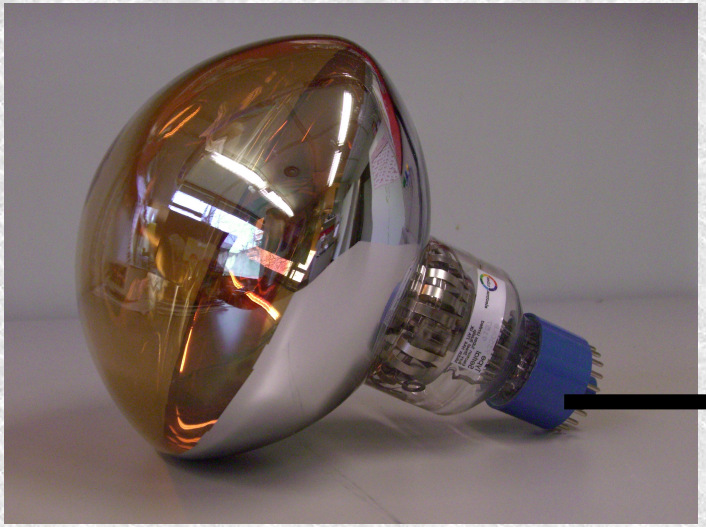
Status of the

Muon Veto DAQ

Florian Ritter – Eberhard Karls Universität Tübingen

PMT Water-Cherenkov



HV - Supply

Slow control

Splitter

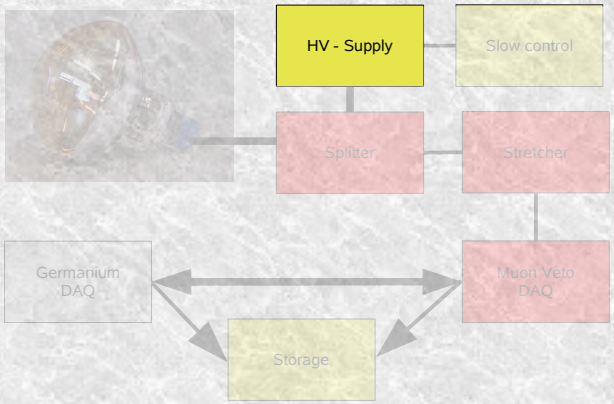
Stretcher

Germanium DAQ

Muon Veto DAQ

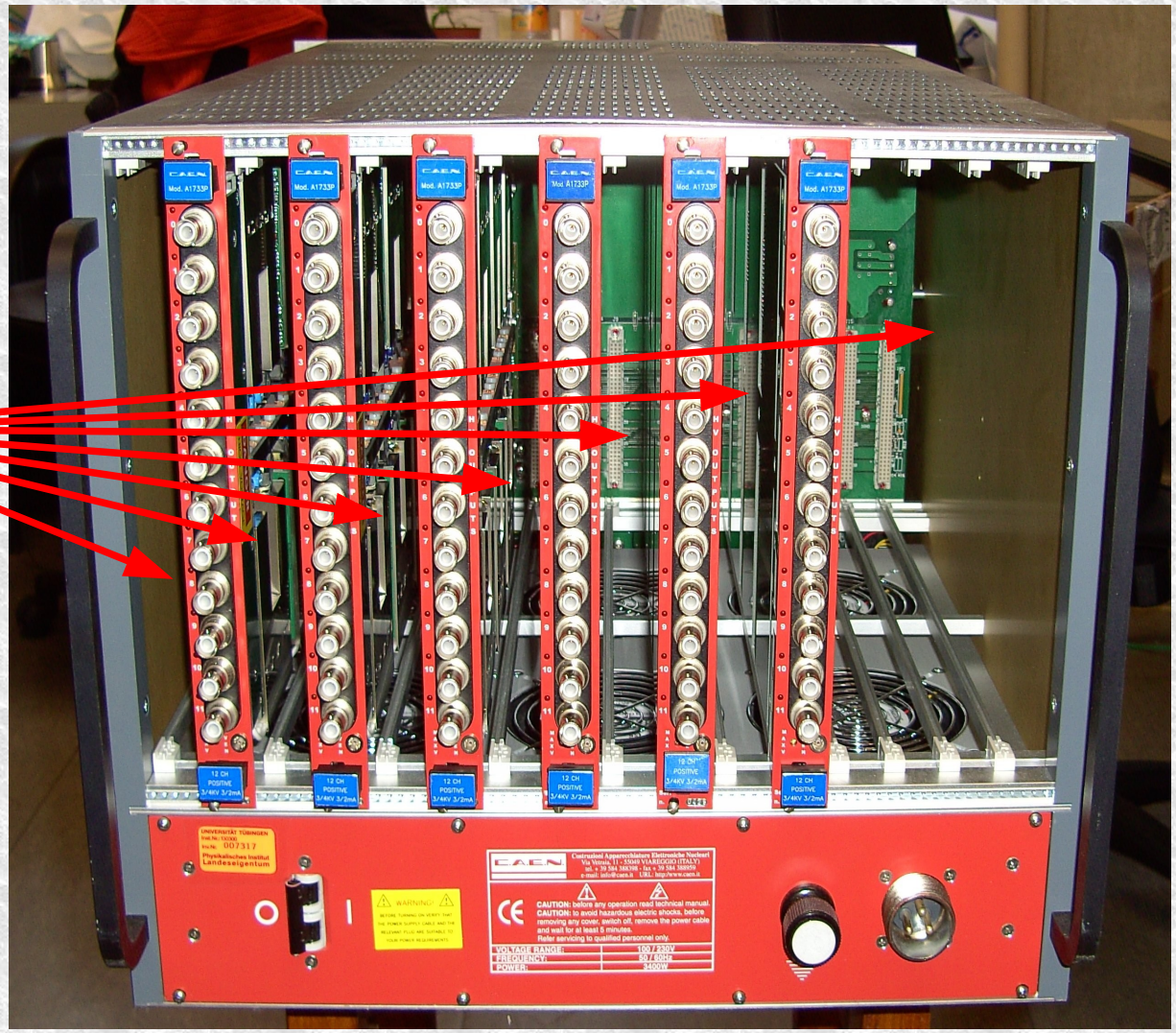
Storage

High Voltage

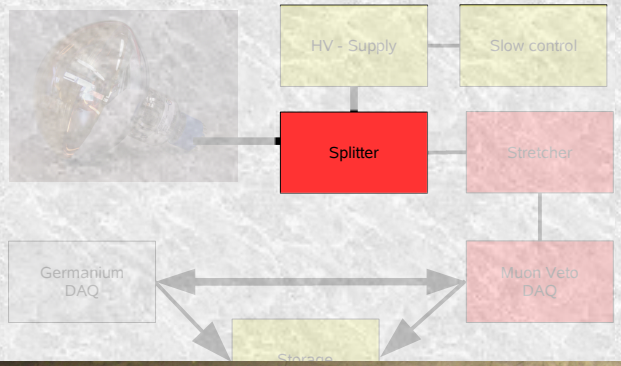


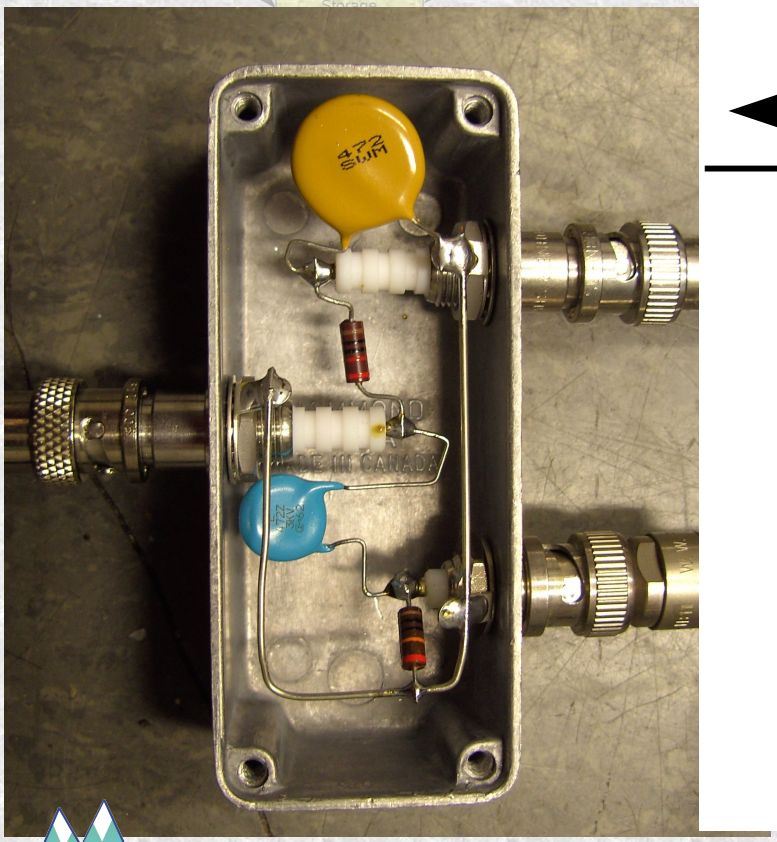
Space for additional Cards

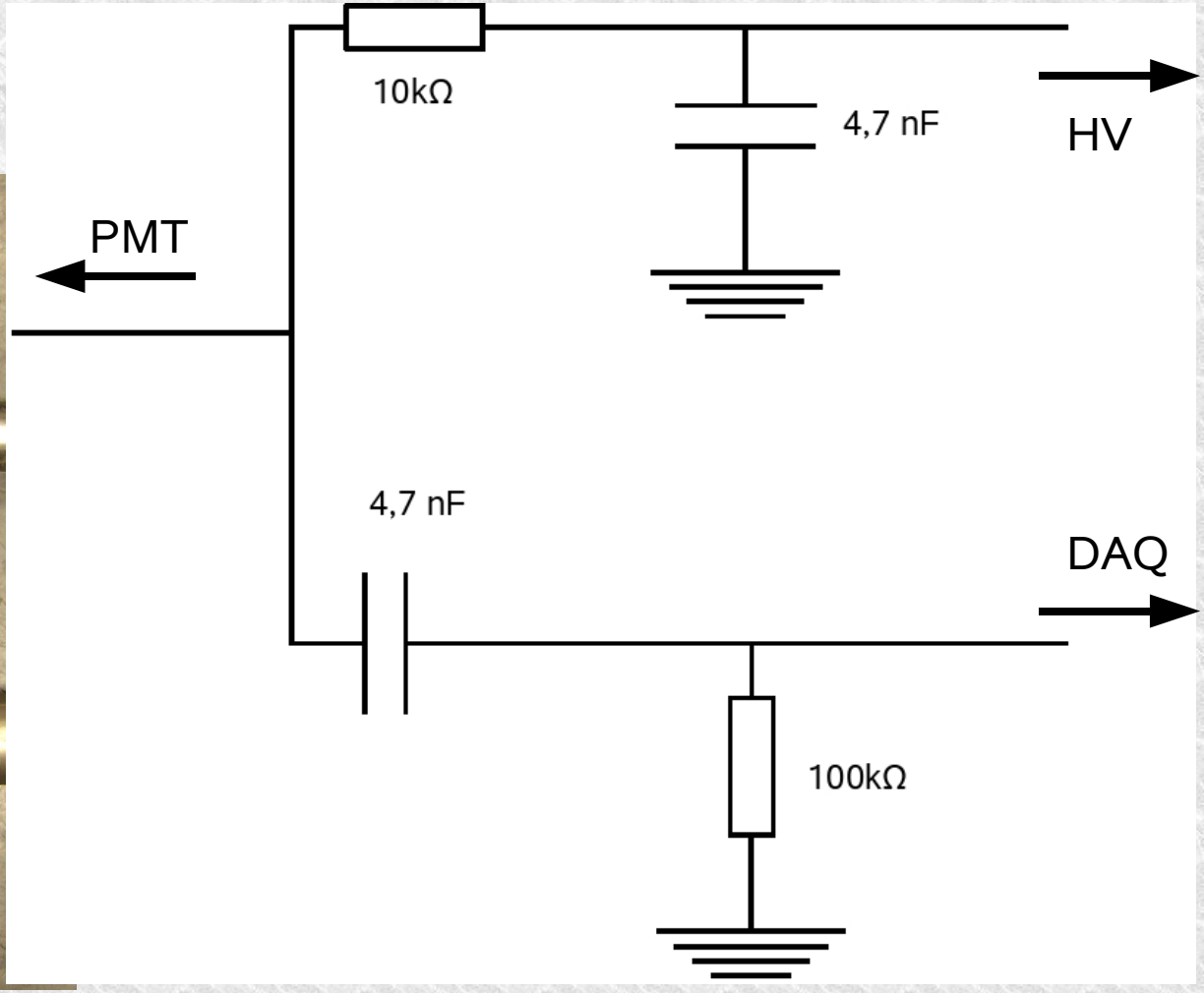
CAEN SY 1527LC
with
6 **CAEN A1733P**
(12 ch. each
up to 3kV, 3mA
resp. 4kV, 2mA)



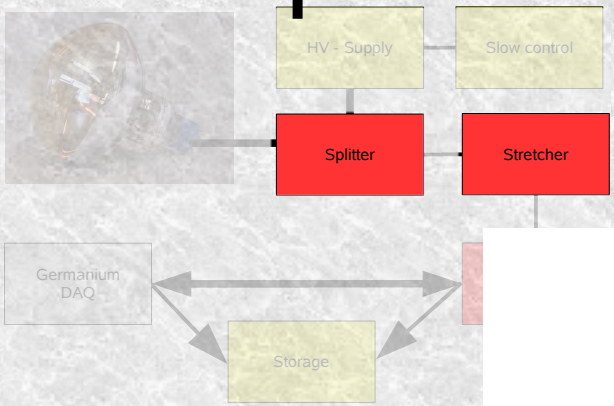
Splitter

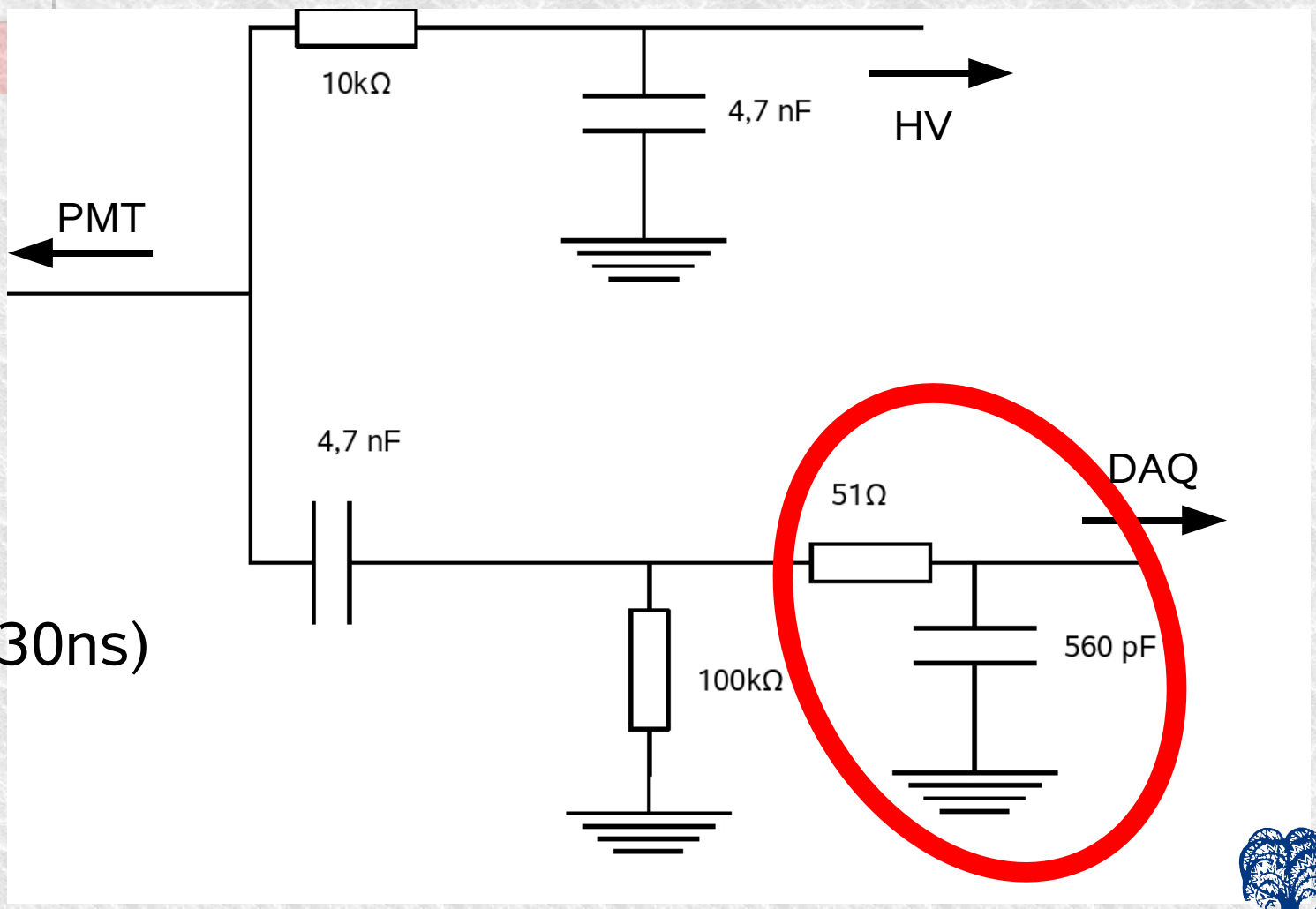

HV - Supply
Slow control
Splitter
Stretcher
Germanium DAQ
Muon Veto DAQ




10kΩ
4,7 nF
HV
PMT
4,7 nF
DAQ
100kΩ

Splitter with passive stretcher



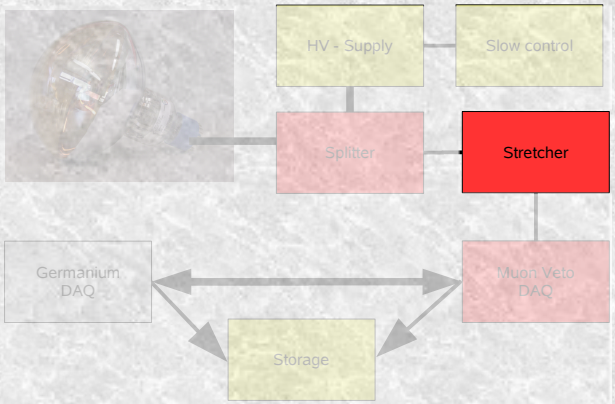


additional:

RC filter

--> stretch signal
(here: $\tau = R*C \approx 30ns$)

Stretcher - why?



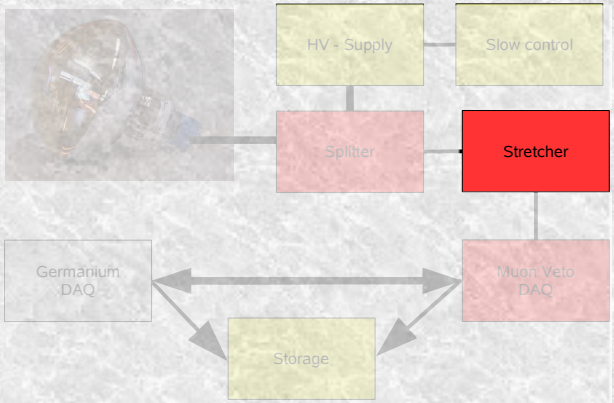
Idea: Use mainly same electronics as for Ge-DAQ (Phase II)

Problem: Width of typical single photon signals: ~ 20ns

--> 100MHz sampling rate of FADCs too slow for sampling of PMT signals

--> stretch the signals (to ~ 100ns width) for better signal processing

Stretcher – Test setup



LED

PMT

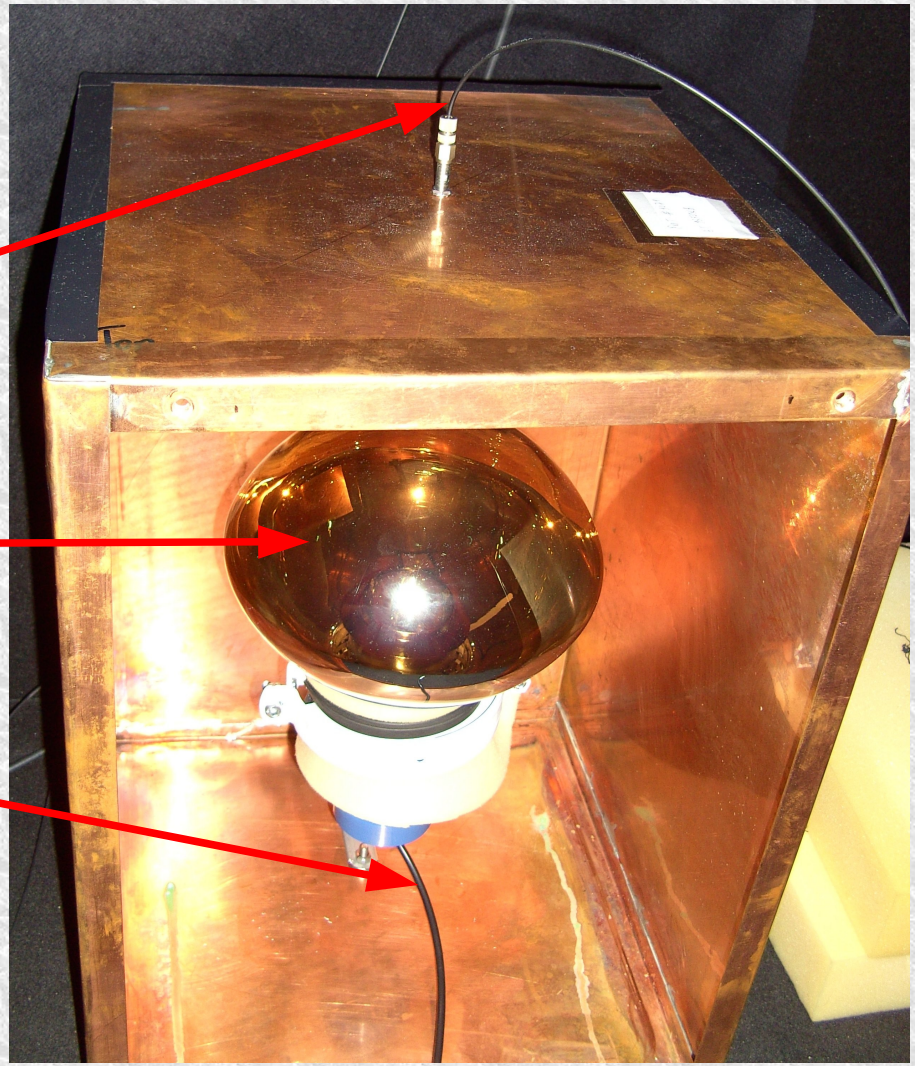
Splitter

no / passive / active Stretcher

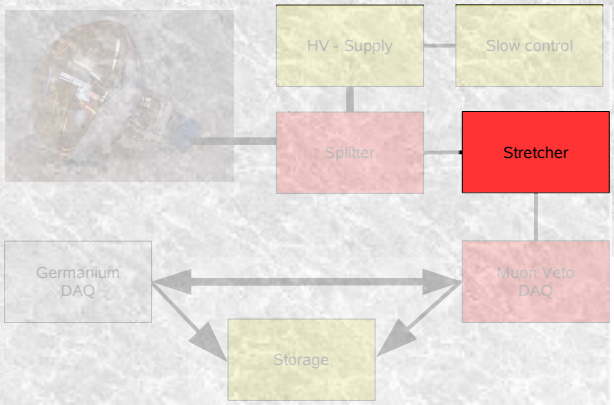
optical fibre

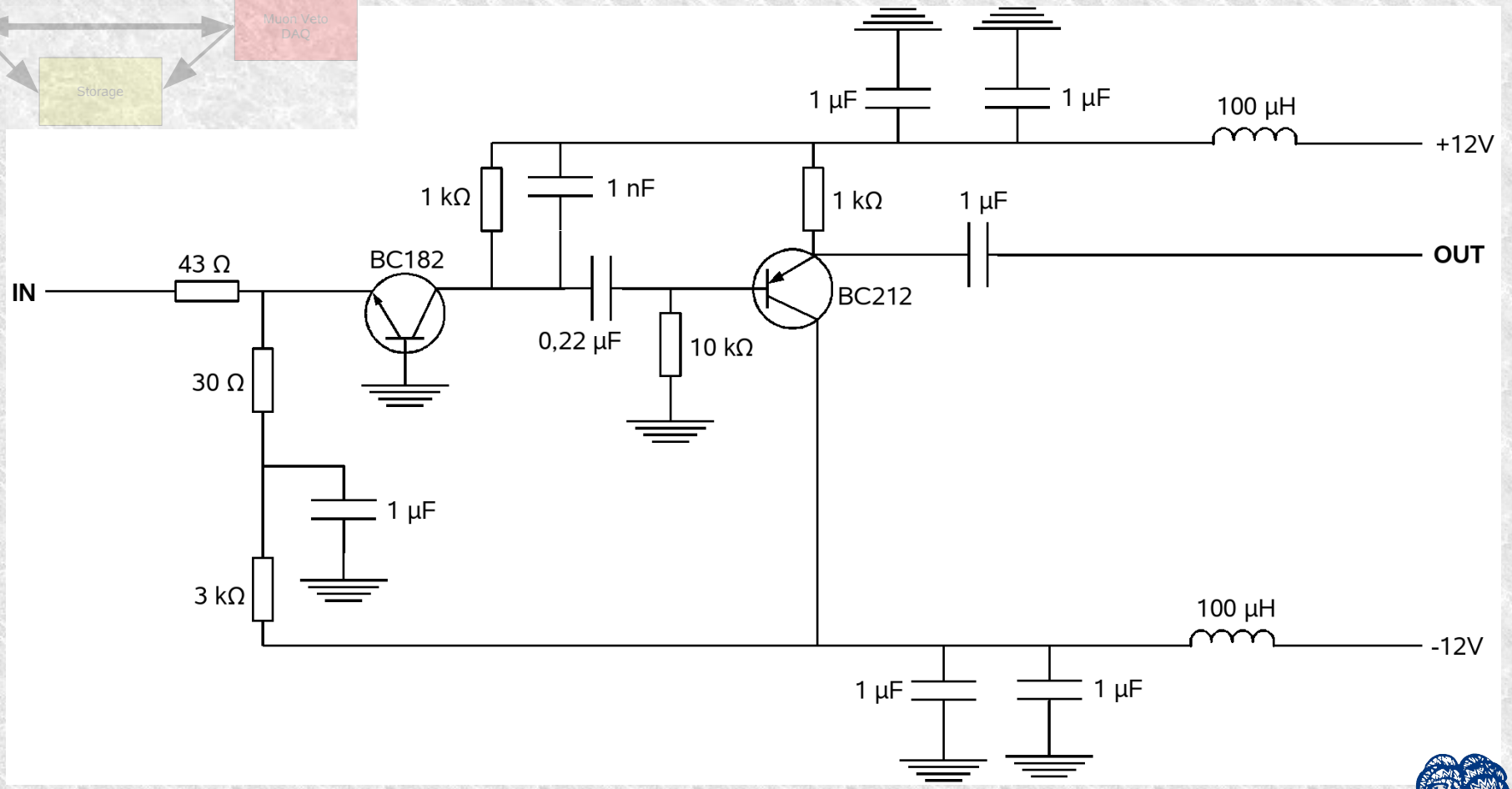
PMT

signal + HV cable

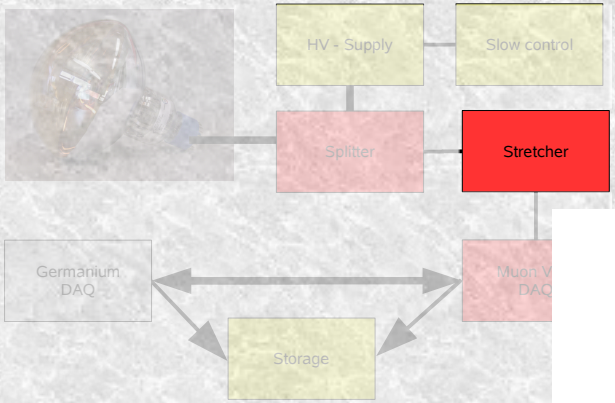


active stretcher



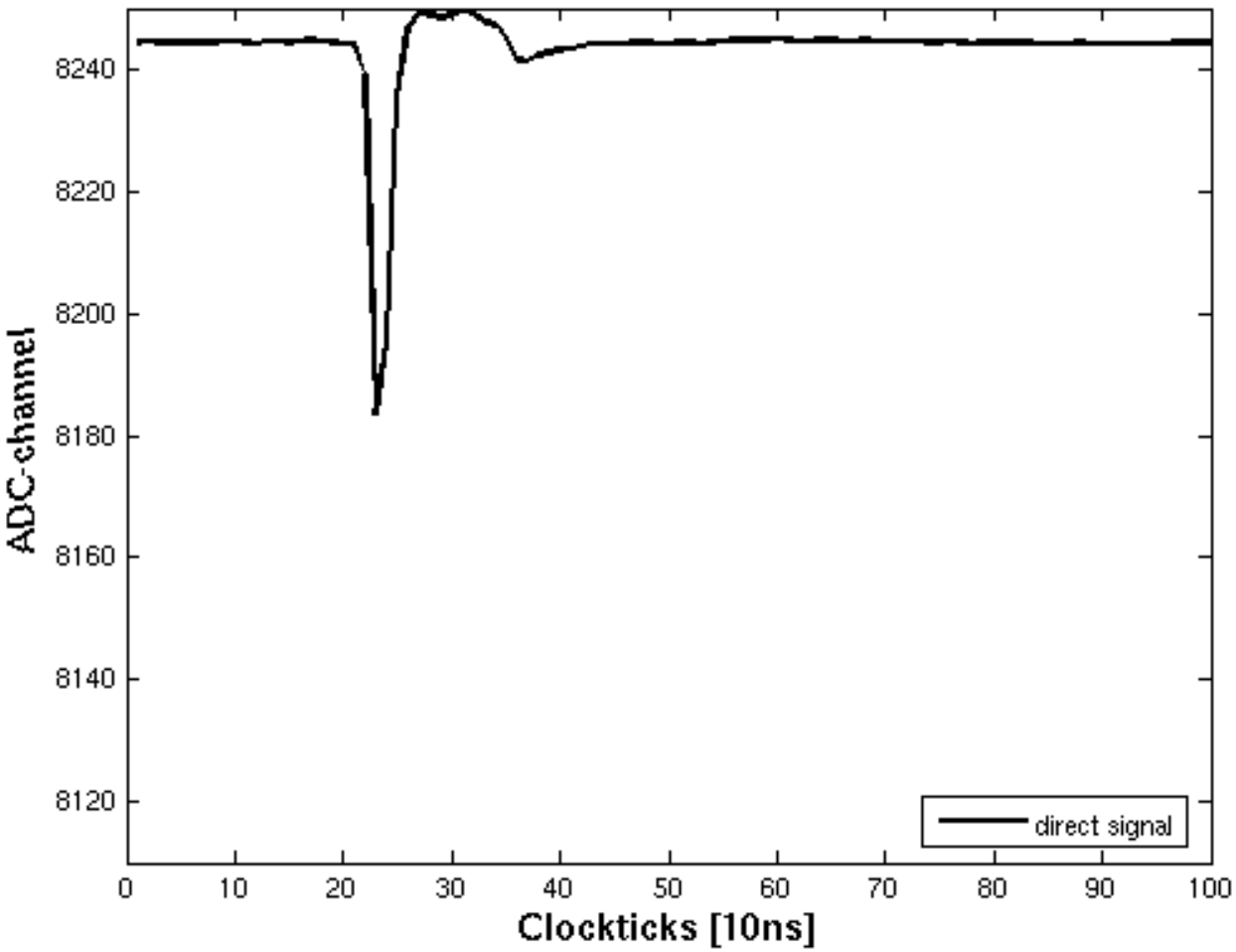


without stretcher

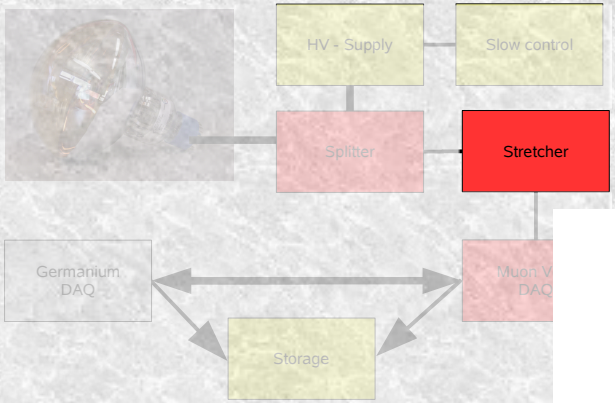


average pulses (Sum over 1000 pulses)

- direct signal:
  rise time: ~ 10ns
  (due to sampling)

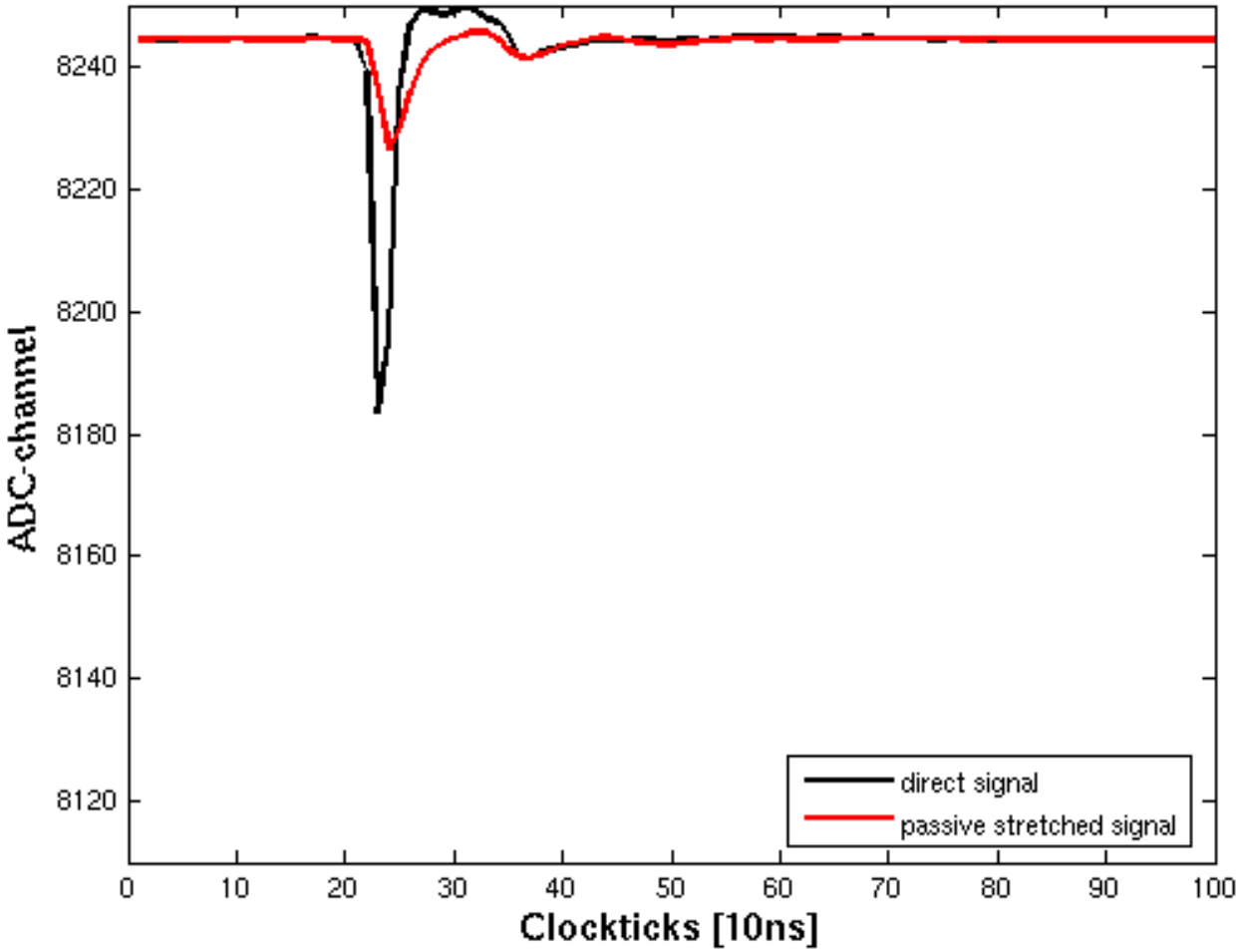


with passive stretcher

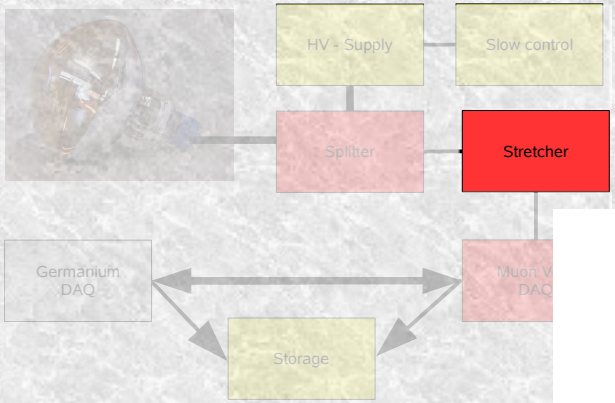


average pulses (Sum over 1000 pulses)

- direct signal:
  rise time: ~ 10ns
  (due to sampling)
- passive signal:
  rise time: ~ 30ns
  but: less ampl.

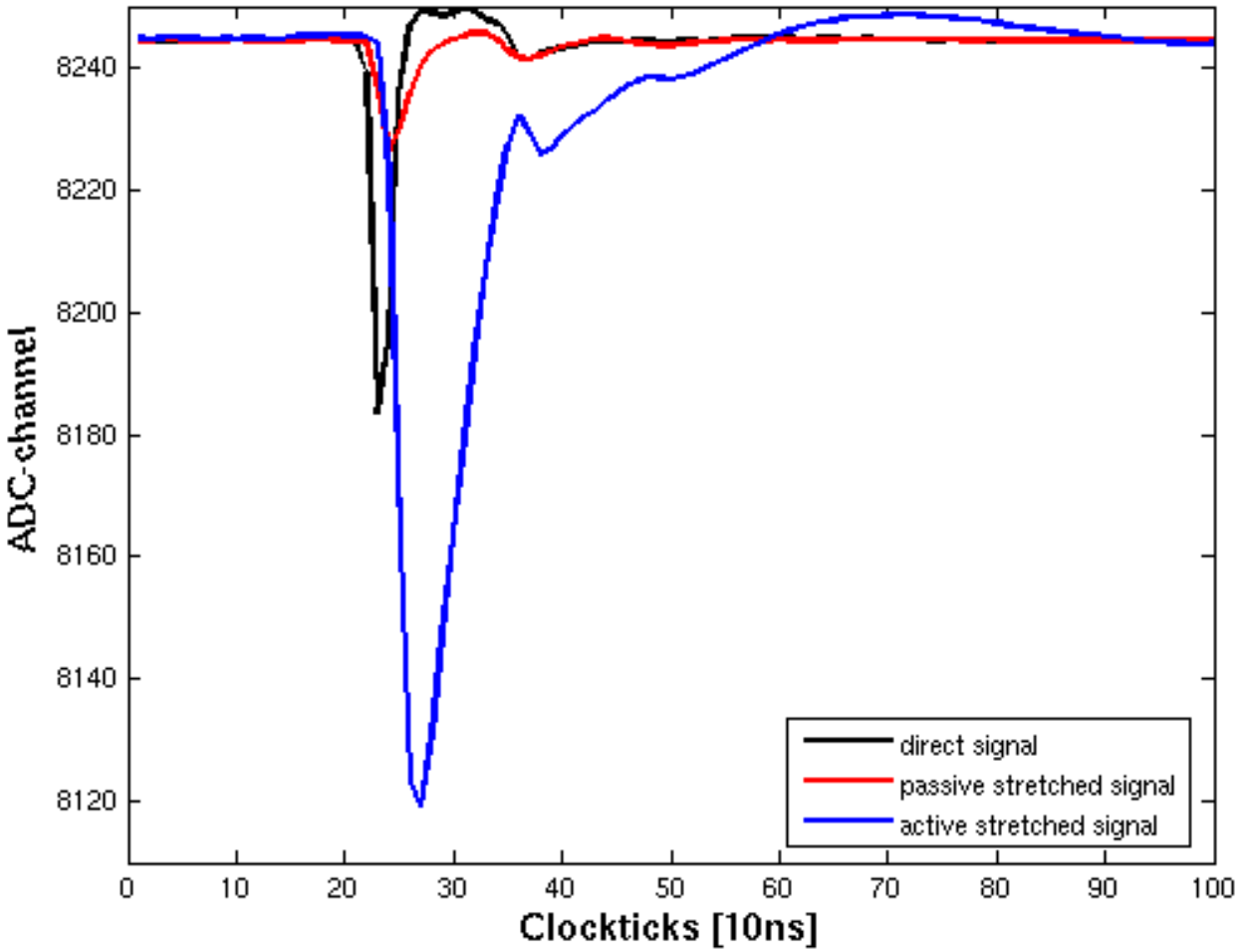


with active stretcher

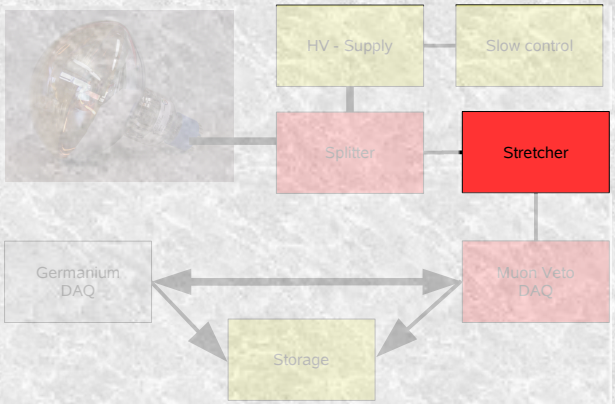


average pulses (Sum over 1000 pulses)

- direct signal:
  rise time: ~ 10ns
  (due to sampling)
- passive signal:
  rise time: ~ 30ns
  but: less ampl.
- active signal:
  rise time: ~ 40ns



Stretcher

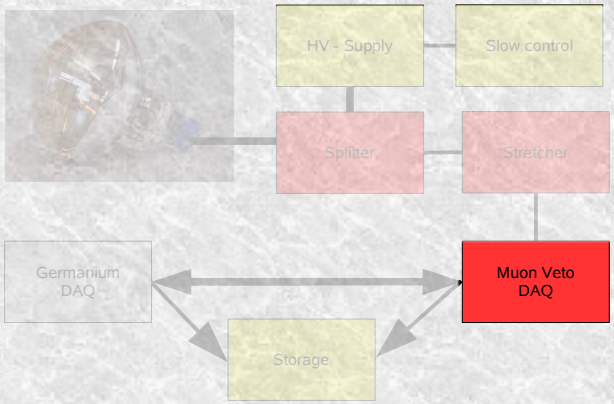


passive stretched signal loses amplitude
⟶ amplify signal afterwards / adjust FADCs

active stretcher exists already

⟶ use splitter plus active stretcher

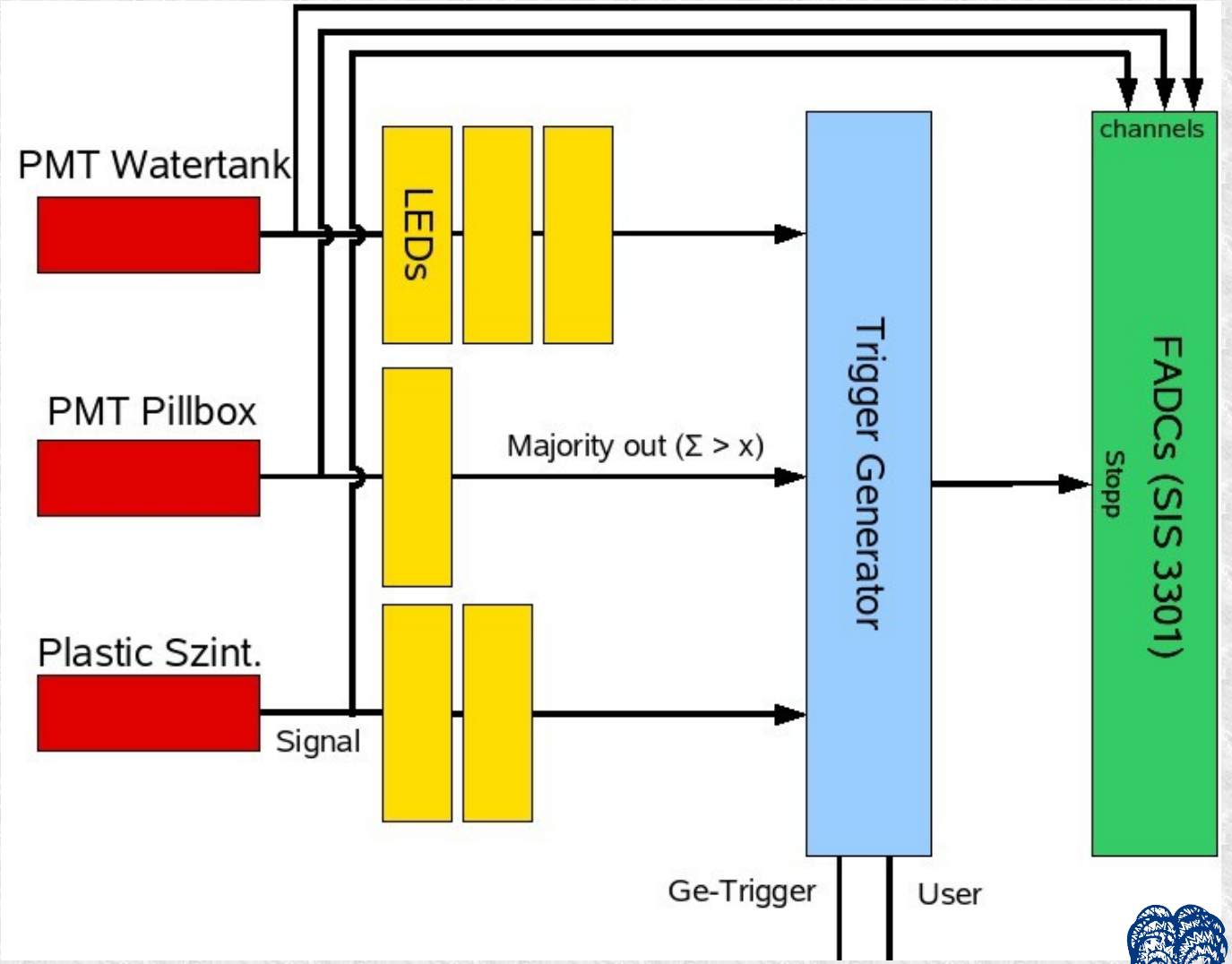
DAQ Setup 1



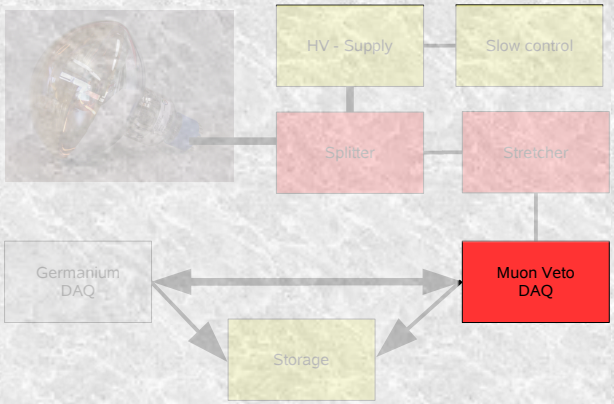
up to 7 Discriminators (Leading Edge Disc.)

plus one (or more) trigger generator (tbd)

--> cost intensive, triggering on PMTs

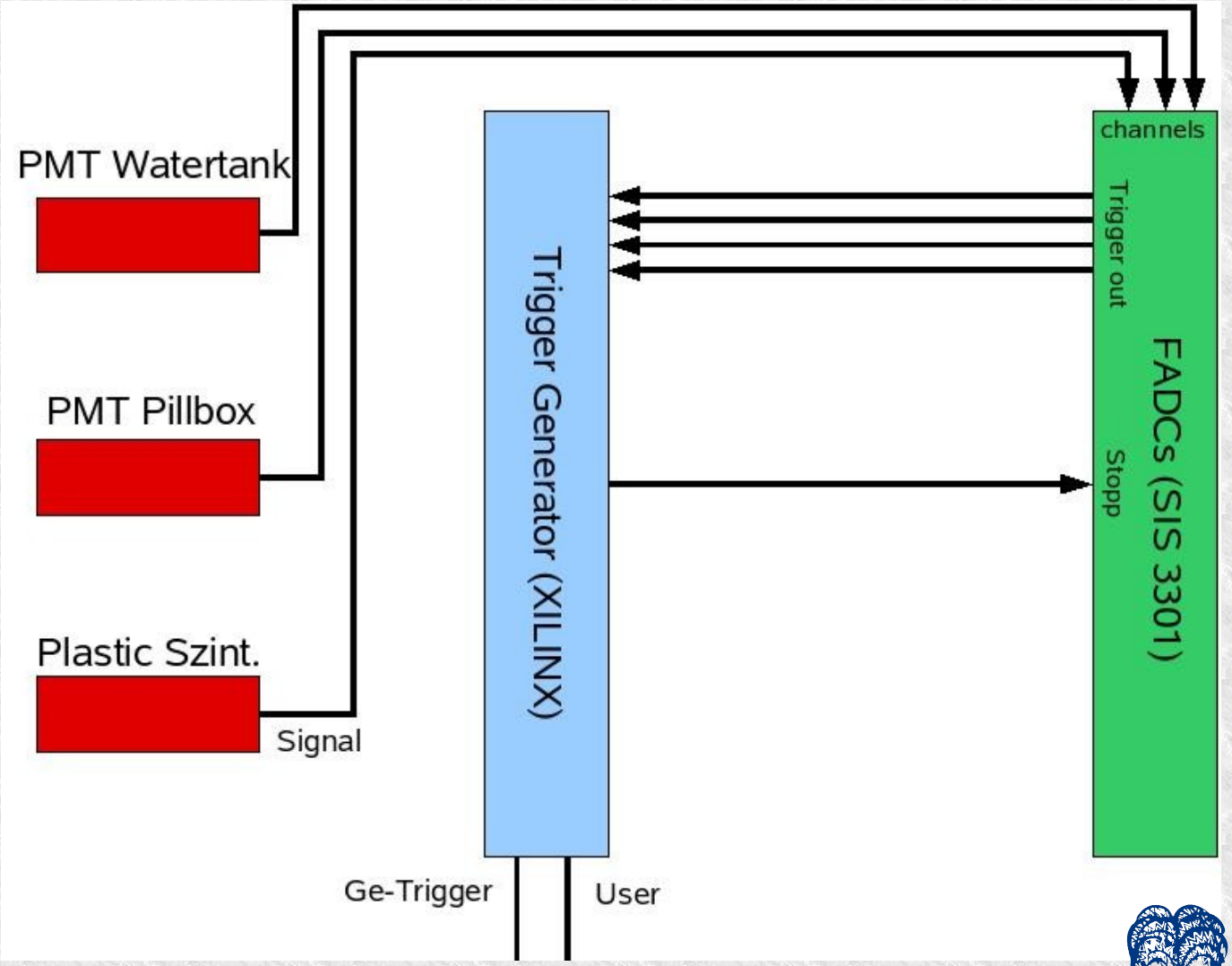


DAQ Setup 2

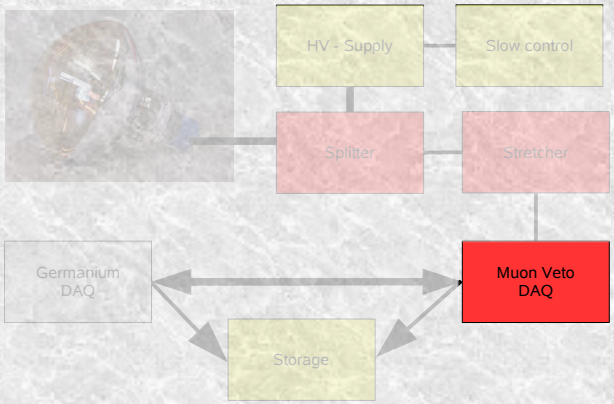


only one trigger generator (XILINX), triggering on „Trigger out“ of the FADCs

--> low cost,
triggering on FADC

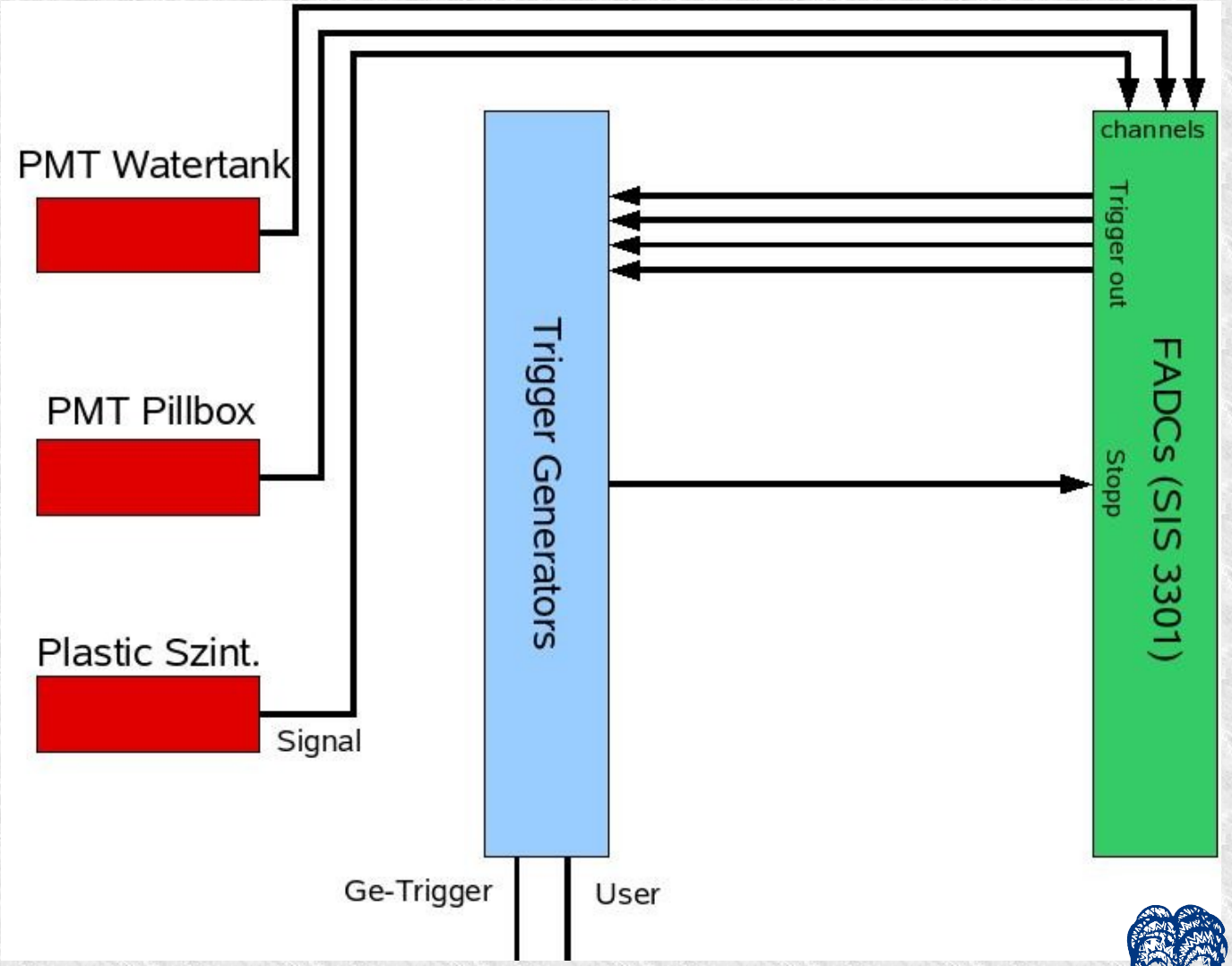


DAQ Setup 3

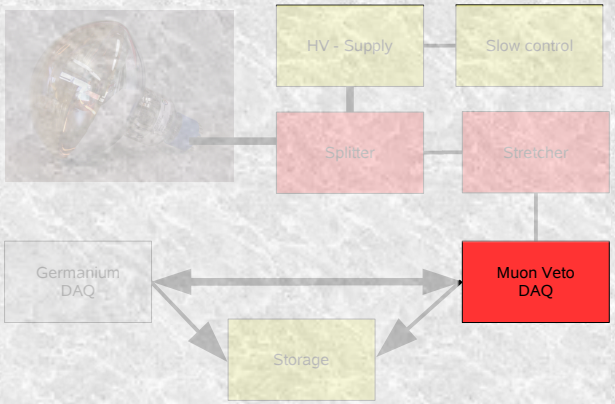


several (conventional) trigger generators, triggering on „Trigger out“ of the FADCs

--> intermediate cost, triggering on FADCs



DAQ

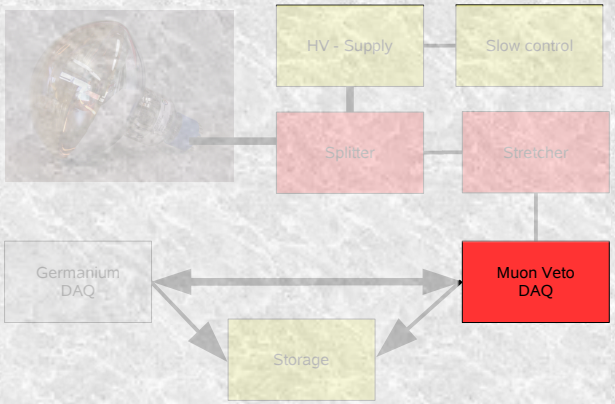


Estimation of random rates (Setup 3)

- Assumed dark count rate for a PMT: r_{PM} = 5kHz
- FADC has triggered, when at least one channel exceeds the threshold

- Dark count rate for one FADC with 8 PMTs: r_{FADC} = 8*5kHz = 40kHz
- Time window τ = 10 ... 50ns
- random coincidence rate (2FADCs) $r_{rand,2} = r_{FADC} * r_{FADC} * \tau$
- 3FADCs: $r_{rand,3} = r_{rand,2} * r_{FADC} * \tau = (r_{FADC} * r_{FADC} * \tau) * r_{FADC} * \tau$
- More FADCs: ...

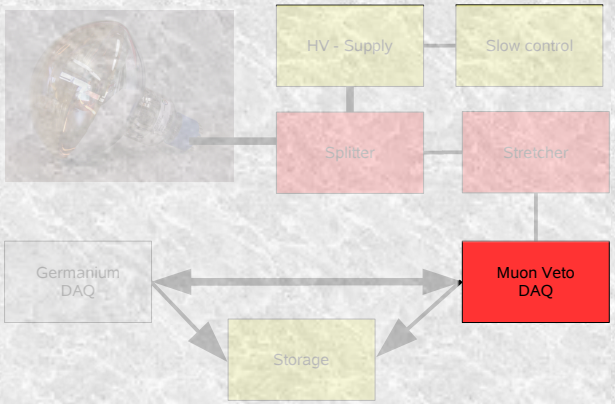
DAQ



- Monte Carlos:
  efficiency > **98 %** possible
  (-> Talk by M. Knapp)

Time Window	coincidence	random rate (Hz)
10 ns	3 FADC	1,408
30 ns	4 FADC	0,034
30 ns	3 FADC	12,670
50 ns	4 FADC	0,158
50 ns	3 FADC	35,200

DAQ



Software:

- FADC readout: done
  (ca. 10 readout cycles (20MB) per second possible)
- Leading Edge Disc. handling: done

(Test at a small setup with two PMTs: sucessful)

- combination of both and GUI: not yet completed
- Control of Flasher (LED + optical fibre) for stability tests: tbd

Status Muon Veto DAQ

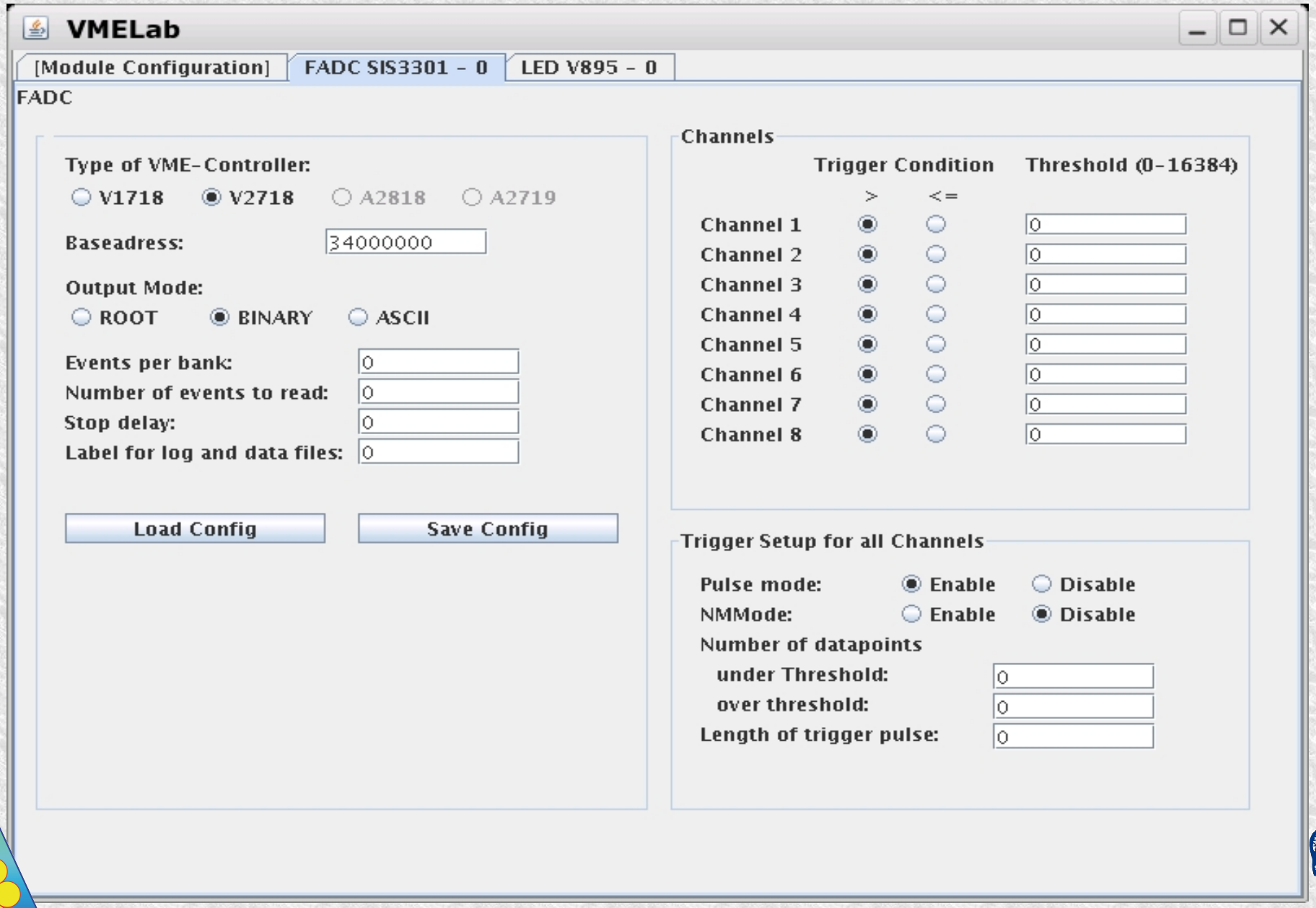
- Electronics: delivered (as far as decided)
  FADCs have to be ordered
- Software: single parts existing
  Mainframe in progress

- Test of plastic panels in Heidelberg with DAQ

- Connection to Ge-DAQ: to be done

Thank you!

DAQ


VMELab
[Module Configuration]
FADC SIS3301 - 0
LED V895 - 0
FADC
Type of VME-Controller:
V1718
V2718
A2818
A2719
Baseadress:
34000000
Output Mode:
ROOT
BINARY
ASCII
Events per bank:
Number of events to read:
Stop delay:
Label for log and data files:
Load Config
Save Config
Channels
Trigger Condition
Threshold (0-16384)
>
<=
Channel 1
Channel 2
Channel 3
Channel 4
Channel 5
Channel 6
Channel 7
Channel 8
Trigger Setup for all Channels
Pulse mode:
Enable
Disable
NMMode:
Number of datapoints
under Threshold:
over threshold:
Length of trigger pulse:

Base

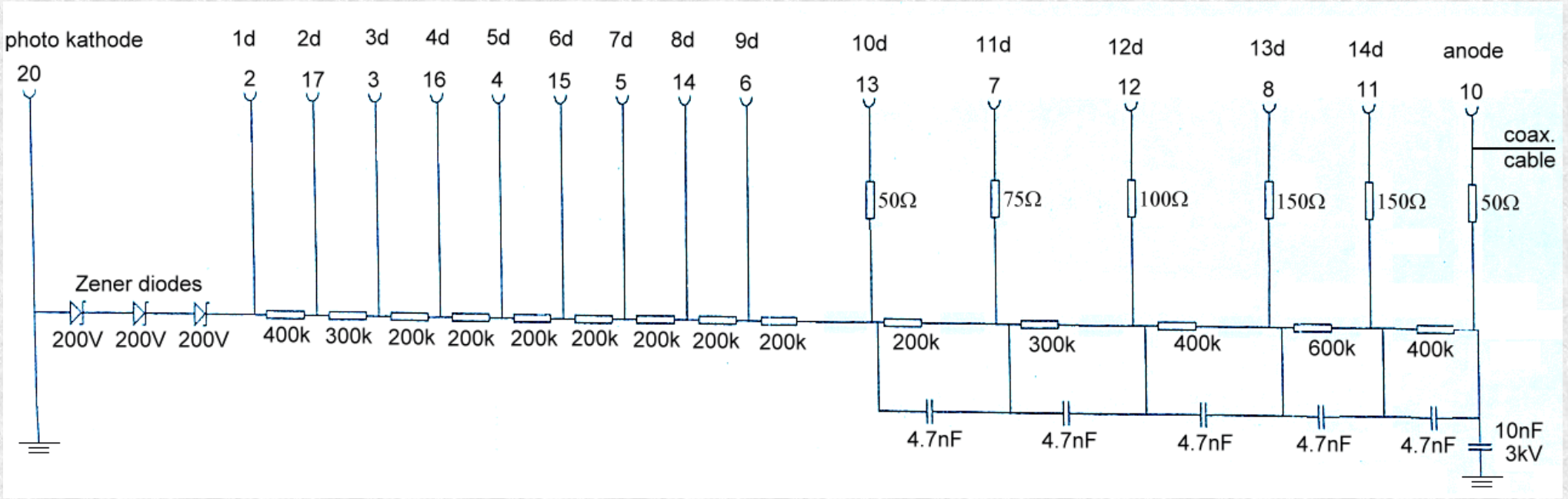


photo kathode
20
1d
2
2d
17
3d
3
4d
16
5d
4
6d
15
7d
5
8d
14
9d
6
10d
13
11d
7
12d
12
13d
8
14d
11
anode
10
coax. cable
50Ω
75Ω
100Ω
150Ω
150Ω
50Ω
Zener diodes
200V 200V 200V
400k 300k 200k 200k 200k 200k 200k 200k 200k
200k
300k
400k
600k
400k
4.7nF
4.7nF
4.7nF
4.7nF
4.7nF
10nF
3kV