

Results from Lab and Testbeam Measurements

CBM-TRD Retreat, Schloß Waldthausen
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- **Overall electron detection efficiency as system check**

- 12 mm Xe/CO₂ 80:20: should be ~ 100%

- Reference: Scintillation coincidence

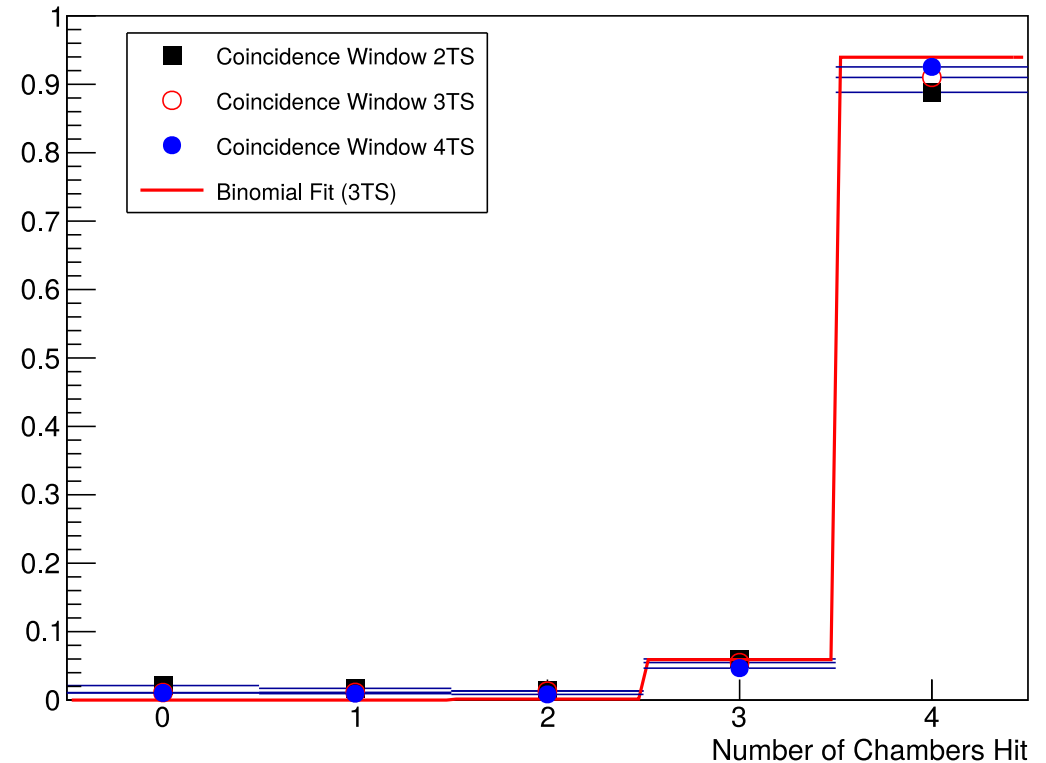
- **Random coincidences excluded**

- Timeshifts uncover: random coincidences only from one module

- Single coincidences understood in geometrical acceptance matching

- **Message efficiency about 85 %**

- Message building in SPADIC 2.0, fully redesigned in SPADIC 2.2



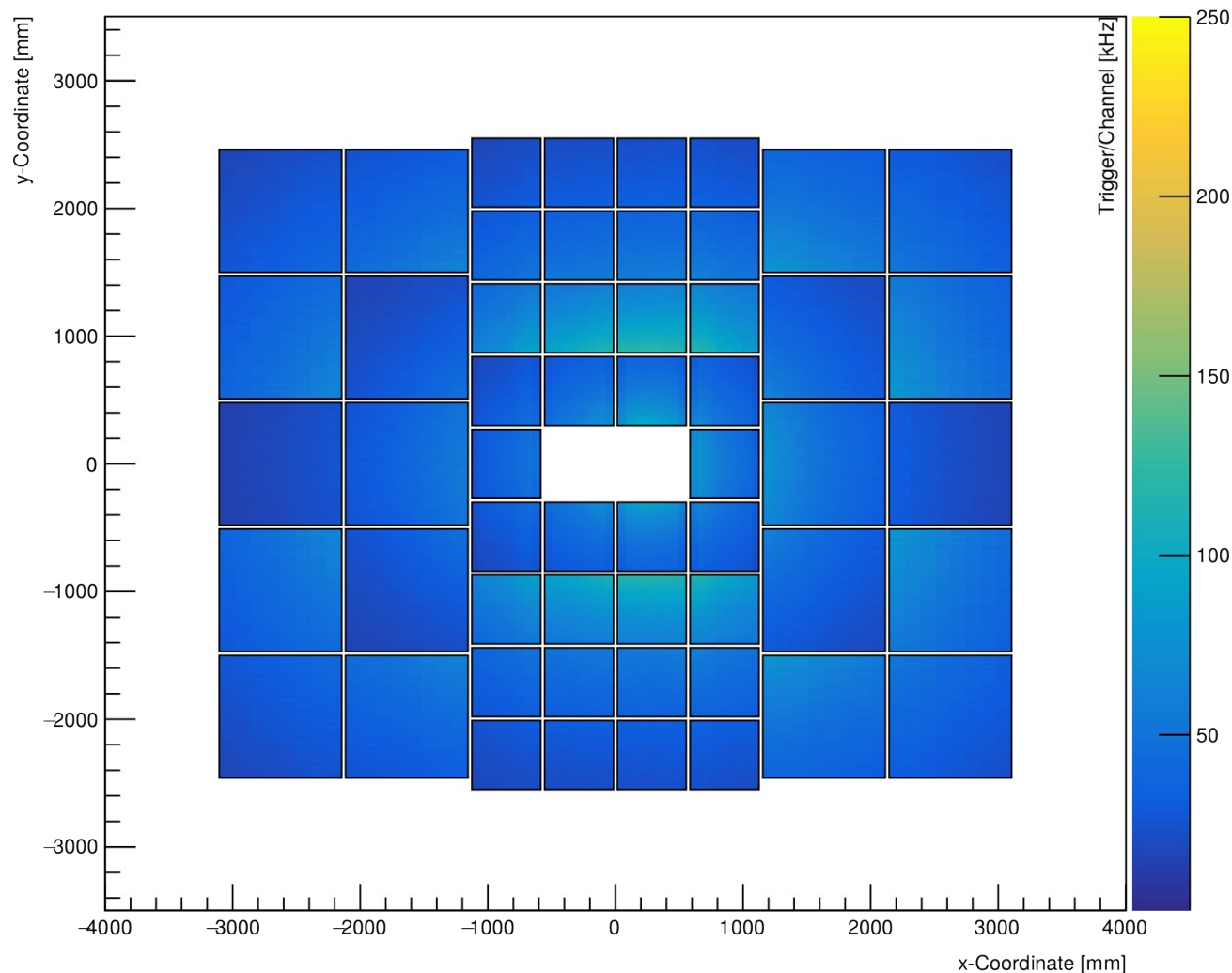
- ▶ Electron momentum $p = 4 \text{ GeV}/c$
- ▶ Binomial fit for time window of $\pm 3 \text{ TS}$:
Efficiency $\varepsilon = (98.45 \pm 2.00) \%$

- **TRD cathode pad granularity is scaling with local hit rates**

- 1.2 cm² (central modules)
- up to 8 cm² (peripheral modules)
- Balancing self-trigger rates

- **Simulation of trigger rates per TRD layer**

- UrQMD, Au+Au min. bias, 10 AGeV collision energy
- Interactions with detectors and support material included by GEANT3
- Average of 40 kHz / channel, but peaking > 100 kHz / channel



- **Scintillators in μ beam**

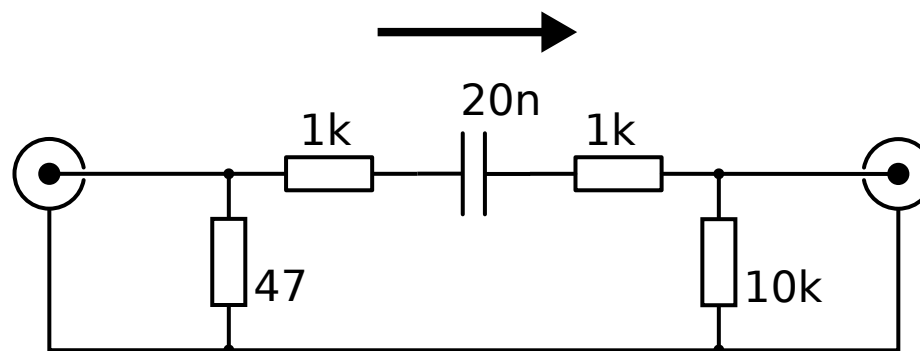
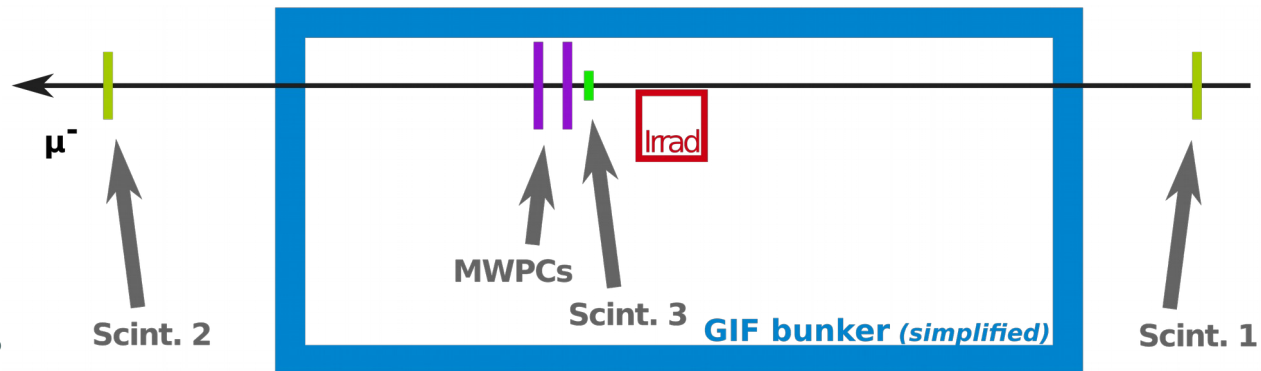
- Scint. 1 and 2 outside the GIF cave
- Scint. 3 directly matching TRDs

- **Coincidence on NIM electronics**

- Twofold: *Coinc* = *Scint. 1* & *Scint. 2*
- Threefold: *Coinc* & *Scint. 3*

- **Integration of coincidence signals via signal adaption and SPADIC into CBM-DAQ**

- **Outlook: μ efficiency determination, ongoing analysis**



NIM signal adaption to SPADIC front-ends

- **Hit rate determined from front-end data**

- Counting of self-trigger (threshold \sim MIP)
- Adjacent self-triggers respected

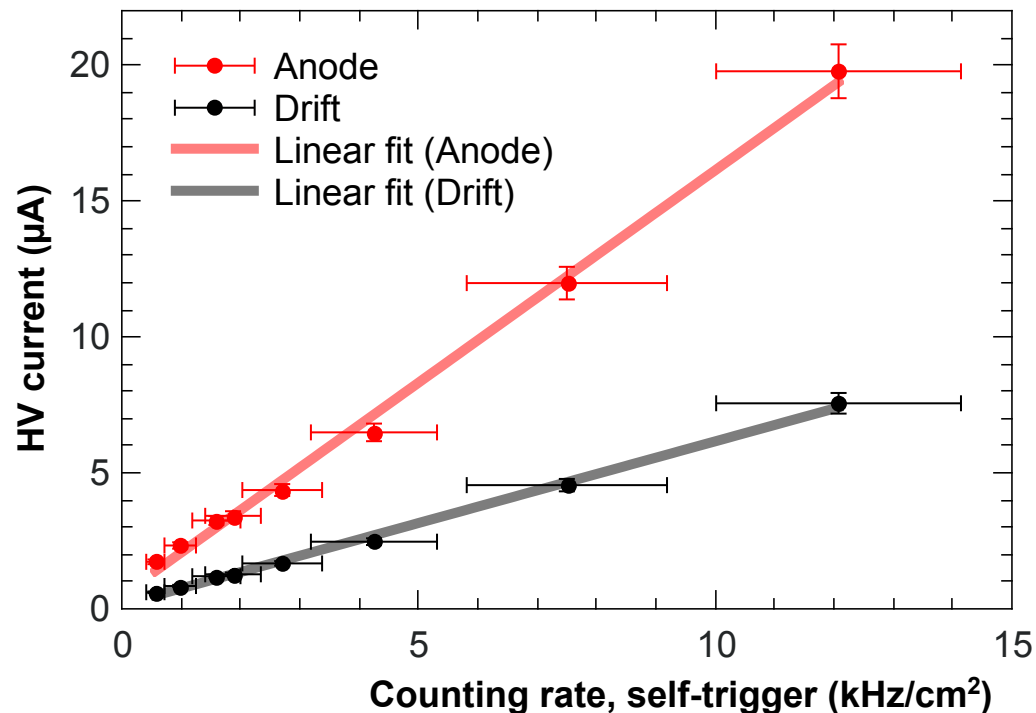
- **Anode and drift currents from HV supply of MWPC**

- **Drift and anode currents compatible with linear scaling**

- **Ongoing: mean ionisation per event to be checked against expectation**

- Assuming: photon spectrum stable for different attenuation levels

- **Ongoing: μ event selection, detection probability**

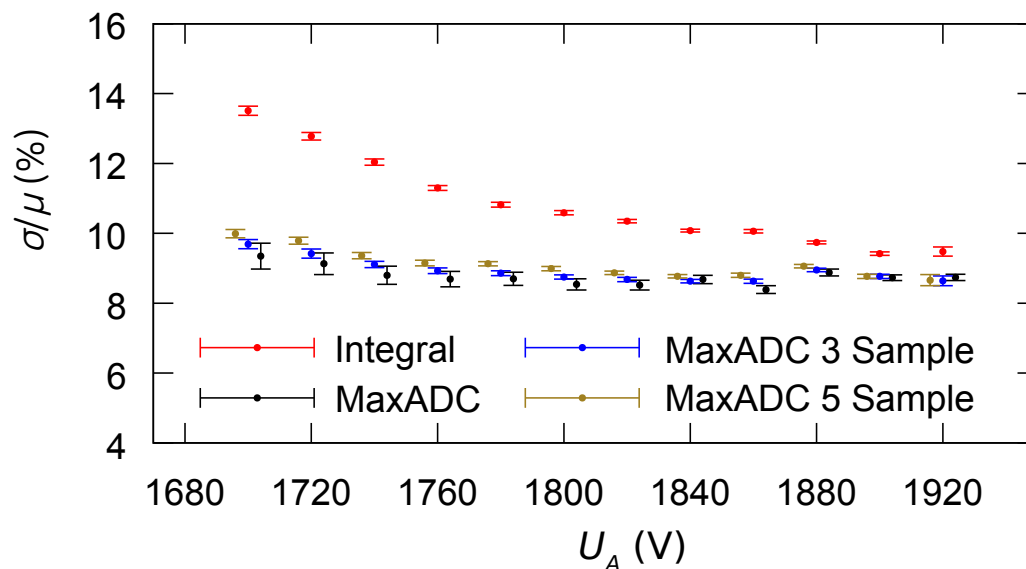


- **Overall energy resolution from ^{55}Fe**

- K lines at $U_A = 1850$ V:
240 ADC units above baseline (central pad),
MIP (3.47 keV/5.9 keV): 141 ADC units,
gas gain > 2000
- σ/μ down 8.4 %

- **Overall baseline width of up to $\sigma = 7$ ADC units**

- Expectation: common modes
- No significant modes found so far
- *Outlook*: Investigation over broad range of trigger frequencies started

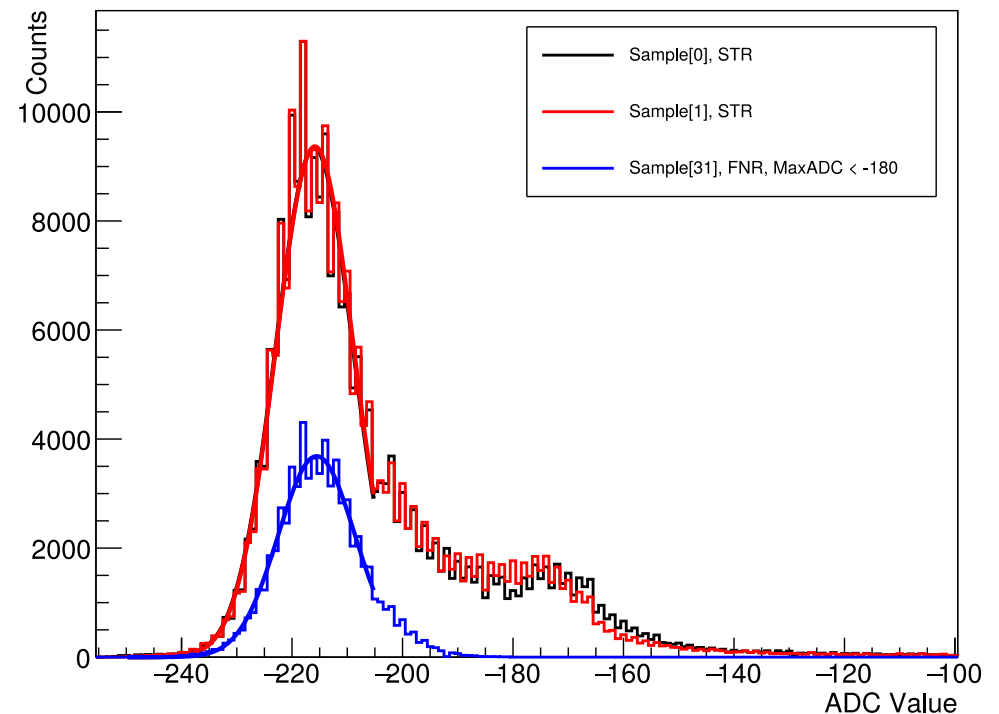


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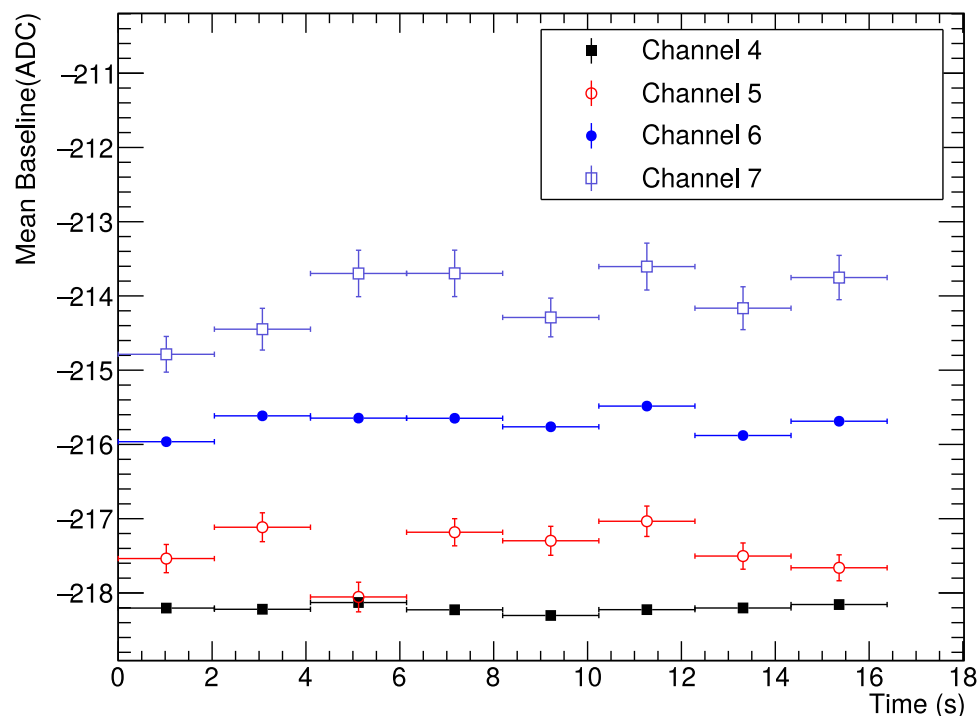


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Gain Matching

- **Target value for MIP signals (central pad):**
7 % of available ADC range,
35 ADC units

- **^{55}Fe with Ar-CO₂ 82:18**

- K lines at $U_A = 1850$ V:
240 ADC units above baseline (central pad),
MIP (3.47 keV/5.9 keV): 141 ADC units
- Gas gain 3400 (Garfield)
- $3400 \times (35 \text{ ADC} / 141 \text{ ADC}) = 850$

- **^{55}Fe with Xe-CO₂ 80:20**

- K lines at $U_A = 2000$ V:
155 ADC units above baseline (central pad),
MIP (6.0 keV/5.9 keV): 158 ADC units
- Gas gain 4200 (Garfield)
- $4200 \times (35 \text{ ADC} / 158 \text{ ADC}) = 930$

