



AGH UNIVERSITY OF SCIENCE
AND TECHNOLOGY

Development of readout electronics for straw tubes - status

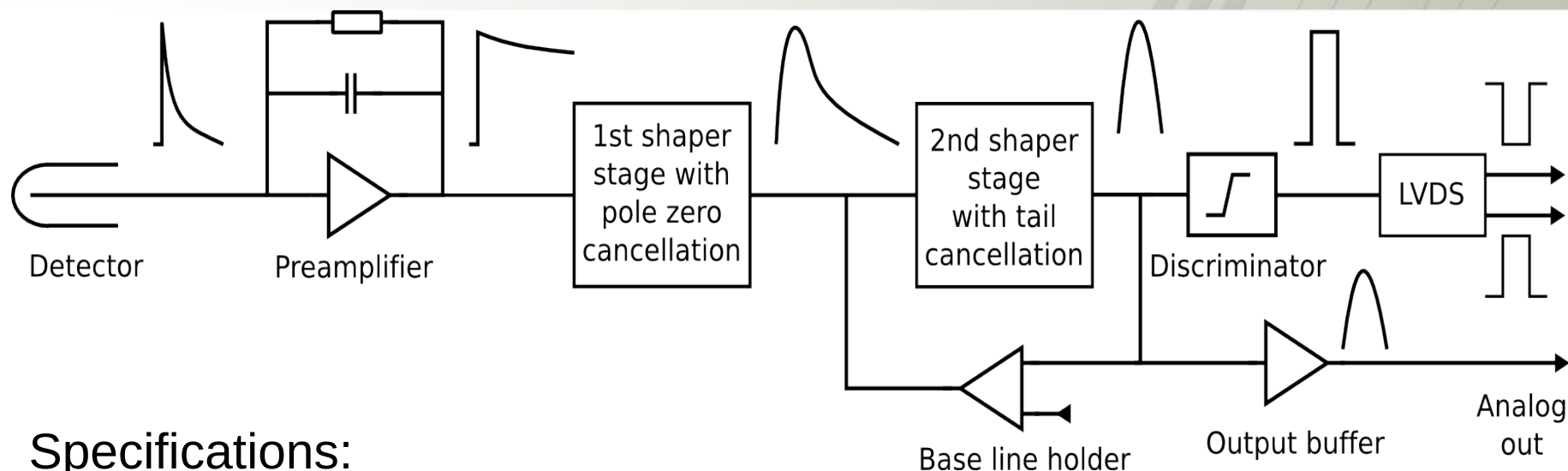
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Front end architecture

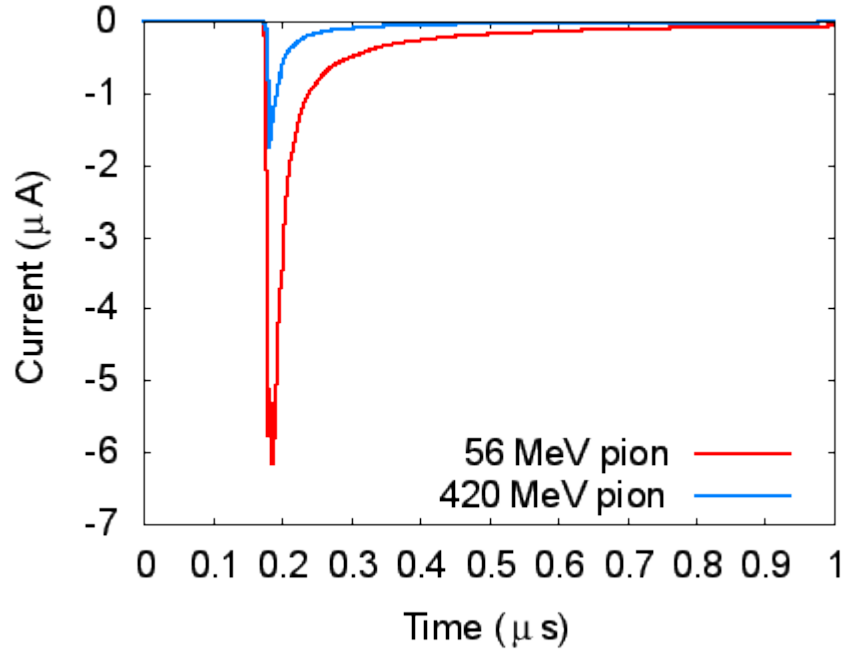


Specifications:

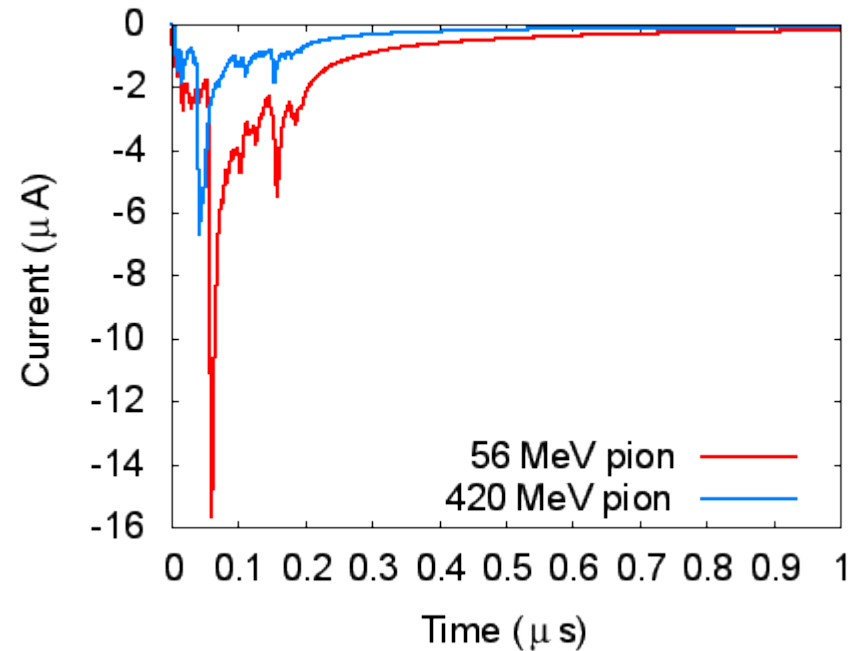
- Technology – AMS 0.35 μm (1st prototype)
- Two readout versions: single ended and differential
- 1st prototype should give: Timing information, Amplitude and Time over Threshold
- Preamplifier with variable gain
- CR – RC² with peaking time ≈ 15 ns (for delta pulse), if possible variable...
- Ion tail cancellation circuit
- Baseline stabilised by BLH circuit
- Leading edge discriminator for time measurement
- Fast LVDS output
- Equivalent Noise Charge $\approx 0.4 - 0.6$ fC for 25 pF detector capacitance

Garfield signals generated in straw tube (examples)

Generated 4.7 mm from anode

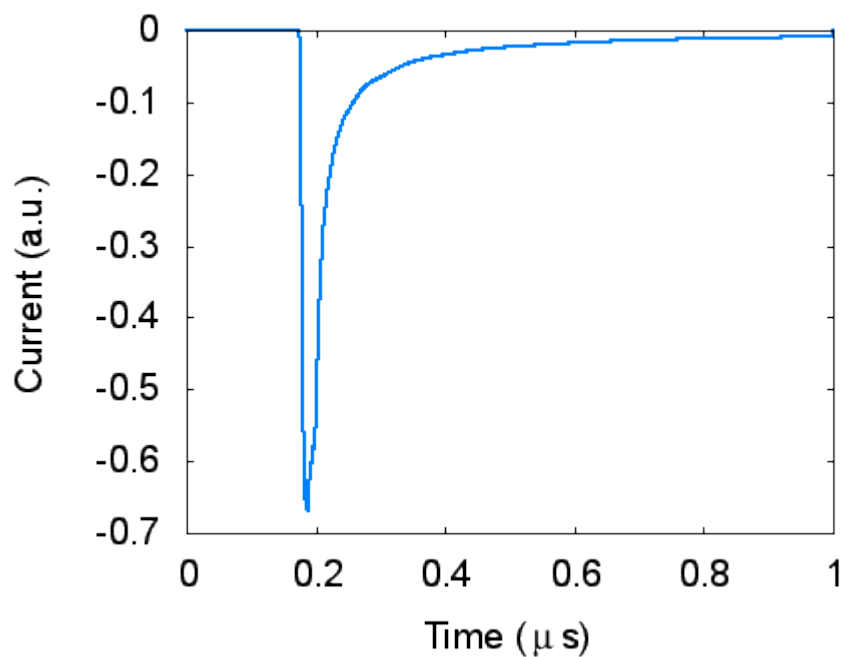


Generated ~ 0 mm from anode



Reference signals from straw tube

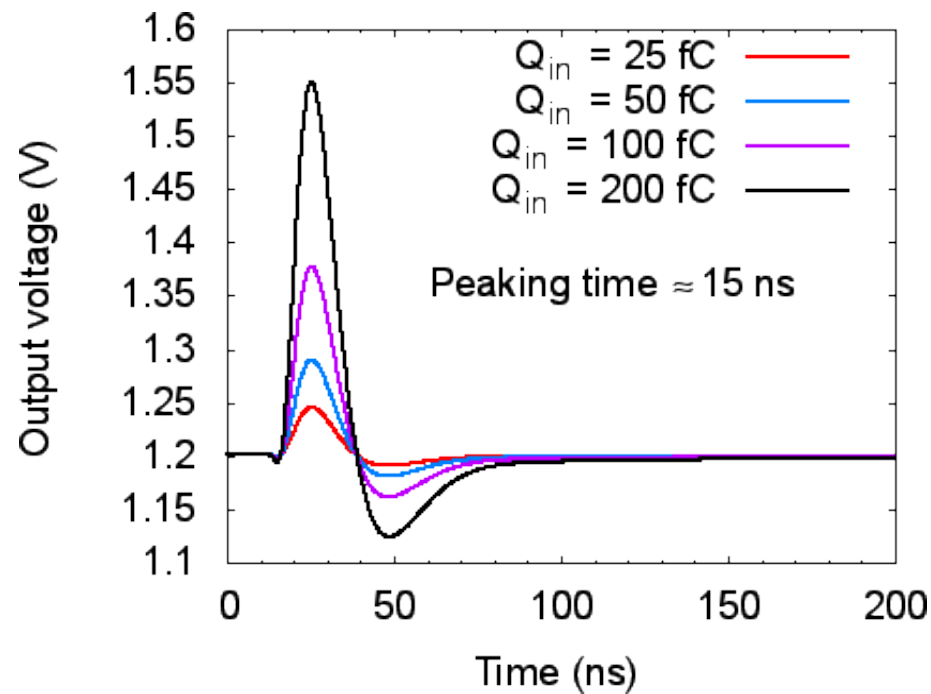
To simulate ion tail cancellation in front-end electronics a reference straw tube signal was generated as an average of 100 MIP pion signals



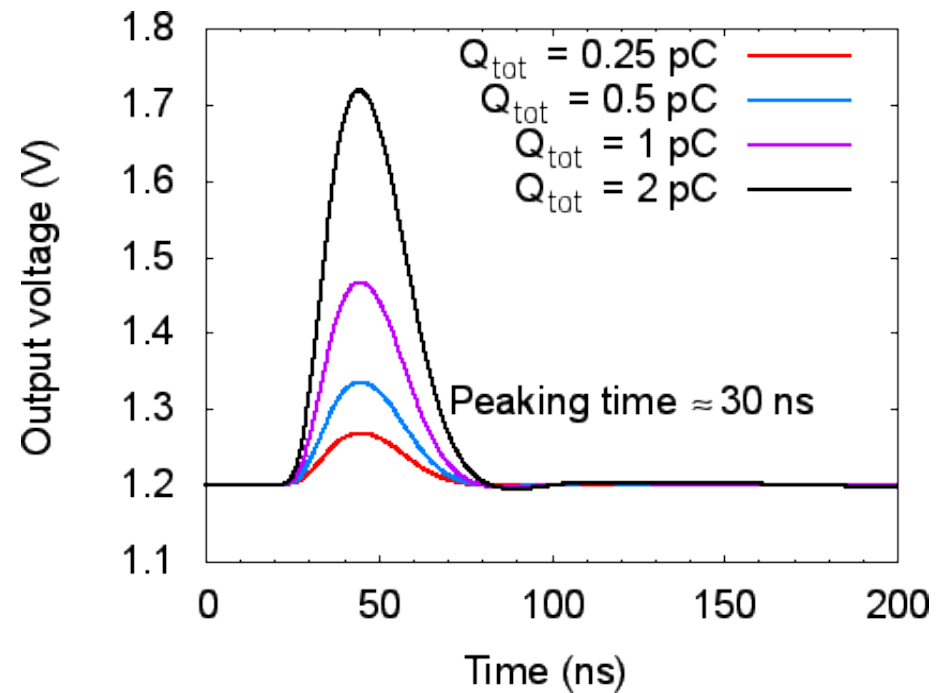
Front end response

Analog pulses available at shaper output

Response to delta input

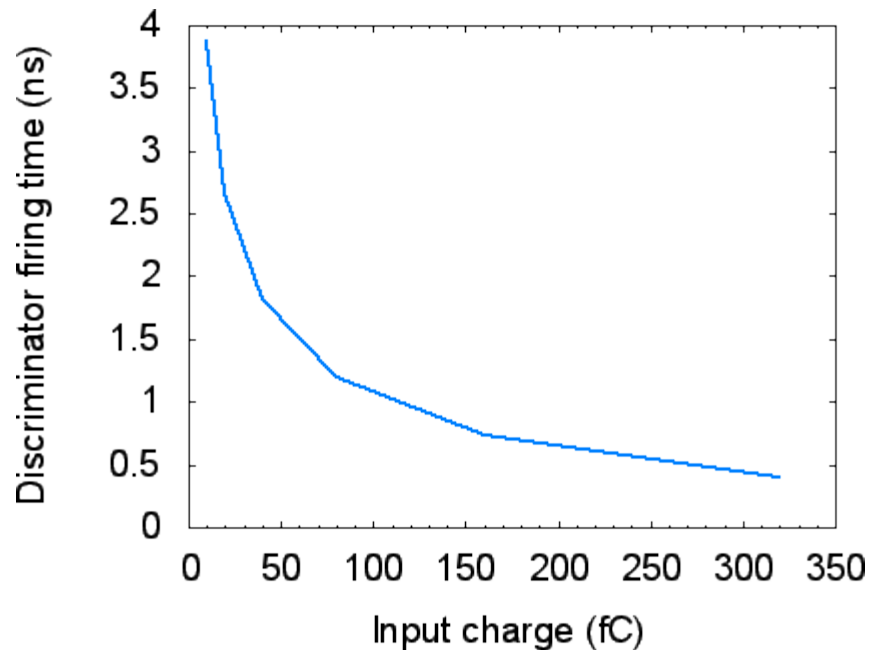


Response to reference pion

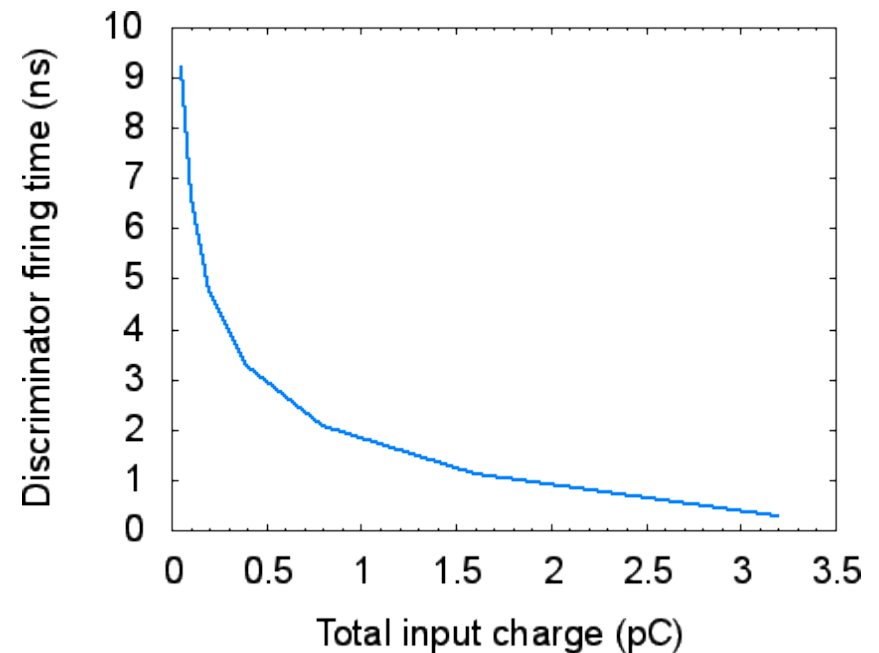


Discriminator response time vs input charge

Response to delta pulses

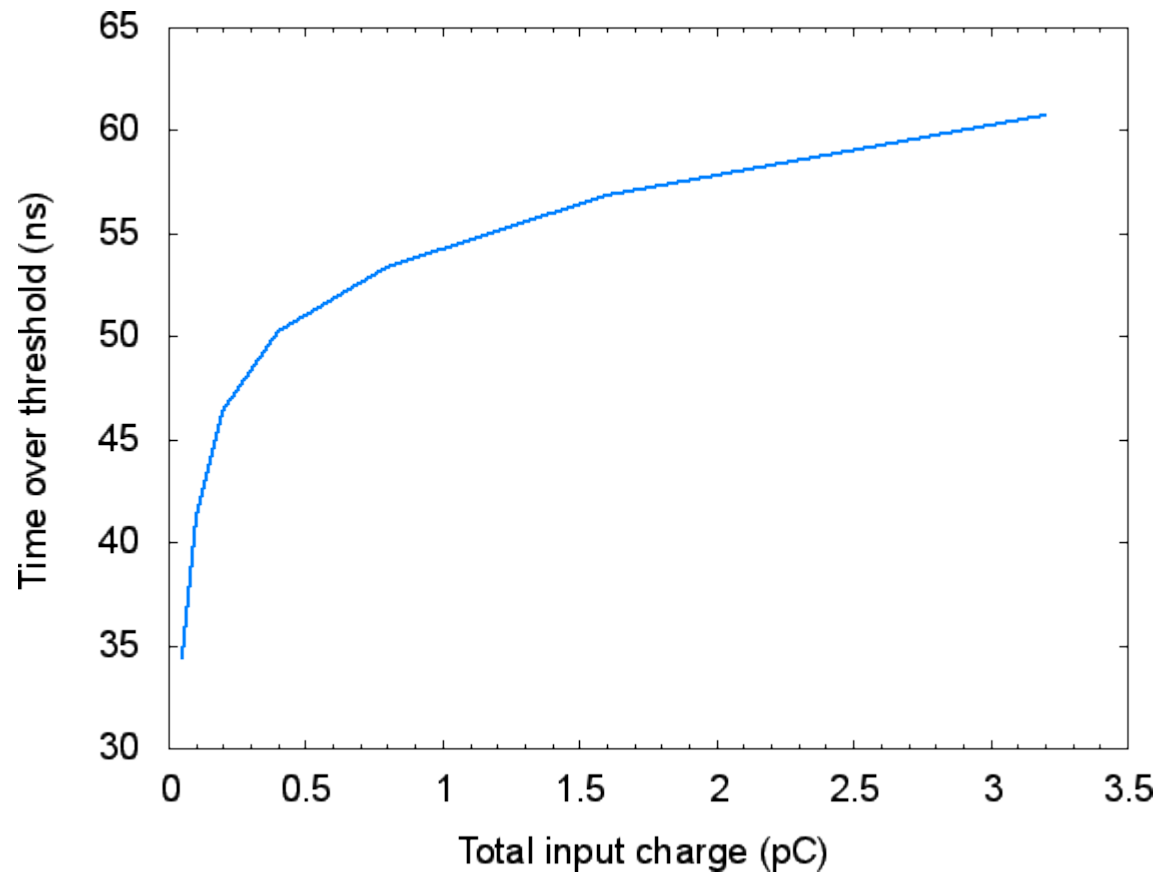


Response to reference pion pulses



Discriminator Time over Threshold

Response to reference pion pulses



Design **status**, **question marks** and **plans**

- 1st version of single ended readout: preamplifier, shaper, PZC, tail cancellation, BLH and discriminator designed and in optimisation phase, layout design will be started soon
- Design of differential version in progress...
- Peripheral blocks: LVDS, bandgap reference, DACs – prototypes already done, will be integrated in the design
- Main design parameters like input charge range, peaking time and time resolution have not been completely fixed yet. There is still time for modifications if needed ???
- Number of channels have not been decided yet ???
- What are the constraints for power consumption ???
- Submission originally planned before the end of 2010 will move by ~ 2 months (due to complicated design)