

Detector Infrastructure: HV

CBM-TRD Retreat, Schloß Waldthausen
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Philipp Kähler

Institut für Kernphysik, WWU Münster

- **Currents can be calculated from the ionisation process**

- Per length of anode wire:
up to $j_w = 3.3 \text{ nA / cm}$ expected

- **Anode current in 54 x 54 cm²:**

- Up to 38.5 μA per module assumed 50 kHz / cm²

- **Anode current in 96 x 96 cm²:**

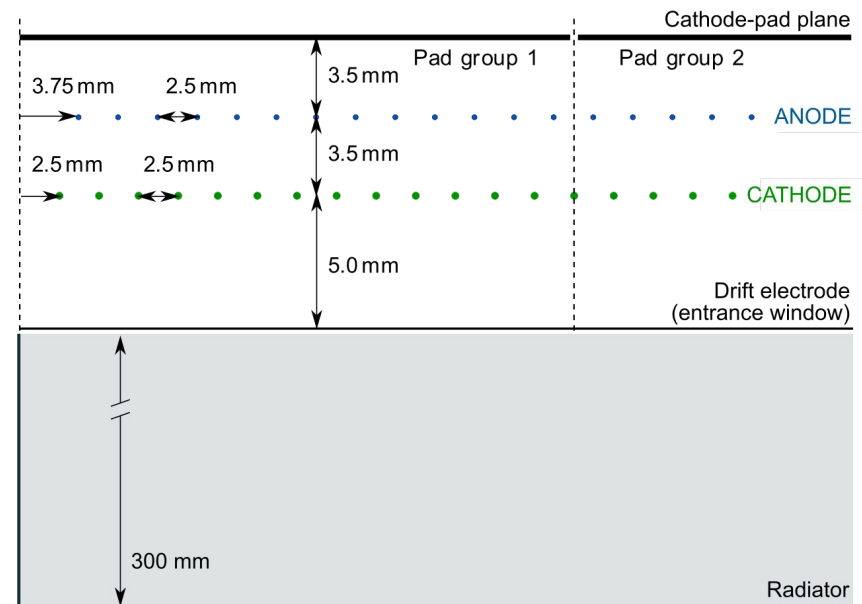
- Up to 12.2 μA per module assumed 10 kHz / cm²

- **Supply with one channel per module favoured**

$$j_w = n \cdot \epsilon_{\text{MIP}} \cdot k_{\text{particle}} \cdot L \cdot W_{\text{XeCO}_2}^{-1} \cdot G \cdot e \cdot \lambda^{-1}$$

with

Variable	Value	Interpretation
n	100 kHz cm ⁻²	Track rate density
ϵ_{MIP}	5 keV cm ⁻¹	Energy loss of minimum-ionising particle
k_{particle}	1.5	Factor from minimum ionisation to mean energy loss
L	1.2 cm	Track length in active volume (straight case)
W_{XeCO_2}	22 eV e ⁻¹	Ionisation work per electron
G	2000	Gas amplification
e	1.6 · 10 ⁻¹⁹ C	Elementary charge
λ	4 cm ⁻¹	Anode wire length per area



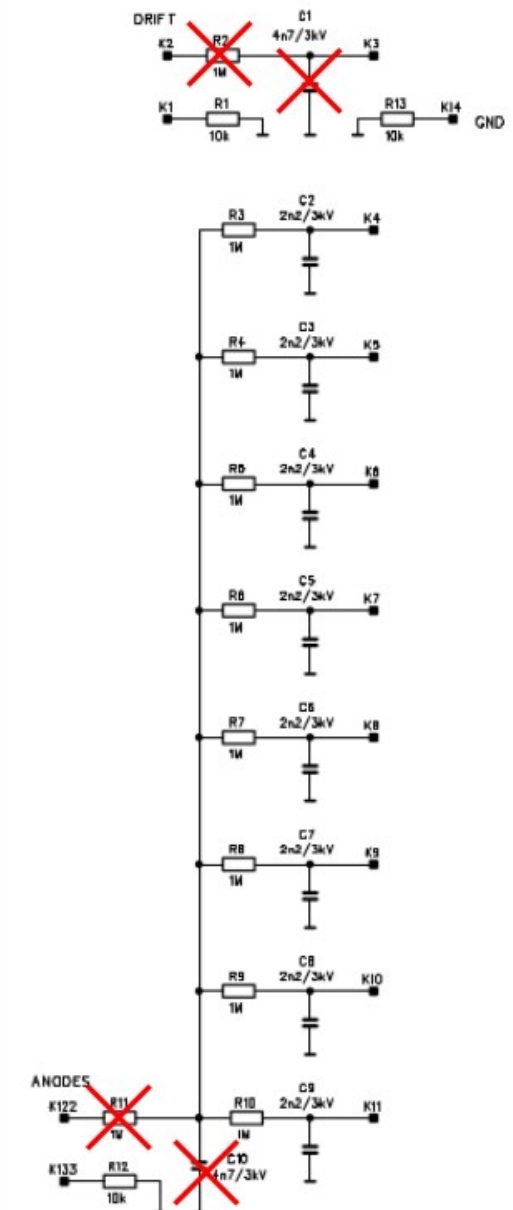
TR PHOTON DRIFT AMPLIFICATION GENERATION

• ALICE-TRD: ceramic capacitors

- Significant failure rate during Run 1 and Run 2, repair during LS2, real test in Run 3 (March 2021)
- Tested with > 5000 HV cycles, 2.5 kV, current lim: 11.4 A
- Leakage currents not significantly changed, comparable conditioning behaviour (order of few minutes)
- Neutron exposition test starting now
- Capacitor reliability: strong doubts

• Capacitance aims

- Noise filter
- Quick supply, overall and segmented
- But: cabling already in comparable cap domain



- **Suggest (conservative)**

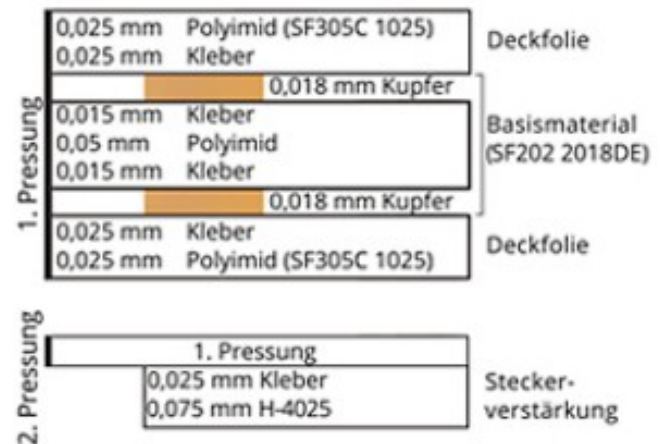
- Design filterboard with capacitors, decision on equipment in 2021
- Increase distances on board (humidity resilience)

- **Prototyping: self-capacitive board**

- Two-sided 50 μm Kapton design
- Capacitance by Cu-Kapton-Cu layout
- If usage considered: separation into anode and cathode board to avoid leakage currents

Lagenaufbau Flex Pool

Lagen: 2
Stärke: 0,2 mm ohne Steckerverstärkung



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