DC Proto I instrumentation

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Cluster Counting Studies

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Front-End Electronics R&D (2009)

- Chamber prototype instrumentation (KLOE DC FEE)

- Cluster counting feasibility study
  - local derivative method
  - oscilloscope acquisition

- RO architecture
  - BaBar "like"
  - Cluster counting option

Proto I Instrumentation

Proto I DC Instrumentation

24 channels Preamplification/Amplification/Discrimination

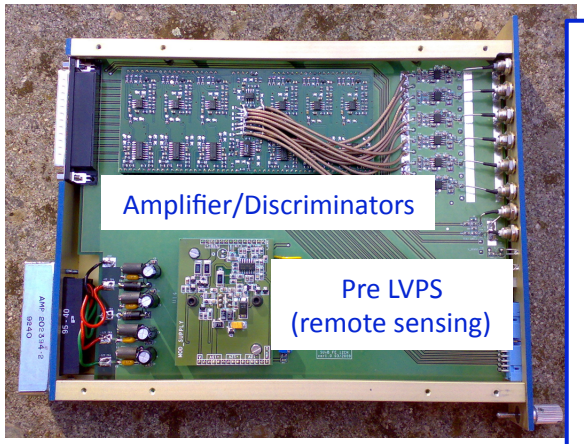
Analog Outputs

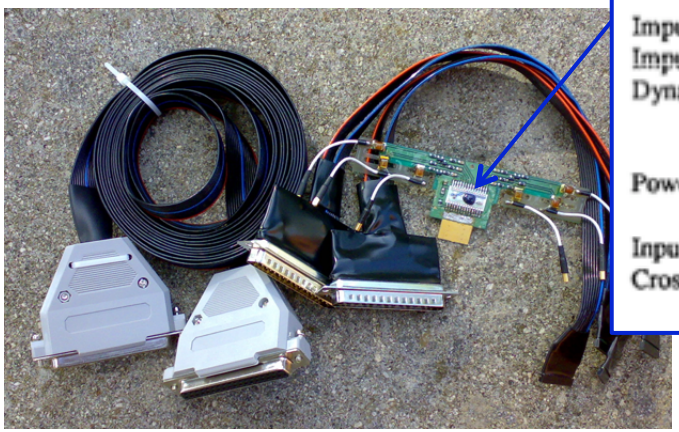
Test Inputs

V_{TH} set

Digital outputs

Pre I/O





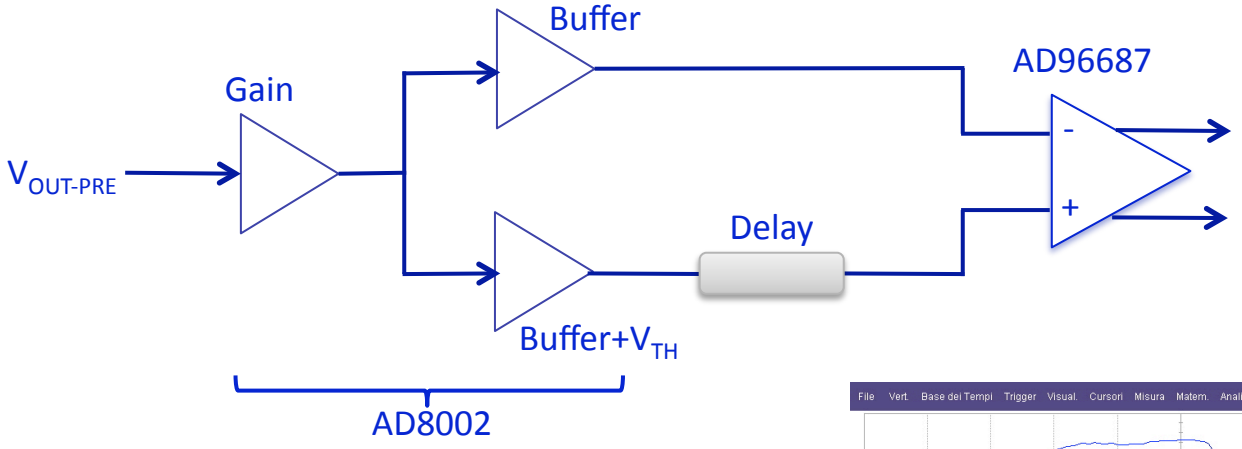
VTX main features

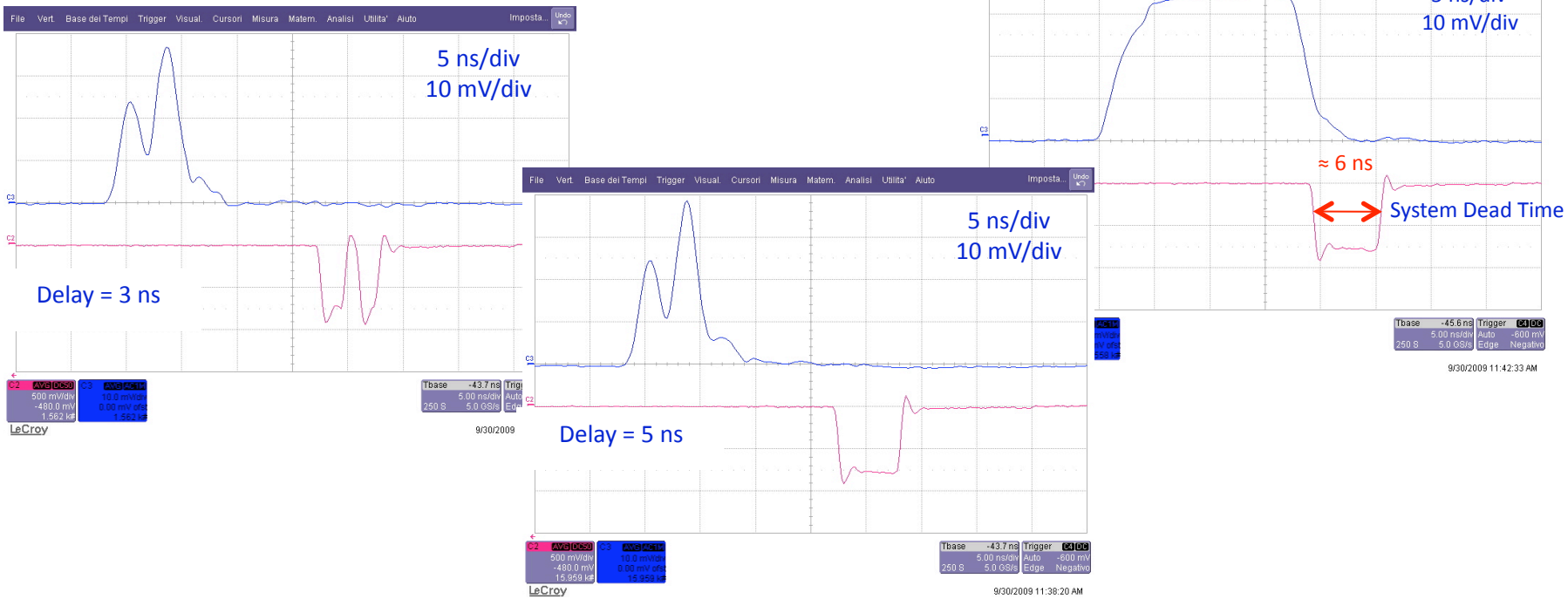
Preamplifier type: Single ended common emitter, three stage inverting
Channels/chip: 6 (independently powered sections of 4 and 2 channels)
Power supply: 4V
Inputs: One signal and one ground per channel
Quiescent input voltage: 0.7V
Input impedance: 130 ohms
Outputs: One per channel, single ended. External pulldown to negative voltage required.

Quiescent output voltage: 1.0V
Output impedance: 43 ohms
Impulse gain: 1.0 mv/fc (with a capacitively coupled 43 ohm load)
Impulse risetime (10-90%): 5 ns
Impulse falltime (90-10%): 16 ns
Dynamic range: -400 fc to +20 fc inputs, linear to within 3% at the maximum output (1 ma output pulldown current)
Power dissipation: 10 mw/channel (1 ma output pulldown current)
Input noise: 860 electrons + 47 e/pf (100 MHz bandwidth)
Crosstalk: <0.5% between any two channels

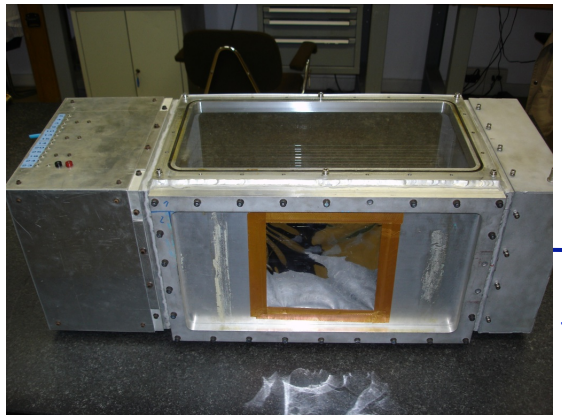
Cluster Counting
(Local Derivative Method)

Cluster Counting – Test Bench





Cluster Counting – Measurement Setup (to be implemented)

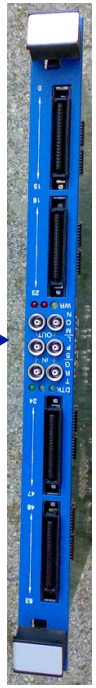


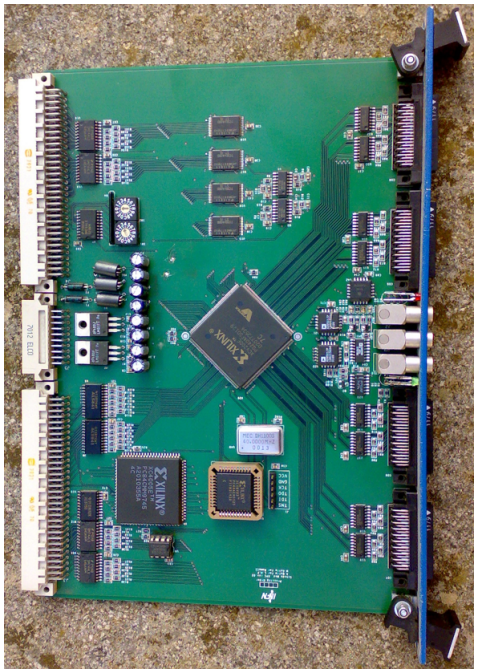
- Gain = 10mV/μA
- tr = 4 ns
- ENC < 1000 erms

Transimpedence Preamplifier

Local Derivative circuit

Oscilloscope

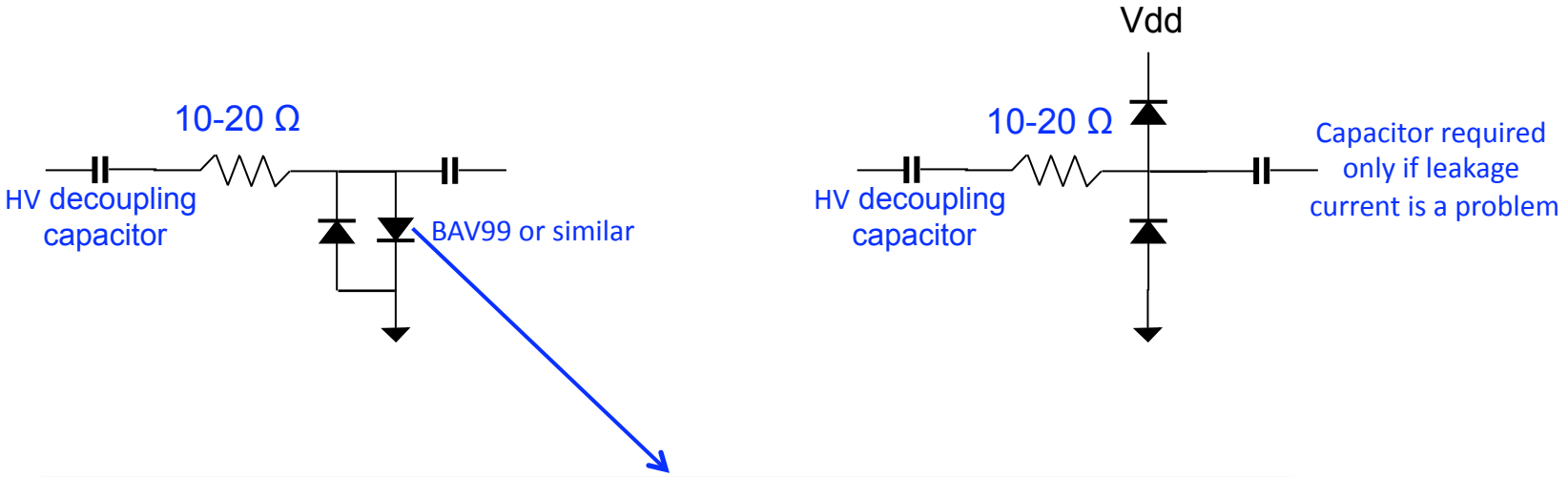




VME Scaler

- Double Pulse Resolution : 10 ns
- Input Signal Delay : adjustable (up to 1 μs)
- Minimum Input Signal Width : 5 ns

Preamplifier Input Protection & Reference Network



Electrical Characteristics @T_A=25°C unless otherwise specified

Characteristic	Symbol	Min	Max	Unit	Test Condition
Forward Voltage	V_F	— —	0.855 1.0	V	@ I_F = 10mA @ I_F = 50mA
Reverse Leakage Current	I_R	—	2.5	µA	@ V_R = 75V
Junction Capacitance	C_j	—	2.0	pF	V_R = 0V, f = 1.0MHz
Reverse Recovery Time	t_{rr}	—	6.0	nS	I_F = I_R = 10mA, I_{RR} = 0.1 x I_R, R_L = 100Ω

Conclusion & Requirements

- Chamber prototype instrumentation (KLOE DC FEE) → Setup completed within October
- Cluster counting feasibility study → Setup completed within November
  - local derivative method
  - oscilloscope acquisition
- RO architecture
  - BaBar "like" (Cluster counting option ?)

To start the work on the RO architecture some information about the foreseen working conditions are required :

- Background rate
- Trigger rate (Lev 1 & 2)
- Power Dissipation
- Material Budget (DC end plates)