

First common beam test of the CBM STS, RICH and TRD subsystems at the CERN Proton Synchrotron

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A first common beam test of the CBM Transition Radiation Detector (TRD), Ring Imaging CHerenkov (RICH) and Silicon Tracking System (STS) subsystems was performed for one week at the CERN Proton Synchrotron in November 2010 [1]. The measurements were carried out at the T10 beamline in an electron/pion beam with momenta of 2 to 5 GeV/c. The beamline setup is presented in Fig. 1.

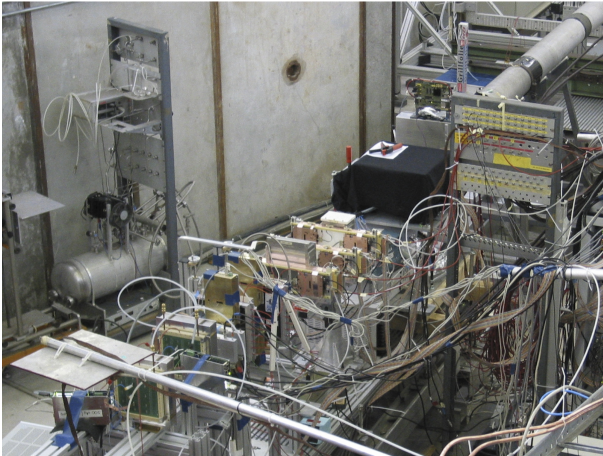
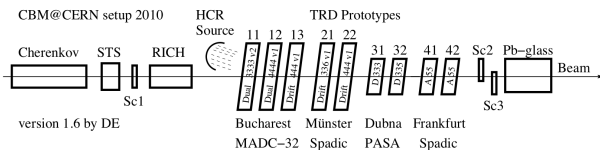


Figure 1: Setup of the prototypes along the T10 beamline

Upstream, at the beginning of the setup the STS station was mounted, followed by a RICH prototype, then came nine TRD prototypes from the four laboratories in Bucharest [2], Münster, Dubna and Frankfurt [3]. Besides the above mentioned prototypes, the setup comprised a Cherenkov detector and a Pb-glass calorimeter for e/π identification (see Fig. 2), as well as three beam trigger scintillators.

The STS station was commissioned in beam at CERN to prepare for the following December beam time at COSY. The RICH was based on a proximity focussing setup with a solid (plexiglass) radiator and four Hamamatsu MAPMTs allowing to reconstruct Cherenkov ring segments [4]. The readout of the STS and RICH subsystems was based on the nXYTER front-end, read out by the CBM readout controller (ROC).

For the TRD, various MWPC geometries were under test, and two complementary approaches for the signal

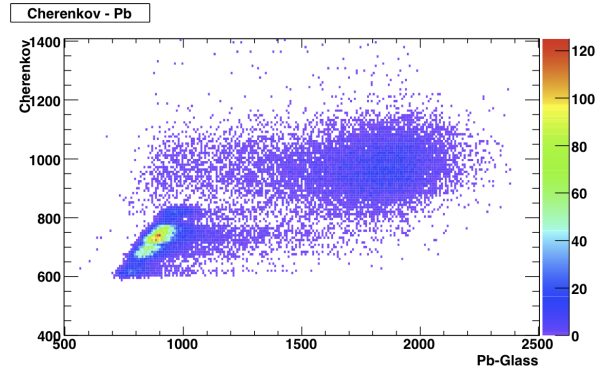


Figure 2: e/π separation for a run at 2 GeV/c

processing were investigated: The TRDs from Münster and Frankfurt were readout with the custom SPADIC [5], a self-triggered sampling ADC, while the detectors from Bucharest and Dubna used a VME-based peak sensing ADC. Part of the test program were high voltage scans, Ar-CO₂ and Xe-CO₂ gas mixtures, variation of the incident beam angle and momentum, and different versions of radiators.

A hybrid DABC/MBS setup was prepared allowing to read the beam monitoring detectors and all (self-)triggered prototypes in a common data acquisition system [6]. The analysis of the beam time data, e.g. pion efficiency and position resolution for the TRDs, is still ongoing.

In autumn 2011 the tests will be iterated with another common CBM beam time at the CERN PS/T9 beam line, giving access to higher momenta.

References

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