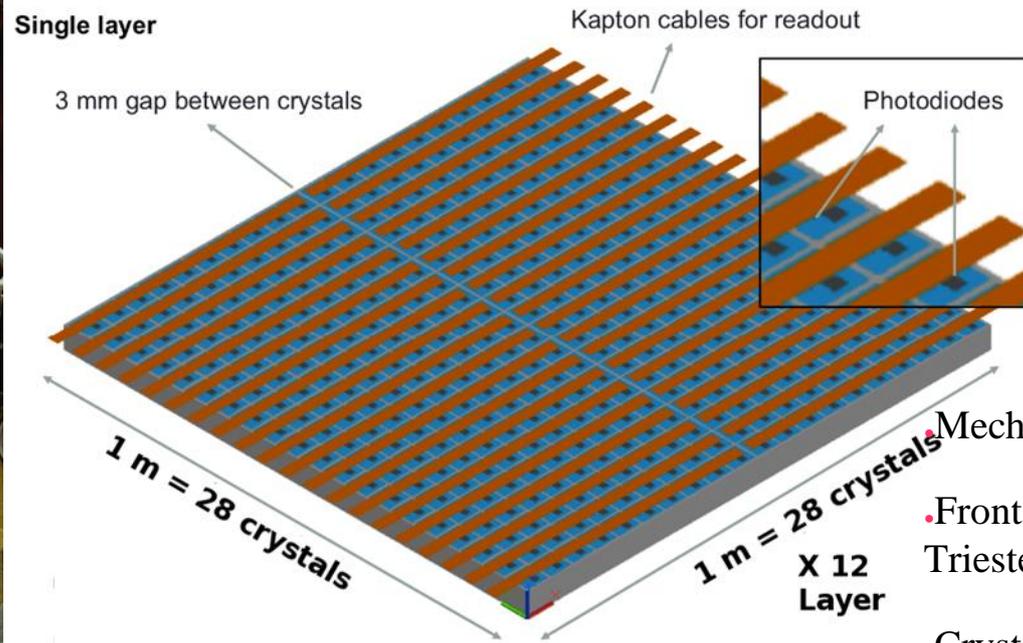
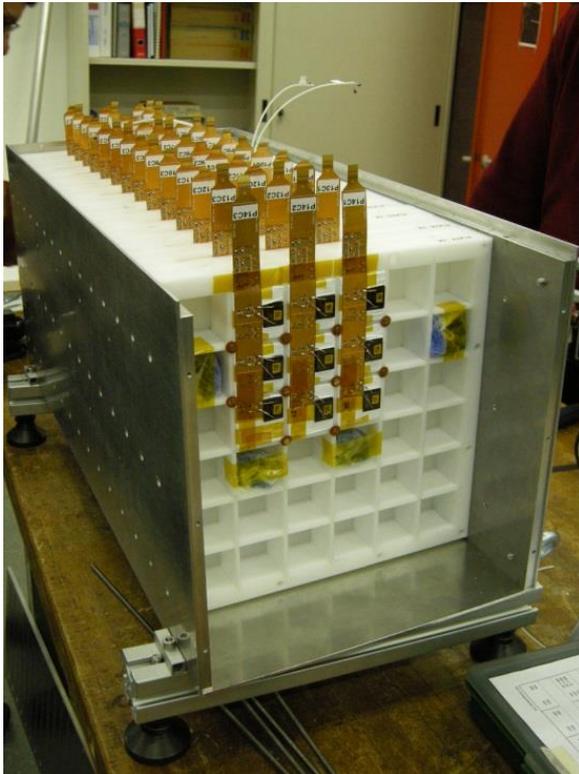
- Assumption: detector weight ~ 1600 kg
- Baseline material CsI(Tl): Density: 4.51 g/cm³
 - x_0 : 1.86 cm ; λ_I : 38 cm ; Moliere radius: 3.5 cm
 - Light yield: 54.000 ph/MeV ; τ_{decay} : 1.3 ms ; λ_{max} : 560 nm



$N \times N \times N$	20×20×20
crystal side (cm)	3.6
crystal volume (cm ³)	46.7
gap (cm)	0.3
mass (kg)	1685
number of crystals	8000
size (m ³)	0.78×0.78×0.78
depth (R.L.)	39×39×39
" (I.L.)	1.8×1.8×1.8
planar GF (m ² sr) *	1.91

Prototype (1)

- 14 Layers ; 9 crystals in each layer
- 126 Crystals in total - 126 Large Photodiodes
- 50.4 cm of CsI(Tl) ; $27 X_0$, $1.32 \lambda_T$
- Photodiodes read-out by 9 CASIS1.2A (16-channel ASICs)



Mechanics: INFN Pisa

• Front-end electronics: INFN Trieste

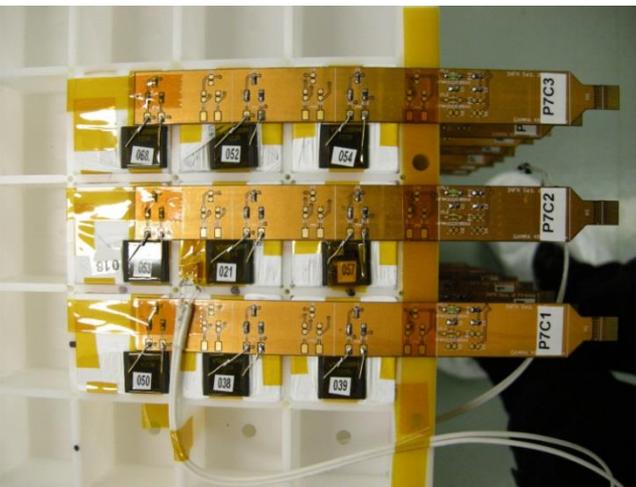
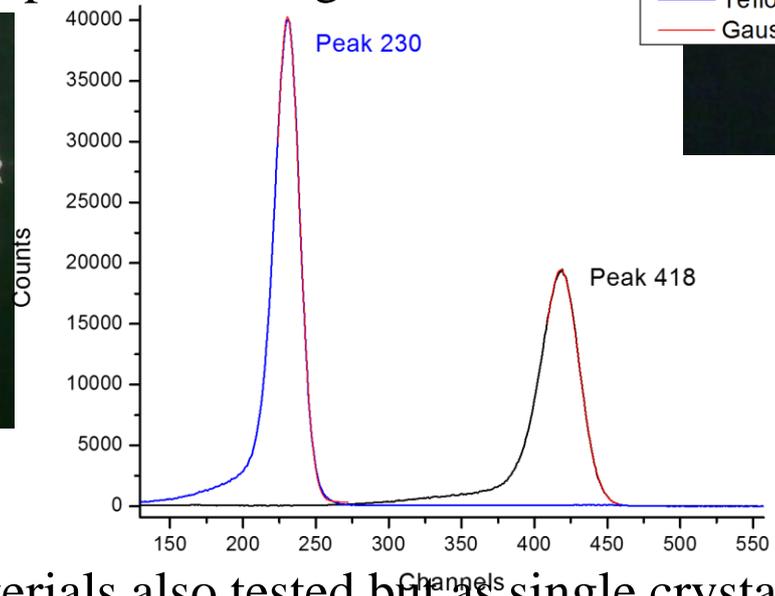
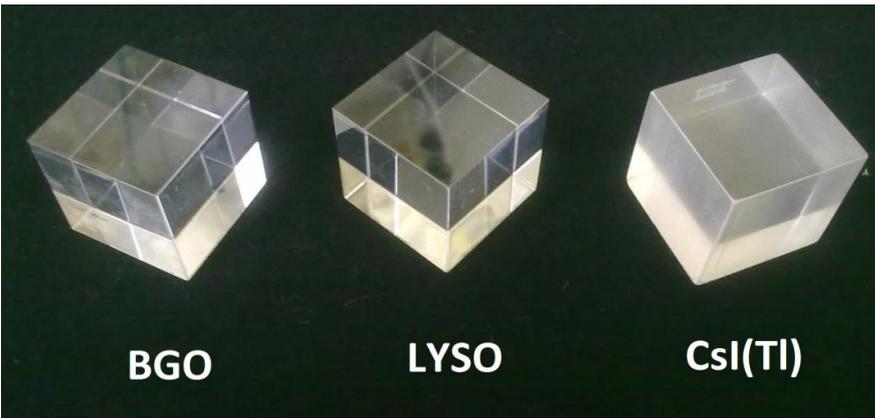
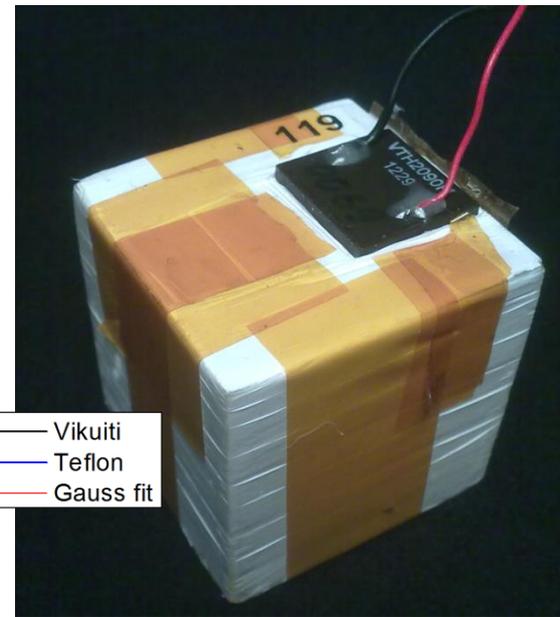
• Crystals, photodiodes, DAQ, assembly: INFN Firenze

29/05/2015

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Prototype (2)

- CsI(Tl) cubes , 36 mm side, wrapping 150 micron of teflon
- VTH2090 PD (large).
- Kapton cables to collect the signals and provid Biasing

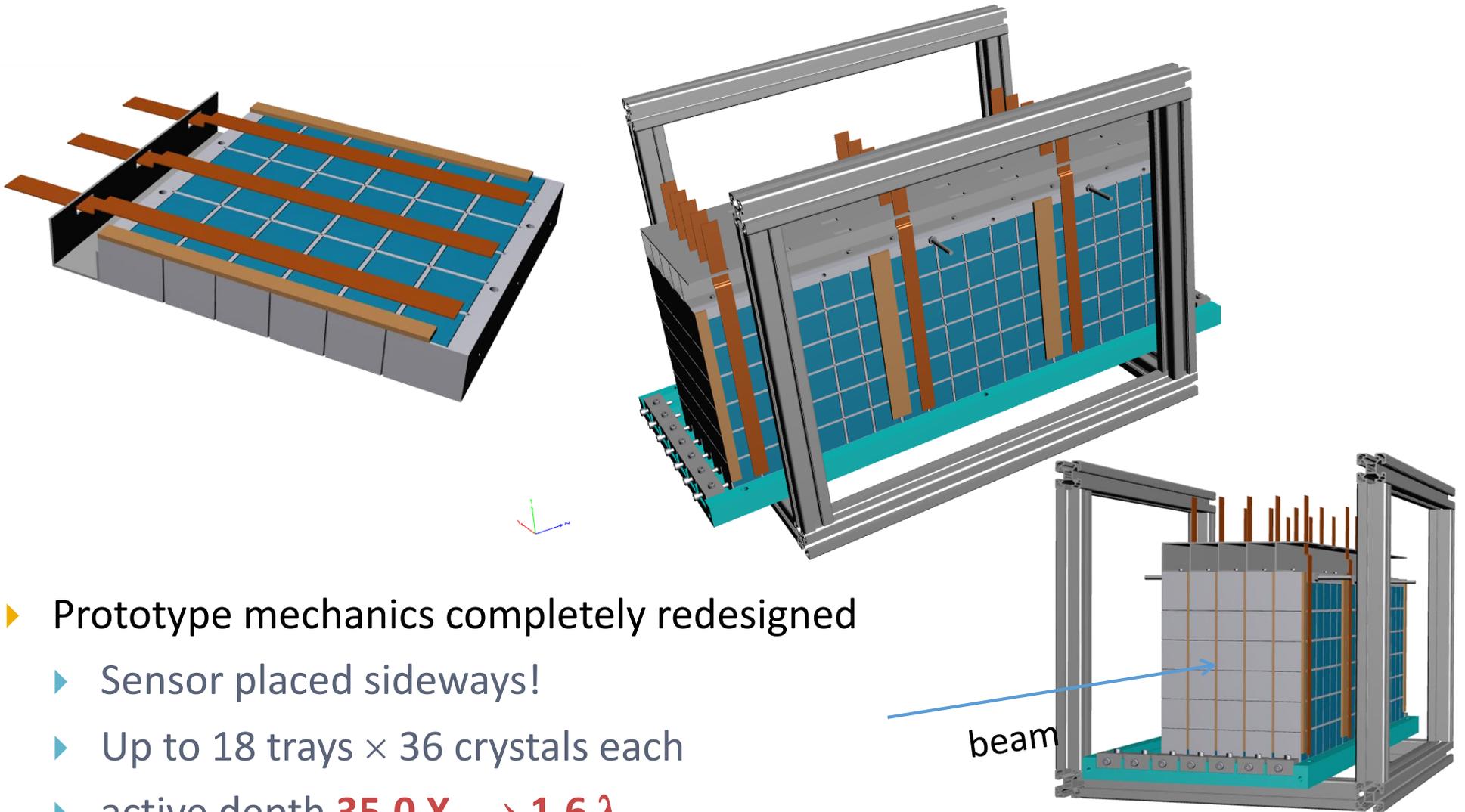


- Other materials also tested but as single crystals
- Also comparisons made on surface treatment (Simulation/Amptek system)
- Various wrappings tried (i.e. Vikuiti , 1.8 gain)

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Prototype upgrade (v2)

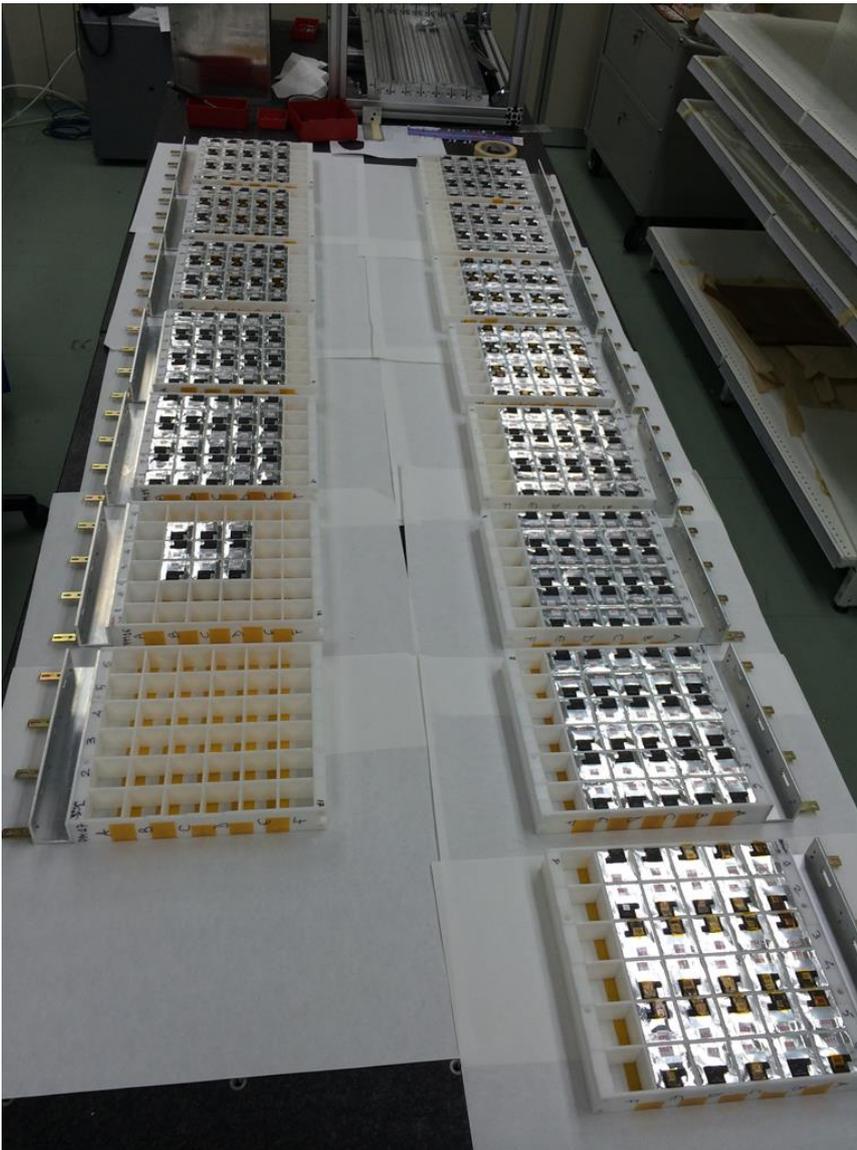


- ▶ Prototype mechanics completely redesigned
 - ▶ Sensor placed sideways!
 - ▶ Up to 18 trays \times 36 crystals each
 - ▶ active depth $35.0 X_0 \rightarrow 1.6 \lambda_1$

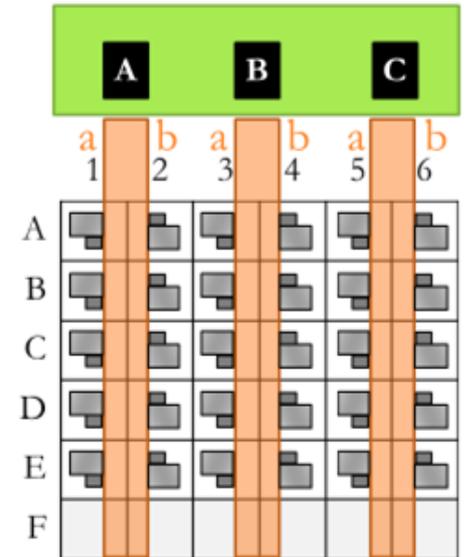
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• Mechanics: INFN Pisa

Prototype upgrade (v2)



HYDRA board



- ▶ First version of HYDRA chip (28 channels)
- ▶ Two-PD readout
- ▶ V2.0 → 5×5×18 instrumented elements

Sep 2016	v2.0	μ, π, e 50÷200 GeV
Oct 2016	v2.0	(3÷40000) e 300MeV
Aug 2017	v2.1	μ, π, e 50÷279 GeV

• Data analysis: INFN Florence+Pisa, CIEMATMadrid

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Silicon to be added

First layers **MUST** be modified to accommodate Perugia ladders.

- DAMPE/AMS silicon modules:
- Double sided $4 \times 7 \text{ cm}^2$ sensors
 - Modules range from one sensor up to 12 ($7 \times 48 \text{ cm}^2$)
- Single sided $9.5 \times 9.5 \text{ cm}^2$ sensors
 - Modules range from 1 to 4 sensors ($9.5 \times \sim 40 \text{ cm}^2$)
- Thickness: $300 \mu\text{m} + \text{bonds, etc. etc.}$

Delrin tray and calorimeter



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Do not change support structure and base plate!

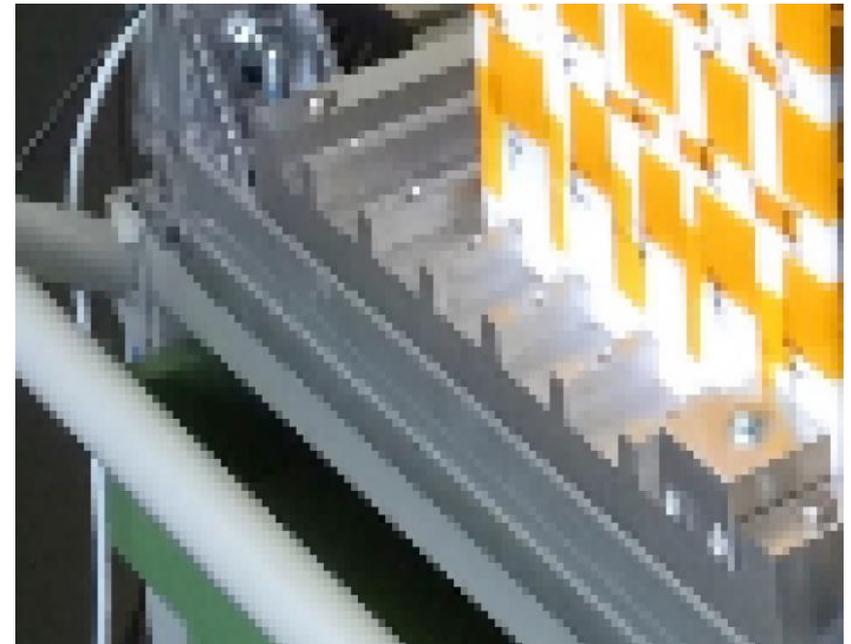
Work only on the first 6 trays.

Change back to the old version with trays perpendicular to the beam. **BUT PHOTODIODES STILL LATERAL!**

Prepare ad hoc supports for the silicon ladders in between trays.

Minimise space in between trays.

Re-orient the electronic boards but using the same “scolopendre”.



Further options

Prepare trays for half-thickness crystals

Need more Front End Boards which could come from border crystals

Could cut current crystals (we have a diamond saw in Naples)

Carbon Fibre option (Andrea Basti presentation)

New FE electronics (self triggering)