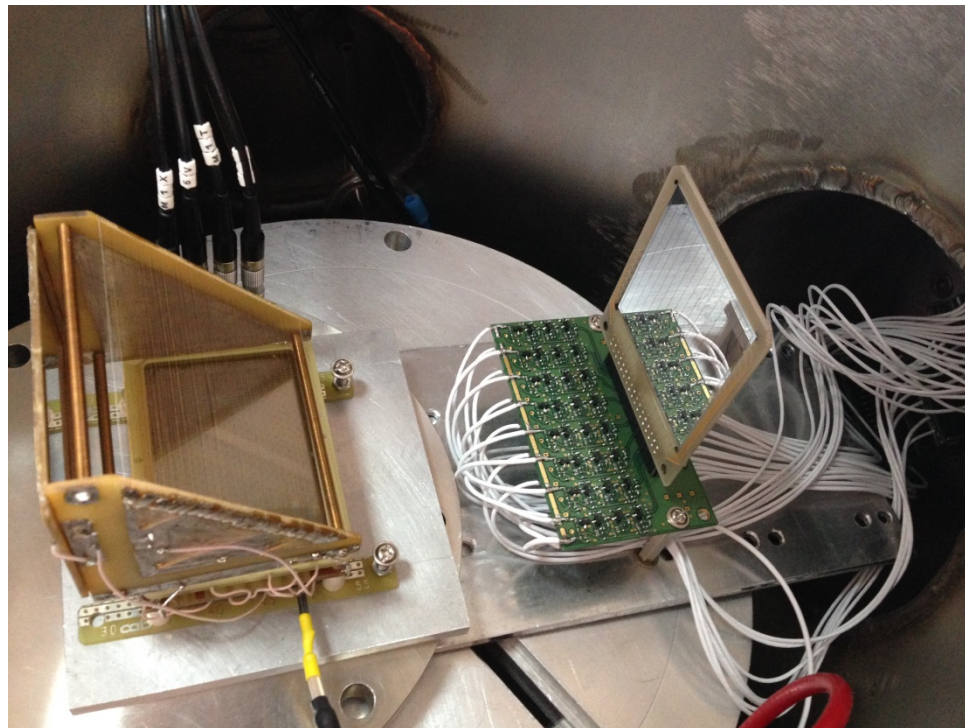


Fast timing of double sided Si strip detector

Lecture: Hans-Jürgen Wollersheim

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Akhil Jhingan, Inter University Accelerator Centre, Delhi

Fast timing of double sided Si strip detector

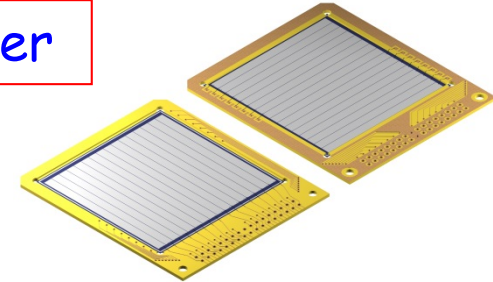
RIB-experiments after slowing down to Coulomb barrier

Ideal beam tracking detector:

- ✓ large area tracking system
- ✓ Energy resolution $\Delta E/E < 1\%$
- ✓ Position resolution ~ 1 mm
- ✓ Time resolution ≤ 100 ps

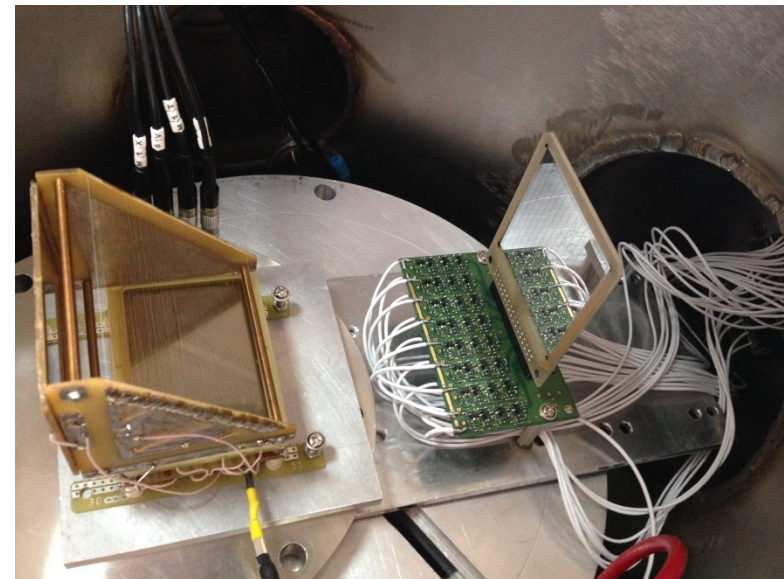
double-sided silicon-strip detectors

- active area 50×50 mm²
- thickness 40 μ m
- 16×16 strips (3.125 mm)
- manufactured by MICRON

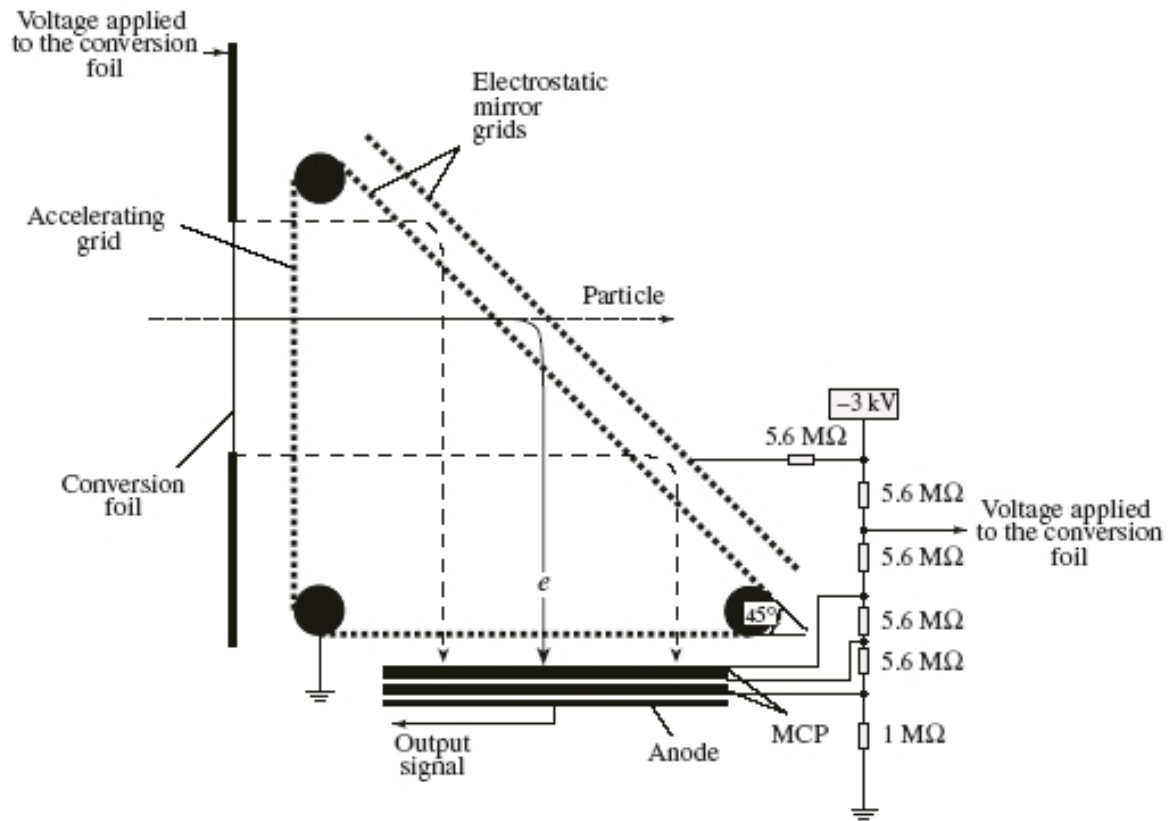
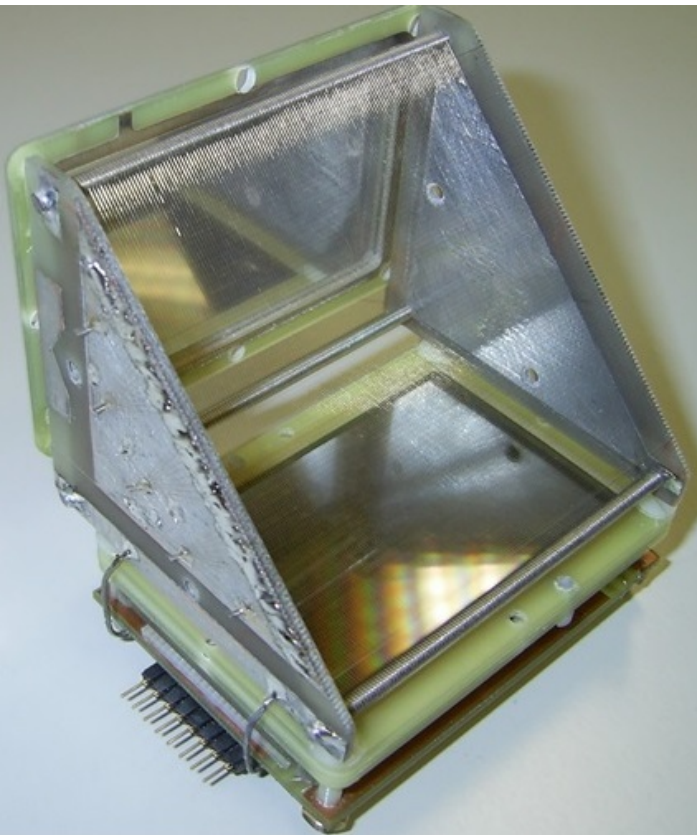


MCP

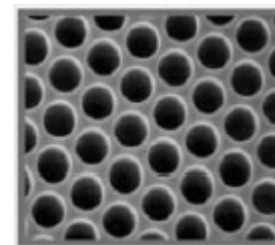
DSSSD



Micro Channel Plates - MCP

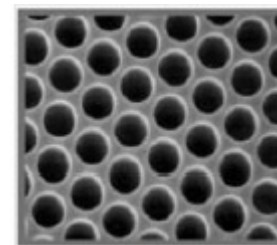
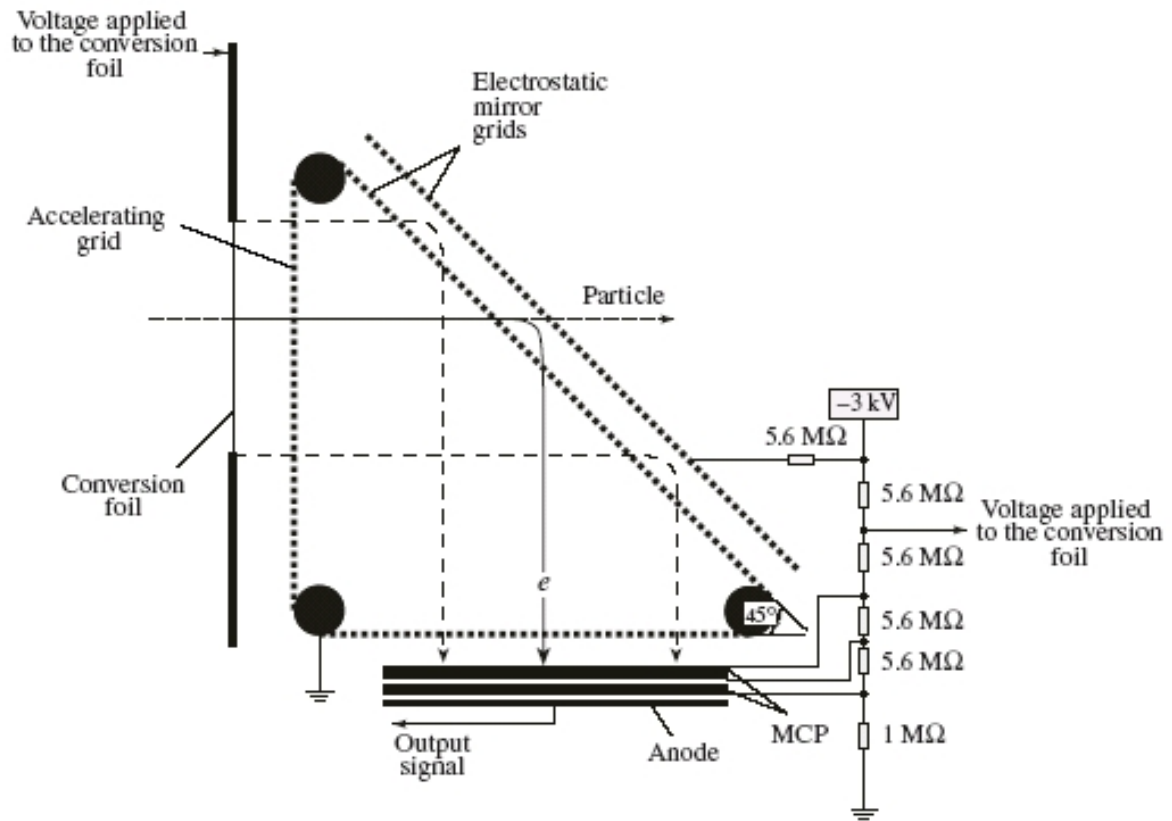
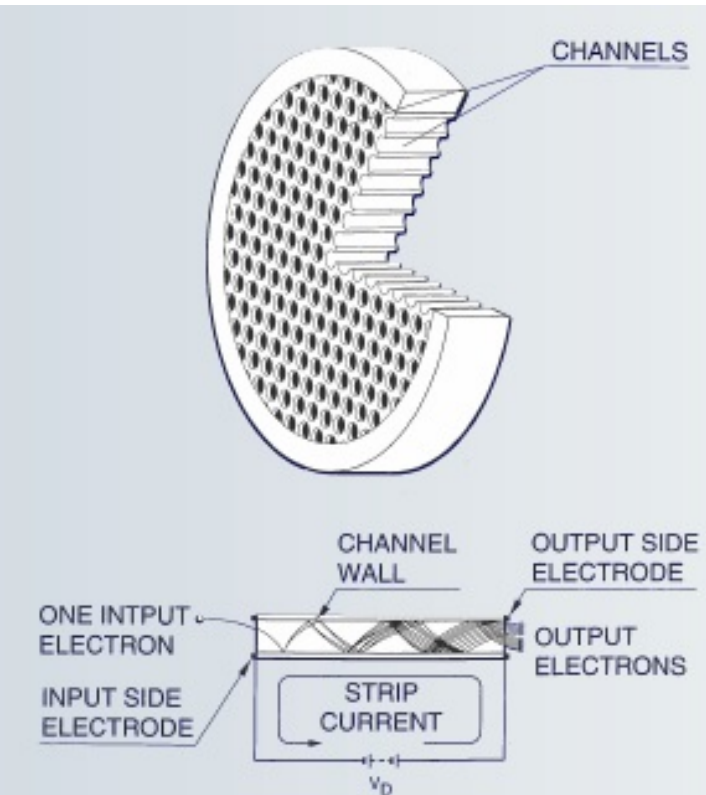


- time resolution – 150 ps
- position resolution
- for alpha particles – 3 mm
- for fission fragments – 1.7 mm



N. Kondratiev (FLNR JINRDubna), M. Pfeiffer (IKP Köln)

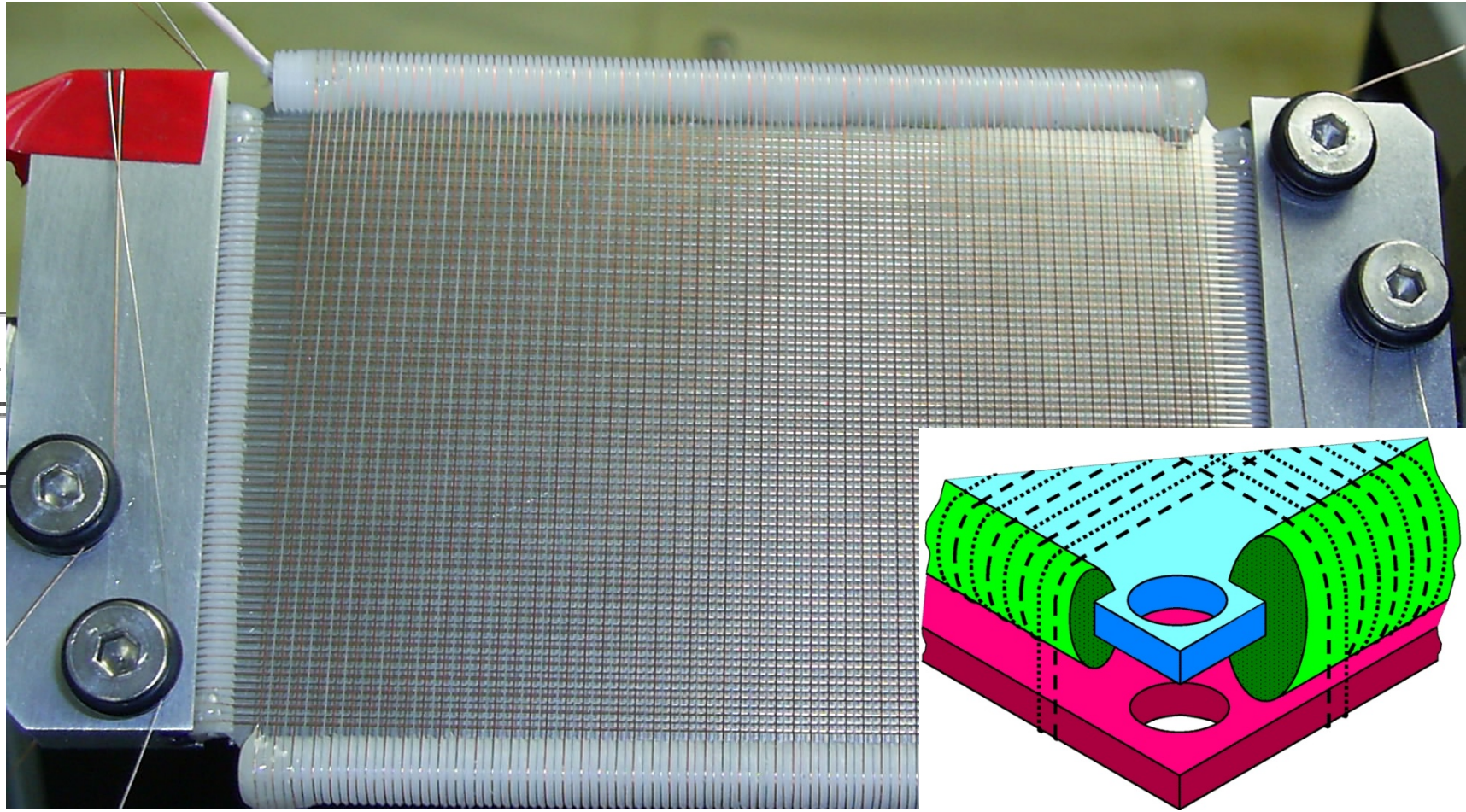
Micro Channel Plates - MCP



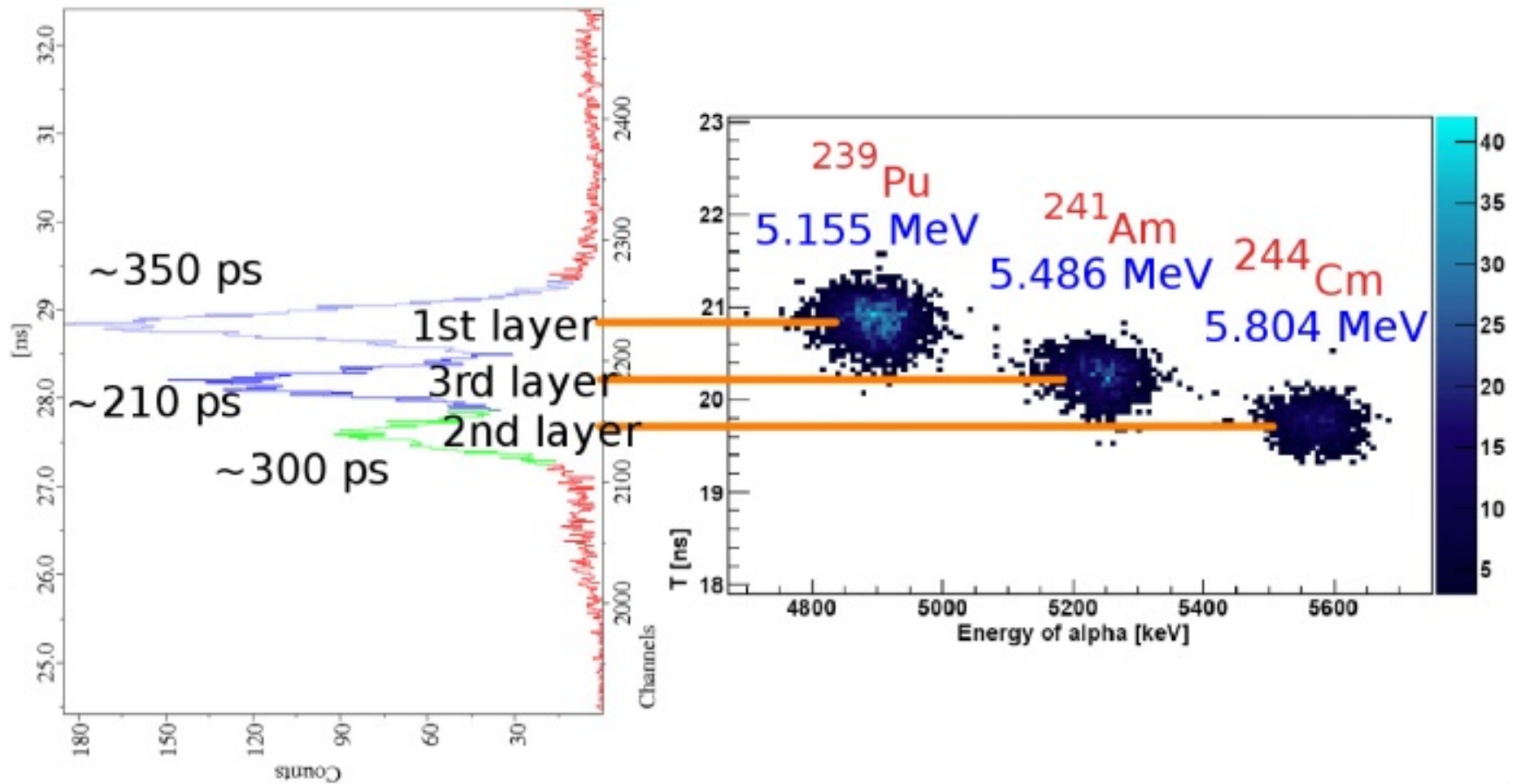
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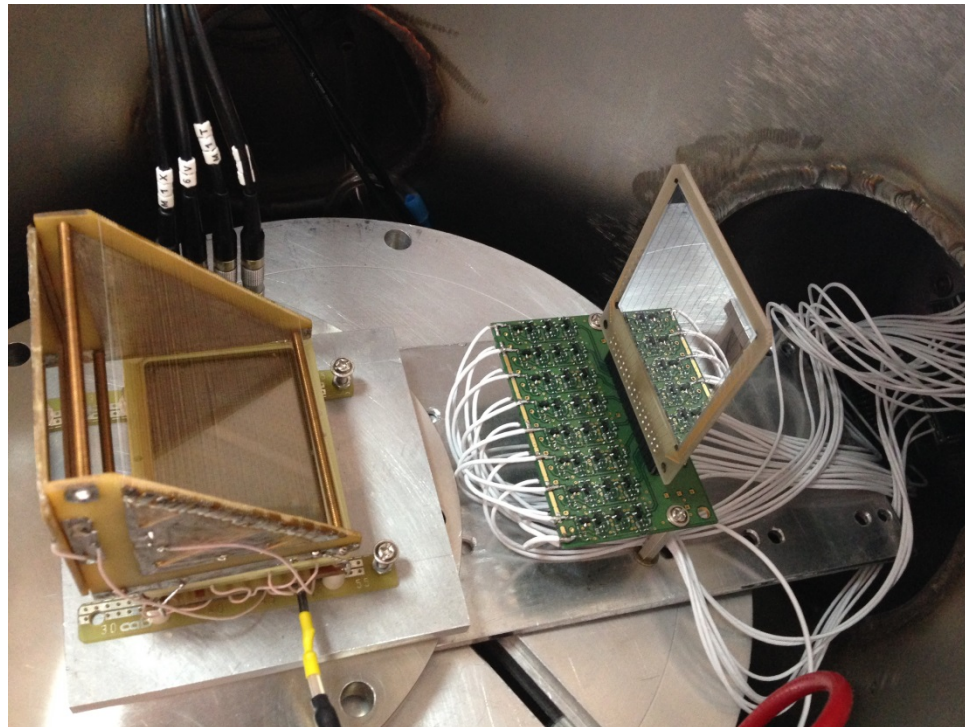
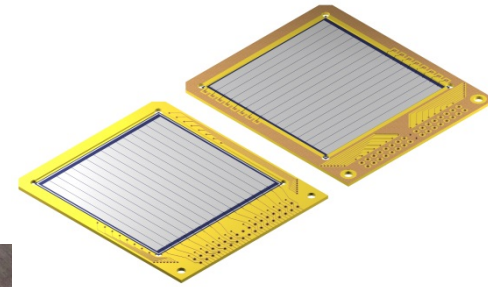
Schematic diagram of the MCP-based position-sensitive detector



Tagging of triple alpha source

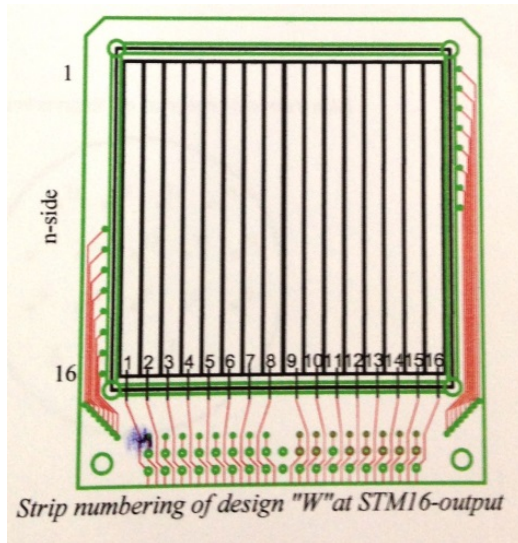
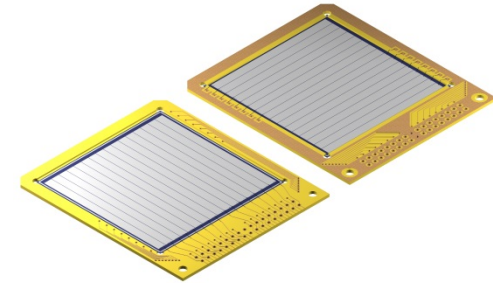


Fast timing of double sided Si strip detector

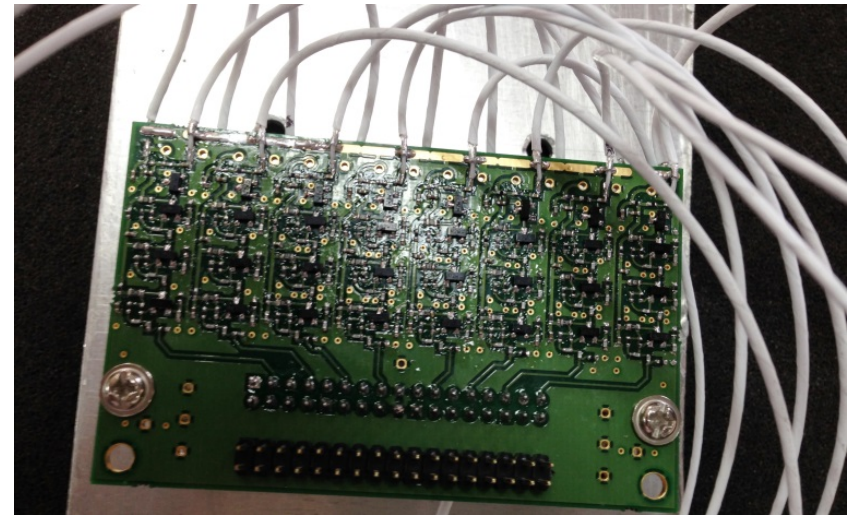


Experimental ToF setup with MCP and DSSSD

Fast timing of double sided Si strip detector



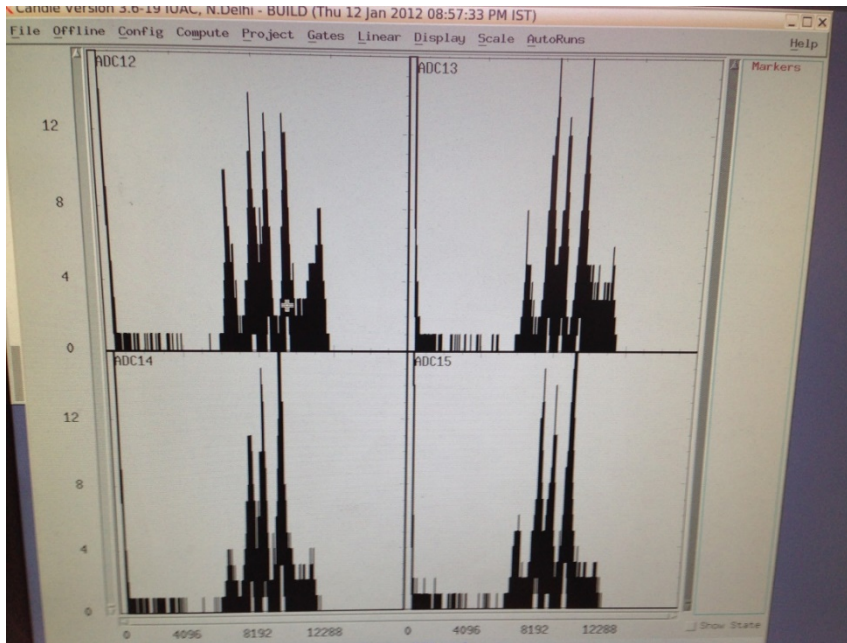
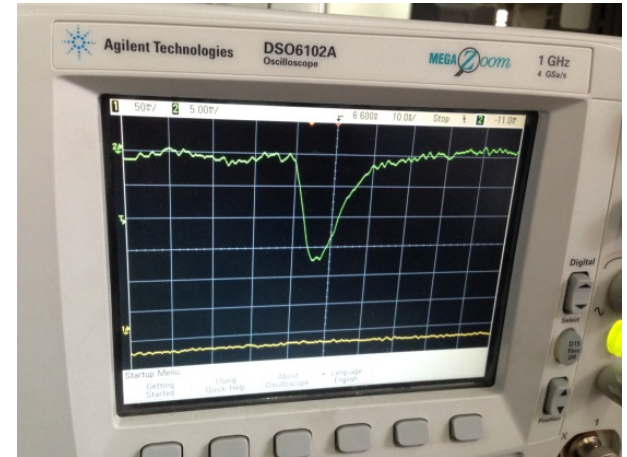
front strips



timing preamplifiers

Fast timing of double sided Si strip detector

	^{229}Th α -source	Cf fission source
rise time	5 ns	9 ns
pulse height	15 mV	300 mV
noise	5 mV	



Energy resolution ~ 300 keV for different strips

Fast timing of double sided Si strip detector

Energy measurement with Mesytec:

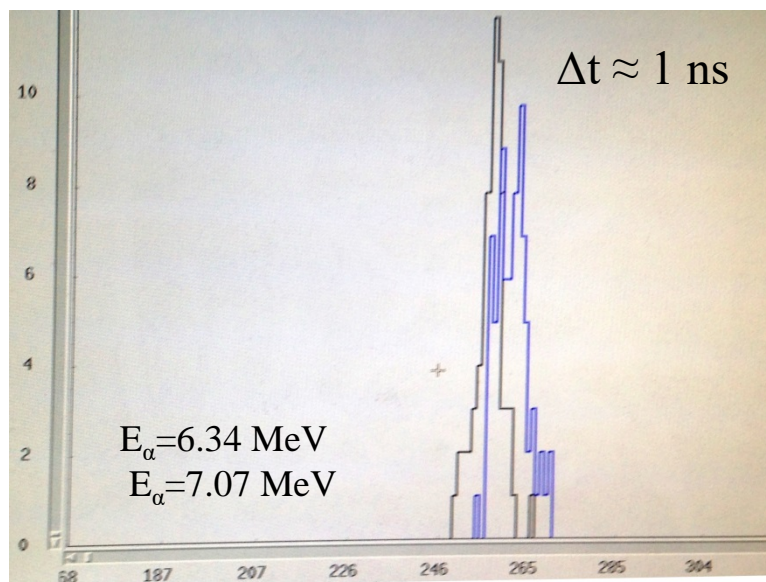
Energy resolution $\Delta E = 300$ keV

Time measurement with 16-ch. fast timing preamplifier (IUAC):

pulse height 15 mV

noise 5 mV

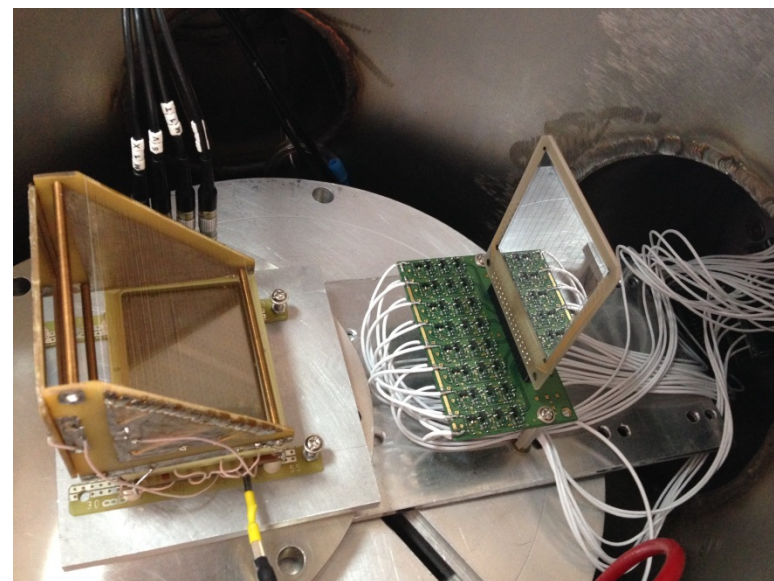
rise time 5 ns



energy gated TOF spectra:

MCP

DSSSD



Fast timing of double sided Si strip detector

Energy measurement with Mesytec:

Energy resolution $\Delta E/E = 1.5\%$

Time measurement with 16-ch. fast timing preamplifier (IUAC):

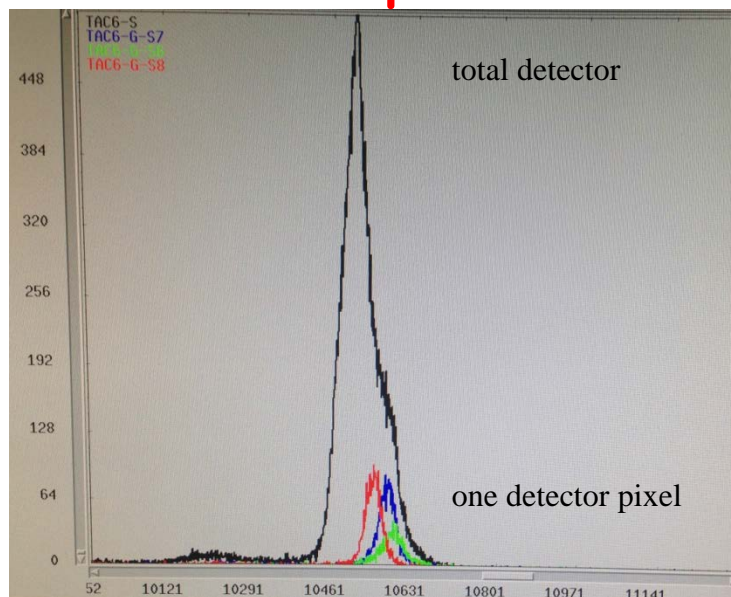
pulse height 300 mV

rise time 6.3 ns

Time resolution 200 ps for one of the 256 detector pixels

IUAC experiment :

$^{28}\text{Si} \rightarrow ^{197}\text{Au}$ (0.2mg/cm²) at 122 MeV



TOF between MCP and DSSSD

