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Hit Reconstruction for the CBM-TRD

DPG Frühjahrstagung 2018, Bochum

Bundesministerium
für Bildung
und Forschung

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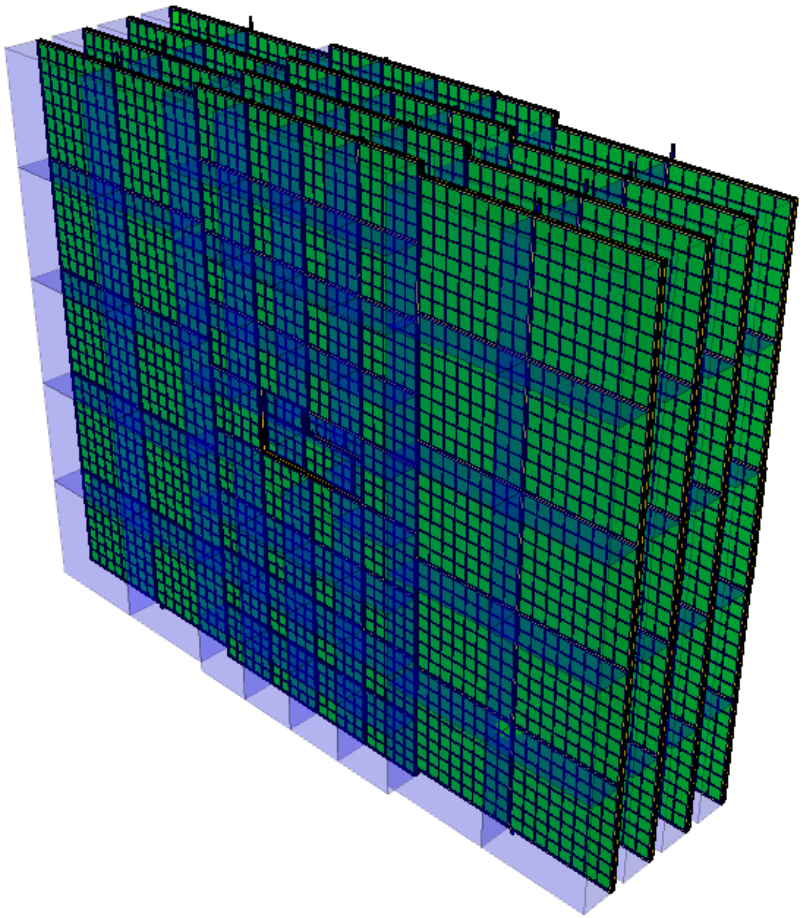
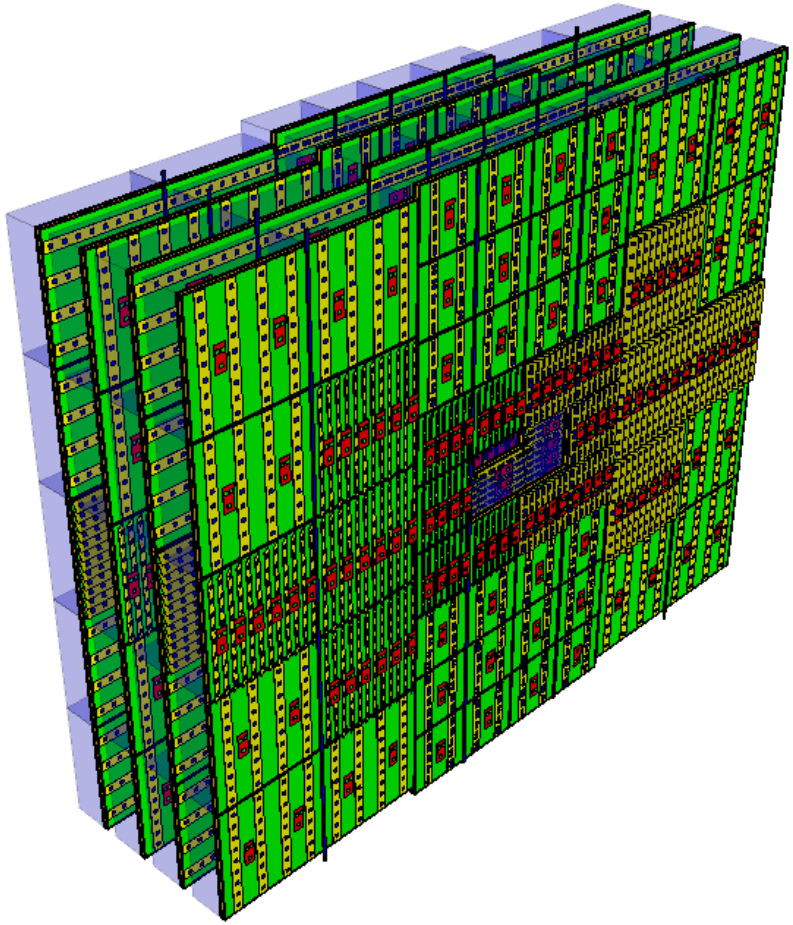
The CBM-TRD

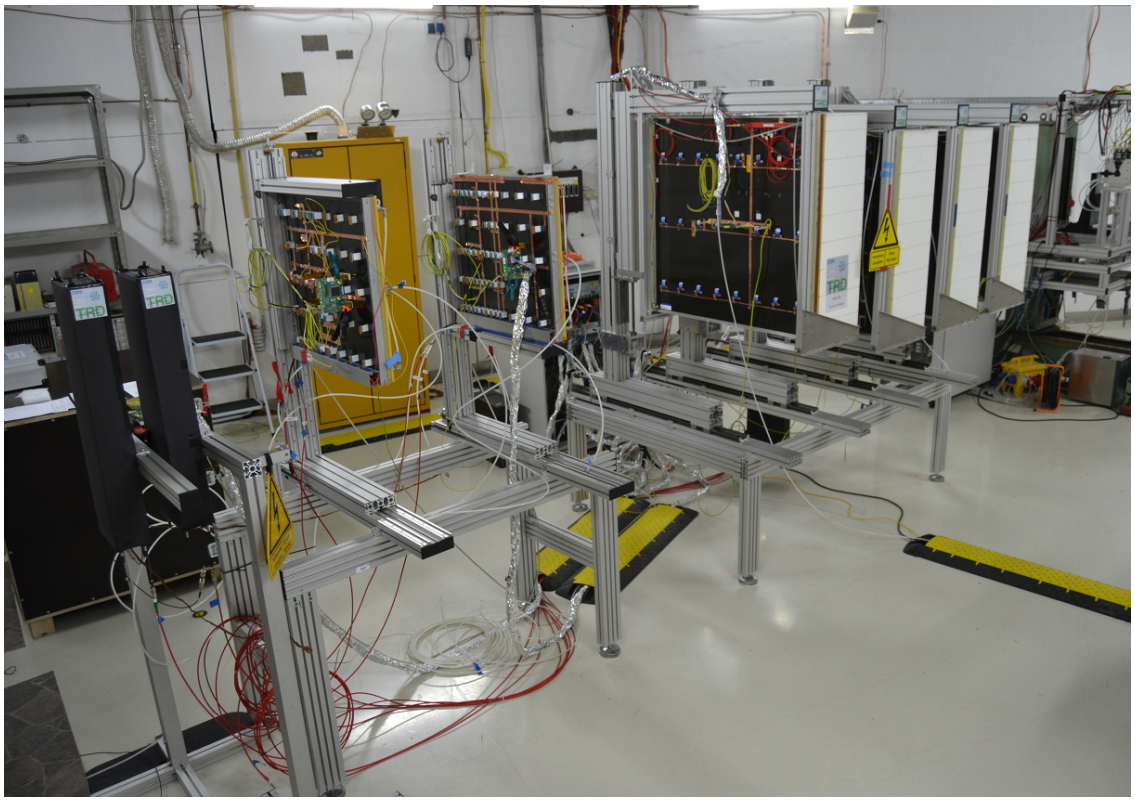
- CBM-TRD in 4.1 m < z < 5.9 m from target
- Two chamber sizes to cover 6.93 x 4.95 m² (0.98 < η < 3.16)





Test Beam Analysis

- The CBM-TRD has gone through extensive Test Beam campaigns
- $\approx$ 2 weeks of data taking were done at DESY 2017
- Analysis for Test-Beam data are usually performed with newly developed components



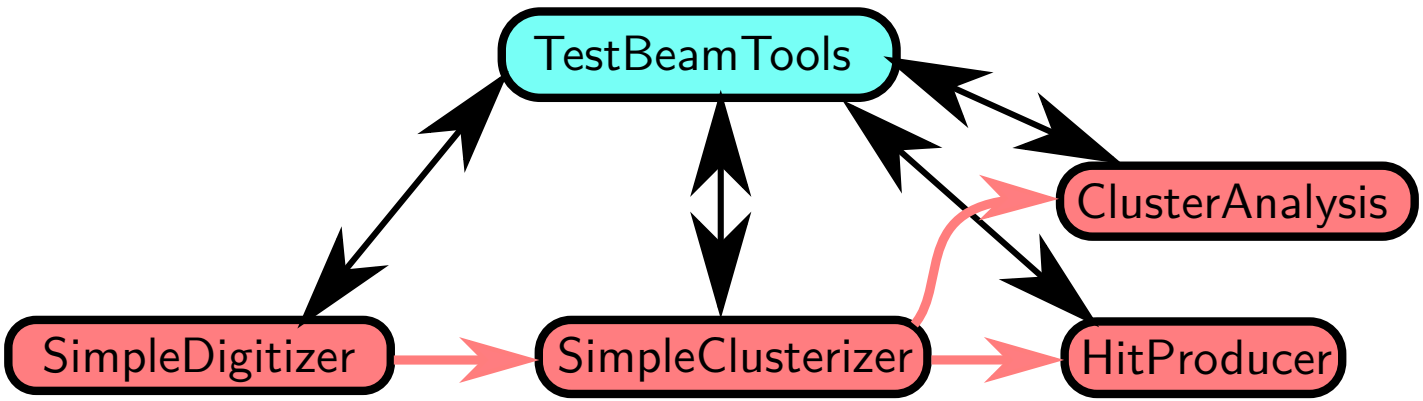
Previous In-Beam Test campaigns

Year	Beamline	Beam / Set-up	Prototypes	Read-out
2006	GSI-SIS18	p, e, π (up to 2 GeV) direct	dual-sided pre-types	ALICE-PASA *
2010	CERN-PS /T10	e, μ, π (up to 5 GeV) direct	pre-types	SPADIC 0.3 * Susibo
2011	CERN-PS /T9	e, μ, π (up to 10 GeV) direct	pre-types	SPADIC 0.3 * Susibo
2012	CERN-PS /T9	e, μ, π (up to 8 GeV) direct	2012-style (57x57 cm^2)	SPADIC 0.3 * Susibo
2014	CERN-PS /T9	e, μ, π (up to 6 GeV) direct	2012+2014-style (57x57 cm^2)	SPADIC 1.0 SysCore
2015	CERN-SPS /H4	^{208}Pb (30 AGeV) Pb target	2012-style (57x57 cm^2)	SPADIC 1.0 SysCore
2016	CERN-SPS /H4	Pb (13, 30, 150 AGeV) on Pb target	Type 8 (95x95 cm^2)	SPADIC 1.1 SysCore
2017	DESY II /TB24	e (1...4 GeV) direct	Type 8	SPADIC 2.0 AFCK
2017	CERN-GIF++	γ from ^{137}Cs + μ beam	2012-style	SPADIC 2.0 AFCK

*: triggered readout

Unified Test Beam Analysis

- Core Idea: Maximize code reuse and modularity
- Write analysis code with minimal assumptions on parameters
  - Number/Type of *Front End Boards* (FEBs)
  - Geometry of Setup
- Use helper classes to abstract parameter handling away
  - This framework predates the new parameter handler
- Modularity enables experimental analysis classes, without major modifications

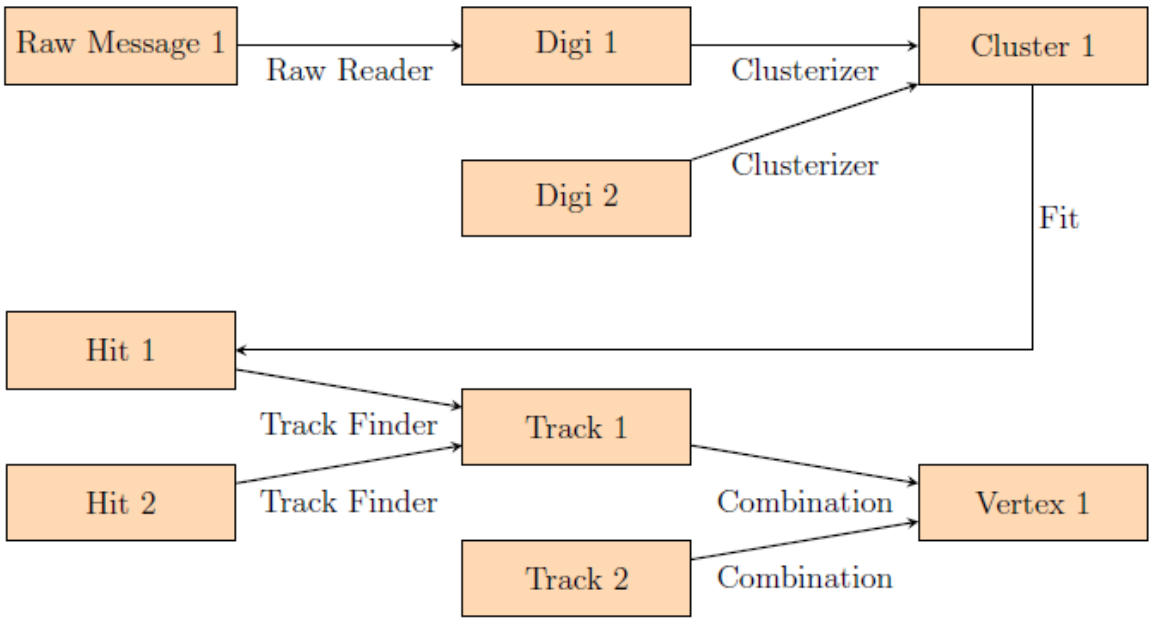


Unified Test Beam Analysis

- Provide basic analysis classes for QA
- Provide infrastructure for more specialized analysis
  - Digitization
  - Clusterization
- More specific analysis for a given setup
  - Alignment analysis for DESY data

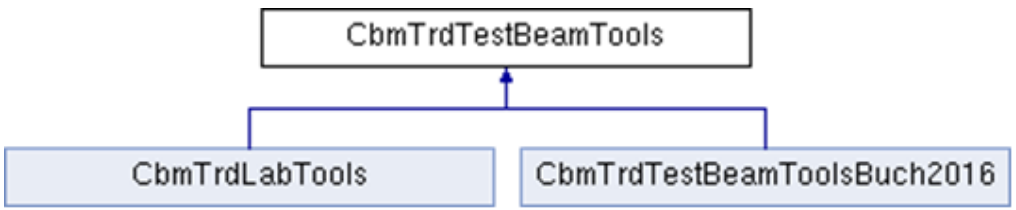
Architecture of framework

- Framework consists of analysis pipeline and helper classes
- Every setup dependent information is queried from helper class



Helper classes

- Helper classes are called **test beam tools**
- They contain the **full parametrization** for a specific setup
- Due to inheritance from base class, only differing functions/parameters need to be implemented
  - Different number of detectors
  - Different mapping of SPADIC channel to detector pad
  - Different shaping times



A few tests

- Data recorded at DESY on same MWPC
- Here about 40 s of data
- Clusters only filtered based on meta data
- No filter on the signal shape/charge distribution

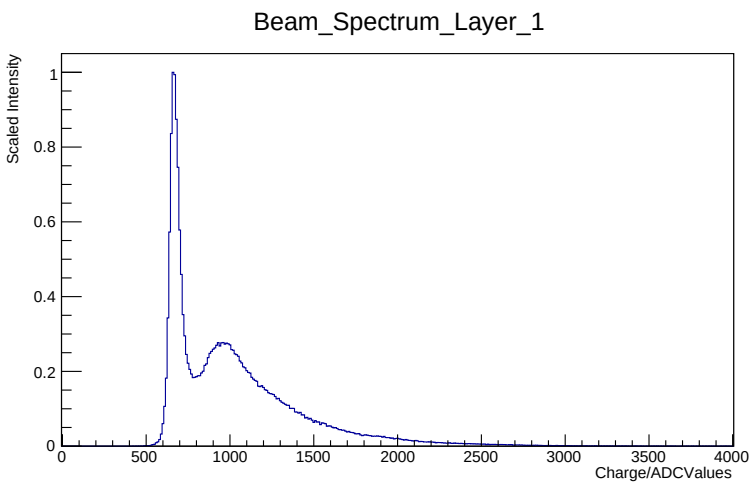


Figure: Without Radiator

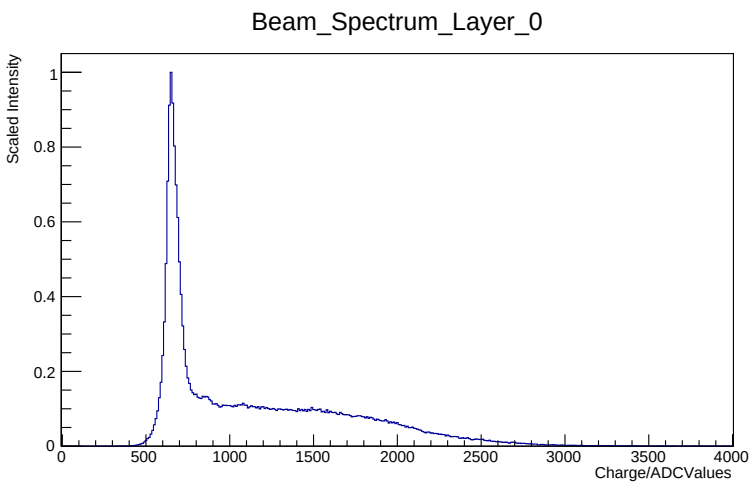


Figure: With Radiator

A few tests

- Software test: Filter out messages with atypical signal shape

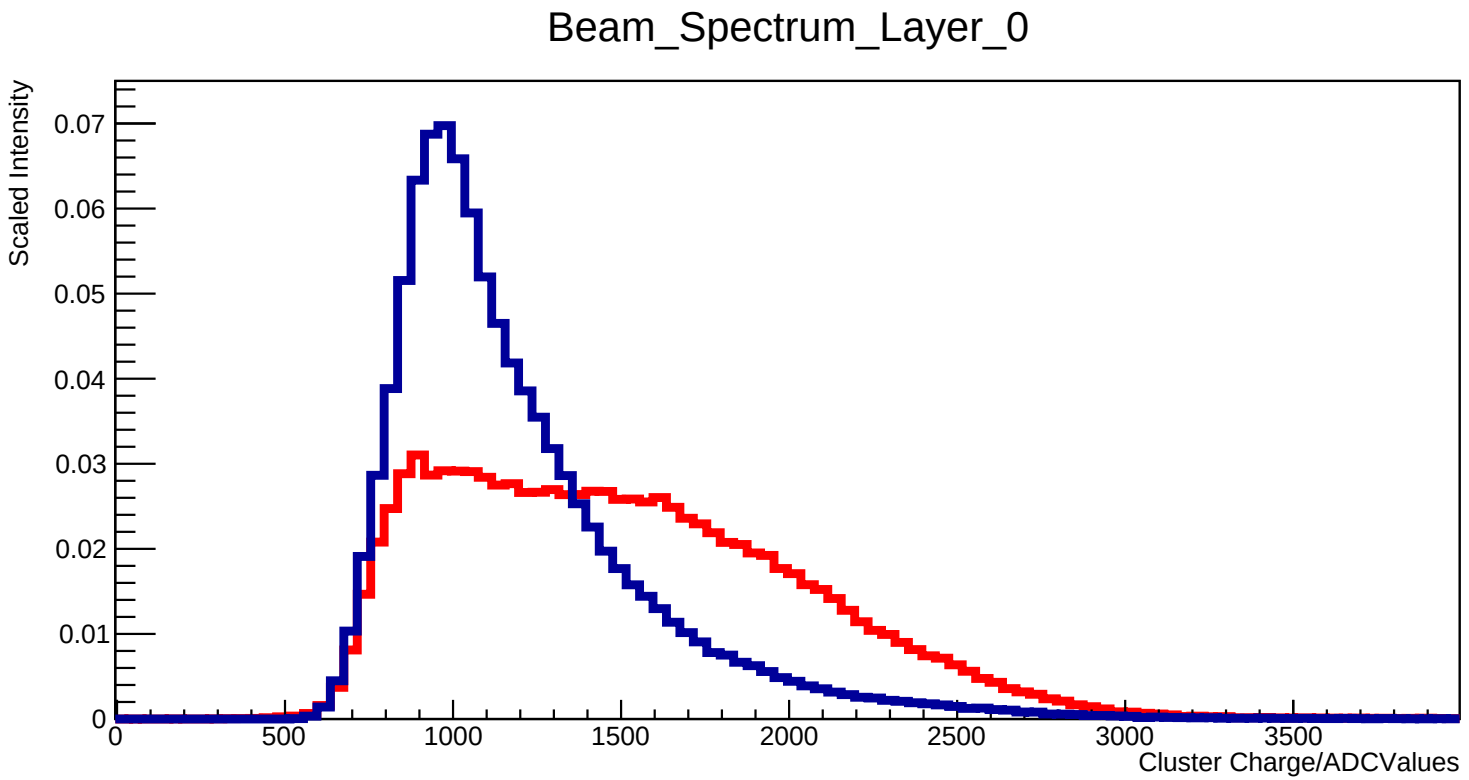


Figure: Blue: Without radiator, Red: With radiator

Summary

- Current status of In-Beam Test Analysis has been presented
- Data quality assurance tasks have been implemented and are in use
- Simple digitization and clusterization strategies are implemented and already in use for analysis
- TODO:
  - New Digitizer to deal with heavy load scenarios
  - New Clusterizer to limit fragmentation
  - Integration into the standard CBM-TRD Software