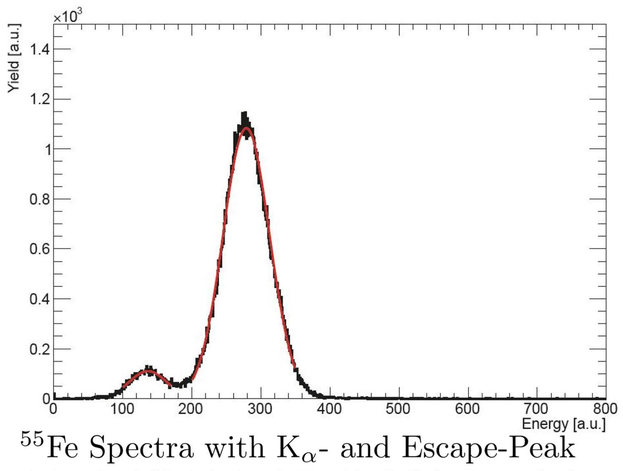
Energy resolution measurements with the CBM-TRD using a ^{55}Fe-Source

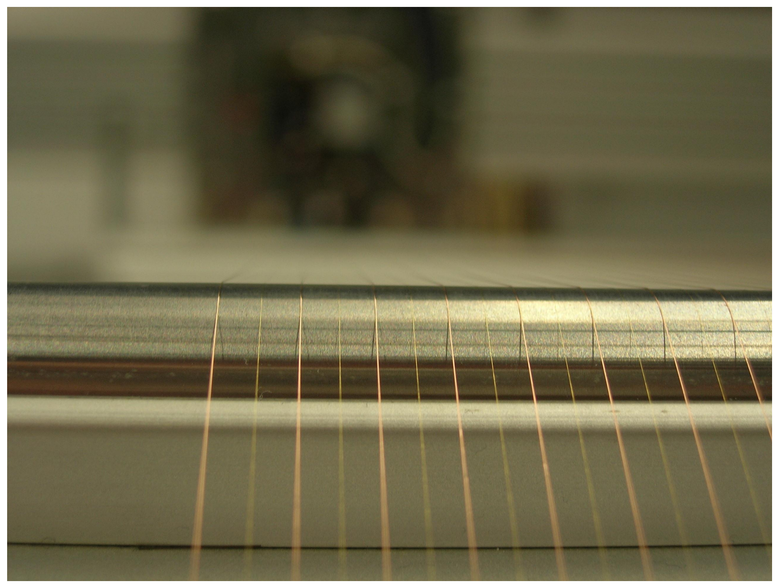
The Readout Chamber

The Transition-Radiation-Detector (TRD) of the CBM Experiment consists of radiators and multiwire proportional chambers filled with a gas mixture of 85% Argon and 15% CO_2. Two full-size (59 x 59 cm^2) prototypes have been build at the Institut für Kernphysik in Frankfurt and were equipped with a plane of anode wires with alternating high voltages. The produced charge is measured on a pad plane on the backside but can also be measured with the anode wires.



^{55}Fe Spectra with K_α- and Escape-Peak

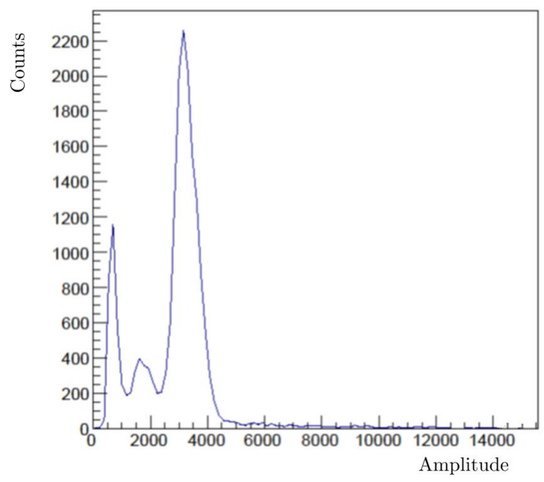
Andreas Arend, "Optimization of a Transition Radiation Detector for the Compressed Baryonic Matter Experiment", 2008



The Source

- Material: ^{55}Fe decays via electron capture into ^{55}Mn
- The significant K_α peak is at 5.9 keV
- An Argon-escpae peak is at 2.9 keV
- Both peaks are used for calibration

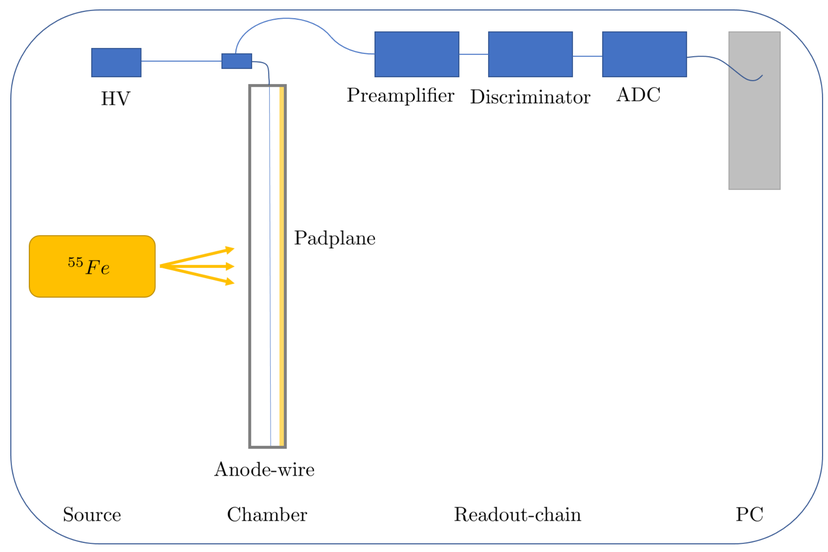
Measurements with anode readout



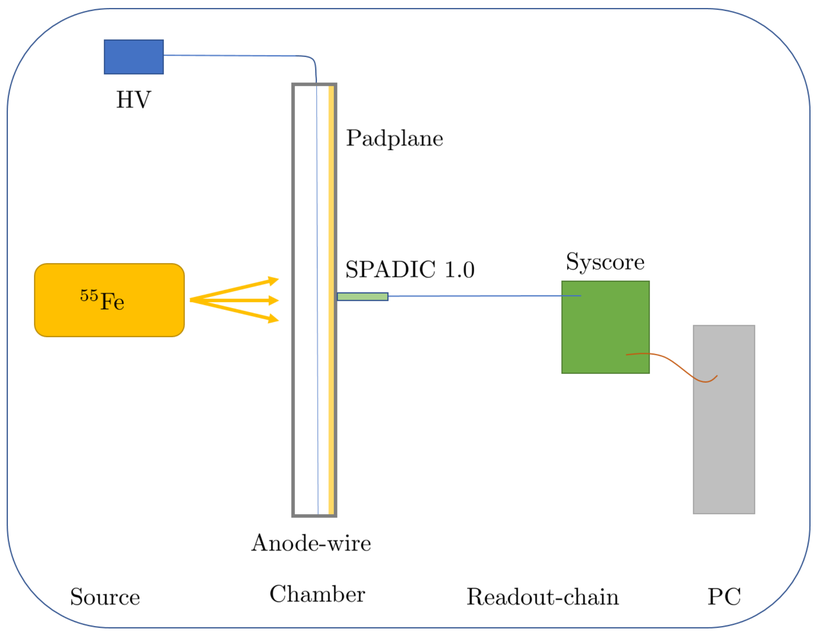
with anode readout measured ^{55}Fe spectrum

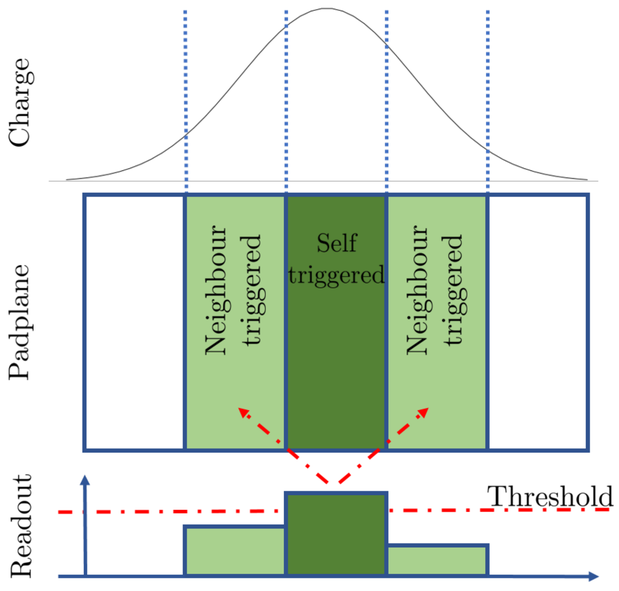
Readout setup

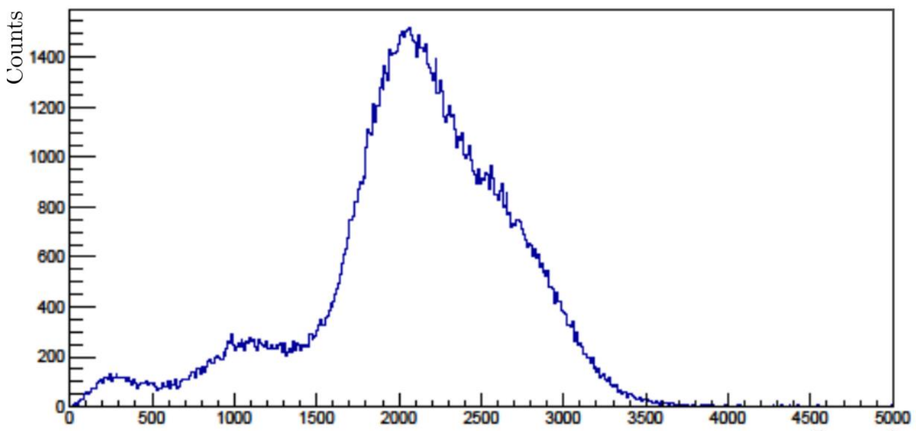
- Signal is decoupled by a capacitor
- Preamplifier - amplifies the signal
- Discriminator - defines a trigger signal
- ADC - converts the signal from analog into digital
- PC - for analysis and saving the data



Measurement with the SPADIC 1.0







with SPADIC 1.0 measured ^{55}Fe spectrum

Readout setup

- SPADIC 1.0 is positioned on the backside of the chamber and conected to 32 pads with a flat cable
- SPADIC 1.0 triggers and shapes the signal in a defined form (80ns shaping time)
- Syscore board collects data from up to three SPADICs and converts it into an optical signal
- Glass fiber connects Syscore with PC

Triggering

- Incoming charge is collected on pads
- Charge on one pad reaches the threshold
- Self-triggered pad triggers its two neighbours
  ⇒ called "3-pad-cluster"
- Also 2 adjacent pads can be self-triggered at the same time
- Both trigger their neigbour
  ⇒ called "4-pad-cluster"
- The sum over all pads in one cluster gives the produced charge

Bundesministerium für Bildung und Forschung

Supported by the German BMBF-grant 05P15RFFC10

Contact me: mraabe@ikf.uni-frankfurt.de