

SiPM for scintillation fiber tracking

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Inspiration

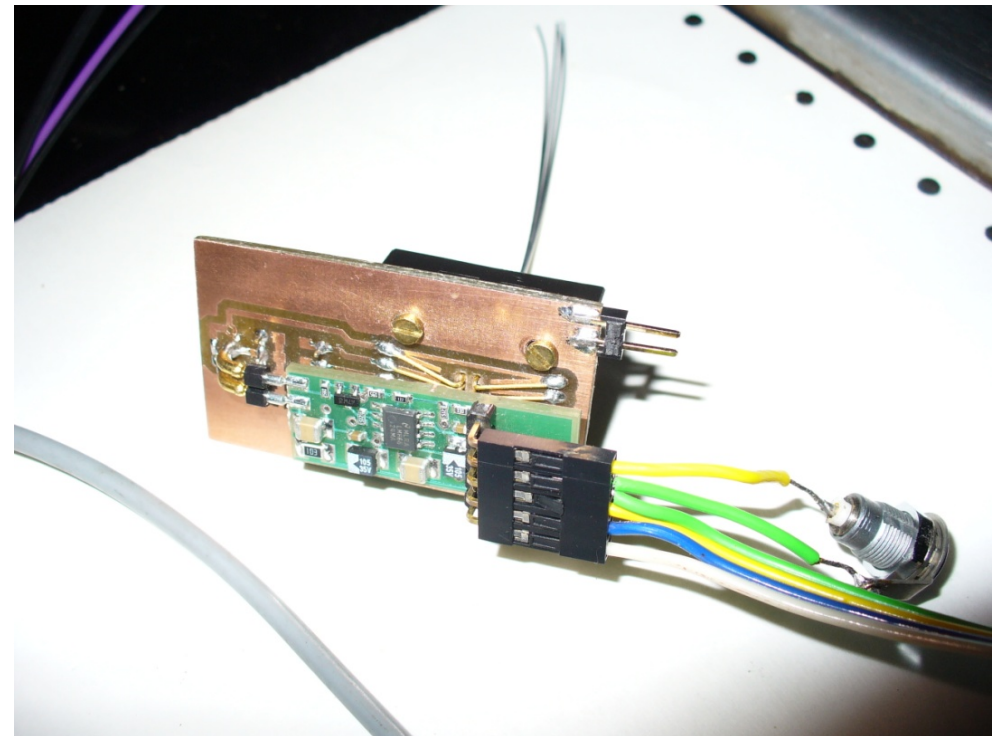
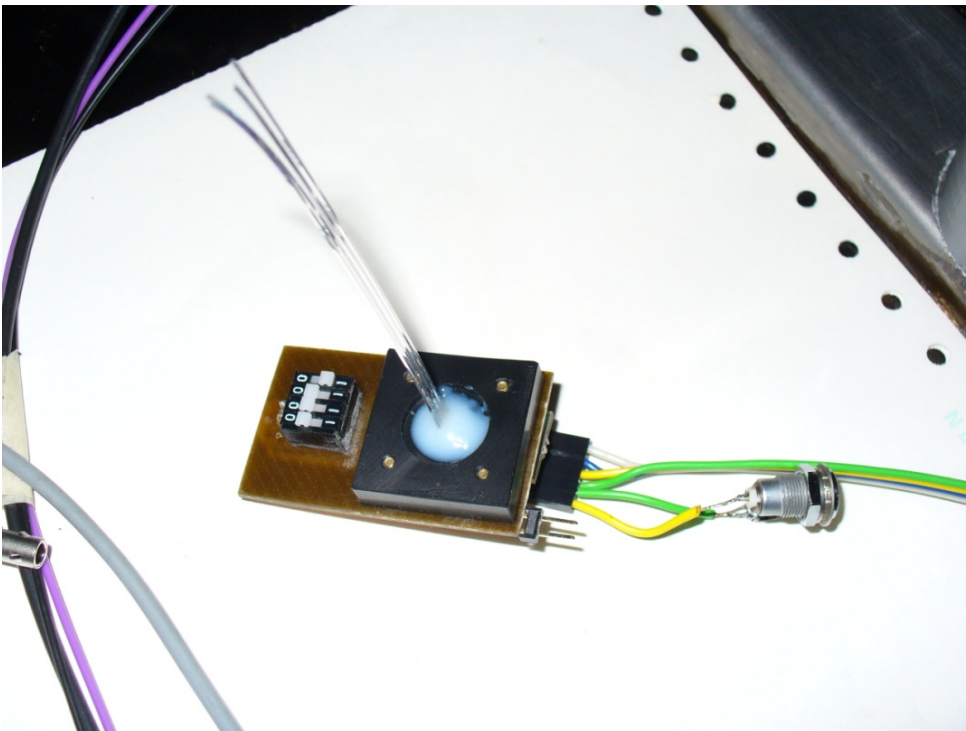
- Detector ALFA for measurement with μrad precision scattering in very forward region of ATLAS at LHC
- ALFA = 20 layers with 64 scintillating fibres each (10 X-layers, 10 Y-layers), square fibre size - 0.5x0.5mm. Installed in Roman Pot
- Readout from fibres 24 MAPMT 8x8 chan.

Ambition

- Substitute MAPMT by SiPM
- Reduce an electronics $\rightarrow$ lower a price per channel
- Save a space in RP using more compact devices $\rightarrow$ Increase number of fibres $\rightarrow$
- **Acceptance extension to cover area of new physics interest.**

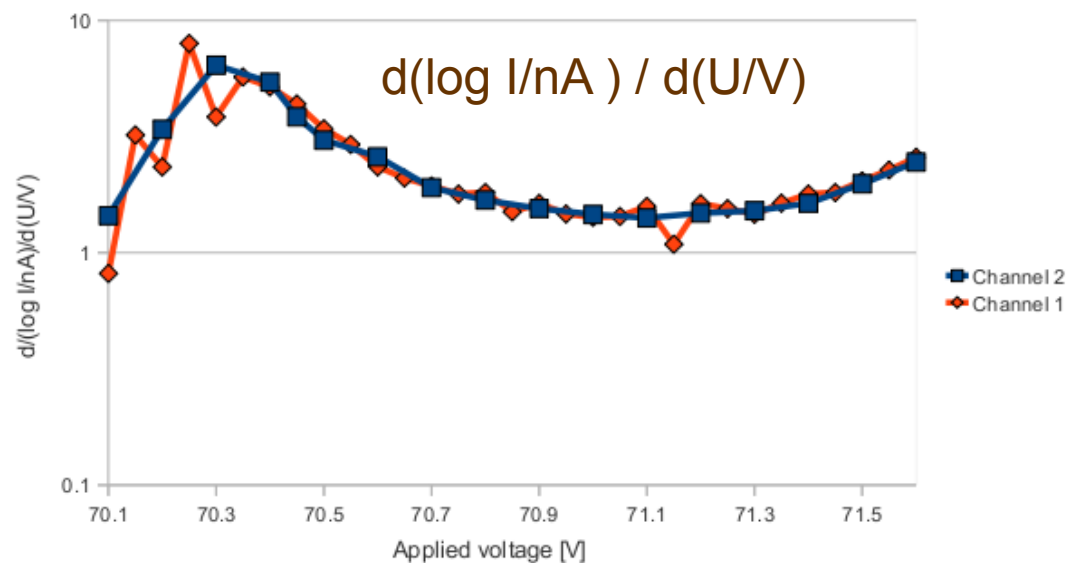
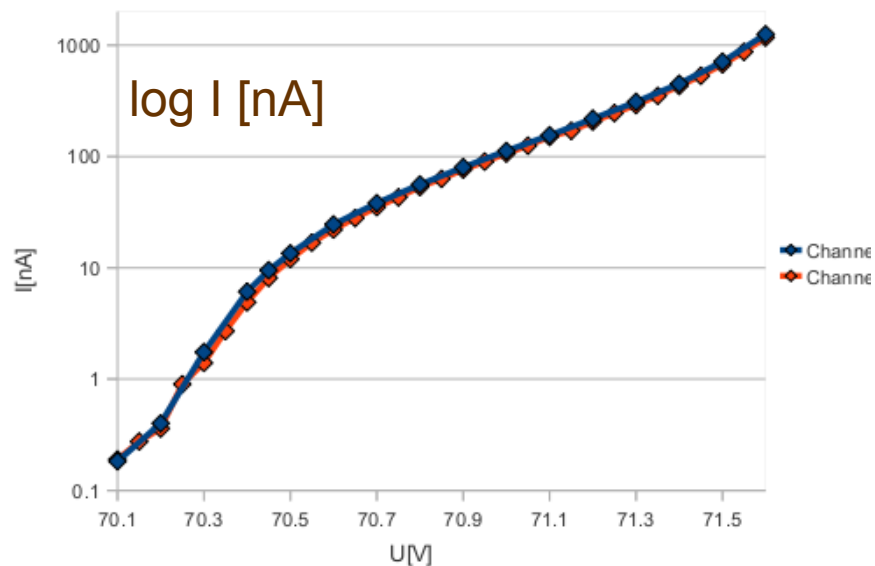
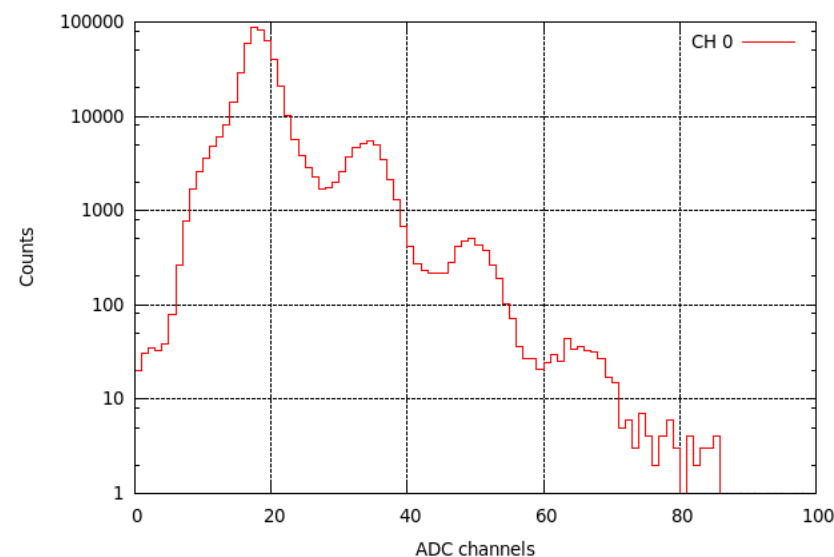
First prototype

- Hamamatsu S10984-100P - array of 4 SiPMs, 100 pixels each
- 4 scintillating fibres, identical to ALFA – Kuraray, 0.5 x 0.5 mm
- Preamplifier – custom made, borrowed from JINR colleagues



1-st prototype – results

- All 4 SiPM of the array behave similarly
- Operational voltage set 71.2V
- Single photon signals distinguished.
- Soldering avoided – springs used instead



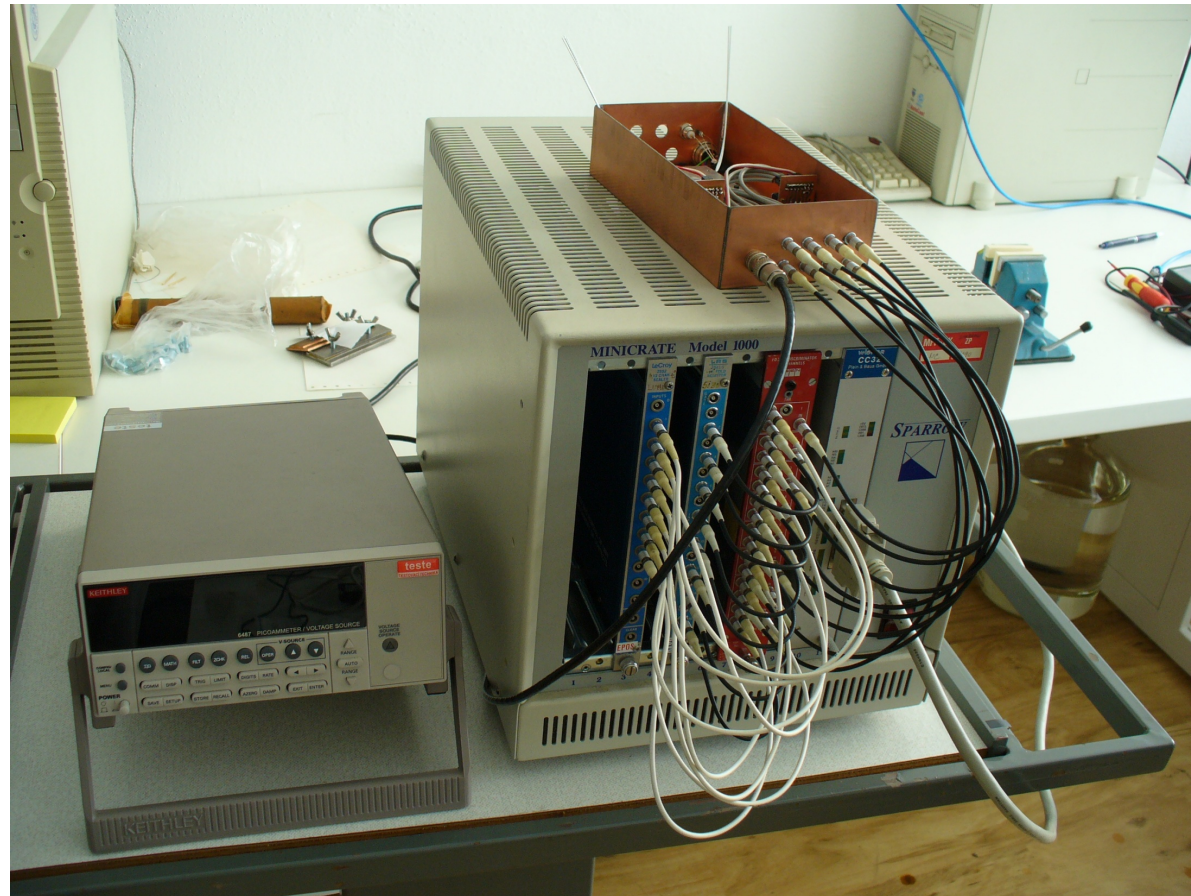
Second prototype

- 1-st layer – 4 fibres, U-direction
- 2-nd layer – 3 fibres, V-direction
- 1 fibre in front of UV-plane.
- 8 fibres equipped with 2 arrays of 4 SiPM
- Preamplifier skipped, signal goes directly to a discriminator
- Tested with β -source $^{90}\text{Sr}/\text{Y}$

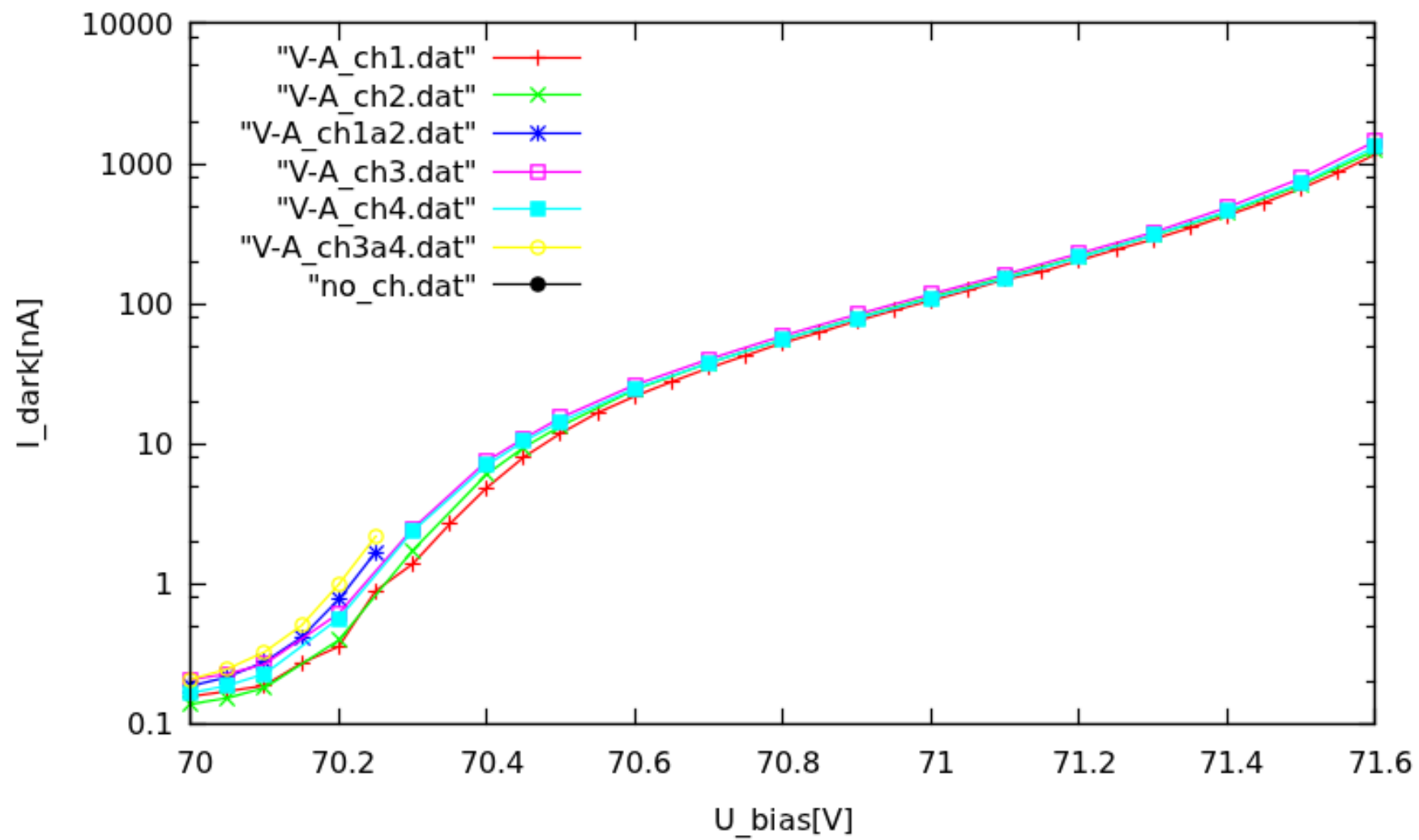


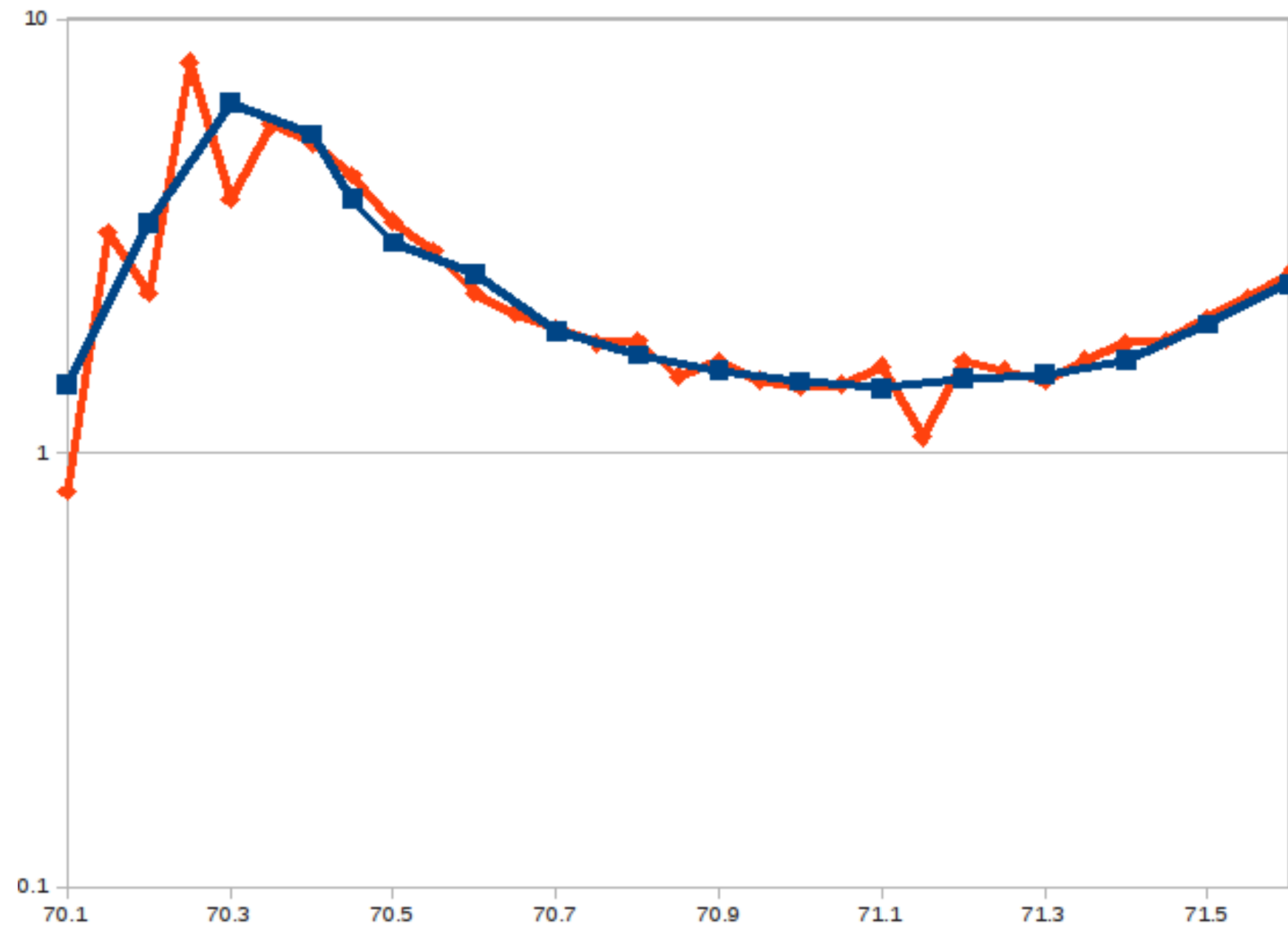
2-nd prototype – result

- Attempt to reconstruct position of a fibre relative to UV-plane – **no success yet**
- Signal is of order 10mV
- **Low threshold discriminator could be a solution.**



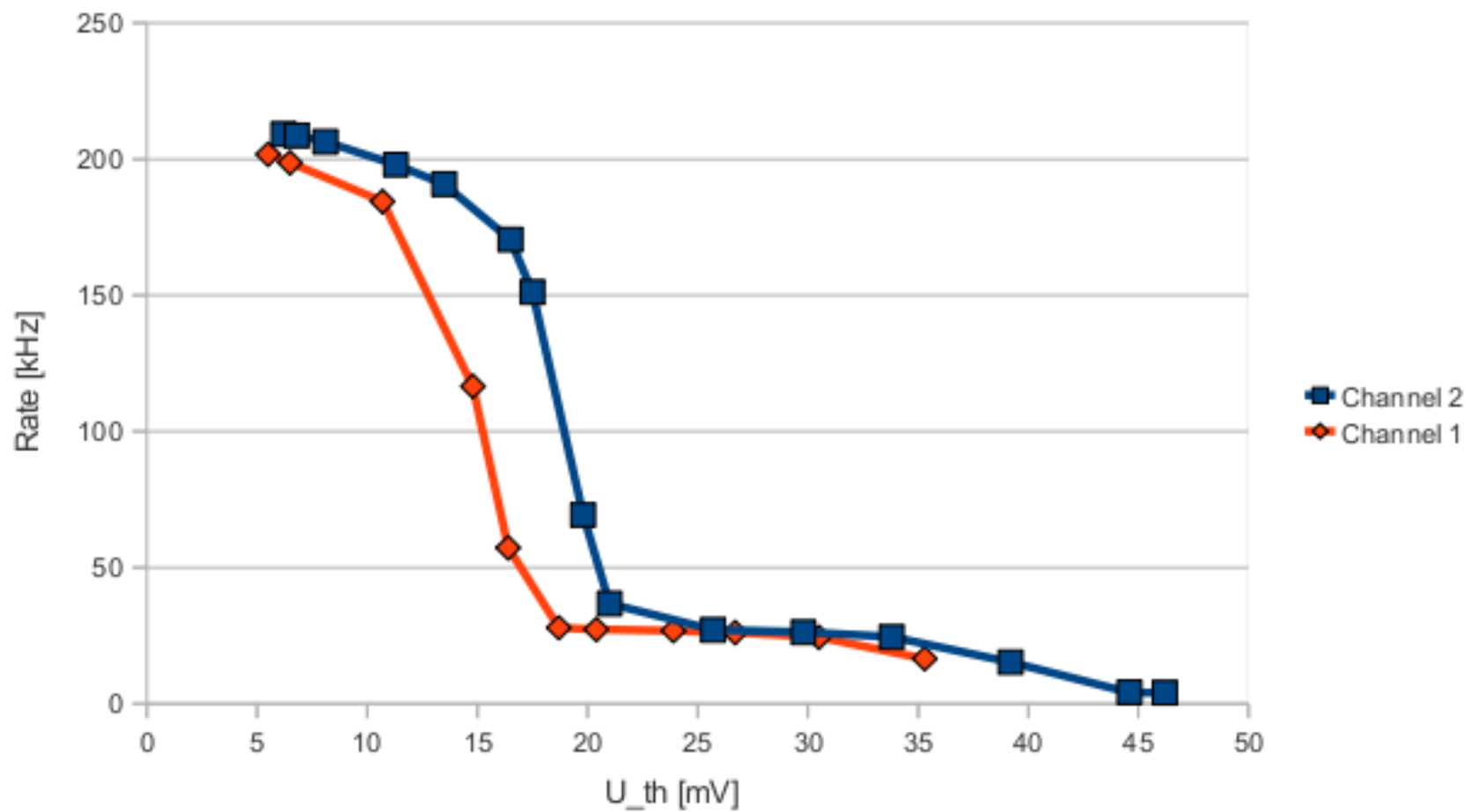
Backups





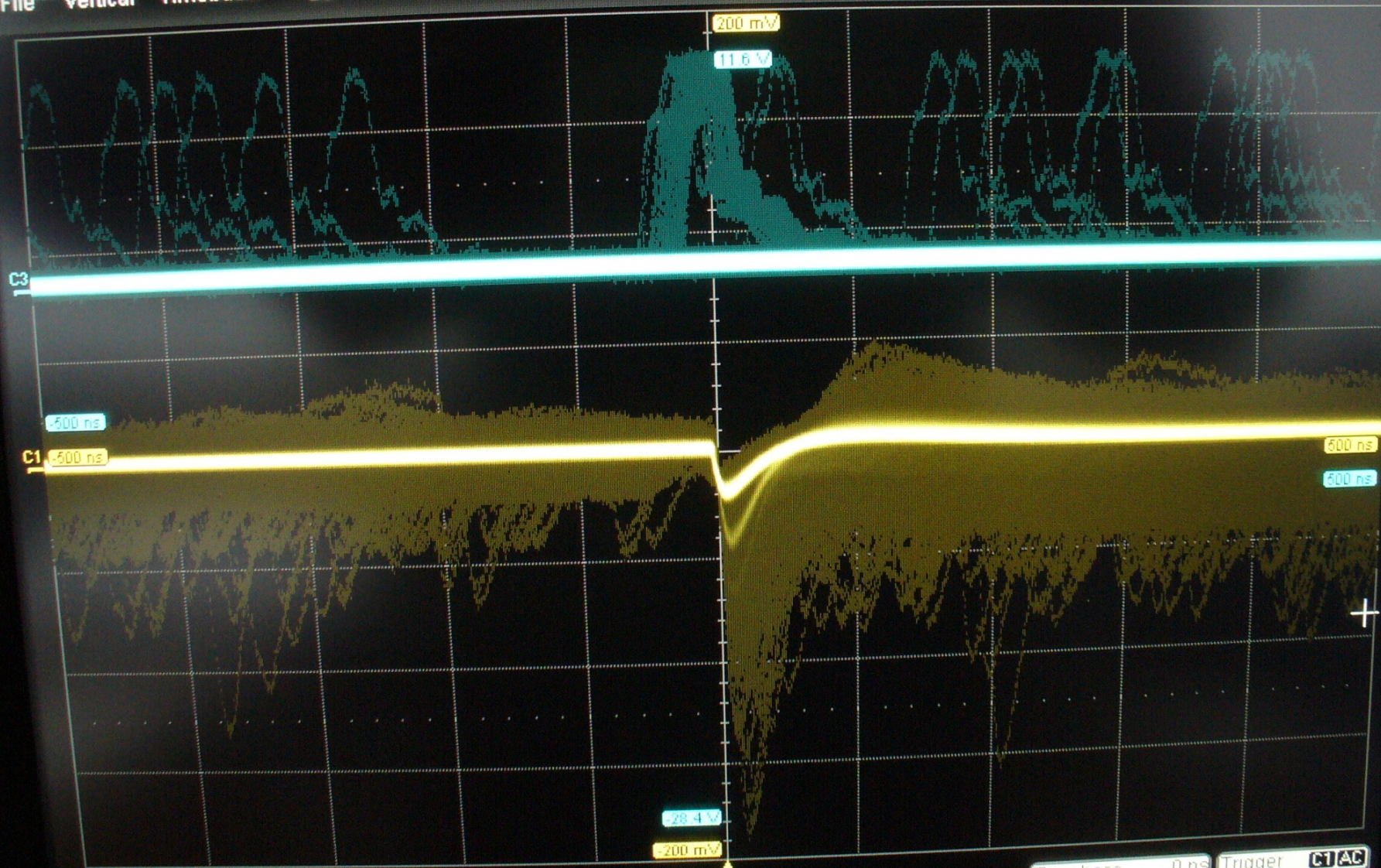
6.10.2011

V. Vorobel - GSI, SiPM workshop



File Vertical Timebase Trigger Display Cursors Measure Math Analysis Utilities Help

Undo



C1 DC50
50.0 mV/div
0.0 mV offset

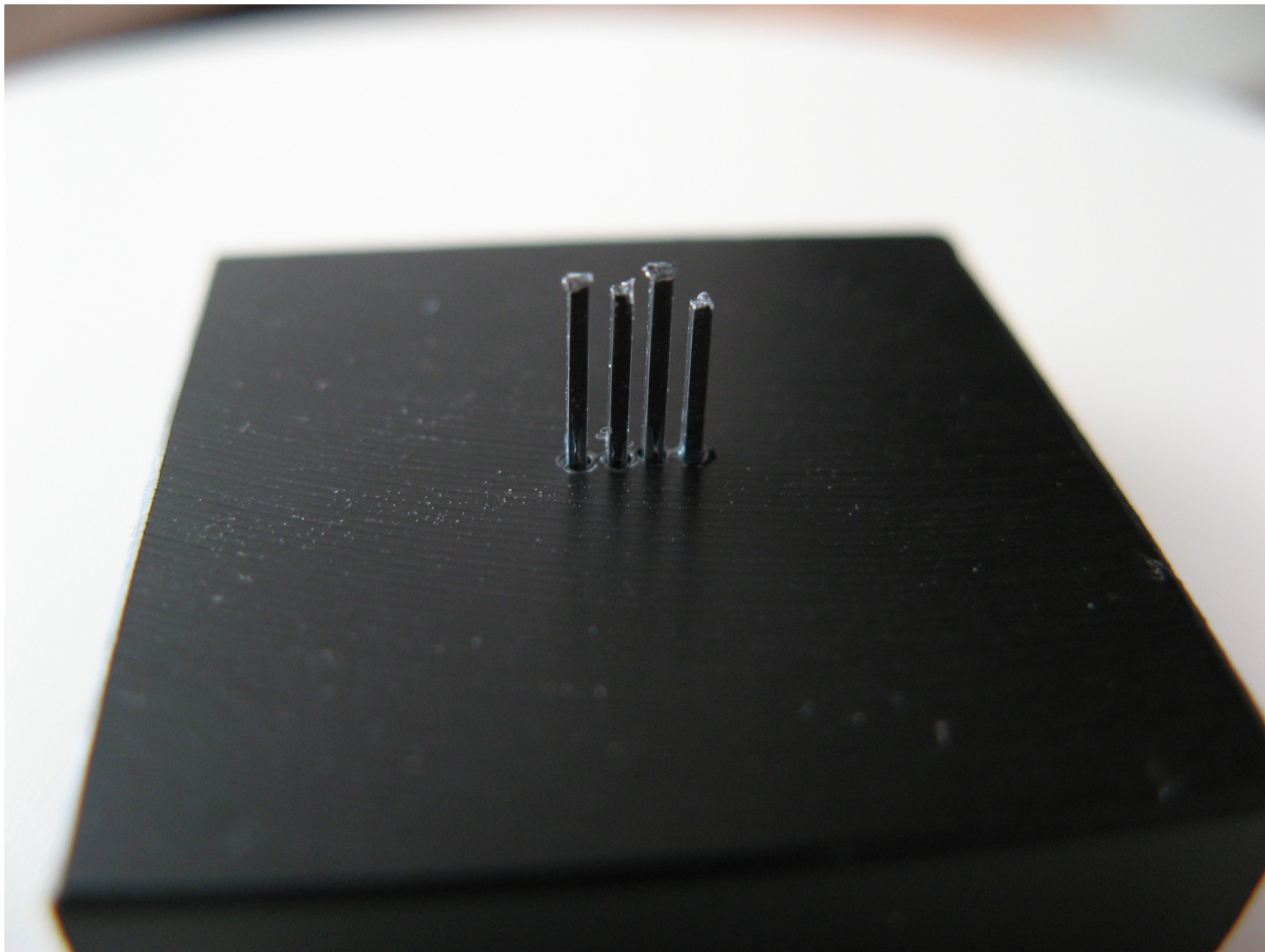
C3 DC1M
5.00 V/div
8.40 V offset

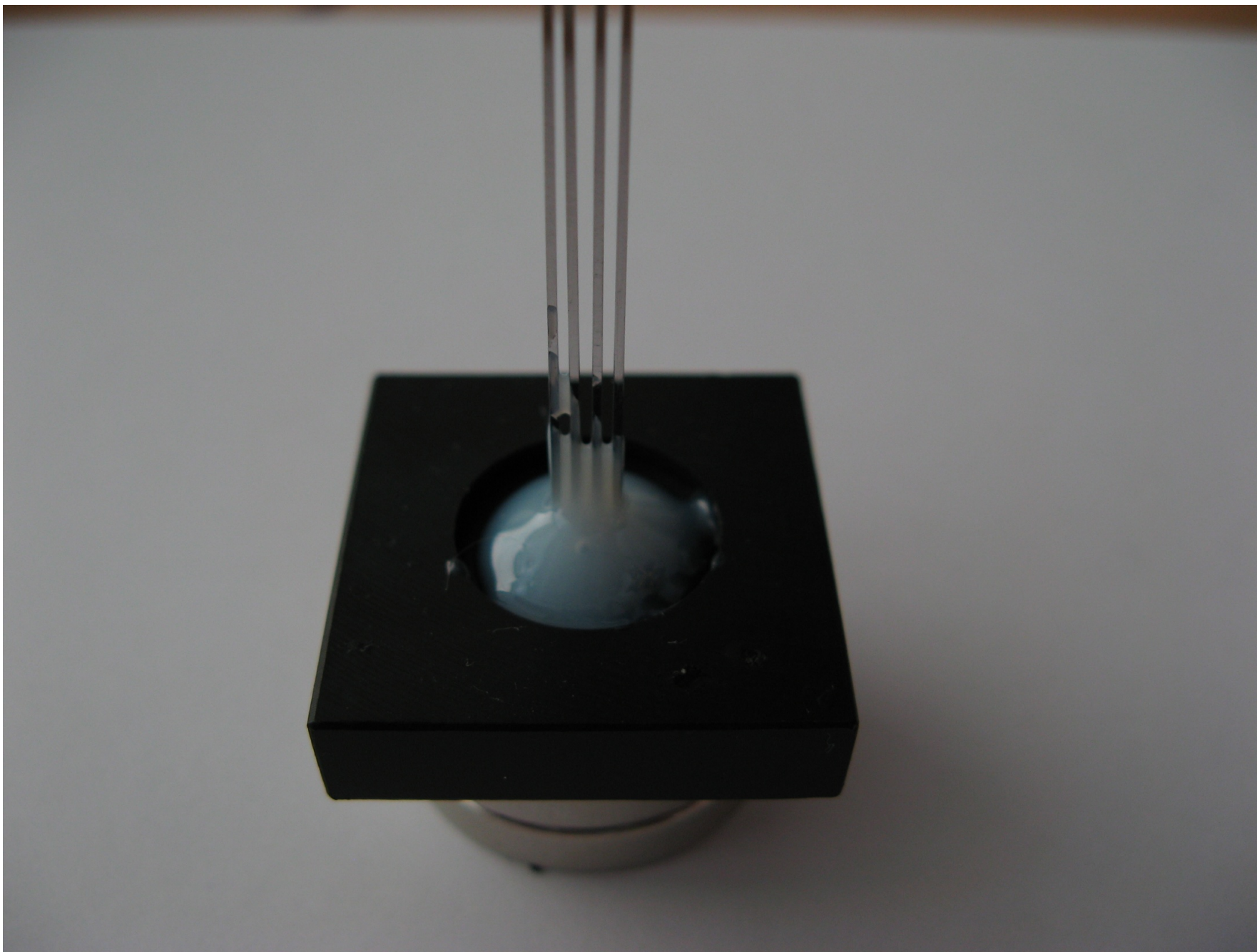
LeCroy

Timebase 0 ns
2.50 kS 100 ns/div 2.5 GS/s

Trigger **C1AC**
Auto -6.5 mV
Edge Negative

1/25/2011 3:36:17 PM





Missing discriminator

- CAEN V814B – 16 ch. low threshold discriminator, 3747 EUR
- The discriminator thresholds are individually settable in a range from -1 mV to -255 mV (1 mV step), via VME
- 16 negative (positive on request) inputs
- 16 differential ECL outputs with a fan-out of two on four front panel flat cable connectors