First pp collisions seen with the ALICE Time Projection Chamber

The ALICE TPC collaboration[1]

The ALICE Time Projection Chamber (TPC) is the central tracking detector of the CERN-LHC ALICE experiment [1]. First proton-proton collisions at $\sqrt{s}$=900 GeV/c were successfully recorded during the initial data taking campaign in December 2009. A typical example of tracks from a pp-event is shown in Fig. 1.

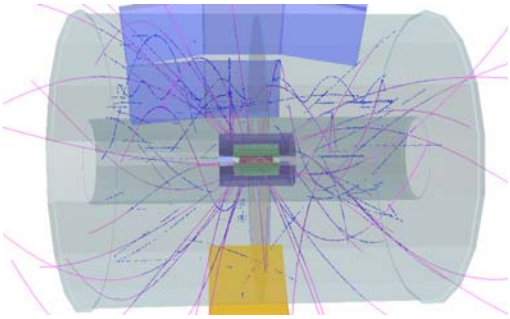

Figure 1: Clusters (blue dots) and reconstructed tracks (red lines) recorded by the TPC.

The commissioning and calibration of the TPC has been done with cosmic data, laser runs and radioactive krypton in 2008 and 2009 and is reported in detail elsewhere [2].

Collision Data

During the initial data-taking period the TPC trigger rate from the collisions of 4 on 4 counter-rotating proton bunches was up to 10 Hz. Each of the bunches containing initially up to 10^{11} protons. The trigger included both empty events and beam-gas interaction. The events size was in average of the order of 170kB owing to the excellent low noise behaviour of the TPC readout chain. The magnetic field was set to ±0.5 T and, for alignment purposes, to B=0 T.

To ensure immediate feedback on the data quality the raw data were immediately transferred to GSI, where they were reconstructed and analyzed using the entire GSI Tier 2 batch farm and the high-performance cluster with 2000 cores and 1 PB of storage on Lustre. Feedback on the detector performance was available within a few hours after the data had been recorded. All results were constantly communicated to the CERN detector control room. Thanks to the outstanding performance of the GSI computing infrastructure, the analysis chain was running uninterrupted during the complete data-taking period.

Result from Data Analyses

Fig.2 shows a dE/dx vs. momentum spectrum from pp collision at 900 GeV/c employing the calibration data from the cosmic and krypton runs. As can be seen the excellent particle separation anticipated from the cosmic runs is also manifest in the collision data, e.g., by the π/μ-separation visible at low momentum.

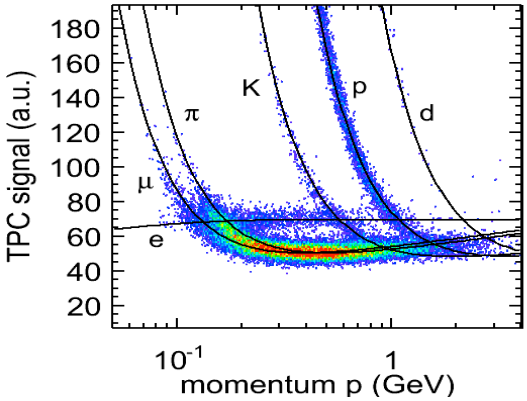

Figure 2: Particle identification the TPC.

This, together with precise tracking, readily allows reconstructing invariant mass spectra. As a further example of the TPC performance with data we show in Fig. 3 the K_0^S-invariant mass plot from the $\pi^+\pi^-$ V0 decays vertices. The narrow width and the perfect agreement with the PDG mass should be taken as certification of the readiness of the TPC for the upcoming pp and PbPb runs in 2010.

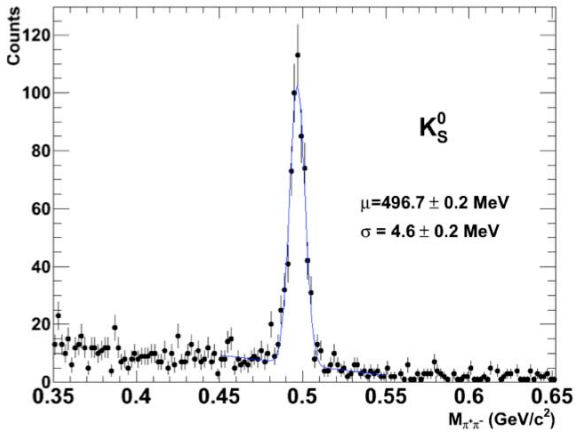

Figure 3: Reconstructed K_0^S from $\pi^+\pi^-$ V0 decays vertices.

References

[1] "The ALICE experiment at the CERN LHC", ALICE Collaboration, 2008, JINST 3 S08002

[2] "The ALICE TPC, a large 3-dimensional tracking device with fast readout for ultra-high multiplicity events", J. Alme *et al.*, 2010, e-Print: arXiv:1001.1950

[1] The list of members and institutions is available at http://www-alice.gsi.de/tpc